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:
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Louisville, Kentucky

December 30, 2020

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Attn: Mr. Steven Link, Sr. Director – Project Development
P: (954) 319-4143
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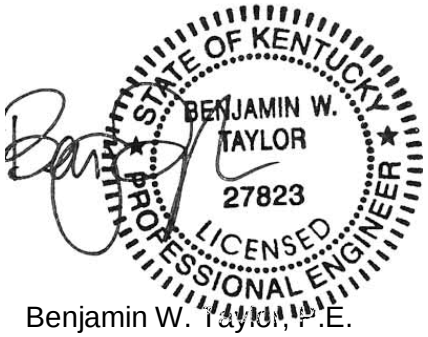
Re: Preliminary Geotechnical Engineering Report
LGE-KU Solar Project
Cecilia, Hardin County, Kentucky
Terracon Project No. 57205074

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.



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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:

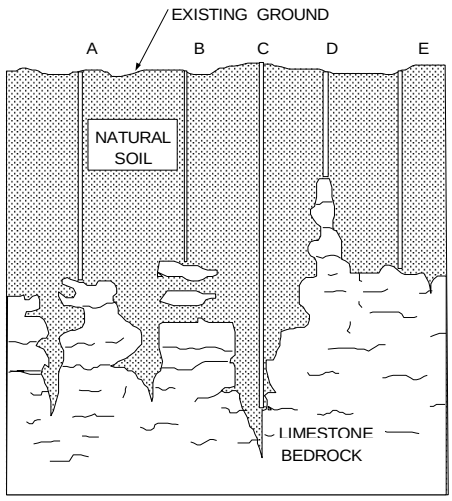
- 5 feet at ROW-4,
- 10 feet at borings B-2, B-4, B-6, B-8, ROW-2, and
- 15 feet at borings B-5, B-7, B-9, B-10, B-11, and ROW-1

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.

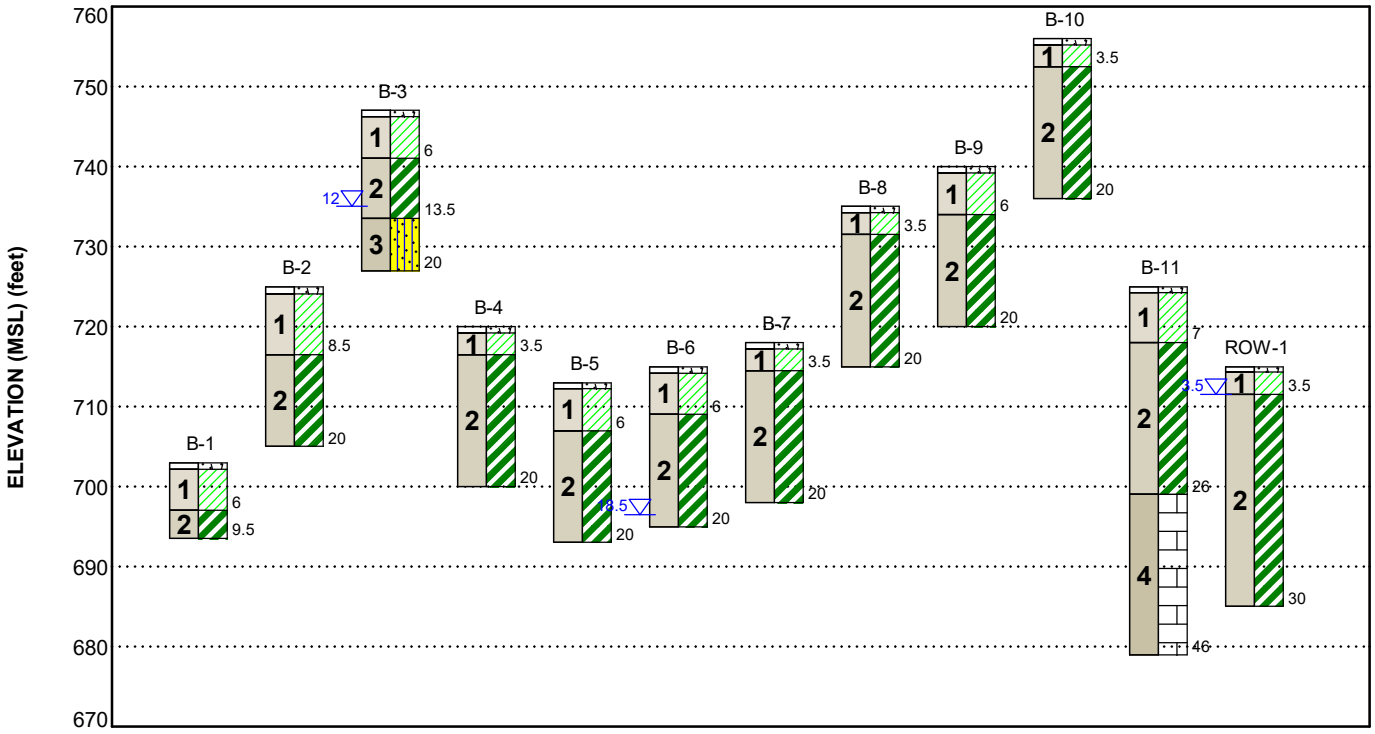
FIGURES

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

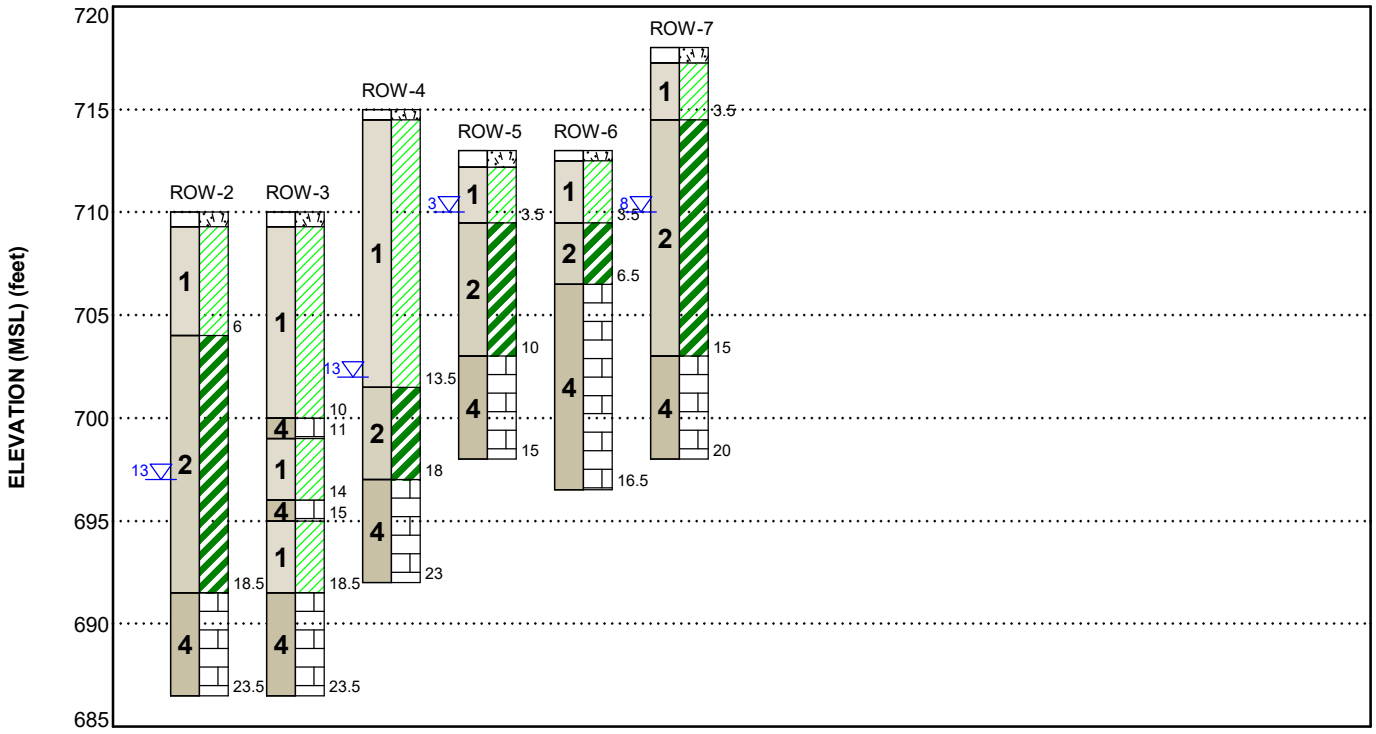
▽ First Water Observation

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



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

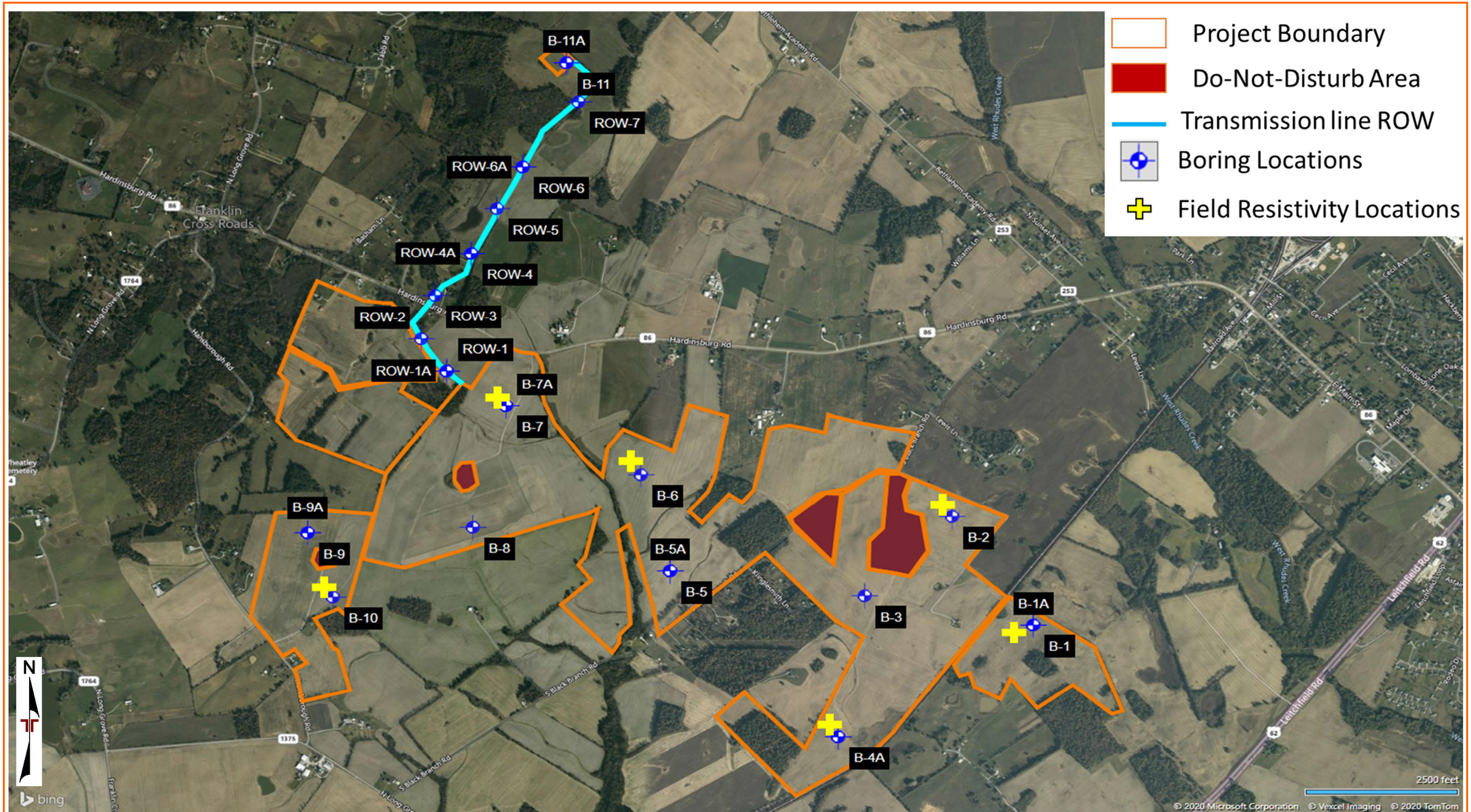


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

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	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	702+/-													
1							18	2-2-2 N=4		1.25 (HP)				21.0		
							18	3-3-4 N=7		2.00 (HP)				19.7		
				5												
		6.0	697+/-													
2							18	3-3-4 N=7		1.75 (HP)				37.9		
							10	10-50/4"		1.50 (HP)				25.6		
		9.5	693.5+/-													

0.8 **TOPSOIL**

LEAN CLAY (CL), with silt, brown, medium stiff

6.0 **FAT CLAY (CH)**, reddish brown, medium stiff

9.5 with limestone fragments

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

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.6495° Longitude: -85.9687° Approximate Surface Elev.: 703 (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
		Blank Drilling 2.0 701+/-													
1		**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	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
		0.0	725+/-													
		0.9	724+/-													
1							18	1-2-2 N=4		0.75 (HP)				24.3		
							18	2-3-5 N=8		2.25 (HP)				21.7		
				5			18	3-4-5 N=9		1.75 (HP)				14.7		
		8.5	716.5+/-													
2							18	4-5-6 N=11		2.00 (HP)				18.8		
				10												
							18	2-3-4 N=7		2.25 (HP)				14.1		
				15												
							17	3-3-4 N=7		2.25 (HP)				21.3		
		20.0	705+/-	20												

LEAN CLAY (CL), with silt, brown, medium stiff to stiff

FAT CLAY (CH), reddish brown, medium stiff to stiff

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	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
		0.8	746+/-													
1							18	1-3-7 N=10		1.25 (HP)				21.7		
							18	4-7-8 N=15		4.50+ (HP)				13.9		
		6.0	741+/-	5												
2							18	3-5-6 N=11		4.50 (HP)				17.2		52-18-34
							18	6-3-5 N=8		1.75 (HP)				18.5		
				10	▽											
3							18	5-10-12 N=22						18.9		
				15												
		20.0	727+/-				18	7-10-8 N=18						21.8		
				20												

TOPSOIL

LEAN CLAY (CL), with silt, brown, stiff

FAT CLAY (CH), trace fine sand, gray, stiff

SILTY SAND (SM), black, medium dense

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: 11-24-2020 | 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	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
		0.8	719+/-													
		TOPSOIL														
1		**LEAN CLAY (CL)**, with silt, trace fine sand, brown, medium stiff to stiff				X	18	3-4-5 N=9		2.50 (HP)				16.9		
		3.5	716.5+/-													
2		**FAT CLAY (CH)**, reddish brown, stiff				X	18	5-7-8 N=15		4.50+ (HP)				28.0		
				5												
						X	18	4-7-7 N=14		4.50+ (HP)				30.8		
						X	18	5-6-7 N=13		4.50+ (HP)				31.2		
				10												
						X	18	4-6-6 N=12		3.00 (HP)				24.7		
				15												
						X	18	3-4-5 N=9		2.50 (HP)				30.2		
		20.0	700+/-	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

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	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
			Blank Drilling													
		1.0	719+/-													
1			**LEAN CLAY (CL)**, with silt, brown, hard				21			3.50 (HP)	UC	4.61	3.9	18.0	109	45-17-28
		3.0	717+/-													
			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	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
		0.8	712+/-													
		TOPSOIL														
1		**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff				X	18	1-2-3 N=5		1.50 (HP)				22.9		
						X	18	3-5-6 N=11		2.75 (HP)				19.9		
				5												
		6.0	707+/-													
2		**FAT CLAY (CH)**, reddish brown, medium stiff to stiff				X	18	3-5-6 N=11		3.00 (HP)				21.7		
						X	18	4-4-6 N=10		3.50 (HP)				20.9		
				10												
						X	18	5-6-5 N=11		2.50 (HP)				39.7		
				15												
						X	18	3-3-5 N=8		2.50 (HP)				29.3		
		20.0	693+/-	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

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

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.6522° Longitude: -85.9892° Approximate Surface Elev.: 713 (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
		Blank Drilling 2.0 711+/-													
1		**LEAN CLAY (CL)**, with silt, brown, very stiff 4.0 709+/-				23			3.50 (HP)	UC	2.01	3.6	17.8	108	33-18-15
		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	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
		0.8	714+/-													
			TOPSOIL													
1			**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff				18	1-2-3 N=5		2.00 (HP)				23.9		
							18	4-5-7 N=12		3.25 (HP)				19.0		
				5												
		6.0	709+/-													
			FAT CLAY (CH), reddish brown, medium stiff to stiff				18	6-8-7 N=15		3.00 (HP)				21.9		
							18	3-4-5 N=9		2.50 (HP)				23.4		
2				10												
							18	3-4-4 N=8		2.75 (HP)				26.5		
				15	▽											
							18	2-3-4 N=7		1.75 (HP)				28.0		
		20.0	695+/-	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: 11-24-2020 | 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	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	717+/-													
			TOPSOIL													
1			**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff			X	18	2-3-5 N=8		2.00 (HP)				17.7		
		3.5	714.5+/-													
2			**FAT CLAY (CH)**, reddish brown, stiff	5		X	18	5-7-9 N=16		4.50+ (HP)				22.5		
						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												
			trace fine sand			X	18	3-3-4 N=7		0.75 (HP)				28.2		
		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

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+/-				13			4.50 (HP)	UC	4.96	4.8	19.2	107	46-20-26
		Boring Terminated at 5 Feet	5												

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	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
		0.8	734+/-													
		TOPSOIL														
1		**LEAN CLAY (CL)**, with silt, brown, medium stiff				X	18	1-2-2 N=4		1.25 (HP)				24.5		
		3.5	731.5+/-													
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		
						X	18	4-5-7 N=12		4.25 (HP)				27.6		
				10												
						X	18	4-5-6 N=11		3.75 (HP)				39.3		
				15												
						X	18	8-5-5 N=10		3.00 (HP)				33.3		
		20.0	715+/-	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

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	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	739+/-													
	TOPSOIL															
1	**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff					X	18	1-2-3 N=5		2.00 (HP)				17.6		
						X	18	4-6-7 N=13		2.50 (HP)				14.9		
		6.0	734+/-	5												
2	**FAT CLAY (CH)**, reddish brown, medium stiff to stiff					X	18	5-6-8 N=14		4.50+ (HP)				17.4		
						X	18	3-5-5 N=10		2.75 (HP)				24.7		
				10												
						X	18	3-4-6 N=10		2.50 (HP)				22.6		
				15												
						X	18	3-3-4 N=7		1.50 (HP)				46.8		
		20.0	720+/-	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

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

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.6541° Longitude: -86.0097° Approximate Surface Elev.: 740 (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
		Blank Drilling 2.0 738+/-													
1		**LEAN CLAY (CL)**, with silt, brown, very stiff 4.0 736+/-				19			3.50 (HP)	UC	3.26	5.3	19.4	103	25-17-8
		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	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	755+/-													
		TOPSOIL														
1		**LEAN CLAY (CL)**, with silt, brown, stiff					18	3-4-5 N=9		1.75 (HP)				16.7		
		3.5	752.5+/-													
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	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	724.5+/-													
			TOPSOIL													
1			**LEAN CLAY (CL)**, with silt, brown with reddish brown, medium stiff			X	18	2-3-4 N=7		3.75 (HP)				17.8		
						X	18	3-4-5 N=9		2.25 (HP)				17.8		
				5												
						X	18	3-4-5 N=9		2.00 (HP)				17.8		
		7.0	718+/-													
2			**FAT CLAY (CH)**, reddish brown, medium stiff to stiff			X	18	5-6-6 N=12		3.00 (HP)				18.4		
				10												
						X	18	4-5-6 N=11		3.00 (HP)				38.7		
				15												
						X	18	2-3-4 N=7		1.25 (HP)				38.9		
				20												
						X	18	2-2-2 N=4		0.50 (HP)				27.0		
				25												

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	30			112		60%		UC	867.60			167	
				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

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.6776° Longitude: -85.9951° Approximate Surface Elev.: 725 (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
		Blank Drilling 2.0 / 723+/-													
1		**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	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
		0.7	714.5+/-													
		TOPSOIL														
1		**LEAN CLAY (CL)**, with silt, brown with gray, soft, trace rock fragments					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					18	3-5-5 N=10		2.00 (HP)				27.5		73-24-49
				5			18	4-6-8 N=14		2.00 (HP)				21.1		
							18	3-3-5 N=8		1.50 (HP)				31.8		
				10												
							18	3-4-5 N=9		1.00 (HP)				39.6		
				15												
							18	2-3-4 N=7		2.00 (HP)				28.9		
				20												
							18	2-2-2 N=4		1.00 (HP)				36.9		
				25												

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

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.6622° Longitude: -86.0019° Approximate Surface Elev.: 715 (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
2		**FAT CLAY (CH)**, reddish brown, medium stiff to stiff *(continued)*													
		30.0 685+/-				18	1-2-2 N=4		0.25 (HP)				29.7		
		Boring Terminated at 30 Feet	30												

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

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.6622° Longitude: -86.0019° Approximate Surface Elev.: 715 (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 3.0 712+/-													
		LEAN CLAY (CL), with silt, brown, stiff 5.0 710+/-				22			3.00 (HP)	UC	1.85	3	25.7	96	
		Boring Terminated at 5 Feet	5												

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	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
		0.7	709.5+/-													
		TOPSOIL														
1		**LEAN CLAY (CL)**, with silt, brown, medium stiff to stiff					17	1-2-2 N=4		1.75 (HP)				19.5		
							18	3-4-5 N=9		1.75 (HP)				27.8		
		6.0	704+/-	5												
2		**FAT CLAY (CH)**, reddish brown, stiff					18	4-4-4 N=8		2.50 (HP)				22.7		
							18	3-4-4 N=8		2.50 (HP)				29.7		
				10	▽											
							18	1-3-9 N=12		0.25 (HP)				33.7		
		18.5	691.5+/-	15												
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					58		75%		UC	1233.36			165	
		23.5	686.5+/-	20												
		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	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	Description
		0.7	709.5+/-														**TOPSOIL**
1						X	18	2-2-3 N=5		1.50 (HP)				32.0			**LEAN CLAY (CL)**, with silt, brown, medium stiff
						X	18	4-3-4 N=7		2.00 (HP)				28.5			
				5		X	18	2-2-3 N=5		1.25 (HP)				28.3			
		10.0	700+/-			X	13	2-17-50/1"		1.00 (HP)				48.2			
4		11.0	699+/-	10													**LIMESTONE**, close fracture spacing, thin bedding, unweathered to completely weathered, strong rock
1							40		10%								3 inches of high-angled fracture
		14.0	696+/-														**CLAY-FILLED VOID**
4		15.0	695+/-	15													**LIMESTONE**, close fracture spacing, thin bedding, unweathered to completely weathered, strong rock
1		18.5	691.5+/-				20		0%								**CLAY-FILLED VOID**
4				20			60		85%		UC	436.32			158		**LIMESTONE**, close fracture spacing, thin bedding, unweathered to slightly weathered, medium strong
		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

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	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
		0.5	714.5+/-													
1			**TOPSOIL**													
			LEAN CLAY (CL), with silt, brown, medium stiff to stiff			X	17	1-2-2 N=4		1.25 (HP)				22.5		
						X	18	3-4-5 N=9		2.50 (HP)				22.9		
				5		X	18	4-4-5 N=9		2.00 (HP)				24.1		
						X	18	1-2-2 N=4		1.75 (HP)				32.5		
				10	▽											
		13.5	701.5+/-													
2			**FAT CLAY (CH)**, reddish brown, medium stiff			X	18	3-3-4 N=7		1.25 (HP)				36.6		
		18.0	697+/-	15												
4			**LIMESTONE**, light gray with dark gray, moderate to close spacing, thin bedding, unweathered, strong rock				58		81 %		UC	578.16			165	
		23.0	692+/-	20												
			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					22			4.00 (HP)	UC	1.67	3	19.3	107	31-20-11
		5.0	710+/-													
		Boring Terminated at 5 Feet		5												

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	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
		0.8	712+/-													
1			**TOPSOIL**													
			LEAN CLAY (CL), with silt, brown, medium stiff		▽		17	3-3-4 N=7		1.50 (HP)				25.5		
		3.5	709.5+/-													
2			**FAT CLAY (CH)**, brown, soft to medium stiff	5			18	1-1-2 N=3		0.50 (HP)				23.5		
							18	1-2-2 N=4		1.75 (HP)				25.6		
							18	2-2-3 N=5		1.75 (HP)				30.4		62-21-41
		10.0	703+/-	10												
4			**LIMESTONE**, light gray with dark gray, moderate to close spacing, thin bedding, unweathered, medium strong				60		90%		UC	445.68			166	
		15.0	698+/-	15												
			vertical fracture from 14.25 ft to 14.75 ft													
			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	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	712.5+/-													
			TOPSOIL													
1			**LEAN CLAY (CL)**, with silt, brown, medium stiff				18	1-1-3 N=4		1.50 (HP)				23.6		
		3.5	709.5+/-													
2			**FAT CLAY (CH)**, reddish brown with brown, medium stiff	5			18	2-2-3 N=5		2.00 (HP)				28.1		
		6.5	706.5+/-				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				58.5		54%		UC	1098.72			167	
				10												
							60		88%							
				15												
		16.5	696.5+/-													
			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

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.6724° Longitude: -85.9976° Approximate Surface Elev.: 713 (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
		Blank Drilling 2.0 711+/-													
1		**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	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
		0.8	717.5+/-													
			TOPSOIL													
1			**LEAN CLAY (CL)**, with silt, brown, medium stiff				18	2-3-4 N=7		1.25 (HP)				25.1		
		3.5	714.5+/-													
			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		
					▽											
2							18	1-1-2 N=3		1.25 (HP)				41.4		
				10												
							5	50/5"		0.50 (HP)				33.8		
		15.0	703+/-													
			LIMESTONE, light gray, close fracture spacing, thin bedding, unweathered, strong rock	15												
4							58.5		76%		UC	709.92			163	
		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

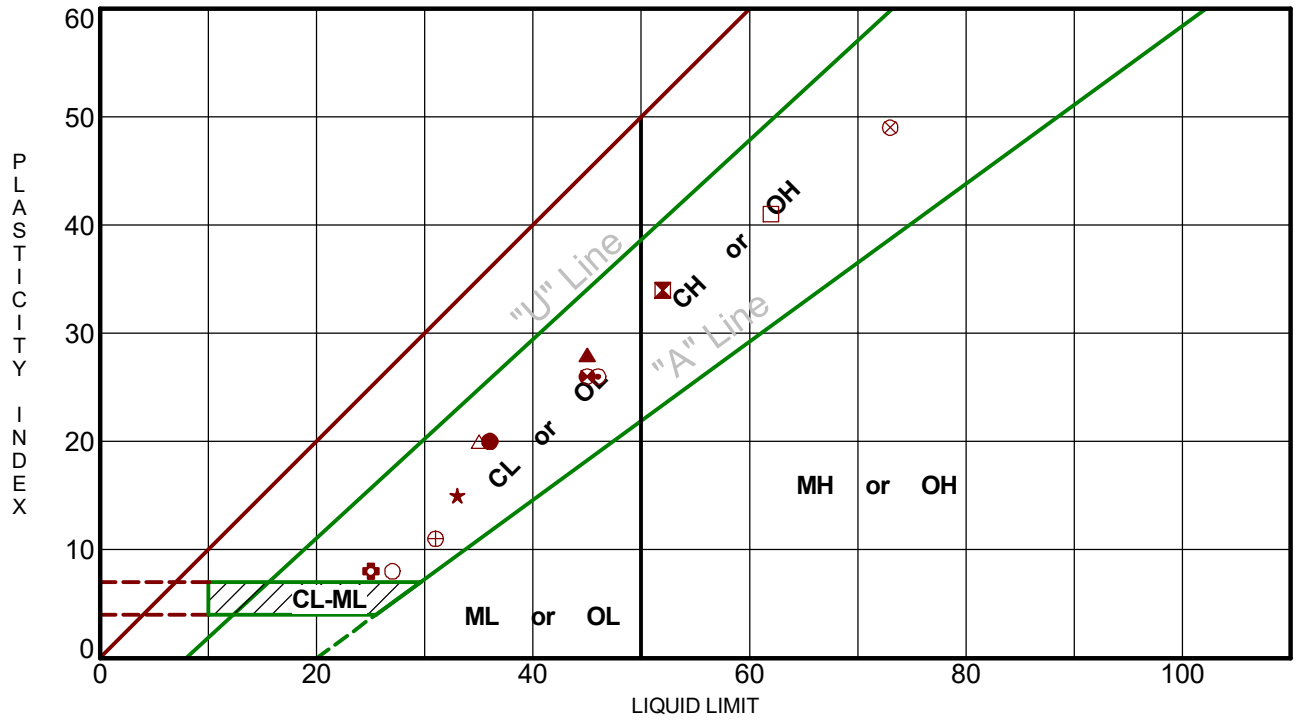
Boring Started: 11-25-2020 | Boring Completed: 11-25-2020

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

PROJECT NUMBER: 57205074

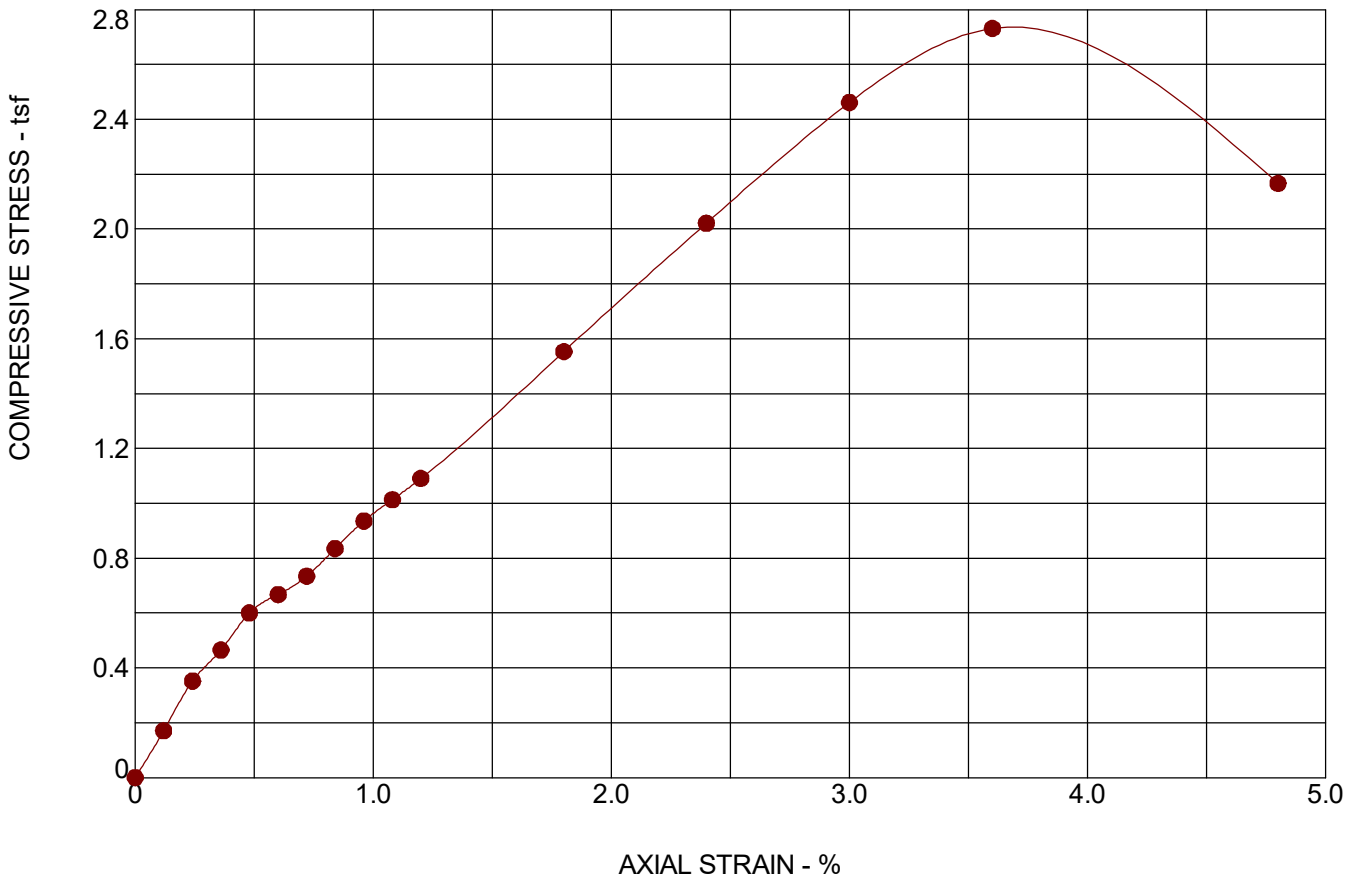
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

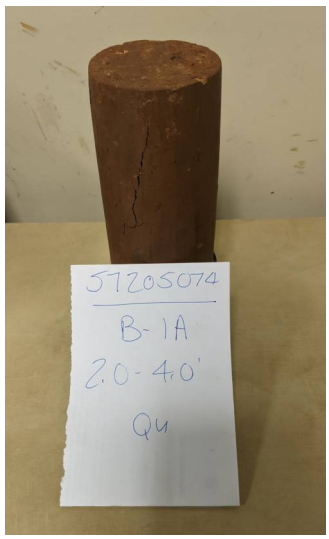
CLIENT: ibV Energy Partners LLC
Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE PHOTOGRAPH



SPECIMEN TEST DATA

Moisture Content:	%	18.0
Dry Density:	pcf	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	PL	PI	Percent < #200 Sieve
36	16	20	

PROJECT: LGE-KU Solar Project

PROJECT NUMBER: 57205074

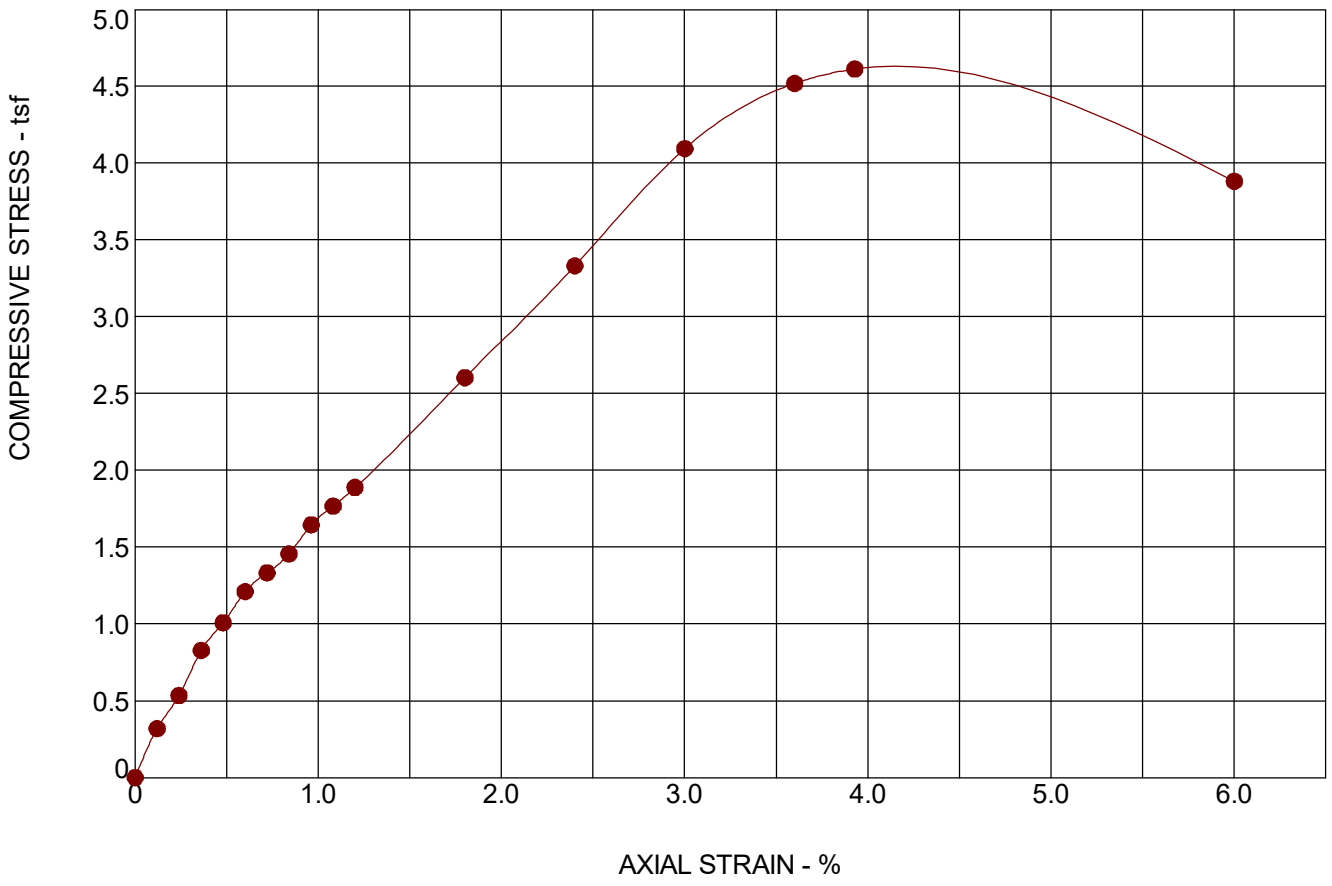
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

CLIENT: ibV Energy Partners LLC
Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



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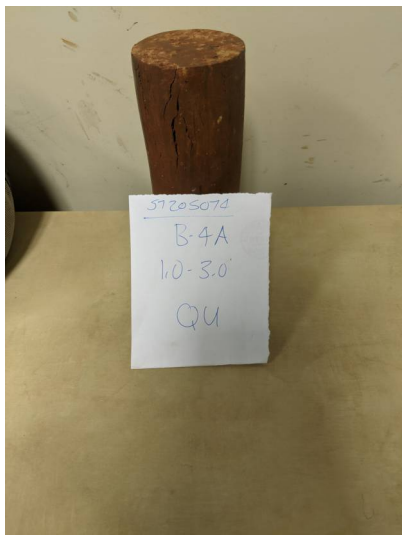


SPECIMEN TEST DATA

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	PL	PI	Percent < #200 Sieve
45	17	28	

PROJECT: LGE-KU Solar Project

PROJECT NUMBER: 57205074

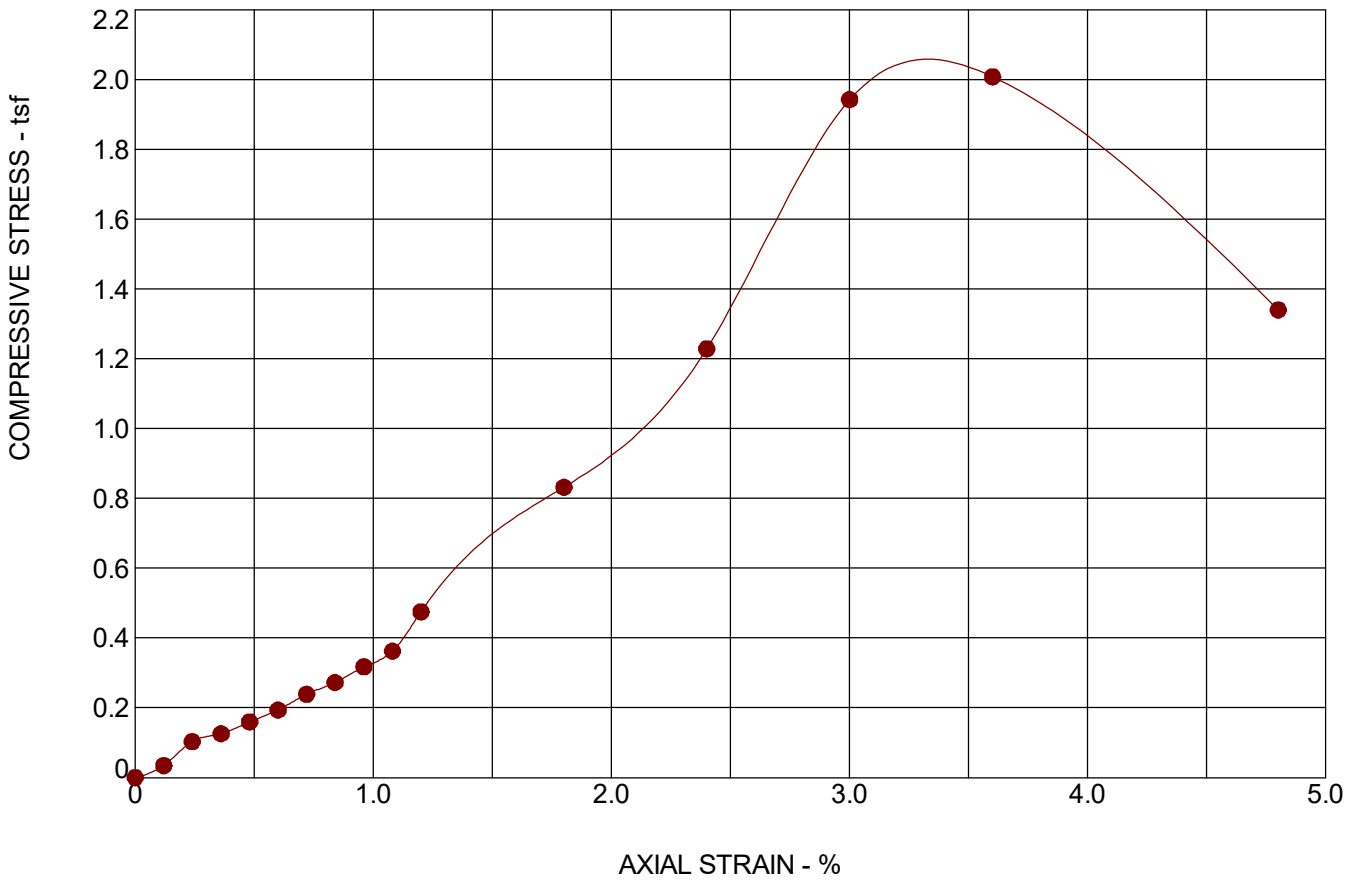
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

CLIENT: ibV Energy Partners LLC
Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



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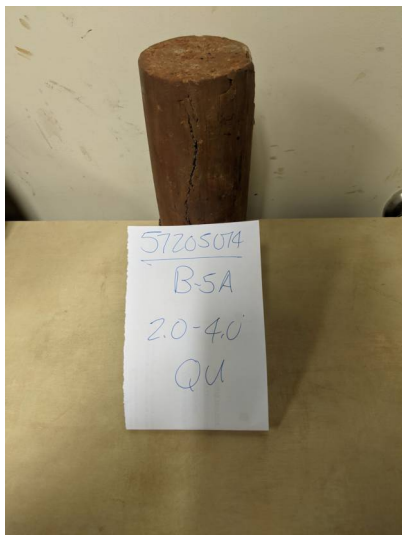


SPECIMEN TEST DATA

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	PL	PI	Percent < #200 Sieve
33	18	15	

PROJECT: LGE-KU Solar Project

PROJECT NUMBER: 57205074

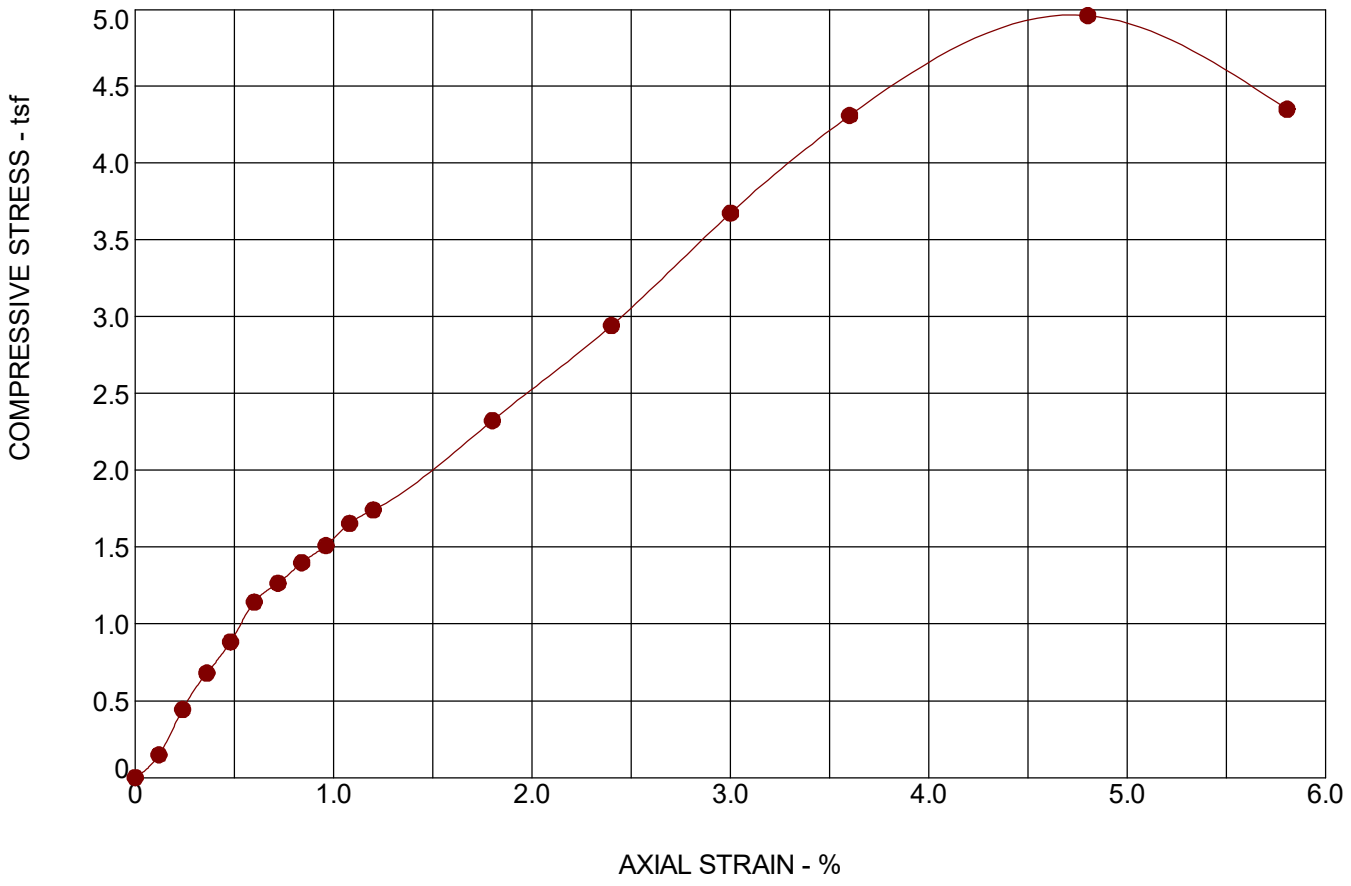
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

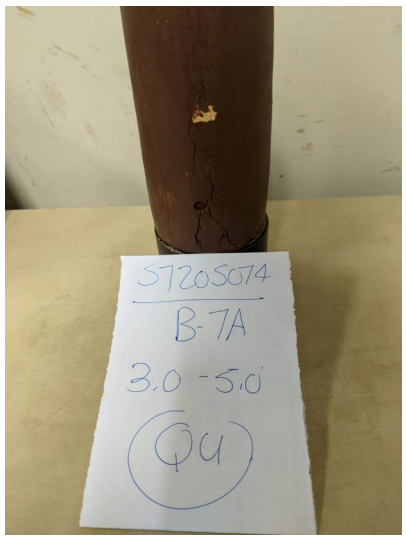
CLIENT: ibV Energy Partners LLC
Miami, FL

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	PL	PI	Percent < #200 Sieve
46	20	26	

PROJECT: LGE-KU Solar Project

PROJECT NUMBER: 57205074

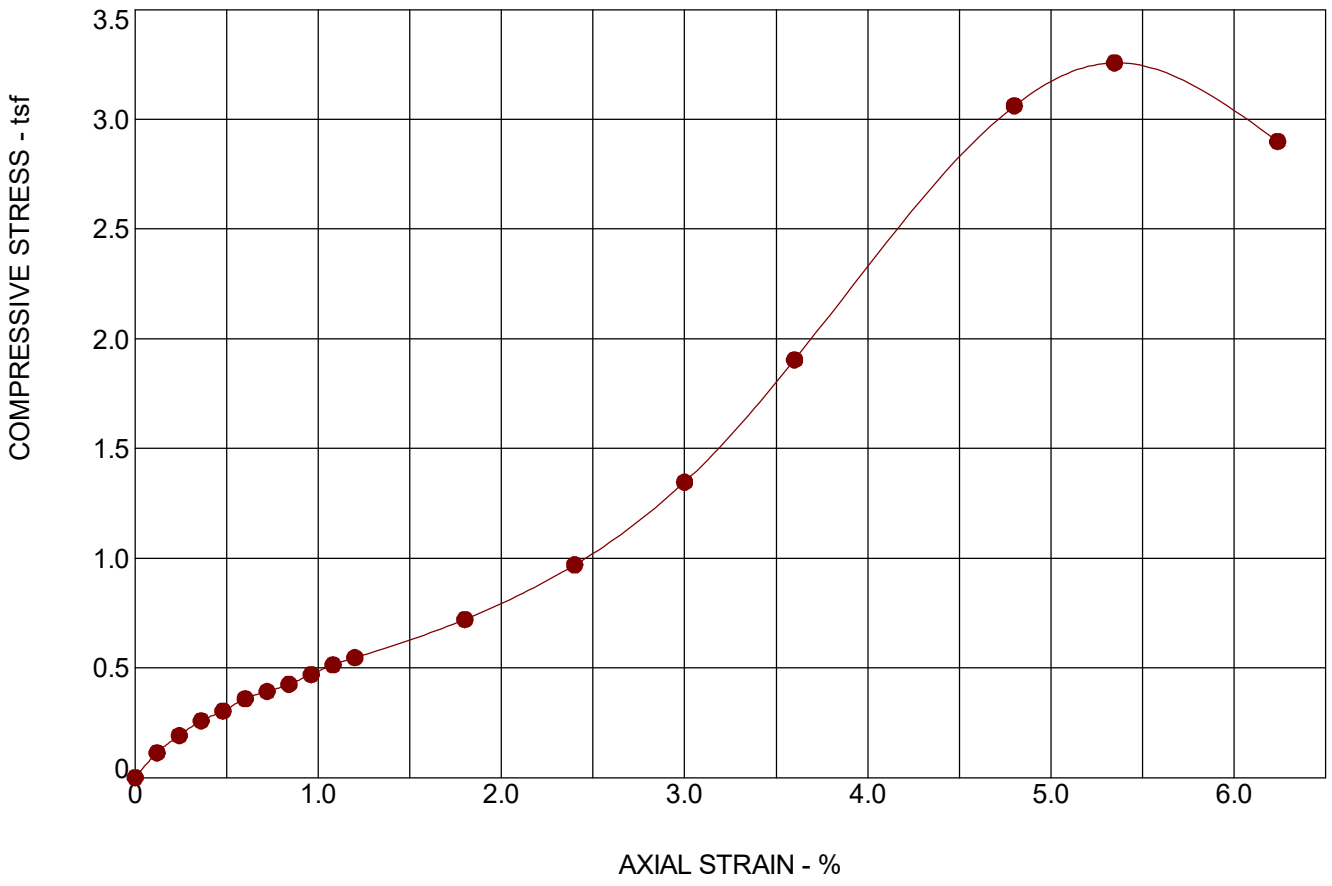
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

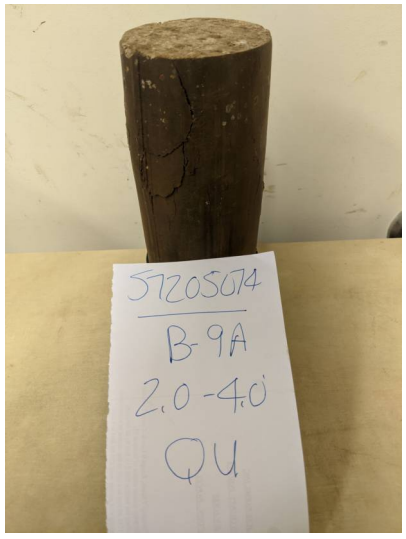
CLIENT: ibV Energy Partners LLC
Miami, FL

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	PL	PI	Percent < #200 Sieve
25	17	8	

PROJECT: LGE-KU Solar Project

PROJECT NUMBER: 57205074

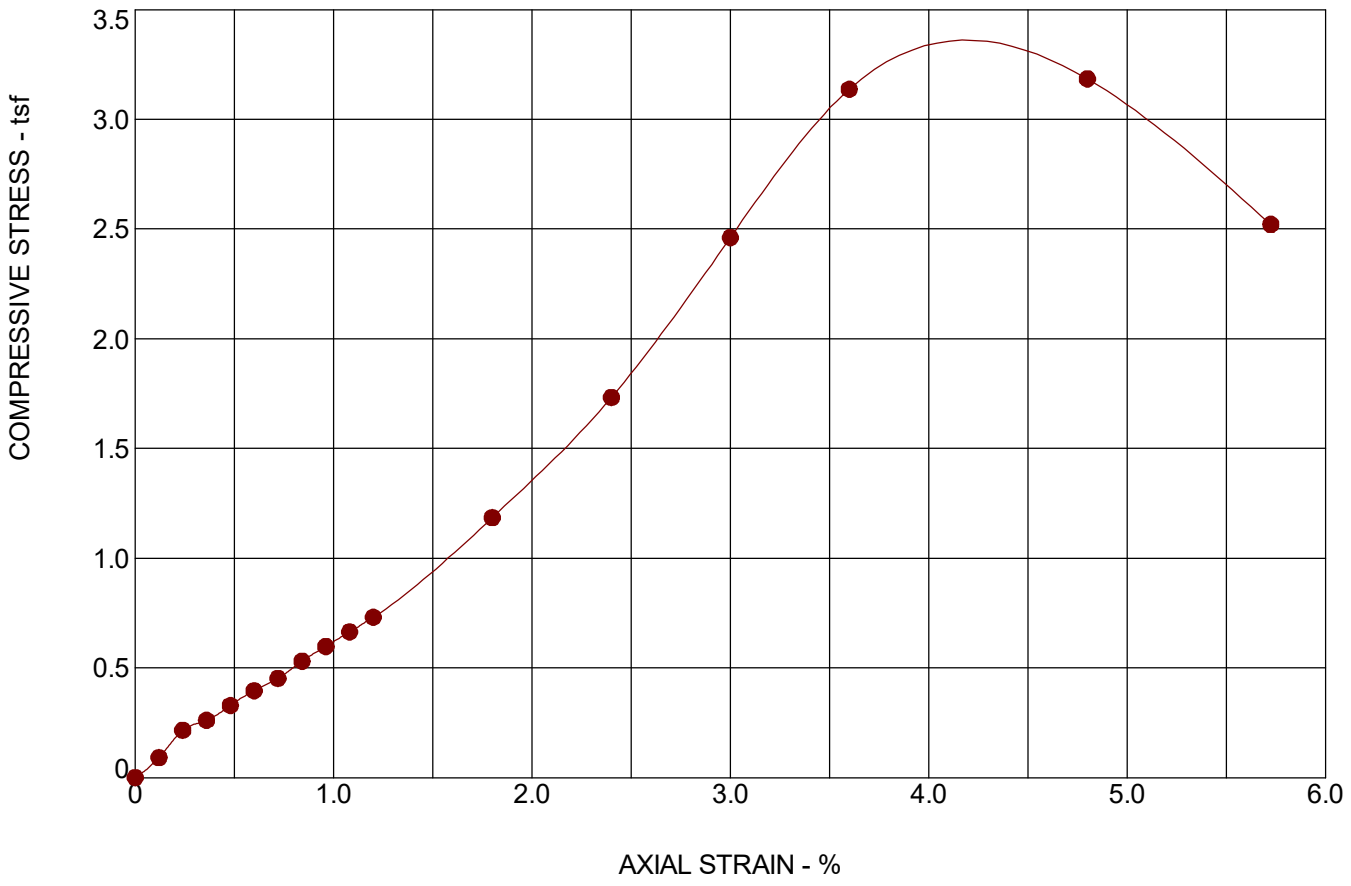
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

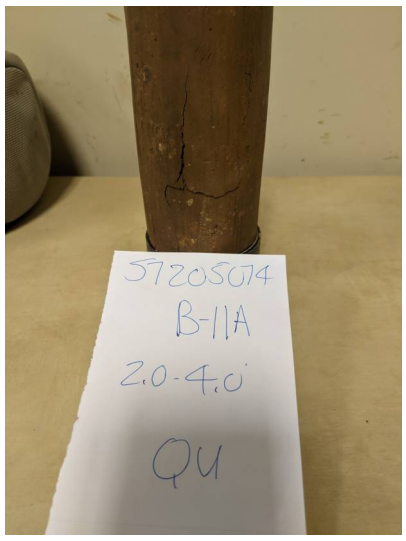
CLIENT: ibV Energy Partners LLC
Miami, FL

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

PROJECT NUMBER: 57205074

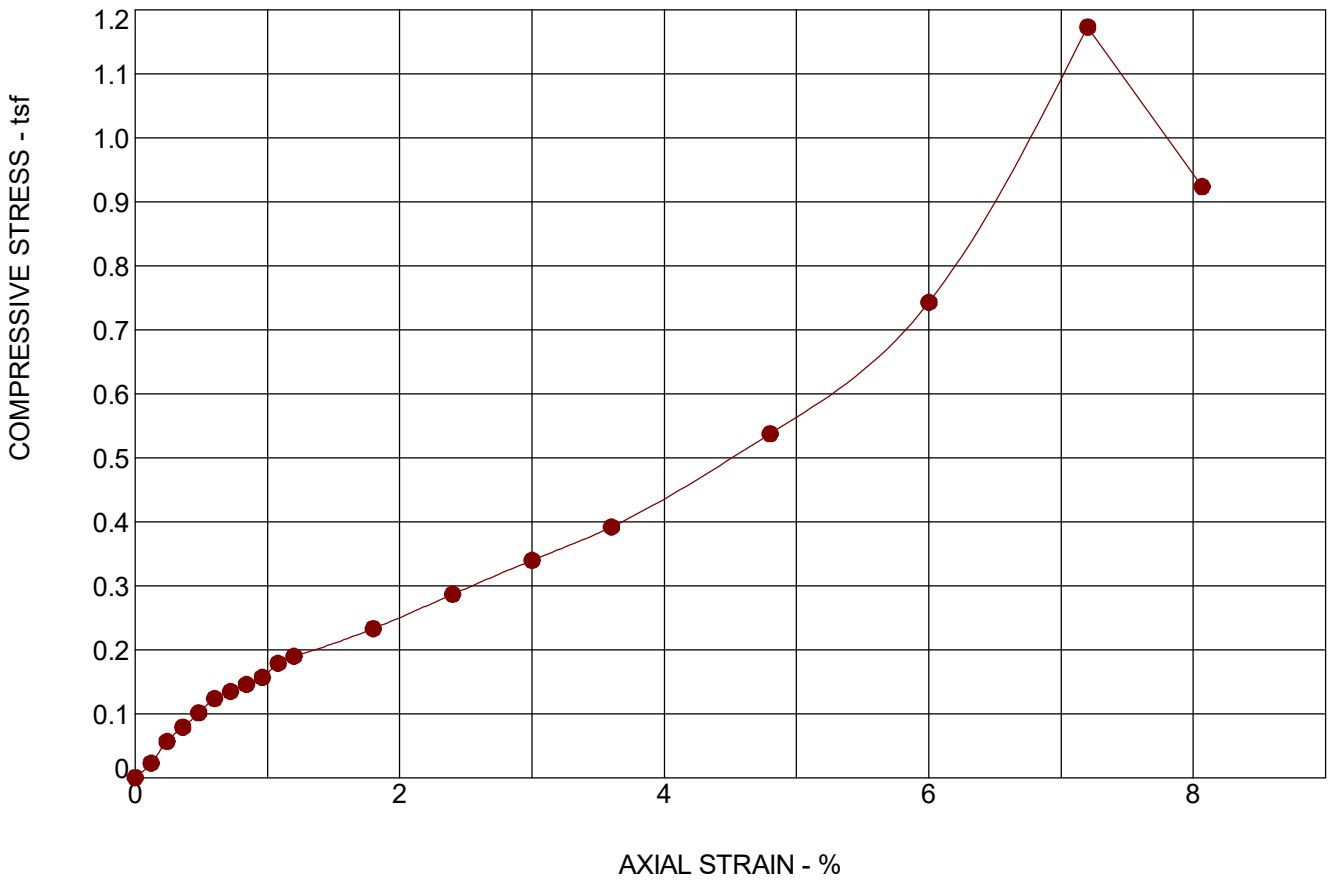
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

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

PROJECT NUMBER: 57205074

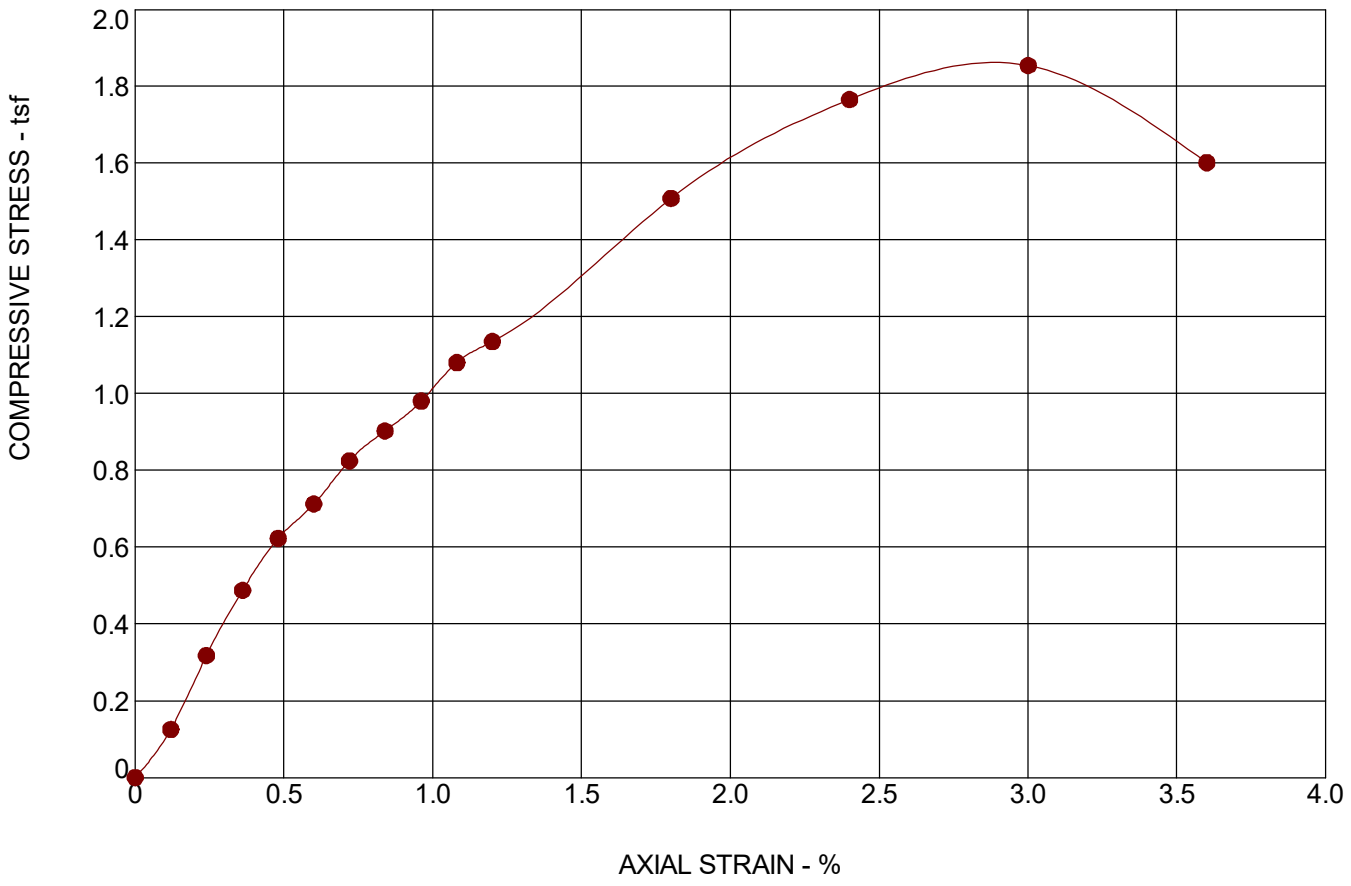
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

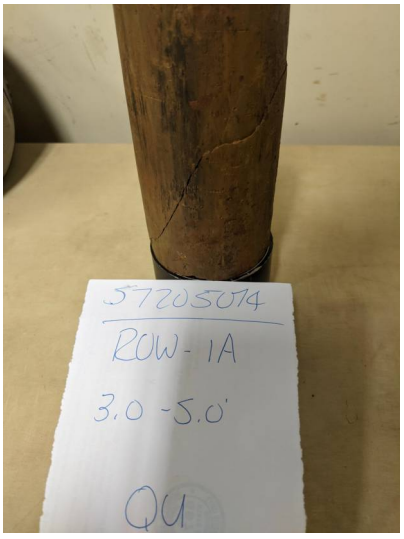
CLIENT: ibV Energy Partners LLC
Miami, FL

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

PROJECT NUMBER: 57205074

SITE: Hardinsburg Road
Cecilia, KY

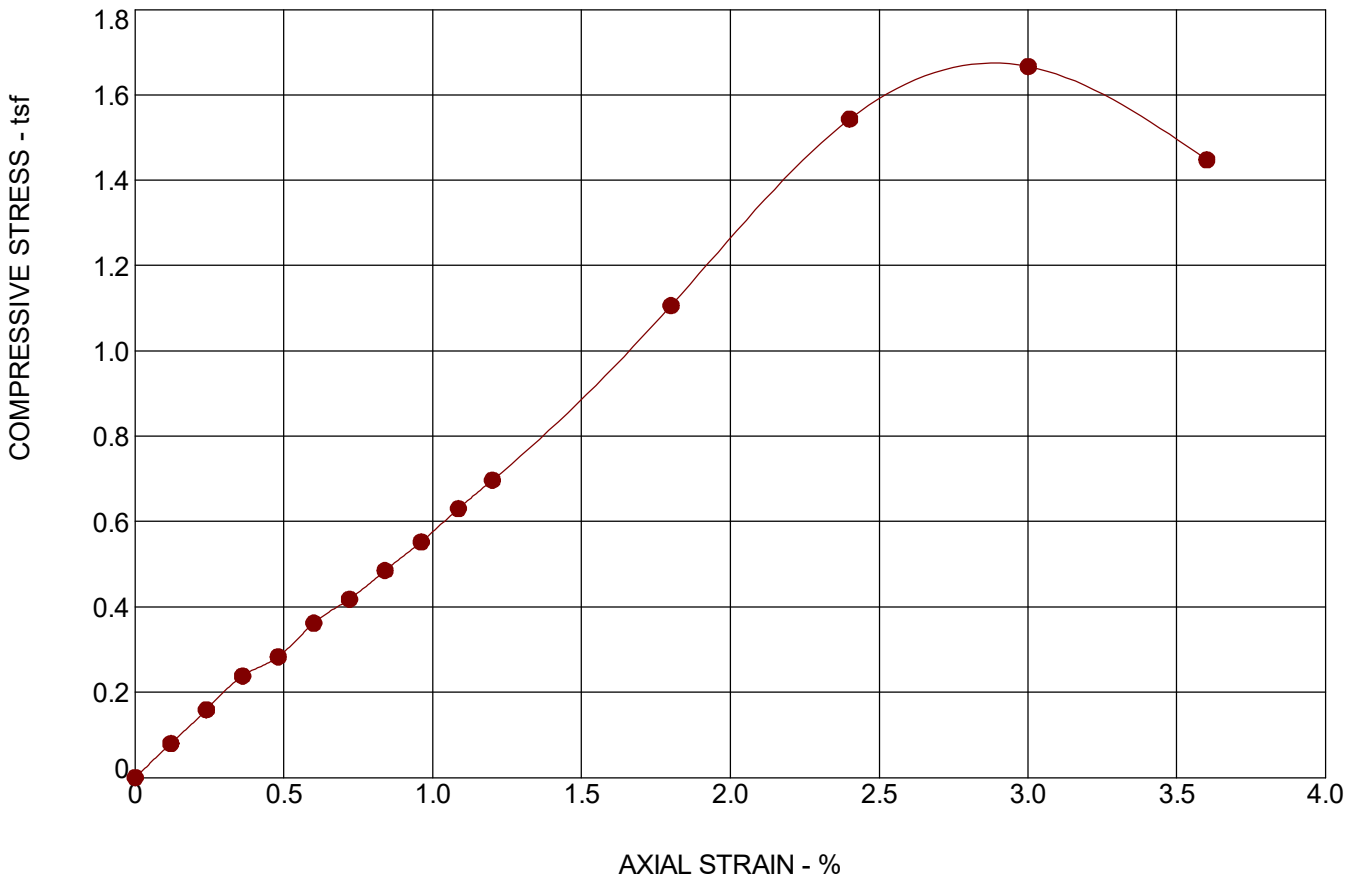
Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

CLIENT: ibV Energy Partners LLC
Miami, FL

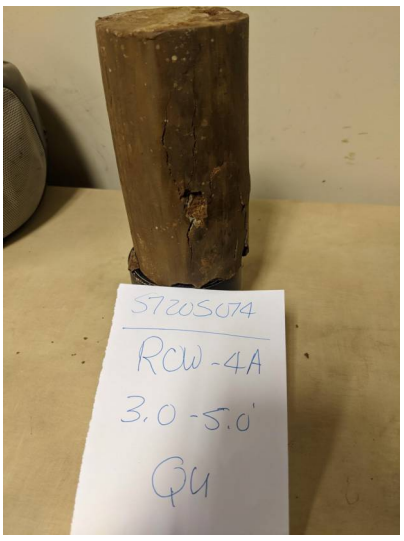
LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. UNCONFINED WITH PHOTOS 57205074 PRELIMINARY GEOTE.GPJ TERRACON_DATATEMPLATE.GDT 12/30/20

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

PROJECT NUMBER: 57205074

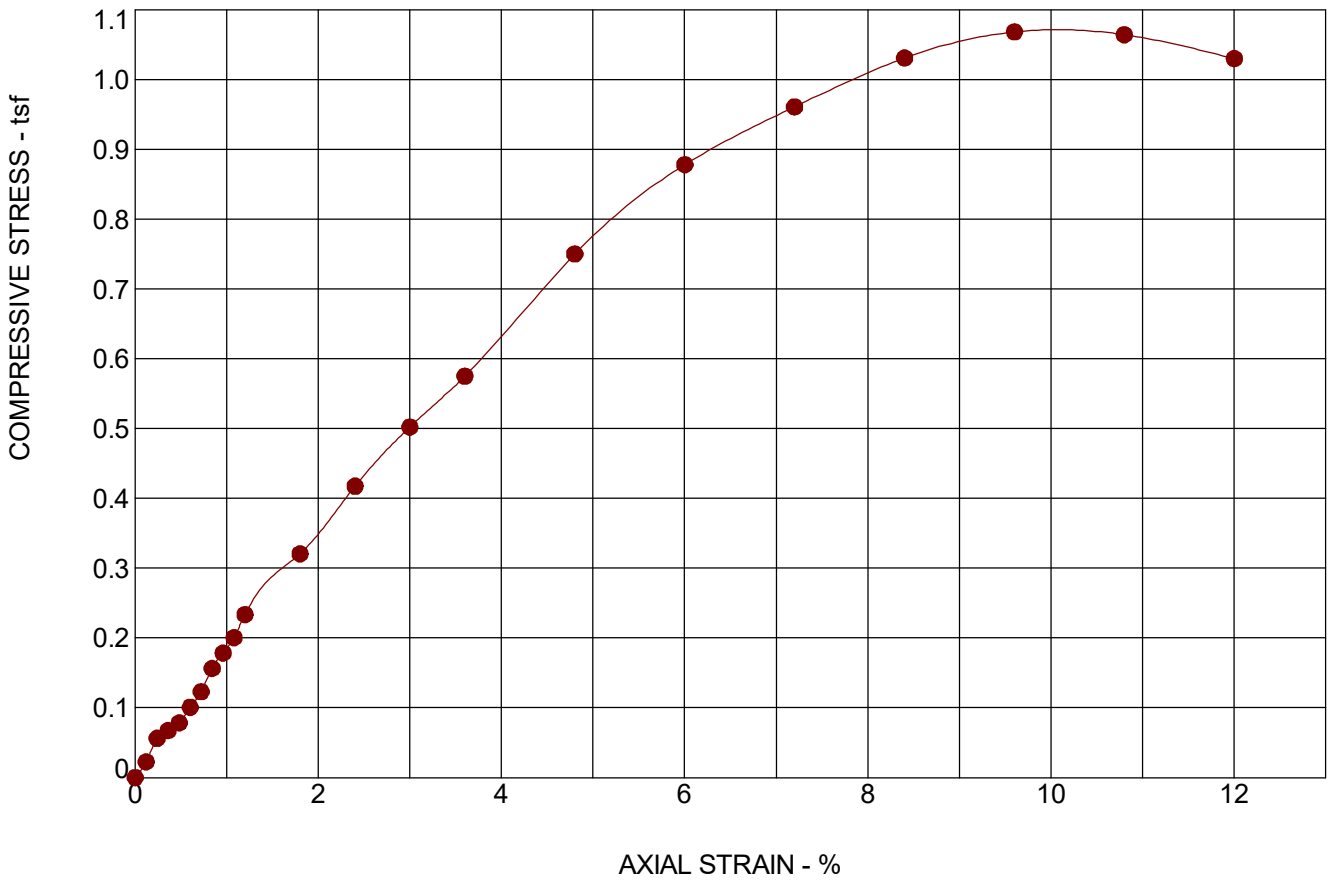
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

CLIENT: ibV Energy Partners LLC
Miami, FL

UNCONFINED COMPRESSION TEST

ASTM D2166



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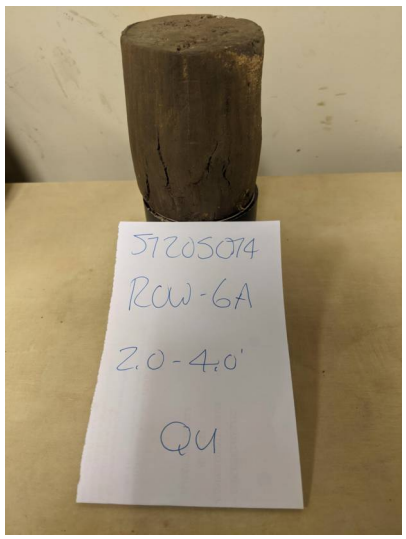


SPECIMEN TEST DATA

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	PL	PI	Percent < #200 Sieve
45	19	26	

PROJECT: LGE-KU Solar Project

PROJECT NUMBER: 57205074

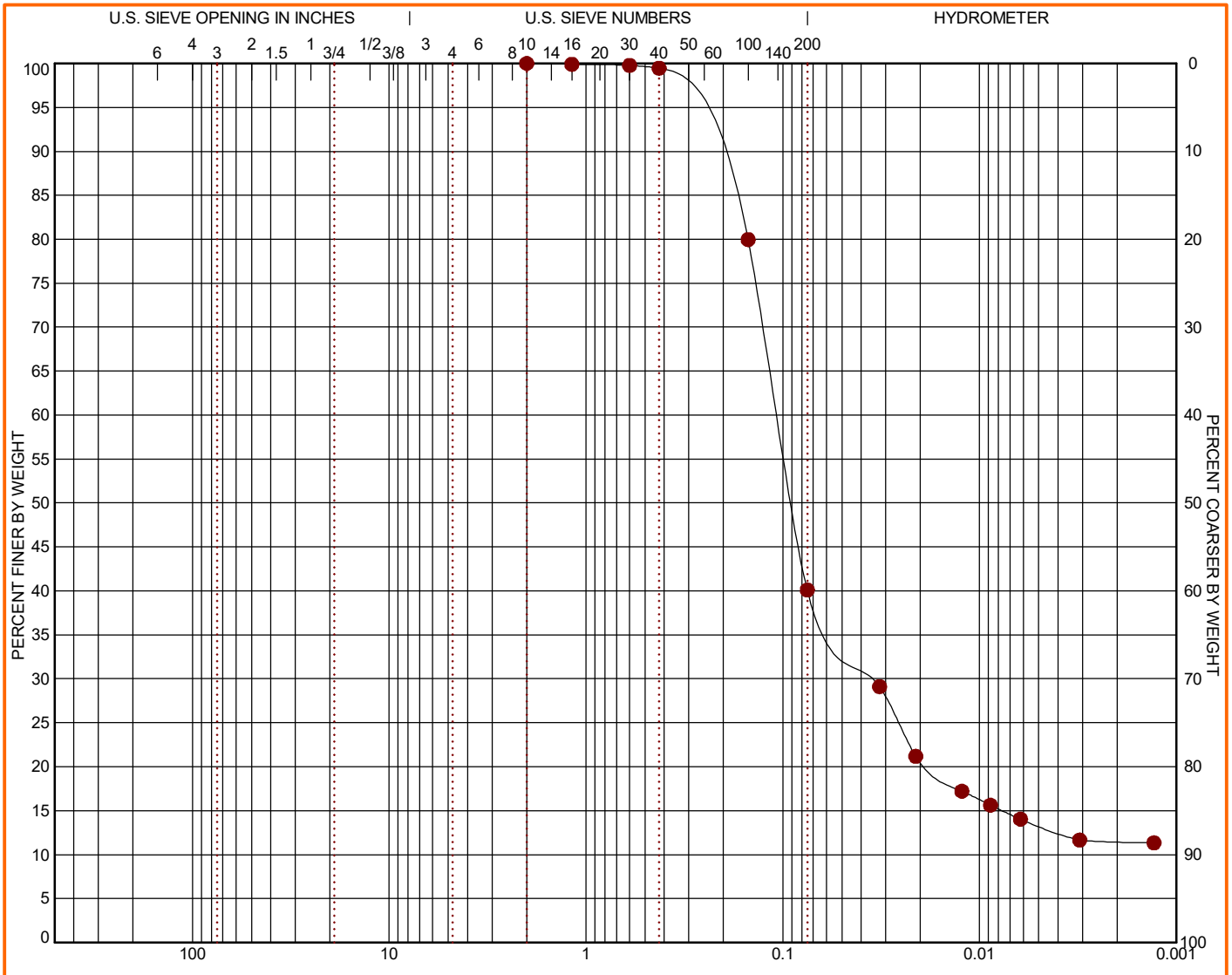
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, 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

PROJECT NUMBER: 57205074

SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

CLIENT: ibV Energy Partners LLC
Miami, FL

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 57205074 PRELIMINARY GEOTE.GPJ TERRACON_DATATEMPLATE.GDT 12/27/20

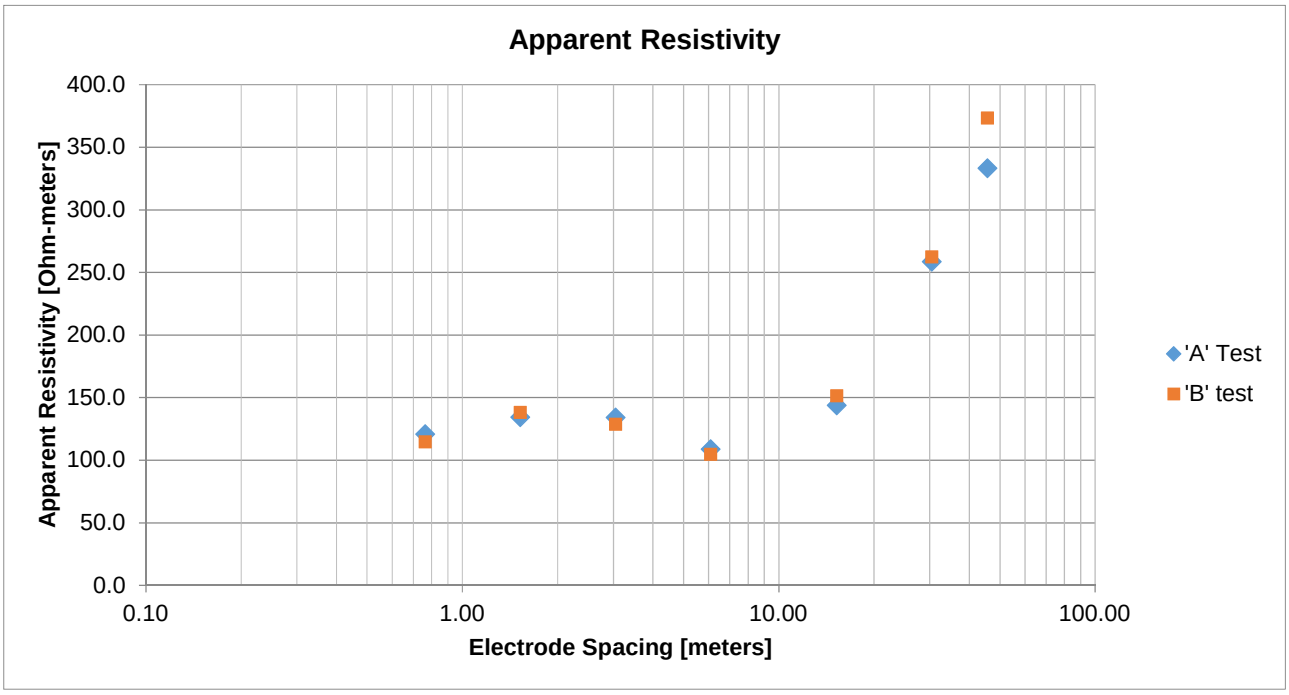
ELECTRICAL EARTH RESISTIVITY TEST DATA

Test Line at B-1 location with approximate center poin: 37.64949°, -85.96873°

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	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 : $$\rho = \frac{4\pi aR}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$



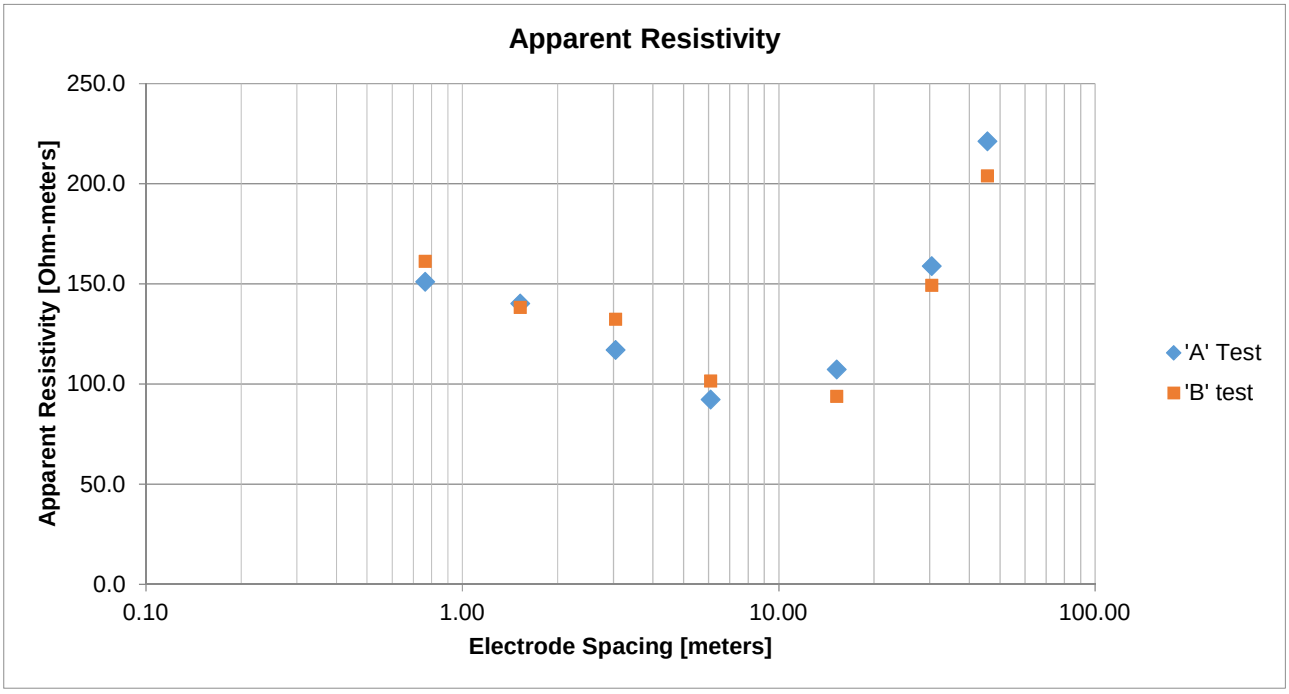
ELECTRICAL EARTH RESISTIVITY TEST DATA

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 : $$\rho = \frac{4\pi aR}{1 + \frac{2a}{\sqrt{a^2+4b^2}} - \frac{a}{\sqrt{a^2+b^2}}}$$



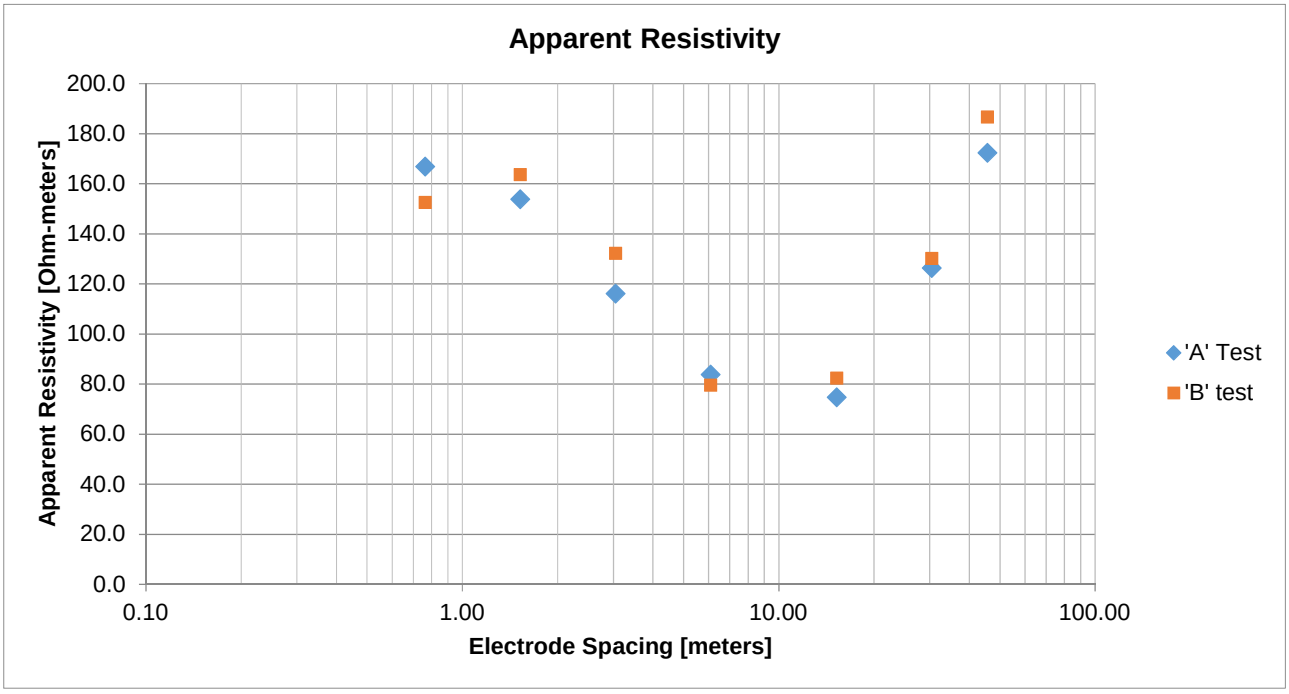
ELECTRICAL EARTH RESISTIVITY TEST DATA

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 : $$\rho = \frac{4\pi aR}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$



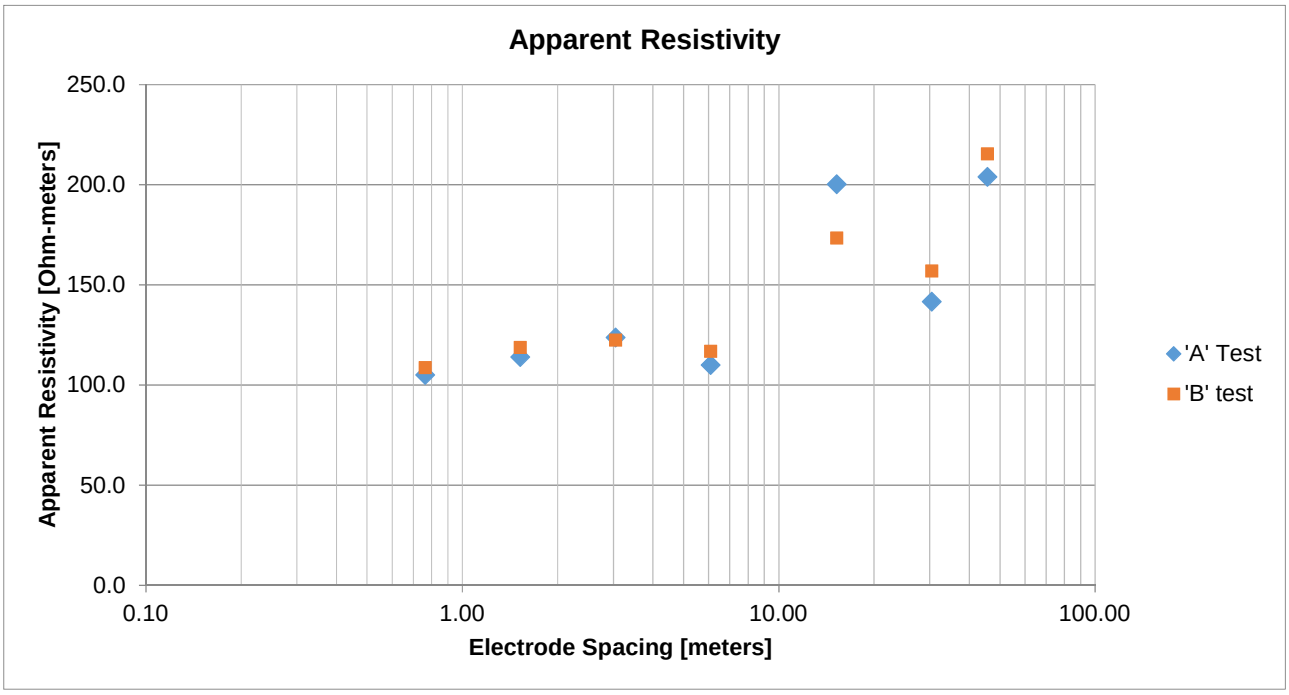
ELECTRICAL EARTH RESISTIVITY TEST DATA

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 : $$\rho = \frac{4\pi aR}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$



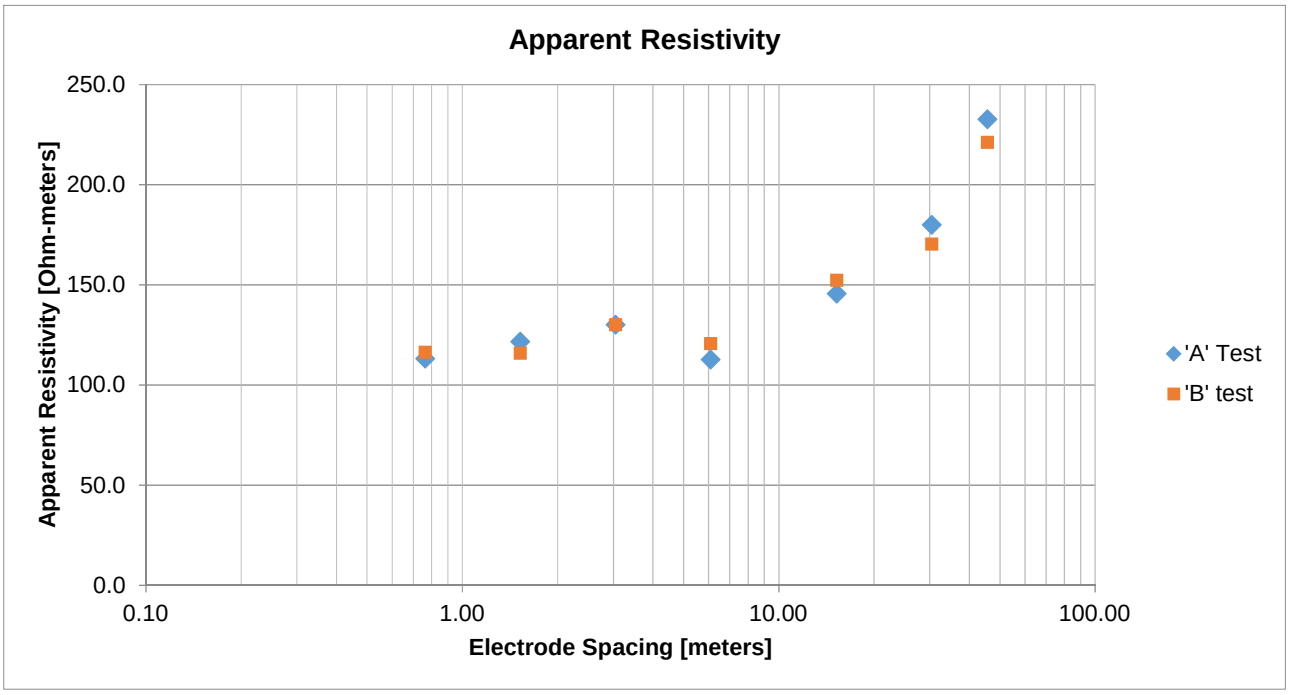
ELECTRICAL EARTH RESISTIVITY TEST DATA

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 : $$\rho = \frac{4\pi aR}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$



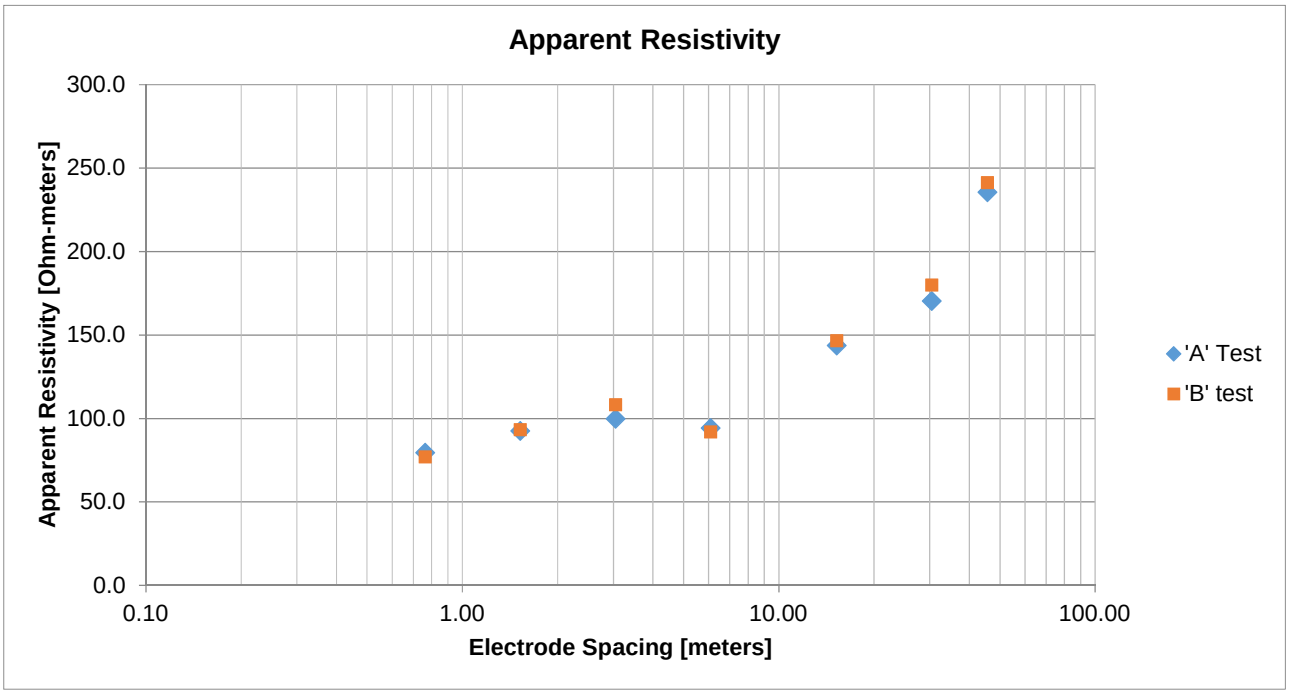
ELECTRICAL EARTH RESISTIVITY TEST DATA

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 : $$\rho = \frac{4\pi aR}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$



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

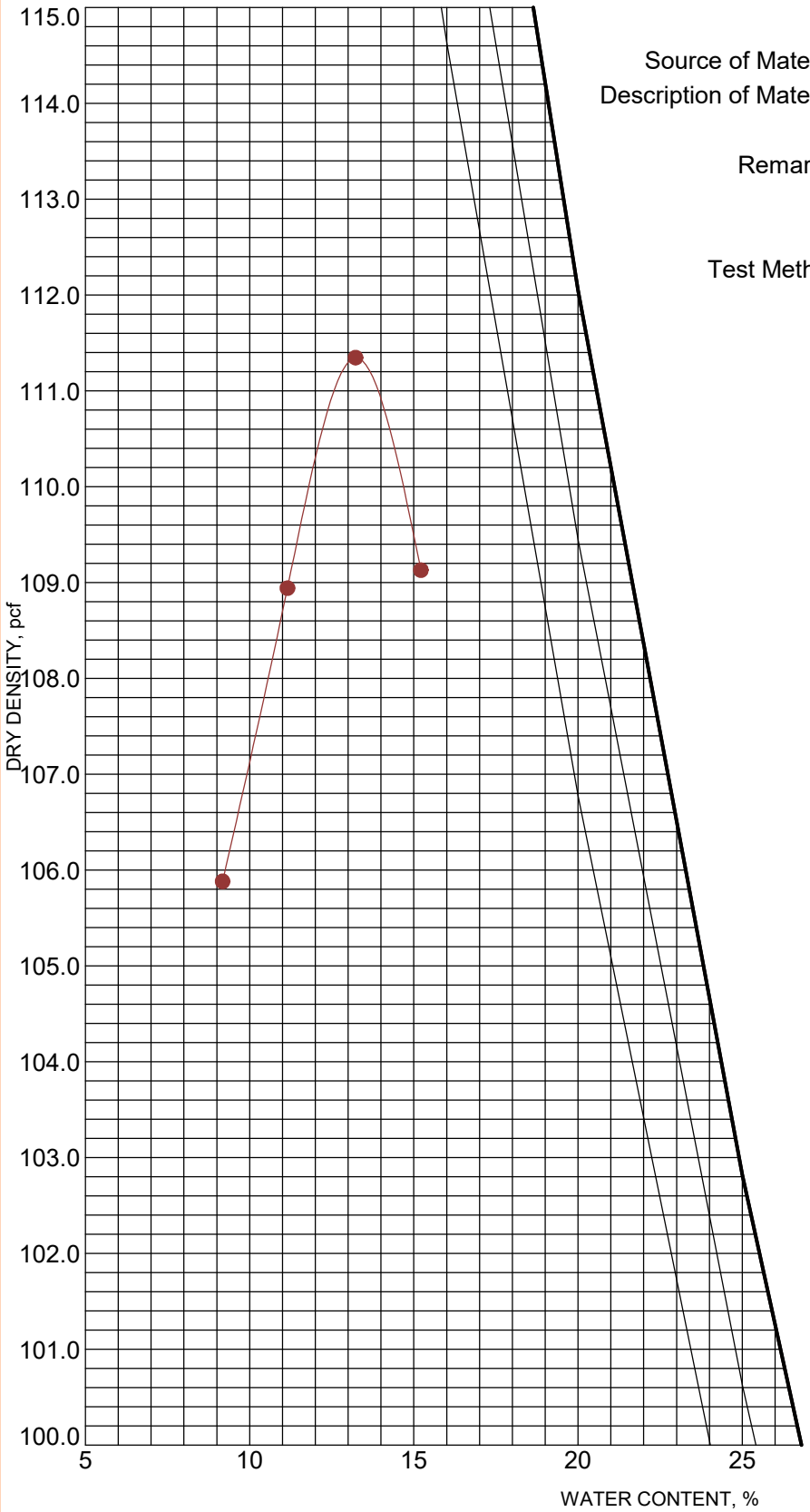
LGE-KU Solar Project
Hardinsburg Road
Cecilia, KY

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
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

PROJECT NUMBER: 57205074

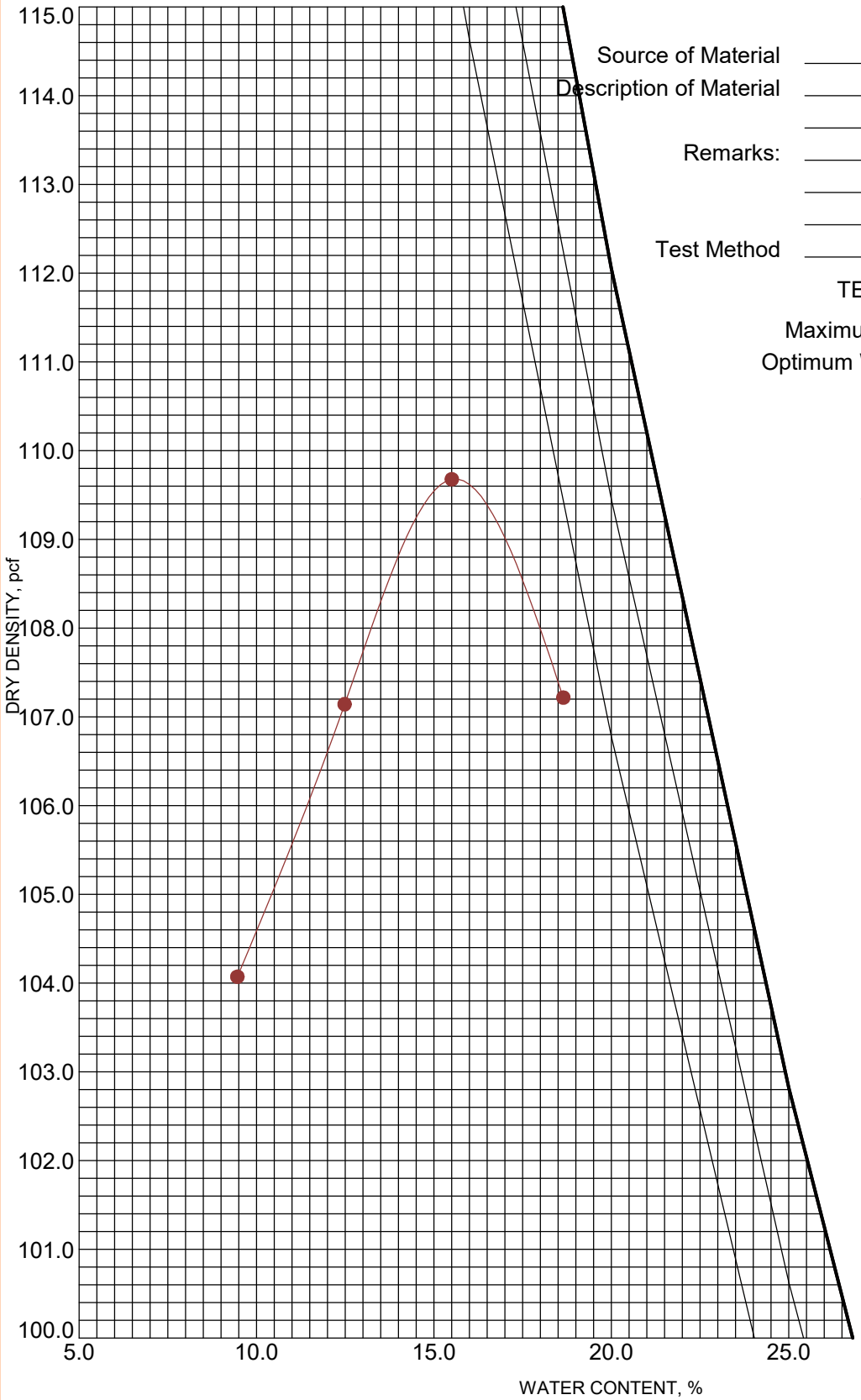
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, KY

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

PROJECT NUMBER: 57205074

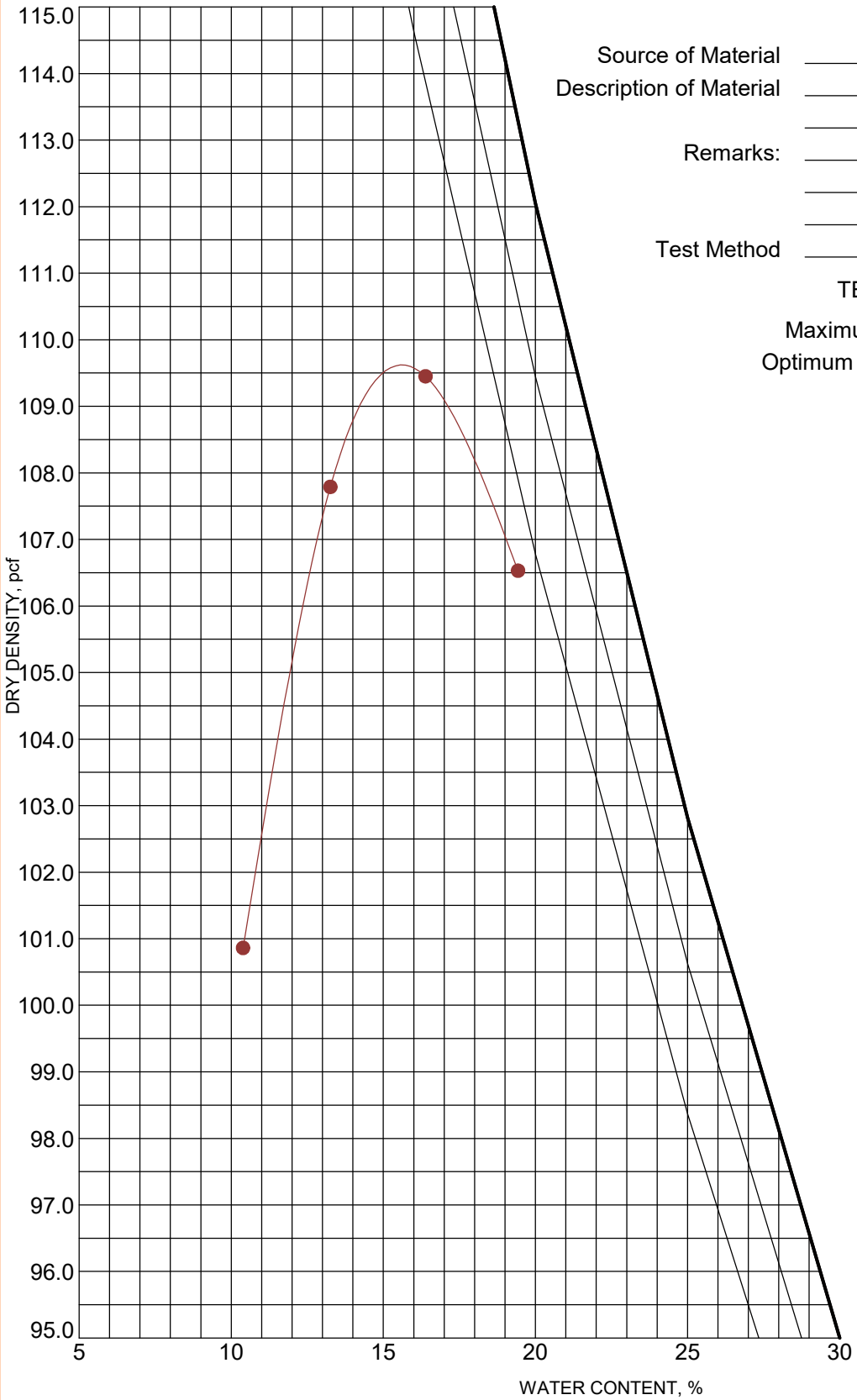
SITE: Hardinsburg Road
Cecilia, KY

Terracon
13050 Eastgate Park Way Ste 101
Louisville, 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

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

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

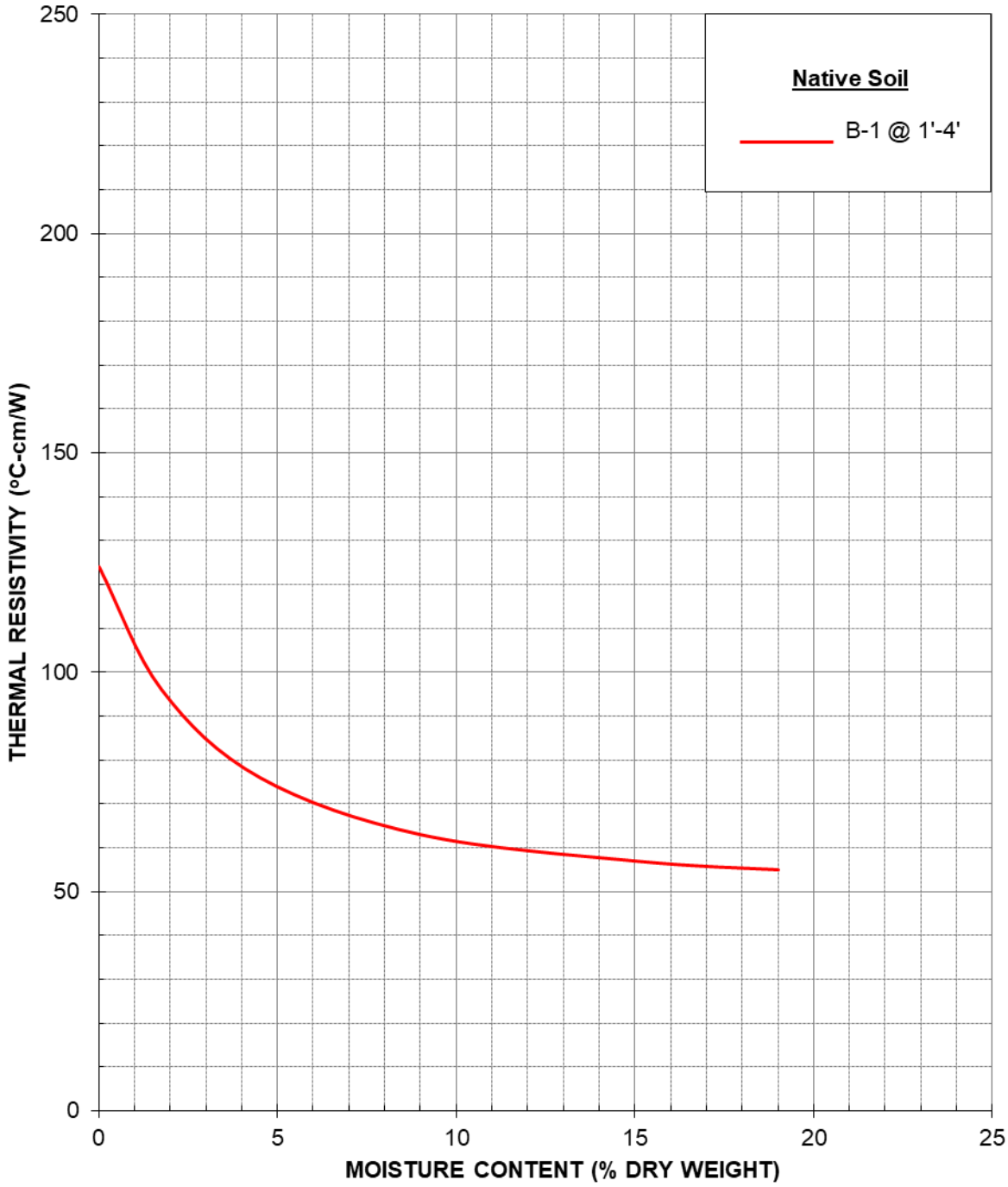
Comments: The thermal characteristic depicted in the dryout curves apply for the samples at their respective test dry density.

Please contact us if you have any questions or if we can be of further assistance.

Geotherm USA

Nimesh Patel

THERMAL DRYOUT CURVE

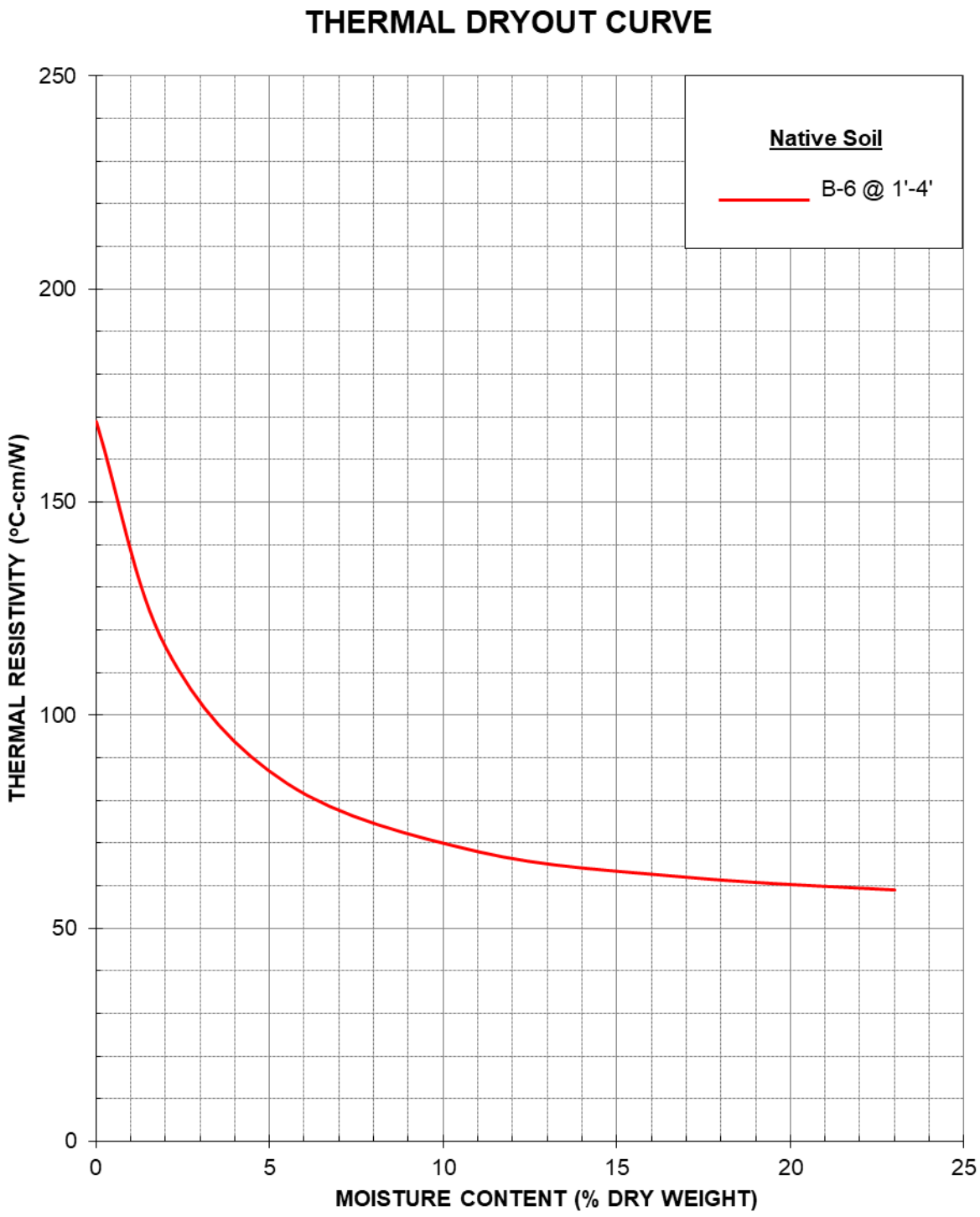


Terracon Consultants, Inc. (PO No. 57205074)

Thermal Analysis of Native Soil

LGE - KU Solar Project - Cecilia, KY

December 2020 **Figure 1**

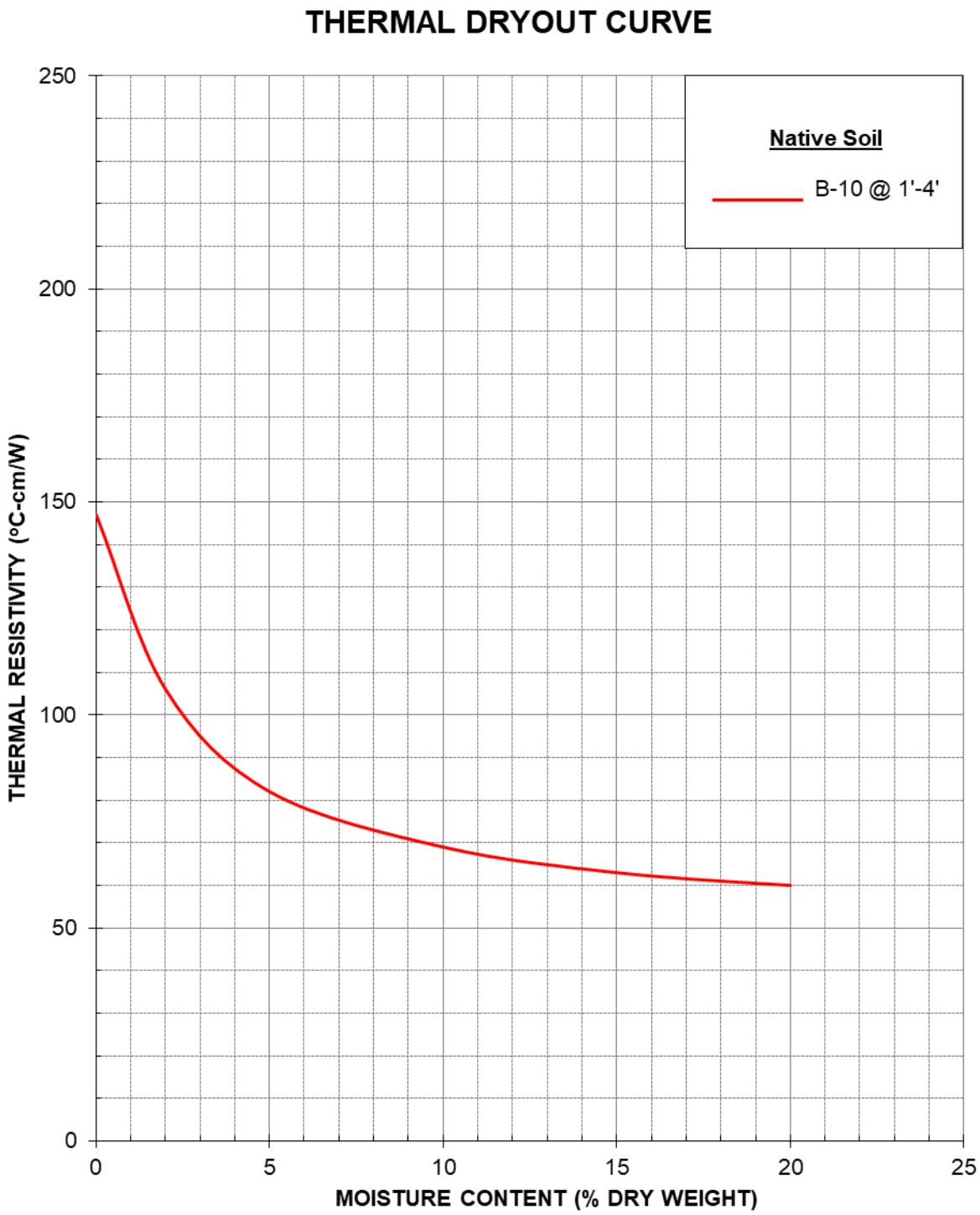


Terracon Consultants, Inc. (PO No. 57205074)

Thermal Analysis of Native Soil

LGE - KU Solar Project - Cecilia, KY

December 2020 **Figure 2**



Terracon Consultants, Inc. (PO No. 57205074)

Thermal Analysis of Native Soil

LGE - KU Solar Project - Cecilia, KY

December 2020 **Figure 3**

SUPPORTING INFORMATION

Contents:

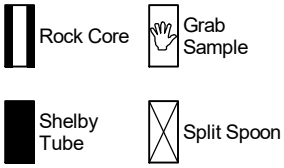
Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS
LGE-KU Solar Project ■ Cecilia, KY
Terracon Project No. 57205074

Terracon GeoReport

SAMPLING



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

Terracon GeoReport

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	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"		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.

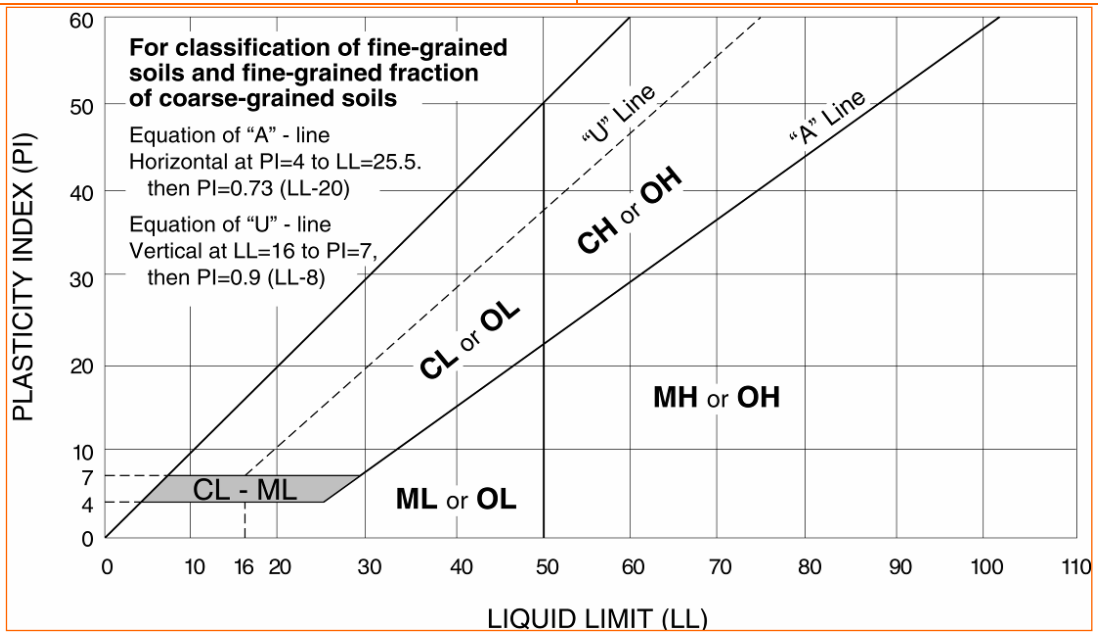
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[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