COMMONWEALTH OF KENTUCKY
BEFORE THE KENTUCKY STATE BOARD
ON ELECTRIC GENERATION AND TRANSMISSION SITING

IN THE MATTER OF THE APPLICATION OF BLUEBIRD SOLAR LLC FOR A CONSTRUCTION CERTIFICATE TO CONSTRUCT A MERCHANT ELECTRIC GENERATING FACILITY	)))	**Case No. 2021-00141**

BLUEBIRD SOLAR, LLC'S
RESPONSES TO SITING BOARD'S
SECOND REQUEST FOR INFORMATION
DATED MAY 6, 2022

Data Request SITING BOARD_2_1:

Refer to the Application, Site Assessment Report (SAR), Appendix D, Operation Noise Analysis Report on pages 1–2, Table 1 on page 4, Table 2 on page 5, Figure 2 on page 6, Table 3 on page 11, and Figure 5 on page 13. Pages one and two define noise measures. Each of the Tables and Figures list noise measures, not all of which appear to be consistent. Explain and provide updates that contain or indicate consistent noise measures.

Response:

- Table 1 on page 4 shows common, non-site specific, noise sources and associated noise levels, which provide relevant background information.

- Table 2 on page 5 displays noise level measurement data recorded at monitoring sites.

- Figure 2 on page 6 shows the same monitoring sites and measured noise levels as those in Table 2. The data from Table 2 and Figure 2 are the same, reflecting the same data set of existing noise levels.

- Table 3 on page 11 displays predicted operational noise levels specifically associated with the Bluebird Solar project, which the SoundPlan modeled at select receptor locations.

- Figure 5 on page 13 shows the same predicted operational noise levels on a contour map with 20 dBA and 30 dBA contour lines. The data from Table 3 and Figure 5 identical as they reflect the same data set: predicted noise levels. The predicted noise levels are lower than the existing noise levels as they only account for predicted noise from the solar project and do not include ambient or existing noise levels.

In sum, these tables and figures provide background information (Table 1), existing noise measurement data (Table 2 and Figure 2), and predicted noise levels during project operation (Table 3 and Figure 5). These three sets of noise information are not readily comparable.

Witness: David Shu

Data Request SITING BOARD_2_2:

Refer to Bluebird Solar's response to the Siting Board's First Request for Information (Siting Board's First Request), Item 14a. The Construction Noise Analysis Report was not included with either the Application or the response. Provide a copy of the report.

Response: See attached Construction Noise Analysis Report: "Construction Noise Analysis Report, July 12, 2021,"_BSLLC_R_SITING_BOARD_2_2_Attachment.

Witness: David Shu

BLUEBIRD SOLAR PROJECT

CONSTRUCTION NOISE ANALYSIS REPORT

Prepared for
BayWa r.e. Solar Projects LLC
18575 Jamboree Road, Suite 850
Irvine, CA 92612

Prepared by
AZTEC Engineering
501 N 44th Street, Suite 300
Phoenix, AZ 85008

July 12, 2021

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APPENDICES

1.0 INTRODUCTION

The Bluebird Solar project is located in Harrison County, approximately one mile east of Leesburg, KY. The majority of the project sits between Highways 62 and 353, with a portion of the project located to the east of Highway 353. The project's southern border is 0.5 mile north of the Harrison County southern boundary line. Figure 1 depicts the project location.

The Bluebird Solar project is a 90 to 100 MWac PV solar farm. The buildable area, of approximately 1000 acres which will be permitted, includes discrete fenced areas of solar panels, laydown areas, landscaping, internal access roads, a project substation, and a utility switchyard. Battery storage is not included. To evaluate the existing and the proposed construction noise impacts from the project to nearby sensitive receptors, AZTEC Engineering was contracted by BayWa to conduct a construction noise impact analysis. This construction noise analysis report was prepared to document the existing noise levels surrounding the project area, predict construction noise levels at sensitive receptors, and determine the construction noise impact.

2.0 NOISE BACKGROUND INFORMATION

Sound is a form of energy that is transmitted by pressure variations that the human ear can detect. Sound levels are expressed in units of decibels (dB). Sound frequency is expressed in units of hertz (Hz). A normal human ear is able to hear sound with frequencies from 20 Hz to 20,000 Hz. Because the human ear does not equally perceive all sound frequencies, people perceive sound in the middle frequency better than sound in the low and high frequencies. As a result, sound levels in some frequency bands are adjusted or weighted to the frequency response of human hearing and the human perception of loudness. The "A"-weighted sound in decibels, or dBA, most closely represents the range of human hearing.

Noise is often called unwanted sound. Each individual perceives noise level changes differently. Generally, a 3 dBA noise change is the smallest change that can be detected by the human ear. A 5 dBA noise change is readily perceivable by most people. An increase of 10 dBA is normally perceived as a doubling of noise loudness. Typical sound levels experienced by people range from the 30s dBA, such as a quiet living room at night, to the 80s dBA, such as a sidewalk adjacent to heavy traffic. Noise levels related to point sources such as pump motors decrease rapidly with a 6 dBA reduction when doubling the distance. Noise levels related to linear sources such as traffic on roadways decrease less rapidly ─ 3 dBA when doubling the distance. Table 1 shows noise levels associated with common sources.

Noise varies in frequency, and its intensity fluctuates over time. Therefore, the A-weighted equivalent steady-state noise level ─ expressed as "L_{Aeq}" ─ is used to represent a single number to describe varying noise levels over a specified period. Another metric used in determining the impact of environmental noise is the differences in response that people have to daytime and nighttime noise levels. During the evening and at night, exterior background noises generally are lower than daytime levels. However, most household noise also decreases at night, and exterior noise becomes more noticeable. Furthermore, most people sleep at night and are sensitive to intrusive noises. The L_{dn} is a noise metric that accounts for the greater annoyance of noise during the nighttime hours (10:00 p.m. to 7:00 a.m.).

Figure 1. Vicinity Map

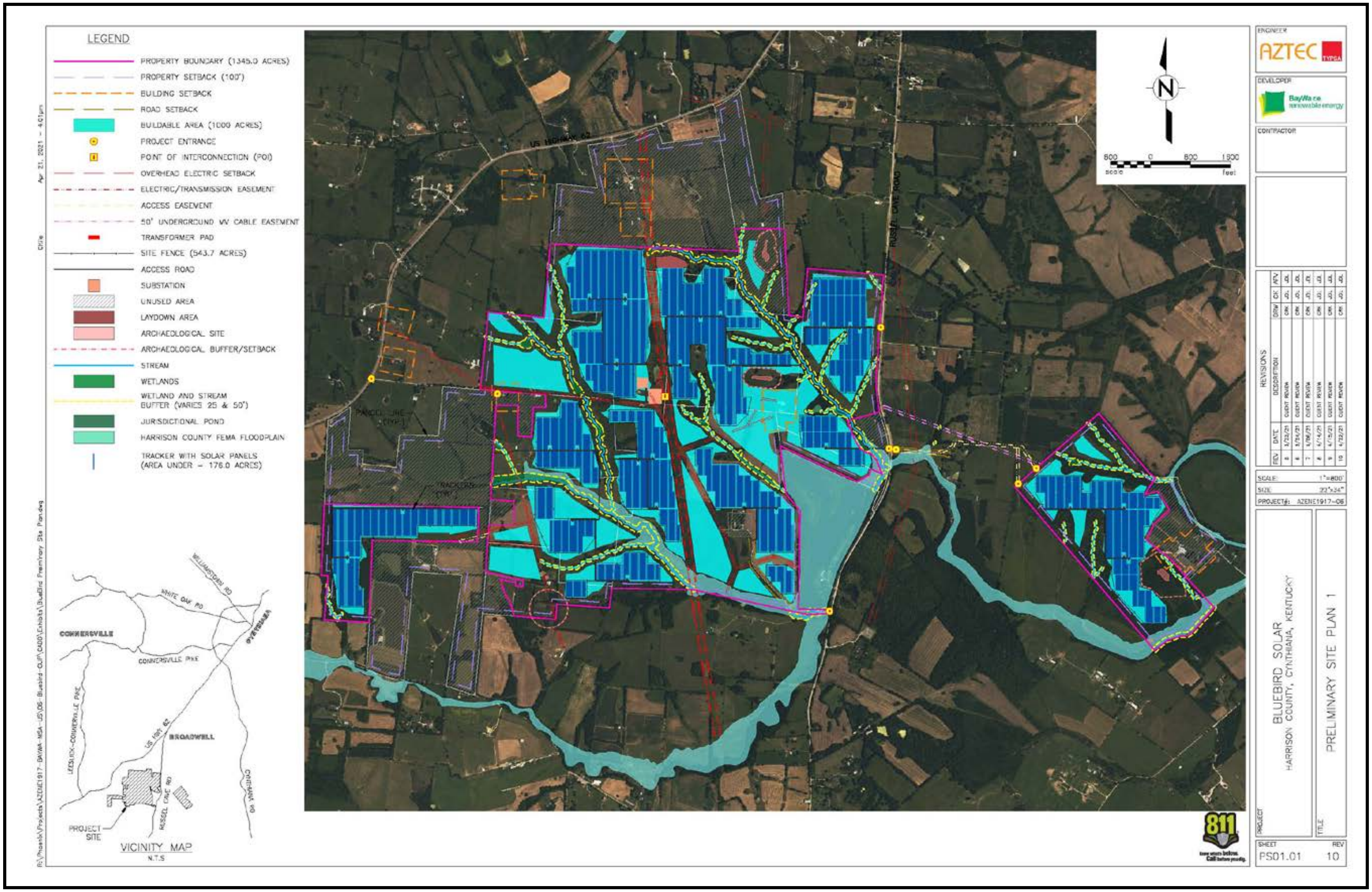


TABLE 1 COMMON NOISE SOURCES AND LEVELS	
Sound Pressure Level (dBA)	**Typical Sources**
120	Jet aircraft takeoff at 100 feet
110	Same aircraft at 400 feet
90	Motorcycle at 25 feet
80	Garbage disposal
70	City street corner
60	Conversational speech
50	Typical office
40	Living room (without TV)
30	Quiet bedroom at night
Source: *Environmental Impact Analysis Handbook* (Rau and Wooten 1980)	

3.0 ENVIRONMENTAL SETTING

3.1 Land Uses and Noise Sensitive Receptors

Noise-sensitive receptors generally are defined as locations where people reside or where the presence of unwanted sound may adversely affect the existing land use. Typically, noise-sensitive land uses include residences, hospitals, places of worship, libraries, performance spaces, offices, and schools, as well as nature and wildlife preserves, recreational areas, and parks.

The project is located in a rural area. Existing land use within the project site is primarily agricultural. Ambient noise is mainly from traffic on Highways 62 and 353 for those sensitive receptors with close proximity. For other sensitive receptors further away from the roadways, ambient noise is composed of farm equipment (e.g., tractors) used to grow and harvest crops and to raise cattle and other farm animals. No commercial or industrial sources were identified in the analysis area.

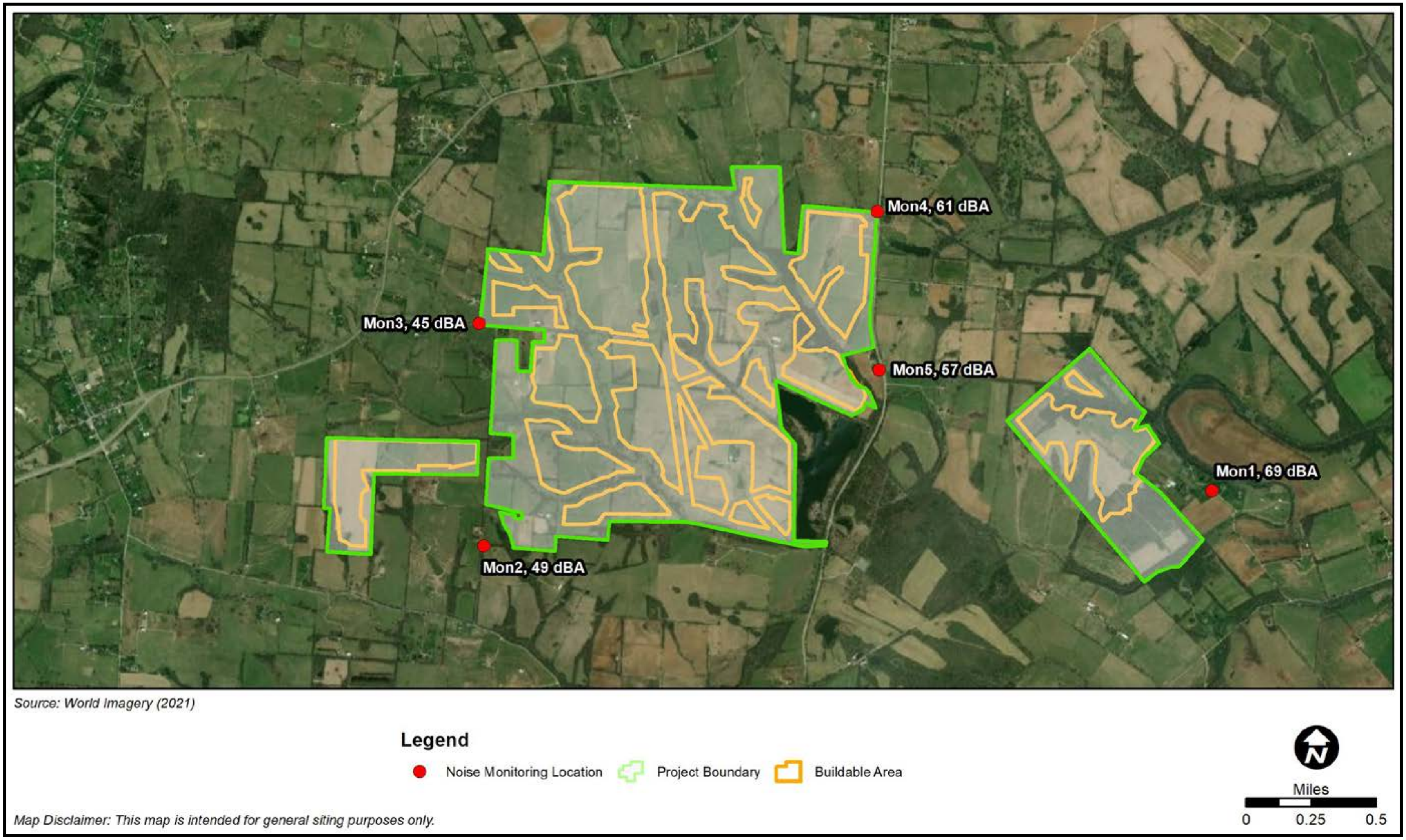
3.2 Existing Noise Conditions

Noise monitoring was conducted at 5 different sites outside the project boundary to document existing noise conditions on April 12, 2021. Each site was monitored for 15 minutes. Weather conditions (temperature, relative humidity, wind speed and direction, and sky condition) were documented. The Larson Davis System 824 with sound level meter and real-time analyzer, which complies with American National Standards Institute (ANSI) S1.4 and Type I Standards, was used to collect the sound. The monitoring results are summarized in Table 2 and Figure 2.

TABLE 2 NOISE LEVEL MEASUREMENTS SUMMARY			
Monitor Number (MON)	**Address/Description**	**Day/ Time**	**Monitoring Result L_{Aeq}, dBA**
1	Property owner driveway approximately 3 feet west of Lail Ln	April 12/ 2:28-2:43 PM	69
2	Road ROW approximately 10 feet east of Allen Pike	April 12/ 12:24-12:39 PM	49
3	Road ROW approximately 12 feet north of Allen Pike	April 12/ 11:42-11:47 AM	45
4	Road ROW approximately 15 feet west of Russel Cave Rd/KY-353	April 12/ 1:37 -1:52 PM	61
5	Property owner driveway approximately 30 feet west of Russel Cave Rd/KY-353	April 12/ 1:01-1:16 PM	57

The monitored noise levels represent the existing baseline noise condition within and adjacent to the project area during daytime hours. The average ambient noise levels from the measurements ranged from 45 dBA to 69 dBA. The lowest monitored noise level was recorded from site MON-3 on the west side of the project boundary approximately 12 feet north of Allen Pike. The highest monitored noise level was recorded from site MON-1 on a private driveway west of Lail Ln. Detailed noise level monitoring information is located in Appendix A of this report.

Figure 2. Noise Monitoring Results



4.0 REGULATORY SETTING

No local, county, or state construction thresholds were identified. Below are some references from other agencies in the US regarding the construction noise criteria.

- The Federal Transit Administration (FTA) published *Transit Noise and Vibration Impact Assessment Manual* in September 2018. The report specifies a construction noise limit of 80 dBA in daytime and 70 dBA at night for residential land use.
- County of Imperial's Noise Element of the General Plan in California specifies construction noise from a single piece of equipment or a combination of equipment, shall not exceed 75 dB L_{eq}, when averaged over an eight (8) hour period, and measured at the nearest sensitive receptor.
- Department of Health & Human Services in City of Berkeley, California mandates daily maximum sound levels for mobile equipment during construction shall not exceed 75 dBA.

Based on above references, a L_{Aeq} of 75 dBA is used to determine if the project would adversely affect public health and welfare during construction phase.

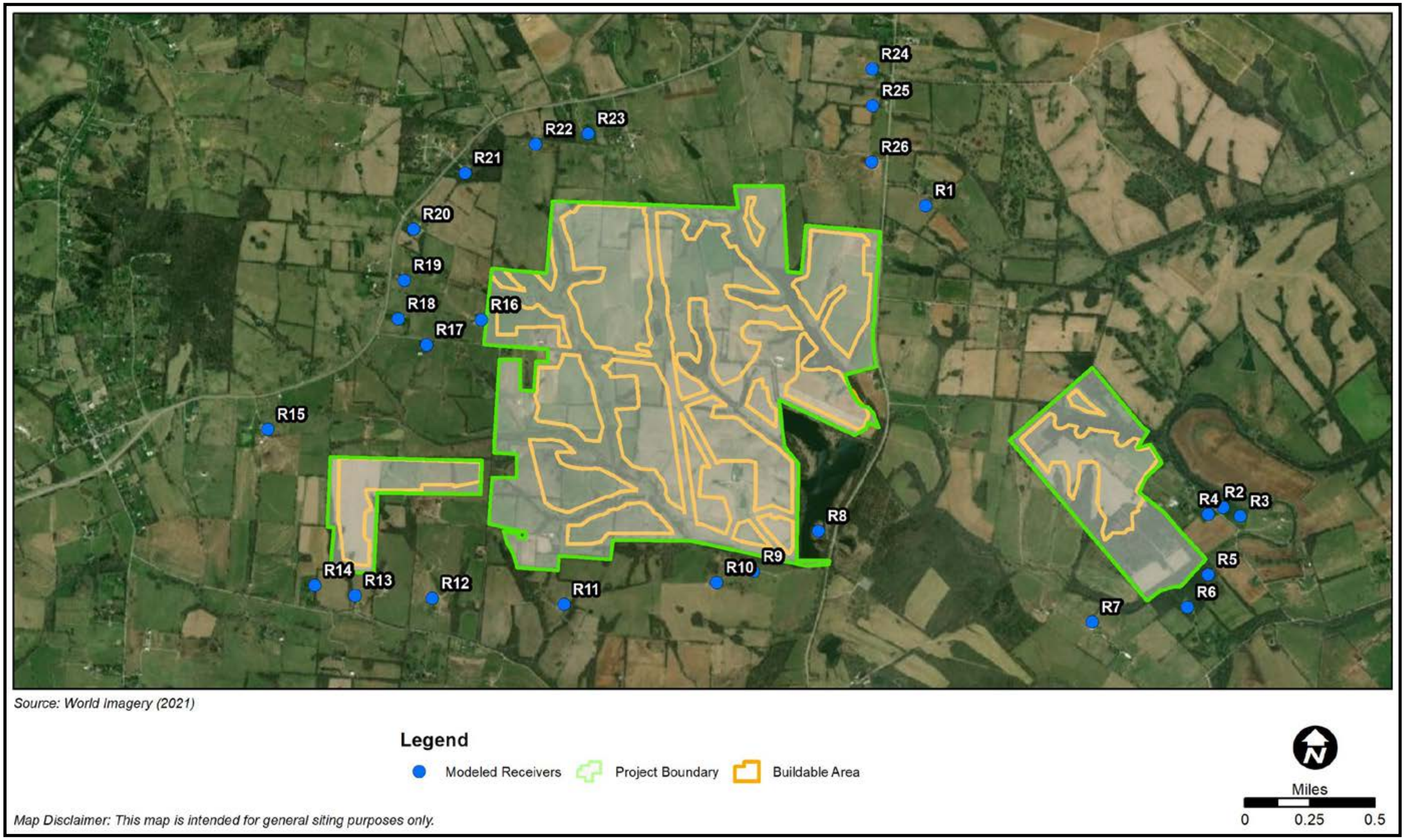
5.0 IMPACT ANALYSIS

Potential noise sensitive receptors were selected for noise modeling with up to 3,000-foot buffer from the project boundary. High resolution aerial photography, Google street view photos, and proposed site layouts were analyzed using Google Earth Pro to determine the presence of potential noise sensitive receptors. The selected receptors are all dwelling units. No schools, childcare centers, outdoor recreation, medical centers or other types of noise sensitive receptors were observed. Figure 3 shows the selected receptors to be modeled as noise receivers in the noise model. Table 3 below shows the distance from project boundary to noise receivers.

TABLE 3
Approximate Distance from Project Boundary to Noise Receivers

Receiver ID	Distance (feet)	Receiver ID	Distance (feet)
R1	1,065	R14	420
R2	970	R15	1,385
R3	1,105	R16	95
R4	650	R17	1,150
R5	250	R18	1,775
R6	450	R19	1,735
R7	1,130	R20	1,765
R8	430	R21	1,870
R9	335	R22	1,205
R10	730	R23	1,415
R11	700	R24	3,000
R12	1,280	R25	2,450
R13	470	R26	1,385

Figure 3. Modeled Noise Receivers



The SoundPLAN® computer noise model was used for computing noise levels from the proposed construction noise from equipment under worst case scenario. An industry standard, SoundPLAN® was developed by Braunstein + Berndt GmbH to provide estimates of sound levels at distances from specific noise sources taking into account the effects of terrain features including relative elevations of noise sources, receivers, and intervening objects (buildings, hills, trees), and ground effects due to areas of hard ground (pavement, water) and soft ground (grass, field, forest). In addition to computing sound levels at specific receiver positions, SoundPLAN® can produce noise contour graphics that show areas of equal and similar sound level.

Analysis Methodology

The sound propagation model within SoundPLAN® that was used for this study was ISO 9613-2 This international standard propagation model is used nearly universally in the U.S. for environmental noise studies, due to its conservative propagation equations. ISO 9613-2 uses “worst-case” downwind propagation conditions in all directions, and accounts for variations in terrain and the effects of ground type.

The equivalent sound pressure level at the receiver, in downwind conditions, is calculated for each point source based on the formula below.

$$L_{eq} = L_w + D_c - A$$

Where:

L_{eq} is the equivalent sound pressure level at the receiver, in downwind conditions,

L_w is the sound power level by the point source,

D_c is the directivity correction that describes the deviation of the sound pressure level in a specific direction from the sound power level,

A is the attenuation of the sound propagation. It is a sum of the attenuation due to the geometrical divergence, the ground effect, the atmospheric absorption, the barriers, and miscellaneous other effects.

Geometrical divergence refers to the decline in noise level that occurs in association with increased distance from the receptor. Sounds generated from a point source typically attenuate or decrease at a rate of 6 dBA for each doubling of distance. For example, a noise level of 80 dBA measured at a distance of 5 feet from the noise source would be reduced to 74 dBA at 10 feet from the source and be further reduced to 32 dBA at 1280 feet.

The propagation of noise is also affected by the intervening ground, known as ground effect. A hard site (such as parking lots or smooth bodies of water) receives no additional ground attenuation, and the changes in noise levels with distance are simply the geometric spreading from the source, which equates to 6 dBA per doubling distance. A soft site (such as soft dirt, grass, or scattered bushes and trees) provides an additional ground attenuation value of 1.5 dBA per doubling of distance. Thus, a point source over a soft site would drop off at generally 7.5 dBA per doubling of distance. The 7.5 dBA drop off rate is just a rule of thumb for quick noise level estimation. SoundPLAN uses complex formula based on ground absorption coefficient and other factors such as terrain change to calculate noise levels at the receivers. SoundPLAN does not use 7.5 dBA drop off rate directly in the model.

The sound attenuation due to atmospheric absorption is calculated based on the atmospheric absorption coefficient (α). The absorption coefficient is calculated according to the ISO 9613-1 “Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere”. It is dependent on the frequency, air pressure, temperature, and relative humidity.

Construction Schedule and Equipment

Table 4 below shows a typical 80 MW 13-month example construction schedule. Construction of the facility is expected to commence in September/October of 2022 and be completed in December of 2023/January of 2024. The noisiest phase of construction is anticipated to be the system installation phase due to pile driver use. Construction work is expected to progress across the site such that equipment and activities would only be in a single area for a short period of time. Given this, the potential for adverse impacts at any one receptor is expected to only occur for a short period of time.

TABLE 4
Construction Phase Breakdown Including Duration and Equipment Inventory

Activity	Duration	Equipment	Quantity
Perimeter fence installation	1.5 months	Front-end loader with auger	1
		Pick-up truck	1
		Flatbed truck	1
Site preparation and clearing/grading	2 months	Water truck -3 axles	3
		Grader	2
		Bulldozer	1
		Scraper	1
		10-ton roller	1
		Sheepsfoot roller	1
		Tractor (with mower attachment)	1
Underground work (trenching)	4 months	Excavator	2
		Sheepsfoot roller	1
		Water truck – 3 axles	1
		5 kW generator	1
		Soil mix rig	1
		4x4 forklift	1
System installation	4.5 months	4x4 forklift	8
		Small crane (80 ton)	1
		Pile driver	4
		Pick-up truck	4
		5 kW generator	2
Testing & commissioning, Site cleanup & restoration	1 month	Pick-up truck	4
		Grader	1
		Front-End loader	1

Table 5 shows the construction equipment type that would be used and their typical maximum noise levels at 50 feet.

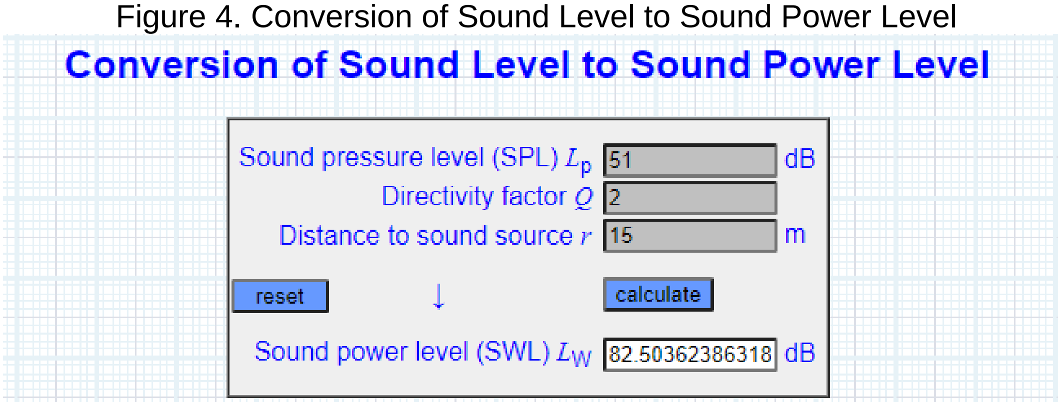
TABLE 5
Equipment Noise Emission Reference Levels and Usage Factors

Equipment Type	Use Factor (%)	Typical Maximum Noise Levels at 50 feet (dBA)
Backhoe	40	80
Crane	16	85
Dozer	40	85
Excavator	40	85
Flat Bed Truck	40	84
Forklift	40	80
Front End Loader	40	80
Generator	50	82
Grader	40	85
Pickup Truck	40	55
Pile Driver	20	95
Roller	20	85
Scraper	40	85
Soil Mix Drill Rig	50	80
Tractor	40	84
Water Truck	40	80

Note:
a. use factor is the ratio of the time that a piece of equipment is in use to the total time that it could be in use.
Source: FHWA Roadway Construction Noise Model User's Guide, Final Report, January 2006

Roadway Construction Noise Model (RCNM) was used to convert equipment maximum noise level to average noise level using its use factor. For example, the maximum noise level of a pickup truck is 55 dBA at 50 feet; this would translate to an average noise level of 51 dBA at 50 feet with use factor of 40%. Then the average noise level L_{eq} of the equipment was converted to sound power level as an input to SoundPLAN model, see conversion example in figure 4 below. Sound power level is the acoustic energy emitted by a source which produces a sound pressure level at some distance. While the sound power level of a source is fixed (similar to the concept of power in watts for a light bulb), the sound pressure level depends upon the distance from the source and the acoustic characteristics of the area in which it is located. Sound power level of each point source is the input to SoundPLAN.

Figure 4. Conversion of Sound Level to Sound Power Level



Source: www.sengpielaudio.com/calculator-soundpower.htm

In total five worst case construction scenarios were modeled in five different construction zones that are closest to the sensitive receptors. In each scenario, it was assumed all construction equipment during the system installation phase (noisiest phase) would work simultaneously in one construction zone.

The following data was used as input into the model.

- For worst case consideration, a combined sound power level of 132 dBA was assumed for all equipment used in System Installation Phase in one construction zone. An area source with source height of 5 feet was assumed in the model.
- A total of 26 receivers was modeled to represent sensitive noise receptors. The source height was assumed to be 5 feet.
- Topo contour lines were inputted into the model to consider terrain variation.
- Ground surface was assumed to be soft ground.

Table 6 shows the predicted project construction noise levels in hourly L_{Aeq} for all selected receivers under the worst case scenario. Figures 4 through 8 show construction noise contours of 60 dBA and 70 dBA L_{Aeq} generated by the noise models at five different sites. As can be seen from Table 6 below, predicted construction noise levels are below 75 dBA L_{Aeq} at all sensitive receivers. Because the predicted construction noise levels at System Installation would be the noisiest, it can be inferred that predicted construction noise levels in other construction phases would be lower. The proposed project construction will comply with the proposed noise criteria of 75 dBA L_{Aeq} as identified in Section 4.

The ambient noise levels monitored ranged from 45 to 69 dBA. The project-generated construction noise levels ranged from 53 to 72 dBA and could be noticeable to the nearby sensitive receptors.

To further reduce noise concerns, it is recommended that at least 30 days but no more than 45 days prior to the start of construction activities, all property owners and occupants within 500 feet of the Project Site shall be notified of the pending work. The notification shall include the construction start date, days and hours of work, and estimated completion date. The notification shall also state that the project will include typical and sometimes loud noise and provide mobile phone and email contact information.

No future construction noise mitigation is needed for the project.

TABLE 6
Predicted system Installation Construction Noise Levels (L_{Aeq}, dBA)

Receiver ID	Site 1 (Hines & Reed)	Site 2 (Wilson)	Site 3 (Bradford)	Site 4 (Whalen)	Site 5 (McDaniel)
R1	---	---	---	---	62.4
R2	62.4	---	---	---	---
R3	60.8	---	---	---	---
R4	63.6	---	---	---	---
R5	60.9	---	---	---	---
R6	59.9	---	---	---	---
R7	59.8	---	---	---	---
R8	---	---	72.1	---	---
R9	---	---	69.4	---	---
R10	---	---	64.5	---	---
R11	---	54.5	---	---	---
R12	---	63.0	---	---	---
R13	---	69.3	---	---	---
R14	---	68.1	---	---	---
R15	---	59.0	---	---	---
R16	---	---	---	62.5	---
R17	---	---	---	59.1	---
R18	---	---	---	56.8	---
R19	---	---	---	56.2	---
R20	---	---	---	55.0	---
R21	---	---	---	54.2	---
R22	---	---	---	53.9	---
R23	---	---	---	53.4	---
R24	---	---	---	---	55.9
R25	---	---	---	---	58.1
R26	---	---	---	---	62.5

Figure 4. Construction Noise Contour Map at Site 1 (Hines & Reed site)

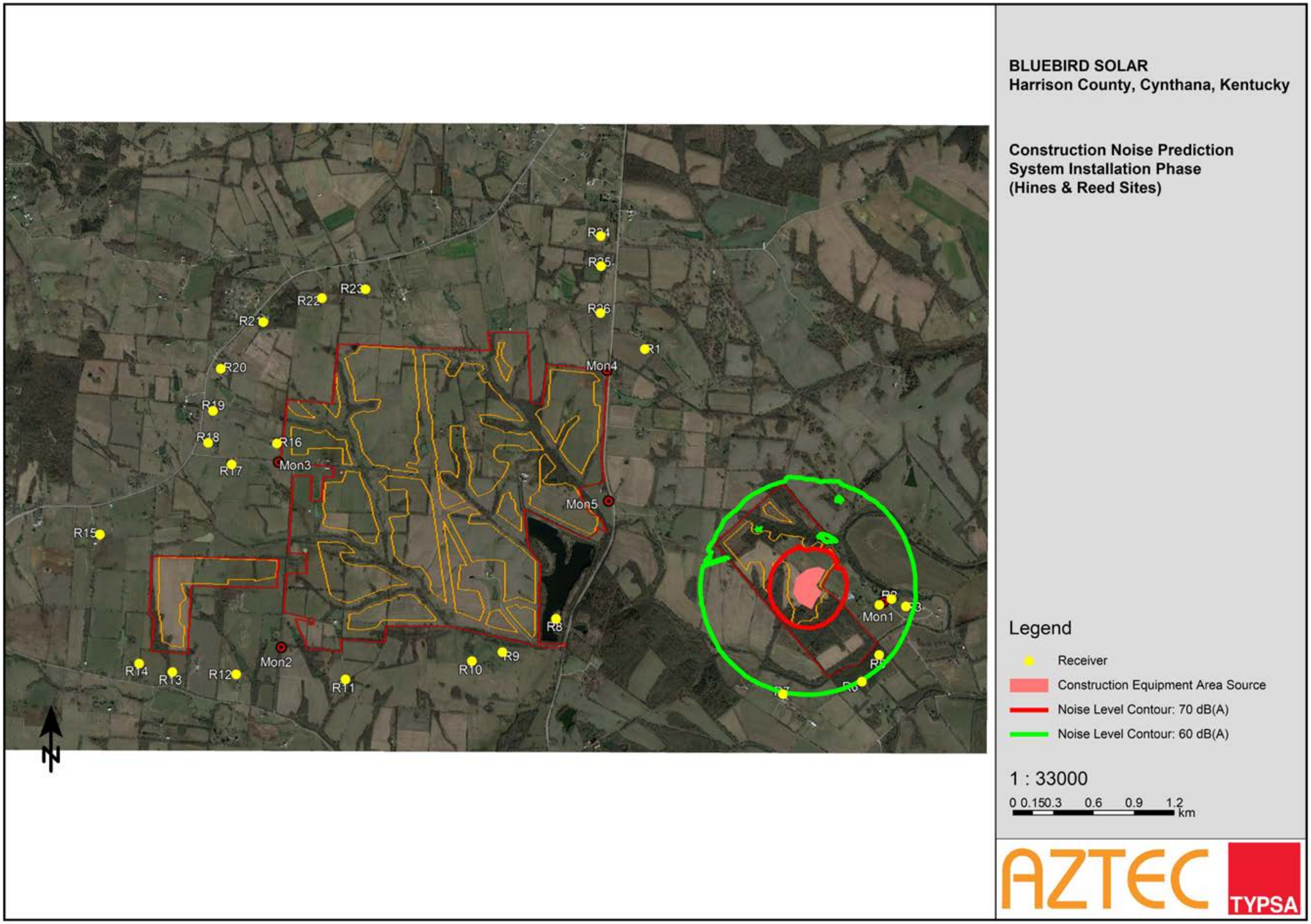


Figure 5. Construction Noise Contour Map at Site 2 (Wilson site)

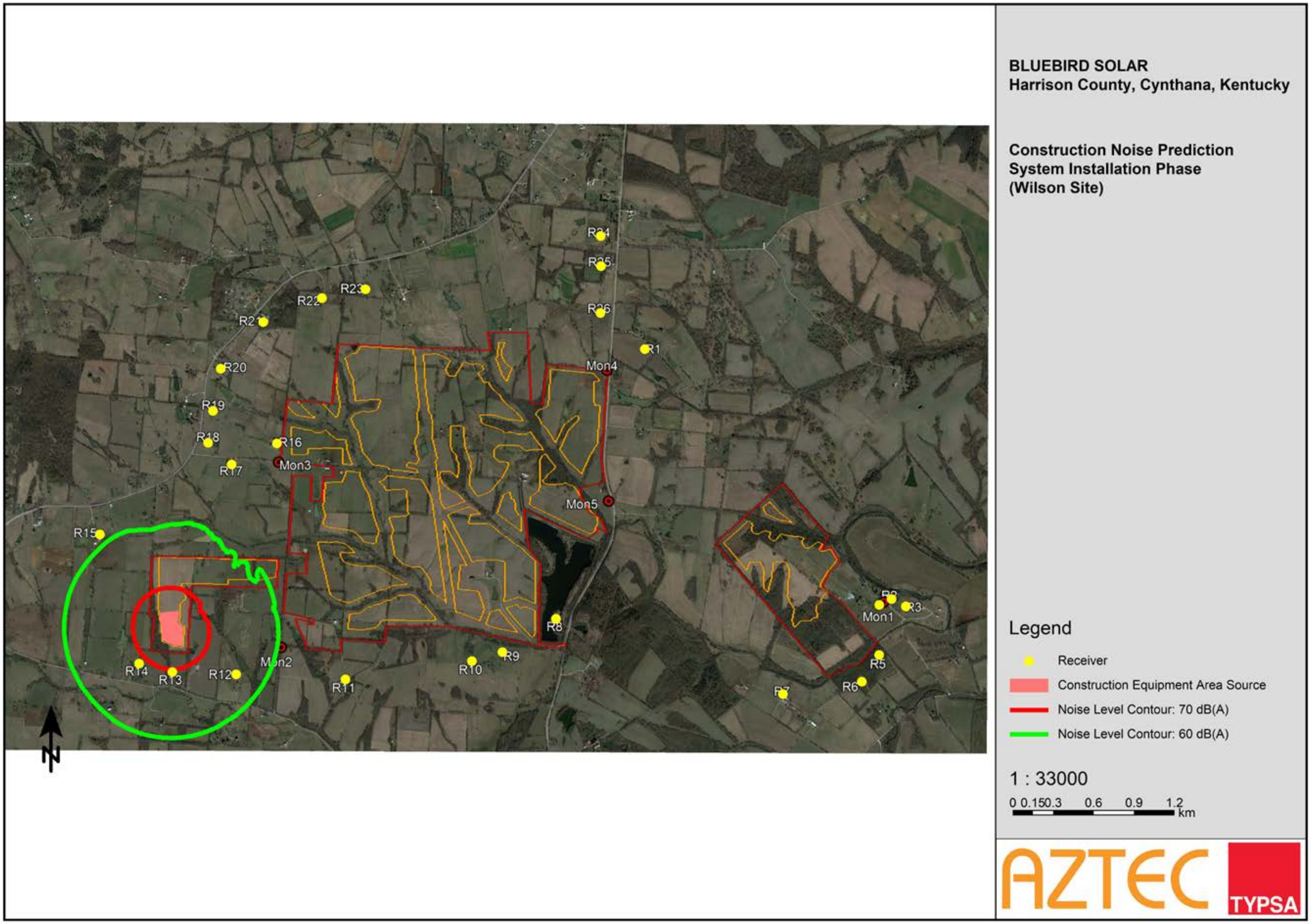


Figure 6. Construction Noise Contour Map at Site 3 (Bradford site)

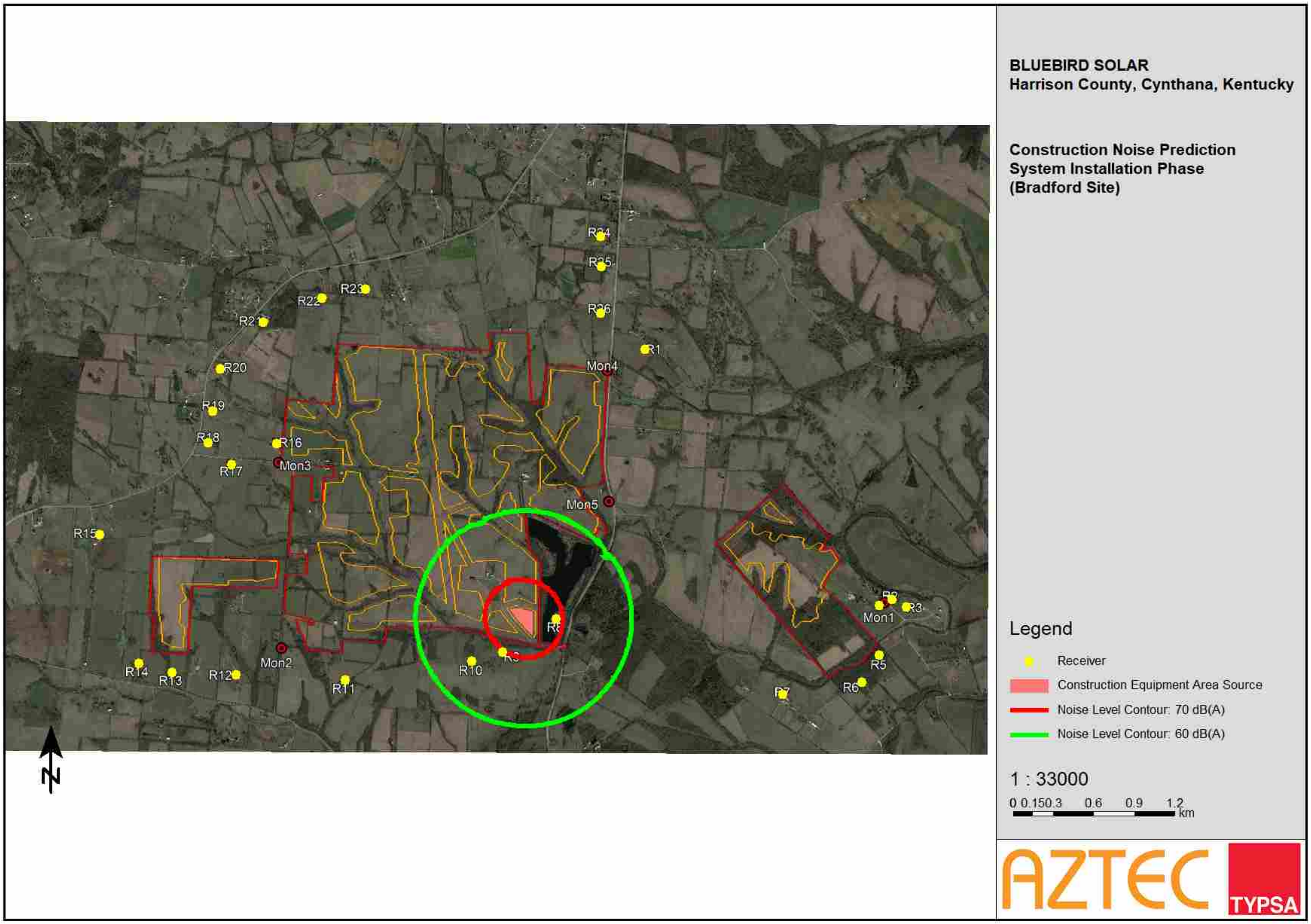


Figure 7. Construction Noise Contour Map at Site 4 (Whalen site)

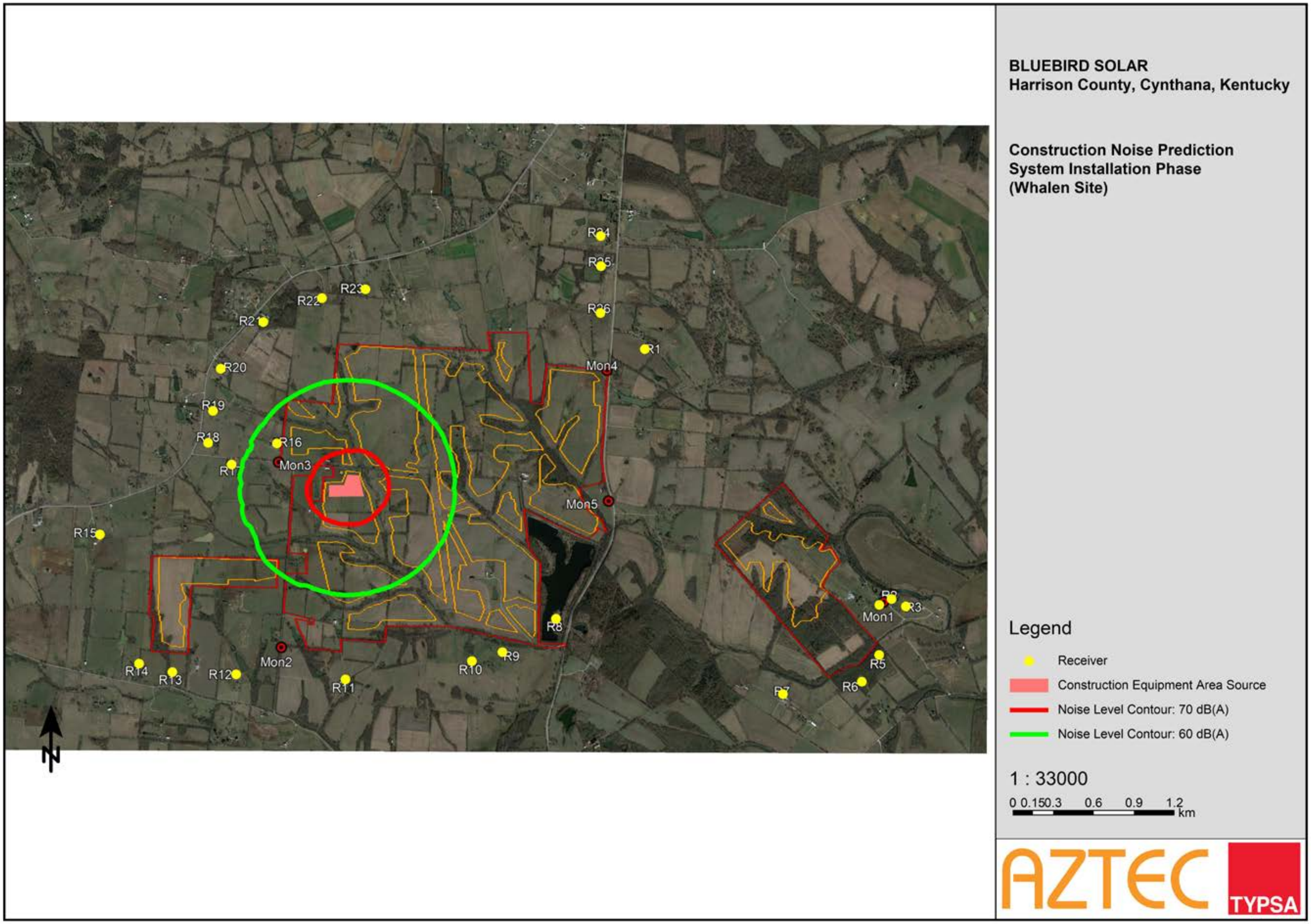
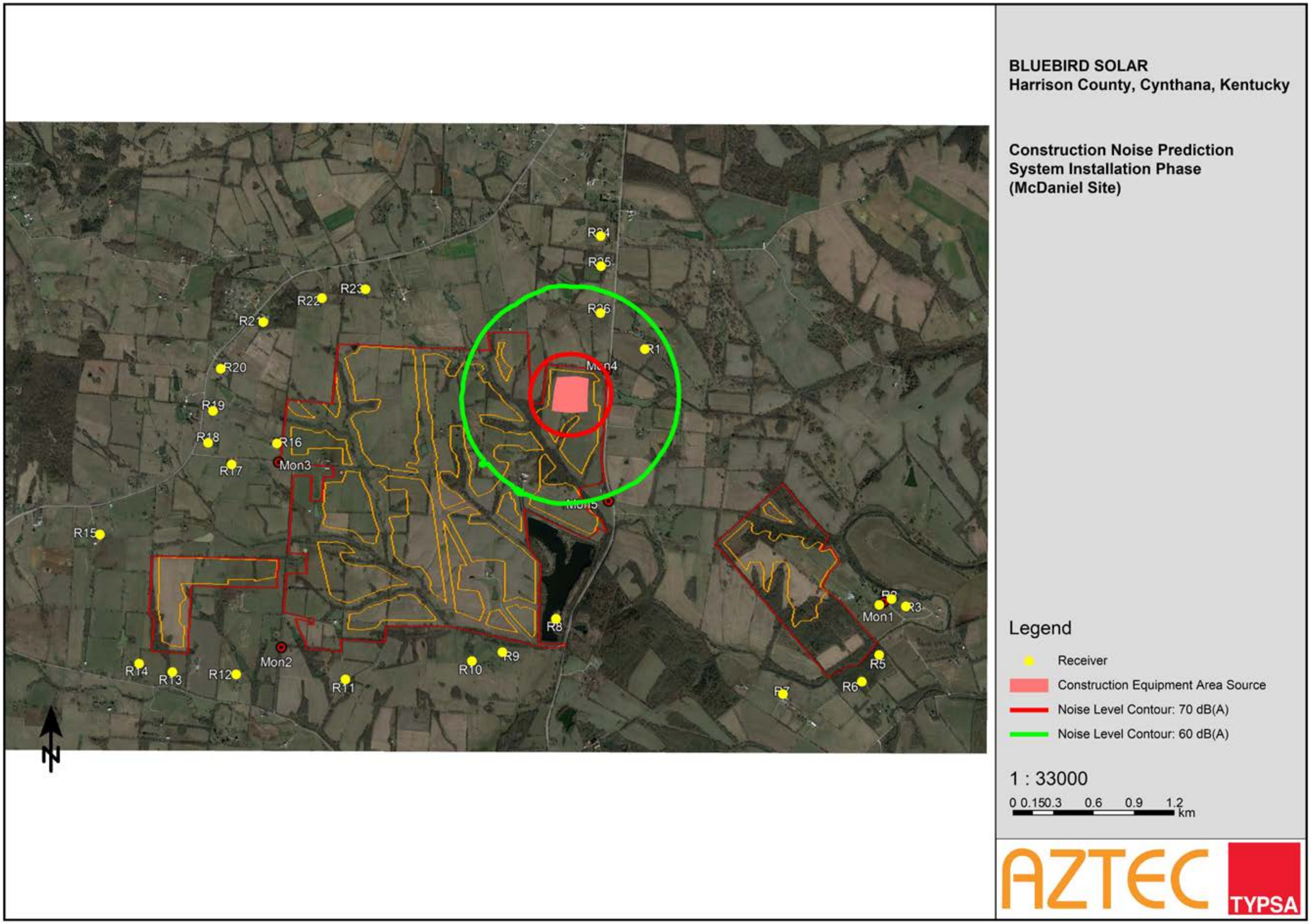


Figure 8. Construction Noise Contour Map at Site 5 (McDaniel site)



Conclusion

Based on background noise monitoring and noise analysis for the project construction, it is expected that the project construction generated noise from equipment would range from 53 to 72 dBA L_{Aeq} at the sensitive receptors, which are above ambient noise levels and could be noticeable to the sensitive receptors for a short period of time. The proposed project construction will comply with the proposed noise criteria of 75 dBA L_{Aeq}.

REFERENCE

Code of Federal Regulations, Title 24. Part 51.103, Revised April 1, 2005

John G. Rau and David C. Wooten, *Environmental Impact Analysis Handbook*, 1980

Environmental Protection Authority, *Environmental Criteria for Road Traffic Noise*, 1999

Ldn Consulting Inc, *Noise Assessment Centinela Solar Energy Project County of Imperial*, September 6, 2011

Stantec Consulting Services, Inc, *Noise Assessment Ashwood 86MW Solar Facility*, December 11, 2020

APPENDIX A

Noise Level Monitoring Results

AZTEC TYPSA
501 N 44th St, Suite 300
Phoenix, AZ 85008
Tel: (602) 454-0402
Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Project Number/Name: BLUEBIRD SOLAR PROJECT **Date:** 4/12/2021

Site Number/Description: MON 1, (Lat/Long: 33.290644, -84.339009)

Property owner driveway approximately 3 feet west of Lail Ln

Prepared by/Crew: Brynne Taylor

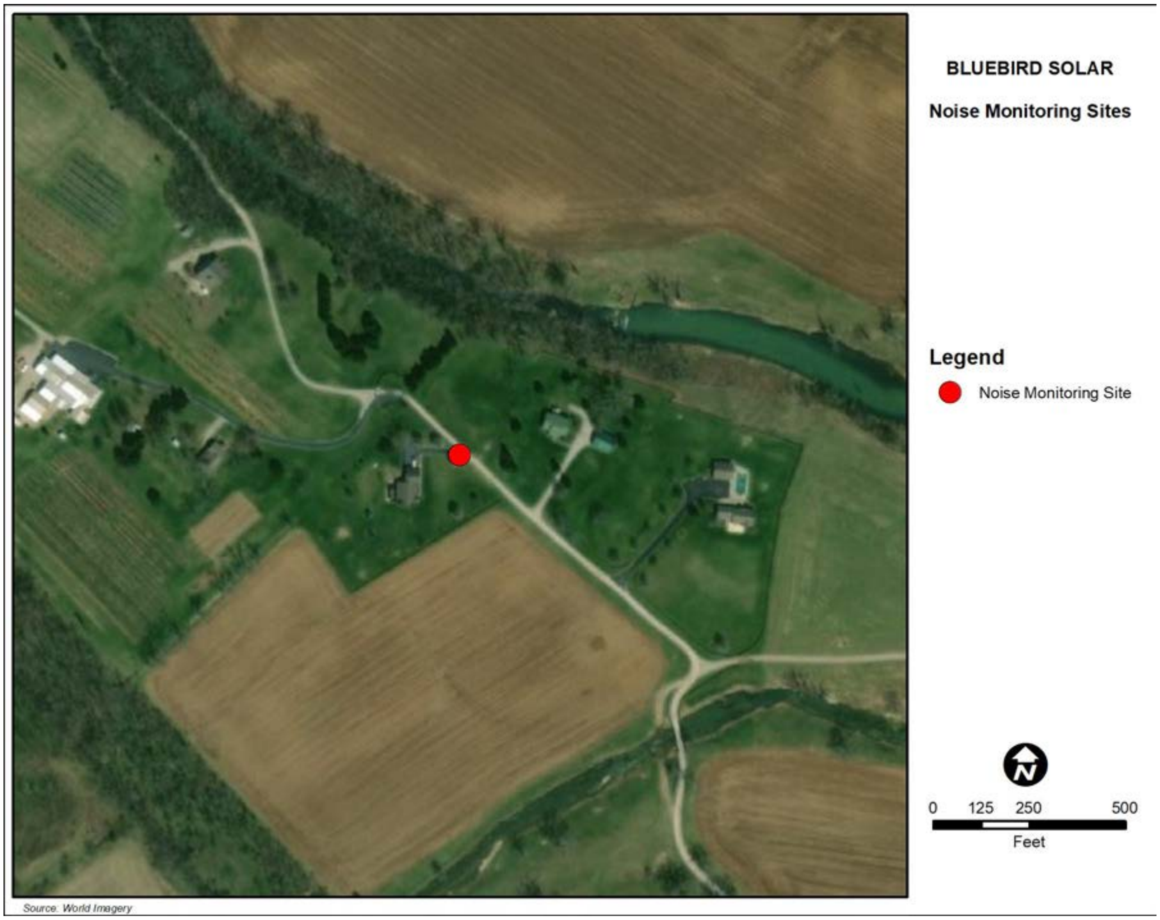
Temperature: 65 °F **Relative Humidity:** 67 % **Wind & Direction:** 7.2 mph/W **Sky:** Partly Sunny

SLM Make/Model: LDL 824 **Calibration Make/Model:** LDL CA 200 @ 114.00 dB

Calibration: ☒

Posted Speed Limit (mph): 15

Observed Speed (mph): N/A



Sample	Time		Sound Level, dBA			Traffic Count		
	Start	Duration	L_{MIN}	L_{EQ}	L_{MAX}	Auto	Med. Trk.	Hvy. Trk.
1	2:28 PM	15 mins	38.6	69.1	94.8	---	---	---

Several dogs barking and lawn mowers cutting grass on nearby properties while monitoring.

AZTEC TYPSA
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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 1. Looking northwest

Figure 2. Looking northeast

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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

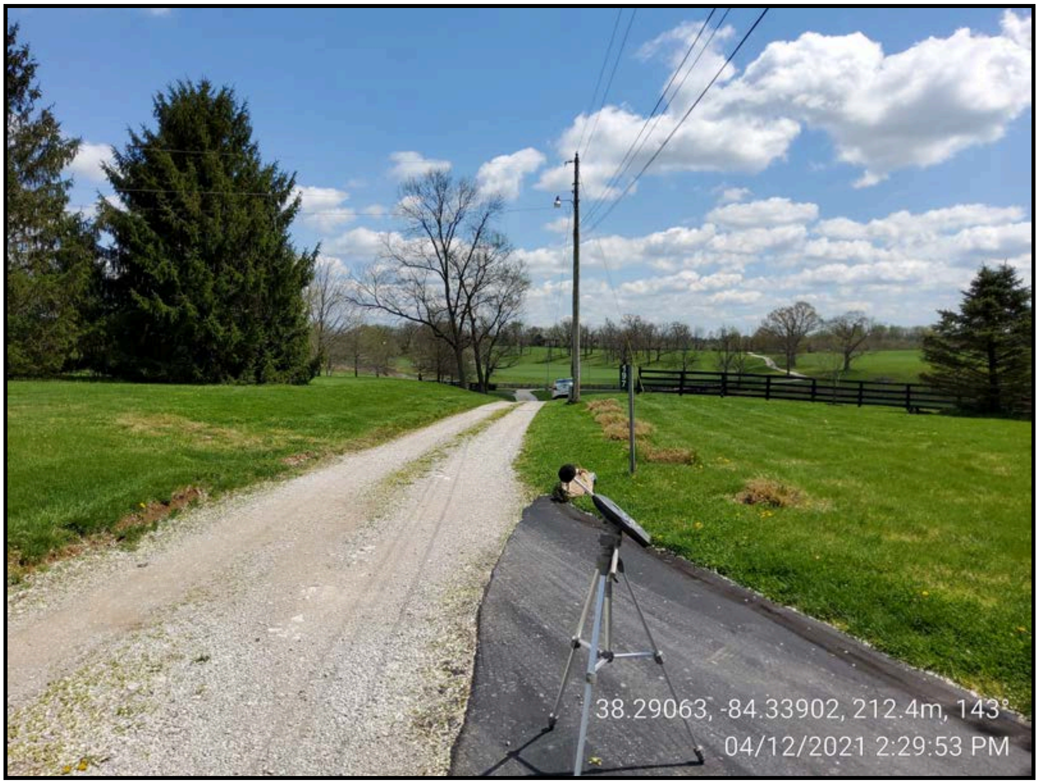

Figure 3. Looking southeast

Figure 4. Looking southwest

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Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Project Number/Name: BLUEBIRD SOLAR PROJECT **Date:** 4/12/2021

Site Number/Description: MON 2, (Lat/Long: 38.287490, -84.390540)

Road ROW approximately 10 feet east of Allen Pike

Prepared by/Crew: Brynne Taylor

Temperature: 61 °F **Relative Humidity:** 84 % **Wind & Direction:** 8.4 mph/W **Sky:** Partly Sunny

SLM Make/Model: LDL 824 **Calibration Make/Model:** LDL CA 200 @ 114.00 dB

Calibration: ☒

Posted Speed Limit (mph): N/A

Observed Speed (mph): N/A

Sample	Time		Sound Level, dBA			Traffic Count		
	Start	Duration	L_{MIN}	L_{EQ}	L_{MAX}	Auto	Med. Trk.	Hvy. Trk.
1	12:24 PM	15 mins	39.4	48.9	62.0	---	---	---

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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

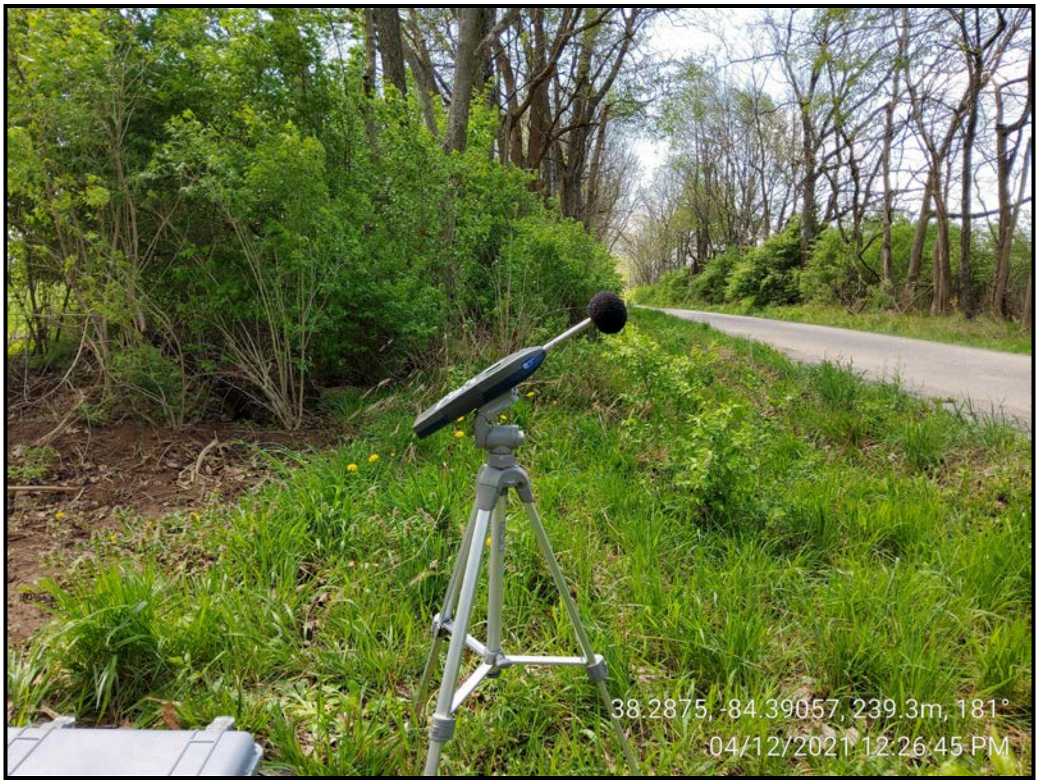

Figure 1. Looking south

Figure 2. Looking west

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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 3. Looking north

Figure 4. Looking east

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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Project Number/Name: BLUEBIRD SOLAR PROJECT **Date:** 4/12/2021

Site Number/Description: MON 3, (Lat/Long: 38.299880, -84.390890)

Road ROW approximately 12 feet north of Allen Pike

Prepared by/Crew: Brynne Taylor

Temperature: 59 °F **Relative Humidity:** 86 % **Wind & Direction:** 7 mph/W **Sky:** Cloudy

SLM Make/Model: LDL 824 **Calibration Make/Model:** LDL CA 200 @ 114.00 dB

Calibration: ☒

Posted Speed Limit (mph): N/A

Observed Speed (mph): N/A

Sample	Time		Sound Level, dBA			Traffic Count		
	Start	Duration	L_{MIN}	L_{EQ}	L_{MAX}	Auto	Med. Trk.	Hvy. Trk.
1	11:42 AM	15 mins	38.4	44.7	53.0	---	---	---

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Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 1. Looking east

Figure 2. Looking south

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Figure 3. Looking west

Figure 4. Looking north

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NOISE LEVEL MEASUREMENT DATA SHEET

Project Number/Name: BLUEBIRD SOLAR PROJECT **Date:** 4/12/2021

Site Number/Description: MON 4, (Lat/Long: 38.306144, -84.362672)

Road ROW approximately 15 feet west of Russel Cave Rd/KY-353

Prepared by/Crew: Brynne Taylor

Temperature: 65 °F **Relative Humidity:** 75 % **Wind & Direction:** 7.9 mph/W **Sky:** Partly Sunny

SLM Make/Model: LDL 824 **Calibration Make/Model:** LDL CA 200 @ 114.00 dB

Calibration: ☒

Posted Speed Limit (mph): 55

Observed Speed (mph): 65

Sample	Time		Sound Level, dBA			Traffic Count		
	Start	Duration	L_{MIN}	L_{EQ}	L_{MAX}	Auto	Med. Trk.	Hvy. Trk.
1	1:37 PM	15 mins	35.1	60.5	85.0	---	---	---

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Figure 1. Looking north

Figure 2. Looking east

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NOISE LEVEL MEASUREMENT DATA SHEET

Figure 3. Looking south

Figure 4. Looking west

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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Project Number/Name: BLUEBIRD SOLAR PROJECT **Date:** 4/12/2021

Site Number/Description: MON 5, (Lat/Long: 38.297383, -84.362496)

Property owner driveway approximately 30 feet west of Russel Cave Rd/KY-353

Prepared by/Crew: Brynne Taylor

Temperature: 63 °F **Relative Humidity:** 82 % **Wind & Direction:** 6.8 mph/W **Sky:** Partly Sunny

SLM Make/Model: LDL 824 **Calibration Make/Model:** LDL CA 200 @ 114.00 dB

Calibration: ☒

Posted Speed Limit (mph): 55

Observed Speed (mph): 65

Sample	Time		Sound Level, dBA			Traffic Count		
	Start	Duration	L_{MIN}	L_{EQ}	L_{MAX}	Auto	Med. Trk.	Hvy. Trk.
1	1:01 PM	15 mins	36.4	57.4	75.2	---	---	---

At one point a donkey was braying and several cows started mooing on the property.

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Figure 1. Looking north

Figure 2. Looking east

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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 3. Looking south

Figure 4. Looking west

Data Request SITING BOARD_2_3:

Refer to Bluebird Solar's response to the Siting Board's First Request, Item 14b. The Bluebird Operation Noise Analysis Report included as an attachment is dated July 2021. A similar report was included with the Application as included with the Application in the SAR, Appendix D, Noise Analysis Report dated April 2021. These reports contain different data and explanations beginning on page 11. In addition, neither report contains a Table 6, referenced in the response. The last table included in the report is Table 3 on page 11. Provide a complete copy of the report and explain which report should be relied upon by the Siting Board.

Response: The Siting Board should rely on the "Operation Noise Analysis Report," dated July 2021, as it was the latest version. The more recent data from July represents more accurate and current noise data for the Bluebird Solar project. The Table 6 referenced in the response is found in the Construction Noise Analysis Report and is not in the Operation Noise Analysis Report.

See attached Operation Noise Analysis Report: "Operation Noise Analysis Report, July 2021,"_BSLLC_R_SITING_BOARD_2_3_Attachment.

Witness: David Shu

BLUEBIRD SOLAR PROJECT

OPERATION NOISE ANALYSIS REPORT

Prepared for
BayWa r.e. Solar Projects LLC
18575 Jamboree Road, Suite 850
Irvine, CA 92612

Prepared by
AZTEC Engineering
501 N 44th Street, Suite 300
Phoenix, AZ 85008

July 2021

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

The Bluebird Solar project is located in Harrison County, approximately one mile east of Leesburg, KY. The majority of the project sits between Highways 62 and 353, with a portion of the project located to the east of Highway 353. The project's southern border is 0.5 mile north of the Harrison County southern boundary line. Figure 1 depicts the project location.

The Bluebird Solar project is a 90 to 100 MWac PV solar farm. The buildable area, of approximately 1000 acres which will be permitted, includes discrete fenced areas of solar panels, laydown areas, landscaping, internal access roads, a project substation, and a utility switchyard. Battery storage is not included. To evaluate the existing and the proposed operation noise impacts from the project to nearby sensitive receptors, AZTEC Engineering was contracted by BayWa to conduct an operation noise impact analysis. This operation noise analysis report was prepared to document the existing noise levels surrounding the project area, predict operation noise levels at sensitive receptors, and determine the operation noise impact.

2.0 NOISE BACKGROUND INFORMATION

Sound is a form of energy that is transmitted by pressure variations that the human ear can detect. Sound levels are expressed in units of decibels (dB). Sound frequency is expressed in units of hertz (Hz). A normal human ear is able to hear sound with frequencies from 20 Hz to 20,000 Hz. Because the human ear does not equally perceive all sound frequencies, people perceive sound in the middle frequency better than sound in the low and high frequencies. As a result, sound levels in some frequency bands are adjusted or weighted to the frequency response of human hearing and the human perception of loudness. The "A"-weighted sound in decibels, or dBA, most closely represents the range of human hearing.

Noise is often called unwanted sound. Each individual perceives noise level changes differently. Generally, a 3 dBA noise change is the smallest change that can be detected by the human ear. A 5 dBA noise change is readily perceivable by most people. An increase of 10 dBA is normally perceived as a doubling of noise loudness. Typical sound levels experienced by people range from the 30s dBA, such as a quiet living room at night, to the 80s dBA, such as a sidewalk adjacent to heavy traffic. Noise levels related to point sources such as pump motors decrease rapidly with a 6 dBA reduction when doubling the distance. Noise levels related to linear sources such as traffic on roadways decrease less rapidly ─ 3 dBA when doubling the distance. Table 1 shows noise levels associated with common sources.

Noise varies in frequency, and its intensity fluctuates over time. Therefore, the A-weighted equivalent steady-state noise level ─ expressed as "L_{Aeq}" ─ is used to represent a single number to describe varying noise levels over a specified period. Another metric used in determining the impact of environmental noise is the differences in response that people have to daytime and nighttime noise levels. During the evening and at night, exterior background noises generally are lower than daytime levels. However, most household noise also decreases at night, and exterior noise becomes more noticeable. Furthermore, most people sleep at night and are sensitive to intrusive noises. The L_{dn} is a noise metric that accounts for the greater annoyance of noise during the nighttime hours (10:00 p.m. to 7:00 a.m.).

Figure 1. Vicinity Map

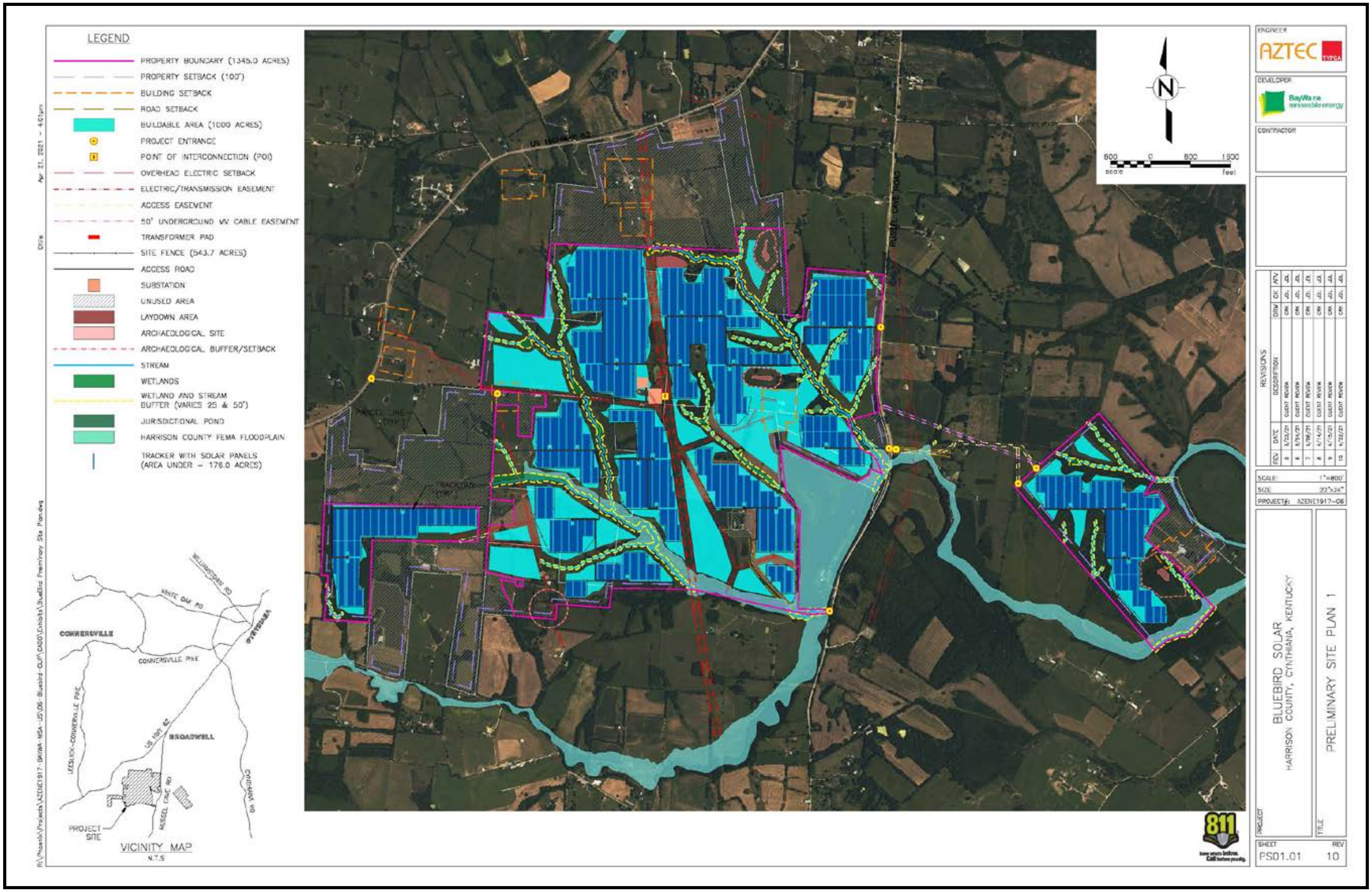


TABLE 1
COMMON NOISE SOURCES AND LEVELS

Sound Pressure Level (dBA)	Typical Sources
120	Jet aircraft takeoff at 100 feet
110	Same aircraft at 400 feet
90	Motorcycle at 25 feet
80	Garbage disposal
70	City street corner
60	Conversational speech
50	Typical office
40	Living room (without TV)
30	Quiet bedroom at night

Source: *Environmental Impact Analysis Handbook* (Rau and Wooten 1980)

3.0 ENVIRONMENTAL SETTING

3.1 Land Uses and Noise Sensitive Receptors

Noise-sensitive receptors generally are defined as locations where people reside or where the presence of unwanted sound may adversely affect the existing land use. Typically, noise-sensitive land uses include residences, hospitals, places of worship, libraries, performance spaces, offices, and schools, as well as nature and wildlife preserves, recreational areas, and parks.

The project is located in a rural area. Existing land use within the project site is primarily agricultural. Ambient noise is mainly from traffic on Highways 62 and 353 for those sensitive receptors with close proximity. For other sensitive receptors further away from the roadways, ambient noise is composed of farm equipment (e.g., tractors) used to grow and harvest crops and to raise cattle and other farm animals. No commercial or industrial sources were identified in the analysis area.

3.2 Existing Noise Conditions

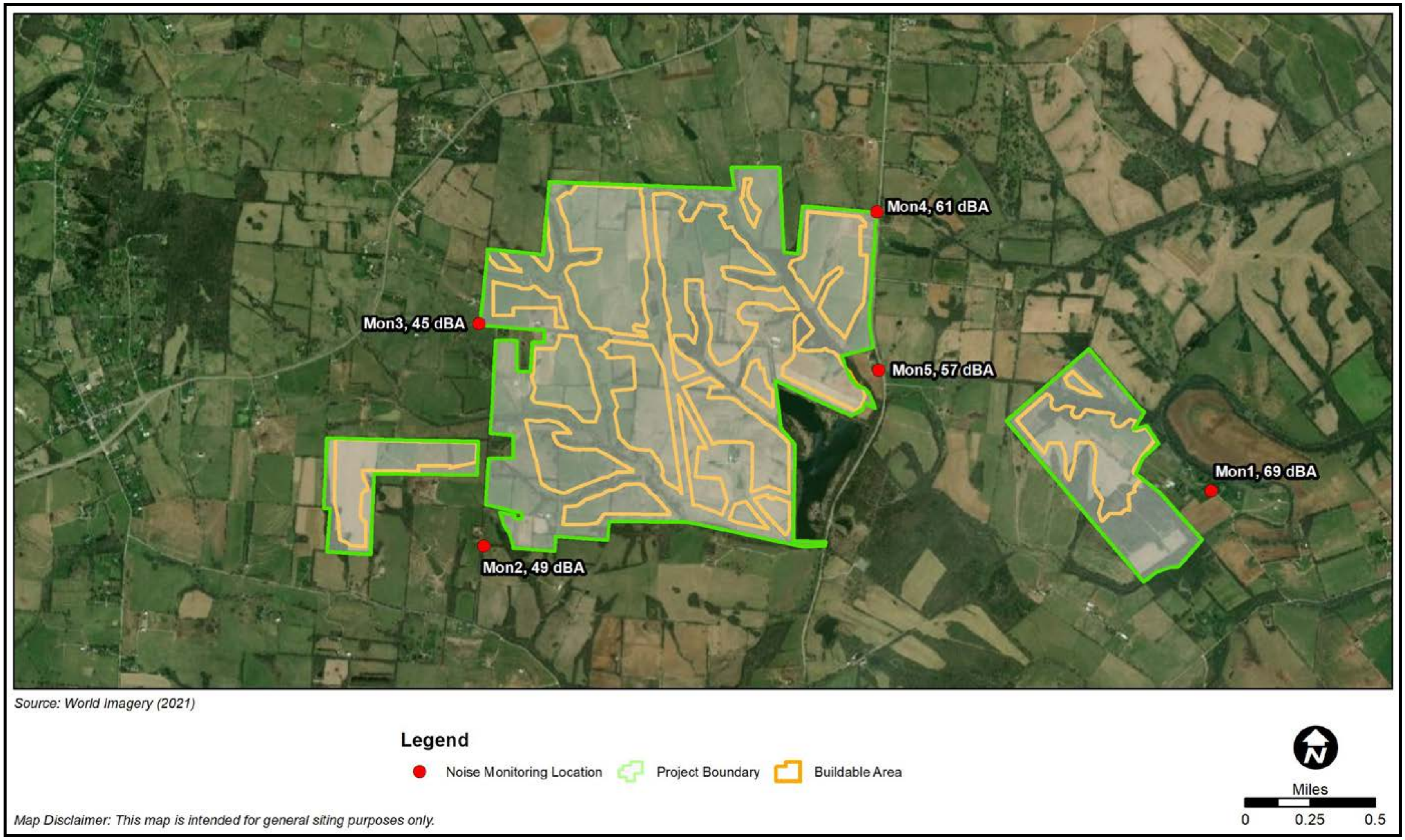
Noise monitoring was conducted at 5 different sites outside the project boundary to document existing noise conditions on April 12, 2021. Each site was monitored for 15 minutes. Weather conditions (temperature, relative humidity, wind speed and direction, and sky condition) were documented. The Larson Davis System 824 with sound level meter and real-time analyzer, which complies with American National Standards Institute (ANSI) S1.4 and Type I Standards, was used to collect the sound. The monitoring results are summarized in Table 2 and Figure 2.

TABLE 2
NOISE LEVEL MEASUREMENTS SUMMARY

Monitor Number (MON)	Address/Description	Day/ Time	Monitoring Result L_{Aeq}, dBA
1	Property owner driveway approximately 3 feet west of Lail Ln	April 12/ 2:28-2:43 PM	69
2	Road ROW approximately 10 feet east of Allen Pike	April 12/ 12:24-12:39 PM	49
3	Road ROW approximately 12 feet north of Allen Pike	April 12/ 11:42-11:47 AM	45
4	Road ROW approximately 15 feet west of Russel Cave Rd/KY-353	April 12/ 1:37 -1:52 PM	61
5	Property owner driveway approximately 30 feet west of Russel Cave Rd/KY-353	April 12/ 1:01-1:16 PM	57

The monitored noise levels represent the existing baseline noise condition within and adjacent to the project area during daytime hours. The average ambient noise levels from the measurements ranged from 45 dBA to 69 dBA. The lowest monitored noise level was recorded from site MON-3 on the west side of the project boundary approximately 12 feet north of Allen Pike. The highest monitored noise level was recorded from site MON-1 on a private driveway west of Lail Ln. Detailed noise level monitoring information is located in Appendix A of this report.

Figure 2. Noise Monitoring Results



4.0 REGULATORY SETTING

In 1974 the U.S. EPA published "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety". In this publication, the U.S. EPA evaluated the effects of environmental noise with respect to health and safety and determined an L_{dn} of 55 dBA (equivalent to a continuous noise level of 48.6 dBA) to be the maximum sound level that will not adversely affect public health and welfare by interfering with speech or other activities in outdoor areas.

Since no other local, county, or state thresholds were identified, an L_{dn} of 55 dBA has been used to determine if the project would adversely affect public health and welfare.

5.0 IMPACT ANALYSIS

Potential noise sensitive receptors were selected for noise modeling with up to 3,000-foot buffer from the project boundary. High resolution aerial photography, Google street view photos, and proposed site layouts were analyzed using Google Earth Pro to determine the presence of potential noise sensitive receptors. The selected receptors are all dwelling units. No schools, childcare centers, outdoor recreation, medical centers or other types of noise sensitive receptors were observed. Figure 3 shows the selected receptors to be modeled as noise receivers in the noise model.

The SoundPLAN® computer noise model was used for computing noise levels from the proposed operation noise from the transformers, inverters, and trackers under worst case scenario. An industry standard, SoundPLAN® was developed by Braunstein + Berndt GmbH to provide estimates of sound levels at distances from specific noise sources taking into account the effects of terrain features including relative elevations of noise sources, receivers, and intervening objects (buildings, hills, trees), and ground effects due to areas of hard ground (pavement, water) and soft ground (grass, field, forest). In addition to computing sound levels at specific receiver positions, SoundPLAN® can produce noise contour graphics that show areas of equal and similar sound level.

Analysis Methodology

The sound propagation model within SoundPLAN® that was used for this study was ISO 9613-2 This international standard propagation model is used nearly universally in the U.S. for environmental noise studies, due to its conservative propagation equations. ISO 9613-2 uses "worst-case" downwind propagation conditions in all directions, and accounts for variations in terrain and the effects of ground type.

The equivalent sound pressure level at the receiver, in downwind conditions, is calculated for each point source based on the formula below.

$$L_{eq} = L_w + D_c - A$$

Where:

L_{eq} is the equivalent sound pressure level at the receiver, in downwind conditions,

L_w is the sound power level by the point source,

D_c is the directivity correction that describes the deviation of the sound pressure level in a specific direction from the sound power level,

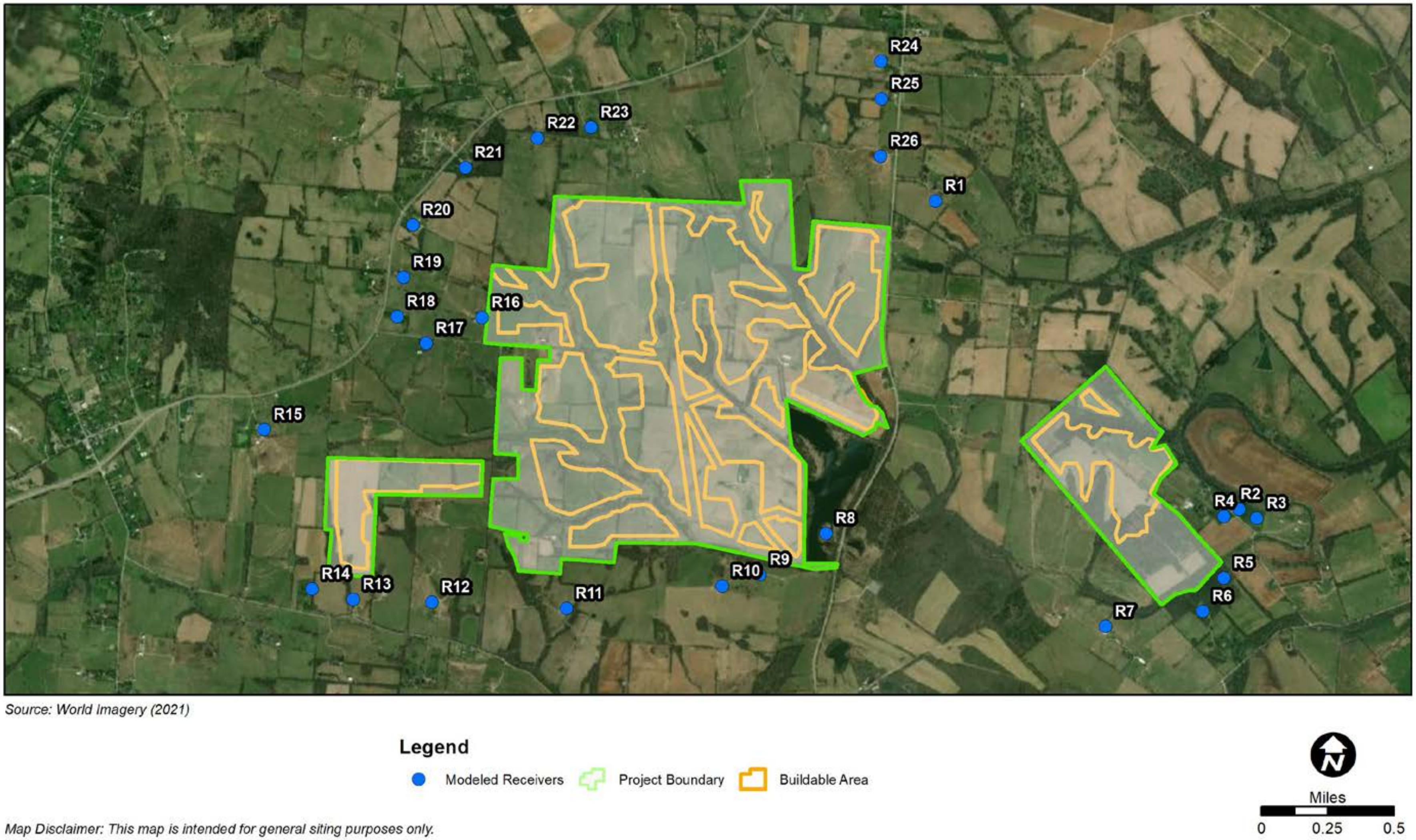
A is the attenuation of the sound propagation. It is a sum of the attenuation due to the geometrical divergence, the ground effect, the atmospheric absorption, the barriers, and miscellaneous other effects.

Geometrical divergence refers to the decline in noise level that occurs in association with increased distance from the receptor. Sounds generated from a point source typically attenuate or decrease at a rate of 6 dBA for each doubling of distance. For example, a noise level of 80 dBA measured at a distance of 5 feet from the noise source would be reduced to 74 dBA at 10 feet from the source and be further reduced to 32 dBA at 1280 feet.

The propagation of noise is also affected by the intervening ground, known as ground effect. A hard site (such as parking lots or smooth bodies of water) receives no additional ground attenuation, and the changes in noise levels with distance are simply the geometric spreading from the source, which equates to 6 dBA per doubling distance. A soft site (such as soft dirt, grass, or scattered bushes and trees) provides an additional ground attenuation value of 1.5 dBA per doubling of distance. Thus, a point source over a soft site would drop off at generally 7.5 dBA per doubling of distance. The 7.5 dBA drop off rate is just a rule of thumb for quick noise level estimation. SoundPLAN uses complex formula based on ground absorption coefficient and other factors such as terrain change to calculate noise levels at the receivers. SoundPLAN does not use 7.5 dBA drop off rate directly in the model.

The sound attenuation due to atmospheric absorption is calculated based on the atmospheric absorption coefficient (α). The absorption coefficient is calculated according to the ISO 9613-1 “Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere”. It is dependent on the frequency, air pressure, temperature, and relative humidity.

Figure 3. Modeled Noise Receivers



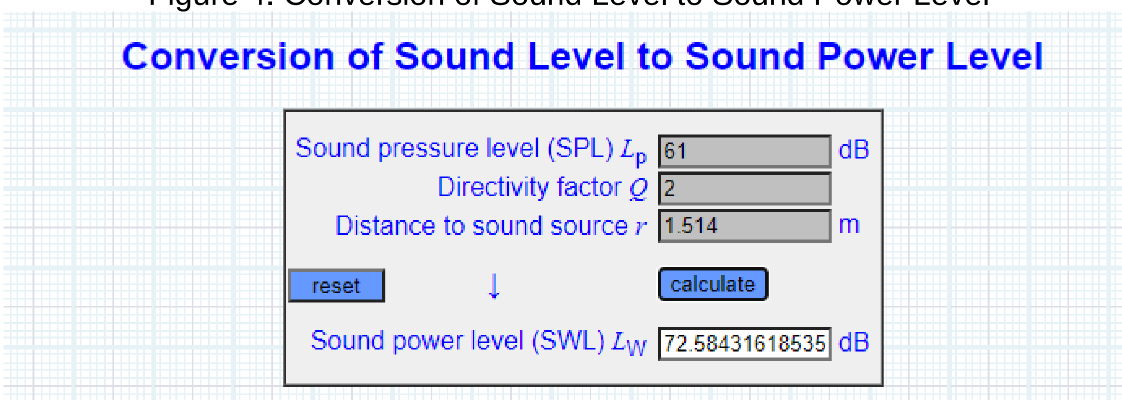
Source: World Imagery (2021)

Map Disclaimer: This map is intended for general siting purposes only.

Transformer, Inverter, and Tracker Noise

The solar array associated with this project includes tracking panels distributed evenly across the site. Tracking systems involve the panels being driven by small DC motors to track the arc of the sun to maximize each panel's potential for solar absorption. Panels would turn no more than five (5) degrees every 15 minutes and would operate no more than one (1) minute out of every 15-minute period. These tracking motors are a potential source of mechanical noise and are included in this assessment. Because the model of the tracker was not available at the time of this report, it is assumed that the sound typically produced by each panel tracking motor is 61 dBA at 5 feet. For reference, that equates to a sound power level of 73 dBA, see conversion example in figure 4 below. Sound power level is the acoustic energy emitted by a source which produces a sound pressure level at some distance. While the sound power level of a source is fixed, the sound pressure level depends upon the distance from the source and the acoustic characteristics of the area in which it is located. Sound power level of each point source is the input to SoundPLAN.

Figure 4. Conversion of Sound Level to Sound Power Level



Source: www.sengpielaudio.com/calculator-soundpower.htm

This facility will consist of approximately 31 inverters, which are expected to be the loudest noise generating operational equipment. The model of the inverter is Power Electronics FS4010M. According to its specification, its noise level is less than 79 dBA measured at 1 meter from the back of the unit. To be conservative, noise level of 79 dBA at 1 meter was used to estimate inverter noise. That equates to a sound power level of 87 dBA. In addition, a small-scaled transformer would be used along with the inverter on each transformer pad. It is assumed that the sound typically produced by each small-scaled transformer is 58 dBA at 5 feet; that equates to a sound power level of 70 dBA.

Substation/Switchyard Noise

The proposed project's onsite substation/switchyard will be located in the middle of the project site (please refer to Figure 1). The substation is located more than 3,000 feet from the nearest sensitive noise receptor. It is assumed that a larger transformer at the Substation has a noise level of 71 dBA at a distance of 5 feet, which equates to a sound power level of 83 dBA. To be conservative, a total sound power level of 86 dBA was considered for the substation and switchyard.

The following data was used as input into the model.

- A total of 31-point sources was modeled to represent small-scaled transformers, inverters, and trackers on the transformer pads. A combined sound power level of 88 dBA was assumed for equipment on each transformer pad. The source height was assumed to be 5 feet.
- A point source was modeled to represent a large-scaled transformer for the substation/switchyard. A combined sound power level of 86 dBA was assumed for equipment in the substation and switchyard.
- A total of 26 receivers was modeled to represent sensitive noise receptors. The source height was assumed to be 5 feet.
- Topo contour lines were inputted into the model to consider terrain variation.
- Ground surface was assumed to be soft ground.

Table 3 shows the predicted project operation noise levels in hourly L_{Aeq} and L_{dn} for all selected receivers under the worst case scenario. Figure 5 shows operation noise contours of 30 dBA and 40 dBA L_{Aeq} generated by the noise model. As indicated, operation noise contours of 40 dBA L_{Aeq} were confined within the project site itself. Because all the solar equipment were considered point sources and they are located far away from the sensitive receptors, the equipment noise energy dissipated rapidly before reaching to the receptors. Figure 6 shows operation noise grid map within the project area. Operation noise would be masked by background ambient noise.

As can be seen from Table 3 below, predicted operation noise level are below 30 dBA L_{dn} at all sensitive receivers. Therefore, the proposed project operation will comply with EPA standard of 55 dBA L_{dn} as identified in Section 4. No future noise mitigation is needed for the project.

TABLE 3
Predicted Operation Noise Levels

Receiver ID	Noise Levels (L_{Aeq}, dBA)	Noise Levels (L_{dn}, dBA)	Receiver ID	Noise Levels (L_{Aeq}, dBA)	Noise Levels (L_{dn}, dBA)
R1	24.7	22.7	R14	24.7	22.7
R2	23.6	21.7	R15	22.7	20.8
R3	22.2	20.3	R16	26.9	24.9
R4	24.7	22.7	R17	25.2	23.2
R5	22.6	20.7	R18	23.8	21.9
R6	21.9	20.0	R19	23.1	21.2
R7	22.8	20.9	R20	22.5	20.6
R8	26.3	24.3	R21	22.9	21.0
R9	25.5	23.5	R22	24.3	22.4
R10	25.5	23.5	R23	25.2	23.2
R11	24.7	22.7	R24	20.7	18.9
R12	23.7	21.8	R25	22.0	20.1
R13	24.7	22.7	R26	24.5	22.6

Note:
1. Solar facility would not operate during night time hours and thus would not generate noise.

Vehicular Traffic

The solar facility is expected to have up to two technicians visiting the site daily for daily operations and maintenance activities. Other professionals will visit the site on an as-needed basis. Weekend work is not anticipated but may be required upon any component outages that may impact energy production from the site. Asides from the scenarios mentioned, vehicular traffic onsite will be limited to typical weekday business hours. Technicians will drive mid- or full-sized trucks and will not contribute noticeably to the existing traffic noise levels.

Maintenance Activities

Typical maintenance activities may include inspection, minor repair and maintenance on the solar panels, the tracking system, wiring, and/or inverters. Ground maintenance will include periodic inspection of the vegetative buffers, boundary fencing, and vegetation control through mowing and herbicide applications. Technicians will be on site Monday to Friday. Noise from maintenance activities will not contribute noticeably to the nearest sensitive receptors as they are similar to the background agricultural noise characteristics.

Figure 5. Operation Noise Contour Map

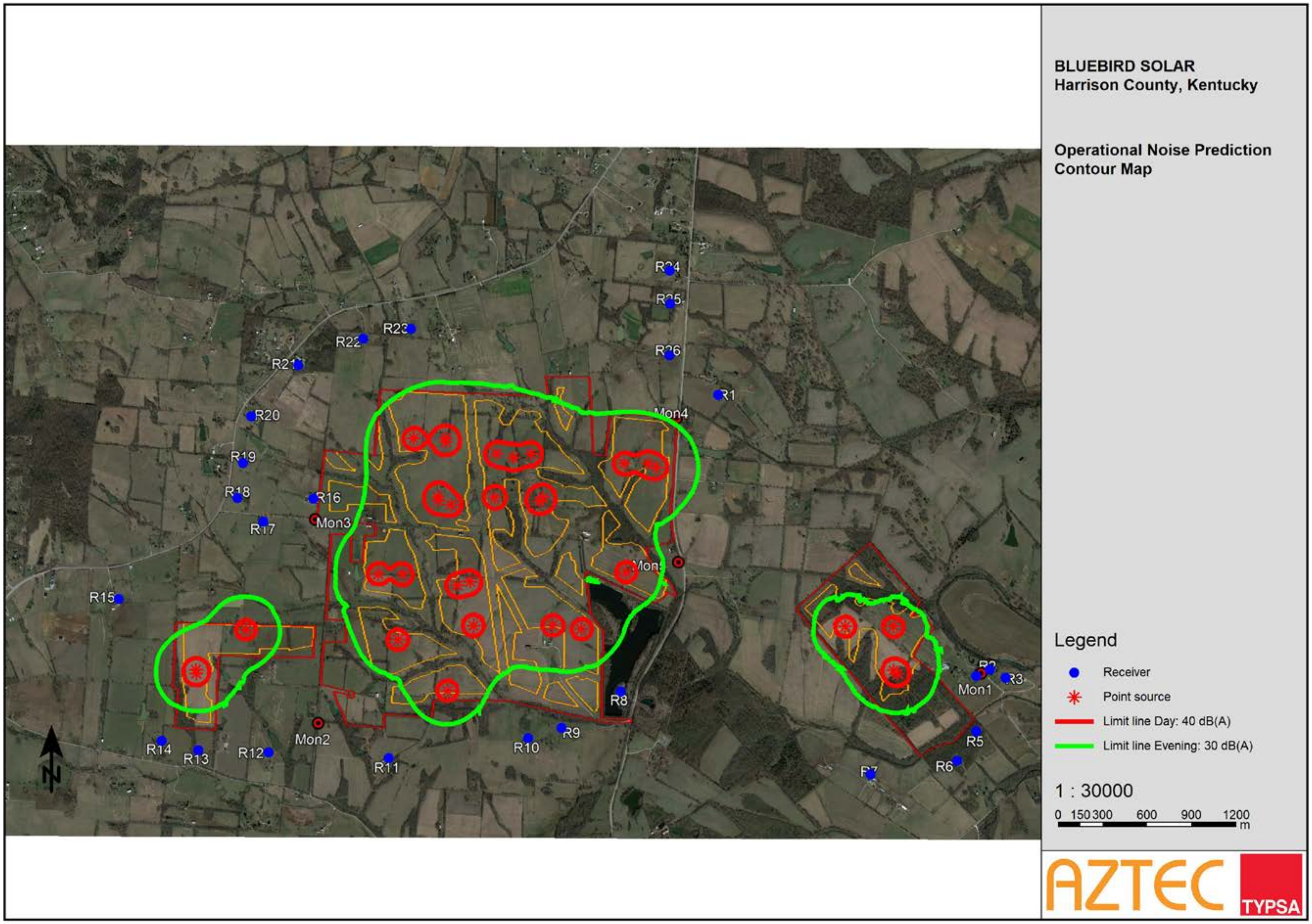
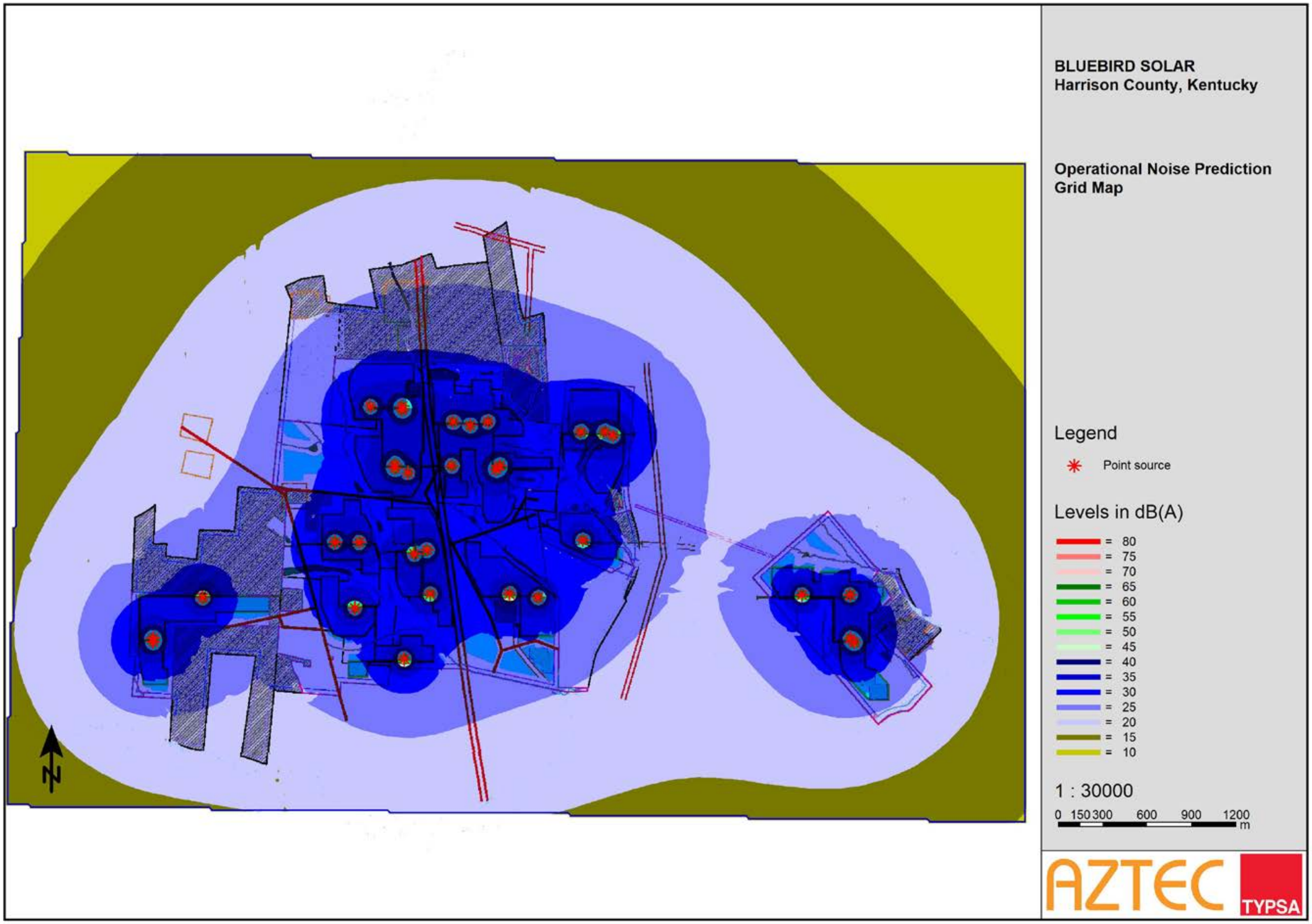


Figure 6. Operation Noise Grid Map



Conclusion

Based on background noise monitoring and noise analysis for the project operation, it is expected that the ambient noise levels in the project vicinity could be low in the 40s dBA L_{dn}. The project generated noise from equipment within the site is less than 40 dBA L_{dn} and less than 30 dBA L_{dn} at the sensitive receptors, which are far below ambient noise levels. Noise from project generated vehicular traffic and maintenance activities are minimal and will not contribute noticeably to the nearby sensitive receptors. In conclusion, the project operation noise complies with EPA standard of 55 dBA L_{dn} threshold and no noise impact would occur.

REFERENCE

Code of Federal Regulations, Title 24. Part 51.103, Revised April 1, 2005

John G. Rau and David C. Wooten, *Environmental Impact Analysis Handbook*, 1980

Environmental Protection Authority, *Environmental Criteria for Road Traffic Noise*, 1999

Ldn Consulting Inc, *Noise Assessment Centinela Solar Energy Project County of Imperial*, September 6, 2011

Stantec Consulting Services, Inc, *Noise Assessment Ashwood 86MW Solar Facility*, December 11, 2020

APPENDIX A

Noise Level Monitoring Results

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ENVIRONMENTAL NOISE LEVEL MEASUREMENT DATA SHEET

Project Number/Name: **BLUEBIRD SOLAR PROJECT** **Date:** **4/12/2021**

Site Number/Description: **MON 1, (Lat/Long: 33.290644, -84.339009)**

Property owner driveway approximately 3 feet west of Lail Ln

Prepared by/Crew: **Brynne Taylor**

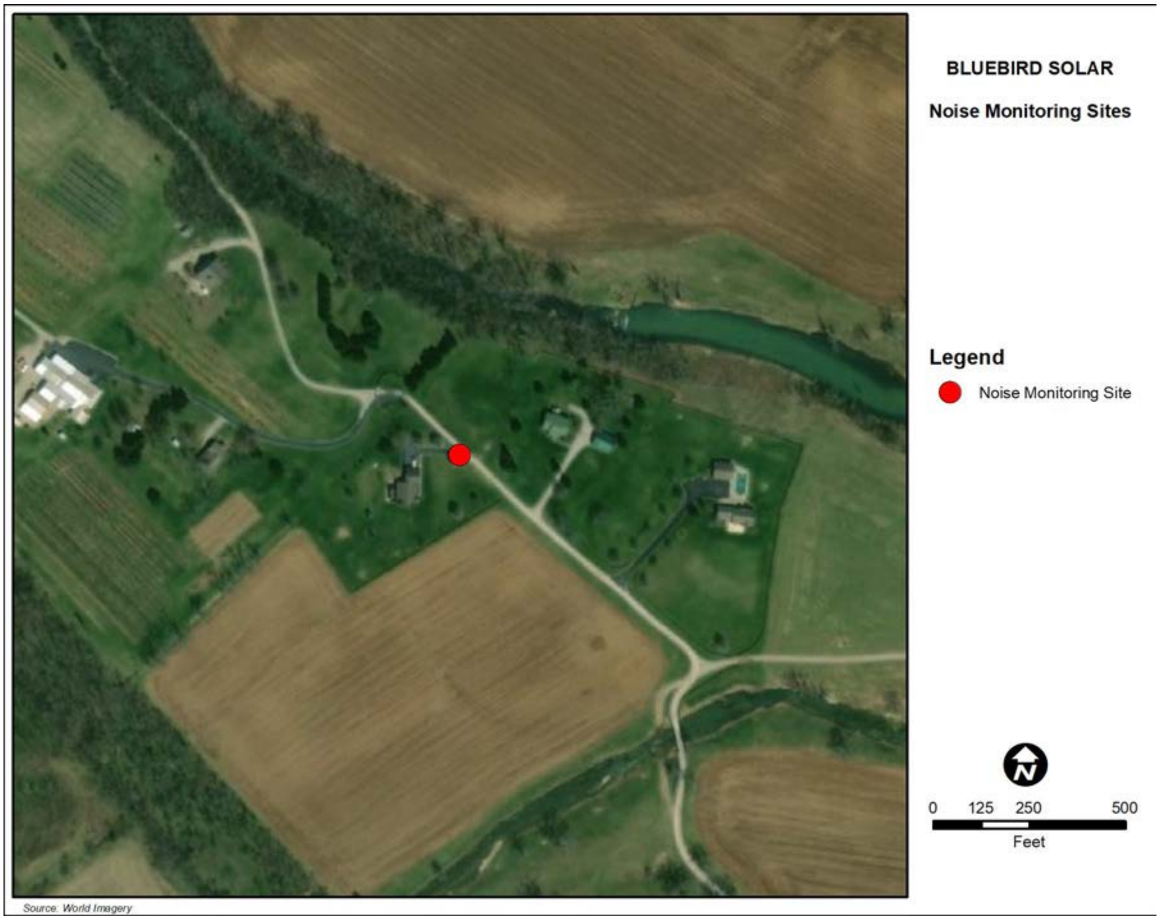
Temperature: **65 °F** **Relative Humidity:** **67 %** **Wind & Direction:** **7.2 mph/W** **Sky:** **Partly Sunny**

SLM Make/Model: **LDL 824** **Calibration Make/Model:** **LDL CA 200 @ 114.00 dB**

Calibration: ☒

Posted Speed Limit (mph): 15

Observed Speed (mph): N/A



Sample	Time		Sound Level, dBA			Traffic Count		
	Start	Duration	L_{MIN}	L_{EQ}	L_{MAX}	Auto	Med. Trk.	Hvy. Trk.
1	2:28 PM	15 mins	38.6	69.1	94.8	---	---	---

Several dogs barking and lawn mowers cutting grass on nearby properties while monitoring.

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ENVIRONMENTAL
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Figure 1. Looking northwest

Figure 2. Looking northeast

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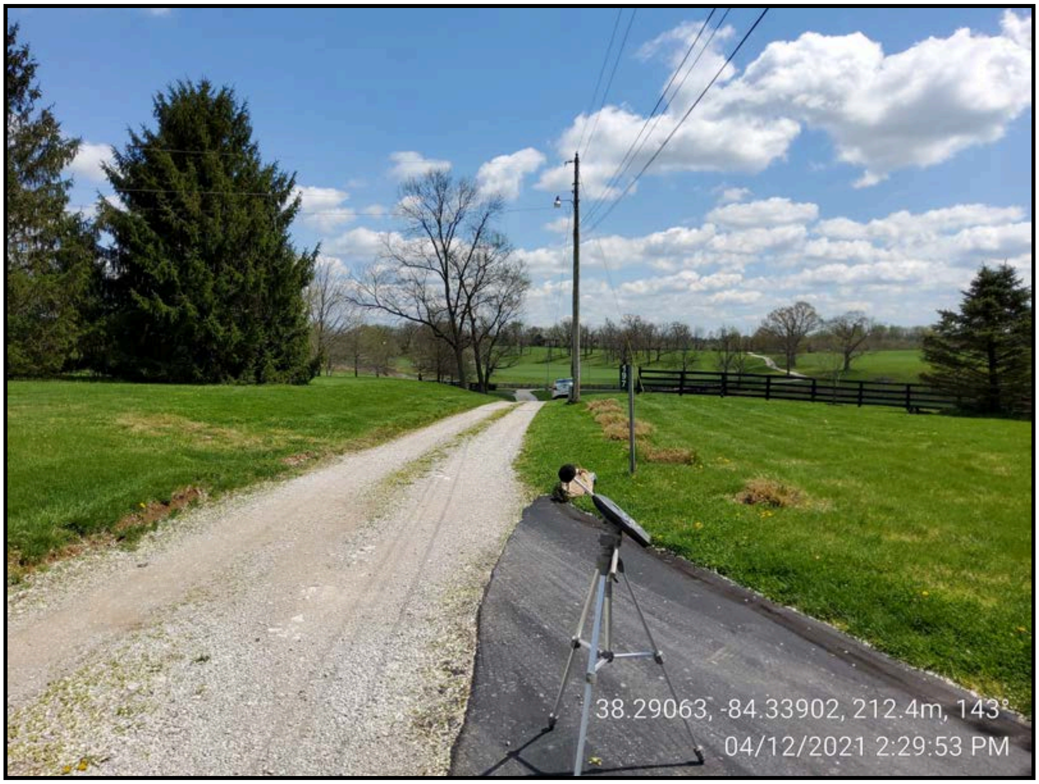

Figure 3. Looking southeast

Figure 4. Looking southwest

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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Project Number/Name: BLUEBIRD SOLAR PROJECT **Date:** 4/12/2021

Site Number/Description: MON 2, (Lat/Long: 38.287490, -84.390540)

Road ROW approximately 10 feet east of Allen Pike

Prepared by/Crew: Brynne Taylor

Temperature: 61 °F **Relative Humidity:** 84 % **Wind & Direction:** 8.4 mph/W **Sky:** Partly Sunny

SLM Make/Model: LDL 824 **Calibration Make/Model:** LDL CA 200 @ 114.00 dB

Calibration: ☒

Posted Speed Limit (mph): N/A

Observed Speed (mph): N/A

Sample	Time		Sound Level, dBA			Traffic Count		
	Start	Duration	L_{MIN}	L_{EQ}	L_{MAX}	Auto	Med. Trk.	Hvy. Trk.
1	12:24 PM	15 mins	39.4	48.9	62.0	---	---	---

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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

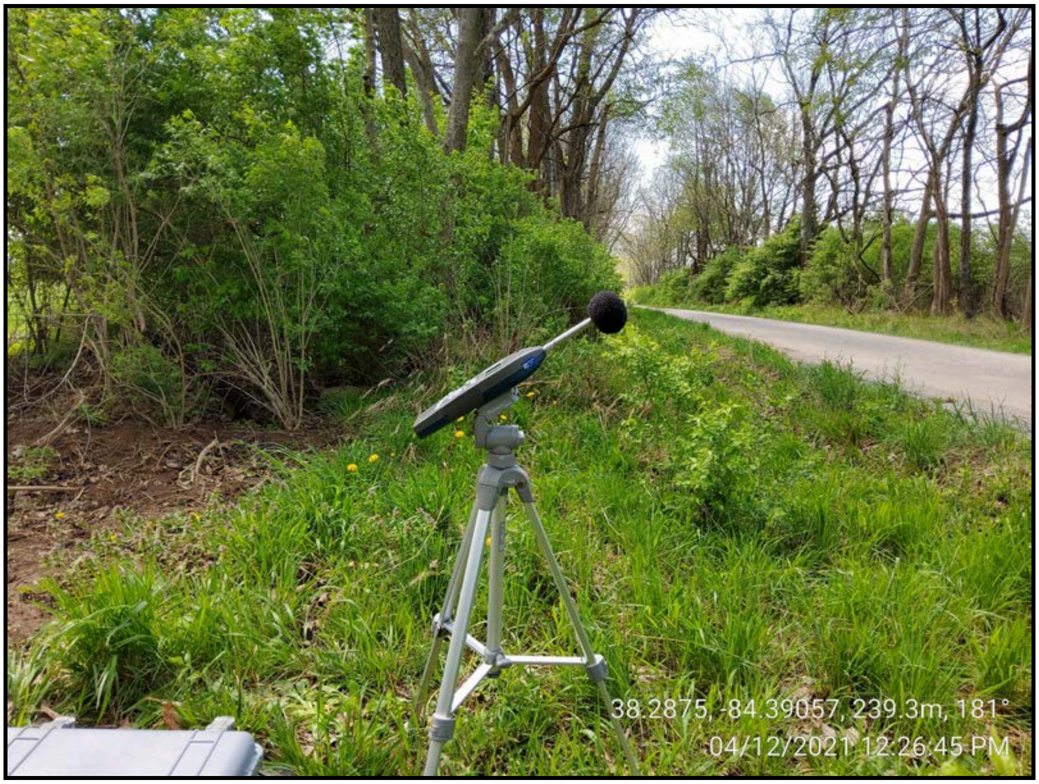

Figure 1. Looking south

Figure 2. Looking west

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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 3. Looking north

Figure 4. Looking east

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ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Project Number/Name: BLUEBIRD SOLAR PROJECT **Date:** 4/12/2021

Site Number/Description: MON 3, (Lat/Long: 38.299880, -84.390890)

Road ROW approximately 12 feet north of Allen Pike

Prepared by/Crew: Brynne Taylor

Temperature: 59 °F **Relative Humidity:** 86 % **Wind & Direction:** 7 mph/W **Sky:** Cloudy

SLM Make/Model: LDL 824 **Calibration Make/Model:** LDL CA 200 @ 114.00 dB

Calibration: ☒

Posted Speed Limit (mph): N/A

Observed Speed (mph): N/A

Sample	Time		Sound Level, dBA			Traffic Count		
	Start	Duration	L_{MIN}	L_{EQ}	L_{MAX}	Auto	Med. Trk.	Hvy. Trk.
1	11:42 AM	15 mins	38.4	44.7	53.0	---	---	---

501 N 44th St, Suite 300
Phoenix, AZ 85008
Tel: (602) 454-0402
Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 1. Looking east

Figure 2. Looking south

AZTEC TYPSA
501 N 44th St, Suite 300
Phoenix, AZ 85008
Tel: (602) 454-0402
Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 3. Looking west

Figure 4. Looking north

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501 N 44th St, Suite 300
Phoenix, AZ 85008
Tel: (602) 454-0402
Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Project Number/Name: BLUEBIRD SOLAR PROJECT **Date:** 4/12/2021

Site Number/Description: MON 4, (Lat/Long: 38.306144, -84.362672)

Road ROW approximately 15 feet west of Russel Cave Rd/KY-353

Prepared by/Crew: Brynne Taylor

Temperature: 65 °F **Relative Humidity:** 75 % **Wind & Direction:** 7.9 mph/W **Sky:** Partly Sunny

SLM Make/Model: LDL 824 **Calibration Make/Model:** LDL CA 200 @ 114.00 dB

Calibration: ☒

Posted Speed Limit (mph): 55

Observed Speed (mph): 65

Sample	Time		Sound Level, dBA			Traffic Count		
	Start	Duration	L_{MIN}	L_{EQ}	L_{MAX}	Auto	Med. Trk.	Hvy. Trk.
1	1:37 PM	15 mins	35.1	60.5	85.0	---	---	---

AZTEC TYPSA
501 N 44th St, Suite 300
Phoenix, AZ 85008
Tel: (602) 454-0402
Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 1. Looking north

Figure 2. Looking east

AZTEC TYPSA
501 N 44th St, Suite 300
Phoenix, AZ 85008
Tel: (602) 454-0402
Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 3. Looking south

Figure 4. Looking west

AZTEC TYPSA
501 N 44th St, Suite 300
Phoenix, AZ 85008
Tel: (602) 454-0402
Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Project Number/Name: **BLUEBIRD SOLAR PROJECT** **Date:** **4/12/2021**

Site Number/Description: **MON 5, (Lat/Long: 38.297383, -84.362496)**

Property owner driveway approximately 30 feet west of Russel Cave Rd/KY-353

Prepared by/Crew: **Brynne Taylor**

Temperature: **63 °F** **Relative Humidity:** **82 %** **Wind & Direction:** **6.8 mph/W** **Sky:** **Partly Sunny**

SLM Make/Model: **LDL 824** **Calibration Make/Model:** **LDL CA 200 @ 114.00 dB**

Calibration: ☒

Posted Speed Limit (mph): 55

Observed Speed (mph): 65

Sample	Time		Sound Level, dBA			Traffic Count		
	Start	Duration	L_{MIN}	L_{EQ}	L_{MAX}	Auto	Med. Trk.	Hvy. Trk.
1	1:01 PM	15 mins	36.4	57.4	75.2	---	---	---

At one point a donkey was braying and several cows started mooing on the property.

AZTEC TYPSA
501 N 44th St, Suite 300
Phoenix, AZ 85008
Tel: (602) 454-0402
Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 1. Looking north

Figure 2. Looking east

AZTEC TYPSA
501 N 44th St, Suite 300
Phoenix, AZ 85008
Tel: (602) 454-0402
Fax: (602) 458-7465

ENVIRONMENTAL
NOISE LEVEL MEASUREMENT DATA SHEET

Figure 3. Looking south

Figure 4. Looking west

APPENDIX B

Inverter Noise Specification

TECHNICAL CHARACTERISTICS HEM

REFERENCES		FS4010M
OUTPUT	AC Output Power(kVA/kW) @40°C [1]	4010
	AC Output Power(kVA/kW) @50°C[1]	3720
	Operating Grid Voltage (VAC)	34.5kV ±10%
	Operating Grid Frequency (Hz)	60Hz
	Current Harmonic Distortion (THDi)	< 3% per IEEE519
	Power Factor (cosine phi)[3]	0.5 leading … 0.5 lagging adjustable / Reactive power injection at night
INPUT	MPPt @Full Power (VDC)[4]	891V-1500V
	Maximum DC Voltage	1500V
	Number of PV Inputs [2]	Up to 40
	Max. DC Continuous Current (A)[5]	4590
	Max. DC Short Circuit Current (A)[5]	6940
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η) (preliminary)	97.75% including MV transformer
	CEC (η) (preliminary)	97.48% including MV transformer
	Max. Power Consumption (kVA) (preliminary)	20
CABINET	Dimensions [WxDxH] (ft) (preliminary)	21.3 x 6.6 x 7.2
	Dimensions [WxDxH] (m) (preliminary)	6.5 x 2.0 x 2.2
	Weight (lb) (preliminary)	30865
	Weight (kg) (preliminary)	14000
	Type of Ventilation	Forced air cooling
ENVIROMENT	Degree of Protection	NEMA 3R
	Permissible Ambient Temperature	-35°C to +60°C / >50°C Active Power derating
	Relative Humidity	4% to 100% non condensing
	Max. Altitude (above sea level)[6]	2000m
	Noise Level[7]	< 79 dBA
CONTROL INTERFACE	Communication Protocol	Modbus TCP
	Plant Controller Communication	Optional
	Keyed ON/OFF Switch	Standard
PROTECTIONS	Ground Fault Protection	GFDI and Isolation monitoring device
	General AC Protection	MV Switchgear (configurable)
	General DC Protection	Fuses
	Overvoltage Protection	AC, DC Inverter and auxiliary supply type 2
CERTIFICATIONS	Safety	UL 1741, CSA 22.2 No.107.1-16
	Compliance	NEC 2017
	Utility Interconnect	IEEE 1547.1-2005 / UL 1741 SA-Feb. 2018

[1] Values at 1.00•Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult Power Electronics for other configurations.
[3] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$.
[4] Consult Power Electronics for derating curves.
[5] Consult Power Electronics for Freemaq DC/DC connection configurations.
[6] Consult Power Electronics for altitudes above 1000m.
[7] Readings taken 1 meter from the back of the unit.

Data Request SITING BOARD_2_4:

Bluebird Solar is in an area classified as intense karst by the Kentucky Geological Survey. Provide any geologic studies that have been done. If a geologic study has not been done, explain how it will be determined if any karst formations will affect the construction of the solar facility.

Response: The Geotechnical reports that American Engineers, Inc. prepared in 2019 and 2020 at the project site revealed that the majority of the project lies within high-Karst risk areas susceptible to sinkholes. For this reason, Bluebird performed a more intensive study for the project to avoid high-Karst risk areas and/or mitigate the region as necessary. The performed Electrical Tomography identified areas of high, moderate, and low concern within the project area. Bluebird incorporated these results in the project design by avoiding the identified areas of high and moderate concern.

See attached:

Geotechnical Reports: "Report of Geotechnical Exploration, September 2019,"_BSLLC_R_SITING_BOARD_2_4_Attachment; "Report of Geotechnical Exploration, October 2020,"_BSLLC_R_SITING_BOARD_2_4_Attachment.

Electrical Tomography Reports: "Electrical Resistivity Survey, EKPC Cluster, December 13, 2019,"_BSLLC_R_SITING_BOARD_2_4_Attachment; "Electrical Resistivity Survey, EKPC Cluster Phase 2, August 14, 2020,"_BSLLC_R_SITING_BOARD_2_4_Attachment; "Electrical Resistivity Survey, EKPC Cluster Phase 3, February 25, 2022,"_BSLLC_R_SITING_BOARD_2_4_Attachment.

Witness: Michael Stanton

REPORT OF GEOTECHNICAL EXPLORATION

AMERICAN ENGINEERS, INC.

SEPTEMBER 2019

BAYWA 160 MW EKPC CLUSTER

(BLUEBIRD, GREAT BLUE HERON AND BLUEJAY)

CYNTHIANA, KY

AEI
AMERICAN ENGINEERS, INC.

September 26, 2019

Ms. Akhila Krishnan, PE
Project Engineer
BayWa r.e. Solar Projects, LLC
17901 Von Karman Avenue
Suite 1050
Irvine, CA 92614

RE: Preliminary Geotechnical Report
BayWa 160 MW EKPC Cluster
(Bluebird, Great Blue Heron and Bluejay)
Cynthia, KY
AEI Project No. 219-076

Dear Ms. Krishnan:

American Engineers, Inc. (AEI) is pleased to submit this letter report that summarizes the results of the solar array field exploration performed at the above referenced site.

1. Site and Project Description

The geotechnical investigation consisted of drilling 58 soil test borings, six with rock core, and four electrical resistivity field tests. The project is generally divided by two areas, one “West Array Field’ west of KY 353 (Russell Caved Road) and one “East Array Field” east of KY 353. The site of the proposed development covers an area larger than 2,000 acres. Currently the site is made up of mostly farm land with pockets of tree and ponds. The boring layout included in Appendix A depicts the approximate drilling locations.

2. General Site Geology

Due to the vast size of the project the geologic mapping shows various types of geologic landscapes. Available geologic mapping (*Geologic Map of the Shawhan and Leesburg Quadrangle, Bourbon and Harrison counties, Kentucky, USGS*), shows the site to be underlain by Clays Ferry Formation, Tanglewood Limestone Member (No. 4, No. 3 and No. 2), Millersburg Member and Lexington Limestone. Bedrock of the Clays Ferry Formation is predominantly shale and limestone. The shale is described as medium to olive-gray in color, stained in limonite. The limestone is described as light-brown to light brownish-gray in color, fine to medium grained. Bedrock of the Millerburg member is predominantly limestone and shale. The limestone is described as Bedrock of the Lexington Lime- stone is predominantly orstracodal shale and limestone. The limestone is described as brownish to light gray in color, micro-grained to fine grained in lenticular beds. The shale is described as brown in color and is poorly exposed. Bedrock of the Tanglewood Limestone Member is predominantly limestone. The limestone is described as gray and brown in color, fined to coarse-grained.

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Karst potential mapping was reviewed for the site and indicated the site and surrounding areas exhibited non-karst to very high potential and the likely presence of sinkholes, caves, springs and disappearing streams in the area. Fourteen sinkholes were indicated on karst mapping east of KY 353 in the “East Array Field” and two more sinkholes was indicated west of KY 353 in the “West Array Field”. Several more were noted proximate to the site mostly concentrated to the southern end. It should be noted that any previous developments in the area of work can mask the presence of existing karst features such as sinkholes. It should be understood by the Owner that there is some degree of risk of future ground subsidence where karst is known to exist. It is impossible to fully identify the presence of or risk for development of all geologic hazards during the course of a typical geotechnical investigation.

3. Results of Exploration

A geotechnical investigation was performed and consisted of drilling 58 soil test borings with six borings having rock core obtained. All borings were advanced to auger refusal. Rock core samples were taken at Borings B-6A, B-21A, B-29, SSB-1, SSB-2 and SSB-3. A copy of the boring logs is included in Appendix B of this report.

The borings were drilled by an AEI drill crew using a track-and truck-mounted drill rig equipped with continuous flight hollow-stem augers and diamond impregnated coring equipment. A Geologist-In-Training (GIT) was on site throughout the fieldwork to log the soil encountered during the drilling operation. During logging, particular attention was given to the soil color, texture, consistency and apparent moisture content. Standard Penetration Tests (SPT’s) were performed at the surface and then on two and one-half foot centers in the upper ten feet and typically on five-foot centers thereafter to the boring termination or auger refusal depths. Undisturbed tube samples were obtained at select locations; samples were taken in 36 of 58 borings. Soil samples were collected from the recovered samples and stored in sealed plastic bags to be transported back to our laboratory for further analysis.

Topsoil was encountered in each of the borings at the site to depths ranging from three to 12 inches beneath the existing ground surface. Beneath the topsoil, the soils encountered were typically described as lean clay (CL) and fat clay (CH), containing variable amounts of silts and sands, brown to gray in color, moist to wet of the anticipated optimum moisture content for compaction and soft to hard in soil strength consistency.

SPT-N values ranged from three to 43 blows per foot (bpf), excluding 50 plus blow counts, with most values ranging from six to 12 bpf. Corresponding Qp values ranged from 1.5 to greater than 4.5 tons per square foot (tsf) with most values between three to four tsf. Together, SPT-N and Qp values are generally indictive of medium stiff to stiff consistencies with isolated soft, very stiff and hard zones.

Visual classification and Atterberg limits testing were performed on representative samples. The results indicate that the near-surface clay soils typically classify as CL (Clay of Low plasticity), lean clay and CH (Clay of High Plasticity), fat clay in accordance with the Unified Soil Classification System (USCS). Liquid limit test results range from 41 to 74 percent with corresponding plasticity indices ranging from 18 to 46 percent. Natural moisture content testing was also performed on recovered samples. Natural moisture contents range from about six to 46 percent with most values between about 18 and 29 percent. Results

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of natural moisture content and Atterberg limits indicate the on-site soils are typically near to eleven percent wet of the plastic limit.

Electrical resistivity determination was performed in the field. The AASHTO LRFD Bridge Design Specifications, 8th Edition, states that resistivity values less than 2,000 ohm-cm, pH less than 5.5 and sulfate concentration greater than 1,000 ppm should be considered corrosive. If groundwater is encountered at above the pile termination depth then the following guidelines are indicative of corrosion potential: chloride content greater than 500 ppm, sulfate concentration greater than 500 ppm, pH less than 5.5 and high organic content.

Table 1: Corrosivity Testing Results

Boring Number	Sample Depth (feet)	Electrical Resistivity (KΩ)	pH	Sulfate Ion Content (ppm)	Chloride Ion Content (ppm)
B-34		-	4.94	<3	18
B-48		-	5.34	<3	32
B-52	-	1.57	-	-	-
B-54		-	5.05	<3	21
B-61		-	4.82	<3	12
SSB-1		-	5.57	<3	15
SSB-2	-	4.64	-	-	-

The pH values for Borings B-34, B-48, B-54 and B-61 are indicative of corrosive material. The sulfate and chloride ion contents are not indicative of potential pile deterioration or corrosion. USDA mapping shows high corrosion potential for the soils in the area. We suggest that some effort is made to account for the corrosion of steel piles. Potential mitigation methods are elaborated in Section 5.2.4 Corrosion Mitigation.

4. Bedrock Conditions

Refusal, as would be indicated by the driller on the field boring logs, indicates a depth where either essentially no downward progress can be made by the auger or where the N-value indicates essentially no penetration of the split-spoon sampler. It is normally indicative of a very hard or very dense material such as large boulders or the upper bedrock surface. Auger refusal was encountered in each soil test borings. Depth to bedrock ranged from about 3.1 to about 16.5 feet beneath the existing ground surface. Six, approximate ten-foot rock core samples were taken at various locations. The samples were comprised of mostly limestone interbedded with shale. Some rock core samples showed indications of clay seams in the upper four feet of the existing bedrock. Included in Appendix A is a Refusal Depth Map for your use in estimating locations which may encounter early refusal. Please note that the rockline may vary greatly between borings in karst terrain. No guarantee can be made to the continuity of the rock depth between borings.

5. Analyses and Recommendations

5.1. General Site Work

5.1.1 Topsoil Stripping

Prior to earthwork operations, topsoil and surface plant material root mat should be stripped from both cut and fill areas. The topsoil can be stockpiled and used for landscaping purposes.

5.1.2 Subgrade Evaluation/Conditioning

Once the surface material is removed, areas to receive fill should be "proof-rolled" under the observation of an AEI Geotechnical Engineer or Engineering Technician to evaluate the subgrade for suitability for fill placement. The proof-rolling should be performed using heavy construction equipment such as a fully loaded single or tandem axle dump truck (approximately 20-25 tons), passing repeatedly over the subgrade at a slow rate of speed.

Subgrade soils that are considered unstable after proof-rolling should be stabilized by additional compaction or by one or more of the following methods; in-place stabilization using chemical methods (lime/soil cement), removal and replacement with engineered fill, partial depth removal and replacement with a crushed (angular) aggregate layer, or partial depth removal and replacement with a geogrid and a crushed aggregate layer. The specific method of treatment will be based on the conditions present at the time the proof-rolling is performed and local availability of materials and economic factors. The selection of the appropriate method to mitigate degrading subgrade soils is dependent on the time of year site work is anticipated, cost, anticipated effectiveness, and scheduling impacts. AEI can assist in selecting this method considering all factors.

Once the subgrade is judged to be relatively uniform and suitable for support of engineered fill, fill areas should be brought to design elevations with on-site soil and/or suitable off-site borrow material placed and compacted as specified in Section 5.1.6 Fill Placement.

5.1.3 On-site Soils

The near-surface soils on this site are low plasticity clays that classify as CL and CH in accordance with the USCS. Efforts should be made to schedule earthwork activities during the late spring to early fall months since these soils will pump, rut and lose strength with moisture contents more than several points wet or dry of the optimum moisture content for compaction. These soils are judged suitable for use as fill material at the site provided provisions are made for wetting or drying the soils for compaction and are placed and compacted in accordance with Section 5.1.6 Fill Placement, however we would recommend that they not be placed beneath any lightly loaded floor slabs or footings due to the expansive potential of such clays with changes in moisture content.

An **average shrinkage factor of 3.4%** should be utilized for estimating earthwork quantities.

5.1.4 General Fill Requirements

Any material, whether borrowed on-site or imported to the site, placed as engineered fill on the project site beneath the proposed structure should be an approved material, free of environmental contamination, vegetation, topsoil, organic material, wet soil, construction debris, and rock fragments greater than six inches in diameter.

We recommend that any borrow material, if needed, consist of granular or lean clay materials or mixtures thereof with Unified Classifications of CL, SC, or GC. We further recommend high plasticity clays, known as fat clays (CH soils) not be imported to the site due to their potential for volume changes with fluctuations in moisture content.

The preferred off-site borrow material should have a Plasticity Index (PI) less than 30 and a standard Proctor maximum dry density of at least 95 pcf. Engineering classification and standard Proctor tests should be performed on all potential borrow soils and the test results evaluated by an AEI Geotechnical Engineer to evaluate the suitability of the soil for use as engineered fill.

5.1.5 Off-Site Soils

If off-site material is needed it should meet the requirements specified in section 5.1.4 above.

5.1.6 Fill Placement

Suitable fill material placed under structural areas should be placed in maximum eight inch (loose thickness) horizontal lifts, with each lift being compacted to a minimum of 98 percent of the standard Proctor maximum dry density at a moisture content within two percent of optimum. The compaction requirement may be reduced to 95 percent in proposed roadway and paved areas and to 92 percent in proposed field and landscape areas. At this site, wetting or drying of the soils will typically be necessary to achieve a moisture content suitable for compaction. Representative and adequate field density testing should be performed by AEI to verify that compaction requirements have been met.

5.1.7 Soil Movement

Site grading should be maintained during construction so that positive drainage is promoted at all times. Final site grading should be accomplished in such a manner as to divert surface runoff and roof drains away from the foundation elements and paved areas. Precipitation runoff should be collected in storm sewers as quickly as possible. Maintenance should be performed regularly on paved areas to seal pavement cracks and reduce surface water infiltration into the pavement subgrade.

5.1.8 Site Soil Practices

Working with the on-site soils will demand sensible construction practices and techniques. Some of these include:

- Prevent stripping too far in advance of actual earthwork needs. Problems arise when broad areas of clay/silt mixtures are exposed and allowed to become wet and soft from rainfall. Once saturated, deep rutting can occur by movement of construction equipment.

- Strip areas to receive fill in small, sequential areas as needed. These areas should be limited to the contractor's abilities to reasonably place and compact fill material.

- Schedule earthwork construction to take full advantage of a summer season. Generally, the on-site clays need to be placed within two percent of optimum moisture content to achieve compaction and reduce the potential for subgrade volume change. This moisture range is difficult to achieve in the winter and early spring when rainfall activity is more prevalent and soil drying is not always possible.

- Maintain good surface drainage during earthwork construction. Grade construction areas on a daily basis if necessary, to promote sheet drainage of precipitation and seal all engineered fill placed with a smooth drum steel roller at the end of each day.

- Perform frequent density tests during fill placement to confirm achievement of proper compaction.

5.2. Structure Foundations

5.2.1. Pile Design Loads

Uplift capacities were initially derived assuming the piles were pre-drilled and backfilled a minimum of 10 feet into rock as described above. The total factored uplift resistance was determined to be 2.5 kips using a factor of 0.35. However, pile testing was performed using an ultimate load of 7,000 pounds which relates to a design load of 4,375 pounds. Results of pile testing indicate that the **W6x9 piles** met or exceeded the aforementioned load prior to failure criteria when the piles were embedded a depth of seven (7) feet or greater. We suggest utilizing a **factored design uplift capacity of 4,375 pounds** for all piles on the project. Where required pre-drill the piles to achieve the minimum embedment depth of seven feet.

Pile compression tests were not required. Tension load tests exceed the ultimate compression load of 8,400 pounds when piles were embedded seven feet or greater. We suggest utilizing a **factored design compression capacity of 6,000 pounds** for all piles on the project.

5.2.2. Pre-Drilled Piles

The designer should address pre-drilling for piles at specified locations to achieve a minimum embedment depth of seven feet. Where pre-drilling is necessary for pile installation, holes shall be drilled into solid rock. Place the piles in the pre-drilled hole and tap them with a low energy driving hammer to confirm practical refusal. Backfill the holes with 4,000 psi concrete. To aid in the determination of areas which may require pre-drilling, a rock depth layout is included in the appendices of this report.

5.2.3. Drivability Analysis

A diesel pile driving hammer with a rated energy between 10 foot-kips and 20.5 foot-kips will be required to drive **W6x9** steel piles to practical refusal without encountering excessive blow counts or damaging the piles. The Contractor shall submit the proposed pile driving system to the Engineer for approval prior to the installation of the first pile. Approval of the pile driving system by the Engineer will be subject to satisfactory field performance of the pile driving procedures.

5.2.4. Corrosion Mitigation

There are various methods commonly used to mitigate the concern of pile corrosion and the subsequent loss of axial resistance. We suggest over sizing the steel section, i.e. a higher weight per foot section. As corrosion occurs the pile loses section area but due to the over sizing the pile section remains above the minimum design criteria. Alternatively, special steel alloys may be used to increase the corrosion resistance. If pre-drilling the piles it may be advantageous to case the piles in concrete using a low permeability mix design. If steel piles are being protected by concrete encasement they should be coated with a dielectric coating near the base of the concrete jacket. Another viable option would be to utilize hot-dipped galvanized steel piles. A cost analysis can be performed to determine whether over-sizing the pile or galvanization is the most fiscally responsible.

5.2.5. Potential Foundation Movement

A detailed settlement analysis was beyond the scope of this investigation. However, based on engineering experience with similar structures and similar bearing conditions, it is anticipated that less than ½ inch of total settlement will occur for point bearing piles driven to rock. Differential settlement is expected to be less than ¼ inch.

5.2.6. Aggregate Pavement

Aggregate pavement should be designed to support conventional construction equipment. The FHWA publication titled "Gravel Roads Construction and Maintenance Guide" offers guidance on the design of aggregate pavement. We suggest a minimum aggregate thickness of ten (10) inches in accordance with the Table 2.

Table 2:

Estimated Daily Number of Heavy Trucks	Subgrade Support Condition	Suggested Minimum Aggregate Layer Thickness (in.)
0-5	Low	6.5
	Medium	5.5
	High	4.5
5-10	Low	8.5
	Medium	7.0
	High	5.5
10-25	Low	11.5
	Medium	**9.0**
	High	7.0
25-50	Low	14.5
	Medium	11.5
	High	8.5

From Appendix A, Table 3 of the Gravel Roads Construction and Maintenance Guide

The aggregate layer thickness can be reduced by treating the subgrade with lime. The lime should be placed and mixed at a rate of 3 percent of the subgrade unit weight to a depth of 12 inches. The compacted subgrade average dry unit weight is 105 pounds per cubic foot (pcf). Reduce the aggregate layer thickness to seven (7) inches when constructing on a properly treated lime stabilized subgrade. It is possible, if the construction schedule for areas are short duration, that lime stabilized soil subgrades may support temporary construction equipment. We would anticipate this performing for three to six months provided construction occurs from late spring to late fall. For more permanent access roads, we recommend stone to be placed with the use of lime.

The lime stabilization should be performed in accordance to the guidelines described in the FHWA “Soil and Base Stabilization and Associated Drainage Considerations Volume 1” (FHWA-SA-93-004). In general, construction should consist of first scarifying the soils. Spread the lime and mix the soil and lime to the appropriate depth. Apply water to the soil and lime mixture either during the mixing process (slurry) or after the mixing process (dry lime application). After mixing, the lime treated subgrade should be lightly compacted with a smooth drum roller to minimize evaporation loss and decrease surface infiltration of possible precipitation during the mellowing process. Allow the mixture to mellow for a minimum of five days. Mix and pulverize the mixture prior to performing the final compaction. Continue mixing until 100 percent passes the 1-inch sieve and at least 60 percent pass the No. 4 sieve.

The aggregate should be placed in maximum lifts of eight (8) inches and should be densified in accordance with 5.1.6 Fill Placement.

5.3. General Considerations

5.3.1. Earthwork Considerations

The surface soils at the site are susceptible to loss of bearing capacity (pumping) by the action of water and construction equipment. Once the subgrade has been stripped, cut to grade and passed a proof-roll, it should be sealed at the end of each filling day with a smooth drum roller and sloped to sheet drain rainwater. Any material disturbed by rainwater and construction operations should be undercut prior to placing the next lift of fill.

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5.3.2. LIMITATIONS

The conclusions and recommendations presented herein are based on information gathered from the borings advanced during this exploration using that degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. No warranties can be made regarding the continuity of conditions between the borings. We will retain samples acquired for this project for a period of 30 days subsequent to the submittal date printed on the cover of this report. After this period, the samples will be discarded unless otherwise requested.

We appreciate the opportunity to be of service to you on this project and hope to provide further support on this and other projects in the future. Please contact us if you have any questions regarding this report.

Respectfully,
AMERICAN ENGINEERS, INC.

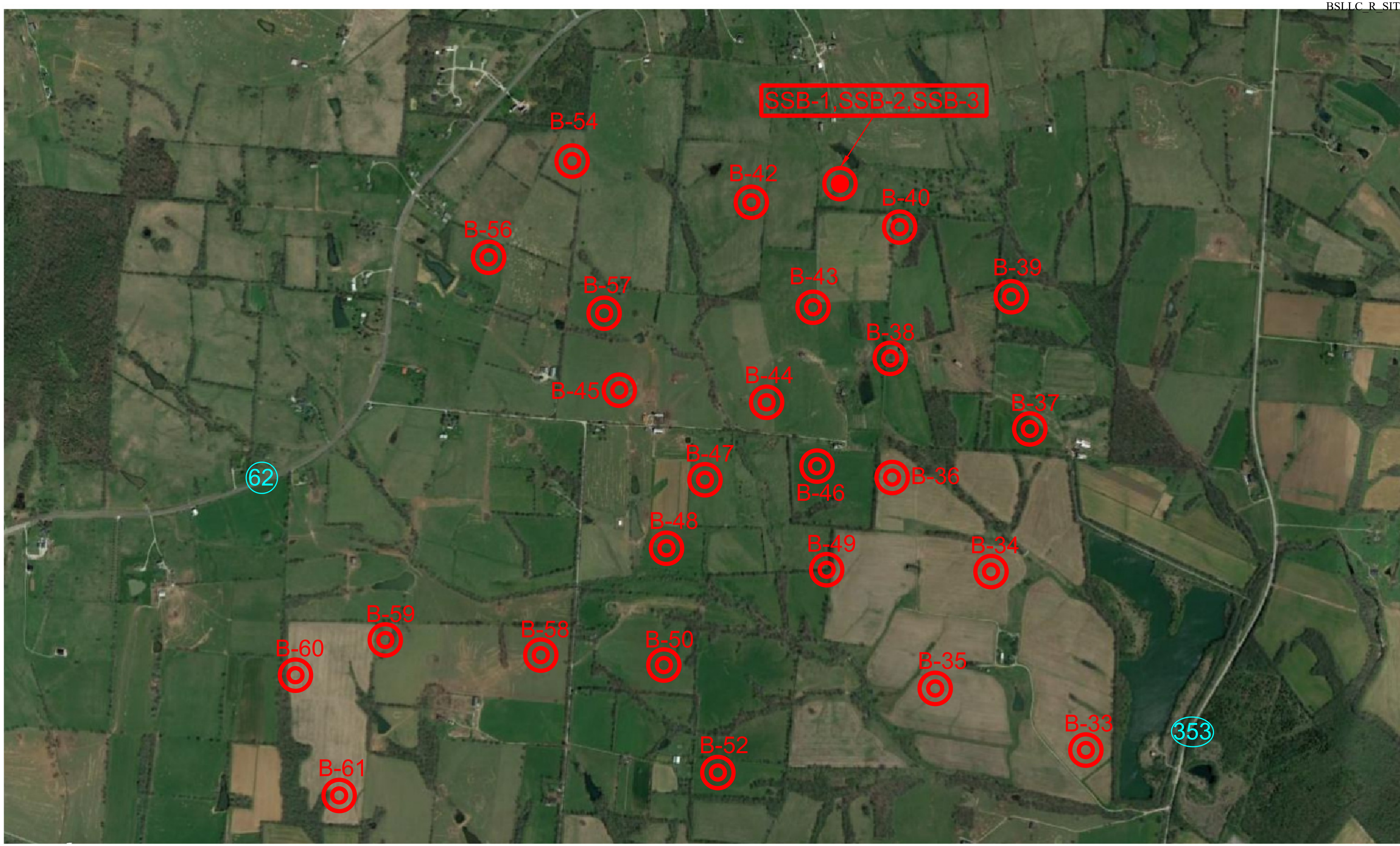
Trey Baston, EIT
Geotechnical Engineer

Jackson Daugherty, PE, PMP
Geotechnical Engineer

Dusty Barrett, PE, PMP
Director of Geotechnical Services

APPENDIX A

Boring Layout
Refusal Depth Map
Karst Potential Map
Corrosion Potential Map



LEGEND

SOIL TEST BORING WITH STANDARD PENETRATION TESTS AND/OR UNDISTURBED SHELBY TUBES

SOIL TEST BORING WITH STANDARD PENETRATION TESTS AND/OR UNDISTURBED SHELBY TUBES AND ROCK CORE

DRAWING NOT TO SCALE

ALL BORING LOCATIONS APPROXIMATE

NO.	DATE	REVISIONS DESCRIPTION

BORING LAYOUT

CLIENT: BayWa r.e. Solar Projects, LLC

PROJECT: BayWa 160 MW EKPC Cluster Cynthiana, KY

AMERICAN ENGINEERS, INC.
DESIGNING YOUR FUTURE
65 Aberdeen Drive Glasgow KY
270.651.7220

SCALE: NTS

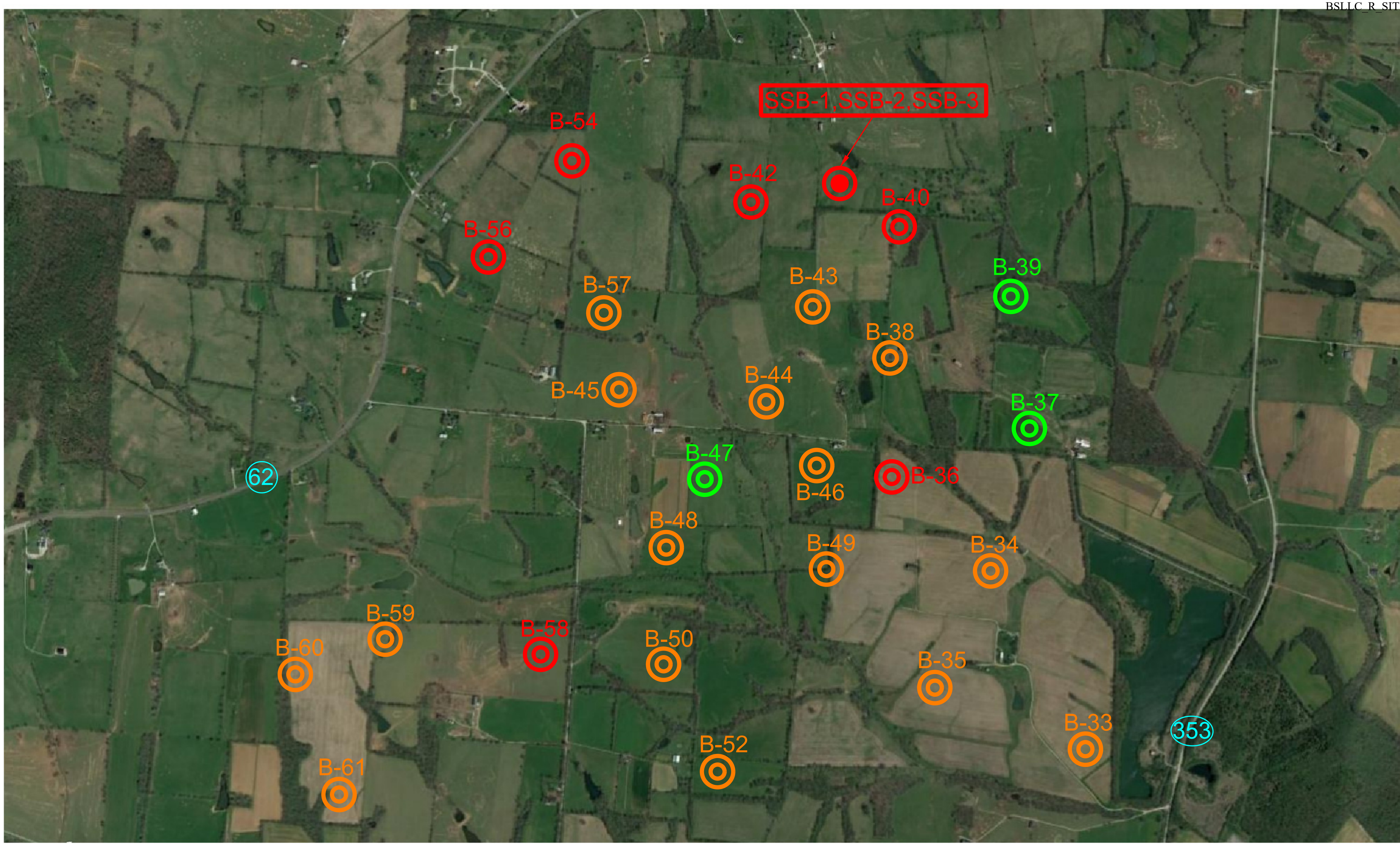
DATE: 04/29/2109

DRAWN BY: J. CHILDRESS

CHECKED BY: D. BARRETT

FILE: T:/19 PROJECTS/219-076 BayWa Solar Cynthiana KY/Geotechnical/Reports/Support Information/Boring Layout/BayWa Boring layout.dgn

SHEET: B1



REFUSAL DEPTHS

- 0'-7'
- 7'-12'
- 12'+

DRAWING NOT TO SCALE

ALL BORING LOCATIONS APPROXIMATE

REVISIONS: NO. | DATE | DESCRIPTION

REFUSAL DEPTHS

CLIENT: BayWa r.e. Solar Projects, LLC

PROJECT: BayWa 160 MW EKPC Cluster
Cynthiana, KY

AMERICAN ENGINEERS, INC.
DESIGNING YOUR FUTURE
65 Aberdeen Drive Glasgow KY
270.651.7220

SCALE: NTS

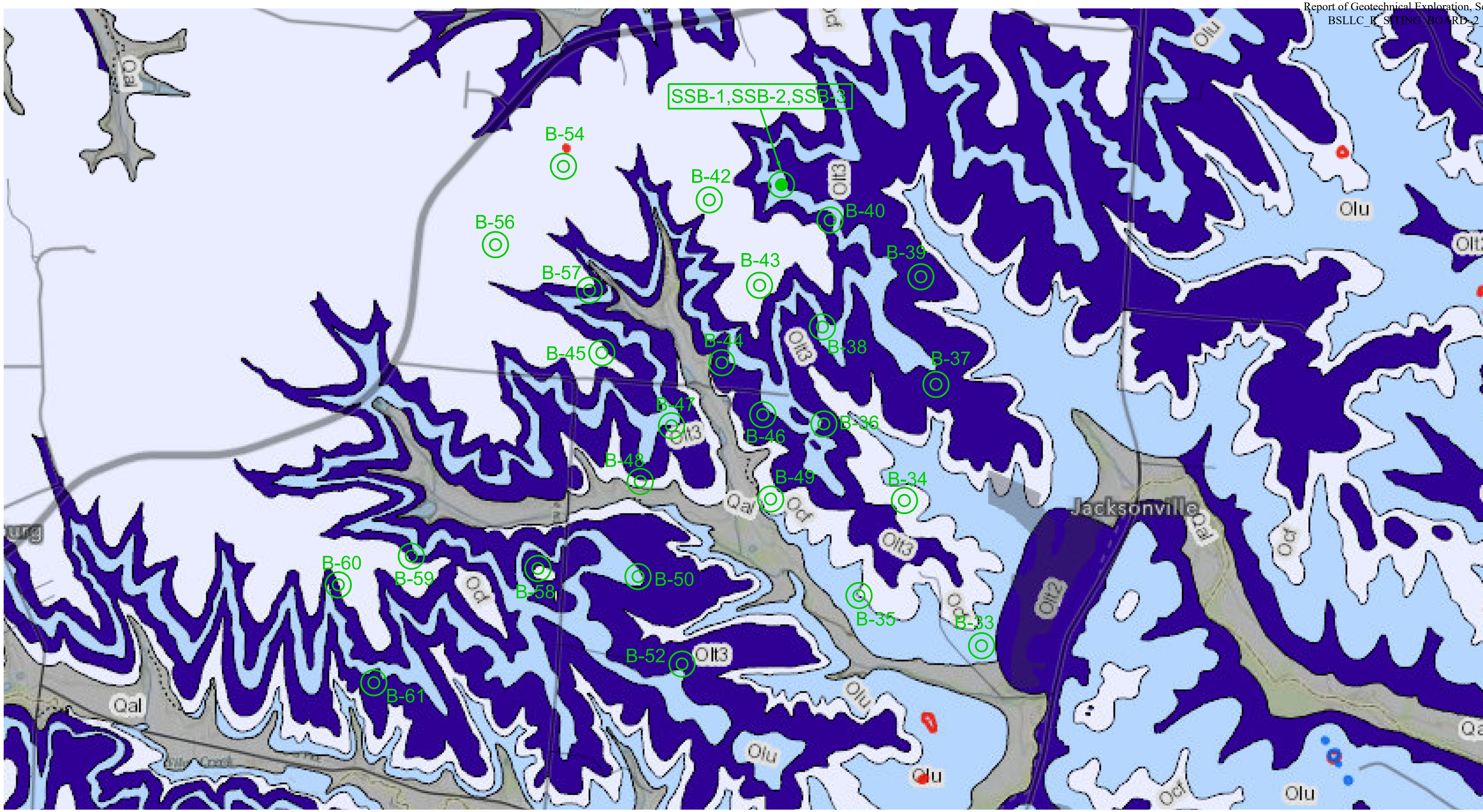
DATE: 04/29/2109

DRAWN BY: J. CHILDRESS

CHECKED BY: D. BARRETT

FILE: T:/19 PROJECTS/219-076 BayWa Solar Cynthiana KY/Geotechnical/Reports/Support Information/Boring Layout/BayWa Boring layout.dgn

SHEET: R1



LEGEND

SOIL TEST BORING WITH STANDARD PENETRATION TESTS AND/OR UNDISTURBED SHELBY TUBES

SOIL TEST BORING WITH STANDARD PENETRATION TESTS AND/OR UNDISTURBED SHELBY TUBES AND ROCK CORE

SINKHOLE

Karst Potential Units

- very high
- high
- medium
- low
- non-karst

DRAWING NOT TO SCALE

ALL BORING LOCATIONS APPROXIMATE

REVISIONS | NO. | DATE | DESCRIPTION

KARST POTENTIAL MAP

CLIENT: BayWa r.e. Solar Projects, LLC

PROJECT: BayWa 160 MW EKPC Cluster Cynthiana, KY

AEI AMERICAN ENGINEERS, INC. DESIGNING YOUR FUTURE 65 Aberdeen Drive Glasgow KY

SCALE: NTS

DATE: 04/29/2109

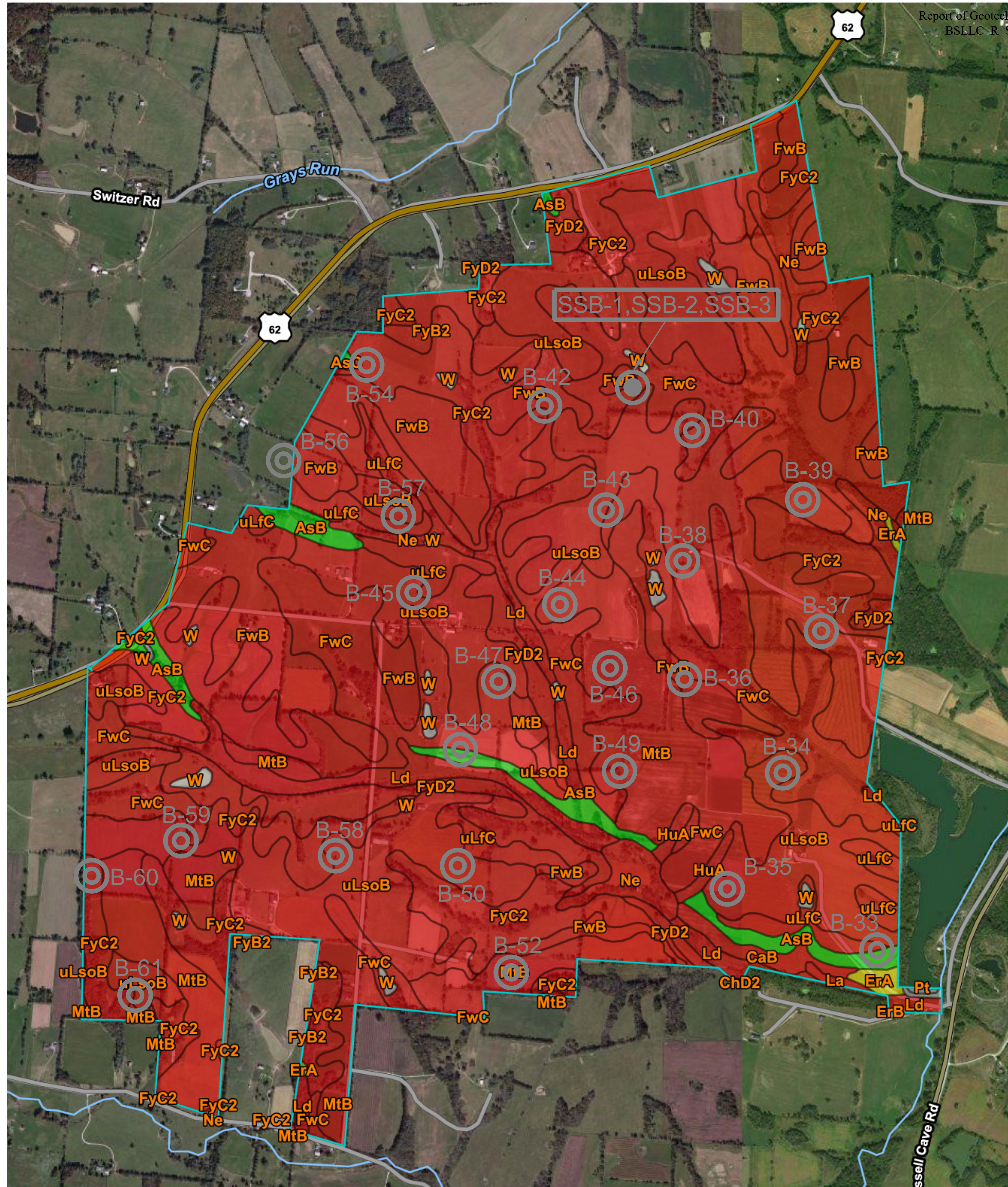
DRAWN BY: J. CHILDRESS

CHECKED BY: D. BARRETT

FILE: T:/19 PROJECTS/219-076 BayWa Solar Cynthiana KY/Geotechnical/Reports/Support Information/Boring Layout/BayWa Boring layout.dgn

SHEET: K1

Report of Geotechnical Exploration, September 2019
BSLLC_R_SITING_BOARD_2_4_Attachment



LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Background

Aerial Photography

Soil Rating Points

- High
- Moderate
- Low
- Not rated or not available

SOIL TEST BORING WITH STANDARD PENETRATION TESTS AND/OR UNDISTURBED SHELBY TUBES

SOIL TEST BORING WITH STANDARD PENETRATION TESTS AND/OR UNDISTURBED SHELBY TUBES AND ROCK CORE

DRAWING NOT TO SCALE

ALL BORING LOCATIONS APPROXIMATE

NO.	DATE	REVISIONS DESCRIPTION

CORROSION POTENTIAL MAPS

CLIENT: BayWa r.e. Solar Projects, LLC

PROJECT: BayWa 160 MW EKPC Cluster Cynthiana, KY

AEI AMERICAN ENGINEERS, INC. DESIGNING YOUR FUTURE

SCALE: NTS

DATE: 09/18/2019

DRAWN BY: J. CHILDRESS

CHECKED BY: D. BARRETT

FILE: T:/19 PROJECTS/219-076 BayWa Solar Cynthiana KY/Geotechnical/Reports/Support Information/Corrosion Potential/BayWa Corrosion potential and karst maps.dgn

SHEET: M1

APPENDIX B

Boring Logs

CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COHESIVE SOILS
(Clay, Silt, and Mixtures)

CONSISTENCY	SPT N-VALUE	Qu/Qp (tsf)
Very Soft	2 blows/ft or less	0 – 0.25
Soft	2 to 4 blows/ft	0.25 – 0.49
Medium Stiff	4 to 8 blows/ft	0.50 – 0.99
Stiff	8 to 15 blows/ft	1.00 – 2.00
Very Stiff	15 to 30 blows/ft	2.00 – 4.00
Hard	30 blows/ft or more	> 4.00

PLASTICITY

Degree of Plasticity	Plasticity Index (PI)
Low	0 – 7
Medium	8 – 22
High	over 22

NON-COHESIVE SOILS
(Silt, Sand, Gravel, and Mixtures)

DENSITY	SPT N-VALUE
Very Loose	4 blows/ft or less
Loose	4 to 10 blows/ft
Medium Dense	10 to 30 blows/ft
Dense	30 to 50 blows/ft
Very Dense	50 blows/ft or more

PARTICLE SIZE IDENTIFICATION

Boulders	12 inch diameter or more
Cobbles	3 to 12 inch diameter
Gravel	Coarse – 1 to 3 inch
	Medium – ½ to 1 inch
	Fine – ¼ to ½ inch
Sand	Coarse – 0.6mm to ¼ inch
	Medium – 0.2mm to 0.6mm
	Fine – 0.05mm to 0.2mm
Silt	0.05mm to 0.005mm
Clay	0.005mm

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 – 10
Trace to Some	11 – 20
Some	21 – 35
And	36 – 50

NOTES

Classification – The Unified Soil Classification System is used to identify soil unless otherwise noted.

Standard "N" Penetration Test (SPT) (ASTM D1586) – Driving a 2-inch O.D., 1 3/8-inch I.D. sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6-inches to seat the sampler into undisturbed soil, and then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the field drill long (e.g., 10/8/7). On the report log, the Standard Penetration Test result (i.e., the N value) is normally presented and consists of the sum of the 2nd and 3rd penetration counts (i.e., N = 8 + 7 = 15 blows/ft.)

Soil Property Symbols

Qu:	Unconfined Compressive Strength	N:	Standard Penetration Value (see above)
Qp:	Unconfined Comp. Strength (pocket pent.)	omc:	Optimum Moisture content
LL:	Liquid Limit, % (Atterberg Limit)	PL:	Plastic Limit, % (Atterberg Limit)
PI:	Plasticity Index	mdd:	Maximum Dry Density

FIELD TESTING PROCEDURES

The general field procedures employed by the Field Services Center are summarized in the following outline. The procedures utilized by the AEI Field Service Center are recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Soil Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the surface conditions. Borings are advanced into the ground using continuous flight augers. At prescribed intervals throughout the boring depths, soil samples are obtained with a split-spoon or thin-walled sampler and sealed in airtight glass jars and labeled. The sampler is first seated 6 inches to penetrate loose cuttings and then driven an additional foot, where possible, with blows from a 140 pound hammer falling 30 inches. The number of blows required to drive the sampler each six-inch increment is recorded. The penetration resistance, or "N-value" is designated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split spoon sampling procedures used during the exploration are in general accordance with ASTM D 1586. Split spoon samples are considered to provide *disturbed* samples, yet are appropriate for most engineering applications. Thin-walled (Shelby tube) samples are considered to provide *undisturbed* samples and obtained when warranted in general accordance with ASTM D 1587.

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Core Drilling Procedures for use on refusal materials. Prior to coring, casing is set in the boring through the overburden soils. Refusal materials are then cored according to ASTM D-2113 using a diamond bit attached to the end of a hollow double tube core barrel. This device is rotated at high speeds and the cuttings are brought to the surface by circulating water. Samples of the material penetrated are protected and retained in the inner tube, which is retrieved at the end of each drill run. Upon retrieval of the inner tube the core is recovered, measured and placed in boxes for storage.

The subsurface conditions encountered during drilling are reported on a field test boring record by the driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soil in general accordance with the procedures outlined in ASTM D 2487 and D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

Representative portions of soil samples are placed in sealed containers and transported to the laboratory. In the laboratory, the samples are examined to verify the driller's field classifications. Test Boring Records are attached which show the soil descriptions and penetration resistances.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designate the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

Water table readings are normally taken in conjunction with borings and are recorded on the "Boring Logs". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using as electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Sampling Terminology

Undisturbed Sampling: Thin-walled or Shelby tube samples used for visual examination, classification tests and quantitative laboratory testing. This procedure is described by ASTM D 1587. Each tube, together with the encased soil, is carefully removed from the ground, made airtight and transported to the laboratory. Locations and depths of undisturbed samples are shown on the "Boring Logs."

Bag Sampling: Bulk samples of soil are obtained at selected locations. These samples consist of soil brought to the surface by the drilling augers, or obtained from test pits or the ground surface using hand tools. Samples are placed in bags, with sealed jar samples of the material, and taken to our laboratory for testing where more mass material is required (i.e. Proctors and CBR's). The locations of these samples are indicated on the appropriate logs, or on the Boring Location Plan.

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B-33

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/26/19 **COMPLETED** 3/26/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Cash
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (9 inches)	SPT 1	93	3-4-4 (8)	3.5	22				
		(CL) lean CLAY, brown, moist to wet, medium stiff to very stiff	SPT 2	87	3-5-7 (12)	4.5+	21				
5			ST 1	40		3.75	26				
			SPT 3	100	4-10-10 (20)	4.5+	24				

Refusal at 7.9 feet.
Bottom of borehole at 7.9 feet.

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B-34

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/27/19 **COMPLETED** 3/27/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Cash
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (9 inches)	SPT 1	60	2-3-4 (7)	2.5	24				
		(CL) lean CLAY, brown, moist to wet, medium stiff to stiff	SPT 2	73	4-5-6 (11)	3.5	18				
			ST 1	55		4.0	25				
5											
			SPT 3	93	4-6-10 (16)	4.5	30				

Refusal at 8.9 feet.
Bottom of borehole at 8.9 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/27/19 **COMPLETED** 3/27/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (9 inches)	SPT 1	73	2-2-3 (5)	2.0	23				
		(CL) lean CLAY, brown, moist to wet, medium stiff	SPT 2	93	3-3-4 (7)	3.0	25				
5			ST 1	65		3.75	23	41	23	18	
10											

Refusal at 10.7 feet.
Bottom of borehole at 10.7 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/27/19 **COMPLETED** 3/27/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (5 inches) (CH) fat CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 1	73	0-2-3 (5)	2.5	33				
			ST 1	60		2.25	27				
5			SPT 2	73	3-4-6 (10)	3	29				

Refusal at 7.0 feet.
Bottom of borehole at 7.0 feet.

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PAGE 1 OF 1

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/28/19 **COMPLETED** 3/28/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (12 inches)	SPT 1	73	2-2-4 (6)	3.0	26				
		(CL) lean CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 2	60	3-3-4 (7)	3.0	22				
5			SPT 3	93	2-3-4 (7)	2.5	32				
			SPT 4	87	4-6-9 (15)	4.5	25				
10			SPT 5	100	4-5-7 (12)	4.5	26				

Refusal at 12.1 feet.
Bottom of borehole at 12.1 feet.

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PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/28/19 **COMPLETED** 3/28/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (12 inches)	SPT 1	100	3-4-5 (9)	3.5	26				
		(CL) lean CLAY, brown to tan, moist to wet, medium stiff to very stiff	SPT 2	100	3-4-5 (9)	3.5	23				
5			SPT 3	100	2-2-5 (7)	3.0	26				
			SPT 4	87	4-7-10 (17)	4.0	28				
10			SPT 5	100	4-6-10 (16)	4.5	14				

Refusal at 11.3 feet.
Bottom of borehole at 11.3 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/28/19 **COMPLETED** 3/28/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (8 inches)	SPT 1	100	1-1-3 (4)	2.5	24				
		(CL) lean CLAY, brown, moist to wet, medium stiff to stiff	ST 1	85		2.25	23				
5			SPT 2	100	3-4-7 (11)	3.5	27				
			SPT 3	100	3-7-8 (15)	4.5	26				
10			SPT 4	100	3-5-5 (10)	4.5	28				

Refusal at 12.4 feet.
Bottom of borehole at 12.4 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
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PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/28/19 **COMPLETED** 3/28/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (8 inches)	SPT 1	73	2-3-4 (7)	3.0	25				
		(CL) lean CLAY, brown, moist, medium stiff	SPT 2	100	3-3-4 (7)	3.0	24				
5			SPT 3	75	4-10-50 (60)	3.5	21				

Refusal at 5.2 feet.
Bottom of borehole at 5.2 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/28/19 **COMPLETED** 3/28/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (6 inches) (CH) fat CLAY, brown, moist to wet, medium stiff	SPT 1	100	1-2-3 (5)	3.0	25				
			SPT 2	100	2-3-4 (7)	3.0	34				
			SPT 3	100	5-50	4.5+	22				

Refusal at 4.6 feet.
Bottom of borehole at 4.6 feet.

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AEI AMERICAN ENGINEERS, INC.
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65 Aberdeen Drive
Glasgow, KY 42141
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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/28/19 **COMPLETED** 3/28/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (11 inches)	SPT 1	87	2-2-5 (7)	2.5	25				
		(CL) lean CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 2	93	2-2-3 (5)	2.5	22				
5			SPT 3	100	3-4-6 (10)	3.0	21				
			SPT 4	93	4-5-6 (11)	3.0	28				

Refusal at 8.9 feet.
Bottom of borehole at 8.9 feet.

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PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/29/19 **COMPLETED** 3/29/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (8 inches)	SPT 1	93	3-4-6 (10)	3.0	23				
		(CL) lean CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 2	80	3-4-6 (10)	3.5	26				
5			SPT 3	100	2-2-4 (6)	3.0	33				
			SPT 4	100	3-6-9 (15)	4.5	25				
10			SPT 5	100	3-5-8 (13)	4.5	23				

Refusal at 11.6 feet.
Bottom of borehole at 11.6 feet.

AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
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(270) 651-7220

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/29/19 **COMPLETED** 3/29/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (8 inches)	SPT 1	87	2-2-4 (6)	3.0	23				
		(CL) lean CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 2	87	3-3-4 (7)	3.0	21				
5			SPT 3	67	2-3-4 (7)	2.5	31				
			SPT 4	87	4-6-9 (15)	4.5	25				
10			SPT 5	100	4-5-7 (12)	4.5	24				

Refusal at 11.5 feet.
Bottom of borehole at 11.5 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/29/19 **COMPLETED** 3/29/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (12 inches)	SPT 1	80	3-4-5 (9)	3.0	23				
		(CL) lean CLAY, brown to tan, moist to wet, stiff	SPT 2	100	3-4-6 (10)	3.0	22				
5			SPT 3	100	3-4-5 (9)	2.5	33				
			SPT 4	67	3-5-4 (9)	4.5	25				
10			SPT 5	93	3-1-8 (9)	4.5	23				

Refusal at 10.6 feet.
Bottom of borehole at 10.6 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/29/19 **COMPLETED** 3/29/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
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AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (9 inches)	SPT 1	100	2-3-4 (7)	2.5	27				
		(CL) lean CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 2	100	3-3-5 (8)	3.0	23				
5			SPT 3	100	4-5-5 (10)	3.5	25				
			SPT 4	100	3-4-4 (8)	3.5	25				
10			SPT 5	53	3-2-2 (4)	3.0	24				
15			SPT 6	38	2-2-3 (5)	3.5	29				

Refusal at 15.3 feet.
Bottom of borehole at 15.3 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/29/19 **COMPLETED** 3/29/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (9 inches)	SPT 1	87	3-3-5 (8)	2.5	25				
		(CL) lean CLAY wih sand, brown to tan, moist to wet, medium stiff to stiff	ST 1	100		3.75	23	42	18	24	
5			SPT 2	100	3-4-6 (10)	4.5	24				
			SPT 3	93	3-6-8 (14)	4.5+	24				
10			SPT 4	73	4-7-7 (14)	3.5	21				

Refusal at 10.6 feet.
Bottom of borehole at 10.6 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/29/19 **COMPLETED** 3/29/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (6 inches)									
		(CL) lean CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 1	87	2-2-4 (6)	3.5	23				
			ST 1	60		4.5+					
5			SPT 2	87	2-5-10 (15)	4.5+	17				
		(CL) lean CLAY with limestone boulders, brown, moist, stiff	SPT 3	113	14-10-9 (19)	4.5+	19				
10			SPT 4	40	13-8-9 (17)	4.5+	13				

Refusal at 11.5 feet.
Bottom of borehole at 11.5 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/29/19 **COMPLETED** 3/29/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (7 inches)	SPT 1	93	2-3-4 (7)	4.0	25				
		(CL) lean CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 2	80	3-4-5 (9)	4.0	23				
5			SPT 3	100	2-3-5 (8)	4.0	22				
			SPT 4	100	10-23-50 (73)	4.0+	28				limestone boulders

Refusal at 8.4 feet.
Bottom of borehole at 8.4 feet.

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PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 3/29/19 **COMPLETED** 3/29/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (12 inches)	SPT 1	67	2-3-5 (8)	3.0	26				
		(CH) fat CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 2	100	2-3-3 (6)	2.0	32				
5			SPT 3	100	2-3-5 (8)	3.0	30				
			SPT 4	100	3-6-8 (14)	4.0	30				
10			ST 1	92		4.0	30	74	28	46	

Refusal at 10.2 feet.
Bottom of borehole at 10.2 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 4/1/19 **COMPLETED** 4/1/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (9 inches)	SPT 1	80	1-1-2 (3)	1.5	30				
		(CH) fat CLAY, brown, moist to wet, soft to stiff	ST 1	95		1.75	34				
5			SPT 2	100	4-4-7 (11)	3.5	28				

Refusal at 6.1 feet.
Bottom of borehole at 6.1 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 4/1/19 **COMPLETED** 4/1/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (6 inches)	SPT 1	87	1-1-2 (3)	2.0	25				
		(CL) lean CLAY, brown, moist to wet, soft to stiff	ST 1	35		2.0	22				
5			SPT 2	93	1-2-14 (16)	3.5	21				

Refusal at 5.6 feet.
Bottom of borehole at 5.6 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 4/1/19 **COMPLETED** 4/1/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (8 inches)	SPT 1	73	2-2-4 (6)		23				
		(CL) lean CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 2	80	3-4-5 (9)		23				
5			SPT 3	87	3-4-6 (10)		23				
			SPT 4	100	5-6-7 (13)		18				

Refusal at 8.6 feet.
Bottom of borehole at 8.6 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 4/1/19 **COMPLETED** 4/1/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (9 inches)	SPT 1	33	3-2-3 (5)	2.0	23				
		(CL) lean CLAY, brown, moist to wet, medium stiff to stiff	SPT 2	87	2-3-4 (7)	2.0	31				
5			SPT 3	100	5-6-7 (13)	3.5	21				

Refusal at 5.4 feet.
Bottom of borehole at 5.4 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
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PROJECT LOCATION Cynthiana, KY
DATE STARTED 4/1/19 **COMPLETED** 4/1/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (8 inches)	SPT 1	87	2-3-4 (7)	2.5	36				
		(CH) fat CLAY, brown, moist to wet, medium stiff to very stiff	SPT 2	93	2-2-4 (6)	2.5	35				
5			SPT 3	100	3-4-8 (12)	3.5	35				
			SPT 4	100	2-4-5 (9)	3.0	33				
10			SPT 5	100	4-12-12 (24)	2.5	29				

Refusal at 10.1 feet.
Bottom of borehole at 10.1 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 4/1/19 **COMPLETED** 4/1/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (6 inches)									
		(CL) lean CLAY, brown to tan, moist to wet, medium stiff to stiff	SPT 1	93	2-3-6 (9)	3.5	25				
			SPT 2	100	4-6-9 (15)	4.5	22				
5			SPT 3	100	4-5-6 (11)	4.5	23				
			SPT 4	100	3-3-3 (6)	4.5	28				

Refusal at 8.5 feet.
Bottom of borehole at 8.5 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 4/2/19 **COMPLETED** 4/2/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (11 inches)	SPT 1	100	2-3-3 (6)	2.5	29				
		(CL) sandy lean CLAY, brown to gray, moist to wet, medium stiff to stiff	SPT 2	100	2-3-5 (8)	3.0	26				
5			ST 1	67		2.0	25	44	21	23	
			SPT 3	100	3-6-9 (15)	4.5+	22				

Refusal at 9.0 feet.
Bottom of borehole at 9.0 feet.

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CLIENT BayWa r.e. Solar Projects, LLC
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PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 4/2/19 **COMPLETED** 4/2/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD HSA/ Diamond impregnated coring bit
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (12 inches)	SPT 1	87	2-2-3 (5)	3.0	24				
		(CH) fat CLAY, brown to gray, moist, medium stiff to stiff	ST 1	55		2.75	25				
5			SPT 2	100	3-4-5 (9)	3.5	26				
			SPT 3	100	4-6-7 (13)	4.5	25				
10			SPT 4	90	2-10-50 (60)	4.5+	26				
		LIMESTONE, light gray, weathered joints, thin to moderately thick bedded, hard	RC 1	94							
		LIMESTONE, interbedded shale, light gray, weathered joints, thin to moderately thick bedded, hard									
15			RC 2	91							
20											

Refusal at 10.2 feet.
Bottom of borehole at 20.5 feet.

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DATE STARTED 4/2/19 **COMPLETED** 4/2/19
GROUND ELEVATION
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD HSA/ Diamond impregnated coring bit
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
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NOTES
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (12 inches)	SPT 1	93	1-1-3 (4)	2.5	46				
		(CH) fat CLAY, brown to gray, moist to saturated, medium stiff	SPT 2	100	2-2-3 (5)	2.0	33				
5			SPT 3	60	6-50-0 (50)	3.5	27				
		LIMESTONE, light gray, weathered joints, thin to moderately thick bedded, hard	RC 1	98							
10		LIMESTONE, interbedded shale, light gray, weathered joints, thin to moderately thick bedded, hard	RC 2	100							

Refusal at 5.0 feet.
Bottom of borehole at 14.9 feet.

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DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD HSA/ Diamond impregnated coring bit
AT TIME OF DRILLING ---
LOGGED BY Caleb Koostra **CHECKED BY** Trey Baston
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (12 inches)	SPT 1	93	0-2-3 (5)	2.0	34				
		(CH) fat CLAY, brown to gray, moist to wet, medium stiff	SPT 2	93	2-2-3 (5)	2.5	29				
5			ST 1	35		4.5+	31	54	22	32	
		LIMESTONE, light gray, weathered joints, mulitiple clay seams, thin to moderately thick bedded, hard	RC 1	81							
		LIMESTONE, light gray, weathered joints, thin to moderately thick bedded, hard									
10			RC 2	100							
15			RC 3	74							

Refusal at 6.1 feet.
Bottom of borehole at 17.5 feet.

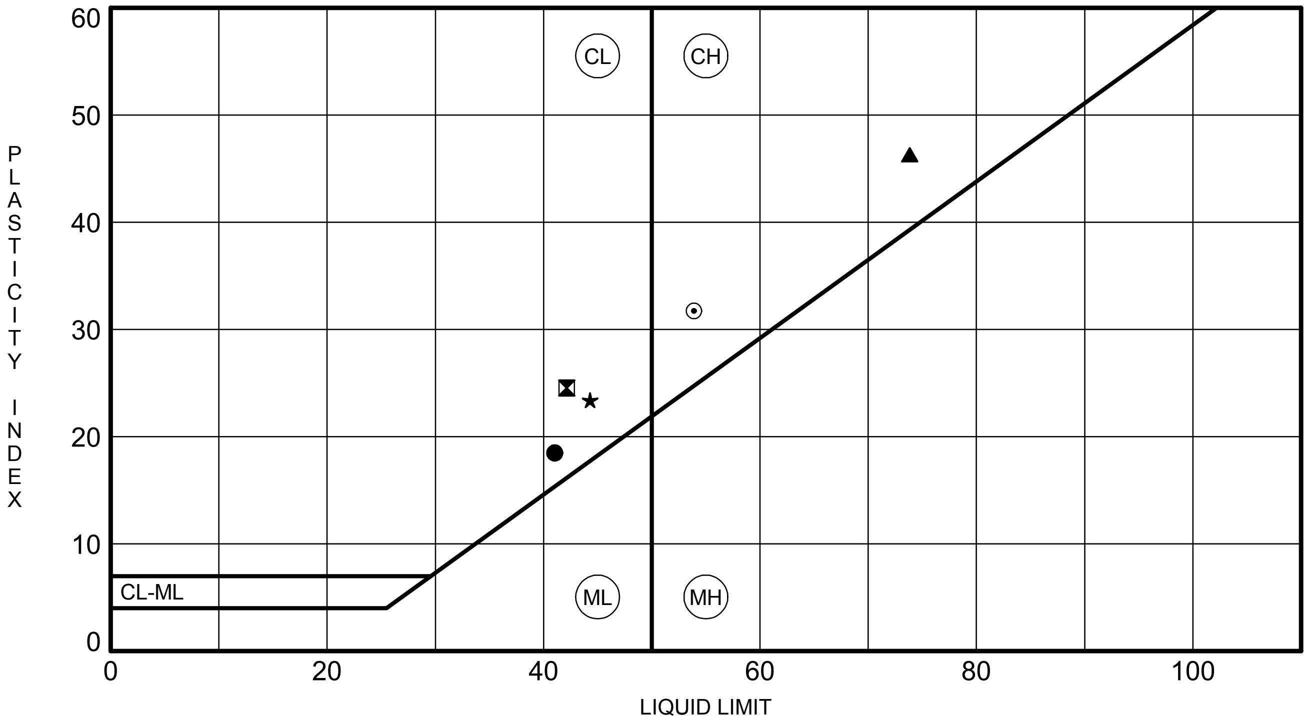
APPENDIX C

Laboratory Testing Results

ATTERBERG LIMITS' RESULTS

AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-35**	**4.0**	**41**	**23**	**18**	**97**	**LEAN CLAY(CL)**
⧗	**B-48**	**2.0**	**42**	**18**	**24**	**77**	**LEAN CLAY with SAND(CL)**
▲	**B-52**	**9.0**	**74**	**28**	**46**	**90**	**FAT CLAY(CH)**
★	**B-61**	**4.0**	**44**	**21**	**23**	**63**	**SANDY LEAN CLAY(CL)**
⊙	**SSB-3**	**4.0**	**54**	**22**	**32**	**88**	**FAT CLAY(CH)**

GRAIN SIZE DISTRIBUTION

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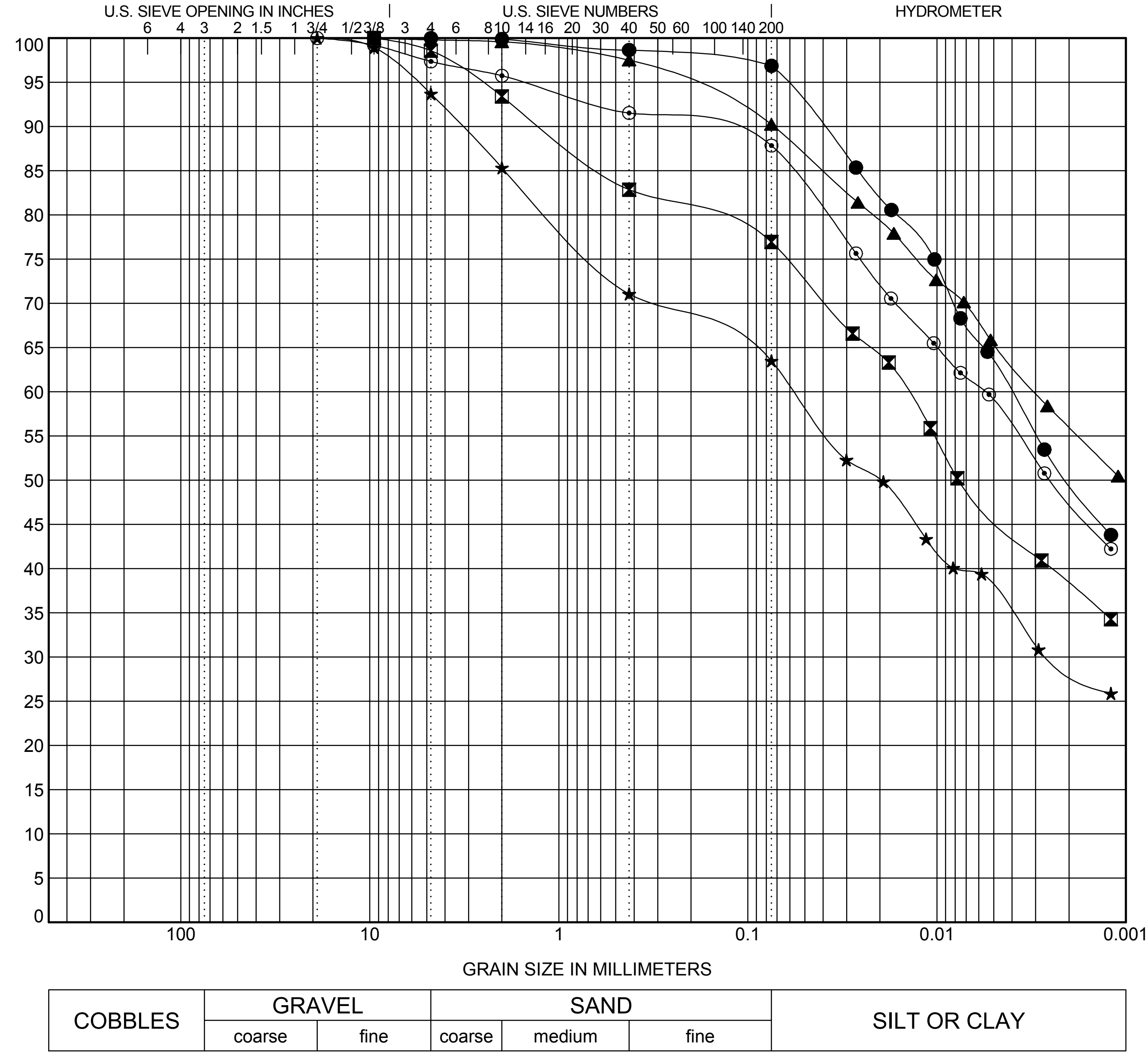
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY



	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-35**	**4.0**	**LEAN CLAY(CL)**	**41**	**23**	**18**		
⊠	**B-48**	**2.0**	**LEAN CLAY with SAND(CL)**	**42**	**18**	**24**		
▲	**B-52**	**9.0**	**FAT CLAY(CH)**	**74**	**28**	**46**		
★	**B-61**	**4.0**	**SANDY LEAN CLAY(CL)**	**44**	**21**	**23**		
⊙	**SSB-3**	**4.0**	**FAT CLAY(CH)**	**54**	**22**	**32**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-35**	**4.0**	**9.5**	**0.004**			**0.0**	**3.1**	**33.6**	**63.3**
⊠	**B-48**	**2.0**	**9.5**	**0.014**			**1.4**	**21.6**	**30.8**	**46.2**
▲	**B-52**	**9.0**	**9.5**	**0.003**			**0.2**	**9.6**	**24.8**	**65.4**
★	**B-61**	**4.0**	**19**	**0.056**	**0.002**		**6.3**	**30.2**	**25.9**	**37.6**
⊙	**SSB-3**	**4.0**	**19**	**0.006**			**2.6**	**9.5**	**28.9**	**58.9**

UNCONFINED COMPRESSION TEST

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PROFESSIONAL ENGINEERING
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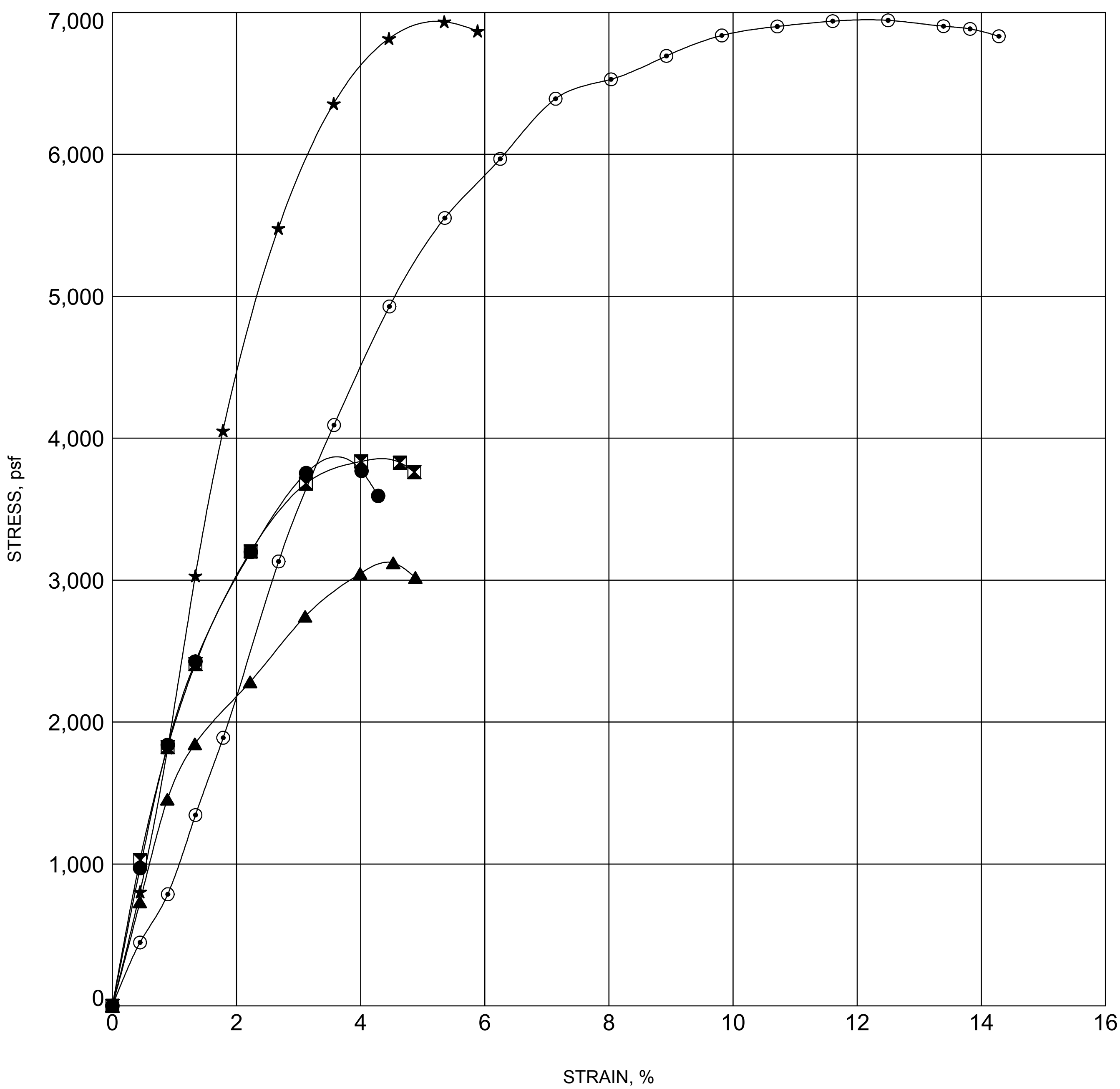
Glasgow, KY 42141
(270) 651-7220

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY



	BOREHOLE	DEPTH	Classification	γ_d	Qu
●	B-35	4.0	LEAN CLAY(CL)	104	3770
⧗	B-48	2.0	LEAN CLAY with SAND(CL)	100	3837
▲	B-52	9.0	FAT CLAY(CH)	91	3122
★	B-61	4.0	SANDY LEAN CLAY(CL)	119	6935
⊙	SSB-3	4.0	FAT CLAY(CH)	104	6944

MOISTURE-DENSITY RELATIONSHIP

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Glasgow, KY 42141
(270) 651-7220

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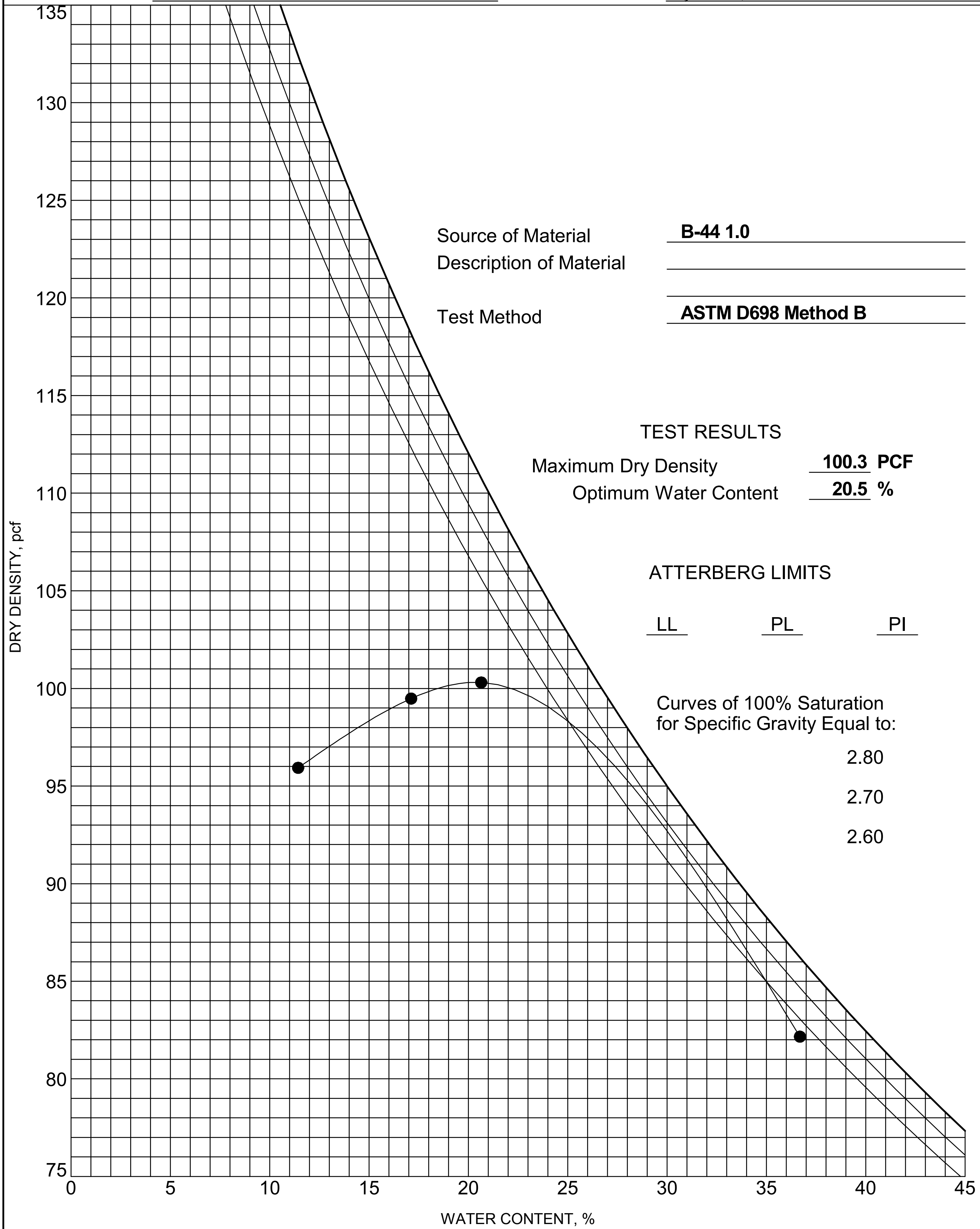
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY



Source of Material **B-44 1.0**
Description of Material

Test Method **ASTM D698 Method B**

TEST RESULTS

Maximum Dry Density **100.3 PCF**
Optimum Water Content **20.5 %**

ATTERBERG LIMITS

LL	PL	PI

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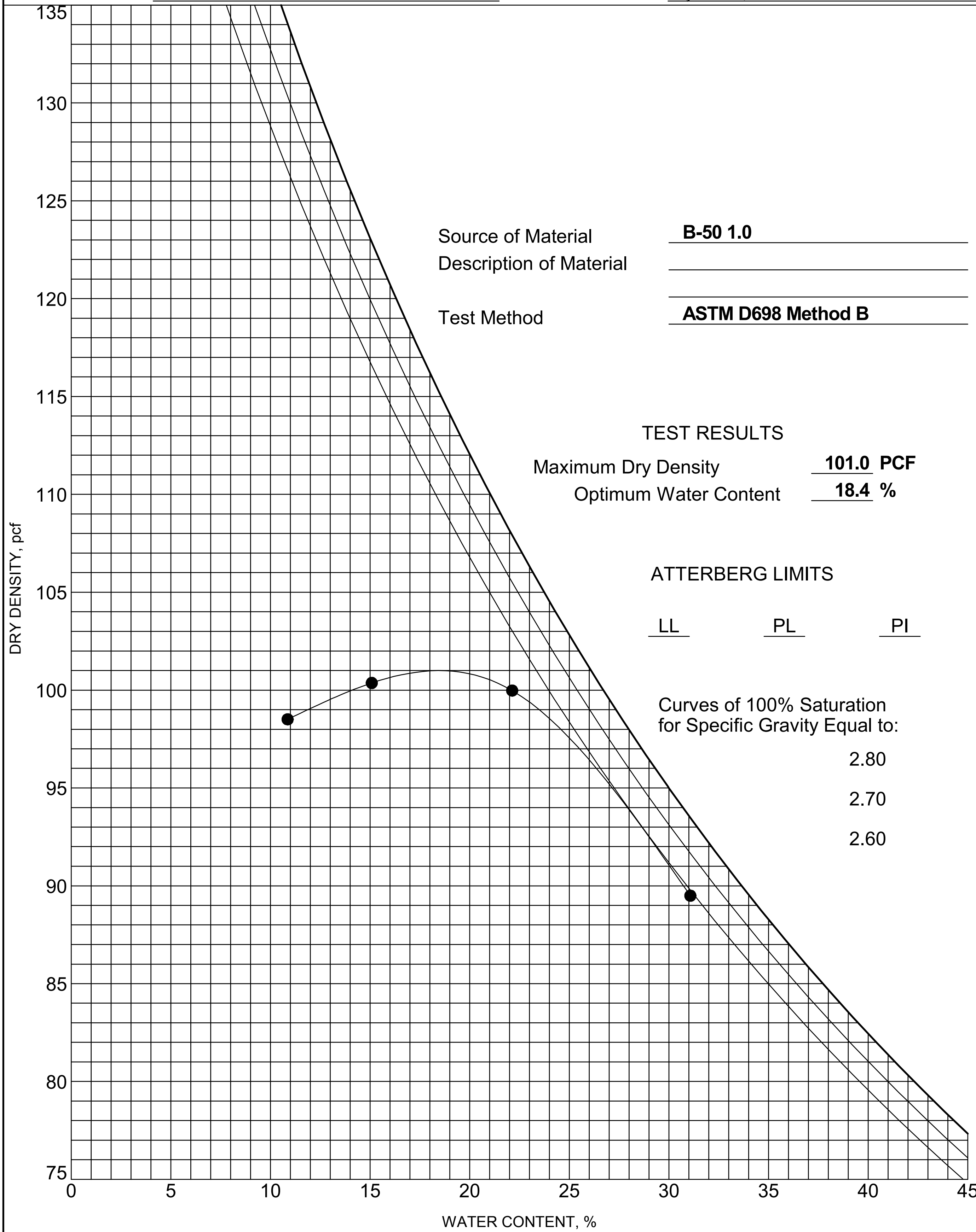
MOISTURE-DENSITY RELATIONSHIP

CLIENT BayWa r.e. Solar Projects, LLC

PROJECT NAME BayWa 160 MW EKPC Cluster

PROJECT NUMBER 219-076

PROJECT LOCATION Cynthiana, KY



MOISTURE-DENSITY RELATIONSHIP

AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
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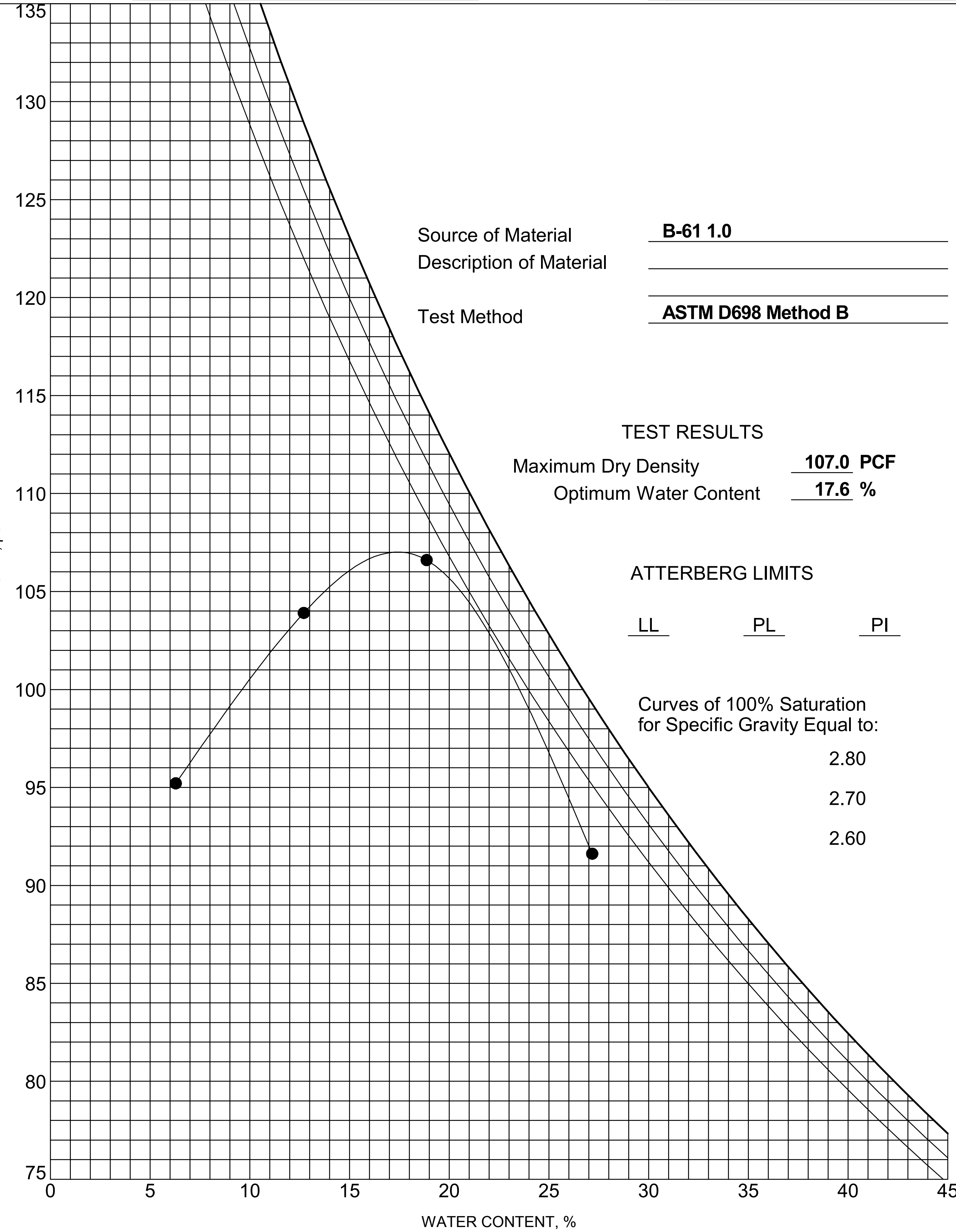

Source of Material **B-61 1.0**
Description of Material

Test Method **ASTM D698 Method B**

TEST RESULTS

Maximum Dry Density **107.0 PCF**
Optimum Water Content **17.6 %**

ATTERBERG LIMITS

LL	PL	PI

Curves of 100% Saturation
for Specific Gravity Equal to:
2.80
2.70
2.60

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MOISTURE-DENSITY RELATIONSHIP

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PROJECT NAME BayWa 160 MW EKPC Cluster
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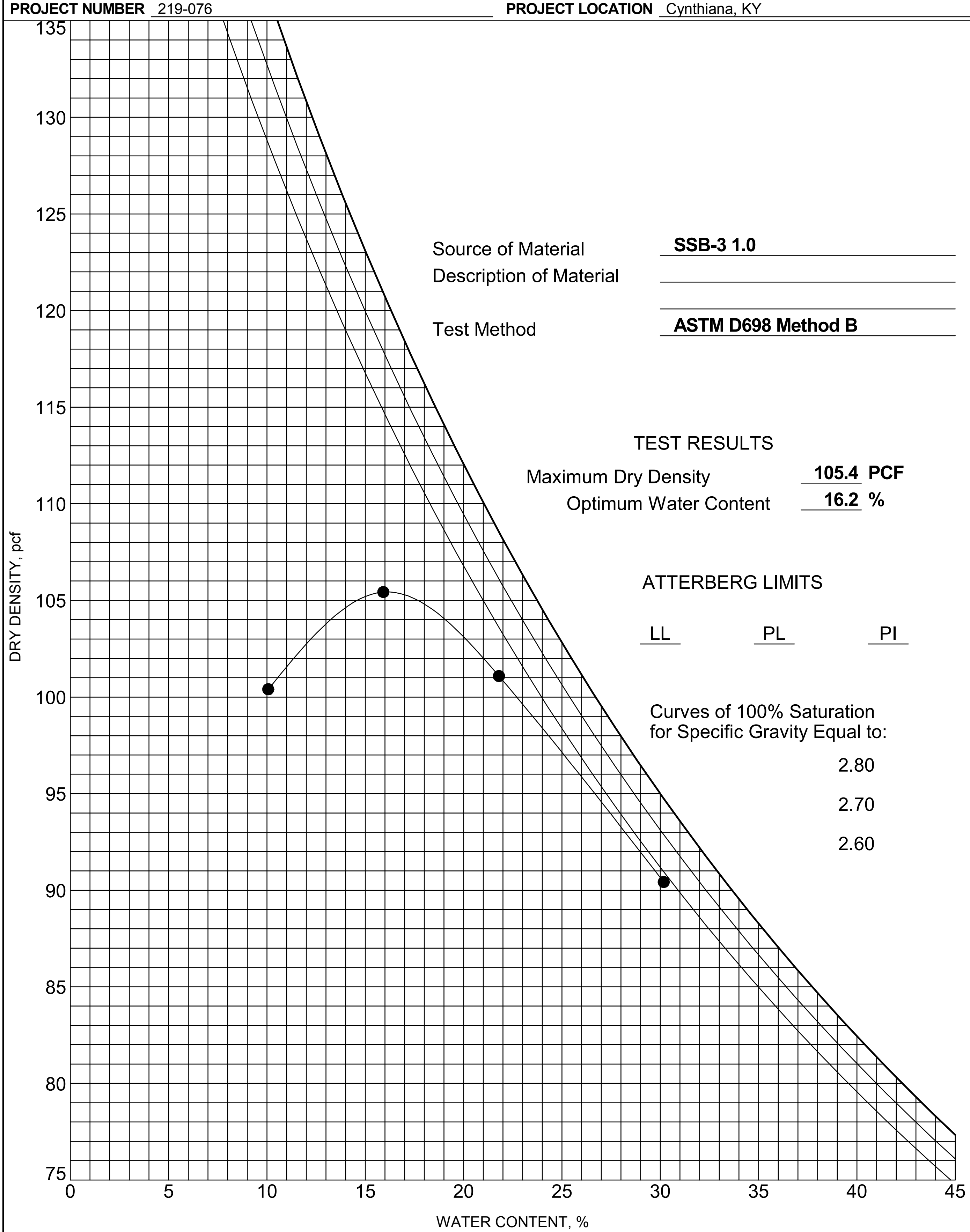


Source of Material **SSB-3 1.0**
Description of Material

Test Method **ASTM D698 Method B**

TEST RESULTS

Maximum Dry Density **105.4 PCF**
Optimum Water Content **16.2 %**

ATTERBERG LIMITS

LL	PL	PI

BOWSER-MORNER, INC.

Delivery Address: 4518 Taylorsville Road • Dayton, Ohio 45424 **Mailing Address**: P. O. Box 51 • Dayton, Ohio 45401

AASHTO/ISO 17025 Accredited • USACE Validated ACIL INDEPENDENCE

LABORATORY REPORT

Report To: American Engineers, Inc.
Attn: Brad High
65 Aberdeen Drive
Glasgow, KY 42141

Report Date: May 10, 2019
Job No.: 190148
Report No.: 430811
No. of Pages: 2

Report On: Laboratory Determination of Water Soluble Sulfates and Chlorides
Project: BayWa EKPC Cluster – AEI Job No. 219-076

On March 30, 2019, ten disturbed soil samples were submitted for determination of water soluble sulfates and chlorides for the above referenced project. Testing was performed as specified by the client and in accordance with the following procedures:

ASTM D 512, "Determining Chloride Ion in Water".

ASTM D 516, "Determining Sulfate Ion in Water".

Results are presented in the following table.

Should you have any questions, or if we may be of further service, please contact me at (937) 236-8805, extension 322.

Respectfully submitted,

BOWSER-MORNER, INC.

Karl A. Fletcher, Manager
Construction Materials and
Geotechnical Laboratories

KAF/blc
430811
1-File
1-bhigh@aei.cc

Report To: American Engineers, Inc.
Project: BayWa EKPC Cluster
AEI Job No. 219-076

BMI Job No.: 190148
BMI Report No.: 430811
Date Received: 04/30/19

TABLE I

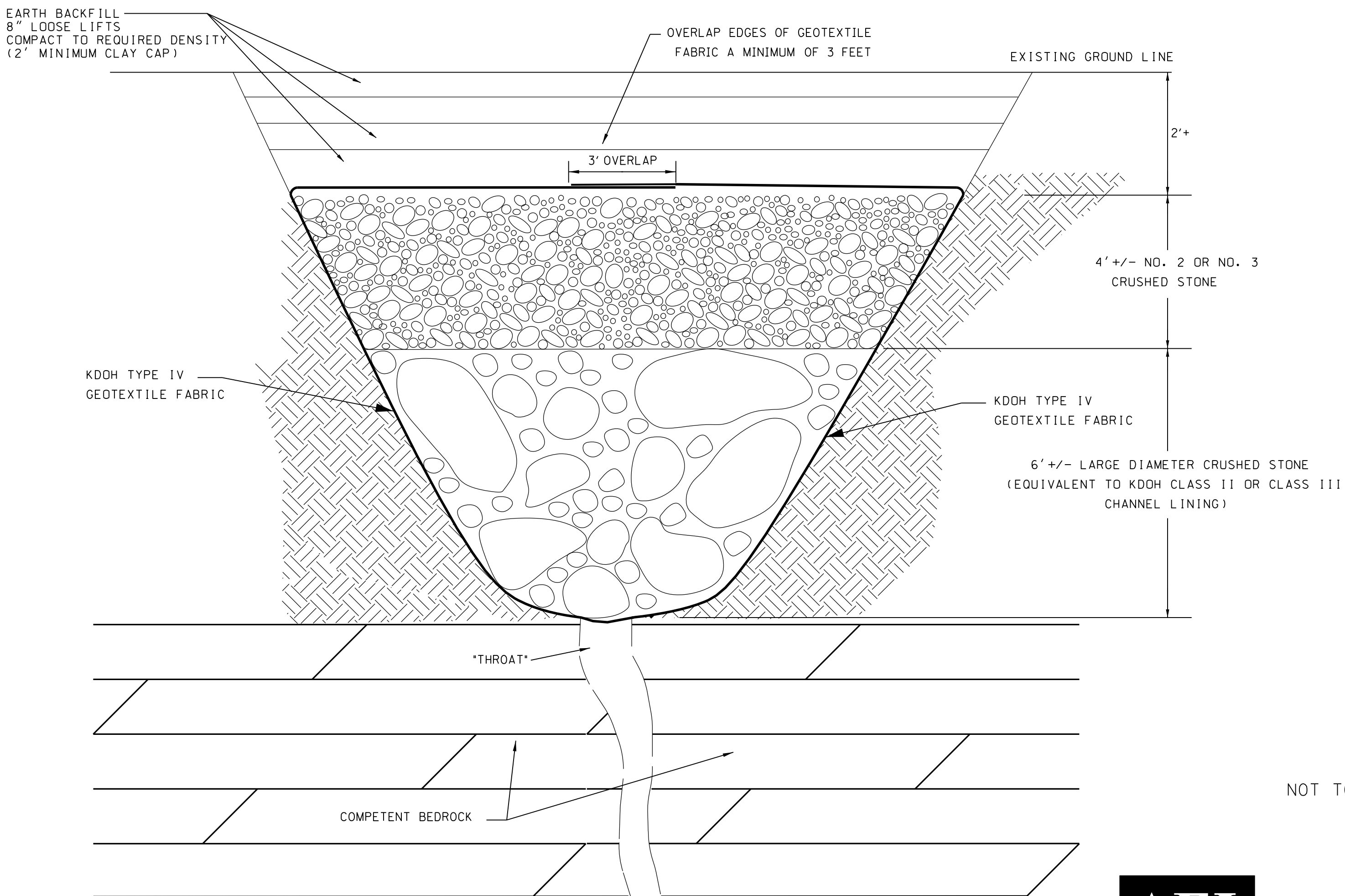
Summary of Results

Sample ID	Water Soluble Chloride Ion, mg/kg (ppm):	Water Soluble Sulfate Ion, mg/kg (ppm):
SSB-1, 2'	< 3	15
B-3, 4'	< 3	52
B-13, 4'	< 3	15
B-18, 4'	< 3	14
B-25, 4'	< 3	14
B-27, 4'	< 3	12
B-34, 3'	< 3	18
B-48, 2'	< 3	32
B-54, 2'	< 3	21
B-61, 4'	< 3	12

APPENDIX D

Typical Sinkhole Treatment Detail

TYPICAL SINKHOLE TREATMENT DETAIL



NOT TO SCALE

AEI AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING

Your Geotechnical Engineering Report

To help manage your risks, this information is being provided because subsurface issues are a major cause of construction delays, cost overruns, disputes, and claims.

Geotechnical Services are Performed for Specific Projects, Purposes, and People

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering exploration conducted for an engineer may not fulfill the needs of a contractor or even another engineer. Each geotechnical engineering exploration and report is unique and is prepared solely for the client. No one except the client should rely on the geotechnical engineering report without first consulting with the geotechnical engineer who prepared it. The report should not be applied for any project or purpose except the one originally intended.

Read the Entire Report

To avoid serious problems, the full geotechnical engineering report should be read in its entirety. Do not only read selected sections or the executive summary.

A Unique Set of Project-Specific Factors is the Basis for a Geotechnical Engineering Report

Geotechnical engineers consider a numerous unique, project-specific factors when determining the scope of a study. Typical factors include: the client's goals, objectives, project costs, risk management preferences, proposed structures, structures on site, topography, and other proposed or existing site improvements, such as access roads, parking lots, and utilities. Unless indicated otherwise by the geotechnical engineer who conducted the original exploration, a geotechnical engineering report should not be relied upon if it was:

- not prepared for you or your project,
- not prepared for the specific site explored, or
- completed before important changes to the project were implemented.

Typical changes that can lessen the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a multi-story hotel to a parking lot
- finished floor elevation, location, orientation, or weight of the proposed structure, anticipated loads or
- project ownership

Geotechnical engineers cannot be held liable or responsible for issues that occur because their report did not take into account development items of which they were not informed. The geotechnical engineer should always be notified of any project changes. Upon notification, it should be requested of the geotechnical engineer to give an assessment of the impact of the project changes.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that exist at the time of the exploration. A geotechnical engineering report should not be relied upon if its reliability could be in question due to factors such as man-made events as construction on or adjacent to the site, natural events such as floods, earthquakes, or groundwater fluctuation, or time. To determine if a geotechnical report is still reliable, contact the geotechnical engineer. Major problems could be avoided by performing a minimal amount of additional analysis and/or testing.

Most Geotechnical Findings are Professional Opinions

Geotechnical site explorations identify subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field logs and laboratory data and apply their professional judgment to make conclusions about the subsurface conditions throughout the site. Actual subsurface conditions may differ from those indicated in the report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risk associated with unanticipated conditions.

The Recommendations within a Report Are Not Final

Do not put too much faith on the construction recommendations included in the report. The recommendations are not final due to geotechnical engineers developing them principally from judgment and opinion. Only by observing actual subsurface conditions revealed during construction can geotechnical engineers finalize their recommendations. Responsibility and liability cannot be assumed for the recommendations within the report by the geotechnical engineer who developed the report if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Misinterpretation of geotechnical engineering reports has resulted in costly problems. The risk of misinterpretation can be lowered after the submittal of the final report by having the geotechnical engineer consult with appropriate members of the design team. The geotechnical engineer could also be retained to review crucial parts of the plans and specifications put together by the design team. The geotechnical engineering report can also be misinterpreted by contractors which can result in many problems. By participating in pre-bid and preconstruction meetings and providing construction observations by the geotechnical engineer, many risks can be reduced.

Final Boring Logs Should not be Re-drawn

Geotechnical engineers prepare final boring logs and testing results based on field logs and laboratory data. The logs included in a final geotechnical engineering report should never be redrawn to be included in architectural or design drawings due to errors that could be made. Electronic reproduction is acceptable, along with photographic reproduction, but it should be understood that separating logs from the report can elevate risk.

Contractors Need a Complete Report and Guidance

By limiting what is provided for bid preparation, contractors are not liable for unforeseen subsurface conditions although some owners and design professionals believe the opposite to be true. The complete geotechnical engineering report, accompanied with a cover letter or transmittal, should be provided to contractors to help prevent costly problems. The letter states that the report was not prepared for purposes of bid development and the report's accuracy is limited. Although a fee may be required, encourage the contractors to consult with the geotechnical engineer who prepared the report and/or to conduct additional studies to obtain the specific types of information they need or prefer. A prebid conference involving the owner, geotechnical engineer, and contractors can prove to be very valuable. If needed, allow contractors sufficient time to perform additional studies. Upon doing this you might be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Closely Read Responsibility Provisions

Geotechnical engineering is not as exact as other engineering disciplines. This lack of understanding by clients, design professionals, and contractors has created unrealistic expectations that have led to disappointments, claims, and disputes. To minimize such risks, a variety of explanatory provisions may be included in the report by the geotechnical engineer. To help others recognize their own responsibilities and risks, many of these provisions indicate where the geotechnical engineer's responsibilities begin and end. These provisions should be read carefully, questions asked if needed, and the geotechnical engineer should provide satisfactory responses.

Environmental Issues/Concerns are not Covered

Unforeseen environmental issues can lead to project delays or even failures. Geotechnical engineering reports do not usually include environmental findings, conclusions, or recommendations. As with a geotechnical engineering report, do not rely on an environmental report that was prepared for someone else.

AEI
AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING

65 Aberdeen Drive
Glasgow, KY 42141
270-651-7220

REPORT OF GEOTECHNICAL EXPLORATION

AMERICAN ENGINEERS, INC.

OCTOBER 2020

BAYWA 160 MW EKPC CLUSTER

(REED, ARNOLD, MCDOWELL AND AGNES)

CYNTHIANA, KY

October 7, 2020

Ms. Akhila Krishnan, PE
Project Engineer
BayWa r.e. Solar Projects, LLC
17901 Von Karman Avenue
Suite 1050
Irvine, CA 92614

RE: Preliminary Geotechnical Report
BayWa 160 MW EKPC Cluster
(Reed, Arnold, and McDowell Agnes)
Cynthia, KY
AEI Project No. 219-076

Dear Ms. Krishnan:

American Engineers, Inc. (AEI) is pleased to submit this letter report that summarizes the results of the solar array field exploration performed at the above referenced site.

1. Site and Project Description

The geotechnical investigation consisted of drilling 12 soil test borings. The project is generally divided into two areas, farmland west of KY 353 (Russell Caved Road) and land on Reed Valley Orchard east of KY 353. Currently, the site consists of mostly farmland with some woodland areas and ponds. A boring layout is included in Appendix A.

2. General Site Geology

Available geologic mapping (*Geologic Map of the Shawhan and Leesburg Quadrangle, Bourbon and Harrison counties, Kentucky, USGS 1973*), shows the site to be underlain by Clays Ferry Formation, Tanglewood Limestone Member No. 3 and upper part of Lexington Limestone. Bedrock of the Formations are predominantly shale and limestone. The shale is described as medium to olive-gray to brown in color and fissile. The limestone is described as light brown to light brownish-gray in color and micrograined to coarse grained, bioclastic and evenly bedded.

Karst potential mapping indicates the development of karst features in the immediate vicinity of the site is non-karst to very high. It should be noted that any previous developments in the area of work can mask the presence of existing karst features such as sinkholes. It should be understood by the Owner that there is some degree of risk of future ground subsidence where karst is known to exist. It is impossible to fully identify the presence of or risk for development of all geologic hazards during the course of a typical geotechnical investigation.

3. Results of Exploration

The geotechnical investigation consisted of 12 soil test borings. All borings were advanced to auger refusal. A boring layout is included in Appendix A of this report. Typed Boring logs are included in Appendix B of this report.

The borings were drilled by an AEI drill crew using a track and truck-mounted drill rig equipped with continuous flight hollow-stem augers. A Geologist was on site throughout the fieldwork to log the soil encountered during the drilling operation. During logging, particular attention was given to the soil color, texture, consistency and apparent moisture content. Standard Penetration Tests (SPT's) were performed at the surface and then on two and one-half foot centers in the upper ten feet and typically on five-foot centers thereafter to the auger refusal depths. Soil samples were collected from the recovered samples and stored in sealed plastic bags to be transported back to our laboratory for further classification and testing.

Topsoil was encountered at the surface with thicknesses ranging from four to six inches beneath the existing ground surface. Beneath the topsoil, the soils encountered were typically described as lean clay (CL) and fat clay (CH), containing variable amounts of sand and gravel, brown to gray in color, moist of the anticipated optimum moisture content for compaction and medium stiff to hard in soil strength consistency.

SPT-N values ranged from seven to 39 blows per foot (bpf), excluding 50+ blow counts, with most values ranging from eight to 30 bpf. Corresponding Q_p values ranged from 2.0 to greater than 4.5 tons per square foot (tsf), with most values from 3.5 to greater than 4.5 tsf. Together, SPT-N and Qp values are generally indictive of medium stiff to hard soil strength consistencies.

Visual classification and Atterberg limits testing were performed on representative samples. The results indicate that the near-surface clay soils typically classify as CL (Clay of Low Plasticity), lean clay and CH (Clay of High Plasticity), fat clay in accordance with the Unified Soil Classification System (USCS). Liquid limit test results range from 51 to 71 percent with corresponding plasticity indices ranging from 24 to 44 percent. Natural moisture content testing was also performed on recovered samples. Natural moisture contents range from about 12 to 28 percent, with most values between about 15 and 22 percent. Results of natural moisture content and Atterberg limits indicate the on-site soils are typically near to eight percent dry of the plastic limit.

Electrical resistivity determination was performed in the laboratory. The site corrosion potential criteria are derived from the *AASHTO LRFD Bridge Design Specifications, 8th Edition*. Resistivity values less than 2,000 ohm-cm, pH less than 5.5 and sulfate concentration greater than 1,000 ppm should be considered corrosive. If groundwater is encountered above the pile termination depth, then the following guidelines are indicative of corrosion potential: chloride content greater than 500 ppm, sulfate concentration greater than 500 ppm, pH less than 5.5 and high organic content. The table below summarizes the corrosivity testing results:

Table 1: Corrosivity Testing Results

Boring Number	Sample Depth (feet)	Electrical Resistivity (KΩ-cm)	pH	Sulfate Ion Content (ppm)	Chloride Ion Content (ppm)
B-2	7.0	1.00	8.0	17.0	10.8
B-6	4.0	2.56	8.1	17.9	8.6
B-11	4.0	1.31	7.7	21.4	12.8

Chloride content from selected samples yielded concentrations of 8.6 to 12.8 parts per million (ppm). Sulfate content from the same selected samples ranged from 17.0 to 21.4 ppm. Resistivity and pH testing from selected samples ranged from 1,000 to 2,560 ohm-centimeters and 7.7 to 8.1, respectively. Based on the results of corrosion potential testing (the low electrical resistivity readings from B-2 and B-11 specifically), **this site is of a moderate risk of inducing corrosive environmental conditions for metallic elements**. Potential mitigation methods are included in Section 5.2.4 Corrosion Mitigation.

4. Bedrock Conditions

Refusal, as would be indicated by the driller on the field boring logs, indicates a depth where either essentially no downward progress can be made by the auger or where the N-value indicates essentially no penetration of the split-spoon sampler. It is normally indicative of a very hard or very dense material such as large boulders or the upper bedrock surface. Auger refusal was encountered in all test borings. The auger refusal depths are summarized in the table below. It is impossible to determine the exact top of relatively unweathered bedrock or clearly define refusal material type without performing rock coring, which was beyond the scope of this investigation. Please note that the rockline may vary greatly between borings in karst terrain. No guarantee can be made to the continuity of the rock depth between borings.

Table 2: Summary of Auger Refusal Data

Boring Number	Auger Refusal Depth (feet)
B-1	10.2
B-2	11.5
B-3	7.8
B-4	11.0
B-5*	3.5*
B-6*	6.2*
B-7*	4.2*
B-8	10.3
B-9	8.7
B-10	14.7
B-11	10.8
B-12	7.7

*Auger refusal in Borings B-5, B-6 and B-7 was encountered prior to the minimum anticipated depth (seven feet) necessary to achieve the design pile capacities. Pre-drilling may be required to achieve sufficient pile capacity. Refer to Section 5.2.2 for further guidance on pre-drilling.

5. Analyses and Recommendations

5.1. General Site Work

5.1.1 Topsoil Stripping

Prior to earthwork operations, topsoil and surface plant material root mat should be stripped from both cut and fill areas. The topsoil can be stockpiled and used for landscaping purposes.

5.1.2 SUBGRADE EVALUATION/CONDITIONING

Once the surface material is removed, areas to receive fill should be "proof-rolled" under the observation of an AEI Geotechnical Engineer or Engineering Technician to evaluate the subgrade for suitability for fill placement. The proof-rolling should be performed using heavy construction equipment such as a fully loaded single or tandem axle dump truck (approximately 20-25 tons), passing repeatedly over the subgrade at a slow rate of speed.

Subgrade soils that are considered unstable after proof-rolling should be stabilized by additional compaction or by one or more of the following methods; in-place stabilization using chemical methods (lime/soil cement), removal and replacement with engineered fill, partial depth removal and replacement with a crushed (angular) aggregate layer, or partial depth removal and replacement with a geogrid and a crushed aggregate layer. The specific method of treatment will be based on the conditions present at the time the proof-rolling is performed and local availability of materials and economic factors. The selection of the appropriate method to mitigate degrading subgrade soils is dependent on the time of year site work is anticipated, cost, anticipated effectiveness, and scheduling impacts. AEI can assist in selecting this method considering all factors.

Once the subgrade is judged to be relatively uniform and suitable for support of engineered fill, fill areas should be brought to design elevations with on-site soil and/or suitable off-site borrow material placed and compacted as specified in Section 5.1.6 Fill Placement.

5.1.3 ON-SITE SOILS

The near-surface soils on this site are high plasticity clays that classify as CH in accordance with the USCS. Efforts should be made to schedule earthwork activities during the late spring to early fall months since these soils will pump, rut and lose strength with moisture contents more than several points wet or dry of the optimum moisture content for compaction. These soils are judged suitable for use as fill material at the site provided provisions are made for wetting or drying the soils for compaction and are placed and compacted in accordance with Section 5.1.6 Fill Placement, however we would recommend that they **not be placed beneath any lightly loaded floor slabs or footings due to the expansive potential of such clays with changes in moisture content.**

An **average shrinkage factor of 3.4%** should be utilized for estimating earthwork quantities.

5.1.4 GENERAL FILL REQUIREMENTS

Any material, whether borrowed on-site or imported to the site, placed as engineered fill on the project site beneath the proposed structure should be an approved material, free of environmental contamination, vegetation, topsoil, organic material, wet soil, construction debris, and rock fragments greater than six inches in diameter.

We recommend that any borrow material, if needed, consist of granular or lean clay materials or mixtures thereof with Unified Classifications of CL, SC, or GC. We further recommend high plasticity clays, known as fat clays (CH soils) not be imported to the site due to their potential for volume changes with fluctuations in moisture content.

The preferred off-site borrow material should have a Plasticity Index (PI) less than 30 and a standard Proctor maximum dry density of at least 95 pcf. Engineering classification and standard Proctor tests should be performed on all potential borrow soils and the test results evaluated by an AEI Geotechnical Engineer to evaluate the suitability of the soil for use as engineered fill.

5.1.5 Off-Site Soils

If off-site material is needed it should meet the requirements specified in section 5.1.4 above.

5.1.6 Fill Placement

Suitable fill material placed under structural areas should be placed in maximum eight inch (loose thickness) horizontal lifts, with each lift being compacted to a minimum of 98 percent of the standard Proctor maximum dry density at a moisture content within two percent of optimum. The compaction requirement may be reduced to 95 percent in proposed roadway and paved areas and to 92 percent in proposed field and landscape areas. At this site, wetting or drying of the soils will typically be necessary to achieve a moisture content suitable for compaction. Representative and adequate field density testing should be performed by AEI to verify that compaction requirements have been met.

5.1.7 Soil Movement

Site grading should be maintained during construction so that positive drainage is promoted at all times. Final site grading should be accomplished in such a manner as to divert surface runoff and roof drains away from the foundation elements and paved areas. Precipitation runoff should be collected in storm sewers as quickly as possible. Maintenance should be performed regularly on paved areas to seal pavement cracks and reduce surface water infiltration into the pavement subgrade.

5.1.8 Site Soil Practices

Working with the on-site soils will demand sensible construction practices and techniques. Some of these include:

- Prevent stripping too far in advance of actual earthwork needs. Problems arise when broad areas of clay/silt mixtures are exposed and allowed to become wet and soft from rainfall. Once saturated, deep rutting can occur by movement of construction equipment.

- Strip areas to receive fill in small, sequential areas as needed. These areas should be limited to the contractor's abilities to reasonably place and compact fill material.

- Schedule earthwork construction to take full advantage of a summer season. Generally, the on-site clays need to be placed within two percent of optimum moisture content to achieve compaction and reduce the potential for subgrade volume change. This moisture range is difficult to achieve in the winter and early spring when rainfall activity is more prevalent and soil drying is not always possible.

- Maintain good surface drainage during earthwork construction. Grade construction areas on a daily basis if necessary, to promote sheet drainage of precipitation and seal all engineered fill placed with a smooth drum steel roller at the end of each day.

- Perform frequent density tests during fill placement to confirm achievement of proper compaction.

5.2. Structure Foundations

5.2.1. Pile Design Loads

Static uplift capacities were initially derived assuming the piles were pre-drilled and backfilled a minimum of 10 feet as described above. The total static factored uplift resistance was determined to be 2.5 kips using a resistance factor of 0.35. However, pile testing was performed using an ultimate load of 8,400 pounds which relates to a design load of 5,250 pounds. Results of pile testing indicate that the **W6x9 piles** met or exceeded the aforementioned load prior to failure criteria when the piles were embedded a depth of seven (7) feet or greater with the exception of Pile No. 2-1. For that reason, we recommend a minimum pile embedment depth of ten (10) feet for piles installed in Area 2. We suggest utilizing a **factored design uplift capacity of 5,250 pounds** for all piles on the project. Where pre-drilling is required, pre-drill the piles to achieve the minimum embedment depth of ten feet. Refer to Section 4 of the attached pile test report in Appendix D for further guidance regarding minimum pile embedment depths for the associated sites.

Pile compression tests were not required. Tension load tests exceed the ultimate compression load of 8,400 pounds when piles were embedded seven feet or greater with the exception of Pile No. 2-1. We suggest utilizing a **factored design compression capacity of 7,000 pounds** for all piles on the project. The results of the pile testing are included in Appendix D of this report.

5.2.2. Pre-Drilled Piles

The designer should address pre-drilling for piles at specified locations to achieve a minimum embedment depth of seven feet. Shallow refusal was encountered in Borings B-5, B-6 and B-7. This corresponds to the shallow refusal of test pile 2-2. Pre-drilling may be necessary when installing piles on the Arnold property (Area 2) in the pile testing report included in Appendix D. Where pre-drilling is necessary for pile installation, holes shall be drilled into solid rock. Place the piles in the pre-drilled hole and tap them with a low energy driving hammer to confirm practical refusal. Backfill the holes with 4,000 psi concrete.

5.2.3. Drivability Analysis

A diesel pile driving hammer with a rated energy between 10 foot-kips and 20.5 foot-kips will be required to drive **W6x9** steel piles to practical refusal without encountering excessive blow counts or damaging the piles. The Contractor shall submit the proposed pile driving system to the Engineer for approval prior to the installation of the first pile. Approval of the pile driving system by the Engineer will be subject to satisfactory field performance of the pile driving procedures.

5.2.4. Corrosion Mitigation

There are various methods commonly used to mitigate pile corrosion and the subsequent loss of axial resistance that includes protective coatings, galvanization and a sacrificial steel area. Regarding the utilization of sacrificial steel, the designer should over-size the steel section such that the available section after corrosion (typically determined from the design life of the structure) meets the structural requirements. Alternatively, specifying ASTM A-690 marine grade steel alloys may be used to increase the corrosion resistance. If pre-drilling the piles, it may be advantageous to case the piles in concrete using a low permeability mix design. If steel piles are being protected by concrete encasement they should be coated with a dielectric coating near the base of the concrete jacket. Another viable option would be to utilize hot-dipped galvanized steel piles. A cost analysis can be performed to determine whether over-sizing the pile or galvanization is the most fiscally responsible.

5.2.5. Potential Foundation Movement

A detailed settlement analysis was beyond the scope of this investigation. However, based on engineering experience with similar structures and similar bearing conditions, it is anticipated that less than ½ inch of total settlement will occur for point bearing piles driven to rock. Differential settlement is expected to be less than ¼ inch.

5.2.6. Aggregate Pavement

Aggregate pavement should be designed to support conventional construction equipment. The FHWA publication titled "Gravel Roads Construction and Maintenance Guide" offers guidance on the design of aggregate pavement. We suggest a minimum aggregate thickness of ten (10) inches in accordance with the Table 3.

Table 3: Aggregate Pavement Design

Estimated Daily Number of Heavy Trucks	Subgrade Support Condition	Suggested Minimum Aggregate Layer Thickness (in.)
0-5	Low	6.5
	Medium	5.5
	High	4.5
5-10	Low	8.5
	Medium	7.0
	High	5.5
10-25	Low	11.5
	Medium	**9.0**
	High	7.0
25-50	Low	14.5
	Medium	11.5
	High	8.5

From Appendix A, Table 3 of the Gravel Roads Construction and Maintenance Guide

The aggregate layer thickness can be reduced by treating the subgrade with lime. The lime should be placed and mixed at a rate of 3 percent of the subgrade unit weight to a depth of 12 inches. The compacted subgrade average dry unit weight is 105 pounds per cubic foot (pcf) based on the previous report. Reduce the aggregate layer thickness to seven (7) inches when constructing on a properly treated lime stabilized subgrade. It is possible, if the construction schedule for areas are short duration, that lime stabilized soil subgrades may support temporary construction equipment. We would anticipate this performing for three to six months provided construction occurs from late spring to late fall. For more permanent access roads, we recommend stone to be placed with the use of lime.

The lime stabilization should be performed in accordance to the guidelines described in the FHWA "Soil and Base Stabilization and Associated Drainage Considerations Volume 1" (FHWA-SA-93-004). In general, construction should consist of first scarifying the soils. Spread the lime and mix the soil and lime to the appropriate depth. Apply water to the soil and lime mixture either during the mixing process (slurry) or after the mixing process (dry lime application). After mixing, the lime treated subgrade should be lightly compacted with a smooth drum roller to minimize evaporation loss and decrease surface infiltration of possible precipitation during the mellowing process. Allow the mixture to mellow for a minimum of five days. Mix and pulverize the mixture prior to performing the final compaction. Continue mixing until 100 percent passes the 1-inch sieve and at least 60 percent pass the No. 4 sieve.

The aggregate should be placed in maximum lifts of eight (8) inches and should be densified in accordance with 5.1.6 Fill Placement.

5.3. General Considerations

5.3.1. Earthwork Considerations

The surface soils at the site are susceptible to loss of bearing capacity (pumping) by the action of water and construction equipment. Once the subgrade has been stripped, cut to grade and passed a proof-roll, it should be sealed at the end of each filling day with a smooth drum roller and sloped to sheet drain rainwater. Any material disturbed by rainwater and construction operations should be undercut prior to placing the next lift of fill.

5.3.2. Limitations

The conclusions and recommendations presented herein are based on information gathered from the borings advanced during this exploration using that degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. No warranties can be made regarding the continuity of conditions between the borings. We will retain samples acquired for this project for a period of 30 days subsequent to the submittal date printed on the cover of this report. After this period, the samples will be discarded unless otherwise requested.

We appreciate the opportunity to be of service to you on this project and hope to provide further support on this and other projects in the future. Please contact us if you have any questions regarding this report.

Respectfully,
AMERICAN ENGINEERS, INC.

Peyton Linder
Geotechnical Engineer

Jackson Daugherty, PE, PMP
Geotechnical Engineer

Dusty Barrett, PE, PMP
Director of Geotechnical Services

APPENDIX A

Boring Layout

LEGEND

SOIL TEST BORING

DRAWING NOT TO SCALE

NOTE: ALL BORING LOCATIONS ARE APPROXIMATE

NO.	DATE	DESCRIPTION

REVISIONS

BORING LAYOUT

CLIENT: BayWa r.e. Solar Projects, LLC

PROJECT: BayWa 160 MW EKPC Cluster
Cynthiana, KY

AMERICAN ENGINEERS, INC.
DESIGNING YOUR FUTURE

SCALE: NTS

DATE: 9/28/2020

DRAWN BY: P. LINDER

CHECKED BY: D. BARRETT

FILE: T:\PROJECTS-076 BayWa Solar Cynthiana KY\Baywa 2020 Report\Boring Layout

SHEET: A-1

LEGEND

SOIL TEST BORING

DRAWING NOT TO SCALE

NOTE: ALL BORING LOCATIONS ARE APPROXIMATE

NO. / DATE / DESCRIPTION	REVISIONS
BORING LAYOUT	
CLIENT:	BayWa r.e. Solar Projects, LLC
PROJECT:	BayWa 160 MW EKPC Cluster Cynthiana, KY
AMERICAN ENGINEERS, INC. DESIGNING YOUR FUTURE 65 Aberdeen Drive Glasgow KY 270.651.7220	
SCALE:	NTS
DATE:	9/28/2020
DRAWN BY:	P. LINDER
CHECKED BY:	D. BARRETT
FILE:	T: PROJECTS-076 BayWa Solar Cynthiana KY\Baywa 2020\Report\Boring Layout
SHEET:	A-2

APPENDIX B

Boring Logs

CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COHESIVE SOILS
(Clay, Silt, and Mixtures)

CONSISTENCY	SPT N-VALUE	Qu/Qp (tsf)
Very Soft	2 blows/ft or less	0 – 0.25
Soft	2 to 4 blows/ft	0.25 – 0.49
Medium Stiff	4 to 8 blows/ft	0.50 – 0.99
Stiff	8 to 15 blows/ft	1.00 – 2.00
Very Stiff	15 to 30 blows/ft	2.00 – 4.00
Hard	30 blows/ft or more	> 4.00

PLASTICITY

Degree of Plasticity	Plasticity Index (PI)
Low	0 – 7
Medium	8 – 22
High	over 22

NON-COHESIVE SOILS
(Silt, Sand, Gravel, and Mixtures)

DENSITY	SPT N-VALUE
Very Loose	4 blows/ft or less
Loose	4 to 10 blows/ft
Medium Dense	10 to 30 blows/ft
Dense	30 to 50 blows/ft
Very Dense	50 blows/ft or more

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 – 10
Trace to Some	11 – 20
Some	21 – 35
And	36 – 50

PARTICLE SIZE IDENTIFICATION

Boulders	12 inch diameter or more
Cobbles	3 to 12 inch diameter
Gravel	Coarse – 1 to 3 inch
	Medium – ½ to 1 inch
	Fine – ¼ to ½ inch
Sand	Coarse – 0.6mm to ¼ inch
	Medium – 0.2mm to 0.6mm
	Fine – 0.05mm to 0.2mm
Silt	0.05mm to 0.005mm
Clay	0.005mm

NOTES

Classification – The Unified Soil Classification System is used to identify soil unless otherwise noted.

Standard "N" Penetration Test (SPT) (ASTM D1586) – Driving a 2-inch O.D., 1 3/8-inch I.D. sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6-inches to seat the sampler into undisturbed soil, and then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the field drill long (e.g., 10/8/7). On the report log, the Standard Penetration Test result (i.e., the N value) is normally presented and consists of the sum of the 2nd and 3rd penetration counts (i.e., N = 8 + 7 = 15 blows/ft.)

Soil Property Symbols

Qu:	Unconfined Compressive Strength	N:	Standard Penetration Value (see above)
Qp:	Unconfined Comp. Strength (pocket pent.)	omc:	Optimum Moisture content
LL:	Liquid Limit, % (Atterberg Limit)	PL:	Plastic Limit, % (Atterberg Limit)
PI:	Plasticity Index	mdd:	Maximum Dry Density

FIELD TESTING PROCEDURES

The general field procedures employed by the Field Services Center are summarized in the following outline. The procedures utilized by the AEI Field Service Center are recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Soil Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the surface conditions. Borings are advanced into the ground using continuous flight augers. At prescribed intervals throughout the boring depths, soil samples are obtained with a split-spoon or thin-walled sampler and sealed in airtight glass jars and labeled. The sampler is first seated 6 inches to penetrate loose cuttings and then driven an additional foot, where possible, with blows from a 140 pound hammer falling 30 inches. The number of blows required to drive the sampler each six-inch increment is recorded. The penetration resistance, or “N-value” is designated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split spoon sampling procedures used during the exploration are in general accordance with ASTM D 1586. Split spoon samples are considered to provide *disturbed* samples, yet are appropriate for most engineering applications. Thin-walled (Shelby tube) samples are considered to provide *undisturbed* samples and obtained when warranted in general accordance with ASTM D 1587.

These drilling methods are not capable of penetrating through material designated as “refusal materials.” Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Core Drilling Procedures for use on refusal materials. Prior to coring, casing is set in the boring through the overburden soils. Refusal materials are then cored according to ASTM D-2113 using a diamond bit attached to the end of a hollow double tube core barrel. This device is rotated at high speeds and the cuttings are brought to the surface by circulating water. Samples of the material penetrated are protected and retained in the inner tube, which is retrieved at the end of each drill run. Upon retrieval of the inner tube the core is recovered, measured and placed in boxes for storage.

The subsurface conditions encountered during drilling are reported on a field test boring record by the driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soil in general accordance with the procedures outlined in ASTM D 2487 and D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

Representative portions of soil samples are placed in sealed containers and transported to the laboratory. In the laboratory, the samples are examined to verify the driller’s field classifications. Test Boring Records are attached which show the soil descriptions and penetration resistances.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designate the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

Water table readings are normally taken in conjunction with borings and are recorded on the “Boring Logs”. These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using as electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Sampling Terminology

Undisturbed Sampling: Thin-walled or Shelby tube samples used for visual examination, classification tests and quantitative laboratory testing. This procedure is described by ASTM D 1587. Each tube, together with the encased soil, is carefully removed from the ground, made airtight and transported to the laboratory. Locations and depths of undisturbed samples are shown on the “Boring Logs.”

Bag Sampling: Bulk samples of soil are obtained at selected locations. These samples consist of soil brought to the surface by the drilling augers, or obtained from test pits or the ground surface using hand tools. Samples are placed in bags, with sealed jar samples of the material, and taken to our laboratory for testing where more mass material is required (i.e. Proctors and CBR’s). The locations of these samples are indicated on the appropriate logs, or on the Boring Location Plan.

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PAGE 1 OF 1

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CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 8/12/20 **COMPLETED** 8/12/20
GROUND ELEVATION
DRILLING CONTRACTOR Clint Ervin
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Augers
AT TIME OF DRILLING ---
LOGGED BY Thomas Pike **CHECKED BY** Peyton Linder
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (6 inches)	SPT 1	87	4-5-5 (10)	3.0	15				
		(CL) lean CLAY, light brown to brown, moist, stiff to very stiff	SPT 2	80	6-8-10 (18)	4.5+	18				
5		(CH) fat CLAY with trace gravel, brown to gray, moist, stiff	SPT 3	20	7-5-6 (11)	3.0	28				
		(CH) fat CLAY with gravel, brown to gray, moist, stiff to hard	SPT 4	80	8-5-8 (13)	2.5	23				
10			SPT 5	75	12-50	4.5+	14				

Refusal at 10.2 feet.
Bottom of borehole at 10.2 feet.

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (6 inches)									
		(CL) lean CLAY, brown with black mottle, moist, stiff to very stiff	SPT 1	87	5-6-7 (13)	3.0	14				
			SPT 2	60	9-9-7 (16)	4.5+	16				
5		(CH) fat CLAY, brown, moist, medium stiff to stiff	SPT 3	87	4-4-4 (8)	3.5	26	71	27	44	Bulk sample obtained from 3.0 ft to 5.0 ft
		(CH) fat CLAY with gravel, brown to gray, moist, stiff to very stiff	SPT 4	100	9-5-7 (12)	4.0	25				
10			SPT 5	40	5-9-10 (19)	3.0	20				

Refusal at 11.5 feet.
Bottom of borehole at 11.5 feet.

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (5 inches)	SPT 1	87	4-5-5 (10)	3.0	13				
		(CH) fat CLAY, brown, moist, stiff	SPT 2	80	5-5-5 (10)	4.5+	21				
5			SPT 3	100	4-5-7 (12)	4.5+	20				
		(CH) fat CLAY with gravel, brown to gray, moist, hard	SPT 4	43	9-50	4.5+	20				

Refusal at 7.8 feet.
Bottom of borehole at 7.8 feet.

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DRILLING CONTRACTOR Clint Ervin
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Augers
AT TIME OF DRILLING ---
LOGGED BY Thomas Pike **CHECKED BY** Peyton Linder
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (5 inches)									
		(CH) fat CLAY with sand, brown, moist, stiff to very stiff	SPT 1	87	6-7-8 (15)	3.5	12				
			SPT 2	80	7-5-4 (9)	4.5+	20				
5			SPT 3	100	3-5-8 (13)	4.5+	19	51	27	24	Bulk sample obtained from 3.0 ft to 5.0 ft
		(CH) fat CLAY with gravel, brown to gray, moist, very stiff	SPT 4	93	7-9-10 (19)	4.0	23				
10			SPT 5	33	7-9-19 (28)	4.5+	17				

Refusal at 11.0 feet.
Bottom of borehole at 11.0 feet.

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0		TOPSOIL (4 inches)	SPT 1	73	4-3-4 (7)	4.5+	19				
		(CL) lean CLAY, brown, moist, medium stiff									
		(CH) fat CLAY, trace gravel, brown, moist, very stiff	SPT 2	40	4-12-14 (26)	4.5+	22				

Refusal at 3.5 feet.
Bottom of borehole at 3.5 feet.

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LOGGED BY Thomas Pike **CHECKED BY** Peyton Linder
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (4 inches)									
		(CL) lean CLAY with gravel, brown to gray, moist, stiff to very stiff	SPT 1	80	5-5-5 (10)	3.5	14				
			SPT 2	87	6-7-9 (16)	4.0	13				
		(CH) fat CLAY, brown to gray, moist, very stiff									
5			SPT 3	80	4-6-22 (28)	4.5+	21				

Refusal at 6.2 feet.
Bottom of borehole at 6.2 feet.

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GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Augers
AT TIME OF DRILLING ---
LOGGED BY Thomas Pike **CHECKED BY** Peyton Linder
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (5 inches)	SPT 1	100	7-8-9 (17)	4.5+	12				
		(CL) lean CLAY, brown, moist, stiff to very stiff	SPT 2	67	8-8-9 (17)	4.5+	17				
		(CH) fat CLAY, brown, moist, hard	SPT 3	50	50	4.5+	24				

Refusal at 4.2 feet.
Bottom of borehole at 4.2 feet.

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 10/7/20 10:05 - T:\19 PROJECTS\219-076 BAYWA SOLAR CYNTHIANA KY\BAYWA 2020\LAB\BAYWA 2020 SOILS.GPJ

B-8
PAGE 1 OF 1

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PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 8/11/20 **COMPLETED** 8/11/20
GROUND ELEVATION
DRILLING CONTRACTOR Clint Ervin
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Augers
AT TIME OF DRILLING ---
LOGGED BY Thomas Pike **CHECKED BY** Peyton Linder
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (4 inches)	SPT 1	80	5-6-5 (11)	3.5	15				
		(CH) fat CLAY, brown with black mottle, moist, stiff to very stiff	SPT 2	67	6-6-9 (15)	4.5+	23				
5			SPT 3	93	6-6-10 (16)	4.5+	16				
		(CH) fat CLAY with gravel, brown to gray, moist, very stiff to hard	SPT 4	100	13-13-13 (26)	4.0	15				
10			SPT 5	77	7-7-50 (57)	4.0	18				

Refusal at 10.3 feet.
Bottom of borehole at 10.3 feet.

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(270) 651-7220

B-9

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 8/11/20 **COMPLETED** 8/11/20
GROUND ELEVATION
DRILLING CONTRACTOR Clint Ervin
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Augers
AT TIME OF DRILLING ---
LOGGED BY Thomas Pike **CHECKED BY** Peyton Linder
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (4 inches)									
		(CH) fat CLAY, brown, moist, stiff to very stiff	SPT 1	73	4-5-4 (9)	2.0	18				
			SPT 2	53	4-6-11 (17)	4.5+	24	58	27	31	
		(CH) fat CLAY with gravel, brown to gray, moist, stiff to very stiff									
5			SPT 3	100	6-8-7 (15)	4.5+	22				
			SPT 4	100	14-12-12 (24)	4.5+	16				

Refusal at 8.7 feet.
Bottom of borehole at 8.7 feet.

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B-10

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 8/12/20 **COMPLETED** 8/12/20
GROUND ELEVATION
DRILLING CONTRACTOR Clint Ervin
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Augers
AT TIME OF DRILLING ---
LOGGED BY Thomas Pike **CHECKED BY** Peyton Linder
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (4 inches)									
		(CH) fat CLAY, brown, moist, stiff	SPT 1	80	6-6-5 (11)	4.0	15				
			SPT 2	73	5-6-7 (13)	4.5+	24				
5			SPT 3	20	5-6-9 (15)	4.0	19				Bulk sample obtained from 3.0 ft to 5.0 ft
		(CH) fat CLAY with gravel, brown to gray, moist, stiff to hard									
			SPT 4	53	9-10-16 (26)	4.5+	20				
10			SPT 5	47	6-5-8 (13)	4.5+	16				
			SPT 6	87	16-16-23 (39)	4.5+	21				
			SPT 7	71	9-50	4.5+	15				

Refusal at 14.7 feet.
Bottom of borehole at 14.7 feet.

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B-11

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 8/12/20 **COMPLETED** 8/12/20
GROUND ELEVATION
DRILLING CONTRACTOR Clint Ervin
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Augers
AT TIME OF DRILLING ---
LOGGED BY Thomas Pike **CHECKED BY** Peyton Linder
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (4 inches)									
		(CL) lean CLAY, brown with black mottle, moist, stiff to medium stiff	SPT 1	87	5-5-6 (11)	4.0	15				
			SPT 2	60	6-8-7 (15)	4.5+	25				
5			SPT 3	87	4-3-4 (7)	4.0	15				
		(CH) fat CLAY, brown to gray, moist, stiff to hard	SPT 4	100	8-7-8 (15)	3.5	22	62	28	34	
10			SPT 5	100	4-15-15 (30)	4.0	23				

Refusal at 10.8 feet.
Bottom of borehole at 10.8 feet.

B-12

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AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY
DATE STARTED 8/12/20 **COMPLETED** 8/12/20
GROUND ELEVATION
DRILLING CONTRACTOR Clint Ervin
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Augers
AT TIME OF DRILLING ---
LOGGED BY Thomas Pike **CHECKED BY** Peyton Linder
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (4 inches) (CH) fat CLAY, brown, moist, stiff to very stiff	SPT 1	80	5-5-5 (10)	4.5+	19				
			SPT 2	73	5-7-9 (16)	4.5+	18				
5			SPT 3	100	5-6-8 (14)	4.5+	20				Bulk sample obtained from 3.0 ft to 5.0 ft
		(CH) fat CLAY with gravel, brown, moist, hard	SPT 4	71	13-50	4.0	20				

Refusal at 7.7 feet.
Bottom of borehole at 7.7 feet.

APPENDIX C

Laboratory Testing Results

ATTERBERG LIMITS' RESULTS

AEI
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65 Aberdeen Drive
Glasgow, KY 42141
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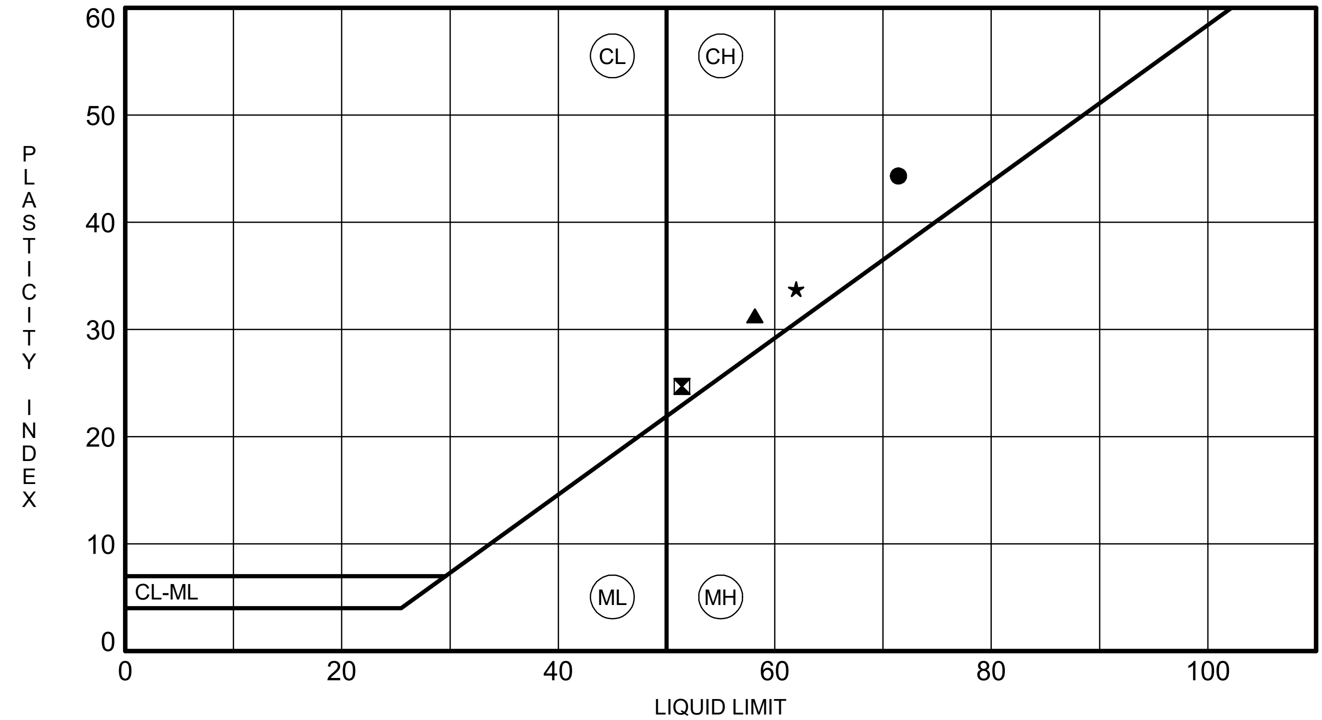
CLIENT BayWa r.e. Solar Projects, LLC
PROJECT NAME BayWa 160 MW EKPC Cluster
PROJECT NUMBER 219-076
PROJECT LOCATION Cynthiana, KY



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-2**	**4.0**	**71**	**27**	**44**	**92**	**FAT CLAY(CH)**
⊠	**B-4**	**4.0**	**51**	**27**	**24**	**80**	**FAT CLAY with SAND(CH)**
▲	**B-9**	**1.5**	**58**	**27**	**31**	**96**	**FAT CLAY(CH)**
★	**B-11**	**7.0**	**62**	**28**	**34**	**87**	**FAT CLAY(CH)**

ATTERBERG LIMITS - GINT STD US LAB.GDT - 9/28/20 10:19 - T:\19 PROJECTS\219-076 BAYWA SOLAR CYNTHIANA KY\BAYWA 2020\LAB\BAYWA 2020 SOILS.GPJ

GRAIN SIZE DISTRIBUTION

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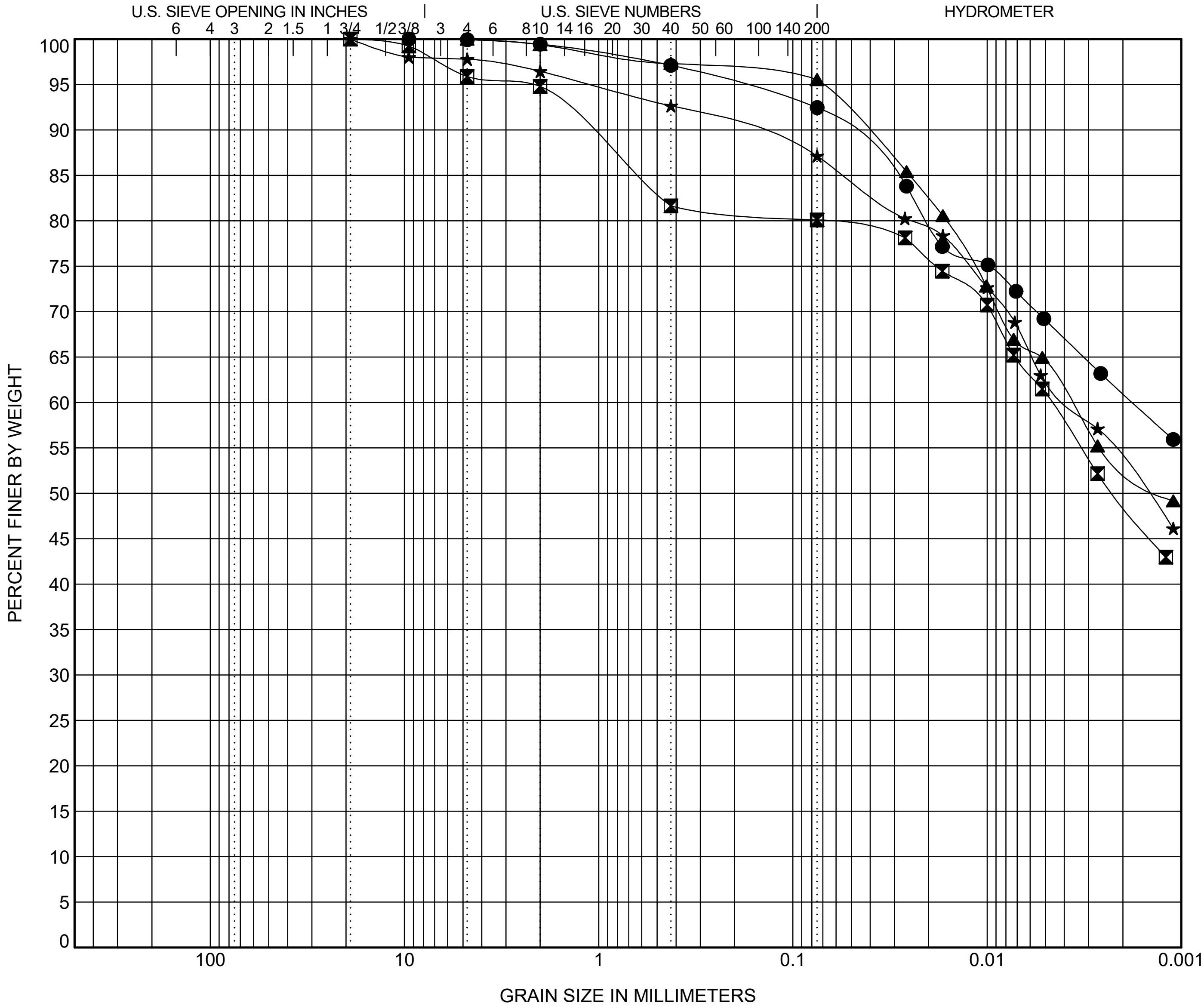
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT BayWa r.e. Solar Projects, LLC **PROJECT NAME** BayWa 160 MW EKPC Cluster

PROJECT NUMBER 219-076 **PROJECT LOCATION** Cynthiana, KY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-2**	**4.0**	**FAT CLAY(CH)**	**71**	**27**	**44**		
⧗	**B-4**	**4.0**	**FAT CLAY with SAND(CH)**	**51**	**27**	**24**		
▲	**B-9**	**1.5**	**FAT CLAY(CH)**	**58**	**27**	**31**		
★	**B-11**	**7.0**	**FAT CLAY(CH)**	**62**	**28**	**34**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-2**	**4.0**	**9.5**	**0.002**			**0.1**	**7.5**	**23.4**	**69.0**
⧗	**B-4**	**4.0**	**19**	**0.005**			**4.1**	**15.8**	**19.2**	**60.9**
▲	**B-9**	**1.5**	**4.75**	**0.004**			**0.0**	**4.5**	**31.2**	**64.4**
★	**B-11**	**7.0**	**19**	**0.004**			**2.2**	**10.7**	**24.6**	**62.5**

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September 21, 2020

Project No. 2020-472-001

Mr. Peyton Linder
American Engineers, Inc.
65 Aberdeen Drive
Glasgow, KY 42141

Transmittal
Laboratory Test Results
BayWa r.e. 219-076

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2004) (*Method B*)

Client:	American Engineers, Inc.	Boring No.:	B-2
Client Reference:	BayWa r.e. 219-076	Depth (ft):	7.0-8.5'
Project No.:	2020-472-001	Sample No.:	1
Lab ID:	2020-472-001-001	Description:	Brown Clay

(- # 10 Sieve material)

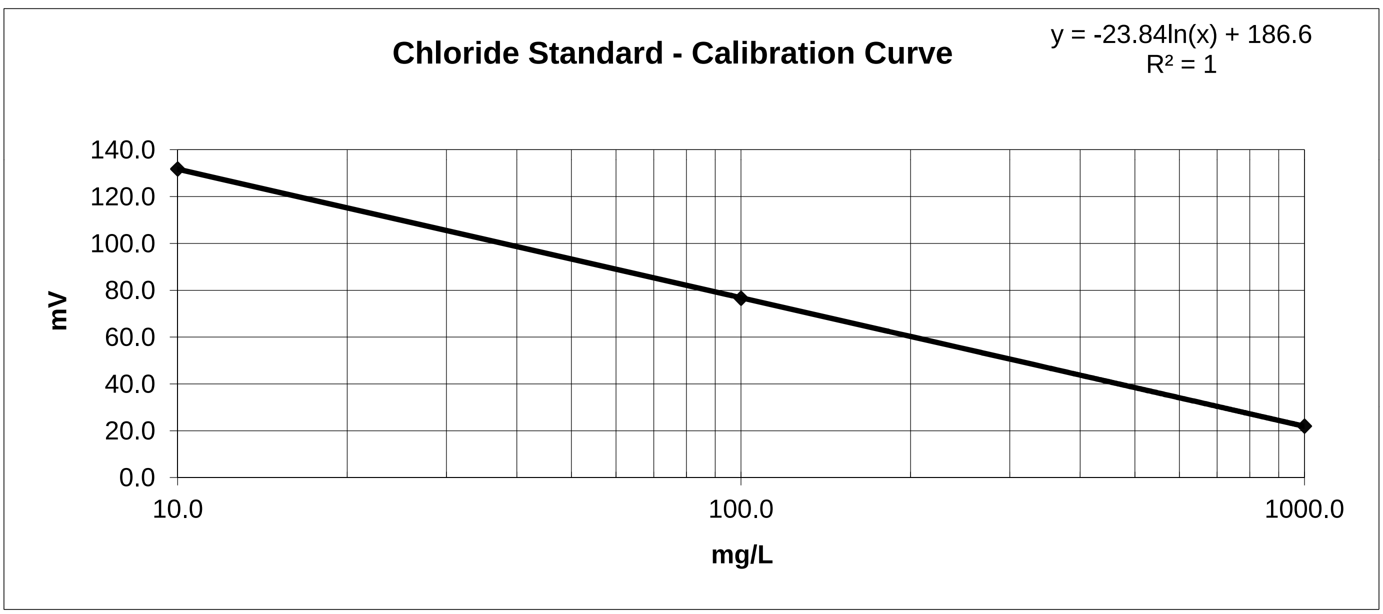
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD	MILLIVOLTS (mV)
10.0 mg/L	131.8
100.0 mg/L	76.6
1000.0 mg/L	22.0

MEASUREMENT OF CHLORIDES

		CONCENTRATION (mg/L)	CONCENTRATION (mg/kg)
Sample Weight (g):	100.0		
Water added to Sample (ml):	100.0		
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	129.9	10.78	10.78

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO_3 solution (1:1 volume).
2) Samples were dried for a minimum of 12 hours at 110 $^{+}/_{-}$ 5^{o}C.



Notes:

Tested By	JAM	Date	9/17/20	Checked By	JLK	Date	9/18/20

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Water-Soluble Sulfate Ion Content in Soil
AASHTO T 290-95 (2012)

Client:	American Engineers, Inc.	Boring No.:	B-2
Client Reference:	BayWa r.e. 219-076	Depth (ft):	7.0-8.5'
Project No.:	2020-472-001	Sample No.:	1
Lab ID:	2020-472-001-001	Soil Description:	Brown Clay

Sulfate Standard - Calibration Curve Spectrophotometer Readings

Sulfate Ion Concentrations (mg/L)								
0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0
Spectrophotometer Readings (FAU)								
Underrange	Underrange	9	25	44	71	139	210	287

Measurement of Barium Chloride Turbidity

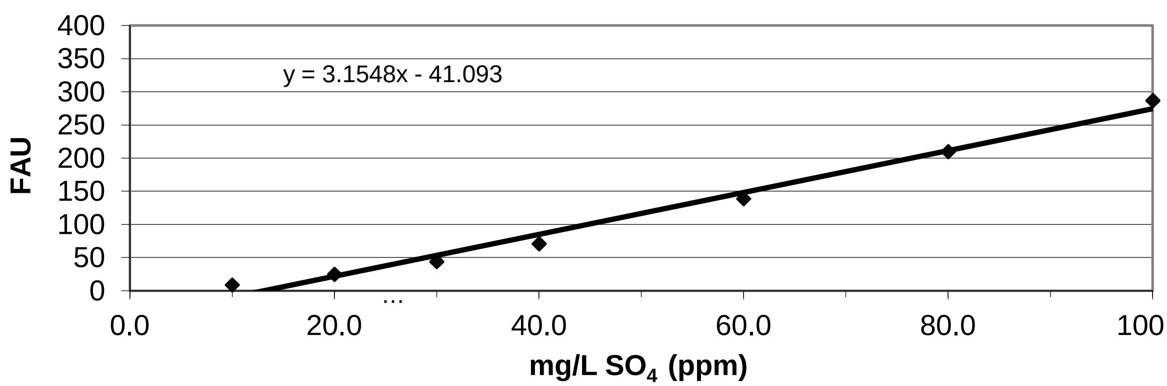
(Sample contains 5.0 mL NaCl solution and 0.3 g $BaCl_2 \cdot 2H_2O$)

Sample Weight (g):	100.0
Water added to Sample (mL):	300.0
Size of Sample Aliquot (mL):	50.0
Sample Reading (FAU):	14
Sample Diluted:	No
Sulfate Solution Added (ml):	5

Sample Moisture Content

Tare Number:	610
Weight of Tare & Wet Sample (g):	253.00
Weight of Tare & Dry Sample (g):	247.24
Weight of Tare (g):	82.75
Weight of Water (g):	5.76
Weight of Dry Sample (g):	164.49
Moisture Content (%):	3.50

Sample Sulfate Ion Concentration:	16.96	**mg/L SO_4 (ppm)**
Sample Sulfate Ion Content:	50.9	**mg/Kg SO_4 (not corrected for moisture)**
Sample Sulfate Ion Content:	52.7	**mg/Kg SO4 (corrected for moisture)**



Tested by:	JAM	Date:	9/17/20	Checked by:	JLK	Date:	9/18/20

DCN: CT-S87 DATE: 3/5/2020 REV: 1 S:\Excel\Excel QA\Spreadsheets\Sulfate T290

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CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2004) (*Method B*)

Client:	American Engineers, Inc.	Boring No.:	B-6
Client Reference:	BayWa r.e. 219-076	Depth (ft):	4.0-5.5'
Project No.:	2020-472-001	Sample No.:	2
Lab ID:	2020-472-001-002	Description:	Brown Clay

(- # 10 Sieve material)

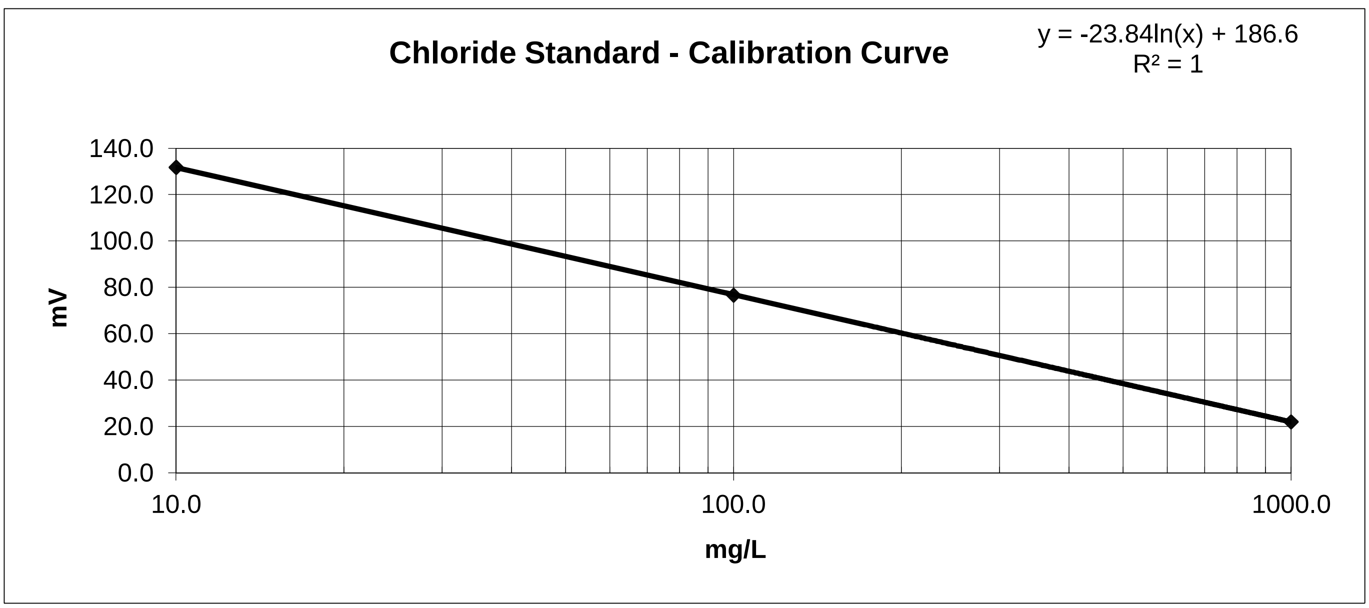
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD	MILLIVOLTS (mV)
10.0 mg/L	131.8
100.0 mg/L	76.6
1000.0 mg/L	22.0

MEASUREMENT OF CHLORIDES

		CONCENTRATION (mg/L)	CONCENTRATION (mg/kg)
Sample Weight (g):	100.0		
Water added to Sample (ml):	100.0		
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	135.4	8.56	8.56

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO_3 solution (1:1 volume).
2) Samples were dried for a minimum of 12 hours at 110 $^{+}/_{-}$ 5^{o}C.



Notes:

Tested By	JAM	Date	9/17/20	Checked By	JLK	Date	9/18/20

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Water-Soluble Sulfate Ion Content in Soil
AASHTO T 290-95 (2012)

Client:	American Engineers, Inc.	Boring No.:	B-6
Client Reference:	BayWa r.e. 219-076	Depth (ft):	4.0-5.5'
Project No.:	2020-472-001	Sample No.:	2
Lab ID:	2020-472-001-002	Soil Description:	Brown Clay

Sulfate Standard - Calibration Curve Spectrophotometer Readings

Sulfate Ion Concentrations (mg/L)	0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0
Spectrophotometer Readings (FAU)	Underrange	Underrange	9	25	44	71	139	210	287

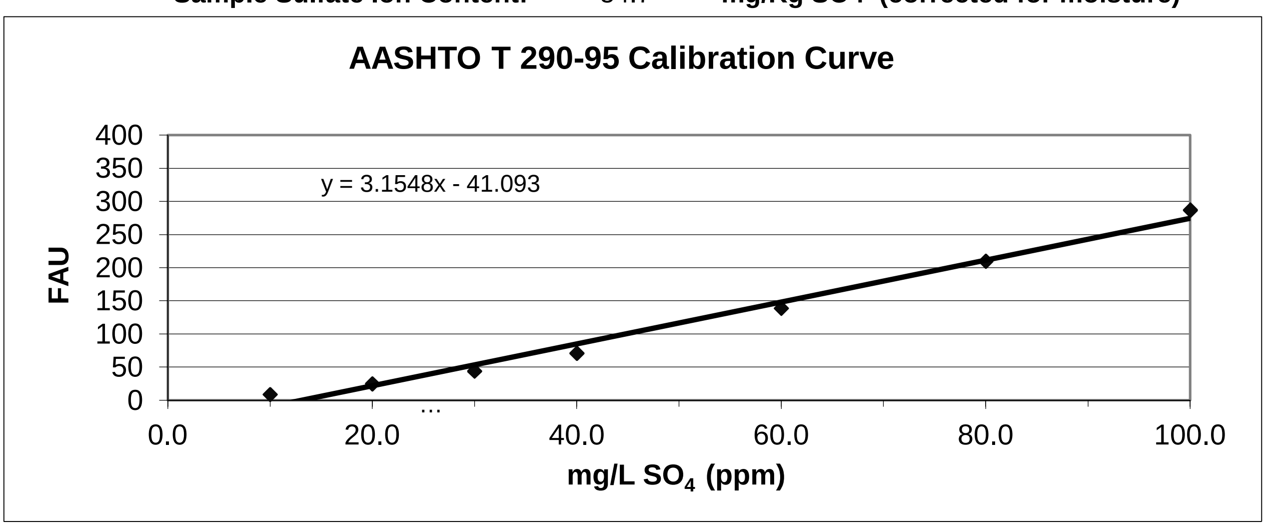
Measurement of Barium Chloride Turbidity
(Sample contains 5.0 mL NaCl solution and 0.3 g $BaCl_2 \cdot 2H_2O$)

Sample Weight (g):	100.0
Water added to Sample (mL):	300.0
Size of Sample Aliquot (mL):	50.0
Sample Reading (FAU):	17
Sample Diluted:	No
Sulfate Solution Added (ml):	5

Sample Moisture Content

Tare Number:	1699
Weight of Tare & Wet Sample (g):	241.37
Weight of Tare & Dry Sample (g):	238.70
Weight of Tare (g):	83.22
Weight of Water (g):	2.67
Weight of Dry Sample (g):	155.48
Moisture Content (%):	1.72

Sample Sulfate Ion Concentration:	17.91	**mg/L SO_4 (ppm)**
Sample Sulfate Ion Content:	53.7	**mg/Kg SO_4 (not corrected for moisture)**
Sample Sulfate Ion Content:	54.7	**mg/Kg SO4 (corrected for moisture)**



Tested by:	JAM	Date:	9/17/20	Checked by:	JLK	Date:	9/18/20

DCN: CT-S87 DATE: 3/5/2020 REV: 1 S:\Excel\Excel QA\Spreadsheets\Sulfate T290

CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2004) (*Method B*)

Client:	American Engineers, Inc.	Boring No.:	B-11
Client Reference:	BayWa r.e. 219-076	Depth (ft):	4.0-5.5'
Project No.:	2020-472-001	Sample No.:	3
Lab ID:	2020-472-001-003	Description:	Brown Clay

(- # 10 Sieve material)

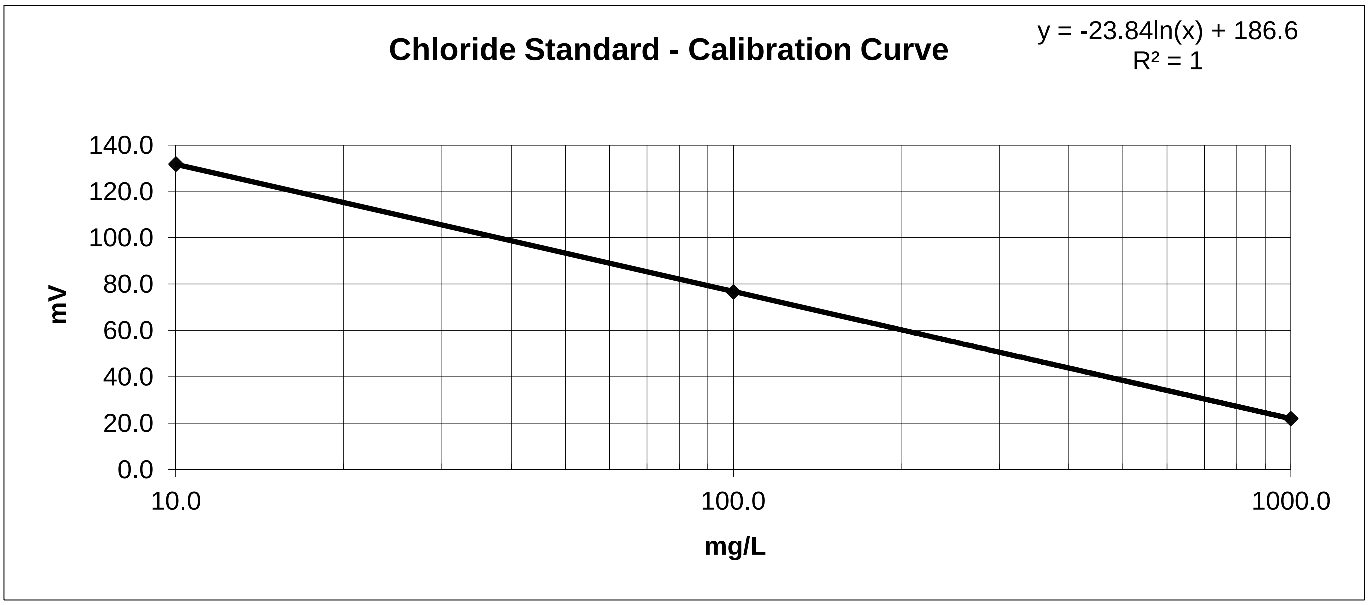
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD	MILLIVOLTS (mV)
10.0 mg/L	131.8
100.0 mg/L	76.6
1000.0 mg/L	22.0

MEASUREMENT OF CHLORIDES

		CONCENTRATION (mg/L)	CONCENTRATION (mg/kg)
Sample Weight (g):	100.0		
Water added to Sample (ml):	100.0		
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	125.9	12.75	12.75

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO_3 solution (1:1 volume).
2) Samples were dried for a minimum of 12 hours at 110 $^{+}/_{-}$ 5^{o}C.



Notes:

Tested By	JAM	Date	9/17/20	Checked By	JLK	Date	9/18/20

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Water-Soluble Sulfate Ion Content in Soil

AASHTO T 290-95 (2012)

Client:	American Engineers, Inc.	Boring No.:	B-11
Client Reference:	BayWa r.e. 219-076	Depth (ft):	4.0-5.5'
Project No.:	2020-472-001	Sample No.:	3
Lab ID:	2020-472-001-003	Soil Description:	Brown Clay

Sulfate Standard - Calibration Curve Spectrophotometer Readings

Sulfate Ion Concentrations (mg/L)	0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0
Spectrophotometer Readings (FAU)	Underrange	Underrange	9	25	44	71	139	210	287

Measurement of Barium Chloride Turbidity

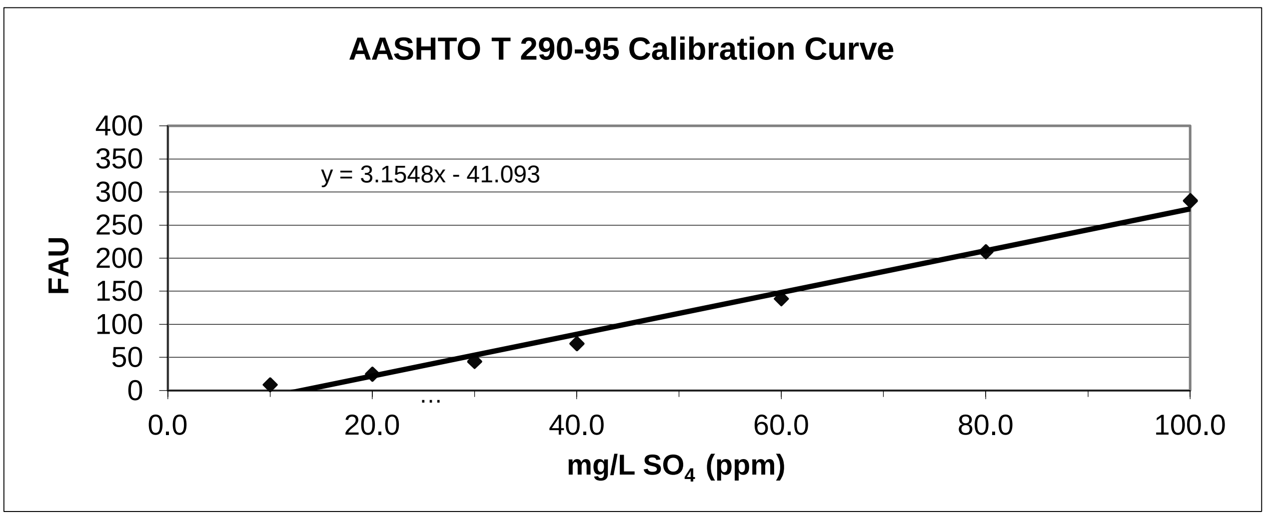
(Sample contains 5.0 mL NaCl solution and 0.3 g $BaCl_2 \cdot 2H_2O$)

Sample Weight (g):	100.0
Water added to Sample (mL):	300.0
Size of Sample Aliquot (mL):	50.0
Sample Reading (FAU):	28
Sample Diluted:	No
Sulfate Solution Added (ml):	5

Sample Moisture Content

Tare Number:	545
Weight of Tare & Wet Sample (g):	230.04
Weight of Tare & Dry Sample (g):	224.50
Weight of Tare (g):	82.63
Weight of Water (g):	5.54
Weight of Dry Sample (g):	141.87
Moisture Content (%):	3.90

Sample Sulfate Ion Concentration:	21.40	**mg/L SO_4 (ppm)**
Sample Sulfate Ion Content:	64.2	**mg/Kg SO_4 (not corrected for moisture)**
Sample Sulfate Ion Content:	66.8	**mg/Kg SO4 (corrected for moisture)**



Tested by:	JAM	Date:	9/17/20	Checked by:	JLK	Date:	9/18/20

APPENDIX D

Pile Test Program

October 7, 2020

Ms. Akhila Krishnan, PE
Project Engineer
BayWa r.e Solar Projects, LLC
17901 Von Karman Avenue
Suite 1050
Irvine, CA 92614

RE: Report of Pile Testing
BayWa 160 MW EKPC Cluster
(Arnold, McDowell, Agnes ad Reed)
Cynthiana, KY
AEI Project Number 219-076

Dear Ms. Krishnan:

American Engineers, Inc. (AEI) is pleased to submit this letter report that summarizes the results of the pile testing performed at the above referenced site.

1. Project Description

Pile testing was performed at three areas of interest (Area 1, 2 and 3). These locations were selected based on the subsurface data obtained during the geotechnical exploration, site access considerations and the variance of soil conditions encountered. Area 1 typically consists of stiff lean clay and fat clay with an overburden thickness ranging from about eight to ten feet. Area 2 typically consists of stiff to very stiff lean clay and fat clay with an overburden thickness ranging from about four to ten feet. Area 3 typically consisted of medium stiff lean clay with an overburden thickness ranging from about seven to 15 feet.

2. Pile Test Methods

The field pile testing methods were performed in accordance with the Pile Test Program and ASTM D3689-07 *Standard Test Methods for Deep Foundations under Static Axial Tensile Load* and ASTM D3966-07 *Standard Test Methods for Deep Foundations under Lateral Load*.

AEI and Haydon Bridge Company were on-site to perform pile installations on September 19, 2020. Pile installation consisted of driving two piles per test location (six in total) with ten-foot center to center spacing as shown on the attached Test Pile Layout. The piles were left undisturbed for a three-day waiting period such that pile "set" conditions may occur. Pile set is more significant in displacement type piles such as closed-end pipe piles. However, it also occurs to a lesser degree in non-displacement piles such as the W6x9 and W6x7 used on this project. When driven, excess porewater pressures are generated which decreases the effective stress of the soil. Over time, the excess porewater pressures dissipate and the effective stress subsequently increases.

Tension and lateral loading were performed with a work truck utilizing a 10,000-pound capacity crane and a pull cylinder with electric pump. The applied loads (tension and lateral) were measured with a dynamometer (S/N AP27682). The applied loads (tension and lateral) were incrementally increased 500 pounds per minute until the design load capacities were achieved or when deflections exceeded one inch. Test pile deflections were measured with two independent methods that include using a dial indicator and a guidewire attached to isolated stakes at four inches from the grade as viewed below.

Typical Setup for Tension Testing

Typical Setup for Lateral Testing

Results of pile testing and further recommendations are described below.

3. Results of Pile Testing

The **W6x9** piles were tested in accordance with the project specific pile test program. Results of the pile testing are described in the tables below. A test pile layout is attached to this report.

Table 1: Tension Test Results

Test Area	Pile No.	Total Resistance (lbs)	Total Deflection (inch)	Embedment Depth (feet)	Remarks
1	1-1	8400	0.12	7	-
2	2-1	7300	1.0	7	-
3	3-1	8400	0.125	7	-

Table 2: Lateral Test Results

Test Area	Pile No.	Total Resistance (lbs)	Total Deflection (inch)	Embedment Depth (feet)	Load Height from Grade (feet)
1	1-2	4000	0.318	7	1.25
2	2-2	4000	0.486	Refusal at 5.5	1.25
3	3-2	4000	0.495	7	1.25

4. ANALYSES AND RECOMMENDATIONS

In Area Two, Pile No. 2-1 was embedded to seven (7) feet without encountering refusal and failed to meet the required pile compression capacity (8400 pounds) through tension load testing (only 7,300 pounds of tension force was applied to the pile and the axial deflection exceeded the one-inch tolerance). For that reason, piles in Area 2 should be driven to a minimum depth of ten (10) feet unless the piles are driven to refusal. Piles which encounter refusal should have a minimum embedment depth of five (5) feet. In the event that refusal is encountered prior to achieving the minimum embedment depth of five feet, the piles should be pre-drilled to a minimum depth of ten (10) feet. In Area One and Area Three, piles should be driven a minimum of seven (7) feet or to refusal. Place the piles in the pre-drilled holes and backfill around the piles with 4,000 psi concrete. The table below summarizes the minimum pile embedment depths for the associated areas:

Table 3: Minimum Pile Embedment Depths

Test Area	Minimum Pile Embedment Depth (feet)
1	7.0
2	10.0
3	7.0

For this project, minimum blow requirements may be reached after total penetration becomes ¼ inch or less for five consecutive blows. Practical refusal is obtained after the pile is struck an additional five blows with total penetration of ¼ inch or less. Advance the production piling to the driving resistances specified above and to depths determined by test pile(s). Immediately cease driving operations if the pile visibly yields or becomes damaged during driving.

The conclusions and recommendations presented herein are based on information gathered from the borings advanced during this exploration using that degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. No warranties can be made regarding the continuity of conditions between the borings.

We appreciate the opportunity to be of service to you on this project and hope to provide further support on this and other projects in the future. Please contact us if you have any questions regarding this report.

Respectfully,
AMERICAN ENGINEERS, INC.

Peyton Linder
Geotechnical Engineer

Jackson Daugherty, PE, PMP
Geotechnical Engineer

Dusty Barrett, PE, PMP
Director of Geotechnical Services

DRAWING NOT TO SCALE

NOTE: ALL LOCATIONS ARE APPROXIMATE

REVISIONS	NO. / DATE / DESCRIPTION
	TEST PILE LAYOUT
CLIENT:	BayWa r.e Solar Projects, LLC
PROJECT:	BayWa 160 MW EKPC Cluster Cynthiana, KY
	AMERICAN ENGINEERS, INC. DESIGNING YOUR FUTURE 65 Aberdeen Drive Glasgow KY 270.651.7220
SCALE:	NTS
DATE:	9/28/2020
DRAWN BY:	J. DAUGHERTY
CHECKED BY:	D. BARRETT
FILE:	T: PROJECTS \ 219-076 BayWa Solar Cynthiana KY\Baywa 2020\Pile Test Program\Report\Support Info\ Pile Test Layout.dng
SHEET:	B1

DRAWING NOT TO SCALE

NOTE: ALL LOCATIONS ARE APPROXIMATE

REVISIONS		
NO.	DATE	DESCRIPTION

TEST PILE LAYOUT

CLIENT: BayWa r.e Solar Projects, LLC

PROJECT: BayWa 160 MW EKPC Cluster Cynthiana, KY

AMERICAN ENGINEERS, INC.
DESIGNING YOUR FUTURE
65 Aberdeen Drive Glasgow KY
270.651.7220

SCALE: NTS

DATE: 9/28/2020

DRAWN BY: J. DAUGHERTY

CHECKED BY: D. BARRETT

FILE: T: PROJECTS \ 219-076 BayWa Solar Cynthiana KY\Baywa 2020\Pile Test Program\Report\Support Info\ Pile Test Layout.dng

SHEET: B2

Your Geotechnical Engineering Report

To help manage your risks, this information is being provided because subsurface issues are a major cause of construction delays, cost overruns, disputes, and claims.

Geotechnical Services are Performed for Specific Projects, Purposes, and People

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering exploration conducted for an engineer may not fulfill the needs of a contractor or even another engineer. Each geotechnical engineering exploration and report is unique and is prepared solely for the client. No one except the client should rely on the geotechnical engineering report without first consulting with the geotechnical engineer who prepared it. The report should not be applied for any project or purpose except the one originally intended.

Read the Entire Report

To avoid serious problems, the full geotechnical engineering report should be read in its entirety. Do not only read selected sections or the executive summary.

A Unique Set of Project-Specific Factors is the Basis for a Geotechnical Engineering Report

Geotechnical engineers consider a numerous unique, project-specific factors when determining the scope of a study. Typical factors include: the client's goals, objectives, project costs, risk management preferences, proposed structures, structures on site, topography, and other proposed or existing site improvements, such as access roads, parking lots, and utilities. Unless indicated otherwise by the geotechnical engineer who conducted the original exploration, a geotechnical engineering report should not be relied upon if it was:

- not prepared for you or your project,
- not prepared for the specific site explored, or
- completed before important changes to the project were implemented.

Typical changes that can lessen the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a multi-story hotel to a parking lot
- finished floor elevation, location, orientation, or weight of the proposed structure, anticipated loads or
- project ownership

Geotechnical engineers cannot be held liable or responsible for issues that occur because their report did not take into account development items of which they were not informed. The geotechnical engineer should always be notified of any project changes. Upon notification, it should be requested of the geotechnical engineer to give an assessment of the impact of the project changes.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that exist at the time of the exploration. A geotechnical engineering report should not be relied upon if its reliability could be in question due to factors such as man-made events as construction on or adjacent to the site, natural events such as floods, earthquakes, or groundwater fluctuation, or time. To determine if a geotechnical report is still reliable, contact the geotechnical engineer. Major problems could be avoided by performing a minimal amount of additional analysis and/or testing.

Most Geotechnical Findings are Professional Opinions

Geotechnical site explorations identify subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field logs and laboratory data and apply their professional judgment to make conclusions about the subsurface conditions throughout the site. Actual subsurface conditions may differ from those indicated in the report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risk associated with unanticipated conditions.

The Recommendations within a Report Are Not Final

Do not put too much faith on the construction recommendations included in the report. The recommendations are not final due to geotechnical engineers developing them principally from judgment and opinion. Only by observing actual subsurface conditions revealed during construction can geotechnical engineers finalize their recommendations. Responsibility and liability cannot be assumed for the recommendations within the report by the geotechnical engineer who developed the report if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Misinterpretation of geotechnical engineering reports has resulted in costly problems. The risk of misinterpretation can be lowered after the submittal of the final report by having the geotechnical engineer consult with appropriate members of the design team. The geotechnical engineer could also be retained to review crucial parts of the plans and specifications put together by the design team. The geotechnical engineering report can also be misinterpreted by contractors which can result in many problems. By participating in pre-bid and preconstruction meetings and providing construction observations by the geotechnical engineer, many risks can be reduced.

Final Boring Logs Should not be Re-drawn

Geotechnical engineers prepare final boring logs and testing results based on field logs and laboratory data. The logs included in a final geotechnical engineering report should never be redrawn to be included in architectural or design drawings due to errors that could be made. Electronic reproduction is acceptable, along with photographic reproduction, but it should be understood that separating logs from the report can elevate risk.

Contractors Need a Complete Report and Guidance

By limiting what is provided for bid preparation, contractors are not liable for unforeseen subsurface conditions although some owners and design professionals believe the opposite to be true. The complete geotechnical engineering report, accompanied with a cover letter or transmittal, should be provided to contractors to help prevent costly problems. The letter states that the report was not prepared for purposes of bid development and the report's accuracy is limited. Although a fee may be required, encourage the contractors to consult with the geotechnical engineer who prepared the report and/or to conduct additional studies to obtain the specific types of information they need or prefer. A prebid conference involving the owner, geotechnical engineer, and contractors can prove to be very valuable. If needed, allow contractors sufficient time to perform additional studies. Upon doing this you might be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Closely Read Responsibility Provisions

Geotechnical engineering is not as exact as other engineering disciplines. This lack of understanding by clients, design professionals, and contractors has created unrealistic expectations that have led to disappointments, claims, and disputes. To minimize such risks, a variety of explanatory provisions may be included in the report by the geotechnical engineer. To help others recognize their own responsibilities and risks, many of these provisions indicate where the geotechnical engineer's responsibilities begin and end. These provisions should be read carefully, questions asked if needed, and the geotechnical engineer should provide satisfactory responses.

Environmental Issues/Concerns are not Covered

Unforeseen environmental issues can lead to project delays or even failures. Geotechnical engineering reports do not usually include environmental findings, conclusions, or recommendations. As with a geotechnical engineering report, do not rely on an environmental report that was prepared for someone else.

AMERICAN ENGINEERS, INC.
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Bringing the Subsurface into View

ELECTRICAL RESISTIVITY SURVEY
EKPC Cluster
Allen Pike
Cynthiana, Kentucky

Prepared for:

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December 13, 2019

Prepared by:

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Contents

1.0 Introduction

The area under investigation is located within a 530-acre property along Allen Pike near Cynthiana, Harrison County, Kentucky. The purpose of this project (a solar energy generating facility designated as the EKPC Cluster) was to perform a reconnaissance geophysical survey to determine the degree of karstification in several areas on the proposed construction site. In general, the proposed construction site possesses a grass or crop covered rolling topography, is currently undeveloped, and is used as open pasture for roaming cattle. The intent of this geophysical investigation is to characterize subsurface features prior to construction of solar equipment. Based on information from the client, a preliminary geotechnical report indicated a potential for the development of karst features. As directed by the client, several locations of interest were identified and this geophysical survey was planned accordingly to specifically investigate suspected karst features. A total of 15 geophysical electrical resistivity (ER) survey lines were used to determine subsurface anomalies related to development of karst features and to identify potential impacts of ER anomalies in proximity to any proposed construction footprint. A vicinity map showing the location of the site is included as Figure 1 and a site map showing the location of the survey area in relation to the project site is illustrated in Figure 2a. Figure 2b is a detailed aerial view or map illustrating the approximate locations of the ER lines laid out across the region.

2.0 Technical Background

The challenge for this project is to select the correct non-intrusive tools and techniques to evaluate the potential karst features at the site. In general, a variety of geophysical techniques can be applied to the mapping of subsurface features. Certain chosen field methods, however, are sensitive to a range of contrasting physical properties, and can possess attributes that make them more suitable than others, depending on site-specific conditions. Contrasting physical properties that typically are useful for mapping soil and bedrock include electrical conductivity or resistivity, acoustic velocity, density, and magnetic susceptibility. Of these, electrical resistivity is commonly determined to have the greatest range of contrast and is most applicable for detailed characterization of karst sites. Given the desired depth of investigation (approximately 100 feet), and the desire to image both the lateral and vertical extent of possible features, two-dimensional electrical resistivity (2-D ER) was selected as the method of choice to document the soil-sediment-rock profile beneath the site. A description of techniques used in this field study is presented in the sections following the geologic setting discussion.

2.1 Geological Setting

2.1.1 Bedrock

The exposed surface geology on the 530-acre site is almost entirely Ordovician-aged limestone units, with the exception of Quaternary-aged alluvium in ravines or valleys at elevations approximately 40 to 50 feet below any proposed construction areas with rare exceptions where some alluvium is only about 20 feet below any given geophysical survey line (Figure 2c). The Clays Ferry Formation (Ocf), a Middle-Upper Ordovician-aged limestone intermixed with approximately 50% shale is exposed over a large portion of the site. The unit contain abundant fragments of crinoids, brachiopods, and bryozoans while rarely containing fragments of pelecypods, gastropods, and trilobites. The Clay Ferry Formation weathers to light-brown, rounded fragments of limestone in dark-yellowish-orange clayey soil. Underlying the Clays Ferry Formation is the Lexington Limestone. The Lexington in turn possesses four formal Members including the Tanglewood Limestone, Millersburg Member, Stamping Ground Member, and the Grier Limestone. These Members are characterized as light-gray to light-brown and range from fine-to-coarse grained. Differentiating the members is based on slight differences in sedimentary structures and fossils found within the beds. Overall, the Lexington Limestone is typified by approximately 70% limestone and commonly contains well-preserved, whole fossils including brachiopods, bryozoans, gastropods, etc.

2.1.2 Soils

Study of the USDA Soil Survey of the site indicates that a variety of soils cover the area with the most prominent units being the Faywood Silt Loam, the Lowell-Sandview Silt Loam, and to a lesser extent the Mercer Silt Loam and Lowell-Faywood Silt Loam and Faywood Silty Clay Loam. These units are all described as silt, silty clay and clay in varying amounts with parent material noted as clayey residuum weathered from limestone or limestone and shale but in some cases, the parent material is fine, noncalcareous loess over clayey residuum weathered from phosphatic limestone units. Each of the soils on site are considered farmland of statewide importance and some even as prime farmland and are typified by slopes ranging from two to 12 percent and bedrock or weathered bedrock is found at a general depth of approximately 40 inches. Bedrock depth however is also dependent on slope angle and the stratigraphic unit underlying specific soil units (e.g., limestone versus shale).

The soils are generally moderately well drained to well drained and contain a significant silt component in contrast to some clay-dominant substrates associated with other karst regions of Kentucky away from the Inner Bluegrass region. The ER survey lines were generally conducted over soils that are indeed classified as loams either a silty or clayey-silt variety. It should be noted that all the field investigated areas have at least six inches of silt loam typifying the uppermost horizon. Some sites however, possess loam mapped to depths of 41 inches as “silt loam” such as in the case of the Lowell-Faywood Silt Loam. The Mercer Silt Loam has a silt-clay loam from nine inches to 40 inches and clay is mapped from 40 to 70 inches. Important soil units in the area in a vertical sense that can be correlated to geophysical “imaging” are generally as follows: silts in the uppermost one foot, then three feet of silty clay or as noted above, silt dominated loams but rarely are clays within the uppermost four to five feet of substrates. This is an important distinction for this relatively large site. This is because in well-developed “statewide importance” or “prime” farmland which characterizes most of the investigation area there is a significant silt content that in many locations is in contrast to underlying clay, clay on bedrock, or bedrock. Such contrasts between relatively well-drained silt (essentially quartz that is finer than sand size) substrates nearest the surface and those immediately underlying, aid in interpretation of geophysical surveys and better understanding of site conditions prior to development or construction. Due to the fact that the uppermost four to five feet of substrates have a significant silt component, and that there are various descriptors vis-à-vis the soil survey literature, including silt, silty clay and to a lessor extent clay, for discussion purposes and graphical display the term “soil” will be used in association with geophysical surveys presented later in this report.

2.2 Two-Dimensional Electrical Resistivity (2-D ER)

Electrical resistivity is one of the most widely varying of the physical properties of natural materials. Certain minerals such as native metals and graphite, conduct electricity via the passage of electrons; however, electronic conduction is generally very rare in the subsurface. Most minerals and rocks are insulators, and therefore electrical current preferentially travels through water-filled pores in soil and rock via the passage of the free ions in pore waters *(i.e.*, ionic conduction). It thus follows that the degree of saturation, interconnected porosity, and water chemistry (*i.e*., concentration of total dissolved solids or TDS) are the major controlling variables of the resistivity of a given soil or rock. In general, electrical resistivity directly varies with changes in these parameters.

Fine-grained sediments, particularly those that are clay-rich are excellent conductors of electricity, whereas relatively coarse-grained materials such as sand and gravel in contrast, are much more resistive stratigraphic units. Carbonate rocks (*i.e.*, limestone and dolomite or dolostone) are very electrically resistive when they are unfractured but they can possess significantly lower resistivity values if fractured and/or weathered and solutioned. In contrast, shale is very conductive. The conditions of conduction of electricity are very dependent on moisture and therefore equally dependent on precipitation and/or presence of groundwater. Periods of drought can deplete the amount of water in a system thereby changing the overall resistivity of the system. Void spaces in a clay matrix for example could actually appear to be more resistive than the clay. However, if after a protracted drought, sufficient rain falls to infill void spaces and the clay does not have sufficient time to absorb moisture, the resistive void can appear to be conductive. Thus, the interpretation of geophysical data requires the consideration of many lines of evidence.

2.3 Electrical Resistivity Methods

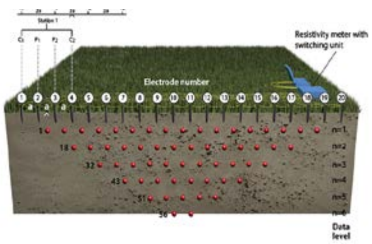


Diagram 1. Schematic diagram of a multi-electrode system, and a possible sequence of measurements to create a 2-D pseudosection.

While the resistivity meter used in sounding and profiling surveys typically has four electrodes connected via four separate cables, a multi-electrode system has 25 or more electrodes connected to the resistivity meter via a multi-core cable (see inset Diagram 1). Commercial multi-electrode systems first appeared in the late 1980s and since then have become a standard tool in many geophysical organizations. An internal switching circuitry controlled by a programmable microcomputer or microprocessor within the resistivity meter automatically selects the appropriate four electrodes for each measurement. This enables almost any array configuration to be used. By making measurements with different spacing at variable locations along the cable, a 2-D profile of the subsurface is obtained. Together with the parallel development of fast and stable automatic data inversion techniques that could be implemented on commonly available microcomputers, 2-D electrical imaging surveys became widely used in the early 1990s. There are many commercial multi-electrode resistivity systems capable of connecting up to several hundred electrodes at once, with electrode spacing practically varying from one to 20 meters. A recent development over the past 10 years is multi-channeled systems that can greatly reduce the survey time. Only two electrodes can be used as the current electrodes at a single time, but the voltage measurements can be made between many different pairs of potential electrodes. Commercial systems with four to 10 channels are widely available (Loke et al., 2013).

3.0 Procedures

Standard Operating Procedures (SOPs) for ER begins with a site safety check. Each site is evaluated for possible safety concerns and the surveys are modified to take these into account. After the location of the survey line is determined, the overall distance of the survey is measured. The desired resolution is factored in and a spacing optimal to these parameters is determined. Tape measures are laid out and stainless-steel electrodes are placed into the ground at pre-determined positions. Depth of emplacement of the electrodes is determined by field conditions. Where possible, electrode stakes are driven approximately six inches below surface to minimize contact resistance. A few ounces of a salt-water solution are then poured at the base of each stake where needed to decrease contact resistance. The electrical resistivity cables are unrolled and an electrode bulb is placed at each stake. The bulbs are then attached to the stakes. The AGI SuperSting R8/IP and Swift switch box are in turn attached to the cables. A final check of the setup is made to ensure proper working order of the laid-out survey line. A contact resistance test is then completed and data recording is initiated.

3.1 ER Lines Conducted

A total of 15 ER lines were conducted in multiple areas at the proposed site. Figure 2b displays the orientation of each ER line. As is noted in Table 1, electrode spacing was 10 feet and the number of electrodes was 56 on all lines except for AB1204LD, which was conducted with two-foot spacing and AB1205LK in which 42 electrodes were used. All ohms-meter values from the 15 ER lines were normalized to better estimate depth to rock from resistivity values. The normalized values for the surveyed lines range from 10 to 2,562 ohms meters. A combined dipole-dipole and strong-gradient array was used (command file name ddsg56) on all ER lines. Two 12-volt batteries were used to power the system in boost mode, allowing for deeper penetration of energy. Data were processed using the Advanced Geoscience Inc. (AGI) 2D-EarthImager software. Data were processed to remove interfering data points based on criteria of achieving low root mean squared (RMS) values yet retaining data points.

Table 1 – Electrical Resistivity Lines Conducted

Field Name and Processed Name*	Report Figure	Electrode Spacing (feet)	Electrode 1 Position	Last Electrode Position (56)	Length (feet)
AB1203LA	3	10	W	E	550
AB1203LB	4	10	W	E	550
AB1203LC	5	10	W	E	550
AB1204LD	6	2	W	E	110
AB1204LE	7	10	NW	SE	550
AB1204LF	8	10	W	E	550
AB1204LG	9	10	W	E	550
AB1204LH	10	10	N	S	550
AB1204LI	11	10	W	E	550
AB1205LJ	12	10	W	E	550
AB1205LK	13	10	W	E (42)	410
AB1205LL	14	10	SW	NE	550
AB1205LM	15	10	S	N	550
AB1205LN	16	10	S	N	550
AB1205LO	17	10	W	E	550
*Naming Nomenclature: Site Name, Month, Day and Line Letters					

4.0 Results of Geophysical Survey

4.1 Lines AB1203LA, LB, LC, and AB1204LD

Study of this series of profiles (Figures 3 through 6) suggests that the upper five to 10 feet is unconsolidated moist to wet silty clay and clay-rich earth material overlying a layer of weathered rock. These uppermost silty to silty-clay to clay-rich soils (green overlying blue colors) are continuous across the site and are relatively undisturbed. Weathered rock is observed at a depth of about 10 feet and varies from five to 15 feet thick. The weathered rock, typical of epikarst or solution-enlarged limestones is conductive (light blue to green colors) and is continuous across the site, with several areas of varying thickness observable on profiles LA (Figure 3) and LC (Figure 5) at stations 130 and 290 on LA and stations 205 and 360 on LC. These locations in the weathered rock layer are nearly 40 feet thick and appears to incise down into the underlying resistive bedrock (red to yellow colors). The bedrock begins near a depth of 20 to 25 feet and continues to the depth of the profile, with exceptions in profiles LA and LC, where incision of weathered rock is cutting through to greater depths. Arrows in the profile indicate inferred water flow pathways in the subsurface and do not represent the actual route of infiltration. These features at stations LA 130 and 290 and LC 205 and 360 may represent a series of closely spaced fractures or joints in the bedrock. Such movement of water along joints and also bedding planes typical of this region is illustrated in Figure 23 Generalized Block Diagram of the Inner Bluegrass Karst (Currens, 2001). Additional means of exploration may be required to confirm the presence and location of significant bedrock-fracture sets if deemed necessary for construction. Figure 6, Profile AB1204LD, represents a high-resolution, close electrode spacing designed to provide detail of the subsurface lithology. The close electrode spacing of two feet provides high resolution, thus greater accuracy in determining depth to bedrock underneath the proposed substation. Bedrock was found to be approximately nine to 10 feet deep using the two-foot electrode spacing.

4.2 Lines AB1204LE, LF, and LG

The upper five to 10 feet of this series of profiles LE, LF, and LG (Figures 7 through 9, respectively) contains generally moist, unconsolidated silt, silty clay to clay (green overlying blue colors). Such soils are continuous across the site and are positioned atop a slightly less-conductive layer of weathered rock (light blue to green). The weathered rock layer is continuous across the site, is 10 to 15 feet thick, and is positioned atop patchy layers of resistive bedrock (red) at a depth of about 20 feet. Line E was oriented obliquely (40 degrees) to lines F and G (see insert aerial in Figure 8 and Figure 2b). Located near stations 245 and 310 along Line E (Figure 7), small breaks in the weathered rock are observable. Line F and Line G were conducted with a quarter overlap for the purpose of creating one long line. Line F has two small breaks in the weathered rock at stations 140 and 175 (Figure 8). Line G, at station 230 also shows a break in the weathered rock (Figure 9). These breaks, although not deeply penetrating into the bedrock, are likely resulting from solution enlargement of fractured bedrock along shale and limestone interbeds rather than a fully developed karst conduit or similar feature (see for example groundwater flow along bedding plane contacts as illustrated in Figure 23). Possible water-flow pathways are indicated by blue arrows. Actual flow may be in or out of the cross-section plane as presented with lateral movement into and out of areas not imaged.

4.3 Lines AB1204LH and LI

Moist to wet silts, silty clay and clays (green overlying blue colors) are continuous along the surface of profiles AB1204LH and LI (Figures 10 and 11). These unconsolidated materials range in thickness from five to 12 feet and appear relatively undisturbed by joints or solution-enlarged joints. The weathered rock, slightly less conductive (light blue to green), is present across the site with varying depths of five to 20 feet and ranges in thickness from 10 to 50 feet. Profile LH (Figure 10) exhibits a hummocky contact between the weathered rock and bedrock whereas Profile LI (Figure 11) displays a relatively flat contact between the weathered rock and bedrock with a small break below station 160. The dashed boxes near a depth of 45 feet is a possible perched water table, and possible water-flow pathways are indicated by the blue arrows (Figure 10). The patch, hummocky nature of the resistive (yellow and orange colors) bedrock in LH is suggestive of a well-developed karst feature and may warrant further investigation. Only a minor potential perched water table is shown by the small dashed box in Figure 11.

4.4 Lines AB1205LJ and LK

Study of profiles AB1205LJ and LK (Figures 12 and 13) depicts the upper 10 to 15 feet of moist to wet silts to silty-clay to clay (green overlying blue colors) that are continuous and undisturbed across this area. Below the conductive clay layer is an area of weathered rock, slightly less conductive than the clays above. The weathered rock begins at a depth of 10 to 15 feet and ranges from 10 to 15 feet thick across this area. A slight break in the weathered rock is observable at LK station 320. More resistive bedrock is observed on the profiles, beginning at a depth of approximately 25 feet. The bedrock layer is 20 to 50 feet thick and discontinuous, where the weathered rock drops down. The break in bedrock under station 320 on profile K (Figure 13) is inferred to be a water pathway to an inferred perched water table (small dashed rectangle or box), as indicated by the blue arrows.

4.5 Lines AB1205LL, LM, LN, and LO

The upper five to 15 feet of profiles LL, LM, LN, and LO is typified by moist to wet silts, clayey silts to clay rich earth material or soil (green overlying blue colors) (Figures 14, 15, 16, and 17). Note that Lines M and N are generally trending north-south and that Line O was oriented nearly perpendicular to M and N and intersects them as well (Figure 2b). The soils appear undisturbed across this portion of the site and rest atop a layer of weathered rock and bedrock. Most significantly, Profiles LM, LN and LO (Figures 15, 16, and 17) indicate an area of the site were karst features appear to be better developed relative to other parts of the site surveyed by ER profiling. Profile LM, Figure 15, for example, presents a hummocky surface of weathered rock with patchy, discontinuous bedrock below. Profiles LN and LO, Figures 16 and 17, both indicate a break in the weathered rock into the bedrock at stations 180 and 400 on Profile LN and at stations 160 and 370 on Profile LO. The resistive (yellow, orange and red) rock in these profiles appears to be near a depth of 20 feet, and is somewhat continuous in Profile LN but patchy or discontinuous in Profile LO. At a depth of 55 to 65 feet, dashed boxes outline conductive areas on each profile. This area may be indicative of a karst solution enlarged fractured rock or a perched water table along shale-limestone partings or contacts (again, quite typical of bedding-plane contact horizontal flow of Inner Bluegrass Karst in KY – Figure 23). In profile LM (Figure 15) multiple possible water-flow pathways are indicated by blue arrows across the profile. These pathways show weathered rock extending down into the less conductive layers below. A sinkhole basin is mapped in the area according the KY Geological Survey (KGS) online database karst geohazard interactive map results and visual inspection indicate the presence of other such features to the north and east. The area exhibits karst terrain and the ER profiles or cross-sectional views confirm the presence of features associated with solution enlarged joints and closed basins. These areas have been marked with a red ellipse to indicate elevated or significant concern for the development of karst features that shown be addressed prior to construction activities. In short, further exploration of this area is suggested.

5.0 Summary of Findings

This proposed EKPC solar project area is located in a region near Kentucky Highway 62 and Allen Pike, southwest of Cynthiana, Kentucky. Figures 18 through 22, Electrical Resistivity Overlays, show the ER profiles grouped by locations. These location groupings are based on areal distribution and to a lesser extent, geology, as the exposed or near-surface lithology changes roughly from the southeast (various members of Lexington Limestone) to the northwest (dominance of Clays Ferry Formation). These location groupings serve as a valuable visual tool, providing a complete view of all profiles in the context of the development of subsurface features across this site. A small portion of the proposed construction area in the northwest sector has a mapped sinkhole according to the KGS. A black line has been drawn through the profiles at a constant elevation (~870 ft) to show potential local base-level flow. Figure 23, Generalized Block Diagram of the Inner Bluegrass Karst (Currens 2001), represents a schematic illustration of the potential subsurface conditions which exist at this site. This conclusion is based on tracing paths of relatively highly conductive portions of ER profiles both vertically and horizontally with inferred vertical transmission of groundwater through solution-enlarged joints or fractures and in turn, horizontal transmission of groundwater via contacts or boundaries between interbedded shale and limestone units.

Several features of concern have been marked on the profiles indicating further investigation may be warranted if critical infrastructure is proposed at a given location. Breaks in the resistive bedrock are readily observable and are interpreted to be water flow pathways into the subsurface in to perched water tables present above less permeable geological units. It is noted that ER cross sections may show a broad extent of color variations at depth and the potential karst feature may appear to be rather large. Small amounts of conductive water and ions can have a pronounced effect on the final model. Investigation of the ER method, modeling process and resolution of data collection coupled with case studies indicate the actual conductive feature is much smaller than shown in many cases.

Figure 18 Electrical Resistivity Overlay Lines A, B and C indicate minimal development of karst features with fractures or solution-enlarged joints underlying a thick, continuous, unconsolidated and undisturbed silt and silty clay and clay soil. The fractures allow water to migrate down to a perched water table near the 870 feet elevation line. Whereas features profiled or mapped on this site are indicative of karst processes, the terrain is poorly developed as attributable to karst processes in this specific location and in contrast, is more indicative of a perched water table recharged from the surface through fractures in the limestone. Aquifers are most likely small partings or anastomosing surfaces in the partings that only have been moderately affected by rock dissolution or solution enlargement. Again, such development of groundwater flow systems between rocks of variable weatherability such as shale and limestone are quite typical of Kentucky's Inner Bluegrass karst terrain. Similar conditions can be seen in Figure 19, Electrical Resistivity Overlay Lines E, F and G.

Figure 20 Electrical Resistivity Overlay Lines H and I were conducted across two valleys. Line I displays conditions similar to Figures 18 and 19. Line H was conducted through an abandoned pond, above a series of newer ponds, and is at a lower elevation than all the other lines. The elevation of the survey is much closer to the 870 feet elevation line. The proximity to the 870 elevation and the existence of ponds down slope indicate that the water table or potentiometric surface is discharging into this area. An additional potentiometric surface is observable at depth.

Figure 21, Electrical Resistivity Overlay Lines J and K, were conducted in the southwest sector of the site and indicate similar conditions as noted in areas possessing a similar elevation. Fractures shunting water to a perched water table are present but in a relatively reduced capacity.

Figure 22, Electrical Resistivity Overlay Lines L, M, N and O, shows the greatest concentration of features of concern. The area exhibits characteristics of a well-developed karst area. Silts, clayey silts and clays appear across the site and sit atop a mixed layer of weathered rock and bedrock. Figure 22 shows all the profiles with a hummocky surface and discontinuous bedrock interrupted by weathered bedrock cutting through to the base of the profiles. A conductive area at a depth of nearly 70 feet (near the 870-elevation line) can be seen outlined by the dashed box. This area may be indicative of a karst solution enlarged fractured rock or a perched water table along shale-limestone partings or contacts. A sinkhole basin is mapped in the area and visual inspection indicate the presence of other such features to the north and east. The area exhibits possible karst terrain and cross sections confirm the presence of features associated with solution enlarged joints and closed basins. Further exploration of this area is suggested if considered for the location of engineered structures.

A general overall geological assessment of the site (Figure 2c) suggests a well-developed karst terrain to the northwest in the higher elevations of the Upper Clays Ferry Formation (Ocf), diminishing to a minimally impacted karst area with fractures and perched water tables in the Tanglewood (Olt) and Millersburg Members transitioning to a discharge area to the southeast on a lower section of the Clays Ferry Formation (Ocf). Thus, areas to the northwest should be evaluated further prior to being considered for development of engineered structures or removed from consideration.

6.0 Limitations

This study included a limited set of geophysical readings across limited portions of the site. The results and interpretations of the geophysical survey performed are considered generally reliable and were conducted in a manner generally consistent with practitioners in the field of geophysical engineering. The methods used in this investigation are considered reliable; however, localized variations may exist in the subsurface conditions that have not been completely defined at this time. The resistivity results are not unique to geological features and more than one geologic feature or model may yield similar results. Therefore, properly conducted soil test borings and other exploratory techniques are necessary to more completely determine the subsurface conditions at the site.

The site features presented on the site base map are for informational purposes only and no representation is made as to the accuracy or completeness of this information. It is recommended that a practicing geosciences or geotechnical engineering professional be contacted prior to conducting verification drilling or excavating activities.

Figure 1 Vicinity Map

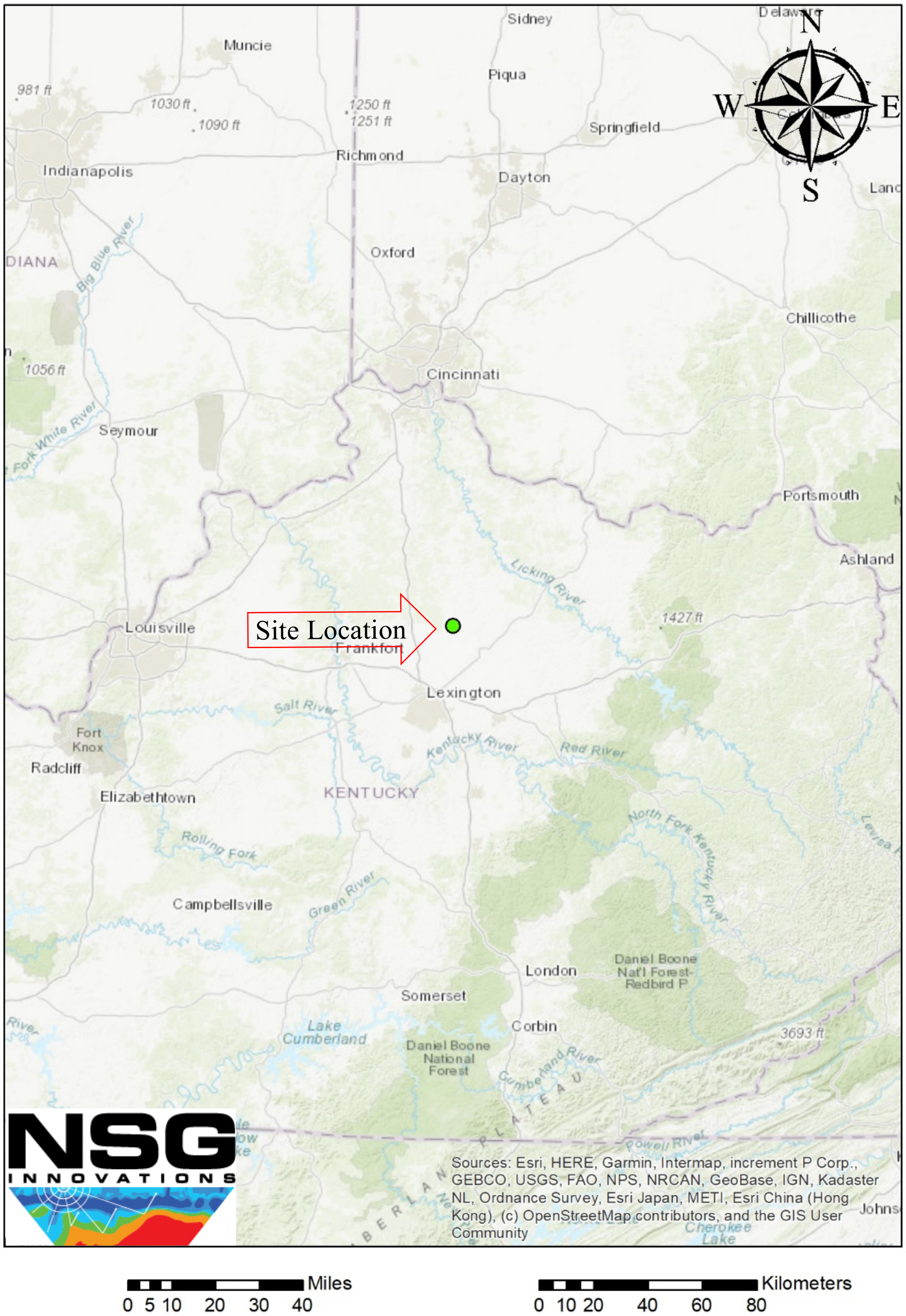


Figure 2a Site Map

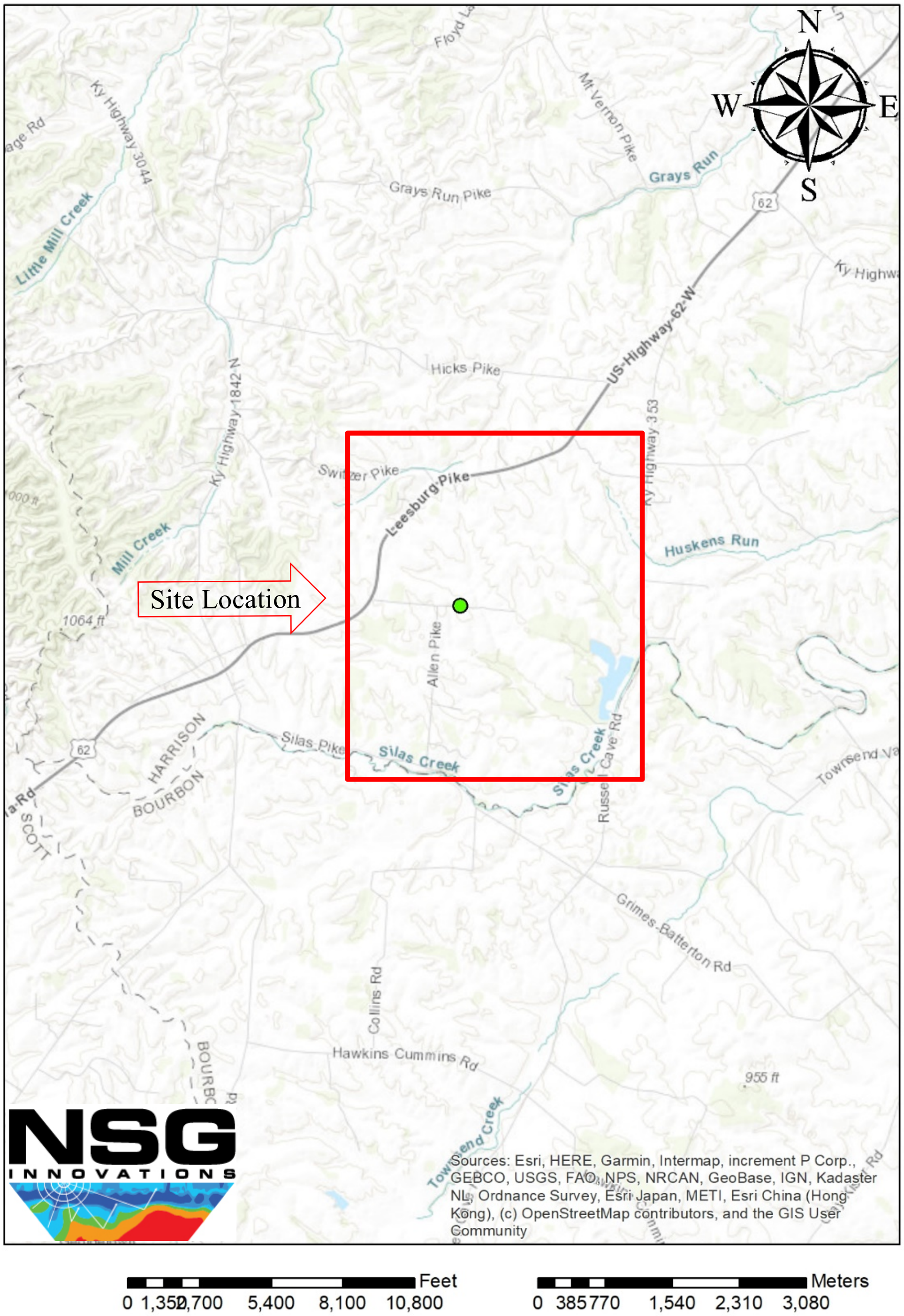
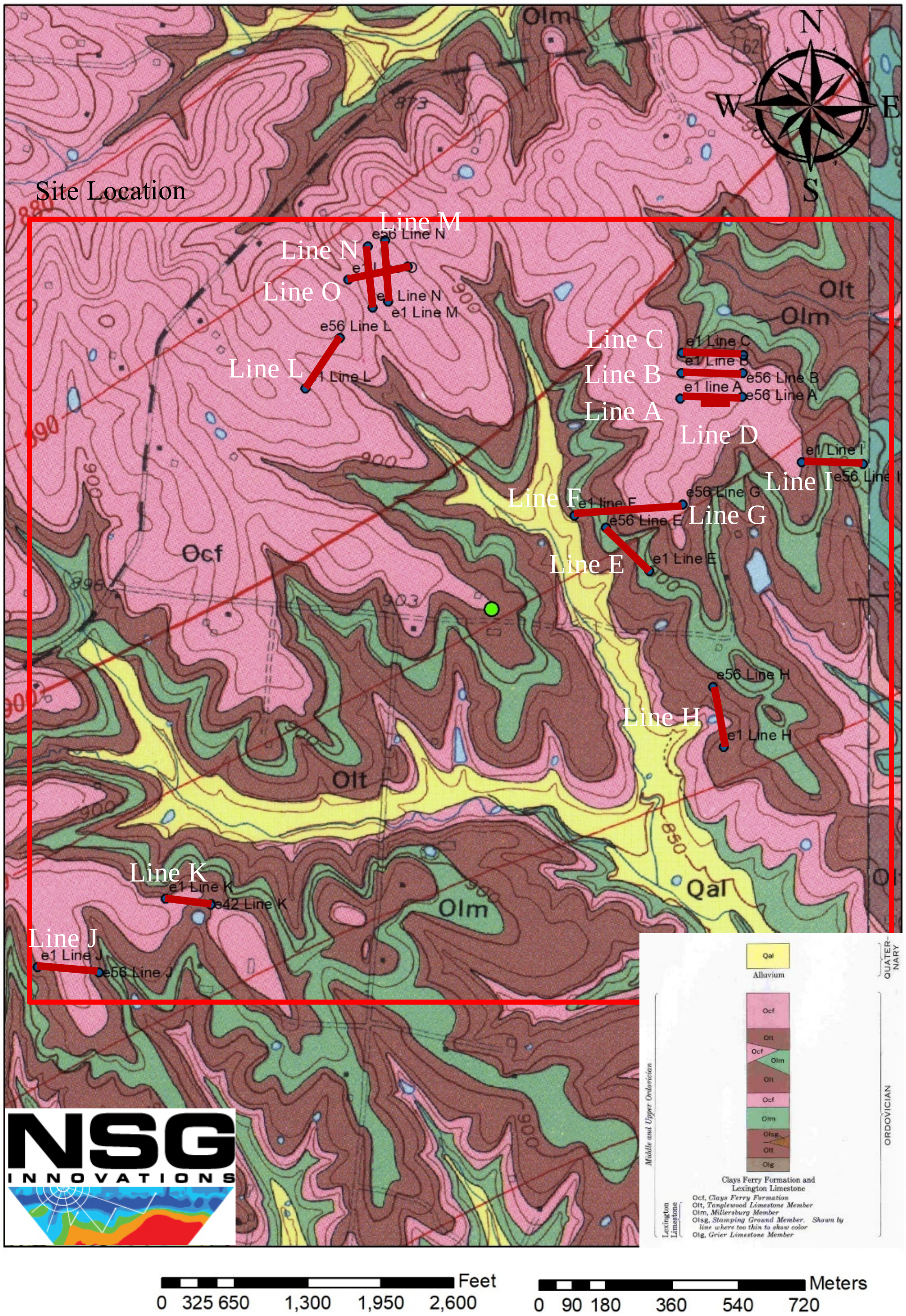


Figure 2b **Line Location Map**

Figure 2c Geological Setting



Electrical Resistivity Profile AB1203LA
Figure 3

Figure 3 AB1203LA

Inferred geophysical boundaries

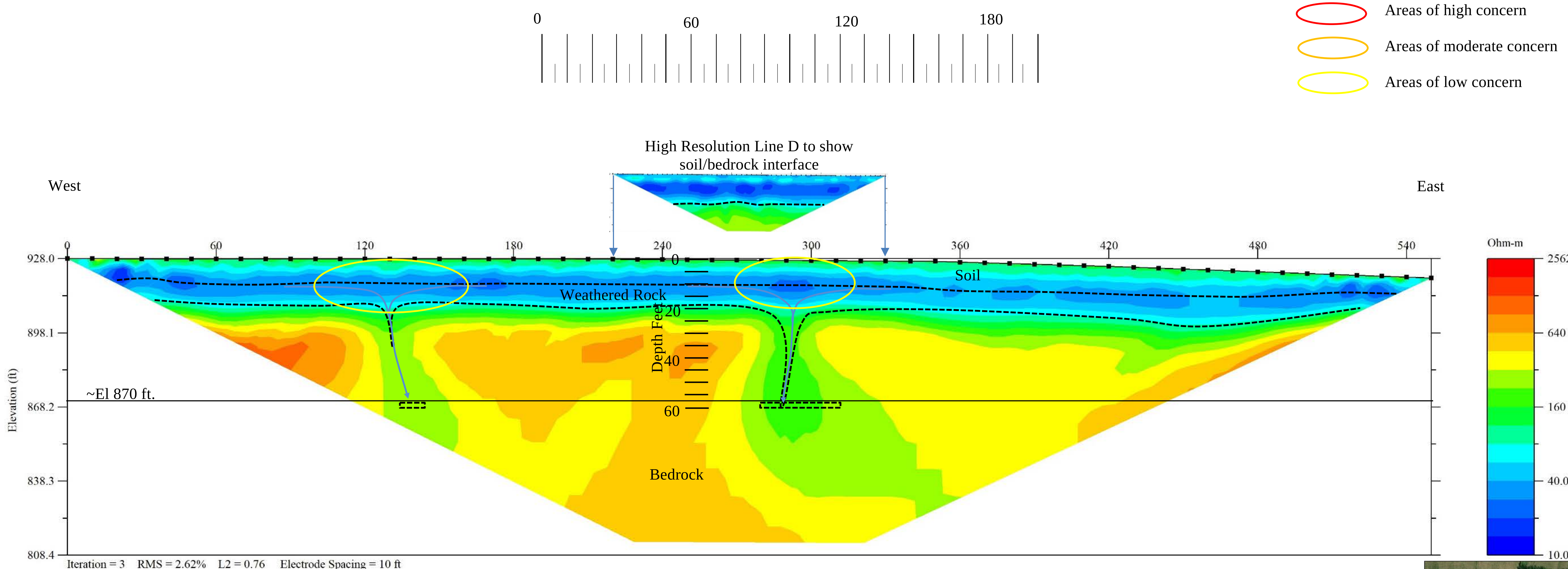
Inferred location perched water table

Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern

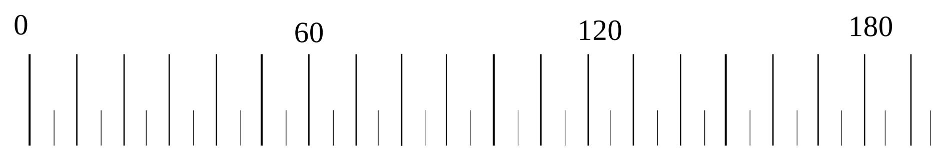


NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 3, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Profile AB1203LB
Figure 4

Figure 4 AB1203LB

Electrical Resistivity



Inferred geophysical boundaries

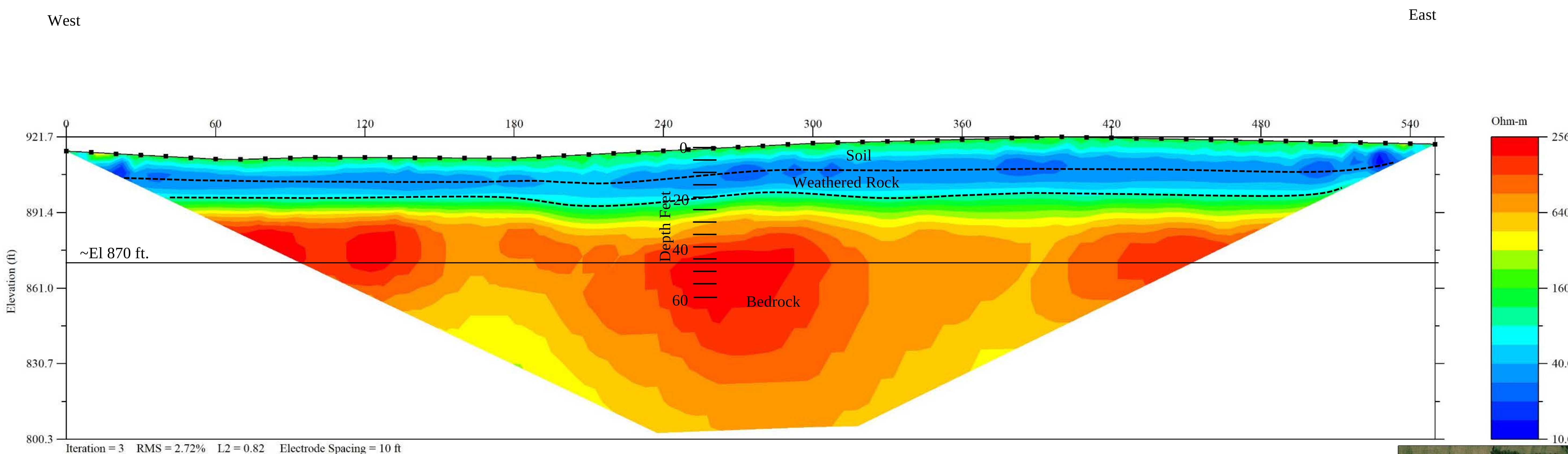
Inferred location perched water table

Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern



	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 4, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Profile AB1203LC
Figure 5

Figure 5 AB1203LC

Inferred geophysical boundaries

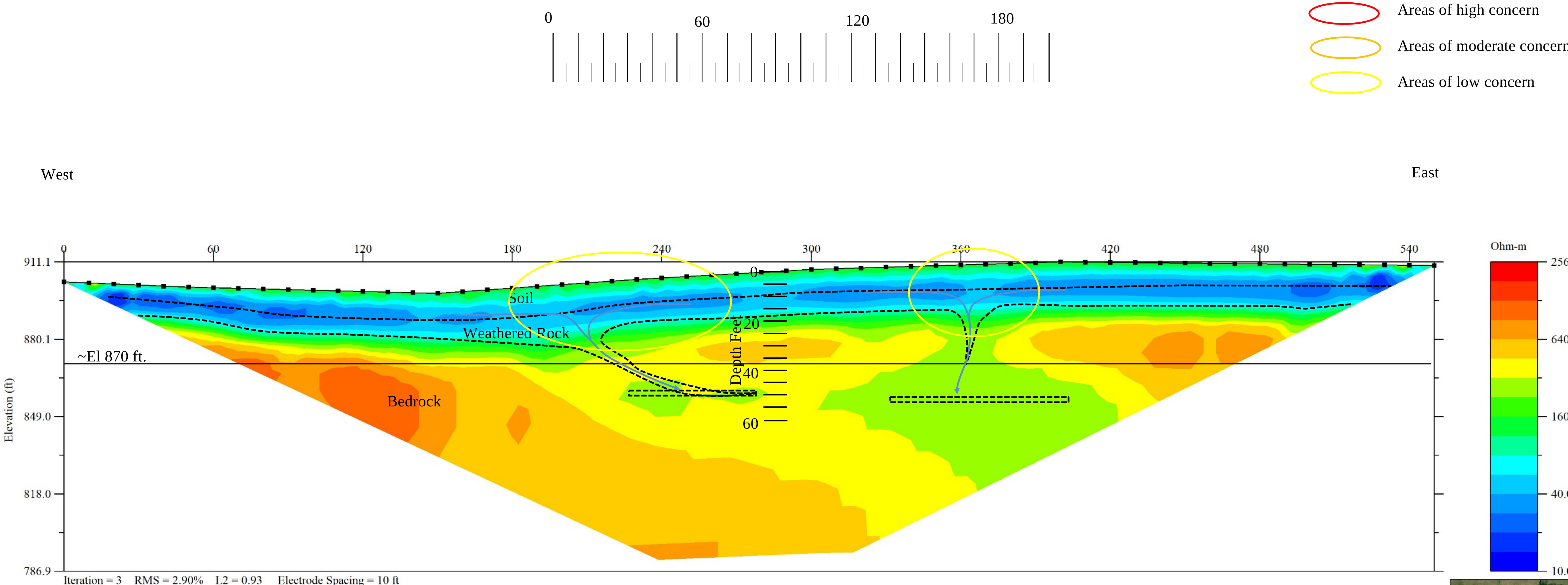
Inferred location perched water table

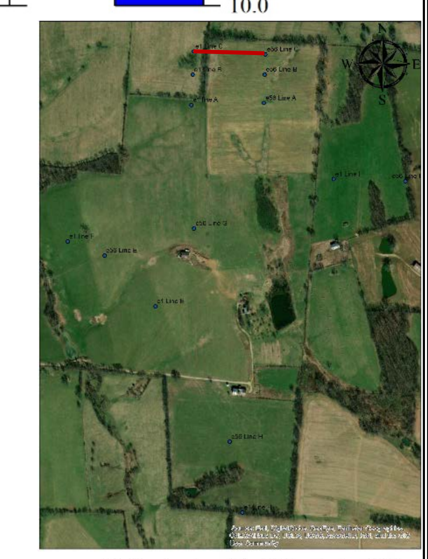
Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern



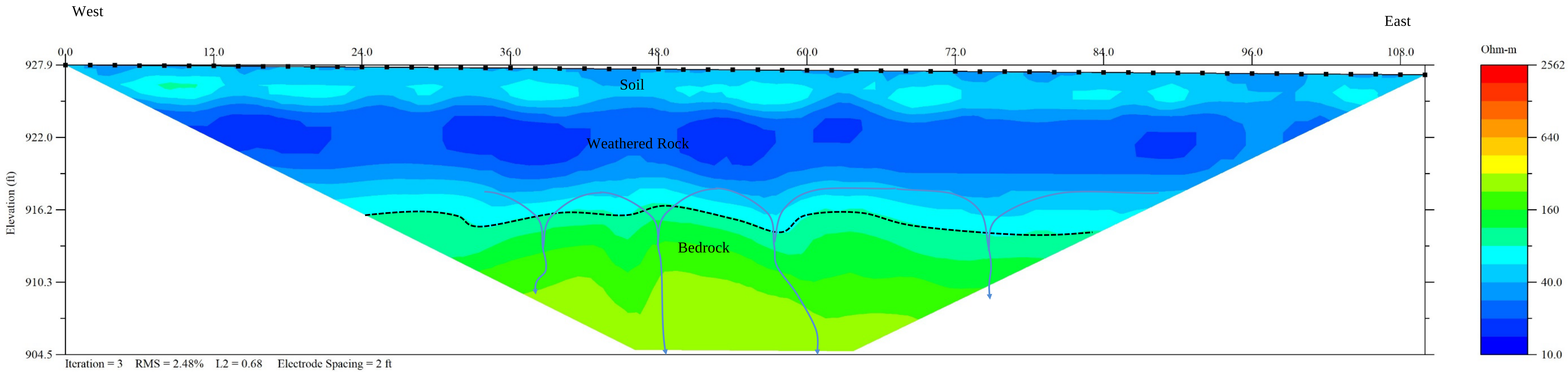


NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 5, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Profile AB1204LD
Figure 6

Electrical Resistivity

Figure 6 AB1204LD



NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 6, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Survey, EKPC Cluster, December 13, 2019

Electrical Resistivity Profile AB1204LE
Figure 7

Figure 7 AB1204LE

Electrical Resistivity

0 60 120 180

Inferred geophysical boundaries

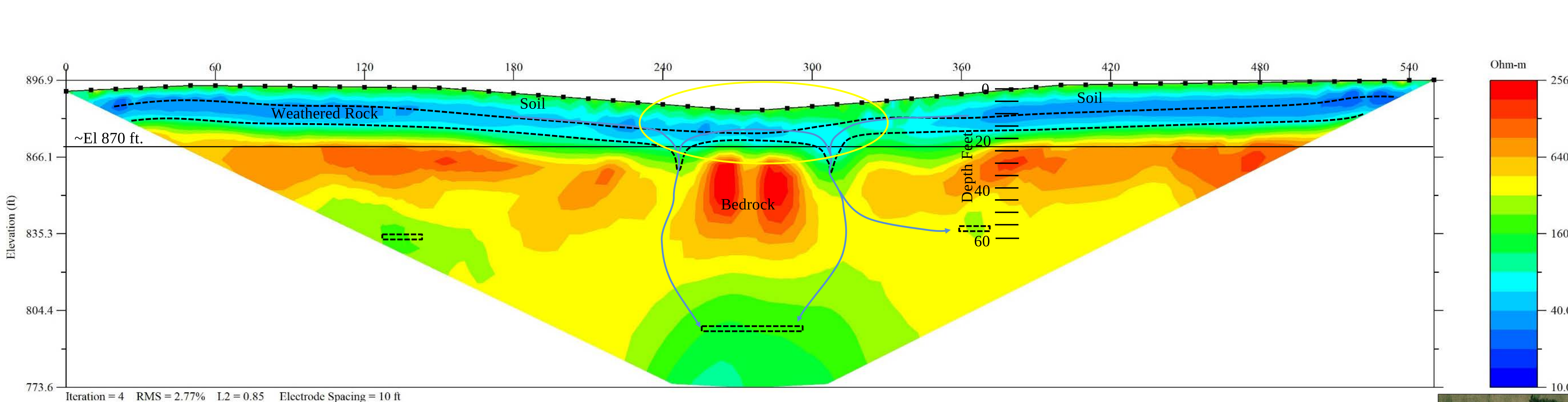
Inferred location perched water table

Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern

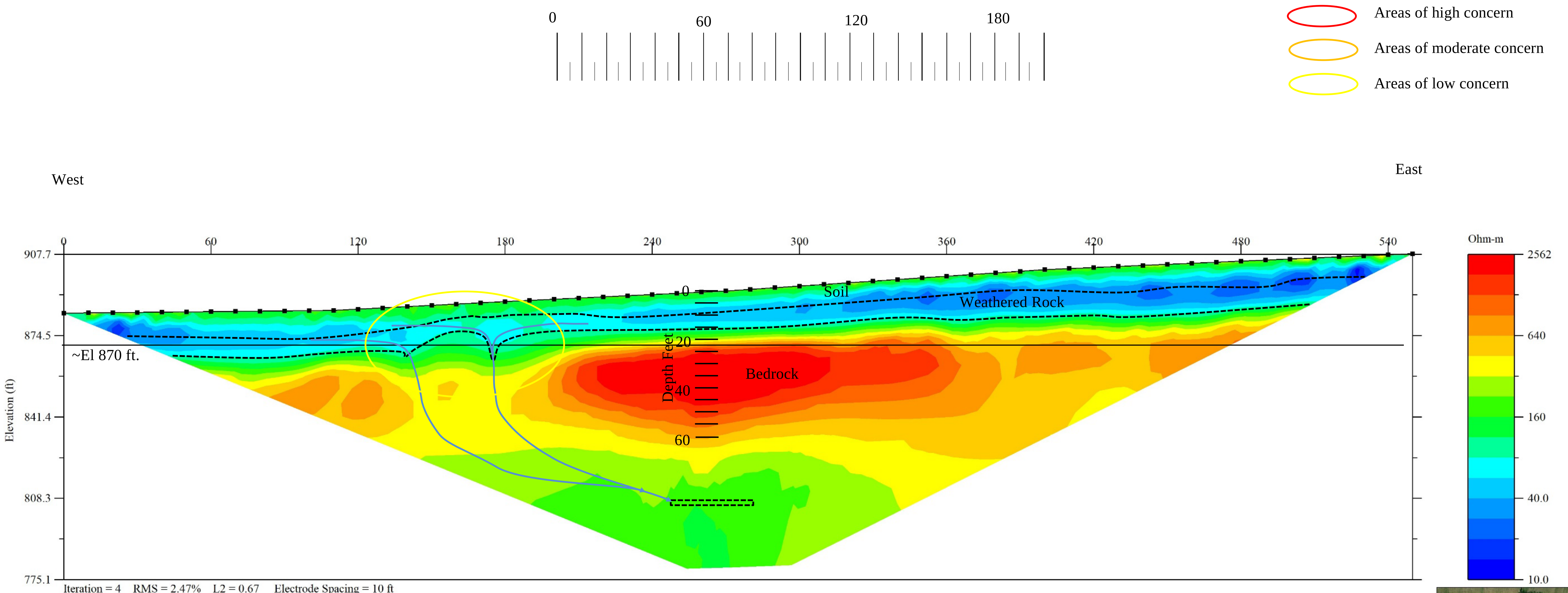


NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 7, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Survey, EKPC Cluster, December 13, 2019

Electrical Resistivity Profile AB1204LF
Figure 8

Figure 8 AB1204LF



NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 8, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown	Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky 20

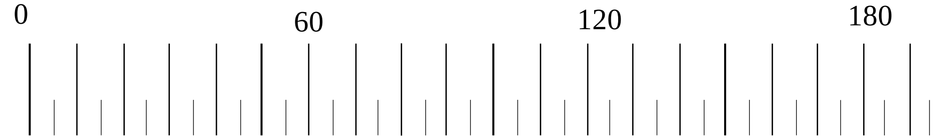
Electrical Resistivity Survey, EKPC Cluster, December 13, 2019

Electrical Resistivity Profile AB1204LG

Figure 9

Figure 9 AB1204LG

Electrical Resistivity



Inferred geophysical boundaries

Inferred location perched water table

Features of Concern

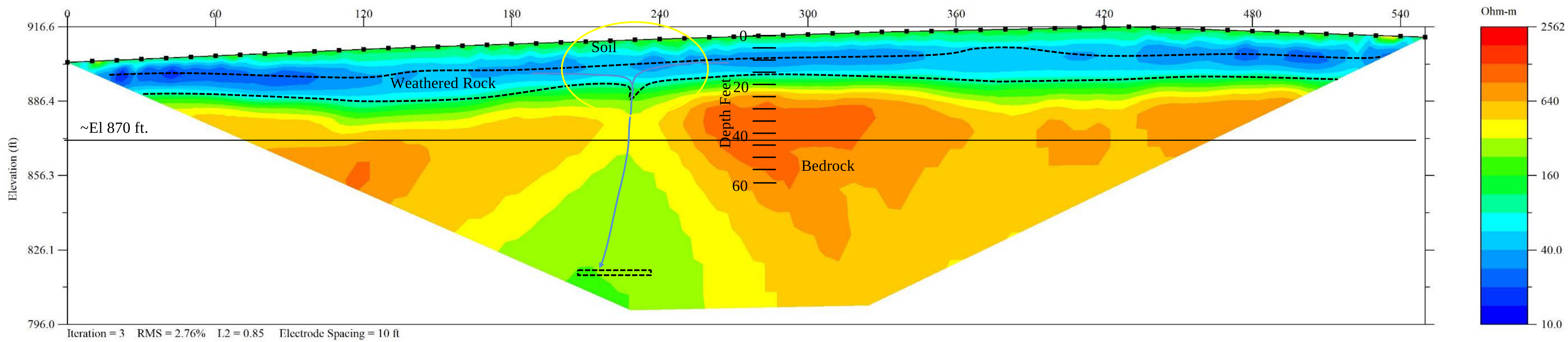
Areas of high concern

Areas of moderate concern

Areas of low concern

West

East



NSG INNOVATIONS

NSG Innovations, LLC
Near Surface Geophysics
501 Nutwood Street
Bowling Green, KY

Figure 9, Electrical Cross Section
Drawn By: Thomas Brackman

Horizontal Scale (feet): as shown

Vertical Scale (feet): as shown

Electrical Resistivity Survey
EKPC Cluster
Cynthiana, Kentucky

Electrical Resistivity Survey, EKPC Cluster, December 13, 2019

Electrical Resistivity Profile AB1204LH
Figure 10

Figure 10 AB1204LH

Inferred geophysical boundaries

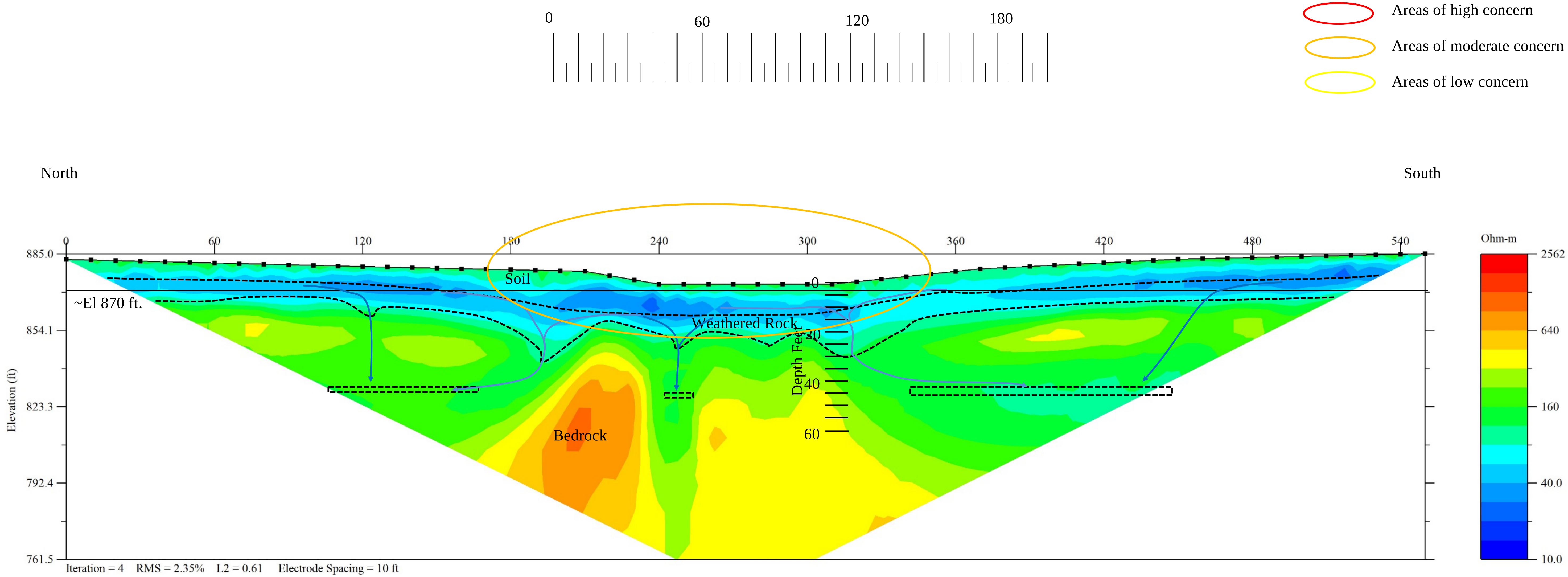
Inferred location perched water table

Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern



NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 10, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Profile AB1204LI
Figure 11

Figure 11 AB1204LI

Inferred geophysical boundaries

Inferred location perched water table

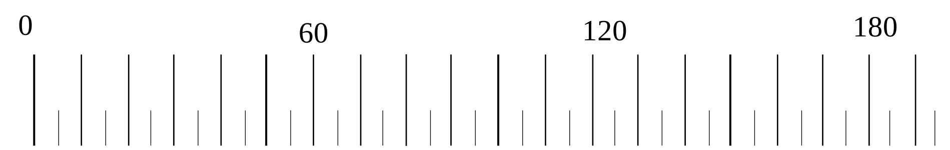
Features of Concern

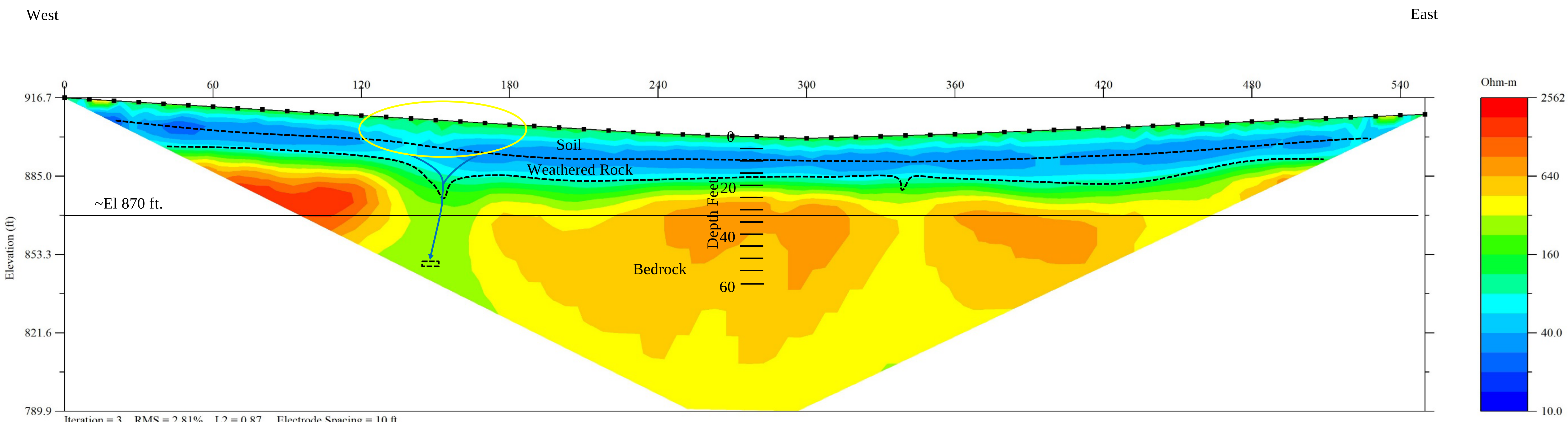
Areas of high concern

Areas of moderate concern

Areas of low concern

Electrical Resistivity



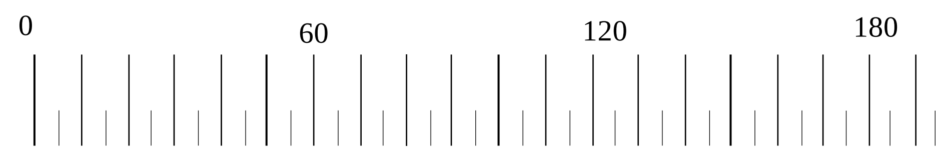


NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 11, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Profile AB1205LJ
Figure 12

Figure 12 AB1205LJ

Electrical Resistivity



Inferred geophysical boundaries

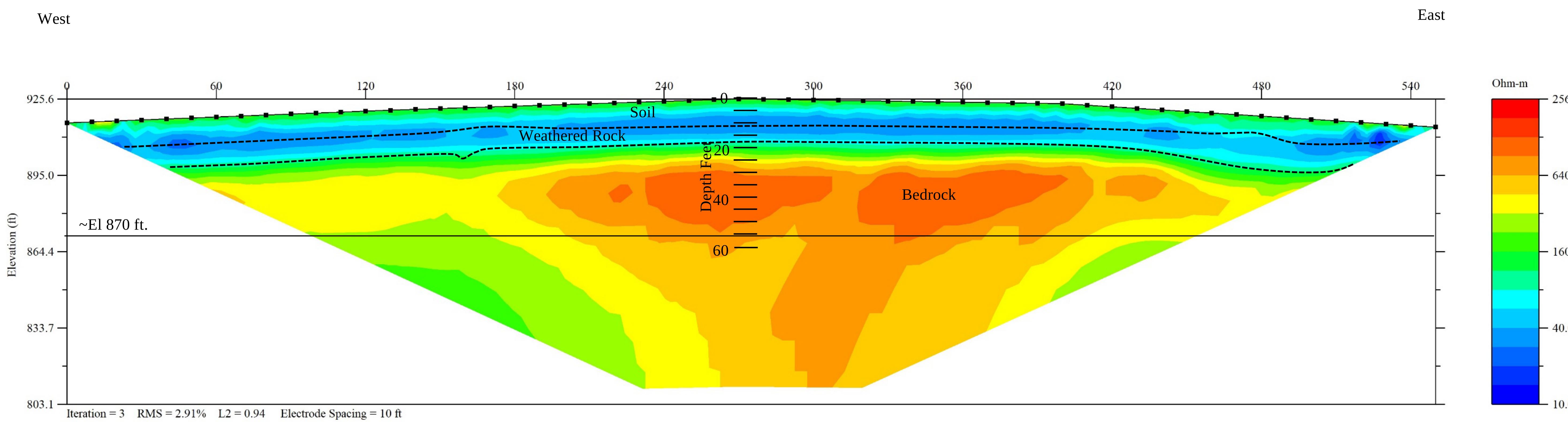
Inferred location perched water table

Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern

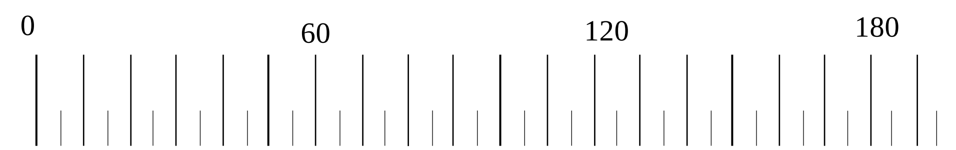


	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 12, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

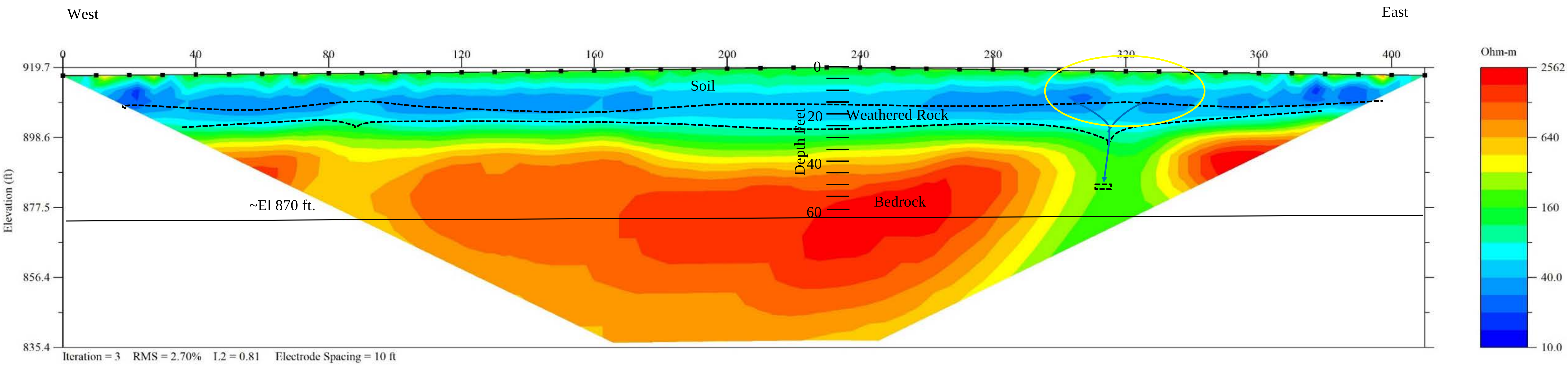
Electrical Resistivity Profile AB1205LK
Figure 13

Figure 13 AB1205LK

Electrical Resistivity



Inferred geophysical boundaries
Inferred location perched water table
Features of Concern
Areas of high concern
Areas of moderate concern
Areas of low concern



NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 13, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Profile AB1205LL
Figure 14

Figure 14 AB1205LL

Electrical Resistivity

0 60 120 180

Inferred geophysical boundaries

Inferred location perched water table

Features of Concern

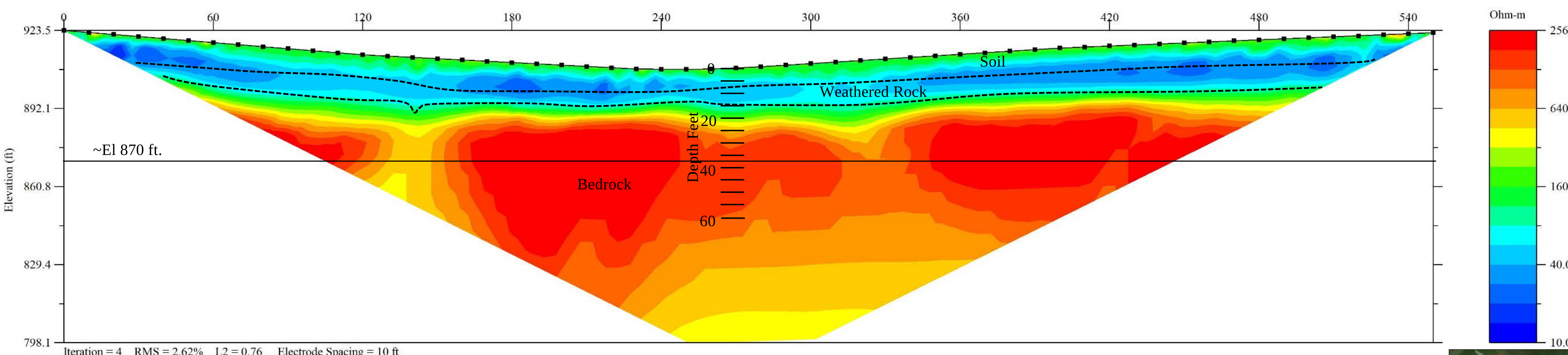
Areas of high concern

Areas of moderate concern

Areas of low concern

Southwest

Northeast

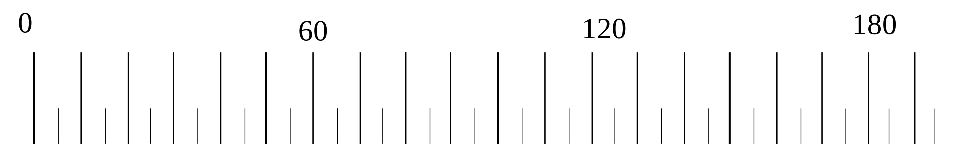


NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 14, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Profile AB1205LM
Figure 15

Figure 15 AB1205LM

Electrical Resistivity



Inferred geophysical boundaries

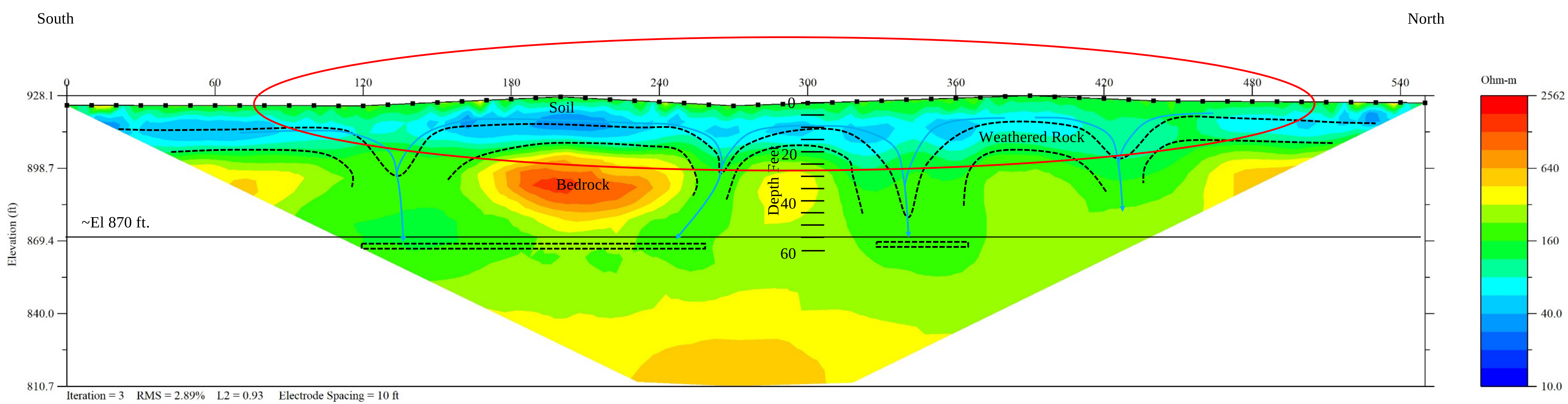
Inferred location perched water table

Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern



NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 15, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Profile AB1205LN
Figure 16

Figure 16 AB1205LN

Electrical Resistivity

0 60 120 180

Inferred geophysical boundaries

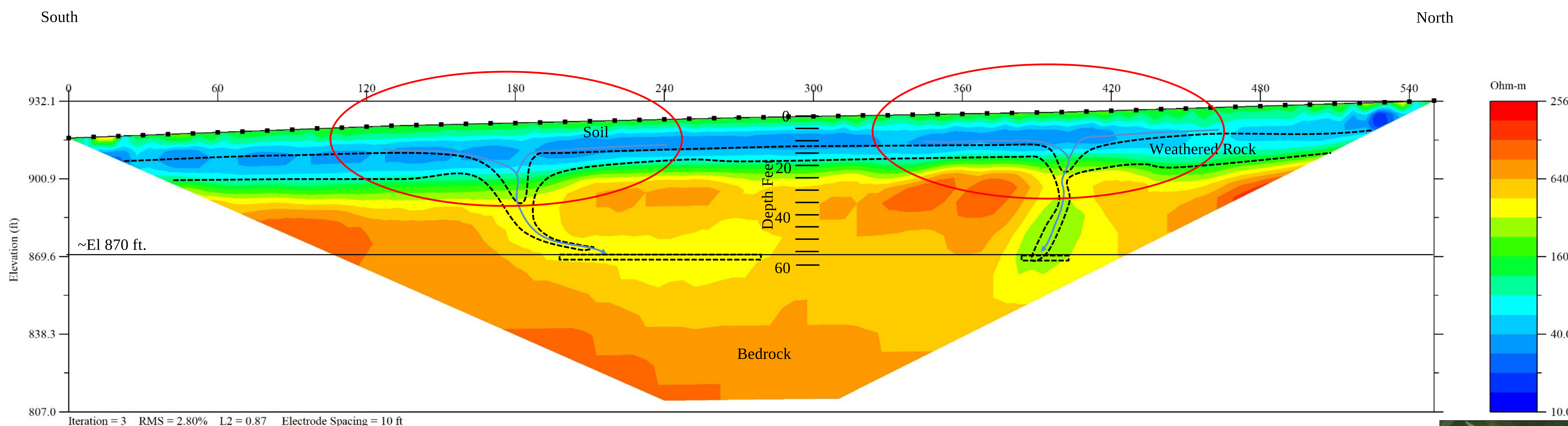
Inferred location perched water table

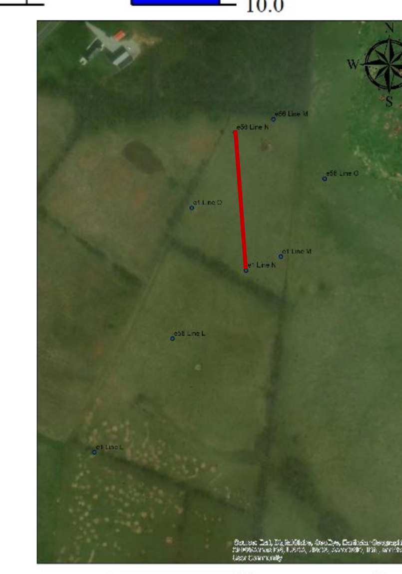
Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern





NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 16, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Electrical Resistivity Survey, EKPC Cluster, December 13, 2019

Electrical Resistivity Profile AB1205LO
Figure 17

Figure 17 AB1205LO

Inferred geophysical boundaries

Inferred location perched water table

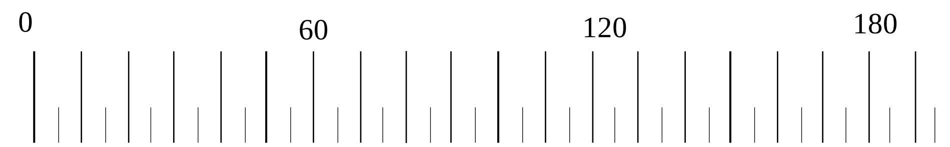
Features of Concern

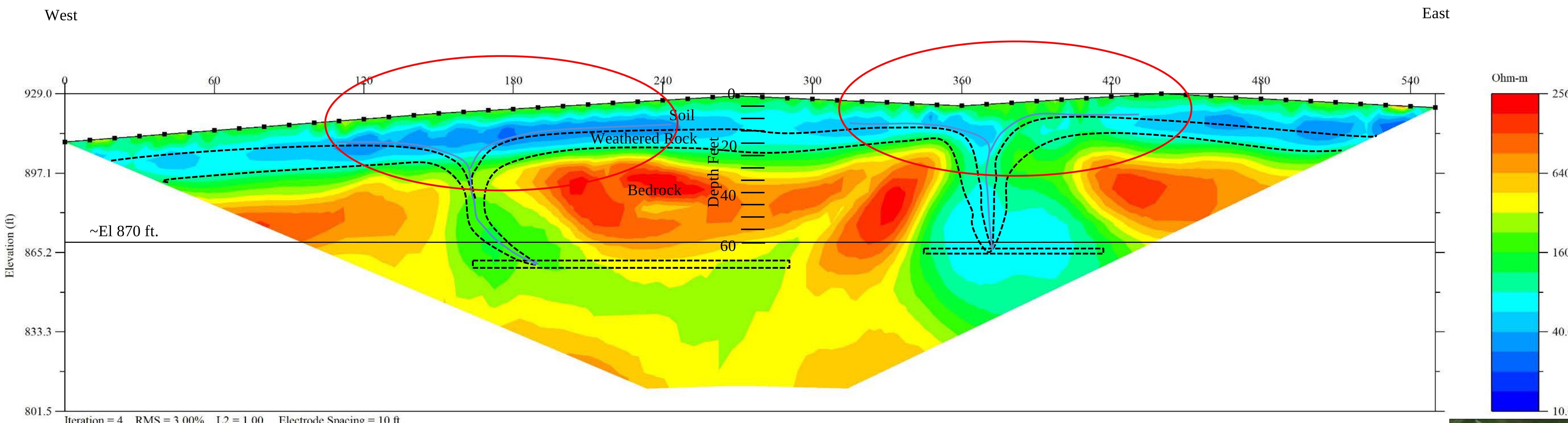
Areas of high concern

Areas of moderate concern

Areas of low concern

Electrical Resistivity

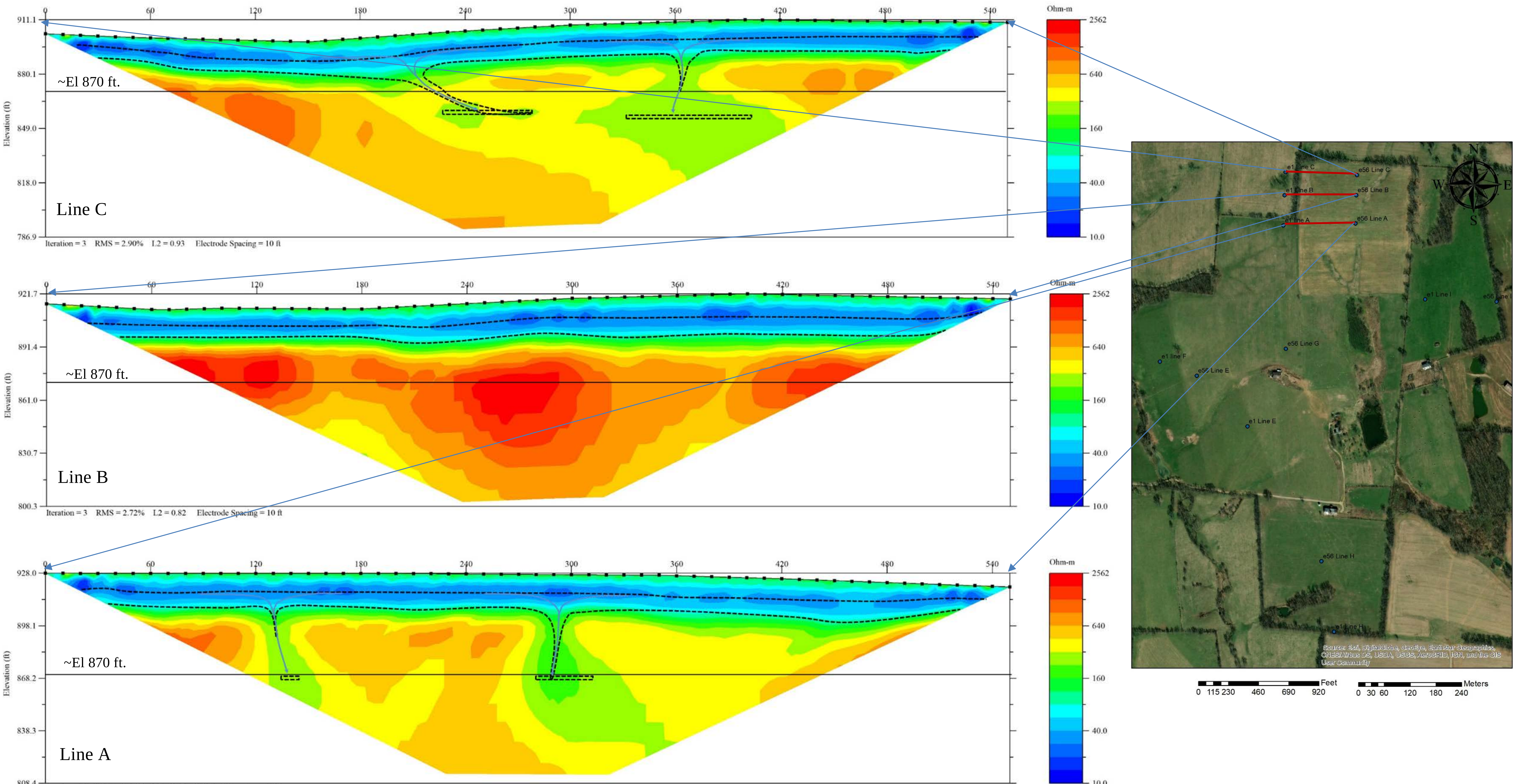




NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 17, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown	Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky 29

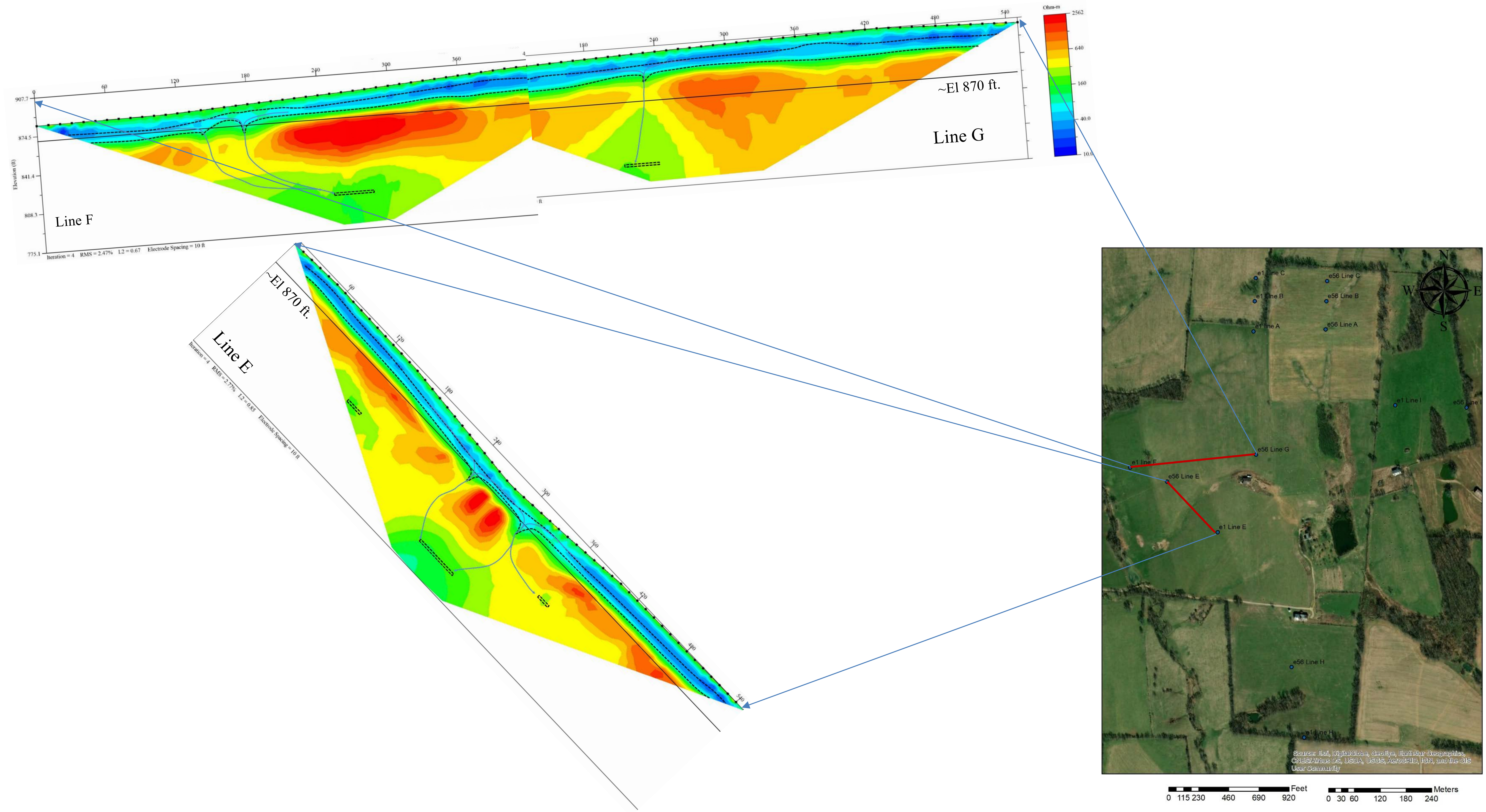
Figure 18 Electrical Resistivity Overlay Lines A, B and C

Electrical Resistivity Overlay Lines A, B, and C
Figure 18



NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 18, Electrical Resistivity Overlay Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

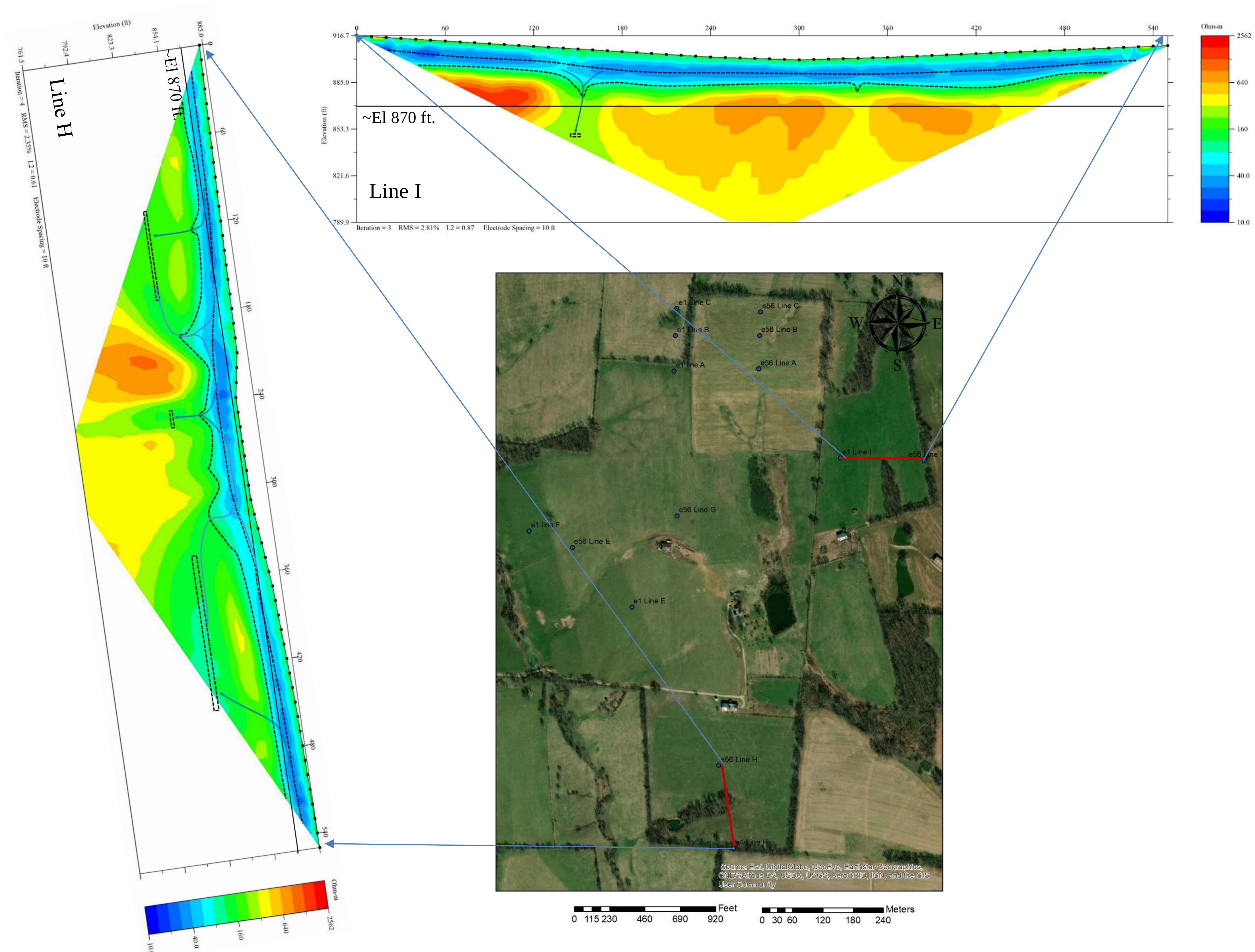
Electrical Resistivity Overlay Lines E, F and G
Figure 19



NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 19, Electrical Resistivity Overlay Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

Figure 20 Electrical Resistivity Overlay Lines H and I

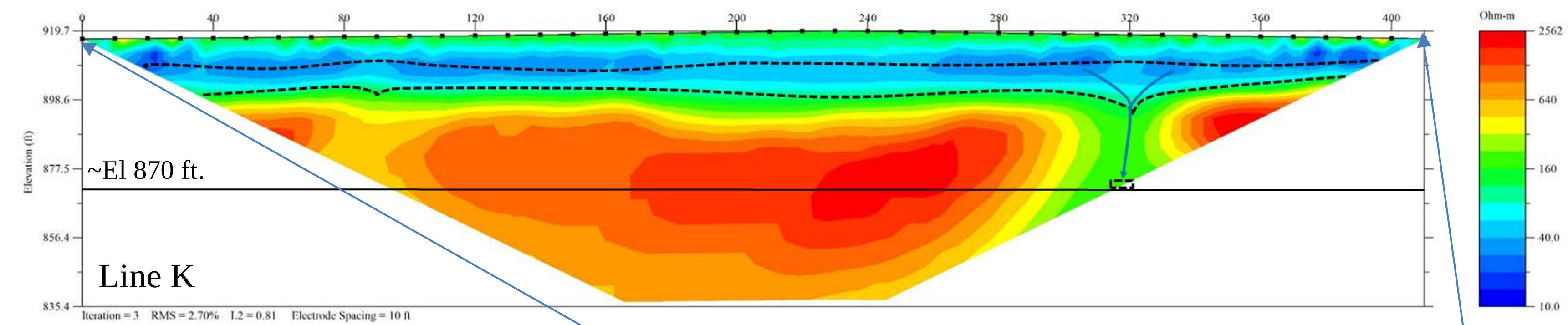
Electrical Resistivity Overlay Lines H and I
Figure 20

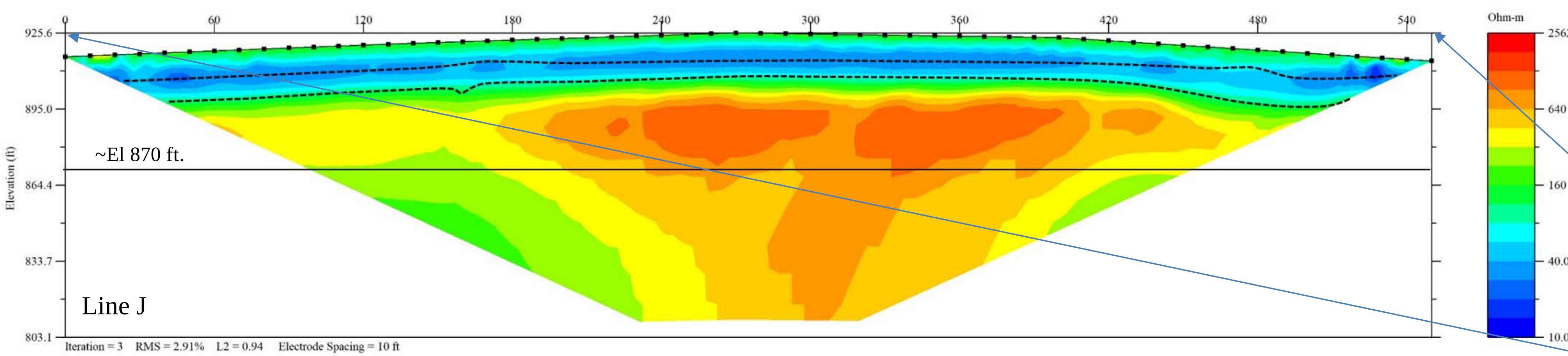


NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 20, Electrical Resistivity Overlay Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky 32

Figure 21 Electrical Resistivity Overlay Lines J and K

Electrical Resistivity Overlay Lines J and K
Figure 21



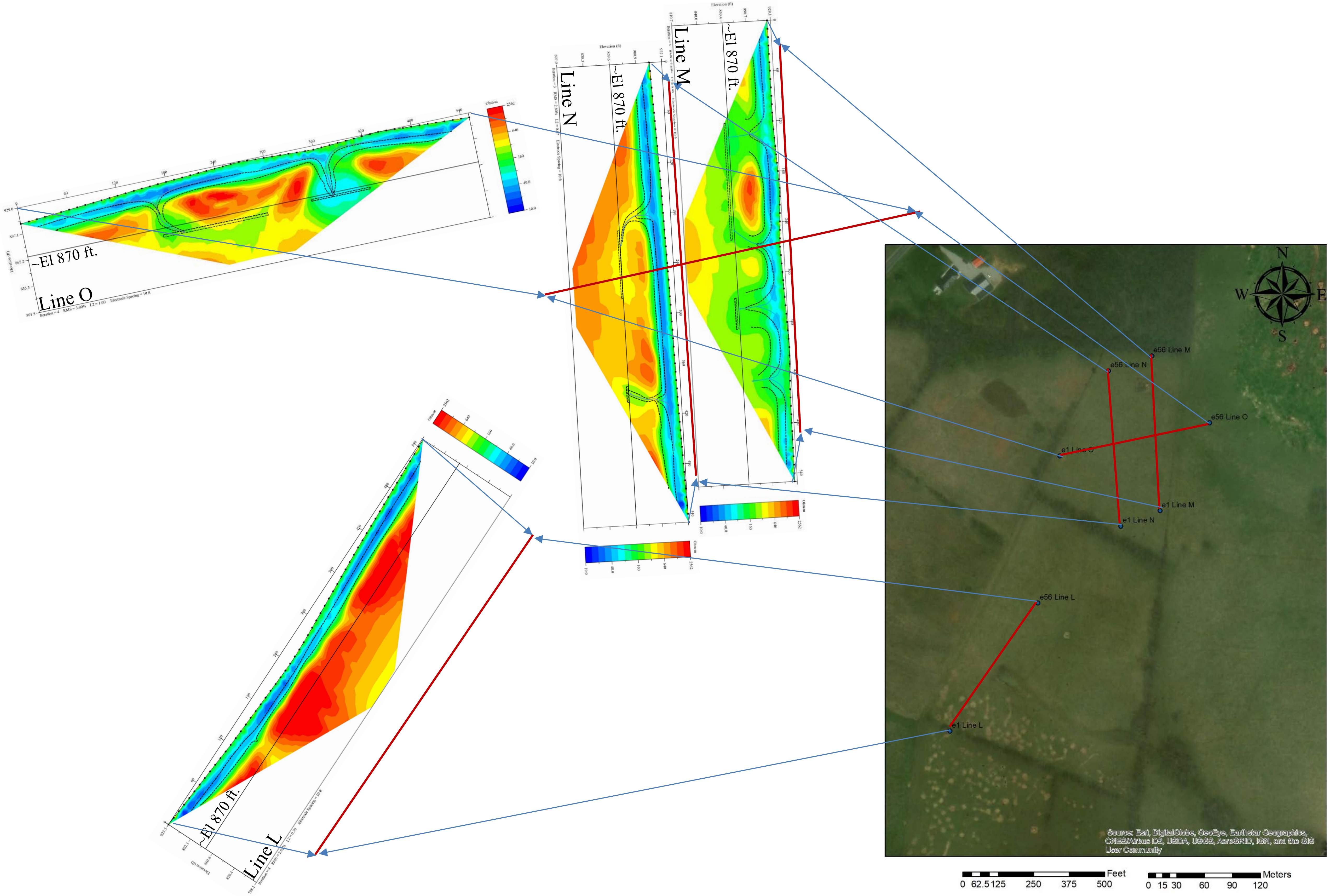


Feet: 0 80 160 320 480 640
Meters: 0 20 40 80 120 160

NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 21, Electrical Resistivity Overlay Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky 33

Figure 22 Electrical Resistivity Overlay Lines L, M, N and O

Electrical Resistivity Overlay Lines L, M, N and O
Figure 22



NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 22, Electrical Resistivity Overlay Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Cynthiana, Kentucky

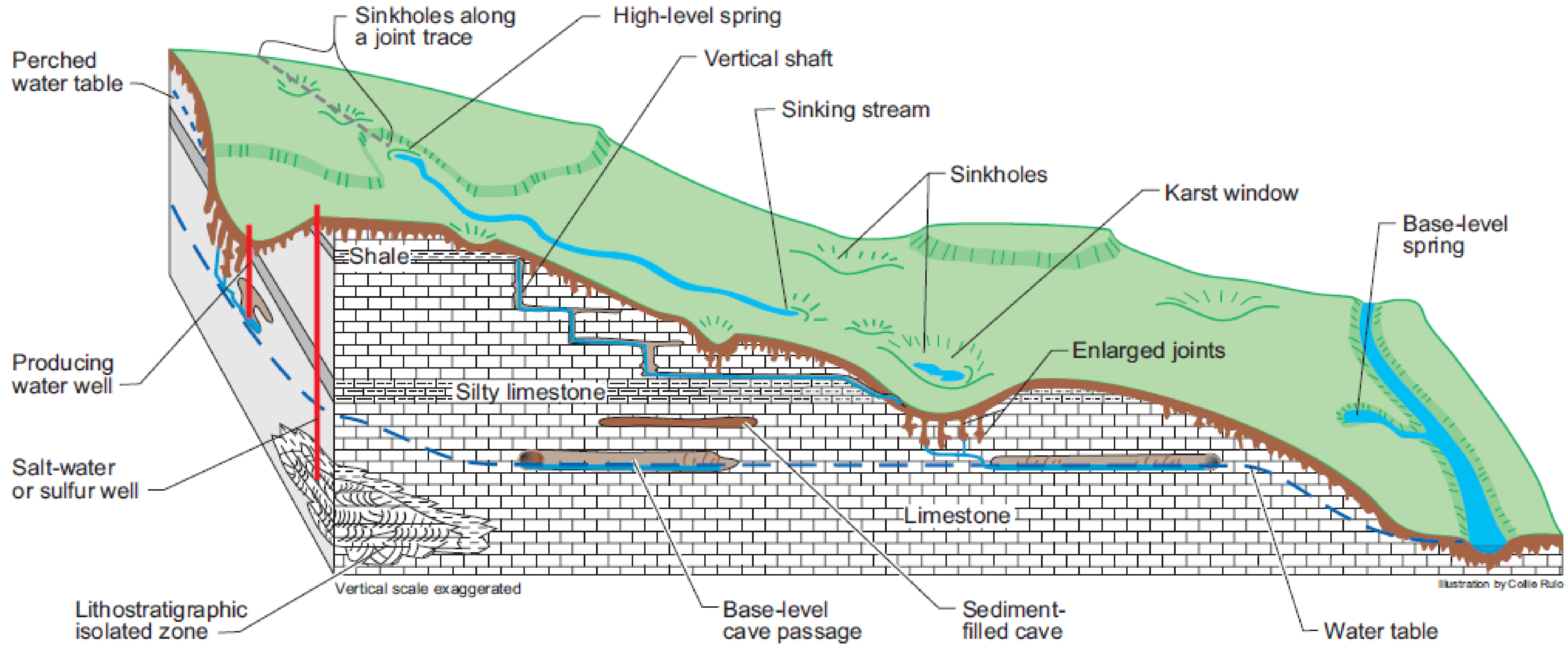
Figure 23 Generalized Block Diagram of the Inner Bluegrass Karst (Currens 2001)

Kentucky Geological Survey
James C. Cobb, State Geologist and Director
UNIVERSITY OF KENTUCKY, LEXINGTON

Generalized Block Diagram of the Inner Bluegrass Karst

James C. Currens

MAP AND CHART 15
Series XII, 2001



Inner Bluegrass karst:

Karst occurs where limestone or other soluble bedrock is near the earth's surface, and fractures in the rock become enlarged when the rock dissolves. Sinkholes and sinking streams are two surface features that indicate karst development. In karst areas most rainfall sinks underground, resulting in fewer streams flowing on the surface than in non-karst settings. Instead of flowing on the surface, the water flows underground through caves, sometimes reemerging at karst windows, then sinks again to eventually discharge at a base-level spring along a major stream or at the top of an impermeable strata. The development of karst features is influenced by the type of soluble rock and how it has been broken or folded by geologic forces. There are four major karst regions in Kentucky: the Inner Bluegrass, Western Pennyroyal, Eastern Pennyroyal, and Pine Mountain. This diagram depicts the Inner Bluegrass karst.

In the Inner Bluegrass, insoluble impurities within the limestone, such as shale, result in a perched or isolated water table that discharges ground water at high-level springs or may locally isolate pockets of saltwater or sulfur water. In some locations, vertical fractures in the rock, called joints, may increase the rate of water flowing toward base level. The joints and impurities also influence the location and development of vertical shafts and caves. As erosion on the surface continues over geologic time, the major stream draining a karst terrane cuts its channel deeper. In response, deeper conduits increase their flow to the major stream, and new springs develop at lower elevations along the stream's banks. Older, higher flow routes are left as dry cave passages, some of which become sediment filled. To produce significant amounts of water, wells drilled into karst aquifers must intersect a set of enlarged fractures, a dissolution conduit, or a cave passage with an underground stream.

NSG INNOVATIONS

Bringing the Subsurface into View

ELECTRICAL RESISTIVITY SURVEY
EKPC Cluster Phase 2
Russell Cave Road Area
Cynthiana, Kentucky

Prepared for:

Alex Plaza, PE
AZTEC Engineering
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August 14, 2020

Prepared by:

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Elizabeth C. May

Contents

1.0 Introduction

The areas under investigation are located on multiple properties near Russell Creek Road (Kentucky Highway 353) in the southern portion of Harrison County Kentucky. The purpose of this project (Phase 2 of a solar energy generating facility designated as the EKPC Cluster) is similar to that of Phase 1- to perform a reconnaissance geophysical survey to determine the degree of karstification in the areas of the proposed construction sites. In general, the proposed construction sites possess a grass or crop covered rolling topography, are currently undeveloped, and are used as open pasture, row crops, and an orchard. The intent of this geophysical investigation was to characterize subsurface features prior to construction of solar related infrastructure. As directed by the client, several locations of interest were identified and this geophysical survey was planned accordingly to specifically investigate suspected karst features. A total of five geophysical electrical resistivity (ER) survey lines were used to determine subsurface anomalies related to development of karst features and to identify potential impacts of ER anomalies in proximity to any proposed construction footprint. A vicinity map showing the location of the site is included as Figure 1 and a site map showing the location of the survey area in relation to the project site is illustrated in Figure 2. Figure 3 is a detailed aerial view or map illustrating the approximate locations of the ER lines laid out across the region.

2.0 Technical Background

The challenge for this project was to select the correct non-intrusive tools and techniques to evaluate the potential karst features at the site. In general, a variety of geophysical techniques can be applied to the mapping of subsurface features. Certain chosen field methods, however, are sensitive to a range of contrasting physical properties, and can possess attributes that make them more suitable than others, depending on site-specific conditions. Contrasting physical properties that typically are useful for mapping soil and bedrock include electrical conductivity or resistivity, acoustic velocity, density, and magnetic susceptibility. Of these, electrical resistivity is commonly determined to have the greatest range of contrast and is most applicable for detailed characterization of karst sites. Given the desired depth of investigation (approximately 100 feet), and the desire to image both the lateral and vertical extent of possible features, two-dimensional electrical resistivity (2-D ER) was selected as the method of choice to document the soil-sediment-rock profile beneath the site. A description of techniques used in this field study is presented in the sections following the geologic setting discussion.

2.1 Geological Setting

2.1.1 Bedrock

The exposed surface geology at the EKPC Phase 2 series of sites is entirely Ordovician-aged limestone units below any given geophysical survey line (Figure 4). The Clays Ferry Formation (Ocf), a Middle-Upper Ordovician-aged limestone intermixed with approximately 50% shale is exposed over a large portion of the area. The unit contain abundant fragments of crinoids, brachiopods, and bryozoans while rarely containing fragments of pelecypods, gastropods, and trilobites. The Clays Ferry Formation weathers to light-brown, rounded fragments of limestone in dark-yellowish-orange clayey soil. Underlying the Clays Ferry Formation is the Lexington Limestone. The Lexington in turn possesses four formal Members including the Tanglewood Limestone (Olt), Millersburg Member (Olm), Stamping Ground Member, and the Grier Limestone. These Members are characterized as light-gray to light-brown and range from fine-to-coarse grained. Differentiating the members is based on slight differences in sedimentary structures and fossil content. Overall, the Lexington Limestone is typified by approximately 70% limestone and commonly contains well-preserved, whole fossils including brachiopods, bryozoans, gastropods, etc.

2.1.2 Soils

Study of the USDA Soil Survey of the site indicates that a variety of soils cover the area with the most prominent units being the Faywood Silt Loam, the Lowell-Sandview Silt Loam, and to a lesser extent the Mercer Silt Loam, Nolin Silt Loam, Lowell-Faywood Silt Loam and Faywood Silty Clay Loam. These units are all described as silt, silty clay and clay in varying amounts with parent material noted as clayey residuum weathered from limestone or limestone and shale but in some cases, the parent material is fine, noncalcareous loess over clayey residuum weathered from phosphatic limestone units. Each of the soils on site are considered farmland of statewide importance and some even as prime farmland and are typified by slopes ranging from two to 12 percent and bedrock or weathered bedrock is found at a general depth of approximately 40 inches. Bedrock depth however is also dependent on slope angle and the stratigraphic unit underlying specific soil units (e.g., limestone versus shale).

The soils are generally moderately well drained to well drained and contain a significant silt component in contrast to some clay-dominant substrates associated with other karst regions of Kentucky away from the Inner Bluegrass region. The ER survey lines were generally conducted over soils that are indeed classified as loams either a silty or clayey-silt variety. It should be noted that all the field investigated areas have at least six inches of silt loam typifying the uppermost horizon. Some sites however, possess loam mapped to depths of 41 inches as “silt loam” such as in the case of the Lowell-Faywood Silt Loam. The Mercer Silt Loam has a silt-clay loam from nine inches to 40 inches and clay is mapped from 40 to 70 inches. Important soil units in the area in a vertical sense that can be correlated to geophysical “imaging” are generally as follows: silts in the uppermost one foot, then three feet of silty clay or as noted above, silt dominated loams but rarely are clays within the uppermost four to five feet of substrates. This is an important distinction for this relatively large site. This is because in well-developed “statewide importance” or “prime” farmland which characterizes most of the investigation area there is a significant silt content that in many locations is in contrast to underlying clay, clay on bedrock, or bedrock. Such contrasts between relatively well-drained silt (essentially quartz that is finer than sand size) substrates nearest the surface and those immediately underlying, aid in interpretation of geophysical surveys and better understanding of site conditions prior to development or construction. Due to the fact that the uppermost four to five feet of substrates have a significant silt component, and that there are various descriptors vis-à-vis the soil survey literature, including silt, silty clay and to a lesser extent clay, for discussion purposes and graphical display the term “soil” will be used in association with geophysical surveys presented later in this report.

2.2 Two-Dimensional Electrical Resistivity (2-D ER)

Electrical resistivity is one of the most widely varying of the physical properties of natural materials. Certain minerals such as native metals and graphite, conduct electricity via the passage of electrons; however, electronic conduction is generally very rare in the subsurface. Most minerals and rocks are insulators, and therefore electrical current preferentially travels through water-filled pores in soil and rock via the passage of the free ions in pore waters (*i.e.*, ionic conduction). It thus follows that the degree of saturation, interconnected porosity, and water chemistry (*i.e*., concentration of total dissolved solids or TDS) are the major controlling variables of the resistivity of a given soil or rock. In general, electrical resistivity directly varies with changes in these parameters.

Fine-grained sediments, particularly those that are clay-rich are excellent conductors of electricity, whereas relatively coarse-grained materials such as sand and gravel in contrast, are much more resistive stratigraphic units. Carbonate rocks (*i.e.*, limestone and dolomite or dolostone) are very electrically resistive when they are unfractured but they can possess significantly lower resistivity values if fractured and/or weathered and solutioned. In contrast, shale is very conductive. The conditions of conduction of electricity are very dependent on moisture and therefore equally dependent on precipitation and/or presence of groundwater. Periods of drought can deplete the amount of water in a system thereby changing the overall resistivity of the system. Void spaces in a clay matrix for example could actually appear to be more resistive than the clay. However, if after a protracted drought, sufficient rain falls to infill void spaces and the clay does not have sufficient time to absorb moisture, the resistive void can appear to be conductive. Thus, the interpretation of geophysical data requires the consideration of many lines of evidence.

2.3 Electrical Resistivity Methods

While the resistivity meter used in sounding and profiling surveys typically has four electrodes connected via four separate cables, a multi-electrode system has 25 or more electrodes connected to the resistivity meter via a multi-core cable (see inset Diagram 1). Commercial multi-electrode systems first appeared in the late 1980s and since then have become a standard tool in many geophysical organizations. An internal switching circuitry controlled by a programmable microcomputer or microprocessor within the resistivity meter automatically selects the appropriate four electrodes for each measurement. This enables almost any array configuration to be used. By making measurements with different spacing at variable locations along the cable, a 2-D profile of the subsurface is obtained. Together with the parallel development of fast and stable automatic data inversion techniques that could be implemented on commonly available microcomputers, 2-D electrical imaging surveys became widely used in the early 1990s. There are many commercial multi-electrode resistivity systems capable of connecting up to several hundred electrodes at once, with electrode spacing practically varying from one to 20 meters. A recent development over the past 10 years is multi-channeled systems that can greatly reduce the survey time. Only two electrodes can be used as the current electrodes at a single time, but the voltage measurements can be made between many different pairs of potential electrodes. Commercial systems with four to 10 channels are widely available (Loke et al., 2013).

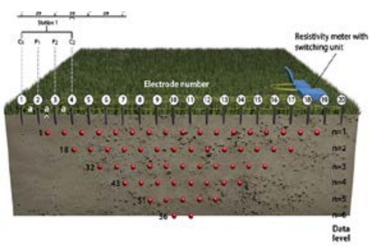


Diagram 1. Schematic diagram of a multi-electrode system, and a possible sequence of measurements to create a 2-D pseudosection.

3.0 Procedures

Standard Operating Procedures (SOPs) for ER begins with a site safety check. Each site is evaluated for possible safety concerns and the surveys are modified to take these into account. After the location of the survey line is determined, the overall distance of the survey is measured. The desired resolution is factored in and a spacing optimal to these parameters is determined. Tape measures are laid out and stainless-steel electrodes are placed into the ground at pre-determined positions. Depth of emplacement of the electrodes is determined by field conditions. Where possible, electrode stakes are driven approximately six inches below surface to minimize contact resistance. A few ounces of a salt-water solution are then poured at the base of each stake where needed to decrease contact resistance. The electrical resistivity cables are unrolled and an electrode bulb is placed at each stake. The bulbs are then attached to the stakes. The AGI SuperSting R8/IP and Swift switch box are in turn attached to the cables. A final check of the setup is made to ensure proper working order of the laid-out survey line. A contact resistance test is then completed and data recording is initiated.

3.1 ER Lines Conducted

A total of five ER lines were conducted in multiple areas at the proposed site. Figure 3 displays the orientation of each ER line. As is noted in Table 1, electrode spacing was 10 feet and the number of electrodes was 56 on all lines. All ohms-meter values from the five ER lines were normalized to better estimate depth to rock from resistivity values. The normalized values for the surveyed lines range from

10 to 1,610 ohms meters. A combined dipole-dipole and strong-gradient array was used (command file name ddsg56) on all ER lines. Two 12-volt batteries were used to power the system in boost mode, allowing for deeper penetration of energy. Data were processed using the Advanced Geoscience Inc. (AGI) 2D-EarthImager software. Data were processed to remove interfering data points based on criteria of achieving low root mean squared (RMS) values yet retaining data points.

Table 1 – Electrical Resistivity Lines Conducted

Field Name and Processed Name*	Report Figure	Electrode Spacing (feet)	Electrode 1 Position	Last Electrode Position (56)	Length (feet)
EK285LA	5	10	SE	NW	550
EK286LB	6	10	E	W	550
EK286LC	7	10	NW	SE	550
EK286LD	8	10	W	E	550
EK286LE	9	10	S	N	550

*Naming Nomenclature: Site Name, Month, Day and Line Letters

4.0 Results of Geophysical Survey

4.1 Lines EK285LA, and EK286LB

Study of these profiles (Figures 5 and 6) suggests that approximately the upper five to ten feet is unconsolidated moist-to-wet silty clay and clay-rich earth material overlying a layer of weathered rock. These uppermost silty to silty-clay to clay-rich soils (overlying blue colors) are continuous across the site and are relatively undisturbed. Weathered rock is observed at a depth of about 10 feet and varies from five to 15 feet thick. The weathered rock, typical of epikarst or solution-enlarged limestones is conductive (light blue to green colors) and is continuous across the site, with several areas of varying thickness observable on profiles LA (Figure 5) and LB (Figure 6) below stations 270 and 415 on LA and stations 70 and 520 on LB. These locations in the weathered rock layer are 20 to 40 feet thick and appears to incise down into the underlying resistive bedrock (light green color). The bedrock begins near a depth of 20 to 25 feet and continues to the depth of the profile, with exceptions in profiles LA and LB, where incision of weathered rock is cutting through to greater depths. These features at stations LA 270 and 415 and LB 70 and 520 may represent a series of closely spaced fractures or joints in the bedrock. Surface depressions/sinkholes were identified near both ends of Line B, however, heavy brush and crops negatively impacted the ability to identify other karst features. Additional means of exploration may be required to confirm the presence and location of significant bedrock-fracture sets if deemed necessary for construction.

4.2 Lines EK286LC, EK286LD, and EK286LE

The upper five to 10 feet of this series of profiles LC, LD, and LE (Figures 7 through 9, respectively) contains generally moist, unconsolidated silt, silty clay to clay (green overlying blue colors). Such soils are continuous across the site and are positioned atop a slightly less-conductive layer of weathered rock (blue, light blue to green). The weathered rock layer is continuous across the site, is 10 to 20 feet thick, and is positioned atop discontinuous layers of resistive bedrock (orange) at a depth of about 20 to 30 feet. The geologic map available from the Kentucky Geological Survey (KGS) has a depression marked near Line C, however it is most likely an old farm pond. The ER profile for Line C does not indicate any karst features in the area. Both Lines D and E, located north of Line C, are similar to Line C with no obvious signs of active karst features.

5.0 Summary of Findings

This proposed EKPC solar project area is located in a region near Kentucky Highway 352, southwest of Cynthiana, Kentucky. Figures 10 and 11, Electrical Resistivity Overlays, show the ER profiles grouped by locations. These location groupings are based on areal distribution (note that Lines A and B are east of Highway 352 and Lines C, D, and E are west of Highway 352) and to a lesser extent, geology, as the exposed or near-surface lithology is differentiable in both areas (e.g., various members of Lexington Limestone and the Clays Ferry Formation). These location groupings serve as a valuable visual tool, providing a complete view of all profiles in the context of the development of subsurface features across the series of surveyed sites.

Several features of concern have been marked on profiles EK285LA and EK286LB, indicating further investigation may be warranted if critical infrastructure is proposed at either given location. Breaks in the resistive bedrock are readily observable and are interpreted to be water flow pathways into the subsurface in to perched water tables present above less permeable geological units. It is noted that ER cross sections may show a broad extent of color variations at depth and the potential karst feature may appear to be rather large. Small amounts of conductive water and ions can have a pronounced effect on the final model. Investigation of the ER method, modeling process and resolution of data collection coupled with case studies indicate the actual conductive feature is much smaller than shown in many cases.

Figure 10, Electrical Resistivity Overlay for Lines A and B indicate development of karst features with fractures or solution-enlarged joints underlying a thick, continuous, unconsolidated and undisturbed silt and silty clay and clayey soils. The fractures allow water to migrate down to a perched water table, as is observable in the profile for Line B, at approximately 60 feet of depth. Whereas features profiled or mapped on this site are indicative of karst processes, the terrain is poorly developed as attributable to karst processes in this specific location and in contrast, is more indicative of a perched water table recharged from the surface through fractures in the limestone. Aquifers are most likely small partings or anastomosing surfaces in the partings that only have been moderately affected by rock dissolution or solution enlargement. Both Lines A and B appear to be the only areas with possible karst features. Again, such development of groundwater-flow systems between rocks of variable weatherability such as shale and limestone are quite typical of Kentucky's Inner Bluegrass karst terrain. Figure 11, Electrical Resistivity Overlay for Lines D and E (note that Line C was not included on the overlay) is provided for informational or comparative purposes only. Inspection of Lines C, D, and E does not suggest development of karst in the areas.

6.0 Limitations

This study included a limited set of geophysical readings across limited portions of the site. The results and interpretations of the geophysical survey performed are considered generally reliable and were conducted in a manner generally consistent with practitioners in the field of geophysical engineering. The methods used in this investigation are considered reliable; however, localized variations may exist in the subsurface conditions that have not been completely defined at this time. The resistivity results are not unique to geological features and more than one geologic feature or model may yield similar results. Therefore, properly conducted soil test borings and other exploratory techniques are necessary to more completely determine the subsurface conditions at the site.

The site features presented on the site base map are for informational purposes only and no representation is made as to the accuracy or completeness of this information. It is recommended that a practicing geosciences or geotechnical engineering professional be contacted prior to conducting verification drilling or excavating activities.

Figure 1 Vicinity Map

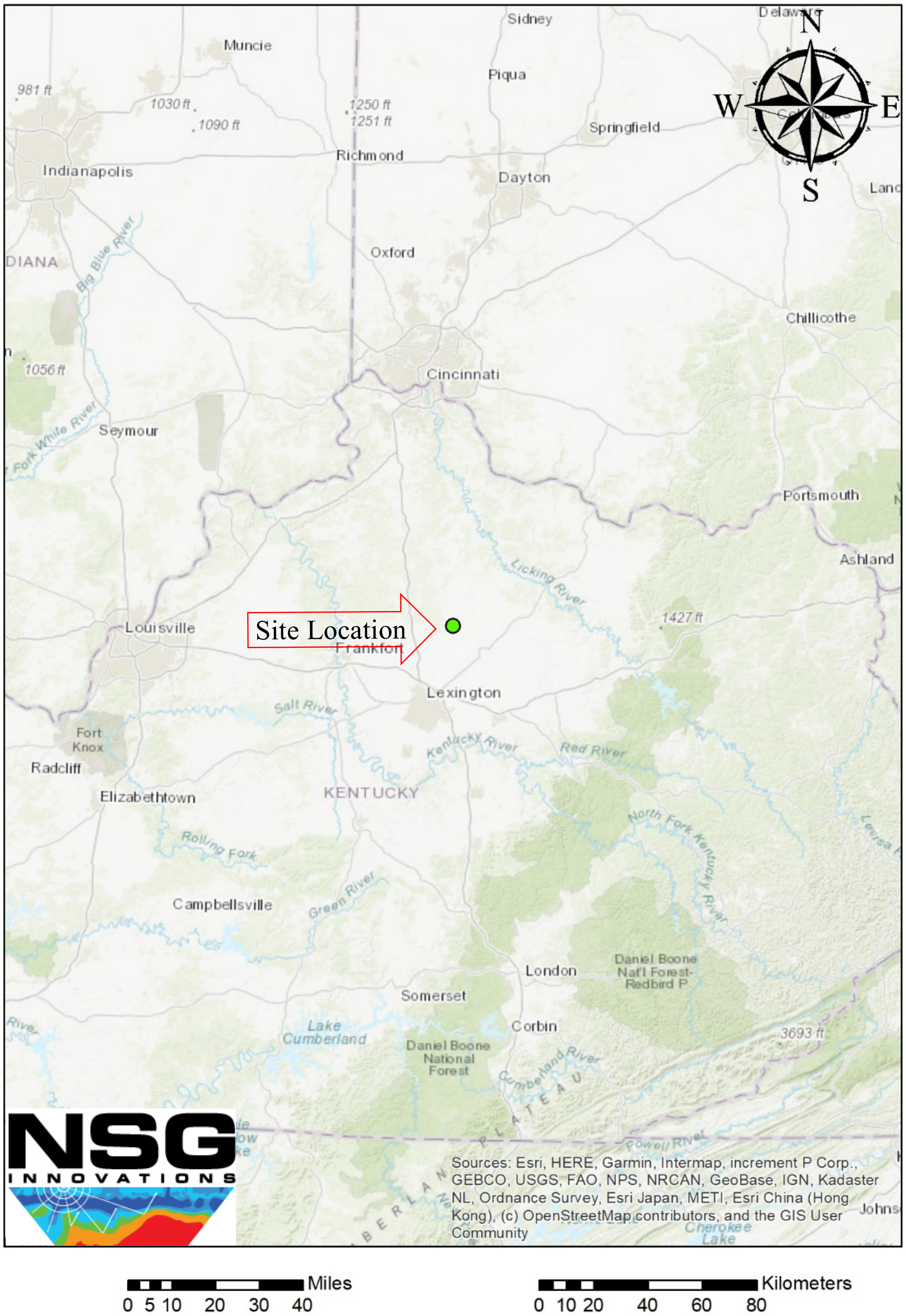


Figure 2 Site Map

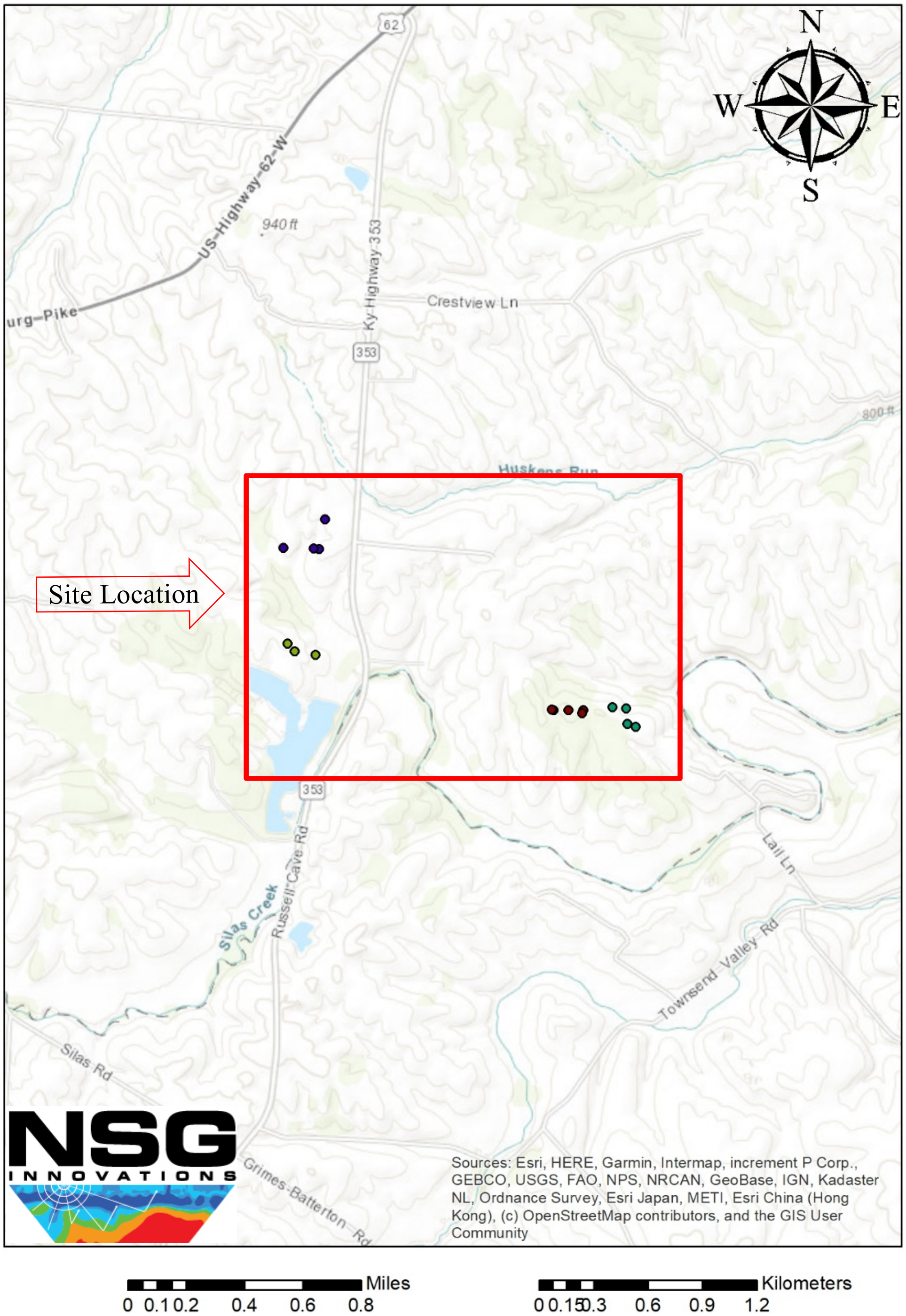
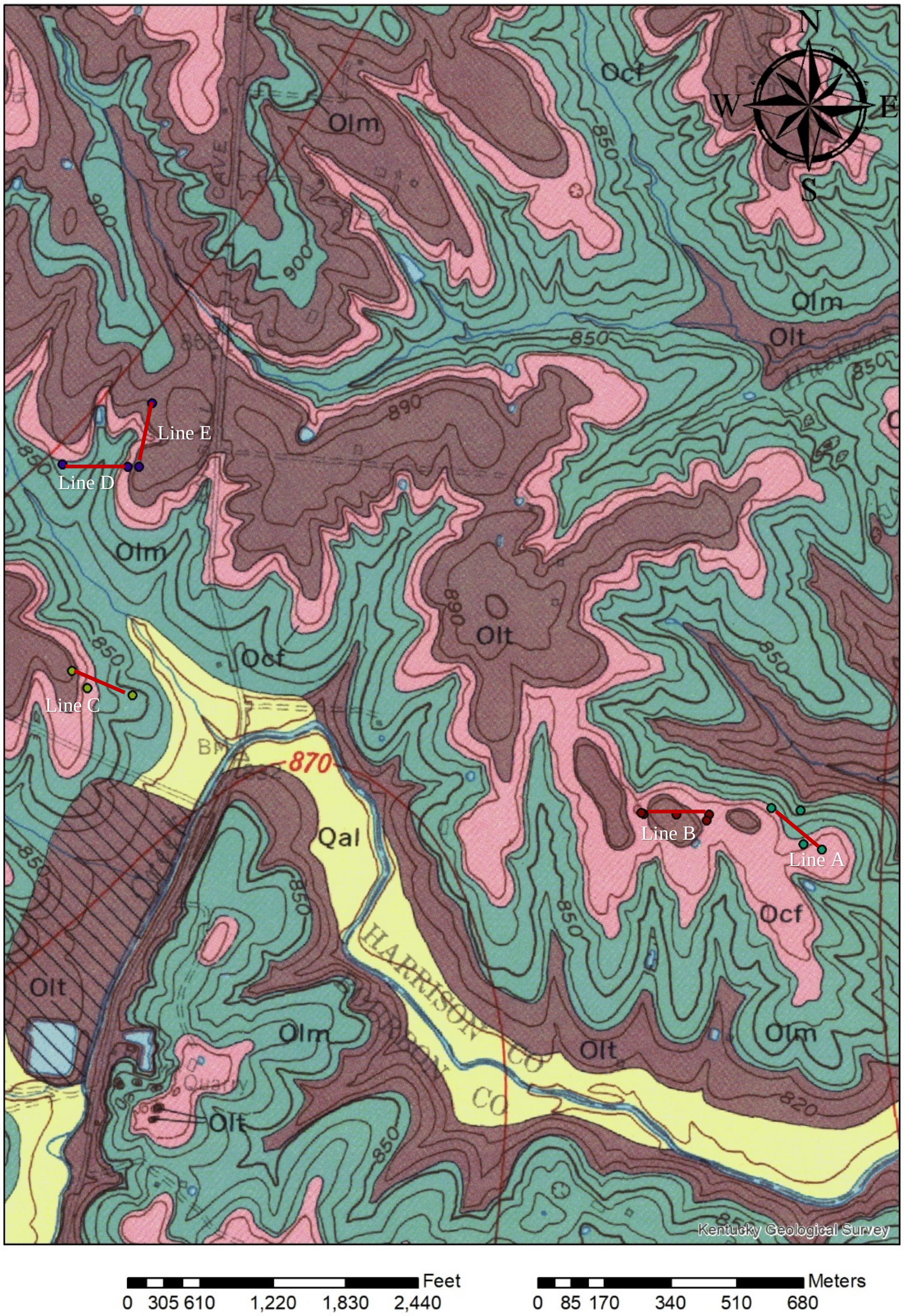


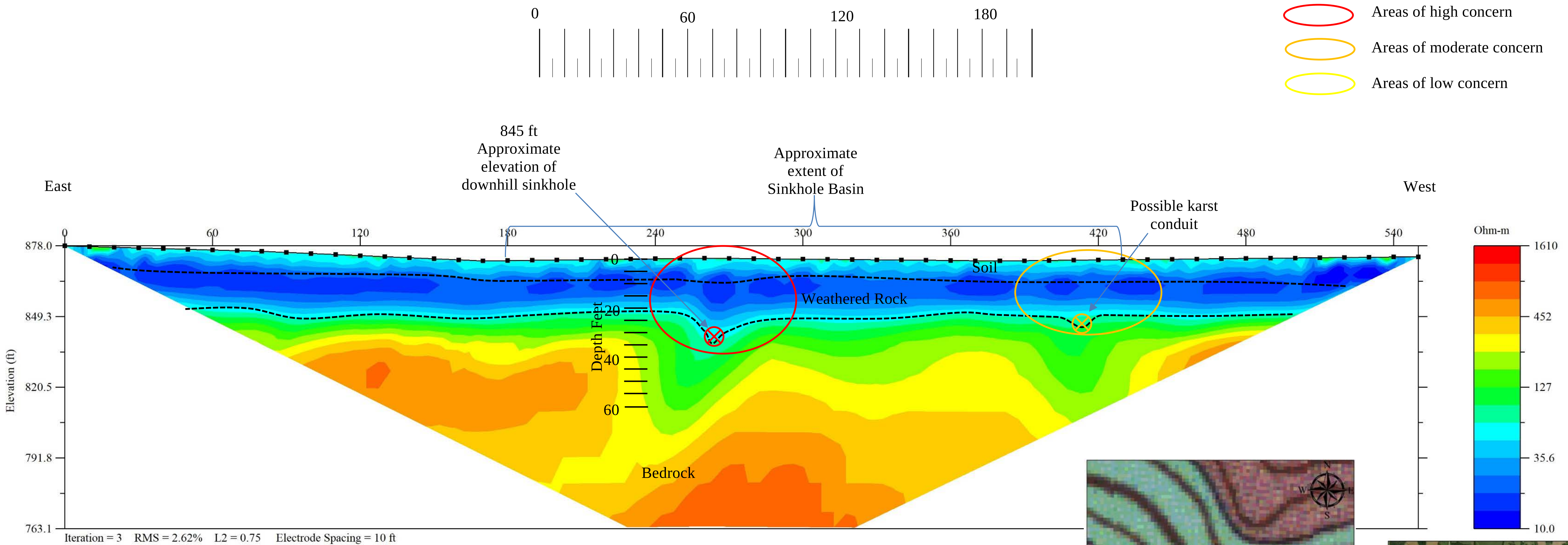
Figure 3 Line Location Map

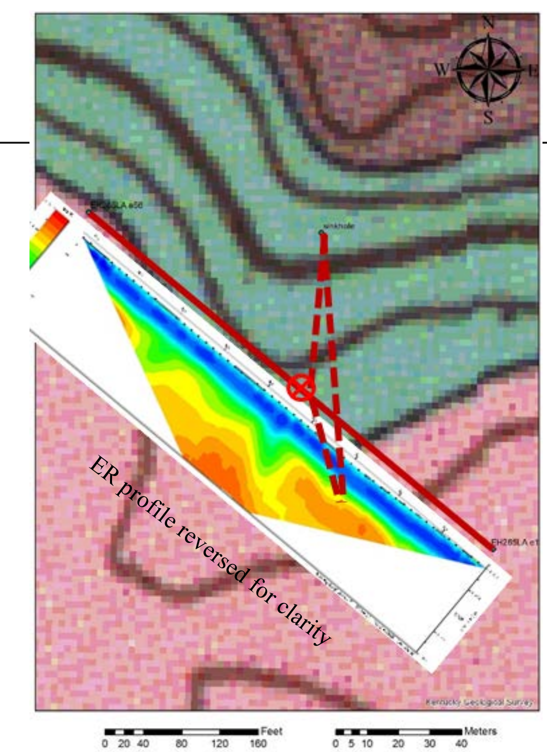
Figure 4 Geological Setting



Electrical Resistivity Profile EK285LA
Figure 5

Figure 5 EK285LA





NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 5, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 2 Cynthiana, Kentucky

Electrical Resistivity Profile EK286LB
Figure 6

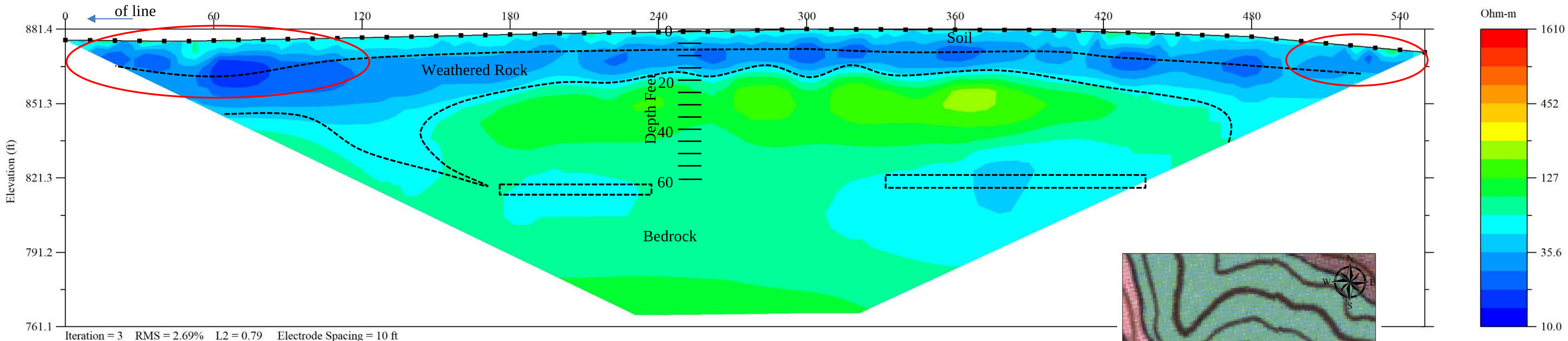
Figure 6 EK286LB

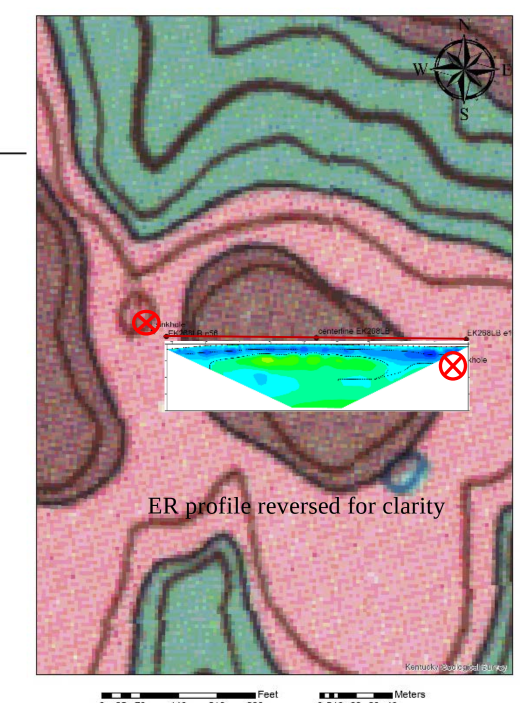
Electrical Resistivity
0 60 120 180

Inferred geophysical boundaries
Inferred location perched water table
Features of Concern
Areas of high concern
Areas of moderate concern
Areas of low concern

East
Located sinkhole basin ~20 feet to the East from end of line

Located sinkhole basin ~55 feet to the Southwest from end of line
West

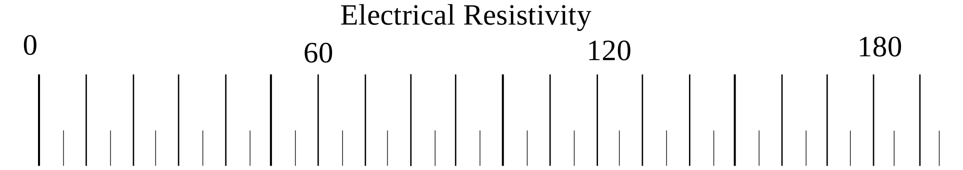




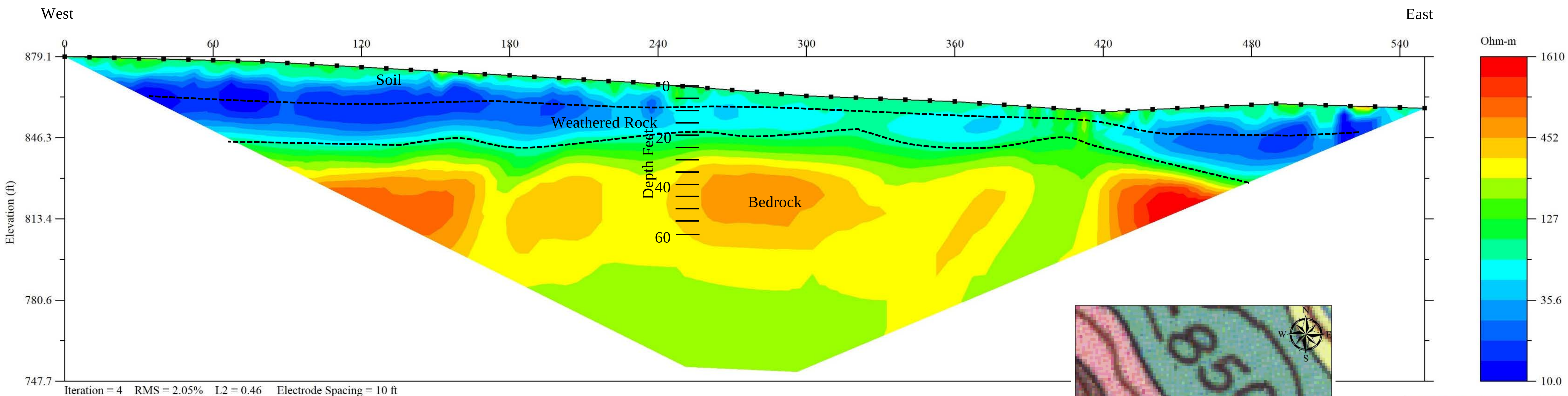
NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 6, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 2 Cynthiana, Kentucky

Electrical Resistivity Profile EK286LC
Figure 7

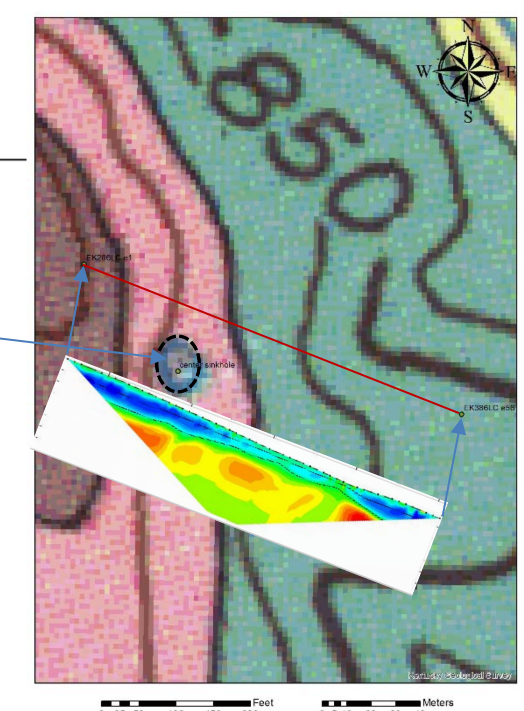
Figure 7 EK286LC



Inferred geophysical boundaries
Inferred location perched water table
Features of Concern
Areas of high concern
Areas of moderate concern
Areas of low concern



Depression is mapped as pond. ER does not indicate any karst features



NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 7, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 2 Cynthiana, Kentucky

Electrical Resistivity Profile EK286LD
Figure 8

Figure 8 EK286LD

Electrical Resistivity

0 60 120 180

Inferred geophysical boundaries

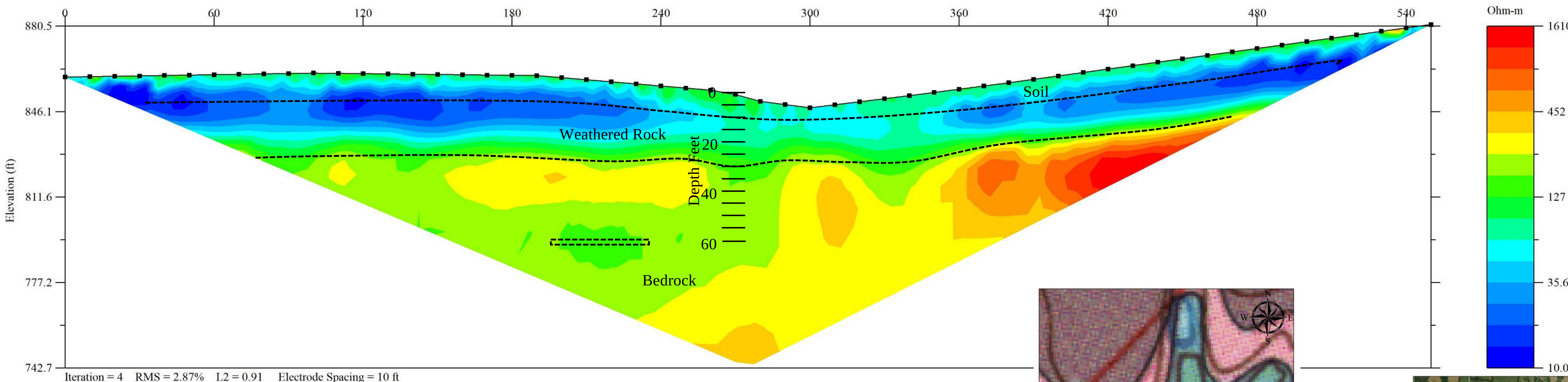
Inferred location perched water table

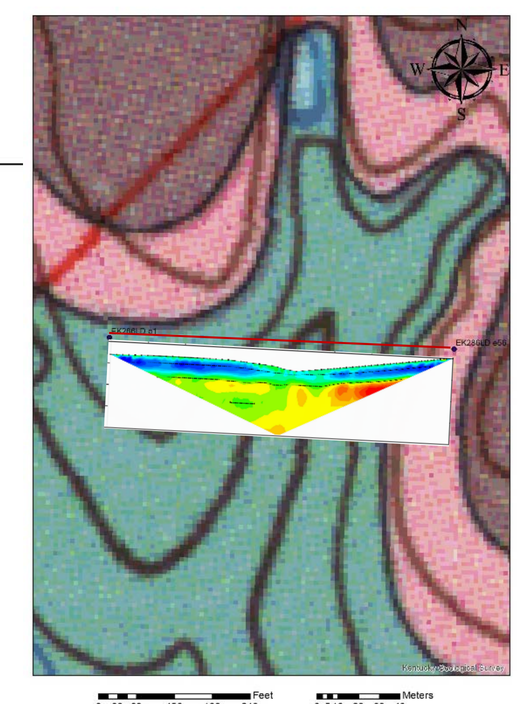
Features of Concern

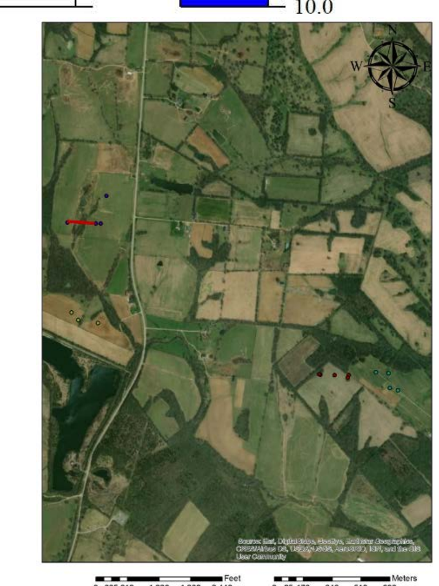
Areas of high concern

Areas of moderate concern

Areas of low concern





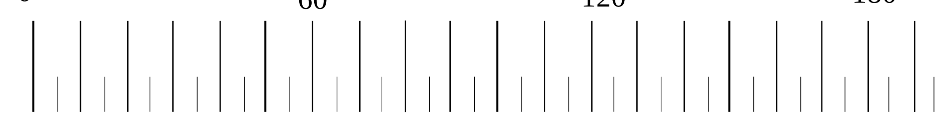


NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 8, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 2 Cynthiana, Kentucky

Electrical Resistivity Profile EK286LE
Figure 9

Figure 9 EK285LE

Electrical Resistivity



Inferred geophysical boundaries

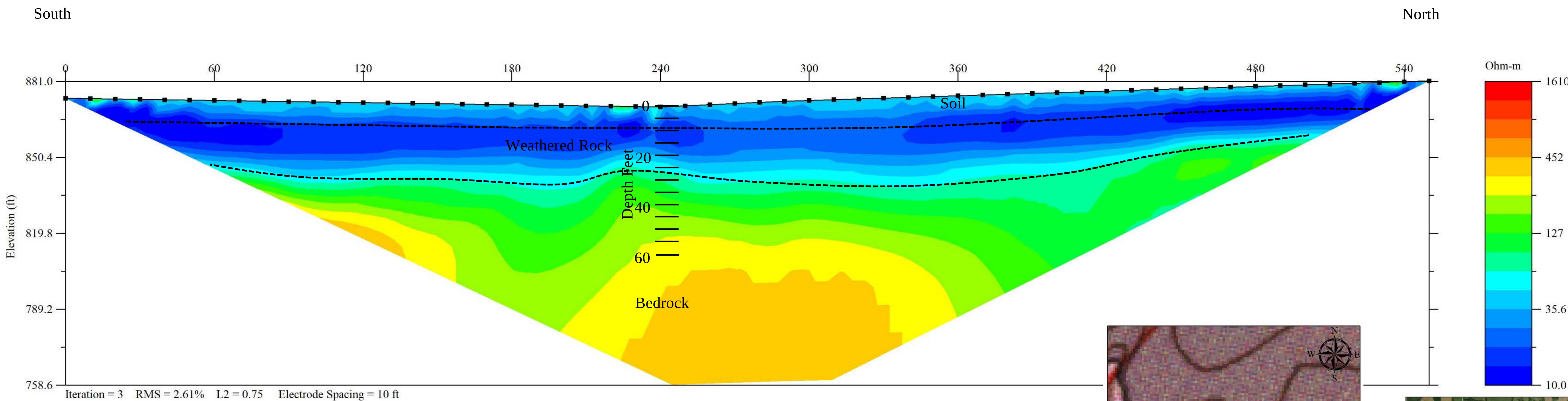
Inferred location perched water table

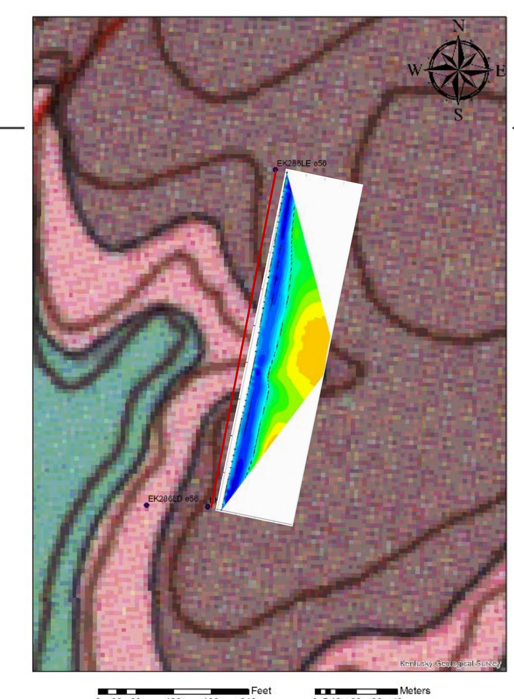
Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern





NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 9, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 2 Cynthiana, Kentucky

Electrical Resistivity Overlay Lines A and B
Figure 10

Electrical Resistivity

Figure 10 ER Overlay A & B

Inferred geophysical boundaries

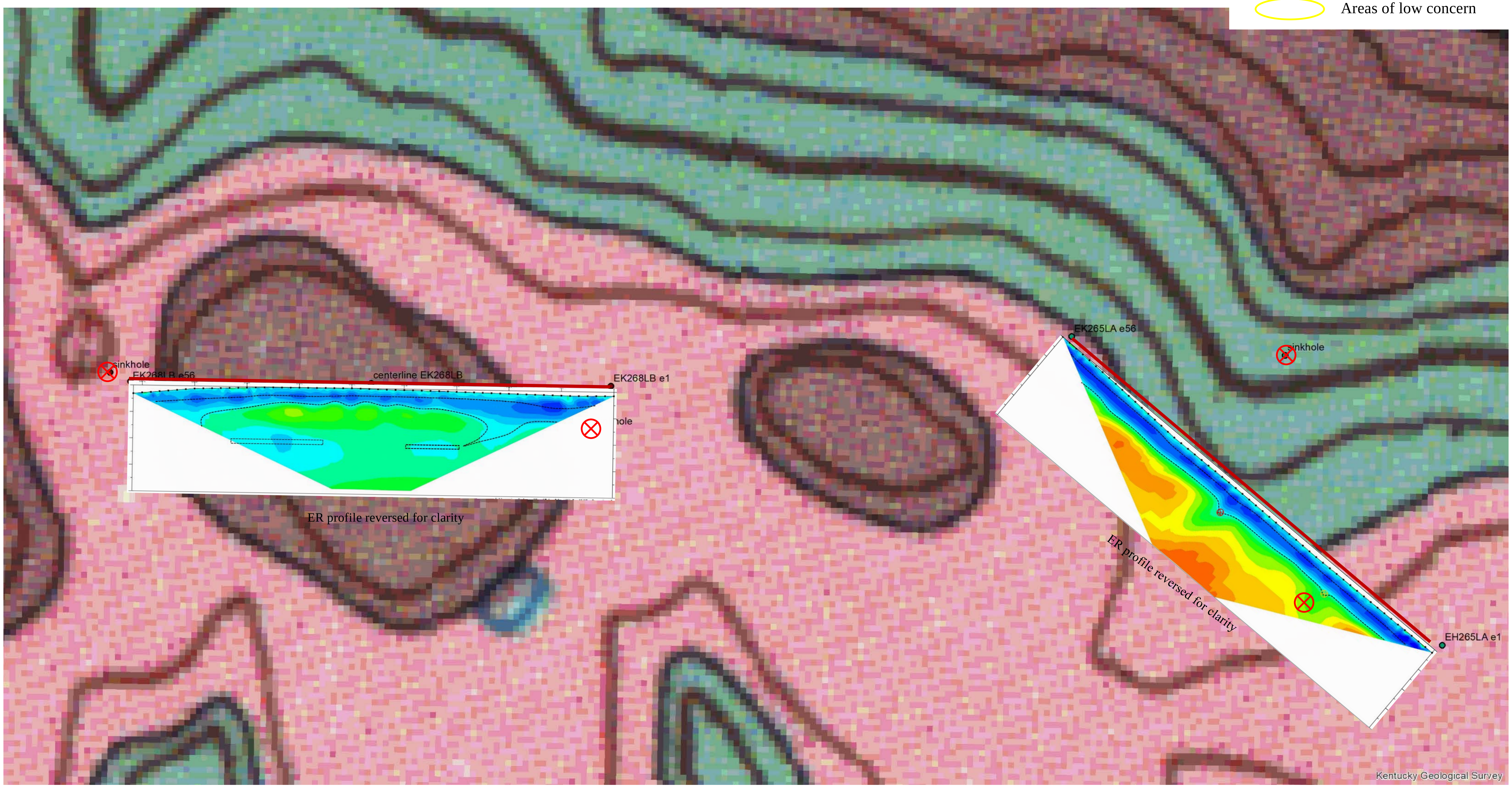
Inferred location perched water table

Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern

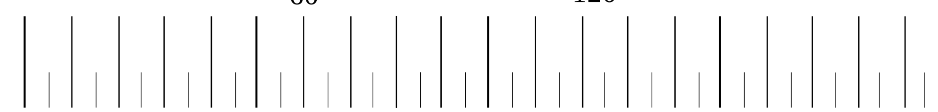


NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 10, Electrical Resistivity Overlay Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 2 Cynthiana, Kentucky

Electrical Resistivity Overlay Lines D and E
Figure 11

Figure 11 ER Overlay D & E

Electrical Resistivity



Inferred geophysical boundaries

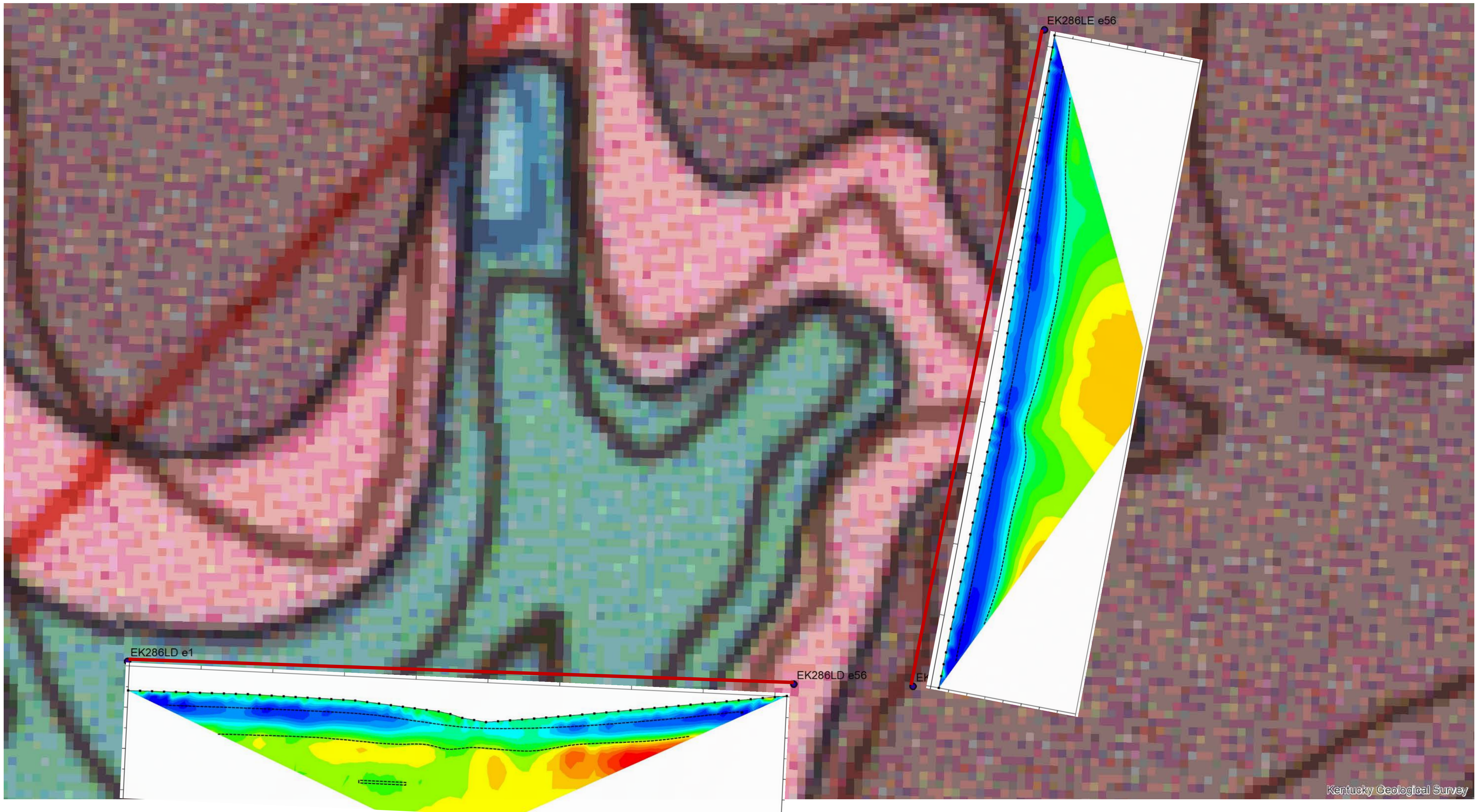
Inferred location perched water table

Features of Concern

Areas of high concern

Areas of moderate concern

Areas of low concern



NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 11, Electrical Resistivity Overlay Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 2 Cynthiana, Kentucky

NSG INNOVATIONS

Bringing the Subsurface into View

ELECTRICAL RESISTIVITY SURVEY
EKPC Cluster Phase 3
East of Allen Pike
Harrison County, Kentucky

Prepared for:

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February 25, 2022

Prepared by:

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Elizabeth C. May

Contents

1.0 Introduction

The areas under investigation are located on multiple properties east of Allen Pike in the southern portion of Harrison County Kentucky. The purpose of this project (Phase 3 of a solar energy generating facility designated as the EKPC Cluster) is similar to that of Phases 1 and 2 – to perform a reconnaissance geophysical survey to determine the degree of karstification in the areas of the proposed construction sites for solar related infrastructure. In general, the proposed construction sites possess a grass or crop covered rolling topography, are currently undeveloped, and are used as open pasture or recent row crops. As directed by the client, several locations of interest were identified and this geophysical survey was planned accordingly to specifically investigate suspected karst features. A total of eight geophysical electrical resistivity (ER) survey lines were used to determine subsurface anomalies related to development of karst features and to identify potential impacts of ER anomalies in proximity to any proposed construction footprint. A vicinity map showing the location of the site is included as Figure 1 and a site map showing the location of the survey area in relation to the project site is illustrated in Figure 2. Figure 3 is a detailed aerial view or map illustrating the approximate locations of the ER lines laid out across the region.

2.0 Technical Background

The challenge for this project was to select the correct non-intrusive tools and techniques to evaluate the potential karst features at the site. In general, a variety of geophysical techniques can be applied to the mapping of subsurface features. Certain chosen field methods, however, are sensitive to a range of contrasting physical properties, and can possess attributes that make them more suitable than others, depending on site-specific conditions. Contrasting physical properties that typically are useful for mapping soil and bedrock include electrical conductivity or resistivity, acoustic velocity, density, and magnetic susceptibility. Of these, electrical resistivity is commonly determined to have the greatest range of contrast and is most applicable for detailed characterization of karst sites. Given the desired depth of investigation (approximately 100 feet), and the desire to image both the lateral and vertical extent of possible features, two-dimensional electrical resistivity (2-D ER) was selected as the method of choice to document the soil-sediment-rock profile beneath the site. A description of techniques used in this field study is presented in the sections following the geologic setting discussion.

2.1 Geological Setting

2.1.1 Bedrock

The exposed surface geology at the EKPC Phase 3 series of sites is entirely Ordovician-aged limestone units below any given geophysical survey line (Figure 4). The Clays Ferry Formation (Ocf), a Middle- and Upper Ordovician-aged limestone intermixed with approximately 50% shale is exposed over a large portion of the area. The unit contains abundant fragments of crinoids, brachiopods, and bryozoans while rarely containing fragments of pelecypods, gastropods, and trilobites. The Clays Ferry Formation weathers to light-brown, and possesses rounded fragments of limestone in dark-yellowish-orange clayey soil. Underlying the Clays Ferry Formation is the Lexington Limestone. The Lexington in turn possesses four formal members including the Tanglewood Limestone (Olt), Millersburg Member (Olm), Stamping Ground Member, and the Grier Limestone. These members are characterized as light-gray to light-brown and range from fine-to-coarse grained. Differentiating the members is based on slight differences in sedimentary structures and fossil content. Overall, the Lexington Limestone is typified by approximately 70% limestone and commonly contains well-preserved, whole fossils including brachiopods, bryozoans, gastropods, etc.

2.1.2 Soils

Study of the USDA Soil Survey of the surveyed areas indicates that a variety of soils cover the areas with the most prominent units being the Faywood Silt Loam, the Mercer Silt Loam, the Lowell-Sandview Silt Loam, and the Lindside Silt Loam, and to a lesser extent the Newark Silt Loam, the Lowell-Faywood Silt Loam and the Ashton Silt Loam. These units are all described as silt, silt loam, silty clay and clay in varying amounts with parent material noted as clayey residuum weathered from limestone or limestone and shale but in some cases, the parent material is fine, noncalcareous loess over clayey residuum weathered from phosphatic limestone units. Each of the soils on site are considered farmland of statewide importance and some even as prime farmland and are typified by slopes ranging from zero to 12 percent and bedrock or weathered bedrock is found at a general depth of approximately 40 inches. Bedrock depth however is also dependent on slope angle and the stratigraphic unit underlying specific soil units (e.g., limestone versus shale).

The soils are generally moderately well drained to well drained and contain a significant silt component in contrast to some clay-dominant substrates associated with other karst regions of Kentucky away from the Inner Bluegrass region. The ER survey lines were generally conducted over soils that are classified as loams being silty or clayey-silt varieties. It should be noted that all the field investigated areas have at least six inches of silt loam typifying the uppermost horizon. Some sites however, possess loam mapped to depths of 27 inches as “silt loam” such as in the case of the Lindside Silt Loam. The Mercer Silt Loam has a silt-clay loam from nine inches to 40 inches and clay is mapped from 40 to 70 inches. Important soil units in the area in a vertical sense that can be correlated to geophysical “imaging” are generally as follows: silts in the uppermost one foot, then three feet of silty clay or as noted above, silt dominated loams but rarely are clays within the uppermost four to five feet of substrates. This is an important distinction for this relatively large site. This is because in well-developed “statewide importance” or “prime” farmland which characterizes most of the investigation area there is a significant silt content that in many locations is in contrast to underlying clay, clay on bedrock, or bedrock. Such contrasts between relatively well-drained silt (essentially quartz that is finer than sand size) substrates nearest the surface and those immediately underlying, aid in interpretation of geophysical surveys and better understanding of site conditions prior to development or construction. Due to the fact that the uppermost four to five feet of substrates have a significant silt component, and that there are various descriptors vis-à-vis the soil survey literature, including silt, silty clay and to a lesser extent clay, for discussion purposes and graphical display the term “soil” will be used in association with geophysical surveys presented later in this report.

2.2 Two-Dimensional Electrical Resistivity (2-D ER)

Electrical resistivity is one of the most widely varying of the physical properties of natural materials. Certain minerals such as native metals and graphite, conduct electricity via the passage of electrons; however, electronic conduction is generally very rare in the subsurface. Most minerals and rocks are insulators, and therefore electrical current preferentially travels through water-filled pores in soil and rock via the passage of the free ions in pore waters (*i.e.*, ionic conduction). It thus follows that the degree of saturation, interconnected porosity, and water chemistry (*i.e*., concentration of total dissolved solids or TDS) are the major controlling variables of the resistivity of a given soil or rock. In general, electrical resistivity directly varies with changes in these parameters.

Fine-grained sediments, particularly those that are clay-rich are excellent conductors of electricity, whereas relatively coarse-grained materials such as sand and gravel in contrast, are much more resistive stratigraphic units. Carbonate rocks (*i.e.*, limestone and dolomite or dolostone) are very electrically resistive when they are unfractured but they can possess significantly lower resistivity values if fractured and/or weathered and solutioned. In contrast, shale is very conductive. The conditions of conduction of electricity are very dependent on moisture and therefore equally dependent on precipitation and/or presence of groundwater. Periods of drought can deplete the amount of water in a system thereby changing the overall resistivity of the system. Void spaces in a clay matrix for example could actually appear to be more resistive than the clay. However, if after a protracted drought, sufficient rain falls to infill void spaces and the clay does not have sufficient time to absorb moisture, the resistive void can appear to be conductive. Thus, the interpretation of geophysical data requires the consideration of many lines of evidence.

2.3 Electrical Resistivity Methods

While the resistivity meter used in sounding and profiling surveys typically has four electrodes connected via four separate cables, a multi-electrode system has 25 or more electrodes connected to the resistivity meter via a multi-core cable (see inset Diagram 1). Commercial multi-electrode systems first appeared in the late 1980s and since then have become a standard tool in many geophysical organizations. An internal switching circuitry controlled by a programmable microcomputer or microprocessor within the resistivity meter automatically selects the appropriate four electrodes for each measurement. This enables almost any array configuration to be used. By making measurements with different spacing at variable locations along the cable, a 2-D profile of the subsurface is obtained. Together with the parallel development of fast and stable automatic data inversion techniques that could be implemented on commonly available microcomputers, 2-D electrical imaging surveys became widely used in the early 1990s. There are many commercial multi-electrode resistivity systems capable of connecting up to several hundred electrodes at once, with electrode spacing practically varying from one to 20 meters. A recent development over the past 10 years is multi-channeled systems that can greatly reduce the survey time. Only two electrodes can be used as the current electrodes at a single time, but the voltage measurements can be made between many different pairs of potential electrodes. Commercial systems with four to 10 channels are widely available (Loke et al., 2013).

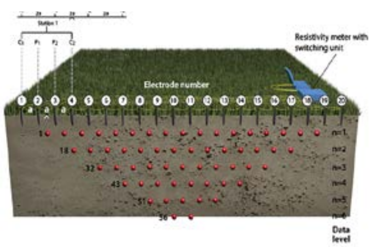


Diagram 1. Schematic diagram of a multi-electrode system, and a possible sequence of measurements to create a 2-D pseudosection.

3.0 Procedures

Standard Operating Procedures (SOPs) for ER begins with a site safety check. Each site is evaluated for possible safety concerns and the surveys are modified to take these into account. After the location of the survey line is determined, the overall distance of the survey is measured. The desired resolution is factored in and a spacing optimal to these parameters is determined. Tape measures are laid out and stainless-steel electrodes are placed into the ground at pre-determined positions. Depth of emplacement of the electrodes is determined by field conditions. Where possible, electrode stakes are driven approximately six inches below surface to minimize contact resistance. A few ounces of a salt-water solution are then poured at the base of each stake where needed to decrease contact resistance. The electrical resistivity cables are unrolled and an electrode bulb is placed at each stake. The bulbs are then attached to the stakes. The AGI SuperSting R8/IP and Swift switch box are in turn attached to the cables. A final check of the setup is made to ensure proper working order of the laid-out survey line. A contact resistance test is then completed and data recording is initiated.

3.1 ER Lines Conducted

A total of eight ER lines were conducted in multiple areas at the proposed site. Figure 3 displays the orientation of each ER line. As is noted in Table 1, electrode spacing was 10 feet and the number of electrodes was 56 on all lines. All ohms-meter values from the eight ER lines were normalized to better estimate depth to rock from resistivity values. The normalized values for ER lines A through E range from 10.0 to 867 ohms meters (with exception of Line E with a maximum value of 879 ohms meters), whereas the normalized values for Lines F, G, and H range from 10.0 to 1501 ohms meters. The normalized values for the ER lines were separated based on their areal distribution to better compare ER lines conducted in the same vicinity. A combined dipole-dipole and strong-gradient array was used (command file name DDSG) on all ER lines. Two 12-volt batteries were used to power the system in boost mode, allowing for deeper penetration of energy. Data were processed using the Advanced Geoscience Inc. (AGI) 2D-EarthImager software. Data were processed to remove interfering data points based on criteria of achieving low root mean squared (RMS) values yet retaining data points.

Table 1 – Electrical Resistivity Lines Conducted

Field Name and Processed Name*	Report Figure	Electrode Spacing (feet)	Electrode 1 Position	Last Electrode Position (56)	Length (feet)
AP3215LA	5	10	W	E	550
AP3215LB	6	10	S	N	550
AP3215LC	7	10	W	E	550
AP3215LD	8	10	S	N	550
AP3215LE	9	10	S	N	550
AP3216LF	10	10	W	E	550
AP3216LG	11	10	W	E	550
AP3216LH	12	10	W	E	550

*Naming Nomenclature: Project Name, Month, Day and Line Letters

4.0 Results of Geophysical Survey

4.1 Lines AP3215LA through AP3216LH

Study of these profiles (Figures 5 through 12) suggests that approximately the upper five to 12 feet is unconsolidated moist-to-wet silty clay and clay-rich earth material (green colors primarily) overlying a layer of weathered rock (blue with green colors). These uppermost silty to silty-clay to clay-rich soils are continuous across the surveyed areas and are relatively undisturbed. Weathered rock is observed at a depth of generally 10 to 15 feet and varies from five to 18 feet thick. A resistive bedrock layer (yellow, orange and red colors) is observable below the weathered rock at a general depth of 20 feet or greater and extends to the bottom of the profiles. In two of the profiles, Line A (Figure 5) and Line D (Figure 8) there are anomalous locations demarcating possible infiltration routes through the uppermost weathered rock and bedrock layers. This is specifically notable in Line A centered below station 120 and extending to depth toward the east or to station 300 and between stations 150 and 200 in Line D. The more conductive weathered rock (green colors) is observable extending deeper into the subsurface below the bedrock layer. This weathered rock is typical of epikarst or solution-enlarged limestones anomalies in the area.

The anomaly identified in Line A (Figure 5) suggests weathered rock begins at a depth of nearly 50 feet and is positioned just below the bedrock layer. This is likely a result of increased water infiltration beginning under station 120 and extending down to a possible perched water table within the rock layer below. This area has been marked with a yellow ellipse denoting an area of low concern. From stations 150 to 200 in the profile for Line D (Figure 8) there is an area marked with an orange ellipse indicating an increased level of concern. Within this area and at the base of the weathered rock layer, a depression or solution-enlarged fracture (i.e., “cutter” or grike) is present and appears to be extending into the bedrock at depth. The bedrock (dark green grading to red) begins near a depth of 25 feet or greater and continues to the bottom of the profile, with exceptions in the aforementioned locations along the profiles for Line A and Line D, where incision of weathered rock is cutting through to greater depths.

5.0 Summary of Findings

This proposed EKPC solar project area is located in a region east of U.S. Highway 62 W, southwest of Cynthiana, Kentucky. Figures 13 and 14, Electrical Resistivity Overlays, show the ER profiles grouped by locations. These location groupings are based on areal distribution and serve as a valuable visual tool, providing a complete view of all profiles in the context of the development of subsurface features across the series of surveyed sites.

Several features of concern have been marked on profiles AP3215LA and AP3216LD, indicating further investigation may be warranted if critical infrastructure is proposed at either given location. Breaks in the resistive bedrock are observable and are interpreted to be water migration pathways into the subsurface in to perched water tables present above less permeable geological units. It is noted that ER cross sections may show a broad extent of color variations at depth and the potential karst anomalies may appear to be rather large. Small amounts of conductive water and ions can have a pronounced effect on the final model. Investigation of the ER method, modeling process and resolution of data collection coupled with case studies indicate the actual conductive feature is much smaller than as shown in many cases.

Overall, the findings within this particular study (Phase 3) suggests significantly less karst development throughout the surveyed areas compared to previous studies (Phases 1 and 2). Lines A through E indicate two areas pertaining to the development of possible karst anomalies, with fractures or solution-enlarged joints underlying a thick, continuous, unconsolidated and undisturbed silt and silty clay and clayey soils (Figure 13). The fractures observed in the profiles for Lines A and D allow water to migrate down to a perched water table, as is observable in the profile for Line A, at approximately 60 feet of depth. Whereas features profiled or mapped on this site are indicative of karst processes, development is somewhat limited to solutioning along bedding plane contacts with the water table being recharged from the surface through fractures in the limestone. Aquifers are most likely small partings or anastomosing surfaces in the partings that only have been moderately affected by rock dissolution or solution enlargement. Both Lines A and D appear to be the only areas with possible karst features. Such development of groundwater-flow systems between rocks of variable weatherability such as shale and limestone are quite typical of Kentucky's Inner Bluegrass karst terrain. Figure 14, Electrical Resistivity Overlay for Lines F, G, and H is provided for a view of the findings in the area of the proposed substation. Inspection of Lines F, G, and H does not suggest development of significant karst features in the area of these three lines.

6.0 Limitations

This study included a limited set of geophysical readings across limited portions of the site. The results and interpretations of the geophysical survey performed are considered generally reliable and were conducted in a manner generally consistent with practitioners in the field of geophysical engineering. The methods used in this investigation are considered reliable; however, localized variations may exist in the subsurface conditions that have not been completely defined at this time. The resistivity results are not unique to geological features and more than one geologic feature or model may yield similar results. Therefore, properly conducted soil test borings and other exploratory techniques are necessary to more completely determine the subsurface conditions at the site.

The site features presented on the site base map are for informational purposes only and no representation is made as to the accuracy or completeness of this information. It is recommended that a practicing geosciences or geotechnical engineering professional be contacted prior to conducting verification drilling or excavating activities.

Figure 1 Vicinity Map

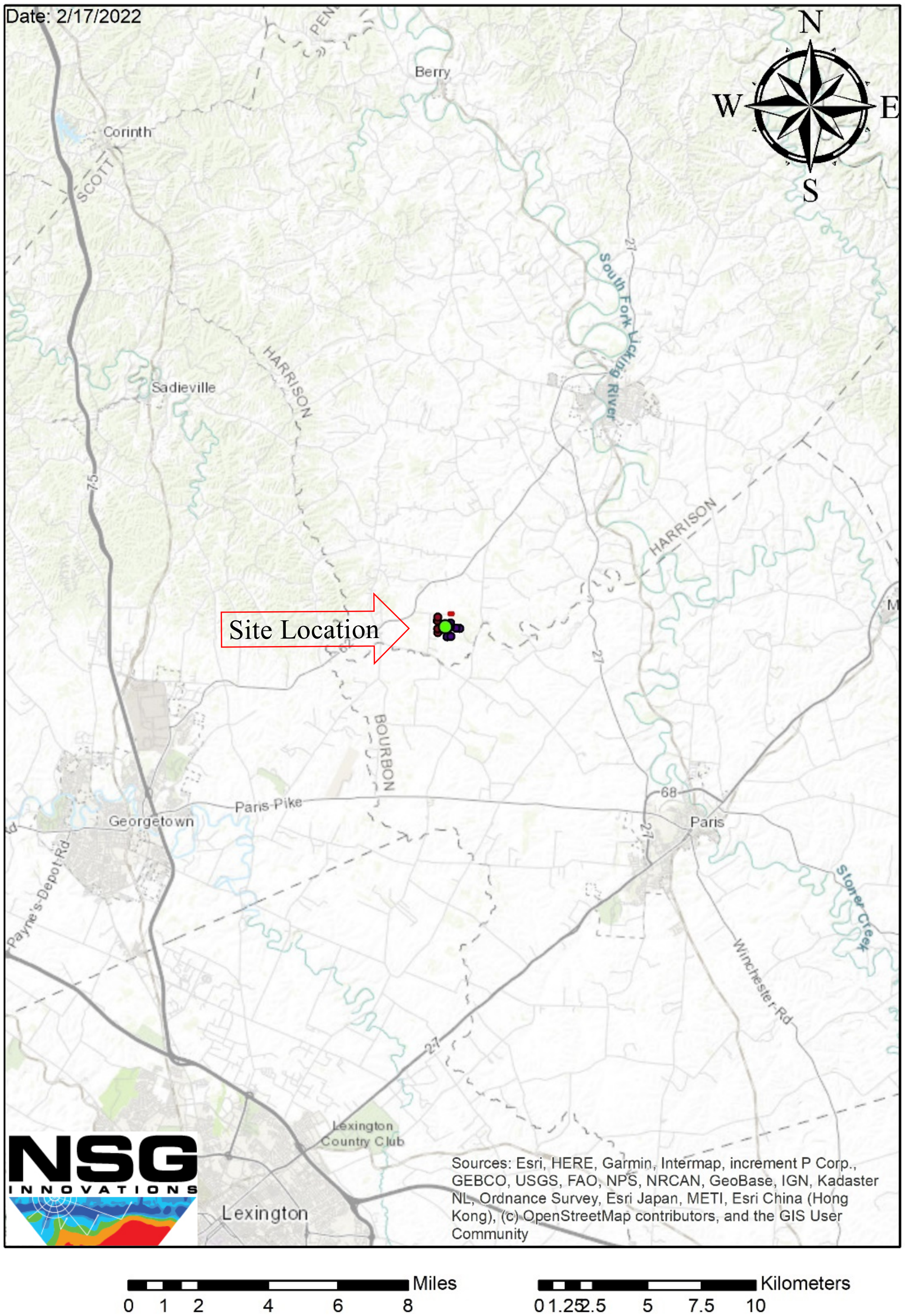


Figure 2 Site Map

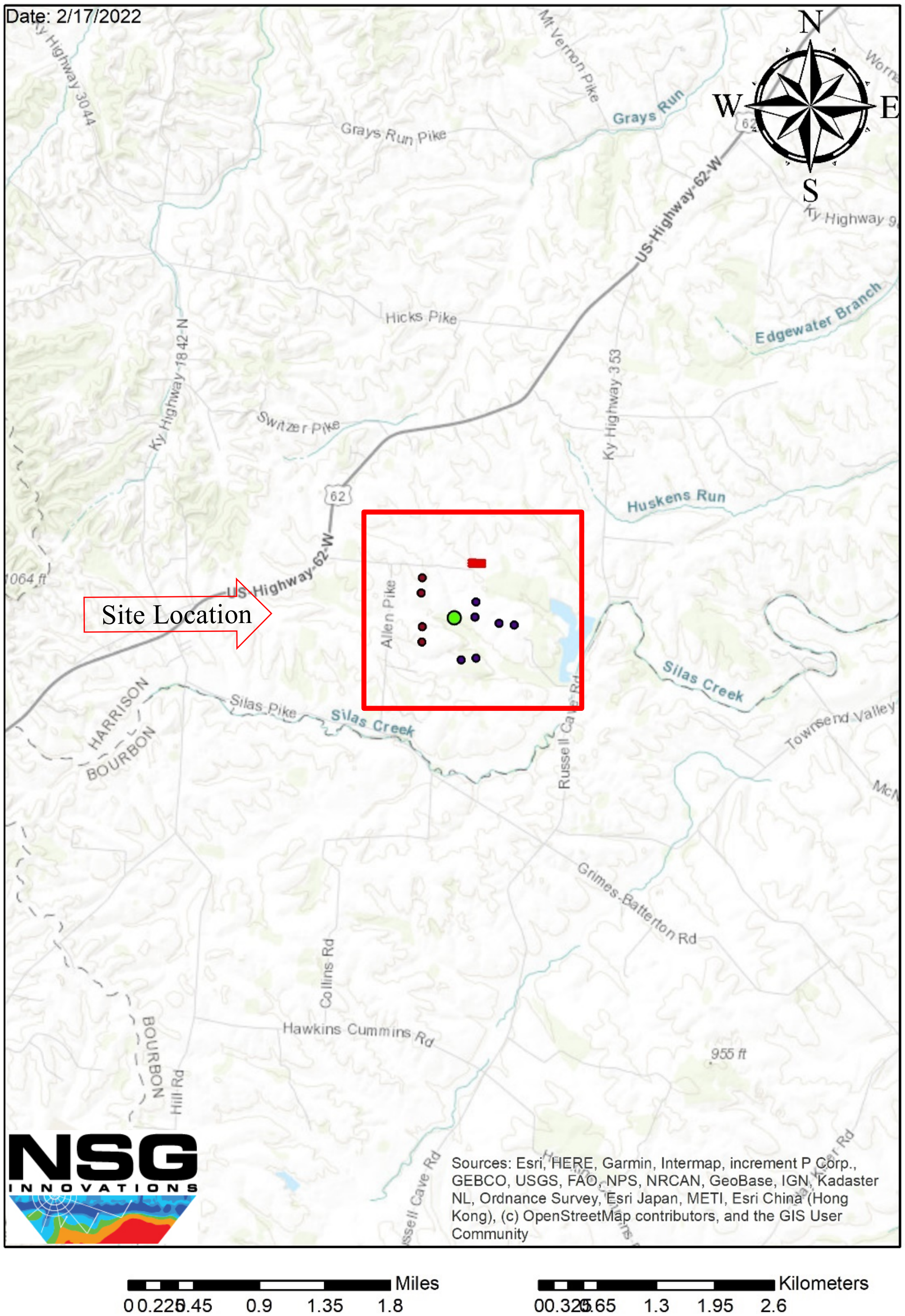
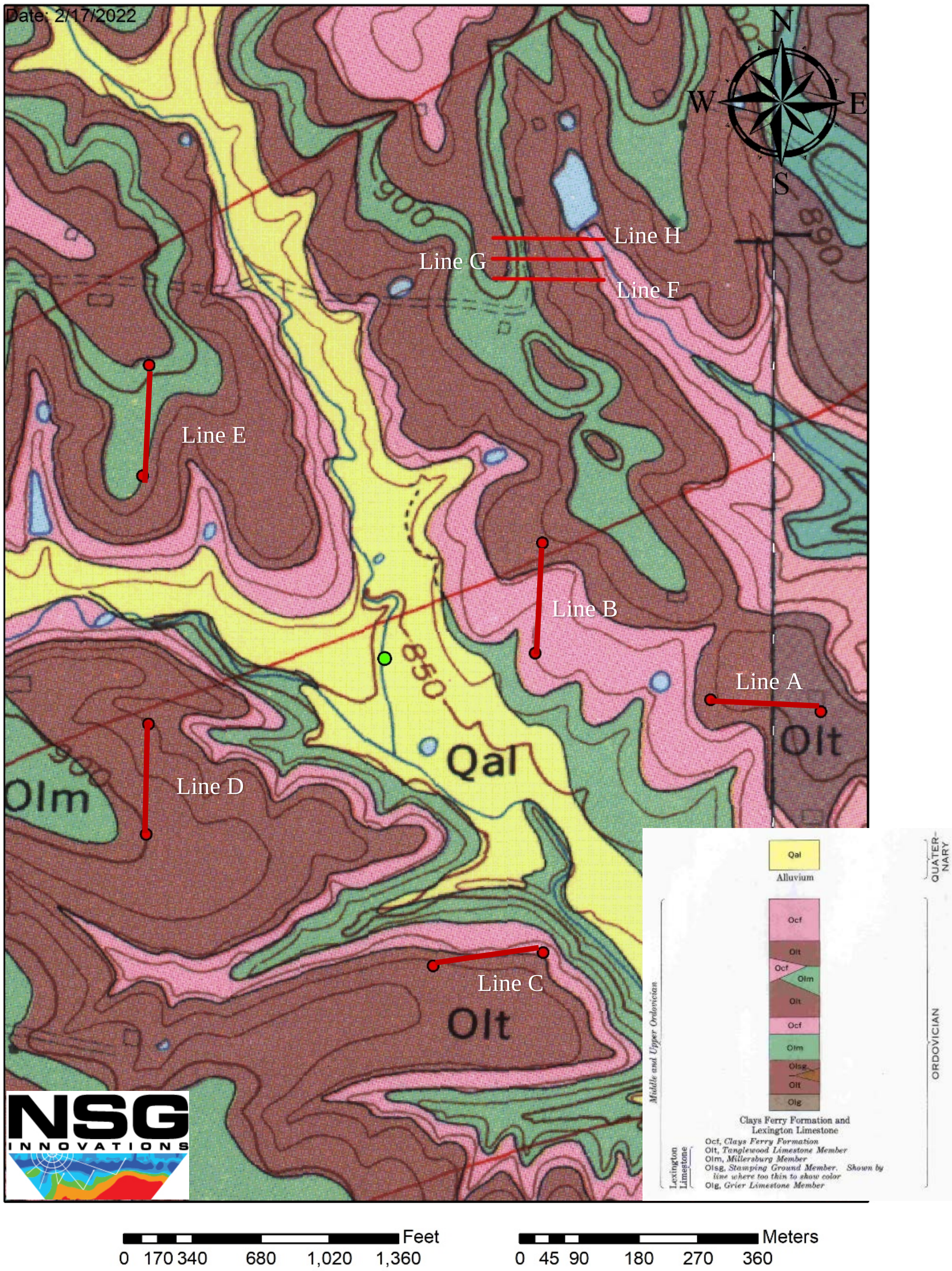


Figure 3 Line Location Map

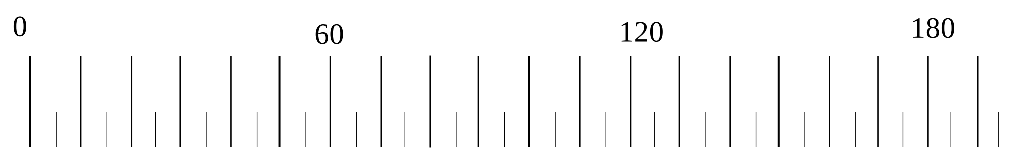
Figure 4 Geological Setting



Electrical Resistivity Profile AP3215LA
Figure 5

Figure 5 AP3215LA

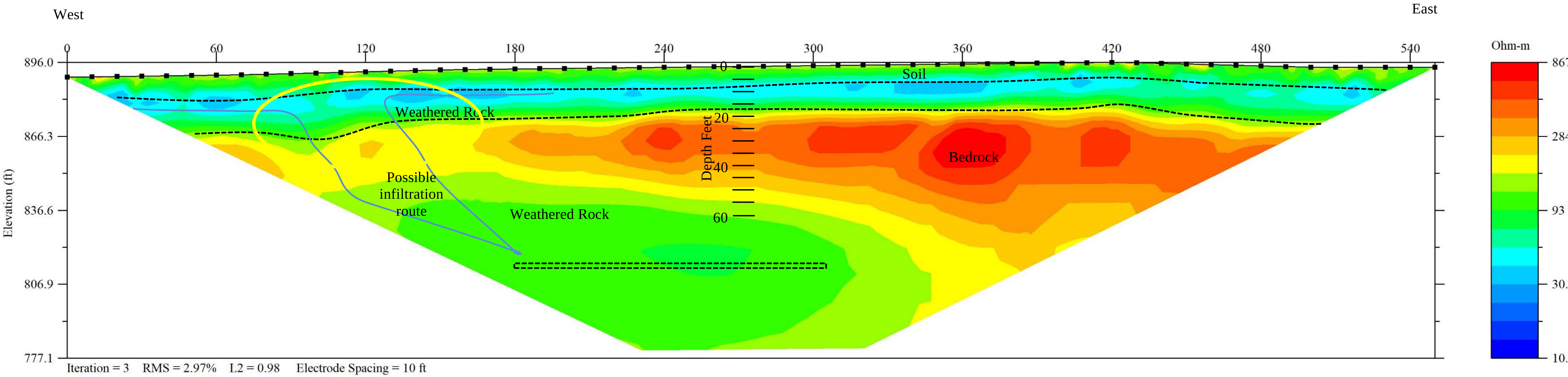
Electrical Resistivity



Inferred geophysical boundaries
Inferred location perched water table

Features of Concern

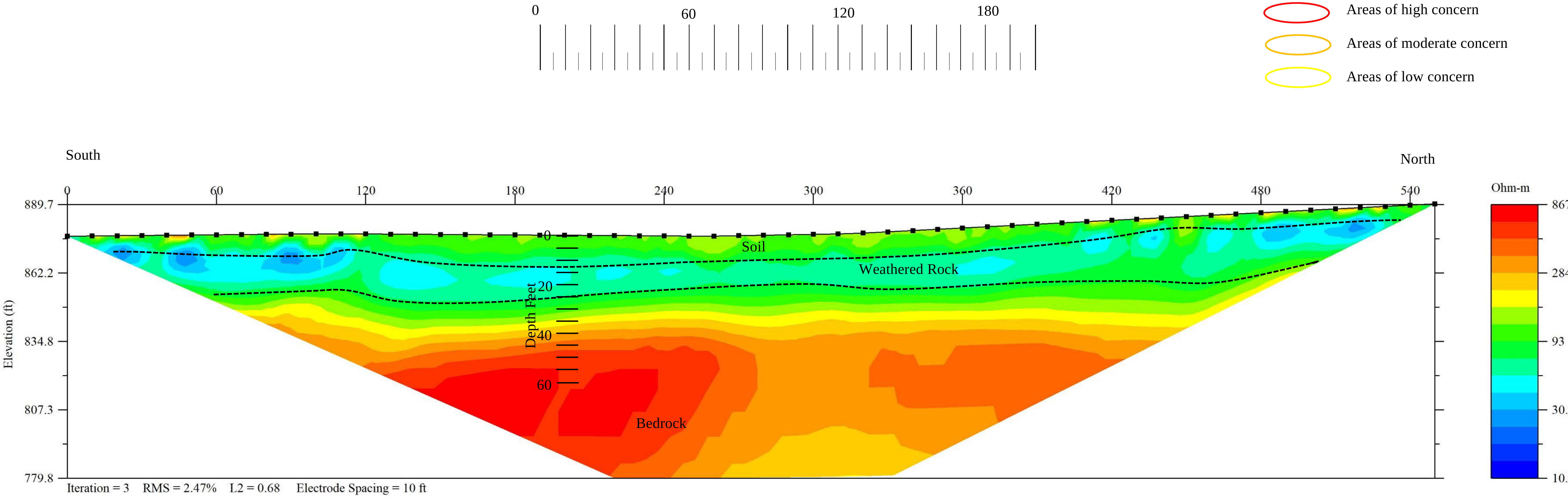
Areas of high concern
Areas of moderate concern
Areas of low concern



NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 5, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 3 Cynthiana, Kentucky 13

Electrical Resistivity Profile AP3215LB
Figure 6

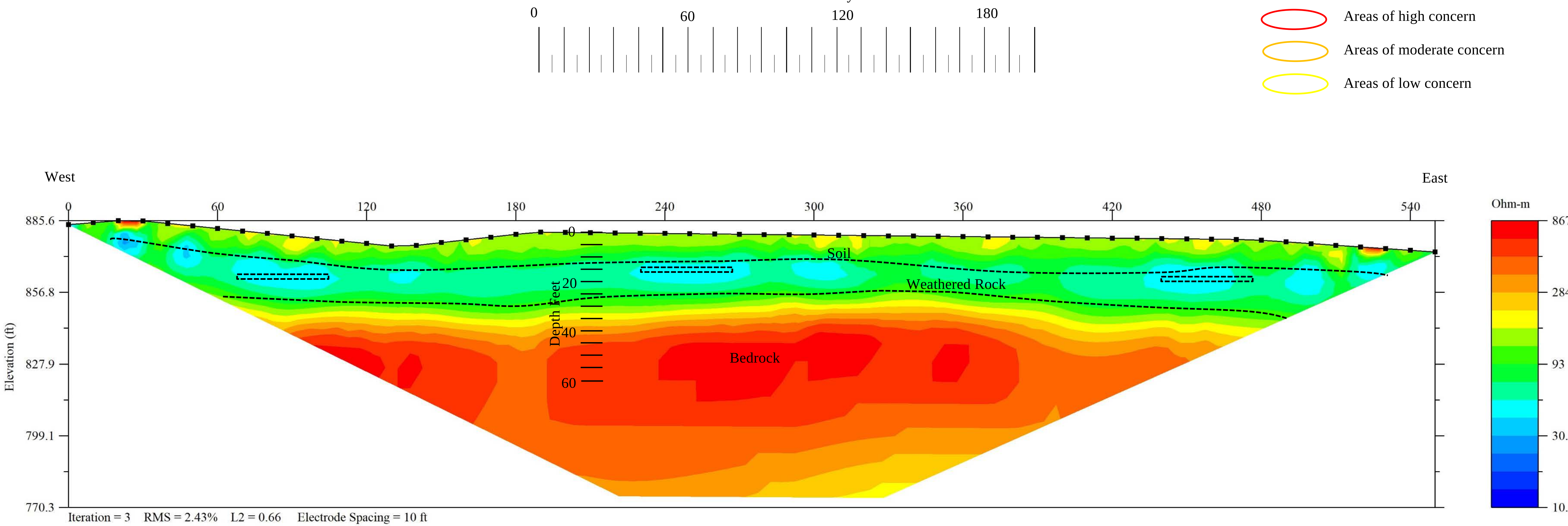
Figure 6 AP3215LB



NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 6, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 3 Cynthiana, Kentucky

Electrical Resistivity Profile AP3215LC
Figure 7

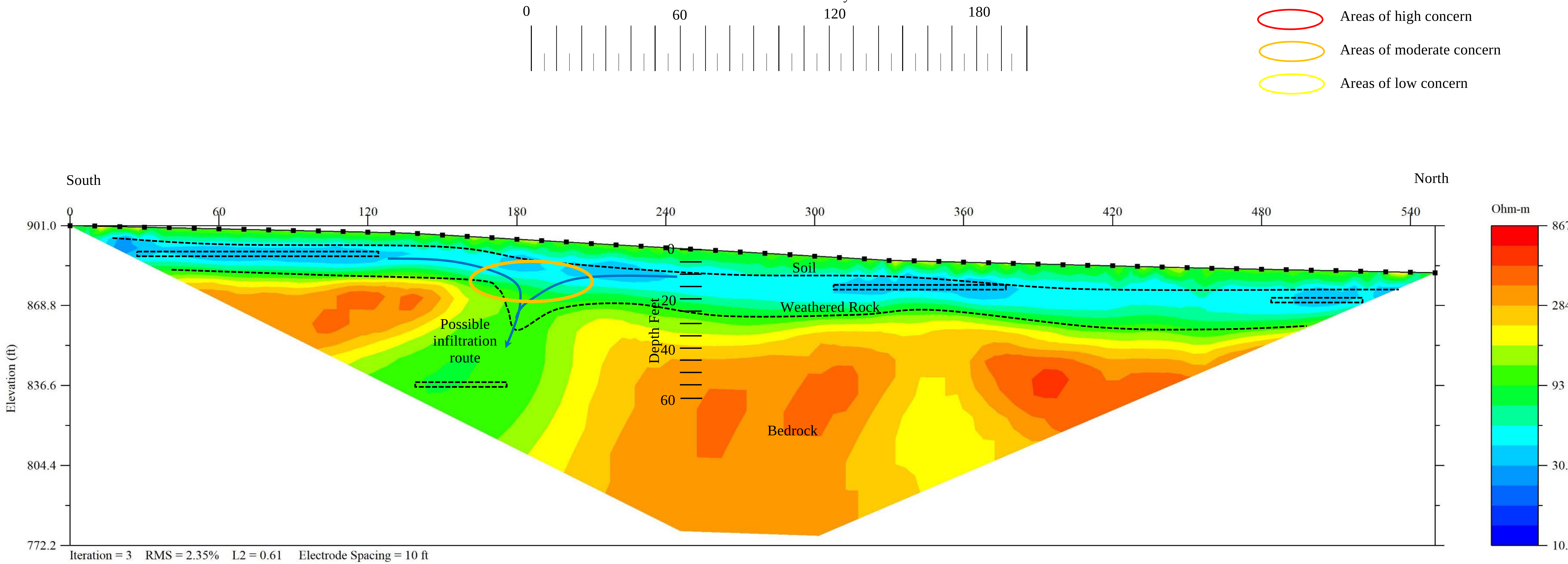
Figure 7 AP3215LC



NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 7, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 3 Cynthiana, Kentucky

Electrical Resistivity Profile AP3215LD
Figure 8

Figure 8 AP3215LD

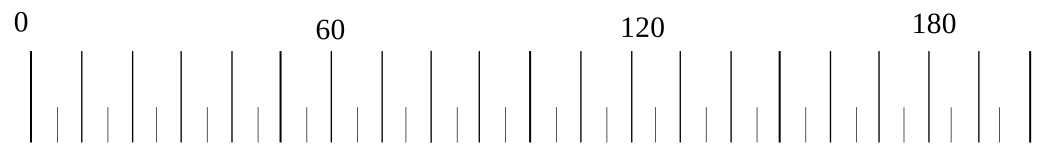


NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 8, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 3 Cynthiana, Kentucky

Electrical Resistivity Profile AP3215LE
Figure 9

Figure 9 AP3215LE

Electrical Resistivity



Inferred geophysical boundaries

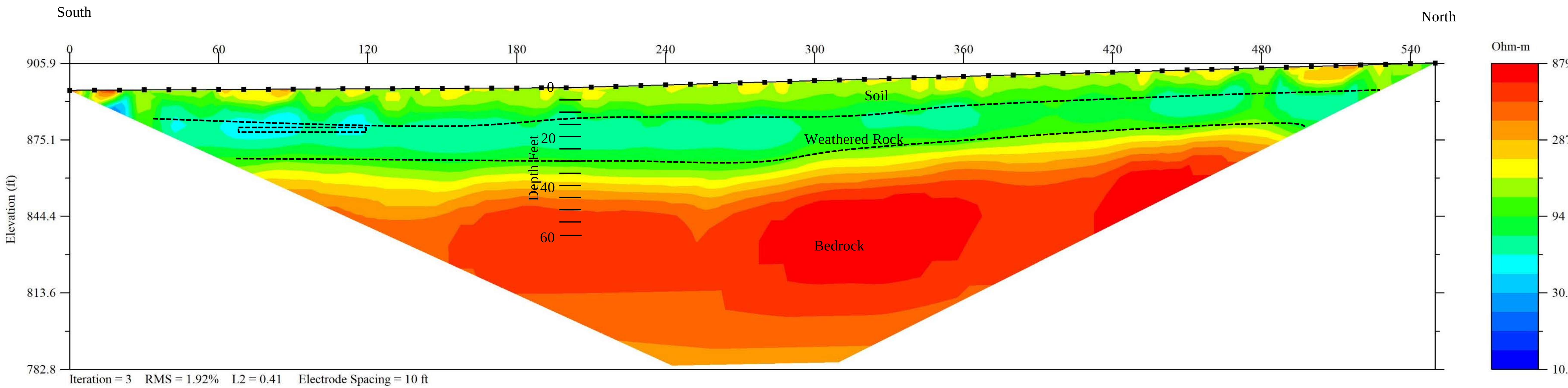
Inferred location perched water table

Features of Concern

Areas of high concern

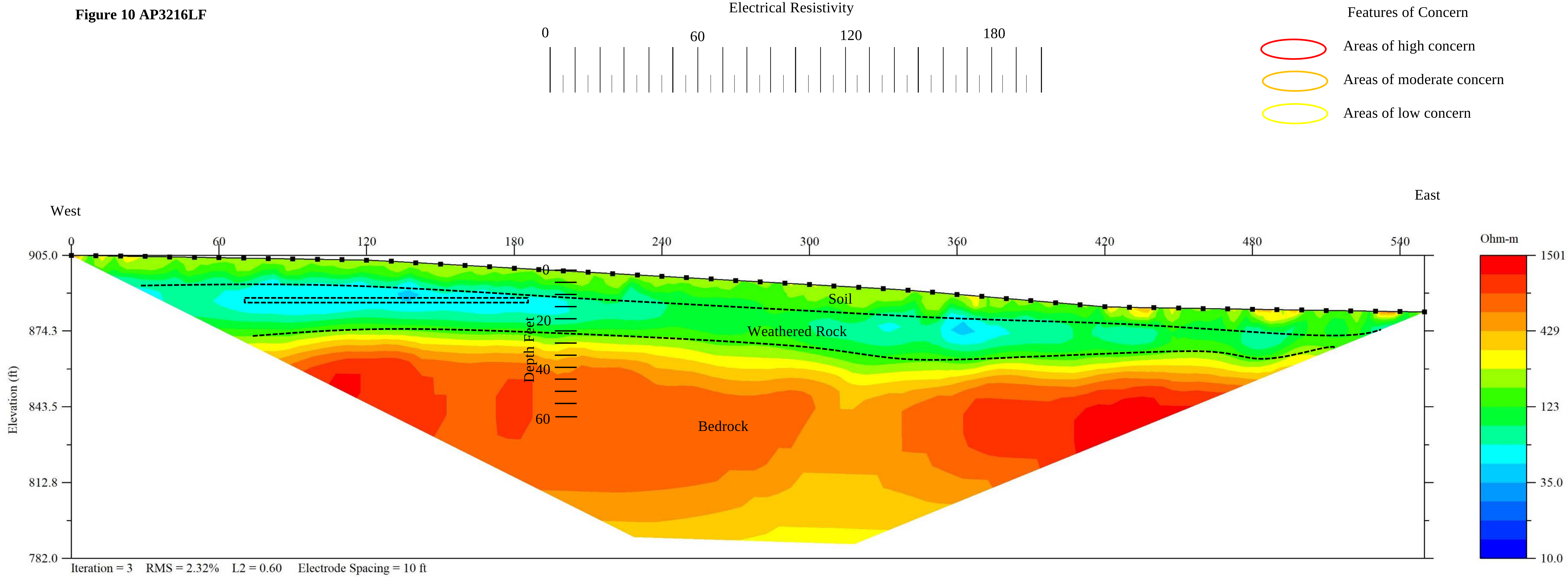
Areas of moderate concern

Areas of low concern



NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 9, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 3 Cynthiana, Kentucky

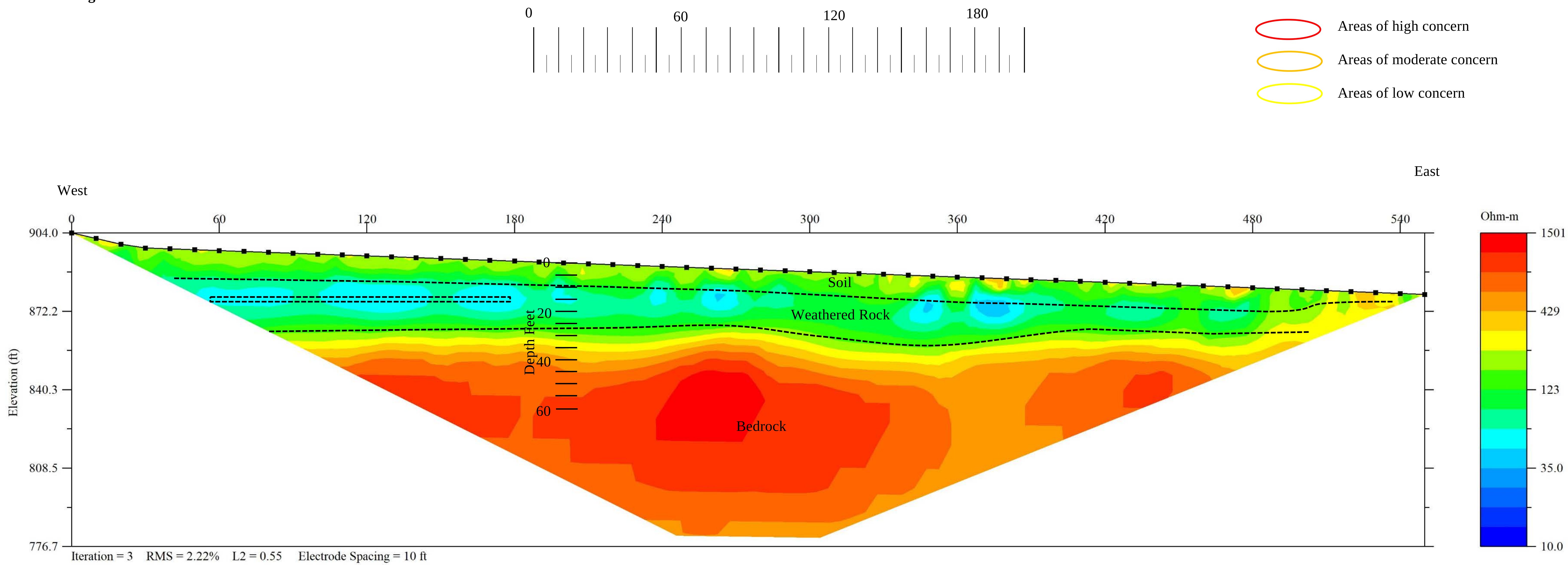
Electrical Resistivity Profile AP3216LF
Figure 10



NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 10, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 3 Cynthiana, Kentucky

Electrical Resistivity Profile AP3216LG
Figure 11

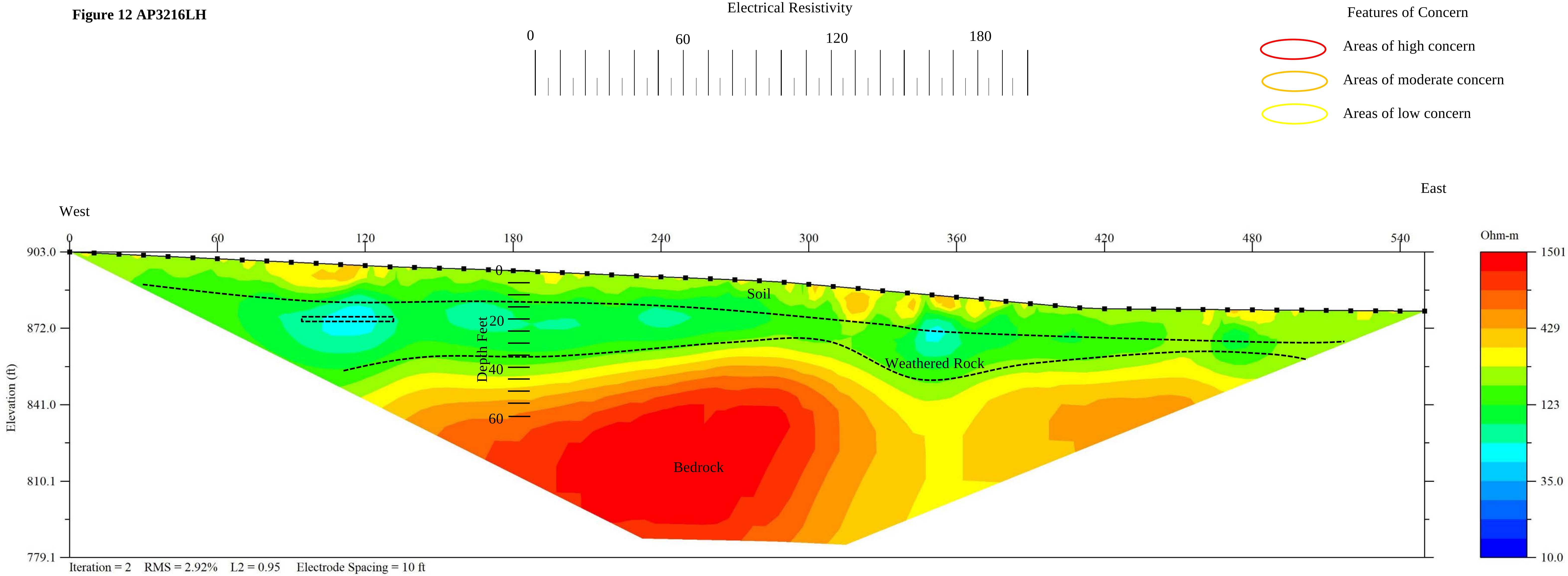
Figure 11 AP3216LG



NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 11, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 3 Cynthiana, Kentucky 19

Electrical Resistivity Profile AP3216LH
Figure 12

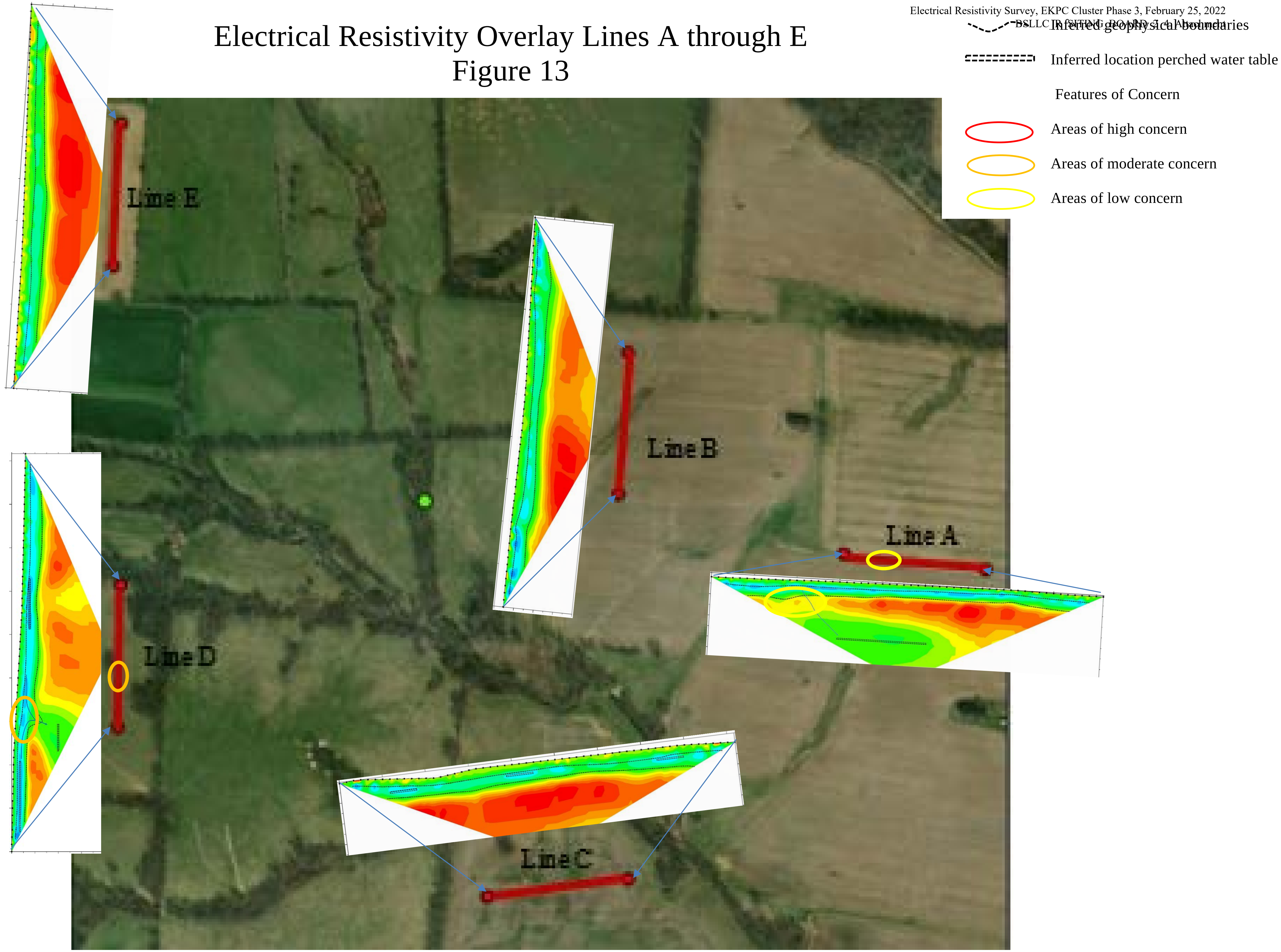
Figure 12 AP3216LH



NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 12, Electrical Cross Section Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 3 Cynthiana, Kentucky

Electrical Resistivity Overlay Lines A through E
Figure 13

Figure 13 ER Overlay A through E



NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 13, Electrical Resistivity Overlay Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 3 Cynthiana, Kentucky

Electrical Resistivity Overlay Lines F, G, and H
Figure 14

Figure 14 ER Overlay F, G, and H

Inferred geophysical boundaries

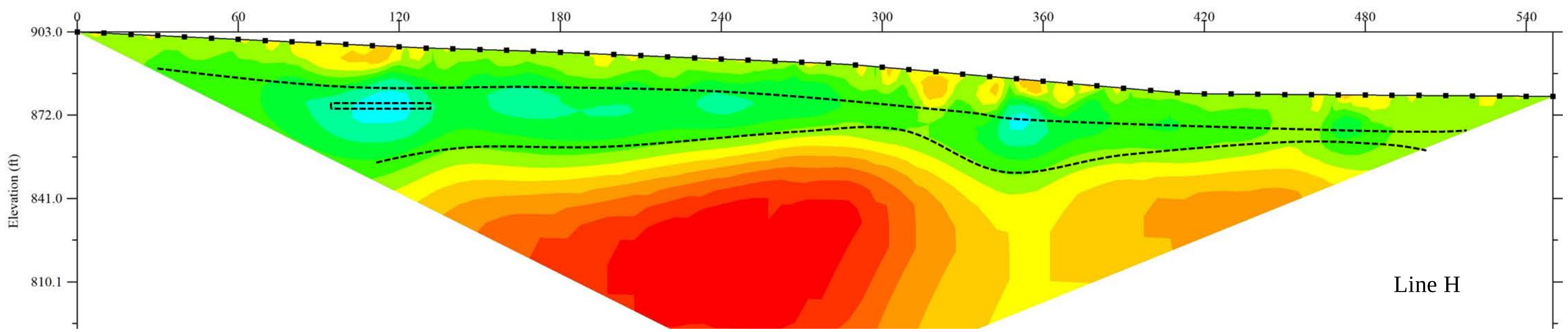
Inferred location perched water table

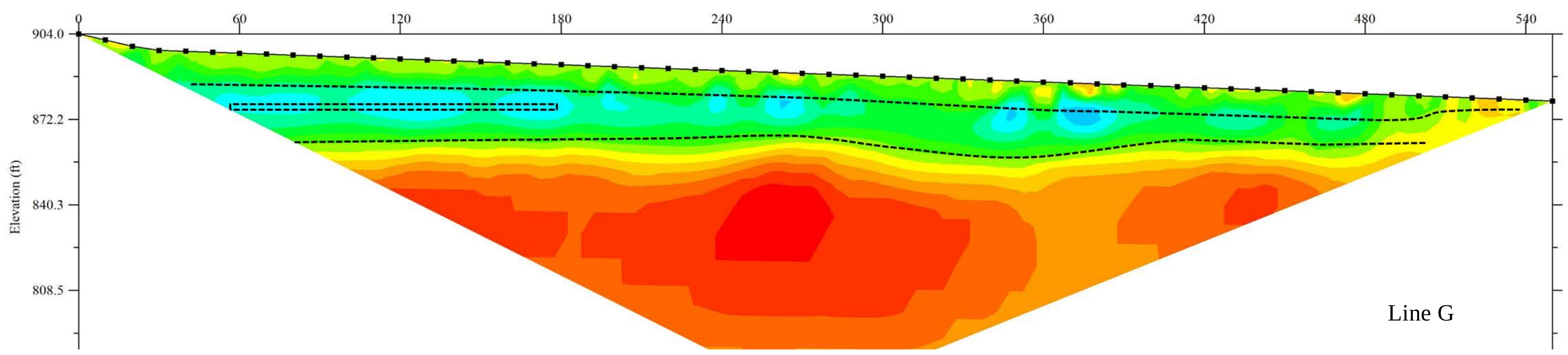
Features of Concern

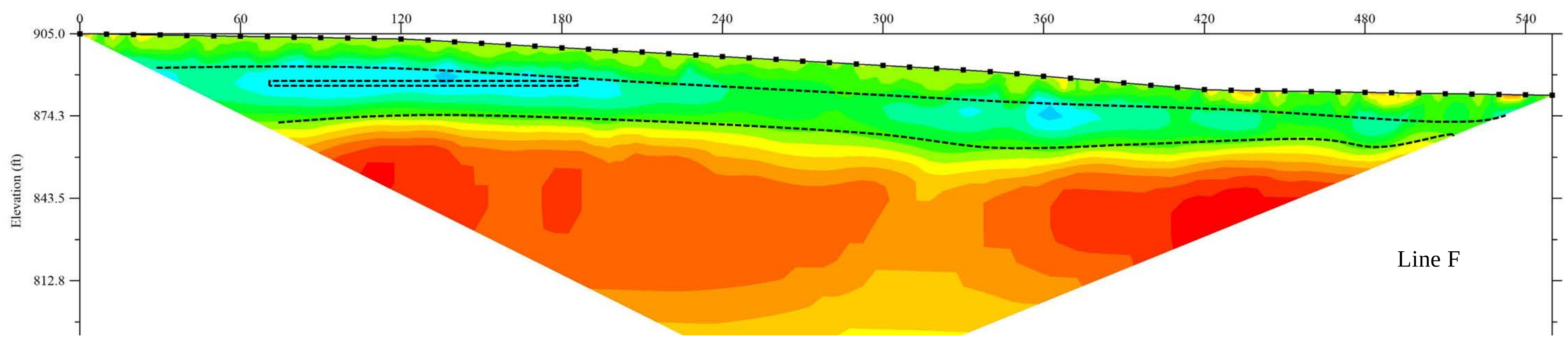
Areas of high concern

Areas of moderate concern

Areas of low concern







NSG INNOVATIONS	NSG Innovations, LLC Near Surface Geophysics 501 Nutwood Street Bowling Green, KY	Figure 14, Electrical Resistivity Overlay Drawn By: Thomas Brackman	Horizontal Scale (feet): as shown Vertical Scale (feet): as shown		Electrical Resistivity Survey EKPC Cluster Phase 3 Cynthiana, Kentucky

Data Request SITING BOARD_2_5:

Harrison County Water Association provides water services in the project area. The Water Resource Information System (https://wris.ky.gov) shows a proposed 4-inch water line extension on the project's eastern boundary. Explain how the construction and operation of the project affects this proposed water line extension.

Response: The Proposed Water Extension (WX21097030) is shown to run parallel to Highway 353. As a result, it would not overlap the project boundaries. The proposed water extension and the project's access roads and/or electrical collection lines may require crossings, however, these types of crossings are typical and not problematic. To the extent crossings of these proposed infrastructure are required, Bluebird will work with the appropriate counterparts to plan those crossings in a manner to avoid causing any negative impact

Witness: Michael Stanton

Data Request SITING BOARD_2_6:

Provide information describing how the interconnection of the three project areas will not interfere with existing utilities: particularly water, gas, or communications.

Response: During detail design and engineering of the project, Bluebird references an ALTA survey to avoid causing any impact to existing utilities and infrastructure. Bluebird will avoid all existing utilities. When avoidance is not feasible, or if the project needs to build access roads, collection lines, or other equipment in the same area as existing utilities, Bluebird will create a detailed plan, which can include crossing or relocation agreements, in coordination with the owner of the existing utilities to ensure no interference.

Witness: Michael Stanton

Data Request SITING BOARD_2_7:

Refer to Bluebird Solar's response to the Siting Board's First Request. Resubmit the following maps with a higher resolution: Exhibit 6 to the Real Estate Swap Agreement provided in response to Item 14 (ALTA/NSPS Land Title Survey), and Figure 1 of the Operation Noise Analysis Report provided in response to Item 41.

Response: A higher resolution of Exhibit 6 to the Real Estate Swap Agreement is available in the ALTA/NSPS Land Title Survey and ALTA/NSPS Land Title Survey of the Spencer Tracts documents, which have been included in this response as an attachment to Data Request SITING BOARD_2_11. A higher resolution of Figure 1 of the Operation Noise Analysis Report has been attached to this response, and it is also available in the Operation Noise Analysis Report attached above in Data Request SITING BOARD_2_3.

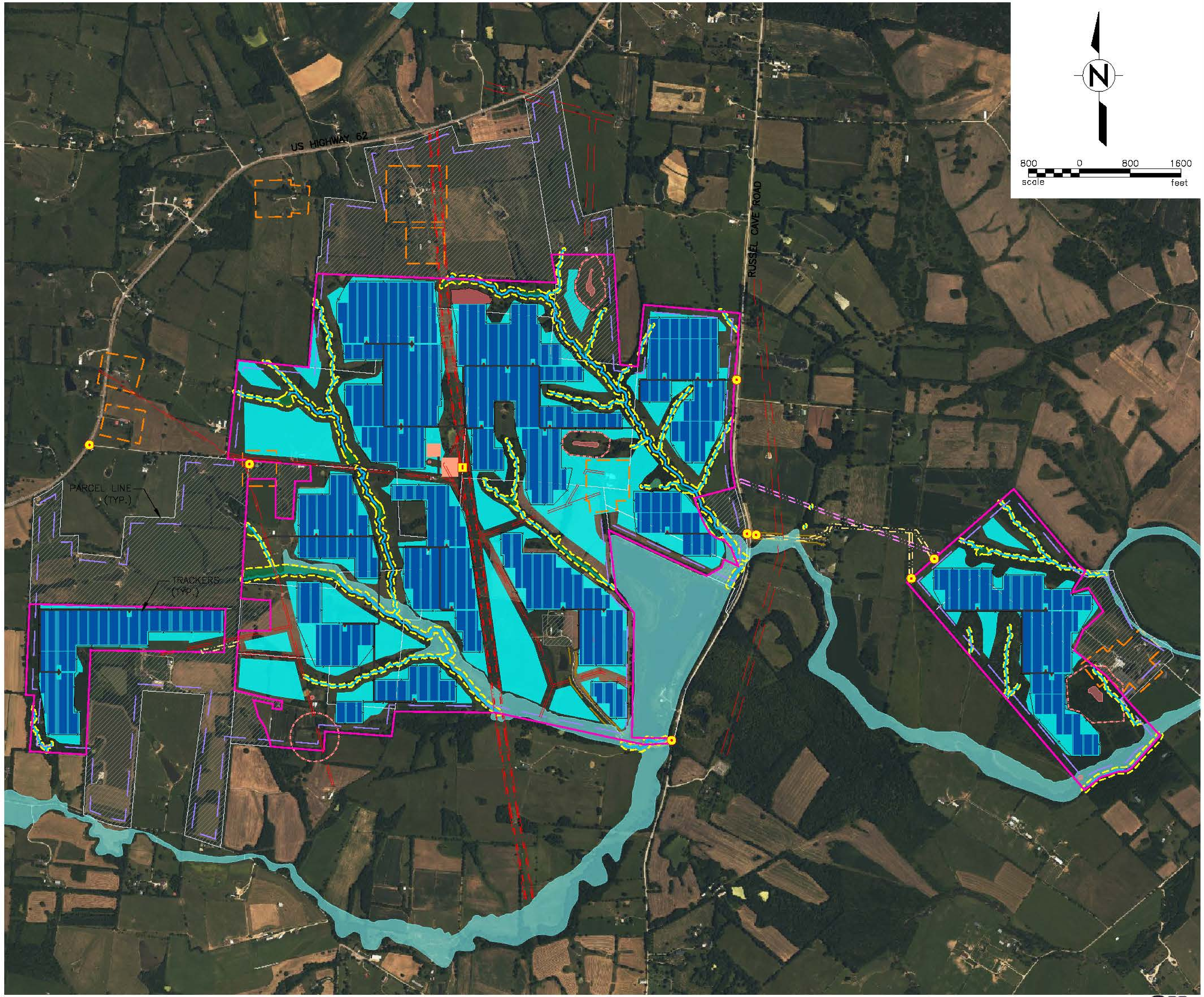
See attached: Bluebird Preliminary Site Plan Image: "Bluebird Preliminary Site Plan 1,"_ BSLLC_R_SITING_BOARD_2_7_Attachment.

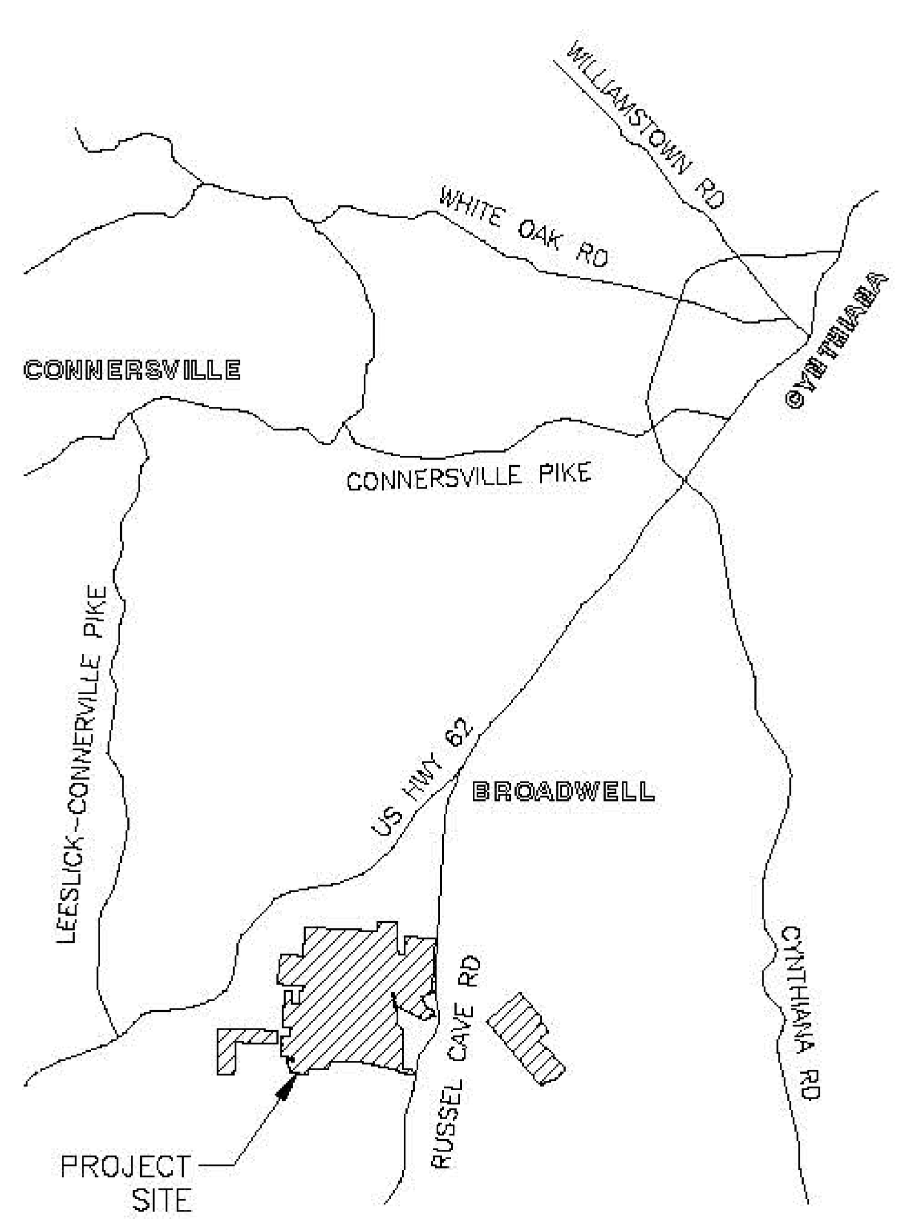
Witness: Michael Stanton

Bluebird Preliminary Site Plan 1
BSLLC_R_SITING_BOARD_2_7_Attachment

LEGEND

- PROPERTY BOUNDARY (1345.0 ACRES)
- PROPERTY SETBACK (100')
- BUILDING SETBACK
- ROAD SETBACK
- BUILDABLE AREA (1000 ACRES)
- PROJECT ENTRANCE
- POINT OF INTERCONNECTION (POI)
- OVERHEAD ELECTRIC SETBACK
- ELECTRIC/TRANSMISSION EASEMENT
- ACCESS EASEMENT
- 50' UNDERGROUND MV CABLE EASEMENT
- TRANSFORMER PAD
- SITE FENCE (543.7 ACRES)
- ACCESS ROAD
- SUBSTATION
- UNUSED AREA
- LAYDOWN AREA
- ARCHAEOLOGICAL SITE
- ARCHAEOLOGICAL BUFFER/SETBACK
- STREAM
- WETLANDS
- WETLAND AND STREAM BUFFER (VARIES 25 & 50')
- JURISDICTIONAL POND
- HARRISON COUNTY FEMA FLOODPLAIN
- TRACKER WITH SOLAR PANELS (AREA UNDER = 176.0 ACRES)





VICINITY MAP
N.T.S

Apr 21, 2021 – 4:01pm

CKile

R:\Phoenix\Projects\AZENE1917-BAYWA-MSA-US\06-Bluebird-CUP\CADD\Exhibits\Bluebird Preliminary Site Plan.dwg

ENGINEER: AZTEC TYPSA

DEVELOPER: BayWa r.e. renewable energy

CONTRACTOR:

REVISIONS

REV	DATE	DESCRIPTION	DRW	CK	APV
5	3/23/21	CLIENT REVIEW	CRK	JDL	JDL
6	3/24/21	CLIENT REVIEW	CRK	JDL	JDL
7	4/06/21	CLIENT REVIEW	CRK	JDL	JDL
8	4/14/21	CLIENT REVIEW	CRK	JDL	JDL
9	4/15/21	CLIENT REVIEW	CRK	JDL	JDL
10	4/22/21	CLIENT REVIEW	CRK	JDL	JDL

SCALE: 1"=800'

SIZE: 22"x34"

PROJECT#: AZENE1917-06

PROJECT: BLUEBIRD SOLAR
HARRISON COUNTY, CYNTHIANA, KENTUCKY

TITLE: PRELIMINARY SITE PLAN 1

SHEET: PS01.01

REV: 10

811 Know what's below. Call before you dig.

Data Request SITING_BOARD_2_8:

Refer to Bluebird Solar's response to Item 41 of Staff's First Request. The Operation Noise Analysis Report Figure 1 shows archaeological sites. Describe these archaeological sites within the project boundaries and provide any study and photographs of those sites.

Response:

Site 15Hr82

Site 15Hr82 is located on gently sloped hill on the edge of a pasture/hayfield near the southwestern corner of the parcel. Site 15Hr82 is just north of an unnamed tributary that drains into Silas Creek. The site has an area of 0.41 ha (1.01 ac). The Site investigation included shovel test pit (STP) excavations in a pasture/hay field. In total, 41 STPs were excavated in the site area. 13 positive STPs contained artifacts on the Sharp parcel.

Site 15Hr82 has been subject to land clearing activities for pasture and field. These clearing activities would have impacted the site's subsurface deposits, and plowing would have more substantively disturbed site deposits. However, no clear evidence exists to confirm extensive or repeat plowing in the area. The site's compromised integrity, as well as the lack of diagnostic artifacts recovered and the lack of features, precludes site 15Hr82 from eligibility considerations for the NRHP. No further work is recommended.

Site 15Hr77

Site 15Hr77 is in a pasture/hayfield just northeast of an unnamed tributary that drains into Silas Creek. The site has an area of 0.22 ha (0.54 ac). The site is present near the southeastern corner of parcel and is adjacent to a gravel road. The investigation at 15Hr77 included STP excavation in a pasture/hay field. In total, 22 STPs were excavated in the site area. 3 STPs were positive for artifacts, and the investigation did not reveal archaeological features.

Site 15Hr77 has been subject to land clearing activities for pasture and field. These clearing activities would have impacted the site's subsurface deposits, and plowing would have more substantively disturbed site deposits. However, no clear evidence exists to confirm extensive or repeat plowing in the area. The site's compromised integrity, as well as the lack of diagnostic artifacts recovered and the lack of features, precludes site 15Hr77 from eligibility consideration for the NHRP. No further work is recommended.

Site 15Hr94

Site 15Hr94 is in a pasture/hayfield northeast of an unnamed tributary that drains into Silas Creek. The site has an area of 0.24 ha (0.60 ac) and is located near the northeastern corner of the parcel. The investigation at 15Hr94 included STP excavation in a pasture/hay field. In total, 31 STPs were excavated in the site area. 6 positive STPs contained artifacts.

Site 15Hr94 has been subject to land clearing activities for pasture and field. These clearing activities would have impacted the site's subsurface deposits, and plowing would have more substantively disturbed site deposits. However, no clear evidence exists to confirm extensive or repeat plowing in the area. The site's compromised integrity, as well as the lack of diagnostic artifacts recovered and the lack of features, precludes site 15Hr94 from eligibility consideration for the NHRP. No further work is recommended.

Site 15Hr111

Site 15Hr111 is an undocumented historic cemetery in a wooded, upland forest located northwest of the South Fork of the Licking River. An associated historic secondary deposit was recorded in association with 15Hr111. An investigation revealed no intact soil deposits or existed in association with this deposit, and no further work is recommended. Cemeteries are typically ineligible for listing in the NRHP, and this cemetery is not associated with persons of transcendent importance or historic events. If future development plans are revised that may affect the cemetery, a barrier fence should be erected.

Name	Date of Birth	Date of Death	Marker Material
Polly Tucker	February 7, 1793	June 10, 1850	Dressed Limestone
Unknown	Unknown	Unknown	Native Limestone
Unknown	Unknown	Unknown	Native Limestone
Unknown	Unknown	Unknown	Native Limestone
Unknown	Unknown	Unknown	Dressed Limestone
Unknown	Unknown	Unknown	Dressed Limestone
John Jones	April 4, 1802	May 14, 1859	Dressed Limestone
Unknown	Unknown	Unknown	Dressed Limestone
Nancy Sydnor	1816	September 2, 1836	Dressed Limestone
Unknown	Unknown	Unknown	Dressed Ledger Stone
Unknown	Unknown	Unknown	Native Limestone
Unknown	Unknown	Unknown	Dressed Ledger Stone

Site 15Hr84

Site 15Hr84 is an undocumented cemetery in a hay field surrounded by brush north of the Silas Creek. The site has an area of 0.09 ha (0.22 ac). The site is present near the south boundary of the parcel. The investigation at Site 15Hr84 included visual inspection of gravestone and depressions and did not include excavation within the boundary or within the cemetery. The cemetery was identified by the large, dressed limestone that laid in an overgrown brush area on Silas Baptist Church parcel.

See attached images of Investigated Sites: "Site Hr82 Image," _BSLLC_R_SITING_BOARD_2_8_Attachment; "Site 15Hr77 Image," _BSLLC_R_SITING_BOARD_2_8_Attachment; "Site 15Hr94 Image," _BSLLC_R_SITING_BOARD_2_8_Attachment, "Site 15Hr111 Image," _BSLLC_R_SITING_BOARD_2_8_Attachment, "Site 15Hr84 Image," _BSLLC_R_SITING_BOARD_2_8_Attachment.

Witness: Jeremy Jackson

Site 15Hr82 Image
BSLLC_R_SITING_BOARD_2_8_Attachment

Site 15Hr77 Image
BSLLC_R_SITING_BOARD_2_8_Attachment

Site 15Hr94 Image
BSLLC_R_SITING_BOARD_2_8_Attachment


Site 15Hr111 Image
BSLLC_R_SITING_BOARD_2_8_Attachment

Site 15Hr84 Image
BSLLC_R_SITING_BOARD
_2_8_Attachment

Data Request SITING BOARD_2_9:

Refer to Bluebird Solar's response to the Siting Board's First Request Item 14. Exhibit 12 in the Real Estate Swap Agreement references the Jacksonville Cemetery. Explain the location of the Jacksonville Cemetery within the project boundaries. Describe the cemetery including the number of burials, the date of the most recent burial, and photographs.

Response: The Jacksonville Cemetery is not located within the Project boundary. The Jacksonville Cemetery is located ¾ mile south of the project boundary on Russell Cave Road. Please see response to Data Request SITING BOARD_2_10 for more information on the Jacksonville Cemetery.

Witness: Jeremy Jackson

Data Request SITING BOARD_2_10:

Provide any information as to whether there are any additional cemeteries within two miles of the project boundaries. Provide descriptions of the cemeteries including the number of burials, the date of the most recent burial, and photographs.

Response: Four cemeteries are located within two miles of the project boundary: Hines Cemetery, Silas Baptist Church Cemetery, Jacksonville Cemetery, and Pleasant Green Cemetery. Information on number of burials, most recent burials, and photographs are below.

Jacksonville Cemetery

1180 Russell Cave Road
Paris, Bourbon County, Kentucky

Number of burials – 1,911

Date of most recent burial February 2, 2022

Pleasant Green Cemetery

Number of burials – 33

Date of most recent burial – August 9, 2020

Hines Cemetery and Silas Baptist Church Cemetery

Please see attached Archaeological Investigation report dated January 10, 2021, for information on the Hines Cemetery and the Silas Baptist Church Cemetery.

See attached:

Photos of Jacksonville Cemetery and Pleasant Green Cemetery: “Jacksonville Cemetery 1,”_BSLLC_R_SITING_BOARD_2_10_Attachment; “Jacksonville Cemetery 2,”_BSLLC_R_SITING_BOARD_2_10_Attachment; “Pleasant Green Cemetery,”_BSLLC_R_SITING_BOARD_2_10_Attachment.

Archaeological Investigation: “Phase I Archaeological Investigation of the Bluebird Solar Farm, January 10, 2021,”_BSLLC_R_SITING_BOARD_2_10_Attachment. This document is being uploaded as a separate file.

Witness: Jeremy Jackson

Jacksonville Cemetery 1
BSLLC_R_SITING_BOARD_2_10_Attachment

Jacksonville Cemetery 2
BSLLC_R_SITING_BOARD_2_10_Attachment

Pleasant Green Cemetery
BSLLC_R_SITING_BOARD_2_10_Attachment

Data Request SITING BOARD_2_11:

Provide an ALTA Survey for the project. If it has not been completed, provide the estimated date for completion.

<u>Response</u>: See attached ALTA Survey Documents: "ALTA/NSPS Land Title Survey, Spencer Tracts 1 and 2,"_BSLLC_R_SITING_BOARD_2_11_Attachment; "ALTA/NSPS Land Title Survey,"_BSLLC_R_SITING_BOARD_2_11_Attachment.

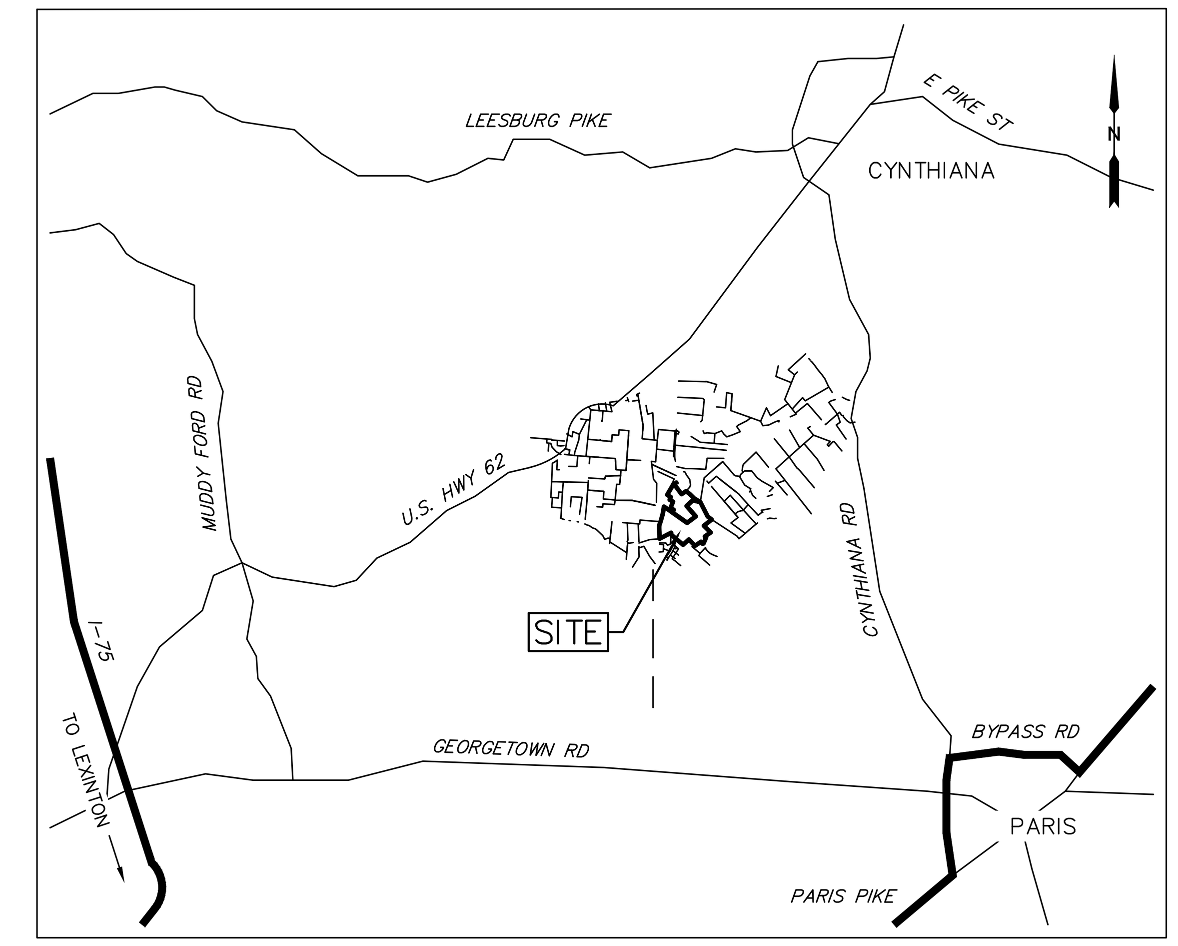
Witness: Michael Stanton

ALTA/NSPS LAND TITLE SURVEY
OF 362.835 ± ACRES OF LAND
PREPARED FOR
BayWa r.e. RENEWABLE ENERGY;
BLUEBIRD SOLAR, LLC;
BLUE JAY SOLAR, LLC;
And BLUEBIRD SOLAR

THE SPENCER TRACTS, 1 AND 2

PROPERTY OF:
BIRTLE L. & PATRICIA H. SPENCER
P.I.D. 008-00-00-001.00
BOURBON COUNTY, KENTUCKY

LOCATED ALONG THE FOLLOWING PUBLIC ROADS:
RUSSELL CAVE ROAD (KY 353)



VICINITY MAP
NOT TO SCALE

DATUMS
Horizontal: Grid North, NAD83, Kentucky
(North American Datum of 1983) (2011)
Survey Foot, Bourbon & Harrison County, Kentucky
Vertical: NAVD88 (North American Vertical Datum of 1988)
Geoid: Geoid12B Conus

STEWART TITLE GUARANTY COMPANY
TITLE COMMITMENT NUMBER: 01219-21334e
ISSUING FILE NUMBER: 01219-21334e
COMMITMENT EFFECTIVE DATE: SEPTEMBER 26, 2019 AT 8:00 A.M.

SCHEDULE B - II
EXCEPTIONS

1. Any defect, lien, encumbrance, adverse claim, or other matter that appears for the first time in the Public Records or is created, attaches, or is disclosed between the Commitment Date and the date on which all of the Schedule B, Part I - Requirements are met.
2. Rights of tenants in possession, as tenants only, under prior unrecorded leases.
3. Any discrepancies, conflicts, or shortages in area or boundary lines, or any encroachments or protrusions, or overlapping of improvements which would be disclosed by an inspection and accurate survey of the premises.
4. Any lien, or right to a lien, for services, labor, or material heretofore or hereafter furnished, imposed by law and not shown by the public records.
5. Rights or claims of easements not recorded in the public records.
6. Taxes and assessments for the current year and subsequent installments, which are a lien, not yet due and payable.
7. Bourbon County Parcel Number: 008-00-00-001.00 Valuation: $168,400.00 2018 County Taxes in the annual amount of $1,747.54 is PAID. 2019 County Taxes constitute a lien not yet due and payable.

   Bourbon County Parcel Number: 007-00-00-002.00 Valuation: $82,600.00 2018 County Taxes in the annual amount of $857.17 is PAID. 2019 County Taxes constitute a lien not yet due and payable.
8. Real Estate Option by and between East Kentucky Power Cooperative, Inc., Birtle L. Spencer and Patricia H. Spencer, dated April 10, 1998, recorded April 20, 1998 in Deed Book 231, Page 465 of the Bourbon County, Kentucky Clerk's Office.
9. Transmission Line Easement in favor of East Kentucky Power Cooperative, Inc., dated July 24, 1998, recorded July 28, 1998 in Deed Book 232, Page 609 of the Bourbon County, Kentucky Clerk's Office.
10. Easement Agreement by and between Jacobson Partnership, a Kentucky general partnership (Don R. Jacobson, Molette M. Jacobson and Dean Richard Jacobson, Partners) and Kentucky-America Water Company, a Kentucky corporation dated July 8, 1987, recorded July 21, 1987 in Deed Book 200, Page 255 of the Bourbon County, Kentucky Clerk's Office.
11. Deed of Easement in favor of Columbia Gas of Kentucky, Inc., a corporation dated February 19, 1987, recorded February 19, 1987 in Deed Book 198, Page 721 of the Bourbon County, Kentucky Clerk's Office.
12. Easement as set forth in deed dated July 25, 1998, recorded July 28, 1998 in Deed Book 232, Page 611 of the Bourbon County, Kentucky Clerk's Office.
13. Minerals of whatsoever kind, subsurface and surface substances, including but not limited to coal, lignite, oil, gas, uranium, clay, rock, sand and gravel in, on, under and that may be produced from the Land, together with all rights, privileges, and immunities relating thereto, whether or not appearing in the Public Records or listed in Schedule B. The Company makes no representation as to the present ownership of any such interests. There may be leases, grants, exceptions or reservations of interests that are not listed.
14. Any acreage or square footage indicated in the legal description, and/or the address shown on Schedule A, is solely for the purpose of identifying said tract of land and shall not be construed as insuring the quantity of land, and/or the address as set forth in the description of the property.

STEWART TITLE GUARANTY COMPANY
TITLE COMMITMENT NUMBER: 01219-21334e
ISSUING FILE NUMBER: 01219-21334e
COMMITMENT EFFECTIVE DATE: SEPTEMBER 26, 2019 AT 8:00 A.M.

The Title is, at the Commitment Date, vested in: Birtle L. Spencer and Patricia H. Spencer by virtue of deed dated May 25, 1990, recorded June 19, 1990 in Deed Book 207, Page 441 of the Bourbon County, Kentucky Clerk's Office.

EXHIBIT "A"
LEGAL DESCRIPTION

Tract I:

Beginning at a point in the east right of way of Russell Cave Road, said point being the southwest property corner; thence with the right of way of Russell Cave Road
N 5 deg. 52'54" W 707.06 feet, N 20 deg. 18'39" E 60.18', N 08 deg. 44'26" W 197.22', N 01 deg. 35'44" E 344.04',
N 08 deg. 16'25" E 133.36', N 11 deg. 40'40" E 350.87', N 16 deg. 46'43" E 147.15',
N 12 deg. 30'21" E 105.34', N 12 deg. 11'27" E 423.50', N 20 deg. 54'10" W 93.64' and N 5 deg. 26'35" E 465.64 feet to a corner post; thence leaving the right of way of Russell Cave Road
S 58 deg. 04'47" E 645.75 feet, S 59 deg. 41'58" E 1933.53', N 47 deg. 43'41" E 967.17', N 45 deg. 54'16" W 1252.18',
N 42 deg. 10'04" E 759.00', S 80 deg. 20'40" E 739.01', S 30 deg. 11'14" E 1474.03', S 60 deg. 19'31" E 474.59',
S 47 deg. 52'02" W 925.11', S 50 deg. 18'52' E 859.23', S 50 deg. 46'18" W 631.85', S 56 deg. 04'23" E 151.65',
S 19 deg. 55'18" W 564.81', S 82 deg. 27'35" W 100.35', N 9 deg 51'14" W 53.41', N 60 deg. 52'53" W 143.75',
S 51 deg. 22'55" W 661.28', N 48 deg. 01'49" W 801.60', S 43 deg. 42'15" W 712.66', N 53 deg. 52'49" W 1422.27',
N 0 deg. 20'42" W 161.04' and S 57 deg. 58'56" W 1225.52 feet to the point of beginning and containing 256.25 acres, more or less.

Tract II:

Beginning at a point in the center of the Russell Cave Road, a corner to Tract I, and running with the center of said road North 31 deg. 08 min. East 1170.0 feet to a corner to McDowell; thence leaving said road and running with the line of McDowell South 37 deg. 50 min. East 1226.0 feet; North 52 deg. 10 min. East 480.0 feet; South 12 deg. 30 min. East 258.0 feet; South 61 deg. 30 min. East 238.0 feet; thence crossing Silas Creek North 42 deg. 00 min. East 98.0 feet; North 71 deg. 30 min. East 41.0 feet; and thence with the line of McDowell South 48 deg. 00 min. East 532.0 feet to a corner to McDowell and Jacobson; thence crossing Silas Creek and running with the line of Jacobson South 43 deg. 00 min. West 391.0 feet; South 48 deg. 00 min. West 578.0 feet; South 42 deg. 00 min. East 1253.0 feet; South 51 deg. 50 min. West 967.0 feet; North 56 deg. 32 min. West 1936.0 feet to a post, a corner to Tract I; thence running with the line of Tract I North 21 deg. 30 min. East 637.0 feet; North 19 deg. 46 min. East 216.5 feet; North 61 deg. 55 min. West 347.0 feet; North 20 deg. 09 min. East 279.5 feet; North 61 deg. 55 min. West 183.0 feet; North 59 deg. 41 min. West 126.5 feet; and thence with the line of Tract I North 52 deg. 53 min. West 117.0 feet to the point of beginning, and containing 107.99 acres of land. The aforedescribed tract and second tract hereinabove referred to as Tract I are identified in that survey of William E. Hudnall, Registered Land Surveyor, dated February 1980.

SAVE AND EXCEPT the following described real estate:

Beginning at a Survey Spike, corner to Birtle Spencer (Parcel I and Parcel II) and Bourbon Limestone Company; thence leaving Spencer with Bourbon Limestone Company, North 21°03'25" East 269.28 feet to an iron pin, corner to Birtle Spencer (Parcel II); thence leaving Bourbon Limestone Company with Birtle Spencer (Parcel II), South 56°32'00" East 357.87 feet to an iron pin; thence South 33°28'00" West 262.99 feet to an iron pin, corner to Birtle Spencer (Parcel I); thence continuing with Spencer (Parcel I), North 56°32'00" West 300.00 feet to the beginning, containing 1.99 acres.

EXCEPTING THEREFROM, all those portions of the above described Tract I located in Harrison County, Kentucky. The same having not been examined by the Company, the Company hereby expressly excludes from the description of the Land any portion of the above described real estate in Harrison County, Kentucky.

AREA TABLE

SPENCER TR-1 :	4,732,381	Sq Ft	108.641	Acres
SPENCER TR-2:	11,072,682	Sq Ft	254.194	Acres
TOTAL:	15,805,063	Sq Ft	362.835	Acres

FLOOD NOTE

1. PORTIONS OF THE SITE SHOWN HEREON IS LOCATED WITHIN A FLOOD HAZARD ZONE AND IS FOUND TO BE LOCATED WITHIN THE FOLLOWING FLOOD HAZARD AREAS:
   -- ZONE A (AREAS DETERMINED TO BE INSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN)
   -- ZONE AE (AREAS WITH BASE FLOOD ELEVATION DETERMINED)
   -- ZONE AE - FLOODWAY (FLOODWAY AREAS IN ZONE AE)

   THIS INFORMATION IS ACCORDING TO:
   A.) MAP (PANEL) NUMBER 21209C0150D, EFFECTIVE DATE: DECEMBER 21, 2017 AND
   B.) MAP (PANEL) NUMBER 21097C0265C, EFFECTIVE DATE: JANUARY 6, 2011.

SHEET INDEX

SHEET 1	COVER SHEET, TITLE COMMITMENT & EXHIBIT "A" LEGAL DESCRIPTIONS
SHEETS 2 - 3	BOUNDARY SURVEY @ 1" = 200' SCALE

SURVEY NOTES

1. THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND IS FOUND TO BE ACCURATE WITHIN:
   SPENCER, TR-1: ONE FOOT IN 665,344 FEET
   SPENCER, TR-2: ONE FOOT IN 2,366,848 FEET
2. ALL EASEMENTS AND RIGHTS OF WAY OF WHICH THE SURVEYOR HAS KNOWLEDGE ARE SHOWN HEREON. OTHERS MAY EXIST OF WHICH THE SURVEYOR HAS NO KNOWLEDGE AND OF WHICH THERE IS NO OBSERVABLE EVIDENCE.
3. THE PROPERTY SHOWN IS SUBJECT TO ALL EASEMENTS AND RESTRICTIONS OF RECORD BOTH WRITTEN AND UNWRITTEN
4. THE LOCATIONS OF UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON VISIBLE STRUCTURES AND MAPS AND/OR FIELD LOCATED MARKINGS PROVIDED BY THE UTILITY COMPANIES SERVICING THAT UTILITY AND ARE APPROXIMATE ONLY. THE PROPERTY SHOWN HEREON MAY BE SERVED BY UNDERGROUND UTILITIES WHICH ARE NOT SHOWN HEREON. ALL UTILITY COMPANIES SHOULD BE CONTACTED BEFORE BEGINNING ANY DESIGN, DIGGING OR CONSTRUCTION.
5. NORTH ARROW AND BEARINGS SHOWN ARE BASED ON THE KENTUCKY STATE PLANE COORDINATE SYSTEM, NAD 83 (North American Datum of 1983) (ADJUSTED 2011), FOR THIS SURVEY THE STATE PLANE COORDINATES WERE OBTAINED USING RTK OBSERVATIONS TIED INTO THE KENTUCKY VRS STATE WIDE NETWORK . ALL DISTANCES SHOWN ARE HORIZONTAL GROUND MEASUREMENTS AND ARE EXPRESSED IN SURVEY FEET.
6. THE EQUIPMENT USED FOR MEASUREMENT IS:
   ANGULAR: TRIMBLE S8 ROBOTIC TOTAL STATION
   LINEAR: TRIMBLE S8 ROBOTIC TOTAL STATION
   GPS: TRIMBLE R8 GPS RECIEVER
7. THIS PLAT WAS PREPARED FOR THE EXCLUSIVE USE OF THE PERSON, PERSONS, OR ENTITY NAMED HEREON. THIS PLAT DOES NOT EXTEND TO ANY UNNAMED PERSON, PERSONS OR ENTITY WITHOUT EXPRESS WRITTEN CERTIFICATION BY THE SURVEYOR NAMING SAID PERSON, PERSONS, OR ENTITY.
8. STATE, COUNTY, & LOCAL BUFFERS AND SETBACKS MIGHT EXIST ON THE SUBJECT PROPERTY THAT ARE NOT SHOWN HEREON.
9. THIS SURVEY IS NOT VALID WITHOUT THE ORIGINAL SIGNATURE AND SEAL OF A KENTUCKY LICENSED LAND SURVEYOR.
10. DURING THE TIME OF THE SURVEY THERE WAS NOT OBSERVED ANY EVIDENCE OF RECENT EARTH MOVING WORK, BUILDING CONSTRUCTION, OR BUILDING ADDITIONS OBSERVED IN THE PROCESS OF CONDUCTING THE FIELDWORK.
11. DURING THE COURSE OF THE SURVEY, THERE WERE NOT ANY PROPOSED CHANGES IN STREET RIGHT OF WAY LINES, OR SIDEWALK CONSTRUCTION OR REPAIRS BY EITHER VISIBLE MEANS OR IN ANY OF THE RESEARCH REVIEWED, OBTAINED OR PROVIDED.
12. DURING THE COURSE OF THE SURVEY, OTHER THAN SHOWN HEREON, THERE WERE NOT ANY PLOTTABLE OFFSITE (I.E., APPURTENANT) EASEMENTS OR SERVITUDES DISCLOSED IN DOCUMENTS PROVIDED TO OR OBTAINED BY THE SURVEYOR AS A PART OF THIS SURVEY.
13. THE PROPERTY SHOWN HAS NO EVIDENCE OF THE SITE BEING USED AS A SOLID WASTE DUMP, SLUMP, OR SANITARY LANDFILL AT THE TIME OF THE FIELD SURVEY.
14. THE TOPOGRAPHIC SURVEY SHOWN HEREON IS ACCURATE TO ONE HALF OF THE CONTOUR INTERVAL SHOWN. THE SURVEY HAS A ONE FOOT CONTOUR INTERVAL AND THE TOPOGRAPHIC SURVEY IS ACCURATE TO 0.5 FEET.
15. THE TOPOGRAPHIC CONTOURS AND MAPPING SHOWN HEREON WAS PROVIDED BY HALIS, AN AERIAL MAPPING COMPANY BASED IN McDONOUGH, GEORGIA THAT PROVIDES LiDAR AND IMAGERY DATA ACQUISITION AND GEOSPATIAL SERVICES.

LEGEND

FIR	FOUND IRON ROD		STORM SEWER LINE
	EXISTING MAILBOX		SANITARY SEWER MANHOLE
IPF	IRON PIPE FOUND		STORM SEWER MANHOLE
IRF	IRON REBAR FOUND		CATCH BASIN/INLET
F	CONCRETE MONUMENT		SANITARY SEWER
U.P.	UTILITY POLE	C.O.	SANITARY CLEANOUT
	EXISTING ELECTRIC TRANSFORMER	G	GAS LINE
	EXISTING CULVERT		GAS METER
	EXISTING TELEPHONE MARKER	W	WATER LINE – UNDERGROUND
	EXISTING WETLAND MARKER		WATER GATE VALVE
	LIGHT POLE		FIRE HYDRANT
	SIGN	OHE	OVERHEAD ELECTRIC LINE
	GUY WIRE	E	UNDERGROUND ELECTRIC LINE
TPED	TELEPHONE RISER	T	UNDERGROUND TELEPHONE
×280.64	SPOT ELEVATION		EXISTING BUILDING
	CONTOUR		EXISTING WETLAND
	CONTOUR INDEX	13	TITLE EXCEPTION FLAG
	BOUNDARY LINE		
	EXISTING EDGE OF ROAD		
	EDGE OF WATER		
	FENCE		
	WOODS/HEDGE LINE		

SURVEYOR'S CERTIFICATION

TO: ByWa r.e. RENEWABLE ENERGY; AND STEWART TITLE GUARANTY COMPANY;

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2016 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4, 5, 6(a), 6(b), 7(a), 7(b-1), 7(c), 8, 9, 10(a), 11, 13, 14, 16, 17, 18, 19 & 20 OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON SEPTEMBER 3, 2020

STATE OF KENTUCKY
CLYDE R. ELDREDGE
4332
LICENSED PROFESSIONAL LAND SURVEYOR

FOR REVIEW

CLYDE R. ELDREDGE, PLS DATE
KENTUCKY REGISTERED LAND SURVEYOR
REGISTRATION NUMBER 4332

811
Know what's below.
Call before you dig.

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NOTICE:
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CLIENT
BayWa r.e. Renewable Energy

ALTA/NSPS LAND TITLE SURVEY OF THE SPENCER TRACTS I AND II BLUEBIRD SOLAR, LLC SITE U.S. HIGHWAY 62 And STATE ROUTE No. 353

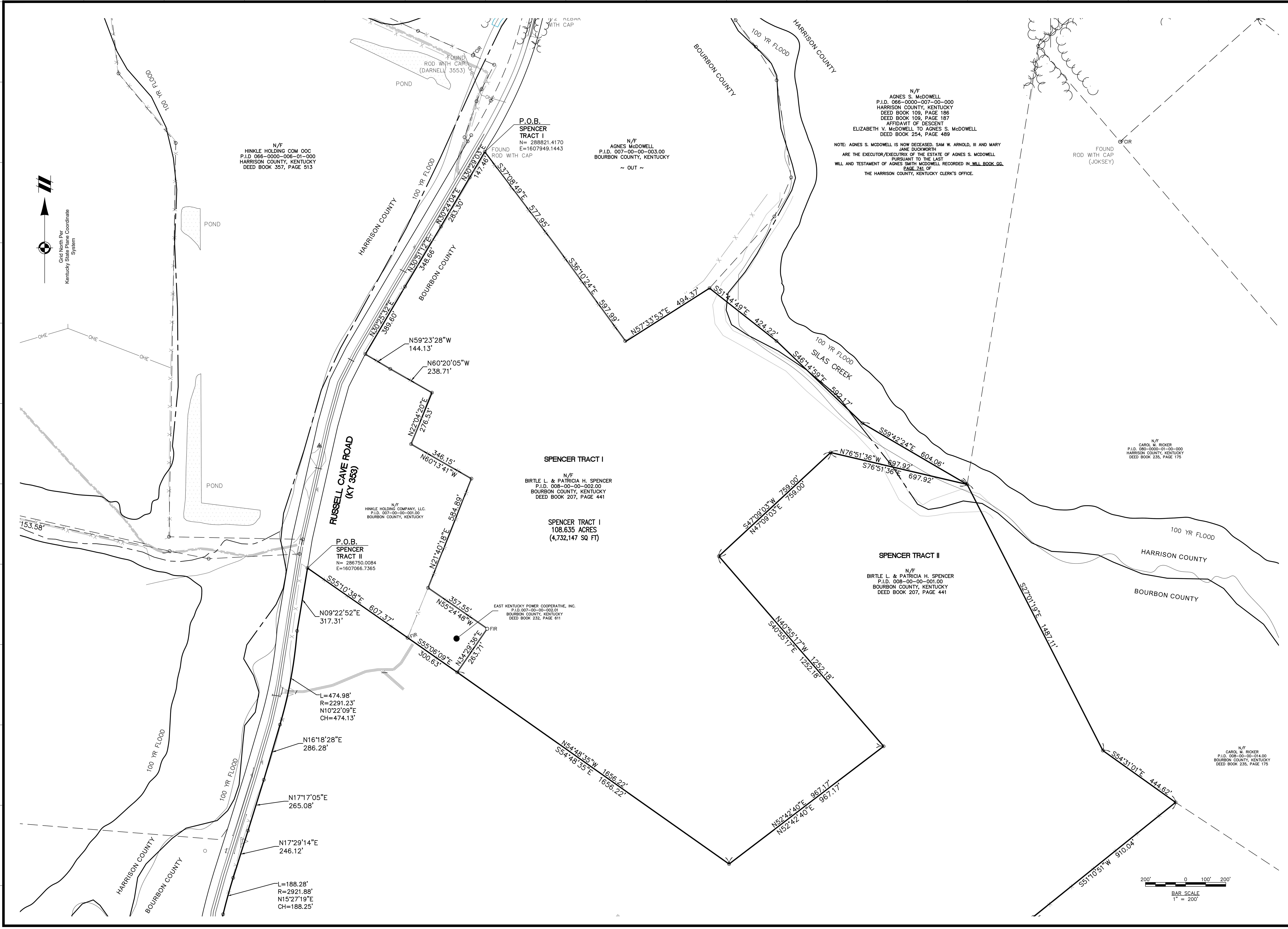
LOCATED IN
BOURBON COUNTY, PARIS KENTUCKY
& HARRISON COUNTY
CYNTHIANA, KENTUCKY

ATWELL
866.850.4200 www.atwell-group.com
1255 LAKES PARKWAY, BLDG 100, SUITE 120
LAWRENCEVILLE, GA 30043
(770) 423-0807
SURVEY COA #PS778

DATE OF SURVEY: FEBRUARY 8, 2021
REVISIONS

JOB No. 20002456
NO SCALE
DR. CE CH. CE
P.M. A. HARPER
SHEET NO.

CAD FILE: 20002456 AS SPENCER-01.DWG



811 Know what's below. Call before you dig.

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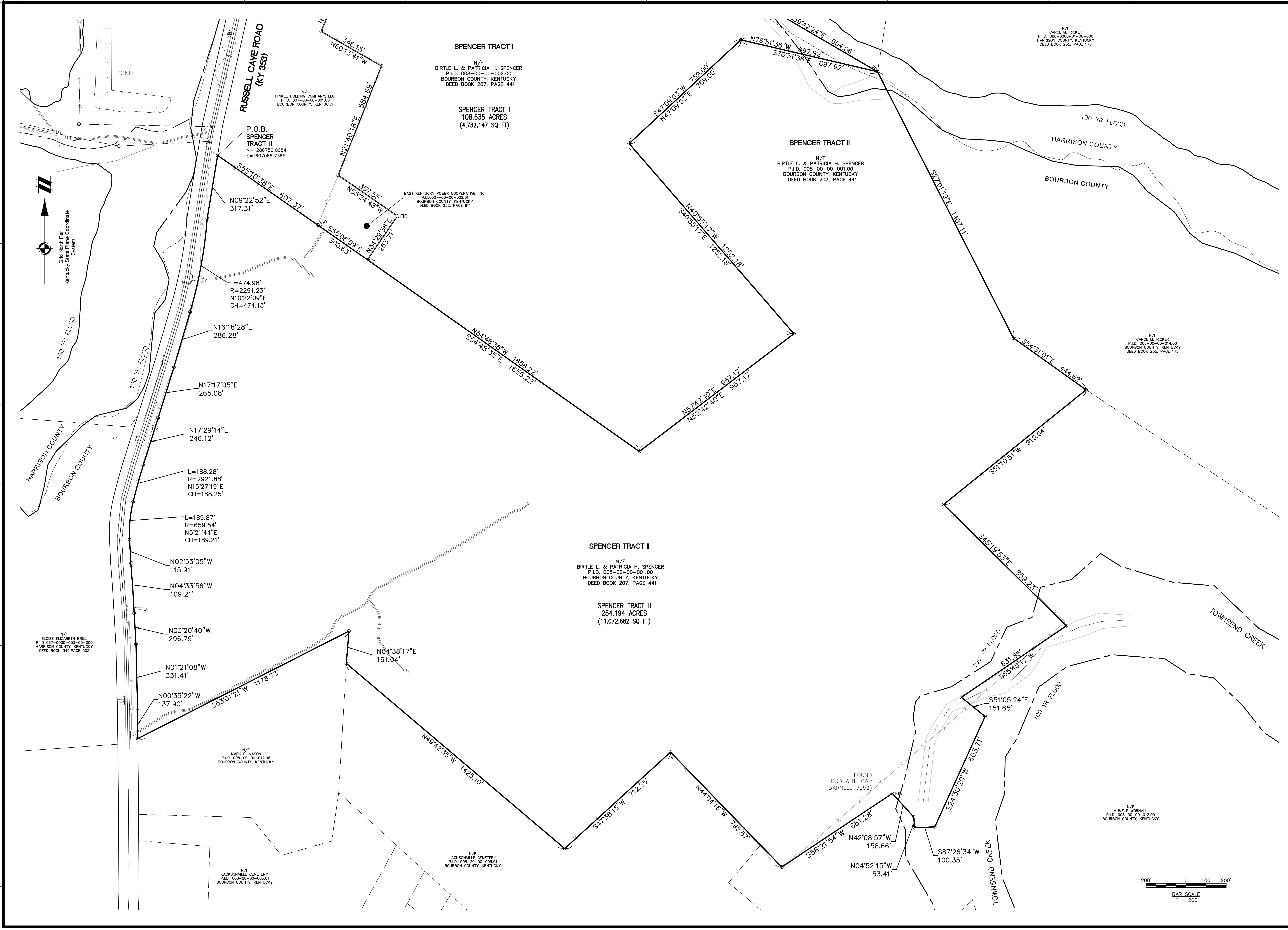
BLUEBIRD SOLAR, LLC SITE
U.S. HIGHWAY 62 And STATE ROUTE No. 353

DATE
FEBRUARY 8, 2021

REVISIONS

SCALE 0 100 200
1" = 200 FEET
DR. CE | CH. DAH
P.M. A. HARPER
BOOK --
JOB 20002456
SHEET NO.
2 OF 4

CAD FILE: 20002456 AS SPENCER-01.DWG



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LOCATED IN
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CYNTHIANA, KENTUCKY

CLIENT
BayWa r.e. Renewable Energy

ALTA/NSPS LAND TITLE SURVEY OF THE SPENCER TRACTS I AND II BLUEBIRD SOLAR, LLC SITE U.S. HIGHWAY 62 And STATE ROUTE No. 353

DATE FEBRUARY 8, 2021

REVISIONS

SCALE 0 100 200
1" = 200 FEET

DR. CE	CH. DAH
P.M. A. HARPER	
BOOK --	
JOB 20002456	
SHEET NO. 3 OF 4	

CAD FILE: 20002456 AS SPENCER-01.DWG

"AS SURVEYED" LEGAL DESCRIPTION

Spencer Tract I
Birtle L. & Patricia H. Spencer
Bourbon County, Kentucky
(Deed Book 207, Page 441)

Being Parcel Identification No. 008-00-00-002.00

ALL That certain tract or parcel of land, lying and being located in Bourbon County, Kentucky and situated on the east side of Russell Cave Road (Ky 353); and being more particularly described as follows:

Commencing at an iron rod found with cap located on the easterly right-of-way line of Russell Cave Road (Ky 353), said right-of-way being 100-feet wide at this point, said point having State Plane coordinates of Northing: 288821.4170, Easting: 1607949.1443 and being a corner to Agnes McDowell, Parcel Identification No. 007-00-00-003.00 and also being the POINT OF BEGINNING;

THENCE leaving the said easterly right-of-way line of Russell Cave Road (variable width right-of-way, 100-feet wide at this point) proceed South 37°08'49" East, a distance of 577.95 feet to a point being a corner to Agnes McDowell;

THENCE South 36°10'24" East, a distance of 597.99 feet to a point being a corner to Agnes McDowell;

THENCE North 57°33'53" East, a distance of 494.37 feet to a point being a corner to Agnes McDowell and Agnes S. McDowell, (D.B. 109, Page 186);

THENCE South 51°44'49" East, a distance of 424.22 feet to a point being a corner to Agnes S. McDowell;

THENCE South 46°14'59" East, a distance of 592.17 feet to a point being a corner to Agnes S. McDowell;

THENCE South 59°42'24" East, a distance of 604.06 feet to a point being a corner to Agnes S. McDowell (D.B. 109, Page 186), and Carol M. Ricker, (D.B. 235, PG 175), and Birtle L. & Patricia H. Spencer (D.B. 207, PG 441);

THENCE North 76°51'36" West, a distance of 697.92 feet to a point being a corner to Birtle L. & Patricia H. Spencer;

THENCE South 47°09'03" West, a distance of 759.00 feet to a point being a corner to Birtle L. & Patricia H. Spencer;

THENCE South 40°55'17" East, a distance of 1252.18 feet to a point being a corner to Birtle L. & Patricia H. Spencer;

THENCE South 52°42'40" West, a distance of 967.17 feet to a point being a corner to Birtle L. & Patricia H. Spencer;

THENCE North 54°48'35" West, a distance of 1656.22 feet to a point being a corner to Birtle L. & Patricia H. Spencer and East Kentucky Power cooperative, Inc. (D.B. 232, PG 611);

THENCE North 34°29'36" East, a distance of 263.71 feet to an iron pin found, a one-half inch rebar being a corner to Birtle L. & Patricia H. Spencer and East Kentucky Power cooperative, Inc.;

THENCE North 55°24'48" West, a distance of 357.55 feet to a point being a corner to Birtle L. & Patricia H. Spencer and East Kentucky Power cooperative, Inc., and Hinkle Holding Company, LLC;

THENCE North 21°40'18" East, a distance of 584.89 feet to a point being a corner to Hinkle Holding Company, LLC;

THENCE North 60°13'41" West, a distance of 346.15 feet to a point being a corner to Hinkle Holding Company, LLC;

THENCE North 22°04'20" East, a distance of 276.53 feet to a point being a corner to Hinkle Holding Company, LLC;

THENCE North 60°20'05" West, a distance of 238.71 feet to a point being a corner to Hinkle Holding Company, LLC;

THENCE North 59°23'28" West, a distance of 144.13 feet to a point being a corner to Hinkle Holding Company, LLC and also on the easterly right-of-way line of Russell Cave Road (Ky 353) being 100-feet wide at this point;

THENCE along the said easterly right-of-way line of Russell Cave Road North 30°25'32" East, a distance of 389.60 feet to a point;

THENCE continuing along the said easterly right-of-way line North 30°51'12" East, a distance of 348.66 feet to a point;

THENCE along the said easterly right-of-way line North 30°24'04" East, a distance of 283.30 feet to a point;

THENCE along the said easterly right-of-way line North 30°29'03" East, a distance of 147.46 feet to the POINT OF BEGINNING.

Said tract or parcel of land containing 4,732,147 Square Feet or 108.635 Acres, more or less.

"AS SURVEYED" LEGAL DESCRIPTION

Spencer Tract II
Birtle L. & Patricia H. Spencer
Bourbon County, Kentucky
(Deed Book 207, Page 441)

Being Parcel Identification No. 008-00-00-001.00

ALL That certain tract or parcel of land, lying and being located in Bourbon County, Kentucky and situated on the east side of Russell Cave Road (Ky 353); and being more particularly described as follows:

Commencing at a point located on the easterly right-of-way line of Russell Cave Road (Ky 353), said right-of-way being 100-feet wide at this point, said point having State Plane coordinates of Northing: 288821.4170, Easting: 1607949.1443 and being a corner to Agnes McDowell, Parcel Identification No. 007-00-00-003.00 and also being the POINT OF BEGINNING;

THENCE leaving the said easterly right-of-way line of Russell Cave Road (variable width right-of-way, 100-feet wide at this point) proceed South 55°10'38" East, a distance of 607.37 feet to an iron pin found and being a corner to Hinkle Holding Company, LLC, and to East Kentucky Power cooperative, Inc. (D.B. 232, PG 611);

THENCE South 55°06'09" East, a distance of 300.63 feet to a point being a corner to East Kentucky Power cooperative, Inc. (D.B. 232, PG 611) and Birtle L. & Patricia H. Spencer (D.B. 207, PG 441);

THENCE South 54°48'35" East, a distance of 1656.22 feet to a point being a corner to Birtle L. & Patricia H. Spencer;

THENCE North 52°42'40" East, a distance of 967.17 feet to a point being a corner to Birtle L. & Patricia H. Spencer;

THENCE North 40°55'17" West, a distance of 1252.18 feet to a point being a corner to Birtle L. & Patricia H. Spencer;

THENCE North 47°09'03" East, a distance of 759.00 feet to a point being a corner to Birtle L. & Patricia H. Spencer;

THENCE South 76°51'36" East, a distance of 697.92 feet to a point being a corner to Birtle L. & Patricia H. Spencer and Carol M. Ricker (D.B. 235, PG 1 75)

THENCE South 27°01'19" East, a distance of 1487.11 feet to a point being a corner to Birtle L. & Patricia H. Spencer and Carol M. Ricker;

THENCE South 54°31'01" East, a distance of 444.62 feet to a point Birtle L. & Patricia H. Spencer and Carol M. Ricker and to Hume P. Wornall;

THENCE South 51°10'51" West, a distance of 910.04 feet to a point being a corner to Hume P. Wornall;

THENCE South 45°19'53" East, a distance of 859.23 feet to a point being a corner to Hume P. Wornall;

THENCE South 55°45'17" West, a distance of 631.85 feet to a point being a corner to Hume P. Wornall;

THENCE South 51°05'24" East, a distance of 151.65 feet to a point being a corner to Hume P. Wornall;

THENCE South 24°30'20" West, a distance of 603.71 feet to a point being a corner to Hume P. Wornall;

THENCE South 87°26'34" West, a distance of 100.35 feet to a point being a corner to Hume P. Wornall;

THENCE North 04°52'15" West, a distance of 53.41 feet to a point being a corner to Hume P. Wornall;

THENCE North 42°08'57" West, a distance of 158.66 feet to a found iron rod with cap marked (Darnell 3553) being a corner to Hume P. Wornall;

THENCE South 56°21'54" West, a distance of 661.28 feet to a point being a corner to Hume P. Wornall;

THENCE North 44°04'16" West, a distance of 795.67 feet to a point being a corner to Jacksonville Cemetery;

THENCE South 47°38'15" West, a distance of 712.25 feet to a point being a corner to Jacksonville Cemetery;

THENCE North 49°42'35" West, a distance of 1425.10 feet to a point being a corner to Jacksonville Cemetery and to Mark E. Nason;

THENCE North 04°38'17" East, a distance of 161.04 feet to a point being a corner to Mark E. Nason;

THENCE South 63°01'21" West, a distance of 1178.73 feet to a point being a corner to Mark E. Nason and also being on the easterly right-of-way line of Russell Cave Road (Ky 353), said right-of-way being 100-feet wide at this point,

THENCE along the said easterly right-of-way line the following bearings and distances:

1. North 00°35'22" West, a distance of 137.90 feet to a point;
2. North 01°21'08" West, a distance of 331.41 feet to a point;
3. North 03°20'40" West, a distance of 296.79 feet to a point;
4. North 04°33'56" West, a distance of 109.21 feet to a point;
5. North 02°53'05" West, a distance of 115.91 feet to a point
6. THENCE northwesterly and northerly a distance of 189.87 feet along the arc of a curve to the right, having a radius of 659.54 feet and being subtended by a chord which bears North 05°21'44" East, for a distance of 189.21 feet, to a point;
7. THENCE northerly a distance of 188.28 feet along the arc of a curve to the right having a radius of 2921.88 feet and being subtended by a chord which bears North 15°27'19" East, for a distance of 188.25 feet, to a point;;
8. North 17°29'14" East, a distance of 246.12 feet to a point;
9. North 17°17'05" East, a distance of 265.08 feet to a point;
10. North 16°18'28" East, a distance of 286.28 feet to a point
11. THENCE northerly a distance of 474.98 feet along the arc of a curve to the left, having a radius of 2291.23 feet and being subtended by a chord which bears North 10°22'09" East, for a distance of 474.13 feet, to a point;
12. North 09°22'52" East, a distance of 317.31 feet to the POINT OF BEGINNING.

Said tract or parcel of land containing 11,072,682 Square Feet or 254.194 Acres, more or less.

Know what's **below.**
Call before you dig.

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SURVEY COA #PS778

LOCATED IN
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& HARRISON COUNTY
CYNTHIANA, KENTUCKY

CLIENT
BayWa r.e. Renewable Energy

ALTA/NSPS LAND TITLE SURVEY OF THE SPENCER TRACTS I AND II
BLUEBIRD SOLAR, LLC SITE
U.S. HIGHWAY 62 And STATE ROUTE No. 353

DATE
FEBRUARY 8, 2021

REVISIONS

SCALE 0 100 200
1" = 200 FEET
DR. CE | CH. DAH
P.M. A. HARPER
BOOK --
JOB 20002456
SHEET NO.
4 OF 4

ALTA/NSPS LAND TITLE SURVEY

OF 2,219.863 ± ACRES OF LAND

PREPARED FOR

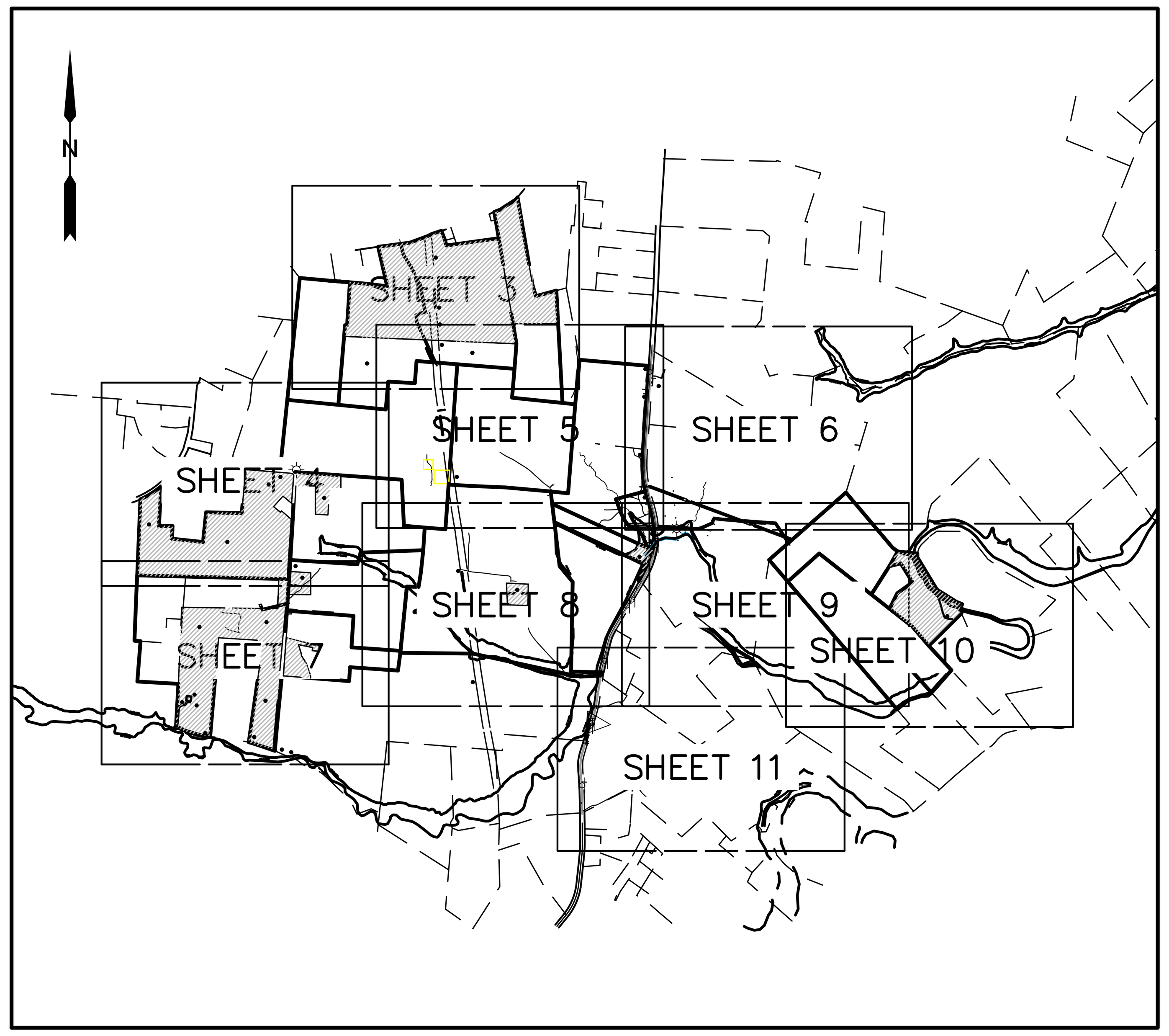
BayWa r.e. RENEWABLE ENERGY; BLUEBIRD SOLAR, LLC; BLUE JAY SOLAR, LLC; And BLUEBIRD SOLAR

PROPERTY OF:

Parcel 1: Troy L. Bradford and Mary Ware Bradford
Parcel 2: Jerry T. Dawson
Parcel 3: William R. Hilliard, Jr.,
Parcel 4: Joe Mike McDaniel
Parcel 5: Gerald M. Whalen
Parcel 6: Deacons At the Regular Baptist Church at Silas, now called Silas Baptist Church, Reservation of lifetime estates in favor of Charles Allen McDaniel, Tom Gilkerson, and Opal Gilkerson as set forth in deed.
Parcel 7: James Evans Wilson and Katherine Allen Wilson
Parcel 8: Sam W. Arnold III
Parcel 9: Dana H. Reed and Trudie Reed
Parcel 10: Douglas Hines and Sara Hines
Parcel 11: Agnes McDowell _on County, Kentucky Clerk's Office.
(Note: Agnes S. McDowell is now deceased. Sam W. Arnold, III and Mary Jane Duckworth are the Executor/Executrix of the Estate of Agnes S. McDowell pursuant to the Last Will and Testament of Agnes Smith McDowell)

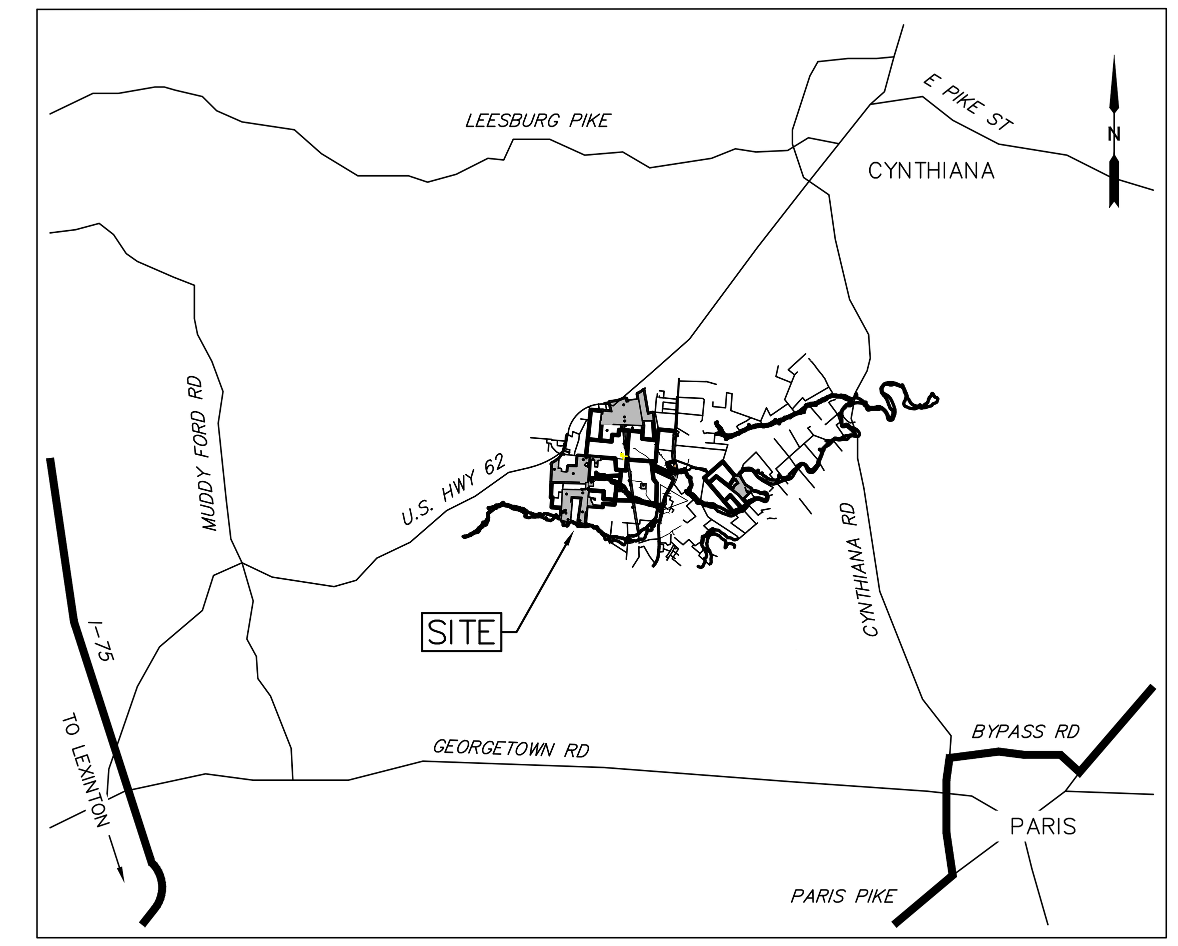
LOCATED ALONG THE FOLLOWING PUBLIC ROADS:

LEESBURG PIKE (STATE ROUTE 62);
RUSSELL CAVE ROAD (KY 353); SILAS PIKE; AND ALLEN PIKE



SHEET INDEX

SHEET INDEX FOR SHEETS No. 3 - 11, AT THE SCALE OF 1" = 200'



VICINITY MAP
NOT TO SCALE

DATUMS

Horizontal: Grid North, NAD83, Kentucky
(North American Datum of 1983) (2011)
Survey Foot, Bourbon & Harrison County, Kentucky
Vertical: NAVD88 (North American Vertical Datum of 1988)
Geoid: Geoid12B Conus

SHEET INDEX

SHEET 1	COVER SHEET
SHEET 2	OVERALL BOUNDARY SURVEY
SHEETS 3 - 11	BOUNDARY SURVEY, SHEETS @ 1" = 200' SCALE
SHEET 12	TOPOGRAPHIC SURVEY OF ADDITIONAL AREA
SHEETS 13 -15	TITLE COMMITMENT & EXHBIT "A" LEGAL DESCRIPTIONS

LEGEND

FIR	FOUND IRON ROD		
	EXISTING MAILBOX		STORM SEWER LINE
IPF	IRON PIPE FOUND	S	SANITARY SEWER MANHOLE
IRF	IRON REBAR FOUND	ST	STORM SEWER MANHOLE
F	CONCRETE MONUMENT		CATCH BASIN/INLET
U.P.	UTILITY POLE		SANITARY SEWER
e	EXISTING ELECTRIC TRANSFORMER	C.O.	SANITARY CLEANOUT
	EXISTING CULVERT	G G	GAS LINE
T	EXISTING TELEPHONE MARKER	G	GAS METER
W	EXISTING WETLAND MARKER	W	WATER LINE – UNDERGROUND
	LIGHT POLE		WATER GATE VALVE
	SIGN		FIRE HYDRANT
	GUY WIRE	OHE OHE	OVERHEAD ELECTRIC LINE
TPED	TELEPHONE RISER	E E	UNDERGROUND ELECTRIC LINE
×280.64	SPOT ELEVATION	T T	UNDERGROUND TELEPHONE
	CONTOUR		EXISTING BUILDING
	CONTOUR INDEX		EXISTING WETLAND
	BOUNDARY LINE	40	TITLE EXCEPTION MARKER
	EXISTING EDGE OF ROAD		AREA NOT INCLUDED IN THE FUTURE DEVELOPMENT
	EDGE OF WATER		
x x x	FENCE		
	WOODS/HEDGE LINE		

FLOOD NOTE

1. PORTIONS OF THE SITE SHOWN HEREON IS LOCATED WITHIN A FLOOD HAZARD ZONE AND IS FOUND TO BE LOCATED WITHIN THE FOLLOWING FLOOD HAZARD AREAS:
   -- ZONE A (AREAS DETERMINED TO BE INSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN)
   -- ZONE AE (AREAS WITH BASE FLOOD ELEVATION DETERMINED)
   -- ZONE AE - FLOODWAY (FLOODWAY AREAS IN ZONE AE)

   THIS INFORMATION IS ACCORDING TO:
   A.) MAP (PANEL) NUMBER 21209C0150D, EFFECTIVE DATE: DECEMBER 21, 2017 AND
   B.) MAP (PANEL) NUMBER 21097C0265C, EFFECTIVE DATE: JANUARY 6, 2011.

SURVEYOR'S CERTIFICATION

TO: ByWa r.e. RENEWABLE ENERGY; AND STEWART TITLE GUARANTY COMPANY;

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2016 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4, 5, 6(a), 6(b), 7(a), 7(b-1), 7(c), 8, 9, 10(a), 11, 13, 14, 16, 17, 18, 19 & 20 OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON APRIL 23, 2021.

STATE OF KENTUCKY
CLYDE R. ELDREDGE
4332
LICENSED PROFESSIONAL LAND SURVEYOR

June 29, 2021
CLYDE R. ELDREDGE, PLS DATE
KENTUCKY REGISTERED LAND SURVEYOR
REGISTRATION NUMBER 4332

AREA TABLE

PARCEL 1:	11,842,686	Sq Ft,	271.871	Acres
PARCEL 2:	4,565,925	Sq Ft,	104.819	Acres
PARCEL 3:	5,963,425	Sq Ft,	136.901	Acres
PARCEL 4, TR-1:	3,441,721	Sq Ft,	79.011	Acres
PARCEL 4, TR-2:	10,097,083	Sq Ft,	231.797	Acres
PARCEL 5:	7,911,787	Sq Ft,	181.630	Acres
PARCEL 6:	2,555,957	Sq Ft,	58.677	Acres
PARCEL 7 -TR-1	5,395,417	Sq Ft,	123.862	Acres
PARCEL 7 -TR-2A	8,181,595	Sq Ft,	187.824	Acres
PARCEL 7 - TR-2B	4,213,601	Sq Ft,	96.731	Acres
PARCEL 8:	827,833	Sq Ft,	19.004	Acres
PARCEL 9:	4,887,748	Sq Ft,	112.007	Acres
PARCEL 10:	4,800,335	Sq Ft,	110.201	Acres
PARCEL 11-A :	6,053,765	Sq Ft,	138.975	Acres
PARCEL 11-B :	15,904,268	Sq Ft,	365.112	Acres
PARCEL 11-C :	54,070	Sq Ft,	1.241	Acres
TOTAL:	96,697,216	Sq Ft	2,219.863	Acres

SURVEY NOTES

1. THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND IS FOUND TO BE ACCURATE WITHIN:

PARCEL 1:	ONE FOOT IN	1,686,833 FEET
PARCEL 2:	ONE FOOT IN	798,792 FEET
PARCEL 3:	ONE FOOT IN	1,696,602 FEET
PARCEL 4, TR-1:	ONE FOOT IN	722,072 FEET
PARCEL 4, TR-2:	ONE FOOT IN	2,547,950 FEET
PARCEL 5:	ONE FOOT IN	1,584,911 FEET
PARCEL 6:	ONE FOOT IN	997,966 FEET
PARCEL 7, TR-1:	ONE FOOT IN	1,809,109 FEET
PARCEL 7, TR-2A:	ONE FOOT IN	1,841,828 FEET
PARCEL 7, TR-2B:	ONE FOOT IN	775,293 FEET
PARCEL 8:	ONE FOOT IN	5,119,145 FEET
PARCEL 9:	ONE FOOT IN	1,486,561 FEET
PARCEL 10:	ONE FOOT IN	794,804 FEET
PARCEL 11-A:	ONE FOOT IN	2,506,239 FEET
PARCEL 11-B:	ONE FOOT IN	1,880,702 FEET
PARCEL 11-C:	ONE FOOT IN	967,477 FEET

2. ALL EASEMENTS AND RIGHTS OF WAY OF WHICH THE SURVEYOR HAS KNOWLEDGE ARE SHOWN HEREON. OTHERS MAY EXIST OF WHICH THE SURVEYOR HAS NO KNOWLEDGE AND OF WHICH THERE IS NO OBSERVABLE EVIDENCE.

3. THE PROPERTY SHOWN IS SUBJECT TO ALL EASEMENTS AND RESTRICTIONS OF RECORD BOTH WRITTEN AND UNWRITTEN

4. THE LOCATIONS OF UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON VISIBLE STRUCTURES AND MAPS AND/OR FIELD LOCATED MARKINGS PROVIDED BY THE UTILITY COMPANIES SERVICING THAT UTILITY AND ARE APPROXIMATE ONLY. THE PROPERTY SHOWN HEREON MAY BE SERVED BY UNDERGROUND UTILITIES WHICH ARE NOT SHOWN HEREON. ALL UTILITY COMPANIES SHOULD BE CONTACTED BEFORE BEGINNING ANY DESIGN, DIGGING OR CONSTRUCTION.

5. NORTH ARROW AND BEARINGS SHOWN ARE BASED ON THE KENTUCKY STATE PLANE COORDINATE SYSTEM, NAD 83 (North American Datum of 1983) (ADJUSTED 2011), FOR THIS SURVEY THE STATE PLANE COORDINATES WERE OBTAINED USING RTK OBSERVATIONS TIED INTO THE KENTUCKY VRS STATE WIDE NETWORK . ALL DISTANCES SHOWN ARE HORIZONTAL GROUND MEASUREMENTS AND ARE EXPRESSED IN SURVEY FEET.

6. THE EQUIPMENT USED FOR MEASUREMENT IS:
   ANGULAR: TRIMBLE S8 ROBOTIC TOTAL STATION
   LINEAR: TRIMBLE S8 ROBOTIC TOTAL STATION
   GPS: TRIMBLE R8 GPS RECIEVER

7. THIS PLAT WAS PREPARED FOR THE EXCLUSIVE USE OF THE PERSON, PERSONS, OR ENTITY NAMED HEREON. THIS PLAT DOES NOT EXTEND TO ANY UNNAMED PERSON, PERSONS OR ENTITY WITHOUT EXPRESS WRITTEN CERTIFICATION BY THE SURVEYOR NAMING SAID PERSON, PERSONS, OR ENTITY.

8. STATE, COUNTY, & LOCAL BUFFERS AND SETBACKS MIGHT EXIST ON THE SUBJECT PROPERTY THAT ARE NOT SHOWN HEREON.

9. THIS SURVEY IS NOT VALID WITHOUT THE ORIGINAL SIGNATURE AND SEAL OF A KENTUCKY LICENSED LAND SURVEYOR.

10. DURING THE TIME OF THE SURVEY THERE WAS NOT OBSERVED ANY EVIDENCE OF RECENT EARTH MOVING WORK, BUILDING CONSTRUCTION, OR BUILDING ADDITIONS OBSERVED IN THE PROCESS OF CONDUCTING THE FIELDWORK.

11. DURING THE COURSE OF THE SURVEY, THERE WERE NOT ANY PROPOSED CHANGES IN STREET RIGHT OF WAY LINES, OR SIDEWALK CONSTRUCTION OR REPAIRS BY EITHER VISIBLE MEANS OR IN ANY OF THE RESEARCH REVIEWED, OBTAINED OR PROVIDED.

12. DURING THE COURSE OF THE SURVEY, OTHER THAN SHOWN HEREON, THERE WERE NOT ANY PLOTTABLE OFFSITE (I.E., APPURTENANT) EASEMENTS OR SERVITUDES DISCLOSED IN DOCUMENTS PROVIDED TO OR OBTAINED BY THE SURVEYOR AS A PART OF THIS SURVEY.

13. THE PROPERTY SHOWN HAS NO EVIDENCE OF THE SITE BEING USED AS A SOLID WASTE DUMP, SLUMP, OR SANITARY LANDFILL AT THE TIME OF THE FIELD SURVEY.

14. THE TOPOGRAPHIC SURVEY SHOWN HEREON IS ACCURATE TO ONE HALF OF THE CONTOUR INTERVAL SHOWN. THE SURVEY HAS A ONE FOOT CONTOUR INTERVAL AND THE TOPOGRAPHIC SURVEY IS ACCURATE TO 0.5 FEET.

15. THE TOPOGRAPHIC CONTOURS AND MAPPING SHOWN HEREON WAS PROVIDED BY HALIS, AN AERIAL MAPPING COMPANY BASED IN McDONOUGH, GEORGIA THAT PROVIDES LiDAR AND IMAGERY DATA ACQUISITION AND GEOSPATIAL SERVICES.

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CLIENT: BayWa r.e. Renewable Energy

ALTA/NSPS LAND TITLE SURVEY OF THE BLUEBIRD SOLAR, LLC SITE U.S. HIGHWAY 62 And STATE ROUTE No. 353

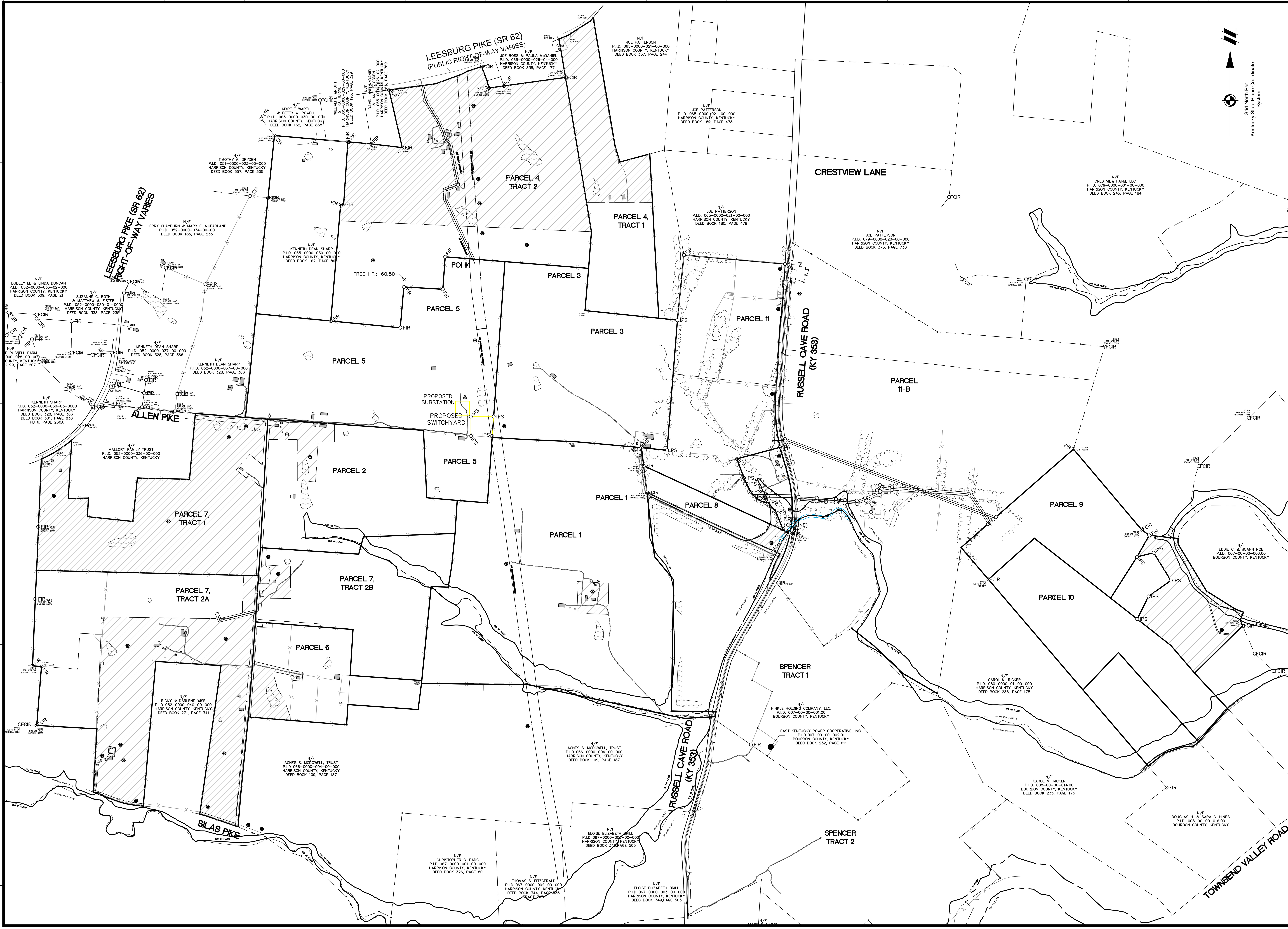
LOCATED IN
BOURBON COUNTY, PARIS KENTUCKY
& HARRISON COUNTY
CYNTHIANA, KENTUCKY

ATWELL
866.850.4200 www.atwell-group.com
1255 LAKES PARKWAY, BLDG 100, SUITE 120
LAWRENCEVILLE, GA 30043
(770) 423-0807
SURVEY COA #PS778

DATE OF SURVEY: NOVEMBER 24, 2020
1. REVISIONS JUNE 24, 2021
REVISIONS

JOB No. 20002456
NO SCALE
DR. AH CH. AH
P.M. A. HARPER
SHEET NO. 1 OF 12

CAD FILE: 20002456 AS-03.DWG



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U.S. HIGHWAY 62 And
STATE ROUTE No. 353

DATE
NOVEMBER 24, 2020

1. REVISIONS JUNE 24, 2021

REVISIONS

SCALE 0 300 600
1" = 600 FEET

DR. AH | CH. DLA
P.M. A. HARPER
BOOK --
JOB 20002456
SHEET NO.
2 OF 12

CAD FILE: 20002456 AS-03.DWG


LEGEND
FOUND IRON ROD
EXISTING MAILBOX
IRON PIPE FOUND
IRON REBAR FOUND
CONCRETE MONUMENT
UTILITY POLE
EXISTING ELECTRIC TRANSFORMER
EXISTING CULVERT
EXISTING TELEPHONE MARKER
EXISTING WETLAND MARKER
LIGHT POLE
SIGN
GUY WIRE
TELEPHONE RISER
SPOT ELEVATION
CONTOUR
CONTOUR INDEX
BOUNDARY LINE
EXISTING EDGE OF ROAD
EDGE OF WATER
FENCE
WOODS/HEDGE LINE
STORM SEWER LINE
SANITARY SEWER MANHOLE
STORM SEWER MANHOLE
CATCH BASIN/INLET
SANITARY SEWER
SANITARY CLEANOUT
GAS LINE
GAS METER
WATER LINE – UNDERGROUND
WATER GATE VALVE
FIRE HYDRANT
OVERHEAD ELECTRIC LINE
UNDERGROUND ELECTRIC LINE
UNDERGROUND TELEPHONE
EXISTING BUILDING
EXISTING WETLAND
TITLE EXCEPTION MARKER
AREA NOT INCLUDED IN THE FUTURE DEVELOPMENT
LEESBURG PIKE (SR 62)
(PUBLIC RIGHT-OF-WAY VARIES)
P.O.C.
50' Access Easement
N: 296,186.954
E:1,602,159.845
P.O.B.
50' Access Easement
N: 296,246.536
E:1,602,631.979
AREA
PARCEL 4, TRACT 2
50' ACCESS EASEMENT
3.374 ACRES
(146,973 SQ FT)
50' ACCESS EASEMENT
150' TRANSMISSION LINE EASEMENT
PARCEL 4, TRACT 2
N/F
JOE MIKE McDANIEL
P.I.D. 065-0000-026-00-000
HARRISON COUNTY, KENTUCKY
DEED BOOK 195, PAGE 122
PARCEL 4 – TRACT 2
231.797 ACRES
(10,097,083 SQ FT)
PARCEL 4, TRACT 1
N/F
JOE MIKE McDANIEL
P.I.D. 065-0000-024-00-000
HARRISON COUNTY, KENTUCKY
DEED BOOK 140, PAGE 250
PARCEL 4 – TRACT 1
79.011 ACRES
(3,441,721 SQ FT)
N/F
JOE ROSS & PAULA McDANIEL
P.I.D. 065-0000-026-04-000
HARRISON COUNTY, KENTUCKY
DEED BOOK 335, PAGE 177
N/F
JOE PATTERSON
P.I.D. 065-0000-021-00-000
HARRISON COUNTY, KENTUCKY
DEED BOOK 357, PAGE 244
N/F
JOE PATTERSON
P.I.D. 065-0000-021-00-000
HARRISON COUNTY, KENTUCKY
DEED BOOK 180, PAGE 478
N/F
MYRTLE WARTH
& BETTY W. POWELL
P.I.D. 065-0000-030-00-000
HARRISON COUNTY, KENTUCKY
DEED BOOK 162, PAGE 868
N/F
KENNETH DEAN SHARP
P.I.D. 065-0000-030-00-000
HARRISON COUNTY, KENTUCKY
DEED BOOK 162, PAGE 868
PROPOSED LIMITS
POND
WOOD BARN
POI #1
PARCEL 5
TREE HT.: 60.50
FOUND ROD WITH CAP (DARNELL 3553)
FOUND R/W MON.
FOUND 1/2" REBAR
N62°47'46"E 101.96'
N71°30'00"E 221.55'
S20°58'46"E 227.33'
S14°43'14"E 112.35'
N82°08'22"E 930.70'
R/W N69°54'25"E 407.29'
N84°09'27"E 147.98'
N82°11'54"E 556.75'
N12°55'14"W 886.10'
S84°52'57"E 636.00'
N85°20'22"W 463.84'
S85°01'02"E 352.11'
S83°11'06"E 465.99'
N03°47'56"E 936.93'
N89°18'02"E 45.22'
N04°49'38"E 1746.97'
N39°12'20"E 68.52'
N57°28'20"E 284.84'
N56°33'18"E 106.46'
N68°20'30"E 148.52'
N09°41'43"W 582.96'
S09°40'29"E 1945.29'
N09°31'09"W 2337.24'
S16°40'29"E 250.80'
N74°55'52"E 462.62'
S03°08'24"E 2457.72'
S04°24'25"W 548.76'
S85°25'03"E 895.06'
S85°23'31"E 1253.85'
S04°53'30"W 633.22'
N04°10'53"E 485.87'
S86°33'37"E 583.59'
N05°41'34"E 976.72'
SEE SHEET 5
Grid North Per Kentucky State Plane Coordinate System
BAR SCALE 1" = 200'
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(770) 423-0807
SURVEY COA #PS778
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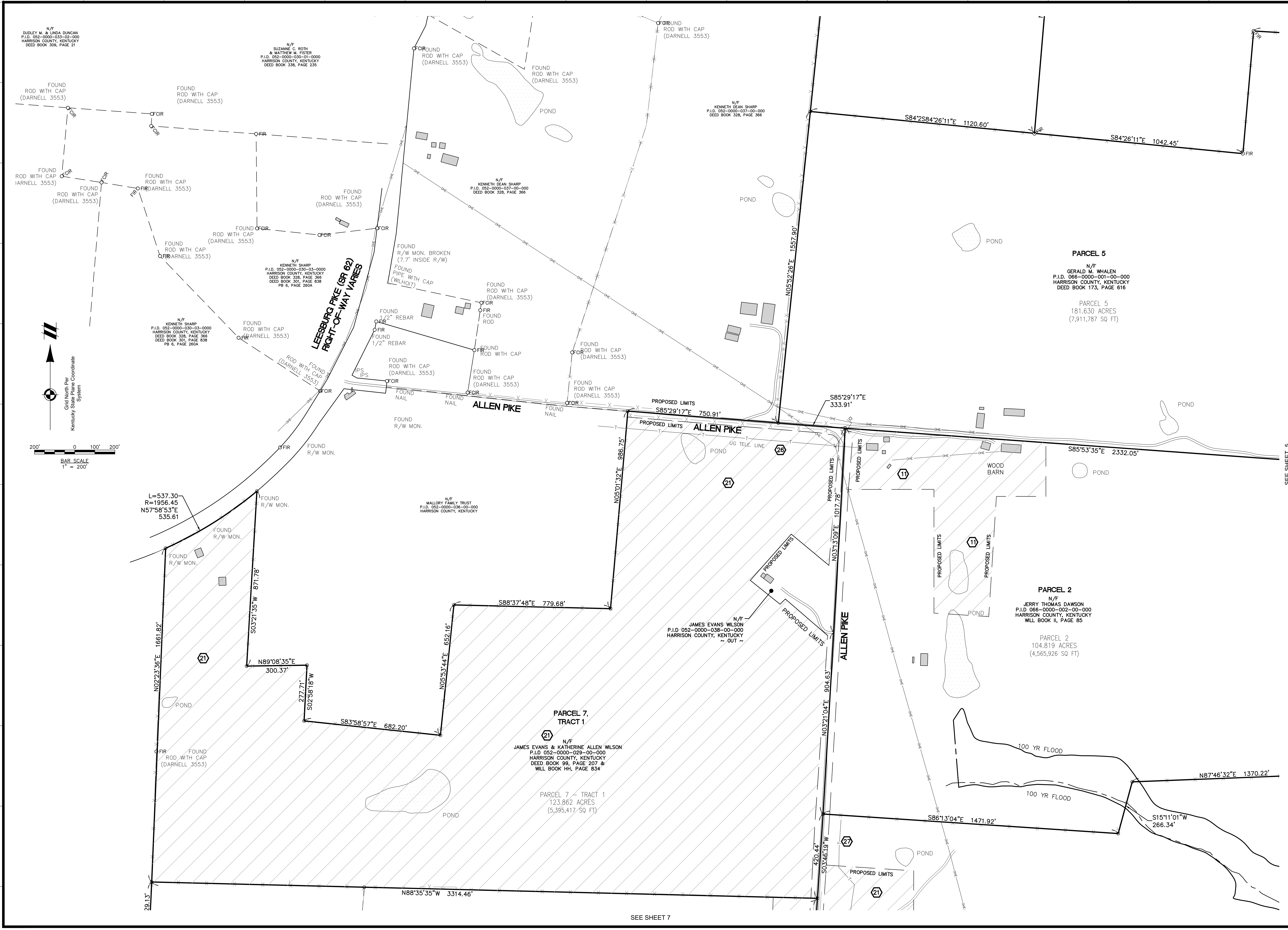
& HARRISON COUNTY
CYNTHIANA, KENTUCKY
CLIENT
BayWa r.e. Renewable Energy
ALTA/NSPS LAND TITLE SURVEY
OF THE
BLUEBIRD SOLAR, LLC SITE
U.S. HIGHWAY 62 And
STATE ROUTE No. 353
DATE
NOVEMBER 24, 2020
1. REVISIONS JUNE 24, 2021
REVISIONS
SCALE 1" = 200 FEET
DR. AH
CH. DLA
P.M. A. HARPER
BOOK --
JOB 20002456
SHEET NO.
3 OF 12
CAD FILE: 20002456 AS-03.DWG



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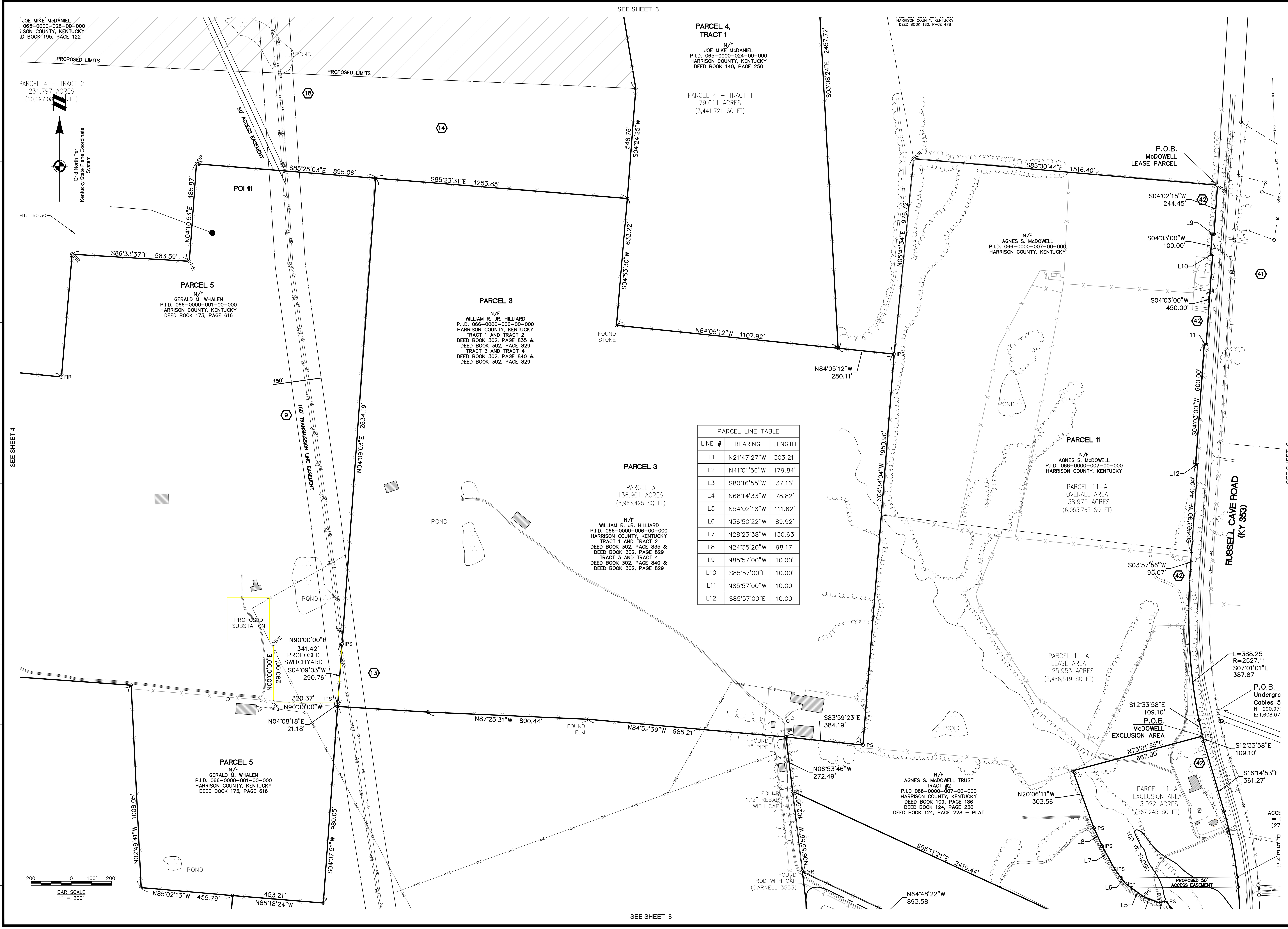

PARCEL LINE TABLE

LINE #	BEARING	LENGTH
L1	N21°47'27"W	303.21'
L2	N41°01'56"W	179.84'
L3	S80°16'55"W	37.16'
L4	N68°14'33"W	78.82'
L5	N54°02'18"W	111.62'
L6	N36°50'22"W	89.92'
L7	N28°23'38"W	130.63'
L8	N24°35'20"W	98.17'
L9	N85°57'00"W	10.00'
L10	S85°57'00"E	10.00'
L11	N85°57'00"W	10.00'
L12	S85°57'00"E	10.00'

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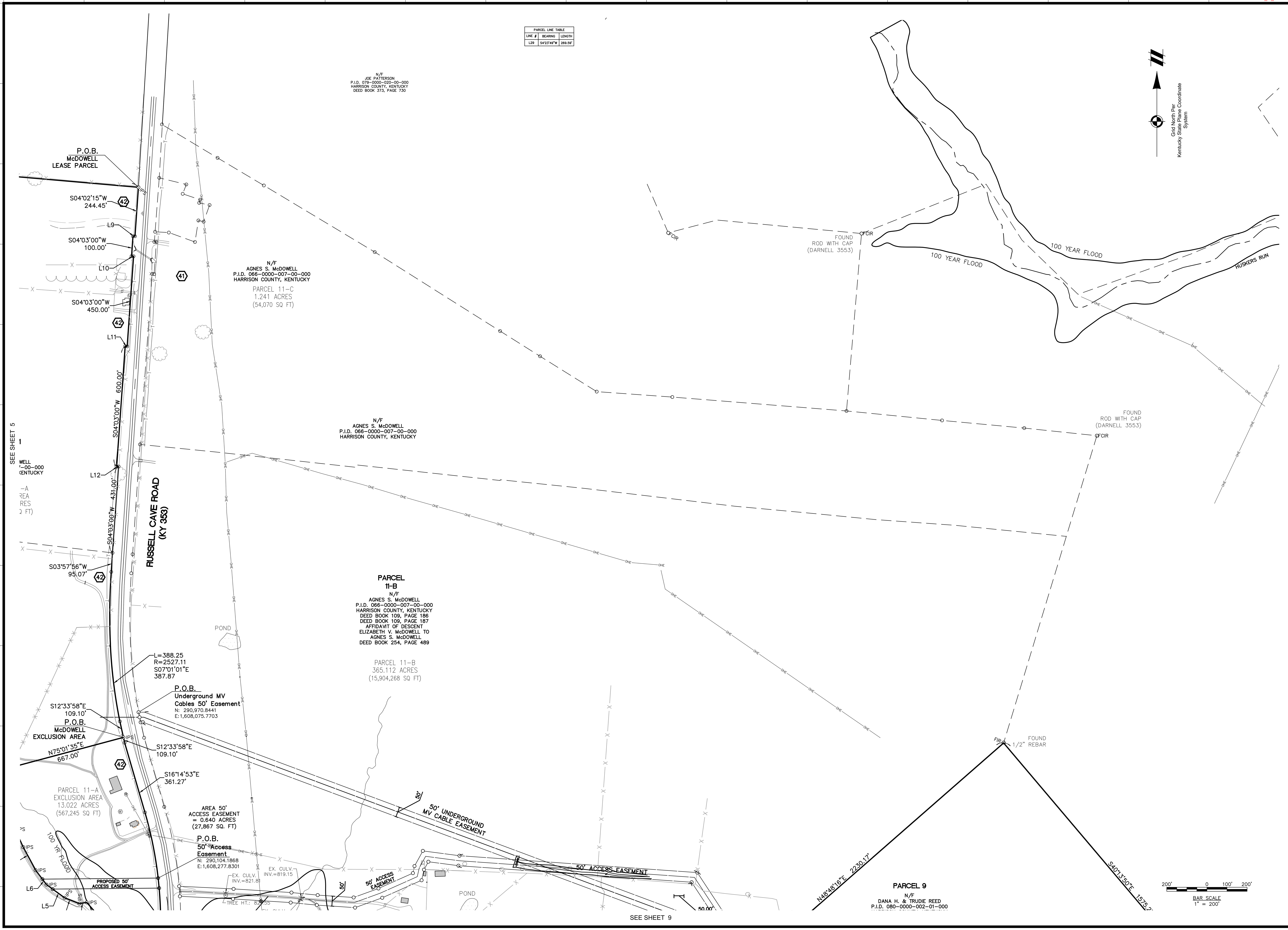

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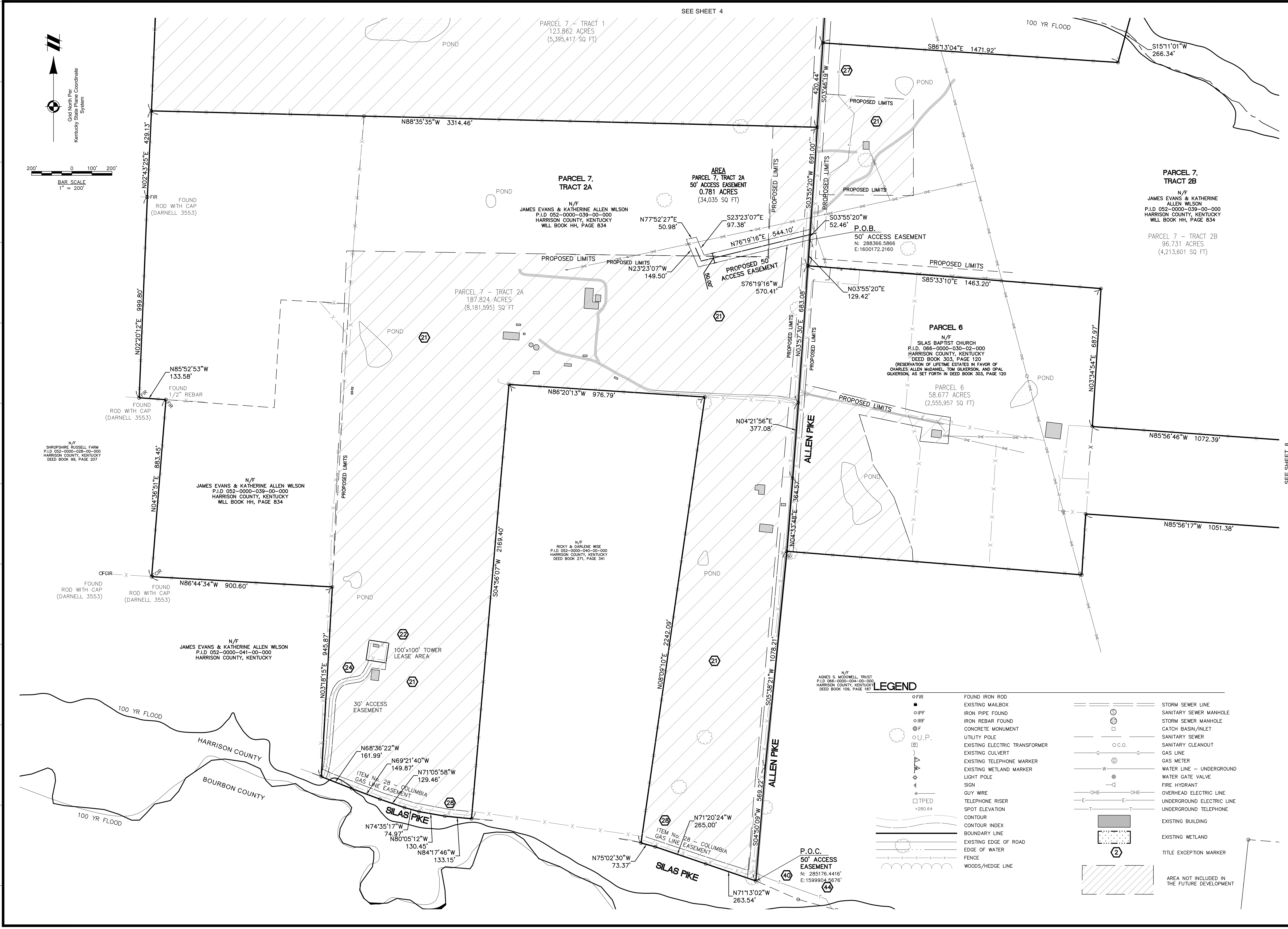

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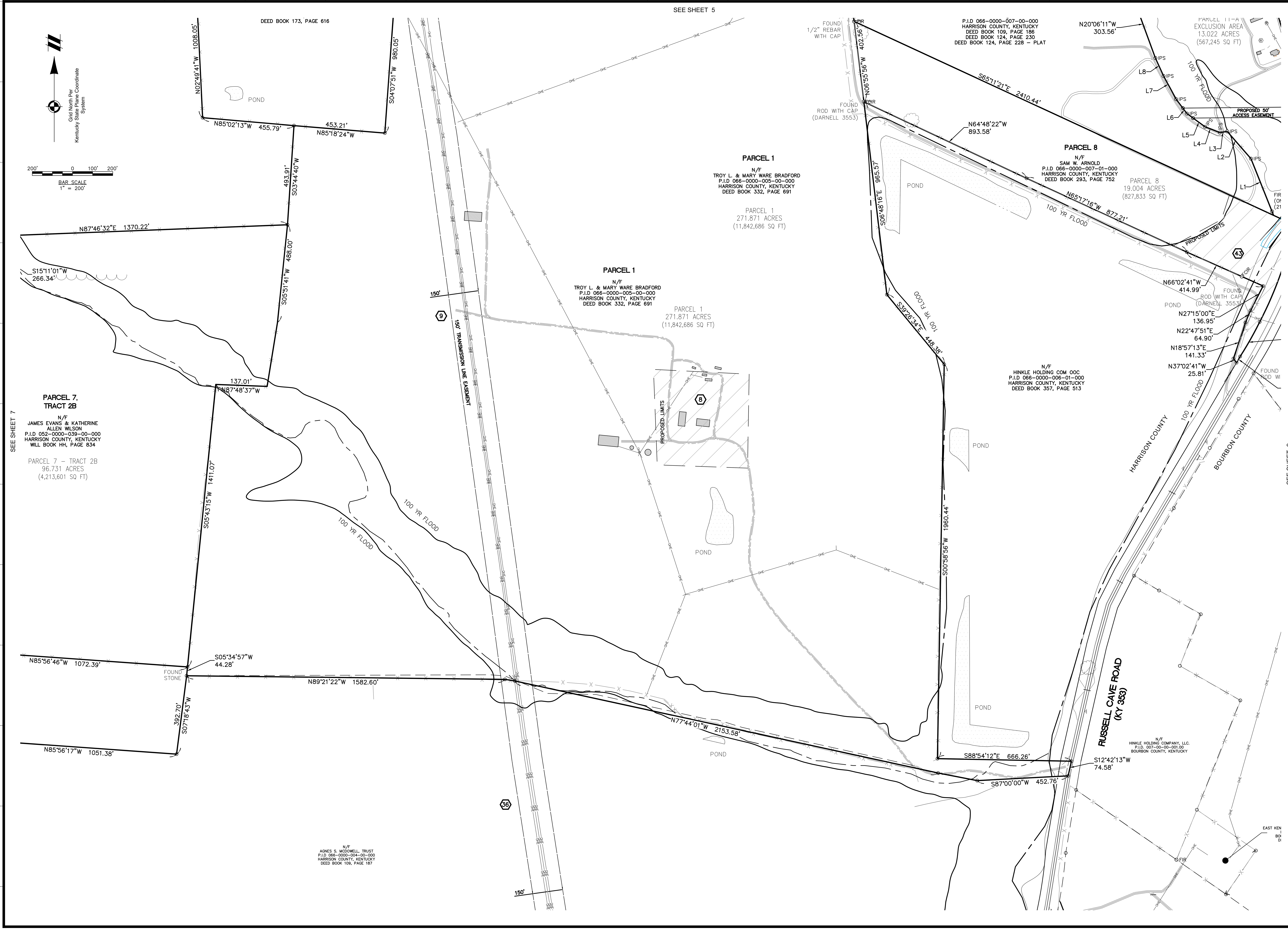

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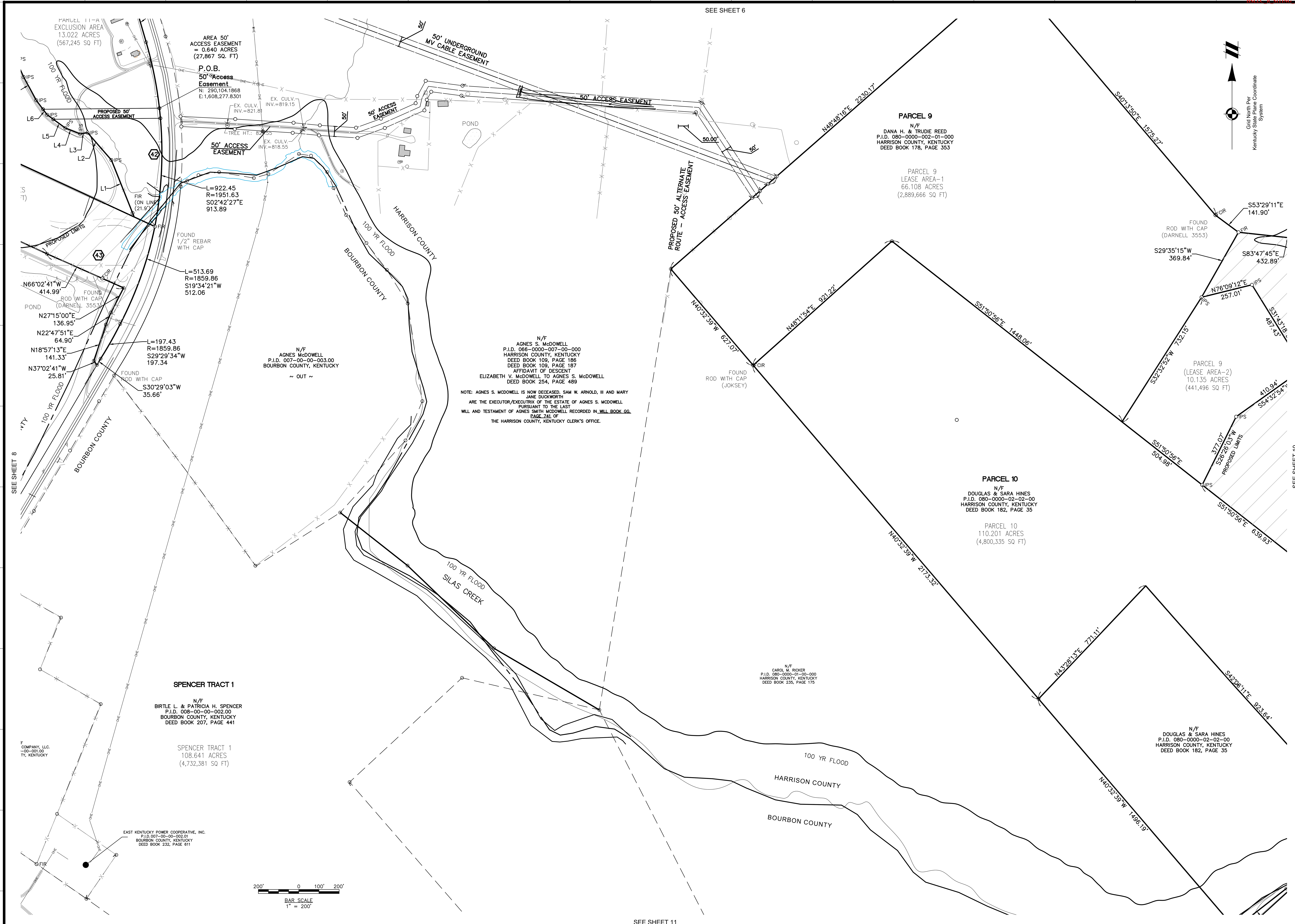

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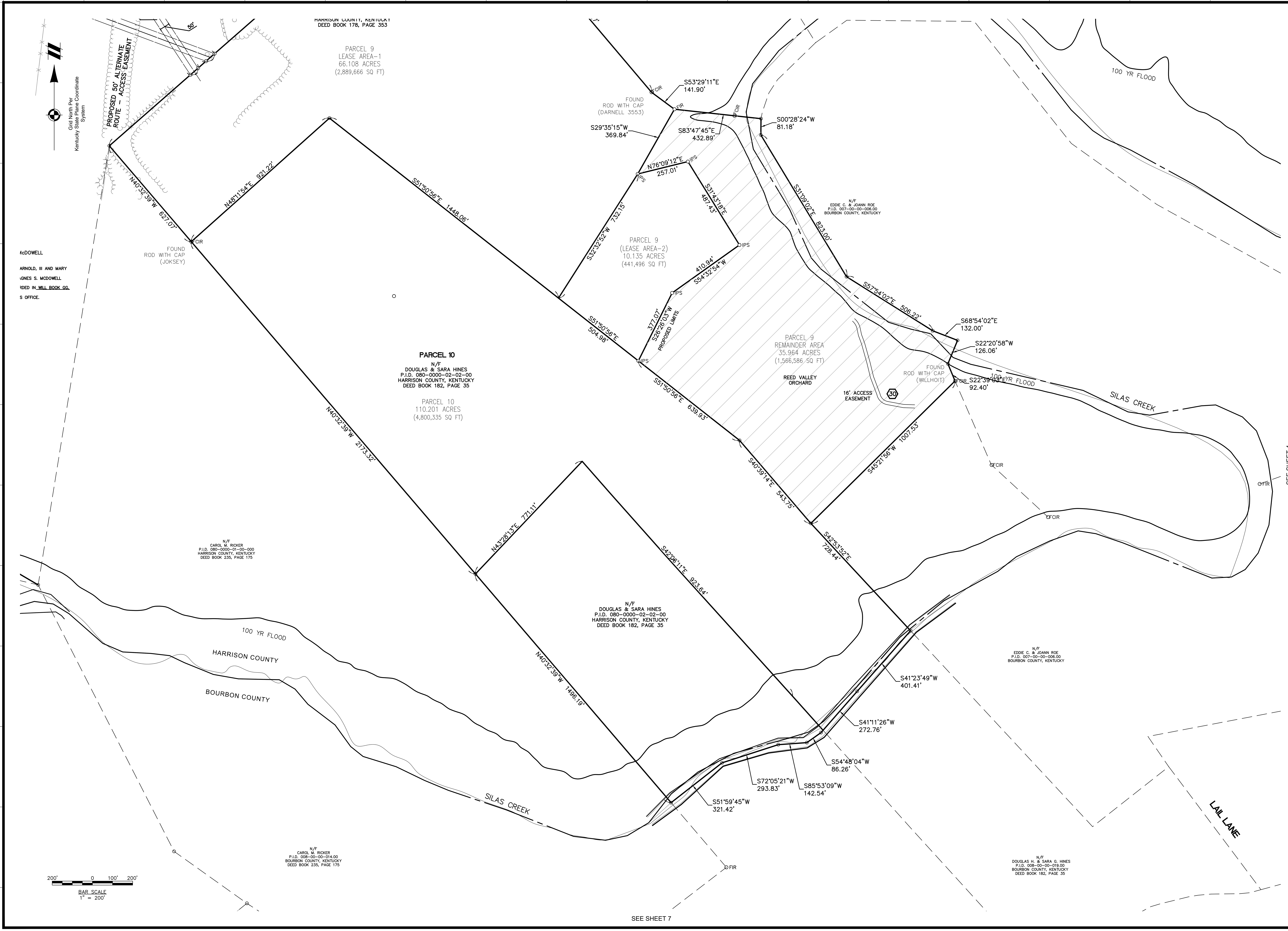

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ATWELL
866.850.4200 www.atwell-group.com
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LAWRENCEVILLE, GA 30043
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SURVEY COA #PS778

LOCATED IN
BOURBON COUNTY, PARIS KENTUCKY
& HARRISON COUNTY
CYNTHIANA, KENTUCKY

CLIENT
BayWa r.e. Renewable Energy

ALTA/NSPS LAND TITLE SURVEY
OF THE
BLUEBIRD SOLAR, LLC SITE
U.S. HIGHWAY 62 And
STATE ROUTE No. 353

DATE
NOVEMBER 24, 2020

--1. REVISIONS JUNE 24, 2021

REVISIONS

SCALE 0 100 200
1" = 200 FEET

DR. AH	CH. DLA
P.M. A. HARPER	
BOOK --	
JOB 20002456	
SHEET NO. 10 OF 12	

CAD FILE: 20002456 AS-03.DWG

STEWART TITLE GUARANTY COMPANY

TITLE COMMITMENT NUMBER: 01219-21334M
ISSUING FILE NUMBER: 01219-21334M
COMMITMENT EFFECTIVE DATE: AUGUST 19, 2020 AT 8:00 A.M.

THE TITLE IS, AT THE COMMITMENT DATE, VESTED IN:

Parcel 1:

Troy L. Bradford and Mary Ware Bradford by virtue of deed dated June 13, 2014, recorded June 17, 2014 in Deed Book 332, Page 691 of the Harrison County, Kentucky Clerk's Office.

Parcel 2:

Jerry T. Dawson by virtue of the Last Will and Testament of Thelma H. Dawson recorded in Will Book II, Page 85 in the Harrison County, Kentucky Clerk's Office.

Parcel 3:

Tract 1 and Tract 2:

William R. Hilliard, Jr., by virtue of deed dated April 24, 2008, recorded April 25, 2008 in Deed Book 302, Page 835, and deed dated April 24, 2008, recorded April 25, 2008 in Deed Book 302, Page 829, both of the Harrison County, Kentucky Clerk's Office.

Tract 3 and Tract 4:

William R. Hilliard, Jr., by virtue of deed dated April 24, 2008, recorded April 25, 2008 in Deed Book 302, Page 840, and deed dated April 24, 2008, recorded April 25, 2008 in Deed Book 302, Page 829, both of the Harrison County, Kentucky Clerk's Office.

Parcel 4:

Tract 1:

Joe Mike McDaniel by virtue of deed dated June 30, 1973, recorded July 13, 1973 in Deed Book 140, Page 250 of the Harrison County, Kentucky Clerk's Office.

Tract 2:

Joe Mike McDaniel by virtue of deed dated December 17, 1992, and recorded December 17, 1992 in Deed Book 195, Page 122 of the Harrison County, Kentucky Clerk's Office.

Parcel 5:

Gerald M. Whalen by virtue of deed dated January 16, 1987, recorded January 16, 1987 in Deed Book 173, Page 616 of the Harrison County, Kentucky Clerk's Office.

Parcel 6:

Deacons At the Regular Baptist Church at Silas, now called Silas Baptist Church by virtue of deed dated May 5, 2008, recorded May 6, 2008 in Deed Book 303, Page 120 of the Harrison County, Kentucky Clerk's Office.

Reservation of lifetime estates in favor of Charles Allen McDaniel, Tom Gilkerson, and Opal Gilkerson as set forth in the aforesaid deed.

Parcel 7:

James Evans Wilson and Katherine Allen Wilson by virtue of Last Will and Testament recorded April 15, 2008 in Will Book HH, Page 834 of the Harrison County, Kentucky Clerk's Office.

Parcel 8:

Sam W. Arnold III by virtue of deed dated July 31, 2006, recorded September 22, 2006 in Deed Book 293, Page 752 of the Harrison County, Kentucky Clerk's Office.

Parcel 9:

Dana H. Reed and Trudie Reed by virtue of deed dated March 18, 1988, and recorded in Deed Book 178, Page 353 of the Harrison County, Kentucky Clerk's Office.

Parcel 10:

Douglas Hines and Sara Hines by virtue of deed dated June 15, 1989, recorded June 23, 1989 in Deed Book 182, Page 35 of the Harrison County, Kentucky Clerk's Office.

Parcel 11:

Tract 1:

Agnes McDowell by virtue of deed dated July 1, 1947, recorded July 8, 1947 in Deed Book 109, Page 186 of the Harrison County, Kentucky Clerk's Office.

Tract 2:

Elizabeth V. McDowell by virtue of deed dated July 1, 1937, recorded July 8, 1947 in Deed Book 109, Page 187 of the Harrison County, Kentucky Clerk's Office.

Note: Agnes Smith McDowell acquires Elizabeth V. McDowell's interest in Tract 2 as evidenced by Affidavit of Descent recorded February 4, 2002 in Deed Book 254, Page 489 of the Harrison County, Kentucky Clerk's Office.

Note: Agnes S. McDowell is now deceased. Sam W. Arnold, III and Mary Jane Duckworth are the Executor/Executrix of the Estate of Agnes S. McDowell pursuant to the Last Will and Testament of Agnes Smith McDowell recorded in Will Book GG, Page 741 of the Harrison County, Kentucky Clerk's Office.

STEWART TITLE GUARANTY COMPANY

TITLE COMMITMENT NUMBER: 01219-21334M

EXHIBIT "A"
LEGAL DESCRIPTION

Parcel 1:

BEGINNING at a point in the center of the Russell Cave Pike, corner to LeBus; thence with the center of said pike S. 70 ° -00' W. 1.13 chains to a point in the center of same; thence S. 87° -00' W. 6.86 chain; N. 79° - 00' W. 3.00 chains; N. 78° - 30' W. 32.63 chains; N. 79° - 00' W. 0.75 chains; N. 78° - 30" W. 10.23 chains to a post; N. 80° - 25' W. 13.56 chains to a post; N. 5° -15' E. 22.00 chains to a post; S. 86° - 25' E. 3.88 chains to a post; N. 1° - 45' E. 19.83 chains to a post; N. 86° -00' W. 6.94 chains to a post; N. 3° - 30' W. 15.04 chains to a post, corner to Tract #1; thence with the line of Tract #1 S. 85° - 00' 15.65 chains to a post; N. 1° - 30' E. 0.32 chains to a post, corner to LeBus; thence with his line N. 89° -15' E. 7.05 chains to a post; S. 89° -00' E. 5.47 chains to a post; S. 88° - 45' E. 6.32 chains to an elm tree; S. 86° -15' E. 15.13 chains to a post; S. 8° -15' E. 6.94 chains to a post; S. 8° - 00' E. 17.86 chains to a post; S. 40° -30' E. 6.57 chains to a post South 29.92 chains to a post; N. 88° - 30' E. 10.13 chains to the point of beginning, containing 294.55 acres.

THERE IS EXCEPTED, however, from the above described property, the following tract of land conveyed to Gerald M. Whalen by deed dated November 1, 1974, and of record in Deed Book 143, Page 153, in the Harrison County Court Clerk's Office, and more fully described as follows, to-wit:

BEGINNING at a common corner to Clarence LeBus, Gerald M. Whalen and R. N. Pribble; thence with R. N. Pribble's line S 1° - 30' W. 14.42 chains to a post; N. 86° - 00' W. 13.82 chains to a post in Dawson's line; thence with Dawson's line N. 3°- 30' W. 15.08 chains to a post; corner to Gerald M. Whalen; thence with his line S. 85° -00' E. 15.65 chains to the point of beginning, containing 22.24 acres, according to a survey by Frazier L. Faulconer, Registered Land Surveyor, Surveyor License #294, of date August 24,1974, a plat of which is a matter of record in Plat Book 1, Page 119A, in the Office of the Harrison County Clerk.

Being the same property conveyed to Troy L. Bradford and Mary Ware Bradford by deed dated June 13, 2014, recorded June 17, 2014 in Deed Book 332, Page 691 of the Harrison County, Kentucky Clerk's Office.

Parcel 2:

Beginning at a stone corner to Joseph Lucas in Mrs. Smith's line; thence S 85 W. 82.72 poles to a stone corner to said Lucas; thence S 12/4 W. 16.30 poles to a stone corner to same; thence N. 88 5/8 W. 89 poles to middle of Silas Dirt Road, now Turnpike; thence with road N. 5/8 E. 116.20/100 poles to a stake, corner to McDaniel; thence S. 88 ½ E. 102.56 poles to stone, corner top D. Allen; thence S. 87 ¼ E. 38.84 poles to stone, corner to same; thence 5 ½ E. 59.84 poles to stake, corner to same; thence S. 87 ¾ E. 27 ½ poles to stake, corner to Mrs. Smith; thence 3 S. 1W 29.84 poles to the beginning, containing one hundred and four and three quarters acres and 15 poles.

Being the same property conveyed to John Thomas Dawson and Thelma H. Dawson by deed recorded in Deed Book 144, Page 409. By virtue of the rights of survivorship set forth in the aforesaid deed, Thelma H. Dawson acquired the interest of John Thomas Dawson upon his death evidenced by Last Will and Testament recorded in Will Book U, Page 201. The interest of Thelma H. Dawson passed to Jerry T. Dawson upon her death, as set forth in the Last Will and Testament of Thelma H. Dawson recorded in Will Book II, Page 85 in the Harrison County, Kentucky Clerk's Office.

Parcel 3:

Tract 1:

FARM NO. 1 - Known as the Clarence LeBus "Allen Farm" and containing 137.41 acres of land, lying and being on the waters of Silas Creek, near Broadwell, Harrison County, Kentucky, and bounded and described as follows:

Beginning at a post corner to Lucas, Skillman and Beyers; thence N 2 ¾ E. 39..99 chains to a stone corner top Skillman, Beyers in line of Bedford; thence S. 86.00 E. 18385 chains to stone, corner to Brand; thence S. 3 ½ W. 9.63 chains to stone, corner to same; thence S. 86 00' E. 21.09 chains to stone, corner to Smith; thence S. 3 ½ W. 29..55 chains to stone, corner to Holiday; thence N 86 ¼ W. 20..97 chains to south side of large elm tree, corner to Lucas; Thence 86 ¼ W. 18.63 chains to the beginning, containing 136.41 acres.

The said 136.41 acres of land shall have the right of pass way 30 feet wide over the other part of the Allen Farm now held by said Skillman and wife and said Sarah E. and J.M. Boyers [Beyers]. The pass way is to begin at the LeBus, Lucas, Skillman and Beyers corner and run in a westerly direction to Bush, Allen, Skillman and Beyers line to the public dirt road. It is further understood that Skillman and Beyers and their vendees shall have the option to fence this pass way if they desire to do so, and if so, to be at their expense and not at the expense of said LeBus, and it is further understood that the south half of the division fence between the land herein conveyed to said LeBus and that conveyed to the Skillmans and Beyers' is to be kept up[by the said LeBus and the other half to be kept up by said Skillman and Beyers.

Also a small tract of land bounded and described as follows:

Beginning at a marked fence post, corner to Clarence LeBus in what is known as the "Shawhan Farm", this point being South of and near Hub Holliday's S. W. corner; thence N. 8 10' W. 11.10 chains to a fence post, corner to same; thence N. 86 30' W. 90 links to a stake in the line of Clarence LeBus; thence S. 8 10' E. 11.29 chains to a stake, corner to Walden; thence N. 83 E. 90 links to the beginning containing one acre of land.

Tract 2:

All that tract or parcel of land situated west of the Russell Cave Road (Kentucky Highway No. 353) at the county line of Bourbon County and Harrison County, Kentucky, and more fully described and bounded as follows, to-wit:

Beginning at a point in the center line of an abandoned road west of the Russell Cave Road (Kentucky Highway No. 353) in Bourbon County, Kentucky, and said point being a corner to Parcel 1 of the Agnes McDowell Estate Property, of record in Plat Cabinet 4, Page 318 in the Harrison County, Kentucky Clerk's Office; thence with the center of said abandoned road and with said Parcel 1 S 26° 32' 41" W 57.76 feet to a point, said point being a corner to a 76.6342+/- acre tract of Bourbon Limestone Company, said tract being of record in Plat Cabinet 2, Page 52 A in the Office of the County Clerk of Harrison County, Kentucky; thence crossing into Harrison County and with said 76.63242 +/- acre tract and beyond for thirteen calls: N 90° 0' 59" W 29.01 feet to a point; N 65 ° 545' 23" 183.07 feet to a point; N 66 ° 32' 50" W 200.59 feet to a point; N 66 ° 53' 09" W 205.69 feet to a point; N 65 ° 43' 13" W 152.10 feet to a point; N 64 ° 39' 28" W 174.98 feet to a point; N 66 ° 14' 36" W 176.23 feet to a point; N 66 ° 03' 51" W 183.76 feet to a point; N 66 ° 40' 53" W 178.54 feet to a point; N 66 ° 10' 20" W 211.26 feet to a point and N 62 ° 40' 48" W 341.34 feet to a point in the line of John Mahan (now or formerly); thence with Mahan (now or formerly) N 08 ° 00' 00" W 55.59 feet to a point; thence S 65 ° 30' 41" E 66.71 feet to a point, said point being a corner to the aforesaid Tract 1 of the Agnes McDowell Estate; thence with said Tract 1 for three calls: S 65 ° 30' 41" E 893.58 feet to a point; S 65 ° 59' 35" E 877.21 feet to a point and crossing into Bourbon County S 66 ° 45' 00" E 414.99 feet to the beginning and containing 2.95 acres.

This description was produced from a combination of field surveys and deed boundary mapping from available sources, and is subject to a full field survey.

Tract 3:

That certain portion of an old road formerly a part of Kentucky Highway 353 lying between the Bourbon County Limestone Company property referenced in Deed Book 177, Page 10 in the Harrison County Clerk's Office; beginning at a point on the road on the north side of Clarence LeBuss (now Hilliard) farm private lane and running to the present right-of-way line of Kentucky Highway #353 closest to the Bourbon-Harrison County line which was closed by order of the Bourbon County Fiscal Court on February 23, 1989.

Tract 4:

Being all of the remaining portion of the 202.67 acres "Shawhan Farm", if any, lying and being on the westerly side of Russell Cave Road in Harrison County, Kentucky, and bounded on the west and south by the property now owned by John Mahan (Deed Book 295, Page 126), bounded on the east by the property now owned by Bourbon Limestone Company (Deed Book 177, Page 10), 1 and on the north by the 2.95 acres tract being conveyed to William R. Hilliard, Jr., simultaneously herewith.

THERE IS EXCEPTED from the foregoing, a deed for Highway purposes dated January 20, 1951, of record in Deed Book 116, Page 7, in the Office of the Harrison County Clerk.

FURTHER EXCEPTING THEREFROM, all that portion of the above described Tract 1, Tract 2, Tract 3 and Tract 4 located in Bourbon County, Kentucky. The same having not been examined by the Company, the Company hereby expressly excludes from the description of the Land any portion of the above described real estate located in Bourbon County, Kentucky.

Tracts 1 and 2 being the same property conveyed to William R. Hilliard, Jr., by deed dated April 24, 2008, recorded April 25, 2008 in Deed Book 302, Page 835, and deed dated April 24, 2008, recorded April 25, 2008 in Deed Book 302, Page 829, both of the Harrison County, Kentucky Clerk's Office.

Tracts 3 and 4 being the same propety conveyed to William R. Hilliard, Jr., by virtue of deed dated April 24, 2008, recorded April 25, 2008 in Deed Book 302, Page 840, and deed dated April 24, 2008, recorded April 25, 2008 in Deed Book 302, Page 829, both of the Harrison County, Kentucky Clerk's Office.

Parcel 4:

Tract 1:

BEGINNING at a point in the center of the Leesburg Pike, corner to Ben Bedford "Estate"; thence with their line, N 9° 50' E 45.90 chains. S. 4° 25' W 17.93 chains to a post; corner to Clarence LeBus; thence with his line, S 84° 15' E 16.82 chains to a post in said LeBus' line, corner to James Patterson; thence with his line, N. 3° 30' W. 37.34 chains; S. 74° 35' W. 7.01 chains to an iron pin; N 17° 00' W. 3.80 chains to an iron pin in the east margin of Drive; thence with the east margin of same, N. 10° 00' W. 30.59 chains to a post in the center of the Leesburg Pike; thence with the center of said Pike, S. 47° 00' W. 3.09 chains; S. 68° 00' W. 6.03 chains to the point of beginning, containing 80.35 acres.

According to a survey made by F. L. Faulkner, Civil Engineer, on March 31, 1950, and for Map and Plat, see Deed Book 112, Page 161, Harrison County Court Clerk's Office. [Due to a recorder's error said reference does not appear in the cited records]

THERE IS EXCEPTED FROM the forgoing: Deed of Conveyance at Deed Book 188, Page 300, dated April 19, 1991, filed May 21,1991, between Joe Mike McDaniel and Joyce F. McDaniel, his wife ("Parties of the First Part"), and the

This page is only a part of a 2016 ALTA® Commitment for Title Insurance. This Commitment is not valid without the Notice; the Commitment to Issue Policy; the Commitment Conditions; Schedule A; Schedule B, Part I - Requirements; and Schedule B, Part II - Exceptions; and a countersignature by the Company or its issuing agent that may be in electronic form.

Commonwealth of Kentucky, for the use and benefit of the Transportation Cabinet, Department of Highways, ("Party of the Second Part") (a .76 acres parcel in fee simple and a 442 square feet temporary easement).

ADDITIONALLY: Conveyance is not to embrace the family grave yard on the said land and the right of ingress and egress thereto is reserved," as recited at Deed Book 77, Page 499, dated August 25,1913, filed August 27,1913, by and between Laura P. Spears (widow) ("Party of the First Part"), and Dr. Leslie Brand ("Party of the Second Part").

Being the same property conveyed to Joe Mike McDaniel by deed dated June 30, 1973, of record in Deed Book 140, Page 250, in the Office of the Harrison County Clerk.

Tract 2:

Sub-Tract I:

Beginning at a corner 15 Baldwin Davis in the center of the Cynthiana-Leesburg Turnpike road; thence with same 77 ¼ E. 6.53 chains; thence N. 75 ½ E. 10.47 chains; thence N. 87 ½ E. 83 links; thence leaving the turnpike road S. 15 E. 15.35 chains to stone in center of a gate; thence S. 14 E. 7.25 chains to corner to Lot No. 2 at E; thence S. 14 E. 7.25 chains to corner to the Case Farm at G; thence N. 2 ½ E. 7 chains; thence S. 87 *** 5.34 chains; thence N. 10 ½ W. 13/02 chains to the beginning, containing 42.84 acres.

Sub-Tract II;

BEGINNING at a stone in the Cynthiana and Leesburg Turnpike Road and corner to B. E. Hiten and Lot No. 3 at V 2; thence with center of pike No. 66 E. 12.33 chains to the school house lot; thence S. 10 ¾ E. 2.50 chains; thence N. 66 E. 2 chains to corner to school house lot and in line to Rickland Brand; thence with Brand's line S. 10 ¾ W. 8.33 chains to stone to Allen at "R"; thence N 87 ¼ W. 12.83 chains to corner to Allen and corner to No. 3 at (2); thence N. 9 ½ W. 47/75 chains to the beginning, containing seventy-one acres.

Sub-Tract III:

Bounded on the West by the lands of second parties of the North by the Cynthiana and Leesburg Pike and on the East by the lands of Miss Jennie Magee, and on the South by the lands of David Allen, this being a part of the old Park Kirty Farm near Broadville, Harrison County, Kentucky and being the part allotted to said W. S. Magee in the division of lands of his mother among his sisters and himself, the land herein conveyed consisting of 73 acres more or less.

Sub-Tract IV:

Beginning at L, a stone in the outside boundary a corner to Case and Urmston; thence North 4 East 26.44 chains; thence North 89 East 69 links; thence 2 ½ East 7.21 chains to corner in line to Case and corner to Lot. No. 1, at G; thence North 86 East 24.05 chains to corner to Lot No. 3, and in line to Lot No. 1 at F; thence South 9 ¾ East 16.50 chains to corner to Lot No. 3 at 4; thence South 86 ¼ West 11.30 chains; thence S 3 ¼ West 10 chains to Allen at N; thence South 4 West 9.35 chains; thence South 86 ¼ West 15.82 chains to the beginning containing 71 ¾ acres.

HOWEVER, THERE IS EXCEPTED FROM THE ABOVE TRACTS THE FOLLOWING DESCRIBED REAL ESTATE.

Lying and being on the south side of what is commonly known as the Leesburg and Georgetown turnpike road, but which is State Highway No. 19 and United States Highway No. 62, and is bounded on the east by the lands of Dr. Leslie Brand, and on the south and west by the lands of B. F. Bedford, and on the north by the Leesburg-Georgetown road as heretofore set out. That the said boundaries are as the fencing is now placed and consists of about one-half (1/2) acre, more or less, of land, it being the land reverting to the heirs at law of Elijah Kirtley, etc., as set out in deed recorded in Deed Book 49 at Page 90 in the office of the clerk of the Harrison County Court.

HOWEVER THERE IS EXCEPTED FROM THE ABOVE DESCRIBED REAL ESTATE THE FOLLOWING:

A parcel of land lying on the south side of US 62 in Harrison County approximately 1,500 feet east of Switzer Pike and more particularly described as follows:

BEGINNING at a point in the grantors' west property line 12.00 feet right of the proposed Georgetown-Cynthiana Road (US 62) Station 139+05.00 said point also being in the existing right of way line; thence northeasterly with the existing right of way line to a point in the grantors' east property line 23.0 feet left of the proposed Georgetown-Cynthiana Road (US 62) Station 168+46.00; thence S 14 deg. 29' 07" E, 89.46 feet with the grantors' east property line to a point 66.18 feet right of the proposed Georgetown-Cynthiana Road (Us 62) Station 168+38.85: thence S 65 deg. 18" 25" W, 39.03 feet to a point 70.0 feet right of the proposed Georgetown-Cynthiana Road (Us 62) Station 168 +00.00; thence S 61 deg. 27'59" W, 152.07 feet to a point 95.0 feet right of the proposed Georgetown-Cynthiana Road (US 62) Station 168+50; thence S 81 deg. 07'57" W, 254.02 feet to a point 50.0 feet right of the proposed Georgetown-Cynthiana Road (US 62) Station 164+00; thence S 70 deg. 55' 43" W, 391.05 feet to a point 50.0 feet right of the proposed Georgetown-Cynthiana Road (US 62) Station 160+00.06; thence S 72 deg. 48' 14" W, 503.24 feet to a point 50.0 feet right of the proposed Georgetown-Cynthiana Road (US 62) Station 155+00; thence S 63 deg. 49' 49" W, 102.75 feet to a point 70.0 feet right of the proposed Georgetown-Cynthiana Road (US 62) Station 154+00; thence S 71 deg. 17' 09" W, 406.64 feet to a point 100.0 feet right of the proposed Georgetown-Cynthiana Road (US 62) Station 150.00; thence S 83 deg. 34' 38" W, 555.86 feet to a point 80.0 feet right of the proposed Georgetown-Cynthiana Road (US 62) Station 144+65; thence S 85 deg. 22'50" W, 201.90 feet to a point 70.0 feet right of the proposed Georgetown-Cynthiana Road (US 62) Station 142+50; thence S 82 deg. 32' 30" W, 343.90 feet to a point 70.0 feet right of the proposed Georgetown-Cynthiana Road (US 62) Station 139+06.10; thence N 8 deg. 13' 30" W, 82.01 feet with the grantors west property line to the point of beginning, containing 5.505 acres of land.

BEING the same property as that conveyed to the COMMONWEALTH OF KENTUCKY, for the use and benefit of the TRANSPORTATION CABINET, DEPARTMENT OF HIGHWAYS, Frankfort, Kentucky 40622 by JOE M. MCDANIEL and his wife, HOLLIS M. MCDANIEL, by deed dated the 4th day of April, 1991, in the office of the Harrison County Court Clerk.

The above parcels or tracts of land being the same property conveyed to Joe Mike McDaniel by deed dated December 17, 1992, of record in Deed Book 195, Page 122, in the Office of the Harrison County Clerk.

Parcel 5:

Tract 1:

BEGINNING at a post, set in concrete, comer to LeBus; thence N. 86° - 00' W. 13.60 chains to a post; S. 3° - 45' W. 7.37 chains to a post; N. 86° - 30' W. 8.85 chains to a post; S. 4° -15' W. 9.28 chains to a post; N. 85° - 05' W. 32.920 chains to a post; S. 6° - 05' W. 23.79 chains to a point in the center of the Allen Pike S. 86° - 15' E. 40.85 chains to a post; N 3° - 30' W. 0.04 chains to a post, comer to Tract #2, S. 85° - 00' E. 15.65 chains to a post; N. 1° - 30' E. 0.32 chains to a post; N. 3° - 25' E. 54.74 chains to the point of beginning, containing 161.31 acres, according to a survey by Frasier L. Faulconer, Registered Land Surveyor, of date May 19, 1973, a plat of which is a matter of record in Plat Book 1, Page 66 A.

(CONTINUED)

Tract 2:

BEGINNING at a common comer to Clarence LeBus, Gerald M. Whalen and R. N. Pribble; thence with R. N. Pribble's line S 1° - 30' W. 14.42 chains to a post; N. 86° - 00' W. 13.82 chains to a post in Dawson's line; thence with Dawson's line N. 3° - 30' W. 15.08 chains to a post; corner to Gerald M. Whalen; thence with his line S. 85° - 00' E. 15.65 chains to the point of beginning, containing 22.24 acres, according to a survey by Frazier L. Faulconer, Registered Land Surveyor, of date August 24,1974, a plat of which is a matter of record in Plat Book 1, Page 119 A.

Being the same property conveyed to Gerald M. Whalen, by deed of the Master Commissioner dated January 16, 1987, of record in Deed Book 173, Page 616, in the Office of the Harrison County Clerk.

Parcel 6:

Tract No. 1: Beginning at a stone corner to F. C. Smith and running thence S. 1/2 E. 18.64 poles to a stone corner to Smith; thence N. 89 1/2 W. W. 89.40 poles to a stake in the Jacksonville road corner to Smith; thence N. 1/2 E. 31 poles to stone in middle of road: thence N. 89 1/2 E. 71.78 poles to stone corner to Annia S. Marcy, thence N. 3 W. 38.70 poles to stake corner to Morey; thence S. 88 3/4 E. 19 1/4 poles to a stump corner to same, thence S. 1/2 E. 25.70 poles to stone; thence E. 65 poles to a stone corner; thence S. 1 1/4 W, 26.70 poles to stake corner to F. C. Smith; thence N. 89 3/4 W. 64.30 poles to the beginning containing 33 acres.

Tract No. 2: Beginning at a stone in the Silas Dirt road in Walker line, corner to Lot No. 1; thence with said line, N. 89 1/2 E 71.68 poles to stone; thence N. 2 degrees 50' W. 38.56 poles to a stone S. 88 3/4 E. 19.25 poles to stone; thence N. 00 10' W. 15.40 poles to stone, corner to Joseph Lucas; thence N. 89 1/2 W. 88.40 poles to middle or dirt road; thence S. 00 35' W. 54.86 poles to the beginning containing 25 1/4 and 22 poles.

All references are to the records of the Harrison County Clerk's Office.

Parcel 7:

Tract 1:

Lying and being near Leesburg in Harrison County, Kentucky, BEGINNING in the center of the Leesburg Pike; thence S 1° 15' W. 26.75 chains to a post in Shropshire's line, corner to Milton Allen; thence S 89 ° 40' E. 50.36 chains to center of Allen Pike; thence with center of same N. 2 ° 20' E. 35.53 chains; thence N 86 ° 20' W. 16.45 chains to a rock in the center of the Pike, corner to J. F. Offutt; thence S ° 00' W. 15 chains to a stone corner to Offutt; thence N 89 ° 40' W. 11.91 chains; thence 4 ° 40' W. 9.90 chains to a stone; thence N 84 ° 50' W. 10.34 [chains]; thence N 1 ° 35' E. 14.32 chains to a post corner to Offutt; thence S 878 ° 05' W. 4.57 chains; thence N 2 ° 20' E. 14.51 chains to the center of the Leesburg Pike; thence S 58 ° 30' W. 7.98 chains to the beginning, containing 125 acres and 25/100 of an acre.

Tract 2:

Sub-Tract I:

Beginning at a corner to Shropshire and McClure, thence 89 W 53.20 poles to a corner to McClure; thence S 88 ½ E 34 poles to corner to same; thence N ¾ E 32.60 to corner to same and McDaniel; thence S 89 ½ E 20.50 to a hackberry; thence N 2 ¾ E 134 poles to East of center of dirt road; thence with same S 1 ¾ E 81.26 poles to a stone in same; thence S 87 ½ W 135.40 poles to a stone 28 feet North of a Walnut stump, thence; S 2 W 62 ½ poles to the beginning, containing 90 acres.

Sub-Tract II:

A certain tract or parcel of land lying in Harrison County, Kentucky, on waters of Silas Creek, and bounded as follows:

BEGINNING at a post corner to the lands of J. Milton Allen and in Vesta Allen's line; thence N. 89'00 W. 16.56 chains to a stake corner to said Vesta Allen and in J. H. Shropshire line; thence with Shropshire two lines S 22-15 W. 13.51 chains to a post 51.55 W. 8.11 chains to post; thence S. 86.31 E. 10.51 chains to post corner to said J. Milton Allen; thence with three line of same N. 3.45 E. 8.16 chains to post S. 86.30 E. 5.13 chains to a post N. 4.55 E. 14.23 chains to the beginning containing Thirty One & 12/100 acres.

Sub-Tract III:

Lying and being on the waters of Silas Creek in Harrison County, Kentucky, Beginning in the center of the turnpike corner to Lula D. Allen; thence N. 82 ½ W. 5.58 chains; N. 70 W. 6.29 chains to a point in the center of the pike corner to Sparks; thence N. 3 E. 15.83 chains; N. 3 ½ E. 14.52 chains to a corner to Milton Allen; thence S. 87 ½ E. 12.12 chains to a fence post corner to Lula Allen; thence S. 4 ½ W. 32.82 chains to the beginning, containing 38 acres.

Sub-Tract IV:

That tract of land, situated on the waters of Silas Creek, in Harrison County, Kentucky, described and bounded as follows: Beginning at a stone corner to B. R. Allen, thence N. 85 E. 83 poles to a stone corner to said Allen in J. W. Lucas's line; thence S. 2 W. 26.30 poles to a stone corner to Lucas; thence S. 6 ¾ W. 22.28 poles to a stone corner to Anna Lucas; thence S. 89 W. 15.60 poles to a stone corner to same; thence S. 2 ¾ W. 85.72 poles to a stone corner to same; thence S 89 W. 64.60 poles to a stone corner to same; thence N. 1 E. 42.20 poles to a stone corner to same; thence N. 88 W. 88.12 poles to the middle of a dirt road; thence with said dirt road N. 1 ½ E. 42.14 poles; thence N. 1 E. 25 poles to a stone in the road, corner to B. R. Allen; thence S. 88 ½ E. 89.20 poles to a stone corner to same; thence N. 12 ½ E. 16.32 poles to the beginning containing 96 acres and 20 poles.

Sub-Tract V:

BEGINNING in center of turnpike, corner to Milton Allen; thence with said pike S. 3 ½ W. 10.03 chains; S. 5 ¼ W. 26.17 chains to a point in the center of the Leesburg and Silas Church Pike; thence with said pike N. 78 W. 8.88 chains to a point in the center of said pike corner to Ella H. Allen; thence N. 7 ¾ E. 12 chains to a stone corner to Ela H. Allen, and continued the same course 22 chains, 34 chains in all, to the line of Milton Allen; thence S. 87 ½ E. 7.03 chains to the beginning, containing 28 acres.

Being the same property devised to Katherine Allen Wilson, a one-half (1/2) undivided interest, and James Allen Wilson, a one-half (1/2) undivided interest, by will of Dorotha Ross Wilson, as recorded in Will Book HH, at Page 834, in the Office of the Harrison County Clerk. Dorotha Ross Wilson having acquired interest in the property by virtue of the passing of Elizabeth C. Evans evidenced by the Affidavit of Descent recorded in Deed Book 305, Page 76, and the Will of J. Milton Allen recorded in Will Book T, Page 39, both of the Harrison County, Kentucky Clerk's Office. J. Milton Allen (also known as Milton Allen) acquired title to the property by deed dated September 15, 1914, recorded in Deed Book 79, Page 66; deed dated March 1, 1919, recorded in Deed Book 84, Page 224; deed dated October 6, 1925, recorded in Deed Book 91, Page 294; deed of the Master Commissioner, dated March 25, 1935, recorded in Deed Book 98, Page 228; and deed dated October 24, 1955, recorded in Deed Book 118, Page 302, all of the Harrison County, Kentucky Clerk's Office.

811
Know what's below.
Call before you dig.

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NOTICE:
CONSTRUCTION SITE SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR; NEITHER THE OWNER NOR THE ENGINEER SHALL BE EXPECTED TO ASSUME ANY RESPONSIBILITY FOR SAFETY OF THE WORK, OF PERSONS ENGAGED IN THE WORK, OF ANY NEARBY STRUCTURES, OR OF ANY OTHER PERSONS.

ATWELL
866.850.4200 www.atwell-group.com
1255 LAKES PARKWAY, BLDG 100, SUITE 120
LAWRENCEVILLE, GA 30043
(770) 423-0807
SURVEY COA #PS778

LOCATED IN
BOURBON COUNTY, PARIS KENTUCKY
& HARRISON COUNTY
CYNTHIANA, KENTUCKY

CLIENT
BayWa r.e. Renewable Energy

ALTA/NSPS LAND TITLE SURVEY
OF THE
BLUEBIRD SOLAR, LLC SITE
U.S. HIGHWAY 62 And
STATE ROUTE No. 353

DATE
NOVEMBER 24, 2020

1. REVISIONS JUNE 24, 2021

REVISIONS

SCALE 0 100 200
1" = 200 FEET

DR. AH	CH. DLA
P.M. A. HARPER	
BOOK ——	
JOB 20002456	
SHEET NO. 11 OF 12	

CAD FILE: 20002456 AS-03.DWG

STEWART TITLE GUARANTY COMPANY

TITLE COMMITMENT NUMBER: 01219-21334M

EXHIBIT "A"
LEGAL DESCRIPTION
(Continued)

Parcel 8:

The following described real estate in the County of Harrison, Commonwealth of Kentucky to-wit:

All that certain tract or parcel of land, lying and being located in Harrison County and Bourbon County, Kentucky and situated on the west side of Russell Cave Road (KY 353); and more particularly described as follows: Unless stated otherwise, any monument referred to herein as an "iron pin" is a set #4 rebar, eighteen inches (18") in length, with an orange cap stamped "Darnell 3553". All bearings stated herein are referenced to the Parent Tract.

'BEGINNING at an iron pin in the west right-of-way of Russell Cave Road (KY 353), a corner to Parcel 2, a new division of Agnes McDowell (D.B. 109, Pg. 186); said point lying N. 22° 00' 41" E. 742.59 feet from an iron pin in said right-of-way, a corner to Bourbon Limestone Company (D.B. 177, Pg. 107; P.C. 2, Sh. 52A); thence with the said west right-of-way of Russell Cave Road (KY 353) for three calls as follows:(1) With a curve to the right having a radius of 1859.86 feet, an arc length of 513.69, and a chord bearing S. 81° 51' 59" W. 512.06 feet to a point, (2) with a spiral curve the right with a chord bearing S. 28° 47' 15" W. 197.34 feet to a point, and, (3) S. 29° 46' 44" W. 35.66 feet to an iron pin, a corner to Bourbon Limestone Company (D.B. 177, pg. 10; P.C. 2, Sh. 52A); thence with said Bourbon Limestone company for eight calls as follows: (1) N. 37° 45' 00" W. 25.81 feet to a point at an abandoned road, (2) N. 18° 14' 54" E. 141.33 feet to a point at an abandoned road,(3) N. 16° 19' 44" E. 47.46 feet to a point at an abandoned road, (4) N. 22° 05' 32" E. 64.90 feet to a point at an abandoned road, (5) N. 26° 32' 41" E. 136.95 feet to a point at an abandoned road, (6) N. 66° 45' 00" W. passing an iron pin at 115.69 feet, in all 414.99 feet to a mag nail set in a tree, (7) N. 65° 59' 35" W. 877.21 feet to a mag nail set in a tree, and (8) N. 65° 30' 41" W. 893.58 feet to an iron pin, in the line Of Roger D. Hockensmith & Linda Hockensmith (D.B. 175, Pg. 154); thence with said Hockensmith N. 07° 38' 15" W. 402.56 feet to an iron pin, a corner to Parcel 2, a new division of Agnes McDowell (D.B. 109, Pg. 186); thence with said Parcel 2 S. 65° 53' 40" E. passing an iron pin at 1205.22 feet, in all 2410.44 feet to the point of beginning containing an area of 19.000 acres or less and being subject to any and all easements or right-of-way of record and in existence and in accordance with a survey and plat by Allen Patrick Darnell PE, PLS on June 9, 2006 and which is recorded in Plat Cabinet 4, Sheet 318, Harrison County Clerk's Office and Plat Cabinet C, Sheet 243, Bourbon County Clerk's Office.

Being the same property conveyed to Sam W. Arnold III by deed dated July 31, 2006, recorded September 22, 2006 in Deed Book 293, Page 752 of the Harrison County, Kentucky Clerk's Office.

EXCEPTING THEREFROM, all that portion of the above described real estate located in Bourbon County, Kentucky. The same having not been examined by the Company, the Company hereby expressly excludes from the description of the Land any portion of the above described real estate located in Bourbon County, Kentucky.

Parcel 9:

Lying and being about 8 miles Southeast of Cynthiana, Ky., on the Townsend Road and beginning at a stone (11); thence N 3/4 W 1.25 chains to a stone near a gate post corner to dower; thence N 85 1/4° W 6.63 chains to stone, (2); thence N 55° W 2.16 chains to (3) at the intersection of two stone walls; thence N 41° 50' W 23.70 chains to stone in a dirt road at (4) and in line to M. Martin; thence with road S 40° 8' W 17.45 chains to stone (6) a corner to Martin and Holliday; thence S 47° 54' W 16.18 chains to stake (6) a corner to Holliday and May; thence S 41° 54' E 9.50 chains to a stone corner to No. 1; thence S 47° 50' E 14 chains to stake (9); thence S 52 3/4° E 2.15 chains to the large white oak, same course, in full 39.53 chains to fence post; thence S 42° 50' E 8.08 chains to stone near a large oak stump; thence N 43° 57' E 15.32 chains; thence N 23 3/4° or 21 3/4° W 1.40 chains to end of water gap; thence crossing the creek N 21 1/4° E 1.91 chains to stone; thence down the creek N 70° W 2 chains; N 59° 7.67 chains to a stone and ash stump at (10); thence N 32 1/2° W 13 chains to the beginning containing 116.96 acres of land.

Being the same property conveyed to Dana H. Reed and Trudie Reed by deed dated March 18, 1988, and recorded in Deed Book 178, Page 353 of the Harrison County, Kentucky Clerk's Office.

Parcel 10:

The following described tract or parcel of land lying and being in Harrison County and Bourbon County, Kentucky, and more particularly described as follows, to-wit:

Beginning at a PK nail in the center of Townsend Valley Road in the center of a bridge over Townsend Creek corner to Alan and Jean Easley; thence with the center of Townsend Valley road for sixteen calls, South 77 degrees 47 minutes 08 seconds West 58.06 feet, South 87 degrees 36 minutes 51 seconds West 49.91 feet, North 87 degrees 42 minutes 34 seconds West 141.53 feet, South 87 degrees 59 minutes 53 seconds West 66.12 feet, South 83 degrees 25 minutes 49 seconds West 48.68 feet, South 73 degrees 11 minutes 57 seconds West 146.72 feet, South 76 degrees 15 minutes 48 seconds West 49.81 feet, South 64 degrees 16 minutes 26 seconds West 100.21 feet, South 52 degrees 45 minutes 02 seconds West 51.57 feet, South 48 degrees 11 minutes 07 seconds West 82.27 feet, South 44 degrees 07 minutes 26 seconds West 73.64 feet, South 42 degrees 05 minutes 51 seconds West 47.29 feet, South 46 degrees 52 minutes 00 seconds West 47.61 feet, South 57 degrees 21 minutes 46 seconds West 97.78 feet, South 60 degrees 43 minutes 13 seconds West 49.53 feet, South 56 degrees 22 minutes 49 seconds West 71.84 feet to a PK nail corner to Anna Eliza Lai; thence with Anna Eliza Lai for eight calls, North 39 degrees 39 minutes 59 seconds West 320.16 feet to a #4 steel rebar (found), North 39 degrees 16 minutes 13 seconds West 744.23 feet to a #4 steel rebar (found), North 38 degrees 50 minutes 46 seconds West 650.78 feet to a point in the center of Silas Creed (Harrison and Bourbon County Line), North 38 degrees 50 minutes 46 seconds West 227.22 feet to a post, North 39 degrees 04 minutes 18 seconds West 923.64 feet to a post, North 38 degrees 35 minutes 54 seconds West 424.15 feet to a post, North 38 degrees 14 minutes 34 seconds West 219.12 feet to a #4 steel rebar, South 46 degrees 30 minutes 06 seconds West 771.11 feet to a #4 steel rebar in the line of Joyce Thome Harris, thence with the line of Joyce Thome Harris, North 37 degrees 30 minutes 46 seconds West 2173.32 feet to a #4 steel rebar corner to Wayne West; thence with Wayne West for three calls, North 51 degrees 13 minutes 47 seconds East 921.22 feet to a #4 steel rebar South 48 degrees 49 minutes 03 seconds East 2592.97 feet to a #4 steel rebar, South 37 degrees 37 minutes 21 seconds East 543.75 feet to a 24 inch hackberry tree corner to Michael J. Kias, thence with Michael J. Kias for three calls, South 37 degrees 51 minutes 59 seconds East 727.18 feet to a point in the center of Silas Creek (Harrison and Bourbon County line), South 39 degrees 51 minutes 59 seconds East 1330.72 feet to a #4 steel rebar, North 54 degrees 47 minutes 58 seconds East 481.84 feet to a railroad spike in the center of the passway and in the line of Alan Easley; thence with the line of Alan Easley and the center of a passway South 33 degrees 51 minutes 48 seconds East 761.60 feet to the beginning and containing 114.78 acres and being subject to easements and rights of way of records and in existence and in accordance with a survey by Jerry L. Casey, LS on the 8th day of January, 1988; a plat of which being recorded in Plat Cabinet 2, Sheet 55A, Harrison County Court Clerk's Office and Plat Cabinet B, Sheet 86, Bourbon County Court Clerk's Office.

Being the same property conveyed to Douglas Hines and Sara Hines by deed dated June 15, 1989, recorded June 23, 1989 in Deed Book 182, Page 35 of the Harrison County, Kentucky Clerk's Office.

EXCEPTING THEREFROM, all that portion of the above described real estate located in Bourbon County, Kentucky. The same having not been examined by the Company, the Company hereby expressly excludes from the description of the Land any portion of the above described real estate located in Bourbon County, Kentucky.

Parcel 11:

Tract 1:

Beginning at a point in the center of the Russell Cave Pike, corner to Clarence LeBus; thence with his line, N 66°45' W, 6.33 chains to an Elm; N 65°45' W, 26.83 chains to a post; N 7°45' W, 10.21 chains to a post near a large Elm; S 85°05' E, 5.83 chains to a stake near a large Ash; N 4°45' E, 12.63 chains to a post in said LeBus' line, corner to Mrs. Agnes McDowell; thence with her line, S 84°00' E, 24.40 chains to a point in the center of the Russell Cave Pike; thence with the center of same, N 3°35' E, 0.88 chains to a point in the center of said pike, corner to Mrs. Agnes McDowell; thence with her line, S 86°00' E, 27.70 chains to a post; S 5°00' W, 17.73 chains to a stake near a large Oak on the South side on an old dirt road; thence with the south margin of said dirt road, S 85°30' E, 20.77 chains to a post; S 83°45' E, 6.27 chains to a Walnut; thence S 66°20' E, 0.43 chains to a post in John Lail's line, corner to Mrs. Agnes McDowell; thence with John

(CONTINUED)

Lail's line, S 48°30' W, 15.74 chains to a post; S 9°15' W, 33.51 chains to a post in Collier's line, corner to Clarence Rouse; thence with his line, N 62°00' W, 5.03 chains to a post; N 59°20' W, 4.02 chains to a post corner to Clarence LeBus; thence with his line N 48°00' W, 8.97 chains to a post; S 71°30' W, 0.82 chains to the stone abutment of a water gap on the north bank of Silas Creek; thence crossing said creek, S 42°00' W, 1.23 chains to a post on the south bank of Silas Creek; thence along the south bank of said creek, N 61°15' W, 3.65 chains to a post; N 12°45' W, 3.89 chains to a post; thence leaving Silas Creek, S 52°00' W, 7.27 chains to a post; N 37°00' W, 9.00 chains, N 37°45' W, 10.81 chains to the center of Russell Cave Pike; thence with the center of same, N 18°20' E, 3.15 chains; N 27°45' E, 2.22 chains to the point of beginning, containing 278.95 acres of land, according to survey made by F. L. Faulconer, Cynthiana, Kentucky, on May 9, 1947, and which said Map and Plat is attached hereto as a part hereof.

SAVE AND EXCEPT that portion of the above described real estate conveyed to the Commonwealth of Kentucky for the use and benefit of the Department of Highways by deed dated March 20, 1954, recorded April 29, 1954 in Deed Book 116, Page 191 of the Harrison County, Kentucky Clerk's Office.

FURTHER SAVE AND EXCEPT that portion of the above described real estate conveyed to the Commonwealth of Kentucky for the use and benefit in the Department of Highways by deed dated March 20, 1954, recorded April 29, 1954 in Deed Book 116, Page 193 of the Harrison County, Kentucky Clerk's Office.

AND FURTHER SAVE AND EXCEPT that portion of the above described real estate conveyed to the Commonwealth of Kentucky for the use and benefit for the Department of Highways by deed dated March 20, 1953, recorded September 25, 1962 in Deed Book 124, Page 193 of the Harrison County, Kentucky Clerk's Office.

Tract 2:

Beginning at a point in the center of the Russell Cave Pike, corner to Clarence LeBus; thence N 89°30' W, 10.12 chains to a post, corner to Lon McLoney; thence with his line, S 68°30' W, 1.70 chains to a gate post; S 29°30' W, 0.25 chains to a post at end of water gap; N 77°45' W, 13.30 chains to a post; N 73°15' W, 1.93 chains to a post; N 85°20' W, 0.97 chains to a post; N 77°45' W, 8.36 chains to a post; N 89°00' W, 3.67 chains to a post; N 68°00' W, 3.47 chains to a post; N 85° 45' W, 1.10 chains to a post; S 89°30' W, 22.88 chains to a post, corner to said McLoney in Kirtley McDaniel's line; thence with his line S 7°00' W, 5.95 chains to a post; N 86°15' W, 15.93 chains to a post; S 3°20' W, 4.60 chains to a post; N 85° 45' W, 22.40 chains to the center of the Allen Pike; thence with the center of same S 5°15' W, 18.00 chains; S 4°45' W, 7.03 chains to the point of intersection of the centers of the Allen Pike and the Silas Pike; thence with the center of the Silas Pike S 68°20' E, 3.57 chains; S 75°00' E, 3.00 chains; S 54°30' E, 5.50 chains; S 72°15' E, 4.00 chains; S 57°30' E, 1.70 chains; S 46°45' E, 12.00 chains; S 33°00' E, 2.00 chains; S 25°30' E, 3.79 chains to a point in the center of said pike, corner to Silas Church; thence with the line of the Silas Church property, N 6°30' E, 5.06 chains to a post; S 65°00' E. 3.00 chains to a post corner to said church in Ed Kelly's line; thence N 5°45' E, 23.73 chains to a post corner to said Kelly; thence S 85°45' E, 38.28 chains to a post corner to Fitzgerald; thence with his line, N 3°30' E, 5.40 chains; S 85°45' E, 26.32 chains, to the center of the Russell Cave Pike; thence with the center of the same N 35°30' E, 2.00 chains; N 16° 45' E, 2.00 chains; N 12°15' E, 2.60 chains; N 17°30' E, 6.00 chains; N 10°20' E, 11.24 chains to the point of beginning, containing 312.55 acres of land, according to survey made by F. L. Faulconer, of Cynthiana, Kentucky, on May 7, 1947; and which sad survey Map and Plat is attached hereto as a part hereof.

SAVE AND EXCEPT: The following described real estate in the County of Harrison, Commonwealth of Kentucky to-wit: All that certain tract or parcel of land, lying and being located in Harrison County and Bourbon County, Kentucky and situated on the west side of Russell Cave Road (KY 353); and more particularly described as follows: Unless stated otherwise, any monument referred to herein as an "iron pin" is a set #4 rebar, eighteen inches (18") in length, with an orange cap stamped "Darnell 3553". All bearings stated herein are referenced to the Parent Tract.

BEGINNING at an iron pin in the west right-of-way of Russell Cave Road (KY 353), a corner to Parcel 2, a new division of Agnes McDowell (D.B. 109, Pg. 186); said point lying N. 22° 00' 41" E. 742.59 feet from an iron pin in said right-of-way, a corner to Bourbon Limestone Company (D.B. 177, Pg. 107; P.C. 2, Sh. 52A); thence with the said west right-of-way of Russell Cave Road (KY 353) for three calls as follows:(1) With a curve to the right having a radius of 1859.86 feet, an arc length of 513.69, and a chord bearing S. 81° 51' 59" W. 512.06 feet to a point, (2) with a spiral curve the right with a chord bearing S. 28° 47' 15" W. 197.34 feet to a point, and, (3) S. 29° 46' 44" W. 35.66 feet to an iron pin, a corner to Bourbon Limestone Company (D.B. 177, pg. 10; P.C. 2, Sh. 52A); thence with said Bourbon Limestone company for eight calls as follows: (1) N. 37° 45' 00" W. 25.81 feet to a point at an abandoned road, (2) N. 18° 14' 54" E. 141.33 feet to a point at an abandoned road,(3) N. 16° 19' 44" E. 47.46 feet to a point at an abandoned road, (4) N. 22° 05' 32" E. 64.90 feet to a point at an abandoned road, (5) N. 26° 32' 41" E. 136.95 feet to a point at an abandoned road, (6) N. 66° 45' 00" W. passing an iron pin at 115.69 feet, in all 414.99 feet to a mag nail set in a tree, (7) N. 65° 59' 35" W. 877.21 feet to a mag nail set in a tree, and (8) N. 65° 30' 41" W. 893.58 feet to an iron pin, in the line Of Roger D. Hockensmith & Linda Hockensmith (D.B. 175, Pg. 154); thence with said Hockensmith N. 07° 38' 15" W. 402.56 feet to an iron pin, a corner to Parcel 2, a new division of Agnes McDowell (D.B. 109, Pg. 186); thence with said Parcel 2 S. 65° 53' 40" E. passing an iron pin at 1205.22 feet, in all 2410.44 feet to the point of beginning containing an area of 19.000 acres or less and being subject to any and all easements or right-of-way of record and in existence and in accordance with a survey and plat by Allen Patrick Darnell PE, PLS on June 9, 2006 and which is recorded in Plat Cabinet 4, Sheet 318, Harrison County Clerk's Office and Plat Cabinet C, Sheet 243, Bourbon County Clerk's Office.

EXCEPTING THEREFROM, all that portion of the above described Tract 1 and Tract 2 located in Bourbon County, Kentucky. The same having not been examined by the Company, the Company hereby expressly excludes from the description of the Land any portion of the above described real estate located in Bourbon County, Kentucky.

STEWART TITLE GUARANTY COMPANY

TITLE COMMITMENT NUMBER: 01219-21334M

ISSUING FILE NUMBER: 01219-21334M

COMMITMENT EFFECTIVE DATE: AUGUST 19, 2020 AT 8:00 A.M.

SCHEDULE B, PART II

EXCEPTIONS

1. Any defect, lien, encumbrance, adverse claim, or other matter that appears for the first time in the Public Records or is created, attaches, or is disclosed between the Commitment Date and the date on which all of the Schedule B, Part I - Requirements are met.
2. Rights of tenants in possession, as tenants only, under prior unrecorded leases.
3. Any discrepancies, conflicts, or shortages in area or boundary lines, or any encroachments or protrusions, or overlapping of improvements which would be disclosed by an inspection and accurate survey of the premises.
4. Any lien, or right to a lien, for services, labor, or material heretofore or hereafter furnished, imposed by law and not shown by the public records.
5. Rights or claims of easements not recorded in the public records.
6. Taxes and assessments for the current year and subsequent installments, which are a lien, not yet due and payable.
7. Harrison County Parcel Number: 066-0000-005-00-000 (Parcel 1) Valuation: $210,700.00 2019 County Taxes in the annual amount of $2,082.76 are PAID for the year. 2020 County Taxes constitute a lien not yet due and payable.

   Harrison County Parcel Number: 066-0000-002-00-000 (Parcel 2) Valuation: $119,215.00 2019 County Taxes in the annual amount of $1,178.43 is PAID for the year. 2020 County Taxes constitute a lien not yet due and payable.

   Harrison County Parcel Number: 066-0000-006-00-000 (Parcel 3) Valuation: $128,280.00 2019 County Taxes in the annual amount of $1,238.04 is PAID for the year. 2020 County Taxes constitute a lien not yet due and payable.

   Harrison County Parcel Number: 065-0000-024-00-000 (Parcel 4, Tract 1) Valuation: $39,945.00 2019 County Taxes in the annual amount of $385.95 is PAID for the year. 2020 County Taxes constitute a lien not yet due and payable.

   Harrison County Parcel Number: 065-0000-026-00-000 (Parcel 4, Tract 2) 2019 County Taxes in the annual amount of $3,060.14 is PAID for the year. 2020 County Taxes constitute a lien not yet due and payable.

(CONTINUED)

   Harrison County Parcel Number: 066-0000-001-00-000 (Parcel 5) Valuation: $106,610.00 2019 County Taxes in the annual amount of $1,053.82 is PAID for the year. 2020 County Taxes constitute a lien not yet due and payable.

   Harrison County Parcel Number: 052-0000-029-00-000 (Parcel 7 - Tract 1) Valuation: $103,055.00 2019 County Taxes in the annual amount of $1,018.69 is PAID for the year. 2020 County Taxes constitute a lien not yet due and payable.

   Harrison County Parcel Number: 052-0000-039-00-000 (Parcel 7 - Tract 2) 2019 County Taxes in the annual amount of $1,826.87 is PAID for the year. 2020 County Taxes constitute a lien not yet due and payable.

   Harrison County Parcel Number: 080-0000-002-01-000 (Parcel 9) 2019 County Taxes in the annual amount of $3,470.39 are PAID. 2020 County Taxes constitute a lien, not yet due and payable.

   Harrison County Parcel Number: 080-0000-002-02-000 (Parcel 10) Valuation: $407,160. 2019 County Taxes in the annual amount of $321.12 are PAID. 2020 County Taxes constitute a lien not yet due and payable.

   Harrison County Taxes Parcel Number: 066-0000-007-01-000 (Parcel 8) Valuation: $4,845.00 2019 County Taxes in the annual amount of $47.89 are PAID. 2020 County Taxes constitute a lien not yet due and payable.

   Harrison County Parcel Number: 066-0000-007-00-000 (Parcel 11)

   This property was exempt from taxation for the year 2019

   Harrison County Taxes Parcel Number: 066-0000-003-02-000 (Parcel 6)

   This property was exempt from taxation for the year 2019
8. Terms and conditions of the lease by and between Troy L. Bradford and Mary Ware Bradford and Bluebird Solar, LLC, a Kentucky limited liability company, as evidenced by Memorandum of Solar Ground Lease Agreement, dated February 10, 2017, recorded April 10, 2017 in Deed Book 347, Page 674 of the Harrison County, Kentucky Clerk's Office, as to Parcel 1.

   (DOES AFFECT THE PARCEL 1, WITH AN AREA SHOWN BEING EXCLUDED FROM THE LEASE) .
9. Transmission Line Right of Way Easement in favor of East Kentucky Rural Electric Cooperative Corporation dated April 11, 1963, recorded April 24, 1963 in Deed Book 124, Page 583 of the Harrison County, Kentucky Clerk's Office, as to Parcel 1, Parcel 5 and Parcel 7.

   (DOES AFFECT PARCELS 1, 4 AND 5, AND SHOWN. RELATES TO A 150-FOOT WIDE TRANSMISSION LINE EASEMENT CROSSING THE SUBJECT PROPERTIES AS SHOWN)
10. Easement for Common Driveway in favor of Elizabeth V. McDowell dated January 11, 1984, recorded April 5, 1984 in Deed Book 164, Page 781 of the Harrison County, Kentucky Clerk's Office, as to Parcel 1 and Parcel 7.

    (THE EASEMENT IS FOR A COMMON DRIVEWAY TO PROVIDE ACCESS TO RUSSELL CAVE PIKE. ACTUAL DRIVEWAY IS NOT DESCRIBED IN THIS DOCUMENT. UNABLE TO PLOT OR LOCATE)
11. Terms and conditions of the lease between Jerry Thomas Dawson, Charlene M. Dawson, and Bluebird Solar, LLC as evidenced by the Memorandum of Solar Ground Lease Agreement dated February 6, 2017, and recorded April 10, 2017 in Deed Book 347, Page 695 of the Harrison County, Kentucky Clerk's Office, as to Parcel 2.

    (DOES RELATE TO PARCEL 2. EASEMENTS ARE BLANKET IN NATURE AND UNABLE TO PLOT. LEASE AREA THAT IS EXCEPTED OUT IN THE NW CORNER OF PARCEL 2 IS AS SHOWN)
12. Terms and conditions of the lease by and between William R. Hilliard, Jr., and Bluebird Solar, LLC, a Kentucky limited liability company, as evidenced by Memorandum of Solar Ground Lease Agreement, dated February 1, 2017, recorded June 5, 2017 in Deed Book 348, Page 721 of the Harrison County, Kentucky Clerk's Office, as to Parcel 3.

    (DOES RELATE TO PARCEL 2. EASEMENTS ARE GENERAL IN NATURE AND UNABLE TO PLOT.)
13. Transmission Line Right of Way Easement in favor of East Kentucky Rural Electric Cooperative Corporation dated March 25, 1963, recorded April 9, 1963 in Deed Book 124, Page 503 of the Harrison County, Kentucky Clerk's Office, as to Parcel 3.

    (DOES RELATE TO PARCEL 3., FOR PORTION OF SOUTHWEST CORNER OF PROPERTY, A 150-FOOT WIDE EASEMENT AS SHOWN.)
14. Terms and conditions of the lease by and between Joe Mike McDaniel and Joyce McDaniel to Bluebird Solar, LLC, as evidenced by Memorandum of Solar Ground Lease Agreement, dated February 28, 2017, recorded April 24, 2017 in Deed Book 348, Page 112 of the Harrison County, Kentucky Clerk's Office, as to Parcel 4.

    (DOES RELATE TO PARCEL 4, AREA AS NOTED HEREON)
15. Terms, conditions and reservation of easement for ingress and egress to grave yard as recited in deed dated August 25, 1913, recorded Aug. 27, 1913, Deed Book 77, Page 499 of the Harrison County, Kentucky Clerk's Office, as to Parcel 4.

    (EASEMENT IS BLANKET IN NATURE AND UNABLE TO PLOT OR LOCATE)
16. Pole Line Agreement in favor of Kentucky Utilities Company, a Kentucky corporation dated July 18, 1940, recorded August 6, 1940 in Deed Book 102, Page 379 of the Harrison County, Kentucky Clerk's Office, as to Parcel 4.

    (EASEMENT DESCRIBES A 100-FOOT WIDE POWER EASEMENT)
17. Terms, conditions, and easements as set forth in deed dated June 30, 1973, recorded July 13, 1973 in Deed Book 140, Page 250 of the Harrison County, Kentucky Clerk's Office, as to Parcel 4.

    (EASEMENTS DESCRIBED ARE VAGUE AND UNABLE TO PLOT.)
18. Transmission Line Right of Way Easement in favor of East Kentucky Rural Electric Cooperative Corporation dated February 5, 1963, and recorded March 4, 1963 in Deed Book 124, Page 530 of the Harrison County, Kentucky Clerk's Office, as to Parcel 4.

    (DOES AFFECT PARCEL 4 AS IT RELATES TO A 150-FOOT WIDE TRANSMISSION LINE EASEMENT CROSSING THE SUBJECT PROPERTY AS SHOWN)
19. Right-of-Way Easement in favor of South Central Bell Telephone Company dated April 18, 1979, and recorded May 3, 1979 in Deed Book 154, Page 503 of the Harrison County, Kentucky Clerk's Office, as to Parcel 4.

    (DOES AFFECT PARCEL 4 ALONG THE ROAD FRONTAGE OF HWY 62. DESCRIPTION IS VAGUE AND UNABLE TO PLOT EXACT LOCATION)
20. Terms and conditions of the lease by and between Gerald M. Whalen and Bluebird Solar, LLC, as evidenced by Memorandum of Solar Ground Lease Agreement, dated February 9, 2017, recorded April 10, 2017 in Deed Book 347, Page 681 of the Harrison County, Kentucky Clerk's Office, as to Parcel 5.

    (DOES RELATE TO PARCEL 5. EASEMENTS ARE GENERAL IN NATURE AND UNABLE TO PLOT.)
21. Terms and conditions of the lease by and between James Evans Wilson, Leslie Anne Wilson, Katherine Allen Wilson and Wyman D. Rice and Bluebird Solar, LLC, as evidenced by Memorandum of Solar Ground Lease Agreement, dated February 22, 2017, recorded April 10, 2017 in Deed Book 347, Page 688 of the Harrison County, Kentucky Clerk's Office, as to Parcel 7.

    (DOES RELATE TO PARCEL 7 . EASEMENTS ARE GENERAL IN NATURE AND UNABLE TO PLOT. CERTAIN AREAS ARE MARKED FOR USE AND AS SHOWN HEREON)
22. Terms and conditions, including a right of first refusal, as set forth in the lease by and between James E. Wilson, Leslie A. Wilson and Katherine Allen Wilson and Cellco Partnership, as evidenced by Memorandum of Lease, dated November 16, 2015, recorded January 28. 2016 in Deed Book 341, Page 351 of the Harrison County, Kentucky Clerk's Office, as to Parcel 7.

    (DOES RELATE TO PARCEL 7 . EASEMENTS ARE GENERAL IN NATURE. THERE IS A 100' X 100' AREA THAT IS NOT INCLUDED, AND IS ALSO IN AN OVERALL AREA THAT IS NOT INCLUDED, AS SHOWN)
23. Terms and conditions of the lease by and between Cellco Partnership, a Delaware general partnership d/b/a Verizon Wireless and ATC Sequoia, LLC, a Delaware limited liability company, as evidenced by Memorandum of Lease, dated September 14, 2015, recorded September 29, 2015 in Deed Book 339, Page 462 of the Harrison County, Kentucky Clerk's Office, as to Parcel 7.

    (DOES RELATE TO PARCEL 7 . NOTHING TO PLOT OR LOCATE)
24. Terms and conditions of the lease between James Wilson, Leslie Anne Wilson, and Kay Allen Wilson, collectively Lessor, and Cellco Partnership, Lessee, as evidenced by Memorandum of Lease dated April 1, 2010, and recoded April 12, 2010 in Deed Book 312, Page 220 of the Harrison County, Kentucky Clerk's Office, as to Parcel 7.

    (DOES RELATE TO PARCEL 7 . EASEMENTS ARE FOR A CELL TOWER AS SHOWN IN AN AREA THAT IS NOT BEING INCLUDED IN THE SOLAR FACILITIES CONSTRUCTION , AS SHOWN).
25. Private Passway Agreement as set forth in document dated January 25, 1894, and recoded in Deed Book 57, Page 405 of the Harrison County, Kentucky Clerk's Office, as to Parcel 7.

    (DOES RELATE TO PARCEL 7 . DOCUMENT IS DATED 1894, AND UNABLE TO PLOT OR LOCATE ANY ITEMS)
26. Right-of-Way Easement in favor of South Central Bell Telephone Company dated September 9, 1975, and recorded December 23, 1975 in Deed Book 145, Page 340 of the Harrison County, Kentucky Clerk's Office, as to Parcel 7.

    (DOES AFFECT THE PROPERTY OF PARCEL 7, NEAR THE TOP OF THE PARCEL ON THE SOUTH SIDE OF ALLEN PIKE. RELATE TO A BURIED CABLE., THE DESCRIPTION IS VAGUE AND THE APPROXIMATE LOCATION OF THE LINE IS SHOWN)
27. Right-of-Way Easement in favor of South Central Bell Telephone Company dated May 16, 1978, and recorded August 1, 1978 in Deed Book 152, Page 22 of the Harrison County, Kentucky Clerk's Office, as to Parcel 7.

    (DOES AFFECT THE PROPERTY OF PARCEL 7, ON THE EAST SIDE OF ALLEN PIKE. LOCATION MARKED IS APPROXIMATE AND BASED ON THE SKETCH PROVIDED.)
28. Deed of Easement in favor of Columbia Gas of Kentucky, Inc. dated December 10, 1986, and recorded January 20, 1987 in Deed Book 173, Page 632 of the Harrison County, Kentucky Clerk's Office, as to Parcel 7.

    (DOES AFFECT THE PROPERTY OF PARCEL 7, AND IS A 50-FOOT EASEMENT LOCATED ON THE NORTH SIDE OF SILAS ROAD, NO FURTHER THAN 20-FEET NORTH OF THE NORTH FENCE LINE ALONG SILAS ROAD)
29. Right-of-Way Easement in favor of Judy Water Association, Inc. dated December 11, 1998, and recorded in Deed Book 230, Page 164 of the Harrison County, Kentucky Clerk's Office, as to Parcel 9.

    (MAY OR MAY NOT AFFECFT PARCEL 9. THE DESCRIPTION IS VAGUE AND UNABLE TO PLOT. LAIL ROAD IS NOW REFERRED TO AS LAIL LANE.)
30. Easements, setbacks, and restrictions as set forth on the Minor Plat recorded in Plat Cabinet 5, Slide 5C of the Harrison County, Kentucky Clerk's Office, as to Parcel 9.

    (INGRESS - EGRESS EASEMENT TO THE REED PROPERTY IS AS SHOWN HEREON)
31. Easements, setbacks, and restrictions as set forth on the Minor Plat recorded in Plat Cabinet 7, Slide 19A of the Harrison County, Kentucky Clerk's Office, as to Parcel 9.

    (DOES RELATE TO PARCEL 9 PROPERTY. THERE ARE NOT ANY EASEMENTS TO ADD OR SHOWN FROM THIS PLAT. PARCEL 1 IS BROKEN OUT FROM THE OVERALL PROPERTY, LEAVING A PARCEL 2. THE TAX RECORDS STILL SHOW THIS PROPERTY AS BEING ONE OVERALL PARCEL.)
32. Passway Easement as set forth in Deed of Conveyance dated April 11, 1934, recorded April 11, 1934 in Deed Book 97, Page 373 of the Harrison County, Kentucky Clerk's Office, as to Parcel 10.

    (THE EASEMENT LOCATION IS BLANKET AND VAGUE IN NATURE AND UNABLE TO PLOT OR LOCATE UPON THE SURVEY)
33. Agreement for Joint Use and Maintenance of Passway by and between Michael Kias, Susan Kias, Alan E. Easley, Jean O. Easley, Stanley Wayne West, Alyne G. West, James E. Poe, Carolyn Poe, Clyde Cockrell, Bernice Cockrell, Larry R. Lehmann, and Verna T. Lehmann, dated March 11, 1988, recorded May 17, 1988 in Deed Book 178, Page 355 of the Harrison County, Kentucky Clerk's Office, as to Parcel 10.

    (DOES AFFECT THE PROPERTY OF PARCEL 10. THE PASSWAY EASEMENT IS 20-FEET WIDE AND FOLLOWS MORE OR LESS THE EXISTING LAIL LANE, DOWN TO TOWNSEND VALLEY ROAD LOCATION)
34. Easements, setbacks, and restrictions as shown in Plat Cabinet 2, Slide 55A of the Harrison County, Kentucky Clerk's Office, as to Parcel 10.

    (DOES RELATE TO THE PROPERTY OF PARCEL 10. NO EASEMENTS, SETBACKS, OR RESTRICTIONS FOUND).
35. Easements and restrictions as shown in Plat Cabinet 4, Slide 318 of the Harrison County, Kentucky Clerk's Office, as to Parcel 8 and Parcel 11.

    (DOES RELATE TO THE PROPERTY OF PARCELS 8 & 11. NO EASEMENTS, SETBACKS, OR RESTRICTIONS FOUND. RUSSELL CAVE ROAD (KY. ROUTE 353 IS SHOWN).
36. Deed for Highway Purposes by and between Miss Agnes McDowell and the Commonwealth of Kentucky for the use and benefit of the Department of Highways dated March 20, 1954, recorded April 29, 1954 in Deed Book 116, Page 191 of the Harrison County, Kentucky Clerk's Office, as to Parcel 8 and Parcel 11.

    (DOES RELATE TO THE PROPERTY OF PARCELS 8 & 11, WITH RUSSELL CAVE ROAD HAVING A 100-FOOT RIGHT-OF-WAY EASEMENT BEING 50 FEET ON EITHER SIDE FROM THE CENTER OF ROAD)
37. Deed for Highway Purposes by and between Miss Agnes McDowell and the Commonwealth of Kentucky for the use and benefit in the Department of Highways dated March 20, 1954, recorded April 29, 1954 in Deed Book 116, Page 193 of the Harrison County, Kentucky Clerk's Office, as to Parcel 8 and Parcel 11.

    (DOES RELATE TO THE PROPERTY OF PARCELS 8 & 11, WITH THIS ROAD BEING RUSSELL CAVE ROAD)
38. Deed of Highway Purposes by and between Agnes McDowell and the Commonwealth of Kentucky for the use and benefit for the Department of Highways dated March 20, 1953, recorded September 25, 1962 in Deed Book 124, Page 193 of the Harrison County, Kentucky Clerk's Office, as to Parcel 8 and Parcel 11.

    (DOES RELATE TO THE PROPERTY OF PARCELS 8 & 11, WITH THIS ROAD BEING RUSSELL CAVE ROAD)
39. Transmission Line Right of Way Easement by and between Elizabeth V. McDowell and East Kentucky Rural Electric Cooperative Corporation, Winchester, Kentucky, dated March 9, 1963, recorded March 18, 1963 in Deed Book 124, Page 441 of the Harrison County, Kentucky Clerk's Office, as to Parcel 8.

    (DOES NOT RELATE TO THE PROPERTY OF PARCEL 8. RELATES TO A DIFFERENT PARCEL OF LAND OWNED BY ELIZABETH V. McDOWELL, PID 066-0000-004-00-000, LOCATED SOUTH OF PARCEL 1 AS SHOWN HEREON)
40. Right of Way Easement in favor of South Central Bell Telephone Company, dated August 1, 1980, recorded August 13, 1980 in Deed Book 157, Page 272 of the Harrison County, Kentucky Clerk's Office, as to Parcel 8 and Parcel 11.

    (DOES NOT RELATE TO THE PROPERTY OF PARCEL 8 OR 11. RELATES TO A DIFFERENT PARCEL OF LAND OWNED BY ELIZABETH V. McDOWELL, PID 066-0000-004-00-000, LOCATED SOUTH OF PARCEL 6 AS SHOWN HEREON)
41. Right of Way Easement in favor of South Central Bell Telephone Company, dated December 14 1973, recorded January 10, 1974 in Deed Book 141, Page 187 of the Harrison County, Kentucky Clerk's Office, as to Parcel 8 and Parcel 11.

    (DOES NOT RELATE TO THE PROPERTY OF PARCELS 8 OR 11. RELATES TO THE McDOWELL PROPERTY LOCATED ON THE EAST SIDE OF RUSSELL CAVE ROAD AS SHOWN HEREON)
42. Right of Way Easement in favor of South Central Bell Telephone Company, dated January 24, 1974, recorded February 12, 1974 in Deed Book 141, Page 359 of the Harrison County, Kentucky Clerk's Office, as to Parcel 8 and Parcel 11.

    (DOES RELATE TO THE PROPERTY OF PARCEL 11. RELATES TO THE McDOWELL PROPERTY LOCATED ON THE WEST SIDE OF RUSSELL CAVE ROAD AS SHOWN HEREON)
43. Right of Way Easement in favor of South Central Bell Telephone Company, dated January 24, 1974, recorded February 12, 1974 in Deed Book 141, Page 360 of the Harrison County, Kentucky Clerk's Office, as to Parcel 8 and Parcel 11.

    (DOES RELATE TO THE PROPERTY OF PARCEL 8. RELATES TO THE McDOWELL PROPERTY LOCATED ON THE WEST SIDE OF RUSSELL CAVE ROAD AS SHOWN HEREON)
44. Deed of Easement by and between Elizabeth V. McDowell and Columbia Gas of Kentucky, Inc., a corporation dated August 24, 1987, recorded August 24, 1987 in Deed Book 175, Page 495 of the Harrison County, Kentucky Clerk's Office, as to Parcel 11.

    (DOES NOT RELATE TO THE PROPERTY OF PARCEL 11. RELATES TO THE McDOWELL PROPERTY PID 066-0000-004-00-000, LOCATED SOUTH OF PARCELS 1 & 6 AS SHOWN HEREON)
45. Terms, conditions and easements as set forth in the lease by and between Silas Baptist Church and Bluebird Solar, LLC as evidenced by the Memorandum of Solar Ground Lease Agreement dated May 1, 2017, recorded June 5, 2017 in Deed Book 348, Page 729 of the Harrison County, Kentucky Clerk's Office, as to Parcel 6.

    (DOES RELATE TO PARCEL 6. EASEMENTS ARE GENERAL IN NATURE AND UNABLE TO PLOT.)

46 Right-of-Way Easement by and between Kirtley McDaniel and Harrison County Water Association, Inc., dated November 19, 1967, recorded August 2, 1972 in Deed Book 138, Page 416 of the Harrison County, Kentucky Clerk's Office, as to Parcel 6.

(MAY OR MAY NOT AFFECT THE PARCEL 6. THE EASEMENT IS VAGUE AND UNABEL TO PLOT OR LOCATE UPON THE PROPERTY)

47. Title to, and easements in, any portion of the Land lying within any highways, roads, streets, or other ways.
48. Minerals of whatsoever kind, subsurface and surface substances, including but not limited to coal, lignite, oil, gas, uranium, clay, rock, sand and gravel in, on, under and that may be produced from the Land, together with all rights, privileges, and immunities relating thereto, whether or not appearing in the Public Records or listed in Schedule B. The Company makes no representation as to the present ownership of any such interests. There may be leases, grants, exceptions or reservations of interests that are not listed.
49. Any acreage or square footage indicated in the legal description, and/or the address shown on Schedule A, is solely for the purpose of identifying said tract of land and shall not be construed as insuring the quantity of land, and/or the address as set forth in the description of the property.

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Know what's **below.**
Call before you dig.

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NOTICE:
CONSTRUCTION SITE SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR; NEITHER THE OWNER NOR THE ENGINEER SHALL BE EXPECTED TO ASSUME ANY RESPONSIBILITY FOR SAFETY OF THE WORK, OF PERSONS ENGAGED IN THE WORK, OF ANY NEARBY STRUCTURES, OR OF ANY OTHER PERSONS.

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LOCATED IN
BOURBON COUNTY, PARIS KENTUCKY
& HARRISON COUNTY
CYNTHIANA, KENTUCKY

CLIENT
BayWa r.e. Renewable Energy

ALTA/NSPS LAND TITLE SURVEY
OF THE
BLUEBIRD SOLAR, LLC SITE
U.S. HIGHWAY 62 And
STATE ROUTE No. 353

DATE
NOVEMBER 24, 2020

1. REVISIONS JUNE 24, 2021

REVISIONS

SCALE 0 100 200
1" = 200 FEET

DR. AH CH. DLA
P.M. A. HARPER
BOOK --
JOB 20002456
SHEET NO.
12 OF 12

CAD FILE: 20002456 AS-03.DWG

Data Request SITING BOARD_2_12:

Refer to the Application, Exhibit J, Economic Impact Report. Provide the amount and source of any excise taxes (sales or use taxes) to be paid for goods and services in Kentucky.

<u>Response</u>:

The project will generate Kentucky income and sales taxes associated with the construction of the solar farm. A common way to estimate these taxes is to rely on 'effective' tax rates, which are calculated by dividing tax revenues by payroll over time. Below is a table showing such a calculation for Kentucky. On average, Kentucky income taxes are 4.87% of wages and salaries, and Kentucky sales taxes are 4.00% of wages and salaries. Applying those percentages to the predicted payroll impact in Harrison County from construction yields an estimated $887,000 in state income taxes and $728,000 in state sales taxes.

Calculation of Effective Tax Rates, Kentucky Individual Income and Kentucky Sales Taxes

	2016	2017	2018	2019	2020	5-year average
Fiscal Year (millions)						
Individual Income Tax	$4,282.1	$4,393.9	$4,603.6	$4,544.7	$4,765.20	
Sales and Use Tax	$3,462.7	$3,485.2	$3,605.7	$3,937.6	4,070.90	
Calendar Year (thousands)						
Wages and Salaries	$87,705,340	$90,433,299	$93,234,914	$96,606,011	$96,172,951	
Effective Rates on W&S						
Individual Income Tax	4.88%	4.86%	4.94%	4.70%	4.95%	4.87%
Sales and Use Tax	3.95%	3.85%	3.87%	4.08%	4.23%	4.00%

Source: state government revenues from Office of State Budget Director; wages and salaries from US Bureau of Economic Analysis.

Witness: Paul Coomes

Data Request SITING BOARD_2_13:

Explain whether the underground construction to interconnect the sections of the project will cause a short-term closure of Allen Pike or Russell Cave Road. If so, confirm compliance with any permitting requirements for road closure.

Response: The construction of overhead or underground, medium-voltage collection lines crossing Allen Pike and/or Russell Cave Road is expected to cause partial and temporary closure of those roads. Bluebird will coordinate these closures with the Kentucky Transportation Cabinet and receive any legally required permits.

Witness: Michael Stanton