CBC ENGINEERS
A KBJW Company

April 21, 2021 Dayton Office

SunEnergy1
192 Raceway Drive
Mooresville, NC 28117

Attn: Jeffrey McDermott
Senior Environmental Specialist

Re: Initial Geotechnical Engineering Investigation for the Proposed Dixon Run Solar Project in Jackson County, Ohio; CBC Report No. 23897D-1-0421-02

Dear Mr. McDermott:

We are pleased to submit our report of the initial geotechnical engineering investigation for the above-referenced project. The purpose of this study was to provide an evaluation of the physical characteristics of the soil strata and foundation capacities at the locations tested. Also noted are other conditions that might affect the design and/or construction of the proposed Dixon Run Solar Project in Jackson County, Ohio based on the results of the testing.

For your convenience, the samples collected that were not used to perform the laboratory tests will be kept in our office for a period of three months. If you have any questions, or if we can help you in any way, please call us.

Respectfully submitted,

CBC Engineers & Associates, Ltd.

Deepa Nair, M.S., P.E.
Project Engineer

STATE OF OHIO
MITCHELL T. HARDERT
E-67613
REGISTERED PROFESSIONAL ENGINEER

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SECTION I

TEXT

1.0 INTRODUCTION

Authorization to proceed with this initial investigation was given by Jeffrey McDermott. Work was to proceed in accordance with CBC Engineers & Associates, Ltd. Quotation No. 21-039-02, Revision No. 3 dated March 10, 2021, and the terms and conditions of the contract attached thereto.

The proposed solar project is to be constructed in Jackson County, Ohio north of Route 35 and east of Route 327 on a site that was previously surface mined and reclaimed. A Vicinity Map is presented in Figure 1 in Section III of this document.

2.0 WORK PERFORMED

2.1 FIELD WORK

Twenty (20) borings were made in the relative positions shown on the Boring Location Plan (Figure 2) in Section III. The boring logs and resulting data are also included in Section III. The borings were made with an ATV-mounted drilling rig using hollow-stem augers and employing standard penetration resistance methods (ASTM D-1586, which includes 140-pound hammer, 30-inch drop, and two-inch-O.D. split-spoon sampler) at maximum 2.5 foot intervals for 10 feet below the ground surface and at 5 foot intervals to the bottom of the borings. The disturbed split-spoon samples were visually classified, logged, sealed in moisture-proof jars, and taken to the CBC Engineers & Associates, Ltd. laboratory for study. The depths where these "A"-type split-spoon samples were collected are noted on the boring logs. Twenty (20) Wenner four-pin field resistivity tests were performed in accordance with ASTM G57 adjacent to borings B21-1, B21-4, B21-6, B21-12, and B21-19 and the test results are summarized in Table 1 as follows, and are also included in Section III of this report:

TABLE 1

RESULTS OF WENNER 4-PIN FIELD RESISTIVITY TESTS (ASTM G57)

ADJACENT TO BORING	PIN SPACING (ft.)	METER READING (ohm)	CALCULATED RESISTIVITY (ohm-cm)
B21-1	5	3.00	2873
B21-1	10	1.27	2432
B21-1	15	0.84	2413
B21-1	20	0.65	2490
B21-4	5	2.71	2595

TABLE 1- Continued

RESULTS OF WENNER 4-PIN FIELD RESISTIVITY TESTS (ASTM G57)

ADJACENT TO BORING	PIN SPACING (ft.)	METER READING (ohm)	CALCULATED RESISTIVITY (ohm-cm)
B21-4	10	1.47	2815
B21-4	15	1.11	3189
B21-4	20	0.90	3447
B21-6	5	4.82	4615
B21-6	10	1.78	3409
B21-6	15	1.20	3447
B21-6	20	1.01	3869
B21-12	5	2.98	2854
B21-12	10	1.59	3045
B21-12	15	1.06	3045
B21-12	20	0.76	2911
B21-19	5	3.39	3246
B21-19	10	1.49	2854
B21-19	15	1.02	2930
B21-19	20	0.60	2298

2.2 LABORATORY WORK

One hundred seventeen (117) natural moisture content determinations were made in accordance with ASTM D-4643 on the collected split spoon samples. The results of these tests are tabulated in Table 2 as follows, and are also included in Section III of this report:

TABLE 2

RESULTS OF NATURAL MOISTURE CONTENT TESTS (ASTM D-4643)

BORING NO.	DEPTH INCREMENT, (FT.)	NATURAL MOISTURE CONTENT, %
B21-1	0.0 – 1.5	19.16
B21-1	1.5 – 3.0	11.99
B21-1	4.0 – 5.5	24.59
B21-1	6.5 – 8.0	12.17
B21-1	9.0 – 10.5	17.56

TABLE 2- Continued

RESULTS OF NATURAL MOISTURE CONTENT TESTS (ASTM D-4643)

BORING NO.	DEPTH INCREMENT, (FT.)	NATURAL MOISTURE CONTENT, %
B21-1	14.0 – 15.5	18.06
B21-2	0.0 – 1.5	16.42
B21-2	4.0 – 5.5	8.63
B21-2	6.5 – 8.0	9.49
B21-2	9.0 – 10.5	10.40
B21-2	14.0 – 15.5	6.61
B21-3	0.0 – 1.5	13.96
B21-3	1.5 – 3.0	7.03
B21-3	4.0 – 5.5	10.98
B21-3	6.5 – 8.0	10.34
B21-3	9.0 – 10.5	13.15
B21-3	14.0 – 15.5	8.94
B21-4	0.0 – 1.5	14.75
B21-4	1.5 – 3.0	13.65
B21-4	4.0 – 5.5	12.79
B21-4	6.5 – 8.0	14.96
B21-4	9.0 – 10.5	11.78
B21-4	14.0 – 15.5	12.38
B21-5	0.0 – 1.5	11.61
B21-5	1.5 – 3.0	8.87
B21-5	4.0 – 5.5	7.02
B21-5	6.5 – 8.0	9.14
B21-5	9.0 – 10.5	8.86
B21-5	14.0 – 15.5	12.26
B21-6	0.0 – 1.5	20.34
B21-6	1.5 – 3.0	18.30
B21-6	4.0 – 5.5	16.59
B21-6	6.5 – 8.0	8.26
B21-6	9.0 – 10.5	8.19

TABLE 2-Continued

RESULTS OF NATURAL MOISTURE CONTENT TESTS (ASTM D-4643)

BORING NO.	DEPTH INCREMENT, (FT.)	NATURAL MOISTURE CONTENT, %
B21-7	0.0 – 1.5	18.25
B21-7	1.5 – 3.0	19.31
B21-7	4.0 – 5.5	10.54
B21-7	6.5 – 8.0	12.89
B21-7	9.0 – 10.5	5.30
B21-7	14.0 – 15.5	11.97
B21-8	0.0 – 1.5	13.19
B21-8	1.5 – 3.0	4.02
B21-8	4.0 – 5.5	12.85
B21-8	6.5 – 8.0	14.83
B21-8	9.0 – 10.5	11.28
B21-8	14.0 – 15.5	10.74
B21-9	0.0 – 1.5	11.77
B21-9	1.5 – 3.0	11.38
B21-9	4.0 – 5.5	11.50
B21-9	6.5 – 8.0	5.05
B21-9	9.0 – 10.5	13.15
B21-9	14.0 – 15.5	16.13
B21-10	0.0 – 1.5	15.67
B21-10	1.5 – 3.0	17.30
B21-10	4.0 – 5.5	12.82
B21-10	9.0 – 10.5	12.96
B21-10	14.0 – 15.5	13.79
B21-11	0.0 – 1.5	18.16
B21-11	1.5 – 3.0	15.88
B21-11	4.0 – 5.5	12.26
B21-11	6.5 – 8.0	8.50
B21-11	9.0 – 10.5	10.65
B21-11	14.0 – 15.5	12.95
B21-12	0.0 – 1.5	15.95

TABLE 2-Continued

RESULTS OF NATURAL MOISTURE CONTENT TESTS (ASTM D-4643)

BORING NO.	DEPTH INCREMENT, (FT.)	NATURAL MOISTURE CONTENT, %
B21-12	1.5 – 3.0	14.69
B21-12	4.0 – 5.5	12.25
B21-12	6.5 – 8.0	4.96
B21-12	9.0 – 10.5	14.68
B21-12	14.0 – 15.5	10.90
B21-13	0.0 – 1.5	17.9
B21-13	1.5 – 3.0	10.11
B21-13	4.0 – 5.5	13.19
B21-13	6.5 – 8.0	6.11
B21-13	9.0 – 10.5	20.33
B21-13	14.0 – 15.5	8.84
B21-14	0.0 – 1.5	15.55
B21-14	1.5 – 3.0	13.25
B21-14	4.0 – 5.5	11.84
B21-14	6.5 – 8.0	11.62
B21-14	9.0 – 10.5	21.88
B21-14	14.0 – 15.5	7.32
B21-15	0.0 – 1.5	15.07
B21-15	1.5 – 3.0	5.96
B21-15	4.0 – 5.5	11.40
B21-15	6.5 – 8.0	7.06
B21-15	9.0 – 10.5	17.33
B21-15	14.0 – 15.5	3.87
B21-16	0.0 – 1.5	18.28
B21-16	1.5 – 3.0	10.03
B21-16	4.0 – 5.5	7.54
B21-16	6.5 – 8.0	26.01
B21-16	9.0 – 10.5	13.04

TABLE 2-Continued

RESULTS OF NATURAL MOISTURE CONTENT TESTS (ASTM D-4643)

BORING NO.	DEPTH INCREMENT, (FT.)	NATURAL MOISTURE CONTENT, %
B21-16	14.0 – 15.5	13.08
B21-17	0.0 – 1.5	14.84
B21-17	1.5 – 3.0	10.32
B21-17	4.0 – 5.5	10.80
B21-17	6.5 – 8.0	9.28
B21-17	9.0 – 10.5	11.23
B21-17	14.0 – 15.5	13.33
B21-18	0.0 – 1.5	27.86
B21-18	1.5 – 3.0	18.49
B21-18	4.0 – 5.5	15.25
B21-18	6.5 – 8.0	19.86
B21-18	9.0 – 10.5	18.16
B21-18	14.0 – 15.5	19.54
B21-19	0.0 – 1.5	14.26
B21-19	1.5 – 3.0	10.95
B21-19	4.0 – 5.5	8.33
B21-19	6.5 – 8.0	18.21
B21-19	9.0 – 10.5	15.95
B21-19	14.0 – 15.5	26.90
B21-20	0.0 – 1.5	20.58
B21-20	1.5 – 3.0	16.30
B21-20	4.0 – 5.5	16.47
B21-20	6.5 – 8.0	14.94
B21-20	9.0 – 10.5	18.05
B21-20	14.0 – 15.5	14.28

Five (5) laboratory soil resistivity tests in accordance with AASHTO T288, five (5) laboratory pH tests in accordance with ASHTO T289, five (5) water-soluble sulfate ion content tests in accordance with AASHTO T290, and five (5) water-soluble chloride ion content tests in accordance with AASHTO T291 were performed on collected grab samples of the boring cuttings (mixed soil samples obtained from the full boring depths and therefore, represent the conglomerated strata from the entire boring depth) from borings B21-1, B21-4, B21-6, B21-12, and B21-19. The results of these tests are tabulated in Table 3 as follows, and are also included in Section III of this report:

TABLE 3

RESULTS OF LABORATORY TESTS FOR SOIL RESISTIVITY, pH, WATER-SOLUBLE SULFATE AND CHLORIDE CONTENT

SAMPLE ID.	SOIL RESISTIVITY (ohm-cm) AASHTO T288	pH AASHTO T289	SULFATE ION (ppm) AASHTO T290	CHLORIDE ION (ppm) AASHTO T291
B21-1	3,400	7.9	669	<10
B21-4	4,012	7.6	959	<10
B21-6	5,372	4.0	595	<10
B21-12	1,564	8.1	452	<10
B21-19	4,964	8.2	316	<10

3.0 SOIL CONDITIONS AND GROUNDWATER LEVELS

A total of twenty (20) borings were made at the proposed solar project site at the locations shown on Figure 2. The project site was generally overlain by approximately 4 to 7 inches of topsoil. The site has been previously surface mined and reclaimed with mine spoil consisting predominantly of mixed silty clay with varying amounts of sand, gravel and rock fragments extending to the bottom of the borings at a depth of 15 feet based on the information obtained from the boring log data. SPT blow counts in this mine spoil stratum varied from 3 to 53. Split spoon refusal was encountered on rock fragments at varying depths in some of the borings as shown on the boring logs, auger refusal was not encountered in any of the borings to the investigated depth of 15 feet.

Groundwater observations were made during the drilling operations (by noting the depth of water on the drilling tools) and in the open boreholes following withdrawal of the drilling augers. No free groundwater was encountered at the time of drilling activities in the borings. However, it should be noted that short-term water level readings are not necessarily a reliable indication of the groundwater level and that significant fluctuations may occur due to variations in rainfall and other factors. For specific information on the soil conditions, please refer to the individual boring logs in Section III.

Based on the encountered soil conditions at the project site, the site classification was determined to be "Site Class D" per the Ohio Building Code. In addition, a S_{DS} coefficient of 0.141g was calculated, and a S_{D1} coefficient of 0.102g was also calculated for design based on the aforementioned building code. A "Site Class D" suggests that the soil materials are stiff with standard penetration test "N-values" between 15 and 50.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 PROJECT DESCRIPTION

SunEnergy1 is currently developing information regarding the proposed solar project at the project site. No other details of the proposed project regarding the spatial geometry, and structural loads have been provided to us at this time. The following recommendations are based on the assumption that no unusual loading conditions or special settlement restrictions apply to the proposed project. Consequently, if the above information is incorrect or if changes are made, CBC Engineers & Associates, Ltd should be notified so that the new data can be reviewed.

4.2 DEVELOPMENT AREA FOUNDATIONS

4.2.1 SHALLOW SPREAD FOOTINGS

The borings showed the presence of existing mine spoil highly variable in consistency across the project site. Therefore for the shallow spread footing support option, it is recommended that the existing mine spoil encountered below the proposed footings be undercut to a depth equal to half of the footing width (a minimum of 2.0 ft. of undercut required) below the bottom of the footings, and the excavation backfilled to the bottom of the footing using engineered fill compacted to at least 95% of the maximum dry unit weight with a moisture content within 2% of the optimum moisture content as determined by the modified Proctor test. In order to ensure the presence of suitable bearing soil at the bottom of the footing excavation, the bottom of the excavation should be observed and tested by a representative of this office. All exposed subgrade at the bottom of the foundation excavations should be compacted to at least 95% of the maximum dry unit weight with moisture content within

2% of the optimum moisture content as determined by the modified Proctor test before engineered fill/footing placement.

All engineered fill should be compacted to at least 95% of the maximum dry unit weight with moisture content within 2% of the optimum moisture content as determined by the modified Proctor test. Excavated material that is free of organic or objectionable materials can be reused as fill. In general, any non-organic naturally-occurring soils can be used for structural fill. Cohesive soils with a Liquid Limit (LL) greater than 50, a Plasticity Index (PI) of greater than 25, or an organic content greater than 7 percent as determined by Loss-on-Ignition (ASTM D2974) should not be used for engineered fill. The fill should contain no fragments whose greatest dimension is larger than half the thickness of the lift being placed. The existing fill at the project site does appear to be suitable for reuse as engineered fill but will likely require moisture adjustment and possible segregation of deleterious content and/or rock fragments. Once the footing subgrade is prepared according to these recommendations, spread-footing foundations can be placed on the new compacted engineered fill. The footing elements bearing on compacted engineered fill can be designed for an allowable bearing capacity of 1,000 psf. This net allowable bearing pressure can be increased by a factor of one-third when designing for transient loadings such as wind or earthquake ground motions. All foundations should bear at a depth of at least 32 inches below the final grade for frost heave considerations. These recommendations are provided based on the assumption that suitable bearing soils are available at the bottom of the footing excavations. As mentioned earlier, CBC Engineers should be retained to confirm the acceptability of the bearing soils and verify the recommended bearing capacity once the excavation is completed and backfilled before the footings are poured.

All soil bearing foundations settle as the result of the externally applied loads. Settlement of the proposed foundations should be anticipated, although such movements are estimated (based upon our experience in similar soils) to be well within the tolerable limits for the structure (i.e., the total settlement will be less than about 1 inch, while differential settlement will be limited to about 3/4 of this value).

Backfill for utility trenches, foundation excavations, etc., should be placed in successive, horizontal layers. Each layer should be compacted to 95% of the maximum modified Proctor dry unit weight within 2% of the optimum moisture content before the next layer is added. In no instance should puddling or jetting the backfill material be allowed as a compaction method. Any silty or clayey soils at foundation depth will soften and the bearing capacity will be reduced if water ponds in the excavation. Soils exposed in the bases of all satisfactory foundation excavations should be protected against any detrimental change in condition such as from disturbance, rain and freezing. Surface run-off water should be drained away from the excavation and not allowed to pond. If possible, all foundation concrete should be placed the same day the excavation is made. If this is not practical, the foundation excavations should be adequately protected. Also, for this reason, proper drainage should be maintained after construction.

All foundations should be located so that the least lateral clear distance between any two foundations will be at least equal to the difference in their bearing elevations (see Figure 3 in Section III of this document). If this distance cannot be maintained, the lower foundation should be designed to account for the load imparted by the upper foundation. If this condition occurs adjacent to a below-grade wall, the wall should be designed for the additional lateral earth pressure due to the upper foundation.

An alternate foundation option to excavation and replacement of the existing mine spoil consists of utilizing driven piles supported in the existing mine spoil. This option is discussed in the following section of this report.

4.2.2 DRIVEN PILES

Driven steel piles are a suitable foundation support for the proposed solar project. Steel piles will need to be driven sufficiently into the existing mine spoil. A minimum embedment depth of 8.0 feet of the steel piles into the mine spoil is recommended for the driven piles. The required embedment depths of the driven piles into the mine spoil zone for adequate vertical and lateral support must be determined by the foundation design engineer. The recommended allowable skin friction resistance for driven piles in direct contact with the mine spoil zone is 100 psf (includes factor of safety of 2.0). The skin friction resistance in the zone below the top 30 inches of embedment must only be considered (i.e. the skin resistance in top 30 inches of soil embedment must be neglected).

The minimum spacing between any two adjacent piles must not be less than 3 times the greatest pile dimension, to avoid any reduction in the allowable pile capacities from group effects. The driven piles can be grouped in clusters as required supporting the proposed loads based upon the anticipated live and dead loads, applying the appropriate structural reduction factors. Piles should be driven according to the specifications for driven piles provided in Section III of this report and in accordance with accepted industry standards.

According to the field and laboratory soil resistivity and pH test results obtained as summarized in Section 2.0 of this report, resistivity of the existing mine spoil at the project site varied from 1,500 to 5,500 ohm-cm and pH from 4.0 to 8.2 indicating that the soils have the potential to be moderately to extremely corrosive in nature. Therefore, corrosion/loss of section of unprotected driven piles over their design life installed in such soils needs to be considered by the foundation designer in determining the required section properties and resulting pile compression/uplift capacities and flexural capacities. A recommended corrosion rate of the proposed steel piles of 1.5mils/yr (0.0015"/year) or higher on every side in contact with the soil should be utilized in determining the loss of pile section and reduction in pile capacities for the embedded portion of the pile. Corrosion of the exposed portion of the pile and at the ground surface level is beyond the scope of this report and is the responsibility of others.

It is recommended that pile load tests be performed as per company protocols and industry standards to verify the analytical design criteria. It is recommended that the production pile-driving criteria be established at the time of installation of the load test piles. If the load tests substantiate the required design capacity, then the same installation criteria which was utilized for the test piles should be implemented for the production piles. This includes the same rate of penetration for the same pile hammer driving piles of a consistent size. If the load test does not meet the required capacity, then it is recommended that further load test piles be installed under a revised driving criterion and that the piles also be tested consistent with ASTM procedures. Pile load testing should be performed according to ASTM D 1143-81 procedures for compressive load tests, and ASTM D-3689-90 procedures for tensile load tests. It is recommended that the pile load tests be accomplished in accordance with the ASTM D1143-81, Paragraph 5.1, "Standard Loading Procedure". After the tests have been completed in accordance with Paragraph 5.1, it is recommended that the test piles be reloaded in accordance with Paragraph 5.3, "Loading in Excess of Standard Test Load" to failure or to the limit of the reaction frame. After the pile load tests have been performed, the results should be evaluated by the foundation designer and a determination made as to whether further load tests and design revisions are warranted.

If any pile encounters refusal conditions without a general buildup of blow counts with depth, the subsurface conditions should be explored to determine the bearing conditions, the pile should be load tested, the pile hole should be pre-drilled, or the pile should be abandoned and replaced with another pile meeting the aforementioned criteria. With the observed rock fragments in the mine spoil material, pile refusal on rock is a potential for this site. It is recommended that each pile be driven without interruption for its entire depth. Where driving is interrupted before reaching final penetration, it is recommended that the pile penetration not be considered valid until after at least 12 inches of additional penetration has been obtained upon the resumption of driving.

It is recommended that the top elevation of each pile be determined after driving and again after all piles at a given pile cap are driven in the event uplift occurs as a result of driving subsequent piles. The affected pile should be back-driven to their original resistance, or original elevation (or both). The driven piles may need splicing to obtain the required length. The joints between sections should be made with a full penetration butt weld continuous around the perimeter of the pile and splice plates shall be used or as otherwise approved by the foundation designer. It is recommended that no more than one (1) joint per full length of pile be permitted. The pile caps (if applicable) should also be adequately reinforced and tied into the upper portion of the individual piles with tensile reinforcement. Note that Specifications relative to driven steel piles are presented in Section III of this document.

Lateral load analysis of the piles will need to be performed by the foundation designer using L Pile or similar methods, using the design shear and moment values acting at the head of the piles to determine the deflections, shear forces, bending moments and soil responses along the length of the piles for design. The following Table provides the recommended strength and response parameters representative of the various types of soil encountered in the borings.

TABLE 4

RECOMMENDED SOIL STRENGTH AND RESPONSE PARAMETERS

MATERIAL TYPE	DEPTH BELOW EXISTING SITE GRADE (ft.)	MATERIAL MODELING TYPE	EFFECTIVE UNIT WEIGHT (pcf)	UNDRAINED SHEAR STRENGTH (psi)	STRAIN FACTOR e50	FRICTION ANGLE (degrees)	P-Y MODULUS k (pci)
Mine Spoil	0.0 ft.- bottom of borings	Soft Clay (Matlock)	0.04	2	0.02	--	30

4.2.3 LATERAL AND UPLIFT FORCES ON SHALLOW FOOTINGS

Lateral forces on the foundation elements can be resisted by passive lateral earth pressures against the opposite vertical face of the foundation and by friction along the soil/foundation interface. An allowable resisting passive earth pressure of 200 lbs./sq. ft., and coefficient of friction of 0.35, respectively, can be used for design purposes. The passive resistance should only be used for that portion of the foundation located at a depth greater than 2.5 feet beneath the final grade (Please see Figure 4 in Section III of this text). A factor of safety of 1.5 relative to the lateral capacity should be used in design. It should be noted that lateral movements, on the order of up to 0.5 inch, may occur to mobilize this lateral resisting force.

It is further recommended that only the weight of the footing and the total weight of the soil above and within the periphery of the footing be used for resisting uplift forces. A total soil unit weight of 120 lbs./cu. ft. should be used for these computations for backfill material compacted as recommended in Section 4.2.2 (Please see Figure 5 in Section III of this document). It is also recommended that a factor of safety of at least 1.5 be used in calculating uplift resistance due to the weight of the footing and the backfill soil.

4.2.4 LATERAL EARTH PRESSURES ON BELOW GRADE WALLS

The magnitude of lateral earth pressure against subsurface walls is dependent on the method of backfill placement, the type of backfill soil, drainage provisions and whether or not the wall is permitted to yield during and/or after placement of the backfill. When a wall is held rigidly against horizontal movement, the lateral pressure against the wall is greater than the "active" earth pressure that is typically used in the design of free-standing retaining walls. Therefore, rigid walls should be designed for higher, "at-rest" pressures (using an at-rest lateral earth pressure coefficient, K_o), while yielding walls can be designed for active pressures (using an active lateral earth pressure coefficient, K_a).

For use in these computations, a total soil unit weight of 130 lbs/cu. ft. should be used. For below-grade walls, a coefficient of earth pressure at-rest (K_o) of 0.5 and a coefficient of "active" earth pressure of 0.33 are recommended, provided a well-graded granular material is used for backfill (Please see Figure 6 in Section III of this document). Also, a passive earth pressure coefficient of 2.75 should be used in design. The granular backfill material should extend upward and outward from the base of the wall on a slope not steeper than about 1 (horizontal) to 1 (vertical). This method of computation presumes that there will be no hydrostatic pressure due to water build-up.

It is recommended that the static weight per axle of equipment utilized for the compaction of the backfill materials not exceed 2 tons per axle for non-vibratory equipment and 1 ton per axle for vibratory equipment. All heavy equipment, including compaction equipment heavier than recommended above, should not be allowed closer to the wall (horizontal distance) than the vertical distance from the backfill surface to the bottom of the wall. If it is desired to use heavier compaction equipment adjacent to the below grade wall, it is recommended that this office be contacted to determine the resulting earth pressures.

4.3 SLABS-ON-GRADE

For the removal and replacement foundation support option, or if a slab-on-grade is desired with the driven pile foundation support option, the topsoil/existing mine spoil below the proposed floor slab should be excavated to a minimum depth of 2.0 feet below the bottom of the slab-on-grade, the base of the excavation properly stabilized, and the excavation backfilled to the bottom of the slab with compacted engineered fill compacted to 95% of the maximum modified Proctor dry unit weight. Slabs-on-grade can then be supported on new compacted structural fill.

It is recommended that all slabs-on-grade be "floating", that is, fully ground supported and not structurally connected to walls or foundations. This is to minimize the possibility of cracking and displacement of the slabs-on-grade because of differential movements between the slab and the foundation. Although the movements are estimated to be within the tolerable limits for structural safety, such movements could be detrimental to the slabs if they were rigidly connected to the foundations.

It is furthermore recommended that the slabs-on-grade be supported on a 4 to 6-inch layer of relatively clean granular material such as sand and gravel or crushed stone. This is to help distribute concentrated loads and equalize moisture conditions beneath the slab. Proper drainage must be incorporated into this granular layer to preclude future wet areas in the finished slab-on-grade. Provided that a minimum of 4 inches of granular material is placed below the new slab-on-grade (and the in-situ soil is prepared as recommended), a modulus of subgrade reaction (k_{30}) of 50 lbs./cu. in. can be used for design of the slabs.

4.4 FOUNDATION EXCAVATIONS

Each foundation excavation should be inspected to insure that all loose, soft or otherwise undesirable material is removed and that the foundation will bear on satisfactory material.

If pockets of soft, loose or otherwise unsuitable material are encountered in the footing excavations and it is inconvenient to lower the footings, the proposed footing elevations may be re-established by backfilling after the undesirable material has been removed. The undercut excavation beneath each footing should extend to suitable bearing soils and the dimensions of the excavation base should be determined by imaginary planes extending outward and down on a 1 (vertical) to 1 (horizontal) slope from the base perimeter of the footing as illustrated in Figure 7 in Section III. The entire excavation should then be refilled with a well-compacted engineered fill. Special care should be exercised to remove any sloughed, loose or soft materials near the base of the excavation slopes. All Federal, State, and Local regulations should be strictly adhered to relative to excavation side-slope geometry.

5.0 <u>SITE PREPARATION</u>

All areas that will support slab-on-grade and roadway areas should be properly prepared. After rough grade has been established in cut areas and prior to placement of fill in all fill areas, the exposed subgrade should be carefully inspected by probing and testing as needed. Any topsoil or other organic material still in place, frozen, wet, soft or loose soil, and other undesirable existing fill should be removed and replaced with engineered fill as recommended in the previous sections. Aeration of the near-surface in-situ soils should be anticipated prior to their placement as engineered fill (or lime stabilization can also be used). The exposed subgrade should furthermore be inspected by proofrolling with a loaded tandem axle truck or other suitable equipment to check for pockets of soft material hidden beneath a thin crust of better soil. Any unsuitable materials thus exposed should be removed and replaced with well-compacted, engineered fill as outlined in the specifications of this document. However, it may also become necessary (due to the presence of soft exposed soil materials) to employ lime stabilization or to locally incorporate 2" aggregate into the subgrade to increase its stiffness.

In general, care should be exercised during the grading operations at the site. Due to the nature of the near surface soils, the traffic of heavy equipment, including heavy compaction equipment, may create pumping and general deterioration of the shallower soils, especially if excess surface water is present. If this occurs, it may be necessary to utilize a biaxial/triaxial geogrid, lime stabilization, or other methodology (such as the incorporation of 2" aggregate into the subgrade) to stabilize the disturbed subgrade. The grading, therefore, should be done during a dry season, if at all possible.

In addition, it must be emphasized that once engineered fill is properly placed on the project site, that these materials can also degrade significantly due to the effects of heavy construction traffic and wet weather. This degradation may in some cases require the excavation and replacement of the engineered fill with aerated, lime-stabilized fill materials; hence, caution should be exercised to avoid such degradation of these soil materials.

It should be noted that when vibratory rollers are utilized on certain soils types (such as fine grain sands or silts), that shear induced pore water pressures may be developed within these materials which will result in significant "pumping" of these materials (even though these soils may be stiff and pass moisture density tests on engineered fills). Therefore (in these types of soils), it is imperative that the vibrator not be utilized and that these soils be statically rolled in order to preclude the development of such shear induced pore water pressures. These shear induced pore water pressures dissipate over a number of days (depending on the permeability of the soil materials); however, in the short term, significant "pumping" of these materials can be witnessed in the field.

6.0 SLOPE CONSIDERATIONS

A detailed slope stability analysis is beyond the scope of this study. However, it is, recommended that fill slopes less than 10 feet in height be designed for slopes not steeper than 2.5 (horizontal) to 1 (vertical). For any fill greater than 10 feet in height, it is recommended that slopes be not steeper than 3 (horizontal) to 1 (vertical).

In general, temporary cut slopes of 2 (horizontal) to 1 (vertical) should remain stable during a reasonable construction period provided they are not higher than about 10 feet and are not subjected to excessive vibration from construction equipment and are protected from surface erosion. The need for temporary bracing of utility trenches should be anticipated. In general, any permanent cut slopes should be no steeper than about 3 (horizontal) to 1 (vertical).

7.0 CONSTRUCTION DEWATERING

At the time of our investigation, the free groundwater level was noted to be potentially below the required excavation depths. However, significant quantities of groundwater should be anticipated in the proposed foundation excavations due to isolated water bearing zones/areas. In order to maintain proper bearing support for the foundations, the entire foundation excavation area must be dewatered (groundwater level lowered) to at least 2 feet below the deepest footing bearing elevation prior to the placement of the foundations, and the dewatering of the area maintained until the foundations are fully constructed. Sump pumping is generally a suitable method of dewatering in such areas where the required depth of groundwater to be lowered is generally less. Extra care must be exercised when pumping from sumps that extend into silts and other granular soils as observed at this site, as a general deterioration of the bearing soils and a localized "quick" condition could result. Extra care must also be exercised during pumping to ensure that the loss of fines does not occur, and filter fabric should be used as necessary to maintain a soil-tight system. It is imperative that the dewatering of the foundations and subgrade soils be continually maintained until the foundations are fully constructed, and they are providing confinement of the underlying soils. If the groundwater level is allowed to rise to the surface of the excavation areas without the surface being confined, detrimental softening and degradation of the foundation and subgrade soils should be expected that will require remedial measures in order to provide adequate support for the structure. The evaluation and design of any required temporary or permanent dewatering measures to facilitate proper construction and proper in-service conditions is the responsibility of others than CBC Engineers & Associates, Ltd.

8.0 SOIL SWELLING POTENTIAL

Based upon the soil investigation performed for this study and the mineralogy of typical soils from the general vicinity of the project site, no significant soil swelling is anticipated. To our knowledge, there are no instances of problems associated with soil swelling in the project vicinity.

9.0 LIQUEFACTION

When certain soils (generally only granular soils) below the groundwater table are subjected to dynamic loads, such as those produced by earthquakes, a sudden increase in pore water pressure occurs as the result of shearing of the soil particles passed one another. In extreme cases, when these shear induced pore water pressures exceed the strength of the soil, the soil strength can reduce to zero thereby resulting in a phenomenon known as "liquefaction." Conditions at this site have been examined to determine the likelihood for liquefaction of the natural soils during earthquake ground motions.

Soil type, relative density, initial confining pressure (i.e., the depth of the potentially liquefiable soil below the ground surface) and the magnitude of potential ground motions are the most important factors in determining the liquefaction potential of a soil mass. It is generally agreed that saturated, relatively loose (with blow counts or "N" values typically less than about 13) in the upper 50 feet or so are most susceptible to liquefaction.

Clayey soils are generally considered to be non-vulnerable to liquefaction. It is, therefore, concluded that liquefaction (or any significant loss of strength) of the soils underlying the project site during earthquake ground motions is extremely unlikely. To our knowledge, there are no recorded cases of liquefaction of subsurface materials similar to those at this project site. Therefore, no special design measures relative to soil liquefaction appear to be warranted.

10.0 BURIED UTILITY PIPES

Excavations for buried utility pipelines should follow the guidelines set forth previously in this report. Depending on the pipeline material, a minimum thickness of at least 0.5 foot of select fine-grained granular bedding material should be used beneath all below-grade pipes, with a minimum cover thickness of at least 3 feet to afford an "arching" effect and reduce stresses on the pipe. The cover thickness may be reduced if the external loading condition on the pipe is relatively light or if the pipe is designed to withstand the external loading condition. It is not recommended that "pea-gravel" or other "open-work" aggregates be used for trench backfill since these materials are nearly impossible to compact and have a tendency to pond water within their interstices.

11.0 DRAINAGE

Adequate drainage should be provided at the site to minimize any increase in moisture content of the foundation soils. The exterior grade (including all parking areas) should be sloped away from all facility structures to prevent ponding of water.

12.0 CLOSURE

12.1 BASIS OF RECOMMENDATIONS

The evaluations, conclusions, and recommendations in this report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project and our experience with similar sites and subsurface conditions. Data used during this exploration included, but were not necessarily limited to:

- Twenty (20) exploratory borings performed during this study,
- observations of the project site by our staff,
- results of the laboratory soil tests,
- site plans and drawings furnished by the client,
- supportive interaction with the client,
- published soil or geologic data of this area.

In the event that changes in the project characteristics are planned, or if additional information or differences from the conditions anticipated in this report become apparent, CBC Engineers & Associates, Ltd., should be notified so that the conclusions and recommendations contained in this report can be reviewed and, if necessary, modified or verified in writing.

12.2 LIMITATIONS OF STUDY/RECOMMENDED ADDITIONAL SERVICES

The subsurface conditions discussed in this report and those shown on the boring logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by designers, or that the construction process has altered the soil conditions. As variations in the soil profile are encountered, additional subsurface sampling and testing may be necessary to provide data required to re-evaluate the recommendations of this report. Consequently, after submission of this report it is recommended that CBC Engineers & Associates, Ltd. be authorized to perform additional services to work with the designer(s) to minimize errors and omissions regarding the interpretation and implementation of this report.

Prior to construction, we recommend that CBC Engineers & Associates, Ltd.:

- work with the designers to implement the recommended geotechnical design parameters into plans and specifications,
- consult with the design team regarding interpretation of this report,
- establish criteria for the construction observation and testing for the soil conditions encountered at this site; and
- review final plans and specifications pertaining to geotechnical aspects of design.

During construction, we recommend that CBC Engineers & Associates, Ltd.:

- observe the construction, particularly the site preparation, fill placement, and foundation excavation or installation,
- perform in-place density testing of all compacted fill,
- perform materials testing of soil and other materials as required; and
- consult with the design team to make design changes in the event that differing subsurface conditions are encountered.

If CBC Engineers & Associates, Ltd. is not retained for these services, we shall assume no responsibility for construction compliance with the design concepts, specifications or recommendations.

12.3 WARRANTY

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, express or implied, is made.

While the services of CBC Engineers & Associates, Ltd. are a valuable and integral part of the design and construction teams, we do not warrant, guarantee, or insure the quality or completeness of services provided by other members of those teams, the quality, completeness, or satisfactory performance of construction plans and specifications which we have not prepared, nor the ultimate performance of building site materials.

12.3.1 SUBSURFACE EXPLORATION

Subsurface exploration is normally accomplished by test borings, although test pits are sometimes employed. The method of determining the boring location and the surface elevation at the boring is noted in the report, and is presented on the Boring Location Plan or on the boring log. The location and elevation of the boring should be considered accurate only to the degree inherent with the method used.

The boring log includes sampling information, description of the materials recovered, approximate depth of boundaries between soil and rock strata and groundwater data. The boring log represents conditions specifically at the location and time the boring was made. The boundaries between different soil strata are indicated at specific depths; however, these depths are in fact approximate and are somewhat dependent upon the frequency of sampling (the transition between soil strata is often gradual). Free groundwater level readings are made at the times and under conditions stated on the boring logs (groundwater levels change with time and season). The borehole does not always remain open sufficiently long enough for the measured water level to coincide with the groundwater table.

12.3.2 LABORATORY AND FIELD TESTS

Laboratory and field tests are performed in accordance with specific ASTM standards unless otherwise indicated. All determinations included in a given ASTM standard are not always required and performed. Each test report indicates the measurements and determinations actually made.

12.3.3 ANALYSIS AND RECOMMENDATIONS

The geotechnical report is prepared primarily to aid in the engineering design of site work and structural foundations. Although the information in the report is expected to be sufficient for these purposes, it is not intended to determine the cost of construction or to stand alone as a construction specification.

Our engineering report recommendations are based primarily on data from test borings made at the locations shown on a boring location plan included in this report. Soil variations may exist between borings and these variations may not become evident until construction. If significant variations are then noted, the geotechnical engineer should be contacted so that field conditions can be examined and recommendations revised if necessary.

The geotechnical engineering report states our understanding as to the location, dimensions and structural features proposed for the site. Any significant changes in the nature, design, or location of the site improvements MUST be communicated to the geotechnical engineer such that the geotechnical analysis, conclusions, and recommendations can be appropriately adjusted. The geotechnical engineer should be given the opportunity to review all drawings that have been prepared based on their recommendations.

12.3.4 CONSTRUCTION MONITORING

Construction monitoring is a vital element of complete geotechnical services. The field engineer/inspector is the owner's "representative" observing the work of the contractor, performing tests as required in the specifications, and reporting data developed from such tests and observations. The field engineer or inspector does not direct the contractor's construction means, methods, operations or personnel. The field inspector/engineer does not interfere with the relationship between the owner and the contractor and, except as an observer, does not become a substitute owner on site. The field inspector/engineer is responsible for his own safety but has no responsibility for the safety of other personnel at the site. The field inspector/engineer is an important member of a team whose responsibility is to watch and test the work being done and report to the owner whether that work is being carried out in general conformance with the plans and specifications.

12.3.5 GENERAL

The scope of our services did not include an environmental assessment for the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater or air, on, within or beyond the site studied. Any statements in the report or on the boring logs regarding odors, staining of soils or other unusual items or conditions observed are strictly for the information of our client.

To evaluate the site for possible environmental liabilities, we recommend an environmental assessment, consisting of a detailed site reconnaissance, a record review, and report of findings. Additional subsurface drilling and samplings, including groundwater sampling, may be required. CBC Engineers & Associates, Ltd. can provide this service and would be pleased to provide a cost proposal to perform such a study, if requested.

This report has been prepared for the exclusive use of SunEnergy1, for specific application to the proposed solar project in Jackson County, Ohio (see Figure 1 in Section III of this report).

Specific design and construction recommendations have been provided in the various sections of the report. The report shall, therefore, be used in its entirety. This report is not a bidding document and shall not be used for that purpose. Anyone reviewing this report must interpret and draw their own conclusions regarding specific construction techniques and methods chosen. CBC Engineers & Associates, Ltd. is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploratory and laboratory test data presented in this report.

SECTION II

SPECIFICATIONS

I - ENGINEERED FILL BENEATH STRUCTURES

CLEARING AND GRADING SPECIFICATIONS

1.0 GENERAL CONDITIONS

The Contractor shall furnish all labor, materials, and equipment, and perform all work and services necessary to complete in a satisfactory manner the site preparation, excavation, filling, compaction and grading as shown on the plans and as described therein.

This work shall consist of all clearing and grading, removal of existing structures unless otherwise stated, preparation of the land to be filled, filling of the land, spreading and compaction of the fill, and all subsidiary work necessary to complete the grading of the cut and fill areas to conform with the lines, grades, slopes, and specifications.

This work is to be accomplished under the constant and continuous supervision of the Owner or his designated representative.

In these specifications the terms "approved" and "as directed" shall refer to directions to the Contractor from the Owner or his designated representative.

2.0 SUBSURFACE CONDITIONS

Prior to bidding the work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site, including without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as he may deem necessary for the planning and proper execution of the work. Borings and/or soil investigations shall have been made. Results of these borings and studies will be made available by the Owner to the Contractor upon his request, but the Owner is not responsible for any interpretations or conclusions with respect thereto made by the Contractor on the basis of such information, and the Owner further has no responsibility for the accuracy of the borings and the soil investigations.

If conditions other than those indicated are discovered by the Contractor, the Owner should be notified immediately. The material which the Contractor believes to be a changed condition should not be disturbed so that the Owner can investigate the condition.

3.0 SITE PREPARATION

Within the specified areas, all trees, brush, stumps, logs, tree roots, and structures scheduled for demolition shall be removed and disposed of.

All cut and fill areas shall be properly stripped. Topsoil will be removed to its full depth and stockpiled for use in finish grading. Any rubbish, organic and other objectionable soils, and other deleterious material shall be disposed of off the site, or as directed by the Owner or his designated representative if on site disposal is provided. In no case shall such objectionable material be allowed in or under the fill unless specifically authorized in writing.

Prior to the addition of fill, the original ground shall be compacted to job specifications as outlined below. Special notice shall be given to the proposed fill area at this time. If wet spots, spongy conditions, or groundwater seepage is found, corrective measures must be taken before the placement of fill.

4.0 FORMATION OF FILL AREAS

Fills shall be formed of satisfactory materials placed in successive horizontal layers of not more than eight (8) inches in loose depth for the full width of the cross-section. The depth of lift may be increased if the Contractor can demonstrate the ability to compact a larger lift. If compaction is accomplished using hand-tamping equipment, lifts will be limited to 4-inch loose lifts. Engineered fill placed shall be compacted to at least 95% of the maximum dry unit weight with a moisture content within 2% of the optimum moisture content as determined by the modified Proctor test.

All material entering the fill shall be free of organic matter such as leaves, grass, roots, and other objectionable material.

The operations on earth work shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions. The Contractor shall keep the work areas graded to provide the drainage at all times.

The fill material shall be of the proper moisture content before compaction efforts are started. Wetting or drying of the material and manipulation to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work thus affected shall be delayed until the material has dried to the required moisture content. The moisture content of the fill material should be no more than two (2) percentage points higher or lower than optimum unless otherwise authorized. Sprinkling shall be done with equipment that will satisfactorily distribute the water over the disced area. Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer. The fill shall contain no fragments whose greatest dimension is larger than 1/2 of the thickness of the lift being placed.

In the construction of filled areas, starting layers shall be placed in the deepest portion of the fill, and as placement progresses, additional layers shall be constructed in horizontal planes. Original slopes shall be continuously, vertically benched to provide horizontal fill planes. The size of the benches shall be formed so that the base of the bench is horizontal and the back of the bench is vertical. As many benches as are necessary to bring the site to final grade shall be constructed. Filling operations shall begin on the lowest bench, with the fill being placed in horizontal eight (8) inch thick loose lifts unless otherwise authorized. The filling shall progress in this manner until the entire first bench has been filled, before any fill is placed on the succeeding benches. Proper drainage shall be maintained at all times during benching and filling of the benches, to insure that all water is drained away from the fill area.

Frozen material shall not be placed in the fill nor shall the fill be placed upon frozen material.

The Contractor shall be responsible for the stability of all fills made under the contract, and shall replace any portion, which in the opinion of the Owner or his designated representative, has become displaced due to carelessness or negligence on the part of the Contractor. Fill damaged by inclement weather shall be repaired at the Contractor's expense.

5.0 SLOPE RATIO AND STORM WATER RUN-OFF

Slopes shall not be greater than 2 (horizontal) to 1 (vertical) in both cut and fill, or as illustrated on the construction drawings. Excavations shall be constructed in accordance with all Federal, State and local codes relative to slope geometry.

6.0 GRADING

The Contractor shall furnish, operate, and maintain such equipment as is necessary to construct uniform layers, and control smoothness of grade for maximum compaction and drainage.

7.0 COMPACTING

The compaction equipment shall be approved equipment of such design, weight, and quantity to obtain the required density in accordance with these specifications.

8.0 TESTING AND INSPECTION SERVICES

Testing and inspection services will be provided by the Owner.

II - DRIVEN STEEL PILES

1.0 <u>GENERAL</u>

1.1 DELIVERY AND STORAGE

1.1.1 During delivery, storage, and handling, support long piles to preclude damage.

1.2 METHOD OF MEASUREMENT

1.2.1 Supply and installation of piles will be measured in total length of piles accepted and incorporated into work.

1.2.2 Pile toe reinforcement, pile shoes, pile splices, pile caps are incidental to the supply and installation of the piles and will not be separately measured.

1.2.3 Mobilization and demobilization of and costs for all equipment are incidental to the supply and installation of the steel piles and will be measured separately.

2.0 <u>PRODUCTS</u>

2.1 MATERIALS

2.1.1 Steel pile material to be in accordance with ASTM A572, Grade 50.

2.1.2 Size and weight of pile to be as indicated on the construction drawings.

2.1.3 Steel plates are to be manufactured in accordance with ASTM A36, Grade 36.

2.1.4 Steel piles are to have the following tolerances when delivered to the site:

2.1.4.1 The maximum curvature of new piles measured along two perpendicular planes before driving, when the beam is not subjected to bending forces, must not exceed 0.1%. (Curvature measurements are taken along a vertical plane and turning the pile 90 degrees between the two series of measurement).

2.1.5 Supplier must deliver pile in lengths as indicated by the Structural Engineer.

2.1.6 Pile toe reinforcement is to be in accordance with ASTM A36, Grade 36.

2.1.7 Pile splices are to be in accordance with ASTM A36, Grade 36.

2.2 FABRICATION

2.2.1 Fabricate full length piles to eliminate splicing during installation wherever possible.

2.2.2 Driving shoes may be installed during shop fabrication or as part of field work.

2.2.3 Full length piles may be fabricated from piling material by splicing lengths of steel piles together. Use complete joint penetration groove welds or a premanufactured splice.

2.2.4 The deviation of the pile from a straight line after splicing shall not exceed 0.5%.

3.0 EXECUTION

3.1 INSTALLATION

3.1.1 Install piles in accordance with ODOT Specifications and in accordance with Section 4 of AASHTO specifications, Division II "Driven Foundation Piles".

3.1.2 Use driving helmet to protect pile head.

3.1.3 Do not use any loose inserts in the helmet. The Structural Engineer is sole judge of the acceptability of the helmet.

3.1.4 Hold pile securely and accurately in position while driving.

3.1.5 Deliver hammer impacts concentrically and in direct alignment with pile taking care to avoid forcing pile laterally or bending pile. If in the Structural Engineer's opinion, lateral or bending forces unduly affect the pile, the Contractor must stop and rectify the situation at his own expense and to the satisfaction of the Structural Engineer.

3.1.6 Reinforce pile heads, if and as necessary.

3.1.7 Advance pile to the required tip depth.

3.1.8 Do not drive piles within a radius of 20 feet of concrete which has been in place for a time shorter than 3 days unless authorized by the Structural Engineer.

3.1.9 Restrike piles which have settled or heaved during driving of adjacent piles. No additional compensation will be made for piles restruck due to such settlement or heave.

3.1.10 Restrike piles as directed by the Structural Engineer.

3.1.11 Remove loose and displaced material from around piles after completion of driving and leave clean, solid surfaces to receive new pile cap concrete.

3.1.12 Provide sufficient length above cut-off elevation so that portion of the pile that is damaged during driving is cut off. Cut off piles neatly and squarely at elevations indicated.

3.1.13 Remove cut-off lengths from site subsequent to the completion of work.

3.1.14 Remove all old pile cushions and subsequently emplace a new pile cushion into the helmet before starting to drive another pile and whenever during the driving there is a indication that the pile cushion has been excessively compressed, heated, or damaged.

3.1.15 Keep the pile driving helmet concentric and square with the pile head at all times and the leads in alignment with the pile during driving activities. Occasionally during driving activities, and whenever requested by the Structural Engineer (or his representative) lift off (lighten) the helmet from the pile to verify that the helmet and leads are not inducing bending stresses in the pile.

3.1.16 Do not prepare and pour pile caps before approval has been given by the Structural Engineer.

3.2 EQUIPMENT INFORMATION

3.2.1 Prior to commencement of pile installation operation, submit to the Structural Engineer for approval the details of equipment for installation of piles.

3.2.2 For impact hammers, give manufacturer's name, type, maximum rated energy and rated energy per blow at normal working rate during easy and at termination driving, mass of striking parts of hammer, mass of driving cap, and type and elastic properties of hammer cushion.

3.2.3 IMPACT HAMMER

3.2.3.1 For final driving of steel piles, provide a hammer capable of delivering to the pile a non-erratic impact load not smaller than one-half of the design axial load of the pile to the pile head at a normal working rate.

3.2.3.2 Remedial action due to failure of the Contractor's hammer equipment will be at the Contractor's own expense. Such remedial action may consist of, but need not be limited to, adjustment or replacement of hammer cushion, or of pile cushion, or to adjustment or replacement of hammer.

3.3 LEADS

3.3.1 Provide leads that will enable the hammer to deliver impacts concentrically and in alignment with the pile longitudinal axis without inducing rocking movements or bending moments in pile.

3.3.2 Performance of leads will be subject to assessment of the Structural Engineer. Any remedial action required will be at the Contractor's own expense.

3.4 PREPARATION

3.4.1 Ensure that ground conditions at the pile locations are adequate to support pile driving and loading-test operations (if applicable). Make provision for access and support of piling equipment during performance of work.

3.4.2 Do not commence pile driving before the pile cap excavation has been completed.

3.5 FIELD MEASUREMENTS

Field measurements shall include (at a minimum):

3.5.1 Maintain accurate and daily records of driving for each pile, in addition to cushion and follower characteristics.

3.5.2 Type, make, and rated energy of hammer.

3.5.3 Other installation equipment including details on use of pile cushion and leads.

3.5.4 Pile size and length, location of pile in pile group, and location or designation of pile group.

3.5.5 Time for start and finish of driving pile and sequence of pile driving for pile group.

3.5.6 Penetration for pile self-weight and weight of hammer, number of blows per one (1) foot of penetration from start of driving, and penetration per one (1) foot when approaching termination driving of pile.

3.5.7 Observed stroke and blow rate (blows/minutes) of hammer.

3.5.8 Tip elevation upon termination of driving pile, and final tie and cut-off elevations upon completion of the given pile group.

3.5.9 Record of restriking.

3.5.10 Other pertinent information, such as interruption of continuous driving, observed pile damage, etc.

3.5.11 Records of the elevation of adjacent piles before and after driving of pile.

3.5.12 Record all information on forms provided by the Structural Engineer.

3.5.13 Provide the Structural Engineer with three copies of the field records.

3.6 OBSTRUCTIONS

3.6.1 Where obstructions are encountered that results in sudden, unexpected change in penetration resistance and deviation from specified tolerances, the Contractor may be required to perform one or all of the following:

3.6.1.1 Remove the obstruction from the driving path.

3.6.1.2 Extraction, repositioning, and redriving of the pile.

3.6.1.3 Addition of extra piles to the group.

3.6.2 If, in the opinion of the Structural Engineer, work done as per Clause 3.6.1 could not have been reasonably anticipated by the Contractor, additional compensation for work done will be considered for payment.

3.7 DESIGN LOAD

3.7.1 The required design load is presented on the Design Drawings and should be verified in the field by a pile load test, pile driving analyzer, or other acceptable means.

3.8 PENETRATION RESISTANCE

3.8.1 Installation of each pile will be subject to approval of the Structural Engineer, who will be sole judge of acceptability of pile with respect to penetration resistance at end-of-initial-driving as well as at restriking, to depth of penetration, or to other penetration criteria. The Structural Engineer will approve the final penetration resistance of all piles prior to removal of pile driving equipment from site.

3.8.2 Prior to taking final penetration resistance, drive piles without interruption for a sufficient interval to break or prevent development of soil "set-up".

3.8.3 Drive each pile to the required tip elevation.

3.8.4 When required by the Structural Engineer, restrike piles to the same criterion as applied in initial driving (Clause 3.8.1 of this text). No additional compensation will be made for restriking.

3.9 TOLERANCES

3.9.1 Pile heads at cut-off elevation to be within 3 inches of locations indicated as measured immediately after termination of initial driving, and 6 inches as measured after all piles have been driven. To achieve pile installation within tolerances specified, the Contractor may have to resort to using temporary bracing and templates.

3.9.2 Pile rotation to be limited to 3 degrees.

3.9.3 Maintain piling within tolerances specified throughout execution work.

3.9.4 If, in the opinion of the Structural Engineer piles are placed beyond tolerances specified, the Contractor may be required to remove such piles and install new piles to the specified tolerances at his own expense.

3.10 DAMAGED OR DEFECTIVE PILES

3.10.1 The Structural Engineer will reject any pile found to be defective or damaged.

3.10.2 Remove the rejected pile and replace with a new and, if necessary, longer pile.

3.10.3 No extra compensation will be made for removing and replacing or other work made necessary through rejection of a defective pile.

3.11 LOADING TEST

3.11.1 Provide static loading test on pile(s) as selected by the Structural Engineer and at any time during performance of work. Static load tests shall conform with the procedures outlined by ASTM D 1143-81 for compressive load tests, and ASTM D-3689-90 for tensile load tests.

3.11.2 Failure of loading test to show satisfactory performance due to inadequate equipment and/or arrangement will result in rejection of the pile test and the subsequent testing of additional piles.

SECTION III

BORING LOGS, LABORATORY TESTING & FIGURES

BORING LOG TERMINOLOGY

STRATUM DEPTH

Distance in feet and/or inches below ground surface.

STRATUM ELEVATION

Elevation in feet below ground surface elevation.

DESCRIPTION OF MATERIALS

Major types of soil material existing at boring location. Soil classification based on one of the following systems: Unified Soil Classification System, Ohio State Highway Classification System, Highway Research Board Classification System, Federal Aviation Authority Classification System, Visual Classification.

SAMPLE NO.

Sample numbers are designated consecutively, increasing with depth for each boring.

SAMPLE TYPE

"A" Split spoon, 2" O.D., 1-3/8" I.D., 18" in length.

"B" One of the following:

- Power Auger Sample
- Piston Sample
- Diamond Bit NX: BX: AX:
- Housel Sample
- Wash Sample
- Denison Sample

"C" Shelby Tube 3" O.D. except where noted.

SAMPLE DEPTH

Depth below top of ground at which appropriate sample was taken.

BLOWS PER 6" ON SAMPLER

The number of blows required to drive a 2" O.D., 1-3/8" I.D., split spoon sampler, using a 140 pound hammer with a 30 inch free fall, is recorded for 6" drive increments. (Example: 3/8/9)

"N" BLOWS/FT.

Standard penetration resistance. This value is based on the total number of blows required for the last 12" of penetration. (Example: 3/8/9 $\therefore$ N = 8 + 9 = 17)

WATER OBSERVATIONS

Depth of water recorded in test boring is measured from top of ground to top of water level. Initial depth indicates water level during boring, completion depth indicates water level immediately after boring, and depth of "X" number hours indicates water level after letting water rise or fall over a time period. Water observations in pervious soil are considered reliable ground water levels for that date. Water observations in impervious soils can not be considered accurate ground water measurements for that date unless records are made over several days' time. Factors such as weather, soil porosity, etc., will cause the ground water level to fluctuate for both pervious and impervious soils.

SOIL DESCRIPTION

COLOR

When the color of the soil is uniform throughout, the color recorded will be such as brown, gray, black and may be modified by adjectives such as light and dark. If the soil's predominant color is shaded by a secondary color, the secondary color precedes the primary color, such as: gray-brown, yellow-brown. If two major and distinct colors are swirled throughout the soil, the colors will be modified by the term mottled, such as: mottled brown and gray.

PARTICLE SIZE	VISUAL	SOIL COMPONENTS	
Boulders	Larger than 8"	**Major Component**	**Minor Component Term**
Cobbles	8" to 3"	Gravel	Trace 1-10%
Gravel—Coarse	3" to ¾"	Sand	Some 11-35%
Fine	2 mm. To ¾"	Silt	And 36-50%
Sand —Coarse	2 mm.-0.6 mm. (Pencil lead size)	Clay	
—Medium	0.6 mm.-0.2 mm.	**Moisture Content**	
	(Table sugar and salt size)	**Term**	**Relative Moisture**
—Fine	0.2 mm.-0.06 mm.	Dry	Powdery
	(Powdered sugar and human hair size)	Damp	Moisture content below plastic limit
Silt	0.06 mm.-0.002 mm.	Moist	Moisture content
Clay	0.002 and smaller (Particle size of both Silt and Clay not visible		above plastic limit but below liquid limit
	to naked eye)	Wet	Moisture content above liquid limit

Condition of Soil Relative to Compactness Granular Material		Condition of Soil Relative to Consistency Cohesive Material	
Very Loose	5 blows/ft. or less	Very Soft	3 blows/ft. or less
Loose	6 to 10 blows/ft.	Soft	4 to 5 blows/ft.
Medium Dense	11 to 30 blows/ft.	Medium Stiff	6 to 10 blows/ft.
Dense	31 to 50 blows/ft.	Stiff	11 to 15 blows/ft.
Very Dense	51 blows/ft. or more	Very Stiff	16 to 30 blows/ft.
		Hard	31 blows/ft. or more

STANDARD PENETRATION RESISTANCE (ASTM D1586)

The purpose of this test is to determine the relative consistency of the soils in a boring, or from boring to boring over the site. This method consists of making a hole in the ground and driving a 2 inch O.D. split spoon sampler into the soil with a 140 pound hammer dropped from a height of 30 inches. The sampler is driven 18 inches and the number of blows recorded for each 6 inches of penetration. Values of standard penetration (N) are determined in blows per foot, summarizing the blows required for the last two 6 inch increments of penetration. (Example: 2-6-8; N = 14)

THIN-WALLED SAMPLER (ASTM D1587)

The purpose of the thin-walled sampler is to recover a relatively undisturbed soil sample for laboratory tests. The sampler is a thin-walled seamless tube with a 3 inch outside diameter, which is hydraulically pressed into the ground, at a constant rate. The ends are then sealed to prevent moisture loss, and the tube is returned to the laboratory for tests.

UNCONFINED COMPRESSION OR TRIAXIAL TESTS (ASTM D2166)

The unconfined compression test and the triaxial tests are performed to determine the shearing strength of the soil, to use in establishing its safe bearing capacity. In order to perform the unconfined compression tests, it is necessary that the soil exhibit sufficient cohesion to stand in an unsupported cylinder. These tests are normally performed on samples which are 6.0 inches in height and 2.85 inches in diameter. In the triaxial test, various lateral stresses can be applied to more closely simulate the actual field conditions. There are several different types of triaxial tests. These are, however, normally performed on constant strain apparatus with a deformation rate of 0.05 inches per minute.

CONSOLIDATION TEST (ASTM D2435)

The purpose of this test is to determine the compressibility of the soil. This test is performed on a sample of soil which is 2.5 inches in diameter and 1.0 inch in height, and has been trimmed from relatively "undisturbed" samples. The test is performed with a level system or an air activated piston for applying load. The loads are applied in increments and allowed to remain on the sample for a period of 24 hours. The consolidation of the sample under each individual load is measured and a curve of void ratio vs. Pressure is obtained. From the information obtained in this manner and the column loads of the structure, it is possible to calculate the settlement of each individual building column. This information, together with the shearing strength of the soil, is used to determine the safe bearing capacity for a particular structure.

REVISED TO ASTM D4318
ATTERBERG LIMITS (ASTM D423 AND D424)

These tests determine the liquid and plastic limits of soils having a predominant percentage of fine particle (silt and clay) sizes. The liquid limit of a soil is the moisture content expressed as a percent at which the soil changes from a liquid to a plastic state, and the plastic limit is the moisture content at which the soil changes from a plastic to a semi-solid state. Their difference is defined as the plasticity index (P.I. = L.L. - P.L.), which is the change in moisture content required to change the soil from a "semi-solid" to a liquid. These tests furnish information about the soil properties which is important in determining their relative swelling potential and their classifications.

MECHANICAL ANALYSIS (ASTM D422)

This test determines the percent of each particle size of a soil. A sieve analysis is conducted on particle sizes greater than a No. 20 sieve (0.074 mm), and a hydrometer test on particles smaller than the No. 200 sieve. The gradation curve is drawn through the points of cumulative per cent of particle size, and plotted on semi-logarithmic paper for the combined sieve and hydrometer analysis. This test, together with the Atterberg Limits tests, is used to classify a soil.

NATURAL MOISTURE CONTENT (ASTM D2216)

The purpose of this test is to indicate the range of moisture contents present in the soil. A wet sample is weighed, placed in the constant temperature oven at 105° for 24 hours, and re-weighed. The moisture content is the change in weight divided by the dry weight.

PROCTOR TESTS

The purpose of these tests is to determine the maximum density and optimum moisture content of a soil. The Modified Proctor test is performed in accordance with ASTM D1557-70. The test is performed by dropping a 10 pound hammer 25 times from an 18 inch height on each of 5 equal layers of soil in a 1/30 cubic foot mold, which represents a compaction effort of 56,250 foot pounds per cubic foot. The moisture content is then raised, and this procedure is repeated. A moisture density curve is then plotted, with the density on the ordinate axis and the moisture content on the abscissa axis. The moisture content at which the maximum density requirement can be achieved with a minimum compactive effort is designated as the optimum moisture content (O.M.C.). The Standard Proctor test is performed in accordance with ASTM D698-70. This test is similar to the Modified Proctor test and is performed by dropping a 5.5 pound hammer 25 times from a height of 12 inches on 3 equal layers of soil in a 1/30 cubic foot mold, which represents a compaction effort of 12,375 foot pounds per cubic foot. This test gives proportionately lower results than the Modified Proctor test.

FIELD CLASSIFICATION SYSTEM FOR ROCK EXPLORATION

Sarpolite A transitional material between soil and rock retains the relic structure of the parent rock and exhibits penetration resistance between 60 blows per foot and 100 blows/2 inches of penetration.

R.Q.D. Rock Quality Designation; Ratio of the core lengths greater than four inches to the total length of the core run.

Description	Percentage Core Recovered	RQD Rock Quality Description	Description of Rock Quality
Incompetent	Less than 40	0 - 25	very poor
Competent	40 - 70	25 - 50	poor
Fairly Competent	70 - 80	50 - 75	fair
Fairly Continuous	80 - 90	75 - 90	good
Continuous	90 - 100	90 - 100	excellent

FIELD HARDNESS: (A measure of resistance to scratching or abrasion)

Very Hard	Cannot be scratched with knife or sharp pick, breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of a hammer required to detach hand specimen.
Moderately Hard	Can be scratched with knife or pick. Gouges or grooves to ¼ inch deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 inch maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips and pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated with point of pick. Pieces 1 inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

WEATHERING: (The action of the elements in altering the color, texture, and composition of the rock)

Very slightly	Rock generally fresh, joints stained, some joints may contain thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slightly	Rock generally fresh, joins stained, and discoloration extends into rock up to 1 inch. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderately	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some may be decomposed to clay. Rock as dull sound under hammer and has a significant loss of strength compared with fresh rock.
Severely	All rock except quartz discolored or stained. Rock "fabric" clear and evident but reduced in strength to strong soil. In granitoid rocks all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very severely	All rock except quartz discolored of stained. Rock "fabric" discernible, but mass effectively reduces to "soil" with only fragments of strong rock usually left.
Completely	All rock completely altered to soil-like material.

ROCK FRACTURE FREQUENCY: (Any break in a rock whether or not it has undergone relative displacement.)

Description	Spacing Between Fractures
Extremely fractured	Less than 1 inch
Moderately fractured	1 inch to 4 inches
Slightly fractured	4 inches to 8 inches
Sound	More than 8 inches

Note: Fracture frequency terms are generalized to described the average condition of the rock obtained from the core run. Portions of the rock within the run described may vary from the generalized descriptions. Where a core break appears to be due to drilling and not to natural causes, it has not been considered as a break for accessing fracture frequency. Frequency shown on Record of Soil Exploration represents condition of core as removed form the core barrel.

JOINTS BEDDING, AND FOLIATION:

Joints	Bedding & Foliation	Spacing
Very close	Very thin	Less than 2 inches
Close	Thin	2 inches - 1 foot
Moderately close	Medium	1 foot - 3 feet
Wide	Thick	3 feet - 10 feet
Very wide	Very Thick	More than 10 feet

Notes: Refers to perpendicular distance between discontinuities

Attitude	Angle (degrees)
Horizontal	0 to 5
Shallow to low angle	5 to 35
Moderately dipping	35 to 55
Steep or high angle	55 to 85
Vertical	85 to 90

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BORING LOG

CLIENT: SunEnergy1 | REPORT NO.: 23897 | BORING NO.: B21-1
DATE STD.: 3/30/21 | DATE FINISHED: 3/30/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH | DRILLERS: Strata | GROUND ELEV.: 788.20
LOCATION: As Shown on the Boring Location Plan | METHOD: HSA

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-2-4	6
	6"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	4-3-7	10
2.0							
3.0							
4.0			3A	4.0	5.5	2-2-2	4
5.0							
6.0							
			4A	6.5	8.0	3-4-3	7
7.0							
8.0							
9.0			5A	9.0	10.5	1-2-1	3
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	4-6-3	9
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger | MD Mud Drilling
CFA Continuous Flight Auger | RC Rock Coring
DC Driven Casing | CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT: SunEnergy1 | REPORT NO.: 23897 | BORING NO.: B21-2
DATE STD.: 3/30/21 | DATE FINISHED: 3/30/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH | DRILLERS: Strata | GROUND ELEV.: 813.70
LOCATION: As Shown on the Boring Location Plan | METHOD: HSA

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Silt, Sand, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-5-4	9
	5"	FILL, stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	5-9-3	12
2.0							
3.0							
4.0			3A	4.0	5.5	5-10-11	21
5.0							
6.0							
			4A	6.5	8.0	10-9-14	23
7.0							
8.0							
9.0			5A	9.0	10.5	3-2-4	6
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	8-7-7	14
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger | MD Mud Drilling
CFA Continuous Flight Auger | RC Rock Coring
DC Driven Casing | CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

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BORING LOG

CLIENT:	SunEnergy1	REPORT NO.:	23897	BORING NO.:	B21-3
		DATE STD.:	3/29/21	DATE FINISHED:	3/29/21
PROJECT:	Dixon Run Solar Project, Jackson Co., OH	DRILLERS:	Strata	GROUND ELEV.:	864.30
LOCATION:	As Shown on the Boring Location Plan	METHOD:	HSA		

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	3-8-11	19
	7"	FILL, stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	9-5-7	12
2.0							
3.0							
4.0			3A	4.0	5.5	5-6-6	12
5.0							
6.0							
			4A	6.5	8.0	9-5-8	13
7.0							
8.0							
9.0			5A	9.0	10.5	6-4-3	7
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	4-3-9	12
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger
CFA Continuous Flight Auger
DC Driven Casing
MD Mud Drilling
RC Rock Coring
CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT: SunEnergy1 | REPORT NO.: 23897 | BORING NO.: B21-4
DATE STD.: 3/29/21 | DATE FINISHED: 3/29/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH | DRILLERS: Strata | GROUND ELEV.: 788.90
LOCATION: As Shown on the Boring Location Plan | METHOD: HSA

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL (Major Soil Components: Gravel, Sand, Silt, Clay; Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%)	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-2-3	5
	6"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	4-7-5	12
2.0							
3.0							
4.0			3A	4.0	5.5	3-4-4	8
5.0							
6.0							
			4A	6.5	8.0	2-4-5	9
7.0							
8.0							
9.0			5A	9.0	10.5	4-9-10	19
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	2-2-5	7
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger — MD Mud Drilling
CFA Continuous Flight Auger — RC Rock Coring
DC Driven Casing — CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT:	SunEnergy1	REPORT NO.:	23897	BORING NO.:	B21-5
		DATE STD.:	3/29/21	DATE FINISHED:	3/29/21
PROJECT:	Dixon Run Solar Project, Jackson Co., OH	DRILLERS:	Strata	GROUND ELEV.:	787.60
LOCATION:	As Shown on the Boring Location Plan	METHOD:	HSA		

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-7-5	12
	6"	FILL, stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	7-6-12	18
2.0							
3.0							
4.0			3A	4.0	5.5	4-4-7	11
5.0							
6.0							
			4A	6.5	8.0	6-7-4	11
7.0							
8.0							
9.0			5A	9.0	10.5	3-3-4	7
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	4-11-7	18
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger — MD Mud Drilling
CFA Continuous Flight Auger — RC Rock Coring
DC Driven Casing — CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT: SunEnergy1	REPORT NO.: 23897	BORING NO.: B21-6
	DATE STD.: 3/31/21	DATE FINISHED: 3/31/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH	DRILLERS: Strata	GROUND ELEV.: 809.00
LOCATION: As Shown on the Boring Location Plan	METHOD: HSA	

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Silt, Sand, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-2-3	5
	5"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	3-4-5	9
2.0							
3.0							
4.0			3A	4.0	5.5	8-12-19	31
5.0							
6.0							
		Split spoon refusal at 6.5 feet and below on rock fragments	4A	6.5	6.8	50/3"	100+
7.0							
8.0							
9.0			5A	9.0	9.2	50/2"	100+
10.0							
11.0							
12.0							
13.0							
14.0		BOTTOM OF BORING AT 14.1 FEET	6A	14.0	14.1	50/1"	100+
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS	BORING METHOD				TYPE SAMPLE	
Noted on rods Dry ft.	HSA	Hollow Stem Auger	MD	Mud Drilling	A - Split Spoon	*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring
At completion Dry ft.	CFA	Continuous Flight Auger	RC	Rock Coring	B - Rock Core	
After -- hours -- ft.	DC	Driven Casing	CA	Casing Advancer	C - Shelby Tube	
					D - Other	

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BORING LOG

CLIENT: SunEnergy1 | REPORT NO.: 23897 | BORING NO.: B21-7
DATE STD.: 3/30/21 | DATE FINISHED: 3/30/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH | DRILLERS: Strata | GROUND ELEV.: 780.40
LOCATION: As Shown on the Boring Location Plan | METHOD: HSA

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	3-4-3	7
	5"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	6-8-4	12
2.0							
3.0							
4.0			3A	4.0	5.5	4-19-34	53
5.0							
6.0							
			4A	6.5	8.0	6-9-5	14
7.0							
8.0							
9.0		Split spoon refusal at 9.0 feet on rock fragments	5A	9.0	9.7	13-50/2"	100+
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	10-14-8	22
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods __Dry__ ft.
At completion __Dry__ ft.
After __--__ hours __--__ ft.

BORING METHOD
HSA Hollow Stem Auger — MD Mud Drilling
CFA Continuous Flight Auger — RC Rock Coring
DC Driven Casing — CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT:	SunEnergy1	REPORT NO.:	23897	BORING NO.:	B21-8
		DATE STD.:	3/30/21	DATE FINISHED:	3/30/21
PROJECT:	Dixon Run Solar Project, Jackson Co., OH	DRILLERS:	Strata	GROUND ELEV.:	853.80
LOCATION:	As Shown on the Boring Location Plan	METHOD:	HSA		

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Silt, Sand, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	3-5-47	52
	6"	FILL, stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
		Split spoon refusal at 1.5 feet and below on rock fragments	2A	1.5	1.7	50/2	100+
2.0							
3.0							
4.0			3A	4.0	5.5	4-6-16	22
5.0							
6.0							
			4A	6.5	7.3	12-50/3	100+
7.0							
8.0							
9.0			5A	9.0	10.5	3-4-3	7
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	6-9-10	19
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods __Dry__ ft.
At completion __Dry__ ft.
After __--__ hours __--__ ft.

BORING METHOD
HSA Hollow Stem Auger — MD Mud Drilling
CFA Continuous Flight Auger — RC Rock Coring
DC Driven Casing — CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT:	SunEnergy1	REPORT NO.:	23897	BORING NO.:	B21-9
		DATE STD.:	3/30/21	DATE FINISHED:	3/30/21
PROJECT:	Dixon Run Solar Project, Jackson Co., OH	DRILLERS:	Strata	GROUND ELEV.:	828.80
LOCATION:	As Shown on the Boring Location Plan	METHOD:	HSA		

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	4-4-4	8
	5"	FILL, stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	3-9-4	13
2.0							
3.0							
4.0			3A	4.0	5.5	5-5-3	8
5.0							
6.0							
			4A	6.5	8.0	7-9-13	22
7.0							
8.0							
9.0			5A	9.0	10.5	3-3-3	6
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	6-6-12	18
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS	BORING METHOD				TYPE SAMPLE	
Noted on rods __Dry__ ft.	HSA	Hollow Stem Auger	MD	Mud Drilling	A - Split Spoon	*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring
At completion __Dry__ ft.	CFA	Continuous Flight Auger	RC	Rock Coring	B - Rock Core	
After __--__ hours __--__ ft.	DC	Driven Casing	CA	Casing Advancer	C - Shelby Tube	
					D - Other	

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BORING LOG

CLIENT: SunEnergy1 | REPORT NO.: 23897 | BORING NO.: B21-10
DATE STD.: 3/31/21 | DATE FINISHED: 3/31/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH | DRILLERS: Strata | GROUND ELEV.: 834.70
LOCATION: As Shown on the Boring Location Plan | METHOD: HSA

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Silt, Sand, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-3-3	6
	7"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace					
1.0		rock fragments (moist)					
			2A	1.5	3.0	5-6-4	10
2.0							
3.0							
4.0		Split spoon refusal at 4.0 feet and below on rock	3A	4.0	4.2	50/2"	100+
		fragments					
5.0							
6.0							
			4A	6.5	7.6	16-25-50/1"	100+
7.0							
8.0							
9.0			5A	9.0	10.5	5-10-4	14
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	9-4-7	11
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger | MD Mud Drilling
CFA Continuous Flight Auger | RC Rock Coring
DC Driven Casing | CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT: SunEnergy1	REPORT NO.: 23897	BORING NO.: B21-11	
	DATE STD.: 3/31/21	DATE FINISHED: 3/31/21	
PROJECT: Dixon Run Solar Project, Jackson Co., OH	DRILLERS: Strata	GROUND ELEV.: 845.40	
LOCATION: As Shown on the Boring Location Plan	METHOD: HSA		

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	1-3-4	7
	6"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	3-4-6	10
2.0							
3.0							
4.0			3A	4.0	5.5	2-7-18	25
5.0							
6.0							
			4A	6.5	8.0	13-21-8	29
7.0							
8.0							
9.0			5A	9.0	10.5	3-3-3	6
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	5-7-4	11
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS	BORING METHOD		TYPE SAMPLE	
Noted on rods Dry ft.	HSA Hollow Stem Auger	MD Mud Drilling	A - Split Spoon	*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring
At completion Dry ft.	CFA Continuous Flight Auger	RC Rock Coring	B - Rock Core	
After -- hours -- ft.	DC Driven Casing	CA Casing Advancer	C - Shelby Tube	
			D - Other	

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BORING LOG

CLIENT: SunEnergy1 | REPORT NO.: 23897 | BORING NO.: B21-12
DATE STD.: 3/29/21 | DATE FINISHED: 3/29/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH | DRILLERS: Strata | GROUND ELEV.: 861.40
LOCATION: As Shown on the Boring Location Plan | METHOD: HSA

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-3-3	6
	5"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	3-5-8	13
2.0							
3.0							
4.0			3A	4.0	5.5	13-13-14	27
5.0							
6.0							
			4A	6.5	8.0	4-14-9	23
7.0							
8.0							
9.0			5A	9.0	10.5	3-4-6	10
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	2-5-6	11
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger — MD Mud Drilling
CFA Continuous Flight Auger — RC Rock Coring
DC Driven Casing — CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT: SunEnergy1 — REPORT NO.: 23897 — BORING NO.: B21-13
DATE STD.: 3/29/21 — DATE FINISHED: 3/29/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH — DRILLERS: Strata — GROUND ELEV.: 808.40
LOCATION: As Shown on the Boring Location Plan — METHOD: HSA

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Silt, Sand, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-1-2	3
	4"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	3-4-5	9
2.0							
3.0							
4.0		Split spoon refusal at 4.0 feet on rock fragments	3A	4.0	5.1	3-24-50/1"	100+
5.0							
6.0							
			4A	6.5	8.0	4-10-15	25
7.0							
8.0							
9.0			5A	9.0	10.5	5-3-5	8
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	6-7-9	16
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods __Dry__ ft.
At completion __Dry__ ft.
After __--__ hours __--__ ft.

BORING METHOD
HSA Hollow Stem Auger — MD Mud Drilling
CFA Continuous Flight Auger — RC Rock Coring
DC Driven Casing — CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT: SunEnergy1 — REPORT NO.: 23897 — BORING NO.: B21-14
DATE STD.: 4/2/21 — DATE FINISHED: 4/2/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH — DRILLERS: Strata — GROUND ELEV.: N.T.
LOCATION: As Shown on the Boring Location Plan — METHOD: HSA

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Silt, Sand, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	1-2-3	5
	6"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	2-6-6	12
2.0							
3.0							
4.0			3A	4.0	5.5	3-3-5	8
5.0							
6.0							
		Split spoon refusal at 6.5 feet and below on rock fragments	4A	6.5	6.8	50/3"	100+
7.0							
8.0							
9.0			5A	9.0	10.5	2-2-4	6
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	14.2	50/2	100+
		BOTTOM OF BORING AT 14.2 FEET					
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger — MD Mud Drilling
CFA Continuous Flight Auger — RC Rock Coring
DC Driven Casing — CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT:	SunEnergy1	REPORT NO.:	23897	BORING NO.:	B21-15
		DATE STD.:	4/2/21	DATE FINISHED:	4/2/21
PROJECT:	Dixon Run Solar Project, Jackson Co., OH	DRILLERS:	Strata	GROUND ELEV.:	805.30
LOCATION:	As Shown on the Boring Location Plan	METHOD:	HSA		

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-3-4	7
	7"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	6-7-11	18
2.0							
3.0							
4.0			3A	4.0	5.5	9-11-13	24
5.0							
6.0							
			4A	6.5	8.0	8-6-3	9
7.0							
8.0							
9.0			5A	9.0	10.5	2-2-2	4
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	25-23-18	41
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger
CFA Continuous Flight Auger
DC Driven Casing
MD Mud Drilling
RC Rock Coring
CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT: SunEnergy1	REPORT NO.: 23897	BORING NO.: B21-16
	DATE STD.: 4/1/21	DATE FINISHED: 4/1/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH	DRILLERS: Strata	GROUND ELEV.: 777.40
LOCATION: As Shown on the Boring Location Plan	METHOD: HSA	

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	1-2-5	7
	7"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	3-12-13	25
2.0							
3.0							
4.0			3A	4.0	5.5	5-9-4	13
5.0							
6.0							
			4A	6.5	8.0	12-8-10	18
7.0							
8.0							
9.0			5A	9.0	10.5	4-4-7	11
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	6-9-7	16
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS	BORING METHOD		TYPE SAMPLE	
Noted on rods __Dry__ ft.	HSA Hollow Stem Auger	MD Mud Drilling	A - Split Spoon	*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring
At completion __Dry__ ft.	CFA Continuous Flight Auger	RC Rock Coring	B - Rock Core	
After __--__ hours __--__ ft.	DC Driven Casing	CA Casing Advancer	C - Shelby Tube	
			D - Other	

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BORING LOG

CLIENT: SunEnergy1 | REPORT NO.: 23897 | BORING NO.: B21-17
DATE STD.: 4/1/21 | DATE FINISHED: 4/1/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH | DRILLERS: Strata | GROUND ELEV.: 834.60
LOCATION: As Shown on the Boring Location Plan | METHOD: HSA

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-2-3	5
	6"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	3-5-9	14
2.0							
3.0							
4.0			3A	4.0	5.5	8-4-7	11
5.0							
6.0							
			4A	6.5	8.0	3-12-4	16
7.0							
8.0							
9.0			5A	9.0	10.5	10-9-8	17
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	9-8-9	17
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger
CFA Continuous Flight Auger
DC Driven Casing
MD Mud Drilling
RC Rock Coring
CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT: SunEnergy1	REPORT NO.: 23897	BORING NO.: B21-18
	DATE STD.: 3/30/21	DATE FINISHED: 3/30/21
PROJECT: Dixon Run Solar Project, Jackson Co., OH	DRILLERS: Strata	GROUND ELEV.: 776.60
LOCATION: As Shown on the Boring Location Plan	METHOD: HSA	

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Silt, Sand, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	DEPTH OF SAMPLE, FT. TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	1-2-7	9
	6"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	4-4-6	10
2.0							
3.0							
4.0			3A	4.0	5.5	4-2-2	4
5.0							
6.0							
			4A	6.5	8.0	6-4-5	9
7.0							
8.0							
9.0			5A	9.0	10.5	3-3-3	6
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	4-5-3	8
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS	BORING METHOD		TYPE SAMPLE	
Noted on rods Dry ft.	HSA Hollow Stem Auger	MD Mud Drilling	A - Split Spoon	*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring
At completion Dry ft.	CFA Continuous Flight Auger	RC Rock Coring	B - Rock Core	
After -- hours -- ft.	DC Driven Casing	CA Casing Advancer	C - Shelby Tube	
			D - Other	

CBC Engineers & Associates, Ltd.
125 Westpark Road
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BORING LOG

CLIENT:	SunEnergy1	REPORT NO.:	23897	BORING NO.:	B21-19
		DATE STD.:	4/2/21	DATE FINISHED:	4/2/21
PROJECT:	Dixon Run Solar Project, Jackson Co., OH	DRILLERS:	Strata	GROUND ELEV.:	752.70
LOCATION:	As Shown on the Boring Location Plan	METHOD:	HSA		

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	2-4-3	7
	5"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace rock fragments (moist)					
1.0							
			2A	1.5	3.0	6-10-5	15
2.0							
3.0							
4.0		Split spoon refusal at 4.0 feet and below on rock fragments	3A	4.0	4.2	50/2"	100+
5.0							
6.0							
			4A	6.5	7.2	1-50/2"	100+
7.0							
8.0							
9.0			5A	9.0	10.5	4-5-2	7
10.0							
11.0							
12.0							
13.0							
14.0			6A	14.0	15.5	2-2-2	4
15.0							
		BOTTOM OF BORING AT 15.5 FEET					
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods __Dry__ ft.
At completion __Dry__ ft.
After __--__ hours __--__ ft.

BORING METHOD
HSA Hollow Stem Auger — MD Mud Drilling
CFA Continuous Flight Auger — RC Rock Coring
DC Driven Casing — CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT:	SunEnergy1	REPORT NO.:	23897	BORING NO.:	B21-20
		DATE STD.:	3/30/21	DATE FINISHED:	3/30/21
PROJECT:	Dixon Run Solar Project, Jackson Co., OH	DRILLERS:	Strata	GROUND ELEV.:	812.10
LOCATION:	As Shown on the Boring Location Plan	METHOD:	HSA		

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	DEPTH OF SAMPLE, FT. TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL	1A	0.0	1.5	3-5-9	14
	6"	FILL, soft to stiff, silty CLAY MINE SPOIL, trace					
1.0		rock fragments (moist)					
			2A	1.5	3.0	7-7-8	15
2.0							
3.0							
4.0			3A	4.0	5.5	8-3-9	12
5.0							
6.0							
			4A	6.5	8.0	2-2-2	4
7.0							
8.0							
9.0			5A	9.0	10.5	4-9-6	15
10.0							
11.0							
12.0							
13.0							
14.0		Split spoon refusal at 14.0 feet on rock fragments	6A	14.0	14.1	50/1"	100+
		BOTTOM OF BORING AT 14.1 FEET					
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							

WATER LEVEL OBSERVATIONS
Noted on rods Dry ft.
At completion Dry ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger — MD Mud Drilling
CFA Continuous Flight Auger — RC Rock Coring
DC Driven Casing — CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

DIXON RUN SOLAR PROJECT, JACKSON COUNTY, OHIO
4-PIN FIELD RESISTIVITY TESTING

ADJACENT TO BORING	PIN SPACING (ft.)	METER READING (ohm)	CALCULATED RESISTIVITY (ohm-cm)
B21-1	5	3.00	2873
B21-1	10	1.27	2432
B21-1	15	0.84	2413
B21-1	20	0.65	2490
B21-4	5	2.71	2595
B21-4	10	1.47	2815
B21-4	15	1.11	3189
B21-4	20	0.90	3447
B21-6	5	4.82	4615
B21-6	10	1.78	3409
B21-6	15	1.20	3447
B21-6	20	1.01	3869
B21-12	5	2.98	2854
B21-12	10	1.59	3045
B21-12	15	1.06	3045
B21-12	20	0.76	2911
B21-19	5	3.39	3246
B21-19	10	1.49	2854
B21-19	15	1.02	2930
B21-19	20	0.60	2298

TABLE 1

RESULTS OF NATURAL MOISTURE CONTENT TESTS (ASTM D-4643)

BORING NO.	DEPTH INCREMENT, (FT.)	NATURAL MOISTURE CONTENT, %
B21-1	0.0 – 1.5	19.16
B21-1	1.5 – 3.0	11.99
B21-1	4.0 – 5.5	24.59
B21-1	6.5 – 8.0	12.17
B21-1	9.0 – 10.5	17.56
B21-1	14.0 – 15.5	18.06
B21-2	0.0 – 1.5	16.42
B21-2	4.0 – 5.5	8.63
B21-2	6.5 – 8.0	9.49
B21-2	9.0 – 10.5	10.40
B21-2	14.0 – 15.5	6.61
B21-3	0.0 – 1.5	13.96
B21-3	1.5 – 3.0	7.03
B21-3	4.0 – 5.5	10.98
B21-3	6.5 – 8.0	10.34
B21-3	9.0 – 10.5	13.15
B21-3	14.0 – 15.5	8.94
B21-4	0.0 – 1.5	14.75
B21-4	1.5 – 3.0	13.65
B21-4	4.0 – 5.5	12.79
B21-4	6.5 – 8.0	14.96
B21-4	9.0 – 10.5	11.78
B21-4	14.0 – 15.5	12.38
B21-5	0.0 – 1.5	11.61
B21-5	1.5 – 3.0	8.87
B21-5	4.0 – 5.5	7.02
B21-5	6.5 – 8.0	9.14
B21-5	9.0 – 10.5	8.86
B21-5	14.0 – 15.5	12.26
B21-6	0.0 – 1.5	20.34
B21-6	1.5 – 3.0	18.30

B21-6	4.0 – 5.5	16.59
B21-6	6.5 – 8.0	8.26
B21-6	9.0 – 10.5	8.19
B21-7	0.0 – 1.5	18.25
B21-7	1.5 – 3.0	19.31
B21-7	4.0 – 5.5	10.54
B21-7	6.5 – 8.0	12.89
B21-7	9.0 – 10.5	5.30
B21-7	14.0 – 15.5	11.97
B21-8	0.0 – 1.5	13.19
B21-8	1.5 – 3.0	4.02
B21-8	4.0 – 5.5	12.85
B21-8	6.5 – 8.0	14.83
B21-8	9.0 – 10.5	11.28
B21-8	14.0 – 15.5	10.74
B21-9	0.0 – 1.5	11.77
B21-9	1.5 – 3.0	11.38
B21-9	4.0 – 5.5	11.50
B21-9	6.5 – 8.0	5.05
B21-9	9.0 – 10.5	13.15
B21-9	14.0 – 15.5	16.13
B21-10	0.0 – 1.5	15.67
B21-10	1.5 – 3.0	17.30
B21-10	4.0 – 5.5	12.82
B21-10	9.0 – 10.5	12.96
B21-10	14.0 – 15.5	13.79
B21-11	0.0 – 1.5	18.16
B21-11	1.5 – 3.0	15.88
B21-11	4.0 – 5.5	12.26
B21-11	6.5 – 8.0	8.50
B21-11	9.0 – 10.5	10.65
B21-11	14.0 – 15.5	12.95
B21-12	0.0 – 1.5	15.95
B21-12	1.5 – 3.0	14.69
B21-12	4.0 – 5.5	12.25
B21-12	6.5 – 8.0	4.96

B21-12	9.0 – 10.5	14.68
B21-12	14.0 – 15.5	10.90
B21-13	0.0 – 1.5	17.9
B21-13	1.5 – 3.0	10.11
B21-13	4.0 – 5.5	13.19
B21-13	6.5 – 8.0	6.11
B21-13	9.0 – 10.5	20.33
B21-13	14.0 – 15.5	8.84
B21-14	0.0 – 1.5	15.55
B21-14	1.5 – 3.0	13.25
B21-14	4.0 – 5.5	11.84
B21-14	6.5 – 8.0	11.62
B21-14	9.0 – 10.5	21.88
B21-14	14.0 – 15.5	7.32
B21-15	0.0 – 1.5	15.07
B21-15	1.5 – 3.0	5.96
B21-15	4.0 – 5.5	11.40
B21-15	6.5 – 8.0	7.06
B21-15	9.0 – 10.5	17.33
B21-15	14.0 – 15.5	3.87
B21-16	0.0 – 1.5	18.28
B21-16	1.5 – 3.0	10.03
B21-16	4.0 – 5.5	7.54
B21-16	6.5 – 8.0	26.01
B21-16	9.0 – 10.5	13.04
B21-16	14.0 – 15.5	13.08
B21-17	0.0 – 1.5	14.84
B21-17	1.5 – 3.0	10.32
B21-17	4.0 – 5.5	10.80
B21-17	6.5 – 8.0	9.28
B21-17	9.0 – 10.5	11.23
B21-17	14.0 – 15.5	13.33
B21-18	0.0 – 1.5	27.86
B21-18	1.5 – 3.0	18.49
B21-18	4.0 – 5.5	15.25
B21-18	6.5 – 8.0	19.86

B21-18	9.0 – 10.5	18.16
B21-18	14.0 – 15.5	19.54
B21-19	0.0 – 1.5	14.26
B21-19	1.5 – 3.0	10.95
B21-19	4.0 – 5.5	8.33
B21-19	6.5 – 8.0	18.21
B21-19	9.0 – 10.5	15.95
B21-19	14.0 – 15.5	26.90
B21-20	0.0 – 1.5	20.58
B21-20	1.5 – 3.0	16.30
B21-20	4.0 – 5.5	16.47
B21-20	6.5 – 8.0	14.94
B21-20	9.0 – 10.5	18.05
B21-20	14.0 – 15.5	14.28

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LABORATORY REPORT

Report To:	CBC Engineers and Associates Attn: Mitch Hardert 125 Westpark Road Centerville, OH 45459	**Report Date:** **Job No.:** **Report No.:** **No. of Pages:**	April 23, 2021 200408 302922A 2

Report On: Laboratory Analysis of One Soil Sample
Project: CBC Job No. 23897
Sample ID: **Boring B21-1**

On April 6, 2021, one sample of soil was submitted for selected laboratory analysis for the above referenced project. Testing was performed as specified by the client and in accordance with the following procedures:

AASHTO T 288, "Determining Minimum Laboratory Soil Resistivity".

AASHTO T 289, "Determining pH of Soil for Use in Corrosion Testing".

AASHTO T 290, "Determining Water-Soluble Sulfate Ion Content in Soil".

AASHTO T 291, "Determining Water-Soluble Chloride Ion Content in Soil".

Results are presented in the following table and detailed on the attached data sheet.

Test Parameter	Results
Minimum Resistivity, ohm-cm:	**3,400**
pH:	**7.9**
Water Soluble Sulfate Ion, mg/kg (ppm):	**669**
Water Soluble Chloride Ion, mg/kg (ppm):	**<10**

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

Respectfully submitted,

BOWSER-MORNER, INC.

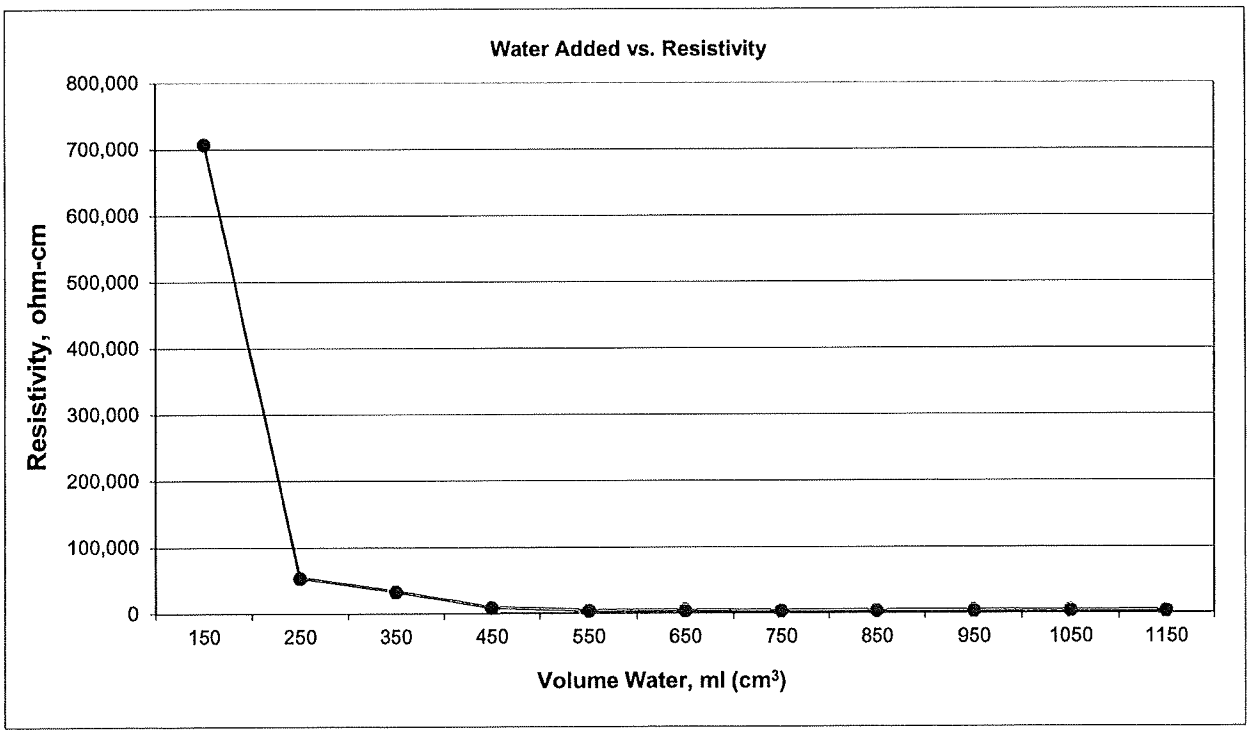
Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

KAF/blc
302922A
1-File
1-mitchhardert@cbceng.com

Report To:	CBC Engineers & Associates, LTD	BMI Job No.:	200408
Project:	CBC-23897	BMI Report No.:	302922A
Sample ID:	**Boring B21-1**	Date Received:	04/06/21

Procedure: AASHTO T 288, "Determining Minimum Laboratory Soil Resistivity"

Water Added, ml.		Resistivity, ohm-cm	
1	150	707,200	
2	250	53,720	
3	350	32,640	
4	450	8,840	**100% Saturation**
5	550	4,148	**Super Saturated**
6	650	3,944	
7	750	3,672	
8	850	3,536	
9	950	3,468	
10	1050	3,400	**Minimum Resistivity**
11	1150	3,604	



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LABORATORY REPORT

Report To: CBC Engineers and Associates
Attn: Mitch Hardert
125 Westpark Road
Centerville, OH 45459

Report Date: April 23, 2021
Job No.: 200408
Report No.: 302923A
No. of Pages: 2

Report On: Laboratory Analysis of One Soil Sample
Project: CBC Job No. 23897
Sample ID: **Boring B21-4**

On April 6, 2021, one sample of soil was submitted for selected laboratory analysis for the above referenced project. Testing was performed as specified by the client and in accordance with the following procedures:

AASHTO T 288, "Determining Minimum Laboratory Soil Resistivity".

AASHTO T 289, "Determining pH of Soil for Use in Corrosion Testing".

AASHTO T 290, "Determining Water-Soluble Sulfate Ion Content in Soil".

AASHTO T 291, "Determining Water-Soluble Chloride Ion Content in Soil".

Results are presented in the following table and detailed on the attached data sheet.

Test Parameter	Results
Minimum Resistivity, ohm-cm:	**4,012**
pH:	**7.6**
Water Soluble Sulfate Ion, mg/kg (ppm):	**959**
Water Soluble Chloride Ion, mg/kg (ppm):	**<10**

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

Respectfully submitted,
BOWSER-MORNER, INC.

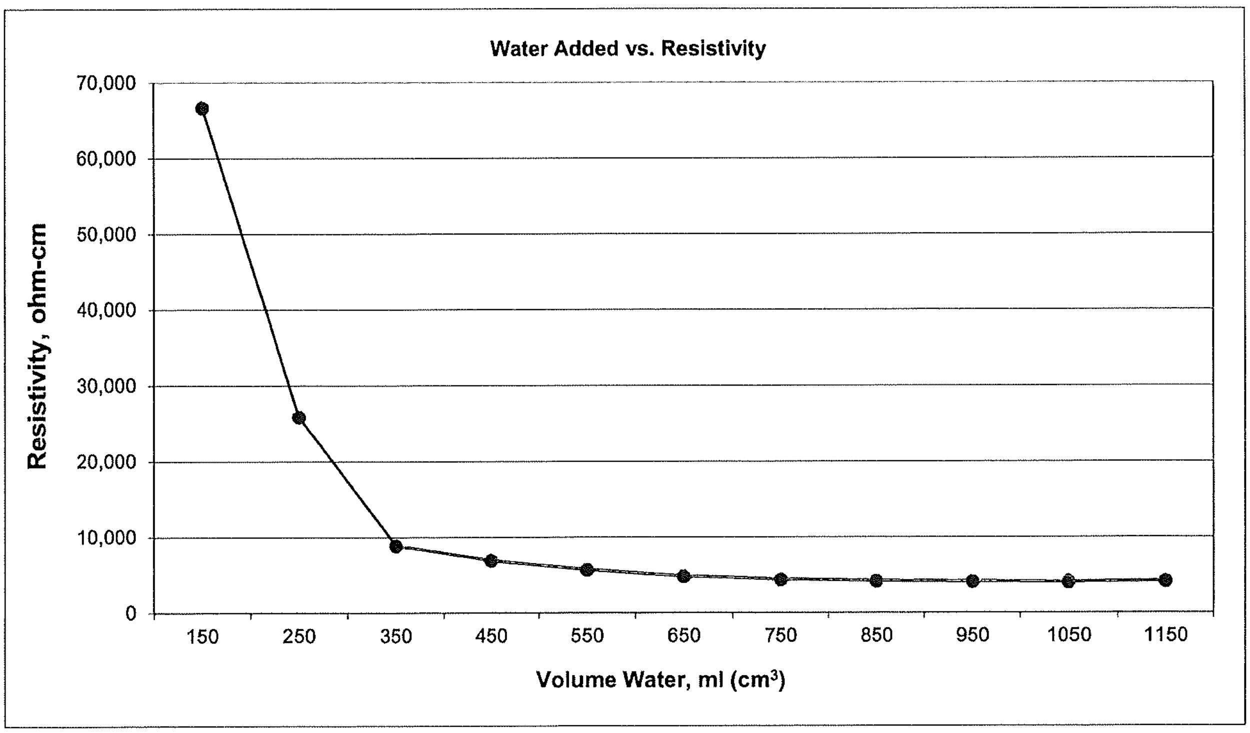
Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

KAF/blc
302923A
1-File
1-mitchhardert@cbceng.com

Report To:	CBC Engineers & Associates, LTD	BMI Job No.:	200408
Project:	CBC-23897	BMI Report No.:	302923A
Sample ID:	**Boring B21-4**	Date Received:	04/06/21

Procedure: AASHTO T 288, "Determining Minimum Laboratory Soil Resistivity"

Water Added, ml.		Resistivity, ohm-cm	
1	150	66,640	
2	250	25,840	
3	350	8,840	
4	450	6,868	**100% Saturation**
5	550	5,644	**Super Saturated**
6	650	4,760	
7	750	4,352	
8	850	4,148	
9	950	4,080	
10	1050	4,012	**Minimum Resistivity**
11	1150	4,148	



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LABORATORY REPORT

Report To: CBC Engineers and Associates
Attn: Mitch Hardert
125 Westpark Road
Centerville, OH 45459

Report Date: April 23, 2021
Job No.: 200408
Report No.: 302924A
No. of Pages: 2

Report On: Laboratory Analysis of One Soil Sample
Project: CBC Job No. 23897
Sample ID: **Boring B21-6**

On April 6, 2021, one sample of soil was submitted for selected laboratory analysis for the above referenced project. Testing was performed as specified by the client and in accordance with the following procedures:

AASHTO T 288, "Determining Minimum Laboratory Soil Resistivity".
AASHTO T 289, "Determining pH of Soil for Use in Corrosion Testing".
AASHTO T 290, "Determining Water-Soluble Sulfate Ion Content in Soil".
AASHTO T 291, "Determining Water-Soluble Chloride Ion Content in Soil".

Results are presented in the following table and detailed on the attached data sheet.

Test Parameter	Results
Minimum Resistivity, ohm-cm:	**5,372**
pH:	**4.0**
Water Soluble Sulfate Ion, mg/kg (ppm):	**595**
Water Soluble Chloride Ion, mg/kg (ppm):	**<10**

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

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

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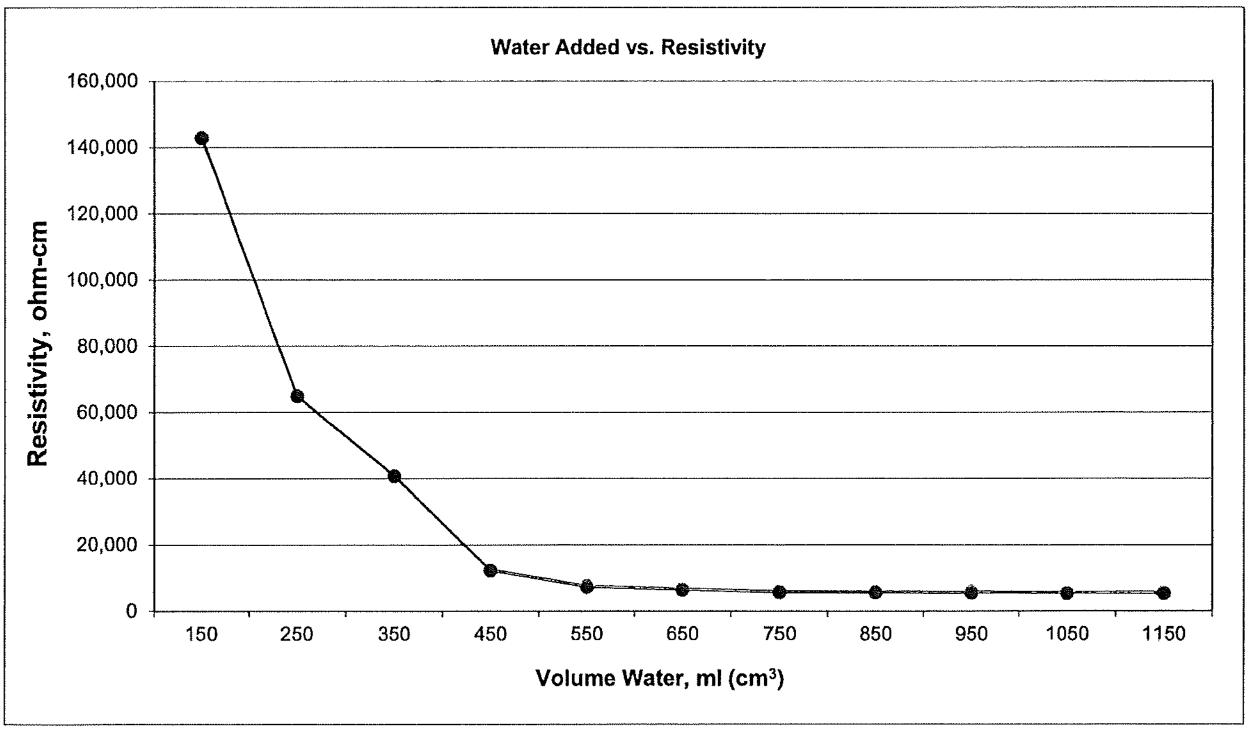
Report To: CBC Engineers & Associates, LTD
Project: CBC-23897
Sample ID: **Boring B21-6**

BMI Job No.: 200408
BMI Report No.: 302924A
Date Received: 04/06/21

Procedure: AASHTO T 288, "Determining Minimum Laboratory Soil Resistivity"

Water Added, ml.		Resistivity, ohm-cm	
1	150	142,800	
2	250	64,880	
3	350	40,800	
4	450	12,240	**100% Saturation**
5	550	7,276	**Super Saturated**
6	650	6,460	
7	750	5,712	
8	850	5,576	
9	950	5,508	
10	1050	5,372	**Minimum Resistivity**
11	1150	5,440	



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LABORATORY REPORT

Report To: CBC Engineers and Associates
Attn: Mitch Hardert
125 Westpark Road
Centerville, OH 45459

Report Date: April 23, 2021
Job No.: 200408
Report No.: 302925A
No. of Pages: 2

Report On: Laboratory Analysis of One Soil Sample
Project: CBC Job No. 23897
Sample ID: **Boring B21-12**

On April 6, 2021, one sample of soil was submitted for selected laboratory analysis for the above referenced project. Testing was performed as specified by the client and in accordance with the following procedures:

AASHTO T 288, "Determining Minimum Laboratory Soil Resistivity".
AASHTO T 289, "Determining pH of Soil for Use in Corrosion Testing".
AASHTO T 290, "Determining Water-Soluble Sulfate Ion Content in Soil".
AASHTO T 291, "Determining Water-Soluble Chloride Ion Content in Soil".

Results are presented in the following table and detailed on the attached data sheet.

Test Parameter	Results
Minimum Resistivity, ohm-cm:	**1,564**
pH:	**8.1**
Water Soluble Sulfate Ion, mg/kg (ppm):	**452**
Water Soluble Chloride Ion, mg/kg (ppm):	**<10**

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

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

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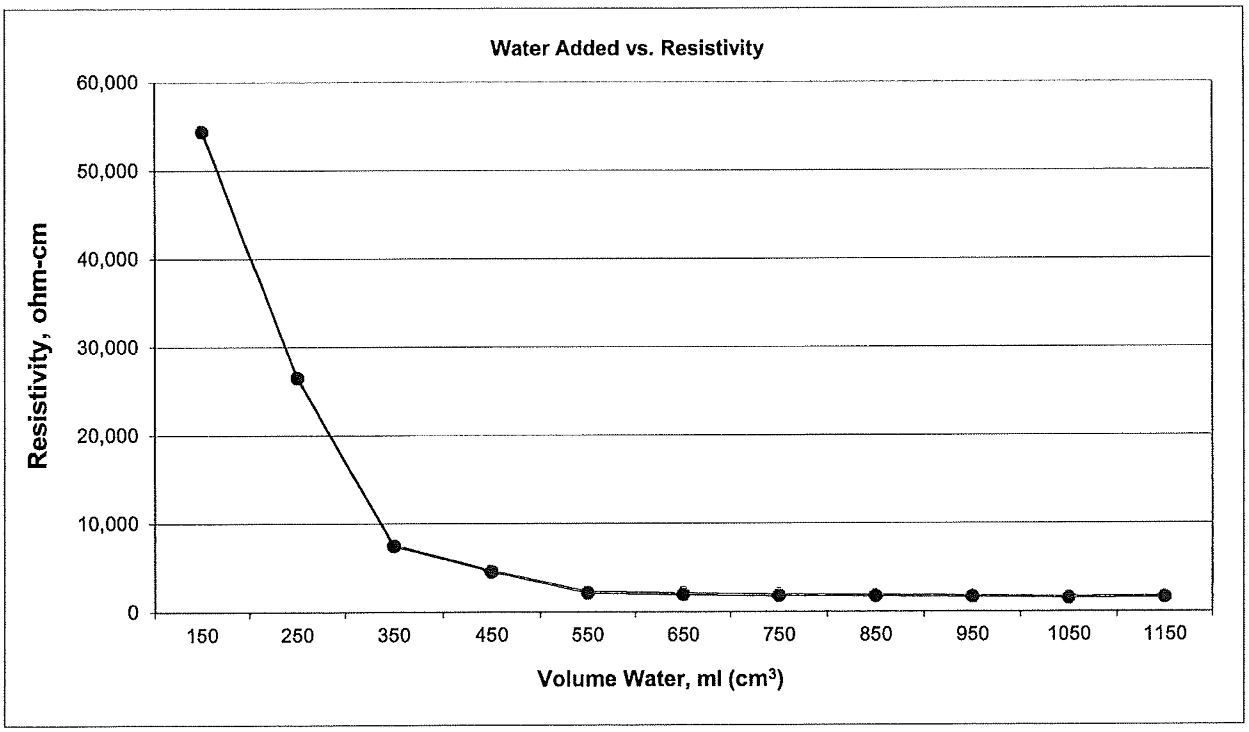
Report To:	CBC Engineers & Associates, LTD	BMI Job No.:	200408
Project:	CBC-23897	BMI Report No.:	302925A
Sample ID:	**Boring B21-12**	Date Received:	04/06/21

Procedure: AASHTO T 288, "Determining Minimum Laboratory Soil Resistivity"

Water Added, ml.		Resistivity, ohm-cm	
1	150	54,400	
2	250	26,520	
3	350	7,480	
4	450	4,556	**100% Saturation**
5	550	2,176	**Super Saturated**
6	650	1,972	
7	750	1,836	
8	850	1,768	
9	950	1,700	
10	1050	1,564	**Minimum Resistivity**
11	1150	1,632	



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LABORATORY REPORT

Report To: CBC Engineers and Associates
Attn: Mitch Hardert
125 Westpark Road
Centerville, OH 45459

Report Date: April 23, 2021
Job No.: 200408
Report No.: 302926A
No. of Pages: 2

Report On: Laboratory Analysis of One Soil Sample
Project: CBC Job No. 23897
Sample ID: **Boring B21-19**

On April 6, 2021, one sample of soil was submitted for selected laboratory analysis for the above referenced project. Testing was performed as specified by the client and in accordance with the following procedures:

AASHTO T 288, "Determining Minimum Laboratory Soil Resistivity".

AASHTO T 289, "Determining pH of Soil for Use in Corrosion Testing".

AASHTO T 290, "Determining Water-Soluble Sulfate Ion Content in Soil".

AASHTO T 291, "Determining Water-Soluble Chloride Ion Content in Soil".

Results are presented in the following table and detailed on the attached data sheet.

Test Parameter	Results
Minimum Resistivity, ohm-cm:	**4,964**
pH:	**8.2**
Water Soluble Sulfate Ion, mg/kg (ppm):	**316**
Water Soluble Chloride Ion, mg/kg (ppm):	**<10**

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

Respectfully submitted,

BOWSER-MORNER, INC.

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Report To: CBC Engineers & Associates, LTD
Project: CBC-23897
Sample ID: **Borin B21-19**

BMI Job No.: 200408
BMI Report No.: 302926A
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Procedure: AASHTO T 288, "Determining Minimum Laboratory Soil Resistivity"

Water Added, ml.		Resistivity, ohm-cm	
1	150	69,360	
2	250	55,080	
3	350	36,040	
4	450	12,240	**100% Saturation**
5	550	5,712	**Super Saturated**
6	650	5,372	
7	750	5,236	
8	850	5,168	
9	950	5,032	
10	1050	4,964	**Minimum Resistivity**
11	1150	5,032