



Subgrade & Light Tower Exploration Report (DRAFT)  
TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area  
Summit County, Ohio  
S&ME Project No. 24170232D

PREPARED FOR:

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**November 3, 2025**



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Youngstown, OH 44503

Attention: Mr. Brian Hughes, PE

Reference: **Subgrade & Light Tower Exploration Report (DRAFT)**  
**TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area (PID 122880)**  
Summit County, Ohio  
S&ME Project No. 24170232D

Mr. Hughes:

In accordance with our proposal dated July 11, 2025, which was authorized on August 5, 2025, by ms consultants, inc. (ms), S&ME has completed a Geotechnical Exploration for a proposed truck parking facility at the vacant rest area along northbound IR 77 approximately 0.5 miles north of Wise Road in Summit County, Ohio. The SUM-77 Vacant Rest Area is known as Site 12 within the TP 26 NE Ohio project. The approximate location of this project is illustrated on the Vicinity Map included as Plate 1 in Appendix I of this report.

In accordance with Section 701 of the ODOT *Specifications for Geotechnical Explorations (SGE)*, S&ME is herewith submitting a "draft" version of this report, which is to be reviewed by the ODOT District Geotechnical Engineer. A final version of this report will be prepared following receipt of all review comments on our draft report and all necessary design information. Additionally, S&ME is preparing the Geotechnical Profile sheets and will submit these drawings under separate cover.

We appreciate having been given the opportunity to be of service. Please do not hesitate to contact us if you have any further questions regarding this report.

Sincerely,

**S&ME, Inc.**

Brian K. Sears, P.E.  
Senior Engineer | Project Manager

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Submitted: Email Copy (bhughes@msconsultants.com)

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## 1.0 Executive Summary

An overview of this project and the findings of this geotechnical exploration are presented below. This summary should not be used in place of the more detailed recommendations presented in the remainder of this report.

Category (Section Reference)	Project Overview/Geotechnical Findings
<b>Project Description</b> (Section 2.0)	Construct a new truck parking area at the vacant rest area along northbound IR 77 approximately 0.5 miles north of Wise Road. The project includes a parking area for 25 trucks, along with entrance/exit ramps and overhead lighting.
<b>Exploration Program</b> (Section 4.0)	Twelve (12) borings were performed for the truck parking area, associated ramps and proposed light towers. See Table 4-1 for a summary of the borings.
<b>Subsurface Conditions</b> (Section 5.0)	<p><i>Surface Materials:</i> Four (4) borings were advanced through existing pavement (including prior chemical stabilization) and 8 borings through existing rootmat. Table 5-1 summarizes the type and thicknesses of surficial materials encountered.</p> <p><i>Natural Soil:</i> Primarily very stiff to hard cohesive soil (A-4a, A-6a, A-6b) with discontinuous layers of loose to dense sand and/or gravel (A-1-b, A-2-4, A-3, A-4a).</p> <p><i>Groundwater:</i> Variable amounts of groundwater were noted between the depths of 7.5 and 22.5 feet in five (5) of the 12 borings drilled at this site.</p>
<b>Subgrade Support Parameters</b> (Section 6.2.1)	Average California Bearing Ratio (CBR) of 8%. Resilient Modulus ( $M_R$ ) of 9,600 psi.
<b>Subgrade Remediation</b> (Section 6.2.2)	None of the borings performed for this exploration encountered unsuitable or unstable soil that the Subgrade Analysis spreadsheet indicated may require subgrade remediation.
<b>Groundwater Considerations</b> (Sections 6.4 and 7.4)	Significant groundwater issues are not anticipated in connection with the proposed roadway or light tower foundation construction. Construction surfaces should be graded to prevent pooling of water on the predominantly cohesive soils at the site.
<b>Light Tower Foundations</b> (Section 7.0)	Light tower foundations are recommended to be 36 inches in diameter and 8 feet below proposed grade with reinforcement as detailed in ODOT SCD HL-20.21.

## 2.0 Introduction

This project includes the construction of a new truck parking area (Site 12) at an existing vacant rest area along the northbound (NB) direction of IR 77 approximately 0.5 north of Wise Road in Summit County, Ohio. Site improvements will include new asphalt pavement along proposed ramp alignments and parking areas along with light towers surrounding the parking area and standard highway light poles along the ramps. A latrine facility is also proposed at each parking area but was not included as part of the scope of work for this exploration. The parking area is proposed to accommodate approximately 25 truck parking spots.



This geotechnical exploration was performed in general accordance with the July 2025 ODOT *Specifications for Geotechnical Explorations (SGE)* and ODOT *Geotechnical Design Manual (GDM)*.

## 3.0 Geology and Observations of the Project

### 3.1 Geology

This project lies within a previously glaciated portion of Ohio within the Akron-Canton Interlobate Plateau Physiographic Region where the overburden soil typically consists of sandy Wisconsinan-age glacial drift. Bedrock topography mapping indicates the uppermost bedrock is anticipated near Elevation (El.) 1130 to El. 1145 (approximately 10 to 20 feet below the existing ground surface) and consists of Pennsylvanian-age shale, siltstone, and sandstone. However, historical boring information near this site indicates bedrock may be slightly deeper, between approximate El. 1106 and El. 1130. Bedrock was not encountered above El. 1128.4 in the borings performed in this geotechnical exploration.

The primary groundwater aquifer is anticipated to be within the Pennsylvanian-age sedimentary bedrock, developing yields from 10 to 25 gallons per minute (gpm). Water well logs indicate that permanent production water wells for households near the parking area are extended into bedrock with test pumping rates ranging from 20 to 50 gpm.

A review of the ODNR resources indicates the site is not in an area known to contain karst bedrock features or be subject to severe slope failure. Borings and plan information from a 2003 mine subsidence project performed along this portion of IR 77 did not encounter mine voids at Site 12; however, mine voids were encountered roughly 0.5 miles south of Site 12.

Please refer to the S&ME Desktop Study Report dated June 18, 2025, for a more detailed discussion of the site geology.

### 3.2 Reconnaissance

S&ME, accompanied by a representative from Stone Environmental, visited Site 12 on May 12, 2025. S&ME returned to the site on August 12, 2025, to mark boring locations and assess access and traffic control requirements to complete the proposed boring program. The following existing site features were noted during our reconnaissance and boring layout visits. Please refer to the S&ME Desktop Study Report dated June 18, 2025, for additional observations and photos of the site.

- The existing drainage swale adjacent to the NB outside shoulder of IR 77 was roughly 2 feet deep.
- Existing grass areas are relatively flat.
- An approximate 18-inch diameter circular concrete culvert (without a headwall) was noted on the south end of the Site 12 entrance ramp, slightly north of the "FOOD – EXIT 118" roadway sign.
- Approximately 350 feet north of the above 18-inch culvert, the inlet of a double barrel elliptical culvert (approximate dimensions of 3.5 to 4 feet high and 4.5 to 5 feet wide) was noted. This double culvert carries an existing stream beneath IR 77.
- A dump pile of used drainage pipe was found just inside (east of) the tree line at the eastern end of the Site 12 parking area.



- A 48-inch diameter circular concrete culvert running beneath IR 77 was located north of the parking area and near the beginning of the on-ramp to NB IR 77.
- Areas of possible wetlands were observed adjacent to and within the tree line bordering the east side of the parking area and near the two culverts on the southern portion of the site.

### **3.3 Available Information**

S&ME searched the online ODOT Transportation Information Mapping System (TIMS) for historic soil boring information in the project vicinity. Within TIMS, multiple previous geotechnical explorations were identified.

The 1960 SUM-8-1.89 project included borings along the centerline of the current IR 77 along with three lines of three borings spanning the width of the IR 77 corridor. The borings encountered interbedded layers of sand/gravel (A-1-a, A-1-b, A-2-4, A-3a, A-4b) and cohesive soils (A-4a, A-6b). Several samples from these borings had an elevated water content (i.e., near to or above the liquid limit) and two borings were noted to have "trace of organic" in samples near the then existing ground surface.

An embankment foundation investigation (STA/SUM-8-(14.00)(0.00)) was performed in 1962 and included eight (8) borings drilled in the vicinity of the Site 12 parking area. Five (5) of these borings encountered layers of organic clay or peat (described as fine textured peat or sedimentary peat) to depths ranging from 2 to 11 feet and two (2) additional borings encountered materials described as "compressible material".

A 2003 preliminary mine subsidence investigation was also performed along the portion of IR 77 west of Site 12. These borings were generally drilled in the outside shoulder pavement of SB IR-77. No sampling was performed in these geohazard borings; however, bedrock was encountered in multiple borings within the project limits of Site 12 between El. 1105.8 and El. 1129.5, with coal encountered in two of the borings.

The historic information summarized above did not meet current ODOT specifications and therefore was not incorporated into this geotechnical exploration for the proposed parking area. Please refer to the S&ME Desktop Study Report dated June 18, 2025, for a more detailed discussion of the historic information available at the site.

## **4.0 Exploration**

### **4.1 Field Investigation**

Between August 25 to 27, 2025, a total of 12 borings were performed within the proposed parking area and ramps in the NB direction. Table 4-1 provides a summary of the borings performed for the project, including their purpose and termination depth. For the remainder of this report, the borings will be referred to without the offset or two-year designation (i.e., B-001). The approximate locations of these borings are shown on the Plan of Borings included as Plates 2A through 2C in Appendix I.



**Table 4-1 – Summary of Project Borings**

Eastbound Truck Parking Area		
Boring ID	Termination Depth (ft)	Purpose
B-001-0-25	8.0	Subgrade
B-002-0-25	8.0	Subgrade
B-003-0-25	7.0	Subgrade
B-004-0-25	7.0	Subgrade
B-005-0-25	25.0	Subgrade/Light Tower
B-006-0-25	25.0	Subgrade/Light Tower
B-007-0-25	25.0	Subgrade/Light Tower
B-008-0-25	25.0	Subgrade/Light Tower
B-009-0-25	25.0	Subgrade/Culvert
B-010-0-25	7.0	Subgrade
B-011-0-25	8.0	Subgrade
B-012-0-25	8.0	Subgrade

The borings were performed by an ATV-mounted drilling rig using a 3¼-inch I.D. hollow-stem auger to advance the borings between sampling attempts. Disturbed but representative soil samples were obtained by lowering a 2-inch O.D. split-barrel sampler to the bottom of the boring and then driving the sampler into the soil with blows from a 140-pound hammer freely falling 30 inches (AASHTO T206 - Standard Penetration Test). Six (6) feet of continuous SPT sampling were attempted in each boring, beginning near the anticipated subgrade level. Borings performed for the proposed light poles were sampled at 2.5-foot intervals to depths outside of the continuously sampled subgrade zone. SPT samples were examined immediately after recovery and representative portions were preserved in airtight jars. In accordance with the ODOT SGE, the hammer system on the drill rig used for this exploration was calibrated in accordance with ASTM D4633 on December 30, 2024, and has a drill rod energy of 91.0%. In accordance with the ODOT SGE, the energy ratio has been limited to 90%.

Groundwater observations were made as the borings were being advanced, and again after the completion of drilling. Water was added inside the hollow-stem auger at depths of 18.5 and 15 feet in Borings B-007 and B-008, respectively, to reduce heave within granular soils encountered in borings. At the completion of drilling, the borings were backfilled with soil cuttings mixed with bentonite and, where advanced through existing pavement, the surface of the road was repaired with cold-patch asphalt.

In the field, experienced S&ME personnel performed the following: 1) examined all samples recovered from the borings; 2) preserved representative portions of all samples in airtight glass jars; 3) prepared a log of each boring; 4) made seepage and groundwater observations; 5) made hand-penetrometer measurements in soil specimens exhibiting cohesion; and, 6) provided liaison between the field work and the Project Engineer so the exploration program could be modified in the event unusual or unexpected subsurface conditions were encountered. All recovered samples were transported to the soil laboratory of S&ME for further examination and testing.



## **4.2 Laboratory Testing**

In the laboratory, moisture-content testing was performed on all recovered soil samples. Classification testing (liquid/plastic limit determinations and/or grain-size analyses) was performed on two (2) soil samples recovered from each subgrade boring. Sulfate testing was performed on a representative specimen obtained from within 3 feet of the approximate pavement subgrade level in each boring. The results of these laboratory tests are recorded numerically on the individual boring logs.

Based upon the results of the laboratory testing program, the field logs were modified, if necessary, and copies of the laboratory-corrected boring logs are submitted as Plates 4 through 15 of Appendix I. Shown on these logs are: descriptions of the soil stratigraphy encountered; depths from which samples were preserved; sampling efforts (blow-counts) required to obtain the specimens in the borings; calculated  $N_{60}$  values; laboratory testing results; seepage and groundwater observations made at the time of drilling; and, values of hand-penetrometer measurements made in soil samples exhibiting cohesion. For your reference, hand-penetrometer values are roughly equivalent to the unconfined compressive strength of the cohesive fraction of the soil sample.

Soils have been classified in general accordance with Section 603 of the ODOT *SGE* and described in general in accordance with Section 602. An explanation of the symbols and terms used on the boring logs, definitions of the special adjectives used to denote the minor soil components and information pertaining to sampling and identification are presented on Plate 3 of Appendix I. Group Indices determined from the results of the laboratory testing program are also provided on the boring logs.

## **5.0 Findings**

### **5.1 Existing Surficial Materials**

Pavement materials were encountered in the four (4) borings (B-001, B-002, B-011, B-012) drilled through the existing shoulder pavement of IR 77. At each boring performed within the existing shoulder of IR 77, approximately 12 to 14 inches of previously chemically stabilized subgrade soil was encountered beneath the granular base. The remaining borings were performed in grassy areas outside of the IR 77 pavement and encountered a variable thickness of rootmat. The existing surficial materials encountered in the borings are summarized in Table 5-1.

**Table 5-1 – Existing Pavement or Rootmat Thicknesses**

Boring No.	Asphalt (in.)	Granular Base (in.)*	Rootmat (in.)
B-001-0-25	14	6	-
B-002-0-25	18	6	-
B-003-0-25	-	-	4
B-004-0-25	-	-	3
B-005-0-25	-	-	2
B-006-0-25	-	-	3
B-007-0-25	-	-	3
B-008-0-25	-	-	3
B-009-0-25	-	-	2
B-010-0-25	-	-	3
B-011-0-25	18	6	-
B-012-0-25	17	6	-

\* The granular base was underlain by approximately 12 to 14 inches of previously chemically stabilized subgrade soil.

## 5.2 Subsurface Stratigraphy

Beneath the surficial materials summarized above, the borings encountered natural soil consisting of predominantly very stiff to hard brown or gray SANDY SILT (A-4a), SILT AND CLAY (A-6a) and SILTY CLAY (A-6b). A few medium stiff to stiff zones were noted in Borings B-003, B-005 and B-006. Discontinuous layers of loose to very dense brown or gray GRAVEL WITH SAND (A-1-b), GRAVEL WITH SAND AND SILT (A-2-4), FINE SAND (A-3) and SANDY SILT (A-4a) were encountered in seven (7) of the borings. Cobbles were encountered at a depth of 10.5 feet in Boring B-007.

## 5.3 Groundwater Observations

During drilling, variable amounts of groundwater were noted in the five (5) light tower or culvert borings (B-005 through B-009) between the depths of 7.5 and 22.5 feet. Please refer to the individual boring logs for more detailed descriptions of the quantity and depth(s) where groundwater was observed or measured. Extended water level readings were not obtained in the borings. Groundwater measurements obtained from the borings should be considered as temporary, short-term observations and should not be assumed to be representative of the long-term static groundwater level.

## 5.4 Soil Sulfate Test Results

Sulfate content testing was performed in accordance with ODOT Supplement 1122 on samples of soil obtained from within 3 feet of the proposed subgrade level in each boring. The results of these tests ranged from 100 parts per million (ppm) to 940 ppm. These results are below the threshold value of 5,000 ppm that has been identified by the ODOT GDM as the sulfate concentration above which chemical stabilization should not be performed. The results of these tests are reported on the individual boring logs and on Plate 16 in Appendix I.



## 6.0 Analysis and Recommendations

### 6.1 General Discussion

Based on Stage 2 plans dated September 12, 2025, the following improvements are being proposed at Site 12, SUM-77 Vacant Rest Area:

- Construction of 16-foot-wide entrance/exit ramps, and a through drive with a 3-foot-wide inside (left) shoulder and a 12-foot-wide outside (right) shoulder.
- Construction of an approximate 200-foot wide and 425-foot-long truck parking area with 25 spaces.
- Regrading of the site to create a ground surface sloping down and away from the pavement at an inclination no steeper than 3(H):1(V).
- Construct an asphalt pavement section consisting of 10 inches of asphalt over 6 inches aggregate base.
- The proposed profile of the ramp and through lane for the NB parking area will generally follow the existing ground surface with less than 2 feet of grade change anticipated, except from approximate Sta. 182+60 to Sta. 183+50 (near the extension of an existing 48-inch diameter culvert) where up to 8.5 feet of new fill will be required.
- Cross sections indicate minor amounts of new fill (less than 4 feet) will be required on the right side of the ramp embankment in some locations, except from approximately Sta. to Sta. 183+50 where up to 12 feet of new fill will be required to construct the parking area or ramp embankments (outside of the ramp pavement).
- Minor amounts of cut (less than 3 feet) within portions of the proposed roadways along most of the project.
- Four (4), 45-foot-tall high mast light towers are proposed at the parking area.
- An existing 48-inch reinforced concrete pipe culvert at Sta. 182+59.92 on Ramp S (exit ramp to IR 77 NB) is to be extended approximately 55 feet to the south with a half-height headwall at the new outlet location. Two other minor (15 to 24-inch diameter) existing culverts at the site will be extended 8 to 19 feet to the south.
- A pit latrine and dumpster pad will be constructed at each parking area. The pit latrine is being designed by others and explorations for this facility were not included in the scope of this exploration.

### 6.2 Subgrade Assessment

#### 6.2.1 Subgrade Support Parameters

Section 600 of the ODOT *GDM* provides a standard approach to performing explorations and assessing roadway subgrades. The associated spreadsheet (Ver. 14.81, updated 7/21/2025) created by the ODOT Office of Geotechnical Engineering (OGE) is used to estimate roadway subgrade support parameters and identify areas requiring remediation. The spreadsheet (see Appendix II) summarizes the soil type (by ODOT/HRB classification), group indices, depth, blow-counts, Atterberg Limit, and sulfate content values of the proposed subgrade soils encountered in the borings drilled for this project. Using this data, this spreadsheet computes an average of the estimated values of the California Bearing Ratio (CBR) for the soils encountered at or below the anticipated subgrade level of the proposed roadway profile.

Based on the profile elevation data for the proposed ramp and parking area pavements, the following average CBR has been computed by the ODOT Subgrade Analysis spreadsheet for use during new pavement design at the parking area based on the anticipated subgrade soils encountered in the borings performed for this project.





$$\text{CBR} = 8\%$$

Based on this average CBR value and Section 203.1 of the current ODOT *Pavement Design Manual (PDM)*, the following value of Resilient Modulus ( $M_R$ ) correlates to this average CBR value.

$$M_R = 9,600 \text{ psi}$$

These subgrade support values may be used during new pavement thickness design for this project provided that the entire proposed pavement subgrade is prepared in strict accordance with Item 204 of the ODOT *CMS*, and that all borrow soil placed within 3 feet of the final subgrade elevation of the new pavement provides average subgrade support parameters which meet or exceed the above values. This subgrade evaluation also assumes that the subgrade for the new roadway pavements is composed of the materials encountered in the borings. If, at the time of construction, it is determined that the subgrade consists of materials different than those encountered in the borings, the pavement design subgrade criteria should be reviewed and, if necessary, modified.

### 6.2.2 Subgrade Remediation Assessment

The ODOT Subgrade Analysis spreadsheet also identifies subgrade soils which are "unsuitable" either by classification (A-4b, A-2-5, A-5, A-7-5, A-8a, A-8b) or if the Liquid Limit value is greater than 65%. The spreadsheet also determines if a subgrade soil may be potentially "unstable" and possibly require subgrade remediation by comparing the lab-measured moisture content to the estimated optimum moisture content of the subgrade soil, and/or by comparing the normalized blow-count ( $N_{60}$ ) and the lowest N value ( $N_{60L}$ ) from SPT sampling.

Based on these comparisons and correlations, the Subgrade Analysis spreadsheet provides alternative approaches to remediate and establish a stable soil subgrade using either an "excavate and replace" (ODOT *CMS* Item 204) approach, or chemical stabilization (*CMS* Item 206 and Supplement 1120). However, soils with a sulfate content above 5,000 ppm are generally prohibited from being chemically stabilized.

The subgrade remediation depths identified by the Subgrade Analysis spreadsheet presented in Appendix II are based on the conditions encountered in the borings during this subsurface investigation. However, because the required amount of remediation is dependent on the moisture content of the subgrade soil at the time of construction, Section 600 of the ODOT *GDM* states that the ultimate decision on required remediation depths and limits should be based on observations during either proofrolling or test-rolling operations at the time of construction.

Based on the results of the borings and the Subgrade Analysis spreadsheet, none of the borings at this site encountered soil identified as unsuitable (by soil classification) or potentially being unstable (low  $N_{60}$ , low hand penetrometer or high moisture content). As such, the need for subgrade remediation is not anticipated at the site. However, because of the variable nature of the wide spacing of the explorations, it is possible that areas of unstable or unsuitable soils may be encountered during earthwork and proofrolling operations. If such conditions are encountered, refer to the procedures described in Section 6.3 below.

## 6.3 General Roadway/Pavement Construction Considerations

Based on the Stage 2 plan and profile information provided to S&ME, we are providing the following recommendations for preparation and construction of the subgrade or embankment for this project.



### 6.3.1 *Subgrade Preparation*

Prior to the commencement of earthwork operations, it is recommended that all existing pavement, granular base, grass, topsoil, vegetation, and other miscellaneous materials be completely removed from the entire footprint of the proposed pavement subgrades. Following the removal of these materials, it is recommended that the entire exposed subgrade be examined by the Geotechnical Engineer of Record or their designated representative to identify any weak, wet, organic, or otherwise unsuitable soils that were not encountered during the subsurface exploration. Any such materials identified should be removed and replaced with suitable compacted fill (ODOT *Construction and Material Specifications, CMS*, Item 204, or Item 203 when more than 12 inches below the proposed subgrade). Test rolling (Item 206.04) of these areas prior to commencing fill placement may assist in identifying soft weak and wet areas.

Existing underground utilities are anticipated beneath the proposed pavement areas, and the type of material used and the relative compactness of backfill within any such utility trenches are unknown. S&ME recommends any planned utility relocation or removal be performed prior to final subgrade proofrolling. Some instability of utility trench backfill may occur during earthwork operations and/or proofrolling, and some recompaction of granular utility trench backfill may become necessary. Additionally, if water has accumulated within the utility backfill, the subgrade soil in the vicinity of any saturated utility trenches may have become sufficiently weak, soft, and/or wet that proofrolling may identify these additional areas as requiring overexcavation and replacement. In any case, care should be taken not to disturb any shallow utilities during proofrolling or overexcavation activities.

### 6.3.2 *"At-Grade"/"Cut" Soil Subgrade Areas*

Once the desired soil subgrade elevation has been attained in all "at-grade" and "cut" subgrade areas, the subgrade soil beneath the entire new pavement areas should be scarified and recompacted to a depth of 12 inches below the subgrade level in accordance with ODOT *CMS* Item 204.03. During recompaction, the moisture content of the subgrade soil should be maintained or adjusted in accordance with ODOT *CMS* Item 203.07.A.

Following the completion of the scarification and recompaction of the subgrade in these "cut"/"at-grade" areas, it is strongly recommended that construction traffic be restricted from traveling on the compacted subgrade until final acceptance proofrolling has been performed. Additionally, the surface of the subgrade should be graded to drain, as cohesive subgrade soils which are subjected to repeated moisture fluctuations resulting from exposure to rainfall and/or surface water runoff, may exhibit subgrade instability.

### 6.3.3 *"Fill" Areas*

Prior to commencing fill placement in pavement areas to attain the proposed subgrade near the edges of the ramps or in the NB parking area, S&ME recommends that consideration be given to performing Item 206.04 Test Rolling on all exposed embankment foundation areas beneath areas where new fill is required. Test rolling, performed in accordance with Item 204.06 of the ODOT *CMS* and Section 204 of the ODOT *Construction Administration Manual of Procedures*, would assist in identifying soft, wet, or weak zones, or areas of unsuitable, organic, or highly plastic soil that may be present. If any such zones of soft, wet, or weak soils are present, the materials contained in these zones should be scarified, dried, and thoroughly recompacted in place in accordance with ODOT *CMS* Item 203.07. If unsuitable or organic soils are encountered, these materials should be completely removed and the overexcavation filled in a controlled manner with compacted, suitable embankment material (*CMS* Item 203.02) which meet the additional requirements previously discussed in Section 6.2.1 and discussed later in Section 6.3.5.

Soft, weak, wet, or unsuitable soils that are not removed where only a thin layer of fill is required may result in difficulties achieving the compaction percentages required for the new fill (ODOT CMS Items 203.07 or 204.03) such that final subgrade acceptance proofrolling may require the removal of the new fill. Although the ODOT CMS Item 203.05 permits the use of a “bridge lift” to aid in spanning soft or wet foundation areas, S&ME recommends that this practice not be permitted unless more than 3 feet of new embankment fill placement is required.

A review of the Stage 2 plans indicates that the inclination of existing ground surface ranges from approximately 4H:1V to 10H:1V (or flatter), with proposed new fill embankment slopes ranging from 3H:1V to 8H:1V. Based on these shallow existing and proposed slope inclinations and the presence of existing predominantly very stiff to hard cohesive soils below the proposed new fill, S&ME believes that, properly constructed, these new fill slopes will be stable, and as such, stability analyses were not performed.

#### 6.3.4 *Benching*

After all unsuitable materials have been removed and prior to commencing fill placement, it is recommended that horizontal benches be cut into all existing sloping surfaces steeper than 8(H):1(V) to permit placement and compaction of new fill in horizontal lifts. Where new fill is to be placed on an existing ground surface with a slope between 8(H):1(V) and 4(H):1(V), S&ME recommends that benching of the existing ground be performed in accordance with Item 203.05 of the ODOT CMS. At locations where the existing ground surface is steeper than 4(H):1(V), S&ME recommends “Special Benchening” procedures as outlined in Section 800 of the ODOT GDM. **If “Special Benchening” is required, Plan Note G109 from the ODOT L&D Manual, Vol. 3, should be included in the General Notes.**

During any required Special Benchening procedures, S&ME also recommends the following: 1) only one bench be exposed at any given time and that excavation of the next bench should not be permitted until embankment fill placement and compaction has been completed to the top of the backslope of the previous bench; and, 2) the length of any given bench that is exposed should not exceed the quantity of embankment fill which may be properly placed and compacted in one day. Additionally, S&ME recommends that the final, completed side slopes of embankments be constructed no steeper than 2(H):1(V).

#### 6.3.5 *Borrow Requirements and Compaction Criteria*

Soil used as fill/backfill for the construction of the proposed embankments/subgrades should consist of inorganic soil free of all miscellaneous materials, cobbles, and boulders. The soil should be placed in uniform, thin layers and then compacted (based on the dry unit weight of the type of soil fill being placed as borrow) in accordance with:

- CMS Item 203.07.B when below 12 inches of the proposed subgrade level; and,
- CMS Item 204.03 when within 12 inches of the proposed subgrade level.

Borrow materials should not be placed in a frozen condition or upon a frozen surface, and any sloping surfaces on which new fill is to be placed should first be benched in accordance with either ODOT CMS Item 203.05 or Section 800 of the ODOT GDM, depending on the slope of the existing ground surface at each location.

Borrow materials to be used as new fill or backfill within 3 feet of the proposed subgrade level of the new pavement should be tested in the laboratory to determine that the borrow materials exhibit subgrade support characteristics that are no less than the CBR value used during the pavement design (see Section 6.2.1).

S&ME also recommends that once the source of borrow for this project is determined, sampling and testing of this borrow material be performed prior to construction to verify that the borrow soils are suitable for the planned construction. Based on the findings of the exploration at the parking area, the soils encountered may be considered suitable for use as embankment fill provided the materials meet the requirements of CMS Item 203.02.R and the recommendations provided in this report.

#### *6.3.6 Moisture Conditioning and Subgrade Protection*

Moisture conditioning and protection of pavement subgrade areas, before and after compaction, should be performed in accordance with CMS Item 203, including maintaining drainage as discussed in CMS Item 203.04.A. The predominantly cohesive soils encountered in the borings performed for this project are susceptible to absorbing additional moisture and weakening.

#### *6.3.7 Final Subgrade Preparation*

The subgrade should be proof rolled in accordance with CMS Item 204.06, with any weak or unstable areas being repaired. S&ME recommends that construction traffic be minimized once the required subgrade level has been attained.

### **6.4 Groundwater Considerations During Construction**

Based upon observations made at the time of this investigation, significant groundwater problems are not anticipated in connection with the proposed construction. The new pavement subgrade should be graded to prevent surface runoff from pooling on the cohesive soils during construction as exposure of cohesive soils to moisture will result in a decrease in strength and an increase in compressibility. Soil softened by standing water or disturbed by construction activities should be removed before proceeding with construction.

In addition to proper subgrade preparation, we recommend that the pavement design and construction include surface and subsurface drainage measures. Water which infiltrates the pavement and remains trapped within the pavement components during traffic loading is one of the leading causes of premature pavement failure. Effective design measures include the use of perforated underdrain pipes or finger drains below pavements and/or the use of perimeter swales, perimeter edge drains, curbs, or a combination of these features to collect surface water runoff from areas adjacent to the pavement. Cohesive subgrade soils should be crowned or sloped to promote drainage of infiltrating water towards subsurface drainage collection systems.

## **7.0 Light Tower Foundations**

### **7.1 High Mast Light Tower Foundation Design Approach**

The ODOT *Geotechnical Design Manual (GDM)* Section 1202 provides direction for performing analyses to determine the foundation/embedment length for light towers. Additional information is provided on ODOT's Standard Construction Drawing (SCD) HL-20.21 "Light Tower Foundations".

Based on information provided by ms on October 20, 2025, the light towers proposed at the parking area are to be 45-foot-tall towers with a 36-inch diameter drilled shaft foundation. ODOT SCD HL-20.21 provides guidance on the type, size, and quantity of longitudinal and transverse reinforcement within each drilled shaft. The length (depth) of the drilled shaft foundation is based on meeting criteria given in the ODOT *GDM*. However, the ODOT *GDM* does not indicate a minimum foundation length for given light tower heights.

According to Section 1202 of the ODOT *GDM*, drilled shaft foundations for light towers are geotechnically acceptable with respect to the anticipated lateral loading provided the following conditions are true:

- Service Limit State Loading – The maximum resultant deflection at the top of the light tower is less than 10% of the above ground height of the tower. The maximum resultant deflection is defined as the sum of the deflection at the top of the foundation (shaft head) plus the lateral rotation (in radians) at the top of the shaft (in radians) multiplied by the height of the light tower above the top of the shaft. As all light towers proposed for this project have a height of 45 feet, the maximum Service Limit deflection is equal to 54 inches (45 feet = 540 inches).
- Extreme Limit State – LPILE does not calculate a very large deflection (typically around 100 inches) or an infinite or incalculable deflection (i.e., the program fails to converge on a solution).

## 7.2 Light Tower Foundations – Lateral (LPILE) Analysis Parameters

Section 1202 of the ODOT *GDM* indicates a design wind speed of 76 mph should be used for the Service Limit State analyses and a speed of 115 mph during the Extreme Limit State analyses. Based on these wind speeds and the anticipated height and weight of the proposed towers, ms provided the following load combinations for use in the lateral load (LPILE) analyses.

- Service Limit State Loading (LPILE Load Case 1):
  - Shear (V) = 1,000 lbs; Moment (M) = 315,600 in-lbs; Weight (W) = 4,200 lbs
- Extreme Limit State Loading (LPILE Load Case 2) (maximum weight):
  - Shear (V) = 2,250 lbs; Moment (M) = 724,800 in-lbs; Weight (W) = 4,600 lbs
- Strength Limit State Loading (LPILE Load Case 3) (minimum weight):
  - Shear (V) = 2,250 lbs; Moment (M) = 724,800 in-lbs; Weight (W) = 3,800 lbs

Lateral load analyses were performed using the software LPILE 2022 using the input parameters above and the soil parameters summarized in Appendix III on Plates 1 and 2. In accordance with Section 1201 of the ODOT *GDM*, the upper three feet of the soil profile in these analyses has been modeled as a soft clay to account for soils weakened by freeze-thaw or other disturbance.

The top elevation in each soil parameter table corresponds to the elevation at the proposed ground surface at each proposed light tower as provided by ms in their email dated October 20, 2025. However, per ODOT SCD HL-20.21, the drilled shaft foundation will rise 6 to 12 inches above the surrounding ground surface. As such, a stick-up height of 12 inches has been used in our analyses.

## 7.3 Light Tower Foundations – Lateral Load Analysis Summary

Table 7-1 provides a summary of the deflection, moment, and shear values calculated from the lateral loading analyses for the proposed 45-foot-tall light towers. The deflection values calculated in the Service Limit State

analyses meet the *GDM* criteria given above and the analyses for the Extreme Limit State achieved convergence. However, it should be noted the structural resistance of the drilled shaft foundations should be verified to ensure the foundations can withstand the maximum moment and shear forces computed by the LPILE program and which are summarized in Table 7-1. Based on the results of our analyses, S&ME recommends a minimum 8-foot embedment length for all light tower foundations proposed at this project site. LPILE output from each analysis is provided in Appendix III.

**Table 7-1 – Summary of Lateral Load Analysis Results – NB Parking Area**

Light Tower Location & Boring ID	Limit State*	Minimum Embedment Depth (ft)	Lateral Deflection at Shaft Head (in)	Slope at Shaft Head (rad)	Lateral Deflection at Top of Pole (in)	Total Deflection (in)	Max. Moment (kip-in)	Max. Shear (kips)
TN-13 (B-005-0-25)	SER-I	8	0.0085	0.00014	0.076	0.084	---	---
	EXT-I (+)		---	---	---	---	806.5	24.5
	EXT-I (-)		---	---	---	---	806.4	24.4
TN-10 (B-006-0-25)	SER-I	8	0.018	0.000277	0.15	0.17	---	---
	EXT-I (+)		---	---	---	---	797.5	25.4
	EXT-I (-)		---	---	---	---	797.3	25.4
TN-12 (B-007-0-25)	SER-I	8	0.0078	0.000135	0.073	0.081	---	---
	EXT-I (+)		---	---	---	---	807.7	24.0
	EXT-I (-)		---	---	---	---	807.6	24.0
TN-9 (B-008-0-25)	SER-I	8	0.015	0.000209	0.11	0.13	---	---
	EXT-I (+)		---	---	---	---	801.8	19.9
	EXT-I (-)		---	---	---	---	801.7	19.9

\* (+) indicates Extreme Limit State with maximum weight and (-) indicates Extreme Limit State with minimum weight

## 7.4 Light Tower Foundation Plan Notes

Based on the results of our axial and lateral load analyses and the conditions encountered in the borings, we recommend the following plan note be provided in the plans regarding the light tower foundations.

### **Light Tower Foundation, Misc.: 36" x 8' Deep, As Per Plan**

For the 45-foot-tall High-Mast Light Towers, at all locations, perform drilled shaft foundation excavation and construction in accordance with C&MS 524. Predominantly cohesive soils were encountered in all the nearby project soil borings (B-005-25 through B-008-0-25) along the length of the drilled shafts, so foundation excavation by the Dry Construction Method, in accordance with C&MS 524.04.A, may be anticipated. See the attached soil borings for specific details. At all light tower locations, the drilled shafts shall be 36-inch diameter and penetrate 8 feet deep into the ground below finished grade (exclusive of any above-grade pedestal height for mounting). Steel reinforcement for the drilled shaft foundations shall be in accordance with standard construction drawing HL-20.21.





## **7.5 Groundwater Considerations for Light Tower Foundations**

During this exploration, no significant groundwater was encountered in the borings drilled for the light towers above the anticipated tip elevation of the drilled shafts. Accordingly, no significant quantities of water are anticipated during excavation of the 8-foot-deep foundation at each of the light tower locations. Some water seepage may enter the foundation excavations through sand seams or desiccation cracks; however, the quantity of water is expected to be limited and may likely be controlled by bailing or using portable pumps.

It is recommended that groundwater (if encountered) should not be allowed to accumulate in the light tower foundation excavations, and that surface water runoff be directed away from the foundation excavations both during and after construction, as the cohesive soil in the walls and at the bottom of the light tower excavations will become soft and weaken when exposed to water. Additionally, the excavations should not be left open, as the excavation walls may exhibit instability in the presence of construction vibrations.

## **8.0 Limitations and Final Considerations**

This draft report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty, either expressed or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.

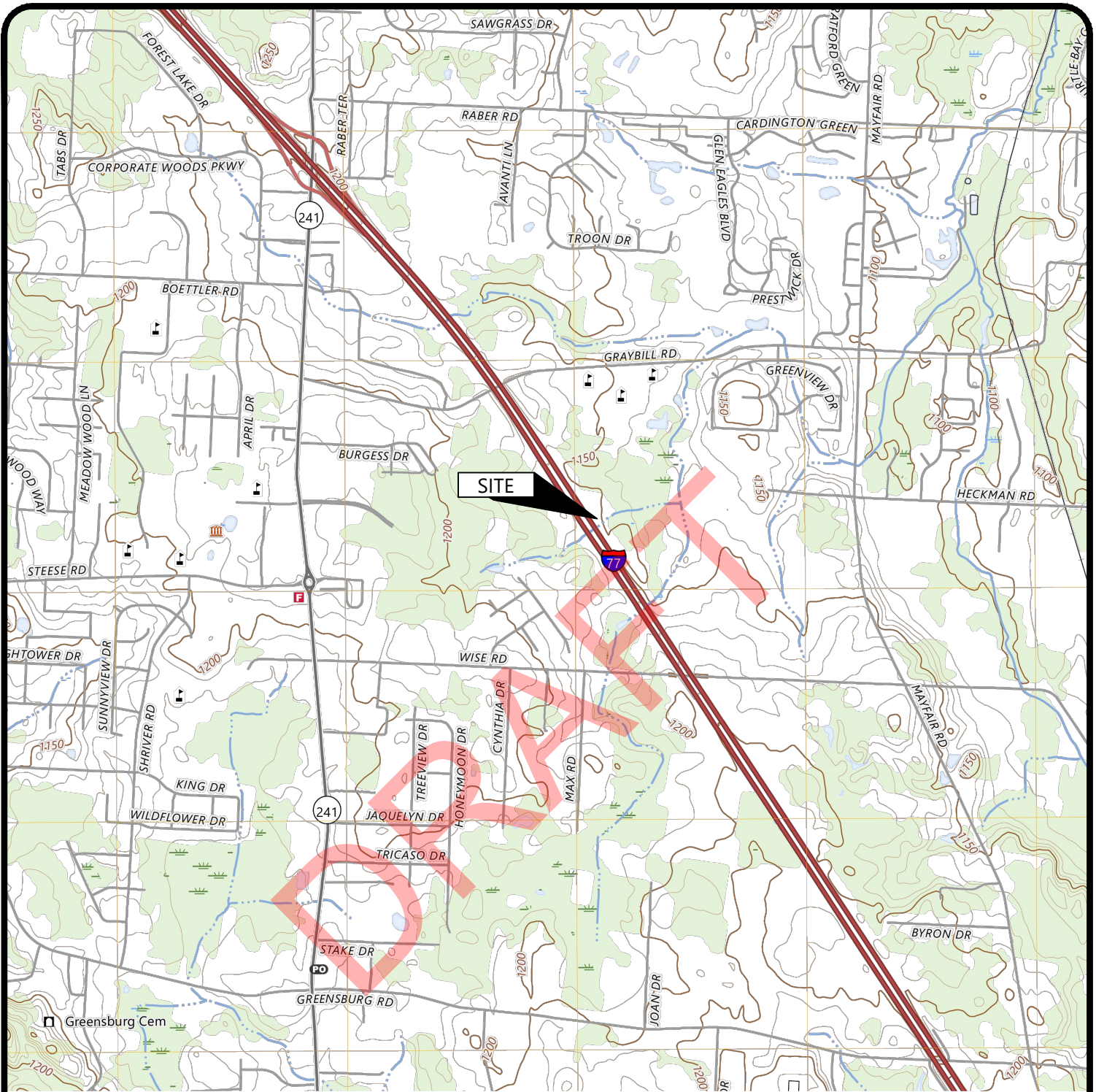
## Appendices

DRAFT



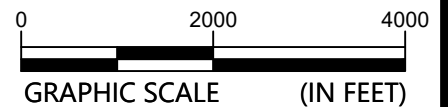
## **Appendix I – General Information**

Drawing Path: T:\Columbus-1170\Projects\2024\24170232\_ms\_TP 26 NE Ohio\GEO\CAD\DWG\Site 12 SUM-77 VMAP.dwg



Project Location  
Summit County, Ohio

USGS Mapping:  
North Canton USGS Quad



GRAPHIC SCALE (IN FEET)



### Vicinity Map

Subgrade & Structure Foundation Exploration  
TP 26 NE Ohio Site 12 - SUM-77 Vacant Rest Area  
Summit County, Ohio

SCALE:  
GRAPHIC  
DATE:  
09-10-2025  
PROJECT NUMBER  
24170232D

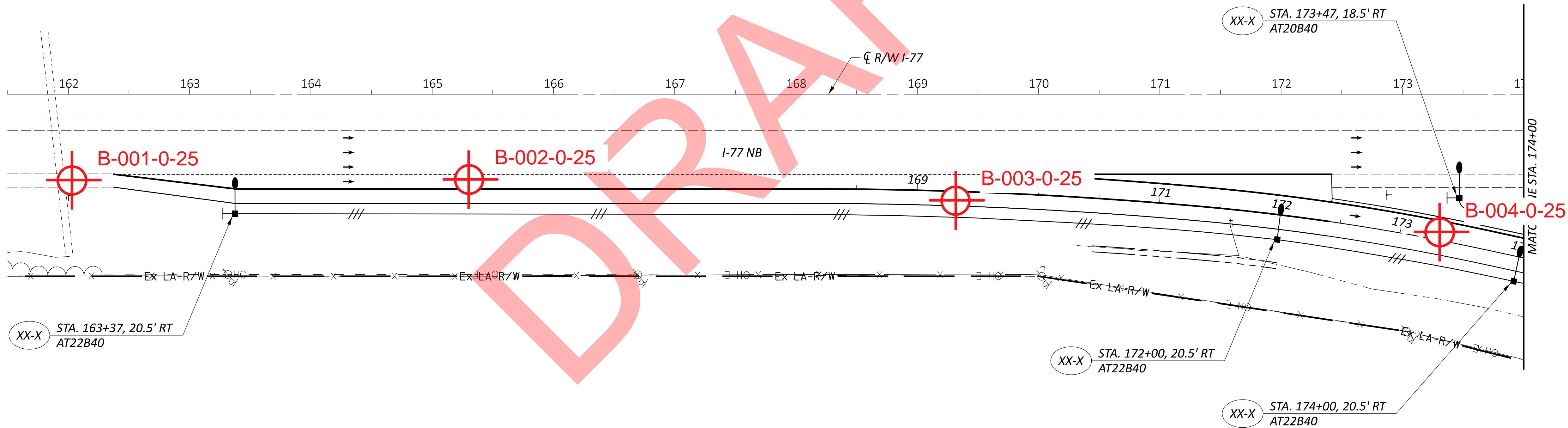
FIGURE NO.

1

LEGEND

B-001-0-25

Soil Boring Location



NOTES:

- OFFSETS TO LIGHT POLES/TOWERS ARE FROM NEAREST EOP.
- OFFSETS TO PULL BOXES ARE FROM E/C.



LEGEND

B-001-0-25

Soil Boring Location



PLAN LEGEND

- XX-X

LIGHT POLE W/ LED LUMINAIRE
- F

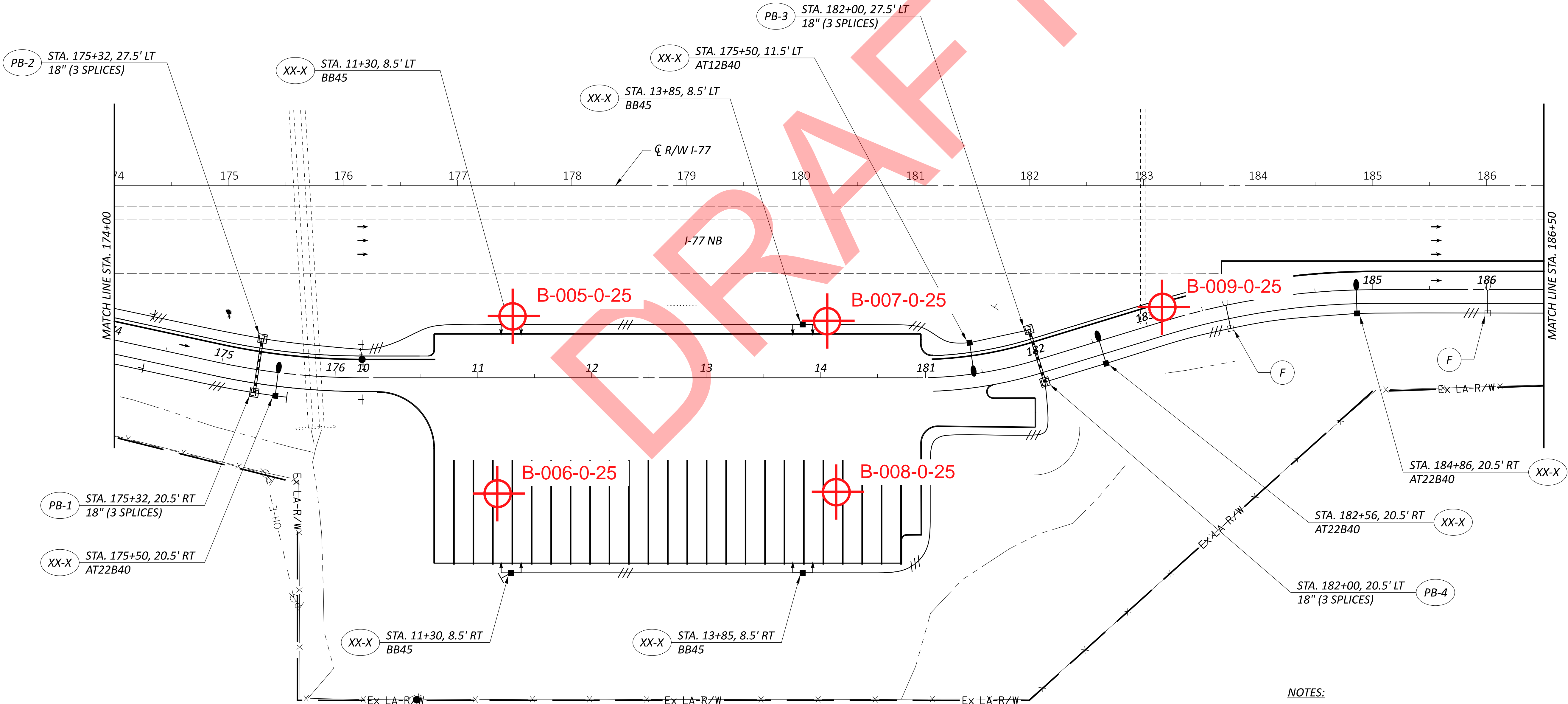
FUTURE LIGHT POLE LOCATION
- XX-X

HIGH MAST LIGHT TOWER W/ 2-LED ASYMMETRIC LUMINAIRES
- PB-X

PULL BOX (LIGHTING), 725.08 (BY SIZE)
- PROPOSED POWER SERVICE
- 1-1/2" DUCT CABLE W/ 3-WIRE NO. X AWG
- 3" CONDUIT, 725.04 W/ 3-WIRE NO. X AWG DISTRIBUTION CABLE
- STUB & CAP CONDUIT ELL



SHEET TITLE  
SHEET SUB-TITLE



NOTES:

1. OFFSETS TO LIGHT POLES/TOWERS ARE FROM NEAREST EOP.
2. OFFSETS TO PULL BOXES ARE FROM E/C.

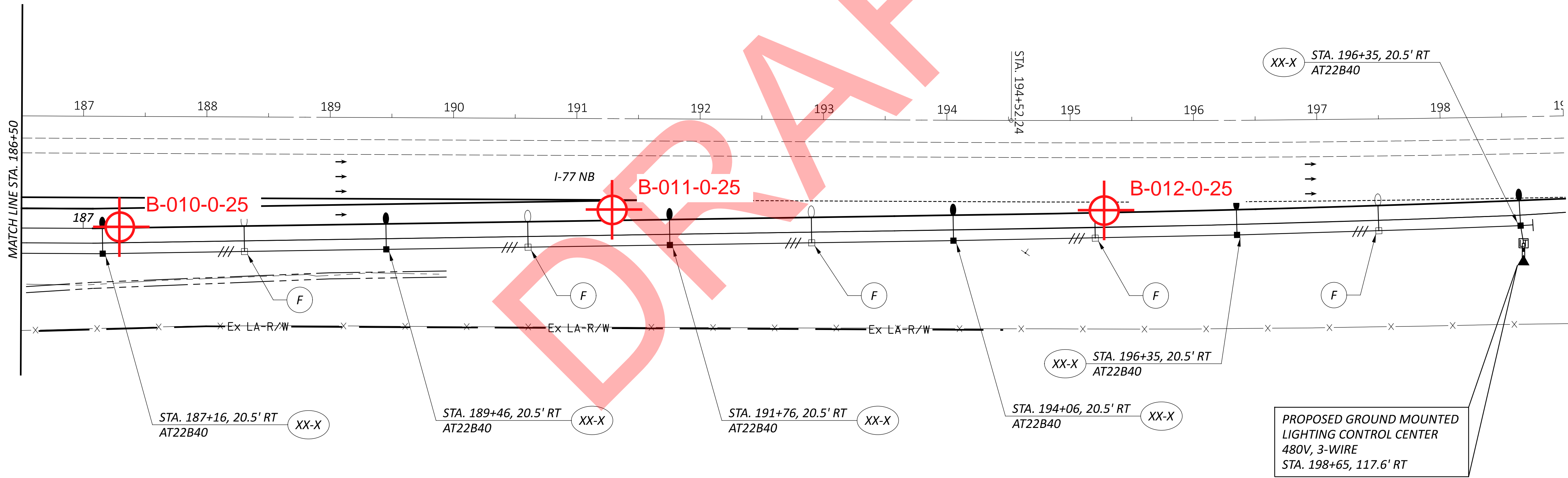
PLATE 2B

DESIGN AGENCY	
DESIGNER	XXX
REVIEWER	XXX MM-DD-YY
PROJECT ID	0
SHEET	P.0
TOTAL	0

LEGEND

B-001-0-25

Soil Boring Location



NOTES:

- OFFSETS TO LIGHT POLES/TOWERS ARE FROM NEAREST EOP.
- OFFSETS TO PULL BOXES ARE FROM E/C.

PLATE 2C



PLAN LEGEND

XX-X

LIGHT POLE W/ LED LUMINAIRE

F

FUTURE LIGHT POLE LOCATION

XX-X

HIGH MAST LIGHT TOWER W/ 2-LED ASYMMETRIC LUMINAIRES

PB-X

PULL BOX (LIGHTING), 725.08 (BY SIZE)

PROPOSED POWER SERVICE

---

1-1/2" DUCT CABLE W/ 3-WIRE NO. X AWG

---

3" CONDUIT, 725.04 W/ 3-WIRE NO. X AWG DISTRIBUTION CABLE

STUB & CAP CONDUIT ELL

SHEET TITLE  
SHEET SUB-TITLE

DESIGN AGENCY

DESIGNER

XXX

REVIEWER

XXX MM-DD-YY

PROJECT ID

0

SHEET

P.0

TOTAL

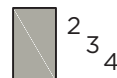
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# ODOT SOIL LOG

## LEGEND



The **STANDARD PENETRATION TEST (SPT)** as defined by AASHTO T206 (or ASTM D1586) is a method to obtain a disturbed soil sample for examination and testing and to obtain relative density and consistency information. A standard 1.4-inch I.D./2-inch O.D. split-barrel sampler is driven three 6-inch increments (see graphic at right) with a 140 lb. hammer freely falling 30 inches. The hammer can either be of a trip, free-fall design, or actuated by a rope and cathead. The SPT N Value is determined by adding the number of blows from the 2nd and 3rd 6-inch increments.



**SPT BLOWCOUNT CORRECTION FOR HAMMER EFFICIENCY** ( $N_{60}$ ) is determined by the following equation:  $N_{60} = N * [ \text{Drill Rod Energy Ratio} (\%) / 60 ]$ , and where the drill rod energy ratio is determined in accordance with ASTM D4633. If the drill rod energy ratio exceeds 90%, it is limited to 90% to determine the  $N_{60}$  value and is shown on the log as 90\*.

**SHELBY TUBE (ST)** samples are obtained by hydraulically pushing a thin-walled tube (typically 3-inches in diameter) to obtain a relatively undisturbed sample for testing of fine-grained soils to determine engineering properties such as strength, compressibility, permeability, and density. Shelby tubes are sampled in general accordance with ASTM D1587 (AASHTO T207).



**DESCRIPTIVE ORDER OF SOIL STRATA:** Consistency/Density, color, ODOT soil classification description, minor soil constituents with percentage modifiers, organic content, miscellaneous constituents or descriptions, relative moisture condition.

### ODOT SOIL CLASSIFICATION DESCRIPTION AND SYMBOL

	<b>GRAVEL</b> (A-1-a)		<b>SILT</b> (A-4-b)		<b>ORGANIC CLAY</b> (A-8-b)
	<b>GRAVEL WITH SAND</b> (A-1-B)		<b>ELASTIC SILT AND CLAY</b> (A-5)		<b>PEAT</b>
	<b>FINE SAND</b> (A-3)		<b>SILT AND CLAY</b> (A-6-a)		<b>UNCONTROLLED FILL</b>
	<b>COARSE AND FINE SAND</b> (A-3-a)		<b>SILTY CLAY</b> (A-6-b)		<b>BOULDERY ZONE</b>
	<b>GRAVEL WITH SAND AND SILT</b> (A-2-4 OR A-2-5)		<b>ELASTIC CLAY</b> (A-7-5)		<b>SOD/ROOTMAT/TOPSOIL</b>
	<b>GRAVEL WITH SAND, SILT AND CLAY</b> (A-2-6 OR A-2-7)		<b>CLAY</b> (A-7-6)		<b>PAVEMENT OR BASE</b>
	<b>SANDY SILT</b> (A-4-a)		<b>ORGANIC SILT</b> (A-8-a)		<b>CONCRETE</b>

### SOIL LOG SYMBOLS

<b>SS</b> - Split-Spoon Sample	<b>Qu</b> - Unconfined Compressive Strength	<b>FS</b> - Fine Sand Content, %
<b>ST</b> - Shelby Tube Sample	$\gamma_d$ - Dry Unit Weight, pcf	<b>SI</b> - Silt Content, %
<b>TR</b> - Top of Rock	$\gamma_m$ - Moist Unit Weight, pcf	<b>CL</b> - Clay Content, %
<b>REC</b> - Sample Recovery, %	<b>GR</b> - Gravel Content, %	<b>LL</b> - Liquid Limit
<b>HP</b> - Hand Penetrometer Value, tsf	<b>CS</b> - Coarse Sand Content, %	<b>PL</b> - Plastic Limit
<b>LOI</b> - Loss on Ignition Test, %		<b>PI</b> - Plasticity Index
		<b>WC</b> - Natural Water Content, %

**NOTE:** Particle size contents are expressed % by weight.

### PARTICLE SIZE

Particle	Size	US Sieve Size
Boulder	>300 mm (12 in.)	12 in.
Cobble	75 - 300 mm (3 - 12 in.)	3 - 12 in.
Coarse gravel	19 - 75 mm (3/4 - 3 in.)	3/4 - 3 in.
Fine gravel	2 - 19 mm (0.08 - 3/4 in.)	#10 - 3/4 in.
Coarse sand	0.42 - 2.0 mm	#40 - #10
Fine sand	0.074 - 0.42 mm	#200 - #40
Silt	0.005 - 0.074 mm	NA
Clay	< 0.005 mm	NA

### FINE-GRAINED SOIL (Relative Consistency)

	$N_{60}$	HP
Very soft	< 2 bpf	< 0.25 tsf
Soft	2 - 4 bpf	> 0.25 - 0.5 tsf
Medium stiff	5 - 8 bpf	> 0.5 - 1.0 tsf
Stiff	9 - 15 bpf	> 1.0 - 2.0 tsf
Very stiff	16 - 30 bpf	> 2.0 - 4.0 tsf
Hard	> 30 bpf	> 4.0 tsf

### COARSE-GRAINED SOIL (Relative Density)

	$N_{60}$
Very loose	< 5 bpf
Loose	5 - 10 bpf
Medium dense	11 - 30 bpf
Dense	31 - 50 bpf
Very dense	> 50 bpf

### MINOR CONSTITUENTS (% By Weight)

	Percentage
Trace	0% - 10%
Little	>10% - 20%
Some	>20% - 35%
"And"	≥ 35%

### ORGANIC CONTENT OF SOIL (Determined by ASTM D2974 or AASHTO T267)

Classification	Percentage
Slightly organic	2% - 4%
Moderately organic	>4% - 10%
Highly organic	> 10%

### RELATIVE MOISTURE CONDITION

Dry	Cohesive - Powdery, WC well below PL Granular - No moisture present
Damp	Cohesive - Leaves very little moisture when pressed, WC < PL Granular - Internal moisture, little to no surface moisture
Moist	Cohesive - Leaves moisture when pressed, PL < WC < LL - 3 Granular - Free water on surface, shiny appearance
Wet	Cohesive - Mushy, WC near or above LL Granular - Voids filled with free water

**At Time of Drilling**

**At end of Drilling**

**24 hrs After Drilling**

Free water (seepage or groundwater) observation made anytime during the drilling process. Depending on time of reading and drilling methodologies, this value may be influenced by the drilling process.

Free water measurement soon after the drilling processes are complete, and the borehole is at final depth. Drilling fluids, if introduced during drilling, may influence this measurement.

Free water measurements made in a borehole hours to days after drilling is complete including the time elapsed (i.e., "24 hrs" as shown at left). Depending on subsurface conditions, elapsed time, drilling process, etc. this observation may reflect a stabilized level.

### REFERENCES:

Ohio Department of Transportation (ODOT), Specifications for Geotechnical Explorations (SGE)



PROJECT: SUM-77 TRUCK PARKING	DRILLING FIRM / OPERATOR: OTB / D. HEPNER	DRILL RIG: OTB ATV B-57	STATION / OFFSET: 161+94, 70' RT	EXPLORATION ID
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / K. HARPER	HAMMER: SAFETY HAMMER	ALIGNMENT: CL R/W IR 77	B-001-0-25
PID: 122880 BR ID: N/A	DRILLING METHOD: 2-1/4" HSA	CALIBRATION DATE: 12/30/24	ELEVATION: 1163.2 (MSL) EOB: 8.0 ft.	PAGE
START: 8/25/25 END: 8/25/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 40.946576 N, 81.447730 W	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 14 INCHES	1163.2																		
GRANULAR BASE - 6 INCHES	1162.0	1																	
CEMENT STABILIZED SUBBASE - 14 INCHES	1161.5	2																	
Very stiff to hard brown <b>SANDY SILT</b> , little clay, trace to little fine to coarse gravel, damp.	1160.4	3	13 50/4"	-	100	SS-1	-	-	-	-	-	-	-	-	-	12	Visual (V)	-	
		4	4																
		5	6	20	100	SS-2	2.5	13	8	23	37	19	23	14	9	11	A-4a (4)	200	
Hard brown <b>SILT AND CLAY</b> , some fine to coarse sand, trace fine gravel, damp.	1156.7	6	5																
		7	6	21	100	SS-3	4.5+	9	7	24	41	19	22	15	7	12	A-4a (5)	-	
		8	3																
	1155.2	7	5	17	100	SS-4	4.5+	-	-	-	-	-	-	-	-	16	A-6a (V)	-	
		EOB	6																

NOTES:  
- No water encountered during drilling.  
- After augers were removed, borehole did not cave and was dry.

NOTES: SEE ABOVE  
ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; PLASTIC HOLE PLUG DEVICE; SOIL CUTTINGS MIXED WITH BENTONITE



PROJECT: SUM-77 TRUCK PARKING	DRILLING FIRM / OPERATOR: OTB / D. HEPNER	DRILL RIG: OTB ATV B-57	STATION / OFFSET: 165+30, 71' RT	EXPLORATION ID
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / K. HARPER	HAMMER: SAFETY HAMMER	ALIGNMENT: CL R/W IR 77	B-002-0-25
PID: 122880 BR ID: N/A	DRILLING METHOD: 2-1/4" HSA	CALIBRATION DATE: 12/30/24	ELEVATION: 1157.6 (MSL) EOB: 8.0 ft.	PAGE
START: 8/25/25 END: 8/25/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 40.947350 N, 81.448397 W	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 18 INCHES	1157.6																		
GRANULAR BASE - 6 INCHES	1156.1	1																	
CEMENT STABILIZED SUBBASE - 12 INCHES	1155.6	2	50/4"	-	100	SS-1	-	-	-	-	-	-	-	-	-	6	Visual (V)	-	
Hard brown <b>SANDY SILT</b> , little fine to coarse sand, trace fine to coarse gravel, damp.	1154.6	3																	
		4	5																
	1152.6	5	8 5	20	100	SS-2	4.5+	9	7	20	39	25	24	16	8	15	A-4a (6)	240	
		6	2 5	15	100	SS-3	-	31	15	26	18	10	20	15	5	11	A-2-4 (0)	-	
Loose to medium dense brown <b>GRAVEL WITH SAND AND SILT</b> , trace clay, damp.		7	3	9	100	SS-4	-	-	-	-	-	-	-	-	-	9	A-2-4 (V)	-	
	1149.6	8	3																
		EOB																	

NOTES:  
- No water encountered during drilling.  
- After augers were removed, borehole caved at 5.5' and was dry.

DRAFT





PROJECT: <u>SUM-77 TRUCK PARKING</u>	DRILLING FIRM / OPERATOR: <u>OTB / D. HEPNER</u>	DRILL RIG: <u>OTB ATV B-57</u>	STATION / OFFSET: <u>169+30, 6' RT</u>	EXPLORATION ID: <u>B-003-0-25</u>
TYPE: <u>ROADWAY</u>	SAMPLING FIRM / LOGGER: <u>S&amp;ME / K. HARPER</u>	HAMMER: <u>SAFETY HAMMER</u>	ALIGNMENT: <u>BL RAMP R</u>	
PID: <u>122880</u> BR ID: <u>N/A</u>	DRILLING METHOD: <u>2-1/4" HSA</u>	CALIBRATION DATE: <u>12/30/24</u>	ELEVATION: <u>1152.7 (MSL)</u> EOB: <u>7.0 ft.</u>	PAGE
START: <u>8/25/25</u> END: <u>8/25/25</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>90*</u>	LAT / LONG: <u>40.948289 N, 81.449145 W</u>	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ROOTMAT - 4 INCHES	1152.4																		
Very stiff to hard brown <b>SANDY SILT</b> , little clay, trace to little fine gravel, damp.		1	3																< >
		2	6	24	100	SS-1	4.5+	19	17	24	28	12	25	18	7	11	A-4a (1)	-	< >
		3	5	20	100	SS-2	3.5	6	9	22	43	20	23	16	7	12	A-4a (6)	180	< >
	1148.7	4	4																< >
Very stiff becoming stiff brown <b>SILT AND CLAY</b> , some fine to coarse sand, little fine gravel, damp.		5	4	15	100	SS-3	3.5	-	-	-	-	-	-	-	-	22	A-6a (V)	-	< >
		6	3	9	100	SS-4	1.0-1.5	-	-	-	-	-	-	-	-	19	A-6a (V)	-	< >
	1145.7	7	3																< >
		EOB																	< >

NOTES:

- No water encountered during drilling.
- After augers were removed, borehole did not cave and was dry.

DRAFT



PROJECT: SUM-77 TRUCK PARKING	DRILLING FIRM / OPERATOR: OTB / D. HEPNER	DRILL RIG: OTB ATV B-57	STATION / OFFSET: 173+32, 5' LT	EXPLORATION ID
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / K. HARPER	HAMMER: SAFETY HAMMER	ALIGNMENT: BL RAMP R	B-004-0-25
PID: 122880 BR ID: N/A	DRILLING METHOD: 2-1/4" HSA	CALIBRATION DATE: 12/30/24	ELEVATION: 1151.7 (MSL) EOB: 7.0 ft.	PAGE
START: 8/27/25 END: 8/27/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 40.949254 N, 81.449851 W	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ROOTMAT - 3 INCHES	1151.4																		< >
Hard brown <b>SANDY SILT</b> , little clay, trace to little fine to coarse gravel, damp.		1	9																< >
		2	17 24	62	100	SS-1	4.5+	9	8	25	39	19	22	14	8	8	A-4a (5)	280	< >
		3	10 12 14	39	100	SS-2	4.5+	17	12	27	32	12	18	13	5	8	A-4a (2)	-	< >
		4	7 10 11	32	100	SS-3	4.5+	-	-	-	-	-	-	-	-	8	A-4a (V)	-	< >
Very stiff brown <b>SANDY SILT</b> , little clay, trace fine gravel, damp.	1145.7	5	3			SS-4A	4.5+	-	-	-	-	-	-	-	-	10	A-4a (V)	-	< >
	1144.7	6	3	9	100	SS-4B	3.0	-	-	-	-	-	-	-	-	14	A-4a (V)	-	< >
		7	3																< >
		EOB																	< >

NOTES:

- No water encountered during drilling.
- After augers were removed, borehole did not cave and was dry.

DRAFT



PROJECT: SUM-77 TRUCK PARKING			DRILLING FIRM / OPERATOR: OTB / D. HEPNER			DRILL RIG: OTB ATV B-57			STATION / OFFSET: 11+31, 56' LT			EXPLORATION ID										
TYPE: LIGHT TOWER/ROADWAY			SAMPLING FIRM / LOGGER: S&ME / K. HARPER			HAMMER: SAFETY HAMMER			ALIGNMENT: BL TRUCK PARKING			B-005-0-25										
PID: 122880 BR ID: N/A			DRILLING METHOD: 3-1/4" HSA			CALIBRATION DATE: 12/30/24			ELEVATION: 1153.4 (MSL) EOB: 25.0 ft.			PAGE										
START: 8/27/25 END: 8/27/25			SAMPLING METHOD: SPT			ENERGY RATIO (%): 90*			LAT / LONG: 40.950207 N, 81.450691 W			1 OF 1										
MATERIAL DESCRIPTION AND NOTES			ELEV.	DEPTHS	SPT/RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	SO4 ppm	BACK FILL	
			1153.4							GR	CS	FS	SI	CL	LL	PL	PI	WC				
ROOTMAT - 2 INCHES			1153.2																			
Very stiff to hard brown <b>SANDY SILT</b> , little clay, trace to little fine gravel, few stiff pockets, damp.				1	7																	
				2	12 14	39	100	SS-1	4.5+	7	7	22	42	22	25	15	10	9	A-4a (6)	300		
				3																		
				4	3																	
				5	5 7	18	100	SS-2	3.0- 4.0	10	10	28	33	19	21	13	8	12	A-4a (3)	-		
				6	4 6	18	100	SS-3	4.5+	-	-	-	-	-	-	-	-	-	13	A-4a (V)	-	
				7	4 6																	
				8	4 2	6	100	SS-4	-	-	-	-	-	-	-	-	-	-	14	A-4a (V)	-	
				9	4 4	14	100	SS-5	4.0- 4.5	14	9	25	34	18	20	14	6	12	A-4a (3)	-		
				10	4 5																	
				11	3 4	14	100	SS-6	-	-	-	-	-	-	-	-	-	-	14	A-4a (V)	-	
				12	4 5																	
	13																					
Very stiff gray <b>SANDY SILT</b> , little clay, trace fine gravel, damp.			1139.9																			
	14	2 4	12	100	SS-7	2.5	-	-	-	-	-	-	-	-	-	-	14	A-4a (V)	-			
	15																					
	16	2 3																				
	17	4 4	11	100	SS-8	3.0	7	11	26	39	17	18	13	5	12	A-4a (4)	-					
	18																					
	19	2 4	14	100	SS-9	-	-	-	-	-	-	-	-	-	-	-	14	A-4a (V)	-			
	20	4 5																				
Dense to very dense gray <b>SANDY SILT</b> , little fine to coarse gravel, trace clay, moist to wet.			1132.9																			
	21	7 9	29	100	SS-10	-	15	5	38	39	3	NP	NP	NP	15	A-4a (1)	-					
	22	10																				
	23																					
	24	7 9	32	100	SS-11	-	-	-	-	-	-	-	-	-	-	-	11	A-4a (V)	-			
	25	12																				
			1128.4	EOB																		
NOTES: - Seepage encountered at 7.5' during drilling. - Water encountered at 18.5 during drilling. - After augers were removed, borehole caved at 18.5' and was dry.																						
NOTES: SEE ABOVE																						
ABANDONMENT METHODS. MATERIALS. QUANTITIES: PLASTIC HOLE PLUG DEVICE: SOIL CUTTINGS MIXED WITH BENTONITE																						



PROJECT: SUM-77 TRUCK PARKING			DRILLING FIRM / OPERATOR: OTB / D. HEPNER			DRILL RIG: OTB ATV B-57			STATION / OFFSET: 11+17, 102' RT			EXPLORATION ID								
TYPE: LIGHT TOWER/ROADWAY			SAMPLING FIRM / LOGGER: S&ME / K. HARPER			HAMMER: SAFETY HAMMER			ALIGNMENT: BL TRUCK PARKING			B-006-0-25								
PID: 122880 BR ID: N/A			DRILLING METHOD: 3-1/4" HSA			CALIBRATION DATE: 12/30/24			ELEVATION: 1154.0 (MSL) EOB: 25.0 ft.			PAGE								
START: 8/27/25 END: 8/27/25			SAMPLING METHOD: SPT			ENERGY RATIO (%): 90*			LAT / LONG: 40.950412 N, 81.450182 W			1 OF 1								
MATERIAL DESCRIPTION AND NOTES		ELEV.	DEPTHS	SPT/RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ROOTMAT - 3 INCHES		1154.0							GR	CS	FS	SI	CL	LL	PL	PI				
Hard brown SANDY SILT, little clay, little fine gravel, damp.		1153.7	1	8																
			2	13 14	41	100	SS-1	4.5+	18	20	22	27	13	20	14	6	5	A-4a (1)	340	
		1151.0	3																	
Very stiff to hard brown SILT AND CLAY, some fine to coarse sand, trace fine gravel, damp.			4	6																
			5	9 11	30	100	SS-2	4.5+	9	9	24	36	22	27	15	12	10	A-6a (5)	-	
			6	5 8	26	100	SS-3	4.5+	-	-	-	-	-	-	-	-	10	A-6a (V)	-	
		1146.0	7	6 5	17	100	SS-4	4.5+	-	-	-	-	-	-	-	-	11	A-6a (V)	-	
Medium stiff to stiff brown SILT AND CLAY, some fine to coarse sand, trace fine gravel, damp.		1144.5	8	10 6	17	100	SS-5	1.0	-	-	-	-	-	-	-	-	21	A-6a (V)	-	
			9	5 4																
Stiff to very stiff brown SANDY SILT, little fine gravel, little clay, damp.			10	4 4	12	100	SS-6	1.5	17	9	24	35	15	22	13	9	14	A-4a (3)	-	
			11	3 4																
		1141.0	12	4 4	12	100	SS-7	3.0	-	-	-	-	-	-	-	-	12	A-4a (V)	-	
			13																	
Stiff brown SILT AND CLAY, some fine to coarse sand, trace fine gravel, damp to moist.			14	1 2	6	100	SS-8	1.0	-	-	-	-	-	-	-	-	17	A-6a (V)	-	
			15	2 2																
			16	3 3																
			17	3 3	9	100	SS-9	1.5	-	-	-	-	-	-	-	-	23	A-6a (V)	-	
		1136.0	18																	
Medium dense gray SANDY SILT, little clay, trace fine gravel, damp.			19	3 4	15	100	SS-10	-	8	9	31	39	13	NP	NP	NP	11	A-4a (3)	-	
			20	6 6																
			21	3 4																
		1131.5	22	6 6	15	100	SS-11	-	-	-	-	-	-	-	-	-	9	A-4a (V)	-	
			23																	
Medium dense gray FINE SAND, some coarse sand, trace fine gravel, trace silt, trace clay, wet.			24	5 6	20	100	SS-12	-	-	-	-	-	-	-	-	-	18	A-3 (V)	-	
		1129.0	25	7																
			EOB																	
NOTES: - Seepage encountered at 13.5' during drilling. - Water encountered at 22.5' during drilling.																				
NOTES: SEE ABOVE																				
ABANDONMENT METHODS. MATERIALS. QUANTITIES: PLASTIC HOLE PLUG DEVICE: SOIL CUTTINGS MIXED WITH BENTONITE																				



PROJECT: SUM-77 TRUCK PARKING			DRILLING FIRM / OPERATOR: OTB / D. HEPNER			DRILL RIG: OTB ATV B-57			STATION / OFFSET: 14+12, 97' RT			EXPLORATION ID								
TYPE: LIGHT TOWER/ROADWAY			SAMPLING FIRM / LOGGER: S&ME / K. HARPER			HAMMER: SAFETY HAMMER			ALIGNMENT: BL TRUCK PARKING			B-007-0-25								
PID: 122880 BR ID: N/A			DRILLING METHOD: 3-1/4" HSA			CALIBRATION DATE: 12/30/24			ELEVATION: 1156.1 (MSL) EOB: 25.0 ft.			PAGE								
START: 8/26/25 END: 8/26/25			SAMPLING METHOD: SPT			ENERGY RATIO (%): 90*			LAT / LONG: 40.951081 N, 81.450786 W			1 OF 1								
MATERIAL DESCRIPTION AND NOTES		ELEV.	DEPTHS	SPT/RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	SO4 ppm	BACK FILL
ROOTMAT - 3 INCHES		1156.1							GR	CS	FS	SI	CL	LL	PL	PI	WC			
Hard (est.) brown SANDY SILT, some fine gravel, little clay, damp.		1155.8	1	5																
			2	9 12	32	100	SS-1	-	23	18	22	25	12	23	17	6	5	A-4a (0)	320	
			3																	
		1152.1	4	3																
Very stiff brown SILT AND CLAY, trace fine to coarse sand, damp.		1150.6	5	3 4	11	100	SS-2	3.0	3	3	10	55	29	33	20	13	20	A-6a (9)	-	
Very stiff to hard brown SANDY SILT, little clay, trace fine gravel, damp.		1149.1	6	4 5 8	20	100	SS-3	3.5-4.5	-	-	-	-	-	-	-	-	13	A-4a (V)	-	
Very stiff brown SILT AND CLAY, some fine to coarse sand, trace fine gravel, damp.		1147.6	7	3 5 7	18	100	SS-4	2.0	-	-	-	-	-	-	-	-	18	A-6a (V)	-	
Medium dense brown SANDY SILT, little clay, trace fine to coarse gravel, damp.			8																	
			9	3 5	12	100	SS-5	-	8	9	37	34	12	17	13	4	13	A-4a (2)	-	
- Encountered cobble at 10.5'.			10																	
			11	3 4																
		1143.1	12	4 4	12	100	SS-6	-	-	-	-	-	-	-	-	-	16	A-4a (V)	-	
Medium dense brown GRAVEL WITH SAND, little silt, trace clay, wet.			13																	
			14	6 9 8	26	100	SS-7	-	41	22	19	16	2	NP	NP	NP	15	A-1-b (0)	-	
			15																	
			16	7 6 7	20	100	SS-8	-	-	-	-	-	-	-	-	-	15	A-1-b (V)	-	
		1138.1	17																	
Loose gray FINE SAND, some coarse sand, trace silt, trace fine gravel, trace clay, wet.			18																	
			19	2 2 2	6	100	SS-9	-	4	23	63	8	2	NP	NP	NP	18	A-3 (0)	-	
		1134.8	20																	
Very stiff to hard gray SANDY SILT, little clay, trace fine gravel, wet.			21	5 12 14	39	100	SS-10A SS-10B	- 4.5+	-	-	-	-	-	-	-	-	22 11	A-3 (V) A-4a (V)	- -	
			22																	
			23																	
		1131.1	24	7 9 12	32	100	SS-11	3.0-4.5+	-	-	-	-	-	-	-	-	11	A-4a (V)	-	
			25																	
EOB																				
NOTES: - Water encountered at 13.5' during drilling. - Water added inside HSA at 18.5' to reduce heave.																				
NOTES: SEE ABOVE																				
ABANDONMENT METHODS. MATERIALS. QUANTITIES: PLASTIC HOLE PLUG DEVICE: SOIL CUTTINGS MIXED WITH BENTONITE																				



PROJECT: SUM-77 TRUCK PARKING			DRILLING FIRM / OPERATOR: OTB / D. HEPNER			DRILL RIG: OTB ATV B-57			STATION / OFFSET: 14+12, 51' LT			EXPLORATION ID										
TYPE: LIGHT TOWER/ROADWAY			SAMPLING FIRM / LOGGER: S&ME / K. HARPER			HAMMER: SAFETY HAMMER			ALIGNMENT: BL TRUCK PARKING			B-008-0-25										
PID: 122880 BR ID: N/A			DRILLING METHOD: 3-1/4" HSA			CALIBRATION DATE: 12/30/24			ELEVATION: 1155.7 (MSL) EOB: 25.0 ft.			PAGE										
START: 8/26/25 END: 8/26/25			SAMPLING METHOD: SPT			ENERGY RATIO (%): 90*			LAT / LONG: 40.950860 N, 81.451234 W			1 OF 1										
MATERIAL DESCRIPTION AND NOTES			ELEV.	DEPTHS	SPT/RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	SO4 ppm	BACK FILL	
ROOTMAT - 3 INCHES			1155.7							GR	CS	FS	SI	CL	LL	PL	PI	WC				
Hard brown SANDY SILT, little to some clay, trace to little fine gravel, damp.			1155.4	1	7																	
				2	10	30	100	SS-1	4.5+	8	6	21	42	23	23	15	8	10	A-4a (6)	100		
				3	3	21	100	SS-2	4.5+	13	9	22	38	18	21	15	6	13	A-4a (4)	-		
				4	3	24	100	SS-3	4.5+	-	-	-	-	-	-	-	-	16	A-4a (V)	-		
Medium dense gray SANDY SILT, little clay, trace fine gravel, few brown fine sand pockets, damp.			1150.2	5	6	10	24	100	SS-3	4.5+	-	-	-	-	-	-	-	16	A-4a (V)	-		
				6	3	21	100	SS-4	-	8	12	27	41	12	18	14	4	12	A-4a (4)	-		
Very stiff gray SANDY SILT, little clay, trace fine gravel, damp.			1148.2	7	6	8	21	100	SS-4	-	8	12	27	41	12	18	14	4	12	A-4a (4)	-	
				8																		
Medium dense to dense gray SANDY SILT, little fine gravel, trace clay, moist to wet.			1145.2	9	3	5	18	100	SS-5	3.0	-	-	-	-	-	-	-	13	A-4a (V)	-		
				10	5	7	18	100	SS-5	3.0	-	-	-	-	-	-	-	-	13	A-4a (V)	-	
				11	4	6	18	100	SS-6	-	-	-	-	-	-	-	-	-	16	A-4a (V)	-	
				12	6	6	18	100	SS-6	-	-	-	-	-	-	-	-	-	16	A-4a (V)	-	
				13	5	7	21	100	SS-7	-	-	-	-	-	-	-	-	15	A-4a (V)	-		
				14	7	7	21	100	SS-7	-	-	-	-	-	-	-	-	-	15	A-4a (V)	-	
				15																		
				16	5	7	21	100	SS-8	-	12	10	40	32	6	14	13	1	16	A-4a (1)	-	
				17	7	7	21	100	SS-8	-	12	10	40	32	6	14	13	1	16	A-4a (1)	-	
				18																		
				19	7	9	35	100	SS-9	-	-	-	-	-	-	-	-	-	11	A-4a (V)	-	
				20	14																	
				21	6	17	50	100	SS-10	-	-	-	-	-	-	-	-	-	10	A-4a (V)	-	
				22	16																	
				23																		
EOB			1130.7	24	5	6	18	100	SS-11	-	-	-	-	-	-	-	-	11	A-4a (V)	-		
				25	6	6	18	100	SS-11	-	-	-	-	-	-	-	-	-	11	A-4a (V)	-	
NOTES: - Seepage encountered at 11.5' during drilling. - Water encountered at 13.5' during drilling. - Water added inside HSA at 15.0' to reduce heave.																						
NOTES: SEE ABOVE																						
ABANDONMENT METHODS. MATERIALS. QUANTITIES: PLASTIC HOLE PLUG DEVICE: SOIL CUTTINGS MIXED WITH BENTONITE																						

PROJECT: SUM-77 TRUCK PARKING		DRILLING FIRM / OPERATOR: OTB / D. HEPNER		DRILL RIG: OTB ATV B-57		STATION / OFFSET: 183+18, 13' LT		EXPLORATION ID: B-009-0-25												
TYPE: CULVERT/ROADWAY		SAMPLING FIRM / LOGGER: S&ME / K. HARPER		HAMMER: SAFETY HAMMER		ALIGNMENT: BL RAMP S		PAGE 1 OF 1												
PID: 122880 BR ID: N/A		DRILLING METHOD: 3-1/4" HSA		CALIBRATION DATE: 12/30/24		ELEVATION: 1155.1 (MSL) EOB: 25.0 ft.														
START: 8/26/25 END: 8/26/25		SAMPLING METHOD: SPT		ENERGY RATIO (%): 90*		LAT / LONG: 40.951501 N, 81.451842 W														
MATERIAL DESCRIPTION AND NOTES		ELEV.	DEPTHS	SPT/RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	SO4 ppm	BACK FILL
		1155.1							GR	CS	FS	SI	CL	LL	PL	PI	WC			
ROOTMAT - 2 INCHES		1154.9	1	9	42	100	SS-1	4.5+	15	9	26	33	17	19	13	6	7	A-4a (3)	140	
Hard brown SANDY SILT, little clay, little to some fine to coarse gravel, damp to moist.			2	15 13																
			3	5 11	29	100	SS-2	4.5+	22	8	22	32	16	19	14	5	9	A-4a (3)	-	
		1150.3	4	5 8																
Very stiff gray SILTY CLAY, little fine to coarse sand, few wood fragments above 7', damp.			5	4 4	12	100	SS-3A	4.5+	-	-	-	-	-	-	-	-	16	A-4a (V)	-	
			6	2 3	11	100	SS-3B	3.5	-	-	-	-	-	-	-	-	23	A-6b (V)	-	
			7	3 4			SS-4	2.5	-	-	-	-	-	-	-	-	23	A-6b (V)	-	
			8																	
		1144.6	9	2 3	12	100	SS-5	3.0	0	1	12	53	34	38	17	21	24	A-6b (12)	-	
Very stiff brown SANDY SILT, little clay, trace fine gravel, damp.			10	5																
			11	3 2	8	100	SS-6	2.5	-	-	-	-	-	-	-	-	15	A-4a (V)	-	
		1142.1	12	3																
Loose brown SANDY SILT, little clay, trace fine gravel, wet.			13																	
		1140.7	14	2 4	11	100	SS-7A	-	-	-	-	-	-	-	-	-	19	A-4a (V)	-	
Very stiff becoming hard brown SANDY SILT, some clay, trace fine gravel, damp.			15	3			SS-7B	2.5	-	-	-	-	-	-	-	-	15	A-4a (V)	-	
			16	2 4	15	100	SS-8	3.5	9	8	23	38	22	21	15	6	13	A-4a (5)	-	
			17	6																
- SS-9; becoming gray.			18																	
			19	3 6	20	100	SS-9	3.5	-	-	-	-	-	-	-	-	11	A-4a (V)	-	
			20	7																
			21	4 6	26	100	SS-10	4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	-	
			22	11																
			23																	
		1130.1	24	4 6	21	100	SS-11	4.5+	-	-	-	-	-	-	-	-	13	A-4a (V)	-	
			25	8																
			EOB																	
NOTES:																				
- Seepage encountered at 13.5' during drilling.																				
NOTES: SEE ABOVE																				
ABANDONMENT METHODS. MATERIALS. QUANTITIES: PLASTIC HOLE PLUG DEVICE: SOIL CUTTINGS MIXED WITH BENTONITE																				



PROJECT: SUM-77 TRUCK PARKING	DRILLING FIRM / OPERATOR: OTB / D. HEPNER	DRILL RIG: OTB ATV B-57	STATION / OFFSET: 187+29, 88' RT	EXPLORATION ID
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / K. HARPER	HAMMER: SAFETY HAMMER	ALIGNMENT: CL R/W IR 77	B-010-0-25
PID: 122880 BR ID: N/A	DRILLING METHOD: 2-1/4" HSA	CALIBRATION DATE: 12/30/24	ELEVATION: 1159.8 (MSL) EOB: 7.0 ft.	PAGE
START: 8/25/25 END: 8/25/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 40.952420 N, 81.452709 W	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ROOTMAT - 3 INCHES	1159.5																		<L>
Very stiff to hard brown and gray <b>SANDY SILT</b> , little clay, little fine to coarse gravel, damp.		1	4																<L>
		2	12	41	100	SS-1	4.5+	12	9	27	35	17	17	12	5	8	A-4a (3)	820	<L>
		3	7																<L>
		4	9	24	100	SS-2	3.0	12	7	21	43	17	21	15	6	13	A-4a (5)	-	<L>
		5	4																<L>
	1154.3	6	6	18	100	SS-3	3.5	-	-	-	-	-	-	-	-	16	A-4a (V)	-	<L>
Very stiff brown mottled with gray <b>SILTY CLAY</b> , little fine to coarse sand, damp.		7	3																<L>
	1152.8	EOB	4	15	100	SS-4	3.5	-	-	-	-	-	-	-	-	25	A-6b (V)	-	<L>

NOTES:  
- No water encountered during drilling.  
- After augers were removed, borehole caved at 4.7' and was dry.

DRAFT





PROJECT: SUM-77 TRUCK PARKING	DRILLING FIRM / OPERATOR: OTB / D. HEPNER	DRILL RIG: OTB ATV B-57	STATION / OFFSET: 191+28, 72' RT	EXPLORATION ID
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / K. HARPER	HAMMER: SAFETY HAMMER	ALIGNMENT: CL R/W IR 77	B-011-0-25
PID: 122880 BR ID: N/A	DRILLING METHOD: 2-1/4" HSA	CALIBRATION DATE: 12/30/24	ELEVATION: 1163.1 (MSL) EOB: 8.0 ft.	PAGE
START: 8/25/25 END: 8/25/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 40.953312 N, 81.453553 W	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 18 INCHES	1163.1																		
GRANULAR BASE - 6 INCHES	1161.6	1																	
CEMENT STABILIZED SUBBASE - 12 INCHES	1161.1	2	50/4"	-	100	SS-1	-	-	-	-	-	-	-	-	-	12	Visual (V)	-	
Very dense brown GRAVEL WITH SAND AND SILT, trace clay, damp.	1160.1	3																	
		4	16 25 24	74	100	SS-2	-	17	15	33	25	10	14	11	3	8	A-2-4 (0)	900	
	1158.1	5	11 13 11	36	100	SS-3	-	20	13	27	29	11	16	12	4	7	A-4a (1)	-	
Medium dense to dense gray SANDY SILT, little fine gravel, little clay, damp.		6																	
		7	12 9	26	100	SS-4	-	-	-	-	-	-	-	-	-	9	A-4a (V)	-	
	1155.1	8																	
		EOB																	

NOTES:  
- No water encountered during drilling.  
- After augers were removed, borehole did not cave and was dry.

NOTES: SEE ABOVE  
ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; PLASTIC HOLE PLUG DEVICE; SOIL CUTTINGS MIXED WITH BENTONITE

S&ME ODOT SULFATE (8.5X11) - SGE 01/2019 - OH DOT GDT - 10/20/25 17:31 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINT\PROJECTS\24170232D-SUM-77 TP.GPJ



PROJECT: SUM-77 TRUCK PARKING	DRILLING FIRM / OPERATOR: OTB / D. HEPNER	DRILL RIG: OTB ATV B-57	STATION / OFFSET: 195+27, 71' RT	EXPLORATION ID
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / K. HARPER	HAMMER: SAFETY HAMMER	ALIGNMENT: CL R/W IR 77	B-012-0-25
PID: 122880 BR ID: N/A	DRILLING METHOD: 2-1/4" HSA	CALIBRATION DATE: 12/30/24	ELEVATION: 1165.2 (MSL) EOB: 8.0 ft.	PAGE
START: 8/25/25 END: 8/25/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 40.954227 N, 81.454349 W	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 17 INCHES	1165.2																		
GRANULAR BASE - 6 INCHES	1163.8	1																	
CEMENT STABILIZED SUBBASE - 12 INCHES	1163.3	2	50/4"	-	100	SS-1	-	-	-	-	-	-	-	-	-	10	Visual (V)	-	
Very stiff to hard gray <b>SANDY SILT</b> , little clay, little fine gravel, damp.	1162.3	3																	
		4	7																
		5	8 12	30	100	SS-2	3.0	11	9	26	38	16	17	12	5	9	A-4a (4)	940	
		6	10 16 15	47	61	SS-3	4.5+	15	11	27	32	15	18	13	5	8	A-4a (2)	-	
		7	6 7 8	23	100	SS-4	4.5+	-	-	-	-	-	-	-	-	10	A-4a (V)	-	
	1157.2	8																	
		EOB																	

NOTES:  
- No water encountered during drilling.  
- After augers were removed, borehole did not cave and was dry.

NOTES: SEE ABOVE  
ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; PLASTIC HOLE PLUG DEVICE; SOIL CUTTINGS MIXED WITH BENTONITE



**OHIO DEPARTMENT OF TRANSPORTATION**  
**DETERMINING SULFATE CONTENT IN SOILS**  
**SUPPLEMENT 1122**

Project C-R-S:

TP 26 Site 12 SUM-77 Vacant Rest Area

PID No:

122880

Report Date:

10/30/2025

Consultant:

S&ME, Inc. (sulfate testing by Resource)

Technician:

EM/KL

Sample or Boring ID	Station	Offset	Latitude & Longitude or State Plane Coordinates		Elevation	Soaking Time (hr)	Replicate Sample Readings						Sulfate Content (ppm)
							1		2		3		
							Dilution	Reading	Dilution	Reading	Dilution	Reading	
B-001-0-25	161+94	-70	40.946576	-81.44773	1159.7	24	20	10	20	10	20	10	200
B-002-0-25	165+30	-71	40.94735	-81.448397	1154.1	24	20	12	20	12	20	12	240
B-003-0-25	169+30	6	40.948289	-81.449145	1150.2	24	20	9	20	9	20	9	180
B-004-0-25	173+32	5	40.949254	-81.449851	1150.7	24	20	14	20	14	20	14	280
B-005-0-25	11+31	56	40.950207	-81.450691	1152.4	24	20	15	20	15	20	15	300
B-006-0-25	11+17	102	40.950412	-81.450182	1153	24	20	17	20	17	20	17	340
B-007-0-25	14+12	97	40.951081	-81.450786	1155.1	24	20	16	20	16	20	16	320
B-008-0-25	14+12	51	40.95086	-81.451234	1154.7	24	20	5	20	5	20	5	100
B-009-0-25	183+18	-13	40.951501	-81.451842	1154.1	24	20	7	20	7	20	7	140
B-010-0-25	187+29	88	40.95242	-81.452709	1158.8	24	20	41	20	41	20	41	820
B-011-0-25	191+28	72	40.953312	-81.453553	1159.6	24	20	45	20	45	20	45	900
B-012-0-25	195+27	71	40.954227	-81.454349	1161.7	24	20	47	20	47	20	47	940



# Important Information About Your Geotechnical Engineering Report

*Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.*

## Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

## Scope of Geotechnical Services

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

## Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project.

Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

## Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

## Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.

## **Appendix II – Subgrade Analyses**

## OHIO DEPARTMENT OF TRANSPORTATION

## OFFICE OF GEOTECHNICAL ENGINEERING

## PLAN SUBGRADES

## Geotechnical Design Manual Section 600

Site 12 SUM-77 Vacant Rest Area TP  
122880

Truck Parking area along IR 77 Northbound in Summit County, Ohio

S&ME, Inc.

Prepared By: M. Sohیب Ansari  
Date prepared: Monday, October 20, 2025

M. Sohیب Ansari  
6190 Enterprise Court  
Dublin, OH 43016  
  
634-793-2226  
mohdansari@smeinc.com

NO. OF BORINGS: 12

NO. OF DCPS: 0

#	Boring ID	Alignment	Station	Add DCP Test Data Worksheets				Boring EL.	Proposed Subgrade EL.	Cut Fill
				Offset	Dir	Drill Rig	ER			
1	B-001-0-25	CL R/W IR 77	161+94	70	RT	OTB ATV B-57	90	1163.2	1161.9	1.3 C
2	B-002-0-25	CL R/W IR 77	165+30	71	RT	OTB ATV B-57	90	1157.6	1156.5	1.1 C
3	B-003-0-25	BL Ramp R	169+30	6	RT	OTB ATV B-57	90	1152.7	1152.3	0.4 C
4	B-004-0-25	BL Ramp R	173+32	5	LT	OTB ATV B-57	90	1151.7	1150.9	0.8 C
5	B-005-0-25	BL Truck Parking	11+31	56	LT	OTB ATV B-57	90	1153.4	1152.4	1.0 C
6	B-006-0-25	BL Truck Parking	11+17	102	RT	OTB ATV B-57	90	1154.0	1153.7	0.3 C
7	B-007-0-25	BL Truck Parking	14+12	97	RT	OTB ATV B-57	90	1156.1	1155.3	0.8 C
8	B-008-0-25	BL Truck Parking	14+12	51	LT	OTB ATV B-57	90	1155.7	1155.1	0.6 C
9	B-009-0-25	BL Ramp S	183+18	43	LT	OTB ATV B-57	90	1155.1	1156.7	1.6 F
10	B-010-0-25	CL R/W IR 77	187+29	88	RT	OTB ATV B-57	90	1159.8	1159.7	0.1 C
11	B-011-0-25	CL R/W IR 77	191+28	72	RT	OTB ATV B-57	90	1163.1	1161.9	1.2 C
12	B-012-0-25	CL R/W IR 77	195+27	71	RT	OTB ATV B-57	90	1165.2	1164.0	1.2 C

DRAFT



#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N <sub>60</sub>	N <sub>60L</sub>		LL	PL	PI	% Silt	% Clay	P200	M <sub>c</sub>	M <sub>OPT</sub>	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B 001-0 25	SS-1	2.0	2.8	0.7	1.5	100	17								12								SS-1 Ex. Chem. Stab.	
		SS-2	3.5	5.0	2.2	3.7	20		2.5	23	14	9	37	19	56	11	10	A-4a	4	200					
		SS-3	5.0	6.5	3.7	5.2	21		4.5	22	15	7	41	19	60	12	10	A-4a	5						
		SS-4	6.5	8.0	5.2	6.7	17		4.5							16	14	A-6a							
2	B 002-0 25	SS-1	2.0	2.3	0.9	1.2	100	9								6								SS-1 Ex. Chem. Stab.	
		SS-2	3.5	5.0	2.4	3.9	20		4.5	24	16	8	39	25	64	15	11	A-4a	6	240					
		SS-3	5.0	6.5	3.9	5.4	15			20	15	5	18	10	28	11	10	A-2-4	0						
		SS-4	6.5	8.0	5.4	6.9	9									9	10	A-2-4							
3	B 003-0 25	SS-1	1.0	2.5	0.6	2.1	24	9	4.5	25	18	7	28	12	40	11	13	A-4a	1						
		SS-2	2.5	4.0	2.1	3.6	20		3.5	23	16	7	43	20	63	12	11	A-4a	6	180					
		SS-3	4.0	5.5	3.6	5.1	15		3.5							22	14	A-6a	10						
		SS-4	5.5	7.0	5.1	6.6	9		1							19	14	A-6a							
4	B 004-0 25	SS-1	1.0	2.5	0.2	1.7	62	9	4.5	22	14	8	39	19	58	8	10	A-4a	5	280					
		SS-2	2.5	4.0	1.7	3.2	39		4.5	18	13	5	32	12	44	8	10	A-4a	2						
		SS-3/4A	4.0	6.0	3.2	5.2	32		4.5							8	10	A-4a	8						
		SS-4B	6.0	7.0	5.2	6.2	9		3							14	10	A-4a							
5	B 005-0 25	SS-2	1.0	2.5	0.0	1.5	39	18	4.5	25	15	10	42	22	64	9	10	A-4a	6	300					
		SS-3	4.0	5.5	3.0	4.5	18		3	21	13	8	33	19	52	12	10	A-4a	3						
		SS-4	5.5	7.0	4.5	6.0	18		4.5							13	10	A-4a	8						
		SS-5	7.0	8.5	6.0	7.5	6									14	10	A-4a							
6	B 006-0 25	SS-2	1.0	2.5	0.7	2.2	30	17	4.5	20	14	6	27	13	40	5	10	A-4a	1	340					
		SS-3	3.5	5.0	3.2	4.7	26		4.5	27	15	12	36	22	58	10	14	A-6a	5						
		SS-4	5.0	6.5	4.7	6.2	17		4.5							10	14	A-6a	10						
		SS-5	6.5	8.0	6.2	7.7	17		4.5							11	14	A-6a							
7	B 007-0 25	SS-2	1.0	2.5	0.2	1.7	32	11		23	17	6	25	12	37	5	12	A-4a	0	320					
		SS-3	4.0	5.5	3.2	4.7	11		2	33	20	13	55	29	84	20	15	A-6a	9						
		SS-4	5.5	7.0	4.7	6.2	20		3.5							13	10	A-4a	8						
		SS-5	7.0	8.5	6.2	7.7	18		2							18	14	A-6a							
8	B 008-0 25	SS-1	1.0	2.5	0.4	1.9	30	21	4.5	23	15	8	42	23	65	10	10	A-4a	6	100					
		SS-2	2.5	4.0	1.9	3.4	21		4.5	21	15	6	38	18	56	13	10	A-4a	4		Mc				
		SS-3	4.0	5.5	3.4	4.9	24		4.5							16	10	A-4a	8						
		SS-4	5.5	7.0	4.9	6.4	21			18	14	4	41	12	53	12	10	A-4a	4						
9	B 009-0 25	SS-1	1.0	2.5	2.6	4.1	42	29	4.5	19	13	6	33	17	50	7	10	A-4a	3	140					
		SS-2/3A	2.5	4.8	4.1	6.4	29		4.5	19	14	5	32	16	48	9	10	A-4a	3						
		SS-3B	4.8	5.5	6.4	7.1	12		3.5							23	16	A-6b							
		SS-4	5.5	7.0	7.1	8.6	11		2.5							23	16	A-6b							



#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N <sub>60</sub>	N <sub>60L</sub>		LL	PL	PI	% Silt	% Clay	P200	M <sub>C</sub>	M <sub>OPT</sub>	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
10	B 010-0 25	SS-1	1.0	2.5	0.9	2.4	41	15	4.5	17	12	5	35	17	52	8	10	A-4a	3	820					
		SS-2	2.5	4.0	2.4	3.9	24		3	21	15	6	43	17	60	13	10	A-4a	5						
		SS-3	4.0	5.5	3.9	5.4	18		3.5						16	10	A-4a	8							
		SS-4	5.5	7.0	5.4	6.9	15		3.5						25	16	A-6b								
11	B 011-0 25	SS-1	2.0	2.3	0.8	1.1	100	26							12									SS-1 Ex. Chem. Stab.	
		SS-2	3.5	5.0	2.3	3.8	74			14	11	3	25	10	35	8	10	A-2-4	0	900					
		SS-3	5.0	6.5	3.8	5.3	36			16	12	4	29	11	40	7	10	A-4a	1						
		SS-4	6.5	8.0	5.3	6.8	26								9	10	A-4a								
12	B 012-0 25	SS-2	3.5	5.0	2.3	3.8	30	23	3	17	12	5	38	16	54	9	10	A-4a	4	940					SS-1 Ex. Chem. Stab.
		SS-3	5.0	6.5	3.8	5.3	47		4.5	18	13	5	32	15	47	8	10	A-4a	2						
		SS-4	6.5	8.0	5.3	6.8	23		4.5							10	10	A-4a							

**PID:** 122880

**County-Route-Section:** Site 12 SUM-77 Vacant Rest Area TP

**No. of Borings:** 12

**Geotechnical Consultant:** S&ME, Inc.

**Prepared By:** M. Sohیب Ansari

**Date prepared:** 10/20/2025

Chemical Stabilization Options		
320	Rubblize & Roll	Option
206	Cement Stabilization	Option
	Lime Stabilization	No
206	Depth	NA

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L): Average(HP):	0" 0"
Global Geogrid Average(N60L): Average(HP):	0" 0"

<b>Design CBR</b>	<b>8</b>
-----------------------	----------

% Samples within 3 feet of subgrade			
N <sub>60</sub> ≤ 5	0%	HP ≤ 0.5	0%
N <sub>60</sub> < 12	0%	0.5 < HP ≤ 1	0%
12 ≤ N <sub>60</sub> < 15	0%	1 < HP ≤ 2	0%
N <sub>60</sub> ≥ 20	44%	HP > 2	35%
M+	2%		
Rock	0%		
Unsuitable Soil	0%		

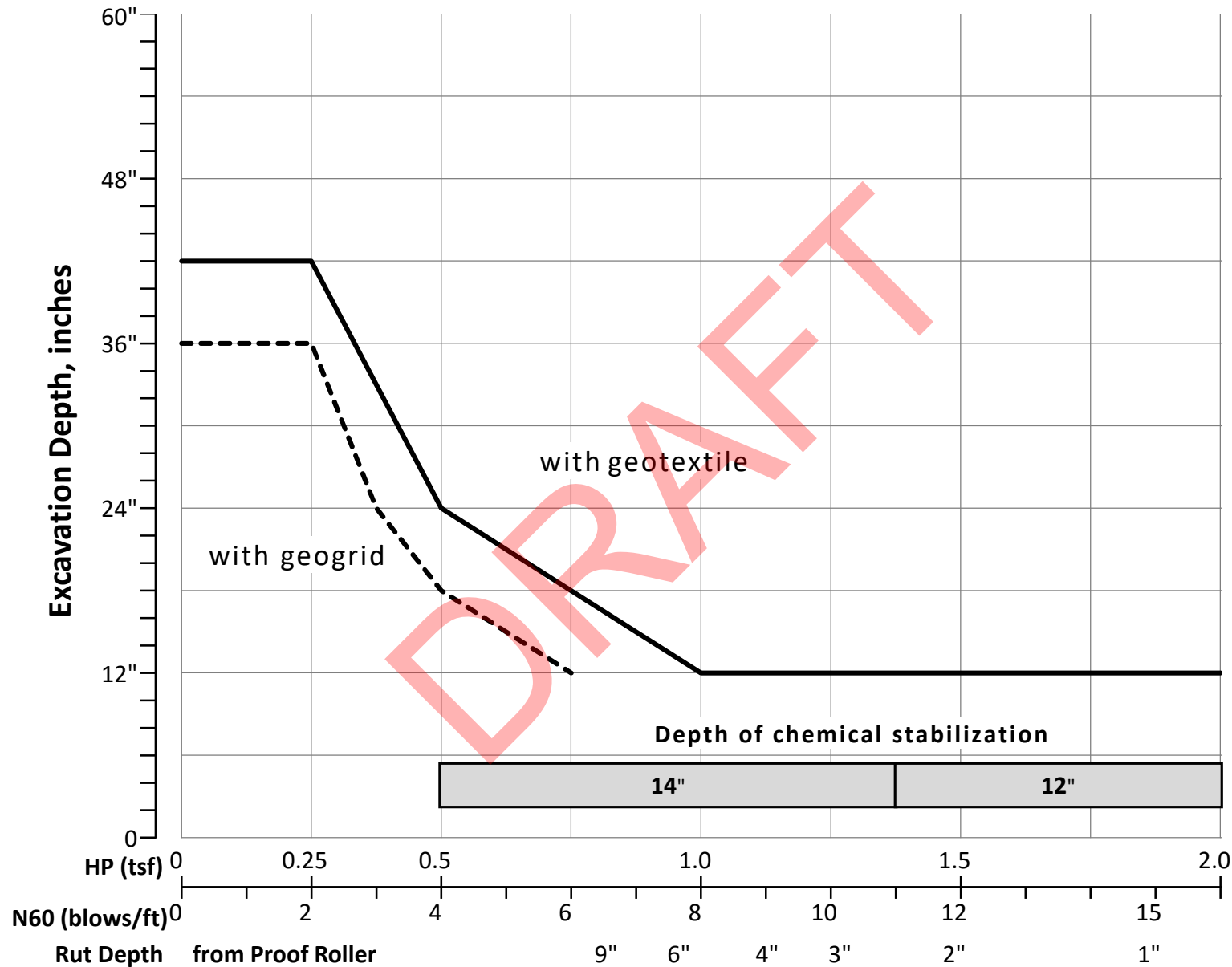
Excavate and Replace at Surface	
Average	0"
Maximum	0"
Minimum	0"

% Proposed Subgrade Surface	
Unstable & Unsuitable	6%
Unstable	6%
Unsuitable (Soil & Rock)	0%

	N <sub>60</sub>	N <sub>60L</sub>	HP	LL	PL	PI	Silt	Clay	P 200	M <sub>C</sub>	M <sub>OPT</sub>	GI
<b>Average</b>	30	17	3.82	21	14	7	35	17	52	12	11	5
<b>Maximum</b>	100	29	4.50	33	20	13	55	29	84	25	16	10
<b>Minimum</b>	6	9	1.00	14	11	3	18	10	28	5	10	0

Classification Counts by Sample																					
ODOT Class	UCF	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals	
Count	0	0	0	0	3	0	0	0	0	0	30	0	0	8	3	0	0	0	0	44	
Percent	0%	0%	0%	0%	7%	0%	0%	0%	0%	0%	68%	0%	0%	18%	7%	0%	0%	0%	0%	100%	
% Rock   Granular   Cohesive	0%	0%	75%									25%									100%
Surface Class Count	0	0	0	0	1	0	0	0	0	0	15	0	0	0	0	0	0	0	0	16	
Surface Class Percent	0%	0%	0%	0%	6%	0%	0%	0%	0%	0%	94%	0%	0%	0%	0%	0%	0%	0%	0%	100%	

Fig. 600-1 – Subgrade Stabilization



**OVERRIDE TABLE**

Calculated Average	New Values	Check to Override
3.82		<input type="checkbox"/> HP
17.00		<input type="checkbox"/> N60L

Average HP  
Average N<sub>60L</sub>



## **Appendix III – Light Tower Foundation Analyses**

## LPILE Parameters for Lateral Analyses – SUM-77 Northbound Parking Area

The following tables include parameters used by S&ME to perform a lateral load (LPILE) analysis on the foundations of each light tower at the northbound parking area. These tables include p-y models, soil unit weights, friction angle and subgrade modulus value for granular, and cohesion and strain values for cohesive soils. These parameters are based on the soil encountered and lab data shown on the boring logs, and recommended values given in the LPILE 2022 user's manual and guidance provided by ODOT Office of Geotechnical Engineering (OGE).

**Table 1 – LPILE Input Parameters at Light Tower TN-13 (Boring B-005)**

Stratum	Depth* Interval (ft.)	Elevation Range	p-y Soil Model	Effective Unit Weight	Subgrade Modulus, k	C (psf) or $\phi$ (deg)	Strain $\epsilon_{50}$
Disturbed Layer (per GDM Sec. 1201)	0.0 – 3.0	1156.3 – 1153.3	Soft Clay (Matlock)	98 pcf	---	250	0.02
Sandy Silt (A-4a)	3.0 – 16.4	1153.3 – 1139.9	Stiff Clay w/o Free Water	112 pcf	---	4,000	0.005
Sandy Silt (A-4a)	16.4 – 23.4	1139.9 – 1132.9	Stiff Clay w/o Free Water	110 pcf	---	2,500	0.005
Sandy Silt (A-4a)	23.4 – 27.9	1132.9 – 1128.4	Sand (Reese)	56 pcf	60 pci	32°	---

\*Below proposed ground surface at light tower, estimated to be at El. 1156.28.

**Table 2 – LPILE Input Parameters at Light Tower TN-10 (Boring B-006)**

Stratum	Depth* Interval (ft.)	Elevation Range	p-y Soil Model	Effective Unit Weight	Subgrade Modulus, k	C (psf) or $\phi$ (deg)	Strain $\epsilon_{50}$
Disturbed Layer (per GDM Sec. 1201)	0.0 – 3.0	1151.7 – 1148.7	Soft Clay (Matlock)	98 pcf	---	250	0.02
Silt and Clay (A-6a)	3.0 – 5.7	1148.7 – 1146.0	Stiff Clay w/o Free Water	115 pcf	---	4,500	0.004
Silt and Clay (A-6a)	5.7 – 7.2	1146.0 – 1144.5	Stiff Clay w/o Free Water	112 pcf	---	1,000	0.007
Sandy Silt (A-4a)	7.2 – 10.7	1144.5 – 1141.0	Stiff Clay w/o Free Water	110 pcf	---	2,000	0.005
Silt and Clay (A-6a)	10.7 – 15.7	1141.0 – 1136.0	Stiff Clay w/o Free Water	108 pcf	---	1,000	0.007
Sandy Silt (A-4a)	15.7 – 20.2	1136.0 – 1131.5	Sand (Reese)	115 pcf	90 pci	31°	---
Fine Sand (A-3)	20.2 – 22.7	1131.5 – 1129.0	Sand (Reese)	63 pcf	60 pci	33°	---

\*Below proposed ground surface at light tower, estimated to be at El. 1151.71.

**Table 3 – LPILE Input Parameters at Light Tower TN-12 (Boring B-007)**

Stratum	Depth* Interval (ft.)	Elevation Range	p-y Soil Model	Effective Unit Weight	Subgrade Modulus, k	C (psf) or $\phi$ (deg)	Strain $\epsilon_{50}$
Disturbed Layer (per GDM Sec. 1201)	0.0 – 3.0	1157.4 – 1154.4	Soft Clay (Matlock)	98 pcf	---	250	0.02
Sandy Silt (A-4a)	3.0 – 5.3	1154.4 – 1152.1	Stiff Clay w/o Free Water	118 pcf	---	4,500	0.004
Silt and Clay (A-6a)	5.3 – 6.8	1152.1 – 1150.6	Stiff Clay w/o Free Water	110 pcf	---	3,000	0.005
Sandy Silt (A-4a)	6.8 – 8.3	1150.6 – 1149.1	Stiff Clay w/o Free Water	115 pcf	---	3,500	0.005
Silt and Clay (A-6a)	8.3 – 9.8	1149.1 – 1147.6	Stiff Clay w/o Free Water	112 pcf	---	2,000	0.005
Sandy Silt (A-4a)	9.8 – 14.3	1147.6 – 1143.1	Sand (Reese)	112 pcf	90 pci	30°	---
Gravel with Sand (A-1-b)	14.3 – 19.3	1143.1 – 1138.1	Sand (Reese)	63 pcf	60 pci	35°	---
Fine Sand (A-3)	19.3 – 22.6	1138.1 – 1134.8	Sand (Reese)	58 pcf	20 pci	29°	---
Sandy Silt (A-4a)	22.6 – 26.3	1134.8 – 1131.1	Stiff Clay w/o Free Water	66 pcf	---	4,000	0.005

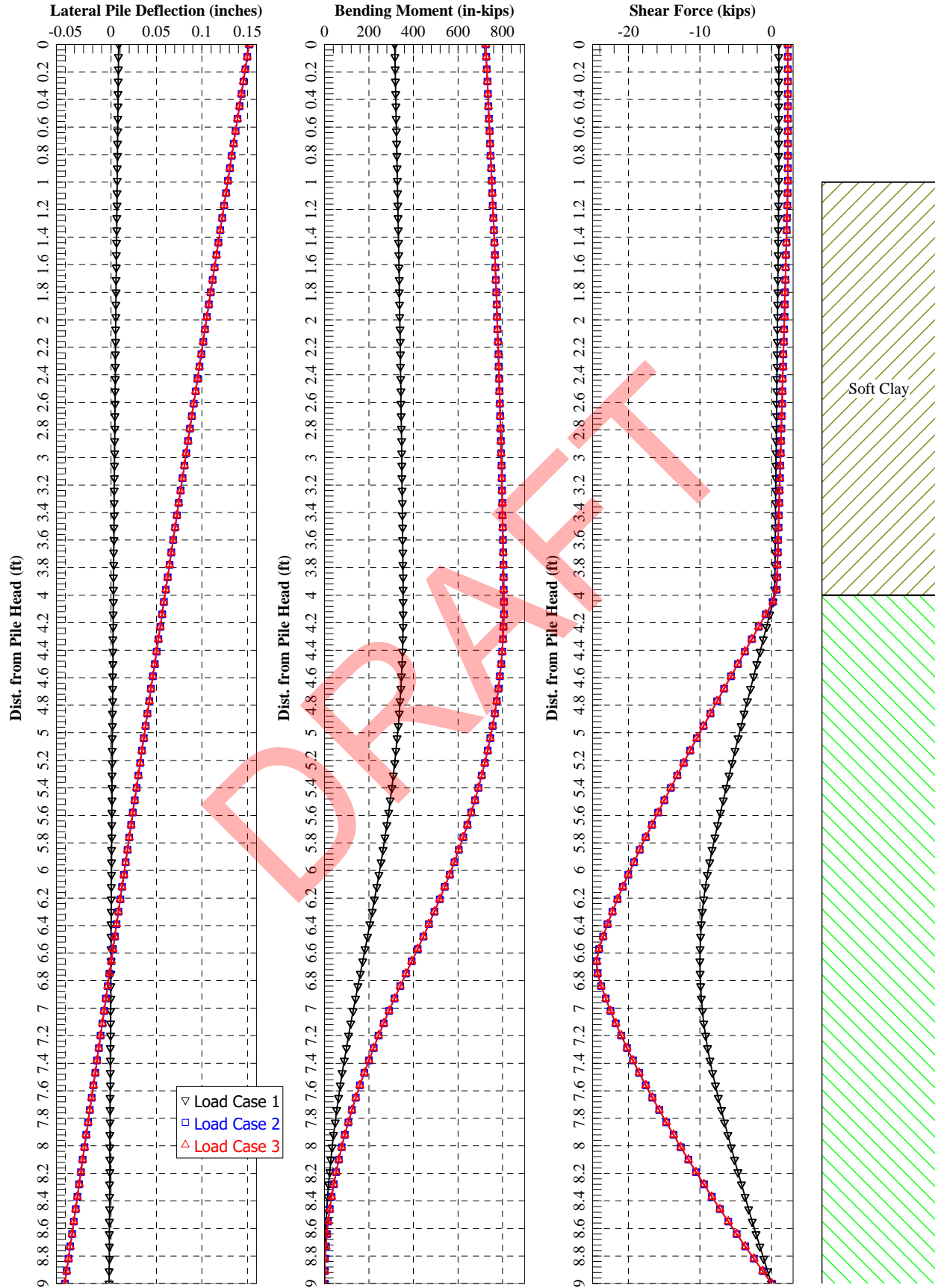
\*Below proposed ground surface at light tower, estimated to be at El. 1157.42.

**Table 4 – LPILE Input Parameters at Light Tower TN-9 (Boring B-008)**

Stratum	Depth* Interval (ft.)	Elevation Range	p-y Soil Model	Effective Unit Weight	Subgrade Modulus, k	C (psf) or $\phi$ (deg)	Strain $\epsilon_{50}$
Disturbed Layer (per GDM Sec. 1201)	0.0 – 3.0	1154.3 – 1151.3	Soft Clay (Matlock)	98 pcf	---	250	0.02
Sandy Silt (A-4a)	3.0 – 4.1	1151.3 – 1150.2	Stiff Clay w/o Free Water	115 pcf	---	4,500	0.004
Sandy Silt (A-4a)	4.1 – 6.1	1150.2 – 1148.2	Sand (Reese)	115 pcf	90 pci	32°	---
Sandy Silt (A-4a)	6.1 – 9.1	1148.2 – 1145.2	Stiff Clay w/o Free Water	115 pcf	---	4,000	0.005
Sandy Silt (A-4a)	9.1 – 12.1	1145.2 – 1142.2	Sand (Reese)	118 pcf	90 pci	31°	---
Sandy Silt (A-4a)	12.1 – 23.6	1142.2 – 1130.7	Sand (Reese)	66 pcf	60 pci	33°	---

\*Below proposed ground surface at light tower, estimated to be at El. 1154.34.

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

=====

LPILE for Version 2022-12.012

License ID : 228332755  
License Type : (Single User License)

Analysis of Individual Piles and Drilled Shafts  
Subjected to Lateral Loading Using the p-y Method  
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This software is licensed for exclusive use by:  
S&ME, Inc.  
Valley View, OH

=====

This model was prepared by:  
BSears

-----

Files Used for Analysis

-----

Path to file locations:  
\Columbus-1170\Projects\2024\24170232\_ms\_TP 26 NE Ohio\GEO\Project Docs\Site  
12\_SUM-77 (STONE)\Calcs\Light Towers\

Name of input data file:  
Tower TN-13 (B-005).lp12d

Name of output report file:  
Tower TN-13 (B-005).lp12o

Name of plot output file:  
Tower TN-13 (B-005).lp12p

Name of runtime message file:  
Tower TN-13 (B-005).lp12r

-----

Date and Time of Analysis

-----



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Date: October 24, 2025

Time: 8:29:45

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

Project Name: TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area

Job Number: 24170232D

Client: ms consultants, inc.

Engineer: BKS

Description: Light Tower TN-13 (B-005-0-25)

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

Computational Options:

- 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

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- 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
- Input of moment 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 = 9.000 ft  
Depth of ground surface below top of pile = 1.0000 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	36.0000
2	9.000	36.0000

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

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile  
Length of section = 9.000000 ft  
Shaft Diameter = 36.000000 in

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

---

Soil and Rock Layering Information

---

The soil profile is modelled using 4 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	1.000000	ft
Distance from top of pile to bottom of layer	=	4.000000	ft
Effective unit weight at top of layer	=	98.000000	pcf
Effective unit weight at bottom of layer	=	98.000000	pcf
Undrained cohesion at top of layer	=	250.000000	psf
Undrained cohesion at bottom of layer	=	250.000000	psf
Epsilon-50 at top of layer	=	0.020000	
Epsilon-50 at bottom of layer	=	0.020000	

Layer 2 is stiff clay without free water

Distance from top of pile to top of layer	=	4.000000	ft
Distance from top of pile to bottom of layer	=	17.400000	ft
Effective unit weight at top of layer	=	112.000000	pcf
Effective unit weight at bottom of layer	=	112.000000	pcf
Undrained cohesion at top of layer	=	4000.	psf
Undrained cohesion at bottom of layer	=	4000.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer	=	17.400000	ft
Distance from top of pile to bottom of layer	=	24.400000	ft
Effective unit weight at top of layer	=	110.000000	pcf
Effective unit weight at bottom of layer	=	110.000000	pcf
Undrained cohesion at top of layer	=	2500.	psf
Undrained cohesion at bottom of layer	=	2500.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	

Layer 4 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	24.400000	ft
Distance from top of pile to bottom of layer	=	28.900000	ft
Effective unit weight at top of layer	=	56.000000	pcf

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Effective unit weight at bottom of layer = 56.000000 pcf  
 Friction angle at top of layer = 32.000000 deg.  
 Friction angle at bottom of layer = 32.000000 deg.  
 Subgrade k at top of layer = 60.000000 pci  
 Subgrade k at bottom of layer = 60.000000 pci

(Depth of the lowest soil layer extends 19.900 ft below the pile tip)

Summary of Input Soil Properties

Layer E50 Num. or krm	Soil Type Name kpy (p-y Curve Type) pci	Layer Depth ft	Effective Unit Wt. pcf	Cohesion psf	Angle of Friction deg.
1 0.02000	Soft --	1.0000	98.0000	250.0000	--
0.02000	Clay --	4.0000	98.0000	250.0000	--
2 0.00500	Stiff Clay --	4.0000	112.0000	4000.	--
0.00500	w/o Free Water --	17.4000	112.0000	4000.	--
3 0.00500	Stiff Clay --	17.4000	110.0000	2500.	--
0.00500	w/o Free Water --	24.4000	110.0000	2500.	--
4 --	Sand 60.0000	24.4000	56.0000	--	32.0000
--	(Reese, et al.) 60.0000	28.9000	56.0000	--	32.0000

Static Loading Type

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

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 3

Load Compute No.	Load Top y Type	Condition Run Analysis 1	Condition 2	Axial Thrust Force, lbs
vs. Pile Length				
1	1	V = 1000.000000 lbs	M = 315600. in-lbs	4200.
Yes		Yes		
2	1	V = 2250. lbs	M = 724800. in-lbs	4600.
Yes		Yes		
3	1	V = 2250. lbs	M = 724800. in-lbs	3800.
Yes		Yes		

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:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	9.000000 ft
Shaft Diameter	=	36.000000 in
Concrete Cover Thickness (to edge of trans. reinf.)	=	3.500000 in
Number of Reinforcing Bars	=	16 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	1018. sq. in.

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Total Area of Reinforcing Steel	=	16.000000 sq. in.
Area Ratio of Steel Reinforcement	=	1.57 percent
Edge-to-Edge Bar Spacing	=	4.114467 in
Maximum Concrete Aggregate Size	=	0.750000 in
Ratio of Bar Spacing to Aggregate Size	=	5.49
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in
Transverse Reinforcement		
Type: Spiral		
Number of Transverse Reinf. (per spacing)	=	1
Spacing of Transverse Reinf.	=	4.500000 in
Yield Stress of Transverse Reinf.	=	60000. psi
Diameter of Transverse Reinf.	=	0.500000 in

Axial Structural Capacities:

-----

Nom. Axial Structural Capacity = $0.85 F_c A_c + F_y A_s$	=	4366.378 kips
Tensile Load for Cracking of Concrete	=	-470.222 kips
Nominal Axial Tensile Capacity	=	-960.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.128000	1.000000	13.436000	0.000000
2	1.128000	1.000000	12.413245	5.141735
3	1.128000	1.000000	9.500687	9.500687
4	1.128000	1.000000	5.141735	12.413245
5	1.128000	1.000000	0.000000	13.436000
6	1.128000	1.000000	-5.14173	12.413245
7	1.128000	1.000000	-9.50069	9.500687
8	1.128000	1.000000	-12.41325	5.141735
9	1.128000	1.000000	-13.43600	0.000000
10	1.128000	1.000000	-12.41325	-5.14173
11	1.128000	1.000000	-9.50069	-9.50069
12	1.128000	1.000000	-5.14173	-12.41325
13	1.128000	1.000000	0.000000	-13.43600
14	1.128000	1.000000	5.141735	-12.41325
15	1.128000	1.000000	9.500687	-9.50069
16	1.128000	1.000000	12.413245	-5.14173

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 4.114 inches  
between bars 11 and 12.

Ratio of bar spacing to maximum aggregate size = 5.49

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Concrete Properties:

-----

Compressive Strength of Concrete	=	4000. psi
Modulus of Elasticity of Concrete	=	3604997. psi
Modulus of Rupture of Concrete	=	-474.34165 psi
Compression Strain at Peak Stress	=	0.001886
Tensile Strain at Fracture of Concrete	=	-0.0001154
Maximum Coarse Aggregate Size	=	0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 3

Number	Axial Thrust Force kips
-----	-----
1	3.800
2	4.200
3	4.600

Definitions of Run Messages and Notes:

-----

C = concrete in section has cracked in tension.  
 Y = stress in reinforcing steel has reached yield stress.  
 T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318-14, Section 21.2.3.  
 Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.  
 Position of neutral axis is measured from edge of compression side of pile.  
 Compressive stresses and strains are positive in sign.  
 Tensile stresses and strains are negative in sign.

Axial Thrust Force = 3.800 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

6.25000E-07	240.5062135	384809942.	19.2929823	0.00001206	-0.00001044
0.0505030	0.2746478				
0.00000125	480.1472468	384117797.	18.6479768	0.00002331	-0.00002169
0.0973082	0.5259142				
0.00000188	718.9174733	383422652.	18.4329804	0.00003456	-0.00003294
0.1438345	0.7771808				
0.00000250	956.8168886	382726755.	18.3254857	0.00004581	-0.00004419
0.1900818	1.0284477				
0.00000313	1194.	382030558.	18.2609917	0.00005707	-0.00005543
0.2360502	1.2797149				
0.00000375	1430.	381334209.	18.2179981	0.00006832	-0.00006668
0.2817396	1.5309823				
0.00000438	1665.	380637775.	18.1872904	0.00007957	-0.00007793
0.3271500	1.7822500				
0.00000500	1900.	379941287.	18.1642614	0.00009082	-0.00008918
0.3722815	2.0335179				
0.00000563	2133.	379244764.	18.1463515	0.0001021	-0.000100
0.4171340	2.2847861				
0.00000625	2366.	378548215.	18.1320251	0.0001133	-0.000112
0.4617075	2.5360546				
0.00000688	2366.	344134741.	10.2494785	0.00007047	-0.000177
0.2882187	-4.308598 C				
0.00000750	2366.	315456846.	10.2198771	0.00007665	-0.000193
0.3129821	-4.706727 C				
0.00000813	2366.	291190934.	10.1952302	0.00008284	-0.000210
0.3376758	-5.104761 C				
0.00000875	2366.	270391582.	10.1744772	0.00008903	-0.000226
0.3622998	-5.502701 C				
0.00000938	2366.	252365477.	10.1568402	0.00009522	-0.000242
0.3868539	-5.900547 C				
0.00001000	2366.	236592634.	10.1417358	0.0001014	-0.000259
0.4113380	-6.298297 C				
0.00001063	2366.	222675420.	10.1287027	0.0001076	-0.000275
0.4357521	-6.695951 C				
0.00001125	2366.	210304564.	10.1174231	0.0001138	-0.000291
0.4600960	-7.093510 C				
0.00001188	2366.	199235903.	10.1076093	0.0001200	-0.000307
0.4843696	-7.490973 C				
0.00001250	2366.	189274107.	10.0990420	0.0001262	-0.000324
0.5085729	-7.888340 C				
0.00001313	2366.	180261055.	10.0915439	0.0001325	-0.000340
0.5327056	-8.285611 C				
0.00001375	2366.	172067370.	10.0849699	0.0001387	-0.000356
0.5567678	-8.682785 C				
0.00001438	2366.	164586180.	10.0792000	0.0001449	-0.000373
0.5807594	-9.079861 C				
0.00001500	2366.	157728423.	10.0741344	0.0001511	-0.000389
0.6046801	-9.476841 C				
0.00001563	2366.	151419286.	10.0696892	0.0001573	-0.000405
0.6285300	-9.873723 C				



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00001625	2366.	145595467.	10.0657933	0.0001636	-0.000421
0.6523089	-10.270507 C				
0.00001688	2366.	140203043.	10.0623863	0.0001698	-0.000438
0.6760167	-10.667193 C				
0.00001750	2366.	135195791.	10.0594163	0.0001760	-0.000454
0.6996534	-11.063781 C				
0.00001813	2366.	130533867.	10.0568387	0.0001823	-0.000470
0.7232187	-11.460271 C				
0.00001875	2366.	126182738.	10.0546147	0.0001885	-0.000486
0.7467127	-11.856661 C				
0.00001938	2366.	122112327.	10.0527107	0.0001948	-0.000503
0.7701352	-12.252952 C				
0.00002000	2366.	118296317.	10.0510970	0.0002010	-0.000519
0.7934860	-12.649144 C				
0.00002063	2366.	114711580.	10.0497478	0.0002073	-0.000535
0.8167652	-13.045236 C				
0.00002125	2366.	111337710.	10.0486401	0.0002135	-0.000551
0.8399726	-13.441228 C				
0.00002188	2366.	108156633.	10.0477539	0.0002198	-0.000568
0.8631080	-13.837120 C				
0.00002250	2366.	105152282.	10.0470709	0.0002261	-0.000584
0.8861714	-14.232911 C				
0.00002313	2366.	102310328.	10.0465752	0.0002323	-0.000600
0.9091627	-14.628602 C				
0.00002375	2366.	99617951.	10.0462524	0.0002386	-0.000616
0.9320817	-15.024191 C				
0.00002438	2366.	97063645.	10.0460897	0.0002449	-0.000633
0.9549284	-15.419678 C				
0.00002563	2429.	94800037.	10.0461990	0.0002574	-0.000665
1.0004043	-16.210348 C				
0.00002688	2545.	94692477.	10.0468231	0.0002700	-0.000697
1.0455896	-17.000609 C				
0.00002813	2660.	94589756.	10.0479254	0.0002826	-0.000730
1.0904832	-17.790458 C				
0.00002938	2776.	94491232.	10.0493946	0.0002952	-0.000762
1.1350844	-18.579893 C				
0.00003063	2891.	94396370.	10.0512127	0.0003078	-0.000795
1.1793922	-19.368912 C				
0.00003188	3006.	94304718.	10.0533415	0.0003205	-0.000827
1.2234058	-20.157511 C				
0.00003313	3121.	94215891.	10.0557483	0.0003331	-0.000859
1.2671243	-20.945689 C				
0.00003438	3236.	94129561.	10.0584054	0.0003458	-0.000892
1.3105466	-21.733443 C				
0.00003563	3350.	94045446.	10.0612887	0.0003584	-0.000924
1.3536720	-22.520771 C				
0.00003688	3465.	93963300.	10.0643778	0.0003711	-0.000956
1.3964994	-23.307669 C				
0.00003813	3579.	93882912.	10.0676547	0.0003838	-0.000989
1.4390279	-24.094136 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00003938	3694.	93804096.	10.0711039	0.0003965	-0.001021
1.4812567	-24.880169 C				
0.00004063	3808.	93726688.	10.0747116	0.0004093	-0.001053
1.5231846	-25.665765 C				
0.00004188	3922.	93650546.	10.0784659	0.0004220	-0.001085
1.5648108	-26.450921 C				
0.00004313	4035.	93575540.	10.0823562	0.0004348	-0.001118
1.6061342	-27.235635 C				
0.00004438	4149.	93501560.	10.0863731	0.0004476	-0.001150
1.6471540	-28.019904 C				
0.00004563	4263.	93428502.	10.0905084	0.0004604	-0.001182
1.6878690	-28.803725 C				
0.00004688	4376.	93356279.	10.0947545	0.0004732	-0.001214
1.7282784	-29.587096 C				
0.00004813	4489.	93284807.	10.0991050	0.0004860	-0.001246
1.7683810	-30.370013 C				
0.00004938	4602.	93214014.	10.1035538	0.0004989	-0.001279
1.8081759	-31.152474 C				
0.00005063	4715.	93143835.	10.1080956	0.0005117	-0.001311
1.8476620	-31.934476 C				
0.00005188	4828.	93074209.	10.1127258	0.0005246	-0.001343
1.8868384	-32.716016 C				
0.00005313	4941.	93005082.	10.1174399	0.0005375	-0.001375
1.9257039	-33.497091 C				
0.00005438	5053.	92936405.	10.1222340	0.0005504	-0.001407
1.9642575	-34.277698 C				
0.00005563	5166.	92868132.	10.1271047	0.0005633	-0.001439
2.0024981	-35.057833 C				
0.00005688	5278.	92800222.	10.1320488	0.0005763	-0.001471
2.0404247	-35.837495 C				
0.00005813	5390.	92732637.	10.1370633	0.0005892	-0.001503
2.0780361	-36.616679 C				
0.00005938	5502.	92665342.	10.1421457	0.0006022	-0.001535
2.1153313	-37.395383 C				
0.00006063	5614.	92598305.	10.1472935	0.0006152	-0.001567
2.1523092	-38.173604 C				
0.00006188	5725.	92531497.	10.1525046	0.0006282	-0.001599
2.1889685	-38.951338 C				
0.00006313	5837.	92464888.	10.1577769	0.0006412	-0.001631
2.2253083	-39.728581 C				
0.00006438	5948.	92398455.	10.1631088	0.0006543	-0.001663
2.2613274	-40.505332 C				
0.00006563	6059.	92332173.	10.1684984	0.0006673	-0.001695
2.2970245	-41.281586 C				
0.00006688	6170.	92266020.	10.1739444	0.0006804	-0.001727
2.3323987	-42.057340 C				
0.00006813	6281.	92199976.	10.1794453	0.0006935	-0.001759
2.3674485	-42.832591 C				
0.00006938	6392.	92134020.	10.1849998	0.0007066	-0.001791
2.4021730	-43.607335 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00007063	6502.	92068136.	10.1906070	0.0007197	-0.001823
2.4365708	-44.381568 C				
0.00007188	6613.	92002305.	10.1962656	0.0007329	-0.001855
2.4706408	-45.155288 C				
0.00007313	6723.	91936511.	10.2020028	0.0007460	-0.001886
2.5043818	-45.928490 C				
0.00007438	6833.	91870742.	10.2077616	0.0007592	-0.001918
2.5377924	-46.701172 C				
0.00007938	7271.	91607617.	10.2312788	0.0008121	-0.002045
2.6681070	-49.786612 C				
0.00008438	7707.	91343844.	10.2555391	0.0008653	-0.002172
2.7930345	-52.863415 C				
0.00008938	8140.	91079227.	10.2796933	0.0009187	-0.002299
2.9123325	-55.933382 C				
0.00009438	8570.	90813004.	10.3043877	0.0009725	-0.002425
3.0260259	-58.995009 C				
0.00009938	8979.	90357411.	10.3225581	0.0010258	-0.002552
3.1326575	-60.000000 CY				
0.0001044	9304.	89144470.	10.3110511	0.0010762	-0.002681
3.2276850	-60.000000 CY				
0.0001094	9546.	87273573.	10.2718035	0.0011235	-0.002814
3.3116704	-60.000000 CY				
0.0001144	9782.	85523680.	10.2357064	0.0011707	-0.002947
3.3907664	-60.000000 CY				
0.0001194	10004.	83800225.	10.1987328	0.0012175	-0.003080
3.4643165	-60.000000 CY				
0.0001244	10154.	81641326.	10.1374818	0.0012608	-0.003217
3.5282172	-60.000000 CY				
0.0001294	10287.	79513660.	10.0756441	0.0013035	-0.003354
3.5871212	-60.000000 CY				
0.0001344	10419.	77536664.	10.0197410	0.0013464	-0.003491
3.6423258	-60.000000 CY				
0.0001394	10550.	75693983.	9.9691573	0.0013895	-0.003628
3.6937845	-60.000000 CY				
0.0001444	10680.	73971519.	9.9233661	0.0014327	-0.003765
3.7414497	-60.000000 CY				
0.0001494	10808.	72355946.	9.8810316	0.0014760	-0.003902
3.7851328	-60.000000 CY				
0.0001544	10925.	70772035.	9.8368433	0.0015186	-0.004039
3.8241552	-60.000000 CY				
0.0001594	11008.	69072220.	9.7809580	0.0015588	-0.004179
3.8574366	-60.000000 CY				
0.0001644	11071.	67351790.	9.7204156	0.0015978	-0.004320
3.8862696	-60.000000 CY				
0.0001694	11131.	65719446.	9.6635689	0.0016368	-0.004461
3.9118664	-60.000000 CY				
0.0001744	11191.	64176802.	9.6094393	0.0016756	-0.004602
3.9342902	-60.000000 CY				
0.0001794	11250.	62716278.	9.5601863	0.0017149	-0.004743
3.9535015	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0001844	11308.	61329164.	9.5136161	0.0017541	-0.004883
3.9693617	-60.000000 CY				
0.0001894	11364.	60009896.	9.4690774	0.0017932	-0.005024
3.9819050	-60.000000 CY				
0.0001944	11420.	58754909.	9.4280227	0.0018326	-0.005165
3.9911986	-60.000000 CY				
0.0001994	11476.	57559296.	9.3897594	0.0018721	-0.005305
3.9971986	-60.000000 CY				
0.0002044	11531.	56418622.	9.3531932	0.0019116	-0.005446
3.9998595	-60.000000 CY				
0.0002094	11584.	55328385.	9.3201259	0.0019514	-0.005586
3.9974517	-60.000000 CY				
0.0002144	11637.	54285454.	9.2909722	0.0019918	-0.005726
3.9998812	-60.000000 CY				
0.0002194	11690.	53285909.	9.2626721	0.0020320	-0.005866
3.9969940	-60.000000 CY				
0.0002244	11740.	52321336.	9.2356724	0.0020723	-0.006005
3.9997138	-60.000000 CY				
0.0002294	11786.	51384137.	9.2093226	0.0021124	-0.006145
3.9955528	-60.000000 CY				
0.0002344	11823.	50445667.	9.1796872	0.0021515	-0.006286
3.9989818	-60.000000 CY				
0.0002394	11855.	49524943.	9.1473565	0.0021896	-0.006428
3.9994466	-60.000000 CY				
0.0002444	11876.	48598228.	9.1109548	0.0022265	-0.006571
3.9965160	-60.000000 CY				
0.0002494	11895.	47701101.	9.0745971	0.0022630	-0.006715
3.9991770	-60.000000 CY				
0.0002544	11912.	46829816.	9.0405915	0.0022997	-0.006858
3.9995775	-60.000000 CY				
0.0002594	11929.	45990067.	9.0077660	0.0023364	-0.007001
3.9954763	-60.000000 CY				
0.0002644	11945.	45181124.	8.9766457	0.0023732	-0.007144
3.9984997	-60.000000 CY				
0.0002694	11961.	44401256.	8.9468563	0.0024101	-0.007287
3.9998981	-60.000000 CY				
0.0002744	11976.	43648250.	8.9191370	0.0024472	-0.007430
3.9944635	-60.000000 CY				
0.0003044	12062.	39628140.	8.7757363	0.0026711	-0.008286
3.9984635	-60.000000 CY				
0.0003344	12138.	36300180.	8.6628609	0.0028966	-0.009141
3.9998209	-60.000000 CY				
0.0003644	12207.	33502446.	8.5793723	0.0031261	-0.009991
3.9999551	-60.000000 CYT				
0.0003944	12272.	31117026.	8.5161103	0.0033585	-0.010839
3.9996166	-60.000000 CYT				
0.0004244	12331.	29056485.	8.4674428	0.0035934	-0.011684
3.9972132	-60.000000 CYT				
0.0004544	12377.	27238942.	8.4178614	0.0038249	-0.012533
3.9873462	-60.000000 CYT				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Axial Thrust Force = 4.200 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Run Bending Stiffness kip-in2 Msg	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
6.25000E-07	240.5049676	384807948.	19.4290859	0.00001214	-0.00001036
0.0508615	0.2771147				
0.00000125	480.1459926	384116794.	18.7161837	0.00002340	-0.00002160
0.0976654	0.5283867				
0.00000188	718.9162127	383421980.	18.4785558	0.00003465	-0.00003285
0.1441903	0.7796589				
0.00000250	956.8156222	382726249.	18.3597458	0.00004590	-0.00004410
0.1904363	1.0309315				
0.00000313	1194.	382030150.	18.2884629	0.00005715	-0.00005535
0.2364034	1.2822044				
0.00000375	1430.	381333869.	18.2409436	0.00006840	-0.00006660
0.2820914	1.5334776				
0.00000438	1665.	380637482.	18.2070035	0.00007966	-0.00007784
0.3275005	1.7847511				
0.00000500	1900.	379941029.	18.1815504	0.00009091	-0.00008909
0.3726306	2.0360248				
0.00000563	2133.	379244533.	18.1617553	0.0001022	-0.000100
0.4174818	2.2872988				
0.00000625	2366.	378548006.	18.1459208	0.0001134	-0.000112
0.4620539	2.5385732				
0.00000688	2366.	344134551.	10.2895004	0.00007074	-0.000177
0.2893429	-4.300617 C				
0.00000750	2366.	315456672.	10.2575513	0.00007693	-0.000193
0.3141325	-4.698533 C				
0.00000813	2366.	291190774.	10.2300378	0.00008312	-0.000209
0.3388235	-5.096560 C				
0.00000875	2366.	270391433.	10.2068278	0.00008931	-0.000226
0.3634446	-5.494492 C				
0.00000938	2366.	252365338.	10.1870615	0.00009550	-0.000242
0.3879959	-5.892330 C				
0.00001000	2366.	236592504.	10.1700940	0.0001017	-0.000258
0.4124772	-6.290073 C				
0.00001063	2366.	222675298.	10.1554324	0.0001079	-0.000275
0.4368884	-6.687720 C				
0.00001125	2366.	210304448.	10.1426931	0.0001141	-0.000291
0.4612294	-7.085271 C				
0.00001188	2366.	199235793.	10.1315564	0.0001203	-0.000307
0.4855002	-7.482727 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00001250	2366.	189274003.	10.1218127	0.0001265	-0.000323
0.5097005	-7.880086 C				
0.00001313	2366.	180260955.	10.1132503	0.0001327	-0.000340
0.5338304	-8.277349 C				
0.00001375	2366.	172067276.	10.1057088	0.0001390	-0.000356
0.5578898	-8.674515 C				
0.00001438	2366.	164586090.	10.0990556	0.0001452	-0.000372
0.5818784	-9.071585 C				
0.00001500	2366.	157728336.	10.0931803	0.0001514	-0.000389
0.6057963	-9.468556 C				
0.00001563	2366.	151419203.	10.0879903	0.0001576	-0.000405
0.6296433	-9.865431 C				
0.00001625	2366.	145595387.	10.0834069	0.0001639	-0.000421
0.6534193	-10.262207 C				
0.00001688	2366.	140202965.	10.0793634	0.0001701	-0.000437
0.6771242	-10.658886 C				
0.00001750	2366.	135195717.	10.0758025	0.0001763	-0.000454
0.7007579	-11.055466 C				
0.00001813	2366.	130533795.	10.0726747	0.0001826	-0.000470
0.7243204	-11.451947 C				
0.00001875	2366.	126182669.	10.0699372	0.0001888	-0.000486
0.7478114	-11.848330 C				
0.00001938	2366.	122112260.	10.0675528	0.0001951	-0.000502
0.7712309	-12.244613 C				
0.00002000	2366.	118296252.	10.0654889	0.0002013	-0.000519
0.7945789	-12.640797 C				
0.00002063	2366.	114711517.	10.0637168	0.0002076	-0.000535
0.8178551	-13.036882 C				
0.00002125	2366.	111337649.	10.0622112	0.0002138	-0.000551
0.8410595	-13.432866 C				
0.00002188	2366.	108156573.	10.0609497	0.0002201	-0.000567
0.8641920	-13.828750 C				
0.00002250	2366.	105152224.	10.0599125	0.0002263	-0.000584
0.8872524	-14.224533 C				
0.00002313	2366.	102310272.	10.0590817	0.0002326	-0.000600
0.9102407	-14.620215 C				
0.00002375	2366.	99617896.	10.0584414	0.0002389	-0.000616
0.9331568	-15.015796 C				
0.00002438	2366.	97063591.	10.0579776	0.0002452	-0.000632
0.9560005	-15.411276 C				
0.00002563	2432.	94924068.	10.0575288	0.0002577	-0.000665
1.0014704	-16.201930 C				
0.00002688	2548.	94810571.	10.0576469	0.0002703	-0.000697
1.0466496	-16.992174 C				
0.00002813	2664.	94702439.	10.0582592	0.0002829	-0.000730
1.0915372	-17.782007 C				
0.00002938	2779.	94598964.	10.0593353	0.0002955	-0.000762
1.1361324	-18.571425 C				
0.00003063	2894.	94499555.	10.0607664	0.0003081	-0.000794
1.1804341	-19.360427 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00003188	3009.	94403710.	10.0625387	0.0003207	-0.000827
1.2244416	-20.149010 C				
0.00003313	3124.	94311007.	10.0646159	0.0003334	-0.000859
1.2681539	-20.937171 C				
0.00003438	3239.	94221082.	10.0669675	0.0003461	-0.000891
1.3115700	-21.724908 C				
0.00003563	3354.	94133623.	10.0695670	0.0003587	-0.000924
1.3546892	-22.512219 C				
0.00003688	3468.	94048359.	10.0723915	0.0003714	-0.000956
1.3975103	-23.299100 C				
0.00003813	3582.	93965057.	10.0754214	0.0003841	-0.000988
1.4400326	-24.085550 C				
0.00003938	3697.	93883511.	10.0786392	0.0003968	-0.001021
1.4822550	-24.871565 C				
0.00004063	3811.	93803541.	10.0820299	0.0004096	-0.001053
1.5241766	-25.657144 C				
0.00004188	3925.	93724988.	10.0855803	0.0004223	-0.001085
1.5657965	-26.442282 C				
0.00004313	4039.	93647711.	10.0892786	0.0004351	-0.001117
1.6071135	-27.226979 C				
0.00004438	4152.	93571586.	10.0931145	0.0004479	-0.001150
1.6481268	-28.011230 C				
0.00004563	4266.	93496502.	10.0970787	0.0004607	-0.001182
1.6888354	-28.795033 C				
0.00004688	4379.	93422358.	10.1011630	0.0004735	-0.001214
1.7292383	-29.578385 C				
0.00004813	4492.	93349066.	10.1053601	0.0004863	-0.001246
1.7693344	-30.361284 C				
0.00004938	4606.	93276544.	10.1096634	0.0004992	-0.001278
1.8091228	-31.143727 C				
0.00005063	4718.	93204721.	10.1140670	0.0005120	-0.001310
1.8486023	-31.925710 C				
0.00005188	4831.	93133529.	10.1185657	0.0005249	-0.001343
1.8877721	-32.707231 C				
0.00005313	4944.	93062909.	10.1231546	0.0005378	-0.001375
1.9266309	-33.488287 C				
0.00005438	5056.	92992807.	10.1278294	0.0005507	-0.001407
1.9651778	-34.268875 C				
0.00005563	5169.	92923173.	10.1325862	0.0005636	-0.001439
2.0034117	-35.048992 C				
0.00005688	5281.	92853961.	10.1374215	0.0005766	-0.001471
2.0413316	-35.828634 C				
0.00005813	5393.	92785130.	10.1423320	0.0005895	-0.001503
2.0789362	-36.607799 C				
0.00005938	5505.	92716640.	10.1473148	0.0006025	-0.001535
2.1162246	-37.386484 C				
0.00006063	5617.	92648458.	10.1523672	0.0006155	-0.001567
2.1531956	-38.164685 C				
0.00006188	5728.	92580549.	10.1574868	0.0006285	-0.001599
2.1898481	-38.942399 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00006313	5840.	92512883.	10.1626714	0.0006415	-0.001631
2.2261809	-39.719622 C				
0.00006438	5951.	92445433.	10.1679189	0.0006546	-0.001663
2.2621930	-40.496353 C				
0.00006563	6062.	92378172.	10.1732276	0.0006676	-0.001695
2.2978832	-41.272587 C				
0.00006688	6173.	92311077.	10.1785957	0.0006807	-0.001727
2.3332503	-42.048320 C				
0.00006813	6284.	92244124.	10.1840217	0.0006938	-0.001759
2.3682931	-42.823550 C				
0.00006938	6395.	92177292.	10.1895041	0.0007069	-0.001791
2.4030104	-43.598274 C				
0.00007063	6505.	92110561.	10.1950417	0.0007200	-0.001822
2.4374011	-44.372486 C				
0.00007188	6616.	92043913.	10.2006608	0.0007332	-0.001854
2.4714639	-45.146185 C				
0.00007313	6726.	91977331.	10.2063053	0.0007463	-0.001886
2.5051976	-45.919366 C				
0.00007438	6836.	91910797.	10.2120017	0.0007595	-0.001918
2.5386010	-46.692026 C				
0.00007938	7274.	91644853.	10.2352897	0.0008124	-0.002045
2.6688860	-49.777380 C				
0.00008438	7710.	91378587.	10.2593338	0.0008656	-0.002172
2.7937834	-52.854093 C				
0.00008938	8143.	91111830.	10.2831857	0.0009191	-0.002298
2.9130226	-55.924331 C				
0.00009438	8573.	90843621.	10.3077273	0.0009728	-0.002425
3.0266854	-58.985869 C				
0.00009938	8982.	90387473.	10.3258078	0.0010261	-0.002551
3.1332951	-60.000000 CY				
0.0001044	9308.	89176212.	10.3143071	0.0010766	-0.002681
3.2283182	-60.000000 CY				
0.0001094	9549.	87304848.	10.2749831	0.0011238	-0.002814
3.3122821	-60.000000 CY				
0.0001144	9785.	85553556.	10.2389100	0.0011711	-0.002946
3.3913727	-60.000000 CY				
0.0001194	10007.	83830919.	10.2019402	0.0012179	-0.003080
3.4649106	-60.000000 CY				
0.0001244	10158.	81671814.	10.1406407	0.0012612	-0.003216
3.5287895	-60.000000 CY				
0.0001294	10291.	79542859.	10.0787027	0.0013039	-0.003354
3.5876602	-60.000000 CY				
0.0001344	10423.	77564670.	10.0227059	0.0013468	-0.003491
3.6428308	-60.000000 CY				
0.0001394	10554.	75720878.	9.9720357	0.0013899	-0.003628
3.6942550	-60.000000 CY				
0.0001444	10683.	73997378.	9.9261646	0.0014331	-0.003764
3.7418850	-60.000000 CY				
0.0001494	10812.	72381005.	9.8838986	0.0014764	-0.003901
3.7855535	-60.000000 CY				



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0001544	10929.	70796718.	9.8396771	0.0015190	-0.004038
3.8245440	-60.000000 CY				
0.0001594	11012.	69097838.	9.7838573	0.0015593	-0.004178
3.8578061	-60.000000 CY				
0.0001644	11075.	67376662.	9.7232508	0.0015983	-0.004319
3.8866026	-60.000000 CY				
0.0001694	11135.	65743511.	9.6663364	0.0016372	-0.004460
3.9121613	-60.000000 CY				
0.0001744	11195.	64200103.	9.6121495	0.0016761	-0.004601
3.9345463	-60.000000 CY				
0.0001794	11254.	62738857.	9.5628376	0.0017153	-0.004742
3.9537182	-60.000000 CY				
0.0001844	11312.	61351278.	9.5162917	0.0017546	-0.004883
3.9695496	-60.000000 CY				
0.0001894	11368.	60031354.	9.4717005	0.0017937	-0.005024
3.9820503	-60.000000 CY				
0.0001944	11425.	58775745.	9.4305957	0.0018331	-0.005164
3.9913005	-60.000000 CY				
0.0001994	11480.	57579537.	9.3922863	0.0018726	-0.005305
3.9972564	-60.000000 CY				
0.0002044	11535.	56438298.	9.3556780	0.0019121	-0.005445
3.9998723	-60.000000 CY				
0.0002094	11588.	55347517.	9.3241700	0.0019522	-0.005585
3.9975077	-60.000000 CY				
0.0002144	11641.	54304067.	9.2934428	0.0019923	-0.005725
3.9998931	-60.000000 CY				
0.0002194	11694.	53304015.	9.2651074	0.0020325	-0.005865
3.9970558	-60.000000 CY				
0.0002244	11744.	52339157.	9.2380944	0.0020728	-0.006005
3.9997330	-60.000000 CY				
0.0002294	11790.	51401489.	9.2117130	0.0021129	-0.006145
3.9956300	-60.000000 CY				
0.0002344	11827.	50463153.	9.1821360	0.0021521	-0.006285
3.9990203	-60.000000 CY				
0.0002394	11859.	49542728.	9.1500193	0.0021903	-0.006427
3.9992468	-60.000000 CY				
0.0002444	11880.	48615611.	9.1135780	0.0022271	-0.006570
3.9965958	-60.000000 CY				
0.0002494	11900.	47718283.	9.0771076	0.0022636	-0.006714
3.9992162	-60.000000 CY				
0.0002544	11917.	46846598.	9.0431776	0.0023004	-0.006857
3.9993713	-60.000000 CY				
0.0002594	11933.	46006491.	9.0103157	0.0023371	-0.007000
3.9955701	-60.000000 CY				
0.0002644	11949.	45197204.	8.9791598	0.0023739	-0.007144
3.9985538	-60.000000 CY				
0.0002694	11965.	44417005.	8.9493437	0.0024107	-0.007287
3.9999119	-60.000000 CY				
0.0002744	11980.	43663657.	8.9215934	0.0024479	-0.007430
3.9942523	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0003044	12066.	39641995.	8.7782176	0.0026719	-0.008286
3.9985257	-60.000000 CY				
0.0003344	12142.	36312646.	8.6652203	0.0028974	-0.009140
3.9998424	-60.000000 CY				
0.0003644	12212.	33513765.	8.5815911	0.0031269	-0.009991
3.9999658	-60.000000 CYT				
0.0003944	12276.	31127384.	8.5182268	0.0033594	-0.010838
3.9996505	-60.000000 CYT				
0.0004244	12335.	29066055.	8.4694819	0.0035942	-0.011683
3.9973093	-60.000000 CYT				
0.0004544	12381.	27248100.	8.4201387	0.0038259	-0.012532
3.9875919	-60.000000 CYT				

Axial Thrust Force = 4.600 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
6.25000E-07	240.5035986	384805758.	19.5651901	0.00001223	-0.00001027
0.0512199	0.2795816				
0.00000125	480.1446137	384115691.	18.7843907	0.00002348	-0.00002152
0.0980225	0.5308592				
0.00000188	718.9148267	383421241.	18.5241312	0.00003473	-0.00003277
0.1445462	0.7821371				
0.00000250	956.8142298	382725692.	18.3940059	0.00004599	-0.00004401
0.1907908	1.0334154				
0.00000313	1194.	382029703.	18.3159341	0.00005724	-0.00005526
0.2367565	1.2846940				
0.00000375	1430.	381333494.	18.2638891	0.00006849	-0.00006651
0.2824433	1.5359729				
0.00000438	1665.	380637159.	18.2267166	0.00007974	-0.00007776
0.3278510	1.7872522				
0.00000500	1900.	379940746.	18.1988394	0.00009099	-0.00008901
0.3729798	2.0385317				
0.00000563	2133.	379244280.	18.1771590	0.0001022	-0.000100
0.4178295	2.2898116				
0.00000625	2366.	378547777.	18.1598165	0.0001135	-0.000112
0.4624003	2.5410917				
0.00000688	2366.	344134343.	10.3291778	0.00007101	-0.000176
0.2904571	-4.292706 C				
0.00000750	2366.	315456481.	10.2940289	0.00007721	-0.000193
0.3152465	-4.690597 C				
0.00000813	2366.	291190598.	10.2646762	0.00008340	-0.000209
0.3399656	-5.088396 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00000875	2366.	270391269.	10.2391817	0.00008959	-0.000225
0.3645893	-5.486283 C				
0.00000938	2366.	252365185.	10.2172859	0.00009579	-0.000242
0.3891378	-5.884113 C				
0.00001000	2366.	236592361.	10.1984552	0.0001020	-0.000258
0.4136162	-6.281848 C				
0.00001063	2366.	222675163.	10.1821496	0.0001082	-0.000274
0.4380246	-6.679488 C				
0.00001125	2366.	210304321.	10.1679490	0.0001144	-0.000291
0.4623628	-7.077032 C				
0.00001188	2366.	199235672.	10.1555219	0.0001206	-0.000307
0.4866307	-7.474480 C				
0.00001250	2366.	189273889.	10.1446030	0.0001268	-0.000323
0.5108282	-7.871831 C				
0.00001313	2366.	180260846.	10.1349589	0.0001330	-0.000339
0.5349552	-8.269087 C				
0.00001375	2366.	172067171.	10.1264498	0.0001392	-0.000356
0.5590117	-8.666245 C				
0.00001438	2366.	164585990.	10.1189132	0.0001455	-0.000372
0.5829974	-9.063307 C				
0.00001500	2366.	157728241.	10.1122282	0.0001517	-0.000388
0.6069124	-9.460271 C				
0.00001563	2366.	151419111.	10.1062933	0.0001579	-0.000405
0.6307565	-9.857138 C				
0.00001625	2366.	145595299.	10.1010224	0.0001641	-0.000421
0.6545296	-10.253907 C				
0.00001688	2366.	140202880.	10.0963423	0.0001704	-0.000437
0.6782316	-10.650577 C				
0.00001750	2366.	135195635.	10.0921903	0.0001766	-0.000453
0.7018624	-11.047150 C				
0.00001813	2366.	130533716.	10.0885122	0.0001829	-0.000470
0.7254219	-11.443623 C				
0.00001875	2366.	126182592.	10.0852613	0.0001891	-0.000486
0.7489100	-11.839998 C				
0.00001938	2366.	122112186.	10.0823966	0.0001953	-0.000502
0.7723266	-12.236274 C				
0.00002000	2366.	118296180.	10.0798824	0.0002016	-0.000518
0.7956716	-12.632450 C				
0.00002063	2366.	114711448.	10.0776874	0.0002079	-0.000535
0.8189449	-13.028526 C				
0.00002125	2366.	111337582.	10.0757837	0.0002141	-0.000551
0.8421464	-13.424502 C				
0.00002188	2366.	108156508.	10.0741470	0.0002204	-0.000567
0.8652759	-13.820378 C				
0.00002250	2366.	105152160.	10.0727554	0.0002266	-0.000583
0.8883333	-14.216153 C				
0.00002313	2366.	102310210.	10.0715894	0.0002329	-0.000600
0.9113187	-14.611828 C				
0.00002375	2366.	99617836.	10.0706317	0.0002392	-0.000616
0.9342318	-15.007401 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00002438	2366.	97063533.	10.0698667	0.0002455	-0.000632
0.9570725	-15.402873 C				
0.00002563	2436.	95048091.	10.0688598	0.0002580	-0.000664
1.0025364	-16.193510 C				
0.00002688	2551.	94928657.	10.0684718	0.0002706	-0.000697
1.0477096	-16.983738 C				
0.00002813	2667.	94815115.	10.0686232	0.0002832	-0.000729
1.0925912	-17.773555 C				
0.00002938	2782.	94706690.	10.0692479	0.0002958	-0.000762
1.1371802	-18.562957 C				
0.00003063	2897.	94602733.	10.0703211	0.0003084	-0.000794
1.1814759	-19.351942 C				
0.00003188	3012.	94502697.	10.0717368	0.0003210	-0.000826
1.2254772	-20.140508 C				
0.00003313	3127.	94406117.	10.0734845	0.0003337	-0.000859
1.2691834	-20.928652 C				
0.00003438	3242.	94312597.	10.0755306	0.0003463	-0.000891
1.3125933	-21.716373 C				
0.00003563	3357.	94221794.	10.0778462	0.0003590	-0.000923
1.3557063	-22.503666 C				
0.00003688	3471.	94133413.	10.0804061	0.0003717	-0.000956
1.3985212	-23.290530 C				
0.00003813	3586.	94047197.	10.0831888	0.0003844	-0.000988
1.4410372	-24.076963 C				
0.00003938	3700.	93962921.	10.0861753	0.0003971	-0.001020
1.4832533	-24.862961 C				
0.00004063	3814.	93880388.	10.0893491	0.0004099	-0.001053
1.5251686	-25.648521 C				
0.00004188	3928.	93799425.	10.0926956	0.0004226	-0.001085
1.5667821	-26.433642 C				
0.00004313	4042.	93719877.	10.0962019	0.0004354	-0.001117
1.6080927	-27.218321 C				
0.00004438	4155.	93641609.	10.0998566	0.0004482	-0.001149
1.6490996	-28.002554 C				
0.00004563	4269.	93564497.	10.1036497	0.0004610	-0.001182
1.6898018	-28.786339 C				
0.00004688	4382.	93488434.	10.1075722	0.0004738	-0.001214
1.7301982	-29.569674 C				
0.00004813	4496.	93413321.	10.1116159	0.0004866	-0.001246
1.7702878	-30.352554 C				
0.00004938	4609.	93339070.	10.1157737	0.0004995	-0.001278
1.8100696	-31.134978 C				
0.00005063	4722.	93265602.	10.1200391	0.0005123	-0.001310
1.8495425	-31.916943 C				
0.00005188	4834.	93192845.	10.1244063	0.0005252	-0.001342
1.8887057	-32.698446 C				
0.00005313	4947.	93120733.	10.1288700	0.0005381	-0.001374
1.9275579	-33.479483 C				
0.00005438	5060.	93049206.	10.1334255	0.0005510	-0.001406
1.9660981	-34.260052 C				

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 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00005563	5172.	92978211.	10.1380684	0.0005639	-0.001439
2.0043253	-35.040149 C				
0.00005688	5284.	92907697.	10.1427948	0.0005769	-0.001471
2.0422384	-35.819772 C				
0.00005813	5396.	92837619.	10.1476012	0.0005898	-0.001503
2.0798362	-36.598918 C				
0.00005938	5508.	92767935.	10.1524844	0.0006028	-0.001535
2.1171178	-37.377583 C				
0.00006063	5620.	92698606.	10.1574414	0.0006158	-0.001567
2.1540819	-38.155764 C				
0.00006188	5731.	92629597.	10.1624696	0.0006288	-0.001599
2.1907275	-38.933458 C				
0.00006313	5843.	92560874.	10.1675664	0.0006418	-0.001631
2.2270535	-39.710662 C				
0.00006438	5954.	92492407.	10.1727297	0.0006549	-0.001663
2.2630586	-40.487373 C				
0.00006563	6065.	92424168.	10.1779574	0.0006679	-0.001695
2.2987417	-41.263586 C				
0.00006688	6176.	92356130.	10.1832476	0.0006810	-0.001726
2.3341018	-42.039299 C				
0.00006813	6287.	92288268.	10.1885986	0.0006941	-0.001758
2.3691375	-42.814509 C				
0.00006938	6398.	92220560.	10.1940089	0.0007072	-0.001790
2.4038477	-43.589211 C				
0.00007063	6508.	92152983.	10.1995039	0.0007203	-0.001822
2.4382312	-44.363403 C				
0.00007188	6619.	92085519.	10.2050285	0.0007335	-0.001854
2.4722868	-45.137081 C				
0.00007313	6729.	92018147.	10.2106084	0.0007467	-0.001886
2.5060133	-45.910241 C				
0.00007438	6839.	91950850.	10.2162424	0.0007598	-0.001918
2.5394094	-46.682880 C				
0.00007938	7277.	91682087.	10.2393011	0.0008127	-0.002045
2.6696649	-49.768146 C				
0.00008438	7713.	91413389.	10.2630109	0.0008659	-0.002172
2.7945082	-52.845065 C				
0.00008938	8146.	91144431.	10.2866786	0.0009194	-0.002298
2.9137126	-55.915279 C				
0.00009438	8576.	90874234.	10.3110673	0.0009731	-0.002424
3.0273448	-58.976728 C				
0.00009938	8985.	90417533.	10.3290580	0.0010265	-0.002551
3.1339327	-60.000000 CY				
0.0001044	9311.	89207952.	10.3175636	0.0010769	-0.002681
3.2289512	-60.000000 CY				
0.0001094	9552.	87336121.	10.2781631	0.0011242	-0.002813
3.3128936	-60.000000 CY				
0.0001144	9789.	85583430.	10.2421143	0.0011714	-0.002946
3.3919789	-60.000000 CY				
0.0001194	10011.	83861611.	10.2051482	0.0012182	-0.003079
3.4655044	-60.000000 CY				

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0.0001244	10162.	81702300.	10.1438002	0.0012616	-0.003216
3.5293615	-60.000000 CY				
0.0001294	10295.	79572057.	10.0817619	0.0013043	-0.003353
3.5881988	-60.000000 CY				
0.0001344	10427.	77592674.	10.0256713	0.0013472	-0.003490
3.6433355	-60.000000 CY				
0.0001394	10557.	75747771.	9.9749147	0.0013903	-0.003627
3.6947252	-60.000000 CY				
0.0001444	10687.	74023236.	9.9289636	0.0014335	-0.003764
3.7423201	-60.000000 CY				
0.0001494	10816.	72406063.	9.8867661	0.0014768	-0.003901
3.7859739	-60.000000 CY				
0.0001544	10933.	70821400.	9.8425115	0.0015194	-0.004038
3.8249324	-60.000000 CY				
0.0001594	11017.	69123456.	9.7867573	0.0015598	-0.004178
3.8581753	-60.000000 CY				
0.0001644	11079.	67401534.	9.7260868	0.0015987	-0.004319
3.8869352	-60.000000 CY				
0.0001694	11139.	65767574.	9.6691048	0.0016377	-0.004460
3.9124557	-60.000000 CY				
0.0001744	11199.	64223403.	9.6148605	0.0016766	-0.004601
3.9348020	-60.000000 CY				
0.0001794	11258.	62761436.	9.5654896	0.0017158	-0.004742
3.9539345	-60.000000 CY				
0.0001844	11316.	61373390.	9.5189681	0.0017551	-0.004882
3.9697370	-60.000000 CY				
0.0001894	11373.	60052811.	9.4743244	0.0017942	-0.005023
3.9821950	-60.000000 CY				
0.0001944	11429.	58796578.	9.4331695	0.0018336	-0.005164
3.9914019	-60.000000 CY				
0.0001994	11484.	57599778.	9.3948139	0.0018731	-0.005304
3.9973136	-60.000000 CY				
0.0002044	11539.	56457972.	9.3581635	0.0019126	-0.005445
3.9998845	-60.000000 CY				
0.0002094	11592.	55366642.	9.3266817	0.0019528	-0.005585
3.9975630	-60.000000 CY				
0.0002144	11645.	54322678.	9.2959142	0.0019928	-0.005725
3.9999044	-60.000000 CY				
0.0002194	11698.	53322120.	9.2675435	0.0020331	-0.005864
3.9971169	-60.000000 CY				
0.0002244	11748.	52356977.	9.2405172	0.0020733	-0.006004
3.9997515	-60.000000 CY				
0.0002294	11794.	51418840.	9.2141042	0.0021135	-0.006144
3.9957066	-60.000000 CY				
0.0002344	11831.	50480617.	9.1845645	0.0021526	-0.006285
3.9990577	-60.000000 CY				
0.0002394	11864.	49560513.	9.1526832	0.0021909	-0.006427
3.9990468	-60.000000 CY				
0.0002444	11885.	48632992.	9.1162023	0.0022278	-0.006570
3.9966747	-60.000000 CY				

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 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
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0.0002494	11904.	47735462.	9.0796192	0.0022642	-0.006713
3.9992545	-60.000000 CY				
0.0002544	11921.	46863378.	9.0457647	0.0023010	-0.006856
3.9991650	-60.000000 CY				
0.0002594	11937.	46022914.	9.0128664	0.0023377	-0.007000
3.9956629	-60.000000 CY				
0.0002644	11953.	45213284.	8.9816750	0.0023745	-0.007143
3.9986069	-60.000000 CY				
0.0002694	11969.	44432753.	8.9518321	0.0024114	-0.007286
3.9999247	-60.000000 CY				
0.0002744	11984.	43679063.	8.9240509	0.0024485	-0.007429
3.9940409	-60.000000 CY				
0.0003044	12070.	39655848.	8.7807001	0.0026726	-0.008285
3.9985866	-60.000000 CY				
0.0003344	12146.	36325110.	8.6675807	0.0028982	-0.009139
3.9998625	-60.000000 CY				
0.0003644	12216.	33525083.	8.5838110	0.0031277	-0.009990
3.9999751	-60.000000 CYT				
0.0003944	12280.	31137740.	8.5203443	0.0033602	-0.010837
3.9996828	-60.000000 CYT				
0.0004244	12339.	29075625.	8.4715220	0.0035951	-0.011682
3.9974037	-60.000000 CYT				
0.0004544	12385.	27257253.	8.4224181	0.0038269	-0.012531
3.9878351	-60.000000 CYT				

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 Summary of Results for Nominal Moment Capacity for Section 1  
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Moment values interpolated at maximum compressive strain = 0.003  
 or maximum developed moment if pile fails at smaller strains.

Load Tens. No. Strain	Axial Thrust  kips	Nominal Mom. Cap.  in-kip	Max. Comp.  Strain	Max.
----- -----	----- -----	----- -----	----- -----	
1 -0.00952396	3.800	12169.214	0.00300000	
2 -0.00952020	4.200	12173.120	0.00300000	
3 -0.00951645	4.600	12177.027	0.00300000	

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether

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 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.75).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Stiff. Load Ult Mom No. kip-in <sup>2</sup>	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. at
1 91219895.	0.65	3.800000	12169.	2.470000	7910.	
2 91253873.	0.65	4.200000	12173.	2.730000	7913.	
3 91287886.	0.65	4.600000	12177.	2.990000	7915.	
1 89806706.	0.75	3.800000	12169.	2.850000	9127.	
2 89838295.	0.75	4.200000	12173.	3.150000	9130.	
3 89869877.	0.75	4.600000	12177.	3.450000	9133.	
1 70221645.	0.90	3.800000	12169.	3.420000	10952.	
2 70254444.	0.90	4.200000	12173.	3.780000	10956.	
3 70287179.	0.90	4.600000	12177.	4.140000	10959.	

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
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Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

1	1.0000	0.00	N.A.	No	0.00	8832.
2	4.0000	0.2434	No	No	8832.	211469.
3	17.4000	16.4000	No	No	220301.	0.00
4	24.4000	23.4000	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 = 1000.0 lbs  
Applied moment at pile head = 315600.0 in-lbs  
Axial thrust load on pile head = 4200.0 lbs

Depth Res.	Soil X	Deflect. Spr.	Bending Distrib.	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
	Es*H feet lb/inch	y Lat. Load inches lb/inch	Moment in-lbs lb/inch	lbs	radians	psi*	lb-in^2	
0.00	0.00	0.00845	315600.	1000.	-1.40E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.09000	0.00	0.00830	316681.	1000.	-1.39E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.1800	0.00	0.00815	317761.	1000.0000	-1.39E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.2700	0.00	0.00800	318842.	1000.0000	-1.38E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.3600	0.00	0.00786	319923.	1000.0000	-1.37E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.4500	0.00	0.00771	321003.	1000.0000	-1.36E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.5400	0.00	0.00756	322084.	1000.0000	-1.35E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.6300	0.00	0.00742	323164.	1000.0000	-1.34E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					

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36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.7200	0.00727	324245.	1000.0000	-1.33E-04	0.00	3.84E+11
0.00	0.00	0.00				
0.8100	0.00713	325326.	1000.0000	-1.32E-04	0.00	3.84E+11
0.00	0.00	0.00				
0.9000	0.00699	326406.	1000.	-1.31E-04	0.00	3.84E+11
0.00	0.00	0.00				
0.9900	0.00685	327487.	1000.	-1.30E-04	0.00	3.84E+11
0.00	0.00	0.00				
1.0800	0.00670	328567.	992.0294	-1.30E-04	0.00	3.84E+11
-14.760	2378.	0.00				
1.1700	0.00657	329631.	976.0132	-1.29E-04	0.00	3.84E+11
-14.899	2451.	0.00				
1.2600	0.00643	330677.	959.8490	-1.28E-04	0.00	3.84E+11
-15.034	2526.	0.00				
1.3500	0.00629	331705.	943.5412	-1.27E-04	0.00	3.84E+11
-15.165	2604.	0.00				
1.4400	0.00615	332716.	927.0945	-1.26E-04	0.00	3.84E+11
-15.292	2684.	0.00				
1.5300	0.00602	333709.	910.5135	-1.25E-04	0.00	3.84E+11
-15.414	2766.	0.00				
1.6200	0.00588	334684.	893.8028	-1.24E-04	0.00	3.84E+11
-15.532	2851.	0.00				
1.7100	0.00575	335641.	876.9672	-1.23E-04	0.00	3.84E+11
-15.645	2938.	0.00				
1.8000	0.00562	336579.	860.0116	-1.22E-04	0.00	3.84E+11
-15.754	3029.	0.00				
1.8900	0.00549	337499.	842.9407	-1.21E-04	0.00	3.84E+11
-15.859	3122.	0.00				
1.9800	0.00536	338401.	825.7596	-1.20E-04	0.00	3.84E+11
-15.958	3218.	0.00				
2.0700	0.00523	339284.	808.4734	-1.19E-04	0.00	3.84E+11
-16.053	3317.	0.00				
2.1600	0.00510	340148.	791.0871	-1.18E-04	0.00	3.84E+11
-16.144	3419.	0.00				
2.2500	0.00497	340994.	773.6060	-1.17E-04	0.00	3.84E+11
-16.229	3525.	0.00				
2.3400	0.00485	341820.	756.0353	-1.16E-04	0.00	3.84E+11
-16.309	3635.	0.00				
2.4300	0.00472	342628.	738.3806	-1.15E-04	0.00	3.84E+11
-16.385	3749.	0.00				
2.5200	0.00460	343416.	720.6473	-1.14E-04	0.00	3.84E+11
-16.455	3866.	0.00				
2.6100	0.00447	344186.	702.8410	-1.13E-04	0.00	3.84E+11
-16.520	3988.	0.00				
2.7000	0.00435	344936.	684.9674	-1.12E-04	0.00	3.84E+11
-16.579	4115.	0.00				
2.7900	0.00423	345666.	667.0325	-1.11E-04	0.00	3.84E+11
-16.634	4246.	0.00				
2.8800	0.00411	346377.	649.0421	-1.11E-04	0.00	3.84E+11
-16.682	4383.	0.00				

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Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

2.9700	0.00399	347069.	631.0023	-1.10E-04	0.00	3.84E+11
-16.725	4525.	0.00				
3.0600	0.00387	347741.	612.9195	-1.09E-04	0.00	3.84E+11
-16.762	4673.	0.00				
3.1500	0.00376	348394.	594.7999	-1.08E-04	0.00	3.84E+11
-16.793	4827.	0.00				
3.2400	0.00364	349027.	576.6502	-1.07E-04	0.00	3.84E+11
-16.818	4988.	0.00				
3.3300	0.00353	349640.	558.4770	-1.06E-04	0.00	3.84E+11
-16.836	5155.	0.00				
3.4200	0.00341	350234.	540.2873	-1.05E-04	0.00	3.84E+11
-16.848	5331.	0.00				
3.5100	0.00330	350808.	522.0881	-1.04E-04	0.00	3.84E+11
-16.854	5514.	0.00				
3.6000	0.00319	351363.	503.8867	-1.03E-04	0.00	3.84E+11
-16.852	5706.	0.00				
3.6900	0.00308	351898.	485.6907	-1.02E-04	0.00	3.84E+11
-16.844	5908.	0.00				
3.7800	0.00297	352413.	467.5077	-1.01E-04	0.00	3.84E+11
-16.828	6119.	0.00				
3.8700	0.00286	352908.	449.3458	-9.97E-05	0.00	3.84E+11
-16.805	6342.	0.00				
3.9600	0.00275	353384.	431.2132	-9.87E-05	0.00	3.84E+11
-16.774	6577.	0.00				
4.0500	0.00265	353841.	193.3706	-9.77E-05	0.00	3.84E+11
-423.675	172764.	0.00				
4.1400	0.00254	353803.	-263.176	-9.67E-05	0.00	3.84E+11
-421.782	179092.	0.00				
4.2300	0.00244	353273.	-717.606	-9.57E-05	0.00	3.84E+11
-419.753	185822.	0.00				
4.3200	0.00234	352254.	-1170.	-9.47E-05	0.00	3.84E+11
-417.582	192998.	0.00				
4.4100	0.00223	350747.	-1620.	-9.38E-05	0.00	3.84E+11
-415.258	200664.	0.00				
4.5000	0.00213	348757.	-2067.	-9.28E-05	0.00	3.84E+11
-412.774	208877.	0.00				
4.5900	0.00203	346284.	-2511.	-9.18E-05	0.00	3.84E+11
-410.118	217698.	0.00				
4.6800	0.00194	343334.	-2952.	-9.08E-05	0.00	3.84E+11
-407.280	227203.	0.00				
4.7700	0.00184	339908.	-3391.	-8.99E-05	0.00	3.84E+11
-404.244	237478.	0.00				
4.8600	0.00174	336011.	-3825.	-8.89E-05	0.00	3.84E+11
-400.998	248626.	0.00				
4.9500	0.00165	331646.	-4257.	-8.80E-05	0.00	3.84E+11
-397.522	260771.	0.00				
5.0400	0.00155	326817.	-4684.	-8.71E-05	0.00	3.84E+11
-393.799	274061.	0.00				
5.1300	0.00146	321529.	-5107.	-8.61E-05	0.00	3.84E+11
-389.803	288677.	0.00				

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36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

5.2200	0.00137	315787.	-5526.	-8.52E-05	0.00	3.84E+11
-385.510	304842.	0.00				
5.3100	0.00127	309594.	-5940.	-8.44E-05	0.00	3.84E+11
-380.888	322835.	0.00				
5.4000	0.00118	302958.	-6348.	-8.35E-05	0.00	3.85E+11
-375.899	343008.	0.00				
5.4900	0.00109	295883.	-6751.	-8.27E-05	0.00	3.85E+11
-370.499	365812.	0.00				
5.5800	0.00101	288376.	-7148.	-8.18E-05	0.00	3.85E+11
-364.632	391841.	0.00				
5.6700	9.17E-04	280443.	-7539.	-8.10E-05	0.00	3.85E+11
-358.233	421886.	0.00				
5.7600	8.30E-04	272093.	-7922.	-8.03E-05	0.00	3.85E+11
-351.214	457031.	0.00				
5.8500	7.44E-04	263333.	-8297.	-7.95E-05	0.00	3.85E+11
-343.469	498806.	0.00				
5.9400	6.58E-04	254172.	-8651.	-7.88E-05	0.00	3.85E+11
-312.676	513061.	0.00				
6.0300	5.73E-04	244647.	-8968.	-7.81E-05	0.00	3.85E+11
-273.821	515673.	0.00				
6.1200	4.90E-04	234802.	-9243.	-7.74E-05	0.00	3.85E+11
-234.912	518286.	0.00				
6.2100	4.06E-04	224683.	-9475.	-7.68E-05	0.00	3.85E+11
-195.941	520899.	0.00				
6.3000	3.24E-04	214336.	-9666.	-7.62E-05	0.00	3.85E+11
-156.897	523513.	0.00				
6.3900	2.42E-04	203806.	-9814.	-7.56E-05	0.00	3.85E+11
-117.769	526127.	0.00				
6.4800	1.60E-04	193138.	-9920.	-7.50E-05	0.00	3.85E+11
-78.548	528742.	0.00				
6.5700	7.97E-05	182379.	-9984.	-7.45E-05	0.00	3.85E+11
-39.221	531357.	0.00				
6.6600	-4.52E-07	171574.	-10005.	-7.40E-05	0.00	3.85E+11
0.2235	533973.	0.00				
6.7500	-8.01E-05	160769.	-9983.	-7.35E-05	0.00	3.85E+11
39.7981	536589.	0.00				
6.8400	-1.59E-04	150011.	-9919.	-7.31E-05	0.00	3.85E+11
79.5153	539205.	0.00				
6.9300	-2.38E-04	139345.	-9811.	-7.27E-05	0.00	3.85E+11
119.3880	541822.	0.00				
7.0200	-3.16E-04	128819.	-9661.	-7.23E-05	0.00	3.85E+11
159.4293	544439.	0.00				
7.1100	-3.94E-04	118479.	-9467.	-7.20E-05	0.00	3.85E+11
199.6523	547056.	0.00				
7.2000	-4.72E-04	108371.	-9229.	-7.16E-05	0.00	3.85E+11
240.0702	549674.	0.00				
7.2900	-5.49E-04	98544.	-8948.	-7.14E-05	0.00	3.85E+11
280.6962	552292.	0.00				
7.3800	-6.26E-04	89044.	-8623.	-7.11E-05	0.00	3.85E+11
321.5432	554910.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

7.4700	-7.02E-04	79919.	-8254.	-7.08E-05	0.00	3.85E+11
362.6239	557529.	0.00				
7.5600	-7.79E-04	71217.	-7852.	-7.06E-05	0.00	3.85E+11
381.2591	528681.	0.00				
7.6500	-8.55E-04	62959.	-7434.	-7.04E-05	0.00	3.85E+11
392.0866	495253.	0.00				
7.7400	-9.31E-04	55159.	-7005.	-7.03E-05	0.00	3.85E+11
402.3893	466782.	0.00				
7.8300	-0.00101	47829.	-6565.	-7.01E-05	0.00	3.85E+11
412.2471	442204.	0.00				
7.9200	-0.00108	40979.	-6115.	-7.00E-05	0.00	3.85E+11
421.7230	420743.	0.00				
8.0100	-0.00116	34621.	-5655.	-6.99E-05	0.00	3.85E+11
430.8679	401822.	0.00				
8.1000	-0.00123	28765.	-5184.	-6.98E-05	0.00	3.85E+11
439.7233	384998.	0.00				
8.1900	-0.00131	23423.	-4705.	-6.97E-05	0.00	3.85E+11
448.3236	369927.	0.00				
8.2800	-0.00138	18603.	-4216.	-6.97E-05	0.00	3.85E+11
456.6975	356339.	0.00				
8.3700	-0.00146	14316.	-3719.	-6.96E-05	0.00	3.85E+11
464.8694	344016.	0.00				
8.4600	-0.00153	10572.	-3212.	-6.96E-05	0.00	3.85E+11
472.8599	332784.	0.00				
8.5500	-0.00161	7379.	-2697.	-6.96E-05	0.00	3.85E+11
480.6868	322498.	0.00				
8.6400	-0.00168	4746.	-2174.	-6.96E-05	0.00	3.85E+11
488.3655	313038.	0.00				
8.7300	-0.00176	2683.	-1643.	-6.96E-05	0.00	3.85E+11
495.9092	304306.	0.00				
8.8200	-0.00184	1199.	-1103.	-6.95E-05	0.00	3.85E+11
503.3297	296217.	0.00				
8.9100	-0.00191	301.6889	-555.378	-6.95E-05	0.00	3.85E+11
510.6370	288701.	0.00				
9.0000	-0.00199	0.00	0.00	-6.95E-05	0.00	3.85E+11
517.8402	140849.	0.00				

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.00845408 inches  
 Computed slope at pile head = -0.0001404 radians  
 Maximum bending moment = 353841. inch-lbs

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Maximum shear force = -10005. lbs  
 Depth of maximum bending moment = 4.05000000 feet below pile head  
 Depth of maximum shear force = 6.66000000 feet below pile head  
 Number of iterations = 16  
 Number of zero deflection points = 1  
 Pile deflection at ground = 0.00682953 inches

-----  
 Pile-head Deflection vs. Pile Length for Load Case 1  
 -----

Boundary Condition Type 1, Shear and Moment

Shear = 1000. lbs  
 Moment = 315600. in-lbs  
 Axial Load = 4200. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.00000	0.00845408	353841.	-10005.
8.55000	0.01404582	351326.	-11227.
8.10000	0.03076040	347877.	-12631.
7.65000	0.07456355	343404.	-13983.
7.20000	0.18854321	339104.	-15309.
6.75000	0.59294386	336364.	-17054.
6.30000	1.99501542	335871.	-19082.
5.85000	11.10851419	347621.	-23250.

-----  
 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 = 2250.0 lbs  
 Applied moment at pile head = 724800.0 in-lbs  
 Axial thrust load on pile head = 4600.0 lbs

Depth Res.	Soil Spr.	Deflect. Distrib.	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
X Es*H feet		y Lat. Load inches	in-lbs	lbs	radians	psi*	lb-in^2	

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

lb/inch	lb/inch	lb/inch				
-----	-----	-----	-----	-----	-----	-----
0.00	0.1519	724800.	2250.	-0.00198	0.00	3.83E+11
0.00	0.00	0.00				
0.09000	0.1497	727240.	2250.	-0.00197	0.00	3.83E+11
0.00	0.00	0.00				
0.1800	0.1476	729680.	2250.	-0.00197	0.00	3.83E+11
0.00	0.00	0.00				
0.2700	0.1455	732119.	2250.	-0.00197	0.00	3.83E+11
0.00	0.00	0.00				
0.3600	0.1434	734559.	2250.	-0.00197	0.00	3.83E+11
0.00	0.00	0.00				
0.4500	0.1412	736999.	2250.	-0.00196	0.00	3.83E+11
0.00	0.00	0.00				
0.5400	0.1391	739439.	2250.	-0.00196	0.00	3.83E+11
0.00	0.00	0.00				
0.6300	0.1370	741878.	2250.	-0.00196	0.00	3.83E+11
0.00	0.00	0.00				
0.7200	0.1349	744318.	2250.	-0.00196	0.00	3.83E+11
0.00	0.00	0.00				
0.8100	0.1328	746758.	2250.	-0.00196	0.00	3.83E+11
0.00	0.00	0.00				
0.9000	0.1307	749198.	2250.	-0.00195	0.00	3.83E+11
0.00	0.00	0.00				
0.9900	0.1285	751637.	2250.	-0.00195	0.00	3.83E+11
0.00	0.00	0.00				
1.0800	0.1264	754077.	2229.	-0.00195	0.00	3.83E+11
-39.260	335.3451	0.00				
1.1700	0.1243	756471.	2186.	-0.00195	0.00	3.83E+11
-39.685	344.7196	0.00				
1.2600	0.1222	758818.	2143.	-0.00195	0.00	3.83E+11
-40.101	354.3260	0.00				
1.3500	0.1201	761119.	2100.	-0.00194	0.00	3.83E+11
-40.508	364.1742	0.00				
1.4400	0.1180	763373.	2056.	-0.00194	0.00	3.83E+11
-40.904	374.2748	0.00				
1.5300	0.1159	765579.	2011.	-0.00194	0.00	3.83E+11
-41.291	384.6391	0.00				
1.6200	0.1138	767736.	1966.	-0.00194	0.00	3.83E+11
-41.667	395.2792	0.00				
1.7100	0.1118	769845.	1921.	-0.00194	0.00	3.83E+11
-42.032	406.2079	0.00				
1.8000	0.1097	771905.	1876.	-0.00193	0.00	3.83E+11
-42.387	417.4387	0.00				
1.8900	0.1076	773916.	1830.	-0.00193	0.00	3.83E+11
-42.731	428.9862	0.00				
1.9800	0.1055	775877.	1783.	-0.00193	0.00	3.83E+11
-43.063	440.8661	0.00				
2.0700	0.1034	777787.	1737.	-0.00193	0.00	3.83E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-43.384	453.0949	0.00					
2.1600	0.1013	779647.	1690.	-0.00192	0.00	3.83E+11	
-43.694	465.6906	0.00					
2.2500	0.09926	781456.	1642.	-0.00192	0.00	3.83E+11	
-43.991	478.6722	0.00					
2.3400	0.09718	783213.	1595.	-0.00192	0.00	3.83E+11	
-44.277	492.0604	0.00					
2.4300	0.09511	784919.	1547.	-0.00192	0.00	3.83E+11	
-44.549	505.8772	0.00					
2.5200	0.09304	786573.	1498.	-0.00192	0.00	3.83E+11	
-44.809	520.1467	0.00					
2.6100	0.09097	788175.	1450.	-0.00191	0.00	3.83E+11	
-45.056	534.8945	0.00					
2.7000	0.08891	789724.	1401.	-0.00191	0.00	3.83E+11	
-45.289	550.1485	0.00					
2.7900	0.08684	791220.	1352.	-0.00191	0.00	3.83E+11	
-45.508	565.9390	0.00					
2.8800	0.08478	792663.	1303.	-0.00191	0.00	3.83E+11	
-45.713	582.2986	0.00					
2.9700	0.08273	794053.	1253.	-0.00190	0.00	3.83E+11	
-45.903	599.2631	0.00					
3.0600	0.08067	795389.	1204.	-0.00190	0.00	3.83E+11	
-46.077	616.8713	0.00					
3.1500	0.07862	796672.	1154.	-0.00190	0.00	3.83E+11	
-46.236	635.1656	0.00					
3.2400	0.07657	797900.	1104.	-0.00190	0.00	3.83E+11	
-46.379	654.1923	0.00					
3.3300	0.07452	799075.	1054.	-0.00190	0.00	3.83E+11	
-46.506	674.0023	0.00					
3.4200	0.07247	800195.	1003.	-0.00189	0.00	3.83E+11	
-46.615	694.6517	0.00					
3.5100	0.07043	801261.	952.9545	-0.00189	0.00	3.83E+11	
-46.706	716.2021	0.00					
3.6000	0.06839	802272.	902.4726	-0.00189	0.00	3.83E+11	
-46.779	738.7217	0.00					
3.6900	0.06635	803229.	851.9227	-0.00189	0.00	3.83E+11	
-46.832	762.2861	0.00					
3.7800	0.06432	804131.	801.3256	-0.00188	0.00	3.83E+11	
-46.866	786.9793	0.00					
3.8700	0.06228	804979.	750.7036	-0.00188	0.00	3.83E+11	
-46.879	812.8951	0.00					
3.9600	0.06025	805771.	700.0793	-0.00188	0.00	3.83E+11	
-46.870	840.1386	0.00					
4.0500	0.05822	806510.	179.8615	-0.00188	0.00	3.83E+11	
-916.496	17000.	0.00					
4.1400	0.05620	806179.	-808.360	-0.00187	0.00	3.83E+11	
-913.544	17557.	0.00					
4.2300	0.05417	804782.	-1793.	-0.00187	0.00	3.83E+11	
-910.291	18148.	0.00					
4.3200	0.05215	802324.	-2774.	-0.00187	0.00	3.83E+11	



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-906.720	18777.	0.00				
4.4100	0.05013	798808.	-3752.	-0.00187	0.00	3.83E+11
-902.810	19449.	0.00				
4.5000	0.04812	794239.	-4724.	-0.00187	0.00	3.83E+11
-898.540	20168.	0.00				
4.5900	0.04610	788622.	-5692.	-0.00186	0.00	3.83E+11
-893.884	20940.	0.00				
4.6800	0.04409	781962.	-6655.	-0.00186	0.00	3.83E+11
-888.817	21771.	0.00				
4.7700	0.04208	774266.	-7612.	-0.00186	0.00	3.83E+11
-883.307	22669.	0.00				
4.8600	0.04008	765539.	-8563.	-0.00186	0.00	3.83E+11
-877.320	23643.	0.00				
4.9500	0.03807	755789.	-9507.	-0.00185	0.00	3.83E+11
-870.817	24703.	0.00				
5.0400	0.03607	745024.	-10443.	-0.00185	0.00	3.83E+11
-863.753	25863.	0.00				
5.1300	0.03407	733250.	-11372.	-0.00185	0.00	3.83E+11
-856.078	27137.	0.00				
5.2200	0.03207	720479.	-12292.	-0.00185	0.00	3.83E+11
-847.732	28547.	0.00				
5.3100	0.03008	706718.	-13203.	-0.00185	0.00	3.83E+11
-838.645	30114.	0.00				
5.4000	0.02808	691979.	-14103.	-0.00184	0.00	3.83E+11
-828.735	31870.	0.00				
5.4900	0.02609	676274.	-14992.	-0.00184	0.00	3.84E+11
-817.905	33854.	0.00				
5.5800	0.02410	659615.	-15869.	-0.00184	0.00	3.84E+11
-806.035	36116.	0.00				
5.6700	0.02212	642015.	-16733.	-0.00184	0.00	3.84E+11
-792.979	38723.	0.00				
5.7600	0.02013	623490.	-17581.	-0.00184	0.00	3.84E+11
-778.554	41768.	0.00				
5.8500	0.01815	604058.	-18413.	-0.00184	0.00	3.84E+11
-762.528	45379.	0.00				
5.9400	0.01617	583736.	-19227.	-0.00183	0.00	3.84E+11
-744.594	49742.	0.00				
6.0300	0.01419	562545.	-20020.	-0.00183	0.00	3.84E+11
-724.341	55141.	0.00				
6.1200	0.01221	540510.	-20790.	-0.00183	0.00	3.84E+11
-701.190	62026.	0.00				
6.2100	0.01023	517656.	-21533.	-0.00183	0.00	3.84E+11
-674.292	71167.	0.00				
6.3000	0.00826	494017.	-22244.	-0.00183	0.00	3.84E+11
-642.308	84001.	0.00				
6.3900	0.00628	469628.	-22916.	-0.00183	0.00	3.84E+11
-602.922	103605.	0.00				
6.4800	0.00431	444535.	-23540.	-0.00183	0.00	3.84E+11
-551.489	138090.	0.00				
6.5700	0.00234	418800.	-24095.	-0.00182	0.00	3.84E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-475.784	219332.	0.00				
6.6600	3.74E-04	392509.	-24451.	-0.00182	0.00	3.84E+11
-184.734	533973.	0.00				
6.7500	-0.00159	366003.	-24315.	-0.00182	0.00	3.84E+11
436.4064	295625.	0.00				
6.8400	-0.00356	340006.	-23790.	-0.00182	0.00	3.84E+11
536.1086	162587.	0.00				
6.9300	-0.00553	314635.	-23176.	-0.00182	0.00	3.84E+11
601.2814	117494.	0.00				
7.0200	-0.00749	289964.	-22499.	-0.00182	0.00	3.85E+11
651.9208	93979.	0.00				
7.1100	-0.00946	266055.	-21772.	-0.00182	0.00	3.85E+11
694.3125	79301.	0.00				
7.2000	-0.01142	242955.	-21002.	-0.00182	0.00	3.85E+11
731.3244	69168.	0.00				
7.2900	-0.01338	220707.	-20195.	-0.00182	0.00	3.85E+11
764.5257	61704.	0.00				
7.3800	-0.01534	199352.	-19353.	-0.00182	0.00	3.85E+11
794.8759	55951.	0.00				
7.4700	-0.01730	178924.	-18479.	-0.00182	0.00	3.85E+11
823.0073	51366.	0.00				
7.5600	-0.01926	159456.	-17576.	-0.00182	0.00	3.85E+11
849.3604	47616.	0.00				
7.6500	-0.02123	140978.	-16645.	-0.00181	0.00	3.85E+11
874.2552	44485.	0.00				
7.7400	-0.02318	123520.	-15688.	-0.00181	0.00	3.85E+11
897.9316	41828.	0.00				
7.8300	-0.02514	107110.	-14706.	-0.00181	0.00	3.85E+11
920.5747	39541.	0.00				
7.9200	-0.02710	91773.	-13700.	-0.00181	0.00	3.85E+11
942.3303	37550.	0.00				
8.0100	-0.02906	77536.	-12671.	-0.00181	0.00	3.85E+11
963.3155	35799.	0.00				
8.1000	-0.03102	64422.	-11620.	-0.00181	0.00	3.85E+11
983.6258	34246.	0.00				
8.1900	-0.03298	52455.	-10547.	-0.00181	0.00	3.85E+11
1003.	32858.	0.00				
8.2800	-0.03494	41659.	-9453.	-0.00181	0.00	3.85E+11
1023.	31609.	0.00				
8.3700	-0.03689	32055.	-8338.	-0.00181	0.00	3.85E+11
1041.	30479.	0.00				
8.4600	-0.03885	23666.	-7204.	-0.00181	0.00	3.85E+11
1060.	29452.	0.00				
8.5500	-0.04081	16512.	-6050.	-0.00181	0.00	3.85E+11
1077.	28512.	0.00				
8.6400	-0.04277	10616.	-4877.	-0.00181	0.00	3.85E+11
1095.	27650.	0.00				
8.7300	-0.04473	5996.	-3685.	-0.00181	0.00	3.85E+11
1112.	26856.	0.00				
8.8200	-0.04668	2674.	-2475.	-0.00181	0.00	3.85E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

1129.	26122.	0.00					
8.9100	-0.04864	668.7960	-1246.	-0.00181	0.00	3.85E+11	
1146.	25440.	0.00					
9.0000	-0.05060	0.00	0.00	-0.00181	0.00	3.85E+11	
1162.	12403.	0.00					

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection	=	0.15187511 inches
Computed slope at pile head	=	-0.0019751 radians
Maximum bending moment	=	806510. inch-lbs
Maximum shear force	=	-24451. lbs
Depth of maximum bending moment	=	4.0500000 feet below pile head
Depth of maximum shear force	=	6.6600000 feet below pile head
Number of iterations	=	34
Number of zero deflection points	=	1
Pile deflection at ground	=	0.12831166 inches

Pile-head Deflection vs. Pile Length for Load Case 2

Boundary Condition Type 1, Shear and Moment

Shear	=	2250. lbs
Moment	=	724800. in-lbs
Axial Load	=	4600. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.00000	0.15187511	806510.	-24451.
8.55000	0.29995498	798776.	-26246.
8.10000	0.71567714	789992.	-28726.
7.65000	1.79606976	783872.	-31585.
7.20000	4.73639957	780804.	-34949.
6.75000	19.23001574	800279.	-41809.

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-----  
 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 = 2250.0 lbs  
 Applied moment at pile head = 724800.0 in-lbs  
 Axial thrust load on pile head = 3800.0 lbs

Depth Res.	Soil X Es*H feet lb/inch	Deflect. Spr. y Lat. inches lb/inch	Bending Distrib. Moment Load in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil p
0.00	0.00	0.1518	724800.	2250.	-0.00197	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.09000	0.00	0.1496	727238.	2250.	-0.00197	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.1800	0.00	0.1475	729676.	2250.	-0.00197	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.2700	0.00	0.1454	732114.	2250.	-0.00197	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.3600	0.00	0.1433	734552.	2250.	-0.00197	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.4500	0.00	0.1411	736990.	2250.	-0.00196	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.5400	0.00	0.1390	739428.	2250.	-0.00196	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.6300	0.00	0.1369	741866.	2250.	-0.00196	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.7200	0.00	0.1348	744305.	2250.	-0.00196	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.8100	0.00	0.1327	746743.	2250.	-0.00196	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.9000	0.00	0.1306	749181.	2250.	-0.00195	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.9900	0.00	0.1285	751619.	2250.	-0.00195	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
1.0800	0.00	0.1264	754057.	2229.	-0.00195	0.00	3.83E+11	
-39.251	335.4965		0.00					
1.1700	0.00	0.1242	756449.	2186.	-0.00195	0.00	3.83E+11	
-39.676	344.8754		0.00					
1.2600	0.00	0.1221	758795.	2143.	-0.00194	0.00	3.83E+11	
-40.092	354.4861		0.00					

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

1.3500	0.1200	761094.	2100.	-0.00194	0.00	3.83E+11
-40.499	364.3388	0.00				
1.4400	0.1180	763346.	2056.	-0.00194	0.00	3.83E+11
-40.895	374.4441	0.00				
1.5300	0.1159	765550.	2011.	-0.00194	0.00	3.83E+11
-41.281	384.8132	0.00				
1.6200	0.1138	767706.	1966.	-0.00194	0.00	3.83E+11
-41.657	395.4582	0.00				
1.7100	0.1117	769813.	1921.	-0.00193	0.00	3.83E+11
-42.023	406.3919	0.00				
1.8000	0.1096	771872.	1876.	-0.00193	0.00	3.83E+11
-42.377	417.6278	0.00				
1.8900	0.1075	773881.	1830.	-0.00193	0.00	3.83E+11
-42.721	429.1807	0.00				
1.9800	0.1054	775840.	1783.	-0.00193	0.00	3.83E+11
-43.054	441.0660	0.00				
2.0700	0.1033	777749.	1737.	-0.00193	0.00	3.83E+11
-43.375	453.3005	0.00				
2.1600	0.1013	779607.	1690.	-0.00192	0.00	3.83E+11
-43.684	465.9019	0.00				
2.2500	0.09919	781415.	1642.	-0.00192	0.00	3.83E+11
-43.981	478.8895	0.00				
2.3400	0.09711	783171.	1595.	-0.00192	0.00	3.83E+11
-44.267	492.2839	0.00				
2.4300	0.09504	784875.	1547.	-0.00192	0.00	3.83E+11
-44.539	506.1071	0.00				
2.5200	0.09298	786527.	1499.	-0.00191	0.00	3.83E+11
-44.799	520.3831	0.00				
2.6100	0.09091	788128.	1450.	-0.00191	0.00	3.83E+11
-45.045	535.1377	0.00				
2.7000	0.08885	789675.	1401.	-0.00191	0.00	3.83E+11
-45.278	550.3988	0.00				
2.7900	0.08678	791170.	1352.	-0.00191	0.00	3.83E+11
-45.497	566.1965	0.00				
2.8800	0.08473	792612.	1303.	-0.00191	0.00	3.83E+11
-45.702	582.5637	0.00				
2.9700	0.08267	794000.	1254.	-0.00190	0.00	3.83E+11
-45.892	599.5360	0.00				
3.0600	0.08062	795335.	1204.	-0.00190	0.00	3.83E+11
-46.067	617.1523	0.00				
3.1500	0.07856	796616.	1154.	-0.00190	0.00	3.83E+11
-46.226	635.4550	0.00				
3.2400	0.07652	797843.	1104.	-0.00190	0.00	3.83E+11
-46.369	654.4904	0.00				
3.3300	0.07447	799017.	1054.	-0.00189	0.00	3.83E+11
-46.495	674.3096	0.00				
3.4200	0.07242	800135.	1004.	-0.00189	0.00	3.83E+11
-46.604	694.9685	0.00				
3.5100	0.07038	801200.	953.2491	-0.00189	0.00	3.83E+11
-46.695	716.5288	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

3.6000	0.06834	802210.	902.7788	-0.00189	0.00	3.83E+11
-46.768	739.0587	0.00				
3.6900	0.06631	803165.	852.2404	-0.00188	0.00	3.83E+11
-46.822	762.6339	0.00				
3.7800	0.06427	804066.	801.6549	-0.00188	0.00	3.83E+11
-46.855	787.3385	0.00				
3.8700	0.06224	804912.	751.0444	-0.00188	0.00	3.83E+11
-46.868	813.2662	0.00				
3.9600	0.06021	805704.	700.4317	-0.00188	0.00	3.83E+11
-46.859	840.5222	0.00				
4.0500	0.05818	806441.	180.3046	-0.00188	0.00	3.83E+11
-916.339	17009.	0.00				
4.1400	0.05616	806109.	-807.748	-0.00187	0.00	3.83E+11
-913.387	17566.	0.00				
4.2300	0.05414	804711.	-1792.	-0.00187	0.00	3.83E+11
-910.135	18157.	0.00				
4.3200	0.05212	802252.	-2773.	-0.00187	0.00	3.83E+11
-906.564	18787.	0.00				
4.4100	0.05010	798736.	-3750.	-0.00187	0.00	3.83E+11
-902.655	19459.	0.00				
4.5000	0.04808	794167.	-4723.	-0.00186	0.00	3.83E+11
-898.386	20178.	0.00				
4.5900	0.04607	788550.	-5691.	-0.00186	0.00	3.83E+11
-893.731	20951.	0.00				
4.6800	0.04406	781890.	-6653.	-0.00186	0.00	3.83E+11
-888.665	21782.	0.00				
4.7700	0.04205	774194.	-7610.	-0.00186	0.00	3.83E+11
-883.156	22681.	0.00				
4.8600	0.04005	765468.	-8561.	-0.00186	0.00	3.83E+11
-877.170	23655.	0.00				
4.9500	0.03805	755718.	-9504.	-0.00185	0.00	3.83E+11
-870.668	24716.	0.00				
5.0400	0.03604	744953.	-10441.	-0.00185	0.00	3.83E+11
-863.605	25876.	0.00				
5.1300	0.03405	733181.	-11369.	-0.00185	0.00	3.83E+11
-855.932	27151.	0.00				
5.2200	0.03205	720410.	-12289.	-0.00185	0.00	3.83E+11
-847.587	28561.	0.00				
5.3100	0.03006	706651.	-13200.	-0.00185	0.00	3.83E+11
-838.502	30129.	0.00				
5.4000	0.02806	691914.	-14100.	-0.00184	0.00	3.83E+11
-828.594	31887.	0.00				
5.4900	0.02607	676210.	-14989.	-0.00184	0.00	3.84E+11
-817.765	33871.	0.00				
5.5800	0.02409	659552.	-15866.	-0.00184	0.00	3.84E+11
-805.897	36134.	0.00				
5.6700	0.02210	641955.	-16729.	-0.00184	0.00	3.84E+11
-792.844	38743.	0.00				
5.7600	0.02012	623432.	-17578.	-0.00184	0.00	3.84E+11
-778.422	41789.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

5.8500	0.01814	604002.	-18410.	-0.00183	0.00	3.84E+11
-762.399	45402.	0.00				
5.9400	0.01616	583682.	-19223.	-0.00183	0.00	3.84E+11
-744.469	49767.	0.00				
6.0300	0.01418	562494.	-20017.	-0.00183	0.00	3.84E+11
-724.219	55169.	0.00				
6.1200	0.01220	540461.	-20786.	-0.00183	0.00	3.84E+11
-701.074	62057.	0.00				
6.2100	0.01023	517611.	-21529.	-0.00183	0.00	3.84E+11
-674.181	71202.	0.00				
6.3000	0.00825	493974.	-22240.	-0.00183	0.00	3.84E+11
-642.204	84042.	0.00				
6.3900	0.00628	469588.	-22912.	-0.00183	0.00	3.84E+11
-602.826	103654.	0.00				
6.4800	0.00431	444499.	-23535.	-0.00182	0.00	3.84E+11
-551.406	138152.	0.00				
6.5700	0.00234	418767.	-24090.	-0.00182	0.00	3.84E+11
-475.723	219417.	0.00				
6.6600	3.74E-04	392480.	-24447.	-0.00182	0.00	3.84E+11
-184.819	533973.	0.00				
6.7500	-0.00159	365977.	-24311.	-0.00182	0.00	3.84E+11
436.3002	295841.	0.00				
6.8400	-0.00356	339983.	-23786.	-0.00182	0.00	3.84E+11
535.9982	162687.	0.00				
6.9300	-0.00552	314615.	-23172.	-0.00182	0.00	3.84E+11
601.1640	117563.	0.00				
7.0200	-0.00749	289947.	-22495.	-0.00182	0.00	3.85E+11
651.7969	94033.	0.00				
7.1100	-0.00945	266040.	-21768.	-0.00182	0.00	3.85E+11
694.1826	79346.	0.00				
7.2000	-0.01141	242942.	-20999.	-0.00182	0.00	3.85E+11
731.1890	69207.	0.00				
7.2900	-0.01337	220698.	-20191.	-0.00182	0.00	3.85E+11
764.3852	61738.	0.00				
7.3800	-0.01533	199345.	-19349.	-0.00181	0.00	3.85E+11
794.7306	55982.	0.00				
7.4700	-0.01729	178919.	-18476.	-0.00181	0.00	3.85E+11
822.8575	51394.	0.00				
7.5600	-0.01925	159452.	-17573.	-0.00181	0.00	3.85E+11
849.2064	47641.	0.00				
7.6500	-0.02121	140977.	-16642.	-0.00181	0.00	3.85E+11
874.0970	44509.	0.00				
7.7400	-0.02317	123520.	-15685.	-0.00181	0.00	3.85E+11
897.7695	41850.	0.00				
7.8300	-0.02513	107111.	-14703.	-0.00181	0.00	3.85E+11
920.4089	39562.	0.00				
7.9200	-0.02708	91776.	-13698.	-0.00181	0.00	3.85E+11
942.1609	37570.	0.00				
8.0100	-0.02904	77539.	-12669.	-0.00181	0.00	3.85E+11
963.1425	35818.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

8.1000	-0.03100	64426.	-11618.	-0.00181	0.00	3.85E+11
983.4493	34264.	0.00				
8.1900	-0.03295	52460.	-10545.	-0.00181	0.00	3.85E+11
1003.	32876.	0.00				
8.2800	-0.03491	41664.	-9451.	-0.00181	0.00	3.85E+11
1022.	31626.	0.00				
8.3700	-0.03687	32060.	-8337.	-0.00181	0.00	3.85E+11
1041.	30496.	0.00				
8.4600	-0.03882	23671.	-7203.	-0.00181	0.00	3.85E+11
1059.	29468.	0.00				
8.5500	-0.04078	16517.	-6049.	-0.00181	0.00	3.85E+11
1077.	28528.	0.00				
8.6400	-0.04274	10620.	-4876.	-0.00181	0.00	3.85E+11
1095.	27665.	0.00				
8.7300	-0.04469	6000.	-3684.	-0.00181	0.00	3.85E+11
1112.	26870.	0.00				
8.8200	-0.04665	2677.	-2474.	-0.00181	0.00	3.85E+11
1129.	26136.	0.00				
8.9100	-0.04861	670.2467	-1246.	-0.00181	0.00	3.85E+11
1146.	25454.	0.00				
9.0000	-0.05056	0.00	0.00	-0.00181	0.00	3.85E+11
1162.	12410.	0.00				

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 3:

Pile-head deflection	=	0.15177279 inches
Computed slope at pile head	=	-0.0019738 radians
Maximum bending moment	=	806441. inch-lbs
Maximum shear force	=	-24447. lbs
Depth of maximum bending moment	=	4.05000000 feet below pile head
Depth of maximum shear force	=	6.66000000 feet below pile head
Number of iterations	=	34
Number of zero deflection points	=	1
Pile deflection at ground	=	0.12822478 inches

-----  
Pile-head Deflection vs. Pile Length for Load Case 3  
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Boundary Condition Type 1, Shear and Moment



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Shear = 2250. lbs  
 Moment = 724800. in-lbs  
 Axial Load = 3800. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment in-lbs	Maximum Shear lbs
9.00000	0.15177279	806441.	-24447.
8.55000	0.29954793	798640.	-26236.
8.10000	0.71334373	789685.	-28701.
7.65000	1.78136426	783172.	-31517.
7.20000	4.63193181	779049.	-34744.
6.75000	17.16406827	790724.	-40567.

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	Load 1	Load 2	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max in lbs
1	V, lb	1000.0000	M, in-lb	4200.	0.00845	-1.40E-04	
2	V, lb	2250.	M, in-lb	4600.	0.1519	-0.00198	
3	V, lb	2250.	M, in-lb	3800.	0.1518	-0.00197	

Maximum pile-head deflection = 0.1518751057 inches

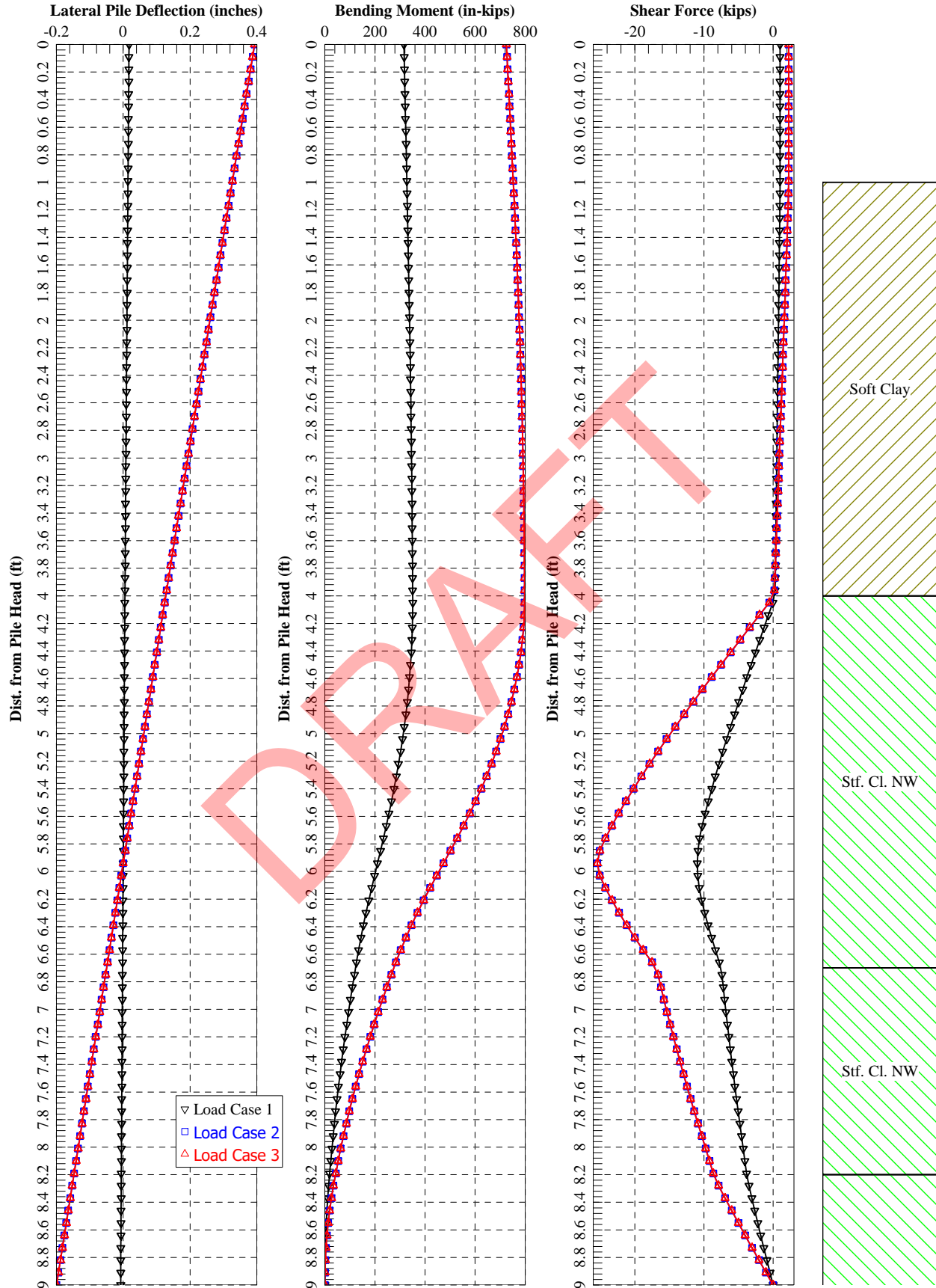
Maximum pile-head rotation = -0.0019751138 radians = -0.113166 deg.

The analysis ended normally.

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-13 (Boring B-005-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

DRAFT

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

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License Type : (Single User License)

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

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Files Used for Analysis

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Path to file locations:  
\Columbus-1170\Projects\2024\24170232\_ms\_TP 26 NE Ohio\GEO\Project Docs\Site  
12\_SUM-77 (STONE)\Calcs\Light Towers\

Name of input data file:  
Tower TN-10 (B-006).lp12d

Name of output report file:  
Tower TN-10 (B-006).lp12o

Name of plot output file:  
Tower TN-10 (B-006).lp12p

Name of runtime message file:  
Tower TN-10 (B-006).lp12r

-----

Date and Time of Analysis

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TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Date: October 24, 2025

Time: 8:39:47

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

Project Name: TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area

Job Number: 24170232D

Client: ms consultants, inc.

Engineer: BKS

Description: Light Tower TN-10 (B-006-0-25)

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

Computational Options:

- 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

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- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- 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
- Input of moment 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	=	9.000 ft
Depth of ground surface below top of pile	=	1.0000 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	36.0000
2	9.000	36.0000

Input Structural Properties for Pile Sections:  
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Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile		
Length of section	=	9.000000 ft
Shaft Diameter	=	36.000000 in

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Soil and Rock Layering Information

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The soil profile is modelled using 7 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	1.000000	ft
Distance from top of pile to bottom of layer	=	4.000000	ft
Effective unit weight at top of layer	=	98.000000	pcf
Effective unit weight at bottom of layer	=	98.000000	pcf
Undrained cohesion at top of layer	=	250.000000	psf
Undrained cohesion at bottom of layer	=	250.000000	psf
Epsilon-50 at top of layer	=	0.020000	
Epsilon-50 at bottom of layer	=	0.020000	

Layer 2 is stiff clay without free water

Distance from top of pile to top of layer	=	4.000000	ft
Distance from top of pile to bottom of layer	=	6.700000	ft
Effective unit weight at top of layer	=	115.000000	pcf
Effective unit weight at bottom of layer	=	115.000000	pcf
Undrained cohesion at top of layer	=	4500.	psf
Undrained cohesion at bottom of layer	=	4500.	psf
Epsilon-50 at top of layer	=	0.004000	
Epsilon-50 at bottom of layer	=	0.004000	

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer	=	6.700000	ft
Distance from top of pile to bottom of layer	=	8.200000	ft
Effective unit weight at top of layer	=	112.000000	pcf
Effective unit weight at bottom of layer	=	112.000000	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	=	0.007000	
Epsilon-50 at bottom of layer	=	0.007000	

Layer 4 is stiff clay without free water

Distance from top of pile to top of layer	=	8.200000	ft
Distance from top of pile to bottom of layer	=	11.700000	ft
Effective unit weight at top of layer	=	110.000000	pcf

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Effective unit weight at bottom of layer	=	110.000000	pcf
Undrained cohesion at top of layer	=	2000.	psf
Undrained cohesion at bottom of layer	=	2000.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	11.700000	ft
Distance from top of pile to bottom of layer	=	16.700000	ft
Effective unit weight at top of layer	=	108.000000	pcf
Effective unit weight at bottom of layer	=	108.000000	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	=	0.007000	
Epsilon-50 at bottom of layer	=	0.007000	

Layer 6 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	16.700000	ft
Distance from top of pile to bottom of layer	=	21.200000	ft
Effective unit weight at top of layer	=	115.000000	pcf
Effective unit weight at bottom of layer	=	115.000000	pcf
Friction angle at top of layer	=	31.000000	deg.
Friction angle at bottom of layer	=	31.000000	deg.
Subgrade k at top of layer	=	90.000000	pci
Subgrade k at bottom of layer	=	90.000000	pci

Layer 7 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	21.200000	ft
Distance from top of pile to bottom of layer	=	23.700000	ft
Effective unit weight at top of layer	=	63.000000	pcf
Effective unit weight at bottom of layer	=	63.000000	pcf
Friction angle at top of layer	=	33.000000	deg.
Friction angle at bottom of layer	=	33.000000	deg.
Subgrade k at top of layer	=	60.000000	pci
Subgrade k at bottom of layer	=	60.000000	pci

(Depth of the lowest soil layer extends 14.700 ft below the pile tip)

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Summary of Input Soil Properties

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Layer E50 Num. or krm	Soil Type Name kpy (p-y Curve Type) pci	Layer Depth ft	Effective Unit Wt. pcf	Cohesion psf	Angle of Friction deg.
1 0.02000	Soft --	1.0000	98.0000	250.0000	--
0.02000	Clay --	4.0000	98.0000	250.0000	--
2 0.00400	Stiff Clay --	4.0000	115.0000	4500.	--
0.00400	w/o Free Water --	6.7000	115.0000	4500.	--
3 0.00700	Stiff Clay --	6.7000	112.0000	1000.0000	--
0.00700	w/o Free Water --	8.2000	112.0000	1000.0000	--
4 0.00500	Stiff Clay --	8.2000	110.0000	2000.	--
0.00500	w/o Free Water --	11.7000	110.0000	2000.	--
5 0.00700	Stiff Clay --	11.7000	108.0000	1000.0000	--
0.00700	w/o Free Water --	16.7000	108.0000	1000.0000	--
6 --	Sand 90.0000 (Reese, et al.)	16.7000	115.0000	--	31.0000
--	90.0000 (Reese, et al.)	21.2000	115.0000	--	31.0000
7 --	Sand 60.0000 (Reese, et al.)	21.2000	63.0000	--	33.0000
--	60.0000 (Reese, et al.)	23.7000	63.0000	--	33.0000
--	60.0000				

Static Loading Type

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

Pile-head Loading and Pile-head Fixity Conditions

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Number of loads specified = 3

Load Compute No.	Load Top y Type	Condition Run Analysis 1	Condition 2	Axial Thrust Force, lbs
vs. Pile Length				
1	1	V = 1000.000000 lbs	M = 315600. in-lbs	4200.
Yes		Yes		
2	1	V = 2250. lbs	M = 724800. in-lbs	4600.
Yes		Yes		
3	1	V = 2250. lbs	M = 724800. in-lbs	3800.
Yes		Yes		

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:  
 -----

Dimensions and Properties of Drilled Shaft (Bored Pile):  
 -----

Length of Section	=	9.000000 ft
Shaft Diameter	=	36.000000 in
Concrete Cover Thickness (to edge of trans. reinf.)	=	3.500000 in
Number of Reinforcing Bars	=	16 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	1018. sq. in.
Total Area of Reinforcing Steel	=	16.000000 sq. in.
Area Ratio of Steel Reinforcement	=	1.57 percent

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Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Edge-to-Edge Bar Spacing	=	4.114467 in
Maximum Concrete Aggregate Size	=	0.750000 in
Ratio of Bar Spacing to Aggregate Size	=	5.49
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in
Transverse Reinforcement		
Type: Spiral		
Number of Transverse Reinf. (per spacing)	=	1
Spacing of Transverse Reinf.	=	4.500000 in
Yield Stress of Transverse Reinf.	=	60000. psi
Diameter of Transverse Reinf.	=	0.500000 in

Axial Structural Capacities:

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Nom. Axial Structural Capacity = $0.85 F_c A_c + F_y A_s$	=	4366.378 kips
Tensile Load for Cracking of Concrete	=	-470.222 kips
Nominal Axial Tensile Capacity	=	-960.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.128000	1.000000	13.436000	0.000000
2	1.128000	1.000000	12.413245	5.141735
3	1.128000	1.000000	9.500687	9.500687
4	1.128000	1.000000	5.141735	12.413245
5	1.128000	1.000000	0.000000	13.436000
6	1.128000	1.000000	-5.14173	12.413245
7	1.128000	1.000000	-9.50069	9.500687
8	1.128000	1.000000	-12.41325	5.141735
9	1.128000	1.000000	-13.43600	0.000000
10	1.128000	1.000000	-12.41325	-5.14173
11	1.128000	1.000000	-9.50069	-9.50069
12	1.128000	1.000000	-5.14173	-12.41325
13	1.128000	1.000000	0.000000	-13.43600
14	1.128000	1.000000	5.141735	-12.41325
15	1.128000	1.000000	9.500687	-9.50069
16	1.128000	1.000000	12.413245	-5.14173

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 4.114 inches  
between bars 11 and 12.

Ratio of bar spacing to maximum aggregate size = 5.49

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Concrete Properties:

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Compressive Strength of Concrete	=	4000. psi
Modulus of Elasticity of Concrete	=	3604997. psi
Modulus of Rupture of Concrete	=	-474.34165 psi
Compression Strain at Peak Stress	=	0.001886
Tensile Strain at Fracture of Concrete	=	-0.0001154
Maximum Coarse Aggregate Size	=	0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 3

Number	Axial Thrust Force kips
-----	-----
1	3.800
2	4.200
3	4.600

Definitions of Run Messages and Notes:

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C = concrete in section has cracked in tension.  
 Y = stress in reinforcing steel has reached yield stress.  
 T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318-14, Section 21.2.3.  
 Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.  
 Position of neutral axis is measured from edge of compression side of pile.  
 Compressive stresses and strains are positive in sign.  
 Tensile stresses and strains are negative in sign.

Axial Thrust Force = 3.800 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
-----	-----	-----	-----	-----	-----
6.25000E-07 0.0505030	240.5062135 0.2746478	384809942.	19.2929823	0.00001206	-0.00001044

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0.00000125	480.1472468	384117797.	18.6479768	0.00002331	-0.00002169
0.0973082	0.5259142				
0.00000188	718.9174733	383422652.	18.4329804	0.00003456	-0.00003294
0.1438345	0.7771808				
0.00000250	956.8168886	382726755.	18.3254857	0.00004581	-0.00004419
0.1900818	1.0284477				
0.00000313	1194.	382030558.	18.2609917	0.00005707	-0.00005543
0.2360502	1.2797149				
0.00000375	1430.	381334209.	18.2179981	0.00006832	-0.00006668
0.2817396	1.5309823				
0.00000438	1665.	380637775.	18.1872904	0.00007957	-0.00007793
0.3271500	1.7822500				
0.00000500	1900.	379941287.	18.1642614	0.00009082	-0.00008918
0.3722815	2.0335179				
0.00000563	2133.	379244764.	18.1463515	0.0001021	-0.000100
0.4171340	2.2847861				
0.00000625	2366.	378548215.	18.1320251	0.0001133	-0.000112
0.4617075	2.5360546				
0.00000688	2366.	344134741.	10.2494785	0.00007047	-0.000177
0.2882187	-4.308598 C				
0.00000750	2366.	315456846.	10.2198771	0.00007665	-0.000193
0.3129821	-4.706727 C				
0.00000813	2366.	291190934.	10.1952302	0.00008284	-0.000210
0.3376758	-5.104761 C				
0.00000875	2366.	270391582.	10.1744772	0.00008903	-0.000226
0.3622998	-5.502701 C				
0.00000938	2366.	252365477.	10.1568402	0.00009522	-0.000242
0.3868539	-5.900547 C				
0.00001000	2366.	236592634.	10.1417358	0.0001014	-0.000259
0.4113380	-6.298297 C				
0.00001063	2366.	222675420.	10.1287027	0.0001076	-0.000275
0.4357521	-6.695951 C				
0.00001125	2366.	210304564.	10.1174231	0.0001138	-0.000291
0.4600960	-7.093510 C				
0.00001188	2366.	199235903.	10.1076093	0.0001200	-0.000307
0.4843696	-7.490973 C				
0.00001250	2366.	189274107.	10.0990420	0.0001262	-0.000324
0.5085729	-7.888340 C				
0.00001313	2366.	180261055.	10.0915439	0.0001325	-0.000340
0.5327056	-8.285611 C				
0.00001375	2366.	172067370.	10.0849699	0.0001387	-0.000356
0.5567678	-8.682785 C				
0.00001438	2366.	164586180.	10.0792000	0.0001449	-0.000373
0.5807594	-9.079861 C				
0.00001500	2366.	157728423.	10.0741344	0.0001511	-0.000389
0.6046801	-9.476841 C				
0.00001563	2366.	151419286.	10.0696892	0.0001573	-0.000405
0.6285300	-9.873723 C				
0.00001625	2366.	145595467.	10.0657933	0.0001636	-0.000421
0.6523089	-10.270507 C				

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0.00001688	2366.	140203043.	10.0623863	0.0001698	-0.000438
0.6760167	-10.667193 C				
0.00001750	2366.	135195791.	10.0594163	0.0001760	-0.000454
0.6996534	-11.063781 C				
0.00001813	2366.	130533867.	10.0568387	0.0001823	-0.000470
0.7232187	-11.460271 C				
0.00001875	2366.	126182738.	10.0546147	0.0001885	-0.000486
0.7467127	-11.856661 C				
0.00001938	2366.	122112327.	10.0527107	0.0001948	-0.000503
0.7701352	-12.252952 C				
0.00002000	2366.	118296317.	10.0510970	0.0002010	-0.000519
0.7934860	-12.649144 C				
0.00002063	2366.	114711580.	10.0497478	0.0002073	-0.000535
0.8167652	-13.045236 C				
0.00002125	2366.	111337710.	10.0486401	0.0002135	-0.000551
0.8399726	-13.441228 C				
0.00002188	2366.	108156633.	10.0477539	0.0002198	-0.000568
0.8631080	-13.837120 C				
0.00002250	2366.	105152282.	10.0470709	0.0002261	-0.000584
0.8861714	-14.232911 C				
0.00002313	2366.	102310328.	10.0465752	0.0002323	-0.000600
0.9091627	-14.628602 C				
0.00002375	2366.	99617951.	10.0462524	0.0002386	-0.000616
0.9320817	-15.024191 C				
0.00002438	2366.	97063645.	10.0460897	0.0002449	-0.000633
0.9549284	-15.419678 C				
0.00002563	2429.	94800037.	10.0461990	0.0002574	-0.000665
1.0004043	-16.210348 C				
0.00002688	2545.	94692477.	10.0468231	0.0002700	-0.000697
1.0455896	-17.000609 C				
0.00002813	2660.	94589756.	10.0479254	0.0002826	-0.000730
1.0904832	-17.790458 C				
0.00002938	2776.	94491232.	10.0493946	0.0002952	-0.000762
1.1350844	-18.579893 C				
0.00003063	2891.	94396370.	10.0512127	0.0003078	-0.000795
1.1793922	-19.368912 C				
0.00003188	3006.	94304718.	10.0533415	0.0003205	-0.000827
1.2234058	-20.157511 C				
0.00003313	3121.	94215891.	10.0557483	0.0003331	-0.000859
1.2671243	-20.945689 C				
0.00003438	3236.	94129561.	10.0584054	0.0003458	-0.000892
1.3105466	-21.733443 C				
0.00003563	3350.	94045446.	10.0612887	0.0003584	-0.000924
1.3536720	-22.520771 C				
0.00003688	3465.	93963300.	10.0643778	0.0003711	-0.000956
1.3964994	-23.307669 C				
0.00003813	3579.	93882912.	10.0676547	0.0003838	-0.000989
1.4390279	-24.094136 C				
0.00003938	3694.	93804096.	10.0711039	0.0003965	-0.001021
1.4812567	-24.880169 C				

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0.00004063	3808.	93726688.	10.0747116	0.0004093	-0.001053
1.5231846	-25.665765 C				
0.00004188	3922.	93650546.	10.0784659	0.0004220	-0.001085
1.5648108	-26.450921 C				
0.00004313	4035.	93575540.	10.0823562	0.0004348	-0.001118
1.6061342	-27.235635 C				
0.00004438	4149.	93501560.	10.0863731	0.0004476	-0.001150
1.6471540	-28.019904 C				
0.00004563	4263.	93428502.	10.0905084	0.0004604	-0.001182
1.6878690	-28.803725 C				
0.00004688	4376.	93356279.	10.0947545	0.0004732	-0.001214
1.7282784	-29.587096 C				
0.00004813	4489.	93284807.	10.0991050	0.0004860	-0.001246
1.7683810	-30.370013 C				
0.00004938	4602.	93214014.	10.1035538	0.0004989	-0.001279
1.8081759	-31.152474 C				
0.00005063	4715.	93143835.	10.1080956	0.0005117	-0.001311
1.8476620	-31.934476 C				
0.00005188	4828.	93074209.	10.1127258	0.0005246	-0.001343
1.8868384	-32.716016 C				
0.00005313	4941.	93005082.	10.1174399	0.0005375	-0.001375
1.9257039	-33.497091 C				
0.00005438	5053.	92936405.	10.1222340	0.0005504	-0.001407
1.9642575	-34.277698 C				
0.00005563	5166.	92868132.	10.1271047	0.0005633	-0.001439
2.0024981	-35.057833 C				
0.00005688	5278.	92800222.	10.1320488	0.0005763	-0.001471
2.0404247	-35.837495 C				
0.00005813	5390.	92732637.	10.1370633	0.0005892	-0.001503
2.0780361	-36.616679 C				
0.00005938	5502.	92665342.	10.1421457	0.0006022	-0.001535
2.1153313	-37.395383 C				
0.00006063	5614.	92598305.	10.1472935	0.0006152	-0.001567
2.1523092	-38.173604 C				
0.00006188	5725.	92531497.	10.1525046	0.0006282	-0.001599
2.1889685	-38.951338 C				
0.00006313	5837.	92464888.	10.1577769	0.0006412	-0.001631
2.2253083	-39.728581 C				
0.00006438	5948.	92398455.	10.1631088	0.0006543	-0.001663
2.2613274	-40.505332 C				
0.00006563	6059.	92332173.	10.1684984	0.0006673	-0.001695
2.2970245	-41.281586 C				
0.00006688	6170.	92266020.	10.1739444	0.0006804	-0.001727
2.3323987	-42.057340 C				
0.00006813	6281.	92199976.	10.1794453	0.0006935	-0.001759
2.3674485	-42.832591 C				
0.00006938	6392.	92134020.	10.1849998	0.0007066	-0.001791
2.4021730	-43.607335 C				
0.00007063	6502.	92068136.	10.1906070	0.0007197	-0.001823
2.4365708	-44.381568 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00007188	6613.	92002305.	10.1962656	0.0007329	-0.001855
2.4706408	-45.155288 C				
0.00007313	6723.	91936511.	10.2020028	0.0007460	-0.001886
2.5043818	-45.928490 C				
0.00007438	6833.	91870742.	10.2077616	0.0007592	-0.001918
2.5377924	-46.701172 C				
0.00007938	7271.	91607617.	10.2312788	0.0008121	-0.002045
2.6681070	-49.786612 C				
0.00008438	7707.	91343844.	10.2555391	0.0008653	-0.002172
2.7930345	-52.863415 C				
0.00008938	8140.	91079227.	10.2796933	0.0009187	-0.002299
2.9123325	-55.933382 C				
0.00009438	8570.	90813004.	10.3043877	0.0009725	-0.002425
3.0260259	-58.995009 C				
0.00009938	8979.	90357411.	10.3225581	0.0010258	-0.002552
3.1326575	-60.000000 CY				
0.0001044	9304.	89144470.	10.3110511	0.0010762	-0.002681
3.2276850	-60.000000 CY				
0.0001094	9546.	87273573.	10.2718035	0.0011235	-0.002814
3.3116704	-60.000000 CY				
0.0001144	9782.	85523680.	10.2357064	0.0011707	-0.002947
3.3907664	-60.000000 CY				
0.0001194	10004.	83800225.	10.1987328	0.0012175	-0.003080
3.4643165	-60.000000 CY				
0.0001244	10154.	81641326.	10.1374818	0.0012608	-0.003217
3.5282172	-60.000000 CY				
0.0001294	10287.	79513660.	10.0756441	0.0013035	-0.003354
3.5871212	-60.000000 CY				
0.0001344	10419.	77536664.	10.0197410	0.0013464	-0.003491
3.6423258	-60.000000 CY				
0.0001394	10550.	75693983.	9.9691573	0.0013895	-0.003628
3.6937845	-60.000000 CY				
0.0001444	10680.	73971519.	9.9233661	0.0014327	-0.003765
3.7414497	-60.000000 CY				
0.0001494	10808.	72355946.	9.8810316	0.0014760	-0.003902
3.7851328	-60.000000 CY				
0.0001544	10925.	70772035.	9.8368433	0.0015186	-0.004039
3.8241552	-60.000000 CY				
0.0001594	11008.	69072220.	9.7809580	0.0015588	-0.004179
3.8574366	-60.000000 CY				
0.0001644	11071.	67351790.	9.7204156	0.0015978	-0.004320
3.8862696	-60.000000 CY				
0.0001694	11131.	65719446.	9.6635689	0.0016368	-0.004461
3.9118664	-60.000000 CY				
0.0001744	11191.	64176802.	9.6094393	0.0016756	-0.004602
3.9342902	-60.000000 CY				
0.0001794	11250.	62716278.	9.5601863	0.0017149	-0.004743
3.9535015	-60.000000 CY				
0.0001844	11308.	61329164.	9.5136161	0.0017541	-0.004883
3.9693617	-60.000000 CY				



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0001894	11364.	60009896.	9.4690774	0.0017932	-0.005024
3.9819050	-60.000000 CY				
0.0001944	11420.	58754909.	9.4280227	0.0018326	-0.005165
3.9911986	-60.000000 CY				
0.0001994	11476.	57559296.	9.3897594	0.0018721	-0.005305
3.9971986	-60.000000 CY				
0.0002044	11531.	56418622.	9.3531932	0.0019116	-0.005446
3.9998595	-60.000000 CY				
0.0002094	11584.	55328385.	9.3201259	0.0019514	-0.005586
3.9974517	-60.000000 CY				
0.0002144	11637.	54285454.	9.2909722	0.0019918	-0.005726
3.9998812	-60.000000 CY				
0.0002194	11690.	53285909.	9.2626721	0.0020320	-0.005866
3.9969940	-60.000000 CY				
0.0002244	11740.	52321336.	9.2356724	0.0020723	-0.006005
3.9997138	-60.000000 CY				
0.0002294	11786.	51384137.	9.2093226	0.0021124	-0.006145
3.9955528	-60.000000 CY				
0.0002344	11823.	50445667.	9.1796872	0.0021515	-0.006286
3.9989818	-60.000000 CY				
0.0002394	11855.	49524943.	9.1473565	0.0021896	-0.006428
3.9994466	-60.000000 CY				
0.0002444	11876.	48598228.	9.1109548	0.0022265	-0.006571
3.9965160	-60.000000 CY				
0.0002494	11895.	47701101.	9.0745971	0.0022630	-0.006715
3.9991770	-60.000000 CY				
0.0002544	11912.	46829816.	9.0405915	0.0022997	-0.006858
3.9995775	-60.000000 CY				
0.0002594	11929.	45990067.	9.0077660	0.0023364	-0.007001
3.9954763	-60.000000 CY				
0.0002644	11945.	45181124.	8.9766457	0.0023732	-0.007144
3.9984997	-60.000000 CY				
0.0002694	11961.	44401256.	8.9468563	0.0024101	-0.007287
3.9998981	-60.000000 CY				
0.0002744	11976.	43648250.	8.9191370	0.0024472	-0.007430
3.9944635	-60.000000 CY				
0.0003044	12062.	39628140.	8.7757363	0.0026711	-0.008286
3.9984635	-60.000000 CY				
0.0003344	12138.	36300180.	8.6628609	0.0028966	-0.009141
3.9998209	-60.000000 CY				
0.0003644	12207.	33502446.	8.5793723	0.0031261	-0.009991
3.9999551	-60.000000 CYT				
0.0003944	12272.	31117026.	8.5161103	0.0033585	-0.010839
3.9996166	-60.000000 CYT				
0.0004244	12331.	29056485.	8.4674428	0.0035934	-0.011684
3.9972132	-60.000000 CYT				
0.0004544	12377.	27238942.	8.4178614	0.0038249	-0.012533
3.9873462	-60.000000 CYT				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Axial Thrust Force = 4.200 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
-----	-----	-----	-----	-----	-----
6.25000E-07	240.5049676	384807948.	19.4290859	0.00001214	-0.00001036
0.0508615	0.2771147				
0.00000125	480.1459926	384116794.	18.7161837	0.00002340	-0.00002160
0.0976654	0.5283867				
0.00000188	718.9162127	383421980.	18.4785558	0.00003465	-0.00003285
0.1441903	0.7796589				
0.00000250	956.8156222	382726249.	18.3597458	0.00004590	-0.00004410
0.1904363	1.0309315				
0.00000313	1194.	382030150.	18.2884629	0.00005715	-0.00005535
0.2364034	1.2822044				
0.00000375	1430.	381333869.	18.2409436	0.00006840	-0.00006660
0.2820914	1.5334776				
0.00000438	1665.	380637482.	18.2070035	0.00007966	-0.00007784
0.3275005	1.7847511				
0.00000500	1900.	379941029.	18.1815504	0.00009091	-0.00008909
0.3726306	2.0360248				
0.00000563	2133.	379244533.	18.1617553	0.0001022	-0.000100
0.4174818	2.2872988				
0.00000625	2366.	378548006.	18.1459208	0.0001134	-0.000112
0.4620539	2.5385732				
0.00000688	2366.	344134551.	10.2895004	0.00007074	-0.000177
0.2893429	-4.300617 C				
0.00000750	2366.	315456672.	10.2575513	0.00007693	-0.000193
0.3141325	-4.698533 C				
0.00000813	2366.	291190774.	10.2300378	0.00008312	-0.000209
0.3388235	-5.096560 C				
0.00000875	2366.	270391433.	10.2068278	0.00008931	-0.000226
0.3634446	-5.494492 C				
0.00000938	2366.	252365338.	10.1870615	0.00009550	-0.000242
0.3879959	-5.892330 C				
0.00001000	2366.	236592504.	10.1700940	0.0001017	-0.000258
0.4124772	-6.290073 C				
0.00001063	2366.	222675298.	10.1554324	0.0001079	-0.000275
0.4368884	-6.687720 C				
0.00001125	2366.	210304448.	10.1426931	0.0001141	-0.000291
0.4612294	-7.085271 C				
0.00001188	2366.	199235793.	10.1315564	0.0001203	-0.000307
0.4855002	-7.482727 C				
0.00001250	2366.	189274003.	10.1218127	0.0001265	-0.000323
0.5097005	-7.880086 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00001313	2366.	180260955.	10.1132503	0.0001327	-0.000340
0.5338304	-8.277349 C				
0.00001375	2366.	172067276.	10.1057088	0.0001390	-0.000356
0.5578898	-8.674515 C				
0.00001438	2366.	164586090.	10.0990556	0.0001452	-0.000372
0.5818784	-9.071585 C				
0.00001500	2366.	157728336.	10.0931803	0.0001514	-0.000389
0.6057963	-9.468556 C				
0.00001563	2366.	151419203.	10.0879903	0.0001576	-0.000405
0.6296433	-9.865431 C				
0.00001625	2366.	145595387.	10.0834069	0.0001639	-0.000421
0.6534193	-10.262207 C				
0.00001688	2366.	140202965.	10.0793634	0.0001701	-0.000437
0.6771242	-10.658886 C				
0.00001750	2366.	135195717.	10.0758025	0.0001763	-0.000454
0.7007579	-11.055466 C				
0.00001813	2366.	130533795.	10.0726747	0.0001826	-0.000470
0.7243204	-11.451947 C				
0.00001875	2366.	126182669.	10.0699372	0.0001888	-0.000486
0.7478114	-11.848330 C				
0.00001938	2366.	122112260.	10.0675528	0.0001951	-0.000502
0.7712309	-12.244613 C				
0.00002000	2366.	118296252.	10.0654889	0.0002013	-0.000519
0.7945789	-12.640797 C				
0.00002063	2366.	114711517.	10.0637168	0.0002076	-0.000535
0.8178551	-13.036882 C				
0.00002125	2366.	111337649.	10.0622112	0.0002138	-0.000551
0.8410595	-13.432866 C				
0.00002188	2366.	108156573.	10.0609497	0.0002201	-0.000567
0.8641920	-13.828750 C				
0.00002250	2366.	105152224.	10.0599125	0.0002263	-0.000584
0.8872524	-14.224533 C				
0.00002313	2366.	102310272.	10.0590817	0.0002326	-0.000600
0.9102407	-14.620215 C				
0.00002375	2366.	99617896.	10.0584414	0.0002389	-0.000616
0.9331568	-15.015796 C				
0.00002438	2366.	97063591.	10.0579776	0.0002452	-0.000632
0.9560005	-15.411276 C				
0.00002563	2432.	94924068.	10.0575288	0.0002577	-0.000665
1.0014704	-16.201930 C				
0.00002688	2548.	94810571.	10.0576469	0.0002703	-0.000697
1.0466496	-16.992174 C				
0.00002813	2664.	94702439.	10.0582592	0.0002829	-0.000730
1.0915372	-17.782007 C				
0.00002938	2779.	94598964.	10.0593353	0.0002955	-0.000762
1.1361324	-18.571425 C				
0.00003063	2894.	94499555.	10.0607664	0.0003081	-0.000794
1.1804341	-19.360427 C				
0.00003188	3009.	94403710.	10.0625387	0.0003207	-0.000827
1.2244416	-20.149010 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00003313	3124.	94311007.	10.0646159	0.0003334	-0.000859
1.2681539	-20.937171 C				
0.00003438	3239.	94221082.	10.0669675	0.0003461	-0.000891
1.3115700	-21.724908 C				
0.00003563	3354.	94133623.	10.0695670	0.0003587	-0.000924
1.3546892	-22.512219 C				
0.00003688	3468.	94048359.	10.0723915	0.0003714	-0.000956
1.3975103	-23.299100 C				
0.00003813	3582.	93965057.	10.0754214	0.0003841	-0.000988
1.4400326	-24.085550 C				
0.00003938	3697.	93883511.	10.0786392	0.0003968	-0.001021
1.4822550	-24.871565 C				
0.00004063	3811.	93803541.	10.0820299	0.0004096	-0.001053
1.5241766	-25.657144 C				
0.00004188	3925.	93724988.	10.0855803	0.0004223	-0.001085
1.5657965	-26.442282 C				
0.00004313	4039.	93647711.	10.0892786	0.0004351	-0.001117
1.6071135	-27.226979 C				
0.00004438	4152.	93571586.	10.0931145	0.0004479	-0.001150
1.6481268	-28.011230 C				
0.00004563	4266.	93496502.	10.0970787	0.0004607	-0.001182
1.6888354	-28.795033 C				
0.00004688	4379.	93422358.	10.1011630	0.0004735	-0.001214
1.7292383	-29.578385 C				
0.00004813	4492.	93349066.	10.1053601	0.0004863	-0.001246
1.7693344	-30.361284 C				
0.00004938	4606.	93276544.	10.1096634	0.0004992	-0.001278
1.8091228	-31.143727 C				
0.00005063	4718.	93204721.	10.1140670	0.0005120	-0.001310
1.8486023	-31.925710 C				
0.00005188	4831.	93133529.	10.1185657	0.0005249	-0.001343
1.8877721	-32.707231 C				
0.00005313	4944.	93062909.	10.1231546	0.0005378	-0.001375
1.9266309	-33.488287 C				
0.00005438	5056.	92992807.	10.1278294	0.0005507	-0.001407
1.9651778	-34.268875 C				
0.00005563	5169.	92923173.	10.1325862	0.0005636	-0.001439
2.0034117	-35.048992 C				
0.00005688	5281.	92853961.	10.1374215	0.0005766	-0.001471
2.0413316	-35.828634 C				
0.00005813	5393.	92785130.	10.1423320	0.0005895	-0.001503
2.0789362	-36.607799 C				
0.00005938	5505.	92716640.	10.1473148	0.0006025	-0.001535
2.1162246	-37.386484 C				
0.00006063	5617.	92648458.	10.1523672	0.0006155	-0.001567
2.1531956	-38.164685 C				
0.00006188	5728.	92580549.	10.1574868	0.0006285	-0.001599
2.1898481	-38.942399 C				
0.00006313	5840.	92512883.	10.1626714	0.0006415	-0.001631
2.2261809	-39.719622 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00006438	5951.	92445433.	10.1679189	0.0006546	-0.001663
2.2621930	-40.496353 C				
0.00006563	6062.	92378172.	10.1732276	0.0006676	-0.001695
2.2978832	-41.272587 C				
0.00006688	6173.	92311077.	10.1785957	0.0006807	-0.001727
2.3332503	-42.048320 C				
0.00006813	6284.	92244124.	10.1840217	0.0006938	-0.001759
2.3682931	-42.823550 C				
0.00006938	6395.	92177292.	10.1895041	0.0007069	-0.001791
2.4030104	-43.598274 C				
0.00007063	6505.	92110561.	10.1950417	0.0007200	-0.001822
2.4374011	-44.372486 C				
0.00007188	6616.	92043913.	10.2006608	0.0007332	-0.001854
2.4714639	-45.146185 C				
0.00007313	6726.	91977331.	10.2063053	0.0007463	-0.001886
2.5051976	-45.919366 C				
0.00007438	6836.	91910797.	10.2120017	0.0007595	-0.001918
2.5386010	-46.692026 C				
0.00007938	7274.	91644853.	10.2352897	0.0008124	-0.002045
2.6688860	-49.777380 C				
0.00008438	7710.	91378587.	10.2593338	0.0008656	-0.002172
2.7937834	-52.854093 C				
0.00008938	8143.	91111830.	10.2831857	0.0009191	-0.002298
2.9130226	-55.924331 C				
0.00009438	8573.	90843621.	10.3077273	0.0009728	-0.002425
3.0266854	-58.985869 C				
0.00009938	8982.	90387473.	10.3258078	0.0010261	-0.002551
3.1332951	-60.000000 CY				
0.0001044	9308.	89176212.	10.3143071	0.0010766	-0.002681
3.2283182	-60.000000 CY				
0.0001094	9549.	87304848.	10.2749831	0.0011238	-0.002814
3.3122821	-60.000000 CY				
0.0001144	9785.	85553556.	10.2389100	0.0011711	-0.002946
3.3913727	-60.000000 CY				
0.0001194	10007.	83830919.	10.2019402	0.0012179	-0.003080
3.4649106	-60.000000 CY				
0.0001244	10158.	81671814.	10.1406407	0.0012612	-0.003216
3.5287895	-60.000000 CY				
0.0001294	10291.	79542859.	10.0787027	0.0013039	-0.003354
3.5876602	-60.000000 CY				
0.0001344	10423.	77564670.	10.0227059	0.0013468	-0.003491
3.6428308	-60.000000 CY				
0.0001394	10554.	75720878.	9.9720357	0.0013899	-0.003628
3.6942550	-60.000000 CY				
0.0001444	10683.	73997378.	9.9261646	0.0014331	-0.003764
3.7418850	-60.000000 CY				
0.0001494	10812.	72381005.	9.8838986	0.0014764	-0.003901
3.7855535	-60.000000 CY				
0.0001544	10929.	70796718.	9.8396771	0.0015190	-0.004038
3.8245440	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0001594	11012.	69097838.	9.7838573	0.0015593	-0.004178
3.8578061	-60.000000 CY				
0.0001644	11075.	67376662.	9.7232508	0.0015983	-0.004319
3.8866026	-60.000000 CY				
0.0001694	11135.	65743511.	9.6663364	0.0016372	-0.004460
3.9121613	-60.000000 CY				
0.0001744	11195.	64200103.	9.6121495	0.0016761	-0.004601
3.9345463	-60.000000 CY				
0.0001794	11254.	62738857.	9.5628376	0.0017153	-0.004742
3.9537182	-60.000000 CY				
0.0001844	11312.	61351278.	9.5162917	0.0017546	-0.004883
3.9695496	-60.000000 CY				
0.0001894	11368.	60031354.	9.4717005	0.0017937	-0.005024
3.9820503	-60.000000 CY				
0.0001944	11425.	58775745.	9.4305957	0.0018331	-0.005164
3.9913005	-60.000000 CY				
0.0001994	11480.	57579537.	9.3922863	0.0018726	-0.005305
3.9972564	-60.000000 CY				
0.0002044	11535.	56438298.	9.3556780	0.0019121	-0.005445
3.9998723	-60.000000 CY				
0.0002094	11588.	55347517.	9.3241700	0.0019522	-0.005585
3.9975077	-60.000000 CY				
0.0002144	11641.	54304067.	9.2934428	0.0019923	-0.005725
3.9998931	-60.000000 CY				
0.0002194	11694.	53304015.	9.2651074	0.0020325	-0.005865
3.9970558	-60.000000 CY				
0.0002244	11744.	52339157.	9.2380944	0.0020728	-0.006005
3.9997330	-60.000000 CY				
0.0002294	11790.	51401489.	9.2117130	0.0021129	-0.006145
3.9956300	-60.000000 CY				
0.0002344	11827.	50463153.	9.1821360	0.0021521	-0.006285
3.9990203	-60.000000 CY				
0.0002394	11859.	49542728.	9.1500193	0.0021903	-0.006427
3.9992468	-60.000000 CY				
0.0002444	11880.	48615611.	9.1135780	0.0022271	-0.006570
3.9965958	-60.000000 CY				
0.0002494	11900.	47718283.	9.0771076	0.0022636	-0.006714
3.9992162	-60.000000 CY				
0.0002544	11917.	46846598.	9.0431776	0.0023004	-0.006857
3.9993713	-60.000000 CY				
0.0002594	11933.	46006491.	9.0103157	0.0023371	-0.007000
3.9955701	-60.000000 CY				
0.0002644	11949.	45197204.	8.9791598	0.0023739	-0.007144
3.9985538	-60.000000 CY				
0.0002694	11965.	44417005.	8.9493437	0.0024107	-0.007287
3.9999119	-60.000000 CY				
0.0002744	11980.	43663657.	8.9215934	0.0024479	-0.007430
3.9942523	-60.000000 CY				
0.0003044	12066.	39641995.	8.7782176	0.0026719	-0.008286
3.9985257	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0003344	12142.	36312646.	8.6652203	0.0028974	-0.009140
3.9998424	-60.000000 CY				
0.0003644	12212.	33513765.	8.5815911	0.0031269	-0.009991
3.9999658	-60.000000 CYT				
0.0003944	12276.	31127384.	8.5182268	0.0033594	-0.010838
3.9996505	-60.000000 CYT				
0.0004244	12335.	29066055.	8.4694819	0.0035942	-0.011683
3.9973093	-60.000000 CYT				
0.0004544	12381.	27248100.	8.4201387	0.0038259	-0.012532
3.9875919	-60.000000 CYT				

Axial Thrust Force = 4.600 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
6.25000E-07	240.5035986	384805758.	19.5651901	0.00001223	-0.00001027
0.0512199	0.2795816				
0.00000125	480.1446137	384115691.	18.7843907	0.00002348	-0.00002152
0.0980225	0.5308592				
0.00000188	718.9148267	383421241.	18.5241312	0.00003473	-0.00003277
0.1445462	0.7821371				
0.00000250	956.8142298	382725692.	18.3940059	0.00004599	-0.00004401
0.1907908	1.0334154				
0.00000313	1194.	382029703.	18.3159341	0.00005724	-0.00005526
0.2367565	1.2846940				
0.00000375	1430.	381333494.	18.2638891	0.00006849	-0.00006651
0.2824433	1.5359729				
0.00000438	1665.	380637159.	18.2267166	0.00007974	-0.00007776
0.3278510	1.7872522				
0.00000500	1900.	379940746.	18.1988394	0.00009099	-0.00008901
0.3729798	2.0385317				
0.00000563	2133.	379244280.	18.1771590	0.0001022	-0.000100
0.4178295	2.2898116				
0.00000625	2366.	378547777.	18.1598165	0.0001135	-0.000112
0.4624003	2.5410917				
0.00000688	2366.	344134343.	10.3291778	0.00007101	-0.000176
0.2904571	-4.292706 C				
0.00000750	2366.	315456481.	10.2940289	0.00007721	-0.000193
0.3152465	-4.690597 C				
0.00000813	2366.	291190598.	10.2646762	0.00008340	-0.000209
0.3399656	-5.088396 C				
0.00000875	2366.	270391269.	10.2391817	0.00008959	-0.000225
0.3645893	-5.486283 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00000938	2366.	252365185.	10.2172859	0.00009579	-0.000242
0.3891378	-5.884113 C				
0.00001000	2366.	236592361.	10.1984552	0.0001020	-0.000258
0.4136162	-6.281848 C				
0.00001063	2366.	222675163.	10.1821496	0.0001082	-0.000274
0.4380246	-6.679488 C				
0.00001125	2366.	210304321.	10.1679490	0.0001144	-0.000291
0.4623628	-7.077032 C				
0.00001188	2366.	199235672.	10.1555219	0.0001206	-0.000307
0.4866307	-7.474480 C				
0.00001250	2366.	189273889.	10.1446030	0.0001268	-0.000323
0.5108282	-7.871831 C				
0.00001313	2366.	180260846.	10.1349589	0.0001330	-0.000339
0.5349552	-8.269087 C				
0.00001375	2366.	172067171.	10.1264498	0.0001392	-0.000356
0.5590117	-8.666245 C				
0.00001438	2366.	164585990.	10.1189132	0.0001455	-0.000372
0.5829974	-9.063307 C				
0.00001500	2366.	157728241.	10.1122282	0.0001517	-0.000388
0.6069124	-9.460271 C				
0.00001563	2366.	151419111.	10.1062933	0.0001579	-0.000405
0.6307565	-9.857138 C				
0.00001625	2366.	145595299.	10.1010224	0.0001641	-0.000421
0.6545296	-10.253907 C				
0.00001688	2366.	140202880.	10.0963423	0.0001704	-0.000437
0.6782316	-10.650577 C				
0.00001750	2366.	135195635.	10.0921903	0.0001766	-0.000453
0.7018624	-11.047150 C				
0.00001813	2366.	130533716.	10.0885122	0.0001829	-0.000470
0.7254219	-11.443623 C				
0.00001875	2366.	126182592.	10.0852613	0.0001891	-0.000486
0.7489100	-11.839998 C				
0.00001938	2366.	122112186.	10.0823966	0.0001953	-0.000502
0.7723266	-12.236274 C				
0.00002000	2366.	118296180.	10.0798824	0.0002016	-0.000518
0.7956716	-12.632450 C				
0.00002063	2366.	114711448.	10.0776874	0.0002079	-0.000535
0.8189449	-13.028526 C				
0.00002125	2366.	111337582.	10.0757837	0.0002141	-0.000551
0.8421464	-13.424502 C				
0.00002188	2366.	108156508.	10.0741470	0.0002204	-0.000567
0.8652759	-13.820378 C				
0.00002250	2366.	105152160.	10.0727554	0.0002266	-0.000583
0.8883333	-14.216153 C				
0.00002313	2366.	102310210.	10.0715894	0.0002329	-0.000600
0.9113187	-14.611828 C				
0.00002375	2366.	99617836.	10.0706317	0.0002392	-0.000616
0.9342318	-15.007401 C				
0.00002438	2366.	97063533.	10.0698667	0.0002455	-0.000632
0.9570725	-15.402873 C				



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00002563	2436.	95048091.	10.0688598	0.0002580	-0.000664
1.0025364	-16.193510 C				
0.00002688	2551.	94928657.	10.0684718	0.0002706	-0.000697
1.0477096	-16.983738 C				
0.00002813	2667.	94815115.	10.0686232	0.0002832	-0.000729
1.0925912	-17.773555 C				
0.00002938	2782.	94706690.	10.0692479	0.0002958	-0.000762
1.1371802	-18.562957 C				
0.00003063	2897.	94602733.	10.0703211	0.0003084	-0.000794
1.1814759	-19.351942 C				
0.00003188	3012.	94502697.	10.0717368	0.0003210	-0.000826
1.2254772	-20.140508 C				
0.00003313	3127.	94406117.	10.0734845	0.0003337	-0.000859
1.2691834	-20.928652 C				
0.00003438	3242.	94312597.	10.0755306	0.0003463	-0.000891
1.3125933	-21.716373 C				
0.00003563	3357.	94221794.	10.0778462	0.0003590	-0.000923
1.3557063	-22.503666 C				
0.00003688	3471.	94133413.	10.0804061	0.0003717	-0.000956
1.3985212	-23.290530 C				
0.00003813	3586.	94047197.	10.0831888	0.0003844	-0.000988
1.4410372	-24.076963 C				
0.00003938	3700.	93962921.	10.0861753	0.0003971	-0.001020
1.4832533	-24.862961 C				
0.00004063	3814.	93880388.	10.0893491	0.0004099	-0.001053
1.5251686	-25.648521 C				
0.00004188	3928.	93799425.	10.0926956	0.0004226	-0.001085
1.5667821	-26.433642 C				
0.00004313	4042.	93719877.	10.0962019	0.0004354	-0.001117
1.6080927	-27.218321 C				
0.00004438	4155.	93641609.	10.0998566	0.0004482	-0.001149
1.6490996	-28.002554 C				
0.00004563	4269.	93564497.	10.1036497	0.0004610	-0.001182
1.6898018	-28.786339 C				
0.00004688	4382.	93488434.	10.1075722	0.0004738	-0.001214
1.7301982	-29.569674 C				
0.00004813	4496.	93413321.	10.1116159	0.0004866	-0.001246
1.7702878	-30.352554 C				
0.00004938	4609.	93339070.	10.1157737	0.0004995	-0.001278
1.8100696	-31.134978 C				
0.00005063	4722.	93265602.	10.1200391	0.0005123	-0.001310
1.8495425	-31.916943 C				
0.00005188	4834.	93192845.	10.1244063	0.0005252	-0.001342
1.8887057	-32.698446 C				
0.00005313	4947.	93120733.	10.1288700	0.0005381	-0.001374
1.9275579	-33.479483 C				
0.00005438	5060.	93049206.	10.1334255	0.0005510	-0.001406
1.9660981	-34.260052 C				
0.00005563	5172.	92978211.	10.1380684	0.0005639	-0.001439
2.0043253	-35.040149 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00005688	5284.	92907697.	10.1427948	0.0005769	-0.001471
2.0422384	-35.819772 C				
0.00005813	5396.	92837619.	10.1476012	0.0005898	-0.001503
2.0798362	-36.598918 C				
0.00005938	5508.	92767935.	10.1524844	0.0006028	-0.001535
2.1171178	-37.377583 C				
0.00006063	5620.	92698606.	10.1574414	0.0006158	-0.001567
2.1540819	-38.155764 C				
0.00006188	5731.	92629597.	10.1624696	0.0006288	-0.001599
2.1907275	-38.933458 C				
0.00006313	5843.	92560874.	10.1675664	0.0006418	-0.001631
2.2270535	-39.710662 C				
0.00006438	5954.	92492407.	10.1727297	0.0006549	-0.001663
2.2630586	-40.487373 C				
0.00006563	6065.	92424168.	10.1779574	0.0006679	-0.001695
2.2987417	-41.263586 C				
0.00006688	6176.	92356130.	10.1832476	0.0006810	-0.001726
2.3341018	-42.039299 C				
0.00006813	6287.	92288268.	10.1885986	0.0006941	-0.001758
2.3691375	-42.814509 C				
0.00006938	6398.	92220560.	10.1940089	0.0007072	-0.001790
2.4038477	-43.589211 C				
0.00007063	6508.	92152983.	10.1995039	0.0007203	-0.001822
2.4382312	-44.363403 C				
0.00007188	6619.	92085519.	10.2050285	0.0007335	-0.001854
2.4722868	-45.137081 C				
0.00007313	6729.	92018147.	10.2106084	0.0007467	-0.001886
2.5060133	-45.910241 C				
0.00007438	6839.	91950850.	10.2162424	0.0007598	-0.001918
2.5394094	-46.682880 C				
0.00007938	7277.	91682087.	10.2393011	0.0008127	-0.002045
2.6696649	-49.768146 C				
0.00008438	7713.	91413389.	10.2630109	0.0008659	-0.002172
2.7945082	-52.845065 C				
0.00008938	8146.	91144431.	10.2866786	0.0009194	-0.002298
2.9137126	-55.915279 C				
0.00009438	8576.	90874234.	10.3110673	0.0009731	-0.002424
3.0273448	-58.976728 C				
0.00009938	8985.	90417533.	10.3290580	0.0010265	-0.002551
3.1339327	-60.000000 CY				
0.0001044	9311.	89207952.	10.3175636	0.0010769	-0.002681
3.2289512	-60.000000 CY				
0.0001094	9552.	87336121.	10.2781631	0.0011242	-0.002813
3.3128936	-60.000000 CY				
0.0001144	9789.	85583430.	10.2421143	0.0011714	-0.002946
3.3919789	-60.000000 CY				
0.0001194	10011.	83861611.	10.2051482	0.0012182	-0.003079
3.4655044	-60.000000 CY				
0.0001244	10162.	81702300.	10.1438002	0.0012616	-0.003216
3.5293615	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0001294	10295.	79572057.	10.0817619	0.0013043	-0.003353
3.5881988	-60.000000 CY				
0.0001344	10427.	77592674.	10.0256713	0.0013472	-0.003490
3.6433355	-60.000000 CY				
0.0001394	10557.	75747771.	9.9749147	0.0013903	-0.003627
3.6947252	-60.000000 CY				
0.0001444	10687.	74023236.	9.9289636	0.0014335	-0.003764
3.7423201	-60.000000 CY				
0.0001494	10816.	72406063.	9.8867661	0.0014768	-0.003901
3.7859739	-60.000000 CY				
0.0001544	10933.	70821400.	9.8425115	0.0015194	-0.004038
3.8249324	-60.000000 CY				
0.0001594	11017.	69123456.	9.7867573	0.0015598	-0.004178
3.8581753	-60.000000 CY				
0.0001644	11079.	67401534.	9.7260868	0.0015987	-0.004319
3.8869352	-60.000000 CY				
0.0001694	11139.	65767574.	9.6691048	0.0016377	-0.004460
3.9124557	-60.000000 CY				
0.0001744	11199.	64223403.	9.6148605	0.0016766	-0.004601
3.9348020	-60.000000 CY				
0.0001794	11258.	62761436.	9.5654896	0.0017158	-0.004742
3.9539345	-60.000000 CY				
0.0001844	11316.	61373390.	9.5189681	0.0017551	-0.004882
3.9697370	-60.000000 CY				
0.0001894	11373.	60052811.	9.4743244	0.0017942	-0.005023
3.9821950	-60.000000 CY				
0.0001944	11429.	58796578.	9.4331695	0.0018336	-0.005164
3.9914019	-60.000000 CY				
0.0001994	11484.	57599778.	9.3948139	0.0018731	-0.005304
3.9973136	-60.000000 CY				
0.0002044	11539.	56457972.	9.3581635	0.0019126	-0.005445
3.9998845	-60.000000 CY				
0.0002094	11592.	55366642.	9.3266817	0.0019528	-0.005585
3.9975630	-60.000000 CY				
0.0002144	11645.	54322678.	9.2959142	0.0019928	-0.005725
3.9999044	-60.000000 CY				
0.0002194	11698.	53322120.	9.2675435	0.0020331	-0.005864
3.9971169	-60.000000 CY				
0.0002244	11748.	52356977.	9.2405172	0.0020733	-0.006004
3.9997515	-60.000000 CY				
0.0002294	11794.	51418840.	9.2141042	0.0021135	-0.006144
3.9957066	-60.000000 CY				
0.0002344	11831.	50480617.	9.1845645	0.0021526	-0.006285
3.9990577	-60.000000 CY				
0.0002394	11864.	49560513.	9.1526832	0.0021909	-0.006427
3.9990468	-60.000000 CY				
0.0002444	11885.	48632992.	9.1162023	0.0022278	-0.006570
3.9966747	-60.000000 CY				
0.0002494	11904.	47735462.	9.0796192	0.0022642	-0.006713
3.9992545	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0002544	11921.	46863378.	9.0457647	0.0023010	-0.006856
3.9991650	-60.000000 CY				
0.0002594	11937.	46022914.	9.0128664	0.0023377	-0.007000
3.9956629	-60.000000 CY				
0.0002644	11953.	45213284.	8.9816750	0.0023745	-0.007143
3.9986069	-60.000000 CY				
0.0002694	11969.	44432753.	8.9518321	0.0024114	-0.007286
3.9999247	-60.000000 CY				
0.0002744	11984.	43679063.	8.9240509	0.0024485	-0.007429
3.9940409	-60.000000 CY				
0.0003044	12070.	39655848.	8.7807001	0.0026726	-0.008285
3.9985866	-60.000000 CY				
0.0003344	12146.	36325110.	8.6675807	0.0028982	-0.009139
3.9998625	-60.000000 CY				
0.0003644	12216.	33525083.	8.5838110	0.0031277	-0.009990
3.9999751	-60.000000 CYT				
0.0003944	12280.	31137740.	8.5203443	0.0033602	-0.010837
3.9996828	-60.000000 CYT				
0.0004244	12339.	29075625.	8.4715220	0.0035951	-0.011682
3.9974037	-60.000000 CYT				
0.0004544	12385.	27257253.	8.4224181	0.0038269	-0.012531
3.9878351	-60.000000 CYT				

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 Summary of Results for Nominal Moment Capacity for Section 1  
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Moment values interpolated at maximum compressive strain = 0.003  
 or maximum developed moment if pile fails at smaller strains.

Load Tens. No. Strain	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain	Max.
-----	-----	-----	-----	
1	3.800	12169.214	0.00300000	
-0.00952396				
2	4.200	12173.120	0.00300000	
-0.00952020				
3	4.600	12177.027	0.00300000	
-0.00951645				

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.75).

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Stiff. Load Ult Mom No. kip-in <sup>2</sup>	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. at
1 91219895.	0.65	3.800000	12169.	2.470000	7910.	
2 91253873.	0.65	4.200000	12173.	2.730000	7913.	
3 91287886.	0.65	4.600000	12177.	2.990000	7915.	
1 89806706.	0.75	3.800000	12169.	2.850000	9127.	
2 89838295.	0.75	4.200000	12173.	3.150000	9130.	
3 89869877.	0.75	4.600000	12177.	3.450000	9133.	
1 70221645.	0.90	3.800000	12169.	3.420000	10952.	
2 70254444.	0.90	4.200000	12173.	3.780000	10956.	
3 70287179.	0.90	4.600000	12177.	4.140000	10959.	

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	1.0000	0.00	N.A.	No	0.00	8859.

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Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

2	4.0000	0.2172	No	No	8859.	119852.
3	6.7000	9.8717	Yes	No	128711.	26727.
4	8.2000	6.8915	Yes	No	155437.	22097.
5	11.7000	10.7000	No	No	177534.	0.00
6	16.7000	15.7000	No	No	0.00	0.00
7	21.2000	20.2000	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 = 1000.0 lbs  
Applied moment at pile head = 315600.0 in-lbs  
Axial thrust load on pile head = 4200.0 lbs

Depth Res.	Soil X lb/inch	Deflect. Spr. y inches lb/inch	Bending Distrib. Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil p
0.00	0.00	0.01754	315600.	1000.0000	-2.77E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.09000	0.00	0.01724	316681.	1000.0000	-2.76E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.1800	0.00	0.01694	317763.	1000.	-2.75E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.2700	0.00	0.01665	318844.	1000.	-2.74E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.3600	0.00	0.01635	319925.	1000.	-2.73E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.4500	0.00	0.01606	321006.	1000.	-2.72E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.5400	0.00	0.01576	322087.	1000.	-2.71E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.6300	0.00	0.01547	323169.	1000.	-2.70E-04	0.00	3.84E+11	

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 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00	0.00	0.00				
0.7200	0.01518	324250.	1000.	-2.70E-04	0.00	3.84E+11
0.00	0.00	0.00				
0.8100	0.01489	325331.	1000.	-2.69E-04	0.00	3.84E+11
0.00	0.00	0.00				
0.9000	0.01460	326412.	1000.	-2.68E-04	0.00	3.84E+11
0.00	0.00	0.00				
0.9900	0.01431	327494.	1000.	-2.67E-04	0.00	3.84E+11
0.00	0.00	0.00				
1.0800	0.01402	328575.	989.8115	-2.66E-04	0.00	3.84E+11
-18.868	1453.	0.00				
1.1700	0.01374	329634.	969.3371	-2.65E-04	0.00	3.84E+11
-19.048	1497.	0.00				
1.2600	0.01345	330671.	948.6715	-2.64E-04	0.00	3.84E+11
-19.222	1543.	0.00				
1.3500	0.01317	331685.	927.8206	-2.63E-04	0.00	3.84E+11
-19.391	1590.	0.00				
1.4400	0.01288	332677.	906.7908	-2.62E-04	0.00	3.84E+11
-19.553	1639.	0.00				
1.5300	0.01260	333647.	885.5886	-2.61E-04	0.00	3.84E+11
-19.710	1689.	0.00				
1.6200	0.01232	334593.	864.2205	-2.60E-04	0.00	3.84E+11
-19.861	1741.	0.00				
1.7100	0.01204	335516.	842.6933	-2.59E-04	0.00	3.84E+11
-20.005	1795.	0.00				
1.8000	0.01176	336415.	821.0138	-2.58E-04	0.00	3.84E+11
-20.142	1850.	0.00				
1.8900	0.01148	337291.	799.1891	-2.57E-04	0.00	3.84E+11
-20.274	1907.	0.00				
1.9800	0.01120	338144.	777.2263	-2.56E-04	0.00	3.84E+11
-20.398	1966.	0.00				
2.0700	0.01093	338972.	755.1329	-2.56E-04	0.00	3.84E+11
-20.516	2028.	0.00				
2.1600	0.01065	339777.	732.9163	-2.55E-04	0.00	3.84E+11
-20.626	2091.	0.00				
2.2500	0.01038	340558.	710.5844	-2.54E-04	0.00	3.84E+11
-20.729	2157.	0.00				
2.3400	0.01010	341314.	688.1451	-2.53E-04	0.00	3.84E+11
-20.825	2226.	0.00				
2.4300	0.00983	342047.	665.6067	-2.52E-04	0.00	3.84E+11
-20.913	2297.	0.00				
2.5200	0.00956	342754.	642.9775	-2.51E-04	0.00	3.84E+11
-20.993	2372.	0.00				
2.6100	0.00929	343438.	620.2662	-2.50E-04	0.00	3.84E+11
-21.065	2449.	0.00				
2.7000	0.00902	344096.	597.4819	-2.49E-04	0.00	3.84E+11
-21.128	2530.	0.00				
2.7900	0.00875	344731.	574.6336	-2.48E-04	0.00	3.84E+11
-21.183	2614.	0.00				
2.8800	0.00849	345340.	551.7311	-2.47E-04	0.00	3.84E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-21.229	2702.	0.00				
2.9700	0.00822	345924.	528.7841	-2.46E-04	0.00	3.84E+11
-21.265	2794.	0.00				
3.0600	0.00795	346484.	505.8029	-2.45E-04	0.00	3.84E+11
-21.292	2891.	0.00				
3.1500	0.00769	347019.	482.7981	-2.44E-04	0.00	3.84E+11
-21.309	2993.	0.00				
3.2400	0.00743	347529.	459.7807	-2.43E-04	0.00	3.84E+11
-21.316	3100.	0.00				
3.3300	0.00717	348015.	436.7623	-2.42E-04	0.00	3.84E+11
-21.311	3212.	0.00				
3.4200	0.00690	348475.	413.7547	-2.41E-04	0.00	3.84E+11
-21.295	3331.	0.00				
3.5100	0.00664	348910.	390.7705	-2.40E-04	0.00	3.84E+11
-21.268	3457.	0.00				
3.6000	0.00639	349321.	367.8228	-2.39E-04	0.00	3.84E+11
-21.228	3590.	0.00				
3.6900	0.00613	349707.	344.9253	-2.38E-04	0.00	3.84E+11
-21.175	3732.	0.00				
3.7800	0.00587	350068.	322.0923	-2.37E-04	0.00	3.84E+11
-21.108	3883.	0.00				
3.8700	0.00562	350405.	299.3391	-2.36E-04	0.00	3.84E+11
-21.027	4044.	0.00				
3.9600	0.00536	350717.	276.6816	-2.35E-04	0.00	3.84E+11
-20.931	4216.	0.00				
4.0500	0.00511	351005.	-54.522	-2.34E-04	0.00	3.84E+11
-592.408	125246.	0.00				
4.1400	0.00486	350601.	-692.058	-2.33E-04	0.00	3.84E+11
-588.214	130821.	0.00				
4.2300	0.00460	349512.	-1325.	-2.32E-04	0.00	3.84E+11
-583.674	136895.	0.00				
4.3200	0.00435	347742.	-1953.	-2.31E-04	0.00	3.84E+11
-578.758	143541.	0.00				
4.4100	0.00411	345297.	-2575.	-2.30E-04	0.00	3.84E+11
-573.431	150851.	0.00				
4.5000	0.00386	342182.	-3191.	-2.29E-04	0.00	3.84E+11
-567.653	158936.	0.00				
4.5900	0.00361	338406.	-3801.	-2.28E-04	0.00	3.84E+11
-561.378	167935.	0.00				
4.6800	0.00336	333975.	-4403.	-2.27E-04	0.00	3.84E+11
-554.548	178024.	0.00				
4.7700	0.00312	328897.	-4998.	-2.26E-04	0.00	3.84E+11
-547.098	189429.	0.00				
4.8600	0.00288	323181.	-5585.	-2.25E-04	0.00	3.84E+11
-538.946	202444.	0.00				
4.9500	0.00263	316837.	-6162.	-2.25E-04	0.00	3.84E+11
-529.993	217463.	0.00				
5.0400	0.00239	309874.	-6729.	-2.24E-04	0.00	3.84E+11
-520.113	235025.	0.00				
5.1300	0.00215	302304.	-7285.	-2.23E-04	0.00	3.85E+11



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36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-509.145	255886.	0.00				
5.2200	0.00191	294141.	-7828.	-2.22E-04	0.00	3.85E+11
-496.880	281152.	0.00				
5.3100	0.00167	285398.	-8357.	-2.21E-04	0.00	3.85E+11
-483.030	312499.	0.00				
5.4000	0.00143	276092.	-8870.	-2.20E-04	0.00	3.85E+11
-467.193	352626.	0.00				
5.4900	0.00119	266240.	-9365.	-2.20E-04	0.00	3.85E+11
-448.772	406177.	0.00				
5.5800	9.56E-04	255866.	-9838.	-2.19E-04	0.00	3.85E+11
-426.818	481959.	0.00				
5.6700	7.20E-04	244993.	-10284.	-2.18E-04	0.00	3.85E+11
-399.664	599171.	0.00				
5.7600	4.85E-04	233654.	-10646.	-2.18E-04	0.00	3.85E+11
-270.513	602271.	0.00				
5.8500	2.50E-04	222000.	-10868.	-2.17E-04	0.00	3.85E+11
-140.400	605335.	0.00				
5.9400	1.66E-05	210182.	-10949.	-2.16E-04	0.00	3.85E+11
-9.335	608401.	0.00				
6.0300	-2.17E-04	198353.	-10887.	-2.16E-04	0.00	3.85E+11
122.6983	611468.	0.00				
6.1200	-4.49E-04	186667.	-10683.	-2.15E-04	0.00	3.85E+11
255.7142	614535.	0.00				
6.2100	-6.82E-04	175280.	-10334.	-2.15E-04	0.00	3.85E+11
389.7285	617603.	0.00				
6.3000	-9.13E-04	164347.	-9887.	-2.14E-04	0.00	3.85E+11
439.2678	519557.	0.00				
6.3900	-0.00114	153926.	-9397.	-2.14E-04	0.00	3.85E+11
467.0525	440849.	0.00				
6.4800	-0.00137	144050.	-8880.	-2.13E-04	0.00	3.85E+11
491.3983	386023.	0.00				
6.5700	-0.00161	134747.	-8337.	-2.13E-04	0.00	3.85E+11
513.2906	345392.	0.00				
6.6600	-0.00183	126043.	-7772.	-2.13E-04	0.00	3.85E+11
533.3378	313937.	0.00				
6.7500	-0.00206	117962.	-7392.	-2.12E-04	0.00	3.85E+11
170.7187	89322.	0.00				
6.8400	-0.00229	110079.	-7205.	-2.12E-04	0.00	3.85E+11
176.0511	82912.	0.00				
6.9300	-0.00252	102401.	-7012.	-2.12E-04	0.00	3.85E+11
181.0857	77549.	0.00				
7.0200	-0.00275	94935.	-6814.	-2.11E-04	0.00	3.85E+11
185.8710	72988.	0.00				
7.1100	-0.00298	87686.	-6610.	-2.11E-04	0.00	3.85E+11
190.4443	69057.	0.00				
7.2000	-0.00321	80658.	-6402.	-2.11E-04	0.00	3.85E+11
194.8352	65629.	0.00				
7.2900	-0.00343	73858.	-6190.	-2.11E-04	0.00	3.85E+11
199.0676	62610.	0.00				
7.3800	-0.00366	67291.	-5973.	-2.10E-04	0.00	3.85E+11

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36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

203.1610	59929.	0.00				
7.4700	-0.00389	60960.	-5751.	-2.10E-04	0.00	3.85E+11
207.1315	57531.	0.00				
7.5600	-0.00412	54870.	-5525.	-2.10E-04	0.00	3.85E+11
210.9926	55371.	0.00				
7.6500	-0.00434	49027.	-5295.	-2.10E-04	0.00	3.85E+11
214.7557	53415.	0.00				
7.7400	-0.00457	43435.	-5061.	-2.10E-04	0.00	3.85E+11
218.4307	51633.	0.00				
7.8300	-0.00480	38097.	-4823.	-2.10E-04	0.00	3.85E+11
222.0259	50004.	0.00				
7.9200	-0.00502	33018.	-4582.	-2.10E-04	0.00	3.85E+11
225.5487	48507.	0.00				
8.0100	-0.00525	28202.	-4336.	-2.10E-04	0.00	3.85E+11
229.0055	47126.	0.00				
8.1000	-0.00547	23653.	-4087.	-2.09E-04	0.00	3.85E+11
232.4019	45849.	0.00				
8.1900	-0.00570	19375.	-3834.	-2.09E-04	0.00	3.85E+11
235.7428	44663.	0.00				
8.2800	-0.00593	15373.	-3500.	-2.09E-04	0.00	3.85E+11
384.3039	70031.	0.00				
8.3700	-0.00615	11818.	-3082.	-2.09E-04	0.00	3.85E+11
389.6229	68392.	0.00				
8.4600	-0.00638	8718.	-2658.	-2.09E-04	0.00	3.85E+11
394.8741	66857.	0.00				
8.5500	-0.00660	6079.	-2229.	-2.09E-04	0.00	3.85E+11
400.0624	65418.	0.00				
8.6400	-0.00683	3906.	-1794.	-2.09E-04	0.00	3.85E+11
405.1922	64065.	0.00				
8.7300	-0.00706	2206.	-1354.	-2.09E-04	0.00	3.85E+11
410.2677	62790.	0.00				
8.8200	-0.00728	984.2610	-907.759	-2.09E-04	0.00	3.85E+11
415.2924	61587.	0.00				
8.9100	-0.00751	247.0292	-456.555	-2.09E-04	0.00	3.85E+11
420.2698	60450.	0.00				
9.0000	-0.00773	0.00	0.00	-2.09E-04	0.00	3.85E+11
425.2027	29686.	0.00				

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.01754005 inches  
 Computed slope at pile head = -0.0002767 radians

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 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Maximum bending moment = 351005. inch-lbs  
 Maximum shear force = -10949. lbs  
 Depth of maximum bending moment = 4.05000000 feet below pile head  
 Depth of maximum shear force = 5.94000000 feet below pile head  
 Number of iterations = 24  
 Number of zero deflection points = 1  
 Pile deflection at ground = 0.01427961 inches

-----  
 Pile-head Deflection vs. Pile Length for Load Case 1  
 -----

Boundary Condition Type 1, Shear and Moment

Shear = 1000. lbs  
 Moment = 315600. in-lbs  
 Axial Load = 4200. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.00000	0.01754005	351005.	-10949.
8.55000	0.03459324	347102.	-12508.
8.10000	0.08695040	342591.	-14414.
7.65000	0.15350989	340533.	-15706.
7.20000	0.22716045	338562.	-16675.
6.75000	0.37428457	337302.	-17614.
6.30000	1.21281753	335711.	-19615.
5.85000	6.10676534	340966.	-23082.

-----  
 Computed Values of Pile Loading and Deflection  
 for Lateral Loading for Load Case Number 2  
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Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 2250.0 lbs  
 Applied moment at pile head = 724800.0 in-lbs  
 Axial thrust load on pile head = 4600.0 lbs

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil
Res. Soil Spr.	Distrib.	Moment	Force	S	Stress	Stiffness	p
X	y						
Es*H	Lat. Load						

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 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
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feet lb/inch	inches lb/inch	in-lbs lb/inch	lbs	radians	psi*	lb-in^2
0.00	0.3936	724800.	2250.	-0.00559	0.00	3.83E+11
0.00	0.00	0.00				
0.09000	0.3876	727258.	2250.	-0.00559	0.00	3.83E+11
0.00	0.00	0.00				
0.1800	0.3815	729716.	2250.	-0.00559	0.00	3.83E+11
0.00	0.00	0.00				
0.2700	0.3755	732173.	2250.	-0.00559	0.00	3.83E+11
0.00	0.00	0.00				
0.3600	0.3695	734631.	2250.	-0.00558	0.00	3.83E+11
0.00	0.00	0.00				
0.4500	0.3634	737089.	2250.	-0.00558	0.00	3.83E+11
0.00	0.00	0.00				
0.5400	0.3574	739547.	2250.	-0.00558	0.00	3.83E+11
0.00	0.00	0.00				
0.6300	0.3514	742004.	2250.	-0.00558	0.00	3.83E+11
0.00	0.00	0.00				
0.7200	0.3454	744462.	2250.	-0.00558	0.00	3.83E+11
0.00	0.00	0.00				
0.8100	0.3393	746920.	2250.	-0.00557	0.00	3.83E+11
0.00	0.00	0.00				
0.9000	0.3333	749377.	2250.	-0.00557	0.00	3.83E+11
0.00	0.00	0.00				
0.9900	0.3273	751835.	2250.	-0.00557	0.00	3.83E+11
0.00	0.00	0.00				
1.0800	0.3213	754293.	2221.	-0.00557	0.00	3.83E+11
-53.572	180.0846	0.00				
1.1700	0.3153	756688.	2163.	-0.00557	0.00	3.83E+11
-54.115	185.3784	0.00				
1.2600	0.3093	759020.	2104.	-0.00556	0.00	3.83E+11
-54.642	190.8228	0.00				
1.3500	0.3033	761288.	2045.	-0.00556	0.00	3.83E+11
-55.154	196.4253	0.00				
1.4400	0.2972	763492.	1985.	-0.00556	0.00	3.83E+11
-55.650	202.1941	0.00				
1.5300	0.2912	765631.	1925.	-0.00556	0.00	3.83E+11
-56.129	208.1379	0.00				
1.6200	0.2852	767705.	1864.	-0.00555	0.00	3.83E+11
-56.591	214.2661	0.00				
1.7100	0.2792	769712.	1802.	-0.00555	0.00	3.83E+11
-57.036	220.5888	0.00				
1.8000	0.2733	771653.	1741.	-0.00555	0.00	3.83E+11
-57.463	227.1169	0.00				
1.8900	0.2673	773527.	1678.	-0.00555	0.00	3.83E+11
-57.872	233.8621	0.00				
1.9800	0.2613	775334.	1616.	-0.00555	0.00	3.83E+11
-58.262	240.8372	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

2.0700	0.2553	777072.	1553.	-0.00554	0.00	3.83E+11
-58.632	248.0559	0.00				
2.1600	0.2493	778742.	1489.	-0.00554	0.00	3.83E+11
-58.983	255.5333	0.00				
2.2500	0.2433	780343.	1425.	-0.00554	0.00	3.83E+11
-59.314	263.2855	0.00				
2.3400	0.2373	781876.	1361.	-0.00554	0.00	3.83E+11
-59.624	271.3304	0.00				
2.4300	0.2313	783338.	1296.	-0.00554	0.00	3.83E+11
-59.912	279.6874	0.00				
2.5200	0.2254	784731.	1232.	-0.00553	0.00	3.83E+11
-60.177	288.3776	0.00				
2.6100	0.2194	786053.	1166.	-0.00553	0.00	3.83E+11
-60.420	297.4245	0.00				
2.7000	0.2134	787305.	1101.	-0.00553	0.00	3.83E+11
-60.638	306.8536	0.00				
2.7900	0.2075	788486.	1035.	-0.00553	0.00	3.83E+11
-60.832	316.6932	0.00				
2.8800	0.2015	789597.	969.6414	-0.00552	0.00	3.83E+11
-61.001	326.9746	0.00				
2.9700	0.1955	790636.	903.6842	-0.00552	0.00	3.83E+11
-61.142	337.7325	0.00				
3.0600	0.1896	791603.	837.5888	-0.00552	0.00	3.83E+11
-61.256	349.0056	0.00				
3.1500	0.1836	792500.	771.3859	-0.00552	0.00	3.83E+11
-61.342	360.8369	0.00				
3.2400	0.1776	793324.	705.1070	-0.00552	0.00	3.83E+11
-61.397	373.2748	0.00				
3.3300	0.1717	794077.	638.7852	-0.00551	0.00	3.83E+11
-61.421	386.3735	0.00				
3.4200	0.1657	794759.	572.4553	-0.00551	0.00	3.83E+11
-61.412	400.1945	0.00				
3.5100	0.1598	795369.	506.1532	-0.00551	0.00	3.83E+11
-61.369	414.8071	0.00				
3.6000	0.1538	795907.	439.9171	-0.00551	0.00	3.83E+11
-61.290	430.2907	0.00				
3.6900	0.1479	796374.	373.7868	-0.00550	0.00	3.83E+11
-61.173	446.7357	0.00				
3.7800	0.1419	796769.	307.8043	-0.00550	0.00	3.83E+11
-61.016	464.2465	0.00				
3.8700	0.1360	797093.	242.0140	-0.00550	0.00	3.83E+11
-60.817	482.9437	0.00				
3.9600	0.1301	797346.	176.4630	-0.00550	0.00	3.83E+11
-60.573	502.9676	0.00				
4.0500	0.1241	797529.	-566.270	-0.00550	0.00	3.83E+11
-1315.	11440.	0.00				
4.1400	0.1182	796178.	-1982.	-0.00549	0.00	3.83E+11
-1306.	11934.	0.00				
4.2300	0.1123	793303.	-3387.	-0.00549	0.00	3.83E+11
-1297.	12473.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

4.3200	0.1063	788916.	-4782.	-0.00549	0.00	3.83E+11
-1286.	13062.	0.00				
4.4100	0.1004	783029.	-6165.	-0.00549	0.00	3.83E+11
-1275.	13711.	0.00				
4.5000	0.09449	775655.	-7535.	-0.00548	0.00	3.83E+11
-1262.	14430.	0.00				
4.5900	0.08857	766809.	-8891.	-0.00548	0.00	3.83E+11
-1249.	15230.	0.00				
4.6800	0.08265	756506.	-10232.	-0.00548	0.00	3.83E+11
-1234.	16128.	0.00				
4.7700	0.07673	744763.	-11556.	-0.00548	0.00	3.83E+11
-1218.	17144.	0.00				
4.8600	0.07082	731599.	-12862.	-0.00548	0.00	3.83E+11
-1200.	18305.	0.00				
4.9500	0.06490	717036.	-14147.	-0.00547	0.00	3.83E+11
-1181.	19646.	0.00				
5.0400	0.05899	701095.	-15411.	-0.00547	0.00	3.83E+11
-1159.	21216.	0.00				
5.1300	0.05309	683803.	-16649.	-0.00547	0.00	3.83E+11
-1135.	23085.	0.00				
5.2200	0.04718	665187.	-17860.	-0.00547	0.00	3.84E+11
-1108.	25353.	0.00				
5.3100	0.04128	645279.	-19040.	-0.00547	0.00	3.84E+11
-1077.	28174.	0.00				
5.4000	0.03537	624115.	-20184.	-0.00546	0.00	3.84E+11
-1041.	31795.	0.00				
5.4900	0.02947	601737.	-21286.	-0.00546	0.00	3.84E+11
-1000.	36647.	0.00				
5.5800	0.02358	578192.	-22339.	-0.00546	0.00	3.84E+11
-950.720	43552.	0.00				
5.6700	0.01768	553538.	-23333.	-0.00546	0.00	3.84E+11
-889.260	54322.	0.00				
5.7600	0.01178	527847.	-24249.	-0.00546	0.00	3.84E+11
-807.620	74012.	0.00				
5.8500	0.00589	501214.	-25054.	-0.00546	0.00	3.84E+11
-682.562	125117.	0.00				
5.9400	2.08E-07	473784.	-25423.	-0.00545	0.00	3.84E+11
-0.117	608401.	0.00				
6.0300	-0.00589	446355.	-25050.	-0.00545	0.00	3.84E+11
689.4235	126415.	0.00				
6.1200	-0.01178	419729.	-24233.	-0.00545	0.00	3.84E+11
823.9594	75549.	0.00				
6.2100	-0.01767	394065.	-23293.	-0.00545	0.00	3.84E+11
916.3890	56022.	0.00				
6.3000	-0.02355	369470.	-22264.	-0.00545	0.00	3.84E+11
989.5910	45377.	0.00				
6.3900	-0.02944	346029.	-21162.	-0.00545	0.00	3.84E+11
1052.	38577.	0.00				
6.4800	-0.03532	323814.	-19997.	-0.00545	0.00	3.84E+11
1106.	33815.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

6.5700	-0.04121	302889.	-18776.	-0.00545	0.00	3.85E+11
1155.	30273.	0.00				
6.6600	-0.04709	283312.	-17504.	-0.00545	0.00	3.85E+11
1200.	27523.	0.00				
6.7500	-0.05297	265134.	-16649.	-0.00545	0.00	3.85E+11
384.1030	7832.	0.00				
6.8400	-0.05885	247404.	-16228.	-0.00544	0.00	3.85E+11
396.1061	7269.	0.00				
6.9300	-0.06473	230136.	-15794.	-0.00544	0.00	3.85E+11
407.4506	6798.	0.00				
7.0200	-0.07061	213343.	-15348.	-0.00544	0.00	3.85E+11
418.2428	6397.	0.00				
7.1100	-0.07649	197039.	-14891.	-0.00544	0.00	3.85E+11
428.5648	6051.	0.00				
7.2000	-0.08237	181234.	-14422.	-0.00544	0.00	3.85E+11
438.4817	5750.	0.00				
7.2900	-0.08824	165940.	-13944.	-0.00544	0.00	3.85E+11
448.0458	5484.	0.00				
7.3800	-0.09412	151170.	-13455.	-0.00544	0.00	3.85E+11
457.3000	5247.	0.00				
7.4700	-0.10000	136932.	-12956.	-0.00544	0.00	3.85E+11
466.2798	5036.	0.00				
7.5600	-0.106	123239.	-12448.	-0.00544	0.00	3.85E+11
475.0151	4846.	0.00				
7.6500	-0.112	110099.	-11930.	-0.00544	0.00	3.85E+11
483.5310	4673.	0.00				
7.7400	-0.118	97524.	-11403.	-0.00544	0.00	3.85E+11
491.8491	4516.	0.00				
7.8300	-0.123	85522.	-10868.	-0.00544	0.00	3.85E+11
499.9880	4372.	0.00				
7.9200	-0.129	74103.	-10324.	-0.00544	0.00	3.85E+11
507.9640	4240.	0.00				
8.0100	-0.135	63277.	-9771.	-0.00544	0.00	3.85E+11
515.7910	4119.	0.00				
8.1000	-0.141	53052.	-9210.	-0.00544	0.00	3.85E+11
523.4815	4006.	0.00				
8.1900	-0.147	43438.	-8640.	-0.00544	0.00	3.85E+11
531.0465	3902.	0.00				
8.2800	-0.153	34444.	-7886.	-0.00544	0.00	3.85E+11
865.7649	6117.	0.00				
8.3700	-0.159	26459.	-6944.	-0.00544	0.00	3.85E+11
877.8071	5972.	0.00				
8.4600	-0.165	19498.	-5990.	-0.00544	0.00	3.85E+11
889.6949	5837.	0.00				
8.5500	-0.170	13575.	-5023.	-0.00544	0.00	3.85E+11
901.4394	5710.	0.00				
8.6400	-0.176	8704.	-4043.	-0.00544	0.00	3.85E+11
913.0505	5591.	0.00				
8.7300	-0.182	4897.	-3050.	-0.00544	0.00	3.85E+11
924.5373	5479.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

8.8200	-0.188	2169.	-2046.	-0.00544	0.00	3.85E+11
935.9082	5373.	0.00				
8.9100	-0.194	531.8797	-1029.	-0.00544	0.00	3.85E+11
947.1704	5273.	0.00				
9.0000	-0.200	0.00	0.00	-0.00544	0.00	3.85E+11
958.3310	2589.	0.00				

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection = 0.39360289 inches  
 Computed slope at pile head = -0.0055928 radians  
 Maximum bending moment = 797529. inch-lbs  
 Maximum shear force = -25423. lbs  
 Depth of maximum bending moment = 4.05000000 feet below pile head  
 Depth of maximum shear force = 5.94000000 feet below pile head  
 Number of iterations = 38  
 Number of zero deflection points = 1  
 Pile deflection at ground = 0.32662766 inches

Pile-head Deflection vs. Pile Length for Load Case 2

Boundary Condition Type 1, Shear and Moment

Shear = 2250. lbs  
 Moment = 724800. in-lbs  
 Axial Load = 4600. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.00000	0.39360289	797529.	-25423.
8.55000	0.82221311	788442.	-28473.
8.10000	2.13968543	782955.	-32708.
7.65000	3.87826924	782521.	-35889.
7.20000	5.88831909	781917.	-38316.
6.75000	10.37943343	787236.	-41249.



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

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 Computed Values of Pile Loading and Deflection  
 for Lateral Loading for Load Case Number 3  
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Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 2250.0 lbs  
 Applied moment at pile head = 724800.0 in-lbs  
 Axial thrust load on pile head = 3800.0 lbs

Depth Res.	Soil X lb/inch	Deflect. Spr. y inches lb/inch	Bending Distrib. Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil p
feet	Es*H	Lat. Load						
0.00	0.00	0.3928	724800.	2250.	-0.00558	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.09000	0.00	0.3868	727253.	2250.	-0.00558	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.1800	0.00	0.3807	729706.	2250.	-0.00558	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.2700	0.00	0.3747	732159.	2250.	-0.00558	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.3600	0.00	0.3687	734612.	2250.	-0.00557	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.4500	0.00	0.3627	737064.	2250.	-0.00557	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.5400	0.00	0.3567	739517.	2250.	-0.00557	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.6300	0.00	0.3506	741970.	2250.	-0.00557	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.7200	0.00	0.3446	744423.	2250.	-0.00556	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.8100	0.00	0.3386	746876.	2250.	-0.00556	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.9000	0.00	0.3326	749329.	2250.	-0.00556	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
0.9900	0.00	0.3266	751781.	2250.	-0.00556	0.00	3.83E+11	
0.00	0.00	0.00	0.00					
1.0800	0.00	0.3206	754234.	2221.	-0.00556	0.00	3.83E+11	
-53.535	180.3333		0.00					
1.1700	0.00	0.3146	756625.	2163.	-0.00555	0.00	3.83E+11	
-54.078	185.6345		0.00					
1.2600	0.00	0.3086	758952.	2104.	-0.00555	0.00	3.83E+11	

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-54.605	191.0864	0.00				
1.3500	0.3026	761215.	2045.	-0.00555	0.00	3.83E+11
-55.116	196.6967	0.00				
1.4400	0.2966	763415.	1985.	-0.00555	0.00	3.83E+11
-55.611	202.4735	0.00				
1.5300	0.2906	765549.	1925.	-0.00555	0.00	3.83E+11
-56.090	208.4256	0.00				
1.6200	0.2847	767618.	1864.	-0.00554	0.00	3.83E+11
-56.552	214.5623	0.00				
1.7100	0.2787	769621.	1803.	-0.00554	0.00	3.83E+11
-56.996	220.8938	0.00				
1.8000	0.2727	771558.	1741.	-0.00554	0.00	3.83E+11
-57.423	227.4309	0.00				
1.8900	0.2667	773427.	1679.	-0.00554	0.00	3.83E+11
-57.832	234.1855	0.00				
1.9800	0.2607	775229.	1616.	-0.00553	0.00	3.83E+11
-58.221	241.1702	0.00				
2.0700	0.2547	776963.	1553.	-0.00553	0.00	3.83E+11
-58.592	248.3990	0.00				
2.1600	0.2488	778629.	1490.	-0.00553	0.00	3.83E+11
-58.943	255.8867	0.00				
2.2500	0.2428	780226.	1426.	-0.00553	0.00	3.83E+11
-59.273	263.6497	0.00				
2.3400	0.2368	781754.	1362.	-0.00553	0.00	3.83E+11
-59.582	271.7058	0.00				
2.4300	0.2309	783212.	1297.	-0.00552	0.00	3.83E+11
-59.870	280.0743	0.00				
2.5200	0.2249	784601.	1232.	-0.00552	0.00	3.83E+11
-60.136	288.7767	0.00				
2.6100	0.2189	785919.	1167.	-0.00552	0.00	3.83E+11
-60.378	297.8361	0.00				
2.7000	0.2130	787167.	1102.	-0.00552	0.00	3.83E+11
-60.596	307.2782	0.00				
2.7900	0.2070	788345.	1036.	-0.00551	0.00	3.83E+11
-60.790	317.1315	0.00				
2.8800	0.2011	789451.	970.5263	-0.00551	0.00	3.83E+11
-60.958	327.4272	0.00				
2.9700	0.1951	790486.	904.6147	-0.00551	0.00	3.83E+11
-61.100	338.2000	0.00				
3.0600	0.1892	791450.	838.5651	-0.00551	0.00	3.83E+11
-61.214	349.4887	0.00				
3.1500	0.1832	792343.	772.4079	-0.00551	0.00	3.83E+11
-61.299	361.3364	0.00				
3.2400	0.1773	793164.	706.1749	-0.00550	0.00	3.83E+11
-61.355	373.7916	0.00				
3.3300	0.1713	793913.	639.8990	-0.00550	0.00	3.83E+11
-61.379	386.9084	0.00				
3.4200	0.1654	794591.	573.6149	-0.00550	0.00	3.83E+11
-61.370	400.7485	0.00				
3.5100	0.1595	795197.	507.3587	-0.00550	0.00	3.83E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-61.327	415.3814	0.00					
3.6000	0.1535	795732.	441.1684	-0.00549	0.00	3.83E+11	
-61.248	430.8864	0.00					
3.6900	0.1476	796195.	375.0838	-0.00549	0.00	3.83E+11	
-61.131	447.3541	0.00					
3.7800	0.1417	796587.	309.1469	-0.00549	0.00	3.83E+11	
-60.974	464.8892	0.00					
3.8700	0.1357	796908.	243.4021	-0.00549	0.00	3.83E+11	
-60.775	483.6122	0.00					
3.9600	0.1298	797158.	177.8964	-0.00549	0.00	3.83E+11	
-60.532	503.6638	0.00					
4.0500	0.1239	797337.	-564.445	-0.00548	0.00	3.83E+11	
-1314.	11458.	0.00					
4.1400	0.1180	795984.	-1979.	-0.00548	0.00	3.83E+11	
-1305.	11953.	0.00					
4.2300	0.1120	793108.	-3384.	-0.00548	0.00	3.83E+11	
-1296.	12492.	0.00					
4.3200	0.1061	788720.	-4778.	-0.00548	0.00	3.83E+11	
-1285.	13083.	0.00					
4.4100	0.1002	782833.	-6160.	-0.00547	0.00	3.83E+11	
-1274.	13733.	0.00					
4.5000	0.09429	775460.	-7529.	-0.00547	0.00	3.83E+11	
-1262.	14452.	0.00					
4.5900	0.08838	766615.	-8885.	-0.00547	0.00	3.83E+11	
-1248.	15254.	0.00					
4.6800	0.08248	756314.	-10225.	-0.00547	0.00	3.83E+11	
-1234.	16153.	0.00					
4.7700	0.07657	744574.	-11548.	-0.00547	0.00	3.83E+11	
-1217.	17170.	0.00					
4.8600	0.07067	731414.	-12854.	-0.00546	0.00	3.83E+11	
-1200.	18333.	0.00					
4.9500	0.06477	716855.	-14139.	-0.00546	0.00	3.83E+11	
-1180.	19676.	0.00					
5.0400	0.05887	700919.	-15401.	-0.00546	0.00	3.83E+11	
-1158.	21249.	0.00					
5.1300	0.05298	683633.	-16639.	-0.00546	0.00	3.83E+11	
-1134.	23121.	0.00					
5.2200	0.04708	665023.	-17849.	-0.00546	0.00	3.84E+11	
-1107.	25392.	0.00					
5.3100	0.04119	645123.	-19028.	-0.00545	0.00	3.84E+11	
-1076.	28217.	0.00					
5.4000	0.03530	623967.	-20172.	-0.00545	0.00	3.84E+11	
-1041.	31844.	0.00					
5.4900	0.02941	601597.	-21273.	-0.00545	0.00	3.84E+11	
-999.626	36703.	0.00					
5.5800	0.02353	578061.	-22326.	-0.00545	0.00	3.84E+11	
-950.239	43618.	0.00					
5.6700	0.01764	553417.	-23319.	-0.00545	0.00	3.84E+11	
-888.815	54404.	0.00					
5.7600	0.01176	527736.	-24235.	-0.00545	0.00	3.84E+11	

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-807.226	74121.	0.00				
5.8500	0.00588	501113.	-25040.	-0.00544	0.00	3.84E+11
-682.252	125287.	0.00				
5.9400	1.85E-06	473695.	-25409.	-0.00544	0.00	3.84E+11
-1.043	608401.	0.00				
6.0300	-0.00588	446275.	-25037.	-0.00544	0.00	3.84E+11
689.0142	126640.	0.00				
6.1200	-0.01175	419659.	-24220.	-0.00544	0.00	3.84E+11
823.4989	75676.	0.00				
6.2100	-0.01763	394004.	-23281.	-0.00544	0.00	3.84E+11
915.8875	56114.	0.00				
6.3000	-0.02350	369417.	-22252.	-0.00544	0.00	3.84E+11
989.0552	45451.	0.00				
6.3900	-0.02937	345983.	-21151.	-0.00544	0.00	3.84E+11
1051.	38640.	0.00				
6.4800	-0.03525	323776.	-19986.	-0.00544	0.00	3.84E+11
1105.	33869.	0.00				
6.5700	-0.04112	302857.	-18766.	-0.00544	0.00	3.85E+11
1154.	30321.	0.00				
6.6600	-0.04699	283285.	-17495.	-0.00543	0.00	3.85E+11
1199.	27567.	0.00				
6.7500	-0.05286	265112.	-16640.	-0.00543	0.00	3.85E+11
383.8987	7844.	0.00				
6.8400	-0.05872	247387.	-16219.	-0.00543	0.00	3.85E+11
395.8956	7281.	0.00				
6.9300	-0.06459	230124.	-15785.	-0.00543	0.00	3.85E+11
407.2344	6809.	0.00				
7.0200	-0.07046	213335.	-15340.	-0.00543	0.00	3.85E+11
418.0211	6407.	0.00				
7.1100	-0.07633	197034.	-14883.	-0.00543	0.00	3.85E+11
428.3378	6061.	0.00				
7.2000	-0.08219	181233.	-14415.	-0.00543	0.00	3.85E+11
438.2496	5759.	0.00				
7.2900	-0.08806	165943.	-13936.	-0.00543	0.00	3.85E+11
447.8087	5492.	0.00				
7.3800	-0.09392	151175.	-13448.	-0.00543	0.00	3.85E+11
457.0582	5256.	0.00				
7.4700	-0.09978	136940.	-12949.	-0.00543	0.00	3.85E+11
466.0334	5044.	0.00				
7.5600	-0.106	123249.	-12441.	-0.00543	0.00	3.85E+11
474.7641	4853.	0.00				
7.6500	-0.112	110112.	-11924.	-0.00543	0.00	3.85E+11
483.2755	4681.	0.00				
7.7400	-0.117	97538.	-11397.	-0.00543	0.00	3.85E+11
491.5894	4523.	0.00				
7.8300	-0.123	85538.	-10862.	-0.00543	0.00	3.85E+11
499.7241	4379.	0.00				
7.9200	-0.129	74121.	-10318.	-0.00543	0.00	3.85E+11
507.6959	4247.	0.00				
8.0100	-0.135	63296.	-9766.	-0.00543	0.00	3.85E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

515.5188	4125.	0.00				
8.1000	-0.141	53072.	-9205.	-0.00543	0.00	3.85E+11
523.2053	4013.	0.00				
8.1900	-0.147	43458.	-8636.	-0.00543	0.00	3.85E+11
530.7664	3908.	0.00				
8.2800	-0.153	34464.	-7882.	-0.00543	0.00	3.85E+11
865.3082	6126.	0.00				
8.3700	-0.158	26478.	-6941.	-0.00543	0.00	3.85E+11
877.3442	5982.	0.00				
8.4600	-0.164	19516.	-5987.	-0.00543	0.00	3.85E+11
889.2258	5846.	0.00				
8.5500	-0.170	13592.	-5020.	-0.00543	0.00	3.85E+11
900.9642	5719.	0.00				
8.6400	-0.176	8718.	-4041.	-0.00543	0.00	3.85E+11
912.5692	5600.	0.00				
8.7300	-0.182	4908.	-3049.	-0.00543	0.00	3.85E+11
924.0501	5488.	0.00				
8.8200	-0.188	2177.	-2045.	-0.00543	0.00	3.85E+11
935.4149	5382.	0.00				
8.9100	-0.194	536.3310	-1028.	-0.00543	0.00	3.85E+11
946.6713	5282.	0.00				
9.0000	-0.199	0.00	0.00	-0.00543	0.00	3.85E+11
957.8261	2593.	0.00				

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 3:

Pile-head deflection = 0.39279009 inches  
 Computed slope at pile head = -0.0055813 radians  
 Maximum bending moment = 797337. inch-lbs  
 Maximum shear force = -25409. lbs  
 Depth of maximum bending moment = 4.05000000 feet below pile head  
 Depth of maximum shear force = 5.94000000 feet below pile head  
 Number of iterations = 38  
 Number of zero deflection points = 1  
 Pile deflection at ground = 0.32595208 inches

-----  
 Pile-head Deflection vs. Pile Length for Load Case 3  
 -----

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Boundary Condition Type 1, Shear and Moment

Shear = 2250. lbs  
 Moment = 724800. in-lbs  
 Axial Load = 3800. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.00000	0.39279009	797337.	-25409.
8.55000	0.81870528	788074.	-28440.
8.10000	2.11616007	782097.	-32612.
7.65000	3.80261415	780998.	-35702.
7.20000	5.71857018	779645.	-38022.
6.75000	9.85249844	782977.	-40681.

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	Load 1	Load 2	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max in lbs
1	V, lb	1000.0000	M, in-lb	4200.	0.01754	-2.77E-04	
2	V, lb	2250.	M, in-lb	4600.	0.3936	-0.00559	
3	V, lb	2250.	M, in-lb	3800.	0.3928	-0.00558	

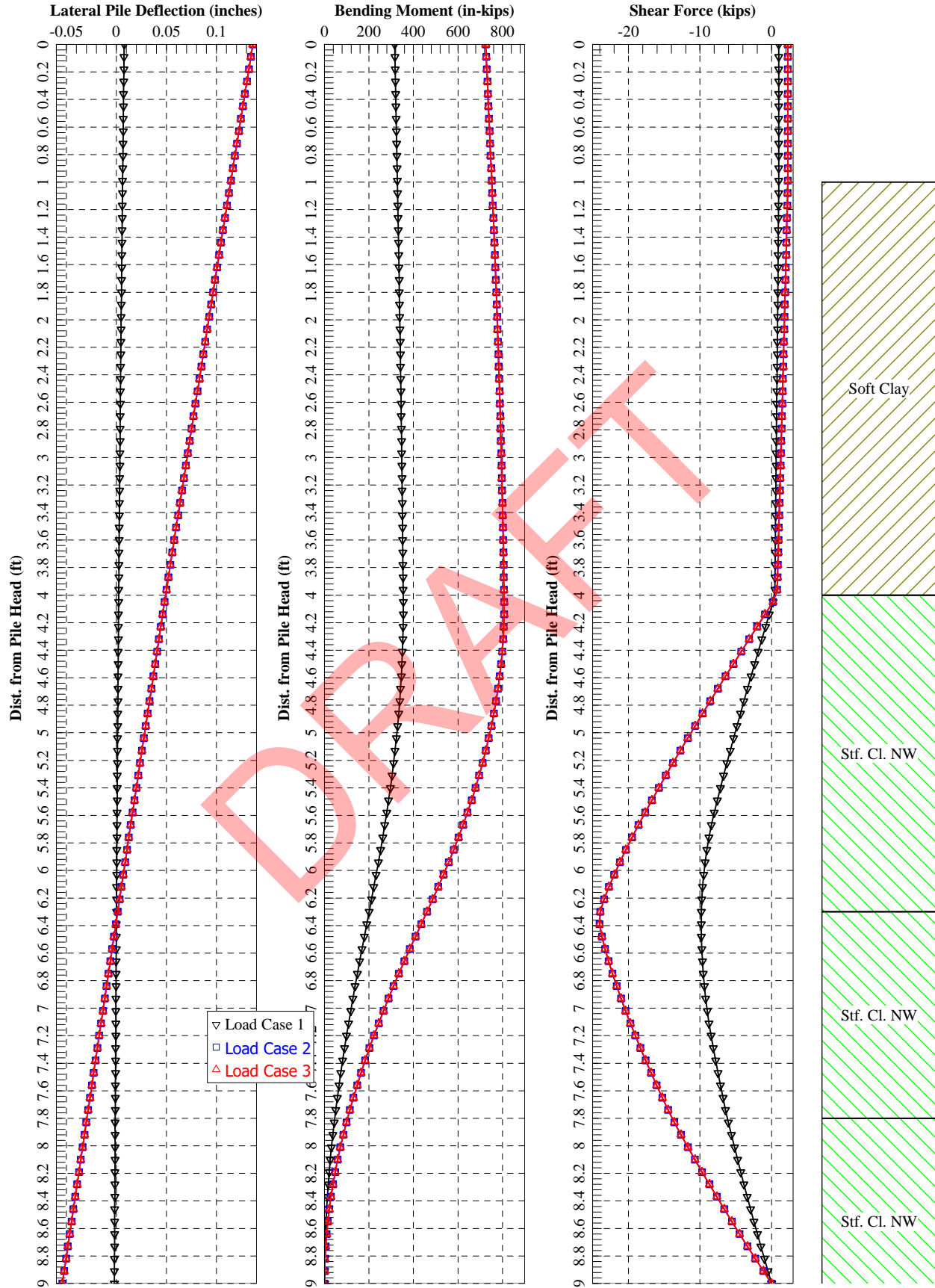
Maximum pile-head deflection = 0.3936028922 inches  
 Maximum pile-head rotation = -0.0055927637 radians = -0.320442 deg.

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-10 (Boring B-006-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

The analysis ended normally.

DRAFT

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation





TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

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

This model was prepared by:  
BSears

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Files Used for Analysis

-----

Path to file locations:  
\Columbus-1170\Projects\2024\24170232\_ms\_TP 26 NE Ohio\GEO\Project Docs\Site  
12\_SUM-77 (STONE)\Calcs\Light Towers\

Name of input data file:  
Tower TN-12 (B-007).lp12d

Name of output report file:  
Tower TN-12 (B-007).lp12o

Name of plot output file:  
Tower TN-12 (B-007).lp12p

Name of runtime message file:  
Tower TN-12 (B-007).lp12r

-----

Date and Time of Analysis

-----

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Date: October 24, 2025

Time: 9:04:01

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

Project Name: TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area

Job Number: 24170232D

Client: ms consultants, inc.

Engineer: BKS

Description: Light Tower TN-12 (B-007-0-25)

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

Computational Options:

- 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

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- 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
- Input of moment 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 = 9.000 ft  
Depth of ground surface below top of pile = 1.0000 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	36.0000
2	9.000	36.0000

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

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile  
Length of section = 9.000000 ft  
Shaft Diameter = 36.000000 in

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

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

The soil profile is modelled using 9 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	1.000000	ft
Distance from top of pile to bottom of layer	=	4.000000	ft
Effective unit weight at top of layer	=	98.000000	pcf
Effective unit weight at bottom of layer	=	98.000000	pcf
Undrained cohesion at top of layer	=	250.000000	psf
Undrained cohesion at bottom of layer	=	250.000000	psf
Epsilon-50 at top of layer	=	0.020000	
Epsilon-50 at bottom of layer	=	0.020000	

Layer 2 is stiff clay without free water

Distance from top of pile to top of layer	=	4.000000	ft
Distance from top of pile to bottom of layer	=	6.300000	ft
Effective unit weight at top of layer	=	118.000000	pcf
Effective unit weight at bottom of layer	=	118.000000	pcf
Undrained cohesion at top of layer	=	4500.	psf
Undrained cohesion at bottom of layer	=	4500.	psf
Epsilon-50 at top of layer	=	0.004000	
Epsilon-50 at bottom of layer	=	0.004000	

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer	=	6.300000	ft
Distance from top of pile to bottom of layer	=	7.800000	ft
Effective unit weight at top of layer	=	110.000000	pcf
Effective unit weight at bottom of layer	=	110.000000	pcf
Undrained cohesion at top of layer	=	3000.	psf
Undrained cohesion at bottom of layer	=	3000.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	

Layer 4 is stiff clay without free water

Distance from top of pile to top of layer	=	7.800000	ft
Distance from top of pile to bottom of layer	=	9.300000	ft
Effective unit weight at top of layer	=	115.000000	pcf

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Effective unit weight at bottom of layer	=	115.000000	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	

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	9.300000	ft
Distance from top of pile to bottom of layer	=	10.800000	ft
Effective unit weight at top of layer	=	112.000000	pcf
Effective unit weight at bottom of layer	=	112.000000	pcf
Undrained cohesion at top of layer	=	2000.	psf
Undrained cohesion at bottom of layer	=	2000.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	

Layer 6 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	10.800000	ft
Distance from top of pile to bottom of layer	=	15.300000	ft
Effective unit weight at top of layer	=	112.000000	pcf
Effective unit weight at bottom of layer	=	112.000000	pcf
Friction angle at top of layer	=	30.000000	deg.
Friction angle at bottom of layer	=	30.000000	deg.
Subgrade k at top of layer	=	90.000000	pci
Subgrade k at bottom of layer	=	90.000000	pci

Layer 7 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	15.300000	ft
Distance from top of pile to bottom of layer	=	20.300000	ft
Effective unit weight at top of layer	=	63.000000	pcf
Effective unit weight at bottom of layer	=	63.000000	pcf
Friction angle at top of layer	=	35.000000	deg.
Friction angle at bottom of layer	=	35.000000	deg.
Subgrade k at top of layer	=	60.000000	pci
Subgrade k at bottom of layer	=	60.000000	pci

Layer 8 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	20.300000	ft
Distance from top of pile to bottom of layer	=	23.600000	ft
Effective unit weight at top of layer	=	58.000000	pcf
Effective unit weight at bottom of layer	=	58.000000	pcf
Friction angle at top of layer	=	29.000000	deg.

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Friction angle at bottom of layer = 29.000000 deg.  
 Subgrade k at top of layer = 20.000000 pci  
 Subgrade k at bottom of layer = 20.000000 pci

Layer 9 is stiff clay without free water

Distance from top of pile to top of layer = 23.600000 ft  
 Distance from top of pile to bottom of layer = 27.300000 ft  
 Effective unit weight at top of layer = 66.000000 pcf  
 Effective unit weight at bottom of layer = 66.000000 pcf  
 Undrained cohesion at top of layer = 4000. psf  
 Undrained cohesion at bottom of layer = 4000. psf  
 Epsilon-50 at top of layer = 0.005000  
 Epsilon-50 at bottom of layer = 0.005000

(Depth of the lowest soil layer extends 18.300 ft below the pile tip)

Summary of Input Soil Properties

Layer E50 Num. or krm	Soil Type Name kpy (p-y Curve Type) pci	Layer Depth ft	Effective Unit Wt. pcf	Cohesion psf	Angle of Friction deg.
1 0.02000	Soft --	1.0000	98.0000	250.0000	--
0.02000	Clay --	4.0000	98.0000	250.0000	--
2 0.00400	Stiff Clay --	4.0000	118.0000	4500.	--
0.00400	w/o Free Water --	6.3000	118.0000	4500.	--
3 0.00500	Stiff Clay --	6.3000	110.0000	3000.	--
0.00500	w/o Free Water --	7.8000	110.0000	3000.	--
4 0.00500	Stiff Clay --	7.8000	115.0000	3500.	--
0.00500	w/o Free Water --	9.3000	115.0000	3500.	--
5	Stiff Clay	9.3000	112.0000	2000.	--

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00500	--				
	w/o Free Water	10.8000	112.0000	2000.	--
0.00500	--				
6	Sand	10.8000	112.0000	--	30.0000
--	90.0000				
	(Reese, et al.)	15.3000	112.0000	--	30.0000
--	90.0000				
7	Sand	15.3000	63.0000	--	35.0000
--	60.0000				
	(Reese, et al.)	20.3000	63.0000	--	35.0000
--	60.0000				
8	Sand	20.3000	58.0000	--	29.0000
--	20.0000				
	(Reese, et al.)	23.6000	58.0000	--	29.0000
--	20.0000				
9	Stiff Clay	23.6000	66.0000	4000.	--
0.00500	--				
	w/o Free Water	27.3000	66.0000	4000.	--
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 Compute No.	Load Top y Type	Condition Run Analysis 1	Condition 2	Axial Thrust Force, lbs
vs. Pile Length				
1	1	V = 1000.000000 lbs	M = 315600. in-lbs	4200.
Yes		Yes		
2	1	V = 2250. lbs	M = 724800. in-lbs	4600.
Yes		Yes		
3	1	V = 2250. lbs	M = 724800. in-lbs	3800.
Yes		Yes		

V = shear force applied normal to pile axis

M = bending moment applied to pile head

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

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:  
-----

Dimensions and Properties of Drilled Shaft (Bored Pile):  
-----

Length of Section	=	9.000000 ft
Shaft Diameter	=	36.000000 in
Concrete Cover Thickness (to edge of trans. reinf.)	=	3.500000 in
Number of Reinforcing Bars	=	16 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	1018. sq. in.
Total Area of Reinforcing Steel	=	16.000000 sq. in.
Area Ratio of Steel Reinforcement	=	1.57 percent
Edge-to-Edge Bar Spacing	=	4.114467 in
Maximum Concrete Aggregate Size	=	0.750000 in
Ratio of Bar Spacing to Aggregate Size	=	5.49
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in
Transverse Reinforcement		
Type: Spiral		
Number of Transverse Reinf. (per spacing)	=	1
Spacing of Transverse Reinf.	=	4.500000 in
Yield Stress of Transverse Reinf.	=	60000. psi
Diameter of Transverse Reinf.	=	0.500000 in

Axial Structural Capacities:  
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Nom. Axial Structural Capacity = $0.85 F_c A_c + F_y A_s$	=	4366.378 kips
Tensile Load for Cracking of Concrete	=	-470.222 kips
Nominal Axial Tensile Capacity	=	-960.000 kips



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
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 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.128000	1.000000	13.436000	0.000000
2	1.128000	1.000000	12.413245	5.141735
3	1.128000	1.000000	9.500687	9.500687
4	1.128000	1.000000	5.141735	12.413245
5	1.128000	1.000000	0.000000	13.436000
6	1.128000	1.000000	-5.14173	12.413245
7	1.128000	1.000000	-9.50069	9.500687
8	1.128000	1.000000	-12.41325	5.141735
9	1.128000	1.000000	-13.43600	0.000000
10	1.128000	1.000000	-12.41325	-5.14173
11	1.128000	1.000000	-9.50069	-9.50069
12	1.128000	1.000000	-5.14173	-12.41325
13	1.128000	1.000000	0.000000	-13.43600
14	1.128000	1.000000	5.141735	-12.41325
15	1.128000	1.000000	9.500687	-9.50069
16	1.128000	1.000000	12.413245	-5.14173

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 4.114 inches  
 between bars 11 and 12.

Ratio of bar spacing to maximum aggregate size = 5.49

Concrete Properties:

Compressive Strength of Concrete	=	4000. psi
Modulus of Elasticity of Concrete	=	3604997. psi
Modulus of Rupture of Concrete	=	-474.34165 psi
Compression Strain at Peak Stress	=	0.001886
Tensile Strain at Fracture of Concrete	=	-0.0001154
Maximum Coarse Aggregate Size	=	0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 3

Number	Axial Thrust Force kips
1	3.800
2	4.200

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3

4.600

Definitions of Run Messages and Notes:

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C = concrete in section has cracked in tension.  
 Y = stress in reinforcing steel has reached yield stress.  
 T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318-14, Section 21.2.3.  
 Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.  
 Position of neutral axis is measured from edge of compression side of pile.  
 Compressive stresses and strains are positive in sign.  
 Tensile stresses and strains are negative in sign.

Axial Thrust Force = 3.800 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
6.25000E-07	240.5062135	384809942.	19.2929823	0.00001206	-0.00001044
0.0505030	0.2746478				
0.00000125	480.1472468	384117797.	18.6479768	0.00002331	-0.00002169
0.0973082	0.5259142				
0.00000188	718.9174733	383422652.	18.4329804	0.00003456	-0.00003294
0.1438345	0.7771808				
0.00000250	956.8168886	382726755.	18.3254857	0.00004581	-0.00004419
0.1900818	1.0284477				
0.00000313	1194.	382030558.	18.2609917	0.00005707	-0.00005543
0.2360502	1.2797149				
0.00000375	1430.	381334209.	18.2179981	0.00006832	-0.00006668
0.2817396	1.5309823				
0.00000438	1665.	380637775.	18.1872904	0.00007957	-0.00007793
0.3271500	1.7822500				
0.00000500	1900.	379941287.	18.1642614	0.00009082	-0.00008918
0.3722815	2.0335179				
0.00000563	2133.	379244764.	18.1463515	0.0001021	-0.000100
0.4171340	2.2847861				
0.00000625	2366.	378548215.	18.1320251	0.0001133	-0.000112
0.4617075	2.5360546				

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0.00000688	2366.	344134741.	10.2494785	0.00007047	-0.000177
0.2882187	-4.308598 C				
0.00000750	2366.	315456846.	10.2198771	0.00007665	-0.000193
0.3129821	-4.706727 C				
0.00000813	2366.	291190934.	10.1952302	0.00008284	-0.000210
0.3376758	-5.104761 C				
0.00000875	2366.	270391582.	10.1744772	0.00008903	-0.000226
0.3622998	-5.502701 C				
0.00000938	2366.	252365477.	10.1568402	0.00009522	-0.000242
0.3868539	-5.900547 C				
0.00001000	2366.	236592634.	10.1417358	0.0001014	-0.000259
0.4113380	-6.298297 C				
0.00001063	2366.	222675420.	10.1287027	0.0001076	-0.000275
0.4357521	-6.695951 C				
0.00001125	2366.	210304564.	10.1174231	0.0001138	-0.000291
0.4600960	-7.093510 C				
0.00001188	2366.	199235903.	10.1076093	0.0001200	-0.000307
0.4843696	-7.490973 C				
0.00001250	2366.	189274107.	10.0990420	0.0001262	-0.000324
0.5085729	-7.888340 C				
0.00001313	2366.	180261055.	10.0915439	0.0001325	-0.000340
0.5327056	-8.285611 C				
0.00001375	2366.	172067370.	10.0849699	0.0001387	-0.000356
0.5567678	-8.682785 C				
0.00001438	2366.	164586180.	10.0792000	0.0001449	-0.000373
0.5807594	-9.079861 C				
0.00001500	2366.	157728423.	10.0741344	0.0001511	-0.000389
0.6046801	-9.476841 C				
0.00001563	2366.	151419286.	10.0696892	0.0001573	-0.000405
0.6285300	-9.873723 C				
0.00001625	2366.	145595467.	10.0657933	0.0001636	-0.000421
0.6523089	-10.270507 C				
0.00001688	2366.	140203043.	10.0623863	0.0001698	-0.000438
0.6760167	-10.667193 C				
0.00001750	2366.	135195791.	10.0594163	0.0001760	-0.000454
0.6996534	-11.063781 C				
0.00001813	2366.	130533867.	10.0568387	0.0001823	-0.000470
0.7232187	-11.460271 C				
0.00001875	2366.	126182738.	10.0546147	0.0001885	-0.000486
0.7467127	-11.856661 C				
0.00001938	2366.	122112327.	10.0527107	0.0001948	-0.000503
0.7701352	-12.252952 C				
0.00002000	2366.	118296317.	10.0510970	0.0002010	-0.000519
0.7934860	-12.649144 C				
0.00002063	2366.	114711580.	10.0497478	0.0002073	-0.000535
0.8167652	-13.045236 C				
0.00002125	2366.	111337710.	10.0486401	0.0002135	-0.000551
0.8399726	-13.441228 C				
0.00002188	2366.	108156633.	10.0477539	0.0002198	-0.000568
0.8631080	-13.837120 C				

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 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00002250	2366.	105152282.	10.0470709	0.0002261	-0.000584
0.8861714	-14.232911 C				
0.00002313	2366.	102310328.	10.0465752	0.0002323	-0.000600
0.9091627	-14.628602 C				
0.00002375	2366.	99617951.	10.0462524	0.0002386	-0.000616
0.9320817	-15.024191 C				
0.00002438	2366.	97063645.	10.0460897	0.0002449	-0.000633
0.9549284	-15.419678 C				
0.00002563	2429.	94800037.	10.0461990	0.0002574	-0.000665
1.0004043	-16.210348 C				
0.00002688	2545.	94692477.	10.0468231	0.0002700	-0.000697
1.0455896	-17.000609 C				
0.00002813	2660.	94589756.	10.0479254	0.0002826	-0.000730
1.0904832	-17.790458 C				
0.00002938	2776.	94491232.	10.0493946	0.0002952	-0.000762
1.1350844	-18.579893 C				
0.00003063	2891.	94396370.	10.0512127	0.0003078	-0.000795
1.1793922	-19.368912 C				
0.00003188	3006.	94304718.	10.0533415	0.0003205	-0.000827
1.2234058	-20.157511 C				
0.00003313	3121.	94215891.	10.0557483	0.0003331	-0.000859
1.2671243	-20.945689 C				
0.00003438	3236.	94129561.	10.0584054	0.0003458	-0.000892
1.3105466	-21.733443 C				
0.00003563	3350.	94045446.	10.0612887	0.0003584	-0.000924
1.3536720	-22.520771 C				
0.00003688	3465.	93963300.	10.0643778	0.0003711	-0.000956
1.3964994	-23.307669 C				
0.00003813	3579.	93882912.	10.0676547	0.0003838	-0.000989
1.4390279	-24.094136 C				
0.00003938	3694.	93804096.	10.0711039	0.0003965	-0.001021
1.4812567	-24.880169 C				
0.00004063	3808.	93726688.	10.0747116	0.0004093	-0.001053
1.5231846	-25.665765 C				
0.00004188	3922.	93650546.	10.0784659	0.0004220	-0.001085
1.5648108	-26.450921 C				
0.00004313	4035.	93575540.	10.0823562	0.0004348	-0.001118
1.6061342	-27.235635 C				
0.00004438	4149.	93501560.	10.0863731	0.0004476	-0.001150
1.6471540	-28.019904 C				
0.00004563	4263.	93428502.	10.0905084	0.0004604	-0.001182
1.6878690	-28.803725 C				
0.00004688	4376.	93356279.	10.0947545	0.0004732	-0.001214
1.7282784	-29.587096 C				
0.00004813	4489.	93284807.	10.0991050	0.0004860	-0.001246
1.7683810	-30.370013 C				
0.00004938	4602.	93214014.	10.1035538	0.0004989	-0.001279
1.8081759	-31.152474 C				
0.00005063	4715.	93143835.	10.1080956	0.0005117	-0.001311
1.8476620	-31.934476 C				

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0.00005188	4828.	93074209.	10.1127258	0.0005246	-0.001343
1.8868384	-32.716016 C				
0.00005313	4941.	93005082.	10.1174399	0.0005375	-0.001375
1.9257039	-33.497091 C				
0.00005438	5053.	92936405.	10.1222340	0.0005504	-0.001407
1.9642575	-34.277698 C				
0.00005563	5166.	92868132.	10.1271047	0.0005633	-0.001439
2.0024981	-35.057833 C				
0.00005688	5278.	92800222.	10.1320488	0.0005763	-0.001471
2.0404247	-35.837495 C				
0.00005813	5390.	92732637.	10.1370633	0.0005892	-0.001503
2.0780361	-36.616679 C				
0.00005938	5502.	92665342.	10.1421457	0.0006022	-0.001535
2.1153313	-37.395383 C				
0.00006063	5614.	92598305.	10.1472935	0.0006152	-0.001567
2.1523092	-38.173604 C				
0.00006188	5725.	92531497.	10.1525046	0.0006282	-0.001599
2.1889685	-38.951338 C				
0.00006313	5837.	92464888.	10.1577769	0.0006412	-0.001631
2.2253083	-39.728581 C				
0.00006438	5948.	92398455.	10.1631088	0.0006543	-0.001663
2.2613274	-40.505332 C				
0.00006563	6059.	92332173.	10.1684984	0.0006673	-0.001695
2.2970245	-41.281586 C				
0.00006688	6170.	92266020.	10.1739444	0.0006804	-0.001727
2.3323987	-42.057340 C				
0.00006813	6281.	92199976.	10.1794453	0.0006935	-0.001759
2.3674485	-42.832591 C				
0.00006938	6392.	92134020.	10.1849998	0.0007066	-0.001791
2.4021730	-43.607335 C				
0.00007063	6502.	92068136.	10.1906070	0.0007197	-0.001823
2.4365708	-44.381568 C				
0.00007188	6613.	92002305.	10.1962656	0.0007329	-0.001855
2.4706408	-45.155288 C				
0.00007313	6723.	91936511.	10.2020028	0.0007460	-0.001886
2.5043818	-45.928490 C				
0.00007438	6833.	91870742.	10.2077616	0.0007592	-0.001918
2.5377924	-46.701172 C				
0.00007938	7271.	91607617.	10.2312788	0.0008121	-0.002045
2.6681070	-49.786612 C				
0.00008438	7707.	91343844.	10.2555391	0.0008653	-0.002172
2.7930345	-52.863415 C				
0.00008938	8140.	91079227.	10.2796933	0.0009187	-0.002299
2.9123325	-55.933382 C				
0.00009438	8570.	90813004.	10.3043877	0.0009725	-0.002425
3.0260259	-58.995009 C				
0.00009938	8979.	90357411.	10.3225581	0.0010258	-0.002552
3.1326575	-60.000000 CY				
0.0001044	9304.	89144470.	10.3110511	0.0010762	-0.002681
3.2276850	-60.000000 CY				

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 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
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0.0001094	9546.	87273573.	10.2718035	0.0011235	-0.002814
3.3116704	-60.000000 CY				
0.0001144	9782.	85523680.	10.2357064	0.0011707	-0.002947
3.3907664	-60.000000 CY				
0.0001194	10004.	83800225.	10.1987328	0.0012175	-0.003080
3.4643165	-60.000000 CY				
0.0001244	10154.	81641326.	10.1374818	0.0012608	-0.003217
3.5282172	-60.000000 CY				
0.0001294	10287.	79513660.	10.0756441	0.0013035	-0.003354
3.5871212	-60.000000 CY				
0.0001344	10419.	77536664.	10.0197410	0.0013464	-0.003491
3.6423258	-60.000000 CY				
0.0001394	10550.	75693983.	9.9691573	0.0013895	-0.003628
3.6937845	-60.000000 CY				
0.0001444	10680.	73971519.	9.9233661	0.0014327	-0.003765
3.7414497	-60.000000 CY				
0.0001494	10808.	72355946.	9.8810316	0.0014760	-0.003902
3.7851328	-60.000000 CY				
0.0001544	10925.	70772035.	9.8368433	0.0015186	-0.004039
3.8241552	-60.000000 CY				
0.0001594	11008.	69072220.	9.7809580	0.0015588	-0.004179
3.8574366	-60.000000 CY				
0.0001644	11071.	67351790.	9.7204156	0.0015978	-0.004320
3.8862696	-60.000000 CY				
0.0001694	11131.	65719446.	9.6635689	0.0016368	-0.004461
3.9118664	-60.000000 CY				
0.0001744	11191.	64176802.	9.6094393	0.0016756	-0.004602
3.9342902	-60.000000 CY				
0.0001794	11250.	62716278.	9.5601863	0.0017149	-0.004743
3.9535015	-60.000000 CY				
0.0001844	11308.	61329164.	9.5136161	0.0017541	-0.004883
3.9693617	-60.000000 CY				
0.0001894	11364.	60009896.	9.4690774	0.0017932	-0.005024
3.9819050	-60.000000 CY				
0.0001944	11420.	58754909.	9.4280227	0.0018326	-0.005165
3.9911986	-60.000000 CY				
0.0001994	11476.	57559296.	9.3897594	0.0018721	-0.005305
3.9971986	-60.000000 CY				
0.0002044	11531.	56418622.	9.3531932	0.0019116	-0.005446
3.9998595	-60.000000 CY				
0.0002094	11584.	55328385.	9.3201259	0.0019514	-0.005586
3.9974517	-60.000000 CY				
0.0002144	11637.	54285454.	9.2909722	0.0019918	-0.005726
3.9998812	-60.000000 CY				
0.0002194	11690.	53285909.	9.2626721	0.0020320	-0.005866
3.9969940	-60.000000 CY				
0.0002244	11740.	52321336.	9.2356724	0.0020723	-0.006005
3.9997138	-60.000000 CY				
0.0002294	11786.	51384137.	9.2093226	0.0021124	-0.006145
3.9955528	-60.000000 CY				

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0.0002344	11823.	50445667.	9.1796872	0.0021515	-0.006286
3.9989818	-60.000000 CY				
0.0002394	11855.	49524943.	9.1473565	0.0021896	-0.006428
3.9994466	-60.000000 CY				
0.0002444	11876.	48598228.	9.1109548	0.0022265	-0.006571
3.9965160	-60.000000 CY				
0.0002494	11895.	47701101.	9.0745971	0.0022630	-0.006715
3.9991770	-60.000000 CY				
0.0002544	11912.	46829816.	9.0405915	0.0022997	-0.006858
3.9995775	-60.000000 CY				
0.0002594	11929.	45990067.	9.0077660	0.0023364	-0.007001
3.9954763	-60.000000 CY				
0.0002644	11945.	45181124.	8.9766457	0.0023732	-0.007144
3.9984997	-60.000000 CY				
0.0002694	11961.	44401256.	8.9468563	0.0024101	-0.007287
3.9998981	-60.000000 CY				
0.0002744	11976.	43648250.	8.9191370	0.0024472	-0.007430
3.9944635	-60.000000 CY				
0.0003044	12062.	39628140.	8.7757363	0.0026711	-0.008286
3.9984635	-60.000000 CY				
0.0003344	12138.	36300180.	8.6628609	0.0028966	-0.009141
3.9998209	-60.000000 CY				
0.0003644	12207.	33502446.	8.5793723	0.0031261	-0.009991
3.9999551	-60.000000 CYT				
0.0003944	12272.	31117026.	8.5161103	0.0033585	-0.010839
3.9996166	-60.000000 CYT				
0.0004244	12331.	29056485.	8.4674428	0.0035934	-0.011684
3.9972132	-60.000000 CYT				
0.0004544	12377.	27238942.	8.4178614	0.0038249	-0.012533
3.9873462	-60.000000 CYT				

Axial Thrust Force = 4.200 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
-----					
6.25000E-07	240.5049676	384807948.	19.4290859	0.00001214	-0.00001036
0.0508615	0.2771147				
0.00000125	480.1459926	384116794.	18.7161837	0.00002340	-0.00002160
0.0976654	0.5283867				
0.00000188	718.9162127	383421980.	18.4785558	0.00003465	-0.00003285
0.1441903	0.7796589				
0.00000250	956.8156222	382726249.	18.3597458	0.00004590	-0.00004410
0.1904363	1.0309315				

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0.00000313	1194.	382030150.	18.2884629	0.00005715	-0.00005535
0.2364034	1.2822044				
0.00000375	1430.	381333869.	18.2409436	0.00006840	-0.00006660
0.2820914	1.5334776				
0.00000438	1665.	380637482.	18.2070035	0.00007966	-0.00007784
0.3275005	1.7847511				
0.00000500	1900.	379941029.	18.1815504	0.00009091	-0.00008909
0.3726306	2.0360248				
0.00000563	2133.	379244533.	18.1617553	0.0001022	-0.000100
0.4174818	2.2872988				
0.00000625	2366.	378548006.	18.1459208	0.0001134	-0.000112
0.4620539	2.5385732				
0.00000688	2366.	344134551.	10.2895004	0.00007074	-0.000177
0.2893429	-4.300617 C				
0.00000750	2366.	315456672.	10.2575513	0.00007693	-0.000193
0.3141325	-4.698533 C				
0.00000813	2366.	291190774.	10.2300378	0.00008312	-0.000209
0.3388235	-5.096560 C				
0.00000875	2366.	270391433.	10.2068278	0.00008931	-0.000226
0.3634446	-5.494492 C				
0.00000938	2366.	252365338.	10.1870615	0.00009550	-0.000242
0.3879959	-5.892330 C				
0.00001000	2366.	236592504.	10.1700940	0.0001017	-0.000258
0.4124772	-6.290073 C				
0.00001063	2366.	222675298.	10.1554324	0.0001079	-0.000275
0.4368884	-6.687720 C				
0.00001125	2366.	210304448.	10.1426931	0.0001141	-0.000291
0.4612294	-7.085271 C				
0.00001188	2366.	199235793.	10.1315564	0.0001203	-0.000307
0.4855002	-7.482727 C				
0.00001250	2366.	189274003.	10.1218127	0.0001265	-0.000323
0.5097005	-7.880086 C				
0.00001313	2366.	180260955.	10.1132503	0.0001327	-0.000340
0.5338304	-8.277349 C				
0.00001375	2366.	172067276.	10.1057088	0.0001390	-0.000356
0.5578898	-8.674515 C				
0.00001438	2366.	164586090.	10.0990556	0.0001452	-0.000372
0.5818784	-9.071585 C				
0.00001500	2366.	157728336.	10.0931803	0.0001514	-0.000389
0.6057963	-9.468556 C				
0.00001563	2366.	151419203.	10.0879903	0.0001576	-0.000405
0.6296433	-9.865431 C				
0.00001625	2366.	145595387.	10.0834069	0.0001639	-0.000421
0.6534193	-10.262207 C				
0.00001688	2366.	140202965.	10.0793634	0.0001701	-0.000437
0.6771242	-10.658886 C				
0.00001750	2366.	135195717.	10.0758025	0.0001763	-0.000454
0.7007579	-11.055466 C				
0.00001813	2366.	130533795.	10.0726747	0.0001826	-0.000470
0.7243204	-11.451947 C				



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00001875	2366.	126182669.	10.0699372	0.0001888	-0.000486
0.7478114	-11.848330 C				
0.00001938	2366.	122112260.	10.0675528	0.0001951	-0.000502
0.7712309	-12.244613 C				
0.00002000	2366.	118296252.	10.0654889	0.0002013	-0.000519
0.7945789	-12.640797 C				
0.00002063	2366.	114711517.	10.0637168	0.0002076	-0.000535
0.8178551	-13.036882 C				
0.00002125	2366.	111337649.	10.0622112	0.0002138	-0.000551
0.8410595	-13.432866 C				
0.00002188	2366.	108156573.	10.0609497	0.0002201	-0.000567
0.8641920	-13.828750 C				
0.00002250	2366.	105152224.	10.0599125	0.0002263	-0.000584
0.8872524	-14.224533 C				
0.00002313	2366.	102310272.	10.0590817	0.0002326	-0.000600
0.9102407	-14.620215 C				
0.00002375	2366.	99617896.	10.0584414	0.0002389	-0.000616
0.9331568	-15.015796 C				
0.00002438	2366.	97063591.	10.0579776	0.0002452	-0.000632
0.9560005	-15.411276 C				
0.00002563	2432.	94924068.	10.0575288	0.0002577	-0.000665
1.0014704	-16.201930 C				
0.00002688	2548.	94810571.	10.0576469	0.0002703	-0.000697
1.0466496	-16.992174 C				
0.00002813	2664.	94702439.	10.0582592	0.0002829	-0.000730
1.0915372	-17.782007 C				
0.00002938	2779.	94598964.	10.0593353	0.0002955	-0.000762
1.1361324	-18.571425 C				
0.00003063	2894.	94499555.	10.0607664	0.0003081	-0.000794
1.1804341	-19.360427 C				
0.00003188	3009.	94403710.	10.0625387	0.0003207	-0.000827
1.2244416	-20.149010 C				
0.00003313	3124.	94311007.	10.0646159	0.0003334	-0.000859
1.2681539	-20.937171 C				
0.00003438	3239.	94221082.	10.0669675	0.0003461	-0.000891
1.3115700	-21.724908 C				
0.00003563	3354.	94133623.	10.0695670	0.0003587	-0.000924
1.3546892	-22.512219 C				
0.00003688	3468.	94048359.	10.0723915	0.0003714	-0.000956
1.3975103	-23.299100 C				
0.00003813	3582.	93965057.	10.0754214	0.0003841	-0.000988
1.4400326	-24.085550 C				
0.00003938	3697.	93883511.	10.0786392	0.0003968	-0.001021
1.4822550	-24.871565 C				
0.00004063	3811.	93803541.	10.0820299	0.0004096	-0.001053
1.5241766	-25.657144 C				
0.00004188	3925.	93724988.	10.0855803	0.0004223	-0.001085
1.5657965	-26.442282 C				
0.00004313	4039.	93647711.	10.0892786	0.0004351	-0.001117
1.6071135	-27.226979 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00004438	4152.	93571586.	10.0931145	0.0004479	-0.001150
1.6481268	-28.011230 C				
0.00004563	4266.	93496502.	10.0970787	0.0004607	-0.001182
1.6888354	-28.795033 C				
0.00004688	4379.	93422358.	10.1011630	0.0004735	-0.001214
1.7292383	-29.578385 C				
0.00004813	4492.	93349066.	10.1053601	0.0004863	-0.001246
1.7693344	-30.361284 C				
0.00004938	4606.	93276544.	10.1096634	0.0004992	-0.001278
1.8091228	-31.143727 C				
0.00005063	4718.	93204721.	10.1140670	0.0005120	-0.001310
1.8486023	-31.925710 C				
0.00005188	4831.	93133529.	10.1185657	0.0005249	-0.001343
1.8877721	-32.707231 C				
0.00005313	4944.	93062909.	10.1231546	0.0005378	-0.001375
1.9266309	-33.488287 C				
0.00005438	5056.	92992807.	10.1278294	0.0005507	-0.001407
1.9651778	-34.268875 C				
0.00005563	5169.	92923173.	10.1325862	0.0005636	-0.001439
2.0034117	-35.048992 C				
0.00005688	5281.	92853961.	10.1374215	0.0005766	-0.001471
2.0413316	-35.828634 C				
0.00005813	5393.	92785130.	10.1423320	0.0005895	-0.001503
2.0789362	-36.607799 C				
0.00005938	5505.	92716640.	10.1473148	0.0006025	-0.001535
2.1162246	-37.386484 C				
0.00006063	5617.	92648458.	10.1523672	0.0006155	-0.001567
2.1531956	-38.164685 C				
0.00006188	5728.	92580549.	10.1574868	0.0006285	-0.001599
2.1898481	-38.942399 C				
0.00006313	5840.	92512883.	10.1626714	0.0006415	-0.001631
2.2261809	-39.719622 C				
0.00006438	5951.	92445433.	10.1679189	0.0006546	-0.001663
2.2621930	-40.496353 C				
0.00006563	6062.	92378172.	10.1732276	0.0006676	-0.001695
2.2978832	-41.272587 C				
0.00006688	6173.	92311077.	10.1785957	0.0006807	-0.001727
2.3332503	-42.048320 C				
0.00006813	6284.	92244124.	10.1840217	0.0006938	-0.001759
2.3682931	-42.823550 C				
0.00006938	6395.	92177292.	10.1895041	0.0007069	-0.001791
2.4030104	-43.598274 C				
0.00007063	6505.	92110561.	10.1950417	0.0007200	-0.001822
2.4374011	-44.372486 C				
0.00007188	6616.	92043913.	10.2006608	0.0007332	-0.001854
2.4714639	-45.146185 C				
0.00007313	6726.	91977331.	10.2063053	0.0007463	-0.001886
2.5051976	-45.919366 C				
0.00007438	6836.	91910797.	10.2120017	0.0007595	-0.001918
2.5386010	-46.692026 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00007938	7274.	91644853.	10.2352897	0.0008124	-0.002045
2.6688860	-49.777380 C				
0.00008438	7710.	91378587.	10.2593338	0.0008656	-0.002172
2.7937834	-52.854093 C				
0.00008938	8143.	91111830.	10.2831857	0.0009191	-0.002298
2.9130226	-55.924331 C				
0.00009438	8573.	90843621.	10.3077273	0.0009728	-0.002425
3.0266854	-58.985869 C				
0.00009938	8982.	90387473.	10.3258078	0.0010261	-0.002551
3.1332951	-60.000000 CY				
0.0001044	9308.	89176212.	10.3143071	0.0010766	-0.002681
3.2283182	-60.000000 CY				
0.0001094	9549.	87304848.	10.2749831	0.0011238	-0.002814
3.3122821	-60.000000 CY				
0.0001144	9785.	85553556.	10.2389100	0.0011711	-0.002946
3.3913727	-60.000000 CY				
0.0001194	10007.	83830919.	10.2019402	0.0012179	-0.003080
3.4649106	-60.000000 CY				
0.0001244	10158.	81671814.	10.1406407	0.0012612	-0.003216
3.5287895	-60.000000 CY				
0.0001294	10291.	79542859.	10.0787027	0.0013039	-0.003354
3.5876602	-60.000000 CY				
0.0001344	10423.	77564670.	10.0227059	0.0013468	-0.003491
3.6428308	-60.000000 CY				
0.0001394	10554.	75720878.	9.9720357	0.0013899	-0.003628
3.6942550	-60.000000 CY				
0.0001444	10683.	73997378.	9.9261646	0.0014331	-0.003764
3.7418850	-60.000000 CY				
0.0001494	10812.	72381005.	9.8838986	0.0014764	-0.003901
3.7855535	-60.000000 CY				
0.0001544	10929.	70796718.	9.8396771	0.0015190	-0.004038
3.8245440	-60.000000 CY				
0.0001594	11012.	69097838.	9.7838573	0.0015593	-0.004178
3.8578061	-60.000000 CY				
0.0001644	11075.	67376662.	9.7232508	0.0015983	-0.004319
3.8866026	-60.000000 CY				
0.0001694	11135.	65743511.	9.6663364	0.0016372	-0.004460
3.9121613	-60.000000 CY				
0.0001744	11195.	64200103.	9.6121495	0.0016761	-0.004601
3.9345463	-60.000000 CY				
0.0001794	11254.	62738857.	9.5628376	0.0017153	-0.004742
3.9537182	-60.000000 CY				
0.0001844	11312.	61351278.	9.5162917	0.0017546	-0.004883
3.9695496	-60.000000 CY				
0.0001894	11368.	60031354.	9.4717005	0.0017937	-0.005024
3.9820503	-60.000000 CY				
0.0001944	11425.	58775745.	9.4305957	0.0018331	-0.005164
3.9913005	-60.000000 CY				
0.0001994	11480.	57579537.	9.3922863	0.0018726	-0.005305
3.9972564	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0002044	11535.	56438298.	9.3556780	0.0019121	-0.005445
3.9998723	-60.000000 CY				
0.0002094	11588.	55347517.	9.3241700	0.0019522	-0.005585
3.9975077	-60.000000 CY				
0.0002144	11641.	54304067.	9.2934428	0.0019923	-0.005725
3.9998931	-60.000000 CY				
0.0002194	11694.	53304015.	9.2651074	0.0020325	-0.005865
3.9970558	-60.000000 CY				
0.0002244	11744.	52339157.	9.2380944	0.0020728	-0.006005
3.9997330	-60.000000 CY				
0.0002294	11790.	51401489.	9.2117130	0.0021129	-0.006145
3.9956300	-60.000000 CY				
0.0002344	11827.	50463153.	9.1821360	0.0021521	-0.006285
3.9990203	-60.000000 CY				
0.0002394	11859.	49542728.	9.1500193	0.0021903	-0.006427
3.9992468	-60.000000 CY				
0.0002444	11880.	48615611.	9.1135780	0.0022271	-0.006570
3.9965958	-60.000000 CY				
0.0002494	11900.	47718283.	9.0771076	0.0022636	-0.006714
3.9992162	-60.000000 CY				
0.0002544	11917.	46846598.	9.0431776	0.0023004	-0.006857
3.9993713	-60.000000 CY				
0.0002594	11933.	46006491.	9.0103157	0.0023371	-0.007000
3.9955701	-60.000000 CY				
0.0002644	11949.	45197204.	8.9791598	0.0023739	-0.007144
3.9985538	-60.000000 CY				
0.0002694	11965.	44417005.	8.9493437	0.0024107	-0.007287
3.9999119	-60.000000 CY				
0.0002744	11980.	43663657.	8.9215934	0.0024479	-0.007430
3.9942523	-60.000000 CY				
0.0003044	12066.	39641995.	8.7782176	0.0026719	-0.008286
3.9985257	-60.000000 CY				
0.0003344	12142.	36312646.	8.6652203	0.0028974	-0.009140
3.9998424	-60.000000 CY				
0.0003644	12212.	33513765.	8.5815911	0.0031269	-0.009991
3.9999658	-60.000000 CYT				
0.0003944	12276.	31127384.	8.5182268	0.0033594	-0.010838
3.9996505	-60.000000 CYT				
0.0004244	12335.	29066055.	8.4694819	0.0035942	-0.011683
3.9973093	-60.000000 CYT				
0.0004544	12381.	27248100.	8.4201387	0.0038259	-0.012532
3.9875919	-60.000000 CYT				

Axial Thrust Force = 4.600 kips

Bending Max Conc Curvature Stress	Bending Max Steel Moment Stress	Bending Run Stiffness Msg	Depth to N Axis	Max Comp Strain	Max Tens Strain
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 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

rad/in. ksi	in-kip ksi	kip-in2	in	in/in	in/in
6.25000E-07	240.5035986	384805758.	19.5651901	0.00001223	-0.00001027
0.0512199	0.2795816				
0.00000125	480.1446137	384115691.	18.7843907	0.00002348	-0.00002152
0.0980225	0.5308592				
0.00000188	718.9148267	383421241.	18.5241312	0.00003473	-0.00003277
0.1445462	0.7821371				
0.00000250	956.8142298	382725692.	18.3940059	0.00004599	-0.00004401
0.1907908	1.0334154				
0.00000313	1194.	382029703.	18.3159341	0.00005724	-0.00005526
0.2367565	1.2846940				
0.00000375	1430.	381333494.	18.2638891	0.00006849	-0.00006651
0.2824433	1.5359729				
0.00000438	1665.	380637159.	18.2267166	0.00007974	-0.00007776
0.3278510	1.7872522				
0.00000500	1900.	379940746.	18.1988394	0.00009099	-0.00008901
0.3729798	2.0385317				
0.00000563	2133.	379244280.	18.1771590	0.0001022	-0.000100
0.4178295	2.2898116				
0.00000625	2366.	378547777.	18.1598165	0.0001135	-0.000112
0.4624003	2.5410917				
0.00000688	2366.	344134343.	10.3291778	0.00007101	-0.000176
0.2904571	-4.292706 C				
0.00000750	2366.	315456481.	10.2940289	0.00007721	-0.000193
0.3152465	-4.690597 C				
0.00000813	2366.	291190598.	10.2646762	0.00008340	-0.000209
0.3399656	-5.088396 C				
0.00000875	2366.	270391269.	10.2391817	0.00008959	-0.000225
0.3645893	-5.486283 C				
0.00000938	2366.	252365185.	10.2172859	0.00009579	-0.000242
0.3891378	-5.884113 C				
0.00001000	2366.	236592361.	10.1984552	0.0001020	-0.000258
0.4136162	-6.281848 C				
0.00001063	2366.	222675163.	10.1821496	0.0001082	-0.000274
0.4380246	-6.679488 C				
0.00001125	2366.	210304321.	10.1679490	0.0001144	-0.000291
0.4623628	-7.077032 C				
0.00001188	2366.	199235672.	10.1555219	0.0001206	-0.000307
0.4866307	-7.474480 C				
0.00001250	2366.	189273889.	10.1446030	0.0001268	-0.000323
0.5108282	-7.871831 C				
0.00001313	2366.	180260846.	10.1349589	0.0001330	-0.000339
0.5349552	-8.269087 C				
0.00001375	2366.	172067171.	10.1264498	0.0001392	-0.000356
0.5590117	-8.666245 C				
0.00001438	2366.	164585990.	10.1189132	0.0001455	-0.000372
0.5829974	-9.063307 C				

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 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00001500	2366.	157728241.	10.1122282	0.0001517	-0.000388
0.6069124	-9.460271 C				
0.00001563	2366.	151419111.	10.1062933	0.0001579	-0.000405
0.6307565	-9.857138 C				
0.00001625	2366.	145595299.	10.1010224	0.0001641	-0.000421
0.6545296	-10.253907 C				
0.00001688	2366.	140202880.	10.0963423	0.0001704	-0.000437
0.6782316	-10.650577 C				
0.00001750	2366.	135195635.	10.0921903	0.0001766	-0.000453
0.7018624	-11.047150 C				
0.00001813	2366.	130533716.	10.0885122	0.0001829	-0.000470
0.7254219	-11.443623 C				
0.00001875	2366.	126182592.	10.0852613	0.0001891	-0.000486
0.7489100	-11.839998 C				
0.00001938	2366.	122112186.	10.0823966	0.0001953	-0.000502
0.7723266	-12.236274 C				
0.00002000	2366.	118296180.	10.0798824	0.0002016	-0.000518
0.7956716	-12.632450 C				
0.00002063	2366.	114711448.	10.0776874	0.0002079	-0.000535
0.8189449	-13.028526 C				
0.00002125	2366.	111337582.	10.0757837	0.0002141	-0.000551
0.8421464	-13.424502 C				
0.00002188	2366.	108156508.	10.0741470	0.0002204	-0.000567
0.8652759	-13.820378 C				
0.00002250	2366.	105152160.	10.0727554	0.0002266	-0.000583
0.8883333	-14.216153 C				
0.00002313	2366.	102310210.	10.0715894	0.0002329	-0.000600
0.9113187	-14.611828 C				
0.00002375	2366.	99617836.	10.0706317	0.0002392	-0.000616
0.9342318	-15.007401 C				
0.00002438	2366.	97063533.	10.0698667	0.0002455	-0.000632
0.9570725	-15.402873 C				
0.00002563	2436.	95048091.	10.0688598	0.0002580	-0.000664
1.0025364	-16.193510 C				
0.00002688	2551.	94928657.	10.0684718	0.0002706	-0.000697
1.0477096	-16.983738 C				
0.00002813	2667.	94815115.	10.0686232	0.0002832	-0.000729
1.0925912	-17.773555 C				
0.00002938	2782.	94706690.	10.0692479	0.0002958	-0.000762
1.1371802	-18.562957 C				
0.00003063	2897.	94602733.	10.0703211	0.0003084	-0.000794
1.1814759	-19.351942 C				
0.00003188	3012.	94502697.	10.0717368	0.0003210	-0.000826
1.2254772	-20.140508 C				
0.00003313	3127.	94406117.	10.0734845	0.0003337	-0.000859
1.2691834	-20.928652 C				
0.00003438	3242.	94312597.	10.0755306	0.0003463	-0.000891
1.3125933	-21.716373 C				
0.00003563	3357.	94221794.	10.0778462	0.0003590	-0.000923
1.3557063	-22.503666 C				

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 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
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0.00003688	3471.	94133413.	10.0804061	0.0003717	-0.000956
1.3985212	-23.290530 C				
0.00003813	3586.	94047197.	10.0831888	0.0003844	-0.000988
1.4410372	-24.076963 C				
0.00003938	3700.	93962921.	10.0861753	0.0003971	-0.001020
1.4832533	-24.862961 C				
0.00004063	3814.	93880388.	10.0893491	0.0004099	-0.001053
1.5251686	-25.648521 C				
0.00004188	3928.	93799425.	10.0926956	0.0004226	-0.001085
1.5667821	-26.433642 C				
0.00004313	4042.	93719877.	10.0962019	0.0004354	-0.001117
1.6080927	-27.218321 C				
0.00004438	4155.	93641609.	10.0998566	0.0004482	-0.001149
1.6490996	-28.002554 C				
0.00004563	4269.	93564497.	10.1036497	0.0004610	-0.001182
1.6898018	-28.786339 C				
0.00004688	4382.	93488434.	10.1075722	0.0004738	-0.001214
1.7301982	-29.569674 C				
0.00004813	4496.	93413321.	10.1116159	0.0004866	-0.001246
1.7702878	-30.352554 C				
0.00004938	4609.	93339070.	10.1157737	0.0004995	-0.001278
1.8100696	-31.134978 C				
0.00005063	4722.	93265602.	10.1200391	0.0005123	-0.001310
1.8495425	-31.916943 C				
0.00005188	4834.	93192845.	10.1244063	0.0005252	-0.001342
1.8887057	-32.698446 C				
0.00005313	4947.	93120733.	10.1288700	0.0005381	-0.001374
1.9275579	-33.479483 C				
0.00005438	5060.	93049206.	10.1334255	0.0005510	-0.001406
1.9660981	-34.260052 C				
0.00005563	5172.	92978211.	10.1380684	0.0005639	-0.001439
2.0043253	-35.040149 C				
0.00005688	5284.	92907697.	10.1427948	0.0005769	-0.001471
2.0422384	-35.819772 C				
0.00005813	5396.	92837619.	10.1476012	0.0005898	-0.001503
2.0798362	-36.598918 C				
0.00005938	5508.	92767935.	10.1524844	0.0006028	-0.001535
2.1171178	-37.377583 C				
0.00006063	5620.	92698606.	10.1574414	0.0006158	-0.001567
2.1540819	-38.155764 C				
0.00006188	5731.	92629597.	10.1624696	0.0006288	-0.001599
2.1907275	-38.933458 C				
0.00006313	5843.	92560874.	10.1675664	0.0006418	-0.001631
2.2270535	-39.710662 C				
0.00006438	5954.	92492407.	10.1727297	0.0006549	-0.001663
2.2630586	-40.487373 C				
0.00006563	6065.	92424168.	10.1779574	0.0006679	-0.001695
2.2987417	-41.263586 C				
0.00006688	6176.	92356130.	10.1832476	0.0006810	-0.001726
2.3341018	-42.039299 C				

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0.00006813	6287.	92288268.	10.1885986	0.0006941	-0.001758
2.3691375	-42.814509 C				
0.00006938	6398.	92220560.	10.1940089	0.0007072	-0.001790
2.4038477	-43.589211 C				
0.00007063	6508.	92152983.	10.1995039	0.0007203	-0.001822
2.4382312	-44.363403 C				
0.00007188	6619.	92085519.	10.2050285	0.0007335	-0.001854
2.4722868	-45.137081 C				
0.00007313	6729.	92018147.	10.2106084	0.0007467	-0.001886
2.5060133	-45.910241 C				
0.00007438	6839.	91950850.	10.2162424	0.0007598	-0.001918
2.5394094	-46.682880 C				
0.00007938	7277.	91682087.	10.2393011	0.0008127	-0.002045
2.6696649	-49.768146 C				
0.00008438	7713.	91413389.	10.2630109	0.0008659	-0.002172
2.7945082	-52.845065 C				
0.00008938	8146.	91144431.	10.2866786	0.0009194	-0.002298
2.9137126	-55.915279 C				
0.00009438	8576.	90874234.	10.3110673	0.0009731	-0.002424
3.0273448	-58.976728 C				
0.00009938	8985.	90417533.	10.3290580	0.0010265	-0.002551
3.1339327	-60.000000 CY				
0.0001044	9311.	89207952.	10.3175636	0.0010769	-0.002681
3.2289512	-60.000000 CY				
0.0001094	9552.	87336121.	10.2781631	0.0011242	-0.002813
3.3128936	-60.000000 CY				
0.0001144	9789.	85583430.	10.2421143	0.0011714	-0.002946
3.3919789	-60.000000 CY				
0.0001194	10011.	83861611.	10.2051482	0.0012182	-0.003079
3.4655044	-60.000000 CY				
0.0001244	10162.	81702300.	10.1438002	0.0012616	-0.003216
3.5293615	-60.000000 CY				
0.0001294	10295.	79572057.	10.0817619	0.0013043	-0.003353
3.5881988	-60.000000 CY				
0.0001344	10427.	77592674.	10.0256713	0.0013472	-0.003490
3.6433355	-60.000000 CY				
0.0001394	10557.	75747771.	9.9749147	0.0013903	-0.003627
3.6947252	-60.000000 CY				
0.0001444	10687.	74023236.	9.9289636	0.0014335	-0.003764
3.7423201	-60.000000 CY				
0.0001494	10816.	72406063.	9.8867661	0.0014768	-0.003901
3.7859739	-60.000000 CY				
0.0001544	10933.	70821400.	9.8425115	0.0015194	-0.004038
3.8249324	-60.000000 CY				
0.0001594	11017.	69123456.	9.7867573	0.0015598	-0.004178
3.8581753	-60.000000 CY				
0.0001644	11079.	67401534.	9.7260868	0.0015987	-0.004319
3.8869352	-60.000000 CY				
0.0001694	11139.	65767574.	9.6691048	0.0016377	-0.004460
3.9124557	-60.000000 CY				



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0.0001744	11199.	64223403.	9.6148605	0.0016766	-0.004601
3.9348020	-60.000000 CY				
0.0001794	11258.	62761436.	9.5654896	0.0017158	-0.004742
3.9539345	-60.000000 CY				
0.0001844	11316.	61373390.	9.5189681	0.0017551	-0.004882
3.9697370	-60.000000 CY				
0.0001894	11373.	60052811.	9.4743244	0.0017942	-0.005023
3.9821950	-60.000000 CY				
0.0001944	11429.	58796578.	9.4331695	0.0018336	-0.005164
3.9914019	-60.000000 CY				
0.0001994	11484.	57599778.	9.3948139	0.0018731	-0.005304
3.9973136	-60.000000 CY				
0.0002044	11539.	56457972.	9.3581635	0.0019126	-0.005445
3.9998845	-60.000000 CY				
0.0002094	11592.	55366642.	9.3266817	0.0019528	-0.005585
3.9975630	-60.000000 CY				
0.0002144	11645.	54322678.	9.2959142	0.0019928	-0.005725
3.9999044	-60.000000 CY				
0.0002194	11698.	53322120.	9.2675435	0.0020331	-0.005864
3.9971169	-60.000000 CY				
0.0002244	11748.	52356977.	9.2405172	0.0020733	-0.006004
3.9997515	-60.000000 CY				
0.0002294	11794.	51418840.	9.2141042	0.0021135	-0.006144
3.9957066	-60.000000 CY				
0.0002344	11831.	50480617.	9.1845645	0.0021526	-0.006285
3.9990577	-60.000000 CY				
0.0002394	11864.	49560513.	9.1526832	0.0021909	-0.006427
3.9990468	-60.000000 CY				
0.0002444	11885.	48632992.	9.1162023	0.0022278	-0.006570
3.9966747	-60.000000 CY				
0.0002494	11904.	47735462.	9.0796192	0.0022642	-0.006713
3.9992545	-60.000000 CY				
0.0002544	11921.	46863378.	9.0457647	0.0023010	-0.006856
3.9991650	-60.000000 CY				
0.0002594	11937.	46022914.	9.0128664	0.0023377	-0.007000
3.9956629	-60.000000 CY				
0.0002644	11953.	45213284.	8.9816750	0.0023745	-0.007143
3.9986069	-60.000000 CY				
0.0002694	11969.	44432753.	8.9518321	0.0024114	-0.007286
3.9999247	-60.000000 CY				
0.0002744	11984.	43679063.	8.9240509	0.0024485	-0.007429
3.9940409	-60.000000 CY				
0.0003044	12070.	39655848.	8.7807001	0.0026726	-0.008285
3.9985866	-60.000000 CY				
0.0003344	12146.	36325110.	8.6675807	0.0028982	-0.009139
3.9998625	-60.000000 CY				
0.0003644	12216.	33525083.	8.5838110	0.0031277	-0.009990
3.9999751	-60.000000 CYT				
0.0003944	12280.	31137740.	8.5203443	0.0033602	-0.010837
3.9996828	-60.000000 CYT				

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0.0004244	12339.	29075625.	8.4715220	0.0035951	-0.011682
3.9974037	-60.000000 CYT				
0.0004544	12385.	27257253.	8.4224181	0.0038269	-0.012531
3.9878351	-60.000000 CYT				

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 Summary of Results for Nominal Moment Capacity for Section 1  
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Moment values interpolated at maximum compressive strain = 0.003  
 or maximum developed moment if pile fails at smaller strains.

Load Tens. No. Strain	Axial Thrust  kips	Nominal Mom. Cap.  in-kip	Max. Comp.  Strain	Max.
----	-----	-----	-----	
1 -0.00952396	3.800	12169.214	0.00300000	
2 -0.00952020	4.200	12173.120	0.00300000	
3 -0.00951645	4.600	12177.027	0.00300000	

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.75).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Stiff. Load Ult Mom No. kip-in^2	Resist.  Factor	Nominal  Ax. Thrust  kips	Nominal  Moment Cap  in-kips	Ult. (Fac)  Ax. Thrust  kips	Ult. (Fac)  Moment Cap  in-kips	Bend.  at
-----	-----	-----	-----	-----	-----	
1 91219895.	0.65	3.800000	12169.	2.470000	7910.	

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2 91253873.	0.65	4.200000	12173.	2.730000	7913.
3 91287886.	0.65	4.600000	12177.	2.990000	7915.
1 89806706.	0.75	3.800000	12169.	2.850000	9127.
2 89838295.	0.75	4.200000	12173.	3.150000	9130.
3 89869877.	0.75	4.600000	12177.	3.450000	9133.
1 70221645.	0.90	3.800000	12169.	3.420000	10952.
2 70254444.	0.90	4.200000	12173.	3.780000	10956.
3 70287179.	0.90	4.600000	12177.	4.140000	10959.

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	1.0000	0.00	N.A.	No	0.00	8859.
2	4.0000	0.2172	No	No	8859.	101002.
3	6.3000	3.6258	Yes	No	109861.	52509.
4	7.8000	4.4912	Yes	No	162370.	50460.
5	9.3000	8.3000	No	No	212831.	0.00
6	10.8000	9.8000	No	No	0.00	0.00
7	15.3000	14.3000	No	No	0.00	0.00
8	20.3000	19.3000	No	No	0.00	0.00
9	23.6000	22.6000	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.

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 Computed Values of Pile Loading and Deflection  
 for Lateral Loading for Load Case Number 1  
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Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 1000.0 lbs  
 Applied moment at pile head = 315600.0 in-lbs  
 Axial thrust load on pile head = 4200.0 lbs

Depth Res.	Soil X Es*H feet lb/inch	Deflect. Spr. y Lat. inches lb/inch	Bending Distrib. Moment Load in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil p
0.00	0.00	0.00776	315600.	1000.	-1.35E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.09000	0.00761	316681.	1000.	-1.34E-04	0.00	3.84E+11		
0.00	0.00	0.00						
0.1800	0.00747	317761.	1000.	-1.33E-04	0.00	3.84E+11		
0.00	0.00	0.00						
0.2700	0.00732	318842.	1000.	-1.32E-04	0.00	3.84E+11		
0.00	0.00	0.00						
0.3600	0.00718	319922.	1000.	-1.31E-04	0.00	3.84E+11		
0.00	0.00	0.00						
0.4500	0.00704	321003.	1000.0000	-1.30E-04	0.00	3.84E+11		
0.00	0.00	0.00						
0.5400	0.00690	322084.	1000.	-1.29E-04	0.00	3.84E+11		
0.00	0.00	0.00						
0.6300	0.00676	323164.	1000.	-1.28E-04	0.00	3.84E+11		
0.00	0.00	0.00						
0.7200	0.00662	324245.	1000.	-1.27E-04	0.00	3.84E+11		
0.00	0.00	0.00						
0.8100	0.00649	325325.	1000.	-1.26E-04	0.00	3.84E+11		
0.00	0.00	0.00						
0.9000	0.00635	326406.	1000.0000	-1.26E-04	0.00	3.84E+11		
0.00	0.00	0.00						
0.9900	0.00621	327486.	1000.0000	-1.25E-04	0.00	3.84E+11		
0.00	0.00	0.00						
1.0800	0.00608	328567.	992.2856	-1.24E-04	0.00	3.84E+11		
-14.286	2537.	0.00						
1.1700	0.00595	329631.	976.7871	-1.23E-04	0.00	3.84E+11		
-14.415	2618.	0.00						
1.2600	0.00582	330678.	961.1513	-1.22E-04	0.00	3.84E+11		
-14.540	2700.	0.00						
1.3500	0.00568	331708.	945.3830	-1.21E-04	0.00	3.84E+11		

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-14.661	2785.	0.00				
1.4400	0.00555	332721.	929.4867	-1.20E-04	0.00	3.84E+11
-14.777	2873.	0.00				
1.5300	0.00543	333717.	913.4674	-1.19E-04	0.00	3.84E+11
-14.889	2964.	0.00				
1.6200	0.00530	334695.	897.3297	-1.18E-04	0.00	3.84E+11
-14.996	3057.	0.00				
1.7100	0.00517	335656.	881.0787	-1.17E-04	0.00	3.84E+11
-15.099	3154.	0.00				
1.8000	0.00504	336599.	864.7194	-1.16E-04	0.00	3.84E+11
-15.197	3254.	0.00				
1.8900	0.00492	337525.	848.2568	-1.15E-04	0.00	3.84E+11
-15.290	3357.	0.00				
1.9800	0.00479	338433.	831.6961	-1.14E-04	0.00	3.84E+11
-15.378	3464.	0.00				
2.0700	0.00467	339323.	815.0425	-1.13E-04	0.00	3.84E+11
-15.462	3574.	0.00				
2.1600	0.00455	340194.	798.3015	-1.12E-04	0.00	3.84E+11
-15.540	3689.	0.00				
2.2500	0.00443	341048.	781.4784	-1.11E-04	0.00	3.84E+11
-15.614	3807.	0.00				
2.3400	0.00431	341883.	764.5788	-1.11E-04	0.00	3.84E+11
-15.682	3930.	0.00				
2.4300	0.00419	342700.	747.6084	-1.10E-04	0.00	3.84E+11
-15.745	4058.	0.00				
2.5200	0.00407	343499.	730.5730	-1.09E-04	0.00	3.84E+11
-15.802	4191.	0.00				
2.6100	0.00396	344279.	713.4785	-1.08E-04	0.00	3.84E+11
-15.854	4329.	0.00				
2.7000	0.00384	345041.	696.3309	-1.07E-04	0.00	3.84E+11
-15.901	4472.	0.00				
2.7900	0.00373	345784.	679.1364	-1.06E-04	0.00	3.84E+11
-15.941	4622.	0.00				
2.8800	0.00361	346509.	661.9013	-1.05E-04	0.00	3.84E+11
-15.976	4777.	0.00				
2.9700	0.00350	347215.	644.6321	-1.04E-04	0.00	3.84E+11
-16.004	4940.	0.00				
3.0600	0.00339	347902.	627.3354	-1.03E-04	0.00	3.84E+11
-16.027	5110.	0.00				
3.1500	0.00328	348571.	610.0181	-1.02E-04	0.00	3.84E+11
-16.043	5287.	0.00				
3.2400	0.00317	349221.	592.6871	-1.01E-04	0.00	3.84E+11
-16.052	5473.	0.00				
3.3300	0.00306	349852.	575.3498	-9.98E-05	0.00	3.84E+11
-16.054	5668.	0.00				
3.4200	0.00295	350465.	558.0134	-9.89E-05	0.00	3.84E+11
-16.050	5872.	0.00				
3.5100	0.00285	351058.	540.6857	-9.79E-05	0.00	3.84E+11
-16.038	6087.	0.00				
3.6000	0.00274	351633.	523.3746	-9.69E-05	0.00	3.84E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-16.019	6313.	0.00				
3.6900	0.00264	352190.	506.0883	-9.59E-05	0.00	3.84E+11
-15.992	6551.	0.00				
3.7800	0.00253	352727.	488.8353	-9.49E-05	0.00	3.84E+11
-15.958	6803.	0.00				
3.8700	0.00243	353247.	471.6244	-9.39E-05	0.00	3.84E+11
-15.915	7069.	0.00				
3.9600	0.00233	353747.	454.4647	-9.29E-05	0.00	3.84E+11
-15.863	7351.	0.00				
4.0500	0.00223	354229.	185.7103	-9.19E-05	0.00	3.84E+11
-481.831	233269.	0.00				
4.1400	0.00213	354149.	-333.174	-9.09E-05	0.00	3.84E+11
-479.067	242672.	0.00				
4.2300	0.00203	353510.	-848.973	-8.99E-05	0.00	3.84E+11
-476.115	252754.	0.00				
4.3200	0.00194	352316.	-1361.	-8.89E-05	0.00	3.84E+11
-472.962	263595.	0.00				
4.4100	0.00184	350570.	-1870.	-8.80E-05	0.00	3.84E+11
-469.594	275288.	0.00				
4.5000	0.00175	348277.	-2376.	-8.70E-05	0.00	3.84E+11
-465.995	287941.	0.00				
4.5900	0.00165	345440.	-2877.	-8.60E-05	0.00	3.84E+11
-462.149	301685.	0.00				
4.6800	0.00156	342063.	-3374.	-8.50E-05	0.00	3.84E+11
-458.033	316675.	0.00				
4.7700	0.00147	338153.	-3866.	-8.41E-05	0.00	3.84E+11
-453.626	333099.	0.00				
4.8600	0.00138	333713.	-4353.	-8.31E-05	0.00	3.84E+11
-448.899	351186.	0.00				
4.9500	0.00129	328750.	-4835.	-8.22E-05	0.00	3.84E+11
-443.821	371220.	0.00				
5.0400	0.00120	323270.	-5312.	-8.13E-05	0.00	3.84E+11
-438.356	393554.	0.00				
5.1300	0.00112	317277.	-5782.	-8.04E-05	0.00	3.84E+11
-432.457	418638.	0.00				
5.2200	0.00103	310781.	-6246.	-7.95E-05	0.00	3.84E+11
-426.072	447051.	0.00				
5.3100	9.44E-04	303787.	-6702.	-7.86E-05	0.00	3.85E+11
-419.134	479554.	0.00				
5.4000	8.59E-04	296305.	-7151.	-7.78E-05	0.00	3.85E+11
-411.564	517172.	0.00				
5.4900	7.76E-04	288343.	-7591.	-7.70E-05	0.00	3.85E+11
-403.256	561312.	0.00				
5.5800	6.93E-04	279910.	-8015.	-7.62E-05	0.00	3.85E+11
-382.681	596217.	0.00				
5.6700	6.11E-04	271031.	-8405.	-7.54E-05	0.00	3.85E+11
-339.235	599287.	0.00				
5.7600	5.30E-04	261756.	-8748.	-7.47E-05	0.00	3.85E+11
-295.783	602358.	0.00				
5.8500	4.50E-04	252136.	-9044.	-7.39E-05	0.00	3.85E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-252.315	605429.	0.00				
5.9400	3.71E-04	242222.	-9293.	-7.32E-05	0.00	3.85E+11
-208.823	608502.	0.00				
6.0300	2.92E-04	232064.	-9495.	-7.26E-05	0.00	3.85E+11
-165.294	611576.	0.00				
6.1200	2.14E-04	221714.	-9650.	-7.19E-05	0.00	3.85E+11
-121.717	614650.	0.00				
6.2100	1.37E-04	211221.	-9758.	-7.13E-05	0.00	3.85E+11
-78.080	617725.	0.00				
6.3000	5.98E-05	200637.	-9815.	-7.08E-05	0.00	3.85E+11
-28.866	521360.	0.00				
6.3900	-1.63E-05	190020.	-9828.	-7.02E-05	0.00	3.85E+11
6.3746	422044.	0.00				
6.4800	-9.18E-05	179410.	-9805.	-6.97E-05	0.00	3.85E+11
36.0660	424100.	0.00				
6.5700	-1.67E-04	168843.	-9750.	-6.92E-05	0.00	3.85E+11
65.8303	426155.	0.00				
6.6600	-2.41E-04	158352.	-9662.	-6.87E-05	0.00	3.85E+11
95.6771	428211.	0.00				
6.7500	-3.15E-04	147972.	-9543.	-6.83E-05	0.00	3.85E+11
125.6163	430267.	0.00				
6.8400	-3.89E-04	137739.	-9391.	-6.79E-05	0.00	3.85E+11
155.6577	432322.	0.00				
6.9300	-4.62E-04	127688.	-9207.	-6.75E-05	0.00	3.85E+11
185.8111	434378.	0.00				
7.0200	-5.35E-04	117854.	-8990.	-6.72E-05	0.00	3.85E+11
216.0866	436434.	0.00				
7.1100	-6.07E-04	108271.	-8740.	-6.69E-05	0.00	3.85E+11
246.4941	438490.	0.00				
7.2000	-6.79E-04	98976.	-8457.	-6.66E-05	0.00	3.85E+11
277.0434	440546.	0.00				
7.2900	-7.51E-04	90004.	-8146.	-6.63E-05	0.00	3.85E+11
298.5266	429346.	0.00				
7.3800	-8.22E-04	81380.	-7819.	-6.61E-05	0.00	3.85E+11
306.8083	402902.	0.00				
7.4700	-8.94E-04	73115.	-7484.	-6.59E-05	0.00	3.85E+11
314.6945	380315.	0.00				
7.5600	-9.65E-04	65216.	-7140.	-6.57E-05	0.00	3.85E+11
322.2442	360769.	0.00				
7.6500	-0.00104	57693.	-6788.	-6.55E-05	0.00	3.85E+11
329.5047	343668.	0.00				
7.7400	-0.00111	50554.	-6428.	-6.53E-05	0.00	3.85E+11
336.5140	328563.	0.00				
7.8300	-0.00118	43808.	-6038.	-6.52E-05	0.00	3.85E+11
385.5054	353847.	0.00				
7.9200	-0.00125	37512.	-5618.	-6.51E-05	0.00	3.85E+11
392.9412	340322.	0.00				
8.0100	-0.00132	31674.	-5190.	-6.50E-05	0.00	3.85E+11
400.1845	328112.	0.00				
8.1000	-0.00139	26303.	-4754.	-6.49E-05	0.00	3.85E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

407.2560	317027.	0.00				
8.1900	-0.00146	21406.	-4310.	-6.48E-05	0.00	3.85E+11
414.1733	306911.	0.00				
8.2800	-0.00153	16993.	-3859.	-6.48E-05	0.00	3.85E+11
420.9516	297638.	0.00				
8.3700	-0.00160	13071.	-3401.	-6.48E-05	0.00	3.85E+11
427.6041	289102.	0.00				
8.4600	-0.00167	9648.	-2936.	-6.47E-05	0.00	3.85E+11
434.1423	281215.	0.00				
8.5500	-0.00174	6731.	-2463.	-6.47E-05	0.00	3.85E+11
440.5761	273902.	0.00				
8.6400	-0.00181	4327.	-1984.	-6.47E-05	0.00	3.85E+11
446.9144	267101.	0.00				
8.7300	-0.00188	2445.	-1498.	-6.47E-05	0.00	3.85E+11
453.1648	260757.	0.00				
8.8200	-0.00195	1092.	-1005.	-6.47E-05	0.00	3.85E+11
459.3344	254824.	0.00				
8.9100	-0.00202	274.6587	-505.917	-6.47E-05	0.00	3.85E+11
465.4290	249263.	0.00				
9.0000	-0.00209	0.00	0.00	-6.47E-05	0.00	3.85E+11
471.4541	122019.	0.00				

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.00775504 inches  
 Computed slope at pile head = -0.0001346 radians  
 Maximum bending moment = 354229. inch-lbs  
 Maximum shear force = -9828. lbs  
 Depth of maximum bending moment = 4.05000000 feet below pile head  
 Depth of maximum shear force = 6.39000000 feet below pile head  
 Number of iterations = 16  
 Number of zero deflection points = 1  
 Pile deflection at ground = 0.00619993 inches

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 Pile-head Deflection vs. Pile Length for Load Case 1  
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Boundary Condition Type 1, Shear and Moment



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Shear = 1000. lbs  
 Moment = 315600. in-lbs  
 Axial Load = 4200. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.00000	0.00775504	354229.	-9828.
8.55000	0.01322283	351680.	-11081.
8.10000	0.03067443	348028.	-12744.
7.65000	0.07672149	343366.	-14419.
7.20000	0.18092504	339295.	-16027.
6.75000	0.48721126	336752.	-17915.
6.30000	1.21248305	335711.	-19616.
5.85000	6.10531165	340964.	-23082.

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 = 2250.0 lbs  
 Applied moment at pile head = 724800.0 in-lbs  
 Axial thrust load on pile head = 4600.0 lbs

Depth Res. X feet lb/inch	Deflect. Soil Spr. y inches lb/inch	Bending Distrib. Moment Lat. Load in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil p
0.00	0.1364	724800.	2250.	-0.00186	0.00	3.83E+11	
0.00	0.00	0.00					
0.09000	0.1344	727239.	2250.	-0.00186	0.00	3.83E+11	
0.00	0.00	0.00					
0.1800	0.1324	729678.	2250.	-0.00186	0.00	3.83E+11	
0.00	0.00	0.00					
0.2700	0.1303	732118.	2250.	-0.00186	0.00	3.83E+11	
0.00	0.00	0.00					
0.3600	0.1283	734557.	2250.	-0.00185	0.00	3.83E+11	
0.00	0.00	0.00					
0.4500	0.1263	736996.	2250.	-0.00185	0.00	3.83E+11	
0.00	0.00	0.00					

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.5400	0.1243	739435.	2250.	-0.00185	0.00	3.83E+11
0.00	0.00	0.00				
0.6300	0.1223	741875.	2250.	-0.00185	0.00	3.83E+11
0.00	0.00	0.00				
0.7200	0.1204	744314.	2250.	-0.00185	0.00	3.83E+11
0.00	0.00	0.00				
0.8100	0.1184	746753.	2250.	-0.00184	0.00	3.83E+11
0.00	0.00	0.00				
0.9000	0.1164	749192.	2250.	-0.00184	0.00	3.83E+11
0.00	0.00	0.00				
0.9900	0.1144	751631.	2250.	-0.00184	0.00	3.83E+11
0.00	0.00	0.00				
1.0800	0.1124	754070.	2230.	-0.00184	0.00	3.83E+11
-37.749	362.7252	0.00				
1.1700	0.1104	756465.	2189.	-0.00184	0.00	3.83E+11
-38.145	373.1172	0.00				
1.2600	0.1084	758816.	2147.	-0.00183	0.00	3.83E+11
-38.532	383.7826	0.00				
1.3500	0.1065	761122.	2105.	-0.00183	0.00	3.83E+11
-38.908	394.7342	0.00				
1.4400	0.1045	763382.	2063.	-0.00183	0.00	3.83E+11
-39.274	405.9852	0.00				
1.5300	0.1025	765596.	2021.	-0.00183	0.00	3.83E+11
-39.630	417.5501	0.00				
1.6200	0.1005	767764.	1978.	-0.00182	0.00	3.83E+11
-39.975	429.4439	0.00				
1.7100	0.09856	769886.	1934.	-0.00182	0.00	3.83E+11
-40.309	441.6832	0.00				
1.8000	0.09660	771961.	1891.	-0.00182	0.00	3.83E+11
-40.632	454.2852	0.00				
1.8900	0.09463	773988.	1846.	-0.00182	0.00	3.83E+11
-40.943	467.2689	0.00				
1.9800	0.09267	775967.	1802.	-0.00182	0.00	3.83E+11
-41.242	480.6542	0.00				
2.0700	0.09071	777898.	1757.	-0.00181	0.00	3.83E+11
-41.530	494.4629	0.00				
2.1600	0.08875	779781.	1712.	-0.00181	0.00	3.83E+11
-41.805	508.7182	0.00				
2.2500	0.08680	781615.	1667.	-0.00181	0.00	3.83E+11
-42.068	523.4452	0.00				
2.3400	0.08484	783400.	1622.	-0.00181	0.00	3.83E+11
-42.318	538.6712	0.00				
2.4300	0.08289	785136.	1576.	-0.00180	0.00	3.83E+11
-42.554	554.4256	0.00				
2.5200	0.08095	786821.	1530.	-0.00180	0.00	3.83E+11
-42.777	570.7401	0.00				
2.6100	0.07900	788457.	1483.	-0.00180	0.00	3.83E+11
-42.986	587.6495	0.00				
2.7000	0.07706	790043.	1437.	-0.00180	0.00	3.83E+11
-43.180	605.1914	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

2.7900	0.07512	791579.	1390.	-0.00180	0.00	3.83E+11
-43.360	623.4069	0.00				
2.8800	0.07318	793064.	1343.	-0.00179	0.00	3.83E+11
-43.524	642.3410	0.00				
2.9700	0.07124	794498.	1296.	-0.00179	0.00	3.83E+11
-43.672	662.0429	0.00				
3.0600	0.06931	795881.	1249.	-0.00179	0.00	3.83E+11
-43.804	682.5667	0.00				
3.1500	0.06738	797213.	1201.	-0.00179	0.00	3.83E+11
-43.919	703.9718	0.00				
3.2400	0.06545	798494.	1154.	-0.00178	0.00	3.83E+11
-44.016	726.3241	0.00				
3.3300	0.06352	799723.	1106.	-0.00178	0.00	3.83E+11
-44.096	749.6962	0.00				
3.4200	0.06160	800901.	1059.	-0.00178	0.00	3.83E+11
-44.156	774.1688	0.00				
3.5100	0.05968	802028.	1011.	-0.00178	0.00	3.83E+11
-44.197	799.8320	0.00				
3.6000	0.05776	803103.	963.2785	-0.00178	0.00	3.83E+11
-44.217	826.7862	0.00				
3.6900	0.05584	804126.	915.5242	-0.00177	0.00	3.83E+11
-44.217	855.1442	0.00				
3.7800	0.05393	805098.	867.7827	-0.00177	0.00	3.83E+11
-44.194	885.0327	0.00				
3.8700	0.05202	806018.	820.0786	-0.00177	0.00	3.83E+11
-44.147	916.5953	0.00				
3.9600	0.05011	806887.	772.4376	-0.00177	0.00	3.83E+11
-44.077	949.9947	0.00				
4.0500	0.04820	807704.	188.1280	-0.00176	0.00	3.83E+11
-1038.	23257.	0.00				
4.1400	0.04630	807311.	-930.363	-0.00176	0.00	3.83E+11
-1033.	24104.	0.00				
4.2300	0.04440	805712.	-2044.	-0.00176	0.00	3.83E+11
-1028.	25012.	0.00				
4.3200	0.04250	802914.	-3151.	-0.00176	0.00	3.83E+11
-1023.	25989.	0.00				
4.4100	0.04060	798923.	-4252.	-0.00176	0.00	3.83E+11
-1017.	27043.	0.00				
4.5000	0.03871	793747.	-5347.	-0.00175	0.00	3.83E+11
-1010.	28183.	0.00				
4.5900	0.03681	787392.	-6434.	-0.00175	0.00	3.83E+11
-1003.	29422.	0.00				
4.6800	0.03492	779868.	-7513.	-0.00175	0.00	3.83E+11
-995.140	30774.	0.00				
4.7700	0.03304	771182.	-8583.	-0.00175	0.00	3.83E+11
-986.716	32256.	0.00				
4.8600	0.03115	761346.	-9643.	-0.00174	0.00	3.83E+11
-977.558	33890.	0.00				
4.9500	0.02927	750370.	-10694.	-0.00174	0.00	3.83E+11
-967.591	35702.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

5.0400	0.02739	738265.	-11733.	-0.00174	0.00	3.83E+11
-956.730	37725.	0.00				
5.1300	0.02551	725044.	-12760.	-0.00174	0.00	3.83E+11
-944.872	40000.	0.00				
5.2200	0.02364	710721.	-13773.	-0.00174	0.00	3.83E+11
-931.892	42581.	0.00				
5.3100	0.02176	695311.	-14772.	-0.00173	0.00	3.83E+11
-917.639	45540.	0.00				
5.4000	0.01989	678831.	-15755.	-0.00173	0.00	3.84E+11
-901.927	48972.	0.00				
5.4900	0.01802	661298.	-16719.	-0.00173	0.00	3.84E+11
-884.519	53008.	0.00				
5.5800	0.01615	642734.	-17664.	-0.00173	0.00	3.84E+11
-865.109	57839.	0.00				
5.6700	0.01429	623161.	-18587.	-0.00173	0.00	3.84E+11
-843.292	63741.	0.00				
5.7600	0.01242	602604.	-19484.	-0.00172	0.00	3.84E+11
-818.511	71147.	0.00				
5.8500	0.01056	581093.	-20353.	-0.00172	0.00	3.84E+11
-789.967	80768.	0.00				
5.9400	0.00870	558660.	-21188.	-0.00172	0.00	3.84E+11
-756.447	93870.	0.00				
6.0300	0.00684	535345.	-21983.	-0.00172	0.00	3.84E+11
-715.960	112966.	0.00				
6.1200	0.00499	511194.	-22728.	-0.00172	0.00	3.84E+11
-664.833	143943.	0.00				
6.2100	0.00313	486269.	-23409.	-0.00172	0.00	3.84E+11
-594.824	205038.	0.00				
6.3000	0.00128	460649.	-23946.	-0.00172	0.00	3.84E+11
-401.328	338749.	0.00				
6.3900	-5.73E-04	434561.	-24042.	-0.00171	0.00	3.84E+11
223.8016	422044.	0.00				
6.4800	-0.00242	408735.	-23715.	-0.00171	0.00	3.84E+11
382.9821	170664.	0.00				
6.5700	-0.00427	383355.	-23268.	-0.00171	0.00	3.84E+11
443.4591	112077.	0.00				
6.6600	-0.00612	358492.	-22766.	-0.00171	0.00	3.84E+11
487.4980	86004.	0.00				
6.7500	-0.00797	334198.	-22220.	-0.00171	0.00	3.84E+11
523.2234	70909.	0.00				
6.8400	-0.00982	310514.	-21638.	-0.00171	0.00	3.84E+11
553.8382	60939.	0.00				
6.9300	-0.01166	287476.	-21025.	-0.00171	0.00	3.85E+11
580.9632	53807.	0.00				
7.0200	-0.01351	265116.	-20385.	-0.00171	0.00	3.85E+11
605.5413	48423.	0.00				
7.1100	-0.01535	243462.	-19719.	-0.00171	0.00	3.85E+11
628.1729	44199.	0.00				
7.2000	-0.01719	222541.	-19029.	-0.00171	0.00	3.85E+11
649.2657	40786.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

7.2900	-0.01903	202377.	-18317.	-0.00171	0.00	3.85E+11
669.1100	37964.	0.00				
7.3800	-0.02088	182993.	-17584.	-0.00171	0.00	3.85E+11
687.9204	35588.	0.00				
7.4700	-0.02272	164412.	-16831.	-0.00170	0.00	3.85E+11
705.8600	33557.	0.00				
7.5600	-0.02456	146654.	-16060.	-0.00170	0.00	3.85E+11
723.0564	31798.	0.00				
7.6500	-0.02640	129740.	-15270.	-0.00170	0.00	3.85E+11
739.6107	30258.	0.00				
7.7400	-0.02824	113688.	-14463.	-0.00170	0.00	3.85E+11
755.6050	28899.	0.00				
7.8300	-0.03008	98518.	-13587.	-0.00170	0.00	3.85E+11
865.8984	31092.	0.00				
7.9200	-0.03192	84358.	-12643.	-0.00170	0.00	3.85E+11
882.8822	29875.	0.00				
8.0100	-0.03376	71227.	-11680.	-0.00170	0.00	3.85E+11
899.4307	28777.	0.00				
8.1000	-0.03559	59145.	-10700.	-0.00170	0.00	3.85E+11
915.5888	27780.	0.00				
8.1900	-0.03743	48132.	-9703.	-0.00170	0.00	3.85E+11
931.3948	26872.	0.00				
8.2800	-0.03927	38205.	-8688.	-0.00170	0.00	3.85E+11
946.8820	26040.	0.00				
8.3700	-0.04111	29382.	-7658.	-0.00170	0.00	3.85E+11
962.0790	25275.	0.00				
8.4600	-0.04295	21681.	-6610.	-0.00170	0.00	3.85E+11
977.0113	24568.	0.00				
8.5500	-0.04479	15120.	-5547.	-0.00170	0.00	3.85E+11
991.7008	23914.	0.00				
8.6400	-0.04662	9716.	-4468.	-0.00170	0.00	3.85E+11
1006.	23307.	0.00				
8.7300	-0.04846	5485.	-3374.	-0.00170	0.00	3.85E+11
1020.	22740.	0.00				
8.8200	-0.05030	2445.	-2264.	-0.00170	0.00	3.85E+11
1034.	22212.	0.00				
8.9100	-0.05214	610.9764	-1140.	-0.00170	0.00	3.85E+11
1048.	21716.	0.00				
9.0000	-0.05398	0.00	0.00	-0.00170	0.00	3.85E+11
1062.	10626.	0.00				

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Pile-head deflection = 0.13637023 inches  
 Computed slope at pile head = -0.0018623 radians  
 Maximum bending moment = 807704. inch-lbs  
 Maximum shear force = -24042. lbs  
 Depth of maximum bending moment = 4.05000000 feet below pile head  
 Depth of maximum shear force = 6.39000000 feet below pile head  
 Number of iterations = 34  
 Number of zero deflection points = 1  
 Pile deflection at ground = 0.11416078 inches

Pile-head Deflection vs. Pile Length for Load Case 2

Boundary Condition Type 1, Shear and Moment

Shear = 2250. lbs  
 Moment = 724800. in-lbs  
 Axial Load = 4600. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment In-lbs	Maximum Shear lbs
9.00000	0.13637023	807704.	-24042.
8.55000	0.28283885	799757.	-26032.
8.10000	0.72186780	790251.	-29055.
7.65000	1.87006003	783998.	-32745.
7.20000	4.59354230	781101.	-36658.
6.75000	14.70065383	793594.	-42925.

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 = 2250.0 lbs  
 Applied moment at pile head = 724800.0 in-lbs  
 Axial thrust load on pile head = 3800.0 lbs

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil
Res. Soil Spr.	Distrib.	Moment	Force	S	Stress	Stiffness	p
X	y						

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Es*H feet lb/inch	Lat. Load inches lb/inch	in-lbs lb/inch	lbs	radians	psi*	lb-in^2
0.00	0.1363	724800.	2250.	-0.00186	0.00	3.83E+11
0.00	0.00	0.00				
0.09000	0.1343	727238.	2250.	-0.00186	0.00	3.83E+11
0.00	0.00	0.00				
0.1800	0.1323	729675.	2250.	-0.00186	0.00	3.83E+11
0.00	0.00	0.00				
0.2700	0.1303	732113.	2250.	-0.00185	0.00	3.83E+11
0.00	0.00	0.00				
0.3600	0.1283	734550.	2250.	-0.00185	0.00	3.83E+11
0.00	0.00	0.00				
0.4500	0.1263	736988.	2250.	-0.00185	0.00	3.83E+11
0.00	0.00	0.00				
0.5400	0.1243	739426.	2250.	-0.00185	0.00	3.83E+11
0.00	0.00	0.00				
0.6300	0.1223	741863.	2250.	-0.00185	0.00	3.83E+11
0.00	0.00	0.00				
0.7200	0.1203	744301.	2250.	-0.00184	0.00	3.83E+11
0.00	0.00	0.00				
0.8100	0.1183	746738.	2250.	-0.00184	0.00	3.83E+11
0.00	0.00	0.00				
0.9000	0.1163	749176.	2250.	-0.00184	0.00	3.83E+11
0.00	0.00	0.00				
0.9900	0.1143	751614.	2250.	-0.00184	0.00	3.83E+11
0.00	0.00	0.00				
1.0800	0.1123	754051.	2230.	-0.00184	0.00	3.83E+11
-37.741	362.8809	0.00				
1.1700	0.1103	756445.	2189.	-0.00183	0.00	3.83E+11
-38.137	373.2774	0.00				
1.2600	0.1084	758794.	2147.	-0.00183	0.00	3.83E+11
-38.524	383.9475	0.00				
1.3500	0.1064	761098.	2105.	-0.00183	0.00	3.83E+11
-38.900	394.9038	0.00				
1.4400	0.1044	763356.	2063.	-0.00183	0.00	3.83E+11
-39.266	406.1598	0.00				
1.5300	0.1024	765569.	2021.	-0.00183	0.00	3.83E+11
-39.621	417.7297	0.00				
1.6200	0.1005	767736.	1978.	-0.00182	0.00	3.83E+11
-39.966	429.6288	0.00				
1.7100	0.09850	769856.	1934.	-0.00182	0.00	3.83E+11
-40.300	441.8734	0.00				
1.8000	0.09653	771929.	1891.	-0.00182	0.00	3.83E+11
-40.623	454.4810	0.00				
1.8900	0.09457	773955.	1847.	-0.00182	0.00	3.83E+11
-40.934	467.4703	0.00				
1.9800	0.09261	775932.	1802.	-0.00181	0.00	3.83E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-41.234	480.8615	0.00					
2.0700	0.09065	777862.	1758.	-0.00181	0.00	3.83E+11	
-41.521	494.6762	0.00					
2.1600	0.08869	779744.	1713.	-0.00181	0.00	3.83E+11	
-41.796	508.9377	0.00					
2.2500	0.08674	781576.	1667.	-0.00181	0.00	3.83E+11	
-42.059	523.6713	0.00					
2.3400	0.08479	783360.	1622.	-0.00181	0.00	3.83E+11	
-42.309	538.9040	0.00					
2.4300	0.08284	785094.	1576.	-0.00180	0.00	3.83E+11	
-42.545	554.6652	0.00					
2.5200	0.08089	786778.	1530.	-0.00180	0.00	3.83E+11	
-42.768	570.9869	0.00					
2.6100	0.07895	788413.	1483.	-0.00180	0.00	3.83E+11	
-42.976	587.9037	0.00					
2.7000	0.07701	789997.	1437.	-0.00180	0.00	3.83E+11	
-43.171	605.4533	0.00					
2.7900	0.07507	791532.	1390.	-0.00179	0.00	3.83E+11	
-43.350	623.6768	0.00					
2.8800	0.07313	793015.	1343.	-0.00179	0.00	3.83E+11	
-43.514	642.6192	0.00					
2.9700	0.07120	794448.	1296.	-0.00179	0.00	3.83E+11	
-43.662	662.3298	0.00					
3.0600	0.06926	795830.	1249.	-0.00179	0.00	3.83E+11	
-43.794	682.8626	0.00					
3.1500	0.06733	797160.	1202.	-0.00179	0.00	3.83E+11	
-43.909	704.2771	0.00					
3.2400	0.06541	798440.	1154.	-0.00178	0.00	3.83E+11	
-44.007	726.6392	0.00					
3.3300	0.06348	799668.	1107.	-0.00178	0.00	3.83E+11	
-44.086	750.0215	0.00					
3.4200	0.06156	800845.	1059.	-0.00178	0.00	3.83E+11	
-44.146	774.5049	0.00					
3.5100	0.05964	801970.	1011.	-0.00178	0.00	3.83E+11	
-44.187	800.1794	0.00					
3.6000	0.05772	803044.	963.5567	-0.00177	0.00	3.83E+11	
-44.208	827.1454	0.00					
3.6900	0.05581	804066.	915.8127	-0.00177	0.00	3.83E+11	
-44.207	855.5158	0.00					
3.7800	0.05389	805037.	868.0817	-0.00177	0.00	3.83E+11	
-44.184	885.4175	0.00					
3.8700	0.05198	805956.	820.3880	-0.00177	0.00	3.83E+11	
-44.138	916.9939	0.00					
3.9600	0.05008	806823.	772.7573	-0.00177	0.00	3.83E+11	
-44.067	950.4078	0.00					
4.0500	0.04817	807639.	188.5445	-0.00176	0.00	3.83E+11	
-1038.	23268.	0.00					
4.1400	0.04627	807245.	-929.764	-0.00176	0.00	3.83E+11	
-1033.	24116.	0.00					
4.2300	0.04437	805645.	-2043.	-0.00176	0.00	3.83E+11	



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

-1028.	25025.	0.00				
4.3200	0.04247	802847.	-3150.	-0.00176	0.00	3.83E+11
-1022.	26002.	0.00				
4.4100	0.04057	798856.	-4251.	-0.00175	0.00	3.83E+11
-1016.	27056.	0.00				
4.5000	0.03868	793679.	-5345.	-0.00175	0.00	3.83E+11
-1010.	28197.	0.00				
4.5900	0.03679	787324.	-6432.	-0.00175	0.00	3.83E+11
-1003.	29436.	0.00				
4.6800	0.03490	779800.	-7511.	-0.00175	0.00	3.83E+11
-994.978	30789.	0.00				
4.7700	0.03302	771115.	-8581.	-0.00175	0.00	3.83E+11
-986.555	32272.	0.00				
4.8600	0.03113	761280.	-9641.	-0.00174	0.00	3.83E+11
-977.398	33907.	0.00				
4.9500	0.02925	750304.	-10692.	-0.00174	0.00	3.83E+11
-967.433	35720.	0.00				
5.0400	0.02737	738200.	-11731.	-0.00174	0.00	3.83E+11
-956.574	37743.	0.00				
5.1300	0.02549	724980.	-12757.	-0.00174	0.00	3.83E+11
-944.718	40019.	0.00				
5.2200	0.02362	710659.	-13771.	-0.00173	0.00	3.83E+11
-931.740	42602.	0.00				
5.3100	0.02175	695250.	-14769.	-0.00173	0.00	3.83E+11
-917.490	45562.	0.00				
5.4000	0.01988	678771.	-15752.	-0.00173	0.00	3.84E+11
-901.780	48996.	0.00				
5.4900	0.01801	661241.	-16716.	-0.00173	0.00	3.84E+11
-884.375	53034.	0.00				
5.5800	0.01614	642679.	-17661.	-0.00173	0.00	3.84E+11
-864.969	57867.	0.00				
5.6700	0.01428	623108.	-18583.	-0.00173	0.00	3.84E+11
-843.156	63772.	0.00				
5.7600	0.01242	602553.	-19480.	-0.00172	0.00	3.84E+11
-818.379	71181.	0.00				
5.8500	0.01056	581044.	-20349.	-0.00172	0.00	3.84E+11
-789.840	80807.	0.00				
5.9400	0.00870	558614.	-21184.	-0.00172	0.00	3.84E+11
-756.327	93915.	0.00				
6.0300	0.00684	535302.	-21979.	-0.00172	0.00	3.84E+11
-715.848	113019.	0.00				
6.1200	0.00499	511154.	-22724.	-0.00172	0.00	3.84E+11
-664.730	144009.	0.00				
6.2100	0.00313	486232.	-23404.	-0.00172	0.00	3.84E+11
-594.737	205128.	0.00				
6.3000	0.00128	460615.	-23942.	-0.00171	0.00	3.84E+11
-401.281	338869.	0.00				
6.3900	-5.72E-04	434531.	-24038.	-0.00171	0.00	3.84E+11
223.5556	422044.	0.00				
6.4800	-0.00242	408707.	-23711.	-0.00171	0.00	3.84E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

382.9084	170762.	0.00				
6.5700	-0.00427	383330.	-23264.	-0.00171	0.00	3.84E+11
443.3788	112138.	0.00				
6.6600	-0.00612	358470.	-22762.	-0.00171	0.00	3.84E+11
487.4118	86050.	0.00				
6.7500	-0.00796	334178.	-22216.	-0.00171	0.00	3.84E+11
523.1320	70946.	0.00				
6.8400	-0.00981	310497.	-21635.	-0.00171	0.00	3.84E+11
553.7423	60970.	0.00				
6.9300	-0.01165	287461.	-21022.	-0.00171	0.00	3.85E+11
580.8632	53834.	0.00				
7.0200	-0.01350	265104.	-20381.	-0.00171	0.00	3.85E+11
605.4374	48448.	0.00				
7.1100	-0.01534	243452.	-19715.	-0.00171	0.00	3.85E+11
628.0655	44222.	0.00				
7.2000	-0.01718	222533.	-19026.	-0.00171	0.00	3.85E+11
649.1549	40807.	0.00				
7.2900	-0.01902	202371.	-18314.	-0.00170	0.00	3.85E+11
668.9961	37984.	0.00				
7.3800	-0.02086	182989.	-17581.	-0.00170	0.00	3.85E+11
687.8034	35606.	0.00				
7.4700	-0.02270	164410.	-16829.	-0.00170	0.00	3.85E+11
705.7402	33574.	0.00				
7.5600	-0.02454	146653.	-16057.	-0.00170	0.00	3.85E+11
722.9337	31814.	0.00				
7.6500	-0.02638	129740.	-15267.	-0.00170	0.00	3.85E+11
739.4854	30274.	0.00				
7.7400	-0.02822	113690.	-14460.	-0.00170	0.00	3.85E+11
755.4770	28913.	0.00				
7.8300	-0.03006	98520.	-13585.	-0.00170	0.00	3.85E+11
865.7518	31107.	0.00				
7.9200	-0.03190	84361.	-12640.	-0.00170	0.00	3.85E+11
882.7328	29890.	0.00				
8.0100	-0.03373	71231.	-11678.	-0.00170	0.00	3.85E+11
899.2786	28791.	0.00				
8.1000	-0.03557	59150.	-10698.	-0.00170	0.00	3.85E+11
915.4340	27794.	0.00				
8.1900	-0.03741	48137.	-9701.	-0.00170	0.00	3.85E+11
931.2375	26885.	0.00				
8.2800	-0.03925	38210.	-8687.	-0.00170	0.00	3.85E+11
946.7221	26053.	0.00				
8.3700	-0.04108	29387.	-7656.	-0.00170	0.00	3.85E+11
961.9166	25287.	0.00				
8.4600	-0.04292	21686.	-6609.	-0.00170	0.00	3.85E+11
976.8464	24581.	0.00				
8.5500	-0.04476	15125.	-5546.	-0.00170	0.00	3.85E+11
991.5335	23926.	0.00				
8.6400	-0.04659	9720.	-4468.	-0.00170	0.00	3.85E+11
1006.	23318.	0.00				
8.7300	-0.04843	5489.	-3374.	-0.00170	0.00	3.85E+11

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-12 (Boring B-007-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

1020.	22752.	0.00					
8.8200	-0.05027	2447.	-2264.	-0.00170	0.00	3.85E+11	
1034.	22223.	0.00					
8.9100	-0.05210	612.3471	-1139.	-0.00170	0.00	3.85E+11	
1048.	21727.	0.00					
9.0000	-0.05394	0.00	0.00	-0.00170	0.00	3.85E+11	
1062.	10631.	0.00					

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 3:

Pile-head deflection = 0.13628299 inches  
 Computed slope at pile head = -0.0018611 radians  
 Maximum bending moment = 807639. inch-lbs  
 Maximum shear force = -24038. lbs  
 Depth of maximum bending moment = 4.05000000 feet below pile head  
 Depth of maximum shear force = 6.39000000 feet below pile head  
 Number of iterations = 34  
 Number of zero deflection points = 1  
 Pile deflection at ground = 0.11408733 inches

Pile-head Deflection vs. Pile Length for Load Case 3

Boundary Condition Type 1, Shear and Moment

Shear = 2250. lbs  
 Moment = 724800. in-lbs  
 Axial Load = 3800. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.00000	0.13628299	807639.	-24038.
8.55000	0.28245511	799622.	-26022.
8.10000	0.71937315	789927.	-29028.
7.65000	1.85335220	783239.	-32667.
7.20000	4.49186775	779331.	-36442.

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
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6.75000    13.56955461    786977.    -42032.

-----  
 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

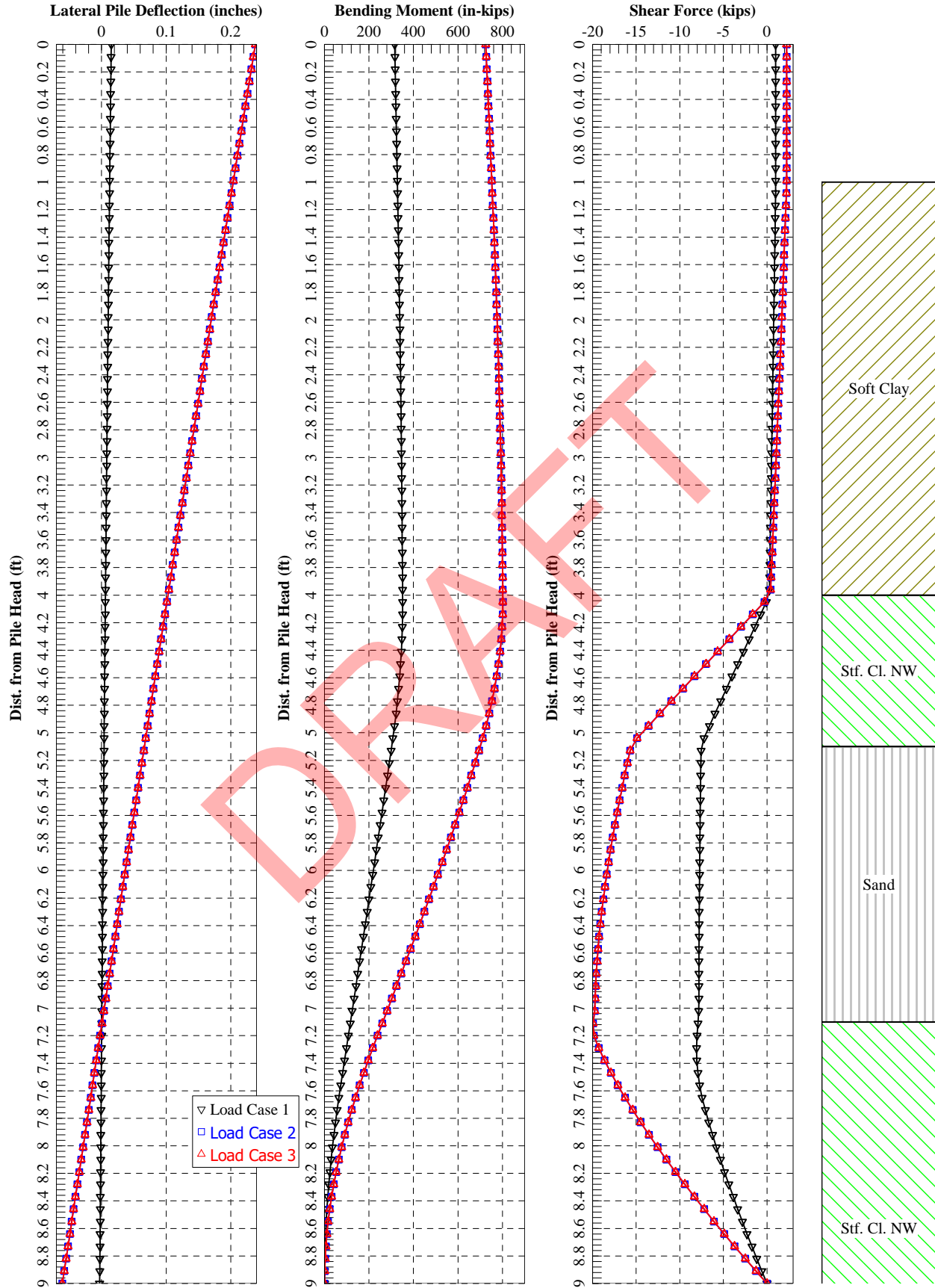
Load Case No.	Load Type	Load 1	Load 2	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max in lbs
		lbs	in-lb	lbs	inches	radians	
1	V, lb	1000.0000	M, in-lb	315600.	0.00776	-1.35E-04	
-9828.		354229.		4200.			
2	V, lb	2250.	M, in-lb	724800.	0.1364	-0.00186	
-24042.		807704.		4600.			
3	V, lb	2250.	M, in-lb	724800.	0.1363	-0.00186	
-24038.		807639.		3800.			

Maximum pile-head deflection = 0.1363702339 inches

Maximum pile-head rotation = -0.0018622811 radians = -0.106701 deg.

The analysis ended normally.

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
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TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

=====

LPILE for Version 2022-12.012

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License Type : (Single User License)

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

This model was prepared by:  
BSears

-----

Files Used for Analysis

-----

Path to file locations:  
\Columbus-1170\Projects\2024\24170232\_ms\_TP 26 NE Ohio\GEO\Project Docs\Site  
12\_SUM-77 (STONE)\Calcs\Light Towers\

Name of input data file:  
Tower TN-9 (B-008).lp12d

Name of output report file:  
Tower TN-9 (B-008).lp12o

Name of plot output file:  
Tower TN-9 (B-008).lp12p

Name of runtime message file:  
Tower TN-9 (B-008).lp12r

-----

Date and Time of Analysis

-----

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Date: October 24, 2025

Time: 9:09:09

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

Project Name: TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area

Job Number: 24170232D

Client: ms consultants, inc.

Engineer: BKS

Description: Light Tower TN-9 (B-008-0-25)

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

Computational Options:

- 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

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- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- 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
- Input of moment 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	=	9.000 ft
Depth of ground surface below top of pile	=	1.0000 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	36.0000
2	9.000	36.0000

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

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile		
Length of section	=	9.000000 ft
Shaft Diameter	=	36.000000 in



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

The soil profile is modelled using 6 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	1.000000	ft
Distance from top of pile to bottom of layer	=	4.000000	ft
Effective unit weight at top of layer	=	98.000000	pcf
Effective unit weight at bottom of layer	=	98.000000	pcf
Undrained cohesion at top of layer	=	250.000000	psf
Undrained cohesion at bottom of layer	=	250.000000	psf
Epsilon-50 at top of layer	=	0.020000	
Epsilon-50 at bottom of layer	=	0.020000	

Layer 2 is stiff clay without free water

Distance from top of pile to top of layer	=	4.000000	ft
Distance from top of pile to bottom of layer	=	5.100000	ft
Effective unit weight at top of layer	=	115.000000	pcf
Effective unit weight at bottom of layer	=	115.000000	pcf
Undrained cohesion at top of layer	=	4500.	psf
Undrained cohesion at bottom of layer	=	4500.	psf
Epsilon-50 at top of layer	=	0.004000	
Epsilon-50 at bottom of layer	=	0.004000	

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	5.100000	ft
Distance from top of pile to bottom of layer	=	7.100000	ft
Effective unit weight at top of layer	=	115.000000	pcf
Effective unit weight at bottom of layer	=	115.000000	pcf
Friction angle at top of layer	=	32.000000	deg.
Friction angle at bottom of layer	=	32.000000	deg.
Subgrade k at top of layer	=	90.000000	pci
Subgrade k at bottom of layer	=	90.000000	pci

Layer 4 is stiff clay without free water

Distance from top of pile to top of layer	=	7.100000	ft
Distance from top of pile to bottom of layer	=	10.100000	ft
Effective unit weight at top of layer	=	115.000000	pcf

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Effective unit weight at bottom of layer = 115.000000 pcf  
 Undrained cohesion at top of layer = 4000. psf  
 Undrained cohesion at bottom of layer = 4000. psf  
 Epsilon-50 at top of layer = 0.005000  
 Epsilon-50 at bottom of layer = 0.005000

Layer 5 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 10.100000 ft  
 Distance from top of pile to bottom of layer = 13.100000 ft  
 Effective unit weight at top of layer = 118.000000 pcf  
 Effective unit weight at bottom of layer = 118.000000 pcf  
 Friction angle at top of layer = 31.000000 deg.  
 Friction angle at bottom of layer = 31.000000 deg.  
 Subgrade k at top of layer = 90.000000 pci  
 Subgrade k at bottom of layer = 90.000000 pci

Layer 6 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 13.100000 ft  
 Distance from top of pile to bottom of layer = 24.600000 ft  
 Effective unit weight at top of layer = 66.000000 pcf  
 Effective unit weight at bottom of layer = 66.000000 pcf  
 Friction angle at top of layer = 33.000000 deg.  
 Friction angle at bottom of layer = 33.000000 deg.  
 Subgrade k at top of layer = 60.000000 pci  
 Subgrade k at bottom of layer = 60.000000 pci

(Depth of the lowest soil layer extends 15.600 ft below the pile tip)

-----  
 Summary of Input Soil Properties  
 -----

Layer E50 Num. or krm	Soil Type Name kpy (p-y Curve Type) pci	Layer Depth ft	Effective Unit Wt. pcf	Cohesion psf	Angle of Friction deg.
1	Soft	1.0000	98.0000	250.0000	--
0.02000	--				
	Clay	4.0000	98.0000	250.0000	--

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0.02000	--				
2	Stiff Clay	4.0000	115.0000	4500.	--
0.00400	--				
	w/o Free Water	5.1000	115.0000	4500.	--
0.00400	--				
3	Sand	5.1000	115.0000	--	32.0000
--	90.0000				
	(Reese, et al.)	7.1000	115.0000	--	32.0000
--	90.0000				
4	Stiff Clay	7.1000	115.0000	4000.	--
0.00500	--				
	w/o Free Water	10.1000	115.0000	4000.	--
0.00500	--				
5	Sand	10.1000	118.0000	--	31.0000
--	90.0000				
	(Reese, et al.)	13.1000	118.0000	--	31.0000
--	90.0000				
6	Sand	13.1000	66.0000	--	33.0000
--	60.0000				
	(Reese, et al.)	24.6000	66.0000	--	33.0000
--	60.0000				

-----  
 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 Compute No.	Load Top y Type	Condition Run Analysis 1	Condition 2	Axial Thrust Force, lbs
vs. Pile Length				
1	1	V = 1000.000000 lbs	M = 315600. in-lbs	4200.
Yes		Yes		
2	1	V = 2250. lbs	M = 724800. in-lbs	4600.
Yes		Yes		
3	1	V = 2250. lbs	M = 724800. in-lbs	3800.
Yes		Yes		

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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:  
-----

Dimensions and Properties of Drilled Shaft (Bored Pile):  
-----

Length of Section	=	9.000000 ft
Shaft Diameter	=	36.000000 in
Concrete Cover Thickness (to edge of trans. reinf.)	=	3.500000 in
Number of Reinforcing Bars	=	16 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	1018. sq. in.
Total Area of Reinforcing Steel	=	16.000000 sq. in.
Area Ratio of Steel Reinforcement	=	1.57 percent
Edge-to-Edge Bar Spacing	=	4.114467 in
Maximum Concrete Aggregate Size	=	0.750000 in
Ratio of Bar Spacing to Aggregate Size	=	5.49
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in
Transverse Reinforcement		
Type: Spiral		
Number of Transverse Reinf. (per spacing)	=	1
Spacing of Transverse Reinf.	=	4.500000 in
Yield Stress of Transverse Reinf.	=	60000. psi
Diameter of Transverse Reinf.	=	0.500000 in

Axial Structural Capacities:  
-----

Nom. Axial Structural Capacity = $0.85 F_c A_c + F_y A_s$	=	4366.378 kips
Tensile Load for Cracking of Concrete	=	-470.222 kips

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Nominal Axial Tensile Capacity = -960.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.128000	1.000000	13.436000	0.000000
2	1.128000	1.000000	12.413245	5.141735
3	1.128000	1.000000	9.500687	9.500687
4	1.128000	1.000000	5.141735	12.413245
5	1.128000	1.000000	0.000000	13.436000
6	1.128000	1.000000	-5.14173	12.413245
7	1.128000	1.000000	-9.50069	9.500687
8	1.128000	1.000000	-12.41325	5.141735
9	1.128000	1.000000	-13.43600	0.000000
10	1.128000	1.000000	-12.41325	-5.14173
11	1.128000	1.000000	-9.50069	-9.50069
12	1.128000	1.000000	-5.14173	-12.41325
13	1.128000	1.000000	0.000000	-13.43600
14	1.128000	1.000000	5.141735	-12.41325
15	1.128000	1.000000	9.500687	-9.50069
16	1.128000	1.000000	12.413245	-5.14173

NOTE: The positions of the above rebars were computed by LPILE

Minimum spacing between any two bars not equal to zero = 4.114 inches  
 between bars 11 and 12.

Ratio of bar spacing to maximum aggregate size = 5.49

Concrete Properties:

Compressive Strength of Concrete	=	4000. psi
Modulus of Elasticity of Concrete	=	3604997. psi
Modulus of Rupture of Concrete	=	-474.34165 psi
Compression Strain at Peak Stress	=	0.001886
Tensile Strain at Fracture of Concrete	=	-0.0001154
Maximum Coarse Aggregate Size	=	0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 3

Number	Axial Thrust Force kips
-----	-----

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1	3.800
2	4.200
3	4.600

Definitions of Run Messages and Notes:  
 -----

C = concrete in section has cracked in tension.  
 Y = stress in reinforcing steel has reached yield stress.  
 T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318-14, Section 21.2.3.  
 Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.  
 Position of neutral axis is measured from edge of compression side of pile.  
 Compressive stresses and strains are positive in sign.  
 Tensile stresses and strains are negative in sign.

Axial Thrust Force = 3.800 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
6.25000E-07	240.5062135	384809942.	19.2929823	0.00001206	-0.00001044
0.0505030	0.2746478				
0.00000125	480.1472468	384117797.	18.6479768	0.00002331	-0.00002169
0.0973082	0.5259142				
0.00000188	718.9174733	383422652.	18.4329804	0.00003456	-0.00003294
0.1438345	0.7771808				
0.00000250	956.8168886	382726755.	18.3254857	0.00004581	-0.00004419
0.1900818	1.0284477				
0.00000313	1194.	382030558.	18.2609917	0.00005707	-0.00005543
0.2360502	1.2797149				
0.00000375	1430.	381334209.	18.2179981	0.00006832	-0.00006668
0.2817396	1.5309823				
0.00000438	1665.	380637775.	18.1872904	0.00007957	-0.00007793
0.3271500	1.7822500				
0.00000500	1900.	379941287.	18.1642614	0.00009082	-0.00008918
0.3722815	2.0335179				
0.00000563	2133.	379244764.	18.1463515	0.0001021	-0.000100
0.4171340	2.2847861				

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0.00000625	2366.	378548215.	18.1320251	0.0001133	-0.000112
0.4617075	2.5360546				
0.00000688	2366.	344134741.	10.2494785	0.00007047	-0.000177
0.2882187	-4.308598 C				
0.00000750	2366.	315456846.	10.2198771	0.00007665	-0.000193
0.3129821	-4.706727 C				
0.00000813	2366.	291190934.	10.1952302	0.00008284	-0.000210
0.3376758	-5.104761 C				
0.00000875	2366.	270391582.	10.1744772	0.00008903	-0.000226
0.3622998	-5.502701 C				
0.00000938	2366.	252365477.	10.1568402	0.00009522	-0.000242
0.3868539	-5.900547 C				
0.00001000	2366.	236592634.	10.1417358	0.0001014	-0.000259
0.4113380	-6.298297 C				
0.00001063	2366.	222675420.	10.1287027	0.0001076	-0.000275
0.4357521	-6.695951 C				
0.00001125	2366.	210304564.	10.1174231	0.0001138	-0.000291
0.4600960	-7.093510 C				
0.00001188	2366.	199235903.	10.1076093	0.0001200	-0.000307
0.4843696	-7.490973 C				
0.00001250	2366.	189274107.	10.0990420	0.0001262	-0.000324
0.5085729	-7.888340 C				
0.00001313	2366.	180261055.	10.0915439	0.0001325	-0.000340
0.5327056	-8.285611 C				
0.00001375	2366.	172067370.	10.0849699	0.0001387	-0.000356
0.5567678	-8.682785 C				
0.00001438	2366.	164586180.	10.0792000	0.0001449	-0.000373
0.5807594	-9.079861 C				
0.00001500	2366.	157728423.	10.0741344	0.0001511	-0.000389
0.6046801	-9.476841 C				
0.00001563	2366.	151419286.	10.0696892	0.0001573	-0.000405
0.6285300	-9.873723 C				
0.00001625	2366.	145595467.	10.0657933	0.0001636	-0.000421
0.6523089	-10.270507 C				
0.00001688	2366.	140203043.	10.0623863	0.0001698	-0.000438
0.6760167	-10.667193 C				
0.00001750	2366.	135195791.	10.0594163	0.0001760	-0.000454
0.6996534	-11.063781 C				
0.00001813	2366.	130533867.	10.0568387	0.0001823	-0.000470
0.7232187	-11.460271 C				
0.00001875	2366.	126182738.	10.0546147	0.0001885	-0.000486
0.7467127	-11.856661 C				
0.00001938	2366.	122112327.	10.0527107	0.0001948	-0.000503
0.7701352	-12.252952 C				
0.00002000	2366.	118296317.	10.0510970	0.0002010	-0.000519
0.7934860	-12.649144 C				
0.00002063	2366.	114711580.	10.0497478	0.0002073	-0.000535
0.8167652	-13.045236 C				
0.00002125	2366.	111337710.	10.0486401	0.0002135	-0.000551
0.8399726	-13.441228 C				

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0.00002188	2366.	108156633.	10.0477539	0.0002198	-0.000568
0.8631080	-13.837120 C				
0.00002250	2366.	105152282.	10.0470709	0.0002261	-0.000584
0.8861714	-14.232911 C				
0.00002313	2366.	102310328.	10.0465752	0.0002323	-0.000600
0.9091627	-14.628602 C				
0.00002375	2366.	99617951.	10.0462524	0.0002386	-0.000616
0.9320817	-15.024191 C				
0.00002438	2366.	97063645.	10.0460897	0.0002449	-0.000633
0.9549284	-15.419678 C				
0.00002563	2429.	94800037.	10.0461990	0.0002574	-0.000665
1.0004043	-16.210348 C				
0.00002688	2545.	94692477.	10.0468231	0.0002700	-0.000697
1.0455896	-17.000609 C				
0.00002813	2660.	94589756.	10.0479254	0.0002826	-0.000730
1.0904832	-17.790458 C				
0.00002938	2776.	94491232.	10.0493946	0.0002952	-0.000762
1.1350844	-18.579893 C				
0.00003063	2891.	94396370.	10.0512127	0.0003078	-0.000795
1.1793922	-19.368912 C				
0.00003188	3006.	94304718.	10.0533415	0.0003205	-0.000827
1.2234058	-20.157511 C				
0.00003313	3121.	94215891.	10.0557483	0.0003331	-0.000859
1.2671243	-20.945689 C				
0.00003438	3236.	94129561.	10.0584054	0.0003458	-0.000892
1.3105466	-21.733443 C				
0.00003563	3350.	94045446.	10.0612887	0.0003584	-0.000924
1.3536720	-22.520771 C				
0.00003688	3465.	93963300.	10.0643778	0.0003711	-0.000956
1.3964994	-23.307669 C				
0.00003813	3579.	93882912.	10.0676547	0.0003838	-0.000989
1.4390279	-24.094136 C				
0.00003938	3694.	93804096.	10.0711039	0.0003965	-0.001021
1.4812567	-24.880169 C				
0.00004063	3808.	93726688.	10.0747116	0.0004093	-0.001053
1.5231846	-25.665765 C				
0.00004188	3922.	93650546.	10.0784659	0.0004220	-0.001085
1.5648108	-26.450921 C				
0.00004313	4035.	93575540.	10.0823562	0.0004348	-0.001118
1.6061342	-27.235635 C				
0.00004438	4149.	93501560.	10.0863731	0.0004476	-0.001150
1.6471540	-28.019904 C				
0.00004563	4263.	93428502.	10.0905084	0.0004604	-0.001182
1.6878690	-28.803725 C				
0.00004688	4376.	93356279.	10.0947545	0.0004732	-0.001214
1.7282784	-29.587096 C				
0.00004813	4489.	93284807.	10.0991050	0.0004860	-0.001246
1.7683810	-30.370013 C				
0.00004938	4602.	93214014.	10.1035538	0.0004989	-0.001279
1.8081759	-31.152474 C				



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00005063	4715.	93143835.	10.1080956	0.0005117	-0.001311
1.8476620	-31.934476 C				
0.00005188	4828.	93074209.	10.1127258	0.0005246	-0.001343
1.8868384	-32.716016 C				
0.00005313	4941.	93005082.	10.1174399	0.0005375	-0.001375
1.9257039	-33.497091 C				
0.00005438	5053.	92936405.	10.1222340	0.0005504	-0.001407
1.9642575	-34.277698 C				
0.00005563	5166.	92868132.	10.1271047	0.0005633	-0.001439
2.0024981	-35.057833 C				
0.00005688	5278.	92800222.	10.1320488	0.0005763	-0.001471
2.0404247	-35.837495 C				
0.00005813	5390.	92732637.	10.1370633	0.0005892	-0.001503
2.0780361	-36.616679 C				
0.00005938	5502.	92665342.	10.1421457	0.0006022	-0.001535
2.1153313	-37.395383 C				
0.00006063	5614.	92598305.	10.1472935	0.0006152	-0.001567
2.1523092	-38.173604 C				
0.00006188	5725.	92531497.	10.1525046	0.0006282	-0.001599
2.1889685	-38.951338 C				
0.00006313	5837.	92464888.	10.1577769	0.0006412	-0.001631
2.2253083	-39.728581 C				
0.00006438	5948.	92398455.	10.1631088	0.0006543	-0.001663
2.2613274	-40.505332 C				
0.00006563	6059.	92332173.	10.1684984	0.0006673	-0.001695
2.2970245	-41.281586 C				
0.00006688	6170.	92266020.	10.1739444	0.0006804	-0.001727
2.3323987	-42.057340 C				
0.00006813	6281.	92199976.	10.1794453	0.0006935	-0.001759
2.3674485	-42.832591 C				
0.00006938	6392.	92134020.	10.1849998	0.0007066	-0.001791
2.4021730	-43.607335 C				
0.00007063	6502.	92068136.	10.1906070	0.0007197	-0.001823
2.4365708	-44.381568 C				
0.00007188	6613.	92002305.	10.1962656	0.0007329	-0.001855
2.4706408	-45.155288 C				
0.00007313	6723.	91936511.	10.2020028	0.0007460	-0.001886
2.5043818	-45.928490 C				
0.00007438	6833.	91870742.	10.2077616	0.0007592	-0.001918
2.5377924	-46.701172 C				
0.00007938	7271.	91607617.	10.2312788	0.0008121	-0.002045
2.6681070	-49.786612 C				
0.00008438	7707.	91343844.	10.2555391	0.0008653	-0.002172
2.7930345	-52.863415 C				
0.00008938	8140.	91079227.	10.2796933	0.0009187	-0.002299
2.9123325	-55.933382 C				
0.00009438	8570.	90813004.	10.3043877	0.0009725	-0.002425
3.0260259	-58.995009 C				
0.00009938	8979.	90357411.	10.3225581	0.0010258	-0.002552
3.1326575	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0001044	9304.	89144470.	10.3110511	0.0010762	-0.002681
3.2276850	-60.000000 CY				
0.0001094	9546.	87273573.	10.2718035	0.0011235	-0.002814
3.3116704	-60.000000 CY				
0.0001144	9782.	85523680.	10.2357064	0.0011707	-0.002947
3.3907664	-60.000000 CY				
0.0001194	10004.	83800225.	10.1987328	0.0012175	-0.003080
3.4643165	-60.000000 CY				
0.0001244	10154.	81641326.	10.1374818	0.0012608	-0.003217
3.5282172	-60.000000 CY				
0.0001294	10287.	79513660.	10.0756441	0.0013035	-0.003354
3.5871212	-60.000000 CY				
0.0001344	10419.	77536664.	10.0197410	0.0013464	-0.003491
3.6423258	-60.000000 CY				
0.0001394	10550.	75693983.	9.9691573	0.0013895	-0.003628
3.6937845	-60.000000 CY				
0.0001444	10680.	73971519.	9.9233661	0.0014327	-0.003765
3.7414497	-60.000000 CY				
0.0001494	10808.	72355946.	9.8810316	0.0014760	-0.003902
3.7851328	-60.000000 CY				
0.0001544	10925.	70772035.	9.8368433	0.0015186	-0.004039
3.8241552	-60.000000 CY				
0.0001594	11008.	69072220.	9.7809580	0.0015588	-0.004179
3.8574366	-60.000000 CY				
0.0001644	11071.	67351790.	9.7204156	0.0015978	-0.004320
3.8862696	-60.000000 CY				
0.0001694	11131.	65719446.	9.6635689	0.0016368	-0.004461
3.9118664	-60.000000 CY				
0.0001744	11191.	64176802.	9.6094393	0.0016756	-0.004602
3.9342902	-60.000000 CY				
0.0001794	11250.	62716278.	9.5601863	0.0017149	-0.004743
3.9535015	-60.000000 CY				
0.0001844	11308.	61329164.	9.5136161	0.0017541	-0.004883
3.9693617	-60.000000 CY				
0.0001894	11364.	60009896.	9.4690774	0.0017932	-0.005024
3.9819050	-60.000000 CY				
0.0001944	11420.	58754909.	9.4280227	0.0018326	-0.005165
3.9911986	-60.000000 CY				
0.0001994	11476.	57559296.	9.3897594	0.0018721	-0.005305
3.9971986	-60.000000 CY				
0.0002044	11531.	56418622.	9.3531932	0.0019116	-0.005446
3.9998595	-60.000000 CY				
0.0002094	11584.	55328385.	9.3201259	0.0019514	-0.005586
3.9974517	-60.000000 CY				
0.0002144	11637.	54285454.	9.2909722	0.0019918	-0.005726
3.9998812	-60.000000 CY				
0.0002194	11690.	53285909.	9.2626721	0.0020320	-0.005866
3.9969940	-60.000000 CY				
0.0002244	11740.	52321336.	9.2356724	0.0020723	-0.006005
3.9997138	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0002294	11786.	51384137.	9.2093226	0.0021124	-0.006145
3.9955528	-60.000000 CY				
0.0002344	11823.	50445667.	9.1796872	0.0021515	-0.006286
3.9989818	-60.000000 CY				
0.0002394	11855.	49524943.	9.1473565	0.0021896	-0.006428
3.9994466	-60.000000 CY				
0.0002444	11876.	48598228.	9.1109548	0.0022265	-0.006571
3.9965160	-60.000000 CY				
0.0002494	11895.	47701101.	9.0745971	0.0022630	-0.006715
3.9991770	-60.000000 CY				
0.0002544	11912.	46829816.	9.0405915	0.0022997	-0.006858
3.9995775	-60.000000 CY				
0.0002594	11929.	45990067.	9.0077660	0.0023364	-0.007001
3.9954763	-60.000000 CY				
0.0002644	11945.	45181124.	8.9766457	0.0023732	-0.007144
3.9984997	-60.000000 CY				
0.0002694	11961.	44401256.	8.9468563	0.0024101	-0.007287
3.9998981	-60.000000 CY				
0.0002744	11976.	43648250.	8.9191370	0.0024472	-0.007430
3.9944635	-60.000000 CY				
0.0003044	12062.	39628140.	8.7757363	0.0026711	-0.008286
3.9984635	-60.000000 CY				
0.0003344	12138.	36300180.	8.6628609	0.0028966	-0.009141
3.9998209	-60.000000 CY				
0.0003644	12207.	33502446.	8.5793723	0.0031261	-0.009991
3.9999551	-60.000000 CYT				
0.0003944	12272.	31117026.	8.5161103	0.0033585	-0.010839
3.9996166	-60.000000 CYT				
0.0004244	12331.	29056485.	8.4674428	0.0035934	-0.011684
3.9972132	-60.000000 CYT				
0.0004544	12377.	27238942.	8.4178614	0.0038249	-0.012533
3.9873462	-60.000000 CYT				

Axial Thrust Force = 4.200 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
<hr/>					
6.25000E-07	240.5049676	384807948.	19.4290859	0.00001214	-0.00001036
0.0508615	0.2771147				
0.00000125	480.1459926	384116794.	18.7161837	0.00002340	-0.00002160
0.0976654	0.5283867				
0.00000188	718.9162127	383421980.	18.4785558	0.00003465	-0.00003285
0.1441903	0.7796589				

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 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00000250	956.8156222	382726249.	18.3597458	0.00004590	-0.00004410
0.1904363	1.0309315				
0.00000313	1194.	382030150.	18.2884629	0.00005715	-0.00005535
0.2364034	1.2822044				
0.00000375	1430.	381333869.	18.2409436	0.00006840	-0.00006660
0.2820914	1.5334776				
0.00000438	1665.	380637482.	18.2070035	0.00007966	-0.00007784
0.3275005	1.7847511				
0.00000500	1900.	379941029.	18.1815504	0.00009091	-0.00008909
0.3726306	2.0360248				
0.00000563	2133.	379244533.	18.1617553	0.0001022	-0.000100
0.4174818	2.2872988				
0.00000625	2366.	378548006.	18.1459208	0.0001134	-0.000112
0.4620539	2.5385732				
0.00000688	2366.	344134551.	10.2895004	0.00007074	-0.000177
0.2893429	-4.300617 C				
0.00000750	2366.	315456672.	10.2575513	0.00007693	-0.000193
0.3141325	-4.698533 C				
0.00000813	2366.	291190774.	10.2300378	0.00008312	-0.000209
0.3388235	-5.096560 C				
0.00000875	2366.	270391433.	10.2068278	0.00008931	-0.000226
0.3634446	-5.494492 C				
0.00000938	2366.	252365338.	10.1870615	0.00009550	-0.000242
0.3879959	-5.892330 C				
0.00001000	2366.	236592504.	10.1700940	0.0001017	-0.000258
0.4124772	-6.290073 C				
0.00001063	2366.	222675298.	10.1554324	0.0001079	-0.000275
0.4368884	-6.687720 C				
0.00001125	2366.	210304448.	10.1426931	0.0001141	-0.000291
0.4612294	-7.085271 C				
0.00001188	2366.	199235793.	10.1315564	0.0001203	-0.000307
0.4855002	-7.482727 C				
0.00001250	2366.	189274003.	10.1218127	0.0001265	-0.000323
0.5097005	-7.880086 C				
0.00001313	2366.	180260955.	10.1132503	0.0001327	-0.000340
0.5338304	-8.277349 C				
0.00001375	2366.	172067276.	10.1057088	0.0001390	-0.000356
0.5578898	-8.674515 C				
0.00001438	2366.	164586090.	10.0990556	0.0001452	-0.000372
0.5818784	-9.071585 C				
0.00001500	2366.	157728336.	10.0931803	0.0001514	-0.000389
0.6057963	-9.468556 C				
0.00001563	2366.	151419203.	10.0879903	0.0001576	-0.000405
0.6296433	-9.865431 C				
0.00001625	2366.	145595387.	10.0834069	0.0001639	-0.000421
0.6534193	-10.262207 C				
0.00001688	2366.	140202965.	10.0793634	0.0001701	-0.000437
0.6771242	-10.658886 C				
0.00001750	2366.	135195717.	10.0758025	0.0001763	-0.000454
0.7007579	-11.055466 C				

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 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00001813	2366.	130533795.	10.0726747	0.0001826	-0.000470
0.7243204	-11.451947 C				
0.00001875	2366.	126182669.	10.0699372	0.0001888	-0.000486
0.7478114	-11.848330 C				
0.00001938	2366.	122112260.	10.0675528	0.0001951	-0.000502
0.7712309	-12.244613 C				
0.00002000	2366.	118296252.	10.0654889	0.0002013	-0.000519
0.7945789	-12.640797 C				
0.00002063	2366.	114711517.	10.0637168	0.0002076	-0.000535
0.8178551	-13.036882 C				
0.00002125	2366.	111337649.	10.0622112	0.0002138	-0.000551
0.8410595	-13.432866 C				
0.00002188	2366.	108156573.	10.0609497	0.0002201	-0.000567
0.8641920	-13.828750 C				
0.00002250	2366.	105152224.	10.0599125	0.0002263	-0.000584
0.8872524	-14.224533 C				
0.00002313	2366.	102310272.	10.0590817	0.0002326	-0.000600
0.9102407	-14.620215 C				
0.00002375	2366.	99617896.	10.0584414	0.0002389	-0.000616
0.9331568	-15.015796 C				
0.00002438	2366.	97063591.	10.0579776	0.0002452	-0.000632
0.9560005	-15.411276 C				
0.00002563	2432.	94924068.	10.0575288	0.0002577	-0.000665
1.0014704	-16.201930 C				
0.00002688	2548.	94810571.	10.0576469	0.0002703	-0.000697
1.0466496	-16.992174 C				
0.00002813	2664.	94702439.	10.0582592	0.0002829	-0.000730
1.0915372	-17.782007 C				
0.00002938	2779.	94598964.	10.0593353	0.0002955	-0.000762
1.1361324	-18.571425 C				
0.00003063	2894.	94499555.	10.0607664	0.0003081	-0.000794
1.1804341	-19.360427 C				
0.00003188	3009.	94403710.	10.0625387	0.0003207	-0.000827
1.2244416	-20.149010 C				
0.00003313	3124.	94311007.	10.0646159	0.0003334	-0.000859
1.2681539	-20.937171 C				
0.00003438	3239.	94221082.	10.0669675	0.0003461	-0.000891
1.3115700	-21.724908 C				
0.00003563	3354.	94133623.	10.0695670	0.0003587	-0.000924
1.3546892	-22.512219 C				
0.00003688	3468.	94048359.	10.0723915	0.0003714	-0.000956
1.3975103	-23.299100 C				
0.00003813	3582.	93965057.	10.0754214	0.0003841	-0.000988
1.4400326	-24.085550 C				
0.00003938	3697.	93883511.	10.0786392	0.0003968	-0.001021
1.4822550	-24.871565 C				
0.00004063	3811.	93803541.	10.0820299	0.0004096	-0.001053
1.5241766	-25.657144 C				
0.00004188	3925.	93724988.	10.0855803	0.0004223	-0.001085
1.5657965	-26.442282 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
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 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00004313	4039.	93647711.	10.0892786	0.0004351	-0.001117
1.6071135	-27.226979 C				
0.00004438	4152.	93571586.	10.0931145	0.0004479	-0.001150
1.6481268	-28.011230 C				
0.00004563	4266.	93496502.	10.0970787	0.0004607	-0.001182
1.6888354	-28.795033 C				
0.00004688	4379.	93422358.	10.1011630	0.0004735	-0.001214
1.7292383	-29.578385 C				
0.00004813	4492.	93349066.	10.1053601	0.0004863	-0.001246
1.7693344	-30.361284 C				
0.00004938	4606.	93276544.	10.1096634	0.0004992	-0.001278
1.8091228	-31.143727 C				
0.00005063	4718.	93204721.	10.1140670	0.0005120	-0.001310
1.8486023	-31.925710 C				
0.00005188	4831.	93133529.	10.1185657	0.0005249	-0.001343
1.8877721	-32.707231 C				
0.00005313	4944.	93062909.	10.1231546	0.0005378	-0.001375
1.9266309	-33.488287 C				
0.00005438	5056.	92992807.	10.1278294	0.0005507	-0.001407
1.9651778	-34.268875 C				
0.00005563	5169.	92923173.	10.1325862	0.0005636	-0.001439
2.0034117	-35.048992 C				
0.00005688	5281.	92853961.	10.1374215	0.0005766	-0.001471
2.0413316	-35.828634 C				
0.00005813	5393.	92785130.	10.1423320	0.0005895	-0.001503
2.0789362	-36.607799 C				
0.00005938	5505.	92716640.	10.1473148	0.0006025	-0.001535
2.1162246	-37.386484 C				
0.00006063	5617.	92648458.	10.1523672	0.0006155	-0.001567
2.1531956	-38.164685 C				
0.00006188	5728.	92580549.	10.1574868	0.0006285	-0.001599
2.1898481	-38.942399 C				
0.00006313	5840.	92512883.	10.1626714	0.0006415	-0.001631
2.2261809	-39.719622 C				
0.00006438	5951.	92445433.	10.1679189	0.0006546	-0.001663
2.2621930	-40.496353 C				
0.00006563	6062.	92378172.	10.1732276	0.0006676	-0.001695
2.2978832	-41.272587 C				
0.00006688	6173.	92311077.	10.1785957	0.0006807	-0.001727
2.3332503	-42.048320 C				
0.00006813	6284.	92244124.	10.1840217	0.0006938	-0.001759
2.3682931	-42.823550 C				
0.00006938	6395.	92177292.	10.1895041	0.0007069	-0.001791
2.4030104	-43.598274 C				
0.00007063	6505.	92110561.	10.1950417	0.0007200	-0.001822
2.4374011	-44.372486 C				
0.00007188	6616.	92043913.	10.2006608	0.0007332	-0.001854
2.4714639	-45.146185 C				
0.00007313	6726.	91977331.	10.2063053	0.0007463	-0.001886
2.5051976	-45.919366 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00007438	6836.	91910797.	10.2120017	0.0007595	-0.001918
2.5386010	-46.692026 C				
0.00007938	7274.	91644853.	10.2352897	0.0008124	-0.002045
2.6688860	-49.777380 C				
0.00008438	7710.	91378587.	10.2593338	0.0008656	-0.002172
2.7937834	-52.854093 C				
0.00008938	8143.	91111830.	10.2831857	0.0009191	-0.002298
2.9130226	-55.924331 C				
0.00009438	8573.	90843621.	10.3077273	0.0009728	-0.002425
3.0266854	-58.985869 C				
0.00009938	8982.	90387473.	10.3258078	0.0010261	-0.002551
3.1332951	-60.000000 CY				
0.0001044	9308.	89176212.	10.3143071	0.0010766	-0.002681
3.2283182	-60.000000 CY				
0.0001094	9549.	87304848.	10.2749831	0.0011238	-0.002814
3.3122821	-60.000000 CY				
0.0001144	9785.	85553556.	10.2389100	0.0011711	-0.002946
3.3913727	-60.000000 CY				
0.0001194	10007.	83830919.	10.2019402	0.0012179	-0.003080
3.4649106	-60.000000 CY				
0.0001244	10158.	81671814.	10.1406407	0.0012612	-0.003216
3.5287895	-60.000000 CY				
0.0001294	10291.	79542859.	10.0787027	0.0013039	-0.003354
3.5876602	-60.000000 CY				
0.0001344	10423.	77564670.	10.0227059	0.0013468	-0.003491
3.6428308	-60.000000 CY				
0.0001394	10554.	75720878.	9.9720357	0.0013899	-0.003628
3.6942550	-60.000000 CY				
0.0001444	10683.	73997378.	9.9261646	0.0014331	-0.003764
3.7418850	-60.000000 CY				
0.0001494	10812.	72381005.	9.8838986	0.0014764	-0.003901
3.7855535	-60.000000 CY				
0.0001544	10929.	70796718.	9.8396771	0.0015190	-0.004038
3.8245440	-60.000000 CY				
0.0001594	11012.	69097838.	9.7838573	0.0015593	-0.004178
3.8578061	-60.000000 CY				
0.0001644	11075.	67376662.	9.7232508	0.0015983	-0.004319
3.8866026	-60.000000 CY				
0.0001694	11135.	65743511.	9.6663364	0.0016372	-0.004460
3.9121613	-60.000000 CY				
0.0001744	11195.	64200103.	9.6121495	0.0016761	-0.004601
3.9345463	-60.000000 CY				
0.0001794	11254.	62738857.	9.5628376	0.0017153	-0.004742
3.9537182	-60.000000 CY				
0.0001844	11312.	61351278.	9.5162917	0.0017546	-0.004883
3.9695496	-60.000000 CY				
0.0001894	11368.	60031354.	9.4717005	0.0017937	-0.005024
3.9820503	-60.000000 CY				
0.0001944	11425.	58775745.	9.4305957	0.0018331	-0.005164
3.9913005	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0001994	11480.	57579537.	9.3922863	0.0018726	-0.005305
3.9972564	-60.000000 CY				
0.0002044	11535.	56438298.	9.3556780	0.0019121	-0.005445
3.9998723	-60.000000 CY				
0.0002094	11588.	55347517.	9.3241700	0.0019522	-0.005585
3.9975077	-60.000000 CY				
0.0002144	11641.	54304067.	9.2934428	0.0019923	-0.005725
3.9998931	-60.000000 CY				
0.0002194	11694.	53304015.	9.2651074	0.0020325	-0.005865
3.9970558	-60.000000 CY				
0.0002244	11744.	52339157.	9.2380944	0.0020728	-0.006005
3.9997330	-60.000000 CY				
0.0002294	11790.	51401489.	9.2117130	0.0021129	-0.006145
3.9956300	-60.000000 CY				
0.0002344	11827.	50463153.	9.1821360	0.0021521	-0.006285
3.9990203	-60.000000 CY				
0.0002394	11859.	49542728.	9.1500193	0.0021903	-0.006427
3.9992468	-60.000000 CY				
0.0002444	11880.	48615611.	9.1135780	0.0022271	-0.006570
3.9965958	-60.000000 CY				
0.0002494	11900.	47718283.	9.0771076	0.0022636	-0.006714
3.9992162	-60.000000 CY				
0.0002544	11917.	46846598.	9.0431776	0.0023004	-0.006857
3.9993713	-60.000000 CY				
0.0002594	11933.	46006491.	9.0103157	0.0023371	-0.007000
3.9955701	-60.000000 CY				
0.0002644	11949.	45197204.	8.9791598	0.0023739	-0.007144
3.9985538	-60.000000 CY				
0.0002694	11965.	44417005.	8.9493437	0.0024107	-0.007287
3.9999119	-60.000000 CY				
0.0002744	11980.	43663657.	8.9215934	0.0024479	-0.007430
3.9942523	-60.000000 CY				
0.0003044	12066.	39641995.	8.7782176	0.0026719	-0.008286
3.9985257	-60.000000 CY				
0.0003344	12142.	36312646.	8.6652203	0.0028974	-0.009140
3.9998424	-60.000000 CY				
0.0003644	12212.	33513765.	8.5815911	0.0031269	-0.009991
3.9999658	-60.000000 CYT				
0.0003944	12276.	31127384.	8.5182268	0.0033594	-0.010838
3.9996505	-60.000000 CYT				
0.0004244	12335.	29066055.	8.4694819	0.0035942	-0.011683
3.9973093	-60.000000 CYT				
0.0004544	12381.	27248100.	8.4201387	0.0038259	-0.012532
3.9875919	-60.000000 CYT				

Axial Thrust Force = 4.600 kips

Bending Max Conc	Bending Max Steel	Bending Run	Depth to	Max Comp	Max Tens
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TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Curvature Stress rad/in. ksi	Moment Stress in-kip ksi	Stiffness Msg kip-in2	N Axis in	Strain in/in	Strain in/in
6.25000E-07	240.5035986	384805758.	19.5651901	0.00001223	-0.00001027
0.0512199	0.2795816				
0.00000125	480.1446137	384115691.	18.7843907	0.00002348	-0.00002152
0.0980225	0.5308592				
0.00000188	718.9148267	383421241.	18.5241312	0.00003473	-0.00003277
0.1445462	0.7821371				
0.00000250	956.8142298	382725692.	18.3940059	0.00004599	-0.00004401
0.1907908	1.0334154				
0.00000313	1194.	382029703.	18.3159341	0.00005724	-0.00005526
0.2367565	1.2846940				
0.00000375	1430.	381333494.	18.2638891	0.00006849	-0.00006651
0.2824433	1.5359729				
0.00000438	1665.	380637159.	18.2267166	0.00007974	-0.00007776
0.3278510	1.7872522				
0.00000500	1900.	379940746.	18.1988394	0.00009099	-0.00008901
0.3729798	2.0385317				
0.00000563	2133.	379244280.	18.1771590	0.0001022	-0.000100
0.4178295	2.2898116				
0.00000625	2366.	378547777.	18.1598165	0.0001135	-0.000112
0.4624003	2.5410917				
0.00000688	2366.	344134343.	10.3291778	0.00007101	-0.000176
0.2904571	-4.292706 C				
0.00000750	2366.	315456481.	10.2940289	0.00007721	-0.000193
0.3152465	-4.690597 C				
0.00000813	2366.	291190598.	10.2646762	0.00008340	-0.000209
0.3399656	-5.088396 C				
0.00000875	2366.	270391269.	10.2391817	0.00008959	-0.000225
0.3645893	-5.486283 C				
0.00000938	2366.	252365185.	10.2172859	0.00009579	-0.000242
0.3891378	-5.884113 C				
0.00001000	2366.	236592361.	10.1984552	0.0001020	-0.000258
0.4136162	-6.281848 C				
0.00001063	2366.	222675163.	10.1821496	0.0001082	-0.000274
0.4380246	-6.679488 C				
0.00001125	2366.	210304321.	10.1679490	0.0001144	-0.000291
0.4623628	-7.077032 C				
0.00001188	2366.	199235672.	10.1555219	0.0001206	-0.000307
0.4866307	-7.474480 C				
0.00001250	2366.	189273889.	10.1446030	0.0001268	-0.000323
0.5108282	-7.871831 C				
0.00001313	2366.	180260846.	10.1349589	0.0001330	-0.000339
0.5349552	-8.269087 C				
0.00001375	2366.	172067171.	10.1264498	0.0001392	-0.000356
0.5590117	-8.666245 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00001438	2366.	164585990.	10.1189132	0.0001455	-0.000372
0.5829974	-9.063307 C				
0.00001500	2366.	157728241.	10.1122282	0.0001517	-0.000388
0.6069124	-9.460271 C				
0.00001563	2366.	151419111.	10.1062933	0.0001579	-0.000405
0.6307565	-9.857138 C				
0.00001625	2366.	145595299.	10.1010224	0.0001641	-0.000421
0.6545296	-10.253907 C				
0.00001688	2366.	140202880.	10.0963423	0.0001704	-0.000437
0.6782316	-10.650577 C				
0.00001750	2366.	135195635.	10.0921903	0.0001766	-0.000453
0.7018624	-11.047150 C				
0.00001813	2366.	130533716.	10.0885122	0.0001829	-0.000470
0.7254219	-11.443623 C				
0.00001875	2366.	126182592.	10.0852613	0.0001891	-0.000486
0.7489100	-11.839998 C				
0.00001938	2366.	122112186.	10.0823966	0.0001953	-0.000502
0.7723266	-12.236274 C				
0.00002000	2366.	118296180.	10.0798824	0.0002016	-0.000518
0.7956716	-12.632450 C				
0.00002063	2366.	114711448.	10.0776874	0.0002079	-0.000535
0.8189449	-13.028526 C				
0.00002125	2366.	111337582.	10.0757837	0.0002141	-0.000551
0.8421464	-13.424502 C				
0.00002188	2366.	108156508.	10.0741470	0.0002204	-0.000567
0.8652759	-13.820378 C				
0.00002250	2366.	105152160.	10.0727554	0.0002266	-0.000583
0.8883333	-14.216153 C				
0.00002313	2366.	102310210.	10.0715894	0.0002329	-0.000600
0.9113187	-14.611828 C				
0.00002375	2366.	99617836.	10.0706317	0.0002392	-0.000616
0.9342318	-15.007401 C				
0.00002438	2366.	97063533.	10.0698667	0.0002455	-0.000632
0.9570725	-15.402873 C				
0.00002563	2436.	95048091.	10.0688598	0.0002580	-0.000664
1.0025364	-16.193510 C				
0.00002688	2551.	94928657.	10.0684718	0.0002706	-0.000697
1.0477096	-16.983738 C				
0.00002813	2667.	94815115.	10.0686232	0.0002832	-0.000729
1.0925912	-17.773555 C				
0.00002938	2782.	94706690.	10.0692479	0.0002958	-0.000762
1.1371802	-18.562957 C				
0.00003063	2897.	94602733.	10.0703211	0.0003084	-0.000794
1.1814759	-19.351942 C				
0.00003188	3012.	94502697.	10.0717368	0.0003210	-0.000826
1.2254772	-20.140508 C				
0.00003313	3127.	94406117.	10.0734845	0.0003337	-0.000859
1.2691834	-20.928652 C				
0.00003438	3242.	94312597.	10.0755306	0.0003463	-0.000891
1.3125933	-21.716373 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00003563	3357.	94221794.	10.0778462	0.0003590	-0.000923
1.3557063	-22.503666 C				
0.00003688	3471.	94133413.	10.0804061	0.0003717	-0.000956
1.3985212	-23.290530 C				
0.00003813	3586.	94047197.	10.0831888	0.0003844	-0.000988
1.4410372	-24.076963 C				
0.00003938	3700.	93962921.	10.0861753	0.0003971	-0.001020
1.4832533	-24.862961 C				
0.00004063	3814.	93880388.	10.0893491	0.0004099	-0.001053
1.5251686	-25.648521 C				
0.00004188	3928.	93799425.	10.0926956	0.0004226	-0.001085
1.5667821	-26.433642 C				
0.00004313	4042.	93719877.	10.0962019	0.0004354	-0.001117
1.6080927	-27.218321 C				
0.00004438	4155.	93641609.	10.0998566	0.0004482	-0.001149
1.6490996	-28.002554 C				
0.00004563	4269.	93564497.	10.1036497	0.0004610	-0.001182
1.6898018	-28.786339 C				
0.00004688	4382.	93488434.	10.1075722	0.0004738	-0.001214
1.7301982	-29.569674 C				
0.00004813	4496.	93413321.	10.1116159	0.0004866	-0.001246
1.7702878	-30.352554 C				
0.00004938	4609.	93339070.	10.1157737	0.0004995	-0.001278
1.8100696	-31.134978 C				
0.00005063	4722.	93265602.	10.1200391	0.0005123	-0.001310
1.8495425	-31.916943 C				
0.00005188	4834.	93192845.	10.1244063	0.0005252	-0.001342
1.8887057	-32.698446 C				
0.00005313	4947.	93120733.	10.1288700	0.0005381	-0.001374
1.9275579	-33.479483 C				
0.00005438	5060.	93049206.	10.1334255	0.0005510	-0.001406
1.9660981	-34.260052 C				
0.00005563	5172.	92978211.	10.1380684	0.0005639	-0.001439
2.0043253	-35.040149 C				
0.00005688	5284.	92907697.	10.1427948	0.0005769	-0.001471
2.0422384	-35.819772 C				
0.00005813	5396.	92837619.	10.1476012	0.0005898	-0.001503
2.0798362	-36.598918 C				
0.00005938	5508.	92767935.	10.1524844	0.0006028	-0.001535
2.1171178	-37.377583 C				
0.00006063	5620.	92698606.	10.1574414	0.0006158	-0.001567
2.1540819	-38.155764 C				
0.00006188	5731.	92629597.	10.1624696	0.0006288	-0.001599
2.1907275	-38.933458 C				
0.00006313	5843.	92560874.	10.1675664	0.0006418	-0.001631
2.2270535	-39.710662 C				
0.00006438	5954.	92492407.	10.1727297	0.0006549	-0.001663
2.2630586	-40.487373 C				
0.00006563	6065.	92424168.	10.1779574	0.0006679	-0.001695
2.2987417	-41.263586 C				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00006688	6176.	92356130.	10.1832476	0.0006810	-0.001726
2.3341018	-42.039299 C				
0.00006813	6287.	92288268.	10.1885986	0.0006941	-0.001758
2.3691375	-42.814509 C				
0.00006938	6398.	92220560.	10.1940089	0.0007072	-0.001790
2.4038477	-43.589211 C				
0.00007063	6508.	92152983.	10.1995039	0.0007203	-0.001822
2.4382312	-44.363403 C				
0.00007188	6619.	92085519.	10.2050285	0.0007335	-0.001854
2.4722868	-45.137081 C				
0.00007313	6729.	92018147.	10.2106084	0.0007467	-0.001886
2.5060133	-45.910241 C				
0.00007438	6839.	91950850.	10.2162424	0.0007598	-0.001918
2.5394094	-46.682880 C				
0.00007938	7277.	91682087.	10.2393011	0.0008127	-0.002045
2.6696649	-49.768146 C				
0.00008438	7713.	91413389.	10.2630109	0.0008659	-0.002172
2.7945082	-52.845065 C				
0.00008938	8146.	91144431.	10.2866786	0.0009194	-0.002298
2.9137126	-55.915279 C				
0.00009438	8576.	90874234.	10.3110673	0.0009731	-0.002424
3.0273448	-58.976728 C				
0.00009938	8985.	90417533.	10.3290580	0.0010265	-0.002551
3.1339327	-60.000000 CY				
0.0001044	9311.	89207952.	10.3175636	0.0010769	-0.002681
3.2289512	-60.000000 CY				
0.0001094	9552.	87336121.	10.2781631	0.0011242	-0.002813
3.3128936	-60.000000 CY				
0.0001144	9789.	85583430.	10.2421143	0.0011714	-0.002946
3.3919789	-60.000000 CY				
0.0001194	10011.	83861611.	10.2051482	0.0012182	-0.003079
3.4655044	-60.000000 CY				
0.0001244	10162.	81702300.	10.1438002	0.0012616	-0.003216
3.5293615	-60.000000 CY				
0.0001294	10295.	79572057.	10.0817619	0.0013043	-0.003353
3.5881988	-60.000000 CY				
0.0001344	10427.	77592674.	10.0256713	0.0013472	-0.003490
3.6433355	-60.000000 CY				
0.0001394	10557.	75747771.	9.9749147	0.0013903	-0.003627
3.6947252	-60.000000 CY				
0.0001444	10687.	74023236.	9.9289636	0.0014335	-0.003764
3.7423201	-60.000000 CY				
0.0001494	10816.	72406063.	9.8867661	0.0014768	-0.003901
3.7859739	-60.000000 CY				
0.0001544	10933.	70821400.	9.8425115	0.0015194	-0.004038
3.8249324	-60.000000 CY				
0.0001594	11017.	69123456.	9.7867573	0.0015598	-0.004178
3.8581753	-60.000000 CY				
0.0001644	11079.	67401534.	9.7260868	0.0015987	-0.004319
3.8869352	-60.000000 CY				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0001694	11139.	65767574.	9.6691048	0.0016377	-0.004460
3.9124557	-60.000000 CY				
0.0001744	11199.	64223403.	9.6148605	0.0016766	-0.004601
3.9348020	-60.000000 CY				
0.0001794	11258.	62761436.	9.5654896	0.0017158	-0.004742
3.9539345	-60.000000 CY				
0.0001844	11316.	61373390.	9.5189681	0.0017551	-0.004882
3.9697370	-60.000000 CY				
0.0001894	11373.	60052811.	9.4743244	0.0017942	-0.005023
3.9821950	-60.000000 CY				
0.0001944	11429.	58796578.	9.4331695	0.0018336	-0.005164
3.9914019	-60.000000 CY				
0.0001994	11484.	57599778.	9.3948139	0.0018731	-0.005304
3.9973136	-60.000000 CY				
0.0002044	11539.	56457972.	9.3581635	0.0019126	-0.005445
3.9998845	-60.000000 CY				
0.0002094	11592.	55366642.	9.3266817	0.0019528	-0.005585
3.9975630	-60.000000 CY				
0.0002144	11645.	54322678.	9.2959142	0.0019928	-0.005725
3.9999044	-60.000000 CY				
0.0002194	11698.	53322120.	9.2675435	0.0020331	-0.005864
3.9971169	-60.000000 CY				
0.0002244	11748.	52356977.	9.2405172	0.0020733	-0.006004
3.9997515	-60.000000 CY				
0.0002294	11794.	51418840.	9.2141042	0.0021135	-0.006144
3.9957066	-60.000000 CY				
0.0002344	11831.	50480617.	9.1845645	0.0021526	-0.006285
3.9990577	-60.000000 CY				
0.0002394	11864.	49560513.	9.1526832	0.0021909	-0.006427
3.9990468	-60.000000 CY				
0.0002444	11885.	48632992.	9.1162023	0.0022278	-0.006570
3.9966747	-60.000000 CY				
0.0002494	11904.	47735462.	9.0796192	0.0022642	-0.006713
3.9992545	-60.000000 CY				
0.0002544	11921.	46863378.	9.0457647	0.0023010	-0.006856
3.9991650	-60.000000 CY				
0.0002594	11937.	46022914.	9.0128664	0.0023377	-0.007000
3.9956629	-60.000000 CY				
0.0002644	11953.	45213284.	8.9816750	0.0023745	-0.007143
3.9986069	-60.000000 CY				
0.0002694	11969.	44432753.	8.9518321	0.0024114	-0.007286
3.9999247	-60.000000 CY				
0.0002744	11984.	43679063.	8.9240509	0.0024485	-0.007429
3.9940409	-60.000000 CY				
0.0003044	12070.	39655848.	8.7807001	0.0026726	-0.008285
3.9985866	-60.000000 CY				
0.0003344	12146.	36325110.	8.6675807	0.0028982	-0.009139
3.9998625	-60.000000 CY				
0.0003644	12216.	33525083.	8.5838110	0.0031277	-0.009990
3.9999751	-60.000000 CYT				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.0003944	12280.	31137740.	8.5203443	0.0033602	-0.010837
3.9996828	-60.000000 CYT				
0.0004244	12339.	29075625.	8.4715220	0.0035951	-0.011682
3.9974037	-60.000000 CYT				
0.0004544	12385.	27257253.	8.4224181	0.0038269	-0.012531
3.9878351	-60.000000 CYT				

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 Summary of Results for Nominal Moment Capacity for Section 1  
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Moment values interpolated at maximum compressive strain = 0.003  
 or maximum developed moment if pile fails at smaller strains.

Load Tens. No. Strain	Axial Thrust  kips	Nominal Mom. Cap.  in-kip	Max. Comp.  Strain	Max.
----	-----	-----	-----	
1 -0.00952396	3.800	12169.214	0.00300000	
2 -0.00952020	4.200	12173.120	0.00300000	
3 -0.00951645	4.600	12177.027	0.00300000	

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.75).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Stiff. Load Ult Mom No. kip-in^2	Resist.  Factor	Nominal  Ax. Thrust  kips	Nominal  Moment Cap  in-kips	Ult. (Fac)  Ax. Thrust  kips	Ult. (Fac)  Moment Cap  in-kips	Bend.  at
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TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

1 91219895.	0.65	3.800000	12169.	2.470000	7910.
2 91253873.	0.65	4.200000	12173.	2.730000	7913.
3 91287886.	0.65	4.600000	12177.	2.990000	7915.
1 89806706.	0.75	3.800000	12169.	2.850000	9127.
2 89838295.	0.75	4.200000	12173.	3.150000	9130.
3 89869877.	0.75	4.600000	12177.	3.450000	9133.
1 70221645.	0.90	3.800000	12169.	3.420000	10952.
2 70254444.	0.90	4.200000	12173.	3.780000	10956.
3 70287179.	0.90	4.600000	12177.	4.140000	10959.

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	1.0000	0.00	N.A.	No	0.00	8859.
2	4.0000	0.2172	No	No	8859.	46634.
3	5.1000	5.7685	No	No	55492.	45975.
4	7.1000	2.6006	No	No	101468.	84074.
5	10.1000	9.1000	No	No	185542.	0.00
6	13.1000	12.1000	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.

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

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 = 1000.0 lbs  
 Applied moment at pile head = 315600.0 in-lbs  
 Axial thrust load on pile head = 4200.0 lbs

Depth Res.	Soil X Es*H feet lb/inch	Deflect. Spr. y Lat. inches lb/inch	Bending Distrib. Moment Load in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil p
0.00	0.00	0.01503	315600.	1000.	-2.09E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.09000	0.00	0.01480	316681.	1000.	-2.08E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.1800	0.00	0.01458	317762.	1000.0000	-2.07E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.2700	0.00	0.01436	318843.	1000.0000	-2.06E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.3600	0.00	0.01413	319924.	1000.0000	-2.05E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.4500	0.00	0.01391	321005.	1000.0000	-2.04E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.5400	0.00	0.01369	322086.	1000.0000	-2.03E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.6300	0.00	0.01347	323167.	1000.0000	-2.02E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.7200	0.00	0.01326	324247.	1000.	-2.02E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.8100	0.00	0.01304	325328.	1000.	-2.01E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.9000	0.00	0.01282	326409.	1000.	-2.00E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
0.9900	0.00	0.01261	327490.	1000.	-1.99E-04	0.00	3.84E+11	
0.00	0.00	0.00	0.00					
1.0800	0.00	0.01239	328571.	990.2223	-1.98E-04	0.00	3.84E+11	
-18.107	1578.		0.00					
1.1700	0.00	0.01218	329631.	970.5626	-1.97E-04	0.00	3.84E+11	
-18.300	1623.		0.00					
1.2600	0.00	0.01197	330669.	950.6970	-1.96E-04	0.00	3.84E+11	
-18.488	1668.		0.00					
1.3500	0.00	0.01176	331686.	930.6299	-1.95E-04	0.00	3.84E+11	
-18.673	1715.		0.00					



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

1.4400	0.01155	332681.	910.3660	-1.94E-04	0.00	3.84E+11
-18.853	1763.	0.00				
1.5300	0.01134	333654.	889.9099	-1.93E-04	0.00	3.84E+11
-19.029	1813.	0.00				
1.6200	0.01113	334605.	869.2664	-1.92E-04	0.00	3.84E+11
-19.200	1863.	0.00				
1.7100	0.01092	335534.	848.4404	-1.91E-04	0.00	3.84E+11
-19.367	1915.	0.00				
1.8000	0.01072	336440.	827.4367	-1.90E-04	0.00	3.84E+11
-19.529	1968.	0.00				
1.8900	0.01051	337323.	806.2603	-1.89E-04	0.00	3.84E+11
-19.687	2023.	0.00				
1.9800	0.01031	338183.	784.9162	-1.89E-04	0.00	3.84E+11
-19.840	2079.	0.00				
2.0700	0.01010	339020.	763.4095	-1.88E-04	0.00	3.84E+11
-19.988	2137.	0.00				
2.1600	0.00990	339833.	741.7453	-1.87E-04	0.00	3.84E+11
-20.131	2196.	0.00				
2.2500	0.00970	340624.	719.9291	-1.86E-04	0.00	3.84E+11
-20.269	2257.	0.00				
2.3400	0.00950	341390.	697.9661	-1.85E-04	0.00	3.84E+11
-20.403	2320.	0.00				
2.4300	0.00930	342133.	675.8617	-1.84E-04	0.00	3.84E+11
-20.531	2384.	0.00				
2.5200	0.00910	342852.	653.6216	-1.83E-04	0.00	3.84E+11
-20.654	2451.	0.00				
2.6100	0.00891	343546.	631.2514	-1.82E-04	0.00	3.84E+11
-20.772	2519.	0.00				
2.7000	0.00871	344217.	608.7568	-1.81E-04	0.00	3.84E+11
-20.885	2590.	0.00				
2.7900	0.00852	344863.	586.1436	-1.80E-04	0.00	3.84E+11
-20.992	2662.	0.00				
2.8800	0.00832	345485.	563.4179	-1.79E-04	0.00	3.84E+11
-21.093	2738.	0.00				
2.9700	0.00813	346082.	540.5857	-1.78E-04	0.00	3.84E+11
-21.189	2815.	0.00				
3.0600	0.00794	346654.	517.6533	-1.77E-04	0.00	3.84E+11
-21.279	2895.	0.00				
3.1500	0.00775	347201.	494.6270	-1.76E-04	0.00	3.84E+11
-21.363	2978.	0.00				
3.2400	0.00756	347724.	471.5132	-1.75E-04	0.00	3.84E+11
-21.441	3064.	0.00				
3.3300	0.00737	348221.	448.3187	-1.74E-04	0.00	3.84E+11
-21.512	3153.	0.00				
3.4200	0.00718	348694.	425.0501	-1.73E-04	0.00	3.84E+11
-21.578	3245.	0.00				
3.5100	0.00699	349141.	401.7146	-1.72E-04	0.00	3.84E+11
-21.636	3341.	0.00				
3.6000	0.00681	349563.	378.3191	-1.71E-04	0.00	3.84E+11
-21.689	3440.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

3.6900	0.00663	349960.	354.8710	-1.70E-04	0.00	3.84E+11
-21.734	3543.	0.00				
3.7800	0.00644	350331.	331.3778	-1.69E-04	0.00	3.84E+11
-21.772	3650.	0.00				
3.8700	0.00626	350677.	307.8472	-1.68E-04	0.00	3.84E+11
-21.803	3762.	0.00				
3.9600	0.00608	350998.	284.2872	-1.67E-04	0.00	3.84E+11
-21.827	3878.	0.00				
4.0500	0.00590	351293.	-59.140	-1.66E-04	0.00	3.84E+11
-614.150	112447.	0.00				
4.1400	0.00572	350871.	-721.712	-1.65E-04	0.00	3.84E+11
-612.836	115717.	0.00				
4.2300	0.00554	349735.	-1383.	-1.64E-04	0.00	3.84E+11
-611.389	119149.	0.00				
4.3200	0.00536	347886.	-2042.	-1.63E-04	0.00	3.84E+11
-609.803	122757.	0.00				
4.4100	0.00519	345325.	-2700.	-1.62E-04	0.00	3.84E+11
-608.071	126555.	0.00				
4.5000	0.00501	342056.	-3356.	-1.61E-04	0.00	3.84E+11
-606.186	130558.	0.00				
4.5900	0.00484	338079.	-4009.	-1.60E-04	0.00	3.84E+11
-604.140	134786.	0.00				
4.6800	0.00467	333397.	-4660.	-1.59E-04	0.00	3.84E+11
-601.925	139259.	0.00				
4.7700	0.00450	328014.	-5309.	-1.58E-04	0.00	3.84E+11
-599.531	143999.	0.00				
4.8600	0.00433	321931.	-5955.	-1.58E-04	0.00	3.84E+11
-596.948	149035.	0.00				
4.9500	0.00416	315152.	-6599.	-1.57E-04	0.00	3.84E+11
-594.164	154396.	0.00				
5.0400	0.00399	307679.	-7239.	-1.56E-04	0.00	3.85E+11
-591.167	160117.	0.00				
5.1300	0.00382	299518.	-7567.	-1.55E-04	0.00	3.85E+11
-17.037	4817.	0.00				
5.2200	0.00365	291336.	-7585.	-1.54E-04	0.00	3.85E+11
-16.648	4922.	0.00				
5.3100	0.00349	283135.	-7603.	-1.53E-04	0.00	3.85E+11
-16.230	5027.	0.00				
5.4000	0.00332	274915.	-7620.	-1.53E-04	0.00	3.85E+11
-15.785	5132.	0.00				
5.4900	0.00316	266677.	-7637.	-1.52E-04	0.00	3.85E+11
-15.311	5237.	0.00				
5.5800	0.00299	258420.	-7653.	-1.51E-04	0.00	3.85E+11
-14.809	5342.	0.00				
5.6700	0.00283	250147.	-7669.	-1.50E-04	0.00	3.85E+11
-14.280	5447.	0.00				
5.7600	0.00267	241857.	-7684.	-1.50E-04	0.00	3.85E+11
-13.722	5552.	0.00				
5.8500	0.00251	233550.	-7699.	-1.49E-04	0.00	3.85E+11
-13.137	5657.	0.00				

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Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

5.9400	0.00235	225229.	-7713.	-1.48E-04	0.00	3.85E+11
-12.525	5762.	0.00				
6.0300	0.00219	216893.	-7726.	-1.48E-04	0.00	3.85E+11
-11.885	5867.	0.00				
6.1200	0.00203	208543.	-7738.	-1.47E-04	0.00	3.85E+11
-11.217	5972.	0.00				
6.2100	0.00187	200180.	-7750.	-1.47E-04	0.00	3.85E+11
-10.522	6077.	0.00				
6.3000	0.00171	191804.	-7761.	-1.46E-04	0.00	3.85E+11
-9.800	6182.	0.00				
6.3900	0.00155	183417.	-7771.	-1.45E-04	0.00	3.85E+11
-9.051	6287.	0.00				
6.4800	0.00140	175020.	-7780.	-1.45E-04	0.00	3.85E+11
-8.274	6392.	0.00				
6.5700	0.00124	166613.	-7789.	-1.44E-04	0.00	3.85E+11
-7.470	6497.	0.00				
6.6600	0.00109	158197.	-7797.	-1.44E-04	0.00	3.85E+11
-6.638	6602.	0.00				
6.7500	9.31E-04	149774.	-7803.	-1.44E-04	0.00	3.85E+11
-5.780	6707.	0.00				
6.8400	7.76E-04	141344.	-7809.	-1.43E-04	0.00	3.85E+11
-4.894	6812.	0.00				
6.9300	6.21E-04	132908.	-7814.	-1.43E-04	0.00	3.85E+11
-3.980	6917.	0.00				
7.0200	4.67E-04	124467.	-7818.	-1.42E-04	0.00	3.85E+11
-3.039	7022.	0.00				
7.1100	3.14E-04	116023.	-7902.	-1.42E-04	0.00	3.85E+11
-152.787	525707.	0.00				
7.2000	1.61E-04	107401.	-8027.	-1.42E-04	0.00	3.85E+11
-78.576	528329.	0.00				
7.2900	7.69E-06	98687.	-8071.	-1.41E-04	0.00	3.85E+11
-3.781	530952.	0.00				
7.3800	-1.45E-04	89968.	-8035.	-1.41E-04	0.00	3.85E+11
71.6098	533575.	0.00				
7.4700	-2.97E-04	81333.	-7916.	-1.41E-04	0.00	3.85E+11
147.6063	536198.	0.00				
7.5600	-4.49E-04	72871.	-7715.	-1.41E-04	0.00	3.85E+11
224.2202	538822.	0.00				
7.6500	-6.01E-04	64670.	-7431.	-1.41E-04	0.00	3.85E+11
301.4628	541446.	0.00				
7.7400	-7.53E-04	56820.	-7071.	-1.40E-04	0.00	3.85E+11
366.9545	526300.	0.00				
7.8300	-9.05E-04	49398.	-6664.	-1.40E-04	0.00	3.85E+11
386.0218	460902.	0.00				
7.9200	-0.00106	42427.	-6238.	-1.40E-04	0.00	3.85E+11
403.1764	412373.	0.00				
8.0100	-0.00121	35926.	-5794.	-1.40E-04	0.00	3.85E+11
418.8919	374766.	0.00				
8.1000	-0.00136	29914.	-5334.	-1.40E-04	0.00	3.85E+11
433.4832	344667.	0.00				

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Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

8.1900	-0.00151	24407.	-4858.	-1.40E-04	0.00	3.85E+11
447.1710	319969.	0.00				
8.2800	-0.00166	19422.	-4368.	-1.40E-04	0.00	3.85E+11
460.1164	299295.	0.00				
8.3700	-0.00181	14973.	-3864.	-1.40E-04	0.00	3.85E+11
472.4407	281706.	0.00				
8.4600	-0.00196	11076.	-3348.	-1.40E-04	0.00	3.85E+11
484.2377	266538.	0.00				
8.5500	-0.00211	7743.	-2819.	-1.40E-04	0.00	3.85E+11
495.5815	253309.	0.00				
8.6400	-0.00226	4988.	-2278.	-1.40E-04	0.00	3.85E+11
506.5316	241658.	0.00				
8.7300	-0.00241	2825.	-1725.	-1.40E-04	0.00	3.85E+11
517.1366	231309.	0.00				
8.8200	-0.00257	1264.	-1161.	-1.40E-04	0.00	3.85E+11
527.4366	222049.	0.00				
8.9100	-0.00272	318.5236	-585.747	-1.40E-04	0.00	3.85E+11
537.4653	213710.	0.00				
9.0000	-0.00287	0.00	0.00	-1.40E-04	0.00	3.85E+11
547.2511	103078.	0.00				

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.01502865 inches  
 Computed slope at pile head = -0.0002088 radians  
 Maximum bending moment = 351293. inch-lbs  
 Maximum shear force = -8071. lbs  
 Depth of maximum bending moment = 4.05000000 feet below pile head  
 Depth of maximum shear force = 7.29000000 feet below pile head  
 Number of iterations = 23  
 Number of zero deflection points = 1  
 Pile deflection at ground = 0.01258341 inches

-----  
 Pile-head Deflection vs. Pile Length for Load Case 1  
 -----

Boundary Condition Type 1, Shear and Moment

Shear = 1000. lbs

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Moment = 315600. in-lbs  
 Axial Load = 4200. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.00000	0.01502865	351293.	-8071.
8.55000	0.02190081	349108.	-8750.
8.10000	0.04889096	345356.	-9477.
7.65000	0.14670805	340857.	-10893.
7.20000	0.38662521	337290.	-12938.
6.75000	0.95941546	335946.	-15762.
6.30000	2.83138523	336666.	-19011.

-----  
 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 = 2250.0 lbs  
 Applied moment at pile head = 724800.0 in-lbs  
 Axial thrust load on pile head = 4600.0 lbs

Depth Res. Soil X Es*H feet lb/inch	Deflect. Spr. Distrib. y Lat. Load inches lb/inch	Bending Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil p
0.00	0.2382	724800.	2250.	-0.00287	0.00	3.83E+11	
0.00	0.00	0.00					
0.09000	0.2351	727244.	2250.	-0.00287	0.00	3.83E+11	
0.00	0.00	0.00					
0.1800	0.2320	729688.	2250.	-0.00286	0.00	3.83E+11	
0.00	0.00	0.00					
0.2700	0.2289	732133.	2250.	-0.00286	0.00	3.83E+11	
0.00	0.00	0.00					
0.3600	0.2258	734577.	2250.	-0.00286	0.00	3.83E+11	
0.00	0.00	0.00					
0.4500	0.2227	737021.	2250.	-0.00286	0.00	3.83E+11	
0.00	0.00	0.00					
0.5400	0.2196	739465.	2250.	-0.00285	0.00	3.83E+11	
0.00	0.00	0.00					

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.6300	0.2165	741909.	2250.	-0.00285	0.00	3.83E+11
0.00	0.00	0.00				
0.7200	0.2135	744354.	2250.	-0.00285	0.00	3.83E+11
0.00	0.00	0.00				
0.8100	0.2104	746798.	2250.	-0.00285	0.00	3.83E+11
0.00	0.00	0.00				
0.9000	0.2073	749242.	2250.	-0.00285	0.00	3.83E+11
0.00	0.00	0.00				
0.9900	0.2042	751686.	2250.	-0.00284	0.00	3.83E+11
0.00	0.00	0.00				
1.0800	0.2012	754130.	2225.	-0.00284	0.00	3.83E+11
-45.832	246.0516	0.00				
1.1700	0.1981	756521.	2175.	-0.00284	0.00	3.83E+11
-46.351	252.6909	0.00				
1.2600	0.1950	758857.	2125.	-0.00284	0.00	3.83E+11
-46.859	259.4803	0.00				
1.3500	0.1920	761139.	2074.	-0.00284	0.00	3.83E+11
-47.358	266.4257	0.00				
1.4400	0.1889	763366.	2023.	-0.00283	0.00	3.83E+11
-47.846	273.5336	0.00				
1.5300	0.1859	765537.	1971.	-0.00283	0.00	3.83E+11
-48.324	280.8105	0.00				
1.6200	0.1828	767651.	1918.	-0.00283	0.00	3.83E+11
-48.790	288.2636	0.00				
1.7100	0.1797	769709.	1866.	-0.00283	0.00	3.83E+11
-49.246	295.9003	0.00				
1.8000	0.1767	771709.	1812.	-0.00282	0.00	3.83E+11
-49.690	303.7285	0.00				
1.8900	0.1736	773651.	1758.	-0.00282	0.00	3.83E+11
-50.123	311.7567	0.00				
1.9800	0.1706	775535.	1704.	-0.00282	0.00	3.83E+11
-50.545	319.9938	0.00				
2.0700	0.1675	777359.	1649.	-0.00282	0.00	3.83E+11
-50.954	328.4494	0.00				
2.1600	0.1645	779125.	1594.	-0.00282	0.00	3.83E+11
-51.352	337.1336	0.00				
2.2500	0.1615	780830.	1538.	-0.00281	0.00	3.83E+11
-51.737	346.0571	0.00				
2.3400	0.1584	782475.	1482.	-0.00281	0.00	3.83E+11
-52.109	355.2316	0.00				
2.4300	0.1554	784059.	1426.	-0.00281	0.00	3.83E+11
-52.469	364.6695	0.00				
2.5200	0.1524	785582.	1369.	-0.00281	0.00	3.83E+11
-52.815	374.3838	0.00				
2.6100	0.1493	787044.	1312.	-0.00281	0.00	3.83E+11
-53.148	384.3888	0.00				
2.7000	0.1463	788443.	1254.	-0.00280	0.00	3.83E+11
-53.467	394.6996	0.00				
2.7900	0.1433	789780.	1196.	-0.00280	0.00	3.83E+11
-53.772	405.3326	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

2.8800	0.1402	791054.	1138.	-0.00280	0.00	3.83E+11
-54.062	416.3054	0.00				
2.9700	0.1372	792265.	1079.	-0.00280	0.00	3.83E+11
-54.337	427.6368	0.00				
3.0600	0.1342	793413.	1020.	-0.00279	0.00	3.83E+11
-54.597	439.3472	0.00				
3.1500	0.1312	794497.	961.3396	-0.00279	0.00	3.83E+11
-54.841	451.4589	0.00				
3.2400	0.1282	795517.	901.9880	-0.00279	0.00	3.83E+11
-55.069	463.9957	0.00				
3.3300	0.1252	796473.	842.3991	-0.00279	0.00	3.83E+11
-55.281	476.9836	0.00				
3.4200	0.1222	797365.	782.5910	-0.00279	0.00	3.83E+11
-55.475	490.4509	0.00				
3.5100	0.1192	798191.	722.5826	-0.00278	0.00	3.83E+11
-55.652	504.4283	0.00				
3.6000	0.1161	798953.	662.3931	-0.00278	0.00	3.83E+11
-55.810	518.9494	0.00				
3.6900	0.1131	799650.	602.0426	-0.00278	0.00	3.83E+11
-55.950	534.0510	0.00				
3.7800	0.1101	800281.	541.5516	-0.00278	0.00	3.83E+11
-56.070	549.7735	0.00				
3.8700	0.1072	800847.	480.9414	-0.00277	0.00	3.83E+11
-56.171	566.1611	0.00				
3.9600	0.1042	801347.	420.2341	-0.00277	0.00	3.83E+11
-56.250	583.2628	0.00				
4.0500	0.1012	801782.	-284.765	-0.00277	0.00	3.83E+11
-1249.	13337.	0.00				
4.1400	0.09817	800760.	-1633.	-0.00277	0.00	3.83E+11
-1247.	13717.	0.00				
4.2300	0.09519	798283.	-2978.	-0.00276	0.00	3.83E+11
-1244.	14116.	0.00				
4.3200	0.09220	794355.	-4320.	-0.00276	0.00	3.83E+11
-1241.	14537.	0.00				
4.4100	0.08922	788980.	-5658.	-0.00276	0.00	3.83E+11
-1238.	14982.	0.00				
4.5000	0.08624	782160.	-6993.	-0.00276	0.00	3.83E+11
-1234.	15453.	0.00				
4.5900	0.08326	773902.	-8324.	-0.00276	0.00	3.83E+11
-1230.	15952.	0.00				
4.6800	0.08029	764209.	-9649.	-0.00275	0.00	3.83E+11
-1225.	16482.	0.00				
4.7700	0.07732	753087.	-10970.	-0.00275	0.00	3.83E+11
-1220.	17047.	0.00				
4.8600	0.07434	740541.	-12285.	-0.00275	0.00	3.83E+11
-1215.	17649.	0.00				
4.9500	0.07138	726578.	-13594.	-0.00275	0.00	3.83E+11
-1209.	18294.	0.00				
5.0400	0.06841	711205.	-14896.	-0.00275	0.00	3.83E+11
-1203.	18986.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

5.1300	0.06545	694430.	-15703.	-0.00274	0.00	3.83E+11
-291.917	4817.	0.00				
5.2200	0.06248	677313.	-16015.	-0.00274	0.00	3.84E+11
-284.780	4922.	0.00				
5.3100	0.05952	659865.	-16318.	-0.00274	0.00	3.84E+11
-277.077	5027.	0.00				
5.4000	0.05657	642093.	-16613.	-0.00274	0.00	3.84E+11
-268.807	5132.	0.00				
5.4900	0.05361	624008.	-16898.	-0.00274	0.00	3.84E+11
-259.973	5237.	0.00				
5.5800	0.05066	605620.	-17174.	-0.00273	0.00	3.84E+11
-250.573	5342.	0.00				
5.6700	0.04771	586939.	-17439.	-0.00273	0.00	3.84E+11
-240.608	5447.	0.00				
5.7600	0.04476	567978.	-17694.	-0.00273	0.00	3.84E+11
-230.078	5552.	0.00				
5.8500	0.04181	548748.	-17936.	-0.00273	0.00	3.84E+11
-218.984	5657.	0.00				
5.9400	0.03886	529263.	-18166.	-0.00273	0.00	3.84E+11
-207.326	5762.	0.00				
6.0300	0.03591	509536.	-18384.	-0.00273	0.00	3.84E+11
-195.104	5867.	0.00				
6.1200	0.03297	489582.	-18587.	-0.00272	0.00	3.84E+11
-182.317	5972.	0.00				
6.2100	0.03003	469414.	-18777.	-0.00272	0.00	3.84E+11
-168.967	6077.	0.00				
6.3000	0.02709	449050.	-18952.	-0.00272	0.00	3.84E+11
-155.053	6182.	0.00				
6.3900	0.02415	428505.	-19112.	-0.00272	0.00	3.84E+11
-140.575	6287.	0.00				
6.4800	0.02121	407796.	-19255.	-0.00272	0.00	3.84E+11
-125.533	6392.	0.00				
6.5700	0.01827	386940.	-19383.	-0.00272	0.00	3.84E+11
-109.928	6497.	0.00				
6.6600	0.01534	365957.	-19493.	-0.00272	0.00	3.84E+11
-93.759	6602.	0.00				
6.7500	0.01240	344864.	-19585.	-0.00272	0.00	3.84E+11
-77.026	6707.	0.00				
6.8400	0.00947	323681.	-19659.	-0.00272	0.00	3.84E+11
-59.729	6812.	0.00				
6.9300	0.00654	302428.	-19713.	-0.00271	0.00	3.85E+11
-41.869	6917.	0.00				
7.0200	0.00361	281126.	-19749.	-0.00271	0.00	3.85E+11
-23.444	7022.	0.00				
7.1100	6.75E-04	259798.	-19939.	-0.00271	0.00	3.85E+11
-328.598	525707.	0.00				
7.2000	-0.00225	238086.	-19863.	-0.00271	0.00	3.85E+11
468.6280	224450.	0.00				
7.2900	-0.00518	216920.	-19297.	-0.00271	0.00	3.85E+11
579.8775	120803.	0.00				



TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

7.3800	-0.00811	196431.	-18632.	-0.00271	0.00	3.85E+11
651.7646	86765.	0.00				
7.4700	-0.01104	176702.	-17898.	-0.00271	0.00	3.85E+11
707.4155	69199.	0.00				
7.5600	-0.01397	157798.	-17109.	-0.00271	0.00	3.85E+11
753.9247	58292.	0.00				
7.6500	-0.01690	139774.	-16273.	-0.00271	0.00	3.85E+11
794.4968	50787.	0.00				
7.7400	-0.01982	122676.	-15395.	-0.00271	0.00	3.85E+11
830.8756	45270.	0.00				
7.8300	-0.02275	106547.	-14480.	-0.00271	0.00	3.85E+11
864.1231	41026.	0.00				
7.9200	-0.02567	91427.	-13530.	-0.00271	0.00	3.85E+11
894.9374	37646.	0.00				
8.0100	-0.02860	77350.	-12548.	-0.00271	0.00	3.85E+11
923.8039	34885.	0.00				
8.1000	-0.03152	64351.	-11535.	-0.00271	0.00	3.85E+11
951.0743	32582.	0.00				
8.1900	-0.03445	52461.	-10494.	-0.00271	0.00	3.85E+11
977.0124	30629.	0.00				
8.2800	-0.03738	41710.	-9426.	-0.00271	0.00	3.85E+11
1002.	28949.	0.00				
8.3700	-0.04030	32128.	-8331.	-0.00271	0.00	3.85E+11
1026.	27487.	0.00				
8.4600	-0.04322	23743.	-7211.	-0.00271	0.00	3.85E+11
1049.	26201.	0.00				
8.5500	-0.04615	16581.	-6066.	-0.00271	0.00	3.85E+11
1071.	25062.	0.00				
8.6400	-0.04907	10667.	-4898.	-0.00271	0.00	3.85E+11
1093.	24044.	0.00				
8.7300	-0.05200	6028.	-3706.	-0.00271	0.00	3.85E+11
1114.	23128.	0.00				
8.8200	-0.05492	2688.	-2493.	-0.00271	0.00	3.85E+11
1134.	22300.	0.00				
8.9100	-0.05785	671.0849	-1257.	-0.00271	0.00	3.85E+11
1154.	21547.	0.00				
9.0000	-0.06077	0.00	0.00	-0.00271	0.00	3.85E+11
1174.	10430.	0.00				

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection = 0.23816804 inches

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

Computed slope at pile head = -0.0028671 radians  
 Maximum bending moment = 801782. inch-lbs  
 Maximum shear force = -19939. lbs  
 Depth of maximum bending moment = 4.05000000 feet below pile head  
 Depth of maximum shear force = 7.11000000 feet below pile head  
 Number of iterations = 32  
 Number of zero deflection points = 1  
 Pile deflection at ground = 0.20390071 inches

Pile-head Deflection vs. Pile Length for Load Case 2

Boundary Condition Type 1, Shear and Moment

Shear = 2250. lbs  
 Moment = 724800. in-lbs  
 Axial Load = 4600. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.00000	0.23816804	801782.	-19939.
8.55000	0.39768343	795468.	-21126.
8.10000	0.86099700	788377.	-23921.
7.65000	1.98177327	783677.	-28065.
7.20000	5.01862663	781439.	-32815.

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 = 2250.0 lbs  
 Applied moment at pile head = 724800.0 in-lbs  
 Axial thrust load on pile head = 3800.0 lbs

Depth Res. Soil	Deflect. Spr. Distrib.	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
X Es*H feet lb/inch	y Lat. Load inches lb/inch	in-lbs lb/inch	lbs	radians	psi*	lb-in^2	

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

0.00	0.2380	724800.	2250.	-0.00286	0.00	3.83E+11
0.00	0.00	0.00				
0.09000	0.2349	727242.	2250.	-0.00286	0.00	3.83E+11
0.00	0.00	0.00				
0.1800	0.2318	729683.	2250.	-0.00286	0.00	3.83E+11
0.00	0.00	0.00				
0.2700	0.2287	732125.	2250.	-0.00286	0.00	3.83E+11
0.00	0.00	0.00				
0.3600	0.2256	734567.	2250.	-0.00286	0.00	3.83E+11
0.00	0.00	0.00				
0.4500	0.2225	737009.	2250.	-0.00285	0.00	3.83E+11
0.00	0.00	0.00				
0.5400	0.2194	739450.	2250.	-0.00285	0.00	3.83E+11
0.00	0.00	0.00				
0.6300	0.2164	741892.	2250.	-0.00285	0.00	3.83E+11
0.00	0.00	0.00				
0.7200	0.2133	744334.	2250.	-0.00285	0.00	3.83E+11
0.00	0.00	0.00				
0.8100	0.2102	746775.	2250.	-0.00285	0.00	3.83E+11
0.00	0.00	0.00				
0.9000	0.2071	749217.	2250.	-0.00284	0.00	3.83E+11
0.00	0.00	0.00				
0.9900	0.2041	751659.	2250.	-0.00284	0.00	3.83E+11
0.00	0.00	0.00				
1.0800	0.2010	754100.	2225.	-0.00284	0.00	3.83E+11
-45.819	246.1867	0.00				
1.1700	0.1979	756489.	2175.	-0.00284	0.00	3.83E+11
-46.338	252.8296	0.00				
1.2600	0.1949	758823.	2125.	-0.00284	0.00	3.83E+11
-46.847	259.6227	0.00				
1.3500	0.1918	761102.	2074.	-0.00283	0.00	3.83E+11
-47.345	266.5720	0.00				
1.4400	0.1888	763327.	2023.	-0.00283	0.00	3.83E+11
-47.833	273.6838	0.00				
1.5300	0.1857	765495.	1971.	-0.00283	0.00	3.83E+11
-48.310	280.9647	0.00				
1.6200	0.1826	767607.	1919.	-0.00283	0.00	3.83E+11
-48.777	288.4219	0.00				
1.7100	0.1796	769662.	1866.	-0.00282	0.00	3.83E+11
-49.232	296.0627	0.00				
1.8000	0.1765	771660.	1812.	-0.00282	0.00	3.83E+11
-49.677	303.8952	0.00				
1.8900	0.1735	773600.	1758.	-0.00282	0.00	3.83E+11
-50.110	311.9278	0.00				
1.9800	0.1705	775481.	1704.	-0.00282	0.00	3.83E+11
-50.531	320.1694	0.00				
2.0700	0.1674	777304.	1649.	-0.00282	0.00	3.83E+11
-50.941	328.6296	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

2.1600	0.1644	779067.	1594.	-0.00281	0.00	3.83E+11
-51.338	337.3185	0.00				
2.2500	0.1613	780770.	1538.	-0.00281	0.00	3.83E+11
-51.723	346.2469	0.00				
2.3400	0.1583	782413.	1482.	-0.00281	0.00	3.83E+11
-52.095	355.4264	0.00				
2.4300	0.1553	783995.	1426.	-0.00281	0.00	3.83E+11
-52.455	364.8694	0.00				
2.5200	0.1522	785515.	1369.	-0.00281	0.00	3.83E+11
-52.801	374.5890	0.00				
2.6100	0.1492	786975.	1312.	-0.00280	0.00	3.83E+11
-53.133	384.5994	0.00				
2.7000	0.1462	788372.	1254.	-0.00280	0.00	3.83E+11
-53.452	394.9159	0.00				
2.7900	0.1432	789707.	1196.	-0.00280	0.00	3.83E+11
-53.757	405.5546	0.00				
2.8800	0.1401	790979.	1138.	-0.00280	0.00	3.83E+11
-54.047	416.5333	0.00				
2.9700	0.1371	792188.	1080.	-0.00279	0.00	3.83E+11
-54.322	427.8708	0.00				
3.0600	0.1341	793334.	1021.	-0.00279	0.00	3.83E+11
-54.582	439.5876	0.00				
3.1500	0.1311	794416.	961.6928	-0.00279	0.00	3.83E+11
-54.826	451.7058	0.00				
3.2400	0.1281	795434.	902.3574	-0.00279	0.00	3.83E+11
-55.054	464.2493	0.00				
3.3300	0.1251	796388.	842.7847	-0.00278	0.00	3.83E+11
-55.266	477.2442	0.00				
3.4200	0.1221	797277.	782.9930	-0.00278	0.00	3.83E+11
-55.460	490.7187	0.00				
3.5100	0.1191	798102.	723.0009	-0.00278	0.00	3.83E+11
-55.637	504.7035	0.00				
3.6000	0.1161	798862.	662.8279	-0.00278	0.00	3.83E+11
-55.795	519.2324	0.00				
3.6900	0.1131	799556.	602.4937	-0.00278	0.00	3.83E+11
-55.935	534.3421	0.00				
3.7800	0.1101	800186.	542.0192	-0.00277	0.00	3.83E+11
-56.055	550.0729	0.00				
3.8700	0.1071	800750.	481.4255	-0.00277	0.00	3.83E+11
-56.155	566.4692	0.00				
3.9600	0.1041	801248.	420.7346	-0.00277	0.00	3.83E+11
-56.235	583.5798	0.00				
4.0500	0.1011	801681.	-284.119	-0.00277	0.00	3.83E+11
-1249.	13345.	0.00				
4.1400	0.09809	800657.	-1632.	-0.00276	0.00	3.83E+11
-1247.	13725.	0.00				
4.2300	0.09511	798179.	-2977.	-0.00276	0.00	3.83E+11
-1244.	14125.	0.00				
4.3200	0.09213	794250.	-4318.	-0.00276	0.00	3.83E+11
-1241.	14546.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

4.4100	0.08915	788874.	-5657.	-0.00276	0.00	3.83E+11
-1237.	14991.	0.00				
4.5000	0.08617	782055.	-6991.	-0.00276	0.00	3.83E+11
-1234.	15462.	0.00				
4.5900	0.08320	773796.	-8321.	-0.00275	0.00	3.83E+11
-1230.	15962.	0.00				
4.6800	0.08022	764103.	-9647.	-0.00275	0.00	3.83E+11
-1225.	16492.	0.00				
4.7700	0.07725	752981.	-10967.	-0.00275	0.00	3.83E+11
-1220.	17057.	0.00				
4.8600	0.07428	740437.	-12282.	-0.00275	0.00	3.83E+11
-1215.	17660.	0.00				
4.9500	0.07132	726475.	-13591.	-0.00275	0.00	3.83E+11
-1209.	18305.	0.00				
5.0400	0.06836	711103.	-14893.	-0.00274	0.00	3.83E+11
-1202.	18998.	0.00				
5.1300	0.06539	694329.	-15699.	-0.00274	0.00	3.83E+11
-291.684	4817.	0.00				
5.2200	0.06243	677215.	-16011.	-0.00274	0.00	3.84E+11
-284.554	4922.	0.00				
5.3100	0.05948	659769.	-16314.	-0.00274	0.00	3.84E+11
-276.857	5027.	0.00				
5.4000	0.05652	642000.	-16608.	-0.00274	0.00	3.84E+11
-268.595	5132.	0.00				
5.4900	0.05357	623917.	-16894.	-0.00273	0.00	3.84E+11
-259.768	5237.	0.00				
5.5800	0.05062	605532.	-17169.	-0.00273	0.00	3.84E+11
-250.377	5342.	0.00				
5.6700	0.04767	586854.	-17434.	-0.00273	0.00	3.84E+11
-240.421	5447.	0.00				
5.7600	0.04472	567896.	-17688.	-0.00273	0.00	3.84E+11
-229.901	5552.	0.00				
5.8500	0.04177	548670.	-17930.	-0.00273	0.00	3.84E+11
-218.816	5657.	0.00				
5.9400	0.03883	529189.	-18160.	-0.00273	0.00	3.84E+11
-207.168	5762.	0.00				
6.0300	0.03589	509466.	-18378.	-0.00272	0.00	3.84E+11
-194.957	5867.	0.00				
6.1200	0.03295	489516.	-18581.	-0.00272	0.00	3.84E+11
-182.181	5972.	0.00				
6.2100	0.03001	469353.	-18771.	-0.00272	0.00	3.84E+11
-168.843	6077.	0.00				
6.3000	0.02707	448993.	-18946.	-0.00272	0.00	3.84E+11
-154.941	6182.	0.00				
6.3900	0.02413	428452.	-19105.	-0.00272	0.00	3.84E+11
-140.476	6287.	0.00				
6.4800	0.02120	407748.	-19249.	-0.00272	0.00	3.84E+11
-125.447	6392.	0.00				
6.5700	0.01826	386897.	-19376.	-0.00272	0.00	3.84E+11
-109.856	6497.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

6.6600	0.01533	365918.	-19486.	-0.00272	0.00	3.84E+11
-93.701	6602.	0.00				
6.7500	0.01240	344830.	-19578.	-0.00271	0.00	3.84E+11
-76.983	6707.	0.00				
6.8400	0.00947	323652.	-19652.	-0.00271	0.00	3.84E+11
-59.701	6812.	0.00				
6.9300	0.00654	302405.	-19707.	-0.00271	0.00	3.85E+11
-41.856	6917.	0.00				
7.0200	0.00361	281108.	-19742.	-0.00271	0.00	3.85E+11
-23.447	7022.	0.00				
7.1100	6.78E-04	259784.	-19933.	-0.00271	0.00	3.85E+11
-330.083	525707.	0.00				
7.2000	-0.00225	238076.	-19858.	-0.00271	0.00	3.85E+11
468.3397	224866.	0.00				
7.2900	-0.00518	216913.	-19292.	-0.00271	0.00	3.85E+11
579.6522	120945.	0.00				
7.3800	-0.00810	196427.	-18627.	-0.00271	0.00	3.85E+11
651.5524	86850.	0.00				
7.4700	-0.01103	176700.	-17894.	-0.00271	0.00	3.85E+11
707.2061	69260.	0.00				
7.5600	-0.01395	157799.	-17105.	-0.00271	0.00	3.85E+11
753.7145	58341.	0.00				
7.6500	-0.01688	139776.	-16269.	-0.00271	0.00	3.85E+11
794.2842	50828.	0.00				
7.7400	-0.01980	122680.	-15391.	-0.00271	0.00	3.85E+11
830.6598	45306.	0.00				
7.8300	-0.02272	106553.	-14476.	-0.00271	0.00	3.85E+11
863.9037	41057.	0.00				
7.9200	-0.02565	91434.	-13527.	-0.00271	0.00	3.85E+11
894.7142	37675.	0.00				
8.0100	-0.02857	77358.	-12545.	-0.00271	0.00	3.85E+11
923.5768	34911.	0.00				
8.1000	-0.03149	64359.	-11533.	-0.00271	0.00	3.85E+11
950.8433	32606.	0.00				
8.1900	-0.03442	52470.	-10492.	-0.00271	0.00	3.85E+11
976.7775	30651.	0.00				
8.2800	-0.03734	41719.	-9423.	-0.00271	0.00	3.85E+11
1002.	28970.	0.00				
8.3700	-0.04026	32137.	-8329.	-0.00271	0.00	3.85E+11
1025.	27506.	0.00				
8.4600	-0.04318	23752.	-7209.	-0.00271	0.00	3.85E+11
1048.	26220.	0.00				
8.5500	-0.04611	16588.	-6065.	-0.00271	0.00	3.85E+11
1071.	25079.	0.00				
8.6400	-0.04903	10674.	-4897.	-0.00271	0.00	3.85E+11
1092.	24061.	0.00				
8.7300	-0.05195	6034.	-3706.	-0.00271	0.00	3.85E+11
1113.	23144.	0.00				
8.8200	-0.05487	2692.	-2492.	-0.00271	0.00	3.85E+11
1134.	22316.	0.00				

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area

Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis

36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

8.9100	-0.05779	673.2772	-1257.	-0.00271	0.00	3.85E+11
1154.	21562.	0.00				
9.0000	-0.06072	0.00	0.00	-0.00271	0.00	3.85E+11
1173.	10437.	0.00				

\* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 3:

Pile-head deflection	=	0.23797222 inches
Computed slope at pile head	=	-0.0028648 radians
Maximum bending moment	=	801681. inch-lbs
Maximum shear force	=	-19933. lbs
Depth of maximum bending moment	=	4.05000000 feet below pile head
Depth of maximum shear force	=	7.11000000 feet below pile head
Number of iterations	=	32
Number of zero deflection points	=	1
Pile deflection at ground	=	0.20373294 inches

Pile-head Deflection vs. Pile Length for Load Case 3

Boundary Condition Type 1, Shear and Moment

Shear	=	2250. lbs
Moment	=	724800. in-lbs
Axial Load	=	3800. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.00000	0.23797222	801681.	-19933.
8.55000	0.39706373	795288.	-21115.
8.10000	0.85818213	788009.	-23889.
7.65000	1.96524094	782872.	-27982.
7.20000	4.90744046	779498.	-32579.

Summary of Pile-head Responses for Conventional Analyses

TP 26 NE Ohio Site 12 SUM-77 Vacant Rest Area - Northbound Parking Area  
 Light Tower TN-9 (Boring B-008-0-25) Lateral Load Analysis  
 36" Diameter, 8' Embedment Light Tower Drilled Shaft Foundation

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	Load Type	Load 1	Load 2	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max
Shear	Max Moment	Pile-head Load 1	Type Pile-head Load 2	lbs	inches	radians	in lbs
Pile No.	1	2	2				
1	V, lb	1000.0000	M, in-lb	315600.	4200.	0.01503	-2.09E-04
-8071.	351293.						
2	V, lb	2250.	M, in-lb	724800.	4600.	0.2382	-0.00287
-19939.	801782.						
3	V, lb	2250.	M, in-lb	724800.	3800.	0.2380	-0.00286
-19933.	801681.						

Maximum pile-head deflection = 0.2381680436 inches

Maximum pile-head rotation = -0.0028671045 radians = -0.164273 deg.

The analysis ended normally.



## **Appendix IV – OGE Geotechnical Checklists**

I. Geotechnical Design Checklists			
Project: SUM-77 Vacant Rest Area		PDP Path:	
PID: 122880		Review Stage:	3

Checklist	Included in This Submission
II. Reconnaissance and Planning	✓
III. A. Centerline Cuts	✓
III. B. Embankments	
III. C. Subgrade	
IV. A. Foundations of Structures	
IV. B. Retaining Wall	
V. A. Landslide Remediation	
V. B. Rockfall Remediation	
V. C. Wetland or Peat Remediation	
V. D. Underground Mine Remediation	
V. E. Surface Mine Remediation	✓
V. F. Karst Remediation	
VI. A. Geotechnical Profile	
VI. D. Geotechnical Reports	✓

## II. Reconnaissance and Planning Checklist

<b>C-R-S:</b>	SUM-77 Vacant Rest Area	<b>PID:</b>	122880	<b>Reviewer:</b>	BKS	<b>Date:</b>	10/30/2025
<b>Reconnaissance</b>		(Y/N/X)	Notes:				
1	Based on Section 302.1 in the SGE, have the necessary plans been developed in the following areas prior to the commencement of the subsurface exploration reconnaissance:	Y					
	Roadway plans	✓					
	Structures plans						
	Geohazards plans						
2	Have the resources listed in Section 302.2.1 of the SGE been reviewed as part of the office reconnaissance?	Y					
3	Have all the features listed in Section 302.3 of the SGE been observed and evaluated during the field reconnaissance?	Y					
4	If notable features were discovered in the field reconnaissance, were the GPS coordinates of these features recorded?	X					
<b>Planning - General</b>		(Y/N/X)	Notes:				
5	In planning the geotechnical exploration program for the project, have the specific geologic conditions, the proposed work, and historic subsurface exploration work been considered?	Y					
6	Has the ODOT Transportation Information Mapping System (TIMS) been accessed to find all available historic boring information and inventoried geohazards?	Y					
7	Have the borings been located to develop the maximum subsurface information while using a minimum number of borings, utilizing historic geotechnical explorations to the fullest extent possible?	Y					
8	Have the topography, geologic origin of materials, surface manifestation of soil conditions, and any other special design considerations been utilized in determining the spacing and depth of borings?	Y					
9	Have the borings been located so as to provide adequate overhead clearance for the equipment, clearance of underground utilities, minimize damage to private property, and minimize disruption of traffic, without compromising the quality of the exploration?	Y					

## II. Reconnaissance and Planning Checklist

Planning - General		(Y/N/X)	Notes:
10	Have the scaled boring plans, showing all project and historic borings, and a schedule of borings in tabular format, been submitted to the District Geotechnical Engineer?	Y	
The schedule of borings should present the following information for each boring:			
a.	exploration identification number	Y	
b.	location by station and offset	Y	
c.	estimated amount of rock and soil, including the total for each for the entire program.	Y	
Planning – Exploration Number		(Y/N/X)	Notes:
11	Have the coordinates, stations and offsets of all explorations (borings, soundings, test pits, etc.) been identified?	Y	
12	Has each exploration been assigned a unique identification number, in the following format X-ZZZ-W-YY, as per Section 303.2 of the SGE?	Y	
13	When referring to historic explorations that did not use the identification scheme in 12 above, have the historic explorations been assigned identification numbers according to Section 303.2 of the SGE?	X	

## II. Reconnaissance and Planning Checklist

Planning – Boring Types		(Y/N/X)	Notes:
14	Based on Sections 303.3 to 303.7.6 of the SGE, have the location, depth, and sampling requirements for the following boring types been determined for the project?	Y	
	Check all boring types utilized for this project:		
	Existing Subgrades (Type A)	✓	
	Roadway Borings (Type B)		
	Embankment Foundations (Type B1)		
	Cut Sections (Type B2)		
	Sidehill Cut Sections (Type B3)		
	Sidehill Cut-Fill Sections (Type B4)		
	Sidehill Fill Sections on Unstable Slopes (Type B5)		
	Geohazard Borings (Type C)		
	Lakes, Ponds, and Low-Lying Areas (Type C1)		
	Peat Deposits, Compressible Soils, and Low Strength Soils (Type C2)		
	Uncontrolled Fills, Waste Pits, and Reclaimed Surface Mines (Type C3)		
	Underground Mines (C4)		
	Landslides (Type C5)		
	Rock Slope (Type C6)		
	Karst (Type C7)		
	Proposed Underground Utilities (Type D)		
	Structure Borings (Type E)		
	Bridges (Type E1)		
	Culverts (Type E2 a,b,c)		
	Retaining Walls (Type E3 a and b)		
	Noise Barrier (Type E4)		
	CCTV & High Mast Lighting Towers (Type E5)	✓	
	Buildings and Salt Domes (Type E6)		

### III.C. Subgrade Checklist

<b>C-R-S:</b>	SUM-77 Vacant Rest Area	<b>PID:</b>	122880	<b>Reviewer:</b>	BKS	<b>Date:</b>	10/30/2025
<p align="center"><b>Use this Checklist in conjunction with the Subgrade design guidance in GDM Section 600</b>  <b>If you do not have any subgrade work on the project, you do not have to fill out this checklist.</b></p>							
Subgrade		(Y/N/X)	Notes:				
1	Has the subsurface exploration adequately characterized the soil or rock according to GDM Section 600?	Y					
a.	Has each sample been visually classified and inspected for the presence of gypsum? Has a moisture content been performed on each sample?	Y					
b.	Has mechanical classification (Plastic Limit (PL), Liquid Limit (LL), and gradation testing) been done on at least two samples from each boring within six feet of the proposed subgrade?	Y					
c.	Has the sulfate content of at least one sample from each boring within 3 feet of the proposed subgrade been determined, per Supplement 1122, Determining Sulfate Content in Soils?	Y					
d.	Has the sulfate content of all samples that exhibit gypsum crystals been determined?	X					
e.	Have A-2-5, A-4b, A-5, A-7-5, A-8a, or A-8b soils within the top 3 feet of the proposed subgrade been mechanically classified?	X					
2	If soils classified as A-2-5, A-4b, A-5, A-7-5, A-8a, or A-8b, or having a LL>65, are present at the proposed subgrade (geotechnical profile), do the plans specify that these materials need to be removed and replaced or chemically stabilized?	X					
a.	If these materials are to be removed and replaced, have the station limits, depth, and lateral limits for the planned removal been provided?	X					
3	If there is any rock, shale, or coal present at the proposed subgrade (C&MS 204.05), do the plans specify the removal of the material?	X					
a.	If removal of any rock, shale, or coal is required, have the station limits, depth, and lateral limits for the planned removal of the material at proposed subgrade been provided?	X					

### III.C. Subgrade Checklist

Subgrade	(Y/N/X)	Notes:
4 In accordance with GDM Section 600, do the SPT ( $N_{60}$ )/HP values and existing moisture contents for the proposed subgrade soils indicate the need for subgrade stabilization?	Y	
a. If removal and replacement is applicable, has the detail of subgrade removal been shown on the plans, including depth of removal, station limits, lateral extent, replacement material, and plan notes (Item 204 - Subgrade Compaction and Proof Rolling)?	X	No unsuitable or unstable soils were encountered. No subgrade remediation needed.
b. If chemical stabilization is applicable, has the detail of this treatment been shown on the plans, including depth, percentage of chemical, station limits, lateral extent, and plan notes?	X	
Indicate type of chemical stabilization specified:		
cement stabilization		
lime stabilization		
5 If removal and replacement has been specified, do the plans include Plan Note G121 from L&D3?	X	
6 If drainage or groundwater is an issue with the proposed subgrade, has an appropriate drainage system (e.g., pipe, underdrains) been provided?	X	
7 Has an appropriate quantity of Proof Rolling (C&MS 204.06) and has Plan Note G111 from L&D3 been included in the plans?	X	
8 Has a design CBR value been provided?	Y	

## VI.B. Geotechnical Reports

<b>C-R-S:</b>	SUM-77 Vacant Rest Area	<b>PID:</b>	122880	<b>Reviewer:</b>	BKS	<b>Date:</b>	10/30/2025
<b>General</b>		(Y/N/X)	Notes:				
1	Has an electronic copy of all geotechnical submissions been provided to the District Geotechnical Engineer (DGE)?	Y					
2	Has the first complete version of a geotechnical report being submitted been labeled as 'Draft'?	Y					
3	Subsequent to ODOT's review and approval, has the complete version of the revised geotechnical report being submitted been labeled 'Final'?	X					
4	Has the boring data been submitted in a native format that is DIGGS (Data Interchange for Geotechnical and Geoenvironmental) compatible? gINT files meet this demand?	X	Will be submitted with final report.				
5	Does the report cover format follow ODOT's Brand and Identity Guidelines Report Standards found at <a href="http://www.dot.state.oh.us/brand/Pages/default.aspx">http://www.dot.state.oh.us/brand/Pages/default.aspx</a> ?	Y					
6	Have all geotechnical reports being submitted been titled correctly as prescribed in Section 706.1 of the SGE?	Y					
<b>Report Body</b>		(Y/N/X)	Notes:				
7	Do all geotechnical reports being submitted contain the following:	Y					
a.	an Executive Summary as described in Section 706.2 of the SGE?	Y					
b.	an Introduction as described in Section 706.3 of the SGE?	Y					
c.	a section titled "Geology and Observations of the Project," as described in Section 706.4 of the SGE?	Y					
d.	a section titled "Exploration," as described in Section 706.5 of the SGE?	Y					
e.	a section titled "Findings," as described in Section 706.6 of the SGE?	Y					
f.	a section titled "Analyses and Recommendations," as described in Section 706.7 of the SGE?	Y					
<b>Appendices</b>		(Y/N/X)	Notes:				
8	Do all geotechnical reports being submitted contain all applicable Appendices as described in Section 706.8 of the SGE?	Y					
9	Do the Appendices present a site Boring Plan showing all boring locations as described in Section 706.8.1 of the SGE?	Y					



## VI.B. Geotechnical Reports

Appendices		(Y/N/X)	Notes:
10	Do the Appendices include boring logs and color pictures of rock, if applicable, as described in Section 706.8.2 of the SGE?	Y	
11	Do the Appendices include reports of undisturbed test data as described in Section 706.8.3 of the SGE?	X	
12	Do the Appendices include calculations in a logical format to support recommendations as described in Section 706.8.4 of the SGE?	Y	

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