CONSULTING GROUP

Report of Preliminary Geotechnical Investigation

Proposed Madison County Solar Power Plant London, Madison County, Ohio

Latitude 39.858881˚ N
Longitude 83.342829˚ W

Prepared for:

First Solar, Inc.
350 West Washington Street
Suite 600
Tempe, Arizona 85282

G2 Project No. 173483
December 20, 2017

December 20, 2017

Mr. Brian Tretbar, P.E.
First Solar, Inc.
350 West Washington Street, Suite 600
Tempe, Arizona 85282

Re: Report of Preliminary Geotechnical Investigation
Proposed Madison County Solar Power Plant
London, Madison County, Ohio
G2 Project No. 173483

Dear Mr. Tretbar:

We have completed the Preliminary Geotechnical Investigation for the proposed Madison County Solar Power Plant located in London, Madison County, Ohio. This report presents the results of our observations, on-site testing and analyses, and our recommendations for site preparation, foundation design, and construction considerations as they relate to the geotechnical conditions beneath the site.

We appreciate the opportunity to be of service to First Solar, Inc. and look forward to discussing the recommendations presented. In the meantime, if you have any questions regarding the report or any other matter pertaining to the project, please call us.

Sincerely,

G2 Consulting Group, LLC

Jeffrey D. Crow
Staff Engineer

David L. Wanlass
Project Manager

Bruce J. Wilberding, P.E.
Project Consultant

JDC/DLW/BJW/cjb

Enclosures

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PROJECT DESCRIPTION

The site is divided into two areas, one larger area located north of Big Plain Circleville Road and the other smaller area located south of Big Plain Circleville Road. The irregularly shaped site is identified on the attached Geotechnical Test Location Plan, Plate No. 1, in relation to the surrounding area. The northern portion is approximately 1,710 acres, and the southern portion is approximately 370 acres with a total area of approximately 2,080 acres. The development will include large areas of solar photovoltaic panel arrays that will be supported on galvanized steel W6x7 or W6x9 driven posts extending approximately 5 to 9 feet below grade.

The development will include numerous auxiliary systems and structures designed to convert the collected energy to electricity and transmit the electricity off site. The auxiliary systems and structures may include power conversion enclosures, transformers and overhead power transmission lines; however, these have not as yet been identified or laid out. Most of the other structures are typically supported on shallow spread footing foundations or mat foundations. The power transmission monopoles are supported on drilled cast-in-place concrete pier foundations. The development is also anticipated to include underground utilities, site surface drainage features, gravel surfaced site roads and paved access roads.

Final design grades were not available at the time of this report; however, we anticipate proposed site grades are expected to be generally similar to existing grades. Existing grades range from Elevation 932 feet to 990 feet, but earthwork will include minor to moderate grade cuts and fill placement to correct grade disparities and to prepare structure pads, pavement subgrades and site drainage excavations. At the time of this report, no other specific project or structural information regarding the proposed development was available for review.

SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under the direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering. Our scope of services for this project was as follows:

1. G2 installed a total of eight (8) galvanized W6x9 steel test posts (two at each designated test area) to depths ranging from 5 to 9 feet below existing ground surface within the proposed solar array fields.

2. G2 excavated four (4) test pits (one at each designated test area) to depths ranging from 8 to 9 feet below existing grade to observe the subsurface conditions, perform in-situ testing and collect soil samples for further testing.

3. G2 performed in-situ thermal resistivity testing at three depths within the four (4) test pits. In addition, laboratory thermal resistivity testing was performed on forty-five (45) remolded soil samples obtained from the same test pits.

4. G2 performed field and laboratory electrochemical testing and analyses to determine the soil electrical resistivity and soil chemical corrosivity.

5. G2 performed laboratory testing, including Standard Proctor, California Bearing Ratio (CBR), grain-size distribution (sieve analyses), Atterberg limits, expansion index, moisture content, dry density, organic matter content determinations (loss-on-ignition), and visual engineering classification on representative samples obtained from the test pits.

6. G2 prepared this engineering report. The report includes geotechnical design recommendations based on the encountered and tested geotechnical conditions at the site. The report includes geotechnical engineering recommendations for site preparation and design of foundations, floor slabs and pavements.

FIELD OPERATIONS

First Solar, Inc. and G2 Consulting Group, LLC (G2) selected the number, depths and locations of the test pits and test posts based on the features of the proposed development and site access conflicts. A G2 representative staked the proposed test locations in the field at the approximate locations indicated on the attached Geotechnical Test Location Plan, Plate No. 1.

Post Load Testing

Test Post Installation

G2 obtained new 10-foot long galvanized steel W6x9 test posts. G2 precut each of the eight (8) proposed test posts to 1 foot longer than the proposed embedment depths of 5, 6, 8 and 9 feet. A 1-1/4-inch diameter hole, centered 2-3/4 inches below the top of the post, was precut through each beam web to provide a connection point for the post tension test apparatus. The following post properties were assumed for the W6x9 test posts:

Property	Value
Depth	5.90 inches
Flange Width - bf	3.94 inches
Flange Thickness – tf	0.215 inches
Web Thickness - tw	0.170 inches
Moment of Inertia - Ix	16.4 in^4
Section Area - A	2.68 in^2
Young's Modulus, Es	29 ksi
Yield Stress - Fy	50 ksi
Hot Dip Galvanization	3 mils

A John Deere 310K backhoe fitted with an Okada TOP60B hydraulic impact hammer, having an operating weight of 1,190 pounds, a rated drive energy of 1,250 ft-lbs, and adjustable impact rate of 730 to 970 BPM, was used to drive each test post to the final test embedment depth. A proprietary drive head was used with the impact hammer to maintain post head seating and alignment. During driving operations, post plumbness was monitored and adjusted as needed.

Backhoe and Vibratory Hammer Used for Post Installation

The following table presents the test post locations and embedment depths.

Post No.	Latitude (deg)	Longitude (deg)	Embedment Depth (ft)
PT-1A	39.858881	-83.342829	6
PT-1B	39.858881	-83.342829	9
PT-2A	39.850962	-83.325841	5
PT-2B	39.850962	-83.325841	8
PT-3A	39.846586	-83.344411	5
PT-3B	39.846586	-83.344411	8
PT-4A	39.839922	-83.319817	6
PT-4B	39.839922	-83.319817	9

Actual continuous drive times were between 1 and 2 minutes; however, periodic plumbness checks and adjustments resulted in installation times of up to 15 minutes. The estimated rate of installation varied from 2 to 4 inches of penetration per second during variable driving resistance with the low and high vibratory hammer settings on.

During installation, relative drivability of each test post was observed as follows:

Test Post	Pushed with Vibratory Off		Driven on Low Vibratory Setting		Driven on High Vibratory Setting	
	From (ft)	To (ft)	From (ft)	To (ft)	From (ft)	To (ft)
PT-1A	0	3	3	6	n/a	n/a
PT-1B	0	3	3	6-1/2	6-1/2	9
PT-2A	0	2	2	5	n/a	n/a
PT-2B	0	2-1/2	2-1/2	5	5	8
PT-3A	0	5	5	5	n/a	n/a
PT-3B	0	6-1/2	6-1/2	8	n/a	n/a
PT-4A	0	2	2	4-1/2	4-1/2	6
PT-4B	0	2-1/2	2-1/2	5-1/2	5-1/2	9

The web and flanges of the top and bottom of each post were examined for damage that may have resulted during the installation process. The following table presents a summary of these observations. Please see the Post Head Photographic Documentation Figure Nos. 13 through 16 in Appendix A.

Post No.	Relative Degree of Damage	
	Top of Post	Bottom of Post
PT-1A	Little	None
PT-1B	Little	None
PT-2A	Minor	None
PT-2B	Little	None
PT-3A	Minor	None
PT-3B	Little	None
PT-4A	Minor	None
PT-4B	Minor	None

The noted damage to the tops of the posts can be characterized as minor to little deformation of the flanges on one or both sides of the post web, and is primarily attributed to adjustments to the alignment of the driving helmet during driving operations.

Post Tension Load Test

Tension post load tests were performed in general conformance with the procedures described in the ASTM D3689 method of testing for Deep Foundations under Static Axial Tensile Load. A fabricated steel reaction beam was supported on wood cribbing above the test post. An Enerpac hydraulic load jack, with a rated capacity of 30 tons, was used to apply a tensile load to the top of the test post. A Measurement Specialties, Inc. wireless pressure transducer with a pressure range up to 5,000 psi and accuracy of 0.25 percent was fitted to the manual hydraulic pump and calibrated to the jack load. The resulting jack loads during the load test were transmitted wirelessly and displayed on a hand-held computer.

Two (2) Motionics BlueDial wireless digital dial gauges with a resolution of 0.0005 inches were mounted to opposing sides of the post web using magnetic bases. Two steel L-channel reference beams were supported above grade adjacent to opposing sides of the test post and perpendicular to the reaction beam. The dial gauges were extended to a vertical position over and in contact with the reference beams. In addition, supplementary test data was manually recorded from the digital gauge displays in conjunction with the wireless transmission.

Post Tension Load Test Setup

The proposed load sequence was provided by First Solar, Inc. Each post was incrementally loaded to the design load of 2,000 pounds. Once this load was reached, the post was unloaded and each post was loaded until tension load failure was experienced (greater than 0.25 inches of deflection). The posts were then loaded until approximately 1 inch of deflection occurred. Finally, the posts were unloaded and reloaded to determine the load at which 0.5 inch of additional deflection occurs after failure of the post had already been experienced to evaluate residual post capacity. Incremental load hold times were generally maintained for approximately 1 minute; however, a 5-minute hold time was observed at the design load of 2,000 pounds to evaluate post creep. A tension load greater than 10,000 pounds was applied at PT-4B prior to reaching a deflection of 0.25-inch; therefore, the test was terminated due to the high loading condition. Post load test results are presented in Appendix A, Figure Nos. 18 through 25.

Post Lateral Load Test

Lateral post load tests were performed on each of the installed test posts in general conformance with the procedures described in the ASTM D3966 method of testing for Deep Foundations under Lateral Load. A John Deere 310K backhoe was used as a lateral reaction against the test post load in an effort to provide better resistance against the lateral loads. The fabricated steel reaction beam was placed between the front of the dozer and the test post, and was supported at-grade. The load jack was seated and leveled with wooden shims as necessary to assure the lateral load was applied to the post side flange face approximately three (3) inches above grade.

An Enerpac hydraulic load jack, with a rated capacity of 30 tons, was used to apply a lateral load to the side of the test post. A Measurement Specialties, Inc. wireless pressure transducer with a pressure range up to 5,000 psi and accuracy of 0.25 percent was fitted to the manual hydraulic pump and calibrated to the jack load. The resulting jack loads during the load test were transmitted wirelessly and displayed on a hand-held computer.

Two (2) Motionics BlueDial wireless digital dial gauges with a resolution of 0.0005 inches were mounted using magnetic bases to opposing sides of the post web at the ground surface. A steel L-channel reference beam was supported above grade perpendicular to the load direction adjacent to the non-load side of the test post. The dial gauges were extended to a horizontal position parallel to the load jack and in contact with the side of the reference beam. In addition, supplementary test data was manually recorded from the digital gauge displays in conjunction with the wireless transmission.

Post Lateral Load Test Setup

The proposed load sequence was provided by First Solar, Inc. The Procedure B - Cyclic Loading Schedule was generally followed. Each post was laterally loaded in cyclical steps until it experienced load failure (greater than 0.5 inches deflection). The posts were then unloaded and reloaded to attempt to determine the load at which approximately 1 inch of deflection occurs. Incremental load hold times were maintained for approximately 1 minute. At PT-4B the load test was terminated before a deflection of 1 inch could be reached due to high load resistance (greater than 10,000 pounds). Post load test results are presented in Appendix A, Figure Nos. 18 through 25.

Test Pits at Test Post Areas

Test pits were excavated near each of the proposed test post areas within the solar panel array field. The test pits were excavated using a John Deere 310K, rated at 70 HP and equipped with a 24-inch wide bucket.

The test pits extended to depths of 8 to 9 feet below the existing ground surface. During excavation operations, a log of the encountered subsurface conditions was maintained for each test pit, including changes in stratigraphy and groundwater levels, where observed. Bulk samples of the excavated soils were obtained and placed in sealed containers in the field for further laboratory testing and classification. In addition, relatively undisturbed Shelby tube soil samples of the upper soils between the ground surface and a depth of one foot were obtained by pushing the tubes into the ground surface using the backhoe. The Shelby tube samples were sealed in the field and transported to our laboratory for determination of the in-situ soil density and moisture content of the upper soils.

After completion of the excavation operations, the test pits were backfilled with the excavated soils. No controlled compaction of the backfill was performed during backfilling operations. The final test pit logs are based on the field logs, laboratory test results and laboratory soil classification. The test pit logs are presented in Appendix A, Figure Nos. 1 through 4. Photographic documentation of the test pit conditions is presented in Appendix A, Figure Nos. 5 through 8.

In-Situ Soil Thermal Resistivity Testing

During test pit excavation, in-situ thermal resistivity testing was performed at all of the test pit locations. In general, the in-situ tests were performed on undisturbed soils exposed in the test pit wall at 2-foot, 3-foot and 4-foot depths below ground surface. Thermal resistivity testing was performed using a KD2 Pro Thermal Properties Analyzer in general conformance with the procedures described in the ASTM D5334 method of testing. In-situ thermal resistivity test results are presented in Appendix A, Figure No. 26.

Soil Electrical Resistivity Testing

In-situ soil electrical resistivity tests were performed at each of the test post areas. The testing was performed following the Wenner four-pin test procedure (ASTM G57-06) using a Nilsson Model 400 resistivity meter with steel probes. At all test post areas, the pins were set at a spacing of 2, 4, 6 and 8 feet. The results of the electrical resistivity tests are presented in Appendix A, Figure No. 27.

LABORATORY TESTING

General

Representative soil samples were subjected to geotechnical and chemical laboratory testing to determine soil parameters pertinent to site preparation and foundation and pavement design. An experienced geotechnical engineer classified the samples in general conformance with the Unified Soil Classification System (USCS). Geotechnical laboratory testing included Standard Proctor compaction, California Bearing Ratio (CBR), grain-size distribution (sieve analysis), Atterberg limits, expansion index, soil thermal resistivity, dry densities, organic matter content (loss-on-ignition), and natural moisture content. Chemical laboratory testing included determinations of soil pH, chloride content, sulfate content and oxidation-reduction (redox) potential.

Additionally, unconfined compressive strengths were determined using a spring-loaded hand penetrometer device. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a calibrated spring-loaded cylinder.

Geotechnical Testing

The thermal resistivity of remolded soil samples within a range of moisture contents was determined for bulk soil samples obtained at depths ranging from 2 to 4 feet within each test pit. The results were used to plot the Thermal Resistivity Dryout curves for each sample. To do this, a One-point Standard Proctor density was determined for each sample at its as-received moisture content. The remolded densities equal to 85 percent of the maximum density value were determined for each soil sample. In addition, the remolded density equal to 95 percent of the maximum density value was determined for the samples obtained from TP-1. Remolded samples at 85 and 95 percent were prepared at approximate moisture contents of 0 percent, 2 percent and as-received moisture contents for each sample. The thermal resistivity of each of the forty-five (45) remolded samples was determined using a KD2 Pro Thermal Properties Analyzer in general conformance with the procedures described in the ASTM D5334 method of testing. The complete results of the thermal resistivity testing on remolded soil samples and the corresponding "Thermal Dryout Curves" are presented in Appendix A, Figure Nos. 28 through 31.

Standard Proctor tests were performed for four (4) bulk soil samples obtained from the test pits at depth intervals ranging between the ground surface and 4 feet below the ground surface. The Standard Proctor tests were performed in general conformance with the procedures described in the ASTM D698 method of testing. The results of the Standard Proctor tests, including the maximum dry densities and optimum moisture contents, are presented in Appendix A, Figure Nos. 32 through 35.

The CBR value of compacted soils was determined for two (2) bulk soil samples obtained from the test pits at depth intervals ranging between the ground surface and 4 feet below the ground surface for use in pavement design. The CBR tests were performed in general conformance with the procedures described in the ASTM D1883 method of testing. The results of the CBR tests are presented in Appendix A, Figure Nos. 36 and 37.

Grain-size distribution analyses (sieve analyses) were performed on three (3) samples obtained from the test pits at depth intervals ranging between 2 and 8 feet below the ground surface. The sieve analyses were performed in general conformance with the procedures described in the ASTM D422 method of testing. The results of the sieve analyses are presented in Appendix A, Figure Nos. 38.

Atterberg limit determinations were performed on three (3) samples obtained from the test pits at depth intervals ranging between 1 feet and 6 feet below the ground surface. The Atterberg limit determinations were performed in general conformance with the procedures described in the ASTM D4138 method of testing. The Atterberg limits are presented in Appendix A, Figure No. 39

The in-situ (natural) moisture content, dry density, and organic matter content were determined for each relatively undisturbed Shelby tube drive-cylinder sample obtained between the ground surface and 1 foot below ground surface at each of the four (4) test pits. Natural moisture content determinations were performed in accordance with the ASTM D2216 method of testing. The organic matter content of representative samples was determined in accordance with ASTM Test Method D2974, "Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils". A summary of the drive-cylinder sample test results is presented in Appendix A, Figure No. 40. The results of the drive-cylinder sample test results and the bulk sample moisture content test results are indicated on the test pit logs at the depths the samples were obtained.

Expansion Index testing was performed on two (2) bulk sample obtained from the test pits at a depth of 5 to 6 feet for evaluation of swell potential of the on-site soils for use as engineered fill. The expansion index test was performed in general conformance with the procedures described in the ASTM D4829 method of testing. The results of the expansion index test are presented in Appendix A, Figure No. 41.

Chemical Testing

Chemical tests were performed on samples of soils obtained between the depths of 2 and 3 feet from within each of the four (4) test pits. Chemical testing was performed on our behalf by Russell Corrosion Consultants, LLC located in Columbia, Maryland. Each of the tested samples was tested for the following:

Tested Soil Parameter	Test Method
pH	ASTM G51-95 2005
Chloride Content	ASTM D512-10
Sulfate Content	ASTM D516-07
Oxidation-Reduction Potential	SM 2580-B Mod.

The complete results of the chemical testing are presented in Appendix B.

SITE CONDITIONS

The site is divided into two areas, one larger area located north of Big Plain Circleville Road and the other smaller area located south of Big Plain Circleville Road. The irregularly shaped site is identified on the attached Geotechnical Test Location Plan, Plate No. 1, in relation to the surrounding area. The northern portion is approximately 1,710 acres, and the southern portion is approximately 370 acres with a total area of approximately 2,080 acres. The site currently has minor to moderate grade changes with elevations ranging between 932 feet and 990 feet; however, these elevation changes typically occur over large distances resulting in a site that seams relatively flat.

Currently, most of the site is primarily active agricultural land with corn and/or hay fields in the adjacent areas. An existing overhead electrical power transmission line runs alongside Big Plain Circleville Road. The surrounding properties are similarly primarily agricultural.

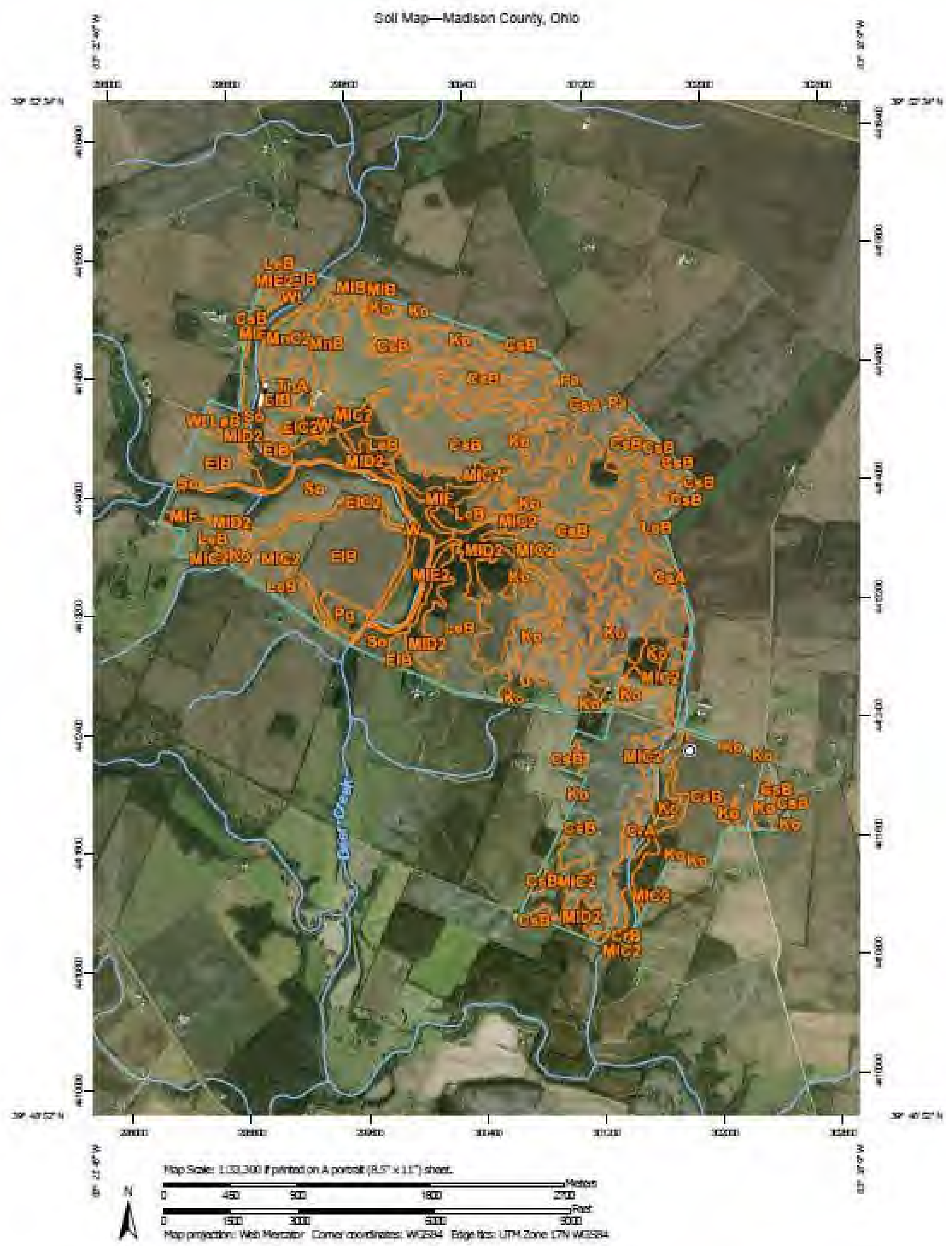
View from North Area of Site (Near TP-2) Facing East

SUBSURFACE CONDTIONS

Regional and Site Geology

Madison County in Ohio lies within the Salina Group geological formation. Per the United States Geological Survey (USGS), this formation consists of gray dolomite, which is laminated to thin bedded. Occasional thin beds and laminae of dark gray shale and anhydrite and/or gypsum are also present within the area. Brecciated zones are also present locally.

According to the United States Department of Agriculture (USDA) soil survey, the near surface soils across the site consist predominantly of various types of silt, silty clay, and clay loam soils. Surface slopes generally range from 0 to 6 percent.



Site Seismicity

Based on the 2015 International Building Code, our familiarity with soil conditions in the area, and our engineering judgement, structures may be designed for seismic loading conditions on the basis of the following seismic coefficients and classifications. Once additional information is obtained from deeper soil borings or other geotechnical investigations, the Site Class assumed below shall be confirmed.

- Site Class D – Stiff Soil Profile
- Maximum Considered Earthquake Spectral Response Acceleration
  - At short periods (S_S) = 0.125g
  - At one second period (S_1) = 0.063g
- Maximum Considered Earthquake Spectral Response Acceleration (adjusted for site class)
  - At short periods (S_{MS}) = 0.200g
  - At one second period (S_{M1}) = 0.151g
- Five Percent Damped Design Spectral Response Acceleration
  - At short periods (S_{DS}) = 0.133g
  - At one second period (S_{D1})= 0.101g

Subsurface Soil Conditions

Approximately 12 to 22 inches of dark gray and dark brown fat clay tilled earth with trace organic matter is present at the ground surface of each test pit location. This soil is identified as tilled earth that has resulted from agricultural operations on site. The tilled earth is stiff in consistency with unconfined compressive strengths ranging from 2,000 to 2,500 pounds per square foot (psf), natural moisture contents ranging from 22 to 32 percent, organic matter contents ranging from 3.9 to 7.3 percent, and dry densities ranging from 85 to 96 pounds per cubic foot (pcf). The liquid limit is 54 percent and the plasticity index is 33 percent.

Native brown and gray fat clay and sandy clay underlie the tilled earth within each test pit and extends to the explored depths of tests pits TP-1 through TP-3 and to approximately 7 feet below ground surface within TP-4. The fat clay is stiff to very stiff in consistency with unconfined compressive strengths ranging from 3,000 to 7,500 psf, a liquid limit of 55 percent, a plasticity index of 35, and natural moisture contents ranging from 13 to 26 percent. The expansion index of the fat clay is 9, which is indicative of slight expansion potential. The sandy clay is stiff to very stiff in consistency with unconfined compressive strengths ranging from 2,000 to 4,000 psf, a liquid limit of 49 percent, a plasticity index of 27, and natural moisture contents ranging from 22 to 30 percent. The expansion index of the sandy clay is 35, which is indicative of moderate expansion potential.

Clayey sand underlies the sandy clay within TP-4 and extends to the explored depth. An isolated layer of clayey sand is present within test pit TP-1 between 3 and 4 feet. The clayey sand appears to be loose with natural moisture contents ranging from 13 to 26 percent.

The Test Pit Logs, Figure Nos. 1 through 4, are presented in Appendix A. The soil profiles described above are generalized descriptions of the conditions encountered at the exploration locations. Additional photographic documentation of the conditions at each test pit location is presented on Figure Nos. 5 through 8 in Appendix A. General Notes Terminology defining the nomenclature used on the test pit logs and elsewhere in this report are presented on Figure No. 17, Appendix A.

The stratification depths shown on the test pit logs represent the soil conditions at the exploration locations. Variations may occur between exploration locations. Additionally, the stratigraphic lines represent the approximate boundary between soil types. The transition may be more gradual than what is shown. G2 has prepared the logs on the basis of laboratory classification and testing as well as field logs of the soils encountered.

Groundwater Conditions

Groundwater seepage was encountered during excavation operations at depths ranging from 4 to 5-1/2 feet within test pits TP-1, TP-2 and TP-4; however, no measurable groundwater was observed upon completion of excavation operations within these test pits. No groundwater was observed during or upon completion of excavation operations within TP-3. Test pit excavations were not left open long enough to identify the long-term static groundwater level. Fluctuations in perched and long-term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation.

Thermal Resistivity

During test pit excavations, in-situ thermal resistivity (Rho) testing was performed at all of the test pit locations. In general, the tests were performed on undisturbed soils exposed in the test pit wall at 2-foot, 3-foot and 4-foot depths below ground surface. Thermal resistivity testing was performed using a KD2 Pro Thermal Properties Analyzer in general conformance with the procedures described in the ASTM D5334 method of testing. The complete results of the in-situ thermal resistivity tests are presented in Appendix A, Figure No. 35. A summary of the test results is presented in the following table:

Location	Depth (ft)	Thermal Resistivity (˚C-cm/W)
TP-1	2	79.5
	3	70.9
	4	72.2
TP-2	2	76.8
	3	71.2
	4	74.7
TP-3	2	69.2
	3	63.4
	4	62.9
TP-4	2	76.1
	3	76.4
	4	72.2

In addition to in-situ testing, laboratory testing to determine the thermal resistivity (Rho) of remolded soil samples prepared across a range of moisture contents was performed on bulk soil samples obtained at depths ranging between 2 and 4 feet within each test pit. The results were used to plot the Thermal Resistivity Dryout curves for each sample. To do this, a One-point Standard Proctor density was determined for each sample at its as-received moisture content. The remolded densities equal to 85 percent of the maximum density value were determined for each soil sample. In addition, the remolded density equal to 95 percent of the maximum density value was determined for the samples obtained from TP-1.

Remolded samples were then prepared at approximate moisture contents of 0 percent, 2 percent and as-received moisture content (between 16.5 and 27.0 percent) for each sample. The thermal resistivity of each of the forty-five (45) remolded samples was determined using a KD2 Pro Thermal Properties Analyzer in general conformance with the procedures described in the ASTM D5334 method of testing.

The thermal resistivity (Rho) values of all samples remolded to 85 percent compaction at 2 percent moisture content averaged 467 ^{0}C-cm/W and ranged between 426 and 600 ^{0}C-cm/W. The Rho values of all samples remolded to 95 percent compaction at 2 percent moisture content averaged 449 ^{0}C-cm/W and ranged between and 430 and 481 ^{0}C-cm/W. The complete results of the thermal resistivity testing on remolded soil samples and the corresponding "Thermal Dryout Curves" are presented in Appendix A, Figure Nos. 37 through 48. A summary of the Rho test results is presented in the following table:

Location	Depth (ft)	Compaction Percentage	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (˚C-cm/W)
TP-1	2	85%	84.6	0.0	736
			84.6	2.0	544
			84.6	24.6	120
		95%	94.6	0.0	584
			94.6	2.0	436
			94.6	24.6	92
	3	85%	87.0	0.0	747
			87.0	2.0	512
			87.0	25.3	147
		95%	97.3	0.0	638
			97.3	2.0	430
			97.3	25.3	91
	4	85%	82.2	0.0	768
			82.2	2.0	566
			82.2	27.0	108
		95%	91.9	0.0	614
			91.9	2.0	481
			91.9	27.0	89
TP-2	2	85%	82.8	0.0	792
			82.8	2.0	600
			82.8	24.8	107
	3	85%	96.7	0.0	655
			96.7	2.0	458
			96.7	16.5	118
	4	85%	91.1	0.0	612
			91.1	2.0	426
			91.1	19.8	99
TP-3	2	85%	86.4	0.0	611
			86.4	2.0	459
			86.4	22.1	86
	3	85%	84.2	0.0	742
			84.2	2.0	554
			84.2	24.1	144
	4	85%	85.3	0.0	655
			85.3	2.0	493
			85.3	23.2	122
TP-4	2	85%	80.6	0.0	676
			80.6	2.0	485
			80.6	26.7	122
	3	85%	87.0	0.0	663
			87.0	2.0	476
			87.0	22.5	142
	4	85%	87.7	0.0	792
			87.7	2.0	574
			87.7	22.4	145

Corrosion Potential

In-Situ Soil Electrical Resistivity

In-situ soil electrical resistivity was performed at each of the test post areas. The complete results of the in-situ soil electrical resistivity tests are presented in Appendix A, Figure No. 27. A summary of the test results is presented in the following table:

	Depth 0–2ft ohm-cm	Depth 0–4ft ohm-cm	Depth 0–6ft ohm-cm	Depth 0–8ft ohm-cm
Minimum	2,230	2,834	2,843	3,064
Maximum	5,649	6,683	7,411	7,736
Average	3,238	3,897	4,194	4,452
Median	2,537	3,035	3,260	3,504

The test results indicate that the electrical resistivities of the soils extending to a depth of 8 feet range between 2,230 and 7,736 ohm-cm. Based on the test results, the upper soils to within the range of proposed post embedment depths should generally be considered moderately corrosive to corrosive based on the standard limits in the table below.

Soil Corrosivity	Soil Resistivity (ohm-cm)
Extremely/Very Corrosive	Less than 1,000
Corrosive	1,000 to 5,000
Moderately Corrosive	5,000 to 10,000
Mildly Corrosive	Over 10,000

Laboratory Soil Electrical Resistivity

In addition to in-situ testing, laboratory testing to determine the soil electrical resistivity (ohm-cm) of remolded soil samples prepared at as-received and saturated moisture conditions was performed on bulk soil samples obtained at depths ranging between 2 and 3 feet within each test pit. The testing was performed on our behalf by Russell Corrosion Consultants, LLC (Columbia, MD). The test results indicate that the electrical resistivities of the soils at depths between 2 and 3 feet range between 1,600 and 3,000 ohm-cm. Based on the test results, the upper soils should generally be considered corrosive based on the standard limits in the table above. A summary of the test results is presented in the following table:

	Remolded Soil Electrical Resistivity (ohm-cm)	
Location	As-Received Moisture Condition	Saturated Moisture Condition
TP-1	1,700	1,600
TP-2	3,000	3,000
TP-3	3,000	2,900
TP-4	1,800	1,800
Average	2,375	2,325

Soil Chemical Corrosivity

Laboratory chemical tests were performed on soil samples obtained from each of the test pits between the depths of 2 and 3 feet. The testing was performed on our behalf by Russell Corrosion Consultants, LLC (Columbia, MD). The testing included soil pH, chloride content, sulfate content, and oxidation-reduction potential (redox).

The complete results of chemical testing are presented in Appendix B. A summary of the test results is presented in the following table:

Location	pH	Sulfates (ppm)	Chlorides (ppm)	Redox Potential, Eh (mV)
TP-1	7.1	ND	68	344
TP-2	7.6	ND	46	331
TP-3	5.8	ND	45	425
TP-4	7.0	ND	45	372
Average	6.9	ND	51	368

ND = Non-Detectable

pH

The measured pH values range from 5.8 to 7.6 with an average of 6.9, indicating the soils are slightly acidic to slightly basic. Based on these results, the pH values of the on-site soils suggest the soils could show little to no corrosion to buried metallic structures or pipelines.

Sulfate Content

High contents of sulfates of sodium, calcium, potassium and magnesium can contribute to soil corrosivity based on the following standard limits:

Soil Corrosivity	Sulfate Content (ppm)
Negligible	Less than 150
Moderate	150 to 1,500
Severe	1,500 to 10,000
Very Severe	Over 10,000

The sulfate content of the on-site soils were non-detectable, indicating there should not be an increase in corrosion rates of buried metallic structures or pipelines due to sulfate content.

Chloride Content

Typically, chloride ion contents greater than 150 ppm are indicative of contaminated soils that could potentially be corrosive to metal. The chloride content of the on-site soils range from 45 to 68, indicating there is negligible potential increase in corrosion rates of buried metallic structures or pipelines due to chloride ion content.

Oxidation-Reduction Potential

The oxidation-reduction potential of soils identifies the potential for anaerobic bacterial corrosion. Redox potentials and their relationship to potential soil corrosivity are presented in the following table:

Soil Corrosivity	Redox Potential (mV)
Very Corrosive	Less than 100
Moderately Corrosive	100 to 200
Slightly Corrosive	200 to 400
Non-corrosive	Over 400

The measured redox potentials range from 331 to 425. These test results indicate there should be a slight potential increase in corrosion rates of buried metal structures or pipelines due to anaerobic bacterial corrosion near the test pit locations.

DESIGN RECOMMENDATIONS

Earthwork

Site and Subgrade Preparation

Earthwork operations are expected to consist of removing the existing vegetation and organic soils, cutting existing soils or placing engineered fill to achieve proposed site design grades and minimize severe surface undulations within proposed solar panel areas, excavating for foundations and underground utilities, and preparing the subgrade for support of access and maintenance drives. G2 recommends all earthwork operations be performed in accordance with specifications that have been prepared by an Ohio licensed professional engineer and be properly monitored in the field by qualified technical personnel under the direction of a licensed engineer.

At the beginning of the earthwork operations, all vegetation and their root mass should be grubbed from proposed construction areas and disposed of off site. No distinct topsoil layer was observed at the test pit locations due to past agricultural tilling of the surface layer; however, some topsoil should be anticipated at other non-tilled areas within the project site. Where buildings or auxiliary structures supported on shallow spread footing foundations or mat foundations are planned, the full depth of any existing topsoil or tilled earth shall be completely undercut from within the structure footprints. Where site roads and access drives are planned, any topsoil or tilled earth containing more than 5 percent organic matter shall be completely undercut. Where solar panel arrays are planned, any topsoil or tilled earth containing more than 10 percent organic matter shall be completely undercut. Mass grading should generally be achievable using conventional earth moving equipment. Sheep-foot roller compaction equipment should be used for all compaction operations using on-site cohesive soils.

We anticipate the subgrade soils will consist of primarily of sandy clay and fat clay. These native soils are extremely prone to instability due to fluctuations in moisture content and will become very unstable during prolonged precipitation periods. As such, we recommend site grading operations be performed during the drier low-precipitation months of August through October.

Once the proposed subgrade has been exposed, and prior to placement of engineered fill and/or construction of pavement sections, the exposed subgrade in proposed pavement and auxiliary structure areas should be thoroughly proof-rolled using a heavy rubber-tired vehicle, such as a fully-loaded dump truck or front-end loader, and should be visually evaluated for instability and/or unsuitable conditions. Any unstable or unsuitable areas noted should be undercut and replaced with engineered fill.

Fill Materials and Placement

The on-site cohesive soils have a moderate potential for shrinkage or swelling with decreases or increases in moisture content. Any structures that are highly sensitive to shrink or swell movement should not be supported directly on engineered fill prepared from on-site cohesive soils. If the native fat clay and sandy clay is to be used as engineered fill, we recommend it be lime treated to improve the soil stability and resistance to shrink and swell. Alternatively, consideration should be given to supporting sensitive structures on at least a 2-foot thick layer of imported non-cohesive granular engineered fill.

Engineered fill should consist of pre-approved environmentally clean soils, and should be free of organic matter, frozen soil clods or other harmful material. Engineered fill should also have a liquid limit less than 30 percent and a plasticity index of less than 12 percent. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade. Engineered fill should be placed in uniform horizontal layers, not more than 9 inches in loose thickness. The engineered fill should be compacted to achieve a density of at least 95 percent of the maximum dry density as determined by the Modified Proctor compaction test (ASTM D 1557). If lime-treated soil is used as engineered fill, the treated soil should be moisture conditioned to within 3 percent above the optimum moisture content. If non-cohesive granular fill soils are imported to the site for use as engineered fill or aggregate base material for roadways, the granular fill should be compacted at moisture contents that are within 3 percent above or below its optimum moisture content.

Excavation Slopes and Support

For open cut temporary excavations where space is available, temporary unsurcharged slopes may be sloped back without shoring at 3/4 units horizontal to 1 unit vertical (3/4H:1V) within the existing native stiff to very stiff sandy clay and fat clay. Any excavations within the existing loose clayey sand should be sloped no steeper than 1H:1V. Where sloped excavations are used, the tops of the slopes should be barricaded to prevent vehicles and storage loads within 5 feet of the tops of the slopes. If materials are stored or equipment is operated near an excavation, shoring and slopes must be designed to resist the additional lateral pressure due to the surcharge loads. Berms are recommended along the tops of slopes as necessary to prevent runoff water from entering the excavations and eroding the slope faces.

Where sloped excavations are not possible, shoring may be required to support vertical cuts that extend below a depth of 5 feet. For design of multi-level braced or tied-back shoring, we recommend the use of a rectangular distribution of lateral earth pressure. It may be assumed that the retained soils with a level surface behind the braced shoring will exert a lateral pressure equal to 24H in pounds per square foot, where H is the height of the shoring in feet. For design of single-level braced or tied back shoring and cantilevered shoring, a trapezoidal distribution of lateral earth pressure may be used. It may be assumed that the retained soils with a level surface behind cantilevered shoring will exert a lateral pressure equal to that developed by a fluid with a density of 40 pounds per cubic foot (pcf) for soils above water level. If construction traffic or material storage is allowed within 10 feet of the vertical excavation, a uniform lateral pressure of 250 pounds per square foot should be added to the design lateral loads.

All excavations should be safely sheeted, shored, sloped, or braced in accordance with local or federal OSHA requirements. If material is stored or equipment is operated near an excavation, stronger shoring must be used to resist the extra pressure due to the superimposed loads and should be evaluated by an experienced professional engineer registered in the State of Ohio. Care should always be exercised when excavating near existing roadways or utilities to avoid undermining them. In no case should excavations extend below the level of adjacent existing structures unless underpinning is planned.

Foundations

General

As previously noted, the soil conditions consist of approximately 12 to 22 inches of fat clay tilled earth underlain by native clayey sand, sandy clay, and fat clay and extend to the explored depths. The undisturbed native clayey sand, sandy clay, and fat clay are generally conducive to support of shallow foundation types such as shallow spread footings and mat foundations for auxiliary systems and structures that may be proposed for use at this development. It is critical to understand that once the native sandy clay and fat clay soils have been disturbed by excavation or construction traffic, the native clay soils are no longer suitable for reuse or recompaction as engineered fill beneath foundations; therefore, every attempt should be made to excavate foundations neat and place foundation concrete as soon as practical to prevent such disturbance.

The undisturbed native clay soils will also generally provide suitable support for embedded shallow driven pile foundations that support solar array panels; however, some minor pile foundation deflection should be expected when the surrounding soil shrinks or swells during moisture fluctuations. Deep soil borings would be required to evaluate deeper drilled pile or drilled pier foundations where required.

Solar Array Driven Embedded Post Foundations

Field Post Load Tests

During our field investigation, eight (8) W6x9 galvanized steel test posts were driven to depths ranging between 5 and 9 feet below the existing ground surface using a 1,000-ft-lb hydraulic impact hammer. Two (2) posts were driven at each of the four (4) test locations identified on the Geotechnical Test Location Plan. The distance between test posts at each given location was approximately 20 feet. Actual continuous drive times were generally between 1 and 2 minutes. The web and flanges of the post heads experienced minor to little damage during the test post installation operations. Upon removal of the posts, no observable damaged to the post tips was noted.

At all the test post locations, both tension post load tests and lateral post load tests were performed on the installed posts. The load tests were performed on the following day the posts were installed. The complete results of the post load tests are presented in Appendix A, Figure Nos. 18 through 25. The following tables present summaries of the tensile and lateral loads measured at the indicated deflections.

A tension load greater than 10,000 pounds was applied at PT-4B prior to reaching a deflection of 0.25-inch; therefore, the test was terminated due to the high loading condition. Similarly, the lateral load test was terminated at PT-4B before a deflection of 1 inch could be reached due to high load resistance (greater than 10,000 pounds).

		Uplift Load (lbs)				
Post No.	Post Embedment Depth (feet)	Load @ 0.25-inch Deflection	Load @ 0.50-inch Deflection	Load @ 1.0-inch Deflection	Maximum Recorded Load During Initial Load Sequence	Reload @ 0.50-inch Deflection
PT-1A	6	3,360	3,530	3,160	3,668 @ 0.31 in.	3,230
PT-1B	9	5,280	5,520	5,420	5,573 @ 0.28 in.	4,790
PT-2A	5	3,650	3,950	4,200	4,229 @ 1.05 in.	4,264
PT-2B	8	6,000	7,440	7,380	7,458 @ 0.35 in.	7,000
PT-3A	5	6,070	6,760	7,580	7,638 @ 1.04 in.	7,030
PT-3B	8	7,230	7,580	6,410	7,909 @ 0.36 in.	5,660
PT-4A	6	3,940	4,070	3,940	4,133 @ 0.28 in.	3,320
PT-4B	9	>10,000	--	--	10,205 @ 0.06 in.	--

Notes: 1) Tension Load Acceptance Criteria is 0.25-inch deflection

Post Test Area	Post Embedment Interval (feet)	Estimated Ultimate Uplift Capacity (pounds per foot of depth)
PT-1A & 1B	3 to 6	1,140
	6 to 9	1,200
PT-2A & 2B	2-1/2 to 6	1,150
	6 to 8	1,210
PT-3A & 3B	1-1/2 to 6	1,180
	6 to 8	1,220
PT-4A & 4B	2 to 7	1,160
	7 to 9	950

Notes: 1) Values assume cohesive soil conditions.
2) Values only applicable to the subsurface conditions at the specific test area and are limited to the maximum test pit excavations.

3) Initial top of post embedment interval based on Maximum Recorded Load During Initial Load Sequence.

		Lateral Load (lbs)			
Post No.	Post Embedment Depth (feet)	Load @ 0.25-inch Deflection	Load @ 0.5-inch Deflection	Load @ 1.0-inch Deflection	Maximum Recorded Load
PT-1A	6	2,900	4,060	5,170	5,424 @ 1.12 in.
PT-1B	9	3,210	5,240	7,350	7,513 @ 1.04 in.
PT-2A	5	2,480	3,560	4,860	4,944 @ 1.04 in.
PT-2B	8	2,690	3,930	6,190	6,857 @ 1.15 in.
PT-3A	5	2,870	4,240	6,190	6,512 @ 1.11 in.
PT-3B	8	3,020	4,980	8,300	8,824 @ 1.10 in.
PT-4A	6	3,640	4,800	6,690	7,044 @ 1.11 in.
PT-4B	9	4,970	8,470	>10,000	10,122 @ 0.62 in.

Note: Lateral Load Acceptance Criteria is 0.50-inch deflection

LPILE Analyses

LPILE analyses were performed using LPILE Plus (version 2016.9.10) to "reverse model" the observed deflections at the applied lateral loads. Stiff Clay without Free Water and Cemented Silt soil models were assumed based on the observed soil conditions at each test location.

The appropriate soil parameters, including cohesion, friction angle, E50, soil modulus, and soil unit weight were adjusted until 1/2 inch of deflection was approximated at the actual applied lateral load observed in the field for 1/2 inch of deflection. The detailed LPILE analyses for each of the eight (8) lateral load tests are presented in Appendix A, Figure Nos. 42 through 49.

The resulting modeled soil parameters based on the actual 1/2-inch deflection and load conditions are presented below:

Post No. (Depth)	Modeled LPILE Parameters @ 1/2-inch Deflection						
	Depth (ft)	LPILE Soil Type	Cohesion (psf)	ε_{50}	Phi (deg)	k (pci)	Unit Weight (pcf)
PT-1A	0 to 3	Stiff Clay w/o F.W.	1,420	0.0072	--	--	130
	3 to 4	Silt (c-ϕ)	250	0.0080	30	400	130
	4 to 6	Stiff Clay w/o F.W.	1,000	0.0100	--	--	135
	6 to 9	Stiff Clay w/o F.W.	3,500	0.0050	--	--	130
PT-1A	0 to 3	Stiff Clay w/o F.W.	1,250	0.0109	--	--	130
	3 to 4	Silt (c-ϕ)	250	0.0100	30	400	130
	4 to 6	Stiff Clay w/o F.W.	1,000	0.0100	--	--	135
	6 to 9	Stiff Clay w/o F.W.	3,500	0.0050	--	--	130
PT-2A	0 to 5	Stiff Clay w/o F.W.	2,280	0.0300	--	--	130
	5 to 6	Silt (c-ϕ)	250	0.0100	20	400	130
	6 to 8	Stiff Clay w/o F.W.	2,000	0.0100	--	--	135
PT-2B	0 to 5	Stiff Clay w/o F.W.	1,200	0.0157	--	--	125
	5 to 6	Silt (c-ϕ)	250	0.0100	20	400	130
	6 to 8	Stiff Clay w/o F.W.	2,000	0.0100	--	--	135

PT-3A	0 to 1	Stiff Clay w/o F.W.	725	0.0070	--	--	100
	1 to 8	Stiff Clay w/o F.W.	2,250	0.0043	--	--	135
PT-3B	0 to 1	Stiff Clay w/o F.W.	725	0.0150	--	--	100
	1 to 8	Stiff Clay w/o F.W.	2,250	0.0157	--	--	135
PT-4A	0 to 2	Stiff Clay w/o F.W.	1,200	0.0200	--	--	120
	2 to 5-1/2	Stiff Clay w/o F.W.	2,975	0.0200	--	--	135
	5-1/2 to 7	Silt (c-ϕ)	1,500	0.0040	25	440	130
	7 to 9	Silt (c-ϕ)	750	0.0040	30	500	130
PT-4B	0 to 2	Stiff Clay w/o F.W.	2,000	0.0030	--	--	120
	2 to 5-1/2	Stiff Clay w/o F.W.	3,500	0.0027	--	--	135
	5-1/2 to 7	Silt (c-ϕ)	1,500	0.0040	25	440	130
	7 to 9	Silt (c-ϕ)	750	0.0040	30	500	130

The soil parameters resulting from the 1/2-inch model were then used to calculate the model deflections based on actual test loads for 1/4-inch and 1-inch deflections to determine relative model concurrence.

	0.5-inch Deflection Model				
Post No. (Depth)	Actual Load @ 0.25-inch Deflection (lbs)	Modeled Deflection @ Actual Load (in)	Actual Load @ 1-inch Deflection (lbs)	Modeled Deflection @ Actual Load (in)	Relative Model Concurrence
PT-1A (6 ft)	2,900	0.19	5,170	1.44	Fair
PT-1B (9 ft)	3,210	0.23	7,350	1.27	Very Good
PT-2A (5 ft)	2,480	0.14	4,860	1.61	Fair
PT-2B (8 ft)	2,690	0.23	6,190	1.74	Fair
PT-3A (5 ft)	2,870	0.15	6,190	4.35	Poor
PT-3B (8 ft)	3,020	0.20	8,300	1.58	Good
PT-4A (6 ft)	3,640	0.27	6,690	2.46	Fair
PT-4B (9 ft)	4,970	0.19	>10,000	0.70	Good

Given the significantly different soil conditions present in the vicinity of TP-4 compared to the other three test locations (TP-1 through TP-3) where substantially more consistent soil conditions are present, we recommend the use of two sets of composite LPILE soil parameters for use in preliminary design evaluation of the lateral capacity of driven steel posts with embedment depths to 9 feet:

In the vicinity of test locations TP-1 through TP-3, we recommend the use of the following composite LPILE soil parameters:

Depth (ft)	LPILE Soil Type	Cohesion (psf)	ε_{50}	Phi (deg)	k (pci)	Unit Weight (pcf)
0 to 4	Stiff Clay w/o F.W.	1,260	0.0250	--	--	130
4 to 5	Silt (c-ϕ)	250	0.0095	20	400	130
5 to 9	Stiff Clay w/o F.W.	2,580	0.0150	--	--	135

In the vicinity of test location TP-4, we recommend the use of the following composite LPILE soil parameters:

Depth (ft)	LPILE Soil Type	Cohesion (psf)	ε_{50}	Phi (deg)	k (pci)	Unit Weight (pcf)
0 to 2	Stiff Clay w/o F.W.	2,000	0.0030	--	--	120
2 to 5-1/2	Stiff Clay w/o F.W.	3,500	0.0027	--	--	135
5-1/2 to 7	Silt (c-ϕ)	1,500	0.0040	25	440	130
7 to 9	Silt (c-ϕ)	750	0.0040	30	500	130

<u>International Building Code Analyses</u>

We evaluated the lateral capacity of the tested posts based on International Building Code (IBC) 2012. For shallow post foundations, IBC Equation 18-1, Section 1807.3 suggests the following equation:

$$d = 0.5A\left\{1 + \left[1 + \left(\frac{4.36h}{A}\right)\right]^{1/2}\right\}$$

where:

- $A = 2.34P/(S_1 b)$
- b = diagonal dimension of square post (ft)
- d = depth of embedment in earth (ft), not over 12 feet
- h = distance from ground surface to point of application of P (ft)
- P = applied lateral force (lbs)
- S_1 = lateral soil-bearing pressure (psf)

The diagonal dimension of the post (b) has been calculated from the width and depth of W6x9 post. The depth of embedment (d) is the installed depth of the particular test post (5 to 9 feet). The distance from the ground surface to the point of load application (h) was measured during field operations. The applied lateral force (P) is the actual load at which 1/2-inch deflection occurred during the load test.

Equation 18-1 above was then solved for the ultimate lateral soil bearing pressure (S_1), and is presented below. The S1 term is identified as an ultimate value, since it is based on the actual load applied during the load test. The lateral bearing pressure (psf/ft) was calculated by taking the lateral soil bearing pressure (S_1) over the length of the post influenced by the lateral load. The length of the post influenced by the lateral load was approximated from the LPILE model for each test location and is the depth at which the deflection of the embedded post approaches zero. No factor of safety was applied in the calculation of any of the values presented below.

Post No.	Diagonal dimension of post, b (ft)	Depth of Embedment, d (ft)	Distance from ground surface to load point, h (ft)	Lateral load, P (lbs)	Ultimate lateral soil-bearing pressure, S1 (psf)	Influenced Post Length, LPILE Estimate (ft)	Ultimate lateral bearing pressure (psf/ft)
PT-1A	0.59	6	0.25	4,060	2,800	6	466
PT-1B	0.59	9	0.25	5,240	2,370	5-1/2	430
PT-2A	0.59	5	0.25	3,560	2,970	5	594
PT-2B	0.59	8	0.25	3,930	2,010	6	335
PT-3A	0.59	5	0.25	4,240	3,540	5	708
PT-3B	0.59	8	0.25	4,980	2,550	6	425
PT-4A	0.59	6	0.25	4,800	3,310	6	551
PT-4B	0.59	9	0.25	8,470	3,840	5	768

Mat Foundations

Thickened monolithic concrete slabs or mat foundations for equipment pads and precast enclosures may be supported on a properly prepared subgrade as recommended in the Earthwork section of this report. Mat foundations should bear at a minimum depth of 3 feet below the final adjacent grade. Mat foundations constructed on native undisturbed stiff or very stiff sandy clay or fat clay soils may be designed using an average modulus of subgrade reaction (k_1) of up to 55 pounds per cubic inch (pci).

The recommended k_1 modulus values are based on an assumed 1-foot square plate loading surface. For determination of the allowable subgrade modulus values (k) for actual mat foundation dimensions of mats bearing on sand soils, we recommend the use of the following relationship:

$$k_s = k_1[(B+1)/2B]^2$$

where B equals the least mat foundation width.

Spread and Continuous (Strip) Footing Foundations

The existing native undisturbed stiff to very stiff clay soils, loose clayey sand soils, lime treated clay engineered fill or imported non-cohesive granular engineered fill, placed in accordance with the recommendations presented in the Earthwork section of this report, are generally suitable for support of shallow spread footing foundations beneath proposed auxiliary systems and structures. Continuous wall and isolated column spread footing foundations bearing on native undisturbed soils or engineered fill may be designed based on a net allowable soil bearing pressure of 3,000 psf for foundations bearing at least 3 feet below the final adjacent grade.
Exterior footings must extend to a minimum depth of 3 feet below finished grade elevations for protection against frost penetration. Interior footings may bear at shallower depths provided adequate bearing soils are present. Continuous wall or strip foundations should be at least 16 inches in width and isolated column spread foundations should be at least 30 inches in their least dimension. We recommend all foundations be suitably reinforced to minimize the effects of differential settlements associated with local variations in subgrade conditions. If the recommendations outlined in this report are adhered to, total settlement of individual spread footing foundations and differential settlement between adjacent spread footing foundations should be less than 1 inch and 1/2 inch, respectively.

Floor Slabs

Building slab-on-grade concrete floor slabs may be supported on undisturbed native soils, lime treated clay engineered fill or imported non-cohesive granular engineered fill, provided the fill soils meet the recommendations outlined in the Site and Subgrade Preparation section of this report. A maximum subgrade modulus (k) of up to 55 pounds per cubic inch (pci) may be used in the design of floor slabs supported on grade.

We recommend that at least 4 inches of clean coarse sand or crushed pea gravel be placed between the subgrade and the bottom of the floor slab for use as a capillary break to reduce moisture transmission through the concrete floors and to reduce the potential for concrete curling. If moisture sensitive floor coverings are planned, or if greater protection against vapor transmission is desired, a vapor barrier consisting of 10-mil plastic sheeting or equivalent may be placed on the sand layer beneath floor slabs. The floor slab should be isolated from the foundation system to allow for independent movement.

Lateral Earth Pressures

Lateral loads on shallow spread footing and mat foundations may be resisted by the combined passive resistance of the adjacent soils and the soil frictional resistance beneath the foundations. The allowable passive resistance of undisturbed native soils or engineered fill may be assumed to be equal to the pressure developed by a fluid with a density of 300 pounds per cubic foot (pcf) up to a maximum of 3,000 psf.

An allowable frictional resistance factor of 0.4 may be used along the bottoms of shallow spread footing or mat foundations. A one-third increase in the passive resistance values may be used for temporary wind or seismic loads. Uplift loads on spread footing foundations may be resisted by the foundation concrete weight plus the weight of the soil backfill placed over the spread footing foundation.

Pavements and Roadways

Compacted Native Soils Construction and Access Road Design Recommendations

It is anticipated that certain roads will be constructed by compacting the native soils for use during the construction phase and as preparation for final access roads for the development. The most severe traffic conditions will occur during the construction phase. We recommend the construction of all final pavements be delayed until after construction of all other development features. During site construction operations and during preparation of final access and maintenance roads, instability of the native soils will likely develop, particularly during and following precipitation events.

The near-surface soils generally consist of 12 to 22 inches of fat clay tilled earth soil underlain by native sandy clay or fat clay. Laboratory test data for the fat clay tilled earth and native sandy clay and fat clay indicate a California Rearing Ratio (CBR) values equal to 2.1 percent and 2.2 percent at 95 percent compaction, and 0.9 percent and 1.3 percent at 90 percent compaction. The Plasticity Index ranges between 27 and 35 percent, and the Expansion Index ranges between 9 and 35. Given the low CBR values and high plasticity and shrink/swell characteristics of the fat clay tilled earth and native sandy clay that is predominantly present across the site, compacted native soil roadways will not generally provide consistent support for construction and site service vehicles. During and following precipitation events, the native clay soils will become unstable and slippery. Under these conditions, any wheeled vehicle traffic will cause moderate to severe disturbance to the compacted native soils, resulting in rutting and difficult passage. During extended periods of warm and dry weather, the upper few inches of the exposed native fat clay surface will shrink and harden; however, the underlying disturbed clay may remain unstable for heavier traffic.

If it is necessary or desired to attempt to use the native soils for temporary roadway access, we recommend the roadway subgrade be initially prepared as described in the Site and Subgrade Preparation section of this report. Where proof rolling identifies areas of instability, the subgrade should be scarified to at least a depth of 12 inches and moisture conditioned (typically manipulation and drying in the sun will be required) to within 3 percent above the soil's optimum moisture content, as determined by the Standard Proctor test (ASTM D698). After moisture conditioning, the scarified soil should be recompacted to at least 95 percent of the soil's maximum density, as determined by the Standard Proctor test (ASTM D698). It should be anticipated that frequent maintenance, reconditioning and recompaction of native soil roadways will be required.

In order to provide improved support for construction traffic and appropriate preparation for permanent roadways, we recommend the native soils be stabilized using either lime treatment methods or by the placement of a crushed aggregate surface layer. Lime treatment of the upper 12 to 18 inches of the roadway subgrade will reduce the plasticity and shrink/swell properties of the sandy clay and fat clay soils. Further evaluation will be required during the final geotechnical investigation to determine the recommended quantity of lime needed to adequately modify the clay soils. For estimating purposes, approximately 7 percent hydrated lime addition may be required to properly modify the sandy clay and fat clay characteristics.

Alternatively, subgrade stabilization for improved temporary and permanent roadway support may be performed by placing a minimum 12-inch thick layer of 1-inch by 3-inch (1x3) crushed concrete or gravel over the exposed subgrade after the roadway subgrade is initially prepared as described in the Site and

Subgrade Preparation section of this report. If greater stability is required, such as along heavily traveled construction routes, a layer of biaxial geogrid may be placed beneath the layer of 1x3 crushed concrete or gravel. The geogrid may consist of Tensar BX1100, or approved equal. The crushed 1x3 should be compacted to a stable and unyielding condition using a minimum 15-ton roller compactor.

We assume that entrance, perimeter and internal maintenance road pavement sections will be constructed over and supported on subgrade soils consisting of one or more of the following soils:

- Existing fat clay tilled earth with less than 5 percent organic matter, which has been proof-rolled and prepared as outlined in the Site Preparation section of this report
- Native undisturbed sandy clay and fat clay, which has been proof-rolled and prepared as outlined in the Site Preparation section of this report
- Granular engineered fill, which has been placed and compacted as outlined in the Site Preparation section of this report
- Lime-treated sandy clay and fat clay engineered fill, which has been placed and compacted as outlined in the Site Preparation section of this report

Aggregate Base Roadway Design Recommendations

We assume that perimeter and internal maintenance roads will consist of a compacted aggregate base pavement section placed over and supported on a prepared soil subgrade as previously described. We performed pavement design analyses for the proposed gravel roadways in accordance with the AASHTO design procedures for low traffic volume aggregate surface pavements. For purposes of our evaluation, we have estimated 25-year traffic loads of 10,000 equivalent single-axle 18 kip loads (ESALs) for the perimeter and internal maintenance roads after construction is complete. Based on our analyses we recommend the following section for internal maintenance roads:

Perimeter and Internal Maintenance Roads – Aggregate Pavement	
Material Type	Thickness
ODOT Crushed Aggregate Base Course	8 inches*

*Assumes clay subgrade has been stabilized as recommended.

Entrance Road Pavement Design Recommendations

General

We assume the entrance road will consist of either flexible bituminous concrete (hot-mix asphalt) or rigid Portland cement concrete (PCC) placed over compacted aggregate base. The entrance road pavement requires the design be based on HS-20 truck loadings. No other design traffic conditions were provided. For purposes of our evaluation, we have estimated 25-year traffic loads of 25,000 ESALs for the entrance road.

As noted previously, the CBR of the native soils and tilled earth ranges between 2.1 and 2.2 at 95 percent compaction and the expansion index ranges between 9 and 35. Based on these results, an effective CBR value of 2 percent would generally be appropriate for use in pavement design at this site. If a CBR value of 2 percent were used in pavement design, the resulting flexible and rigid pavement sections would be inordinately thick and expensive. We recommend, therefore, that the native soil subgrade be lime treated or stabilized with a layer of 1x3 crushed concrete or gravel as previously described. Provided the subgrade is prepared and stabilized as recommended to a minimum depth of 12 inches, an effective CBR of 7 percent and an effective Resilient Modulus (M_R) of 7,000 psi may be preliminarily assumed. The actual CBR and M_R values of lime treated soil should be determined during the final geotechnical investigation phase.

Bituminous Concrete Flexible Pavement Design Recommendations

In accordance with AASHTO pavement design criteria for flexible bituminous concrete pavements, we have assumed a terminal serviceability of 2.0, standard deviations of 0.45 for bituminous concrete pavements, and a reliability of 85 percent. We performed pavement design analyses for the proposed pavements in accordance with the AASHTO design procedures for bituminous concrete pavements. Based on our analyses we recommend the following pavement section for the entrance road:

Entrance Road	Thickness
Bituminous Concrete Pavement	
ODOT Asphalt Concrete Surface Course, Type 1	1-1/2 inches
ODOT Asphalt Concrete Intermediate/Leveling Course, Type 1	2 inches
ODOT Crushed Aggregate Base Course	7 inches

We recommend regular timely maintenance be performed on the bituminous pavements to reduce the potential deterioration associated with moisture infiltration through surface cracks. The owner should be prepared to seal the cracks with a hot-applied elastic crack filler as soon as possible after cracking develops and as often as necessary to block the passage of water to the subgrade soils.

Portland Cement Concrete Rigid Pavement Design Recommendations

In accordance with AASHTO rigid Portland cement concrete pavement design criteria, we have assumed a terminal serviceability of 2.0, standard deviations of 0.35 for rigid pavements, and a reliability of 85 percent. For purposes of this design we have assumed an effective modulus of subgrade reaction (k) of 50 psi/in and a drainage factor (Cd) of 1.2. We performed pavement design analyses for the proposed rigid pavement roadways in accordance with the AASHTO design procedures for rigid pavements. Based on our analyses we recommend the following section for maintenance roads:

Entrance Road – Portland Cement Concrete Pavement	
Material Type	Thickness
ODOT Portland Cement Concrete Pavement	6 inches
ODOT Crushed Aggregate Base Course	6 inches

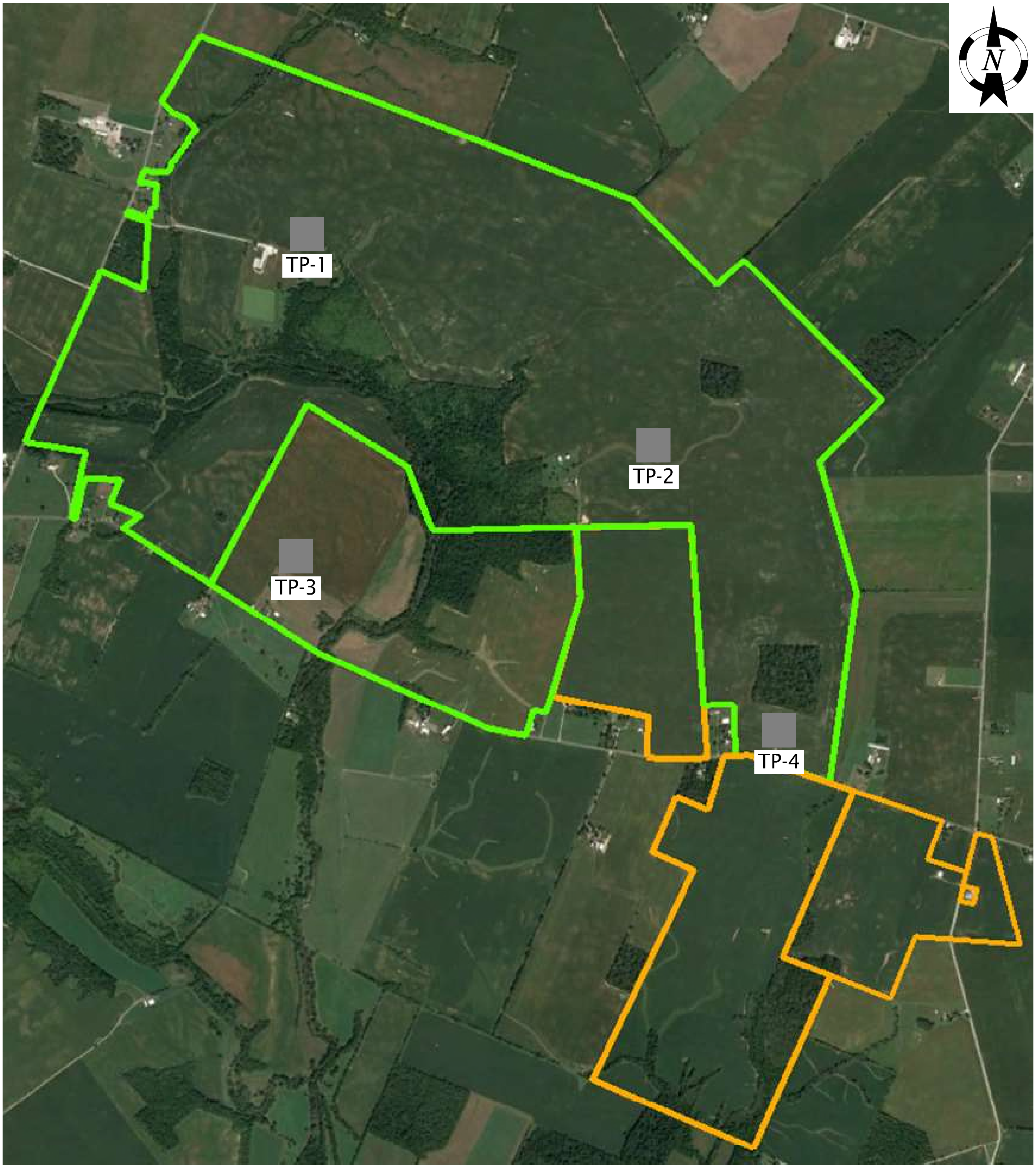
GENERAL COMMENTS

G2 has formulated the evaluations and recommendations presented in this report relative to site preparation and foundations on the basis of data provided to them relating to the location, type, and grade for the proposed site. Any significant change in this data should be brought to G2's attention for review and evaluation with respect to the prevailing subsurface conditions.

The scope of the present investigation was limited to evaluation of subsurface conditions for the support of the proposed structures and pavements and other related aspects of the development. No environmental or hydrogeological testing or analyses were included in the scope of this investigation. If changes occur in the design, location, or concept of the project, the conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.

G2 has based the analyses and recommendations submitted in this report upon the data from test pits and post load tests performed at the approximate locations shown on the Geotechnical Test Location Plan, Plate No. 1. This report does not reflect variations that may occur between the actual test locations and the actual structure locations. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for G2 to re-evaluate the report recommendations.

Soil conditions at the site could vary from those generalized on the basis of tests performed at specific locations. It is, therefore, recommended that G2 Consulting Group, LLC be retained to provide geotechnical engineering services during the site preparation, excavation, and foundation construction phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations. Also, this allows design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction.



Test Pit / Test Pile locations performed by G2 Consulting Group, LLC on December 1 and December 2, 2017

Geotechnical Test Location Plan

Madison County Solar
London, Madison County, Alabama

G2 CONSULTING GROUP

Project No. 173483	
Drawn by: JDC	
Date: 12-22-17	Plate No. 1
Scale: NTS	

APPENDIX A

Geotechnical Data

Project Name: Madison County Solar Power Plant

Project Location: London, Madison County, Ohio

G2 Project No. 173483

Latitude: 39.858881° Longitude: -83.342829°

Test Pit No. TP-1

G2 CONSULTING GROUP

SUBSURFACE PROFILE

ELEV. (ft)	GROUND SURFACE ELEVATION: 961.0 ft ±	DEPTH (ft)
	Tilled Earth: Stiff to Very Stiff Dark Gray Fat Clay with trace sand and organic matter (22 inches) (Organic Content @ 6 inches = 6.2%)	1.8
	Stiff Mottled Brown and Gray Sandy Clay with trace gravel	3.0
	Loose Mottled Brown and Gray Clayey Sand with trace silt, frequent clay lumps ▽	4.0
956.0	Stiff Mottled Brown and Gray Sandy Clay with trace gravel	5 / 6.0
	Very Stiff Brown Fat Clay with trace sand and gravel	9.0
951.0	End of Test Pit @ 9 ft	10

SOIL SAMPLE DATA

SAMPLE TYPE/NO.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	PERCENT COMPACTION	UNCOF. COMP. ST. (PSF)
ST-0	94.0	25.1		2500*
BS-1				4500*
BS-2		27.1		4000*
BS-3				3500*
BS-4		25.8		
BS-5		22.2		2000*
BS-6				2500*
BS-7		21.5		5000*
BS-8				7000*
BS-9				7000*

Total Depth: 9 ft
Excavation Date: December 2, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Operator: R. Kurdyla

Excavation Equipment:
John Deere 310K EP Backhoe

Water Level Observation:
Water seepage at 4 feet during excavation operations; dry upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Test Pits backfilled with excavated spoils

Project Name: Madison County Solar Power Plant

Project Location: London, Madison County, Ohio

G2 Project No. 173483

Latitude: 39.850962° Longitude: -83.325841°

Test Pit No. TP-2

G2 CONSULTING GROUP

SUBSURFACE PROFILE / SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 980.0 ft ±	DEPTH (ft)	SAMPLE TYPE/NO.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	PERCENT COMPACTION	UNCOF. COMP. ST. (PSF)
		Tilled Earth: Stiff to Very Stiff Dark Gray Fat Clay with trace sand and organic matter (18 inches) (Organic Content @ 6 inches = 5.9%)	1.5	ST-0	96.0	25.0		2500*
				BS-1				5000*
		Stiff to Very Stiff Mottled Brown and Gray Fat Clay with trace sand and gravel	5.0	BS-2				3500*
				BS-3		21.6		4500*
				BS-4				4000*
975.0	▽		5	BS-5		13.6		3000*
		Stiff Mottled Brown and Gray Sandy Clay with trace gravel, frequent sand seams	6.0	BS-6				3500*
		Very Stiff Mottled Brown and Gray Fat Clay with trace sand and gravel	8.0	BS-7				6000*
				BS-8				7000*
		End of Test Pit @ 8 ft						
970.0			10					

Total Depth: 8 ft
Excavation Date: December 1, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Operator: R. Kurdyla

Excavation Equipment:
John Deere 310K EP Backhoe

Water Level Observation:
Water seepage at 5 feet during excavation operations; dry upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Test Pits backfilled with excavated spoils

Figure No. 2

Project Name: Madison County Solar Power Plant

Project Location: London, Madison County, Ohio

G2 Project No. 173483

Latitude: 39.846586° Longitude: -83.344411°

Test Pit No. TP-3

G2 CONSULTING GROUP

SUBSURFACE PROFILE / SOIL SAMPLE DATA

GROUND SURFACE ELEVATION: 945.0 ft ±

ELEV. (ft)	PRO-FILE	Description	DEPTH (ft)	SAMPLE TYPE/NO.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	PERCENT COMPACTION	UNCOF. COMP. ST. (PSF)
		Tilled Earth: Stiff to Very Stiff Dark Brown Fat Clay with trace sand and roots (12 inches) (Organic Content @ 6 inches = 3.9%)		ST-0	88.0	22.3		2000*
			1.0	BS-1				4000*
		Very Stiff Brown Fat Clay with little sand		BS-2		22.3		5000*
				BS-3				5000*
				BS-4		25.5		5000*
940.0			5	BS-5				6000*
				BS-6		15.0		6000*
				BS-7				7500*
			8.0	BS-8				7000*
		End of Test Pit @ 8 ft						
935.0			10					

Total Depth: 8 ft
Excavation Date: December 1, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Operator: R. Kurdyla

Excavation Equipment:
John Deere 310K EP Backhoe

Water Level Observation:
Dry during and upon completion of excavation operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Test Pits backfilled with excavated spoils

Figure No. 3

Project Name: Madison County Solar Power Plant

Project Location: London, Madison County, Ohio

G2 Project No. 173483

Latitude: 39.839922° Longitude: -83.319817°

Test Pit No. TP-4

G2 CONSULTING GROUP

SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: 983.0 ft ±

ELEV. (ft)	DEPTH (ft)	Description
	0–1.7	Tilled Earth: Stiff to Very Stiff Dark Gray Fat Clay with trace sand and organic matter (20 inches) (Organic Content @ 6 inches = 7.3%)
978.0 (at 5 ft)	1.7–5.5	Very Stiff Mottled Brown and Gray Fat Clay with trace sand and gravel
	5.5–7.0	Stiff Mottled Brown and Gray Sandy Clay with trace gravel, frequent sand seams
	7.0–9.0	Loose Brown Clayey Sand with trace silt and gravel, frequent clay lumps
973.0 (at 10 ft)	9.0	End of Test Pit @ 9 ft

SOIL SAMPLE DATA

SAMPLE TYPE/NO.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	PERCENT COMPACTION	UNCOF. COMP. ST. (PSF)
ST-0	85.0	32.0		2500*
BS-1				5500*
BS-2				7000*
BS-3		25.9		7000*
BS-4				7500*
BS-5				6500*
BS-6		30.2		3500*
BS-7				3000*
BS-8		12.9		
BS-9				

Total Depth: 9 ft
Excavation Date: December 1, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Operator: R. Kurdyla

Excavation Equipment:
John Deere 310K EP Backhoe

Water Level Observation:
Water seepage at 5-1/2 feet during excavation operations; dry upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Test Pits backfilled with excavated spoils

Test Pit Photographic Documentation
Madison County Solar, London, Ohio
G2 Project No. 173483

Test Pit ID: TP-1
Test Pit Depth: 9 feet
Date: December 2, 2017
Field Engineer(s): Jeff Crow, E.I.T.
Reece Kurdyla, E.I.T.

Figure No. 5

Test Pit Photographic Documentation
Madison County Solar, London, Ohio
G2 Project No. 173483

Test Pit ID: TP-2
Test Pit Depth: 8 feet
Date: December 1, 2017
Field Engineer(s): Jeff Crow, E.I.T.
Reece Kurdyla, E.I.T.

Figure No. 6

Test Pit Photographic Documentation
Madison County Solar, London, Ohio
G2 Project No. 173483

Test Pit ID: TP-3
Test Pit Depth: 8 feet
Date: December 1, 2017
Field Engineer(s): Jeff Crow, E.I.T.
Reece Kurdyla, E.I.T.

Figure No. 7

Test Pit Photographic Documentation
Madison County Solar, London, Ohio
G2 Project No. 173483

Test Pit ID: TP-4
Test Pit Depth: 9 feet
Date: December 1, 2017
Field Engineer(s): Jeff Crow, E.I.T.
Reece Kurdyla, E.I.T.

CONSULTING GROUP

Terrain Photographic Documentation
Madison County Solar, London, Ohio
G2 Project No. 173483

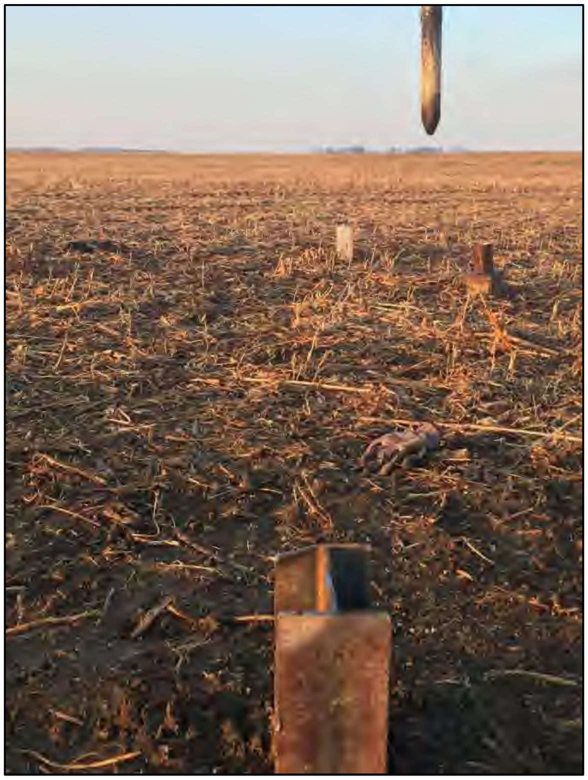
PT-1 - Looking North

PT-1 - Looking East

PT-1 - Looking West

PT-1 - Looking South

Figure No. 9



PT-2 - Looking North

PT-2 - Looking East

PT-2 - Looking West

PT-2 - Looking South


PT-3 - Looking North


PT-3 - Looking East


PT-3 - Looking West


PT-3 - Looking South

PT-4 - Looking North

PT-4 - Looking East

PT-4 - Looking West

PT-4 - Looking South

PT-1A (Top)

PT-1A (Bottom)

PT-1B (Top)

PT-1B (Bottom)

Figure No. 13

Post Head Photographic Documentation
Madison County Solar, London, Ohio
G2 Project No. 173483


PT-2A (Top)


PT-2A (Bottom)


PT-2B (Top)


PT-2B (Bottom)

Figure No. 14


PT-3A (Top)


PT-3A (Bottom)


PT-3B (Top)


PT-3B (Bottom)

Figure No. 15

PT-4A (Top)

PT-4A (Bottom)

PT-4B (Top)

PT-4B (Bottom)

Figure No. 16

GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

PARTICLE SIZE

Boulders		- greater than 12 inches
Cobbles		- 3 inches to 12 inches
Gravel	- Coarse	- 3/4 inches to 3 inches
	- Fine	- No. 4 to 3/4 inches
Sand	- Coarse	- No. 10 to No. 4
	- Medium	- No. 40 to No. 10
	- Fine	- No. 200 to No. 40
Silt		- 0.005mm to 0.074mm
Clay		- Less than 0.005mm

CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

Second Major Constituent (percent by weight)	Minor Constituent (percent by weight)
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35%	Little - 12 to 23%
And - over 35%	Some - 23 to 33%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

COHESIONLESS SOILS

Density Classification	Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

AS - Auger Sample – Cuttings directly from auger flight
BS - Bottle or Bag Samples
S - Split Spoon Sample - ASTM D 1586
LS - Liner Sample with liner insert 3 inches in length
ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
PS - Piston Sample - 3 inch diameter unless otherwise noted
RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).

CONSULTING GROUP

Post Load Test Results

Test Location: 1A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	6 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/2/2017

Tension Load Test						Lateral Load Test					
	Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)		Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)
1	1	0	0.000	0.000	0.000	1	1	0	0.000	0.000	0.000
2	1	631	0.000	0.001	0.000	2	1	813	0.028	0.017	0.022
3	1	1057	0.000	0.001	0.000	3	1	1257	0.056	0.043	0.049
4	1	1711	0.003	0.005	0.004	4	1	0	0.033	0.009	0.021
5	1	2051	0.007	0.009	0.008	5	1	1268	0.063	0.042	0.052
6	5	2203	0.015	0.017	0.016	6	1	1728	0.102	0.081	0.091
7	1	0	0.015	0.017	0.016	7	1	0	0.036	0.014	0.025
8	1	2193	0.017	0.019	0.018	8	1	1502	0.092	0.069	0.080
9	1	3668	0.310	0.312	0.311	9	1	2133	0.156	0.133	0.144
10	1	0	0.300	0.295	0.297	10	1	0	0.046	0.025	0.035
11	1	3138	1.033	1.040	1.036	11	1	2158	0.161	0.130	0.146
12	1	0	1.030	1.028	1.029	12	1	2571	0.213	0.180	0.196
Reset Gauge to Zero						13	1	0	0.054	0.028	0.041
13	1	0	0.000	0.000	0.000	14	1	2671	0.239	0.190	0.215
14	1	3262	0.500	0.510	0.505	15	1	3042	0.300	0.242	0.271
15	0	0	0.000	0.000	0.000	16	1	0	0.077	0.045	0.061
						17	1	3226	0.341	0.265	0.303
						18	1	3951	0.508	0.397	0.452
						19	1	4199	0.621	0.501	0.561
						20	1	0	0.214	0.116	0.165
						21	1	4964	1.010	0.811	0.910
						22	1	5424	1.009	1.220	1.115
						23	1	0	0.408	0.562	0.485

Figure No. 18A

Tension Post Load Test Results

Test Location: 1A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	6 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/2/2017

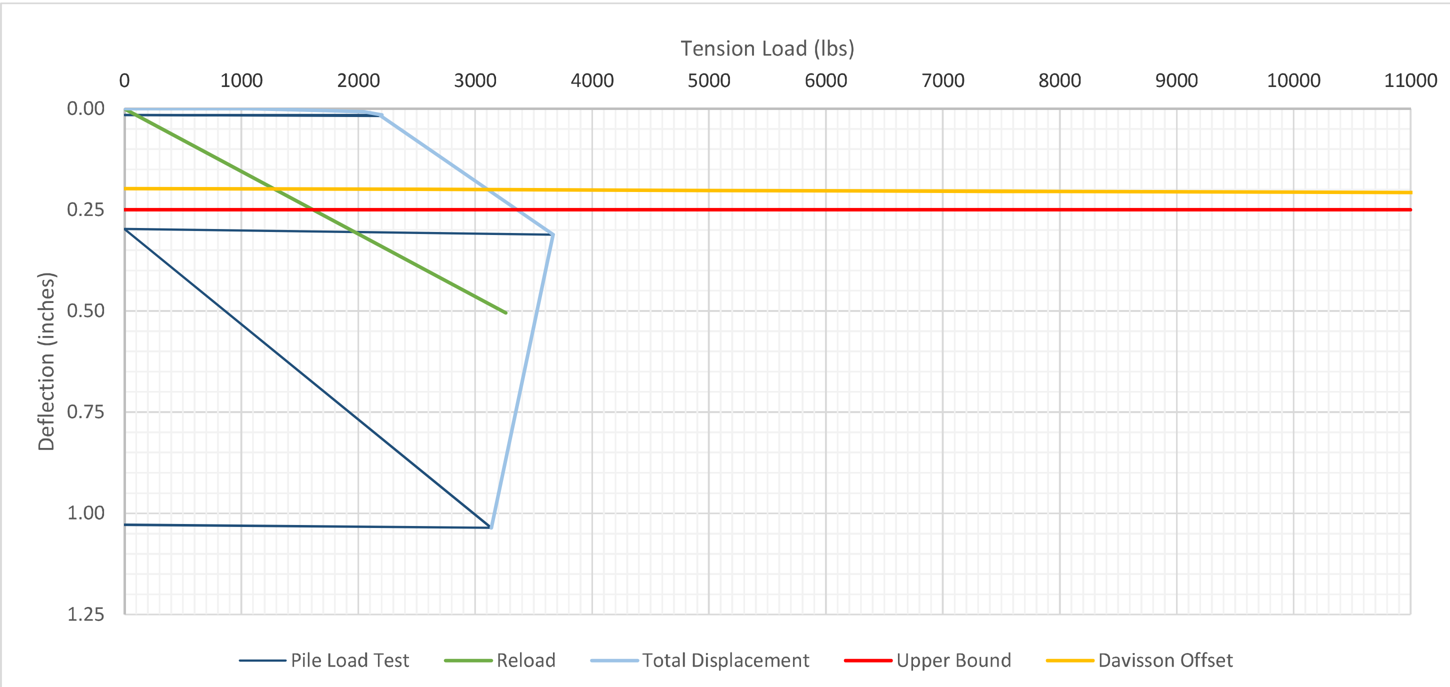


Figure No. 18B

Lateral Post Load Test Results

Test Location: 1A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	6 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/2/2017

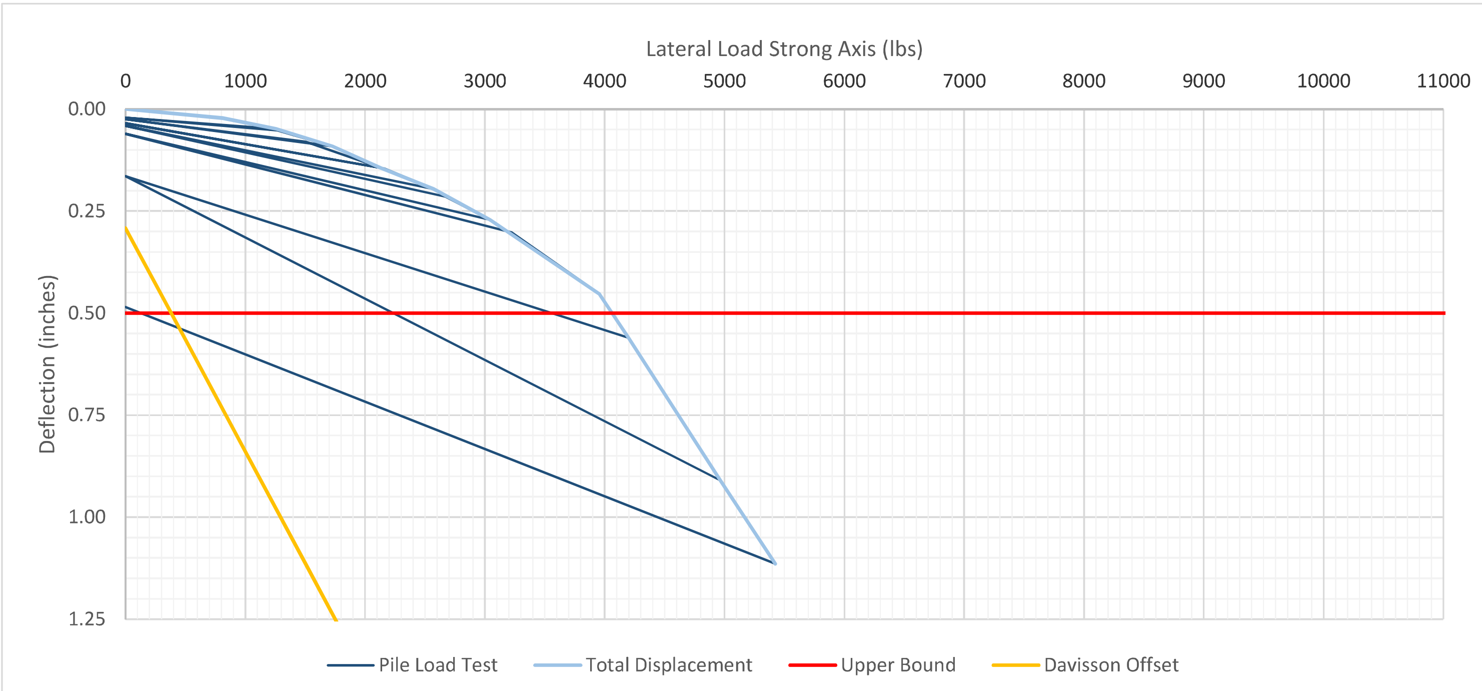


Figure No. 18C

CONSULTING GROUP

Post Load Test Results

Test Location: 1B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	9 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/2/2017

Tension Load Test						Lateral Load Test					
	Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)		Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)
1	1	0	0.000	0.000	0.000	1	1	0	0.000	0.000	0.000
2	1	775	0.000	0.011	0.006	2	1	773	-0.002	0.013	0.006
3	1	1334	0.000	0.011	0.006	3	1	1057	-0.002	0.013	0.006
4	1	2072	0.000	0.011	0.006	4	1	0	0.000	0.000	0.000
5	5	2255	0.001	0.011	0.006	5	1	1271	0.009	0.092	0.051
6	1	0	0.002	0.011	0.006	6	1	1570	0.007	0.113	0.060
7	1	2374	0.002	0.011	0.006	7	1	0	-0.038	0.113	0.038
8	1	5573	0.268	0.282	0.275	8	1	1620	0.038	0.127	0.082
9	1	0	0.275	0.258	0.266	9	1	2012	0.063	0.149	0.106
10	1	5409	1.037	1.040	1.038	10	1	0	-0.043	0.149	0.053
11	1	0	1.037	1.040	1.038	11	1	2380	0.135	0.210	0.172
Reset Gauge to Zero						12	1	2570	0.162	0.208	0.185
13	1	0	0.000	0.000	0.000	13	1	0	-0.059	0.071	0.006
13	1	5258	0.551	0.547	0.549	14	1	2561	0.195	0.176	0.185
14	1	0	0.560	0.538	0.549	15	1	3189	0.224	0.263	0.244
						16	1	0	-0.058	0.118	0.030
						17	1	3267	0.249	0.280	0.264
						18	1	5219	0.472	0.521	0.496
						19	1	5420	0.506	0.561	0.533
						20	1	0	-0.057	0.219	0.081
						21	1	7513	1.064	1.014	1.039
						22	1	0	0.087	0.237	0.162

CONSULTING GROUP

Tension Post Load Test Results

Test Location: 1B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	9 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/2/2017

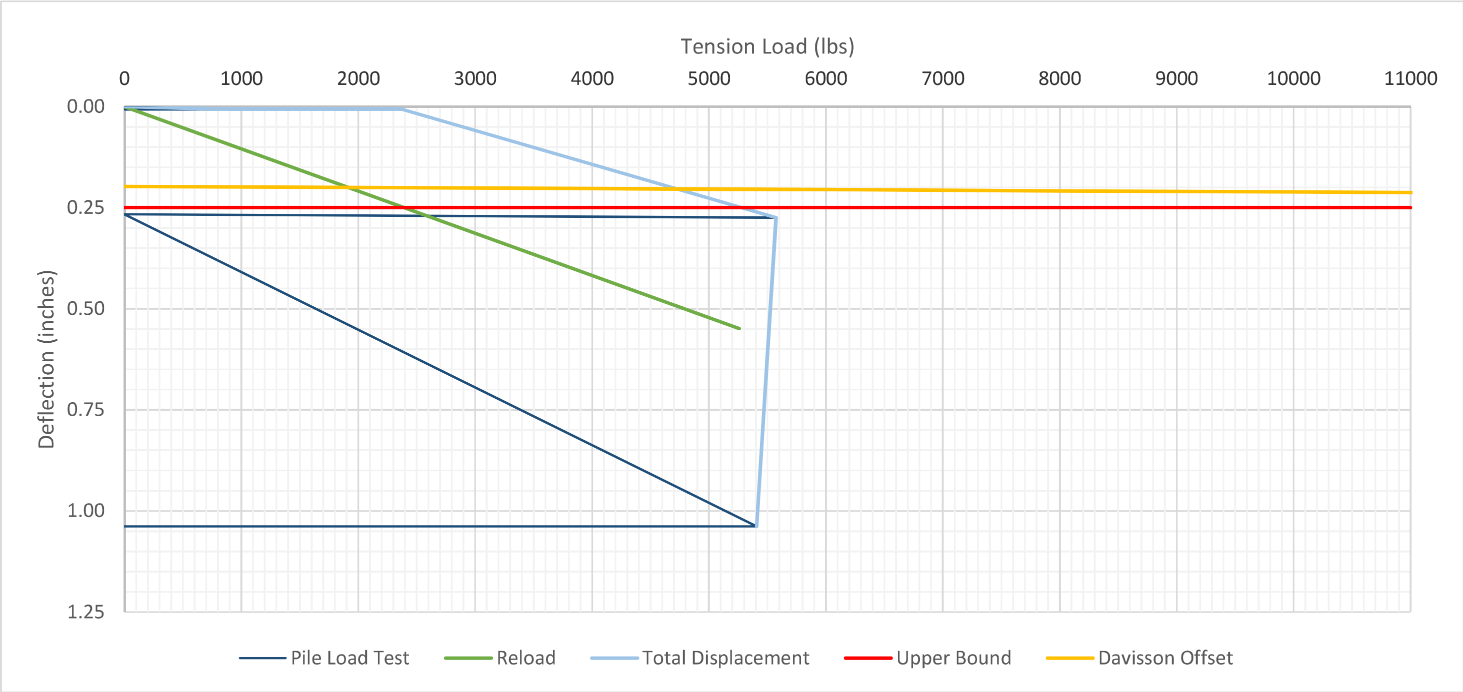


Figure No. 19B

Lateral Post Load Test Results

Test Location: 1B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	9 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/2/2017

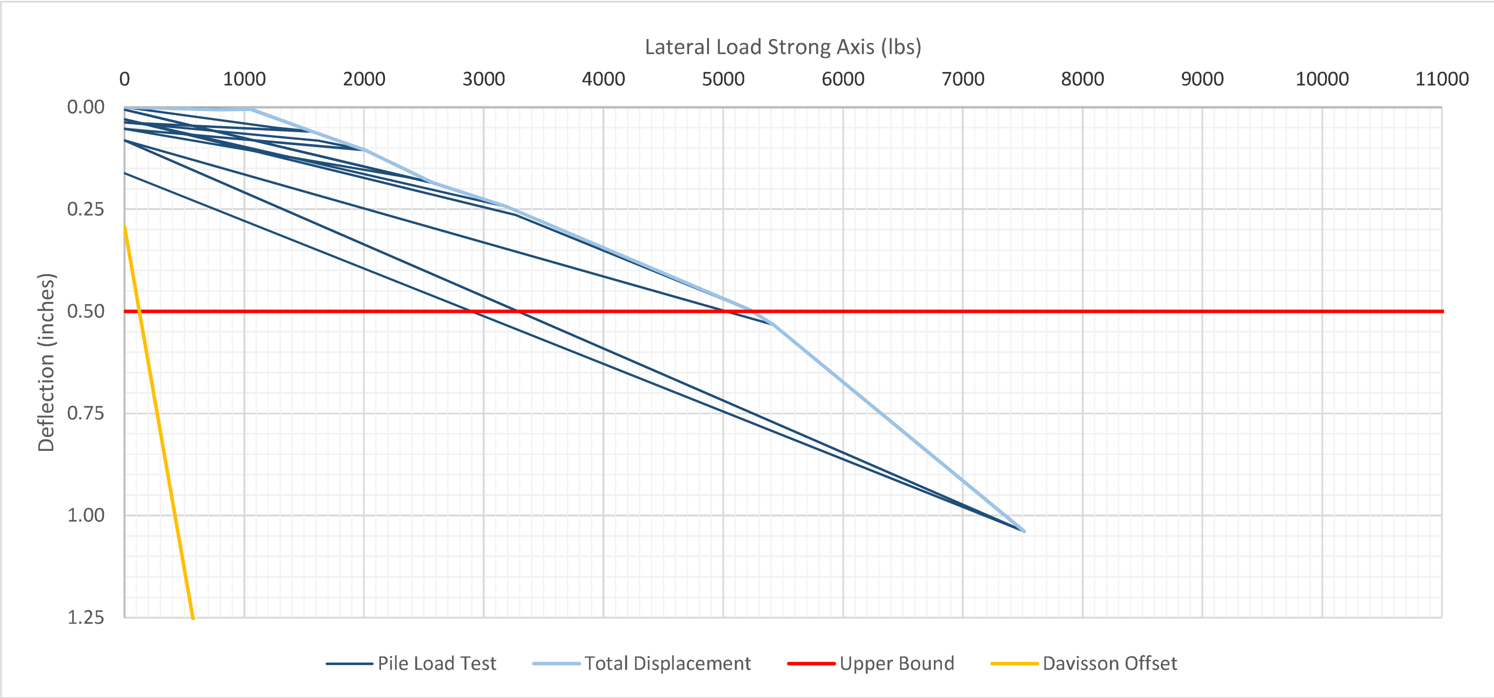


Figure No. 19C

CONSULTING GROUP

Post Load Test Results

Test Location: 2A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	5 feet	Project Number:	173483
GPS Test Coordinates:	39.850962°, -83.325841°	Test Date:	12/1/2017

Tension Load Test						Lateral Load Test					
	Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)		Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)
1	1	0	0.000	0.000	0.000	1	1	0	0.000	0.000	0.000
2	1	590	0.000	0.000	0.000	2	1	687	0.025	0.011	0.018
3	1	1119	0.002	0.000	0.001	3	1	1397	0.109	0.064	0.086
4	1	1542	0.006	0.003	0.004	4	1	0	0.037	0.021	0.029
5	1	2070	0.015	0.011	0.013	5	1	1521	0.128	0.078	0.103
6	5	2145	0.026	0.021	0.023	6	1	0	0.040	0.019	0.029
7	1	0	0.022	0.021	0.022	7	1	1852	0.169	0.119	0.144
8	1	2580	0.044	0.037	0.040	8	1	2292	0.232	0.190	0.211
9	1	3849	0.297	0.281	0.289	9	1	0	0.070	0.038	0.054
10	1	0	0.274	0.268	0.271	10	1	2019	0.211	0.177	0.194
11	1	4229	1.054	1.046	1.050	11	1	2526	0.268	0.244	0.256
12	1	0	1.061	1.022	1.042	12	1	0	0.087	0.045	0.066
Reset Gauge to Zero						13	1	2632	0.296	0.280	0.288
13	1	0	0.000	0.000	0.000	14	1	3040	0.377	0.376	0.377
14	1	4264	0.499	0.502	0.500	15	1	0	0.153	0.075	0.114
15	1	0	0.498	0.502	0.500	16	1	3256	0.417	0.413	0.415
						17	1	3689	0.538	0.538	0.538
						18	1	0	0.240	0.145	0.193
						19	1	4944	1.027	1.044	1.035
						20	1	0	0.540	0.410	0.475

Figure No. 20A

Tension Post Load Test Results

Test Location: 2A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	5 feet	Project Number:	173483
GPS Test Coordinates:	39.850962°, -83.325841°	Test Date:	12/1/2017

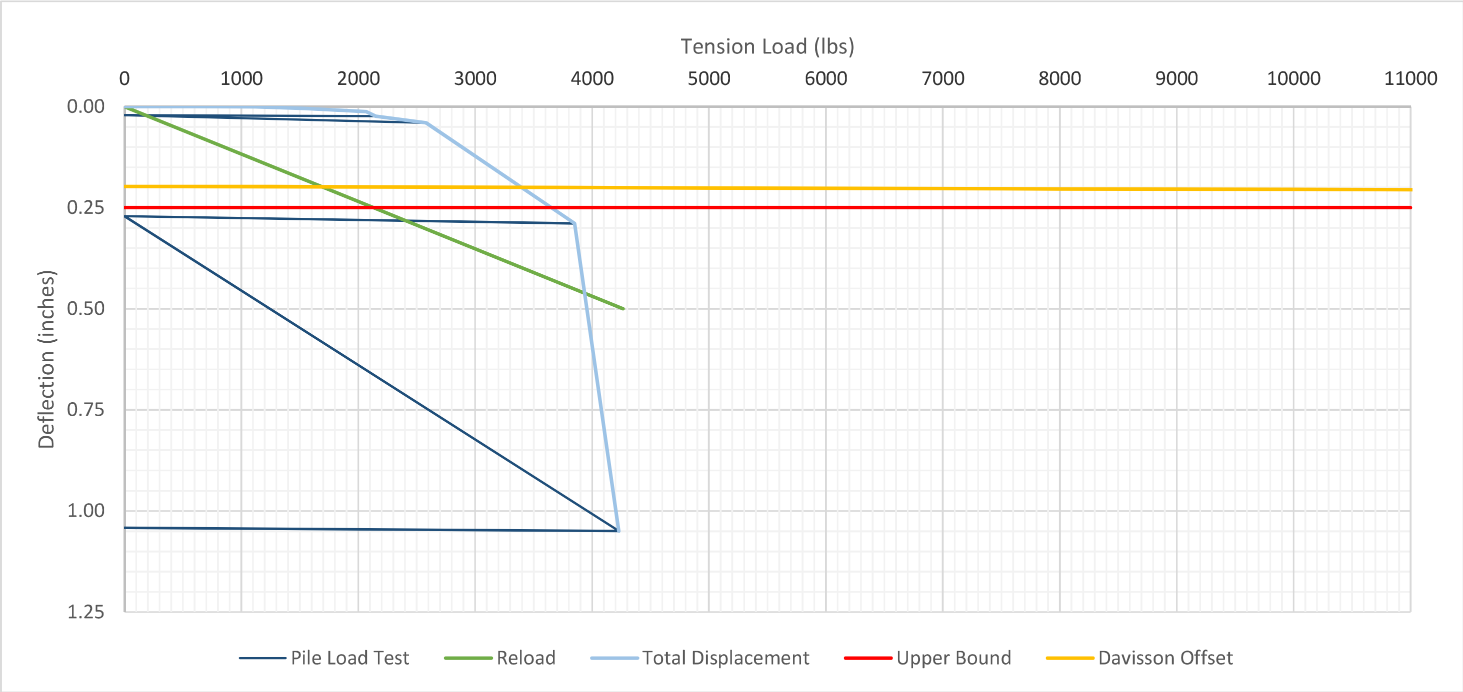


Figure No. 20B

Lateral Post Load Test Results

Test Location: 2A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	5 feet	Project Number:	173483
GPS Test Coordinates:	39.850962°, -83.325841°	Test Date:	12/1/2017

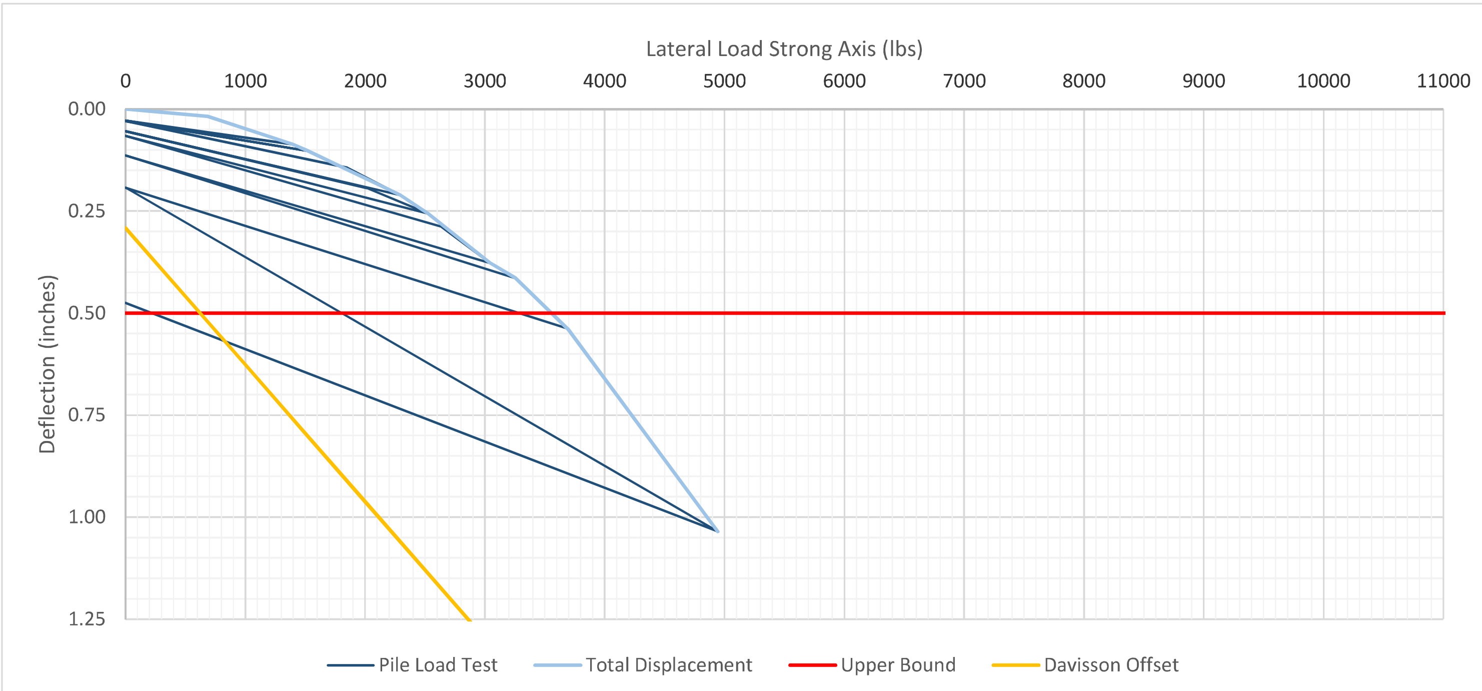


Figure No. 20C

CONSULTING GROUP

Post Load Test Results

Test Location: 2B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	8 feet	Project Number:	173483
GPS Test Coordinates:	39.850962°, -83.325841°	Test Date:	12/1/2017

Tension Load Test						Lateral Load Test					
	Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)		Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)
1	1	0	0.000	0.000	0.000	1	1	0	0.000	0.000	0.000
2	1	663	0.000	0.000	0.000	2	1	915	-0.003	0.095	0.046
3	1	1231	0.000	0.000	0.000	3	1	1309	0.027	0.139	0.083
4	1	1663	0.000	0.000	0.000	4	1	0	-0.041	0.111	0.035
5	1	2166	0.005	0.000	0.002	5	1	1737	0.033	0.183	0.108
6	5	2031	0.005	0.000	0.002	6	1	0	-0.055	0.121	0.033
7	1	0	0.005	0.000	0.002	7	1	1630	0.048	0.207	0.127
8	1	2495	0.004	0.001	0.002	8	1	2004	0.048	0.212	0.130
9	1	7458	0.420	0.286	0.353	9	1	0	-0.060	0.133	0.037
10	1	0	0.420	0.267	0.344	10	1	2154	0.089	0.275	0.182
11	1	7362	1.221	1.014	1.118	11	1	2550	0.089	0.306	0.198
12	1	0	1.224	0.994	1.109	12	1	0	-0.076	0.182	0.053
Reset Gauge to Zero						13	1	2752	0.138	0.412	0.275
13	1	0	0.000	0.000	0.000	14	1	3073	0.162	0.446	0.304
14	1	7318	0.521	0.525	0.523	15	1	0	-0.094	0.210	0.058
15	1	0	0.540	0.499	0.519	16	1	3091	0.160	0.491	0.326
						17	1	3787	0.268	0.670	0.469
						18	1	4589	0.365	0.924	0.645
						19	1	0	-0.155	0.382	0.113
						20	1	5093	0.400	1.104	0.752
						21	1	6857	0.606	1.695	1.150
						22	1	0	-0.170	0.710	0.270

Figure No. 21A

Tension Post Load Test Results

Test Location: 2B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	8 feet	Project Number:	173483
GPS Test Coordinates:	39.850962°, -83.325841°	Test Date:	12/1/2017

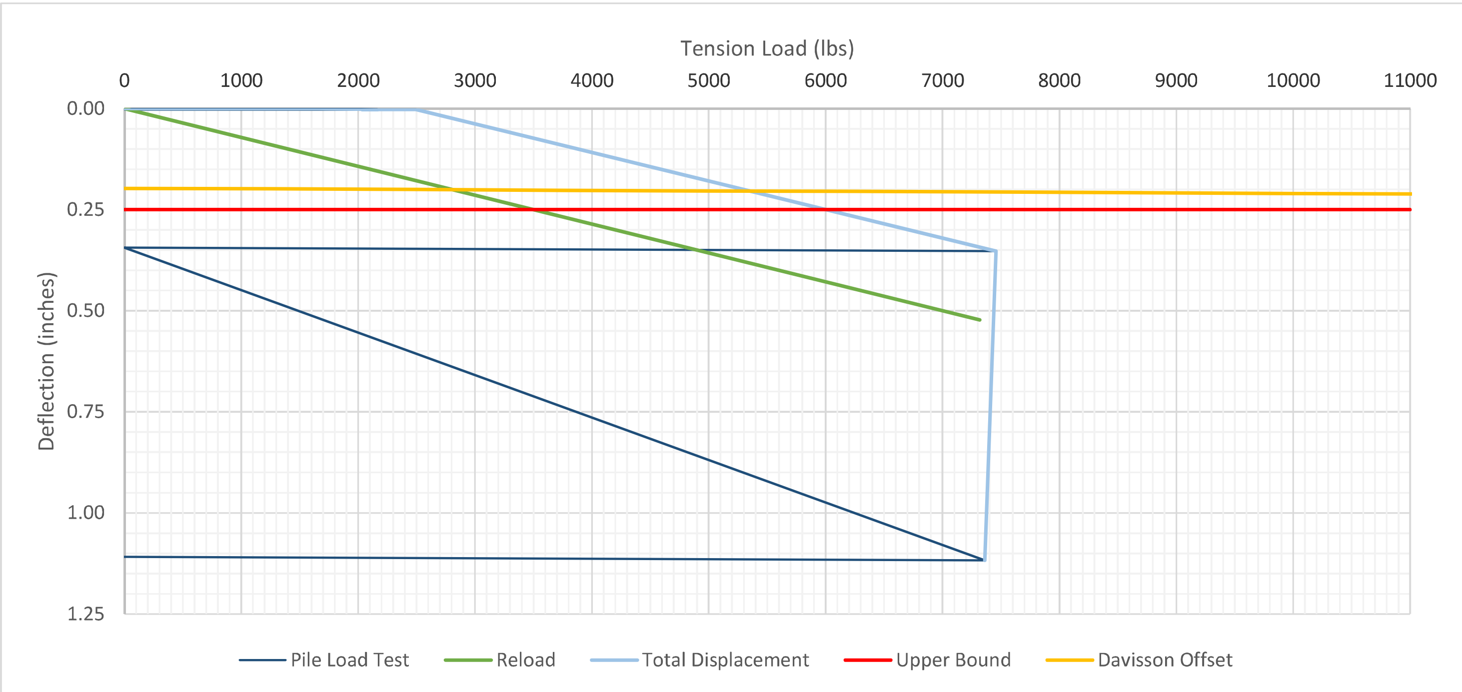


Figure No. 21B

CONSULTING GROUP

Lateral Post Load Test Results

Test Location: 2B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	8 feet	Project Number:	173483
GPS Test Coordinates:	39.850962°, -83.325841°	Test Date:	12/1/2017

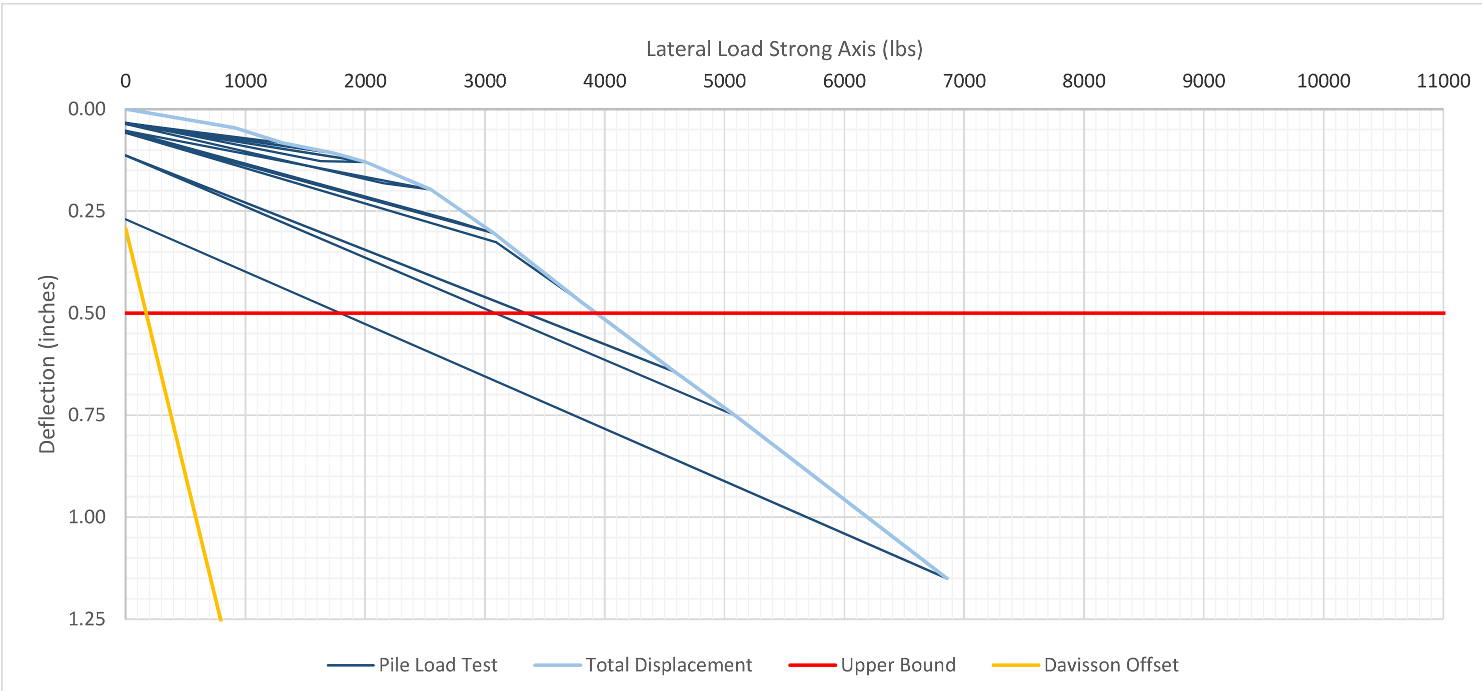


Figure No. 21C

CONSULTING GROUP

Post Load Test Results

Test Location: 3A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	5 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/1/2017

Tension Load Test						Lateral Load Test					
	Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)		Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)
1	1	0	0.000	0.000	0.000	1	1	0	0.000	0.000	0.000
2	1	862	0.000	0.000	0.000	2	1	675	0.080	-0.030	0.025
3	1	1358	0.000	0.000	0.000	3	1	1270	0.160	-0.032	0.064
4	1	1719	0.000	0.001	0.000	4	1	0	0.023	-0.010	0.007
5	1	2225	0.000	0.006	0.003	5	1	1506	0.167	-0.027	0.070
6	5	2167	0.000	0.006	0.003	6	1	0	0.027	-0.002	0.013
7	1	0	0.000	0.006	0.003	7	1	1755	0.173	0.027	0.100
8	1	2349	0.002	0.007	0.004	8	1	2109	0.245	0.069	0.157
9	1	6383	0.264	0.279	0.271	9	1	0	0.034	0.033	0.033
10	1	0	0.262	0.274	0.268	10	1	2291	0.249	0.082	0.165
11	1	7638	1.030	1.042	1.036	11	1	2662	0.297	0.143	0.220
12	1	0	1.027	1.049	1.038	12	1	0	0.051	0.046	0.048
Reset Gauge to Zero						13	1	2735	0.300	0.163	0.231
13	1	0	0.000	0.000	0.000	14	1	3039	0.341	0.208	0.275
14	1	7540	0.543	0.530	0.536	15	1	0	0.073	0.053	0.063
15	1	0	0.530	0.535	0.532	16	1	3358	0.390	0.264	0.327
						17	1	4011	0.519	0.387	0.453
						18	1	4634	0.655	0.503	0.579
						19	1	0	0.203	0.153	0.178
						20	1	5959	1.014	0.831	0.923
						21	1	6512	1.199	1.017	1.108
						22	1	0	0.511	0.408	0.459

Figure No. 22A

CONSULTING GROUP

Tension Post Load Test Results

Test Location: 3A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	5 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/1/2017

Figure No. 22B

Lateral Post Load Test Results

Test Location: 3A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	5 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/1/2017

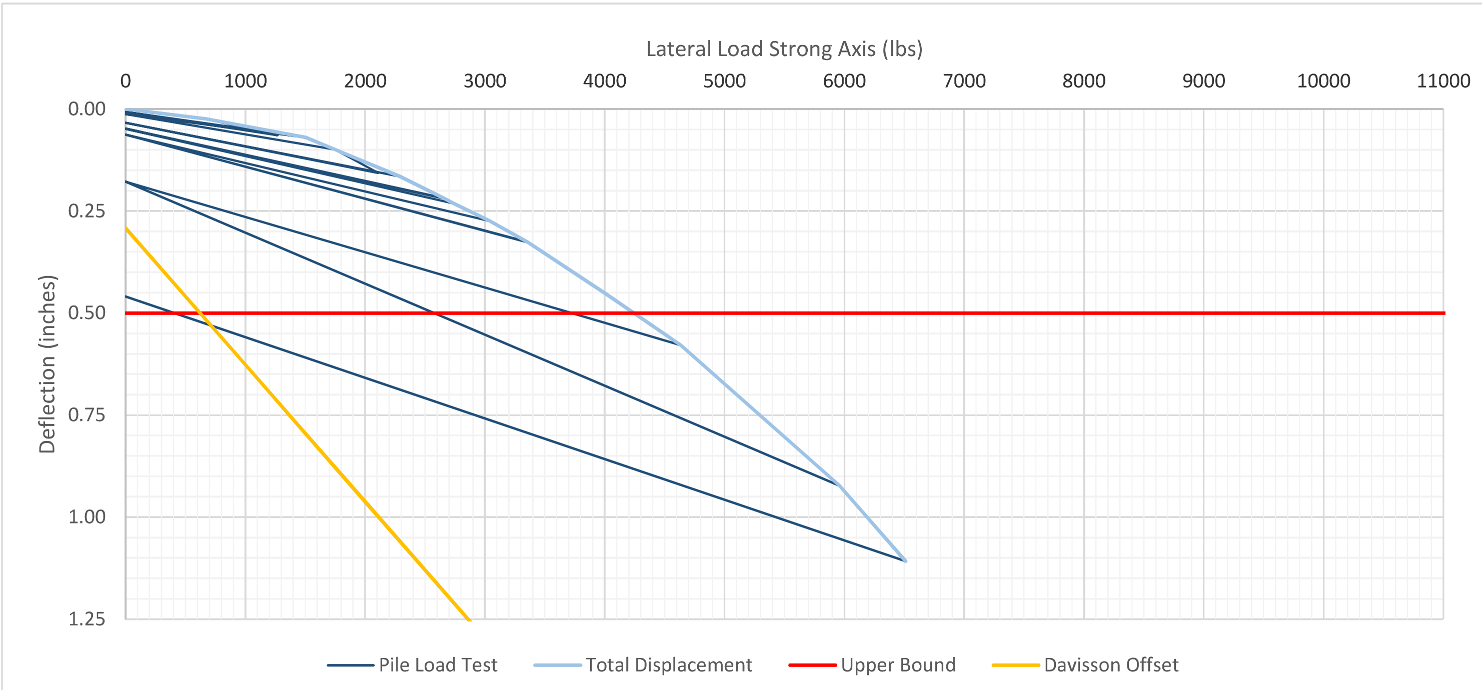


Figure No. 22C

CONSULTING GROUP

Post Load Test Results

Test Location: 3B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	8 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/1/2017

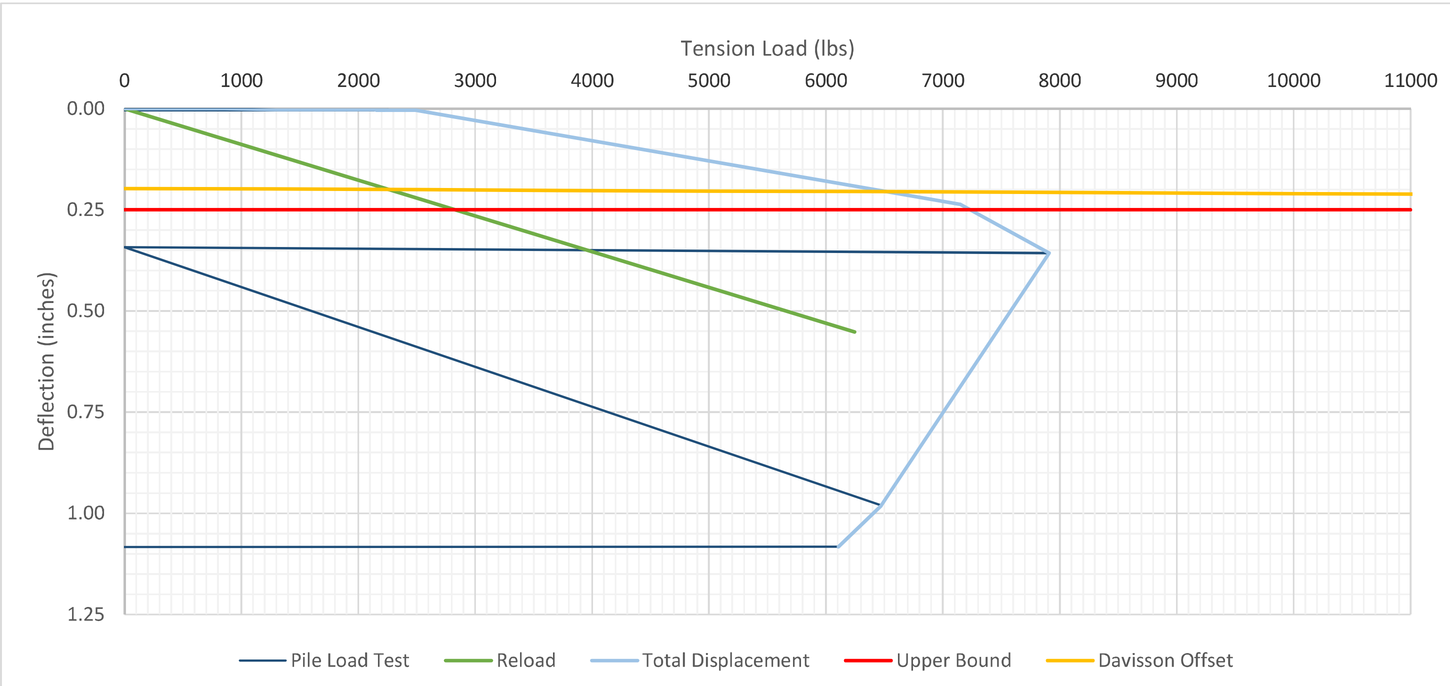
Tension Load Test						Lateral Load Test					
	Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)		Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)
1	1	0	0.000	0.000	0.000	1	1	0	0.000	0.000	0.000
2	1	858	0.001	0.000	0.000	2	1	645	-0.056	0.105	0.025
3	1	1294	0.004	0.001	0.002	3	1	1147	-0.041	0.162	0.061
4	1	1596	0.004	0.001	0.002	4	1	0	-0.033	0.064	0.016
5	1	2256	0.004	0.001	0.002	5	1	1081	-0.041	0.155	0.057
6	5	2154	0.007	0.001	0.004	6	1	1617	-0.001	0.212	0.105
7	1	0	0.002	0.006	0.004	7	1	0	-0.028	0.072	0.022
8	1	2490	0.002	0.006	0.004	8	1	1764	0.022	0.225	0.123
9	1	7145	0.189	0.283	0.236	9	1	2012	0.042	0.247	0.145
10	1	7909	0.309	0.406	0.357	10	1	0	-0.021	0.078	0.028
11	1	0	0.332	0.353	0.343	11	1	2210	0.072	0.270	0.171
12	1	6473	0.930	1.032	0.981	12	1	2500	0.109	0.294	0.201
13	1	6108	1.034	1.132	1.083	13	1	0	-0.012	0.079	0.034
15	1	0	1.065	1.102	1.083	14	1	2632	0.125	0.301	0.213
Reset Gauge to Zero						15	1	3001	0.154	0.342	0.248
16	1	0	0.000	0.000	0.000	16	1	0	0.004	0.070	0.037
17	1	6245	0.519	0.585	0.552	17	1	3368	0.192	0.383	0.288
18	1	0	0.541	0.544	0.543	18	1	4308	0.286	0.534	0.410
						19	1	6424	0.548	0.841	0.695
						20	1	0	0.105	0.104	0.105
						21	1	7805	0.819	1.005	0.912
						22	1	8824	1.013	1.178	1.095
						23	1	0	0.228	0.160	0.194

Figure No. 23A

Tension Post Load Test Results

Test Location: 3B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	8 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/1/2017



CONSULTING GROUP

Lateral Post Load Test Results

Test Location: 3B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	8 feet	Project Number:	173483
GPS Test Coordinates:	39.858881°, -83.342829°	Test Date:	12/1/2017

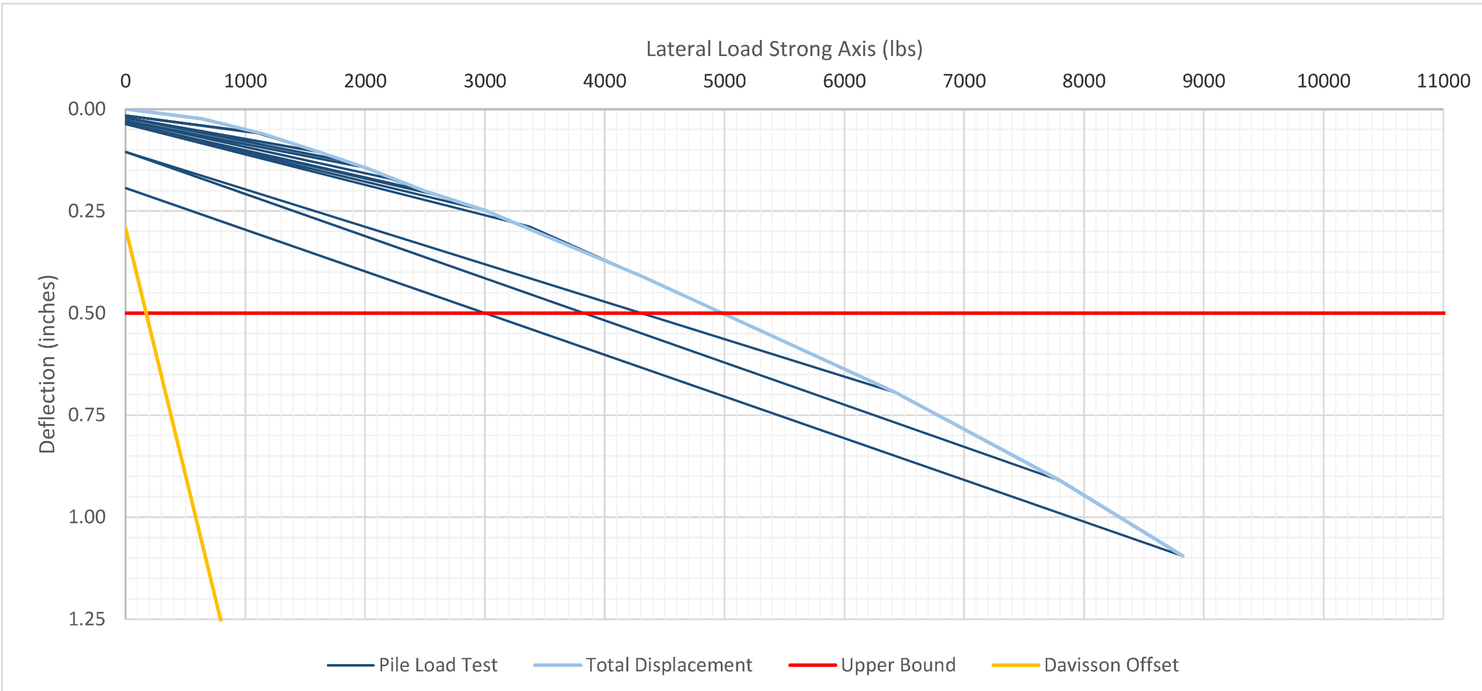


Figure No. 23C

CONSULTING GROUP

Post Load Test Results

Test Location: 4A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	6 feet	Project Number:	173483
GPS Test Coordinates:	39.839922°, -83.319817°	Test Date:	12/1/2017

Tension Load Test						Lateral Load Test					
	Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)		Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)
1	1	0	0.000	0.000	0.000	1	1	0	0.000	0.000	0.000
2	1	605	0.002	0.000	0.001	2	1	859	0.007	0.001	0.004
3	1	1145	0.003	0.005	0.004	3	1	1074	0.007	0.020	0.013
4	1	1657	0.006	0.009	0.008	4	1	0	0.007	0.013	0.010
5	1	2039	0.009	0.013	0.011	5	1	1383	0.022	0.053	0.038
6	5	2058	0.024	0.016	0.020	6	1	1580	0.041	0.064	0.052
7	1	0	0.024	0.016	0.020	7	1	0	0.001	0.033	0.017
8	1	2476	0.027	0.022	0.025	8	1	1685	0.047	0.070	0.059
9	1	4133	0.265	0.294	0.280	9	1	2107	0.067	0.120	0.093
10	1	0	0.258	0.274	0.266	10	1	0	0.004	0.051	0.027
11	1	3927	1.032	1.077	1.054	11	1	2305	0.102	0.142	0.122
12	1	0	1.031	1.053	1.042	12	1	2644	0.125	0.160	0.142
Reset Gauge to Zero						13	1	0	0.025	0.049	0.037
15	1	0	0.000	0.000	0.000	14	1	2961	0.168	0.170	0.169
16	1	3517	0.518	0.541	0.529	15	1	3184	0.188	0.181	0.184
17	1	0	0.513	0.511	0.512	16	1	0	0.018	0.060	0.039
						17	1	3759	0.258	0.277	0.268
						18	1	4378	0.297	0.473	0.385
						19	1	5187	0.535	0.681	0.608
						20	1	0	0.123	0.241	0.182
						21	1	5966	0.646	0.928	0.787
						22	1	7044	1.015	1.193	1.104
						23	1	0	0.356	0.939	0.647

Figure No. 24A

Tension Post Load Test Results

Test Location: 4A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	6 feet	Project Number:	173483
GPS Test Coordinates:	39.839922°, -83.319817°	Test Date:	12/1/2017

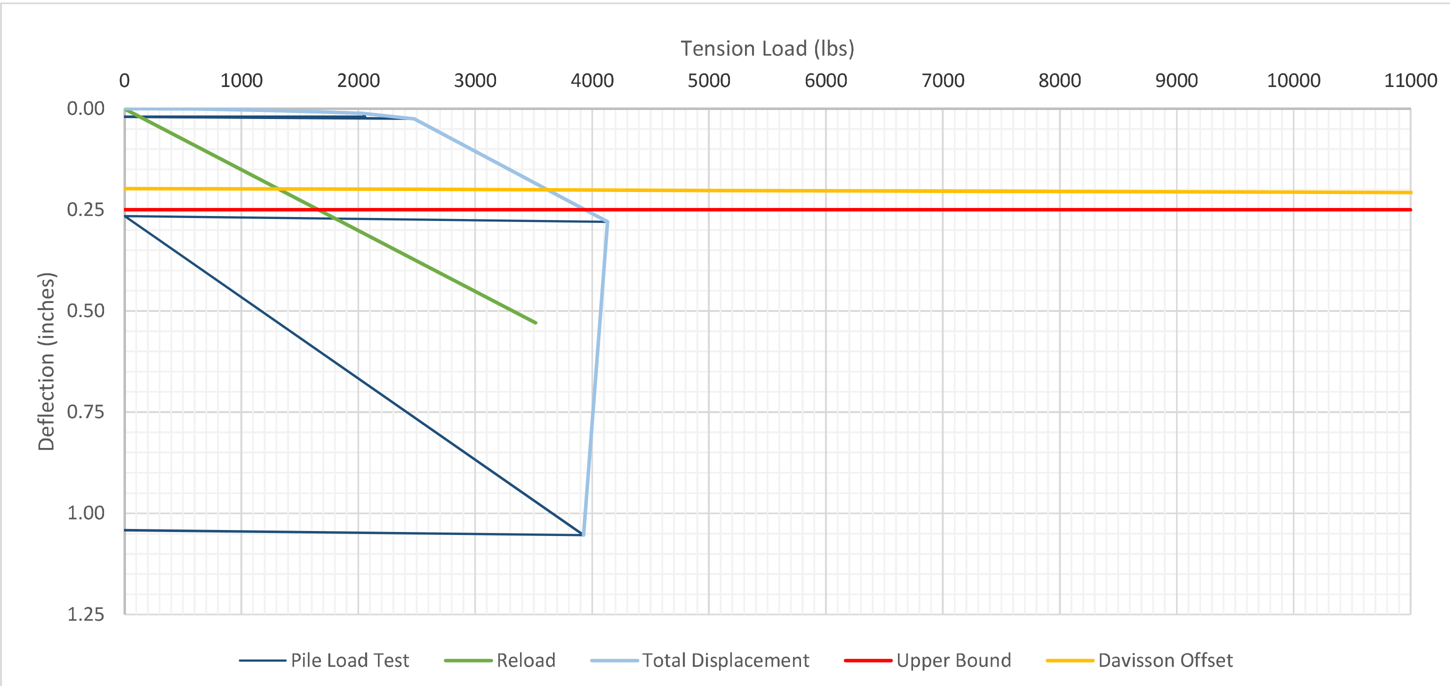


Figure No. 24B

Lateral Post Load Test Results

Test Location: 4A

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	6 feet	Project Number:	173483
GPS Test Coordinates:	39.839922°, -83.319817°	Test Date:	12/1/2017

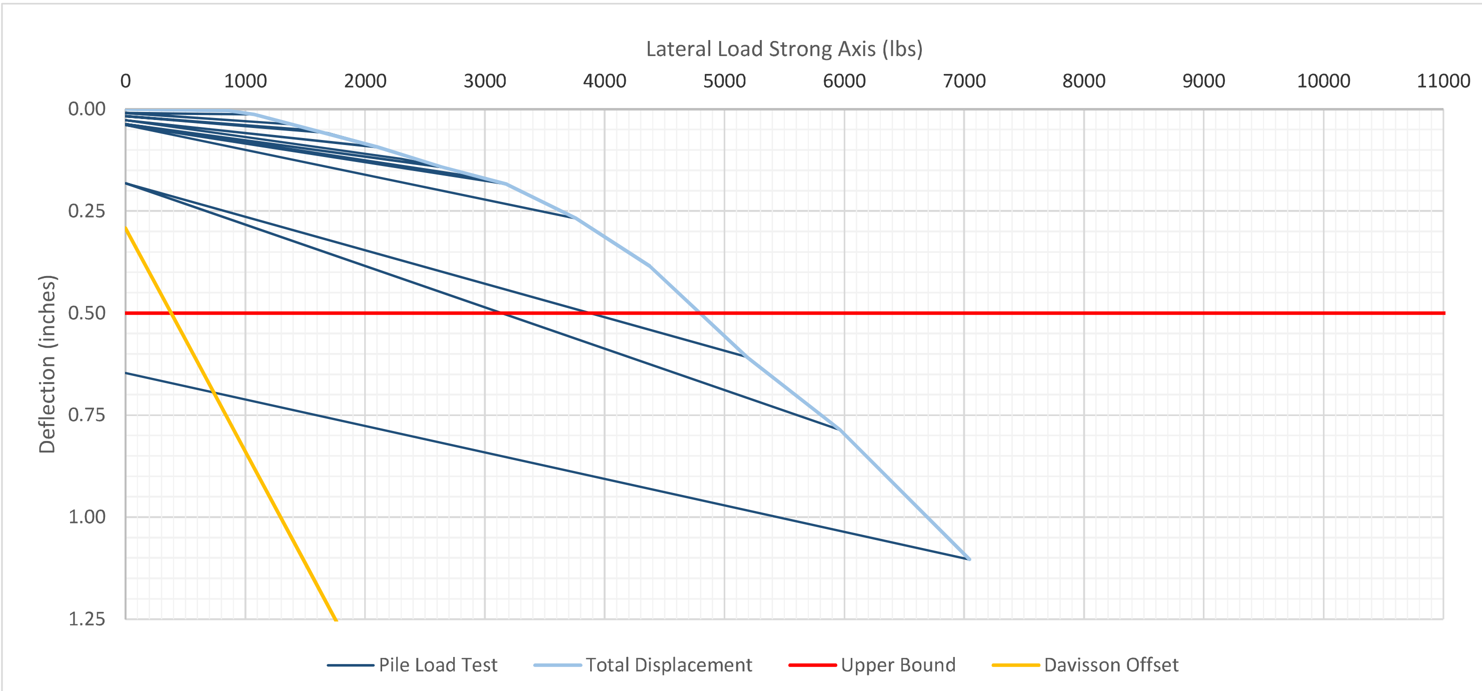


Figure No. 24C

CONSULTING GROUP

Post Load Test Results

Test Location: 4B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	9 feet	Project Number:	173483
GPS Test Coordinates:	39.839922°, -83.319817°	Test Date:	12/1/2017

Tension Load Test						Lateral Load Test					
	Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)		Hold Time (min)	Load (lbs)	Deflection Gauge #1 (inches)	Deflection Gauge #2 (inches)	Average Deflection (inches)
1	1	0	0.000	0.000	0.000	1	1	0	0.000	0.000	0.000
2	1	653	0.000	0.000	0.000	2	1	814	0.017	-0.004	0.007
3	1	1146	0.000	0.003	0.002	3	1	1187	0.031	0.001	0.016
4	1	1781	0.000	0.004	0.002	4	1	0	0.025	-0.005	0.010
5	1	2059	0.000	0.008	0.004	5	1	1289	0.037	0.002	0.019
6	5	2149	0.005	0.027	0.016	6	1	1628	0.068	0.032	0.050
7	1	0	0.005	0.027	0.016	7	1	0	0.026	0.000	0.013
8	1	2137	0.006	0.028	0.017	8	1	1708	0.067	0.030	0.049
9	1	10205	0.024	0.088	0.056	9	1	2042	0.083	0.042	0.062
10	1	0	0.025	0.069	0.047	10	1	0	0.029	0.000	0.014
						11	1	2186	0.086	0.042	0.064
						12	1	2564	0.115	0.066	0.090
						13	1	0	0.029	0.002	0.016
						14	1	2630	0.120	0.075	0.097
						15	1	3031	0.148	0.096	0.122
						16	1	0	0.033	0.010	0.021
						17	1	3469	0.192	0.125	0.158
						18	1	4519	0.263	0.173	0.218
						19	1	10122	0.813	0.423	0.618
						20	1	0	-0.055	-0.046	-0.050

Figure No. 25A

Tension Post Load Test Results

Test Location: 4B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	9 feet	Project Number:	173483
GPS Test Coordinates:	39.839922°, -83.319817°	Test Date:	12/1/2017

Lateral Post Load Test Results

Test Location: 4B

Post Size:	W6x9	Project Name:	Madison County Solar
Depth Driven:	9 feet	Project Number:	173483
GPS Test Coordinates:	39.839922°, -83.319817°	Test Date:	12/1/2017

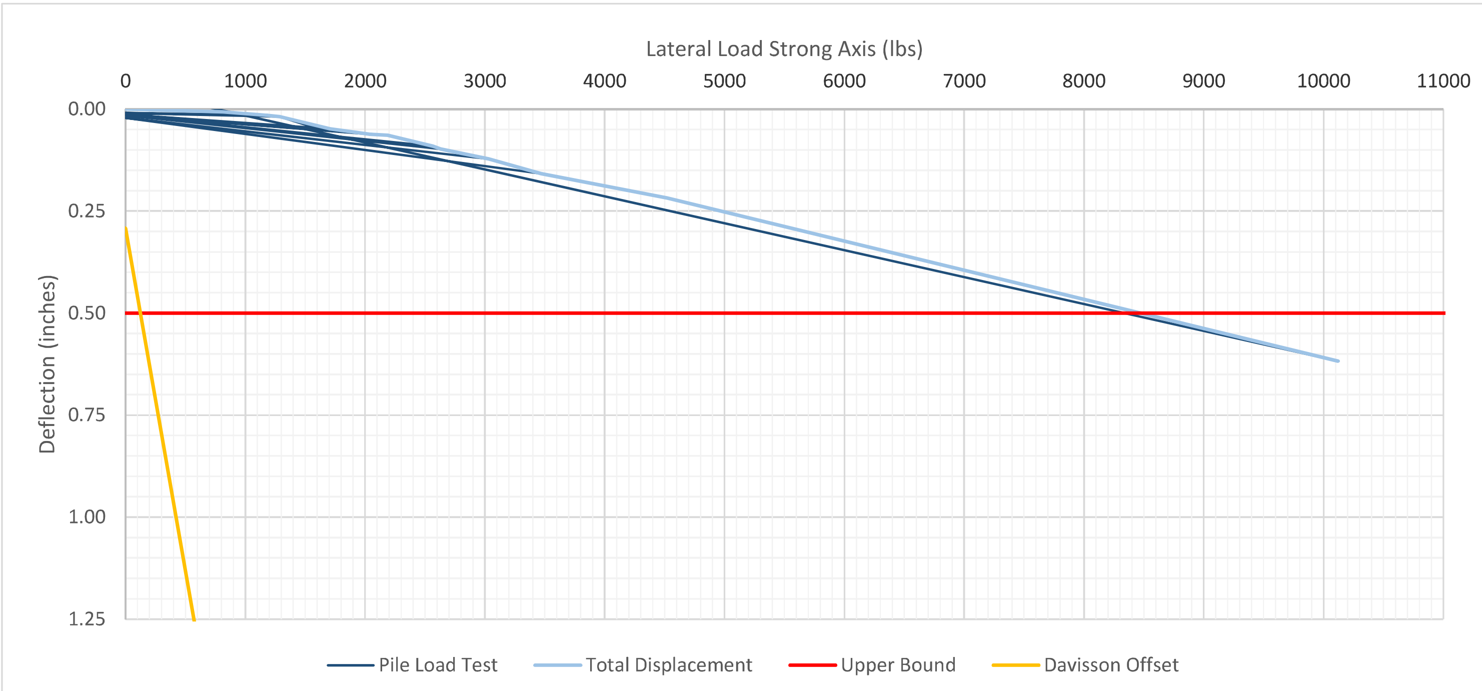


Figure No. 25C

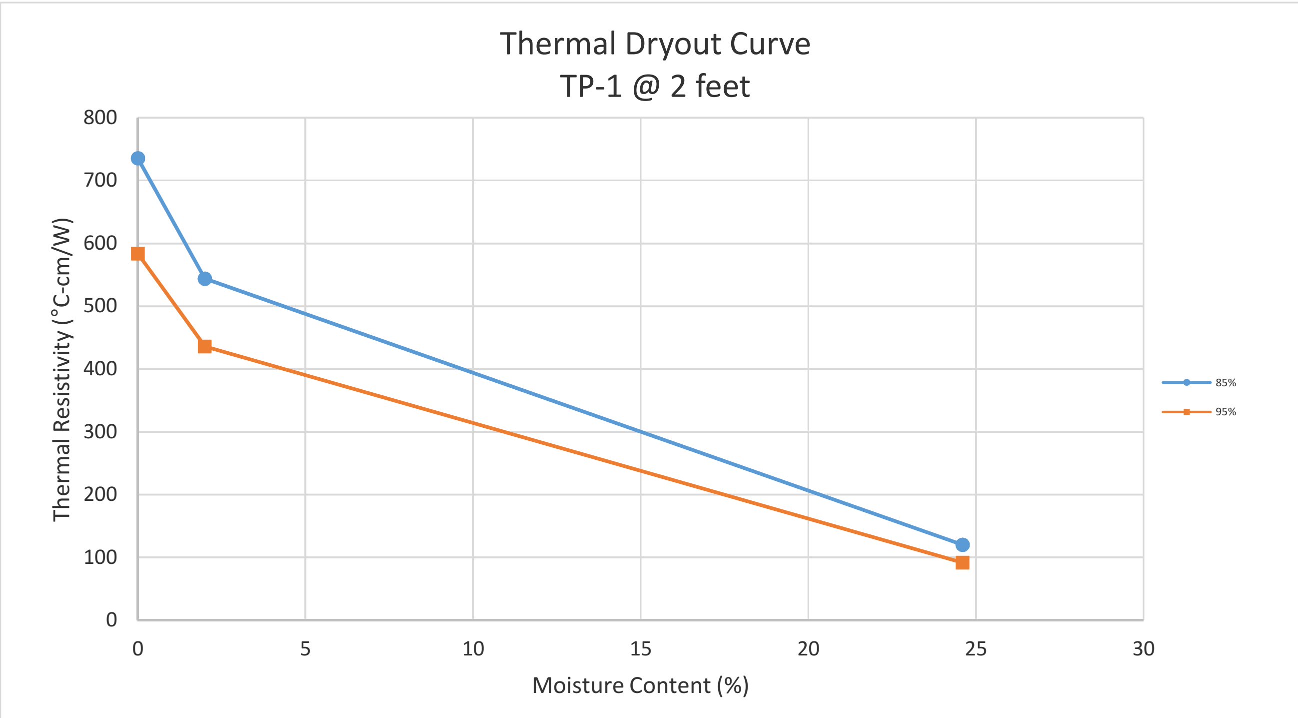
In-Situ Thermal Resistivity

Test Pit No.	Depth (ft)	Thermal Resistivity (°C-cm/W)	Temperature (°C)	Soil Classification
TP-1	2	79.5	7.9	Sandy Clay
TP-1	3	70.9	7.8	Sandy Clay
TP-1	4	72.2	10.2	Clayey Sand
TP-2	2	76.8	10.7	Fat Clay
TP-2	3	71.2	11.1	Fat Clay
TP-2	4	74.7	10.8	Fat Clay
TP-3	2	69.2	10.6	Fat Clay
TP-3	3	63.4	11.0	Fat Clay
TP-3	4	62.9	10.3	Fat Clay
TP-4	2	76.1	8.2	Fat Clay
TP-4	3	76.4	9.3	Fat Clay
TP-4	4	72.2	9.5	Fat Clay

In-situ Electrical Resistivity (ohm-cm)
Madison County Solar, London, Ohio
G2 Project No. 173483

Location Number	GPS Coordinates		0 to 2 ft.	0 to 4 ft.	0-6 ft.	0-8 ft.
	Latitude	Longitude				
PT-1	39.858881	-83.342829	2,843	2,987	3,389	3,561
PT-2	39.850962	-83.325841	2,230	2,834	3,131	3,447
PT-3	39.846586	-83.344411	5,649	6,683	7,411	7,736
PT-4	39.839922	-83.319817	2,230	3,083	2,843	3,064
MINIMUM			2,230	2,834	2,843	3,064
MAXIMUM			5,649	6,683	7,411	7,736
AVERAGE			3,238	3,897	4,194	4,452
MEDIAN			2,537	3,035	3,260	3,504

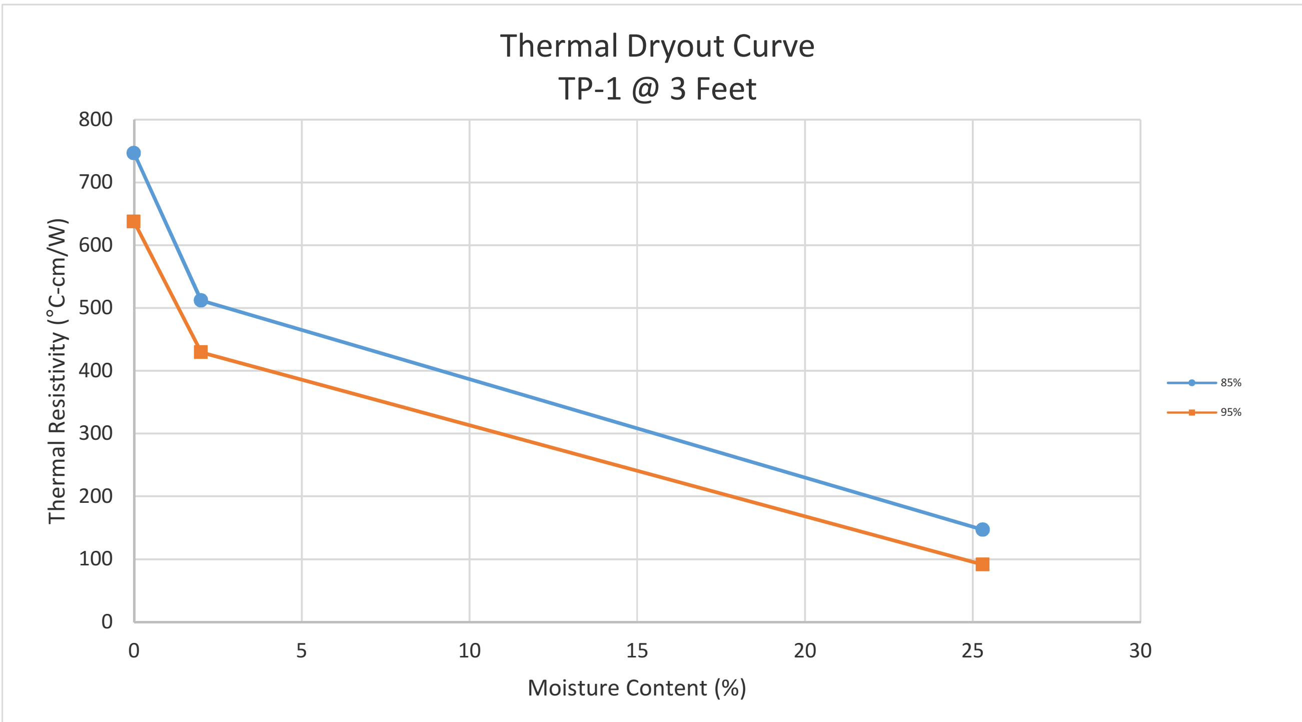
Figure No. 27



85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-1 @ 2 feet	Mottled Brown and Gray Sandy Clay	Remolded 85%	84.6	0.0	736
TP-1 @ 2 feet	Mottled Brown and Gray Sandy Clay	Remolded 85%	84.6	2.0	544
TP-1 @ 2 feet	Mottled Brown and Gray Sandy Clay	Remolded 85%	84.6	24.6	120

95% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-1 @ 2 feet	Mottled Brown and Gray Sandy Clay	Remolded 95%	94.6	0.0	584
TP-1 @ 2 feet	Mottled Brown and Gray Sandy Clay	Remolded 95%	94.6	2.0	436
TP-1 @ 2 feet	Mottled Brown and Gray Sandy Clay	Remolded 95%	94.6	24.6	92

Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483

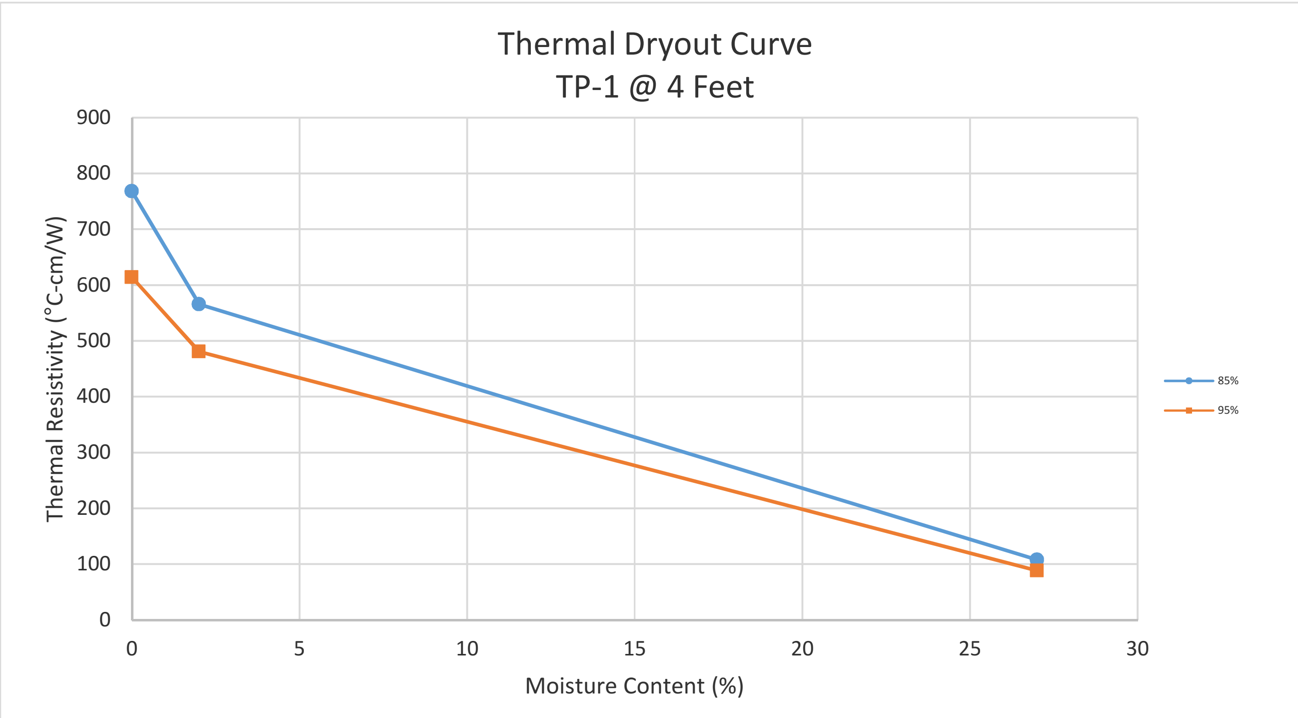


85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-1 @ 3 feet	Mottled Brown and Gray Sandy Clay	Remolded 85%	87.0	0.0	747
TP-1 @ 3 feet	Mottled Brown and Gray Sandy Clay	Remolded 85%	87.0	2.0	512
TP-1 @ 3 feet	Mottled Brown and Gray Sandy Clay	Remolded 85%	87.0	25.3	147

95% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-1 @ 3 feet	Mottled Brown and Gray Sandy Clay	Remolded 95%	97.3	0.0	638
TP-1 @ 3 feet	Mottled Brown and Gray Sandy Clay	Remolded 95%	97.3	2.0	430
TP-1 @ 3 feet	Mottled Brown and Gray Sandy Clay	Remolded 95%	97.3	25.3	91

Figure No. 28b

Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483

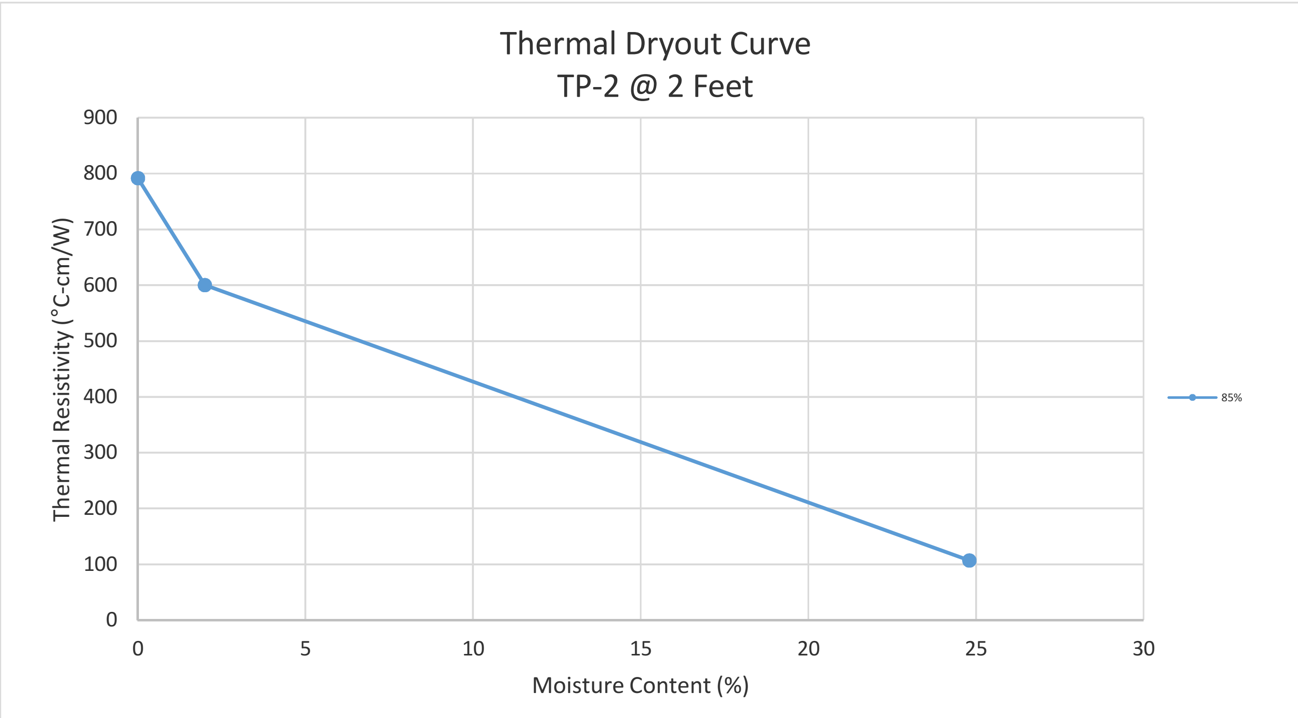


85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-1 @ 4 feet	Mottled Brown and Gray Clayey Sand	Remolded 85%	82.2	0.0	768
TP-1 @ 4 feet	Mottled Brown and Gray Clayey Sand	Remolded 85%	82.2	2.0	566
TP-1 @ 4 feet	Mottled Brown and Gray Clayey Sand	Remolded 85%	82.2	27.0	108

95% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-1 @ 4 feet	Mottled Brown and Gray Clayey Sand	Remolded 95%	91.9	0.0	614
TP-1 @ 4 feet	Mottled Brown and Gray Clayey Sand	Remolded 95%	91.9	2.0	481
TP-1 @ 4 feet	Mottled Brown and Gray Clayey Sand	Remolded 95%	91.9	27.0	89

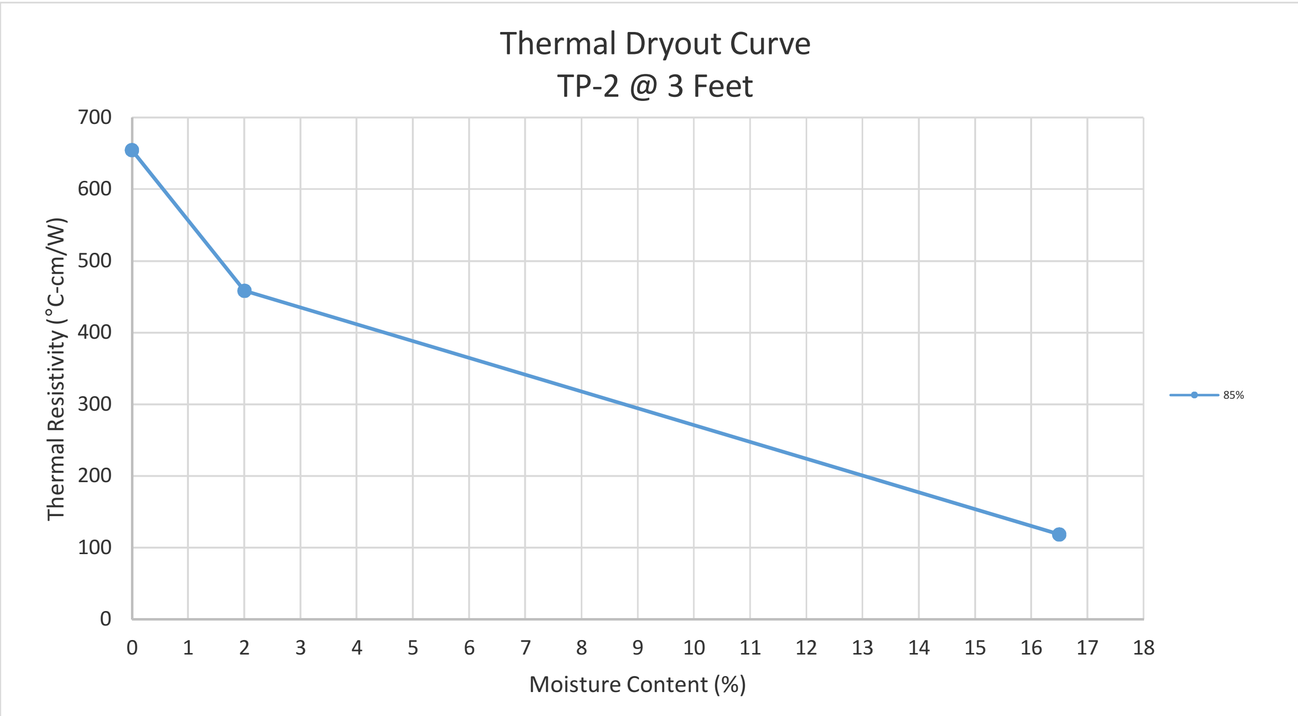
Figure No. 28c

Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483



85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-2 @ 2 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	82.8	0.0	792
TP-2 @ 2 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	82.8	2.0	600
TP-2 @ 2 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	82.8	24.8	107

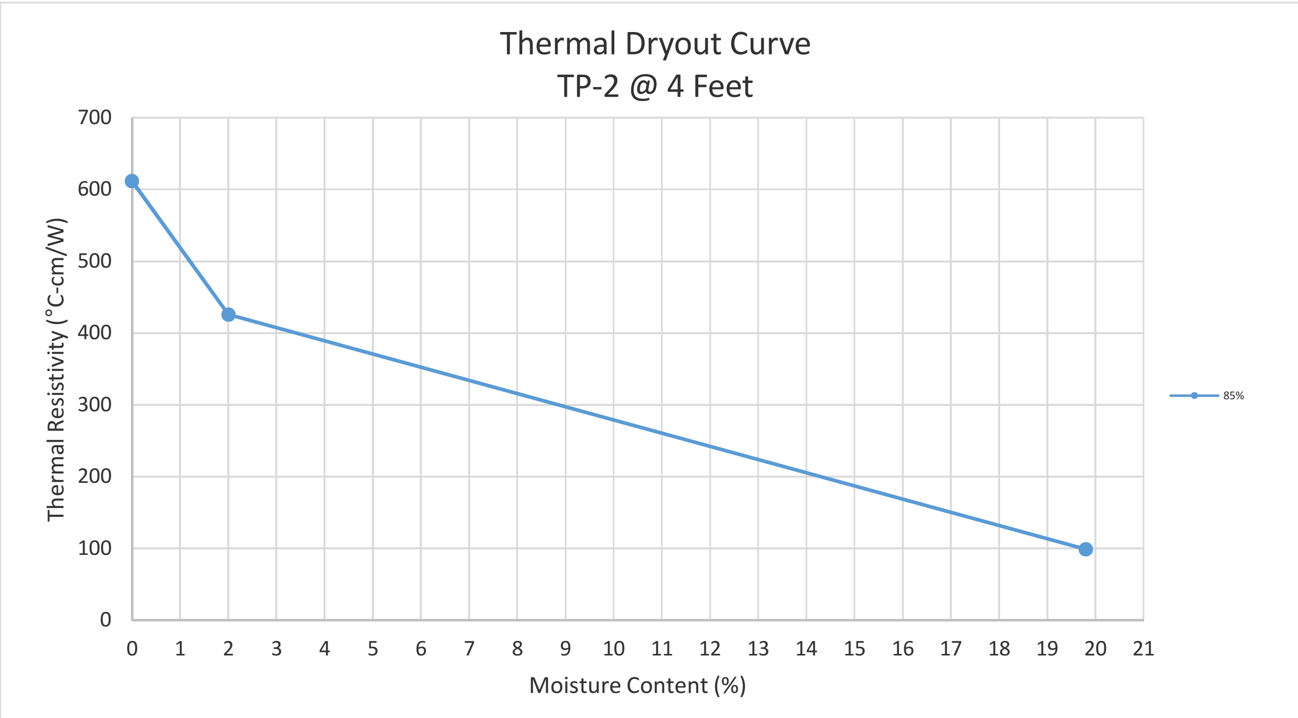
Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483



85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-2 @ 3 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	96.7	0.0	655
TP-2 @ 3 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	96.7	2.0	458
TP-2 @ 3 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	96.7	16.5	118

Figure No. 29b

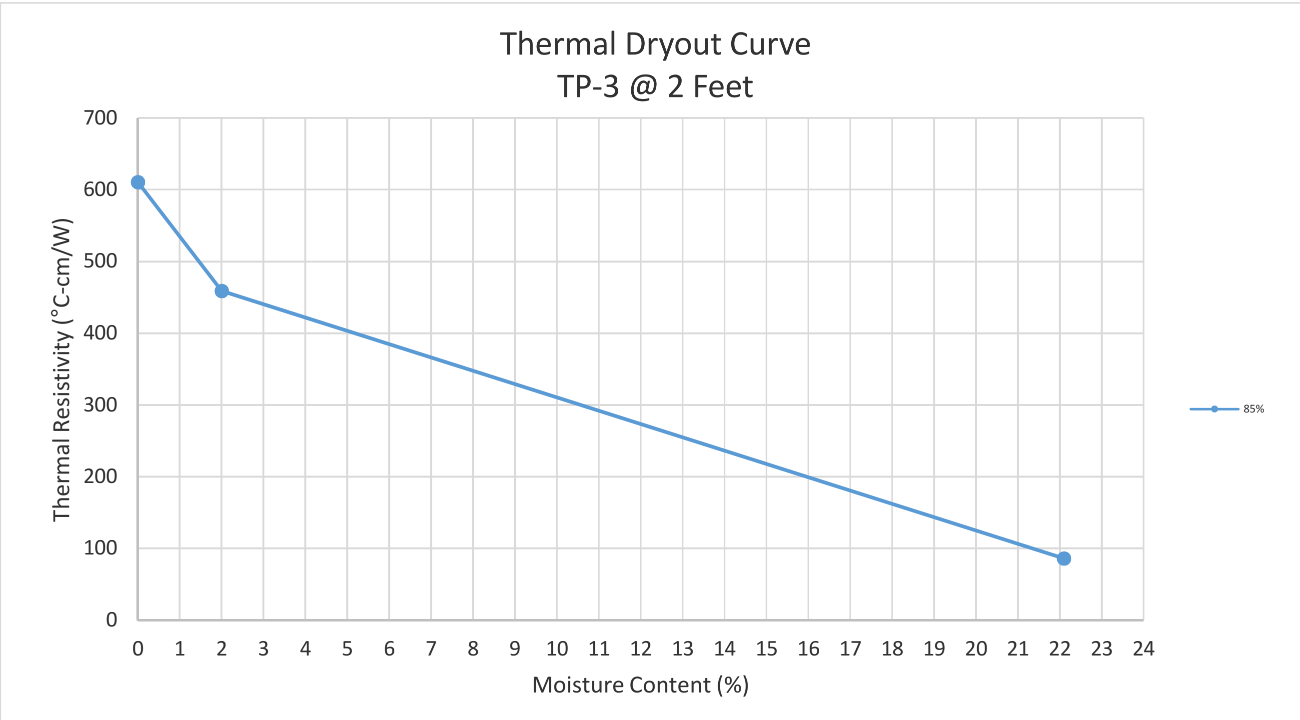
Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483



85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-2 @ 4 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	91.1	0.0	612
TP-2 @ 4 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	91.1	2.0	426
TP-2 @ 4 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	91.1	19.8	99

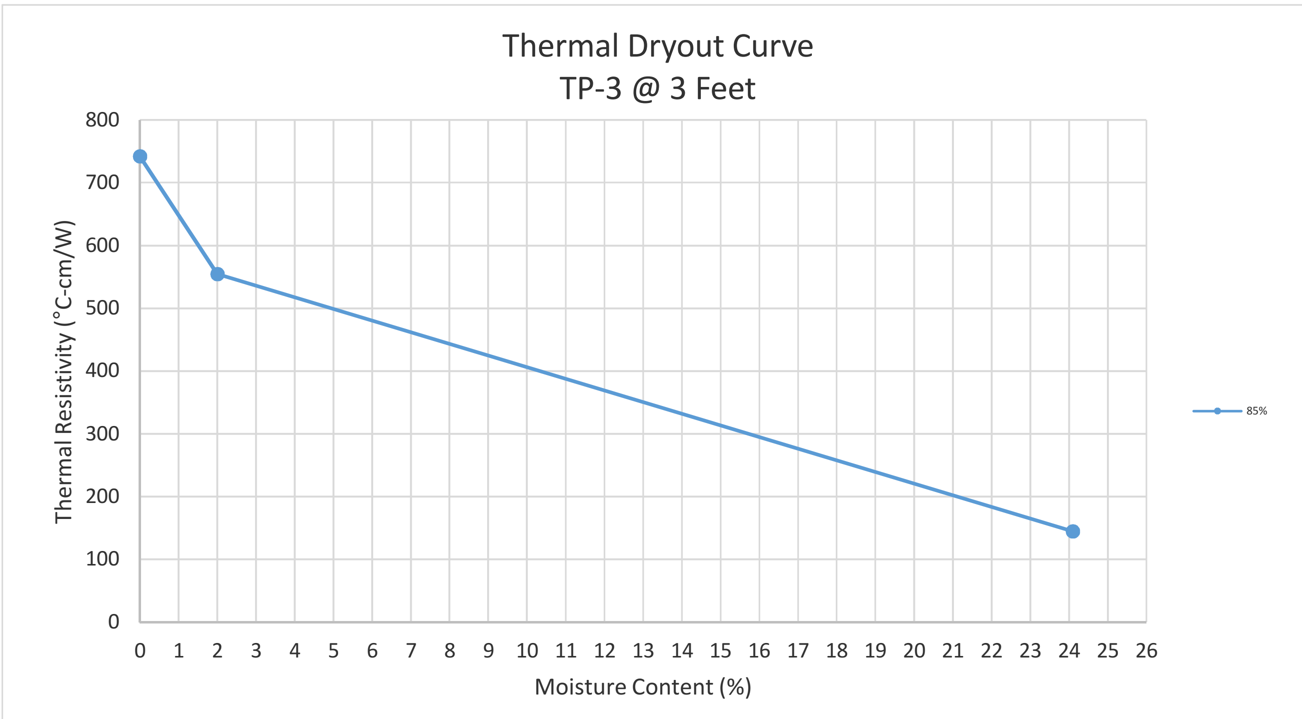
Figure No. 29c

Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483



85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-3 @ 2 feet	Brown Fat Clay	Remolded 85%	86.4	0.0	611
TP-3 @ 2 feet	Brown Fat Clay	Remolded 85%	86.4	2.0	459
TP-3 @ 2 feet	Brown Fat Clay	Remolded 85%	86.4	22.1	86

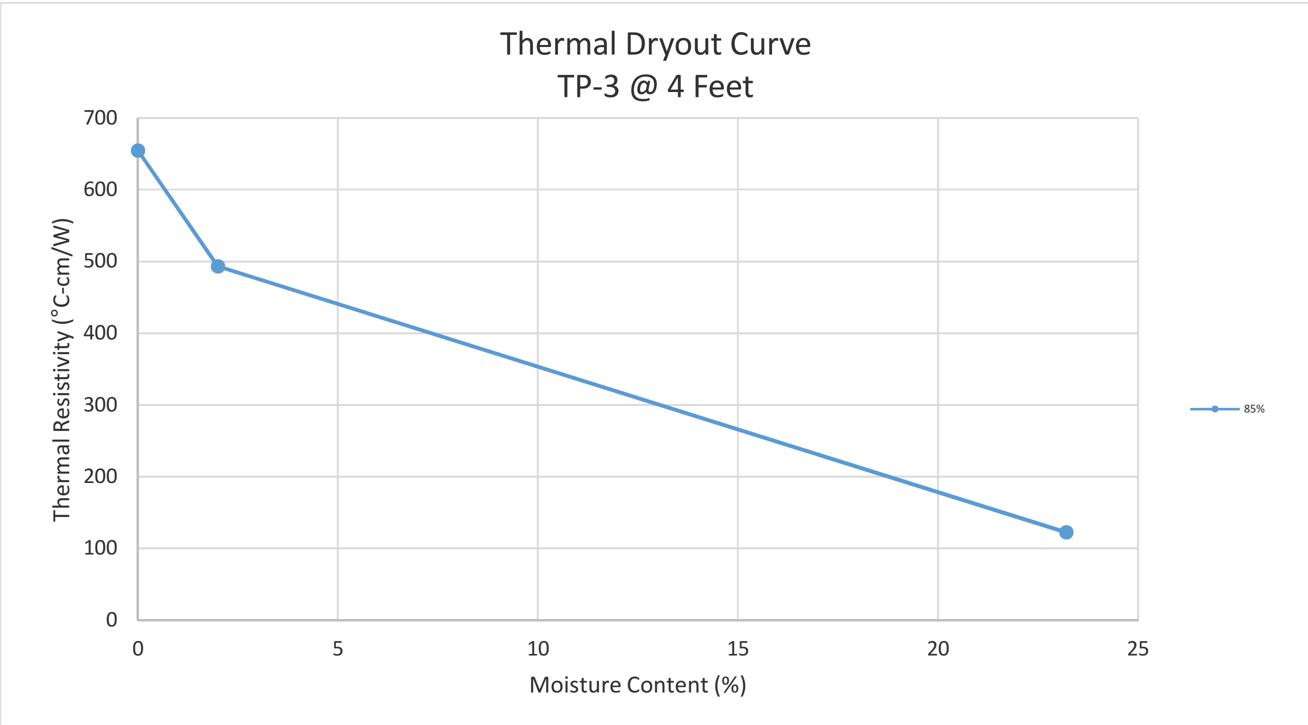
Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483



85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-3 @ 3 feet	Brown Fat Clay	Remolded 85%	84.2	0.0	742
TP-3 @ 3 feet	Brown Fat Clay	Remolded 85%	84.2	2.0	554
TP-3 @ 3 feet	Brown Fat Clay	Remolded 85%	84.2	24.1	144

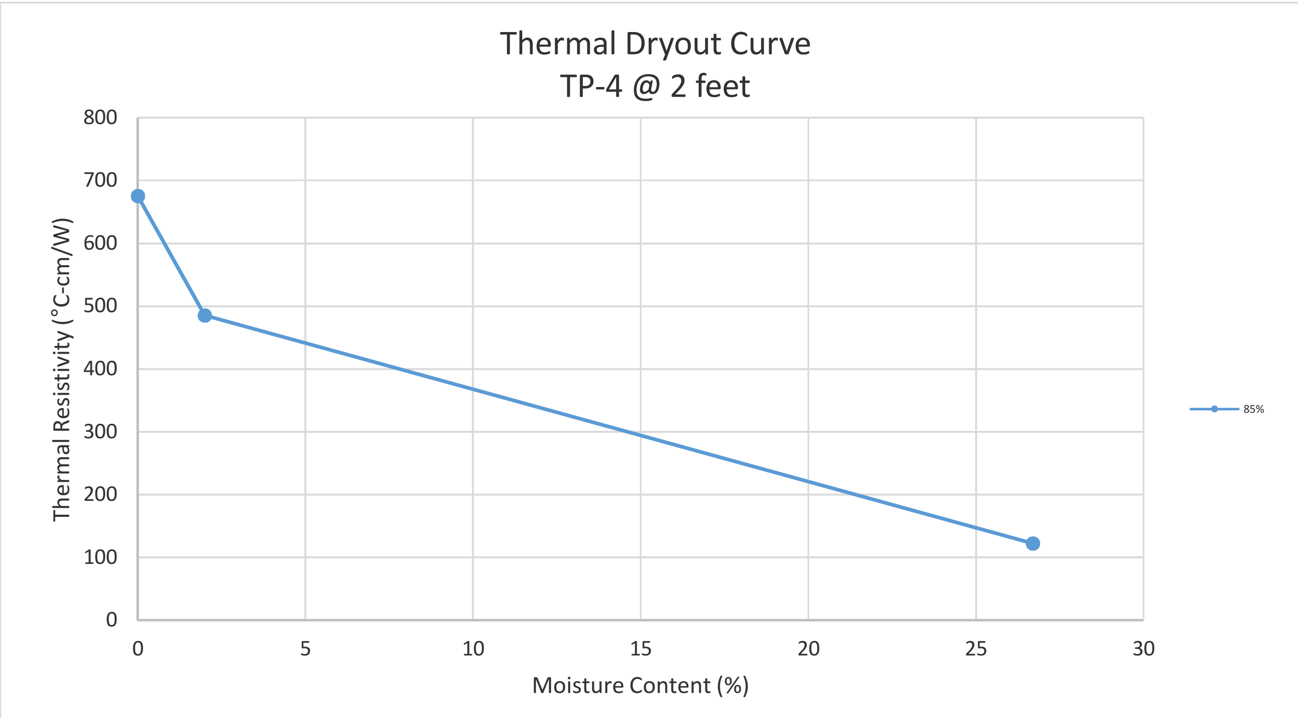
Figure No. 30b

Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483



85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-3 @ 4 feet	Brown Fat Clay	Remolded 85%	85.3	0.0	655
TP-3 @ 4 feet	Brown Fat Clay	Remolded 85%	85.3	2.0	493
TP-3 @ 4 feet	Brown Fat Clay	Remolded 85%	85.3	23.2	122

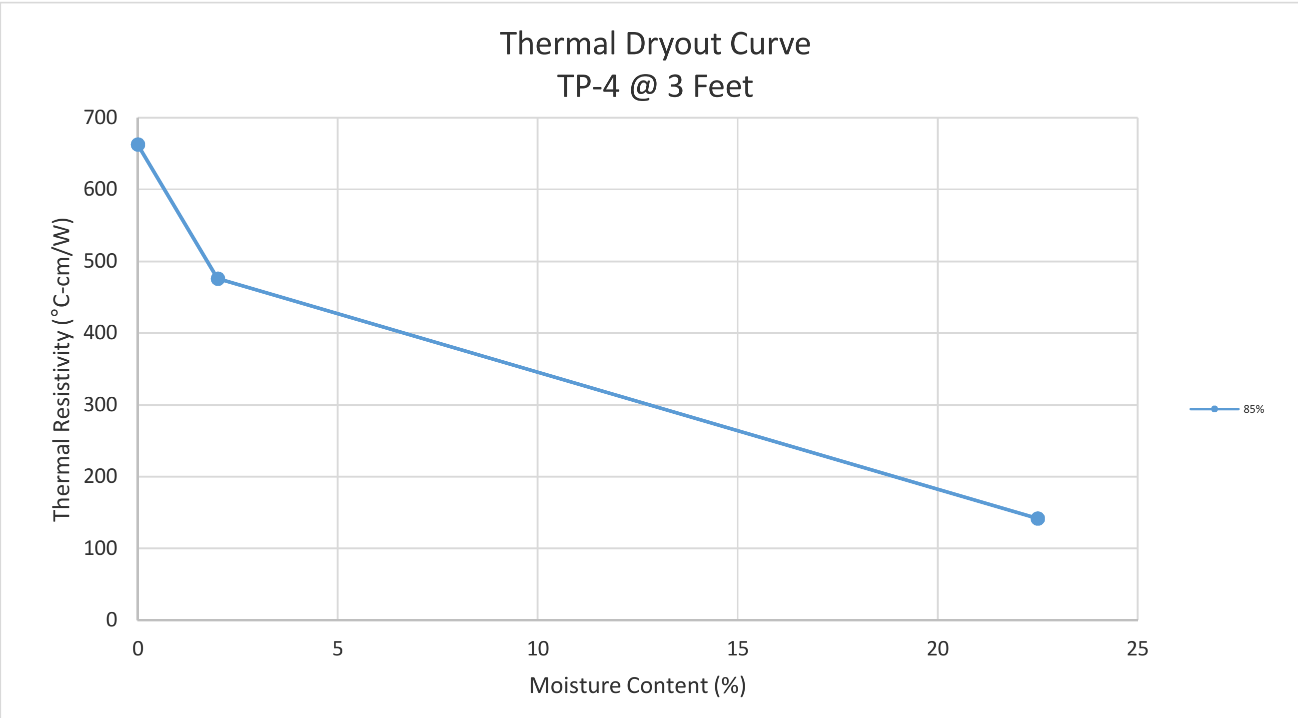
Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483



85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-4 @ 2 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	80.6	0.0	676
TP-4 @ 2 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	80.6	2.0	485
TP-4 @ 2 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	80.6	26.7	122

Figure No. 31a

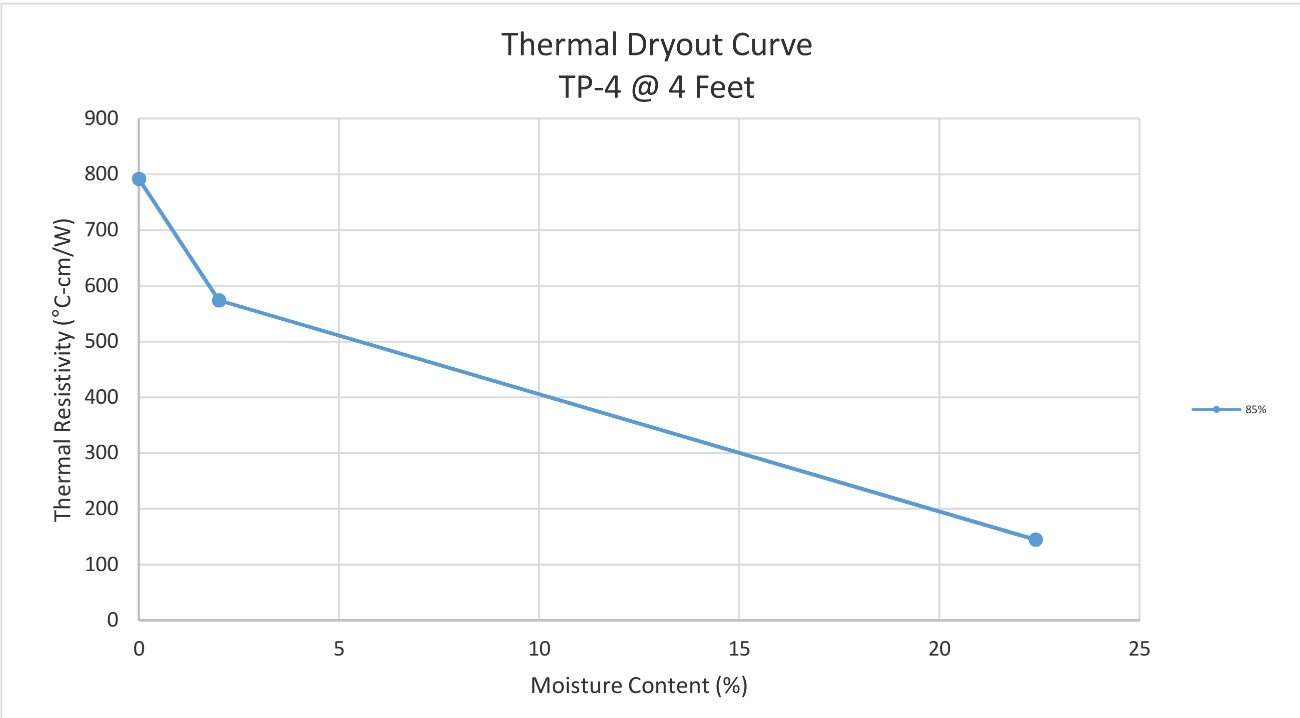
Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483



85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-4 @ 3 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	87.0	0.0	663
TP-4 @ 3 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	87.0	2.0	476
TP-4 @ 3 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	87.0	22.5	142

Figure No. 31b

Thermal Resistivity Dryout Curve
Madison County Solar, London, Ohio
G2 Project No. 173483



85% Compaction					
Location	Sample Description	Specimen	Dry Density (pcf)	Moisture Content (%)	Thermal Resistivity (°C-cm/W)
TP-4 @ 4 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	87.7	0.0	792
TP-4 @ 4 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	87.7	2.0	574
TP-4 @ 4 feet	Mottled Brown and Gray Fat Clay	Remolded 85%	87.7	22.4	145

Figure No. 31c

ASTM D698
D03 - Standard Proctor

Project Name:	Madison County Solar Power Plant	Job No.:	173483
Location of Project:	London, Madison County, Ohio	Boring No.: TP-1	Sample No.: ---
Description of Soil:	Dark Gray Fat Clay	Depth of Sample:	0FT - 1FT
Tested By:	K. Crow	Date of Testing:	12/7/2017
Blows/Lift: 25	No. of Lifts: 3	Wt. of Hammer, lb:	5.5
Mold Dia., in: 4	Mold Ht., in: 4.584	Mold Vol., ft^3:	0.0333
Test Method:	A	Prep. Method (Select One):	Wet
Type of Hammer (Select One):	Manual	Specific Gravity, G_s:	2.6 Est.?/Known?

Split Data

Initial Air Dried Mass of Total Sample, g:	10000.0
Initial Air Dried Mass of Test Fraction, g:	10000.0
Initial Air Dried Mass of Oversize Fraction, g:	0.0
Oven Dry Mass of Oversize Fraction, g:	0.0
Oversize Fraction, % (P_c):	0.0
Test Fraction, % (P_F):	100.0

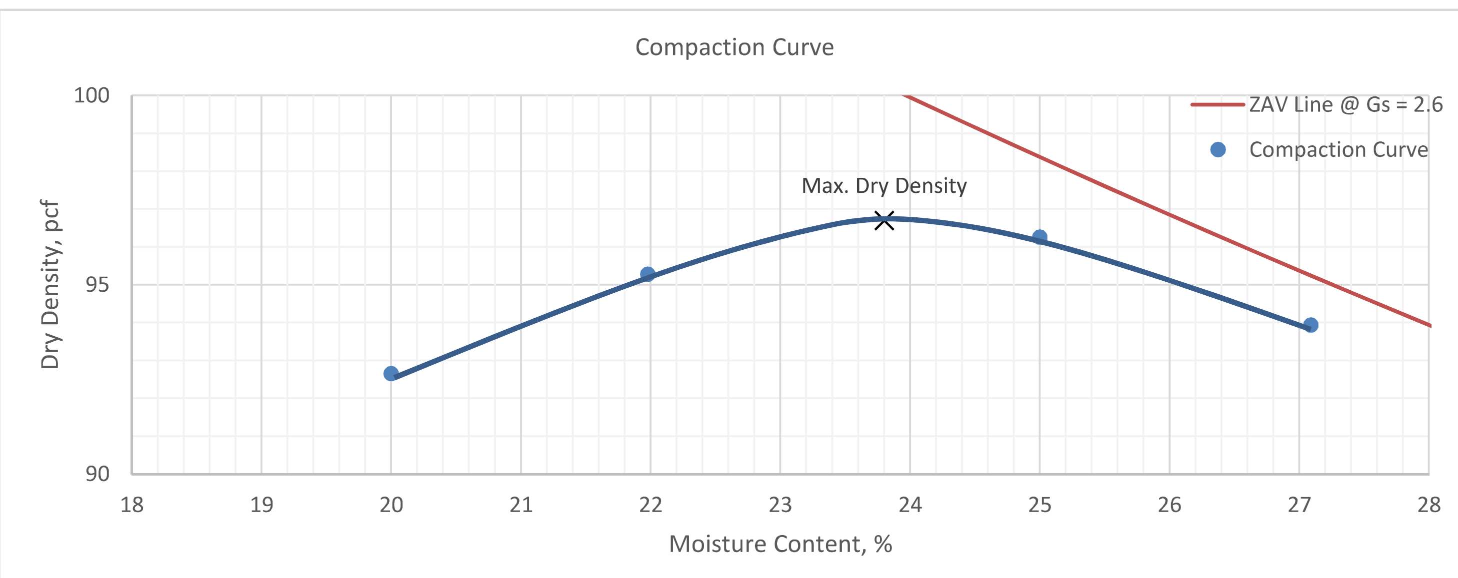
Sieve Designation	Mass Retained,g	Cum. Retained, %	Passing, %
3/4 inch	0.00	0.00	100.00
3/8 inch	0.00	0.00	100.00
No. 4	0.00	0.00	100.00

Water Content Determinations

Point No.:	As Recd.	Test Fraction	1	2	3	4	5
Tare ID:	A	B	C	D	E	F	
Tare Mass, g:	0.00	8.20	8.10	8.00	8.10	8.40	
Tare + Wet Soil, g;	10000.00	55.20	208.50	157.30	182.10	233.60	
Tare + Dry Soil, g:	10000.00	51.30	175.10	130.40	147.30	185.60	
Water Content , %:	0.0	9.0	20.0	22.0	25.0	27.1	---

Density Determinations

Point No.:	1	2	3	4	5
Target Moisture, %:	20	22	23	27	
Actual Moisture, %:	20.0	22.0	25.0	27.1	---
Mold, g:	4194.0	4194.0	4194.0	4194.0	
Wet Soil + Mold, g:	5875.2	5951.4	6013.4	5999.2	
Wet Density, pcf:	111.2	116.2	120.3	119.4	---
Dry Density, pcf:	92.7	95.3	96.3	93.9	---
Corrected Dry Density, pcf:	---	---	---	---	---
Corrected Water Content, %:	---	---	---	---	---



Optimum Moisture, %: 23.8

Max. Dry Density, pcf: 96.7

ASTM D698
D03 - Standard Proctor

Project Name:	Madison County Solar Power Plant	Job No.:	173483
Location of Project:	London, Madison County, Ohio	Boring No.: TP-2	Sample No.: ---
Description of Soil:	Mottled Brown and Gray Fat Clay	Depth of Sample:	2FT - 4FT
Tested By:	K. Crow	Date of Testing:	12/7/2017
Blows/Lift: 25	No. of Lifts: 3	Wt. of Hammer, lb:	5.5
Mold Dia., in: 4	Mold Ht., in: 4.584	Mold Vol., ft^3:	0.0333
Test Method:	A	Prep. Method (Select One):	Wet
Type of Hammer (Select One):	Manual	Specific Gravity, G_s:	2.6 Est.?/Known?

Split Data

Initial Air Dried Mass of Total Sample, g:	10000.0
Initial Air Dried Mass of Test Fraction, g:	10000.0
Initial Air Dried Mass of Oversize Fraction, g:	0.0
Oven Dry Mass of Oversize Fraction, g:	0.0
Oversize Fraction, % (P_C):	0.0
Test Fraction, % (P_F):	100.0

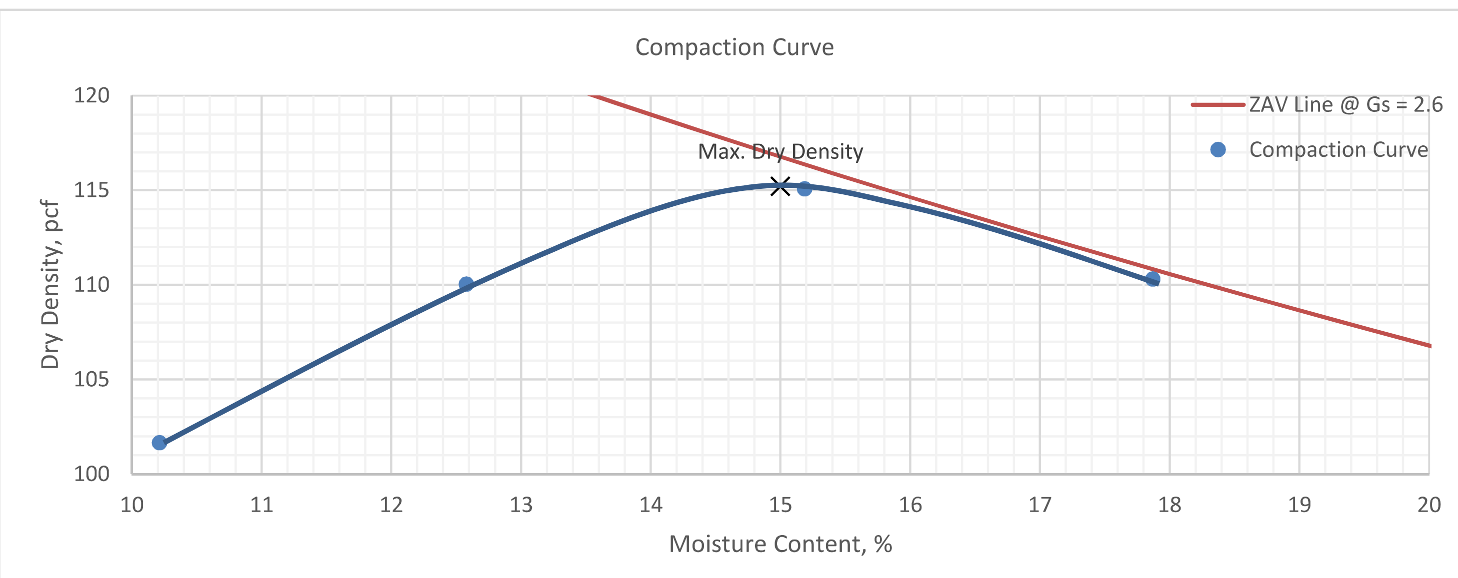
Sieve Designation	Mass Retained,g	Cum. Retained, %	Passing, %
3/4 inch	0.00	0.00	100.00
3/8 inch	0.00	0.00	100.00
No. 4	0.00	0.00	100.00

Water Content Determinations

Point No.:	As Recd.	Test Fraction	1	2	3	4	5
Tare ID:	A	B	C	D	E	F	
Tare Mass, g:	0.00	8.20	8.30	8.30	8.20	8.10	
Tare + Wet Soil, g;	10000.00	56.33	244.60	241.90	244.10	300.30	
Tare + Dry Soil, g:	10000.00	49.55	222.70	215.80	213.00	256.00	
Water Content , %:	0.0	16.4	10.2	12.6	15.2	17.9	---

Density Determinations

Point No.:	1	2	3	4	5
Target Moisture, %:	11	13	15	18	
Actual Moisture, %:	10.2	12.6	15.2	17.9	---
Mold, g:	4194.0	4194.0	4194.0	4194.0	
Wet Soil + Mold, g:	5888.0	6067.1	6198.2	6160.0	
Wet Density, pcf:	112.0	123.9	132.5	130.0	---
Dry Density, pcf:	101.6	110.0	115.1	110.3	---
Corrected Dry Density, pcf:	---	---	---	---	---
Corrected Water Content, %:	---	---	---	---	---



Optimum Moisture, %: 15.0

Max. Dry Density, pcf: 115.2

ASTM D698
D03 - Standard Proctor

Project Name:	Madison County Solar Power Plant	Job No.:	173483
Location of Project:	London, Madison County, Ohio	Boring No.: TP-3	Sample No.: ---
Description of Soil:	Brown Fat Clay	Depth of Sample:	2FT - 4FT
Tested By:	K. Crow	Date of Testing:	12/7/2017
Blows/Lift: 25	No. of Lifts: 3	Wt. of Hammer, lb:	5.5
Mold Dia., in: 4	Mold Ht., in: 4.584	Mold Vol., ft^3:	0.0333
Test Method:	A	Prep. Method (Select One):	Wet
Type of Hammer (Select One):	Manual	Specific Gravity, G_s:	2.6 Est.?/Known?

Split Data

Initial Air Dried Mass of Total Sample, g:	10000.0
Initial Air Dried Mass of Test Fraction, g:	10000.0
Initial Air Dried Mass of Oversize Fraction, g:	0.0
Oven Dry Mass of Oversize Fraction, g:	0.0
Oversize Fraction, % (P_C):	0.0
Test Fraction, % (P_F):	100.0

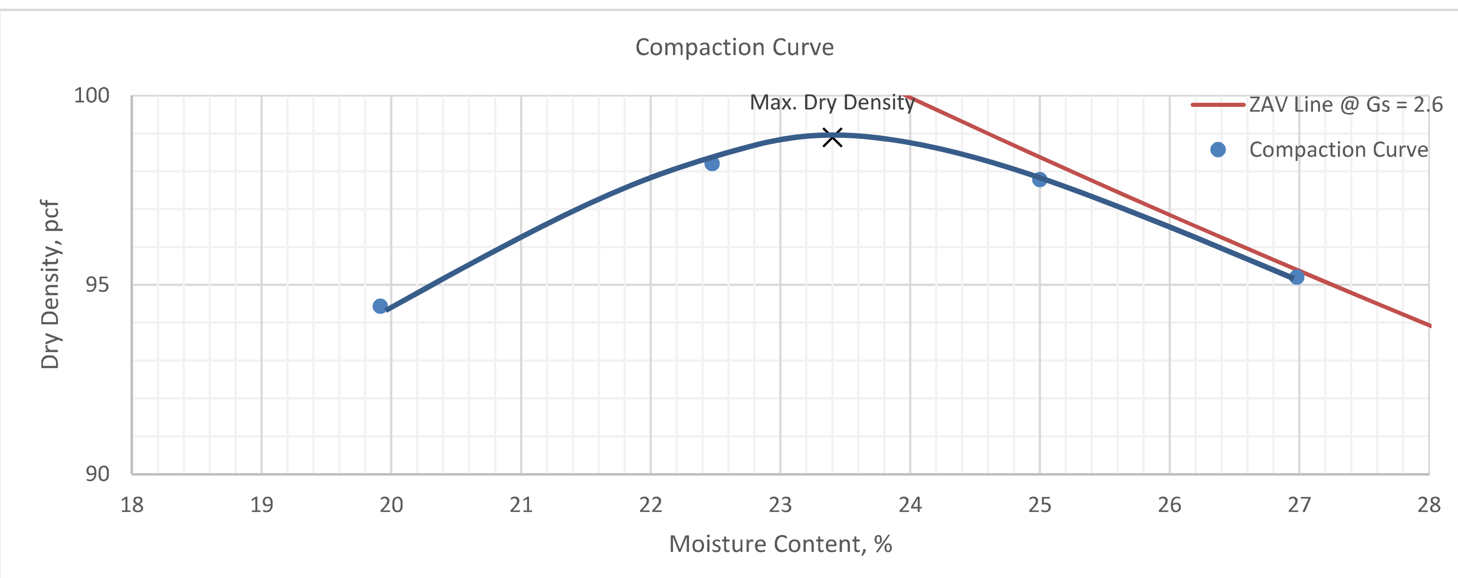
Sieve Designation	Mass Retained,g	Cum. Retained, %	Passing, %
3/4 inch	0.00	0.00	100.00
3/8 inch	0.00	0.00	100.00
No. 4	0.00	0.00	100.00

Water Content Determinations

Point No.:	As Recd.	Test Fraction	1	2	3	4	5
Tare ID:	A	B	C	D	E	F	
Tare Mass, g:	0.00	8.20	8.20	8.10	8.20	8.20	
Tare + Wet Soil, g;	10000.00	65.33	179.20	164.50	232.70	232.70	
Tare + Dry Soil, g:	10000.00	55.30	150.80	135.80	187.80	185.00	
Water Content , %:	0.0	21.3	19.9	22.5	25.0	27.0	---

Density Determinations

Point No.:	1	2	3	4	5
Target Moisture, %:	20	22	25	27	
Actual Moisture, %:	19.9	22.5	25.0	27.0	---
Mold, g:	4194.0	4194.0	4194.0	4194.0	
Wet Soil + Mold, g:	5906.3	6012.6	6042.2	6022.0	
Wet Density, pcf:	113.2	120.3	122.2	120.9	---
Dry Density, pcf:	94.4	98.2	97.8	95.2	---
Corrected Dry Density, pcf:	---	---	---	---	---
Corrected Water Content, %:	---	---	---	---	---



Optimum Moisture, %: 23.4

Max. Dry Density, pcf: 98.9

ASTM D698
D03 - Standard Proctor

Project Name:	Madison County Solar Power Plant	Job No.:	173483
Location of Project:	London, Madison County, Ohio	Boring No.: TP-4	Sample No.: ---
Description of Soil:	Dark Gray Fat Clay	Depth of Sample:	0FT - 1FT
Tested By:	K. Crow	Date of Testing:	12/7/2017
Blows/Lift: 25	No. of Lifts: 3	Wt. of Hammer, lb:	5.5
Mold Dia., in: 4	Mold Ht., in: 4.584	Mold Vol., ft^3:	0.0333
Test Method:	A	Prep. Method (Select One):	Wet
Type of Hammer (Select One):	Manual	Specific Gravity, G_s:	2.6 Est.?/Known?

Split Data

Initial Air Dried Mass of Total Sample, g:	10000.0
Initial Air Dried Mass of Test Fraction, g:	10000.0
Initial Air Dried Mass of Oversize Fraction, g:	0.0
Oven Dry Mass of Oversize Fraction, g:	0.0
Oversize Fraction, % (P_c):	0.0
Test Fraction, % (P_F):	100.0

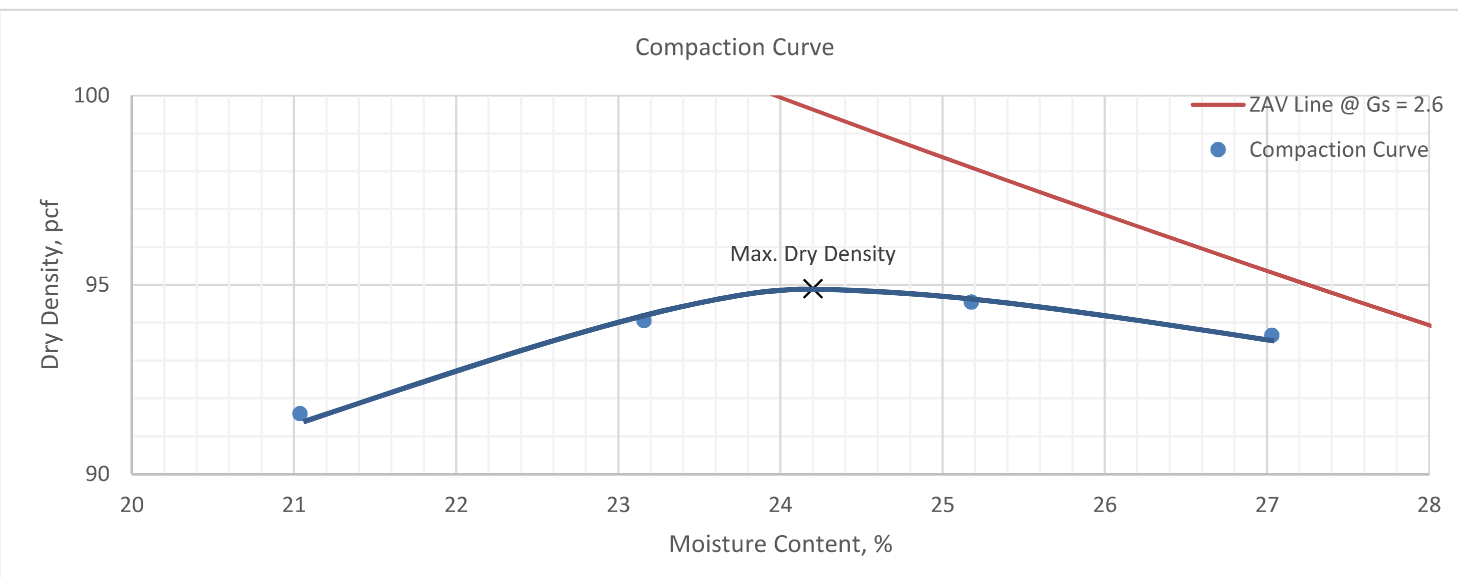
Sieve Designation	Mass Retained,g	Cum. Retained, %	Passing, %
3/4 inch	0.00	0.00	100.00
3/8 inch	0.00	0.00	100.00
No. 4	0.00	0.00	100.00

Water Content Determinations

Point No.:	As Recd.	Test Fraction	1	2	3	4	5
Tare ID:	A	B	C	D	E	F	
Tare Mass, g:	0.00	8.20	8.00	8.00	8.00	8.20	
Tare + Wet Soil, g:	10000.00	65.33	201.90	160.10	237.20	266.20	
Tare + Dry Soil, g:	10000.00	55.30	168.20	131.50	191.10	211.30	
Water Content , %:	0.0	21.3	21.0	23.2	25.2	27.0	---

Density Determinations

Point No.:	1	2	3	4	5
Target Moisture, %:	21	23	25	27	
Actual Moisture, %:	21.0	23.2	25.2	27.0	---
Mold, g:	4194.0	4194.0	4194.0	4194.0	
Wet Soil + Mold, g:	5870.3	5945.5	5983.5	5993.2	
Wet Density, pcf:	110.9	115.8	118.3	119.0	---
Dry Density, pcf:	91.6	94.1	94.5	93.7	---
Corrected Dry Density, pcf:	---	---	---	---	---
Corrected Water Content, %:	---	---	---	---	---



Optimum Moisture, %: 24.2

Max. Dry Density, pcf: 94.9

California Bearing Ratio (CBR)
Madison County Solar Power Plant, London, Ohio
G2 Project No. 173483

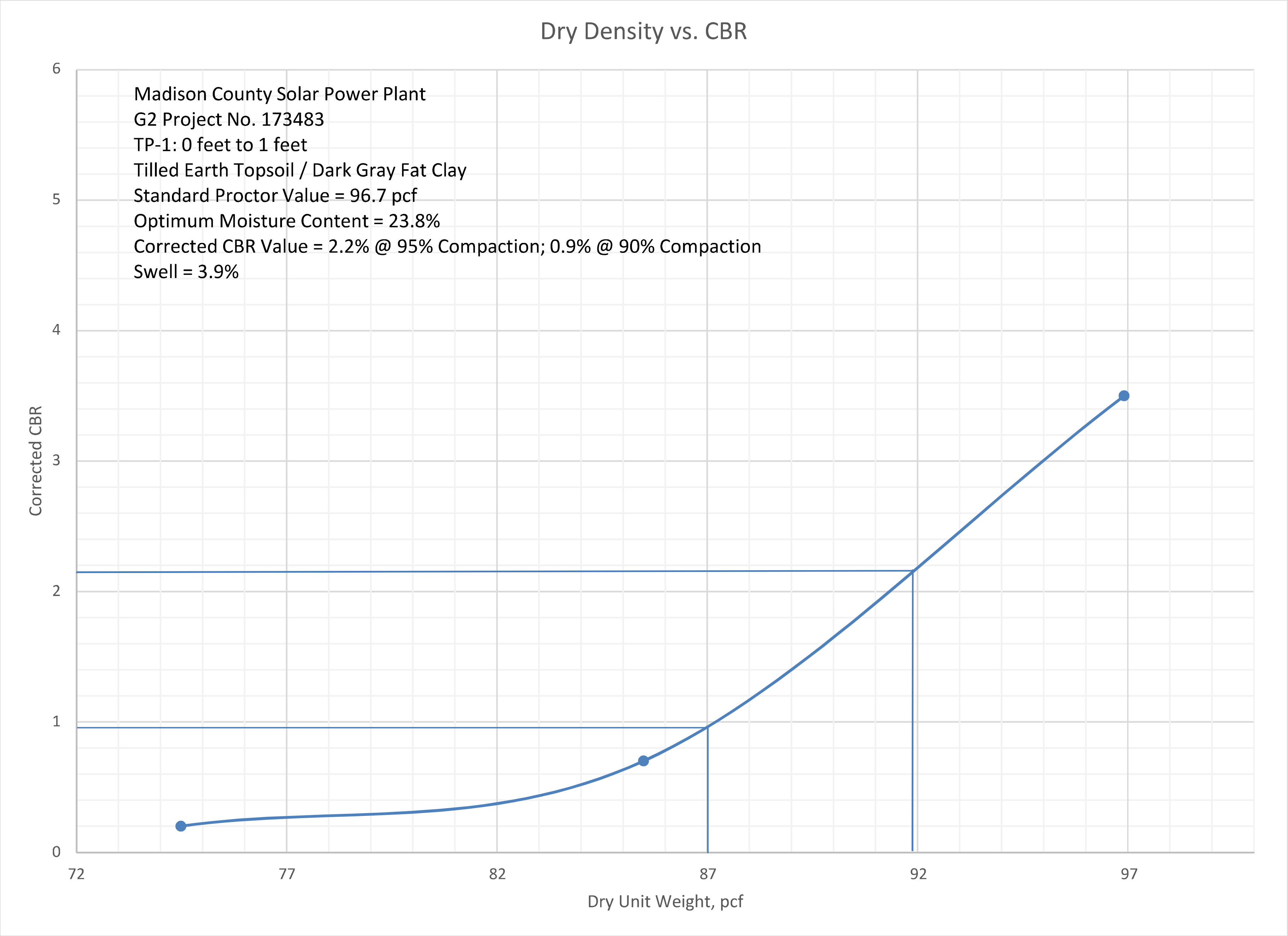


Figure No. 36

California Bearing Ratio (CBR)
Madison County Solar Power Plant, London, Ohio
G2 Project No. 173483

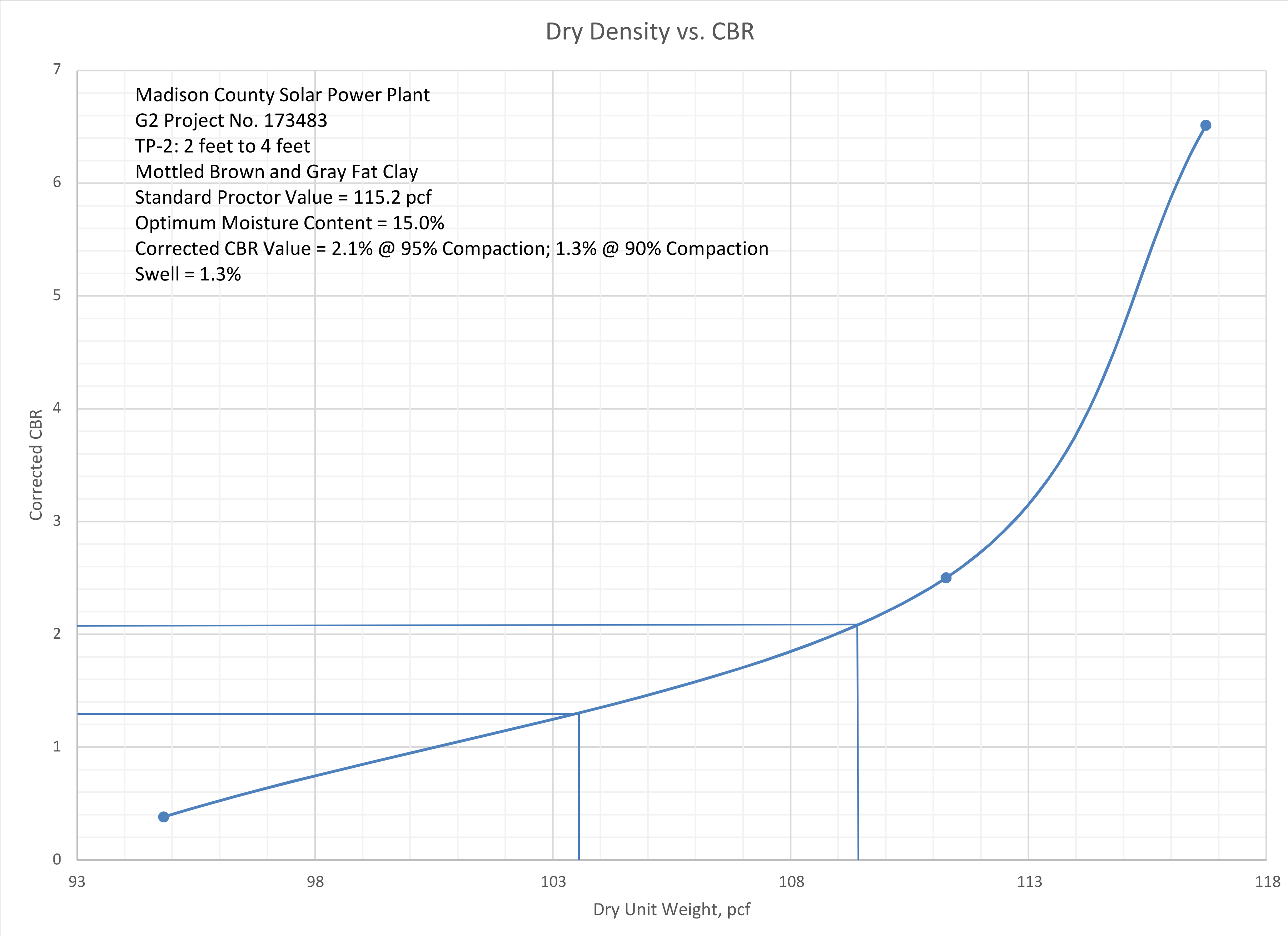
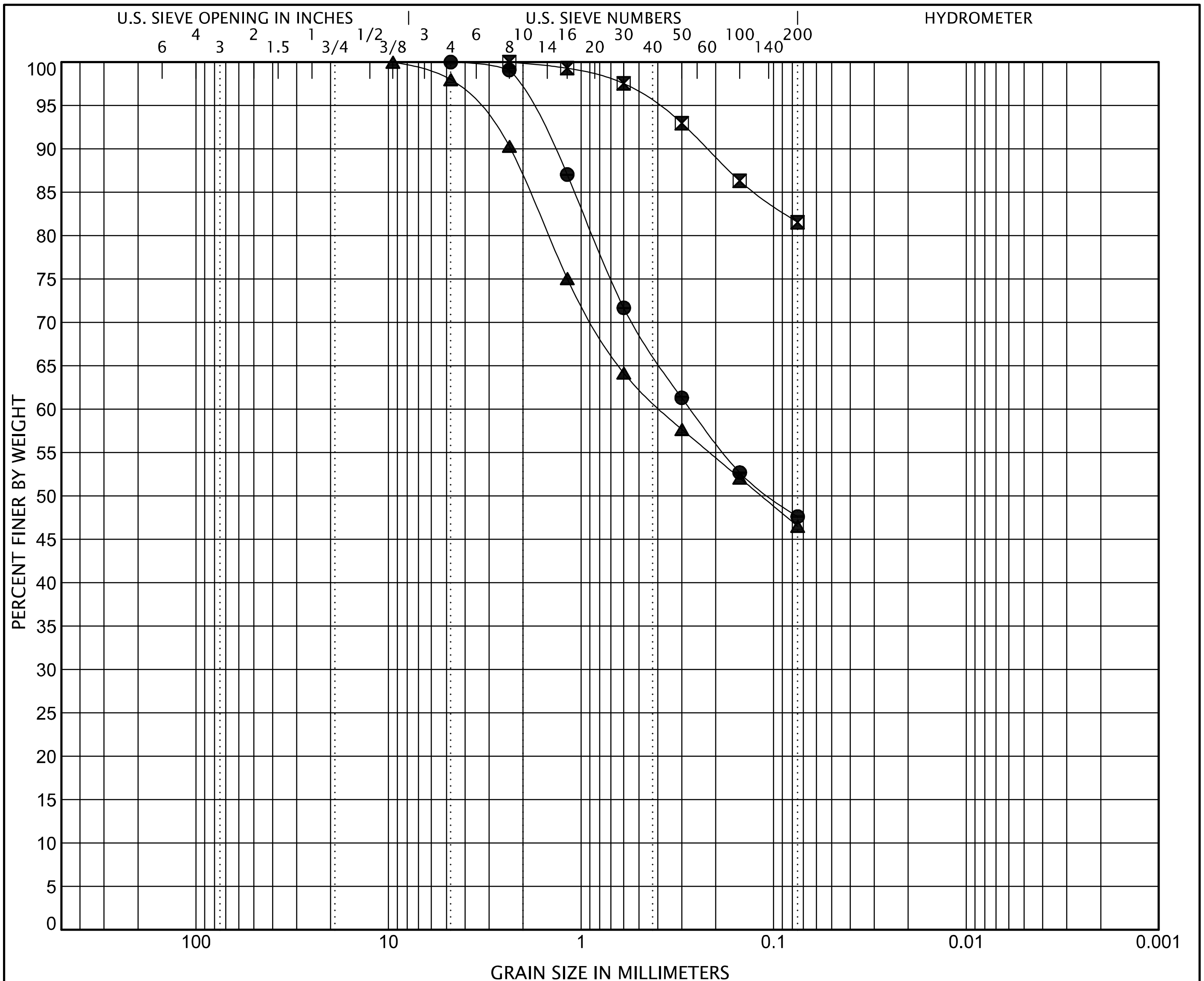


Figure No. 37



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID		Description	LL	PL	PI	Cc	Cu
● TP-1	BS-4	Mottled Brown and Gray Clayey Sand with trace silt					
⊠ TP-3	BS-2	Brown Fat Clay with little sand					
▲ TP-4	BS-8	Brown Clayey Sand with trace silt and gravel					

Specimen ID		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP-1	BS-4	4.75	0.27			0.0	52.4	47.6	
⊠ TP-3	BS-2	2.36				0.0	18.5	81.5	
▲ TP-4	BS-8	9.5	0.384			2.0	51.5	46.5	

G2 CONSULTING GROUP

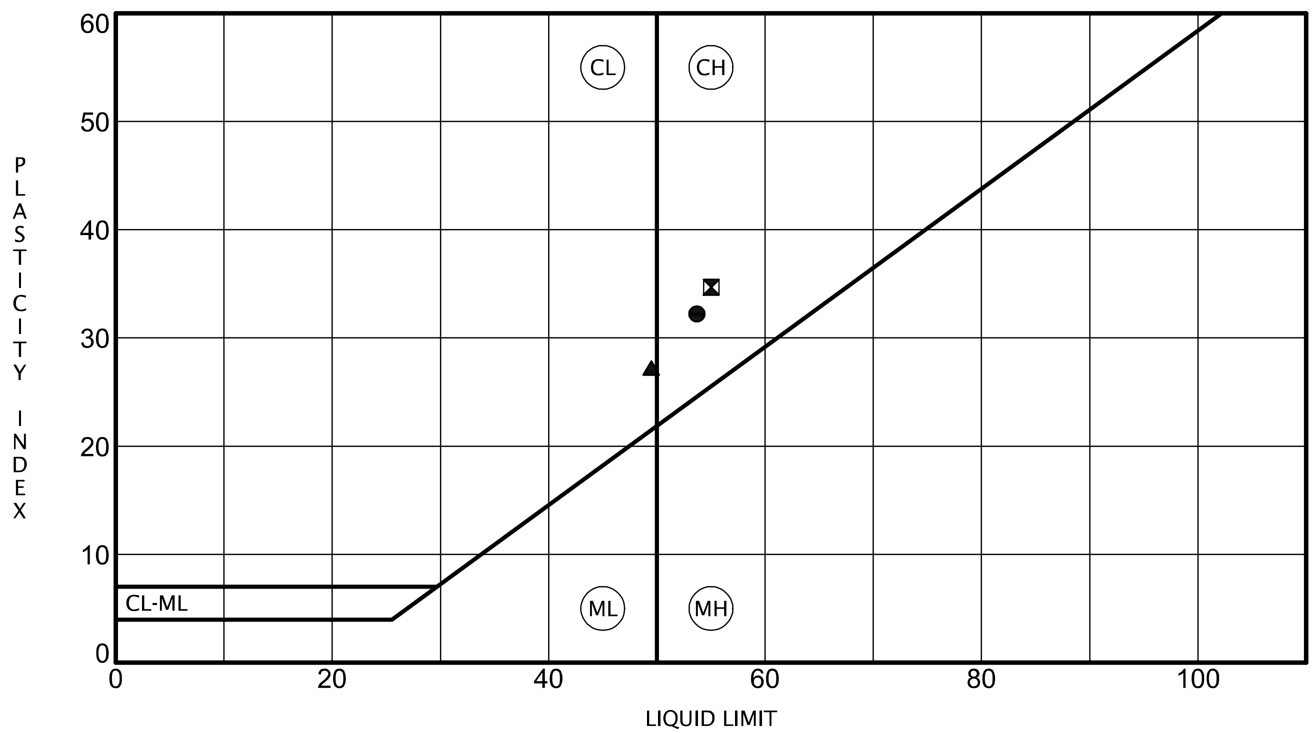
GRAIN SIZE DISTRIBUTION

Project Name: Madison County Solar Power Plant

Project Location: London, Madison County, Ohio

G2 Project No.: 173483

Figure No. 38



	Specimen Identification		LL	PL	PI	Fines	M %	Classification
●	TP-1	BS-1	54	21	33			Dark Gray Fat Clay with trace sand
⧗	TP-3	BS-3	55	20	35			Brown Fat Clay with little sand
▲	TP-4	BS-6	49	22	27		30	Brown Sandy Clay with trace gravel

CONSULTING GROUP

ATTERBERG LIMITS RESULTS

Project Name: Madison County Solar Power Plant

Project Location: London, Madison County, Ohio

G2 Project No.: 173483

Figure No. 39

Summary of Dry Density Results

Test Pit No.	Depth (ft)	Dry Density (pcf)	Moisture Content (%)	Soil Classification
TP-1	1	94.0	25.1	Tilled Earth: Fat Clay
TP-2	1	96.0	25	Tilled Earth: Fat Clay
TP-3	1	88.0	22.3	Tilled Earth: Fat Clay
TP-4	1	85.0	32.0	Tilled Earth: Fat Clay

Dry density samples obtained via Shelby tube method (ASTM D2937)

G2 Consulting Group, LLC

ASTM D4829 - Standard Test Method for Expansion Index of Soils

Project	Madison County Solar Power Plant	**Job No.**	173483
Location	Lyons, Georgia	**Date of Testing**	12/20/2017
Tested By	J. Crow, EIT / N. Zaporski, EIT	**Checked By**	D. Wanlass

Test Pit No.	TP-2	TP-3		
Sample No.	BS-6	BS-6		
Depth (ft)	5-6	5-6		
Soil Description	Sandy Clay	Fat Clay		
Initial Moisture Content (%)	15.5	10.4		
Initial Degree of Saturation (%)	51	51		
Initial Dry Density (pcf)	92.5	107.8		
Initial Height of Speciment (in)	1.0000	1.0000		
Consolidation Pressure (psf)	144	144		
Initial Dial Reading (in)	0.8005	0.6420		
Final Dial Reading (in)	0.8350	0.6510		
Final Moisture Content (%)	27.2	20.2		
Expansion Index	35	9		

Notes: Soil samples were air-dried and milled through a No. 4 sieve prior to wetting. Wetted soils were allowed to hydrate for a period not less than 16 hours.

==

LPile for Windows, Version 2016-09.011

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

==

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G2 Consulting Group, LLC., Troy,

Files Used for Analysis

Path to file locations:
\2017 Geotechnical\003-Ann Arbor\173483 (p) Madison Co Solar OH - FS\Report & Analyses\LPile\

Name of input data file:
1A - 6 ft.lp9d

Name of output report file:
1A - 6 ft.lp9o

Name of plot output file:
1A - 6 ft.lp9p

Name of runtime message file:
1A - 6 ft.lp9r

Date and Time of Analysis

Date: December 18, 2017 Time: 10:33:21

Problem Title

Project Name: Madison County Solar Power Plant

Job Number: 173483

Client: First Solar, Inc.

Engineer: J. Crow

Description: 1A - 6FT

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- Layering correction is not computed if soil above is of same type
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and
  soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

```
Number of pile sections defined                          =           1
Total length of pile                                     =       6.250 ft
Depth of ground surface below top of pile                =      0.2500 ft
```

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	3.9400
2	6.250	3.9400

Input Structural Properties for Pile Sections:

Pile Section No. 1:

```
   Section 1 is an elastic pile
   Cross-sectional Shape                                 = Strong H-Pile
   Length of section                                     =    6.250000 ft
   Flange Width                                          =    3.940000 in
   Section Depth                                         =    5.900000 in
   Flange Thickness                                      =    0.215000 in
   Web Thickness                                         =    0.170000 in
   Section Area                                          =    2.680000 sq. in
   Moment of Inertia                                     =   16.400000 in^4
   Elastic Modulus                                       =   29000000. psi
```

Ground Slope and Pile Batter Angles

```
Ground Slope Angle                                       =       0.000 degrees
                                                         =       0.000 radians

Pile Batter Angle                                        =       0.000 degrees
                                                         =       0.000 radians
```

Soil and Rock Layering Information

The soil profile is modelled using 4 layers

Layer 1 is stiff clay without free water

```
   Distance from top of pile to top of layer             =    0.250000 ft
   Distance from top of pile to bottom of layer          =    3.250000 ft
   Effective unit weight at top of layer                 =  130.000000 pcf
   Effective unit weight at bottom of layer              =  130.000000 pcf
   Undrained cohesion at top of layer                    =       1420. psf
   Undrained cohesion at bottom of layer                 =       1420. psf
   Epsilon-50 at top of layer                            =    0.007170
   Epsilon-50 at bottom of layer                         =    0.007170
```

Layer 2 is cemented silt with cohesion and friction

```
   Distance from top of pile to top of layer             =    3.250000 ft
   Distance from top of pile to bottom of layer          =    4.250000 ft
   Effective unit weight at top of layer                 =  130.000000 pcf
   Effective unit weight at bottom of layer              =  130.000000 pcf
   Undrained cohesion at top of layer                    =  250.000000 psf
   Undrained cohesion at bottom of layer                 =  250.000000 psf
   Friction angle at top of layer                        =   30.000000 deg.
   Friction angle at bottom of layer                     =   30.000000 deg.
   Epsilon-50 at top of layer                            =    0.008000
   Epsilon-50 at bottom of layer                         =    0.008000
   Subgrade k at top of layer                            =  400.000000 pci
   Subgrade k at bottom of layer                         =  400.000000 pci
```

Layer 3 is stiff clay without free water

```
   Distance from top of pile to top of layer             =    4.250000 ft
   Distance from top of pile to bottom of layer          =    6.250000 ft
   Effective unit weight at top of layer                 =  135.000000 pcf
   Effective unit weight at bottom of layer              =  135.000000 pcf
   Undrained cohesion at top of layer                    = 1000.000000 psf
   Undrained cohesion at bottom of layer                 = 1000.000000 psf
   Epsilon-50 at top of layer                            =    0.010000
   Epsilon-50 at bottom of layer                         =    0.010000
```

Layer 4 is stiff clay without free water

```
   Distance from top of pile to top of layer             =    6.250000 ft
   Distance from top of pile to bottom of layer          =    9.500000 ft
   Effective unit weight at top of layer                 =  130.000000 pcf
   Effective unit weight at bottom of layer              =  130.000000 pcf
   Undrained cohesion at top of layer                    =       3500. psf
   Undrained cohesion at bottom of layer                 =       3500. psf
   Epsilon-50 at top of layer                            =    0.005000
   Epsilon-50 at bottom of layer                         =    0.005000
```

(Depth of the lowest soil layer extends 3.250 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	0.2500	130.0000	1420.	--	0.00717	--
	w/o Free Water	3.2500	130.0000	1420.	--	0.00717	--
2	Cemented	3.2500	130.0000	250.0000	30.0000	0.00800	400.0000
	Silt	4.2500	130.0000	250.0000	30.0000	0.00800	400.0000
3	Stiff Clay	4.2500	135.0000	1000.0000	--	0.01000	--
	w/o Free Water	6.2500	135.0000	1000.0000	--	0.01000	--
4	Stiff Clay	6.2500	130.0000	3500.	--	0.00500	--
	w/o Free Water	9.5000	130.0000	3500.	--	0.00500	--

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 3

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	1	V = 2900. lbs	M = 0.0000 in-lbs	0.0000000	No
2	1	V = 4060. lbs	M = 0.0000 in-lbs	0.0000000	No
3	1	V = 5170. lbs	M = 0.0000 in-lbs	0.0000000	No

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.2500	0.00	N.A.	No	0.00	7569.
2	3.2500	4.4626	No	No	7569.	3779.
3	4.2500	5.0502	No	No	11348.	5903.
4	6.2500	6.0000	No	No	17250.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 2900.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.1911	0.00	2900.	-0.00565	0.00	4.76E+08	0.00	0.00	0.00
0.06250	0.1868	2175.	2900.	-0.00565	261.2652	4.76E+08	0.00	0.00	0.00
0.1250	0.1826	4350.	2900.	-0.00565	522.5305	4.76E+08	0.00	0.00	0.00
0.1875	0.1783	6525.	2900.	-0.00564	783.7957	4.76E+08	0.00	0.00	0.00

0.2500	0.1741	8700.	2873.	-0.00563	1045.	4.76E+08	-73.0303	314.5674	0.00
0.3125	0.1699	10834.	2817.	-0.00561	1301.	4.76E+08	-75.0255	331.1788	0.00
0.3750	0.1657	12926.	2760.	-0.00559	1553.	4.76E+08	-76.9833	348.4389	0.00
0.4375	0.1615	14974.	2702.	-0.00557	1799.	4.76E+08	-78.9028	366.3853	0.00
0.5000	0.1573	16978.	2642.	-0.00555	2039.	4.76E+08	-80.7835	385.0580	0.00
0.5625	0.1532	18937.	2580.	-0.00552	2275.	4.76E+08	-82.6244	404.5000	0.00
0.6250	0.1491	20849.	2518.	-0.00549	2504.	4.76E+08	-84.4250	424.7573	0.00
0.6875	0.1450	22713.	2454.	-0.00545	2728.	4.76E+08	-86.1844	445.8792	0.00
0.7500	0.1409	24530.	2389.	-0.00541	2947.	4.76E+08	-87.9018	467.9188	0.00
0.8125	0.1368	26296.	2322.	-0.00537	3159.	4.76E+08	-89.5765	490.9329	0.00
0.8750	0.1328	28013.	2254.	-0.00533	3365.	4.76E+08	-91.2076	514.9829	0.00
0.9375	0.1288	29678.	2185.	-0.00529	3565.	4.76E+08	-92.7944	540.1351	0.00
1.0000	0.1249	31290.	2115.	-0.00524	3759.	4.76E+08	-94.3359	566.4607	0.00
1.0625	0.1210	32850.	2044.	-0.00519	3946.	4.76E+08	-95.8314	594.0372	0.00
1.1250	0.1171	34356.	1971.	-0.00513	4127.	4.76E+08	-97.2800	622.9480	0.00
1.1875	0.1133	35807.	1898.	-0.00508	4301.	4.76E+08	-98.6806	653.2841	0.00
1.2500	0.1095	37203.	1823.	-0.00502	4469.	4.76E+08	-100.0325	685.1440	0.00
1.3125	0.1058	38542.	1748.	-0.00496	4630.	4.76E+08	-101.3347	718.6352	0.00
1.3750	0.1021	39824.	1671.	-0.00490	4784.	4.76E+08	-102.5860	753.8747	0.00
1.4375	0.09841	41049.	1594.	-0.00484	4931.	4.76E+08	-103.7856	790.9907	0.00
1.5000	0.09480	42215.	1516.	-0.00477	5071.	4.76E+08	-104.9323	830.1234	0.00
1.5625	0.09125	43323.	1437.	-0.00470	5204.	4.76E+08	-106.0249	871.4265	0.00
1.6250	0.08775	44370.	1357.	-0.00463	5330.	4.76E+08	-107.0623	915.0696	0.00
1.6875	0.08430	45358.	1276.	-0.00456	5448.	4.76E+08	-108.0433	961.2392	0.00
1.7500	0.08090	46284.	1195.	-0.00449	5560.	4.76E+08	-108.9664	1010.	0.00
1.8125	0.07756	47150.	1113.	-0.00442	5664.	4.76E+08	-109.8303	1062.	0.00
1.8750	0.07428	47953.	1030.	-0.00434	5760.	4.76E+08	-110.6335	1117.	0.00
1.9375	0.07105	48694.	946.6350	-0.00427	5849.	4.76E+08	-111.3745	1176.	0.00
2.0000	0.06788	49373.	862.8503	-0.00419	5931.	4.76E+08	-112.0514	1238.	0.00
2.0625	0.06477	49989.	778.5826	-0.00411	6005.	4.76E+08	-112.6625	1305.	0.00
2.1250	0.06171	50541.	693.8820	-0.00403	6071.	4.76E+08	-113.2058	1376.	0.00
2.1875	0.05872	51029.	608.8002	-0.00395	6130.	4.76E+08	-113.6791	1452.	0.00
2.2500	0.05579	51454.	523.3905	-0.00387	6181.	4.76E+08	-114.0800	1534.	0.00
2.3125	0.05291	51815.	437.7082	-0.00379	6224.	4.76E+08	-114.4061	1622.	0.00
2.3750	0.05010	52111.	351.8105	-0.00371	6260.	4.76E+08	-114.6544	1716.	0.00
2.4375	0.04735	52342.	265.7569	-0.00362	6287.	4.76E+08	-114.8218	1819.	0.00
2.5000	0.04467	52509.	179.6094	-0.00354	6308.	4.76E+08	-114.9049	1929.	0.00
2.5625	0.04204	52612.	93.4327	-0.00346	6320.	4.76E+08	-114.8996	2050.	0.00
2.6250	0.03948	52649.	7.2947	-0.00338	6324.	4.76E+08	-114.8017	2181.	0.00
2.6875	0.03698	52623.	-78.7332	-0.00329	6321.	4.76E+08	-114.6061	2325.	0.00
2.7500	0.03454	52531.	-164.5756	-0.00321	6310.	4.76E+08	-114.3070	2482.	0.00
2.8125	0.03216	52376.	-250.1525	-0.00313	6291.	4.76E+08	-113.8980	2656.	0.00
2.8750	0.02985	52156.	-335.3784	-0.00305	6265.	4.76E+08	-113.3714	2849.	0.00
2.9375	0.02759	51873.	-420.1621	-0.00296	6231.	4.76E+08	-112.7183	3064.	0.00
3.0000	0.02540	51526.	-504.4045	-0.00288	6189.	4.76E+08	-111.9282	3305.	0.00
3.0625	0.02327	51116.	-587.9982	-0.00280	6140.	4.76E+08	-110.9885	3577.	0.00
3.1250	0.02120	50644.	-670.8254	-0.00272	6083.	4.76E+08	-109.8841	3887.	0.00
3.1875	0.01919	50110.	-752.7556	-0.00264	6019.	4.76E+08	-108.5963	4244.	0.00
3.2500	0.01724	49515.	-925.2711	-0.00256	5948.	4.76E+08	-351.4453	15290.	0.00
3.3125	0.01535	48722.	-1171.	-0.00248	5853.	4.76E+08	-303.5417	14835.	0.00
3.3750	0.01351	47758.	-1395.	-0.00241	5737.	4.76E+08	-294.6807	16357.	0.00
3.4375	0.01173	46629.	-1604.	-0.00233	5601.	4.76E+08	-261.8863	16740.	0.00
3.5000	0.01001	45352.	-1787.	-0.00226	5448.	4.76E+08	-226.4255	16965.	0.00
3.5625	0.00834	43948.	-1944.	-0.00219	5279.	4.76E+08	-191.1603	17190.	0.00
3.6250	0.00672	42437.	-2074.	-0.00212	5098.	4.76E+08	-156.1002	17415.	0.00
3.6875	0.00516	40838.	-2178.	-0.00206	4906.	4.76E+08	-121.2501	17640.	0.00
3.7500	0.00364	39170.	-2256.	-0.00199	4705.	4.76E+08	-86.6101	17865.	0.00
3.8125	0.00216	37454.	-2308.	-0.00193	4499.	4.76E+08	-52.1759	18090.	0.00
3.8750	7.35E-04	35708.	-2334.	-0.00188	4289.	4.76E+08	-17.9399	18315.	0.00
3.9375	-6.52E-04	33953.	-2335.	-0.00182	4078.	4.76E+08	16.1092	18540.	0.00
4.0000	-0.00200	32206.	-2310.	-0.00177	3869.	4.76E+08	49.9854	18765.	0.00
4.0625	-0.00331	30488.	-2260.	-0.00172	3662.	4.76E+08	83.7048	18990.	0.00
4.1250	-0.00458	28816.	-2185.	-0.00167	3461.	4.76E+08	117.2852	19215.	0.00
4.1875	-0.00582	27211.	-2084.	-0.00163	3269.	4.76E+08	150.7453	19440.	0.00
4.2500	-0.00702	25690.	-2012.	-0.00159	3086.	4.76E+08	40.8284	4361.	0.00
4.3125	-0.00820	24192.	-1972.	-0.00155	2906.	4.76E+08	66.1373	6052.	0.00
4.3750	-0.00934	22732.	-1922.	-0.00151	2731.	4.76E+08	68.3380	5485.	0.00
4.4375	-0.01046	21310.	-1870.	-0.00148	2560.	4.76E+08	70.2994	5039.	0.00
4.5000	-0.01156	19927.	-1816.	-0.00144	2394.	4.76E+08	72.0700	4677.	0.00
4.5625	-0.01263	18586.	-1762.	-0.00141	2233.	4.76E+08	73.6846	4376.	0.00
4.6250	-0.01368	17285.	-1706.	-0.00139	2076.	4.76E+08	75.1693	4122.	0.00
4.6875	-0.01471	16027.	-1649.	-0.00136	1925.	4.76E+08	76.5444	3904.	0.00
4.7500	-0.01572	14812.	-1591.	-0.00133	1779.	4.76E+08	77.8256	3714.	0.00
4.8125	-0.01671	13640.	-1532.	-0.00131	1638.	4.76E+08	79.0259	3547.	0.00
4.8750	-0.01768	12513.	-1473.	-0.00129	1503.	4.76E+08	80.1555	3399.	0.00
4.9375	-0.01865	11431.	-1412.	-0.00127	1373.	4.76E+08	81.2232	3267.	0.00
5.0000	-0.01959	10395.	-1351.	-0.00126	1249.	4.76E+08	82.2362	3148.	0.00
5.0625	-0.02053	9405.	-1289.	-0.00124	1130.	4.76E+08	83.2007	3040.	0.00
5.1250	-0.02145	8462.	-1226.	-0.00123	1017.	4.76E+08	84.1218	2941.	0.00
5.1875	-0.02237	7567.	-1162.	-0.00121	908.9073	4.76E+08	85.0042	2850.	0.00
5.2500	-0.02327	6719.	-1098.	-0.00120	807.0481	4.76E+08	85.8516	2767.	0.00
5.3125	-0.02417	5919.	-1034.	-0.00119	710.9897	4.76E+08	86.6675	2689.	0.00
5.3750	-0.02506	5168.	-968.4355	-0.00118	620.7873	4.76E+08	87.4550	2617.	0.00
5.4375	-0.02594	4466.	-902.5587	-0.00118	536.4942	4.76E+08	88.2165	2550.	0.00
5.5000	-0.02682	3814.	-836.1196	-0.00117	458.1617	4.76E+08	88.9544	2487.	0.00
5.5625	-0.02770	3212.	-769.1352	-0.00116	385.8397	4.76E+08	89.6707	2428.	0.00
5.6250	-0.02857	2660.	-701.6209	-0.00116	319.5766	4.76E+08	90.3673	2372.	0.00
5.6875	-0.02944	2160.	-633.5910	-0.00116	259.4196	4.76E+08	91.0457	2320.	0.00
5.7500	-0.03030	1710.	-565.0587	-0.00115	205.4143	4.76E+08	91.7073	2270.	0.00
5.8125	-0.03116	1312.	-496.0359	-0.00115	157.6056	4.76E+08	92.3534	2223.	0.00
5.8750	-0.03203	965.9945	-426.5339	-0.00115	116.0371	4.76E+08	92.9851	2178.	0.00
5.9375	-0.03289	672.2462	-356.5632	-0.00115	80.7515	4.76E+08	93.6034	2135.	0.00
6.0000	-0.03375	431.1497	-286.1335	-0.00115	51.7905	4.76E+08	94.2091	2094.	0.00
6.0625	-0.03460	243.0460	-215.2539	-0.00115	29.1952	4.76E+08	94.8030	2055.	0.00
6.1250	-0.03546	108.2689	-143.9331	-0.00114	13.0055	4.76E+08	95.3858	2017.	0.00
6.1875	-0.03632	27.1463	-72.1792	-0.00114	3.2609	4.76E+08	95.9579	1981.	0.00
6.2500	-0.03718	0.00	0.00	-0.00114	0.00	4.76E+08	96.5200	973.5000	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection            =     0.19105898 inches
Computed slope at pile head     =    -0.00565460 radians
Maximum bending moment          =         52649. inch-lbs
Maximum shear force             =          2900. lbs
Depth of maximum bending moment =     2.62500000 feet below pile head
Depth of maximum shear force    =     0.12500000 feet below pile head
Number of iterations            =             33
```

Number of zero deflection points = 1

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 4060.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5000	-1.78E-06	4060.	-0.01294	2.14E-07	4.76E+08	0.00	0.00	0.00
0.06250	0.4903	3045.	4060.	-0.01294	365.7713	4.76E+08	0.00	0.00	0.00
0.1250	0.4806	6090.	4060.	-0.01293	731.5427	4.76E+08	0.00	0.00	0.00
0.1875	0.4709	9135.	4060.	-0.01292	1097.	4.76E+08	0.00	0.00	0.00
0.2500	0.4612	12180.	4025.	-0.01291	1463.	4.76E+08	-93.1638	151.5091	0.00
0.3125	0.4515	15173.	3954.	-0.01288	1823.	4.76E+08	-95.7883	159.1141	0.00
0.3750	0.4419	18111.	3881.	-0.01286	2176.	4.76E+08	-98.3722	166.9763	0.00
0.4375	0.4322	20995.	3807.	-0.01283	2522.	4.76E+08	-100.9146	175.1091	0.00
0.5000	0.4226	23821.	3730.	-0.01279	2861.	4.76E+08	-103.4149	183.5270	0.00
0.5625	0.4130	26590.	3652.	-0.01275	3194.	4.76E+08	-105.8720	192.2451	0.00
0.6250	0.4035	29299.	3571.	-0.01271	3519.	4.76E+08	-108.2852	201.2799	0.00
0.6875	0.3940	31947.	3489.	-0.01266	3837.	4.76E+08	-110.6537	210.6488	0.00
0.7500	0.3845	34532.	3405.	-0.01261	4148.	4.76E+08	-112.9764	220.3706	0.00
0.8125	0.3751	37055.	3320.	-0.01255	4451.	4.76E+08	-115.2525	230.4653	0.00
0.8750	0.3657	39512.	3232.	-0.01249	4746.	4.76E+08	-117.4810	240.9545	0.00
0.9375	0.3563	41903.	3143.	-0.01243	5033.	4.76E+08	-119.6610	251.8613	0.00
1.0000	0.3470	44227.	3053.	-0.01236	5313.	4.76E+08	-121.7913	263.2106	0.00
1.0625	0.3378	46483.	2961.	-0.01229	5584.	4.76E+08	-123.8710	275.0295	0.00
1.1250	0.3286	48668.	2867.	-0.01221	5846.	4.76E+08	-125.8989	287.3471	0.00
1.1875	0.3195	50783.	2772.	-0.01213	6100.	4.76E+08	-127.8738	300.1947	0.00
1.2500	0.3104	52826.	2675.	-0.01205	6346.	4.76E+08	-129.7946	313.6067	0.00
1.3125	0.3014	54796.	2577.	-0.01197	6582.	4.76E+08	-131.6599	327.6201	0.00
1.3750	0.2925	56692.	2478.	-0.01188	6810.	4.76E+08	-133.4685	342.2754	0.00
1.4375	0.2836	58513.	2377.	-0.01179	7029.	4.76E+08	-135.2189	357.6167	0.00
1.5000	0.2748	60258.	2275.	-0.01169	7238.	4.76E+08	-136.9097	373.6923	0.00
1.5625	0.2660	61926.	2172.	-0.01160	7439.	4.76E+08	-138.5392	390.5551	0.00
1.6250	0.2574	63516.	2067.	-0.01150	7630.	4.76E+08	-140.1059	408.2633	0.00
1.6875	0.2488	65027.	1962.	-0.01140	7811.	4.76E+08	-141.6079	426.8809	0.00
1.7500	0.2403	66458.	1855.	-0.01129	7983.	4.76E+08	-143.0434	446.4788	0.00
1.8125	0.2319	67809.	1747.	-0.01119	8145.	4.76E+08	-144.4103	467.1354	0.00
1.8750	0.2235	69079.	1638.	-0.01108	8298.	4.76E+08	-145.7065	488.9379	0.00
1.9375	0.2152	70267.	1529.	-0.01097	8441.	4.76E+08	-146.9296	511.9838	0.00
2.0000	0.2070	71372.	1418.	-0.01086	8573.	4.76E+08	-148.0771	536.3819	0.00
2.0625	0.1989	72394.	1307.	-0.01074	8696.	4.76E+08	-149.1463	562.2545	0.00
2.1250	0.1909	73332.	1194.	-0.01063	8809.	4.76E+08	-150.1342	589.7396	0.00
2.1875	0.1830	74185.	1081.	-0.01051	8911.	4.76E+08	-151.0376	618.9935	0.00
2.2500	0.1752	74954.	967.7603	-0.01040	9004.	4.76E+08	-151.8529	650.1940	0.00
2.3125	0.1674	75637.	853.5994	-0.01028	9086.	4.76E+08	-152.5762	683.5444	0.00
2.3750	0.1597	76234.	738.9321	-0.01016	9157.	4.76E+08	-153.2032	719.2783	0.00
2.4375	0.1522	76745.	623.8324	-0.01004	9219.	4.76E+08	-153.7292	757.6656	0.00
2.5000	0.1447	77170.	508.3782	-0.00992	9270.	4.76E+08	-154.1488	799.0203	0.00
2.5625	0.1373	77508.	392.6514	-0.00979	9310.	4.76E+08	-154.4559	843.7098	0.00
2.6250	0.1300	77759.	276.7389	-0.00967	9341.	4.76E+08	-154.6441	892.1674	0.00
2.6875	0.1228	77923.	160.7329	-0.00955	9360.	4.76E+08	-154.7055	944.9075	0.00
2.7500	0.1157	78000.	44.7315	-0.00943	9370.	4.76E+08	-154.6315	1003.	0.00
2.8125	0.1087	77990.	-71.1599	-0.00930	9368.	4.76E+08	-154.4122	1066.	0.00
2.8750	0.1017	77893.	-186.8281	-0.00918	9357.	4.76E+08	-154.0361	1136.	0.00
2.9375	0.09489	77710.	-302.1502	-0.00906	9335.	4.76E+08	-153.4897	1213.	0.00
3.0000	0.08814	77440.	-416.9929	-0.00893	9302.	4.76E+08	-152.7573	1300.	0.00
3.0625	0.08149	77084.	-531.2093	-0.00881	9260.	4.76E+08	-151.8199	1397.	0.00
3.1250	0.07492	76643.	-644.6373	-0.00869	9207.	4.76E+08	-150.6548	1508.	0.00
3.1875	0.06845	76117.	-757.0958	-0.00857	9143.	4.76E+08	-149.2345	1635.	0.00
3.2500	0.06206	75508.	-1056.	-0.00845	9070.	4.76E+08	-646.6077	7814.	0.00
3.3125	0.05577	74534.	-1485.	-0.00833	8953.	4.76E+08	-498.8732	6709.	0.00
3.3750	0.04957	73280.	-1854.	-0.00822	8803.	4.76E+08	-485.4534	7346.	0.00
3.4375	0.04345	71753.	-2212.	-0.00810	8619.	4.76E+08	-469.8557	8111.	0.00
3.5000	0.03741	69961.	-2558.	-0.00799	8404.	4.76E+08	-451.6473	9054.	0.00
3.5625	0.03146	67916.	-2889.	-0.00788	8158.	4.76E+08	-430.2141	10256.	0.00
3.6250	0.02559	65628.	-3202.	-0.00778	7883.	4.76E+08	-404.6345	11859.	0.00
3.6875	0.01980	63113.	-3494.	-0.00767	7581.	4.76E+08	-373.4124	14147.	0.00
3.7500	0.01408	60388.	-3759.	-0.00758	7254.	4.76E+08	-333.8123	17785.	0.00
3.8125	0.00843	57475.	-3960.	-0.00748	6904.	4.76E+08	-203.3278	18090.	0.00
3.8750	0.00285	54448.	-4063.	-0.00740	6540.	4.76E+08	-69.6036	18315.	0.00
3.9375	-0.00266	51381.	-4064.	-0.00731	6172.	4.76E+08	65.8764	18540.	0.00
4.0000	-0.00812	48352.	-3963.	-0.00723	5808.	4.76E+08	203.1450	18765.	0.00
4.0625	-0.01352	45436.	-3759.	-0.00716	5458.	4.76E+08	342.2382	18990.	0.00
4.1250	-0.01886	42714.	-3476.	-0.00709	5131.	4.76E+08	410.9513	16342.	0.00
4.1875	-0.02415	40222.	-3150.	-0.00703	4832.	4.76E+08	457.7444	14214.	0.00
4.2500	-0.02940	37988.	-2957.	-0.00696	4563.	4.76E+08	58.3974	1490.	0.00
4.3125	-0.03460	35787.	-2899.	-0.00691	4299.	4.76E+08	94.7891	2055.	0.00
4.3750	-0.03976	33639.	-2827.	-0.00685	4041.	4.76E+08	98.1401	1851.	0.00
4.4375	-0.04487	31547.	-2752.	-0.00680	3789.	4.76E+08	101.1568	1691.	0.00
4.5000	-0.04996	29511.	-2675.	-0.00675	3545.	4.76E+08	103.9060	1560.	0.00
4.5625	-0.05500	27534.	-2596.	-0.00671	3307.	4.76E+08	106.4360	1451.	0.00
4.6250	-0.06001	25616.	-2516.	-0.00666	3077.	4.76E+08	108.7828	1359.	0.00
4.6875	-0.06500	23760.	-2433.	-0.00663	2854.	4.76E+08	110.9738	1281.	0.00
4.7500	-0.06995	21966.	-2349.	-0.00659	2639.	4.76E+08	113.0309	1212.	0.00
4.8125	-0.07488	20236.	-2264.	-0.00656	2431.	4.76E+08	114.9715	1152.	0.00
4.8750	-0.07979	18570.	-2177.	-0.00653	2231.	4.76E+08	116.8097	1098.	0.00
4.9375	-0.08467	16971.	-2089.	-0.00650	2039.	4.76E+08	118.5574	1050.	0.00
5.0000	-0.08953	15437.	-1999.	-0.00647	1854.	4.76E+08	120.2242	1007.	0.00
5.0625	-0.09438	13972.	-1908.	-0.00645	1678.	4.76E+08	121.8186	968.0586	0.00
5.1250	-0.09921	12575.	-1816.	-0.00643	1511.	4.76E+08	123.3477	932.5030	0.00
5.1875	-0.1040	11247.	-1723.	-0.00641	1351.	4.76E+08	124.8174	899.9490	0.00
5.2500	-0.1088	9990.	-1629.	-0.00639	1200.	4.76E+08	126.2331	870.0086	0.00
5.3125	-0.1136	8803.	-1534.	-0.00638	1057.	4.76E+08	127.5994	842.3595	0.00
5.3750	-0.1184	7689.	-1438.	-0.00636	923.5949	4.76E+08	128.9203	816.7313	0.00
5.4375	-0.1232	6647.	-1341.	-0.00635	798.4137	4.76E+08	130.1994	792.8955	0.00
5.5000	-0.1279	5678.	-1243.	-0.00634	682.0300	4.76E+08	131.4399	770.6576	0.00
5.5625	-0.1327	4783.	-1144.	-0.00634	574.5274	4.76E+08	132.6446	749.8510	0.00
5.6250	-0.1374	3963.	-1044.	-0.00633	475.9875	4.76E+08	133.8159	730.3322	0.00

5.6875	-0.1422	3217.	-942.8062	-0.00632	386.4893	4.76E+08	134.9561	711.9768	0.00
5.7500	-0.1469	2548.	-841.1724	-0.00632	306.1099	4.76E+08	136.0673	694.6764	0.00
5.8125	-0.1516	1956.	-738.7155	-0.00631	234.9244	4.76E+08	137.1512	678.3363	0.00
5.8750	-0.1564	1440.	-635.4553	-0.00631	173.0060	4.76E+08	138.2095	662.8731	0.00
5.9375	-0.1611	1003.	-531.4104	-0.00631	120.4262	4.76E+08	139.2436	648.2132	0.00
6.0000	-0.1658	643.1373	-426.5984	-0.00631	77.2549	4.76E+08	140.2550	634.2916	0.00
6.0625	-0.1706	362.6352	-321.0360	-0.00631	43.5604	4.76E+08	141.2448	621.0504	0.00
6.1250	-0.1753	161.5833	-214.7389	-0.00631	19.4097	4.76E+08	142.2141	608.4377	0.00
6.1875	-0.1800	40.5268	-107.7222	-0.00631	4.8682	4.76E+08	143.1639	596.4075	0.00
6.2500	-0.1848	0.00	0.00	-0.00631	0.00	4.76E+08	144.0952	292.4591	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection            =     0.49997345 inches
Computed slope at pile head     =    -0.01294344 radians
Maximum bending moment          =         78000. inch-lbs
Maximum shear force             =         -4064. lbs
Depth of maximum bending moment =     2.75000000 feet below pile head
Depth of maximum shear force    =     3.93750000 feet below pile head
Number of iterations            =             39
Number of zero deflection points =             1
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Shear and Moment (Loading Type 1)

```
Shear force at pile head                        =        5170.0 lbs
Applied moment at pile head                     =           0.0 in-lbs
Axial thrust load on pile head                  =           0.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.4364	-5.63E-07	5170.	-0.03273	6.77E-08	4.76E+08	0.00	0.00	0.00
0.06250	1.4119	3878.	5170.	-0.03273	465.7729	4.76E+08	0.00	0.00	0.00
0.1250	1.3873	7755.	5170.	-0.03272	931.5457	4.76E+08	0.00	0.00	0.00
0.1875	1.3628	11633.	5170.	-0.03270	1397.	4.76E+08	0.00	0.00	0.00
0.2500	1.3383	15510.	5126.	-0.03268	1863.	4.76E+08	-116.5591	65.3218	0.00
0.3125	1.3138	19322.	5037.	-0.03265	2321.	4.76E+08	-120.4793	68.7780	0.00
0.3750	1.2893	23066.	4946.	-0.03262	2771.	4.76E+08	-124.3996	72.3642	0.00
0.4375	1.2649	26740.	4851.	-0.03258	3212.	4.76E+08	-128.3198	76.0877	0.00
0.5000	1.2404	30342.	4753.	-0.03254	3645.	4.76E+08	-132.2401	79.9558	0.00
0.5625	1.2161	33870.	4652.	-0.03248	4069.	4.76E+08	-136.1603	83.9769	0.00
0.6250	1.1917	37321.	4549.	-0.03243	4483.	4.76E+08	-140.0806	88.1595	0.00
0.6875	1.1674	40693.	4442.	-0.03237	4888.	4.76E+08	-144.0008	92.5131	0.00
0.7500	1.1432	43984.	4333.	-0.03230	5283.	4.76E+08	-147.9211	97.0477	0.00
0.8125	1.1190	47192.	4221.	-0.03223	5669.	4.76E+08	-151.4691	101.5246	0.00
0.8750	1.0948	50315.	4106.	-0.03215	6044.	4.76E+08	-154.5347	105.8636	0.00
0.9375	1.0707	53351.	3989.	-0.03207	6409.	4.76E+08	-157.5455	110.3537	0.00
1.0000	1.0467	56299.	3870.	-0.03198	6763.	4.76E+08	-160.5003	115.0034	0.00
1.0625	1.0228	59156.	3748.	-0.03189	7106.	4.76E+08	-163.3978	119.8217	0.00
1.1250	0.9989	61921.	3624.	-0.03180	7438.	4.76E+08	-166.2366	124.8183	0.00
1.1875	0.9751	64592.	3499.	-0.03170	7759.	4.76E+08	-169.0153	130.0037	0.00
1.2500	0.9513	67169.	3371.	-0.03159	8068.	4.76E+08	-171.7324	135.3892	0.00
1.3125	0.9277	69649.	3241.	-0.03149	8366.	4.76E+08	-174.3863	140.9872	0.00
1.3750	0.9041	72030.	3109.	-0.03137	8652.	4.76E+08	-176.9754	146.8110	0.00
1.4375	0.8806	74313.	2976.	-0.03126	8927.	4.76E+08	-179.4980	152.8752	0.00
1.5000	0.8572	76494.	2840.	-0.03114	9189.	4.76E+08	-181.9521	159.1955	0.00
1.5625	0.8339	78573.	2703.	-0.03102	9438.	4.76E+08	-184.3359	165.7893	0.00
1.6250	0.8107	80548.	2564.	-0.03089	9676.	4.76E+08	-186.6472	172.6754	0.00
1.6875	0.7876	82419.	2423.	-0.03076	9900.	4.76E+08	-188.8838	179.8747	0.00
1.7500	0.7645	84183.	2280.	-0.03063	10112.	4.76E+08	-191.0434	187.4100	0.00
1.8125	0.7416	85839.	2136.	-0.03050	10311.	4.76E+08	-193.1234	195.3066	0.00
1.8750	0.7188	87387.	1991.	-0.03036	10497.	4.76E+08	-195.1212	203.5923	0.00
1.9375	0.6961	88825.	1844.	-0.03022	10670.	4.76E+08	-197.0338	212.2981	0.00
2.0000	0.6735	90153.	1695.	-0.03008	10829.	4.76E+08	-198.8581	221.4585	0.00
2.0625	0.6510	91368.	1545.	-0.02994	10975.	4.76E+08	-200.5907	231.1119	0.00
2.1250	0.6286	92471.	1394.	-0.02979	11108.	4.76E+08	-202.2280	241.3015	0.00
2.1875	0.6063	93460.	1242.	-0.02965	11227.	4.76E+08	-203.7659	252.0758	0.00
2.2500	0.5841	94334.	1089.	-0.02950	11332.	4.76E+08	-205.2001	263.4896	0.00
2.3125	0.5620	95093.	934.3760	-0.02935	11423.	4.76E+08	-206.5260	275.6051	0.00
2.3750	0.5401	95736.	779.0269	-0.02920	11500.	4.76E+08	-207.7383	288.4930	0.00
2.4375	0.5182	96261.	622.8133	-0.02905	11563.	4.76E+08	-208.8313	302.2345	0.00
2.5000	0.4965	96670.	465.8271	-0.02889	11612.	4.76E+08	-209.7987	316.9228	0.00
2.5625	0.4749	96960.	308.1650	-0.02874	11647.	4.76E+08	-210.6335	332.6661	0.00
2.6250	0.4534	97132.	149.9295	-0.02859	11668.	4.76E+08	-211.3279	349.5901	0.00
2.6875	0.4320	97185.	-8.7710	-0.02844	11674.	4.76E+08	-211.8732	367.8422	0.00
2.7500	0.4107	97119.	-167.8208	-0.02828	11666.	4.76E+08	-212.2596	387.5968	0.00
2.8125	0.3896	96933.	-327.0966	-0.02813	11644.	4.76E+08	-212.4760	409.0610	0.00
2.8750	0.3685	96628.	-486.4662	-0.02798	11607.	4.76E+08	-212.5096	432.4837	0.00
2.9375	0.3476	96204.	-645.7871	-0.02783	11556.	4.76E+08	-212.3460	458.1664	0.00
3.0000	0.3268	95660.	-804.9051	-0.02767	11491.	4.76E+08	-211.9685	486.4787	0.00
3.0625	0.3061	94996.	-963.6522	-0.02752	11411.	4.76E+08	-211.3574	517.8786	0.00
3.1250	0.2855	94214.	-1122.	-0.02737	11317.	4.76E+08	-210.4897	552.9412	0.00
3.1875	0.2650	93313.	-1279.	-0.02723	11209.	4.76E+08	-209.3380	592.4002	0.00
3.2500	0.2447	92295.	-1459.	-0.02708	11087.	4.76E+08	-269.0343	824.7027	0.00
3.3125	0.2244	91125.	-1663.	-0.02694	10946.	4.76E+08	-275.5522	920.9252	0.00
3.3750	0.2043	89801.	-1872.	-0.02679	10787.	4.76E+08	-281.1758	1032.	0.00
3.4375	0.1842	88318.	-2085.	-0.02665	10609.	4.76E+08	-286.7993	1168.	0.00
3.5000	0.1643	86674.	-2302.	-0.02651	10411.	4.76E+08	-292.4230	1335.	0.00
3.5625	0.1444	84865.	-2527.	-0.02638	10194.	4.76E+08	-308.9744	1604.	0.00
3.6250	0.1247	82883.	-2786.	-0.02625	9956.	4.76E+08	-380.9951	2291.	0.00
3.6875	0.1051	80686.	-3099.	-0.02612	9692.	4.76E+08	-454.5871	3245.	0.00
3.7500	0.08554	78234.	-3469.	-0.02599	9398.	4.76E+08	-529.7456	4645.	0.00
3.8125	0.06609	75483.	-3895.	-0.02587	9067.	4.76E+08	-606.4670	6882.	0.00
3.8750	0.04673	72392.	-4326.	-0.02575	8696.	4.76E+08	-543.1065	8717.	0.00
3.9375	0.02746	68994.	-4699.	-0.02564	8288.	4.76E+08	-451.5168	12334.	0.00
4.0000	0.00826	65343.	-4946.	-0.02554	7849.	4.76E+08	-206.7856	18765.	0.00
4.0625	-0.01085	61576.	-4920.	-0.02544	7397.	4.76E+08	274.7219	18990.	0.00
4.1250	-0.02989	57963.	-4634.	-0.02534	6963.	4.76E+08	488.3490	12253.	0.00
4.1875	-0.04886	54625.	-4227.	-0.02525	6562.	4.76E+08	595.7961	9145.	0.00

4.2500	-0.06777	51622.	-3977.	-0.02517	6201.	4.76E+08	71.9566	796.2973	0.00
4.3125	-0.08662	48660.	-3905.	-0.02509	5845.	4.76E+08	119.2320	1032.	0.00
4.3750	-0.1054	45764.	-3814.	-0.02502	5497.	4.76E+08	125.2301	891.0189	0.00
4.4375	-0.1241	42939.	-3718.	-0.02495	5158.	4.76E+08	130.4582	788.1334	0.00
4.5000	-0.1428	40187.	-3618.	-0.02488	4827.	4.76E+08	135.1120	709.4678	0.00
4.5625	-0.1615	37512.	-3515.	-0.02482	4506.	4.76E+08	139.3190	647.1187	0.00
4.6250	-0.1801	34915.	-3409.	-0.02476	4194.	4.76E+08	143.1673	596.3265	0.00
4.6875	-0.1986	32398.	-3301.	-0.02471	3892.	4.76E+08	146.7205	554.0432	0.00
4.7500	-0.2171	29964.	-3189.	-0.02466	3599.	4.76E+08	150.0262	518.2209	0.00
4.8125	-0.2356	27614.	-3076.	-0.02462	3317.	4.76E+08	153.1210	487.4297	0.00
4.8750	-0.2541	25350.	-2960.	-0.02457	3045.	4.76E+08	156.0338	460.6388	0.00
4.9375	-0.2725	23174.	-2842.	-0.02454	2784.	4.76E+08	158.7877	437.0856	0.00
5.0000	-0.2909	21088.	-2722.	-0.02450	2533.	4.76E+08	161.4015	416.1927	0.00
5.0625	-0.3092	19092.	-2600.	-0.02447	2293.	4.76E+08	163.8908	397.5147	0.00
5.1250	-0.3276	17188.	-2476.	-0.02444	2065.	4.76E+08	166.2688	380.7019	0.00
5.1875	-0.3459	15378.	-2350.	-0.02441	1847.	4.76E+08	168.5464	365.4760	0.00
5.2500	-0.3642	13663.	-2223.	-0.02439	1641.	4.76E+08	170.7331	351.6123	0.00
5.3125	-0.3825	12044.	-2094.	-0.02437	1447.	4.76E+08	172.8371	338.9274	0.00
5.3750	-0.4007	10522.	-1964.	-0.02435	1264.	4.76E+08	174.8653	327.2701	0.00
5.4375	-0.4190	9098.	-1832.	-0.02434	1093.	4.76E+08	176.8241	316.5143	0.00
5.5000	-0.4372	7774.	-1699.	-0.02432	933.7850	4.76E+08	178.7187	306.5545	0.00
5.5625	-0.4555	6550.	-1564.	-0.02431	786.7948	4.76E+08	180.5540	297.3010	0.00
5.6250	-0.4737	5428.	-1428.	-0.02430	652.0044	4.76E+08	182.3343	288.6776	0.00
5.6875	-0.4919	4408.	-1290.	-0.02430	529.5341	4.76E+08	184.0632	280.6188	0.00
5.7500	-0.5102	3492.	-1152.	-0.02429	419.5007	4.76E+08	185.7443	273.0683	0.00
5.8125	-0.5284	2681.	-1012.	-0.02429	322.0178	4.76E+08	187.3806	265.9769	0.00
5.8750	-0.5466	1975.	-870.6430	-0.02428	237.1959	4.76E+08	188.9749	259.3020	0.00
5.9375	-0.5648	1375.	-728.3289	-0.02428	165.1428	4.76E+08	190.5295	253.0061	0.00
6.0000	-0.5830	882.1324	-584.8627	-0.02428	105.9635	4.76E+08	192.0469	247.0563	0.00
6.0625	-0.6012	497.4986	-440.2717	-0.02428	59.7605	4.76E+08	193.5291	241.4233	0.00
6.1250	-0.6194	221.7249	-294.5815	-0.02428	26.6340	4.76E+08	194.9780	236.0813	0.00
6.1875	-0.6376	55.6263	-147.8166	-0.02428	6.6819	4.76E+08	196.3952	231.0073	0.00
6.2500	-0.6558	0.00	0.00	-0.02428	0.00	4.76E+08	197.7824	113.0903	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection            =     1.43642835 inches
Computed slope at pile head     =    -0.03272947 radians
Maximum bending moment          =         97185. inch-lbs
Maximum shear force             =          5170. lbs
Depth of maximum bending moment =     2.68750000 feet below pile head
Depth of maximum shear force    =     0.06250000 feet below pile head
Number of iterations            =             66
Number of zero deflection points =             1
```

Summary of Pile-head Responses for Conventional Analyses

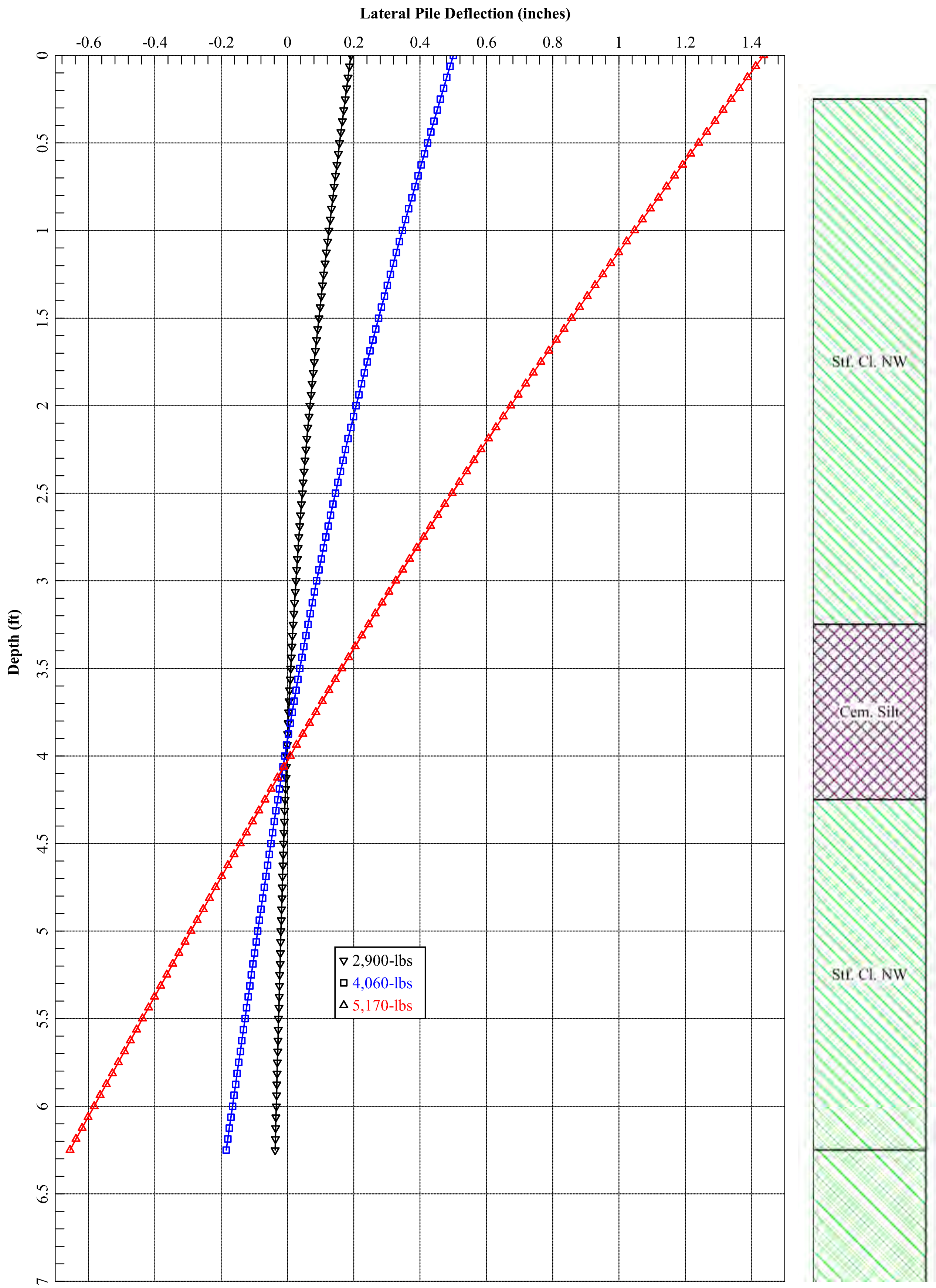
Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

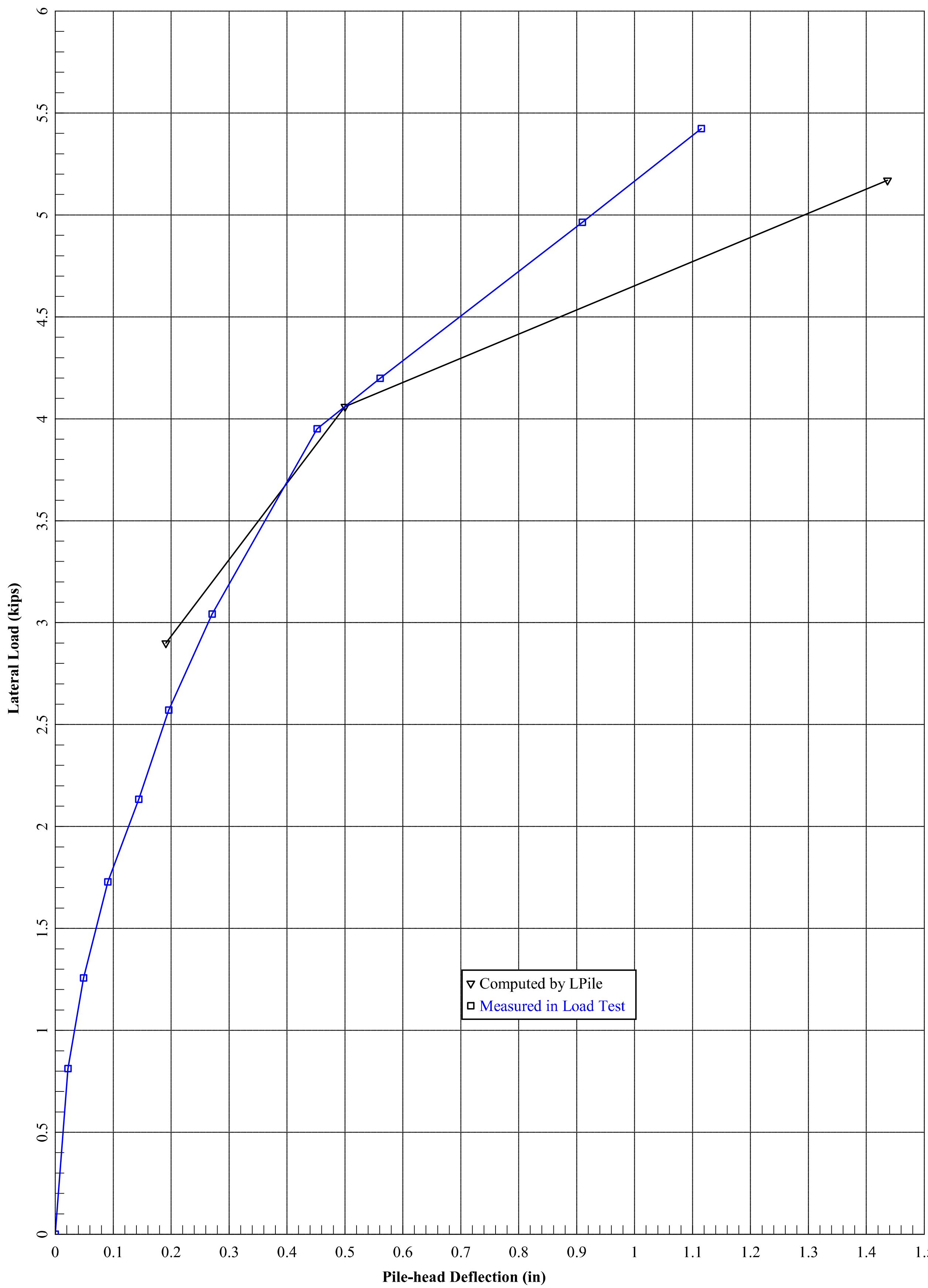
Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	V, lb	2900.	M, in-lb	0.00	0.00	0.1911	-0.00565	2900.	52649.
2	V, lb	4060.	M, in-lb	0.00	0.00	0.5000	-0.01294	-4064.	78000.
3	V, lb	5170.	M, in-lb	0.00	0.00	1.4364	-0.03273	5170.	97185.

Maximum pile-head deflection = 1.4364283543 inches
Maximum pile-head rotation   = -0.0327294699 radians = -1.875260 deg.

The analysis ended normally.



Lateral Pile Deflection (inches)
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Depth (ft)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
2,900-lbs
4,060-lbs
5,170-lbs
Stf. Cl. NW
Cem. Silt
Stf. Cl. NW



Lateral Load (kips)
Pile-head Deflection (in)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
Computed by LPile
Measured in Load Test

```
================================================================================
                     LPile for Windows, Version 2016-09.011

                 Analysis of Individual Piles and Drilled Shafts
                Subjected to Lateral Loading Using the p-y Method
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================================================================================

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--------------------------------------------------------------------------------
                            Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:
\Users\JCrow\Desktop\LPile\

Name of input data file:
1B - 9 ft.lp9d

Name of output report file:
1B - 9 ft.lp9o

Name of plot output file:
1B - 9 ft.lp9p

Name of runtime message file:
1B - 9 ft.lp9r


--------------------------------------------------------------------------------
                           Date and Time of Analysis
--------------------------------------------------------------------------------

              Date:  December 14, 2017          Time:  10:43:22


--------------------------------------------------------------------------------
                                 Problem Title
--------------------------------------------------------------------------------

Project Name: Madison County Solar Power Plant

Job Number: 173483

Client: First Solar, Inc.

Engineer: J. Crow

Description: 1B - 9FT



--------------------------------------------------------------------------------
                          Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:
 - Maximum number of iterations allowed               =          500
 - Deflection tolerance for convergence               =   1.0000E-05 in
 - Maximum allowable deflection                       =     100.0000 in
 - Number of pile increments                          =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Use of p-y modification factors for p-y curves not selected
 - Analysis uses layering correction (Method of Georgiadis)
 - Layering correction is not computed if soil above is of same type
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
 - No p-y curves to be computed and reported for user-specified depths
 - Print using wide report formats
```

```
--------------------------------------------------------------------------------
                    Pile Structural Properties and Geometry
--------------------------------------------------------------------------------

Number of pile sections defined                          =           1
Total length of pile                                     =       9.250 ft
Depth of ground surface below top of pile                =      0.2500 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

            Depth Below          Pile
Point       Pile Head          Diameter
 No.          feet              inches
-----     ------------      ------------
  1           0.000            3.9400
  2           9.250            3.9400


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:

   Section 1 is an elastic pile
   Cross-sectional Shape                                 = Strong H-Pile
   Length of section                                     =     9.250000 ft
   Flange Width                                          =     3.940000 in
   Section Depth                                         =     5.900000 in
   Flange Thickness                                      =     0.215000 in
   Web Thickness                                         =     0.170000 in
   Section Area                                          =     2.680000 sq. in
   Moment of Inertia                                     =    16.400000 in^4
   Elastic Modulus                                       =    29000000. psi



--------------------------------------------------------------------------------
                      Ground Slope and Pile Batter Angles
--------------------------------------------------------------------------------

Ground Slope Angle                                       =       0.000 degrees
                                                         =       0.000 radians

Pile Batter Angle                                        =       0.000 degrees
                                                         =       0.000 radians


--------------------------------------------------------------------------------
                      Soil and Rock Layering Information
--------------------------------------------------------------------------------

The soil profile is modelled using 4 layers

Layer 1 is stiff clay without free water

   Distance from top of pile to top of layer             =     0.250000 ft
   Distance from top of pile to bottom of layer          =     3.250000 ft
   Effective unit weight at top of layer                 =   130.000000 pcf
   Effective unit weight at bottom of layer              =   130.000000 pcf
   Undrained cohesion at top of layer                    =        1250. psf
   Undrained cohesion at bottom of layer                 =        1250. psf
   Epsilon-50 at top of layer                            =     0.010900
   Epsilon-50 at bottom of layer                         =     0.010900


Layer 2 is cemented silt with cohesion and friction

   Distance from top of pile to top of layer             =     3.250000 ft
   Distance from top of pile to bottom of layer          =     4.250000 ft
   Effective unit weight at top of layer                 =   130.000000 pcf
   Effective unit weight at bottom of layer              =   130.000000 pcf
   Undrained cohesion at top of layer                    =   250.000000 psf
   Undrained cohesion at bottom of layer                 =   250.000000 psf
   Friction angle at top of layer                        =    30.000000 deg.
   Friction angle at bottom of layer                     =    30.000000 deg.
   Epsilon-50 at top of layer                            =     0.010000
   Epsilon-50 at bottom of layer                         =     0.010000
   Subgrade k at top of layer                            =   400.000000 pci
   Subgrade k at bottom of layer                         =   400.000000 pci


Layer 3 is stiff clay without free water

   Distance from top of pile to top of layer             =     4.250000 ft
   Distance from top of pile to bottom of layer          =     6.250000 ft
   Effective unit weight at top of layer                 =   135.000000 pcf
   Effective unit weight at bottom of layer              =   135.000000 pcf
   Undrained cohesion at top of layer                    =  1000.000000 psf
   Undrained cohesion at bottom of layer                 =  1000.000000 psf
   Epsilon-50 at top of layer                            =     0.010000
   Epsilon-50 at bottom of layer                         =     0.010000


Layer 4 is stiff clay without free water

   Distance from top of pile to top of layer             =     6.250000 ft
   Distance from top of pile to bottom of layer          =     9.500000 ft
   Effective unit weight at top of layer                 =   130.000000 pcf
   Effective unit weight at bottom of layer              =   130.000000 pcf
   Undrained cohesion at top of layer                    =        3500. psf
   Undrained cohesion at bottom of layer                 =        3500. psf
   Epsilon-50 at top of layer                            =     0.005000
   Epsilon-50 at bottom of layer                         =     0.005000


 (Depth of the lowest soil layer extends 0.250 ft below the pile tip)
```

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	0.2500	130.0000	1250.	--	0.01090	--
	w/o Free Water	3.2500	130.0000	1250.	--	0.01090	--
2	Cemented	3.2500	130.0000	250.0000	30.0000	0.01000	400.0000
	Silt	4.2500	130.0000	250.0000	30.0000	0.01000	400.0000
3	Stiff Clay	4.2500	135.0000	1000.0000	--	0.01000	--
	w/o Free Water	6.2500	135.0000	1000.0000	--	0.01000	--
4	Stiff Clay	6.2500	130.0000	3500.	--	0.00500	--
	w/o Free Water	9.5000	130.0000	3500.	--	0.00500	--

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 3

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	1	V = 3210. lbs	M = 0.0000 in-lbs	0.0000000	No
2	1	V = 5240. lbs	M = 0.0000 in-lbs	0.0000000	No
3	1	V = 7350. lbs	M = 0.0000 in-lbs	0.0000000	No

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.2500	0.00	N.A.	No	0.00	6686.
2	3.2500	4.2710	No	No	6686.	3779.
3	4.2500	4.7515	No	No	10465.	5927.
4	6.2500	6.7515	Yes	No	16392.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 3210.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2256	0.00	3210.	-0.00658	0.00	4.76E+08	0.00	0.00	0.00
0.09250	0.2183	3563.	3210.	-0.00658	428.0065	4.76E+08	0.00	0.00	0.00
0.1850	0.2110	7126.	3210.	-0.00657	856.0130	4.76E+08	0.00	0.00	0.00
0.2775	0.2037	10689.	3176.	-0.00655	1284.	4.76E+08	-61.1097	332.9963	0.00

0.3700	0.1964	14177.	3107.	-0.00652	1703.	4.76E+08	-63.5514	359.0859	0.00
0.4625	0.1892	17587.	3035.	-0.00648	2113.	4.76E+08	-65.9248	386.6998	0.00
0.5550	0.1821	20915.	2961.	-0.00644	2512.	4.76E+08	-68.2280	415.9705	0.00
0.6475	0.1749	24159.	2884.	-0.00638	2902.	4.76E+08	-70.4589	447.0441	0.00
0.7400	0.1679	27317.	2804.	-0.00632	3281.	4.76E+08	-72.6155	480.0826	0.00
0.8325	0.1609	30384.	2722.	-0.00626	3650.	4.76E+08	-74.6959	515.2654	0.00
0.9250	0.1540	33360.	2638.	-0.00618	4007.	4.76E+08	-76.6978	552.7921	0.00
1.0175	0.1472	36242.	2552.	-0.00610	4353.	4.76E+08	-78.6193	592.8851	0.00
1.1100	0.1405	39026.	2464.	-0.00601	4688.	4.76E+08	-80.4580	635.7931	0.00
1.2025	0.1338	41712.	2374.	-0.00592	5010.	4.76E+08	-82.2118	681.7945	0.00
1.2950	0.1273	44296.	2281.	-0.00582	5321.	4.76E+08	-83.8783	731.2024	0.00
1.3875	0.1209	46777.	2187.	-0.00571	5619.	4.76E+08	-85.4551	784.3695	0.00
1.4800	0.1147	49152.	2092.	-0.00560	5904.	4.76E+08	-86.9398	841.6946	0.00
1.5725	0.1085	51420.	1995.	-0.00548	6177.	4.76E+08	-88.3298	903.6301	0.00
1.6650	0.1025	53580.	1896.	-0.00536	6436.	4.76E+08	-89.6225	970.6907	0.00
1.7575	0.09661	55629.	1796.	-0.00523	6682.	4.76E+08	-90.8150	1043.	0.00
1.8500	0.09087	57566.	1694.	-0.00510	6915.	4.76E+08	-91.9046	1123.	0.00
1.9425	0.08529	59390.	1592.	-0.00496	7134.	4.76E+08	-92.8880	1209.	0.00
2.0350	0.07985	61100.	1488.	-0.00482	7339.	4.76E+08	-93.7622	1303.	0.00
2.1275	0.07458	62694.	1384.	-0.00468	7531.	4.76E+08	-94.5238	1407.	0.00
2.2200	0.06947	64171.	1278.	-0.00453	7708.	4.76E+08	-95.1690	1521.	0.00
2.3125	0.06452	65532.	1172.	-0.00438	7872.	4.76E+08	-95.6942	1646.	0.00
2.4050	0.05975	66774.	1066.	-0.00422	8021.	4.76E+08	-96.0951	1785.	0.00
2.4975	0.05515	67898.	959.1066	-0.00407	8156.	4.76E+08	-96.3673	1940.	0.00
2.5900	0.05072	68903.	852.0618	-0.00391	8277.	4.76E+08	-96.5061	2112.	0.00
2.6825	0.04647	69789.	744.9401	-0.00375	8383.	4.76E+08	-96.5062	2305.	0.00
2.7750	0.04241	70557.	637.8983	-0.00358	8475.	4.76E+08	-96.3619	2522.	0.00
2.8675	0.03852	71206.	531.1004	-0.00342	8553.	4.76E+08	-96.0669	2768.	0.00
2.9600	0.03482	71736.	424.7174	-0.00325	8617.	4.76E+08	-95.6142	3048.	0.00
3.0525	0.03131	72148.	318.9286	-0.00308	8667.	4.76E+08	-94.9961	3368.	0.00
3.1450	0.02798	72444.	213.9227	-0.00291	8702.	4.76E+08	-94.2038	3737.	0.00
3.2375	0.02484	72623.	109.8985	-0.00274	8724.	4.76E+08	-93.2272	4166.	0.00
3.3300	0.02189	72688.	-131.3125	-0.00257	8731.	4.76E+08	-341.3871	17311.	0.00
3.4225	0.01913	72332.	-509.0838	-0.00240	8689.	4.76E+08	-339.2819	19689.	0.00
3.5150	0.01655	71558.	-881.7272	-0.00224	8596.	4.76E+08	-332.1478	22274.	0.00
3.6075	0.01416	70374.	-1241.	-0.00207	8454.	4.76E+08	-314.6404	24661.	0.00
3.7000	0.01195	68803.	-1566.	-0.00191	8265.	4.76E+08	-270.8991	25154.	0.00
3.7925	0.00992	66899.	-1843.	-0.00175	8036.	4.76E+08	-229.3155	25646.	0.00
3.8850	0.00807	64711.	-2076.	-0.00160	7773.	4.76E+08	-190.0110	26139.	0.00
3.9775	0.00638	62290.	-2266.	-0.00145	7482.	4.76E+08	-153.0804	26632.	0.00
4.0700	0.00485	59680.	-2417.	-0.00131	7169.	4.76E+08	-118.5938	27125.	0.00
4.1625	0.00348	56924.	-2531.	-0.00117	6838.	4.76E+08	-86.5978	27618.	0.00
4.2550	0.00226	54061.	-2606.	-0.00104	6494.	4.76E+08	-47.8837	23566.	0.00
4.3475	0.00117	51139.	-2655.	-9.18E-04	6143.	4.76E+08	-40.6277	38533.	0.00
4.4400	2.18E-04	48167.	-2692.	-8.02E-04	5786.	4.76E+08	-26.6058	135613.	0.00
4.5325	-6.10E-04	45162.	-2688.	-6.93E-04	5425.	4.76E+08	34.5886	62938.	0.00
4.6250	-0.00132	42200.	-2645.	-5.91E-04	5069.	4.76E+08	41.9285	35237.	0.00
4.7175	-0.00192	39290.	-2596.	-4.96E-04	4720.	4.76E+08	46.0442	26588.	0.00
4.8100	-0.00242	36436.	-2544.	-4.08E-04	4377.	4.76E+08	48.7785	22356.	0.00
4.9025	-0.00283	33643.	-2489.	-3.26E-04	4041.	4.76E+08	50.7003	19905.	0.00
4.9950	-0.00315	30911.	-2432.	-2.51E-04	3713.	4.76E+08	52.0689	18375.	0.00
5.0875	-0.00338	28244.	-2373.	-1.82E-04	3393.	4.76E+08	53.0267	17397.	0.00
5.1800	-0.00355	25643.	-2314.	-1.19E-04	3080.	4.76E+08	53.6611	16787.	0.00
5.2725	-0.00365	23107.	-2254.	-6.17E-05	2776.	4.76E+08	54.0296	16446.	0.00
5.3650	-0.00369	20638.	-2194.	-1.07E-05	2479.	4.76E+08	54.1723	16316.	0.00
5.4575	-0.00367	18236.	-2134.	3.47E-05	2191.	4.76E+08	54.1181	16366.	0.00
5.5500	-0.00361	15901.	-2074.	7.45E-05	1910.	4.76E+08	53.8884	16577.	0.00
5.6425	-0.00351	13632.	-2015.	1.09E-04	1637.	4.76E+08	53.4993	16943.	0.00
5.7350	-0.00337	11428.	-1955.	1.38E-04	1373.	4.76E+08	52.9633	17464.	0.00
5.8275	-0.00320	9290.	-1897.	1.62E-04	1116.	4.76E+08	52.2901	18149.	0.00
5.9200	-0.00301	7217.	-1839.	1.82E-04	866.9046	4.76E+08	51.4870	19013.	0.00
6.0125	-0.00279	5207.	-1783.	1.96E-04	625.4489	4.76E+08	50.5603	20080.	0.00
6.1050	-0.00257	3259.	-1727.	2.06E-04	391.4762	4.76E+08	49.5147	21383.	0.00
6.1975	-0.00234	1372.	-1673.	2.11E-04	164.8318	4.76E+08	48.3548	22963.	0.00
6.2900	-0.00210	-455.0045	-1537.	2.13E-04	54.6560	4.76E+08	195.9770	103541.	0.00
6.3825	-0.00187	-2041.	-1323.	2.10E-04	245.1388	4.76E+08	190.2537	113195.	0.00
6.4750	-0.00164	-3392.	-1115.	2.03E-04	407.4636	4.76E+08	184.1091	124944.	0.00
6.5675	-0.00141	-4517.	-914.5138	1.94E-04	542.5398	4.76E+08	177.5539	139343.	0.00
6.6600	-0.00120	-5422.	-721.2923	1.82E-04	651.3377	4.76E+08	170.5929	157163.	0.00
6.7525	-0.00101	-6118.	-536.0235	1.69E-04	734.8874	4.76E+08	163.2249	179499.	0.00
6.8450	-8.30E-04	-6612.	-359.1642	1.54E-04	794.2794	4.76E+08	155.4405	207946.	0.00
6.9375	-6.67E-04	-6915.	-191.1879	1.38E-04	830.6660	4.76E+08	147.2196	244917.	0.00
7.0300	-5.23E-04	-7037.	-32.5990	1.22E-04	845.2636	4.76E+08	138.5261	294212.	0.00
7.1225	-3.96E-04	-6988.	116.0430	1.06E-04	839.3592	4.76E+08	129.2974	362179.	0.00
7.2150	-2.88E-04	-6779.	254.0835	8.96E-05	814.3184	4.76E+08	119.4241	460267.	0.00
7.3075	-1.97E-04	-6423.	380.6947	7.42E-05	771.6025	4.76E+08	108.7042	611533.	0.00
7.4000	-1.23E-04	-5934.	494.7061	5.98E-05	712.7982	4.76E+08	96.7218	871063.	0.00
7.4925	-6.46E-05	-5325.	587.5818	4.67E-05	639.6789	4.76E+08	70.6218	1214062.	0.00
7.5850	-1.97E-05	-4630.	638.7231	3.50E-05	556.1074	4.76E+08	21.5247	1214062.	0.00
7.6775	1.32E-05	-3907.	642.6469	2.51E-05	469.3501	4.76E+08	-14.4548	1214062.	0.00
7.7700	3.60E-05	-3203.	612.7781	1.68E-05	384.7322	4.76E+08	-39.3630	1214062.	0.00
7.8625	5.05E-05	-2547.	560.2979	1.01E-05	305.9401	4.76E+08	-55.1959	1214062.	0.00
7.9550	5.83E-05	-1959.	494.2484	4.81E-06	235.3172	4.76E+08	-63.8122	1214062.	0.00
8.0475	6.11E-05	-1450.	421.7154	8.33E-07	174.1386	4.76E+08	-66.8777	1214062.	0.00
8.1400	6.02E-05	-1023.	348.0596	-2.05E-06	122.8580	4.76E+08	-65.8356	1214062.	0.00
8.2325	5.66E-05	-676.9893	277.1689	-4.04E-06	81.3213	4.76E+08	-61.8954	1214062.	0.00
8.3250	5.12E-05	-407.4625	211.7164	-5.30E-06	48.9452	4.76E+08	-56.0370	1214062.	0.00
8.4175	4.48E-05	-206.9789	153.4076	-6.02E-06	24.8627	4.76E+08	-49.0240	1214062.	0.00
8.5100	3.79E-05	-66.8977	103.2087	-6.34E-06	8.0359	4.76E+08	-41.4246	1214062.	0.00
8.6025	3.08E-05	22.1444	61.5503	-6.39E-06	2.6600	4.76E+08	-33.6356	1214062.	0.00
8.6950	2.37E-05	69.7440	28.5029	-6.28E-06	8.3778	4.76E+08	-25.9093	1214062.	0.00
8.7875	1.68E-05	85.4208	3.9220	-6.10E-06	10.2609	4.76E+08	-18.3807	1214062.	0.00
8.8800	1.01E-05	78.4508	-12.4365	-5.91E-06	9.4237	4.76E+08	-11.0941	1214062.	0.00
8.9725	3.68E-06	57.8117	-20.8303	-5.75E-06	6.9445	4.76E+08	-4.0298	1214062.	0.00
9.0650	-2.62E-06	32.2076	-21.4735	-5.65E-06	3.8688	4.76E+08	2.8707	1214062.	0.00
9.1575	-8.85E-06	10.1405	-14.5079	-5.60E-06	1.2181	4.76E+08	9.6799	1214062.	0.00
9.2500	-1.50E-05	0.00	0.00	-5.58E-06	0.00	4.76E+08	16.4605	607031.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection            =     0.22558713 inches
Computed slope at pile head     =    -0.00658345 radians
Maximum bending moment          =         72688. inch-lbs
Maximum shear force             =          3210. lbs
Depth of maximum bending moment =     3.33000000 feet below pile head
Depth of maximum shear force    =     0.09250000 feet below pile head
Number of iterations            =             18
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Number of zero deflection points = 3

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 5240.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5001	-4.71E-07	5240.	-0.01335	5.66E-08	4.76E+08	0.00	0.00	0.00
0.09250	0.4853	5816.	5240.	-0.01335	698.6773	4.76E+08	0.00	0.00	0.00
0.1850	0.4705	11633.	5240.	-0.01333	1397.	4.76E+08	0.00	0.00	0.00
0.2775	0.4557	17449.	5199.	-0.01329	2096.	4.76E+08	-74.7346	182.0413	0.00
0.3700	0.4410	23174.	5114.	-0.01324	2784.	4.76E+08	-77.7867	195.8053	0.00
0.4625	0.4263	28802.	5026.	-0.01318	3460.	4.76E+08	-80.7640	210.2967	0.00
0.5550	0.4117	34331.	4935.	-0.01311	4124.	4.76E+08	-83.6647	225.5735	0.00
0.6475	0.3972	39757.	4840.	-0.01302	4776.	4.76E+08	-86.4867	241.6991	0.00
0.7400	0.3828	45076.	4743.	-0.01292	5415.	4.76E+08	-89.2278	258.7433	0.00
0.8325	0.3685	50286.	4642.	-0.01281	6040.	4.76E+08	-91.8860	276.7826	0.00
0.9250	0.3543	55382.	4539.	-0.01269	6653.	4.76E+08	-94.4590	295.9016	0.00
1.0175	0.3403	60362.	4432.	-0.01255	7251.	4.76E+08	-96.9446	316.1935	0.00
1.1100	0.3265	65222.	4324.	-0.01241	7835.	4.76E+08	-99.3405	337.7615	0.00
1.2025	0.3128	69960.	4212.	-0.01225	8404.	4.76E+08	-101.6445	360.7200	0.00
1.2950	0.2993	74573.	4098.	-0.01208	8958.	4.76E+08	-103.8540	385.1963	0.00
1.3875	0.2860	79057.	3982.	-0.01190	9497.	4.76E+08	-105.9667	411.3321	0.00
1.4800	0.2728	83411.	3863.	-0.01171	10020.	4.76E+08	-107.9799	439.2859	0.00
1.5725	0.2600	87633.	3742.	-0.01151	10527.	4.76E+08	-109.8911	469.2351	0.00
1.6650	0.2473	91718.	3619.	-0.01130	11017.	4.76E+08	-111.6976	501.3789	0.00
1.7575	0.2349	95667.	3494.	-0.01109	11492.	4.76E+08	-113.3966	535.9419	0.00
1.8500	0.2227	99475.	3367.	-0.01086	11949.	4.76E+08	-114.9850	573.1776	0.00
1.9425	0.2108	103142.	3239.	-0.01062	12390.	4.76E+08	-116.4600	613.3734	0.00
2.0350	0.1991	106665.	3109.	-0.01038	12813.	4.76E+08	-117.8184	656.8562	0.00
2.1275	0.1877	110043.	2977.	-0.01012	13219.	4.76E+08	-119.0568	703.9988	0.00
2.2200	0.1766	113274.	2844.	-0.00986	13607.	4.76E+08	-120.1718	755.2282	0.00
2.3125	0.1658	116358.	2711.	-0.00960	13977.	4.76E+08	-121.1598	811.0356	0.00
2.4050	0.1553	119292.	2576.	-0.00932	14330.	4.76E+08	-122.0169	871.9876	0.00
2.4975	0.1451	122076.	2440.	-0.00904	14664.	4.76E+08	-122.7393	938.7411	0.00
2.5900	0.1353	124708.	2303.	-0.00875	14980.	4.76E+08	-123.3225	1012.	0.00
2.6825	0.1257	127189.	2166.	-0.00846	15278.	4.76E+08	-123.7623	1093.	0.00
2.7750	0.1165	129517.	2028.	-0.00816	15558.	4.76E+08	-124.0538	1182.	0.00
2.8675	0.1076	131692.	1891.	-0.00785	15819.	4.76E+08	-124.1919	1281.	0.00
2.9600	0.09905	133714.	1753.	-0.00754	16062.	4.76E+08	-124.1714	1392.	0.00
3.0525	0.09085	135583.	1615.	-0.00723	16287.	4.76E+08	-123.9865	1515.	0.00
3.1450	0.08301	137300.	1478.	-0.00691	16493.	4.76E+08	-123.6311	1653.	0.00
3.2375	0.07551	138864.	1341.	-0.00659	16681.	4.76E+08	-123.0987	1809.	0.00
3.3300	0.06838	140276.	987.5288	-0.00626	16850.	4.76E+08	-513.4078	8334.	0.00
3.4225	0.06161	141056.	407.6105	-0.00593	16944.	4.76E+08	-531.4901	9575.	0.00
3.5150	0.05521	141181.	-179.4460	-0.00560	16959.	4.76E+08	-526.2695	10581.	0.00
3.6075	0.04917	140658.	-758.1192	-0.00528	16896.	4.76E+08	-516.3848	11657.	0.00
3.7000	0.04350	139498.	-1325.	-0.00495	16757.	4.76E+08	-505.2134	12892.	0.00
3.7925	0.03819	137716.	-1879.	-0.00462	16543.	4.76E+08	-492.7018	14322.	0.00
3.8850	0.03323	135327.	-2418.	-0.00431	16256.	4.76E+08	-478.7802	15992.	0.00
3.9775	0.02863	132348.	-2941.	-0.00399	15898.	4.76E+08	-463.3558	17967.	0.00
4.0700	0.02437	128798.	-3446.	-0.00369	15471.	4.76E+08	-446.3026	20332.	0.00
4.1625	0.02044	124698.	-3931.	-0.00339	14979.	4.76E+08	-427.4451	23216.	0.00
4.2550	0.01683	120071.	-4212.	-0.00311	14423.	4.76E+08	-79.1729	5221.	0.00
4.3475	0.01354	115347.	-4298.	-0.00283	13856.	4.76E+08	-74.9797	6148.	0.00
4.4400	0.01054	110531.	-4378.	-0.00257	13277.	4.76E+08	-70.4389	7416.	0.00
4.5325	0.00783	105628.	-4454.	-0.00232	12688.	4.76E+08	-65.4029	9266.	0.00
4.6250	0.00540	100644.	-4523.	-0.00208	12090.	4.76E+08	-59.5971	12251.	0.00
4.7175	0.00323	95587.	-4585.	-0.00185	11482.	4.76E+08	-52.4044	18035.	0.00
4.8100	0.00130	90465.	-4637.	-0.00163	10867.	4.76E+08	-41.7760	35707.	0.00
4.9025	-3.94E-04	85292.	-4644.	-0.00143	10245.	4.76E+08	30.8302	86936.	0.00
4.9950	-0.00186	80156.	-4601.	-0.00123	9629.	4.76E+08	45.6346	27161.	0.00
5.0875	-0.00313	75077.	-4547.	-0.00105	9018.	4.76E+08	51.9542	18432.	0.00
5.1800	-0.00420	70062.	-4487.	-8.81E-04	8416.	4.76E+08	55.9239	14787.	0.00
5.2725	-0.00509	65116.	-4423.	-7.24E-04	7822.	4.76E+08	58.6754	12807.	0.00
5.3650	-0.00580	60242.	-4357.	-5.77E-04	7236.	4.76E+08	60.6503	11598.	0.00
5.4575	-0.00637	55443.	-4289.	-4.42E-04	6660.	4.76E+08	62.0720	10820.	0.00
5.5500	-0.00679	50720.	-4220.	-3.19E-04	6093.	4.76E+08	63.0709	10315.	0.00
5.6425	-0.00707	46075.	-4149.	-2.06E-04	5535.	4.76E+08	63.7304	9999.	0.00
5.7350	-0.00724	41509.	-4078.	-1.03E-04	4986.	4.76E+08	64.1074	9824.	0.00
5.8275	-0.00730	37021.	-4007.	-1.18E-05	4447.	4.76E+08	64.2426	9763.	0.00
5.9200	-0.00727	32613.	-3936.	6.95E-05	3918.	4.76E+08	64.1662	9798.	0.00
6.0125	-0.00715	28284.	-3865.	1.41E-04	3398.	4.76E+08	63.9014	9920.	0.00
6.1050	-0.00696	24033.	-3794.	2.02E-04	2887.	4.76E+08	63.4669	10126.	0.00
6.1975	-0.00670	19861.	-3724.	2.53E-04	2386.	4.76E+08	62.8776	10413.	0.00
6.2900	-0.00640	15766.	-3545.	2.94E-04	1894.	4.76E+08	258.6679	44890.	0.00
6.3825	-0.00605	11990.	-3260.	3.27E-04	1440.	4.76E+08	255.0841	46809.	0.00
6.4750	-0.00567	8528.	-2979.	3.51E-04	1024.	4.76E+08	250.9993	49132.	0.00
6.5675	-0.00527	5376.	-2703.	3.67E-04	645.7574	4.76E+08	246.4467	51905.	0.00
6.6600	-0.00486	2527.	-2433.	3.76E-04	303.5389	4.76E+08	241.4538	55192.	0.00
6.7525	-0.00444	-24.5071	-2168.	3.79E-04	2.9438	4.76E+08	236.0431	59075.	0.00
6.8450	-0.00401	-2285.	-1909.	3.76E-04	274.4917	4.76E+08	230.2334	63660.	0.00
6.9375	-0.00360	-4262.	-1657.	3.69E-04	511.9645	4.76E+08	224.0393	69087.	0.00
7.0300	-0.00320	-5963.	-1412.	3.57E-04	716.2789	4.76E+08	217.4722	75536.	0.00
7.1225	-0.00281	-7396.	-1174.	3.41E-04	888.4070	4.76E+08	210.5399	83245.	0.00
7.2150	-0.00244	-8569.	-944.4398	3.23E-04	1029.	4.76E+08	203.2467	92530.	0.00
7.3075	-0.00209	-9493.	-723.0841	3.02E-04	1140.	4.76E+08	195.5925	103822.	0.00
7.4000	-0.00177	-10175.	-510.4275	2.79E-04	1222.	4.76E+08	187.5724	117714.	0.00
7.4925	-0.00147	-10626.	-306.8828	2.54E-04	1276.	4.76E+08	179.1749	135049.	0.00
7.5850	-0.00120	-10856.	-112.8803	2.29E-04	1304.	4.76E+08	170.3791	157057.	0.00
7.6775	-9.64E-04	-10876.	71.1186	2.04E-04	1306.	4.76E+08	161.1504	185606.	0.00
7.7700	-7.52E-04	-10698.	244.6020	1.79E-04	1285.	4.76E+08	151.4324	223669.	0.00
7.8625	-5.67E-04	-10333.	406.9746	1.54E-04	1241.	4.76E+08	141.1307	276288.	0.00
7.9550	-4.09E-04	-9795.	557.4966	1.31E-04	1177.	4.76E+08	130.0803	352811.	0.00
8.0475	-2.77E-04	-9096.	695.1639	1.09E-04	1093.	4.76E+08	117.9689	472930.	0.00
8.1400	-1.68E-04	-8251.	818.4231	8.84E-05	991.1635	4.76E+08	104.1197	687635.	0.00
8.2325	-8.06E-05	-7279.	924.2932	7.03E-05	874.3337	4.76E+08	86.6373	1192543.	0.00
8.3250	-1.21E-05	-6199.	979.7005	5.45E-05	744.6815	4.76E+08	13.1958	1214062.	0.00

8.4175	4.05E-05	-5104.	962.4692	4.14E-05	613.0763	4.76E+08	-44.2432	1214062.	0.00
8.5100	7.97E-05	-4063.	889.9288	3.07E-05	488.0191	4.76E+08	-86.4603	1203480.	0.00
8.6025	1.09E-04	-3128.	790.1225	2.23E-05	375.7583	4.76E+08	-93.3709	955106.	0.00
8.6950	1.29E-04	-2309.	684.1757	1.59E-05	277.3166	4.76E+08	-97.5241	838003.	0.00
8.7875	1.44E-04	-1609.	574.4495	1.14E-05	193.3087	4.76E+08	-100.1808	772966.	0.00
8.8800	1.54E-04	-1033.	462.2612	8.27E-06	124.1277	4.76E+08	-101.9602	733111.	0.00
8.9725	1.62E-04	-583.0504	348.3819	6.38E-06	70.0371	4.76E+08	-103.2278	706361.	0.00
9.0650	1.69E-04	-259.9400	233.2496	5.40E-06	31.2245	4.76E+08	-104.2177	686362.	0.00
9.1575	1.74E-04	-65.2362	117.0901	5.02E-06	7.8363	4.76E+08	-105.0788	669570.	0.00
9.2500	1.80E-04	0.00	0.00	4.94E-06	0.00	4.76E+08	-105.8943	327084.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection            =     0.50010049 inches
Computed slope at pile head     =    -0.01335284 radians
Maximum bending moment          =        141181. inch-lbs
Maximum shear force             =          5240. lbs
Depth of maximum bending moment =     3.51500000 feet below pile head
Depth of maximum shear force    =     0.09250000 feet below pile head
Number of iterations            =             26
Number of zero deflection points =             2
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Shear and Moment (Loading Type 1)

```
Shear force at pile head                        =       7350.0 lbs
Applied moment at pile head                     =          0.0 in-lbs
Axial thrust load on pile head                  =          0.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.2735	1.89E-06	7350.	-0.02679	2.27E-07	4.76E+08	0.00	0.00	0.00
0.09250	1.2438	8159.	7350.	-0.02678	980.0149	4.76E+08	0.00	0.00	0.00
0.1850	1.2141	16317.	7350.	-0.02676	1960.	4.76E+08	0.00	0.00	0.00
0.2775	1.1844	24476.	7297.	-0.02671	2940.	4.76E+08	-94.8910	88.9302	0.00
0.3700	1.1548	32517.	7190.	-0.02664	3906.	4.76E+08	-98.9525	95.1148	0.00
0.4625	1.1253	40437.	7078.	-0.02656	4857.	4.76E+08	-102.9439	101.5482	0.00
0.5550	1.0958	48230.	6961.	-0.02645	5793.	4.76E+08	-106.8639	108.2456	0.00
0.6475	1.0665	55891.	6841.	-0.02633	6714.	4.76E+08	-110.7109	115.2232	0.00
0.7400	1.0374	63415.	6716.	-0.02619	7618.	4.76E+08	-114.4834	122.4982	0.00
0.8325	1.0084	70799.	6586.	-0.02604	8505.	4.76E+08	-118.1800	130.0892	0.00
0.9250	0.9796	78037.	6453.	-0.02586	9374.	4.76E+08	-121.7993	138.0160	0.00
1.0175	0.9510	85125.	6316.	-0.02567	10225.	4.76E+08	-125.3396	146.3000	0.00
1.1100	0.9226	92059.	6175.	-0.02546	11058.	4.76E+08	-128.7996	154.9640	0.00
1.2025	0.8944	98834.	6030.	-0.02524	11872.	4.76E+08	-132.1778	164.0328	0.00
1.2950	0.8665	105446.	5882.	-0.02500	12666.	4.76E+08	-135.4726	173.5328	0.00
1.3875	0.8389	111891.	5729.	-0.02475	13441.	4.76E+08	-138.6826	183.4926	0.00
1.4800	0.8116	118165.	5574.	-0.02448	14194.	4.76E+08	-141.8062	193.9430	0.00
1.5725	0.7846	124265.	5415.	-0.02420	14927.	4.76E+08	-144.8419	204.9173	0.00
1.6650	0.7579	130186.	5252.	-0.02390	15638.	4.76E+08	-147.7882	216.4515	0.00
1.7575	0.7315	135925.	5087.	-0.02359	16328.	4.76E+08	-150.6436	228.5845	0.00
1.8500	0.7055	141478.	4918.	-0.02327	16995.	4.76E+08	-153.4064	241.3586	0.00
1.9425	0.6799	146843.	4746.	-0.02293	17639.	4.76E+08	-156.0753	254.8196	0.00
2.0350	0.6546	152015.	4571.	-0.02258	18260.	4.76E+08	-158.6485	269.0172	0.00
2.1275	0.6297	156991.	4394.	-0.02222	18858.	4.76E+08	-161.1245	284.0055	0.00
2.2200	0.6053	161769.	4214.	-0.02185	19432.	4.76E+08	-163.5017	299.8434	0.00
2.3125	0.5812	166346.	4031.	-0.02147	19982.	4.76E+08	-165.7786	316.5952	0.00
2.4050	0.5576	170718.	3846.	-0.02107	20507.	4.76E+08	-167.9535	334.3309	0.00
2.4975	0.5344	174884.	3658.	-0.02067	21007.	4.76E+08	-170.0248	353.1273	0.00
2.5900	0.5117	178840.	3468.	-0.02026	21483.	4.76E+08	-171.9908	373.0683	0.00
2.6825	0.4895	182584.	3277.	-0.01984	21932.	4.76E+08	-173.8500	394.2460	0.00
2.7750	0.4677	186113.	3083.	-0.01941	22356.	4.76E+08	-175.6006	416.7612	0.00
2.8675	0.4464	189427.	2887.	-0.01897	22754.	4.76E+08	-177.2411	440.7251	0.00
2.9600	0.4256	192522.	2689.	-0.01852	23126.	4.76E+08	-178.7696	466.2600	0.00
3.0525	0.4053	195397.	2490.	-0.01807	23471.	4.76E+08	-180.1846	493.5007	0.00
3.1450	0.3855	198050.	2289.	-0.01761	23790.	4.76E+08	-181.4844	522.5962	0.00
3.2375	0.3662	200479.	2087.	-0.01714	24082.	4.76E+08	-182.6672	553.7112	0.00
3.3300	0.3474	202683.	1836.	-0.01667	24347.	4.76E+08	-269.9468	862.4890	0.00
3.4225	0.3292	204555.	1529.	-0.01620	24572.	4.76E+08	-283.4023	955.6701	0.00
3.5150	0.3115	206077.	1208.	-0.01572	24754.	4.76E+08	-293.7741	1047.	0.00
3.6075	0.2943	207237.	877.7564	-0.01524	24894.	4.76E+08	-302.0971	1140.	0.00
3.7000	0.2776	208026.	537.8093	-0.01475	24988.	4.76E+08	-310.4201	1241.	0.00
3.7925	0.2615	208431.	188.6238	-0.01427	25037.	4.76E+08	-318.7431	1353.	0.00
3.8850	0.2460	208444.	-169.8004	-0.01378	25039.	4.76E+08	-327.0662	1476.	0.00
3.9775	0.2309	208054.	-537.4631	-0.01329	24992.	4.76E+08	-335.3892	1612.	0.00
4.0700	0.2164	207251.	-914.3645	-0.01281	24895.	4.76E+08	-343.7123	1763.	0.00
4.1625	0.2025	206025.	-1301.	-0.01233	24748.	4.76E+08	-352.0355	1930.	0.00
4.2550	0.1891	204364.	-1576.	-0.01185	24549.	4.76E+08	-144.9278	850.8274	0.00
4.3475	0.1762	202525.	-1736.	-0.01137	24328.	4.76E+08	-142.3927	897.0880	0.00
4.4400	0.1638	200511.	-1892.	-0.01090	24086.	4.76E+08	-139.8265	947.3950	0.00
4.5325	0.1520	198324.	-2046.	-0.01044	23823.	4.76E+08	-137.2280	1002.	0.00
4.6250	0.1407	195968.	-2197.	-0.00998	23540.	4.76E+08	-134.5960	1062.	0.00
4.7175	0.1298	193447.	-2345.	-0.00952	23237.	4.76E+08	-131.9291	1128.	0.00
4.8100	0.1195	190762.	-2490.	-0.00907	22915.	4.76E+08	-129.2255	1200.	0.00
4.9025	0.1097	187919.	-2632.	-0.00863	22573.	4.76E+08	-126.4834	1280.	0.00
4.9950	0.1003	184920.	-2771.	-0.00820	22213.	4.76E+08	-123.7007	1368.	0.00
5.0875	0.09149	181768.	-2906.	-0.00777	21834.	4.76E+08	-120.8749	1467.	0.00
5.1800	0.08310	178467.	-3039.	-0.00735	21438.	4.76E+08	-118.0033	1576.	0.00
5.2725	0.07517	175021.	-3168.	-0.00694	21024.	4.76E+08	-115.0826	1699.	0.00
5.3650	0.06770	171434.	-3294.	-0.00653	20593.	4.76E+08	-112.1091	1838.	0.00
5.4575	0.06067	167708.	-3417.	-0.00614	20145.	4.76E+08	-109.0783	1996.	0.00
5.5500	0.05407	163848.	-3537.	-0.00575	19682.	4.76E+08	-105.9850	2176.	0.00
5.6425	0.04790	159857.	-3652.	-0.00537	19202.	4.76E+08	-102.8229	2383.	0.00
5.7350	0.04215	155739.	-3765.	-0.00500	18708.	4.76E+08	-99.5843	2623.	0.00
5.8275	0.03679	151499.	-3873.	-0.00465	18198.	4.76E+08	-96.2597	2904.	0.00
5.9200	0.03183	147140.	-3978.	-0.00430	17675.	4.76E+08	-92.8374	3237.	0.00
6.0125	0.02725	142667.	-4080.	-0.00396	17137.	4.76E+08	-89.3021	3637.	0.00
6.1050	0.02304	138083.	-4177.	-0.00363	16587.	4.76E+08	-85.6342	4125.	0.00
6.1975	0.01919	133395.	-4270.	-0.00331	16024.	4.76E+08	-81.8071	4732.	0.00

6.2900	0.01569	128605.	-4495.	-0.00301	15448.	4.76E+08	-323.7546	22911.	0.00
6.3825	0.01251	123417.	-4844.	-0.00271	14825.	4.76E+08	-305.9715	27144.	0.00
6.4750	0.00966	117851.	-5173.	-0.00243	14157.	4.76E+08	-286.8040	32960.	0.00
6.5675	0.00711	111932.	-5480.	-0.00216	13446.	4.76E+08	-265.6704	41472.	0.00
6.6600	0.00485	105686.	-5761.	-0.00191	12695.	4.76E+08	-241.4772	55238.	0.00
6.7525	0.00287	99142.	-6013.	-0.00167	11909.	4.76E+08	-211.7508	81950.	0.00
6.8450	0.00114	92338.	-6224.	-0.00145	11092.	4.76E+08	-168.2118	163697.	0.00
6.9375	-3.48E-04	85326.	-6248.	-0.00124	10250.	4.76E+08	124.6924	398091.	0.00
7.0300	-0.00161	78468.	-6077.	-0.00105	9426.	4.76E+08	183.3170	126000.	0.00
7.1225	-0.00268	71835.	-5860.	-8.75E-04	8629.	4.76E+08	208.0762	86216.	0.00
7.2150	-0.00356	65459.	-5620.	-7.14E-04	7863.	4.76E+08	223.3698	69709.	0.00
7.3075	-0.00427	59359.	-5366.	-5.69E-04	7130.	4.76E+08	233.7527	60835.	0.00
7.4000	-0.00482	53546.	-5103.	-4.37E-04	6432.	4.76E+08	241.0112	55507.	0.00
7.4925	-0.00524	48030.	-4833.	-3.19E-04	5769.	4.76E+08	246.0533	52168.	0.00
7.5850	-0.00553	42817.	-4558.	-2.13E-04	5143.	4.76E+08	249.4108	50092.	0.00
7.6775	-0.00571	37912.	-4280.	-1.18E-04	4554.	4.76E+08	251.4250	48900.	0.00
7.7700	-0.00579	33316.	-4000.	-3.52E-05	4002.	4.76E+08	252.3283	48379.	0.00
7.8625	-0.00579	29032.	-3720.	3.76E-05	3487.	4.76E+08	252.2864	48405.	0.00
7.9550	-0.00571	25058.	-3440.	1.01E-04	3010.	4.76E+08	251.4199	48909.	0.00
8.0475	-0.00556	21394.	-3162.	1.55E-04	2570.	4.76E+08	249.8187	49857.	0.00
8.1400	-0.00536	18038.	-2886.	2.01E-04	2167.	4.76E+08	247.5490	51244.	0.00
8.2325	-0.00512	14986.	-2613.	2.39E-04	1800.	4.76E+08	244.6583	53084.	0.00
8.3250	-0.00483	12237.	-2343.	2.71E-04	1470.	4.76E+08	241.1783	55418.	0.00
8.4175	-0.00451	9784.	-2078.	2.97E-04	1175.	4.76E+08	237.1257	58312.	0.00
8.5100	-0.00417	7623.	-1817.	3.17E-04	915.7457	4.76E+08	232.5017	61866.	0.00
8.6025	-0.00381	5749.	-1562.	3.33E-04	690.6343	4.76E+08	227.2902	66226.	0.00
8.6950	-0.00343	4155.	-1313.	3.44E-04	499.1624	4.76E+08	221.4537	71609.	0.00
8.7875	-0.00305	2834.	-1071.	3.53E-04	340.4662	4.76E+08	214.9257	78346.	0.00
8.8800	-0.00265	1778.	-836.4190	3.58E-04	213.5794	4.76E+08	207.5986	86954.	0.00
8.9725	-0.00225	977.4875	-610.5905	3.61E-04	117.4177	4.76E+08	199.2997	98300.	0.00
9.0650	-0.00185	422.5107	-394.6697	3.63E-04	50.7528	4.76E+08	189.7468	113948.	0.00
9.1575	-0.00145	101.3209	-190.3201	3.63E-04	12.1709	4.76E+08	178.4506	137065.	0.00
9.2500	-0.00104	0.00	0.00	3.63E-04	0.00	4.76E+08	164.4686	87628.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection            =     1.27353835 inches
Computed slope at pile head     =    -0.02679367 radians
Maximum bending moment          =        208444. inch-lbs
Maximum shear force             =          7350. lbs
Depth of maximum bending moment =     3.88500000 feet below pile head
Depth of maximum shear force    =     0.18500000 feet below pile head
Number of iterations            =             43
Number of zero deflection points =             1
```

Summary of Pile-head Responses for Conventional Analyses

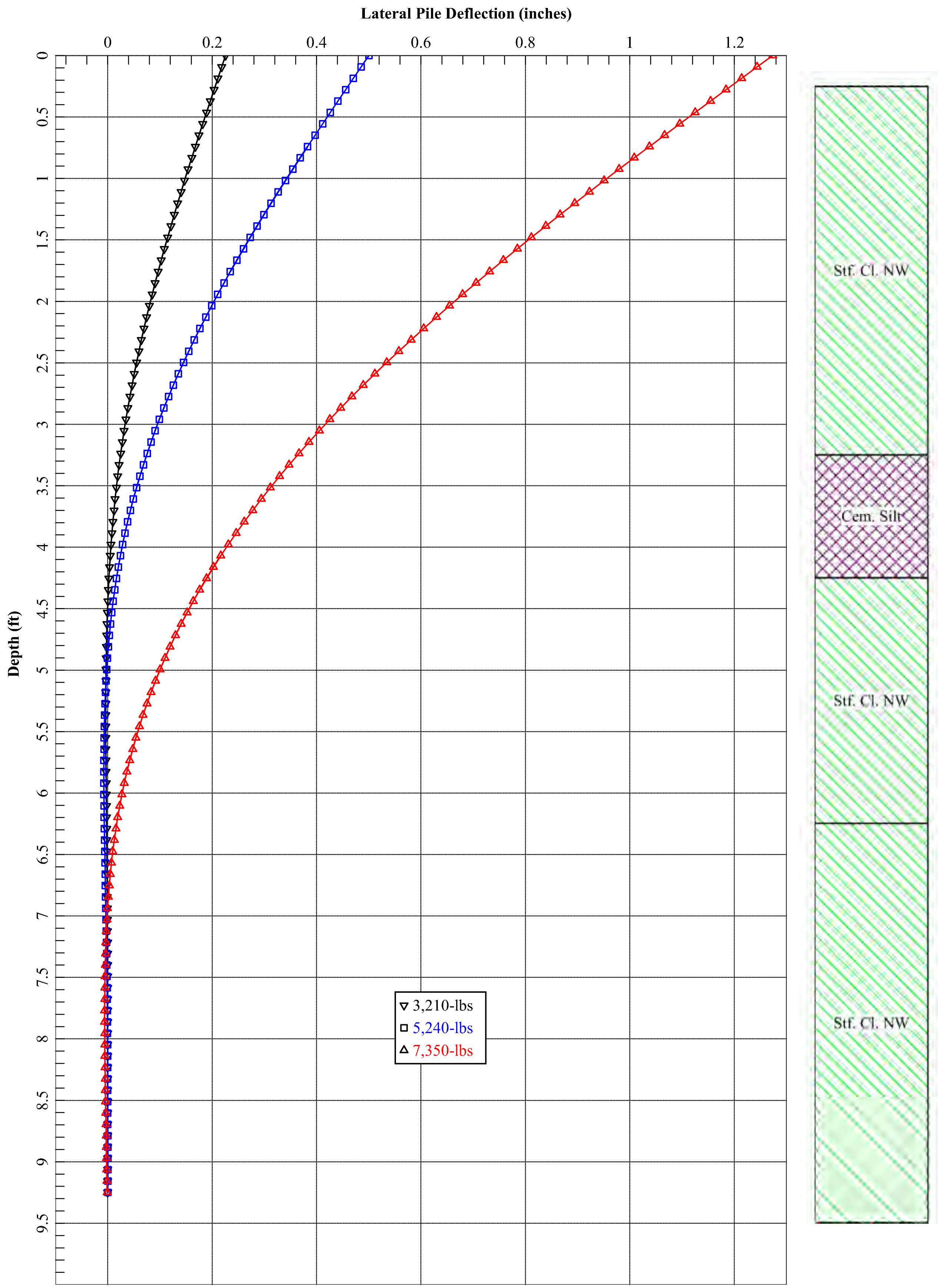
Definitions of Pile-head Loading Conditions:

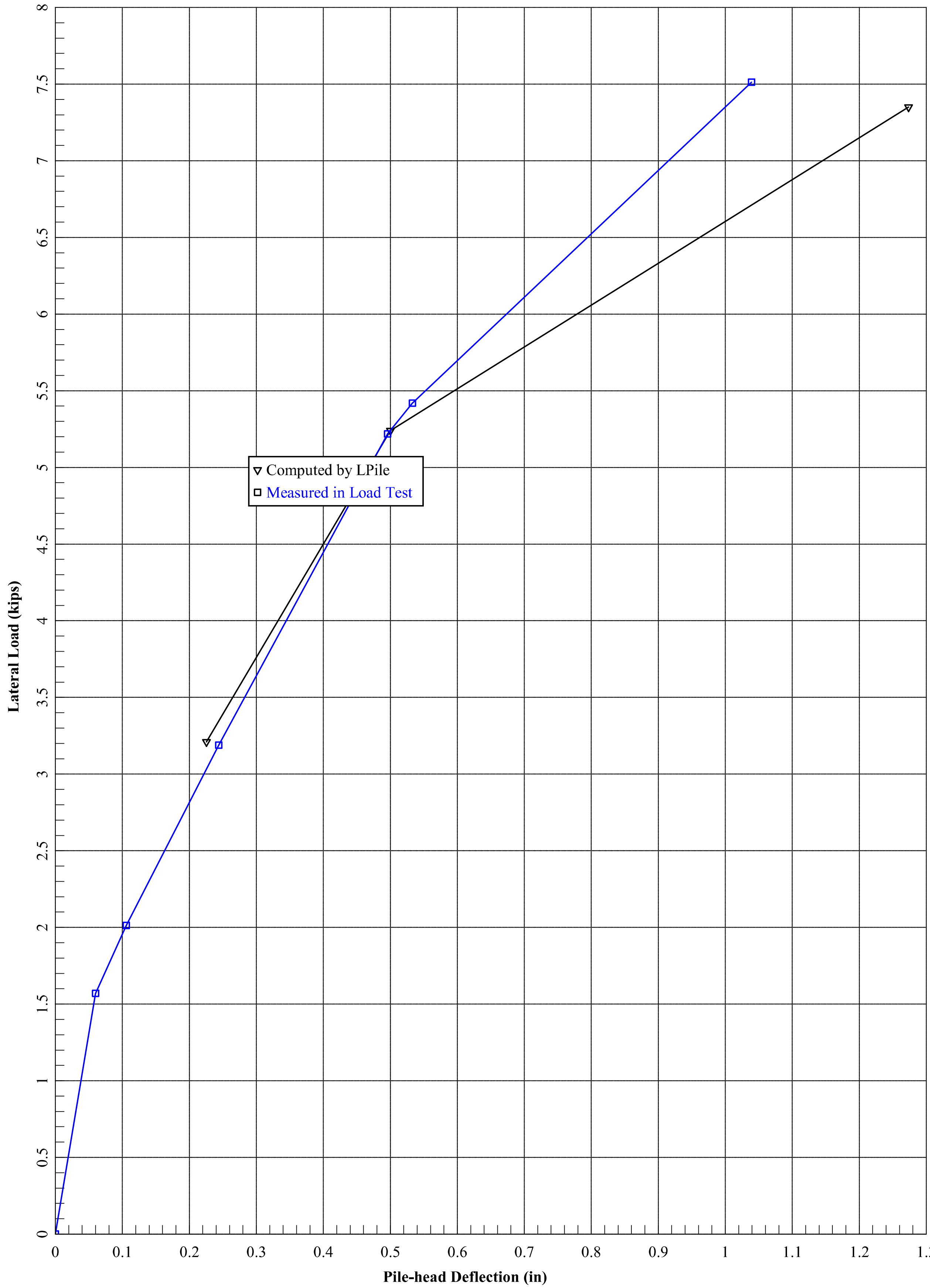
Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	V, lb	3210.	M, in-lb	0.00	0.00	0.2256	-0.00658	3210.	72688.
2	V, lb	5240.	M, in-lb	0.00	0.00	0.5001	-0.01335	5240.	141181.
3	V, lb	7350.	M, in-lb	0.00	0.00	1.2735	-0.02679	7350.	208444.

Maximum pile-head deflection = 1.2735383531 inches
Maximum pile-head rotation   = -0.0267936661 radians = -1.535164 deg.

The analysis ended normally.


Lateral Pile Deflection (inches)
0
0.2
0.4
0.6
0.8
1
1.2
Depth (ft)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
3,210-lbs
5,240-lbs
7,350-lbs
Stf. Cl. NW
Cem. Silt
Stf. Cl. NW
Stf. Cl. NW



Computed by LPile
Measured in Load Test
Lateral Load (kips)
Pile-head Deflection (in)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3

```
===============================================================================

                    LPile for Windows, Version 2016-09.011

                Analysis of Individual Piles and Drilled Shafts
               Subjected to Lateral Loading Using the p-y Method
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-------------------------------------------------------------------------------
                           Files Used for Analysis
-------------------------------------------------------------------------------

Path to file locations:
\2017 Geotechnical\003-Ann Arbor\173483 (p) Madison Co Solar OH - FS\Report & Analyses\LPile\

Name of input data file:
2A - 5 ft.lp9d

Name of output report file:
2A - 5 ft.lp9o

Name of plot output file:
2A - 5 ft.lp9p

Name of runtime message file:
2A - 5 ft.lp9r


-------------------------------------------------------------------------------
                          Date and Time of Analysis
-------------------------------------------------------------------------------

               Date:  December 18, 2017          Time:  10:36:39


-------------------------------------------------------------------------------
                                Problem Title
-------------------------------------------------------------------------------

Project Name: Madison County Solar Power Plant

Job Number: 173483

Client: First Solar, Inc.

Engineer: J. Crow

Description: 2A - 5FT



-------------------------------------------------------------------------------
                         Program Options and Settings
-------------------------------------------------------------------------------

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:
 - Maximum number of iterations allowed                =          500
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Use of p-y modification factors for p-y curves not selected
 - Analysis uses layering correction (Method of Georgiadis)
 - Layering correction is not computed if soil above is of same type
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
 - No p-y curves to be computed and reported for user-specified depths
 - Print using wide report formats
```

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 5.250 ft
Depth of ground surface below top of pile = 0.2500 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	3.9400
2	5.250	3.9400

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile
Cross-sectional Shape = Strong H-Pile
Length of section = 5.250000 ft
Flange Width = 3.940000 in
Section Depth = 5.900000 in
Flange Thickness = 0.215000 in
Web Thickness = 0.170000 in
Section Area = 2.680000 sq. in
Moment of Inertia = 16.400000 in^4
Elastic Modulus = 29000000. psi

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is stiff clay without free water

Distance from top of pile to top of layer = 0.250000 ft
Distance from top of pile to bottom of layer = 5.250000 ft
Effective unit weight at top of layer = 130.000000 pcf
Effective unit weight at bottom of layer = 130.000000 pcf
Undrained cohesion at top of layer = 2280. psf
Undrained cohesion at bottom of layer = 2280. psf
Epsilon-50 at top of layer = 0.030020
Epsilon-50 at bottom of layer = 0.030020

Layer 2 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 5.250000 ft
Distance from top of pile to bottom of layer = 6.250000 ft
Effective unit weight at top of layer = 130.000000 pcf
Effective unit weight at bottom of layer = 130.000000 pcf
Undrained cohesion at top of layer = 250.000000 psf
Undrained cohesion at bottom of layer = 250.000000 psf
Friction angle at top of layer = 20.000000 deg.
Friction angle at bottom of layer = 20.000000 deg.
Epsilon-50 at top of layer = 0.010000
Epsilon-50 at bottom of layer = 0.010000
Subgrade k at top of layer = 400.000000 pci
Subgrade k at bottom of layer = 400.000000 pci

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer = 6.250000 ft
Distance from top of pile to bottom of layer = 8.500000 ft
Effective unit weight at top of layer = 135.000000 pcf
Effective unit weight at bottom of layer = 135.000000 pcf
Undrained cohesion at top of layer = 2000. psf
Undrained cohesion at bottom of layer = 2000. psf
Epsilon-50 at top of layer = 0.010000
Epsilon-50 at bottom of layer = 0.010000

(Depth of the lowest soil layer extends 3.250 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	0.2500	130.0000	2280.	--	0.03002	--

	w/o Free Water	5.2500	130.0000	2280.	--	0.03002	--
2	Cemented	5.2500	130.0000	250.0000	20.0000	0.01000	400.0000
	Silt	6.2500	130.0000	250.0000	20.0000	0.01000	400.0000
3	Stiff Clay	6.2500	135.0000	2000.	--	0.01000	--
	w/o Free Water	8.5000	135.0000	2000.	--	0.01000	--

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 3

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	1	V = 2480. lbs	M = 0.0000 in-lbs	0.0000000	No
2	1	V = 3560. lbs	M = 0.0000 in-lbs	0.0000000	No
3	1	V = 4860. lbs	M = 0.0000 in-lbs	0.0000000	No

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

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Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.2500	0.00	N.A.	No	0.00	25158.
2	5.2500	5.0000	No	No	25158.	0.00
3	6.2500	6.0000	No	No	0.00	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 2480.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.1447	5.99E-07	2480.	-0.00435	7.19E-08	4.76E+08	0.00	0.00	0.00
0.05250	0.1420	1562.	2480.	-0.00435	187.6785	4.76E+08	0.00	0.00	0.00
0.1050	0.1393	3125.	2480.	-0.00435	375.3571	4.76E+08	0.00	0.00	0.00
0.1575	0.1365	4687.	2480.	-0.00435	563.0356	4.76E+08	0.00	0.00	0.00
0.2100	0.1338	6250.	2480.	-0.00434	750.7141	4.76E+08	0.00	0.00	0.00
0.2625	0.1311	7812.	2456.	-0.00433	938.3927	4.76E+08	-76.8567	369.4620	0.00
0.3150	0.1283	9344.	2407.	-0.00432	1122.	4.76E+08	-78.5542	385.6367	0.00
0.3675	0.1256	10845.	2357.	-0.00430	1303.	4.76E+08	-80.2240	402.3491	0.00
0.4200	0.1229	12313.	2306.	-0.00429	1479.	4.76E+08	-81.8657	419.6252	0.00
0.4725	0.1202	13750.	2254.	-0.00427	1652.	4.76E+08	-83.4789	437.4924	0.00
0.5250	0.1175	15153.	2201.	-0.00425	1820.	4.76E+08	-85.0631	455.9797	0.00
0.5775	0.1149	16523.	2147.	-0.00423	1985.	4.76E+08	-86.6179	475.1179	0.00
0.6300	0.1122	17858.	2091.	-0.00421	2145.	4.76E+08	-88.1428	494.9394	0.00
0.6825	0.1096	19158.	2035.	-0.00418	2301.	4.76E+08	-89.6375	515.4788	0.00
0.7350	0.1069	20422.	1979.	-0.00416	2453.	4.76E+08	-91.1014	536.7725	0.00
0.7875	0.1043	21651.	1921.	-0.00413	2601.	4.76E+08	-92.5341	558.8596	0.00
0.8400	0.1017	22842.	1862.	-0.00410	2744.	4.76E+08	-93.9351	581.7811	0.00
0.8925	0.09915	23997.	1802.	-0.00407	2883.	4.76E+08	-95.3041	605.5811	0.00
0.9450	0.09659	25113.	1742.	-0.00404	3017.	4.76E+08	-96.6404	630.3063	0.00

0.9975	0.09406	26192.	1681.	-0.00400	3146.	4.76E+08	-97.9437	656.0065	0.00
1.0500	0.09155	27231.	1618.	-0.00397	3271.	4.76E+08	-99.2135	682.7350	0.00
1.1025	0.08906	28231.	1556.	-0.00393	3391.	4.76E+08	-100.4491	710.5486	0.00
1.1550	0.08660	29191.	1492.	-0.00389	3506.	4.76E+08	-101.6503	739.5081	0.00
1.2075	0.08416	30111.	1428.	-0.00385	3617.	4.76E+08	-102.8163	769.6785	0.00
1.2600	0.08174	30990.	1362.	-0.00381	3723.	4.76E+08	-103.9467	801.1298	0.00
1.3125	0.07935	31827.	1297.	-0.00377	3823.	4.76E+08	-105.0409	833.9369	0.00
1.3650	0.07699	32623.	1230.	-0.00373	3919.	4.76E+08	-106.0984	868.1804	0.00
1.4175	0.07466	33377.	1163.	-0.00368	4009.	4.76E+08	-107.1186	903.9471	0.00
1.4700	0.07235	34088.	1095.	-0.00364	4095.	4.76E+08	-108.1008	941.3306	0.00
1.5225	0.07007	34757.	1027.	-0.00359	4175.	4.76E+08	-109.0445	980.4320	0.00
1.5750	0.06782	35382.	957.6976	-0.00355	4250.	4.76E+08	-109.9489	1021.	0.00
1.6275	0.06560	35964.	888.1575	-0.00350	4320.	4.76E+08	-110.8133	1064.	0.00
1.6800	0.06341	36501.	818.0856	-0.00345	4385.	4.76E+08	-111.6371	1109.	0.00
1.7325	0.06125	36994.	747.5078	-0.00340	4444.	4.76E+08	-112.4195	1156.	0.00
1.7850	0.05912	37443.	676.4504	-0.00335	4498.	4.76E+08	-113.1596	1206.	0.00
1.8375	0.05702	37847.	604.9402	-0.00330	4546.	4.76E+08	-113.8567	1258.	0.00
1.8900	0.05495	38205.	533.0048	-0.00325	4589.	4.76E+08	-114.5097	1313.	0.00
1.9425	0.05292	38518.	460.6721	-0.00320	4627.	4.76E+08	-115.1178	1370.	0.00
1.9950	0.05092	38786.	387.9709	-0.00315	4659.	4.76E+08	-115.6798	1431.	0.00
2.0475	0.04895	39007.	314.9304	-0.00310	4686.	4.76E+08	-116.1948	1496.	0.00
2.1000	0.04701	39183.	241.5807	-0.00305	4707.	4.76E+08	-116.6614	1563.	0.00
2.1525	0.04511	39312.	167.9527	-0.00300	4722.	4.76E+08	-117.0783	1635.	0.00
2.2050	0.04323	39394.	94.0780	-0.00295	4732.	4.76E+08	-117.4443	1711.	0.00
2.2575	0.04140	39430.	19.9894	-0.00289	4736.	4.76E+08	-117.7577	1792.	0.00
2.3100	0.03959	39419.	-54.2795	-0.00284	4735.	4.76E+08	-118.0168	1878.	0.00
2.3625	0.03782	39362.	-128.6940	-0.00279	4728.	4.76E+08	-118.2198	1969.	0.00
2.4150	0.03608	39257.	-203.2182	-0.00274	4716.	4.76E+08	-118.3647	2067.	0.00
2.4675	0.03437	39106.	-277.8146	-0.00268	4697.	4.76E+08	-118.4493	2171.	0.00
2.5200	0.03269	38907.	-352.4445	-0.00263	4674.	4.76E+08	-118.4710	2283.	0.00
2.5725	0.03105	38662.	-427.0674	-0.00258	4644.	4.76E+08	-118.4271	2403.	0.00
2.6250	0.02944	38369.	-501.6409	-0.00253	4609.	4.76E+08	-118.3144	2532.	0.00
2.6775	0.02786	38030.	-576.1208	-0.00248	4568.	4.76E+08	-118.1295	2671.	0.00
2.7300	0.02632	37643.	-650.4601	-0.00243	4522.	4.76E+08	-117.8683	2822.	0.00
2.7825	0.02480	37210.	-724.6094	-0.00238	4470.	4.76E+08	-117.5264	2985.	0.00
2.8350	0.02332	36730.	-798.5163	-0.00233	4412.	4.76E+08	-117.0986	3164.	0.00
2.8875	0.02186	36204.	-872.1247	-0.00228	4349.	4.76E+08	-116.5789	3359.	0.00
2.9400	0.02044	35631.	-945.3746	-0.00224	4280.	4.76E+08	-115.9604	3574.	0.00
2.9925	0.01905	35013.	-1018.	-0.00219	4206.	4.76E+08	-115.2352	3812.	0.00
3.0450	0.01768	34348.	-1091.	-0.00214	4126.	4.76E+08	-114.3935	4076.	0.00
3.0975	0.01635	33639.	-1162.	-0.00210	4041.	4.76E+08	-113.4243	4371.	0.00
3.1500	0.01504	32884.	-1233.	-0.00205	3950.	4.76E+08	-112.3139	4705.	0.00
3.2025	0.01376	32084.	-1304.	-0.00201	3854.	4.76E+08	-111.0457	5084.	0.00
3.2550	0.01251	31241.	-1373.	-0.00197	3753.	4.76E+08	-109.5995	5521.	0.00
3.3075	0.01128	30354.	-1442.	-0.00193	3646.	4.76E+08	-107.9496	6029.	0.00
3.3600	0.01008	29424.	-1509.	-0.00189	3535.	4.76E+08	-106.0633	6630.	0.00
3.4125	0.00890	28453.	-1575.	-0.00185	3418.	4.76E+08	-103.8978	7354.	0.00
3.4650	0.00775	27439.	-1640.	-0.00181	3296.	4.76E+08	-101.3953	8246.	0.00
3.5175	0.00662	26386.	-1703.	-0.00178	3170.	4.76E+08	-98.4749	9376.	0.00
3.5700	0.00551	25294.	-1764.	-0.00174	3038.	4.76E+08	-95.0181	10868.	0.00
3.6225	0.00442	24164.	-1822.	-0.00171	2903.	4.76E+08	-90.8389	12946.	0.00
3.6750	0.00335	22997.	-1878.	-0.00168	2762.	4.76E+08	-85.6192	16086.	0.00
3.7275	0.00231	21797.	-1930.	-0.00165	2618.	4.76E+08	-78.7292	21518.	0.00
3.7800	0.00128	20566.	-1976.	-0.00162	2470.	4.76E+08	-68.5591	33874.	0.00
3.8325	2.62E-04	19307.	-2012.	-0.00159	2319.	4.76E+08	-46.6123	111942.	0.00
3.8850	-7.34E-04	18030.	-2008.	-0.00157	2166.	4.76E+08	60.8865	52236.	0.00
3.9375	-0.00172	16777.	-1965.	-0.00155	2015.	4.76E+08	75.9901	27900.	0.00
3.9900	-0.00268	15554.	-1914.	-0.00153	1868.	4.76E+08	85.7762	20137.	0.00
4.0425	-0.00364	14366.	-1857.	-0.00151	1726.	4.76E+08	93.4186	16177.	0.00
4.0950	-0.00458	13214.	-1797.	-0.00149	1587.	4.76E+08	99.0493	13622.	0.00
4.1475	-0.00551	12102.	-1733.	-0.00147	1454.	4.76E+08	103.7411	11856.	0.00
4.2000	-0.00643	11030.	-1666.	-0.00146	1325.	4.76E+08	107.8286	10558.	0.00
4.2525	-0.00735	10002.	-1597.	-0.00144	1201.	4.76E+08	111.4631	9559.	0.00
4.3050	-0.00825	9018.	-1526.	-0.00143	1083.	4.76E+08	114.7442	8762.	0.00
4.3575	-0.00915	8079.	-1453.	-0.00142	970.4916	4.76E+08	117.7416	8110.	0.00
4.4100	-0.01004	7187.	-1378.	-0.00141	863.3577	4.76E+08	120.5059	7564.	0.00
4.4625	-0.01092	6343.	-1301.	-0.00140	761.9692	4.76E+08	123.0752	7100.	0.00
4.5150	-0.01180	5548.	-1223.	-0.00139	666.4483	4.76E+08	125.4789	6700.	0.00
4.5675	-0.01267	4803.	-1143.	-0.00138	576.9099	4.76E+08	127.7402	6351.	0.00
4.6200	-0.01354	4108.	-1062.	-0.00138	493.4617	4.76E+08	129.8779	6042.	0.00
4.6725	-0.01441	3465.	-979.3182	-0.00137	416.2056	4.76E+08	131.9070	5768.	0.00
4.7250	-0.01527	2874.	-895.6078	-0.00137	345.2383	4.76E+08	133.8403	5521.	0.00
4.7775	-0.01613	2336.	-810.7063	-0.00137	280.6520	4.76E+08	135.6883	5299.	0.00
4.8300	-0.01699	1853.	-724.6647	-0.00136	222.5349	4.76E+08	137.4597	5097.	0.00
4.8825	-0.01785	1423.	-637.5288	-0.00136	170.9714	4.76E+08	139.1622	4912.	0.00
4.9350	-0.01871	1049.	-549.3401	-0.00136	126.0426	4.76E+08	140.8021	4742.	0.00
4.9875	-0.01956	731.1467	-460.1361	-0.00136	87.8268	4.76E+08	142.3851	4586.	0.00
5.0400	-0.02042	469.5173	-369.9513	-0.00136	56.3993	4.76E+08	143.9159	4441.	0.00
5.0925	-0.02127	265.0081	-278.8172	-0.00136	31.8333	4.76E+08	145.3987	4306.	0.00
5.1450	-0.02212	118.2076	-186.7630	-0.00136	14.1993	4.76E+08	146.8370	4181.	0.00
5.1975	-0.02298	29.6867	-93.8155	-0.00136	3.5660	4.76E+08	148.2342	4064.	0.00
5.2500	-0.02383	0.00	0.00	-0.00136	0.00	4.76E+08	149.5929	1977.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection            =     0.14474471 inches
Computed slope at pile head     =    -0.00435435 radians
Maximum bending moment          =         39430. inch-lbs
Maximum shear force             =          2480. lbs
Depth of maximum bending moment =     2.25750000 feet below pile head
Depth of maximum shear force    =     0.15750000 feet below pile head
Number of iterations            =             36
Number of zero deflection points =             1
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Moment (Loading Type 1)

```
Shear force at pile head                          =       3560.0 lbs
Applied moment at pile head                       =          0.0 in-lbs
Axial thrust load on pile head                    =          0.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.4998	1.20E-06	3560.	-0.01252	1.44E-07	4.76E+08	0.00	0.00	0.00
0.05250	0.4919	2243.	3560.	-0.01252	269.4095	4.76E+08	0.00	0.00	0.00
0.1050	0.4841	4486.	3560.	-0.01251	538.8190	4.76E+08	0.00	0.00	0.00
0.1575	0.4762	6728.	3560.	-0.01250	808.2285	4.76E+08	0.00	0.00	0.00
0.2100	0.4683	8971.	3560.	-0.01249	1078.	4.76E+08	0.00	0.00	0.00
0.2625	0.4604	11214.	3527.	-0.01248	1347.	4.76E+08	-105.2190	143.9700	0.00
0.3150	0.4526	13415.	3460.	-0.01246	1611.	4.76E+08	-107.6448	149.8466	0.00
0.3675	0.4447	15573.	3391.	-0.01245	1871.	4.76E+08	-110.0401	155.8840	0.00
0.4200	0.4369	17688.	3321.	-0.01242	2125.	4.76E+08	-112.4047	162.0889	0.00
0.4725	0.4291	19758.	3250.	-0.01240	2373.	4.76E+08	-114.7378	168.4685	0.00
0.5250	0.4213	21783.	3177.	-0.01237	2617.	4.76E+08	-117.0391	175.0304	0.00
0.5775	0.4135	23761.	3102.	-0.01234	2854.	4.76E+08	-119.3080	181.7827	0.00
0.6300	0.4057	25691.	3026.	-0.01231	3086.	4.76E+08	-121.5439	188.7337	0.00
0.6825	0.3980	27574.	2949.	-0.01227	3312.	4.76E+08	-123.7464	195.8925	0.00
0.7350	0.3903	29407.	2870.	-0.01224	3532.	4.76E+08	-125.9148	203.2684	0.00
0.7875	0.3826	31190.	2790.	-0.01219	3747.	4.76E+08	-128.0487	210.8714	0.00
0.8400	0.3749	32923.	2709.	-0.01215	3955.	4.76E+08	-130.1473	218.7123	0.00
0.8925	0.3672	34604.	2626.	-0.01211	4157.	4.76E+08	-132.2100	226.8023	0.00
0.9450	0.3596	36232.	2542.	-0.01206	4352.	4.76E+08	-134.2363	235.1534	0.00
0.9975	0.3520	37807.	2457.	-0.01201	4541.	4.76E+08	-136.2255	243.7783	0.00
1.0500	0.3445	39328.	2371.	-0.01196	4724.	4.76E+08	-138.1769	252.6907	0.00
1.1025	0.3370	40795.	2283.	-0.01191	4900.	4.76E+08	-140.0898	261.9051	0.00
1.1550	0.3295	42205.	2194.	-0.01185	5070.	4.76E+08	-141.9635	271.4370	0.00
1.2075	0.3220	43559.	2104.	-0.01180	5232.	4.76E+08	-143.7971	281.3030	0.00
1.2600	0.3146	44857.	2013.	-0.01174	5388.	4.76E+08	-145.5900	291.5208	0.00
1.3125	0.3073	46096.	1921.	-0.01168	5537.	4.76E+08	-147.3412	302.1096	0.00
1.3650	0.2999	47277.	1828.	-0.01162	5679.	4.76E+08	-149.0499	313.0898	0.00
1.4175	0.2926	48399.	1733.	-0.01155	5814.	4.76E+08	-150.7153	324.4835	0.00
1.4700	0.2854	49461.	1638.	-0.01149	5941.	4.76E+08	-152.3362	336.3145	0.00
1.5225	0.2781	50462.	1541.	-0.01142	6062.	4.76E+08	-153.9118	348.6084	0.00
1.5750	0.2710	51402.	1444.	-0.01135	6175.	4.76E+08	-155.4409	361.3931	0.00
1.6275	0.2638	52281.	1345.	-0.01128	6280.	4.76E+08	-156.9224	374.6985	0.00
1.6800	0.2568	53098.	1246.	-0.01121	6378.	4.76E+08	-158.3552	388.5575	0.00
1.7325	0.2497	53851.	1146.	-0.01114	6469.	4.76E+08	-159.7380	403.0056	0.00
1.7850	0.2427	54541.	1045.	-0.01107	6552.	4.76E+08	-161.0694	418.0816	0.00
1.8375	0.2358	55168.	942.8931	-0.01100	6627.	4.76E+08	-162.3480	433.8280	0.00
1.8900	0.2289	55729.	840.2281	-0.01093	6694.	4.76E+08	-163.5723	450.2912	0.00
1.9425	0.2220	56226.	736.8095	-0.01085	6754.	4.76E+08	-164.7407	467.5223	0.00
1.9950	0.2152	56658.	632.6730	-0.01078	6806.	4.76E+08	-165.8514	485.5774	0.00
2.0475	0.2084	57023.	527.8556	-0.01070	6850.	4.76E+08	-166.9025	504.5188	0.00
2.1000	0.2017	57323.	422.3953	-0.01063	6886.	4.76E+08	-167.8920	524.4151	0.00
2.1525	0.1950	57556.	316.3317	-0.01055	6914.	4.76E+08	-168.8178	545.3428	0.00
2.2050	0.1884	57721.	209.7057	-0.01047	6934.	4.76E+08	-169.6775	567.3870	0.00
2.2575	0.1818	57820.	102.5597	-0.01040	6945.	4.76E+08	-170.4685	590.6429	0.00
2.3100	0.1753	57851.	-5.0621	-0.01032	6949.	4.76E+08	-171.1880	615.2173	0.00
2.3625	0.1688	57814.	-113.1137	-0.01024	6945.	4.76E+08	-171.8330	641.2307	0.00
2.4150	0.1624	57708.	-221.5472	-0.01017	6932.	4.76E+08	-172.4003	668.8194	0.00
2.4675	0.1560	57534.	-330.3124	-0.01009	6911.	4.76E+08	-172.8860	698.1381	0.00
2.5200	0.1497	57292.	-439.3567	-0.01002	6882.	4.76E+08	-173.2863	729.3636	0.00
2.5725	0.1434	56981.	-548.6248	-0.00994	6845.	4.76E+08	-173.5966	762.6987	0.00
2.6250	0.1372	56601.	-658.0586	-0.00986	6799.	4.76E+08	-173.8121	798.3775	0.00
2.6775	0.1310	56152.	-767.5965	-0.00979	6745.	4.76E+08	-173.9272	836.6717	0.00
2.7300	0.1248	55634.	-877.1733	-0.00972	6683.	4.76E+08	-173.9358	877.8983	0.00
2.7825	0.1187	55046.	-986.7199	-0.00964	6612.	4.76E+08	-173.8310	922.4305	0.00
2.8350	0.1127	54390.	-1096.	-0.00957	6533.	4.76E+08	-173.6048	970.7104	0.00
2.8875	0.1067	53665.	-1205.	-0.00950	6446.	4.76E+08	-173.2485	1023.	0.00
2.9400	0.1007	52871.	-1314.	-0.00943	6351.	4.76E+08	-172.7517	1081.	0.00
2.9925	0.09479	52009.	-1423.	-0.00936	6247.	4.76E+08	-172.1028	1144.	0.00
3.0450	0.08891	51078.	-1531.	-0.00929	6136.	4.76E+08	-171.2880	1214.	0.00
3.0975	0.08308	50080.	-1639.	-0.00922	6016.	4.76E+08	-170.2913	1291.	0.00
3.1500	0.07729	49013.	-1746.	-0.00916	5888.	4.76E+08	-169.0936	1378.	0.00
3.2025	0.07154	47880.	-1852.	-0.00909	5751.	4.76E+08	-167.6723	1477.	0.00
3.2550	0.06583	46680.	-1957.	-0.00903	5607.	4.76E+08	-165.9996	1589.	0.00
3.3075	0.06016	45414.	-2061.	-0.00897	5455.	4.76E+08	-164.0416	1718.	0.00
3.3600	0.05453	44084.	-2163.	-0.00891	5295.	4.76E+08	-161.7556	1869.	0.00
3.4125	0.04894	42688.	-2265.	-0.00885	5128.	4.76E+08	-159.0868	2048.	0.00
3.4650	0.04338	41230.	-2364.	-0.00880	4953.	4.76E+08	-155.9635	2265.	0.00
3.5175	0.03785	39710.	-2461.	-0.00874	4770.	4.76E+08	-152.2883	2535.	0.00
3.5700	0.03236	38129.	-2555.	-0.00869	4580.	4.76E+08	-147.9240	2880.	0.00
3.6225	0.02690	36490.	-2647.	-0.00864	4383.	4.76E+08	-142.6666	3341.	0.00
3.6750	0.02147	34794.	-2735.	-0.00860	4180.	4.76E+08	-136.1914	3996.	0.00
3.7275	0.01607	33044.	-2818.	-0.00855	3969.	4.76E+08	-127.9254	5015.	0.00
3.7800	0.01070	31244.	-2895.	-0.00851	3753.	4.76E+08	-116.6791	6871.	0.00
3.8325	0.00535	29396.	-2963.	-0.00847	3531.	4.76E+08	-99.0742	11664.	0.00
3.8850	2.90E-05	27510.	-2998.	-0.00843	3305.	4.76E+08	-12.8315	278563.	0.00
3.9375	-0.00527	25619.	-2971.	-0.00839	3077.	4.76E+08	100.5878	12024.	0.00
3.9900	-0.01055	23767.	-2901.	-0.00836	2855.	4.76E+08	120.7658	7213.	0.00
4.0425	-0.01581	21963.	-2820.	-0.00833	2638.	4.76E+08	134.8595	5375.	0.00
4.0950	-0.02105	20213.	-2732.	-0.00830	2428.	4.76E+08	145.0011	4340.	0.00
4.1475	-0.02627	18521.	-2638.	-0.00828	2225.	4.76E+08	153.2637	3676.	0.00
4.2000	-0.03148	16889.	-2540.	-0.00825	2029.	4.76E+08	160.3522	3209.	0.00
4.2525	-0.03667	15321.	-2437.	-0.00823	1840.	4.76E+08	166.5926	2862.	0.00
4.3050	-0.04185	13819.	-2330.	-0.00821	1660.	4.76E+08	172.1882	2592.	0.00
4.3575	-0.04702	12385.	-2220.	-0.00820	1488.	4.76E+08	177.2751	2375.	0.00
4.4100	-0.05218	11022.	-2107.	-0.00818	1324.	4.76E+08	181.9494	2197.	0.00
4.4625	-0.05733	9731.	-1991.	-0.00817	1169.	4.76E+08	186.2814	2047.	0.00
4.5150	-0.06247	8514.	-1872.	-0.00816	1023.	4.76E+08	190.3245	1919.	0.00
4.5675	-0.06760	7373.	-1751.	-0.00814	885.6073	4.76E+08	194.1201	1809.	0.00
4.6200	-0.07273	6308.	-1627.	-0.00814	757.7365	4.76E+08	197.7011	1712.	0.00
4.6725	-0.07786	5322.	-1502.	-0.00813	639.2914	4.76E+08	201.0940	1627.	0.00
4.7250	-0.08297	4416.	-1374.	-0.00812	530.4337	4.76E+08	204.3207	1551.	0.00
4.7775	-0.08809	3591.	-1244.	-0.00812	431.3172	4.76E+08	207.3992	1483.	0.00
4.8300	-0.09320	2848.	-1113.	-0.00811	342.0889	4.76E+08	210.3447	1422.	0.00
4.8825	-0.09831	2189.	-979.4055	-0.00811	262.8890	4.76E+08	213.1701	1366.	0.00
4.9350	-0.1034	1614.	-844.2527	-0.00811	193.8523	4.76E+08	215.8865	1315.	0.00
4.9875	-0.1085	1125.	-707.4198	-0.00810	135.1082	4.76E+08	218.5034	1268.	0.00
5.0400	-0.1136	722.4465	-568.9671	-0.00810	86.7817	4.76E+08	221.0291	1225.	0.00
5.0925	-0.1187	407.8605	-428.9496	-0.00810	48.9930	4.76E+08	223.4707	1186.	0.00
5.1450	-0.1238	181.9700	-287.4184	-0.00810	21.8586	4.76E+08	225.8347	1149.	0.00
5.1975	-0.1289	45.7133	-144.4206	-0.00810	5.4912	4.76E+08	228.1266	1115.	0.00
5.2500	-0.1340	0.00	0.00	-0.00810	0.00	4.76E+08	230.3515	541.3093	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection            =     0.49982323 inches
Computed slope at pile head     =    -0.01251799 radians
Maximum bending moment          =         57851. inch-lbs
Maximum shear force             =          3560. lbs
Depth of maximum bending moment =     2.31000000 feet below pile head
Depth of maximum shear force    =     0.05250000 feet below pile head
Number of iterations            =             42
Number of zero deflection points =             1
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Shear and Moment (Loading Type 1)

```
Shear force at pile head                        =        4860.0 lbs
Applied moment at pile head                     =           0.0 in-lbs
Axial thrust load on pile head                  =           0.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.6139	5.32E-06	4860.	-0.03702	6.39E-07	4.76E+08	0.00	0.00	0.00
0.05250	1.5905	3062.	4860.	-0.03702	367.7894	4.76E+08	0.00	0.00	0.00
0.1050	1.5672	6124.	4860.	-0.03702	735.5788	4.76E+08	0.00	0.00	0.00
0.1575	1.5439	9185.	4860.	-0.03701	1103.	4.76E+08	0.00	0.00	0.00
0.2100	1.5206	12247.	4860.	-0.03699	1471.	4.76E+08	0.00	0.00	0.00
0.2625	1.4973	15309.	4815.	-0.03697	1839.	4.76E+08	-141.2948	59.4511	0.00
0.3150	1.4740	18315.	4725.	-0.03695	2200.	4.76E+08	-144.6079	61.8064	0.00
0.3675	1.4507	21263.	4633.	-0.03692	2554.	4.76E+08	-147.8841	64.2205	0.00
0.4200	1.4275	24153.	4539.	-0.03689	2901.	4.76E+08	-151.1227	66.6960	0.00
0.4725	1.4042	26982.	4443.	-0.03686	3241.	4.76E+08	-154.3232	69.2354	0.00
0.5250	1.3810	29751.	4345.	-0.03682	3574.	4.76E+08	-157.4848	71.8412	0.00
0.5775	1.3579	32457.	4244.	-0.03678	3899.	4.76E+08	-160.6068	74.5165	0.00
0.6300	1.3347	35099.	4142.	-0.03674	4216.	4.76E+08	-163.6885	77.2641	0.00
0.6825	1.3116	37676.	4038.	-0.03669	4526.	4.76E+08	-166.7292	80.0873	0.00
0.7350	1.2885	40187.	3932.	-0.03664	4827.	4.76E+08	-169.7281	82.9893	0.00
0.7875	1.2654	42631.	3824.	-0.03658	5121.	4.76E+08	-172.6844	85.9738	0.00
0.8400	1.2424	45006.	3715.	-0.03652	5406.	4.76E+08	-175.5973	89.0446	0.00
0.8925	1.2194	47311.	3603.	-0.03646	5683.	4.76E+08	-178.4659	92.2057	0.00
0.9450	1.1964	49546.	3490.	-0.03640	5952.	4.76E+08	-181.2893	95.4613	0.00
0.9975	1.1735	51708.	3375.	-0.03633	6211.	4.76E+08	-184.0667	98.8160	0.00
1.0500	1.1506	53798.	3258.	-0.03626	6462.	4.76E+08	-186.7970	102.2748	0.00
1.1025	1.1278	55813.	3139.	-0.03619	6704.	4.76E+08	-189.4793	105.8427	0.00
1.1550	1.1050	57754.	3019.	-0.03611	6937.	4.76E+08	-192.1124	109.5254	0.00
1.2075	1.0823	59617.	2897.	-0.03604	7161.	4.76E+08	-194.6953	113.3289	0.00
1.2600	1.0596	61404.	2774.	-0.03596	7376.	4.76E+08	-197.2269	117.2594	0.00
1.3125	1.0370	63113.	2649.	-0.03587	7581.	4.76E+08	-199.7059	121.3240	0.00
1.3650	1.0144	64742.	2522.	-0.03579	7777.	4.76E+08	-202.1311	125.5299	0.00
1.4175	0.9919	66291.	2394.	-0.03570	7963.	4.76E+08	-204.5010	129.8852	0.00
1.4700	0.9695	67758.	2265.	-0.03561	8139.	4.76E+08	-206.8145	134.3984	0.00
1.5225	0.9470	69144.	2134.	-0.03552	8306.	4.76E+08	-209.0698	139.0788	0.00
1.5750	0.9247	70447.	2001.	-0.03543	8462.	4.76E+08	-211.2656	143.9364	0.00
1.6275	0.9024	71666.	1867.	-0.03534	8609.	4.76E+08	-213.4001	148.9823	0.00
1.6800	0.8802	72800.	1732.	-0.03524	8745.	4.76E+08	-215.4716	154.2281	0.00
1.7325	0.8580	73848.	1596.	-0.03514	8871.	4.76E+08	-217.4783	159.6869	0.00
1.7850	0.8359	74811.	1458.	-0.03505	8986.	4.76E+08	-219.4181	165.3728	0.00
1.8375	0.8138	75686.	1320.	-0.03495	9092.	4.76E+08	-221.2890	171.3011	0.00
1.8900	0.7919	76473.	1180.	-0.03484	9186.	4.76E+08	-223.0888	177.4888	0.00
1.9425	0.7699	77172.	1038.	-0.03474	9270.	4.76E+08	-224.8150	183.9544	0.00
1.9950	0.7481	77782.	896.3134	-0.03464	9343.	4.76E+08	-226.4651	190.7185	0.00
2.0475	0.7263	78302.	753.1454	-0.03454	9406.	4.76E+08	-228.0364	197.8036	0.00
2.1000	0.7046	78731.	609.0133	-0.03443	9457.	4.76E+08	-229.5259	205.2349	0.00
2.1525	0.6829	79069.	463.9695	-0.03433	9498.	4.76E+08	-230.9305	213.0402	0.00
2.2050	0.6613	79315.	318.0688	-0.03422	9528.	4.76E+08	-232.2466	221.2505	0.00
2.2575	0.6398	79470.	171.3678	-0.03412	9546.	4.76E+08	-233.4707	229.9007	0.00
2.3100	0.6183	79531.	23.9259	-0.03401	9553.	4.76E+08	-234.5987	239.0297	0.00
2.3625	0.5969	79500.	-124.1950	-0.03391	9550.	4.76E+08	-235.6263	248.6815	0.00
2.4150	0.5756	79375.	-272.9301	-0.03380	9535.	4.76E+08	-236.5486	258.9059	0.00
2.4675	0.5543	79156.	-422.2114	-0.03370	9508.	4.76E+08	-237.3604	269.7593	0.00
2.5200	0.5331	78843.	-571.9675	-0.03359	9471.	4.76E+08	-238.0559	281.3064	0.00
2.5725	0.5120	78435.	-722.1233	-0.03349	9422.	4.76E+08	-238.6290	293.6211	0.00
2.6250	0.4909	77933.	-872.5992	-0.03339	9361.	4.76E+08	-239.0725	306.7888	0.00
2.6775	0.4699	77336.	-1023.	-0.03328	9290.	4.76E+08	-239.3786	320.9087	0.00
2.7300	0.4490	76644.	-1174.	-0.03318	9207.	4.76E+08	-239.5387	336.0962	0.00
2.7825	0.4281	75856.	-1325.	-0.03308	9112.	4.76E+08	-239.5431	352.4875	0.00
2.8350	0.4073	74974.	-1476.	-0.03298	9006.	4.76E+08	-239.3807	370.2433	0.00
2.8875	0.3866	73997.	-1627.	-0.03288	8889.	4.76E+08	-239.0390	389.5557	0.00
2.9400	0.3659	72924.	-1777.	-0.03278	8760.	4.76E+08	-238.5040	410.6560	0.00
2.9925	0.3453	71758.	-1927.	-0.03269	8620.	4.76E+08	-237.7591	433.8255	0.00
3.0450	0.3247	70496.	-2077.	-0.03259	8468.	4.76E+08	-236.7855	459.4100	0.00
3.0975	0.3042	69141.	-2225.	-0.03250	8305.	4.76E+08	-235.5610	487.8401	0.00
3.1500	0.2838	67692.	-2373.	-0.03241	8131.	4.76E+08	-234.0595	519.6588	0.00
3.2025	0.2634	66151.	-2520.	-0.03232	7946.	4.76E+08	-232.2498	555.5625	0.00
3.2550	0.2430	64517.	-2666.	-0.03224	7750.	4.76E+08	-230.0940	596.4595	0.00
3.3075	0.2228	62792.	-2810.	-0.03215	7543.	4.76E+08	-227.5459	643.5597	0.00
3.3600	0.2025	60976.	-2952.	-0.03207	7325.	4.76E+08	-224.5475	698.5142	0.00
3.4125	0.1823	59072.	-3093.	-0.03199	7096.	4.76E+08	-221.0249	763.6406	0.00
3.4650	0.1622	57079.	-3231.	-0.03191	6856.	4.76E+08	-216.8817	842.3066	0.00
3.5175	0.1421	55001.	-3366.	-0.03184	6607.	4.76E+08	-211.9876	939.6166	0.00
3.5700	0.1221	52839.	-3497.	-0.03177	6347.	4.76E+08	-206.1602	1064.	0.00
3.6225	0.1021	50594.	-3625.	-0.03170	6077.	4.76E+08	-199.1309	1229.	0.00
3.6750	0.08216	48271.	-3748.	-0.03163	5798.	4.76E+08	-190.4766	1461.	0.00
3.7275	0.06225	45872.	-3864.	-0.03157	5510.	4.76E+08	-179.4631	1816.	0.00
3.7800	0.04238	43402.	-3973.	-0.03151	5213.	4.76E+08	-164.6079	2447.	0.00
3.8325	0.02255	40866.	-4069.	-0.03146	4909.	4.76E+08	-141.9410	3966.	0.00
3.8850	0.00275	38274.	-4141.	-0.03140	4598.	4.76E+08	-84.6574	19418.	0.00
3.9375	-0.01702	35649.	-4125.	-0.03135	4282.	4.76E+08	134.8437	4991.	0.00
3.9900	-0.03676	33077.	-4030.	-0.03131	3973.	4.76E+08	165.0008	2828.	0.00
4.0425	-0.05647	30570.	-3920.	-0.03127	3672.	4.76E+08	185.4055	2068.	0.00
4.0950	-0.07616	28138.	-3799.	-0.03123	3380.	4.76E+08	199.9849	1654.	0.00
4.1475	-0.09582	25784.	-3669.	-0.03119	3097.	4.76E+08	211.8033	1393.	0.00
4.2000	-0.1155	23515.	-3532.	-0.03116	2825.	4.76E+08	221.9101	1211.	0.00
4.2525	-0.1351	21333.	-3390.	-0.03113	2563.	4.76E+08	230.7904	1076.	0.00
4.3050	-0.1547	19244.	-3242.	-0.03110	2312.	4.76E+08	238.7430	972.3776	0.00

4.3575	-0.1743	17249.	-3089.	-0.03108	2072.	4.76E+08	245.9663	889.2010	0.00
4.4100	-0.1938	15351.	-2932.	-0.03106	1844.	4.76E+08	252.5993	820.9751	0.00
4.4625	-0.2134	13554.	-2771.	-0.03104	1628.	4.76E+08	258.7437	763.8665	0.00
4.5150	-0.2329	11860.	-2606.	-0.03102	1425.	4.76E+08	264.4758	715.2678	0.00
4.5675	-0.2525	10270.	-2438.	-0.03101	1234.	4.76E+08	269.8551	673.3401	0.00
4.6200	-0.2720	8788.	-2266.	-0.03099	1056.	4.76E+08	274.9285	636.7470	0.00
4.6725	-0.2915	7415.	-2092.	-0.03098	890.6563	4.76E+08	279.7339	604.4925	0.00
4.7250	-0.3111	6152.	-1914.	-0.03097	739.0383	4.76E+08	284.3023	575.8180	0.00
4.7775	-0.3306	5003.	-1733.	-0.03097	600.9748	4.76E+08	288.6594	550.1351	0.00
4.8300	-0.3501	3968.	-1550.	-0.03096	476.6736	4.76E+08	292.8267	526.9799	0.00
4.8825	-0.3696	3050.	-1365.	-0.03096	366.3333	4.76E+08	296.8228	505.9815	0.00
4.9350	-0.3891	2249.	-1176.	-0.03095	270.1444	4.76E+08	300.6631	486.8395	0.00
4.9875	-0.4086	1567.	-985.7563	-0.03095	188.2900	4.76E+08	304.3614	469.3077	0.00
5.0400	-0.4281	1007.	-792.8847	-0.03095	120.9466	4.76E+08	307.9293	453.1826	0.00
5.0925	-0.4476	568.4560	-597.8032	-0.03095	68.2840	4.76E+08	311.3772	438.2944	0.00
5.1450	-0.4671	253.6328	-400.5844	-0.03095	30.4669	4.76E+08	314.7141	424.4999	0.00
5.1975	-0.4866	63.7196	-201.2958	-0.03095	7.6541	4.76E+08	317.9481	411.6778	0.00
5.2500	-0.5061	0.00	0.00	-0.03095	0.00	4.76E+08	321.0863	199.8623	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

Pile-head deflection = 1.61386736 inches
Computed slope at pile head = -0.03702388 radians
Maximum bending moment = 79531. inch-lbs
Maximum shear force = 4860. lbs
Depth of maximum bending moment = 2.31000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 47
Number of zero deflection points = 1

Summary of Pile-head Responses for Conventional Analyses

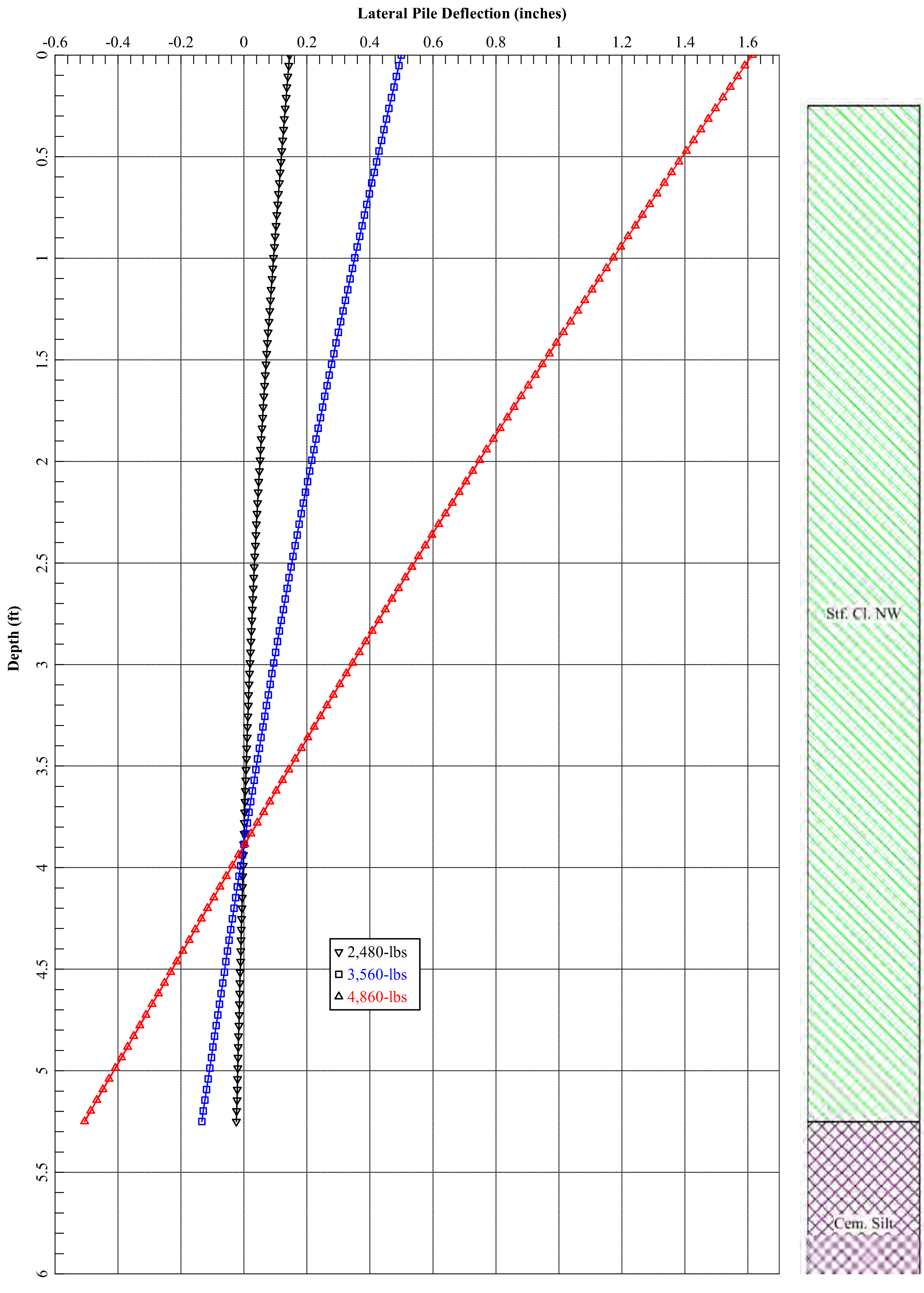
Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

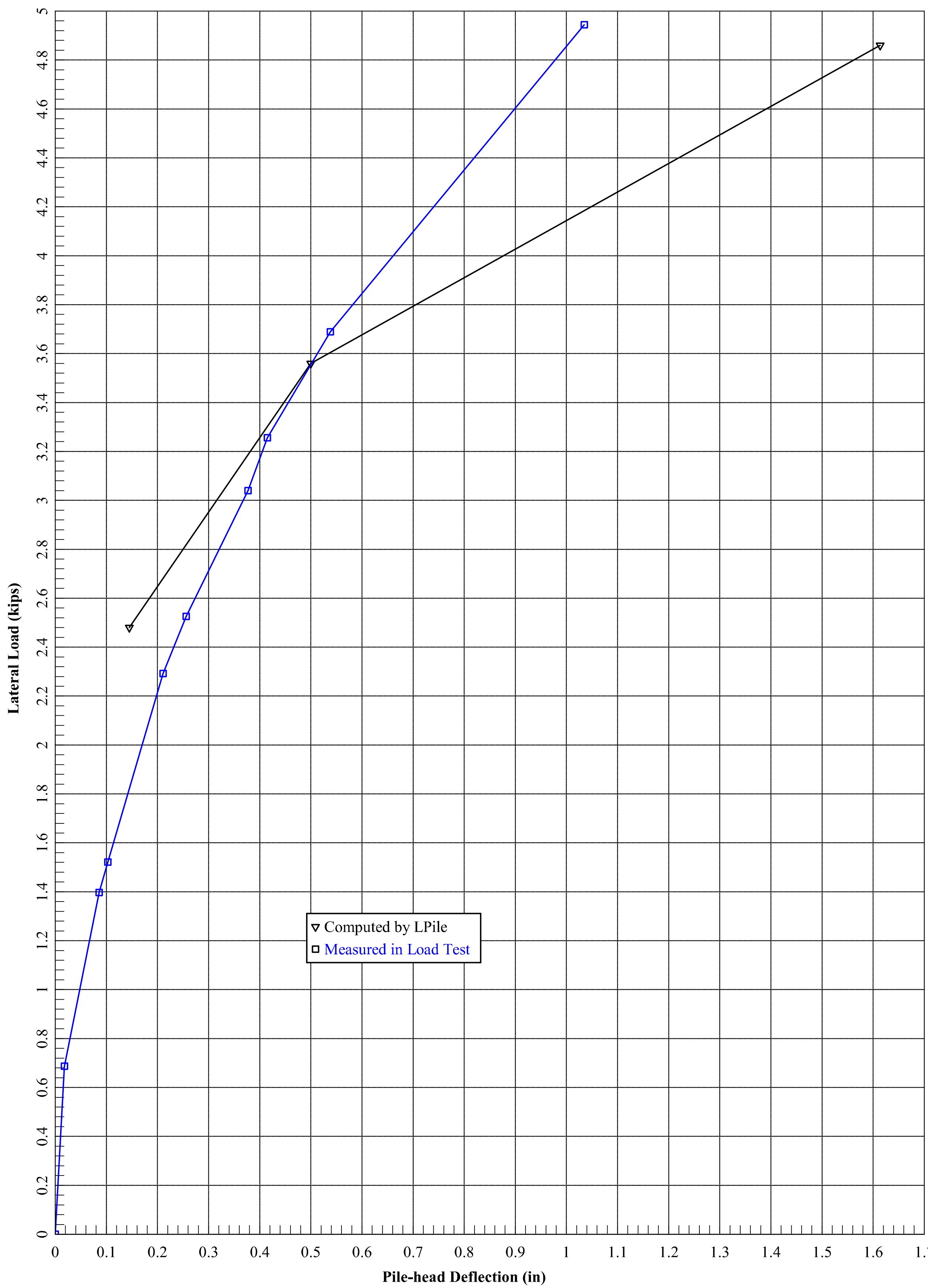
Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	V, lb	2480.	M, in-lb	0.00	0.00	0.1447	-0.00435	2480.	39430.
2	V, lb	3560.	M, in-lb	0.00	0.00	0.4998	-0.01252	3560.	57851.
3	V, lb	4860.	M, in-lb	0.00	0.00	1.6139	-0.03702	4860.	79531.

Maximum pile-head deflection = 1.6138673614 inches
Maximum pile-head rotation = -0.0370238836 radians = -2.121312 deg.

The analysis ended normally.



Lateral Pile Deflection (inches)
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Depth (ft)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
2,480-lbs
3,560-lbs
4,860-lbs
Stf. Cl. NW
Cem. Silt


Lateral Load (kips)
Pile-head Deflection (in)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
5
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
Computed by LPile
Measured in Load Test

```
================================================================================
                    LPile for Windows, Version 2016-09.011

                Analysis of Individual Piles and Drilled Shafts
               Subjected to Lateral Loading Using the p-y Method
                          © 1985-2017 by Ensoft, Inc.
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================================================================================
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```
--------------------------------------------------------------------------------
                            Files Used for Analysis
--------------------------------------------------------------------------------
```

Path to file locations:
\2017 Geotechnical\003-Ann Arbor\173483 (p) Madison Co Solar OH - FS\Report & Analyses\LPile\

Name of input data file:
2b - 8 ft.lp9d

Name of output report file:
2b - 8 ft.lp9o

Name of plot output file:
2b - 8 ft.lp9p

Name of runtime message file:
2b - 8 ft.lp9r

```
--------------------------------------------------------------------------------
                           Date and Time of Analysis
--------------------------------------------------------------------------------

               Date:  December 18, 2017          Time:  10:36:59


--------------------------------------------------------------------------------
                                 Problem Title
--------------------------------------------------------------------------------
```

Project Name: Madison County Solar Power Plant

Job Number: 173483

Client: First Solar, Inc.

Engineer: J. Crow

Description: 2B - 8FT

```
--------------------------------------------------------------------------------
                          Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:
 - Maximum number of iterations allowed               =          500
 - Deflection tolerance for convergence               =   1.0000E-05 in
 - Maximum allowable deflection                       =     100.0000 in
 - Number of pile increments                          =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Use of p-y modification factors for p-y curves not selected
 - Analysis uses layering correction (Method of Georgiadis)
 - Layering correction is not computed if soil above is of same type
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
 - No p-y curves to be computed and reported for user-specified depths
 - Print using wide report formats
```

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 8.250 ft
Depth of ground surface below top of pile = 0.2500 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	3.9400
2	8.250	3.9400

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile
Cross-sectional Shape = Strong H-Pile
Length of section = 8.250000 ft
Flange Width = 3.940000 in
Section Depth = 5.900000 in
Flange Thickness = 0.215000 in
Web Thickness = 0.170000 in
Section Area = 2.680000 sq. in
Moment of Inertia = 16.400000 in^4
Elastic Modulus = 29000000. psi

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is stiff clay without free water

Distance from top of pile to top of layer = 0.250000 ft
Distance from top of pile to bottom of layer = 5.250000 ft
Effective unit weight at top of layer = 125.000000 pcf
Effective unit weight at bottom of layer = 125.000000 pcf
Undrained cohesion at top of layer = 1200. psf
Undrained cohesion at bottom of layer = 1200. psf
Epsilon-50 at top of layer = 0.015650
Epsilon-50 at bottom of layer = 0.015650

Layer 2 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 5.250000 ft
Distance from top of pile to bottom of layer = 6.250000 ft
Effective unit weight at top of layer = 130.000000 pcf
Effective unit weight at bottom of layer = 130.000000 pcf
Undrained cohesion at top of layer = 250.000000 psf
Undrained cohesion at bottom of layer = 250.000000 psf
Friction angle at top of layer = 20.000000 deg.
Friction angle at bottom of layer = 20.000000 deg.
Epsilon-50 at top of layer = 0.010000
Epsilon-50 at bottom of layer = 0.010000
Subgrade k at top of layer = 400.000000 pci
Subgrade k at bottom of layer = 400.000000 pci

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer = 6.250000 ft
Distance from top of pile to bottom of layer = 8.500000 ft
Effective unit weight at top of layer = 135.000000 pcf
Effective unit weight at bottom of layer = 135.000000 pcf
Undrained cohesion at top of layer = 2000. psf
Undrained cohesion at bottom of layer = 2000. psf
Epsilon-50 at top of layer = 0.010000
Epsilon-50 at bottom of layer = 0.010000

(Depth of the lowest soil layer extends 0.250 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	0.2500	125.0000	1200.	--	0.01565	--

	w/o Free Water	5.2500	125.0000	1200.	--	0.01565	--
2	Cemented	5.2500	130.0000	250.0000	20.0000	0.01000	400.0000
	Silt	6.2500	130.0000	250.0000	20.0000	0.01000	400.0000
3	Stiff Clay	6.2500	135.0000	2000.	--	0.01000	--
	w/o Free Water	8.5000	135.0000	2000.	--	0.01000	--

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 3

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	1	V = 2690. lbs	M = 0.0000 in-lbs	0.0000000	No
2	1	V = 3930. lbs	M = 0.0000 in-lbs	0.0000000	No
3	1	V = 6190. lbs	M = 0.0000 in-lbs	0.0000000	No

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

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Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.2500	0.00	N.A.	No	0.00	13348.
2	5.2500	9.3933	No	No	13348.	1715.
3	6.2500	3.8098	No	No	15062.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 2690.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2336	-6.46E-07	2690.	-0.00617	7.77E-08	4.76E+08	0.00	0.00	0.00
0.08250	0.2275	2663.	2690.	-0.00617	319.8968	4.76E+08	0.00	0.00	0.00
0.1650	0.2214	5326.	2690.	-0.00616	639.7935	4.76E+08	0.00	0.00	0.00
0.2475	0.2153	7989.	2690.	-0.00615	959.6903	4.76E+08	0.00	0.00	0.00
0.3300	0.2092	10652.	2663.	-0.00613	1280.	4.76E+08	-55.4647	262.4815	0.00
0.4125	0.2031	13261.	2607.	-0.00610	1593.	4.76E+08	-57.4199	279.8354	0.00
0.4950	0.1971	15814.	2549.	-0.00607	1900.	4.76E+08	-59.3324	297.9999	0.00
0.5775	0.1911	18308.	2489.	-0.00604	2199.	4.76E+08	-61.2013	317.0304	0.00
0.6600	0.1852	20742.	2428.	-0.00600	2492.	4.76E+08	-63.0256	336.9868	0.00
0.7425	0.1792	23115.	2364.	-0.00595	2777.	4.76E+08	-64.8043	357.9334	0.00
0.8250	0.1734	25424.	2299.	-0.00590	3054.	4.76E+08	-66.5367	379.9403	0.00
0.9075	0.1676	27668.	2233.	-0.00585	3323.	4.76E+08	-68.2217	403.0829	0.00
0.9900	0.1618	29845.	2164.	-0.00579	3585.	4.76E+08	-69.8583	427.4434	0.00
1.0725	0.1561	31953.	2094.	-0.00572	3838.	4.76E+08	-71.4457	453.1108	0.00
1.1550	0.1505	33992.	2023.	-0.00565	4083.	4.76E+08	-72.9829	480.1819	0.00
1.2375	0.1449	35959.	1950.	-0.00558	4319.	4.76E+08	-74.4689	508.7622	0.00
1.3200	0.1394	37852.	1876.	-0.00550	4547.	4.76E+08	-75.9028	538.9667	0.00
1.4025	0.1340	39672.	1800.	-0.00542	4765.	4.76E+08	-77.2836	570.9210	0.00
1.4850	0.1287	41416.	1723.	-0.00534	4975.	4.76E+08	-78.6103	604.7626	0.00

1.5675	0.1234	43083.	1644.	-0.00525	5175.	4.76E+08	-79.8819	640.6418	0.00
1.6500	0.1183	44671.	1564.	-0.00516	5366.	4.76E+08	-81.0974	678.7238	0.00
1.7325	0.1132	46180.	1484.	-0.00506	5547.	4.76E+08	-82.2559	719.1902	0.00
1.8150	0.1083	47608.	1402.	-0.00497	5719.	4.76E+08	-83.3562	762.2408	0.00
1.8975	0.1034	48955.	1319.	-0.00487	5881.	4.76E+08	-84.3973	808.0961	0.00
1.9800	0.09863	50219.	1234.	-0.00476	6032.	4.76E+08	-85.3782	856.9999	0.00
2.0625	0.09396	51399.	1149.	-0.00466	6174.	4.76E+08	-86.2978	909.2219	0.00
2.1450	0.08941	52495.	1064.	-0.00455	6306.	4.76E+08	-87.1550	965.0617	0.00
2.2275	0.08496	53505.	976.9503	-0.00444	6427.	4.76E+08	-87.9487	1025.	0.00
2.3100	0.08062	54429.	889.5202	-0.00433	6538.	4.76E+08	-88.6777	1089.	0.00
2.3925	0.07639	55267.	801.4011	-0.00421	6639.	4.76E+08	-89.3408	1158.	0.00
2.4750	0.07228	56016.	712.6587	-0.00410	6729.	4.76E+08	-89.9368	1232.	0.00
2.5575	0.06828	56678.	623.3600	-0.00398	6808.	4.76E+08	-90.4645	1312.	0.00
2.6400	0.06440	57250.	533.5734	-0.00386	6877.	4.76E+08	-90.9226	1398.	0.00
2.7225	0.06064	57734.	443.3684	-0.00374	6935.	4.76E+08	-91.3097	1491.	0.00
2.8050	0.05699	58128.	352.8159	-0.00362	6982.	4.76E+08	-91.6245	1592.	0.00
2.8875	0.05347	58433.	261.9885	-0.00350	7019.	4.76E+08	-91.8654	1701.	0.00
2.9700	0.05007	58647.	170.9598	-0.00338	7045.	4.76E+08	-92.0310	1820.	0.00
3.0525	0.04678	58771.	79.8052	-0.00325	7060.	4.76E+08	-92.1196	1949.	0.00
3.1350	0.04362	58805.	-11.3982	-0.00313	7064.	4.76E+08	-92.1297	2091.	0.00
3.2175	0.04058	58749.	-102.5717	-0.00301	7057.	4.76E+08	-92.0592	2246.	0.00
3.3000	0.03766	58602.	-193.6347	-0.00289	7039.	4.76E+08	-91.9064	2416.	0.00
3.3825	0.03486	58365.	-284.5047	-0.00277	7011.	4.76E+08	-91.6692	2603.	0.00
3.4650	0.03218	58039.	-375.0969	-0.00265	6972.	4.76E+08	-91.3454	2810.	0.00
3.5475	0.02963	57623.	-465.3244	-0.00252	6922.	4.76E+08	-90.9324	3039.	0.00
3.6300	0.02719	57117.	-555.0976	-0.00241	6861.	4.76E+08	-90.4277	3293.	0.00
3.7125	0.02486	56524.	-644.3243	-0.00229	6790.	4.76E+08	-89.8282	3577.	0.00
3.7950	0.02266	55842.	-732.9090	-0.00217	6708.	4.76E+08	-89.1308	3895.	0.00
3.8775	0.02057	55072.	-820.7529	-0.00205	6615.	4.76E+08	-88.3316	4252.	0.00
3.9600	0.01859	54217.	-907.5797	-0.00194	6513.	4.76E+08	-87.0762	4638.	0.00
4.0425	0.01672	53275.	-992.6607	-0.00183	6400.	4.76E+08	-84.8046	5020.	0.00
4.1250	0.01497	52251.	-1075.	-0.00172	6276.	4.76E+08	-82.4858	5456.	0.00
4.2075	0.01332	51146.	-1156.	-0.00161	6144.	4.76E+08	-80.1154	5955.	0.00
4.2900	0.01178	49962.	-1234.	-0.00151	6002.	4.76E+08	-77.6881	6531.	0.00
4.3725	0.01034	48702.	-1310.	-0.00140	5850.	4.76E+08	-75.1971	7202.	0.00
4.4550	0.00900	47369.	-1383.	-0.00130	5690.	4.76E+08	-72.6339	7992.	0.00
4.5375	0.00776	45964.	-1454.	-0.00121	5521.	4.76E+08	-69.9875	8934.	0.00
4.6200	0.00661	44491.	-1521.	-0.00111	5344.	4.76E+08	-67.2436	10074.	0.00
4.7025	0.00555	42952.	-1587.	-0.00102	5159.	4.76E+08	-64.3827	11478.	0.00
4.7850	0.00459	41349.	-1649.	-9.34E-04	4967.	4.76E+08	-61.3779	13249.	0.00
4.8675	0.00370	39687.	-1708.	-8.49E-04	4767.	4.76E+08	-58.1902	15551.	0.00
4.9500	0.00290	37968.	-1764.	-7.68E-04	4561.	4.76E+08	-54.7601	18664.	0.00
5.0325	0.00218	36194.	-1816.	-6.91E-04	4348.	4.76E+08	-50.9907	23124.	0.00
5.1150	0.00154	34371.	-1865.	-6.18E-04	4129.	4.76E+08	-46.7070	30103.	0.00
5.1975	9.60E-04	32502.	-1908.	-5.48E-04	3904.	4.76E+08	-41.5380	42843.	0.00
5.2800	4.51E-04	30593.	-1939.	-4.83E-04	3675.	4.76E+08	-20.3828	44779.	0.00
5.3625	4.45E-06	28663.	-1949.	-4.21E-04	3443.	4.76E+08	-0.2032	45171.	0.00
5.4450	-3.83E-04	26733.	-1941.	-3.63E-04	3211.	4.76E+08	17.6112	45564.	0.00
5.5275	-7.15E-04	24821.	-1915.	-3.10E-04	2982.	4.76E+08	33.1749	45956.	0.00
5.6100	-9.96E-04	22941.	-1876.	-2.60E-04	2756.	4.76E+08	46.6070	46348.	0.00
5.6925	-0.00123	21107.	-1825.	-2.14E-04	2535.	4.76E+08	55.4892	44694.	0.00
5.7750	-0.00142	19327.	-1768.	-1.72E-04	2322.	4.76E+08	60.0096	41860.	0.00
5.8575	-0.00157	17605.	-1707.	-1.33E-04	2115.	4.76E+08	63.6822	40169.	0.00
5.9400	-0.00168	15947.	-1642.	-9.85E-05	1916.	4.76E+08	66.6801	39212.	0.00
6.0225	-0.00176	14353.	-1575.	-6.70E-05	1724.	4.76E+08	69.1158	38776.	0.00
6.1050	-0.00182	12828.	-1506.	-3.87E-05	1541.	4.76E+08	71.0678	38739.	0.00
6.1875	-0.00184	11372.	-1435.	-1.35E-05	1366.	4.76E+08	72.5934	39031.	0.00
6.2700	-0.00184	9987.	-1354.	8.70E-06	1200.	4.76E+08	91.0650	48918.	0.00
6.3525	-0.00182	8691.	-1264.	2.81E-05	1044.	4.76E+08	90.8318	49299.	0.00
6.4350	-0.00179	7485.	-1174.	4.50E-05	899.0866	4.76E+08	90.3711	50059.	0.00
6.5175	-0.00173	6367.	-1085.	5.94E-05	764.7932	4.76E+08	89.7043	51186.	0.00
6.6000	-0.00167	5337.	-996.4808	7.16E-05	641.0609	4.76E+08	88.8482	52682.	0.00
6.6825	-0.00159	4394.	-909.0324	8.17E-05	527.7888	4.76E+08	87.8153	54565.	0.00
6.7650	-0.00151	3537.	-822.6895	9.00E-05	424.8553	4.76E+08	86.6148	56867.	0.00
6.8475	-0.00142	2765.	-737.6152	9.65E-05	332.1191	4.76E+08	85.2525	59639.	0.00
6.9300	-0.00132	2076.	-653.9684	1.02E-04	249.4198	4.76E+08	83.7310	62952.	0.00
7.0125	-0.00121	1470.	-571.9071	1.05E-04	176.5783	4.76E+08	82.0495	66905.	0.00
7.0950	-0.00111	944.0121	-491.5922	1.08E-04	113.3966	4.76E+08	80.2028	71636.	0.00
7.1775	-0.00100	496.6391	-413.1922	1.09E-04	59.6573	4.76E+08	78.1810	77342.	0.00
7.2600	-8.92E-04	125.8914	-336.8890	1.10E-04	15.1223	4.76E+08	75.9670	84306.	0.00
7.3425	-7.83E-04	-170.4010	-262.8857	1.10E-04	20.4689	4.76E+08	73.5344	92958.	0.00
7.4250	-6.75E-04	-394.6223	-191.4193	1.09E-04	47.4028	4.76E+08	70.8423	103970.	0.00
7.5075	-5.67E-04	-549.4111	-122.7780	1.08E-04	65.9963	4.76E+08	67.8270	118473.	0.00
7.5900	-4.60E-04	-637.7227	-57.3330	1.07E-04	76.6045	4.76E+08	64.3851	138523.	0.00
7.6725	-3.55E-04	-662.9304	4.4045	1.06E-04	79.6325	4.76E+08	60.3371	168346.	0.00
7.7550	-2.51E-04	-629.0018	61.6608	1.04E-04	75.5569	4.76E+08	55.3322	218355.	0.00
7.8375	-1.48E-04	-540.8420	113.0676	1.03E-04	64.9670	4.76E+08	48.5198	324098.	0.00
7.9200	-4.67E-05	-405.1280	149.2247	1.02E-04	48.6648	4.76E+08	24.5248	520305.	0.00
8.0025	5.40E-05	-245.3772	147.3041	1.01E-04	29.4752	4.76E+08	-28.4048	520305.	0.00
8.0850	1.54E-04	-113.4659	109.0076	1.01E-04	13.6297	4.76E+08	-48.9619	314241.	0.00
8.1675	2.54E-04	-29.5422	57.3060	1.01E-04	3.5487	4.76E+08	-55.4857	216073.	0.00
8.2500	3.54E-04	0.00	0.00	1.01E-04	0.00	4.76E+08	-60.2840	84264.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.23358457 inches
Computed slope at pile head      =    -0.00617264 radians
Maximum bending moment           =         58805. inch-lbs
Maximum shear force              =          2690. lbs
Depth of maximum bending moment  =     3.13500000 feet below pile head
Depth of maximum shear force     =     0.08250000 feet below pile head
Number of iterations             =             26
Number of zero deflection points =              2
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Moment (Loading Type 1)

```
Shear force at pile head                              =       3930.0 lbs
Applied moment at pile head                           =          0.0 in-lbs
Axial thrust load on pile head                        =          0.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.4999	-3.23E-07	3930.	-0.01161	3.88E-08	4.76E+08	0.00	0.00	0.00
0.08250	0.4885	3891.	3930.	-0.01160	467.3585	4.76E+08	0.00	0.00	0.00
0.1650	0.4770	7781.	3930.	-0.01159	934.7170	4.76E+08	0.00	0.00	0.00
0.2475	0.4655	11672.	3930.	-0.01157	1402.	4.76E+08	0.00	0.00	0.00
0.3300	0.4541	15563.	3897.	-0.01154	1869.	4.76E+08	-67.3208	146.7800	0.00
0.4125	0.4427	19388.	3829.	-0.01150	2329.	4.76E+08	-69.7624	156.0240	0.00
0.4950	0.4313	23144.	3759.	-0.01146	2780.	4.76E+08	-72.1600	165.6408	0.00
0.5775	0.4200	26829.	3686.	-0.01141	3223.	4.76E+08	-74.5128	175.6527	0.00
0.6600	0.4087	30442.	3611.	-0.01135	3657.	4.76E+08	-76.8198	186.0833	0.00
0.7425	0.3975	33979.	3534.	-0.01128	4082.	4.76E+08	-79.0803	196.9583	0.00
0.8250	0.3864	37439.	3455.	-0.01121	4497.	4.76E+08	-81.2933	208.3046	0.00
0.9075	0.3753	40819.	3373.	-0.01113	4903.	4.76E+08	-83.4579	220.1515	0.00
0.9900	0.3643	44118.	3289.	-0.01104	5299.	4.76E+08	-85.5734	232.5303	0.00
1.0725	0.3534	47332.	3204.	-0.01094	5686.	4.76E+08	-87.6388	245.4744	0.00
1.1550	0.3427	50461.	3116.	-0.01084	6061.	4.76E+08	-89.6532	259.0198	0.00
1.2375	0.3320	53501.	3026.	-0.01073	6427.	4.76E+08	-91.6158	273.2053	0.00
1.3200	0.3214	56452.	2934.	-0.01062	6781.	4.76E+08	-93.5257	288.0726	0.00
1.4025	0.3110	59311.	2841.	-0.01050	7125.	4.76E+08	-95.3820	303.6666	0.00
1.4850	0.3006	62077.	2746.	-0.01037	7457.	4.76E+08	-97.1838	320.0359	0.00
1.5675	0.2904	64748.	2648.	-0.01024	7778.	4.76E+08	-98.9302	337.2328	0.00
1.6500	0.2804	67321.	2550.	-0.01010	8087.	4.76E+08	-100.6204	355.3139	0.00
1.7325	0.2704	69796.	2449.	-0.00996	8384.	4.76E+08	-102.2533	374.3407	0.00
1.8150	0.2606	72171.	2347.	-0.00981	8669.	4.76E+08	-103.8281	394.3796	0.00
1.8975	0.2510	74444.	2244.	-0.00966	8942.	4.76E+08	-105.3438	415.5028	0.00
1.9800	0.2415	76613.	2139.	-0.00950	9203.	4.76E+08	-106.7995	437.7889	0.00
2.0625	0.2322	78678.	2032.	-0.00934	9451.	4.76E+08	-108.1944	461.3231	0.00
2.1450	0.2230	80637.	1925.	-0.00917	9686.	4.76E+08	-109.5273	486.1986	0.00
2.2275	0.2140	82489.	1815.	-0.00900	9909.	4.76E+08	-110.7973	512.5170	0.00
2.3100	0.2052	84232.	1705.	-0.00883	10118.	4.76E+08	-112.0035	540.3894	0.00
2.3925	0.1965	85865.	1594.	-0.00865	10314.	4.76E+08	-113.1448	569.9375	0.00
2.4750	0.1881	87388.	1481.	-0.00847	10497.	4.76E+08	-114.2203	601.2946	0.00
2.5575	0.1798	88798.	1368.	-0.00829	10667.	4.76E+08	-115.2288	634.6073	0.00
2.6400	0.1716	90096.	1253.	-0.00810	10822.	4.76E+08	-116.1693	670.0370	0.00
2.7225	0.1637	91279.	1138.	-0.00791	10965.	4.76E+08	-117.0408	707.7614	0.00
2.8050	0.1560	92348.	1021.	-0.00772	11093.	4.76E+08	-117.8420	747.9772	0.00
2.8875	0.1484	93302.	904.3522	-0.00753	11208.	4.76E+08	-118.5720	790.9019	0.00
2.9700	0.1411	94139.	786.6406	-0.00734	11308.	4.76E+08	-119.2294	836.7769	0.00
3.0525	0.1339	94859.	668.3146	-0.00714	11395.	4.76E+08	-119.8130	885.8705	0.00
3.1350	0.1269	95462.	549.4479	-0.00694	11467.	4.76E+08	-120.3217	938.4819	0.00
3.2175	0.1202	95947.	430.1154	-0.00674	11525.	4.76E+08	-120.7540	994.9454	0.00
3.3000	0.1136	96314.	310.3933	-0.00654	11569.	4.76E+08	-121.1087	1056.	0.00
3.3825	0.1072	96562.	190.3593	-0.00634	11599.	4.76E+08	-121.3843	1121.	0.00
3.4650	0.1010	96691.	70.0924	-0.00614	11615.	4.76E+08	-121.5792	1191.	0.00
3.5475	0.09505	96700.	-50.3267	-0.00594	11616.	4.76E+08	-121.6919	1268.	0.00
3.6300	0.08927	96591.	-170.8160	-0.00574	11603.	4.76E+08	-121.7207	1350.	0.00
3.7125	0.08369	96362.	-291.2913	-0.00554	11575.	4.76E+08	-121.6638	1439.	0.00
3.7950	0.07830	96014.	-411.6670	-0.00534	11533.	4.76E+08	-121.5193	1536.	0.00
3.8775	0.07312	95547.	-531.8552	-0.00514	11477.	4.76E+08	-121.2852	1642.	0.00
3.9600	0.06813	94961.	-651.5262	-0.00494	11407.	4.76E+08	-120.4744	1751.	0.00
4.0425	0.06334	94257.	-769.7188	-0.00474	11322.	4.76E+08	-118.2984	1849.	0.00
4.1250	0.05875	93437.	-885.7417	-0.00455	11224.	4.76E+08	-116.0912	1956.	0.00
4.2075	0.05434	92503.	-999.5633	-0.00435	11112.	4.76E+08	-113.8515	2074.	0.00
4.2900	0.05013	91458.	-1111.	-0.00416	10986.	4.76E+08	-111.5773	2204.	0.00
4.3725	0.04610	90303.	-1220.	-0.00397	10847.	4.76E+08	-109.2668	2346.	0.00
4.4550	0.04226	89041.	-1327.	-0.00379	10696.	4.76E+08	-106.9175	2504.	0.00
4.5375	0.03861	87675.	-1432.	-0.00360	10532.	4.76E+08	-104.5266	2680.	0.00
4.6200	0.03513	86206.	-1534.	-0.00342	10355.	4.76E+08	-102.0909	2877.	0.00
4.7025	0.03184	84637.	-1634.	-0.00324	10167.	4.76E+08	-99.6064	3097.	0.00
4.7850	0.02871	82970.	-1732.	-0.00307	9967.	4.76E+08	-97.0685	3347.	0.00
4.8675	0.02576	81208.	-1826.	-0.00290	9755.	4.76E+08	-94.4714	3631.	0.00
4.9500	0.02298	79354.	-1919.	-0.00273	9532.	4.76E+08	-91.8081	3956.	0.00
5.0325	0.02036	77409.	-2008.	-0.00257	9299.	4.76E+08	-89.0699	4332.	0.00
5.1150	0.01789	75377.	-2095.	-0.00241	9054.	4.76E+08	-86.2458	4772.	0.00
5.1975	0.01559	73261.	-2179.	-0.00225	8800.	4.76E+08	-83.3217	5292.	0.00
5.2800	0.01343	71063.	-2291.	-0.00210	8536.	4.76E+08	-142.7290	10519.	0.00
5.3625	0.01142	68725.	-2428.	-0.00196	8255.	4.76E+08	-135.1642	11714.	0.00
5.4450	0.00956	66255.	-2558.	-0.00182	7959.	4.76E+08	-127.1215	13169.	0.00
5.5275	0.00783	63660.	-2680.	-0.00168	7647.	4.76E+08	-118.4966	14990.	0.00
5.6100	0.00623	60949.	-2792.	-0.00155	7321.	4.76E+08	-109.1330	17352.	0.00
5.6925	0.00475	58131.	-2895.	-0.00143	6983.	4.76E+08	-98.7804	20576.	0.00
5.7750	0.00340	55216.	-2987.	-0.00131	6633.	4.76E+08	-87.0010	25342.	0.00
5.8575	0.00216	52216.	-3066.	-0.00120	6272.	4.76E+08	-72.9068	33439.	0.00
5.9400	0.00103	49145.	-3127.	-0.00109	5903.	4.76E+08	-49.6528	47916.	0.00
6.0225	-5.46E-06	46025.	-3152.	-9.94E-04	5529.	4.76E+08	0.2663	48308.	0.00
6.1050	-9.42E-04	42905.	-3129.	-9.01E-04	5154.	4.76E+08	46.3365	48700.	0.00
6.1875	-0.00179	39830.	-3070.	-8.15E-04	4784.	4.76E+08	71.7538	39684.	0.00
6.2700	-0.00256	36826.	-2986.	-7.35E-04	4424.	4.76E+08	98.8484	38286.	0.00
6.3525	-0.00325	33919.	-2885.	-6.62E-04	4074.	4.76E+08	104.9347	32003.	0.00
6.4350	-0.00387	31114.	-2779.	-5.94E-04	3737.	4.76E+08	109.6234	28069.	0.00
6.5175	-0.00442	28417.	-2668.	-5.32E-04	3414.	4.76E+08	113.3692	25378.	0.00
6.6000	-0.00492	25831.	-2554.	-4.76E-04	3103.	4.76E+08	116.4319	23428.	0.00
6.6825	-0.00536	23359.	-2438.	-4.24E-04	2806.	4.76E+08	118.9765	21957.	0.00
6.7650	-0.00576	21004.	-2319.	-3.78E-04	2523.	4.76E+08	121.1155	20815.	0.00
6.8475	-0.00611	18768.	-2198.	-3.37E-04	2254.	4.76E+08	122.9299	19907.	0.00
6.9300	-0.00643	16652.	-2076.	-3.00E-04	2000.	4.76E+08	124.4806	19173.	0.00
7.0125	-0.00671	14658.	-1952.	-2.67E-04	1761.	4.76E+08	125.8150	18570.	0.00
7.0950	-0.00696	12787.	-1827.	-2.39E-04	1536.	4.76E+08	126.9707	18068.	0.00
7.1775	-0.00718	11041.	-1701.	-2.14E-04	1326.	4.76E+08	127.9786	17645.	0.00
7.2600	-0.00738	9420.	-1573.	-1.93E-04	1132.	4.76E+08	128.8640	17284.	0.00
7.3425	-0.00756	7926.	-1445.	-1.75E-04	952.0426	4.76E+08	129.6485	16973.	0.00
7.4250	-0.00773	6558.	-1317.	-1.60E-04	787.7838	4.76E+08	130.3503	16701.	0.00
7.5075	-0.00788	5319.	-1187.	-1.47E-04	638.8713	4.76E+08	130.9848	16460.	0.00
7.5900	-0.00802	4207.	-1057.	-1.37E-04	505.3799	4.76E+08	131.5653	16243.	0.00
7.6725	-0.00815	3225.	-926.8838	-1.30E-04	387.3778	4.76E+08	132.1032	16046.	0.00
7.7550	-0.00828	2372.	-795.8518	-1.24E-04	284.9284	4.76E+08	132.6080	15864.	0.00
7.8375	-0.00840	1649.	-664.3325	-1.20E-04	198.0912	4.76E+08	133.0877	15694.	0.00
7.9200	-0.00851	1057.	-532.3473	-1.17E-04	126.9226	4.76E+08	133.5490	15532.	0.00
8.0025	-0.00863	595.0366	-399.9120	-1.15E-04	71.4770	4.76E+08	133.9971	15377.	0.00
8.0850	-0.00874	264.7890	-267.0376	-1.14E-04	31.8070	4.76E+08	134.4360	15227.	0.00
8.1675	-0.00885	66.3021	-133.7318	-1.14E-04	7.9643	4.76E+08	134.8687	15082.	0.00
8.2500	-0.00897	0.00	0.00	-1.14E-04	0.00	4.76E+08	135.2966	7470.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

Pile-head deflection = 0.49994332 inches
Computed slope at pile head = -0.01160581 radians
Maximum bending moment = 96700. inch-lbs
Maximum shear force = 3930. lbs
Depth of maximum bending moment = 3.54750000 feet below pile head
Depth of maximum shear force = 0.08250000 feet below pile head
Number of iterations = 36
Number of zero deflection points = 1

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 6190.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.7366	-4.96E-06	6190.	-0.03117	5.95E-07	4.76E+08	0.00	0.00	0.00
0.08250	1.7057	6128.	6190.	-0.03116	736.1193	4.76E+08	0.00	0.00	0.00
0.1650	1.6749	12256.	6190.	-0.03114	1472.	4.76E+08	0.00	0.00	0.00
0.2475	1.6441	18384.	6190.	-0.03111	2208.	4.76E+08	0.00	0.00	0.00
0.3300	1.6133	24512.	6144.	-0.03107	2944.	4.76E+08	-92.4261	56.7173	0.00
0.4125	1.5826	30550.	6051.	-0.03101	3670.	4.76E+08	-95.9272	60.0087	0.00
0.4950	1.5519	36493.	5954.	-0.03094	4384.	4.76E+08	-99.3842	63.3999	0.00
0.5775	1.5213	42339.	5854.	-0.03086	5086.	4.76E+08	-102.7965	66.8953	0.00
0.6600	1.4908	48085.	5751.	-0.03076	5776.	4.76E+08	-106.1632	70.4999	0.00
0.7425	1.4604	53726.	5644.	-0.03066	6454.	4.76E+08	-109.4837	74.2186	0.00
0.8250	1.4301	59260.	5534.	-0.03054	7118.	4.76E+08	-112.7573	78.0570	0.00
0.9075	1.3999	64684.	5421.	-0.03041	7770.	4.76E+08	-115.9831	82.0205	0.00
0.9900	1.3699	69993.	5304.	-0.03027	8408.	4.76E+08	-119.1605	86.1153	0.00
1.0725	1.3400	75186.	5185.	-0.03012	9032.	4.76E+08	-122.2888	90.3477	0.00
1.1550	1.3103	80260.	5062.	-0.02996	9641.	4.76E+08	-125.3671	94.7243	0.00
1.2375	1.2807	85210.	4937.	-0.02978	10236.	4.76E+08	-128.3948	99.2522	0.00
1.3200	1.2513	90034.	4808.	-0.02960	10815.	4.76E+08	-131.3710	103.9388	0.00
1.4025	1.2221	94730.	4677.	-0.02941	11379.	4.76E+08	-134.2950	108.7922	0.00
1.4850	1.1931	99294.	4542.	-0.02921	11927.	4.76E+08	-137.1660	113.8207	0.00
1.5675	1.1642	103724.	4405.	-0.02900	12459.	4.76E+08	-139.9833	119.0332	0.00
1.6500	1.1356	108016.	4265.	-0.02878	12975.	4.76E+08	-142.7460	124.4393	0.00
1.7325	1.1073	112169.	4122.	-0.02855	13474.	4.76E+08	-145.4533	130.0490	0.00
1.8150	1.0791	116178.	3977.	-0.02831	13956.	4.76E+08	-148.1044	135.8731	0.00
1.8975	1.0512	120043.	3829.	-0.02806	14420.	4.76E+08	-150.6984	141.9231	0.00
1.9800	1.0236	123760.	3679.	-0.02781	14866.	4.76E+08	-153.2345	148.2112	0.00
2.0625	0.9961	127327.	3526.	-0.02755	15295.	4.76E+08	-155.7118	154.7505	0.00
2.1450	0.9690	130742.	3371.	-0.02728	15705.	4.76E+08	-158.1293	161.5549	0.00
2.2275	0.9421	134001.	3213.	-0.02700	16096.	4.76E+08	-160.4862	168.6395	0.00
2.3100	0.9155	137103.	3053.	-0.02672	16469.	4.76E+08	-162.7814	176.0204	0.00
2.3925	0.8892	140045.	2891.	-0.02643	16823.	4.76E+08	-165.0140	183.7147	0.00
2.4750	0.8632	142826.	2726.	-0.02614	17157.	4.76E+08	-167.1830	191.7412	0.00
2.5575	0.8375	145443.	2560.	-0.02584	17471.	4.76E+08	-169.2872	200.1197	0.00
2.6400	0.8120	147894.	2391.	-0.02553	17765.	4.76E+08	-171.3255	208.8720	0.00
2.7225	0.7869	150177.	2220.	-0.02522	18040.	4.76E+08	-173.2969	218.0214	0.00
2.8050	0.7621	152290.	2048.	-0.02491	18293.	4.76E+08	-175.2000	227.5932	0.00
2.8875	0.7376	154232.	1873.	-0.02459	18527.	4.76E+08	-177.0335	237.6149	0.00
2.9700	0.7134	156000.	1697.	-0.02427	18739.	4.76E+08	-178.7962	248.1162	0.00
3.0525	0.6895	157593.	1520.	-0.02394	18930.	4.76E+08	-180.4866	259.1299	0.00
3.1350	0.6660	159009.	1340.	-0.02361	19100.	4.76E+08	-182.1032	270.6914	0.00
3.2175	0.6428	160246.	1159.	-0.02328	19249.	4.76E+08	-183.6443	282.8395	0.00
3.3000	0.6199	161303.	976.4445	-0.02294	19376.	4.76E+08	-185.1084	295.6171	0.00
3.3825	0.5974	162179.	792.5016	-0.02261	19481.	4.76E+08	-186.4934	309.0710	0.00
3.4650	0.5752	162872.	607.2276	-0.02227	19565.	4.76E+08	-187.7975	323.2531	0.00
3.5475	0.5533	163382.	420.7036	-0.02193	19626.	4.76E+08	-189.0186	338.2208	0.00
3.6300	0.5317	163705.	233.0130	-0.02159	19665.	4.76E+08	-190.1544	354.0376	0.00
3.7125	0.5105	163843.	44.2414	-0.02125	19681.	4.76E+08	-191.2023	370.7746	0.00
3.7950	0.4897	163793.	-145.5228	-0.02091	19675.	4.76E+08	-192.1597	388.5109	0.00
3.8775	0.4691	163555.	-336.1886	-0.02057	19647.	4.76E+08	-193.0237	407.3355	0.00
3.9600	0.4489	163127.	-527.2775	-0.02023	19595.	4.76E+08	-193.0145	425.6365	0.00
4.0425	0.4291	162511.	-717.2874	-0.01989	19521.	4.76E+08	-190.8440	440.3252	0.00
4.1250	0.4096	161707.	-905.1297	-0.01955	19425.	4.76E+08	-188.6354	455.9741	0.00
4.2075	0.3904	160719.	-1091.	-0.01921	19306.	4.76E+08	-186.3861	472.6824	0.00
4.2900	0.3715	159547.	-1274.	-0.01888	19165.	4.76E+08	-184.0933	490.5644	0.00
4.3725	0.3530	158196.	-1455.	-0.01855	19003.	4.76E+08	-181.7539	509.7525	0.00
4.4550	0.3348	156666.	-1634.	-0.01822	18819.	4.76E+08	-179.3642	530.4006	0.00
4.5375	0.3169	154960.	-1810.	-0.01790	18614.	4.76E+08	-176.9200	552.6892	0.00
4.6200	0.2993	153082.	-1984.	-0.01758	18388.	4.76E+08	-174.4166	576.8311	0.00
4.7025	0.2821	151032.	-2156.	-0.01726	18142.	4.76E+08	-171.8487	603.0796	0.00
4.7850	0.2652	148813.	-2324.	-0.01695	17876.	4.76E+08	-169.2098	631.7387	0.00
4.8675	0.2485	146429.	-2491.	-0.01664	17589.	4.76E+08	-166.4927	663.1766	0.00
4.9500	0.2322	143882.	-2654.	-0.01634	17283.	4.76E+08	-163.6888	697.8438	0.00
5.0325	0.2162	141174.	-2815.	-0.01604	16958.	4.76E+08	-160.7882	736.2986	0.00
5.1150	0.2005	138309.	-2972.	-0.01575	16614.	4.76E+08	-157.7787	779.2413	0.00
5.1975	0.1850	135289.	-3127.	-0.01547	16251.	4.76E+08	-154.6461	827.5640	0.00
5.2800	0.1698	132117.	-3268.	-0.01519	15870.	4.76E+08	-130.2298	759.1701	0.00
5.3625	0.1549	128818.	-3398.	-0.01492	15474.	4.76E+08	-132.4509	846.3821	0.00
5.4450	0.1403	125389.	-3537.	-0.01465	15062.	4.76E+08	-148.8962	1051.	0.00
5.5275	0.1259	121814.	-3700.	-0.01440	14633.	4.76E+08	-178.9359	1407.	0.00
5.6100	0.1118	118063.	-3892.	-0.01415	14182.	4.76E+08	-209.0359	1851.	0.00
5.6925	0.09790	114108.	-4114.	-0.01390	13707.	4.76E+08	-239.1971	2419.	0.00
5.7750	0.08426	109919.	-4365.	-0.01367	13204.	4.76E+08	-269.4219	3166.	0.00
5.8575	0.07083	105465.	-4647.	-0.01345	12669.	4.76E+08	-299.7142	4189.	0.00
5.9400	0.05763	100717.	-4942.	-0.01323	12098.	4.76E+08	-296.9830	5102.	0.00
6.0225	0.04463	95679.	-5223.	-0.01303	11493.	4.76E+08	-269.9030	5987.	0.00
6.1050	0.03183	90376.	-5474.	-0.01283	10856.	4.76E+08	-237.0353	7371.	0.00
6.1875	0.01922	84840.	-5687.	-0.01265	10191.	4.76E+08	-194.2302	10004.	0.00
6.2700	0.00678	79115.	-5846.	-0.01248	9503.	4.76E+08	-126.1760	18415.	0.00
6.3525	-0.00549	73265.	-5849.	-0.01232	8801.	4.76E+08	119.6273	21565.	0.00
6.4350	-0.01762	67533.	-5711.	-0.01218	8112.	4.76E+08	160.1252	8999.	0.00
6.5175	-0.02960	61958.	-5541.	-0.01204	7442.	4.76E+08	182.3159	6098.	0.00
6.6000	-0.04146	56561.	-5353.	-0.01192	6794.	4.76E+08	198.3386	4736.	0.00
6.6825	-0.05320	51359.	-5150.	-0.01181	6169.	4.76E+08	211.0978	3928.	0.00
6.7650	-0.06483	46364.	-4936.	-0.01170	5569.	4.76E+08	221.7996	3387.	0.00

6.8475	-0.07637	41586.	-4712.	-0.01161	4995.	4.76E+08	231.0718	2995.	0.00
6.9300	-0.08783	37035.	-4479.	-0.01153	4449.	4.76E+08	239.2873	2697.	0.00
7.0125	-0.09920	32718.	-4238.	-0.01146	3930.	4.76E+08	246.6870	2462.	0.00
7.0950	-0.1105	28643.	-3991.	-0.01139	3441.	4.76E+08	253.4363	2270.	0.00
7.1775	-0.1218	24816.	-3737.	-0.01134	2981.	4.76E+08	259.6543	2111.	0.00
7.2600	-0.1330	21244.	-3477.	-0.01129	2552.	4.76E+08	265.4297	1976.	0.00
7.3425	-0.1441	17932.	-3211.	-0.01125	2154.	4.76E+08	270.8304	1860.	0.00
7.4250	-0.1552	14885.	-2941.	-0.01122	1788.	4.76E+08	275.9096	1760.	0.00
7.5075	-0.1663	12109.	-2665.	-0.01119	1455.	4.76E+08	280.7100	1671.	0.00
7.5900	-0.1774	9608.	-2385.	-0.01117	1154.	4.76E+08	285.2659	1592.	0.00
7.6725	-0.1884	7386.	-2101.	-0.01115	887.2458	4.76E+08	289.6058	1522.	0.00
7.7550	-0.1995	5449.	-1812.	-0.01113	654.4913	4.76E+08	293.7534	1458.	0.00
7.8375	-0.2105	3799.	-1519.	-0.01112	456.3208	4.76E+08	297.7284	1400.	0.00
7.9200	-0.2215	2441.	-1222.	-0.01112	293.2023	4.76E+08	301.5476	1348.	0.00
8.0025	-0.2325	1378.	-922.0386	-0.01111	165.5855	4.76E+08	305.2253	1300.	0.00
8.0850	-0.2435	615.2358	-618.1090	-0.01111	73.9033	4.76E+08	308.7738	1255.	0.00
8.1675	-0.2545	154.6225	-310.7251	-0.01111	18.5736	4.76E+08	312.2036	1214.	0.00
8.2500	-0.2655	0.00	0.00	-0.01111	0.00	4.76E+08	315.5239	588.2739	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection            =     1.73659467 inches
Computed slope at pile head     =    -0.03116759 radians
Maximum bending moment          =        163843. inch-lbs
Maximum shear force             =          6190. lbs
Depth of maximum bending moment =     3.71250000 feet below pile head
Depth of maximum shear force    =     0.08250000 feet below pile head
Number of iterations            =             62
Number of zero deflection points =             1
```

Summary of Pile-head Responses for Conventional Analyses

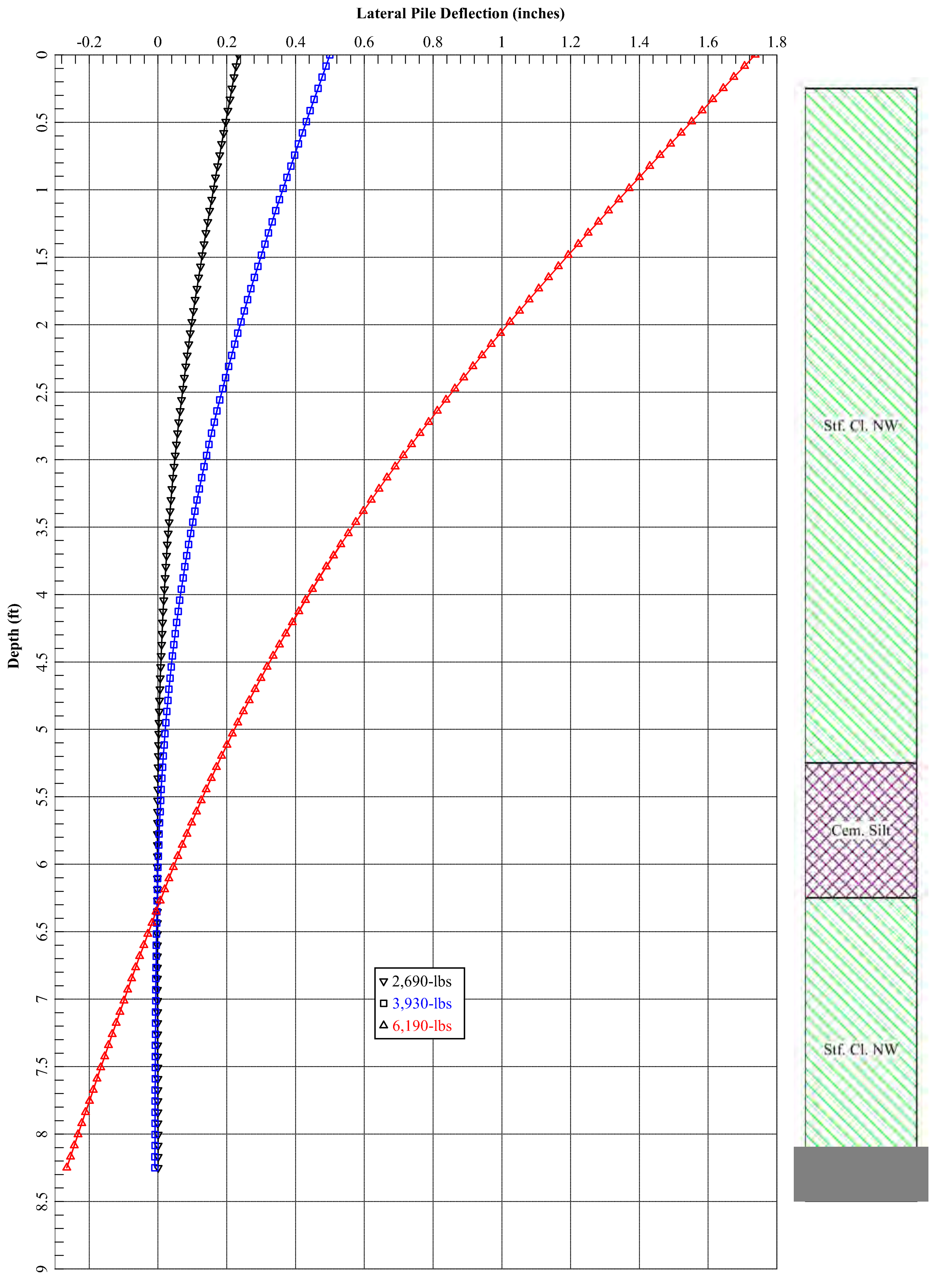
Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	V, lb	2690.	M, in-lb	0.00	0.00	0.2336	-0.00617	2690.	58805.
2	V, lb	3930.	M, in-lb	0.00	0.00	0.4999	-0.01161	3930.	96700.
3	V, lb	6190.	M, in-lb	0.00	0.00	1.7366	-0.03117	6190.	163843.

Maximum pile-head deflection = 1.7365946684 inches
Maximum pile-head rotation   = -0.0311675854 radians = -1.785771 deg.

The analysis ended normally.



Lateral Pile Deflection (inches)
-0.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Depth (ft)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
2,690-lbs
3,930-lbs
6,190-lbs
Stf. Cl. NW
Cem. Silt
Stf. Cl. NW