Attachment 14

Final Geotechnical Study

ANS GEO

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Geotechnical Report

ibV Energy – Rhudes Creek Solar Project

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1 Introduction

ANS Geo, Inc. is pleased to provide this Geotechnical Report (Report) to ibV Energy (ibV) to summarize the results of our geotechnical field investigations in support of the proposed Rhudes Creek Solar project located in Hardin County, Kentucky. At the time of this Report, it is our understanding that the solar facility is planned to include a substation, access roadways, and solar panel arrays. In addition, the purpose of this Geotechnical Report is to provide preliminary information for schematic design, as well as Information for Bidders to inform them of expected subsurface conditions for the proposed photovoltaic development, as well as support their respective designs.

ANS Geo notes that our geotechnical program was conducted to supplement Terracon's preliminary investigation completed in 2020. The factual results of their investigation, summarized in their *Preliminary Geotechnical Engineering Report* dated December 30, 2020 (**Attachment H**), were reviewed and incorporated as factual data points, to the extent practical, into our report and evaluations to provide a singular comprehensive report. Our design-level geotechnical program encompassed a desktop study of local geologic conditions and available reports, soil borings, field electrical resistivity testing, pile load testing, geophysical testing as part of a karst investigation, laboratory thermal resistivity and corrosion testing, California Bearing Ratio (CBR) and laboratory soil material testing.

In addition to a traditional geotechnical investigation to support the proposed solar facility, it is known from publicly-available geologic records and Terracon's preliminary investigation that the site is underlain by a geologic formation exhibits signs and dissolution features typical of a karstic environment. As part of our investigation, a geophysics investigation, consisting of Electrical Resistivity Imaging (ERI) and 1-D multichannel analysis of surface wave (MASW) testing, was also conducted to perform a high-level evaluation as to the extent and type of karst features across the project site.

2 Methodology

2.1 Soil Borings

ANS Geo retained Tri-State Drilling, (TSD) of Chattanooga, Tennessee to advance 29 soil borings (B-12 through B-38, B-SS-1, and B-SS-2) completed at select locations across the project site between February 22 and 27, 2021. ANS Geo notes that our soil boring nomenclature intentionally begins at "B-12" as borings B-1 through B-11 were completed at the project site within Terracon's preliminary investigation program. The soil boring locations are depicted in the Investigation Location Plan, provided as **Attachment A**. Soil borings B-12 through 34 were completed within the planned array area(s), borings B-35 through 38 were positioned along the planned utility right-of-way, and borings B-SS-1 and B-SS-2 were situated within the substation footprint.

Each soil boring was generally advanced to approximately 20 feet below ground surface (BGS) or until practical refusal, whichever was encountered first. Select soil borings (B-27, 29, SS-1, and SS-2) were extended to practical refusal to collect additional, deeper information. A CME-55 ATV track rig was used to collect soil samples using the Standard Penetration Test (SPT) Method through hollow-stem augers in accordance with ASTM Standard D1586. Soil samples were generally collected continuously within the upper 10 feet in each boring, then in five-foot intervals thereafter to the termination depth. Within boring B-36, rock coring was conducting using a wireline retrieval method in accordance with ASTM D2113 to confirm the presence and type of bedrock. Soil borings, proposed by ANS Geo and confirmed by ibV review, were located at relatively evenly spread locations throughout the project footprint. All soil borings were overseen and logged by an ANS Geo representative under the direction of a Professional Engineer licensed in the State of Kentucky.

At select soil boring locations, auger cuttings were collected within four (4) feet of grade with the purpose of obtaining bulk soil samples for laboratory California Bearing Ratio (CBR), thermal resistivity testing (TRT), and corrosivity testing. Upon completion, each borehole was backfilled to its existing grade with soil cuttings and bentonite holeplug.

2.2 Electrical Resistivity Testing

As part of our field investigation program, ANS Geo performed field Electrical Resistivity Tomography (ERT) testing at six (6) locations within the proposed array area(s), and one (1) additional location within the proposed substation footprint. In-situ soil resistivity measurements were obtained by utilizing the Wenner 4-Pin Method in accordance with ASTM G57 and IEEE Standard 80. Two (2) mutually perpendicular traverses were collected at each location utilizing "a"-spacings of 2, 5, 10, 25, and 50 feet, with additional 100 and 150-foot spacings at the substation location. Test results are presented as **Attachment C**.

2.3 Pile Load Testing

2.3.1 Test Pile Installation

As part of our scope of work, ANS Geo conducted pile load testing at 19 locations across the proposed solar array area(s) between February 27 and March 6, 2021. Each test location included a pair of test piles, totaling 38 piles tested for both uplift and lateral capacities. At each test location, W6x9 steel sections ("piles") were installed to between 7 and 11 feet BGS through the overburden via direct push to significant resistance, then driven to their targeted depths using a GAYK HRE 4000 Pile Driver. Installation rates varied between 16.7 and 50.1 seconds per foot (average around 30 seconds per foot). The installation and load testing program was overseen and logged by an ANS Geo geotechnical representative under the direction of a Professional Engineer licensed in the State of Kentucky.

2.3.2 Uplift Load Testing

Once driven to the targeted embedment depth (varying between 6.0 and 9.9 feet BGS), an uplift load test was performed on each test pile in accordance with the ASTM D3689 (uplift) test method. The tension load was generally applied through a load cylinder fastened to a tripod apparatus which was mounted to the pile driver. Uplift loads were generally applied in one-minute, 500-pound increments up to 2,000 pounds. Once achieved, the load was then unloaded in similar increments and timing. After the tension was fully released, the piles were reloaded up to a maximum uplift load of roughly 10,000 pounds.

2.3.3 Lateral Load Testing

A lateral load test was also performed at each test location, following each uplift load test, in accordance with ASTM D3966 (lateral) test method. Horizontal loads were applied at approximately three (3) feet above grade on each pile using a "twin-pile" setup. The pair of piles were strapped together and loaded, in tension, using the pulling force of the interior load cylinder. Each test load was applied cyclically in one-minute, 500-pound increments up to 4,000 pounds, where feasible. Once achieved, the load was immediately released and reloaded up to a maximum deflection of approximately one-inch, if not already achieved.

The location of each pile load test is depicted in the Investigation Location Plan, provided as **Attachment A**. Results of the pile load testing program are summarized within **Section 5**.

2.3.4 Pile Extraction

Upon completion of the testing program, each test pile was excavated in its entirety with a backhoe and stockpiled on site per the landowner's approval.

2.4 Karst Investigation

As common within central Kentucky, the project site is mapped as an "area underlain by bedrock with high potential for karst development" as depicted within the Kentucky Geological Survey's *Karst Occurrence in Kentucky* map. Karst terrains include regions where the topography is formed and altered by the dissolution of bedrock (commonly limestone or dolomite). Karst landscapes are commonly characterized by features such as surficial depressions, sinkholes, sinking streams, subsurface drainage, springs, and caves. This karst classification is defined by thick-bedded, typically fine-grained and pure limestone units with little or no insoluble content. Units in this class will exhibit mature karst, including caves, sinkholes, and springs where they crop out. In addition, this unit is commonly covered by as much as 30 feet of soil, which is fairly consistent with the completed geotechnical investigations (Terracon and ANS Geo) which revealed auger refusal depths of 6.5 to 34.5 feet below grade across the site. As several surficial depressions and karst-associated features were evident at the project site, ANS Geo designed and implemented a high-level karst investigation program.

To conduct the work, ANS Geo retained THG Geophysics to support a limited geophysical investigation at the project site to evaluate the potential for karst features. The survey activities completed by THG included the use of electrical resistivity imaging (EI) and multichannel analysis of surface wave (MASW) testing to characterize subsurface soils and bedrock in an area expected to exhibit signs of karst. THG utilized a GF Instruments' ARES II electrical resistivity meter and a Geometrics Geode seismograph to image the subsurface. Given the size of the project site, testing locations were selected to be distributed across the property while also targeting potential karst features in the field such as visible topographic depressions, low-lying areas collecting and holding surface water, and waterbody features such as creeks.

It should be noted that purpose of the geophysical program was not intended to be an exhaustive evaluation of the entirety of the site, as that intent would require extensive and comprehensive canvassing and investigation across each parcel of the proposed solar farm. However, the investigation was intended to gain a general understanding of the subsurface conditions and gauge the preliminary impact which karst geohazards may or may not contribute to the design, siting, and construction of the proposed solar farm.

3 Geology and Subsurface Conditions

ANS Geo conducted a brief, desktop review of surficial and bedrock geology maps and reports made available by the United States Geological Survey (USGS) and the USDA Natural Resources Conservation Service (NRCS) prior to conducting our field investigation. We also consulted Terracon's *Preliminary Geotechnical Engineering Report* within our review. The available mapping and reports indicate that the native surficial soils are classified as predominantly clays and silts underlain by limestone bedrock which, on average, exists between 20 and 40 feet below grade. Localized areas of elevated/shallow bedrock are also expected to be present throughout the project extents. The mapped soil formations identified within our desktop study are consistent with the findings of our field investigations.

ANS Geo has provided the generalized subsurface conditions within Table 1 below based upon the observations made during our geotechnical investigation for the solar project. ANS Geo notes that this profile is highly generalized and that soil boring logs, been provided as **Attachment B**, should be reviewed for location-specific subsurface conditions.

Table 1 – Generalized Subsurface Profile

Avg. Depth (ft)	Material	Avg. Consistency	Description
0' – 0.5'	Topsoil	-	Two (2) to 10 inches of topsoil existed at surface across most of the project.
0.5 – 20'	Clay / Silt	Stiff	Clays and/or medium to high plasticity silts were encountered as the primary soil type across the project site. Soil consistency typically ranged between medium and very stiff, and maintained average pocket penetrometer measurements of 1.0 to 2.5 tons per square foot. Occasional sand inclusions were observed at depths of 6 feet or greater, within a few boring locations.
20' +	Boulders / Weathered Rock	Very dense	Refusal on dense material, likely including cobbles, boulders, or limestone bedrock, was encountered in four (14 percent) of the drilled boring locations within 20 feet of grade. The shallowest drilled refusal was recorded at 14.8 feet below grade; hand auger refusal was encountered at 4.2 feet within Boring B-38, likely due to cobble, boulder, or stiff soil.

Based on observations recorded at the time of our investigation program, seasonal high groundwater is expected to exist at six (6) feet below grade or deeper. Wet soils recovered at shallower depths within our explorations are, in our opinion, indicative of perched water conditions in localized areas.

4 Laboratory Results

4.1 Soil Index Testing

Representative soil samples were collected during our investigation and submitted to ANS's accredited materials testing laboratory. A summary of the index laboratory test results is provided within Table 2. As-received laboratory test results are included within **Attachment D**.

Table 2 – Soil Index Testing Summary

Boring ID	Sample ID	Depth (feet)	% Gravel	% Sand	% Fines	% Moisture
B-15	S-4	6 - 8	0	70.2	29.8	11.1
B-21	S-5	8 - 10	0	80.4	19.6	11.9
Boring ID	**Sample ID**	**Depth (feet)**	**Liquid Limit**	**Plastic Limit**	**Plasticity Index**	**USCS Soil Type**
B-12	S-4	6 - 8	29.8	20.3	9.5	CL
B-16	S-1	0 - 2	30.8	19.6	11.2	CL
B-17	S-5	8 - 10	27.4	18.9	8.5	CL
B-18	S-2	2 - 4	30.5	20.6	9.9	CL
B-19	S-3	4 - 6	26.7	19.2	7.5	CL
B-20	S-4	6 - 8	29.5	18.3	11.2	CL
B-24	S-3	4 - 6	29.7	19.7	10.0	CL
B-26	S-1	0 - 2	28.9	18.2	10.7	CL
B-27	S-4	6 - 8	29.6	18.8	10.8	CL
B-29	S-2	2 - 4	28.7	18.7	10.0	CL
B-31	S-3	4 - 6	31.8	19.2	12.6	CL
B-33	S-5	8 - 10	28.6	19.7	8.9	CL
B-35	S-5	8 - 10	26.4	19.2	7.4	CL
B-37	S-2	2 - 4	29.8	18.7	11.1	CL
B-38	G-3	4 - 5	29.2	18.5	10.7	CL
B-SS-1	S-3	4 - 6	27.4	18.4	9.0	CL
B-SS-2	S-S	2 - 4	28.0	19.1	8.9	CL

4.2 Compressive Strength of Rock

A rock sample was cored within one soil boring locations (B-36) which was submitted to ANS's laboratory for Unconfined Compressive Strength testing in accordance with ASTM D2938. In summary, the tested limestone exhibited a corrected compressive strength of 8,660 pounds per square inch. Full test results are included within **Attachment D**.

4.3 Thermal Resistivity Testing

ANS Geo collected bulk samples from three (3) locations throughout the project area from two (2) to four (4) feet below grade for laboratory testing of Thermal Resistivity. Soils were collected in a five-gallon bucket and delivered to ANS Consultants' accredited laboratory for testing. The soil was compacted to 85 percent of its Standard Proctor Density in accordance with ASTM D698, and Thermal Resistivity Testing was conducted in accordance with IEEE Standard 442-2017. Results of the thermal testing are summarized within Table 3. Complete, as-received results have been provided within **Attachment D**.

Table 3 – Thermal Resistivity Testing Summary

Location ID	Material Type	Thermal Resistivity Values at Various Moisture Contents					Received Moisture Content (%)	Re-Molded Dry Density (lb/ft^3)
		% water	% water	% water	% water	% water		
		(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)		
B-15	Clay	0.0	2.5	5.0	7.5	10.1	20.8	98.0
		462	**232**	**136**	**114**	**107**		
B-31	Clay	0.0	3.8	7.5	11.3	14.6	20.8	93.7
		647	**248**	**112**	**85**	**77**		
B-SS-2	Clay	0.0	3.8	7.5	11.3	14.2	23.5	87.9
		669	**301**	**204**	**182**	**170**		

4.4 Corrosivity Testing

ANS Geo collected additional samples from zero (0) to three (3) feet below grade at five (5) locations for corrosivity testing. The results of the testing, completed by ANS Consultants, have been summarized within Table 4 and are detailed within **Attachment D**.

Table 4 – Corrosivity Testing Summary

Location ID	pH	Sulfate (mg/kg)	Chloride (mg/kg)	Soil Box (Calculated Resistivity) (Ω/cm)	Redox Potential (average) (mV)
B-14	6.94	17	40	7,000	121
B-20	6.88	25	50	9,000	129
B-23	7.07	14	35	8,000	117
B-32	6.88	27	50	9,500	135
B-SS-1	6.74	21	45	10,000	125

4.5 California Bearing Ratio

ANS Geo collected an additional sample within two (2) feet of grade, stripped of any topsoil or organics, at three (3) locations for testing of California Bearing Ratio (CBR) in accordance with ASTM D1883 at approximately 90 percent of its Standard Proctor Density (ASTM D698). The results of the testing, completed by ANS Consultants, have been summarized within Table 5 and are detailed within **Attachment D**.

Table 5 – California Bearing Ratio Summary

Location ID	CBR Ratio (%)
B-21	4.9
B-38	1.5
B-SS-1	0.9

5 Pile Load Testing Results

Table 6 presents the summarized results of the pile load testing program at each test location. Complete Load Testing Logs are provided as **Attachment E** and should be referenced for detailed information.

Table 6 – Pile Load Testing Summary

Load Test ID	Embedment Depth (ft.)	Average Pile Installation Rate (sec/ft)	Approx. **Uplift** Load at 0.75-inch Deflection (lbs)	Approx. **Lateral** Load at 1-inch Deflection (lbs)
PLT-01 A	9	17.5	> 10,000	5,500
PLT-01 B	9	25.1	> 10,000	5,100
PLT-02 A	9	30.3	> 10,000	4,400
PLT-02 B	9	38.6	> 10,000	4,500
PLT-03 A	7	22.6	> 10,000	5,700
PLT-03 B	7	22.4	> 10,000	5,600
PLT-04 A	8	37.4	> 10,000	5,600
PLT-04 B	8	40.7	> 10,000	5,800
PLT-05 A	8	35.8	> 10,000	5,400
PLT-05 B	8	36.7	> 10,000	5,100
PLT-06 A	11	28.4	> 10,000	3,800
PLT-06 B	11	34.4	> 10,000	4,000
PLT-07 A	10	26.3	> 10,000	4,100
PLT-07 B	10	26.1	> 10,000	4,200
PLT-08 A	11	30.2	> 10,000	5,100
PLT-08 B	11	29.6	> 10,000	5,500
PLT-09 A	8	22.2	> 10,000	5,000
PLT-09 B	8	25.3	> 10,000	5,600
PLT-10 A	9	27.9	> 10,000	4,900
PLT-10 B	9	29.2	> 10,000	4,900
PLT-11 A	9	27.9	> 10,000	4,800
PLT-11 B	9	29.1	> 10,000	4,700
PLT-12 A	9	34.2	> 10,000	5,100
PLT-12 B	9	42.6	> 10,000	5,100
PLT-13 A	8	16.2	> 10,000	3,700
PLT-13 B	8	26.7	> 10,000	4,100
PLT-14 A	9	27.9	> 10,000	3,300
PLT-14 B	9	25.5	> 10,000	3,300
PLT-15 A	10	22.1	> 10,000	3,400
PLT-15 B	10	21.4	> 10,000	3,400
PLT-16 A	7	26.2	> 10,000	5,300
PLT-16 B	7	31.1	> 10,000	5,300
PLT-17 A	10	26.1	> 10,000	4,300
PLT-17 B	10	23.4	> 10,000	3,900
PLT-18 A	8	23.4	> 10,000	4,100
PLT-18 B	8	24.0	> 10,000	4,500
PLT-19 A	10	29.3	> 10,000	4,600
PLT-19 B	10	50.1	> 10,000	6,000

ANS Geo notes that the depicted lateral loading conditions represent deflections measured at approximately four (4) inches above ground surface as a result of horizontal loads applied perpendicular to the pile's strong axis at three (3) feet above grade.

6 Seismic Site Classification

ANS Geo utilized the average shear wave velocity method as prescribed in Chapter 20 of ASCE 7-16 to determine the Seismic Site Classification. Multichannel Analysis of Surface Waves (MASW) testing was conducted as part of the geophysical karst investigation program which obtained shear wave velocity data at 11 locations throughout the project site. Based on the average shear wave velocities collected within 100 feet of grade, Site Class C can be assumed as the average condition across the project site.

The following Site Class C seismic ground motion values were obtained from the USGS Seismic Hazard Maps, referenced in ASCE 7-16 Standard, for this site:

- 0.2 second spectral response acceleration, S_S= 0.208 g
- 1 second spectral response acceleration, S_1= 0.110 g
- Maximum spectral acceleration for short periods, S_{MS}= 0.271 g
- Maximum spectral acceleration for a 1-second period, S_{M1}= 0.165 g
- 5% damped design spectral acceleration at short periods, S_{DS}= 0.180 g
- 5% damped design spectral acceleration at 1-second period, S_{D1}= 0.110 g

6.1 Preliminary Seismic Evaluation

The designated seismic site class is anticipated based on results from our investigation program and using select areas of the site which have been investigated by ANS Geo. Seismic support data is provided as **Attachment F**. Based on our observation of subsurface conditions, estimated Site Class ratings, and review of USGS's 2018 National Seismic Hazard Map, ANS Geo concludes that there is a low risk of significant seismic activity which may impact the proposed solar facility.

7 Karst Investigation

7.1 Investigation Findings

Within the karst investigation, a total of 29 EI profiles and 11 MASW tests were completed. THG's full geophysical report has been provided as **Attachment G**; however, the conclusions are summarized below:

- The project site is located in a geological setting with a high potential for karst development.
- Electrical imaging acquired from February 9 to 11, 2021, confirms the presence of karst features at this site.
  - The project site was divided into nine (9) discrete "Areas", each denoting an array area from a conceptual site plan provided to us by ibV Energy in January 2021.
  - A number of "lines", or an alignment where the geophysical sensors were placed in a linear fashion, were taken in each of the Areas.
  - Each line provided a two-dimensional cross section profile of the subsurface resistivity measured beneath and along the survey line. The length of the line, measured in feet, begins at 0-feet (start of line) to the maximum extent of the line.
  - Depressions or features are noted and identified by their location along the line, denoted by the range [feet] the feature exists along the line.
- Depth to bedrock is variable, but is commonly greater than 20 feet below grade within the solar project footprint.
- Topographically-derived sinkhole features developed by KGS located with Areas 6 and 8 (A key map of areas is defined and illustrated as Figure 2 of the THG report). Other areas not geophysically surveyed, either because they were not observed in the field or conditions were too wet to access.

- Shallow (within 30 ft below grade) karst features, which may impact the siting of array areas, inverter pads, substation, and other ancillary features, may exist at the following locations:
  - Line 12: 45-58 ft and 155-226 ft
  - Line 15: 20-120 ft (potential air-filled void)
- Deeper (greater than 45 ft) karst conditions may exist at the following locations:
  - Line 4: 155-226 ft
  - Line 21: 110-160 ft
  - Line 22: 160-200 ft
  - Line 23: 20-115 ft
  - Line 24: 140-180 ft

7.2 Recommendations

ANS Geo recommends additional geotechnical drilling and investigation be conducted at specific areas identified in the geophysical study as having karst potential and risk. However, notwithstanding additional site investigations, we recommend that solar areas and critical structures avoid “higher-risk” locations, or locations where surface depressions are readily apparent, or geophysics has observed shallow karst features. While smaller surface depressions do currently and have formerly existed across the site, these particular areas of “higher-risk” have generally show signs of continual subsidence over time, indicating that they will continue to develop into the future. Results of the geophysics investigation pinpoints areas along the survey line where karstic subsurface anomalies may occur.

The “higher-risk” designated areas were adjusted based on the results from the geophysics investigation. It is our professional opinion that critical structures (ie. substation elements) should avoid these “higher-risk” locations, wherever possible, with a minimum 100-foot buffer from the nearest extent of such “higher-risk” area or topographic depression. If required to be sited in “higher-risk” areas, foundations for these structures should consist of deep foundations that are bearing on a competent, intact subsurface layer. Bedrock-supported foundations will aid in minimizing future deflection or displacement of critical structures which may be otherwise adversely impacted by continued overburden subsidence. These “higher-risk” karst areas are depicted in the Karst Hazard Map, provided within **Attachment G**.

In areas where geophysics has identified relic karst features (previously-mapped KGS features), or deeper karst conditions, it is possible that loose, raveled soils are likely to exist in these “moderate-risk” areas. These areas may need longer or stiffer pile sections to achieve necessary loading capacities. A “moderate-risk” designation denotes areas where loose soils, likely those which “raveled” (soils that filled into depressions or below-grade cavities) may exist.

It should be noted that the term “high” risk is relative, and these terms do not preclude the potential for detrimental karst activity and subsidence elsewhere at non-delineated and named locations across the site. In addition, our relative risk classification is limited by our investigation program, specifically the alignments and locations which our investigations were conducted. We are unable to extrapolate, deduce, or evaluate the subsurface conditions outside of these investigated areas, and as such, other depressions, remnant, or active karst features may exist within uninvestigated locations. It should also be noted that the southeastern project parcel, located east of the existing railroad tracks, was not investigated as part of our investigation programs. The prepared Karst Hazard Map (**Attachment G**) was extended to include this area solely based on KGS-documented features, and not field observations.

Karst is frequently a complex system which are impacted by groundwater flow direction, infiltration and precipitation, changes in landform and topography, as well as man-made development. A change in any of these conditions, such as re-grading and re-direction of quantity, drainage, and infiltration of stormwater, can result in a change in the risk profile for areas across the site. Off-site impacts, such as groundwater pumping or increased infiltration caused by storm events can also alter the groundwater flow direction which can modify subsurface conditions. It is suggested that the developer and site/civil engineer review available resources prepared by the Kentucky Geological Society (KGS) related to best management practices for site development, including, but not limited to the *Ordinance for the Control of Urban Development in Sinkhole Areas in the Blue Grass Karst Region* (Dinger and Rebmann, 1991).

7.3 Monitoring

Sinkholes (and associated ground movement) generally occur in two ways: the first, as a sudden collapse caused by exceeding the capacity of bridging support which exists above an air-filled void; and, the second, a longer-duration and gradual ground surface movement as surface soils and subsurface soils are washed into cavities and karst features by groundwater movement. Based on our experience with the project area, review of geophysical and soil boring data, as well as the nature of karst formations in the local area, it is expected that the method of sinkhole formation and movement at this site will be more gradual in nature than sudden cover-collapse. Review of geophysical data did not show prominent air-filled voids; however, the presence of soil-filled voids, throats, and relic karst features appear to show that groundwater action is creating karst but is simultaneously filling voids by carrying in clay, silt, and sand sediment. In addition, no "rod drops" or signs of open voids were identified by any of the soil borings advanced at the project site.

Therefore, in addition to an offset buffer from potential karst risk zones as identified in Section 7.2, it is recommended that a monitoring program is implemented to identify, understand, and mitigate/remediate during long-term operation of the development. The intent of the monitoring program is to evaluate larger-scale, ground-level movement attributable to karst, such as the gradual "bowl-like" movement which gradually occurs as a sinkhole feature develops over time. The monitoring program is intended to determine topographic variations over time, which would result in bending, tilting, and added stress to racking, modules, and structural components. This type of monitoring can be accomplished by installing survey monuments on fixed points, such as rigid steel markers at the end of panel rows/strings and installing a fixed survey marker/nail on top of concrete inverter and substation slabs. A separate survey monument, such as a sole steel post driven specifically for the purpose of monitoring each "area", may also be installed to allow for rapid evaluation. It is recommended that, at minimum, one monument be installed for each one-half acre of developed area.

Following installation of monitoring points, the owner/operator should conduct at least annual surveys of the monitoring points and compare the year-over-year movement between points. If individual monitoring points are not possible, annual LiDAR or drone surveying may be possible to rapidly evaluate the entire project area. If monitoring points show a change in individual elevation, or differential movement compared to nearby reference points, a detailed evaluation should be undertaken. This should include engaging a geotechnical engineer to conduct geophysical investigations (electrical resistivity tomography or other recognized method) to evaluate the potential development of detrimental karst activity. In addition, re-setting of panels, racking, or other structural elements may become necessary if movement is shown from monitoring to prevent flexure of sensitive PV modules, cracking of glass, or added stress and/or shearing of connection pins, bolts, and other hardware.

8 Foundation Considerations

ANS Geo anticipates that, as typical with solar farm construction, embedded posts, such as W6x9 or W8x10 H-piles, will be used to support the proposed solar panels. Conventional shallow foundations such as sonotubes, spread footings, or similar systems may also be utilized for equipment pads and associated support structures.

8.1 Corrosion Considerations

Given the soil's measured acidity, sulfate and chloride concentrations, resistivity, and redox potential summarized in **Section 4.4** (Table 4), in consideration with the soil and moisture conditions observed, the influence of corrosion attack on embedded steel piles is considered to be generally low (Corrosion Category C2).

8.2 Frost & Adfreeze Considerations

Within Hardin County, Kentucky, frost depth is mapped to exist at approximately 24 inches below grade. As such, ANS Geo recommends that all structural foundations be founded at 24 inches (2 feet) below grade or deeper to ensure adequate protection from frost conditions which may jeopardize the integrity of subgrade soils and associated substructure.

Given the location of the project and soils encountered, the potential for frost heave against post foundations should be considered. Fine-grained soils, or granular soils with greater than 10 percent fine-grained content are frost-susceptible due to the inability of entrapped moisture from infiltrating or evaporating prior to freezing. Trapped moisture will begin to create ice lenses, which will grip the steel posts or embedded structures, followed by ice-jacking due to frost heave. The phenomenon is more commonly referred to as "adfreeze stress", which can be considered as an external, upward force applied to the post. The magnitude of the upward force will depend on the depth/thickness of the frost zone, the interface bond stress between embedded structure/material and the surrounding area, and the surface area of the structure/material in contact with this bond stress. As predominantly silty and clayey soils were observed near grade, ANS Geo recommends that an unfactored adfreeze (uplift) stress of 1,500 pounds per square foot (10.4 psi) be considered for the upper 12 inches (1 foot) of overburden soil during panel foundation sizing and design.

8.3 Recommended Soil Parameters for Pile Design

Based on our interpretation of the subsurface conditions observed within our investigation programs and results of pile load testings, ANS Geo recommends that the soil parameters, as depicted within Table 7, be considered for foundation post design purposes.

Table 7 – Recommended LPILE Soil Parameters

Depth	Material	Effective Unit Weight	Internal Friction Angle	Cohesion	Soil Modulus (k)	Soil Strain (E_{50})	Allowable Bearing Capacity	Allowable Side Resistance
0' – 1'	Topsoil *(Soft Clay)*	105 lb/ft^3	---	750 lb/ft^2	---	0.010	---	---
1' – 2'	Silt *(Soft Clay)*	105 lb/ft^3	---	750 lb/ft^2	---	0.010	---	300 lb/ft^2
2' – 6'	Clay *(Mod. Stiff Clay w/o Free Water)*	115 lb/ft^3	---	1,800 lb/ft^2	200 lb/in^3	0.007	2,000 lb/ft^2	600 lb/ft^2
6' – 8'	Clay *(Mod. Stiff Clay w/o Free Water)*	120 lb/ft^3	---	2,500 lb/ft^2	350 lb/in^3	0.005	3,000 lb/ft^2	700 lb/ft^2
8' +	Clay *(Mod. Stiff Clay w/o Free Water)*	115 lb/ft^3	---	1,800 lb/ft^2	200 lb/in^3	0.007	3,500 lb/ft^2	700 lb/ft^2

Note: Italicized material types represent our recommended LPILE soil models.

ANS Geo recommends that allowable side resistance within the upper foot be neglected due to anticipated surficial disturbance, and adfreeze stresses as noted in **Section 8.2** should be considered. Pile load testing results and subsurface observations were evaluated by ANS Geo using LPILE software to provide these refined soil parameters. ANS Geo notes that the soil parameters depicted within Table 7 represent values calibrated to curve-fit our lateral load test data; these parameters (effective unit weight and internal friction angle) should not be relied upon for axial design or other site foundation designs. It is our recommendation that verification load testing and detailed structural calculations be performed prior to construction to confirm these recommendations.

8.4 Recommended Soil Parameters for General Foundation Design

For foundations other than posts for solar panels (ie. substation elements, inverter slabs, transformers, etc.), ANS Geo recommends the design parameters depicted in Table 8.

Table 8 – Recommended Soil Parameters (non-post foundations)

Depth	Material	Effective Unit Weight	Internal Friction Angle	Cohesion	Allowable Bearing Capacity
0' – 1'	Topsoil	95 lb/ft^3	---	300 lb/ft^2	300 lb/ft^2
1' – 2'	Silt	100 lb/ft^3	---	500 lb/ft^2	500 lb/ft^2
2' – 6'	Clay	110 lb/ft^3	---	1,000 lb/ft^2	1,000 lb/ft^2
6' – 8'	Clay	115 lb/ft^3	---	1,500 lb/ft^2	2,000 lb/ft^2
8' +	Clay	110 lb/ft^3	---	1,000 lb/ft^2	2,500 lb/ft^2

9 Construction Recommendations

9.1 Excavation

Depending on the depths of basins, drainage features, and foundation elements, some excavations may extend deeper than four feet below grade. As such, excavations deeper than four feet should be shored or sloped and benched, in accordance with OSHA regulations, to ensure safe working conditions within the excavations. For benching purposes, overburden clays and silts may be considered as "Type A" material and should be sloped no steeper than ¾H:1V (horizontal to vertical). OSHA soil classifications should be field-determined by the contractor's "competent person" prior to excavation. Any proposed shoring systems should be designed by the contractor's "competent person", be certified by a Professional Engineer licensed in the State of Kentucky, and should be submitted to the engineer for review.

Permanent excavations for drainage swales, ditches, or similar features should be limited to a maximum slope of 3H:1V and should be protected from erosion via stone, riprap, jute-mat, or similar method.

9.2 Dewatering

ANS Geo observed perched water at or near grade at the time of our investigation program. As such, the contractor should be prepared to manage shallow groundwater, perched water, and/or infiltrated stormwater as needed using localized pump-and-sump or similar techniques to allow for subgrade preparation and concrete foundation construction in-the-dry. Water discharge should be managed in compliance with applicable state and local regulations. The contractor should be sure to grade the surface as necessary to divert stormwater away from open excavation to the extent possible.

9.3 Subgrade Preparation

Prior to the installation of shallow concrete foundations, ANS Geo recommends overexcavating the subgrade by at least six (6) inches, lining the exposed material with a geotextile separation fabric, and bringing the subgrade back up to the design foundation elevation with compacted structural fill as specified within Table 9. Native material beneath the separation fabric should be inspected for unsatisfactory conditions such as standing water, frozen soil, organics, or deleterious materials. Should any unsatisfactory conditions exist within the native subgrade, the excavation should be undercut an additional six inches (12 total inches beneath proposed foundation depth) prior to placement of the geotextile separation fabric.

Table 9 – Recommended Gradation of Structural Fill

Sieve Size	Percent Passing
3-inch	100
1 ½-inch	60 – 100
No. 4	30 – 60
No. 200	0 – 10

Structural fill material should be placed in loose lifts not exceeding eight (8) inches in height and be compacted to at least 95 percent of its Modified Proctor Density in accordance with ASTM D1557.

9.4 Backfilling and Re-use of Native Soils

ANS Geo notes that native fine-grained soils (clays and silts) on site will likely be difficult to handle, place, and compact without proper moisture conditioning and protection. ANS Geo recommends the following measures be considered to reduce the adverse impacts of moisture-sensitive soils:

- Positive measure should be implemented and maintained to intercept and direct surface water away from moisture-sensitive subgrade surfaces.
- Subgrade surfaces should be sloped and, as appropriate, seal-rolled to facilitate proper drainage. Surfaces should be properly prepared in anticipation of inclement weather. Moisture should not be allowed to collect on subgrade surfaces.
- To the extent practical, the limits of exposed subgrade soils should be minimized.
- Construction traffic should be limited to properly constructed haul roads.
- Disturbed soils should be removed and replaced with compacted controlled fill material.
- In place moisture contents should be maintained with two percent wet/dry of the optimum moisture content as determined by the Modified Proctor Test (ASTM D1557).

These soils may be re-used across the project area for fill in landscaped areas; however, it should not be used under or above foundations or load-bearing structures where typically imported structural fill is used. Native material used as backfill for cable trenches should be handled and placed at a moisture content at or above its optimum value to ensure representative thermal properties are maintained.

In areas around and above installed foundations, large utilities, and other buried site features, ANS Geo recommends importing a clean granular material with less than 15 percent fine-grained content for use as general backfill. General backfill material should be screened of cobbles, boulders, and any particles larger than 3 inches in diameter, and should not be used beneath any load-bearing structures. General backfill should be placed in loose lift thicknesses not exceeding 12 inches and be compacted to at least 95 percent of its Modified Proctor Density (ASTM D1557). Soil used as backfill should not be handled when frozen and should be free of excessive moisture, organics, and deleterious material.

In fill areas beneath foundations, access roads, and load-bearing structures, ANS Geo recommends structural fill as described in **Section 9.3** and Table 9.

9.5 Access Roads

ANS Geo understands that an access road will likely be required for post-construction use to enter and exit the project site as well as provide access to the equipment pad locations. It is also our understanding that this access road will likely be unpaved, to accommodate occasional light vehicular traffic such as utility pickup truck or similar vehicle. As such, ANS Geo recommends that access roads be constructed with at least 10 inches of crushed stone as specified within Table 10.

Table 10 – Recommended Gradation of Crushed Stone

Sieve Size	Percent Passing
1 ½-inch	100
¾-inch	55 – 90
No. 4	25 – 50
No. 50	5 – 20
No. 200	3 – 10

If a biaxial geogrid is placed atop the proof-rolled and prepared subgrade, access road thickness may be reduced by two inches. A biaxial geogrid such as Tensar BX1200 or equal is recommended.

Prior to roadway construction, the subgrade should be stripped of vegetation and topsoil, and be proof-rolled with at least four (4) roundtrip passes of a smooth-drum roller with a minimum operating weight of eight (8) tons. The prepared subgrade should be confirmed to maintain a minimum CBR value of 10. If required, additional stabilization may be obtained through chemical treatment of the subgrade including introduction of lime or cement. Crushed stone should be placed in loose lifts not exceeding eight (8) inches in height and be compacted to at least 95 percent of its Modified Proctor Density (ASTM D1557).

9.6 Flooding and Erosion

Using the US Department of Agriculture National Resources Soil Conservation (USDA NRCS) Web Soil Survey, the site geology consists of soils predominately of the Crider, Otwood, and Bedford silt loam units which indicates the frequency of flooding as “rare”. However, given presence of fine-grained soils and observed wet conditions at the time of our investigations, it is possible that ponding of water may occur during following significant storm events. ANS Geo understands that the proposed site plan will maintain drainage swales, berms, and/or ditches to intercept and divert such stormwater thus reducing the likelihood of appreciate flooding.

From our review of the site conditions, the project area maintains a “hummocky” topography, however, slopes across the site are generally less than 10 percent. Therefore, we believe the risk of erosion to be low. Based on the site’s topography and soil composition, the NRCS Web Soil Survey has listed the predominant soil types as maintaining a generally “moderate” concern for erosion. Notwithstanding, we anticipate that proper housekeeping will be maintained during construction such as limiting the amount of disturbance and earth moving, and compaction and wetting of soils which are exposed for structural and foundation purposes. Therefore, we believe the overall risk of erosion will be minor and will be mostly managed during construction with proper soil erosion and sediment control measures.

9.7 Pile Drivability

ANS Geo anticipates that, as typical with solar farm construction, solar panels will be supported by steel H-Piles (wide-flanged sections) driven to approximately 8 to 10 feet below grade. It is ANS Geo’s professional opinion that the parameters provided in **Section 8.3** may be used to preliminarily size the proposed piles, however, we recommend verification load testing prior to construction. These steel piles are typically installed via direct-push, vibration, and/or percussive hammer methods.

10 Limitations

ANS Geo notes that the findings and recommendations presented within this Geotechnical Report are based on our investigation program conducted in February and March, 2021 and our engineering judgment. Should the scope of the project or proposed site layout change, ANS Geo should be given the opportunity to review the applicability of the collected information and modify our recommendations, as needed.

We sincerely appreciate the opportunity to support this project, and please feel free to contact us should you have any questions regarding the findings of this Report.

Attachments

Attachment A – Investigation Location Plan

Attachment B – Soil Boring Logs

Attachment C – Electrical Resistivity Testing Results

Attachment D – Laboratory Results

Attachment E – Pile Load Testing Logs

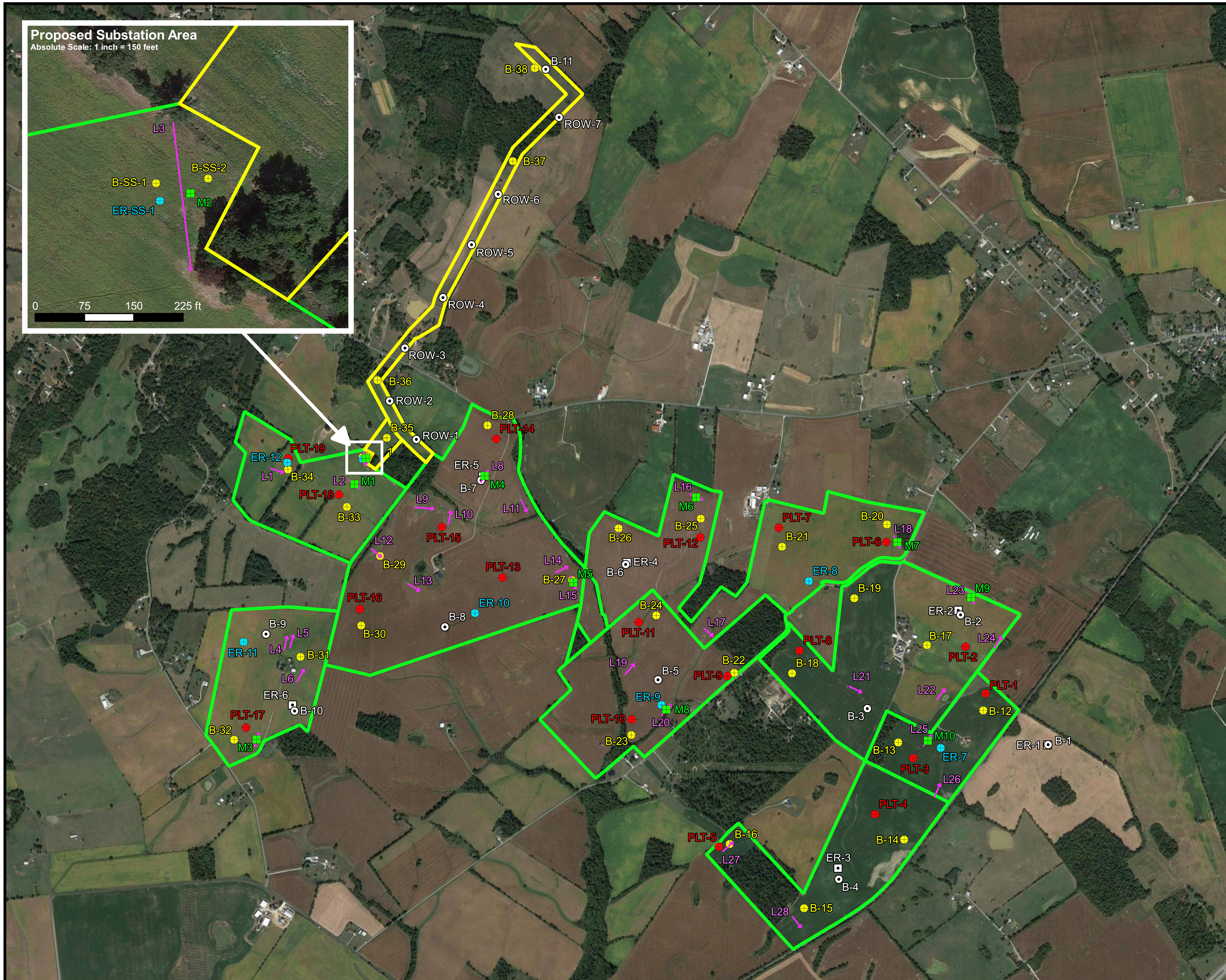
Attachment F – Seismic Support Data

Attachment G – Geophysical Report (Karst Investigation)

Attachment H – Terracon's *Preliminary Geotechnical Engineering Report*

Attachment A

Investigation Location Plan



ANS GEO

Client:

ibV energypartners
an ib vogt company

INVESTIGATION LOCATION PLAN

ibV ENERGY
RHUDES CREEK
SOLAR PROJECT
HARDIN COUNTY, KENTUCKY

Legend

- Project Boundary
- Proposed ROW
- Soil Boring Location
- ERT Location
- Pile Load Testing Location
- Karst Study - ERI Location
- Karst Study - MASW Location
- Preliminary Soil Boring Location (2020)
- Preliminary ERT Location (2020)

0 1,500 3,000 ft

Absolute Scale: 1 inch = 1,500 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Kyle Hansen
Date: March 31, 2021
Drawing Number: ILP-1 Rev.0

Attachment B

Soil Boring Logs

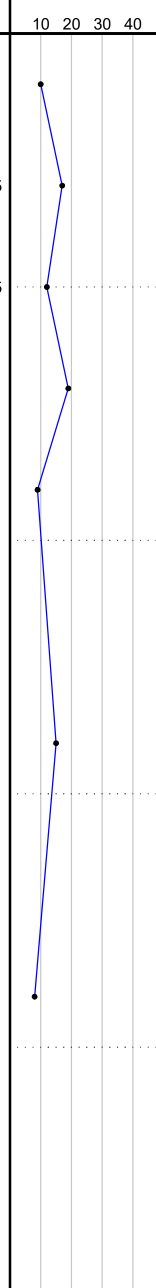
Soil Boring Log — B-12

ANS GEO

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.97211027 N, 37.65092558 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/22/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/22/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	17	1 3 7 12	10	CL	Stiff, brown, CLAY, some fine Sand, some Silt, moist (CL)	L	M	3.5	.5	4 inches of topsoil
	S-2	20	6 7 10 13	17	CL	Very stiff, reddish brown, CLAY, some Sand, some Silt, moist (CL)	M	M	3.5	1.5	
5	S-3	24	3 5 7 15	12	ML	Stiff, reddish brown, SILT, some fine Sand, some Clay, moist (ML)	M	L	2.5	1.5	
	S-4	24	3 7 12 11	19	CL	Very stiff, reddish brown Silty CLAY, some fine Sand, moist (CL)	L	L	2.5	1	
	S-5	24	3 4 5 6	9	ML	Stiff, reddish brown, SILT, some fine Sand, little Clay, moist (ML)	L	L	2	1	
10					ML						
	S-6	15	3 7 8	15	SM	Medium dense, reddish brown, fine SAND, some Silt, little Clay, moist (SM)					
15					SM						
	S-7	16	3 3 5	8	SM	Loose, brown yellow, fine SAND, some Silt, little Clay, moist (SM)					
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

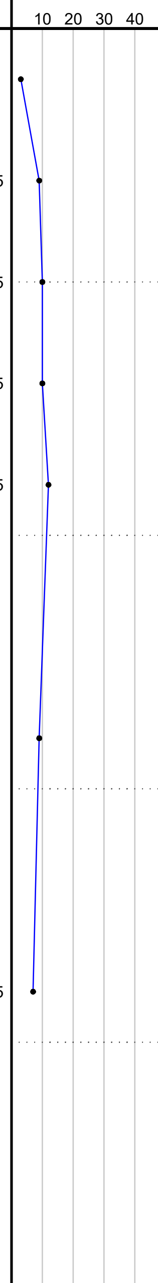
B-13

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.97657701 N, 37.64959167 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/23/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/23/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	1 1 2 3	3	ML		Soft, brown, SILT, some Clay, little fine Sand, moist (ML)	L	M	1	1	
	S-2	24	2 3 6 7	9	CH		Stiff, grayish brown, CLAY, little fine Sand, trace Silt, moist (CH)	H	H	4.5	8.5	
5	S-3	24	3 4 6 11	10			Stiff, brown, CLAY, trace fine Sand, trace Silt, moist (CH)	H	H	4.5	8.5	5
	S-4	24	3 4 6 7	10	MH		Stiff, light gray, SILT, some Clay, little fine Sand, moist (MH)	H	H	4	2.5	
	S-5	24	3 3 9 5	12	CH		Stiff, reddish brown, CLAY, little fine Sand, moist (CH)	H	H	2.5	1.5	
10												10
	S-6	24	3 4 5 8	9			Stiff, reddish brown, CLAY, trace fine Sand, moist (CH)	H	H	3.5	8	
15												15
	S-7	24	3 3 4 4	7			Medium stiff, reddish brown, CLAY, trace coarse to fine Sand, moist (CH)	H	H	4	8.5	
20							End of Boring at 20 feet BGS Borehole backfilled with cuttings					20

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

B-14

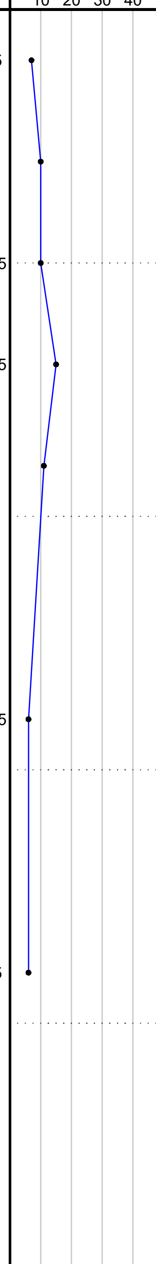
ANS GEO

Client: ibV Energy	**Drilling Firm:** Tri-State Drilling, LLC	**Coordinates:** -85.9762638 N, 37.64554847 E
Project: Rhudes Creek Solar Project	**Drill Crew:** Shannon / Brandon	**Horiz. Datum:** NAD 83
Location: Hardin County, Kentucky	**Boring Start:** 2/23/2021	**Elevation:** 0
Inspector: Diego Melgar	**Boring End:** 2/23/2021	**Vert. Datum:** Grade

Rig Model: CME-55	**Sampler Type:** Split Spoon	**Casing Type:** N/A
Rig Type: Track	**Sampler Length:** 24 inches	**Casing Length:** 4 feet
Drill Method: Hollow Stem Auger	**Sampler I.D.:** 2 inches	**Casing I.D.:** 4 inches
Hammer Type: Automatic	**Hammer Wt.:** 140 pounds	**Hammer Wt.:** 140 pounds
Drilling Fluid: None	**Hammer Fall:** 30 inches	**Hammer Fall:** 30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
0–2	S-1	24	2 3 4 4	7	MH	Medium stiff, light brown to brown, SILT, some Clay, moist (MH)	M	H	.75	1.5	7 inches of topsoil
2–4	S-2	24	2 3 7 9	10	MH	Stiff, light brown to gray, SILT, some Clay, trace Sand, moist (MH)	H	H	3.75	2	
4–6	S-3	24	3 4 6 2	10	CH	Stiff, brown, CLAY, some Silt, trace coarse to fine Sand, moist (CH)	H	H	1.25	3.25	
6–8	S-4	24	4 6 9 12	15	CL	Very stiff, light grayish brown, CLAY, some Silt, trace fine Sand, moist (CL)	M	M	3.5	4.25	
8–10	S-5	24	4 6 5 5	11	CH	Stiff, light brown, CLAY, little fine Sand, little Silt, trace coarse Gravel, moist (CH)	L	H	2.25	3	
13–15	S-6	24	2 3 3 4	6	CH	Medium stiff, brownish red, CLAY, little fine Sand, trace Silt, moist (CH)	H	H	2.5	3.25	
18–20	S-7	24	2 3 3 4	6	CH	Medium stiff, brownish red, CLAY, trace fine Sand, trace Silt, moist (CH)	H	H	2	3.5	
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

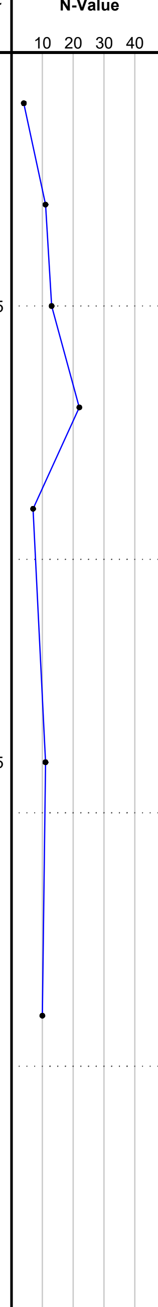
Soil Boring Log

B-15

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.9815247 N, 37.64269295 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/23/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/23/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	2 2 2 3	4	MH		Medium stiff, light brown, SILT, some Clay, trace fine Sand, moist (MH)	L	H	1	2	
	S-2	20	2 3 8 12	11	CL		Stiff, light brownish gray, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	1.5	2	
5	S-3	18	3 3 10 23	13	CL		Stiff, grayish brown, CLAY, some Silt, little fine Sand, moist (CL)	H	M	1.5	2.5	
	S-4	24	8 13 9 9	22	SC		Medium dense, light brown medium to fine SAND, some Clay, trace Silt, moist (SC)					
	S-5	18	3 3 4 4	7	CH		Medium stiff, grayish brown, CLAY, some Silt, little fine Sand, moist (CH)	H	H	1.75	2	
10												
	S-6	18	3 4 7	11	CH		Stiff, reddish brown, CLAY, trace fine Sand, moist (CH)	H	H	4	5.5	Dark brown spotting through sample
15												
	S-7	18	2 3 7	10	CH		Stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CH)	H	H	3	5	
20							End of Boring at 20 feet BGS Borehole backfilled with cuttings					



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

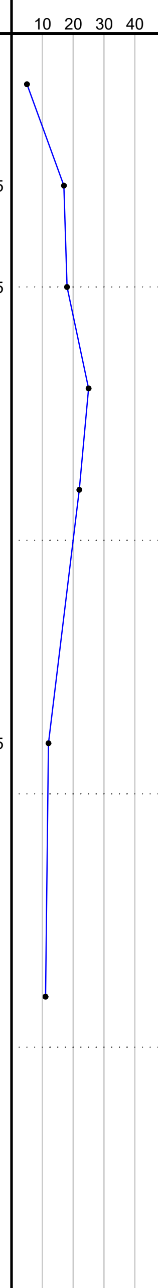
Soil Boring Log

B-16

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.98543302 N, 37.64536359 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/24/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/24/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	1 2 3 4	5	CL	Medium stiff, light brown, CLAY, some Silt, moist (CL)	L	M	2	4	6 inches of topsoil
	S-2	24	5 7 10 11	17	CL	Very stiff, reddish brown, CLAY, little Silt, trace fine Sand, moist (CL)	H	M	R	4.5	
5	S-3	24	5 8 10 17	18	CL	Very stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	R	4.5	
	S-4	24	12 12 13 15	25	ML	Very stiff, reddish brown, SILT, some fine Sand, little Clay, moist (ML)	L	L	3	2	
	S-5	24	6 10 12 14	22	MH	Very stiff, reddish brown, SILT, some Clay, some fine Sand, moist (MH)	H	H	R	4	
10											
	S-6	24	4 5 7 9	12	ML	Stiff, reddish brown, SILT, some fine Sand, little Clay, moist (ML)	L	L	3.5	3.5	
15											
	S-7	24	2 4 7 7	11	SM	Medium dense, light brown, fine SAND, some Silt, moist (SM)					
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

ANS GEO

Soil Boring Log

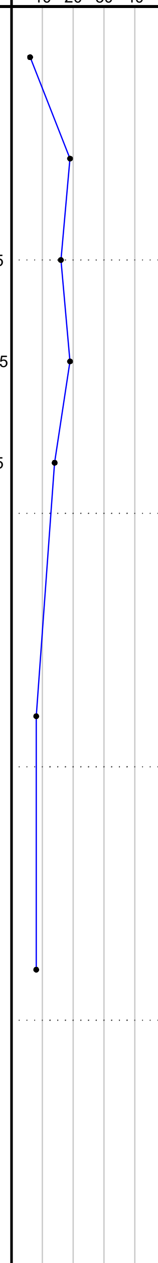
B-17

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.97506302 N, 37.65364036 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/23/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/23/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	22	2 2 4 8	6	MH	Medium stiff, brown, SILT, some Clay, little fine Sand, moist (MH)	H	H	1.75	5
	S-2	24	9 9 10 12	19	MH	Very stiff, light brown, SILT, some Clay, little fine Sand, moist (MH)	H	H	2.75	3
5	S-3	24	3 7 9 4	16	CL	Very stiff, brown, CLAY, little coarse to fine Sand, trace Silt, moist (CL)	H	M	4.5	4.5
	S-4	24	8 9 10 13	19	MH	Very stiff, light brown, SILT, some Clay, some fine Sand, moist (MH)	H	M	4	5.25
	S-5	24	3 6 8 9	14	CL	Stiff, reddish brown, Silty CLAY, some Clay, some fine Sand, moist (CL)	H	H	3.5	3.5
10					CL					
	S-6	16	3 3 5 5	8	CL	Stiff, reddish brown, CLAY, some fine Sand, little Silt, moist (CL)	H	M	2	5
15					CL					
	S-7	6	2 3 5 6	8	CL	Stiff, reddish brown, CLAY, some fine Sand, little Silt, moist (CL)	H	M	2.5	4
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings				

N-Value



Drilling & Strata Notes

5

10

15

20

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

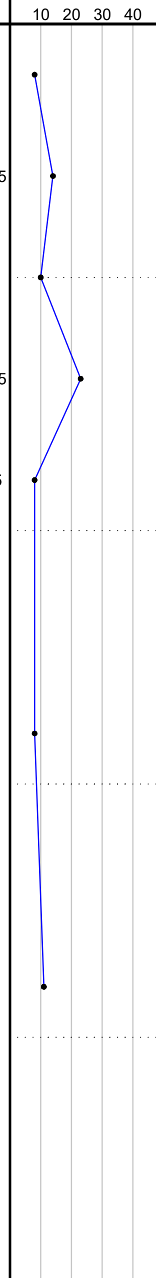
Soil Boring Log

B-18

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.98215629 N, 37.65246975 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/25/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/25/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	N-Value (10 20 30 40)	Drilling & Strata Notes
	S-1	22	2 3 5 7	8	ML		Medium stiff, brown, SILT, some Clay, little fine Sand, moist (ML)	H	M	1.5	2		6 inches of topsoil
	S-2	22	5 5 9 9	14	CL		Stiff, light brown, Silty CLAY, some fine Sand, moist (CL)	L	L	1.5	2.25		
5	S-3	24	4 4 6 9	10	ML		Stiff, light brown, SILT, some fine Sand, little Clay, moist (ML)	L	L	2.75	3		5
	S-4	24	9 11 12 15	23	ML		Very stiff, reddish brown, SILT, little fine Sand, little Clay, moist (ML)	H	L	4	3.75		
	S-5	24	3 4 4 7	8	MH		Stiff, reddish brown, SILT, some fine Sand, little Clay, moist (MH)	L	H	3	2.5		
10					MH								10
	S-6	24	2 4 4 9	8	CL		Stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	R	4		
15					CL								15
	S-7	24	2 3 8 4	11	CL		Stiff, reddish brown, CLAY, some Silt, trace, fine Sand, moist (CL)	H	M	2	4		
20							End of Boring at 20 feet BGS Borehole backfilled with cuttings						20



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)

BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

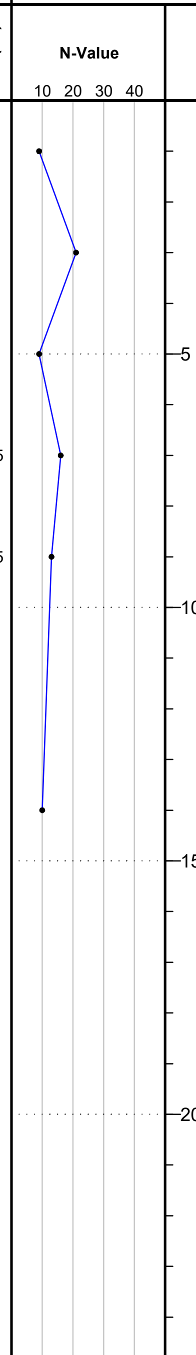
Soil Boring Log

B-19

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.97888642 N, 37.655591 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/23/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/23/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	3 3 6 9	9	MH	Stiff, reddish brown, SILT, some Clay, some fine Sand, moist (MH)	H	H	4.5	6	8 inches of topsoil
	S-2	21	6 10 11 11	21	CL	Very stiff, light brown, CLAY, little fine Sand, little Silt (CL)	H	M	4.5	7	
5	S-3	20	3 4 5 8	9	CL	Stiff, light reddish brown, CLAY, some fine Sand, moist (CL)	H	M	3.5	5	
	S-4	16	7 8 8 11	16	CH	Very stiff, reddish brown, CLAY, little fine Sand, trace Silt, moist (CH)	H	H	3	6.5	
	S-5	24	3 5 8 11	13	CH	Stiff reddish brown, CLAY, trace fine Sand, trace Silt, wet, (CH)	H	H	R	6.5	Black spotting, red Sand intrusion
10											
	S-6	24	3 4 6 7	10	CH	Stiff, reddish brown, CLAY, little fine Sand, trace Silt, moist (CH)	H	H	3	4	
15											
17.5						Auger refusal at 17.5' End of Boring at 17.5 feet BGS Borehole backfilled with cuttings					Augered from 15 to 17.5 feet
20											



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

B-20

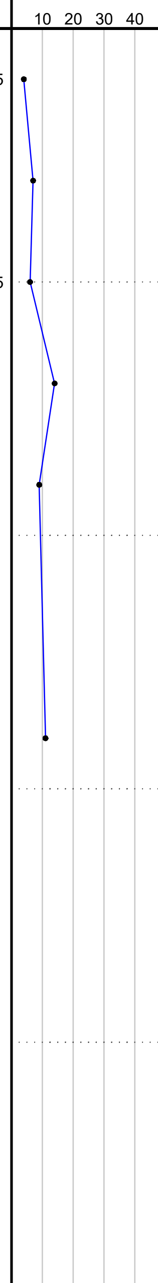
ANS GEO

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.9771686 N, 37.65866381 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/23/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/23/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	1 2 2 2	4	ML	Medium stiff, brown, SILT, some Clay, little fine Sand, moist (ML)	L	M	1.25	2.5	10 inches of topsoil
	S-2	12	2 4 3 4	7	ML	Medium stiff, brown, SILT, some Clay, some fine Sand, moist (ML)	L	M	1.75	2	
5	S-3	24	2 3 3 5	6	MH	Medium stiff, brown, SILT, some Clay, some fine Sand, moist (MH)	M	M	1.75	3.5	
	S-4	11	4 6 8 10	14	CL	Stiff, reddish brown, CLAY, some Silt, little fine Sand, moist (CL)	H	M	R	4	
	S-5	24	3 4 5 8	9	CH	Stiff, reddish brown, CLAY, some Silt, little fine Sand, moist (CH)	H	H	4.5	7	
10					CH						
	S-6	24	2 3 8 4	11	CH	Stiff, reddish brown, CLAY, some fine Sand, some Silt, trace coarse to fine Gravel, wet (CH)	H	H	4.5	5	Gravel recovered at the bottom of spoon, possible boulders
15						Auger refusal at 15.25 feet End of Boring at 15.25 feet BGS Borehole backfilled with cuttings					
20											

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)
2/23/2021			13

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

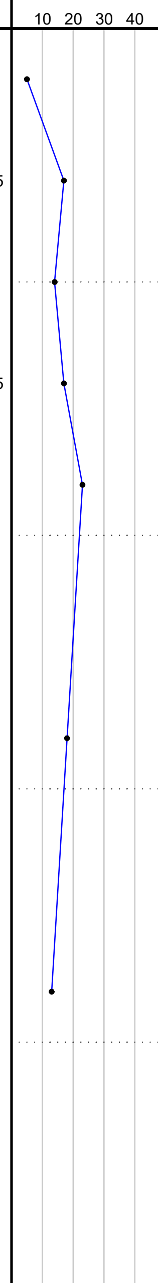
B-21

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.98268066 N, 37.65773548 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/24/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/24/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	20	1 2 3 4	5	CL	Medium stiff, brown, CLAY, little fine Sand, trace Silt, moist (CL)	H	M	2	4	2 inches of topsoil
	S-2	19	6 7 10 8	17	MH	Very stiff, brown, SILT, some Clay, little coarse to fine Sand, moist (MH)	H	H	3	3.5	
5	S-3	22	4 6 8 10	14	MH	Stiff, brownish red, SILT, some Clay, some fine Sand, moist (MH)	M	H	2	2	
	S-4	22	4 8 9 9	17	CL	Very stiff, brownish red, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	4.5	6.5	
	S-5	9	9 12 11 11	23	SC	Medium dense, light brown coarse to fine SAND, little Clay, trace Silt, dry (SC)					
10											
	S-6	24	8 9 9 11	18	ML	Very stiff, reddish brown, SILT, some coarse to fine SAND, some Clay, moist (ML)	M	L	2	2	
15											
	S-7	24	4 5 8 10	13	MH	Stiff, brown, SILT, some Clay, some coarse to fine Sand, moist (MH)	H	H	4.5	6	
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

= Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

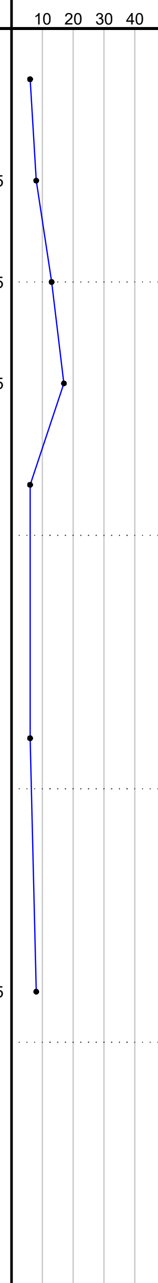
B-22

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.98519194 N, 37.65248758 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/24/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/24/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	1 2 4 4	6	CL		Medium stiff, brownish yellow, CLAY, some Silt, little coarse to fine Sand, moist (CL)	H	M	2	4	6 inches of topsoil
	S-2	24	2 4 4 6	8	CL		Stiff, brownish yellow, CLAY, some Silt, little fine Sand, moist (CL)	H	M	2	4.5	
5	S-3	24	3 5 8 11	13	CL		Stiff, brownish yellow, CLAY, little Silt, little fine Sand, moist (CL)	H	M	2.25	3.5	
	S-4	24	4 8 9 8	17	MH		Very stiff, reddish brown, SILT, some Clay, little fine Sand, moist (MH)	H	H	3.75	6.5	
	S-5	24	3 3 3 4	6	ML		Medium stiff, light grayish brown, SILT, some fine Sand, little Clay, moist (ML)	L	L	1	2	
10												
	S-6	24	8 3 3 5	6	ML		Medium stiff, light brown, SILT, some fine Sand, little Clay, trace coarse to fine Gravel, moist (ML)	L	M	2.5	5	
15												
	S-7	24	3 4 4 6	8	CL		Stiff, dark reddish brown, CLAY, some Silt, little fine Sand, moist (CL)	H	M	4	6.5	
20							End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

ANS GEO

Soil Boring Log

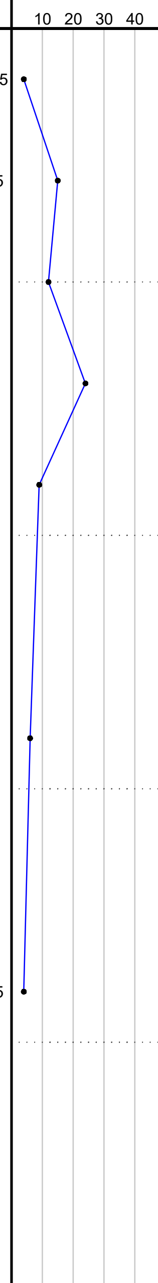
B-23

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.99060213 N, 37.64990067 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/24/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/24/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	20	1 2 2 5	4	CL		Medium stiff, brown, CLAY, some SIlt, trace fine Sand, moist (CL)	H	M	1.25	2.75	5 inches of topsoil
	S-2	24	6 7 8 8	15	MH		Very stiff, reddish brown, SILT, some Clay, little fine Sand, moist (MH)	H	H	3.75	3.5	
5	S-3	20	2 5 7 9	12			Stiff, reddish brown, SILT, some Clay, some coarse to fine Sand, moist (MH)	H	H	2	3	5
	S-4	12	10 13 11 14	24			Very stiff, reddish brown SILT, some Clay, some coarse to fine Sand, moist (MH)	H	H	3.5	4	
	S-5	24	3 4 5 6	9			Stiff, reddish brown, SILT, some Clay, little fine Sand, moist (MH)					
10												10
	S-6	24	2 2 4 4	6			Medium stiff, brownish yellow, SILT, some Clay, little coarse to fine Sand, moist (MH)	M	H	2	4	
15												15
	S-7	24	2 2 2 2	4	CL		Medium stiff, brownish yellow, CLAY, some coarse to finr Sand, little Silt, moist (CL)	H	M	2.25	4.5	
20							End of Boring at 20 feet BGS Borehole backfilled with cuttings					20

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

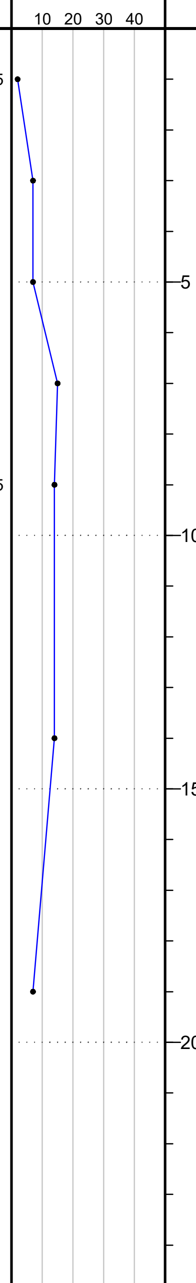
B-24

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.98929083 N, 37.6548771 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/24/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/24/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	18	1 1 1 2	2	MH	Soft, brown, SILT, some Clay, little fine Sand, moist (MH)	L	H	1.5	2.5	4 inches of topsoil
	S-2	13	2 3 4 5	7	CL	Medium stiff, brown, Silty CLAY, little fine Sand, trace fine Gravel, moist (CL)	M	M	1	2	
5	S-3	18	2 3 4 6	7	CL	Medium stiff, dark reddish brown, Silty CLAY, some coarse to fine Sand, moist (CL)	H	M	4.5	3	
	S-4	18	5 7 8 12	15	CL	Very stiff, light brown, Silty CLAY, little fine Sand, moist (CL)	H	M	2	3	
	S-5	24	4 6 8 10	14	MH	Stiff, reddish brown, SILT, some Clay, some coarse to fine Sand, moist (MH)	H	H	4	5.5	
10					MH						
	S-6	24	3 6 8 11	14	MH	Stiff, reddish brown, SILT, some Clay, some coarse to fine Sand, moist (MH)	M	H	3.5	3	
15											
	S-7	16	3 3 4 4	7	SM	Loose, reddish brown, coarse to fine SAND, some Silt, little Clay, moist (SM)					
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

B-25

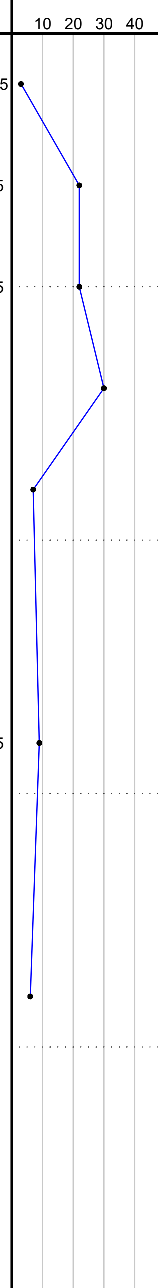
ANS GEO

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.98695358 N, 37.6589022 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/24/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/24/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	1 1 2 3	3	CL	Soft, brown, CLAY, little fine Sand, little Silt, moist (CL)	M	M	2	3.75	5 inches of topsoil
	S-2	12	5 10 12 14	22	MH	Very stiff, brown, SILT, some Clay, little fine Sand, moist (MH)	H	H	3.5	2.5	
5	S-3	24	5 10 12 15	22	CL	Very stiff, brown, CLAY, some Silt, little fine Sand, moist (CL)	H	M	2.5	1.5	
	S-4	24	15 15 15 11	30	CL	Hard, reddish brown, CLAY, some fine Sand, some Silt, moist (CL)	H	M	3.5	4	
	S-5	24	2 4 3 10	7	CL	Medium Stiff, light reddish brown, CLAY, some fine Sand, trace Silt, moist (CL)	M	M	2	4	
10											
	S-6	24	2 3 6 5	9	CL	Stiff, reddish brown, CLAY, some Silt, little fine Sand, moist (CL)	H	M	2	4.5	
15											
	S-7	24	2 3 3 5	6	CH	Medium stiff, light reddish brown, CLAY, little Silt, little fine Sand, moist (CH)	H	H	2	4	
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

= Water Level (if observed)

BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

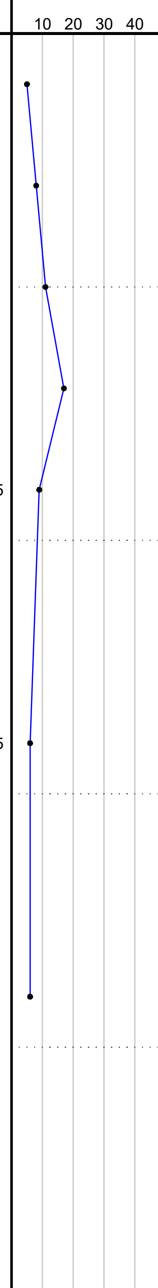
B-26

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.99127222 N, 37.6585 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/24/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/24/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	19	1 2 3 3	5	CL	Medium stiff, brown, CLAY, some Silt, little fine Sand, moist (CL)	L	M	1.25	3	6 inches of topsoil
	S-2	24	3 4 4 5	8	MH	Stiff, dark grayish brown, SILT, some Clay, some coarse to fine Sand, moist (MH)	H	H	2.5	3	
5	S-3	24	3 5 6 9	11	MH	Stiff, grayish brown, SILT, some Clay, some fine Sand, moist (MH)	H	H	3.5	3	
	S-4	24	6 8 9 9	17	CL	Very stiff, brownish gray, SILT, some Clay, some fine Sand, moist (CL)	H	M	4.25	3	
	S-5	24	2 4 5 7	9	CL	Stiff, brownish gray, CLAY, some Silt, moist (CL)	H	M	4	3.5	
10											
	S-6	24	3 3 3 4	6	MH	Medium stiff, reddish brown, SILT, some Clay, little coarse to fine Sand, moist (MH)	H	H	1.5	3.5	
15											
	S-7	24	3 3 3 4	6	MH	Medium stiff, reddish brown, SILT, some Clay, little fine Sand, moist (MH)	H	H	3	6	
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

= Water Level (if observed)

BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

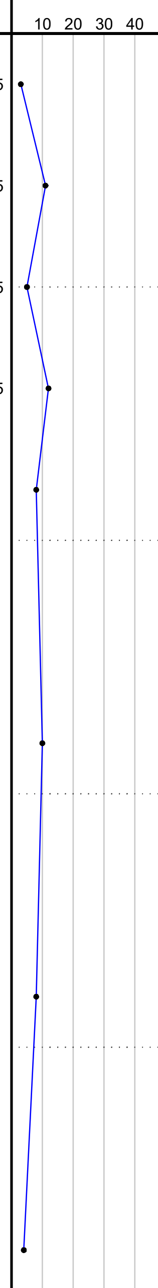
Soil Boring Log

B-27

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.99372222 N, 37.656346 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/25/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/25/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	18	1 1 2 3	3	ML	Soft, dark brown, SILT, some Clay, little fine Sand, moist (ML)	H	L	1.75	3.5	4 inches of top soil
	S-2	17	4 5 6 6	11	CL	Stiff, dark gray, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	3.75	5.5	
5	S-3	24	2 2 3 4	5	CL	Medium stiff, gray, CLAY, some Silt, trace fine Sand, moist (CL)	H	H	2	3.5	
	S-4	14	3 6 6 9	12	CL	Stiff, gray, CLAY, some Silt, some fine Sand, moist (CL)	L	H	.5	1.5	
	S-5	24	2 3 5 5	8	CL	Stiff, grayish brown, CLAY, some Silt, little fine Sand, moist (CL)	H	H	1.75	3	
10											
	S-6	24	3 4 6 7	10	CL	Stiff, grayish brown, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	1.5	4	
15											
	S-7	24	2 3 5 7	8	CH	Stiff, reddish brown, CLAY, come Silt, trace fine Sand, moist (CH)	H	H	3.5	6	
20											
	S-8	24	2 2 2 8	4	MH	Brown, SILT, some Clay, some coarse to fine Sand, wet (MH)					Recovered material was saturated, possible weathered limestone
					ML	Light gray, SILT, some fine Sand, trace Clay, wet (ML)					



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)
2/25/2021			23

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

B-27
(Continued)

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.99372222 N, 37.656346 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/25/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/25/2021	**Vert. Datum:**	Grade

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	N-Value 10 20 30 40	Drilling & Strata Notes
							Auger refusal at 25 feet End of Boring at 25 feet BGS Borehole backfilled with cuttings						
30													30
35													35
40													40
45													45
50													50

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)
2/25/2021			23

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

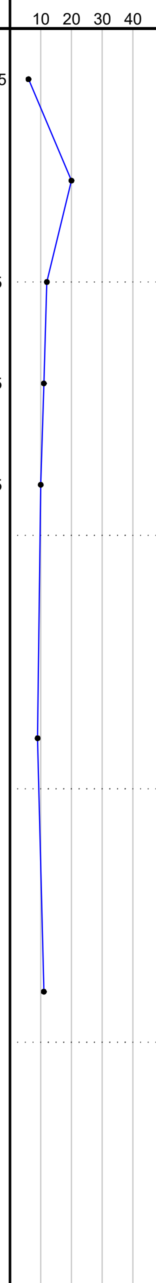
B-28

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.99815867 N, 37.66278382 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/26/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/26/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
0–2	S-1	24	1 3 3 6	6	ML	Medium stiff, reddish brown, SILT, some Clay, trace fine Sand, moist (ML)	H	M	2.5	3.75	7 inches of topsoil
2–4	S-2	21	8 10 10 4	20	ML	Very stiff, reddish brown, SILT, some CLay, little coarse to fine Sand, moist (ML)	H	M	R	6	
4–6	S-3	22	3 5 7 4	12	CL	Stiff, reddish brown, CLAY, some Silt, little fine Sand, moist (CL)	H	M	4.25	7.5	
6–8	S-4	24	3 5 6 9	11	CL	Stiff, reddish brown, Silty CLAY, little coarse to fine Sand, moist (CL)	H	M	3	4.5	
8–10	S-5	24	3 5 5 5	10	CL	Stiff, reddish brown, Silty CLAY, little coarse to fine Sand, moist (CL)	H	M	3	5.5	
13–15	S-6	24	3 3 6 5	9	MH	Stiff, reddish brown, CLAY, some Silt, little coarse to fine Sand, trace fine Gravel, moist (MH)	H	H	2.25	4	
18–20	S-7	24	3 3 8 6	11	MH	Stiff, reddish brown, CLAY, some Silt, little coarse to fine Sand, moist (MH)	H	H	2.75	5	
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

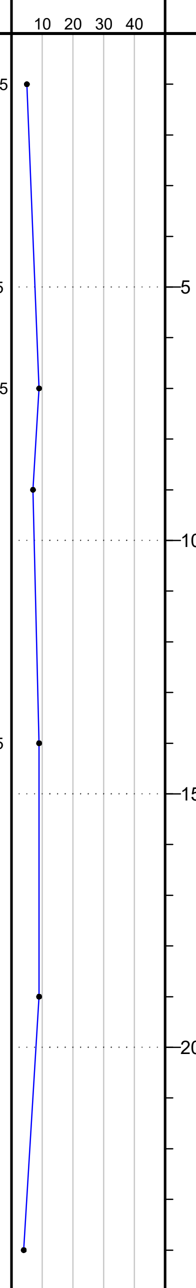
B-29

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00381111 N, 37.657351 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/26/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/26/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	14	1 2 3 3	5	ML	Medium stiff, brown, SILT, some Clay, trace fine Sand, moist (ML)	L	M	1	2.25	8 inches of topsoil
	S-2	14	0 0 4 5	4	CL	Soft, light brown, Silty CLAY, some fine Sand, moist (CL)	L	NP	.25	.5	Slurry material
5	S-3	22	0 0 2 3	2	CL	Soft, light brown, SILTY Clay, some fine Sand, moist (CL)	L	H	1.5	1.5	Slurry material
	S-4	17	3 4 5 7	9	CL	Stiff, brownish gray, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	1.75	3.25	
	S-5	18	2 3 4 5	7	MH	Medium stiff, brownish gray, SILT, some Clay, little fine Sand, moist (MH)	L	H	.75	2	
10											
	S-6	24	2 4 5 5	9	ML	Stiff, reddish brown, SILT, some Clay, little coarse to fine Sand, moist (ML)	H	M	2.5	2.5	
15											
	S-7	24	2 3 6 5	9	CH	Stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CH)	H	H	2.5	5	
20											
	S-8	24	1 2 2 3	4	CH	Medium stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CH)	H	H	1.5	5	

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)

BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

B-29 *(Continued)*

ANS GEO

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00381111 N, 37.657351 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/26/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/26/2021	**Vert. Datum:**	Grade

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	N-Value (10 20 30 40)	Drilling & Strata Notes
							Auger refusal at 27.5 feet End of Boring at 27.5 feet BGS Borehole backfilled with cuttings						
30													30
35													35
40													40
45													45
50													50

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log — B-30

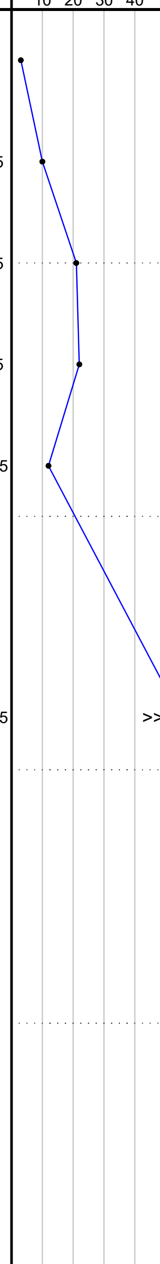
ANS GEO

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00479839 N, 37.65445873 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/25/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/25/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	1 1 2 3	3	ML		Soft, brown, SILT, little Clay, little fine Sand, moist (ML)	L	M	2	1	
	S-2	24	3 4 6 9	10	CL		Stiff, grayish brown, Silty CLAY, little fine Sand, moist (CL)	M	M	R	4.5	
5	S-3	24	4 9 12 14	21			Very stiff, brown, Silty CLAY, little fine Sand, moist (CL)	L	M	1	1.5	5
	S-4	24	8 10 12 14	22			Very stiff, brown, Silty CLAY, little coarse to fine Sand, moist (MH)	H	M	3	3.5	
	S-5	9	3 5 7 7	12			Stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	3.25	3.75	
10												10
	S-6	12	2 3 50/1"	> 50	CH		Hard, reddish brown, CLAY, some Silt, some coarse to fine Sand, moist (CH)	H	H	2	4.25	
15							Auger refusal at 14.8 feet End of Boring at 14.8 feet BGS Borehole backfilled with cuttings					15
20												20

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

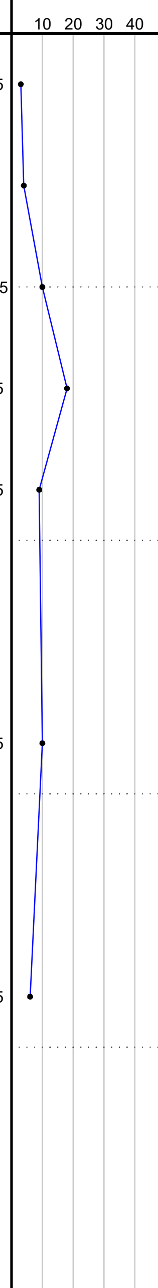
Soil Boring Log — B-31

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00798758 N, 37.65315247 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/25/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/25/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	20	1 1 2 2	3	ML	Soft, brown, SILT, little Clay, little fine Sand, moist (ML)	L	L	1	1.5	7 inches of topsoil
	S-2	24	2 2 2 2	4	CL	Medium stiff, brown Silty CLAY, little fine Sand, moist (CL)	L	H	1	.5	
5	S-3	16	3 4 6 2	10	CL	Stiff, brownish yellow, CLAY, some fine Sand, little Silt, moist (CL)	H	L	2.25	3.25	
	S-4	24	6 9 9 12	18	ML	Very stiff, brownish yellow, SILT, some Clay, little fine Sand, moist (ML)	H	M	3.75	3.5	
	S-5	24	3 4 5 6	9	MH	Stiff, reddish brown, SILT, some Clay, little fine Sand, moist (MH)	H	H	3.25	4.5	
10					MH						
	S-6	24	2 4 6 7	10	MH	Stiff, reddish brown, SILT, some Clay, little fine Sand, moist (MH)	H	H	2.5	3.5	
15											
	S-7	24	2 2 4 4	6	CL	Medium stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	1.5	3.5	
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

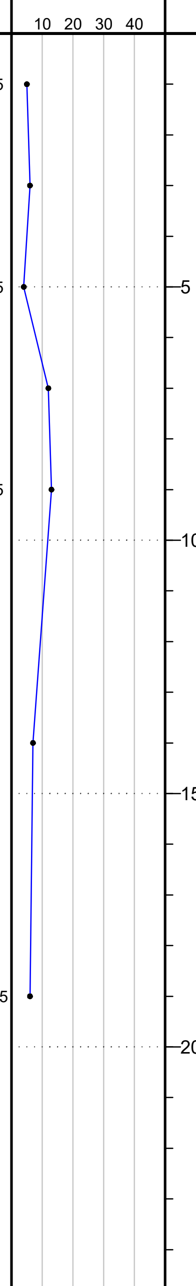
B-32

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.01147618 N, 37.64970661 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/25/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/25/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	2 3 2 3	5	ML	Medium stiff, brown, SILT, some Clay, little fine Sand, moist (ML)	L	M	1.5	1.5	7 inches of topsoil
	S-2	24	WH 3 3 3	6	CL	Medium stiff, brown, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	1.5	2	
5	S-3	24	2 2 2 4	4	CH	Medium stiff, light brown, CLAY, some Silt, trace fine Sand, moist (CH)	H	H	1	2.5	
	S-4	24	3 5 7 9	12	CH	Stiff, grayish brown, CLAY, some Silt, trace fine Sand, moist (CH)	H	H	4	4	
	S-5	24	6 6 7 9	13	CH	Stiff, gray, CLAY, some Silt, moist (CH)	H	H	R	4.5	
10											
	S-6	24	2 4 3 3	7	CH	Medium stiff, gray, CLAY, some Silt, trace coarse to fine Sand, trace coarse to fine Gravel, moist (CH)	H	H	1	3	Mottling on the inside of sample
15											
	S-7	24	2 3 3 4	6	MH	Medium stiff, dark grayish brown, SILT, some Clay, little fine Sand, moist (MH)	L	H	2	3.25	
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

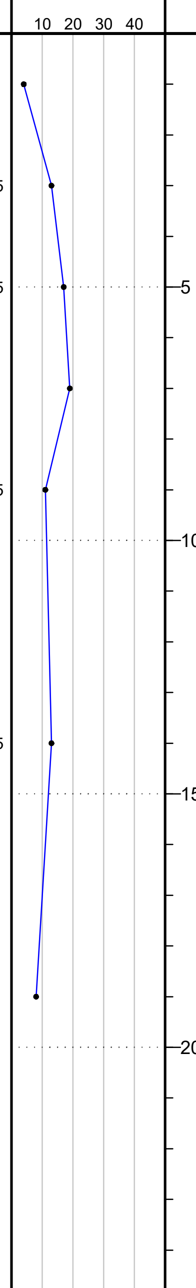
Soil Boring Log — B-33

ANS GEO

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00555134 N, 37.65939348 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/27/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/27/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	15	2 2 2 4	4	MH	Medium stiff, brown, SILT, some Clay, little fine Sand, moist (MH)	L	H	1	2	7 inches of topsoil
	S-2	24	4 5 8 10	13	CL	Stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	3	4.5	
5	S-3	24	4 8 9 10	17	CL	Very stiff, reddish brown, CLAY, some Silt, trace fine Sand, wet (CL)	H	M	R	7.5	Likely perched water
	S-4	24	8 8 11 10	19	CL	Very stiff, reddish brown, CLAY, some Silt, trace fine Sand, wet (CL)	H	M	R	5	Likely perched water
	S-5	24	3 5 6 8	11	CL	Stiff, reddish brown, CLAY, some Silt, little coarse to fine Sand, moist (CL)	H	M	R	5.5	
10											
	S-6	24	7 6 7 8	13	CH	Stiff, reddish brown, CLAY, some Silt, little fine Sand, moist (CH)	H	H	1.5	3.5	
15											
	S-7	24	2 4 4 5	8	CH	Stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CH)	H	H	2.5	6	Black spots
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

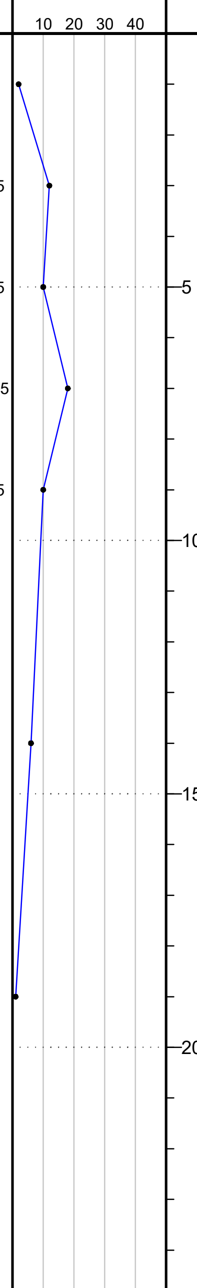
B-34

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00864622 N, 37.66094789 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/27/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/27/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	1 1 1 2	2	ML	Soft, light brown, SILT, some Clay, some fine Sand, wet (ML)	L	M	.5	1	7 inches of topsoil Likely perched water
	S-2	24	3 6 6 7	12	MH	Stiff, brown, SILT, some Clay, little Sand, wet (MH)	H	H	3	3.5	Likely perched water
5	S-3	24	3 4 6 6	10	CL	Stiff, brownish gray, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	3.5	4.5	
	S-4	24	6 9 9 9	18	CL	Very stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	4.5	3.25	Black streaks and spots
	S-5	24	3 5 5 6	10	CL	Stiff, reddish brown, CLAY, some Silt, trace coarse to fine Sand, moist (CL)	H	M	2.5	4.5	
10											
	S-6	24	2 2 4 3	6	CH	Medium stiff, light brown, CLAY, some Silt, moist (CH)	H	H	1.5	4	
15											
	S-7	24	0 0 1 2	1	CH	Very soft, brown, CLAY, some Silt, moist (CH)	L	H	.5	2	Wet slurry top possible void encountered
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

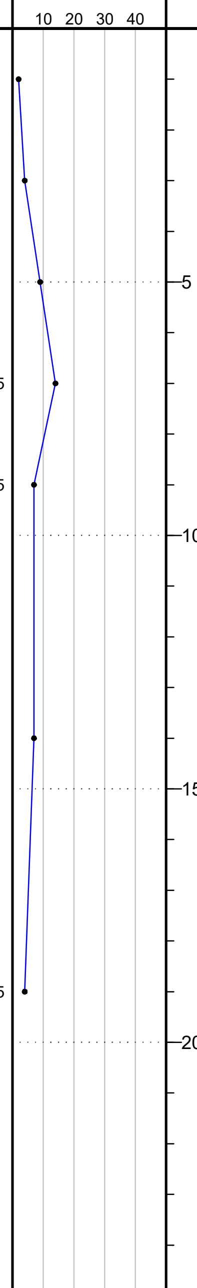
B-35

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00345065 N, 37.66226533 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/27/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/27/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	17	0 1 1 2	2	ML	Soft, gray, SILT, some Clay, some fine Sand, moist (ML)	L	M	1	3	7 inches of topsoil
	S-2	20	1 2 2 2	4	ML	Medium stiff, gray, SILT, little fine Sand, little Clay, wet (ML)	L	NP	.25	1	Likely perched water
5	S-3	24	2 4 5 6	9	MH	Stiff, brownish gray, SILT, some Clay, wet (MH)	H	H	4.5	5	Likely perched water
	S-4	24	6 6 8 7	14	CL	Stiff, grayish brown, CLAY, some Silt, moist (CL)	H	M	3	4.5	
	S-5	12	3 3 4 5	7	ML	Gray, SILT, some fine Sand, moist (ML)	L	NP	1	2.5	
					CL	Reddish brown, CLAY, some Silt, little fine Sand, moist (CL)	H	M	4	5	
10											
	S-6	24	2 3 4 6	7	CL	Medium stiff, brownish gray, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	2	5	
15											
	S-7	24	0 2 2 3	4	CH	Medium stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CH)	H	H	2	5.5	
20						End of Boring at 20 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

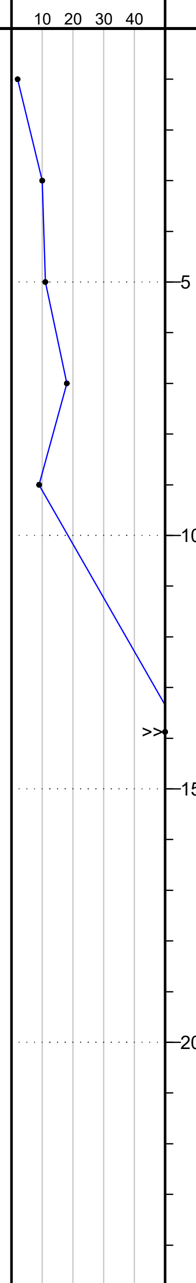
Soil Boring Log

B-36

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00394647 N, 37.66466711 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/27/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/27/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
											6 inches of topsoil
	S-1	18	2 1 1 2	2	MH	Soft, brown, SILT, some Clay, trace fine Sand, moist (MH)	L	M	1	2	
	S-2	12	2 5 5 6	10	ML	Stiff, dark brown, SILT, some coarse to fine Sand, trace Clay, moist (ML)	H	NP	4	3	
5	S-3	24	2 5 6 8	11	ML	Stiff, reddish brown, SILT, some fine Sand, some Clay, moist (ML)	H	M	4	4	
	S-4	14	5 9 9 10	18	MH	Very stiff, brown to reddish brown, SILT, some Clay, some coarse to fine Sand, moist (ML)	H	H	2.75	5	
	S-5	24	3 4 5 6	9	CL	Stiff, reddish brown, CLAY, some Silt, trace fine Sand (CL)	H	M	4	3	Black material intrusion
10					CL						
	S-6	24	2 3 5 50/3"	> 50	CL	Stiff, reddish brown, CLAY, some Silt, moist (CL)	H	M	3.5	4	
15						Split spoon and auger refusal at 14.8 feet See rock core log.					Apparent cobble or boulder at 14.5 feet BGS. Cored through soil to 20.5 feet BGS.
20											



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Core Boring Log

B-36

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00394647 N, 37.66466711 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/27/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/27/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Casing Type:**		**Core Barrel Type:**		**Core Bit Type:**	Imp. Diamond
Rig Type:	Track	**Casing Length:**	4 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	6 inches
Drill Method:	Hollow Stem Auger	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**		**Core Bit I.D.:**	

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	2.0	R-1	60 100%	46 77%	R2	SL		LIMESTONE, gray, fine grained, slightly weathered, weak, moderate to widely spaced discontinuities	21	J	10	P,R	DE	VW	N	Apparent dissolution or cavity from 21.5 to 22 feet BGS.
	2.3															
	2.3								23.4	J	10	P,Sm	DG	VW	CL	
	2.8															
25	3.4															
								End of boring at 25.5 feet BGS. Borehole backfilled with bentonite holeplug and soil cuttings.								
30																
35																
40																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

= Water Level (if observed)　　**BGS =** Below Ground Surface

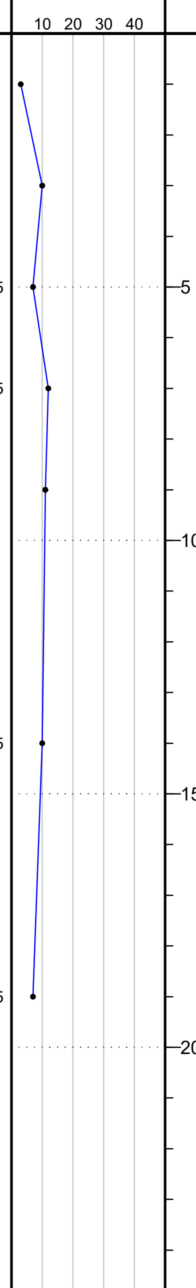
Soil Boring Log

B-37

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.99683333 N, 37.67377778 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/27/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/27/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	18	2 2 1 2	3	ML		Soft, brown, SILT, some Clay, little fine Sand, moist (ML)	L	M	1.5	2	5 inches of topsoil
	S-2	24	3 5 5 7	10	CL		Stiff, brown, CLAY, some Silt, trace fine Sand, trace coarse to fine Gravel, moist (CL)	H	M	2	3	
5	S-3	24	2 2 5 3	7	MH		Medium stiff, reddish brown, SILT, some Clay, trace fine Sand, trace coarse to fine Gravel, moist (ML)	H	M	2.5	3.5	
	S-4	24	5 5 7 6	12			Stiff, reddish brown and gray, SILT, some CLay, trace fine Gravel, trace fine Sand, moist (MH)	H	H	3	3.5	
	S-5	24	4 6 5 11	11			Stiff, reddish brown, SILT, some Clay, little coarse to fine Sand, trace fine Gravel, moist (MH)	H	H	4.5	5	
10												
	S-6	24	3 4 6 7	10	CH		Stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CH)	H	H	3	4.5	
15												
	S-7	24	2 3 4 3	7			Medium stiff, reddish brown, CLAY, some Silt, trace fine Sand, moist (CH)	H	H	1.5	3.5	
20							End of Boring at 20 feet BGS Borehole backfilled with cuttings					



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

= Water Level (if observed)

BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

B-38

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-85.99567894 N, 37.67764463 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/27/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/27/2021	**Vert. Datum:**	Grade

Rig Model:		**Sampler Type:**	Hand Auger	**Casing Type:**	N/A
Rig Type:		**Sampler Length:**		**Casing Length:**	N/A
Drill Method:	Hand Auger	**Sampler I.D.:**		**Casing I.D.:**	N/A
Hammer Type:		**Hammer Wt.:**		**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**		**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	N-Value (10 20 30 40)	Drilling & Strata Notes
	G-1	24			ML		Dark brown, SILT, some Clay, some fine Sand, moist (ML)	H	M				
	G-2	12			CL		Light brown, Silty CLAY, some fine Sand, moist (CL)	H	H				
	G-3	12			CL		Light brown, Silty CLAY, some fine Sand, wet (CL)	L	M				Likely perched water
													Likely cobble or boulder present
5							Hand auger refusal at 4.2 feet End of Boring at 4.2 feet BGS Borehole backfilled with cuttings						
10													
15													
20													

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

B-SS-1

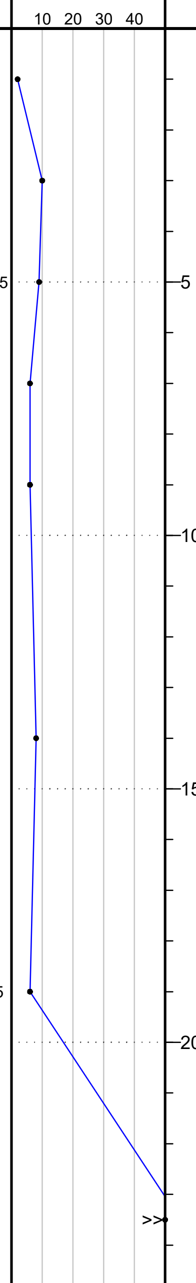
ANS GEO

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00473638 N, 37.66145425 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/26/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/26/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	18	2 1 1 2	2	CL	Very soft, grayish brown, Silty CLAY, little fine Sand, moist (CL)	L	H	1	.5	4 inches of topsoil
	S-2	24	4 5 5 6	10	CL	Stiff, grayish brown, Silty CLAY, little fine Sand, moist (CL)	H	H	3	3	
5	S-3	24	5 6 3 7	9	CL	Stiff, grayish brown, Silty CLAY, little fine Sand, moist (CL)	M	H	3	2.75	
	S-4	20	2 3 3 5	6	CL	Medium stiff, grayish brown, Silty CLAY, trace fine Sand, moist (CL)	H	M	1.25	4	Organic material recovered
	S-5	24	1 3 3 4	6	CL	Medium stiff, grayish brown, CLAY, some Sillt, trace fine Sand, moist (CL)	H	M	1.75	4	
10											
	S-6	14	2 3 5 5	8	ML	Stiff, brownish gray, SILT, some Clay, little fine Sand, moist (ML)	H	NP	1	3	
15											
	S-7	24	2 2 4 4	6	CL	Medium stiff, greenish gray, CLAY, little Silt, trace fine Sand, moist (CL)	H	M	1.5	3.5	
20											
	S-8		50/2"	> 50	SM	Very dense, gray, coarse to fine SAND, some Silt, some coarse to fine Gravel, little Clay, wet (SM)					Split spoon refusal at 23.2 feet BGS. Likely cobble or boulder present.
						End of Boring at 23.2 feet BGS Borehole backfilled with cuttings					

N-Value



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)
2/26/2021			20

General Notes

▼ = Water Level (if observed)

BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

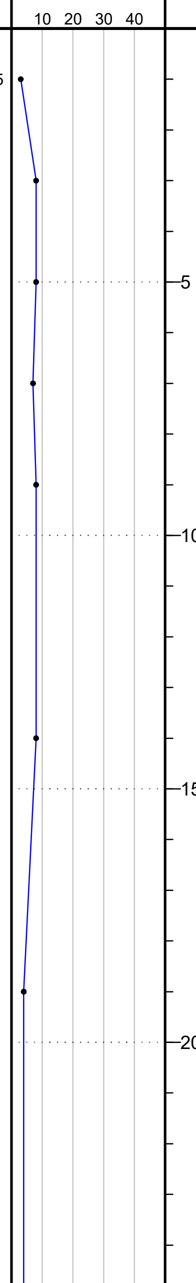
B-SS-2

Client:	ibV Energy	**Drilling Firm:**	Tri-State Drilling, LLC	**Coordinates:**	-86.00446277 N, 37.66147358 E
Project:	Rhudes Creek Solar Project	**Drill Crew:**	Shannon / Brandon	**Horiz. Datum:**	NAD 83
Location:	Hardin County, Kentucky	**Boring Start:**	2/27/2021	**Elevation:**	0
Inspector:	Diego Melgar	**Boring End:**	2/27/2021	**Vert. Datum:**	Grade

Rig Model:	CME-55	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	4 feet
Drill Method:	Hollow Stem Auger	**Sampler I.D.:**	2 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 feet

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	20	1 1 2 3	3	MH	Soft, brown, SILT, some Clay, trace fine Sand, moist (MH)	H	H	2.5	3.5
	S-2	24	3 4 4 4	8	CL	Stiff, brown, Silty CLAY, trace fine Sand, moist (CL)	H	M	2.25	4
5	S-3	24	2 3 5 5	8	CL	Stiff, grayish brown, CLAY, some Silt, trace fine Sand, moist (CL)	H	M	3.25	5
	S-4	24	3 3 4 5	7	CL	Medium stiff, grayish brown, CLAY, some Silt, moist (CL)	H	M	1.5	5
	S-5	24	3 3 5 4	8	CL	Stiff, brownish gray, CLAY, some Silt, moist (CL)	H	M	2	5
10										
	S-6	24	2 3 5 5	8	ML	Stiff, brown, SILT, some coarse to fine Sand, some Clay, wet (ML)	H	L	1.5	2
15										
	S-7	24	0 2 2 3	4	SM	Very loose, light brown, coarse to fine SAND, some Silt, little Clay, wet (SM)				
20										
	S-8	24	0 0 0 0		CH	Very soft, brown, CLAY, some Silt, wet (CH)	L	H		

N-Value



Drilling & Strata Notes

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)
2/27/2021			13

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Soil Boring Log

B-SS-2
(Continued)

Client: ibV Energy	**Drilling Firm:** Tri-State Drilling, LLC	**Coordinates:** -86.00446277 N, 37.66147358 E
Project: Rhudes Creek Solar Project	**Drill Crew:** Shannon / Brandon	**Horiz. Datum:** NAD 83
Location: Hardin County, Kentucky	**Boring Start:** 2/27/2021	**Elevation:** 0
Inspector: Diego Melgar	**Boring End:** 2/27/2021	**Vert. Datum:** Grade

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	N-Value (10 20 30 40)	Drilling & Strata Notes
	S-9	24	0 2 2 2	4			Soft, brown, CLAY, some Silt, wet (CH)	L	M	.5	1.9		
30													30
35							Auger refusal at 34.5 feet End of Boring at 34.5 feet BGS Borehole backfilled with cuttings						35
40													40
45													45
50													50

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)
2/27/2021			13

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Attachment C

Electrical Resistivity Testing Results

ANS GEO

Soil Resistivity Results

Client:	ibV Energy	Date:	2/9/2021 - 2/10/2021
Project Name:	Rhudes Creek Solar Project	Weather:	Sunny
Project Location:	Hardin County, Kentucky	Temperature:	55° F
Equipment:	AGI MiniSting		
Test Method:	Wenner 4 Electrode Array		

Array		Data	Array spacing (ft)						
			2	5	10	25	50	100	150
ER-07	N-S	Measured Resistance (Ω)	38.22	16.26	8.67	2.08	0.82	-	-
		Apparent Resistivity (Ω-ft)	480	511	545	327	256	-	-
	E-W	Measured Resistance (Ω)	36.89	16.97	8.12	2.25	1.00	-	-
		Apparent Resistivity (Ω-ft)	464	533	510	354	314	-	-
ER-08	N-S	Measured Resistance (Ω)	55.58	22.15	9.30	4.03	1.01	-	-
		Apparent Resistivity (Ω-ft)	698	696	584	632	316	-	-
	E-W	Measured Resistance (Ω)	52.34	21.34	8.57	4.91	0.98	-	-
		Apparent Resistivity (Ω-ft)	658	670	538	771	308	-	-
ER-09	N-S	Measured Resistance (Ω)	52.34	22.76	12.50	2.70	1.01	-	-
		Apparent Resistivity (Ω-ft)	658	715	785	425	318	-	-
	E-W	Measured Resistance (Ω)	51.73	31.89	10.02	2.52	1.02	-	-
		Apparent Resistivity (Ω-ft)	650	1,002	630	396	319	-	-
ER-10	N-S	Measured Resistance (Ω)	32.36	12.09	7.18	2.28	1.19	-	-
		Apparent Resistivity (Ω-ft)	407	380	451	358	374	-	-
	E-W	Measured Resistance (Ω)	33.58	12.50	7.07	2.07	0.93	-	-
		Apparent Resistivity (Ω-ft)	422	393	444	326	293	-	-
ER-11	N-S	Measured Resistance (Ω)	41.98	29.54	10.12	3.29	1.61	-	-
		Apparent Resistivity (Ω-ft)	528	928	636	517	505	-	-
	E-W	Measured Resistance (Ω)	40.66	18.39	10.15	3.46	1.44	-	-
		Apparent Resistivity (Ω-ft)	511	578	638	543	453	-	-
ER-12	N-S	Measured Resistance (Ω)	58.24	21.24	6.71	1.27	0.67	-	-
		Apparent Resistivity (Ω-ft)	732	667	421	199	210	-	-
	E-W	Measured Resistance (Ω)	57.53	20.63	7.39	1.81	0.99	-	-
		Apparent Resistivity (Ω-ft)	723	648	464	284	311	-	-
ER-SS-1	N-S	Measured Resistance (Ω)	21.75	4.94	4.48	0.69	0.66	0.84	1.40
		Apparent Resistivity (Ω-ft)	273	155	282	108	208	526	1,321
	E-W	Measured Resistance (Ω)	24.84	5.81	3.51	2.97	1.89	1.88	1.38
		Apparent Resistivity (Ω-ft)	312	182	220	466	593	1,180	1,299
		Site Average (Ω)	**42.72**	**18.32**	**8.13**	**2.59**	**1.09**	**1.36**	**1.39**
		Site Average (Ω-ft)	**537**	**576**	**511**	**407**	**341**	**853**	**1,310**

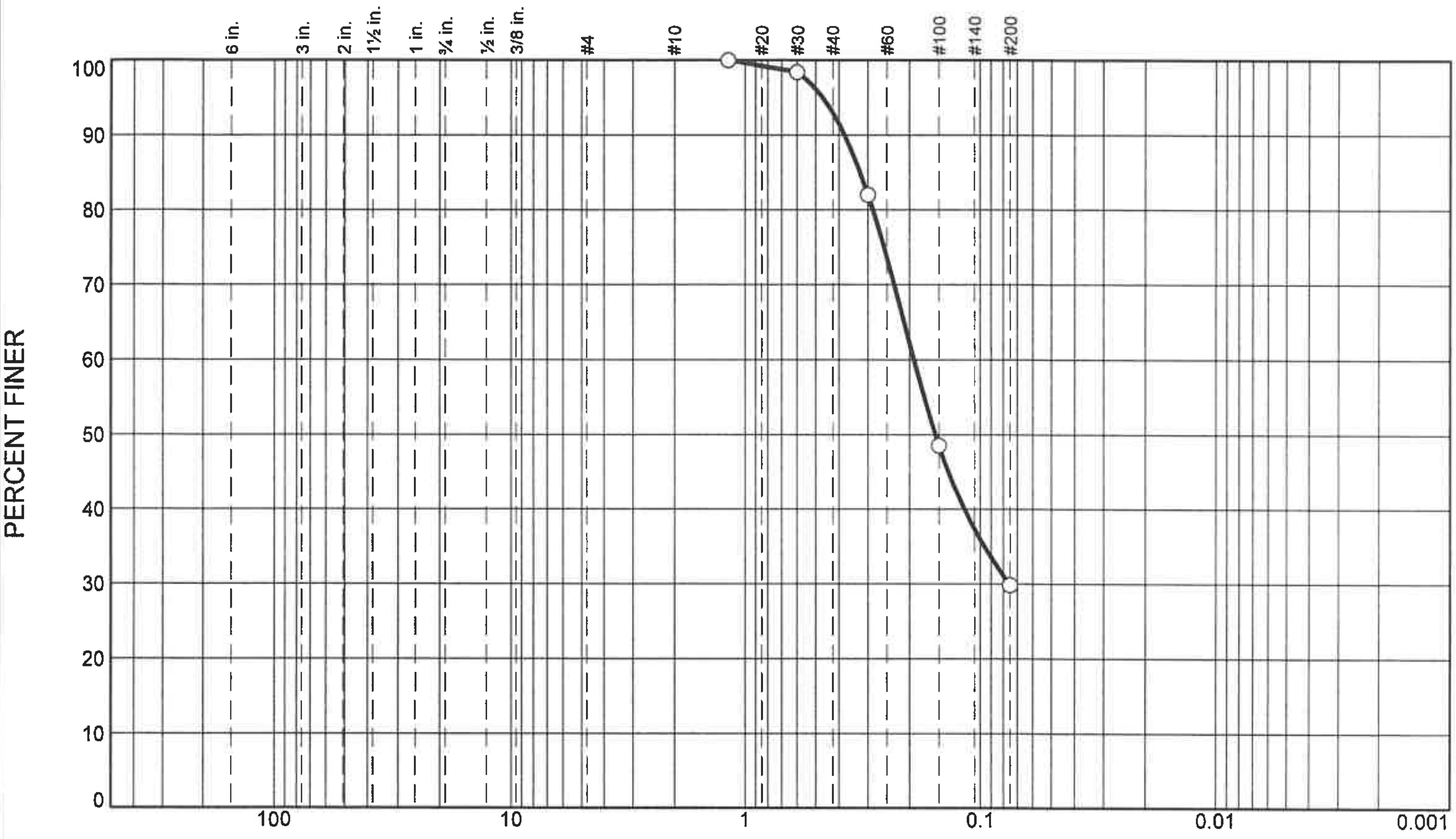
Attachment D

Laboratory Results

SIEVE ANALYSIS

RESULTS

Particle Size Distribution Report As per ASTM D-422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	7.0	63.2	29.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#16	100.0		
#30	98.4		
#50	82.0		
#100	48.5		
#200	29.8		

* (no specification provided)

Material Description

silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.3778 D_{85}= 0.3240 D_{60}= 0.1916
D_{50}= 0.1553 D_{30}= 0.0756 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

In-Situ %MC=11.1
F.M.=0.71

Location: B-15, S-4
Sample Number: S-4 **Depth:** 6'-8' **Date:**

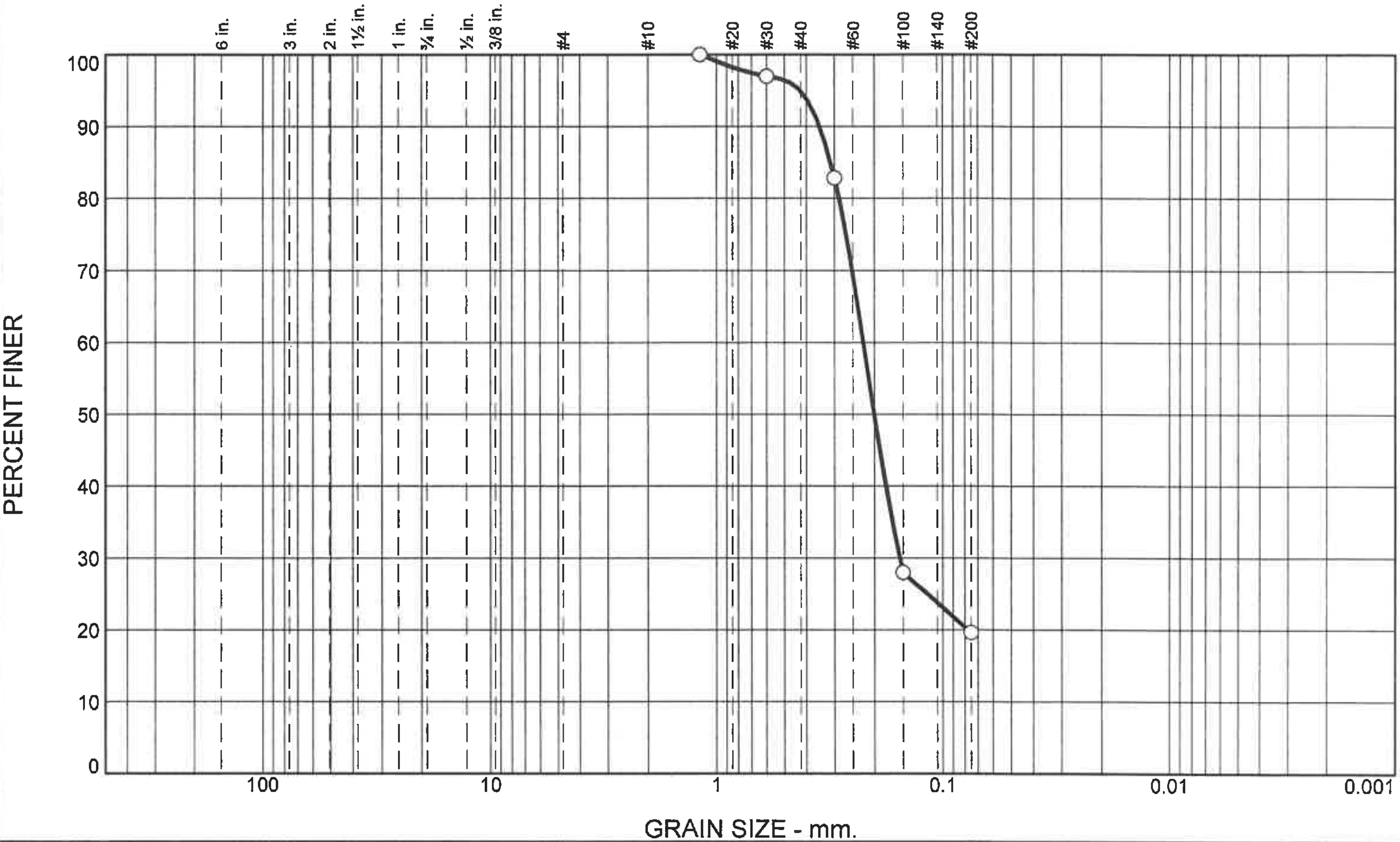
ANS CONSULTANTS, INC.

South Plainfield, New Jersey

Client: ANS GEO, Inc.
Project: ibv Energy - Rhudes creek, Cecilia, KY

Project No: AOS-5632 **Figure 4 F 1**

Particle Size Distribution Report As per ASTM D-422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	5.1	75.3	19.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#16	100.0		
#30	97.0		
#50	82.8		
#100	28.0		
#200	19.6		

* (no specification provided)

Material Description

silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.3487 D_{85}= 0.3118 D_{60}= 0.2242
D_{50}= 0.2005 D_{30}= 0.1552 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

In-Situ %MC=11.9
F.M.=0.92

Location: B-21, S-5,
Sample Number: S-10 **Depth:** 8'-10' **Date:**

ANS CONSULTANTS, INC.

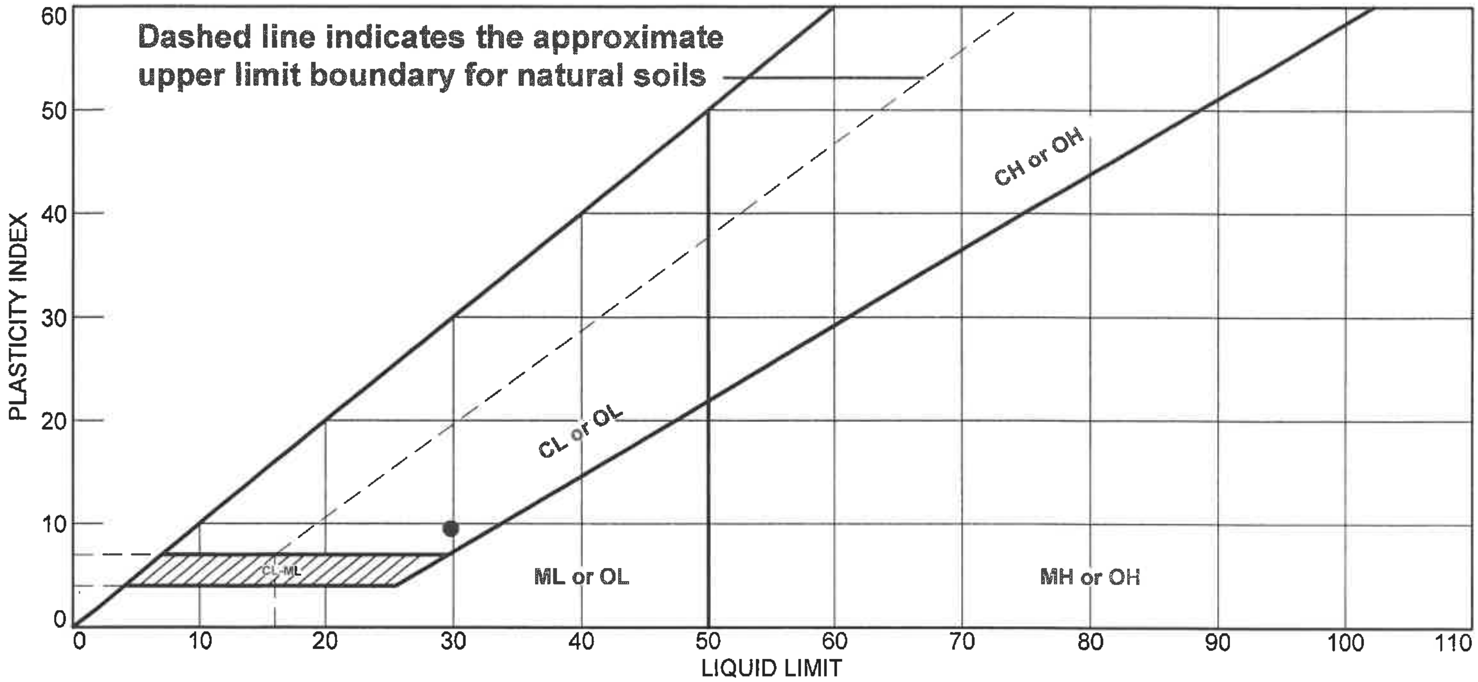
South Plainfield, New Jersey

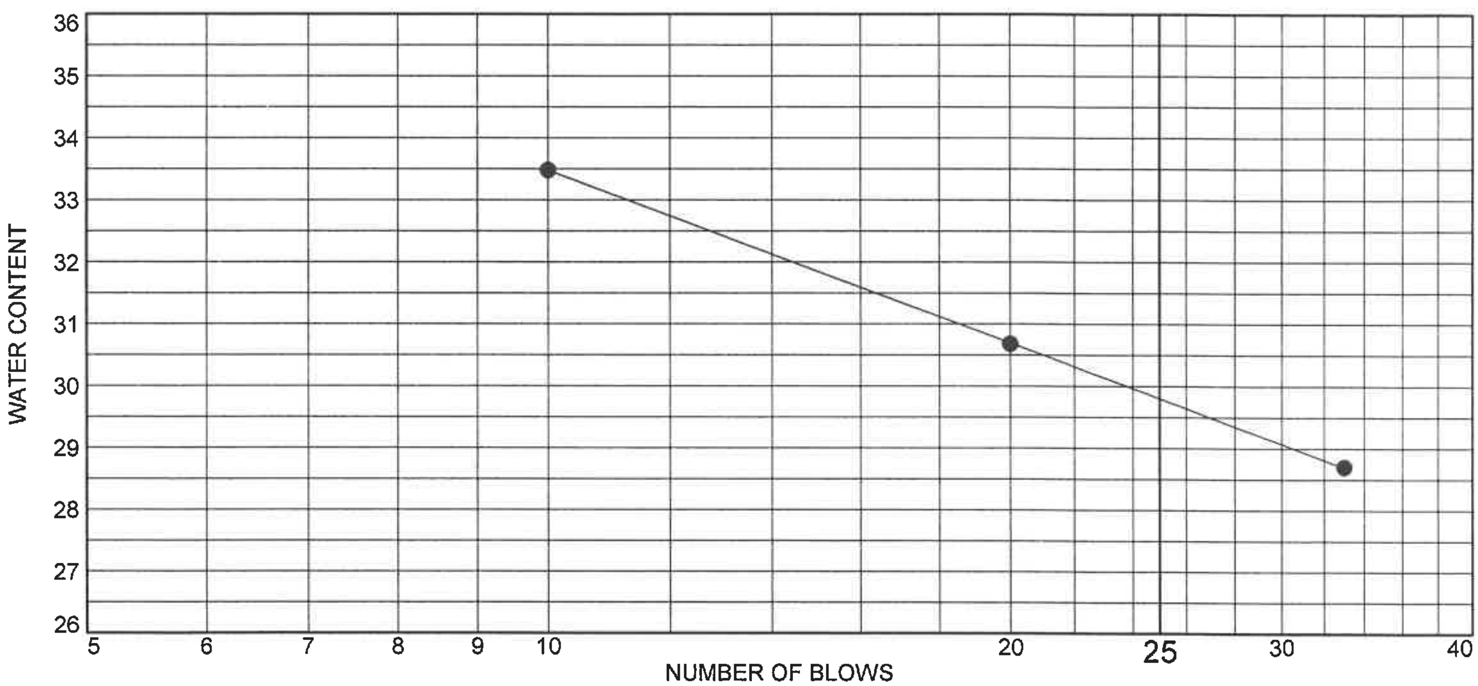
Client: ANS GEO, Inc.
Project: ibv Energy - Rhudes creek, Cecilia, KY
Project No: AOS-5632 **Figure 10 F 1**

ATTERBERG LIMITS

RESULTS

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		29.8	20.3	9.5			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-12, S-4
Sample Number: S-1 **Depth:** 6'-8'

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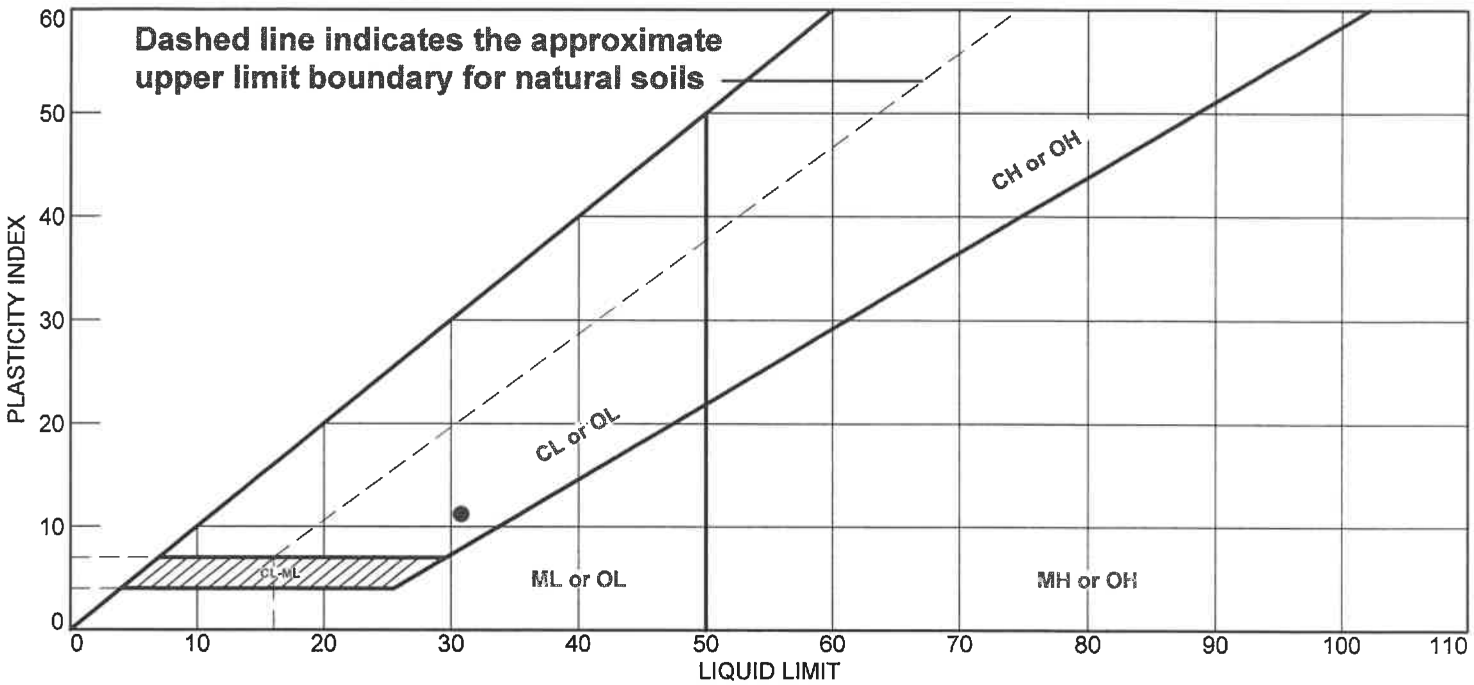
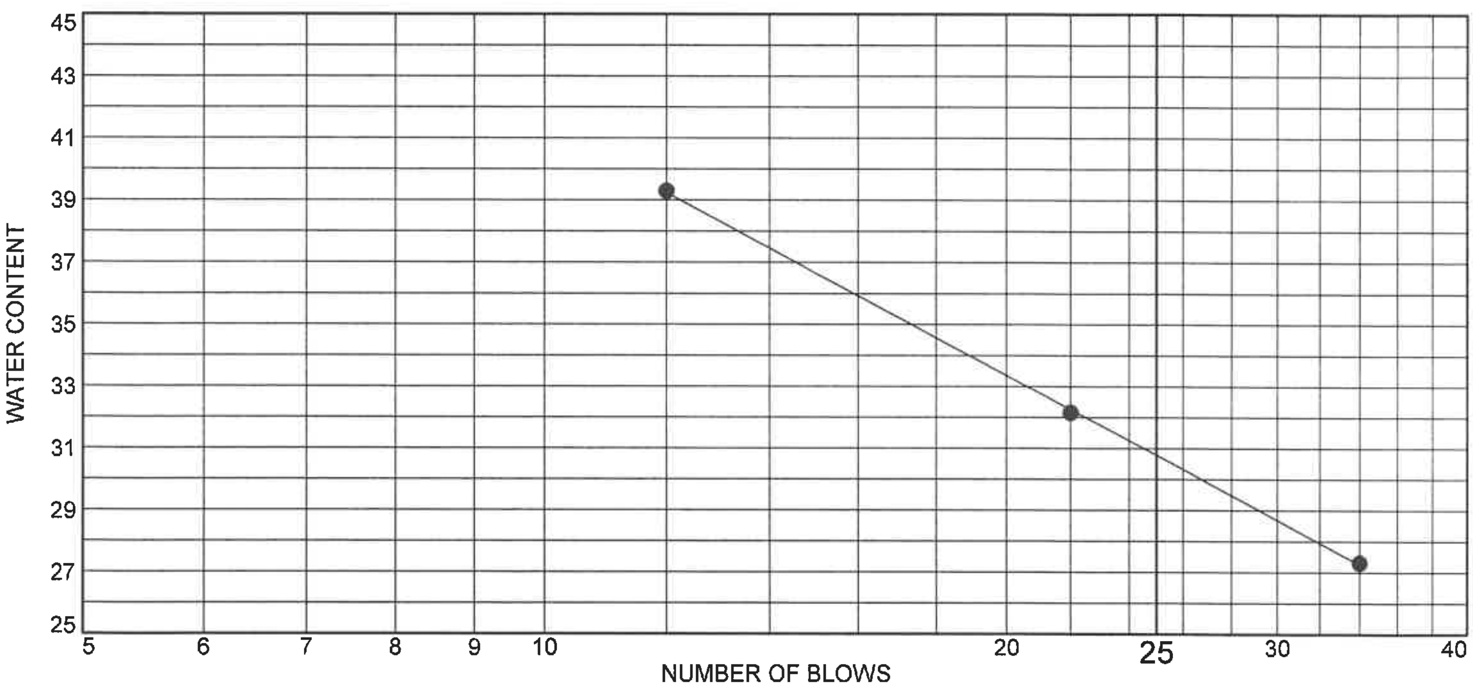
South Plainfield, New Jersey

Remarks:
● In-Situ %MC=

Figure 1 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		30.8	19.6	11.2			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-16, S-1
Sample Number: S-5 **Depth:** 0'-2'

Remarks:
● In-Situ %MC=

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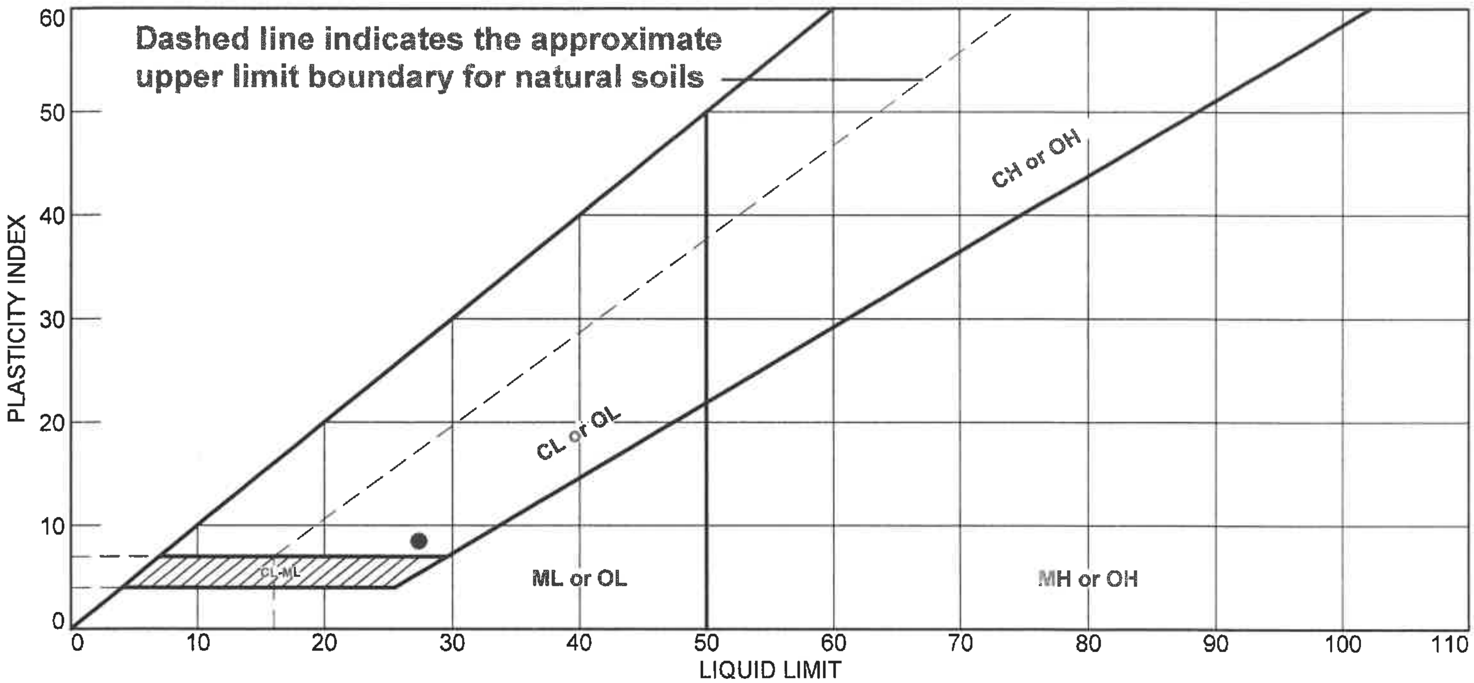
Figure 5 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		27.4	18.9	8.5			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-17, S-5

Sample Number: S-6 **Depth:** 8'-10'

Remarks:

● In-Situ %MC=

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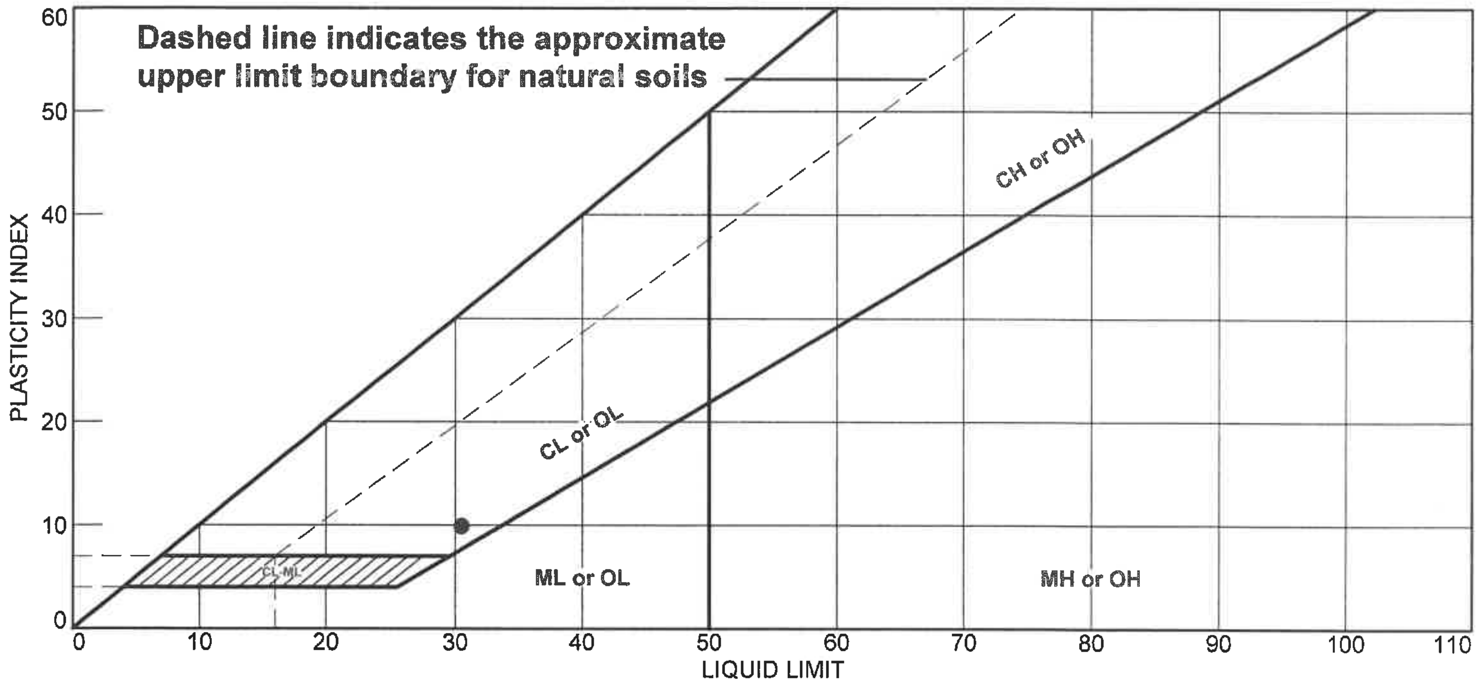
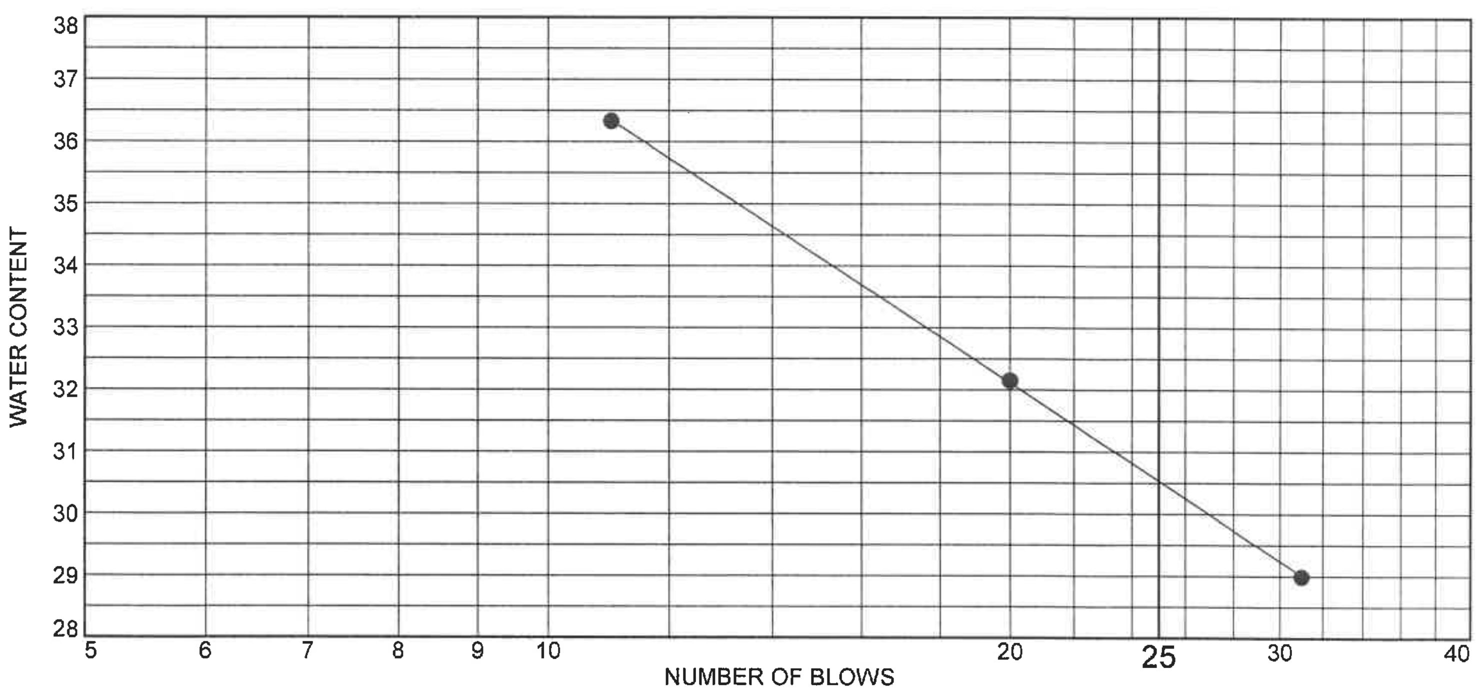
South Plainfield, New Jersey

Figure 6 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		30.5	20.6	9.9			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-18, S-2
Sample Number: S-7 **Depth:** 2'-4'

Remarks:
● In-Situ %MC=

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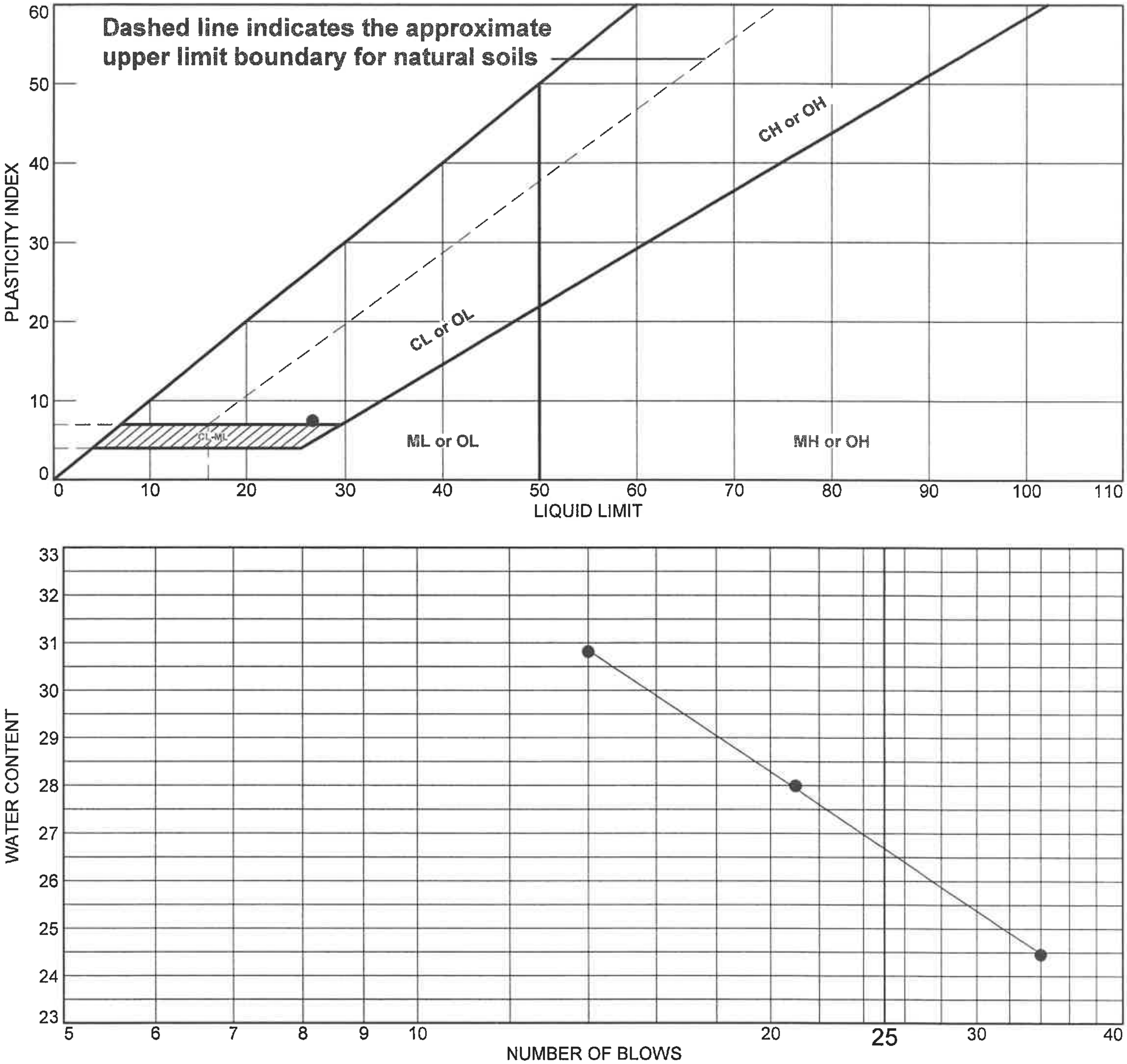
South Plainfield, New Jersey

Figure 7 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		26.7	19.2	7.5			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-19, S-3
Sample Number: S-8 **Depth:** 4'-6'

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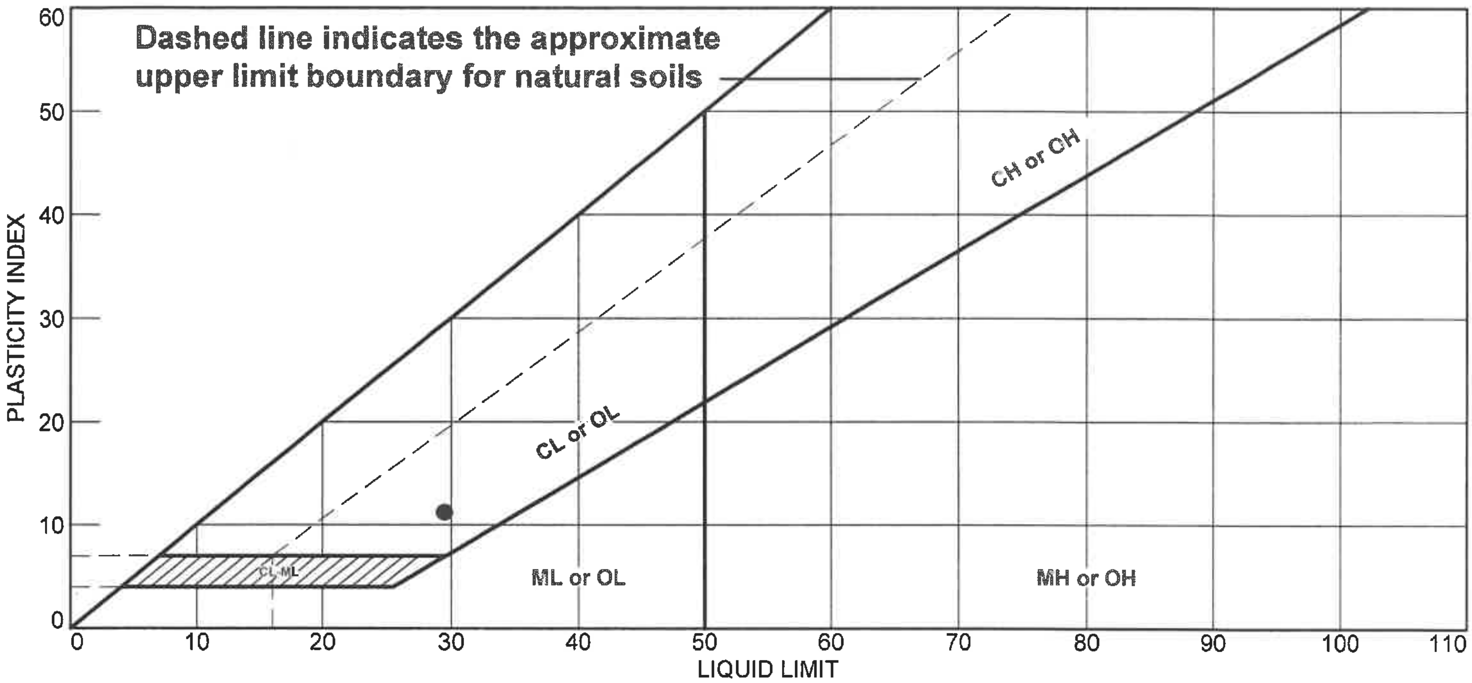
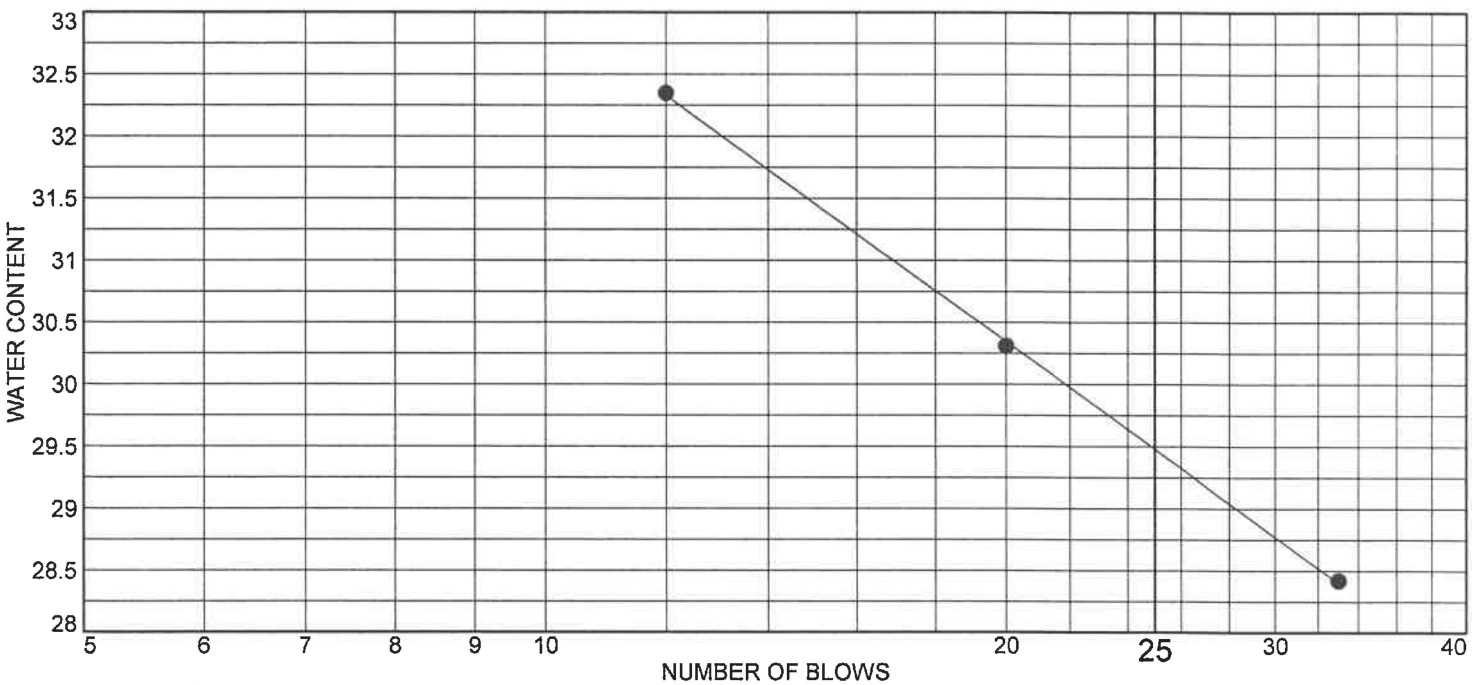
Remarks:
● In-Situ %MC=

Figure 8 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT

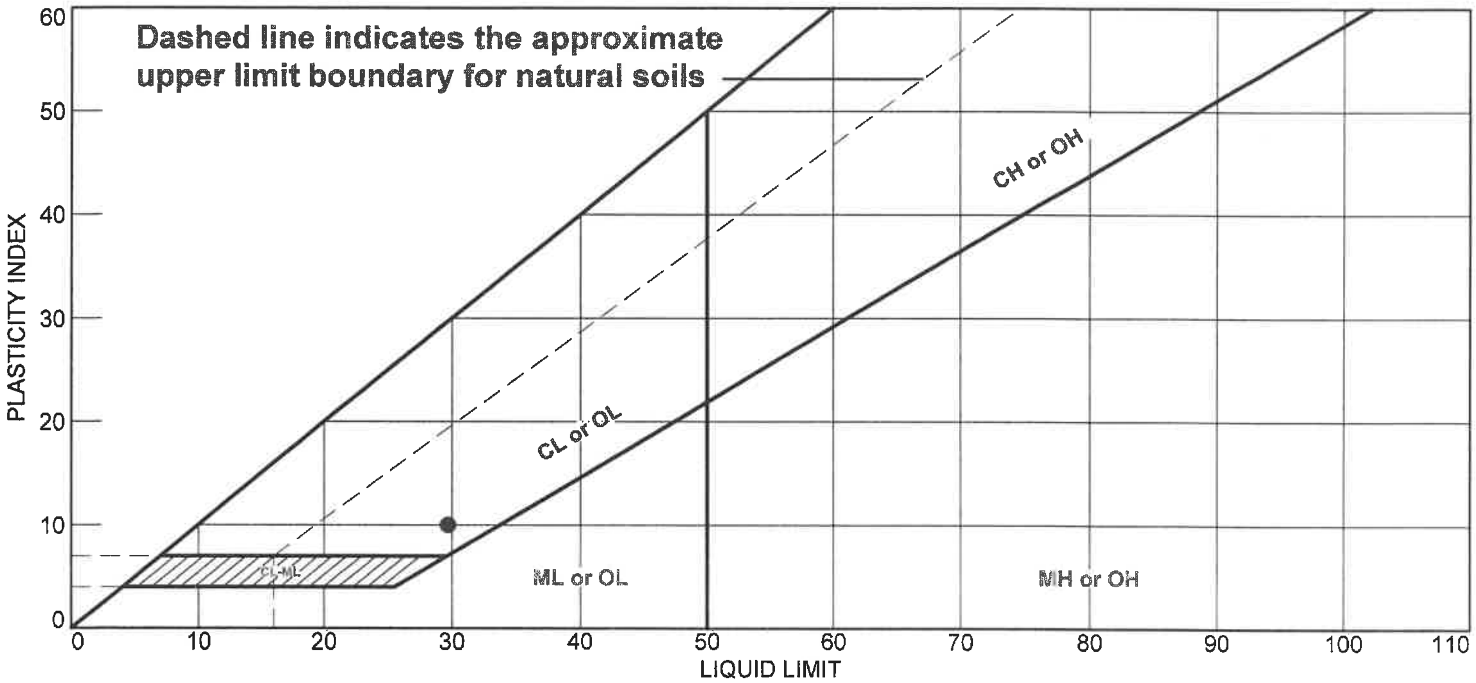


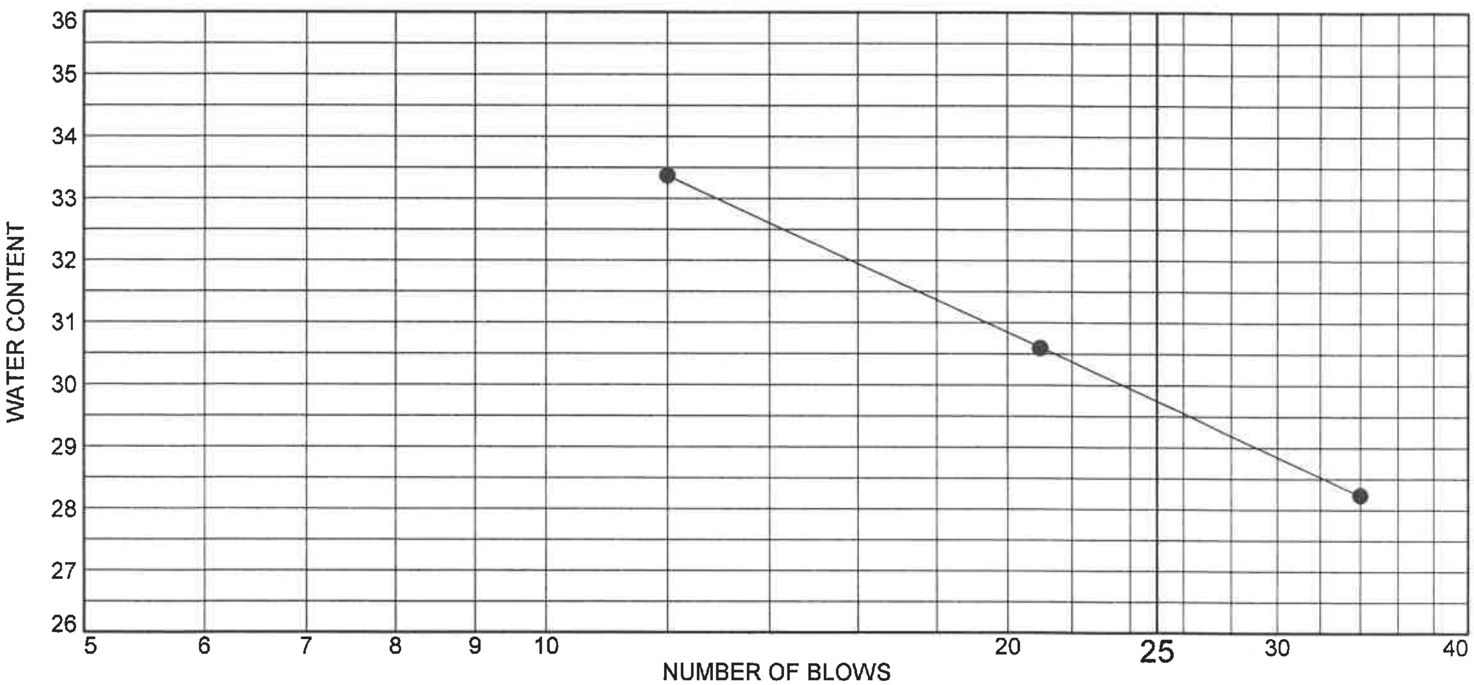


	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		29.5	18.3	11.2			

Project No. AOS-5632 **Client:** ANS GEO, Inc. **Project:** ibv Energy - Rhudes creek, Cecilia, KY **Location:** B-20, S-4 **Sample Number:** S-9 **Depth:** 6'-8'	**Remarks:** ● In-Situ %MC=
ANS CONSULTANTS, INC. **South Plainfield, New Jersey**	**Figure 9 F 3**

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		29.7	19.7	10.0			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-24, S-3
Sample Number: S-11 **Depth:** 4'-6'

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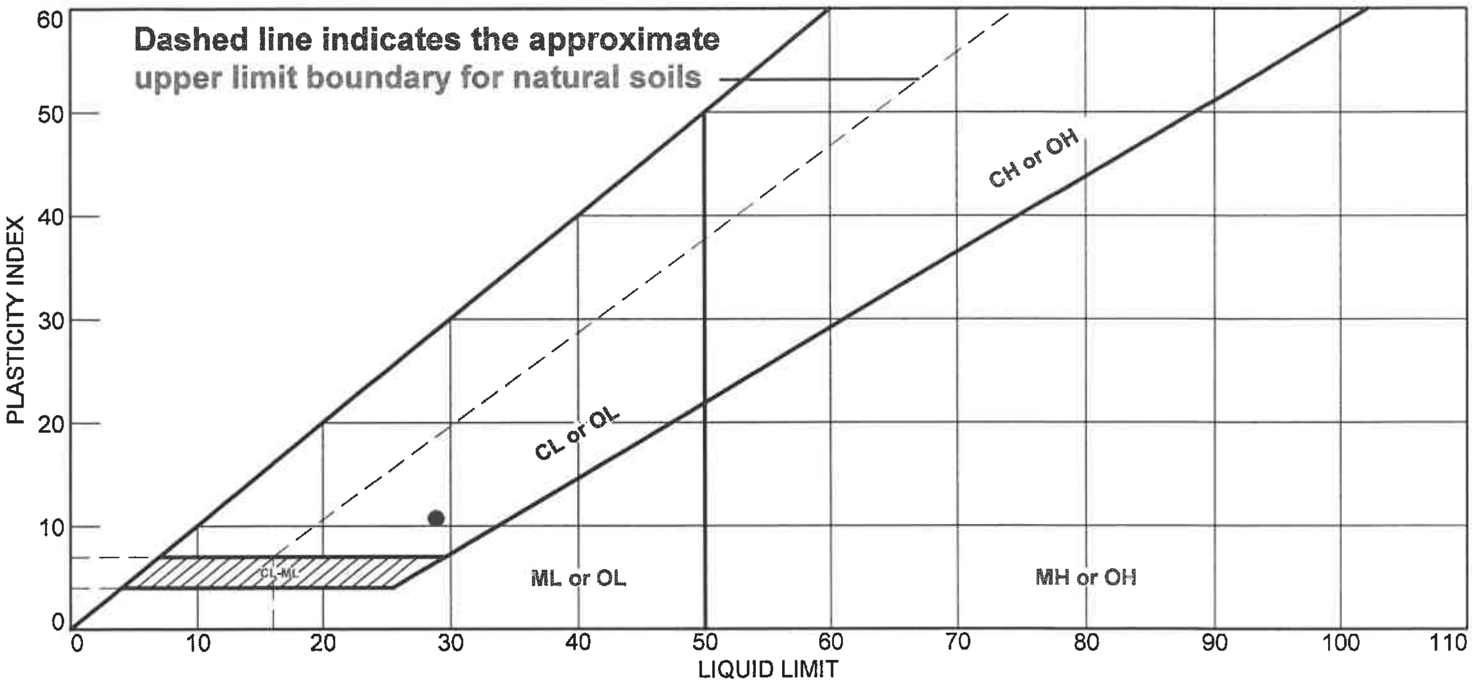
Remarks:
● In-Sity %MC=

Figure 11 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		28.9	18.2	10.7			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-26, S-1
Sample Number: S-12 **Depth:** 0'-2'

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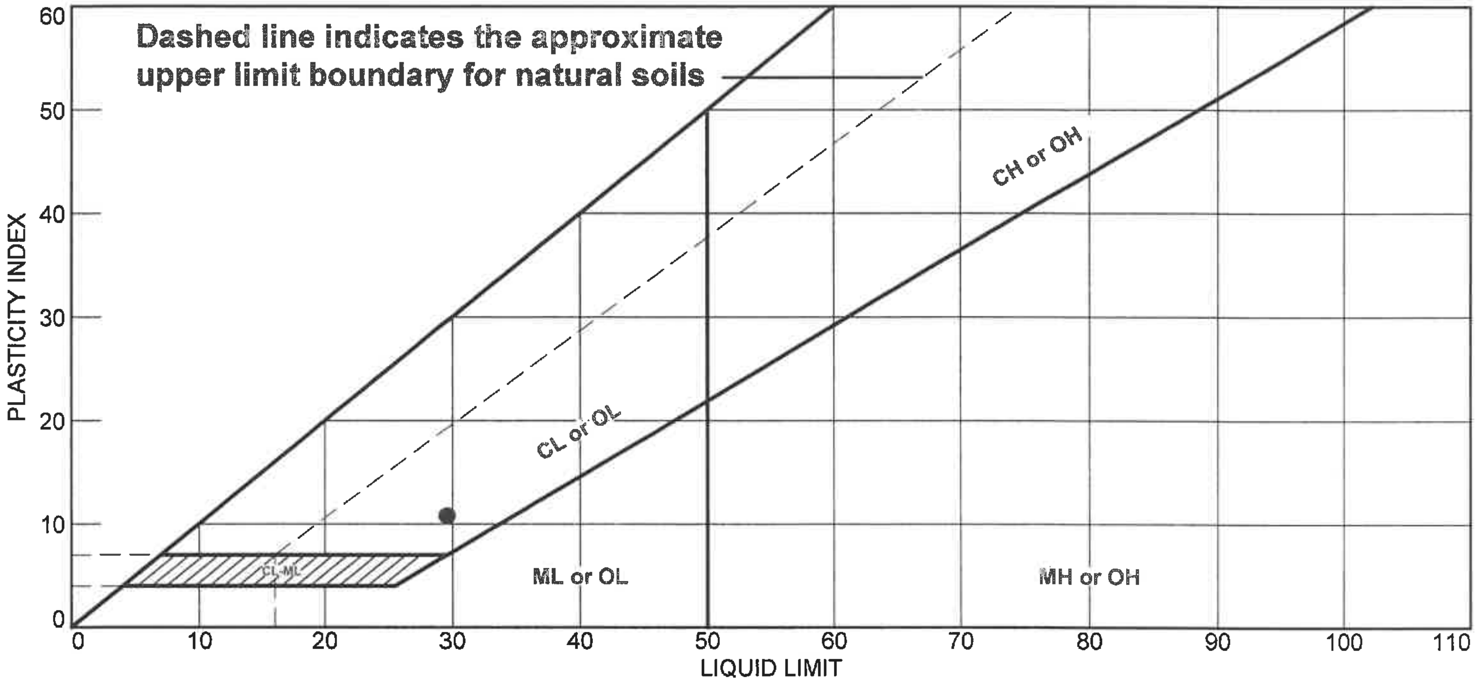
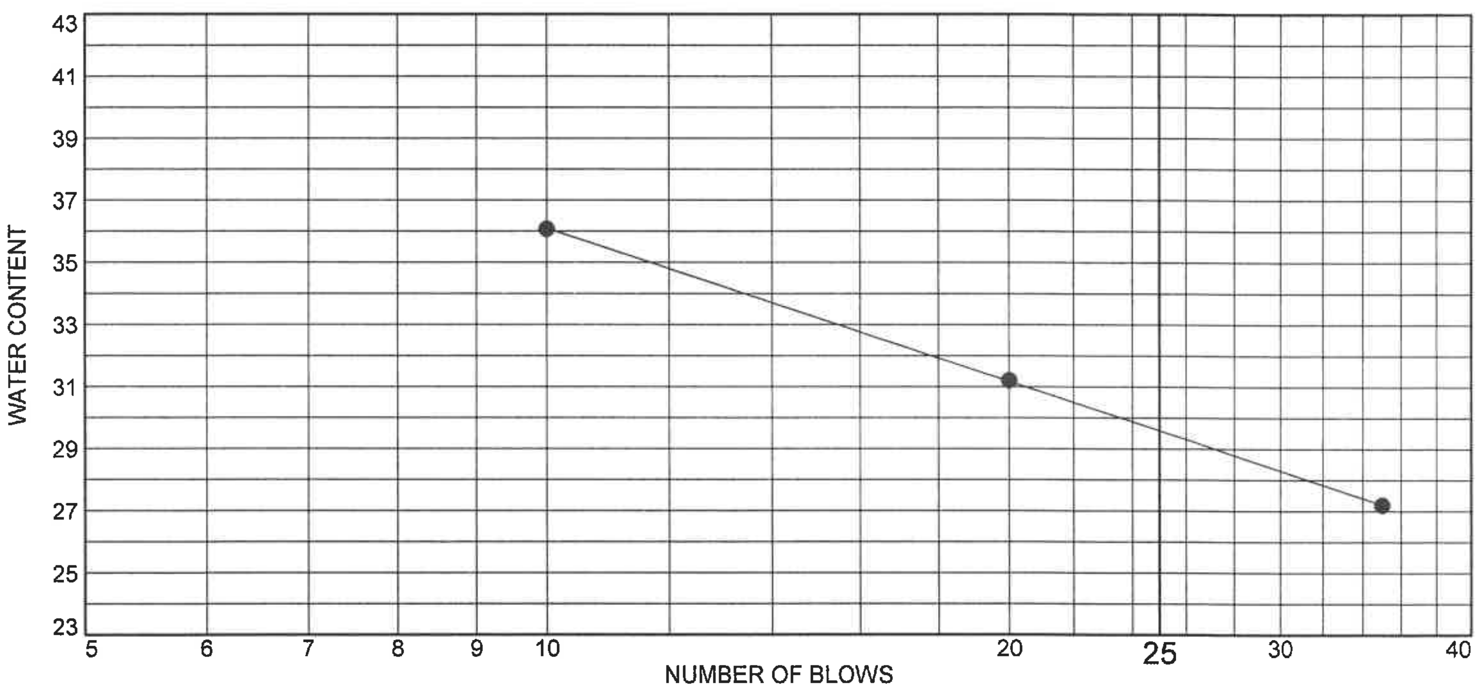
South Plainfield, New Jersey

Remarks:
● In-Situ %MC=

Figure 12 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		29.6	18.8	10.8			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-27, S-4

Sample Number: S-13 **Depth:** 6'-8'

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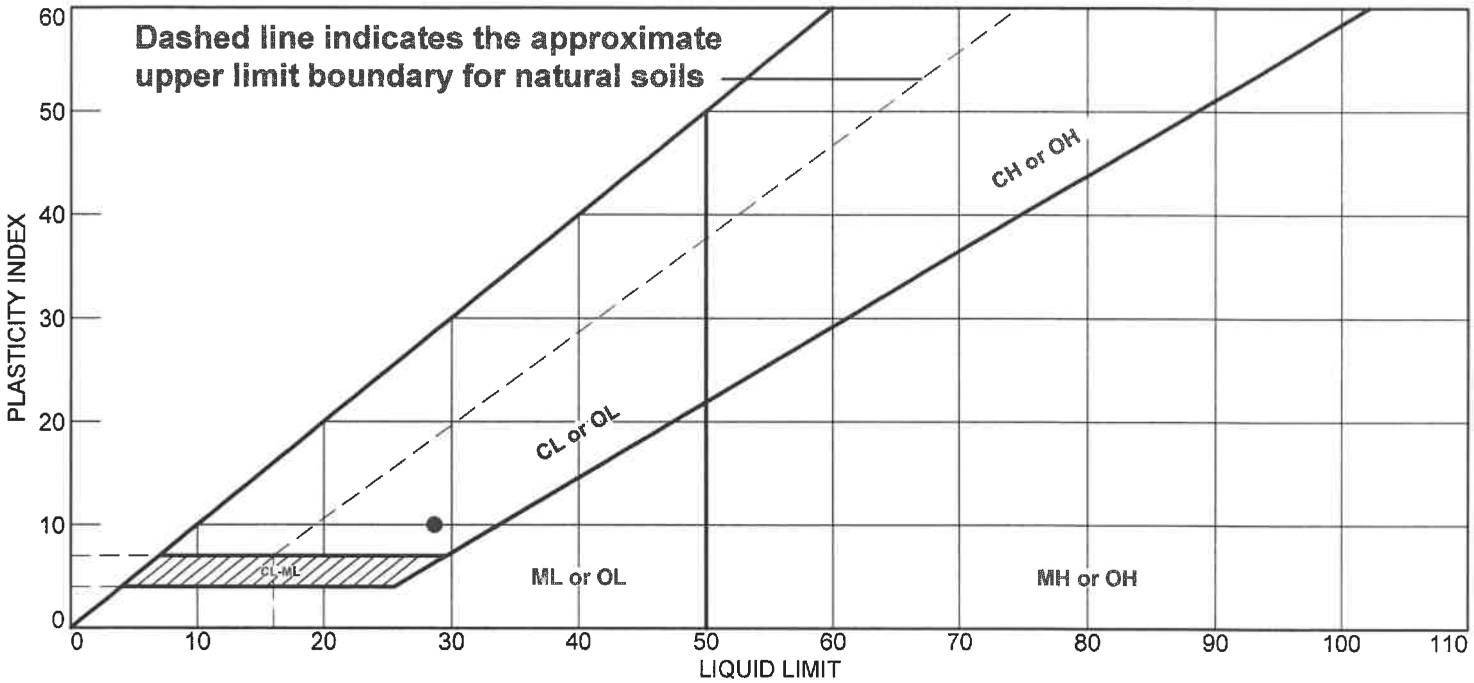
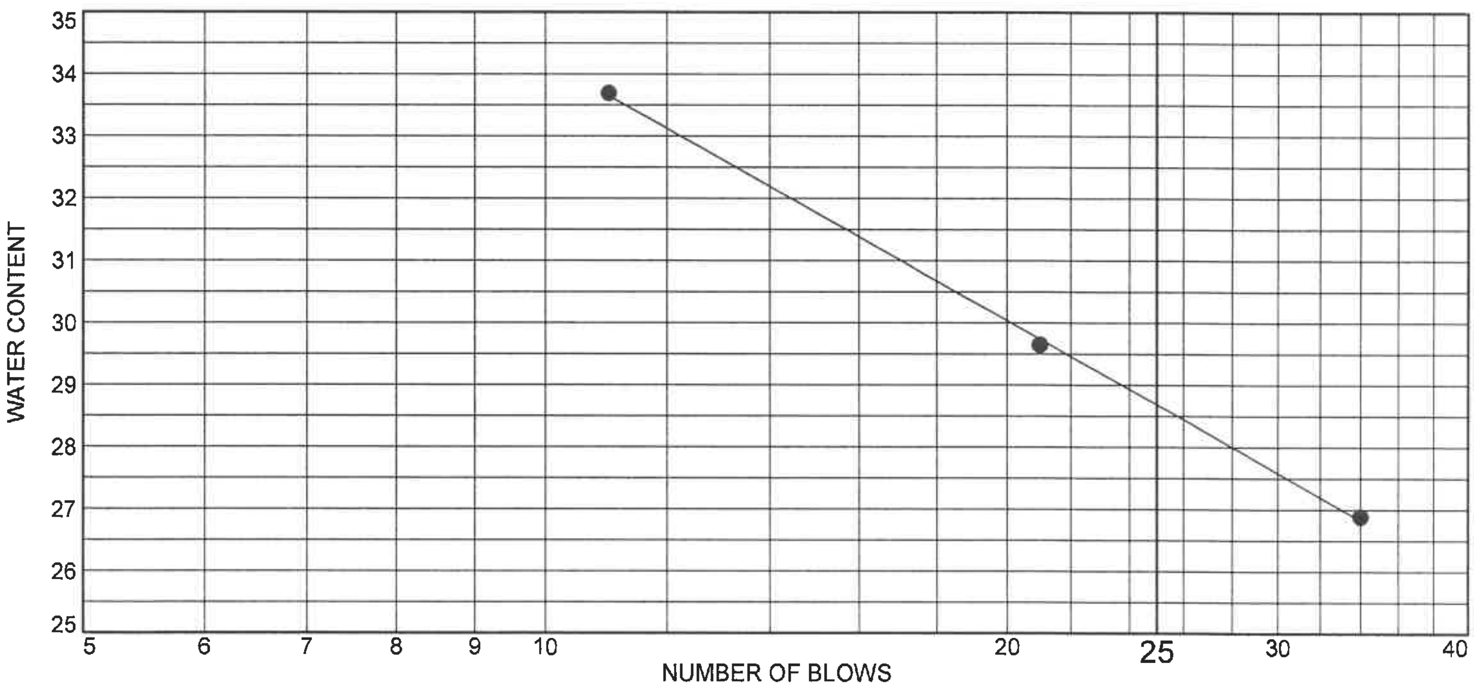
Remarks:

● In-Situ %MC=

Figure 13 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		28.7	18.7	10.0			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-29, S-2
Sample Number: S-14 **Depth:** 2'-4'

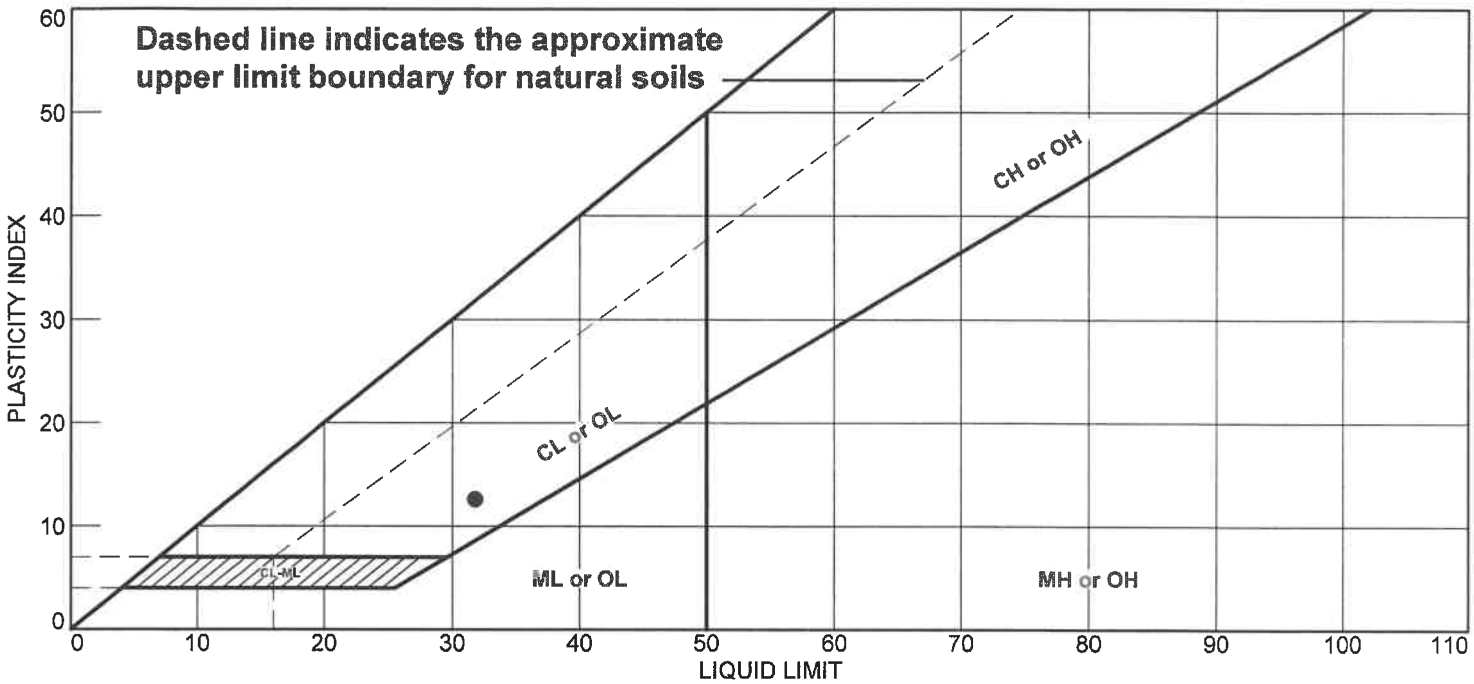
ANS CONSULTANTS, INC.

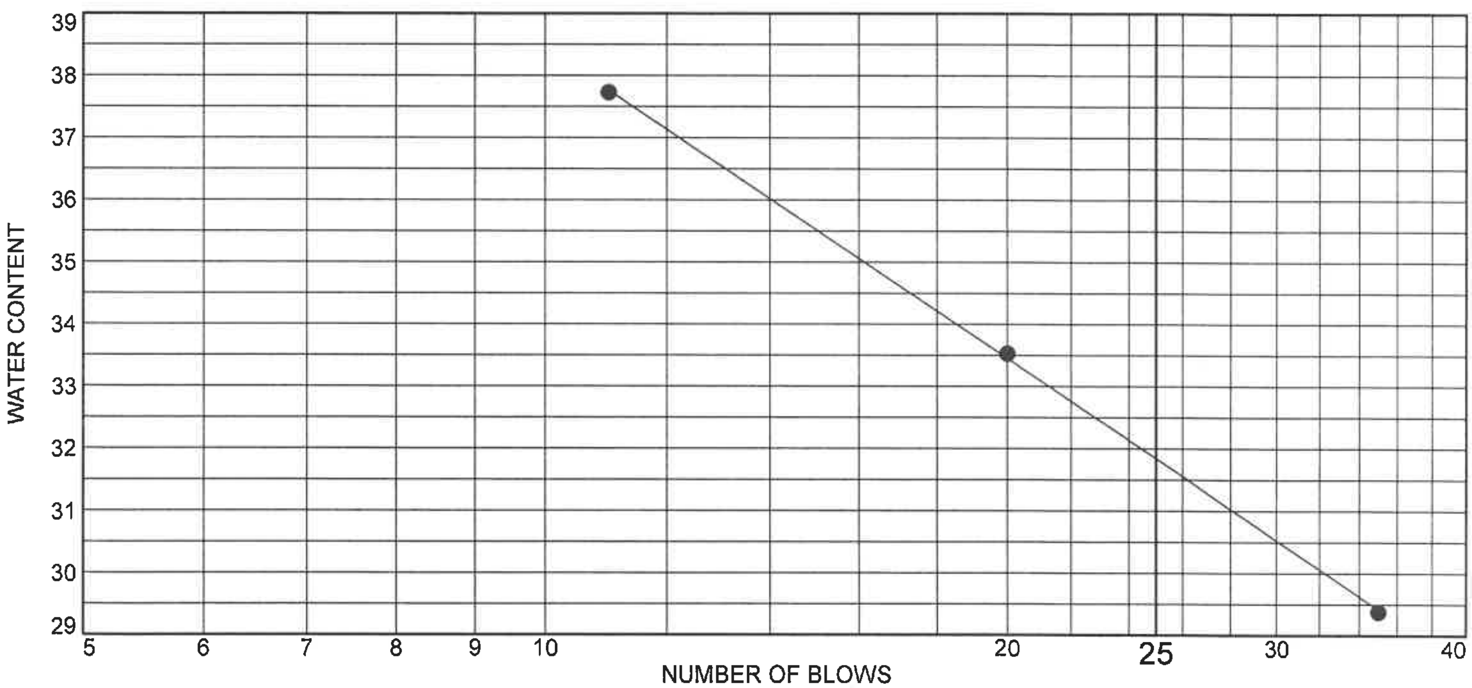
South Plainfield, New Jersey

Remarks:
● In-Situ %MC=

Figure 14 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		31.8	19.2	12.6			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-31, S-3
Sample Number: S-15 **Depth:** 4'-6'

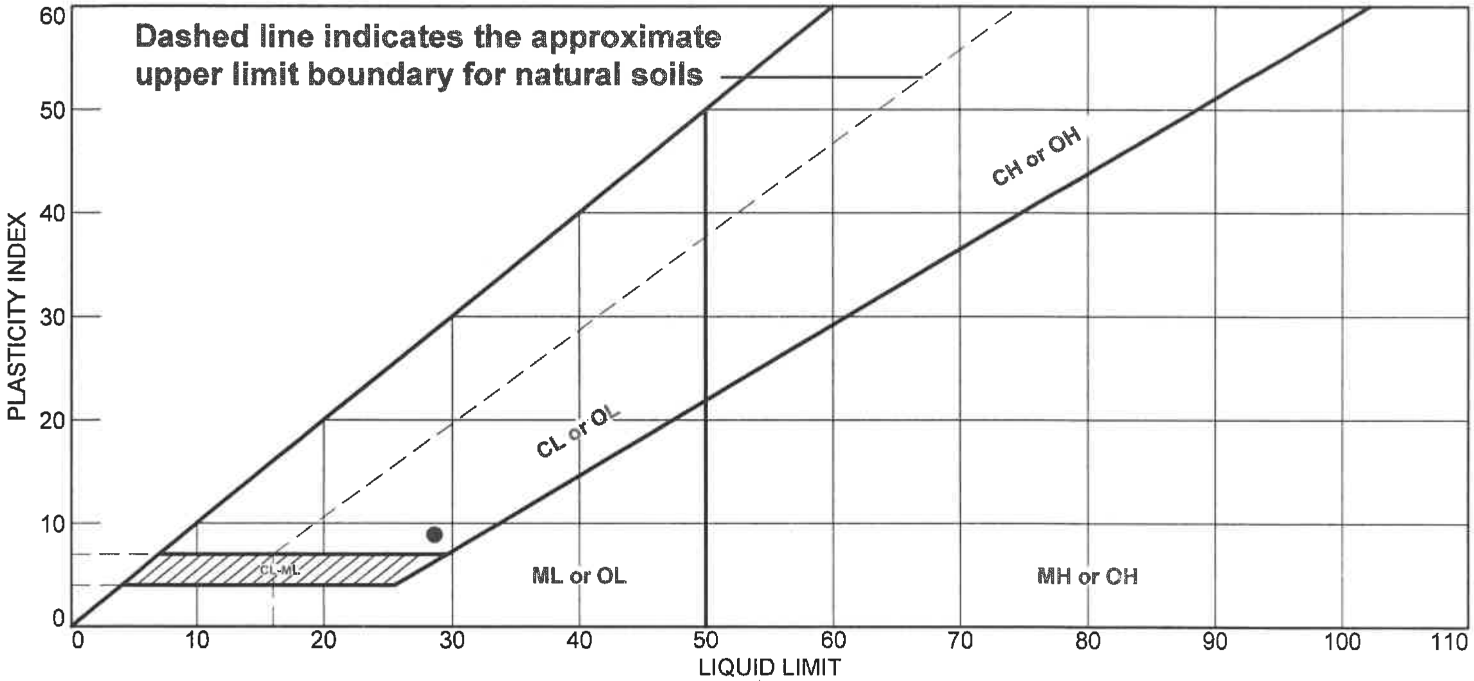
ANS CONSULTANTS, INC.

South Plainfield, New Jersey

Remarks:
● In-Situ %MC=

Figure 15 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		28.6	19.7	8.9			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-33, S-5
Sample Number: S-16 **Depth:** 8'-10'

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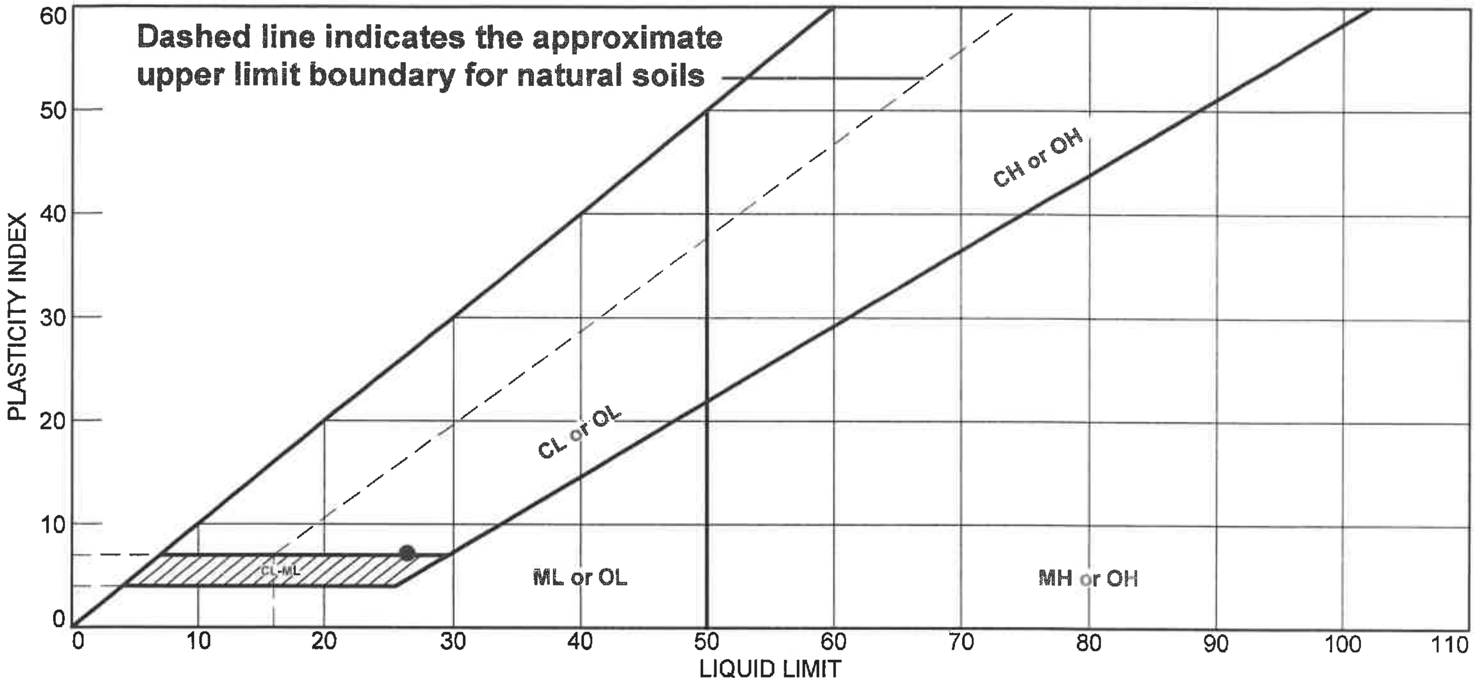
South Plainfield, New Jersey

Remarks:
● In-Situ %MC=

Figure 16 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		26.4	19.2	7.2			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-35, S-5

Sample Number: S-17 **Depth:** 8'-10'

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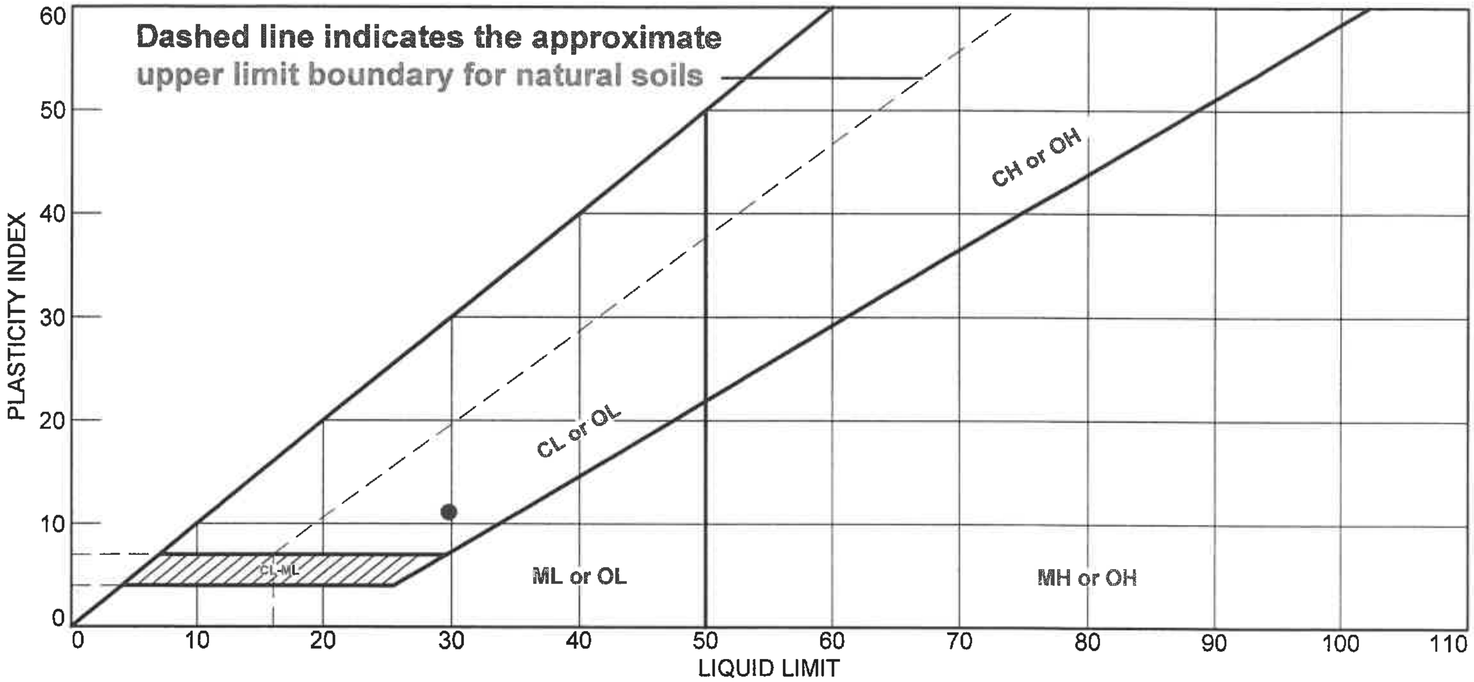
South Plainfield, New Jersey

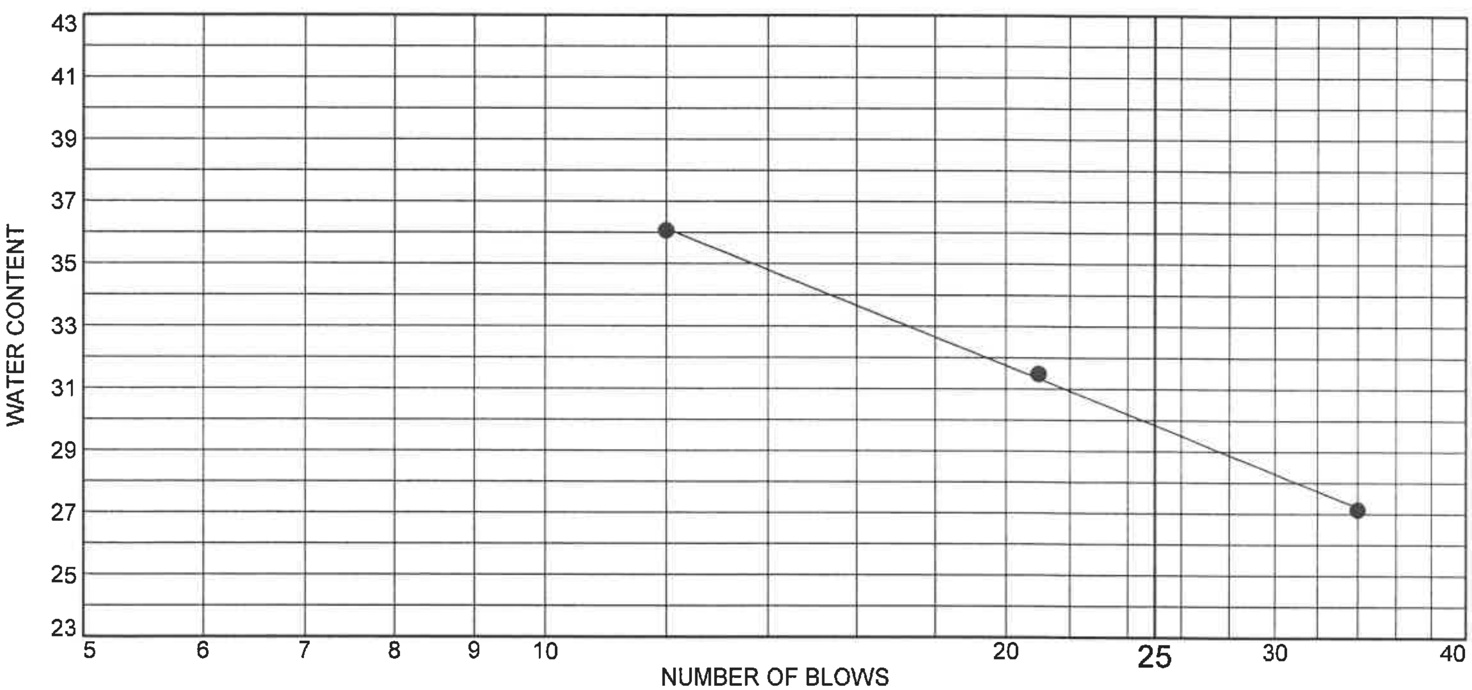
Remarks:

● In-Situ %MC-

Figure 17 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		29.8	18.7	11.1			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-37, S-2
Sample Number: S-18 **Depth:** 2'-4'

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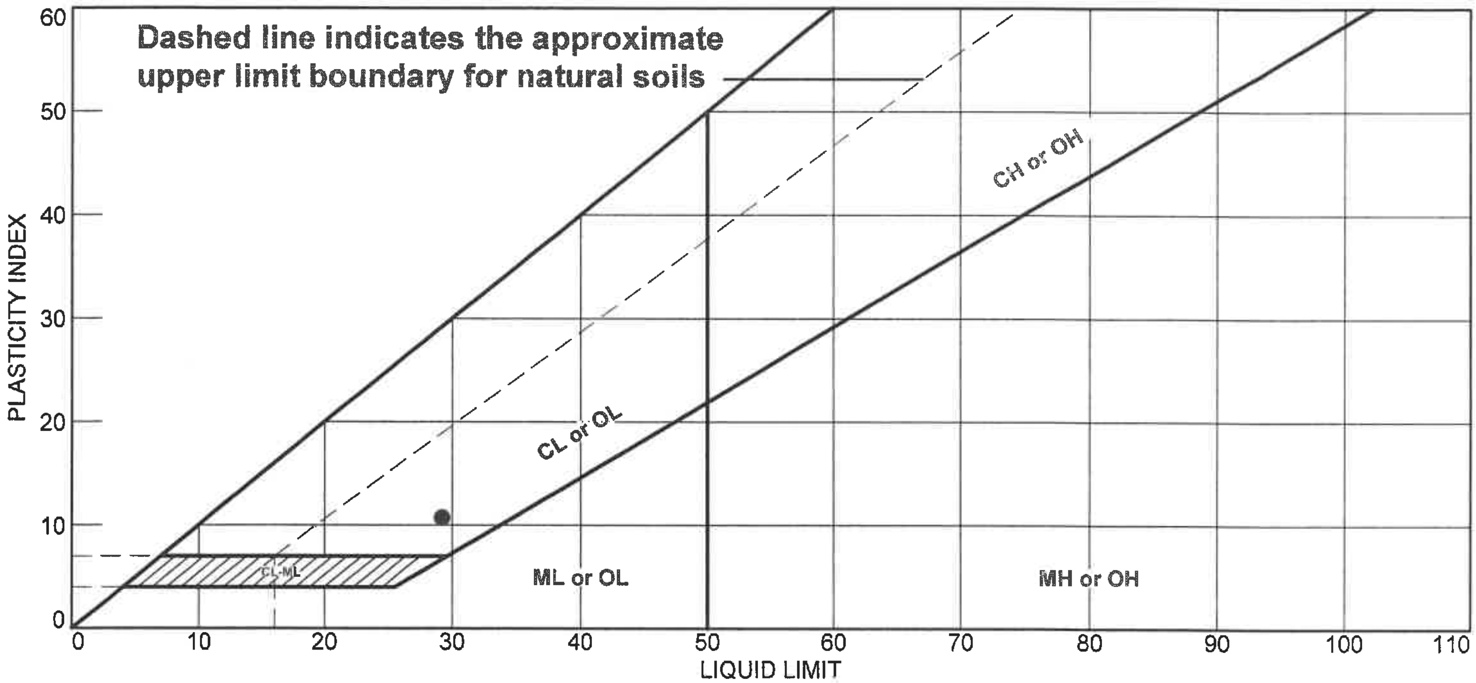
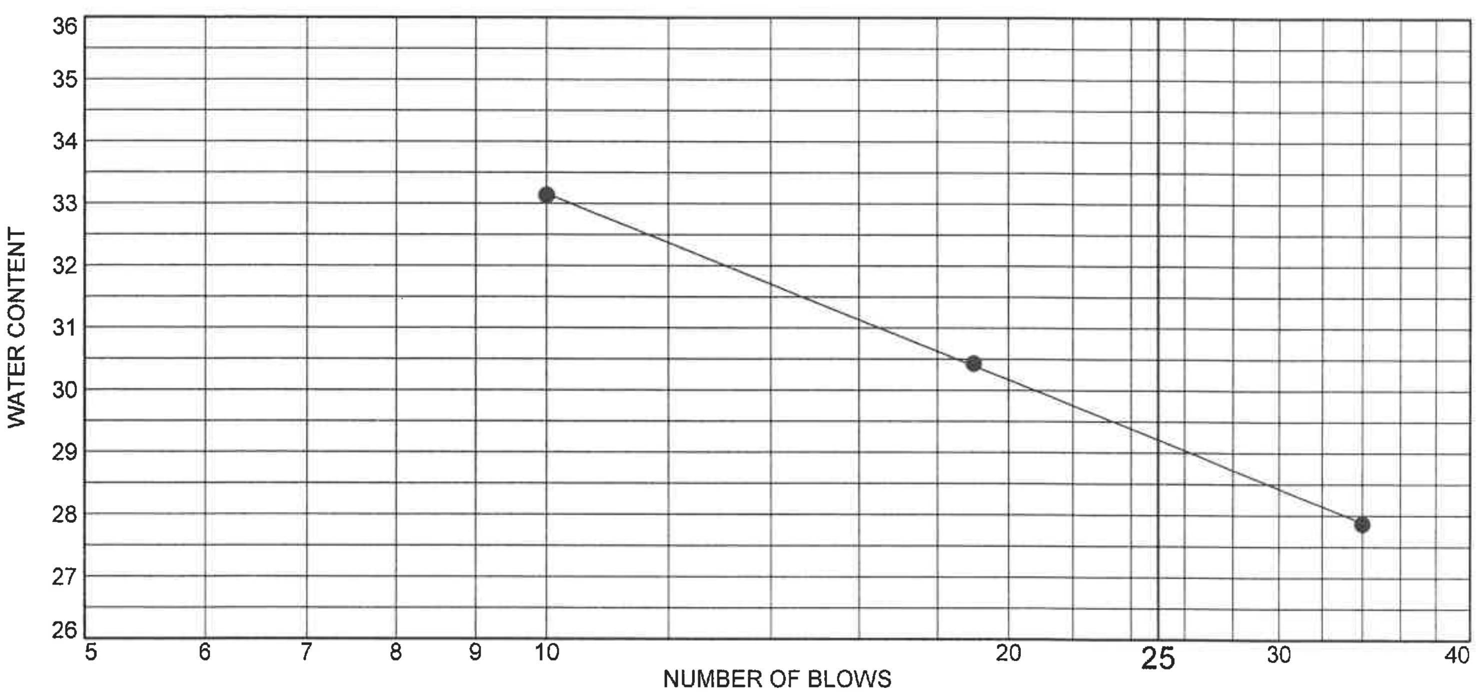
South Plainfield, New Jersey

Remarks:
● In-Situ %MC=

Figure 18 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		29.2	18.5	10.7			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-38, G-3
Sample Number: S-19 **Depth:** 4'-5'

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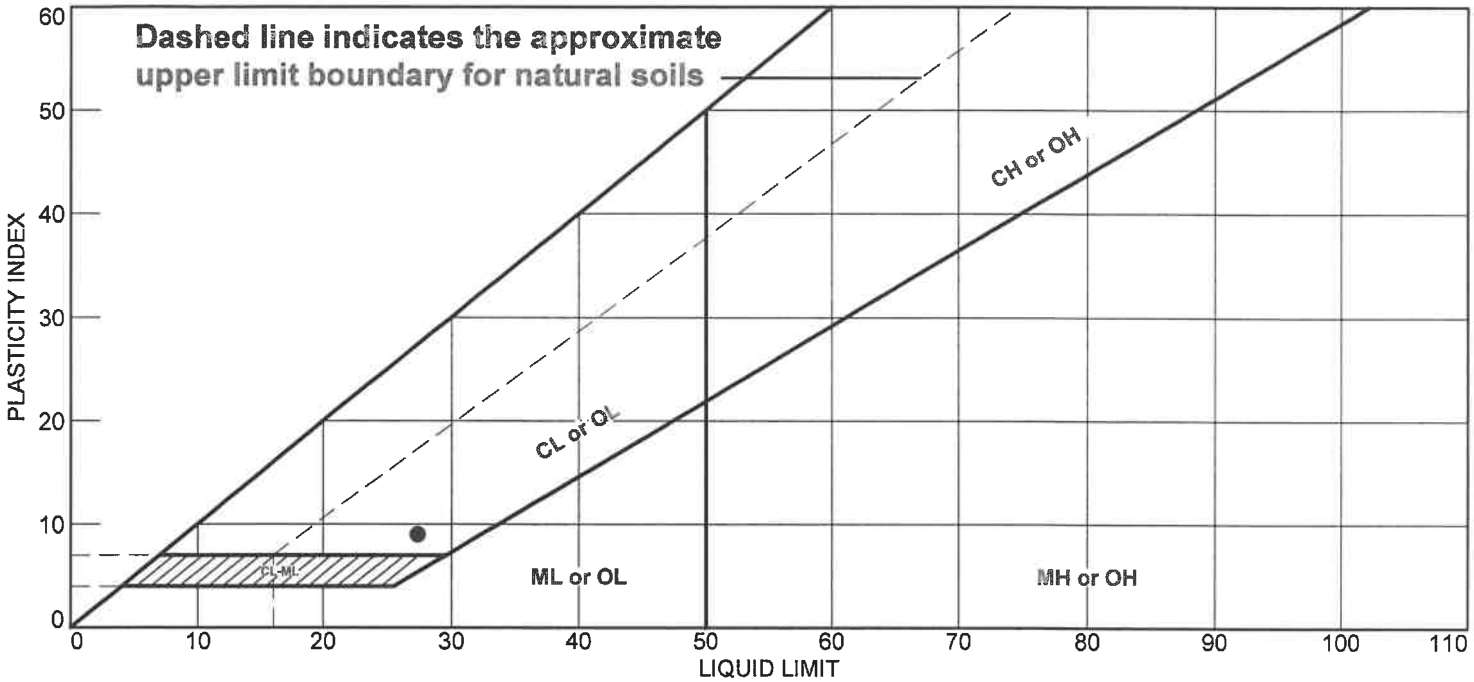
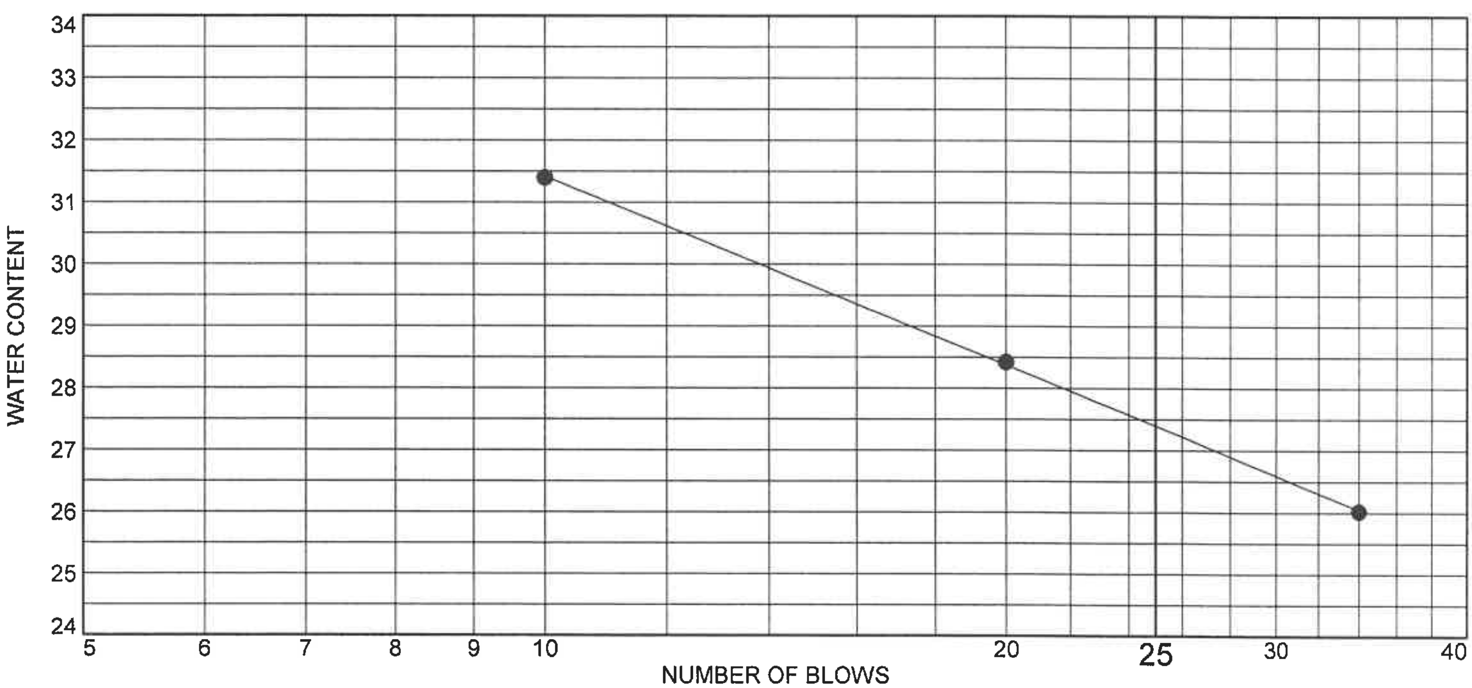
South Plainfield, New Jersey

Remarks:
● In-Situ %MC=

Figure 19 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		27.4	18.4	9.0			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-SS-1, S-3
Sample Number: S-2 **Depth:** 4'-6'

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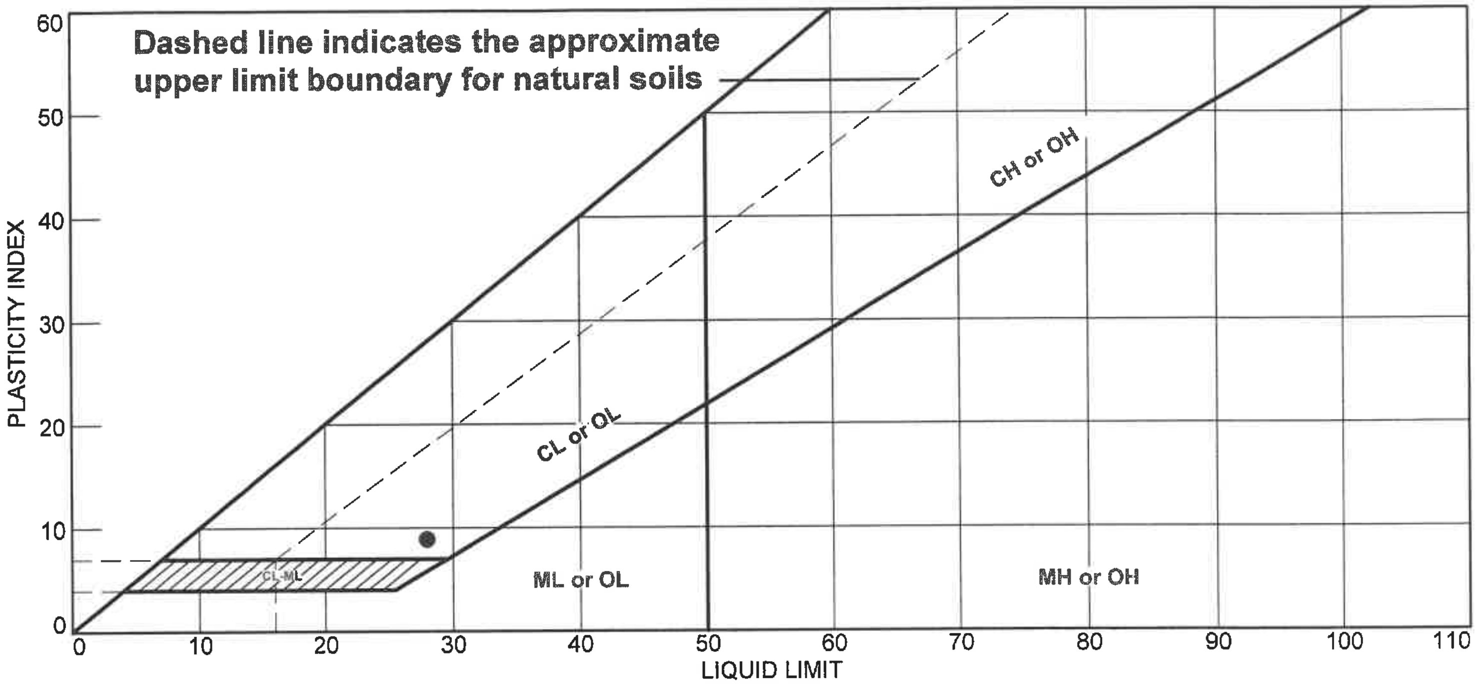
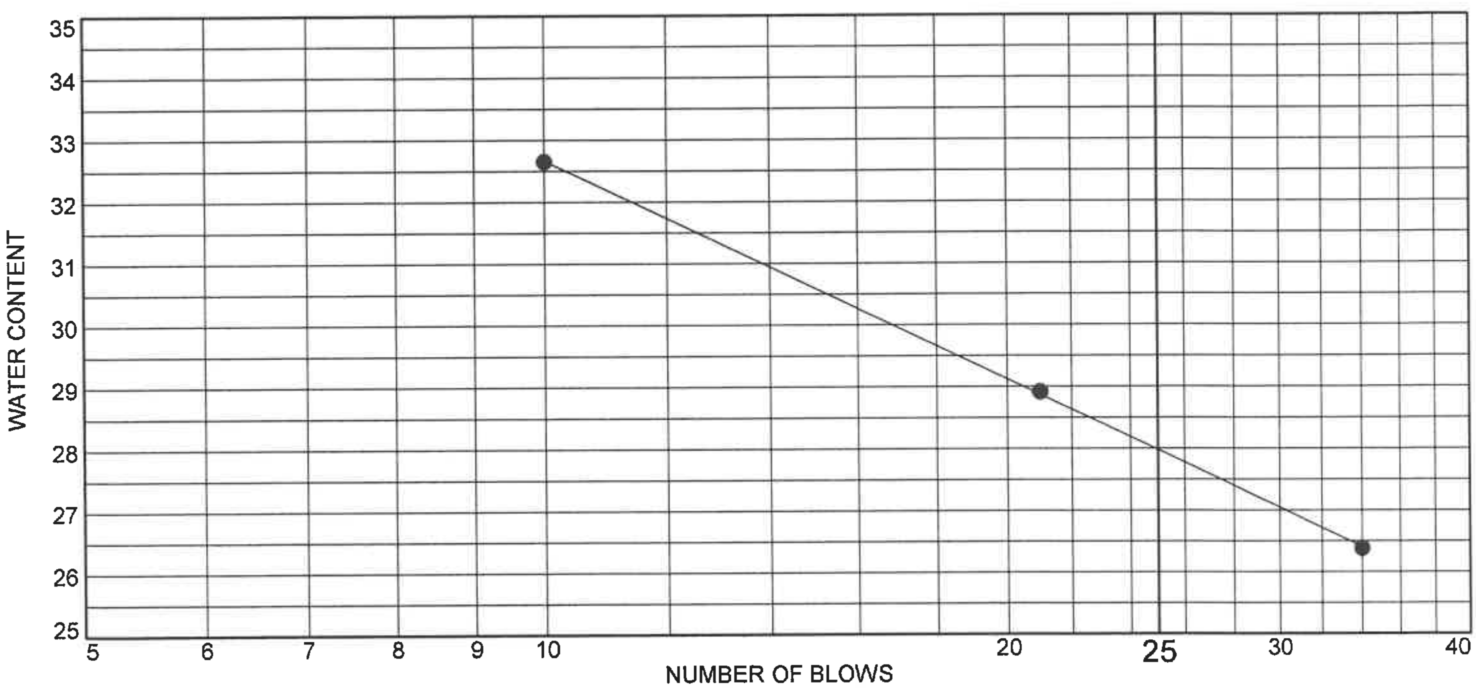
Remarks:
● In-Situ %MC=

Figure 2 F 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		28.0	19.1	8.9			

Project No. AOS-5632 **Client:** ANS GEO, Inc.

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: B-SS-2, S-2

Sample Number: S-3 **Depth:** 2'-4'

Remarks:

● In-Situ %MC=

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Figure 3 F 3

COMPRESSIVE ROCK STRENGTH

RESULTS

CONSULTANTS, INC.
4405 South Clinton Avenue
South Plainfield, NJ 07080

Tel: (800) 545-ATUL
(908) 754-8383
Fax: (908) 754-8633

CLIENT : ANS GEO, Inc.

DATE : 03/13/2021

FILE NO. : AOS-5632

PROJECT : ibv Energy - Rhudes Creek
Cecilia, KY

REPORT No. : 27

TEST REQUIRED : Unconfined Compression Strength of intact Rock Core
AS PER ASTM D 2938

DATE RECEIVED: 03/07/2021

DATE TESTED : 03/13/2021

IDENTIFICATION	R-36			
Depth (feet)				
Length of Core Drilled (in) :	10.000			
Length of Core Prepared (in) :	3.8220			
Diameter (in) :	1.9245			
Area (sq. in.) :	2.0930			
Ratio H to D :	2.0000			
Correction Factor :	1.0000			
Crushing Load (lbs) :	25,190			
P. S. I. :	8,658			
Corrected P. S. I. :	**8,660**			
Density pcf	156.33			

REMARKS :

1. Average compressive strength of one (1) core was 8,660 psi.
2. Rock core was conventional weight with density (unit weight) of ± 156.3 lb./ft³.
3. Compression testing machine of 500,000 lb. Capacity, manufactured by Test Mark Industries, Sr. No. 10897, Model # CM-5000 EBS (Extended Frame) was utilized for testing core.

THERMAL RESISTIVITY

RESULTS

CONSULTANTS, INC.
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South Plainfield, NJ 07080

Tel: (800) 545-ATUL
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THERMAL CONDUCTIVITY OF SOIL & SOFT ROCK BY THERMAL NEEDLE PROBE -IEEE 442

CLIENT: ANS Geo, Inc.
4405 South Clinton Avenue, Suite#A
South Plainfield, NJ 07080

DATE: 03/19/2021

FILE NO: AOS-5632

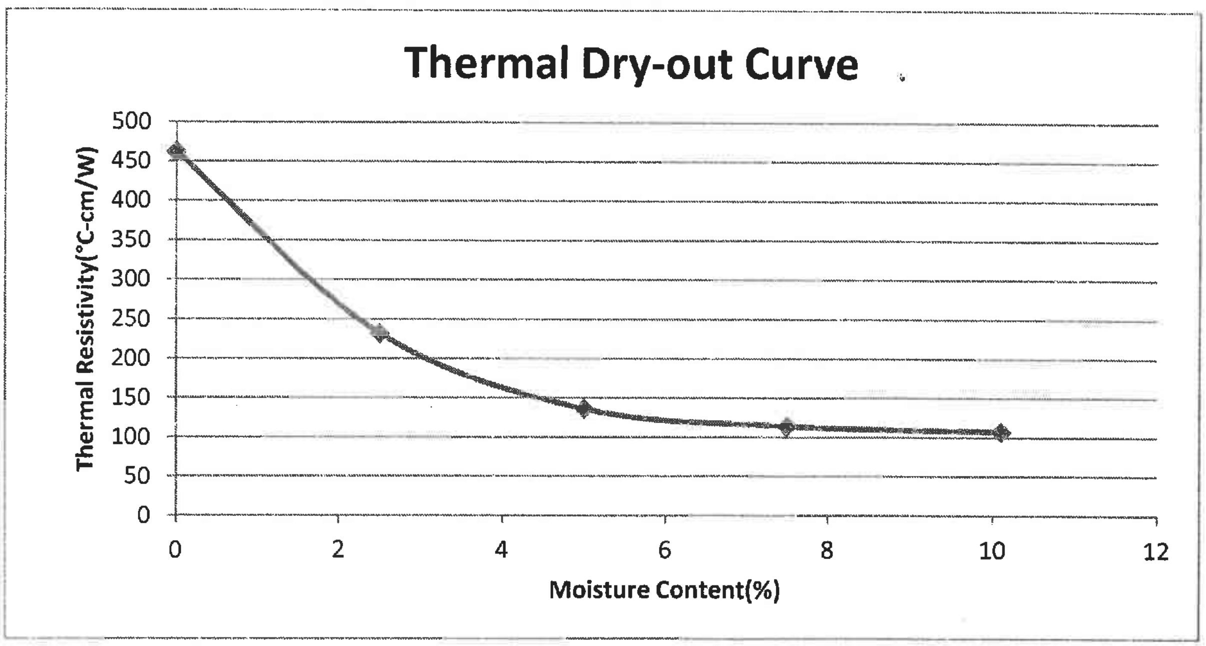
PROJECT: ibV Energy – Rhudes Creek, KY
Cecilia, KY

REPORT NO: S-20

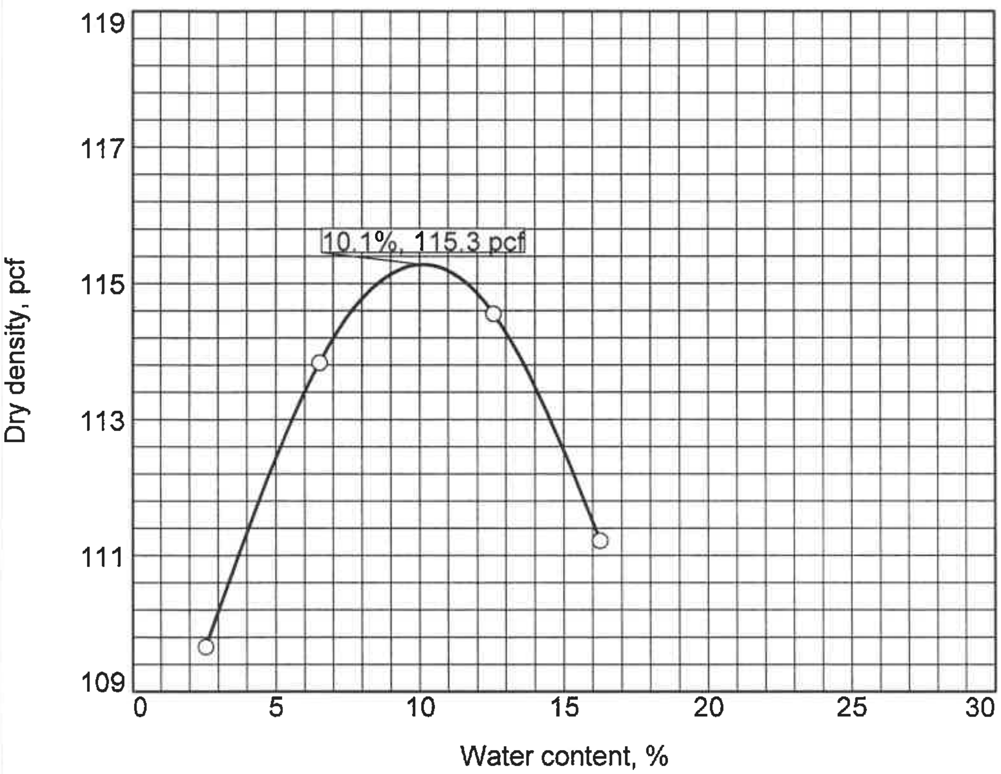
Test Data- Sample No. S-20 (B-15, Thermal-15, 2'- 4')

Standard Proctor Value: 115.3
Remolded Dry Density: 98.005 (85%)
Optimum Moisture Content: 10.1%
In-Situ Moisture Content: 20.83%

Moisture Content (%)	Initial Soil Temperature (°C)	Thermal Resistivity (°C-cm/W)
0	26.5	462
2.5	26.2	232
5	25.9	136
7.5	25.7	114
10.1	25.5	107



COMPACTION TEST REPORT



Curve No.
S-20

Test Specification:
ASTM D 698-12 Method B Standard

Preparation Method	
Hammer Wt.	5.5 lb.
Hammer Drop	12 in.
Number of Layers	three
Blows per Layer	25
Mold Size	0.03333 cu. ft.

Test Performed on Material
Passing 3/8 in. **Sieve**

NM ______ **LL** ______ **PI** ______
Sp.G. (ASTM D 854) ______
%>3/8 in. ______ **%<No.200** ______
USCS ______ **AASHTO** ______
Date Sampled ______
Date Tested ______
Tested By ______

TESTING DATA

	1	2	3	4	5	6
WM + WS	13.17	13.47	13.72	13.74		
WM	9.43	9.43	9.43	9.43		
WW + T #1	814.0	674.8	631.9	746.3		
WD + T #1	793.6	633.5	561.3	641.9		
TARE #1	0.0	0.0	0.0	0.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	2.6	6.5	12.6	16.3		
DRY DENSITY	109.7	113.8	114.6	111.2		

TEST RESULTS

Maximum dry density = 115.3 pcf

Optimum moisture = 10.1 %

Material Description

Remarks:

Project No. AOS-5632 **Client:** ANS GEO, Inc.
Project: ibv Energy - Rhudes creek, Cecilia, KY

o **Location:** TR-15 **Depth:** 2'-4 **Sample Number:** S-20

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Title:

Figure 20 F 2

THERMAL CONDUCTIVITY OF SOIL & SOFT ROCK BY THERMAL NEEDLE PROBE -IEEE 442

CLIENT: ANS Geo, Inc.
4405 South Clinton Avenue, Suite#A
South Plainfield, NJ 07080

DATE: 03-19-2021

FILE NO: AOS-5632

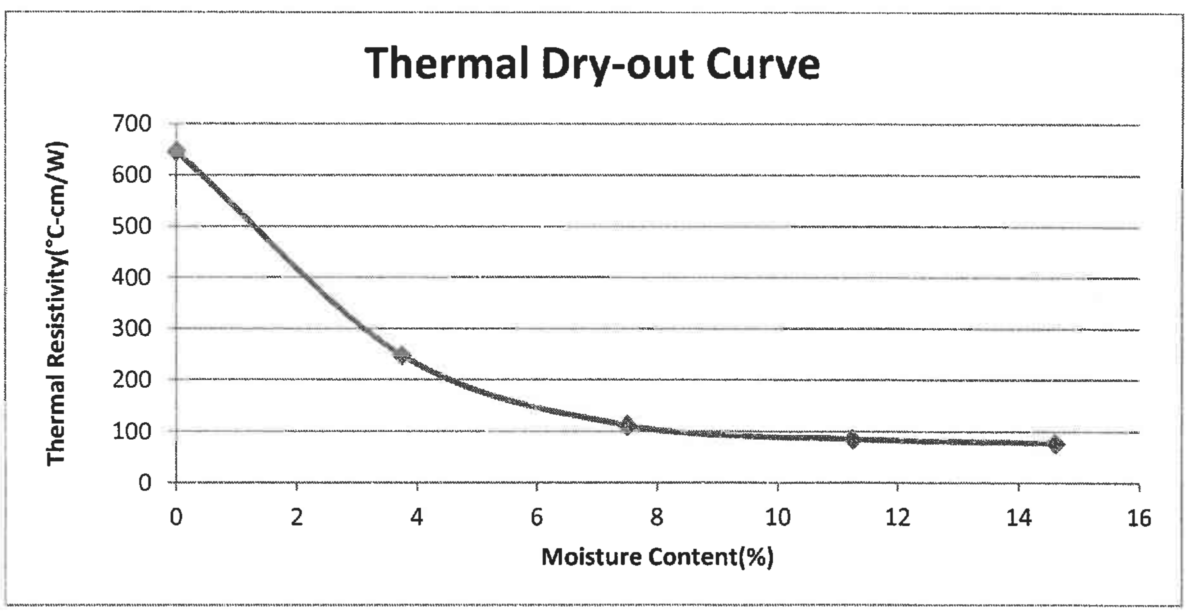
PROJECT: ibV Energy – Rhudes Creek, KY
Cecilia, KY

REPORT NO: S-21

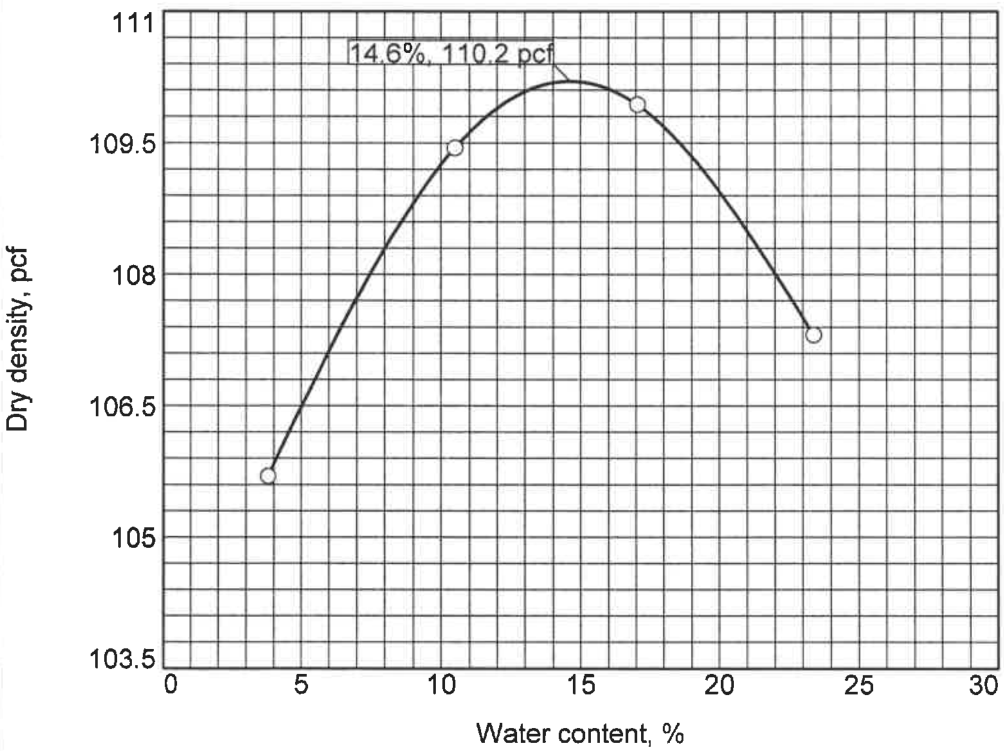
Test Data- Sample No. S-21 (B-31, Thermal-31, 2'- 4')

Standard Proctor Value: 110.2
Remolded Dry Density: 93.67 (85%)
Optimum Moisture Content: 14.6%
In-Situ Moisture Content: 20.83%

Moisture Content (%)	Initial Soil Temperature (°C)	Thermal Resistivity (°C-cm/W)
0	26.4	647
3.75	26	248
7.5	25.7	112
11.25	25.6	85
14.6	25.5	77



COMPACTION TEST REPORT



Curve No.
S-21

Test Specification:
ASTM D 698-12 Method B Standard

Preparation Method ______
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM ______ **LL** ______ **PI** ______
Sp.G. (ASTM D 854) ______
%>3/8 in. ______ **%<No.200** ______
USCS ______ **AASHTO** ______
Date Sampled ______
Date Tested ______
Tested By ______

TESTING DATA

	1	2	3	4	5	6
WM + WS	13.08	13.46	13.71	13.84		
WM	9.43	9.43	9.43	9.43		
WW + T #1	615.9	704.1	842.2	855.6		
WD + T #1	593.4	637.2	719.5	693.4		
TARE #1	0.0	0.0	0.0	0.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	3.8	10.5	17.1	23.4		
DRY DENSITY	105.7	109.4	109.9	107.3		

TEST RESULTS

Maximum dry density = 110.2 pcf

Optimum moisture = 14.6 %

Material Description

Remarks:

Project No. AOS-5632 **Client:** ANS GEO, Inc.
Project: ibv Energy - Rhudes creek, Cecilia, KY

○ **Location:** TR-31 **Depth:** 2'-4' **Sample Number:** S-21

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South Plainfield, New Jersey

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Title:

Figure 21 F 2

A N S

CONSULTANTS, INC.
4405 South Clinton Avenue
South Plainfield, NJ 07080

Tel: (800) 545-ATUL
(908) 754-8383
Fax: (908) 754-8633

THERMAL CONDUCTIVITY OF SOIL & SOFT ROCK BY THERMAL NEEDLE PROBE -IEEE 442

CLIENT: ANS Geo, Inc.
4405 South Clinton Avenue, Suite#A
South Plainfield, NJ 07080

DATE: 03-19-2021

FILE NO: AOS-5632

PROJECT: ibV Energy – Rhudes Creek, KY
Cecilia, KY

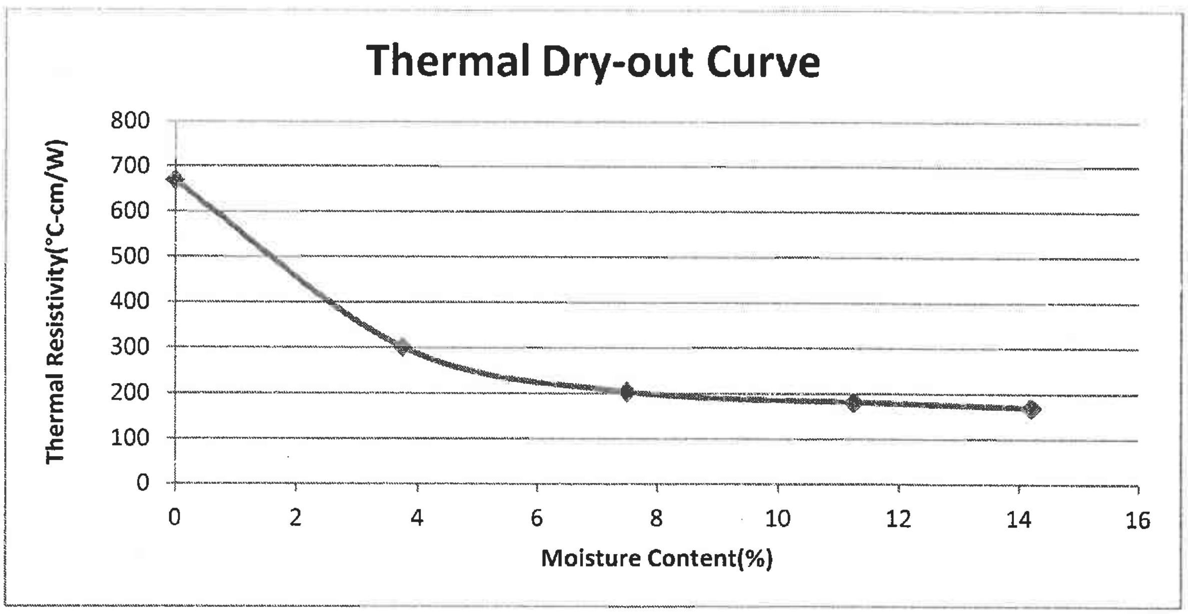
REPORT NO: S-22

Test Data - Sample No. S-22 (B-SS-2, Thermal-SS-2, 2'- 4')

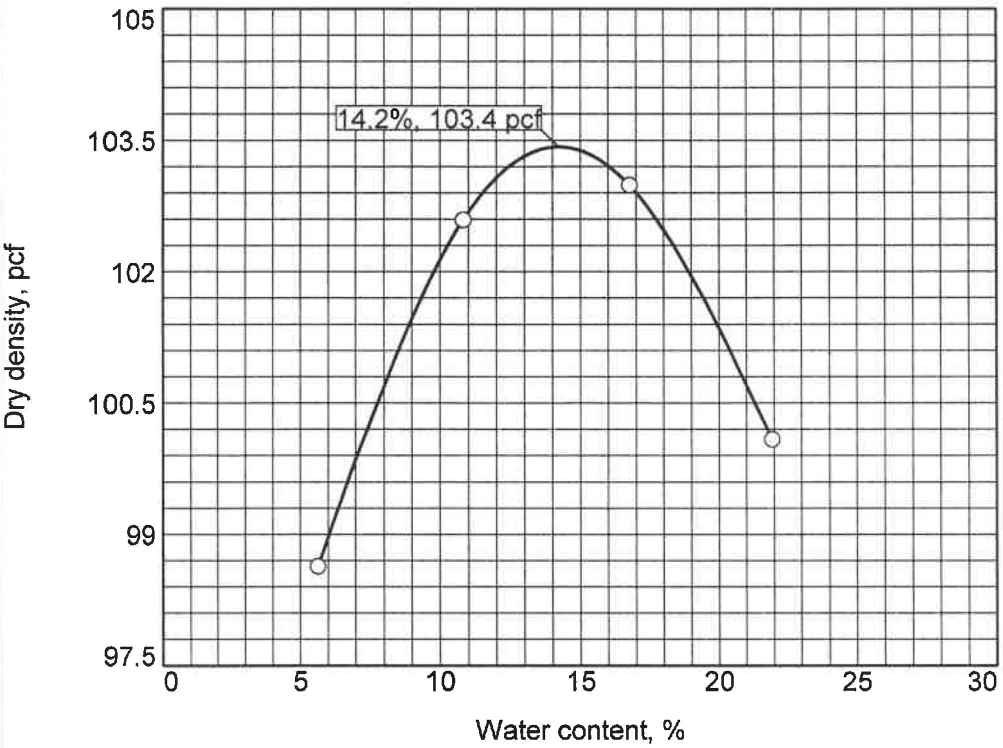
Standard Proctor Value: 103.4
Remolded Dry Density: 87.89 (85%)

Optimum Moisture Content: 14.2%
In-Situ Moisture Content: 23.5 %

Moisture Content (%)	Initial Soil Temperature (°C)	Thermal Resistivity (°C-cm/W)
0	26.7	669
3.75	26.3	301
7.5	26	204
11.25	25.8	182
14.2	25.6	170



COMPACTION TEST REPORT



Curve No.
S-22

Test Specification:
ASTM D 698-12 Method B Standard

Preparation Method ______
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM ______ **LL** ______ **PI** ______
Sp.G. (ASTM D 854) ______
%>3/8 in. ______ **%<No.200** ______
USCS ______ **AASHTO** ______
Date Sampled ______
Date Tested ______
Tested By ______

TESTING DATA

	1	2	3	4	5	6
WM + WS	12.90	13.21	13.43	13.49		
WM	9.43	9.43	9.43	9.43		
WW + T #1	633.0	703.6	618.5	930.2		
WD + T #1	599.3	634.9	529.7	762.9		
TARE #1	0.0	0.0	0.0	0.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	5.6	10.8	16.8	21.9		
DRY DENSITY	98.6	102.6	103.0	100.1		

TEST RESULTS

Maximum dry density = 103.4 pcf

Optimum moisture = 14.2 %

Material Description

Remarks:

Project No. AOS-5632 **Client:** ANS GEO, Inc.
Project: ibv Energy - Rhudes creek, Cecilia, KY

o **Location:** TR-SS-2 **Depth:** 2'-4' **Sample Number:** S-22

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Figure 22 F 2

CORROSIVITY SUITE

RESULTS

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South Plainfield, NJ 07080

Tel: (800) 545-ATUL
(908) 754-8383
Fax: (908) 754-8633

CERTIFICATE OF TEST - CORROSION ANALYSIS

CLIENT: ANS Geo, Inc.
4405 South Clinton Avenue
South Plainfield, NJ 07080

DATE: 03/23/2021

FILE NO: AOS-5632

PROJECT: ibV Energy – Rhudes Creek, KY
Cecilia, KY

REPORT NO: S-26

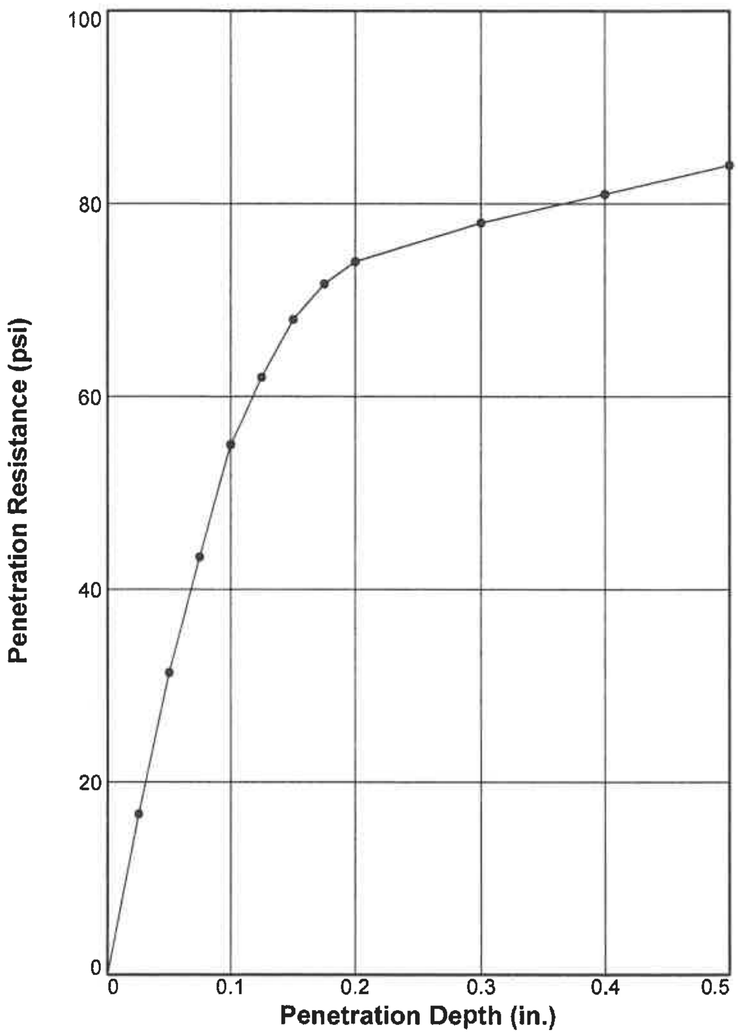
TEST PERFORMED:
1) Standard Test Method for Water Soluble Sulfate in Soil AS PER ASTM C-1580
2) Standard Test Method for measuring pH of Soil for use in Corrosion Testing AS PER ASTM G51-18
3) Standard Test Method for Measurement of Oxidation-Reduction Potential (ORP) of Soil AS PER ASTM G-200
4) Standard Method for Test for Determining Water Soluble Chloride Ion AS PER AASHTO T-291
5) Standard Test Method for Measuring Soil Resistivity using two-Electrode AS PER ASTM G187-18

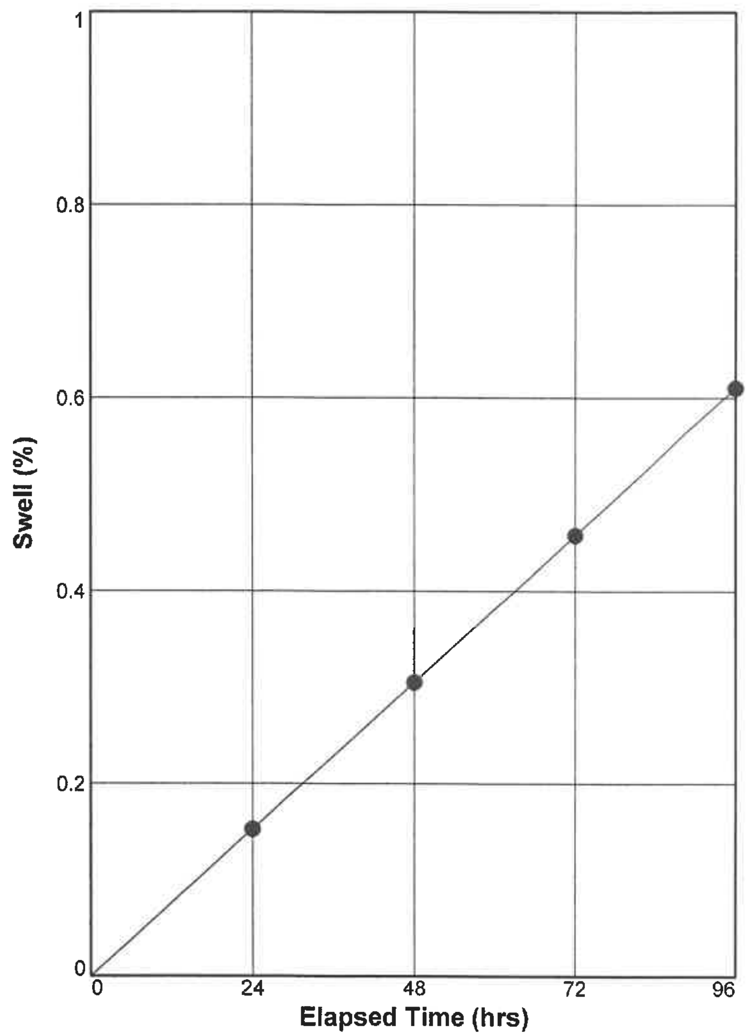
Sample No.	Sample ID	Sulfate (mg/Kg)	pH	ORP (mV)	Chloride (mg/Kg)	Resistivity (Ohm-cm)
S-26	CRT-SS, CRT-SS, 0'- 3'	21	6.74	+125	45	10,000
S-28	CRT-14, CRT-14, 0'- 3'	17	6.94	+121	40	7,000
S-29	CRT-20, CRT-20, 0'- 3'	25	6.88	+129	50	9,000
S-30	CRT-23, CRT-23, 0'- 3'	14	7.01	+117	35	8,000
S-31	CRT-32, CRT-32, 0'- 3'	27	6.88	+135	50	9,500

CALIFORNIA BEARING RATIO

RESULTS

BEARING RATIO TEST REPORT
ASTM D 1883-07





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	105.3	90	13.6	104.6	89.4	20.6	5.5	4.9	0.000	10	0.6
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
		117.0	13.6		

Project No: AOS-5632

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: CBR-21

Sample Number: S-24 **Depth:** 0'-2'

Date:

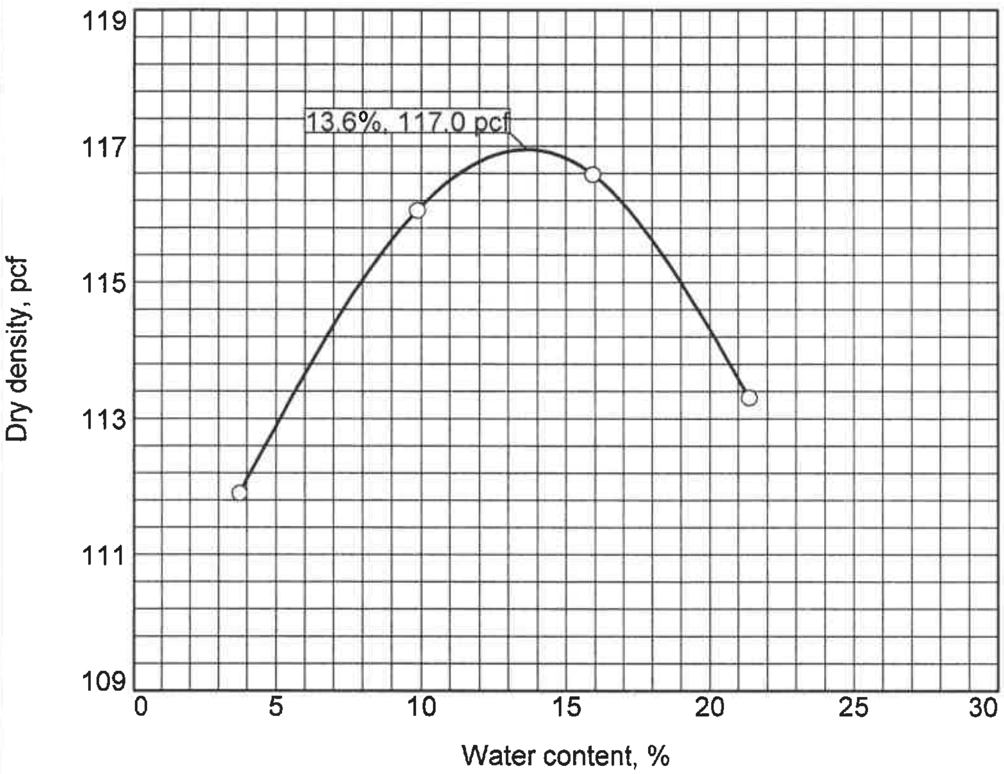
Test Description/Remarks:

BEARING RATIO TEST REPORT

ANS CONSULTANTS, INC.

Figure 24 F 4

COMPACTION TEST REPORT



Curve No.
S-24

Test Specification:
ASTM D 698-12 Method B Standard

Preparation Method
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS **AASHTO**
Date Sampled
Date Tested
Tested By

TESTING DATA

	1	2	3	4	5	6
WM + WS	13.29	13.68	13.93	14.01		
WM	9.43	9.43	9.43	9.43		
WW + T #1	613.4	749.2	748.3	875.7		
WD + T #1	591.3	681.9	645.5	721.5		
TARE #1	0.0	0.0	0.0	0.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	3.7	9.9	15.9	21.4		
DRY DENSITY	111.9	116.1	116.6	113.3		

TEST RESULTS

Maximum dry density = 117.0 pcf

Optimum moisture = 13.6 %

Material Description

Remarks:

Project No. AOS-5632 **Client:** ANS GEO, Inc.
Project: ibv Energy - Rhudes creek, Cecilia, KY

○ **Location:** CBR-21 **Depth:** 0'-2' **Sample Number:** S-24

ANS CONSULTANTS, INC.

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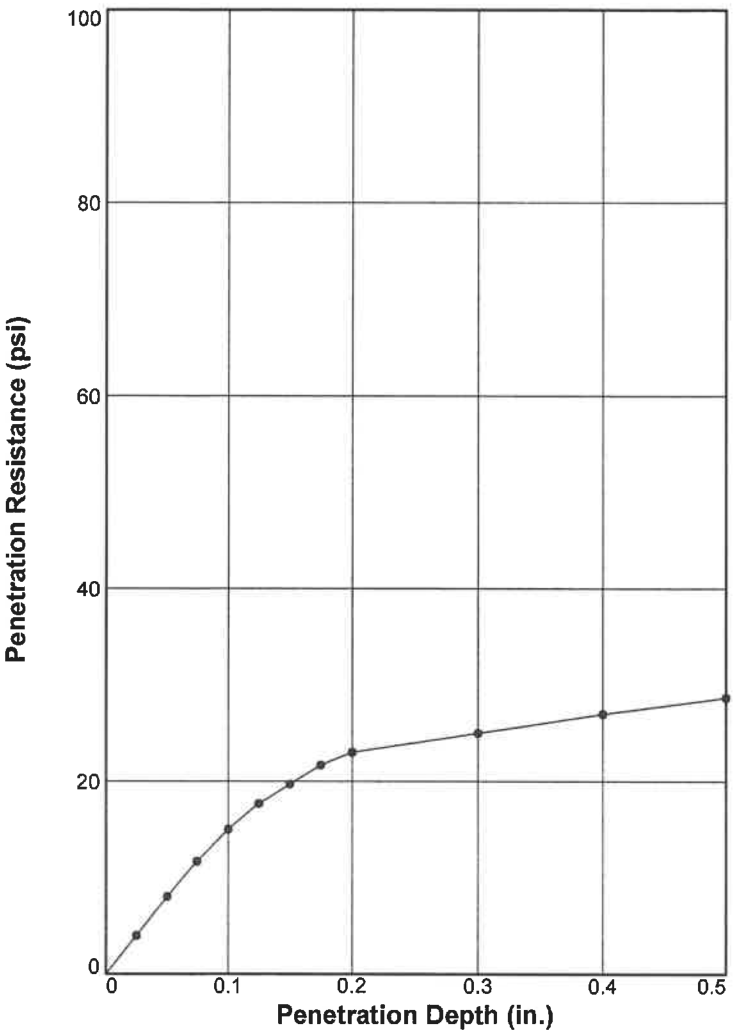
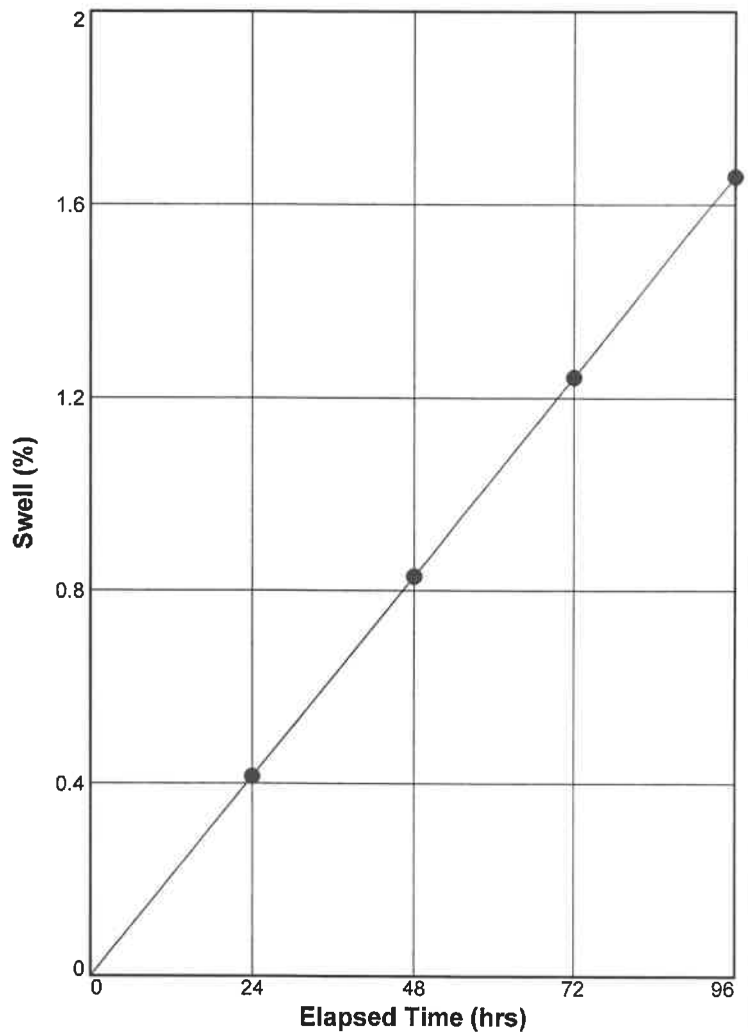
Checked by:
Title:

Figure 24 F 2

BEARING RATIO TEST REPORT
ASTM D 1883-07





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	101.2	90.2	14.6	99.5	88.7	26.7	1.5	1.5	0.000	10	1.7
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
		112.2	14.7		

Project No: AOS-5632

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: CBR-38

Sample Number: S-25 **Depth:** 0'-2'

Date:

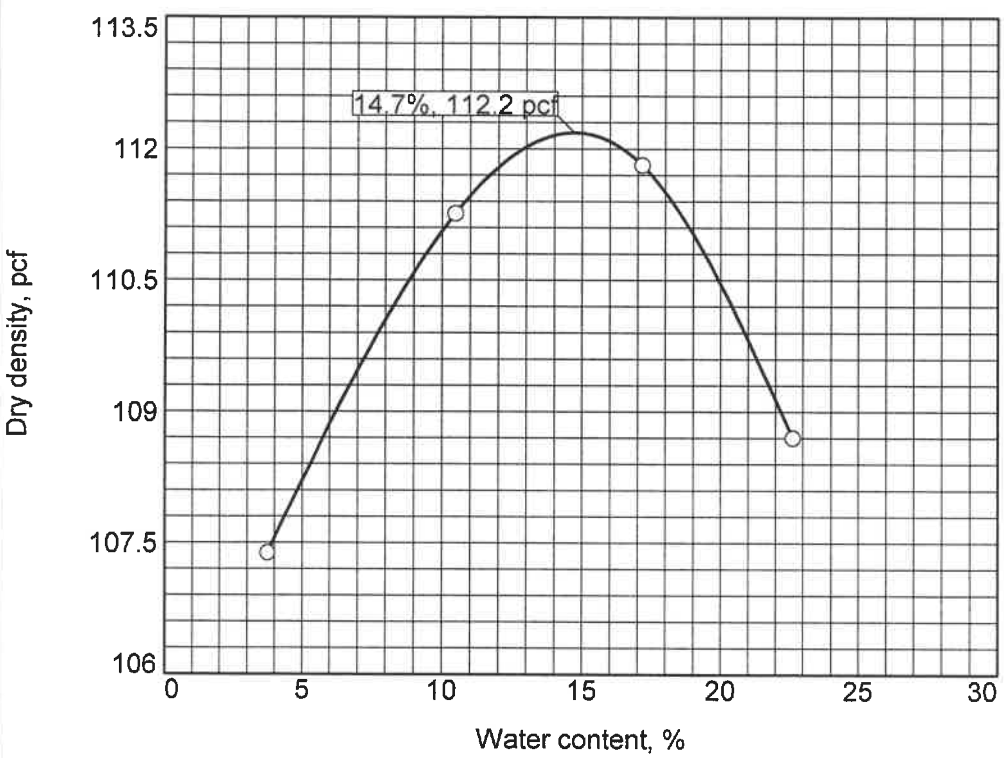
Test Description/Remarks:

BEARING RATIO TEST REPORT

ANS CONSULTANTS, INC.

Figure 25 F 4

COMPACTION TEST REPORT



Curve No.
S-25

Test Specification:
ASTM D 698-12 Method B Standard

Preparation Method ______
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM ______ **LL** ______ **PI** ______
Sp.G. (ASTM D 854) ______
%>3/8 in. ______ **%<No.200** ______
USCS ______ **AASHTO** ______
Date Sampled ______
Date Tested ______
Tested By ______

TESTING DATA

	1	2	3	4	5	6
WM + WS	13.14	13.52	13.79	13.87		
WM	9.43	9.43	9.43	9.43		
WW + T #1	696.5	818.8	744.0	963.0		
WD + T #1	671.4	741.2	635.0	785.3		
TARE #1	0.0	0.0	0.0	0.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	3.7	10.5	17.2	22.6		
DRY DENSITY	107.4	111.3	111.8	108.7		

TEST RESULTS

Maximum dry density = 112.2 pcf

Optimum moisture = 14.7 %

Material Description

Remarks:

Project No. AOS-5632 **Client:** ANS GEO, Inc.
Project: ibv Energy - Rhudes creek, Cecilia, KY

○ **Location:** CBR-38 **Depth:** 0'-2' **Sample Number:** S-25

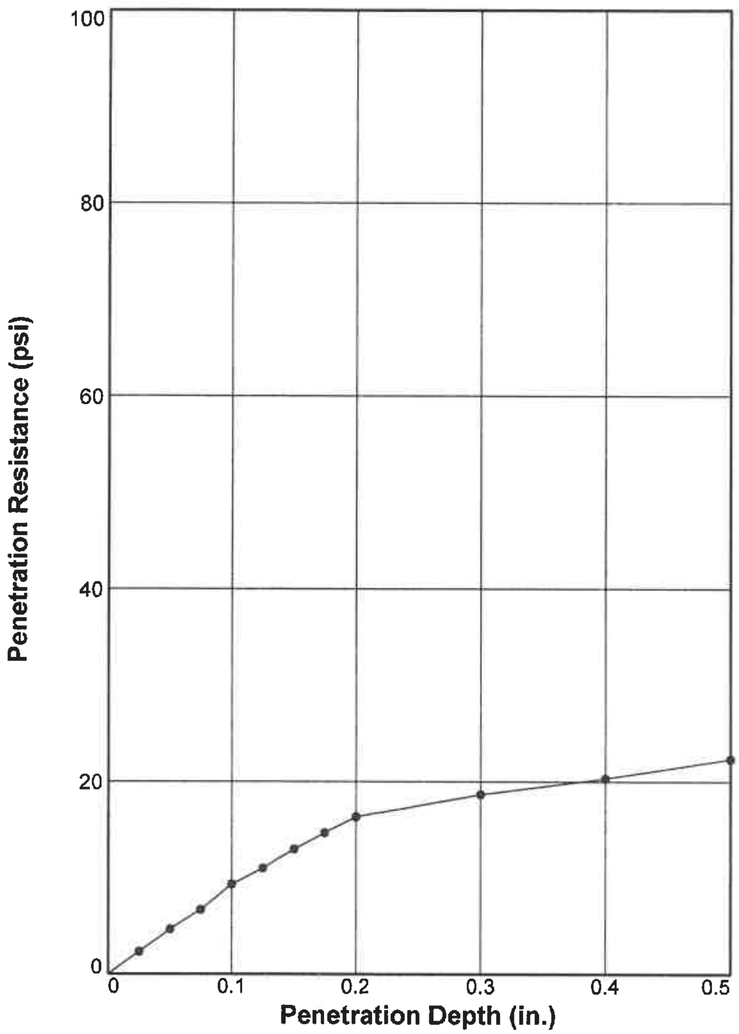
ANS CONSULTANTS, INC.

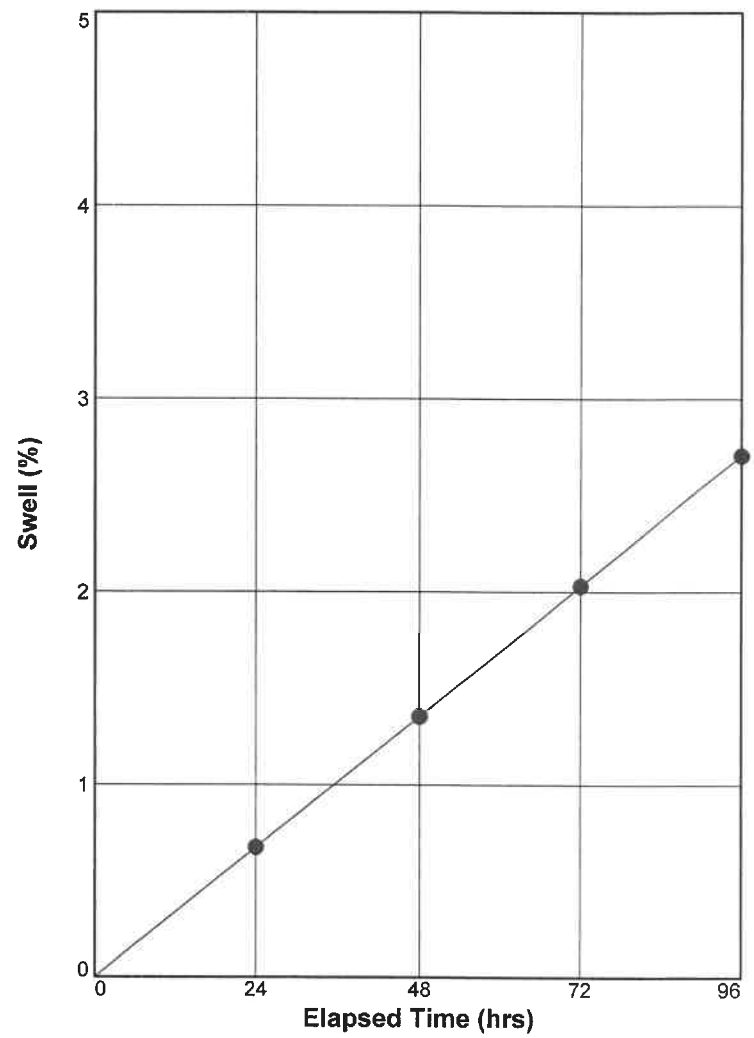
South Plainfield, New Jersey

Checked by:
Title:

Figure 25 F 2

BEARING RATIO TEST REPORT
ASTM D 1883-07





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	92.5	89.9	19.0	90.1	87.5	36.6	0.9	1.1	0.000	10	2.7
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
		102.9	18.9		

Project No: AOS-5632

Project: ibv Energy - Rhudes creek, Cecilia, KY

Location: CBR-SS-1

Sample Number: S-23 **Depth:** 0'-2'

Date:

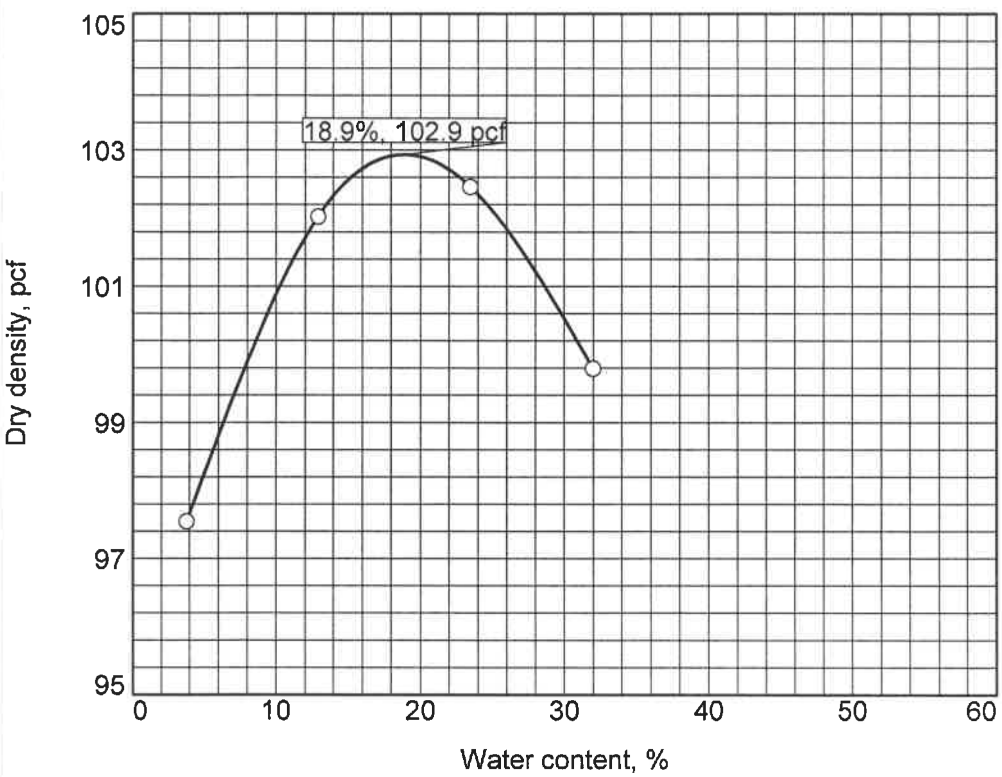
Test Description/Remarks:

BEARING RATIO TEST REPORT

ANS CONSULTANTS, INC.

Figure 23 F 4

COMPACTION TEST REPORT



Curve No.
S-23

Test Specification:
ASTM D 698-12 Method B Standard

Preparation Method
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size 0.03333 cu. ft.

Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS **AASHTO**
Date Sampled
Date Tested
Tested By

TESTING DATA

	1	2	3	4	5	6
WM + WS	12.80	13.27	13.64	13.82		
WM	9.43	9.43	9.43	9.43		
WW + T #1	849.9	714.2	966.5	913.6		
WD + T #1	818.8	632.5	782.7	692.2		
TARE #1	0.0	0.0	0.0	0.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	3.8	12.9	23.5	32.0		
DRY DENSITY	97.5	102.0	102.5	99.8		

TEST RESULTS

Maximum dry density = 102.9 pcf

Optimum moisture = 18.9 %

Material Description

Remarks:

Project No. AOS-5632 **Client:** ANS GEO, Inc.
Project: ibv Energy - Rhudes creek, Cecilia, KY

○ **Location:** CBR-SS-1 **Depth:** 0'-2' **Sample Number:** S-23

ANS CONSULTANTS, INC.

South Plainfield, New Jersey

Checked by:
Title:

Figure 23 F 2

Attachment E

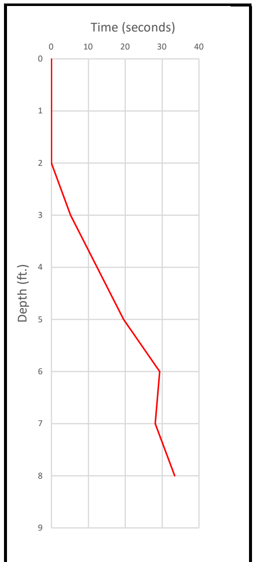
Pile Load Testing Logs

ANS GEO

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-1 A
Date/Time Installed:	3/1/2021 15:50	Date/Time Tested:	7:40AM 3/6/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	17.5	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	5.17
4	12.34
5	19.54
6	29.32
7	28.08
8	33.43
9	34.43
Total Time (s) =	157.14



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	240	0.0025	0.0020	0.0023
1	500	500	0.0055	0.0040	0.0048
1	1000	1100	0.0140	0.0095	0.0118
1	1500	1520	0.0185	0.0120	0.0153
1	2000	2000	0.0235	0.0140	0.0188
1	1500	1520	0.0205	0.0120	0.0163
1	1000	1020	0.0145	0.0095	0.0120
1	500	500	0.0080	0.0050	0.0065
1	250	280	0.0045	0.0030	0.0038
1	0	0	0.0020	0.0010	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.1095	0.1155	0.1125
1	0	0	0.0735	0.078	0.0758

Lateral Testing

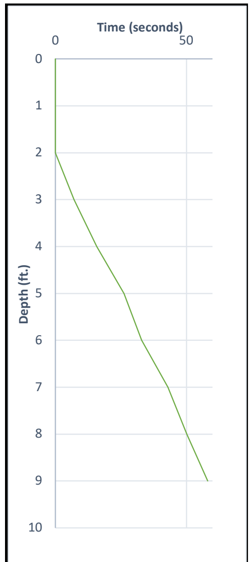
Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0805	0.0575	0.0690
1	1000	1000	0.1555	0.1175	0.1365
1	1500	1500	0.2270	0.1780	0.2025
1	0	0	0.0165	0.0295	0.0230
1	500	500	0.0950	0.0920	0.0935
1	1000	1000	0.1685	0.1410	0.1548
1	1500	1500	0.2350	0.1940	0.2145
1	2000	2000	0.3105	0.2580	0.2843
1	2500	2500	0.3950	0.3285	0.3618
1	0	0	0.0275	0.0460	0.0368
1	2500	2500	0.4120	0.3550	0.3835
1	3000	3000	0.4930	0.4135	0.4533
1	3500	3500	0.5885	0.5020	0.5453
1	4000	4000	0.6885	0.6085	0.6485
Target Deflection (in.)					
1	0.25	1900	0.2855	0.221	0.2533
1	0.5	3150	0.5345	0.4695	0.5020
1	1	5560	1.0355	0.9820	1.0088
Target Load					
1	6000	-	-	-	-
1	0	0	0.1165	0.1265	0.1215

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-1 B
Date/Time Installed:	3/1/2021 16:00	Date/Time Tested:	7:55AM 3/6/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	25.1	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	7.05
4	15.82
5	26.24
6	32.87
7	42.93
8	50.18
9	58.18
Total Time (s) =	226.22



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	280	0.0010	0.0005	0.0008
1	500	500	0.0020	0.0010	0.0015
1	1000	1000	0.0035	0.0010	0.0023
1	1500	1500	0.0050	0.0015	0.0033
1	2000	2000	0.0065	0.0020	0.0043
1	1500	1540	0.0055	0.0025	0.0040
1	1000	1040	0.0035	0.0020	0.0028
1	500	500	0.0025	0.0010	0.0018
1	250	260	0.0020	0.0010	0.0015
1	0	0	0.0010	0.0010	0.0010
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0575	0.0675	0.0625
1	0	0	0.012	0.01	0.0110

Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4

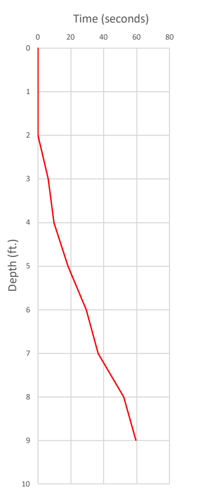
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0425	0.1175	0.0800
1	1000	1000	0.1250	0.2010	0.1630
1	1500	1500	0.1885	0.2780	0.2333
1	0	0	0.0285	0.0150	0.0218
1	500	500	0.0995	0.1295	0.1145
1	1000	1000	0.1490	0.2120	0.1805
1	1500	1500	0.1935	0.2845	0.2390
1	2000	2000	0.2750	0.3405	0.3078
1	2500	2500	0.3450	0.4260	0.3855
1	0	0	0.0565	0.0155	0.0360
1	2500	2500	0.3470	0.4695	0.4083
1	3000	3000	0.4590	0.5395	0.4993
1	3500	3500	0.5560	0.6360	0.5960
1	4000	4000	0.6670	0.7590	0.7130
Target Deflection (in.)					
1	0.25	1720	0.2085	0.305	0.2568
1	0.5	3000	0.4590	0.5395	0.4993
1	1	5180	0.9015	1.1235	1.0125
Target Load					
1	6000	-	-	-	-
1	0	0	0.2035	0.1145	0.159

ANS GEO

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-2 A
Date/Time Installed:	3/1/2021 16:10	Date/Time Tested:	12:15AM 3/6/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	30.3	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	6.25
4	9.77
5	18.36
6	29.53
7	36.69
8	52.01
9	59.59
Total Time (s) =	205.95



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	300	0.0030	0.0040	0.0035
1	500	520	0.0055	0.0065	0.0060
1	1000	1000	0.0100	0.0100	0.0100
1	1500	1500	0.0135	0.0125	0.0130
1	2000	2000	0.0160	0.0155	0.0158
1	1500	1480	0.0140	0.0135	0.0138
1	1000	980	0.0110	0.0110	0.0110
1	500	480	0.0060	0.0070	0.0065
1	250	240	0.0030	0.0045	0.0038
1	0	0	0.0000	0.0100	0.0050
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0515	0.0515	0.0515
1	0	0	0.0195	0.023	0.0213

Lateral Testing

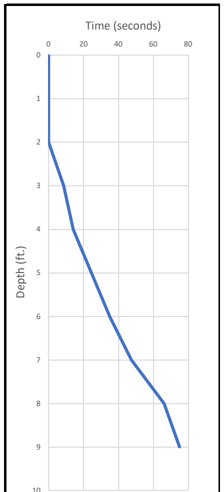
Lateral Load Height Above Grade (ft):	3	Deflection Gauge Height (in):	4

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0780	0.0800	0.0790
1	1000	1000	0.1530	0.1830	0.1680
1	1500	1500	0.2325	0.2810	0.2568
1	0	0	0.0340	0.0420	0.0380
1	500	500	0.1185	0.1380	0.1283
1	1000	1000	0.1815	0.2225	0.2020
1	1500	1500	0.2360	0.2925	0.2643
1	2000	2000	0.3170	0.3825	0.3498
1	2500	2500	0.4000	0.4835	0.4418
1	0	0	0.0490	0.0640	0.0565
1	2500	2500	0.4340	0.5120	0.4730
1	3000	3000	0.5225	0.6165	0.5695
1	3500	3500	0.6220	0.7340	0.6780
1	4000	4000	0.7455	0.8825	0.8140
Target Deflection (in.)					
1	0.25	1500	0.2325	0.2810	0.2568
1	0.5	2750	0.4755	0.5585	0.5170
1	1	4500	0.9280	1.0890	1.0085
Target Load					
1	6000	-	-	-	-
1	0	0	0.0825	0.109	0.09575

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-2 B
Date/Time Installed:	3/1/2021 16:10	Date/Time Tested:	3/6/2021 12:30
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	38.6	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	8.5
4	13.97
5	24.53
6	34.88
7	47.44
8	66.08
9	75.01
Total Time (s) =	261.91



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	280	0.0030	0.0055	0.0043
1	500	500	0.0070	0.0120	0.0095
1	1000	1000	0.0135	0.0235	0.0185
1	1500	1520	0.0180	0.0305	0.0243
1	2000	2040	0.0235	0.0385	0.0310
1	1500	1480	0.0195	0.0345	0.0270
1	1000	1020	0.0140	0.0270	0.0205
1	500	600	0.0085	0.0190	0.0138
1	250	280	0.0040	0.0100	0.0070
1	0	0	0.0010	0.0045	0.0028
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.048	0.118	0.0830
1	0	0	0.012	0.018	0.0150

Lateral Testing

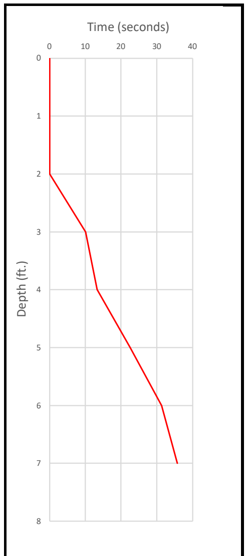
Lateral Load Height Above Grade (ft):	3	Deflection Gauge Height (in):	4

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0910	0.1005	0.0958
1	1000	1000	0.1985	0.1820	0.1903
1	1500	1500	0.3085	0.2740	0.2913
1	0	0	0.0250	0.0310	0.0280
1	500	500	0.1410	0.1320	0.1365
1	1000	1000	0.2355	0.2185	0.2270
1	1500	1500	0.3145	0.2780	0.2963
1	2000	2000	0.4170	0.3690	0.3930
1	2500	2500	0.5250	0.4560	0.4905
1	0	0	0.0480	0.0415	0.0448
1	2500	2500	0.5475	0.4770	0.5123
1	3000	3000	0.6490	0.5635	0.6063
1	3500	3500	0.7500	0.6580	0.7040
1	4000	4000	0.8850	0.7745	0.8298
Target Deflection (in.)					
1	0.25	1350	0.2745	0.238	0.2563
1	0.5	2520	0.538	0.4695	0.5038
1	1	4500	1.0540	0.9560	1.0050
Target Load					
1	6000	-	-	-	-
1	0	0	0.086	0.064	0.075

ANS GEO

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-3 A
Date/Time Installed:	3/1/2021 13:30	Date/Time Tested:	11:20AM 3/6/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	7
Avg. Installation Rate (sec/ft.):	22.6	Pile Section	W6x9x15

Embedment Data	
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	10.08
4	13.32
5	22.54
6	31.35
7	35.71
Total Time (s) =	102.92

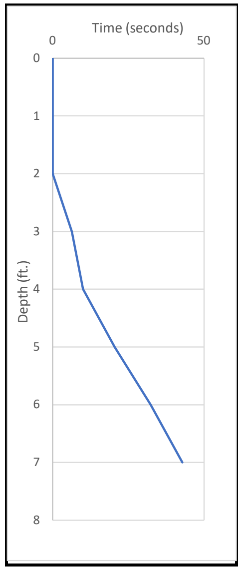


Tensile Testing					
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	260	0.0000	0.0005	0.0003
1	500	500	0.0005	0.0015	0.0010
1	1000	1000	0.0010	0.0025	0.0018
1	1500	1500	0.0020	0.0040	0.0030
1	2000	2000	0.0050	0.0050	0.0050
1	1500	1500	0.0030	0.0035	0.0033
1	1000	980	0.0025	0.0025	0.0025
1	500	500	0.0020	0.0020	0.0020
1	250	260	0.0020	0.0020	0.0020
1	0	0	0.0015	0.0015	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.175	0.145	0.1600
1	0	0	0.1085	0.0985	0.1035

Lateral Testing					
Lateral Load Height Above Grade (ft):		3	**Deflection Gauge Height (in):**		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.1165	0.0525	0.0845
1	1000	1000	0.1845	0.1490	0.1668
1	1500	1500	0.2530	0.2225	0.2378
1	0	0	0.0280	0.0160	0.0220
1	500	500	0.1155	0.1015	0.1085
1	1000	1000	0.2065	0.1625	0.1845
1	1500	1500	0.2765	0.2220	0.2493
1	2000	2000	0.3390	0.2925	0.3158
1	2500	2500	0.4050	0.3780	0.3915
1	0	0	0.0560	0.0260	0.0410
1	2500	2500	0.4350	0.3810	0.4080
1	3000	3000	0.5050	0.4530	0.4790
1	3500	3500	0.6125	0.5140	0.5633
1	4000	4000	0.6975	0.5970	0.6473
Target Deflection (in.)					
1	0.25	1500	0.2765	0.2220	0.2493
1	0.5	3200	0.5365	0.4895	0.5130
1	1	5780	1.1075	0.9365	1.0220
Target Load					
1	6000	-	-	-	-
1	0	0	0.1495	0.098	0.12375

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-3 B
Date/Time Installed:	3/1/2021 13:40	Date/Time Tested:	11AM 3/6/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	7
Avg. Installation Rate (sec/ft.):	22.4	Pile Section	W6x9x15

Embedment Data	
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	6.32
4	9.99
5	20.42
6	32.42
7	42.86
Total Time (s) =	105.69



Tensile Testing					
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	240	0.0000	0.0015	0.0008
1	500	500	0.0010	0.0030	0.0020
1	1000	1000	0.0025	0.0060	0.0043
1	1500	1460	0.0040	0.0090	0.0065
1	2000	2000	0.0050	0.0110	0.0080
1	1500	1440	0.0040	0.0100	0.0070
1	1000	960	0.0030	0.0080	0.0055
1	500	500	0.0010	0.0050	0.0030
1	250	260	0.0005	0.0035	0.0020
1	0	0	0.0000	0.0010	0.0005
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.3085	0.351	0.3298
1	0	0	0.299	0.3045	0.3018

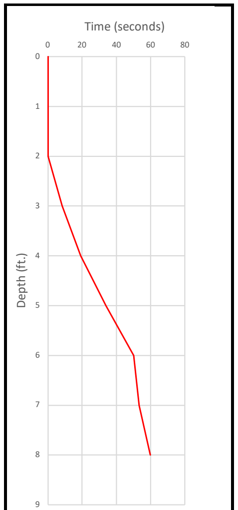
Lateral Testing					
Lateral Load Height Above Grade (ft):		3	**Deflection Gauge Height (in):**		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0825	0.0580	0.0703
1	1000	1000	0.1610	0.1340	0.1475
1	1500	1500	0.2325	0.1925	0.2125
1	0	0	0.0125	0.0310	0.0218
1	500	500	0.1010	0.0925	0.0968
1	1000	1000	0.1805	0.1470	0.1638
1	1500	1500	0.2450	0.1980	0.2215
1	2000	2000	0.3150	0.2565	0.2858
1	2500	2500	0.3930	0.3250	0.3590
1	0	0	0.0285	0.0530	0.0408
1	2500	2500	0.4105	0.3555	0.3830
1	3000	3000	0.4880	0.4310	0.4595
1	3500	3500	0.5850	0.4985	0.5418
1	4000	4000	0.6750	0.5695	0.6223
Target Deflection (in.)					
1	0.25	1850	0.2755	0.2285	0.2520
1	0.5	3200	0.5365	0.4585	0.4975
1	1	5700	1.0520	0.9555	1.0038
Target Load					
1	6000	-	-	-	-
1	0	0	0.1435	0.0825	0.113

ANS GEO

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-4 A
Date/Time Installed:	3/1/2021 14:00	Date/Time Tested:	10AM 3/6/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	8
Avg. Installation Rate (sec/ft.):	37.4	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	8.32
4	19.16
5	33.88
6	50.12
7	53.33
8	59.72
Total Time (s) =	216.21



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	260	0.0015	0.0030	0.0023
1	500	500	0.0045	0.0065	0.0055
1	1000	1000	0.0100	0.0140	0.0120
1	1500	1500	0.0160	0.0220	0.0190
1	2000	2100	0.0215	0.0300	0.0258
1	1500	1440	0.0165	0.0245	0.0205
1	1000	1040	0.0125	0.0185	0.0155
1	500	520	0.0065	0.0105	0.0085
1	250	200	0.0020	0.0045	0.0033
1	0	0	0.0000	0.0015	0.0008
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0555	0.084	0.0698
1	0	0	0.0155	0.0195	0.0175

Lateral Testing

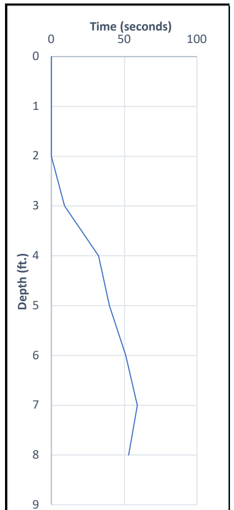
Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0570	0.0670	0.0620
1	1000	1000	0.1165	0.1515	0.1340
1	1500	1500	0.1830	0.2040	0.1935
1	0	0	0.0075	0.0265	0.0170
1	500	500	0.0340	0.1290	0.0815
1	1000	1000	0.1355	0.1580	0.1468
1	1500	1500	0.1670	0.2460	0.2065
1	2000	2000	0.2455	0.3025	0.2740
1	2500	2500	0.3040	0.4035	0.3538
1	0	0	0.0215	0.0455	0.0335
1	2500	2500	0.3250	0.4060	0.3655
1	3000	3000	0.3940	0.4900	0.4420
1	3500	3500	0.4875	0.5515	0.5195
1	4000	4000	0.5675	0.6480	0.6078
Target Deflection (in.)					
1	0.25	1850	0.2155	0.2855	0.2505
1	0.5	3400	0.4655	0.5395	0.5025
1	1	5700	0.9705	1.0450	1.0078
Target Load					
1	6000	-	-	-	-
1	0	0	0.2755	0.1195	0.1975

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-4 B
Date/Time Installed:	3/1/2021 14:35	Date/Time Tested:	10:15AM 3/6/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	8
Avg. Installation Rate (sec/ft.):	40.7	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	8.94
4	32.29
5	39.74
6	51.06
7	58.93
8	53.08
Total Time (s) =	235.1



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	300	0.0005	0.0005	0.0005
1	500	500	0.0010	0.0040	0.0025
1	1000	1000	0.0030	0.0050	0.0040
1	1500	1500	0.0070	0.0100	0.0085
1	2000	2000	0.0105	0.0150	0.0128
1	1500	1520	0.0095	0.0095	0.0095
1	1000	1000	0.0060	0.0065	0.0063
1	500	540	0.0035	0.0030	0.0033
1	250	240	0.0015	0.0015	0.0015
1	0	0	0.0010	0.0010	0.0010
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.092	0.056	0.0740
1	0	0	0.012	0.0105	0.0113

Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4

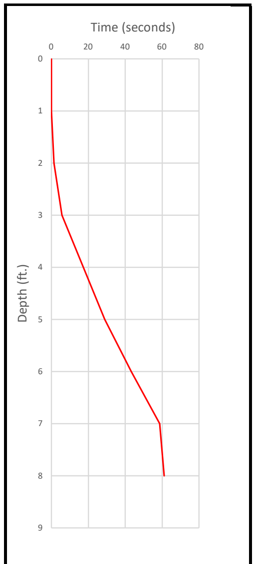
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0685	0.0590	0.0638
1	1000	1000	0.1590	0.1145	0.1368
1	1500	1500	0.2035	0.1895	0.1965
1	0	0	0.0150	0.0105	0.0128
1	500	500	0.1235	0.0405	0.0820
1	1000	1000	0.1720	0.1215	0.1468
1	1500	1500	0.2405	0.1650	0.2028
1	2000	2000	0.3075	0.2505	0.2790
1	2500	2500	0.4045	0.3240	0.3643
1	0	0	0.0360	0.0205	0.0283
1	2500	2500	0.4090	0.3355	0.3723
1	3000	3000	0.5195	0.3960	0.4578
1	3500	3500	0.5510	0.4710	0.5110
1	4000	4000	0.7060	0.5320	0.6190
Target Deflection (in.)					
1	0.25	1750	0.2795	0.228	0.2538
1	0.5	3400	0.5405	0.4585	0.4995
1	1	5820	1.1095	0.8950	1.0023
Target Load					
1	6000	-	-	-	-
1	0	0	0.2165	0.119	0.16775

PLT-5 A

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-5 A
Date/Time Installed:	3/1/2021 12:30	Date/Time Tested:	3/4/2021 11:00
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	8
Avg. Installation Rate (sec/ft.):	35.8	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	1.32
3	5.67
4	17.23
5	28.84
6	43.28
7	58.6
8	61.05
Total Time (s) =	209



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0
1	250	340	0	0.001	0.0005
1	500	500	0.0005	0.001	0.0008
1	1000	1000	0.0015	0.0015	0.0015
1	1500	1540	0.0025	0.002	0.0023
1	2000	2000	0.0025	0.0025	0.0025
1	1500	-	-	-	-
1	1000	1140	0.0015	0.0015	0.0015
1	500	-	-	-	-
1	250	240	0	0.001	0.0005
1	0	0	0	0	0
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0305	0.03	0.0303
1	0	0	0.011	0.007	0.0090

Lateral Testing

Lateral Load Height Above Grade (ft):	3	Deflection Gauge Height (in):	4

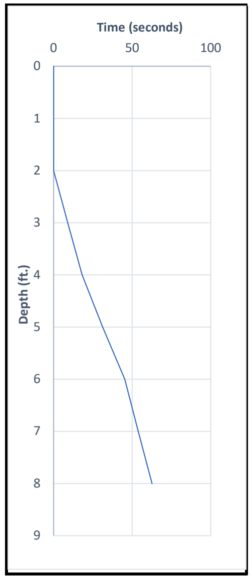
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	500	500	0.086	0.046	0.0660
1	1000	1000	0.1715	0.1035	0.1375
1	1500	1500	0.2566	0.164	0.2103
1	0	0	0.019	0.026	0.0225
1	500	540	0.1465	0.0945	0.1205
1	1000	1000	0.204	0.129	0.1665
1	1500	1580	0.277	0.1815	0.2293
1	2000	2000	0.3515	0.2385	0.2950
1	2500	2500	0.4445	0.3165	0.3805
1	0	0	0.031	0.0405	0.0358
1	2500	2500	0.464	0.3345	0.3993
1	3000	3000	0.546	0.411	0.4785
1	3500	3500	0.648	0.511	0.5795
1	4000	4000	0.7505	0.6195	0.6850
Target Deflection (in.)					
1	0.25	1800	0.311	0.2065	0.2588
1	0.5	3240	0.578	0.4385	0.5083
1	1	5440	1.046	0.9825	1.0143
Target Load					
1	6000	-	-	-	-
1	0	0	0.065	0.1255	0.09525

PLT-5 B

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-5 B
Date/Time Installed:	3/1/2021 13:20	Date/Time Tested:	3/4/2021 11:00
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	1.75
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	8
Avg. Installation Rate (sec/ft.):	36.7	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	9.02
4	18.22
5	31.29
6	45.25
7	53.78
8	62.68
Total Time (s) =	211.22



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	260	0.001	0.002	0.0015
1	500	520	0.001	0.003	0.0020
1	1000	1040	0.0015	0.005	0.0033
1	1500	1500	0.002	0.007	0.0045
1	2000	2020	0.003	0.009	0.0060
1	1500	-	-	-	-
1	1000	1120	0.002	0.0065	0.0043
1	500	600	0.0015	0.0045	0.0030
1	250	260	0.001	0.0045	0.0028
1	0	0	0.0005	0.0025	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0325	0.02	0.0263
1	0	0	0.0115	0.0105	0.0110

Lateral Testing

Lateral Load Height Above Grade (ft):	3	Deflection Gauge Height (in):	4

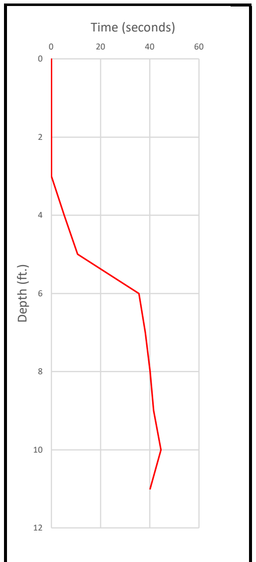
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	500	500	0.067	0.069	0.0680
1	1000	1000	0.1405	0.136	0.1383
1	1500	1500	0.219	0.2085	0.2138
1	0	0	0.0106	0.023	0.0168
1	500	540	0.1205	0.119	0.1198
1	1000	1000	0.172	0.164	0.1680
1	1500	1500	0.242	0.227	0.2345
1	2000	2000	0.316	0.297	0.3065
1	2500	2500	0.414	0.3885	0.4013
1	0	0	0.03	0.0305	0.0303
1	2500	2500	0.438	0.408	0.4230
1	3000	3000	0.525	0.4995	0.5123
1	3500	3500	0.631	0.6045	0.6178
1	4000	4000	0.75	0.7195	0.7348
Target Deflection (in.)					
1	0.25	1800	0.275	0.258	0.2665
1	0.5	3000	0.525	0.4995	0.5123
1	1	5160	1.0325	1.0005	1.0165
Target Load					
1	6000	-	-	-	-
1	0	0	0.076	0.108	0.092

ANS GEO

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-6 A
Date/Time Installed:	3/1/2021 7:30	Date/Time Tested:	11:20AM 3/5/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	3
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	11
Avg. Installation Rate (sec/ft.):	28.4	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	0
4	5.11
5	10.65
6	35.58
7	38.06
8	40.11
9	41.47
10	44.55
11	40.11
Total Time (s) =	255.64



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	260	0.0020	0.0025	0.0023
1	500	540	0.0040	0.0060	0.0050
1	1000	1000	0.0065	0.0110	0.0088
1	1500	1500	0.0095	0.0160	0.0128
1	2000	2000	0.0115	0.0210	0.0163
1	1500	1540	0.0105	0.0185	0.0145
1	1000	1060	0.0075	0.0140	0.0108
1	500	520	0.0035	0.0085	0.0060
1	250	240	0.0010	0.0055	0.0033
1	0	0	0.0000	0.0030	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.051	0.0565	0.0538
1	0	0	0.0065	0.0105	0.0085

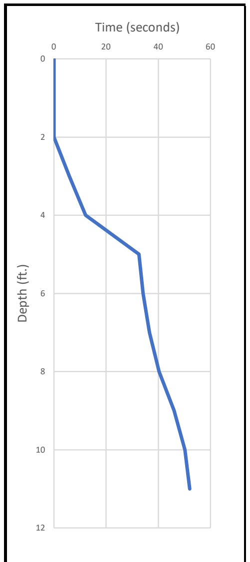
Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**		4	
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.1345	0.0800	0.1073
1	1000	1000	0.2690	0.1800	0.2245
1	1500	1500	0.4020	0.2895	0.3458
1	0	0	0.0570	0.0465	0.0518
1	500	500	0.2085	0.1395	0.1740
1	1000	1000	0.3245	0.2205	0.2725
1	1500	1500	0.4305	0.3120	0.3713
1	2000	2000	0.5480	0.4160	0.4820
1	2500	2500	0.6660	0.5290	0.5975
1	0	0	0.1160	0.0905	0.1033
1	2500	2500	0.7010	0.5720	0.6365
1	3000	3000	0.8190	0.6920	0.7555
1	3500	3500	0.9575	0.8455	0.9015
1	4000	-	-	-	-
Target Deflection (in.)					
1	0.25	1250	0.3075	0.2185	0.2630
1	0.5	2150	0.5815	0.462	0.5218
1	1	3900	1.0565	0.9580	1.0073
Target Load					
1	6000	-	-	-	-
1	0	0	0.1855	0.2025	0.194

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-6 B
Date/Time Installed:	3/1/2021 7:40	Date/Time Tested:	3/5/2021 11:35
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	11
Avg. Installation Rate (sec/ft.):	34.4	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	5.85
4	12.11
5	32.58
6	34.12
7	36.54
8	40.25
9	45.96
10	50.17
11	52.05
Total Time (s) =	303.78



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	260	0.0015	0.0030	0.0023
1	500	520	0.0040	0.0060	0.0050
1	1000	1020	0.0070	0.0105	0.0088
1	1500	1500	0.0100	0.0140	0.0120
1	2000	2000	0.0120	0.0175	0.0148
1	1500	1500	0.0095	0.0130	0.0113
1	1000	1000	0.0065	0.0100	0.0083
1	500	560	0.0040	0.0085	0.0063
1	250	260	0.0010	0.0050	0.0030
1	0	0	0.0000	0.0030	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0115	0.025	0.0183
1	0	0	0.0085	0.0085	0.0085

Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**		4	
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.1400	0.0475	0.0938
1	1000	1000	0.2550	0.1140	0.1845
1	1500	1500	0.3610	0.2005	0.2808
1	0	0	0.0515	0.1550	0.1033
1	500	500	0.1900	0.0825	0.1363
1	1000	1000	0.2825	0.1685	0.2255
1	1500	1500	0.3720	0.2600	0.3160
1	2000	2000	0.4680	0.3870	0.4275
1	2500	2500	0.5790	0.4810	0.5300
1	0	0	0.1070	0.0295	0.0683
1	2500	2500	0.6250	0.5110	0.5680
1	3000	3000	0.7380	0.6230	0.6805
1	3500	3500	0.8760	0.8205	0.8483
1	4000	4000	1.0295	0.9355	0.9825
Target Deflection (in.)					
1	0.25	1250	0.335	0.1985	0.2668
1	0.5	2250	0.5485	0.4375	0.4930
1	1	4120	1.0825	0.9555	1.0190
Target Load					
1	6000	-	-	-	-
1	0	0	0.175	0.0675	0.12125

ANS GEO

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-7 A
Date/Time Installed:	3/1/2021 7:50	Date/Time Tested:	10:25am 3/5/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	10
Avg. Installation Rate (sec/ft.):	26.3	Pile Section	W6x9x15

Embedment Data

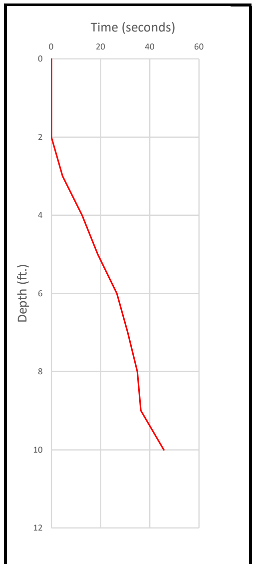
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	4.58
4	12.45
5	18.75
6	26.52
7	30.98
8	34.88
9	36.25
10	45.74
Total Time (s) =	205.57

Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	280	0.0030	0.0045	0.0038
1	500	540	0.0060	0.0085	0.0073
1	1000	1000	0.0100	0.0150	0.0125
1	1500	1500	0.0145	0.0215	0.0180
1	2000	2000	0.0185	0.0275	0.0230
1	1500	1500	0.0140	0.0215	0.0178
1	1000	1000	0.0120	0.0190	0.0155
1	500	540	0.0075	0.0125	0.0100
1	250	260	0.0040	0.0070	0.0055
1	0	0	0.0010	0.0030	0.0020
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.038	0.0805	0.0593
1	0	0	0.0015	0.009	0.0053

Lateral Testing

Lateral Load Height Above Grade (ft):	3	Deflection Gauge Height (in):	4		
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0885	0.0965	0.0925
1	1000	1000	0.1925	0.2030	0.1978
1	1500	1500	0.2930	0.3065	0.2998
1	0	0	0.0085	0.0155	0.0120
1	500	500	0.1085	0.1165	0.1125
1	1000	1000	0.2055	0.2175	0.2115
1	1500	1500	0.2895	0.3030	0.2963
1	2000	2000	0.3895	0.4030	0.3963
1	2500	2500	0.4850	0.5040	0.4945
1	0	0	0.0200	0.0455	0.0328
1	2500	2500	0.5245	0.5455	0.5350
1	3000	3000	0.6250	0.6545	0.6398
1	3500	3500	0.7535	0.7920	0.7728
1	4000	4000	0.9120	0.9630	0.9375
Target Deflection (in.)					
1	0.25	1200	0.2455	0.2605	0.2530
1	0.5	2550	0.49	0.515	0.5025
1	1	4180	0.9825	1.0380	1.0103
Target Load					
1	6000	-	-	-	-
1	0	0	0.0905	0.0108	0.05065



Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-7 B
Date/Time Installed:	3/1/2021 7:55	Date/Time Tested:	3/5/2021 10:10
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	3
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	10
Avg. Installation Rate (sec/ft.):	26.1	Pile Section	W6x9x15

Embedment Data

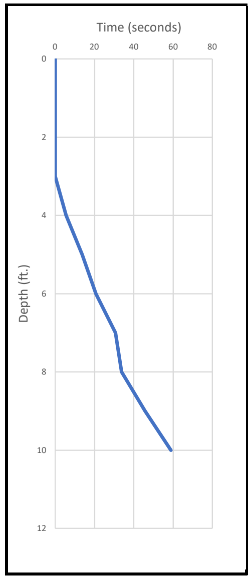
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	0
4	5.55
5	13.67
6	20.75
7	30.66
8	33.81
9	45.67
10	58.94
Total Time (s) =	209.05

Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	280	0.0010	0.0020	0.0015
1	500	500	0.0020	0.0045	0.0033
1	1000	1060	0.0035	0.0075	0.0055
1	1500	1520	0.0060	0.0100	0.0080
1	2000	2000	0.0070	0.0120	0.0095
1	1500	1540	0.0065	0.0105	0.0085
1	1000	1000	0.0030	0.0085	0.0058
1	500	520	0.0010	0.0055	0.0033
1	250	260	0.0005	0.0035	0.0020
1	0	0	0.0000	0.0015	0.0008
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0275	0.0215	0.0245
1	0	0	0.0055	0.0045	0.0050

Lateral Testing

Lateral Load Height Above Grade (ft):	3	Deflection Gauge Height (in):	4		
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0565	0.1075	0.0820
1	1000	1000	0.1375	0.2055	0.1715
1	1500	1500	0.2280	0.3010	0.2645
1	0	0	0.0215	0.0085	0.0150
1	500	500	0.0920	0.1010	0.0965
1	1000	1000	0.1655	0.1995	0.1825
1	1500	1500	0.2340	0.2795	0.2568
1	2000	2000	0.3265	0.3810	0.3538
1	2500	2500	0.4270	0.4845	0.4558
1	0	0	0.0530	0.0025	0.0278
1	2500	2500	0.4675	0.5260	0.4968
1	3000	3000	0.5775	0.6315	0.6045
1	3500	3500	0.7045	0.7640	0.7343
1	4000	4000	0.8840	0.9295	0.9068
Target Deflection (in.)					
1	0.25	1500	0.2340	0.2795	0.2568
1	0.5	2500	0.4675	0.5260	0.4968
1	1	4260	0.9645	1.0435	1.0040
Target Load					
1	6000	-	-	-	-
1	0	0	0.123	0.059	0.091

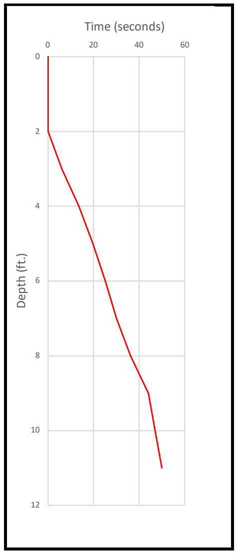


ANS GEO

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-8 A
Date/Time Installed:	3/1/2021 7:55	Date/Time Tested:	9:10AM 3/5/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	11
Avg. Installation Rate (sec/ft.):	30.2	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	6.19
4	13.54
5	19.75
6	25.21
7	30.05
8	36.16
9	44.07
10	47.05
11	49.89
Total Time (s) =	271.91



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	240	0.0010	0.0010	0.0010
1	500	500	0.0050	0.0085	0.0068
1	1000	1000	0.0095	0.0155	0.0125
1	1500	1500	0.0130	0.0215	0.0173
1	2000	2000	0.0175	0.0290	0.0233
1	1500	1300	0.0135	0.0235	0.0185
1	1000	1000	0.0110	0.0210	0.0160
1	500	400	0.0040	0.0105	0.0073
1	250	240	0.0015	0.0080	0.0048
1	0	0	0.0000	0.0030	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.095	0.112	0.1035
1	0	0	0.0325	0.0415	0.0370

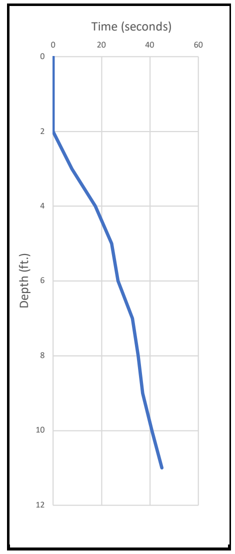
Lateral Testing

Lateral Load Height Above Grade (ft):		3	Deflection Gauge Height (in):		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0935	0.0570	0.0753
1	1000	1000	0.1780	0.1245	0.1513
1	1500	1500	0.2620	0.1865	0.2243
1	0	0	0.0120	0.0220	0.0170
1	500	500	0.1390	0.9300	0.5345
1	1000	1000	0.2095	0.1375	0.1735
1	1500	1500	0.2785	0.1955	0.2370
1	2000	2000	0.3575	0.2615	0.3095
1	2500	2500	0.4495	0.3310	0.3903
1	0	0	0.0280	0.0375	0.0328
1	2500	2500	0.4845	0.3555	0.4200
1	3000	3000	0.5740	0.4305	0.5023
1	3500	3500	0.6970	0.5255	0.6113
1	4000	4000	0.8160	0.6250	0.7205
Target Deflection (in.)					
1	0.25	1600	0.2915	0.2155	0.2535
1	0.5	3000	0.5740	0.4305	0.5023
1	1	5180	1.1455	0.8725	1.0090
Target Load					
1	6000	-	-	-	-
1	0	0	0.0785	0.108	0.09325

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-8 B
Date/Time Installed:	3/1/2021 7:55	Date/Time Tested:	9:20AM 3/5/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	11
Avg. Installation Rate (sec/ft.):	29.6	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	7.68
4	17.31
5	24.08
6	26.7
7	32.65
8	35.03
9	36.92
10	40.83
11	44.94
Total Time (s) =	266.14



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	300	0.0025	0.0030	0.0028
1	500	500	0.0035	0.0045	0.0040
1	1000	1000	0.0050	0.0085	0.0068
1	1500	1500	0.0085	0.0115	0.0100
1	2000	2000	0.0115	0.0150	0.0133
1	1500	1440	0.0080	0.0130	0.0105
1	1000	980	0.0055	0.0105	0.0080
1	500	580	0.0030	0.0080	0.0055
1	250	260	0.0020	0.0050	0.0035
1	0	0	0.0000	0.0030	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.045	0.094	0.0695
1	0	0	0.0425	0.0505	0.0465

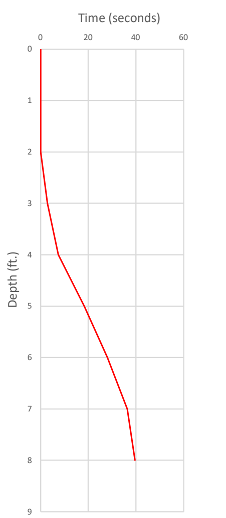
Lateral Testing

Lateral Load Height Above Grade (ft):		3	Deflection Gauge Height (in):		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0795	0.0620	0.0708
1	1000	1000	0.1810	0.1290	0.1550
1	1500	1500	0.2790	0.2030	0.2410
1	0	0	0.0160	0.0215	0.0188
1	500	500	0.1205	0.0960	0.1083
1	1000	1000	0.2025	0.1525	0.1775
1	1500	1500	0.2880	0.2170	0.2525
1	2000	2000	0.3770	0.2875	0.3323
1	2500	2500	0.3620	0.3620	0.3620
1	0	0	0.0400	0.0360	0.0380
1	2500	2500	0.4815	0.3855	0.4335
1	3000	3000	0.5590	0.4595	0.5093
1	3500	3500	0.6650	0.5500	0.6075
1	4000	4000	0.7765	0.6455	0.7110
Target Deflection (in.)					
1	0.25	1500	0.2880	0.2170	0.2525
1	0.5	3000	0.5590	0.4595	0.5093
1	1	5560	1.1000	0.9005	1.0003
Target Load					
1	6000	-	-	-	-
1	0	0	0.0935	0.121	0.10725

ANS GEO

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-9 A
Date/Time Installed:	3/1/2021 10:10	Date/Time Tested:	3/5/2021 7:50
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	8
Avg. Installation Rate (sec/ft.):	22.2	Pile Section	W6x9x15

Embedment Data	
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	2.9
4	7.53
5	18.43
6	28.1
7	36.47
8	39.59
Total Time (s) =	130.12

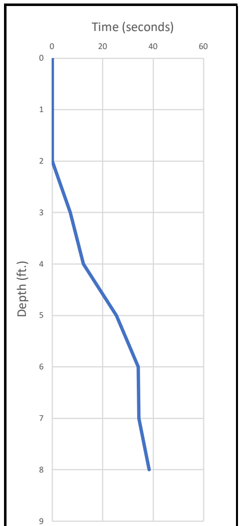


Tensile Testing					
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	300	0.0025	0.0055	0.0040
1	500	500	0.0045	0.0085	0.0065
1	1000	1000	0.0105	0.0155	0.0130
1	1500	1500	0.0160	0.0215	0.0188
1	2000	2000	0.0205	0.0275	0.0240
1	1500	1500	0.0175	0.0250	0.0213
1	1000	1000	0.0120	0.0200	0.0160
1	500	500	0.0060	0.0140	0.0100
1	250	240	0.0015	0.0105	0.0060
1	0	0	0.0000	0.0030	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.1085	0.1095	0.1090
1	0	0	0.0305	0.042	0.0363

Lateral Testing					
Lateral Load Height Above Grade (ft):		3	Deflection Gauge Height (in):		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	
1	500	500	0.0875	0.0895	0.0885
1	1000	1000	0.1640	0.1840	0.1740
1	1500	1500	0.2355	0.2800	0.2578
1	0	0	0.0485	0.0510	0.0498
1	500	500	0.1215	0.1515	0.1365
1	1000	1000	0.1555	0.2400	0.1978
1	1500	1500	0.2640	0.3175	0.2908
1	2000	2000	0.3360	0.3995	0.3678
1	2500	2500	0.4135	0.4920	0.4528
1	0	0	0.0345	0.0445	0.0395
1	2500	2500	0.4325	0.5128	0.4727
1	3000	3000	0.5120	0.6065	0.5593
1	3500	3500	0.6055	0.7088	0.6571
1	4000	4000	0.7010	0.8135	0.7573
Target Deflection (in.)					
1	0.25	1500	0.2355	0.2800	0.2578
1	0.5	2760	0.471	0.548	0.5095
1	1	5040	0.9400	1.0685	1.0043
Target Load					
1	6000	-	-	-	-
1	0	0	0.1435	,1195	0.1435

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-9 B
Date/Time Installed:	3/1/2021 10:15	Date/Time Tested:	3/5/2021 8:10
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	8
Avg. Installation Rate (sec/ft.):	25.3	Pile Section	W6x9x15

Embedment Data	
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	7.14
4	12.37
5	25.39
6	34.07
7	34.36
8	38.44
Total Time (s) =	144.63



Tensile Testing					
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	260	0.0010	0.0020	0.0015
1	500	500	0.0010	0.0040	0.0025
1	1000	1000	0.0035	0.0080	0.0058
1	1500	1500	0.0050	0.0105	0.0078
1	2000	2000	0.0065	0.0135	0.0100
1	1500	1560	0.0055	0.0120	0.0088
1	1000	1080	0.0035	0.0105	0.0070
1	500	560	0.0010	0.0070	0.0040
1	250	260	0.0005	0.0050	0.0028
1	0	0	0.0000	0.0030	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0715	0.091	0.0813
1	0	0	0.068	0.0695	0.0688

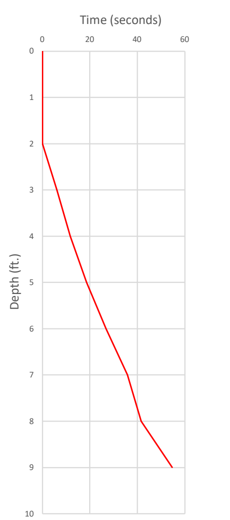
Lateral Testing					
Lateral Load Height Above Grade (ft):		3	Deflection Gauge Height (in):		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0815	0.0550	0.0683
1	1000	1000	0.1590	0.1240	0.1415
1	1500	1500	0.2270	0.1910	0.2090
1	0	0	0.0060	0.0505	0.0283
1	500	500	0.0935	0.1080	0.1008
1	1000	1000	0.1740	0.1635	0.1688
1	1500	1500	0.2465	0.2215	0.2340
1	2000	2000	0.3190	0.2860	0.3025
1	2500	2500	0.3930	0.3625	0.3778
1	0	0	0.0140	0.0525	0.0333
1	2500	2500	0.4065	0.3810	0.3938
1	3000	3000	0.4875	0.4550	0.4713
1	3500	3500	0.5750	0.5450	0.5600
1	4000	4000	0.6650	0.6360	0.6505
Target Deflection (in.)					
1	0.25	1800	0.278	0.234	0.2560
1	0.5	3280	0.5125	0.501	0.5068
1	1	5640	1.0055	1.0185	1.0120
Target Load					
1	6000	-	-	-	-
1	0	0	0.0245	0.1345	0.0795

ANS GEO

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-10 A
Date/Time Installed:	3/1/2021 9:40	Date/Time Tested:	2:55PM 3/3/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	27.9	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	6.11
4	11.77
5	18.64
6	26.85
7	35.94
8	41.62
9	54.67
Total Time (s) =	195.6



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	240	0.0035	0.003	0.0033
1	500	540	0.0055	0.005	0.0053
1	1000	1000	0.0085	0.0085	0.0085
1	1500	1520	0.011	0.011	0.0110
1	2000	2000	0.013	0.013	0.0130
1	1500	1560	0.0115	0.012	0.0118
1	1000	980	0.0085	0.01	0.0093
1	500	500	0.0055	0.0075	0.0065
1	250	260	0.0025	0.0065	0.0045
1	0	0	0.0045	0.0045	0.0045
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0235	0.023	0.0233
1	0	0	0.012	0.0105	0.0113

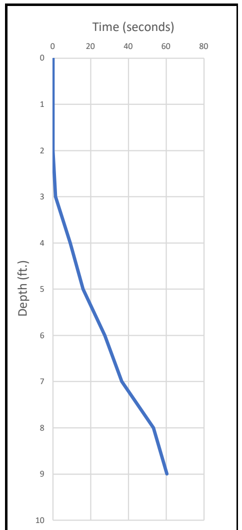
Lateral Testing

Lateral Load Height Above Grade (ft):		3	Deflection Gauge Height (in):		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0685	0.0695	0.0690
1	1000	1020	0.1435	0.144	0.1438
1	1500	1560	0.225	0.2275	0.2263
1	0	0	0.012	0.0325	0.0223
1	500	500	0.077	0.103	0.0900
1	1000	1000	0.162	0.179	0.1705
1	1500	1500	0.2225	0.233	0.2278
1	2000	2000	0.306	0.3165	0.3113
1	2500	2500	0.392	0.3815	0.3868
1	0	0	0.027	0.046	0.0365
1	2500	2540	0.416	0.4085	0.4123
1	3000	3000	0.5165	0.495	0.5058
1	3500	3500	0.6185	0.5865	0.6025
1	4000	4000	0.7555	0.7065	0.7310
Target Deflection (in.)					
1	0.25	1800	0.245	0.255	0.2500
1	0.5	3000	0.5165	0.495	0.5058
1	1	5000	1.0555	0.9585	1.0070
Target Load					
1	6000	-	-	-	-
1	0	0	0.0685	0.1185	0.0935

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-10 B
Date/Time Installed:	3/1/2021 9:50	Date/Time Tested:	3:05PM 3/3/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2.5
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	29.2	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	1.46
4	9.17
5	15.97
6	27.53
7	36.48
8	53.28
9	60.33
Total Time (s) =	204.22



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	300	0.0065	0.005	0.0058
1	500	580	0.012	0.0105	0.0113
1	1000	980	0.0195	0.0105	0.0150
1	1500	1500	0.0275	0.026	0.0268
1	2000	2000	0.0355	0.0325	0.0340
1	1500	1460	0.0305	0.0285	0.0295
1	1000	1000	0.025	0.0235	0.0243
1	500	560	0.016	0.0135	0.0148
1	250	280	0.0105	0.0075	0.0090
1	0	0	0.0035	0.0005	0.0020
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.112	0.0875	0.0998
1	0	0	0.009	0.0005	0.0048

Lateral Testing

Lateral Load Height Above Grade (ft):		3	Deflection Gauge Height (in):		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0575	0.089	0.0733
1	1000	1020	0.14	0.216	0.1780
1	1500	1560	0.233	0.32	0.2765
1	0	0	0.001	0.04	0.0205
1	500	500	0.062	0.16	0.1110
1	1000	1000	0.1625	0.262	0.2123
1	1500	1500	0.2325	0.3395	0.2860
1	2000	2000	0.3325	0.44	0.3863
1	2500	2500	0.4335	0.5505	0.4920
1	0	0	0.029	0.0395	0.0343
1	2500	2540	0.401	0.42	0.4105
1	3000	3000	0.515	0.5305	0.5228
1	3500	3500	0.6165	0.6285	0.6225
1	4000	4000	0.751	0.7585	0.7548
Target Deflection (in.)					
1	0.25	1400	0.2105	0.2885	0.2495
1	0.5	2550	0.4455	0.5685	0.5070
1	1	5000	1.013	1.025	1.0190
Target Load					
1	6000	-	-	-	-
1	0	0	0.0785	0.0855	0.082

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Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-11 A
Date/Time Installed:	3/1/2021 9:00	Date/Time Tested:	2:10PM 3/3/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	27.9	Pile Section	W6x9x15

Embedment Data

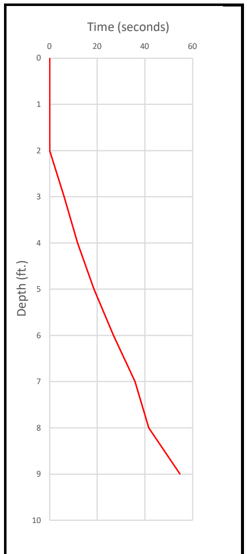
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	6.11
4	11.77
5	18.64
6	26.85
7	35.94
8	41.62
9	54.67
Total Time (s) =	189.49

Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	300	0.001	0.0005	0.0008
1	500	520	0.001	0	0.0005
1	1000	1000	0.003	0.001	0.0020
1	1500	1540	0.003	0.0015	0.0023
1	2000	2100	0.0035	0.0025	0.0030
1	1500	1480	0.003	0.002	0.0025
1	1000	820	0.0025	0.001	0.0018
1	500	480	0.0015	0.001	0.0013
1	250	260	0.001	0.001	0.0010
1	0	0	0	0.0005	0.0003
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.035	0.0125	0.0238
1	0	0	0.0085	0.003	0.0058

Lateral Testing

Lateral Load Height Above Grade (ft):		3	Deflection Gauge Height (in):		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	500	500	0.0565	0.1	0.0783
1	1000	1000	0.138	0.189	0.1635
1	1500	1500	0.208	0.2595	0.2338
1	0	0	0.016	0.0235	0.0198
1	500	500	0.084	0.1435	0.1138
1	1000	1000	0.154	0.214	0.1840
1	1500	1500	0.2155	0.273	0.2443
1	2000	2000	0.2895	0.3445	0.3170
1	2500	2500	0.3565	0.416	0.3863
1	0	0	0.037	0.036	0.0365
1	2500	2500	0.372	0.4475	0.4098
1	3000	3060	0.473	0.5745	0.5238
1	3500	3520	0.545	0.6705	0.6078
1	4000	4000	0.6385	0.7995	0.7190
Target Deflection (in.)					
1	0.25	1740	0.236	0.2885	0.2623
1	0.5	2960	0.456	0.5585	0.5073
1	1	4820	0.899	1.1035	1.0013
Target Load					
1	6000	-	-	-	-
1	0	0	0.0675	0.116	0.09175



Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-11 B
Date/Time Installed:	3/1/2021 9:20	Date/Time Tested:	2:25PM 3/3/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2.5
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	29.1	Pile Section	W6x9x15

Embedment Data

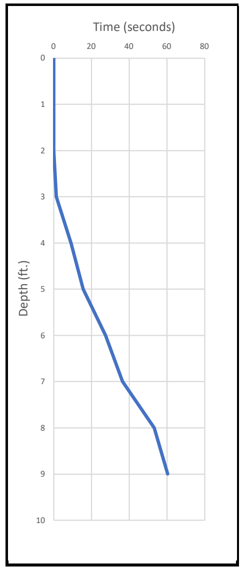
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	1.46
4	9.17
5	15.67
6	27.53
7	36.48
8	53.26
9	60.33
Total Time (s) =	202.44

Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	-	-	-	-
1	500	440	0.0015	0.0035	0.0025
1	1000	1000	0.0025	0.0055	0.0040
1	1500	1500	0.0035	0.0065	0.0050
1	2000	2000	0.005	0.008	0.0065
1	1500	1580	0.0045	0.0075	0.0060
1	1000	980	0.0045	0.006	0.0053
1	500	450	0.004	0.0045	0.0043
1	250	260	0.004	0.004	0.0040
1	0	0	0.003	0.003	0.0030
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0555	0.0125	0.0340
1	0	0	0.0215	0.0115	0.0165

Lateral Testing

Lateral Load Height Above Grade (ft):		3	Deflection Gauge Height (in):		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	500	500	0.04	0.138	0.0890
1	1000	1000	0.11	0.2405	0.1753
1	1500	1500	0.1835	0.3305	0.2570
1	0	0	0.0435	0.0075	0.0255
1	500	500	0.0105	0.171	0.0908
1	1000	1000	0.1555	0.268	0.2118
1	1500	1500	0.212	0.344	0.2780
1	2000	2000	0.293	0.436	0.3645
1	2500	2500	0.3685	0.523	0.4458
1	0	0	0.0655	0.035	0.0503
1	2500	2500	0.408	0.5405	0.4743
1	3000	3060	0.514	0.673	0.5935
1	3500	3520	0.586	0.76	0.6730
1	4000	4000	0.6805	0.8735	0.7770
Target Deflection (in.)					
1	0.25	1500	0.1835	0.3305	0.2570
1	0.5	2780	0.438	0.5875	0.5128
1	1	4820	0.8995	1.129	1.0143
Target Load					
1	6000	-	-	-	-
1	0	0	0.111	0.1025	0.10675



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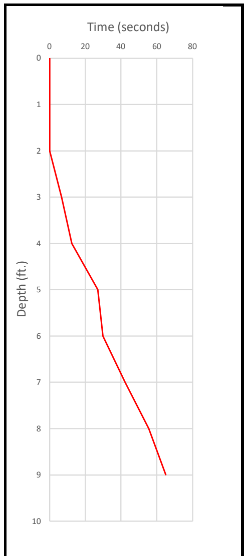
Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-12 A
Date/Time Installed:	3/1/2021 8:30	Date/Time Tested:	1PM 3/4/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	34.2	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	6.77
4	12.54
5	26.98
6	29.95
7	42.25
8	55.62
9	64.92
Total Time (s) =	239.03



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	260	0.002	0.002	0.0020
1	500	520	0.004	0.0045	0.0043
1	1000	1000	0.0085	0.0085	0.0085
1	1500	1500	0.012	0.0135	0.0128
1	2000	2000	0.0155	0.0175	0.0165
1	1500	-	-	-	-
1	1000	900	0.0085	0.0105	0.0095
1	500	540	0.005	0.0085	0.0068
1	250	260	0.0015	0.0055	0.0035
1	0	0	0.0015	0.003	0.0023
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.025	0.0585	0.0418
1	0	0	0.023	0.0275	0.0253

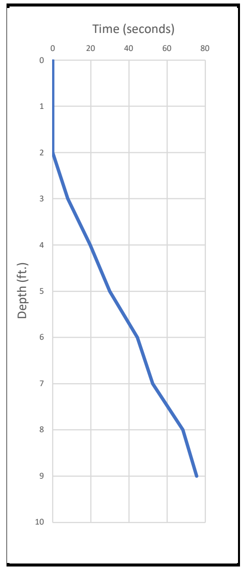
Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4		
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	500	520	0.0585	0.103	0.0808
1	1000	980	0.1315	0.1865	0.1590
1	1500	1600	0.2335	0.2955	0.2645
1	0	0	0.0295	0.0085	0.0190
1	500	480	0.0805	0.1055	0.0930
1	1000	1080	0.1655	0.2175	0.1915
1	1500	1540	0.227	0.288	0.2575
1	2000	2060	0.3085	0.3685	0.3385
1	2500	2520	0.3865	0.442	0.4143
1	0	0	0.0475	0.0195	0.0335
1	2500	2540	0.413	0.465	0.4390
1	3000	3000	0.488	0.5394	0.5137
1	3500	3520	0.581	0.631	0.6060
1	4000	4040	0.6845	0.7325	0.7085
Target Deflection (in.)					
1	0.25	1600	0.2335	0.2955	0.2645
1	0.5	2900	0.4685	0.52	0.4943
1	1	5250	0.9975	1.0335	1.0155
Target Load					
1	6000	-	-	-	-
1	0	0	0.102	0.0205	0.06125

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-12 B
Date/Time Installed:	3/1/2021 8:40	Date/Time Tested:	1:20PM 3/4/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	42.6	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	7.85
4	19.65
5	29.87
6	44.39
7	52.37
8	68.25
9	75.55
Total Time (s) =	297.93



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	280	0.0015	0.0045	0.0030
1	500	520	0.0045	0.0085	0.0065
1	1000	1060	0.0115	0.0165	0.0140
1	1500	1540	0.0165	0.024	0.0203
1	2000	2000	0.022	0.032	0.0270
1	1500	1480	0.017	0.027	0.0220
1	1000	1000	0.0115	0.02	0.0158
1	500	520	0.0045	0.012	0.0083
1	250	260	0.001	0.0085	0.0048
1	0	0	0.0025	0.0045	0.0035
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.097	0.069	0.0830
1	0	0	0.0065	0.012	0.0093

Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4		
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	500	520	0.077	0.077	0.0770
1	1000	980	0.1465	0.1435	0.1450
1	1500	1600	0.238	0.2435	0.2408
1	0	0	0.025	0.0235	0.0243
1	500	480	0.0875	0.09	0.0888
1	1000	1080	0.1695	0.175	0.1723
1	1500	1540	0.227	0.227	0.2270
1	2000	2060	0.3965	0.3175	0.3570
1	2500	2520	0.364	0.3955	0.3798
1	0	0	0.0345	0.05	0.0423
1	2500	2540	0.3895	0.425	0.4073
1	3000	3000	0.462	0.5011	0.4816
1	3500	3520	0.55	0.603	0.5765
1	4000	4040	0.654	0.7185	0.6863
Target Deflection (in.)					
1	0.25	1740	0.2565	0.2715	0.2640
1	0.5	3050	0.478	0.5179	0.4980
1	1	5200	0.9325	1.0735	1.0030
Target Load					
1	6000	-	-	-	-
1	0	0	0.0565	0.077	0.06675

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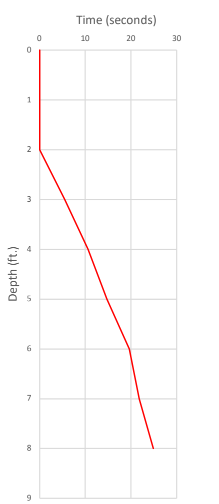
PLT-13 A

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-13 A
Date/Time Installed:	2/27/2021 13:30	Date/Time Tested:	2:15PM 3/3/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	8
Avg. Installation Rate (sec/ft.):	16.2	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	5.53
4	10.65
5	14.78
6	19.65
7	21.85
8	24.88
Total Time (s) =	97.34



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	300	0.007	0.0035	0.0053
1	500	540	0.012	0.0085	0.0103
1	1000	1000	0.0215	0.0175	0.0195
1	1500	1500	0.0315	0.0285	0.0300
1	2000	2020	0.043	0.0405	0.0418
1	1500	1460	0.0375	0.0345	0.0360
1	1000	1080	0.031	0.027	0.0290
1	500	480	0.019	0.012	0.0155
1	250	240	0.013	0.006	0.0095
1	0	0	0.0075	0.0005	0.0040
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.14	0.165	0.1525
1	0	0	0.002	0.0145	0.0083

Lateral Testing

Lateral Load Height Above Grade (ft):	3	Deflection Gauge Height (in):	4

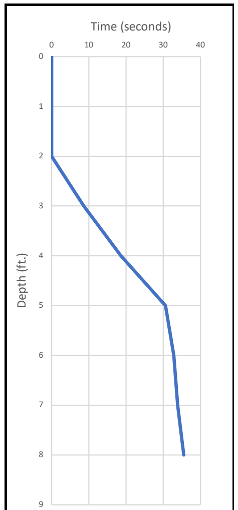
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	500	500	0.089	0.1295	0.1093
1	1000	1000	0.164	0.256	0.2100
1	1500	1500	0.238	0.368	0.3030
1	0	0	0.012	0.038	0.0250
1	500	500	0.112	0.1975	0.1548
1	1000	1000	0.186	0.3085	0.2473
1	1500	1500	0.249	0.3975	0.3233
1	2000	2000	0.3385	0.511	0.4248
1	2500	2500	0.471	0.662	0.5665
1	0	0	0.02	0.062	0.0410
1	2500	2500	0.505	0.7065	0.6058
1	3000	3000	0.615	0.83	0.7225
1	3500	3500	0.765	0.984	0.8745
-	-	-	-	-	-
Target Deflection (in.)					
1	0.25	1350	0.204	0.315	0.2595
1	0.5	2360	0.419	0.603	0.5110
1	1	3800	0.89	1.1355	1.0128
Target Load					
1	6000	-	-	-	-
1	0	0	0.0475	0.112	0.07975

PLT-13 B

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-13 B
Date/Time Installed:	2/27/2021 13:30	Date/Time Tested:	2:25PM 3/3/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	8
Avg. Installation Rate (sec/ft.):	26.7	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	8.59
4	18.57
5	30.55
6	32.83
7	33.87
8	35.51
Total Time (s) =	159.92



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	400	0.003	0.003	0.0030
1	500	560	0.004	0.0035	0.0038
1	1000	1000	0.007	0.0065	0.0068
1	1500	1540	0.01	0.0105	0.0103
1	2000	2020	0.0125	0.012	0.0123
1	1500	1520	0.011	0.011	0.0110
1	1000	900	0.008	0.008	0.0080
1	500	520	0.005	0.0045	0.0048
1	250	100	0.0015	0.0005	0.0010
1	0	0	0.001	0	0.0005
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0115	0.036	0.0238
1	0	0	0.0085	0.012	0.0103

Lateral Testing

Lateral Load Height Above Grade (ft):	3	Deflection Gauge Height (in):	4

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	500	500	0.057	0.092	0.0745
1	1000	1020	0.1345	0.1945	0.1645
1	1500	1520	0.2395	0.2895	0.2645
1	0	0	0.0435	0.0085	0.0260
1	500	500	0.119	0.111	0.1150
1	1000	1000	0.1805	0.1985	0.1895
1	1500	1480	0.25	0.2765	0.2633
1	2000	2000	0.332	0.353	0.3425
1	2500	2520	0.471	0.475	0.4730
1	0	0	0.1085	0.01	0.0593
1	2500	2580	0.5565	0.5175	0.5370
1	3000	2990	0.657	0.618	0.6375
1	3500	3440	0.8165	0.7755	0.7960
1	4000	4020	0.908	0.891	0.8995
Target Deflection (in.)					
1	0.25	1480	0.2205	0.2725	0.2465
1	0.5	2400	0.5195	0.4895	0.5045
1	1	4200	1.051	1.005	1.0280
Target Load					
1	6000	-	-	-	-
1	0	0	0.138	0.0105	0.07425

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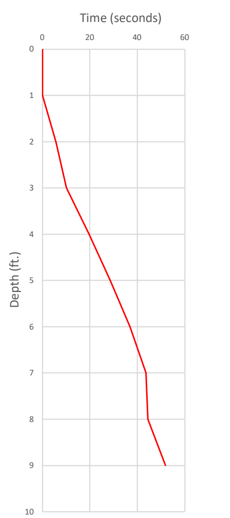
Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-14 A
Date/Time Installed:	2/27/2021 14:30	Date/Time Tested:	12:45PM 3/3/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	1
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	27.9	Pile Section	W6x9x15

Embedment Data	
Depth (ft.)	Time (s)
0	0
1	0
2	5.77
3	10.23
4	19.74
5	28.65
6	36.97
7	43.71
8	44.5
9	51.87
Total Time (s) =	225.44

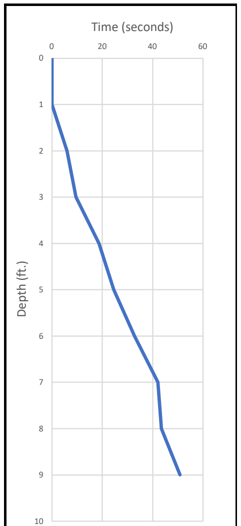


Tensile Testing					
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	280	0.0035	0.004	0.0038
1	500	500	0.006	0.0065	0.0063
1	1000	1000	0.012	0.0135	0.0128
1	1500	1500	0.0175	0.0195	0.0185
1	2000	2040	0.0235	0.0265	0.0250
1	1500	1500	0.0195	0.0225	0.0210
1	1000	1080	0.016	0.0185	0.0173
1	500	660	0.01	0.012	0.0110
1	250	300	0.005	0.007	0.0060
1	0	0	0.001	0.002	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.0545	0.1	0.0773
1	0	0	0.0095	0.0195	0.0145

Lateral Testing					
Lateral Load Height Above Grade (ft):		3	**Deflection Gauge Height (in):**		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	500	500	0.111	0.785	0.4480
1	1000	1020	0.1955	0.124	0.1598
1	1500	1540	0.3285	0.221	0.2748
1	0	0	0.0255	0.0245	0.0250
1	500	500	0.1355	0.127	0.1313
1	1000	980	0.2485	0.1905	0.2195
1	1500	1500	0.328	0.241	0.2845
1	2000	2000	0.51	0.37	0.4400
1	2500	2540	0.6675	0.526	0.5968
1	0	0	0.115	0.1105	0.1128
1	2500	2500	0.7405	0.5995	0.6700
1	3000	3000	0.9205	0.748	0.8343
1	3500	3500	1.135	0.9455	1.0403
1	4000	-	-	-	-
Target Deflection (in.)					
1	0.25	1400	0.2955	0.2005	0.2480
1	0.5	2100	0.5385	0.4475	0.4930
1	1	3500	1.135	0.9455	1.0403
Target Load					
1	6000	-	-	-	-
1	0	0	0.218	0.152	0.185

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-14 B
Date/Time Installed:	2/27/2021 14:45	Date/Time Tested:	12:45PM 3/3/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	1
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	9
Avg. Installation Rate (sec/ft.):	25.5	Pile Section	W6x9x15

Embedment Data	
Depth (ft.)	Time (s)
0	0
1	0
2	6.05
3	9.51
4	18.74
5	24.55
6	32.74
7	42.1
8	43.5
9	50.9
Total Time (s) =	212.53



Tensile Testing					
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0	0	0.0000
1	250	240	0	0.0025	0.0013
1	500	580	0.0015	0.0055	0.0035
1	1000	1000	0.0035	0.0085	0.0060
1	1500	1500	0.0065	0.012	0.0093
1	2000	2060	0.0085	0.015	0.0118
1	1500	-	-	-	-
1	1000	800	0.003	0.0085	0.0058
1	500	500	0.002	0.0045	0.0033
1	250	300	0.001	0.005	0.0030
1	0	0	0.0005	0.002	0.0013
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.019	0.0415	0.0303
1	0	0	0.0135	0.0105	0.0120

Lateral Testing					
Lateral Load Height Above Grade (ft):		3	**Deflection Gauge Height (in):**		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.1055	0.0855	0.0955
1	1020	1000	0.1745	0.1145	0.1445
1	1500	1540	0.322	0.2385	0.2803
1	0	0	0.0555	0.0515	0.0535
1	500	500	0.1575	0.1025	0.1300
1	1000	1020	0.2485	0.1965	0.2225
1	1500	1500	0.3455	0.2505	0.2980
1	2000	2000	0.5015	0.3905	0.4460
1	2500	2540	0.6775	0.522	0.5998
1	0	0	0.117	0.1095	0.1133
1	2500	2500	0.7065	0.599	0.6528
1	3000	3000	0.9115	0.7245	0.8180
1	3500	3500	1.145	0.9175	1.0313
1	4000	-	-	-	-
Target Deflection (in.)					
1	0.25	1500	0.315	0.2105	0.2628
1	0.5	2100	0.558	0.441	0.4995
1	1	3500	1.145	0.9175	1.0313
Target Load					
1	6000	-	-	-	-
1	0	0	0.218	0.152	0.185

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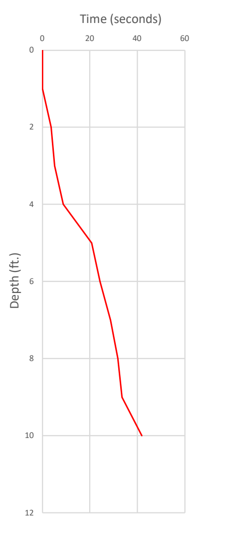
Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-15 A
Date/Time Installed:	2/27/2021 15:10	Date/Time Tested:	3:45PM 3/3/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	1
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	10
Avg. Installation Rate (sec/ft.):	22.1	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	3.71
3	5.24
4	8.8
5	20.85
6	24.36
7	28.79
8	31.84
9	33.65
10	41.88
Total Time (s) =	199.12



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	300	0.004	0.0045	0.0043
1	500	540	0.0075	0.0085	0.0080
1	1000	1020	0.0165	0.0165	0.0165
1	1500	1520	0.023	0.024	0.0235
1	2000	2020	0.0305	0.033	0.0318
1	1500	1240	0.024	0.0255	0.0248
1	1000	940	0.0195	0.0205	0.0200
1	500	540	0.013	0.0145	0.0138
1	250	220	0.0065	0.0085	0.0075
1	0	0	0.002	0.004	0.0030
Target Deflection (in.)					
1	0.5	9560	0.4155	0.6155	0.5155
1	0.75	9920	0.7085	0.845	0.7768
1	1	10000	0.9065	1.1265	1.0165
Target Load					
1	10000	10000	0.9065	1.1265	1.0165
1	0	0	0.8965	1.0655	0.9810

Lateral Testing

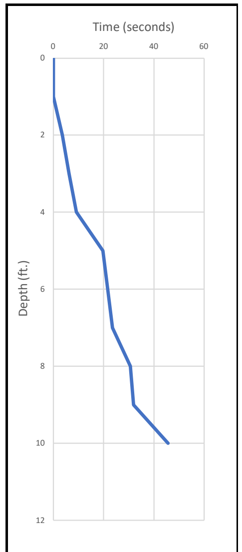
Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0925	0.0625	0.0775
1	1000	1000	0.185	0.1145	0.1498
1	1500	1540	0.318	0.2385	0.2783
1	0	0	0.0485	0.0425	0.0455
1	500	500	0.1485	0.11	0.1293
1	1000	1020	0.258	0.1875	0.2228
1	1500	1500	0.3585	0.241	0.2998
1	2000	2000	0.4995	0.3815	0.4405
1	2500	2500	0.6875	0.5155	0.6015
1	0	0	0.1255	0.101	0.1133
1	2500	2500	0.7355	0.5875	0.6615
1	3000	3000	0.901	0.7355	0.8183
1	3500	3500	1.115	0.9255	1.0203
1	4000	-	-	-	-
Target Deflection (in.)					
1	0.25	1400	0.3285	0.2255	0.2770
1	0.5	2250	0.6255	0.4522	0.5389
1	1	3500	1.115	0.9255	1.0203
Target Load					
1	6000	-	-	-	-
1	0	0	0.115	0.158	0.1365

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-15 B
Date/Time Installed:	2/27/2021 13:30	Date/Time Tested:	12:45PM 3/3/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	1
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	10
Avg. Installation Rate (sec/ft.):	21.4	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	3.65
3	6.25
4	9.2
5	19.78
6	21.65
7	23.49
8	30.67
9	31.88
10	45.66
Total Time (s) =	192.23



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	340	0.0005	0.0015	0.0010
1	500	540	0.0005	0.003	0.0018
1	1000	1020	0.001	0.005	0.0030
1	1500	1560	0.001	0.0075	0.0043
1	2000	2080	0.001	0.01	0.0055
1	1500	1320	0.001	0.0085	0.0048
1	1000	1080	0.0005	0.008	0.0043
1	500	-	-	-	-
1	250	220	0.0005	0.0035	0.0020
1	0	0	0.001	0.002	0.0015
Target Deflection (in.)					
1	0.5	9600	0.501	0.5185	0.5098
1	0.75	9890	0.7545	0.802	0.7783
1	1	10000	1.065	1.0245	1.0448
Target Load					
1	10000	10000	1.065	1.0245	1.0448
1	0	0	1.065	1.0245	1.0448

Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.09	0.062	0.0760
1	1000	1000	0.1945	0.1345	0.1645
1	1500	1540	0.328	0.2385	0.2833
1	0	0	0.05	0.0435	0.0468
1	500	500	0.1595	0.109	0.1343
1	1000	1020	0.249	0.1745	0.2118
1	1500	1500	0.351	0.26	0.3055
1	2000	2000	0.488	0.371	0.4295
1	2500	2500	0.65	0.5065	0.5783
1	0	0	0.1905	0.142	0.1663
1	2500	2500	0.722	0.5675	0.6448
1	3000	3000	0.8925	0.7175	0.8050
1	3500	3500	1.0825	0.9	0.9913
1	4000	-	-	-	-
Target Deflection (in.)					
1	0.25	1540	0.328	0.2385	0.2833
1	0.5	2300	0.61	0.4555	0.5328
1	1	3550	1.116	0.9265	1.0213
Target Load					
1	6000	-	-	-	-
1	0	0	0.218	0.152	0.185

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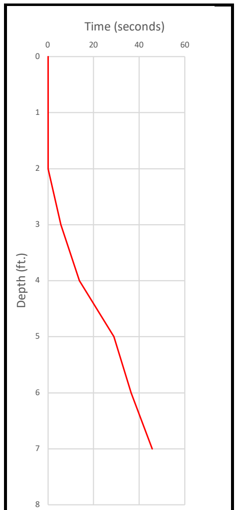
Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-16 A
Date/Time Installed:	2/27/2021 13:30	Date/Time Tested:	3/3/2021 13:30
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	7
Avg. Installation Rate (sec/ft.):	26.2	Pile Section	W6x9x15

Embedment Data	
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	5.71
4	13.85
5	28.94
6	36.57
7	45.66
Total Time (s) =	130.73

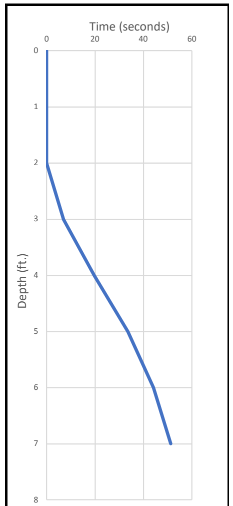


Tensile Testing					
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	300	0.001	0.0025	0.0018
1	500	500	0.0015	0.0035	0.0025
1	1000	1040	0.003	0.008	0.0055
1	1500	1520	0.0045	0.012	0.0083
1	2000	2040	0.0055	0.016	0.0108
1	1500	-	-	-	#DIV/0!
1	1000	1040	0.003	0.0105	0.0068
1	500	560	0.0015	0.0065	0.0040
1	250	280	0.0005	0.003	0.0018
1	0	0	0	0	0.0000
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10200	0.01	0.0875	0.0488
1	0	0	0.0085	0.0105	0.0095

Lateral Testing					
Lateral Load Height Above Grade (ft):		3	Deflection Gauge Height (in):		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.064	0.064	0.0640
1	1000	1000	0.1375	0.133	0.1353
1	1500	1500	0.2075	0.2045	0.2060
1	0	0	0.0075	0.009	0.0083
1	500	500	0.0715	0.0725	0.0720
1	1000	1000	0.14	0.14	0.1400
1	1500	1500	0.2045	0.209	0.2068
1	2000	2000	0.2855	0.288	0.2868
1	2500	2500	0.3725	0.377	0.3748
1	0	0	0.0245	0.011	0.0178
1	2500	2500	0.3645	0.3985	0.3815
1	3000	3000	0.443	0.4785	0.4608
1	3500	3500	0.542	0.579	0.5605
1	4000	-	-	-	-
Target Deflection (in.)					
1	0.25	1860	0.2565	0.2605	0.2585
1	0.5	3150	0.4875	0.536	0.5118
1	1	5380	0.9965	1.034	1.0153
Target Load					
1	6000	-	-	-	-
1	0	0	0.062	0.027	0.0445

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-16 B
Date/Time Installed:	2/27/2021 13:30	Date/Time Tested:	3/3/2021 13:45
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	7
Avg. Installation Rate (sec/ft.):	31.1	Pile Section	W6x9x15

Embedment Data	
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	6.94
4	19.54
5	33.51
6	44.01
7	51.23
Total Time (s) =	155.23



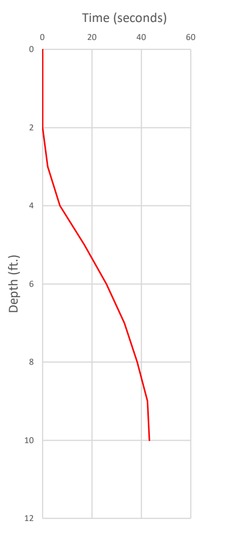
Tensile Testing					
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	240	0	0.0005	0.0003
1	500	500	0.001	0.0015	0.0013
1	1000	1040	0.001	0.003	0.0020
1	1500	1520	0.0015	0.0045	0.0030
1	2000	2000	0.002	0.0055	0.0038
1	1500	1400	0.001	0.0045	0.0028
1	1000	960	0.001	0.0035	0.0023
1	500	460	0.001	0.0025	0.0018
1	250	260	0.001	0.0015	0.0013
1	0	0	0	0.001	0.0005
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.07	0.0565	0.0633
1	0	0	0.0485	0.044	0.0463

Lateral Testing					
Lateral Load Height Above Grade (ft):		3	Deflection Gauge Height (in):		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.066	0.0585	0.0623
1	1000	1000	0.1325	0.136	0.1343
1	1500	1500	0.199	0.21	0.2045
1	0	0	0.0195	0.011	0.0153
1	500	500	0.0815	0.0725	0.0770
1	1000	1000	0.142	0.143	0.1425
1	1500	1500	0.2015	0.214	0.2078
1	2000	2000	0.277	0.2975	0.2873
1	2500	2500	0.36	0.385	0.3725
1	0	0	0.049	0.018	0.0335
1	2500	2500	0.349	0.4075	0.3783
1	3000	3000	0.4275	0.4875	0.4575
1	3500	3500	0.525	0.5875	0.5563
1	4000	4000	0.629	0.696	0.6625
Target Deflection (in.)					
1	0.25	1860	0.25	0.2685	0.2593
1	0.5	3150	0.482	0.542	0.5120
1	1	5380	0.986	1.07	1.0280
Target Load					
1	6000	-	-	-	-
1	0	0	0.109	0.0505	0.07975

ANS GEO

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-17 A
Date/Time Installed:	3/1/2021 13:30	Date/Time Tested:	9:20AM 3/4/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2.5
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	10
Avg. Installation Rate (sec/ft.):	26.1	Pile Section	W6x9x15

Embedment Data	
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	2.05
4	6.96
5	16.82
6	25.78
7	33.05
8	38.21
9	42.38
10	43.22
Total Time (s) =	208.47

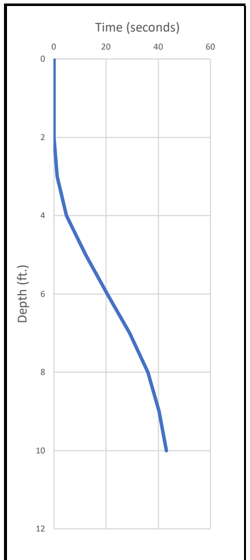


Tensile Testing					
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	300	0.0005	0.0025	0.0015
1	500	520	0.001	0.003	0.0020
1	1000	1040	0.003	0.006	0.0045
1	1500	1540	0.004	0.008	0.0060
1	2000	2040	0.0045	0.009	0.0068
1	1500	1480	0.0035	0.0085	0.0060
1	1000	1020	0.003	0.0085	0.0058
1	500	600	0.002	0.0065	0.0043
1	250	250	0.0005	0.0045	0.0025
1	0	0	0.0005	0.0035	0.0020
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.01	0.01	0.0100
1	0	0	0.006	0.005	0.0055

Lateral Testing					
Lateral Load Height Above Grade (ft):		3	**Deflection Gauge Height (in):**		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	520	0.1125	0.157	0.1348
1	1000	1000	0.18	0.225	0.2025
1	1500	1520	0.257	0.301	0.2790
1	0	0	0.032	0.0455	0.0388
1	500	500	0.1025	0.1565	0.1295
1	1000	1000	0.1905	0.2445	0.2175
1	1500	1500	0.262	0.3115	0.2868
1	2000	2000	0.351	0.3945	0.3728
1	2500	2500	0.4695	0.501	0.4853
1	0	0	0.107	0.1405	0.1238
1	2500	2500	0.518	0.538	0.5280
1	3000	3000	0.6225	0.6305	0.6265
1	3500	3500	0.7845	0.778	0.7813
1	4000	4000	0.925	0.918	0.9215
Target Deflection (in.)					
1	0.25	1380	0.236	0.2805	0.2583
1	0.5	2420	0.4865	0.5195	0.5030
1	1	4380	1.021	0.9965	1.0088
Target Load					
1	6000	-	-	-	-
1	0	0	0.1215	0.113	0.11725

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-17 B
Date/Time Installed:	3/1/2021 13:30	Date/Time Tested:	9:35AM 3/4/2021
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2.75
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	10
Avg. Installation Rate (sec/ft.):	23.4	Pile Section	W6x9x15

Embedment Data	
Depth (ft.)	Time (s)
0	0
1	0
2	0
3	1.18
4	4.75
5	12.16
6	20.38
7	29.06
8	36.03
9	40.27
10	43.05
Total Time (s) =	185.7



Tensile Testing					
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	260	0.0025	0.0005	0.0015
1	500	540	0.0045	0.001	0.0028
1	1000	1040	0.008	0.003	0.0055
1	1500	1520	0.0115	0.0045	0.0080
1	2000	2020	0.015	0.006	0.0105
1	1500	1420	0.013	0.005	0.0090
1	1000	-	-	-	#DIV/0!
1	500	680	0.0085	0.003	0.0058
1	250	240	0.0045	1	0.5023
1	0	0	0.002	0.001	0.0015
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.069	0.0055	0.0373
1	0	0	0.017	0.012	0.0145

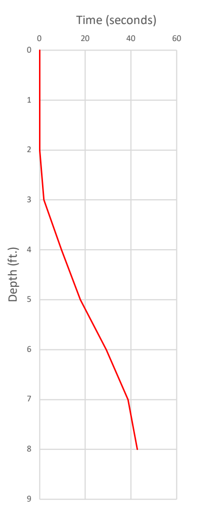
Lateral Testing					
Lateral Load Height Above Grade (ft):		3	**Deflection Gauge Height (in):**		4
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	520	0.1195	0.1765	0.1480
1	1000	1000	0.2045	0.253	0.2288
1	1500	1520	0.301	0.3605	0.3308
1	0	0	0.025	0.0725	0.0488
1	500	500	0.115	0.176	0.1455
1	1000	1000	0.227	0.277	0.2520
1	1500	1500	0.318	0.361	0.3395
1	2000	2000	0.429	0.4675	0.4483
1	2500	2500	0.5615	0.5975	0.5795
1	0	0	0.1045	0.1845	0.1445
1	2500	2500	0.5955	0.6505	0.6230
1	3000	3000	0.7055	0.755	0.7303
1	3500	3500	0.8585	0.905	0.8818
1	4000	4000	0.9955	1.0255	1.0105
Target Deflection (in.)					
1	0.25	1200	0.24	0.2935	0.2668
1	0.5	2250	0.4865	0.5195	0.5030
1	1	4000	0.9955	1.0255	1.0105
Target Load					
1	6000	-	-	-	-
1	0	0	0.1315	0.207	0.16925

PLT-18 A

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-18 A
Date/Time Installed:	3/1/2021 16:30	Date/Time Tested:	1:45PM 3/6/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2.5
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	8
Avg. Installation Rate (sec/ft.):	23.4	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	2.01
4	9.58
5	17.96
6	29.23
7	38.78
8	42.74
Total Time (s) =	140.3



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	280	0.0010	0.0010	0.0010
1	500	500	0.0015	0.0030	0.0023
1	1000	1060	0.0025	0.0075	0.0050
1	1500	1480	0.0035	0.0115	0.0075
1	2000	2060	0.0075	0.0160	0.0118
1	1500	-	-	-	-
1	1000	1140	0.0035	0.1050	0.0543
1	500	500	0.0025	0.0085	0.0055
1	250	300	0.0015	0.0060	0.0038
1	0	0	0.0015	0.0025	0.0020
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.019	0.022	0.0205
1	0	0	0.01	0.02	0.0150

Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4

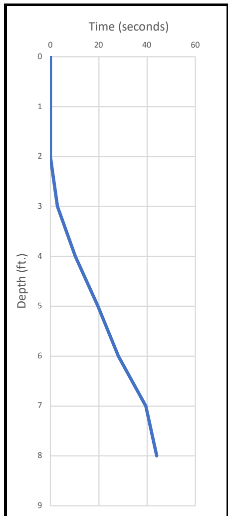
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	600	0.1300	0.0945	0.1123
1	1000	1000	0.2290	0.1865	0.2078
1	1500	1500	0.3505	0.3100	0.3303
1	0	0	0.0445	0.0380	0.0413
1	500	500	0.1265	0.1325	0.1295
1	1000	1000	0.2490	0.2370	0.2430
1	1500	1500	0.3505	0.3290	0.3398
1	2000	2000	0.4620	0.4335	0.4478
1	2500	2500	0.5760	0.5425	0.5593
1	0	0	0.0625	0.0725	0.0675
1	2500	2500	0.6085	0.5850	0.5968
1	3000	3000	0.7270	0.6970	0.7120
1	3500	3500	0.8450	0.8050	0.8250
1	4000	4000	0.9860	0.9360	0.9610
Target Deflection (in.)					
1	0.25	1300	0.278	0.234	0.2560
1	0.5	2200	0.5355	0.4795	0.5075
1	1	4200	1.0390	0.9860	1.0125
Target Load					
1	6000	-	-	-	-
1	0	0	0.1105	0.155	0.13275

PLT-18 B

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-18 B
Date/Time Installed:	3/1/2021 16:45	Date/Time Tested:	2PM 3/6/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	2.5
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	8
Avg. Installation Rate (sec/ft.):	24.0	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0
3	2.85
4	10.25
5	19.58
6	28.09
7	39.51
8	43.95
Total Time (s) =	144.23



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	280	0.0010	0.0030	0.0020
1	500	520	0.0025	0.0045	0.0035
1	1000	1000	0.0045	0.0085	0.0065
1	1500	1500	0.0080	0.0140	0.0110
1	2000	2000	0.0100	0.0180	0.0140
1	1500	-	-	-	-
1	1000	1160	0.0060	0.0135	0.0098
1	500	480	0.0010	0.0085	0.0048
1	250	260	0.0010	0.0065	0.0038
1	0	0	0.0000	0.0040	0.0020
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.055	0.049	0.0520
1	0	0	0.019	0.02	0.0195

Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	600	0.0770	0.0980	0.0875
1	1000	1000	0.1410	0.1880	0.1645
1	1500	1500	0.2275	0.2900	0.2588
1	0	0	0.0385	0.4550	0.2468
1	500	500	0.1010	0.1250	0.1130
1	1000	1000	0.1755	0.2205	0.1980
1	1500	1500	0.2395	0.2990	0.2693
1	2000	2000	0.3160	0.3885	0.3523
1	2500	2500	0.4045	0.4870	0.4458
1	0	0	0.0690	0.0585	0.0638
1	2500	2500	0.4400	0.5415	0.4908
1	3000	3000	0.5385	0.6585	0.5985
1	3500	3500	0.6415	0.7790	0.7103
1	4000	4000	0.7750	0.9290	0.8520
Target Deflection (in.)					
1	0.25	1500	0.2275	0.2900	0.2588
1	0.5	2500	0.4400	0.5415	0.4908
1	1	4660	0.9255	1.1250	1.0253
Target Load					
1	6000	-	-	-	-
1	0	0	0.163	0.1315	0.14725

A N S GEO

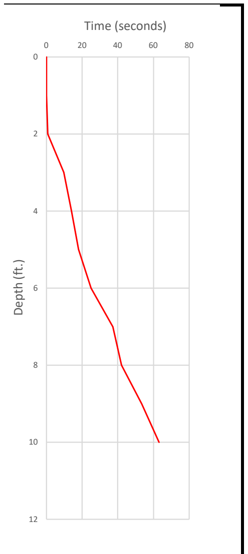
PLT-19 A

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-19 A
Date/Time Installed:	3/1/2021 16:30	Date/Time Tested:	3PM 3/6/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	1.5
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	10
Avg. Installation Rate (sec/ft.):	29.3	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	0.79
3	9.8
4	14.05
5	18.01
6	25.12
7	37.22
8	42.08
9	53.32
10	62.95
Total Time (s) =	263.34

65



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	240	0.0015	0.0025	0.0020
1	500	500	0.0045	0.0055	0.0050
1	1000	1000	0.0085	0.0120	0.0103
1	1500	1500	0.0125	0.0170	0.0148
1	2000	2000	0.0160	0.0215	0.0188
1	1500	1460	0.0140	0.0185	0.0163
1	1000	1000	0.0095	0.0120	0.0108
1	500	500	0.0060	0.0075	0.0068
1	250	240	0.0030	0.0035	0.0033
1	0	0	0.0010	0.0010	0.0010
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.035	0.075	0.0550
1	0	0	0.003	0.0075	0.0053

Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4

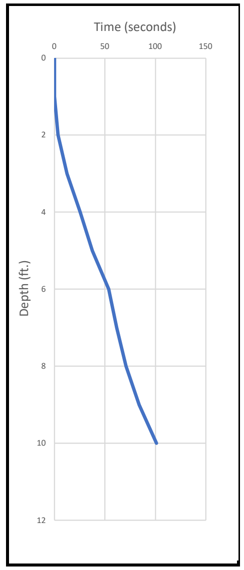
Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0530	0.0880	0.0705
1	1000	1000	0.1215	0.1700	0.1458
1	1500	1500	0.2000	0.2600	0.2300
1	0	0	0.0305	0.0565	0.0435
1	500	500	0.0845	0.1225	0.1035
1	1000	1000	0.1480	0.2025	0.1753
1	1500	1500	0.2150	0.2770	0.2460
1	2000	2000	0.2880	0.3640	0.3260
1	2500	2500	0.3880	0.4795	0.4338
1	0	0	0.0765	0.1040	0.0903
1	2500	2500	0.4255	0.5225	0.4740
1	3000	3000	0.5235	0.6275	0.5755
1	3500	3500	0.6380	0.7510	0.6945
1	4000	4000	0.7785	0.8850	0.8318
Target Deflection (in.)					
1	0.25	1550	0.2200	0.2890	0.2545
1	0.5	3150	0.4685	0.552	0.5103
1	1	4700	0.9545	1.0655	1.0100
Target Load					
1	6000	-	-	-	-
1	0	0	0.34	0.4195	0.37975

PLT-19 B

Project:	ibV Energy-Rhudes Creek	Pile ID:	PLT-19 B
Date/Time Installed:	3/1/2021 16:30	Date/Time Tested:	3:15PM 3/6/21
Pre-Auger (Y/N)?:	N	Pushed to Depth (ft.):	1.75
Pre-Auger Depth (ft):	-	Embedment Depth (ft.):	10
Avg. Installation Rate (sec/ft.):	50.1	Pile Section	W6x9x15

Embedment Data

Depth (ft.)	Time (s)
0	0
1	0
2	3.69
3	12.48
4	25.47
5	37.63
6	53.73
7	61.74
8	70.96
9	84.03
10	101.08
Total Time (s) =	450.81



Tensile Testing

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	250	300	0.0005	0.0010	0.0008
1	500	500	0.0010	0.0020	0.0015
1	1000	1000	0.0030	0.0030	0.0030
1	1500	1500	0.0040	0.0035	0.0038
1	2000	2000	0.0065	0.0040	0.0053
1	1500	1350	0.0045	0.0040	0.0043
1	1000	940	0.0040	0.0040	0.0040
1	500	460	0.0035	0.0035	0.0035
1	250	200	0.0030	0.0030	0.0030
1	0	0	0.0010	0.0010	0.0010
Target Deflection (in.)					
1	0.5	-	-	-	-
1	0.75	-	-	-	-
1	1	-	-	-	-
Target Load					
1	10000	10000	0.075	0.065	0.0700
1	0	0	0.016	0.0095	0.0128

Lateral Testing

Lateral Load Height Above Grade (ft):	3	**Deflection Gauge Height (in):**	4

Hold Time (min)	Target Load (lbs)	Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0780	0.0335	0.0558
1	1000	1000	0.1510	0.1010	0.1260
1	1500	1500	0.2245	0.1650	0.1948
1	0	0	0.0305	0.0100	0.0203
1	500	500	0.1010	0.0890	0.0950
1	1000	1000	0.1715	0.1205	0.1460
1	1500	1500	0.2380	0.1890	0.2135
1	2000	2000	0.3010	0.2335	0.2673
1	2500	2500	0.3805	0.2975	0.3390
1	0	0	0.0475	0.0335	0.0405
1	2500	2500	0.4105	0.3130	0.3618
1	3000	3000	0.4855	0.3990	0.4423
1	3500	3500	0.5690	0.4605	0.5148
1	4000	4000	0.6605	0.5505	0.6055
Target Deflection (in.)					
1	0.25	2000	0.3010	0.2335	0.2673
1	0.5	3400	0.5540	0.4505	0.5023
1	1	6000	1.0365	0.9345	0.9855
Target Load					
1	6000	6000	1.0365	0.9345	0.9855
1	0	0	0.1145	0.1995	0.157

Attachment F

Seismic Support Data

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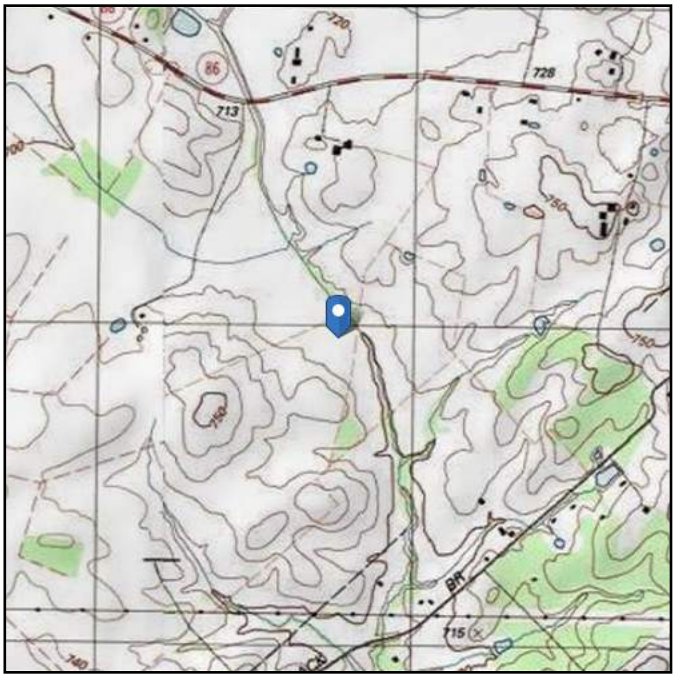
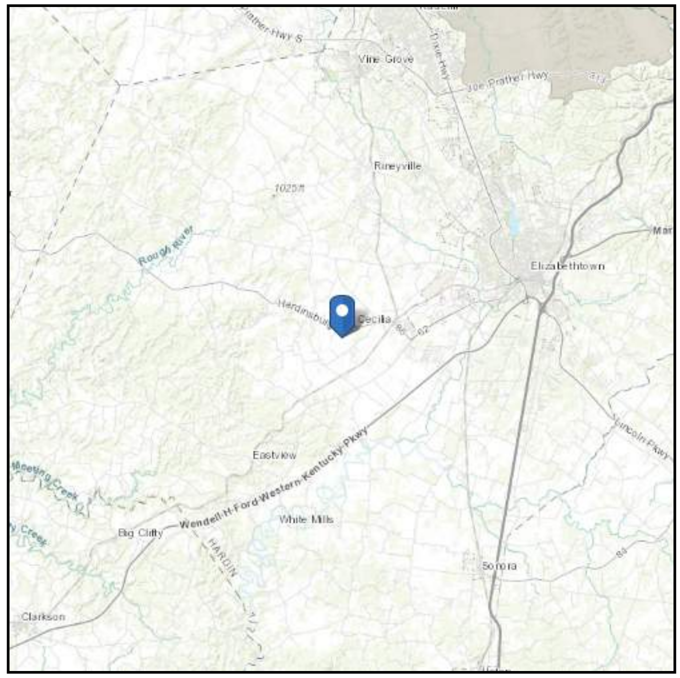
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: C - Very Dense Soil and Soft Rock

Elevation: 704.01 ft (NAVD 88)
Latitude: 37.656346
Longitude: -85.993722





ASCE
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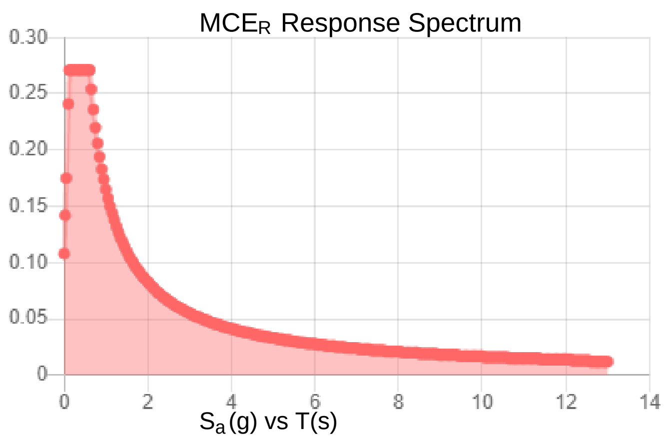
Seismic

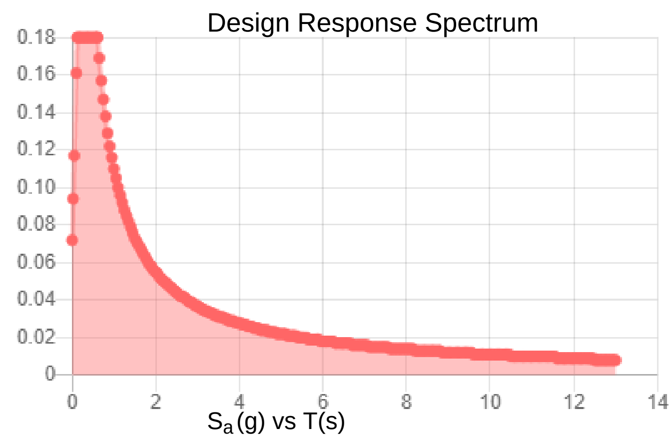
Site Soil Class: C - Very Dense Soil and Soft Rock

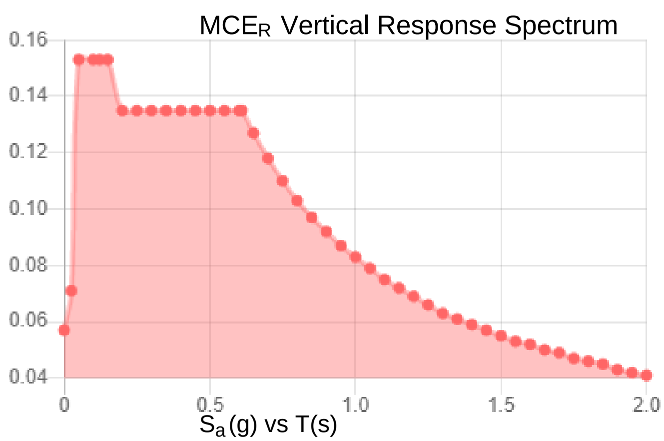
Results:

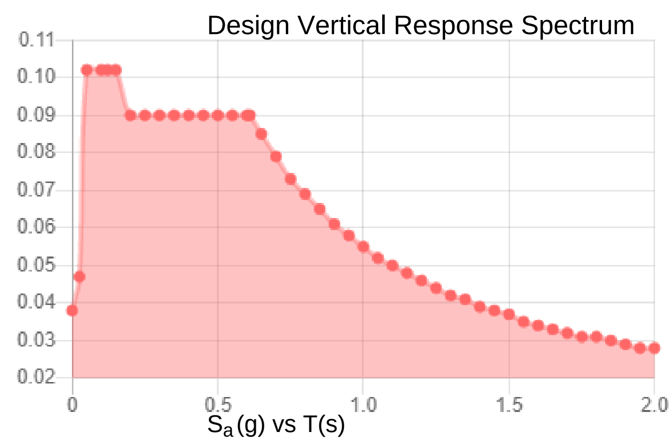
S_S :	0.208	S_{D1} :	0.11
S_1 :	0.11	T_L :	12
F_a :	1.3	PGA :	0.101
F_v :	1.5	PGA_M :	0.131
S_{MS} :	0.271	F_{PGA} :	1.299
S_{M1} :	0.165	I_e :	1
S_{DS} :	0.18	C_v :	0.708

Seismic Design Category B









Data Accessed: Wed Mar 31 2021

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

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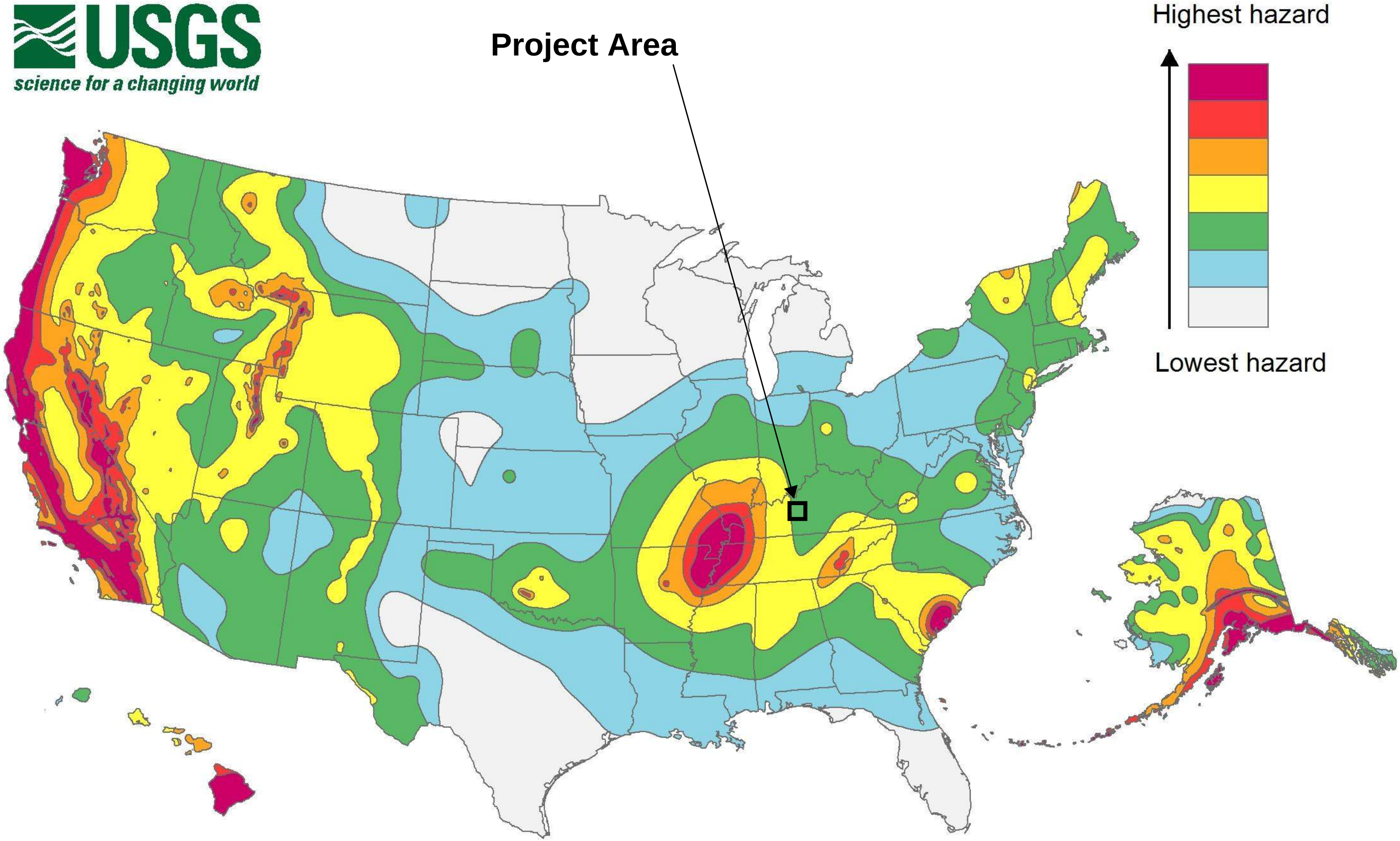

USGS
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Project Area
Highest hazard
Lowest hazard

Attachment G

Geophysical Report (Karst Investigation)

GEOPHYSICAL INVESTIGATION
Rhudes Creek Solar Project
Cecilia, Kentucky

Prepared for:
ANS Geo, Inc.
4405 S Clinton Ave
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February 24, 2021

Prepared by:

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THG Project No. 1265-10736

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1.0 INTRODUCTION

1.1 BACKGROUND

THG Geophysics, Ltd. (THG) conducted a geophysical investigation to characterize a sampling of the subsurface across approximately 950 acres of the proposed Rhudes Creek Solar Project and transmission line Right-of-Way (ROW) located near Cecilia, Kentucky. The project site is in an area prone to development of sinkholes and other karst phenomena. The survey was completed February 8-12, 2021 (**Figure 1**).

1.2 WORK SCOPE

The scope of work included the use of electrical resistivity imaging (EI) and multichannel analysis of surface wave (MASW) testing to characterize bedrock in an area known to be impacted by karst. THG utilized a GF Instruments' ARES II electrical resistivity meter and a Geometrics Geode seismograph to image the subsurface. Given the size of the project site, testing locations were selected to be distributed across the property while also targeting potential karst features determined in the field (**Figure 2**).

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2.0 GEOPHYSICAL INVESTIGATION

2.1 ELECTRICAL IMAGING THEORY

2.1.1 Introduction

Electrical resistance is based upon Ohm's Law:

$$R = \frac{V}{I} \quad [ohms]$$

Where, resistance, **R**, is equal to the ratio of potential, **V** (volts) to current flow, **I** (amperes).

Resistivity is the measure of the resistance along a linear distance of a material with a known cross-sectional area. Consequently, resistivity is measured in Ohm-meters. This report presents the geophysical results as geo-electrical profiles of modeled resistance plotted as 2-dimensional profiles of distance and depth, in units of feet.

Electrical currents propagate as a function of three material properties (1) ohmic conductivity, (2) electrolytic conductivity, and (3) dielectric conductivity. Ohmic conductivity is a property exhibited by metals. Electrolytic conductivity is a function of the concentration of total dissolved solids and chlorides in the groundwater that exists in the pore spaces of a material. Dielectric conductivity is a function of the permittivity of the matrix of the material. Therefore, the matrix of most soil and bedrock is highly resistive. Of these three properties, electrolytic conductivity is the dominant material characteristic that influences the apparent resistivity values collected by this method. In general, resistivity values decrease in water-bearing rocks and soil with increasing:

a. Fractional volume of the rock occupied by groundwater;
b. Total dissolved solid and chloride content of the groundwater;
c. Permeability of the pore spaces; and,
d. Temperature.

Materials with minimal primary pore space (i.e., limestone, dolomite) or those which lack groundwater in the pore spaces will exhibit high resistivity values (Mooney, 1980). Highly porous, moist, or saturated soil will exhibit very low resistivity values.

In homogeneous ground, the apparent resistivity is the true ground resistivity; however, in heterogeneous ground, the apparent resistivity represents a weighted average of all formations through which the current passes. Many electrode placements (arrays) have been proposed (for examples see Reynolds, 1997); however, the Schlumberger array has proven to be an effective configuration for imaging bedrock. The following Schlumberger array was used in the collection of data:

$$R_i = \frac{\pi a^2}{b} [1 - \frac{b^2}{4a^2}] R; \; a = 5b$$

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Where, R_i, resistivity, is related to the number of poles, n, the separation distance between the current source and current sink b, and the pole spacing, **a**.

2.1.2 Methods

The resistivity survey was performed using the ARES II multi-electrode cable system (GF Instruments, s.r.o., Brno, Czech Republic). The survey was conducted using stainless steel electrodes and passive multi-electrode cables with switch boxes. Twenty nine (29) EI profiles were collected with a 3-m step-out Schlumberger array. The locations and elevations of all data were recorded in the field using a Trimble Geo-7XH global positioning system (DGPS).

2.2 PROCESSING

A forward modeling subroutine was used to calculate the apparent resistivity values using the EarthImager2D program (AGI, 2002). This program is based on the smoothness-constrained least-squares method (deGroot-Hedlin and Constable, 1990; Loke and Barker, 1996). The smoothness-constrained least-squares method is based upon the following equation:

$$J^T g = (J^T J + \mu F)d$$

Where, **F** is a function of the horizontal and vertical flatness filter, **J** is the matrix of partial derivatives, **μ** is the damping factor, **d** is the model perturbation vector, and **g** is the discrepancy vector.

The EarthImager2D program divides the subsurface 2-D space into a number of rectangular blocks. Resistivities of each block are then calculated to produce an apparent resistivity pseudo section. The pseudo section is compared to the actual measurements for consistency. A measure of the difference is given by the root-mean-squared (rms) error.

2.3 MULTICHANNEL ANALYSIS OF SURFACE WAVES THEORY

Multichannel Analysis of Surface Waves (MASW) is a method of collecting shear-wave data using surface wave velocity analysis (Xia, et al., 2000). MASW uses surface wave fronts (i.e., Raleigh and Love waves) to predict the shear wave velocity often to a depth of 75 feet or greater. This method is non-destructive and non-intrusive. MASW theory holds that the penetration depth of a surface wave increases with wavelength. Further, propagation velocity (i.e., phase velocity) is determined mainly by shear-wave velocity of penetrated materials; consequently, surface waves have nearly the same velocity as shear wave at depth. Through the use of dispersion curves, or the change of propagation speed (i.e., phase velocity) with wavelength (or frequency), the shear wave velocity with depth can be derived.

One-dimensional multichannel analysis of surface waves (MASW) data was collected at eleven (11) locations across the site. Elastic waves were initiated using a 16-lbs sledge hammer striking a 12-in by 12-in aluminum plate. The velocity data were collected using a 24-channel seismograph and 4.5-Hz geophones in a 5-foot step-out array. Three events (5 stacks each) were recorded and processed using SurfSeis 6.0.1.4 software. The location of each MASW test was recorded using a Trimble Geo-7XH DGPS.

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3.0 GEOLOGY

The bedrock in the project area primarily consists of the Mississippian-aged Ste. Genevieve Limestone (**Figure 3**). This unit consists of limestone, dolomite, and shale. Limestone is light yellowish gray and massive, interbedded with sublithographic to medium-grained clastic limestone. Dolomite is yellowish gray, very fine grained and massive. Shale is yellowish to greenish gray. This unit is commonly covered by as much as 30 feet of soil (Kepferle 1963). This soil coverage is consistent with a preliminary geotechnical report performed by Terracon that revealed auger refusal depths of 6.5 to 26 feet below grade (ft bg) across the site.

The Karst Potential Classification developed by the Kentucky Geological Survey (KGS) classifies this unit as having very high karst potential. This classification is defined by thick-bedded, typically fine-grained and pure limestone units with little or no insoluble content. Units in this class will exhibit mature karst, including caves, sinkholes, and springs where they crop out (KGS Karst Potential Index).

The Kentucky Geological Survey also developed a GIS database of topographically mapped depressions resulting from karst processes (i.e. sinkholes). This database was developed by digitizing the highest elevation, closed, topographic contour as a polygon. Although these data do not indicate the probability of future cover-collapse or bedrock collapse, they do identify areas where karst features are likely to have developed. These features are common along the eastern and western borders of the project site (Purple hashed polygons, **Figure 2**).

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4.0 GEOPHYSICAL ANALYSES

4.1 INTRODUCTION

This report covers the 950-acre proposed Rhudes Creek Profect and is divided into eight project areas and a transmission line right-of-way (ROW). This naming scheme does not necessarily divide the site into distinct subsurface conditions, but was instead based on polygon divisions provided by ANS during the proposal phase of this survey (Areas 1-8 & ROW, **Figure 2**).

4.1.1 Electrical Imaging

Twenty-nine (29) EI profiles were collected within the eight (8) project areas and ROW (**Figures 2-11**). All profiles were acquired using a three-meter (9.8 feet) electrode spacing and imaged to a depth of approximately forty-eight (48) feet below grade (ft bg), with slight variations depending on topography.

EI test locations were selected to get both a sampling of subsurface conditions across the site and to delineate potential karst features. Potential karst features were determined in the field using a combination of aerial imagery showing farmer-avoidance areas; observations of depressions that either ephemerally or actively held shallow standing water (orange polygons, **Figure 2**); and low-grade erosional creeks that lead to depressions. This report does not include all depressions within the nine (9) study areas.

Low apparent resistivity values are typically associated with soils, saturated materials, and highly weathered bedrock, whereas high apparent resistivity values are associated with rock (increasing with rock competence). Clay materials can exhibit a range of resistivity from 1-100 Ohm-m, sand and shale can exhibit a range from 20-300 Ohm-m, and limestone units can exhibit a range of resistivity from 100-1,000,000 Ohm-m, depending on weathering and porosity. Consequently, very high apparent resistivity measurements can indicate very hard, non-permeable rock (i.e., limestone) or air–filled voids. Very low apparent resistivity measurements can indicate soil or saturated voids.

The preliminary geotechnical report by Terracon observed groundwater between 3-18.5 ft bg at this site. Because groundwater is relatively close to the surface, voids may exist within rock zones that show high variability. Similarly, drier soils near the surface overlying saturated soils at depth are commonly exhibited as resistivity inversions at this site, where a more resistive layer near the surface is underlain by a less resistive layer. In areas with deeper soil, this is likely due to increases in saturation with depth. However, in areas with shallow rock, this resistivity inversion may be caused by more competent rock underlain by more vuggy, saturated rock.

4.1.2 MASW

Eleven (11) 1-D MASW profiles were collected at the center point (~113 feet) of each EI profile. MASW test locations were selected to provide a relatively even distribution across the project site and to help further characterize EI data. Results are included in this report as stand-alone intervals (**Table 1, Figures 12-15**) and as overlays on EI profiles, highlighting velocity increases that may indicate the transition from overburden to bedrock (Vs overlays, **Figures 4-10**). These must be the stars that are on the figures – you have lable them on the figures

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Various rock types display unique shear wave velocities that are further impacted by factors such as saturation, temperature, and porosity. Shale has a shear wave velocity of 1,500-8,000 ft/s and limestones exhibit shear wave velocities from 1,000-8,000 ft/s (Greenwood, 2015).

4.2 Area 1

Area 1 is located along the western edge of the project site and measures approximately 75 acres (**Figure 4**). At the time of this survey, this area was highly saturated and is adjacent to an alluvial deposit along the creek (**Figure 3**). KGS sinkhole GIS identified potential karst features along the northern and western edge of this area (Paylor et al. 2003).

EI Lines 1 and 3 were collected in saturated surface soil conditions through observed depressions, while Line 2 was collected in a drier area. Additionally, EI Line 3 was collected diagonally across the footprint of a proposed substation near the entrance to the transmission line ROW.

No anomalies were identified in EI profiles collected near depressions. However, EI Line 1 exhibits some lateral variation in resistivity at depth, likely due to irregular weathering of limestone surface at depth.

MASW tests M1 and M2, collected in Area 1, indicate that top of rock is at approximately 35-40 ft bg where tested, consistent with an increase in resistivity at those depths along the EI profiles (Vs overlay, **Table 1; Figure 4**; **Figure 12**).

4.3 Area 2

Area 2 is located along the southwestern edge of the project site and measures approximately 75 acres (**Figure 5**). Four (4) EI profiles and one (1) MASW test were acquired in Area 2. No field depressions or KGS sinkholes were identified in this area, but EI Lines 4-5 were collected perpendicular to a low-grade erosional creek that held standing water in some areas (Paylor et al. 2003).

EI Lines 4, 6, and 7 exhibit resistivity inversions to varying extents along each profile (**Table 2**). The inversion at 140-226 feet along EI Line 4 overlies a decrease in resistivity at depth, indicating a possible increase in shallow porosity caused by deeper karst features. Inversions on EI Lines 6 and 7 are likely related to changes in saturation with depth.

MASW test M3, collected in Area 2, indicates that top of rock is at approximately 30 bg, consistent with an increase in resistively at that depth along EI Line 7 (Vs overlay**, Table 1; Figure 5**; **Figure 12**).

4.4 Area 3

Area 3 is located in the central portion of the project site and measures approximately 204 acres (**Figure 6**). Eight (8) EI profiles and two (2) MASW tests were acquired in Area 3. Five (5) field depressions exist along the creek in this area and were imaged on EI Lines 9, 10, 11, 14, and 15. These depressions occurred on or near the edges of an alluvial deposit (**Figure 3**).

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EI Lines 8, 12, 13, 14, and 15 exhibit resistivity inversions to varying extents along each profile (**Table 2**). Inversions on EI Lines 8, 13, and 14 are likely related to increasing saturation with depth through a thick overburden layer.

From 45 to 58 feet and 155 to 226 feet along EI Line 12, more conductive areas are present in an otherwise resistive shallow subsurface that connects to laterally varied resistivity inversions at depth. These features are characteristic of karst features in saturated conditions. From 20 to 120 feet along EI Line 15, apparent resistivities were far greater than other profiles, requiring the use of a different color scale than the rest of the profiles. This highly resistive feature, which overlaps with a dry depression on the surface, is characteristic of an air-filled void.

MASW tests M4 and M5, collected in Area 3, indicate that the top of rock is at approximately 33-38 feet below grade, consistent with an increase in resistivity at those depths along the EI profiles (Vs overlay, **Table 1; Figure 6**; **Figure 13**).

4.5 Area 4

Area 4 is located in the north-central portion of the project site and measures approximately 144 acres (**Figure 7**). Three (3) EI profiles and two (2) MASW tests were acquired in Area 4. No field depressions or KGS sinkholes were identified in this area, but EI line 17 was collected perpendicular to a dry erosional creek (Paylor et al. 2003).

EI Lines 16 and 17 exhibit resistivity inversions to varying extents along each profile (**Table 2**). These inversions are likely related to increasing saturation with depth through a thick overburden layer. None of the EI profiles collected in this area are interpreted to image karst-related features.

MASW tests M6 and M7, collected in Area 4, indicate that there is a variable top of rock at between approximately 17 to 44 feet below grade, consistent with an increase in resistivity at those depths along their respective EI profiles (Vs overlay, **Table 1**; **Figure 7**; **Figures 13-14**)

4.6 Area 5

Area 5 is located in the south-central portion of the project site and measures approximately 115 acres (**Figure 8**). Two (2) EI profiles and one (1) MASW tests were acquired in Area 5. No field depressions or KGS sinkholes were identified in this area (Paylor et al. 2003).

EI Lines 19 and 20 exhibit laterally extensive resistivity inversions along each profile (**Table 2**). These inversions are likely related to increasing saturation with depth through a thick overburden layer. None of the EI profiles collected in this area are interpreted to image karst-related features.

MASW test M8, collected in Area 5, indicates that the top of rock is at approximately 43 feet below grade, consistent with an increase in resistivity at that depth along EI Line 20 (**Table 1**; Vs overlay, **Figure 8**; **Figure 14**).

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4.7 Area 6

Area 6 is located in the northeastern portion of the project site and measures approximately 141 acres (**Figure 9**). Four (4) EI profiles and one (1) MASW tests were acquired in Area 6. No field depressions or KGS sinkholes were identified in this area (Paylor et al. 2003). One field depression was identified in this area and is imaged by EI Line 24. KGS sinkholes are present along the northern edge of the project site, including one within the project site that was not observed or imaged in the field. EI Line 23 was collected perpendicular to an erosional creek leading into an off-property sinkhole.

All four EI Lines collected in this area (Lines 21-24) exhibit laterally varied resistivity inversions along each profile (**Table 2**). This lateral inconsistency suggests that these features may be related to karst features instead of increased saturation with depth in the overburden. While the profiles likely did not image karst features directly, they may be the result of increased porosity in the overlying soils caused by deeper karst features.

MASW test M9, collected in Area 6, indicates that the top of rock is at approximately 41 feet below grade, consistent with an increase in resistivity at that depth along EI Line 23 (Vs overlay, **Table 1; Figure 9**; **Figure 14**).

4.8 Areas 7-8

Areas 7 and 8 are located along the southeastern edge of the project site and measure approximately 143 acres combined (**Figure 10**). Four (4) EI profiles and one (2) MASW tests were acquired in Areas 7-8. Several KGS sinkholes are located along the eastern edge of Areas 7-8 (Paylor et al. 2003). EI Line 26 was collected perpendicular to an erosional creek leading into a sinkhole in the southeast corner of Area 7. Following a heavy rain during field work, the large sinkhole along the southeastern edge of Area 8 was too wet to access and/or survey.

All four EI Lines (Lines 25-28) collected in this area exhibit resistivity inversions to varying extents along each profile (**Table 2**). Inversions on EI Lines 25, 27, and 28 are likely related to changes in saturation with depth in the soil overburden.

From 40-70 feet along EI profile 26, a slight inversion in resistivity may be related to the sinkhole located just east of the profile.

MASW tests M10 and M11, collected in Areas 7 and 8, indicate that the top of rock is at approximately 34-36 feet below grade, consistent with an increase in resistivity at those depths along each EI profile (Vs overlay, **Table 1; Figure 10**; **Figure 15**).

4.9 Right-of-Way (ROW)

The transmission line ROW is a narrow corridor of land extending north of the project site measuring approximately 40 acres (**Figure 11**). ANS request that two additional areas of interest be imaged along this ROW, if time allowed after completing the primary project areas. One surrounded a wetlands area around the middle of the ROW, and the other was for a substation near the northern extent. One EI profile was collected about two-thirds of the way across the central area of interest. However, heavy rain and flooding along the only identified access to the northern portion of the ROW prevent further surveying.

No anomalies were identified in EI Line 29, collected over the wetlands area of interest. However, this profile exhibits some lateral variation in resistivity at depth, likely due to irregular weathering of limestone surface.

5.0 CONCLUSION

This geophysical report characterizes a sampling of the subsurface at the approximately 950-acre Rhudes Creek Solar Project located southwest of Cecilia, Kentucky. The area is characterized by surface features that indicate karst is present in the subsurface. Electrical imaging acquired from February 9-11, 2021, confirms the presence of karst features at this site.

The findings and conclusions in this report are stated with a reasonable degree of scientific certainty. THG's findings and conclusions are as follows:

1. The project site is located in a geological setting with a high potential for karst development.
2. Depth to bedrock is variable, but is commonly greater than 20 feet below grade within the solar project footprint.
3. Topographically-derived sinkhole features developed by KGS located with Areas 6 and 8 were not geophysically surveyed, either because they were not observed in the field or conditions were too wet to access.
4. Shallow (within 30 ft bg) karst conditions may exist at the following locations:
    - Line 12: 45-58 ft and 155-226 ft
    - Line 15: 20-120 ft (potential air-filled void)
5. Deeper (greater than 45 ft) karst conditions may exist at the following locations:
    - Line 4: 155-226 ft
    - Line 21: 110-160 ft
    - Line 22: 160-200 ft
    - Line 23: 20-115 ft
    - Line 24: 140-180 ft
6. The results of this survey should be confirmed with drilling.

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TABLE 1
MASW Shear Wave Velocity Data

MASW ID	Easting	Northing	Elevation at Surface	Depth (ft/bg)	Elevation	Shear Wave Velocity (ft/S)
M1	4,847,395	3,764,117	711	-2	710	749
				-3	708	764
				-6	705	808
				-9	702	864
				-13	699	859
				-17	694	742
				-23	688	751
				-30	681	929
				-39	672	1,105
				-49	662	1,876
M2	4,847,567	3,764,507	703	-3	699	542
				-7	695	492
				-12	690	534
				-19	684	686
				-26	676	935
				-36	666	1,168
				-49	654	1,285
				-64	639	1,428
				-83	619	1,580
				-104	599	2,521
M3	4,845,895	3,760,254	735	-2	733	872
				-4	731	915
				-8	728	965
				-11	724	973
				-16	719	913
				-22	713	910
				-30	705	1,013
				-39	696	1,146
				-51	684	1,367
				-64	671	2,108
M4	4,849,376	3,764,237	722	-3	719	909
				-6	716	924
				-10	712	920
				-15	707	872
				-21	701	756
				-29	693	815
				-38	684	1,056
				-51	671	1,414
				-66	656	1,758
				-82	640	2,859

NOTES:

Coordinates - NAD83 State Plane
(Kentucky Single Zone), US Survey ft

Elevation - NAVD88, ft amsl

TABLE 1
MASW Shear Wave Velocity Data

MASW ID	Easting	Northing	Elevation at Surface	Depth (ft/bg)	Elevation	Shear Wave Velocity (ft/S)
M5	4,850,718	3,762,617	705	-4	701	921
				-9	696	638
				-15	690	638
				-23	682	847
				-33	672	1,144
				-45	660	1,296
				-60	645	1,475
				-79	626	1,748
				-102	602	2,173
				-128	577	3,702
M6	4,852,592	3,763,903	747	-2	744	776
				-5	742	875
				-8	738	792
				-13	734	792
				-18	728	965
				-25	722	749
				-34	713	834
				-44	702	1,168
				-57	689	1,344
				-72	675	1,785
M7	4,855,650	3,763,216	719	-1	718	1,160
				-3	717	1,033
				-4	715	907
				-7	713	907
				-9	710	907
				-13	706	907
				-17	702	1,274
				-23	697	1,737
				-30	690	1,688
				-37	682	2,381
M8	4,852,128	3,760,690	697	-3	694	783
				-6	691	783
				-11	686	783
				-17	681	783
				-24	674	783
				-32	665	913
				-43	654	1,454
				-57	640	1,142
				-74	623	1,805
				-93	604	2,071

NOTES:
Coordinates - NAD83 State Plane
(Kentucky Single Zone), US Survey ft

Elevation - NAVD88, ft amsl

TABLE 1
MASW Shear Wave Velocity Data

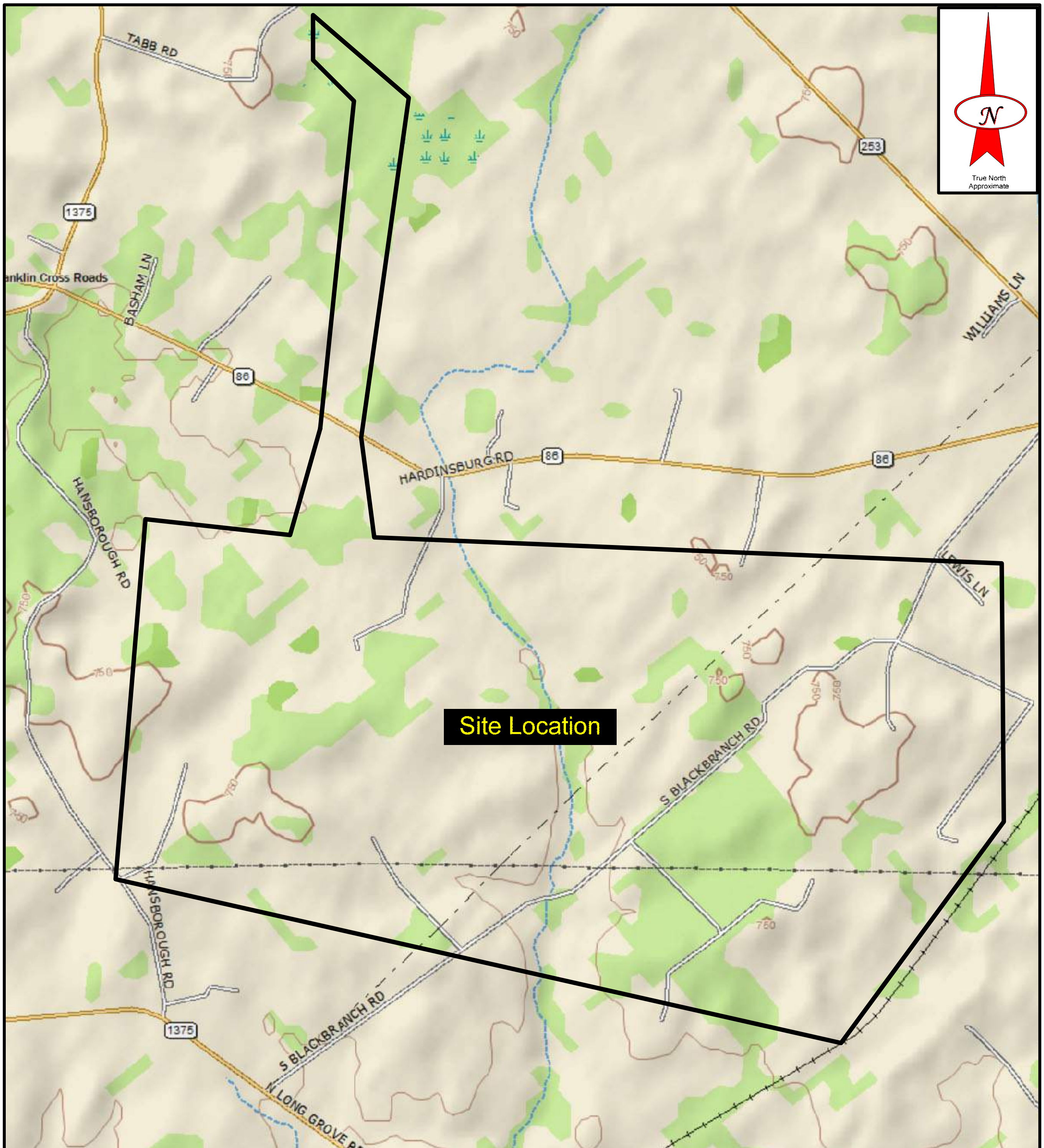
MASW ID	Easting	Northing	Elevation at Surface	Depth (ft/bg)	Elevation	Shear Wave Velocity (ft/S)
M9	4,856,770	3,762,376	713	-2	711	736
				-5	709	862
				-8	706	777
				-12	701	784
				-17	696	698
				-24	690	617
				-32	682	998
				-41	672	1,241
				-54	660	1,434
				-67	646	2,392
M10	4,856,106	3,760,208	727	-2	725	803
				-4	723	877
				-7	720	829
				-10	716	829
				-15	712	829
				-20	706	885
				-27	700	646
				-36	691	877
				-46	680	1,148
				-58	669	1,673
M11	4,854,104	3,757,464	697	-2	696	699
				-4	693	932
				-7	691	825
				-10	687	825
				-14	683	966
				-20	678	691
				-26	671	941
				-34	663	748
				-45	653	1,398
				-56	641	1,530

NOTES:
Coordinates - NAD83 State Plane
(Kentucky Single Zone), US Survey ft

Elevation - NAVD88, ft amsl

TABLE 2
EI Profile Features

Figure	Area	EI Line	Surface Feature	Surface Location (ft)	Resistivity Inversion	Potentially Karst Related	Notes
4	1	1	Depression	72 - 141			
		2			Yes		
		3	Depression	130 - 170			Standing water; Substation
5	2	4	Erosion creek	132	Yes	Yes, Deep	
		5	Erosion creek	116			Standing water
		6			Yes		
		7	Pond	170 SW	Yes		
6	3	8	Boring B-7	110	Yes		
		9	Depression	70 - 167			Standing water
		10	Depression	77 - 156			Standing water
		11	Depression	40 - 160			Standing water
		12			Yes	Yes	
		13	Pond	260 N	Yes		Wet area
		14	Depression	47 - 141	Yes		
		15	Depression	74 - 160	Yes	Yes, air-filled	Different color scale
7	4	16	Pond	100 NW	Yes		
		17	Erosion creek	87	Yes		Dry
		18	Depression	100 NE			Trees-not farmed
8	5	19			Yes		
		20			Yes		
9	6	21			Yes	Yes, Deep	
		22	Pond	22 E	Yes	Yes, Deep	
		23	Erosion creek	70	Yes	Yes, Deep	Leads into sinkhole
		24	Depression	87 - 175	Yes	Yes, Deep	Standing water
10	7	25	Erosion creek	50	Yes		Leads into sinkhole
		26			Yes	Yes, offset from profile	
10	8	27			Yes		
		28	Erosion creek	80	Yes		
11	ROW	29	Depression	300 - 474			Standing water



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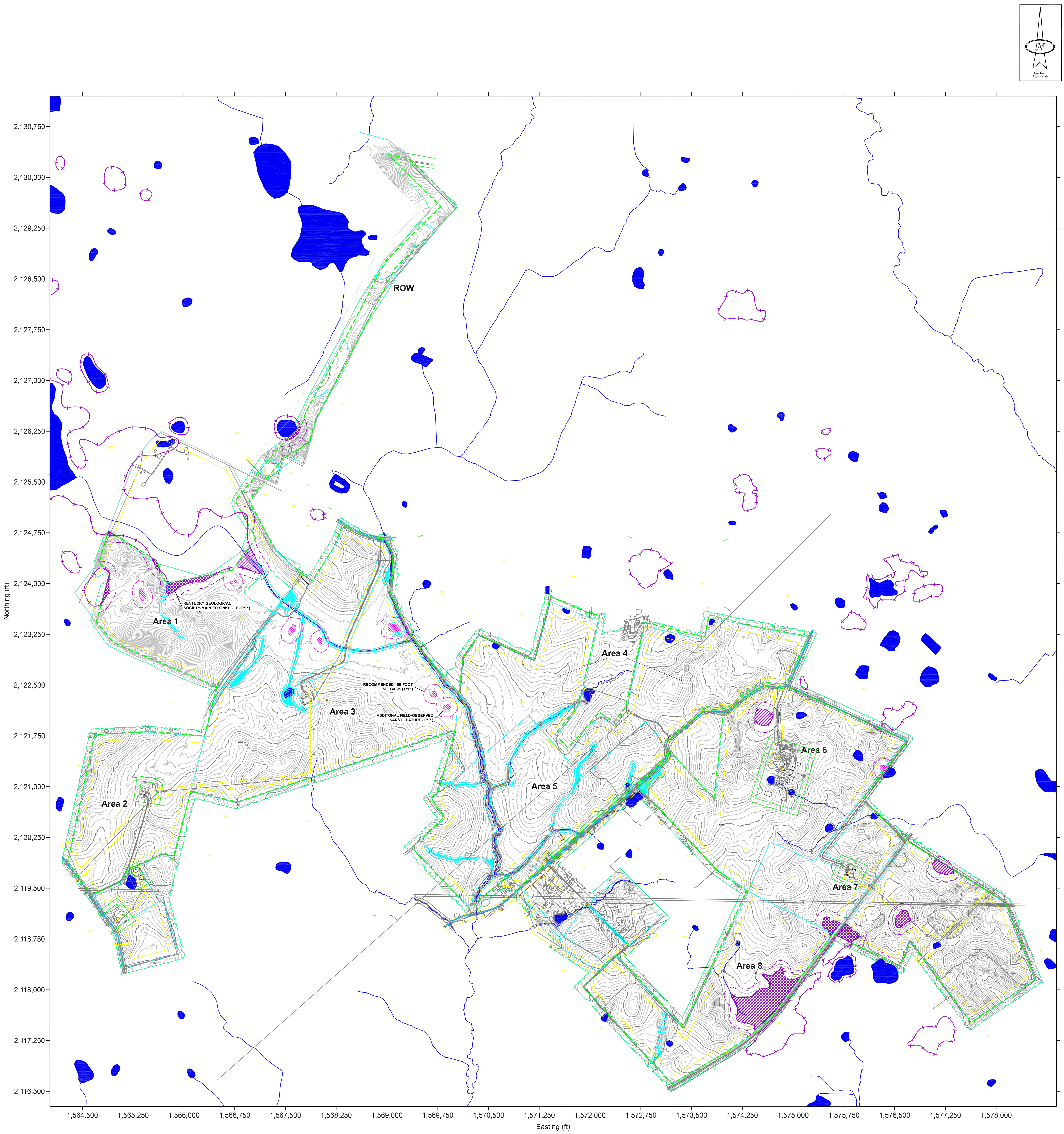
0 ft 1000 ft 2000 ft 3000 ft 4000 ft 5000 ft

Figure 1
Site Location Map

Geophysical Investigation
Rhudes Creek Solar Project
Cecilia, Kentucky

SCALE: 1:24,000	PROJECT NO.: 1265-10736	DRAWING NO.: DWG10736F1
DATE : 2/3/2021		
DRAWN BY: DJH	SOURCE: 1991 Howe Valley (KY) & 1992 Cecilia (KY) USGS 7.5 Minute Topographic Quadrangle	
CHECKED BY: KSM		



Legend

- Project Boundary
- NHD Water Bodies
- NHD Flow Lines
- Kentucky Geological Society-Mapped Sinkholes within Project Boundary
- Additional Field-Observed Karst Features within Project Boundary
- Recommended 100-Foot Setback (KGS-Mapped Sinkholes)
- Recommended 100-Foot Setback (Field-Observed Karst Features)

Notes

Geophysical survey conducted February 8-12, 2021 using a GF Instruments ARES II electrical resistivity meter with active multi-electrode cable sections and Geometrics Geode 24-channel seismograph.

Real-time positioning of data using fully integrated Trimble Geo-7X global positioning system set to NAD 1983 US State Plane (Kentucky Single Zone) coordinate system in US Survey feet.

Locations are approximate.

GIS Overlays:
Topography
Provided by TRC Companies on 4/7/2021

Water Bodies & Stream Flow Lines
USGS NHD for Hydrologic Unit 8 - 05110001, 2021

Sinkholes
Paylor, R.L., Florea, L., Caudill, M., & Currens, J. C. (2003). A GIS Sinkhole Coverage for the Karst Areas of Kentucky. Kentucky Speleological Survey, Inc., 228 Mining and Minerals Resources Building, Lexington, KY.

DRN	AXB	2/15/21
DES	AXB	2/15/21
CHK	PJH	2/23/21
REV	MLT	4/15/21
PROJ. MGR.	AXB	2/23/21

SCALE: 1 in = 750 ft

SOURCE: USGS High Resolution Orthoimagery 2012

PROJECT: Geophysical Investigation Rhudes Creek Solar Project Cecilia, Kentucky

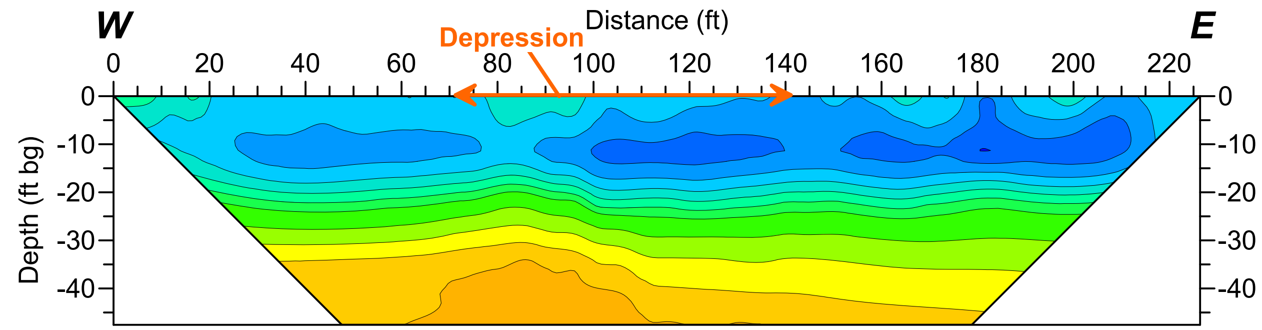
DRAWING NO.: Karst Hazard Map

PREPARED FOR:

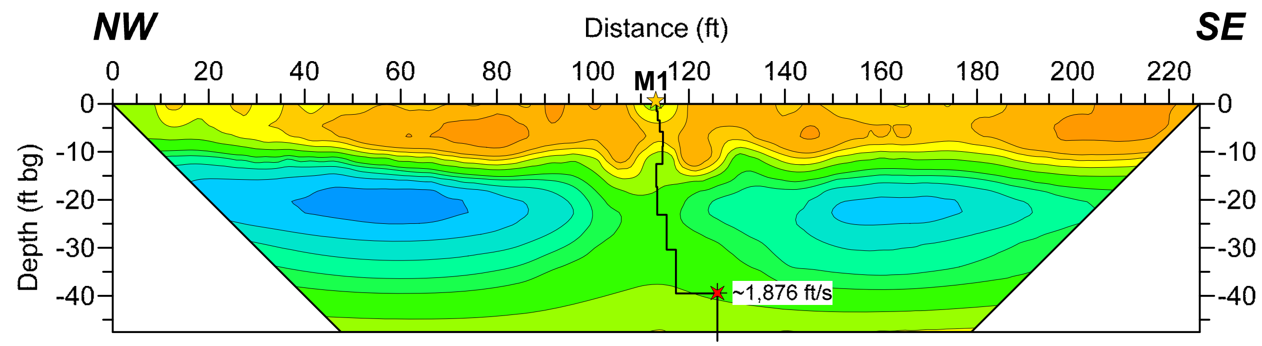
PROJECT NO.: 1265-10736

SHEET TITLE: DWG10736F2rev

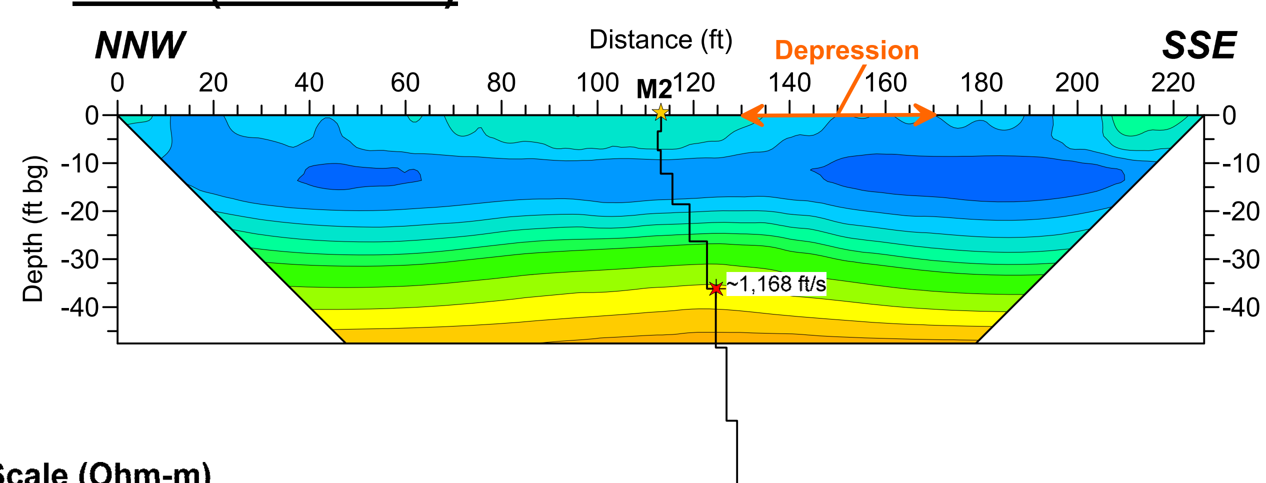
Line 1



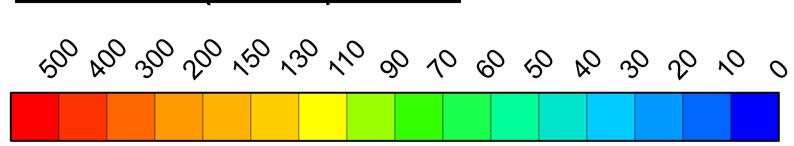
Line 2

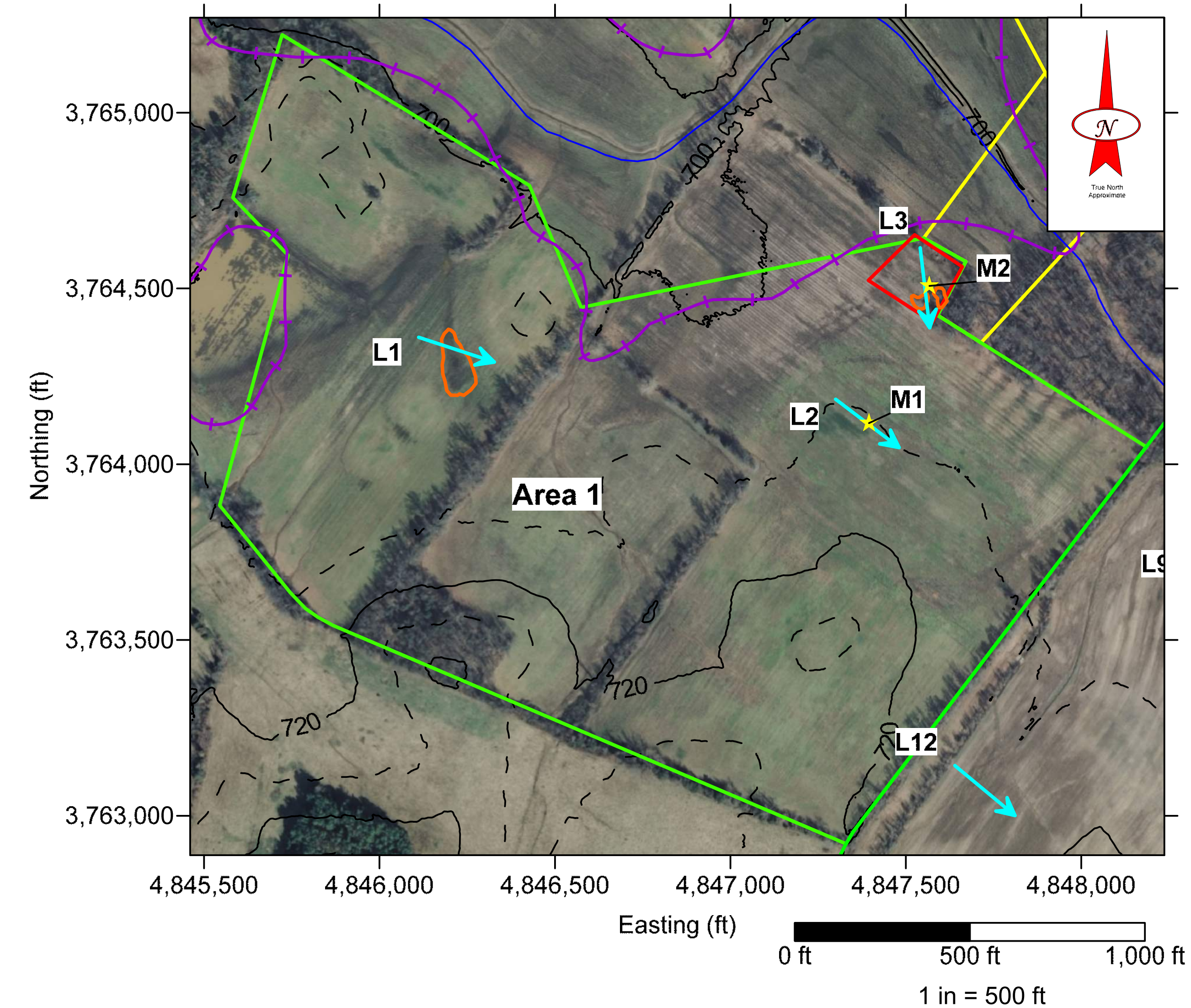


Line 3 (Substation)



Color Scale (Ohm-m)





Legend

Shear Wave Velocity Profile (Vs, ft/s)

- Electrical Imaging Profile (arrow indicates direction)
- 1D MASW
- Project Boundary
- Right-of-Way
- Geotechnical Boring
- Area of Interest/ Substation
- NHD Water Bodies
- NHD Flow Lines
- Topographically-derived Sinkholes (Paylor et al. 2003)
- Observed Depressions (field)

Notes

Geophysical survey conducted February 8-12, 2021 using a GF Instruments ARES II electrical resistivity meter with active multi-electrode cable sections and Geometrics Geode 24-channel seismograph.

Horizontal Scale 1 in = 40 ft
Vertical Scale 1 in = 40 ft
No Vertical Exaggeration.

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DRN	AXB	2/16/21
DES	AXB	2/16/21
CHK	PJH	2/23/21
REV		
PROJ. MGR.	AXB	2/23/21

PROJECT: **Geophysical Investigation Rhudes Creek Solar Project Cecilia, Kentucky**

SCALE: As Shown

SOURCE: USGS 2012 Earthimager 2D

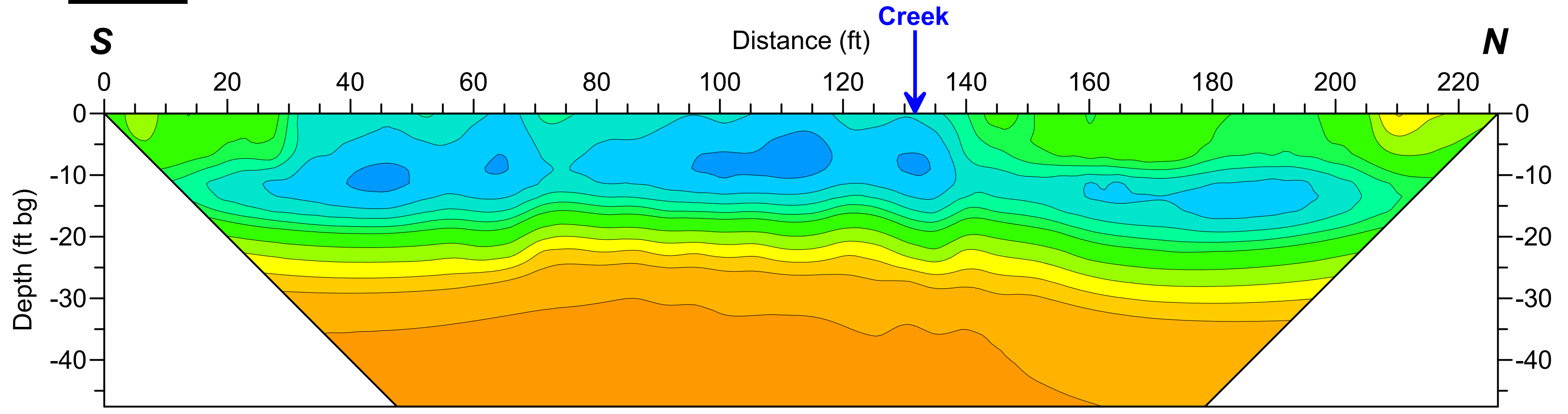
DRAWING NO.: **Figure 4** EI Profiles - Area 1

PREPARED FOR: ANS

PROJECT NO.: 1265-10736

SHEET TITLE: DWG10736F4

Line 4



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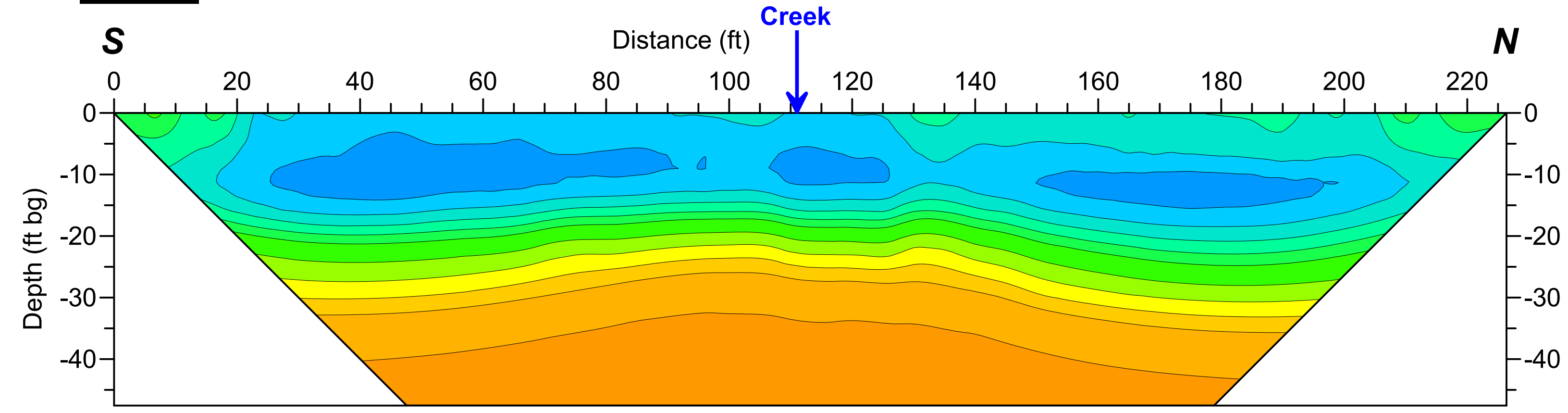
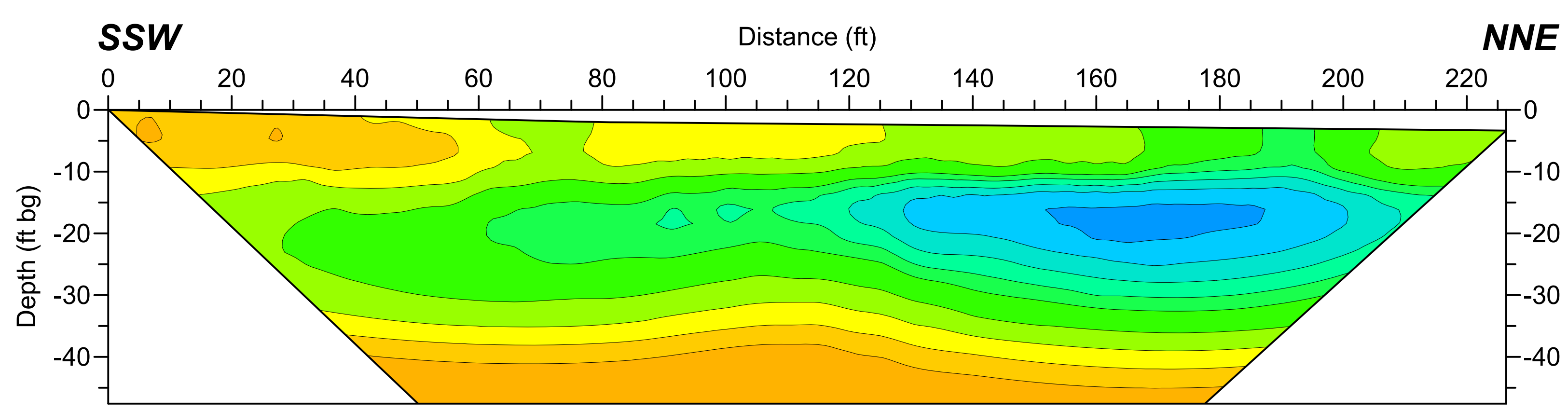


Line 6



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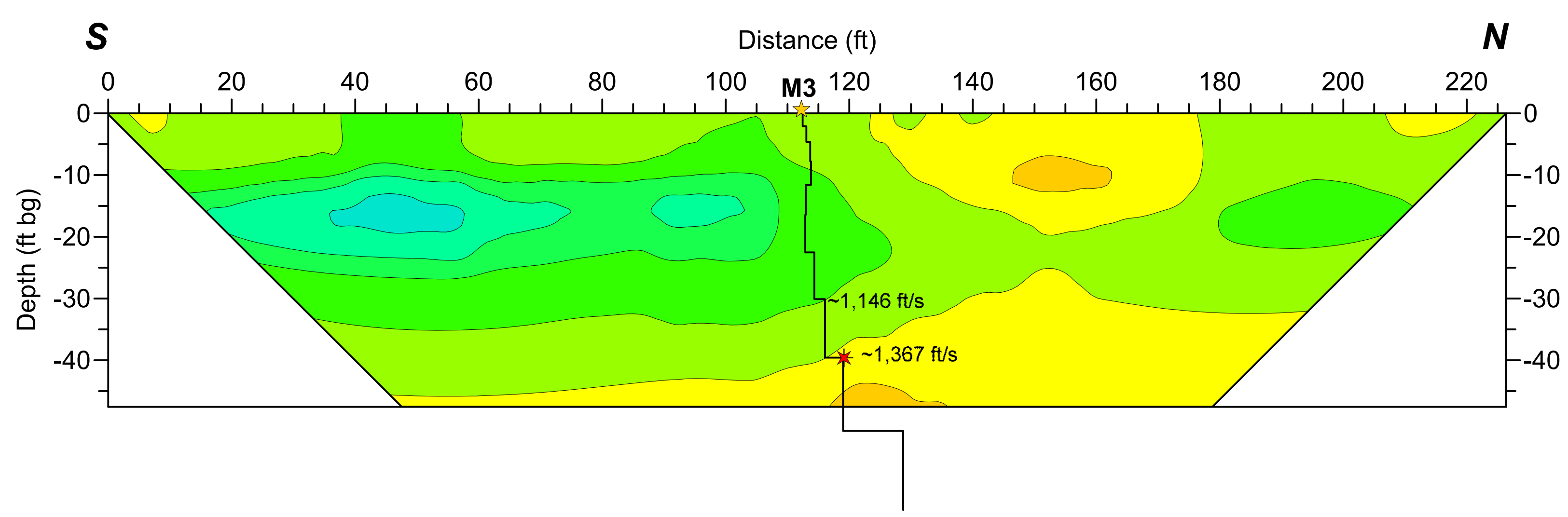
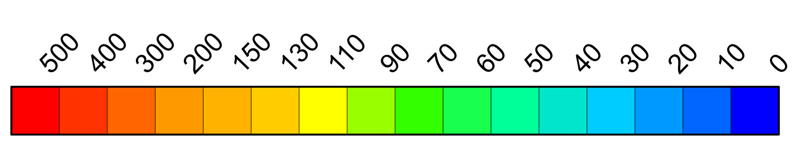
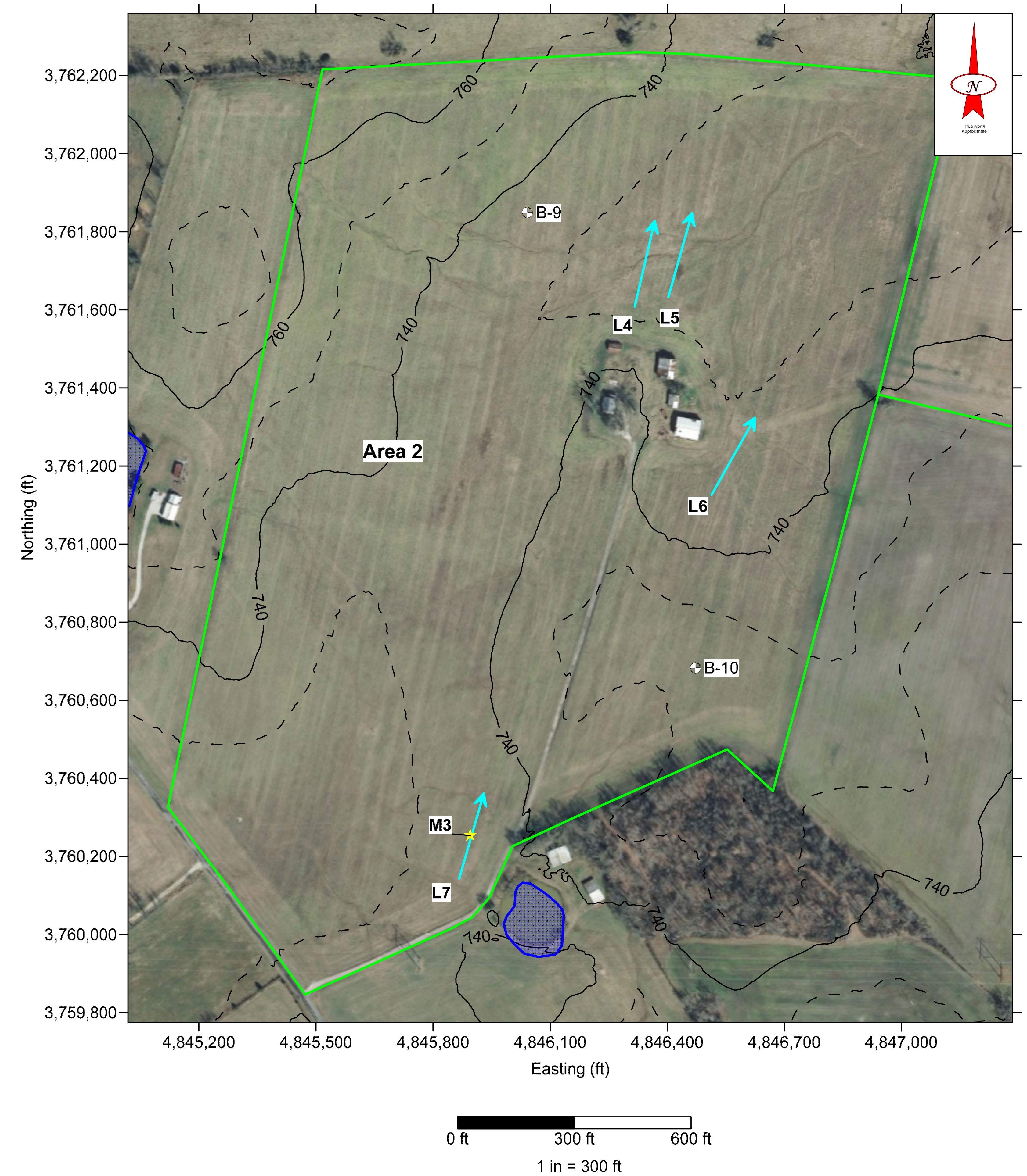


Color Scale (Ohm-m)





Legend

- Electrical Imaging Profile (arrow indicates direction)
- 1D MASW
- Project Boundary
- Right-of-Way
- Geotechnical Boring
- Area of Interest/ Substation
- NHD Water Bodies
- NHD Flow Lines
- Topographically-derived Sinkholes (Paylor et al. 2003)
- Observed Depressions (field)
- Shear Wave Velocity Profile (Vs, ft/s)
- Star at 1st interval >1,000 ft/s

Notes

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Horizontal Scale 1 in = 30 ft
Vertical Scale 1 in = 30 ft
No Vertical Exaggeration.

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DES	AXB	2/16/21
CHK	PJH	2/23/21
REV		
PROJ. MGR.	AXB	2/23/21

SCALE: As Shown

SOURCE: USGS 2012 Earthimager 2D

PREPARED FOR: ANS

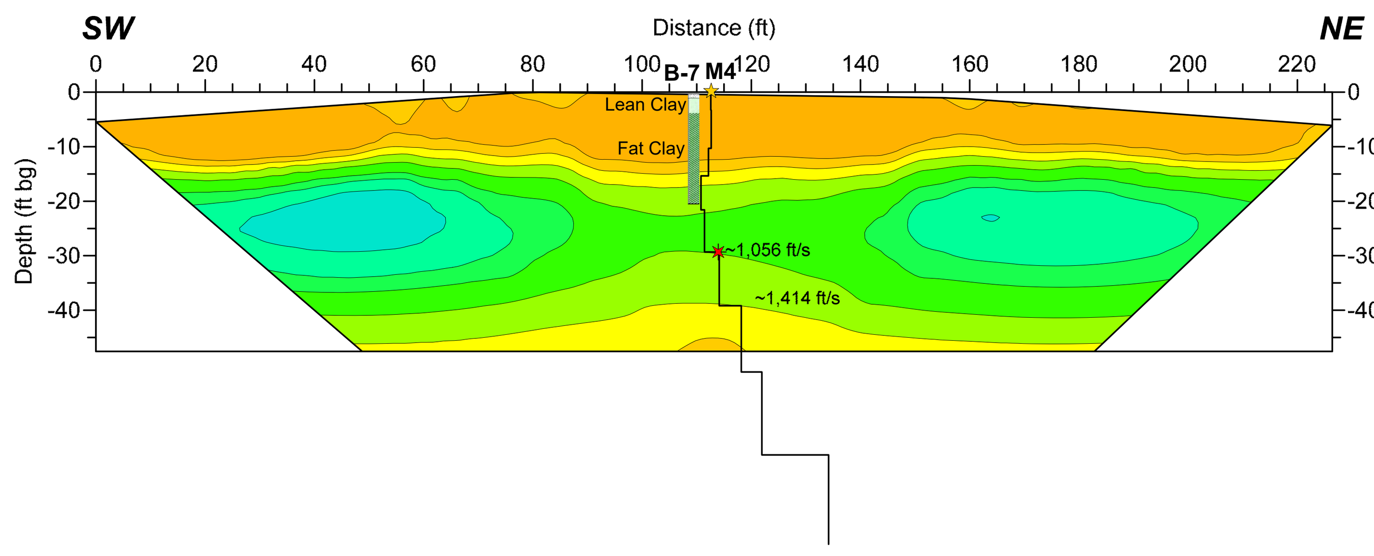
PROJECT: Geophysical Investigation Rhudes Creek Solar Project Cecilia, Kentucky

DRAWING NO.: Figure 5 EI Profiles - Area 2

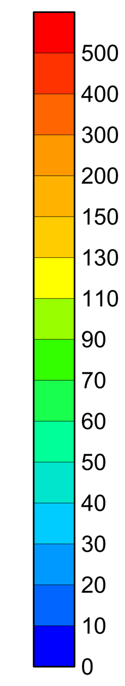
PROJECT NO.: 1265-10736

SHEET TITLE: DWG10736F5

Line 8



Color Scale (Lines 8-14: Ohm-m)



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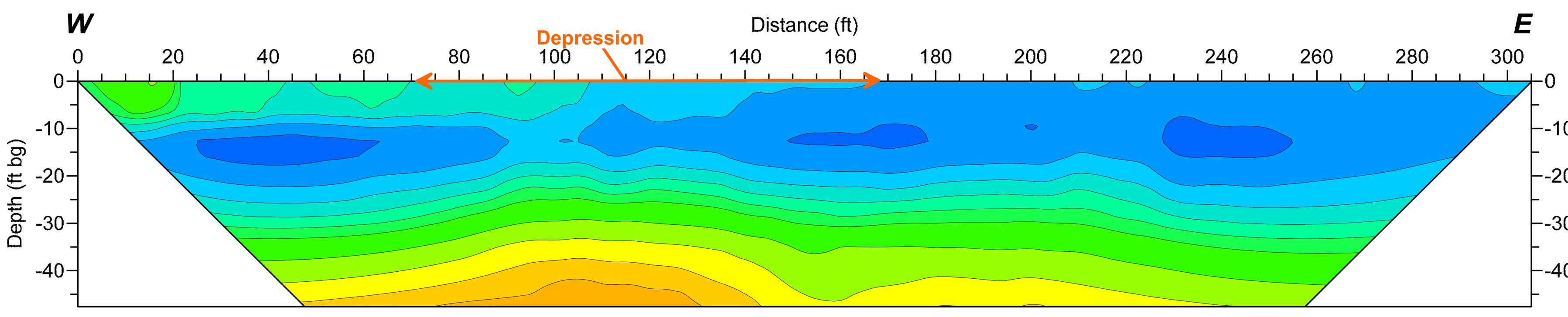

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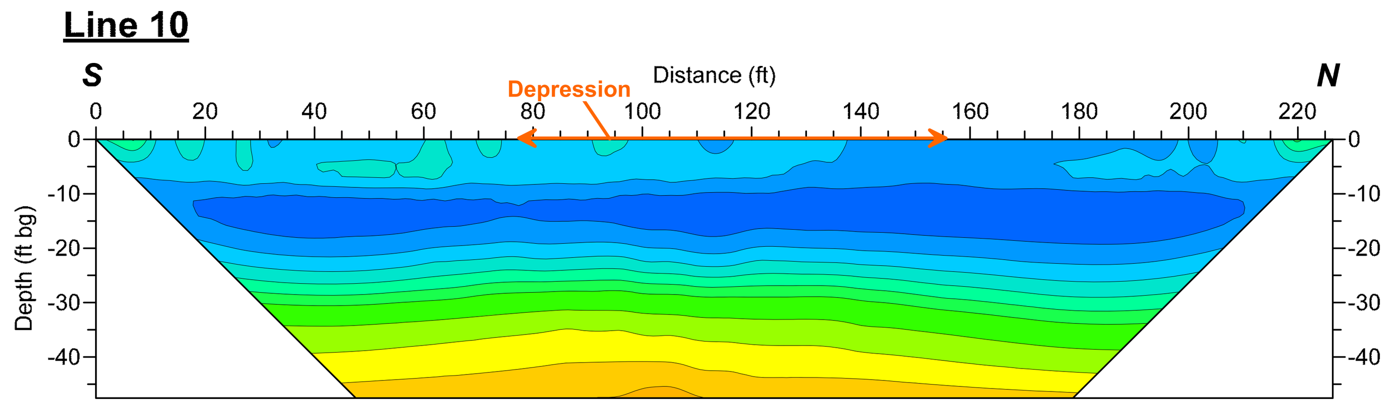

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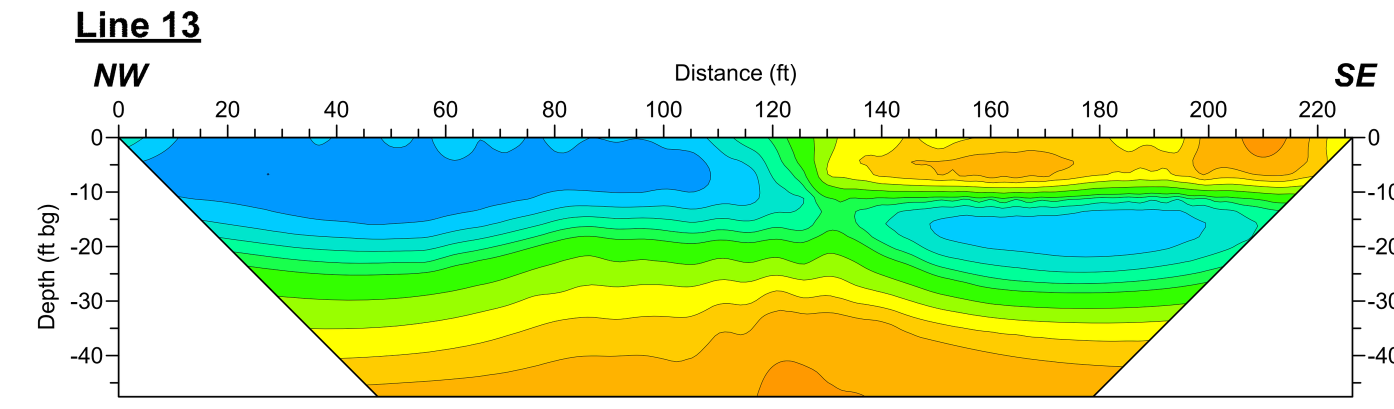

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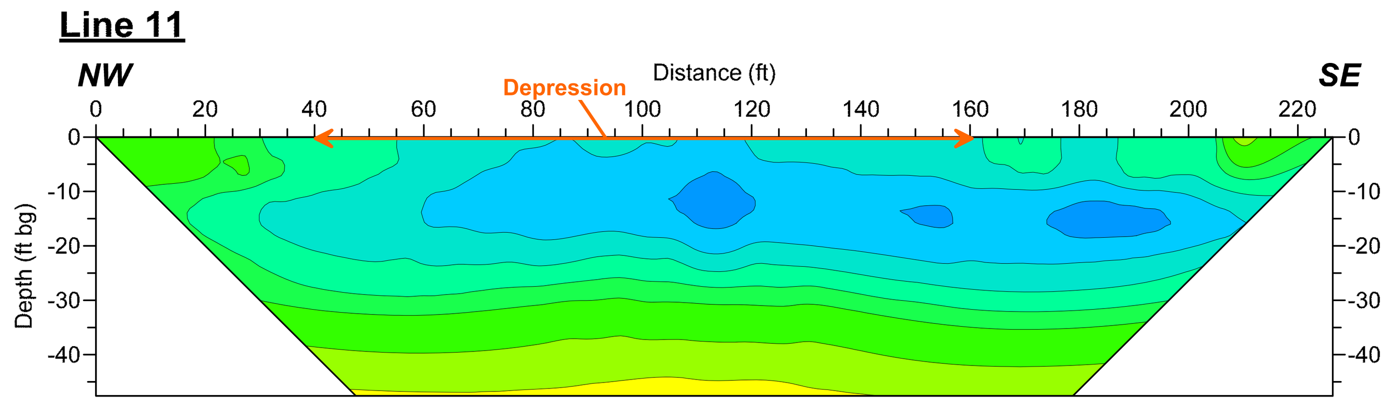

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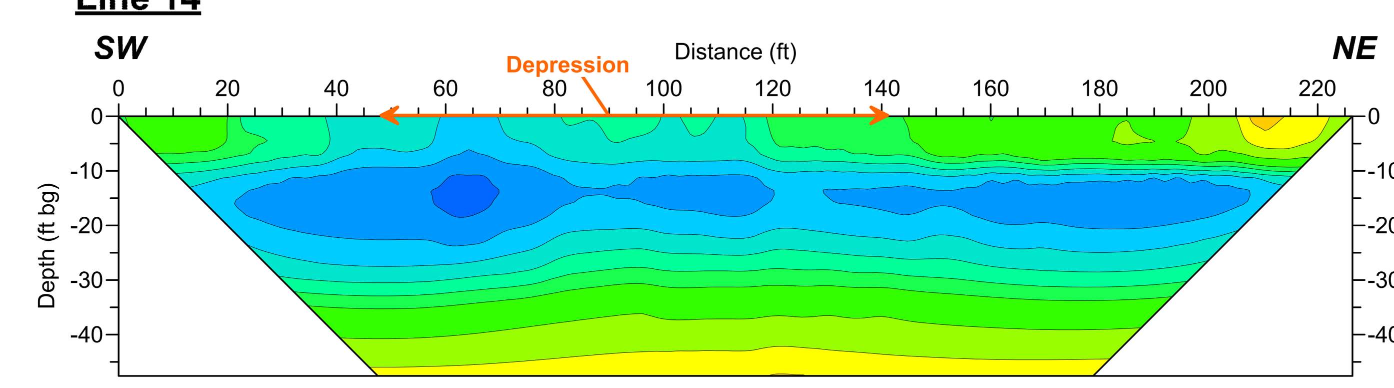

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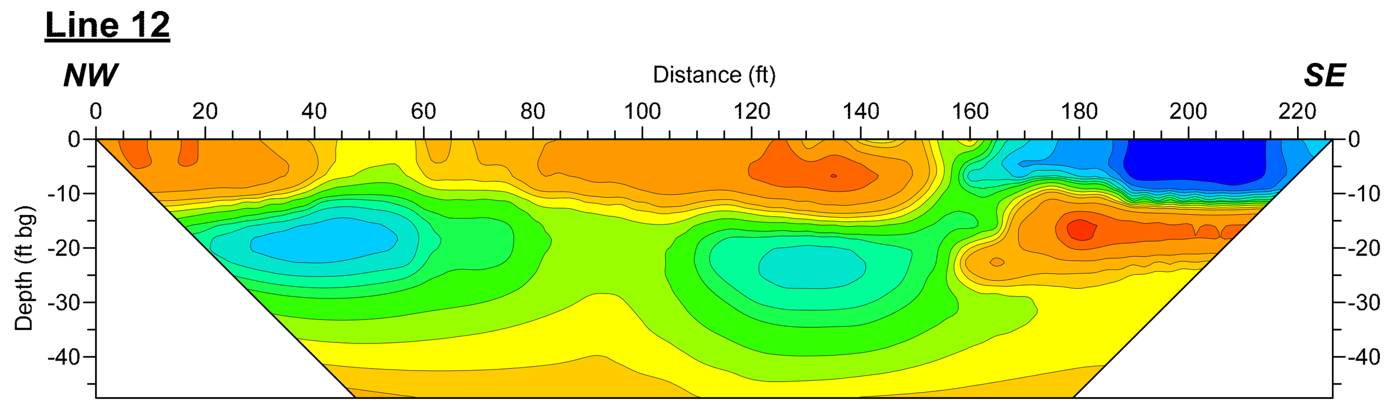
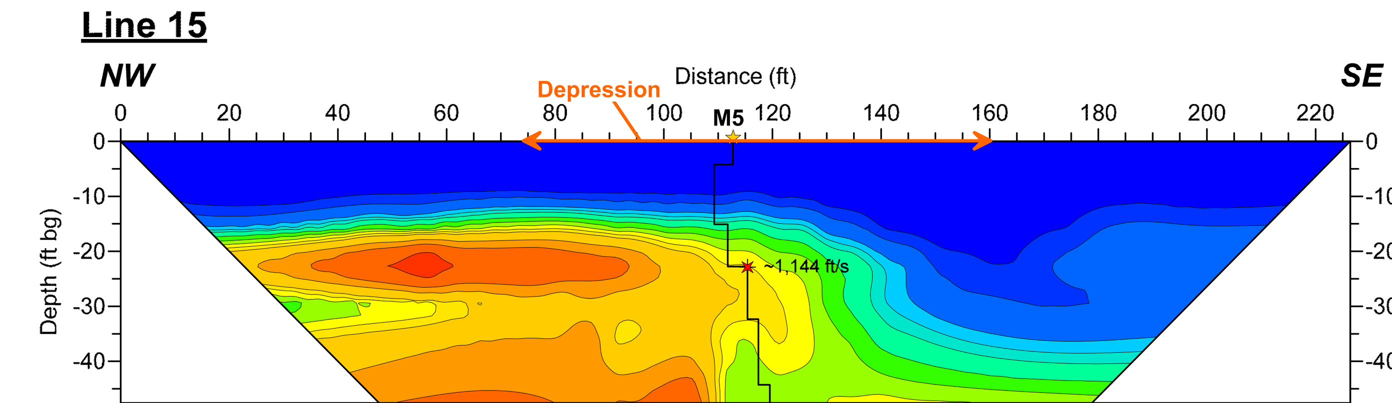
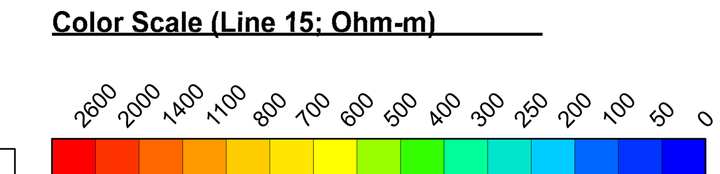
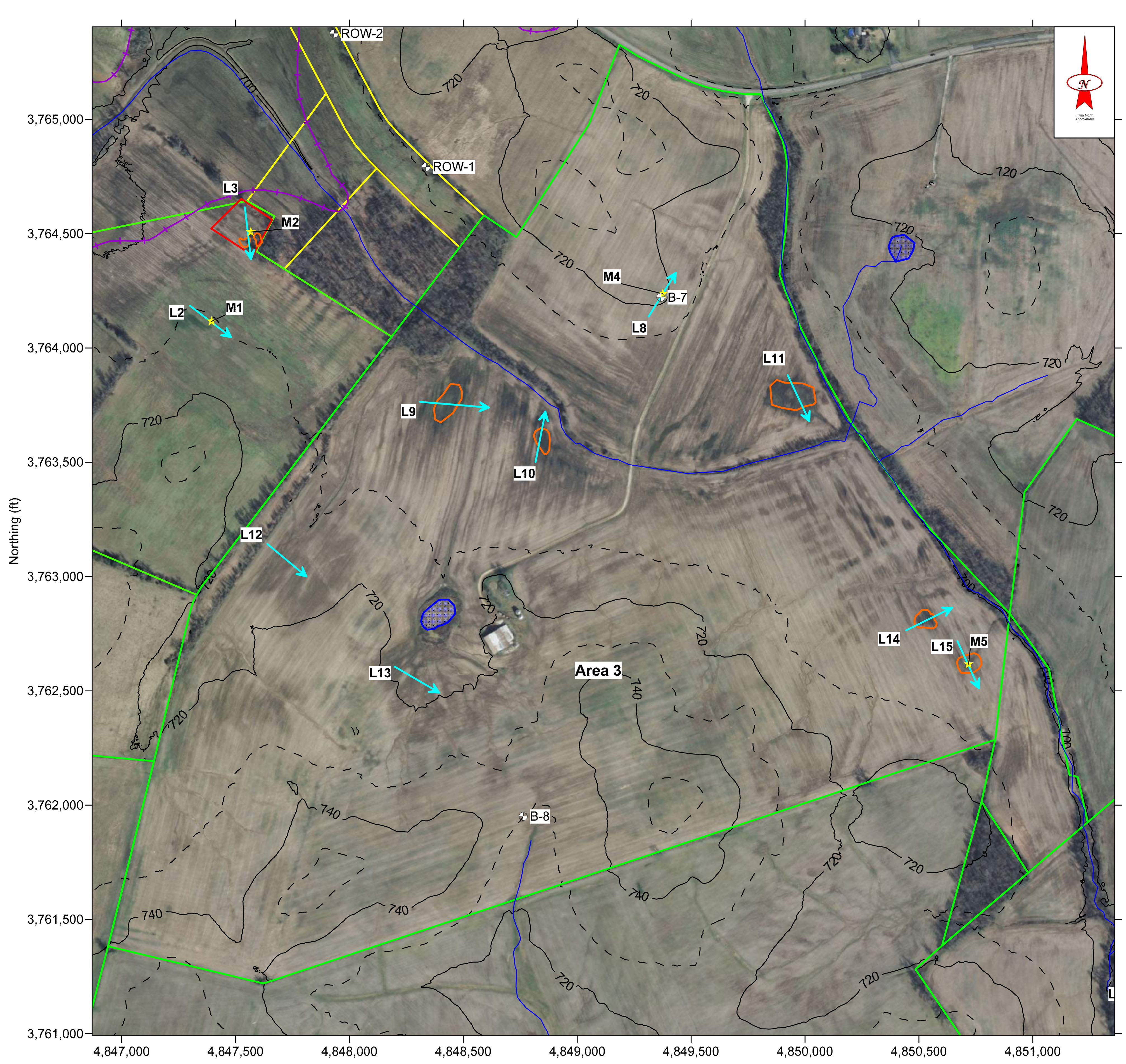


Line 15



Color Scale (Line 15: Ohm-m)





1 in = 400 ft

Legend

- Electrical Imaging Profile (arrow indicates direction)
- 1D MASW
- Project Boundary
- Right-of-Way
- Geotechnical Boring
- Area of Interest/ Substation
- NHD Water Bodies
- NHD Flow Lines
- Topographically-derived Sinkholes (Paylor et al. 2003)
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Notes

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Horizontal Scale 1 in = 30 ft
Vertical Scale 1 in = 30 ft
No Vertical Exaggeration.

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REV		
PROJ. MGR.	AXB	2/23/21
SCALE:	As Shown	
SOURCE:	USGS 2012 Earthimager 2D	

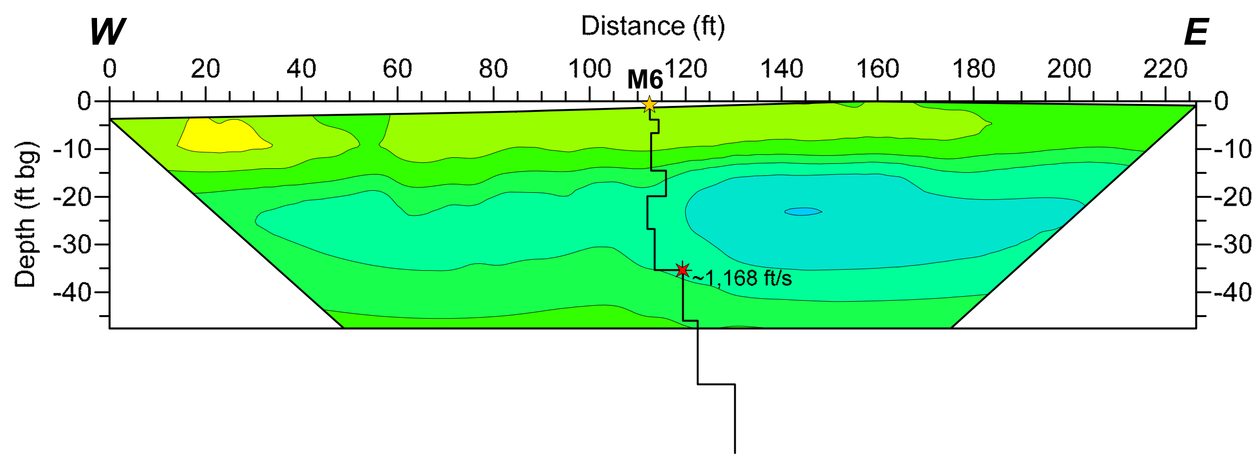
PROJECT: Geophysical Investigation
Rhudes Creek Solar Project
Cecilia, Kentucky

DRAWING NO.: Figure 6
EI Profiles - Area 3

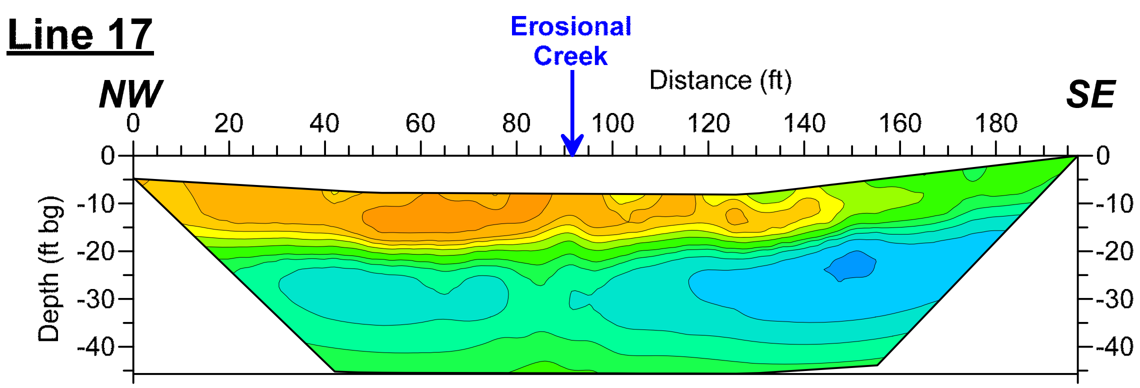
PREPARED FOR: ANS

PROJECT NO.: 1265-10736
SHEET TITLE: DWG10736F6

Line 16



Line 17



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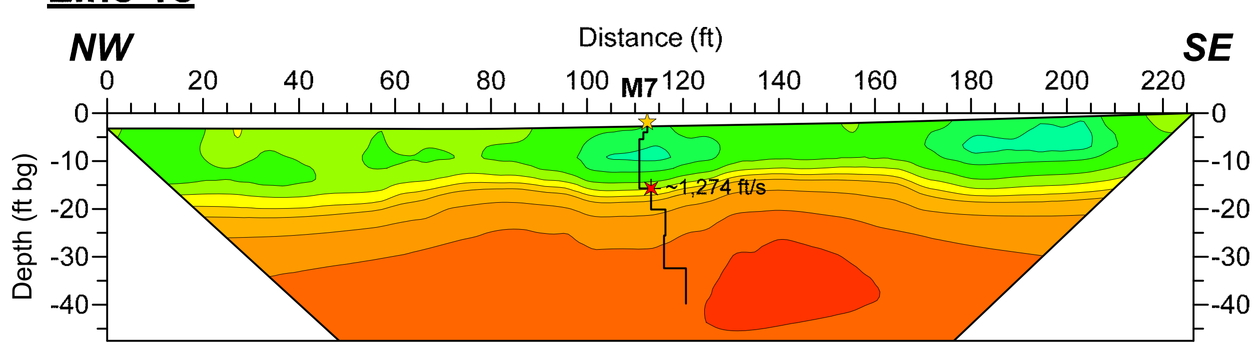
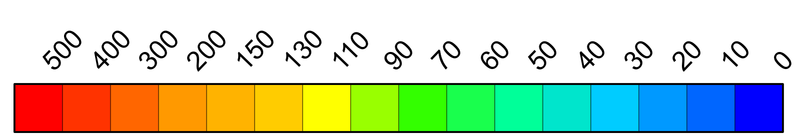
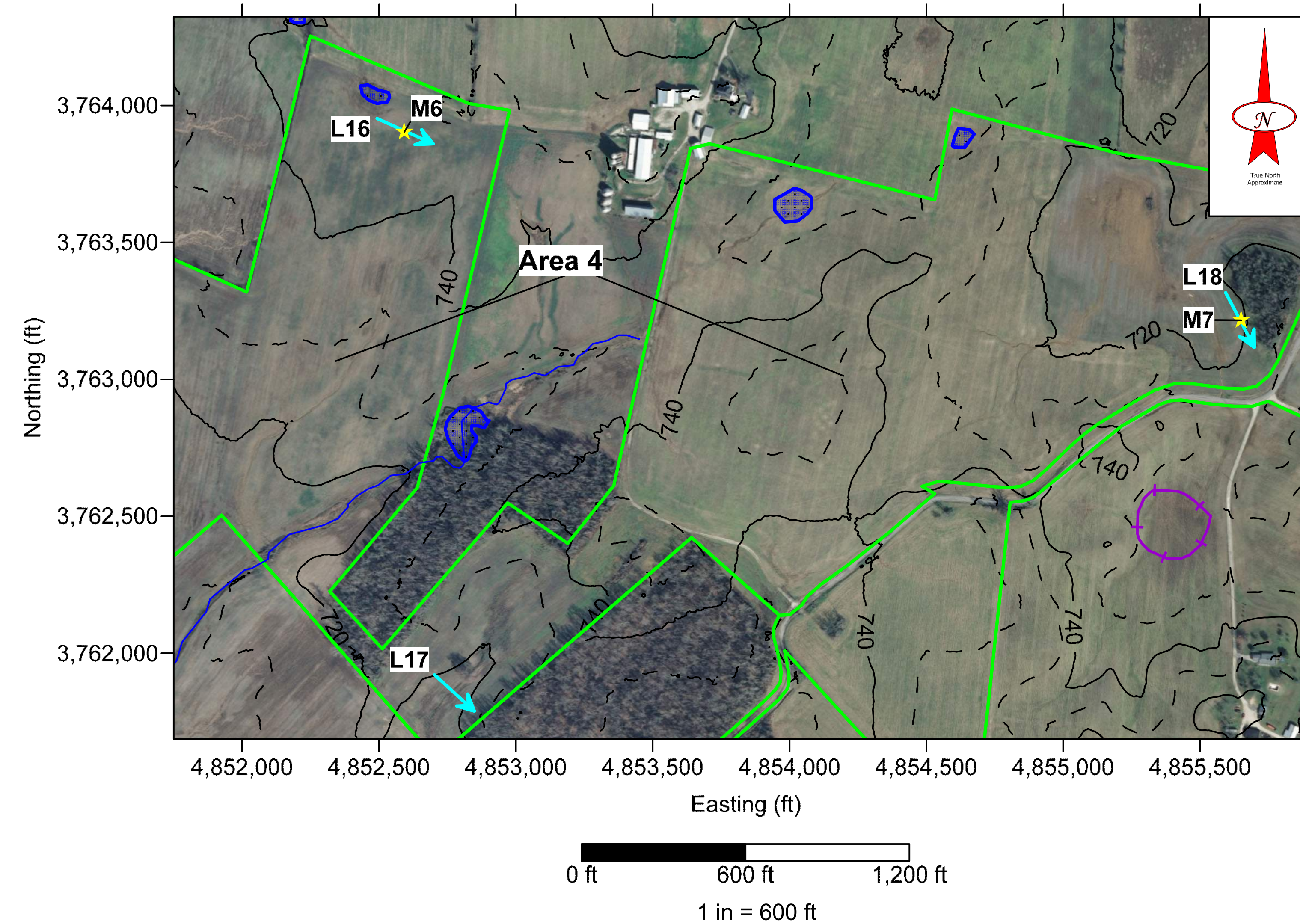


Color Scale (Ohm-m)





Legend

- Electrical Imaging Profile (arrow indicates direction)
- 1D MASW
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- Right-of-Way
- Geotechnical Boring
- Area of Interest/ Substation
- NHD Water Bodies
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- Star at 1st interval >1,000 ft/s

Notes

Geophysical survey conducted February 8-12, 2021 using a GF Instruments ARES II electrical resistivity meter with active multi-electrode cable sections and Geometrics Geode 24-channel seismograph.

Horizontal Scale 1 in = 40 ft
Vertical Scale 1 in = 40 ft
No Vertical Exaggeration.

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CHK	PJH	2/23/21
REV		
PROJ. MGR.	AXB	2/23/21

PROJECT: **Geophysical Investigation Rhudes Creek Solar Project Cecilia, Kentucky**

SCALE: As Shown

SOURCE: USGS 2012 Earthimager 2D

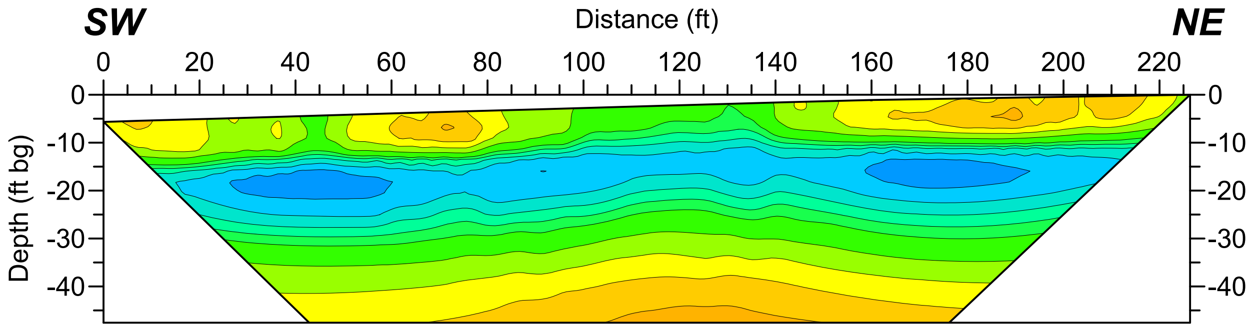
DRAWING NO.: **Figure 7** EI Profiles - Area 4

PREPARED FOR: ANS

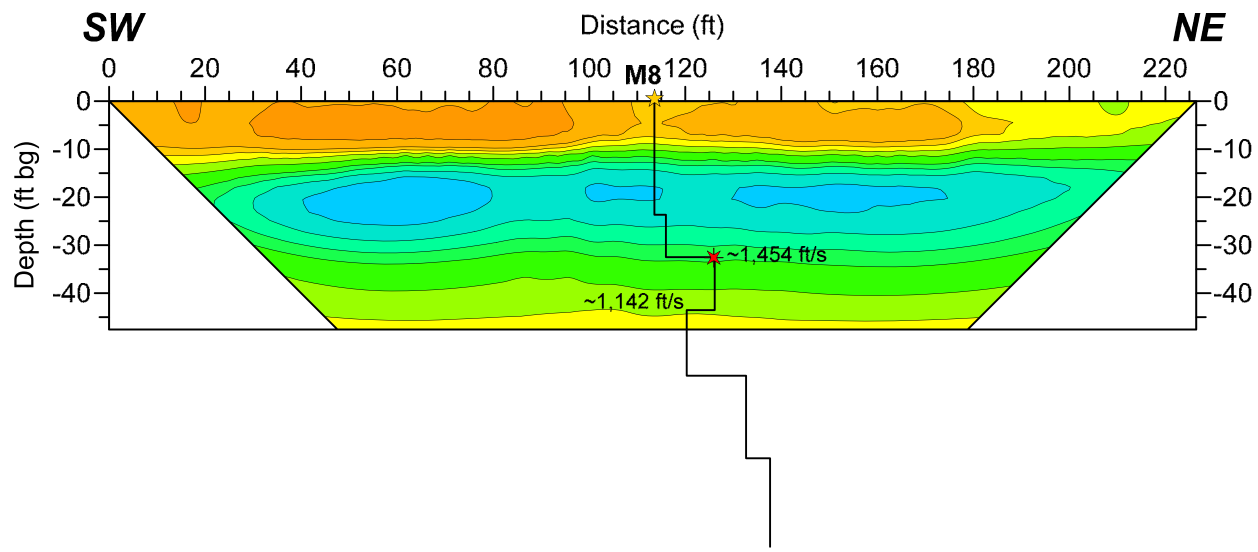
PROJECT NO.: 1265-10736

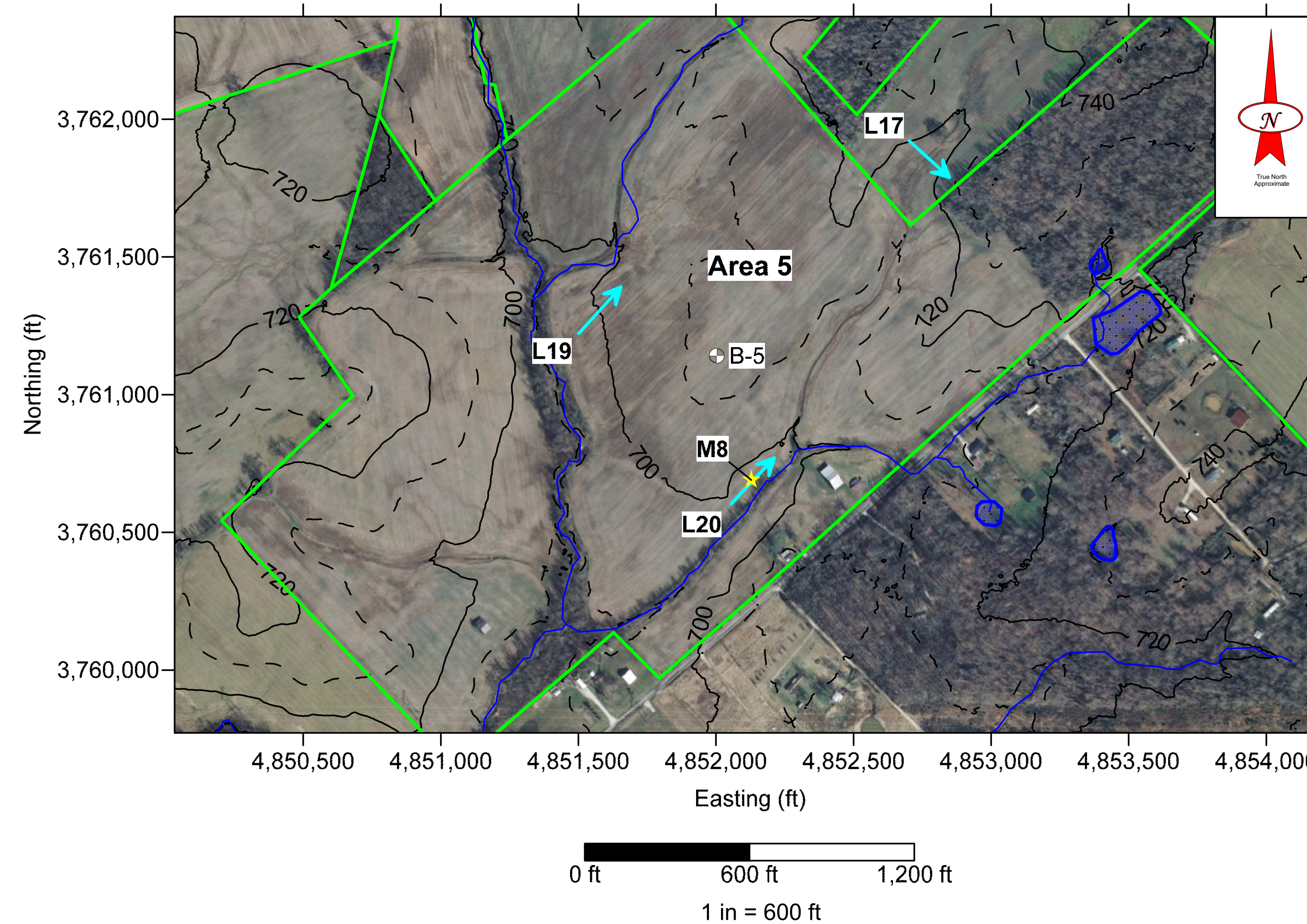
SHEET TITLE: DWG10736F7

Line 19



Line 20





Legend

Electrical Imaging Profile (arrow indicates direction)

1D MASW

Project Boundary

Right-of-Way

Geotechnical Boring

Area of Interest/ Substation

NHD Water Bodies

NHD Flow Lines

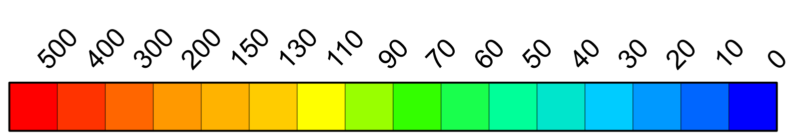
Topographically-derived Sinkholes (Paylor et al. 2003)

Observed Depressions (field)

Shear Wave Velocity Profile (Vs, ft/s)

Star at 1st interval >1,000 ft/s

Color Scale (Ohm-m)



Notes

Geophysical survey conducted February 8-12, 2021 using a GF Instruments ARES II electrical resistivity meter with active multi-electrode cable sections and Geometrics Geode 24-channel seismograph.

Horizontal Scale 1 in = 40 ft
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CHK	PJH	2/23/21
REV		
PROJ. MGR.	AXB	2/23/21

PROJECT: **Geophysical Investigation Rhudes Creek Solar Project Cecilia, Kentucky**

SCALE: As Shown

SOURCE: USGS 2012 Earthimager 2D

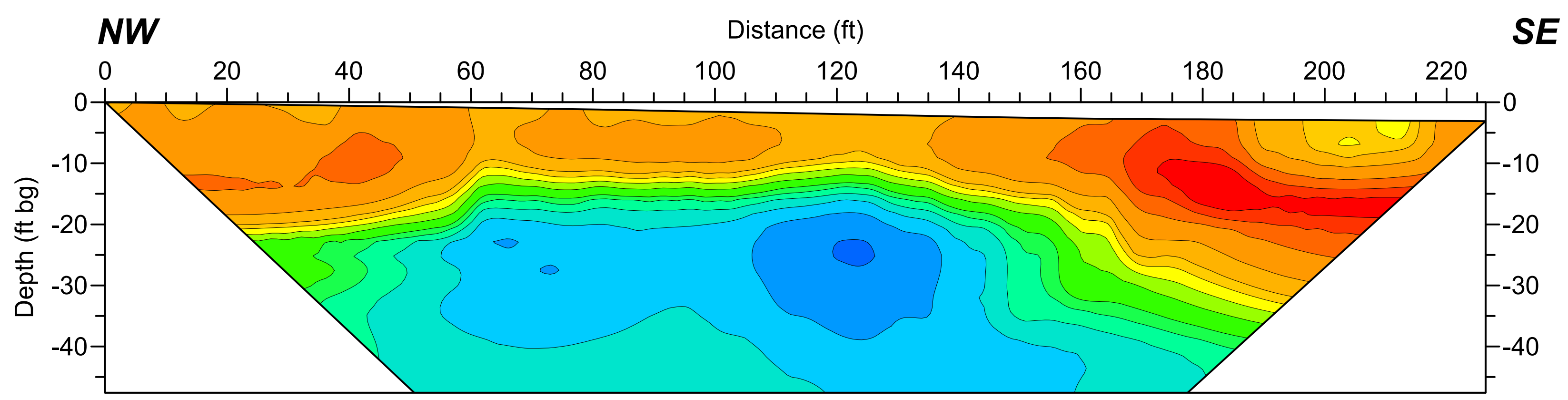
DRAWING NO.: **Figure 8** EI Profiles - Area 5

PREPARED FOR: ANS

PROJECT NO.: 1265-10736

SHEET TITLE: DWG10736F8

Line 21



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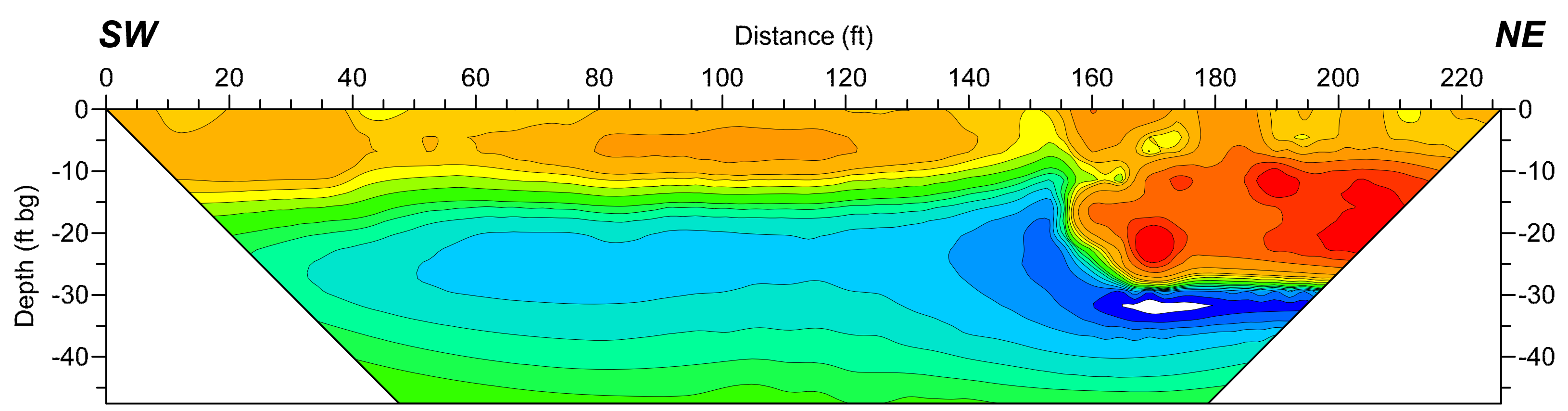

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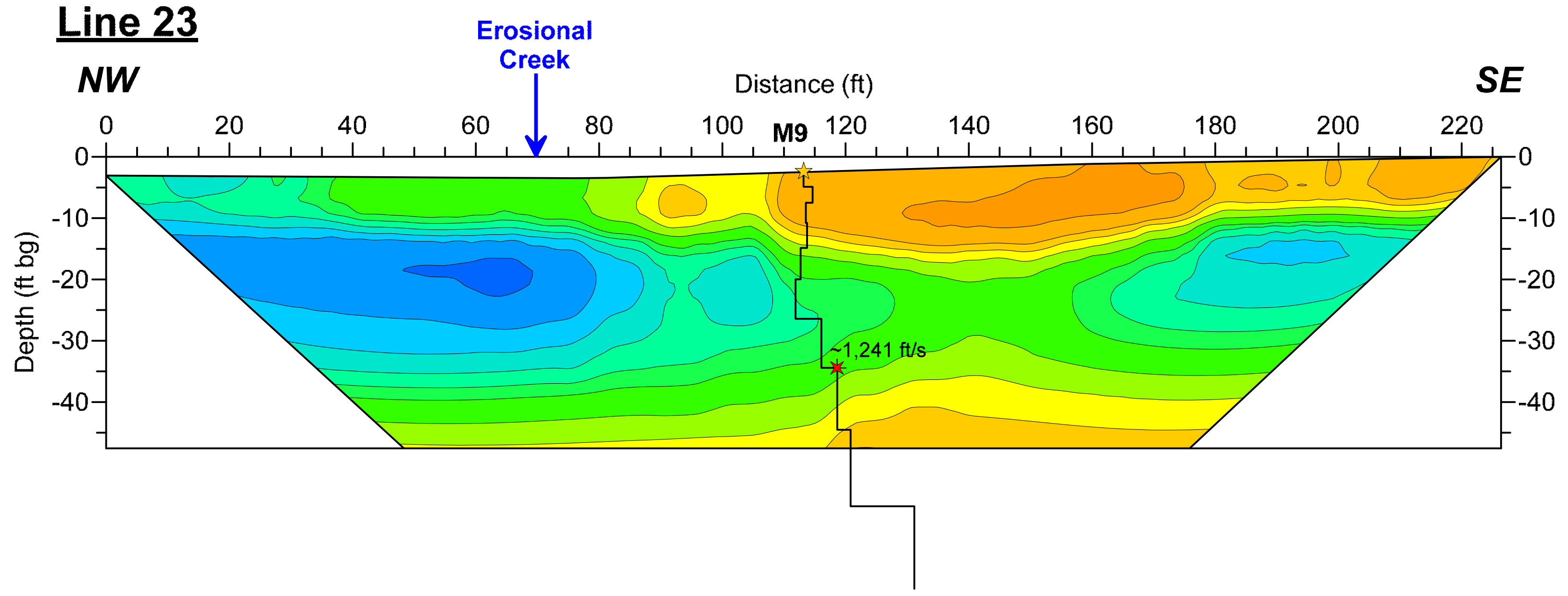

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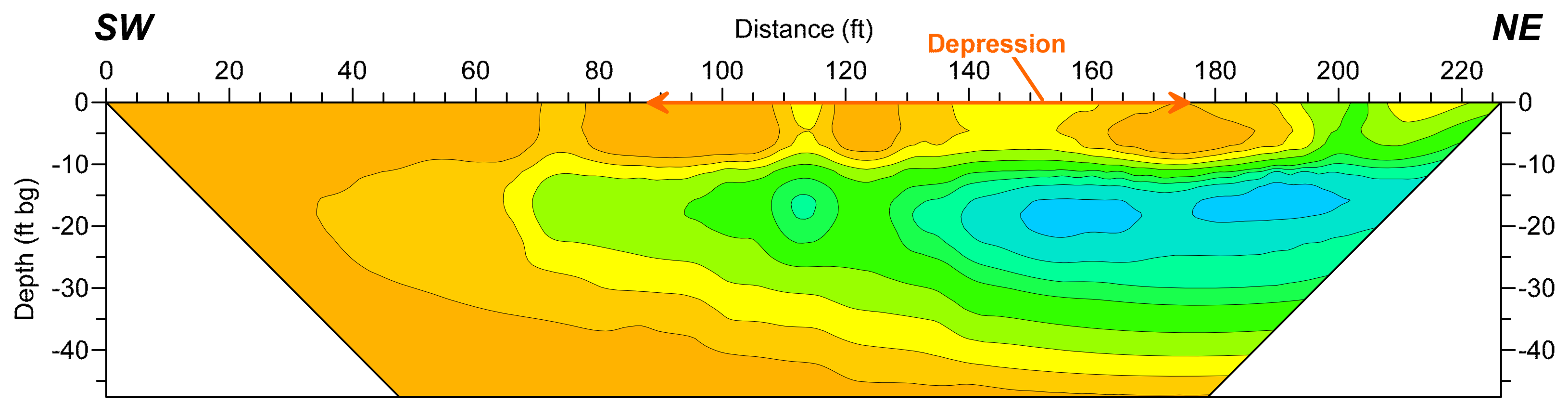
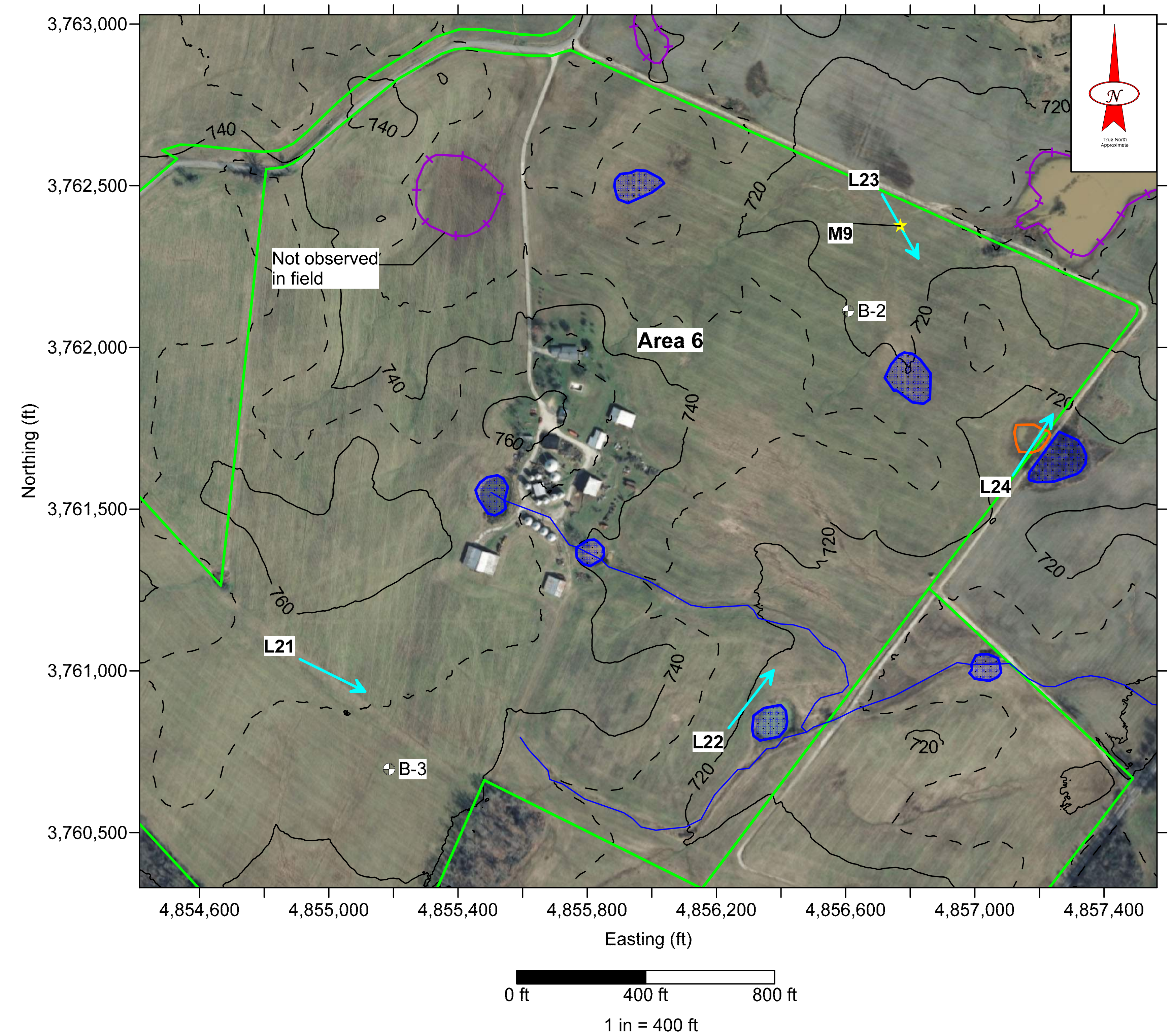
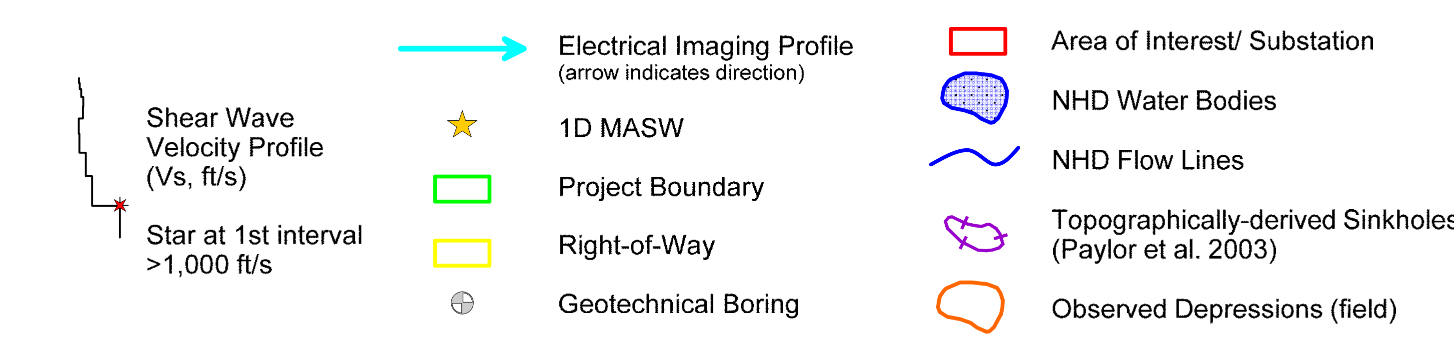
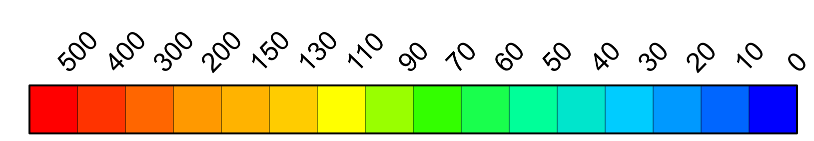




Legend



Color Scale (Ohm-m)



Notes

Geophysical survey conducted February 8-12, 2021 using a GF Instruments ARES II electrical resistivity meter with active multi-electrode cable sections and Geometrics Geode 24-channel seismograph.

Horizontal Scale 1 in = 30 ft
Vertical Scale 1 in = 30 ft
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DES	AXB	2/16/21
CHK	PJH	2/23/21
REV		
PROJ. MGR.	AXB	2/23/21

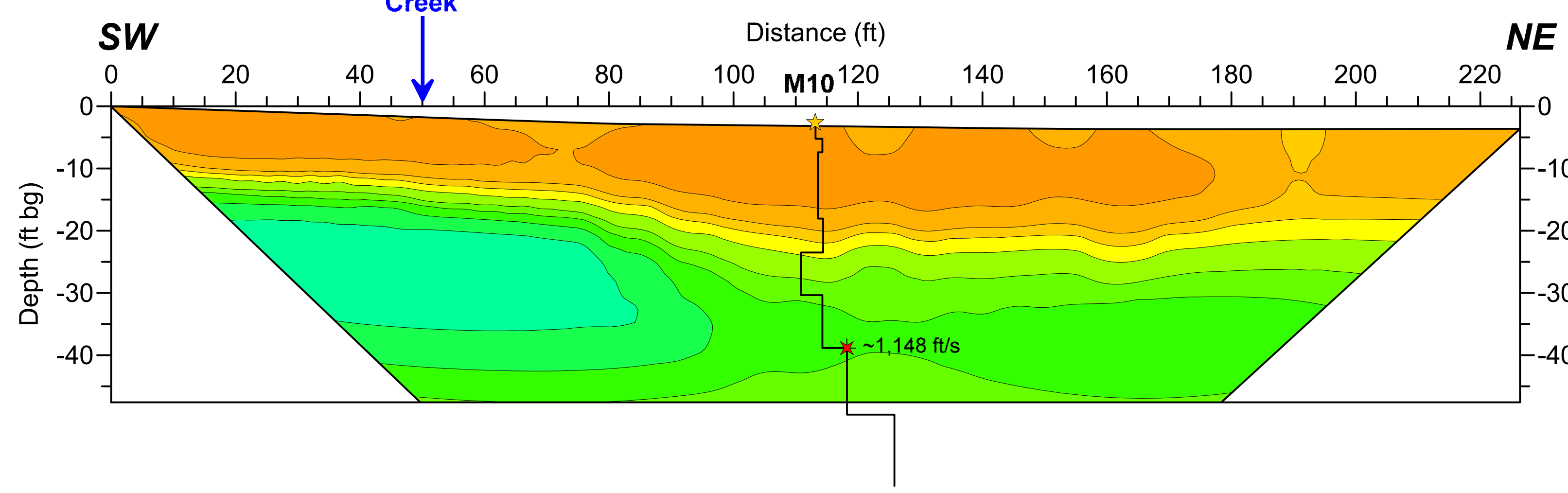
SCALE: As Shown
SOURCE: USGS 2012 Earthimager 2D
PREPARED FOR: ANS

PROJECT: Geophysical Investigation
Rhudes Creek Solar Project
Cecilia, Kentucky

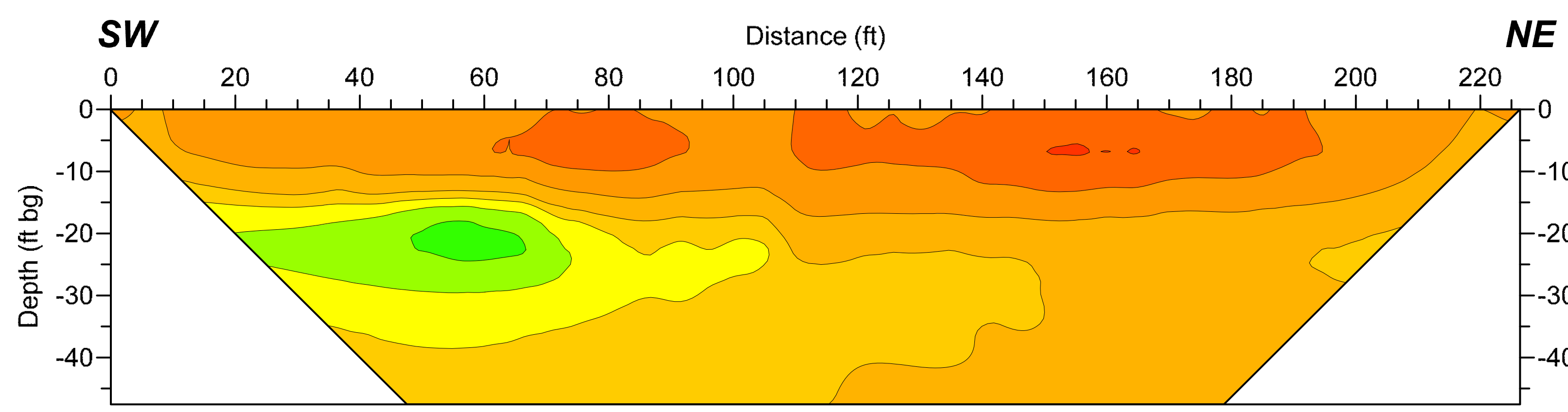
DRAWING NO.: Figure 9
EI Profiles - Area 6

PROJECT NO.: 1265-10736
SHEET TITLE: DWG10736F9

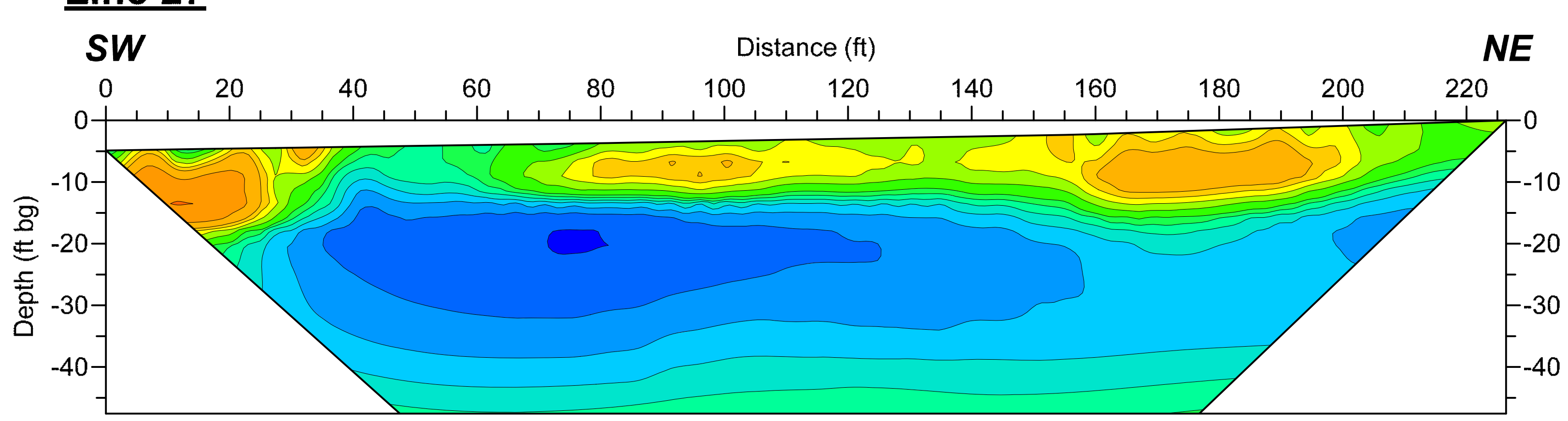
Line 25



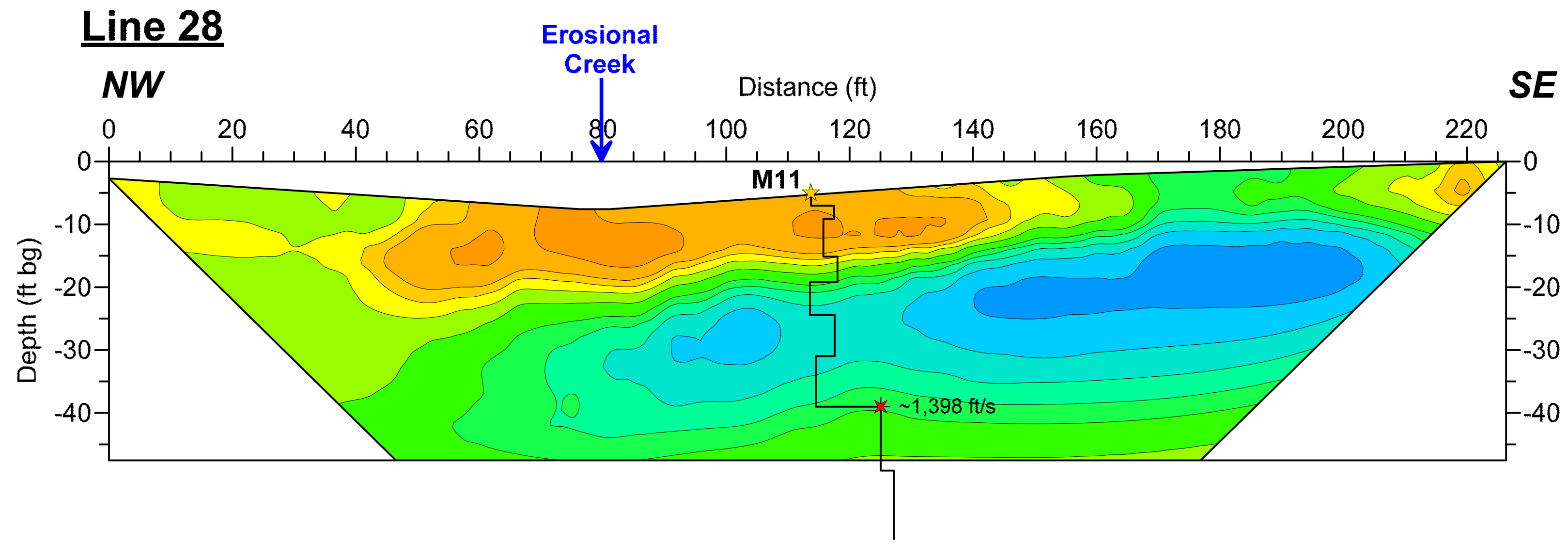
Line 26

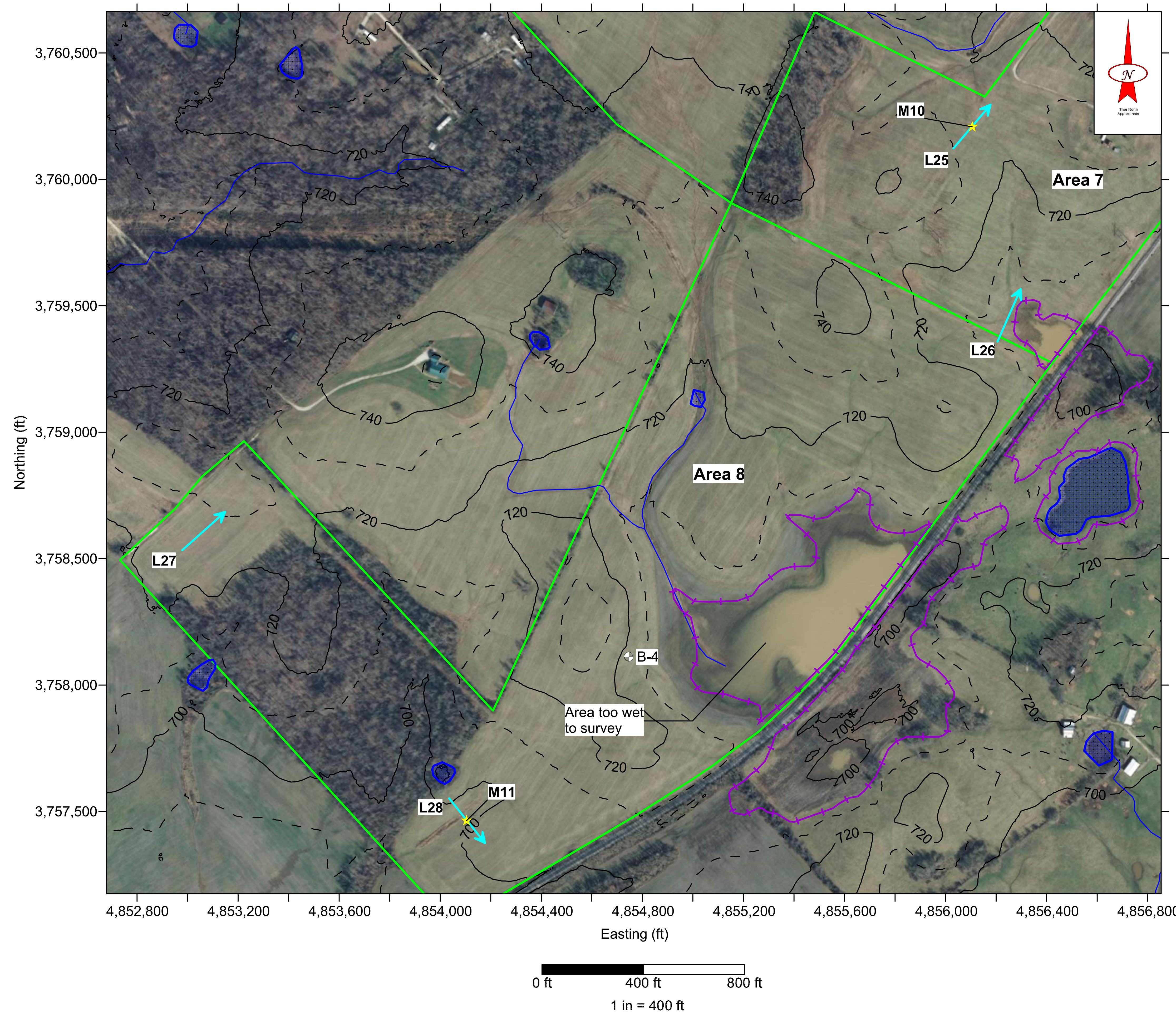


Line 27

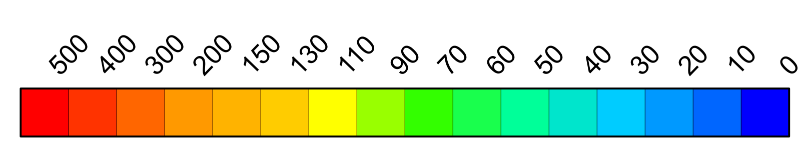


Line 28





Color Scale (Ohm-m)



Legend

- Electrical Imaging Profile (arrow indicates direction)
- 1D MASW
- Project Boundary
- Right-of-Way
- Geotechnical Boring
- Shear Wave Velocity Profile (Vs, ft/s)
- Star at 1st interval >1,000 ft/s
- Area of Interest/ Substation
- NHD Water Bodies
- NHD Flow Lines
- Topographically-derived Sinkholes (Paylor et al. 2003)
- Observed Depressions (field)

Notes

Geophysical survey conducted February 8-12, 2021 using a GF Instruments ARES II electrical resistivity meter with active multi-electrode cable sections and Geometrics Geode 24-channel seismograph.

Horizontal Scale 1 in = 30 ft
Vertical Scale 1 in = 30 ft
No Vertical Exaggeration.

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DRN	AXB	2/16/21
DES	AXB	2/16/21
CHK	PJH	2/23/21
REV		
PROJ. MGR.	AXB	2/23/21
SCALE:	As Shown	
SOURCE:	USGS 2012 Earthimager 2D	

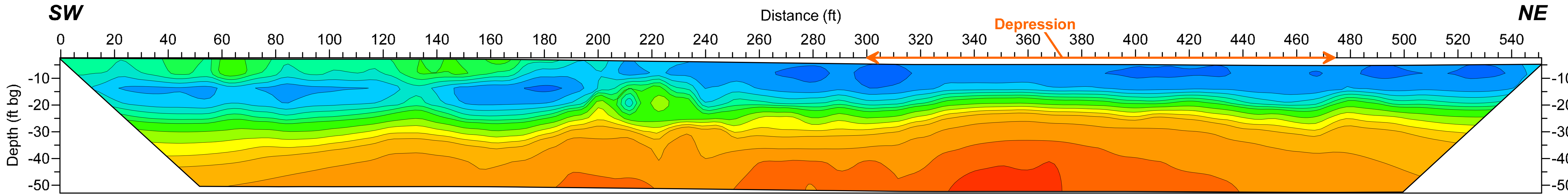
PROJECT:
Geophysical Investigation
Rhudes Creek Solar Project
Cecilia, Kentucky

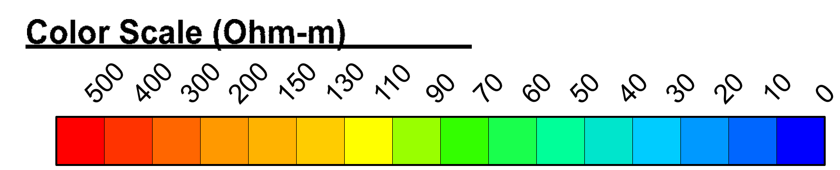
DRAWING NO.:
Figure 10
EI Profiles - Areas 7-8

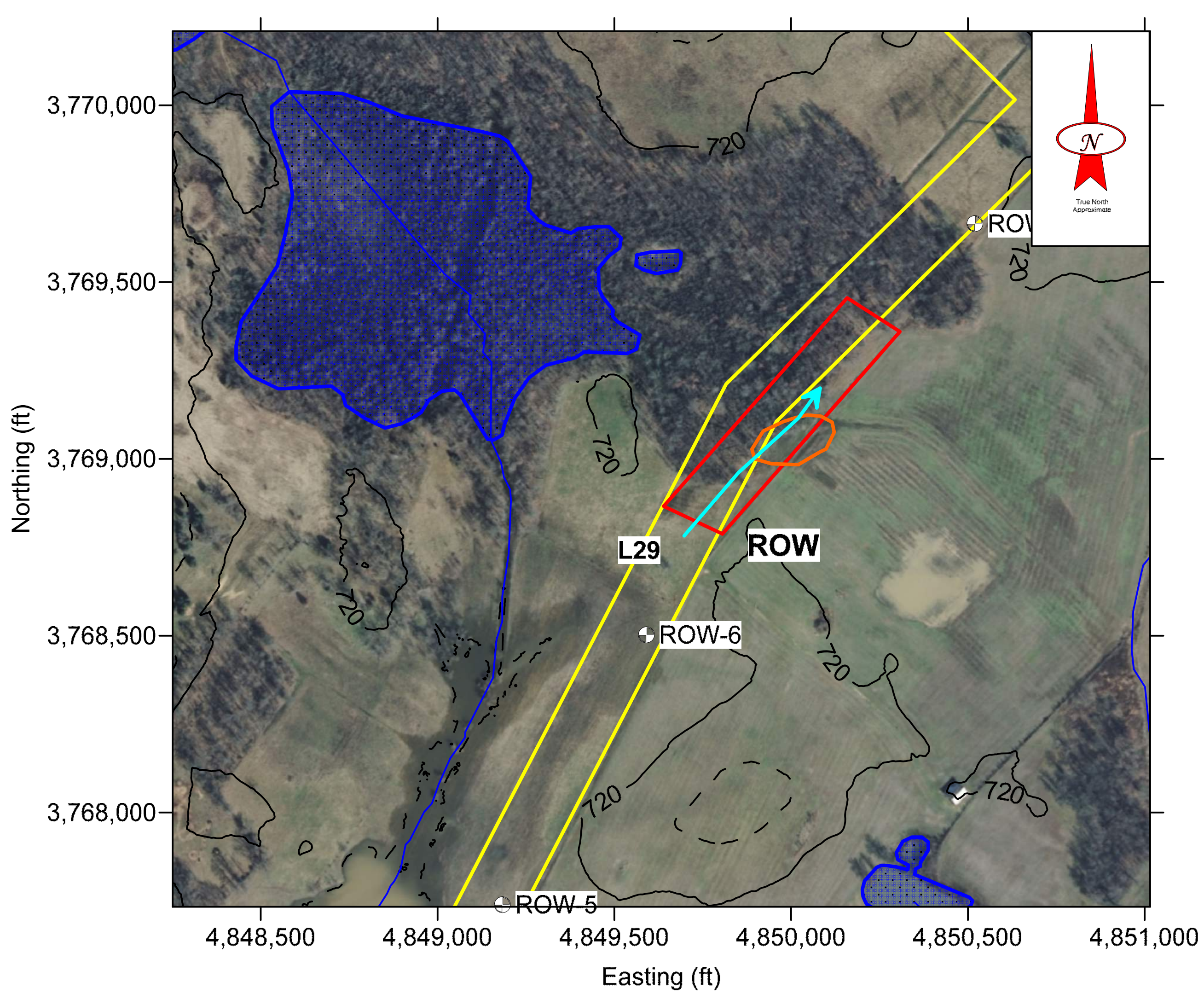
PREPARED FOR: ANS

PROJECT NO.: 1265-10736
SHEET TITLE: DWG10736F10

Line 29







Legend

- Electrical Imaging Profile (arrow indicates direction)
- 1D MASW
- Project Boundary
- Right-of-Way
- Geotechnical Boring
- Area of Interest/ Substation
- NHD Water Bodies
- NHD Flow Lines
- Topographically-derived Sinkholes (Paylor et al. 2003)
- Observed Depressions (field)

0 ft 500 ft 1,000 ft

1 in = 500 ft

Notes

Geophysical survey conducted February 8-12, 2021 using a GF Instruments ARES II electrical resistivity meter with active multi-electrode cable sections and Geometrics Geode 24-channel seismograph.

Horizontal Scale 1 in = 40 ft
Vertical Scale 1 in = 40 ft
No Vertical Exaggeration.

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CHK	PJH	2/23/21
REV		
PROJ. MGR.	AXB	2/23/21

PROJECT: Geophysical Investigation Rhudes Creek Solar Project Cecilia, Kentucky

SCALE: As Shown

SOURCE: USGS 2012 Earthimager 2D

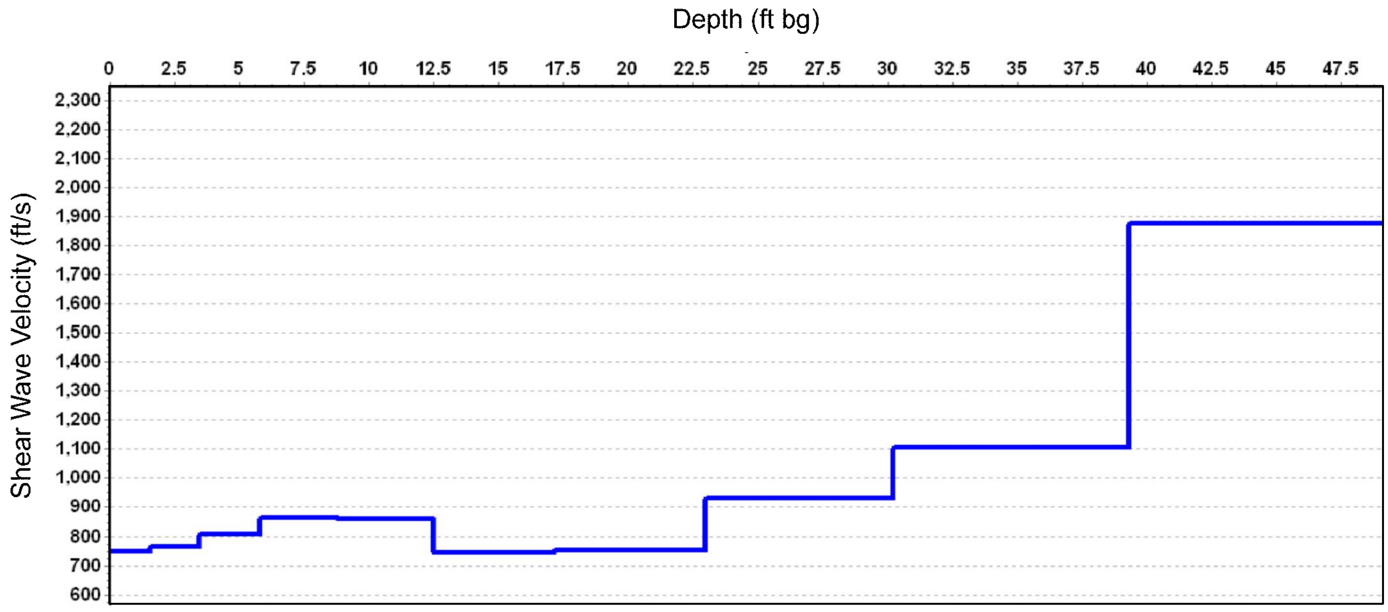
DRAWING NO.: Figure 11 EI Profiles - ROW

PREPARED FOR: ANS

PROJECT NO.: 1265-10736

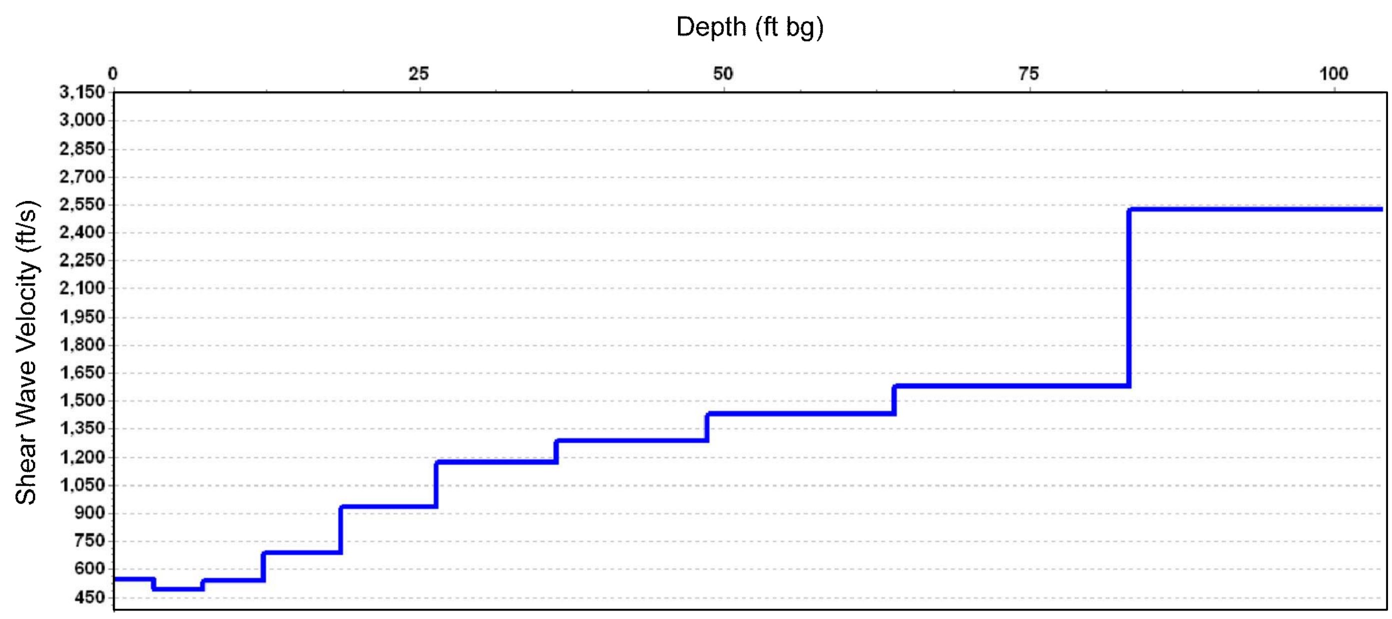
SHEET TITLE: DWG10736F11

MASW M1



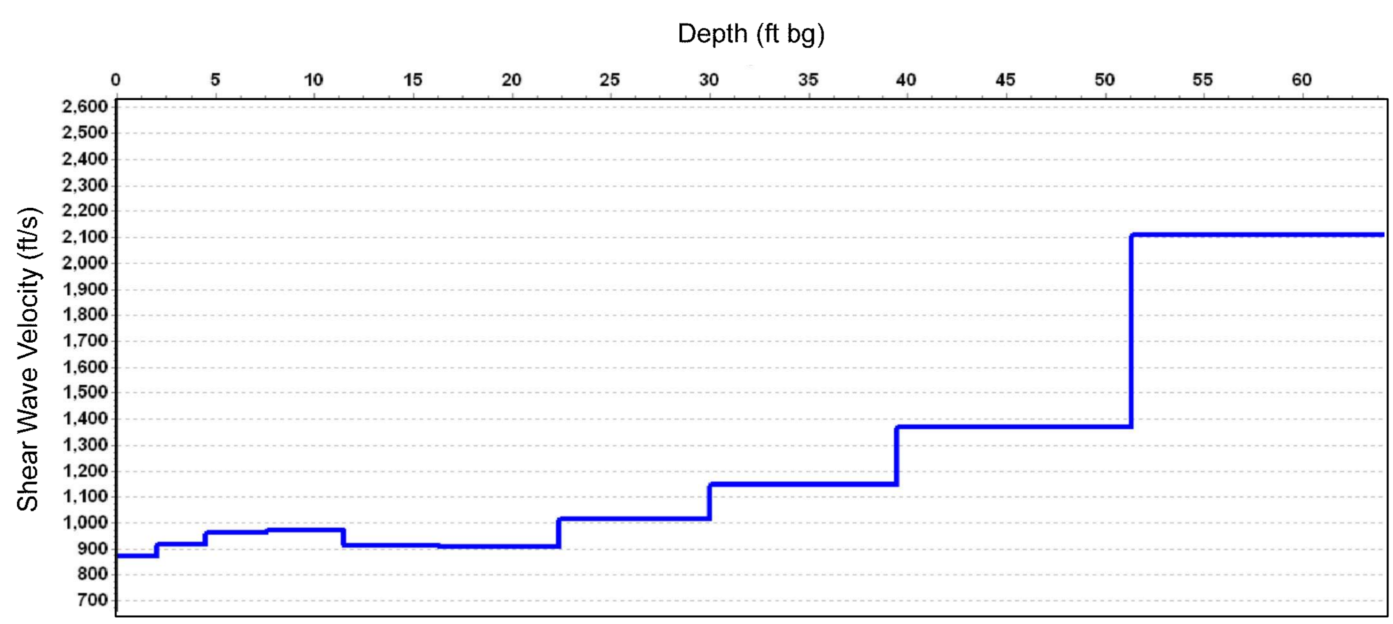
Depth (ft bgs)	Shear Wave Velocity (ft/s)
-2	749
-3	764
-6	808
-9	864
-13	859
-17	742
-23	751
-30	929
-39	1,105
-49	1,876

MASW M2



Depth (ft bgs)	Shear Wave Velocity (ft/s)
-3	542
-7	492
-12	534
-19	686
-26	935
-36	1,168
-49	1,285
-64	1,428
-83	1,580
-104	2,521

MASW M3



Depth (ft bgs)	Shear Wave Velocity (ft/s)
-2	872
-4	915
-8	965
-11	973
-16	913
-22	910
-30	1,013
-39	1,146
-51	1,367
-64	2,108

Notes

Geophysical survey conducted February 8-12, 2020 using Geometrics ES-3000 seismograph, 4.5 Hz geophones and SurfSeis 6.0.1.46 software.

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DRN	AXB	2/17/21
DES	AXB	2/17/21
CHK	PJH	2/18/21
REV		
PROJ. MGR.	AXB	2/18/21

SCALE: Not to Scale

SOURCE: SurfSeis 6.0.1.46

PROJECT: **Geophysical Investigation Rhudes Creek Solar Project Cecilia, Kentucky**

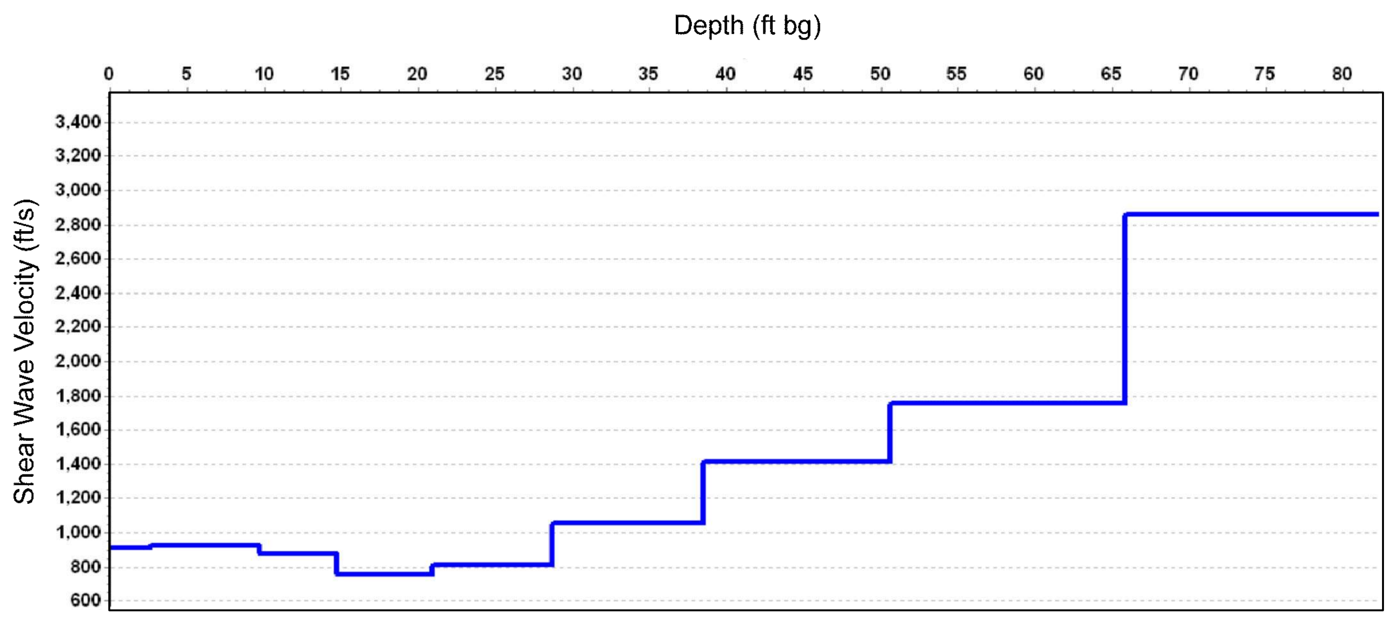
DRAWING NO.: **Figure 12** MASW Data - M1-M3

PREPARED FOR: ANS

PROJECT NO.: 1265-10736

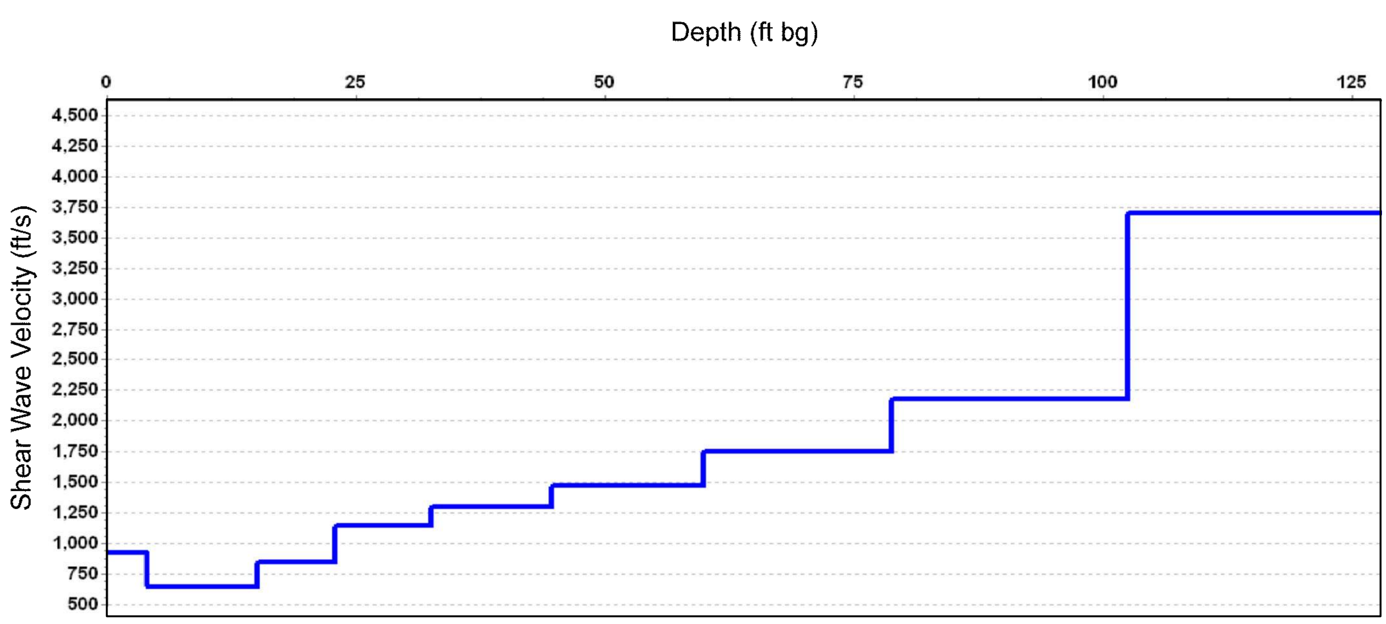
SHEET TITLE: DWG10736F12

MASW M4



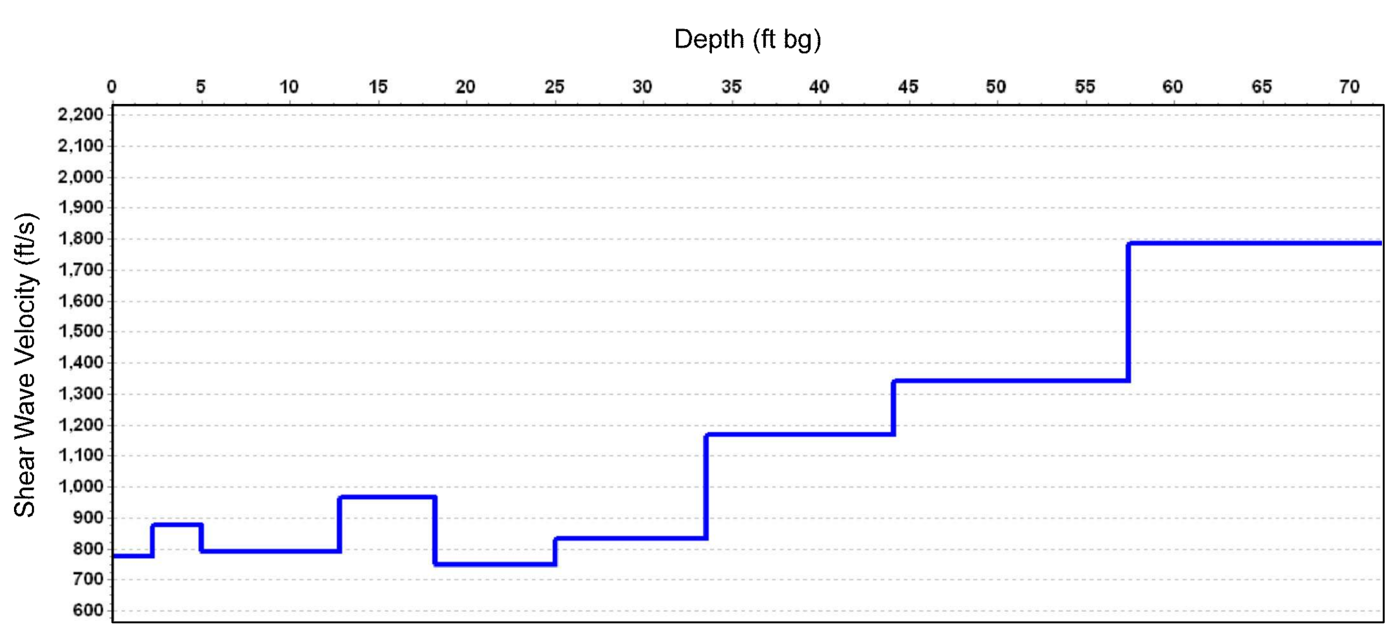
Depth (ft bgs)	Shear Wave Velocity (ft/s)
-3	909
-6	924
-10	920
-15	872
-21	756
-29	815
-38	1,056
-51	1,414
-66	1,758
-82	2,859

MASW M5



Depth (ft bgs)	Shear Wave Velocity (ft/s)
-4	921
-9	638
-15	638
-23	847
-33	1,144
-45	1,296
-60	1,475
-79	1,748
-102	2,173
-128	3,702

MASW M6



Depth (ft bgs)	Shear Wave Velocity (ft/s)
-2	776
-5	875
-8	792
-13	792
-18	965
-25	749
-34	834
-44	1,168
-57	1,344
-72	1,785

Notes

Geophysical survey conducted February 8-12, 2020 using Geometrics ES-3000 seismograph, 4.5 Hz geophones and SurfSeis 6.0.1.46 software.

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DRN	AXB	2/17/21
DES	AXB	2/17/21
CHK	PJH	2/18/21
REV		
PROJ. MGR.	AXB	2/18/21

SCALE: Not to Scale

SOURCE: SurfSeis 6.0.1.46

PROJECT: **Geophysical Investigation Rhudes Creek Solar Project Cecilia, Kentucky**

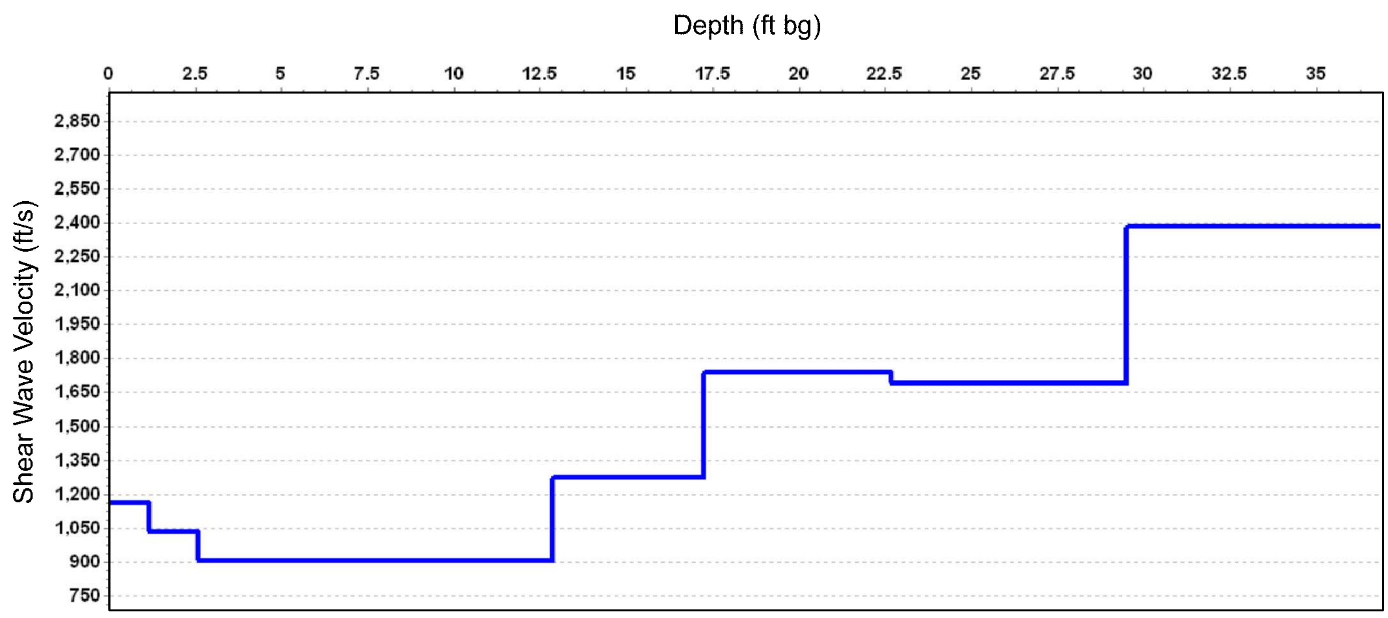
DRAWING NO.: **Figure 13** MASW Data - M4-M6

PREPARED FOR: ANS

PROJECT NO.: 1265-10736

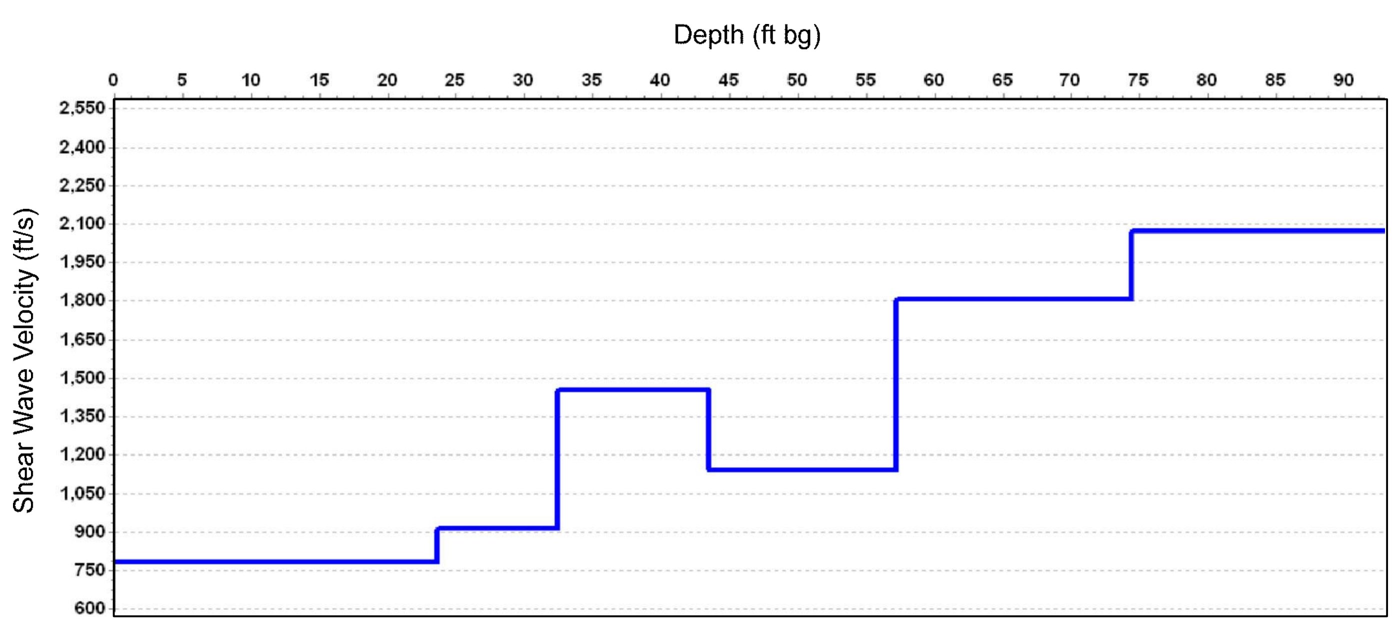
SHEET TITLE: DWG10736F13

MASW M7



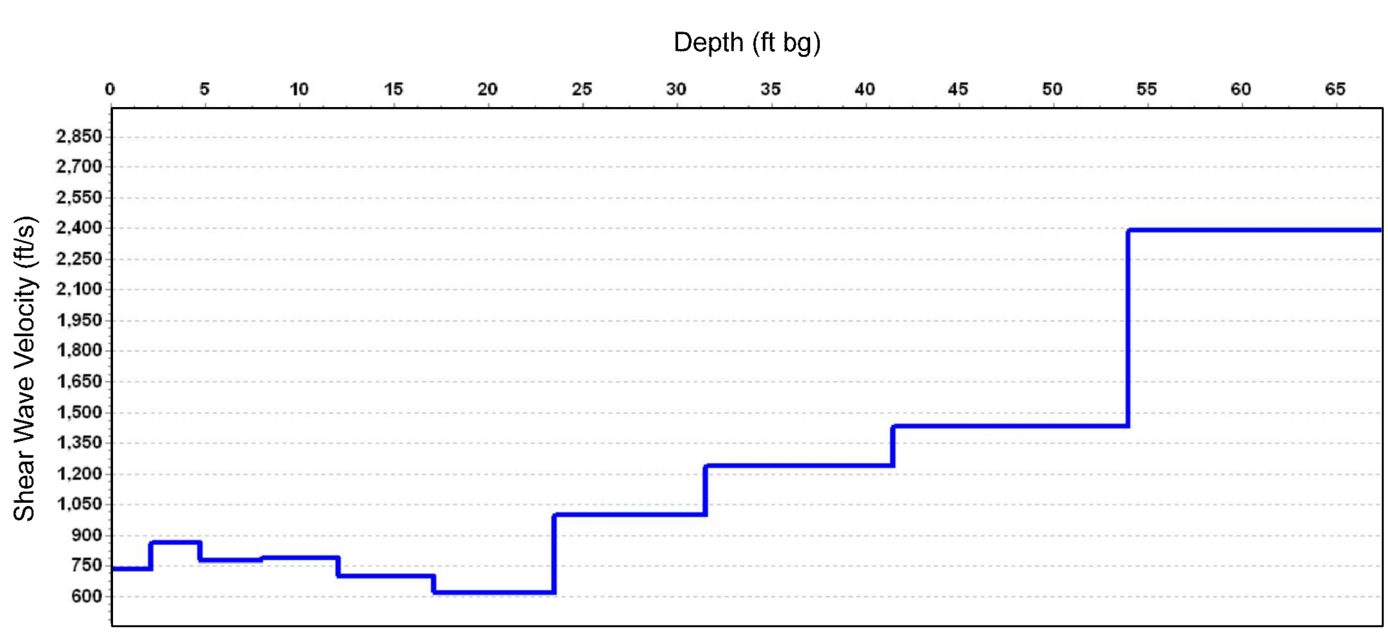
Depth (ft bgs)	Shear Wave Velocity (ft/s)
-1	1,160
-3	1,033
-4	907
-7	907
-9	907
-13	907
-17	1,274
-23	1,737
-30	1,688
-37	2,381

MASW M8



Depth (ft bgs)	Shear Wave Velocity (ft/s)
-3	783
-6	783
-11	783
-17	783
-24	783
-32	913
-43	1,454
-57	1,142
-74	1,805
-93	2,071

MASW M9



Depth (ft bgs)	Shear Wave Velocity (ft/s)
-2	736
-5	862
-8	777
-12	784
-17	698
-24	617
-32	998
-41	1,241
-54	1,434
-67	2,392

Notes

Geophysical survey conducted February 8-12, 2020 using Geometrics ES-3000 seismograph, 4.5 Hz geophones and SurfSeis 6.0.1.46 software.

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DRN	AXB	2/17/21
DES	AXB	2/17/21
CHK	PJH	2/18/21
REV		
PROJ. MGR.	AXB	2/18/21

SCALE: Not to Scale

SOURCE: SurfSeis 6.0.1.46

PROJECT: **Geophysical Investigation Rhudes Creek Solar Project Cecilia, Kentucky**

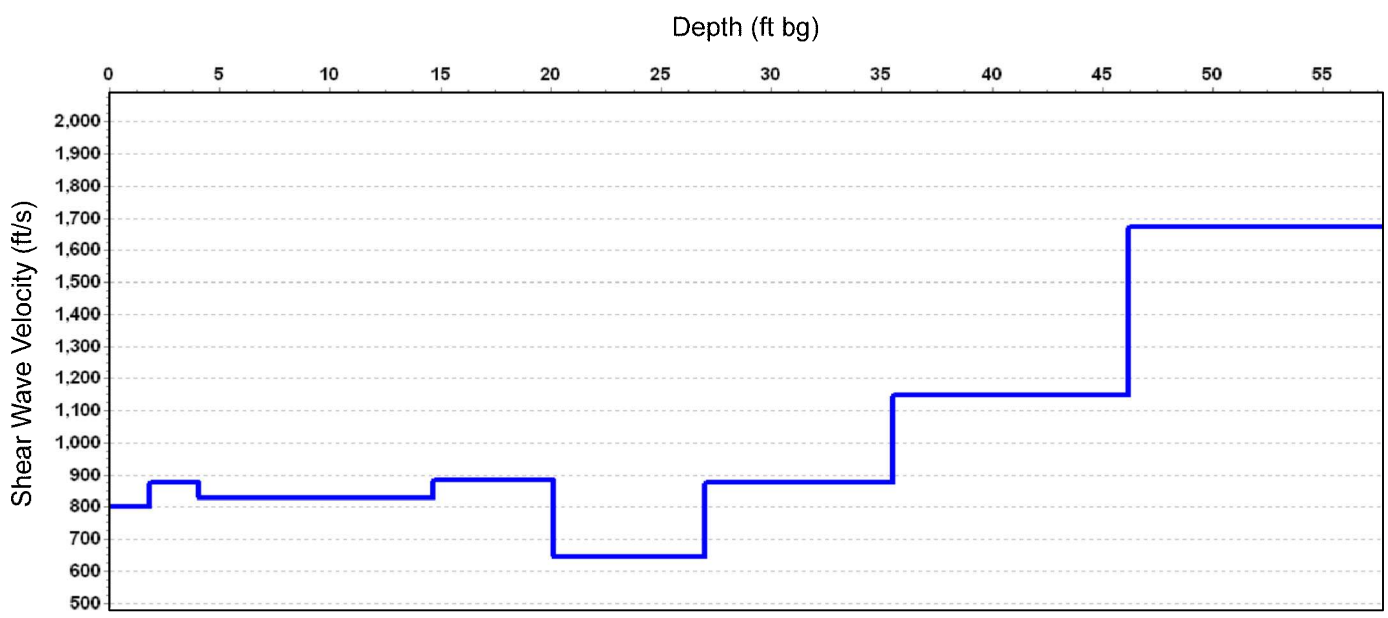
DRAWING NO.: **Figure 14** MASW Data - M7-M9

PREPARED FOR: ANS

PROJECT NO.: 1265-10736

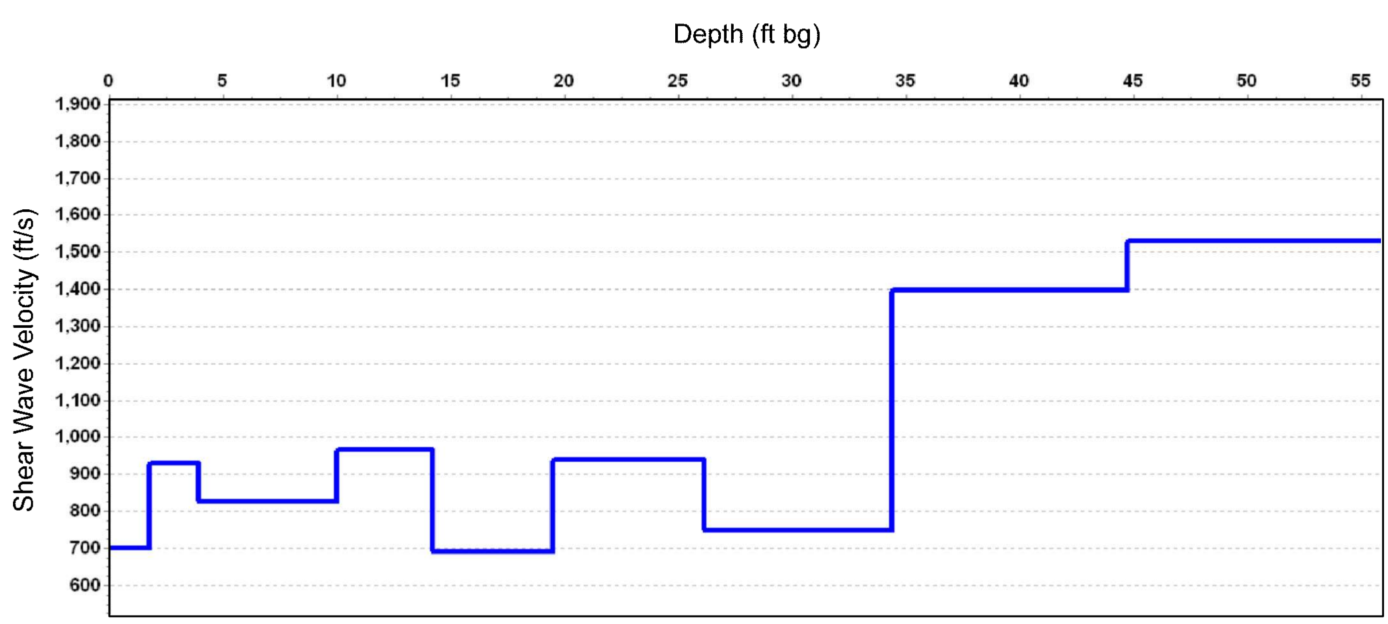
SHEET TITLE: DWG10736F14

MASW M10



Depth (ft bgs)	Shear Wave Velocity (ft/s)
-2	803
-4	877
-7	829
-10	829
-15	829
-20	885
-27	646
-36	877
-46	1,148
-58	1,673

MASW M11



Depth (ft bgs)	Shear Wave Velocity (ft/s)
-2	699
-4	932
-7	825
-10	825
-14	966
-20	691
-26	941
-34	748
-45	1,398
-56	1,530

Notes

Geophysical survey conducted February 8-12, 2020 using Geometrics ES-3000 seismograph, 4.5 Hz geophones and SurfSeis 6.0.1.46 software.

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DRN	AXB	2/17/21
DES	AXB	2/17/21
CHK	PJH	2/18/21
REV		
PROJ. MGR.	AXB	2/18/21

SCALE: Not to Scale

SOURCE: SurfSeis 6.0.1.46

PROJECT: Geophysical Investigation Rhudes Creek Solar Project Cecilia, Kentucky

DRAWING NO.: Figure 15 MASW Data - M10-M11

PREPARED FOR: ANS

PROJECT NO.: 1265-10736

SHEET TITLE: DWG10736F15

Attachment H

Terracon's *Preliminary Geotechnical Engineering Report*

Preliminary Geotechnical Engineering Report

LGE-KU Solar Project
Cecilia, Hardin County, Kentucky
December 30, 2020
Terracon Project No. 57205074

Prepared for:
ibV Energy Partners, LLC
Miami, Florida

Prepared by:
Terracon Consultants, Inc.
Louisville, Kentucky

December 30, 2020

ibV Energy Partners, LLC
777 Brickell Ave Ste 500
Miami, Florida 33131-2809

Attn: Mr. Steven Link, Sr. Director – Project Development
P: (954) 319-4143
E: steven.link@ibvenergy.com

Re: Preliminary Geotechnical Engineering Report
LGE-KU Solar Project
Cecilia, Hardin County, Kentucky
Terracon Project No. 57205074

Dear Mr. Link:

We have completed the Preliminary Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P57205074 dated September 25, 2020. This report presents the findings of the subsurface exploration and provides preliminary geotechnical recommendations concerning earthwork and solar panel foundations for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Sadra Javadi, Ph.D.
Geotechnical Engineer

Benjamin W. Taylor, P.E.
Principal, Regional Manager

SME Reviewer: James M. Jackson, P.E. (FL)

REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the ***GeoReport*** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

Preliminary Geotechnical Engineering Report
LGE-KU Solar Project
Cecilia, Hardin County, Kentucky
Terracon Project No. 57205074
December 30, 2020

INTRODUCTION

This report presents the results of our preliminary subsurface exploration and geotechnical engineering services performed for the proposed 100-Megawatt (Mw) AC photovoltaic (PV) solar power facility to be located in Cecilia, Hardin County, Kentucky. The purpose of these services is to provide information and preliminary geotechnical engineering recommendations relative to:

- Subsurface Soil Conditions
- Foundation Design and Construction
- Corrosivity Testing
- Site Preparation and Earthwork
- Groundwater Considerations
- Seismic Site Classification per IBC
- Thermal Resistivity Testing

The scope of services for this project included the advancement of 18 test borings to the depths ranging between 9½ to 46 feet below existing site grades, field electrical resistivity and laboratory testing.

Maps showing the site and exploration locations are shown in the **Site Location** and **Exploration Plans**. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and/or as separate graphs in the **Exploration Results** section.

The **General Comments** section provides an understanding of the report limitations.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project site consists of approximately 945 acres and 7,300 linear feet of Right of Way (ROW) located on Hardinsburg Road in Cecilia, Hardin County, Kentucky. The approximate coordinates of the site are: 37.655705°, -85.990534°. See **Site Location**
Existing Improvements	The site is primarily agricultural land. South Black Branch Road crosses the site in a northeast-southwest direction. Multiple small wooded areas are located within the project boundaries. A train track parallel to the South Black Branch Road crosses the southeast portion of the site.
Current Ground Cover	The project site is covered with crops, bare soil, and grass with isolated stands of trees presenting between the fields, residential houses, roads/driveways, and ponds.
Existing Topography	Site-specific topographic survey was not available at the time of this report. Based on review of topographic elevation in Google Earth Pro™ and our observation during exploration, the site appears to generally be hilly. Ground surface sloping from an approximate elevation of 770 feet in the West to about 695 feet in the Southeast.
Geology Cecilla Quadrangle GQ-263 Hardin County, KY by the Kentucky Geological Survey (KGS)	The project site is mapped within an area reported by the Kentucky Geological Survey (KGS) to have a very high karst potential. Multiple sinkholes are mapped by the KGS within 1-mile of the site. Further, there are several sinkholes mapped within the site boundaries. A quarry is mapped to the Southeast of the site. It is common for quarry operations to cause fluctuations in the local groundwater levels which can affect sinkhole development in adjacent areas. The project site mapped with the following underlying bedrock geology: ***Ste. Genevieve Limestone*** *Primary Lithology: Limestone, dolomite, and Shale* Limestone is light-yellowish-gray that is weathered partially with white to light -gray color, interbedded with about equal amounts of light-gray to light-brownish-gray sublithographic to medium-grained clastic limestone, locally shaly, cherty or pyritic. Dolomite is yellowish gray, very fine grained, massive; locally calcareous and contains fist-sized vugs filled with crystalline calcite. Silty clay shale is yellowish to greenish gray, locally calcareous. ***Alluvium*** *Primary Lithology: Sand, silt, clay, and gravel* Sand is very fine to fine grained, poorly graded, interbedded with silt and clay. Gravel composed of pebbles, cobbles, and scattered boulders of chert, limestone, and some cemented sandstone. Clayey and silty sand in large shallow sinks. Bedrock exposed in stream beds of West Rhudes, Shaw, and Valley Creeks in narrow strips too small to show on map.

PROJECT DESCRIPTION

Our understanding of the project conditions is as follows:

Item	Description
Information Provided	The updated project boundary ***New LGE-KU Sites- Primary RoW.kmz*** was provided to us by Mr. Link with ibV via email dated September 8, 2020. The ***ALTA/NSPS TITLE SURVEY*** dated January 29, 2020, prepared by Harris Gary, LLC. was provided to us via email on August 19, 2020. The ALTA map was preliminary and did not include the elevations.
Project Description	It is our understanding that the Client intends to develop a 100 MWac solar facility consisting of photovoltaic (PV) solar facility. Ultimately, the facility will consist of solar panels and various other equipment associated with the substation and O&M Building (e.g. switchgear, transformers, inverters, and overhead and underground electrical conveyance). We understand that electrical transmission lines are planned to be constructed at right-of-way. We assumed transmission towers will be supported on drilled shaft foundation.
Proposed Structures	Photovoltaic panels are anticipated to be supported on steel racking system founded on wide flange piles (W6x9 or similar) or other proprietary sections. Electrical equipment will be supported on concrete slabs-on-grade, spread footings, or drilled piers.
Maximum Loads	Structural loads were not provided at the time of this report. Based on our experience with fixed rack systems, we have assumed the following structural loading. ■ Downward: 3 to 7 kips ■ Uplift: 2 kips ■ Lateral: 1.5 to 3.5 kips ■ Substation Structures: 1,500 psf (Substation dimensions were not provided to us at the time of this report. Based on the provided kmz file we assumed that the substation dimensions are 350 ft by 400 ft) ■ O&M Building: 5 kips per linear foot (klf)
Grading/Slopes	A site grading plan has not been developed at this time. It is anticipated that the site work will be minimal, with cuts and fills within +/- 2 feet of existing grade. Localized high and low areas may require greater cut and/or fill.
Pavement	We anticipate low-volume, aggregate-surfaced and native soil access roads will primarily service relatively light maintenance vehicles (pick-up trucks) with a few heavier delivery vehicles (maximum load of 30,000 lbs.) throughout their post-construction life.
Estimated Start of Construction	Unknown.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**LEAN CLAY (CL)**	with silt, trace fine sand, brown with reddish brown, soft to hard
2	**FAT CLAY (CH)**	trace fine sand, with limestone fragments, reddish brown to brown and gray, soft to stiff
3	**SILTY SAND (SM)**	black, medium dense
4	**LIMESTONE**	light with dark gray, moderate to very close spacing, thin bedding, unweathered to slightly weathered, medium strong to very strong rock

The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed in the exploration locations can be found on the boring logs in **Exploration Results** and are summarized below.

Boring Number	Approximate Depth to Groundwater while Drilling[1] (ft)
B-3	12
B-6	18½
ROW-1	3½
ROW-2 [2]	13
ROW-4 [2]	13
ROW-5 [2]	3
ROW-7 [2]	8

1. Below ground surface.
2. Water was used as drilling fluid during for rock coring and the actual water level could be affected due to the introduced water to the borehole.

Groundwater was not observed in the other borings while drilling, or for the short duration the borings could remain open. However, this does not necessarily mean the borings terminated above groundwater, or the water levels summarized above are stable groundwater levels. Due to the relatively low permeability of the soils encountered in the boring, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole in these materials. Long-term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Our exploration encountered overburden that generally consisted of low plasticity LEAN CLAY (CL) underlain by highly plastic FAT CLAY (CH). At boring B-3, SILTY SAND (SM) was encountered below the FAT CLAY (CH). The consistency of native cohesive soils ranged from soft to hard. Rock coring was performed as part of this preliminary exploration at borings B-11, and ROW-1 through ROW-7. Rock core samples consist of unweathered to slightly weathered, medium to very strong limestone.

As discussed in the Geology section, the site is reported to have a very high karst potential. Multiple sinkholes are mapped by the KGS within 1-mile radius inside and on west, north, and east side of the site. Soil softening with depth, which can be indicative of soil raveling into subsurface voids was observed below depths of:

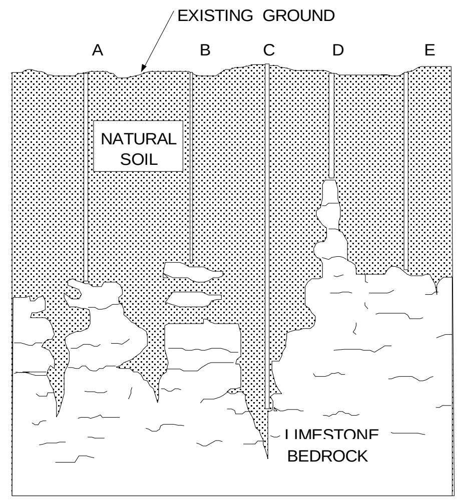
- 5 feet at ROW-4,
- 10 feet at borings B-2, B-4, B-6, B-8, ROW-2, and
- 15 feet at borings B-5, B-7, B-9, B-10, B-11, and ROW-1

Considering the very high karst potential and sinkholes previously mapped by the Kentucky Geological Survey (KGS) as well as the observations noted from boring logs, we recommend Terracon be engaged to perform a karst survey for the site during the project's preliminary assessment and design phase. The purpose of the karst survey will be to identify and delineate existing karst features, evaluate site feasibility for development, assess karst risk, and recommend avoidance and mitigation measures.

Borings were advanced to auger refusal at depths of 6½ to 26 feet below existing grade. Auger refusal is defined as the depth below the ground surface at which a test boring can no longer be advanced with the soil drilling technique being used. Karst bedrock, such as the Ste. Genevieve Limestone formation is known for producing several obstructions that can cause the augers to refuse above sound bedrock.

These obstructions can range from floaters to rock pinnacles as illustrated in Examples A, B, C, and D in the figure. Depth to competent bedrock can vary greatly over short distances. The possibility of varying depths to bedrock should be considered when developing the design and construction plans for this project.

AUGER REFUSAL ILLUSTRATION



THIS FIGURE IS FOR ILLUSTRATIVE PURPOSES ONLY AND DOES NOT NECESSARILY DEPICT THE SPECIFIC BEDROCK CONDITIONS AT THIS SITE

Specific conditions encountered at the exploration locations are indicated by the **Exploration Results**. Stratification boundaries on the boring log represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual.

Due to the residual nature of the overburden soils, rock fragments, chert, and cobbles should be expected. Therefore, it is possible that piles driven into the overburden soils and weathered rock stratum can encounter difficult driving or shallow refusal across most of the site. Pre-drilling of undersized holes and backfilling with soil cuttings may be required to accommodate pile installation in areas where driving piles is difficult. We recommend a pile driving and testing program be developed to assess the difficulty of piles penetrating the onsite soils. The pile test program should include pre-drilling.

Design recommendations and construction considerations for the solar PV panel foundations are presented in the **Foundations** section of this report.

Terracon should be retained for final, design-level geotechnical engineering services and during construction of the project to observe earthwork and to perform necessary tests and observations during pile driving, subgrade preparation; proof-rolling; placement and compaction of controlled compacted fill; backfilling of excavations in the completed subgrade; and for construction of foundations.

Preliminary recommendations contained in this report are based upon the data obtained from the limited number of test borings. This report does not reflect conditions between the points investigated, or between sampling intervals in test borings. The nature and extent of variations between test borings and sampling intervals may not become evident until the course of construction. A detailed subsurface geotechnical investigation should be completed prior to final design and construction to assess localized subsurface conditions at proposed structure locations.

The **General Comments** section provides an understanding of the report limitations.

CONTRIBUTORY RISK COMPONENTS

ITEM	DESCRIPTION
Supplemental Exploration and Services	Additional soil test borings should be performed to adequately explore the site as part of a design-level study. Additionally, a full-scale pile load testing (PLT) program should be considered as the project design progresses. The results of a full scale PLT program in conjunction with soil test boring/test pit results are often successful in reducing the design embedment depth when compared to designs solely based on explorative results and analytical methods.
Soil Conditions	Project site subsurface profile consisted of predominately native cohesive soil underlain by limestone to the depths explored. The surface layer at the site generally contained top soil up to approximately 18 inches thick. These soils are not considered suitable for subgrade support or reuse as fill material. The borings encountered highly expansive soils. Please see information related to expansion soil hazards below.
Karst Potential	Borings were advanced to auger refusal at depths of 6½ to 26 feet below existing grade. Auger refusal is defined as the depth below the ground surface at which a test boring can no longer be advanced with the soil drilling technique being used. Karst bedrock, such as the Ste. Genevieve Limestone formation is known for producing several obstructions that can cause the augers to refuse above sound bedrock. Depth to competent bedrock can vary greatly over short distances. The possibility of varying depths to bedrock should be considered when developing the design and construction plans for this project. Based on the auger refusal depth encountered in our exploration program, the bedrock elevation varies across the site. The project site is mapped within an area reported by the Kentucky Geological Survey (KGS) to have a very high karst potential. Multiple sinkholes are mapped by the KGS within 1-mile of the site. Further, there are several sinkholes mapped within the site boundaries. A quarry is mapped to the Southeast of the site. It is common for quarry operations to cause fluctuations in the local groundwater levels which can affect sinkhole development in adjacent areas.
Access	Wet and loose/soft surface conditions due to rainwater will create access issues for vehicles. The site will generally be more accessible in the summer and early fall due to the improved drying conditions.
Grading	We anticipate very little grading will be required. On-site materials that are used as fill or backfill will likely require drying prior to re-compaction as engineered fill. Alternatively, these materials could be replaced with imported soils containing an appropriate moisture content. We expect localized areas of unsuitable conditions will be encountered prior to placing fill and within the subgrade for roadways and shallow foundations that are planned. Stabilization measures, such as over-excavation and replacement, should be expected.
Groundwater	Groundwater was observed in 7 borings at completion of drilling, and was not observed at the rest of borings. However, this does not necessarily mean the borings terminated above groundwater. Due to the relatively low permeability of the soils encountered in the boring, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole in these

ITEM	DESCRIPTION
	materials. Based on our experience in the project area, groundwater level fluctuation should be anticipated at times during the design period for the project. Excavations, such as trenches for electrical cable and conduit, could encounter groundwater and require dewatering. Excavations for shallow foundations could also encounter groundwater, especially if construction is performed during periods of seasonally high groundwater.
Site Drainage	Final site grading may impact the drainage within the site. A drainage study should be performed once a grading plan has been finalized to review potential drainage or flooding issues.
Corrosion Hazard [1]	Based on field resistivity data and laboratory testing for electrical resistivity and chemical properties, the site soils have a moderate corrosion range to buried metal per corrosion guideline from U.S Department of Transportation Federal Highway Administration. The soils have a 'negligible' classification for sulfate exposure according to ACI Design Manual. The results of our laboratory testing of soil chemical properties (provided in the attachment) are expected to assist a qualified engineer to design corrosion protection for the production piles and other project elements.
Expansive Soil Hazards	Except boring ROW-3, highly expansive soils were encountered at all boring locations within the upper 10 ft during the subsurface exploration and soils in the region may experience moisture content fluctuations to some extent. Therefore, expansive behavior may be anticipated for the site soils. Further impact of highly expansive soils should be investigated in detail using additional evaluations such as swell test. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and (at least minor) cracking in the structure should be anticipated. The severity of cracking and other damage such as uneven floor slabs will probably increase if modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. Depending on the final grading plan, remedial measures may be implemented to limit swelling potential, such as over-excavation and replacement with 2-foot of low volume change (LVC) materials, treatment with a chemical admixture, etc.
Slope Hazards	The site is generally located in a relatively flat area.
Anticipated Pile Drivability	Due to the medium stiff to hard consistency of the overburden and variable depth to bedrock due to karst geology, there is a chance of encountering difficulties/obstructions during pile driving. If difficult pile driving is encountered, we anticipate pre-drilling to be required.
General Construction Considerations	The near-surface soils are moderately moisture sensitive and subject to degradation with exposure to moisture. To the extent practical, earthwork should be performed during warmer and drier periods of weather to reduce the amount of necessary subgrade remedial measures for soft and unsuitable conditions beneath access roadways, equipment pads, etc.

ITEM	DESCRIPTION
1.	The soil properties that can significantly affect the aggressiveness of corrosion to buried metal structures include: pH, oxidation-reduction potential, sulfates, sulfides, total dissolved salts, chlorides, resistivity, and moisture content. These properties were measured, and the results are reported in the attachment. These test results are provided to assist the designers of corrosion protection for the project.

PRELIMINARY RECOMMENDATIONS FOR DRIVEN PILE FOUNDATIONS

We have performed preliminary geotechnical analyses for driven pile foundations to support the typical PV panel racking system. Subsequent analyses will be required once design level geotechnical information is available and once other design considerations are more fully defined. **THEREFORE, THE RESULTS OF THE ANALYSES DESCRIBED BELOW ARE NOT SUITABLE FOR FINAL DESIGN.** Instead, this analysis is intended to assist you in roughly evaluating construction costs and development viability for the proposed project. It should also be noted that our analyses are based on short-term conditions based on boring information. For this type of foundation system, provisions for flexible or adjustable connection between the posts and the array superstructure are recommended.

Adfreeze Stress

The overburden soils encountered in the borings are frost susceptible. In cold weather climates, design to resist frost heave forces exerted on foundations is often the limiting factor in the foundation design. Specifically, pile lengths will need to be long enough to counteract potential heave forces in the seasonal frost zone.

As the frost penetrates deeper into the soil and the ground swells due to freezing, the ground surface will rise due to frost heaving. The upward displacement is due to freezing water contained in the soil voids along with the formation of ice lenses in the soil. The freezing material grips the steel pile and exerts an uplift force due to the adfreeze stress developed around the surface area of the pile. The amount of upward force depends on the following:

- The thickness of ice lenses formed in the seasonal frozen ground
- The bond between the steel pile surface and the frozen ground
- The surface area of the steel pile in the seasonally frozen ground

Based on our review of soil samples, we recommend an adfreeze stress of 1,500 psf be considered when determining the frost heave load on a pile. The box perimeter of the pile (two times the depth plus two times the flange width) acting over a maximum depth of about 1-foot below ground surface should be considered when determining the frost heave load on a pile.

Uplift forces will govern the design and length of the driven pile; therefore, uplift will be the primary factor in foundation costs. The factor of safety against uplift should be determined based on discussions with the owner and design engineer considering the desired level or risk, construction costs, and the long-term maintenance program.

Geotechnical Axial Capacity

The following preliminary geotechnical parameters can be used to estimate the capacity of driven W-section pile foundations. These values should also be suitable to prepare a full-scale pile load testing program which is recommended as part of the overall project design. Final design values will vary from the preliminary estimates below. The upper 1 foot of soil should be neglected when calculating the ultimate capacity from skin friction.

Depth (feet bgs)	Ultimate Unit Skin Friction, q_s (psf) [1]	Ultimate End Bearing Capacity, Qp (psf)
Zone A (B-1)		
0 – 1	---	---
1 – 9½	650	9,000 [2]
below 9½	2,000	100,000 [2, 3]
Zone B (B-3)		
0 – 1	---	---
1 – 13½	750	13,500 [2]
13½ – 20	650	69,000 [2]
Zone C (All borings except B-1 and B-3)		
0 – 1	---	---
1 – 3½	650	---
3½ – 13	750	13,500 [2]
13 – 20	750	9,000 [2]

1. The upper 1 foot should be neglected in pile design due to frost heave.
2. Appropriate for pile toe bearing at depths of at least 5 feet below the ground surface. The ultimate end bearing capacity values are selected based on the type of the soil/rock and our experience with similar geology. We assumed that section W6X9 would be utilized for the pile foundations.
3. The skin friction and ultimate end bearing capacity for rock stratum at B-1 is based on our experience with similar geology

The above values are to be used in the following equations to obtain the ultimate uplift or compression load capacity of a pile:

$$Q_{ult\ (compressive)} = q_t \times A + H \times P \times q_s$$
$$Q_{ult\ (uplift)} = H \times P \times q_s$$

Q_{ult} = Ultimate uplift or compression capacity of post (lbs.)
$Q_{ult\ (end)}$ = Ultimate end bearing capacity per table above (lbs.)
H = Depth of embedment of pile (ft.)
P = Perimeter area/ft. of pile. (i.e. W6x9 = 1.64 sf/ft.)
q_s = Skin friction per depth per table above (psf)
q_t = unit toe-bearing resistance per table above (psf)
A = cross sectional area of pile (i.e. W6x9 = 0.019 sf).

The recommended geotechnical design parameters in this table are based on average conditions encountered in our borings. Additional subsurface exploration and pile load testing should be performed to determine actual design parameters across the site.

The skin friction is appropriate for uplift and compressive loading and represents ultimate values. A factor of safety of 2 should be applied to the skin friction values. The end bearing is also an ultimate value and should have a factor of safety of 2 applied for design.

Piles should have a minimum center-to-center spacing of at least 3 times their largest cross-sectional dimension to prevent reduction in the axial capacities due to group effects. If the piles are designed using the above parameters, settlements are not anticipated to exceed 1 inch.

Geotechnical Lateral Capacity

The parameters in the following table can be used for a preliminary analysis of the lateral capacity of driven steel piles in support of solar panel arrays:

Depth (feet bgs)	LPILE Soil Type	Unit Weight (pcf) [1]	Undrained Cohesion, c (psf)	Friction Angle (Deg)	Uniaxial Compressive Strength (psi)	Strain Factor ε_{50}	RQD (%)	Rock Mass (PSI)	P-Multiplier
Zone A – (B-1)									
0 – 1	Stiff Clay without Free Water (Reese)	125	750	---	---	default	---	---	0.7
1 – 9½		125	750	---	---	default	---	---	1.0
below 9½	Weak Rock (Reese) [2]	135	---	---	100	0.0005	10	50,000	1.0
Zone B – (B-3)									
0 – 1	Stiff Clay without Free Water (Reese)	120	1,500	---	---	default	---	---	0.7
1 – 13½		120	1,500	---	---	default	---	---	1.0
13½ – 20	Sand (Reese)[3]	130	---	32	---	default	---	---	1.0

Depth (feet bgs)	LPILE Soil Type	Unit Weight (pcf) [1]	Undrained Cohesion, c (psf)	Friction Angle (Deg)	Uniaxial Compressive Strength (psi)	Strain Factor ε_{50}	RQD (%)	Rock Mass (PSI)	P-Multiplier
Zone C – (All borings except B-1 and B-3)									
0 – 1	Stiff Clay without Free Water (Reese)	120	750	---	---	default	---	---	0.7
1 – 3½		125	750	---	---	default	---	---	1.0
3½ – 13		128	1,500	---	---	default	---	---	1.0
13 – 20		125	1,000	---	---	default	---	---	1.0

1. Effective unit weight should be used for stratum below groundwater table.
2. For the weathered limestone stratum at B-1 and anticipated limestone bedrock below refusal, we assumed a preliminary parameter based on our experience with similar projects. For the final design, rock coring should be performed to confirm the strength parameters.
3. Use default value for Soil Modulus, k.

The above indicated effective unit weight and effective friction angle have no factor of safety and may be used to analyze suitability of the proposed section and serviceability requirements. These parameters are based on correlations with SPT results, published values, and our experience with similar soil types. Existing p-y models typically under-predict the lateral capacity of shallow driven piles. Therefore, the P-multiplier is most likely higher but would need to be confirmed based on results of site-specific load test results.

PRELIMINARY RECOMMENDATIONS FOR ISOLATED SLAB FOUNDATIONS

We understand that some equipment may be supported on mat/slab foundations while other structures and O&M building may be supported on shallow foundations. Medium stiff lean clay was encountered near the surface and might require improvement prior to foundation construction. Based on the anticipated types of structures and the expected magnitude of loading, surface compaction using an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck with total weight of 20 tons or greater should provide adequate improvement for shallow foundation support of these structures. As discussed in **Geotechnical Overview**, we recommend that fat clay if encountered be undercut a minimum of 2-foot below design foundation bearing elevation and replaced with LVC engineered fill, or lean concrete extending to at least stiff clay. We would expect an allowable bearing capacity of 1,700 psf with total and differential settlements of about 1 inch and ¾ inch, respectively, depending on minimum foundation width and embedment.

PRELIMINARY RECOMMENDATIONS FOR SUBSTATION AND TRANSMISSION LINE FOUNDATIONS

Our recommendations provided below are based on the subsurface information encountered near boring locations B-11 and ROW-1 through ROW-7. If the location of the new substation and equipment pad areas change we should be consulted prior to the design and construction of foundations.

It is anticipated that some of the substation structures/appurtenances will be supported on deep foundation systems such as drilled shaft/pier foundation elements. It is recommended that each drilled shaft element be at least 1.5 feet in diameter. Based on our subsurface findings near the boring locations B-11 and ROW-1 through ROW-7, it is recommended that drilled shaft lengths should be at least 3 times the shaft diameter and it should be terminated within native cohesive soil of at least stiff consistency.

It is recommended that the drilled shaft design should incorporate a factor of safety of 3.0 for end bearing and 2.5 for side resistance, when subjected to axial compression loading situation. A factor of safety of 3.0 is recommended for side resistance against uplift loading situation. Soil parameters for axial design of drilled shaft are provided in the following section.

Depth (feet bgs)	Ultimate Skin Friction, f (psf)	Ultimate End Bearing Pressure, Qp (psf)
B-11		
0 – 2 [1]	---	---
2 – 7	1,200	---
7 – 15	1,050	27,000 [2]
15 – 26	950	9,000
26 – 46	18,000	28,000
ROW-1		
0 – 2 [1]	---	---
2 – 3½	250	---
3½ – 20	1,500	16,500
20 – 30	950	9,000
ROW-2		
0 – 2 [1]	---	---
2 – 13	1,500	18,000
13 – 18½	250	2,250
18½ – 23½	20,000	28,000
ROW-3		
0 – 2 [1]	---	---
2 – 18½	1,125	11,250
18½ – 23½	22,900	28,000

Depth (feet bgs)	Ultimate Skin Friction, f (psf)	Ultimate End Bearing Pressure, Qp (psf)
B-11		
ROW-4		
0 – 2 [1]	---	---
2 – 18	1,350	13,500
18 – 23	22,000	28,000
ROW-5		
0 – 2 [1]	---	---
2 – 6	500	---
6 – 10	1,500	15,750
10 – 15	20,000	28,000
ROW-6		
0 – 2 [1]	---	---
2 – 6½	950	---
6½ – 16½	12,500	28,000
ROW-7		
0 – 2 [1]	---	---
2 – 7	1,125	---
7 – 15	750	6,750
15 – 20	21,000	28,000

1. The side resistance of the uppermost 2 feet of the soil should be ignored due to the potential for disturbance caused during the drilled shaft construction.
2. Drilled shafts should be founded at a depth of at least 10 feet below the ground surface.

Recommended geotechnical parameters of drilled shaft foundations have been developed for use in the L-PILE computer program. Based on the encountered subsurface conditions, laboratory test results, and field penetration test results, generalized engineering properties have been provided at boring locations B-11 and ROW-1 through ROW-7, as shown in the following table:

Depth (feet bgs)	LPILE Soil Type	Unit Weight (pcf) [1]	Undrained Cohesion, c (psf)	Uniaxial Compressive Strength (psi)	Strain Factor ε_{50}
B-11					
0 – 7	Stiff Clay without Free Water (Reese)	125	1,500	---	default
7 – 15		128	3,000	---	default
15 – 26		120	1,000	---	default
26 – 46	Strong Rock (Vuggy Limestone)	167	---	12,000	0.00001
ROW-1					
0 – 3½	Soft Clay (Matlock)	115	250	---	default

Depth (feet bgs)	LPILE Soil Type	Unit Weight (pcf) [1]	Undrained Cohesion, c (psf)	Uniaxial Compressive Strength (psi)	Strain Factor ε_{50}
B-11					
3½ – 20	Stiff Clay without Free Water (Reese)	120	1,850	---	default
20 – 30		120	1,000	---	default
ROW-2					
0 – 13	Stiff Clay without Free Water (Reese)	120	2000	---	default
13 – 18½	Soft Clay (Matlock)	115	250	---	default
18½ – 23½	Strong Rock (Vuggy Limestone)	165	---	17,000	0.00001
ROW-3					
0 – 18½	Stiff Clay without Free Water (Reese)	120	1,250	---	default
18½ – 23½	Strong Rock (Vuggy Limestone)	158	---	6,000	0.00001
ROW-4					
0 – 18½	Stiff Clay without Free Water (Reese)	125	1,500	---	default
18½ – 23½	Strong Rock (Vuggy Limestone)	165	---	8,000	0.00001
ROW-5					
0 – 2	Stiff Clay without Free Water (Reese)	120	1500	---	default
2 – 6	Soft Clay (Matlock)	115	500	---	default
6 – 10	Stiff Clay without Free Water (Reese)	120	1750	---	default
10 – 15	Strong Rock (Vuggy Limestone)	166	---	6,000	0.00001
ROW-6					
0 – 6½	Stiff Clay without Free Water (Reese)	120	1,000	---	default
6½ – 16½	Strong Rock (Vuggy Limestone)	167	---	15,200	0.00001
ROW-7					
0 – 7	Stiff Clay without Free Water (Reese)	120	1,250	---	default
7 – 15	Soft Clay (Matlock)	115	750	---	default
15 – 20	Strong Rock (Vuggy Limestone)	163	---	9,800	0.00001

1. Effective unit weight should be used for stratum below groundwater table.

PRELIMINARY EARTHWORK RECOMMENDATIONS

The site work conditions will be largely dependent on the weather conditions and the contractor's means and methods in controlling surface drainage and protecting the subgrade. Final surrounding grades for any possible structures and inverters should be sloped away from structures on all sides to prevent ponding of water. All grades must provide effective drainage away from the structures during and after construction. Site preparation where inverter mat foundations will be installed should include clearing and grubbing, installation of a site drainage system (where necessary), subgrade preparation, and proof-rolling as necessary. Site preparation is not necessary in the PV Array field or where inverters will be supported on driven piles except to improve site drainage where necessary.

We would expect typical earthmoving equipment (bulldozers, excavators, fully-loaded tandem-axle dump truck) to be suitable for completion of earthwork activities on the site. The most challenging obstacle for earthwork construction will be the control of surface and groundwater, especially during wet season. The site should be graded to prevent ponding of surface water. Additionally, dewatering (rim ditches, sump pumps, well points, etc.) may be needed to lower the groundwater and allow for adequate compaction in trenches.

Typical unpaved access roads in the lightly loaded array areas consisting of about 4 to 6 inches of aggregate base on compacted native soil should be suitable. The substation access road will likely require 6 to 8 inches of aggregate base over 12 inches of stabilized subgrade or native soils reinforced with a geogrid.

SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our professional opinion that the **Seismic Site Classification is C**. Subsurface explorations at this site were extended to a maximum depth of 46 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. We recommend geophysical testing be performed to confirm the conditions below the current boring depth; preliminarily, we expect that the geophysical testing may result in better site class.

CORROSIVITY

The results of laboratory testing for water soluble sulfate, sulfides, soluble chloride, RedOx, Total

Salts, Resistivity, and pH are presented in **EXPLORATION RESULTS**. The values may be used by others to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

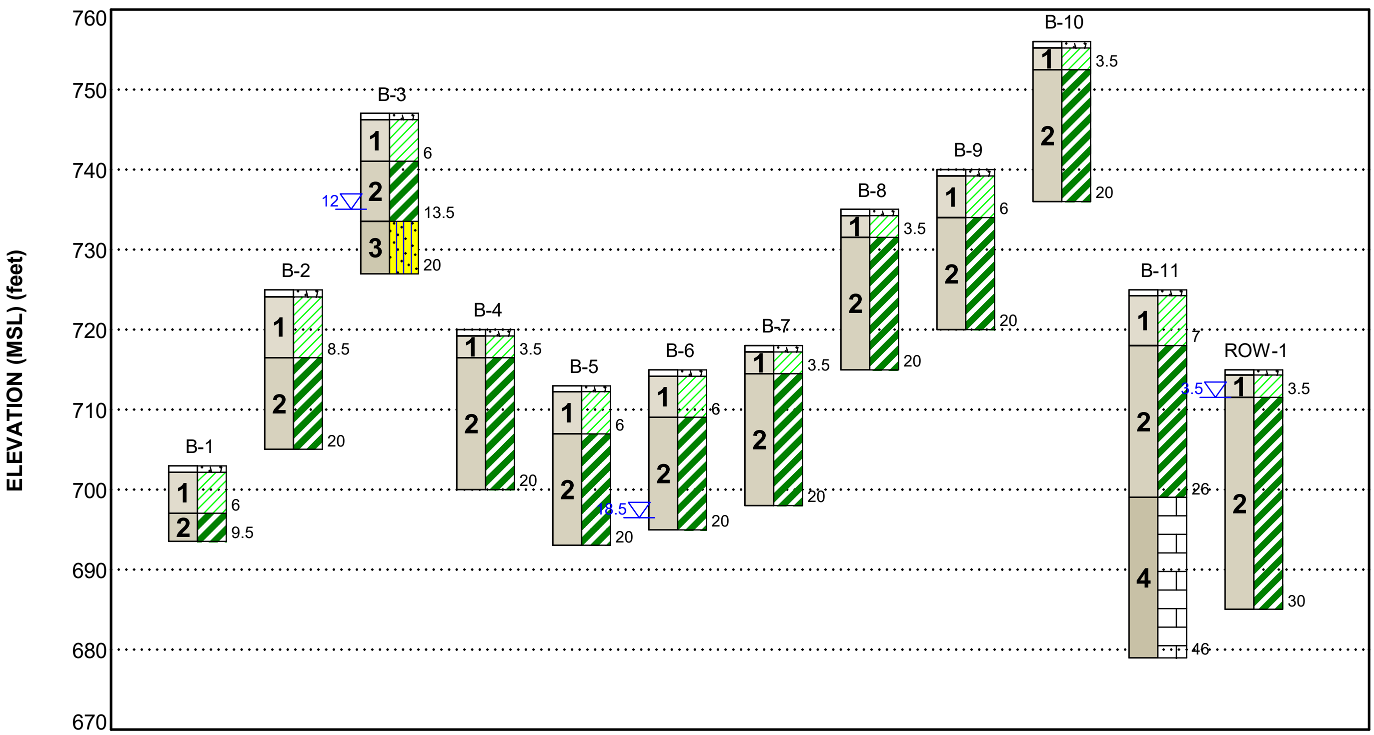
FIGURES

Contents:

GEOMODEL

LGE-KU Solar Project ■ Cecilia, KY
Terracon Project No. 57205074

Terracon GeoReport



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	LEAN CLAY (CL)	with silt, trace fine sand, brown with reddish brown, soft to hard
2	FAT CLAY (CH)	trace fine sand, with limestone fragments, reddish brown to brown and gray, soft to stiff
3	SILTY SAND (SM)	black, medium dense
4	LIMESTONE	light with dark gray, moderate to very close spacing, thin bedding, unweathered to slightly weathered, medium strong to very strong rock

LEGEND

Topsoil
Lean Clay
Fat Clay
Silty Sand
Limestone

First Water Observation

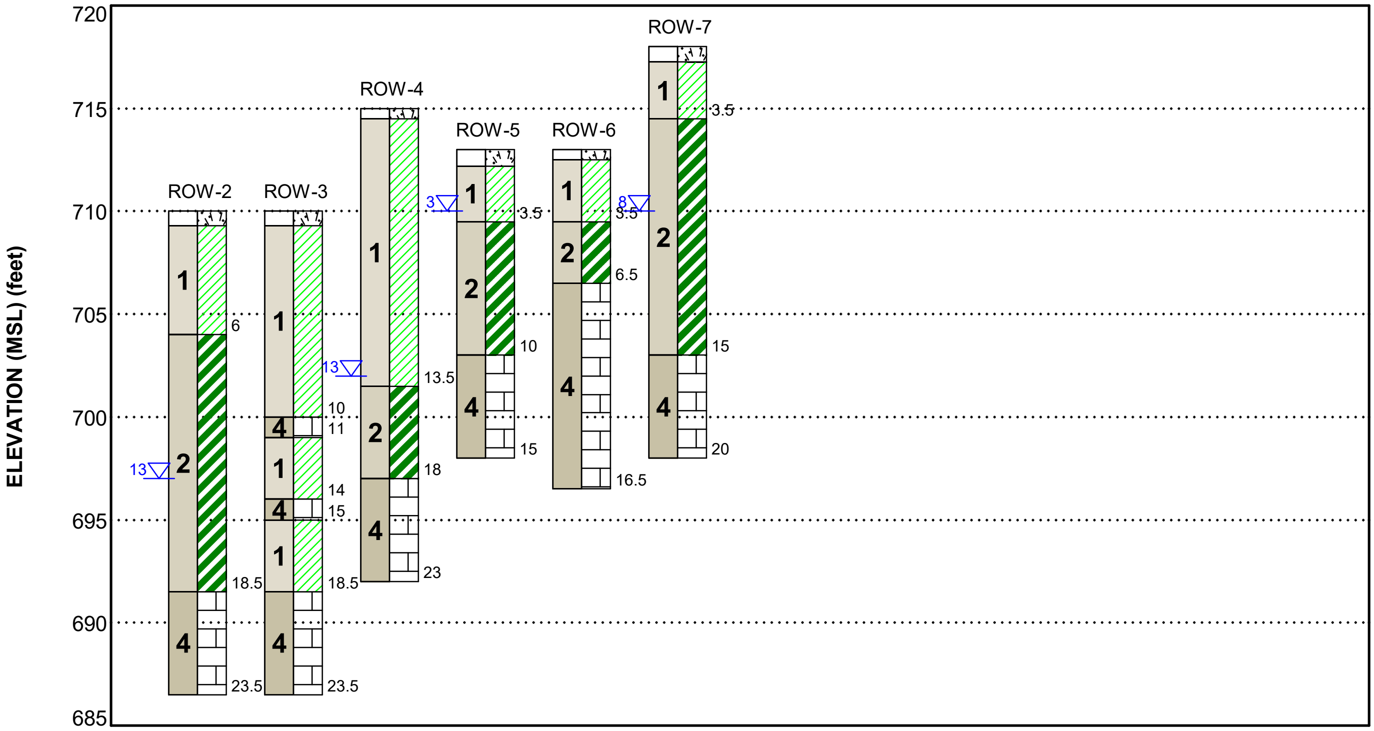
Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

LGE-KU Solar Project ■ Cecilia, KY
Terracon Project No. 57205074

Terracon GeoReport



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	LEAN CLAY (CL)	with silt, trace fine sand, brown with reddish brown, soft to hard
2	FAT CLAY (CH)	trace fine sand, with limestone fragments, reddish brown to brown and gray, soft to stiff
3	SILTY SAND (SM)	black, medium dense
4	LIMESTONE	light with dark gray, moderate to very close spacing, thin bedding, unweathered to slightly weathered, medium strong to very strong rock

LEGEND

- Topsoil
- Limestone
- Lean Clay
- Fat Clay

- First Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

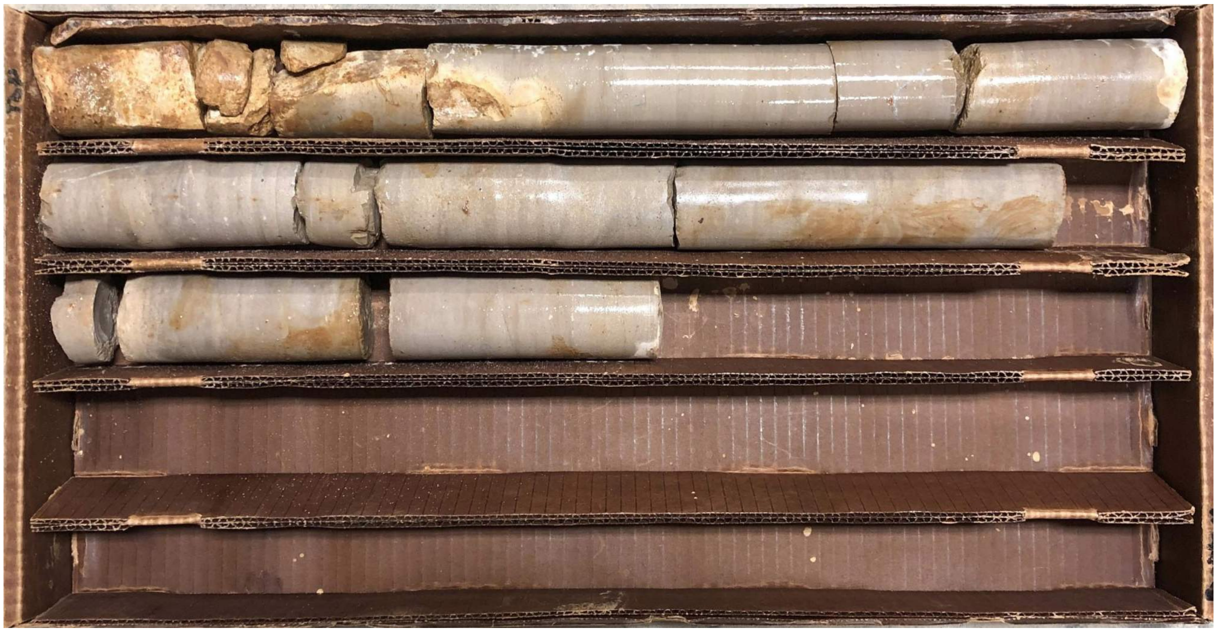
NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

ATTACHMENTS

PHOTOGRAPHY LOG

B-11 - Rock Core Run 1 – 26 to 36 feet

B-11 - Rock Core Run 1 – 36 to 46 feet



ROW-2 - Rock Core Run 1 – 18½ to 23½ feet

ROW-3 - Rock Core Run 1, 2, 3 – 10 to 23½ feet

ROW-4 - Rock Core Run 1 – 18 to 23 feet
ROW-5 - Rock Core Run 1 – 10 to 15 feet

ROW-6 - Rock Core Run 1, 2 – 6½ to 16½ feet

ROW-7 - Rock Core Run 1 – 15 to 20 feet

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Explored Locations
10	9½ to 20	Proposed PV array areas
1	46	Proposed substation area
7	15 to 30	Proposed transmission line right-of-way

Boring Layout and Elevations: Terracon personnel provided the boring layout. Coordinates were obtained with a handheld recreational GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were obtained by interpolation from the Google Earth™. If elevations and a more precise boring layout are desired, we recommend exploration locations be surveyed.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted rotary drill rig using continuous flight hollow stem augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings and bentonite chips upon completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Field (In-Situ) Electrical Resistivity: Utilizing AEMC Model 6471 Digital Ground Resistance Tester, electrical resistivity surveys were performed within the PV array areas. The surveys were performed in general accordance with the Wenner Four Point method (ASTM G57). Two mutually perpendicular arrays with "a" spacing of 2.5, 5, 10, 20, 50, 100, and 150 feet were performed at each location.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils.
- ASTM D2166/D2166M Standard Test Method for Unconfined Compressive Strength of Cohesive Soil.
- ASTM D7012 Standard Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures
- ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

The laboratory testing program included observation of soil samples by an engineer or geologist. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Note: All attachments are one page unless noted above.

SITE LOCATION

LGE-KU Solar Project ■ Cecilia, Hardin County, Kentucky
December 30, 2020 ■ Terracon Project No. 57205074

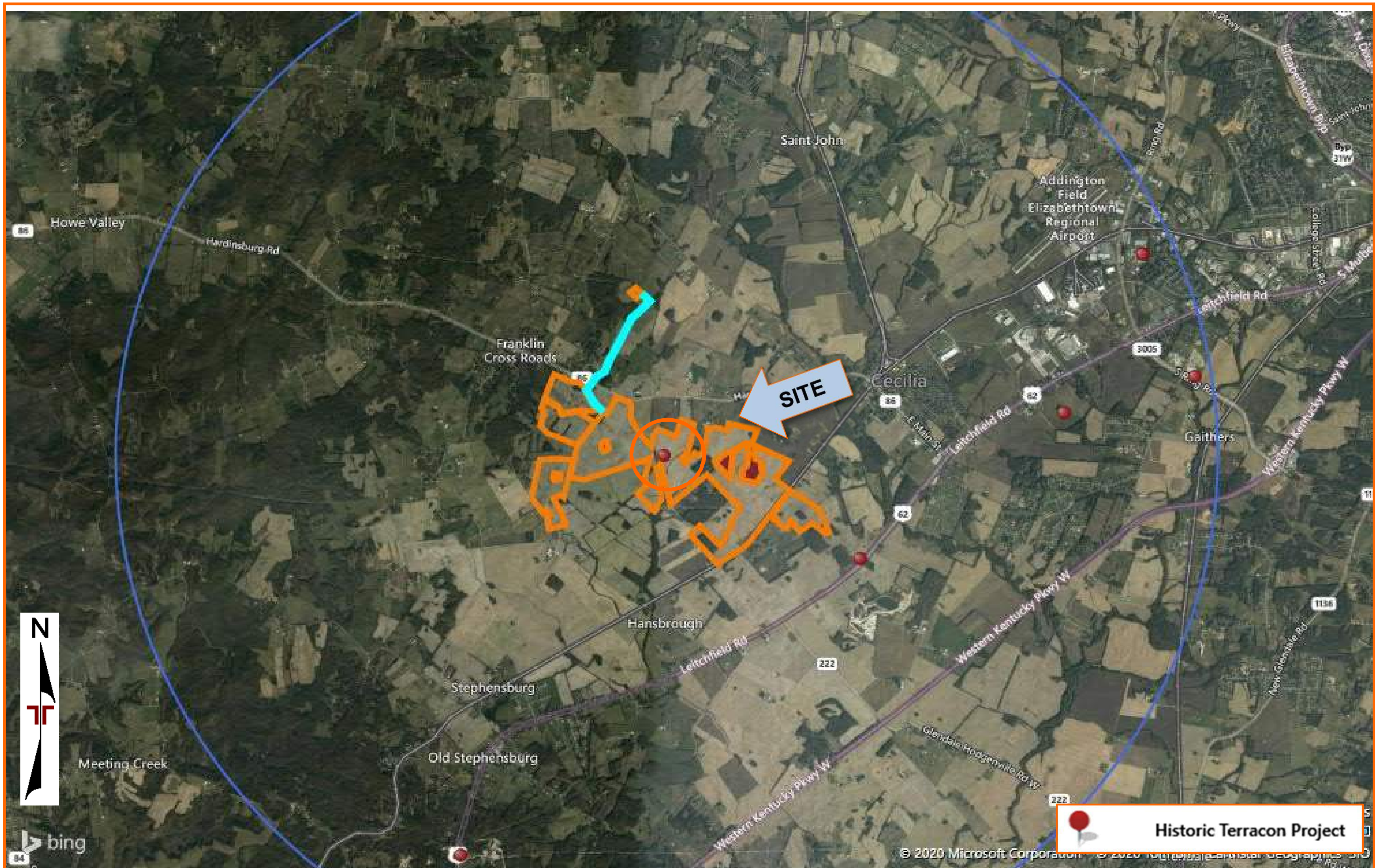


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

LGE-KU Solar Project ■ Cecilia, Hardin County, Kentucky

December 30, 2020 ■ Terracon Project No. 57205074

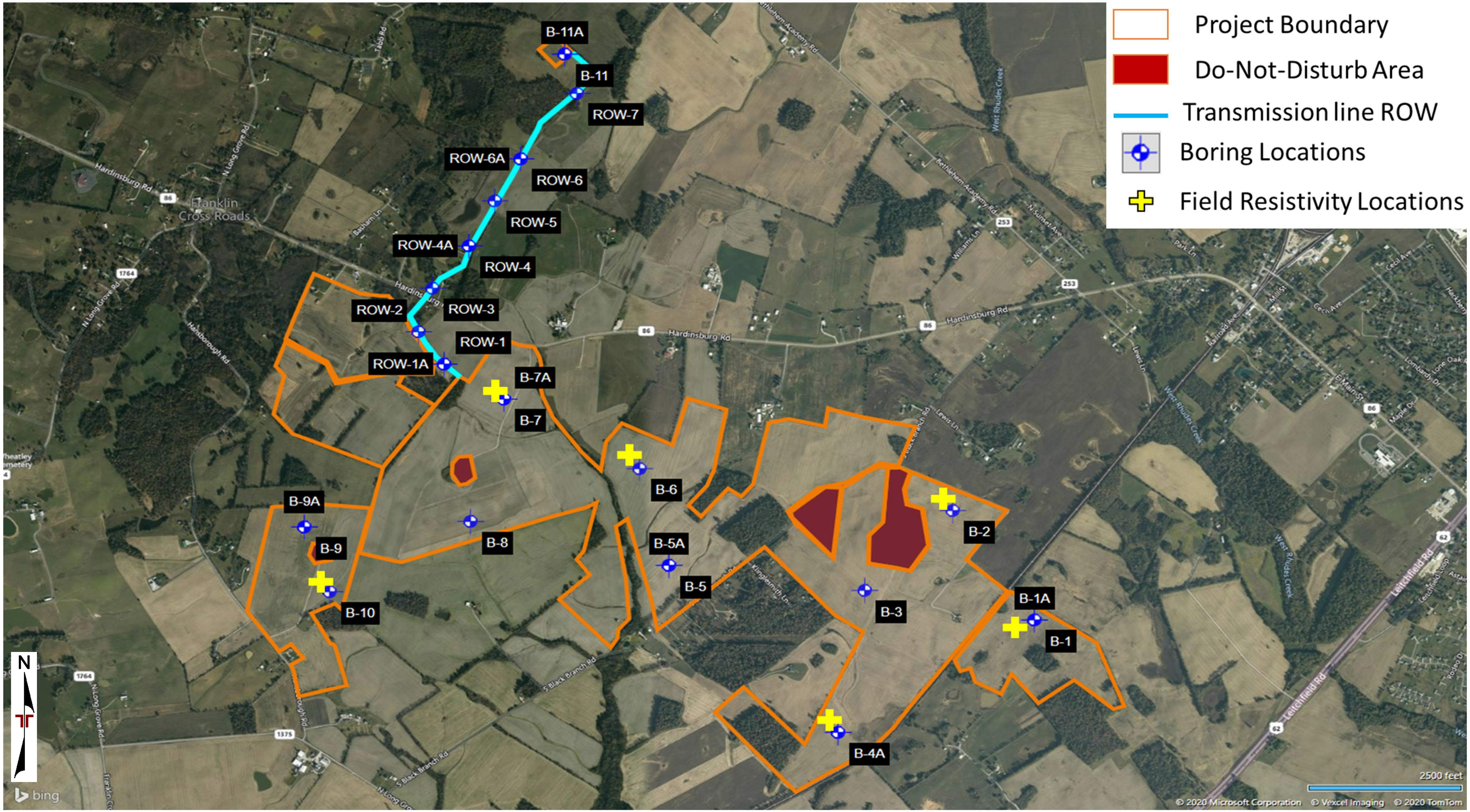


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Note: All attachments are one page unless noted above.

BORING LOG NO. B-1

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6495° Longitude: -85.9687°

Approximate Surface Elev.: 703 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		0.8	**TOPSOIL**	702+/-													
1			**LEAN CLAY (CL)**, with silt, brown, medium stiff				X	18	2-2-2 N=4		1.25 (HP)				21.0		
1		6.0		697+/-	5		X	18	3-3-4 N=7		2.00 (HP)				19.7		
2			**FAT CLAY (CH)**, reddish brown, medium stiff				X	18	3-3-4 N=7		1.75 (HP)				37.9		
2		9.5	with limestone fragments	693.5+/-			X	10	10-50/4"		1.50 (HP)				25.6		

Auger Refusal at 9.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-24-2020	Boring Completed: 11-24-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-1A

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6495° Longitude: -85.9687°

Approximate Surface Elev.: 703 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1		Blank Drilling 2.0 — 701+/-													
		LEAN CLAY (CL), with silt, brown, very stiff 4.0 — 699+/-				22			3.50 (HP)	UC	2.73	3.6	18.0	110	36-16-20
		Boring Terminated at 4 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-24-2020	Boring Completed: 11-24-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-2

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6549° Longitude: -85.9733°

Approximate Surface Elev.: 725 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		0.9	**TOPSOIL**	724+/-													
1		8.5	**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff	716.5+/-				18	1-2-2 N=4		0.75 (HP)				24.3		
					5			18	2-3-5 N=8		2.25 (HP)				21.7		
								18	3-4-5 N=9		1.75 (HP)				14.7		
2		20.0	**FAT CLAY (CH)**, reddish brown, medium stiff to stiff	705+/-	10			18	4-5-6 N=11		2.00 (HP)				18.8		
					15			18	2-3-4 N=7		2.25 (HP)				14.1		
					20			17	3-3-4 N=7		2.25 (HP)				21.3		
			Boring Terminated at 20 Feet														

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-24-2020	Boring Completed: 11-24-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-3

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6510° Longitude: -85.9782°

Approximate Surface Elev.: 747 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)
	0.8	**TOPSOIL**	746+/-
1	6.0	**LEAN CLAY (CL)**, with silt, brown, stiff	741+/-
2	13.5	**FAT CLAY (CH)**, trace fine sand, gray, stiff	733.5+/-
3	20.0	**SILTY SAND (SM)**, black, medium dense	727+/-
		Boring Terminated at 20 Feet	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1–2.5		X	18	1-3-7 N=10		1.25 (HP)				21.7		
3.5–5		X	18	4-7-8 N=15		4.50+ (HP)				13.9		
6–7.5		X	18	3-5-6 N=11		4.50 (HP)				17.2		52-18-34
8.5–10		X	18	6-3-5 N=8		1.75 (HP)				18.5		
~11.8	▽											
13.5–15		X	18	5-10-12 N=22						18.9		
18.5–20		X	18	7-10-8 N=18						21.8		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-24-2020	Boring Completed: 11-24-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-4

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6439° Longitude: -85.9797°

Approximate Surface Elev.: 720 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	0.8	**TOPSOIL**	719+/-													
1	3.5	**LEAN CLAY (CL)**, with silt, trace fine sand, brown, medium stiff to stiff	716.5+/-			X	18	3-4-5 N=9		2.50 (HP)				16.9		
2	20.0	**FAT CLAY (CH)**, reddish brown, stiff	700+/-	5		X	18	5-7-8 N=15		4.50+ (HP)				28.0		
						X	18	4-7-7 N=14		4.50+ (HP)				30.8		
				10		X	18	5-6-7 N=13		4.50+ (HP)				31.2		
				15		X	18	4-6-6 N=12		3.00 (HP)				24.7		
				20		X	18	3-4-5 N=9		2.50 (HP)				30.2		
		Boring Terminated at 20 Feet														

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-24-2020	Boring Completed: 11-24-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-4A

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6439° Longitude: -85.9797°

Approximate Surface Elev.: 720 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		1.0	Blank Drilling	719+/-													
1		3.0	**LEAN CLAY (CL)**, with silt, brown, hard	717+/-				21			3.50 (HP)	UC	4.61	3.9	18.0	109	45-17-28

Boring Terminated at 3 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-24-2020	Boring Completed: 11-24-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-5

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6522° Longitude: -85.9892°

Approximate Surface Elev.: 713 (Ft.) +/-

MODEL LAYER	DEPTH	Material Description	ELEVATION (Ft.)
	0.8	**TOPSOIL**	712+/-
1	6.0	**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff	707+/-
2	20.0	**FAT CLAY (CH)**, reddish brown, medium stiff to stiff	693+/-
		Boring Terminated at 20 Feet	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1–2.5		X	18	1-2-3 N=5		1.50 (HP)				22.9		
3.5–5		X	18	3-5-6 N=11		2.75 (HP)				19.9		
6–7.5		X	18	3-5-6 N=11		3.00 (HP)				21.7		
8.5–10		X	18	4-4-6 N=10		3.50 (HP)				20.9		
13.5–15		X	18	5-6-5 N=11		2.50 (HP)				39.7		
18.5–20		X	18	3-3-5 N=8		2.50 (HP)				29.3		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-23-2020	Boring Completed: 11-23-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-5A

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6522° Longitude: -85.9892°

Approximate Surface Elev.: 713 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1		Blank Drilling													
		2.0 — 711+/-													
		LEAN CLAY (CL), with silt, brown, very stiff				23			3.50 (HP)	UC	2.01	3.6	17.8	108	33-18-15
		4.0 — 709+/-													
		Boring Terminated at 4 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-23-2020	Boring Completed: 11-23-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-6

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6570° Longitude: -85.9909°

Approximate Surface Elev.: 715 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	0.8	714+/-	**TOPSOIL**													
1			**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff			X	18	1-2-3 N=5		2.00 (HP)				23.9		
1				5		X	18	4-5-7 N=12		3.25 (HP)				19.0		
	6.0	709+/-														
2			**FAT CLAY (CH)**, reddish brown, medium stiff to stiff			X	18	6-8-7 N=15		3.00 (HP)				21.9		
2				10		X	18	3-4-5 N=9		2.50 (HP)				23.4		
2				15		X	18	3-4-4 N=8		2.75 (HP)				26.5		
2					▽	X	18	2-3-4 N=7		1.75 (HP)				28.0		
	20.0	695+/-	***Boring Terminated at 20 Feet***	20												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-24-2020	Boring Completed: 11-24-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-7

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6605° Longitude: -85.9985°

Approximate Surface Elev.: 718 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		0.8	**TOPSOIL**	717+/-													
1		3.5	**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff	714.5+/-			X	18	2-3-5 N=8		2.00 (HP)				17.7		
2			**FAT CLAY (CH)**, reddish brown, stiff				X	18	5-7-9 N=16		4.50+ (HP)				22.5		
					5		X	18	4-6-7 N=13		3.50 (HP)				20.6		
							X	18	5-6-6 N=12		4.00 (HP)				23.6		
					10												
			with fine sand				X	18	6-7-8 N=15		2.25 (HP)				21.1		
					15												
		20.0	trace fine sand	698+/-			X	18	3-3-4 N=7		0.75 (HP)				28.2		
			Boring Terminated at 20 Feet		20												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-23-2020	Boring Completed: 11-23-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-7A

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.6605° Longitude: -85.9985° Approximate Surface Elev.: 718 (Ft.) +/- DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1		Blank Drilling 3.0 715+/-													
		LEAN CLAY (CL), reddish brown, hard 5.0 713+/-	5			13			4.50 (HP)	UC	4.96	4.8	19.2	107	46-20-26
		Boring Terminated at 5 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-23-2020	Boring Completed: 11-23-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-8

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6544° Longitude: -86.0004°

Approximate Surface Elev.: 735 (Ft.) +/-

MODEL LAYER	DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	0.8	**TOPSOIL**	734+/-													
1	3.5	**LEAN CLAY (CL)**, with silt, brown, medium stiff	731.5+/-			X	18	1-2-2 N=4		1.25 (HP)				24.5		
2		**FAT CLAY (CH)**, reddish brown, stiff with gray				X	18	4-7-7 N=14		2.25 (HP)				26.4		
				5		X	18	2-4-6 N=10		3.50 (HP)				21.8		
				10		X	18	4-5-7 N=12		4.25 (HP)				27.6		
				15		X	18	4-5-6 N=11		3.75 (HP)				39.3		
	20.0		715+/-	20		X	18	8-5-5 N=10		3.00 (HP)				33.3		
		Boring Terminated at 20 Feet														

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-23-2020	Boring Completed: 11-23-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-9

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6541° Longitude: -86.0098°

Approximate Surface Elev.: 740 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		0.8	**TOPSOIL**	739+/-													
1		6.0	**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff	734+/-			X	18	1-2-3 N=5		2.00 (HP)				17.6		
					5		X	18	4-6-7 N=13		2.50 (HP)				14.9		
2		20.0	**FAT CLAY (CH)**, reddish brown, medium stiff to stiff	720+/-			X	18	5-6-8 N=14		4.50+ (HP)				17.4		
					10		X	18	3-5-5 N=10		2.75 (HP)				24.7		
					15		X	18	3-4-6 N=10		2.50 (HP)				22.6		
					20		X	18	3-3-4 N=7		1.50 (HP)				46.8		

Boring Terminated at 20 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-23-2020	Boring Completed: 11-23-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-9A

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6541° Longitude: -86.0097°

Approximate Surface Elev.: 740 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1		Blank Drilling													
		2.0 — 738+/-													
		LEAN CLAY (CL), with silt, brown, very stiff				19			3.50 (HP)	UC	3.26	5.3	19.4	103	25-17-8
		4.0 — 736+/-													
		Boring Terminated at 4 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-23-2020	Boring Completed: 11-23-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-10

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6509° Longitude: -86.0083°

Approximate Surface Elev.: 756 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		0.8	**TOPSOIL**	755+/-													
1		3.5	**LEAN CLAY (CL)**, with silt, brown, stiff	752.5+/-				18	3-4-5 N=9		1.75 (HP)				16.7		
2			**FAT CLAY (CH)**, reddish brown, medium stiff to stiff trace fine sand		5			18	4-9-11 N=20		4.50+ (HP)				24.8		
								18	6-9-11 N=20		2.75 (HP)				20.0		
			trace fine sand		10			18	4-5-7 N=12		2.75 (HP)				18.6		
					15			18	5-6-7 N=13		4.00 (HP)				36.0		
		20.0		736+/-	20			18	20-4-4 N=8		3.25 (HP)				39.1		
			Boring Terminated at 20 Feet														

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-23-2020	Boring Completed: 11-23-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-11

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6776° Longitude: -85.9951°

Approximate Surface Elev.: 725 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		0.8	**TOPSOIL**	724.5+/-													
1			**LEAN CLAY (CL)**, with silt, brown with reddish brown, medium stiff					18	2-3-4 N=7		3.75 (HP)				17.8		
					5			18	3-4-5 N=9		2.25 (HP)				17.8		
		7.0		718+/-				18	3-4-5 N=9		2.00 (HP)				17.8		
2			**FAT CLAY (CH)**, reddish brown, medium stiff to stiff		10			18	5-6-6 N=12		3.00 (HP)				18.4		
					15			18	4-5-6 N=11		3.00 (HP)				38.7		
					20			18	2-3-4 N=7		1.25 (HP)				38.9		
					25			18	2-2-2 N=4		0.50 (HP)				27.0		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-30-2020	Boring Completed: 12-01-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-11

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6776° Longitude: -85.9951°

Approximate Surface Elev.: 725 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
2		26.0 / 699+/-													
4		**LIMESTONE**, light gray, moderate to very close spacing, thin bedding, unweathered to slightly weathered, strong rock 4 inches high-angled fracture								UC	867.60			167	
			30			112		60%							
			35												
			40			119.5		89%							
		46.0 / 679+/-	45												

Boring Terminated at 46 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-30-2020	Boring Completed: 12-01-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. B-11A

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6776° Longitude: -85.9951°

Approximate Surface Elev.: 725 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1		Blank Drilling 2.0 723+/-													
		LEAN CLAY (CL), with silt, brown, very stiff 4.0 721+/-				20			4.00 (HP)	UC	3.18	4.8	16.7	112	27-19-8
		Blank Drilling 5.0 720+/-	5												
		LEAN CLAY (CL), reddish brown, stiff 7.0 718+/-				24			3.00 (HP)	UC	1.17	7.2	16.7	101	35-15-20
		Boring Terminated at 7 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-30-2020	Boring Completed: 12-01-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. ROW-1

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC Miami, FL

SITE: Hardinsburg Road Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6622° Longitude: -86.0019°

Approximate Surface Elev.: 715 (Ft.) +/-

MODEL LAYER	DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	0.7	**TOPSOIL**	714.5+/-													
1		**LEAN CLAY (CL)**, with silt, brown with gray, soft, trace rock fragments				X	17	1-1-1 N=2		0.25 (HP)				25.4		
	3.5		711.5+/-		▽											
2		**FAT CLAY (CH)**, reddish brown, medium stiff to stiff		5		X	18	3-5-5 N=10		2.00 (HP)				27.5		73-24-49
						X	18	4-6-8 N=14		2.00 (HP)				21.1		
				10		X	18	3-3-5 N=8		1.50 (HP)				31.8		
				15		X	18	3-4-5 N=9		1.00 (HP)				39.6		
				20		X	18	2-3-4 N=7		2.00 (HP)				28.9		
				25		X	18	2-2-2 N=4		1.00 (HP)				36.9		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 12-03-2020	Boring Completed: 12-03-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. ROW-1

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6622° Longitude: -86.0019°

Approximate Surface Elev.: 715 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
2		**FAT CLAY (CH)**, reddish brown, medium stiff to stiff *(continued)*													
		30.0 685+/-	30			18	1-2-2 N=4		0.25 (HP)				29.7		
		Boring Terminated at 30 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 12-03-2020	Boring Completed: 12-03-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. ROW-1A

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6622° Longitude: -86.0019°

Approximate Surface Elev.: 715 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1		Blank Drilling 3.0 — 712+/-													
		LEAN CLAY (CL), with silt, brown, stiff 5.0 — 710+/-	5			22			3.00 (HP)	UC	1.85	3	25.7	96	
		Boring Terminated at 5 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 12-03-2020	Boring Completed: 12-03-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. ROW-2

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6638° Longitude: -86.0033°

Approximate Surface Elev.: 710 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	0.7	**TOPSOIL**	709.5+/-													
1		**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff				SPT	17	1-2-2 N=4		1.75 (HP)				19.5		
				5		SPT	18	3-4-5 N=9		1.75 (HP)				27.8		
	6.0		704+/-													
2		**FAT CLAY (CH)**, reddish brown, stiff				SPT	18	4-4-4 N=8		2.50 (HP)				22.7		
				10		SPT	18	3-4-4 N=8		2.50 (HP)				29.7		
					▽											
				15		SPT	18	1-3-9 N=12		0.25 (HP)				33.7		
	18.5		691.5+/-													
4		**LIMESTONE**, light gray with dark gray, close fracture spacing, thin bedding, unweathered, very strong high-angled fracture from 18.5 ft to 19.25 ft		20		Rock Core	58		75%		UC	1233.36			165	
	23.5		686.5+/-													
		Boring Terminated at 23.5 Feet														

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 12-03-2020	Boring Completed: 12-03-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. ROW-3

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC Miami, FL

SITE: Hardinsburg Road Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6660° Longitude: -86.0025°

Approximate Surface Elev.: 710 (Ft.) +/-

MODEL LAYER	DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	0.7	**TOPSOIL**	709.5+/-											
1	10.0	**LEAN CLAY (CL)**, with silt, brown, medium stiff	700+/-		18	2-2-3 N=5		1.50 (HP)				32.0		
				5	18	4-3-4 N=7		2.00 (HP)				28.5		
					18	2-2-3 N=5		1.25 (HP)				28.3		
					13	2-17-50/1"		1.00 (HP)				48.2		
4	11.0	**LIMESTONE**, close fracture spacing, thin bedding, unweathered to completely weathered, strong rock 3 inches of high-angled fracture	699+/-	10	40		10%							
1	14.0	**CLAY-FILLED VOID**	696+/-											
4	15.0	**LIMESTONE**, close fracture spacing, thin bedding, unweathered to completely weathered, strong rock	695+/-	15	20		0%							
1	18.5	**CLAY-FILLED VOID**	691.5+/-											
4	23.5	**LIMESTONE**, close fracture spacing, thin bedding, unweathered to slightly weathered, medium strong	686.5+/-	20	60		85%		UC	436.32			158	
		Boring Terminated at 23.5 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 12-02-2020	Boring Completed: 12-02-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. ROW-4

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6681° Longitude: -86.0005°

Approximate Surface Elev.: 715 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	0.5	**TOPSOIL**	714.5+/-													
1		**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff					17	1-2-2 N=4		1.25 (HP)				22.5		
				5			18	3-4-5 N=9		2.50 (HP)				22.9		
							18	4-4-5 N=9		2.00 (HP)				24.1		
				10			18	1-2-2 N=4		1.75 (HP)				32.5		
	13.5		701.5+/-		▽											
2		**FAT CLAY (CH)**, reddish brown, medium stiff		15			18	3-3-4 N=7		1.25 (HP)				36.6		
	18.0		697+/-													
4		**LIMESTONE**, light gray with dark gray, moderate to close spacing, thin bedding, unweathered, strong rock		20			58		81 %		UC	578.16			165	
	23.0		692+/-													
		Boring Terminated at 23 Feet														

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-24-2020

Boring Completed: 11-24-2020

Drill Rig: B-53

Driller: R. Mathes

Project No.: 57205074

BORING LOG NO. ROW-4A

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6681° Longitude: -86.0005°

Approximate Surface Elev.: 715 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1		Blank Drilling 3.0 — 712+/-													
		LEAN CLAY (CL), with silt, brown, stiff 5.0 — 710+/-	5			22			4.00 (HP)	UC	1.67	3	19.3	107	31-20-11
		Boring Terminated at 5 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-24-2020	Boring Completed: 11-24-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. ROW-5

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6703° Longitude: -85.9990°

Approximate Surface Elev.: 713 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	0.8	**TOPSOIL**	712+/-													
1	3.5	**LEAN CLAY (CL)**, with silt, brown, medium stiff	709.5+/-		▽		17	3-3-4 N=7		1.50 (HP)				25.5		
2	10.0	**FAT CLAY (CH)**, brown, soft to medium stiff	703+/-	5			18	1-1-2 N=3		0.50 (HP)				23.5		
							18	1-2-2 N=4		1.75 (HP)				25.6		
				10			18	2-2-3 N=5		1.75 (HP)				30.4		62-21-41
4	15.0	**LIMESTONE**, light gray with dark gray, moderate to close spacing, thin bedding, unweathered, medium strong; vertical fracture from 14.25 ft to 14.75 ft	698+/-	15			60		90%		UC	445.68			166	

Boring Terminated at 15 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-25-2020	Boring Completed: 11-25-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. ROW-6

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6724° Longitude: -85.9976°

Approximate Surface Elev.: 713 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		0.5	**TOPSOIL**	712.5+/-													
1		3.5	**LEAN CLAY (CL)**, with silt, brown, medium stiff	709.5+/-				18	1-1-3 N=4		1.50 (HP)				23.6		
2		6.5	**FAT CLAY (CH)**, reddish brown with brown, medium stiff	706.5+/-	5			18	2-2-3 N=5		2.00 (HP)				28.1		
								4	50/4"		1.50 (HP)				27.8		
4			**LIMESTONE**, light gray with dark gray, moderate to close spacing, thin bedding, unweathered to slightly weathered, very strong									UC	1098.72			167	
					10			58.5		54%							
		16.5		696.5+/-	15			60		88%							

Boring Terminated at 16.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-25-2020	Boring Completed: 11-25-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

BORING LOG NO. ROW-6A

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6724° Longitude: -85.9976°

Approximate Surface Elev.: 713 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1		Blank Drilling 2.0 — 711+/-													
		LEAN CLAY (CL), with silt, brown, stiff 4.0 — 709+/-				10			1.50 (HP)	UC	1.07	9.6	22.6	97	45-19-26
		Boring Terminated at 4 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-25-2020

Boring Completed: 11-25-2020

Drill Rig: B-53

Driller: R. Mathes

Project No.: 57205074

BORING LOG NO. ROW-7

PROJECT: LGE-KU Solar Project

CLIENT: ibV Energy Partners LLC
Miami, FL

SITE: Hardinsburg Road
Cecilia, KY

LOCATION See Exploration Plan

Latitude: 37.6756° Longitude: -85.9944°

Approximate Surface Elev.: 718 (Ft.) +/-

MODEL LAYER	DEPTH / MATERIAL DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	0.8 **TOPSOIL** 717.5+/-													
1	**LEAN CLAY (CL)**, with silt, brown, medium stiff				18	2-3-4 N=7		1.25 (HP)				25.1		
	3.5 714.5+/-													
2	**FAT CLAY (CH)**, reddish brown, soft to medium stiff				18	2-2-3 N=5		1.25 (HP)				23.7		
		5			18	2-2-2 N=4		1.25 (HP)				71.2		
			▽		18	1-1-2 N=3		1.25 (HP)				41.4		
		10												
					5	50/5"		0.50 (HP)				33.8		
	15.0 703+/-	15												
4	**LIMESTONE**, light gray, close fracture spacing, thin bedding, unweathered, strong rock								UC	709.92			163	
					58.5		76%							
	20.0 698+/-	20												
	Boring Terminated at 20 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

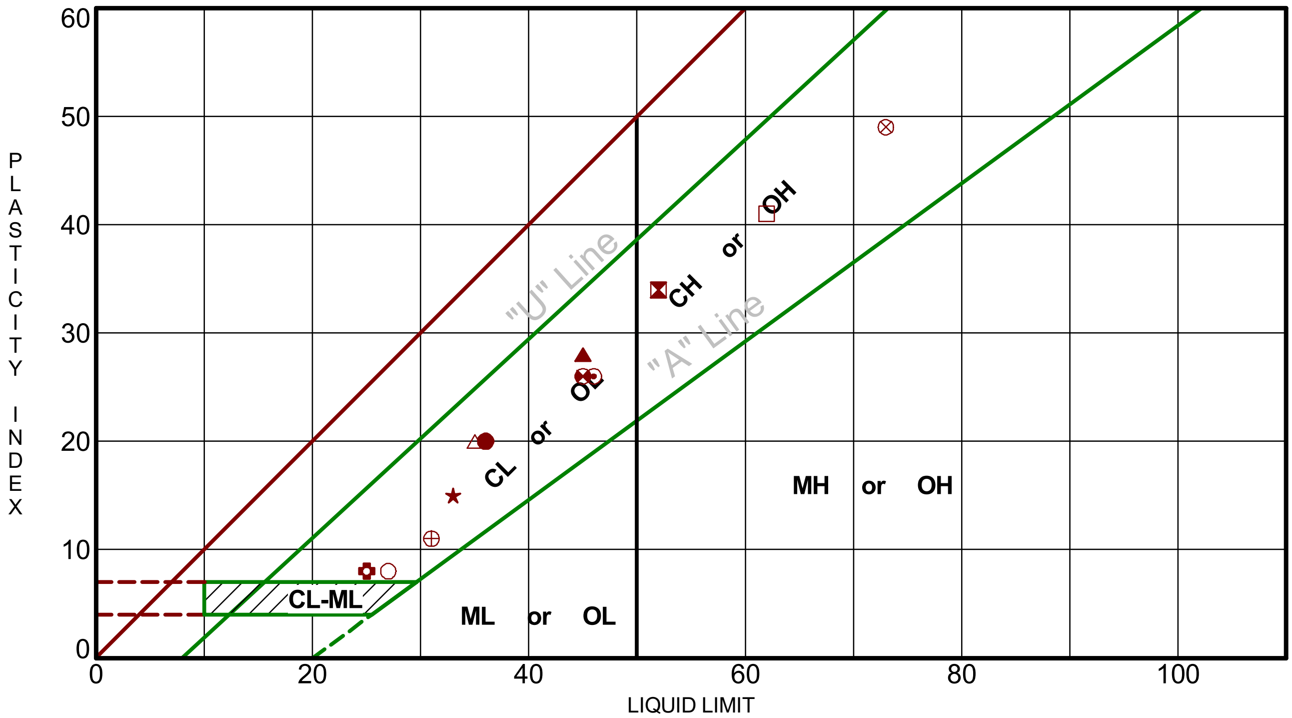
▽ *At completion of drilling*

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

Boring Started: 11-25-2020	Boring Completed: 11-25-2020
Drill Rig: B-53	Driller: R. Mathes
Project No.: 57205074	

ATTERBERG LIMITS RESULTS

ASTM D4318



	Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
●	B-1A	2 - 4	36	16	20		CL	Lean Clay
⧗	B-3	6 - 7.5	52	18	34		CH	Fat Clay
▲	B-4A	1 - 3	45	17	28		CL	Lean Clay
★	B-5A	2 - 4	33	18	15		CL	Lean Clay
⊙	B-7A	3 - 5	46	20	26		CL	Lean Clay
✿	B-9A	2 - 4	25	17	8		CL	Lean Clay
○	B-11A	2 - 4	27	19	8		CL	Lean Clay
△	B-11A	5 - 7	35	15	20		CL	Lean Clay
⊗	ROW-1	3.5 - 5	73	24	49		CH	Fat Clay
⊕	ROW-4A	3 - 5	31	20	11		CL	Lean Clay
□	ROW-5	8.5 - 10	62	21	41		CH	Fat Clay
◉	ROW-6A	2 - 4	45	19	26		CL	Lean Clay

PROJECT: LGE-KU Solar Project

SITE: Hardinsburg Road
Cecilia, KY

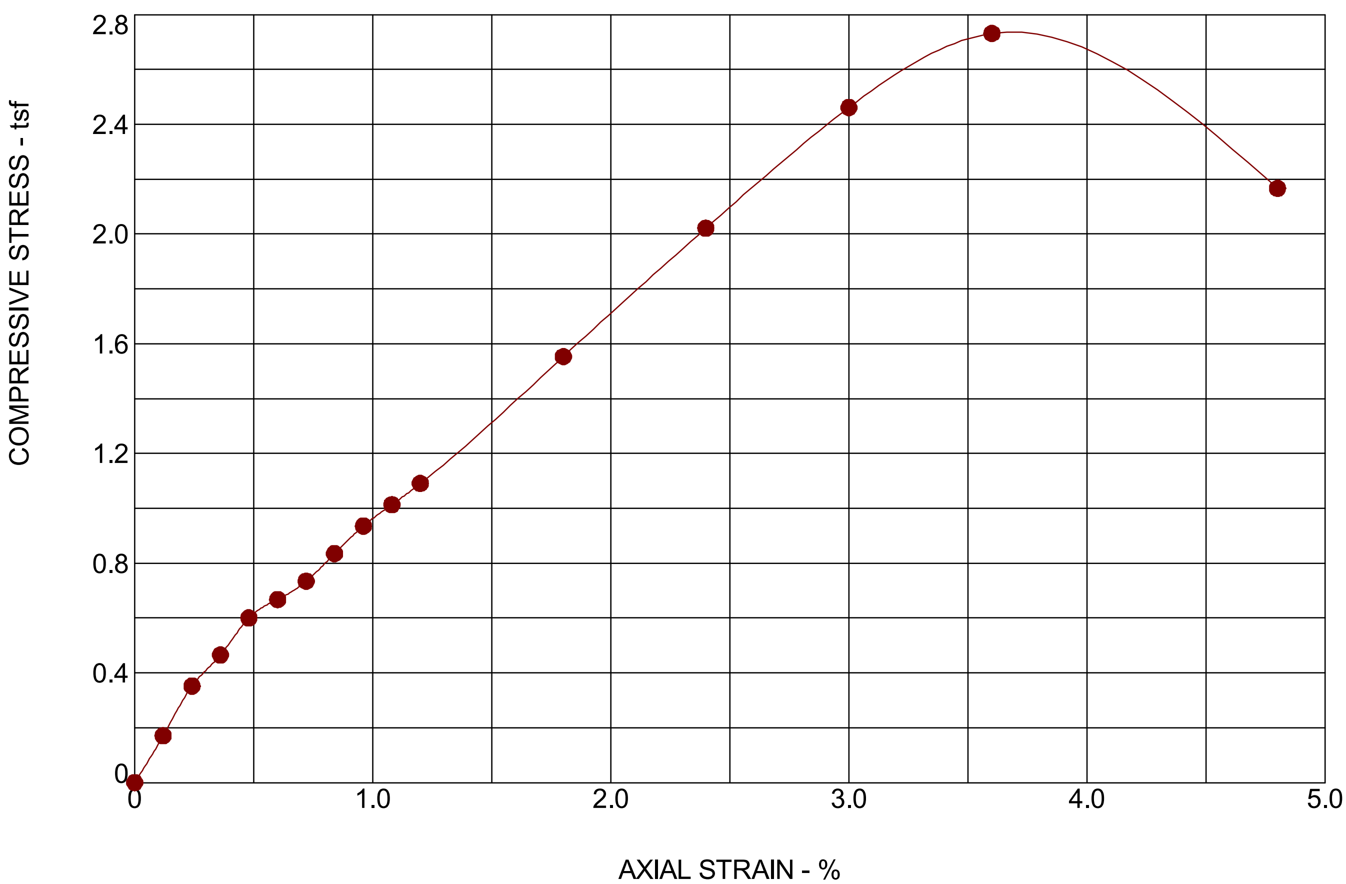
Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

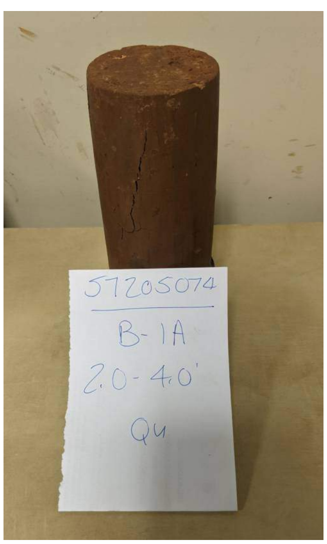
PROJECT NUMBER: 57205074

CLIENT: ibV Energy Partners LLC
Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



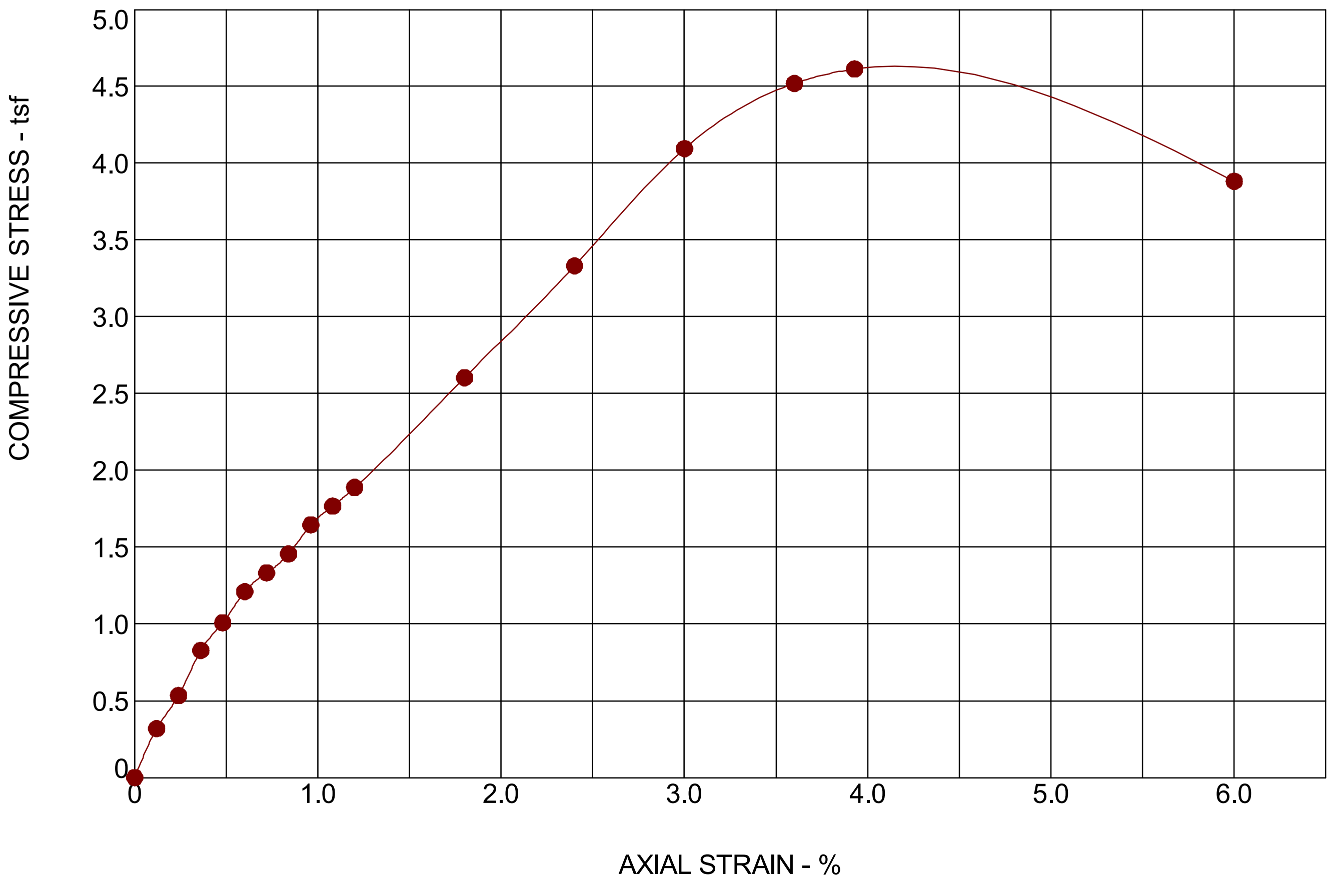
SPECIMEN FAILURE PHOTOGRAPH	SPECIMEN TEST DATA		
	Moisture Content:	%	18.0
	Dry Density:	pcf	110
	Diameter:	in.	2.84
	Height:	in.	5.61
	Height / Diameter Ratio:		1.98
	Calculated Saturation:	%	
	Calculated Void Ratio:		
	Assumed Specific Gravity:		
	Failure Strain:	%	3.60
	Unconfined Compressive Strength	(tsf)	2.73
	Undrained Shear Strength:	(tsf)	1.37
	Strain Rate:	in/min	0.0673
	Remarks:		

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-1A @ 2 - 4 feet			
DESCRIPTION: Lean Clay	LL 36	PL 16	PI 20	Percent < #200 Sieve

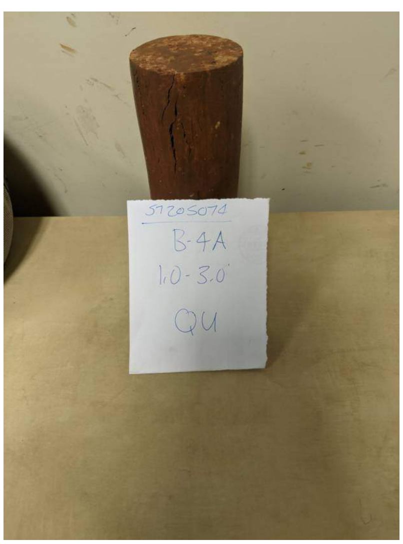
PROJECT: LGE-KU Solar Project	Terracon 13050 Eastgate Park Way Ste 101 Louisville, KY	PROJECT NUMBER: 57205074
SITE: Hardinsburg Road Cecilia, KY		CLIENT: ibV Energy Partners LLC Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE PHOTOGRAPH



SPECIMEN TEST DATA		
Moisture Content:	%	18.0
Dry Density:	pcf	109
Diameter:	in.	2.84
Height:	in.	5.60
Height / Diameter Ratio:		1.97
Calculated Saturation:	%	
Calculated Void Ratio:		
Assumed Specific Gravity:		
Failure Strain:	%	3.93
Unconfined Compressive Strength	(tsf)	4.61
Undrained Shear Strength:	(tsf)	2.31
Strain Rate:	in/min	0.0672
Remarks:		

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-4A @ 1 - 3 feet			
DESCRIPTION: Lean Clay	LL 45	PL 17	PI 28	Percent < #200 Sieve

PROJECT: LGE-KU Solar Project

SITE: Hardinsburg Road
Cecilia, KY

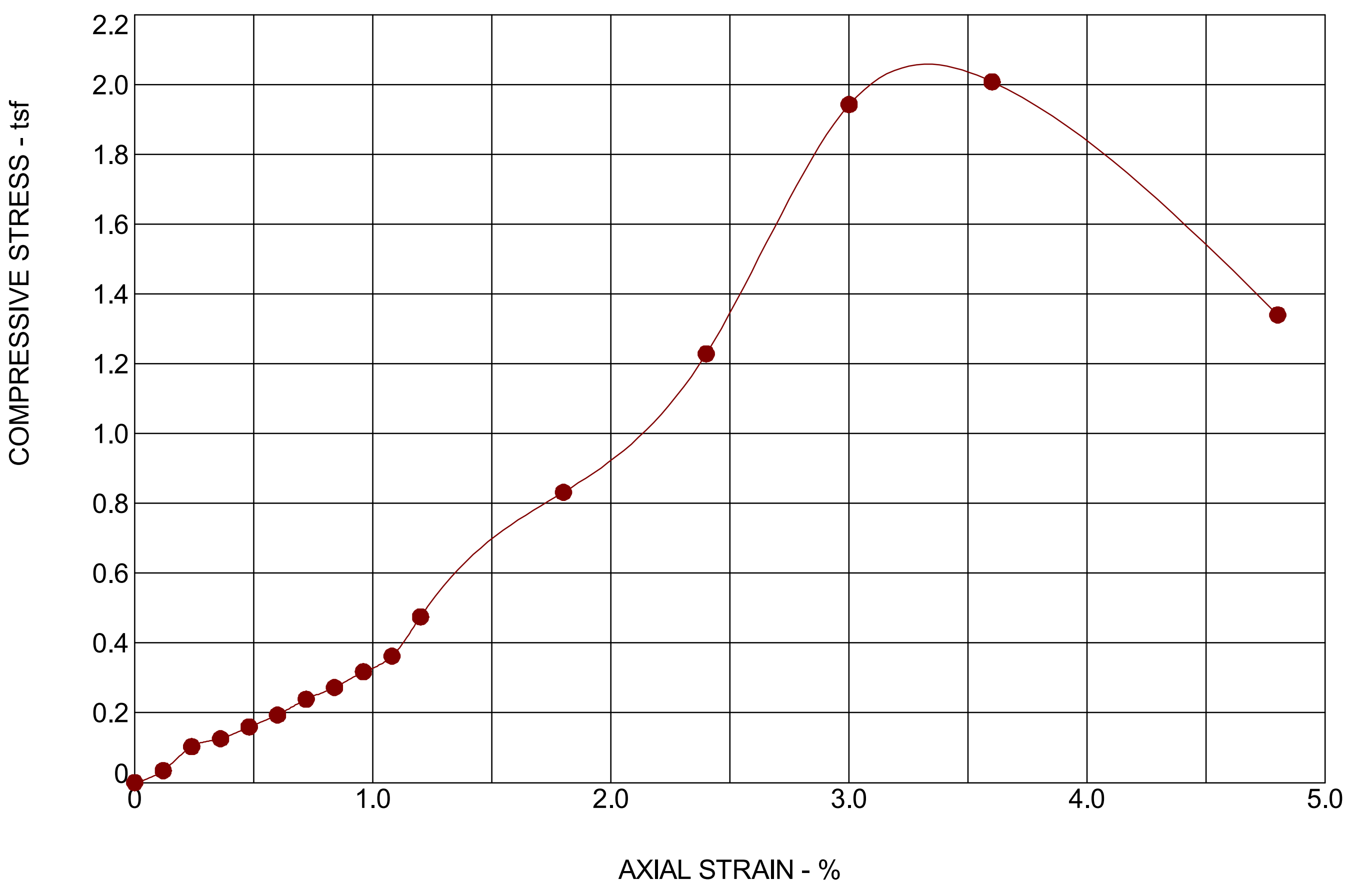
Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

PROJECT NUMBER: 57205074

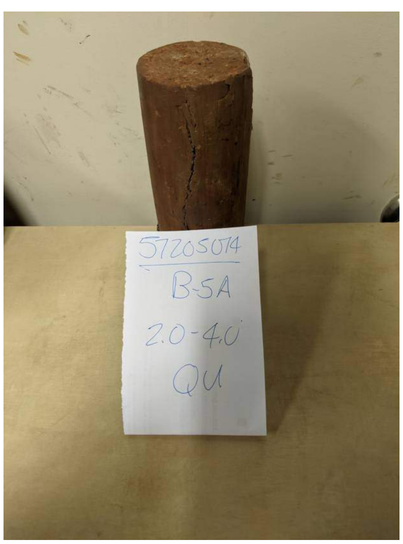
CLIENT: ibV Energy Partners LLC
Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE PHOTOGRAPH



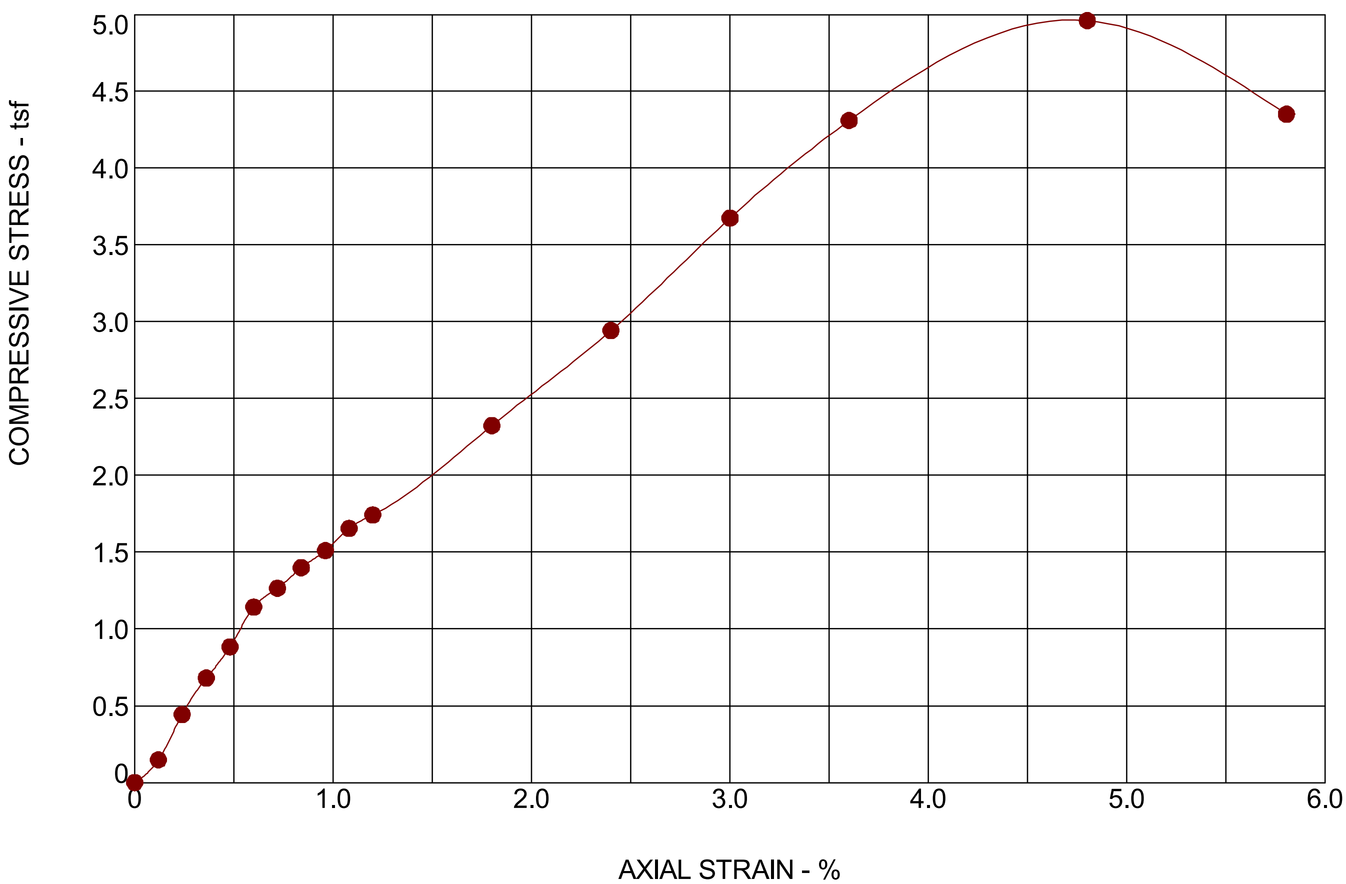
SPECIMEN TEST DATA		
Moisture Content:	%	17.8
Dry Density:	pcf	108
Diameter:	in.	2.83
Height:	in.	5.60
Height / Diameter Ratio:		1.98
Calculated Saturation:	%	
Calculated Void Ratio:		
Assumed Specific Gravity:		
Failure Strain:	%	3.60
Unconfined Compressive Strength	(tsf)	2.01
Undrained Shear Strength:	(tsf)	1.00
Strain Rate:	in/min	0.0672
Remarks:		

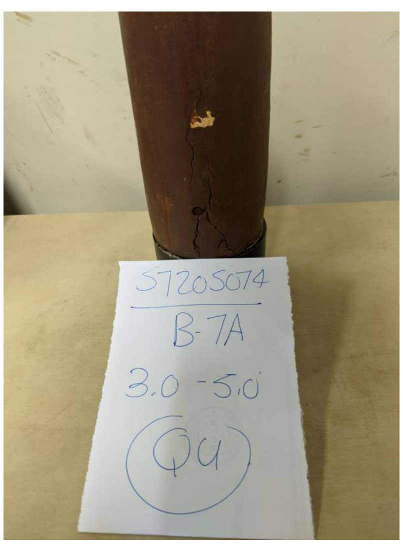
SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-5A @ 2 - 4 feet			
DESCRIPTION: Lean Clay	LL 33	PL 18	PI 15	Percent < #200 Sieve

PROJECT: LGE-KU Solar Project	Terracon 13050 Eastgate Park Way Ste 101 Louisville, KY	PROJECT NUMBER: 57205074
SITE: Hardinsburg Road Cecilia, KY		CLIENT: ibV Energy Partners LLC Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



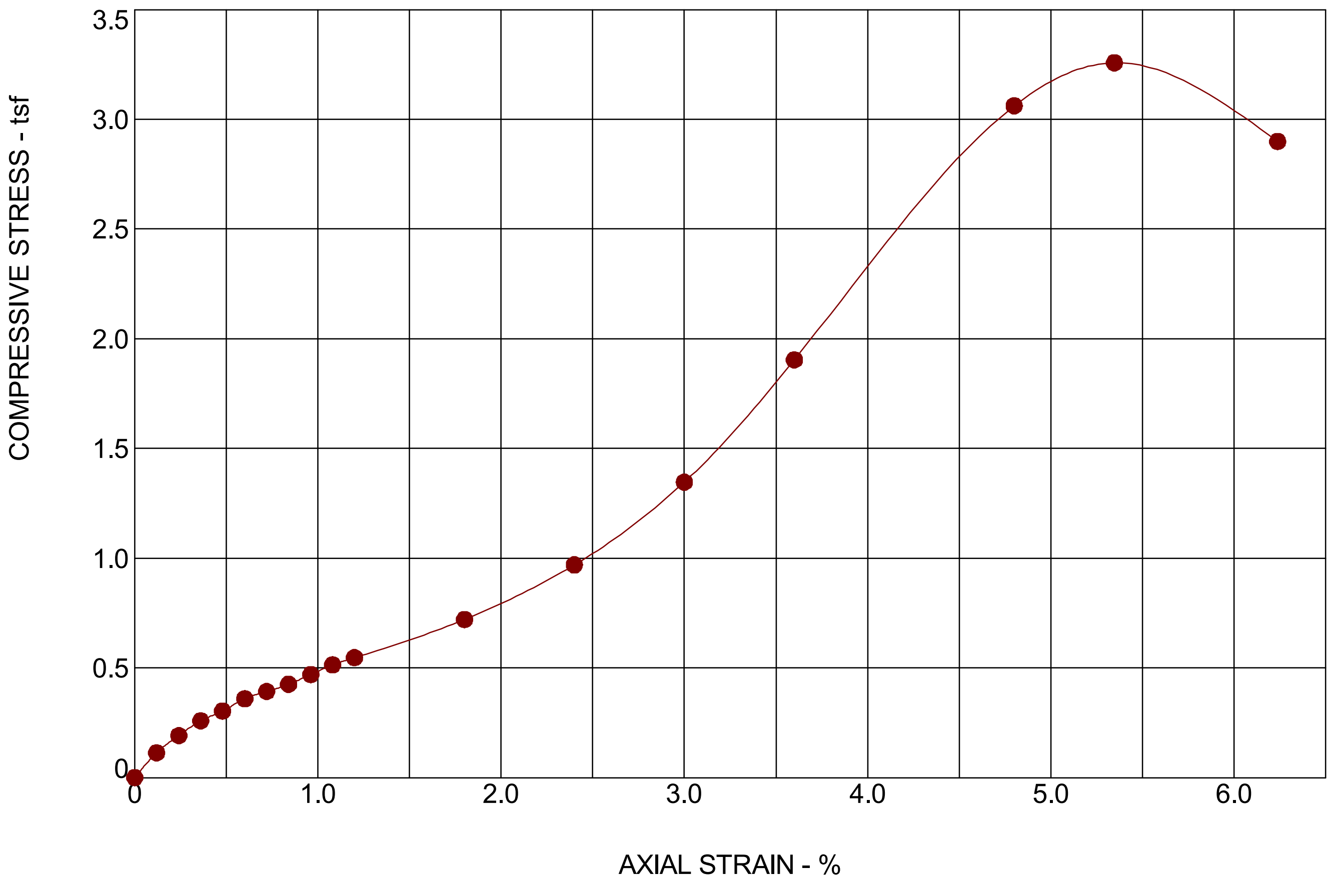
SPECIMEN FAILURE PHOTOGRAPH	SPECIMEN TEST DATA		
	Moisture Content:	%	19.2
	Dry Density:	pcf	107
	Diameter:	in.	2.84
	Height:	in.	5.60
	Height / Diameter Ratio:		1.97
	Calculated Saturation:	%	
	Calculated Void Ratio:		
	Assumed Specific Gravity:		
	Failure Strain:	%	4.80
	Unconfined Compressive Strength	(tsf)	4.96
	Undrained Shear Strength:	(tsf)	2.48
	Strain Rate:	in/min	0.0672
	Remarks:		

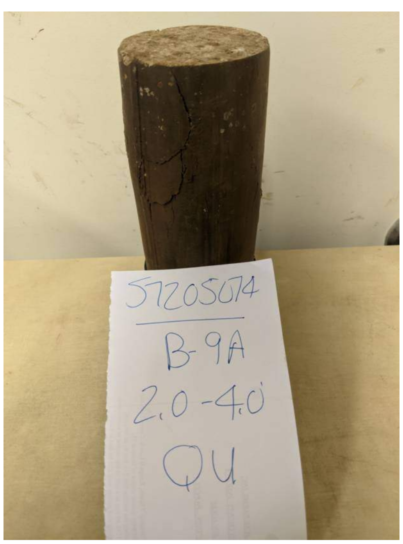
SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-7A @ 3 - 5 feet			
DESCRIPTION: Lean Clay	LL 46	PL 20	PI 26	Percent < #200 Sieve

PROJECT: LGE-KU Solar Project	Terracon 13050 Eastgate Park Way Ste 101 Louisville, KY	PROJECT NUMBER: 57205074
SITE: Hardinsburg Road Cecilia, KY		CLIENT: ibV Energy Partners LLC Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE PHOTOGRAPH	SPECIMEN TEST DATA		
	Moisture Content:	%	19.4
	Dry Density:	pcf	103
	Diameter:	in.	2.85
	Height:	in.	5.61
	Height / Diameter Ratio:		1.97
	Calculated Saturation:	%	
	Calculated Void Ratio:		
	Assumed Specific Gravity:		
	Failure Strain:	%	5.35
	Unconfined Compressive Strength	(tsf)	3.26
	Undrained Shear Strength:	(tsf)	1.63
	Strain Rate:	in/min	0.0673
	Remarks:		

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-9A @ 2 - 4 feet			
DESCRIPTION: Lean Clay	LL 25	PL 17	PI 8	Percent < #200 Sieve

PROJECT: LGE-KU Solar Project

SITE: Hardinsburg Road
Cecilia, KY

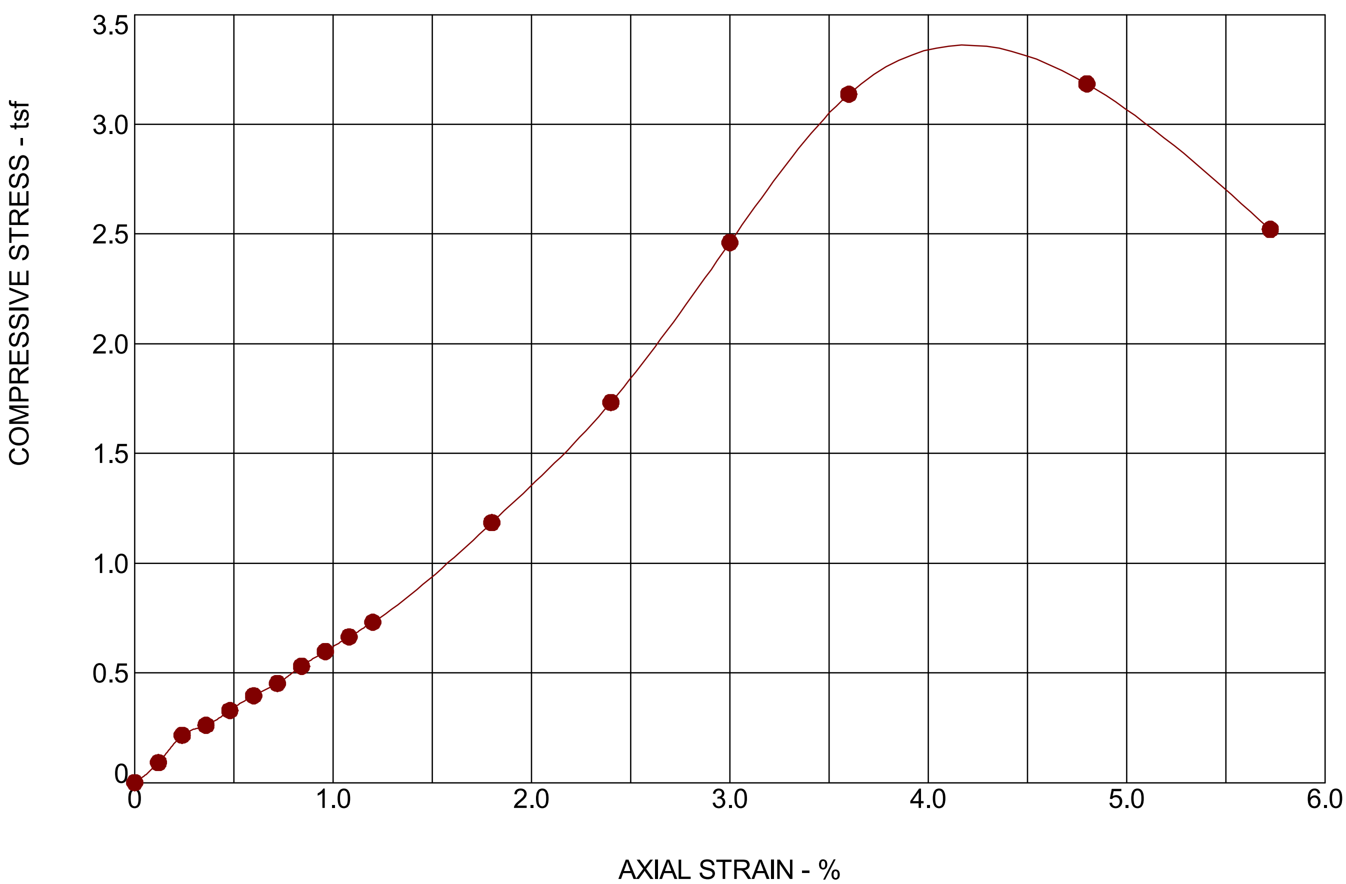
Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

PROJECT NUMBER: 57205074

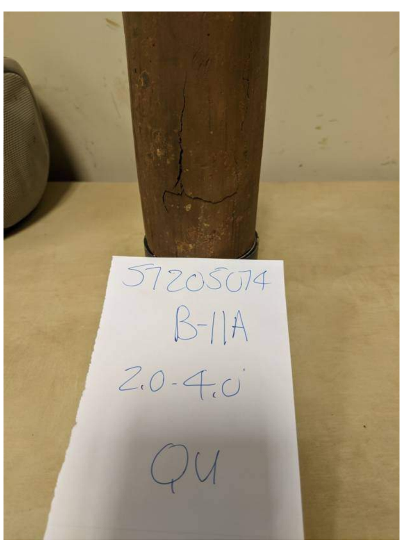
CLIENT: ibV Energy Partners LLC
Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE PHOTOGRAPH



SPECIMEN TEST DATA

Moisture Content:	%	16.7
Dry Density:	pcf	112
Diameter:	in.	2.84
Height:	in.	5.59
Height / Diameter Ratio:		1.97
Calculated Saturation:	%	
Calculated Void Ratio:		
Assumed Specific Gravity:		
Failure Strain:	%	4.80
Unconfined Compressive Strength	(tsf)	3.18
Undrained Shear Strength:	(tsf)	1.59
Strain Rate:	in/min	0.0671
Remarks:		

SAMPLE TYPE: Shelby Tube

SAMPLE LOCATION: B-11A @ 2 - 4 feet

DESCRIPTION: Lean Clay	LL	PL	PI	Percent < #200 Sieve
	27	19	8	

PROJECT: LGE-KU Solar Project

SITE: Hardinsburg Road
Cecilia, KY

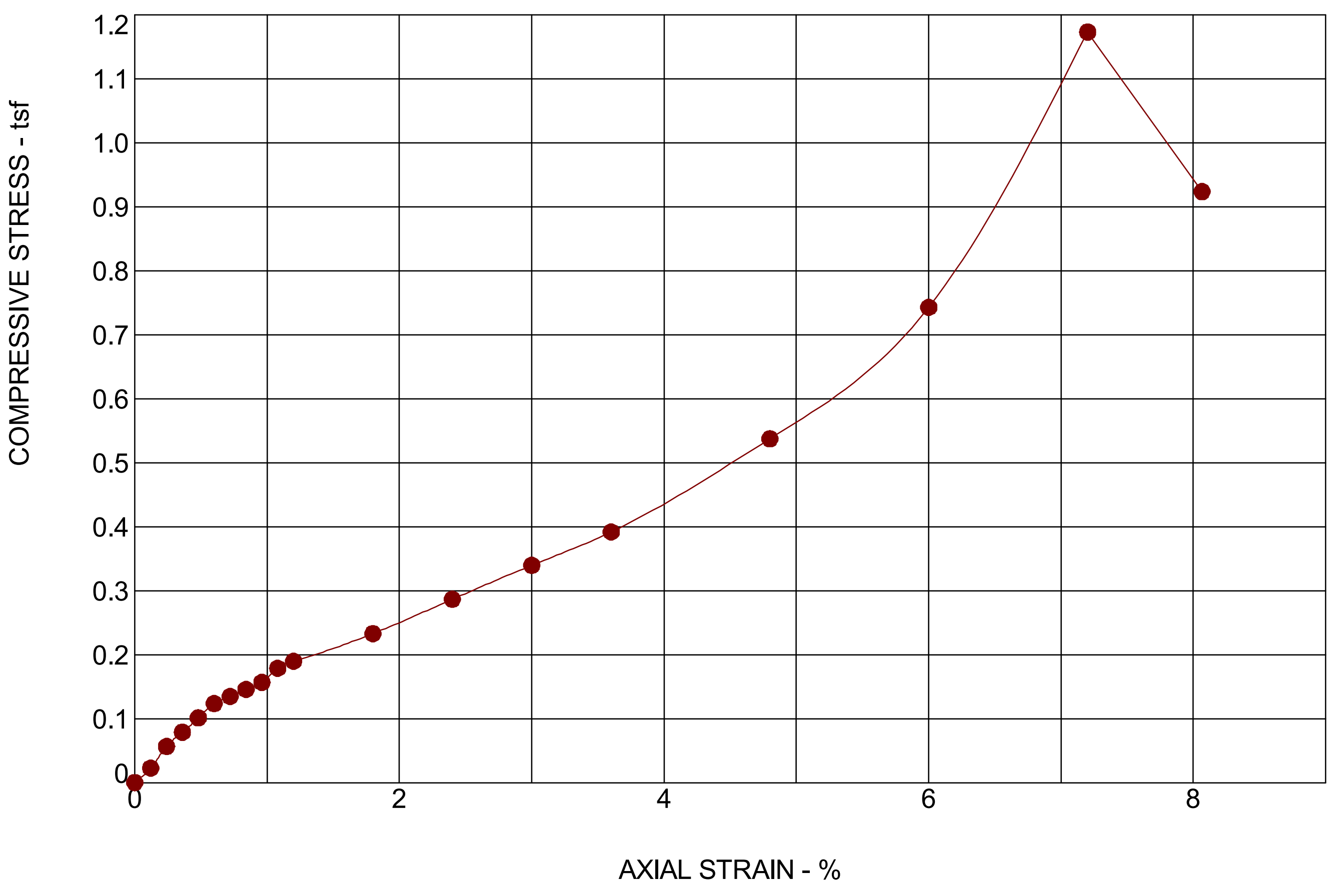
Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

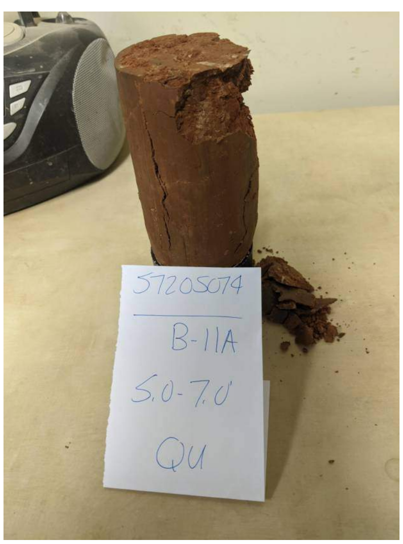
PROJECT NUMBER: 57205074

CLIENT: ibV Energy Partners LLC
Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE PHOTOGRAPH	SPECIMEN TEST DATA		
	Moisture Content:	%	16.7
	Dry Density:	pcf	101
	Diameter:	in.	2.85
	Height:	in.	5.58
	Height / Diameter Ratio:		1.96
	Calculated Saturation:	%	
	Calculated Void Ratio:		
	Assumed Specific Gravity:		
	Failure Strain:	%	7.20
	Unconfined Compressive Strength	(tsf)	1.17
	Undrained Shear Strength:	(tsf)	0.59
	Strain Rate:	in/min	0.0670
	Remarks:		

SAMPLE TYPE: Shelby Tube | SAMPLE LOCATION: B-11A @ 5 - 7 feet

DESCRIPTION: Lean Clay	LL	PL	PI	Percent < #200 Sieve
	35	15	20	

PROJECT: LGE-KU Solar Project

SITE: Hardinsburg Road
Cecilia, KY

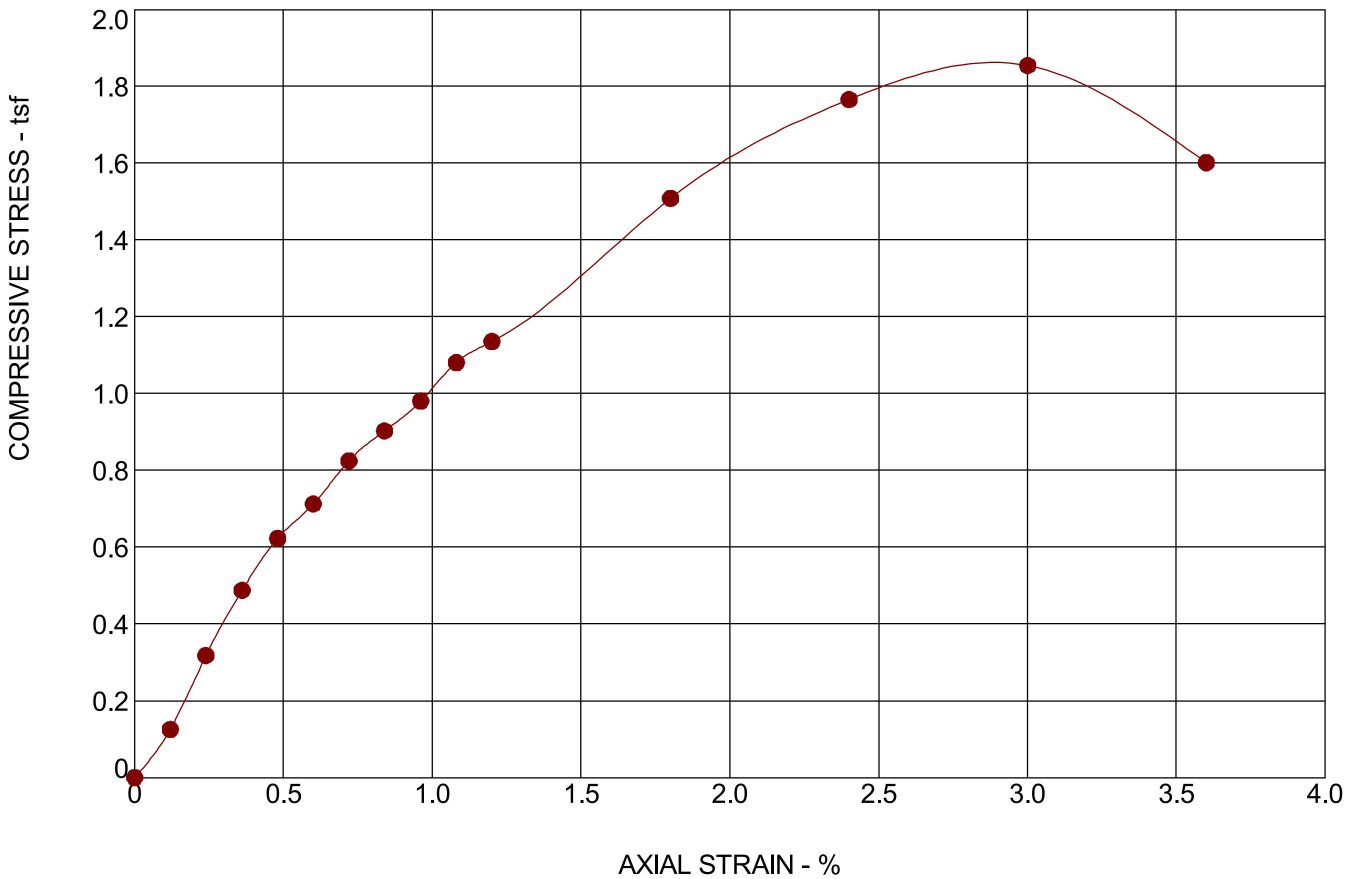
Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

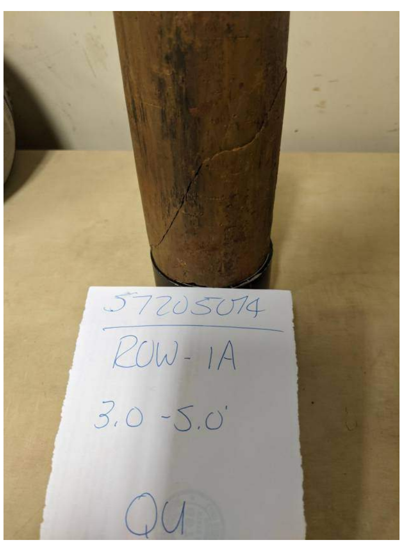
PROJECT NUMBER: 57205074

CLIENT: ibV Energy Partners LLC
Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE PHOTOGRAPH


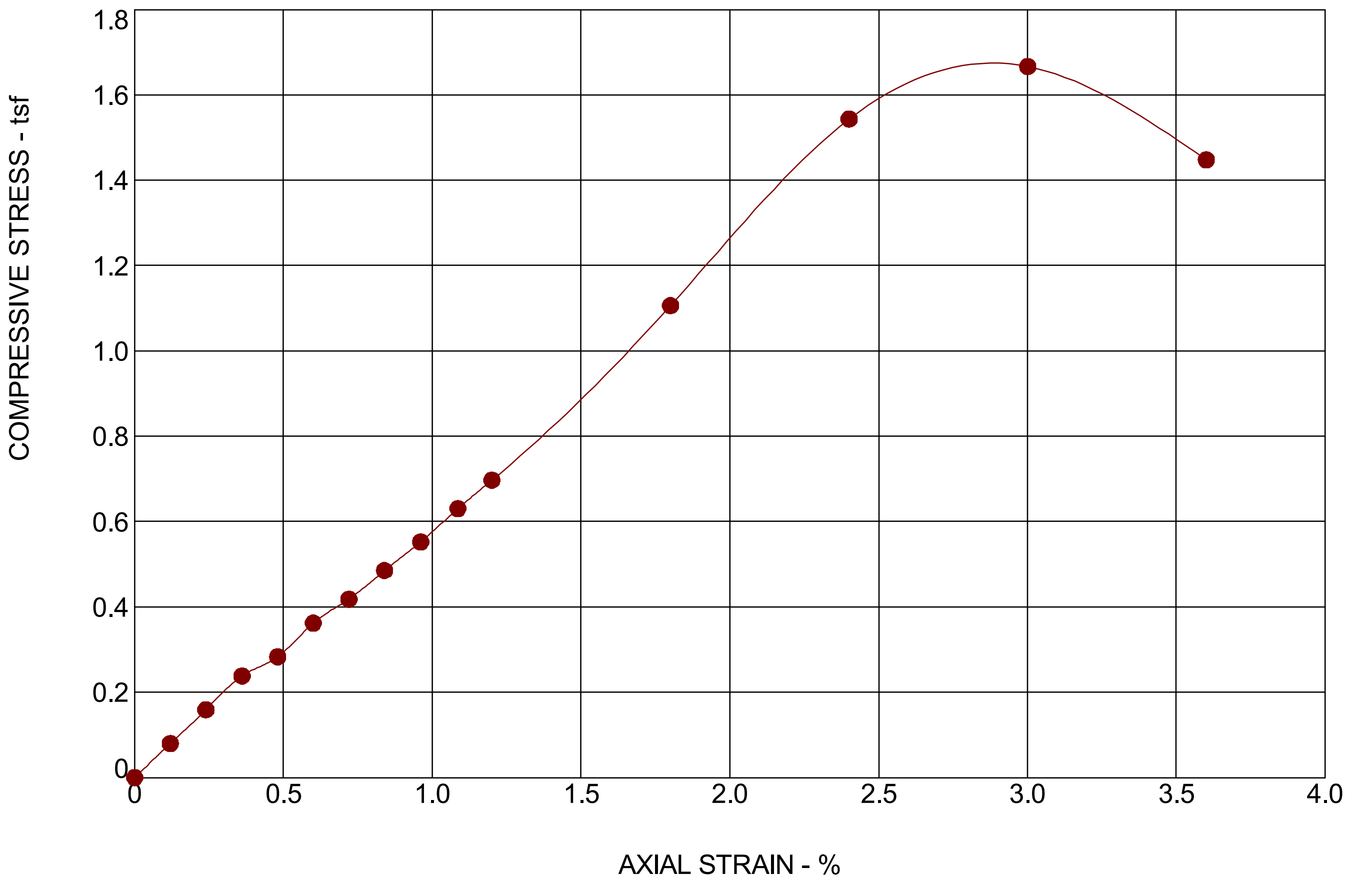
SPECIMEN TEST DATA		
Moisture Content:	%	25.7
Dry Density:	pcf	96
Diameter:	in.	2.84
Height:	in.	5.60
Height / Diameter Ratio:		1.97
Calculated Saturation:	%	
Calculated Void Ratio:		
Assumed Specific Gravity:		
Failure Strain:	%	3.00
Unconfined Compressive Strength	(tsf)	1.85
Undrained Shear Strength:	(tsf)	0.93
Strain Rate:	in/min	0.0672
Remarks:		

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: ROW-1A @ 3 - 5 feet			
DESCRIPTION:	LL	PL	PI	Percent < #200 Sieve

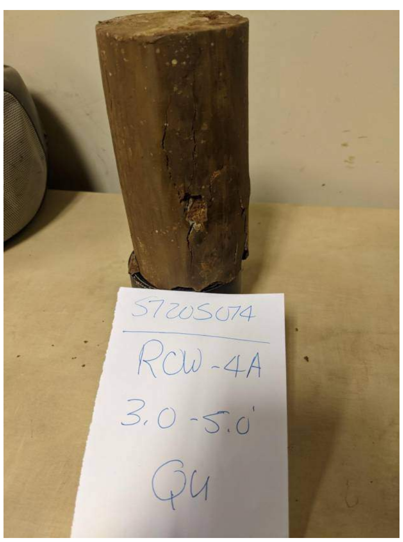
PROJECT: LGE-KU Solar Project	Terracon 13050 Eastgate Park Way Ste 101 Louisville, KY	PROJECT NUMBER: 57205074
SITE: Hardinsburg Road Cecilia, KY		CLIENT: ibV Energy Partners LLC Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE PHOTOGRAPH



SPECIMEN TEST DATA

Moisture Content:	%	19.3
Dry Density:	pcf	107
Diameter:	in.	2.84
Height:	in.	5.60
Height / Diameter Ratio:		1.97
Calculated Saturation:	%	
Calculated Void Ratio:		
Assumed Specific Gravity:		
Failure Strain:	%	3.00
Unconfined Compressive Strength	(tsf)	1.67
Undrained Shear Strength:	(tsf)	0.83
Strain Rate:	in/min	0.0672
Remarks:		

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: ROW-4A @ 3 - 5 feet			
DESCRIPTION: Lean Clay	LL	PL	PI	Percent < #200 Sieve
	31	20	11	

PROJECT: LGE-KU Solar Project

SITE: Hardinsburg Road
Cecilia, KY

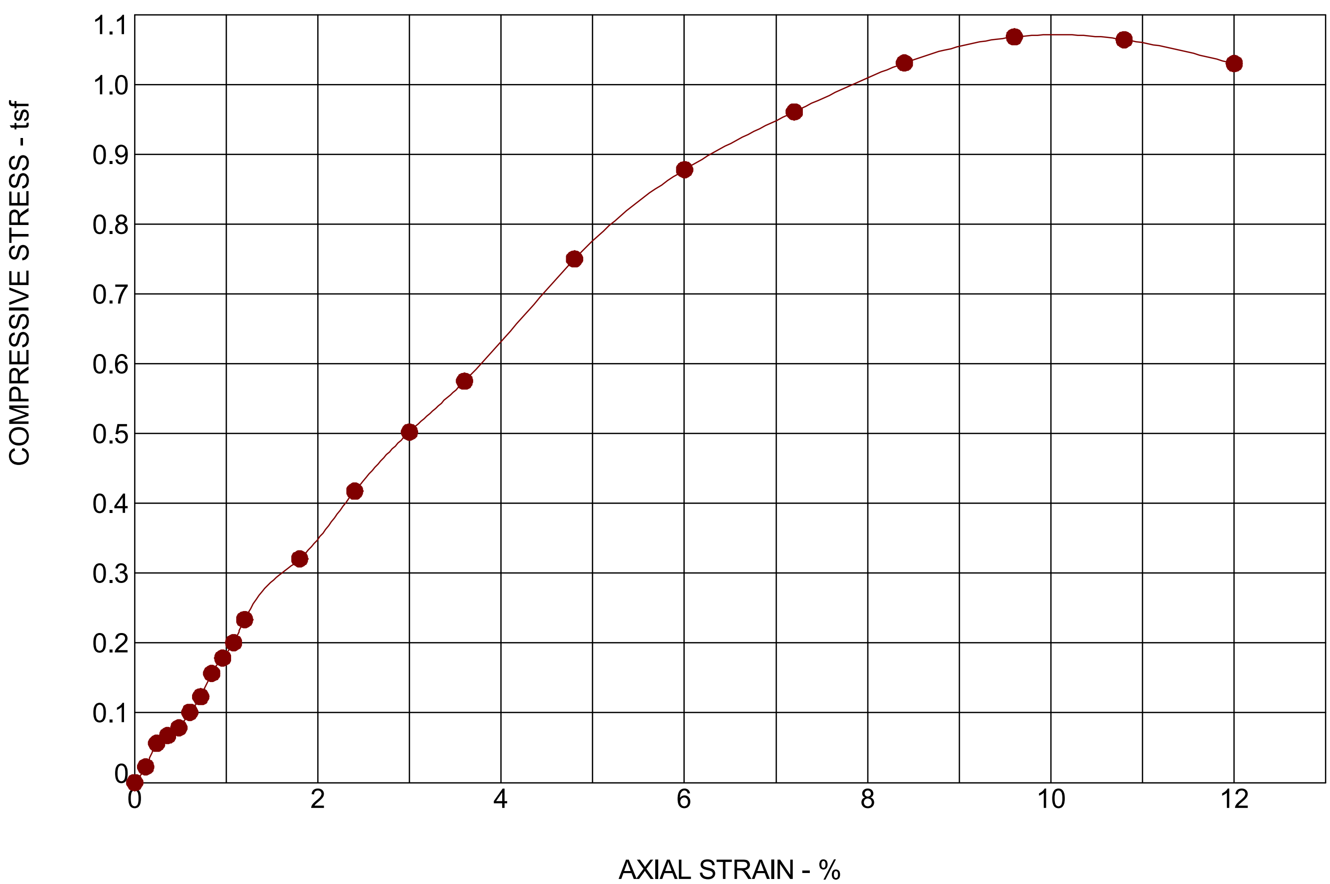
Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

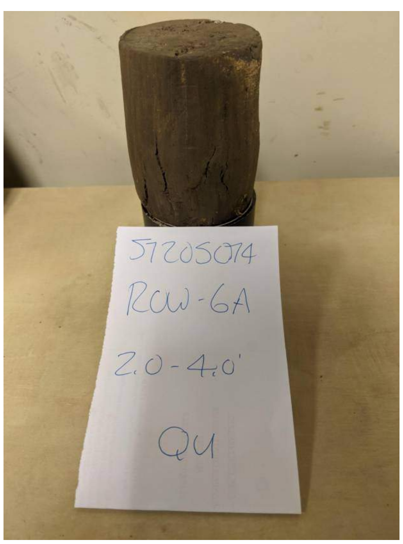
PROJECT NUMBER: 57205074

CLIENT: ibV Energy Partners LLC
Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



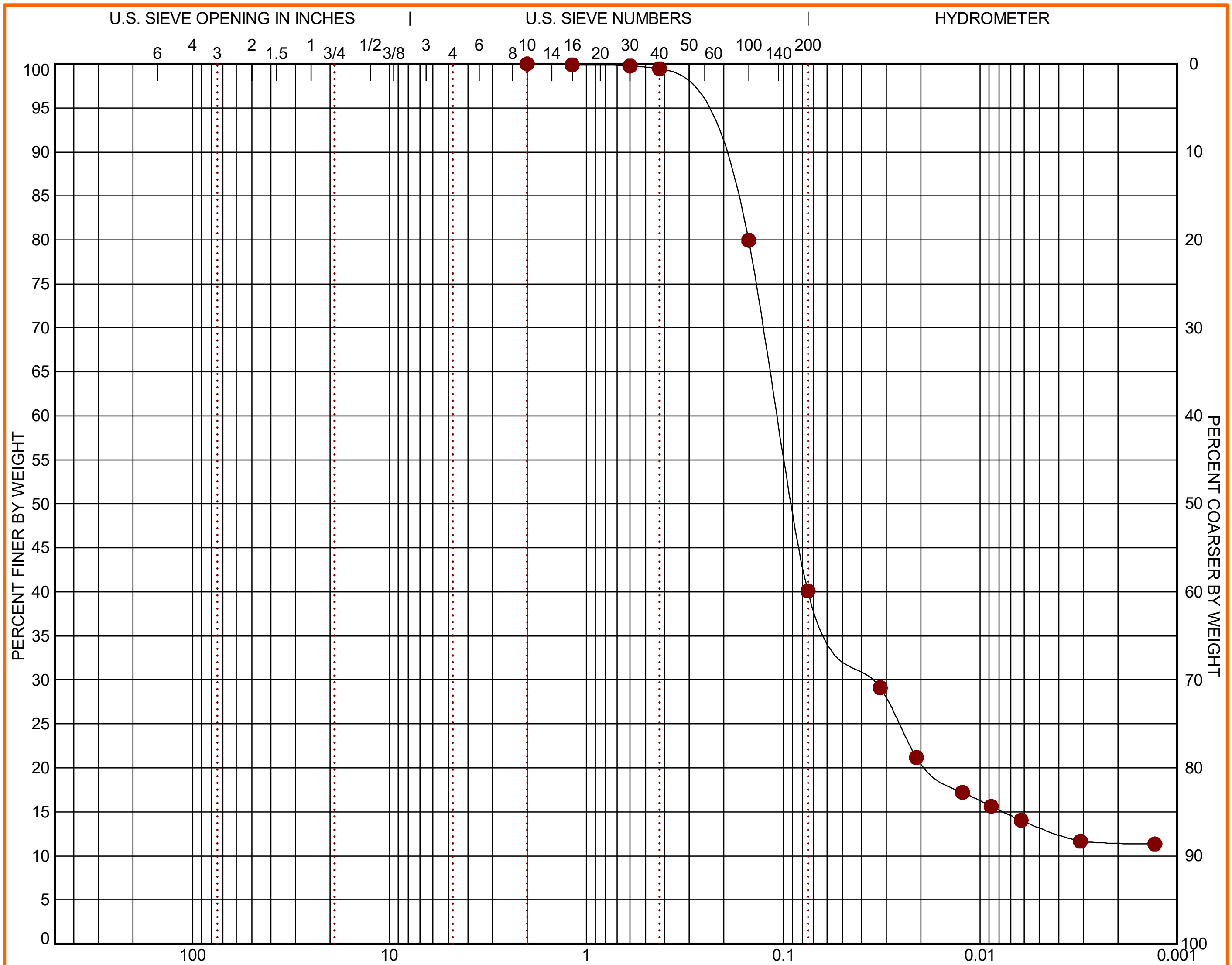
SPECIMEN FAILURE PHOTOGRAPH	SPECIMEN TEST DATA		
	Moisture Content:	%	22.6
	Dry Density:	pcf	97
	Diameter:	in.	2.85
	Height:	in.	4.18
	Height / Diameter Ratio:		1.46
	Calculated Saturation:	%	
	Calculated Void Ratio:		
	Assumed Specific Gravity:		
	Failure Strain:	%	9.60
	Unconfined Compressive Strength	(tsf)	1.07
	Undrained Shear Strength:	(tsf)	0.53
	Strain Rate:	in/min	0.0501
	Remarks:		

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: ROW-6A @ 2 - 4 feet			
DESCRIPTION: Lean Clay	LL 45	PL 19	PI 26	Percent < #200 Sieve

PROJECT: LGE-KU Solar Project	Terracon 13050 Eastgate Park Way Ste 101 Louisville, KY	PROJECT NUMBER: 57205074
SITE: Hardinsburg Road Cecilia, KY		CLIENT: ibV Energy Partners LLC Miami, FL

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-3	13.5 - 15	0.0	0.0	59.9	26.8		13.3	SM

GRAIN SIZE			
	●		
D_{60}	0.106		
D_{30}	0.034		
D_{10}			

COEFFICIENTS			
	●		
C_C			
C_U			

●					
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#10	100.0				
#16	99.9				
#30	99.78				
#40	99.46				
#100	79.96				
#200	40.1				

SOIL DESCRIPTION	
●	Silty Sand (SM)

REMARKS	
●	

PROJECT: LGE-KU Solar Project

SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

PROJECT NUMBER: 57205074

CLIENT: ibV Energy Partners LLC
Miami, FL

ELECTRICAL EARTH RESISTIVITY TEST DATA

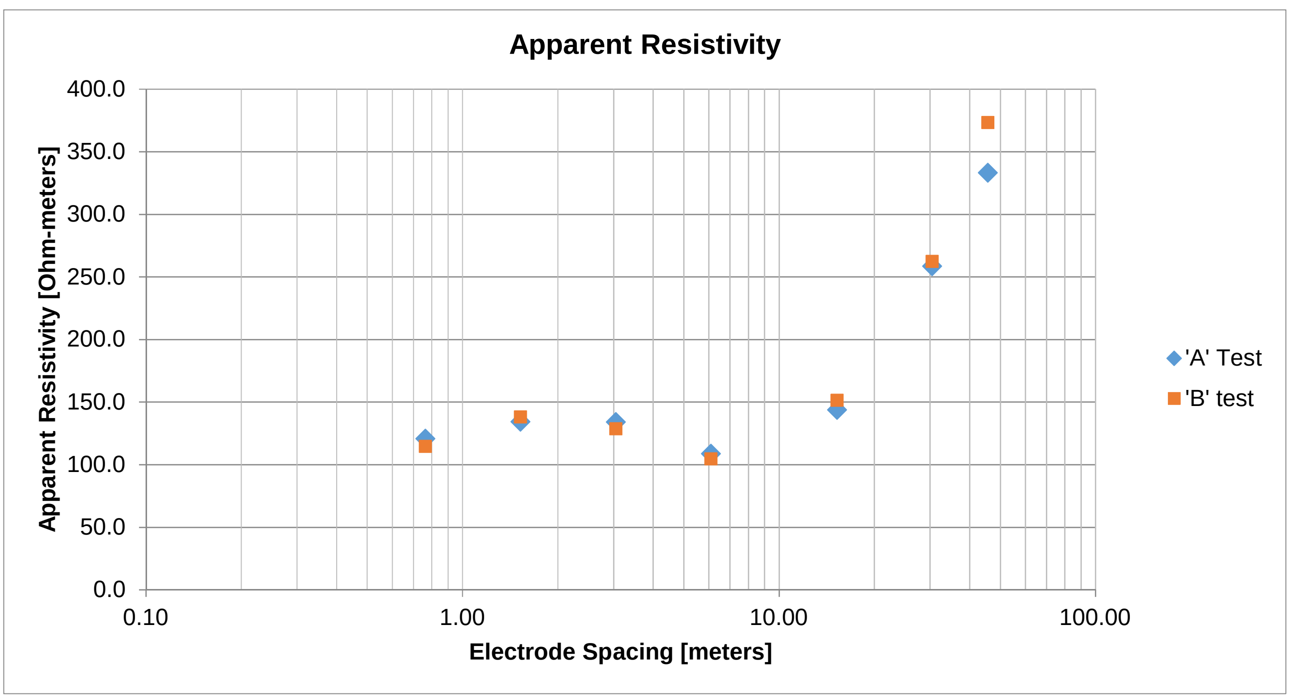
Test Line at B-1 location with approximate center poin: 37.64949°, -85.96873°

Project LGE-KU Solar Project
Location Cecilia, Hardin County, KY
Project # 57205074
Test Date November 24, 2020

Weather Sunny
Surface Soil Silty Clay
Instrument AEMC Model 6471
Tested By Colton M. Hall

Electrode Spacing "a"		Electrode Depth "b"		"A" Test (Extended E-W)		"B" Test (Extended N-S)	
[feet]	[meters]	[feet]	[meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]
2.5	0.76	0.5	0.15	23.70	120.9	22.50	114.8
5	1.52	0.5	0.15	13.80	134.4	14.20	138.3
10	3.05	1	0.30	6.89	134.2	6.61	128.8
20	6.10	1	0.30	2.83	108.9	2.72	104.6
50	15.24	1	0.30	1.500	143.7	1.580	151.4
100	30.48	1	0.30	1.350	258.6	1.370	262.4
150	45.72	1	0.30	1.160	333.3	1.300	373.5

Apparent resistivity p is calculated as : $$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$



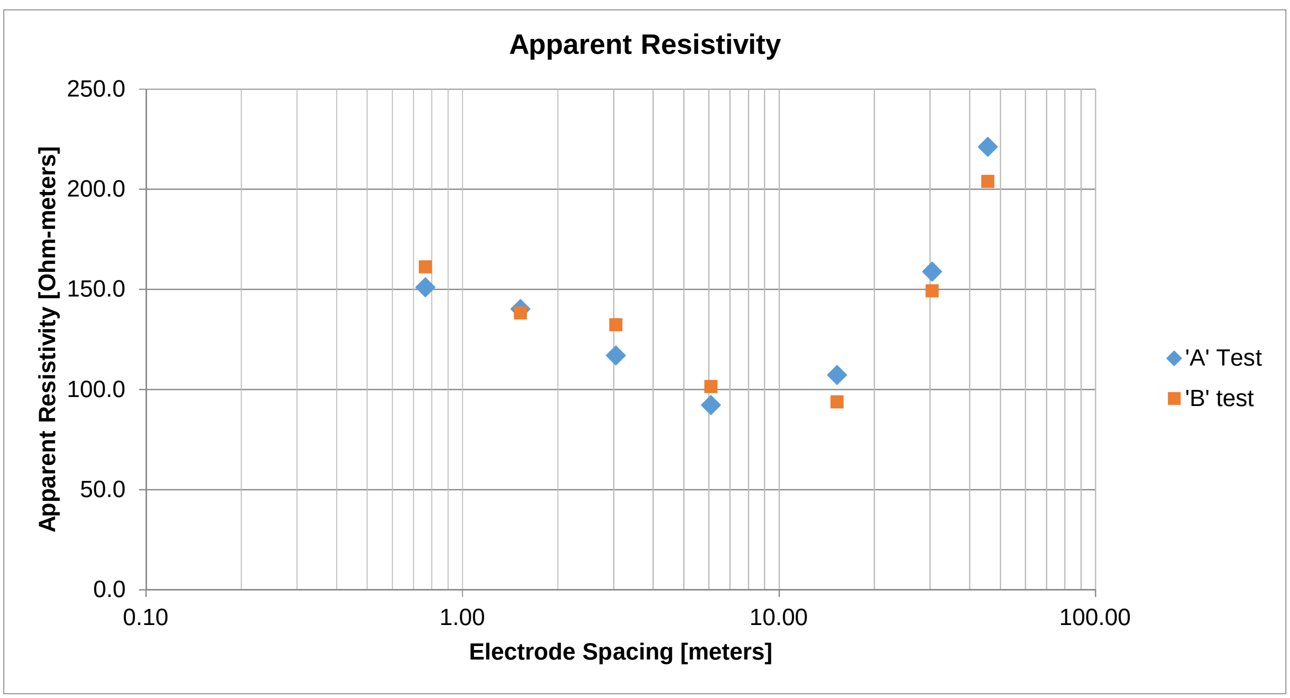
ELECTRICAL EARTH RESISTIVITY TEST DATA

Test Line at B-2 location with approximate center poin: 37.654627°, -85.990830°

Project	LGE-KU Solar Project	**Weather**	Partially Clouidy
Location	Cecilia, Hardin County, KY	**Surface Soil**	Silty Clay
Project #	57205074	**Instrument**	AEMC Model 6471
Test Date	December 2, 2020	**Tested By**	Sadra Javadi

Electrode Spacing "a"		**Electrode Depth "b"**		**"A" Test (Extended E-W)**		**"B" Test (Extended N-S)**	
[feet]	[meters]	[feet]	[meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]
2.5	0.76	0.5	0.15	29.60	151.1	31.60	161.3
5	1.52	0.5	0.15	14.40	140.3	14.20	138.3
10	3.05	1	0.30	6.01	117.1	6.80	132.5
20	6.10	1	0.30	2.40	92.3	2.64	101.6
50	15.24	1	0.30	1.120	107.3	0.980	93.9
100	30.48	1	0.30	0.830	159.0	0.780	149.4
150	45.72	1	0.30	0.770	221.2	0.710	204.0

Apparent resistivity p is calculated as : $\rho = \dfrac{4\pi a R}{1 + \dfrac{2a}{\sqrt{a^2 + 4b^2}} - \dfrac{a}{\sqrt{a^2 + b^2}}}$



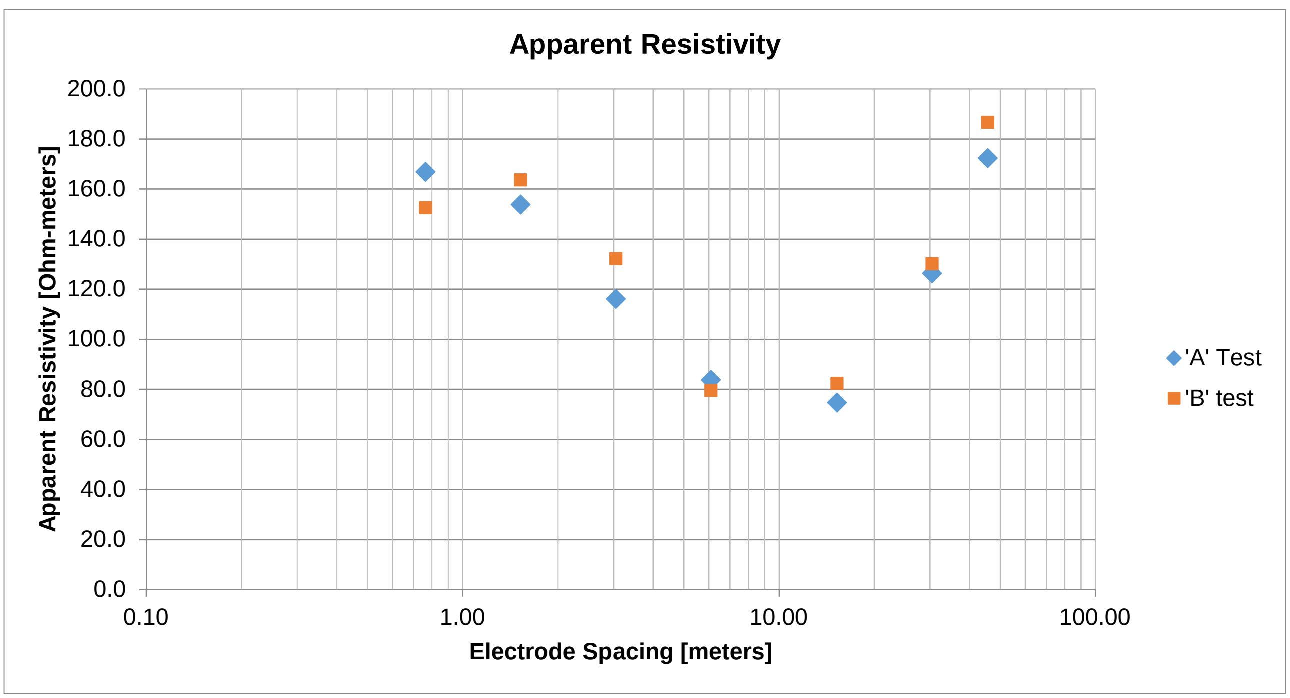
ELECTRICAL EARTH RESISTIVITY TEST DATA

Test Line at B-4 location with approximate center poin: 37.64436°, -85.97974°

Project	LGE-KU Solar Project	**Weather**	Sunny
Location	Cecilia, Hardin County, KY	**Surface Soil**	Silty Clay
Project #	57205074	**Instrument**	AEMC Model 6471
Test Date	November 24, 2020	**Tested By**	Colton M. Hall

Electrode Spacing "a"		**Electrode Depth "b"**		**"A" Test (Extended E-W)**		**"B" Test (Extended N-S)**	
[feet]	[meters]	[feet]	[meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]
2.5	0.76	0.5	0.15	32.70	166.9	29.90	152.6
5	1.52	0.5	0.15	15.80	153.9	16.80	163.6
10	3.05	1	0.30	5.96	116.1	6.79	132.3
20	6.10	1	0.30	2.18	83.9	2.07	79.6
50	15.24	1	0.30	0.780	74.7	0.860	82.4
100	30.48	1	0.30	0.660	126.4	0.680	130.3
150	45.72	1	0.30	0.600	172.4	0.650	186.7

Apparent resistivity p is calculated as : $$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$



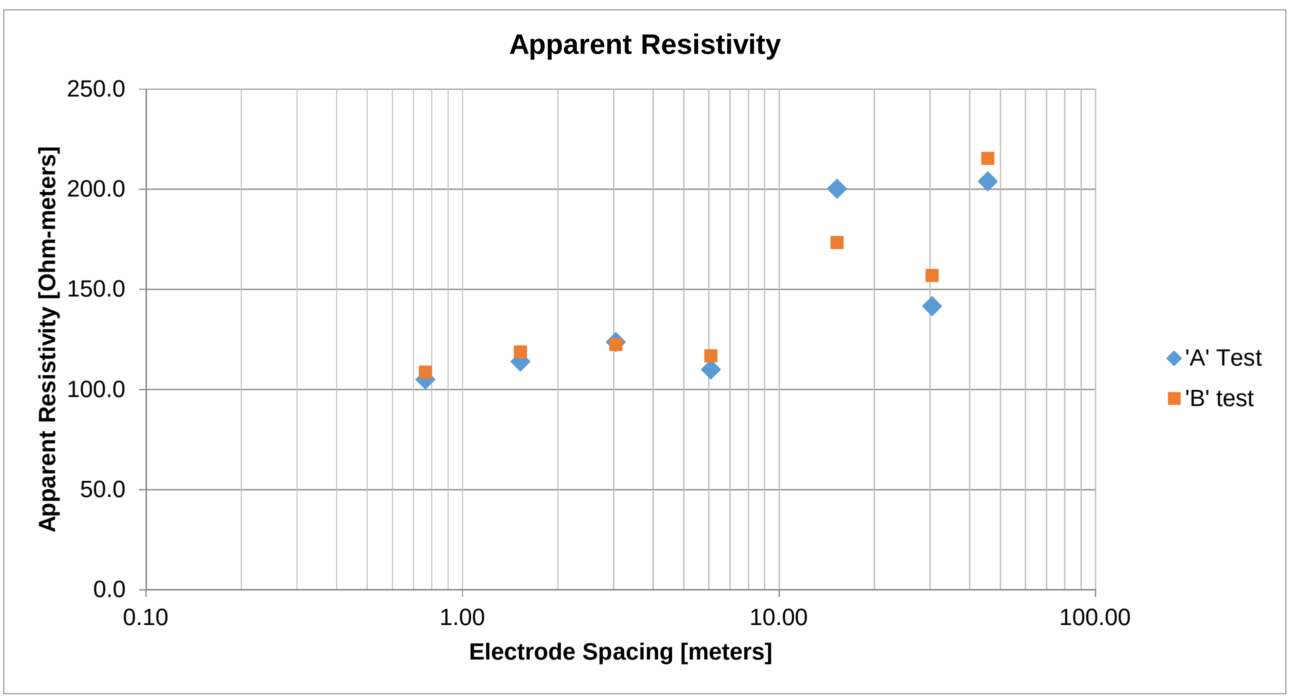
ELECTRICAL EARTH RESISTIVITY TEST DATA

Test Line at B-6 location with approximate center poin: 37.65708°, -85.990830°

Project	LGE-KU Solar Project	**Weather**	Partially Clouidy
Location	Cecilia, Hardin County, KY	**Surface Soil**	Silty Clay
Project #	57205074	**Instrument**	AEMC Model 6471
Test Date	December 2, 2020	**Tested By**	Sadra Javadi

Electrode Spacing "a"		**Electrode Depth "b"**		**"A" Test (Extended E-W)**		**"B" Test (Extended N-S)**	
[feet]	[meters]	[feet]	[meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]
2.5	0.76	0.5	0.15	20.60	105.1	21.30	108.7
5	1.52	0.5	0.15	11.70	114.0	12.20	118.8
10	3.05	1	0.30	6.35	123.7	6.29	122.5
20	6.10	1	0.30	2.86	110.0	3.04	116.9
50	15.24	1	0.30	2.090	200.3	1.810	173.4
100	30.48	1	0.30	0.740	141.7	0.820	157.1
150	45.72	1	0.30	0.710	204.0	0.750	215.5

Apparent resistivity p is calculated as : $\rho = \dfrac{4\pi a R}{1 + \dfrac{2a}{\sqrt{a^2 + 4b^2}} - \dfrac{a}{\sqrt{a^2 + b^2}}}$



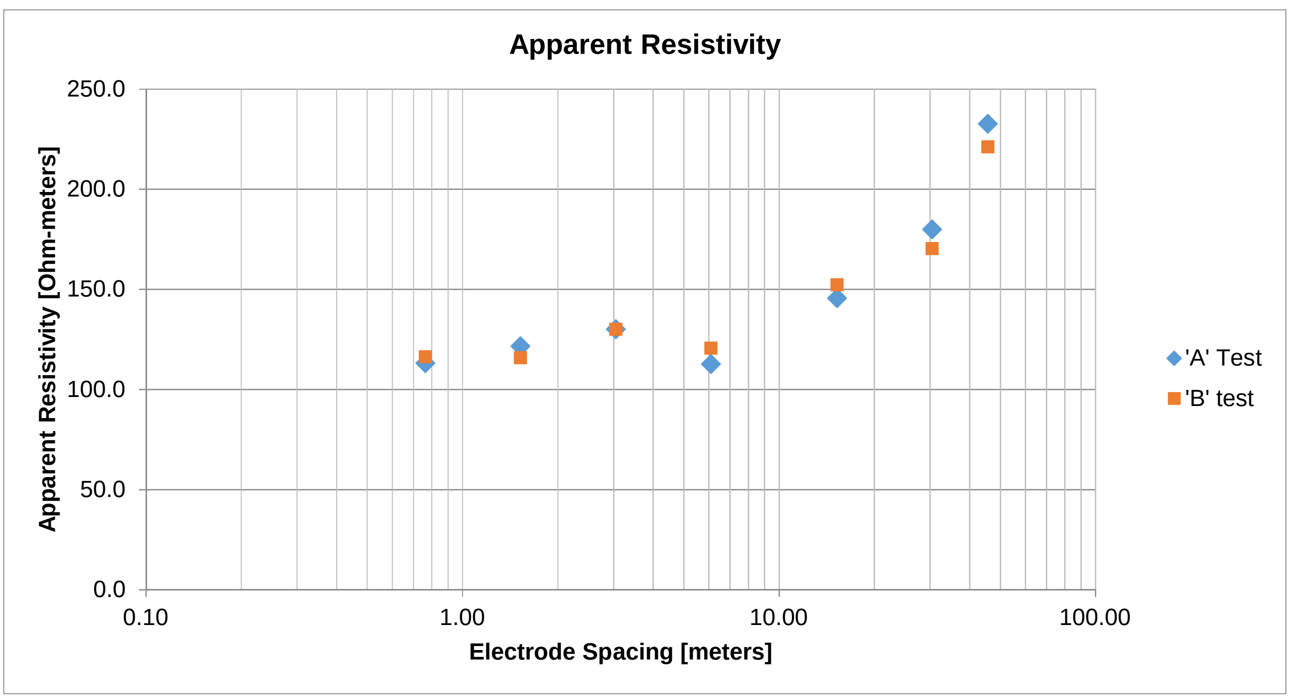
ELECTRICAL EARTH RESISTIVITY TEST DATA

Test Line at B-7 location with approximate center poin: 37.66067°, -85.99841°

Project	LGE-KU Solar Project	**Weather**	Partially Clouidy
Location	Cecilia, Hardin County, KY	**Surface Soil**	Silty Clay
Project #	57205074	**Instrument**	AEMC Model 6471
Test Date	December 2, 2020	**Tested By**	Sadra Javadi

Electrode Spacing "a"		**Electrode Depth "b"**		**"A" Test (Extended E-W)**		**"B" Test (Extended N-S)**	
[feet]	[meters]	[feet]	[meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]
2.5	0.76	0.5	0.15	22.20	113.3	22.80	116.4
5	1.52	0.5	0.15	12.50	121.8	11.90	115.9
10	3.05	1	0.30	6.68	130.1	6.68	130.1
20	6.10	1	0.30	2.93	112.7	3.14	120.8
50	15.24	1	0.30	1.520	145.7	1.590	152.4
100	30.48	1	0.30	0.940	180.1	0.890	170.5
150	45.72	1	0.30	0.810	232.7	0.770	221.2

Apparent resistivity p is calculated as : $\rho = \dfrac{4\pi a R}{1 + \dfrac{2a}{\sqrt{a^2 + 4b^2}} - \dfrac{a}{\sqrt{a^2 + b^2}}}$



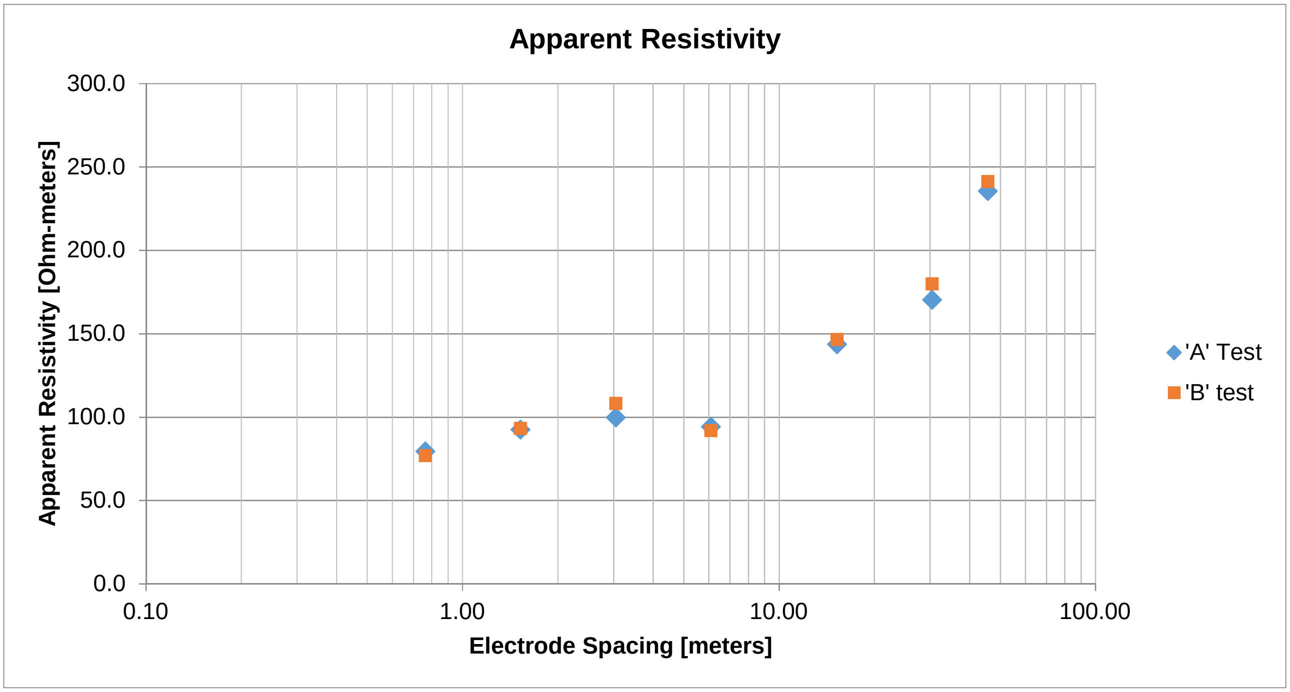
ELECTRICAL EARTH RESISTIVITY TEST DATA

Test Line at B-10 location with approximate center poin: 37.65115°, -86.00841°

Project	LGE-KU Solar Project	**Weather**	Partially Clouidy
Location	Cecilia, Hardin County, KY	**Surface Soil**	Silty Clay
Project #	57205074	**Instrument**	AEMC Model 6471
Test Date	December 2, 2020	**Tested By**	Sadra Javadi

Electrode Spacing "a"		**Electrode Depth "b"**		**"A" Test (Extended E-W)**		**"B" Test (Extended N-S)**	
[feet]	[meters]	[feet]	[meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]
2.5	0.76	0.5	0.15	15.60	79.6	15.10	77.1
5	1.52	0.5	0.15	9.51	92.6	9.58	93.3
10	3.05	1	0.30	5.12	99.7	5.56	108.3
20	6.10	1	0.30	2.45	94.2	2.39	91.9
50	15.24	1	0.30	1.500	143.7	1.530	146.6
100	30.48	1	0.30	0.890	170.5	0.940	180.1
150	45.72	1	0.30	0.820	235.6	0.840	241.3

Apparent resistivity p is calculated as :
$$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$



CHEMICAL LABORATORY TEST REPORT

Project Number: 57205074
Service Date: 12/09/20
Report Date: 12/10/20

Terracon

10400, State Highway 191
Midland, Texas (79707)
(432)-684-9600

Client

ibV Energy Partners LLC
777 Brickell Ave Ste 500
Miami, FL 33131-2809

Project

LGE-KU Solar Project
Hardinsburg Road
Cecilia, KY

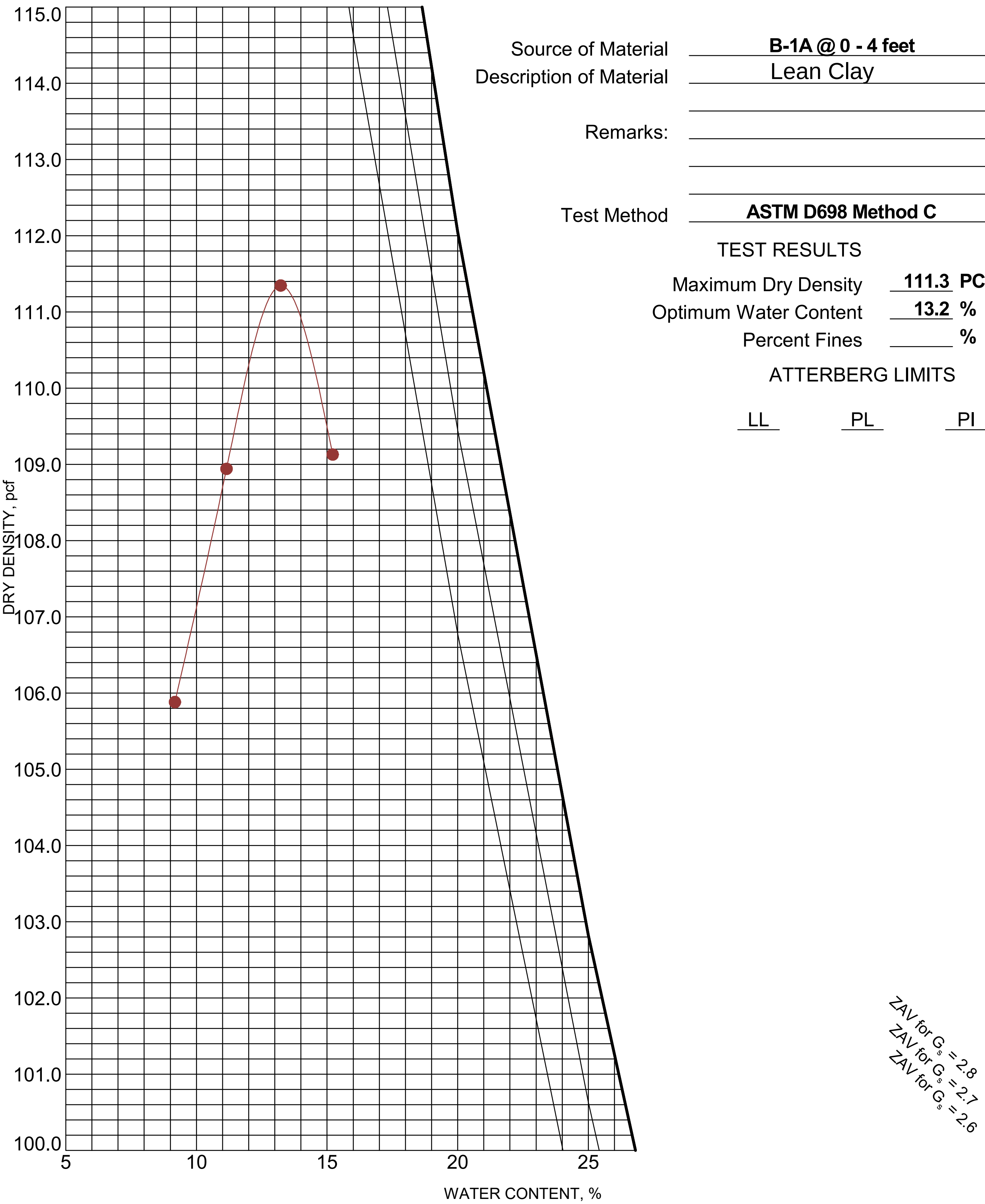
Sample Location	B-1	B-2	B-4	B-6	B-7	B-10
Sample Depth (ft.)	2'-3'	2'-3'	2'-3'	2'-3'	2'-3'	2'-3'
pH Analysis, ASTM - G51-18	7.10	7.00	6.90	5.80	5.90	5.40
Water Soluble Sulfate (SO4), ASTM C 1580 (mg/kg)	116	100	41	37	32	33
Sulfides, ASTM - D4658-15, (mg/kg)	nil	nil	nil	nil	nil	nil
Chlorides, ASTM D 512 , (mg/kg)	16	10	6	6	5	25
RedOx, ASTM D-1498, (mV)	+435	+412	+417	+423	+420	+462
Total Salts, ASTM D1125-14, (mg/kg)	448	235	170	118	175	110
Resistivity, ASTM G187, (ohm-cm)	11358	10325	9293	14455	10325	12390

Analyzed By: Nohelia Monasterios

Nohelia Monasterios
Field Engineer

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material: **B-1A @ 0 - 4 feet**

Description of Material: Lean Clay

Remarks:

Test Method: **ASTM D698 Method C**

TEST RESULTS

Maximum Dry Density **111.3 PCF**

Optimum Water Content **13.2 %**

Percent Fines %

ATTERBERG LIMITS

LL	PL	PI

PROJECT: LGE-KU Solar Project

SITE: Hardinsburg Road
Cecilia, KY

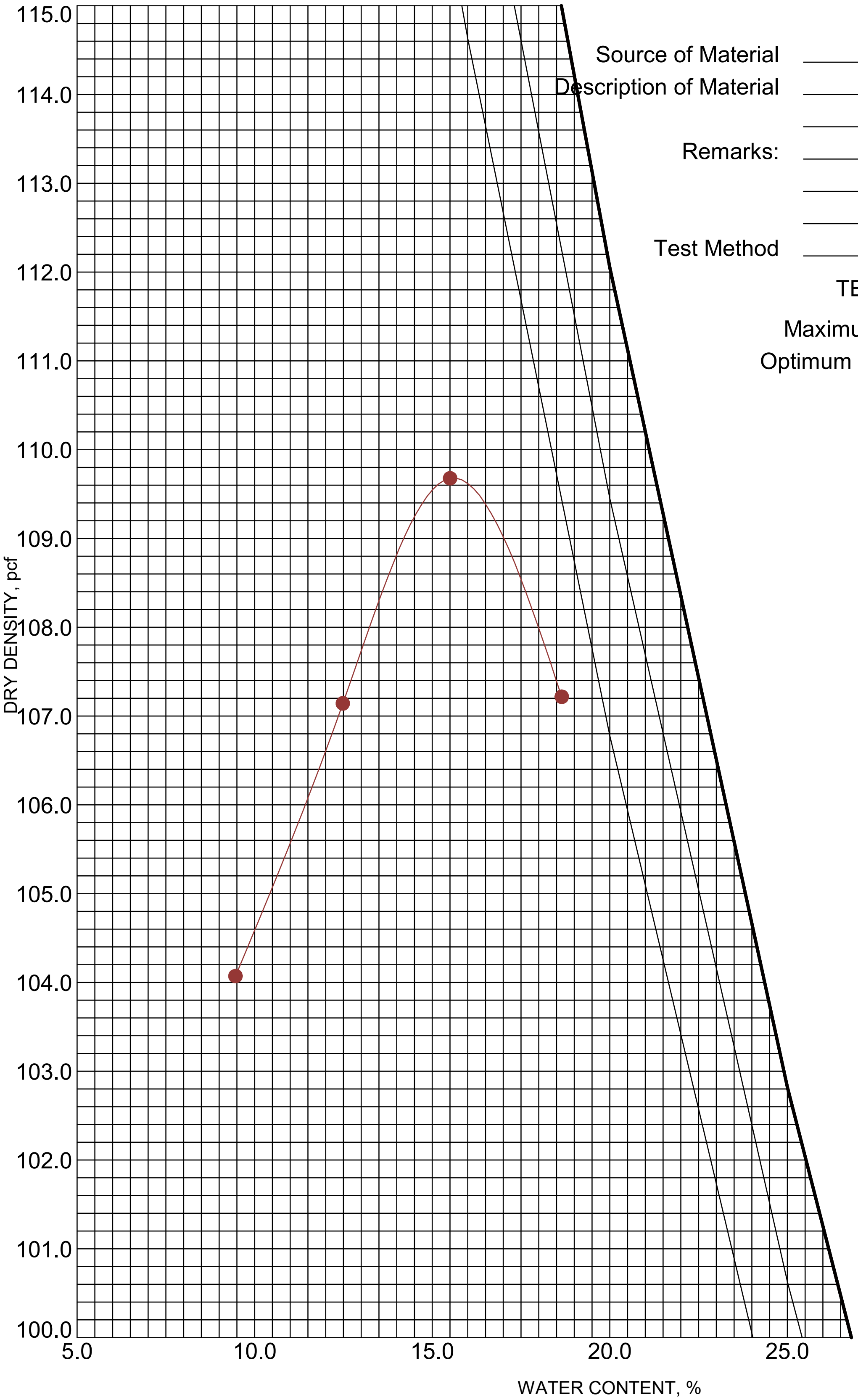
Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

PROJECT NUMBER: 57205074

CLIENT: ibV Energy Partners LLC
Miami, FL

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material: **B-6A @ 0 - 4 feet**

Description of Material: Lean Clay

Remarks:

Test Method: **ASTM D698 Method C**

TEST RESULTS

Maximum Dry Density **109.7** **PCF**

Optimum Water Content **15.7** **%**

Percent Fines ____ **%**

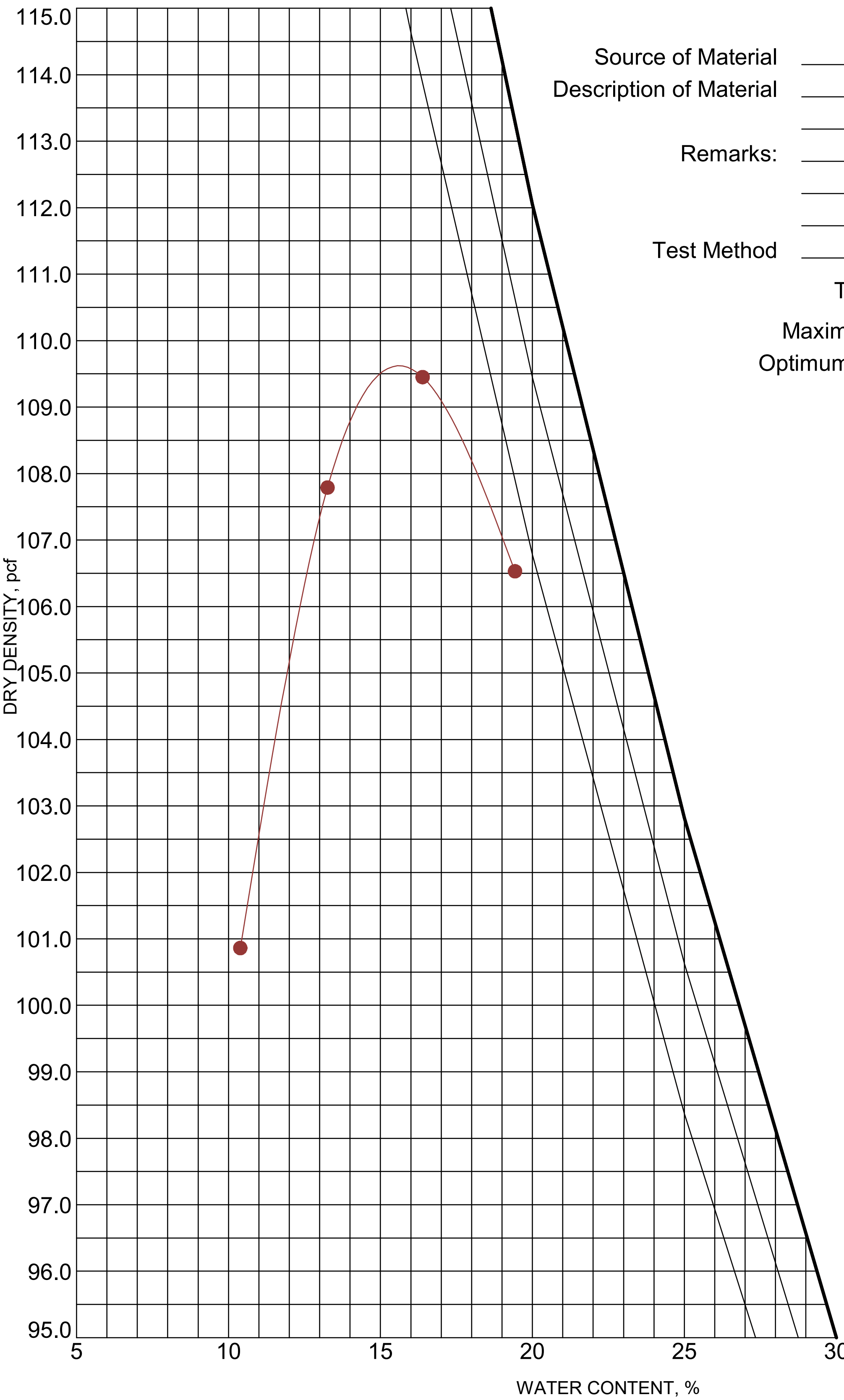
ATTERBERG LIMITS

LL	PL	PI

PROJECT: LGE-KU Solar Project	Terracon 13050 Eastgate Park Way Ste 101 Louisville, KY	PROJECT NUMBER: 57205074
SITE: Hardinsburg Road Cecilia, KY		CLIENT: ibV Energy Partners LLC Miami, FL

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material	**B-10A @ 0 - 4 feet**
Description of Material	Lean Clay
Remarks:	
Test Method	**ASTM D698 Method C**

TEST RESULTS

Maximum Dry Density	**109.6**	**PCF**
Optimum Water Content	**15.6**	**%**
Percent Fines		**%**

ATTERBERG LIMITS

LL	PL	PI

ZAV for G_s = 2.8
ZAV for G_s = 2.7
ZAV for G_s = 2.6

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V3 57205074 PRELIMINARY GEOTE.GPJ TERRACON_DATATEMPLATE.GDT 12/11/20

PROJECT: LGE-KU Solar Project	Terracon 13050 Eastgate Park Way Ste 101 Louisville, KY	PROJECT NUMBER: 57205074
SITE: Hardinsburg Road Cecilia, KY		CLIENT: ibV Energy Partners LLC Miami, FL

21239 FM529 Rd., Bldg. F
Cypress, TX 77433
Tel: 281-985-9344
Fax: 832-427-1752
info@geothermusa.com
http://www.geothermusa.com

December 18, 2020

Terracon Consultants, Inc.
13050 Eastgate Park Way, Ste 101
Louisville, KY 40223
Attn: Sadra Javadi, Ph.D.

Re: Thermal Analysis of Native Soil Samples
LGE – KU Solar Project – Cecilia, KY (PO No. 57205074)

The following is the report of thermal dryout characterization tests conducted on the three (3) soil samples from the referenced project sent to our laboratory.

Thermal Resistivity Tests: The samples were tested at the 'as received' moisture content and at 85% of the dry density ***provided by Terracon.*** The tests were conducted in accordance with the IEEE standard 442-2017. The results are tabulated below and the thermal dryout curves are presented in **Figures 1 to 3.**

Sample ID, Description, Thermal Resistivity, Moisture Content and Density

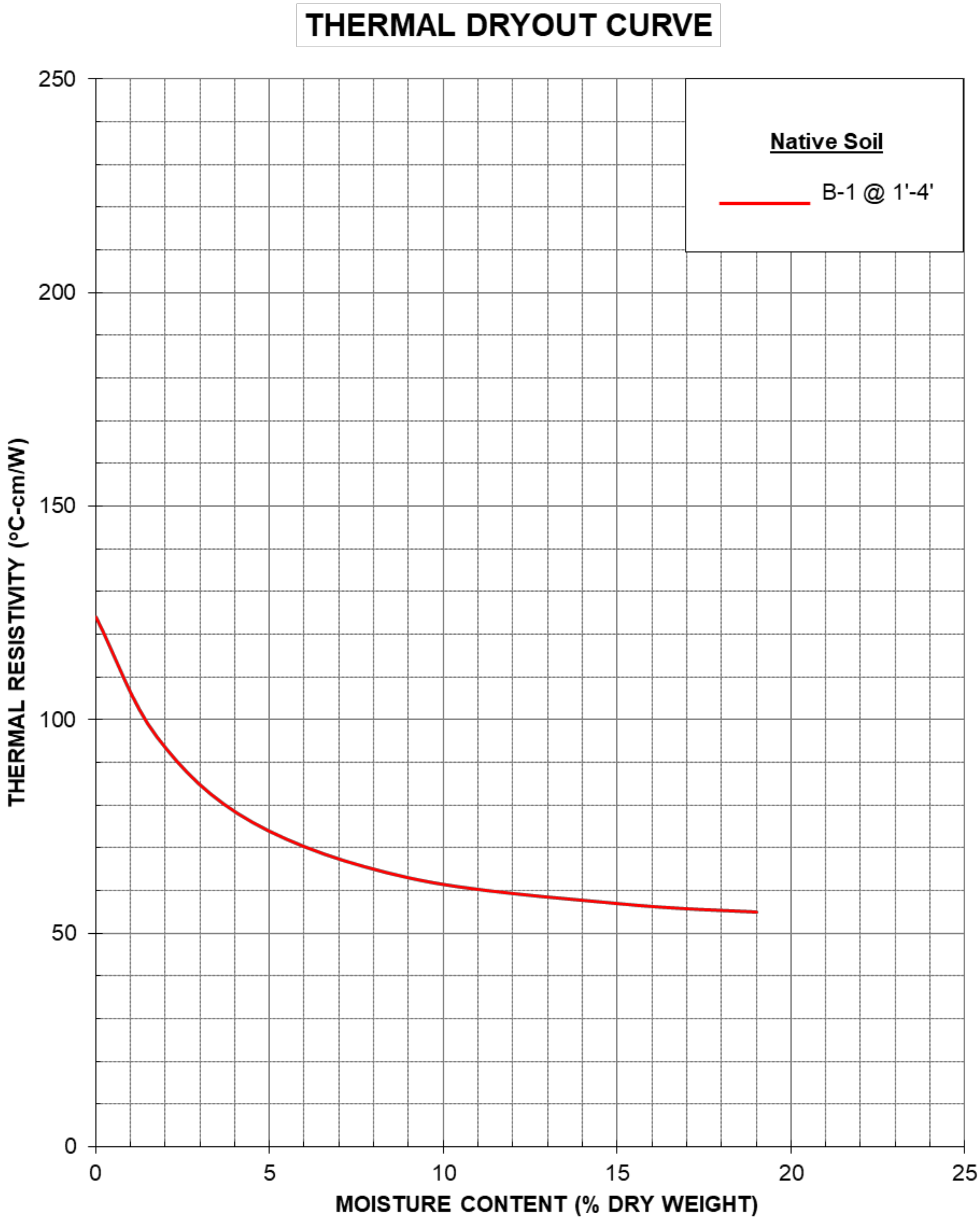
Sample ID	Description (Terracon)	Thermal Resistivity (°C-cm/W)		Moisture Content (%)	Dry Density (lb/ft^3)
		Wet	Dry		
B-1 @ 1'-4'	Silty Lean Clay	55	124	19	95
B-6 @ 1'-4'	Lean/Fat Clay	59	169	23	93
B-10 @ 1'-4'	Fat Clay	60	147	20	93

Comments: The thermal characteristic depicted in the dryout curves apply for the samples at their respective test dry density.

Please contact us if you have any questions or if we can be of further assistance.

Geotherm USA

Nimesh Patel



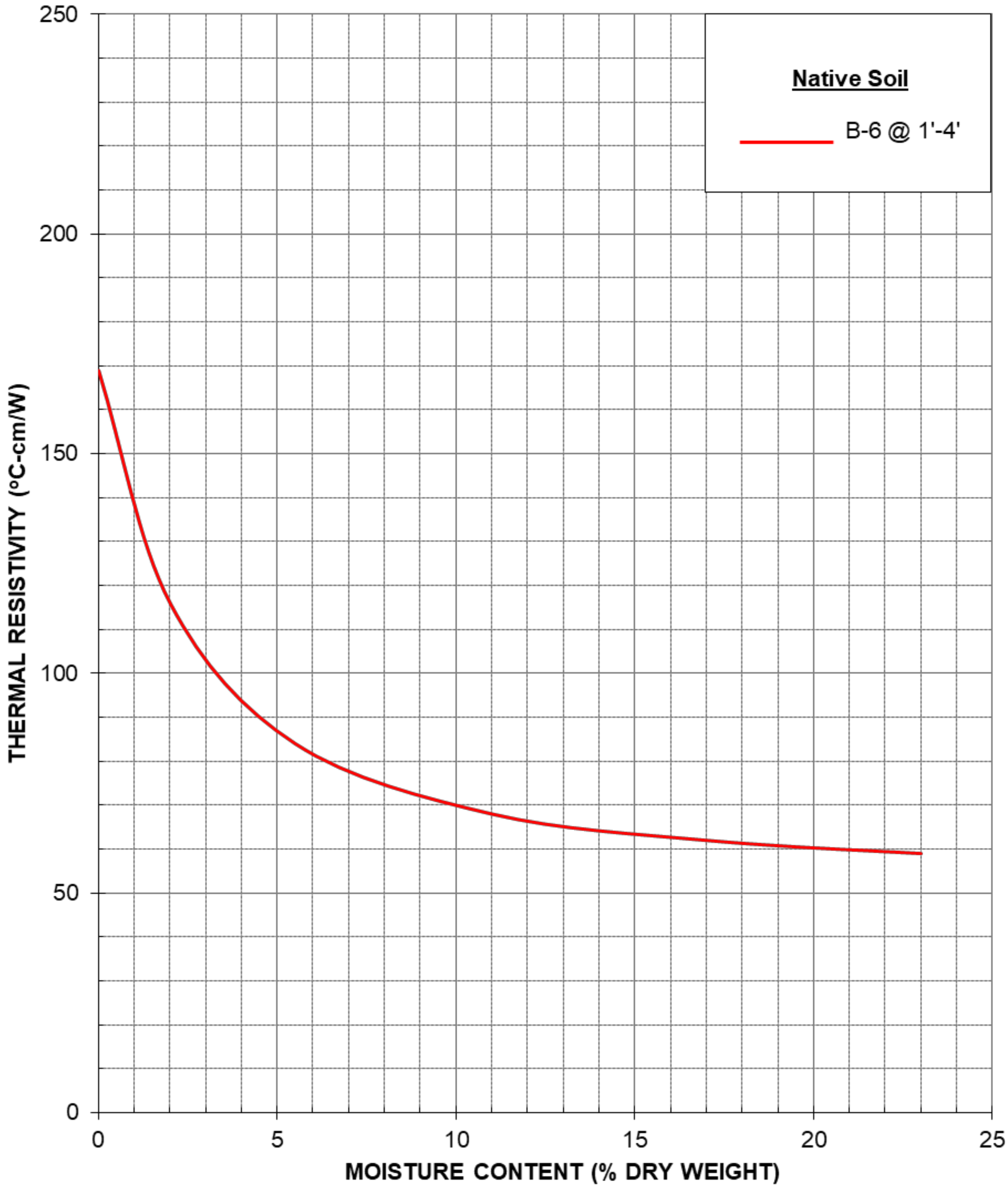
Terracon Consultants, Inc. (PO No. 57205074)

Thermal Analysis of Native Soil

LGE - KU Solar Project - Cecilia, KY

December 2020 **Figure 1**

THERMAL DRYOUT CURVE



Terracon Consultants, Inc. (PO No. 57205074)

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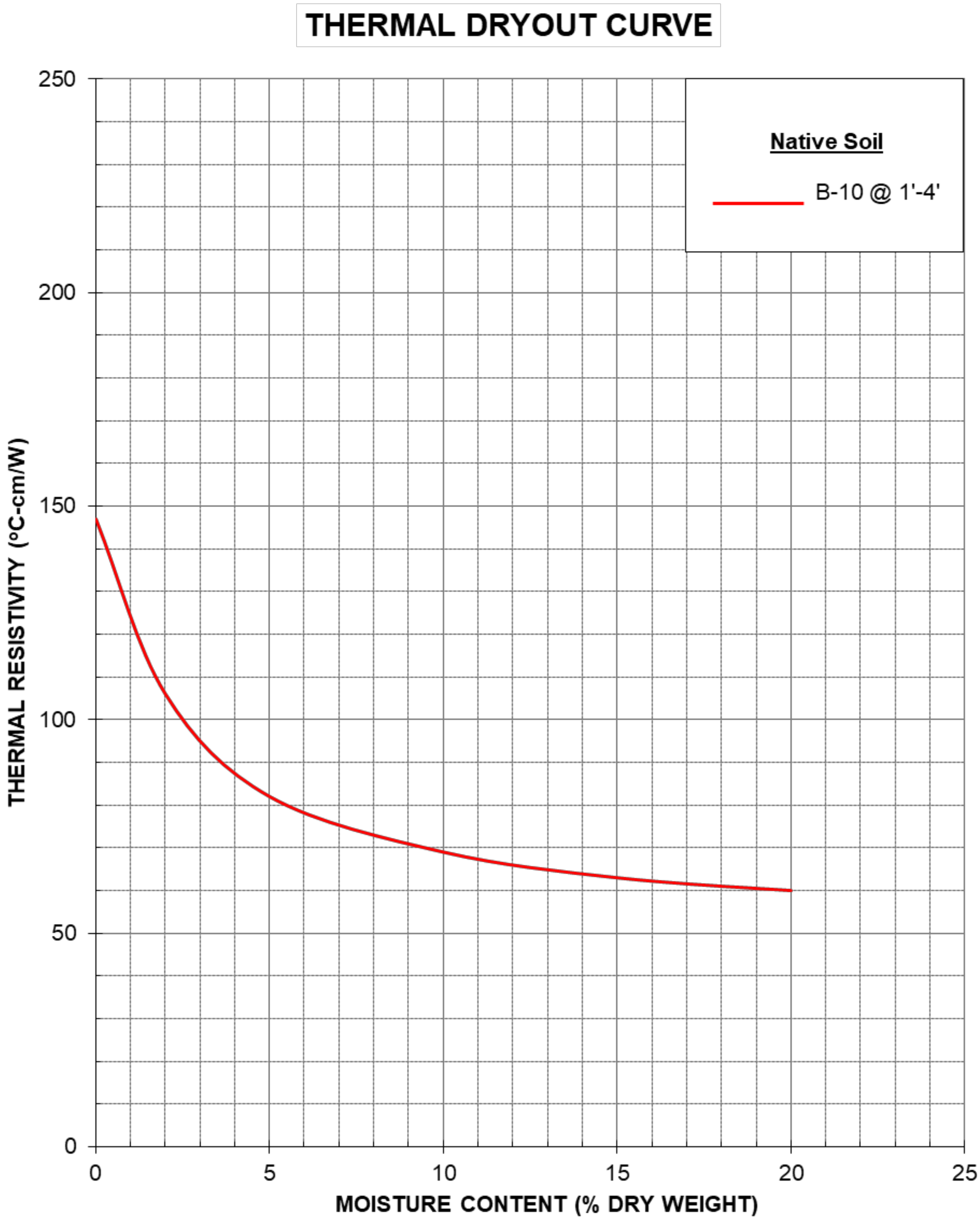
December 2020 **Figure 2**

Geotherm USA



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Thermal Analysis of Native Soil

LGE - KU Solar Project - Cecilia, KY

December 2020 **Figure 3**

SUPPORTING INFORMATION

Contents:

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

LGE-KU Solar Project ■ Cecilia, KY

Terracon Project No. 57205074

SAMPLING

Rock Core

Grab Sample

Shelby Tube

Split Spoon

WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Cave In Encountered

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	**Standard Penetration Test Resistance (Blows/Ft.)**
(HP)	**Hand Penetrometer**
(T)	**Torvane**
(DCP)	**Dynamic Cone Penetrometer**
UC	**Unconfined Compressive Strength**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			**BEDROCK**	
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1	< 20	Weathered
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4	20 - 29	Firm
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8	30 - 49	Medium Hard
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15	50 - 79	Hard
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30	>79	Very Hard
		Hard	> 4.00	> 30		

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification: Group Symbol	Soil Classification: Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or [$Cc<1$ or $Cc>3.0$] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or [$Cc<1$ or $Cc>3.0$] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

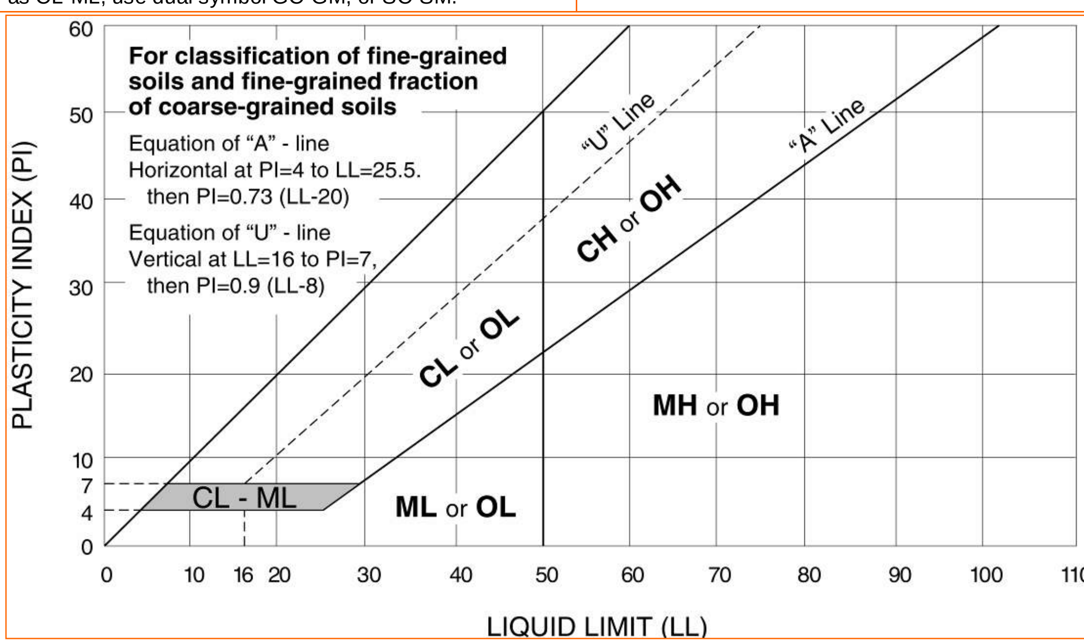
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



DESCRIPTION OF ROCK PROPERTIES

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, psi (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft. (50 – 300 mm)
Moderate	8 in – 2 ft. (200 – 600 mm)	**Medium**	1 ft. – 3 ft. (300 – 900 mm)
Wide	2 ft. – 6 ft. (600 mm – 2.0 m)	**Thick**	3 ft. – 10 ft. (900 mm – 3 m)
Very Wide	6 ft. – 20 ft. (2.0 – 6 m)	**Massive**	> 10 ft. (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) [1]	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009
Technical Manual for Design and Construction of Road Tunnels – Civil Elements