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January 27, 2022

Mr. Kevin Wagner
VP Engineering
Illinois Municipal Electric Agency
3400 Conifer Drive
Springfield, IL 62711

Re: Subsurface Exploration and Foundation Recommendations
Proposed Solar Array
Ace Road
Princeton, Illinois
MET Project No. 213128

Dear Mr. Wagner:

In accordance with your request, Midwest Engineering and Testing, Inc. (MET) has completed a subsurface exploration and an evaluation of the subsurface conditions at the above-referenced project site. Our geotechnical report, which outlines the findings and our recommendations for design and construction of the foundation system, is being submitted in PDF format via e-mail. Hard copies can be provided, if so desired.

MET appreciates the opportunity to be of service during this phase of the project. If there are any further questions or comments you may have regarding the content of this report, please contact us at your convenience.

Sincerely,

Midwest Engineering and Testing, Inc.

Nicholas D. Wendling, P.E.
Geotechnical Department Manager

Daniel E. Tappendorf

Digitally signed by Daniel E. Tappendorf
DN: cn=Daniel E. Tappendorf, o=President, ou=Midwest Engineering and Testing, Inc., email=dtappendorf@metgeotech.com, c=UY
Date: 2022.01.27 13:07:39 -06'00'

Daniel E. Tappendorf, P.E.
President

SUBSURFACE EXPLORATION
AND
FOUNDATION RECOMMENDATIONS

Proposed Solar Array
Ace Road
Princeton, Illinois

Prepared For

Illinois Municipal Electric Agency
3400 Conifer Drive
Springfield, IL 62711

January 27, 2022

MET File No. 213128

TABLE OF CONTENTS

INTRODUCTION

General

This report presents the results of a subsurface exploration and geotechnical evaluation at the site of the proposed new Solar Array on the south side of Ace Road in Princeton, Illinois. A Vicinity Map, Figure 1, is included in the Appendix. The purpose of this study was to determine and evaluate the subsurface conditions existing at the subject site, and to establish related parameters for use by the design engineers. Included herein are the results of the subsurface exploration, field and laboratory soil test data, and recommendations regarding design and construction of the foundation systems.

Scope

The scope of services included a reconnaissance of the site, subsurface exploration, field and laboratory testing of the soil samples collected, and engineering analysis and evaluation of the data. In addition, geologic maps and literature relative to the general area of the site reviewed.

Authorization

Authorization to perform this geotechnical exploration was in the form of fully executed Purchase Order No. 20220056, dated October 14, 2021, which was provided to Midwest Engineering and Testing, Inc. (MET) by the Illinois Municipal Electrical Agency. The purchase order was sent in response to MET Proposal No 21239, dated October 12, 2021 which outlined the scope of services and conditions for performance of the work.

SITE & PROJECT DESCRIPTION

The proposed project site is an approximate 8-acre tract of land located on the south side of Ace Road near its intersection with Van’s Way in northeastern Princeton, Illinois. The project site has historically been utilized as agricultural cropland and has a relatively flat topography with surface drainage generally trending from the southeast to the northwest.

The proposed project involves construction of a new solar array with associated equipment. We anticipate the solar panels will be supported by small driven piles or helical piles while other equipment will be supported by pad-mounted shallow foundations. The solar array racking structures are inherently light, with foundation design typically governed by lateral and uplift forces.

GEOLOGY OF THE AREA

Bedrock in the project area is generally found at depths in excess of 300 feet below the ground surface and consists primarily of Pennsylvanian Age deposits. Shale, Sandstone, and Coal are the predominant rock types comprising the formation in this area.

The surficial geology in the vicinity generally consists of 10 to 15 feet of wind deposited and water worked loessial material overlying Wisconsinan Age glacial drift. The principal constituent of the drift is glacial till, a heterogeneous mixture of sand, gravel and pebbles bound in a compact matrix of clay to silt, but inclusions of water-worked sandy outwash material are also common.

Lacking soil strength and density information through a depth of 100 feet, it is our opinion that the default site class, **Site Class D,** as defined in ASCE 7-16, be utilized. The project site is located near approximate latitude 41.3944°N and longitude 89.4452°W. At this location, the 0.2 second period (S_S) and 1.0 second period (S_1) spectral acceleration values, as determined from the OSHPD Seismic Design Maps Web Application, are 0.134 g and 0.070 g, respectively.

FIELD EXPLORATION

Scope

In order to determine the significant engineering characteristics of the foundation soils, a field exploratory program was undertaken. A total of nine (9) soil borings were advanced for the project which were staked in the field by Chamlin and Associates at the approximate locations indicated on the Boring Location Diagram, Figure 2, included in the Appendix. Each of the borings was advanced through a depth of about 16.5 feet below surface grade.

Drilling and Sampling Procedures

The soil borings were performed with a truck-mounted drilling rig equipped with a rotary head. Conventional, continuous flight, hollow-stem augers were used to advance the borings with representative samples obtained employing split-barrel sampling techniques in general accordance with ASTM Procedure D-1586.

Field Tests and Measurements

Standard Penetration Tests: During the sampling procedure, Standard Penetration Tests (SPTs) were performed at regular intervals through the depth of the borings. The SPT value (“N” Counts) is defined as the number of blows required to advance a 2-inch O.D., split-barrel sampler a distance of one foot by a 140-pound hammer falling 30-inches. These values provide a useful preliminary indication of the consistency or relative density of most soil deposits and are included on the Soil Boring Logs.

Water Level Measurements: Water level observations were made during and upon completion of the boring operations. All water level information is noted on the Soil Boring Logs in the Remarks column.

Earth Resistivity Measurements: The earth resistivity was determined in accordance with ASTM G-57 “Standard Method for Field Measurement of Soil Resistivity using the Wenner Four-Electrode Method”. The earth resistivity measurements indicate the relative ability of a medium to carry electrical current and can be used to evaluate grounding applications. The resistivity was measured using probe spacings of 2.5, 5, 10, and 15 feet in the vicinity of borings B-3 and B-8 and the results are recorded on the Resistivity Data sheet included in the Appendix.

Ground Surface Elevations: The ground surface elevations shown on the boring logs were provided by Chamlin and Associates based upon as-staked data.

LABORATORY TESTING

General

Additional significant characteristics of the foundation materials were determined in the laboratory to provide data on which to classify and quantitatively assess the engineering properties of the soil samples obtained. The types of soils encountered were identified and logged on the boring records. The results of the field and laboratory tests are presented on the Soil Boring Logs in the Appendix. Representative samples of the soils encountered in the field were placed in clean, glass sample jars and are now stored in the laboratory for further analysis, if desired.

Laboratory Tests and Measurements

Visual Classification: A soils engineer visually classified all samples in accordance with the Unified Soil Classification System (ASTM D-2488) terminology. An explanation of the symbols used in this system is included in the Appendix to this report.

Moisture Content Tests: The natural moisture content of all samples was determined by ASTM method D-2216 and is recorded on the Soil Boring Logs as a percentage of dry weight of soil.

Hand Penetrometer Tests: Cohesive specimens extracted from the split-barrel sampler and thin-wall tubes were tested in the laboratory with a calibrated soil penetrometer. This device provides an approximation of the unconfined compressive strength of the soils, and is useful, along with other soil parameters, in evaluating the soil strength characteristics. The results are listed on the Soil Boring Logs beneath the column labeled “Q_P”.

Unconfined Compression Test: The undrained shear strength of the cohesive soils was determined from unconfined compression tests (Q_U) on specimens obtained from the split-barrel sampler and thin wall tubes. The strength values of soil samples obtained by the Standard Penetration Test Method must be considered recognizing that this sampling technique provides a representative, but somewhat disturbed sample.

Dry Density Determination: The dry density was determined on the cohesive soils where intact samples were available. The results are listed on the Soil Boring Logs beneath the column labeled "Dd".

Soil Corrosivity to Pipes Test: Two (2) select soil samples were obtained and shipped to Midwest Laboratories in Omaha, NE to be tested for concentration of soluble chloride and sulfate, pH, sulfides and oxidation reduction potential. The report from Midwest Laboratories was not completed at the time this report was completed and will be forwarded in an addendum.

The laboratory testing was performed in general accordance with the respective ASTM Methods, as applicable. The results are included on the Soil Boring Logs that can be found in the **Appendix** to this report. Unless notified to the contrary, all samples will be disposed of after one month.

DESCRIPTION OF SUBSURFACE CONDITIONS

General

The types of foundation materials encountered at the test boring locations are described on the Soil Boring Logs. The lines delineating the changes in strata on the logs represent an approximate boundary between the various soil classifications. It must be recognized that the soil descriptions are considered representative for the specific test hole location, but that variations may occur between the sampling intervals and boring locations. A summary of the major soil profile components is described in the following paragraphs. A more detailed description and supporting data for each boring location can be found on the individual Soil Boring Logs.

Soil Conditions

The surface at boring location B-1 was comprised of a thin layer of placed topsoil and vegetation, which was underlain by 1 to 2 feet of fill, and then a layer of native buried topsoil, which extended through depths of about 4 to 5 feet below grade. The ground surface at all other boring locations was covered with a thin layer of vegetation and native topsoil.

Below the native topsoil, the borings encountered loessial, brown mottled gray silty clay and clayey silt, with varying amounts of sand which extended through depths of about 7 to 9 feet below surface grade. The loess possessed medium stiff to stiff consistency and moisture contents ranging from 19 to 31 percent. Below the loess, the borings encountered glacial drift which extended throughout the boring termination depths. The drift was primarily comprised of very stiff silty clay glacial till except for some silty outwash soils encountered in boring B-1 and B-5 near the boring termination depths.

Groundwater Observations

Groundwater was encountered in boring B-4 at a depth of about 12.5 feet below grade, while all other borings remained dry during and upon completion of the drilling activities. It must be recognized that groundwater levels fluctuate with time due to variations in seasonal precipitation, lateral drainage conditions, and soil permeability characteristics. Between the surface and a depth of about 5 to 10 feet, more pervious loessial and glacial outwash deposits tend to store infiltrated precipitation and create a “perched” groundwater conditions. The presence and depth of “perched” groundwater fluctuates seasonally and can disappear completely but is subject to recharge from future precipitation.

FOUNDATION DISCUSSION AND RECOMMENDATIONS

Photovoltaic (PV) Solar Array

Driven Piles

On the basis of the available soil boring information, driven steel piles would appear to be a suitable foundation type for support of the PV racking structures. Given the typical small pile section associated with these structures, it is anticipated that most of the load carrying capacity will be derived from friction between the steel pile and the surrounding soil. The soils in the upper 8 feet of the soil profile varied from a medium stiff to stiff consistency. It is recommended that an ultimate adhesion value of 700 PSF be utilized through a depth of 8 feet, with an ultimate adhesion value of 1,000 PSF used below a depth of 8 feet. The upper 3 feet of adhesion should not be included in the calculation due to freeze/thaw impacts.

Although end-bearing contribution is anticipated to be small, considering the relatively light loading, and the number of piles to be installed, it is not considered negligible. Based upon the strength of the soils, we anticipate piles will be installed to a depth of at least 8 feet below grade. At or below a depth of 8 feet, an ultimate end bearing capacity of 18,000 PSF is recommended. When evaluating driven piles, unplugged and plugged piles are typically each evaluated with the more conservative case being utilized in design. We anticipate unplugged pile capacities will control the design.

The soil conditions encountered in the borings are considered to possess sufficient strength such that buckling should not be an issue. The lateral forces exerted on the piles are resisted by the soil surrounding the piles and bending moment resistance of the pile. The LPILE computer program is often used to calculate lateral deflection of piles based upon the soil conditions and structural properties of the pile.

Soil input values for LPILE can be found in the below table.

Soil Layer	Depth Interval (ft.)	LPILE Soil Type	Shear Strength (PSF)	E50	Total Unit Weight (PCF)	Soil Modulus Ks, Kc (PCI)
1	0-8	Medium Stiff Clay	1000	0.01	110	100, NA
2	8-16.5	Stiff Clay	2000	0.007	130	500, 200

In the absence of a load test, it is recommended that a Factor of Safety of 3 be applied to all of the above outlined ultimate values.

<u>Helical Piles</u>

Helical piles would also appear to be a feasible foundation type for support of the PV racking structures. Helical piles are considered deep foundation elements and, as a rule of thumb, must be installed to a depth of at least 6 times the diameter of the largest helix measured from the surface to the uppermost plate. The pile capacities are typically confirmed based upon the torque required for installation. The ultimate bearing capacity of the helical piles can be determined in accordance with the IBC Section 1810.3.3.1.9. For estimation purposes, we recommend using an average undrained shear strength (c) value of 1000 PSF and internal friction angle (Φ) of 0 within the upper 8 ft. of the profile. Below a depth of 8 feet, we recommend using an average undrained shear strength (c) value of 2000 PSF and internal friction angle (Φ) of 0.

The two (2) most common methods used to predict the uplift capacity of multi-helix anchors are the cylindrical shear and individual bearing methods. The cylindrical shear method assumes that a cylindrical shear surface connecting the uppermost and lowermost helices is formed with uplift capacity derived from shear resistance along this cylinder and bearing resistance above the top helix. The individual bearing method assumes that bearing failure occurs above each individual helix with the total uplift capacity being the sum of the individual capacities.

The soil conditions encountered in the borings are considered to possess sufficient strength such that buckling should not be an issue. The lateral capacity of the helical piles may be determined using the LPILE input parameters included in the Driven Pile section above.

Shallow Foundations

Pad-mounted equipment may be supported on reinforced concrete pad or shallow spread foundation systems. The brown and gray mottled silty clay soils encountered immediately below the native topsoil materials are considered suitable for direct foundation support or as subgrade on which to place structural fill. It is recommended that a net allowable bearing pressure of 1800 PSF be used for the design of pad and shallow foundations.

For frost protection purposes, shallow foundations should extend a minimum of 3.5 feet below grade. Where reinforced concrete pads are considered for support of structures it is recommended CA-6 be placed below the pad so the combined thickness of the pad and the CA-6 base extend below a depth of 3.5 feet. The crushed stone fill material should be placed in lift thicknesses not exceeding 8 inches in a loose state, at moisture contents within 3 percentage points of laboratory optimum, and compacted to 95 percent of the maximum ASTM D-698 (Standard Proctor) dry density. If construction is carried out during winter months, no foundations or foundation supporting fill should be placed on frozen ground.

Depending on the final grade of the proposed structures, it is possible that loose, soft, organic or otherwise marginal bearing soils could be encountered at the base of shallow foundation excavations in localized areas. The soils engineer should be consulted to evaluate such areas at the time of construction to determine appropriate remedial measures, which could involve over-excavation down to suitable bearing soils, where available, with footings founded at the lower elevation, or the plan foundation grade could be reestablished using engineered replacement fill.

Where replacement backfill is used in foundation undercuts, the excavations should be widened at least 1 foot in all directions from the edges of the foundation element for each foot of excavation depth below the design base elevation. The replacement backfill should be a well-graded granular material placed in lifts of eight (8) inches or less in loose thickness and compacted to a minimum of 95 percent of the material's maximum Standard Proctor dry density (ASTM D-698).

In general, the performance a shallow foundation system is dependent on the various factors that have been discussed. The recommended bearing pressures discussed above incorporate a factor-of-safety of 3, theoretically keeping potential load responsive settlements in the elastic range and less than 1-inch. It is recommended that the preparation and installation of the foundations be monitored and tested by a representative of the soils engineer.

CONSTRUCTION CONSIDERATIONS

Site Preparation

Site preparation over most of the project area should consist of light grading and clearing to remove vegetation and shape the final surface topography. However, the presence of unsuitable materials in the subgrade can adversely affect the serviceability of structural elements, such as access roads and equipment pads. In these areas, the removal of organic topsoil and vegetation, including root matter, is recommended. It would appear from the borings that an average stripping depth of about 10 inches would be sufficient to remove the more friable, organic topsoil materials.

After the site stripping operations have been completed, pavement and structure subgrades should be proof-rolled to detect areas of unstable, yielding soils. Any such areas found should be overexcavated or improved by appropriate preparation and compaction techniques. Scarification, drying, and recompaction of wet soils, subgrade stabilization using hydrated lime or cement, or the removal and replacement of poor soils with acceptable materials are alternative methods which can be considered depending upon the extent of the unstable area, but this determination should be made in consultation with the soils engineer at the time of construction. Low areas may then be raised to the planned grades with suitable, properly compacted fill. All structural backfill and fill materials should be placed in lift thicknesses not exceeding 8 inches in a loose state at a moisture content within 3 percentage points of laboratory optimum. Structural fill and backfill materials should be compacted to 95 percent of the maximum dry density as determined by ASTM D-698 (Standard Proctor) method of test.

The evaluation of the subgrade and selection of fill materials for various applications should be done in consultation with the soils engineer. Similarly, the placement and compaction of fill for structural applications should be monitored and tested by a qualified representative of the soils engineer.

GENERAL COMMENTS

This geotechnical exploration and foundation analysis has been conducted to aid in the evaluation of the foundation conditions on the site of the proposed solar array project to be located to the south of Ace Road in Princeton, Illinois. The recommendations presented herein are based on the available soil information obtained and the design information provided. Any changes to the soil conditions encountered during construction should be brought to the attention of the soils engineer to determine if modifications in the recommendations are required. The final design plans and specifications should also be reviewed by the soils engineer to determine that the recommendations presented herein have been interpreted and implemented as intended. It is recommended that the earthwork and foundation operations be monitored by the soils engineer, to test and evaluate the bearing capacities, and the selection, placement and compaction of controlled fills.

This geotechnical study has been conducted in a manner consistent with that level of care ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. The findings, recommendations, and opinions contained herein have been promulgated in accordance with generally accepted practice in the fields of foundation engineering, soils mechanics, and engineering geology. No other representations, expressed or implied, and no warranty or guarantee is included or intended in this report.

APPENDIX

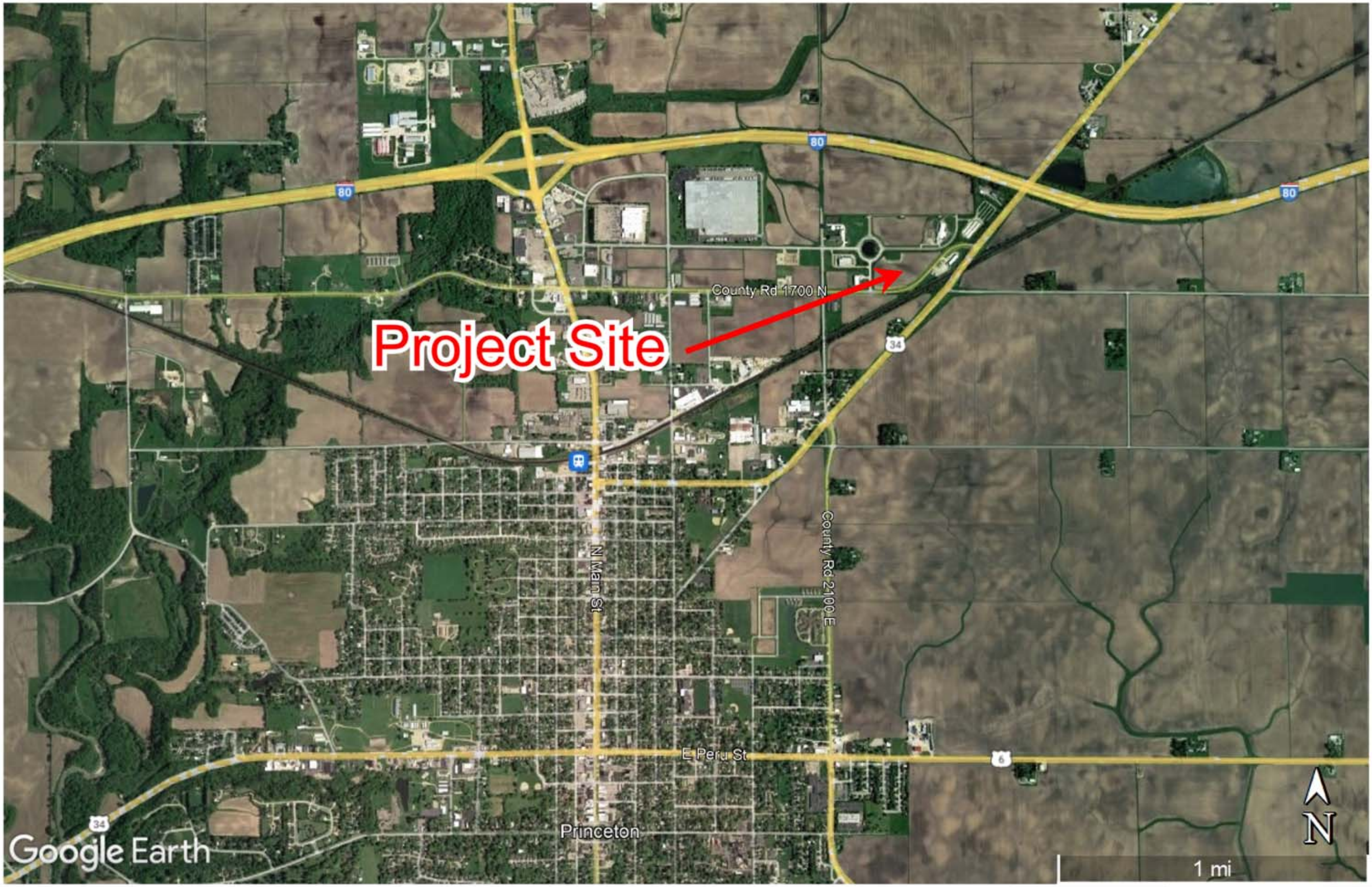

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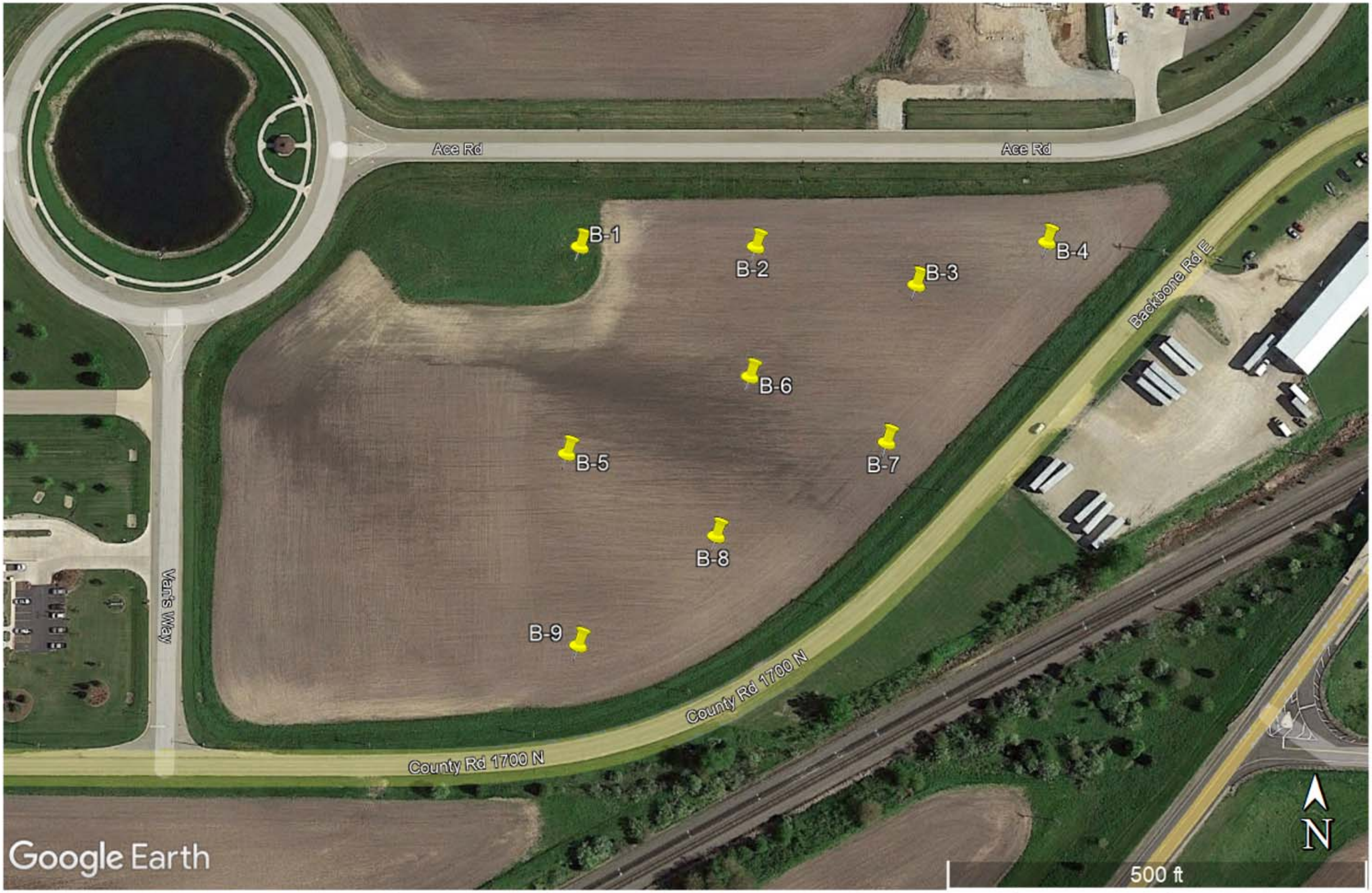
Figure 1 - Vicinity Map

Proposed Solar Array
Ace Road
Princeton, Illinois

SCALE:	Shown Above
PROJECT NO.:	213128
DATE:	January 5, 2022
DRAWN BY:	NDW



MET

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Figure 2 - Boring Location Diagram

Proposed Solar Array
Ace Road
Princeton, Illinois

SCALE: Shown Above

PROJECT NO.: 213128

DATE: January 5, 2022

DRAWN BY: NDW

SOIL BORING LOG

MET Midwest Engineering and Testing, Inc.

Project Name: IMEA Solar Photovoltaic Project
Location: Ace Road
Princeton, Illinois

Boring: B-1
Project No. : 213128
Date of Boring: November 5, 2021
Field Representative: Nick Wendling

VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 719.42	FT.	SAMPLE NO.	N	Q_p (tsf)	Q_u (tsf)	MC (%)	Dd (pcf)	REMARKS
2" Topsoil								
Brown silty CLAY (CL) with gravel - Fill		1-SS	12	4.5	-	11	-	
Dark brown silty CLAY (OH) Buried Topsoil		2-SS	10	4.5	3.2	22	96	Dry during and upon completion of drilling
3-SS No Recovery	5	3-SS	3	-	-	-	-	
Brown silty CLAY (CL) with sand and small gravel - Till		4-SS	9	2.8	2.0	13	119	
	10	5-SS	10	4.0	3.8	14	120	
Gray silty CLAY (CL) with sand and small gravel - Till		6-SS	11	3.8	2.5	14	116	
Gray clayey SILT (ML)	15	7-SS	11	4.5	1.6	14	117	
END OF BORING AT 16.5 FEET								
	20							

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.

SOIL BORING LOG

MET Midwest Engineering and Testing, Inc.

Project Name: IMEA Solar Photovoltaic Project
Location: Ace Road
Princeton, Illinois

Boring: B-2
Project No. : 213128
Date of Boring: November 4, 2021
Field Representative: Nick Wendling

VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 720.02	FT.	SAMPLE NO.	N	Q_p (tsf)	Q_u (tsf)	MC (%)	Dd (pcf)	REMARKS
8" Topsoil								
Brown and gray silty CLAY (CL)		1-SS	5	1.8	-	30	-	
		2-SS	5	1.3	-	26	-	Dry during and upon completion of drilling
Brown and gray clayey SILT (ML)	5	3-SS	6	0.8	0.2	31	87	
		4-SS	7	3.0	1.1	18	113	
Brown silty CLAY (CL) with sand and small gravel - Till	10	5-SS	11	3.8	3.3	14	117	
Gray silty CLAY (CL) with sand and small gravel - Till		6-SS	12	3.0	2.4	12	120	
	15	7-SS	10	4.3	2.8	13	119	
END OF BORING AT 16.5 FEET								
	20							

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.

SOIL BORING LOG

Midwest Engineering and Testing, Inc.

Project Name: IMEA Solar Photovoltaic Project
Location: Ace Road
Princeton, Illinois

Boring: B-3
Project No. : 213128
Date of Boring: November 4, 2021
Field Representative: Nick Wendling

VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 723.49	FT.	SAMPLE NO.	N	Q_p (tsf)	Q_u (tsf)	MC (%)	Dd (pcf)	REMARKS
10" Topsoil		1-SS	7	2.0	1.2	28	81	
Brown and gray silty CLAY (CL)		2-SS	5	2.3	-	27	-	Dry during and upon completion of drilling
Brown and gray clayey SILT (ML)	5	3-SS	5	2.0	-	24	-	
Brown silty CLAY (CL) with sand and small gravel - Till		4-SS	9	4.0	-	15	-	
	10	5-SS	12	4.5	3.0	15	118	
Gray silty CLAY (CL) with sand and small gravel - Till		6-SS	12	3.5	3.1	13	124	
	15	7-SS	10	2.5	1.9	13	121	
END OF BORING AT 16.5 FEET								
	20							

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.

SOIL BORING LOG

MET Midwest Engineering and Testing, Inc.

Project Name: IMEA Solar Photovoltaic Project
Location: Ace Road
Princeton, Illinois

Boring: B-4
Project No. : 213128
Date of Boring: November 4, 2021
Field Representative: Nick Wendling

VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 724.70	FT.	SAMPLE NO.	N	Q_p (tsf)	Q_u (tsf)	MC (%)	Dd (pcf)	REMARKS
10" Topsoil								
Brown and gray silty CLAY (CL)		1-SS	7	2.3	-	26	-	
		2-SS	6	1.8	-	27	-	
Brown and gray clayey SILT (ML)	5	3-SS	3	1.0	0.3	28	93	
		4-SS	6	0.8	0.2	27	99	
Brown silty CLAY (CL) with sand and small gravel - Till	10	5-SS	8	2.0	0.6	17	117	
		6-SS	8	2.0	1.6	17	123	Drilling: 12.5 ft.
Gray silty CLAY (CL) with sand and small gravel - Till	15	7-SS	9	2.3	1.4	16	114	
END OF BORING AT 16.5 FEET								
	20							

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.

SOIL BORING LOG

MET Midwest Engineering and Testing, Inc.

Project Name: IMEA Solar Photovoltaic Project
Location: Ace Road
Princeton, Illinois

Boring: B-5
Project No. : 213128
Date of Boring: November 5, 2021
Field Representative: Nick Wendling

VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 718.49	FT.	SAMPLE NO.	N	Q_p (tsf)	Q_u (tsf)	MC (%)	Dd (pcf)	REMARKS
10" Topsoil								
Brown and gray silty CLAY (CL)		1-SS	4	2.5	-	25	-	
Brown and gray clayey SILT (ML)		2-SS	4	1.8	1.1	27	86	Dry during and upon completion of drilling
	5	3-SS	5	1.8	0.6	24	97	
Brown silty CLAY (CL) with sand and small gravel - Till		4-SS	11	3.5	-	14	-	
	10	5-SS	10	3.8	3.1	14	118	
Gray clayey SILT (ML)		6-SS	17	4.3	1.3	16	113	
	15	7-SS	12	4.5	1.6	14	116	
END OF BORING AT 16.5 FEET								
	20							

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.

SOIL BORING LOG

MET Midwest Engineering and Testing, Inc.

Project Name: IMEA Solar Photovoltaic Project
Location: Ace Road
Princeton, Illinois

Boring: B-6
Project No. : 213128
Date of Boring: November 4, 2021
Field Representative: Nick Wendling

VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 721.47	FT.	SAMPLE NO.	N	Q_p (tsf)	Q_u (tsf)	MC (%)	Dd (pcf)	REMARKS
10" Topsoil		1-SS	6	2.8	-	29	-	
Brown and gray silty CLAY (CL)		2-SS	5	1.8	1.9	26	89	Dry during and upon completion of drilling
Brown and gray clayey SILT (ML)	5	3-SS	5	1.5	0.3	25	91	
Brown silty CLAY (CL) with sand and small gravel - Till		4-SS	9	3.5	1.8	14	116	
	10	5-SS	8	3.0	2.2	16	117	
Gray silty CLAY (CL) with sand and small gravel - Till		6-SS	10	1.8	1.8	14	115	
	15	7-SS	11	3.3	3.5	12	122	
END OF BORING AT 16.5 FEET								
	20							

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.

SOIL BORING LOG

Midwest Engineering and Testing, Inc.

Project Name:	IMEA Solar Photovoltaic Project	Boring:	B-7
Location:	Ace Road Princeton, Illinois	Project No. :	213128
		Date of Boring:	November 5, 2021
		Field Representative:	Nick Wendling

VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 725.52	FT.	SAMPLE NO.	N	Q_p (tsf)	Q_u (tsf)	MC (%)	Dd (pcf)	REMARKS
10" Topsoil		1-SS	7	3.0	-	29	-	
Brown and gray silty CLAY (CL)		2-SS	5	1.5	1.0	27	83	Dry during and upon completion of drilling
Brown and gray clayey SILT (ML)	5	3-SS	7	1.3	0.3	29	86	
		4-SS	7	2.5	0.9	19	103	
Brown silty CLAY (CL) with sand and small gravel - Till	10	5-SS	12	4.5	3.0	14	118	
Gray silty CLAY (CL) with sand and small gravel - Till		6-SS	9	3.5	2.9	12	125	
	15	7-SS	11	2.8	2.4	13	124	
END OF BORING AT 16.5 FEET								
	20							

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.

SOIL BORING LOG

MET Midwest Engineering and Testing, Inc.

Project Name: IMEA Solar Photovoltaic Project
Location: Ace Road
Princeton, Illinois

Boring: B-8
Project No. : 213128
Date of Boring: November 5, 2021
Field Representative: Nick Wendling

VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 724.47	FT.	SAMPLE NO.	N	Q_p (tsf)	Q_u (tsf)	MC (%)	Dd (pcf)	REMARKS
10" Topsoil								
Brown and gray silty CLAY (CL)		1-SS	5	2.3	-	27	-	
		2-SS	5	2.0	1.3	27	83	Dry during and upon completion of drilling
Brown and gray clayey SILT (ML) with sand	5	3-SS	6	2.3	-	19	-	
Brown silty CLAY (CL) with sand and small gravel - Till		4-SS	9	3.0	-	14	-	
Gray silty CLAY (CL) with sand and small gravel - Till	10	5-SS	9	3.3	-	15	-	
		6-SS	10	2.5	1.9	13	127	
	15	7-SS	9	1.8	1.9	14	116	
END OF BORING AT 16.5 FEET								
	20							

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.

SOIL BORING LOG

MET Midwest Engineering and Testing, Inc.

Project Name: IMEA Solar Photovoltaic Project
Location: Ace Road
Princeton, Illinois

Boring: B-9
Project No. : 213128
Date of Boring: November 5, 2021
Field Representative: Nick Wendling

VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 721.09	FT.	SAMPLE NO.	N	Q_p (tsf)	Q_u (tsf)	MC (%)	Dd (pcf)	REMARKS
10" Topsoil		1-SS	7	2.8	-	15	-	
Brown and gray silty CLAY (CL)		2-SS	5	2.0	0.8	27	83	Dry during and upon completion of drilling
Brown and gray clayey SILT (ML)	5	3-SS	4	1.5	0.5	25	90	
Brown silty CLAY (CL) with sand and small gravel - Till		4-SS	7	3.8	2.1	14	119	
Gray silty CLAY (CL) with sand and small gravel - Till	10	5-SS	9	3.0	1.9	16	113	
		6-SS	10	3.3	1.6	14	114	
	15	7-SS	9	2.3	1.5	13	118	
END OF BORING AT 16.5 FEET								
	20							

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.

MET

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Client: Illinois Municipal Electric Agency
3400 Conifer Drive
Springfield, IL 62711

Project: IMEA Solar Array
Ace Road
Princeton, Illinois

Date: January 17, 2022

Project No.: 213128

Technician: Zach Wilcoxen

Equipment: MC Miller 400A

Wenner 4-Pin Resistivity Test Results (ASTM G-57)

Borehole	Orientation	Pin Spacing (ft.)	Pin Depth (in.)	Resistance (Ω)	Resistivity (Ω.cm)
B-3	N/S	2.5	3	13.9	6655
B-3	N/S	5	3	5	4788
B-3	N/S	10	6	1.5	2873
B-3	N/S	15	9	1	2873
B-3	E/W	2.5	3	11.2	5362
B-3	E/W	5	3	5	4788
B-3	E/W	10	6	1.7	3256
B-3	E/W	15	9	2	5745
B-8	N/S	2.5	3	13	6224
B-8	N/S	5	3	5.5	5266
B-8	N/S	10	6	1.5	2873
B-8	N/S	15	9	1.2	3447
B-8	E/W	2.5	3	12.8	6128
B-8	E/W	5	3	5.3	5075
B-8	E/W	10	6	1.7	3256
B-8	E/W	15	9	1.2	3447

Respectully Submitted,
Midwest Engineering and Testing, Inc.

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GENERAL NOTES

SAMPLE IDENTIFICATION

Visual soil classifications are made in general accordance with the Unified Soil Classification System on the basis of textural and particle size categorization, and various soil behavior characteristics. Visual classifications should be substantiated by appropriate laboratory testing when a more exact soil identification is required to satisfy specific project applications criteria.

PARTICLE SIZE ±

Boulders: 8 inches	Coarse Sand: 2 mm to 4 mm	Silt: 0.005 mm to 0.074 mm
Cobbles: 3 to 8 inches	Medium Sand: 0.42 mm to 2 mm	Clay: - 0.005 mm
Gravel: 5 mm to 3 inches	Fine Sand: 0.074 to 0.42 mm	

DRILLING & SAMPLING SYMBOLS

SS: Split-spoon, 2” O.D. by 1 3/8” I.D.
ST: Shelby Tube, 2” O.D. or 3” O.D., as noted in test
AU: Auger Sample
DB: Diamond Bit
CB: Carbide Bit
RB: Roller Bit
WS: Wash Sample
BS: Bag Sample
HA: Hand Auger

SOIL PROPERTY SYMBOLS

N: Standard penetration count, indicating number of blows of a 140 lb. Hammer with a 30-inch drop, required to advance a split-spoon sampler one (1) foot.
Qu: Unconfined compressive strength, tons per square foot (tsf).
Qp: Calibrated hand penetrometer resistance, tsf.
MC: Moisture Content, %
LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index
Dd: Dry density, pounds per cubic foot (pcf).
PID Photoionization Detector (Hnu meter) volatile vapor level, ppm

SOIL RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

NON-COHESIVE SOILS		COHESIVE SOILS		
Classifier	N-Value Range	Classifier	Qu Range (tsf)	N-Value Range
very loose	0 – 3	very soft	0 – 0.25	0 – 2
loose	3 – 7	soft	0.25 – 0.5	2 – 5
medium dense	7 – 15	medium stiff	0.5 – 1.0	5 – 10
dense	15 – 38	stiff	1.0 – 2.0	10 – 14
very dense	38 +	very stiff	2.0 – 4.0	14 – 32
		hard	4.0 +	32 +

GROUNDWATER

Approximate Groundwater level at time noted on soil boring log, measured in open bore hole unless otherwise noted. Groundwater levels often vary with time, and are affected by soil permeability characteristics, weather conditions, and lateral drainage conditions.

UNIFIED SOIL CLASSIFICATION

MAJOR DIVISIONS			SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	Gravel and Gravelly Soils	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures
			GP	Poorly-graded gravels and gravel-sand mixtures
		Gravels with Fines	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	Sand and Sandy Soils	Clean Sands	SW	Well-graded sands and gravelly sands
			SP	Poorly-graded sands and gravelly sands
		Sands with Fines	SM	Silty sands and sand-silt mixtures
			SC	Clayey sands and sand-clay mixtures
FINE GRAINED SOILS	Silts and Clays of Low Plasticity		ML	Inorganic silts or clayey silts of slight plasticity
			CL	Inorganic clays of low to medium plasticity
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays of High Plasticity		MH	Inorganic silts of high plasticity
			CH	Inorganic clays of medium to high plasticity
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, humus and swamp soils with high organic contents

Note: Dual symbols are used to indicate borderline classifications.