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September 3, 2025

Ms. Joanne Shaner, PE HDR, Inc. 1100 Superior Avenue, Suite 650 Cleveland, Ohio 44114

Via E-mail: joanne.shaner@hdrinc.com

Re: Structure Foundation Exploration Report

CUY-17-13.50 PID: 112998 East Schaaf Road Brooklyn Heights, Ohio SME Project No. 088549.00

Dear Ms. Shaner:

The attached report presents the results of our structure foundation exploration and recommendations for the East Schaaf Road bridge replacement in Brooklyn Heights, Ohio.

If you have questions, or wish to discuss our recommendations, please call.

Sincerely,

SME

Brendan P. Lieske, PE Senior Consultant

Brendan Lieske

Enclosure: Structure Foundation Exploration Report, Dated September 3, 2025

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EXECUTIVE SUMMARY

This report represents the results of a structure foundation exploration for the replacement of the East Schaaf Road Bridge over Granger Road (Route 17). The replacement bridge will consist of a two-span structure with a tangent drilled shaft wall at each abutment. The abutments will be supported directly on the tangent drilled shaft wall. The bottom of the abutment footings (continuous pile caps) will be at elevation 710.0 feet at the forward abutment and 712.0 feet at the rear abutment. The piers will be supported on 16-inch CIP piles. The bottom of the pier footings (pile cap) will be at elevation 691.0 feet.

Subsurface conditions were evaluated by drilling four Standard Penetration Test (SPT) borings and four pavement cores. The borings and cores were performed in general accordance with the ODOT Specifications for Geotechnical Explorations, dated January 21, 2022.

Below the pavement materials, we encountered lacustrine soils consisting of stiff to very stiff silt and clay (A-6a) and silty clay (A-6b) to about elevation 703 to 706 feet behind each abutment (B-001-0-22 and B-004-0-22). Below these soils and below the pavement at the remaining borings, we encountered varying layers of loose to medium dense gravel and stone fragments with sand (A-1-b), coarse and fine sand (A-3a), and silt (A-4b) to about elevation 675 feet. This was underlain by medium stiff to very stiff silt (A-4b) "and" clay, and silt and clay (A-6a) to about elevation 645 feet. Below this soil, we encountered layers of varying thickness consisting of medium stiff to very stiff silt (A-4b), silt and clay (A-6a), and clay (A-7-6). Between elevations 603 feet to 615 feet, the lacustrine soils transition to glacial till consisting of very stiff to hard sandy silt (A-4a) "and" clay. We encountered weak to moderately strong shale bedrock between elevation 586 and 589 feet. Groundwater was encountered during drilling within the non-cohesive soils between elevations 691 feet and 682 feet. The groundwater elevation appears to decrease towards the Cuyahoga River.

Based on our field and laboratory testing and our analyses, we conclude that deep foundations will be required to support the replacement bridge. The abutments will be supported directly on the tangent drilled shaft wall. The geotechnical design for the abutment walls was performed by HDR. Refer to HDR's design calculations in Appendix C for additional information.

Driven friction piles consisting of 16-inch CIP piles with a minimum 5/16-inch wall thickness at the piers are recommended. We evaluated pile resistance with and without pile setup. The inclusion of pile setup results in saving more than 10 feet of pile length in each case; therefore, pile setup has been accounted for in the design. The rounded estimated pile lengths are 95 feet at the pier piles. Dynamic load testing should be performed on the first two piles driven at the piers to verify that the EOID resistances have been achieved at the estimated pile lengths. Assuming the EOID resistances are achieved, we recommend driving all piles to the full estimated lengths, then perform restrike testing on the same two piles after a waiting period of 7 days at the piers, to verify setup and that the R_n is achieved. Based on the drivability analysis, a D 19-42 hammer or equivalent is suitable for driving the piles.

The summary presented above includes selected elements of our findings and recommendations and is provided as an overview. Refer to the full text of the report for details needed to fully understand and properly apply our recommendations.

1. INTRODUCTION

This report presents the results of a structure foundation exploration for the replacement of the East Schaaf Road Bridge over Granger Road (Route 17). The replacement bridge will consist of a two-span structure with a tangent drilled shaft wall at each abutment. MSE walls were originally planned in front of each abutment, but the design changed to soldier pile and lagging walls after the Stage 2 submission, then changed to tangent drilled shaft walls directly supporting the abutments after the Stage 3 submission. SME provided soil parameters to HDR based on our boring information. A table showing the provided soil parameters is included in Appendix B. Please refer to HDR's supplemental geotechnical design calculations for additional information about the tangent drilled shaft walls.

The piers will be supported on 16-inch CIP piles. The bottom of the pier footings (pile cap) will be at elevation 691.0 feet.

Maximum pile loads at the piers will be:

- Factored vertical pile load = 305 kips
- Factored lateral pile load = 20 kips
- Service vertical pile load = 255 kips
- Service lateral pile load = 17 kips

Subsurface conditions were evaluated by drilling four Standard Penetration Test (SPT) borings and four pavement cores. Two borings were drilled in the outside, opposing lanes of Granger Road near the existing bridge piers and two borings were drilled on East Schaaf Road in opposite lanes behind each existing abutment. Pavement cores were obtained at each boring location on East Schaaf Road. Two bridge deck cores were obtained in opposite lanes of the bridge. The borings and cores were performed in general accordance with the current ODOT Specifications for Geotechnical Explorations. Samples from the borings and cores were taken to our laboratory for visual classification and testing. The results of the field and laboratory tests were interpreted to provide preliminary foundation recommendations for the new structure.

2. GEOLOGY AND OBSERVATIONS

2.1 GEOLOGY

Geologic references for the project area indicate soils consisting of lacustrine sand, silt, and clay over glacial till deposits of sandy silt extending to shale bedrock. Bedrock in this area consists of Devonian Age Ohio Shale.

2.2 RECONNAISSANCE

We visited the project site on March 3, 2022, to perform site reconnaissance and mark the boring locations. The existing bridge is a four-span structure, with a total length of 320 feet and an overall width of 39 feet. During this site visit we noted overhead utility lines and indications of underground utilities, as well as maintenance of traffic considerations for our field testing services. The pavements along this section of Granger Road appeared to be in fair condition, with longitudinal cracking spanning between the lanes. The pavement on Schaaf Road appeared to be in fair condition, with a significant amount of crack patches and pavement repairs. We did not observe signs of slope instability at either abutment. On the existing bridge structure, we noted multiple areas of rust and pealing paint on the exposed steel elements and spalling concrete, exposing reinforcing steel on the columns.

2.3 EXISTING DATA

Based on historical structure drawings provided by ODOT, we understand the existing bridge piers are supported by 12-inch diameter reinforced concrete piles driven 32 to 34 feet below the bottom of the pile caps. SME has boring information from a project site north of this bridge, between East Schaaf Road and Valley Belt Road. Based on this data, we anticipated our borings would encounter lacustrine soils to about elevation 610 feet, consisting of moist to wet, loose to medium dense silts and medium to stiff clays. We anticipated the lacustrine soils would be underlain by hard glacial till followed by Ohio Shale bedrock near elevation 600 feet.

3. EXPLORATION

3.1 HISTORICAL BORING INFORMATION

Historical geotechnical records consist of drive rod soundings were obtained from ODOT's Transportation Information Mapping System (TIMS) for CUY-17-0164 (sub-batch 2409) completed in 1954 for the original bridge construction. Results of this explorations were reviewed but were not utilized during the current design and not presented on the geotechnical profile.

3.2 FIELD EXPLORATION

Subsurface conditions were identified by a field exploration program consisting of four Standard Penetration Test (SPT) borings, designated B-001-0-22 through B-004-0-22. SME visited the site from March 14 through April 6, 2022, to perform our field exploration. We cored the pavement at each of the East Schaaf Road boring locations, designated X-001-0-22 and X-004-0-22. We also cored the bridge deck at two locations, designated X-002-0-22 and X-003-0-22. For each core location, we measured the pavement section thicknesses and photographed the core. A core photo log is included in Appendix A.

Boring depths ranged from 114 feet to 144 feet below the existing pavement surface. We cored five feet of rock at three of the four boring locations. At B-003-0-22, the metal tip (shoe) of our split-spoon sampler broke off in the bottom of the borehole due to hard driving in the rock and we were unable to retrieve it. Therefore, we were unable to complete rock coring at this location.

We obtained split-spoon samples at approximate two and a half foot intervals in the top 15 to 20 feet at each boring, followed by sampling at five-foot intervals. We also obtained eight thin-walled Shelby tube samples. The approximate boring and core locations are shown on the attached *Boring Location Diagram*.

Drilling equipment consisted of a CME-550 ATV rig with a CME auto hammer having an energy transfer ratio of 70% based on our September 3, 2020, calibration. The field-measured blowcounts are corrected to N_{60} based on calibration of the hammer system. Both the field-measured blowcounts for each six-inch penetration interval, and the energy-corrected blowcounts in blows per foot are reported on the boring logs. We checked the boreholes for the presence of groundwater during drilling and prior to backfilling and recorded its depth where encountered. The boreholes were sealed with bentonite grout in accordance with ODOT's Specifications for Geotechnical Explorations (SGE). The boring and pavement core holes were patched with an EPCO hole plug and asphalt cold patch. For the bridge deck cores, we cored the upper four inches using a core barrel two inches larger in diameter than the through-deck core, then we inserted a one-quarter inch thick steel plate into the core hole and patched the surface with ready-mix concrete.

3.3 LABORATORY TESTING

Samples were placed in clean glass jars each marked with project number, boring number, depth interval, and blow count data. The samples were taken to our laboratory where they were classified in accordance with the ODOT-Modified AASHTO procedure. Laboratory testing included water contents, hand penetrometer values, mechanical sieve, hydrometer, and Atterberg Limits on selected samples.

4. FINDINGS

4.1 SUBSURFACE CONDITIONS

The asphalt pavement section in the approach pavement cores (X-001-0-22 and X-004-0-22) varied from 4 ½ inches of asphalt over 6 inches of concrete at X-001-0-22 to 3 ¼ inches of asphalt over 2 ¾ inches brick over 9 ½ inches concrete at X-004-0-22. The bridge deck cores (X-002-0-22 and X-003-0-22), consisted of 9 ¾ to 10 ½ inches of reinforced concrete.

Below the pavement materials, we encountered lacustrine soils consisting of stiff to very stiff silt and clay (A-6a) and silty clay (A-6b) to about elevation 703 to 706 feet behind each abutment (B-001-0-22 and B-004-0-22). Below these soils and below the pavement at the remaining borings, we encountered varying layers of loose to medium dense gravel and stone fragments with sand (A-1-b), coarse and fine sand (A-3a), and silt (A-4b) to about elevation 675 feet. This was underlain by medium stiff to very stiff silt (A-4b) "and" clay, and silt and clay (A-6a) to about elevation 645 feet. Below this soil, we encountered layers of varying thickness consisting of medium stiff to very stiff silt (A-4b), silt and clay (A-6a), and clay (A-7-6). Between elevations 603 feet to 615 feet, the lacustrine soils transition to glacial till consisting of very stiff to hard sandy silt (A-4a) "and" clay. We encountered weak to moderately strong shale bedrock between elevation 586 to 589 feet.

Groundwater was encountered during drilling within the non-cohesive soils between elevations 691 feet and 682 feet. The groundwater elevation appears to decrease towards the Cuyahoga River. Groundwater levels at completion of drilling could not be obtained due to the water introduced as part of the mud rotary operation. Groundwater levels should be expected to fluctuate during the year based on variations in precipitation, run-off, and other factors. Groundwater conditions indicated by the borings represent conditions at the time the readings were taken. Groundwater levels at other times may vary from those conditions noted on the boring logs.

5. ANALYSIS AND RECOMMENDATIONS

5.1 FILL BEHIND ABUTMENT WALLS

A tangent drilled shaft wall will be constructed to support each abutment. After construction of the wall, engineered fill will be placed behind the wall and compacted in lifts. The fill should be placed and compacted in accordance with ODOT CMS Item 203 with lifts not exceeding 6-inches thick. Refer to HDR's design for material requirements for the backfill.

We performed a settlement analysis for this fill based on the Hough Method outlined in LRFD 10.6.2.4.2b for cohesionless soils and LRFD 10.6.2.4.3 for cohesive soils. Based on these analyses, we estimate a total settlement of 3.7 inches at the rear abutment and 2.9 inches at the forward abutment due to the weight of the new fill. We anticipate settlement in the cohesionless soil layers will occur during construction. We estimate a total settlement in the cohesive soil layers of 1 inch at the rear abutment and 0.6 inches at the forward abutment. Based on this, HDR considered downdrag settlement in their drilled shaft design.

5.2 PIER FOUNDATIONS

Deep foundations will be required for support of the center piers. We recommend driven friction piles consisting of 16-inch CIP piles with a minimum 5/16-inch wall thickness at the piers.

5.2.1 PILE AXIAL CAPACITY

DrivenPiles was used to estimate the nominal resistance for the various foundation options. Results of the **DrivenPiles** analyses are included in Appendix B, with printouts from the spreadsheet analyses and graphs showing skin friction, end bearing, and total capacity in kips versus depth. The analyses for the pier pile analysis starts at the bottom of the pier pile cap (elevation 691.0 feet).

We evaluated subsurface profiles from B-002-0-22 and B-003-0-33 for the piers and found B-002-0-22 to be more conservative, so that is the profile used for our recommendations. For each analysis, we evaluated pile resistances with and without pile setup. The inclusion of pile setup results in saving more than 10 feet of length per pile at each substructure; therefore, pile setup has been accounted for in the design (ODOT GDM 1304.3.1).

The Nominal Bearing Resistance (R_n) was calculated using a resistance factor of 0.7. Based on the ODOT BDM, a resistance factor of 0.7 can be used for the dynamic analysis load test methods (LRFD 10.5.5.2.3) if installed in accordance with ODOT C&MS 507 and tested using dynamic test methods in accordance with ODOT C&MS 523. The R_n was plotted on the pile capacity graphs with setup to determine the estimated pile lengths. Based on the estimated pile lengths, pile capacity graphs without pile setup were used to determine the unfactored pile resistance at the End of Initial Drive (EOID). Dynamic load testing should be performed on the first two piles driven at the piers to verify that the EOID resistances have been achieved at the estimated pile lengths. Contact ODOT, the designer (HDR), and the geotechnical engineer of record (SME) if the EOID resistances are not achieved at the full estimated lengths during the initial drive. Assuming the EOID resistances are achieved, we recommend driving all piles to the full estimated lengths, then perform restrike testing on the same two piles after a waiting period of 7 days, to verify setup and that the R_n is achieved. This waiting period is based on a composite setup factor equal to R_n /EOID, in accordance with ODOT GDM Table 1300-7.

Appendix B includes calculations, marked up graphs showing the graphical analyses, marked up boring logs and a marked up profile sheet showing the soil layer breakdown and parameters, and a table showing the soil layer breakdown and parameters. Table 1 shows a summary of the pile design recommendations.

Table 1: Pile Design Recommendations Summary

SUBSTRUCTURE	PIER PILES
Pile Type/Size	16-in CIP
Wall Thickness (in)	0.3125
Boring Profile	B-002-0-22
Pile Cutoff Elevation (ft)	692.0
Elevation at Bottom of Pile Cap (ft)	691.0
Tip Elevation (ft)	602.8
Estimated Pile Lengths (ft)	89
Rounded Estimated Pile Lengths (ft)	95
Pile Order Lengths (ft)	100
Rn = UBV (kips)	435.7
EOID (kips)	319
Setup Factor	1.37
Waiting Period for Setup (days)	7

Pile lengths include 1-foot embedment into caps

 R_n = Nominal Bearing Resistance

EOID = Unfactored Pile Resistance at End of Initial Drive

UBV =Ultimate Bearing Value

5.2.2 PILE SETTLEMENT

We evaluated elastic compression of the piles based on GEC 12 Section 7.3.5.1 and evaluated settlement of the pile groups using the equivalent footing method as described in LRFD 10.7.2.3. The results are outlined in Table 2.

Table 2: Pile Settlement Estimates

	Pile Group Settlement	0.1 inches
PIER PILES	Elastic compression of the pile	0.4 inches
	Total Settlement of pile head	0.4 inches*

^{*}Total settlement of pier piles is the same as elastic settlement due to rounding

5.2.3 LATERAL PILE ANALYSIS

We performed lateral pile analyses using the program *LPile* for the pier piles based on the following maximum loads per pile:

- Factored vertical pile load is 305 kips
- Factored lateral pile load is 20 kips
- Service vertical pile load is 255 kips
- Service lateral pile load is 17 kips

We performed analyses for multiple cases to evaluate the effect of lateral loads on the pier piles, including:

- Subsurface profiles at B-002-0-22 and B-003-0-22
- With and without axial load applied
- Fixed head and pinned head conditions
- Service load and factored (Strength) load

We did not include a P-Multiplier due to the pile spacing being greater than five diameters. The analysis starts at the bottom of the pier pile cap (elevation 691.0 feet). Our analyses indicate the case using the subsurface profile at B-003-0-22 without axial loads applied and with a pinned-head loading condition is most critical. Based on discussions with the design team, we understand the connection at the top of the piles is somewhere between a fixed head and a pinned head condition, so we have included results for both conditions. Table 3 summarizes the lateral pile analysis results for both the service and factored (Strength) loads based on the B-003-0-22 profile. *LPile* output reports and plots are included in Appendix B.

Table 3. Lateral Pile Analysis Results – B-003-0-22 without Axial Load

LOAD TYPE	LOADING CONDITION	DEFLECTION AT TOP OF PILE (INCHES)	MAXIMUM BENDING MOMENT (INCH-LBS)
Service	Fixed Head	0.19	904,120
Loads	Pinned Head	0.71	948,149
Factored	Fixed Head	0.24	1,106,677
Loads	Pinned Head	0.89	1,156,570

^{*}The maximum bending moment occurred at the bottom of the pile cap for the fixed-head condition and at a depth of 7.9 feet below the bottom of the pile cap for the pinned-head condition.

5.2.4 DRIVABILITY ANALYSIS

We performed wave equation pile drivability analyses using GRLWEAP. At the piers, we performed an analysis based on a Delmag D 19-42 hammer. Our analysis shows that this hammer size can successfully drive 16-inch CIP piles through the upper soils to bear at the top of the hard sandy silt layer, which is anticipated near elevation 602.8 feet based on our borings. The analysis indicates this hammer size should have enough energy to activate the required resistance needed on the hard sandy silt layer. The results of these analyses are included in Appendix B.

Based on the results of our drivability analyses, we recommend using a pile driving hammer with a minimum rated energy of 43,200 foot-pounds (rated energy for a D 19-42 hammer) to install the pier piles. Ensure that stresses in the piles during driving do not exceed 40,500 pounds per square inch (90% of F_y).

5.3 WALL 1 AND WALL 2 FOUNDATIONS

The abutments will be supported on tangent drilled shaft walls. Please refer to HDR's supplemental geotechnical design calculations for additional information. The ends of these walls (see Image 1), designated Wall 1 at the rear abutment and Wall 2 at the forward abutment, will be 10 feet or less tall and will be supported by spread footing foundations. SME evaluated the bearing resistance and global stability of these end sections of the walls based on AASHTO LRFD 10.6.3.1 and 11.6.3.7, respectively. Sliding and overturning were evaluated by HDR. Our bearing resistance calculations, the results of our global stability analyses, and marked up boring logs showing the soil layer breakdown and parameters are included in Appendix B.

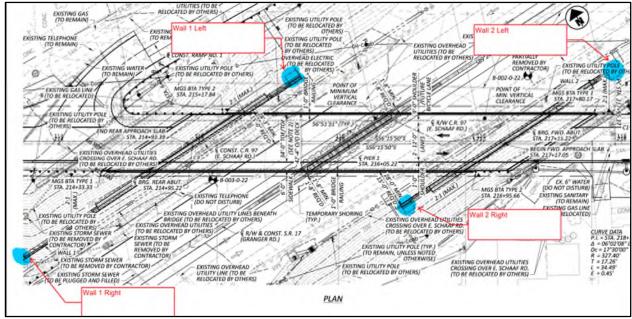


IMAGE NO. 1: Location and Designation of Each End of the CIP Walls.

The bearing resistances were compared with a maximum strength limit state bearing pressure of 2.3 ksf, provided by HDR. Based on our calculations, the factored bearing resistances exceed the maximum strength limit state bearing pressure. In our global stability analyses, we modeled the retaining wall with infinite strength to prevent failure surfaces from passing through the wall. Analyses allowing non-circular failure surfaces resulted in the lowest factors of safety; therefore, our evaluation focused on these analyses. The Wall 2 Right analysis indicates factors of safety exceed 1.5 behind a setback distance of 31 feet from the top of the slope. The residential structure near the top of the slope is positioned behind this setback line, so this meets the criteria.

The results of our calculations are outlined in Table 4 and the calculations and slope stability output files are included in Appendix B. Additional wall calculations performed by HDR are included in Appendix C, which includes factored eccentric load (overturning) resistance, factored sliding resistance, Service 1 Limit State bearing pressure, and Strength Limit State bearing pressure.

Table 4. Summary of MSE External Stability Calculations

Table 4. Summary of MSE External Stability Calculations				
	WALL 1 (REAR ABUTMENT) LEFT WALL		WALL 1 (REAR ABUTMENT) RIGHT WALL	
CRITERION	RESISTANCE	LOAD/TARGET	RESISTANCE	LOAD/TARGET
Bearing resistance	$q_r = 7.1 \text{ ksf}$	Q = 2.3 ksf	$q_r = 6.2 \text{ ksf}$	Q = 2.3 ksf
Overall (Global) Stability* Non-Circular Failure Surfaces	FS = 1.7	FS = or > 1.3	FS = 1.4	FS = or > 1.3
		VARD ABUTMENT) T WALL	WALL 2 (FORWA RIGHT	RD ABUTMENT)
		I WALL	RIGHT	WALL
Bearing resistance	$q_r = 9.9 \text{ ksf}$	Q = 2.3 ksf	$q_r = 7.1 \text{ ksf}$	Q = 2.3 ksf

^{*}FS Criteria at Forward Abutment Right Wall set at 1.5 due to residential structure near the top of the slope.

5.4 SEISMIC CONSIDERATIONS

Structural calculations that consider seismic effects should assume Site Class E in accordance with ASCE 7-16 Chapter 20. Calculations for the Site Class determination are included in the report attachments. Based on ASCE 7-16, the following seismologic data is applicable to this project site:

Horizontal Peak Ground Acceleration (PGA) = 0.076g

Horizontal Response Spectral Acceleration Coefficient at Period of 0.2 s (Ss) = 0.141g

Horizontal Response Spectral Acceleration Coefficient at Period of 1.0 s (S₁) = 0.05q

A report of the site-specific seismologic data from SEA/OSHPD is included in the report attachments.

5.5 CONSTRUCTION CONSIDERATIONS

It will be important for the contractor to incorporate effective site drainage practices to prevent water pressure from building behind the soldier pile and lagging wall. The contractor must take precautions to protect nearby foundations, pavements, and utilities during construction. Do not undermine existing structures. Any shoring/bracing will need to be designed by a professional engineer licensed in the State of Ohio.

Care should be exercised during excavating and compacting operations, so vibrations do not cause settlement or damage to nearby structures, pavements, and utilities. Pile driving within 200 feet of existing buildings requires vibration impact assessment, per BDM 305.3.6. There is a house within 45 feet of the pile driving location. Based on a vibration impact assessment, performed by HDR, there is a potential for damage at that house. Therefore, a preconstruction condition survey is required.

Based on our review of the typical plan notes in the ODOT BDM 605 and our discussions with HDR, we have included recommendations for geotechnical plan notes in Appendix B.

6. SIGNATURES

REPORT PREPARED BY:

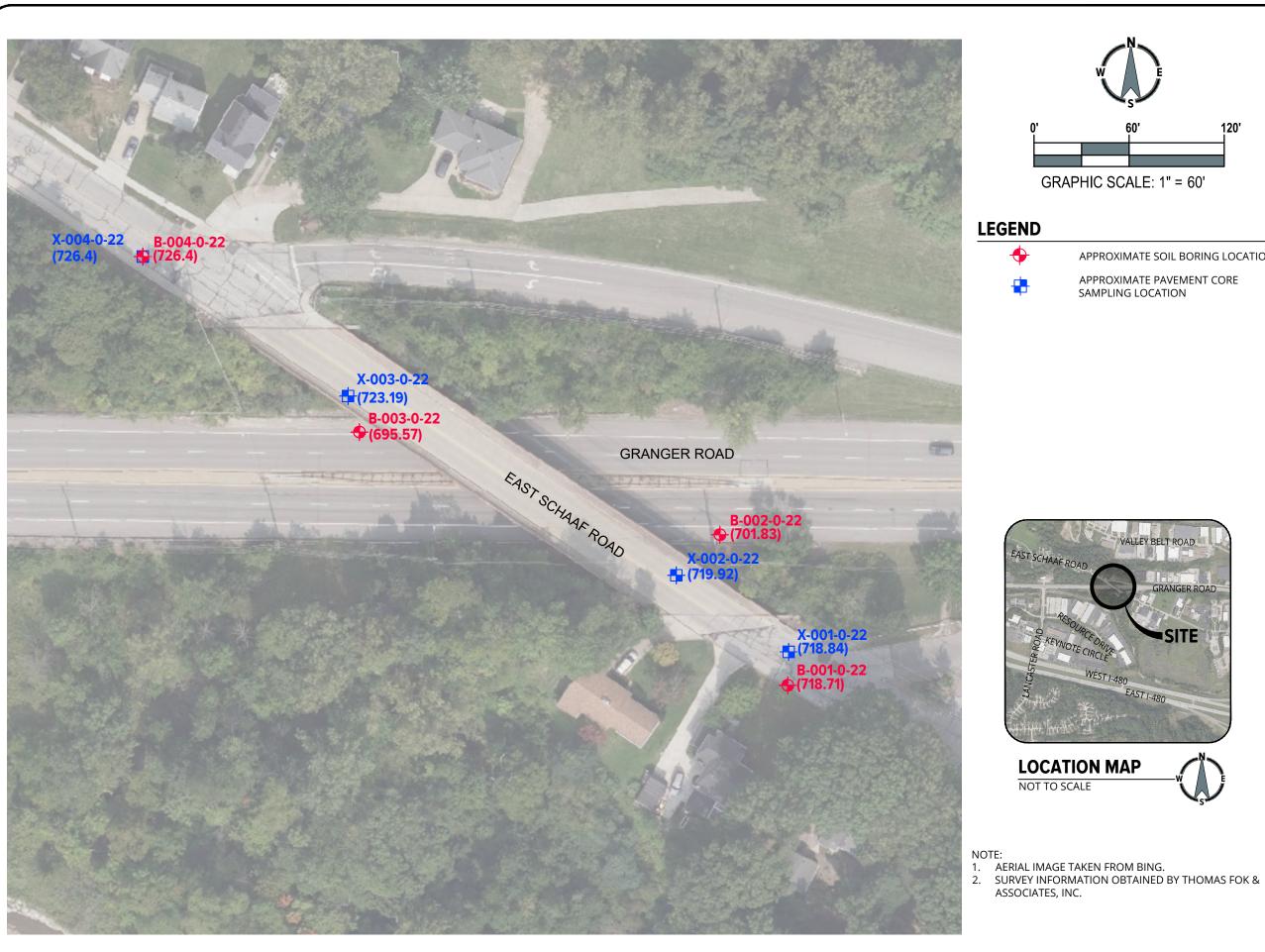


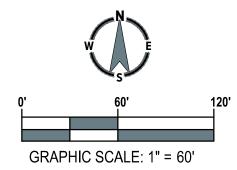
Brendan P. Lieske, PE Senior Consultant **REPORT REVIEWED BY:**

Tom Olding

Alan J. Esser, PE, BC.GE Chief Consultant

APPENDIX A BORING LOCATION DIAGRAM BORING LOG TERMINOLOGY BORING LOGS ROCK CORE PHOTOS PAVEMENT CORE LOGS





LEGEND



APPROXIMATE SOIL BORING LOCATION



LOCATION MAP

NOT TO SCALE

APPROXIMATE PAVEMENT CORE SAMPLING LOCATION



Project

CUY-17-13.50

Project Location

BROOKLYN HEIGHTS, ОНЮ

Sheet Name

BORING LOCATION DIAGRAM

No.	Revision Date
Date	05-19-2022
CADE	

TPM

BPL

AS NOTED

Project 088549.00

Figure No.



1) STRENGTH OF SOIL:

Non-Cohesive (granular) Soils - Compactness		
Description	Blows Per Ft.	
Very Loose	<u>≤</u> 4	
Loose	5 – 10	
Medium Dense	11 – 30	
Dense	31 – 50	
Very Dense	> 50	

2) Color:

If a color is a uniform color throughout, the term is single, modified by an adjective such as light or dark. If the predominate color is shaded by a secondary color, the secondary color procedes the primary color. If two major and distinct colors are swirled throughout the soil, the colors are modified by the term "mottled"

3) PRIMARY COMPONENT

Use **DESCRIPTION** from ODOT Soil Classification Chart on Back

Cohesive (fine grained) Soils - Consistency

Ou Blows			
Description	Qu (TSF)	Per Ft.	Hand Manipulation
Very Soft	< 0.25	<2	Easily penetrates 2" by fist
Soft	0.25-0.5	2 - 4	Easily penetrates 2" by thumb
Medium Stiff	0.5-1.0	5 - 8	Penetrates by thumb with moderate effort
Stiff	1.0-2.0	9 - 15	Readily indents by thumb, but not penetrate
Very Stiff	2.0-4.0	16 - 30	Readily indents by thumbnail
Hard	>4.0	>30	Indent with difficulty by thumbnail

4) COMPONENT MODIFIERS:

Description	Percentage By Weight
Trace	0% - 10%
Little	10% - 20%
Some	20% - 35%
"And"	35% -50%

6) Relative Visual Moisture

5)	Sail	Orga	anic	Con	tent
21	171711	1112	ame	w	

e) bon organic content		
Description	% by Weight	
Slightly Organic	2% - 4%	
Moderately Organic	4% - 10%	
Highly Organic	> 10%	

6) Relative Visual Moisture				
	Criteria			
Description	Cohesive Soil	Non-cohesive Soils		
Dry	Powdery; Cannot be rolled; Water content well below the plastic limit	No moisture present		
Damp	Leaves very little moisture when pressed between fingers; Crumbles at or before rolled to ¹ / ₈ "; Water content below plastic limit	Internal moisture, but no to little surface moisture		
Moist	Leaves small amounts of moisture when pressed between fingers; Rolled to ¹ / ₈ " or smaller before crumbling; Water content above plastic limit to -3% of the liquid limit	Free water on surface, moist (shiny) appearance		
Wet	Very mushy; Rolled multiple times to ¹ / ₈ " or smaller before crumbles; Near or above the liquid limit	Voids filled with free water, can be poured from split spoon.		



CLASSIFICATION OF SOILS Ohio Department of Transportation

(The classification of a soil is found by proceeding from top to bottom of the chart. The first classification that the test data fits is the correct classification.)

SYMBOL	DESCRIPTION	Classifo	OHIO	LL _O /LL × 100*	% Pass #40	% Pass #200	Liquid Limit (LL)	Plastic Index (PI)	Group Index Max.	REMARKS
0000	Gravel and/or Stone Fragments	Α-	1-a		30 Max.	15 Max.		6 Max.	0	Min. of 50% combined gravel, cobble and boulder sizes
	Gravel and/or Stone Fragments with Sand	Α-	1-b		50 Max.	25 Max.		6 Max.	0	
F.S.	Fine Sand	А	-3		51 Min.	10 Max.	NON-P	LASTIC	0	
	Coarse and Fine Sand		A-3a			35 Max.		6 Max.	0	Min. of 50% combined coarse and fine sand sizes
0.0000 0.0000 0.00000	Gravel and/or Stone Fragments with Sand and Silt		2-4			35 Max.	40 Max. 41 Min.	10 Max.	0	
6.0.0 0.0.0 0.0.0	Gravel and/or Stone Fragments with Sand, Silt and Clay		2-6 2-7			35 Max.	40 Max. 41 Min.	11 Min.	4	
	Sandy Silt	A-4	A-4a	76 Min.		36 Min.	40 Max.	10 Max.	8	Less than 50% silt sizes
+ + + + + + + + + + + + + + + + + + + +	Silt	A-4	A-4b	76 Min.		50 Min.	40 Max.	10 Max.	8	50% or more silt sizes
	Elastic Silt and Clay	А	-5	76 Min.		36 Min.	41 Min.	10 Max.	12	
	Silt and Clay	A-6	A-6a	76 Min.		36 Min.	40 Max.	11 - 15	10	
	Silty Clay	A-6	A-6b	76 Min.		36 Min.	40 Max.	16 Min.	16	
	Elastic Clay	Α-	7-5	76 Min.		36 Min.	41 Min.	≦LL-30	20	
	Clay	Α-	7-6	76 Min.		36 Min.	41 Min.	>LL-30	20	
+ + + + + + + +	Organic Silt	A-8	A-8a	75 Max.		36 Min.				W/o organics would classify as A-4a or A-4b
	Organic Clay	A-8	A-8b	75 Max.		36 Min.				W/o organics would classify as A-5, A-6a, A-6b, A-7-5 or A-7-6
	Sod and Topsoil	1	CLASS	SIFIED B	/ VISUAL	INSPEC Boulders			Pe	ea†
XXXX	Pavement or Base $\begin{array}{c} 2 & 7 & 7 \\ > & \Lambda \\ & & \Lambda \end{array}$	Fill (escribe)]	, 20110		P	

* Only perform the oven-dried liquid limit test and this calculation if organic material is present in the sample.

APPENDIX A.2 – ODOT Quick Reference Guide for Rock Description

1: ROCK TYPE: Common rock types are: Claystone; Coal; Dolomite; Limestone; Sandstone; Siltstone; & Shale.

2: COLOR: To be determined when rock is wet. When using the GSA Color charts use only Name, not code.

3: WEATHERING	
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	Description	Field Parameter
	Unweathered	No evidence of any chemical or mechanical alternation of the rock mass. Mineral crystals have a bright
	Unweathered	appearance with no discoloration. Fractures show little or no staining on surfaces.
	Slightly	Slight discoloration of the rock surface with minor alterations along discontinuities. Less than 10% of the
	weathered	rock volume presents alteration.
	Moderately	Portions of the rock mass are discolored as evident by a dull appearance. Surfaces may have a pitted
	weathered	appearance with weathering "halos" evident. Isolated zones of varying rock strengths due to alteration
	weathereu	may be present. 10 to 15% of the rock volume presents alterations.
	Highly	Entire rock mass appears discolored and dull. Some pockets of slightly too moderately weathered rock
weathered may be present and some areas of severely weather		may be present and some areas of severely weathered materials may be present.
	Severely	Majority of the rock mass reduced to a soil-like state with relic rock structure discernable. Zones of more
	weathered	resistant rock may be present, but the material can generally be molded and crumbled by hand pressures.

Ħ,	Description	Field Parameter						
STRENGTH	Very Weak	Core can be carved with a knife and scratched by fingernail. Can be excavated readily with a point of a						
		pick. Pieces 1 inch or more in thickness can be broken by finger pressure.						
STR	Weak	Core can be grooved or gouged readily by a knife or pick. Can be excavated in small fragments by						
E E	weak	moderate blows of a pick point. Small, thin pieces can be broken by finger pressure.						
Ţ	Slightly	Core can be grooved or gouged 0.05 inch deep by firm pressure of a knife or pick point. Can be excavated						
LA	Strong	in small chips to pieces about 1-inch maximum size by hard blows of the point of a geologist's pick.						
REI	Moderately	Core can be scratched with a knife or pick. Grooves or gouges to ¼" deep can be excavated by hand blows						
3:	Strong	of a geologist's pick. Requires moderate hammer blows to detach hand specimen.						
	Strong	Core can be scratched with a knife or pick only with difficulty. Requires hard hammer blows to detach						
		hand specimen. Sharp and resistant edges are present on hand specimen.						
	Very	Core cannot be scratched by a knife or sharp pick. Breaking of hand specimens requires hard repeated						
	Strong	blows of the geologist hammer.						
	Extremely	Core cannot be scratched by a knife or sharp pick. Chipping of hand specimens requires hard repeated						
	strong	blows of the geologist hammer.						

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Component		Grain Diameter
Boulder		>12"
Cobble		3"-12"
Gravel		0.08"-3"
	Coarse	0.02"-0.08"
Sand	Medium	0.01"-0.02"
Sa	Fine	0.005"-0.01"
	Very Fine	0.003"-0.005"

6: Bedding

Description	Thickness
Very Thick	>36"
Thick	18" – 36"
Medium	10"-18"
Thin	2"-10"
Very Thin	0.4" - 2"
Laminated	0.1" - 0.4"
Thinly Laminated	<0.1"

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Arenaceous – sandy
Calcareous - contains calcium carbonate
Conglomeritic - contains rounded to subrounded gravel
Ferriferous – contains iron
Friable – easily broken down
Siliceous – contains silica

Brecciated – contains angular to subangular gravel
Cherty- contains chert fragments
Dolomitic- contains calcium/magnesium carbonate
Fossiliferous – contains fossils
Pyritic – contains pyrite
Vuggy – contains openings

APPENDIX A.2 – ODOT Quick Reference Guide for Rock Description

8: DISCONTINUITIES

Parameters Type a: Discontinuity Types Fracture which expresses displacement parallel to the Fault surface that does not result in a polished surface. Planar fracture that does not express displacement. Joint Generally occurs at regularly spaced intervals. Fracture which expresses displacement parallel to the Shear surface that results in polished surfaces or slickensides. Bedding A surface produced along a bedding plane. A surface produced along a contact plane. Contact (generally not seen in Ohio)

1 8	Description	Spacing
cturir	Unfractured	> 10 ft.
of Fra	Intact	3 ft. – 10 ft.
b: Degree of Fracturing	Slightly fractured	1 ft. – 3 ft.
b: De	Moderately fractured	4 in. – 12 in.
	Fractured	2 in. – 4 in.
	Highly fractured	< 2 in.

re	Description	Spacing
	Open	> 0.2 in.
c: Aperi Wj	Narrow	0.05 in 0.2 in.
	Tight	<0.05 in.

d: Surface Ronobness

Description	Criteria
Very Rough	Near vertical steps and ridges occur on the discontinuity surface.
Slightly Rough	Asperities on the discontinuity surface are distinguishable and can be felt.
Slickensided	Surface has a smooth, glassy finish with visual evidence of striation.

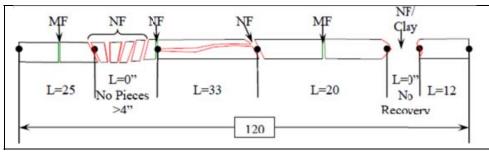
: RECOVERY	$Run \operatorname{Recov} ery = \left(\frac{R_R}{L_R}\right) * 100$	$Unit \operatorname{Recov} ery = \left(\frac{R_U}{L_U}\right) * 100$
11	$L_R = Run Length$	$L_U = Rock Unit Length$
	R _R – Run Recovery	R _U – Rock Unit Recovery

9: GSI DESCRIPTION

re	Description	Parameters
Structure	Intact or Massive	Intact rock with few widely spaced discontinuities
ru	Blocky	Well interlocked undisturbed rock mass consisting of cubical
		blocks formed by three interesting discontinuity sets
a :	Very Blocky	Interlocked, partially disturbed mass with multi-faceted angular
		blocks formed by 4 or more joint sets
	Blocky/Disturbed/	Angular blocks formed by many intersecting discontinuity sets,
	Seamy	Persistence of bedding planes
	Disintegrated	Poorly interlocked, heavily broken rock mass with mixture of
		angular and rounded rock pieces
	Laminated/Sheared	Lack of blockiness due to close spacing of weak shear planes

no	Description	Parameters
dition	Very Good	Very rough, fresh unweathered surfaces
Conc	Good	Rough, slightly weathered, iron stained surface
rface	Fair	Smooth, moderately weathered and altered surfaces
b: Sur	Poor	Slickensided, highly weathered surface with compact coatings or fillings or angular fragments
	Very Poor	Slickensided, highly weathered surfaces with soft clay coating or fillings

10: RQD



$$RQD = \left(\frac{\sum Length \ of \ Pieces > 4inches}{Total \ Length \ of \ Core}\right) *100$$

$$RQD = \left(\frac{25 + 33 + 20 + 12}{120}\right) *100 = 75\%$$

Table 600.10. Strength of Bedrock

	Table 600.10. Strength of Bed	Range of Unconfi	ned Compressive
Description	Field Parameters	Stren	_
		psi (ksf)	MPa
Extremely Strong	Cannot be scratched by a knife or sharp pick. Chipping of hand specimens requires hard repeated blows of the geologist hammer.	Greater than 30,000 (> 4320)	Greater than 200
Very Strong	Cannot be scratched by a knife or sharp pick. Breaking of hand specimens requires hard repeated blows of the geologist hammer.	15,000 to 30,000 (2160 to 4320)	100 to 200
Strong	Can be scratched with a knife or pick only with difficulty. Requires hard hammer blows to detach hand specimen. Sharp and resistant edges are present on hand specimen.	7500 to 15,000 (1080 to 2160)	50 to 100
Moderately Strong	Can be scratched with a knife or pick. Grooves or gouges to ½" (6mm) deep can be excavated by hand blows of a geologist's pick. Requires moderate hammer blows to detach hand specimen.	3600 to 7500 (520 to 1080)	25 to 50
Slightly Strong	Can be grooved or gouged 0.05 inch (2 mm) deep by firm pressure of a knife or pick point. Can be excavated in small chips to pieces about 1-inch (25 mm) maximum size by hard blows of the point of a geologist's pick.	1500 to 3600 (215 to 520)	10 to 25
Weak	Can be grooved or gouged readily by a knife or pick. Can be excavated in small fragments by moderate blows of a pick point. Small, thin pieces can be broken by finger pressure.	750 to 1500 (108 to 215)	5 to 10
Very Weak	Can be carved with a knife. Can be excavated readily with a point of a pick. Pieces 1 inch (25 mm) or more in thickness can be broken by finger pressure. Can be scratched by fingernail.	40 to 750 (6 to 108)	0.3 to 5

PROJECT: CUY	-17-13.50	DRILLING FIRM / OPE	ERATOR:	SME / RM	DRIL	L RIG	6: C	ME550 A1	ΓV 525	5	STAT	ΓΙΟΝ	/ OFI	FSE1	Г:	118+:	21, 9'	LT.	EXPLOR/	
TYPE: BRII	DGE	SAMPLING FIRM / LC	GGER: _	SME / APP	HAM	MER:	CN	IE AUTO	MATIC	;	ALIG	NME	NT:	E.	SCH	IAAF	RD.	CL	B-001	
PID: <u>112998</u> SFN: _	1802437	DRILLING METHOD3.	75" HSA / I	MUD ROTARY/ NWI	_kCALI	BRAT	ION D	ATE:	9/3/20		ELE\	/ATIC	ON: _	718.7	7 (MS	<u>SL)</u> E	EOB:	13	89.0 ft	PAGE
START: <u>3/31/22</u> EN	D: <u>4/6/22</u>	SAMPLING METHOD		SPT	ENE		RATIO	<u> </u>	70		LAT /							1.6593	864	1 OF 5
MA	TERIAL DESCRIPT	TION	ELEV.	DEPTHS	SPT/			SAMPLE		-	GRAD			,	ATT	_	ERG		ODOT	HOLE
	AND NOTES	N.Z	718.7	DEI IIIO	RQD	1 160	(%)	ID	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALED
4" ASPHALT OVER 12"	CONCRETE	×	717.4	-																
HADD BDOWN AND C	DAY CANDY OUT	12	717.4	1 -	10															
HARD, BROWN AND G CLAY, SOME GRAVEL,				- 2 -	9	19	100	SS-1	4.50	-	-	-	-	_	-	-	-	11	A-4a (V)	
SLIGHTLY ORGANIC, D		Trutomento,	715.7	3	7														` ′	
STIFF TO VERY STIFF,		RAY, SILT AND			4															
CLAY, TRACE SAND, M	IOIST			4	5	14	100	SS-2	3.00	-	-	-	-	-	-	-	-	24	A-6a (V)	
		//		<u></u> 5 ⊥	7															
				- 6																
					4	9	100	SS-3	2.00	0	0	2	46	52	38	23	15	20	A-6a (10)	
		//		7 +	4		100	00-0	2.00	L			40	32	30	23	13	23	A-0a (10)	
				- 8 -																
				- 9 -	4															
		//			5	11	100	SS-4	3.50	-	-	-	-	-	-	-	-	29	A-6a (V)	
				10 	4															
		//																		
			705.7	- 12			100	ST-5	4.00	_ ا	_	_	_	_	١.	_	_	21	A-6a (V)	
MEDIUM DENSE, BROV	NN COARSE AND	FINE SAND		<u> </u>																
LITTLE SILT, TRACE C		FINE SAND,		14	6 _	40		20.0			T			_	.					
LITTLE SILT, TRACE C	•			-	7 7	16	33	SS-6	-	0	7	76	12	5	NP	NP	NP	6	A-3a (0)	
				_ 15 _	•															
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				_ 18 _																
				- 19 -	6 7	18	72	SS-7	_	١.	_	_	_	_	١.	_	_	5	A-3a (V)	
				_ 20 _	, 8		12	00-1					_	_					/ (-Oa (V)	
		•••		-																
				21																
				- 22 -																
	A/AL OUT HALLES	AND LITTLE	695.2	- 23 -	7															
MEDIUM DENSE, BRO\ CLAY, DAMP	wn, sil t, "and" S	SAND, LITTLE	+ + +	- 24 -	8	21	100	SS-8	_	0	4	33	50	13	NP	NP	NP	13	A-4b (6)	
		+ -	++	_ 25 _	10					Ĺ						L			- (-/	
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		+ -	+ + +	_ 26 _																
		+ -	++	— 27 —																
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			+ + + + + + - + +	29	8	18	100	SS-9	-	-	-	-	-	-	-	-	-	7	A-4b (V)	
		+-	+++		7														L ` ′	

PID: <u>112998</u>	SFN: _	1802437	PROJECT:	CUY-1	7-13.50	s	TATION	OFFSE	ΞT:		21, 9' LT.			: <u>3/3</u>		_	ND: _		6/22	_	G 2 OI	5 B-00	1-0-2
	MAT	TERIAL DESCR AND NOTES			ELEV.	DEPT	HS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)		RAD			CL	ATT LL	ERBI PL	ERG PI	wc	ODOT CLASS (GI)	HO SEA
CLAY, DAMP	(continued ₎	VN, SILT , "AND)	" SAND, LITTLE ND FINE SAND,	+ + + + + + + + + + + + + + + + + + + +	688.7		- 31 - - 32 -	INQU		(70)	ID	(ISI)	GR	CS	го	51	CL		PL	PI	WC	22.12.2 (0)	JLA
LITTLE SILT,			IND FINE SAND,				33 -	9	27	78	SS-10	-	0	1	82	13	4	NP	NP	NP	23	A-3a (0)	
							- 35 - - 36 - - 37	13															
MEDIUM DEN CLAY, MOIST	SE, GRAY	, SILT, SOME	SAND, TRACE	+++++++++++++++++++++++++++++++++++++++	681.2		- 37 - - 38 - - 39 -	7	24	100	00.44			_	0.4	07		ND.	ND	ND	10	A 41- (0)	
				+ + + + + + + + + + + + + + + + + + + +			- 40 - 41	9	21	100	SS-11	-	0	0	24	67	9	NP	NP	NP	19	A-4b (8)	
TIES TO 1 (=-		ODAY 5" = "	AND OLAY TO SE	++++	675.2		- 42 - - 43 -	2		98	ST-12	-	-	-	-	-	-	-	-	-	21	A-4b (V)	
STIFF TO VER SAND, WET	RY STIFF,	GRAY, SIL T, "A	AND" CLAY, TRACE	=			- 44 - - 45 -	3 4 5	11	100	SS-13	2.00	-	-	-	-	-	-	-	-	26	A-4b (V)	
				+ + + + + + + +			- 46 - - 47 - - 48 -																
				(+ + + + + + + + + + + + + + + + + + + +			- 49 - 50	5 6 7	15	67	SS-14	3.00	0	0	1	54	45	28	20	8	27	A-4b (8)	
				+ + + + + + + +			- 51 - - 52 - - 52																
				+ + + + + + + + + + + + + + + + + + + +			- 53 - - 54 - - 55	4 4 6	12	100	SS-15	1.50	-	-	-	-	-	-	-	-	27	A-4b (V)	
				++++			- 56 - - 57 -	4 6	14	67	SS-16	2.50	-	-	-	-	_	_	_	-	17	A-4b (V)	
				+ + + + + + + +			- 58 - - 59 - - 60 -	6															
STIFF, GRAY,	SANDY S	ILT, "AND" CLA	AY, WET		657.7		61 -																

PID: <u>112998</u>	SFN:	1802437	PROJECT:	CUY-	17-13.50	s	TATION /	OFFSE			21, 9' LT.			: 3/3					5/22		G 3 O	F 5 B-00	1-0-22
	MAT	ERIAL DESCRIP	PTION		ELEV.	DEP.	THS	SPT/ RQD	N ₆₀	REC	SAMPLE			RADA						ERG		ODOT CLASS (GI)	HOLI
OTIES 00 11/		AND NOTES	, 		656.6	J		RQD	1 60	(%)	ID	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALI
(continued)	SANDY S	ILT , "AND" CLAY	, WEI				63 — 64 — 65 —	2 2 3	6	67	SS-17	1.50	-	-	-	-		-	-	-	30	A-4a (V)	
							- 67 - - 68 -	2 2 3	6	100	SS-18	1.50	-	-	-	-	•	-	-	-	33	A-4a (V)	
							F /4 T	2 3 4	8	100	SS-19	1.00	0	1	0	49	50	29	20	9	27	A-4a (8)	
MEDIUM STIF	F TO STIF , MOIST	F, GRAY, CLAY ,	, SOME SILT,		641.7		- 75 - - 76 - - 77 - - 78 -																
							- 79 - 80 - 81 - 82 82 82	3 3 4	8	100	SS-20	1.50	-	-	-	-		-	-	-	26	A-7-6 (V)	
						- 83	3 4 5	11	100	SS-21	1.50	-	-	-	-	•	-	-	-	27	A-7-6 (V)		
							- 88 90	3 5 6	13	67	SS-22	1.50	-	-		-		-	-	-	25	A-7-6 (V)	
							92 93 94 <u></u>	3															

Р	ID:	112998	SFN:		1802437		PROJE	ECT:		CUY-	17-13.50	s	TATION /	OFFSI	ET:	118+	21, 9' LT.	S	TART	T: 3/3	31/22	EI	ND:	4/	6/22	F	G 4 O	F 5 B-00	1-0-22
			M	ATE	RIAL DESC	CRIPT	ION				ELEV.	DEP	LUG	SPT/	N		SAMPLE	HP	(SRAD		N (%	6)	ΑT	TERI	BERG		ODOT	HOLE
L					AND NOTE						624.4	DLF	1110	RQD	N ₆₀	(%)	ID	(tsf)	GR		FS	SI		LL		PI	WC	CLASS (GI)	SEALED
	MEDII ΓRAC	UM STIF E SAND	F TO ST , MOIST	∏FF, 「 <i>(cor</i>	GRAY, CL tinued)	LAY, S	SOME	SILT,					95 — 95 — 96 — 97 — 97 — 98 —	3 4	8	100	SS-23	1.00	0	1	2	30	67	41	24	17	29	A-7-6 (11)	
A/GIN I (U88549.00+LOGS.GP.)													99	3 4 5	11	100	SS-24	1.50	-	-	-	-	-	-	-	-	31	A-7-6 (V)	
2000/1 NIENA 14	(ED)	OTIFE		D 01	DAY GANG		- ua	ID!			615.2		-101- -102- -103-																
	CLAY	, TRACE	O HAR SHALE	ARD, GRAY, SANDY SILT , "AND" ALE FRAGMENTS, DAMP TO MOIS				טי" MOIST	Γ				104 105	6 8	16	0	SS-25	-	-	-	-	-	-	-	-	-	-	A-4a (V)	
J88549.00/PRC													106 107 108																
INCIPE, WIF													-109 -110	5 8 9	20	100	SS-26	2.50	-	-	-	-	-	-	-	-	16	A-4a (V)	
24 12.03 - NSIME-													-111- -112- -113-																
1011-10													-114 -115	6 8 10	21	100	SS-27	2.00	10	6	6	36	42	27	19	8	20	A-4a (8)	
STANDARD ODGE SOIL BURING LOG (6.3 A 11) - OT DOT, GD I - 7/19/24 12:03 - NSIME-INCIPZIWIFW00048:UUFFROJECT													-116- -117- -118-																
200													-119 -120	10 16 21	43	67	SS-28	4.00	-	-	-	-	-	-	-	-	18	A-4a (V)	
טטור טטיוייט									121 122 123																				
											- -124 - -125	11 20 24	51	67	SS-29	4.00	-	-	-	-	-	-	-	-	13	A-4a (V)			
5													- -126-																

PROJECT: CUY-17-13.50	DRILLING FIRM / OPER	RATOR:	SME / RM	DRII	I RIG	· С	ME550 A	TV 525	;	STAT	ΓΙΟΝ	/ OFI	FSFT	г· 1	17+3	3 47	" I T	EXPLORA	ATION IE
TYPE: BRIDGE	SAMPLING FIRM / LOG	_	SME / APP				IE AUTOI		_	ALIG				_				B-002	
PID: 112998 SFN: 1802437	DRILLING METHOD3.75	5" HSA / N	IUD ROTARY/ NWL					9/3/20										23.0 ft	PAGE
START: <u>3/21/22</u> END: <u>3/23/22</u>	SAMPLING METHOD: _		SPT	ENE	RGY F	RATIO	(%):	70		LAT	/ LON	۱G: _		41.4	1504	0, -81	1.6595	516	1 OF 4
MATERIAL DESCRIPT	TION	ELEV.	DEPTHS	SPT/	N ₆₀		SAMPLE		-	GRAD			_	_		ERG	1	ODOT	HOLE
AND NOTES	IVV	701.8	DEI IIIO	RQD	1 60	(%)	ID	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALED
5" ASPAHLT OVER 10" CONCRETE	\bowtie	700.6	- 1 -																
MEDIUM DENSE, BROWN, GRAVEL AND	OR STONE	700.0	1 ⊢ ∏	6															-
FRAGMENTS, WITH SAND, DAMP		3	_ 2 +	10 15	29	100	SS-1	-	-	-	-	-	-	-	-	-	7	A-1-b (V)	
		1	- 3 -																
		3	<u> </u>	5 5	12	56	SS-2		7	49	31	9	4	NP	NP	NP	5	A-1-b (0)	
				5		30	33-2	_	L '	49	31	9	4	INF	INF	INF		A-1-0 (0)	
VERY STIFF, BROWN, SILT AND CLAY , L	ITTLE SAND	696.3																	
DAMP	ITTLE OAIND,	1	6 7	6	15	67	SS-3	4.00	_								24	A 60 (\(\(\) \)	-
	(//		<u> </u>	6 7	15	67	აა-ა	4.00	_	-	-	-	-	-	_	_	24	A-6a (V)	
MEDIUM DENSE, BROWN, COARSE AND	EINE SAND	693.8	- 8 -																
LITTLE SILT, TRACE CLAY, MOIST TO W			_ 9 _	4 _	40	0.7	00.4				0.4	40	_			ND		A 0 - (0)	
			- 10	5 6	13	67	SS-4	-	0	3	81	12	4	NP	NP	NP	8	A-3a (0)	
			W 091.3																
	•••••		<u></u> 11 ⊤	5		400											-		-
	•••••		— 12 —	6 6	14	100	SS-5	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
			_ 13 _	Ì															-
			14	4															_
			H	6 6	14	67	SS-6	-	-	-	-	-	-	-	-	-	28	A-3a (V)	
		686.3	- 15 -	Ĭ															
MEDIUM DENSE, BROWN, SILT , SOME T TRACE CLAY, MOIST TO WET	O AND SAND,	+	_ 16 _	8															-
THAGE GEAT, MOIOT TO WET	+ + + + + + + + +	+	- 17 -	9 9	21	100	SS-7	-	0	0	35	57	8	NP	NP	NP	31	A-4b (6)	
	+++	+	18 —	3															-
	++++++++	+++++++++++++++++++++++++++++++++++++++	l - i	5															_
	+++ +++ +++	± 682.3 ±		6 5	13	100	SS-8	-	-	-	-	-	-	-	-	-	17	A-4b (V)	
MEDIUM DENSE, GRAY, SILT , LITTLE SA CLAY, MOIST	AND, LITTLE +++	‡	_ 20 _)															-
	+++	‡	<u> </u>																
	+ + + + + + + + +	+	_ 22 _																
	+++	‡	-																
	+++ +++	# #	- 23 -	6					_										-
	 + + + + + +	#	_ 24 _	10	29	89	SS-9	-	0	0	17	71	12	NP	NP	NP	17	A-4b (8)	
	+ + + + + + + + +	+++++++++++++++++++++++++++++++++++++++	- 25	15					-										-
	+ + + + + + + + +	+	26 —																
		0.0.0	27																
TRACE TO LITTLE SAND, MOIST TO WE						100	ST-10	2.50	-	-	-	-	-	-	-	-	25	A-6a (V)	
MEDIUM STIFF TO STIFF, GRAY, SILT AI TRACE TO LITTLE SAND, MOIST TO WE	\///		_ 28 _	4					_										
	\///		_ 29 _	4 5	12	100	SS-11	2.00	0	2	8	36	54	33	18	15	23	A-6a (10)	
	///	/		5														L , , ,	

PID:	112998	SFN:	1802437	PROJECT:	CUY-17-13.50	STATION	/ OFFS	ET:		33, 47' LT.			T: <u>3/</u> 2		_	ND:		3/22	_	G 2 O	F 4 B-00	2-0-22
		MAT	TERIAL DESCRI		ELEV.	DEPTHS	SPT/ RQD	N ₆₀		SAMPLE			RAD		_		_	ERB			ODOT	HOLE
			AND NOTES		671.8	DEI IIIO	RQD	1160	(%)	ID	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALE
MEI TRA	DIUM STIF ACE TO LI	F TO STIF ITLE SAN	FF, GRAY, SILT D, MOIST TO V	AND CLAY, VET (continued)		- 31 - - 32 -																
						- 33 - - 34 -	7 8	18	100	SS-12	2.00	_	-	_	-	_	_	_	-	25	A-6a (V)	-
						- 35 - - 36 -	7															_
						- 37 - - 38 - - 39 -	4 _	40	465	00.15												-
						40	5 6	13	100	SS-13	1.75	-	-	-	-	-	-	-	-	29	A-6a (V)	-
STI						- 41 - - 42 - - 43 -	- - -															
						- 44 - - 45 -	3 4	8	100	SS-14	1.50	0	1	2	33	64	36	23	13	29	A-6a (9)	
						46 47 48																
						- 49 - 50	2 3	6	100	SS-15	1.25	-	-	-	-	-	-	-	-	34	A-6a (V)	-
						- 51 - - 52 -																
						- 53 - - 54 - - 55	2 2 3	6	100	SS-16	1.00	-	-	-	-	-	-	-	-	31	A-6a (V)	
STI TO	FF TO VEF	RY STIFF,	GRAY, SILT AN ST TO WET	ND CLAY, TRACE	645.8	- 56 - - 57 -																-
. •	22 3/	_,•				- 58 -	ł		100	ST-17			-	-	-	-	-	-	-	25		-
						- 59 - - 60 -	8 11	22	100	SS-18	3.50	-	-	-	-	-	-	-	-	26	A-6a (V)	-
						— 61 — - -																

PID: _	112998	SFN:	1802437	PROJECT	Γ:	CUY-17-13.50	S	ΓΑΤΙΟΝ /	OFFSE	T: _	117+3	33, 47' LT.	s	TAR	Γ: _3/2	21/22	2 E	ND:	3/2	3/22	_ P	G 3 O	F 4 B-00)2-0-22
		MAT	ERIAL DESCI			ELEV.	DEPT	'HS	SPT/	N ₆₀		SAMPLE			GRAD						ERG	-	ODOT	HOLE
			AND NOTE			639.7	DLII	110	RQD	1 460	(%)	ID	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALE
STIF TO L	F TO VEF ITTLE SA	RY STIFF, ND, MOIS	GRAY, SILT A T TO WET <i>(co</i>	AND CLAY, TR. ontinued)	ACE			63 - 64 - 65 - 65 - 66	2 3 5	9	100	SS-19	2.00	-	-	-	-	-	-	-	-	26	A-6a (V)	-
MED WET	IUM STIF	F TO STIF	TO STIFF, GRAY, SILT , "AND" CLAY,	Υ,	633.3		66 — 67 — 68 —	2 3	9	100	SS-20	1.00	0	0	1	60	39	25	19	6	28	A-4b (8)		
***					+ + + + + + + +		- 70 - - 71 - - 72 -	5															-	
						+ + + + + + + + + + + + + + + +		73	2		100	ST-21	2.00	-	-	-	-	-	-	-	-	26	A-4b (V)	
						+ + + + + + + + + + + + + + + +		- 74 - - 75 -	2 3	6	100	SS-22	1.50	-	-	-	-	-	-	-	-	27	A-4b (V)	
						+ + + + + + + +		76 77 78																
						+ + + + + + + + + + + + + + + + + + + +		79 -	2 3 4	8	100	SS-23	1.50	-	-	-	-	-	-	-	-	35	A-4b (V)	-
						+ + + + + + + +		- 81 - 82 83 -																
						+ + + + + + + + + + + + + + + + + + + +		- - - 85	2 3 4	8	100	SS-24	1.00	-	-	-	-	-	-	-	-	28	A-4b (V)	
						+ + + + + + + +		- 86 - - 87 -																
						+ + + + + + + + + + + + + + + + + + +		- 88 - - 89 - - 90	3 4	8	100	SS-25	2.00	0	0	1	66	33	25	21	4	23	A-4b (8)	
						++++		- 91 - - 92 -																
						+ + + + + + + +		93 — — 94 <u>—</u>	2										igspace					

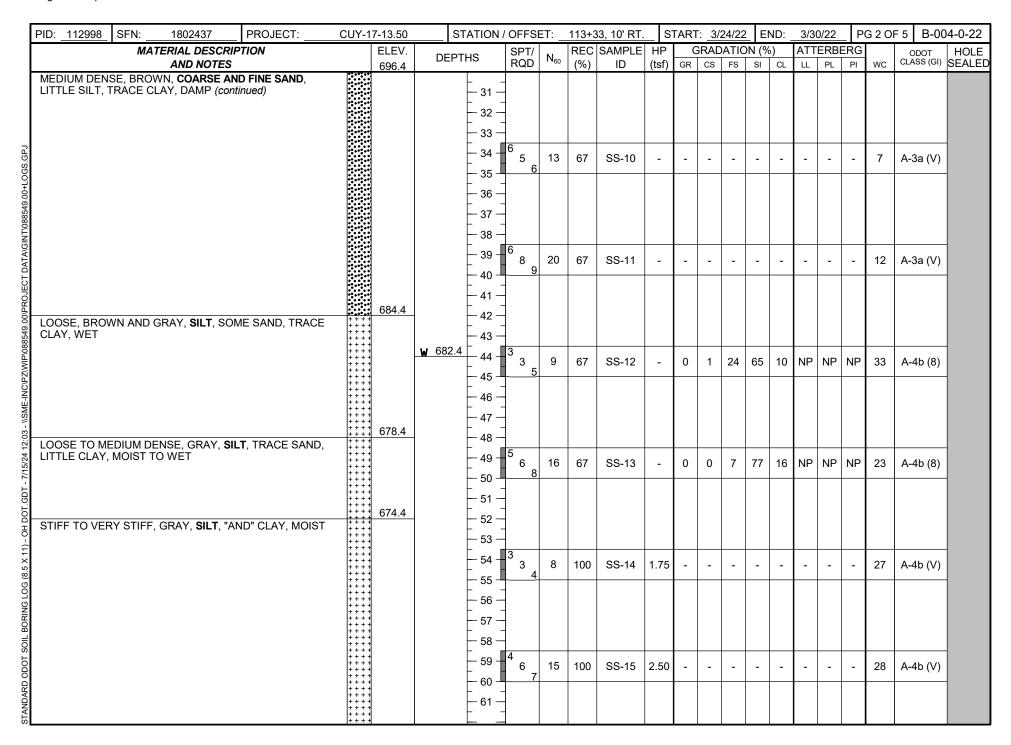
PID: <u>112998</u> SFN: <u>1802437</u>	PROJECT:	CUY-	17-13.50	S	TATION /	OFFSE	ΞT:		33, 47' LT.			: _3/2		_	ND: _	3/2	3/22	_ P	G 4 O	F 4 B-00)2-0-22
MATERIAL DESCRIP	TION		ELEV.	DEP ⁻	THS	SPT/	N ₆₀		SAMPLE			RAD			_	_		ERG		ODOT CLASS (CI)	HOLE
AND NOTES		14.4.4	607.6	<i>D</i> _1	1	RQD		(%) 100	ID SS-26	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI) A-4b (V)	
MEDIUM STIFF TO STIFF, GRAY, SILT , 'WET <i>(continued)</i>	"AND" CLAY,	+++++++++++++++++++++++++++++++++++++++	· + + + + + + + + + + + + + + + + + + +		95 — 95 — 96 — 97 — 97 — 98 —	3 4	8	100	33-20	1.00	-	-	-	-	-	-	-	-	32	A-40 (V)	
		++++	602.8		- I	3			SS-27A	_	-	-	-	-	-	-	-	-	-	A-4b (V)	_
VERY STIFF TO HARD, GRAY, SANDY S CLAY, TRACE GRAVEL, MOIST TO DAM	SILT, "AND" 1P		332.0		99	7 8	18	100	SS-27B		-	-	-	-	-	-	-	-	20	A-48 (V)	
					-101- -102- -103-																
					104 105	11 17 29	54	100	SS-28	4.00	5	6	9	44	36	26	18	8	14	A-4a (8)	
					106 107 108																
					109	18 24 30	63	100	SS-29	4.00	-	-	-	-	-	-	-	-	14	A-4a (V)	
SHALE, GRAY, MODERATELY TO HIGH WEAK TO SLIGHTLY STRONG, VERY F THIN TO MEDIUM BEDDED, SLIGHTLY A FRACTURED; RQD 45%, REC 100%.	INE GRAINED,		587.8	TR	-111- -112- -113- -114- -115- -116- -117-	20 50/6"	-	100	SS-30A SS-30B	4.00		-	-	-		-	-	-	13	A-4b (V) Rock (V)	
			578.8	ЕОВ-	-119- -120- -121- -122- -123-	45		100	RC-31											Rock (V)	
WEAK TO SLIGHTLY STRONG, VERY FI THIN TO MEDIUM BEDDED, SLIGHTLY / FRACTURED; RQD 45%, REC 100%.	INE GRAINED,		578.8		-115- -116- -117- -118- -119- -120- -121- -122-					-		-	-	-	•	-	-	-	-	Rocl	k (V)

PROJE	CT:	CUY	/-17-13	3.50	DRILLING FIRM /	OPER	ATOR:	SME / R	M	DRIL	L RIG	: C	ME550 A	ΓV 525	5	STAT	ION	/ OFI	FSET	Γ: 1	15+1	0, 27	'RT.	EXPLOR	
TYPE:			IDGE		SAMPLING FIRM			SME / AP		- 1			IE AUTO			ALIG		_				RD.			3-0-22
	112998			802437	DRILLING METHO		HSA / N		Y/ NW					9/3/20	_									3.67 ft.	PAGE 1 OF 4
START:	: <u>3/14/</u>	_		3/15/22	SAMPLING METH	OD: _	E1 E) /	SPT		_	RGY F	RATIO		70	_	LAT /							.6603		
		MA		L DESCRIPT ID NOTES	ION		ELEV.	DEPTH	S	SPT/ RQD	N ₆₀	(%)	SAMPLE ID	(tsf)		cs CS		SI (%			PL	ERG PI	wc	ODOT CLASS (GI)	HOLE SEALED
3" ASF	PHALT O	VER 10'				$\times\!\!\times$	695.6			TTQD		(70)	טו	(131)	GIV	0.5	10	- 51	OL		F.L.	г	VVC	. ,	OL/ (EEE
				OARSE AND	EINE SAND	\times	694.6	-	- 1 -	8															_
LITTLE					GRAVEL, DAMP				- 2	10	25	89	SS-1	-	2	8	59	20	11	NP	NP	NP	11	A-3a (0)	
<u>.</u>									. I	11															-
1									·	6															_
2 2									_ 4	7	18	33	SS-2	-	-	-	-	-	-	-	-	-	7	A-3a (V)	
200									_ 5 _	8															-
<u>-</u>									- 6 ₋	6															_
2									- 7 -	6	14	100	SS-3	-	-	-	-	-	-	-	-	-	25	A-3a (V)	
5							687.6		. · L	6															-
		SE, BRO	WN, S	ILT, SOME S	SAND, LITTLE	++++				7															-
CLAY,	, MOIST					++++			- 9 -	6 ,	15	100	SS-4	-	0	1	24	64	11	NP	NP	NP	21	A-4b (8)	
5						++++			– 10 -																_
Ť.000						++++		W 684.6	- 11 -	7															-
<u> </u>						++++			- 12 -	8 _	18	56	SS-5	-	-	-	-	-	-	-	-	-	32	A-4b (V)	
Å17,						++++			. ∎ – 13 –																-
j Z						++++				5															-
<u> </u>					TD. 405	++++	681.1		- 14 -	6 ,	15	100	SS-6	-	-	-	-	-	-	-	-	-	22	A-4b (V)	
MEDIU L CLAY	UM DENS , MOIST	SE, GRA	Y, SIL	T , LITTLE SA	ND, TRACE	++++			– 15 [–]																-
3.11,	,					++++			- 16 -	5															-
47						++++			- - 17 -	8 12	23	100	SS-7	-	0	0	17	75	8	NP	NP	NP	20	A-4b (8)	
2						++++			. ■ 18 	12															-
2						++++				6															-
5						++++			. 19	8 ,	18	100	SS-8	-	-	-	-	-	-	-	-	-	20	A-4b (V)	
<u>د</u>						++++	074.0		- 20 - ¹																-
	IM STIFE	TO ST	IFF GI	RAY, SILT , "A	AND" CLAY	++++	674.6	 	– 21 –																
MOIST		10011	, O	ioti, oili, 7	arb obti,	++++			- 22 -																
9						++++			- 23																
3						++++			_	3															
) É						++++			- 24 -	4 6	12	100	SS-9	1.25	0	0	0	55	45	30	20	10	25	A-4b (8)	
ā						++++			– 25 [–]	0															
201						++++			– 26 –	-															
5						++++			- - 27 -	1															
5						++++			- 28																
MEDIU MOIST						+++++++++++++++++++++++++++++++++++++++		F		5															
Ź						++++			- 29 -	5 6	13	67	SS-10	3.00	-	-	-	-	-	-	-	-	24	A-4b (V)	

PID: <u>112998</u>	SFN:	1802437	PROJECT:	CUY-	17-13.50	STATIC				10, 27' RT			Γ: <u>3/</u>			ND:		5/22	_	G 2 OI	= 4 B-00)3-0-2
	MAT	ERIAL DESC			ELEV.	DEPTHS	SF R0	T/ N ₆₀		SAMPLE			GRAD					ERBI	_		ODOT CLASS (GI)	HOI
MEDILIM STIE	TO STIE	AND NOTE	ES LT, "AND" CLAY,	+++	665.6		R	אַן טַן	(%)	ID	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEA
MOIST (continu	ued)	r, GIVAT, 311	LI, AND CLAI,	+ + + + + + + + + + + + + + + + + +	+ + + + + + + +	- 3 ²	2 –															
				+ + + + + + + + + + + + + + +	+ + + + + +	- 33 - 34 34	4 5	3 15 7	100	SS-11	3.00	-	-	-	-	-	-	-	-	26	A-4b (V)	
				+ + + + + + + + + + + + + + +	+ + + + + + +	— 38 — 36	5 –	- 1														_
				+ + + + + + + + + + + + + + +	+ + + + + +	— 37 — 38	3 -															
				+ + + + + + + + + + + + + + +	654.6	— 39 — 40	, ‡ '	5 11	100	SS-12	2.00	-	-	-	-	-	-	-	-	27	A-4b (V)	-
STIFF, GRAY,	SILT AND	CLAY, TRAC	CE SAND, MOIST		, 004.0	- 4 ² - 42 - 43	2 –															
						- 42 - 45 - 45	4 2	9 6	100	SS-13	1.50	0	0	1	24	75	40	25	15	34	A-6a (10)	
						- 46 47																
						- 48	3 -		100	ST-14	2.00	-	-	-	-	-	-	-	-	30	A-6a (V)	
						49 50 		9 5	100	SS-15	1.50	-	-	-	-	-	-	-	-	35	A-6a (V)	
STIFF TO VER RACE SAND,	Y STIFF, MOIST T	GRAY, SILT , O WET	SOME CLAY,	+++ +++ +++ +++	643.8	5 ² 52 53	2 -															
				+++ +++ +++ +++ +++ +++	† + + + + + +	54 54 55	4 3 4	11	100	SS-16	1.25	0	1	0	69	30	25	21	4	24	A-4b (8)	
				+ + + + + + + + + + + + + + + + + +	† + + + + + +	_ 56	6 - 7 -															
				+ + + + + + + + + + + + + + + + + +	+ + + + + + +	- 58 - 59	3 6	3 15 7	100	SS-17	3.00	-	-	-	-	-	_	_	-	25	A-4b (V)	
				+ + + + + + + + + + + + + + + + + + + + +	#	- 60 - 67) 	/														

PID: <u>112998</u>	SFN: _	1802437	7	PROJE	CT:	CUY-1	17-13.50		STATION /	OFFSE	ET: _		0, 27' RT.		TART	Γ: <u>3</u> /′	14/22	2 E1	ND: _	3/1	5/22	_ P	G 3 OI	F 4 B-00	3-0-22
	MA	TERIAL DES		TION			ELEV.	DEF	THS	SPT/	N ₆₀		SAMPLE			RAD				_		ERG		ODOT	HOLI
		AND NO					633.4	DLI	1110	RQD	1460	(%)	ID	(tsf)	GR	cs	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEAL
STIFF TO VEF TRACE SAND	RY STIFF, , MOIST	GRAY, SIL O WET <i>(co</i>	.T, SON ontinued	ME CLAY	7,	+++++++++++++++++++++++++++++++++++++++			63 — 64 — 65 —	4 5 6	13	100	SS-18	2.00	0	0	1	73	26	27	20	7	27	A-4b (8)	
						+++++++++++++++++++++++++++++++++++++++			66 — 67 — 68 —	3		100	00.40	4.50										A 41- 00	
						+++++++++++++++++++++++++++++++++++++++			- 70 71 72 73	4 5	11	100	SS-19	1.50	-	-	-	-	-	-	-	-	28	A-4b (V)	
						+++++++++++++++++++++++++++++++++++++++			- 74 75 76	2 2 3	6	100	SS-20	1.50	-	-	-	-	-	-	-	-	32	A-4b (V)	
STIFF, GRAY, GRAVEL, MOI	SILT , "AN ST	ND" CLAY, 1	TRACE	SAND,	TRACE	+++++++++++++++++++++++++++++++++++++++	617.1		- 77 - - 78 - - 79 - - 80 - - 81 -	3 3 4	8	100	SS-21	1.50	1	1	2	51	45	27	21	6	24	A-4b (8)	
						+ + + + + + + + + + + + + + + + + + + +			- 82 - - 83 - - 84 - - 85 -	3 4 5	11	33	SS-22	2.00	-	-	-	-	-	-	-	-	24	A-4b (V)	
						+ + + + + + + + + + + + + + + + + + + +			- 86 - - 87 - - 88 -	5															
HARD, GRAY, GRAVEL, DAM	SANDY S	SILT, "AND"	CLAY,	TRACE		+++++++++++++++++++++++++++++++++++++++	+		- 89 - 90 - 91 - 92 - 93 - 93 - 93 - 93 - 95 - 95 - 95 - 95	7 10	20	100	SS-23	1.50	-	-	-	-	-	-	-	-	20	A-4b (V)	
									93 94	15															

	PROJECT: _		17-13.50	DRILLING FIRM / C	-	SME / RM		L RIG		ME550 A		_	STA				_				EXPLOR	ATION IE I-0-22
	TYPE: PID: 11299	BRID 8 SFN:	1802437	SAMPLING FIRM / DRILLING METHOL		SME / APP MUD ROTARY/ NWI				ME AUTOI ATF	9/3/20		ALIG		_				RD.		4.0 ft.	PAGE
	START: 3/2			SAMPLING METHO		SPT			RATIO		70		LAT					_		1.6608		1 OF 5
		MATE	ERIAL DESCRIPT	TON	ELEV.	DEPTHS	SPT/	N ₆₀		SAMPLE	HP	(GRAD		N (%	o)			ERG		ODOT	HOLE
ļ			AND NOTES		726.4	DEI IIIO	RQD	1160	(%)	ID	(tsf)	GR	cs	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALED
L	3.25" ASPH/	ALTOVER 2.	75" BRICK OVER	9.5" CONCRETE	725.4	 																
2			BROWN, SILT AN E GRAVEL, MOIS	ID CLAY, TRACE			4 4	7	67	SS-1	2.00	_	_	_	_	_	١.		_	13	A-6a (V)	
<u>5</u>	TO LITTLE 3	DAND, INACI	E GRAVEL, IVIOIS	SI IO WEI		2	2		ļ												7.02(1)	_
(8.5 X 11) - OH DOT.GDT - 7/15/24 12:03 - \\SME-INC\PZ\WIP\088549.00\PROJECT DATA\GINT\088549.00+LOGS.GPJ						3 -																
9.00						- 4	2	6	39	SS-2	2.00	1	5	11	48	35	33	21	12	33	A-6a (9)	
8854						_ 5 _	3														. ,	_
2 Z						- 6 -	4															
A G						- 7	4 5 _	12	100	SS-3	3.50	-	-	-	-	-	-	-	-	22	A-6a (V)	
DA							5					-								-		
						- 8 -	Λ															_
5						- 9	ີ 6	16	100	SS-4	3.00	1	3	2	48	46	33	22	11	27	A-6a (8)	
9.00						_ 10 _	8															-
2824						11 	4															-
Ñ.						12	6 8	16	100	SS-5	3.50	-	-	-	-	-	-	-	-	26	A-6a (V)	
72					712.9	13 —																-
<u>S</u> -	VERY STIFF	. BROWN. S	ILTY CLAY, MOIS	ST	7// 112.9	14 -	5															1
SME			,			-	8 9	20	100	SS-6	2.50	-	-	-	-	-	-	-	-	28	A-6b (V)	
3-						- 15 -	,															
12:0						<u> </u>																
5/24						_ 17 -																
- (//						- 18 -																
G							5 6	15	100	SS-7	3.50	0	0	0	41	59	38	21	17	24	A 6h (11)	
ج ڪ						_ 20 _	7	10	100	33-1	3.50	L	U	U	41	บษ	٥٥	21	17	24	A-6b (11)	
5						- 21 -																
=						-																
8.5 X					703.4	_ 22 _																
	MEDIUM DE	NSE, BROW	N, COARSE AND	FINE SAND.	703.4	23																
NG LOG	LITTLE SILT			•		_ 24 -	5 6	18	67	SS-8	_	_	_	_	_	_	١.		_	4	A-3a (V)	
						_ 25 _	9		ļ .			_					_	_				
					•••••	26 —																
δ 5						27 —																
					• • • • •																	
STANDARD ODOL SOIL BOR						- 28 -	E													<u> </u>		
ANC						_ 29 _		18	67	SS-9	-	0	4	78	13	5	NP	NP	NP	5	A-3a (0)	
L					******		8					<u> </u>									` <i>`</i>	



PID: _	112998	SFN:	18024	37	PROJECT	Γ:	CUY-1	7-13.50		STATION /	OFFSE			33, 10' RT.		TART	: 3/2	24/22	2 E1	ND:		0/22		G 3 O	F 5 B-00	4-0-2
		MA	TERIAL D		TION			ELEV.	DFF	PTHS	SPT/ RQD	N ₆₀		SAMPLE			RAD						ERG		ODOT CLASS (GI)	HOL
OTIE	E TO VEE	N/ OTIEE	AND N		ID! OLAY I	MOIOT	1++++	664.3	<u> </u>		RQD	• •60	(%)	ID	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALI
(conti		(Y STIFF,	GRAY, S	OILI, "AN	ND" CLAY, I	MOIST	+ + + + + + + + + + + + + + + + + + + +			- 63 - - 64 -	5 6 8	16	100	SS-16	3.00	-	-	-	-	-	-	-	-	24	A-4b (V)	
							+++++++++++++++++++++++++++++++++++++++			65 66 67																-
STIFF	F TO VEF	RY STIFF, E GRAVEL	GRAY, S	SILT AND	CLAY, TR	ACE	++++	657.9	-	68 -	3 3	8	100	SS-17	2.50	2	3	5	29	61	36	21	15	30	A-6a (10)	-
37 II VL	5, TT 0 (SE									- 70 - - 71 - - 72 - - 73 -	4															
										- 74 - 75	3 4 4	9	100	SS-18	1.50	-	-	-	-	-	-	-	-	34	A-6a (V)	-
										76 77 78																
										- 79 - 80	3 3	7	100	SS-19	1.50	-	-	-	-	-	-	-	-	32	A-6a (V)	
										- 81 - - 82 - - 83 -																
										- 84 - 85 - 86	6 8 9	20	100	SS-20	3.50	-	-	-	-	-	-	-	-	23	A-6a (V)	
										- 87 - 88			100	ST-21	3.00	-	-	-	-	-	-	-	-	26	A-6a (V)	
										- 89 - 90	6 7 9	19	100	SS-22	3.00	-	-	-	-	-	-	-	-	26	A-6a (V)	-
								- 91 - - 92 - - 03 -																		
										— 93 — — 94 <u>—</u>	4										\vdash					

PID: _112998	SFN:18024	437	PROJECT:	CUY-17-13.50	STATION /	OFFSET	_		10' RT.	_		: _3/2		_	ND:	3/3	0/22	_ P	G 4 O	F 5 B-00	4-0-22
	MATERIAL D		TION	ELEV.	DEPTHS	SPT/			AMPLE			RAD				-	_	ERG	4	ODOT	HOLE
		NOTES		632.1	DEFINS	וועט	(GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALE
STIFF TO VER SAND, TRACE	RY STIFF, GRAY, \$ GRAVEL, MOIST	SILT AND Γ (continue	OCLAY, TRACE ed)		95 — - 96 — - 97 —	10	20 1	00 S	SS-23	1.00	-	-	-	-	-	-	-	-	26	A-6a (V)	_
					98 — 99 — 100 —	4 5 5	12 1	00 S	SS-24	2.50	1	1	2	31	65	35	21	14	25	A-6a (10)	
					-101- -102- -103-	3															
					-104 -105 -	4 5	11 1	00 S	SS-25	1.50	-	-	-	-	-	-	-	-	27	A-6a (V)	-
					106 107 108		g	16 S	ST-26	4.50	-	-	-	-	-	-	-	-	22	A-6a (V)	
					109 110	7 7 7	16 1	00 S	SS-27	2.00	-	-	-	-	-	-	-	-	25	A-6a (V)	-
					111 112 113																
					114 115	5 7 10	20 3	3 S	SS-28	2.00	-	-	-	-	-	-	-	-	21	A-6a (V)	-
HARD CRAV	SANDY SILT, "AN	ID" CI ∆∨	TRACE	608.4	116 117 																
GRAVEL, DAM	IP	OLAT,	, IIVOL		-119 -120	9 15 23	44 1	00 S	SS-29	4.00	5	4	8	39	44	26	17	9	16	A-4a (8)	
HARD, GRAY, GRAVEL, DAM					-121- -122- -123-																
					-124 - -125	23 35 50/6"	- 1	00 S	SS-30	4.50	-	-	-	-	-	-	-	-	15	A-4a (V)	
					- 126																



CUY-17-13.50

SME Project #: 088549.00

Brooklyn Heights, Ohio April 13, 2022 B-001-0-22 End Core Run, Depth = 139 ft, Elevation = 579.7 ft Begin Core Run, Depth = 134 ft, Elevation = 584.7 ft Recovery RQD Run#: Depth 134.0' 139.0' 60/60 100% 50.5/60 84% CUY-17-13.50



CUY-17-13.50 Brooklyn Heights. Ohio SME Project #: 088549.00

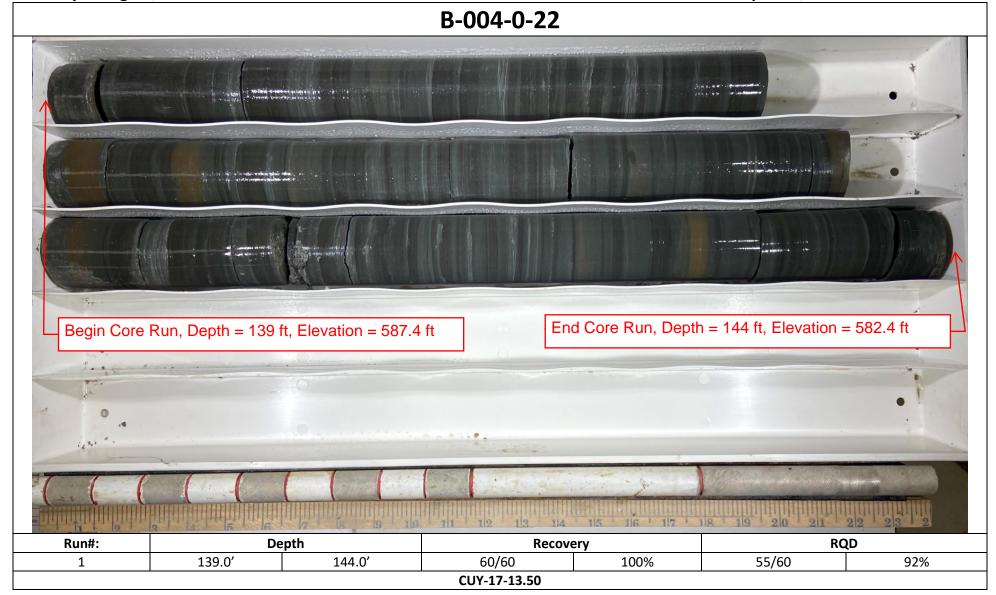


CUY-17-13.50



CUY-17-13.50 Brooklyn Heights, Ohio SME Project #: 088549.00

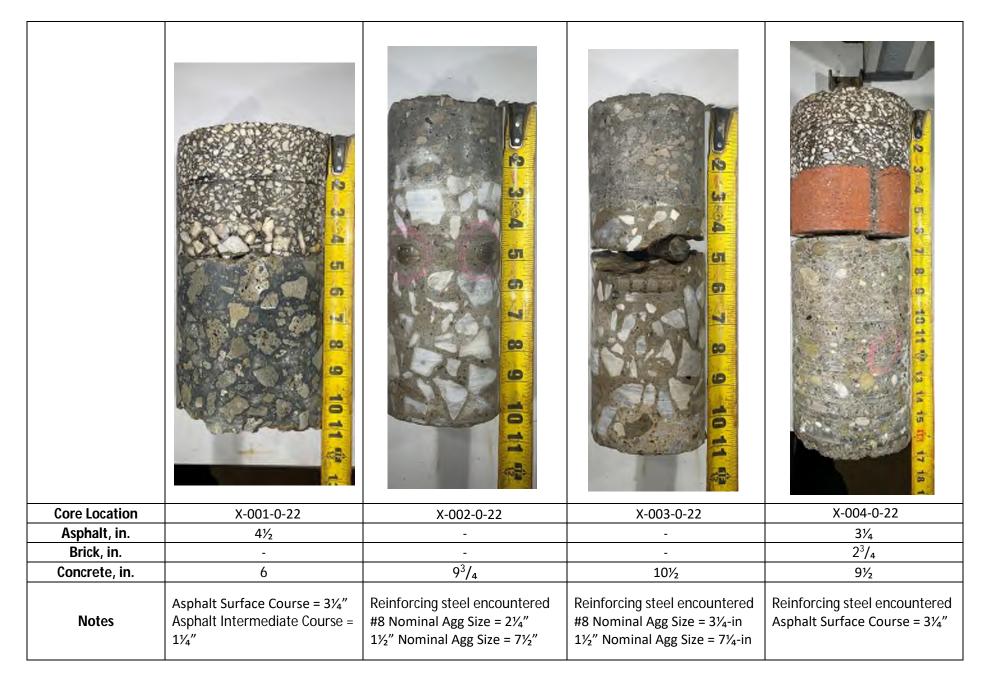
April 13, 2022



CUY-17-13.50 BROOKLYN HEIGHTS, OHIO

SME PROJECT #: 088549.00 March 25, 2022





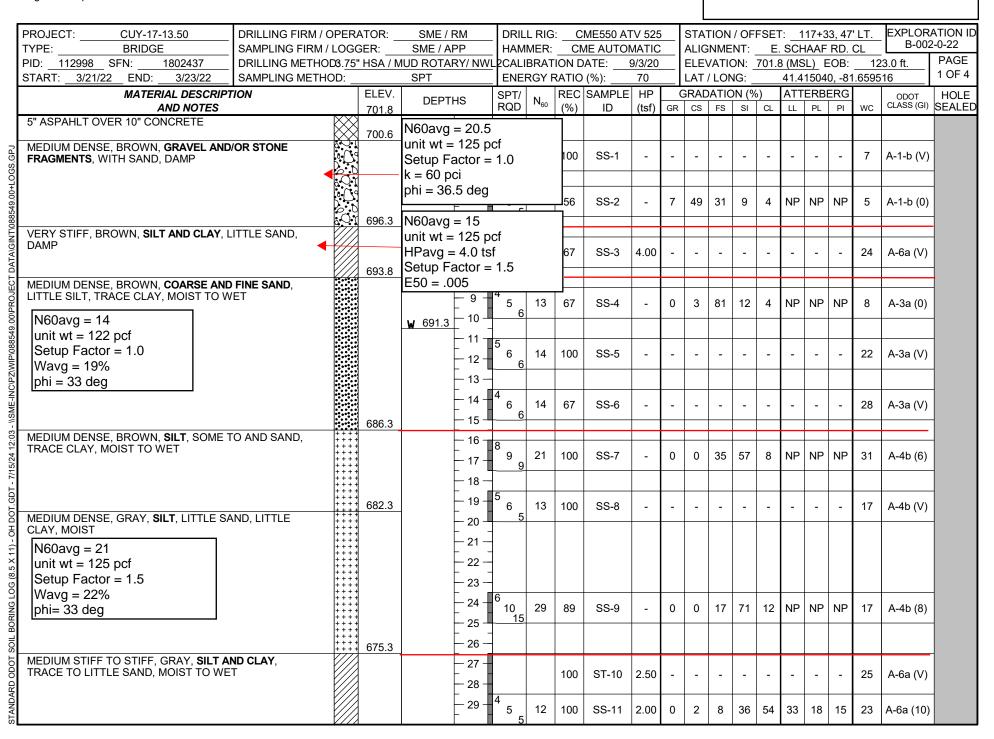
APPENDIX B

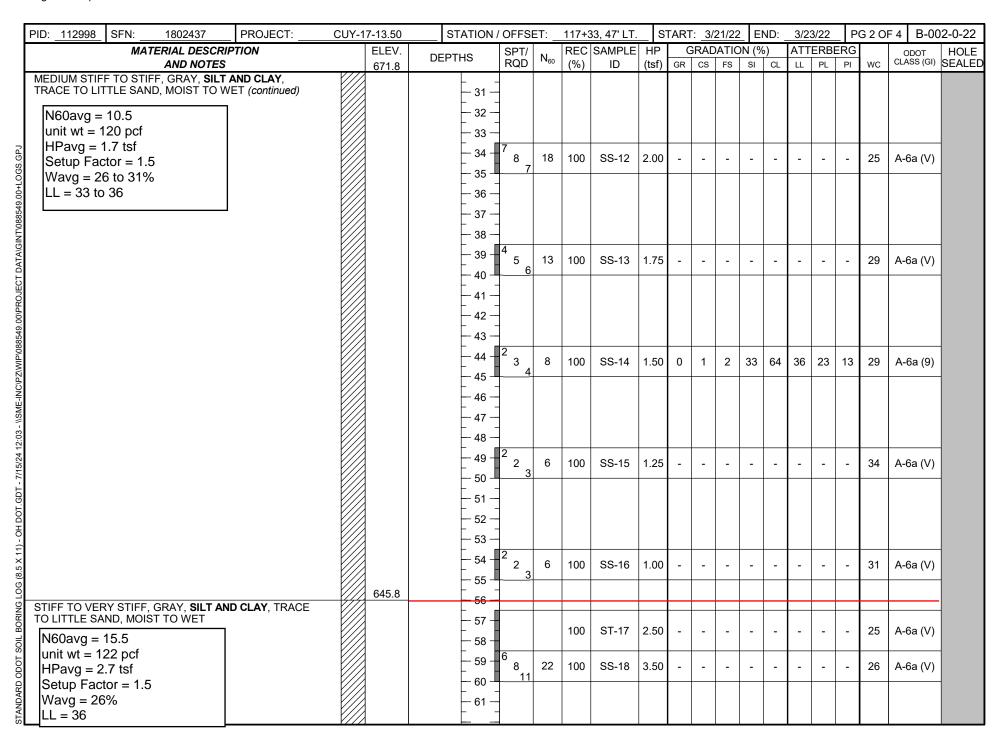
MARKED UP BORING LOGS

SOIL PARAMETERS FOR TANGENT DRILLED SHAFT WALL DESIGN
PILE CAPACITY ANALYSES
PILE SETTLEMENT CALCULATIONS
PILE LATERAL ANALYSES
PILE DRIVABILITY ANALYSES
SITE SPECIFIC SEISMIC INFORMATION
SEISMIC SITE CLASSIFICATION CALCULATIONS
EMBANKMENT SETTLEMENT CALCULATIONS
WALL 1 AND WALL 2 BEARING CALCULATIONS
WALL 1 AND WALL 2 SLOPE STABILITY ANALYSES
RECOMMENDED GEOTECHNICAL PLAN NOTES

Top of Forward Abutment Profile

	1			_					누									T	
PROJECT: <u>CUY-17-13.50</u>	DRILLING FIRM / OPER	_	SME / RM	-	L RIG		ME550 AT		_	STAT								EXPLORA	
TYPE: BRIDGE	SAMPLING FIRM / LOG		SME / APP	- 1	IMER:		ME AUTOM			ALIGN						RD.		B-001	
PID: <u>112998</u> SFN: <u>1802437</u>	DRILLING METHOD3.75	5" HSA / N	IUD ROTARY/ NW	- 1				9/3/20		ELEV	ATIO	N: <u>7</u>						9.0 ft.	PAGE
START: <u>3/31/22</u> END: <u>4/6/22</u>	SAMPLING METHOD:		SPT	ENE	RGY F	RATIO	(%):	70	[LAT /	LON	G:		41.4	1477	9, - 81	.6593	64	1 OF 5
MATERIAL DESCRIPT	TION	ELEV.	DEDTUG	SPT/	N.	REC	SAMPLE	HP	G	RADA	ATIO	N (%)		ATT	ERBI	ERG		ODOT	HOLE
AND NOTES		718.7	DEPTHS	RQD	N ₆₀	(%)	ID	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALED
4" ASPHALT OVER 12" CONCRETE	\bowtie																		
	\bowtie	717.4	- 1 -																
HARD, BROWN AND GRAY, SANDY SILT		ĺ	1	10	40	400	00.4	4 = 0											
CLAY, SOME GRAVEL, SOME ASPHALT	FRAGMENTS,	745 7	_ 2 +	9 7	19	100	SS-1	4.50	-	-	-	-	-	-	-	-	11	A-4a (V)	
SLIGHTLY ORGANIC, DAMP	2 1777	715.7	<u></u>	-															-
STIFF TO VERY STIFF, BROWN AND GR	RAY, SILT AND		_ 4 -	4															
CLAY, TRACE SAND, MOIST	\// _!	1	4	5 ,	14	100	SS-2	3.00	-	-	-	-	-	-	-	-	24	A-6a (V)	
	\// _/			7															-
	(//		- 6 -	ļ															
	\// _/			4	9	100	SS-3	2.00	0	0	2	46	52	38	23	15	29	A-6a (10)	
	\// _/	1		4		100		2.00			_	70	J2	55	20	'		, (-0a (10)	
	\//.	4	- 8 -										\neg						
	\// _/		l ⊢ ∎	4															
	\// _/		_ 9 +	5	11	100	SS-4	3.50	-	-	-	-	-	-	-	-	29	A-6a (V)	
	\//		<u></u> 10 ⊥	4															-
	\// _!	1	- 11 -																
	\// _/		F''-																
	(//		<u> </u>	1		400	OT 5	4 00									0.4		
MEDIUM DENSE, BROWN SILT, "AND" S Top of B-002 Profile: Elevation 700.6 feet	(///	705.7	13			100	ST-5	4.00	-	-	-	-	-	-	-	-	21	A-6a (V)	
MEDIUM DENSE, BROWN COARSE AND	FINE CAND			6								-	\dashv						
LITTLE SILT, TRACE CLAN60avg = 17			<u> </u>	7	16	33	SS-6	-	0	7	76	12	5	NP	NP	NP	6	A-3a (0)	
unit wt = 125				7								_							
Setup Factor	1 = 1.0		- 16	-															
Wavg = 6%			_ 16 _																
phi = 33.75 c	leg		<u> </u>	-															
			18																
	7		l ⊢ ∎	6									-1						-
Top of B-002 Profile:			19	6 7	18	72	SS-7	_	_	-	-	-	-	_	_	-	5	A-3a (V)	
Elevation 700.6 feet			_ 20 _	8									_						
				-															
			21	1															
			- 22 -																
			-	1															
	••••• •••••	695.2	_ 23 _																
MEDIUM DENSE, BROWN, SILT, "AND" S	SAND, LITTLE	1	- 24 -	7 8	21	100	SS-8		0	4	33	50	12	ND	ND		13	A-4b (6)	
	+++++++++++++++++++++++++++++++++++++++	#	_ 25	10		100	00-0				33	30	'	INI	INI	INI	13	A-40 (0)	
	+++	+											\neg						
	+ + +	+	- 26 -	1															
	+ + +	+	_ 27 _																
CLAT, DAIWIF	+++	1	Ly 600 7 -																
	+ + + + + + + + +	1	W 690.7 28 -																
		+	_ 29 _	9	40	400	00.0										_	A 41 00	
	+ + + + + +	‡		8 7	18	100	SS-9	-	-	-	-	-	-	-	-	-	7	A-4b (V)	
	البيا	-11																	

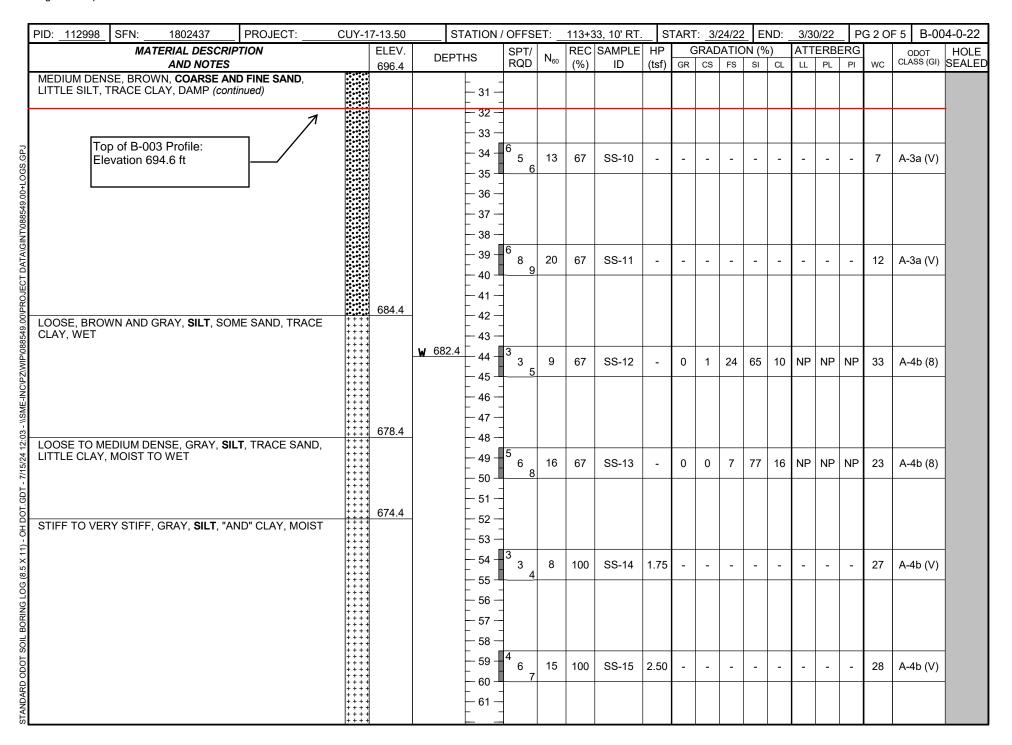




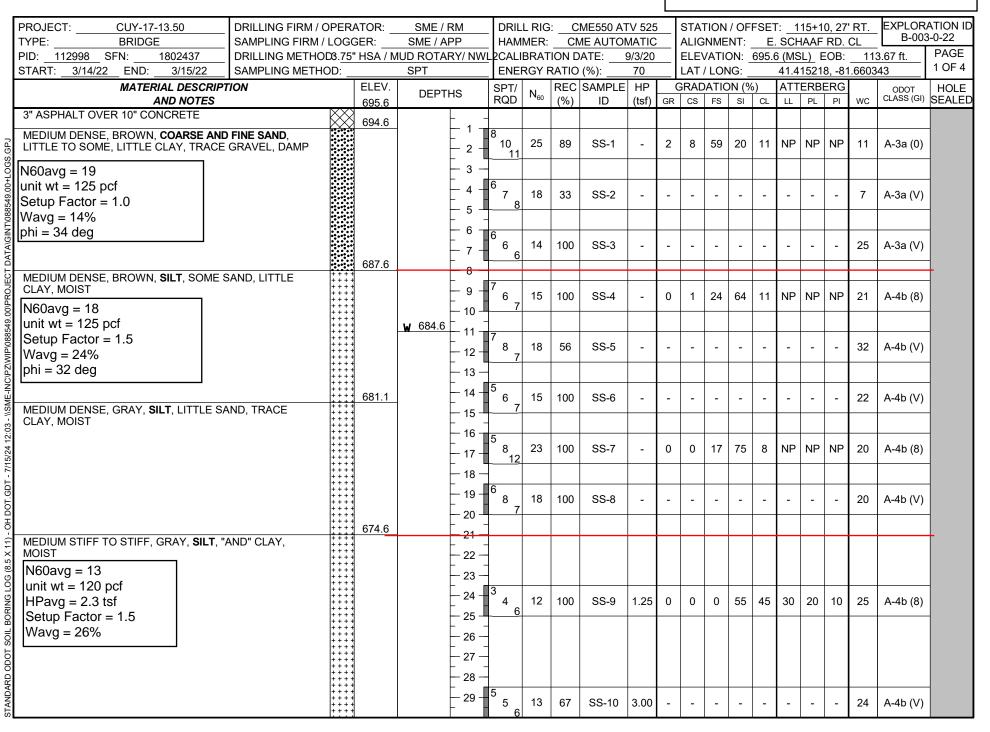
PID: _	112998	SFN:	1802437	PROJECT:	CUY-17-13.50	STA	TION /	OFFSE	ET: _	117+3	33, 47' LT.	s	TAR	: 3/2	21/22	2 EI	ND:	3/2	3/22	_ P	G 3 O	F 4 B-00)2-0-22
		MAT	ERIAL DESCR		ELEV.	DEPTH	٠	SPT/	NI	REC	SAMPLE			RAD	ATIC	ON (%	6)	ΑТΊ		ERG		ODOT	HOLE
			AND NOTES		639.7	DEPIR	3	RQD	N ₆₀	(%)	ID	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALED
STIFI TO LI	F TO VER ITTLE SA	Y STIFF, ND, MOIS	GRAY, SILT AI T TO WET <i>(col</i>	ND CLAY, TRACE ntinued)		 - -	- 63 - - 64 -	2 3	9	100	SS-19	2.00	_	-		_	_	_	_		26	A-6a (V)	-
						 - -	- 65 <u>-</u> - 66 -	5		100		2.00									20	A-0a (V)	
MEDI WET N6 uni HP Sei Wa					633.3	 - -	- 67 - - 68 -																
MEDI WET		TO STIF	F, GRAY, SILT	, "AND" CLAY,	+ + + + + + + + + + + + + + + +	-	- 69 - - 70 -	2 3 5	9	100	SS-20	1.00	0	0	1	60	39	25	19	6	28	A-4b (8)	
N6 uni	0avg = 8 it wt = 1	18 pcf			+ + + + + + + +	 - -	- 71 - - 72 -																-
Set	Pavg = 1 tup Fact avg = 28	or = 1.5			+ + + + + + + + + + + + + + + +	 - -	- 73 -	2		100	ST-21	2.00	-	-	-	-	-	-	-	-	26	A-4b (V)	-
VVA	avy = 20	70			+ + + + + + + + + + + + + + + + + + + +	l -	- 74 - - 75 -	2 3	6	100	SS-22	1.50	-	-	-	-	-	-	-	-	27	A-4b (V)	-
					+ + + + + + + + + + + + + + + +	l ⊢	- 76 - 77																
					+ + + + + + + + + + + + + + + + + + + +		- 78 - - 79 -	2	0	400	00.00	4.50									0.5	A 41- 0.0	-
					+ + + + + + + + + + + + + + + + + + + +	 - -	- 80 -	3 4	8	100	SS-23	1.50	-	-	-	-	-	-	-	-	35	A-4b (V)	_
					+ + + + + + + + + + + + + + + + + + + +	 - -	- 81 - 82																
					++++ ++++ ++++ ++++	 - -	- 83 - - 84 -	2 3	8	100	SS-24	1.00	_	_	-	_	_	-	_	_	28	A-4b (V)	-
					+ + + + + + + + + + + + + + + + + + + +		- 85 <u> </u>	4														, ,	-
					++++ ++++ ++++ ++++ ++++	 -	- 87 -																
					+ + + + + + + + + + + + + + + +	l –	- 88 - - 89 -	9	8	100	SS-25	2.00	0	0	1	66	33	25	21	4	23	A-4b (8)	
						 - -	- 90 - - 91 -	4															
					+ + + + + + + + + + + + + + + +		- 92 - - 93 -																
					++++ ++++ ++++	<u> </u>	_94 <u>_</u>	2										\vdash					

D: <u>112998</u>	SFN:	1802437	_ PROJECT	T:	CUY-	17-13.50	s	NOITAT	OFFSI	ET:		33, 47' LT.			: 3/2		_	ND: _		3/22		G 4 O	F 4 B-00	2-0-
	MATI	ERIAL DESCR				ELEV.	DEP	THS	SPT/	N ₆₀		SAMPLE			RADA				_		ERG	4	ODOT	НС
AEDILINA OTIE	E TO OTIE	AND NOTES		\ <u>\</u>	+ + +	607.6	DLI		RQD 3	8	(%) 100	SS-26	(tsf) 1.00	GR -	CS -	FS -	SI	CL_	LL -	PL -	PI -	WC 32	CLASS (GI)	SEA
VET (continue		F, GRAY, SILT	, AND CLA	ιΥ,	+ + + + + + + + + + + + + + + + + +	+ + + + + + + +		95 96 97	4		100	33 20	1.00									02	77 45 (1)	-
					+++++++++	602.8		98 -	3			SS-27A	-	_	-	-	-	_	_	_	_	_	A-4b (V)	_
		GRAY, SANDY MOIST TO DA		н				100	7 8	18	100	SS-27B	2.00	-	-	-	-	-	-	-	-	20	A-4a (V)	_
N60avg = 4 Init wt = 13 HPavg = 3.3 Setup Facto	5 pcf 3 tsf							-101- -102- -103-																
Vavg = 169								-104 -105	11 17 29	54	100	SS-28	4.00	5	6	9	44	36	26	18	8	14	A-4a (8)	
								-109 -110	18 24 30	63	100	SS-29	4.00	-	-	-	-	-	-	-	-	14	A-4a (V)	
HALE CDAY	MODERA	TELY TO HIG	·UI V \\/E\TU	JEBED		587.8	—TR	114	20 50/6"		100	SS-30A SS-30B	4.00	-	-	-	-	-	-	-	-	13	A-4b (V) Rock (V)	
VEAK TO SLI	GHTLY ST IUM BEDD	RONG, VERY ED, SLIGHTLY	FINE GRAIN	NED,					-			-30 <u>-</u> 30 <u>-</u> 3	_				-						TOOK (V)	
						578.8		119- 120- 121- 122-	45		100	RC-31											Rock (V)	

																		T	
	ORILLING FIRM / OPER	_	SME / RM	-	L RIG		ME550 AT		_	STAT								EXPLOR.	ation id I-0-22
	SAMPLING FIRM / LOGO		SME / APP				ME AUTON		_	ALIG		_						. —	PAGE
	DRILLING METHOD3.75'	'HSA/N		- 1				9/3/20	_	ELEV								4.0 ft.	1 OF 5
	SAMPLING METHOD: _		SPT	_	RGY F			70		LAT /				_			1.6608	37	_
MATERIAL DESCRIPTIO	ON .	ELEV.	DEPTHS	SPT/	N ₆₀		SAMPLE			RAD		_ `	,	_	ERB			ODOT	HOLE
AND NOTES	800	726.4	<i>DEI</i> 1110	RQD	• •60	(%)	ID	(tsf)	GR	cs	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALED
3.25" ASPHALT OVER 2.75" BRICK OVER 9.	.5" CONCRETE	725.4		1															
STIFF TO VERY STIFF, BROWN, SILT AND	CLAY, TRACE			4	_														
TO LITTLE SAND, TRACE GRAVEL, MOIST	TO WET		<u> </u>	4 2	7	67	SS-1	2.00	-	-	-	-	-	-	-	-	13	A-6a (V)	
3			- 3 -																-
+- 				2															-
<u>ကို</u>			_ 4 _	2	6	39	SS-2	2.00	1	5	11	48	35	33	21	12	33	A-6a (9)	
			_ 5 _	3														` '	_
2									L					L	L				
			6 7	4 5	12	100	SS-3	3.50			_						22	A-6a (V)	
	\///		_ 7 -	5	12	100	აა-ა 	3.50	Ľ	<u></u>	_	_	_		L			A-0a (V)	
	<i>\///</i>		- 8 -																
				4						\vdash									
			9 +	6	16	100	SS-4	3.00	1	3	2	48	46	33	22	11	27	A-6a (8)	
			<u></u> 10 - 10 -	8															_
00 00 00 00			 11																
				4	16	100	SS-5	3.50	_	_	_	_	_	١.	l _	l _	26	A-6a (V)	
			_ 12 _	8		100		0.00										71 04 (1)	
		712.9	 13	-															
TO LITTLE SAND, TRACE GRAVEL, MOIST VERY STIFF, BROWN, SILTY CLAY, MOIST WENT STIFF, BROWN, SILTY CLAY, MOIST N60avg = 17.5 unit wt = 122 pcf HPavg = 3.0 tsf Setup Factor = 1.75 Wavg = 26% c' = 250psf phi = 30 deg MEDIUM DENSE, BROWN, COARSE AND FI LITTLE SILT, TRACE CLAY, DAMP			14	5	00	465	0.5.	0.55											
				8 9	20	100	SS-6	2.50	-	-	-	-	-	-	-	-	28	A-6b (V)	
			15	J															
N60avg = 17.5			 16																
unit wt = 122 pcf			- 17 -																
HPavg = 3.0 tsf			-																
Setup Factor = 1.75			_ 18 _																
Wavg = 26%			- 19 -	5 6	15	100	SS-7	3.50	0	0	0	41	59	38	21	17	24	A-6b (11)	
c' = 250psf				7	13	100	33-1	3.30				41	JB					A-00 (11)	
phi = 30 deg			20																
			<u> </u>	1															
 																			
<u>0</u>		703.4		-															
MEDIUM DENSE, BROWN, COARSE AND FI	INE SAND,		23	-															
LITTLE SILT, TRACE CLAY, DAMP			_ 24 _	6	18	67	SS-8	_	l <u>-</u>	_	_	_	_	۱.	۱.	_	4	A-3a (V)	
	00000		_ 25 _	9		, , , , , , , , , , , , , , , , , , ,												/ · · · · · · · · · · · · · · · · · · ·	
N60avg = 18			l ⊢ -	-															
unit wt = 125 pcf	000000000000000000000000000000000000000		_ 26 _																
Setup Factor = 1.0			 27	-															
			- - 28 -																
Wavg = 5%			l ⊢ ∎	5															
N60avg = 18 unit wt = 125 pcf Setup Factor = 1.0 Wavg = 5% phi = 34 deg			_ 29 -	5 7	18	67	SS-9	_	0	4	78	13	5	NP	NP	NP	5	A-3a (0)	
	•••••			8			-				-	-						(-7	



Rear Abutment Profile



PID: <u>112998</u>	SFN:	1802437	PROJE	CT:	CUY-17-13.50		TATION	/ OFFSI	ET: _		10, 27' RT			Γ: <u>3</u> /			ND:		5/22		G 2 O	F 4 B-00)3-0-22
	MATI	ERIAL DESC			ELEV	1 11-2	THS	SPT/	N ₆₀		SAMPLE	HP		SRAD						ERG		ODOT	HOLE
		AND NOTE			665.6	DEF	1110	RQD	1460	(%)	ID	(tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALE
MEDIUM STIFI MOIST (continu	F TO STIFI led)	F, GRAY, SII	LT, "AND" C	LAY,	+ + + + + + + +		- - - - - - - - - 32 - - - - - - - - - - - - - - - - - - -	- - - -															
					+ + + + + + + +		- - - - - - - 35 -	5 6 7	15	100	SS-11	3.00	-	-	-	-	-	-	-	-	26	A-4b (V)	-
					+ + + + + + + +		- 36 - - 37 - - 38 -	- - -															
					++++ ++++ ++++ ++++ ++++ ++++ ++++ ++++ 654.6		- 39 - - 40 -	4 4 5	11	100	SS-12	2.00	-	-	-	-	-	-	-	-	27	A-4b (V)	-
STIFF, GRAY, N60avg = 7. unit wt = 118	 5	CLAY, TRAC	CE SAND, M	OIST	++++ 054.6		- - - - - - - 43 -	-															
HPavg = 1.6 Setup Facto Wavg = 33%	tsf r = 1.5							2 2 3	6	100	SS-13	1.50	0	0	1	24	75	40	25	15	34	A-6a (10)	_
							46 47 48			100	ST-14	2.00	-	-	-	-	-	-	-	-	30	A-6a (V)	
							49 50	2 3 5	9	100	SS-15	1.50	-	-	-	-	-	-	-	-	35	A-6a (V)	_
STIFF TO VER	Y STIFF, 0	GRAY, SILT , D WET	SOME CLA	Υ,	643.8		51 52 53	- - -															_
N60avg = 120 unit wt = 120 HPavg = 1.7) pcf				+ + + + + + + + + + + + + + + + + + +		- 54 - 55 -	3 4 5	11	100	SS-16	1.25	0	1	0	69	30	25	21	4	24	A-4b (8)	
Setup Facto Wavg = 26%	r = 1.5				+ + + + + + + +		- - - - - 57 -																
					+ + + + + + + +		- 58 - - 59 - - 60 -	3 6 7	15	100	SS-17	3.00	-	-	-	-	-	-	-	-	25	A-4b (V)	-
					+ + + + + + + + + + + + + + + + + + + +		- 61 -	- - -															

PID:	: 112998	SFN:	1802437	PROJECT:	CUY-	17-13.50	S	TATION /	OFFSE	T: _		10, 27' RT.			: <u>3/1</u>		_	ND: _		5/22	_	G 3 O	F 4 B-00	3-0-22
		MA	TERIAL DESCI			ELEV.	DEP	THS	SPT/ RQD	N ₆₀		SAMPLE			RAD						ERG		ODOT	HOLE
			AND NOTE			633.4	DEF	ιпо	RQD	1 1 60	(%)	ID	(tsf)	GR	cs	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALE
ST TR	IFF TO VER ACE SAND	RY STIFF, , MOIST 1	GRAY, SILT , FOO WET (contin	SOME CLAY, nued)	+ + + + + + + + + + + + + + + + + +	+ + + + + + +		- 63 - - 64 -	4 5	13	100	SS-18	2.00	0	0	1	73	26	27	20	7	27	A-4b (8)	
					+++ +++ +++ +++ +++ +++ +++ +++	+ + + + + + + + + + + +		- 65 - - 66 - - 67 -	6															
					+ + + + + +	+ + + + + + + + + +		- 68 - - 69 - - 70 -	3 4 5	11	100	SS-19	1.50	-	-	-	-	-	-	-	-	28	A-4b (V)	
					+++ +++ +++ +++ +++ +++ +++	+ + + + + + + + + + + +		- 71 - - 72 - - 73 - - 74 -	2															
					+++ +++ +++ +++ +++ +++ +++ +++	+ + + + + + + + + + + + + + + + + + +		- 75 - 76 - 77	2 3	6	100	SS-20	1.50	-	-	-	•	-	-	-	-	32	A-4b (V)	
ST GR	IFF, GRAY, RAVEL, MO	SILT, "AN	ND" CLAY, TRA	ACE SAND, TRA	CE +++	+1		- 78 - - 79 -	3 3	8	100	SS-21	1.50	1	1	2	51	45	27	21	6	24	A-4b (8)	
	5 (V ZZ, III O				+ + + + + +	+ + + + + + + + + + + + + + + + + + +		- 80 - - 81 - - 82 - - 83 -	4															
					+++ +++ +++ +++ +++ +++ +++ +++ +++	*		- 84 85 86 87 - 87 -	3 4 5	11	33	SS-22	2.00	-	-	-		-	-	-	-	24	A-4b (V)	
					+++ +++ +++ +++ +++ +++ +++ +++	+		- 88 - 89 - 90 - 91 - 91 - 91 - 91 - 91 - 91 - 9	5 7 10	20	100	SS-23	1.50	-	-	-	-	-	-	-	-	20	A-4b (V)	
HA GR	RD, GRAY, RAVEL, DAM	SANDY S	SILT , "AND" CL	AY, TRACE	+++ +++ +++			- 91 - 92 - - 93 - - 94 -	15															

PID: <u>112998</u>	SFN:	1802437	PROJECT:	CUY-	17-13.50		STATION /		ET: _					: 3/1			ND:		5/22		G 4 O		
	MATI	ERIAL DESCRI AND NOTES			ELEV. 601.3	DEP	THS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GR	RAD	ATIC FS	N (%	CL	ATT LL	ERB PL	ERG	wc	ODOT CLASS (GI)	HO
HARD, GRAY GRAVEL, DAN N60avg = 8 unit wt = 14 HPavg = 4	MP <i>(continue</i> 35 40 pcf	LT, "AND" CLA			601.3		95 - 96 - 97	28	72	61	SS-24	4.50		5	8	47	36				13	A-4a (8)	
Setup Fact Wavg = 12	or = 1.5						98 - - 99 - - 100 - - 101 -	18 28 30	68	100	SS-25	4.50	-	-	-	-	-	-	-	-	14	A-4a (V)	-
							-102 103 104	32 50/6"	-	83	SS-26	4.00	-	-	-	-	-	-	-	-	11	A-4a (V)	
							-105 -106 -107 -108	22.0															
SHALE, GRAY	/, SLIGHTL	Y TO MODERA	ATELY STRONG.		585.6	TR	-109 -110 -111 -111 -112	50/6"	-	100	SS-27	-	-	-	-	-	-	-	-	-	11	A-4a (V)	_
					581.9	—EOB-	113	5 0/2" /	\	\100 ⁄	SS-28	\						۰		<u> </u>		Rock (V)	

Project: CUY-17-13.50 PID: 112998 Date: 10/30/24

Forward Abutment and Pier Profile

B-001-0-22 and B-002-0-22 Parameters

Layer			Layer														
Number		Bottom	Depth*			Avg. N ₆₀						φ'		Setup			
(No.)	Top Elev. (ft)	Elev. (ft)	(ft)	Soil Class	Soil Type	(bpf)	Consistency or Density	Qu (tsf)	Qu	(psf)	Su (psf)	(degrees)	γ _{soil} (pcf)	Factor	E50	k (pc	;i)
0**	709.0	705.7	N/A	A-6a	Cohesive	N/A	N/A				2500	28	125				
1	705.7	700.6	5.	1 A-3a	Granular	17	Med. Dense					33.75	125	1			60
2	700.6	696.3	9.	4 A-1-b	Granular	20.5	Med. Dense					36.5	125	1			60
3	696.3	693.8	11.	9 A-6a	Cohesive	15	Very Stiff		4	8000	4000		125	1.5	0	.005	
4	693.8	686.3	19.	4 A-3a	Granular	14	Med. Dense					33	122	1			60
5	686.3	675.3	30.	4 A-4b	Granular	21	Med. Dense					33	125	1.5			60
6	675.3	645.8	59.	9 A-6a	Cohesive	10.5	Med. Stiff to Stiff	1	7	3400	1700		120	1.5	0	.007	
7	645.8	633.3	72.	4 A-6a	Cohesive	15.5	Stiff to Very Stiff	2	7	5400	2700		122	1.5	0	.005	
8	633.3	602.8	102.	9 A-4b	Cohesive	8	Med. Stiff to Stiff	1	.4	2800	1400		118	1.5	0	.007	
9	602.8	587.8	117.	9 A-4a	Cohesive	45	Very Stiff to Hard	3	.3	6600	3300		135	1.5	0	.005	
10	587.8			Rock			Weak to Slightly Strong										
1																	

^{*}Layer Depth referenced from existing ground surface near the proposed footing

Rear Abutment Profile

B-003-0-22 and B-004-0-22 Parameters

Layer		5			A NI					φ'		Setup		
Number		Bottom	Layer*		Avg. N ₆₀		- (. 6)	- (5)		l:				
(No.)	Top Elev. (ft)	Elev. (ft) D	epth (ft) Soil Class	Soil Type	(bpf)	Consistency or Density	Qu (tsf)	Qu (psf)	Su (psf)	(degrees)	γ _{soil} (pcf)	Factor	E50	k (pci)
0**	711.0	706.0 N	/A A-6a	Cohesive	N/A	N/A			2500	28	125			
1	706.0	703.4	2.6 A-6b	Cohesive	17.	5 Very Stiff		3 6000	3000		122	1.75	0.005	
2	703.4	694.6	11.4 A-3a	Granular	1	8 Medium Dense				34	125	1		60
3	694.6	687.6	18.4 A-3a	Granular	1	4 Med. Dense				33	122	1		60
4	687.6	674.6	31.4 A-4b	Granular	1	8 Med. Dense				32	125	1.5		60
5	674.6	654.6	51.4 A-4b	Cohesive	1	3 Med. Stiff to Stiff	2.	3 4600	2300		120	1.5	0.005	
6	654.6	643.8	62.2 A-6a	Cohesive	7.	5 Stiff	1.	6 3200	1600		118	1.5	0.007	
7	643.8	604.6	101.4 A-4b	Cohesive	1	2 Stiff to Very Stiff	1.7	5 3500	1750		120	1.5	0.007	
8	604.6	585.6	120.4 A-4a	Cohesive	8	5 Hard	4.	4 8800	4400		140	1.5	0.004	
9	585.6		Rock			Slightly to Moderately Str	ong							

^{*}Layer Depth referenced from existing ground surface near the proposed footing

^{**}Layer No. 0 is the planned embankment fill.

^{**}Layer No. 0 is the planned embankment fill.

Bearing Resistance - Piers (B-002-0-22 Profile Controls)

General	Project Information
Filename	Driven 16 in CIP Pier Pile B002 at Bottom of Pile Cap.dvn
Project Name	CUY-17-13.50
Project Client	ODOT
Prepared By	Brendan Lieske
Project Manager	Brendan Lieske

Pil	e Information
Pile Type	Pipe Pile - Closed End
Top of Pile (ft)	0.00
Diameter of Pile (in)	16.00

Nomina	al Considerations
Water Table Depth At Time Of	
Drilling (ft)	0.00
Driving/Restrike (ft)	0.00
Nominal (ft)	0.00
Nominal Considerations	
Local Scour (ft)	0.00
Long Term Scour (ft)	0.00
Soft Soil (ft)	0.00

	Nominal Soil Profile									
p.dvn	Layer	Soil Type	Thickness	Setup Factor	Unit Weight	Strength	Nominal Curve			
13.50	1	Cohesionless	4.70 ft	1.000	122.00 pcf	33.0/33.0	Nordlun			
ODOT	2	Cohesionless	11.00 ft	1.500	125.00 pcf	32.8/32.8	Nordlun			
Lieske	3	Cohesive	29.50 ft	1.500	120.00 pcf	1700.00 psf	T-80 Same			
Lieske	4	Cohesive	12.50 ft	1.500	122.00 pcf	2700.00 psf	T-80 Same			
	5	Cohesive	30.50 ft	1.500	118.00 pcf	1400.00 psf	T-80 Same			
	6	Cohesive	15.00 ft	1.500	135.00 pcf	3300.00 psf	T-80 Same			
d End	7	Cohesive	46.80 ft	1.000	140.00 pcf	30000.00 psf	T-80 Same			
0.00										
16.00										

Driving - Sk	Driving - Skin Friction									
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)			
691.00	0.01		0.298	24.169	n/a	1.396	0.000			
690.00	1.00		29.800	24.169	n/a	1.396	0.071			
689.00	2.00		59.600	24.169	n/a	1.396	0.283			
688.00	3.00		89.400	24.169	n/a	1.396	0.637			
687.00	4.00		119.200	24.169	n/a	1.396	1.133			
686.31 686.29	4.69 4.71		139.762 280.433	24.169 23.986	n/a	1.396 1.396	1.557 1.568			
685.30	5.70		311.420	23.986	n/a n/a	1.396	2.044			
684.30	6.70		342.720	23.986	n/a	1.396	2.622			
683.30	7.70		374.020	23.986	n/a	1.396	3.296			
682.30	8.70		405.320	23.986	n/a	1.396	4.066			
681.30	9.70		436.620	23.986	n/a	1.396	4.934			
680.30	10.70	Cohesionless	467.920	23.986	n/a	1.396	5.898			
679.30	11.70	Cohesionless	499.220	23.986	n/a	1.396	6.958			
678.30	12.70		530.520	23.986	n/a	1.396	8.115			
677.30	13.70		561.820	23.986	n/a	1.396	9.369			
676.30	14.70		593.120	23.986	n/a	1.396	10.719			
675.31	15.69		624.107	23.986	n/a	1.396	12.152			
675.29 674.30	15.71 16.70	Cohesive Cohesive	624.420 624.420	23.986 23.986	1,327.493 1,327.493	n/a n/a	12.204 15.874			
673.30	17.70	Cohesive	624.420	23.986	1,327.493	n/a	19.581			
672.30	18.70		624.420	23.986	1,327.493	n/a	23.288			
671.30	19.70	Cohesive	624.420	23.986	1,327.493	n/a	26.995			
670.30	20.70		624.420	23.986	1,327.493	n/a	30.703			
669.30	21.70	Cohesive	624.420	23.986	1,327.493	n/a	34.410			
668.30	22.70	Cohesive	624.420	23.986	1,327.493	n/a	38.117			
667.30	23.70	Cohesive	624.420	23.986	1,327.493	n/a	41.824			
666.30	24.70		624.420	23.986	1,327.493	n/a	45.532			
665.30	25.70	Cohesive	624.420	23.986	1,327.493	n/a	49.239			
664.30	26.70		624.420	23.986	1,327.493	n/a	52.946			
663.30 662.30	27.70 28.70		624.420 624.420	23.986 23.986	1,327.493 1,327.493	n/a n/a	56.653 60.361			
661.30	29.70		624.420	23.986	1,333.087	n/a	64.287			
660.30	30.70	Cohesive	624.420	23.986	1,341.479	n/a	68.361			
659.30	31.70	Cohesive	624.420	23.986	1,349.871	n/a	72.482			
658.30	32.70		624.420	23.986	1,358.263	n/a	76.651			
657.30	33.70	Cohesive	624.420	23.986	1,366.655	n/a	80.866			
656.30	34.70	Cohesive	624.420	23.986	1,375.047	n/a	85.127			
655.30	35.70	Cohesive	624.420	23.986	1,383.439	n/a	89.436			
654.30	36.70		624.420	23.986	1,391.831	n/a	93.792			
653.30	37.70	Cohesive	624.420	23.986	1,400.223	n/a	98.194			
652.30	38.70		624.420	23.986	1,408.614	n/a	102.644			
651.30	39.70	Cohesive	624.420	23.986	1,417.006	n/a	107.140			
650.30 649.30	40.70 41.70		624.420	23.986	1,425.398	n/a	111.683			
649.30	41.70	Cohesive	624.420	23.986	1,433.790	n/a	116.273			

Driving - Sl	Driving - Skin Friction									
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)			
648.30	42.70	Cohesive	624.420	23.986	1,442.182	n/a	120.910			
647.30	43.70	Cohesive	624.420	23.986	1,450.574	n/a	125.594			
646.30	44.70	Cohesive	624.420	23.986	1,458.966	n/a	130.324			
645.81	45.19	Cohesive	624.420	23.986	1,463.078	n/a	132.659			
645.79	45.21	Cohesive	624.420	23.986	1,009.495	n/a	132.735			
644.80	46.20	Cohesive	624.420	23.986	1,009.495	n/a	135.526			
643.80 642.80	47.20 48.20	Cohesive Cohesive	624.420 624.420	23.986 23.986	1,009.495 1,009.495	n/a n/a	138.346 141.165			
641.80	49.20	Cohesive	624.420	23.986	1,009.495	n/a	143.984			
640.80	50.20	Cohesive	624.420	23.986	1,009.495	n/a	146.803			
639.80	51.20	Cohesive	624.420	23.986	1,009.495	n/a	149.622			
638.80	52.20	Cohesive	624.420	23.986	1,009.495	n/a	152.441			
637.80	53.20	Cohesive	624.420	23.986	1,009.495	n/a	155.261			
636.80	54.20	Cohesive	624.420	23.986	1,009.495	n/a	158.080			
635.80	55.20	Cohesive	624.420	23.986	1,009.495	n/a	160.899			
634.80	56.20	Cohesive	624.420	23.986	1,009.495	n/a	163.718			
633.80	57.20	Cohesive	624.420	23.986	1,009.495	n/a	166.537			
633.31	57.69	Cohesive	624.420	23.986	1,009.495	n/a	167.919			
633.29	57.71	Cohesive	624.420	23.986	1,193.001	n/a	167.980			
632.30 631.30	58.70 59.70	Cohesive Cohesive	624.420 624.420	23.986 23.986	1,193.001	n/a n/a	171.279 174.610			
630.30	60.70	Cohesive	624.420	23.986	1,193.001 1,193.001	n/a	174.810			
629.30	61.70	Cohesive	624.420	23.986	1,193.001	n/a	181.274			
628.30	62.70	Cohesive	624.420	23.986	1,193.001	n/a	184.605			
627.30	63.70	Cohesive	624.420	23.986	1,193.001	n/a	187.937			
626.30	64.70	Cohesive	624.420	23.986	1,193.001	n/a	191.269			
625.30	65.70	Cohesive	624.420	23.986	1,193.001	n/a	194.600			
624.30	66.70	Cohesive	624.420	23.986	1,193.001	n/a	197.932			
623.30	67.70	Cohesive	624.420	23.986	1,193.001	n/a	201.263			
622.30	68.70	Cohesive	624.420	23.986	1,193.001	n/a	204.595			
621.30	69.70	Cohesive	624.420	23.986	1,193.001	n/a	207.927			
620.30 619.30	70.70 71.70	Cohesive Cohesive	624.420 624.420	23.986 23.986	1,193.001 1,196.451	n/a	211.258 214.725			
618.30	71.70	Cohesive	624.420	23.986	1,201.626	n/a n/a	214.725			
617.30	73.70	Cohesive	624.420	23.986	1,206.801	n/a	221.870			
616.30	74.70	Cohesive	624.420	23.986	1,211.976	n/a	225.486			
615.30	75.70	Cohesive	624.420	23.986	1,217.151	n/a	229.131			
614.30	76.70	Cohesive	624.420	23.986	1,222.326	n/a	232.804			
613.30	77.70	Cohesive	624.420	23.986	1,227.501	n/a	236.507			
612.30	78.70	Cohesive	624.420	23.986	1,232.676	n/a	240.238			
611.30	79.70	Cohesive	624.420	23.986	1,237.851	n/a	243.999			
610.30	80.70	Cohesive	624.420	23.986	1,243.026	n/a	247.788			
609.30	81.70	Cohesive	624.420	23.986	1,248.201	n/a	251.606			
608.30	82.70	Cohesive	624.420	23.986	1,253.376	n/a	255.453			
607.30	83.70	Cohesive	624.420	23.986	1,258.551	n/a	259.329			

Driving - Skin Friction									
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)		
606.30	84.70	Cohesive	624.420	23.986	1,263.726	n/a	263.234		
605.30	85.70	Cohesive	624.420	23.986	1,268.901	n/a	267.168		
604.30	86.70	Cohesive	624.420	23.986	1,274.076	n/a	271.131		
603.30	87.70	Cohesive	624.420	23.986	1,279.251	n/a	275.123		
602.81	88.19	Cohesive	624.420	23.986	1,281.786	n/a	277.089		
602.79	88.21	Cohesive	624.420	23.986	851.346	n/a	277.153		
601.80 600.80	89.20 90.20	Cohesive Cohesive	624.420 624.420	23.986 23.986	851.346 851.346	n/a n/a	279.507 281.884		
599.80	91.20	Cohesive	624.420	23.986	851.346	n/a	284.262		
598.80	92.20	Cohesive	624.420	23.986	851.346	n/a	286.639		
597.80	93.20	Cohesive	624.420	23.986	851.346	n/a	289.017		
596.80	94.20	Cohesive	624.420	23.986	851.346	n/a	291.394		
595.80	95.20	Cohesive	624.420	23.986	851.346	n/a	293.772		
594.80	96.20	Cohesive	624.420	23.986	851.346	n/a	296.149		
593.80	97.20	Cohesive	624.420	23.986	851.346	n/a	298.527		
592.80	98.20	Cohesive	624.420	23.986	851.346	n/a	300.904		
591.80	99.20	Cohesive	624.420	23.986	851.346	n/a	303.282		
590.80	100.20	Cohesive	624.420	23.986	851.346	n/a	305.659		
589.80	101.20	Cohesive	624.420	23.986	851.346	n/a	308.037		
588.80	102.20	Cohesive	624.420	23.986	860.547	n/a	310.774		
587.81	103.19	Cohesive	624.420	23.986	874.212	n/a	313.726		
587.79	103.21	Cohesive	624.420	23.986	7,140.000	n/a	314.055		
586.80 585.80	104.20	Cohesive	624.420	23.986	7,140.000	n/a	343.664		
584.80	105.20 106.20	Cohesive Cohesive	624.420 624.420	23.986 23.986	7,140.000 7,140.000	n/a n/a	373.572 403.480		
583.80	100.20	Cohesive	624.420	23.986	7,140.000	n/a	433.388		
582.80	107.20	Cohesive	624.420	23.986	7,140.000	n/a	463.296		
581.80	109.20	Cohesive	624.420	23.986	7,140.000	n/a	493.203		
580.80	110.20	Cohesive	624.420	23.986	7,140.000	n/a	523.111		
579.80	111.20	Cohesive	624.420	23.986	7,140.000	n/a	553.019		
578.80	112.20	Cohesive	624.420	23.986	7,140.000	n/a	582.927		
577.80	113.20	Cohesive	624.420	23.986	7,140.000	n/a	612.835		
576.80	114.20	Cohesive	624.420	23.986	7,140.000	n/a	642.743		
575.80	115.20	Cohesive	624.420	23.986	7,140.000	n/a	672.651		
574.80	116.20	Cohesive	624.420	23.986	7,140.000	n/a	702.559		
573.80	117.20	Cohesive	624.420	23.986	7,170.500	n/a	734.256		
572.80	118.20	Cohesive	624.420	23.986	7,216.250	n/a	767.166		
571.80	119.20	Cohesive	624.420	23.986	7,262.000	n/a	800.460		
570.80 569.80	120.20	Cohesive	624.420 624.420	23.986	7,307.750	n/a	834.136 868.197		
568.80	121.20 122.20	Cohesive Cohesive	624.420	23.986 23.986	7,353.500 7,399.250	n/a n/a	902.640		
567.80	123.20	Cohesive	624.420	23.986	7,399.230	n/a	937.467		
566.80	123.20	Cohesive	624.420	23.986	7,443.000	n/a	972.676		
565.80	125.20	Cohesive	624.420	23.986	7,536.500	n/a	1,008.270		
564.80	126.20	Cohesive	624.420	23.986	7,582.250	n/a	1,044.246		

Driving - Sk	Driving - Skin Friction										
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)				
563.80	127.20	Cohesive	624.420	23.986	7,628.000	n/a	1,080.606				
562.80	128.20	Cohesive	624.420	23.986	7,673.750	n/a	1,117.349				
561.80	129.20	Cohesive	624.420	23.986	7,719.500	n/a	1,154.475				
560.80	130.20	Cohesive	624.420	23.986	7,765.250	n/a	1,191.985				
559.80	131.20	Cohesive	624.420	23.986	7,811.000	n/a	1,229.878				
558.80	132.20	Cohesive	624.420	23.986	7,856.750	n/a	1,268.154				
557.80	133.20	Cohesive	624.420	23.986	7,902.500	n/a	1,306.813				
556.80	134.20	Cohesive	624.420	23.986	7,948.250	n/a	1,345.856				
555.80	135.20	Cohesive	624.420	23.986	7,994.000	n/a	1,385.282				
554.80	136.20	Cohesive	624.420	23.986	8,039.750	n/a	1,425.091				
553.80	137.20	Cohesive	624.420	23.986	8,085.500	n/a	1,465.283				
552.80	138.20	Cohesive	624.420	23.986	8,131.250	n/a	1,505.859				
551.80	139.20	Cohesive	624.420	23.986	8,177.000	n/a	1,546.818				
550.80	140.20	Cohesive	624.420	23.986	8,222.750	n/a	1,588.161				
549.80	141.20	Cohesive	624.420	23.986	8,268.500	n/a	1,629.886				
548.80	142.20	Cohesive	624.420	23.986	8,314.250	n/a	1,671.995				
547.80	143.20	Cohesive	624.420	23.986	8,360.000	n/a	1,714.487				
546.80	144.20	Cohesive	624.420	23.986	8,405.750	n/a	1,757.363				
545.80	145.20	Cohesive	624.420	23.986	8,451.500	n/a	1,800.621				
544.80	146.20	Cohesive	624.420	23.986	8,497.250	n/a	1,844.263				
543.80	147.20	Cohesive	624.420	23.986	8,543.000	n/a	1,888.288				
542.80	148.20	Cohesive	624.420	23.986	8,588.750	n/a	1,932.697				
541.80	149.20	Cohesive	624.420	23.986	8,634.500	n/a	1,977.489				
541.01	149.99	Cohesive	624.420	23.986	8,670.643	n/a	2,013.145				

Driving - En	d Bearing	g				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
691.00	0.010	Cohesionless	0.596	47.200	69.81317008	0.025
690.00	1.000	Cohesionless	59.600	47.200	69.81317008	2.536
689.00	2.000	Cohesionless	119.200	47.200	69.81317008	5.072
688.00	3.000	Cohesionless	178.800	47.200	69.81317008	7.607
687.00	4.000	Cohesionless	238.400	47.200	69.81317008	10.143
686.31	4.690	Cohesionless	279.524	47.200	69.81317008	11.893
686.29	4.710	Cohesionless	280.746	45.100	62.83185307	11.338
685.30	5.700	Cohesionless	342.720	45.100	62.83185307	13.840
684.30	6.700	Cohesionless	405.320	45.100	62.83185307	16.368
683.30	7.700	Cohesionless	467.920	45.100	62.83185307	18.896
682.30	8.700	Cohesionless	530.520	45.100	62.83185307	21.424
681.30	9.700	Cohesionless	593.120	45.100	62.83185307	23.952
680.30	10.700	Cohesionless	655.720	45.100	62.83185307	26.480
679.30	11.700	Cohesionless	718.320	45.100	62.83185307	29.008
678.30	12.700	Cohesionless	780.920	45.100	62.83185307	31.536
677.30	13.700	Cohesionless	843.520	45.100	62.83185307	34.064
676.30	14.700	Cohesionless	906.120	45.100	62.83185307	36.592
675.31	15.690	Cohesionless	968.094	45.100	62.83185307	39.095
675.29	15.710	Cohesive	969.296	0.000	n/a	21.363
674.30	16.700	Cohesive	1,026.320	0.000	n/a	21.363
673.30	17.700	Cohesive	1,083.920	0.000	n/a	21.363
672.30	18.700	Cohesive	1,141.520	0.000	n/a	21.363
671.30	19.700	Cohesive	1,199.120	0.000	n/a	21.363
670.30	20.700	Cohesive	1,256.720	0.000	n/a	21.363
669.30	21.700	Cohesive	1,314.320	0.000	n/a	21.363
668.30	22.700	Cohesive	1,371.920	0.000	n/a	21.363
667.30	23.700	Cohesive	1,429.520	0.000	n/a	21.363
666.30	24.700	Cohesive	1,487.120	0.000	n/a	21.363
665.30	25.700	Cohesive	1,544.720	0.000	n/a	21.363
664.30	26.700	Cohesive	1,602.320	0.000	n/a	21.363
663.30	27.700	Cohesive	1,659.920	0.000	n/a	21.363
662.30	28.700	Cohesive	1,717.520	0.000	n/a	21.363
661.30	29.700	Cohesive	1,775.120	0.000	n/a	21.363
660.30	30.700	Cohesive	1,832.720	0.000	n/a	21.363
659.30	31.700	Cohesive	1,890.320	0.000	n/a	21.363
658.30	32.700	Cohesive	1,947.920	0.000	n/a	21.363
657.30	33.700	Cohesive	2,005.520	0.000	n/a	21.363
656.30	34.700	Cohesive	2,063.120	0.000	n/a	21.363
655.30	35.700	Cohesive	2,120.720	0.000	n/a	21.363
654.30	36.700	Cohesive	2,178.320	0.000	n/a	21.363
653.30	37.700	Cohesive	2,235.920	0.000	n/a	21.363

Driving - En	d Bearing	g				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
652.30	38.700	Cohesive	2,293.520	0.000	n/a	21.363
651.30	39.700	Cohesive	2,351.120	0.000	n/a	21.363
650.30	40.700	Cohesive	2,408.720	0.000	n/a	21.363
649.30	41.700	Cohesive	2,466.320	0.000	n/a	21.363
648.30	42.700	Cohesive	2,523.920	0.000	n/a	21.363
647.30	43.700	Cohesive	2,581.520	0.000	n/a	21.363
646.30	44.700	Cohesive	2,639.120	0.000	n/a	21.363
645.81	45.190	Cohesive	2,667.344	0.000	n/a	21.363
645.79	45.210	Cohesive	2,668.516	0.000	n/a	33.929
644.80	46.200	Cohesive	2,727.520	0.000	n/a	33.929
643.80	47.200	Cohesive	2,787.120	0.000	n/a	33.929
642.80	48.200	Cohesive	2,846.720	0.000	n/a	33.929
641.80	49.200	Cohesive	2,906.320	0.000	n/a	33.929
640.80	50.200	Cohesive	2,965.920	0.000	n/a	33.929
639.80	51.200	Cohesive	3,025.520	0.000	n/a	33.929
638.80	52.200	Cohesive	3,085.120	0.000	n/a	33.929
637.80	53.200	Cohesive	3,144.720	0.000	n/a	33.929
636.80	54.200	Cohesive	3,204.320	0.000	n/a	33.929
635.80	55.200	Cohesive	3,263.920	0.000	n/a	33.929
634.80	56.200	Cohesive	3,323.520	0.000	n/a	33.929
633.80	57.200	Cohesive	3,383.120	0.000	n/a	33.929
633.31	57.690	Cohesive	3,412.324	0.000	n/a	33.929
633.29	57.710	Cohesive	3,413.476	0.000	n/a	17.593
632.30	58.700	Cohesive	3,468.520	0.000	n/a	17.593
631.30	59.700	Cohesive	3,524.120	0.000	n/a	17.593
630.30	60.700	Cohesive	3,579.720	0.000	n/a	17.593
629.30	61.700	Cohesive	3,635.320	0.000	n/a	17.593
628.30	62.700	Cohesive	3,690.920	0.000	n/a	17.593
627.30	63.700	Cohesive	3,746.520	0.000	n/a	17.593
626.30	64.700	Cohesive	3,802.120	0.000	n/a	17.593
625.30	65.700	Cohesive	3,857.720	0.000	n/a	17.593
624.30	66.700	Cohesive	3,913.320	0.000	n/a	17.593
623.30	67.700	Cohesive	3,968.920	0.000	n/a	17.593
622.30	68.700	Cohesive	4,024.520	0.000	n/a	17.593
621.30	69.700	Cohesive	4,080.120	0.000	n/a	17.593
620.30	70.700	Cohesive	4,135.720	0.000	n/a	17.593
619.30	71.700	Cohesive	4,191.320	0.000	n/a	17.593
618.30	72.700	Cohesive	4,246.920	0.000	n/a	17.593
617.30	73.700	Cohesive	4,302.520	0.000	n/a	17.593
616.30	74.700	Cohesive	4,358.120	0.000	n/a	17.593
615.30	75.700	Cohesive	4,413.720	0.000	n/a	17.593

Driving - En	nd Bearing	g				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
614.30	76.700	Cohesive	4,469.320	0.000	n/a	17.593
613.30	77.700	Cohesive	4,524.920	0.000	n/a	17.593
612.30	78.700	Cohesive	4,580.520	0.000	n/a	17.593
611.30	79.700	Cohesive	4,636.120	0.000	n/a	17.593
610.30	80.700	Cohesive	4,691.720	0.000	n/a	17.593
609.30	81.700	Cohesive	4,747.320	0.000	n/a	17.593
608.30	82.700	Cohesive	4,802.920	0.000	n/a	17.593
607.30	83.700	Cohesive	4,858.520	0.000	n/a	17.593
606.30	84.700	Cohesive	4,914.120	0.000	n/a	17.593
605.30	85.700	Cohesive	4,969.720	0.000	n/a	17.593
604.30	86.700	Cohesive	5,025.320	0.000	n/a	17.593
603.30	87.700	Cohesive	5,080.920	0.000	n/a	17.593
602.81	88.190	Cohesive	5,108.164	0.000	n/a	17.593
602.79	88.210	Cohesive	5,109.446	0.000	n/a	41.469
601.80	89.200	Cohesive	5,181.320	0.000	n/a	41.469
600.80	90.200	Cohesive	5,253.920	0.000	n/a	41.469
599.80	91.200	Cohesive	5,326.520	0.000	n/a	41.469
598.80	92.200	Cohesive	5,399.120	0.000	n/a	41.469
597.80	93.200	Cohesive	5,471.720	0.000	n/a	41.469
596.80	94.200	Cohesive	5,544.320	0.000	n/a	41.469
595.80	95.200	Cohesive	5,616.920	0.000	n/a	41.469
594.80	96.200	Cohesive	5,689.520	0.000	n/a	41.469
593.80	97.200	Cohesive	5,762.120	0.000	n/a	41.469
592.80	98.200	Cohesive	5,834.720	0.000	n/a	41.469
591.80	99.200	Cohesive	5,907.320	0.000	n/a	41.469
590.80	100.200	Cohesive	5,979.920	0.000	n/a	41.469
589.80	101.200	Cohesive	6,052.520	0.000	n/a	41.469
588.80	102.200	Cohesive	6,125.120	0.000	n/a	41.469
587.81	103.190	Cohesive	6,196.994	0.000	n/a	41.469
587.79	103.210	Cohesive	6,198.496	0.000	n/a	376.991
586.80	104.200	Cohesive	6,275.320	0.000	n/a	376.991
585.80	105.200	Cohesive	6,352.920	0.000	n/a	376.991
584.80	106.200	Cohesive	6,430.520	0.000	n/a	376.991
583.80	107.200	Cohesive	6,508.120	0.000	n/a	376.991
582.80	108.200	Cohesive	6,585.720	0.000	n/a	376.991
581.80	109.200	Cohesive	6,663.320	0.000	n/a	376.991
580.80	110.200	Cohesive	6,740.920	0.000	n/a	376.991
579.80	111.200	Cohesive	6,818.520	0.000	n/a	376.991
578.80	112.200	Cohesive	6,896.120	0.000	n/a	376.991
577.80	113.200	Cohesive	6,973.720	0.000	n/a	376.991
576.80	114.200	Cohesive	7,051.320	0.000	n/a	376.991

Driving - En	d Bearing	g				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
575.80	115.200	Cohesive	7,128.920	0.000	n/a	376.991
574.80	116.200	Cohesive	7,206.520	0.000	n/a	376.991
573.80	117.200	Cohesive	7,284.120	0.000	n/a	376.991
572.80	118.200	Cohesive	7,361.720	0.000	n/a	376.991
571.80	119.200	Cohesive	7,439.320	0.000	n/a	376.991
570.80	120.200	Cohesive	7,516.920	0.000	n/a	376.991
569.80	121.200	Cohesive	7,594.520	0.000	n/a	376.991
568.80	122.200	Cohesive	7,672.120	0.000	n/a	376.991
567.80	123.200	Cohesive	7,749.720	0.000	n/a	376.991
566.80	124.200	Cohesive	7,827.320	0.000	n/a	376.991
565.80	125.200	Cohesive	7,904.920	0.000	n/a	376.991
564.80	126.200	Cohesive	7,982.520	0.000	n/a	376.991
563.80	127.200	Cohesive	8,060.120	0.000	n/a	376.991
562.80	128.200	Cohesive	8,137.720	0.000	n/a	376.991
561.80	129.200	Cohesive	8,215.320	0.000	n/a	376.991
560.80	130.200	Cohesive	8,292.920	0.000	n/a	376.991
559.80	131.200	Cohesive	8,370.520	0.000	n/a	376.991
558.80	132.200	Cohesive	8,448.120	0.000	n/a	376.991
557.80	133.200	Cohesive	8,525.720	0.000	n/a	376.991
556.80	134.200	Cohesive	8,603.320	0.000	n/a	376.991
555.80	135.200	Cohesive	8,680.920	0.000	n/a	376.991
554.80	136.200	Cohesive	8,758.520	0.000	n/a	376.991
553.80	137.200	Cohesive	8,836.120	0.000	n/a	376.991
552.80	138.200	Cohesive	8,913.720	0.000	n/a	376.991
551.80	139.200	Cohesive	8,991.320	0.000	n/a	376.991
550.80	140.200	Cohesive	9,068.920	0.000	n/a	376.991
549.80	141.200	Cohesive	9,146.520	0.000	n/a	376.991
548.80	142.200	Cohesive	9,224.120	0.000	n/a	376.991
547.80	143.200	Cohesive	9,301.720	0.000	n/a	376.991
546.80	144.200	Cohesive	9,379.320	0.000	n/a	376.991
545.80	145.200	Cohesive	9,456.920	0.000	n/a	376.991
544.80	146.200	Cohesive	9,534.520	0.000	n/a	376.991
543.80	147.200	Cohesive	9,612.120	0.000	n/a	376.991
542.80	148.200	Cohesive	9,689.720	0.000	n/a	376.991
541.80	149.200	Cohesive	9,767.320	0.000	n/a	376.991
541.01	149.990	Cohesive	9,828.624	0.000	n/a	376.991

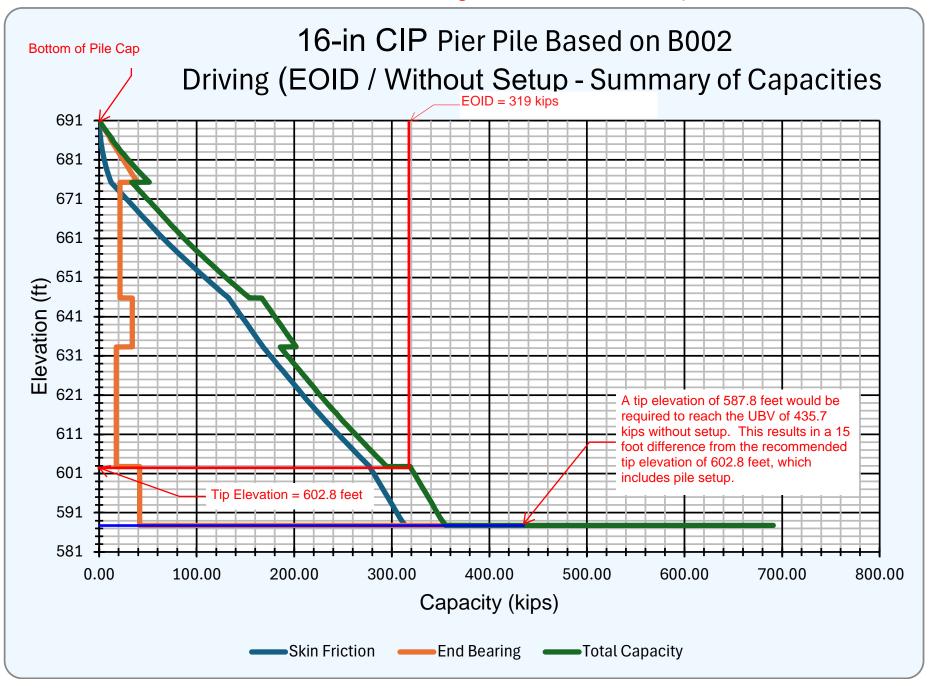
Driving - Su	ımmary o	f Capacities		
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)
691	0.01	0.00	0.03	0.03
690.00	1.00	0.07	2.54	2.61
689.00	2.00	0.28	5.07	5.35
688.00	3.00	0.64	7.61	8.24
687.00	4.00	1.13	10.14	11.28
686.31	4.69	1.56	11.89	13.45
686.29	4.71	1.57	11.34	12.91
685.30	5.70	2.04	13.84	15.88
684.30	6.70	2.62	16.37	18.99
683.30	7.70	3.30	18.90	22.19
682.30	8.70	4.07	21.42	25.49
681.30	9.70	4.93	23.95	28.89
680.30	10.70	5.90	26.48	32.38
679.30	11.70	6.96	29.01	35.97
678.30	12.70	8.12	31.54	39.65
677.30	13.70	9.37	34.06	43.43
676.30	14.70	10.72	36.59	47.31
675.31	15.69	12.15	39.10	51.25
675.29	15.71	12.20	21.36	33.57
674.30	16.70	15.87	21.36	37.24
673.30	17.70	19.58	21.36	40.94
672.30	18.70	23.29	21.36	44.65
671.30	19.70	27.00	21.36	48.36
670.30	20.70	30.70	21.36	52.07
669.30	21.70	34.41	21.36	55.77
668.30	22.70	38.12	21.36	59.48
667.30	23.70	41.82	21.36	63.19
666.30	24.70	45.53	21.36	66.89
665.30	25.70	49.24	21.36	70.60
664.30	26.70	52.95	21.36	74.31
663.30	27.70	56.65	21.36	78.02
662.30	28.70	60.36	21.36	81.72

Driving - Su	ımmary o	f Capacities		
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)
661.30	29.70	64.29	21.36	85.65
660.30	30.70	68.36	21.36	89.72
659.30	31.70	72.48	21.36	93.85
658.30	32.70	76.65	21.36	98.01
657.30	33.70	80.87	21.36	102.23
656.30	34.70	85.13	21.36	106.49
655.30	35.70	89.44	21.36	110.80
654.30	36.70	93.79	21.36	115.15
653.30	37.70	98.19	21.36	119.56
652.30	38.70	102.64	21.36	124.01
651.30	39.70	107.14	21.36	128.50
650.30	40.70	111.68	21.36	133.05
649.30	41.70	116.27	21.36	137.64
648.30	42.70	120.91	21.36	142.27
647.30	43.70	125.59	21.36	146.96
646.30	44.70	130.32	21.36	151.69
645.81	45.19	132.66	21.36	154.02
645.79	45.21	132.74	33.93	166.66
644.80	46.20	135.53	33.93	169.46
643.80	47.20	138.35	33.93	172.27
642.80	48.20	141.16	33.93	175.09
641.80	49.20	143.98	33.93	177.91
640.80	50.20	146.80	33.93	180.73
639.80	51.20	149.62	33.93	183.55
638.80	52.20	152.44	33.93	186.37
637.80	53.20	155.26	33.93	189.19
636.80	54.20	158.08	33.93	192.01
635.80	55.20	160.90	33.93	194.83
634.80	56.20	163.72	33.93	197.65
633.80	57.20	166.54	33.93	200.47
633.31	57.69	167.92	33.93	201.85
633.29	57.71	167.98	17.59	185.57

Driving - Su	ımmary o	f Capacities		
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)
632.30	58.70	171.28	17.59	188.87
631.30	59.70	174.61	17.59	192.20
630.30	60.70	177.94	17.59	195.53
629.30	61.70	181.27	17.59	198.87
628.30	62.70	184.61	17.59	202.20
627.30	63.70	187.94	17.59	205.53
626.30	64.70	191.27	17.59	208.86
625.30	65.70	194.60	17.59	212.19
624.30	66.70	197.93	17.59	215.52
623.30	67.70	201.26	17.59	218.86
622.30	68.70	204.60	17.59	222.19
621.30	69.70	207.93	17.59	225.52
620.30	70.70	211.26	17.59	228.85
619.30	71.70	214.72	17.59	232.32
618.30	72.70	218.28	17.59	235.88
617.30	73.70	221.87	17.59	239.46
616.30	74.70	225.49	17.59	243.08
615.30	75.70	229.13	17.59	246.72
614.30	76.70	232.80	17.59	250.40
613.30	77.70	236.51	17.59	254.10
612.30	78.70	240.24	17.59	257.83
611.30	79.70	244.00	17.59	261.59
610.30	80.70	247.79	17.59	265.38
609.30	81.70	251.61	17.59	269.20
608.30	82.70	255.45	17.59	273.05
607.30	83.70	259.33	17.59	276.92
606.30	84.70	263.23	17.59	280.83
605.30	85.70	267.17	17.59	284.76
604.30	86.70	271.13	17.59	288.72
603.30	87.70	275.12	17.59	292.72
602.81	88.19	277.09	17.59	294.68
602.79	88.21	277.15	41.47	318.62

Driving - Summary of Capacities						
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)		
601.80	89.20	279.51	41.47	320.98		
600.80	90.20	281.88	41.47	323.35		
599.80	91.20	284.26	41.47	325.73		
598.80	92.20	286.64	41.47	328.11		
597.80	93.20	289.02	41.47	330.49		
596.80	94.20	291.39	41.47	332.86		
595.80	95.20	293.77	41.47	335.24		
594.80	96.20	296.15	41.47	337.62		
593.80	97.20	298.53	41.47	340.00		
592.80	98.20	300.90	41.47	342.37		
591.80	99.20	303.28	41.47	344.75		
590.80	100.20	305.66	41.47	347.13		
589.80	101.20	308.04	41.47	349.51		
588.80	102.20	310.77	41.47	352.24		
587.81	103.19	313.73	41.47	355.19		
587.79	103.21	314.05	376.99	691.05		

Bearing Resistance - Piers (B-002-0-22 Profile Controls)



Nominal -	- Skin Fri	ction					
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)
691	0.01	Cohesionless	0.298	24.169	n/a	1.396	0.000
690.00	1.00	Cohesionless	29.800	24.169	n/a	1.396	0.071
689.00	2.00	Cohesionless	59.600	24.169	n/a	1.396	0.283
688.00	3.00	Cohesionless	89.400	24.169	n/a	1.396	0.637
687.00	4.00	Cohesionless	119.200	24.169	n/a	1.396	1.133
686.31	4.69	Cohesionless	139.762	24.169	n/a	1.396	1.557
686.29	4.71	Cohesionless	280.433	23.986	n/a	1.396	1.570
685.30	5.70	Cohesionless	311.420	23.986	n/a	1.396	2.285
684.30	6.70	Cohesionless	342.720	23.986	n/a	1.396	3.151
683.30	7.70	Cohesionless	374.020	23.986	n/a	1.396	4.162
682.30	8.70	Cohesionless	405.320	23.986	n/a	1.396	5.318
681.30	9.70	Cohesionless	436.620	23.986	n/a	1.396	6.618
680.30	10.70	Cohesionless	467.920	23.986	n/a	1.396	8.064
679.30	11.70	Cohesionless	499.220	23.986	n/a	1.396	9.655
678.30	12.70	Cohesionless	530.520	23.986	n/a	1.396	11.391
677.30	13.70	Cohesionless	561.820	23.986	n/a	1.396	13.271
676.30	14.70	Cohesionless	593.120	23.986	n/a	1.396	15.297
675.31	15.69	Cohesionless	624.107	23.986	n/a	1.396	17.445
675.29	15.71	Cohesive	624.420	23.986	1,327.493	n/a	17.523
674.30	16.70	Cohesive	624.420	23.986	1,327.493	n/a	23.028
673.30	17.70	Cohesive	624.420	23.986	1,327.493	n/a	28.588
672.30 671.30	18.70 19.70	Cohesive	624.420 624.420	23.986 23.986	1,327.493 1,327.493	n/a	34.149 39.709
670.30	20.70	Cohesive Cohesive	624.420	23.986	1,327.493	n/a n/a	45.270
669.30	20.70	Cohesive	624.420	23.986	1,327.493	n/a	50.831
668.30	22.70	Cohesive	624.420	23.986	1,327.493	n/a	56.391
667.30	23.70	Cohesive	624.420	23.986	1,327.493	n/a	61.952
666.30	24.70	Cohesive	624.420	23.986	1,327.493	n/a	67.512
665.30	25.70	Cohesive	624.420	23.986	1,327.493	n/a	73.073
664.30	26.70	Cohesive	624.420	23.986	1,327.493	n/a	78.634
663.30	27.70	Cohesive	624.420	23.986	1,327.493	n/a	84.194
662.30	28.70	Cohesive	624.420	23.986	1,327.493	n/a	89.755
661.30	29.70	Cohesive	624.420	23.986	1,333.087	n/a	95.643
660.30	30.70	Cohesive	624.420	23.986	1,341.479	n/a	101.755
659.30	31.70	Cohesive	624.420	23.986	1,349.871	n/a	107.936
658.30	32.70	Cohesive	624.420	23.986	1,358.263	n/a	114.188
657.30	33.70	Cohesive	624.420	23.986	1,366.655	n/a	120.511
656.30	34.70	Cohesive	624.420	23.986	1,375.047	n/a	126.903
655.30	35.70	Cohesive	624.420	23.986	1,383.439	n/a	133.366
654.30	36.70	Cohesive	624.420	23.986	1,391.831	n/a	139.899
653.30	37.70	Cohesive	624.420	23.986	1,400.223	n/a	146.502
652.30	38.70	Cohesive	624.420	23.986	1,408.614	n/a	153.176
651.30	39.70	Cohesive	624.420	23.986	1,417.006	n/a	159.920
650.30	40.70	Cohesive	624.420	23.986	1,425.398	n/a	166.735

Nominal -	Skin Fri	ction					
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)
649.30	41.70	Cohesive	624.420	23.986	1,433.790	n/a	173.619
648.30	42.70	Cohesive	624.420	23.986	1,442.182	n/a	180.574
647.30	43.70	Cohesive	624.420	23.986	1,450.574	n/a	187.599
646.30	44.70	Cohesive	624.420	23.986	1,458.966	n/a	194.695
645.81	45.19	Cohesive	624.420	23.986	1,463.078	n/a	198.197
645.79	45.21	Cohesive	624.420	23.986	1,009.495	n/a	198.311
644.80	46.20	Cohesive	624.420	23.986	1,009.495	n/a	202.498
643.80	47.20	Cohesive	624.420	23.986	1,009.495	n/a	206.726
642.80	48.20	Cohesive	624.420	23.986	1,009.495	n/a	210.955
641.80	49.20	Cohesive	624.420	23.986	1,009.495	n/a	215.183
640.80	50.20	Cohesive	624.420	23.986	1,009.495	n/a	219.412
639.80	51.20	Cohesive	624.420	23.986	1,009.495	n/a	223.640
638.80	52.20	Cohesive	624.420	23.986	1,009.495	n/a	227.869
637.80	53.20	Cohesive	624.420	23.986	1,009.495	n/a	232.098
636.80	54.20	Cohesive	624.420	23.986	1,009.495	n/a	236.326
635.80	55.20	Cohesive	624.420	23.986	1,009.495	n/a	240.555
634.80	56.20	Cohesive	624.420	23.986	1,009.495	n/a	244.783
633.80	57.20	Cohesive	624.420	23.986	1,009.495	n/a	249.012
633.31	57.69	Cohesive	624.420	23.986	1,009.495	n/a	251.084
633.29	57.71	Cohesive	624.420	23.986	1,193.001	n/a	251.176
632.30	58.70	Cohesive	624.420	23.986	1,193.001	n/a	256.123
631.30	59.70	Cohesive	624.420	23.986	1,193.001	n/a	261.121
630.30	60.70	Cohesive	624.420	23.986	1,193.001	n/a	266.118
629.30 628.30	61.70 62.70	Cohesive Cohesive	624.420 624.420	23.986 23.986	1,193.001 1,193.001	n/a	271.115 276.112
627.30	63.70	Cohesive	624.420	23.986	1,193.001	n/a	281.109
626.30	64.70	Cohesive	624.420	23.986	1,193.001	n/a n/a	281.109
625.30	65.70	Cohesive	624.420	23.986	1,193.001	n/a	291.104
624.30	66.70	Cohesive	624.420	23.986	1,193.001	n/a	296.101
623.30	67.70	Cohesive	624.420	23.986	1,193.001	n/a	301.098
622.30	68.70	Cohesive	624.420	23.986	1,193.001	n/a	306.096
621.30	69.70	Cohesive	624.420	23.986	1,193.001	n/a	311.093
620.30	70.70	Cohesive	624.420	23.986	1,193.001	n/a	316.090
619.30	71.70	Cohesive	624.420	23.986	1,196.451	n/a	321.290
618.30	72.70	Cohesive	624.420	23.986	1,201.626	n/a	326.626
617.30	73.70	Cohesive	624.420	23.986	1,206.801	n/a	332.007
616.30	74.70	Cohesive	624.420	23.986	1,211.976	n/a	337.430
615.30	75.70	Cohesive	624.420	23.986	1,217.151	n/a	342.897
614.30	76.70	Cohesive	624.420	23.986	1,222.326	n/a	348.407
613.30	77.70	Cohesive	624.420	23.986	1,227.501	n/a	353.961
612.30	78.70	Cohesive	624.420	23.986	1,232.676	n/a	359.558
611.30	79.70	Cohesive	624.420	23.986	1,237.851	n/a	365.198
610.30	80.70	Cohesive	624.420	23.986	1,243.026	n/a	370.882
609.30	81.70	Cohesive	624.420	23.986	1,248.201	n/a	376.609

Nominal -	- Skin Fri	ction					
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)
608.30	82.70	Cohesive	624.420	23.986	1,253.376	n/a	382.379
607.30	83.70	Cohesive	624.420	23.986	1,258.551	n/a	388.193
606.30	84.70	Cohesive	624.420	23.986	1,263.726	n/a	394.050
605.30	85.70	Cohesive	624.420	23.986	1,268.901	n/a	399.951
604.30	86.70	Cohesive	624.420	23.986	1,274.076	n/a	405.894
603.30	87.70	Cohesive	624.420	23.986	1,279.251	n/a	411.881
602.81	88.19	Cohesive	624.420	23.986	1,281.786	n/a	414.831
602.79	88.21	Cohesive	624.420	23.986	851.346	n/a	414.927
601.80	89.20	Cohesive	624.420	23.986	851.346	n/a	418.457
600.80	90.20	Cohesive	624.420	23.986	851.346	n/a	422.024
599.80	91.20	Cohesive	624.420	23.986	851.346	n/a	425.590
598.80	92.20	Cohesive	624.420	23.986	851.346	n/a	429.156
597.80	93.20	Cohesive	624.420	23.986	851.346	n/a	432.722
596.80	94.20	Cohesive	624.420	23.986	851.346	n/a	436.288
595.80	95.20	Cohesive	624.420	23.986	851.346	n/a	439.854
594.80	96.20	Cohesive	624.420	23.986	851.346	n/a	443.420
593.80	97.20	Cohesive	624.420	23.986	851.346	n/a	446.986
592.80	98.20	Cohesive	624.420	23.986	851.346	n/a	450.552
591.80	99.20	Cohesive	624.420	23.986	851.346	n/a	454.118
590.80	100.20	Cohesive	624.420	23.986	851.346	n/a	457.685
589.80	101.20	Cohesive	624.420	23.986	851.346	n/a	461.251
588.80 587.81	102.20 103.19	Cohesive Cohesive	624.420 624.420	23.986 23.986	860.547 874.212	n/a	465.356 469.783
587.79	103.19		624.420			n/a	470.127
586.80	103.21	Cohesive Cohesive	624.420	23.986 23.986	7,140.000 7,140.000	n/a n/a	499.736
585.80	105.20	Cohesive	624.420	23.986	7,140.000	n/a	529.644
584.80	105.20	Cohesive	624.420	23.986	7,140.000	n/a	559.552
583.80	107.20	Cohesive	624.420	23.986	7,140.000	n/a	589.460
582.80	108.20	Cohesive	624.420	23.986	7,140.000	n/a	619.368
581.80	109.20	Cohesive	624.420	23.986	7,140.000	n/a	649.276
580.80	110.20	Cohesive	624.420	23.986	7,140.000	n/a	679.184
579.80	111.20	Cohesive	624.420	23.986	7,140.000	n/a	709.092
578.80	112.20	Cohesive	624.420	23.986	7,140.000	n/a	739.000
577.80	113.20	Cohesive	624.420	23.986	7,140.000	n/a	768.908
576.80	114.20	Cohesive	624.420	23.986	7,140.000	n/a	798.816
575.80	115.20	Cohesive	624.420	23.986	7,140.000	n/a	828.724
574.80	116.20	Cohesive	624.420	23.986	7,140.000	n/a	858.632
573.80	117.20	Cohesive	624.420	23.986	7,170.500	n/a	890.328
572.80	118.20	Cohesive	624.420	23.986	7,216.250	n/a	923.239
571.80	119.20	Cohesive	624.420	23.986	7,262.000	n/a	956.532
570.80	120.20	Cohesive	624.420	23.986	7,307.750	n/a	990.209
569.80	121.20	Cohesive	624.420	23.986	7,353.500	n/a	1,024.269
568.80	122.20	Cohesive	624.420	23.986	7,399.250	n/a	1,058.713
567.80	123.20	Cohesive	624.420	23.986	7,445.000	n/a	1,093.539

Nominal - Skin Friction							
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)
566.80	124.20	Cohesive	624.420	23.986	7,490.750	n/a	1,128.749
565.80	125.20	Cohesive	624.420	23.986	7,536.500	n/a	1,164.342
564.80	126.20	Cohesive	624.420	23.986	7,582.250	n/a	1,200.319
563.80	127.20	Cohesive	624.420	23.986	7,628.000	n/a	1,236.679
562.80	128.20	Cohesive	624.420	23.986	7,673.750	n/a	1,273.422
561.80	129.20	Cohesive	624.420	23.986	7,719.500	n/a	1,310.548
560.80	130.20	Cohesive	624.420	23.986	7,765.250	n/a	1,348.057
559.80	131.20	Cohesive	624.420	23.986	7,811.000	n/a	1,385.950
558.80	132.20	Cohesive	624.420	23.986	7,856.750	n/a	1,424.226
557.80	133.20	Cohesive	624.420	23.986	7,902.500	n/a	1,462.886
556.80	134.20	Cohesive	624.420	23.986	7,948.250	n/a	1,501.928
555.80	135.20	Cohesive	624.420	23.986	7,994.000	n/a	1,541.354
554.80	136.20	Cohesive	624.420	23.986	8,039.750	n/a	1,581.164
553.80	137.20	Cohesive	624.420	23.986	8,085.500	n/a	1,621.356
552.80	138.20	Cohesive	624.420	23.986	8,131.250	n/a	1,661.932
551.80	139.20	Cohesive	624.420	23.986	8,177.000	n/a	1,702.891
550.80	140.20	Cohesive	624.420	23.986	8,222.750	n/a	1,744.233
549.80	141.20	Cohesive	624.420	23.986	8,268.500	n/a	1,785.959
548.80	142.20	Cohesive	624.420	23.986	8,314.250	n/a	1,828.068
547.80	143.20	Cohesive	624.420	23.986	8,360.000	n/a	1,870.560
546.80	144.20	Cohesive	624.420	23.986	8,405.750	n/a	1,913.435
545.80	145.20	Cohesive	624.420	23.986	8,451.500	n/a	1,956.694
544.80	146.20	Cohesive	624.420	23.986	8,497.250	n/a	2,000.336
543.80	147.20	Cohesive	624.420	23.986	8,543.000	n/a	2,044.361
542.80	148.20	Cohesive	624.420	23.986	8,588.750	n/a	2,088.770
541.80	149.20	Cohesive	624.420	23.986	8,634.500	n/a	2,133.561
541.01	149.99	Cohesive	624.420	23.986	8,670.643	n/a	2,169.218

Nominal - End Bearing								
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)		
691	0.010	Cohesionless	0.596	47.200	69.81317008	0.025		
690.00	1.000	Cohesionless	59.600	47.200	69.81317008	2.536		
689.00	2.000	Cohesionless	119.200	47.200	69.81317008	5.072		
688.00	3.000	Cohesionless	178.800	47.200	69.81317008	7.607		
687.00	4.000	Cohesionless	238.400	47.200	69.81317008	10.143		
686.31	4.690	Cohesionless	279.524	47.200	69.81317008	11.893		
686.29	4.710	Cohesionless	280.746	45.100	62.83185307	11.338		
685.30	5.700	Cohesionless	342.720	45.100	62.83185307	13.840		
684.30	6.700	Cohesionless	405.320	45.100	62.83185307	16.368		
683.30	7.700	Cohesionless	467.920	45.100	62.83185307	18.896		
682.30	8.700	Cohesionless	530.520	45.100	62.83185307	21.424		
681.30	9.700	Cohesionless	593.120	45.100	62.83185307	23.952		
680.30	10.700	Cohesionless	655.720	45.100	62.83185307	26.480		
679.30	11.700	Cohesionless	718.320	45.100	62.83185307	29.008		
678.30	12.700	Cohesionless	780.920	45.100	62.83185307	31.536		
677.30	13.700	Cohesionless	843.520	45.100	62.83185307	34.064		
676.30	14.700	Cohesionless	906.120	45.100	62.83185307	36.592		
675.31	15.690	Cohesionless	968.094	45.100	62.83185307	39.095		
675.29	15.710	Cohesive	969.296	0.000	n/a	21.363		
674.30	16.700	Cohesive	1,026.320	0.000	n/a	21.363		
673.30	17.700	Cohesive	1,083.920	0.000	n/a	21.363		
672.30	18.700	Cohesive	1,141.520	0.000	n/a	21.363		
671.30	19.700	Cohesive	1,199.120	0.000	n/a	21.363		
670.30	20.700	Cohesive	1,256.720	0.000	n/a	21.363		
669.30	21.700	Cohesive	1,314.320	0.000	n/a	21.363		
668.30	22.700	Cohesive	1,371.920	0.000	n/a	21.363		
667.30	23.700	Cohesive	1,429.520	0.000	n/a	21.363		
666.30	24.700	Cohesive	1,487.120	0.000	n/a	21.363		
665.30	25.700	Cohesive	1,544.720	0.000	n/a	21.363		
664.30	26.700	Cohesive	1,602.320	0.000	n/a	21.363		
663.30	27.700	Cohesive	1,659.920	0.000	n/a	21.363		
662.30	28.700	Cohesive	1,717.520	0.000	n/a	21.363		
661.30	29.700	Cohesive	1,775.120	0.000	n/a	21.363		
660.30	30.700	Cohesive	1,832.720	0.000	n/a	21.363		
659.30	31.700	Cohesive	1,890.320	0.000	n/a	21.363		
658.30	32.700	Cohesive	1,947.920	0.000	n/a	21.363		
657.30	33.700	Cohesive	2,005.520	0.000	n/a	21.363		
656.30	34.700	Cohesive	2,063.120	0.000	n/a	21.363		
655.30	35.700	Cohesive	2,120.720	0.000	n/a	21.363		
654.30	36.700	Cohesive	2,178.320	0.000	n/a	21.363		

Nominal -	End Bear	ing				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
653.30	37.700	Cohesive	2,235.920	0.000	n/a	21.363
652.30	38.700	Cohesive	2,293.520	0.000	n/a	21.363
651.30	39.700	Cohesive	2,351.120	0.000	n/a	21.363
650.30	40.700	Cohesive	2,408.720	0.000	n/a	21.363
649.30	41.700	Cohesive	2,466.320	0.000	n/a	21.363
648.30	42.700	Cohesive	2,523.920	0.000	n/a	21.363
647.30	43.700	Cohesive	2,581.520	0.000	n/a	21.363
646.30	44.700	Cohesive	2,639.120	0.000	n/a	21.363
645.81	45.190	Cohesive	2,667.344	0.000	n/a	21.363
645.79	45.210	Cohesive	2,668.516	0.000	n/a	33.929
644.80	46.200	Cohesive	2,727.520	0.000	n/a	33.929
643.80	47.200	Cohesive	2,787.120	0.000	n/a	33.929
642.80	48.200	Cohesive	2,846.720	0.000	n/a	33.929
641.80	49.200	Cohesive	2,906.320	0.000	n/a	33.929
640.80	50.200	Cohesive	2,965.920	0.000	n/a	33.929
639.80	51.200	Cohesive	3,025.520	0.000	n/a	33.929
638.80	52.200	Cohesive	3,085.120	0.000	n/a	33.929
637.80	53.200	Cohesive	3,144.720	0.000	n/a	33.929
636.80	54.200	Cohesive	3,204.320	0.000	n/a	33.929
635.80	55.200	Cohesive	3,263.920	0.000	n/a	33.929
634.80	56.200	Cohesive	3,323.520	0.000	n/a	33.929
633.80	57.200	Cohesive	3,383.120	0.000	n/a	33.929
633.31	57.690	Cohesive	3,412.324	0.000	n/a	33.929
633.29	57.710	Cohesive	3,413.476	0.000	n/a	17.593
632.30	58.700	Cohesive	3,468.520	0.000	n/a	17.593
631.30	59.700	Cohesive	3,524.120	0.000	n/a	17.593
630.30	60.700	Cohesive	3,579.720	0.000	n/a	17.593
629.30	61.700	Cohesive	3,635.320	0.000	n/a	17.593
628.30	62.700	Cohesive	3,690.920	0.000	n/a	17.593
627.30	63.700	Cohesive	3,746.520	0.000	n/a	17.593
626.30	64.700	Cohesive	3,802.120	0.000	n/a	17.593
625.30	65.700	Cohesive	3,857.720	0.000	n/a	17.593
624.30	66.700	Cohesive	3,913.320	0.000	n/a	17.593
623.30	67.700	Cohesive	3,968.920	0.000	n/a	17.593
622.30	68.700	Cohesive	4,024.520	0.000	n/a	17.593
621.30	69.700	Cohesive	4,080.120	0.000	n/a	17.593
620.30	70.700	Cohesive	4,135.720	0.000	n/a	17.593
619.30	71.700	Cohesive	4,191.320	0.000	n/a	17.593
618.30	72.700	Cohesive	4,246.920	0.000	n/a	17.593
617.30	73.700	Cohesive	4,302.520	0.000	n/a	17.593

Nominal - I	End Bear	ing				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
616.30	74.700	Cohesive	4,358.120	0.000	n/a	17.593
615.30	75.700	Cohesive	4,413.720	0.000	n/a	17.593
614.30	76.700	Cohesive	4,469.320	0.000	n/a	17.593
613.30	77.700	Cohesive	4,524.920	0.000	n/a	17.593
612.30	78.700	Cohesive	4,580.520	0.000	n/a	17.593
611.30	79.700	Cohesive	4,636.120	0.000	n/a	17.593
610.30	80.700	Cohesive	4,691.720	0.000	n/a	17.593
609.30	81.700	Cohesive	4,747.320	0.000	n/a	17.593
608.30	82.700	Cohesive	4,802.920	0.000	n/a	17.593
607.30	83.700	Cohesive	4,858.520	0.000	n/a	17.593
606.30	84.700	Cohesive	4,914.120	0.000	n/a	17.593
605.30	85.700	Cohesive	4,969.720	0.000	n/a	17.593
604.30	86.700	Cohesive	5,025.320	0.000	n/a	17.593
603.30	87.700	Cohesive	5,080.920	0.000	n/a	17.593
602.81	88.190	Cohesive	5,108.164	0.000	n/a	17.593
602.79	88.210	Cohesive	5,109.446	0.000	n/a	41.469
601.80	89.200	Cohesive	5,181.320	0.000	n/a	41.469
600.80	90.200	Cohesive	5,253.920	0.000	n/a	41.469
599.80	91.200	Cohesive	5,326.520	0.000	n/a	41.469
598.80	92.200	Cohesive	5,399.120	0.000	n/a	41.469
597.80	93.200	Cohesive	5,471.720	0.000	n/a	41.469
596.80	94.200	Cohesive	5,544.320	0.000	n/a	41.469
595.80	95.200	Cohesive	5,616.920	0.000	n/a	41.469
594.80	96.200	Cohesive	5,689.520	0.000	n/a	41.469
593.80	97.200	Cohesive	5,762.120	0.000	n/a	41.469
592.80	98.200	Cohesive	5,834.720	0.000	n/a	41.469
591.80	99.200	Cohesive	5,907.320	0.000	n/a	41.469
590.80	100.200	Cohesive	5,979.920	0.000	n/a	41.469
589.80	101.200	Cohesive	6,052.520	0.000	n/a	41.469
588.80	102.200	Cohesive	6,125.120	0.000	n/a	41.469
587.81	103.190	Cohesive	6,196.994	0.000	n/a	41.469
587.79	103.210	Cohesive	6,198.496	0.000	n/a	376.991
586.80	104.200	Cohesive	6,275.320	0.000	n/a	376.991
585.80	105.200	Cohesive	6,352.920	0.000	n/a	376.991
584.80	106.200	Cohesive	6,430.520	0.000	n/a	376.991
583.80	107.200	Cohesive	6,508.120	0.000	n/a	376.991
582.80	108.200	Cohesive	6,585.720	0.000	n/a	376.991
581.80	109.200	Cohesive	6,663.320	0.000	n/a	376.991
580.80	110.200	Cohesive	6,740.920	0.000	n/a	376.991
579.80	111.200	Cohesive	6,818.520	0.000	n/a	376.991

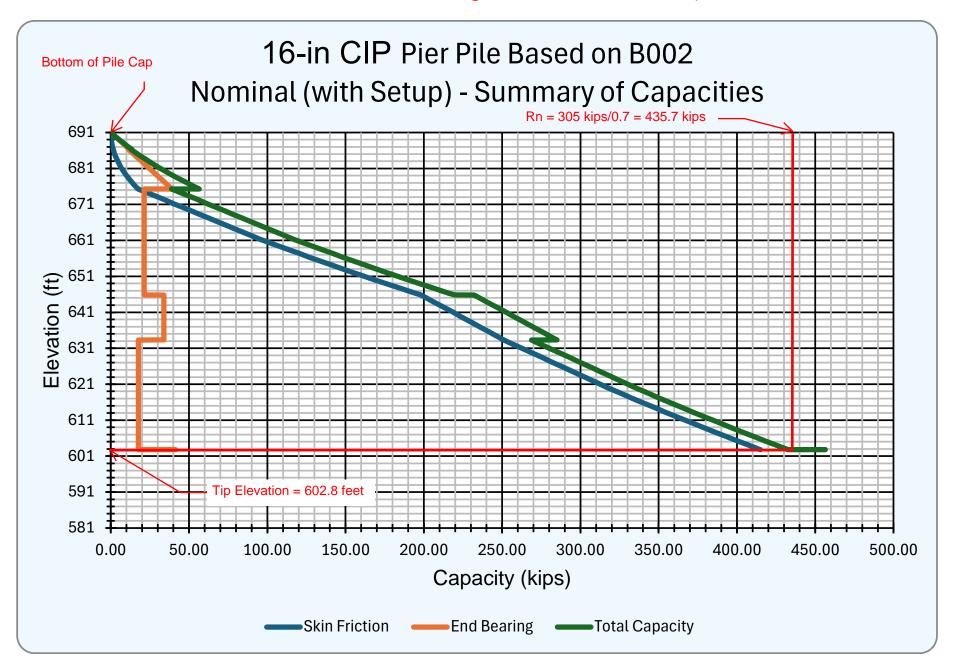
Nominal - I	End Bear	ing				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
578.80	112.200	Cohesive	6,896.120	0.000	n/a	376.991
577.80	113.200	Cohesive	6,973.720	0.000	n/a	376.991
576.80	114.200	Cohesive	7,051.320	0.000	n/a	376.991
575.80	115.200	Cohesive	7,128.920	0.000	n/a	376.991
574.80	116.200	Cohesive	7,206.520	0.000	n/a	376.991
573.80	117.200	Cohesive	7,284.120	0.000	n/a	376.991
572.80	118.200	Cohesive	7,361.720	0.000	n/a	376.991
571.80	119.200	Cohesive	7,439.320	0.000	n/a	376.991
570.80	120.200	Cohesive	7,516.920	0.000	n/a	376.991
569.80	121.200	Cohesive	7,594.520	0.000	n/a	376.991
568.80	122.200	Cohesive	7,672.120	0.000	n/a	376.991
567.80	123.200	Cohesive	7,749.720	0.000	n/a	376.991
566.80	124.200	Cohesive	7,827.320	0.000	n/a	376.991
565.80	125.200	Cohesive	7,904.920	0.000	n/a	376.991
564.80	126.200	Cohesive	7,982.520	0.000	n/a	376.991
563.80	127.200	Cohesive	8,060.120	0.000	n/a	376.991
562.80	128.200	Cohesive	8,137.720	0.000	n/a	376.991
561.80	129.200	Cohesive	8,215.320	0.000	n/a	376.991
560.80	130.200	Cohesive	8,292.920	0.000	n/a	376.991
559.80	131.200	Cohesive	8,370.520	0.000	n/a	376.991
558.80	132.200	Cohesive	8,448.120	0.000	n/a	376.991
557.80	133.200	Cohesive	8,525.720	0.000	n/a	376.991
556.80	134.200	Cohesive	8,603.320	0.000	n/a	376.991
555.80	135.200	Cohesive	8,680.920	0.000	n/a	376.991
554.80	136.200	Cohesive	8,758.520	0.000	n/a	376.991
553.80	137.200	Cohesive	8,836.120	0.000	n/a	376.991
552.80	138.200	Cohesive	8,913.720	0.000	n/a	376.991
551.80	139.200	Cohesive	8,991.320	0.000	n/a	376.991
550.80	140.200	Cohesive	9,068.920	0.000	n/a	376.991
549.80	141.200	Cohesive	9,146.520	0.000	n/a	376.991
548.80	142.200	Cohesive	9,224.120	0.000	n/a	376.991
547.80	143.200	Cohesive	9,301.720	0.000	n/a	376.991
546.80	144.200	Cohesive	9,379.320	0.000	n/a	376.991
545.80	145.200	Cohesive	9,456.920	0.000	n/a	376.991
544.80	146.200	Cohesive	9,534.520	0.000	n/a	376.991
543.80	147.200	Cohesive	9,612.120	0.000	n/a	376.991
542.80	148.200	Cohesive	9,689.720	0.000	n/a	376.991
541.80	149.200	Cohesive	9,767.320	0.000	n/a	376.991
541.01	149.990	Cohesive	9,828.624	0.000	n/a	376.991

Nominal - Summary of Capacities								
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)				
691	0.01	0.00	0.03	0.03				
690.00	1.00	0.07	2.54	2.61				
689.00	2.00	0.28	5.07	5.35				
688.00	3.00	0.64	7.61	8.24				
687.00	4.00	1.13	10.14	11.28				
686.31	4.69	1.56	11.89	13.45				
686.29	4.71	1.57	11.34	12.91				
685.30	5.70	2.28	13.84	16.12				
684.30	6.70	3.15	16.37	19.52				
683.30	7.70	4.16	18.90	23.06				
682.30	8.70	5.32	21.42	26.74				
681.30	9.70	6.62	23.95	30.57				
680.30	10.70	8.06	26.48	34.54				
679.30	11.70	9.65	29.01	38.66				
678.30	12.70	11.39	31.54	42.93				
677.30	13.70	13.27	34.06	47.34				
676.30	14.70	15.30	36.59	51.89				
675.31	15.69	17.44	39.10	56.54				
675.29	15.71	17.52	21.36	38.89				
674.30	16.70	23.03	21.36	44.39				
673.30	17.70	28.59	21.36	49.95				
672.30	18.70	34.15	21.36	55.51				
671.30	19.70	39.71	21.36	61.07				
670.30	20.70	45.27	21.36	66.63				
669.30	21.70	50.83	21.36	72.19				
668.30	22.70	56.39	21.36	77.75				
667.30	23.70	61.95	21.36	83.31				
666.30	24.70	67.51	21.36	88.88				
665.30	25.70	73.07	21.36	94.44				
664.30	26.70	78.63	21.36	100.00				
663.30	27.70	84.19	21.36	105.56				
662.30	28.70	89.75	21.36	111.12				

Nominal - S	Nominal - Summary of Capacities									
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)						
661.30	29.70	95.64	21.36	117.01						
660.30	30.70	101.75	21.36	123.12						
659.30	31.70	107.94	21.36	129.30						
658.30	32.70	114.19	21.36	135.55						
657.30	33.70	120.51	21.36	141.87						
656.30	34.70	126.90	21.36	148.27						
655.30	35.70	133.37	21.36	154.73						
654.30	36.70	139.90	21.36	161.26						
653.30	37.70	146.50	21.36	167.87						
652.30	38.70	153.18	21.36	174.54						
651.30	39.70	159.92	21.36	181.28						
650.30	40.70	166.73	21.36	188.10						
649.30	41.70	173.62	21.36	194.98						
648.30	42.70	180.57	21.36	201.94						
647.30	43.70	187.60	21.36	208.96						
646.30	44.70	194.69	21.36	216.06						
645.81	45.19	198.20	21.36	219.56						
645.79	45.21	198.31	33.93	232.24						
644.80	46.20	202.50	33.93	236.43						
643.80	47.20	206.73	33.93	240.66						
642.80	48.20	210.95	33.93	244.88						
641.80	49.20	215.18	33.93	249.11						
640.80	50.20	219.41	33.93	253.34						
639.80	51.20	223.64	33.93	257.57						
638.80	52.20	227.87	33.93	261.80						
637.80	53.20	232.10	33.93	266.03						
636.80	54.20	236.33	33.93	270.26						
635.80	55.20	240.55	33.93	274.48						
634.80	56.20	244.78	33.93	278.71						
633.80	57.20	249.01	33.93	282.94						
633.31	57.69	251.08	33.93	285.01						
633.29	57.71	251.18	17.59	268.77						

Nominal - S	Summary	of Capacities		
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)
632.30	58.70	256.12	17.59	273.72
631.30	59.70	261.12	17.59	278.71
630.30	60.70	266.12	17.59	283.71
629.30	61.70	271.12	17.59	288.71
628.30	62.70	276.11	17.59	293.71
627.30	63.70	281.11	17.59	298.70
626.30	64.70	286.11	17.59	303.70
625.30	65.70	291.10	17.59	308.70
624.30	66.70	296.10	17.59	313.69
623.30	67.70	301.10	17.59	318.69
622.30	68.70	306.10	17.59	323.69
621.30	69.70	311.09	17.59	328.69
620.30	70.70	316.09	17.59	333.68
619.30	71.70	321.29	17.59	338.88
618.30	72.70	326.63	17.59	344.22
617.30	73.70	332.01	17.59	349.60
616.30	74.70	337.43	17.59	355.02
615.30	75.70	342.90	17.59	360.49
614.30	76.70	348.41	17.59	366.00
613.30	77.70	353.96	17.59	371.55
612.30	78.70	359.56	17.59	377.15
611.30	79.70	365.20	17.59	382.79
610.30	80.70	370.88	17.59	388.47
609.30	81.70	376.61	17.59	394.20
608.30	82.70	382.38	17.59	399.97
607.30	83.70	388.19	17.59	405.79
606.30	84.70	394.05	17.59	411.64
605.30	85.70	399.95	17.59	417.54
604.30	86.70	405.89	17.59	423.49
603.30	87.70	411.88	17.59	429.47
602.81	88.19	414.83	17.59	432.42
602.79	88.21	414.93	41.47	456.40

Bearing Resistance - Piers (B-002-0-22 Profile Controls)



Filename Driven 16 in CIP Pier Pile B003 at Bottom of Pile Cap.dvn Project Name CUY-17-13.50 Project Client ODOT Prepared By Brendan Lieske Project Manager Brendan Lieske

Pile Information						
Pile Type	Pipe Pile - Closed End					
Top of Pile (ft)	0.00					
Diameter of Pile (in)	16.00					

Nominal Considerations					
Water Table Depth At Time Of					
Drilling (ft)	0.00				
Driving/Restrike (ft)	0.00				
Nominal (ft)	0.00				
Nominal Considerations					
Local Scour (ft)	0.00				
Long Term Scour (ft)	0.00				
Soft Soil (ft)	0.00				

Bearing Resistance - Piers (B-003-0-22 Profile)

Nominal Soil Profile									
Layer	Soil Type	Thickness	Setup Factor	Unit Weight	Strength	Nominal Curve			
1	Cohesionless	3.40 ft	1.000	122.00 pcf	33.0/33.0	Nordlund			
2	Cohesionless	13.00 ft	1.500	125.00 pcf	32.0/32.0	Nordlund			
3	Cohesive	20.00 ft	1.500	120.00 pcf	2300.00 psf	T-80 Same			
4	Cohesive	10.80 ft	1.500	118.00 pcf	1600.00 psf	T-80 Same			
5	Cohesive	39.20 ft	1.500	120.00 pcf	1750.00 psf	T-80 Same			
6	Cohesive	19.00 ft	1.500	140.00 pcf	4400.00 psf	T-80 Same			
7	Cohesive	44.60 ft	1.000	140.00 pcf	30000.00 psf	T-80 Same			

Driving - Skin Friction									
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)		
691	0.01		0.298	24.169	n/a	1.396	0.000		
690.00	1.00	Cohesionless	29.800	24.169	n/a	1.396	0.071		
689.00	2.00		59.600	24.169	n/a	1.396	0.283		
688.00	3.00	Cohesionless	89.400	24.169	n/a	1.396	0.637		
687.61	3.39		101.022	24.169	n/a	1.396	0.813		
687.59 686.60	3.41 4.40	Cohesionless Cohesionless	202.953 233.940	23.437 23.437	n/a	1.396 1.396	0.821 1.152		
685.60	5.40		265.240	23.437	n/a n/a	1.396	1.574		
684.60	6.40		296.540	23.437	n/a	1.396	2.086		
683.60	7.40		327.840	23.437	n/a	1.396	2.687		
682.60	8.40		359.140	23.437	n/a	1.396	3.378		
681.60	9.40		390.440	23.437	n/a	1.396	4.157		
680.60	10.40	Cohesionless	421.740	23.437	n/a	1.396	5.026		
679.60	11.40	Cohesionless	453.040	23.437	n/a	1.396	5.984		
678.60	12.40	Cohesionless	484.340	23.437	n/a	1.396	7.031		
677.60	13.40	Cohesionless	515.640	23.437	n/a	1.396	8.167		
676.60	14.40		546.940	23.437	n/a	1.396	9.393		
675.60	15.40	Cohesionless	578.240	23.437	n/a	1.396	10.708		
674.61	16.39		609.227	23.437	n/a	1.396	12.097		
674.59 673.60	16.41 17.40	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,232.996 1,232.996	n/a n/a	12.146 15.555		
672.60	18.40	Cohesive	609.540	23.437	1,232.996	n/a	18.999		
671.60	19.40	Cohesive	609.540	23.437	1,232.996	n/a	22.442		
670.60	20.40	Cohesive	609.540	23.437	1,232.996	n/a	25.885		
669.60	21.40	Cohesive	609.540	23.437	1,232.996	n/a	29.329		
668.60	22.40	Cohesive	609.540	23.437	1,232.996	n/a	32.772		
667.60	23.40	Cohesive	609.540	23.437	1,232.996	n/a	36.215		
666.60	24.40	Cohesive	609.540	23.437	1,232.996	n/a	39.659		
665.60	25.40	Cohesive	609.540	23.437	1,232.996	n/a	43.102		
664.60	26.40	Cohesive	609.540	23.437	1,232.996	n/a	46.545		
663.60	27.40	Cohesive	609.540	23.437	1,232.996	n/a	49.989		
662.60	28.40	Cohesive	609.540	23.437	1,232.996	n/a	53.432		
661.60 660.60	29.40 30.40	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,232.996 1,242.333	n/a	56.875 60.684		
659.60	30.40	Cohesive	609.540	23.437	1,256.339	n/a n/a	64.740		
658.60	32.40	Cohesive	609.540	23.437	1,270.345	n/a	68.874		
657.60	33.40	Cohesive	609.540	23.437	1,284.351	n/a	73.087		
656.60	34.40	Cohesive	609.540	23.437	1,298.357	n/a	77.378		
655.60	35.40	Cohesive	609.540	23.437	1,312.363	n/a	81.747		
654.61	36.39	Cohesive	609.540	23.437	1,326.229	n/a	86.149		
654.59	36.41	Cohesive	609.540	23.437	1,287.723	n/a	86.230		
653.60	37.40	Cohesive	609.540	23.437	1,287.723	n/a	89.790		
652.60	38.40	Cohesive	609.540	23.437	1,287.723	n/a	93.386		
651.60	39.40	Cohesive	609.540	23.437	1,287.723	n/a	96.983		
650.60	40.40	Cohesive	609.540	23.437	1,287.723	n/a	100.579		

Driving - Skin Friction									
Elevation (ft)		Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)		
649.60	41.40	Cohesive	609.540	23.437	1,287.723	n/a	104.175		
648.60	42.40	Cohesive	609.540	23.437	1,287.723	n/a	107.771		
647.60	43.40	Cohesive	609.540	23.437	1,287.723	n/a	111.367		
646.60	44.40	Cohesive	609.540	23.437	1,287.723	n/a	114.963		
645.60	45.40	Cohesive	609.540	23.437	1,287.723	n/a	118.560		
644.60	46.40	Cohesive	609.540	23.437	1,287.723	n/a	122.156		
643.81 643.79	47.19 47.21	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,287.723 1,345.582	n/a n/a	124.997 125.070		
642.80	48.20	Cohesive	609.540	23.437	1,345.582	n/a	128.790		
641.80	49.20	Cohesive	609.540	23.437	1,345.582	n/a	132.548		
640.80	50.20	Cohesive	609.540	23.437	1,345.582	n/a	136.306		
639.80	51.20	Cohesive	609.540	23.437	1,345.582	n/a	140.064		
638.80	52.20	Cohesive	609.540	23.437	1,345.582	n/a	143.822		
637.80	53.20	Cohesive	609.540	23.437	1,345.582	n/a	147.579		
636.80	54.20	Cohesive	609.540	23.437	1,345.582	n/a	151.337		
635.80	55.20	Cohesive	609.540	23.437	1,345.582	n/a	155.095		
634.80	56.20	Cohesive	609.540	23.437	1,345.582	n/a	158.853		
633.80	57.20	Cohesive	609.540	23.437	1,345.582	n/a	162.610		
632.80	58.20	Cohesive	609.540	23.437	1,345.582	n/a	166.368		
631.80	59.20	Cohesive	609.540	23.437	1,345.582	n/a	170.126		
630.80	60.20	Cohesive	609.540	23.437	1,345.582	n/a	173.884		
629.80	61.20	Cohesive	609.540	23.437	1,351.469	n/a	177.872		
628.80	62.20	Cohesive	609.540	23.437	1,360.301	n/a	182.016		
627.80 626.80	63.20 64.20	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,369.132 1,377.963	n/a n/a	186.209 190.452		
625.80	65.20	Cohesive	609.540	23.437	1,386.795	n/a	194.744		
624.80	66.20	Cohesive	609.540	23.437	1,395.626	n/a	199.086		
623.80	67.20	Cohesive	609.540	23.437	1,404.457	n/a	203.476		
622.80	68.20	Cohesive	609.540	23.437	1,413.288	n/a	207.916		
621.80	69.20	Cohesive	609.540	23.437	1,422.120	n/a	212.406		
620.80	70.20	Cohesive	609.540	23.437	1,430.951	n/a	216.945		
619.80	71.20	Cohesive	609.540	23.437	1,439.782	n/a	221.533		
618.80	72.20	Cohesive	609.540	23.437	1,448.614	n/a	226.170		
617.80	73.20	Cohesive	609.540	23.437	1,457.445	n/a	230.857		
616.80	74.20	Cohesive	609.540	23.437	1,466.276	n/a	235.593		
615.80	75.20	Cohesive	609.540	23.437	1,475.108	n/a	240.378		
614.80	76.20	Cohesive	609.540	23.437	1,483.939	n/a	245.213		
613.80 612.80	77.20	Cohesive	609.540 609.540	23.437 23.437	1,492.770	n/a	250.097 255.030		
612.80	78.20 79.20	Cohesive	609.540 609.540	23.437	1,501.601 1,510.433	n/a	255.030		
611.80	80.20	Cohesive Cohesive	609.540	23.437	1,510.433	n/a n/a	265.045		
609.80	81.20	Cohesive	609.540	23.437	1,528.095	n/a	270.126		
608.80	82.20	Cohesive	609.540	23.437	1,536.927	n/a	275.257		
607.80	83.20	Cohesive	609.540	23.437	1,545.758	n/a	280.437		
606.80	84.20	Cohesive	609.540	23.437	1,554.589	n/a	285.666		

Driving - Sk	kin Frictio	n					
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)
605.80	85.20	Cohesive	609.540	23.437	1,563.421	n/a	290.945
604.80	86.20	Cohesive	609.540	23.437	1,572.252	n/a	296.273
604.61	86.39	Cohesive	609.540	23.437	1,573.930	n/a	297.291
604.59	86.41	Cohesive	609.540	23.437	1,047.200	n/a	297.374
603.60	87.40	Cohesive	609.540	23.437	1,047.200	n/a	300.269
602.60 601.60	88.40 89.40	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,047.200 1,047.200	n/a n/a	303.193 306.118
600.60	90.40	Cohesive	609.540	23.437	1,047.200	n/a	309.042
599.60	91.40	Cohesive	609.540	23.437	1,047.200	n/a	311.967
598.60	92.40	Cohesive	609.540	23.437	1,047.200	n/a	314.891
597.60	93.40	Cohesive	609.540	23.437	1,047.200	n/a	317.816
596.60	94.40	Cohesive	609.540	23.437	1,047.200	n/a	320.740
595.60	95.40	Cohesive	609.540	23.437	1,047.200	n/a	323.665
594.60	96.40	Cohesive	609.540	23.437	1,047.200	n/a	326.589
593.60	97.40	Cohesive	609.540	23.437	1,047.200	n/a	329.514
592.60	98.40	Cohesive	609.540	23.437	1,047.200	n/a	332.438
591.60	99.40	Cohesive	609.540	23.437	1,047.200	n/a	335.363
590.60	100.40	Cohesive	609.540	23.437	1,051.686	n/a	338.463
589.60	101.40	Cohesive	609.540	23.437	1,058.416	n/a	341.682
588.60 587.60	102.40 103.40	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,065.146 1,071.876	n/a n/a	344.938 348.232
586.60	103.40	Cohesive	609.540	23.437	1,071.876	n/a	351.564
585.61	105.39	Cohesive	609.540	23.437	1,085.268	n/a	354.899
585.59	105.41	Cohesive	609.540	23.437	7,140.000	n/a	355.232
584.60	106.40	Cohesive	609.540	23.437	7,140.000	n/a	384.841
583.60	107.40	Cohesive	609.540	23.437	7,140.000	n/a	414.749
582.60	108.40	Cohesive	609.540	23.437	7,140.000	n/a	444.657
581.60	109.40	Cohesive	609.540	23.437	7,140.000	n/a	474.565
580.60	110.40	Cohesive	609.540	23.437	7,140.000	n/a	504.473
579.60	111.40	Cohesive	609.540	23.437	7,140.000	n/a	534.381
578.60	112.40	Cohesive	609.540	23.437	7,140.000	n/a	564.289
577.60 576.60	113.40	Cohesive	609.540	23.437	7,140.000	n/a	594.197
576.60	114.40 115.40	Cohesive Cohesive	609.540 609.540	23.437 23.437	7,140.000 7,140.000	n/a n/a	624.105 654.013
573.60	116.40	Cohesive	609.540	23.437	7,140.000	n/a n/a	683.921
573.60	117.40	Cohesive	609.540	23.437	7,140.000	n/a	713.829
572.60	118.40	Cohesive	609.540	23.437	7,140.000	n/a	743.737
571.60	119.40	Cohesive	609.540	23.437	7,170.500	n/a	775.433
570.60	120.40	Cohesive	609.540	23.437	7,216.250	n/a	808.343
569.60	121.40	Cohesive	609.540	23.437	7,262.000	n/a	841.637
568.60	122.40	Cohesive	609.540	23.437	7,307.750	n/a	875.314
567.60	123.40	Cohesive	609.540	23.437	7,353.500	n/a	909.374
566.60	124.40	Cohesive	609.540	23.437	7,399.250	n/a	943.817
565.60	125.40	Cohesive	609.540	23.437	7,445.000	n/a	978.644
564.60	126.40	Cohesive	609.540	23.437	7,490.750	n/a	1,013.854

Driving - Sk	kin Frictic	n					
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)
563.60	127.40	Cohesive	609.540	23.437	7,536.500	n/a	1,049.447
562.60	128.40	Cohesive	609.540	23.437	7,582.250	n/a	1,085.424
561.60	129.40	Cohesive	609.540	23.437	7,628.000	n/a	1,121.783
560.60	130.40	Cohesive	609.540	23.437	7,673.750	n/a	1,158.526
559.60	131.40	Cohesive	609.540	23.437	7,719.500	n/a	1,195.653
558.60	132.40	Cohesive	609.540	23.437	7,765.250	n/a	1,233.162
557.60	133.40	Cohesive	609.540	23.437	7,811.000	n/a	1,271.055
556.60	134.40	Cohesive	609.540	23.437	7,856.750	n/a	1,309.331
555.60	135.40	Cohesive	609.540	23.437	7,902.500	n/a	1,347.990
554.60	136.40	Cohesive	609.540	23.437	7,948.250	n/a	1,387.033
553.60	137.40	Cohesive	609.540	23.437	7,994.000	n/a	1,426.459
552.60	138.40	Cohesive	609.540	23.437	8,039.750	n/a	1,466.268
551.60	139.40	Cohesive	609.540	23.437	8,085.500	n/a	1,506.461
550.60	140.40	Cohesive	609.540	23.437	8,131.250	n/a	1,547.037
549.60	141.40	Cohesive	609.540	23.437	8,177.000	n/a	1,587.996
548.60	142.40	Cohesive	609.540	23.437	8,222.750	n/a	1,629.338
547.60	143.40	Cohesive	609.540	23.437	8,268.500	n/a	1,671.063
546.60	144.40	Cohesive	609.540	23.437	8,314.250	n/a	1,713.172
545.60	145.40	Cohesive	609.540	23.437	8,360.000	n/a	1,755.664
544.60	146.40	Cohesive	609.540	23.437	8,405.750	n/a	1,798.540
543.60	147.40	Cohesive	609.540	23.437	8,451.500	n/a	1,841.799
542.60	148.40	Cohesive	609.540	23.437	8,497.250	n/a	1,885.441
541.60	149.40	Cohesive	609.540	23.437	8,543.000	n/a	1,929.466
541.01	149.99	Cohesive	609.540	23.437	8,569.993	n/a	1,955.620

Driving - I	End Bear	ing				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
691	0.010	Cohesionless	0.596	47.200	69.81317008	0.025
690.00	1.000	Cohesionless	59.600	47.200	69.81317008	2.536
689.00	2.000	Cohesionless	119.200	47.200	69.81317008	5.072
688.00	3.000	Cohesionless	178.800	47.200	69.81317008	7.607
687.61	3.390	Cohesionless	202.044	47.200	69.81317008	8.596
687.59	3.410	Cohesionless	203.266	40.400	46.07669225	7.173
686.60	4.400	Cohesionless	265.240	40.400	46.07669225	9.360
685.60	5.400	Cohesionless	327.840	40.400	46.07669225	11.569
684.60	6.400	Cohesionless	390.440	40.400	46.07669225	13.778
683.60	7.400	Cohesionless	453.040	40.400	46.07669225	15.988
682.60	8.400	Cohesionless	515.640	40.400	46.07669225	18.197
681.60	9.400	Cohesionless	578.240	40.400	46.07669225	20.406
680.60	10.400	Cohesionless	640.840	40.400	46.07669225	22.615
679.60	11.400	Cohesionless	703.440	40.400	46.07669225	24.824
678.60	12.400	Cohesionless	766.040	40.400	46.07669225	27.033
677.60	13.400	Cohesionless	828.640	40.400	46.07669225	29.242
676.60	14.400	Cohesionless	891.240	40.400	46.07669225	31.451
675.60	15.400	Cohesionless	953.840	40.400	46.07669225	33.661
674.61	16.390	Cohesionless	1,015.814	40.400	46.07669225	35.848
674.59	16.410	Cohesive	1,017.016	0.000	n/a	28.903
673.60	17.400	Cohesive	1,074.040	0.000	n/a	28.903
672.60	18.400	Cohesive	1,131.640	0.000	n/a	28.903
671.60	19.400	Cohesive	1,189.240	0.000	n/a	28.903
670.60	20.400	Cohesive	1,246.840	0.000	n/a	28.903
669.60	21.400	Cohesive	1,304.440	0.000	n/a	28.903
668.60	22.400	Cohesive	1,362.040	0.000	n/a	28.903
667.60	23.400	Cohesive	1,419.640	0.000	n/a	28.903
666.60	24.400	Cohesive	1,477.240	0.000	n/a	28.903
665.60	25.400	Cohesive	1,534.840	0.000	n/a	28.903
664.60	26.400	Cohesive	1,592.440	0.000	n/a	28.903
663.60	27.400	Cohesive	1,650.040	0.000	n/a	28.903
662.60	28.400	Cohesive	1,707.640	0.000	n/a	28.903
661.60	29.400	Cohesive	1,765.240	0.000	n/a	28.903
660.60	30.400	Cohesive	1,822.840	0.000	n/a	28.903
659.60	31.400	Cohesive	1,880.440	0.000	n/a	28.903
658.60	32.400	Cohesive	1,938.040	0.000	n/a	28.903
657.60	33.400	Cohesive	1,995.640	0.000	n/a	28.903
656.60	34.400	Cohesive	2,053.240	0.000	n/a	28.903
655.60	35.400	Cohesive	2,110.840	0.000	n/a	28.903
654.61	36.390	Cohesive	2,167.864	0.000	n/a	28.903

Driving - I	End Bear	ing				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
654.59	36.410	Cohesive	2,168.996	0.000	n/a	20.106
653.60	37.400	Cohesive	2,224.040	0.000	n/a	20.106
652.60	38.400	Cohesive	2,279.640	0.000	n/a	20.106
651.60	39.400	Cohesive	2,335.240	0.000	n/a	20.106
650.60	40.400	Cohesive	2,390.840	0.000	n/a	20.106
649.60	41.400	Cohesive	2,446.440	0.000	n/a	20.106
648.60	42.400	Cohesive	2,502.040	0.000	n/a	20.106
647.60	43.400	Cohesive	2,557.640	0.000	n/a	20.106
646.60	44.400	Cohesive	2,613.240	0.000	n/a	20.106
645.60	45.400	Cohesive	2,668.840	0.000	n/a	20.106
644.60	46.400	Cohesive	2,724.440	0.000	n/a	20.106
643.81	47.190	Cohesive	2,768.364	0.000	n/a	20.106
643.79	47.210	Cohesive	2,769.496	0.000	n/a	21.991
642.80	48.200	Cohesive	2,826.520	0.000	n/a	21.991
641.80	49.200	Cohesive	2,884.120	0.000	n/a	21.991
640.80	50.200	Cohesive	2,941.720	0.000	n/a	21.991
639.80	51.200	Cohesive	2,999.320	0.000	n/a	21.991
638.80	52.200	Cohesive	3,056.920	0.000	n/a	21.991
637.80	53.200	Cohesive	3,114.520	0.000	n/a	21.991
636.80	54.200	Cohesive	3,172.120	0.000	n/a	21.991
635.80	55.200	Cohesive	3,229.720	0.000	n/a	21.991
634.80	56.200	Cohesive	3,287.320	0.000	n/a	21.991
633.80	57.200	Cohesive	3,344.920	0.000	n/a	21.991
632.80	58.200	Cohesive	3,402.520	0.000	n/a	21.991
631.80	59.200	Cohesive	3,460.120	0.000	n/a	21.991
630.80	60.200	Cohesive	3,517.720	0.000	n/a	21.991
629.80	61.200	Cohesive	3,575.320	0.000	n/a	21.991
628.80	62.200	Cohesive	3,632.920	0.000	n/a	21.991
627.80	63.200	Cohesive	3,690.520	0.000	n/a	21.991
626.80	64.200	Cohesive	3,748.120	0.000	n/a	21.991
625.80	65.200	Cohesive	3,805.720	0.000	n/a	21.991
624.80	66.200	Cohesive	3,863.320	0.000	n/a	21.991
623.80	67.200	Cohesive	3,920.920	0.000	n/a	21.991
622.80	68.200	Cohesive	3,978.520	0.000	n/a	21.991
621.80	69.200	Cohesive	4,036.120	0.000	n/a	21.991
620.80	70.200	Cohesive	4,093.720	0.000	n/a	21.991
619.80	71.200	Cohesive	4,151.320	0.000	n/a	21.991
618.80	72.200	Cohesive	4,208.920	0.000	n/a	21.991
617.80	73.200	Cohesive	4,266.520	0.000	n/a	21.991
616.80	74.200	Cohesive	4,324.120	0.000	n/a	21.991

Driving - I	End Bear	ing				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
615.80	75.200	Cohesive	4,381.720	0.000	n/a	21.991
614.80	76.200	Cohesive	4,439.320	0.000	n/a	21.991
613.80	77.200	Cohesive	4,496.920	0.000	n/a	21.991
612.80	78.200	Cohesive	4,554.520	0.000	n/a	21.991
611.80	79.200	Cohesive	4,612.120	0.000	n/a	21.991
610.80	80.200	Cohesive	4,669.720	0.000	n/a	21.991
609.80	81.200	Cohesive	4,727.320	0.000	n/a	21.991
608.80	82.200	Cohesive	4,784.920	0.000	n/a	21.991
607.80	83.200	Cohesive	4,842.520	0.000	n/a	21.991
606.80	84.200	Cohesive	4,900.120	0.000	n/a	21.991
605.80	85.200	Cohesive	4,957.720	0.000	n/a	21.991
604.80	86.200	Cohesive	5,015.320	0.000	n/a	21.991
604.61	86.390	Cohesive	5,026.264	0.000	n/a	21.991
604.59	86.410	Cohesive	5,027.616	0.000	n/a	55.292
603.60	87.400	Cohesive	5,104.440	0.000	n/a	55.292
602.60	88.400	Cohesive	5,182.040	0.000	n/a	55.292
601.60	89.400	Cohesive	5,259.640	0.000	n/a	55.292
600.60	90.400	Cohesive	5,337.240	0.000	n/a	55.292
599.60	91.400	Cohesive	5,414.840	0.000	n/a	55.292
598.60	92.400	Cohesive	5,492.440	0.000	n/a	55.292
597.60	93.400	Cohesive	5,570.040	0.000	n/a	55.292
596.60	94.400	Cohesive	5,647.640	0.000	n/a	55.292
595.60	95.400	Cohesive	5,725.240	0.000	n/a	55.292
594.60	96.400	Cohesive	5,802.840	0.000	n/a	55.292
593.60	97.400	Cohesive	5,880.440	0.000	n/a	55.292
592.60	98.400	Cohesive	5,958.040	0.000	n/a	55.292
591.60	99.400	Cohesive	6,035.640	0.000	n/a	55.292
590.60	100.400	Cohesive	6,113.240	0.000	n/a	55.292
589.60	101.400	Cohesive	6,190.840	0.000	n/a	55.292
588.60	102.400	Cohesive	6,268.440	0.000	n/a	55.292
587.60	103.400	Cohesive	6,346.040	0.000	n/a	55.292
586.60	104.400	Cohesive	6,423.640	0.000	n/a	55.292
585.61	105.390	Cohesive	6,500.464	0.000	n/a	55.292
585.59	105.410	Cohesive	6,502.016	0.000	n/a	376.991
584.60	106.400	Cohesive	6,578.840	0.000	n/a	376.991
583.60	107.400	Cohesive	6,656.440	0.000	n/a	376.991
582.60	108.400	Cohesive	6,734.040	0.000	n/a	376.991
581.60	109.400	Cohesive	6,811.640	0.000	n/a	376.991
580.60	110.400	Cohesive	6,889.240	0.000	n/a	376.991
579.60	111.400	Cohesive	6,966.840	0.000	n/a	376.991

Driving - I	End Bear	ing				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
578.60	112.400	Cohesive	7,044.440	0.000	n/a	376.991
577.60	113.400	Cohesive	7,122.040	0.000	n/a	376.991
576.60	114.400	Cohesive	7,199.640	0.000	n/a	376.991
575.60	115.400	Cohesive	7,277.240	0.000	n/a	376.991
574.60	116.400	Cohesive	7,354.840	0.000	n/a	376.991
573.60	117.400	Cohesive	7,432.440	0.000	n/a	376.991
572.60	118.400	Cohesive	7,510.040	0.000	n/a	376.991
571.60	119.400	Cohesive	7,587.640	0.000	n/a	376.991
570.60	120.400	Cohesive	7,665.240	0.000	n/a	376.991
569.60	121.400	Cohesive	7,742.840	0.000	n/a	376.991
568.60	122.400	Cohesive	7,820.440	0.000	n/a	376.991
567.60	123.400	Cohesive	7,898.040	0.000	n/a	376.991
566.60	124.400	Cohesive	7,975.640	0.000	n/a	376.991
565.60	125.400	Cohesive	8,053.240	0.000	n/a	376.991
564.60	126.400	Cohesive	8,130.840	0.000	n/a	376.991
563.60	127.400	Cohesive	8,208.440	0.000	n/a	376.991
562.60	128.400	Cohesive	8,286.040	0.000	n/a	376.991
561.60	129.400	Cohesive	8,363.640	0.000	n/a	376.991
560.60	130.400	Cohesive	8,441.240	0.000	n/a	376.991
559.60	131.400	Cohesive	8,518.840	0.000	n/a	376.991
558.60	132.400	Cohesive	8,596.440	0.000	n/a	376.991
557.60	133.400	Cohesive	8,674.040	0.000	n/a	376.991
556.60	134.400	Cohesive	8,751.640	0.000	n/a	376.991
555.60	135.400	Cohesive	8,829.240	0.000	n/a	376.991
554.60	136.400	Cohesive	8,906.840	0.000	n/a	376.991
553.60	137.400	Cohesive	8,984.440	0.000	n/a	376.991
552.60	138.400	Cohesive	9,062.040	0.000	n/a	376.991
551.60	139.400	Cohesive	9,139.640	0.000	n/a	376.991
550.60	140.400	Cohesive	9,217.240	0.000	n/a	376.991
549.60	141.400	Cohesive	9,294.840	0.000	n/a	376.991
548.60	142.400	Cohesive	9,372.440	0.000	n/a	376.991
547.60	143.400	Cohesive	9,450.040	0.000	n/a	376.991
546.60	144.400	Cohesive	9,527.640	0.000	n/a	376.991
545.60	145.400	Cohesive	9,605.240	0.000	n/a	376.991
544.60	146.400	Cohesive	9,682.840	0.000	n/a	376.991
543.60	147.400	Cohesive	9,760.440	0.000	n/a	376.991
542.60	148.400	Cohesive	9,838.040	0.000	n/a	376.991
541.60	149.400	Cohesive	9,915.640	0.000	n/a	376.991
541.01	149.990	Cohesive	9,961.424	0.000	n/a	376.991

Driving - S	ummary	of Capacities		
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)
691	0.01	0.00	0.03	0.03
690.00	1.00	0.07	2.54	2.61
689.00	2.00	0.28	5.07	5.35
688.00	3.00	0.64	7.61	8.24
687.61	3.39	0.81	8.60	9.41
687.59	3.41	0.82	7.17	7.99
686.60	4.40	1.15	9.36	10.51
685.60	5.40	1.57	11.57	13.14
684.60	6.40	2.09	13.78	15.86
683.60	7.40	2.69	15.99	18.67
682.60	8.40	3.38	18.20	21.57
681.60	9.40	4.16	20.41	24.56
680.60	10.40	5.03	22.61	27.64
679.60	11.40	5.98	24.82	30.81
678.60	12.40	7.03	27.03	34.06
677.60	13.40	8.17	29.24	37.41
676.60	14.40	9.39	31.45	40.84
675.60	15.40	10.71	33.66	44.37
674.61	16.39	12.10	35.85	47.94
674.59	16.41	12.15	28.90	41.05
673.60	17.40	15.56	28.90	44.46
672.60	18.40	19.00	28.90	47.90
671.60	19.40	22.44	28.90	51.34
670.60	20.40	25.89	28.90	54.79
669.60	21.40	29.33	28.90	58.23
668.60	22.40	32.77	28.90	61.67
667.60	23.40	36.22	28.90	65.12
666.60	24.40	39.66	28.90	68.56
665.60	25.40	43.10	28.90	72.00
664.60	26.40	46.55	28.90	75.45
663.60	27.40	49.99	28.90	78.89
662.60	28.40	53.43	28.90	82.33

Driving - S	ummary	of Capacities		
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)
661.60	29.40	56.88	28.90	85.78
660.60	30.40	60.68	28.90	89.59
659.60	31.40	64.74	28.90	93.64
658.60	32.40	68.87	28.90	97.78
657.60	33.40	73.09	28.90	101.99
656.60	34.40	77.38	28.90	106.28
655.60	35.40	81.75	28.90	110.65
654.61	36.39	86.15	28.90	115.05
654.59	36.41	86.23	20.11	106.34
653.60	37.40	89.79	20.11	109.90
652.60	38.40	93.39	20.11	113.49
651.60	39.40	96.98	20.11	117.09
650.60	40.40	100.58	20.11	120.68
649.60	41.40	104.17	20.11	124.28
648.60	42.40	107.77	20.11	127.88
647.60	43.40	111.37	20.11	131.47
646.60	44.40	114.96	20.11	135.07
645.60	45.40	118.56	20.11	138.67
644.60	46.40	122.16	20.11	142.26
643.81	47.19	125.00	20.11	145.10
643.79	47.21	125.07	21.99	147.06
642.80	48.20	128.79	21.99	150.78
641.80	49.20	132.55	21.99	154.54
640.80	50.20	136.31	21.99	158.30
639.80	51.20	140.06	21.99	162.05
638.80	52.20	143.82	21.99	165.81
637.80	53.20	147.58	21.99	169.57
636.80	54.20	151.34	21.99	173.33
635.80	55.20	155.09	21.99	177.09
634.80	56.20	158.85	21.99	180.84
633.80	57.20	162.61	21.99	184.60
632.80	58.20	166.37	21.99	188.36

Driving - S	ummary o	of Capacities		
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)
631.80	59.20	170.13	21.99	192.12
630.80	60.20	173.88	21.99	195.87
629.80	61.20	177.87	21.99	199.86
628.80	62.20	182.02	21.99	204.01
627.80	63.20	186.21	21.99	208.20
626.80	64.20	190.45	21.99	212.44
625.80	65.20	194.74	21.99	216.74
624.80	66.20	199.09	21.99	221.08
623.80	67.20	203.48	21.99	225.47
622.80	68.20	207.92	21.99	229.91
621.80	69.20	212.41	21.99	234.40
620.80	70.20	216.94	21.99	238.94
619.80	71.20	221.53	21.99	243.52
618.80	72.20	226.17	21.99	248.16
617.80	73.20	230.86	21.99	252.85
616.80	74.20	235.59	21.99	257.58
615.80	75.20	240.38	21.99	262.37
614.80	76.20	245.21	21.99	267.20
613.80	77.20	250.10	21.99	272.09
612.80	78.20	255.03	21.99	277.02
611.80	79.20	260.01	21.99	282.00
610.80	80.20	265.05	21.99	287.04
609.80	81.20	270.13	21.99	292.12
608.80	82.20	275.26	21.99	297.25
607.80	83.20	280.44	21.99	302.43
606.80	84.20	285.67	21.99	307.66
605.80	85.20	290.94	21.99	312.94
604.80	86.20	296.27	21.99	318.26
604.61	86.39	297.29	21.99	319.28
604.59	86.41	297.37	55.29	352.67
603.60	87.40	300.27	55.29	355.56
602.60	88.40	303.19	55.29	358.49

Driving - S	Driving - Summary of Capacities							
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)				
601.60	89.40	306.12	55.29	361.41				
600.60	90.40	309.04	55.29	364.33				
599.60	91.40	311.97	55.29	367.26				
598.60	92.40	314.89	55.29	370.18				
597.60	93.40	317.82	55.29	373.11				
596.60	94.40	320.74	55.29	376.03				
595.60	95.40	323.66	55.29	378.96				
594.60	96.40	326.59	55.29	381.88				
593.60	97.40	329.51	55.29	384.81				
592.60	98.40	332.44	55.29	387.73				
591.60	99.40	335.36	55.29	390.65				
590.60	100.40	338.46	55.29	393.75				
589.60	101.40	341.68	55.29	396.97				
588.60	102.40	344.94	55.29	400.23				
587.60	103.40	348.23	55.29	403.52				
586.60	104.40	351.56	55.29	406.86				
585.61	105.39	354.90	55.29	410.19				
585.59	105.41	355.23	376.99	732.22				

Nominal - S	kin Frict	ion					
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)
691	0.01	Cohesionless	0.298	24.169	n/a	1.396	0.000
690.00	1.00	Cohesionless	29.800	24.169	n/a	1.396	0.071
689.00	2.00	Cohesionless	59.600	24.169	n/a	1.396	0.283
688.00	3.00	Cohesionless	89.400	24.169	n/a	1.396	0.637
687.61	3.39	Cohesionless	101.022	24.169	n/a	1.396	0.813
687.59	3.41	Cohesionless	202.953	23.437	n/a	1.396	0.823
686.60 685.60	4.40 5.40	Cohesionless Cohesionless	233.940 265.240	23.437 23.437	n/a n/a	1.396 1.396	1.318 1.952
684.60	6.40	Cohesionless	296.540	23.437	n/a	1.396	2.720
683.60	7.40	Cohesionless	327.840	23.437	n/a	1.396	3.622
682.60	8.40	Cohesionless	359.140	23.437	n/a	1.396	4.657
681.60	9.40	Cohesionless	390.440	23.437	n/a	1.396	5.826
680.60	10.40	Cohesionless	421.740	23.437	n/a	1.396	7.129
679.60	11.40	Cohesionless	453.040	23.437	n/a	1.396	8.566
678.60	12.40	Cohesionless	484.340	23.437	n/a	1.396	10.137
677.60	13.40	Cohesionless	515.640	23.437	n/a	1.396	11.841
676.60	14.40	Cohesionless	546.940	23.437	n/a	1.396	13.680
675.60	15.40	Cohesionless	578.240	23.437	n/a	1.396	15.652
674.61	16.39	Cohesionless	609.227	23.437	n/a	1.396	17.736
674.59	16.41	Cohesive	609.540	23.437	1,232.996	n/a	17.809
673.60	17.40	Cohesive	609.540	23.437	1,232.996	n/a	22.923
672.60	18.40	Cohesive	609.540	23.437	1,232.996	n/a	28.087
671.60 670.60	19.40 20.40	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,232.996 1,232.996	n/a	33.252 38.417
669.60	21.40	Cohesive	609.540	23.437	1,232.996	n/a n/a	43.582
668.60	22.40	Cohesive	609.540	23.437	1,232.996	n/a	48.746
667.60	23.40	Cohesive	609.540	23.437	1,232.996	n/a	53.911
666.60	24.40	Cohesive	609.540	23.437	1,232.996	n/a	59.076
665.60	25.40	Cohesive	609.540	23.437	1,232.996	n/a	64.241
664.60	26.40	Cohesive	609.540	23.437	1,232.996	n/a	69.405
663.60	27.40	Cohesive	609.540	23.437	1,232.996	n/a	74.570
662.60	28.40	Cohesive	609.540	23.437	1,232.996	n/a	79.735
661.60	29.40	Cohesive	609.540	23.437	1,232.996	n/a	84.900
660.60	30.40	Cohesive	609.540	23.437	1,242.333	n/a	90.612
659.60	31.40	Cohesive	609.540	23.437	1,256.339	n/a	96.696
658.60	32.40	Cohesive	609.540	23.437	1,270.345	n/a	102.897
657.60 656.60	33.40 34.40	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,284.351 1,298.357	n/a n/a	109.216 115.652
655.60	34.40 35.40	Cohesive	609.540	23.437	1,312.363	n/a n/a	122.205
654.61	36.39	Cohesive	609.540	23.437	1,326.229	n/a	128.808
654.59	36.41	Cohesive	609.540	23.437	1,287.723	n/a	128.929
653.60	37.40	Cohesive	609.540	23.437	1,287.723	n/a	134.269
652.60	38.40	Cohesive	609.540	23.437	1,287.723	n/a	139.663
651.60	39.40	Cohesive	609.540	23.437	1,287.723	n/a	145.057
650.60	40.40	Cohesive	609.540	23.437	1,287.723	n/a	150.451

Nominal - S	Skin Frict	ion					
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)
649.60	41.40	Cohesive	609.540	23.437	1,287.723	n/a	155.845
648.60	42.40	Cohesive	609.540	23.437	1,287.723	n/a	161.239
647.60	43.40	Cohesive	609.540	23.437	1,287.723	n/a	166.633
646.60	44.40	Cohesive	609.540	23.437	1,287.723	n/a	172.027
645.60	45.40	Cohesive	609.540	23.437	1,287.723	n/a	177.421
644.60 643.81	46.40 47.19	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,287.723 1,287.723	n/a n/a	182.815 187.077
643.79	47.19	Cohesive	609.540	23.437	1,345.582	n/a	187.187
642.80	48.20	Cohesive	609.540	23.437	1,345.582	n/a	192.767
641.80	49.20	Cohesive	609.540	23.437	1,345.582	n/a	198.403
640.80	50.20	Cohesive	609.540	23.437	1,345.582	n/a	204.040
639.80	51.20	Cohesive	609.540	23.437	1,345.582	n/a	209.676
638.80	52.20	Cohesive	609.540	23.437	1,345.582	n/a	215.312
637.80	53.20	Cohesive	609.540	23.437	1,345.582	n/a	220.949
636.80	54.20	Cohesive	609.540	23.437	1,345.582	n/a	226.585
635.80	55.20	Cohesive	609.540	23.437	1,345.582	n/a	232.221
634.80	56.20	Cohesive	609.540	23.437	1,345.582	n/a	237.858
633.80	57.20	Cohesive	609.540	23.437	1,345.582	n/a	243.494
632.80	58.20	Cohesive	609.540	23.437	1,345.582	n/a	249.131
631.80 630.80	59.20	Cohesive	609.540	23.437	1,345.582	n/a	254.767
629.80	60.20 61.20	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,345.582 1,351.469	n/a n/a	260.403 266.385
628.80	62.20	Cohesive	609.540	23.437	1,360.301	n/a	272.601
627.80	63.20	Cohesive	609.540	23.437	1,369.132	n/a	278.891
626.80	64.20	Cohesive	609.540	23.437	1,377.963	n/a	285.255
625.80	65.20	Cohesive	609.540	23.437	1,386.795	n/a	291.692
624.80	66.20	Cohesive	609.540	23.437	1,395.626	n/a	298.204
623.80	67.20	Cohesive	609.540	23.437	1,404.457	n/a	304.790
622.80	68.20	Cohesive	609.540	23.437	1,413.288	n/a	311.450
621.80	69.20	Cohesive	609.540	23.437	1,422.120	n/a	318.184
620.80	70.20	Cohesive	609.540	23.437	1,430.951	n/a	324.992
619.80	71.20	Cohesive	609.540	23.437	1,439.782	n/a	331.873
618.80	72.20	Cohesive	609.540	23.437	1,448.614	n/a	338.829
617.80 616.80	73.20	Cohesive	609.540	23.437	1,457.445	n/a	345.859
615.80	74.20 75.20	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,466.276 1,475.108	n/a n/a	352.963 360.140
614.80	76.20	Cohesive	609.540	23.437	1,483.939	n/a	367.392
613.80	77.20	Cohesive	609.540	23.437	1,492.770	n/a	374.718
612.80	78.20	Cohesive	609.540	23.437	1,501.601	n/a	382.117
611.80	79.20	Cohesive	609.540	23.437	1,510.433	n/a	389.591
610.80	80.20	Cohesive	609.540	23.437	1,519.264	n/a	397.139
609.80	81.20	Cohesive	609.540	23.437	1,528.095	n/a	404.760
608.80	82.20	Cohesive	609.540	23.437	1,536.927	n/a	412.456
607.80	83.20	Cohesive	609.540	23.437	1,545.758	n/a	420.225
606.80	84.20	Cohesive	609.540	23.437	1,554.589	n/a	428.069

Nominal - Skin Friction							
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)
605.80	85.20	Cohesive	609.540	23.437	1,563.421	n/a	435.987
604.80	86.20	Cohesive	609.540	23.437	1,572.252	n/a	443.978
604.61	86.39	Cohesive	609.540	23.437	1,573.930	n/a	445.505
604.59	86.41	Cohesive	609.540	23.437	1,047.200	n/a	445.629
603.60	87.40	Cohesive	609.540	23.437	1,047.200	n/a	449.972
602.60	88.40	Cohesive	609.540	23.437	1,047.200	n/a	454.358
601.60 600.60	89.40 90.40	Cohesive	609.540	23.437	1,047.200	n/a	458.745 463.131
599.60	91.40	Cohesive Cohesive	609.540 609.540	23.437 23.437	1,047.200 1,047.200	n/a n/a	467.518
598.60	92.40	Cohesive	609.540	23.437	1,047.200	n/a	471.904
597.60	93.40	Cohesive	609.540	23.437	1,047.200	n/a	476.291
596.60	94.40	Cohesive	609.540	23.437	1,047.200	n/a	480.677
595.60	95.40	Cohesive	609.540	23.437	1,047.200	n/a	485.064
594.60	96.40	Cohesive	609.540	23.437	1,047.200	n/a	489.450
593.60	97.40	Cohesive	609.540	23.437	1,047.200	n/a	493.837
592.60	98.40	Cohesive	609.540	23.437	1,047.200	n/a	498.223
591.60	99.40	Cohesive	609.540	23.437	1,047.200	n/a	502.610
590.60	100.40	Cohesive	609.540	23.437	1,051.686	n/a	507.259
589.60	101.40	Cohesive	609.540	23.437	1,058.416	n/a	512.088
588.60	102.40	Cohesive	609.540	23.437	1,065.146	n/a	516.972
587.60	103.40	Cohesive	609.540	23.437	1,071.876	n/a	521.913
586.60	104.40	Cohesive	609.540	23.437	1,078.605	n/a	526.910
585.61 585.59	105.39	Cohesive	609.540	23.437	1,085.268	n/a	531.913 532.263
585.59	105.41 106.40	Cohesive Cohesive	609.540 609.540	23.437 23.437	7,140.000 7,140.000	n/a n/a	532.263
583.60	100.40	Cohesive	609.540	23.437	7,140.000	n/a	591.780
582.60	107.40	Cohesive	609.540	23.437	7,140.000	n/a	621.688
581.60	109.40	Cohesive	609.540	23.437	7,140.000	n/a	651.596
580.60	110.40	Cohesive	609.540	23.437	7,140.000	n/a	681.504
579.60	111.40	Cohesive	609.540	23.437	7,140.000	n/a	711.412
578.60	112.40	Cohesive	609.540	23.437	7,140.000	n/a	741.320
577.60	113.40	Cohesive	609.540	23.437	7,140.000	n/a	771.228
576.60	114.40	Cohesive	609.540	23.437	7,140.000	n/a	801.136
575.60	115.40	Cohesive	609.540	23.437	7,140.000	n/a	831.043
574.60	116.40	Cohesive	609.540	23.437	7,140.000	n/a	860.951
573.60	117.40	Cohesive	609.540	23.437	7,140.000	n/a	890.859
572.60 571.60	118.40	Cohesive	609.540	23.437	7,140.000	n/a	920.767 952.464
571.60	119.40 120.40	Cohesive Cohesive	609.540 609.540	23.437 23.437	7,170.500 7,216.250	n/a	985.374
569.60	120.40	Cohesive	609.540	23.437	7,216.250	n/a n/a	1,018.668
568.60	121.40	Cohesive	609.540	23.437	7,262.000	n/a	1,052.345
567.60	123.40	Cohesive	609.540	23.437	7,353.500	n/a	1,086.405
566.60	124.40	Cohesive	609.540	23.437	7,399.250	n/a	1,120.848
565.60	125.40	Cohesive	609.540	23.437	7,445.000	n/a	1,155.675
564.60	126.40	Cohesive	609.540	23.437	7,490.750	n/a	1,190.885

Nominal - S	Nominal - Skin Friction							
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Sliding Friction Angle (degrees)	Adhesion (psf)	Unit Volume (ft^3/ft)	Skin Friction (kips)	
563.60	127.40	Cohesive	609.540	23.437	7,536.500	n/a	1,226.478	
562.60	128.40	Cohesive	609.540	23.437	7,582.250	n/a	1,262.454	
561.60	129.40	Cohesive	609.540	23.437	7,628.000	n/a	1,298.814	
560.60	130.40	Cohesive	609.540	23.437	7,673.750	n/a	1,335.557	
559.60	131.40	Cohesive	609.540	23.437	7,719.500	n/a	1,372.683	
558.60	132.40	Cohesive	609.540	23.437	7,765.250	n/a	1,410.193	
557.60	133.40	Cohesive	609.540	23.437	7,811.000	n/a	1,448.086	
556.60	134.40	Cohesive	609.540	23.437	7,856.750	n/a	1,486.362	
555.60	135.40	Cohesive	609.540	23.437	7,902.500	n/a	1,525.021	
554.60	136.40	Cohesive	609.540	23.437	7,948.250	n/a	1,564.064	
553.60	137.40	Cohesive	609.540	23.437	7,994.000	n/a	1,603.490	
552.60	138.40	Cohesive	609.540	23.437	8,039.750	n/a	1,643.299	
551.60	139.40	Cohesive	609.540	23.437	8,085.500	n/a	1,683.492	
550.60	140.40	Cohesive	609.540	23.437	8,131.250	n/a	1,724.067	
549.60	141.40	Cohesive	609.540	23.437	8,177.000	n/a	1,765.026	
548.60	142.40	Cohesive	609.540	23.437	8,222.750	n/a	1,806.369	
547.60	143.40	Cohesive	609.540	23.437	8,268.500	n/a	1,848.094	
546.60	144.40	Cohesive	609.540	23.437	8,314.250	n/a	1,890.203	
545.60	145.40	Cohesive	609.540	23.437	8,360.000	n/a	1,932.695	
544.60	146.40	Cohesive	609.540	23.437	8,405.750	n/a	1,975.571	
543.60	147.40	Cohesive	609.540	23.437	8,451.500	n/a	2,018.829	
542.60	148.40	Cohesive	609.540	23.437	8,497.250	n/a	2,062.471	
541.60	149.40	Cohesive	609.540	23.437	8,543.000	n/a	2,106.497	
541.01	149.99	Cohesive	609.540	23.437	8,569.993	n/a	2,132.651	

Nominal - End Bearing							
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)	
691	0.010	Cohesionless	0.596	47.200	69.81317008	0.025	
690.00	1.000	Cohesionless	59.600	47.200	69.81317008	2.536	
689.00	2.000	Cohesionless	119.200	47.200	69.81317008	5.072	
688.00	3.000	Cohesionless	178.800	47.200	69.81317008	7.607	
687.61	3.390	Cohesionless	202.044	47.200	69.81317008	8.596	
687.59	3.410	Cohesionless	203.266	40.400	46.07669225	7.173	
686.60	4.400	Cohesionless	265.240	40.400	46.07669225	9.360	
685.60	5.400	Cohesionless	327.840	40.400	46.07669225	11.569	
684.60	6.400	Cohesionless	390.440	40.400	46.07669225	13.778	
683.60	7.400	Cohesionless	453.040	40.400	46.07669225	15.988	
682.60	8.400	Cohesionless	515.640	40.400	46.07669225	18.197	
681.60	9.400	Cohesionless	578.240	40.400	46.07669225	20.406	
680.60	10.400	Cohesionless	640.840	40.400	46.07669225	22.615	
679.60	11.400	Cohesionless	703.440	40.400	46.07669225	24.824	
678.60	12.400	Cohesionless	766.040	40.400	46.07669225	27.033	
677.60	13.400	Cohesionless	828.640	40.400	46.07669225	29.242	
676.60	14.400	Cohesionless	891.240	40.400	46.07669225	31.451	
675.60	15.400	Cohesionless	953.840	40.400	46.07669225	33.661	
674.61	16.390	Cohesionless	1,015.814	40.400	46.07669225	35.848	
674.59	16.410	Cohesive	1,017.016	0.000	n/a	28.903	
673.60	17.400	Cohesive	1,074.040	0.000	n/a	28.903	
672.60	18.400	Cohesive	1,131.640	0.000	n/a	28.903	
671.60	19.400	Cohesive	1,189.240	0.000	n/a	28.903	
670.60	20.400	Cohesive	1,246.840	0.000	n/a	28.903	
669.60	21.400	Cohesive	1,304.440	0.000	n/a	28.903	
668.60	22.400	Cohesive	1,362.040	0.000	n/a	28.903	
667.60	23.400	Cohesive	1,419.640	0.000	n/a	28.903	
666.60	24.400	Cohesive	1,477.240	0.000	n/a	28.903	
665.60	25.400	Cohesive	1,534.840	0.000	n/a	28.903	
664.60	26.400	Cohesive	1,592.440	0.000	n/a	28.903	
663.60	27.400	Cohesive	1,650.040	0.000	n/a	28.903	
662.60	28.400	Cohesive	1,707.640	0.000	n/a	28.903	
661.60	29.400	Cohesive	1,765.240	0.000	n/a	28.903	
660.60	30.400	Cohesive	1,822.840	0.000	n/a	28.903	
659.60	31.400	Cohesive	1,880.440	0.000	n/a	28.903	
658.60	32.400	Cohesive	1,938.040	0.000	n/a	28.903	
657.60	33.400	Cohesive	1,995.640	0.000	n/a	28.903	
656.60	34.400	Cohesive	2,053.240	0.000	n/a	28.903	
655.60	35.400	Cohesive	2,110.840	0.000	n/a	28.903	
654.61	36.390	Cohesive	2,167.864	0.000	n/a	28.903	

Nominal -	End Bea	ring				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
654.59	36.410	Cohesive	2,168.996	0.000	n/a	20.106
653.60	37.400	Cohesive	2,224.040	0.000	n/a	20.106
652.60	38.400	Cohesive	2,279.640	0.000	n/a	20.106
651.60	39.400	Cohesive	2,335.240	0.000	n/a	20.106
650.60	40.400	Cohesive	2,390.840	0.000	n/a	20.106
649.60	41.400	Cohesive	2,446.440	0.000	n/a	20.106
648.60	42.400	Cohesive	2,502.040	0.000	n/a	20.106
647.60	43.400	Cohesive	2,557.640	0.000	n/a	20.106
646.60	44.400	Cohesive	2,613.240	0.000	n/a	20.106
645.60	45.400	Cohesive	2,668.840	0.000	n/a	20.106
644.60	46.400	Cohesive	2,724.440	0.000	n/a	20.106
643.81	47.190	Cohesive	2,768.364	0.000	n/a	20.106
643.79	47.210	Cohesive	2,769.496	0.000	n/a	21.991
642.80	48.200	Cohesive	2,826.520	0.000	n/a	21.991
641.80	49.200	Cohesive	2,884.120	0.000	n/a	21.991
640.80	50.200	Cohesive	2,941.720	0.000	n/a	21.991
639.80	51.200	Cohesive	2,999.320	0.000	n/a	21.991
638.80	52.200	Cohesive	3,056.920	0.000	n/a	21.991
637.80	53.200	Cohesive	3,114.520	0.000	n/a	21.991
636.80	54.200	Cohesive	3,172.120	0.000	n/a	21.991
635.80	55.200	Cohesive	3,229.720	0.000	n/a	21.991
634.80	56.200	Cohesive	3,287.320	0.000	n/a	21.991
633.80	57.200	Cohesive	3,344.920	0.000	n/a	21.991
632.80	58.200	Cohesive	3,402.520	0.000	n/a	21.991
631.80	59.200	Cohesive	3,460.120	0.000	n/a	21.991
630.80	60.200	Cohesive	3,517.720	0.000	n/a	21.991
629.80	61.200	Cohesive	3,575.320	0.000	n/a	21.991
628.80	62.200	Cohesive	3,632.920	0.000	n/a	21.991
627.80	63.200	Cohesive	3,690.520	0.000	n/a	21.991
626.80	64.200	Cohesive	3,748.120	0.000	n/a	21.991
625.80	65.200	Cohesive	3,805.720	0.000	n/a	21.991
624.80	66.200	Cohesive	3,863.320	0.000	n/a	21.991
623.80	67.200	Cohesive	3,920.920	0.000	n/a	21.991
622.80	68.200	Cohesive	3,978.520	0.000	n/a	21.991
621.80	69.200	Cohesive	4,036.120	0.000	n/a	21.991
620.80	70.200	Cohesive	4,093.720	0.000	n/a	21.991
619.80	71.200	Cohesive	4,151.320	0.000	n/a	21.991
618.80	72.200	Cohesive	4,208.920	0.000	n/a	21.991
617.80	73.200	Cohesive	4,266.520	0.000	n/a	21.991
616.80	74.200	Cohesive	4,324.120	0.000	n/a	21.991

Nominal -	End Bea	ring				
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)
615.80	75.200	Cohesive	4,381.720	0.000	n/a	21.991
614.80	76.200	Cohesive	4,439.320	0.000	n/a	21.991
613.80	77.200	Cohesive	4,496.920	0.000	n/a	21.991
612.80	78.200	Cohesive	4,554.520	0.000	n/a	21.991
611.80	79.200	Cohesive	4,612.120	0.000	n/a	21.991
610.80	80.200	Cohesive	4,669.720	0.000	n/a	21.991
609.80	81.200	Cohesive	4,727.320	0.000	n/a	21.991
608.80	82.200	Cohesive	4,784.920	0.000	n/a	21.991
607.80	83.200	Cohesive	4,842.520	0.000	n/a	21.991
606.80	84.200	Cohesive	4,900.120	0.000	n/a	21.991
605.80	85.200	Cohesive	4,957.720	0.000	n/a	21.991
604.80	86.200	Cohesive	5,015.320	0.000	n/a	21.991
604.61	86.390	Cohesive	5,026.264	0.000	n/a	21.991
604.59	86.410	Cohesive	5,027.616	0.000	n/a	55.292
603.60	87.400	Cohesive	5,104.440	0.000	n/a	55.292
602.60	88.400	Cohesive	5,182.040	0.000	n/a	55.292
601.60	89.400	Cohesive	5,259.640	0.000	n/a	55.292
600.60	90.400	Cohesive	5,337.240	0.000	n/a	55.292
599.60	91.400	Cohesive	5,414.840	0.000	n/a	55.292
598.60	92.400	Cohesive	5,492.440	0.000	n/a	55.292
597.60	93.400	Cohesive	5,570.040	0.000	n/a	55.292
596.60	94.400	Cohesive	5,647.640	0.000	n/a	55.292
595.60	95.400	Cohesive	5,725.240	0.000	n/a	55.292
594.60	96.400	Cohesive	5,802.840	0.000	n/a	55.292
593.60	97.400	Cohesive	5,880.440	0.000	n/a	55.292
592.60	98.400	Cohesive	5,958.040	0.000	n/a	55.292
591.60	99.400	Cohesive	6,035.640	0.000	n/a	55.292
590.60	100.400	Cohesive	6,113.240	0.000	n/a	55.292
589.60	101.400	Cohesive	6,190.840	0.000	n/a	55.292
588.60	102.400	Cohesive	6,268.440	0.000	n/a	55.292
587.60	103.400	Cohesive	6,346.040	0.000	n/a	55.292
586.60	104.400	Cohesive	6,423.640	0.000	n/a	55.292
585.61	105.390	Cohesive	6,500.464	0.000	n/a	55.292
585.59	105.410	Cohesive	6,502.016	0.000	n/a	376.991
584.60	106.400	Cohesive	6,578.840	0.000	n/a	376.991
583.60	107.400	Cohesive	6,656.440	0.000	n/a	376.991
582.60	108.400	Cohesive	6,734.040	0.000	n/a	376.991
581.60	109.400	Cohesive	6,811.640	0.000	n/a	376.991
580.60	110.400	Cohesive	6,889.240	0.000	n/a	376.991
579.60	111.400	Cohesive	6,966.840	0.000	n/a	376.991

Nominal -	Nominal - End Bearing							
Elevation (ft)	Depth (ft)	Soil Type	Effective Stress at Midpoint (psf)	Bearing Capacity Factor	Limited End Bearing (kips)	End Bearing (kips)		
578.60	112.400	Cohesive	7,044.440	0.000	n/a	376.991		
577.60	113.400	Cohesive	7,122.040	0.000	n/a	376.991		
576.60	114.400	Cohesive	7,199.640	0.000	n/a	376.991		
575.60	115.400	Cohesive	7,277.240	0.000	n/a	376.991		
574.60	116.400	Cohesive	7,354.840	0.000	n/a	376.991		
573.60	117.400	Cohesive	7,432.440	0.000	n/a	376.991		
572.60	118.400	Cohesive	7,510.040	0.000	n/a	376.991		
571.60	119.400	Cohesive	7,587.640	0.000	n/a	376.991		
570.60	120.400	Cohesive	7,665.240	0.000	n/a	376.991		
569.60	121.400	Cohesive	7,742.840	0.000	n/a	376.991		
568.60	122.400	Cohesive	7,820.440	0.000	n/a	376.991		
567.60	123.400	Cohesive	7,898.040	0.000	n/a	376.991		
566.60	124.400	Cohesive	7,975.640	0.000	n/a	376.991		
565.60	125.400	Cohesive	8,053.240	0.000	n/a	376.991		
564.60	126.400	Cohesive	8,130.840	0.000	n/a	376.991		
563.60	127.400	Cohesive	8,208.440	0.000	n/a	376.991		
562.60	128.400	Cohesive	8,286.040	0.000	n/a	376.991		
561.60	129.400	Cohesive	8,363.640	0.000	n/a	376.991		
560.60	130.400	Cohesive	8,441.240	0.000	n/a	376.991		
559.60	131.400	Cohesive	8,518.840	0.000	n/a	376.991		
558.60	132.400	Cohesive	8,596.440	0.000	n/a	376.991		
557.60	133.400	Cohesive	8,674.040	0.000	n/a	376.991		
556.60	134.400	Cohesive	8,751.640	0.000	n/a	376.991		
555.60	135.400	Cohesive	8,829.240	0.000	n/a	376.991		
554.60	136.400	Cohesive	8,906.840	0.000	n/a	376.991		
553.60	137.400	Cohesive	8,984.440	0.000	n/a	376.991		
552.60	138.400	Cohesive	9,062.040	0.000	n/a	376.991		
551.60	139.400	Cohesive	9,139.640	0.000	n/a	376.991		
550.60	140.400	Cohesive	9,217.240	0.000	n/a	376.991		
549.60	141.400	Cohesive	9,294.840	0.000	n/a	376.991		
548.60	142.400	Cohesive	9,372.440	0.000	n/a	376.991		
547.60	143.400	Cohesive	9,450.040	0.000	n/a	376.991		
546.60	144.400	Cohesive	9,527.640	0.000	n/a	376.991		
545.60	145.400	Cohesive	9,605.240	0.000	n/a	376.991		
544.60	146.400	Cohesive	9,682.840	0.000	n/a	376.991		
543.60	147.400	Cohesive	9,760.440	0.000	n/a	376.991		
542.60	148.400	Cohesive	9,838.040	0.000	n/a	376.991		
541.60	149.400	Cohesive	9,915.640	0.000	n/a	376.991		
541.01	149.990	Cohesive	9,961.424	0.000	n/a	376.991		

Nominal -	Summary	of Capacities		
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)
691	0.01	0.00	0.03	0.03
690.00	1.00	0.07	2.54	2.61
689.00	2.00	0.28	5.07	5.35
688.00	3.00	0.64	7.61	8.24
687.61	3.39	0.81	8.60	9.41
687.59	3.41	0.82	7.17	8.00
686.60	4.40	1.32	9.36	10.68
685.60	5.40	1.95	11.57	13.52
684.60	6.40	2.72	13.78	16.50
683.60	7.40	3.62	15.99	19.61
682.60	8.40	4.66	18.20	22.85
681.60	9.40	5.83	20.41	26.23
680.60	10.40	7.13	22.61	29.74
679.60	11.40	8.57	24.82	33.39
678.60	12.40	10.14	27.03	37.17
677.60	13.40	11.84	29.24	41.08
676.60	14.40	13.68	31.45	45.13
675.60	15.40	15.65	33.66	49.31
674.61	16.39	17.74	35.85	53.58
674.59	16.41	17.81	28.90	46.71
673.60	17.40	22.92	28.90	51.83
672.60	18.40	28.09	28.90	56.99
671.60	19.40	33.25	28.90	62.15
670.60	20.40	38.42	28.90	67.32
669.60	21.40	43.58	28.90	72.48
668.60	22.40	48.75	28.90	77.65
667.60	23.40	53.91	28.90	82.81
666.60	24.40	59.08	28.90	87.98
665.60	25.40	64.24	28.90	93.14
664.60	26.40	69.41	28.90	98.31
663.60	27.40	74.57	28.90	103.47
662.60	28.40	79.73	28.90	108.64

Nominal -	Summary	of Capacities		
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)
661.60	29.40	84.90	28.90	113.80
660.60	30.40	90.61	28.90	119.51
659.60	31.40	96.70	28.90	125.60
658.60	32.40	102.90	28.90	131.80
657.60	33.40	109.22	28.90	138.12
656.60	34.40	115.65	28.90	144.55
655.60	35.40	122.20	28.90	151.11
654.61	36.39	128.81	28.90	157.71
654.59	36.41	128.93	20.11	149.04
653.60	37.40	134.27	20.11	154.38
652.60	38.40	139.66	20.11	159.77
651.60	39.40	145.06	20.11	165.16
650.60	40.40	150.45	20.11	170.56
649.60	41.40	155.85	20.11	175.95
648.60	42.40	161.24	20.11	181.35
647.60	43.40	166.63	20.11	186.74
646.60	44.40	172.03	20.11	192.13
645.60	45.40	177.42	20.11	197.53
644.60	46.40	182.82	20.11	202.92
643.81	47.19	187.08	20.11	207.18
643.79	47.21	187.19	21.99	209.18
642.80	48.20	192.77	21.99	214.76
641.80	49.20	198.40	21.99	220.39
640.80	50.20	204.04	21.99	226.03
639.80	51.20	209.68	21.99	231.67
638.80	52.20	215.31	21.99	237.30
637.80	53.20	220.95	21.99	242.94
636.80	54.20	226.59	21.99	248.58
635.80	55.20	232.22	21.99	254.21
634.80	56.20	237.86	21.99	259.85
633.80	57.20	243.49	21.99	265.49
632.80	58.20	249.13	21.99	271.12

Nominal -	Nominal - Summary of Capacities						
Elevation (ft)	Depth (ft)	Skin Friction (kips)	End Bearing (kips)	Total Capacity (kips)			
631.80	59.20	254.77	21.99	276.76			
630.80	60.20	260.40	21.99	282.39			
629.80	61.20	266.38	21.99	288.38			
628.80	62.20	272.60	21.99	294.59			
627.80	63.20	278.89	21.99	300.88			
626.80	64.20	285.25	21.99	307.25			
625.80	65.20	291.69	21.99	313.68			
624.80	66.20	298.20	21.99	320.20			
623.80	67.20	304.79	21.99	326.78			
622.80	68.20	311.45	21.99	333.44			
621.80	69.20	318.18	21.99	340.17			
620.80	70.20	324.99	21.99	346.98			
619.80	71.20	331.87	21.99	353.86			
618.80	72.20	338.83	21.99	360.82			
617.80	73.20	345.86	21.99	367.85			
616.80	74.20	352.96	21.99	374.95			
615.80	75.20	360.14	21.99	382.13			
614.80	76.20	367.39	21.99	389.38			
613.80	77.20	374.72	21.99	396.71			
612.80	78.20	382.12	21.99	404.11			
611.80	79.20	389.59	21.99	411.58			
610.80	80.20	397.14	21.99	419.13			
609.80	81.20	404.76	21.99	426.75			
608.80	82.20	412.46	21.99	434.45			
607.80	83.20	420.23	21.99	442.22			
606.80	84.20	428.07	21.99	450.06			
605.80	85.20	435.99	21.99	457.98			

Project: CUY-17-13.50

PID: 112998 SME Project No.: 088549.00

Prepared by: Brendan P. Lieske

Date: 7/10/24

Reviewed by: Tim Bedenis

 $plf := \frac{lb}{ft}$ <u>Units</u>

 $psf \coloneqq \frac{lb}{ft^2}$

Settlement of Pier Piles

 $egin{aligned} oldsymbol{pcf} \coloneqq & \dfrac{oldsymbol{lb}}{oldsymbol{ft}^3} \end{aligned}$

 $oldsymbol{psi} \coloneqq rac{oldsymbol{lb}}{oldsymbol{in}^2}$

 $kip := 1000 \ lb$

 $klf := \frac{kip}{ft}$

 $egin{aligned} egin{aligned} oldsymbol{ksf} := & \dfrac{oldsymbol{kip}}{oldsymbol{ft}^2} \end{aligned}$

 $tlf = \frac{ton}{ft}$

 $tsf := \frac{ton}{ft^2}$

 $ksi := \frac{kip}{in^2}$

 $oldsymbol{kci} \coloneqq rac{oldsymbol{kip}}{oldsymbol{in}^3}$

Elastic Compression of Piles - Based on GEC 12 Section 7.3.5.1

 $\Delta = \frac{QL}{AE}$

Eq. 7-48

= unfactored axial load (kips).

= total pile length (inches).

= pile cross sectional area (in²).

elastic modulus of pile material (ksi).

 $E \coloneqq 29000 \ ksi$

 $d_o \coloneqq 16$ in $d_i \coloneqq 15.5$ in

based on .25 inch wall thickness

 $A := \pi \cdot \frac{\left(d_o^2 - d_i^2\right)}{4} = 12.37 \ \textit{in}^2$ Cross sectional area of pipe wall

 $Q_{vile} \coloneqq 125 \ \textit{kip}$

Maximum Unfactored Pile Load at Piers

 $Elev_{BOTCAP} = 691.0 \ ft$

Elevation at bottom of pile cap

 $Elev_{tip} = 602.8 \ ft$

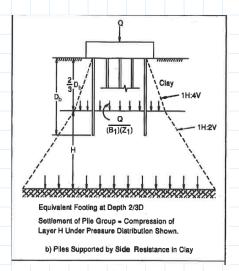
Elevation at pile tip

 $L_{pile} \coloneqq\! Elev_{BOTCAP} \!-\! Elev_{tip} \!=\! 88.2 \; \textit{ft}$

Length of pile from bottom of pile cap

 $\Delta_{ecomp} \coloneqq \frac{\left(Q_{pile}\right) \cdot L_{pile}}{A \cdot E} = 0.369 \; in$





- Plan area of perimeter of pile group = (B)(Z).
- (2) Plan area $(B_1)(Z_1)$ = projection of area (B)(Z) at depth based on shown pressure distribution
- (3) For relatively rigid pile cap, pressure distribution is assumed to vary with depth as above.
- (4) For flexible slab or group of small separate caps, compute pressures by elastic solution

$$Elev_{BOTCAP} = 691 \ ft$$

 $Elev_{tip} = 602.8 \; ft$

Elevation at pile tip

 $Elev_{GS} = 700 \ ft$

Existing Elevation of Ground Surface at Piers

$$D \coloneqq Elev_{BOTCAP} - Elev_{tip} = 88.2 \ ft$$

Depth from bottom of pile cap to pile tip

$$D_{eq} \coloneqq D \cdot \frac{2}{3} = 58.8 \ \textit{ft} \qquad Elev_{eq} \coloneqq Elev_{BOTCAP} - D_{eq} = 632.2 \ \textit{ft} \quad \text{Elevation of Eq. Footing}$$

 $Q_{piers} \coloneqq 2500 \; \pmb{kip}$

Total Unfactored Permanent Load at Piers

$$Z \coloneqq 71.8 \ \mathbf{ft}$$

Length of pile perimeter

$$Z_1 \coloneqq Z + \frac{D_{eq}}{2} = 101.2 \; \textit{ft}$$
 projected length of pile perimeter

$$B \coloneqq 7.8 \ \mathbf{ft}$$

Width of pile perimeter

of pile perimeter

$$A_1 := Z_1 \cdot B_1 = 3764.64 \ \mathbf{ft}^2$$

projected area

$$\Delta\sigma_{eq}\!\coloneqq\!rac{Q_{piers}}{A_1}\!=\!0.664$$
 ksf

Change in Stress at Equivalent Footing Depth

Layer 0 $\gamma_0\!:=\!0.120~$ \pmb{kcf} $\sigma_{00}'\!:=\!\gamma_0\!\cdot\!\left(Elev_{GS}\!-\!Elev_{BOTCAP}\right)\!=\!1.08~$ \pmb{ksf}	Initial Effective Stress at bottom of layer (Bot of Pile Cap)
Layer 1, Elev 690.8 to 686.3 feet, Medium Dense A-3a	
$h_1\!\coloneqq\!Elev_{BOTCAP}\!-\!686.3~ extbf{\textit{ft}}\!=\!4.7~ extbf{\textit{ft}}\!$ $\gamma_1\!\coloneqq\!122~ extbf{\textit{pcf}}$	$\gamma_w \coloneqq 62.4 \ \textit{pcf}$
σ_{01}' := $\sigma_{00}' + \left(\gamma_1 - \gamma_w\right) \cdot h_1 = 1.36$ ksf Initial Effective St	tress at bottom of layer
Layer 2, Elev 686.3 to 675.3 feet, Medium Dense A-4b	
$h_2 \coloneqq 686.3 \; \textit{ft} - 675.3 \; \textit{ft} = 11 \; \textit{ft}$ $\gamma_2 \coloneqq 125 \; \textit{pcf}$	
$\sigma_{02}{'}\!:=\!\sigma_{01}{'}\!+\!\left(\gamma_2\!-\!\gamma_w\right)\!\cdot\!h_2\!=\!2.049$ ksf Initial Effective	e Stress at bottom of layer
Layer 3, Elev 675.3 to 645.8 feet, Medium Stiff to Stiff A-6	a
$h_3 \coloneqq 675.3 \; \textit{ft} - 645.8 \; \textit{ft} = 29.5 \; \textit{ft}$ $\gamma_3 \coloneqq 120 \; \textit{pc}$	ef .
$\sigma_{03}' \coloneqq \sigma_{02}' + \left(\gamma_3 - \gamma_w\right) \cdot h_3 = 3.748 \; \textit{ksf}$ Initial Effective forms	tive Stress at bottom of layer
Layer 4, Elev 645.8 to 633.3 feet, Stiff to Very Stiff Silt and	I Clay A-6a
$h_4\!\coloneqq\!645.8\; extbf{\textit{ft}}\!-\!633.3\; extbf{\textit{ft}}\!=\!12.5\; extbf{\textit{ft}} \qquad \qquad \gamma_4\!\coloneqq\!122\; extbf{\textit{pc}}$	r.f
$\sigma_{04}'\!\coloneqq\!\sigma_{03}'\!+\!\left(\gamma_4\!-\!\gamma_w\right)\!\cdot\!\frac{h_4}{2}\!=\!4.12\;\textit{ksf}\qquad \qquad \text{Initial Effective}$	tive Stress at bottom of layer
Layer 5a, Elev 633.3 to 632.2 feet, Medium Stiff to Stiff Sil	t "and" Clay A-4b
$h_{5a}\!\coloneqq\!633.3\; extbf{ft}\!-\!632.2\; extbf{ft}\!=\!1.1\; extbf{ft}$ $\gamma_5\!\coloneqq\!118\; extbf{pc}$	rf .
$\sigma_{05a}{'}\!\coloneqq\!\sigma_{04}{'}\!+\!\left(\gamma_5\!-\!\gamma_w\right)\!\cdot\!rac{h_{5a}}{2}\!=\!4.151$ ksf Initial Effective forms	tive Stress at bottom of layer
Layer 5b, Elev 632.2 to 622.2 feet, Medium Stiff to Stiff Sil	t "and" Clay A-4b
$Elev_{eq}\!=\!632.2~ extbf{ft}$ $h_{5b}\!\coloneqq\!Elev_{eq}\!-\!622.2~ extbf{ft}\!=\!10~ extbf{ft}$	$LL_5 \coloneqq 25$
$w_5\!\coloneqq\!.28$ $\gamma_{d5}\!\coloneqq\!rac{\gamma_5}{\left(1+w_5 ight)}\!=\!92.188~ extbf$ G_s	:=2.72
$e_{05}\!\coloneqq\!rac{G_s\!\cdot\!\gamma_w}{\gamma_{d5}}\!-1\!=\!0.841 \hspace{1.5cm} C_{r5}\!\coloneqq\!0.1\!\cdot\!.009\!\cdot\!\left(\!LL_5\!-\!$	10)=0.014

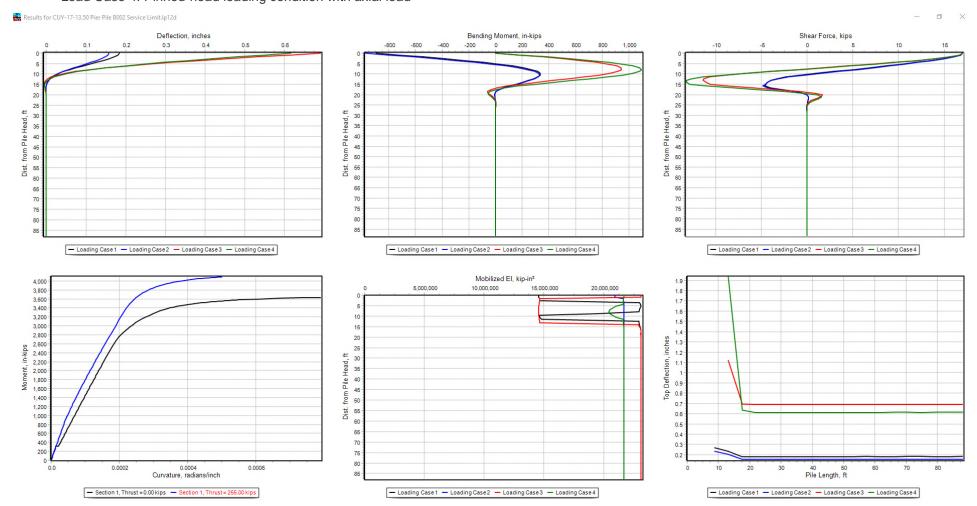
h.			
$\sigma_{05b}' := \sigma_{05a}' + (\gamma_5 - \gamma_w) \cdot \frac{h_{5b}}{2} = 4$	4.429 <i>ksf</i>	Initial Effective	
4		midpoint of laye	er
$B_{5b} \coloneqq B_1 + \frac{h_{5b}}{2} = 42.2 \ \textit{ft}$	$Z_{5b} := Z_1 + \frac{h_5}{2}$	$\frac{6b}{2} = 106.2 \; ft$	
$A_{5b} := B_{5b} \cdot Z_{5b} = 4481.64 \ \textit{ft}^2$	equivalent for midpoint of l	ooting dimensions ayer	at
$\Delta\sigma_{5b}$:= $\dfrac{Q_{piers}}{A_{5b}}$ =0.558 ksf	$\Delta\sigma_{percent}$:= $\frac{1}{2}$	$\frac{\Delta\sigma_{5b}}{\sigma_{05b}'}$ = 0.126	
$\Delta H_{5b} \coloneqq \frac{C_{r5}}{1 + e_{05}} \cdot h_{5b} \cdot \log \left(\frac{\sigma_{05b'}}{\sigma} \right)$	$\left. \frac{+\Delta\sigma_{5b}}{\sigma_{05b'}} \right) = 0.04$	15 <i>in</i>	
Layer 5c, Elev 622.2 to 612.2 f	^f eet, Medium S	tiff to Stiff Silt "an	d" Clay A-4b
$h_{5c} \coloneqq 622.2 \; \textbf{\textit{ft}} - 612.2 \; \textbf{\textit{ft}} = 1$			
$\sigma_{05c}' \coloneqq \sigma_{05b}' + \left(\gamma_5 - \gamma_w\right) \cdot \frac{h_{5b}}{2}$	$+(\gamma_5-\gamma_w)\cdot\frac{n_s}{2}$	$\frac{5c}{2}$ = 4.985 ksf I	nitial Effective Stress at nidpoint of layer
$B_{5c} := B_1 + h_{5b} + \frac{h_{5c}}{2} = 52.2$;	$oldsymbol{ft} Z_{5c}\!\coloneqq\! Z$	$Z_1 + h_{5b} + \frac{h_{5c}}{2} = 116$	$3.2 \ ft$
$A_{5c} \coloneqq B_{5c} \cdot Z_{5c} = 6065.64 \ ft^2$	equivalen midpoint	t footing dimensio of layer	ns at
$\Delta\sigma_{5c}\!\coloneqq\!rac{Q_{piers}}{A_{5c}}\!=\!0.412$ ks $m{f}$	$\Delta\sigma_{percent}$	$=\frac{\Delta\sigma_{5c}}{\sigma_{05c'}}=0.083$	Less than 10%, so stop analysis and do no not
			consider settlement from the layer
otal Pile Group Settlement			
$S_P \coloneqq \Delta H_{5b} = 0.045$ in			
astic compression of the pile	$\Delta_{ecomp} = 0.36$	69 <i>in</i>	
ettlement of pile head	$S_{NDD}\!\coloneqq\!S_P+$	Δ_{ecomp} $=$ 0.414 in	

Pier Pile Service Loads - Based on B-002

Load Case 1: Fixed-head loading condition with no axial load

Load Case 2: Fixed-head loading condition with axial load

Load Case 3: Pinned-head loading condition with no axial load

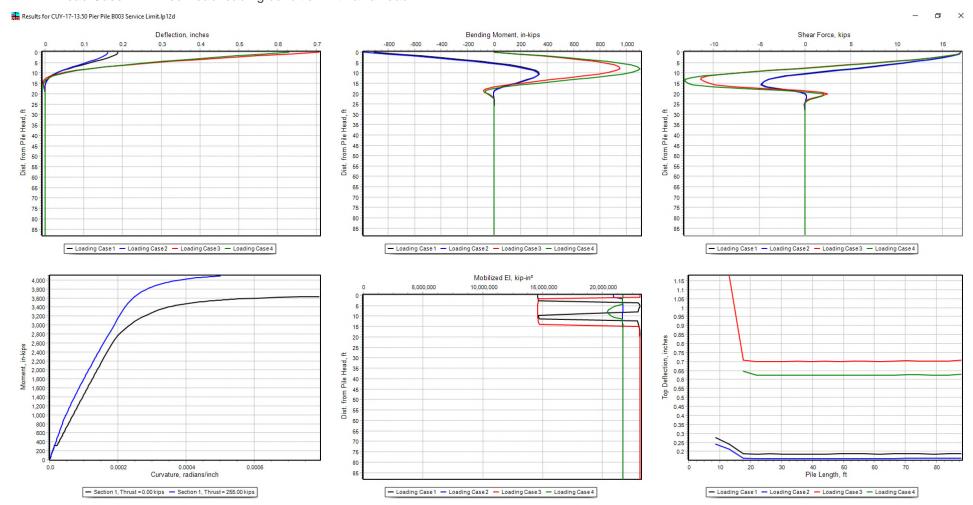


Pier Pile Service Loads - Based on B-003

Load Case 1: Fixed-head loading condition with no axial load

Load Case 2: Fixed-head loading condition with axial load

Load Case 3: Pinned-head loading condition with no axial load

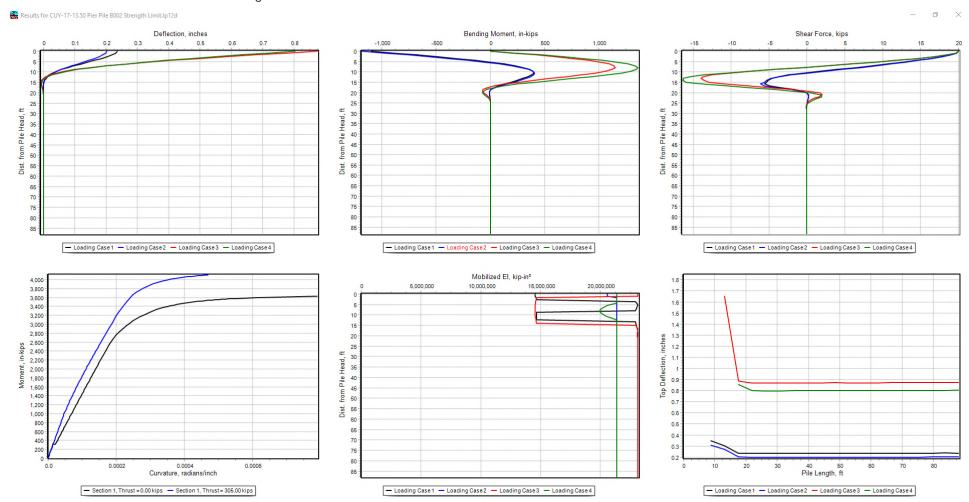


Pier Pile Strength Limit – Based on B-002

Load Case 1: Fixed-head loading condition with no axial load

Load Case 2: Fixed-head loading condition with axial load

Load Case 3: Pinned-head loading condition with no axial load

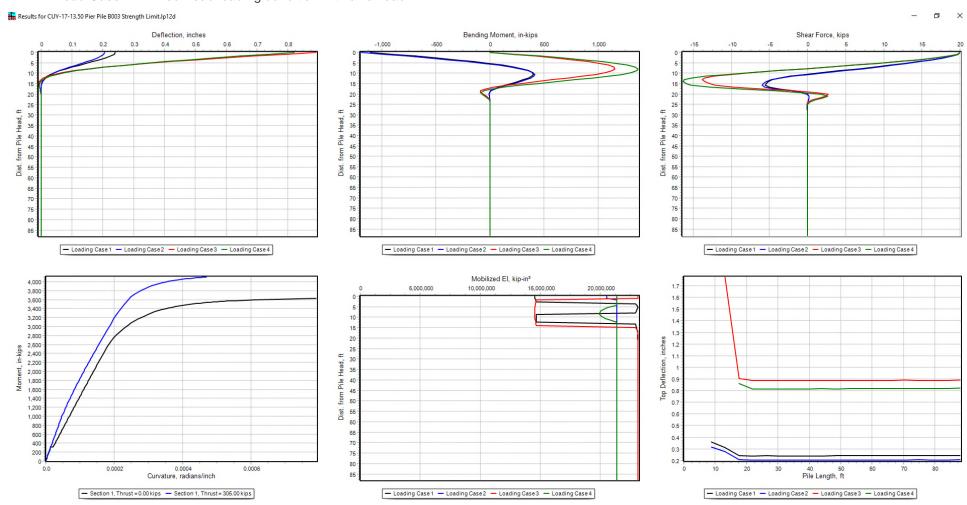


Pier Pile Strength Limit - Based on B-003

Load Case 1: Fixed-head loading condition with no axial load

Load Case 2: Fixed-head loading condition with axial load

Load Case 3: Pinned-head loading condition with no axial load



Job Number: 088549.00

Analysis of Individual Piles and Drilled Shafts Subjected to Lateral Loading Using the p-y Method © 1985-2022 by Ensoft, Inc. All Rights Reserved ______ This copy of LPile is being used by: Brendan Lieske Serial Number of Security Device: 151268597 This copy of LPile is licensed for exclusive use by: SME-USA, 11 Office Sites, MI/IN/OH Use of this software by employees of SME-USA other than those of the office site in 11 Office Sites, MI/IN/OH is a violation of the software license agreement. ______ Files Used for Analysis _____ Path to file locations: \\Sme-inc\pz\WIP\088549.00\Project Data\LPile\ Name of input data file: CUY-17-13.50 Pier Pile B002 Service Limit.lp12d Name of output report file: CUY-17-13.50 Pier Pile B002 Service Limit.lp12o Name of plot output file: CUY-17-13.50 Pier Pile B002 Service Limit.lp12p Name of runtime message file: CUY-17-13.50 Pier Pile B002 Service Limit.lp12r ______ Date and Time of Analysis _____ Date: September 26, 2024 Time: 16:47:03 ______ Problem Title ______ Project Name: CUY-17-13.50

LPile for Windows, Version 2022-12.009

B-002-0-22 Profile - Service Load

Client: ODOT

Engineer: Brendan P. Lieske

Description: Pier Pile Analysis

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
- 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 = 88.000 ft
Depth of ground surface below top of pile = 0.0000 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.

Depth Below

Pile

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	16.0000
2	88.000	16.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a drilled shaft with permanent casing

Length of section = 88.000000 ft
Casing outside diameter = 16.000000 in

Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

```
Distance from top of pile to top of layer
                                                         0.0000 ft
                                                       4.700000 ft
Distance from top of pile to bottom of layer
Effective unit weight at top of layer
                                                      59.600000 pcf
Effective unit weight at bottom of layer
                                                      59.600000 pcf
                                                 = 33.000000 deg.
Friction angle at top of layer
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
```

Layer 2 is sand, p-y criteria by Reese et al., 1974

```
Distance from top of pile to top of layer
                                                       4.700000 ft
                                                       15.700000 ft
Distance from top of pile to bottom of layer
Effective unit weight at top of layer
                                                       62.600000 pcf
Effective unit weight at bottom of layer
                                                       62.600000 pcf
Friction angle at top of layer
                                                       32.750000 deg.
                                                      32.750000 deg.
Friction angle at bottom of layer
Subgrade k at top of layer
                                                       60.000000 pci
Subgrade k at bottom of layer
                                                       60.000000 pci
```

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer	=	15.700000 ft
Distance from top of pile to bottom of layer	=	45.200000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1700. psf
Undrained cohesion at bottom of layer	=	1700. 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 = 45.200000 ft

```
Distance from top of pile to bottom of layer
                                                       57.700000 ft
  Effective unit weight at top of layer
                                                       59.600000 pcf
  Effective unit weight at bottom of layer
                                                        59.600000 pcf
  Undrained cohesion at top of layer
                                                           2700. psf
                                                           2700. psf
  Undrained cohesion at bottom of layer
  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
                                                       57.700000 ft
                                                        88.200000 ft
  Distance from top of pile to bottom of layer
  Effective unit weight at top of layer
                                                       55.600000 pcf
                                                       55.600000 pcf
  Effective unit weight at bottom of layer
  Undrained cohesion at top of layer
                                                           1400. psf
  Undrained cohesion at bottom of layer
                                                           1400. psf
  Epsilon-50 at top of layer
                                                         0.007000
  Epsilon-50 at bottom of layer
                                                        0.007000
Layer 6 is stiff clay without free water
   Distance from top of pile to top of layer
                                                       88.200000 ft
  Distance from top of pile to bottom of layer
                                                      103.200000 ft
                                                       72.600000 pcf
  Effective unit weight at top of layer
  Effective unit weight at bottom of layer
                                                       72.600000 pcf
  Undrained cohesion at top of layer
                                                           3300. psf
  Undrained cohesion at bottom of layer
                                                           3300. psf
  Epsilon-50 at top of layer
                                                        0.005000
  Epsilon-50 at bottom of layer
                                                        0.005000
Layer 7 is massive rock, p-y criteria by Liang et al., 2009
                                                   = 103.200000 ft
  Distance from top of pile to top of layer
  Distance from top of pile to bottom of layer
                                                   = 150.000000 ft
  Effective unit weight at top of layer
                                                       92,600000 pcf
  Effective unit weight at bottom of layer
                                                       92.600000 pcf
                                                   = 1000.000000 psi
  Uniaxial compressive strength at top of layer
                                                  = 1000.000000 psi
  Uniaxial compressive strength at bottom of layer
  Poisson's ratio at top of layer
                                                        0.180000
  Poisson's ratio at bottom of layer
                                                        0.180000
  Option 1: Intact rock modulus at top of layer
                                                          0.0000 psi
           Intact rock modulus at bottom of layer
                                                          0.0000 psi
  Option 1: Geologic Strength Index for layer
                                                        50.000000
  Option 2: Rock mass modulus at top of layer
                                                         380838. psi
            Rock mass modulus at bottom of layer
                                                         380838. psi
  Option 2 will use the input value of rock mass modulus to compute the p-y curve
           in massive rock.
  The rock type is (sedimentary) shales, Hoek-Brown Material Constant mi = 6
 (Depth of the lowest soil layer extends 62.000 ft below the pile tip)
______
                      Summary of Input Soil Properties
______
Layer
             Soil Type
                                         Effective
                                                    Cohesion
                                                                 Angle of
                                                                             Uniaxial
                                                                                            E50
                                                                                                                  Rock Mass
                                                                                                                             Geologic
                                                                                                                                          Int. Rock
                                                                                                                                                    Hoek-Brown
                              Layer
Num.
              Name
                              Depth
                                         Unit Wt.
                                                                 Friction
                                                                                                                  Modulus
                                                                                                                             Strength
                                                                                                                                          Modulus
                                                                                                                                                     Material
                                                                                                                                                                  Poisson's
```

	(p-y Curve Type)	ft	pcf	psf	deg.	psi	krm	pci	psi	Index	psi	Index, mi	Ratio
1	Sand	0.00	59.6000		33.0000			60.0000			0.00	0.00	0.00
	(Reese, et al.)	4.7000	59.6000		33.0000			60.0000			0.00	0.00	0.00
2	Sand	4.7000	62.6000		32.7500			60.0000			0.00	0.00	0.00
	(Reese, et al.)	15.7000	62.6000		32.7500			60.0000			0.00	0.00	0.00
3	Stiff Clay	15.7000	57.6000	1700.			0.00700				0.00	0.00	0.00
	w/o Free Water	45.2000	57.6000	1700.			0.00700				0.00	0.00	0.00
4	Stiff Clay	45.2000	59.6000	2700.			0.00500				0.00	0.00	0.00
	w/o Free Water	57.7000	59.6000	2700.			0.00500				0.00	0.00	0.00
5	Stiff Clay	57.7000	55.6000	1400.			0.00700				0.00	0.00	0.00
	w/o Free Water	88.2000	55.6000	1400.			0.00700				0.00	0.00	0.00
6	Stiff Clay	88.2000	72.6000	3300.			0.00500				0.00	0.00	0.00
	w/o Free Water	103.2000	72.6000	3300.			0.00500				0.00	0.00	0.00
7	Massive	103.2000	92.6000			1000.0000			380838.	50.0000	0.00	6.0000	0.1800
	Rock	150.0000	92.6000			1000.0000				50.0000	0.00	6.0000	0.1800

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 = 4

Load No.	Load Type		Condition 1		Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	2	V =	17000. lbs	S =	0.0000 in/in	0.0000000	Yes	Yes
2	2	V =	17000. lbs	S =	0.0000 in/in	255000.	Yes	Yes
3	1	V =	17000. lbs	M =	0.0000 in-lbs	0.0000000	Yes	Yes
4	1	V =	17000. lbs	M =	0.0000 in-lbs	255000.	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) with Permanent Casing:

Length of Section	=	88.000000 1	ft
Outer Diameter of Casing	=	16.000000	_
Casing Wall Thickness	=	0.250000 i	
Moment of Inertia of Steel Casing	-	383.663935 i	in^4
Yield Stress of Casing	-	35000. r	osi
Elastic Modulus of Casing	=	29000000 . r	osi
Number of Reinforcing Bars	=	0 k	pars
Area of Single Reinforcing Bar	=	0.0000	sq. in.
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 i	in
Yield Stress of Reinforcing Bars	=	0.0000 p	osi
Modulus of Elasticity of Reinforcing Bars	=	0.0000 p	osi
Gross Area of Pile	=	201.061930	sq. in.
Area of Concrete	=	188.691909	sq. in.
Cross-sectional Area of Steel Casing	=	12.370021	sq. in.
Area of All Steel (Casing and Bars)	=	12.370021	sq. in.
Area Ratio of All Steel to Gross Area of Pile	=	6.15 p	percent
Axial Structural Capacities:			
Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	1074.503 k	cinc .
Tensile Load for Cracking of Concrete		-119.866	
Nominal Axial Tensile Capacity		-432.951 k	
Nominal Axial Pensile Capacity		432.331	(143
Concrete Properties:			
Compressive Strength of Concrete	=	4000. r	nci
Modulus of Elasticity of Concrete		3604997. r	
Modulus of Rupture of Concrete		-474.34165 p	
Compression Strain at Peak Stress	_	·	<i>-</i>
Tensile Strain at Fracture of Concrete		-0.0001554	
Maximum Coarse Aggregate Size		0.750000 i	in
		0.750000	

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force								
	kips								
1	0.000								
2	255.000								

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

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 = 0.000 kips

	nding	Bending Moment	Bending Stiffness	Depth to	Max Comp	Max Tens	Max Conc	Max Steel	Max Casing	Run
	ature			N Axis	Strain	Strain	Stress	Stress	Stress	Msg
rad	l/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi	ksi	
9 99	0000125	28.9033419	23122674.	8.0000000	0.00001000	-0.00001000	0.0418774	0.00000	0.2871000	
	000123	57.7542839	23101714.	8.0000000	0.00002000	-0.00002000	0.0835345	0.00000	0.5742000	
	000230	86.5528259	23080754.	8.0000000	0.00003000	-0.00003000	0.1249712	0.00000	0.8613000	
	000575	115.2989680	23059794.	8.0000000	0.00004000	-0.00004000	0.1661875	0.00000	1.1484000	
		143.9927102								
	000625		23038834.	8.0000000	0.00005000	-0.00005000	0.2071834	0.00000	1.4355000	
	000750	172.6340525	23017874.	8.0000000	0.00006000	-0.00006000	0.2479590	0.00000	1.7226000	
	0000875	201.2229948	22996914.	8.0000000	0.00007000	-0.00007000	0.2885142	0.00000	2.0097000	
	001000	229.7595373	22975954.	8.0000000	0.00008000	-0.00008000	0.3288490	0.00000	2.2968000	
	0001125	258.2436798	22954994.	8.0000000	0.00009000	-0.00009000	0.3689635	0.00000	2.5839000	
	001250	286.6754223	22934034.	8.0000000	0.0001000	-0.00010000	0.4088576	0.00000	2.8710000	
	001375	315.0547650	22913074.	8.0000000	0.0001100	-0.000110	0.4485313	0.00000	3.1581000	
	001500	315.0547650	21003651.	6.1265455	0.00009190	-0.000148	0.3754186	0.00000	-4.260153	
	001625	315.0547650	19387986.	6.1277790	0.00009958	-0.000160	0.4059492	0.00000	-4.614584	
	001750	315.0547650	18003129.	6.1290144	0.0001073	-0.000173	0.4363631	0.00000	-4.968925	
	001875	315.0547650	16802921.	6.1302515	0.0001149	-0.000185	0.4666602	0.00000	-5.323176	
0.00	002000	315.0547650	15752738.	6.1314904	0.0001226	-0.000197	0.4968404	0.00000	-5.677336	
	002125	315.0547650	14826107.	6.1327311	0.0001303	-0.000210	0.5269036	0.00000	-6.031404	
0.00	002250	330.0087250	14667054.	6.1339736	0.0001380	-0.000222	0.5568496	0.00000	-6.385382	С
0.00	002375	348.2686053	14663941.	6.1352179	0.0001457	-0.000234	0.5866782	0.00000	-6.739269	C
0.00	002500	366.5206047	14660824.	6.1364640	0.0001534	-0.000247	0.6163894	0.00000	-7.093064	C
0.00	002625	384.7647083	14657703.	6.1377119	0.0001611	-0.000259	0.6459830	0.00000	-7.446767	С
0.00	002750	403.0009009	14654578.	6.1389617	0.0001688	-0.000271	0.6754589	0.00000	-7.800378	С
0.00	002875	421.2291676	14651449.	6.1402133	0.0001765	-0.000283	0.7048169	0.00000	-8.153897	С
0.00	0003000	439.4494932	14648316.	6.1414667	0.0001842	-0.000296	0.7340569	0.00000	-8.507324	C
0.00	003125	457.6618624	14645180.	6.1427219	0.0001920	-0.000308	0.7631787	0.00000	-8.860658	С
0.00	003250	475.8662601	14642039.	6.1439790	0.0001997	-0.000320	0.7921823	0.00000	-9.213900	C
0.00	003375	494.0626709	14638894.	6.1452380	0.0002074	-0.000333	0.8210675	0.00000	-9.567048	С
0.00	003500	512.2510794	14635745.	6.1464988	0.0002151	-0.000345	0.8498341	0.00000	-9.920104	C
0.00	003625	530.4314702	14632592.	6.1477615	0.0002229	-0.000357	0.8784821	0.00000	-10.273066	С
	003750	548.6038278	14629435.	6.1490260	0.0002306	-0.000369	0.9070112	0.00000	-10.625934	
	003875	566.7681368	14626274.	6.1502925	0.0002383	-0.000382	0.9354214	0.00000	-10.978709	
0.00	004000	584.9243814	14623110.	6.1515608	0.0002461	-0.000394	0.9637124	0.00000	-11.331389	С
	004125	603.0725461	14619941.	6.1528309	0.0002538	-0.000406	0.9918842	0.00000	-11.683976	
	004250	621.2126151	14616767.	6.1541030	0.0002615	-0.000418	1.0199367	0.00000	-12.036468	
	004375	639.3445727	14613590.	6.1553770	0.0002693	-0.000431	1.0478696	0.00000	-12.388865	
	004500	657.4684030	14610409.	6.1566529	0.0002770	-0.000443	1.0756828	0.00000	-12.741168	
	004625	675.5840901	14607224.	6.1579306	0.0002848	-0.000455	1.1033762	0.00000	-13.093375	
	004750	693.6916180	14604034.	6.1592103	0.0002926	-0.000467	1.1309497	0.00000	-13.445488	
	004875	711.7909831	14600841.	6.1604839	0.0003003	-0.000480	1.1584017	0.00000	-13.797516	
	005125	747.9651747	14594442.	6.1630109	0.0003159	-0.000504	1.2129399	0.00000	-14.501325	
	005125	784.1064944	14588028.	6.1655454	0.0003133	-0.000529	1.2669953	0.00000	-15.204756	
	005575	820.2148141	14581597.	6.1680875	0.0003314	-0.000553	1.3205669	0.00000	-15.907807	
	005875	856.2900048	14575149.	6.1706371	0.0003470	-0.000577	1.3736534	0.00000	-16.610477	
	0006125	892.3319365	14568685.	6.1731944	0.0003781			0.00000	-17.312763	
	006125	928.3404783	14562204.	6.1757594	0.0003781	-0.000602 -0.000626	1.4262537 1.4783667	0.00000	-17.312763	
	006625	964.3154981	14555706.	6.1783320	0.0004093	-0.000651	1.5299911	0.00000	-18.716179	
	006875	1000.	14549191.	6.1809125	0.0004249	-0.000675	1.5811257	0.00000	-19.417305	
	007125	1036.	14542659.	6.1835008	0.0004406	-0.000699	1.6317694	0.00000	-20.118041	
	007375	1072.	14536110.	6.1860969	0.0004562	-0.000724	1.6819211	0.00000	-20.818385	
	007625	1108.	14529543.	6.1887010	0.0004719	-0.000748	1.7315793	0.00000	-21.518335	
	007875	1144.	14522960.	6.1913131	0.0004876	-0.000772	1.7807430	0.00000	-22.217889	
	0008125	1179.	14516359.	6.1939331	0.0005033	-0.000797	1.8294110	0.00000	-22.917045	
	0008375	1215.	14509740.	6.1965613	0.0005190	-0.000821	1.8775819	0.00000	-23.615802	
	008625	1251.	14503104.	6.1991975	0.0005347	-0.000845	1.9252546	0.00000	-24.314157	
0.00	008875	1287.	14496450.	6.2018420	0.0005504	-0.000870	1.9724277	0.00000	-25.012109	C

0.00009125	1322.	14489778.	6.2044946	0.0005662	-0.000894	2.0191001	0.00000	-25.709656 C
0.00009375	1358.	14483088.	6.2071556	0.0005819	-0.000918	2.0652705	0.00000	-26.406796 C
0.00009625	1393.	14476380.	6.2098248	0.0005977	-0.000942	2.1109375	0.00000	-27.103526 C
0.00009875	1429.	14469654.	6.2125025	0.0006135	-0.000967	2.1561000	0.00000	-27.799846 C
0.0001013	1464.	14462909.	6.2151886	0.0006293	-0.000991	2.2007565	0.00000	-28.495752 C
0.0001013	1500.	14456147.	6.2178831	0.0006451	-0.000331	2.2449059	0.00000	-29.191244 C
0.0001063	1535.	14449365.	6.2205863	0.0006609	-0.001039	2.2885467	0.00000	-29.886318 C
0.0001088	1571.	14442566.	6.2232980	0.0006768	-0.001063	2.3316777	0.00000	-30.580974 C
0.0001113	1606.	14435747.	6.2260184	0.0006926	-0.001087	2.3742976	0.00000	-31.275208 C
0.0001138	1641.	14428910.	6.2287475	0.0007085	-0.001111	2.4164049	0.00000	-31.969019 C
0.0001163	1677.	14422053.	6.2314853	0.0007244	-0.001136	2.4579983	0.00000	-32.662405 C
0.0001188	1712.	14415178.	6.2342320	0.0007403	-0.001160	2.4990765	0.00000	-33.355363 C
0.0001213	1747.	14408283.	6.2369876	0.0007562	-0.001184	2.5396381	0.00000	-34.047892 C
0.0001238	1782.	14401369.	6.2397521	0.0007722	-0.001208	2.5796817	0.00000	-34.739989 C
0.0001263	1816.	14383152.	6.2405419	0.0007879	-0.001232	2.6185817	0.00000	-35.000000 CY
0.0001288	1846.	14337110.	6.2363690	0.0008029	-0.001257	2.6553807	0.00000	-35.000000 CY
0.0001313	1873.	14270122.	6.2283641	0.0008175	-0.001283	2.6904120	0.00000	-35.000000 CY
0.0001338	1898.	14190824.	6.2180212	0.0008317	-0.001308	2.7241362	0.00000	-35.000000 CY
0.0001363	1922.	14103150.	6.2060217	0.0008456	-0.001334	2.7567646	0.00000	-35.000000 CY
0.0001388	1944.	14009108.	6.1927085	0.0008592	-0.001361	2.7884049	0.00000	-35.000000 CY
0.0001413	1965.	13910169.	6.1783343	0.0008727	-0.001387	2.8191387	0.00000	-35.000000 CY
0.0001438	1985.	13807464.	6.1630956	0.0008859	-0.001414	2.8490315	0.00000	-35.000000 CY
0.0001453	2004.	13701766.	6.1468936	0.0008990	-0.001441	2.8780535	0.00000	-35.000000 CY
0.0001403	2022.	13593879.	6.1300381	0.0008330	-0.001441	2.9063097	0.00000	-35.000000 CY
	2088.	13151507.	6.0587306	0.0009118	-0.001408	3.0126578	0.00000	-35.000000 CY
0.0001588								-35.000000 CY
0.0001688	2144.	12706568.	5.9837609	0.0010098	-0.001690	3.1094818	0.00000	
0.0001788	2194.	12271786.	5.9070194	0.0010559	-0.001804	3.1978645	0.00000	-35.000000 CY
0.0001888	2237.	11853862.	5.8310962	0.0011006	-0.001919	3.2791460	0.00000	-35.000000 CY
0.0001988	2276.	11453966.	5.7553253	0.0011439	-0.002036	3.3535515	0.00000	-35.000000 CY
0.0002088	2312.	11075076.	5.6820487	0.0011861	-0.002154	3.4223029	0.00000	-35.000000 CY
0.0002188	2344.	10715076.	5.6100171	0.0012272	-0.002273	3.4853764	0.00000	35.0000000 CY
0.0002288	2371.	10366782.	5.5458144	0.0012686	-0.002391	3.5453058	0.00000	35.0000000 CY
0.0002388	2394.	10029179.	5.4894469	0.0013106	-0.002509	3.6023112	0.00000	35.0000000 CY
0.0002488	2415.	9706832.	5.4381689	0.0013527	-0.002627	3.6556726	0.00000	35.0000000 CY
0.0002588	2432.	9400405.	5.3911658	0.0013950	-0.002745	3.7052844	0.00000	35.0000000 CY
0.0002688	2448.	9109693.	5.3479218	0.0014373	-0.002863	3.7511129	0.00000	35.0000000 CY
0.0002788	2462.	8833460.	5.3066922	0.0014792	-0.002981	3.7927783	0.00000	35.0000000 CY
0.0002888	2475.	8572095.	5.2681523	0.0015212	-0.003099	3.8305877	0.00000	35.0000000 CY
0.0002988	2487.	8324593.	5.2319812	0.0015631	-0.003217	3.8645427	0.00000	35.0000000 CY
0.0003088	2498.	8089520.	5.1984704	0.0016050	-0.003335	3.8947715	0.00000	35.0000000 CY
0.0003188	2507.	7866502.	5.1654543	0.0016465	-0.003454	3.9208832	0.00000	35.0000000 CY
0.0003288	2516.	7654469.	5.1346708	0.0016880	-0.003572	3.9433148	0.00000	35.0000000 CY
0.0003388	2525.	7453181.	5.1053462	0.0017294	-0.003691	3.9619653	0.00000	35.0000000 CY
0.0003488	2532.	7261558.	5.0779719	0.0017709	-0.003809	3.9769374	0.00000	35.0000000 CY
0.0003588	2540.	7079277.	5.0516401	0.0018123	-0.003928	3.9881437	0.00000	35.0000000 CY
0.0003588	2546.	6904996.	5.0265317	0.0018535	-0.004046	3.9956453	0.00000	35.0000000 CY
0.0003088	2552.	6738975.	5.0019685	0.0018945	-0.004166	3.9994521	0.00000	35.0000000 CY
0.0003788	2558.	6580473.	4.9789889	0.0018945	-0.004188	3.9978246	0.00000	35.0000000 CY
0.0003988	2563.	6428648.	4.9568853	0.0019766	-0.004403	3.9999671	0.00000	35.0000000 CY
0.0004088	2568.	6283752.	4.9358338	0.0020175	-0.004522	3.9988308	0.00000	35.0000000 CY
0.0004188	2573.	6144803.	4.9160309	0.0020586	-0.004641	3.9984897	0.00000	35.0000000 CY
0.0004288	2577.	6011602.	4.8972661	0.0020997	-0.004760	3.9992005	0.00000	35.0000000 CY
0.0004388	2582.	5883986.	4.8792433	0.0021408	-0.004879	3.9972419	0.00000	35.0000000 CY
0.0004488	2585.	5761267.	4.8612100	0.0021815	-0.004999	3.9991247	0.00000	35.0000000 CY
0.0004588	2589.	5643322.	4.8444610	0.0022224	-0.005118	3.9981735	0.00000	35.0000000 CY
0.0004688	2592.	5529949.	4.8283264	0.0022633	-0.005237	3.9985838	0.00000	35.0000000 CY
0.0004788	2595.	5420937.	4.8127028	0.0023041	-0.005356	3.9999863	0.00000	35.0000000 CY
0.0004888	2598.	5316082.	4.7980580	0.0023451	-0.005475	3.9972432	0.00000	35.0000000 CY
0.0004988	2601.	5214788.	4.7840855	0.0023861	-0.005594	3.9995981	0.00000	35.0000000 CY
0.0005088	2603.	5117361.	4.7709389	0.0024272	-0.005713	3.9962865	0.00000	35.0000000 CY
0.0005188	2606.	5023324.	4.7581151	0.0024683	-0.005832	3.9981561	0.00000	35.0000000 CY
0.0005288	2608.	4932612.	4.7456812	0.0025093	-0.005951	3.9998515	0.00000	35.0000000 CY
0.0005388	2610.	4845085.	4.7342447	0.0025506	-0.006069	3.9947408	0.00000	35.0000000 CY
0.0005500	2010.	.0.5005.	11,7572777	0.0023300	0.00000	3,3377	0.0000	23.000000 61

0.0005488	2612.	4760327.	4.7232521	0.0025919	-0.006188	3.9981390	0.00000	35.0000000	CY
0.0006088	2622.	4306925.	4.6629320	0.0028386	-0.006901	3.9944264	0.00000	35.0000000	CY
0.0006688	2628.	3930400.	4.6152900	0.0030865	-0.007614	3.9989682	0.00000	35.0000000	CY
0.0007288	2633.	3613061.	4.5785545	0.0033366	-0.008323	3.9999425	0.00000	35.0000000	CY
0.0007888	2636.	3342088.	4.5487548	0.0035878	-0.009032	3.9999948	0.00000	35.0000000	CY
0.0008488	2638.	3108107.	4.5235486	0.0038394	-0.009741	3.9997119	0.00000	35.0000000	CY
Axial Thrust Force	e = 255.00	00 kips							

Avial	Thrust	Force	_	255	aaa	kins	

Bending urvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	R M
.00000125	27.1003158	21680253.		0.0002397	0.0002197	0.9515544	0.00000	6.9476873	. <u>-</u>
.00000250	54.2004074	21680163.	99.8757959	0.0002497	0.0002097	0.9881508	0.00000	7.2351952	
.00000375	81.3000510	21680014.	69.2567828	0.0002597	0.0001997	1.0245604	0.00000	7.5229751	
.00000500	108.3990222	21679804.	53.9491519	0.0002697	0.0001897	1.0607828	0.00000	7.8110270	
.00000625	135.4970972	21679536.	44.7660740	0.0002798	0.0001798	1.0968171	0.00000	8.0993509	
.00000750	162.5940516	21679207.	38.6452727	0.0002898	0.0001698	1.1326630	0.00000	8.3879468	
.00000875	189.6896615	21678818.	34.2743438	0.0002999	0.0001599	1.1683196	0.00000	8.6768148	
.00001000	216.7837027	21678370.	30.9970852	0.0003100	0.0001500	1.2037864	0.00000	8.9659547	
.00001125	243.8759508	21677862.	28.4489401	0.0003201	0.0001401	1.2390627	0.00000	9.2553668	
.00001250	270.9661818	21677295.	26.4111747	0.0003301	0.0001301	1.2741479	0.00000	9.5450509	
.00001375	298.0541714	21676667.	24.7445945	0.0003402	0.0001202	1.3090415	0.00000	9.8350071	
.00001500	325.1396952	21675980.	23.3564033	0.0003503	0.0001103	1.3437427	0.00000	10.1252355	
.00001625	352.2225289	21675233.	22.1823576	0.0003605	0.0001005	1.3782509	0.00000	10.4157361	
.00001750	379.3024481	21674426.	21.1765691	0.0003706	0.00009059	1.4125655	0.00000	10.7065089	
.00001875	406.3792283	21673559.	20.3053864	0.0003807	0.00008073	1.4466859	0.00000	10.9975539	
.00002000	433.4526451	21672632.	19.5435711	0.0003909	0.00007087	1.4806114	0.00000	11.2888713	ï
.00002125	460.5224738	21671646.	18.8718231	0.0004010	0.00006103	1.5143415	0.00000	11.5804610)
.00002250	487.5884899	21670600.	18.2751312	0.0004112	0.00005119	1.5478754	0.00000	11.8723232	
.00002375	514.6504685	21669493.	17.7416446	0.0004214	0.00004136	1.5812125	0.00000	12.1644578	í
.00002500	541.7081849	21668327.	17.2618825	0.0004315	0.00003155	1.6143523	0.00000	12.4568649	į
.00002625	568.7614142	21667101.	16.8281702	0.0004417	0.00002174	1.6472940	0.00000	12.7495446)
.00002750	595.8099314	21665816.	16.4342281	0.0004519	0.00001194	1.6800371	0.00000	13.0424970	j
.00002875	622.8535116	21664470.	16.0748689	0.0004622	0.00000215	1.7125809	0.00000	13.3357220	j
.00003000	649.8919292	21663064.	15.7457698	0.0004724	-0.00000763	1.7449248	0.00000	13.6292198	í
.00003125	676.9246065	21661587.	15.4432984	0.0004826	-0.00001740	1.7770680	0.00000	13.9229892	
.00003250	703.9490631	21659971.	15.1643732	0.0004928	-0.00002716	1.8090090	0.00000	14.2170218	;
.00003375	730.9615690	21658121.	14.9063643	0.0005031	-0.00003691	1.8407456	0.00000	14.5113041	
.00003500	757.9581718	21655948.	14.6670159	0.0005133	-0.00004665	1.8722758	0.00000	14.8058212	
.00003625	784.9352015	21653385.	14.4443839	0.0005236	-0.00005639	1.9035974	0.00000	15.1005587	
.00003750	811.8891584	21650378.	14.2367836	0.0005339	-0.00006612	1.9347084	0.00000	15.3955023	
.00003875	838.8169779	21646890.	14.0427487	0.0005442	-0.00007584	1.9656068	0.00000	15.6906380	
.00004000	865.7158723	21642897.	13.8609971	0.0005544	-0.00008556	1.9962913	0.00000	15.9859560	
.00004125	892.5833714	21638385.	13.6904028	0.0005517	-0.00009527	2.0267600	0.00000	16.2814439	
.00004125	919.4172720	216333348.	13.5299731	0.0005750	-0.000105	2.0570116	0.00000	16.5770915	
.00004230	946.2156276	21627786.	13.3788294	0.0005750	-0.000105	2.0370110	0.00000	16.8728896	
.00004575	946.4841906	21027780.	13.1490453	0.0005917	-0.000113	2.1054290	0.00000	17.0551042	
.00004500	968.8944827	20949070.	13.0016876	0.0005517	-0.000139	2.1331175	0.00000	17.3312136	
.00004023	991.0437523	20864079.	12.8612128	0.0006109	-0.000149	2.1604829	0.00000	17.6061208	
.00004730	1013.	20778235.	12.7270911	0.0006204	-0.000149	2.1875278	0.00000	17.8798245	
	1056.		12.7270911	0.0006394	-0.000181	2.2406559		18.4235113	
.00005125 .00005375	1098.	20604477. 20432711.	12.4/59/09	0.0006582	-0.000181	2.2926383	0.00000 0.00000	18.9634781	
.00005625	1140.	20261856.	12.0335131	0.0006769	-0.000223	2.3434386	0.00000	19.4991675	
.00005875	1181.	20094747.	11.8373071	0.0006954	-0.000245	2.3931617	0.00000	20.0315119	
.00006125	1221.	19931930.	11.6553738	0.0007139	-0.000266	2.4418443	0.00000	20.5607572	
.00006375	1261.	19773658.	11.4861336	0.0007322	-0.000288	2.4895162	0.00000	21.0870895	
.00006625	1300.	19620141.	11.3282580	0.0007505	-0.000310	2.5362081	0.00000	21.6107157	
.00006875	1339.	19471546.	11.1806238	0.0007687	-0.000331	2.5819516	0.00000	22.1318688	
.00007125	1377.	19328001.	11.0422774	0.0007868	-0.000353	2.6267791	0.00000	22.6508057	- 1

0.00007625	1453.	19056391.	10.7903145	0.0008228	-0.000397	2.7138184	0.00000	23.6831831 C
0.00007875	1491.	18927187.	10.6749837	0.0008407	-0.000419	2.7560185	0.00000	24.1962943 C
0.00008125	1528.	18802720.	10.5661104	0.0008585	-0.000442	2.7973938	0.00000	24.7078978 C
0.00008375	1565.	18683335.	10.4633704	0.0008763	-0.000464	2.8379992	0.00000	25.2186111 C
0.00008625	1601.	18567504.	10.3658080	0.0008941	-0.000486	2.8777565	0.00000	25.7273776 C
0.00008875	1638.	18456081.	10.2733772	0.0008541	-0.000480	2.9167502	0.00000	26.2352049 C
0.00009125	1674.	18348756.	10.1856729	0.0009294	-0.000531	2.9549876	0.00000	26.7421371 C
0.00009375	1710.	18244772.	10.1021094	0.0009471	-0.000553	2.9924308	0.00000	27.2476101 C
0.00009625	1746.	18144862.	10.0227681	0.0009647	-0.000575	3.0291670	0.00000	27.7527516 C
0.00009875	1782.	18047872.	9.9469417	0.0009823	-0.000598	3.0651193	0.00000	28.2564545 C
0.0001013	1818.	17954483.	9.8747579	0.0009998	-0.000620	3.1003725	0.00000	28.7598582 C
0.0001038	1853.	17864091.	9.8057762	0.0010173	-0.000643	3.1348917	0.00000	29.2624293 C
0.0001063	1889.	17776484.	9.7397673	0.0010349	-0.000665	3.1686793	0.00000	29.7641582 C
0.0001088	1924.	17692325.	9.6769215	0.0010524	-0.000688	3.2018204	0.00000	30.2662915 C
0.0001113	1959.	17609881.	9.6162785	0.0010698	-0.000710	3.2341590	0.00000	30.7664188 C
0.0001138	1994.	17530589.	9.5584623	0.0010873	-0.000733	3.2658623	0.00000	31.2670780 C
0.0001163	2029.	17453802.	9.5030552	0.0011047	-0.000755	3.2968793	0.00000	31.7674751 C
0.0001188	2064.	17378824.	9.4496152	0.0011221	-0.000778	3.3271513	0.00000	32.2666128 C
0.0001213	2098.	17306496.	9.3985297	0.0011396	-0.000800	3.3567883	0.00000	32.7662806 C
0.0001238	2133.	17236395.	9.3495072	0.0011570	-0.000823	3.3857576	0.00000	33.2659443 C
0.0001263	2167.	17167722.	9.3020371	0.0011744	-0.000846	3.4139797	0.00000	33.7641838 C
0.0001288	2202.	17101298.	9.2565524	0.0011744	-0.000868	3.4415671	0.00000	34.2629527 C
0.0001233	2236.	17036995.	9.2129400	0.0011918	-0.000891	3.4685176	0.00000	34.7622534 C
0.0001338	2270.	16969397.	9.1716245	0.0012267	-0.000913	3.4949360	0.00000	35.0000000 CY
0.0001363	2302.	16895791.	9.1334126	0.0012444	-0.000936	3.5209985	0.00000	35.0000000 CY
0.0001388	2333.	16815021.	9.0987151	0.0012624	-0.000958	3.5467941	0.00000	35.0000000 CY
0.0001413	2363.	16728969.	9.0670680	0.0012807	-0.000979	3.5722328	0.00000	35.0000000 CY
0.0001438	2392.	16641414.	9.0375244	0.0012991	-0.001001	3.5971308	0.00000	35.0000000 CY
0.0001463	2421.	16552624.	9.0094856	0.0013176	-0.001022	3.6213766	0.00000	35.0000000 CY
0.0001488	2449.	16463198.	8.9832798	0.0013363	-0.001044	3.6450376	0.00000	35.0000000 CY
0.0001588	2556.	16103238.	8.8944993	0.0014120	-0.001128	3.7334033	0.00000	35.0000000 CY
0.0001688	2658.	15750882.	8.8246146	0.0014892	-0.001211	3.8104490	0.00000	35.0000000 CY
0.0001788	2742.	15341221.	8.7551006	0.0015650	-0.001295	3.8733844	0.00000	35.0000000 CY
0.0001888	2807.	14869672.	8.6785910	0.0016381	-0.001382	3.9220690	0.00000	35.0000000 CY
0.0001988	2860.	14389041.	8.6030106	0.0017098	-0.001470	3.9584174	0.00000	35.0000000 CY
0.0002088	2905.	13915991.	8.5304618	0.0017807	-0.001559	3.9832020	0.00000	35.0000000 CY
0.0002188	2944.	13456998.	8.4610383	0.0018509	-0.001649	3.9968517	0.00000	35.0000000 CY
0.0002288	2978.	13016552.	8.3961373	0.0019206	-0.001739	3.9995250	0.00000	35.0000000 CY
0.0002388	3007.	12594399.	8.3341940	0.0019898	-0.001830	3.9989759	0.00000	35.0000000 CY
0.0002488	3033.	12191798.	8.2768238	0.0020589	-0.001921	3.9999523	0.00000	35.0000000 CY
0.0002588	3055.	11808584.	8.2235577	0.0021278	-0.002012	3.9991482	0.00000	35.0000000 CY
0.0002688	3075.	11443087.	8.1730811	0.0021965	-0.002103	3.9998311	0.00000	35.0000000 CY
0.0002788	3093.	11095983.	8.1264437	0.0021505	-0.002105	4.0000000	0.00000	35.0000000 CY
0.0002788	3109.	10766137.	8.0834366	0.0022032	-0.002133	3.9984377	0.00000	35.0000000 CY
0.0002988	3123.	10452004.	8.0426298	0.0023341	-0.002377	3.9987582	0.00000	35.0000000 CY
0.0002388	3135.	10153349.	8.0044236	0.0024027	-0.002377	3.9988195	0.00000	35.0000000 CY
0.0003188	3146.	9869139.	7.9692481	0.0025402	-0.002560	3.9986562	0.00000	35.0000000 CY
0.0003288	3156.	9598768.	7.9364497	0.0026091	-0.002651	3.9982135	0.00000	35.0000000 CY
0.0003388	3164.	9340967.	7.9055598	0.0026780	-0.002742	3.9981698	0.00000	35.0000000 CY
0.0003488	3172.	9095273.	7.8760979	0.0027468	-0.002833	3.9999784	0.00000	35.0000000 CY
0.0003588	3179.	8860856.	7.8490030	0.0028158	-0.002924	3.9996541	0.00000	35.0000000 CY
0.0003688	3185.	8637453.	7.8236068	0.0028850	-0.003015	3.9987144	0.00000	35.0000000 CY
0.0003788	3191.	8423842.	7.8001232	0.0029543	-0.003106	3.9976405	0.00000	35.0000000 CY
0.0003888	3195.	8219654.	7.7780704	0.0030237	-0.003196	3.9998027	0.00000	35.0000000 CY
0.0003988	3200.	8024583.	7.7575442	0.0030933	-0.003287	3.9984568	0.00000	35.0000000 CY
0.0004088	3204.	7837404.	7.7375995	0.0031627	-0.003377	3.9996323	0.00000	35.0000000 CY
0.0004188	3207.	7658230.	7.7190208	0.0032323	-0.003468	3.9991541	0.00000	35.0000000 CY
0.0004288	3210.	7486553.	7.7014785	0.0033020	-0.003558	3.9970410	0.00000	35.0000000 CY
0.0004388	3212.	7321655.	7.6854400	0.0033720	-0.003648	3.9993747	0.00000	35.0000000 CY
0.0004488	3215.	7163461.	7.6703125	0.0033720	-0.003738	3.9962121	0.00000	35.0000000 CY
0.0004588	3217.	7011527.	7.6560895	0.0035122	-0.003738	3.9992667	0.00000	35.0000000 CY
0.0004588	3218.	6865349.	7.6428933	0.0035122	-0.003828	3.9972299	0.00000	35.0000000 CY
0.0004788	3220.	6724808.	7.6309435	0.0033828	-0.003917	3.9987715	0.00000	35.0000000 CY
0.0004/00	3220.	0724000.	7.0303433	0.0030333	-0.00400/	J. JJO//1J	0.0000	33.0000000 CT

0.0004888	3221.	6589400.	7.6192180	0.0037239	-0.004096	4.0000000	0.00000	35.0000000 CY
0.0004988	3221.	6459092.	7.6085906	0.0037948	-0.004185	3.9975601	0.00000	35.0000000 CY
0.0005088	3222.	6333402.	7.5986629	0.0038658	-0.004274	3.9997554	0.00000	35.0000000 CY

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain	Max. Tens. Strain
1	0.000	2626.148	0.00300000	-0.00736514
2	255.000	3193.730	0.00300000	-0.00316533

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	0.0000	2626.	0.0000	1707.	14416116.
2	0.65	255.000000	3194.	165.750000	2076.	17353401.
1	0.75	0.0000	2626.	0.0000	1970.	13885537.
2	0.75	255.000000	3194.	191.250000	2395.	16631815.
1	0.90	0.0000	2626.	0.0000	2364.	10466515.
2	0.90	255.000000	3194.	229.500000	2874.	14236726.

Layering Correction Equivalent Depths of Soil & Rock Layers

Top of Equivalent Layer Top Depth Same Layer Layer is F0 F1 Layer Below Below Type As Rock or Integral Integ No. Pile Head Grnd Surf Layer is Below for Layer for L ft ft Above Rock Layer lbs lb	ral ayer
1 0.00 0.00 N.A. No 0.00 9	992.
2 4.7000 4.7447 Yes No 9992. 191	248.
3 15.7000 14.7274 No No 201241. 602	390.
4 45.2000 29.8430 Yes No 803631. 404	425.
5 57.7000 76.7014 Yes No 1208056. 509	828.
6 88.2000 88.2000 No No 1717883.	0.00

N.A.

N.A.

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

103.2000

103.2000

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 Pile-head Rotation (Loading Type 2)

Shear force at pile head 17000.0 lbs Rotation of pile head 0.000E+00 radians Axial load at pile head 0.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.1838	-896128.	17000.	0.00	0.00	1.46E+10	0.00	0.00	0.00
0.8800	0.1804	-716608.	16773.	-5.85E-04	0.00	1.46E+10	-42.899	2511.	0.00
1.7600	0.1715	-541872.	16077.	-0.00104	0.00	1.46E+10	-88.992	5480.	0.00
2.6400	0.1584	-377059.	14945.	-0.00137	0.00	1.47E+10	-125.391	8357.	0.00
3.5200	0.1425	-226230.	13504.	-0.00156	0.00	2.30E+10	-147.556	10932.	0.00
4.4000	0.1255	-91855.	11901.	-0.00163	0.00	2.31E+10	-155.981	13123.	0.00
5.2800	0.1081	25126.	10309.	-0.00165	0.00	2.31E+10	-145.653	14233.	0.00
6.1600	0.09073	125865.	8686.	-0.00161	0.00	2.31E+10	-161.740	18825.	0.00
7.0400	0.07400	208568.	6907.	-0.00154	0.00	2.30E+10	-175.141	24992.	0.00
7.9200	0.05829	271740.	4989.	-0.00143	0.00	2.29E+10	-188.101	34078.	0.00
8.8000	0.04390	313936.	2980.	-0.00128	0.00	1.94E+10	-192.423	46291.	0.00
9.6800	0.03131	334674.	975.8124	-0.00107	0.00	1.47E+10	-187.131	63117.	0.00
10.5600	0.02127	334545.	-865.962	-8.31E-04	0.00	1.47E+10	-161.689	80290.	0.00
11.4400	0.01377	316385.	-2318.	-5.97E-04	0.00	1.48E+10	-113.396	86981.	0.00
12.3200	0.00865	285580.	-3322.	-4.19E-04	0.00	2.29E+10	-76.726	93671.	0.00
13.2000	0.00492	246219.	-3974.	-2.96E-04	0.00	2.30E+10	-46.769	100362.	0.00
14.0800	0.00239	201643.	-4349.	-1.94E-04	0.00	2.30E+10	-24.208	107053.	0.00
14.9600	8.33E-04	154367.	-4524.	-1.12E-04	0.00	2.30E+10	-8.970	113744.	0.00
15.8400	2.50E-05	106090.	-4636.	-5.22E-05	0.00	2.31E+10	-12.193	5157400.	0.00
16.7200	-2.70E-04	56455.	-4004.	-1.50E-05	0.00	2.31E+10	131.8173	5157400.	0.00
17.6000	-2.92E-04	21518.	-2555.	2.80E-06	0.00	2.31E+10	142.7387	5157400.	0.00
18.4800	-2.11E-04	2499.	-1257.	8.28E-06	0.00	2.31E+10	102.9771	5157400.	0.00
19.3600	-1.17E-04	-5037.	-410.918	7.70E-06	0.00	2.31E+10	57.3296	5157400.	0.00
20.2400	-4.82E-05	-6180.	16.1026	5.14E-06	0.00	2.31E+10	23.5456	5157400.	0.00
21.1200	-8.84E-06	-4697.	163.2155	2.66E-06	0.00	2.31E+10	4.3167	5157400.	0.00
22.0000	7.88E-06	-2732.	165.6819	9.59E-07	0.00	2.31E+10	-3.850	5157400.	0.00
22.8800	1.14E-05	-1198.	115.8939	6.21E-08	0.00	2.31E+10	-5.580	5157400.	0.00
23.7600	9.19E-06	-284.816	62.7266	-2.76E-07	0.00	2.31E+10	-4.490	5157400.	0.00
24.6400	5.59E-06	127.2480	24.6147	-3.12E-07	0.00	2.31E+10	-2.729	5157400.	0.00
25.5200	2.59E-06	235.0471	3.5181	-2.30E-07	0.00	2.31E+10	-1.267	5157400.	0.00
26.4000	7.36E-07	201.5498	-5.069	-1.30E-07	0.00	2.31E+10	-0.359	5157400.	0.00
27.2800	-1.51E-07	127.9887	-6.576	-5.47E-08	0.00	2.31E+10	0.07381	5157400.	0.00
28.1600	-4.21E-07	62.6585	-5.102	-1.12E-08	0.00	2.31E+10	0.2054	5157400.	0.00
29.0400	-3.88E-07	20.2370	-3.017	7.72E-09	0.00	2.31E+10	0.1895	5157400.	0.00
29.9200	-2.58E-07	-1.055	-1.352	1.21E-08	0.00	2.31E+10	0.1259	5157400.	0.00

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30.8000	-1.33E-07	-8.314	-0.346	9.96E-09	0.00	2.31E+10	0.06471	5157400.	0.00
31.6800	-4.74E-08	-8.355	0.1183	6.15E-09	0.00	2.31E+10	0.02316	5157400.	0.00
32.5600	-2.62E-09	-5.815	0.2473	2.91E-09	0.00	2.31E+10	0.00128	5157400.	0.00
33.4400	1.41E-08	-3.133	0.2176	8.71E-10	0.00	2.31E+10	-0.00690	5157400.	0.00
34.3200	1.58E-08	-1.219	0.1405	-1.23E-10	0.00	2.31E+10	-0.00770	5157400.	0.00
35.2000	1.15E-08	-0.165	0.07007	-4.39E-10	0.00	2.31E+10	-0.00563	5157400.	0.00
36.0800	6.50E-09	0.2605	0.02357	-4.17E-10	0.00	2.31E+10	-0.00317	5157400.	0.00
36.9600	2.72E-09	0.3325	-1.93E-04	-2.82E-10	0.00	2.31E+10	-0.00133	5157400.	0.00
37.8400	5.41E-10	0.2564	-0.00860	-1.48E-10	0.00	2.31E+10	-2.64E-04	5157400.	0.00
38.7200	-4.00E-10	0.1509	-0.00896	-5.46E-11	0.00	2.31E+10	1.95E-04	5157400.	0.00
39.6000	-6.12E-10	0.06721 0.01684	-0.00635	-4.78E-12	0.00	2.31E+10	2.99E-04	5157400.	0.00
40.4800 41.3600	-5.01E-10 -3.08E-10	-0.00627	-0.00348 -0.00139	1.44E-11 1.68E-11	0.00 0.00	2.31E+10 2.31E+10	2.44E-04 1.50E-04	5157400. 5157400.	0.00 0.00
42.2400	-1.45E-10	-0.00027	-0.00139 -2.27E-04	1.00E-11 1.25E-11	0.00	2.31E+10 2.31E+10	7.09E-05	5157400.	0.00
43.1200	-4.35E-11	-0.01106	2.60E-04	7.11E-12	0.00	2.31E+10	2.12E-05	5157400.	0.00
44.0000	4.91E-12	-0.00713	3.59E-04	2.95E-12	0.00	2.31E+10	-2.40E-06	5157400.	0.00
44.8800	1.89E-11	-0.00347	2.98E-04	0.00	0.00	2.31E+10	-9.23E-06	5157400.	0.00
45.7600	1.61E-11	-8.43E-04	1.77E-04	0.00	0.00	2.31E+10	-1.36E-05	8910000.	0.00
46.6400	9.30E-12	2.70E-04	6.40E-05	0.00	0.00	2.31E+10	-7.84E-06	8910000.	0.00
47.5200	3.77E-12	5.08E-04	5.76E-06	0.00	0.00	2.31E+10	-3.18E-06	8910000.	0.00
48.4000	0.00	3.92E-04	-1.41E-05	0.00	0.00	2.31E+10	-5.79E-07	8910000.	0.00
49.2800	0.00	2.11E-04	-1.49E-05	0.00	0.00	2.31E+10	4.26E-07	8910000.	0.00
50.1600	0.00	7.75E-05	-9.59E-06	0.00	0.00	2.31E+10	5.74E-07	8910000.	0.00
51.0400	0.00	8.21E-06	-4.43E-06	0.00	0.00	2.31E+10	4.05E-07	8910000.	0.00
51.9200	0.00	-1.59E-05	-1.21E-06	0.00	0.00	2.31E+10	2.04E-07	8910000.	0.00
52.8000	0.00	-1.73E-05	2.17E-07	0.00	0.00	2.31E+10	6.67E-08	8910000.	0.00
53.6800	0.00	-1.13E-05	5.70E-07	0.00	0.00	2.31E+10	2.51E-10	8910000.	0.00
54.5600	0.00	-5.29E-06	4.66E-07	0.00	0.00	2.31E+10	-2.00E-08	8910000.	0.00
55.4400	0.00	-1.49E-06	2.61E-07	0.00	0.00	2.31E+10	-1.88E-08	8910000.	0.00
56.3200	0.00	2.14E-07	1.01E-07	0.00	0.00	2.31E+10	-1.15E-08	8910000.	0.00
57.2000	0.00	6.41E-07	1.40E-08	0.00	0.00	2.31E+10	-5.02E-09	8910000.	0.00
58.0800	0.00	5.09E-07	-1.55E-08	0.00	0.00	2.31E+10	-5.58E-10	4247271.	0.00
58.9600	0.00	3.15E-07	-1.69E-08	0.00	0.00	2.31E+10	2.87E-10	4247271.	0.00
59.8400	0.00	1.52E-07	-1.26E-08	0.00	0.00	2.31E+10	5.22E-10	4247271.	0.00
60.7200	0.00 0.00	4.82E-08	-7.43E-09	0.00 0.00	0.00	2.31E+10	4.61E-10 3.07E-10	4247271.	0.00 0.00
61.6000 62.4800	0.00	-4.55E-09 -2.30E-08	-3.37E-09 -8.91E-10	0.00	0.00 0.00	2.31E+10 2.31E+10	1.62E-10	4247271. 4247271.	0.00
63.3600	0.00	-2.34E-08	2.91E-10	0.00	0.00	2.31E+10	6.17E-11	4247271.	0.00
64.2400	0.00	-1.69E-08	6.51E-10	0.00	0.00	2.31E+10	6.47E-12	4247271.	0.00
65.1200	0.00	-9.61E-09	6.00E-10	0.00	0.00	2.31E+10	-1.60E-11	4247271.	0.00
66.0000	0.00	-4.17E-09	4.11E-10	0.00	0.00	2.31E+10	-1.99E-11	4247271.	0.00
66.8800	0.00	-9.42E-10	2.23E-10	0.00	0.00	2.31E+10	-1.57E-11	4247271.	0.00
67.7600	0.00	5.34E-10	8.89E-11	0.00	0.00	2.31E+10	-9.64E-12	4247271.	0.00
68.6400	0.00	9.35E-10	1.35E-11	0.00	0.00	2.31E+10	-4.64E-12	4247271.	0.00
69.5200	0.00	8.19E-10	-1.86E-11	0.00	0.00	2.31E+10	-1.44E-12	4247271.	0.00
70.4000	0.00	5.43E-10	-2.53E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
71.2800	0.00	2.85E-10	-2.06E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
72.1600	0.00		-1.30E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
73.0400	0.00		-6.44E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
73.9200	0.00		-2.15E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
74.8000	0.00	-3.55E-11	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
75.6800	0.00	-2.78E-11	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
76.5600	0.00	-1.70E-11	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
77.4400	0.00	-8.11E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
78.3200	0.00	-2.47E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
79.2000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
80.0800 80.9600	0.00 0.00	1.30E-12	0.00	0.00	0.00 0.00	2.31E+10	0.00 0.00	4247271. 4247271.	0.00 0.00
80.9600	0.00	1.29E-12 0.00	0.00 0.00	0.00 0.00	0.00	2.31E+10 2.31E+10	0.00	4247271. 4247271.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00

86.2400	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	2123635.	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 = 0.18383394 inches
Computed slope at pile head = 0.000000 radians
Maximum bending moment = -896128. inch-lbs
Maximum shear force = 17000. lbs

Depth of maximum bending moment = 0.000000 feet below pile head Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations = 32 Number of zero deflection points = 14

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

Pile-Nead Deflection Vs. Pile Length for Load Case 1

Boundary Condition Type 2, Shear and Slope

Shear = 17000. lbs Slope = 0.00000 Axial Load = 0. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
88.00000	0.18383394	-896128.	17000.
83.60000	0.18204588	-896201.	17000.
79.20000	0.18120631	-896561.	17000.
74.80000	0.18324295	-896093.	17000.
70.40000	0.18274151	-894046.	17000.
66.00000	0.18214531	-896136.	17000.
61.60000	0.18058919	-896900.	17000.
57.20000	0.18237590	-894123.	17000.
52.80000	0.18140366	-897414.	17000.
48.40000	0.18148081	-892075.	17000.
44.00000	0.18104557	-896488.	17000.
39.60000	0.18112047	-895136.	17000.
35.20000	0.18096830	-894612.	17000.
30.80000	0.18090755	-896236.	17000.
26.40000	0.18108744	-894465.	17000.
22.00000	0.18071503	-894892.	17000.
17.60000	0.18166518	-893504.	17000.
13.20000	0.23458459	-996147.	17000.
8.80000	0.26815566	-1094232.	17000.

Computed Values of Pile Loading and Deflection

for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 17000.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 255000.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.1578	-973254.	17000.	0.00	0.00	2.09E+10	0.00	0.00	0.00
0.8800		-793073.	16783.	-4.46E-04	0.00	2.09E+10	-41.086	2795.	0.00
1.7600		-616396.	16116.	-7.96E-04	0.00	2.17E+10	-85.175	6061.	0.00
2.6400		-448408.	15033.	-0.00106	0.00	2.17E+10	-119.980	9154.	0.00
3.5200		-293211.	13654.	-0.00124	0.00	2.17E+10	-141.266	11828.	0.00
4.4000		-153383.	12123.	-0.00134	0.00	2.17E+10	-148.635	13975.	0.00
5.2800		-29929.	10611.	-0.00139	0.00	2.17E+10	-137.714	14882.	0.00
6.1600		78208.	9074.	-0.00138	0.00	2.17E+10	-153.427	19528.	0.00
7.0400	0.06862	169133.	7381.	-0.00132	0.00	2.17E+10	-167.281	25743.	0.00
7.9200	0.05514	241182.	5537.	-0.00122	0.00	2.17E+10	-181.859	34825.	0.00
8.8000	0.04291	292635.	3575.	-0.00109	0.00	2.17E+10	-189.765	46702.	0.00
9.6800	0.03218	322542.	1568.	-9.38E-04	0.00	2.17E+10	-190.262	62438.	0.00
10.5600	0.02311	330810.	-363.765	-7.78E-04	0.00	2.17E+10	-175.689	80290.	0.00
11.4400		319052.	-1976.	-6.20E-04	0.00	2.17E+10	-129.631	86981.	0.00
12.3200		292420.	-3129.	-4.71E-04	0.00	2.17E+10	-88.795	93671.	0.00
13.2000		255502.	-3888.	-3.38E-04	0.00	2.17E+10	-54.997	100362.	0.00
14.0800		212116.	-4333.	-2.24E-04	0.00	2.17E+10	-29.171	107053.	0.00
14.9600		165199.	-4547.	-1.32E-04	0.00	2.17E+10	-11.412	113744.	0.00
15.8400		116793.	-4842.	-6.33E-05	0.00	2.17E+10	-44.519	5157400.	0.00
16.7200		63269.	-4365.	-1.94E-05	0.00	2.17E+10	134.9917	5157400.	0.00
17.6000		24716.	-2831.	2.03E-06	0.00	2.17E+10	155.5642	5157400.	0.00
18.4800		3478.	-1407.	8.90E-06	0.00	2.17E+10	114.0486	5157400.	0.00
19.3600		-5047.	-467.946	8.51E-06	0.00	2.17E+10	63.7969	5157400.	0.00
20.2400		-6451.	7.3633	5.71E-06	0.00	2.17E+10	26.2239	5157400.	0.00
21.1200		-4922.	171.4681	2.94E-06	0.00	2.17E+10	4.8566	5157400.	0.00
22.0000		-2846.	175.2241	1.05E-06	0.00	2.17E+10	-4.145	5157400.	0.00
22.8800		-1227.	121.6640	6.05E-08	0.00	2.17E+10	-5.999	5157400.	0.00
23.7600		-276.404	64.8104	-3.06E-07	0.00	2.17E+10	-4.769	5157400.	0.00
24.6400		143.0934	24.6086	-3.38E-07	0.00	2.17E+10	-2.845	5157400.	0.00
25.5200 26.4000		245.1511	2.8268 -5.684	-2.44E-07 -1.34E-07	0.00 0.00	2.17E+10 2.17E+10	-1.280 -0.332	5157400. 5157400.	0.00 0.00
27.2800		204.1083 125.8180	-5.684 -6.884	-1.34E-07 -5.39E-08	0.00	2.17E+10 2.17E+10	0.1044	5157400.	0.00
28.1600		59.0051	-5.148	-8.89E-09	0.00	2.17E+10 2.17E+10	0.2244	5157400.	0.00
29.0400		17.1346	-2.928	9.65E-09	0.00	2.17E+10 2.17E+10	0.1961	5157400.	0.00
29.9200		-2.891	-1.234	1.31E-08	0.00	2.17E+10 2.17E+10	0.1248	5157400.	0.00
30.8000		-8.997	-0.254	1.02E-08	0.00	2.17E+10	0.06074	5157400.	0.00
31.6800		-8.317	0.1683	6.01E-09	0.00	2.17E+10	0.01930	5157400.	0.00
32.5600		-5.474	0.2636	2.65E-09	0.00	2.17E+10	-0.00126	5157400.	0.00
33.4400		-2.765	0.2144	6.46E-10	0.00	2.17E+10	-0.00806	5157400.	0.00
34.3200		-0.950	0.1300	-2.59E-10	0.00	2.17E+10	-0.00792	5157400.	0.00
35.2000		-0.01735	0.05976	-4.95E-10	0.00	2.17E+10	-0.00539	5157400.	0.00
36.0800		0.3147	0.01645	-4.22E-10	0.00	2.17E+10	-0.00282	5157400.	0.00
36.9600		0.3324	-0.00386	-2.65E-10	0.00	2.17E+10	-0.00103	5157400.	0.00
37.8400		0.2345	-0.00977	-1.27E-10	0.00	2.17E+10	-8.53E-05	5157400.	0.00
38.7200		0.1268	-0.00878	-3.86E-11	0.00	2.17E+10	2.73E-04	5157400.	0.00
39.6000		0.04936	-0.00568	4.28E-12	0.00	2.17E+10	3.13E-04	5157400.	0.00
40.4800		0.00679	-0.00282	1.80E-11	0.00	2.17E+10	2.29E-04	5157400.	0.00
41.3600	-2.62E-10	-0.01027	-9.35E-04	1.71E-11	0.00	2.17E+10	1.28E-04	5157400.	0.00

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42.2400	-1.07E-10	-0.01305	1.66E-05	1.14E-11	0.00	2.17E+10	5.24E-05	5157400.	0.00
43.1200	-2.03E-11	-0.00998	3.46E-04	5.82E-12	0.00	2.17E+10	9.89E-06	5157400.	0.00
44.0000	1.56E-11	-0.00578	3.58E-04	1.98E-12	0.00	2.17E+10	-7.60E-06	5157400.	0.00
44.8800	2.16E-11	-0.00243	2.62E-04	0.00	0.00	2.17E+10	-1.06E-05	5157400.	0.00
45.7600	1.52E-11	-2.51E-04	1.38E-04	0.00	0.00	2.17E+10		8910000.	0.00
46.6400	7.54E-12	4.94E-04	3.67E-05	0.00	0.00	2.17E+10	-6.36E-06	8910000.	0.00
47.5200	2.38E-12	5.28E-04	-7.48E-06	0.00	0.00	2.17E+10	-2.01E-06	8910000.	0.00
48.4000	0.00	3.38E-04	-1.78E-05	0.00	0.00	2.17E+10	5.17E-08	8910000.	0.00
49.2800	0.00		-1.41E-05	0.00	0.00	2.17E+10	6.46E-07	8910000.	0.00
50.1600	0.00	3.96E-05	-7.66E-06	0.00	0.00	2.17E+10	5.78E-07	8910000.	0.00
51.0400	0.00	-9.20E-06	-2.83E-06	0.00	0.00	2.17E+10	3.38E-07	8910000.	0.00
51.9200	0.00		-3.10E-07	0.00	0.00	2.17E+10	1.38E-07	8910000.	0.00
52.8000	0.00	-1.58E-05	5.58E-07	0.00	0.00	2.17E+10	2.61E-08	8910000.	0.00
53.6800	0.00	-8.52E-06	6.04E-07	0.00	0.00	2.17E+10	-1.72E-08	8910000.	0.00
54.5600	0.00	-3.10E-06	3.88E-07	0.00	0.00	2.17E+10	-2.36E-08	8910000.	0.00
55.4400	0.00	-3.13E-07	1.76E-07	0.00	0.00	2.17E+10	-1.65E-08	8910000.	0.00
56.3200	0.00	6.30E-07	4.62E-08	0.00	0.00	2.17E+10	-8.11E-09	8910000.	0.00
57.2000	0.00		-9.38E-09	0.00	0.00	2.17E+10	-2.41E-09	8910000.	0.00
58.0800	0.00		-2.11E-08	0.00	0.00	2.17E+10	1.87E-10	4247271.	0.00
58.9600	0.00	2.22E-07		0.00	0.00	2.17E+10	6.25E-10	4247271.	0.00
59.8400	0.00	7.89E-08	-1.04E-08	0.00	0.00	2.17E+10	6.04E-10	4247271.	0.00
60.7200	0.00		-4.94E-09	0.00	0.00	2.17E+10	4.21E-10	4247271.	0.00
61.6000	0.00	-2.57E-08	-1.50E-09	0.00	0.00	2.17E+10	2.30E-10	4247271.	0.00
62.4800	0.00	-2.88E-08	2.01E-10	0.00	0.00	2.17E+10	9.28E-11	4247271.	0.00
63.3600	0.00	-2.16E-08	7.71E-10	0.00	0.00	2.17E+10	1.51E-11	4247271.	0.00
64.2400	0.00	-1.26E-08	7.56E-10	0.00	0.00	2.17E+10		4247271.	0.00
65.1200	0.00	-5.63E-09	5.30E-10	0.00	0.00	2.17E+10		4247271.	0.00
66.0000	0.00	-1.41E-09	2.92E-10	0.00	0.00	2.17E+10	-2.02E-11	4247271.	0.00
66.8800	0.00	5.52E-10	1.19E-10	0.00	0.00	2.17E+10	-1.26E-11	4247271.	0.00
67.7600	0.00	1.12E-09	2.08E-11	0.00	0.00	2.17E+10	-6.10E-12	4247271.	0.00
68.6400	0.00		-2.16E-11	0.00	0.00	2.17E+10	-1.93E-12	4247271.	0.00
69.5200	0.00		-3.09E-11	0.00	0.00	2.17E+10	0.00	4247271.	0.00
70.4000	0.00		-2.53E-11	0.00	0.00	2.17E+10	0.00	4247271.	0.00
71.2800	0.00		-1.59E-11	0.00	0.00	2.17E+10	0.00	4247271.	0.00
72.1600	0.00		-7.78E-12	0.00	0.00	2.17E+10	0.00	4247271.	0.00
73.0400	0.00		-2.52E-12	0.00	0.00	2.17E+10	0.00	4247271.	0.00
73.9200	0.00	-4.25E-11	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
74.8000	0.00	-3.26E-11	1.10E-12	0.00	0.00	2.17E+10	0.00	4247271.	0.00
75.6800	0.00	-1.95E-11	1.12E-12	0.00	0.00	2.17E+10	0.00	4247271.	0.00
76.5600	0.00	-8.94E-12	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
77.4400	0.00	-2.45E-12	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
78.3200	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
79.2000	0.00	1.61E-12	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
80.0800	0.00	1.49E-12	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
80.9600	0.00	1.01E-12	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
81.8400	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	2123635.	0.00
55.000	0.00	0.00	0.00	0.00	3.00		0.00		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 = 0.15781500 inches
Computed slope at pile head = 0.000000 radians
Maximum bending moment = -973254. inch-lbs
Maximum shear force = 17000. lbs

Depth of maximum bending moment = 0.000000 feet below pile head Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations = 11 Number of zero deflection points = 14

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

Boundary Condition Type 2, Shear and Slope

Shear = 17000. lbs Slope = 0.00000 Axial Load = 255000. lbs

Pile Length	Pile Head Deflection	Maximum Moment	Maximum Shear
feet	inches	ln-lbs	lbs
88.00000	0.15781500	-973254.	17000.
83.60000	0.15748205	-972783.	17000.
79.20000	0.15727085	-972862.	17000.
74.80000	0.15705869	-972794.	17000.
70.40000	0.15684572	-972379.	17000.
66.00000	0.15701428	-973418.	17000.
61.60000	0.15647046	-972335.	17000.
57.20000	0.15639089	-972564.	17000.
52.80000	0.15642071	-973106.	17000.
48.40000	0.15622899	-972938.	17000.
44.00000	0.15612728	-973178.	17000.
39.60000	0.15588972	-973037.	17000.
35.20000	0.15575171	-973045.	17000.
30.80000	0.15558810	-973170.	17000.
26.40000	0.15555511	-973367.	17000.
22.00000	0.15540523	-973388.	17000.
17.60000	0.15746661	-973450.	17000.
13.20000	0.20651176	-1109697.	17000.
8.80000	0.23242043	-1155011.	17000.

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 = 17000.0 lbs

Applied moment at pile head = 0.0 in-lbs

Axial thrust load on pile head = 0.0 lbs

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
X	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	1bs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch

0.00	0.6904	-1.61E-07	17000.	-0.00757	0.00	2.31E+10	0.00	0.00	0.00
0.8800	0.6105	179520.	16655.	-0.00753	0.00	2.31E+10	-65.256	1129.	0.00
1.7600	0.5314	351763.	15612.	-0.00736	0.00	1.47E+10	-132.420	2632.	0.00
2.6400	0.4549	509239.	13947.	-0.00705	0.00	1.46E+10	-182.930	4246.	0.00
3.5200	0.3824	646317.	11856.	-0.00664	0.00	1.46E+10	-213.001	5882.	0.00
4.4000	0.3148	759641.	9500.	-0.00613	0.00	1.46E+10	-233.300	7826.	0.00
5.2800	0.2530	846950.	7033.	-0.00555	0.00	1.46E+10	-233.945	9765.	0.00
6.1600	0.1977	908170.	4445.	-0.00491	0.00	1.46E+10	-256.094	13682.	0.00
7.0400	0.1493	940832.	1676.	-0.00424	0.00	1.46E+10	-268.336	18981.	0.00
7.9200	0.1081	943572.	-1187.	-0.00356	0.00	1.46E+10	-273.848	26747.	0.00
8.8000	0.07418	915773.	-4030.	-0.00288	0.00	1.46E+10	-264.703	37682.	0.00
9.6800	0.04725	858457.	-6697.	-0.00224	0.00	1.46E+10	-240.324	53708.	0.00
10.5600	0.02689 0.01245	774341.	-9026.	-0.00165	0.00	1.46E+10	-200.795	78844.	0.00
11.4400 12.3200	0.01245	667834. 549888.	-10627. -11315.	-0.00113 -6.86E-04	0.00 0.00	1.46E+10 1.46E+10	-102.574 -27.592	86981. 93671.	0.00 0.00
13.2000	-0.00204	428866.	-11313.	-3.33E-04	0.00	1.40E+10 1.47E+10	19.3925	100362.	0.00
14.0800	-0.00204	310006.	-11336.	-1.07E-04	0.00	2.29E+10	39.8102	107053.	0.00
14.9600	-0.00333	195586.	-10590.	9.10E-06	0.00	2.30E+10	46.3700	113744.	0.00
15.8400	-0.00373	86336.	-8820.	7.38E-05	0.00	2.31E+10	288.9830	817097.	0.00
16.7200	-0.00275	9312.	-5881.	9.56E-05	0.00	2.31E+10	267.6599	1028789.	0.00
17.6000	-0.00172	-37864.	-3211.	8.91E-05	0.00	2.31E+10	237.9572	1465105.	0.00
18.4800	-8.66E-04	-58505.	-895.384	6.71E-05	0.00	2.31E+10	200.6138	2447612.	0.00
19.3600	-2.98E-04	-56775.	933.2400	4.07E-05	0.00	2.31E+10	145.7164	5157400.	0.00
20.2400	-5.24E-06	-38795.	1716.	1.89E-05	0.00	2.31E+10	2.5604	5157400.	0.00
21.1200	1.01E-04	-20530.	1470.	5.34E-06	0.00	2.31E+10	-49.177	5157400.	0.00
22.0000	1.08E-04	-7749.	932.8374	-1.11E-06	0.00	2.31E+10	-52.559	5157400.	0.00
22.8800	7.72E-05	-828.391	456.3184	-3.07E-06	0.00	2.31E+10	-37.691	5157400.	0.00
23.7600	4.27E-05	1889.	147.1139	-2.83E-06	0.00	2.31E+10	-20.871	5157400.	0.00
24.6400	1.74E-05	2279.	-7.964	-1.88E-06	0.00	2.31E+10	-8.500	5157400.	0.00
25.5200	3.06E-06	1721.	-60.742	-9.65E-07	0.00	2.31E+10	-1.496	5157400.	0.00
26.4000	-2.98E-06	995.7758	-60.959	-3.45E-07	0.00	2.31E+10	1.4551	5157400.	0.00
27.2800	-4.22E-06	433.1853	-42.394	-1.85E-08	0.00	2.31E+10	2.0609	5157400.	0.00
28.1600	-3.37E-06	100.4101	-22.820	1.03E-07	0.00	2.31E+10	1.6463	5157400.	0.00
29.0400	-2.04E-06	-48.778	-8.873	1.15E-07	0.00	2.31E+10	0.9953	5157400.	0.00
29.9200	-9.40E-07	-86.978	-1.193	8.41E-08	0.00	2.31E+10	0.4591	5157400.	0.00
30.8000	-2.62E-07	-73.981	1.9057	4.73E-08	0.00	2.31E+10	0.1278	5157400.	0.00
31.6800	5.98E-08	-46.730	2.4263	1.98E-08	0.00	2.31E+10	-0.02922	5157400.	0.00
32.5600	1.56E-07	-22.737	1.8697	3.92E-09	0.00	2.31E+10	-0.07620	5157400.	0.00
33.4400	1.43E-07	-7.242	1.0998	-2.93E-09	0.00	2.31E+10	-0.06962	5157400.	0.00
34.3200	9.42E-08	0.4899	0.4893	-4.47E-09	0.00	2.31E+10	-0.04599	5157400.	0.00
35.2000	4.81E-08	3.0929	0.1223 -0.04573	-3.65E-09	0.00	2.31E+10	-0.02351	5157400.	0.00
36.0800 36.9600	1.70E-08	3.0738 2.1271	-0.04573	-2.24E-09 -1.06E-09	0.00 0.00	2.31E+10 2.31E+10	-0.00832 -3.66E-04	5157400. 5157400.	0.00 0.00
	7.49E-10			-1.06E-09	0.00				0.00
37.8400 38.7200	-5.28E-09 -5.81E-09	1.1395 0.4394	-0.07991 -0.05131	5.00E-11	0.00	2.31E+10 2.31E+10	0.00258 0.00284	5157400. 5157400.	0.00
39.6000	-4.22E-09	0.05577	-0.02544	1.63E-10	0.00	2.31E+10	0.00204	5157400.	0.00
40.4800	-2.37E-09	-0.09796	-0.00846	1.53E-10	0.00	2.31E+10	0.00200	5157400.	0.00
41.3600	-9.81E-10	-0.123	1.72E-04	1.03E-10	0.00	2.31E+10	4.79E-04	5157400.	0.00
42.2400	-1.89E-10	-0.09433	0.00319	5.34E-11	0.00	2.31E+10	9.25E-05	5157400.	0.00
43.1200	1.48E-10	-0.05549	0.00330	1.92E-11	0.00	2.31E+10	-7.21E-05	5157400.	0.00
44.0000	2.17E-10	-0.02468	0.00236	0.00	0.00	2.31E+10	-1.06E-04	5157400.	0.00
44.8800	1.67E-10	-0.00568	0.00137	-6.01E-12	0.00	2.31E+10	-8.16E-05	5157400.	0.00
45.7600	8.99E-11	0.00422	5.37E-04	-6.35E-12	0.00	2.31E+10	-7.58E-05	8910000.	0.00
46.6400	3.30E-11	0.00566	-1.04E-05	-4.09E-12	0.00	2.31E+10	-2.79E-05	8910000.	0.00
47.5200	3.47E-12	0.00400	-1.73E-04	-1.89E-12	0.00	2.31E+10	-2.93E-06	8910000.	0.00
48.4000	-6.80E-12	0.00201	-1.58E-04	0.00	0.00	2.31E+10	5.74E-06	8910000.	0.00
49.2800	-7.40E-12	6.56E-04	-9.49E-05	0.00	0.00	2.31E+10	6.24E-06	8910000.	0.00
50.1600	-4.83E-12	1.86E-06	-4.04E-05	0.00	0.00	2.31E+10	4.08E-06	8910000.	0.00
51.0400	-2.26E-12	-1.98E-04	-8.85E-06	0.00	0.00	2.31E+10	1.90E-06	8910000.	0.00
51.9200	0.00	-1.85E-04	4.04E-06	0.00	0.00	2.31E+10	5.36E-07	8910000.	0.00
52.8000	0.00	-1.12E-04	6.46E-06	0.00	0.00	2.31E+10	-7.88E-08	8910000.	0.00
53.6800	0.00	-4.86E-05	4.79E-06	0.00	0.00	2.31E+10	-2.37E-07	8910000.	0.00
54.5600	0.00	-1.12E-05	2.50E-06	0.00	0.00	2.31E+10	-1.97E-07	8910000.	0.00

55.4400	0.00	4.27E-06	8.76E-07	0.00	0.00	2.31E+10	-1.11E-07	8910000.	0.00
56.3200	0.00	7.32E-06	5.94E-08	0.00	0.00	2.31E+10	-4.33E-08	8910000.	0.00
57.2000	0.00	5.53E-06	-1.96E-07	0.00	0.00	2.31E+10	-5.07E-09	8910000.	0.00
58.0800	0.00	3.17E-06	-1.96E-07	0.00	0.00	2.31E+10	5.10E-09	4247271.	0.00
58.9600	0.00	1.39E-06	-1.35E-07	0.00	0.00	2.31E+10	6.47E-09	4247271.	0.00
59.8400	0.00	3.25E-07	-7.36E-08	0.00	0.00	2.31E+10	5.14E-09	4247271.	0.00
60.7200	0.00	-1.66E-07	-2.97E-08	0.00	0.00	2.31E+10	3.18E-09	4247271.	0.00
61.6000	0.00	-3.03E-07	-4.81E-09	0.00	0.00	2.31E+10	1.54E-09	4247271.	0.00
62.4800	0.00	-2.68E-07	5.88E-09	0.00	0.00	2.31E+10	4.87E-10	4247271.	0.00
63.3600	0.00	-1.78E-07	8.21E-09	0.00	0.00	2.31E+10	-4.54E-11	4247271.	0.00
64.2400	0.00	-9.42E-08	6.75E-09	0.00	0.00	2.31E+10	-2.32E-10	4247271.	0.00
65.1200	0.00	-3.58E-08	4.28E-09	0.00	0.00	2.31E+10	-2.36E-10	4247271.	0.00
66.0000	0.00	-3.78E-09	2.14E-09	0.00	0.00	2.31E+10	-1.70E-10	4247271.	0.00
66.8800	0.00	9.29E-09	7.26E-10	0.00	0.00	2.31E+10	-9.71E-11	4247271.	0.00
67.7600	0.00	1.15E-08	-8.98E-12	0.00	0.00	2.31E+10	-4.21E-11	4247271.	0.00
68.6400	0.00	9.10E-09	-2.82E-10	0.00	0.00	2.31E+10	-9.54E-12	4247271.	0.00
69.5200	0.00	5.60E-09	-3.04E-10	0.00	0.00	2.31E+10	5.38E-12	4247271.	0.00
70.4000	0.00	2.69E-09	-2.25E-10	0.00	0.00	2.31E+10	9.43E-12	4247271.	0.00
71.2800	0.00	8.37E-10	-1.32E-10	0.00	0.00	2.31E+10	8.27E-12	4247271.	0.00
72.1600	0.00	-9.58E-11	-5.94E-11	0.00	0.00	2.31E+10	5.48E-12	4247271.	0.00
73.0400	0.00	-4.18E-10	-1.53E-11	0.00	0.00	2.31E+10	2.87E-12	4247271.	0.00
73.9200	0.00	-4.20E-10	5.55E-12	0.00	0.00	2.31E+10	1.08E-12	4247271.	0.00
74.8000	0.00	-3.01E-10	1.18E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
75.6800	0.00	-1.71E-10	1.08E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
76.5600	0.00	-7.34E-11	7.32E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
77.4400	0.00	-1.60E-11	3.95E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
78.3200	0.00	9.99E-12	1.56E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
79.2000	0.00	1.69E-11	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
80.0800	0.00	1.47E-11	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
80.9600	0.00	9.66E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
81.8400	0.00	5.03E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
82.7200	0.00	1.87E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	2123635.	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
                                     0.69041379 inches
Computed slope at pile head
                                     -0.0075722 radians
Maximum bending moment
                                        943572. inch-lbs
Maximum shear force
                                         17000. lbs
Depth of maximum bending moment =
                                     7.92000000 feet below pile head
Depth of maximum shear force
                                       0.000000 feet below pile head
Number of iterations
                                            13
Number of zero deflection points =
                                            14
```

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

Boundary Condition Type 1, Shear and Moment

Shear = 17000. lbs
Moment = 0. in-lbs
Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
88.00000	0.69041379	943572.	17000.
83.60000	0.69078850	945122.	17000.
79.20000	0.69071271	941967.	17000.
74.80000	0.68852546	943713.	17000.
70.40000	0.68835976	942979.	17000.
66.00000	0.69071216	941830.	17000.
61.60000	0.68835027	941919.	17000.
57.20000	0.68920803	941874.	17000.
52.80000	0.68905606	941619.	17000.
48.40000	0.68801787	941118.	17000.
44.00000	0.68792101	941702.	17000.
39.60000	0.68780141	941055.	17000.
35.20000	0.68727376	940467.	17000.
30.80000	0.68714961	940142.	17000.
26.40000	0.68775852	940107.	17000.
22.00000	0.68729273	940246.	17000.
17.60000	0.69451500	936149.	17000.
13.20000	1.11846574	836710.	-17050.

Computed Values of Pile Loading and Deflection

for Lateral Loading for Load Case Number 4

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

Shear force at pile head = 17000.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 255000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.6153	4.32E-08	<mark>17000</mark> .	-0.00642	0.00	2.17E+10	0.00	0.00	0.00
0.8800	0.5475	196817.	16670.	-0.00638	0.00	2.17E+10	-62.537	1206.	0.00
1.7600	0.4807	386401.	15671.	-0.00623	0.00	2.17E+10	-126.547	2780.	0.00
2.6400	0.4158	561367.	14075.	-0.00600	0.00	2.17E+10	-175.808	4465.	0.00
3.5200	0.3539	715991.	12059.	-0.00569	0.00	2.17E+10	-205.973	6146.	0.00
4.4000	0.2956	846707.	9775.	-0.00531	0.00	2.16E+10	-226.554	8093.	0.00
5.2800	0.2417	951046.	7375.	-0.00486	0.00	2.10E+10	-228.096	9964.	0.00
6.1600	0.1929	1028662.	4838.	-0.00436	0.00	2.07E+10	-252.435	13820.	0.00
7.0400	0.1496	1076717.	2086.	-0.00382	0.00	2.05E+10	-268.666	18966.	0.00
7.9200	0.1121	1093319.	-810.585	-0.00326	0.00	2.05E+10	-279.983	26368.	0.00
8.8000	0.08064	1077179.	-3759.	-0.00271	0.00	2.05E+10	-278.484	36469.	0.00
9.6800	0.05500	1028492.	-6621.	-0.00217	0.00	2.07E+10	-263.560	50606.	0.00
10.5600	0.03490	949002.	-9255.	-0.00167	0.00	2.10E+10	-235.254	71191.	0.00
11.4400	0.01983	841994.	-11359.	-0.00122	0.00	2.16E+10	-163.314	86981.	0.00
12.3200	0.00910	715669.	-12648.	-8.42E-04	0.00	2.17E+10	-80.690	93671.	0.00
13.2000	0.00205	579406.	-13177.	-5.26E-04	0.00	2.17E+10	-19.488	100362.	0.00

14.0800	-0.00201	440209.	-13172.	-2.78E-04	0.00	2.17E+10	20.4128	107053.	0.00
14.9600	-0.00381	302711.	-12847.	-9.66E-05	0.00	2.17E+10	41.0656	113744.	0.00
15.8400	-0.00405	169396.	-11074.	1.84E-05	0.00	2.17E+10	294.8664	768037.	0.00
16.7200	-0.00342	68740.	-8024.	7.64E-05	0.00	2.17E+10	282.6858	871692.	0.00
17.6000	-0.00244	-483.361	-5160.	9.30E-05	0.00	2.17E+10	259.7558	1123577.	0.00
18.4800	-0.00146	-40739.	-2582.	8.30E-05	0.00	2.17E+10	228.4541	1651716.	0.00
19.3600	-6.89E-04	-55466.	-376.132	5.95E-05	0.00	2.17E+10	189.3638	2900654.	0.00
20.2400	-2.03E-04	-49004.	1148.	3.41E-05	0.00	2.17E+10	99.3821	5157400.	0.00
21.1200	3.04E-05	-31395.	1595.	1.45E-05	0.00	2.17E+10	-14.826	5157400.	0.00
22.0000	1.03E-04	-15398.	1252.	3.10E-06	0.00	2.17E+10	-50.168	5157400.	0.00
22.8800	9.59E-05	-4975.	739.5807	-1.86E-06	0.00	2.17E+10	-46.831	5157400.	0.00
23.7600	6.35E-05	232.3112	328.6549	-3.01E-06	0.00	2.17E+10	-30.996	5157400.	0.00
24.6400	3.22E-05	1983.	81.8602	-2.47E-06	0.00	2.17E+10	-15.745	5157400.	0.00
25.5200	1.12E-05	1975.	-30.181	-1.51E-06	0.00	2.17E+10	-5.475	5157400.	0.00
26.4000	3.37E-07	1353.	-59.956	-7.00E-07	0.00	2.17E+10	-0.164	5157400.	0.00
27.2800	-3.58E-06	712.0145	-51.604	-1.97E-07	0.00	2.17E+10	1.7463	5157400.	0.00
28.1600	-3.83E-06	264.5026	-32.519	4.07E-08	0.00	2.17E+10	1.8683	5157400.	0.00
29.0400	-2.71E-06	24.9894	-15.653	1.11E-07	0.00	2.17E+10	1.3260	5157400.	0.00
29.9200	-1.48E-06	-66.693	-4.846	1.01E-07	0.00	2.17E+10	0.7208	5157400.	0.00
30.8000	-5.80E-07	-77.905	0.4552	6.59E-08	0.00	2.17E+10	0.2832	5157400.	0.00
31.6800	-8.46E-08	-57.433	2.1687	3.29E-08	0.00	2.17E+10	0.04131	5157400.	0.00
32.5600	1.15E-07	-32.279	2.0894	1.11E-08	0.00	2.17E+10	-0.05632	5157400.	0.00
33.4400	1.49E-07								
		-13.364	1.4073	-4.69E-11	0.00	2.17E+10	-0.07287	5157400.	0.00
34.3200	1.14E-07	-2.556	0.7278	-3.92E-09	0.00	2.17E+10	-0.05584	5157400.	0.00
35.2000	6.63E-08	2.0283	0.2619	-4.05E-09	0.00	2.17E+10	-0.03239	5157400.	0.00
36.0800	2.87E-08	2.9982	0.01682	-2.83E-09	0.00	2.17E+10	-0.01404	5157400.	0.00
36.9600	6.58E-09	2.3988	-0.07427	-1.51E-09	0.00	2.17E+10	-0.00322	5157400.	0.00
37.8400	-3.24E-09	1.4377	-0.08290	-5.80E-10	0.00	2.17E+10	0.00158	5157400.	0.00
38.7200	-5.66E-09	0.6510	-0.05996	-7.10E-11	0.00	2.17E+10	0.00276	5157400.	0.00
39.6000	-4.74E-09	0.1716	-0.03316	1.29E-10	0.00	2.17E+10	0.00231	5157400.	0.00
40.4800	-2.93E-09	-0.05001	-0.01339	1.59E-10	0.00	2.17E+10	0.00143	5157400.	0.00
41.3600	-1.38E-09	-0.112	-0.00229	1.19E-10	0.00	2.17E+10	6.73E-04	5157400.	0.00
42.2400	-4.06E-10	-0.09892	0.00232	6.81E-11	0.00	2.17E+10	1.98E-04	5157400.	0.00
43.1200	5.89E-11	-0.06353	0.00321	2.85E-11	0.00	2.17E+10	-2.88E-05	5157400.	0.00
44.0000	1.97E-10	-0.03126	0.00255	5.43E-12	0.00	2.17E+10	-9.60E-05	5157400.	0.00
44.8800	1.74E-10	-0.00967	0.00160	-4.54E-12	0.00	2.17E+10	-8.48E-05	5157400.	0.00
45.7600	1.01E-10	0.00249	7.01E-04	-6.29E-12	0.00	2.17E+10	-8.50E-05	8910000.	0.00
46.6400	4.08E-11	0.00517	7.04E-05	-4.42E-12	0.00	2.17E+10	-3.44E-05	8910000.	0.00
47.5200	7.41E-12	0.00401	-1.44E-04	-2.18E-12	0.00	2.17E+10	-6.26E-06	8910000.	0.00
48.4000	-5.35E-12	0.00214	-1.53E-04	0.00	0.00	2.17E+10	4.51E-06	8910000.	0.00
49.2800	-7.12E-12	7.68E-04	-9.79E-05	0.00	0.00	2.17E+10	6.01E-06	8910000.	0.00
50.1600	-4.94E-12	6.82E-05	-4.42E-05	0.00	0.00	2.17E+10	4.17E-06	8910000.	0.00
51.0400	-2.42E-12	-1.66E-04	-1.14E-05	0.00	0.00	2.17E+10	2.04E-06	8910000.	0.00
51.9200	0.00	-1.73E-04	2.73E-06	0.00	0.00	2.17E+10	6.30E-07	8910000.	0.00
52.8000	0.00	-1.09E-04	5.89E-06	0.00	0.00		-3.01E-08	8910000.	0.00
53.6800	0.00	-4.88E-05	4.60E-06	0.00	0.00	2.17E+10	-2.15E-07	8910000.	0.00
54.5600	0.00	-1.23E-05	2.46E-06	0.00	0.00	2.17E+10	-1.89E-07	8910000.	0.00
55.4400	0.00	3.22E-06	8.89E-07	0.00	0.00	2.17E+10	-1.09E-07	8910000.	0.00
56.3200	0.00	6.55E-06	8.54E-08	0.00	0.00	2.17E+10	-4.32E-08	8910000.	0.00
57.2000	0.00	5.05E-06	-1.73E-07	0.00	0.00	2.17E+10	-5.80E-09	8910000.	0.00
58.0800	0.00	2.90E-06	-1.80E-07	0.00	0.00	2.17E+10	4.62E-09	4247271.	0.00
58.9600	0.00	1.26E-06	-1.24E-07	0.00	0.00	2.17E+10	5.99E-09	4247271.	0.00
59.8400	0.00	2.91E-07		0.00	0.00	2.17E+10	4.75E-09	4247271.	0.00
60.7200	0.00	-1.52E-07	-2.65E-08	0.00	0.00	2.17E+10	2.91E-09	4247271.	0.00
61.6000	0.00	-2.71E-07	-3.89E-09	0.00	0.00	2.17E+10	1.38E-09	4247271.	0.00
62.4800	0.00	-2.36E-07	5.59E-09	0.00	0.00	2.17E+10	4.15E-10	4247271.	0.00
63.3600	0.00	-1.54E-07	7.45E-09	0.00	0.00	2.17E+10	-6.19E-11	4247271.	0.00
64.2400	0.00	-7.91E-08	5.97E-09	0.00	0.00	2.17E+10	-2.20E-10	4247271.	0.00
65.1200	0.00	-2.83E-08	3.68E-09	0.00	0.00	2.17E+10	-2.14E-10	4247271.	0.00
66.0000	0.00	-1.35E-09	1.76E-09	0.00	0.00	2.17E+10	-1.49E-10	4247271.	0.00
66.8800	0.00	8.99E-09	5.42E-10	0.00	0.00	2.17E+10	-8.19E-11	4247271.	0.00
67.7600	0.00	1.02E-08	-6.57E-11	0.00	0.00		-3.32E-11	4247271.	0.00
68.6400	0.00	7.65E-09	-2.71E-10	0.00	0.00		-5.59E-12	4247271.	0.00
22.0.00	0.00			0.00	0.00		J.JJL 12		0.00

69.5200	0.00	4.49E-09	-2.67E-10	0.00	0.00	2.17E+10	6.23E-12	4247271.	0.00
70.4000	0.00	2.01E-09	-1.88E-10	0.00	0.00	2.17E+10	8.77E-12	4247271.	0.00
71.2800	0.00	5.13E-10	-1.04E-10	0.00	0.00	2.17E+10	7.15E-12	4247271.	0.00
72.1600	0.00	-1.89E-10	-4.27E-11	0.00	0.00	2.17E+10	4.47E-12	4247271.	0.00
73.0400	0.00	-3.93E-10	-7.67E-12	0.00	0.00	2.17E+10	2.18E-12	4247271.	0.00
73.9200	0.00	-3.53E-10	7.50E-12	0.00	0.00	2.17E+10	0.00	4247271.	0.00
74.8000	0.00	-2.36E-10	1.09E-11	0.00	0.00	2.17E+10	0.00	4247271.	0.00
75.6800	0.00	-1.24E-10	8.98E-12	0.00	0.00	2.17E+10	0.00	4247271.	0.00
76.5600	0.00	-4.63E-11	5.65E-12	0.00	0.00	2.17E+10	0.00	4247271.	0.00
77.4400	0.00	-4.26E-12	2.78E-12	0.00	0.00	2.17E+10	0.00	4247271.	0.00
78.3200	0.00	1.25E-11	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
79.2000	0.00	1.50E-11	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
80.0800	0.00	1.16E-11	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
80.9600	0.00	6.92E-12	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
81.8400	0.00	3.19E-12	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	4247271.	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	2123635.	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. 4:

Pile-head deflection = 0.61530006 inches
Computed slope at pile head = -0.0064233 radians
Maximum bending moment = 1093319. inch-lbs
Maximum shear force = 17000. lbs
Depth of maximum bending moment = 7.92000000 feet below pile head

Depth of maximum bending moment = 7.92000000 feet below pile head

Number of iterations = 0.000000 feet below pile head

Number of zero deflection points = 14

Pile-head Deflection vs. Pile Length for Load Case 4

Boundary Condition Type 1, Shear and Moment

Shear = 17000. lbs Moment = 0. in-lbs Axial Load = 255000. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
88.00000	0.61530006	1093319.	17000.
83.60000	0.61348000	1089391.	17000.
79.20000	0.61380440	1092289.	17000.
74.80000	0.61264910	1089072.	17000.

```
70.40000
           0.61319497
                           1090001.
                                           17000.
66.00000
           0.61394643
                           1091468.
                                           17000.
61.60000
           0.61212961
                           1089464.
                                           17000.
57.20000
           0.61182394
                           1089709.
                                           17000.
52.80000
           0.61197488
                           1089784.
                                           17000.
48.40000
           0.61180308
                           1088657.
                                           17000.
44.00000
           0.61143403
                           1089161.
                                           17000.
39.60000
           0.61097070
                                           17000.
                           1088598.
35.20000
           0.61046821
                           1087661.
                                           17000.
30.80000
           0.61049462
                           1087766.
                                           17000.
26.40000
           0.61049923
                           1087988.
                                           17000.
22.00000
           0.61077950
                           1087611.
                                           17000.
17.60000
                           1074240.
           0.63599666
                                           17000.
13.20000
           1.93209641
                           1144269.
                                          -28017.
 8.80000
           -4.7067075
                            212580.
                                           28159.
```

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 Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	1bs	inches	radians	lbs	in-lbs
1 V, lb	17000.	S, rad	0.00	0.00	0.1838	0.00	17000.	-896128.
2 V, 1b	17000.	S, rad	0.00	255000.	0.1578	0.00	17000.	-973254.
3 V, 1b	17000.	M, in-lb	0.00	0.00	0.6904	-0.00757	17000.	943572.
4 V, 1b	17000.	M, in-lb	0.00	255000.	0.6153	-0.00642	17000.	1093319.

Maximum pile-head deflection = 0.6904137881 inches

Maximum pile-head rotation = -0.0075721608 radians = -0.433853 deg.

The analysis ended normally.

Job Number: 088549.00

Analysis of Individual Piles and Drilled Shafts Subjected to Lateral Loading Using the p-y Method © 1985-2022 by Ensoft, Inc. All Rights Reserved
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Files Used for Analysis
Path to file locations: \\Sme-inc\pz\WIP\088549.00\Project Data\LPile\
Name of input data file: CUY-17-13.50 Pier Pile B003 Service Limit.lp12d
Name of output report file: CUY-17-13.50 Pier Pile B003 Service Limit.lp12o
Name of plot output file: CUY-17-13.50 Pier Pile B003 Service Limit.lp12p
Name of runtime message file: CUY-17-13.50 Pier Pile B003 Service Limit.lp12r
Date and Time of Analysis
Date: July 3, 2024 Time: 10:53:04
Problem Title
Project Name: CUY-17-13.50

LPile for Windows, Version 2022-12.009

B-003-0-22 Profile Controls - Service Load

Client: ODOT

Engineer: Brendan P. Lieske

Description: Pier Pile Analysis

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
- 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 = 88.000 ft
Depth of ground surface below top of pile = 0.0000 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.

Depth Below

Pile

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	16.0000
2	88.000	16.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a drilled shaft with permanent casing $% \left(1\right) =\left(1\right) \left(1\right) \left($

Length of section = 88.000000 ft
Casing outside diameter = 16.000000 in

Soil and Rock Layering Information

Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

0.0000 ft Distance from top of pile to top of layer Distance from top of pile to bottom of layer 3.400000 ft Effective unit weight at top of layer 59.600000 pcf Effective unit weight at bottom of layer 59.600000 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

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer 3.400000 ft Distance from top of pile to bottom of layer 16.400000 ft Effective unit weight at top of layer 62.600000 pcf Effective unit weight at bottom of layer 62.600000 pcf Friction angle at top of layer 32.000000 deg. 32.000000 deg. Friction angle at bottom of layer Subgrade k at top of layer 60.000000 pci Subgrade k at bottom of layer 60.000000 pci

Layer 3 is stiff clay without free water

= 16.400000 ft Distance from top of pile to top of layer Distance from top of pile to bottom of layer 36.400000 ft Effective unit weight at top of layer 57.600000 pcf 57.600000 pcf Effective unit weight at bottom of layer Undrained cohesion at top of layer 2300. psf Undrained cohesion at bottom of layer 2300. 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 = 36.400000 ft

```
Distance from top of pile to bottom of layer
                                                       47.200000 ft
  Effective unit weight at top of layer
                                                       55.600000 pcf
  Effective unit weight at bottom of layer
                                                        55.600000 pcf
  Undrained cohesion at top of layer
                                                           1600. psf
                                                           1600. psf
  Undrained cohesion at bottom of layer
  Epsilon-50 at top of layer
                                                         0.007000
  Epsilon-50 at bottom of layer
                                                        0.007000
Layer 5 is stiff clay without free water
   Distance from top of pile to top of layer
                                                       47.200000 ft
                                                        86.400000 ft
  Distance from top of pile to bottom of layer
  Effective unit weight at top of layer
                                                       57.600000 pcf
                                                       57.600000 pcf
  Effective unit weight at bottom of layer
  Undrained cohesion at top of layer
                                                           1750. psf
  Undrained cohesion at bottom of layer
                                                           1750. psf
  Epsilon-50 at top of layer
                                                         0.007000
  Epsilon-50 at bottom of layer
                                                        0.007000
Layer 6 is stiff clay without free water
   Distance from top of pile to top of layer
                                                       86.400000 ft
  Distance from top of pile to bottom of layer
                                                      105.400000 ft
                                                       77.600000 pcf
  Effective unit weight at top of layer
  Effective unit weight at bottom of layer
                                                       77.600000 pcf
  Undrained cohesion at top of layer
                                                           4400. psf
  Undrained cohesion at bottom of layer
                                                           4400. psf
  Epsilon-50 at top of layer
                                                        0.004000
  Epsilon-50 at bottom of layer
                                                         0.004000
Layer 7 is massive rock, p-y criteria by Liang et al., 2009
  Distance from top of pile to top of layer
                                                   = 105.400000 ft
  Distance from top of pile to bottom of layer
                                                   = 150.000000 ft
  Effective unit weight at top of layer
                                                       92,600000 pcf
  Effective unit weight at bottom of layer
                                                       92.600000 pcf
                                                   = 1000.000000 psi
  Uniaxial compressive strength at top of layer
                                                  = 1000.000000 psi
  Uniaxial compressive strength at bottom of layer
  Poisson's ratio at top of layer
                                                        0.180000
  Poisson's ratio at bottom of layer
                                                        0.180000
  Option 1: Intact rock modulus at top of layer
                                                          0.0000 psi
           Intact rock modulus at bottom of layer
                                                          0.0000 psi
  Option 1: Geologic Strength Index for layer
                                                        50.000000
  Option 2: Rock mass modulus at top of layer
                                                         380838. psi
            Rock mass modulus at bottom of layer
                                                         380838. psi
  Option 2 will use the input value of rock mass modulus to compute the p-y curve
           in massive rock.
  The rock type is (sedimentary) shales, Hoek-Brown Material Constant mi = 6
 (Depth of the lowest soil layer extends 62.000 ft below the pile tip)
______
                      Summary of Input Soil Properties
______
Layer
             Soil Type
                                         Effective
                                                    Cohesion
                                                                 Angle of
                                                                             Uniaxial
                                                                                            E50
                                                                                                                  Rock Mass
                                                                                                                             Geologic
                                                                                                                                          Int. Rock
                                                                                                                                                    Hoek-Brown
                              Layer
Num.
              Name
                              Depth
                                         Unit Wt.
                                                                 Friction
                                                                                                                  Modulus
                                                                                                                             Strength
                                                                                                                                          Modulus
                                                                                                                                                      Material
                                                                                                                                                                  Poisson's
```

	(p-y Curve Type)	ft	pcf	psf	deg.	psi	krm	pci	psi	Index	psi	Index, mi	Ratio
1	Sand	0.00	59.6000		33.0000			60.0000			0.00	0.00	0.00
	(Reese, et al.)	3.4000	59.6000		33.0000			60.0000			0.00	0.00	0.00
2	Sand	3.4000	62.6000		32.0000			60.0000			0.00	0.00	0.00
	(Reese, et al.)	16.4000	62.6000		32.0000			60.0000			0.00	0.00	0.00
3	Stiff Clay	16.4000	57.6000	2300.			0.00500				0.00	0.00	0.00
	w/o Free Water	36.4000	57.6000	2300.			0.00500				0.00	0.00	0.00
4	Stiff Clay	36.4000	55.6000	1600.			0.00700				0.00	0.00	0.00
	w/o Free Water	47.2000	55.6000	1600.			0.00700				0.00	0.00	0.00
5	Stiff Clay	47.2000	57.6000	1750.			0.00700				0.00	0.00	0.00
	w/o Free Water	86.4000	57.6000	1750.			0.00700				0.00	0.00	0.00
6	Stiff Clay	86.4000	77.6000	4400.			0.00400				0.00	0.00	0.00
	w/o Free Water	105.4000	77.6000	4400.			0.00400				0.00	0.00	0.00
7	Massive	105.4000	92.6000			1000.0000			380838.	50.0000	0.00	6.0000	0.1800
	Rock	150.0000	92.6000			1000.0000				50.0000	0.00	6.0000	0.1800

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 = 4

Load Load No. Type			Condition 1		Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis	
1	2	V =	17000. lbs	S =	0.0000 in/in	0.0000000	Yes	Yes	
2	2	V =	17000. lbs	S =	0.0000 in/in	255000.	Yes	Yes	
3	1	V =	17000. lbs	M =	0.0000 in-lbs	0.0000000	Yes	Yes	
4	1	V =	17000. lbs	M =	0.0000 in-lbs	255000.	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) with Permanent Casing:

Length of Section	=	88.000000	ft
Outer Diameter of Casing	=	16.000000	in
Casing Wall Thickness		0.250000	in
Moment of Inertia of Steel Casing	=	383.663935	in^4
Yield Stress of Casing	=	50000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Area of Single Reinforcing Bar	=	0.0000	sq. in.
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in
Yield Stress of Reinforcing Bars	=	0.0000	psi
Modulus of Elasticity of Reinforcing Bars	=	0.0000	psi
Gross Area of Pile	=	201.061930	•
Area of Concrete	=	188.691909	sq. in.
Cross-sectional Area of Steel Casing	=		
Area of All Steel (Casing and Bars)	=	12.370021	
Area Ratio of All Steel to Gross Area of Pile	=	6.15	percent
Axial Structural Capacities:			
Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	1260.054	kips
Tensile Load for Cracking of Concrete	=		
Nominal Axial Tensile Capacity	=	-618.501	kips
Concrete Properties:			
Compressive Strength of Concrete	=	4000.	psi
Modulus of Elasticity of Concrete		3604997.	•
Modulus of Rupture of Concrete	=	-474.34165	psi
Compression Strain at Peak Stress	=		
Tensile Strain at Fracture of Concrete	=	-0.0001154	

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

0.750000 in

Number	Axial Thrust Force
	kips
1	0.000
2	255.000

Maximum Coarse Aggregate Size

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

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 = 0.000 kips

	nding	Bending Moment	Bending Stiffness	Depth to	Max Comp	Max Tens	Max Conc	Max Steel	Max Casing	Run
	ature			N Axis	Strain	Strain	Stress	Stress	Stress	Msg
rad	l/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi	ksi	
9 99	0000125	28.9033419	23122674.	8.0000000	0.00001000	-0.00001000	0.0418774	0.00000	0.2871000	
	000123	57.7542839	23101714.	8.0000000	0.00002000	-0.00002000	0.0835345	0.00000	0.5742000	
	000230	86.5528259	23080754.	8.0000000	0.00003000	-0.00003000	0.1249712	0.00000	0.8613000	
	000575	115.2989680	23059794.	8.0000000	0.00004000	-0.00004000	0.1661875	0.00000	1.1484000	
		143.9927102								
	000625		23038834.	8.0000000	0.00005000	-0.00005000	0.2071834	0.00000	1.4355000	
	000750	172.6340525	23017874.	8.0000000	0.00006000	-0.00006000	0.2479590	0.00000	1.7226000	
	0000875	201.2229948	22996914.	8.0000000	0.00007000	-0.00007000	0.2885142	0.00000	2.0097000	
	001000	229.7595373	22975954.	8.0000000	0.00008000	-0.00008000	0.3288490	0.00000	2.2968000	
	0001125	258.2436798	22954994.	8.0000000	0.00009000	-0.00009000	0.3689635	0.00000	2.5839000	
	001250	286.6754223	22934034.	8.0000000	0.0001000	-0.00010000	0.4088576	0.00000	2.8710000	
	001375	315.0547650	22913074.	8.0000000	0.0001100	-0.000110	0.4485313	0.00000	3.1581000	
	001500	315.0547650	21003651.	6.1265455	0.00009190	-0.000148	0.3754186	0.00000	-4.260153	
	001625	315.0547650	19387986.	6.1277790	0.00009958	-0.000160	0.4059492	0.00000	-4.614584	
	001750	315.0547650	18003129.	6.1290144	0.0001073	-0.000173	0.4363631	0.00000	-4.968925	
	001875	315.0547650	16802921.	6.1302515	0.0001149	-0.000185	0.4666602	0.00000	-5.323176	
0.00	002000	315.0547650	15752738.	6.1314904	0.0001226	-0.000197	0.4968404	0.00000	-5.677336	
	002125	315.0547650	14826107.	6.1327311	0.0001303	-0.000210	0.5269036	0.00000	-6.031404	
0.00	002250	330.0087250	14667054.	6.1339736	0.0001380	-0.000222	0.5568496	0.00000	-6.385382	С
0.00	002375	348.2686053	14663941.	6.1352179	0.0001457	-0.000234	0.5866782	0.00000	-6.739269	C
0.00	002500	366.5206047	14660824.	6.1364640	0.0001534	-0.000247	0.6163894	0.00000	-7.093064	C
0.00	002625	384.7647083	14657703.	6.1377119	0.0001611	-0.000259	0.6459830	0.00000	-7.446767	С
0.00	002750	403.0009009	14654578.	6.1389617	0.0001688	-0.000271	0.6754589	0.00000	-7.800378	С
0.00	002875	421.2291676	14651449.	6.1402133	0.0001765	-0.000283	0.7048169	0.00000	-8.153897	С
0.00	0003000	439.4494932	14648316.	6.1414667	0.0001842	-0.000296	0.7340569	0.00000	-8.507324	C
0.00	003125	457.6618624	14645180.	6.1427219	0.0001920	-0.000308	0.7631787	0.00000	-8.860658	С
0.00	003250	475.8662601	14642039.	6.1439790	0.0001997	-0.000320	0.7921823	0.00000	-9.213900	C
0.00	003375	494.0626709	14638894.	6.1452380	0.0002074	-0.000333	0.8210675	0.00000	-9.567048	С
0.00	003500	512.2510794	14635745.	6.1464988	0.0002151	-0.000345	0.8498341	0.00000	-9.920104	C
0.00	003625	530.4314702	14632592.	6.1477615	0.0002229	-0.000357	0.8784821	0.00000	-10.273066	С
	003750	548.6038278	14629435.	6.1490260	0.0002306	-0.000369	0.9070112	0.00000	-10.625934	
	003875	566.7681368	14626274.	6.1502925	0.0002383	-0.000382	0.9354214	0.00000	-10.978709	
0.00	004000	584.9243814	14623110.	6.1515608	0.0002461	-0.000394	0.9637124	0.00000	-11.331389	С
	004125	603.0725461	14619941.	6.1528309	0.0002538	-0.000406	0.9918842	0.00000	-11.683976	
	004250	621.2126151	14616767.	6.1541030	0.0002615	-0.000418	1.0199367	0.00000	-12.036468	
	004375	639.3445727	14613590.	6.1553770	0.0002693	-0.000431	1.0478696	0.00000	-12.388865	
	004500	657.4684030	14610409.	6.1566529	0.0002770	-0.000443	1.0756828	0.00000	-12.741168	
	004625	675.5840901	14607224.	6.1579306	0.0002848	-0.000455	1.1033762	0.00000	-13.093375	
	004750	693.6916180	14604034.	6.1592103	0.0002926	-0.000467	1.1309497	0.00000	-13.445488	
	004875	711.7909831	14600841.	6.1604839	0.0003003	-0.000480	1.1584017	0.00000	-13.797516	
	005125	747.9651747	14594442.	6.1630109	0.0003159	-0.000504	1.2129399	0.00000	-14.501325	
	005125	784.1064944	14588028.	6.1655454	0.0003133	-0.000529	1.2669953	0.00000	-15.204756	
	005575	820.2148141	14581597.	6.1680875	0.0003314	-0.000553	1.3205669	0.00000	-15.907807	
	005875	856.2900048	14575149.	6.1706371	0.0003470	-0.000577	1.3736534	0.00000	-16.610477	
	0006125	892.3319365	14568685.	6.1731944	0.0003781			0.00000	-17.312763	
	006125	928.3404783	14562204.	6.1757594	0.0003781	-0.000602 -0.000626	1.4262537 1.4783667	0.00000	-17.312763	
	006625	964.3154981	14555706.	6.1783320	0.0004093	-0.000651	1.5299911	0.00000	-18.716179	
	006875	1000.	14549191.	6.1809125	0.0004249	-0.000675	1.5811257	0.00000	-19.417305	
	007125	1036.	14542659.	6.1835008	0.0004406	-0.000699	1.6317694	0.00000	-20.118041	
	007375	1072.	14536110.	6.1860969	0.0004562	-0.000724	1.6819211	0.00000	-20.818385	
	007625	1108.	14529543.	6.1887010	0.0004719	-0.000748	1.7315793	0.00000	-21.518335	
	007875	1144.	14522960.	6.1913131	0.0004876	-0.000772	1.7807430	0.00000	-22.217889	
	0008125	1179.	14516359.	6.1939331	0.0005033	-0.000797	1.8294110	0.00000	-22.917045	
	0008375	1215.	14509740.	6.1965613	0.0005190	-0.000821	1.8775819	0.00000	-23.615802	
	008625	1251.	14503104.	6.1991975	0.0005347	-0.000845	1.9252546	0.00000	-24.314157	
0.00	008875	1287.	14496450.	6.2018420	0.0005504	-0.000870	1.9724277	0.00000	-25.012109	C

0.00009125	1322.	14489778.	6.2044946	0.0005662	-0.000894	2.0191001	0.00000	-25.709656 C
0.00009375	1358.	14483088.	6.2071556	0.0005819	-0.000918	2.0652705	0.00000	-26.406796 C
0.00009625	1393.	14476380.	6.2098248	0.0005977	-0.000942	2.1109375	0.00000	-27.103526 C
0.00009875	1429.	14469654.	6.2125025	0.0006135	-0.000967	2.1561000	0.00000	-27.799846 C
0.0001013	1464.	14462909.	6.2151886	0.0006293	-0.000991	2.2007565	0.00000	-28.495752 C
0.0001013	1500.	14456147.	6.2178831	0.0006451	-0.001015	2.2449059	0.00000	-29.191244 C
0.0001063	1535.	14449365.	6.2205863	0.0006609	-0.001039	2.2885467	0.00000	-29.886318 C
0.0001088	1571.	14442566.	6.2232980	0.0006768	-0.001063	2.3316777	0.00000	-30.580974 C
0.0001113	1606.	14435747.	6.2260184	0.0006926	-0.001087	2.3742976	0.00000	-31.275208 C
0.0001138	1641.	14428910.	6.2287475	0.0007085	-0.001111	2.4164049	0.00000	-31.969019 C
0.0001163	1677.	14422053.	6.2314853	0.0007244	-0.001136	2.4579983	0.00000	-32.662405 C
0.0001188	1712.	14415178.	6.2342320	0.0007403	-0.001160	2.4990765	0.00000	-33.355363 C
0.0001213	1747.	14408283.	6.2369876	0.0007562	-0.001184	2.5396381	0.00000	-34.047892 C
0.0001238	1782.	14401369.	6.2397521	0.0007722	-0.001208	2.5796817	0.00000	-34.739989 C
0.0001263	1817.	14394436.	6.2425257	0.0007881	-0.001232	2.6192059	0.00000	-35.431653 C
0.0001288	1852.	14387483.	6.2453083	0.0008041	-0.001256	2.6582093	0.00000	-36.122880 C
0.0001313	1887.	14380511.	6.2481000	0.0008201	-0.001280	2.6966905	0.00000	-36.813669 C
0.0001338	1922.	14373518.	6.2509009	0.0008361	-0.001304	2.7346481	0.00000	-37.504018 C
0.0001363	1957.	14366506.	6.2537111	0.0008521	-0.001328	2.7720807	0.00000	-38.193924 C
0.0001388	1992.	14359474.	6.2565306	0.0008681	-0.001352	2.8089867	0.00000	-38.883385 C
0.0001413	2027.	14352422.	6.2593594	0.0008841	-0.001376	2.8453647	0.00000	-39.572399 C
0.0001418	2062.	14345349.	6.2621977	0.0000041	-0.001400	2.8812133	0.00000	-40.260963 C
0.0001458	2002.	14338256.	6.2650455	0.0009062	-0.001400	2.9165310	0.00000	-40.200303 C
			6.2679028					
0.0001488	2132.	14331142.		0.0009324	-0.001448	2.9513162	0.00000	-41.636734 C
0.0001588	2271.	14302480.	6.2794292	0.0009969	-0.001543	3.0851028	0.00000	-44.382777 C
0.0001688	2409.	14273478.	6.2911141	0.0010616	-0.001638	3.2102483	0.00000	-47.121360 C
0.0001788	2546.	14244127.	6.3029619	0.0011267	-0.001733	3.3266514	0.00000	-49.852321 C
0.0001888	2663.	14107880.	6.2948286	0.0011881	-0.001832	3.4281248	0.00000	-50.000000 CY
0.0001988	2756.	13865633.	6.2656203	0.0012453	-0.001935	3.5149099	0.00000	-50.000000 CY
0.0002088	2835.	13583103.	6.2271715	0.0012999	-0.002040	3.5911567	0.00000	-50.000000 CY
0.0002188	2905.	13281364.	6.1833056	0.0013526	-0.002147	3.6584711	0.00000	-50.000000 CY
0.0002288	2968.	12973720.	6.1361879	0.0014037	-0.002256	3.7179118	0.00000	-50.000000 CY
0.0002388	3024.	12665024.	6.0866979	0.0014532	-0.002367	3.7701425	0.00000	-50.000000 CY
0.0002488	3075.	12361017.	6.0366080	0.0015016	-0.002478	3.8159958	0.00000	-50.000000 CY
0.0002588	3122.	12063842.	5.9861817	0.0015489	-0.002591	3.8558780	0.00000	-50.000000 CY
0.0002688	3164.	11774704.	5.9353039	0.0015951	-0.002705	3.8901017	0.00000	-50.000000 CY
0.0002788	3204.	11495126.	5.8851977	0.0016405	-0.002820	3.9192105	0.00000	-50.000000 CY
0.0002888	3241.	11224812.	5.8357589	0.0016851	-0.002935	3.9434422	0.00000	-50.000000 CY
0.0002988	3276.	10964087.	5.7863563	0.0017287	-0.003051	3.9629669	0.00000	-50.000000 CY
0.0003088	3307.	10710113.	5.7400431	0.0017722	-0.003168	3.9783624	0.00000	50.0000000 CY
0.0003188	3334.	10460823.	5.6985259	0.0018164	-0.003284	3.9897756	0.00000	50.0000000 CY
0.0003288	3358.	10215614.	5.6610944	0.0018611	-0.003399	3.9970199	0.00000	50.0000000 CY
0.0003288	3380.	9976843.	5.6269309	0.0010011	-0.003514	3.9999409	0.00000	50.0000000 CY
0.0003388	3399.	9745757.	5.5955927	0.0019515	-0.003514	3.9996149	0.00000	50.0000000 CY
0.0003488	3416.	9523000.	5.5662590	0.0019313	-0.003743	3.9987849	0.00000	50.0000000 CY
0.0003588	3432.	9308170.		0.0019909	-0.003858	3.9972709	0.00000	50.0000000 CY
			5.5389169					
0.0003788	3447.	9100662.	5.5135311	0.0020882	-0.003972	3.9998848	0.00000	50.0000000 CY
0.0003888	3460.	8901054.	5.4887163	0.0021337	-0.004086	3.9988175	0.00000	50.0000000 CY
0.0003988	3472.	8708397.	5.4658986	0.0021795	-0.004200	3.9980699	0.00000	50.0000000 CY
0.0004088	3484.	8523221.	5.4442003	0.0022253	-0.004315	3.9995204	0.00000	50.0000000 CY
0.0004188	3494.	8344491.	5.4239346	0.0022713	-0.004429	3.9971332	0.00000	50.0000000 CY
0.0004288	3504.	8172419.	5.4045088	0.0023172	-0.004543	3.9997475	0.00000	50.0000000 CY
0.0004388	3513.	8006495.	5.3866025	0.0023634	-0.004657	3.9972566	0.00000	50.0000000 CY
0.0004488	3521.	7846958.	5.3693480	0.0024095	-0.004771	3.9997377	0.00000	50.0000000 CY
0.0004588	3529.	7692389.	5.3530585	0.0024557	-0.004884	3.9966663	0.00000	50.0000000 CY
0.0004688	3536.	7543789.	5.3370328	0.0025017	-0.004998	3.9994541	0.00000	50.0000000 CY
0.0004788	3543.	7400062.	5.3219576	0.0025479	-0.005112	3.9967029	0.00000	50.0000000 CY
0.0004888	3549.	7261361.	5.3077013	0.0025941	-0.005226	3.9986203	0.00000	50.0000000 CY
0.0004988	3555.	7127694.	5.2938021	0.0025541	-0.005340	3.9999812	0.00000	50.0000000 CY
0.0004988	3560.	6998088.	5.2811275	0.0026468	-0.005453	3.9966978	0.00000	50.0000000 CY
0.0005188	3565.	6873062.	5.2688905	0.0027332	-0.005567	3.9993233	0.00000	50.0000000 CY
0.0005288		6752275.	5.2568684	0.0027796	-0.005680		0.00000	50.0000000 CY
	3570.					3.9984329		
0.0005388	3575.	6635114.	5.2460219	0.0028263	-0.005794	3.9970441	0.00000	50.0000000 CY

0.0005488	3579.	6521915.	5.2355609	0.0028730	-0.005907	3.9994075	0.00000	50.0000000 CY
0.0006088	3599.	5912613.	5.1804388	0.0031536	-0.006586	3.9974551	0.00000	50.0000000 CY
0.0006688	3613.	5403248.	5.1373912	0.0034356	-0.007264	3.9999948	0.00000	50.0000000 CY
0.0007288	3623.	4971935.	5.1043568	0.0037198	-0.007940	3.9917765	0.00000	50.0000000 CY
0.0007888	3629.	4600505.	5.0821898	0.0040086	-0.008611	3.9916478	0.00000	50.0000000 CY

Axial Thrust Force = 255.000 kips

Bending Curvature	Bending Moment	Bending Stiffness	Depth to N Axis	Max Comp Strain	Max Tens Strain	Max Conc Stress	Max Steel Stress	Max Casing F Stress M
rad/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi	ksi
		21680253.	191.7403380	0.0002397	0.0002197	0.9515544	0.00000	6.9476873
0.00000250	54.2004074	21680163.	99.8757959	0.0002497	0.0002097	0.9881508	0.00000	7.2351952
0.00000375	81.3000510	21680014.	69.2567828	0.0002597	0.0001997	1.0245604	0.00000	7.5229751
0.00000500	108.3990222	21679804.	53.9491519	0.0002697	0.0001897	1.0607828	0.00000	7.8110270
0.00000625	135.4970972	21679536.	44.7660740	0.0002798	0.0001798	1.0968171	0.00000	8.0993509
0.00000750	162.5940516	21679207.	38.6452727	0.0002898	0.0001698	1.1326630	0.00000	8.3879468
0.00000875	189.6896615	21678818.	34.2743438	0.0002999	0.0001599	1.1683196	0.00000	8.6768148
0.00001000	216.7837027	21678370.	30.9970852	0.0003100	0.0001500	1.2037864	0.00000	8.9659547
0.00001125	243.8759508	21677862.	28.4489401	0.0003201	0.0001401	1.2390627	0.00000	9.2553668
0.00001250	270.9661818	21677295.	26.4111747	0.0003301	0.0001301	1.2741479	0.00000	9.5450509
0.00001375	298.0541714	21676667.	24.7445945	0.0003402	0.0001202	1.3090415	0.00000	9.8350071
0.00001500	325.1396952	21675980.	23.3564033	0.0003503	0.0001103	1.3437427	0.00000	10.1252355
0.00001625	352.2225289	21675233.	22.1823576	0.0003605	0.0001005	1.3782509	0.00000	10.4157361
0.00001750	379.3024481	21674426.	21.1765691	0.0003706	0.00009059	1.4125655	0.00000	10.7065089
0.00001875	406.3792283	21673559.	20.3053864	0.0003807	0.00008073	1.4466859	0.00000	10.9975539
0.00002000	433.4526451	21672632.	19.5435711	0.0003909	0.00007087	1.4806114	0.00000	11.2888713
0.00002125	460.5224738	21671646.	18.8718231	0.0004010	0.00006103	1.5143415	0.00000	11.5804610
0.00002250	487.5884899	21670600.	18.2751312	0.0004112	0.00005119	1.5478754	0.00000	11.8723232
0.00002375	514.6504685	21669493.	17.7416446	0.0004214	0.00004136	1.5812125	0.00000	12.1644578
.00002500	541.7081849	21668327.	17.2618825	0.0004315	0.00003155	1.6143523	0.00000	12.4568649
0.00002625	568.7614142	21667101.	16.8281702	0.0004417	0.00002174	1.6472940	0.00000	12.7495446
0.00002750	595.8099314	21665816.	16.4342281	0.0004519	0.00001194	1.6800371	0.00000	13.0424970
0.00002875	622.8535116	21664470.	16.0748689	0.0004622	0.00000215	1.7125809	0.00000	13.3357220
0.00003000	649.8919292	21663064.	15.7457698	0.0004724	-0.00000763	1.7449248	0.00000	13.6292198
0.00003125	676.9246065	21661587.	15.4432984	0.0004826	-0.00001740	1.7770680	0.00000	13.9229892
0.00003250	703.9490631	21659971.	15.1643732	0.0004928	-0.00002716	1.8090090	0.00000	14.2170218
0.00003375	730.9615690	21658121.	14.9063643	0.0005031	-0.00003691	1.8407456	0.00000	14.5113041
0.00003500	757.9581718	21655948.	14.6670159	0.0005133	-0.00004665	1.8722758	0.00000	14.8058212
0.00003625	784.9352015	21653385.	14.4443839	0.0005236	-0.00005639	1.9035974	0.00000	15.1005587
0.00003750	811.8891584	21650378.	14.2367836	0.0005339	-0.00006612	1.9347084	0.00000	15.3955023
0.00003875	838.8169779	21646890.	14.0427487	0.0005442	-0.00007584	1.9656068	0.00000	15.6906380
0.00004000	865.7158723	21642897.	13.8609971	0.0005544	-0.00008556	1.9962913	0.00000	15.9859560
0.00004125	892.5833714	21638385.	13.6904028	0.0005647	-0.00009527	2.0267600	0.00000	16.2814439
0.00004250	919.4172720	21633348.	13.5299731	0.0005750	-0.000105	2.0570116	0.00000	16.5770915
0.00004375	946.2156276	21627786.	13.3788294	0.0005853	-0.000115	2.0870447	0.00000	16.8728896
.00004500	946.4841906	21032982.	13.1490453	0.0005917	-0.000128	2.1054290	0.00000	17.0551042 (
0.00004625	968.8944827	20949070.	13.0016876	0.0006013	-0.000139	2.1331175	0.00000	17.3312136 (
0.00004750	991.0437523	20864079.	12.8612128	0.0006109	-0.000149	2.1604829	0.00000	17.6061208
0.00004875	1013.	20778235.	12.7270911	0.0006204	-0.000160	2.1875278	0.00000	17.8798245 (
0.00005125	1056.	20604477.	12.4759709	0.0006394	-0.000181	2.2406559	0.00000	18.4235113
0.00005375	1098.	20432711.	12.2458241	0.0006582	-0.000202	2.2926383	0.00000	18.9634781
0.00005625	1140.	20261856.	12.0335131	0.0006769	-0.000223	2.3434386	0.00000	19.4991675 (
0.00005875	1181.	20094747.	11.8373071	0.0006954	-0.000245	2.3931617	0.00000	20.0315119
0.00006125	1221.	19931930.	11.6553738	0.0007139	-0.000266	2.4418443	0.00000	20.5607572
0.00000125	1261.	19773658.	11.4861336	0.0007322	-0.000288	2.4895162	0.00000	21.0870895
0.00000575	1300.	19620141.	11.3282580	0.0007522	-0.000310	2.5362081	0.00000	21.6107157 (
0.000006875	1339.	19471546.	11.1806238	0.0007505	-0.000310	2.5819516	0.00000	22.1318688
0.00000075	1377.	19328001.	11.0422774	0.0007868	-0.000353	2.6267791	0.00000	22.6508057
0.00007125	1415.	19189598.	10.9124058	0.0007000	-0.000375	2.6707236	0.00000	23.1678081
0.00007575	1453.	19056391.	10.7903145	0.0008228	-0.000373	2.7138184	0.00000	23.6831831

0.00007875	1491.	18927187.	10.6749837	0.0008407	-0.000419	2.7560185	0.00000	24.1962943 C
0.00008125	1528.	18802720.	10.5661104	0.0008585	-0.000442	2.7973938	0.00000	24.7078978 C
0.00008375	1565.	18683335.	10.4633704	0.0008763	-0.000464	2.8379992	0.00000	25.2186111 C
0.00008625	1601.	18567504.	10.3658080	0.0008941	-0.000486	2.8777565	0.00000	25.7273776 C
0.00008875	1638.	18456081.	10.2733772	0.0009118	-0.000508	2.9167502	0.00000	26.2352049 C
0.00000075	1674.	18348756.	10.1856729	0.0009294	-0.000531	2.9549876	0.00000	26.7421371 C
					-0.000553			
0.00009375	1710.	18244772.	10.1021094	0.0009471		2.9924308	0.00000	27.2476101 C
0.00009625	1746.	18144862.	10.0227681	0.0009647	-0.000575	3.0291670	0.00000	27.7527516 C
0.00009875	1782.	18047872.	9.9469417	0.0009823	-0.000598	3.0651193	0.00000	28.2564545 C
0.0001013	1818.	17954483.	9.8747579	0.0009998	-0.000620	3.1003725	0.00000	28.7598582 C
0.0001038	1853.	17864091.	9.8057762	0.0010173	-0.000643	3.1348917	0.00000	29.2624293 C
0.0001063	1889.	17776484.	9.7397673	0.0010349	-0.000665	3.1686793	0.00000	29.7641582 C
0.0001088	1924.	17692325.	9.6769215	0.0010524	-0.000688	3.2018204	0.00000	30.2662915 C
0.0001113	1959.	17609881.	9.6162785	0.0010698	-0.000710	3.2341590	0.00000	30.7664188 C
0.0001138	1994.	17530589.	9.5584623	0.0010873	-0.000733	3.2658623	0.00000	31.2670780 C
0.0001163	2029.	17453802.	9.5030552	0.0011047	-0.000755	3.2968793	0.00000	31.7674751 C
0.0001188	2064.	17378824.	9.4496152	0.0011221	-0.000778	3.3271513	0.00000	32.2666128 C
0.0001213	2098.	17306496.	9.3985297	0.0011396	-0.000800	3.3567883	0.00000	32.7662806 C
0.0001213	2133.	17236395.	9.3495072	0.0011570	-0.000823	3.3857576	0.00000	33.2659443 C
			9.3020371	0.0011744	-0.000846		0.00000	33.7641838 C
0.0001263	2167.	17167722.				3.4139797		
0.0001288	2202.	17101298.	9.2565524	0.0011918	-0.000868	3.4415671	0.00000	34.2629527 C
0.0001313	2236.	17036995.	9.2129400	0.0012092	-0.000891	3.4685176	0.00000	34.7622534 C
0.0001338	2270.	16974011.	9.1706678	0.0012266	-0.000913	3.4947432	0.00000	35.2604281 C
0.0001363	2304.	16912652.	9.1298970	0.0012439	-0.000936	3.5202953	0.00000	35.7584058 C
0.0001388	2338.	16853116.	9.0907277	0.0012613	-0.000959	3.5452106	0.00000	36.2569160 C
0.0001413	2372.	16795303.	9.0530755	0.0012787	-0.000981	3.5694872	0.00000	36.7559610 C
0.0001438	2406.	16738616.	9.0165110	0.0012961	-0.001004	3.5930548	0.00000	37.2540806 C
0.0001463	2440.	16683221.	8.9811316	0.0013135	-0.001027	3.6159465	0.00000	37.7519249 C
0.0001488	2474.	16629324.	8.9470660	0.0013309	-0.001049	3.6381992	0.00000	38.2503062 C
0.0001588	2608.	16426112.	8.8218158	0.0014005	-0.001140	3.7206199	0.00000	40.2451351 C
0.0001688	2741.	16240450.	8.7121599	0.0014702	-0.001230	3.7925239	0.00000	42.2436328 C
0.0001788	2872.	16068951.	8.6150567	0.0014702	-0.001320	3.8537909	0.00000	44.2436008 C
0.0001788	3003.	15910367.	8.5294000	0.0015399	-0.001320	3.9045072	0.00000	46.2498982 C
0.0001988	3133.	15762364.	8.4531565	0.0016801	-0.001500	3.9445409	0.00000	48.2607786 C
0.0002088	3261.	15620684.	8.3862859	0.0017506	-0.001589	3.9739118	0.00000	50.0000000 CY
0.0002188	3378.	15441551.	8.3370279	0.0018237	-0.001676	3.9927967	0.00000	50.0000000 CY
0.0002288	3483.	15226412.	8.3022980	0.0018992	-0.001761	3.9999670	0.00000	50.0000000 CY
0.0002388	3566.	14937763.	8.2635277	0.0019729	-0.001847	3.9999119	0.00000	50.0000000 CY
0.0002488	3633.	14604147.	8.2220943	0.0020452	-0.001935	3.9995447	0.00000	50.0000000 CY
0.0002588	3689.	14255586.	8.1806458	0.0021167	-0.002023	3.9991312	0.00000	50.0000000 CY
0.0002688	3736.	13902251.	8.1413508	0.0021880	-0.002112	3.9995144	0.00000	50.0000000 CY
0.0002788	3778.	13552032.	8.1042056	0.0022590	-0.002201	3.9999550	0.00000	50.0000000 CY
0.0002888	3814.	13207699.	8.0688879	0.0023299	-0.002290	3.9985200	0.00000	50.0000000 CY
0.0002988	3845.	12871766.	8.0352239	0.0024005	-0.002379	3.9985874	0.00000	50.0000000 CY
0.0003088	3873.	12545548.	8.0036472	0.0024711	-0.002469	3.9988019	0.00000	50.0000000 CY
0.0003188	3898.	12230331.	7.9742730	0.0025418	-0.002558	3.9987778	0.00000	50.0000000 CY
0.0003288	3921.	11926061.	7.9467938	0.0026125	-0.002647	3.9985053	0.00000	50.0000000 CY
0.0003288	3941.	11632686.	7.9209697	0.0026832	-0.002737	3.9979075	0.00000	50.0000000 CY
0.0003388	3958.	11350197.	7.8961027	0.0020832	-0.002737	3.9991864	0.00000	50.0000000 CY
0.0003588	3974.	11078186.	7.8730969	0.0028245	-0.002916	3.9999110	0.00000	50.0000000 CY
0.0003688	3989.	10816822.	7.8515052	0.0028952	-0.003005	3.9993777	0.00000	50.0000000 CY
0.0003788	4002.	10565813.	7.8311677	0.0029661	-0.003094	3.9980809	0.00000	50.0000000 CY
0.0003888	4013.	10324111.	7.8124669	0.0030371	-0.003183	3.9999606	0.00000	50.0000000 CY
0.0003988	4024.	10091692.	7.7946839	0.0031081	-0.003272	3.9994439	0.00000	50.0000000 CY
0.0004088	4034.	9868201.	7.7781732	0.0031793	-0.003361	3.9974482	0.00000	50.0000000 CY
0.0004188	4042.	9653374.	7.7628252	0.0032507	-0.003449	3.9999072	0.00000	50.0000000 CY
0.0004288	4050.	9446624.	7.7480697	0.0033220	-0.003538	3.9982737	0.00000	50.0000000 CY
0.0004388	4057.	9247295.	7.7338911	0.0033932	-0.003627	3.9999939	0.00000	50.0000000 CY
0.0004488	4064.	9055516.	7.7208864	0.0034647	-0.003715	3.9984590	0.00000	50.0000000 CY
0.0004588	4069.	8870828.	7.7085921	0.0035363	-0.003804	3.9999976	0.00000	50.0000000 CY
0.0004688	4075.	8692526.	7.6971971	0.0036081	-0.003892	3.9981368	0.00000	50.0000000 CY
0.0004788	4079.	8521100.	7.6864616	0.0036799	-0.003980	3.9999528	0.00000	50.0000000 CY
0.0004788	4084.	8355055.	7.6765607	0.0037519	-0.003388	3.9971611	0.00000	50.0000000 CY
0.000+000			,.0,05007	0.005/515	0.00 - 000	J.JJ/ 1011	0.0000	50.000000 CT

0.0004988 4087. 8195361. 7.6673764 0.0038241 -0.004156 3.9996648 0.00000 50.0000000 CY

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.	Max. Tens.
No.	kips	in-kip	Strain	Strain
1	0.000	3588.135	0.00300000	-0.00621448
	255.000	4007.390	0.00300000	-0.00313645

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	0.0000	3588.	0.0000	2332.	14289511.
2	0.65	255.000000	4007.	165.750000	2605.	16430420.
1	0.75	0.0000	3588.	0.0000	2691.	14034271.
2	0.75	255.000000	4007.	191.250000	3006.	15907558.
1	0.90	0.0000	3588.	0.0000	3229.	11311575.
2	0.90	255.000000	4007.	229.500000	3607.	14735452.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layering Correction Equivalent Depths of Soil & Rock Layers

	Top of	Equivalent				
	Layer	Top Depth	Same Layer	Layer is	FØ	F1
Layer	Below	Below	Type As	Rock or	Integral	Integral
No.	Pile Head	Grnd Surf	Layer	is Below	for Layer	for Layer
	ft	ft	Above	Rock Layer	lbs	lbs
1	0.00	0.00	N.A.	No	0.00	5335.
2	3.4000	3.5252	Yes	No	5335.	211227.
3	16.4000	12.7127	No	No	216562.	548691.
4	36.4000	44.7086	Yes	No	765253.	207544.
5	47.2000	51.2193	Yes	No	972797.	825160.
6	86.4000	39.2039	Yes	No	1797957.	84395.
7	105.4000	105.4000	No	Yes	N.A.	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,

Computed Values of Pile Loading and Deflection

for Lateral Loading for Load Case Number 1

TOT Later at Loading TOT Load Case Number 1

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head Rotation of pile head Axial load at pile head

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

= 17000.0 lbs = 0.000E+00 radians

= 0.0 lbs

(Zero slope for this load indicates fixed-head conditions)

non-liquefied sands, and cemented c-phi soil.

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
Χ	у	Moment	Force	S	Stress	Stiffness		Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.1882	- <mark>904120</mark> .	17000.	0.00	0.00	1.46E+10	0.00	0.00	0.00
0.8800	0.1847	-724600.	16772.	-5.90E-04	0.00	1.46E+10	-43.194	2469.	0.00
1.7600	0.1757	-549897.	16070.	-0.00105	0.00	1.46E+10	-89.658	5388.	0.00
2.6400	0.1625	-385192.	14929.	-0.00139	0.00	1.47E+10	-126.443	8216.	0.00
3.5200	0.1464	-234587.	13518.	-0.00158	0.00	2.30E+10	-140.904	10164.	0.00
4.4000	0.1291	-99694.	11984.	-0.00166	0.00	2.31E+10	-149.638	12238.	0.00
5.2800	0.1114	18512.	10434.	-0.00168	0.00	2.31E+10	-143.870	13641.	0.00
6.1600	0.09371	120674.	8832.	-0.00164	0.00	2.31E+10	-159.485	17971.	0.00
7.0400	0.07664	205052.	7074.	-0.00157	0.00	2.30E+10	-173.448	23900.	0.00
7.9200	0.06055	270087.	5177.	-0.00146	0.00	2.29E+10	-185.964	32431.	0.00
8.8000	0.04578	314386.	3191.	-0.00131	0.00	1.91E+10	-190.134	43857.	0.00
9.6800	0.03284	337481.	1210.	-0.00110	0.00	1.47E+10	-185.108	59519.	0.00
10.5600	0.02247	339935.		-8.60E-04	0.00	1.47E+10	-170.844	80290.	0.00
11.4400	0.01468	323337.	-2210.		0.00	1.47E+10	-120.936	86981.	0.00
12.3200	0.00934	293254.		-4.38E-04	0.00	2.29E+10	-82.862	93671.	0.00
13.2000	0.00543	253930.		-3.12E-04	0.00	2.30E+10	-51.575	100362.	0.00
14.0800	0.00275	208854.	-4415.	-2.06E-04	0.00	2.30E+10	-27.831	107053.	0.00
14.9600	0.00108	160676.		-1.21E-04	0.00	2.30E+10	-11.600	113744.	0.00
15.8400	1.87E-04	111203.		-5.88E-05	0.00	2.31E+10	-2.130	120435.	0.00
16.7200	-1.66E-04	61493.	-4132.	-1.93E-05	0.00	2.31E+10	108.9934	6947369.	0.00
17.6000	-2.21E-04	23937.	-2755.	2.02E-07	0.00	2.31E+10	151.7929	7244544.	0.00
	-1.61E-04	3309.	-1345.	6.42E-06	0.00	2.31E+10	115.2744	7541693.	0.00
	-8.56E-05	-4466.	-411.329	6.16E-06	0.00	2.31E+10	61.5260	7590000.	0.00
20.2400	-3.13E-05	-5379.	32.4244		0.00	2.31E+10	22.5183	7590000.	0.00
21.1200	-3.00E-06	-3781.	162.6997	1.82E-06	0.00	2.31E+10	2.1550	7590000.	0.00
22.0000	7.10E-06	-1943.	147.1354	5.13E-07	0.00	2.31E+10	-5.103	7590000.	0.00
22.8800	7.83E-06	-673.290	90.4802		0.00	2.31E+10	-5.627	7590000.	0.00
23.7600	5.31E-06	-31.580		-2.46E-07	0.00	2.31E+10	-3.818	7590000.	0.00
24.6400	2.64E-06	184.3755		-2.11E-07	0.00	2.31E+10	-1.899	7590000.	0.00
25.5200	8.62E-07	188.5496		-1.26E-07	0.00	2.31E+10	-0.619	7590000.	0.00
26.4000	-9.32E-09	123.6476	-6.111		0.00	2.31E+10	0.00670	7590000.	0.00
27.2800	-2.84E-07	59.4926	-4.997	-1.24E-08	0.00	2.31E+10	0.2042	7590000.	0.00
	-2.72E-07	18.1128	-2.886	5.28E-09	0.00	2.31E+10	0.1956	7590000.	0.00
	-1.73E-07	-1.460	-1.198	9.08E-09	0.00	2.31E+10	0.1241	7590000.	0.00
	-8.03E-08	-7.196	-0.239	7.11E-09	0.00	2.31E+10	0.05768	7590000.	0.00
	-2.26E-08	-6.499	0.1516	3.98E-09	0.00	2.31E+10	0.01622	7590000.	0.00
31.6800	3.78E-09	-3.994	0.2229	1.58E-09	0.00	2.31E+10	-0.00272	7590000.	0.00

istrib. at. Load			
lb/inch			
0.00 0.00 0.00			
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32.5600	1.09E-08	-1.791	0.1673	2.62E-10	0.00	2.31E+10	-0.00781	7590000.	0.00
33.4400	9.31E-09	-0.460	0.09076	-2.52E-10	0.00	2.31E+10	-0.00669	7590000.	0.00
34.3200	5.54E-09	0.1255	0.03441	-3.29E-10	0.00	2.31E+10	-0.00398	7590000.	0.00
35.2000	2.37E-09	0.2669	0.00439	-2.39E-10	0.00	2.31E+10	-0.00170	7590000.	0.00
36.0800	4.91E-10	0.2183	-0.00647	-1.28E-10	0.00	2.31E+10	-3.53E-04	7590000.	0.00
36.9600	-3.36E-10	0.1303	-0.00752	-4.86E-11	0.00	2.31E+10	1.54E-04	4854024.	0.00
37.8400	-5.35E-10	0.05946	-0.00541	-5.25E-12	0.00	2.31E+10	2.46E-04	4854024.	0.00
38.7200	-4.47E-10	0.01606	-0.00303	1.20E-11	0.00	2.31E+10	2.05E-04	4854024.	0.00
39.6000	-2.81E-10	-0.00444	-0.00126	1.46E-11	0.00	2.31E+10	1.29E-04	4854024.	0.00
40.4800	-1.37E-10	-0.01054	-2.44E-04	1.12E-11	0.00	2.31E+10	6.31E-05	4854024.	0.00
41.3600	-4.42E-11	-0.00959	1.97E-04	6.63E-12	0.00	2.31E+10	2.03E-05	4854024.	0.00
42.2400	2.75E-12	-0.00638	2.97E-04	2.99E-12	0.00	2.31E+10	-1.27E-06	4854024.	0.00
43.1200	1.89E-11	-0.00331	2.45E-04	0.00	0.00	2.31E+10	-8.69E-06	4854024.	0.00
44.0000	1.91E-11	-0.00121	1.53E-04	0.00	0.00	2.31E+10	-8.77E-06	4854024.	0.00
44.8800	1.34E-11	-8.74E-05	7.36E-05	0.00	0.00	2.31E+10	-6.18E-06	4854024.	0.00
45.7600	7.38E-12	3.45E-04	2.30E-05	0.00	0.00	2.31E+10	-3.39E-06	4854024.	0.00
46.6400	2.98E-12	3.99E-04	-2.15E-06	0.00	0.00	2.31E+10	-1.37E-06	4854024.	0.00
47.5200	0.00	3.00E-04	-1.07E-05	0.00	0.00	2.31E+10	-2.55E-07	5309089.	0.00
48.4000	0.00	1.72E-04	-1.07E-05	0.00	0.00	2.31E+10	2.64E-07	5309089.	0.00
49.2800	0.00	7.37E-05	-7.37E-06	0.00	0.00	2.31E+10	3.65E-07	5309089.	0.00
50.1600	0.00	1.62E-05	-3.92E-06	0.00	0.00	2.31E+10	2.88E-07	5309089.	0.00
51.0400	0.00	-9.09E-06	-1.49E-06	0.00		2.31E+10	1.72E-07	5309089.	0.00
					0.00				
51.9200	0.00	-1.52E-05	-1.70E-07	0.00	0.00	2.31E+10	7.78E-08	5309089.	0.00
52.8000	0.00	-1.27E-05	3.48E-07	0.00	0.00	2.31E+10	2.05E-08	5309089.	0.00
53.6800	0.00	-7.87E-06	4.24E-07	0.00	0.00	2.31E+10	-6.13E-09	5309089.	0.00
54.5600	0.00	-3.74E-06	3.20E-07	0.00	0.00	2.31E+10	-1.36E-08	5309089.	0.00
55.4400	0.00	-1.12E-06	1.84E-07	0.00	0.00	2.31E+10	-1.21E-08	5309089.	0.00
56.3200	0.00	1.50E-07	7.92E-08	0.00	0.00	2.31E+10	-7.78E-09	5309089.	0.00
57.2000	0.00	5.52E-07	1.77E-08	0.00	0.00	2.31E+10	-3.87E-09	5309089.	0.00
58.0800	0.00	5.24E-07	-9.49E-09	0.00	0.00	2.31E+10	-1.29E-09	5309089.	0.00
58.9600	0.00	3.52E-07	-1.62E-08	0.00	0.00	2.31E+10	2.20E-11	5309089.	0.00
			-1.35E-08						
59.8400	0.00	1.82E-07		0.00	0.00	2.31E+10	4.78E-10	5309089.	0.00
60.7200	0.00	6.61E-08	-8.42E-09	0.00	0.00	2.31E+10	4.91E-10	5309089.	0.00
61.6000	0.00	4.63E-09	-4.01E-09	0.00	0.00	2.31E+10	3.44E-10	5309089.	0.00
62.4800	0.00	-1.85E-08	-1.21E-09	0.00	0.00	2.31E+10	1.86E-10	5309089.	0.00
63.3600	0.00	-2.10E-08	1.50E-10	0.00	0.00	2.31E+10	7.24E-11	5309089.	0.00
64.2400	0.00	-1.54E-08	5.85E-10	0.00	0.00	2.31E+10	1.00E-11	5309089.	0.00
65.1200	0.00	-8.63E-09	5.58E-10	0.00	0.00	2.31E+10	-1.51E-11	5309089.	0.00
66.0000	0.00	-3.59E-09	3.76E-10	0.00	0.00	2.31E+10	-1.93E-11	5309089.	0.00
66.8800	0.00	-6.94E-10	1.95E-10	0.00	0.00	2.31E+10	-1.48E-11	5309089.	0.00
67.7600	0.00	5.42E-10	7.13E-11	0.00	0.00	2.31E+10	-8.67E-12	5309089.	0.00
68.6400	0.00	8.11E-10	5.38E-12	0.00	0.00	2.31E+10	-3.81E-12	5309089.	0.00
69.5200									
	0.00	6.55E-10	-1.96E-11	0.00	0.00	2.31E+10	0.00	5309089.	0.00
70.4000	0.00		-2.23E-11	0.00	0.00	2.31E+10	0.00	5309089.	0.00
71.2800	0.00		-1.64E-11	0.00	0.00	2.31E+10	0.00	5309089.	0.00
72.1600	0.00	5.15E-11	-9.24E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
73.0400	0.00	-1.12E-11	-3.85E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
73.9200	0.00	-2.99E-11	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
74.8000	0.00	-2.73E-11	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
75.6800	0.00	-1.79E-11	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
76.5600	0.00	-9.06E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
77.4400	0.00	-3.14E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
								5309089.	
78.3200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00		0.00
79.2000	0.00	1.03E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
80.0800	0.00	1.10E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
80.9600	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
81.8400	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00		0.00	1.54E+07	0.00
07.1200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	1.346+0/	0.00

88.0000 0.00 2.31E+10 0.00 7676515. 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 0.18819225 inches 0.000000 radians Computed slope at pile head Maximum bending moment -904120. inch-lbs Maximum shear force 17000. lbs

0.000000 feet below pile head Depth of maximum bending moment = Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations 15 Number of zero deflection points = 14

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

Boundary Condition Type 2, Shear and Slope

Shear 17000. lbs Slope 0.00000 Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
feet	inches 0.18819225 0.18627662 0.18494236 0.18789134 0.18698204 0.18583508 0.18502534 0.18685604 0.18602687 0.18616514 0.18508096	1n-1bs	1bs 17000. 17000. 17000. 17000. 17000. 17000. 17000. 17000.
44.00000 39.60000 35.20000 30.80000 26.40000 22.00000 17.60000 13.20000 8.80000	0.18548680 0.18548680 0.18559881 0.18489429 0.18574129 0.18510658 0.18658141 0.24129837 0.27618500	-903660. -902896. -902548. -902740. -902926. -902644. -899862. -1007411. -1097222.	17000. 17000. 17000. 17000. 17000. 17000.

______ Computed Values of Pile Loading and Deflection

for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 17000.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 255000.0 lbs

(Zero slope for this load indicates fixed-head conditions)

·	•				·				
Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.		
Х	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.6	0.1618	- <mark>981191</mark> .	17000.	0.00	0.00	2.09E+10	0.00	0.00	0.00
0.886		-801004.	16781.	-4.50E-04	0.00	2.09E+10	-41.385	2745.	0.00
1.760		-624342.	16110.	-8.05E-04	0.00	2.17E+10	-85.847	5953.	0.00
2.640		-456433.	15017.	-0.00107	0.00	2.17E+10	-121.040	8989.	0.00
3.526	0.1297	-301423.	13666.	-0.00125	0.00	2.17E+10	-134.822	10974.	0.00
4.400		-161052.	12202.	-0.00137	0.00	2.17E+10	-142.475	13000.	0.00
5.286		-36358.	10731.	-0.00141	0.00	2.17E+10	-136.115	14245.	0.00
6.160		73205.	9213.	-0.00140	0.00	2.17E+10	-151.437	18621.	0.00
7.040	0.07124	165785.	7537.	-0.00135	0.00	2.17E+10	-165.913	24594.	0.00
7.920		239645.	5710.	-0.00125	0.00	2.17E+10	-180.105	33106.	0.00
8.806	0.04489	293108.	3768.	-0.00112	0.00	2.17E+10	-187.869	44193.	0.00
9.686		325236.	1780.	-9.67E-04	0.00	2.17E+10	-188.503	58819.	0.00
10.560	0.02447	335916.	-174.803	-8.06E-04	0.00	2.17E+10	-181.781	78460.	0.00
11.440		325885.	-1866.	-6.45E-04	0.00	2.17E+10	-138.528	86981.	0.00
12.320	0.01085	299979.	-3105.	-4.92E-04	0.00	2.17E+10	-96.214	93671.	0.00
13.200		262949.	-3936.	-3.55E-04	0.00	2.17E+10	-61.000	100362.	0.00
14.086		218773.	-4437.		0.00	2.17E+10	-33.887	107053.	0.00
14.966		170531.	-4695.	-1.43E-04	0.00	2.17E+10	-14.999	113744.	0.00
15.846		120392.	-4793.	-7.23E-05	0.00	2.17E+10	-3.643	120435.	0.00
16.720	00 -1.34E-04	69690.	-4345.	-2.60E-05	0.00	2.17E+10	88.4338	6947369.	0.00
17.600	00 -2.30E-04	28757.	-3046.	-2.03E-06	0.00	2.17E+10	157.6348	7244544.	0.00
18.486	00 -1.77E-04	5365.	-1546.	6.28E-06	0.00	2.17E+10	126.5649	7541693.	0.00
19.360	00 -9.71E-05	-3920.	-508.979	6.64E-06	0.00	2.17E+10	69.7638	7590000.	0.00
20.246	00 -3.71E-05	-5420.	0.04575	4.36E-06	0.00	2.17E+10	26.6424	7590000.	0.00
21.120	00 -4.95E-06	-3942.	159.5031	2.08E-06	0.00	2.17E+10	3.5579	7590000.	0.00
22.000	0 6.89E-06	-2062.	152.1369	6.19E-07	0.00	2.17E+10	-4.953	7590000.	0.00
22.886	00 8.12E-06	-732.295	95.1534	-6.16E-08	0.00	2.17E+10	-5.839	7590000.	0.00
23.760	00 5.59E-06	-52.412	43.1042	-2.53E-07	0.00	2.17E+10	-4.018	7590000.	0.00
24.640	00 2.79E-06	179.4267	11.3066	-2.22E-07	0.00	2.17E+10	-2.004	7590000.	0.00
25.526	9.08E-07	187.5768	-2.719	-1.32E-07	0.00	2.17E+10	-0.653	7590000.	0.00
26.400	00 -7.45E-09	122.7179	-6.136	-5.68E-08	0.00	2.17E+10	0.00535	7590000.	0.00
27.286	00 -2.92E-07	58.2951	-5.001	-1.27E-08	0.00	2.17E+10	0.2095	7590000.	0.00
28.160	00 -2.76E-07	17.1616	-2.848	5.67E-09	0.00	2.17E+10	0.1982	7590000.	0.00
29.040	00 -1.72E-07	-1.893	-1.150	9.39E-09	0.00	2.17E+10	0.1234	7590000.	0.00
29.926	00 -7.74E-08	-7.182	-0.205	7.18E-09	0.00	2.17E+10	0.05563	7590000.	0.00
30.800	00 -2.00E-08	-6.258	0.1649	3.91E-09	0.00	2.17E+10	0.01440	7590000.	0.00
31.686	00 5.14E-09	-3.720	0.2215	1.48E-09	0.00	2.17E+10	-0.00369	7590000.	0.00
32.560		-1.588	0.1596	1.86E-10	0.00	2.17E+10	-0.00804	7590000.	0.00
33.440	9.06E-09	-0.350	0.08279	-2.86E-10	0.00	2.17E+10	-0.00651	7590000.	0.00
34.326	00 5.13E-09	0.1620	0.02895	-3.32E-10	0.00	2.17E+10	-0.00369	7590000.	0.00
35.200	00 2.04E-09	0.2629	0.00175	-2.29E-10	0.00	2.17E+10	-0.00146	7590000.	0.00
36.086	00 2.97E-10	0.2003	-0.00710	-1.16E-10	0.00	2.17E+10	-2.13E-04	7590000.	0.00
36.960	00 -4.14E-10	0.1136	-0.00722	-3.96E-11	0.00	2.17E+10	1.90E-04	4854024.	0.00
37.846	00 -5.40E-10	0.04793	-0.00491	0.00	0.00	2.17E+10	2.48E-04	4854024.	0.00
38.726	00 -4.19E-10	0.00988	-0.00258	1.38E-11	0.00	2.17E+10	1.93E-04	4854024.	0.00
39.600	00 -2.48E-10	-0.00668	-9.63E-04	1.46E-11	0.00	2.17E+10	1.14E-04	4854024.	0.00
40.486	00 -1.11E-10	-0.01053	-9.17E-05	1.04E-11	0.00	2.17E+10	5.10E-05	4854024.	0.00
41.366	00 -2.83E-11	-0.00868	2.46E-04	5.72E-12	0.00	2.17E+10	1.30E-05	4854024.	0.00
42.246	9.82E-12	-0.00536	2.91E-04	2.30E-12	0.00	2.17E+10	-4.51E-06	4854024.	0.00
43.126	00 2.04E-11	-0.00254	2.18E-04	0.00	0.00	2.17E+10	-9.37E-06	4854024.	0.00

44.0000	1.79E-11	-7.54E-04	1.25E-04	0.00	0.00	2.17E+10	-8.22E-06	4854024.	0.00
44.8800	1.15E-11	1.11E-04	5.38E-05	0.00	0.00	2.17E+10	-5.30E-06	4854024.	0.00
45.7600	5.73E-12	3.85E-04	1.19E-05	0.00	0.00	2.17E+10	-2.64E-06	4854024.	0.00
46.6400	1.92E-12	3.65E-04	-6.68E-06	0.00	0.00	2.17E+10	-8.85E-07	4854024.	0.00
47.5200	0.00	2.46E-04	-1.13E-05	0.00	0.00	2.17E+10	4.05E-09	5309089.	0.00
48.4000	0.00	1.26E-04	-9.51E-06	0.00	0.00	2.17E+10	3.40E-07	5309089.	0.00
49.2800	0.00	4.50E-05	-5.87E-06	0.00	0.00	2.17E+10	3.49E-07	5309089.	0.00
50.1600	0.00	2.50E-06	-2.75E-06	0.00	0.00	2.17E+10	2.42E-07	5309089.	0.00
51.0400	0.00	-1.31E-05	-7.93E-07	0.00	0.00	2.17E+10	1.28E-07	5309089.	0.00
51.9200	0.00	-1.43E-05	1.37E-07	0.00	0.00	2.17E+10	4.80E-08	5309089.	0.00
52.8000	0.00	-1.02E-05	4.16E-07	0.00	0.00	2.17E+10	4.98E-09	5309089.	0.00
53.6800	0.00	-5.58E-06	3.82E-07	0.00	0.00	2.17E+10	-1.15E-08	5309089.	0.00
54.5600	0.00	-2.19E-06	2.49E-07	0.00	0.00	2.17E+10	-1.36E-08	5309089.	0.00
55.4400	0.00	-3.23E-07	1.24E-07	0.00	0.00	2.17E+10	-1.00E-08	5309089.	0.00
56.3200	0.00	4.29E-07	4.13E-08	0.00	0.00	2.17E+10	-5.61E-09	5309089.	0.00
57.2000	0.00	5.54E-07	-4.33E-10	0.00	0.00	2.17E+10	-2.30E-09	5309089.	0.00
58.0800	0.00	4.22E-07	-1.48E-08	0.00	0.00	2.17E+10	-4.22E-10	5309089.	0.00
58.9600	0.00	2.43E-07	-1.51E-08	0.00	0.00	2.17E+10	3.64E-10	5309089.	0.00
59.8400	0.00	1.04E-07	-1.04E-08	0.00	0.00	2.17E+10	5.22E-10	5309089.	0.00
60.7200	0.00	2.25E-08	-5.51E-09	0.00	0.00	2.17E+10	4.11E-10	5309089.	0.00
61.6000	0.00	-1.28E-08	-2.05E-09	0.00	0.00	2.17E+10	2.43E-10	5309089.	0.00
62.4800	0.00	-2.10E-08	-2.04E-10	0.00	0.00	2.17E+10	1.07E-10	5309089.	0.00
63.3600	0.00	-1.72E-08	5.03E-10	0.00	0.00	2.17E+10	2.64E-11	5309089.	0.00
64.2400	0.00	-1.05E-08	5.90E-10	0.00	0.00	2.17E+10	-1.01E-11	5309089.	0.00
65.1200	0.00	-4.79E-09	4.33E-10	0.00	0.00	2.17E+10	-1.96E-11	5309089.	0.00
66.0000	0.00	-1.31E-09	2.42E-10	0.00	0.00	2.17E+10	-1.67E-11	5309089.	0.00
66.8800	0.00	3.14E-10	9.86E-11	0.00	0.00	2.17E+10	-1.04E-11	5309089.	0.00
67.7600	0.00	7.79E-10	1.78E-11	0.00	0.00	2.17E+10	-4.92E-12	5309089.	0.00
68.6400	0.00	6.94E-10	-1.60E-11	0.00	0.00	2.17E+10	-1.46E-12	5309089.	0.00
69.5200	0.00	4.45E-10	-2.26E-11	0.00	0.00	2.17E+10	0.00	5309089.	0.00
70.4000	0.00	2.17E-10	-1.78E-11	0.00	0.00	2.17E+10	0.00	5309089.	0.00
71.2800	0.00	6.97E-11	-1.05E-11	0.00	0.00	2.17E+10	0.00	5309089.	0.00
72.1600	0.00	-3.71E-12	-4.61E-12	0.00	0.00	2.17E+10 2.17E+10	0.00	5309089.	0.00
73.0400	0.00	-2.80E-11	-1.12E-12	0.00	0.00	2.17E+10 2.17E+10	0.00	5309089.	0.00
73.9200	0.00	-2.76E-11	0.00	0.00	0.00	2.17E+10 2.17E+10	0.00	5309089.	0.00
74.8000	0.00	-1.87E-11	0.00	0.00	0.00	2.17E+10 2.17E+10	0.00	5309089.	0.00
75.6800	0.00	-9.71E-12	0.00	0.00	0.00	2.17E+10 2.17E+10	0.00	5309089.	0.00
76.5600	0.00	-3.71E-12	0.00	0.00	0.00	2.17E+10 2.17E+10			0.00
77.4400	0.00	0.00	0.00	0.00		2.17E+10 2.17E+10	0.00	5309089. 5309089.	0.00
78.3200					0.00		0.00		
	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
79.2000	0.00	1.08E-12	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
80.0800	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
80.9600	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
81.8400	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	1.54E+07	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	7676515.	0.00

Output Summary for Load Case No. 2:

Pile-head deflection

= 0.16180390 inches

Computed slope at pile head = 0.000000 radians
Maximum bending moment = -981191. inch-lbs
Maximum shear force = 17000. lbs

Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations = 11 Number of zero deflection points = 14

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

Boundary Condition Type 2, Shear and Slope

Shear = 17000. lbs Slope = 0.00000 Axial Load = 255000. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
88.00000	0.16180390	-981191.	17000.
83.60000	0.16080618	-978800.	17000.
79.20000	0.16076816	-979203.	17000.
74.80000	0.16102220	-980361.	17000.
70.40000	0.16073776	-980370.	17000.
66.00000	0.16044593	-979836.	17000.
61.60000	0.16020225	-979691.	17000.
57.20000	0.16044904	-980808.	17000.
52.80000	0.15997044	-980033.	17000.
48.40000	0.15960989	-979489.	17000.
44.00000	0.15983122	-980558.	17000.
39.60000	0.15960454	-980409.	17000.
35.20000	0.15950537	-980575.	17000.
30.80000	0.15917474	-980075.	17000.
26.40000	0.15928200	-980903.	17000.
22.00000	0.15906442	-980716.	17000.
17.60000	0.16118855	-981797.	17000.
13.20000	0.21263640	-1122089.	17000.
8.80000	0.24019843	-1157648.	17000.

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 = 17000.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
X	y	Moment	Force	S	Stress	Stiffness	p	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.7071 0.6259	4.60E-08 179520.	17000.	-0.00769 -0.00765	0.00 0.00	2.31E+10 2.31E+10	0.00 -65.256	0.00 1101.	0.00

1.7600	0.5456	351763.	15603.	-0.00748	0.00	1.47E+10	-134.067	2595.	0.00
2.6400	0.4679	509056.	13917.	-0.00717	0.00	1.46E+10	-185.296	4182.	0.00
3.5200	0.3942	645686.	11851.	-0.00675	0.00	1.46E+10	-206.043	5520.	0.00
4.4000	0.3253	759339.	9562.	-0.00624	0.00	1.46E+10	-227.476	7384.	0.00
5.2800	0.2623	847625.	7132.	-0.00566	0.00	1.46E+10	-232.615	9366.	0.00
6.1600	0.2057	909972.	4562.	-0.00503	0.00	1.46E+10	-254.256	13052.	0.00
7.0400	0.1561	943966.	1808.	-0.00435	0.00	1.46E+10	-267.325	18082.	0.00
7.9200	0.1138	948149.	-1044.	-0.00367	0.00	1.46E+10	-272.839	25328.	0.00
8.8000	0.07866	921907.	-3880.	-0.00299	0.00	1.46E+10	-264.204	35470.	0.00
9.6800	0.05062	866203.	-6546.	-0.00234	0.00	1.46E+10	-240.778	50231.	0.00
10.5600	0.02921	783649.	-8887.	-0.00174	0.00	1.46E+10	-202.445	73196.	0.00
11.4400	0.01379	678519.	-10555.	-0.00174	0.00	1.46E+10	-113.551	86981.	0.00
12.3200	0.01373	560727.	-11321.	-7.67E-04	0.00	1.46E+10	-31.445	93671.	0.00
13.2000	-0.00242	439428.	-11365.	-4.07E-04	0.00	1.46E+10	23.0099	100362.	0.00
14.0800	-0.00242	320695.	-11303.	-1.33E-04	0.00	1.48E+10	51.1127	107053.	0.00
14.9600		207662.	-10974.				56.4464	113744.	0.00
	-0.00524			2.89E-05	0.00	2.30E+10			
15.8400	-0.00443	100923.	-9841.	9.97E-05	0.00	2.31E+10	50.5449	120435.	0.00
16.7200	-0.00314	-178.924	-7607 .	1.23E-04	0.00	2.31E+10	372.5056	1254579.	0.00
17.6000	-0.00184	-59742.	-3845.	1.09E-04	0.00	2.31E+10	339.9866	1951386.	0.00
18.4800	-8.33E-04	-81391.	-517.276	7.68E-05	0.00	2.31E+10	290.3167	3681860.	0.00
19.3600	-2.19E-04	-70666.	1845.	4.20E-05	0.00	2.31E+10	157.1660	7590000.	0.00
20.2400	5.40E-05	-42416.	2470.	1.61E-05	0.00	2.31E+10	-38.847	7590000.	0.00
21.1200	1.22E-04	-18497.	1802.	2.22E-06	0.00	2.31E+10	-87.750	7590000.	0.00
22.0000	1.01E-04	-4363.	955.4144	-3.00E-06	0.00	2.31E+10	-72.536	7590000.	0.00
22.8800	5.87E-05	1682.	349.6135	-3.61E-06	0.00	2.31E+10	-42.199	7590000.	0.00
23.7600	2.46E-05	3021.	33.4018	-2.54E-06	0.00	2.31E+10	-17.690	7590000.	0.00
24.6400	5.08E-06	2387.	-79.280	-1.30E-06	0.00	2.31E+10	-3.651	7590000.	0.00
25.5200	-2.94E-06	1346.	-87.403	-4.52E-07	0.00	2.31E+10	2.1130	7590000.	0.00
26.4000	-4.47E-06	541.0414	-59.293	-2.11E-08	0.00	2.31E+10	3.2109	7590000.	0.00
27.2800	-3.39E-06	93.9378	-29.490	1.24E-07	0.00	2.31E+10	2.4335	7590000.	0.00
28.1600	-1.85E-06	-81.796	-9.617	1.27E-07	0.00	2.31E+10	1.3305	7590000.	0.00
29.0400	-7.11E-07	-109.163	0.1062	8.30E-08	0.00	2.31E+10	0.5110	7590000.	0.00
29.9200	-9.72E-08	-79.552	3.1728	4.00E-08	0.00	2.31E+10	0.06983	7590000.	0.00
30.8000	1.33E-07	-42.154	3.0371	1.22E-08	0.00	2.31E+10	-0.09553	7590000.	0.00
31.6800	1.60E-07	-15.409	1.9266	-9.83E-10	0.00	2.31E+10	-0.115	7590000.	0.00
32.5600	1.12E-07	-1.464	0.8949	-4.84E-09	0.00	2.31E+10	-0.08062	7590000.	0.00
33.4400	5.76E-08	3.4910	0.2507	-4.37E-09	0.00	2.31E+10	-0.04138	7590000.	0.00
34.3200	1.98E-08	3.8314	-0.04298	-2.70E-09	0.00	2.31E+10	-0.01424	7590000.	0.00
35.2000	5.40E-10	2.5833	-0.120	-1.24E-09	0.00	2.31E+10	-3.88E-04	7590000.	0.00
36.0800	-6.28E-09	1.2920	-0.09845	-3.51E-10	0.00	2.31E+10	0.00451	7590000.	0.00
36.9600	-6.87E-09	0.5040	-0.05794	5.93E-11	0.00	2.31E+10	0.00316	4854024.	0.00
37.8400	-5.03E-09	0.06817	-0.02907	1.90E-10	0.00	2.31E+10	0.00231	4854024.	0.00
38.7200	-2.86E-09	-0.110	-0.00993	1.80E-10	0.00	2.31E+10	0.00131	4854024.	0.00
39.6000	-1.22E-09	-0.141	-3.19E-05	1.23E-10	0.00	2.31E+10	5.60E-04	4854024.	0.00
40.4800	-2.61E-10	-0.111	0.00356	6.54E-11	0.00	2.31E+10	1.20E-04	4854024.	0.00
41.3600	1.64E-10	-0.06633	0.00379	2.50E-11	0.00	2.31E+10	-7.53E-05	4854024.	0.00
42.2400	2.68E-10	-0.03048	0.00274	2.94E-12	0.00	2.31E+10	-1.23E-04	4854024.	0.00
43.1200	2.26E-10	-0.00839	0.00154	-5.94E-12	0.00	2.31E+10	-1.04E-04	4854024.	0.00
44.0000	1.43E-10	0.00211	6.48E-04	-7.37E-12	0.00	2.31E+10	-6.58E-05	4854024.	0.00
44.8800	7.03E-11	0.00529	1.30E-04	-5.68E-12	0.00	2.31E+10	-3.23E-05	4854024.	0.00
45.7600	2.31E-11	0.00486	-9.67E-05	-3.37E-12	0.00	2.31E+10	-1.06E-05	4854024.	0.00
46.6400	0.00	0.00324	-1.51E-04	-1.52E-12	0.00	2.31E+10	3.50E-07	4854024.	0.00
47.5200	-8.94E-12	0.00167	-1.25E-04	0.00	0.00	2.31E+10	4.50E-06	5309089.	0.00
48.4000	-9.07E-12	5.98E-04	-7.74E-05	0.00	0.00	2.31E+10	4.56E-06	5309089.	0.00
49.2800	-6.31E-12	3.46E-05	-3.66E-05	0.00	0.00	2.31E+10	3.17E-06	5309089.	0.00
50.1600	-3.39E-12	-1.75E-04	-1.09E-05	0.00	0.00	2.31E+10	1.70E-06	5309089.	0.00
51.0400	-1.31E-12	-1.95E-04	1.58E-06	0.00	0.00	2.31E+10	6.57E-07	5309089.	0.00
51.9200	0.00	-1.42E-04	5.49E-06	0.00	0.00	2.31E+10	8.44E-08	5309089.	0.00
52.8000	0.00	-7.92E-05	5.49E-06	0.00	0.00	2.31E+10	-1.44E-07	5309089.	0.00
53.6800	0.00	-3.26E-05	3.47E-06	0.00	0.00	2.31E+10	-1.44L-07	5309089.	0.00
54.5600	0.00	-6.05E-06	1.79E-06	0.00	0.00	2.31E+10	-1.37E-07	5309089.	0.00
55.4400	0.00	5.20E-06	6.45E-07	0.00	0.00	2.31E+10 2.31E+10	-1.37E-07 -7.97E-08	5309089.	0.00
56.3200		7.57E-06	4.10E-08			2.31E+10 2.31E+10	-7.97E-08	5309089.	0.00
30.3200	0.00	7.3/6-80	4.100-00	0.00	0.00	2.31E+10	-3.4/6-08	220202.	0.00

57.2000	0.00	6.06E-06	-1.85E-07	0.00	0.00	2.31E+10	-8.10E-09	5309089.	0.00
58.0800	0.00	3.66E-06	-2.08E-07	0.00	0.00	2.31E+10	3.80E-09	5309089.	0.00
58.9600	0.00	1.68E-06	-1.51E-07	0.00	0.00	2.31E+10	6.83E-09	5309089.	0.00
59.8400	0.00	4.60E-07	-8.48E-08	0.00	0.00	2.31E+10	5.79E-09	5309089.	0.00
60.7200	0.00	-1.12E-07	-3.51E-08	0.00	0.00	2.31E+10	3.63E-09	5309089.	0.00
61.6000	0.00	-2.80E-07	-6.64E-09	0.00	0.00	2.31E+10	1.75E-09	5309089.	0.00
62.4800	0.00	-2.53E-07	5.45E-09	0.00	0.00	2.31E+10	5.42E-10	5309089.	0.00
63.3600	0.00	-1.65E-07	8.04E-09	0.00	0.00	2.31E+10	-5.18E-11	5309089.	0.00
64.2400	0.00	-8.30E-08	6.47E-09	0.00	0.00	2.31E+10	-2.46E-10	5309089.	0.00
65.1200	0.00	-2.84E-08	3.91E-09	0.00	0.00	2.31E+10	-2.38E-10	5309089.	0.00
66.0000	0.00	-3.03E-10	1.80E-09	0.00	0.00	2.31E+10	-1.62E-10	5309089.	0.00
66.8800	0.00	9.70E-09	4.99E-10	0.00	0.00	2.31E+10	-8.49E-11	5309089.	0.00
67.7600	0.00	1.02E-08	-1.15E-10	0.00	0.00	2.31E+10	-3.15E-11	5309089.	0.00
68.6400	0.00	7.26E-09	-2.97E-10	0.00	0.00	2.31E+10	-2.88E-12	5309089.	0.00
69.5200	0.00	3.97E-09	-2.69E-10	0.00	0.00	2.31E+10	8.12E-12	5309089.	0.00
70.4000	0.00	1.58E-09	-1.76E-10	0.00	0.00	2.31E+10	9.49E-12	5309089.	0.00
71.2800	0.00	2.45E-10	-8.89E-11	0.00	0.00	2.31E+10	7.04E-12	5309089.	0.00
72.1600	0.00	-3.01E-10	-3.06E-11	0.00	0.00	2.31E+10	4.00E-12	5309089.	0.00
73.0400	0.00	-4.01E-10	0.00	0.00	0.00	2.31E+10	1.69E-12	5309089.	0.00
73.9200	0.00	-3.12E-10	1.03E-11	0.00	0.00	2.31E+10	0.00	5309089.	0.00
74.8000	0.00	-1.85E-10	1.09E-11	0.00	0.00	2.31E+10	0.00	5309089.	0.00
75.6800	0.00	-8.23E-11	7.75E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
76.5600	0.00	-2.08E-11	4.25E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
77.4400	0.00	7.39E-12	1.70E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
78.3200	0.00	1.51E-11	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
79.2000	0.00	1.31E-11	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
80.0800	0.00	8.37E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
80.9600	0.00	4.11E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
81.8400	0.00	1.33E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	1.54E+07	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	7676515.	0.00

Output Summary for Load Case No. 3:

```
0.70709577 inches
Pile-head deflection
Computed slope at pile head
                                    -0.0076886 radians
Maximum bending moment
                                       948149. inch-lbs
Maximum shear force
                                        17000. lbs
Depth of maximum bending moment =
                                    7.92000000 feet below pile head
Depth of maximum shear force =
                                      0.000000 feet below pile head
Number of iterations
                                            23
Number of zero deflection points =
                                            14
```

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

Boundary Condition Type 1, Shear and Moment

Shear = 17000. lbs
Moment = 0. in-lbs
Axial Load = 0. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
88.0000	0.70709577	948149.	17000.
83.60000	0.70160050	948117.	17000.
79.20000	0.70199366	946144.	17000.
74.80000	0.70156271	948478.	17000.
70.40000	0.70385090	947072.	17000.
66.0000	0.70201474	944837.	17000.
61.60000	0.70061386	945954.	17000.
57.20000	0.70230635	946923.	17000.
52.80000	0.70145735	945157.	17000.
48.4000	0.70035545	944447.	17000.
44.00000	0.70201766	945264.	17000.
39.60000	0.70027094	945387.	17000.
35.20000	0.70099344	944634.	17000.
30.80000	0.69920521	944317.	17000.
26.40000	0.70035688	944930.	17000.
22.00000	0.70000761	944153.	17000.
17.60000	0.70748429	940192.	17000.
13.20000	1.17526304	839196.	-17115.

Computed Values of Pile Loading and Deflection

for Lateral Loading for Load Case Number 4

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

Shear force at pile head = 17000.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 255000.0 lbs

	Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
	Χ	У	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
	feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
-	0.00	0.6288	0.00	17000.	-0.00652	0.00	2.17E+10	0.00	0.00	0.00
	0.8800	0.5599	197082.	16666.	-0.00647	0.00	2.17E+10	-63.180	1192.	0.00
	1.7600	0.4920	386859.	15658.	-0.00633	0.00	2.17E+10	-127.865	2744.	0.00
	2.6400	0.4262	561871.	14044.	-0.00610	0.00	2.17E+10	-177.692	4403.	0.00
	3.5200	0.3632	716329.	12058.	-0.00579	0.00	2.17E+10	-198.605	5774.	0.00
	4.4000	0.3039	847701.	9847.	-0.00541	0.00	2.16E+10	-220.034	7645.	0.00
	5.2800	0.2490	953422.	7492.	-0.00496	0.00	2.10E+10	-225.936	9582.	0.00
	6.1600	0.1991	1032657.	4983.	-0.00446	0.00	2.07E+10	-249.407	13226.	0.00
	7.0400	0.1548	1082661.	2261.	-0.00392	0.00	2.05E+10	-266.000	18140.	0.00
	7.9200	0.1164	1101501.	-604.458	-0.00335	0.00	2.04E+10	-276.742	25097.	0.00
	8.8000	0.08406	1087946.	-3518.	-0.00279	0.00	2.05E+10	-275.090	34559.	0.00
	9.6800	0.05760	1042204.	-6346.	-0.00224	0.00	2.07E+10	-260.452	47751.	0.00
	10.5600	0.03676	965983.	-8950.	-0.00173	0.00	2.10E+10	-232.847	66882.	0.00
	11.4400	0.02107	862486.	-11096.	-0.00128	0.00	2.16E+10	-173.547	86981.	0.00
	12.3200	0.00982	738503.	-12472.	-8.85E-04	0.00	2.17E+10	-87.096	93671.	0.00
	13.2000	0.00237	603838.	-13051.	-5.58E-04	0.00	2.17E+10	-22.528	100362.	0.00
	14.0800	-0.00197	465868.	-13065.	-2.98E-04	0.00	2.17E+10	19.9705	107053.	0.00
	14.9600	-0.00391	329514.	-12737.	-1.04E-04	0.00	2.17E+10	42.1488	113744.	0.00

15.8400	-0.00416	197428.	-12264.	2.46E-05	0.0	0 2.17E+10	47.4560	120435.	0.00
16.7200	-0.00339	70374.	-10006.	8.98E-05	0.0	0 2.17E+10	380.0656	1182720.	0.00
17.6000	-0.00226	-14389.	-6108.	1.03E-04	0.0			1671037.	0.00
18.4800	-0.00121	-59184.	-2533.	8.55E-05	0.0			2786686.	0.00
19.3600	-4.57E-04	-68346.	480.3085	5.45E-05	0.0			5817927.	0.00
20.2400	-5.75E-05	-49334.	2028.	2.58E-05	0.0			7590000.	0.00
21.1200	8.84E-05	-25647.	1911.	7.57E-06	0.0			7590000.	0.00
22.0000	1.02E-04	-9009.	1188.	-8.74E-07	0.0			7590000.	0.00
22.8800	6.99E-05	-559.008	534.1634	-3.20E-06	0.0	0 2.17E+10	-50.243	7590000.	0.00
23.7600	3.46E-05	2289.	137.4519	-2.78E-06	0.0	0 2.17E+10	-24.892	7590000.	0.00
24.6400	1.11E-05	2359.	-36.233	-1.65E-06	0.0	0 2.17E+10	-8.003	7590000.	0.00
25.5200	-2.28E-07	1533.	-77.626	-7.03E-07	0.0	0 2.17E+10	0.1639	7590000.	0.00
26.4000	-3.71E-06	723.2909	-62.696	-1.53E-07	0.0			7590000.	0.00
27.2800	-3.46E-06	209.6765	-35.487	7.40E-08	0.0			7590000.	0.00
28.1600	-2.14E-06	-26.589	-14.209	1.19E-07	0.0			7590000.	0.00
29.0400	-9.59E-07	-91.054	-2.436	8.99E-08	0.0			7590000.	0.00
29.9200	-2.43E-07	-78.526	2.1276	4.86E-08	0.0			7590000.	0.00
30.8000	6.82E-08	-46.380	2.7927	1.82E-08	0.0			7590000.	0.00
31.6800	1.41E-07	-19.643	1.9972	2.14E-09	0.0			7590000.	0.00
32.5600	1.14E-07	-4.212	1.0298	-3.67E-09	0.0			7590000.	0.00
33.4400	6.40E-08	2.1260	0.3562	-4.17E-09	0.0	0 2.17E+10	-0.04598	7590000.	0.00
34.3200	2.54E-08	3.3331	0.01708	-2.84E-09	0.0	0 2.17E+10		7590000.	0.00
35.2000	3.92E-09	2.5021	-0.09407	-1.42E-09	0.0	0 2.17E+10	-0.00281	7590000.	0.00
36.0800	-4.67E-09	1.3540	-0.09120	-4.84E-10	0.0	0 2.17E+10	0.00336	7590000.	0.00
36.9600	-6.30E-09	0.5787	-0.05817	-1.30E-11	0.0			4854024.	0.00
37.8400	-4.95E-09	0.1255	-0.03087	1.59E-10	0.0			4854024.	0.00
38.7200	-2.95E-09	-0.07425	-0.01170	1.71E-10	0.0			4854024.	0.00
39.6000	-1.34E-09	-0.123	-0.00129	1.71L-10 1.23E-10	0.0			4854024.	0.00
40.4800	-3.53E-10	-0.102	0.00281	6.83E-11	0.0			4854024.	0.00
41.3600	1.06E-10	-0.06368	0.00341	2.79E-11	0.0			4854024.	0.00
42.2400	2.36E-10	-0.03045	0.00258	4.97E-12	0.0			4854024.	0.00
43.1200	2.10E-10	-0.00929	0.00149	-4.71E-12	0.0			4854024.	0.00
44.0000	1.37E-10	0.00109	6.49E-04	-6.71E-12	0.0	0 2.17E+10	-6.29E-05	4854024.	0.00
44.8800	6.87E-11	0.00445	1.50E-04	-5.36E-12	0.0			4854024.	0.00
45.7600	2.35E-11	0.00429	-7.37E-05	-3.24E-12	0.0	0 2.17E+10	-1.08E-05	4854024.	0.00
46.6400	0.00	0.00291	-1.32E-04	-1.48E-12	0.0			4854024.	0.00
47.5200	-7.77E-12	0.00151	-1.12E-04	0.00	0.0	0 2.17E+10	3.91E-06	5309089.	0.00
48.4000	-8.15E-12	5.49E-04	-6.98E-05	0.00	0.0			5309089.	0.00
49.2800	-5.70E-12	4.00E-05	-3.30E-05	0.00	0.0			5309089.	0.00
50.1600	-3.04E-12	-1.49E-04	-9.79E-06	0.00	0.0			5309089.	0.00
	-1.16E-12	-1.68E-04		0.00					0.00
51.0400			1.37E-06		0.0			5309089.	
51.9200	0.00	-1.21E-04	4.81E-06	0.00	0.0			5309089.	0.00
52.8000	0.00	-6.66E-05	4.49E-06	0.00	0.0			5309089.	0.00
53.6800	0.00	-2.66E-05	2.95E-06	0.00	0.0			5309089.	0.00
54.5600	0.00	-4.25E-06	1.49E-06	0.00	0.0			5309089.	0.00
55.4400	0.00	4.84E-06	5.06E-07	0.00	0.0	00 2.17E+10	-6.69E-08	5309089.	0.00
56.3200	0.00	6.47E-06	5.35E-09	0.00	0.0	0 2.17E+10	-2.78E-08	5309089.	0.00
57.2000	0.00	4.99E-06	-1.70E-07	0.00	0.0	0 2.17E+10	-5.42E-09	5309089.	0.00
58.0800	0.00	2.89E-06	-1.77E-07	0.00	0.0	0 2.17E+10	4.07E-09	5309089.	0.00
58.9600	0.00	1.25E-06	-1.24E-07	0.00	0.0	0 2.17E+10	6.08E-09	5309089.	0.00
59.8400	0.00	2.84E-07	-6.59E-08	0.00	0.0			5309089.	0.00
60.7200	0.00	-1.41E-07	-2.50E-08	0.00	0.0			5309089.	0.00
61.6000	0.00	-2.45E-07	-2.85E-09	0.00	0.0			5309089.	0.00
62.4800	0.00	-2.03E-07	5.73E-09	0.00	0.0			5309089.	0.00
63.3600	0.00	-1.24E-07	6.90E-09	0.00	0.0			5309089.	0.00
64.2400	0.00	-5.76E-08	5.12E-09	0.00	0.0			5309089.	0.00
65.1200	0.00	-1.62E-08	2.88E-09	0.00	0.0			5309089.	0.00
66.0000	0.00	3.28E-09	1.19E-09	0.00	0.0			5309089.	0.00
66.8800	0.00	9.02E-09	2.28E-10	0.00	0.0	00 2.17E+10	-5.91E-11	5309089.	0.00
67.7600	0.00	8.16E-09	-1.79E-10	0.00	0.0	0 2.17E+10	-1.80E-11	5309089.	0.00
68.6400	0.00	5.28E-09	-2.64E-10	0.00	0.0	0 2.17E+10	1.95E-12	5309089.	0.00
69.5200	0.00		-2.10E-10	0.00	0.0			5309089.	0.00
70.4000	0.00	8.54E-10	-1.25E-10	0.00	0.0			5309089.	0.00

71.2800	0.00	-2.52E-11	-5.56E-11	0.00	0.00	2.17E+10	5.22E-12	5309089.	0.00
72.1600	0.00	-3.23E-10	-1.40E-11	0.00	0.00	2.17E+10	2.65E-12	5309089.	0.00
73.0400	0.00	-3.24E-10	4.84E-12	0.00	0.00	2.17E+10	0.00	5309089.	0.00
73.9200	0.00	-2.22E-10	9.86E-12	0.00	0.00	2.17E+10	0.00	5309089.	0.00
74.8000	0.00	-1.16E-10	8.49E-12	0.00	0.00	2.17E+10	0.00	5309089.	0.00
75.6800	0.00	-4.27E-11	5.32E-12	0.00	0.00	2.17E+10	0.00	5309089.	0.00
76.5600	0.00	-3.66E-12	2.54E-12	0.00	0.00	2.17E+10	0.00	5309089.	0.00
77.4400	0.00	1.11E-11	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
78.3200	0.00	1.27E-11	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
79.2000	0.00	9.22E-12	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
80.0800	0.00	5.10E-12	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
80.9600	0.00	2.06E-12	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
81.8400	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	5309089.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	1.54E+07	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.17E+10	0.00	7676515.	0.00

Output Summary for Load Case No. 4:

Pile-head deflection 0.62875827 inches Computed slope at pile head = -0.0065217 radians Maximum bending moment 1101501. inch-lbs Maximum shear force 17000. lbs Depth of maximum bending moment = 7.92000000 feet below pile head Depth of maximum shear force = 0.000000 feet below pile head Number of iterations 14 Number of zero deflection points = 15

Pile-head Deflection vs. Pile Length for Load Case 4

Boundary Condition Type 1, Shear and Moment

Shear = 17000. lbs
Moment = 0. in-lbs
Axial Load = 255000. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
88.00000	0.62875827	1101501.	17000.
83.60000	0.62441040	1094991.	17000.
79.20000	0.62484281	1097916.	17000.
74.80000	0.62533736	1097569.	17000.
70.40000	0.62611954	1097271.	17000.

61.60000	0.62412183	1096631.	17000.
57.20000	0.62488758	1097845.	17000.
52.80000	0.62461222	1096075.	17000.
48.40000	0.62312516	1093838.	17000.
44.00000	0.62441382	1095986.	17000.
39.60000	0.62344041	1095450.	17000.
35.20000	0.62356274	1095128.	17000.
30.80000	0.62239822	1094242.	17000.
26.40000	0.62346547	1095008.	17000.
22.00000	0.62292943	1094330.	17000.
17.60000	0.64627139	1081652.	17000.

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 Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	lbs -	inches	radians	lbs	in-lbs
1 V, lb	17000.	S, rad	0.00	0.00	0.1882	0.00	17000.	-904120.
2 V, 1b	17000.	S, rad	0.00	255000.	0.1618	0.00	17000.	-981191.
3 V, 1b	17000.	M, in-lb	0.00	0.00	0.7071	-0.00769	17000.	948149.
4 V, 1b	17000.	M, in-lb	0.00	255000.	0.6288	-0.00652	17000.	1101501.

Maximum pile-head deflection = 0.7070957714 inches
Maximum pile-head rotation = -0.0076886421 radians = -0.440527 deg.

The analysis ended normally.

Job Number: 088549.00

LPile for Windows, Version 2022-12.009 Analysis of Individual Piles and Drilled Shafts Subjected to Lateral Loading Using the p-y Method © 1985-2022 by Ensoft, Inc. All Rights Reserved ______ This copy of LPile is being used by: Brendan Lieske Serial Number of Security Device: 151268597 This copy of LPile is licensed for exclusive use by: SME-USA, 11 Office Sites, MI/IN/OH Use of this software by employees of SME-USA other than those of the office site in 11 Office Sites, MI/IN/OH is a violation of the software license agreement. ______ Files Used for Analysis _____ Path to file locations: \\Sme-inc\pz\WIP\088549.00\Project Data\LPile\ Name of input data file: CUY-17-13.50 Pier Pile B002 Strength Limit.lp12d Name of output report file: CUY-17-13.50 Pier Pile B002 Strength Limit.lp12o Name of plot output file: CUY-17-13.50 Pier Pile B002 Strength Limit.lp12p Name of runtime message file: CUY-17-13.50 Pier Pile B002 Strength Limit.lp12r ______ Date and Time of Analysis _____ Date: July 5, 2024 Time: 11:49:58 ______ Problem Title ______ Project Name: CUY-17-13.50

B-002-0-22 Profile - Factored (Strength) Load

Client: ODOT

Engineer: Brendan P. Lieske

Description: Pier Pile Analysis

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
- 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 = 88.000 ft
Depth of ground surface below top of pile = 0.0000 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.

Depth Below

Pile

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	16.0000
2	88.000	16.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a drilled shaft with permanent casing

Length of section = 88.000000 ft
Casing outside diameter = 16.000000 in

Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

```
Distance from top of pile to top of layer
                                                         0.0000 ft
                                                       4.700000 ft
Distance from top of pile to bottom of layer
Effective unit weight at top of layer
                                                      59.600000 pcf
Effective unit weight at bottom of layer
                                                      59.600000 pcf
                                                 = 33.000000 deg.
Friction angle at top of layer
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
```

Layer 2 is sand, p-y criteria by Reese et al., 1974

```
Distance from top of pile to top of layer
                                                       4.700000 ft
                                                       15.700000 ft
Distance from top of pile to bottom of layer
Effective unit weight at top of layer
                                                       62.600000 pcf
Effective unit weight at bottom of layer
                                                       62.600000 pcf
Friction angle at top of layer
                                                       32.750000 deg.
                                                      32.750000 deg.
Friction angle at bottom of layer
Subgrade k at top of layer
                                                       60.000000 pci
Subgrade k at bottom of layer
                                                       60.000000 pci
```

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer	=	15.700000 ft
Distance from top of pile to bottom of layer	=	45.200000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1700. psf
Undrained cohesion at bottom of layer	=	1700. 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 = 45.200000 ft

```
Distance from top of pile to bottom of layer = 57.700000 ft

Effective unit weight at top of layer = 59.600000 pcf

Effective unit weight at bottom of layer = 59.600000 pcf

Undrained cohesion at top of layer = 2700. psf

Undrained cohesion at bottom of layer = 2700. 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
                                                        57.700000 ft
Distance from top of pile to bottom of layer
                                                        88.200000 ft
Effective unit weight at top of layer
                                                        55.600000 pcf
                                                        55.600000 pcf
Effective unit weight at bottom of layer
Undrained cohesion at top of layer
                                                            1400. psf
Undrained cohesion at bottom of layer
                                                            1400. psf
Epsilon-50 at top of layer
                                                         0.007000
Epsilon-50 at bottom of layer
                                                         0.007000
```

Layer 6 is stiff clay without free water

```
Distance from top of pile to top of layer
                                                       88.200000 ft
                                                      103.200000 ft
Distance from top of pile to bottom of layer
Effective unit weight at top of layer
                                                      135.000000 pcf
                                                      135.000000 pcf
Effective unit weight at bottom of layer
Undrained cohesion at top of layer
                                                            3300. psf
Undrained cohesion at bottom of layer
                                                            3300. psf
Epsilon-50 at top of layer
                                                         0.005000
Epsilon-50 at bottom of layer
                                                         0.005000
```

Layer 7 is massive rock, p-y criteria by Liang et al., 2009

```
Distance from top of pile to top of layer
                                                   = 103.200000 ft
Distance from top of pile to bottom of layer
                                                   = 150.000000 ft
Effective unit weight at top of layer
                                                   = 155.000000 pcf
Effective unit weight at bottom of layer
                                                   = 155.000000 pcf
                                                   = 1000.000000 psi
Uniaxial compressive strength at top of layer
Uniaxial compressive strength at bottom of layer
                                                 = 1000.000000 psi
                                                        0.180000
Poisson's ratio at top of layer
Poisson's ratio at bottom of layer
                                                        0.180000
Option 1: Intact rock modulus at top of layer
                                                          0.0000 psi
         Intact rock modulus at bottom of layer
                                                          0.0000 psi
Option 1: Geologic Strength Index for layer
                                                        50.000000
Option 2: Rock mass modulus at top of layer
                                                          380838. psi
                                                         380838. psi
         Rock mass modulus at bottom of layer
Option 2 will use the input value of rock mass modulus to compute the p-y curve
        in massive rock.
The rock type is (sedimentary) shales, Hoek-Brown Material Constant mi = 6
```

(Depth of the lowest soil layer extends 62.000 ft below the pile tip)

**** Warning - Possible Input Data Error ****

Values entered for effective unit weight of rock were outside the limits of 50 pcf to 150 pcf.

The maximum input value, in layer 1, for effective unit weight = 155.00 pcf

This data may be erroneous. Please check your data.

______ Summary of Input Soil Properties _____

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Cohesion psf	Angle of Friction deg.	Uniaxial qu psi	E50 or krm	kpy pci	Rock Mass Modulus psi	Geologic Strength Index	Int. Rock Modulus psi	Hoek-Brown Material Index, mi	Poisson's Ratio
1	Sand	0.00	59.6000		33.0000			60.0000			0.00	0.00	0.00
	(Reese, et al.)	4.7000	59.6000		33.0000			60.0000			0.00	0.00	0.00
2	Sand	4.7000	62.6000		32.7500			60.0000			0.00	0.00	0.00
	(Reese, et al.)	15.7000	62.6000		32.7500			60.0000			0.00	0.00	0.00
3	Stiff Clay	15.7000	57.6000	1700.			0.00700				0.00	0.00	0.00
	w/o Free Water	45.2000	57.6000	1700.	= =.		0.00700				0.00	0.00	0.00
4	Stiff Clay	45.2000	59.6000	2700.			0.00500				0.00	0.00	0.00
	w/o Free Water	57.7000	59.6000	2700.			0.00500				0.00	0.00	0.00
5	Stiff Clay	57.7000	55.6000	1400.			0.00700				0.00	0.00	0.00
	w/o Free Water	88.2000	55.6000	1400.			0.00700				0.00	0.00	0.00
6	Stiff Clay	88.2000	135.0000	3300.			0.00500				0.00	0.00	0.00
	w/o Free Water	103.2000	135.0000	3300.			0.00500				0.00	0.00	0.00
7	Massive	103.2000	155.0000			1000.0000			380838.	50.0000	0.00	6.0000	0.1800
	Rock	150.0000	155.0000			1000.0000				50.0000	0.00	6.0000	0.1800

______ 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 = 4

Load Type	(Condition 1		Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
2	V =	20000. lbs	S =	0.0000 in/in	0.0000000	Yes	Yes
2	V =	20000. lbs	S =	0.0000 in/in	305000.	Yes	Yes
1	V =	20000. lbs	M =	0.0000 in-lbs	0.0000000	Yes	Yes
1	V =	20000. lbs	M =	0.0000 in-lbs	305000.	Yes	Yes
		Type 2	Type 1 2 V = 20000. lbs 2 V = 20000. lbs 1 V = 20000. lbs	Type 1 2 V = 20000. lbs S = 2 V = 20000. lbs S = 1 V = 20000. lbs M =	Type 1 2 2 V = 20000. lbs S = 0.0000 in/in 2 V = 20000. lbs S = 0.0000 in/in 1 V = 20000. lbs M = 0.0000 in-lbs	Type 1 2 Force, lbs 2 V = 20000. lbs S = 0.0000 in/in 0.0000000 2 V = 20000. lbs S = 0.0000 in/in 305000. 1 V = 20000. lbs M = 0.0000 in-lbs 0.0000000	Type 1 2 Force, lbs vs. Pile Length 2 V = 20000. lbs S = 0.0000 in/in 0.0000000 Yes 2 V = 20000. lbs S = 0.0000 in/in 305000. Yes 1 V = 20000. lbs M = 0.0000 in-lbs 0.0000000 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.

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) with Permanent Casing: ______

Length of Section	=	88.000000	ft
Outer Diameter of Casing	=	16.000000	in
Casing Wall Thickness	=	0.250000	in
Moment of Inertia of Steel Casing	=	383.663935	in^4
Yield Stress of Casing	=	50000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Area of Single Reinforcing Bar	=	0.0000	sq. in.
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in
Yield Stress of Reinforcing Bars	=	0.0000	psi
Modulus of Elasticity of Reinforcing Bars	=	0.0000	psi
Gross Area of Pile	=	201.061930	sq. in.
Area of Concrete	=	188.691909	sq. in.
Cross-sectional Area of Steel Casing	=	12.370021	sq. in.
Area of All Steel (Casing and Bars)	=	12.370021	sq. in.
Area Ratio of All Steel to Gross Area of Pile	=	6.15	percent

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 1260.054 kips Tensile Load for Cracking of Concrete -119.866 kips Nominal Axial Tensile Capacity -618.501 kips

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 = 2

Number	Axial Thrust Force kips
1	0.000
2	305.000

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 = 0.000 kips

Bending	Bending	Bending	Depth to	Max Comp	Max Tens	Max Conc	Max Steel	Max Casing	Run
Curvature	Moment	Stiffness	N Axis	Strain	Strain	Stress	Stress	Stress	Msg
rad/in.	in-kip 	kip-in2	in	in/in	in/in	ksi	ksi	ksi	
0.00000125	28.9033419	23122674.	8.0000000	0.00001000	-0.00001000	0.0418774	0.00000	0.2871000	
0.00000250	57.7542839	23101714.	8.0000000	0.00002000	-0.00002000	0.0835345	0.00000	0.5742000	
0.00000375	86.5528259	23080754.	8.0000000	0.00003000	-0.00003000	0.1249712	0.00000	0.8613000	
0.00000500	115.2989680	23059794.	8.0000000	0.00004000	-0.00004000	0.1661875	0.00000	1.1484000	
0.00000625	143.9927102	23038834.	8.0000000	0.00005000	-0.00005000	0.2071834	0.00000	1.4355000	
0.00000750	172.6340525	23017874.	8.0000000	0.00006000	-0.00006000	0.2479590	0.00000	1.7226000	
0.00000875	201.2229948	22996914.	8.0000000	0.00007000	-0.00007000	0.2885142	0.00000	2.0097000	
0.00001000	229.7595373	22975954.	8.0000000	0.00008000	-0.00008000	0.3288490	0.00000	2.2968000	
0.00001125	258.2436798	22954994.	8.0000000	0.00009000	-0.00009000	0.3689635	0.00000	2.5839000	
0.00001250	286.6754223	22934034.	8.0000000	0.0001000	-0.00010000	0.4088576	0.00000	2.8710000	
0.00001375	315.0547650	22913074.	8.0000000	0.0001100	-0.000110	0.4485313	0.00000	3.1581000	
0.00001500	315.0547650	21003651.	6.1265455	0.00009190	-0.000148	0.3754186	0.00000	-4.260153	
0.00001625	315.0547650	19387986.	6.1277790	0.00009958	-0.000160	0.4059492	0.00000	-4.614584	
0.00001750	315.0547650	18003129.	6.1290144	0.0001073	-0.000173	0.4363631	0.00000	-4.968925	
0.00001875	315.0547650	16802921.	6.1302515	0.0001149	-0.000185	0.4666602	0.00000	-5.323176	
0.00002000	315.0547650	15752738.	6.1314904	0.0001226	-0.000197	0.4968404	0.00000	-5.677336	
0.00002125	315.0547650	14826107.	6.1327311	0.0001303	-0.000210	0.5269036	0.00000	-6.031404	
0.00002250	330.0087250	14667054.	6.1339736	0.0001380	-0.000222	0.5568496	0.00000	-6.385382	
0.00002375	348.2686053	14663941.	6.1352179	0.0001457	-0.000234	0.5866782	0.00000	-6.739269	
0.00002500	366.5206047	14660824.	6.1364640	0.0001534	-0.000247	0.6163894	0.00000	-7.093064	
0.00002625	384.7647083	14657703.	6.1377119	0.0001611	-0.000259	0.6459830	0.00000	-7.446767	
0.00002750	403.0009009	14654578.	6.1389617	0.0001688	-0.000271	0.6754589	0.00000	-7.800378	
0.00002875	421.2291676	14651449.	6.1402133	0.0001765	-0.000283	0.7048169	0.00000	-8.153897	
0.00003000	439.4494932	14648316.	6.1414667	0.0001842	-0.000296	0.7340569	0.00000	-8.507324	
0.00003125	457.6618624	14645180.	6.1427219	0.0001920	-0.000308	0.7631787	0.00000	-8.860658	
0.00003250	475.8662601	14642039.	6.1439790	0.0001997	-0.000320	0.7921823	0.00000	-9.213900	
0.00003375	494.0626709	14638894.	6.1452380	0.0002074	-0.000333	0.8210675	0.00000	-9.567048	
0.00003500	512.2510794	14635745.	6.1464988	0.0002151	-0.000345	0.8498341	0.00000	-9.920104	
0.00003625	530.4314702	14632592.	6.1477615	0.0002229	-0.000357	0.8784821	0.00000	-10.273066	
0.00003750	548.6038278	14629435.	6.1490260	0.0002306	-0.000369	0.9070112	0.00000	-10.625934	
0.00003875	566.7681368	14626274.	6.1502925	0.0002383	-0.000382	0.9354214	0.00000	-10.978709	
0.00004000 0.00004125	584.9243814	14623110.	6.1515608	0.0002461	-0.000394	0.9637124	0.00000	-11.331389	
0.00004123	603.0725461	14619941.	6.1528309	0.0002538	-0.000406	0.9918842	0.00000	-11.683976	
	621.2126151 639.3445727	14616767.	6.1541030	0.0002615	-0.000418	1.0199367	0.00000	-12.036468	
0.00004375 0.00004500	657.4684030	14613590. 14610409.	6.1553770 6.1566529	0.0002693 0.0002770	-0.000431 -0.000443	1.0478696 1.0756828	0.00000 0.00000	-12.388865 -12.741168	
0.00004500	675.5840901	14607224.	6.1579306	0.0002770	-0.000445	1.1033762	0.00000	-12.741166	
0.00004750	693.6916180	14604034.	6.1592103	0.0002926	-0.000467	1.1309497	0.00000	-13.445488	
0.00004730	711.7909831	14600841.	6.1604839	0.0003003	-0.000480	1.1584017	0.00000	-13.797516	
0.00004873	747.9651747	14594442.	6.1630109	0.0003159	-0.000504	1.2129399	0.00000	-14.501325	
0.00005375	784.1064944	14588028.	6.1655454	0.0003139	-0.000529	1.2669953	0.00000	-14.301323	
0.00005625	820.2148141	14581597.	6.1680875	0.0003314	-0.000553	1.3205669	0.00000	-15.907807	
0.00005875	856.2900048	14575149.	6.1706371	0.0003625	-0.000577	1.3736534	0.00000	-16.610477	
0.00005875	892.3319365	14568685.	6.1731944	0.0003781	-0.000577	1.4262537	0.00000	-17.312763	
0.00006375	928.3404783	14562204.	6.1757594	0.0003781	-0.000626	1.4783667	0.00000	-18.014665	
0.00000373	220.3404703	1-302204.	3.1,3,334	3.0003337	0.000020	1.4703007	0.00000	10.01-003	_

0.00006625	964.3154981	14555706.	6.1783320	0.0004093	-0.000651	1.5299911	0.00000	-18.716179 C
0.00006875	1000.	14549191.	6.1809125	0.0004249	-0.000675	1.5811257	0.00000	-19.417305 C
0.00007125	1036.	14542659.	6.1835008	0.0004406	-0.000699	1.6317694	0.00000	-20.118041 C
0.00007375	1072.	14536110.	6.1860969	0.0004562	-0.000724	1.6819211	0.00000	-20.818385 C
0.00007575	1108.	14529543.	6.1887010	0.0004719	-0.000748	1.7315793	0.00000	-21.518335 C
0.00007875	1144.	14522960.	6.1913131	0.0004713	-0.000748	1.7807430	0.00000	-21.318333 C -22.217889 C
0.00008125	1179.	14516359.	6.1939331	0.0005033	-0.000797	1.8294110	0.00000	-22.917045 C
0.00008375	1215.	14509740.	6.1965613	0.0005190	-0.000821	1.8775819	0.00000	-23.615802 C
0.00008625	1251.	14503104.	6.1991975	0.0005347	-0.000845	1.9252546	0.00000	-24.314157 C
0.00008875	1287.	14496450.	6.2018420	0.0005504	-0.000870	1.9724277	0.00000	-25.012109 C
0.00009125	1322.	14489778.	6.2044946	0.0005662	-0.000894	2.0191001	0.00000	-25.709656 C
0.00009375	1358.	14483088.	6.2071556	0.0005819	-0.000918	2.0652705	0.00000	-26.406796 C
0.00009625	1393.	14476380.	6.2098248	0.0005977	-0.000942	2.1109375	0.00000	-27.103526 C
0.00009875	1429.	14469654.	6.2125025	0.0006135	-0.000967	2.1561000	0.00000	-27.799846 C
0.0001013	1464.	14462909.	6.2151886	0.0006293	-0.000991	2.2007565	0.00000	-28.495752 C
0.0001038	1500.	14456147.	6.2178831	0.0006451	-0.001015	2.2449059	0.00000	-29.191244 C
0.0001063	1535.	14449365.	6.2205863	0.0006609	-0.001039	2.2885467	0.00000	-29.886318 C
0.0001088	1571.	14442566.	6.2232980	0.0006768	-0.001063	2.3316777	0.00000	-30.580974 C
0.0001113	1606.	14435747.	6.2260184	0.0006926	-0.001087	2.3742976	0.00000	-31.275208 C
0.0001138	1641.	14428910.	6.2287475	0.0007085	-0.001111	2.4164049	0.00000	-31.969019 C
0.0001163	1677.	14422053.	6.2314853	0.0007244	-0.001136	2.4579983	0.00000	-32.662405 C
0.0001188	1712.	14415178.	6.2342320	0.0007403	-0.001160	2.4990765	0.00000	-33.355363 C
0.0001133	1747.	14408283.	6.2369876	0.0007403	-0.001100	2.5396381	0.00000	-34.047892 C
				0.0007362				-34.739989 C
0.0001238	1782.	14401369.	6.2397521		-0.001208	2.5796817	0.00000	
0.0001263	1817.	14394436.	6.2425257	0.0007881	-0.001232	2.6192059	0.00000	-35.431653 C
0.0001288	1852.	14387483.	6.2453083	0.0008041	-0.001256	2.6582093	0.00000	-36.122880 C
0.0001313	1887.	14380511.	6.2481000	0.0008201	-0.001280	2.6966905	0.00000	-36.813669 C
0.0001338	1922.	14373518.	6.2509009	0.0008361	-0.001304	2.7346481	0.00000	-37.504018 C
0.0001363	1957.	14366506.	6.2537111	0.0008521	-0.001328	2.7720807	0.00000	-38.193924 C
0.0001388	1992.	14359474.	6.2565306	0.0008681	-0.001352	2.8089867	0.00000	-38.883385 C
0.0001413	2027.	14352422.	6.2593594	0.0008841	-0.001376	2.8453647	0.00000	-39.572399 C
0.0001438	2062.	14345349.	6.2621977	0.0009002	-0.001400	2.8812133	0.00000	-40.260963 C
0.0001463	2097.	14338256.	6.2650455	0.0009163	-0.001424	2.9165310	0.00000	-40.949076 C
0.0001488	2132.	14331142.	6.2679028	0.0009324	-0.001448	2.9513162	0.00000	-41.636734 C
0.0001588	2271.	14302480.	6.2794292	0.0009969	-0.001543	3.0851028	0.00000	-44.382777 C
0.0001688	2409.	14273478.	6.2911141	0.0010616	-0.001638	3.2102483	0.00000	-47.121360 C
0.0001788	2546.	14244127.	6.3029619	0.0011267	-0.001733	3.3266514	0.00000	-49.852321 C
0.0001888	2663.	14107880.	6.2948286	0.0011881	-0.001832	3.4281248	0.00000	-50.000000 CY
0.0001988	2756.	13865633.	6.2656203	0.0012453	-0.001935	3.5149099	0.00000	-50.000000 CY
0.0002088	2835.	13583103.	6.2271715	0.0012999	-0.002040	3.5911567	0.00000	-50.000000 CY
0.0002188	2905.	13281364.	6.1833056	0.0013526	-0.002147	3.6584711	0.00000	-50.000000 CY
0.0002288	2968.	12973720.	6.1361879	0.0014037	-0.002256	3.7179118	0.00000	-50.000000 CY
0.0002388	3024.	12665024.	6.0866979	0.0014532	-0.002367	3.7701425	0.00000	-50.000000 CY
0.0002388	3075.	12361017.	6.0366080	0.0015016	-0.002478	3.8159958	0.00000	-50.000000 CY
0.0002588	3122.	12063842.	5.9861817	0.0015010	-0.002478	3.8558780	0.00000	-50.000000 CY
0.0002588	3164.	11774704.	5.9353039	0.0015485	-0.002331	3.8901017	0.00000	-50.000000 CY
		11495126.			-0.002703			-50.000000 CY
0.0002788	3204.		5.8851977	0.0016405		3.9192105	0.00000	
0.0002888	3241.	11224812.	5.8357589	0.0016851	-0.002935	3.9434422	0.00000	-50.000000 CY
0.0002988	3276.	10964087.	5.7863563	0.0017287	-0.003051	3.9629669	0.00000	-50.000000 CY
0.0003088	3307.	10710113.	5.7400431	0.0017722	-0.003168	3.9783624	0.00000	50.0000000 CY
0.0003188	3334.	10460823.	5.6985259	0.0018164	-0.003284	3.9897756	0.00000	50.0000000 CY
0.0003288	3358.	10215614.	5.6610944	0.0018611	-0.003399	3.9970199	0.00000	50.0000000 CY
0.0003388	3380.	9976843.	5.6269309	0.0019061	-0.003514	3.9999409	0.00000	50.0000000 CY
0.0003488	3399.	9745757.	5.5955927	0.0019515	-0.003629	3.9996149	0.00000	50.0000000 CY
0.0003588	3416.	9523000.	5.5662590	0.0019969	-0.003743	3.9987849	0.00000	50.0000000 CY
0.0003688	3432.	9308170.	5.5389169	0.0020425	-0.003858	3.9972709	0.00000	50.0000000 CY
0.0003788	3447.	9100662.	5.5135311	0.0020882	-0.003972	3.9998848	0.00000	50.0000000 CY
0.0003888	3460.	8901054.	5.4887163	0.0021337	-0.004086	3.9988175	0.00000	50.0000000 CY
0.0003988	3472.	8708397.	5.4658986	0.0021795	-0.004200	3.9980699	0.00000	50.0000000 CY
0.0004088	3484.	8523221.	5.4442003	0.0022253	-0.004315	3.9995204	0.00000	50.0000000 CY
0.0004188	3494.	8344491.	5.4239346	0.0022713	-0.004429	3.9971332	0.00000	50.0000000 CY
0.0004288	3504.	8172419.	5.4045088	0.0023172	-0.004543	3.9997475	0.00000	50.0000000 CY
0.0004388	3513.	8006495.	5.3866025	0.0023634	-0.004657	3.9972566	0.00000	50.0000000 CY
0.000-500	2212.	0000-55.	3.300023	0.0023034	0.00-057	3,33,2300	0.0000	20.000000 C1

0.0004488	3521.	7846958.	5.3693480	0.0024095	-0.004771	3.9997377	0.00000	50.0000000 CY
0.0004588	3529.	7692389.	5.3530585	0.0024557	-0.004884	3.9966663	0.00000	50.0000000 CY
0.0004688	3536.	7543789.	5.3370328	0.0025017	-0.004998	3.9994541	0.00000	50.0000000 CY
0.0004788	3543.	7400062.	5.3219576	0.0025479	-0.005112	3.9967029	0.00000	50.0000000 CY
0.0004888	3549.	7261361.	5.3077013	0.0025941	-0.005226	3.9986203	0.00000	50.0000000 CY
0.0004988	3555.	7127694.	5.2938021	0.0026403	-0.005340	3.9999812	0.00000	50.0000000 CY
0.0005088	3560.	6998088.	5.2811275	0.0026868	-0.005453	3.9966978	0.00000	50.0000000 CY
0.0005188	3565.	6873062.	5.2688905	0.0027332	-0.005567	3.9993233	0.00000	50.0000000 CY
0.0005288	3570.	6752275.	5.2568684	0.0027796	-0.005680	3.9984329	0.00000	50.0000000 CY
0.0005388	3575.	6635114.	5.2460219	0.0028263	-0.005794	3.9970441	0.00000	50.0000000 CY
0.0005488	3579.	6521915.	5.2355609	0.0028730	-0.005907	3.9994075	0.00000	50.0000000 CY
0.0006088	3599.	5912613.	5.1804388	0.0031536	-0.006586	3.9974551	0.00000	50.0000000 CY
0.0006688	3613.	5403248.	5.1373912	0.0034356	-0.007264	3.9999948	0.00000	50.0000000 CY
0.0007288	3623.	4971935.	5.1043568	0.0037198	-0.007940	3.9917765	0.00000	50.0000000 CY
0.0007888	3629.	4600505.	5.0821898	0.0040086	-0.008611	3.9916478	0.00000	50.0000000 CY

Axial Thrust Force = 305.000 kips

В	ending	Bending	Bending	Depth to	Max Comp	Max Tens	Max Conc	Max Steel	Max Casing Rur	n
Cu	rvature	Moment	Stiffness	N Axis	Strain	Strain	Stress	Stress	Stress Msg	g
r	ad/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi	ksi	
										-
	00000125	26.7215910	21377273.	229.7821212	0.0002872	0.0002672	1.1250745	0.00000	8.3267019	
	00000250	53.4429535	21377181.	118.8967965	0.0002972	0.0002572	1.1606118	0.00000	8.6142177	
0.	00000375	80.1638592	21377029.	81.9375710	0.0003073	0.0002473	1.1959621	0.00000	8.9020108	
0.	00000500	106.8840796	21376816.	63.4598703	0.0003173	0.0002373	1.2311246	0.00000	9.1900812	
0.	00000625	133.6033864	21376542.	52.3747795	0.0003273	0.0002273	1.2660988	0.00000	9.4784288	
0.	00000750	160.3215509	21376207.	44.9859939	0.0003374	0.0002174	1.3008841	0.00000	9.7670537	
0.	00000875	187.0383448	21375811.	39.7093827	0.0003475	0.0002075	1.3354797	0.00000	10.0559559	
0.	00001000	213.7535396	21375354.	35.7528805	0.0003575	0.0001975	1.3698851	0.00000	10.3451354	
0.	00001125	240.4669066	21374836.	32.6764511	0.0003676	0.0001876	1.4040995	0.00000	10.6345922	
0.	00001250	267.1782174	21374257.	30.2160727	0.0003777	0.0001777	1.4381225	0.00000	10.9243264	
0.	00001375	293.8872433	21373618.	28.2037315	0.0003878	0.0001678	1.4719532	0.00000	11.2143380	
0.	00001500	320.5937556	21372917.	26.5274183	0.0003979	0.0001579	1.5055911	0.00000	11.5046270	
0.	00001625	347.2975256	21372155.	25.1095882	0.0004080	0.0001480	1.5390356	0.00000	11.7951935	
0.	00001750	373.9983247	21371333.	23.8948521	0.0004182	0.0001382	1.5722859	0.00000	12.0860375	
0.	00001875	400.6959239	21370449.	22.8425913	0.0004283	0.0001283	1.6053415	0.00000	12.3771591	
0.	00002000	427.3900943	21369505.	21.9223416	0.0004384	0.0001184	1.6382018	0.00000	12.6685582	
0.	00002125	454.0806071	21368499.	21.1108072	0.0004486	0.0001086	1.6708659	0.00000	12.9602350	
0.	00002250	480.7672332	21367433.	20.3898689	0.0004588	0.00009877	1.7033334	0.00000	13.2521895	
0.	00002375	507.4497435	21366305.	19.7452221	0.0004689	0.00008895	1.7356036	0.00000	13.5444218	
0.	00002500	534.1279088	21365116.	19.1654232	0.0004791	0.00007914	1.7676758	0.00000	13.8369319	
0.	00002625	560.8014999	21363867.	18.6412082	0.0004893	0.00006933	1.7995494	0.00000	14.1297199	
0.	00002750	587.4702874	21362556.	18.1649977	0.0004995	0.00005954	1.8312238	0.00000	14.4227858	
0.	00002875	614.1340418	21361184.	17.7305303	0.0005098	0.00004975	1.8626982	0.00000	14.7161297	
0.	00003000	640.7925337	21359751.	17.3325881	0.0005200	0.00003998	1.8939721	0.00000	15.0097518	
0.	00003125	667.4455333	21358257.	16.9667883	0.0005302	0.00003021	1.9250448	0.00000	15.3036520	
0.	00003250	694.0928110	21356702.	16.6294221	0.0005405	0.00002046	1.9559157	0.00000	15.5978304	
0.	00003375	720.7341368	21355086.	16.3173304	0.0005507	0.00001071	1.9865841	0.00000	15.8922872	
0.	00003500	747.3692807	21353408.	16.0278052	0.0005610	9.73184E-07	2.0170493	0.00000	16.1870224	
0.	00003625	773.9980127	21351669.	15.7585123	0.0005712	-0.00000875	2.0473107	0.00000	16.4820361	
0.	00003750	800.6198594	21349863.	15.5074275	0.0005815	-0.00001847	2.0773677	0.00000	16.7773276	
0.	00003875	827.2329870	21347948.	15.2727836	0.0005918	-0.00002818	2.1072188	0.00000	17.0728907	
0.	00004000	853.8344283	21345861.	15.0530299	0.0006021	-0.00003788	2.1368624	0.00000	17.3687148	
0.	00004125	880.4209833	21343539.	14.8468029	0.0006124	-0.00004757	2.1662967	0.00000	17.6647880	
0.	00004250	906.9895310	21340930.	14.6528991	0.0006227	-0.00005725	2.1955200	0.00000	17.9610983	
0.	00004375	933.5370734	21337990.	14.4702529	0.0006331	-0.00006693	2.2245304	0.00000	18.2576336	
0.	00004500	960.0607992	21334684.	14.2979174	0.0006434	-0.00007659	2.2533264	0.00000	18.5543823	
0.	00004625	986.5581497	21330987.	14.1350483	0.0006537	-0.00008625	2.2819063	0.00000	18.8513337	
0.	00004750	1013.	21326880.	13.9808910	0.0006641	-0.00009591	2.3102688	0.00000	19.1484775	
0.	00004875	1039.	21322350.	13.8347686	0.0006744	-0.000106	2.3384125	0.00000	19.4458043	
0.	00005125	1071.	20894745.	13.5022636	0.0006920	-0.000128	2.3854895	0.00000	19.9488395 C	

0.00005375	1116.	20762700.	13.2378777	0.0007115	-0.000148	2.4371934	0.00000	20.5098420 C
0.00005625	1160.	20625413.	12.9944256	0.0007309	-0.000169	2.4876793	0.00000	21.0666563 C
0.00005875	1203.	20485061.	12.7693881	0.0007502	-0.000190	2.5369892	0.00000	21.6195452 C
0.00006125	1246.	20344120.	12.5608212	0.0007694	-0.000211	2.5851881	0.00000	22.1690576 C
0.00006375	1288.	20201972.	12.3665188	0.0007884	-0.000232	2.6322489	0.00000	22.7147013 C
0.00006625	1329.	20061206.	12.1853111	0.0008073	-0.000253	2.6782600	0.00000	23.2573280 C
0.00006875	1370.	19922384.	12.0158564	0.0008261	-0.000274	2.7232493	0.00000	23.7971136 C
0.00000375	1410.	19785959.	11.8570066	0.0008201	-0.000274	2.7672436	0.00000	24.3342397 C
0.00007375	1449.	19652322.	11.7077809	0.0008634	-0.000317	2.8102712	0.00000	24.8689163 C
0.00007625	1489.	19521807.	11.5673384	0.0008820	-0.000338	2.8523610	0.00000	25.4013769 C
0.00007875	1527.	19394690.	11.4349559	0.0009005	-0.000359	2.8935422	0.00000	25.9318805 C
0.00008125	1566.	19270081.	11.3096714	0.0009189	-0.000381	2.9337845	0.00000	26.4599131 C
0.00008375	1604.	19148896.	11.1911326	0.0009373	-0.000403	2.9731492	0.00000	26.9861634 C
0.00008625	1641.	19031505.	11.0789307	0.0009556	-0.000424	3.0116763	0.00000	27.5110756 C
0.00008875	1679.	18917594.	10.9725139	0.0009738	-0.000446	3.0493684	0.00000	28.0346078 C
0.00009125	1716.	18806120.	10.8711149	0.0009920	-0.000468	3.0861772	0.00000	28.5559877 C
0.00009375	1753.	18698671.	10.7749086	0.0010101	-0.000490	3.1222192	0.00000	29.0767830 C
0.00009625	1790.	18593838.	10.6830967	0.0010282	-0.000512	3.1574230	0.00000	29.5958940 C
0.00009875	1826.	18492227.	10.5955986	0.0010463	-0.000534	3.1918433	0.00000	30.1140457 C
0.0001013	1862.	18393664.	10.5121152	0.0010644	-0.000556	3.2254880	0.00000	30.6312985 C
0.0001038	1898.	18297733.	10.4322518	0.0010823	-0.000578	3.2583409	0.00000	31.1473380 C
0.0001063	1934.	18204760.	10.3559490	0.0011003	-0.000600	3.2904444	0.00000	31.6627680 C
0.0001088	1970.	18114357.	10.2828632	0.0011003	-0.000622	3.3217823	0.00000	32.1772801 C
0.0001038	2005.	18026402.	10.2127958	0.0011183	-0.000644	3.3523619	0.00000	32.1772801 C
0.0001138	2041.	17941369.	10.1457996	0.0011541	-0.000666	3.3822345	0.00000	33.2045568 C
0.0001163	2076.	17857948.	10.0811826	0.0011719	-0.000688	3.4113067	0.00000	33.7164872 C
0.0001188	2111.	17777547.	10.0194562	0.0011898	-0.000710	3.4397103	0.00000	34.2290025 C
0.0001213	2146.	17698817.	9.9598987	0.0012076	-0.000732	3.4673410	0.00000	34.7401940 C
0.0001238	2181.	17622249.	9.9026532	0.0012255	-0.000755	3.4942555	0.00000	35.2510471 C
0.0001263	2215.	17548249.	9.8478338	0.0012433	-0.000777	3.5205017	0.00000	35.7624819 C
0.0001288	2250.	17475416.	9.7946709	0.0012611	-0.000799	3.5459616	0.00000	36.2721528 C
0.0001313	2284.	17404701.	9.7435791	0.0012788	-0.000821	3.5707355	0.00000	36.7819985 C
0.0001338	2319.	17336190.	9.6945467	0.0012966	-0.000843	3.5948414	0.00000	37.2924235 C
0.0001363	2353.	17268896.	9.6469925	0.0013144	-0.000866	3.6181934	0.00000	37.8015796 C
0.0001388	2387.	17203232.	9.6010939	0.0013322	-0.000888	3.6408420	0.00000	38.3105020 C
0.0001413	2421.	17139477.	9.5569612	0.0013499	-0.000910	3.6628228	0.00000	38.8200027 C
0.0001438	2455.	17077390.	9.5144220	0.0013677	-0.000932	3.6841195	0.00000	39.3297469 C
0.0001463	2489.	17016128.	9.4729490	0.0013854	-0.000955	3.7046562	0.00000	39.8378454 C
0.0001488	2522.	16956530.	9.4330043	0.0014032	-0.000977	3.7245249	0.00000	40.3465227 C
0.0001588	2656.	16731451.	9.2859675	0.0014741	-0.001066	3.7971061	0.00000	42.3819734 C
0.0001688	2789.	16524955.	9.1566439	0.0015452	-0.001155	3.8586493	0.00000	44.4188263 C
0.0001788	2920.	16334528.	9.0424453	0.0015452	-0.001244	3.9091755	0.00000	46.4590765 C
0.0001788	3050.	16157144.	8.9405365	0.0016163	-0.001244	3.9485899	0.00000	48.5003622 C
		15985342.					0.00000	50.0000000 CY
0.0001988	3177.		8.8515700	0.0017592	-0.001421	3.9770361		
0.0002088	3292.	15768042.	8.7847227	0.0018338	-0.001506	3.9946227	0.00000	50.0000000 CY
0.0002188	3396.	15524323.	8.7355867	0.0019109	-0.001589	3.9991273	0.00000	50.0000000 CY
0.0002288	3493.	15271087.	8.6986136	0.0019898	-0.001670	3.9993217	0.00000	50.0000000 CY
0.0002388	3584.	15012274.	8.6711064	0.0020702	-0.001750	3.9992316	0.00000	50.0000000 CY
0.0002488	3659.	14708288.	8.6403928	0.0021493	-0.001831	3.9986434	0.00000	50.0000000 CY
0.0002588	3718.	14368851.	8.6057674	0.0022267	-0.001913	3.9998532	0.00000	50.0000000 CY
0.0002688	3768.	14019419.	8.5709165	0.0023034	-0.001997	3.9986745	0.00000	50.0000000 CY
0.0002788	3810.	13668765.	8.5369198	0.0023797	-0.002080	3.9995723	0.00000	50.0000000 CY
0.0002888	3847.	13323568.	8.5044987	0.0024557	-0.002164	3.9999263	0.00000	50.0000000 CY
0.0002988	3879.	12985001.	8.4734687	0.0025314	-0.002249	4.0000000	0.00000	50.0000000 CY
0.0003088	3908.	12656392.	8.4445504	0.0026073	-0.002333	3.9985314	0.00000	50.0000000 CY
0.0003188	3933.	12338030.	8.4174066	0.0026830	-0.002417	3.9980319	0.00000	50.0000000 CY
0.0003288	3955.	12030104.	8.3915847	0.0027587	-0.002501	3.9985695	0.00000	50.0000000 CY
0.0003388	3975.	11733196.	8.3669462	0.0027387	-0.002586	3.9999998	0.00000	50.0000000 CY
0.0003388	3992.	11446939.	8.3441727	0.0028343	-0.002580	3.9999180	0.00000	50.0000000 CY
	4008.							
0.0003588		11171560.	8.3228505	0.0029858	-0.002754	3.9995616	0.00000	50.0000000 CY
0.0003688	4022.	10906835.	8.3028339	0.0030617	-0.002838	3.9986927	0.00000	50.0000000 CY
0.0003788	4035.	10652198.	8.2842488	0.0031377	-0.002922	3.9971507	0.00000	50.0000000 CY
0.0003888	4046.	10407289.	8.2670738	0.0032138	-0.003006	3.9998932	0.00000	50.0000000 CY

0.0003988	4056.	10171868.	8.2508116	0.0032900	-0.003090	3.9988660	0.00000	50.0000000 CY
0.0004088	4065.	9944953.	8.2356406	0.0033663	-0.003174	3.9973202	0.00000	50.0000000 CY
0.0004188	4073.	9726903.	8.2210053	0.0034425	-0.003257	3.9996266	0.00000	50.0000000 CY
0.0004288	4080.	9517082.	8.2077012	0.0035191	-0.003341	3.9974185	0.00000	50.0000000 CY
0.0004388	4087.	9314925.	8.1948812	0.0035955	-0.003424	3.9998721	0.00000	50.0000000 CY
0.0004488	4093.	9120155.	8.1832602	0.0036722	-0.003508	3.9977302	0.00000	50.0000000 CY
0.0004588	4098.	8932874.	8.1723643	0.0037491	-0.003591	3.9999110	0.00000	50.0000000 CY
0.0004688	4102.	8751759.	8.1622889	0.0038261	-0.003674	3.9974423	0.00000	50.0000000 CY

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.	Max. Tens.
No.	kips	in-kip	Strain	Strain
1	0.000	3588.135	0.00300000	-0.00621448
2	305.000	4010.432	0.00300000	-0.00276991

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	0.0000	3588.	0.0000	2332.	14289511.
2	0.65	305.000000	4010.	198.250000	2607.	16814424.
1	0.75	0.0000	3588.	0.0000	2691.	14034271.
2	0.75	305.000000	4010.	228.750000	3008.	16214289.
1	0.90	0.0000	3588.	0.0000	3229.	11311575.
2	0.90	305.000000	4010.	274.500000	3609.	14909423.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	9992.

2	4.7000	4.7447	Yes	No	9992.	191248.
3	15.7000	14.7274	No	No	201241.	602390.

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3	15.7000	14.7274	No	No	201241.	602390.
4	45.2000	29.8430	Yes	No	803631.	404425.
5	57.7000	76.7014	Yes	No	1208056.	509828.
6	88.2000	88.2000	No	No	1717883.	0.00
7	103.2000	103.2000	No	Yes	N.A.	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 Pile-head Rotation (Loading Type 2)

Shear force at pile head = 20000.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 0.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
Х	У	Moment	Force	S	Stress			Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.2351		20000.	0.00	0.00	1.45E+10	0.00	0.00	0.00
0.8800	0.2309	-886326.	19757.	-7.21E-04	0.00	1.45E+10	-46.056	2106.	0.00
1.7600	0.2199	-680262.	19007.	-0.00129	0.00	1.46E+10	-95.973	4609.	0.00
2.6400	0.2037	-484900.	17781.	-0.00171	0.00	1.46E+10	-136.121	7057.	0.00
3.5200	0.1838	-304718.	16210.	-0.00195	0.00	2.29E+10	-161.554	9283.	0.00
4.4000	0.1624	-142551.	14436.	-0.00206	0.00	2.30E+10	-174.444	11343.	0.00
5.2800	0.1403	163.5672	12625.	-0.00209	0.00	2.31E+10	-168.475	12678.	0.00
6.1600	0.1183	124091.	10737.	-0.00206	0.00	2.31E+10	-189.119	16888.	0.00
7.0400	0.09678	226928.	8650.	-0.00198	0.00	2.30E+10	-206.180	22497.	0.00
7.9200	0.07641	306774.	6390.	-0.00186	0.00	2.29E+10	-221.752	30646.	0.00
8.8000	0.05753	361891.	4022.	-0.00166	0.00	1.47E+10	-226.815	41630.	0.00
9.6800	0.04141	391716.	1653.	-0.00139	0.00	1.47E+10	-221.798	56561.	0.00
10.5600	0.02827	396806.	-610.709	-0.00110	0.00	1.47E+10	-206.970	77324.	0.00
11.4400	0.01814	378817.	-2492.	-8.22E-04	0.00	1.47E+10	-149.420	86981.	0.00
12.3200	0.01090	344166.	-3792.	-5.62E-04	0.00	1.47E+10	-96.662	93671.	0.00
13.2000	0.00627	298735.	-4617.	-3.69E-04	0.00	2.29E+10	-59.600	100362.	0.00
14.0800	0.00310	246659.	-5097.	-2.44E-04	0.00	2.30E+10	-31.406	107053.	0.00
14.9600	0.00112	191080.	-5327.	-1.43E-04	0.00	2.30E+10	-12.094	113744.	0.00
15.8400	7.39E-05	134152.	-5581.	-6.86E-05	0.00	2.30E+10	-36.071	5157400.	0.00
16.7200	-3.26E-04	73202.		-2.11E-05	0.00	2.31E+10	157.0243	5088007.	0.00
17.6000	-3.72E-04	29763.	-3257.	2.42E-06	0.00	2.31E+10	162.3238	4606667.	0.00
18.4800	-2.75E-04	4424.	-1691.	1.02E-05	0.00	2.31E+10	134.1886	5157400.	0.00
19.3600	-1.56E-04	-5950.	-579.954	9.88E-06	0.00	2.31E+10	76.2266	5157400.	0.00
20.2400	-6.61E-05	-7824.	-7.042	6.73E-06	0.00	2.31E+10	32.2793	5157400.	0.00
21.1200	-1.38E-05	-6099.	199.0917	3.56E-06	0.00	2.31E+10	6.7612	5157400.	0.00
22.0000	8.99E-06	-3620.	211.6009	1.34E-06	0.00	2.31E+10	-4.392	5157400.	0.00
22.8800	1.44E-05	-1630.	151.3464	1.37E-07	0.00	2.31E+10	-7.020	5157400.	0.00
23.7600	1.19E-05	-423.070		-3.31E-07	0.00	2.31E+10	-5.809	5157400.	0.00
24.6400	7.37E-06	135.9818	33.9258	-3.97E-07	0.00	2.31E+10	-3.601	5157400.	0.00
25.5200	3.51E-06	293.4438	5.8612	-2.99E-07	0.00	2.31E+10	-1.714	5157400.	0.00

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26.4000	1.06E-06	259.7706	-5.923	-1.73E-07	0.00	2.31E+10	-0.518	5157400.	0.00
27.2800	-1.36E-07	168.3428	-8.308	-7.48E-08	0.00	2.31E+10	0.06632	5157400.	0.00
28.1600	-5.20E-07	84.3108	-6.616	-1.71E-08	0.00	2.31E+10	0.2541	5157400.	0.00
29.0400	-4.98E-07	28.6094	-3.991	8.64E-09	0.00	2.31E+10	0.2432	5157400.	0.00
29.9200	-3.38E-07	0.02852	-1.835	1.52E-08	0.00	2.31E+10	0.1650	5157400.	0.00
30.8000	-1.77E-07	-10.156	-0.507	1.29E-08	0.00	2.31E+10	0.08666	5157400.	0.00
31.6800	-6.61E-08	-10.677	0.1212	8.11E-09	0.00	2.31E+10	0.03228	5157400.	0.00
32.5600	-6.24E-09	-7.597	0.3077	3.93E-09	0.00	2.31E+10	0.00305	5157400.	0.00
33.4400	1.70E-08	-4.177	0.2800	1.25E-09	0.00	2.31E+10	-0.00829	5157400.	0.00
34.3200	2.01E-08	-1.682	0.1846	-9.29E-11	0.00	2.31E+10	-0.00979	5157400.	0.00
35.2000	1.50E-08	-0.280	0.09411	-5.41E-10	0.00	2.31E+10	-0.00733	5157400.	0.00
36.0800	8.63E-09	0.3054	0.03313	-5.35E-10	0.00	2.31E+10	-0.00422	5157400.	0.00
36.9600	3.72E-09	0.4203	0.00129	-3.69E-10	0.00	2.31E+10	-0.00182	5157400.	0.00
37.8400	8.32E-10	0.3326	-0.01044	-1.97E-10	0.00	2.31E+10	-4.06E-04	5157400.	0.00
38.7200	-4.50E-10	0.1997	-0.01143	-7.58E-11	0.00	2.31E+10	2.20E-04	5157400.	0.00
39.6000	-7.69E-10	0.09132	-0.00828	-9.33E-12	0.00	2.31E+10	3.75E-04	5157400.	0.00
40.4800	-6.47E-10	0.02478	-0.00463	1.72E-11	0.00	2.31E+10	3.16E-04	5157400.	0.00
41.3600	-4.06E-10	-0.00652	-0.00192	2.14E-11	0.00	2.31E+10	1.98E-04	5157400.	0.00
42.2400	-1.96E-10	-0.01572	-3.65E-04	1.63E-11	0.00	2.31E+10	9.58E-05	5157400.	0.00
43.1200	-6.22E-11	-0.01424	3.01E-04	9.43E-12	0.00	2.31E+10	3.04E-05	5157400.	0.00
44.0000	3.06E-12	-0.00937	4.53E-04	4.04E-12	0.00	2.31E+10	-1.50E-06	5157400.	0.00
44.8800	2.31E-11	-0.00467	3.86E-04	0.00	0.00	2.31E+10	-1.13E-05	5157400.	0.00
45.7600	2.06E-11	-0.00123	2.34E-04	0.00	0.00	2.31E+10	-1.74E-05	8910000.	0.00
46.6400	1.22E-11	2.74E-04	8.80E-05	0.00	0.00	2.31E+10	-1.03E-05	8910000.	0.00
47.5200	5.11E-12	6.30E-04	1.09E-05	0.00	0.00	2.31E+10	-4.31E-06	8910000.	0.00
48.4000	1.06E-12	5.04E-04	-1.66E-05	0.00		2.31E+10			0.00
					0.00		-8.92E-07	8910000.	
49.2800	0.00	2.78E-04	-1.88E-05	0.00	0.00	2.31E+10	4.79E-07	8910000.	0.00
50.1600	0.00	1.06E-04	-1.25E-05	0.00	0.00	2.31E+10	7.18E-07	8910000.	0.00
51.0400	0.00	1.46E-05	-5.92E-06	0.00	0.00	2.31E+10	5.24E-07	8910000.	0.00
51.9200	0.00	-1.87E-05	-1.73E-06	0.00	0.00	2.31E+10	2.70E-07	8910000.	0.00
52.8000	0.00	-2.19E-05	1.88E-07	0.00	0.00	2.31E+10	9.28E-08	8910000.	0.00
53.6800	0.00	-1.47E-05	7.02E-07	0.00	0.00	2.31E+10	4.36E-09	8910000.	0.00
54.5600	0.00	-7.08E-06	5.97E-07	0.00	0.00	2.31E+10	-2.42E-08	8910000.	0.00
55.4400	0.00	-2.12E-06	3.43E-07	0.00	0.00	2.31E+10	-2.39E-08	8910000.	0.00
56.3200	0.00	1.69E-07	1.38E-07	0.00	0.00	2.31E+10	-1.50E-08	8910000.	0.00
57.2000	0.00	7.86E-07	2.25E-08	0.00	0.00	2.31E+10	-6.80E-09	8910000.	0.00
58.0800	0.00	6.45E-07	-1.79E-08	0.00	0.00	2.31E+10	-8.53E-10	4247271.	0.00
58.9600			-2.09E-08						
	0.00	4.08E-07		0.00	0.00	2.31E+10	2.84E-10	4247271.	0.00
59.8400	0.00	2.04E-07	-1.61E-08	0.00	0.00	2.31E+10	6.29E-10	4247271.	0.00
60.7200	0.00	6.89E-08	-9.69E-09	0.00	0.00	2.31E+10	5.79E-10	4247271.	0.00
61.6000	0.00	-1.11E-09	-4.54E-09	0.00	0.00	2.31E+10	3.96E-10	4247271.	0.00
62.4800	0.00	-2.70E-08	-1.32E-09	0.00	0.00	2.31E+10	2.14E-10	4247271.	0.00
63.3600	0.00	-2.90E-08	2.60E-10	0.00	0.00	2.31E+10	8.54E-11	4247271.	0.00
64.2400	0.00	-2.15E-08	7.79E-10	0.00	0.00	2.31E+10	1.28E-11	4247271.	0.00
65.1200	0.00	-1.26E-08	7.52E-10	0.00	0.00	2.31E+10	-1.80E-11	4247271.	0.00
66.0000	0.00	-5.66E-09	5.27E-10	0.00	0.00	2.31E+10	-2.44E-11	4247271.	0.00
66.8800	0.00	-1.45E-09	2.93E-10	0.00	0.00	2.31E+10	-1.99E-11	4247271.	0.00
67.7600	0.00	5.38E-10	1.22E-10	0.00	0.00		-1.25E-11	4247271.	0.00
68.6400	0.00	1.13E-09	2.33E-11	0.00	0.00	2.31E+10		4247271.	0.00
69.5200	0.00	1.03E-09	-2.04E-11	0.00	0.00	2.31E+10	-2.07E-12	4247271.	0.00
70.4000	0.00	6.99E-10	-3.09E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
71.2800	0.00		-2.61E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
72.1600	0.00	1.48E-10	-1.68E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
73.0400	0.00	2.08E-11	-8.59E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
73.9200	0.00	-3.29E-11	-3.05E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
74.8000	0.00	-4.37E-11	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
75.6800	0.00	-3.53E-11	1.02E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
76.5600	0.00	-2.21E-11	1.16E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
77.4400	0.00	-1.09E-11	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
78.3200	0.00	-3.56E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
79.2000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
80.0800	0.00	1.53E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
80.9600	0.00	1.60E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00

81.8400	0.00	1.17E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	2123635.	0.00

Output Summary for Load Case No. 1:

Pile-head deflection = 0.23510916 inches
Computed slope at pile head = 0.000000 radians
Maximum bending moment = 0.000000 radians
-1097526. inch-lbs
20000. lbs
Depth of maximum bending moment = 0.000000 feet belo

Depth of maximum bending moment = 0.000000 feet below pile head Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations = 12 Number of zero deflection points = 14

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

Boundary Condition Type 2, Shear and Slope

Shear = 20000. lbs Slope = 0.00000 Axial Load = 0. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
88.00000	0.23510916	-1097526.	20000.
83.60000	0.23741482	-1093023.	20000.
79.20000	0.23653965	-1091771.	20000.
74.80000	0.23649018	-1098526.	20000.
70.40000	0.23516477	-1098470.	20000.
66.00000	0.23599216	-1091351.	20000.
61.60000	0.23439815	-1093170.	20000.
57.20000	0.23543341	-1089893.	20000.
52.80000	0.23514062	-1093901.	20000.
48.40000	0.23538912	-1092852.	20000.
44.00000	0.23467920	-1096087.	20000.
39.60000	0.23439272	-1094761.	20000.
35.20000	0.23430216	-1095721.	20000.
30.80000	0.23432560	-1091934.	20000.
26.40000	0.23454472	-1092618.	20000.
22.00000	0.23428044	-1094761.	20000.
17.60000	0.23644804	-1092744.	20000.
13.20000	0.30259188	-1215364.	20000.
13.2000	0.50255100	1213304.	20000.

8.80000 0.34741532 -1316011. 20000.

Computed Values of Pile Loading and Deflection

for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 20000.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 305000.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2015	-1181071.	20000.	0.00	0.00	2.06E+10	0.00	0.00	0.00
0.8800	0.1983	-968894 .	19767.	-5.52E-04	0.00	2.06E+10	-44.084	2347.	0.00
1.7600	0.1899	-760030.	19050.	-9.89E-04	0.00	2.14E+10	-91.788	5105.	0.00
2.6400	0.1774	-560190.	17878.	-0.00132	0.00	2.14E+10	-130.119	7745.	0.00
3.5200	0.1621	-373969.	16376.	-0.00155	0.00	2.14E+10	-154.476	10065.	0.00
4.4000	0.1448	-204379.	14684.	-0.00169	0.00	2.14E+10	-165.952	12106.	0.00
5.2800	0.1264	-52970.	12968.	-0.00175	0.00	2.14E+10	-158.942	13279.	0.00
6.1600	0.1077	80799.	11184.	-0.00175	0.00	2.14E+10	-179.015	17545.	0.00
7.0400	0.08952	194478.	9200.	-0.00168	0.00	2.14E+10	-196.633	23195.	0.00
7.9200	0.07231	285919.	7030.	-0.00156	0.00	2.14E+10	-214.438	31315.	0.00
8.8000	0.05659	352993.	4712.	-0.00140	0.00	2.14E+10	-224.548	41900.	0.00
9.6800	0.04272	394465.	2333.	-0.00122	0.00	2.14E+10	-226.023	55876.	0.00
10.5600	0.03090	410104.	-13.906	-0.00102	0.00	2.14E+10	-218.477	74671.	0.00
11.4400	0.02122	400728.	-2090.	-8.18E-04	0.00	2.14E+10	-174.770	86981.	0.00
12.3200	0.01363	371225.	-3651.	-6.27E-04	0.00	2.14E+10	-120.908	93671.	0.00
13.2000	0.00798	327648.	-4690.	-4.54E-04	0.00	2.14E+10	-75.840	100362.	0.00
14.0800	0.00404	275092.	-5307.	-3.05E-04	0.00	2.14E+10	-40.941	107053.	0.00
14.9600	0.00153	217533.	-5610.	-1.84E-04	0.00	2.14E+10	-16.508	113744.	0.00
15.8400	1.61E-04	157787.	-6114.	-9.09E-05	0.00	2.14E+10	-78.853	5157400.	0.00
16.7200	-3.87E-04	88997.	-5664.	-2.99E-05	0.00	2.14E+10	163.9660	4479361.	0.00
17.6000	-4.70E-04	38350.	-3889.	1.54E-06	0.00	2.14E+10	172.1970	3866537.	0.00
18.4800	-3.54E-04	6844.	-2133.	1.27E-05	0.00	2.14E+10	160.4072	4785186.	0.00
19.3600	-2.02E-04	-6786.	-765.401	1.27E-05	0.00	2.14E+10	98.6479	5157400.	0.00
20.2400	-8.54E-05	-9404.	-24.368	8.72E-06	0.00	2.14E+10	41.6993	5157400.	0.00
21.1200	-1.78E-05	-7357.	241.7840	4.58E-06	0.00	2.14E+10	8.7082	5157400.	0.00
22.0000	1.13E-05	-4327.	258.5080	1.69E-06	0.00	2.14E+10	-5.541	5157400.	0.00
22.8800	1.80E-05	-1908.	182.9639	1.54E-07	0.00	2.14E+10	-8.767	5157400.	0.00
23.7600	1.46E-05	-463.506	99.0169	-4.31E-07	0.00	2.14E+10	-7.132 -4.317	5157400.	0.00 0.00
24.6400	8.84E-06 4.05E-06	186.1970 354.2064	38.5650 5.3385	-5.00E-07	0.00 0.00	2.14E+10	-4.317 -1.976	5157400. 5157400.	
25.5200 26.4000	1.10E-06	301.3069	-7.932	-3.66E-07 -2.05E-07	0.00	2.14E+10 2.14E+10	-0.537	5157400.	0.00 0.00
27.2800	-2.74E-07	188.0045	-10.064	-8.37E-08	0.00	2.14E+10	0.1336	5157400.	0.00
28.1600	-6.67E-07	89.3001	-7.639	-1.52E-08	0.00	2.14E+10	0.3256	5157400.	0.00
29.0400	-5.94E-07	26.7595	-4.389	1.35E-08	0.00	2.14E+10 2.14E+10	0.2900	5157400.	0.00
29.9200	-3.82E-07	-3.479	-1.873	1.92E-08	0.00	2.14E+10	0.1864	5157400.	0.00
30.8000	-1.87E-07	-12.932	-0.406	1.52E-08	0.00	2.14E+10	0.09152	5157400.	0.00
31.6800	-6.07E-08	-12.158	0.2334	9.00E-09	0.00	2.14E+10	0.02963	5157400.	0.00
32.5600	2.63E-09	-8.061	0.3830	4.00E-09	0.00	2.14E+10	-0.00129	5157400.	0.00
33.4400	2.39E-08	-4.094	0.3147	1.00E-09	0.00	2.14E+10	-0.01166	5157400.	0.00
34.3200	2.38E-08	-1.422	0.1918	-3.61E-10	0.00	2.14E+10	-0.01161	5157400.	0.00
35.2000	1.63E-08	-0.04198	0.08852	-7.23E-10	0.00	2.14E+10	-0.00794	5157400.	0.00
36.0800	8.51E-09	0.4525	0.02465	-6.21E-10	0.00	2.14E+10	-0.00416	5157400.	0.00
36.9600	3.13E-09	0.4825	-0.00539	-3.90E-10	0.00	2.14E+10	-0.00153	5157400.	0.00
					0.00				

37.8400	2.71E-10	0.3411	-0.01417	-1.87E-10	0.00	2.14E+10	-1.32E-04	5157400.	0.00
38.7200	-8.13E-10	0.1844	-0.01277	-5.71E-11	0.00	2.14E+10	3.97E-04	5157400.	0.00
39.6000	-9.35E-10	0.07168	-0.00827	6.15E-12	0.00	2.14E+10	4.57E-04	5157400.	0.00
40.4800	-6.83E-10	0.00979	-0.00409	2.63E-11	0.00	2.14E+10	3.34E-04	5157400.	0.00
41.3600	-3.80E-10	-0.01492	-0.00135	2.50E-11	0.00	2.14E+10	1.86E-04	5157400.	0.00
42.2400	-1.55E-10	-0.01889	3.08E-05	1.67E-11	0.00	2.14E+10	7.58E-05	5157400.	0.00
43.1200	-2.85E-11	-0.01437	5.04E-04	8.44E-12	0.00	2.14E+10	1.39E-05	5157400.	0.00
44.0000	2.32E-11	-0.00829	5.18E-04	2.85E-12	0.00	2.14E+10	-1.13E-05	5157400.	0.00
44.8800	3.16E-11	-0.00345	3.77E-04	0.00	0.00	2.14E+10	-1.54E-05	5157400.	0.00
45.7600	2.20E-11	-3.24E-04	1.97E-04	0.00	0.00	2.14E+10	-1.86E-05	8910000.	0.00
46.6400	1.08E-11	7.27E-04	5.11E-05	0.00	0.00	2.14E+10	-9.10E-06	8910000.	0.00
47.5200	3.33E-12	7.61E-04	-1.18E-05	0.00	0.00	2.14E+10	-2.81E-06	8910000.	0.00
48.4000	0.00	4.81E-04	-2.60E-05	0.00	0.00	2.14E+10	1.28E-07	8910000.	0.00
49.2800	-1.13E-12	2.14E-04	-2.03E-05	0.00	0.00	2.14E+10	9.52E-07	8910000.	0.00
50.1600	0.00	5.33E-05	-1.08E-05	0.00	0.00	2.14E+10	8.33E-07	8910000.	0.00
51.0400	0.00	-1.48E-05	-3.90E-06	0.00	0.00	2.14E+10	4.80E-07	8910000.	0.00
51.9200	0.00	-1.48E-05	-3.55E-07	0.00	0.00	2.14E+10	1.92E-07	8910000.	0.00
52.8000	0.00	-2.25E-05	8.33E-07	0.00	0.00	2.14E+10	3.32E-08	8910000.	0.00
53.6800	0.00	-1.19E-05	8.68E-07	0.00	0.00	2.14E+10		8910000.	0.00
54.5600	0.00	-4.18E-06	5.46E-07	0.00	0.00	2.14E+10	-3.42E-08	8910000.	0.00
55.4400	0.00	-3.16E-07	2.42E-07	0.00	0.00	2.14E+10	-2.34E-08	8910000.	0.00
56.3200	0.00	9.42E-07	5.96E-08	0.00	0.00	2.14E+10	-1.12E-08	8910000.	0.00
57.2000	0.00	9.50E-07	-1.60E-08	0.00	0.00	2.14E+10	-3.13E-09	8910000.	0.00
58.0800	0.00	6.07E-07	-3.07E-08	0.00	0.00	2.14E+10	3.56E-10	4247271.	0.00
58.9600	0.00	3.03E-07	-2.39E-08	0.00	0.00	2.14E+10	9.31E-10	4247271.	0.00
59.8400	0.00	1.03E-07	-1.44E-08	0.00	0.00	2.14E+10	8.69E-10	4247271.	0.00
60.7200	0.00	-1.01E-09	-6.69E-09	0.00	0.00	2.14E+10	5.92E-10	4247271.	0.00
61.6000	0.00	-3.89E-08	-1.89E-09	0.00	0.00	2.14E+10	3.16E-10	4247271.	0.00
62.4800	0.00	-4.14E-08	4.22E-10	0.00	0.00	2.14E+10	1.22E-10	4247271.	0.00
63.3600	0.00	-3.02E-08	1.15E-09	0.00	0.00	2.14E+10	1.53E-11	4247271.	0.00
64.2400	0.00	-1.72E-08	1.08E-09	0.00	0.00	2.14E+10	-2.85E-11	4247271.	0.00
65.1200	0.00	-7.40E-09	7.37E-10	0.00	0.00	2.14E+10	-3.63E-11	4247271.	0.00
66.0000	0.00	-1.63E-09	3.96E-10	0.00	0.00	2.14E+10	-2.85E-11	4247271.	0.00
66.8800	0.00	9.68E-10	1.54E-10	0.00	0.00	2.14E+10	-1.73E-11	4247271.	0.00
67.7600	0.00	1.64E-09	2.01E-11	0.00	0.00	2.14E+10	-8.09E-12	4247271.	0.00
68.6400	0.00	1.40E-09	-3.49E-11	0.00	0.00	2.14E+10	-2.34E-12	4247271.	0.00
69.5200	0.00	9.07E-10	-4.49E-11	0.00	0.00	2.14E+10	0.00	4247271.	0.00
70.4000	0.00	4.58E-10	-3.54E-11	0.00	0.00	2.14E+10	1.35E-12	4247271.	0.00
71.2800	0.00	1.59E-10	-2.16E-11	0.00	0.00	2.14E+10	1.28E-12	4247271.	0.00
72.1600	0.00	2.52E-12	-1.01E-11	0.00	0.00	2.14E+10	0.00	4247271.	0.00
73.0400	0.00	-5.57E-11	-2.97E-12	0.00	0.00	2.14E+10	0.00	4247271.	0.00
73.9200	0.00	-6.07E-11	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
74.8000	0.00	-4.48E-11	1.66E-12	0.00	0.00	2.14E+10	0.00	4247271.	0.00
75.6800	0.00	-2.58E-11	1.59E-12	0.00	0.00	2.14E+10	0.00	4247271.	0.00
76.5600	0.00	-1.13E-11	1.10E-12	0.00	0.00	2.14E+10	0.00	4247271.	0.00
77.4400	0.00	-2.62E-12	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
78.3200	0.00	1.32E-12	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
79.2000	0.00	2.38E-12	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
80.0800	0.00	2.07E-12	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
80.9600	0.00	1.35E-12	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
81.8400	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
			0.00		0.00				0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	2123635.	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 inter-

polated 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:

0.20151414 inches Pile-head deflection Computed slope at pile head = 0.000000 radians Maximum bending moment -1181071. inch-lbs 20000. lbs Maximum shear force

0.000000 feet below pile head Depth of maximum bending moment = Depth of maximum shear force = 0.000000 feet below pile head Number of iterations 11

Number of zero deflection points = 14

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

Boundary Condition Type 2, Shear and Slope

20000. lbs Shear Slope 0.00000 305000. lbs Axial Load =

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	1bs
88.0000 83.60000 79.20000 74.80000 66.00000 61.60000 57.20000 52.80000 48.40000 44.00000 39.60000 39.60000 39.80000	0.20151414 0.20098811 0.20089366 0.20059484 0.20032615 0.20048668 0.19985876 0.19969641 0.19972208 0.19948929 0.19933818 0.19905866 0.19885924 0.19866425	-1181071118053011807421180674118009911813941180155118043211810971181097118122511811011181123118123.	20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000.
26.40000	0.19869607	-1181296.	20000.
22.00000	0.19860651	-1181170.	20000.
17.60000	0.20318326	-1183747.	20000.
13.20000	0.26995785	-1364039.	20000.
8.80000	0.30605995	-1398185.	20000.

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 20000.0 lbs Applied moment at pile head 0.0 in-lbs Axial thrust load on pile head 0.0 lbs

Depth	Deflect.	Bending	Shear		Total	Bending		Soil Spr.	
X	У	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.8740	 -2.07E-07	20000.	-0.00939	0.00	2.31E+10	0.00	0.00	0.00
0.8800	0.7748	211200.	19655.	-0.00934	0.00	2.31E+10	-65.256	889.3427	0.00
1.7600	0.6767	415123.	18570.	-0.00915	0.00	1.47E+10	-140.373	2191.	0.00
2.6400	0.5817	603393.	16741.	-0.00878	0.00	1.46E+10	-206.012	3740.	0.00
3.5200	0.4913	768689.	14387.	-0.00828	0.00	1.46E+10	-239.845	5155.	0.00
4.4000	0.4068	907240.	11717.	-0.00768	0.00	1.46E+10	-265.694	6898.	0.00
5.2800	0.3292	1016161.	8876.	-0.00698	0.00	1.45E+10	-272.372	8738.	0.00
6.1600	0.2594	1094710.	5851.	-0.00621	0.00	1.45E+10	-300.651	12240.	0.00
7.0400	0.1980	1139732.	2581.	-0.00540	0.00	1.45E+10	-318.599	16992.	0.00
7.9200	0.1454	1149226 .	-831.944	-0.00457	0.00	1.45E+10	-327.838	23817.	0.00
8.8000	0.1015	1122162.	-4255.	-0.00374	0.00	1.45E+10	-320.384	33318.	0.00
9.6800	0.06635	1059370.	-7506.	-0.00295	0.00	1.45E+10	-295.397	47017.	0.00
10.5600	0.03927	963637.	-10400.	-0.00221	0.00	1.46E+10	-252.769	67968.	0.00
11.4400	0.01958	839717.	-12586.	-0.00156	0.00	1.46E+10	-161.282	86981.	0.00
12.3200	0.00631	697813.	-13734.	-0.00100	0.00	1.46E+10	-55.997	93671.	0.00
13.2000	-0.00163	549663.	-13948.	-5.53E-04	0.00	1.46E+10	15.4575	100362.	0.00
14.0800	-0.00538	403238.	-13578.	-2.10E-04	0.00	1.47E+10	54.4972	107053.	0.00
14.9600	-0.00606	262889.	-12946.	-4.00E-06	0.00	2.30E+10	65.2374	113744.	0.00
15.8400	-0.00546	129815.	-10924.	8.62E-05	0.00	2.30E+10	317.7967	614612.	0.00
16.7200	-0.00424	32181.	-7671.	1.23E-04	0.00	2.31E+10	298.2859	743645.	0.00
17.6000	-0.00286	-32191.	-4668.	1.23E-04	0.00	2.31E+10	270.3511	999603.	0.00
18.4800	-0.00163	-66416.	-2000.	1.01E-04	0.00	2.31E+10	235.1167	1521710.	0.00
19.3600		-74421.	257.0843	6.86E-05	0.00	2.31E+10	192.2689	2789422.	0.00
20.2400	-1.84E-04	-60986.	1746.	3.76E-05	0.00	2.31E+10	89.6713	5157400.	0.00
21.1200	6.62E-05	-37551.	2048.	1.51E-05	0.00	2.31E+10	-32.351	5157400.	0.00
22.0000	1.35E-04	-17724.	1530.	2.46E-06	0.00	2.31E+10	-65.890	5157400.	0.00
22.8800	1.18E-04	-5245.		-2.79E-06	0.00	2.31E+10	-57.682	5157400.	0.00
23.7600	7.60E-05	802.2070	376.6477	-3.80E-06	0.00	2.31E+10	-37.120	5157400.	0.00
24.6400	3.78E-05	2710.	83.2492	-3.00E-06	0.00	2.31E+10	-18.448	5157400.	0.00
25.5200	1.26E-05	2560.		-1.80E-06	0.00	2.31E+10	-6.158	5157400.	0.00
26.4000	-2.06E-07	1724.	-78.656	-8.20E-07	0.00	2.31E+10	0.1005	5157400.	0.00
27.2800	-4.71E-06	899.2220	-65.990	-2.21E-07	0.00	2.31E+10	2.2982	5157400.	0.00
28.1600	-4.87E-06	330.5030	-41.301	6.00E-08	0.00	2.31E+10	2.3778	5157400.	0.00
29.0400	-3.44E-06	26.9464	-19.880	1.42E-07	0.00	2.31E+10	1.6791	5157400.	0.00
29.9200	-1.88E-06	-89.373	-6.174	1.27E-07	0.00	2.31E+10	0.9168	5157400.	0.00
30.8000	-7.47E-07	-103.457	0.5937	8.34E-08	0.00	2.31E+10	0.3650	5157400.	0.00
31.6800	-1.17E-07	-76.834	2.8219	4.22E-08	0.00	2.31E+10	0.05696	5157400.	0.00
32.5600	1.44E-07	-43.859	2.7522	1.46E-08	0.00	2.31E+10	-0.07015	5157400.	0.00
33.4400	1.92E-07	-18.706	1.8858	3.44E-10	0.00	2.31E+10	-0.09395	5157400.	0.00
34.3200	1.51E-07	-4.030	1.0006	-4.85E-09	0.00	2.31E+10	-0.07370	5157400.	0.00
35.2000	9.00E-08	2.4273	0.3795	-5.21E-09	0.00	2.31E+10	-0.04395	5157400.	0.00
36.0800	4.08E-08	3.9843	0.04228	-3.75E-09	0.00	2.31E+10	-0.01992	5157400.	0.00
36.9600	1.08E-08	3.3202		-2.08E-09	0.00	2.31E+10	-0.00527	5157400.	0.00
37.8400	-3.19E-09	2.0685	-0.110	-8.51E-10	0.00	2.31E+10	0.00156	5157400.	0.00
38.7200		0.9902		-1.53E-10	0.00	2.31E+10	0.00351	5157400.	0.00
39.6000	-6.41E-09	0.3035	-0.04849	1.43E-10	0.00	2.31E+10	0.00313	5157400.	0.00
40.4800		-0.03396	-0.02118	2.04E-10	0.00	2.31E+10	0.00204	5157400.	0.00
	-2.10E-09	-0.144	-0.00499	1.64E-10	0.00	2.31E+10	0.00103	5157400.	0.00
	-7.23E-10	-0.139	0.00230	9.88E-11	0.00	2.31E+10	3.53E-04	5157400.	0.00
	-1.58E-11	-0.09544	0.00420	4.52E-11	0.00	2.31E+10	7.74E-06	5157400.	0.00
44.0000	2.31E-10	-0.05064	0.00365	1.18E-11	0.00	2.31E+10		5157400.	0.00
44.8800	2.34E-10	-0.01844		-3.94E-12	0.00	2.31E+10		5157400.	0.00
45.7600	1.48E-10	0.00102		-7.92E-12	0.00		-1.25E-04	8910000.	0.00
46.6400	6.68E-11	0.00656		-6.19E-12	0.00		-5.64E-05	8910000.	0.00
47.5200	1.73E-11	0.00581	-1.49E-04		0.00		-1.46E-05	8910000.	0.00
	-4.14E-12	0.00342	-2.07E-04		0.00	2.31E+10	3.50E-06	8910000.	0.00
	-9.14E-12	0.00142	-1.48E-04	0.00	0.00	2.31E+10		8910000.	0.00
50.1600	-7.26E-12	2.89E-04	-7.52E-05	0.00	0.00	2.31E+10	6.13E-06	8910000.	0.00

51.0400	-4.00E-12	-1.64E-04	-2.51E-05	0.00	0.00	2.31E+10	3.37E-06	8910000.	0.00
51.9200	-1.52E-12	-2.41E-04	-5.06E-07	0.00	0.00	2.31E+10	1.28E-06	8910000.	0.00
52.8000	0.00	-1.75E-04	7.15E-06	0.00	0.00	2.31E+10	1.69E-07	8910000.	0.00
53.6800	0.00	-8.97E-05	6.82E-06	0.00	0.00	2.31E+10		8910000.	0.00
54.5600	0.00	-3.06E-05	4.18E-06	0.00	0.00	2.31E+10	-2.68E-07	8910000.	0.00
55.4400	0.00	-1.32E-06	1.83E-06	0.00	0.00	2.31E+10	-1.79E-07	8910000.	0.00
56.3200	0.00	7.98E-06	4.32E-07	0.00	0.00	2.31E+10	-8.50E-08	8910000.	0.00
57.2000	0.00	7.80E-06	-1.41E-07	0.00	0.00	2.31E+10	-2.35E-08	8910000.	0.00
58.0800	0.00	5.00E-06	-2.50E-07	0.00	0.00	2.31E+10	2.95E-09	4247271.	0.00
58.9600	0.00	2.53E-06	-1.95E-07	0.00	0.00	2.31E+10	7.42E-09	4247271.	0.00
59.8400	0.00	8.83E-07	-1.19E-07	0.00	0.00	2.31E+10	6.98E-09	4247271.	0.00
60.7200	0.00	1.52E-08	-5.67E-08	0.00	0.00	2.31E+10	4.83E-09	4247271.	0.00
61.6000	0.00	-3.14E-07	-1.72E-08	0.00	0.00	2.31E+10	2.65E-09	4247271.	0.00
62.4800	0.00	-3.48E-07	2.48E-09	0.00	0.00	2.31E+10	1.08E-09	4247271.	0.00
63.3600	0.00	-2.62E-07	9.15E-09	0.00	0.00	2.31E+10	1.84E-10	4247271.	0.00
64.2400	0.00	-1.55E-07	9.04E-09	0.00	0.00	2.31E+10	-2.04E-10	4247271.	0.00
65.1200	0.00	-7.08E-08	6.43E-09	0.00	0.00	2.31E+10	-2.91E-10	4247271.	0.00
66.0000	0.00	-1.91E-08	3.62E-09	0.00	0.00	2.31E+10	-2.41E-10	4247271.	0.00
66.8800	0.00	5.65E-09	1.54E-09	0.00	0.00	2.31E+10	-1.53E-10	4247271.	0.00
67.7600	0.00	1.33E-08	3.20E-10	0.00	0.00	2.31E+10	-7.71E-11	4247271.	0.00
68.6400	0.00	1.24E-08	-2.27E-10	0.00	0.00	2.31E+10	-2.65E-11	4247271.	0.00
69.5200	0.00	8.53E-09	-3.67E-10	0.00	0.00	2.31E+10	0.00	4247271.	0.00
70.4000	0.00	4.65E-09	-3.15E-10	0.00	0.00	2.31E+10	9.89E-12	4247271.	0.00
71.2800	0.00		-2.06E-10	0.00	0.00	2.31E+10	1.08E-11	4247271.	0.00
72.1600	0.00	3.01E-10	-1.06E-10	0.00	0.00	2.31E+10	8.06E-12	4247271.	0.00
73.0400	0.00	-3.74E-10	-3.89E-11	0.00	0.00	2.31E+10	4.74E-12	4247271.	0.00
73.9200	0.00	-5.20E-10	-2.52E-12	0.00	0.00	2.31E+10	2.15E-12	4247271.	0.00
74.8000	0.00	-4.27E-10	1.18E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
75.6800	0.00	-2.71E-10	1.38E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
76.5600	0.00	-1.35E-10	1.06E-11	0.00	0.00	2.31E+10	0.00	4247271.	0.00
77.4400	0.00	-4.58E-11	6.42E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
78.3200	0.00	0.00	3.01E-12	0.00	0.00	2.31E+10	0.00	4247271.	0.00
79.2000	0.00	1.79E-11	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
80.0800	0.00	1.92E-11	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
80.9600	0.00	1.43E-11	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
81.8400	0.00	8.33E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
82.7200	0.00	3.75E-12	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	4247271.	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	2123635.	0.00

Output Summary for Load Case No. 3:

```
Pile-head deflection
                                     0.87402776 inches
Computed slope at pile head
                                     -0.0093921 radians
Maximum bending moment
                                      1149226. inch-lbs
Maximum shear force
                                        20000. lbs
Depth of maximum bending moment =
                                     7.92000000 feet below pile head
Depth of maximum shear force =
                                       0.000000 feet below pile head
Number of iterations
                                            14
Number of zero deflection points =
                                            14
```

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

Boundary Condition Type 1, Shear and Moment

Shear = 20000. lbs
Moment = 0. in-lbs
Axial Load = 0. lbs

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
88.00000	0.87402776	1149226.	20000.
83.60000	0.87344255	1148544.	20000.
79.20000	0.87328942	1147988.	20000.
74.80000	0.87238139	1146980.	20000.
70.40000	0.87224686	1148071.	20000.
66.00000	0.87307554	1147165.	20000.
61.60000	0.86998834	1144384.	20000.
57.20000	0.87112452	1145110.	20000.
52.80000	0.87088690	1145804.	20000.
48.40000	0.87145217	1145832.	20000.
44.00000	0.87061831	1144810.	20000.
39.60000	0.86951340	1144944.	20000.
35.20000	0.86979689	1144988.	20000.
30.80000	0.86933975	1144888.	20000.
26.40000	0.86958676	1144745.	20000.
22.00000	0.86984504	1144422.	20000.
17.60000	0.88733312	1136321.	20000.
13.20000	1.65301251	1050562.	-21952.

Computed Values of Pile Loading and Deflection

for Lateral Loading for Load Case Number 4

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

Shear force at pile head = 20000.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 305000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.8033	-1.49E-07	20000.	-0.00826	0.00	2.14E+10	0.00	0.00	0.00
0.8800	0.7161	237797.	19655.	-0.00820	0.00	2.14E+10	-65.256	962.3117	0.00
1.7600	0.6301	467938.	18570.	-0.00802	0.00	2.14E+10	-140.373	2352.	0.00
2.6400	0.5466	681681.	16775.	-0.00774	0.00	2.14E+10	-199.626	3857.	0.00
3.5200	0.4667	872078.	14486.	-0.00736	0.00	2.13E+10	-233.774	5290.	0.00
4.4000	0.3912	1035016.	11878.	-0.00688	0.00	2.13E+10	-260.232	7024.	0.00
5.2800	0.3213	1167284.	9087.	-0.00633	0.00	2.06E+10	-268.386	8822.	0.00
6.1600	0.2576	1267695.	6089.	-0.00570	0.00	2.03E+10	-299.416	12275.	0.00
7.0400	0.2009	1332591.	2811.	-0.00502	0.00	2.00E+10	-321.416	16896.	0.00
7.9200	0.1516	1359384.	-662.117	-0.00431	0.00	2.00E+10	-336.322	23428.	0.00
8.8000	0.1099	1346355.	-4213.	-0.00359	0.00	2.00E+10	-336.174	32300.	0.00

9.6800	0.07572	1293550.	-7678.	-0.00290	0.00	2.02E+10	-320.118	44643.	0.00
10.5600	0.04868	1202866.	-10889.	-0.00225	0.00	2.05E+10	-288.042	62479.	0.00
11.4400	0.02819	1078065.	-13636.	-0.00167	0.00	2.09E+10	-232.233	86981.	0.00
12.3200	0.01346	925611.	-15493.	-0.00117	0.00	2.13E+10	-119.435	93671.	0.00
13.2000	0.00357	758362.	-16303.	-7.49E-04	0.00	2.14E+10	-33.943	100362.	0.00
14.0800	-0.00236	586120.	-16356.	-4.17E-04	0.00	2.14E+10	23.9346	107053.	0.00
14.9600	-0.00523	415614.	-15932.	-1.69E-04	0.00	2.14E+10	56.3750	113744.	0.00
15.8400	-0.00594	250734.	-13920.	-4.74E-06	0.00	2.14E+10	324.5485	577171.	0.00
16.7200	-0.00533	121645.	-10538.	8.72E-05	0.00	2.14E+10	315.9829	625569.	0.00
17.6000	-0.00410	27600.	-7308.	1.24E-04	0.00	2.14E+10	295.8270	762785.	0.00
18.4800	-0.00271	-33500.	-4337.	1.23E-04	0.00	2.14E+10	266.9470	1039100.	0.00
19.3600	-0.00151	-64779.	-1710.	9.84E-05	0.00	2.14E+10	230.4813	1617090.	0.00
20.2400	-6.35E-04	-70253.	488.4079	6.50E-05	0.00	2.14E+10	185.9218	3090723.	0.00
21.1200	-1.32E-04	-54883.	1810.	3.41E-05	0.00	2.14E+10	64.3924	5157400.	0.00
22.0000	8.52E-05	-32245.	1930.	1.26E-05	0.00	2.14E+10	-41.633	5157400.	0.00
	1.34E-04	-14198.	1365.				-65.510		0.00
22.8800				1.12E-06	0.00	2.14E+10		5157400.	
23.7600	1.09E-04	-3433.	737.6446	-3.23E-06	0.00	2.14E+10	-53.216	5157400.	0.00
24.6400	6.59E-05	1402.	286.7754	-3.73E-06	0.00	2.14E+10	-32.176	5157400.	0.00
25.5200	3.01E-05	2648.	39.2311	-2.73E-06	0.00	2.14E+10	-14.708	5157400.	0.00
26.4000	8.16E-06	2248.	-59.465	-1.52E-06	0.00	2.14E+10	-3.985	5157400.	0.00
27.2800	-2.07E-06	1401.	-75.172	-6.22E-07	0.00	2.14E+10	1.0099	5157400.	0.00
28.1600	-4.98E-06	664.8257	-56.987	-1.12E-07	0.00	2.14E+10	2.4342	5157400.	0.00
29.0400	-4.43E-06	198.6010	-32.704	1.01E-07	0.00	2.14E+10	2.1647	5157400.	0.00
29.9200	-2.84E-06	-26.542	-13.939	1.44E-07	0.00	2.14E+10	1.3893	5157400.	0.00
30.8000	-1.40E-06	-96.720	-3.006	1.13E-07	0.00	2.14E+10	0.6815	5157400.	0.00
31.6800	-4.51E-07	-90.751	1.7543	6.71E-08	0.00	2.14E+10	0.2200	5157400.	0.00
32.5600	2.08E-08	-60.101	2.8623	2.98E-08	0.00	2.14E+10	-0.01018	5157400.	0.00
	1.79E-07					2.14E+10 2.14E+10			
33.4400		-30.490	2.3478	7.42E-09	0.00		-0.08728	5157400.	0.00
34.3200	1.78E-07	-10.564	1.4292	-2.72E-09	0.00	2.14E+10	-0.08669	5157400.	0.00
35.2000	1.21E-07	-0.287	0.6589	-5.40E-09	0.00	2.14E+10	-0.05920	5157400.	0.00
36.0800	6.34E-08	3.3875	0.1828	-4.64E-09	0.00	2.14E+10	-0.03097	5157400.	0.00
36.9600	2.33E-08	3.6030	-0.04083	-2.91E-09	0.00	2.14E+10	-0.01138	5157400.	0.00
37.8400	1.97E-09	2.5439	-0.106	-1.39E-09	0.00	2.14E+10	-9.61E-04	5157400.	0.00
38.7200	-6.09E-09	1.3737	-0.09534	-4.24E-10	0.00	2.14E+10	0.00297	5157400.	0.00
39.6000	-6.98E-09	0.5330	-0.06163	4.71E-11	0.00	2.14E+10	0.00341	5157400.	0.00
40.4800	-5.10E-09	0.07189	-0.03047	1.97E-10	0.00	2.14E+10	0.00249	5157400.	0.00
41.3600	-2.83E-09	-0.112	-0.01003	1.87E-10	0.00	2.14E+10	0.00138	5157400.	0.00
42.2400	-1.15E-09	-0.141	2.56E-04	1.24E-10	0.00	2.14E+10	5.64E-04	5157400.	0.00
43.1200	-2.10E-10	-0.107	0.00377	6.29E-11	0.00	2.14E+10	1.03E-04	5157400.	0.00
44.0000	1.74E-10	-0.06175	0.00377	2.11E-11	0.00	2.14E+10	-8.49E-05	5157400.	0.00
44.8800	2.36E-10	-0.02565	0.00281	0.00	0.00	2.14E+10	-1.15E-04	5157400.	0.00
45.7600	1.64E-10	-0.00237	0.00147	-7.37E-12	0.00	2.14E+10	-1.39E-04	8910000.	0.00
46.6400	8.04E-11	0.00544	3.79E-04	-6.61E-12	0.00	2.14E+10	-6.78E-05	8910000.	0.00
47.5200	2.48E-11		-8.91E-05	-3.86E-12	0.00	2.14E+10	-2.09E-05	8910000.	0.00
48.4000	-1.19E-12	0.00359	-1.94E-04	-1.57E-12	0.00	2.14E+10	1.00E-06	8910000.	0.00
49.2800	-8.44E-12	0.00160	-1.51E-04	0.00	0.00	2.14E+10	7.12E-06	8910000.	0.00
50.1600	-7.37E-12	3.95E-04	-8.08E-05	0.00	0.00	2.14E+10	6.22E-06	8910000.	0.00
51.0400	-4.24E-12	-1.12E-04	-2.90E-05	0.00	0.00	2.14E+10	3.58E-06	8910000.	0.00
51.9200	-1.69E-12	-2.20E-04	-2.59E-06	0.00	0.00	2.14E+10	1.43E-06	8910000.	0.00
52.8000	0.00	-1.68E-04	6.24E-06	0.00	0.00	2.14E+10	2.45E-07	8910000.	0.00
53.6800	0.00	-8.84E-05	6.48E-06	0.00	0.00	2.14E+10	-2.00E-07	8910000.	0.00
54.5600	0.00	-3.11E-05	4.08E-06	0.00	0.00	2.14E+10	-2.56E-07	8910000.	0.00
55.4400	0.00	-2.30E-06	1.80E-06	0.00	0.00	2.14E+10	-1.75E-07	8910000.	0.00
56.3200	0.00	7.06E-06	4.42E-07	0.00	0.00	2.14E+10	-8.34E-08	8910000.	0.00
57.2000	0.00		-1.21E-07	0.00	0.00	2.14E+10	-2.33E-08	8910000.	0.00
58.0800	0.00	4.53E-06	-2.30E-07	0.00	0.00	2.14E+10	2.70E-09	4247271.	0.00
58.9600	0.00	2.26E-06	-1.79E-07	0.00	0.00	2.14E+10	6.97E-09	4247271.	0.00
59.8400	0.00	7.65E-07	-1.07E-07	0.00	0.00	2.14E+10	6.49E-09	4247271.	0.00
60.7200	0.00	-9.46E-09	-4.98E-08	0.00	0.00	2.14E+10	4.42E-09	4247271.	0.00
61.6000	0.00	-2.91E-07	-1.41E-08	0.00	0.00	2.14E+10	2.36E-09	4247271.	0.00
62.4800	0.00	-3.09E-07	3.20E-09	0.00	0.00	2.14E+10	9.11E-10	4247271.	0.00
63.3600	0.00	-2.25E-07	8.60E-09	0.00	0.00	2.14E+10	1.12E-10	4247271.	0.00
64.2400	0.00	-1.28E-07	8.06E-09	0.00	0.00	2.14E+10	-2.14E-10	4247271.	0.00
2.12.00	3.00		2.002 03	3.00	2.00			:= · · = · · •	2.00

65.1200	0.00	-5.51E-08	5.50E-09	0.00	0.00	2.14E+10	-2.71E-10	4247271.	0.00
66.0000	0.00	-1.21E-08	2.95E-09	0.00	0.00	2.14E+10	-2.13E-10	4247271.	0.00
66.8800	0.00	7.28E-09	1.15E-09	0.00	0.00	2.14E+10	-1.29E-10	4247271.	0.00
67.7600	0.00	1.23E-08	1.48E-10	0.00	0.00	2.14E+10	-6.03E-11	4247271.	0.00
68.6400	0.00	1.05E-08	-2.62E-10	0.00	0.00	2.14E+10	-1.74E-11	4247271.	0.00
69.5200	0.00	6.76E-09	-3.36E-10	0.00	0.00	2.14E+10	3.43E-12	4247271.	0.00
70.4000	0.00	3.41E-09	-2.65E-10	0.00	0.00	2.14E+10	1.01E-11	4247271.	0.00
71.2800	0.00	1.18E-09	-1.61E-10	0.00	0.00	2.14E+10	9.57E-12	4247271.	0.00
72.1600	0.00	1.59E-11	-7.55E-11	0.00	0.00	2.14E+10	6.58E-12	4247271.	0.00
73.0400	0.00	-4.17E-10	-2.21E-11	0.00	0.00	2.14E+10	3.55E-12	4247271.	0.00
73.9200	0.00	-4.54E-10	4.04E-12	0.00	0.00	2.14E+10	1.40E-12	4247271.	0.00
74.8000	0.00	-3.34E-10	1.24E-11	0.00	0.00	2.14E+10	0.00	4247271.	0.00
75.6800	0.00	-1.92E-10	1.19E-11	0.00	0.00	2.14E+10	0.00	4247271.	0.00
76.5600	0.00	-8.39E-11	8.19E-12	0.00	0.00	2.14E+10	0.00	4247271.	0.00
77.4400	0.00	-1.94E-11	4.44E-12	0.00	0.00	2.14E+10	0.00	4247271.	0.00
78.3200	0.00	9.96E-12	1.76E-12	0.00	0.00	2.14E+10	0.00	4247271.	0.00
79.2000	0.00	1.78E-11	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
80.0800	0.00	1.55E-11	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
80.9600	0.00	1.01E-11	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
81.8400	0.00	5.14E-12	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
82.7200	0.00	1.82E-12	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	4247271.	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	2123635.	0.00

Output Summary for Load Case No. 4:

Pile-head deflection = 0.80329763 inches
Computed slope at pile head = -0.0082578 radians
Maximum bending moment = 1359384. inch-lbs
Maximum shear force = 20000. lbs

Depth of maximum bending moment = 7.92000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 15

Number of zero deflection points = 14

Pile-head Deflection vs. Pile Length for Load Case 4

Boundary Condition Type 1, Shear and Moment

 Shear
 =
 20000. lbs

 Moment
 =
 0. in-lbs

 Axial Load
 =
 305000. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs

88.00000	0.80329763	1359384.	20000.
83.60000	0.80268208	1357294.	20000.
79.20000	0.80240803	1358163.	20000.
74.80000	0.80087033	1356446.	20000.
70.40000	0.80100735	1353910.	20000.
66.00000	0.80189365	1357064.	20000.
61.60000	0.79995796	1355446.	20000.
57.20000	0.80055589	1355644.	20000.
52.80000	0.80000565	1354755.	20000.
48.40000	0.79991408	1354497.	20000.
44.00000	0.79967405	1354107.	20000.
39.60000	0.79916951	1353514.	20000.
35.20000	0.79871199	1353647.	20000.
30.80000	0.79844850	1353322.	20000.
26.40000	0.79864829	1353131.	20000.
22.00000	0.79951896	1352906.	20000.
17.60000	0.85423826	1332949.	20000.

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 Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	lbs	inches	radians	lbs	in-lbs
1 V, lb	20000.	S, rad	0.00	0.00	0.2351	0.00	20000.	-1097526.
2 V, 1b	20000.	S, rad	0.00	305000.	0.2015	0.00	20000.	-1181071.
3 V, 1b	20000.	M, in-lb	0.00	0.00	0.8740	-0.00939	20000.	1149226.
4 V, 1b	20000.	M, in-lb	0.00	305000.	0.8033	-0.00826	20000.	1359384.

Maximum pile-head deflection = 0.8740277622 inches
Maximum pile-head rotation = -0.0093921136 radians = -0.538128 deg.

The analysis ended normally.

Job Number: 088549.00

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Analysis of Individual Piles and Drilled Shafts Subjected to Lateral Loading Using the p-y Method © 1985-2022 by Ensoft, Inc. All Rights Reserved
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Files Used for Analysis
Path to file locations: \\Sme-inc\pz\WIP\088549.00\Project Data\LPile\
Name of input data file: CUY-17-13.50 Pier Pile B003 Strength Limit.lp12d
Name of output report file: CUY-17-13.50 Pier Pile B003 Strength Limit.lp12o
Name of plot output file: CUY-17-13.50 Pier Pile B003 Strength Limit.lp12p
Name of runtime message file: CUY-17-13.50 Pier Pile B003 Strength Limit.lp12r
Date and Time of Analysis
Date: July 5, 2024 Time: 11:51:32
Problem Title
Project Name: CUY-17-13.50
-

B-003-0-22 Profile Controls - Service Load

Client: ODOT

Engineer: Brendan P. Lieske

Description: Pier Pile Analysis

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
- 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 = 88.000 ft
Depth of ground surface below top of pile = 0.0000 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.

Depth Below

Pile

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	16.0000
2	88.000	16.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a drilled shaft with permanent casing $% \left(1\right) =\left(1\right) \left(1\right) \left($

Length of section = 88.000000 ft
Casing outside diameter = 16.000000 in

Soil and Rock Layering Information

Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

0.0000 ft Distance from top of pile to top of layer Distance from top of pile to bottom of layer 3.400000 ft Effective unit weight at top of layer 59.600000 pcf Effective unit weight at bottom of layer 59.600000 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

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer 3.400000 ft Distance from top of pile to bottom of layer 16.400000 ft Effective unit weight at top of layer 62.600000 pcf Effective unit weight at bottom of layer 62.600000 pcf Friction angle at top of layer 32.000000 deg. 32.000000 deg. Friction angle at bottom of layer Subgrade k at top of layer 60.000000 pci Subgrade k at bottom of layer 60.000000 pci

Layer 3 is stiff clay without free water

= 16.400000 ft Distance from top of pile to top of layer Distance from top of pile to bottom of layer 36.400000 ft Effective unit weight at top of layer 57.600000 pcf 57.600000 pcf Effective unit weight at bottom of layer Undrained cohesion at top of layer 2300. psf Undrained cohesion at bottom of layer 2300. 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 = 36.400000 ft

```
Distance from top of pile to bottom of layer
                                                       47.200000 ft
  Effective unit weight at top of layer
                                                       55.600000 pcf
  Effective unit weight at bottom of layer
                                                        55.600000 pcf
  Undrained cohesion at top of layer
                                                           1600. psf
                                                           1600. psf
  Undrained cohesion at bottom of layer
  Epsilon-50 at top of layer
                                                         0.007000
  Epsilon-50 at bottom of layer
                                                        0.007000
Layer 5 is stiff clay without free water
   Distance from top of pile to top of layer
                                                       47.200000 ft
                                                        86.400000 ft
  Distance from top of pile to bottom of layer
  Effective unit weight at top of layer
                                                       57.600000 pcf
                                                       57.600000 pcf
  Effective unit weight at bottom of layer
  Undrained cohesion at top of layer
                                                           1750. psf
  Undrained cohesion at bottom of layer
                                                           1750. psf
  Epsilon-50 at top of layer
                                                         0.007000
  Epsilon-50 at bottom of layer
                                                        0.007000
Layer 6 is stiff clay without free water
   Distance from top of pile to top of layer
                                                       86.400000 ft
  Distance from top of pile to bottom of layer
                                                      105.400000 ft
                                                       77.600000 pcf
  Effective unit weight at top of layer
  Effective unit weight at bottom of layer
                                                       77.600000 pcf
  Undrained cohesion at top of layer
                                                           4400. psf
  Undrained cohesion at bottom of layer
                                                           4400. psf
  Epsilon-50 at top of layer
                                                        0.004000
  Epsilon-50 at bottom of layer
                                                         0.004000
Layer 7 is massive rock, p-y criteria by Liang et al., 2009
  Distance from top of pile to top of layer
                                                   = 105.400000 ft
  Distance from top of pile to bottom of layer
                                                   = 150.000000 ft
  Effective unit weight at top of layer
                                                       92,600000 pcf
  Effective unit weight at bottom of layer
                                                       92.600000 pcf
                                                   = 1000.000000 psi
  Uniaxial compressive strength at top of layer
                                                  = 1000.000000 psi
  Uniaxial compressive strength at bottom of layer
  Poisson's ratio at top of layer
                                                        0.180000
  Poisson's ratio at bottom of layer
                                                        0.180000
  Option 1: Intact rock modulus at top of layer
                                                          0.0000 psi
           Intact rock modulus at bottom of layer
                                                          0.0000 psi
  Option 1: Geologic Strength Index for layer
                                                        50.000000
  Option 2: Rock mass modulus at top of layer
                                                         380838. psi
            Rock mass modulus at bottom of layer
                                                         380838. psi
  Option 2 will use the input value of rock mass modulus to compute the p-y curve
           in massive rock.
  The rock type is (sedimentary) shales, Hoek-Brown Material Constant mi = 6
 (Depth of the lowest soil layer extends 62.000 ft below the pile tip)
______
                      Summary of Input Soil Properties
______
Layer
             Soil Type
                                         Effective
                                                    Cohesion
                                                                 Angle of
                                                                             Uniaxial
                                                                                            E50
                                                                                                                  Rock Mass
                                                                                                                             Geologic
                                                                                                                                          Int. Rock
                                                                                                                                                    Hoek-Brown
                              Layer
Num.
              Name
                              Depth
                                         Unit Wt.
                                                                 Friction
                                                                                                                  Modulus
                                                                                                                             Strength
                                                                                                                                          Modulus
                                                                                                                                                      Material
                                                                                                                                                                  Poisson's
```

	(p-y Curve Type)	ft	pcf	psf	deg.	psi	krm	pci	psi	Index	psi	Index, mi	Ratio
1	Sand	0.00	59.6000		33.0000			60.0000			0.00	0.00	0.00
	(Reese, et al.)	3.4000	59.6000		33.0000			60.0000			0.00	0.00	0.00
2	Sand	3.4000	62.6000		32.0000			60.0000			0.00	0.00	0.00
	(Reese, et al.)	16.4000	62.6000		32.0000			60.0000			0.00	0.00	0.00
3	Stiff Clay	16.4000	57.6000	2300.			0.00500				0.00	0.00	0.00
	w/o Free Water	36.4000	57.6000	2300.			0.00500				0.00	0.00	0.00
4	Stiff Clay	36.4000	55.6000	1600.			0.00700				0.00	0.00	0.00
	w/o Free Water	47.2000	55.6000	1600.			0.00700				0.00	0.00	0.00
5	Stiff Clay	47.2000	57.6000	1750.			0.00700				0.00	0.00	0.00
	w/o Free Water	86.4000	57.6000	1750.			0.00700				0.00	0.00	0.00
6	Stiff Clay	86.4000	77.6000	4400.			0.00400				0.00	0.00	0.00
	w/o Free Water	105.4000	77.6000	4400.			0.00400				0.00	0.00	0.00
7	Massive	105.4000	92.6000			1000.0000			380838.	50.0000	0.00	6.0000	0.1800
	Rock	150.0000	92.6000			1000.0000				50.0000	0.00	6.0000	0.1800

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 = 4

Load No.	Load Type		Condition 1		Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	2	V =	20000. lbs	c _	0.0000 in/in	0.0000000	Yes	Yes
1	2	v –	20000. 103	<i>3</i> –	0.0000 111/111	0.000000	163	165
2	2	V =	20000. lbs	S =	0.0000 in/in	305000.	Yes	Yes
3	1	V =	20000. lbs	M =	0.0000 in-lbs	0.000000	Yes	Yes
4	1	V =	20000. lbs	M =	0.0000 in-lbs	305000.	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) with Permanent Casing:

Length of Section	=	88.000000	ft
Outer Diameter of Casing	=	16.000000	in
Casing Wall Thickness	=	0.250000	in
Moment of Inertia of Steel Casing	=	383.663935	in^4
Yield Stress of Casing	=	50000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Area of Single Reinforcing Bar	=	0.0000	sq. in.
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in
Yield Stress of Reinforcing Bars	=	0.0000	psi
Modulus of Elasticity of Reinforcing Bars	=	0.0000	psi
Gross Area of Pile	=	201.061930	sq. in.
Area of Concrete	=	188.691909	sq. in.
Cross-sectional Area of Steel Casing	=	12.370021	sq. in.
Area of All Steel (Casing and Bars)	=	12.370021	
Area Ratio of All Steel to Gross Area of Pile	=	6.15	percent
Axial Structural Capacities:			
Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	1260.054	kips
Tensile Load for Cracking of Concrete	=	-119.866	kips
Nominal Axial Tensile Capacity	=	-618.501	kips
Concrete Properties:			
Compressive Strength of Concrete	=		•
Modulus of Elasticity of Concrete		3604997.	•
Modulus of Rupture of Concrete	=		hzī
Compression Strain at Peak Stress Tensile Strain at Fracture of Concrete	=		
	=		:
Maximum Coarse Aggregate Size	=	0.750000	τu

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force
	kips
1	0.000
2	305.000

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

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 = 0.000 kips

	nding	Bending Moment	Bending Stiffness	Depth to	Max Comp	Max Tens	Max Conc	Max Steel	Max Casing	Run
	ature			N Axis	Strain	Strain	Stress	Stress	Stress	Msg
rad	l/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi	ksi	
9 99	0000125	28.9033419	23122674.	8.0000000	0.00001000	-0.00001000	0.0418774	0.00000	0.2871000	
	000123	57.7542839	23101714.	8.0000000	0.00002000	-0.00002000	0.0835345	0.00000	0.5742000	
	000230	86.5528259	23080754.	8.0000000	0.00003000	-0.00003000	0.1249712	0.00000	0.8613000	
	000575	115.2989680	23059794.	8.0000000	0.00004000	-0.00004000	0.1661875	0.00000	1.1484000	
		143.9927102								
	000625		23038834.	8.0000000	0.00005000	-0.00005000	0.2071834	0.00000	1.4355000	
	000750	172.6340525	23017874.	8.0000000	0.00006000	-0.00006000	0.2479590	0.00000	1.7226000	
	0000875	201.2229948	22996914.	8.0000000	0.00007000	-0.00007000	0.2885142	0.00000	2.0097000	
	001000	229.7595373	22975954.	8.0000000	0.00008000	-0.00008000	0.3288490	0.00000	2.2968000	
	0001125	258.2436798	22954994.	8.0000000	0.00009000	-0.00009000	0.3689635	0.00000	2.5839000	
	001250	286.6754223	22934034.	8.0000000	0.0001000	-0.00010000	0.4088576	0.00000	2.8710000	
	001375	315.0547650	22913074.	8.0000000	0.0001100	-0.000110	0.4485313	0.00000	3.1581000	
	001500	315.0547650	21003651.	6.1265455	0.00009190	-0.000148	0.3754186	0.00000	-4.260153	
	001625	315.0547650	19387986.	6.1277790	0.00009958	-0.000160	0.4059492	0.00000	-4.614584	
	001750	315.0547650	18003129.	6.1290144	0.0001073	-0.000173	0.4363631	0.00000	-4.968925	
	001875	315.0547650	16802921.	6.1302515	0.0001149	-0.000185	0.4666602	0.00000	-5.323176	
0.00	002000	315.0547650	15752738.	6.1314904	0.0001226	-0.000197	0.4968404	0.00000	-5.677336	
	002125	315.0547650	14826107.	6.1327311	0.0001303	-0.000210	0.5269036	0.00000	-6.031404	
0.00	002250	330.0087250	14667054.	6.1339736	0.0001380	-0.000222	0.5568496	0.00000	-6.385382	С
0.00	002375	348.2686053	14663941.	6.1352179	0.0001457	-0.000234	0.5866782	0.00000	-6.739269	C
0.00	002500	366.5206047	14660824.	6.1364640	0.0001534	-0.000247	0.6163894	0.00000	-7.093064	C
0.00	002625	384.7647083	14657703.	6.1377119	0.0001611	-0.000259	0.6459830	0.00000	-7.446767	С
0.00	002750	403.0009009	14654578.	6.1389617	0.0001688	-0.000271	0.6754589	0.00000	-7.800378	С
0.00	002875	421.2291676	14651449.	6.1402133	0.0001765	-0.000283	0.7048169	0.00000	-8.153897	С
0.00	0003000	439.4494932	14648316.	6.1414667	0.0001842	-0.000296	0.7340569	0.00000	-8.507324	C
0.00	003125	457.6618624	14645180.	6.1427219	0.0001920	-0.000308	0.7631787	0.00000	-8.860658	С
0.00	003250	475.8662601	14642039.	6.1439790	0.0001997	-0.000320	0.7921823	0.00000	-9.213900	C
0.00	003375	494.0626709	14638894.	6.1452380	0.0002074	-0.000333	0.8210675	0.00000	-9.567048	С
0.00	003500	512.2510794	14635745.	6.1464988	0.0002151	-0.000345	0.8498341	0.00000	-9.920104	C
0.00	003625	530.4314702	14632592.	6.1477615	0.0002229	-0.000357	0.8784821	0.00000	-10.273066	С
	003750	548.6038278	14629435.	6.1490260	0.0002306	-0.000369	0.9070112	0.00000	-10.625934	
	003875	566.7681368	14626274.	6.1502925	0.0002383	-0.000382	0.9354214	0.00000	-10.978709	
0.00	004000	584.9243814	14623110.	6.1515608	0.0002461	-0.000394	0.9637124	0.00000	-11.331389	С
	004125	603.0725461	14619941.	6.1528309	0.0002538	-0.000406	0.9918842	0.00000	-11.683976	
	004250	621.2126151	14616767.	6.1541030	0.0002615	-0.000418	1.0199367	0.00000	-12.036468	
	004375	639.3445727	14613590.	6.1553770	0.0002693	-0.000431	1.0478696	0.00000	-12.388865	
	004500	657.4684030	14610409.	6.1566529	0.0002770	-0.000443	1.0756828	0.00000	-12.741168	
	004625	675.5840901	14607224.	6.1579306	0.0002848	-0.000455	1.1033762	0.00000	-13.093375	
	004750	693.6916180	14604034.	6.1592103	0.0002926	-0.000467	1.1309497	0.00000	-13.445488	
	004875	711.7909831	14600841.	6.1604839	0.0003003	-0.000480	1.1584017	0.00000	-13.797516	
	005125	747.9651747	14594442.	6.1630109	0.0003159	-0.000504	1.2129399	0.00000	-14.501325	
	005125	784.1064944	14588028.	6.1655454	0.0003133	-0.000529	1.2669953	0.00000	-15.204756	
	005575	820.2148141	14581597.	6.1680875	0.0003314	-0.000553	1.3205669	0.00000	-15.907807	
	005875	856.2900048	14575149.	6.1706371	0.0003470	-0.000577	1.3736534	0.00000	-16.610477	
	0006125	892.3319365	14568685.	6.1731944	0.0003781			0.00000	-17.312763	
	006125	928.3404783	14562204.	6.1757594	0.0003781	-0.000602 -0.000626	1.4262537 1.4783667	0.00000	-17.312763	
	006625	964.3154981	14555706.	6.1783320	0.0004093	-0.000651	1.5299911	0.00000	-18.716179	
	006875	1000.	14549191.	6.1809125	0.0004249	-0.000675	1.5811257	0.00000	-19.417305	
	007125	1036.	14542659.	6.1835008	0.0004406	-0.000699	1.6317694	0.00000	-20.118041	
	007375	1072.	14536110.	6.1860969	0.0004562	-0.000724	1.6819211	0.00000	-20.818385	
	007625	1108.	14529543.	6.1887010	0.0004719	-0.000748	1.7315793	0.00000	-21.518335	
	007875	1144.	14522960.	6.1913131	0.0004876	-0.000772	1.7807430	0.00000	-22.217889	
	0008125	1179.	14516359.	6.1939331	0.0005033	-0.000797	1.8294110	0.00000	-22.917045	
	0008375	1215.	14509740.	6.1965613	0.0005190	-0.000821	1.8775819	0.00000	-23.615802	
	008625	1251.	14503104.	6.1991975	0.0005347	-0.000845	1.9252546	0.00000	-24.314157	
0.00	008875	1287.	14496450.	6.2018420	0.0005504	-0.000870	1.9724277	0.00000	-25.012109	C

0.00009125	1322.	14489778.	6.2044946	0.0005662	-0.000894	2.0191001	0.00000	-25.709656 C
0.00009375	1358.	14483088.	6.2071556	0.0005819	-0.000918	2.0652705	0.00000	-26.406796 C
0.00009625	1393.	14476380.	6.2098248	0.0005977	-0.000942	2.1109375	0.00000	-27.103526 C
0.00009875	1429.	14469654.	6.2125025	0.0006135	-0.000967	2.1561000	0.00000	-27.799846 C
0.0001013	1464.	14462909.	6.2151886	0.0006293	-0.000991	2.2007565	0.00000	-28.495752 C
0.0001013	1500.	14456147.	6.2178831	0.0006451	-0.001015	2.2449059	0.00000	-29.191244 C
0.0001063	1535.	14449365.	6.2205863	0.0006609	-0.001039	2.2885467	0.00000	-29.886318 C
0.0001088	1571.	14442566.	6.2232980	0.0006768	-0.001063	2.3316777	0.00000	-30.580974 C
0.0001113	1606.	14435747.	6.2260184	0.0006926	-0.001087	2.3742976	0.00000	-31.275208 C
0.0001138	1641.	14428910.	6.2287475	0.0007085	-0.001111	2.4164049	0.00000	-31.969019 C
0.0001163	1677.	14422053.	6.2314853	0.0007244	-0.001136	2.4579983	0.00000	-32.662405 C
0.0001188	1712.	14415178.	6.2342320	0.0007403	-0.001160	2.4990765	0.00000	-33.355363 C
0.0001213	1747.	14408283.	6.2369876	0.0007562	-0.001184	2.5396381	0.00000	-34.047892 C
0.0001238	1782.	14401369.	6.2397521	0.0007722	-0.001208	2.5796817	0.00000	-34.739989 C
0.0001263	1817.	14394436.	6.2425257	0.0007881	-0.001232	2.6192059	0.00000	-35.431653 C
0.0001288	1852.	14387483.	6.2453083	0.0008041	-0.001256	2.6582093	0.00000	-36.122880 C
0.0001313	1887.	14380511.	6.2481000	0.0008201	-0.001280	2.6966905	0.00000	-36.813669 C
0.0001338	1922.	14373518.	6.2509009	0.0008361	-0.001304	2.7346481	0.00000	-37.504018 C
0.0001363	1957.	14366506.	6.2537111	0.0008521	-0.001328	2.7720807	0.00000	-38.193924 C
0.0001388	1992.	14359474.	6.2565306	0.0008681	-0.001352	2.8089867	0.00000	-38.883385 C
0.0001413	2027.	14352422.	6.2593594	0.0008841	-0.001376	2.8453647	0.00000	-39.572399 C
0.0001418	2062.	14345349.	6.2621977	0.0000041	-0.001400	2.8812133	0.00000	-40.260963 C
0.0001458	2002.	14338256.	6.2650455	0.0009163	-0.001400	2.9165310	0.00000	-40.200303 C
			6.2679028					
0.0001488	2132.	14331142.		0.0009324	-0.001448	2.9513162	0.00000	-41.636734 C
0.0001588	2271.	14302480.	6.2794292	0.0009969	-0.001543	3.0851028	0.00000	-44.382777 C
0.0001688	2409.	14273478.	6.2911141	0.0010616	-0.001638	3.2102483	0.00000	-47.121360 C
0.0001788	2546.	14244127.	6.3029619	0.0011267	-0.001733	3.3266514	0.00000	-49.852321 C
0.0001888	2663.	14107880.	6.2948286	0.0011881	-0.001832	3.4281248	0.00000	-50.000000 CY
0.0001988	2756.	13865633.	6.2656203	0.0012453	-0.001935	3.5149099	0.00000	-50.000000 CY
0.0002088	2835.	13583103.	6.2271715	0.0012999	-0.002040	3.5911567	0.00000	-50.000000 CY
0.0002188	2905.	13281364.	6.1833056	0.0013526	-0.002147	3.6584711	0.00000	-50.000000 CY
0.0002288	2968.	12973720.	6.1361879	0.0014037	-0.002256	3.7179118	0.00000	-50.000000 CY
0.0002388	3024.	12665024.	6.0866979	0.0014532	-0.002367	3.7701425	0.00000	-50.000000 CY
0.0002488	3075.	12361017.	6.0366080	0.0015016	-0.002478	3.8159958	0.00000	-50.000000 CY
0.0002588	3122.	12063842.	5.9861817	0.0015489	-0.002591	3.8558780	0.00000	-50.000000 CY
0.0002688	3164.	11774704.	5.9353039	0.0015951	-0.002705	3.8901017	0.00000	-50.000000 CY
0.0002788	3204.	11495126.	5.8851977	0.0016405	-0.002820	3.9192105	0.00000	-50.000000 CY
0.0002888	3241.	11224812.	5.8357589	0.0016851	-0.002935	3.9434422	0.00000	-50.000000 CY
0.0002988	3276.	10964087.	5.7863563	0.0017287	-0.003051	3.9629669	0.00000	-50.000000 CY
0.0003088	3307.	10710113.	5.7400431	0.0017722	-0.003168	3.9783624	0.00000	50.0000000 CY
0.0003188	3334.	10460823.	5.6985259	0.0018164	-0.003284	3.9897756	0.00000	50.0000000 CY
0.0003288	3358.	10215614.	5.6610944	0.0018611	-0.003399	3.9970199	0.00000	50.0000000 CY
0.0003288	3380.	9976843.	5.6269309	0.0010011	-0.003514	3.9999409	0.00000	50.0000000 CY
0.0003388	3399.	9745757.	5.5955927	0.0019515	-0.003514	3.9996149	0.00000	50.0000000 CY
0.0003488	3416.	9523000.	5.5662590	0.0019313	-0.003743	3.9987849	0.00000	50.0000000 CY
0.0003588	3432.	9308170.		0.0019909	-0.003858	3.9972709	0.00000	50.0000000 CY
			5.5389169					
0.0003788	3447.	9100662.	5.5135311	0.0020882	-0.003972	3.9998848	0.00000	50.0000000 CY
0.0003888	3460.	8901054.	5.4887163	0.0021337	-0.004086	3.9988175	0.00000	50.0000000 CY
0.0003988	3472.	8708397.	5.4658986	0.0021795	-0.004200	3.9980699	0.00000	50.0000000 CY
0.0004088	3484.	8523221.	5.4442003	0.0022253	-0.004315	3.9995204	0.00000	50.0000000 CY
0.0004188	3494.	8344491.	5.4239346	0.0022713	-0.004429	3.9971332	0.00000	50.0000000 CY
0.0004288	3504.	8172419.	5.4045088	0.0023172	-0.004543	3.9997475	0.00000	50.0000000 CY
0.0004388	3513.	8006495.	5.3866025	0.0023634	-0.004657	3.9972566	0.00000	50.0000000 CY
0.0004488	3521.	7846958.	5.3693480	0.0024095	-0.004771	3.9997377	0.00000	50.0000000 CY
0.0004588	3529.	7692389.	5.3530585	0.0024557	-0.004884	3.9966663	0.00000	50.0000000 CY
0.0004688	3536.	7543789.	5.3370328	0.0025017	-0.004998	3.9994541	0.00000	50.0000000 CY
0.0004788	3543.	7400062.	5.3219576	0.0025479	-0.005112	3.9967029	0.00000	50.0000000 CY
0.0004888	3549.	7261361.	5.3077013	0.0025941	-0.005226	3.9986203	0.00000	50.0000000 CY
0.0004988	3555.	7127694.	5.2938021	0.0025541	-0.005340	3.9999812	0.00000	50.0000000 CY
0.0004988	3560.	6998088.	5.2811275	0.0026868	-0.005453	3.9966978	0.00000	50.0000000 CY
0.0005188	3565.	6873062.	5.2688905	0.0027332	-0.005567	3.9993233	0.00000	50.0000000 CY
0.0005288		6752275.	5.2568684	0.0027796	-0.005680		0.00000	50.0000000 CY
	3570.					3.9984329		
0.0005388	3575.	6635114.	5.2460219	0.0028263	-0.005794	3.9970441	0.00000	50.0000000 CY

0.0005488	3579.	6521915.	5.2355609	0.0028730	-0.005907	3.9994075	0.00000	50.0000000 CY
0.0006088	3599.	5912613.	5.1804388	0.0031536	-0.006586	3.9974551	0.00000	50.0000000 CY
0.0006688	3613.	5403248.	5.1373912	0.0034356	-0.007264	3.9999948	0.00000	50.0000000 CY
0.0007288	3623.	4971935.	5.1043568	0.0037198	-0.007940	3.9917765	0.00000	50.0000000 CY
0.0007888	3629.	4600505.	5.0821898	0.0040086	-0.008611	3.9916478	0.00000	50.0000000 CY

Axial Thrust Force = 305.000 kips

Bending Curvature	Bending Moment	Bending Stiffness	Depth to N Axis	Max Comp Strain	Max Tens Strain	Max Conc Stress	Max Steel Stress	Max Casing F Stress M
rad/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi	ksi
.00000125	26.7215910	21377273.	229.7821212	0.0002872	0.0002672	1.1250745	0.00000	8.3267019
0.00000250	53.4429535	21377181.	118.8967965	0.0002972	0.0002572	1.1606118	0.00000	8.6142177
.00000375	80.1638592	21377029.	81.9375710	0.0003073	0.0002473	1.1959621	0.00000	8.9020108
.00000500	106.8840796	21376816.	63.4598703	0.0003173	0.0002373	1.2311246	0.00000	9.1900812
.00000625	133.6033864	21376542.	52.3747795	0.0003273	0.0002273	1.2660988	0.00000	9.4784288
.00000750	160.3215509	21376207.	44.9859939	0.0003374	0.0002174	1.3008841	0.00000	9.7670537
.00000875	187.0383448	21375811.	39.7093827	0.0003475	0.0002075	1.3354797	0.00000	10.0559559
0.00001000	213.7535396	21375354.	35.7528805	0.0003575	0.0001975	1.3698851	0.00000	10.3451354
.00001125	240.4669066	21374836.	32.6764511	0.0003676	0.0001876	1.4040995	0.00000	10.6345922
.00001250	267.1782174	21374257.	30.2160727	0.0003777	0.0001777	1.4381225	0.00000	10.9243264
.00001375	293.8872433	21373618.	28.2037315	0.0003878	0.0001678	1.4719532	0.00000	11.2143380
.00001500	320.5937556	21372917.	26.5274183	0.0003979	0.0001579	1.5055911	0.00000	11.5046270
.00001625	347.2975256	21372155.	25.1095882	0.0004080	0.0001480	1.5390356	0.00000	11.7951935
.00001750	373.9983247	21371333.	23.8948521	0.0004182	0.0001382	1.5722859	0.00000	12.0860375
.00001875	400.6959239	21370449.	22.8425913	0.0004283	0.0001283	1.6053415	0.00000	12.3771591
.00002000	427.3900943	21369505.	21.9223416	0.0004384	0.0001184	1.6382018	0.00000	12.6685582
.00002125	454.0806071	21368499.	21.1108072	0.0004486	0.0001086	1.6708659	0.00000	12.9602350
.00002250	480.7672332	21367433.	20.3898689	0.0004588	0.00009877	1.7033334	0.00000	13.2521895
0.00002375	507.4497435	21366305.	19.7452221	0.0004689	0.00008895	1.7356036	0.00000	13.5444218
0.00002500	534.1279088	21365116.	19.1654232	0.0004791	0.00007914	1.7676758	0.00000	13.8369319
.00002625	560.8014999	21363867.	18.6412082	0.0004893	0.00006933	1.7995494	0.00000	14.1297199
0.00002750	587.4702874	21362556.	18.1649977	0.0004995	0.00005954	1.8312238	0.00000	14.4227858
0.00002875	614.1340418	21361184.	17.7305303	0.0005098	0.00004975	1.8626982	0.00000	14.7161297
0.00003000	640.7925337	21359751.	17.3325881	0.0005200	0.00003998	1.8939721	0.00000	15.0097518
0.00003125	667.4455333	21358257.	16.9667883	0.0005302	0.00003021	1.9250448	0.00000	15.3036520
0.00003250	694.0928110	21356702.	16.6294221	0.0005405	0.00002046	1.9559157	0.00000	15.5978304
0.00003375	720.7341368	21355086.	16.3173304	0.0005507	0.00001071	1.9865841	0.00000	15.8922872
.00003500	747.3692807	21353408.	16.0278052	0.0005610	9.73184E-07	2.0170493	0.00000	16.1870224
0.00003625	773.9980127	21351669.	15.7585123	0.0005712	-0.00000875	2.0473107	0.00000	16.4820361
0.00003750	800.6198594	21349863.	15.5074275	0.0005815	-0.00001847	2.0773677	0.00000	16.7773276
0.00003875	827.2329870	21347948.	15.2727836	0.0005918	-0.00002818	2.1072188	0.00000	17.0728907
.00004000	853.8344283	21345861.	15.0530299	0.0006021	-0.00003788	2.1368624	0.00000	17.3687148
0.00004125	880.4209833	21343539.	14.8468029	0.0006124	-0.00004757	2.1662967	0.00000	17.6647880
0.00004250	906.9895310	21340930.	14.6528991	0.0006227	-0.00005725	2.1955200	0.00000	17.9610983
0.00004375	933.5370734	21337990.	14.4702529	0.0006331	-0.00006693	2.2245304	0.00000	18.2576336
.00004500	960.0607992	21334684.	14.2979174	0.0006434	-0.00007659	2.2533264	0.00000	18.5543823
.00004625	986.5581497	21330987.	14.1350483	0.0006537	-0.00008625	2.2819063	0.00000	18.8513337
0.00004750	1013.	21326880.	13.9808910	0.0006641	-0.00009591	2.3102688	0.00000	19.1484775
.00004875	1039.	21322350.	13.8347686	0.0006744	-0.000106	2.3384125	0.00000	19.4458043
0.00005125	1071.	20894745.	13.5022636	0.0006920	-0.000128	2.3854895	0.00000	19.9488395 (
.00005375	1116.	20762700.	13.2378777	0.0007115	-0.000148	2.4371934	0.00000	20.5098420 (
.00005625	1160.	20625413.	12.9944256	0.0007309	-0.000169	2.4876793	0.00000	21.0666563 (
0.00005875	1203.	20485061.	12.7693881	0.0007502	-0.000190	2.5369892	0.00000	21.6195452 (
0.00006125	1246.	20344120.	12.5608212	0.0007694	-0.000211	2.5851881	0.00000	22.1690576
0.00000123	1288.	20201972.	12.3665188	0.0007884	-0.000232	2.6322489	0.00000	22.7147013 (
0.00000575	1329.	20061206.	12.1853111	0.0007004	-0.000253	2.6782600	0.00000	23.2573280 (
0.00000025	1370.	19922384.	12.0158564	0.0008261	-0.000274	2.7232493	0.00000	23.7971136
0.00000075	1410.	19785959.	11.8570066	0.0008201	-0.000274	2.7672436	0.00000	24.3342397 (
0.00007123	1449.	19652322.	11.7077809	0.0008634	-0.000233	2.8102712	0.00000	24.8689163
0.00007575	1489.	19521807.	11.5673384	0.0008820	-0.000338	2.8523610	0.00000	25.4013769

0.00007875	1527.	19394690.	11.4349559	0.0009005	-0.000359	2.8935422	0.00000	25.9318805 C
0.00008125	1566.	19270081.	11.3096714	0.0009189	-0.000381	2.9337845	0.00000	26.4599131 C
0.00008375	1604.	19148896.	11.1911326	0.0009373	-0.000403	2.9731492	0.00000	26.9861634 C
0.00008625	1641.	19031505.	11.0789307	0.0009556	-0.000424	3.0116763	0.00000	27.5110756 C
0.00008875	1679.	18917594.	10.9725139	0.0009738	-0.000446	3.0493684	0.00000	28.0346078 C
0.00009125	1716.	18806120.	10.8711149	0.0009920	-0.000468	3.0861772	0.00000	28.5559877 C
0.00009375	1753.	18698671.	10.7749086	0.0010101	-0.000490	3.1222192	0.00000	29.0767830 C
0.00009625	1790.	18593838.	10.6830967	0.0010282	-0.000512	3.1574230	0.00000	29.5958940 C
0.00009875	1826.	18492227.	10.5955986	0.0010463	-0.000534	3.1918433	0.00000	30.1140457 C
0.0001013	1862.	18393664.	10.5121152	0.0010644	-0.000556	3.2254880	0.00000	30.6312985 C
0.0001038	1898.	18297733.	10.4322518	0.0010823	-0.000578	3.2583409	0.00000	31.1473380 C
0.0001063	1934.	18204760.	10.3559490	0.0011003	-0.000600	3.2904444	0.00000	31.6627680 C
0.0001088	1970.	18114357.	10.2828632	0.0011183	-0.000622	3.3217823	0.00000	32.1772801 C
0.0001113	2005.	18026402.	10.2127958	0.0011362	-0.000644	3.3523619	0.00000	32.6909326 C
0.0001138	2041.	17941369.	10.1457996	0.0011541	-0.000666	3.3822345	0.00000	33.2045568 C
0.0001163	2076.	17857948.	10.0811826	0.0011719	-0.000688	3.4113067	0.00000	33.7164872 C
0.0001188	2111.	17777547.	10.0194562	0.0011898	-0.000710	3.4397103	0.00000	34.2290025 C
0.0001213	2146.	17698817.	9.9598987	0.0012076	-0.000732	3.4673410	0.00000	34.7401940 C
0.0001238	2181.	17622249.	9.9026532	0.0012255	-0.000755	3.4942555	0.00000	35.2510471 C
0.0001263	2215.	17548249.	9.8478338	0.0012433	-0.000777	3.5205017	0.00000	35.7624819 C
0.0001288	2250.	17475416.	9.7946709	0.0012611	-0.000799	3.5459616	0.00000	36.2721528 C
0.0001313	2284.	17404701.	9.7435791	0.0012788	-0.000821	3.5707355	0.00000	36.7819985 C
0.0001338	2319.	17336190.	9.6945467	0.0012966	-0.000843	3.5948414	0.00000	37.2924235 C
0.0001363	2353.	17268896.	9.6469925	0.0013144	-0.000866	3.6181934	0.00000	37.8015796 C
0.0001388	2387.	17203232.	9.6010939	0.0013322	-0.000888	3.6408420	0.00000	38.3105020 C
0.0001413	2421.	17139477.	9.5569612	0.0013499	-0.000910	3.6628228	0.00000	38.8200027 C
0.0001438	2455.	17077390.	9.5144220	0.0013677	-0.000932	3.6841195	0.00000	39.3297469 C
0.0001463	2489.	17016128.	9.4729490	0.0013854	-0.000955	3.7046562	0.00000	39.8378454 C
0.0001488	2522.	16956530.	9.4330043	0.0014032	-0.000977	3.7245249	0.00000	40.3465227 C
0.0001588	2656.	16731451.	9.2859675	0.0014741	-0.001066	3.7971061	0.00000	42.3819734 C
0.0001688	2789.	16524955.	9.1566439	0.0015452	-0.001155	3.8586493	0.00000	44.4188263 C
0.0001788	2920.	16334528.	9.0424453	0.0016163	-0.001244	3.9091755	0.00000	46.4590765 C
0.0001888	3050.	16157144.	8.9405365	0.0016875	-0.001332	3.9485899	0.00000	48.5003622 C
0.0001988	3177.	15985342.	8.8515700	0.0017592	-0.001421	3.9770361	0.00000	50.0000000 CY
0.0002088	3292.	15768042.	8.7847227	0.0018338	-0.001506	3.9946227	0.00000	50.0000000 CY
0.0002188	3396.	15524323.	8.7355867	0.0019109	-0.001589	3.9991273	0.00000	50.0000000 CY
0.0002288	3493.	15271087.	8.6986136	0.0019898	-0.001670	3.9993217	0.00000	50.0000000 CY
0.0002388	3584.	15012274.	8.6711064	0.0020702	-0.001750	3.9992316	0.00000	50.0000000 CY
0.0002488	3659.	14708288.	8.6403928	0.0021493	-0.001831	3.9986434	0.00000	50.0000000 CY
0.0002588	3718.	14368851.	8.6057674	0.0022267	-0.001913	3.9998532	0.00000	50.0000000 CY
0.0002688	3768.	14019419.	8.5709165	0.0023034	-0.001997	3.9986745	0.00000	50.0000000 CY
0.0002788	3810.	13668765.	8.5369198	0.0023797	-0.002080	3.9995723	0.00000	50.0000000 CY
0.0002888	3847.	13323568.	8.5044987	0.0024557	-0.002164	3.9999263	0.00000	50.0000000 CY
0.0002988	3879.	12985001.	8.4734687	0.0025314	-0.002249	4.0000000	0.00000	50.0000000 CY
0.0003088	3908.	12656392.	8.4445504	0.0026073	-0.002333	3.9985314	0.00000	50.0000000 CY
0.0003188	3933.	12338030.	8.4174066	0.0026830	-0.002417	3.9980319	0.00000	50.0000000 CY
0.0003288	3955.	12030104.	8.3915847	0.0027587	-0.002501	3.9985695	0.00000	50.0000000 CY
0.0003388	3975.	11733196.	8.3669462	0.0028343	-0.002586	3.9999998	0.00000	50.0000000 CY
0.0003488	3992.	11446939.	8.3441727	0.0029100	-0.002670	3.9999180	0.00000	50.0000000 CY
0.0003588	4008.	11171560.	8.3228505	0.0029858	-0.002754	3.9995616	0.00000	50.0000000 CY
0.0003688	4022.	10906835.	8.3028339	0.0030617	-0.002838	3.9986927	0.00000	50.0000000 CY
0.0003788	4035.	10652198.	8.2842488	0.0031377	-0.002922	3.9971507	0.00000	50.0000000 CY
0.0003888	4046.	10407289.	8.2670738	0.0032138	-0.003006	3.9998932	0.00000	50.0000000 CY
0.0003988	4056.	10171868.	8.2508116	0.0032900	-0.003090	3.9988660	0.00000	50.0000000 CY
0.0004088	4065.	9944953.	8.2356406	0.0033663	-0.003174	3.9973202	0.00000	50.0000000 CY
0.0004188	4073.	9726903.	8.2210053	0.0034425	-0.003257	3.9996266	0.00000	50.0000000 CY
0.0004288	4080.	9517082.	8.2077012	0.0035191	-0.003341	3.9974185	0.00000	50.0000000 CY
0.0004388	4087.	9314925.	8.1948812	0.0035955	-0.003424	3.9998721	0.00000	50.0000000 CY
0.0004488	4093.	9120155.	8.1832602	0.0036722	-0.003508	3.9977302	0.00000	50.0000000 CY
0.0004588	4098.	8932874.	8.1723643	0.0037491	-0.003591	3.9999110	0.00000	50.0000000 CY
0.0004688	4102.	8751759.	8.1622889	0.0038261	-0.003674	3.9974423	0.00000	50.0000000 CY

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain	Max. Tens. Strain
1	0.000	3588.135	0.00300000	-0.00621448
2	305.000	4010.432	0.00300000	-0.00276991

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	0.0000	3588.	0.0000	2332.	14289511.
2	0.65	305.000000	4010.	198.250000	2607.	16814424.
1	0.75	0.0000	3588.	0.0000	2691.	14034271.
2	0.75	305.000000	4010.	228.750000	3008.	16214289.
1	0.90	0.0000	3588.	0.0000	3229.	11311575.
2	0.90	305.000000	4010.	274.500000	3609.	14909423.

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
				N -	0.00	
1	0.00	0.00	N.A.	No	0.00	5335.
2	3.4000	3.5252	Yes	No	5335.	211227.
3	16.4000	12.7127	No	No	216562.	548691.
4	36.4000	44.7086	Yes	No	765253.	207544.
5	47.2000	51.2193	Yes	No	972797.	825160.
6	86.4000	39.2039	Yes	No	1797957.	84395.
7	105.4000	105.4000	No	Yes	N.A.	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 Pile-head Rotation (Loading Type 2)

Shear force at pile head = 20000.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 0.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
X	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.2406	- <mark>1106677</mark> .	20000.	0.00	0.00	1.45E+10	0.00	0.00	0.00
0.8800	0.2364	-895477.	19755.	-7.28E-04	0.00	1.45E+10	-46.367	2071.	0.00
1.7600	0.2253	-689447.	19000.	-0.00130	0.00	1.46E+10	-96.678	4532.	0.00
2.6400	0.2089	-494199.	17765.	-0.00173	0.00	1.46E+10	-137.244	6939.	0.00
3.5200	0.1887	-314255.	16224.	-0.00198	0.00	2.29E+10	-154.602	8651.	0.00
4.4000	0.1670	-151551.	14521.	-0.00209	0.00	2.30E+10	-167.934	10616.	0.00
5.2800	0.1446	-7574.	12755.	-0.00212	0.00	2.31E+10	-166.587	12162.	0.00
6.1600	0.1222	117826.	10889.	-0.00210	0.00	2.31E+10	-186.670	16133.	0.00
7.0400	0.1003	222410.	8825.	-0.00202	0.00	2.30E+10	-204.291	21506.	0.00
7.9200	0.07951	304212.	6588.	-0.00190	0.00	2.29E+10	-219.455	29145.	0.00
8.8000	0.06019	361543.	4243.	-0.00170	0.00	1.47E+10	-224.546	39392.	0.00
9.6800	0.04363	393833.	1896.	-0.00143	0.00	1.47E+10	-219.972	53246.	0.00
10.5600	0.03005	401594.	-352.749	-0.00114	0.00	1.47E+10	-205.995	72382.	0.00
11.4400	0.01954	386383.	-2290.	-8.57E-04	0.00	1.47E+10	-160.920	86981.	0.00
12.3200	0.01196	353228.	-3700.	-5.90E-04	0.00	1.47E+10	-106.087	93671.	0.00
13.2000	0.00707	308242.	-4615.	-3.92E-04	0.00	2.29E+10	-67.184	100362.	0.00
14.0800	0.00368	255765.	-5166.	-2.62E-04	0.00	2.30E+10	-37.289	107053.	0.00
14.9600	0.00153	199129.	-5450.	-1.58E-04	0.00	2.30E+10	-16.478	113744.	0.00
15.8400	3.47E-04	140656.	-5558.	-7.98E-05	0.00	2.30E+10	-3.957	120435.	0.00
16.7200	-1.55E-04	81741.	-5040.	-2.89E-05	0.00	2.31E+10	102.0578	6947369.	0.00
17.6000	-2.62E-04	34207.	-3551.	-2.34E-06	0.00	2.31E+10	179.9895	7244544.	0.00
18.4800	-2.05E-04	6745.	-1829.	7.01E-06	0.00	2.31E+10	146.1042	7541693.	0.00
19.3600	-1.14E-04	-4425.	-624.115	7.54E-06	0.00	2.31E+10	82.1283	7590000.	0.00
20.2400	-4.53E-05	-6437.	-18.586	5.06E-06	0.00	2.31E+10	32.5553	7590000.	0.00
21.1200	-7.36E-06	-4818.	181.2542	2.49E-06	0.00	2.31E+10	5.2932	7590000.	0.00
22.0000	7.33E-06	-2608.	181.3801	7.96E-07	0.00	2.31E+10	-5.269	7590000.	0.00
22.8800	9.45E-06	-986.868	117.7043	-2.50E-08	0.00	2.31E+10	-6.790	7590000.	0.00
23.7600	6.80E-06	-122.521	56.0286	-2.78E-07	0.00	2.31E+10	-4.891	7590000.	0.00
24.6400	3.57E-06	196.4553	16.6570	-2.61E-07	0.00	2.31E+10	-2.566	7590000.	0.00
25.5200	1.28E-06	229.2749	-1.763	-1.64E-07	0.00	2.31E+10	-0.923	7590000.	0.00
26.4000	1.03E-07	159.2117	-7.025	-7.55E-08	0.00	2.31E+10	-0.07383	7590000.	0.00
27.2800	-3.10E-07	80.9159	-6.237	-2.06E-08	0.00	2.31E+10	0.2231	7590000.	0.00
28.1600	-3.33E-07	27.4960	-3.794	4.12E-09	0.00	2.31E+10	0.2395	7590000.	0.00
29.0400	-2.23E-07	0.7832	-1.682	1.06E-08	0.00	2.31E+10	0.1606	7590000.	0.00
29.9200	-1.10E-07	-8.020	-0.416	8.92E-09	0.00	2.31E+10	0.07900	7590000.	0.00
30.8000	-3.51E-08	-8.013	0.1337	5.26E-09	0.00	2.31E+10	0.02520	7590000.	0.00
31.6800	1.16E-09	-5.196	0.2624	2.24E-09	0.00	2.31E+10	-8.32E-04	7590000.	0.00
32.5600	1.23E-08	-2.472	0.2112	4.92E-10	0.00	2.31E+10	-0.00885	7590000.	0.00
33.4400	1.16E-08	-0.735	0.1207	-2.40E-10	0.00	2.31E+10	-0.00830	7590000.	0.00
34.3200	7.25E-09	0.07651	0.04932	-3.90E-10	0.00	2.31E+10	-0.00521	7590000.	0.00

35.2000	3.31E-09	0.3070	0.00927	-3.03E-10	0.00	2.31E+10	-0.00238	7590000.	0.00
36.0800	8.51E-10	0.2723	-0.00651	-1.70E-10	0.00		-6.12E-04	7590000.	0.00
36.9600	-2.92E-10	0.1694	-0.00903	-6.96E-11	0.00	2.31E+10	1.34E-04	4854024.	0.00
37.8400	-6.19E-10	0.08154	-0.00682	-1.23E-11	0.00	2.31E+10	2.84E-04	4854024.	0.00
38.7200	-5.52E-10	0.02535	-0.00398	1.21E-11	0.00	2.31E+10	2.54E-04	4854024.	0.00
39.6000	-3.62E-10	-0.00256	-0.00176	1.73E-11	0.00	2.31E+10	1.67E-04	4854024.	0.00
40.4800	-1.86E-10	-0.01189	-4.33E-04	1.40E-11	0.00	2.31E+10	8.53E-05	4854024.	0.00
41.3600	-6.61E-11	-0.01189	1.77E-04	8.64E-12	0.00	2.31E+10	3.04E-05	4854024.	0.00
42.2400	-3.10E-11	-0.001171	3.45E-04		0.00	2.31E+10 2.31E+10	1.42E-06		0.00
				4.11E-12				4854024.	
43.1200	2.06E-11	-0.00442	3.03E-04	1.24E-12	0.00		-9.48E-06	4854024.	0.00
44.0000	2.30E-11	-0.00175	1.97E-04	0.00	0.00		-1.06E-05	4854024.	0.00
44.8800	1.70E-11	-2.59E-04	9.97E-05	0.00	0.00		-7.82E-06	4854024.	0.00
45.7600	9.75E-12	3.57E-04	3.48E-05	0.00	0.00		-4.48E-06	4854024.	0.00
46.6400	4.20E-12	4.75E-04	9.00E-07	0.00	0.00		-1.93E-06	4854024.	0.00
47.5200	0.00		-1.18E-05	0.00	0.00		-4.74E-07	5309089.	0.00
48.4000	0.00		-1.30E-05	0.00	0.00	2.31E+10	2.51E-07	5309089.	0.00
49.2800	0.00		-9.38E-06	0.00	0.00	2.31E+10	4.30E-07	5309089.	0.00
50.1600	0.00		-5.21E-06	0.00	0.00	2.31E+10	3.60E-07	5309089.	0.00
51.0400	0.00	-7.68E-06	-2.13E-06	0.00	0.00	2.31E+10	2.24E-07	5309089.	0.00
51.9200	0.00	-1.77E-05	-3.81E-07	0.00	0.00	2.31E+10	1.07E-07	5309089.	0.00
52.8000	0.00	-1.57E-05	3.54E-07	0.00	0.00	2.31E+10	3.24E-08	5309089.	0.00
53.6800	0.00	-1.02E-05	5.04E-07	0.00	0.00	2.31E+10	-3.92E-09	5309089.	0.00
54.5600	0.00	-5.08E-06	4.01E-07	0.00	0.00	2.31E+10	-1.55E-08	5309089.	0.00
55.4400	0.00	-1.71E-06	2.41E-07	0.00	0.00	2.31E+10	-1.48E-08	5309089.	0.00
56.3200	0.00	1.37E-08	1.10E-07	0.00	0.00	2.31E+10	-1.00E-08	5309089.	0.00
57.2000	0.00	6.17E-07	2.96E-08	0.00	0.00	2.31E+10	-5.21E-09	5309089.	0.00
58.0800	0.00	6.39E-07	-7.91E-09	0.00	0.00	2.31E+10	-1.90E-09	5309089.	0.00
58.9600	0.00	4.49E-07	-1.87E-08	0.00	0.00		-1.46E-10	5309089.	0.00
59.8400	0.00	2.44E-07	-1.68E-08	0.00	0.00	2.31E+10	5.19E-10	5309089.	0.00
60.7200	0.00	9.56E-08	-1.09E-08	0.00	0.00	2.31E+10	5.94E-10	5309089.	0.00
61.6000	0.00	1.37E-08	-5.44E-09	0.00	0.00	2.31E+10	4.36E-10	5309089.	0.00
62.4800	0.00	-1.94E-08	-1.84E-09	0.00	0.00	2.31E+10	2.46E-10	5309089.	0.00
63.3600	0.00	-2.51E-08	1.74E-12	0.00	0.00	2.31E+10	1.03E-10	5309089.	0.00
64.2400	0.00	-1.94E-08	6.52E-10	0.00	0.00	2.31E+10	2.04E-11	5309089.	0.00
65.1200	0.00	-1.14E-08	6.80E-10	0.00	0.00		-1.50E-11	5309089.	0.00
66.0000	0.00	-5.02E-09	4.80E-10	0.00	0.00		-2.29E-11	5309089.	0.00
66.8800	0.00	-1.22E-09	2.61E-10	0.00	0.00		-1.86E-11	5309089.	0.00
67.7600	0.00	4.94E-10		0.00	0.00				0.00
			1.03E-10				-1.13E-11	5309089.	
68.6400	0.00	9.48E-10	1.52E-11	0.00	0.00		-5.26E-12	5309089.	0.00
69.5200	0.00		-2.04E-11	0.00	0.00		-1.49E-12	5309089.	0.00
70.4000	0.00	5.17E-10	-2.67E-11	0.00	0.00	2.31E+10	0.00	5309089.	0.00
71.2800	0.00		-2.07E-11	0.00	0.00	2.31E+10	0.00	5309089.	0.00
72.1600	0.00	8.00E-11	-1.22E-11	0.00	0.00	2.31E+10	0.00	5309089.	0.00
73.0400	0.00	-5.29E-12	-5.39E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
73.9200	0.00	-3.38E-11	-1.33E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
74.8000	0.00	-3.34E-11	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
75.6800	0.00	-2.29E-11	1.01E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
76.5600	0.00	-1.22E-11	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
77.4400	0.00	-4.59E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
78.3200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
79.2000	0.00	1.10E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
80.0800	0.00	1.33E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
80.9600	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
81.8400	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	1.54E+07	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	7676515.	0.00
	0.00	0.00	2.20	2.23			3.33		0.00

^{*} This analysis computed pile response using nonlinear moment-curvature rela-

tionships. 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 = 0.24062552 inches
Computed slope at pile head = 0.000000 radians
Maximum bending moment = -1106677. inch-lbs
Maximum shear force = 20000. lbs

Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations = 12 Number of zero deflection points = 14

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

Boundary Condition Type 2, Shear and Slope

Shear = 20000. lbs Slope = 0.00000 Axial Load = 0. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
feet	inches 0.24062552 0.24196321 0.24126388 0.24191284 0.24067309 0.24079086 0.24057606 0.24087748 0.24007707 0.24016030 0.23979514 0.23954833 0.23936855 0.23991871 0.24029994	1n-1bs	1bs
22.00000	0.23944925	-1103063.	20000.
17.60000	0.24187859	-1101767.	20000.
13.20000	0.31122903	-1229694.	20000.
8.80000	0.35749294	-1318682.	20000.

Computed Values of Pile Loading and Deflection

for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head Rotation of pile head Axial load at pile head

= 20000.0 lbs = 0.000E+00 radians = 305000.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.		
X feet	y inches	Moment in-lbs	Force lbs	S radians	Stress psi*	Stiffness lb-in^2	p lb/inch	Es*H lb/inch	Lat. Load lb/inch
0.00	0.2066	- <mark>1190317</mark> .	20000.	0.00	0.00	2.05E+10	0.00	0.00	0.00
0.8800	0.2034	-978131.	19766.	-5.58E-04	0.00	2.05E+10	-44.404	2306.	0.00
1.7600	0.1948	-769275.	19043.	-1.00E-03	0.00	2.14E+10	-92.508	5015.	0.00
2.6400	0.1822	-569511.	17861.	-0.00133	0.00	2.14E+10	-131.262	7606.	0.00
3.5200	0.1667	-383477.	16388.	-0.00157	0.00	2.14E+10	-147.751	9360.	0.00
4.4000	0.1492	-213309.	14765.	-0.00171	0.00	2.14E+10	-159.627	11301.	0.00
5.2800	0.1305	-60602.	13092.	-0.00178	0.00	2.14E+10	-157.254	12724.	0.00
6.1600	0.1115	74666.	11328.	-0.00178	0.00	2.14E+10	-176.844	16742.	0.00
7.0400	0.09297	190094.	9364.	-0.00171	0.00	2.14E+10	-195.060	22157.	0.00
7.9200	0.07538	283468.	7213.	-0.00160	0.00	2.14E+10	-212.447	29762.	0.00
8.8000	0.05927	352700.	4916.	-0.00144	0.00	2.14E+10	-222.449	39632.	0.00
9.6800	0.04501	396564.	2558.	-0.00125	0.00	2.14E+10	-224.176	52600.	0.00
10.5600 11.4400	0.03281 0.02277	414799. 408145.	227.2682 -1910.	-0.00105 -8.49E-04	0.00 0.00	2.14E+10 2.14E+10	-217.276 -187.588	69936. 86981.	0.00 0.00
12.3200	0.01487	379922.	-3597.	-6.55E-04	0.00	2.14E+10 2.14E+10	-131.911	93671.	0.00
13.2000	0.01487	336385.	-3397. -4743.	-4.78E-04	0.00	2.14E+10 2.14E+10	-85.060	100362.	0.00
14.0800	0.00478	282827.	-4743. -5448.	-3.25E-04	0.00	2.14E+10 2.14E+10	-48.499	107053.	0.00
14.9600	0.00209	223410.	-5 44 8.	-2.00E-04	0.00	2.14E+10	-22.552	113744.	0.00
15.8400	5.69E-04	161123.	-5977.	-1.05E-04	0.00	2.14E+10	-6.489	120435.	0.00
16.7200	-1.15E-04	97857.	-5611.	-4.06E-05	0.00	2.14E+10	75.8089	6947369.	0.00
17.6000	-2.89E-04	42888.	-4164.	-5.86E-06	0.00	2.14E+10	198.2569	7244544.	0.00
18.4800	-2.39E-04	9959.	-2215.	7.19E-06	0.00	2.14E+10	170.7054	7541693.	0.00
19.3600	-1.37E-04	-3949.	-793.828	8.68E-06	0.00	2.14E+10	98.5460	7590000.	0.00
20.2400	-5.58E-05	-6862.	-61.778	6.01E-06	0.00	2.14E+10	40.0998	7590000.	0.00
21.1200	-1.03E-05	-5293.	188.9277	3.00E-06	0.00	2.14E+10	7.3823	7590000.	0.00
22.0000	7.64E-06	-2891.	198.9106	9.82E-07	0.00	2.14E+10	-5.492	7590000.	0.00
22.8800	1.05E-05	-1098.		-3.31E-09	0.00	2.14E+10	-7.525	7590000.	0.00
23.7600	7.57E-06	-141.856	61.7239	-3.10E-07	0.00	2.14E+10	-5.441	7590000.	0.00
24.6400	3.93E-06	207.6669	18.0719	-2.93E-07	0.00	2.14E+10	-2.826	7590000.	0.00
25.5200	1.38E-06	241.7119	-2.074	-1.82E-07	0.00	2.14E+10	-0.989	7590000.	0.00
26.4000	8.22E-08	165.0345	-7.610	-8.18E-08	0.00	2.14E+10	-0.05908	7590000.	0.00
27.2800	-3.51E-07	81.5063	-6.589	-2.09E-08	0.00	2.14E+10	0.2525	7590000.	0.00
28.1600	-3.60E-07	26.0086	-3.891	5.63E-09	0.00	2.14E+10	0.2585	7590000.	0.00
29.0400	-2.32E-07	-0.700	-1.644	1.19E-08	0.00	2.14E+10	0.1670	7590000.	0.00
29.9200	-1.09E-07	-8.780	-0.349	9.54E-09	0.00	2.14E+10	0.07816	7590000.	0.00
30.8000	-3.09E-08	-8.130	0.1810	5.36E-09	0.00	2.14E+10	0.02220	7590000.	0.00
31.6800	4.56E-09	-4.991	0.2810	2.12E-09	0.00	2.14E+10	-0.00328	7590000.	0.00
32.5600	1.40E-08	-2.209	0.2106	3.46E-10	0.00	2.14E+10	-0.01005	7590000.	0.00
33.4400	1.19E-08	-0.545	0.1125	-3.34E-10	0.00	2.14E+10	-0.00853	7590000.	0.00
34.3200	6.92E-09	0.1697		-4.27E-10	0.00	2.14E+10	-0.00497	7590000.	0.00
35.2000	2.85E-09	0.3296		-3.04E-10	0.00	2.14E+10	-0.00205	7590000.	0.00
36.0800	5.04E-10	0.2605		-1.58E-10	0.00	2.14E+10	-3.62E-04	7590000.	0.00
36.9600	-4.83E-10	0.1507	-0.00926	-5.63E-11	0.00	2.14E+10	2.22E-04	4854024.	0.00
37.8400	-6.84E-10	0.06530	-0.00643	-2.93E-12	0.00	2.14E+10	3.15E-04	4854024.	0.00
38.7200	-5.45E-10	0.01493	-0.00344	1.69E-11	0.00	2.14E+10	2.51E-04	4854024.	0.00
39.6000	-3.28E-10	-0.00753	-0.00132	1.87E-11	0.00	2.14E+10	1.51E-04	4854024.	0.00
40.4800 41.3600	-1.50E-10	-0.01318 -0.01112	-1.66E-04	1.36E-11	0.00 0.00	2.14E+10	6.89E-05 1.87E-05	4854024. 4854024.	0.00 0.00
42.2400	-4.06E-11 1.07E-11	-0.01112 -0.00697	2.96E-04 3.69E-04	7.60E-12 3.13E-12	0.00	2.14E+10 2.14E+10	-4.90E-06	4854024. 4854024.	0.00
43.1200	2.55E-11	-0.00335	2.81E-04	0.00	0.00	2.14E+10 2.14E+10	-4.90E-06 -1.17E-05	4854024.	0.00
44.0000	2.33E-11 2.30E-11	-0.00333	1.63E-04	0.00	0.00	2.14E+10 2.14E+10	-1.17E-05 -1.05E-05	4854024.	0.00
44.8800	1.50E-11	1.05E-04	7.14E-05	0.00	0.00	2.14E+10 2.14E+10	-6.88E-06	4854024.	0.00
45.7600	7.53E-12	4.77E-04	1.68E-05	0.00	0.00	2.14E+10 2.14E+10		4854024.	0.00
.5.,000	12			0.00	0.00		31.32 00	.05 102 11	0.00

46.6400	2.59E-12	4.63E-04	-7.80E-06	0.00	0.00	2.14E+10	-1.19E-06	4854024.	0.00
47.5200	0.00	3.15E-04	-1.42E-05	0.00	0.00	2.14E+10	-2.57E-08	5309089.	0.00
48.4000	0.00	1.63E-04	-1.21E-05	0.00	0.00	2.14E+10	4.23E-07	5309089.	0.00
49.2800	0.00	5.90E-05	-7.53E-06	0.00	0.00	2.14E+10	4.44E-07	5309089.	0.00
50.1600	0.00	4.16E-06	-3.55E-06	0.00	0.00	2.14E+10	3.10E-07	5309089.	0.00
51.0400	0.00	-1.62E-05	-1.04E-06	0.00	0.00	2.14E+10	1.65E-07	5309089.	0.00
51.9200	0.00	-1.80E-05	1.56E-07	0.00	0.00	2.14E+10	6.23E-08	5309089.	0.00
52.8000	0.00	-1.30E-05	5.22E-07	0.00	0.00	2.14E+10	6.95E-09	5309089.	0.00
53.6800	0.00	-7.08E-06	4.82E-07	0.00	0.00	2.14E+10	-1.44E-08	5309089.	0.00
54.5600	0.00	-2.79E-06	3.15E-07	0.00	0.00	2.14E+10	-1.72E-08	5309089.	0.00
55.4400	0.00	-4.19E-07	1.57E-07	0.00	0.00	2.14E+10	-1.27E-08	5309089.	0.00
56.3200	0.00	5.35E-07	5.24E-08	0.00	0.00	2.14E+10	-7.11E-09	5309089.	0.00
57.2000	0.00	6.95E-07	-4.69E-10	0.00	0.00	2.14E+10	-2.91E-09	5309089.	0.00
58.0800	0.00	5.29E-07	-1.86E-08	0.00	0.00	2.14E+10	-5.30E-10	5309089.	0.00
58.9600	0.00	3.03E-07	-1.90E-08	0.00	0.00	2.14E+10	4.62E-10	5309089.	0.00
59.8400	0.00	1.29E-07	-1.31E-08	0.00	0.00	2.14E+10	6.58E-10	5309089.	0.00
60.7200	0.00	2.74E-08	-6.86E-09	0.00	0.00	2.14E+10	5.17E-10	5309089.	0.00
61.6000	0.00	-1.64E-08	-2.53E-09	0.00	0.00	2.14E+10	3.03E-10	5309089.	0.00
62.4800	0.00	-2.63E-08	-2.29E-10	0.00	0.00	2.14E+10	1.33E-10	5309089.	0.00
63.3600	0.00	-2.14E-08	6.41E-10	0.00	0.00	2.14E+10	3.18E-11	5309089.	0.00
64.2400	0.00	-1.29E-08	7.38E-10	0.00	0.00	2.14E+10	-1.34E-11	5309089.	0.00
65.1200	0.00	-5.84E-09	5.37E-10	0.00	0.00	2.14E+10	-2.47E-11	5309089.	0.00
66.0000	0.00	-1.54E-09	2.97E-10	0.00	0.00	2.14E+10	-2.08E-11	5309089.	0.00
66.8800	0.00	4.35E-10	1.19E-10	0.00	0.00	2.14E+10	-1.28E-11	5309089.	0.00
67.7600	0.00	9.80E-10	1.97E-11	0.00	0.00	2.14E+10	-5.98E-12	5309089.	0.00
68.6400	0.00	8.57E-10	-2.09E-11	0.00	0.00	2.14E+10	-1.71E-12	5309089.	0.00
69.5200	0.00	5.42E-10	-2.83E-11	0.00	0.00	2.14E+10	0.00	5309089.	0.00
70.4000	0.00	2.60E-10	-2.19E-11	0.00	0.00	2.14E+10	0.00	5309089.	0.00
71.2800	0.00	8.02E-11	-1.27E-11	0.00	0.00	2.14E+10	0.00	5309089.	0.00
72.1600	0.00	-7.71E-12	-5.47E-12	0.00	0.00	2.14E+10	0.00	5309089.	0.00
73.0400	0.00	-3.57E-11	-1.23E-12	0.00	0.00	2.14E+10	0.00	5309089.	0.00
73.9200	0.00	-3.40E-11	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
74.8000	0.00	-2.26E-11	1.07E-12	0.00	0.00	2.14E+10	0.00	5309089.	0.00
75.6800	0.00	-1.15E-11	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
76.5600	0.00	-3.97E-12	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
77.4400	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
78.3200	0.00	1.26E-12	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
79.2000	0.00	1.33E-12	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
80.0800	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
80.9600	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
81.8400	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	1.54E+07	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	7676515.	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 = 0.20658394 inches
Computed slope at pile head = 0.000000 radians
Maximum bending moment = -1190317. inch-lbs
Maximum shear force = 20000. lbs

Depth of maximum bending moment = 0.000000 feet below pile head Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations = 11 Number of zero deflection points = 14

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

Prite-fiead Defrection Vs. Prie Length for Load Case 2

Boundary Condition Type 2, Shear and Slope

Shear = 20000. lbs Slope = 0.00000 Axial Load = 305000. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
88.00000 83.60000 79.20000 74.80000 66.00000 61.60000 57.20000 52.80000 48.40000 44.00000 39.60000 35.20000 30.80000 26.400000	0.20658394 0.20534987 0.20518794 0.20550240 0.20521017 0.20483987 0.20448991 0.20478860 0.20420754 0.20378741 0.20402113 0.20373298 0.20360157 0.20320386 0.20344686 0.20322044	-119031711876861188125118947911894491188980118876711900601189177118870211898421189718118948118937111899681189731.	20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000.
17.60000	0.20803101	-1193673.	20000.
13.20000	0.27797590	-1380107.	20000.
8.80000	0.31621748	-1400554.	20000.

Computed Values of Pile Loading and Deflection

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 = 20000.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

0.00 <mark>0.8909</mark> -2.30E-08 <mark>20000</mark> 0.00951 0.00 2.31E+10 0.00 0.00	Distrib. Lat. Load lb/inch	Load	Lat.	Soil Spr. Es*H lb/inch	Soil Res. p lb/inch	Bending Stiffness lb-in^2	Total Stress psi*	Slope S radians	Shear Force lbs	Bending Moment in-lbs	Deflect. y inches	Depth X feet	
0.8800 0.7905 211200. 19655. -0.00946 0.00 2.31E+10 -65.256 871.7655 1.7600 0.6910 415123. 18570. -0.00927 0.00 1.47E+10 -140.372 2145. 2.6400 0.5947 603393. 16728. -0.00890 0.00 1.46E+10 -208.391 3700. 3.5200 0.5031 768424. 14402. -0.00840 0.00 1.46E+10 -232.213 4874.	0.00 0.00 0.00 0.00 0.00	0.00 0.00 0.00		871.7655 2145. 3700.	-65.256 -140.372 -208.391	2.31E+10 1.47E+10 1.46E+10	0.00 0.00 0.00	-0.00946 -0.00927 -0.00890	19655. 18570. 16728.	211200. 415123. 603393.	0.7905 0.6910 0.5947	0.8800 1.7600 2.6400	

4.4000	0.4173	907560.	11806.	-0.00780	0.00	1.46E+10	-259.465	6566.	0.00
5.2800	0.3384	1017763.	9009.	-0.00710	0.00	1.45E+10	-270.232	8433.	0.00
6.1600	0.2673	1097831.	6014.	-0.00633	0.00	1.45E+10	-297.029	11732.	0.00
7.0400	0.2047	1144776.	2781.	-0.00551	0.00	1.45E+10	-315.214	16260.	0.00
7.9200	0.1509	1156570.	-593.560	-0.00468	0.00	1.45E+10	-323.951	22673.	0.00
8.8000	0.1059	1132240.	-3976.	-0.00385	0.00	1.45E+10	-316.604	31565.	0.00
9.6800	0.06965	1072604.	-7191.	-0.00304	0.00	1.45E+10	-292.356	44323.	0.00
10.5600	0.04162	980366.	-10060.	-0.00230	0.00	1.46E+10	-251.079	63708.	0.00
11.4400	0.02109	860129.	-12303.	-0.00163	0.00	1.46E+10	-173.739	86981.	0.00
12.3200	0.00715	720519.	-13556.	-0.00106	0.00	1.46E+10	-63.418	93671.	0.00
13.2000	-0.00129	573836.	-13826.	-5.92E-04	0.00	1.46E+10	12.2662	100362.	0.00
14.0800	-0.00536	428521.	-13474.	-2.30E-04	0.00	1.47E+10	54.2897	107053.	0.00
14.9600 15.8400	-0.00616 -0.00555	289260. 157396.	-12837. -12153.	-9.43E-06 9.33E-05	0.00 0.00	2.29E+10 2.30E+10	66.3304 63.3462	113744. 120435.	0.00 0.00
16.7200	-0.00333	32596.	-12133. -9703.	1.37E-04	0.00	2.30E+10 2.31E+10	400.5867	1009981.	0.00
17.6000	-0.00419	-47534 .	-5618.	1.37E-04 1.33E-04	0.00	2.31E+10 2.31E+10	373.1493	1478485.	0.00
18.4800	-0.00207	-47334. -86052.	-1910.	1.03E-04	0.00	2.31E+10	329.1112	2534188.	0.00
19.3600	-4.93E-04	-87870.	1183.	6.30E-05	0.00	2.31E+10	256.7233	5494783.	0.00
20.2400	-3.99E-05	-61059.	2690.	2.90E-05	0.00	2.31E+10	28.6806	7590000.	0.00
21.1200	1.19E-04	-31051.	2391.	7.94E-06	0.00	2.31E+10	-85.380	7590000.	0.00
22.0000	1.28E-04	-10563.	1455.	-1.57E-06	0.00	2.31E+10	-91.796	7590000.	0.00
22.8800	8.57E-05	-311.788	645.5150	-4.05E-06	0.00	2.31E+10	-61.598	7590000.	0.00
23.7600	4.22E-05	3070.	160.1939	-3.42E-06	0.00	2.31E+10	-30.319	7590000.	0.00
24.6400	1.35E-05	3072.	-51.015	-2.02E-06	0.00	2.31E+10	-9.683	7590000.	0.00
25.5200	-4.27E-07	1993.	-100.522	-8.61E-07	0.00	2.31E+10	0.3066	7590000.	0.00
26.4000	-4.71E-06	948.4924	-81.014	-1.89E-07	0.00	2.31E+10	3.3879	7590000.	0.00
27.2800	-4.43E-06	281.8802	-46.328	9.16E-08	0.00	2.31E+10	3.1815	7590000.	0.00
28.1600	-2.78E-06	-29.951	-18.980	1.49E-07	0.00	2.31E+10	1.9980	7590000.	0.00
29.0400	-1.28E-06	-118.979	-3.582	1.15E-07	0.00	2.31E+10	0.9183	7590000.	0.00
29.9200	-3.49E-07	-105.605	2.5919	6.38E-08	0.00	2.31E+10	0.2510	7590000.	0.00
30.8000	6.98E-08	-64.238	3.6523	2.50E-08	0.00	2.31E+10	-0.05020	7590000.	0.00
31.6800	1.79E-07	-28.469	2.7074	3.85E-09	0.00	2.31E+10	-0.129	7590000.	0.00
32.5600	1.51E-07	-7.057	1.4542	-4.26E-09	0.00	2.31E+10	-0.109	7590000.	0.00
33.4400	8.91E-08	2.2437	0.5427	-5.36E-09	0.00	2.31E+10	-0.06402	7590000.	0.00
34.3200	3.79E-08	4.4047	0.06099	-3.84E-09	0.00	2.31E+10	-0.02721	7590000.	0.00
35.2000	7.87E-09	3.5317	-0.113	-2.03E-09	0.00	2.31E+10	-0.00566	7590000.	0.00
36.0800	-5.07E-09	2.0276	-0.123	-7.63E-10	0.00	2.31E+10	0.00365	7590000.	0.00
36.9600	-8.24E-09	0.9300	-0.08394	-8.76E-11	0.00	2.31E+10	0.00379	4854024.	0.00
37.8400	-6.92E-09 -4.37E-09	0.2548	-0.04715	1.83E-10	0.00	2.31E+10	0.00318	4854024.	0.00
38.7200 39.6000	-4.37E-09 -2.14E-09	-0.06575 -0.162	-0.01974 -0.00392	2.26E-10 1.74E-10	0.00 0.00	2.31E+10 2.31E+10	0.00201 9.86E-04	4854024. 4854024.	0.00 0.00
40.4800	-6.96E-10	-0.102	0.00298	1.03E-10	0.00	2.31E+10	3.20E-04	4854024.	0.00
41.3600	3.58E-11	-0.148	0.00258	4.67E-11	0.00	2.31E+10	-1.64E-05	4854024.	0.00
42.2400	2.90E-10	-0.05163	0.00430	1.23E-11	0.00	2.31E+10	-1.33E-04	4854024.	0.00
43.1200	2.95E-10	-0.01900	0.00237	-3.84E-12	0.00	2.31E+10	-1.36E-04	4854024.	0.00
44.0000	2.09E-10	-0.00151	0.00115	-8.53E-12	0.00	2.31E+10		4854024.	0.00
44.8800	1.15E-10	0.00527	3.63E-04	-7.67E-12	0.00	2.31E+10	-5.29E-05	4854024.	0.00
45.7600	4.69E-11	0.00616	-3.05E-05	-5.06E-12	0.00	2.31E+10	-2.16E-05	4854024.	0.00
46.6400	8.40E-12	0.00463	-1.65E-04	-2.59E-12	0.00	2.31E+10	-3.86E-06	4854024.	0.00
47.5200	-7.81E-12	0.00268	-1.64E-04	0.00	0.00	2.31E+10	3.93E-06	5309089.	0.00
48.4000	-1.11E-11	0.00116	-1.14E-04	0.00	0.00	2.31E+10	5.59E-06	5309089.	0.00
49.2800	-8.86E-12	2.64E-04	-6.11E-05	0.00	0.00	2.31E+10	4.45E-06	5309089.	0.00
50.1600	-5.32E-12	-1.34E-04	-2.35E-05	0.00	0.00	2.31E+10	2.67E-06	5309089.	0.00
51.0400	-2.42E-12	-2.33E-04	-2.94E-06	0.00	0.00	2.31E+10	1.22E-06	5309089.	0.00
51.9200	0.00	-1.96E-04	5.23E-06	0.00	0.00	2.31E+10	3.28E-07	5309089.	0.00
52.8000	0.00	-1.22E-04	6.50E-06	0.00	0.00	2.31E+10	-8.79E-08	5309089.	0.00
53.6800	0.00	-5.85E-05	4.94E-06	0.00	0.00	2.31E+10	-2.08E-07	5309089.	0.00
54.5600	0.00	-1.79E-05	2.86E-06	0.00	0.00	2.31E+10	-1.86E-07	5309089.	0.00
55.4400	0.00	2.00E-06	1.24E-06	0.00	0.00	2.31E+10	-1.21E-07	5309089.	0.00
56.3200	0.00	8.40E-06	2.87E-07	0.00	0.00	2.31E+10	-6.04E-08	5309089.	0.00
57.2000	0.00	8.06E-06	-1.39E-07	0.00	0.00	2.31E+10	-2.04E-08	5309089.	0.00
58.0800	0.00	5.45E-06	-2.47E-07	0.00	0.00	2.31E+10	2.40E-11	5309089.	0.00
58.9600	0.00	2.85E-06	-2.09E-07	0.00	0.00	2.31E+10	7.23E-09	5309089.	0.00

59.8400	0.00	1.04E-06	-1.31E-07	0.00	0.00	2.31E+10	7.55E-09	5309089.	0.00
60.7200	0.00	8.59E-08	-6.27E-08	0.00	0.00	2.31E+10	5.32E-09	5309089.	0.00
61.6000	0.00	-2.79E-07	-1.93E-08	0.00	0.00	2.31E+10	2.89E-09	5309089.	0.00
62.4800	0.00	-3.22E-07	1.98E-09	0.00	0.00	2.31E+10	1.14E-09	5309089.	0.00
63.3600	0.00	-2.38E-07	8.89E-09	0.00	0.00	2.31E+10	1.69E-10	5309089.	0.00
64.2400	0.00	-1.34E-07	8.58E-09	0.00	0.00	2.31E+10	-2.27E-10	5309089.	0.00
65.1200	0.00	-5.63E-08	5.82E-09	0.00	0.00	2.31E+10	-2.96E-10	5309089.	0.00
66.0000	0.00	-1.14E-08	3.05E-09	0.00	0.00	2.31E+10	-2.29E-10	5309089.	0.00
66.8800	0.00	8.03E-09	1.13E-09	0.00	0.00	2.31E+10	-1.35E-10	5309089.	0.00
67.7600	0.00	1.24E-08	9.86E-11	0.00	0.00	2.31E+10	-5.97E-11	5309089.	0.00
68.6400	0.00	1.01E-08	-2.95E-10	0.00	0.00	2.31E+10	-1.48E-11	5309089.	0.00
69.5200	0.00	6.18E-09	-3.43E-10	0.00	0.00	2.31E+10	5.69E-12	5309089.	0.00
70.4000	0.00	2.88E-09	-2.54E-10	0.00	0.00	2.31E+10	1.12E-11	5309089.	0.00
71.2800	0.00	8.24E-10	-1.44E-10	0.00	0.00	2.31E+10	9.64E-12	5309089.	0.00
72.1600	0.00	-1.57E-10	-6.06E-11	0.00	0.00	2.31E+10	6.12E-12	5309089.	0.00
73.0400	0.00	-4.55E-10	-1.24E-11	0.00	0.00	2.31E+10	2.99E-12	5309089.	0.00
73.9200	0.00	-4.20E-10	8.41E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
74.8000	0.00	-2.78E-10	1.32E-11	0.00	0.00	2.31E+10	0.00	5309089.	0.00
75.6800	0.00	-1.42E-10	1.08E-11	0.00	0.00	2.31E+10	0.00	5309089.	0.00
76.5600	0.00	-4.97E-11	6.61E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
77.4400	0.00	-1.93E-12	3.09E-12	0.00	0.00	2.31E+10	0.00	5309089.	0.00
78.3200	0.00	1.56E-11	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
79.2000	0.00	1.69E-11	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
80.0800	0.00	1.22E-11	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
80.9600	0.00	6.73E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
81.8400	0.00	2.73E-12	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	5309089.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	1.54E+07	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.31E+10	0.00	7676515.	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
                                     0.89092700 inches
Computed slope at pile head
                                     -0.0095132 radians
                                      1156570. inch-lbs
Maximum bending moment
Maximum shear force
                                         20000. lbs
Depth of maximum bending moment =
                                     7.92000000 feet below pile head
Depth of maximum shear force =
                                      0.000000 feet below pile head
Number of iterations
                                            14
Number of zero deflection points =
                                            14
```

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

Boundary Condition Type 1, Shear and Moment

Shear = 20000. lbs Moment = 0. in-lbs

Axial Load =	0.	lbs
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Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
88.0000 83.6000 79.2000 74.8000 70.4000 66.0000 61.6000 57.2000 52.8000 48.4000 44.0000 39.6000 35.2000 30.8000 26.4000 21.60000	0.89092700 0.88765903 0.88807028 0.88884186 0.89005090 0.88716638 0.88578923 0.88802101 0.88762682 0.88585017 0.88676570 0.88673261 0.88596225 0.88483138 0.88575768	1156570. 1152109. 1153332. 1153072. 1154229. 1152188. 1151339. 1152566. 1150873. 1150971. 1151155. 1150567. 1151367. 1150683. 1149956. 1142522.	20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000. 20000.
13.20000	1.77391605	1058156.	-22214.

Computed Values of Pile Loading and Deflection

for Lateral Loading for Load Case Number 4

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

Shear force at pile head = 20000.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 305000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force 1bs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.8209	6.38E-08	20000.	-0.00839	0.00	2.14E+10	0.00	0.00	0.00
0.8800	0.7324	238209.	19655.	-0.00833	0.00	2.14E+10	-65.256	940.9140	0.00
1.7600	0.6451	468763.	18570.	-0.00815	0.00	2.14E+10	-140.372	2298.	0.00
2.6400	0.5602	682917.	16761.	-0.00787	0.00	2.14E+10	-202.099	3810.	0.00
3.5200	0.4789	873447.	14499.	-0.00748	0.00	2.13E+10	-226.405	4992.	0.00
4.4000	0.4022	1037337.	11961.	-0.00701	0.00	2.13E+10	-254.210	6675.	0.00
5.2800	0.3308	1171225.	9212.	-0.00645	0.00	2.06E+10	-266.498	8506.	0.00
6.1600	0.2659	1273461.	6242.	-0.00582	0.00	2.02E+10	-296.057	11759.	0.00
7.0400	0.2079	1340542.	2998.	-0.00513	0.00	2.00E+10	-318.202	16161.	0.00
7.9200	0.1574	1369863.	-436.928	-0.00442	0.00	1.99E+10	-332.434	22299.	0.00
8.8000	0.1146	1359774.	-3946.	-0.00370	0.00	2.00E+10	-332.152	30604.	0.00
9.6800	0.07939	1310328.	-7371.	-0.00299	0.00	2.01E+10	-316.553	42107.	0.00
10.5600	0.05143	1223368.	-10550.	-0.00233	0.00	2.04E+10	-285.555	58637.	0.00
11.4400	0.03015	1102526.	-13323.	-0.00174	0.00	2.08E+10	-239.503	83897.	0.00
12.3200	0.01478	953174.	-15279.	-0.00122	0.00	2.13E+10	-131.072	93671.	0.00
13.2000	0.00439	787686.	-16191.	-7.89E-04	0.00	2.14E+10	-41.712	100362.	0.00
14.0800	-0.00188	616291.	-16311.	-4.42E-04	0.00	2.14E+10	19.1050	107053.	0.00
14.9600	-0.00494	446046.	-15929.	-1.79E-04	0.00	2.14E+10	53.2177	113744.	0.00
15.8400	-0.00567	281026.	-15307.	4.39E-07	0.00	2.14E+10	64.6561	120435.	0.00
16.7200	-0.00493	122768.	-12762.	1.00E-04	0.00	2.14E+10	417.1905	893350.	0.00
17.6000	-0.00355	10837.	-8443.	1.33E-04	0.00	2.14E+10	400.8288	1191212.	0.00

18.4800	-0.00212	-56413.	-4391.	1.22E-04	0.00	2.14E+10	366.6942	1827736.	0.00
19.3600	-9.78E-04	-82682.	-848.222	8.76E-05	0.00	2.14E+10	304.2476	3284407.	0.00
20.2400	-2.69E-04	-74891.	1779.	4.87E-05	0.00	2.14E+10	193.4257	7590000.	0.00
21.1200	4.93E-05	-45412.	2614.	1.89E-05	0.00	2.14E+10	-35.445	7590000.	0.00
22.0000	1.31E-04	-19814.	1930.	2.83E-06	0.00	2.14E+10	-94.048	7590000.	0.00
22.8800	1.09E-04	-4671.	1020.	-3.22E-06	0.00	2.14E+10	-78.365	7590000.	0.00
23.7600	6.28E-05	1740.	367.3120	-3.94E-06	0.00	2.14E+10	-45.169	7590000.	0.00
24.6400	2.57E-05	3112.	31.1514	-2.75E-06	0.00	2.14E+10	-18.498	7590000.	0.00
25.5200	4.86E-06	2416.	-84.979	-1.38E-06	0.00	2.14E+10	-3.496	7590000.	0.00
26.4000	-3.40E-06	1326.	-90.519	-4.55E-07	0.00	2.14E+10	2.4470	7590000.	0.00
27.2800	-4.75E-06	507.2787	-59.554	-2.57E-09	0.00	2.14E+10	3.4174	7590000.	0.00
28.1600									
	-3.46E-06	68.5356	-28.384	1.40E-07	0.00	2.14E+10	2.4859	7590000.	0.00
29.0400	-1.81E-06	-93.101	-8.408	1.34E-07	0.00	2.14E+10	1.2975	7590000.	0.00
29.9200	-6.37E-07	-109.904	0.8611	8.34E-08	0.00	2.14E+10	0.4581	7590000.	0.00
30.8000	-4.27E-08	-75.452	3.4419	3.77E-08	0.00	2.14E+10	0.03072	7590000.	0.00
31.6800	1.58E-07	-37.455	3.0036	9.78E-09	0.00	2.14E+10	-0.114	7590000.	0.00
32.5600	1.64E-07	-12.079	1.7815	-2.45E-09	0.00	2.14E+10	-0.118	7590000.	0.00
33.4400	1.06E-07	0.1867	0.7562	-5.39E-09	0.00	2.14E+10	-0.07646	7590000.	0.00
34.3200	4.99E-08	3.9259	0.1630	-4.38E-09	0.00	2.14E+10	-0.03589	7590000.	0.00
35.2000	1.40E-08	3.6571	-0.07945	-2.50E-09	0.00	2.14E+10	-0.01003	7590000.	0.00
36.0800	-2.94E-09	2.2640	-0.121	-1.04E-09	0.00	2.14E+10	0.00211	7590000.	0.00
				-2.09E-10				4854024.	
36.9600	-8.03E-09	1.1030	-0.09061		0.00	2.14E+10	0.00369		0.00
37.8400	-7.36E-09	0.3517	-0.05327	1.50E-10	0.00	2.14E+10	0.00338	4854024.	0.00
38.7200	-4.86E-09	-0.02303	-0.02363	2.31E-10	0.00	2.14E+10	0.00223	4854024.	0.00
39.6000	-2.47E-09	-0.149	-0.00584	1.89E-10	0.00	2.14E+10	0.00114	4854024.	0.00
40.4800	-8.67E-10	-0.148	0.00227	1.16E-10	0.00	2.14E+10	3.98E-04	4854024.	0.00
41.3600	-3.02E-11	-0.102	0.00444	5.41E-11	0.00	2.14E+10	1.39E-05	4854024.	0.00
42.2400	2.76E-10	-0.05412	0.00385	1.56E-11	0.00	2.14E+10	-1.27E-04	4854024.	0.00
43.1200	2.99E-10	-0.02058	0.00245	-2.85E-12	0.00	2.14E+10	-1.38E-04	4854024.	0.00
44.0000	2.15E-10	-0.00235	0.00120	-8.51E-12	0.00	2.14E+10	-9.90E-05	4854024.	0.00
44.8800	1.19E-10	0.00485	3.88E-04	-7.90E-12	0.00	2.14E+10	-5.49E-05	4854024.	0.00
	4.87E-11								
45.7600		0.00591	-1.98E-05	-5.24E-12	0.00	2.14E+10	-2.24E-05	4854024.	0.00
46.6400	8.83E-12	0.00446	-1.60E-04	-2.68E-12	0.00	2.14E+10	-4.06E-06	4854024.	0.00
47.5200	-7.79E-12	0.00256	-1.60E-04	0.00	0.00	2.14E+10	3.91E-06	5309089.	0.00
48.4000	-1.11E-11	0.00108	-1.10E-04	0.00	0.00	2.14E+10	5.56E-06	5309089.	0.00
49.2800	-8.67E-12	2.30E-04	-5.79E-05	0.00	0.00	2.14E+10	4.36E-06	5309089.	0.00
50.1600	-5.09E-12	-1.39E-04	-2.13E-05	0.00	0.00	2.14E+10	2.56E-06	5309089.	0.00
51.0400	-2.23E-12	-2.23E-04	-1.90E-06	0.00	0.00	2.14E+10	1.12E-06	5309089.	0.00
51.9200	0.00	-1.81E-04	5.43E-06	0.00	0.00	2.14E+10	2.67E-07	5309089.	0.00
52.8000	0.00	-1.09E-04	6.24E-06	0.00	0.00	2.14E+10	-1.14E-07	5309089.	0.00
53.6800	0.00	-4.92E-05	4.53E-06	0.00	0.00	2.14E+10	-2.09E-07	5309089.	0.00
54.5600	0.00	-1.30E-05	2.50E-06	0.00	0.00	2.14E+10	-1.76E-07	5309089.	0.00
55.4400	0.00	3.70E-06	1.00E-06		0.00	2.14E+10	-1.76E-07	5309089.	0.00
				0.00					
56.3200	0.00	8.29E-06	1.65E-07	0.00	0.00	2.14E+10	-5.04E-08	5309089.	0.00
57.2000	0.00	7.24E-06	-1.77E-07	0.00	0.00	2.14E+10	-1.44E-08	5309089.	0.00
58.0800	0.00	4.57E-06	-2.39E-07	0.00	0.00	2.14E+10	2.65E-09	5309089.	0.00
58.9600	0.00	2.20E-06	-1.85E-07	0.00	0.00	2.14E+10	7.71E-09	5309089.	0.00
59.8400	0.00	6.75E-07	-1.07E-07	0.00	0.00	2.14E+10	7.00E-09	5309089.	0.00
60.7200	0.00	-6.63E-08	-4.61E-08	0.00	0.00	2.14E+10	4.53E-09	5309089.	0.00
61.6000	0.00	-3.02E-07	-1.03E-08	0.00	0.00	2.14E+10	2.24E-09	5309089.	0.00
62.4800	0.00	-2.87E-07	5.31E-09	0.00	0.00	2.14E+10	7.30E-10	5309089.	0.00
63.3600	0.00	-1.91E-07	9.04E-09	0.00	0.00	2.14E+10	-2.37E-11	5309089.	0.00
64.2400	0.00	-9.67E-08	7.46E-09	0.00	0.00	2.14E+10	-2.77E-10	5309089.	0.00
65.1200	0.00	-3.34E-08	4.53E-09	0.00	0.00	2.14E+10	-2.76E-10	5309089.	0.00
66.0000	0.00	-8.77E-10	2.08E-09	0.00	0.00	2.14E+10	-1.88E-10	5309089.	0.00
66.8800	0.00	1.07E-08	5.70E-10	0.00	0.00	2.14E+10	-9.79E-11	5309089.	0.00
67.7600	0.00	1.13E-08	-1.34E-10	0.00	0.00	2.14E+10	-3.55E-11	5309089.	0.00
68.6400	0.00	7.89E-09	-3.35E-10	0.00	0.00	2.14E+10	-2.60E-12	5309089.	0.00
69.5200	0.00	4.21E-09	-2.98E-10	0.00	0.00	2.14E+10	9.61E-12	5309089.	0.00
70.4000	0.00	1.60E-09	-1.90E-10	0.00	0.00	2.14E+10	1.08E-11	5309089.	0.00
71.2800	0.00	1.86E-10	-9.26E-11	0.00	0.00	2.14E+10	7.75E-12	5309089.	0.00
72.1600	0.00	-3.62E-10	-2.93E-11	0.00	0.00	2.14E+10	4.24E-12	5309089.	0.00
73.0400	0.00	-4.36E-10	1.93E-12	0.00	0.00	2.14E+10	1.68E-12	5309089.	0.00
, , , , , , ,	0.00		1.776-12	0.00	0.00	∠.14LTU	1.00L-1Z	2202002.	0.00

73.9200	0.00	-3.23E-10	1.21E-11	0.00	0.00	2.14E+10	0.00	5309089.	0.00
74.8000	0.00	-1.81E-10	1.18E-11	0.00	0.00	2.14E+10	0.00	5309089.	0.00
75.6800	0.00	-7.45E-11	7.93E-12	0.00	0.00	2.14E+10	0.00	5309089.	0.00
76.5600	0.00	-1.39E-11	4.07E-12	0.00	0.00	2.14E+10	0.00	5309089.	0.00
77.4400	0.00	1.15E-11	1.44E-12	0.00	0.00	2.14E+10	0.00	5309089.	0.00
78.3200	0.00	1.67E-11	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
79.2000	0.00	1.31E-11	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
80.0800	0.00	7.73E-12	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
80.9600	0.00	3.40E-12	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
81.8400	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
82.7200	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
83.6000	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
84.4800	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
85.3600	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
86.2400	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	5309089.	0.00
87.1200	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	1.54E+07	0.00
88.0000	0.00	0.00	0.00	0.00	0.00	2.14E+10	0.00	7676515.	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. 4:

Pile-head deflection = 0.82093066 inches
Computed slope at pile head = -0.0083859 radians
Maximum bending moment = 1369863. inch-lbs
Maximum shear force = 20000. lbs
Depth of maximum bending moment = 7.92000000 feet below pile head
Depth of iterations = 15

Number of zero deflection points = 15

Pile-head Deflection vs. Pile Length for Load Case 4

Boundary Condition Type 1, Shear and Moment

Shear = 20000. lbs
Moment = 0. in-lbs
Axial Load = 305000. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
88.00000 83.60000 79.20000 74.80000 70.40000 66.00000	0.82093066 0.81708795 0.81694153 0.81737842 0.81813797 0.81668166 0.81601848	1369863. 1365020. 1365150. 1366525. 1364430. 1364489.	20000. 20000. 20000. 20000. 20000. 20000.
57.20000	0.81734626	1365735.	20000.
52.80000	0.81638690	1363045.	20000.

48.40000	0.81453151	1362715.	20000
44.00000	0.81586923	1362898.	20000
39.60000	0.81535666	1362696.	20000
35.20000	0.81517264	1363235.	20000
30.80000	0.81412581	1361477.	20000
26.40000	0.81513881	1362915.	20000
22.00000	0.81481087	1362100.	20000
17.60000	0.86264689	1344507.	20000

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
```

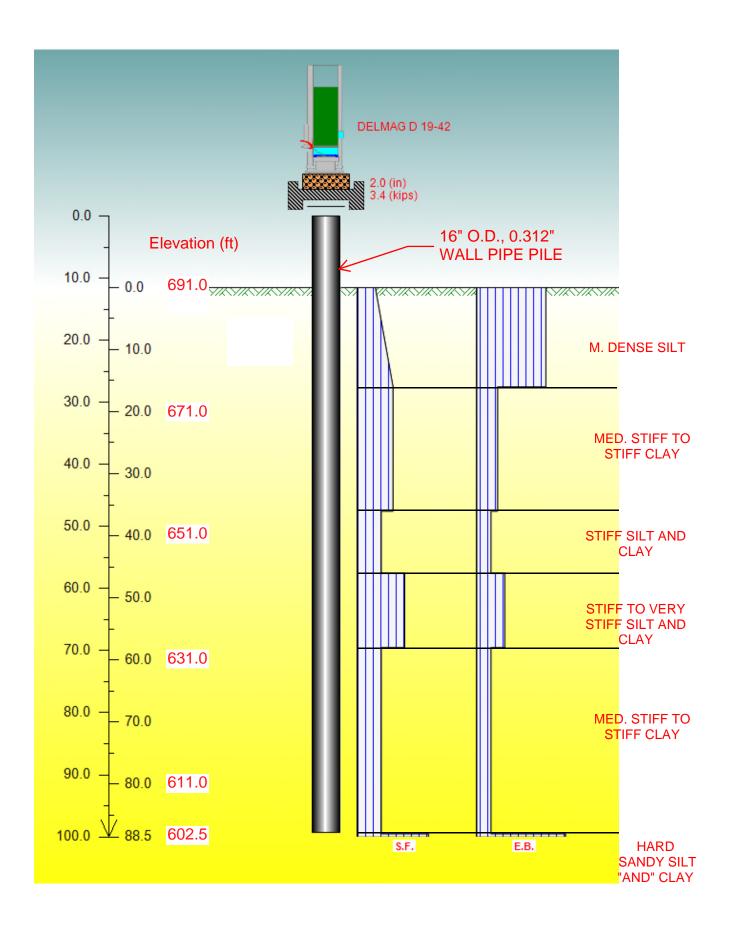
Load Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	lbs	inches	radians	lbs	in-lbs
1 V, lb	20000.	S, rad	0.00	0.00	0.2406	0.00	20000.	-1106677.
2 V, lb	20000.	S, rad	0.00	305000.	0.2066	0.00	20000.	-1190317.
3 V, 1b	20000.	M, in-lb	0.00	0.00	0.8909	-0.00951	20000.	1156570.
4 V, 1b	20000.	M, in-lb	0.00	305000.	0.8209	-0.00839	20000.	1369863.

Maximum pile-head deflection = 0.8909269992 inches
Maximum pile-head rotation = -0.0095131596 radians = -0.545064 deg.

The analysis ended normally.

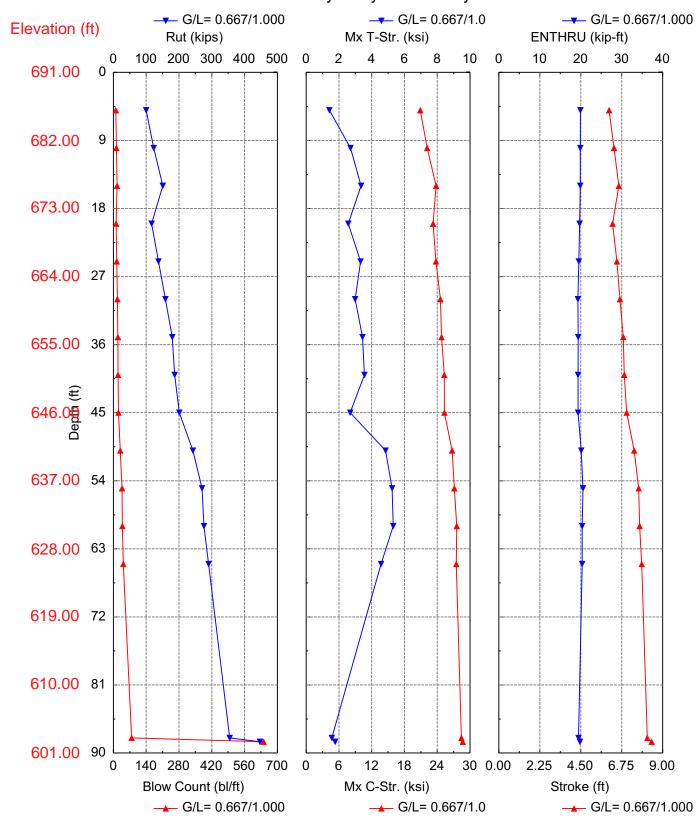
DRIVABILTY ANALYSIS

CENTER PIER - D19-42-HIGHEST FUEL SETTING



SME

Driveability Analysis Summary



088549.00 -D19-42-CENTER PIER

SME

Gain/Loss Factor at Shaft/Toe = 0.667/1.000

Elevation	Depth	Rut	Rshaft	Rtoe	Blow Ct	Mx C-Strl	Их T-Str.	Stroke	ENTHRU	JHammer
ft	ft	kips	kips	kips	bl/ft	ksi	ksi	ft	kip-ft	-
686.00	5.0	99.8	18.2	81.7	10.2	20.885	1.415	6.06	19.9	D 19-42
681.00	10.0	122.9	41.2	81.7	12.7	22.136	2.709	6.33	19.9	D 19-42
676.00	15.0	150.9	69.2	81.7	15.8	23.793	3.356	6.59	19.9	D 19-42
671.00	20.0	116.6	92.2	24.4	11.5	23.224	2.573	6.25	19.7	D 19-42
666.00	25.0	137.5	113.1	24.4	14.3	23.754	3.319	6.48	19.5	D 19-42
661.00	30.0	158.5	134.1	24.4	16.6	24.595	2.992	6.65	19.3	D 19-42
656.00	35.0	179.4	155.0	24.4	19.0	24.783	3.440	6.83	19.4	D 19-42
651.00	40.0	186.9	170.4	16.5	19.9	25.287	3.553	6.88	19.3	D 19-42
646.00	45.0	200.9	184.4	16.5	21.8	25.315	2.692	7.02	19.3	D 19-42
641.00	50.0	242.6	209.5	33.1	29.5	26.714	4.849	7.43	20.1	D 19-42
636.00	55.0	270.5	237.4	33.1	36.6	27.123	5.249	7.68	20.5	D 19-42
631.00	60.0	276.3	259.8	16.5	37.9	27.576	5.312	7.73	20.3	D 19-42
626.00	65.0	290.3	273.8	16.5	42.4	27.472	4.569	7.84	20.4	D 19-42
603.00	88.0	354.6	338.0	16.5	77.5	28.420	1.566	8.16	19.4	D 19-42
602.50	88.5	446.9	342.2	104.7	641.6	28.669	1.767	8.39	19.8	D 19-42

Total driving time: 67 minutes; Total Number of Blows: 2866 (starting at penetration 5.0 ft)

088549.00 -D19-42-CENTER PIER

SME

		INI	\Box	ıΤ
М	LE	III	М	ו ע

Uniform Pile		Pile Type:	Open-End Pipe
Pile Length: (ft)	100.000	Pile Penetration: (ft)	88.500
Pile Size: (ft)	1.33	Toe Area: (in²)	201.06

Pile Profile

Lb Top	X-Area	E-Modulus	Spec. Wt	Perim.	Crit. Index
ft	in²	ksi	lb/ft³	ft	-
0.0	15.4	30,000.0	492.0	4.2	0
100.0	15.4	30,000.0	492.0	4.2	0

HAMMER INPUT

ID	41	Made By:	DELMAG
Model	D 19-42	Type:	OED

Hammer Data

ID	Ram Wt	Ram L.	Ram Ar.	Rtd. Stk	Effic.	Rtd. Energy
-	kips	in	in²	ft	-	kip-ft
41	4.000	129.1	124.7	10.8	0.80	43.2

DRIVE SYSTEM FOR DELMAG D 19-42-OED

Туре	X-Area	E-Modulus	Thickness	COR	Round-out	Stiffness
-	in²	ksi	in	-	in	kips/in
Hammer C.	415.000	530.000	2.000	0.800	0.120	109976.014
Helmet Wt.	3.400	kips				

SOIL RESISTANCE DISTRIBUTION

Depth	Unit Rs	Unit Rt	Qs	Qt	Js	Jt	Set. F.	Limit D.	Set. T.	EB Area
ft	ksf	ksf	in	in	s/ft	s/ft	-	ft	Hours	in²
0.0	0.8	58.5	0.10	0.20	0.10	0.15	1.0	6.6	168.0	201.1
16.0	1.5	58.5	0.10	0.20	0.10	0.15	1.0	6.6	168.0	201.1
16.0	1.5	17.5	0.10	0.23	0.15	0.15	1.5	6.6	168.0	201.1
36.0	1.5	17.5	0.10	0.23	0.15	0.15	1.5	6.6	168.0	201.1
36.0	1.0	11.8	0.10	0.30	0.15	0.15	1.5	6.6	168.0	201.1
46.0	1.0	11.8	0.10	0.30	0.15	0.15	1.5	6.6	168.0	201.1
46.0	2.0	23.7	0.10	0.23	0.15	0.15	1.5	6.6	168.0	201.1
58.0	2.0	23.7	0.10	0.23	0.15	0.15	1.5	6.6	168.0	201.1
58.0	1.0	11.8	0.10	0.30	0.15	0.15	1.5	6.6	168.0	201.1
88.0	1.0	11.8	0.10	0.30	0.15	0.15	1.5	6.6	168.0	201.1
88.0	3.0	75.0	0.10	0.17	0.15	0.15	1.5	6.6	168.0	201.1
88.5	3.0	75.0	0.10	0.17	0.15	0.15	1.5	6.6	168.0	201.1

11/22/2024





Latitude, Longitude: 41.4150404, -81.6595162



	iviap data ©2022
Date	5/18/2022, 6:33:44 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	E - Soft Clay Soil
Site Class	E - Soft Clay Soil

Туре	Value	Description
S _S	0.141	MCE _R ground motion. (for 0.2 second period)
S ₁	0.05	MCE _R ground motion. (for 1.0s period)
S _{MS}	0.339	Site-modified spectral acceleration value
S _{M1}	0.208	Site-modified spectral acceleration value
S _{DS}	0.226	Numeric seismic design value at 0.2 second SA
S _{D1}	0.139	Numeric seismic design value at 1.0 second SA

Туре	Value	Description
SDC	С	Seismic design category
Fa	2.4	Site amplification factor at 0.2 second
F _v	4.2	Site amplification factor at 1.0 second
PGA	0.076	MCE _G peak ground acceleration
F _{PGA}	2.4	Site amplification factor at PGA
PGA _M	0.182	Site modified peak ground acceleration
TL	12	Long-period transition period in seconds
SsRT	0.141	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.147	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.05	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.054	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C _{RS}	0.959	Mapped value of the risk coefficient at short periods
C _{R1}	0.923	Mapped value of the risk coefficient at a period of 1 s

CUY-17-13.50

SME Project #088549.00

Calculated by: Brendan P. Lieske, PE Reviewed by: Alan J. Esser, PE, D.GE.

Site Classification For Seismic Design - ASCE 7-16 Chapter 20

Site classification calculated based on Section 20.4.2, Average Field Standard Penetration Resistance Method

Boring B-002-0-22 was selected as representative of the soil conditions for this project.

From 0 to 25 feet

$$N_{avg25} = 15$$
 blows/ft (uncorrected) $d_{25} = 25$ feet

From 25 to 40 feet

$$N_{avq40} = 12$$
 blows/ft (uncorrected) $d_{40} = 15$ feet

From 40 to 55 feet

$$N_{avq55} = 5$$
 blows/ft (uncorrected) $d_{55} = 15$ feet

From 55 to 60 feet

$$N_{avg60} = 19$$
 blows/ft (uncorrected) $d_{60} = 5$ feet

From 60 to 99 feet

$$N_{avg99} = 7$$
 blows/ft (uncorrected) $d_{99} = 39$ feet

From 99 to 100 feet

$$N_{avg100} = 15$$
 blows/ft (uncorrected) $d_{100} = 1$ foot

$$\Sigma d_i := d_{25} + d_{40} + d_{55} + d_{60} + d_{99} + d_{100} = 100$$
 feet

$$N := \frac{\Sigma d_i}{\Sigma d_i N_i} = 8.5$$
 <15 blows/ft; therefore, Site Classification E

Project: CUY-17-13.50

Rear Abutment Settlement Analysis Based on B-003-0-22 Profile

PID: 112998

SME Project No.: 088549.00

Prepared by: Brendan P. Lieske, PE

Date: 10/31/24

 $plf := \frac{lb}{ft}$ **Units**

 $psf := \frac{lb}{ft^2}$

 $pcf := \frac{lb}{ft^3}$

 $psi := \frac{lb}{in^2}$

 $kip := 1000 \ lb$

 $tlf \coloneqq \frac{ton}{ft}$

 $tsf := \frac{ton}{ft^2}$

 $ksi := \frac{kip}{in^2}$

 $kci := \frac{kip}{in^3}$

Settlement Analysis, in accordance with LRFD 11.6.2, following the Hough Method from LRFD 10.6.2.4.2b for cohesionless soils and LRFD 10.6.2.4.3 for cohesive soils

 $Elev_{Road} = 723.3$ **ft**

 $Elev_{TOP} = 713 \ ft$

Elevation at top of wall at rear abutment

 $Elev_{CS} = 706.0 \ \mathbf{ft}$

Existing Elevation of Ground Surface at Piles

 $\gamma_r = 125 \ pcf$

Unit Weight of Retained Soil Layer

 $B = 20 \, ft$

Approximate width of embankment for Boussinesq Contours. Based on 2V:1H zone of influence below abutment footing.

$$S_e = \sum_{i=1}^n \Delta H_i$$

(10.6.2.4.2b-1)

in which:

$$\Delta H_{l} = H_{c} \frac{1}{C'} \log \left(\frac{\sigma_{o}' + \Delta \sigma_{v}}{\sigma_{o}'} \right)$$
 (10.6.2.4.2b-2)

where:

number of soil layers within zone of stress influence of the footing

 ΔH_i elastic settlement of layer i (ft) initial height of layer i (ft)

capacity index from bearing

Figure 10.6.2.4.2b-1 (dim)

initial vertical effective stress at the midpoint of layer i (ksf)

increase in vertical stress at the midpoint of $\Delta \sigma_v$

layer i (ksf)

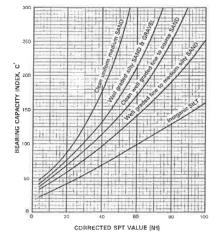


Figure 10.6.2.4.2b-1—Bearing Capacity Index versus Corrected SPT (Hough, 1959, as modified in Samtani and Nowatzki, 2006)

 $\Delta \sigma_{Surface} := (Elev_{Road} - Elev_{GS}) \cdot \gamma_r = 2.162 \text{ ksf}$

Change in Stress at each layer is based on Bouessinesq stress contours for an infinitely long, uniformly loaded foundation (L/B > 5).

Assume groundwater at bottom of abutment footing

Layer 1, Elev 706.0 to 703.4 feet, Very Stiff A-6a

Layer 2, Elev 703.4 to 694.6 feet, Medium Dense A-3a

Layer 3, Elev 694.6 to 687.6 feet, Medium Dense A-3a

Layer 4, Elev 687.6 to 674.6 feet, Medium Dense A-4b

Layer 5, Elev 674.6 to 654.6 feet, Medium Stiff to Stiff A-4b

Layer 6, Elev 654.6 to 643.8 feet, Stiff A-6a

Layer 7, Elev 643.8 to 604.6 feet, Stiff to Very Stiff A-4b

Layer 1, Elev 706.0 to 703.4 feet, Very Stiff A-6a

$$h_1 := 706.0 \ ft - 703.4 \ ft = 2.6 \ ft$$
 $\gamma_1 := 122 \ pcf$

$$LL_1 := 38$$

$$w_1 \coloneqq .26$$

$$w_1\!\coloneqq\!.26 \hspace{1cm} \gamma_{d1}\!\coloneqq\!rac{\gamma_1}{ig(1\!+\!w_1ig)}\!=\!96.825\,\, extbf{\it pcf} \hspace{1cm} G_s\!\coloneqq\!2.72 \hspace{1cm} \gamma_w\!\coloneqq\!62.4\,\, extbf{\it pcf}$$

$$G_s = 2.72$$

$$\gamma_w \coloneqq 62.4 \ \textit{pcf}$$

$$e_{01} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d1}} - 1 = 0.753$$

$$e_{01} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d1}} - 1 = 0.753$$
 $C_{r1} \coloneqq 0.1 \cdot .009 \cdot \left(LL_1 - 10 \right) = 0.025$

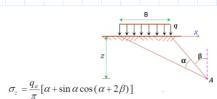
$$\sigma_{01}' \coloneqq \left(\gamma_1 - \gamma_w\right) \cdot \frac{h_1}{2} = 0.077 \; \textit{ksf}$$

Initial Effective Stress at midpoint of layer

$$z_1 = \frac{h_1}{2} = 1.3 \ ft$$

depth from bottom of embankment to midpoint of layer

Boussinesq Stress at Depth z From Infinite Load



$$b = \frac{B}{2} = 10 \ ft$$

$$\beta_1 \coloneqq \operatorname{atan}\left(\frac{-b}{z_1}\right) = -1.442 \qquad \alpha_1 \coloneqq \operatorname{atan}\left(\frac{b}{z_1}\right) - \beta_1 = 2.883$$

$$\Delta\sigma_1 \coloneqq \frac{\Delta\sigma_{Swrface}}{\pi} \cdot (\alpha_1 + \sin{(\alpha_1)} \cdot \cos{(\alpha_1 + 2 \cdot \beta_1)}) = 2.161 \ \textit{ksf}$$

$$\Delta H_1 \coloneqq \frac{C_{r_1}}{1 + e_{01}} \cdot h_1 \cdot \log\left(\frac{\sigma_{01}' + \Delta\sigma_1}{\sigma_{01}'}\right) = 0.655 \ \textit{in} \qquad \Delta\sigma_{percentchange} \coloneqq \frac{\Delta\sigma_1}{\sigma_{01}'} = 27.9$$

$$\operatorname{Layer} 2, \ \operatorname{Elev} 703.4 \ \textit{to} 694.6 \ \textit{feet}, \ \operatorname{Medium} \ \operatorname{Dense} \ \mathsf{A} - 3a$$

$$h_2 \coloneqq 703.4 \ \textit{ft} - 694.6 \ \textit{ft} = 8.8 \ \textit{ft} \qquad \gamma_2 \coloneqq 125 \ \textit{pcf} \qquad \operatorname{Estimated} \ \operatorname{based} \ \text{on} \ \operatorname{ODOT} \ \operatorname{GDM} \ \mathsf{Table} \ \mathsf{400} - \mathsf{4}$$

$$N_{60L2} \coloneqq 18 \qquad \operatorname{Avg}. \ \mathsf{N60} \ \text{for} \ \text{this layer}$$

$$\sigma_{02} \coloneqq \sigma_{01}' + (\gamma_1 - \gamma_w) \cdot \frac{h_1}{2} + (\gamma_2 - \gamma_w) \cdot \frac{h_2}{2} = 0.43 \ \textit{ksf} \qquad \operatorname{Initial} \ \operatorname{Effective} \ \operatorname{Stress} \ \text{at} \ \operatorname{midpoint} \ \text{of} \ \operatorname{layer}$$

$$N1_{60L2} \coloneqq N_{60L2} \cdot .77 \cdot \log\left(40 \frac{\textit{ksf}}{\sigma_{02}'}\right) = 27.279$$

$$C'_2 \coloneqq 70 \qquad \operatorname{Based} \ \text{on} \ \operatorname{LRFD} \ \operatorname{Figure} \ 10.6.2.4.2b - 1$$

$$z_2 \coloneqq \operatorname{Elev}_{GS} - \left(703.4 \ \textit{ft} - \frac{h_2}{2}\right) = 7 \ \textit{ft} \qquad \operatorname{depth} \ \text{from} \ \text{bottom} \ \text{of} \ \operatorname{embankment} \ \text{to} \ \operatorname{midpoint} \ \text{of} \ \operatorname{layer}$$

$$\beta_2 \coloneqq \operatorname{atan}\left(\frac{-b}{z_2}\right) = -0.96 \qquad \alpha_2 \coloneqq \operatorname{atan}\left(\frac{b}{z_2}\right) - \beta_2 = 1.92$$

$$\Delta\sigma_2 \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot (\alpha_2 + \sin{(\alpha_2)} \cdot \cos{(\alpha_2 + 2 \cdot \beta_2)}) = 1.968 \ \textit{ksf}$$

$$\Delta H_2 \coloneqq h_2 \cdot \frac{1}{C'_2} \cdot \log\left(\frac{\sigma_{02}' + \Delta\sigma_2}{\sigma_{02}'}\right) = 1.126 \ \textit{in} \qquad \Delta\sigma_{percentchange} \coloneqq \frac{\Delta\sigma_2}{\sigma_{02}'} = 4.574$$

$$\operatorname{Layer} \ 3, \ \operatorname{Elev} \ 694.6 \ \text{to} \ 687.6 \ \text{feet}, \ \operatorname{Medium} \ \operatorname{Dense} \ \text{A} - 3a$$

$$h_3 \coloneqq 694.6 \ \text{ft} - 687.6 \ \text{ft} = 7 \ \text{ft} \qquad \gamma_3 \coloneqq 122 \ \textit{pcf} \qquad \operatorname{Estimated} \ \operatorname{based} \ \text{on} \ \operatorname{ODOT} \ \operatorname{GDM} \ \operatorname{Table} \ \text{400} - 4$$

$$N_{00L3} \coloneqq 14 \qquad \operatorname{Avg}. \ \operatorname{N60} \ \text{for} \ \text{this layer}$$

$$\sigma_{03}' \coloneqq \sigma_{02}' + (\gamma_2 - \gamma_w) \cdot \frac{h_2}{2} + (\gamma_3 - \gamma_w) \cdot \frac{h_3}{2} = 0.914 \ \textit{ksf} \ \operatorname{Initial} \ \operatorname{Effective} \ \operatorname{Stress} \ \text{at} \ \operatorname{midpoint} \ \text{of} \ \text{layer}$$

$$\sigma_{03}' \coloneqq \sigma_{02}' + (\gamma_2 - \gamma_w) \cdot \frac{h_2}{2} + (\gamma_3 - \gamma_w) \cdot \frac{h_3}{2} = 0.914 \ \textit{ksf} \ \operatorname{Initial} \ \operatorname{Effective} \ \operatorname{Stress} \ \text{at}$$

$$\operatorname{midpoint} \ \text{of} \ \text{layer}$$

$N1_{60I}$	$_{L3}$:= N_{60L3} •.77	$\cdot \log \left(40 \frac{\kappa}{\sigma_0}\right)$	$\left \frac{sj}{03'} \right = 17.68$	9	
C'_3 :=	Base	ed on LRFD	Figure 10.6	5.2.4.2b-1	
$z_3 \coloneqq I$	$Elev_{GS} - igg(694.$	$6 \mathbf{ft} - \frac{h_3}{2} =$	= 14.9 ft	depth fro embankm	m bottom of nent to midpoint of layer
$\beta_3 := \epsilon$	$\arctan\left(\frac{-b}{z_3}\right) = -$	0.591 α_3 :=	$= \operatorname{atan}\left(\frac{b}{z_3}\right)$	$-\beta_3 = 1.182$	
$\Delta\sigma_3$:	$=rac{\Delta\sigma_{Surface}}{m{\pi}}ullet ($	$(\alpha_3 + \sin(\alpha_3))$	$) \cdot \cos (\alpha_3 +$	$(2 \cdot \beta_3) = 1.4$	51 ksf
ΔH_3	$\coloneqq h_3 \cdot \frac{1}{C'_3} \cdot \log$	$\left(\frac{\sigma_{03}' + \Delta\sigma_{3}}{\sigma_{03}'}\right)$	$\left \frac{3}{3} \right = 0.654$	in	$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_3}{\sigma_{03}'} = 1.5$
Layer	4, Elev 687.6	to 674.6 fe	eet, Mediun	n Dense A-4b)
	$h_4 = 687.6 \ ft$				Estimated based on ODO GDM Table 400-4
	$N_{60L4} \coloneqq 18$	Avg. N60		_	
	$\sigma_{04}' \coloneqq \sigma_{03}' + ($	$\left(\gamma_3 - \gamma_w ight) \cdot rac{h_3}{2}$	$\frac{3}{3} + (\gamma_4 - \gamma_w)$	$)\cdot\frac{h_4}{2}=1.53$	ksf Initial Effective Stress midpoint of layer
	$N1_{60L4} := N_{60L}$	$_{L4} \cdot .77 \cdot \log$	$\left(40 \; rac{m{ksf}}{\sigma_{04}'} ight) =$	19.645	
	$C'_4 \coloneqq 40$	Based on	LRFD Figur	e 10.6.2.4.2	b-1
	$z_4\!\coloneqq\!Elev_{GS}-$	$-\left(687.6\ extbf{ft} ightarrow$	$-\frac{h_4}{2}$ = 24.9) ft (depth from bottom of embankment to midpoint of la
	$\beta_4 \coloneqq \operatorname{atan}\left(\frac{-b}{z_4}\right)$	$\left(\frac{b}{a}\right) = -0.382$	α_4 := atar	$\ln\left(\frac{b}{z_4}\right) - \beta_4 =$	0.764
	$\Delta \sigma_4 \coloneqq \frac{\Delta \sigma_{Sur}}{\pi}$	$\bullet \left(\alpha_4 + s\right)$	$\sin\left(lpha_4 ight)$ • \cos	$s\left(lpha_4+2ulleteta_4 ight)$	$=1.002 \ ksf$
	$\Delta H_4 \coloneqq h_4 \cdot \frac{1}{C}$	$-\log\left(\frac{\sigma_{04}}{2}\right)$	$\left \frac{+\Delta\sigma_4}{\tau} \right = 0$	0.853 <i>in</i>	$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_4}{\sigma_{04}'} = 0.6$

Layer 5a, Elev 674.6 to 664.6 feet, Medium Stiff to Stiff A-4b

$$h_{5a} := 674.6 \ ft - 664.6 \ ft = 10 \ ft$$
 $\gamma_5 := 120 \ pcf$

$$LL_5 = 30$$

$$w_5 = .26$$

$$w_5 = .26$$
 $\gamma_{d5} = \frac{\gamma_5}{(1+w_5)} = 95.238 \ \textit{pcf}$

$$G_s = 2.72$$

$$e_{05} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d5}} - 1 = 0.782$$

$$C_{r5} \coloneqq 0.1 \cdot .009 \cdot (LL_5 - 10) = 0.018$$

$$\sigma_{05a}{'} \coloneqq \sigma_{04}{'} + \left(\gamma_4 - \gamma_w\right) \bullet \frac{h_4}{2} + \left(\gamma_5 - \gamma_w\right) \bullet \frac{h_{5a}}{2} = 2.225 \text{ \textit{ksf}} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$z_{5a} \coloneqq Elev_{GS} - \left(674.6 \ \textit{ft} - \frac{h_{5a}}{2}\right) = 36.4 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_{5a} := \operatorname{atan}\left(\frac{-b}{z_{5a}}\right) = -0.268$$

$$eta_{5a} \coloneqq \operatorname{atan}\left(\frac{-b}{z_{5a}}\right) = -0.268$$
 $lpha_{5a} \coloneqq \operatorname{atan}\left(\frac{b}{z_{5a}}\right) - eta_{5a} = 0.536$

$$\Delta \sigma_{5a} \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot \left(\alpha_{5a} + \sin\left(\alpha_{5a}\right) \cdot \cos\left(\alpha_{5a} + 2 \cdot \beta_{5a}\right)\right) = 0.721 \text{ ksf}$$

$$\Delta H_{5a} \coloneqq \frac{C_{r5}}{1 + e_{05}} \cdot h_{5a} \cdot \log \left(\frac{\sigma_{05a}' + \Delta \sigma_{5a}}{\sigma_{05a}'} \right) = 0.148 \ \textit{in} \quad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{5a}}{\sigma_{05a}'} = 0.324$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{5a}}{\sigma_{05a}'} = 0.324$$

Layer 5b, Elev 664.6 to 654.6 feet, Medium Stiff to Stiff A-4b

$$h_{5b} \coloneqq 664.6 \ \mathbf{ft} - 654.6 \ \mathbf{ft} = 10 \ \mathbf{ft}$$

$$\sigma_{05b}' \coloneqq \sigma_{05a}' + \left(\gamma_5 - \gamma_w\right) \cdot h_{5a} + \left(\gamma_5 - \gamma_w\right) \cdot \frac{h_{5b}}{2} = 3.089 \text{ ksf}$$

Initial Effective Stress at midpoint of layer

$$z_{5b} \coloneqq Elev_{GS} - \left(664.6 \ \textit{ft} - \frac{h_{5b}}{2}\right) = 46.4 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_{5b} := \operatorname{atan}\left(\frac{-b}{z_{5b}}\right) = -0.212$$

$$eta_{5b} \coloneqq \operatorname{atan}\left(\frac{-b}{z_{5b}}\right) = -0.212$$
 $\alpha_{5b} \coloneqq \operatorname{atan}\left(\frac{b}{z_{5b}}\right) - \beta_{5b} = 0.425$

$$\Delta\sigma_{5b} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot \left(\alpha_{5b} + \sin\left(\alpha_{5b}\right) \cdot \cos\left(\alpha_{5b} + 2 \cdot \beta_{5b}\right)\right) = 0.576 \text{ ksf}$$

$$\Delta H_{5b} \coloneqq \frac{C_{r5}}{1 + e_{05}} \cdot h_{5b} \cdot \log \left(\frac{\sigma_{05b}' + \Delta \sigma_{5b}}{\sigma_{05b}'} \right) = 0.09 \ \textit{in} \qquad \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{5b}}{\sigma_{05b}'} = 0.186$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{5b}}{\sigma_{05b}} = 0.186$$

Layer 6, Elev 654.6 to 643.8 feet, Stiff A-6a

$$h_6 := 654.6 \ ft - 643.8 \ ft = 10.8 \ ft$$
 $\gamma_6 := 118 \ pcf$

$$\gamma_6 \coloneqq 118 \ pcf$$

$$LL_6 = 40$$

$$w_6 \coloneqq .33$$

$$\gamma_{d6} := \frac{\gamma_6}{(1+w_6)} = 88.722 \ pcf$$

$$G_s = 2.72$$

$$e_{06} := \frac{G_s \cdot \gamma_w}{\gamma_{d6}} - 1 = 0.913$$

$$C_{r6} = 0.1 \cdot .009 \cdot (LL_6 - 10) = 0.027$$

$$\sigma_{06}' \coloneqq \sigma_{05b}' + \left(\gamma_5 - \gamma_w\right) \cdot \frac{h_{5b}}{2} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_6}{2} = 3.677 \text{ ksf} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$z_6 \coloneqq Elev_{GS} - \left(654.6 \ \textit{ft} - \frac{h_6}{2}\right) = 56.8 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_6 := \operatorname{atan}\left(\frac{-b}{z_6}\right) = -0.174$$
 $\alpha_6 := \operatorname{atan}\left(\frac{b}{z_6}\right) - \beta_6 = 0.349$

$$\alpha_6 = \operatorname{atan}\left(\frac{b}{z_6}\right) - \beta_6 = 0.349$$

$$\Delta\sigma_{6} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot \left(\alpha_{6} + \sin\left(\alpha_{6}\right) \cdot \cos\left(\alpha_{6} + 2 \cdot \beta_{6}\right)\right) = 0.475 \text{ ksf}$$

$$\Delta H_6 \coloneqq \frac{C_{r6}}{1 + e_{06}} \cdot h_6 \cdot \log \left(\frac{\sigma_{06}' + \Delta \sigma_6}{\sigma_{06}'} \right) = 0.097 \; \textit{in} \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_6}{\sigma_{06}'} = 0.129$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_6}{\sigma_{06}'} = 0.129$$

Layer 7a, Elev 643.8 to 633.8 feet, Stiff to Very Stiff A-4b

$$h_{7a} := 643.8 \ \textit{ft} - 633.8 \ \textit{ft} = 10 \ \textit{ft}$$
 $\gamma_7 := 120 \ \textit{pcf}$ $LL_7 := 25$

$$LL_7 \coloneqq 25$$

$$w_7 = .26$$

$$w_7 := .26$$
 $\gamma_{d7} := \frac{\gamma_7}{\left(1 + w_7\right)} = 95.238 \; \textit{pcf}$ $G_s := 2.72$

$$G_s = 2.72$$

$$e_{07} := \frac{G_s \cdot \gamma_w}{\gamma_{d7}} - 1 = 0.782$$

$$C_{r7} := 0.1 \cdot .009 \cdot (LL_7 - 10) = 0.014$$

$$\sigma_{07a}' \coloneqq \sigma_{06}' + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_6}{2} + \left(\gamma_7 - \gamma_w\right) \cdot \frac{h_{7a}}{2} = 4.265 \text{ ksf}$$
 Initial Effective Stress at midpoint of layer

$$z_{7a} \coloneqq Elev_{GS} - \left(643.8 \ \textit{ft} - \frac{h_{7a}}{2}\right) = 67.2 \ \textit{ft} \qquad \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$eta_{7a} \coloneqq \operatorname{atan}\left(\frac{-b}{z_{7a}}\right) = -0.148$$
 $lpha_{7a} \coloneqq \operatorname{atan}\left(\frac{b}{z_{7a}}\right) - eta_{7a} = 0.295$

$$\Delta\sigma_{7a} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot \left(\alpha_{7a} + \sin\left(\alpha_{7a}\right) \cdot \cos\left(\alpha_{7a} + 2 \cdot \beta_{7a}\right)\right) = 0.404 \text{ ksf}$$

$$\Delta H_{7a} \coloneqq \frac{C_{r7}}{1 + e_{07}} \cdot h_{7a} \cdot \log \left(\frac{\sigma_{07a}' + \Delta \sigma_{7a}}{\sigma_{07a}'} \right) = 0.036 \ \textit{in} \quad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{7a}}{\sigma_{07a}'} = 0.095$$

Percent change in stress at 10%, so end analysis here

Total Settlement (including granular layers)

$$S_T = \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4 + \Delta H_{5a} + \Delta H_{5b} + \Delta H_6 + \Delta H_{7a} = 3.658$$
 in

Settlement of granular layers, including nonplastic silt. Assumed to occur during construction or upon completion.

$$S_{Granular} := \Delta H_2 + \Delta H_3 + \Delta H_4 = 2.633$$
 in

Settlement of cohesive layers

$$S_{Cohesive} := \Delta H_1 + \Delta H_{5a} + \Delta H_{5b} + \Delta H_6 + \Delta H_{7a} = 1.025$$
 in

Estimated Rate of Consolidation - cv estimates based on 2022 NAVFAC DM7.01, Liquid Limit correlation chart, assuming the lower bound for overconsolidated clays

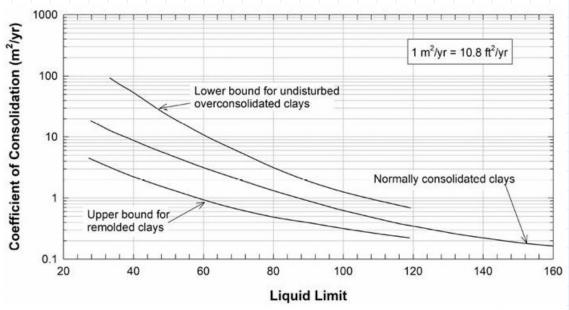


Figure 8-50 Approximate Relationship between Coefficient of Consolidation and Liquid Limit

Anticipate settlement of Layer 2, 3, and 4 occurs during or at completion of construction

Considering double drainage for Layer 1 and single drainage for Layers 5, 6, and 7

Layer 1, Elev 706.0 to 703.4 feet, Very Stiff A-6a

$$\Delta H_1 = 0.655$$
 in

$$\overline{LL_1} = 30$$

$$c_{v1} = 90 \frac{\boldsymbol{m}^2}{\boldsymbol{n}r}$$

$$c_{v1} = 2.652 \frac{ft^2}{day}$$

$$\Delta H_1$$
 = 0.655 in LL_1 := 30 c_{v1} := 90 $\frac{m^2}{yr}$ c_{v1} = 2.652 $\frac{ft^2}{day}$ H_{dr1} := $\frac{h_1}{2}$ = 1.3 ft drainage path

Layer 5a, Elev 674.6 to 664.6 feet, Medium Stiff to Stiff A-4b

$$\Delta H_{5a} = 0.148 \ in$$

$$LL_5 = 30$$

$$c_{v5} = 90 \frac{\boldsymbol{m}^2}{\boldsymbol{vr}}$$

$$\Delta H_{5a} \! = \! 0.148$$
 in $LL_5 \! \coloneqq \! 30$ $c_{v5} \! \coloneqq \! 90$ $\dfrac{m{m}^2}{m{yr}}$ $c_{v5} \! \equiv \! 2.652$ $\dfrac{m{ft}^2}{m{day}}$

$$H_{dr5a} = \frac{h_{5a}}{2} = 5$$
 ft drainage path

Layer 5b, Elev 664.6 to 654.6 feet, Medium Stiff to Stiff A-4b

$$\Delta H_{5b} = 0.09 \ in$$

$$LL_5 = 30$$

$$c_{v5} = 90 \frac{m^2}{vr}$$

$$\Delta H_{5b}\!=\!0.09$$
 in $LL_5\!\coloneqq\!30$ $c_{v5}\!\coloneqq\!90$ $\dfrac{m{m}^2}{m{yr}}$ $c_{v5}\!=\!2.652$ $\dfrac{m{ft}^2}{m{day}}$

$$H_{dr5b} \coloneqq h_{5a} + \frac{h_{5b}}{2} = 15 \; \textit{ft} \;\;\;\; \text{drainage path}$$

Layer 6, Elev 654.6 to 643.8 feet, Stiff A-6a

$$\Delta H_6 = 0.097 \ in$$

$$LL_6 = 40$$

$$c_{v6} = 55 \frac{m^2}{vr}$$

$$\Delta H_6 = 0.097 \; \emph{in}$$
 $LL_6 = 40$ $c_{v6} = 55 \; \dfrac{\emph{m}^2}{\emph{yr}}$ $c_{v6} = 1.621 \; \dfrac{\emph{ft}^2}{\emph{day}}$

$$H_{dr6} := h_{5a} + h_{5b} + \frac{h_6}{2} = 25.4 \ ft$$
 drainage path

Layer 7a, Elev 643.8 to 633.8 feet, Stiff to Very Stiff A-4b

$$\Delta H_{7a} = 0.036 \; in$$

$$LL_7 = 25$$

$$\Delta H_{7a} \! = \! 0.036 \; extbf{in} \qquad LL_7 \! = \! 25 \qquad c_{v7} \! \coloneqq \! 200 \; rac{ extbf{m}^2}{ extbf{vr}} \qquad c_{v7} \! = \! 5.894 \; rac{ extbf{f} t^2}{ extbf{day}}$$

$$c_{v7} = 5.894 \frac{ft^2}{day}$$

$$H_{dr7a} := h_{5a} + h_{5b} + h_6 + \frac{h_{7a}}{2} = 35.8 \ \textit{ft}$$
 drainage path

t	:= 0	days					
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_v	U(%)	Settlement (in)	Ultimate Settlement (in)
1	V. Stiff A-6a	2.652	1.3	0	0	0	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	0	0	0	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	0	0	0	0.08
6	Stiff A-6a	1.621	25.4	0	0	0	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	0	0	0	0.033

Total S (in) 0.000 Total U(%) 0.000

t = 1 days

							Ultimate
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	Settlement (in)
1	V. Stiff A-6a	2.652	1.3	1.5692	97	0.635	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	0.1061	36	0.046	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	0.0118	11	0.009	0.08
6	Stiff A-6a	1.621	25.4	0.0025	3	0.003	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	0.0046	5	0.002	0.033

Total S (in) 0.694 Total U(%) 67.720

t =	7	days					
Layer	Material	Cv (ft²/day)	H _{dr} (ft)	T _v	U(%)	Settlement (in)	Ultimate Settlement (in)
1	V. Stiff A-6a	2.652	1.3	10.985	100	0.655	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	0.7426	86	0.109	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	0.0825	32	0.026	0.08
6	Stiff A-6a	1.621	25.4	0.0176	14	0.012	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	0.0322	20	0.007	0.033

Total S (in) 0.809 Total U(%) 78.888

	t = 14	days					
Layer	Material	Cv (ft²/day)	H _{dr} (ft)	T_v	U(%)	Settlement (in)	Ultimate Settlement (in)
1	V. Stiff A-6a	2.652	1.3	21.96923077	100	0.655	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	1.48512	97	0.123	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	0.165013333	45	0.036	0.08
6	Stiff A-6a	1.621	25.4	0.03517577	21	0.018	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	0.064383134	28	0.009	0.033

Total S (in) 0.842 Total U(%) 82.117

t = 21	aays					
Material	Cv (ft²/day)	H _{at} (ft)	Т	U(%)	Settlement (in)	Ultimate Settlement (in)
V. Stiff A-6a			32.95384615			
M. Stiff to Stiff A-4b	2.652	5	2.22768	100	0.127	0.127
M. Stiff to Stiff A-4b	2.652	15	0.24752	55	0.044	0.08
Stiff A-6a	1.621	25.4	0.052763656	25	0.022	0.087
Stiff to V. Stiff A-4b	5.894	35.8	0.096574701	34	0.011	0.033
	Material V. Stiff A-6a M. Stiff to Stiff A-4b M. Stiff to Stiff A-4b Stiff A-6a	Material Cv (ft²/day) V. Stiff A-6a 2.652 M. Stiff to Stiff A-4b 2.652 M. Stiff to Stiff A-4b 1.652 Stiff A-6a 1.621	Material Cv (ft²/day) H _{dr} (ft) V. Stiff A-6a 2.652 1.3 M. Stiff to Stiff A-4b 2.652 5 M. Stiff to Stiff A-4b 2.652 15 Stiff A-6a 1.621 25.4	Material Cv (ft²/day) H _{dr} (ft) T _v V. Stiff A-6a 2.652 1.3 32.95384615 M. Stiff to Stiff A-4b 2.652 5 2.22768 M. Stiff to Stiff A-4b 2.652 15 0.24752 Stiff A-6a 1.621 25.4 0.052763656	Material Cv (ft²/day) H _{dr} (ft) T _v U(%) V. Stiff A-6a 2.652 1.3 32.95384615 100 M. Stiff to Stiff A-4b 2.652 5 2.22768 100 M. Stiff to Stiff A-4b 2.652 15 0.24752 55 Stiff A-6a 1.621 25.4 0.052763656 25	Material Cv (ft²/day) H _{dr} (ft) T _v U(%) Settlement (in) V. Stiff A-6a 2.652 1.3 32.95384615 100 0.655 M. Stiff to Stiff A-4b 2.652 5 2.22768 100 0.127 M. Stiff to Stiff A-4b 2.652 15 0.24752 55 0.044 Stiff A-6a 1.621 25.4 0.052763656 25 0.022

Total S (in) 0.859 Total U(%) 83.802

	t =	30	days					
								Ultimate
Layer		Material	Cv (ft ² /day)	H _{dr} (ft)	T_v	U(%)	Settlement (in)	Settlement (in)
1		V. Stiff A-6a	2.652	1.3	47.07692308	100	0.655	0.655
5a		M. Stiff to Stiff A-4b	2.652	5	3.1824	100	0.127	0.127
5b		M. Stiff to Stiff A-4b	2.652	15	0.3536	66	0.053	0.08
6		Stiff A-6a	1.621	25.4	0.075376651	30	0.026	0.087
7a		Stiff to V. Stiff A-4b	5.894	35.8	0.137963859	41	0.014	0.033

Total S (in) 0.874 Total U(%) 85.310

t =	45	days
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Layer	Material	Cv (ft²/day)	H _{dr} (ft)	T _v	U(%)	Settlement (in)	Ultimate Settlement (in)
1	V. Stiff A-6a	2.652	1.3	70.61538	100	0.655	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	4.7736	100	0.127	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	0.5304	77	0.062	0.08
6	Stiff A-6a	1.621	25.4	0.113065	37	0.032	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	0.206946	51	0.017	0.033

Total S (in) 0.893 Total U(%) 87.085

t = 60 days

							Ultimate
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	Settlement (in)
1	V. Stiff A-6a	2.652	1.3	94.15385	100	0.655	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	6.3648	100	0.127	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	0.7072	85	0.068	0.08
6	Stiff A-6a	1.621	25.4	0.150753	43	0.037	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	0.275928	58	0.019	0.033

Total S (in) 0.907 Total U(%) 88.444

t = 75 days

	, , ,	aayo					
Layer	Material	Cv (ft²/day)	H _{dr} (ft)	T _v	U(%)	Settlement (in)	Ultimate Settlement (in)
1	V. Stiff A-6a	2.652	1.3	117.6923	100	0.655	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	7.956	100	0.127	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	0.884	90	0.072	0.08
6	Stiff A-6a	1.621	25.4	0.188442	48	0.042	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	0.34491	65	0.021	0.033

Total S (in) 0.917 Total U(%) 89.484

	t =	90	days					
								Ultimate
								Settlement
Layer	Mate	rial	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	(in)
1	V. Sti	ff A-6a	2.652	1.3	141.2308	100	0.655	0.655
5a	M. Sti	ff to Stiff A-4b	2.652	5	9.5472	100	0.127	0.127
5b	M. Sti	ff to Stiff A-4b	2.652	15	1.0608	93	0.074	0.08
6	Stiff A	\-6a	1.621	25.4	0.22613	53	0.046	0.087
7a	Stiff t	o V. Stiff A-4b	5.894	35.8	0.413892	70	0.023	0.033

Total S (in) 0.926 Total U(%) 90.303

t = 120 days

							Ultimate
							Settlement
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	(in)
1	V. Stiff A-6a	2.652	1.3	188.3077	100	0.655	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	12.7296	100	0.127	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	1.4144	96	0.077	0.08
6	Stiff A-6a	1.621	25.4	0.301507	61	0.053	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	0.551855	79	0.026	0.033

Total S (in) 0.938 Total U(%) 91.506

	t =	150	days					
								Ultimate
								Settlement
Layer		Material	Cv (ft ² /day)	H _{dr} (ft)	T_v	U(%)	Settlement (in)	(in)
1	,	V. Stiff A-6a	2.652	1.3	235.3846	100	0.655	0.655
5a		M. Stiff to Stiff A-4b	2.652	5	15.912	100	0.127	0.127
5b		M. Stiff to Stiff A-4b	2.652	15	1.768	98	0.078	0.08
6		Stiff A-6a	1.621	25.4	0.376883	67	0.058	0.087
7a		Stiff to V. Stiff A-4b	5.894	35.8	0.689819	85	0.028	0.033
_								

Total S (in) 0.947 Total U(%) 92.365

t =	180	days

							Ultimate
							Settlement
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	(in)
1	V. Stiff A-6a	2.652	1.3	282.4615	100	0.655	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	19.0944	100	0.127	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	2.1216	100	0.080	0.08
6	Stiff A-6a	1.621	25.4	0.45226	73	0.064	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	0.827783	89	0.029	0.033

Total S (in) 0.955 Total U(%) 93.159

t = 210 days

240

days

t =

							Ultimate
							Settlement
Layer	Material	Cv (ft²/day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	(in)
1	V. Stiff A-6a	2.652	1.3	329.5385	100	0.655	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	22.2768	100	0.127	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	2.4752	100	0.080	0.08
6	Stiff A-6a	1.621	25.4	0.527637	77	0.067	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	0.965747	92	0.030	0.033

Total S (in) 0.959 Total U(%) 93.595

							Ultimate
							Settlement
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	(in)
1	V. Stiff A-6a	2.652	1.3	376.6154	100	0.655	0.655
5a	M. Stiff to Stiff A-4b	2.652	5	25.4592	100	0.127	0.127
5b	M. Stiff to Stiff A-4b	2.652	15	2.8288	100	0.080	0.08
6	Stiff A-6a	1.621	25.4	0.603013	81	0.070	0.087
7a	Stiff to V. Stiff A-4b	5.894	35.8	1.103711	94	0.031	0.033

Total S (in) 0.963 Total U(%) 93.999

	t =	270	days					
Layer		Material	Cv (ft²/day)	H _{dr} (ft)	T_v	U(%)	Settlement (in)	Ultimate Settlement (in)
1		V. Stiff A-6a	2.652	1.3	423.6923	100	0.655	0.655
5a		M. Stiff to Stiff A-4b	2.652	5	28.6416	100	0.127	0.127
5b		M. Stiff to Stiff A-4b	2.652	15	3.1824	100	0.080	0.08
6		Stiff A-6a	1.621	25.4	0.67839	84	0.073	0.087
7a		Stiff to V. Stiff A-4b	5.894	35.8	1.241675	95	0.031	0.033

Total S (in) 0.966 Total U(%) 94.286

300 t = days Ultimate Cv (ft²/day) H_{dr} (ft) T_{v} U(%) Settlement (in) Settlement (in) Layer Material V. Stiff A-6a 2.652 470.7692 100 0.655 0.655 1.3 5a M. Stiff to Stiff A-4b 2.652 31.824 100 0.127 0.127 5 5b M. Stiff to Stiff A-4b 2.652 15 3.536 100 0.080 0.08 6 Stiff A-6a 1.621 25.4 0.753767 87 0.076 0.087 7a Stiff to V. Stiff A-4b 5.894 35.8 1.379639 96 0.032 0.033

> Total S (in) 0.969 Total U(%) 94.573

Total Anticipated Settlement 1.025

	1			
		Ultimate	Remaining	
		Settlement	Settlement	
Time (days)	Total Settlement (in)	(in)	(in)	% Consolidation
0	0.000	1.025	1.025	0.000
1	0.694	1.025	0.331	67.720
7	0.809	1.025	0.216	78.888
14	0.842	1.025	0.183	82.117
21	0.859	1.025	0.166	83.802
30	0.874	1.025	0.151	85.310
45	0.893	1.025	0.132	87.085
60	0.907	1.025	0.118	88.444
75	0.917	1.025	0.108	89.484
90	0.926	1.025	0.099	90.303
120	0.938	1.025	0.087	91.506
150	0.947	1.025	0.078	92.365
180	0.955	1.025	0.070	93.159
210	0.959	1.025	0.066	93.595
240	0.963	1.025	0.062	93.999
270	0.966	1.025	0.059	94.286
300	0.969	1.025	0.056	94.573

Settlement less than 0.4 inches



PID: 112	CUY-17-13.50		utment Settlement Analy	ysis
			002-0-22 Profile	
	ject No.: 088549.0			
-	d by: Brendan P. L	ieske		
Date: 10)/29/24			
<u>Units</u>	$nlf := \frac{lb}{l}$	$nsf := \frac{lb}{l}$	$pct := \frac{lb}{l}$	nsi := -
Jinto	$plf \coloneqq rac{lb}{ft}$	ft^2	ft^3	i
	$kip = 1000 \ lb$	$egin{aligned} oldsymbol{psf} \coloneqq & rac{lb}{ft^2} \ & & & & & & & & & & & & & & & & & & $	$egin{aligned} oldsymbol{pcf} &\coloneqq rac{oldsymbol{lb}}{oldsymbol{ft}^3} \ oldsymbol{ksf} &\coloneqq rac{oldsymbol{kip}}{oldsymbol{ft}^2} \end{aligned}$	$psi \coloneqq -rac{1}{i}$
	~ 1000 to	$hij - \frac{1}{ft}$	ft^2	kcj
	ton	ton	kip	
	$tlf \coloneqq rac{ton}{ft}$	$oldsymbol{tsf} \coloneqq rac{oldsymbol{ton}}{oldsymbol{ft}^2}$	$oldsymbol{ksi} \coloneqq rac{oldsymbol{kip}}{oldsymbol{in}^2}$	$oldsymbol{kci} \coloneqq rac{1}{i}$
	JU	J t	TH	1
Settleme	ent Analysis, in acc	cordance with LRFD 11.6	.2, following the Hough	Method
from LRI	FD 10.6.2.4.2b for	cohesionless soils and L	RFD 10.6.2.4.3 for cohe	esive soils
El	$ev_{Road} \coloneqq 721.2 \; extbf{ft}$			
	co _{Road} := 121.2 jo			
Tr1		Elevation at top of Wall	at forward abutment	
$\mathbf{L}t$	$ev_{TOP} \coloneqq 711 \; ft$	Elevation at top or wall	at folward abduliterit	
		E El	1.0. 6. 1.00	
El	$ev_{GS} \coloneqq 705.7 \; ft$	Existing Elevation of Gro	ound Surface at Piles	
	GB C	Existing Elevation of Gro it Weight of Retained En		
	:=125 <i>pcf</i> Un	it Weight of Retained En	nbankment	
γ_r	:=125 <i>pcf</i> Un		nbankment	q Contours.
γ_r :	$=125 \; extbf{\it pcf} \qquad ext{Un}$	it Weight of Retained En	nbankment ment Fill for Boussinesc	
γ_r	$=125 \; extbf{\it pcf} \qquad ext{Un}$	it Weight of Retained En	nbankment ment Fill for Boussinesc	
γ_r B :	$=125 \; extbf{\it pcf} \qquad ext{Un}$ $=20 \; extbf{\it ft} \qquad ext{Appro}$ Baseo	it Weight of Retained En eximate width of Embank I on 2V:1H zone of influe	nbankment ment Fill for Boussinesc	oting.
γ_r :	$=125 \; extbf{\it pcf} \qquad ext{Un}$ $=20 \; extbf{\it ft} \qquad ext{Appro}$ Baseo	it Weight of Retained En	mbankment ment Fill for Boussinesc ence below abutment for	oting.
γ_r : B : $S_e = \sum_i$	$:=125 \; m{pcf} \qquad ext{Un}$ $=20 \; m{ft} \qquad ext{Approbase}$ $\sum_{i=1}^{n} \Delta H_i$	it Weight of Retained En eximate width of Embank I on 2V:1H zone of influe	mbankment ment Fill for Boussinesc ence below abutment for	oting.
γ_r B : $S_e = \sum_i$ in which	$:=125 \ \textbf{\textit{pcf}}$ Un $=20 \ \textbf{\textit{ft}}$ Approbased Based Ship Ship Ship Ship Ship Ship Ship Ship	it Weight of Retained En eximate width of Embank I on 2V:1H zone of influe	mbankment ment Fill for Boussinescence below abutment for	oting.
γ_r B : $S_e = \sum_i$ in which	$:=125 \ \textbf{\textit{pcf}}$ Un $=20 \ \textbf{\textit{ft}}$ Approbased Based Ship Ship Ship Ship Ship Ship Ship Ship	oximate width of Embank d on 2V:1H zone of influence	ment Fill for Boussinescence below abutment for	oting.
γ_r B : $S_e = \sum_i$ in which	$:=125 \; m{pcf} \qquad ext{Un}$ $=20 \; m{ft} \qquad ext{Approbase}$ $\sum_{i=1}^{n} \Delta H_i$	it Weight of Retained En eximate width of Embank I on 2V:1H zone of influe	ment Fill for Boussinescence below abutment for	oting.
γ_r B : $S_e = \sum_i$ in which $\Delta H_i =$	$:=125 \ \textit{pcf}$ Un $=20 \ \textit{ft}$ Approbased Based $\sum_{i=1}^{n} \Delta H_{i}$ ch: $: H_{c} \frac{1}{C'} \log \left(\frac{\sigma'_{o} + \Delta \sigma_{v}}{\sigma'_{o}} \right)$	oximate width of Embank d on 2V:1H zone of influence	ment Fill for Boussinescence below abutment for	oting.
γ_r B : $S_e = \sum_i$ in which	$:=125 \ \textit{pcf}$ Un $=20 \ \textit{ft}$ Approbased Based $\sum_{i=1}^{n} \Delta H_{i}$ ch: $: H_{c} \frac{1}{C'} \log \left(\frac{\sigma'_{o} + \Delta \sigma_{v}}{\sigma'_{o}} \right)$	oximate width of Embank d on 2V:1H zone of influence	ment Fill for Boussinescence below abutment for	oting.
γ_r B : $S_e = \sum_i$ in which $\Delta H_i =$	$:= 125 \ \textbf{pcf} \qquad \text{Un}$ $= 20 \ \textbf{ft} \qquad \text{Approbabe}$ $= \sum_{i=1}^{n} \Delta H_{i}$ $:= H_{c} \frac{1}{C'} \log \left(\frac{\sigma'_{o} + \Delta \sigma_{v}}{\sigma'_{o}} \right)$ $= \text{number of soil laye}$	oximate width of Embank of on 2V:1H zone of influe (10.6.2.4.2b-1) (10.6.2.4.2b-2)	mbankment ment Fill for Boussinescence below abutment for	oting.
γ_r : B : $S_e = \sum_i$ in which $\Delta H_i = \sum_i$ where:	$:= 125 \ \textit{pcf} \qquad \text{Un}$ $= 20 \ \textit{ft} \qquad \text{Approbability}$ $= \sum_{i=1}^{n} \Delta H_{i}$ $:= H_{c} \frac{1}{C'} \log \left(\frac{\sigma'_{o} + \Delta \sigma_{v}}{\sigma'_{o}} \right)$ $= \text{number of soil laye influence of the foother}$	oximate width of Embank of on 2V:1H zone of influe (10.6.2.4.2b-1) (10.6.2.4.2b-2) ors within zone of stress ting	ment Fill for Boussinescence below abutment for	oting.
γ_r : B : $S_e = \sum_i$ in which $\Delta H_i = \sum_i$	$:= 125 \ \textbf{pcf} \qquad \text{Un}$ $= 20 \ \textbf{ft} \qquad \text{Approbabe}$ $= \sum_{i=1}^{n} \Delta H_{i}$ $:= H_{c} \frac{1}{C'} \log \left(\frac{\sigma'_{o} + \Delta \sigma_{v}}{\sigma'_{o}} \right)$ $= \text{number of soil laye}$	it Weight of Retained Endoximate width of Embank on 2V:1H zone of influence (10.6.2.4.2b-1) (10.6.2.4.2b-2) The result of Retained Endoximate width of Embank of Emb	ment Fill for Boussinescence below abutment for	oting.
γ_r : B : $S_e = \sum_i$ in which $\Delta H_i = \sum_i$ ΔH_i	$:= 125 \text{ pcf} \qquad \text{Un}$ $= 20 \text{ ft} \qquad \text{Approbate}$ $\sum_{i=1}^{n} \Delta H_{i}$ $:= H_{c} \frac{1}{C'} \log \left(\frac{\sigma'_{o} + \Delta \sigma_{v}}{\sigma'_{o}} \right)$ $= \qquad \text{number of soil laye}$ $= \qquad \text{influence of the foo}$ $= \qquad \text{elastic settlement of}$ $= \qquad \text{initial height of laye}$ $= \qquad \text{bearing} \qquad \text{capacin}$	it Weight of Retained Encoximate width of Embank on 2V:1H zone of influence (10.6.2.4.2b-1) (10.6.2.4.2b-2) It within zone of stress ting flayer i (ft) or	mbankment ment Fill for Boussinescence below abutment for	oting.
γ_r B : $S_e = \sum_i$ in which $\Delta H_i = \sum_i$ ΔH_i H_c C'	$:= 125 \text{ pcf} \qquad \text{Un}$ $= 20 \text{ ft} \qquad \text{Approbate}$ $= \sum_{i=1}^{n} \Delta H_{i}$ $= \text{ch:}$ $= H_{c} \frac{1}{C'} \log \left(\frac{\sigma'_{o} + \Delta \sigma_{v}}{\sigma'_{o}} \right)$ $= number of soil laye influence of the fooing elastic settlement of initial height of laye bearing capacing capacing$	it Weight of Retained Encoximate width of Embank on 2V:1H zone of influence (10.6.2.4.2b-1) (10.6.2.4.2b-1) (10.6.2.4.2b-2) It within zone of stress ting flayer i (ft) or i (ft) or i (ft) or i (dim)	mbankment siment Fill for Boussinescence below abutment for being abut	oting.
γ_r B : $S_e = \sum_i$ in which $\Delta H_i = \sum_i$ ΔH_i H_c	$:= 125 \text{ pcf} \qquad \text{Un}$ $= 20 \text{ ft} \qquad \text{Approbate}$ $= \sum_{i=1}^{n} \Delta H_{i}$ $= \text{ch:}$ $= H_{c} \frac{1}{C'} \log \left(\frac{\sigma'_{o} + \Delta \sigma_{v}}{\sigma'_{o}} \right)$ $= number of soil laye influence of the fooing elastic settlement of initial height of laye bearing capacing capacing$	it Weight of Retained Encoximate width of Embank on 2V:1H zone of influence (10.6.2.4.2b-1) (10.6.2.4.2b-1) (10.6.2.4.2b-2) It within zone of stress ting flayer i (ft) ty index from 1 (dim) fective stress at the	mbankment ment Fill for Boussinescence below abutment for	oting.
γ_r B : $S_e = \sum_i$ in which $\Delta H_i = \sum_i$ ΔH_i H_c C'	$:= 125 \text{ pcf} \qquad \text{Un}$ $= 20 \text{ ft} \qquad \text{Approbate}$ $= \sum_{i=1}^{n} \Delta H_{i}$ $:= H_{c} \frac{1}{C'} \log \left(\frac{\sigma'_{o} + \Delta \sigma_{v}}{\sigma'_{e}} \right)$ $= \qquad \text{number of soil laye}$ $= \qquad \text{influence of the foo}$ $= \qquad \text{elastic settlement of}$ $= \qquad \text{initial height of laye}$ $= \qquad \text{bearing} \qquad \text{capaci}$ $= \qquad \text{Figure 10.6.2.4.2b-1}$ $= \qquad \text{initial vertical ef}$ $= \qquad \text{midpoint of layer } i$	it Weight of Retained Encoximate width of Embank on 2V:1H zone of influence (10.6.2.4.2b-1) (10.6.2.4.2b-1) (10.6.2.4.2b-2) It within zone of stress ting flayer i (ft) ty index from 1 (dim) fective stress at the	mbankment sill for Boussinescence below abutment for being below abutment for correct sprivalue (M)	oting.

Figure 10.6.2.4.2b-1—Bearing Capacity Index versus Corrected *SPT* (Hough, 1959, as modified in Samtani and Nowatzki, 2006)

$\Delta\sigma_{Surface}$:=	(Eleva	– Elev	$() \cdot \gamma = 0$	1.937	ksf
- Surface	Roaa	Locags	/ /r	1.00.	···

Change in Stress at each layer is based on Bouessinesq stress contours for an infinitely long, uniformly loaded foundation (L/B > 5).

Assume groundwater at bottom of abutment footing

Layer 1, Elev 705.7 to 700.6 feet, Medium Dense A-3a

Layer 2, Elev 700.6 to 696.3 feet, Medium Dense A-1-b

Layer 3, Elev 696.3 to 693.8 feet, Very Stiff A-6a

Layer 4, Elev 693.8 to 686.3 feet, Medium Dense A-3a

Layer 5, Elev 686.3 to 675.3 feet, Medium Dense A-4b

Layer 6, Elev 675.3 to 645.8 feet, Medium Stiff to Stiff A-6a

Layer 7, Elev 645.8 to 633.3 feet, Stiff to Very Stiff A-6a

Layer 8, Elev 633.3 to 602.8 feet, Medium Stiff to Stiff A-4b

Layer 1, Elev 705.7 to 700.6 feet, Medium Dense A-3a

$$\gamma_1 \coloneqq 125 \ \textit{pcf}$$
 $\gamma_w \coloneqq 62.4 \ \textit{pcf}$

$$h_1 = 705.7 \ ft - 700.6 \ ft = 5.1 \ ft$$

$$N_{60L1} = 17$$
 Avg. N60 for this layer

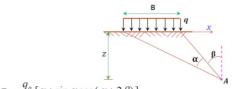
$$\sigma_{01}' \coloneqq \left(\gamma_1 - \gamma_w\right) \cdot \frac{h_1}{2} = 0.16 \text{ ksf}$$
 Initial Effective Stress at midpoint of layer

$$N1_{60L1} := N_{60L1} \cdot .77 \cdot \log \left(40 \frac{\textit{ksf}}{\sigma_{01}'} \right) = 31.402$$
 LRFD 10.4.6.2.4-1

$$C'_1 = 90$$
 Based on LRFD Figure 10.6.2.4.2b-1

$$z_1 \coloneqq \frac{h_1}{2} = 2.55 \; \textit{ft}$$
 depth from bottom of embankment to midpoint of layer

Boussinesq Stress at Depth z From Infinite Load



$$b \coloneqq \frac{B}{2} = 10 \; \mathbf{ft}$$

$$\sigma_z = \frac{q_o}{\pi} [\alpha + \sin \alpha \cos (\alpha + 2\beta)]$$

$$\beta_1 \coloneqq \operatorname{atan}\left(\frac{-b}{z_1}\right) = -1.321$$
 $\alpha_1 \coloneqq \operatorname{atan}\left(\frac{b}{z_1}\right) - \beta_1 = 2.642$

$$\Delta\sigma_{1} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot \left(\alpha_{1} + \sin\left(\alpha_{1}\right) \cdot \cos\left(\alpha_{1} + 2 \cdot \beta_{1}\right)\right) = 1.925 \text{ ksf}$$

$$\Delta H_1 \coloneqq h_1 \cdot \frac{1}{C_1'} \cdot \log \left(\frac{\sigma_{01}' + \Delta \sigma_1}{\sigma_{01}'} \right) = 0.759 \ \textit{in} \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_1}{\sigma_{01}'} = 12.1$$

$$\Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_1}{{\sigma_{01}}'} = 12.1$$

Layer 2, Elev 700.6 to 696.3 feet, Medium Dense A-1-b

$$h_2 \coloneqq 700.6 \ \textit{ft} - 696.3 \ \textit{ft} = 4.3 \ \textit{ft}$$
 $\gamma_2 \coloneqq 0.125 \ \textit{kcf}$

$$\gamma_2 = 0.125 \ kcf$$

Estimated based on ODOT GDM Table 400-4

 $N_{60L2} = 20.5$ Avg. N60 for this layer

$$\sigma_{02}' := (\gamma_1 - \gamma_w) \cdot h_1 + (\gamma_2 - \gamma_w) \cdot \frac{h_2}{2} = 0.454 \text{ ksf}$$

Initial Effective Stress at midpoint of layer

$$N1_{60L2} := N_{60L2} \cdot .77 \cdot \log \left(40 \frac{\textit{ksf}}{\sigma_{02}'} \right) = 30.704$$

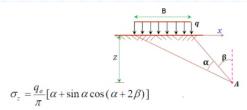
 $C'_2 = 102$

Based on LRFD Figure 10.6.2.4.2b-1

$$z_2 = Elev_{GS} - \left(700.6 \ \textit{ft} - \frac{h_2}{2}\right) = 7.25 \ \textit{ft}$$

depth from bottom of embankment to midpoint of layer

Boussinesq Stress at Depth z From Infinite Load



$$b := \frac{B}{2} = 10 \, ft$$

$$\beta_2 \coloneqq \operatorname{atan}\left(\frac{-b}{z_2}\right) = -0.943 \quad \alpha_2 \coloneqq \operatorname{atan}\left(\frac{b}{z_2}\right) - \beta_2 = 1.887$$

$$\Delta\sigma_2 \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot (\alpha_2 + \sin\left(\alpha_2\right) \cdot \cos\left(\alpha_2 + 2 \cdot \beta_2\right)) = 1.75 \text{ ksf}$$

$$\Delta H_2 \coloneqq h_2 \cdot \frac{1}{C'_2} \cdot \log\left(\frac{\sigma_{02}' + \Delta\sigma_2}{\sigma_{02}'}\right) = 0.347 \text{ in} \qquad \Delta\sigma_{percentchange} = \frac{\Delta\sigma_2}{\sigma_{02}'} = 3.856$$
Layer 3, Elev 696.3 to 693.8 feet, Very Stiff A-6a
$$h_3 \coloneqq 696.3 \text{ ft} - 693.8 \text{ ft} = 2.5 \text{ ft} \qquad \gamma_3 \coloneqq 0.125 \text{ kcf}$$

$$N_{60L3} \coloneqq 15 \qquad \text{Avg. N60 for this layer}$$

$$\sigma_{03}' \coloneqq \sigma_{02}' + (\gamma_2 - \gamma_w) \cdot \frac{h_2}{2} + (\gamma_3 - \gamma_w) \cdot \frac{h_3}{2} = 0.667 \text{ ksf} \qquad \text{Initial Effective Stress at midpoint of layer}$$

$$LL_3 \coloneqq 33 \qquad w_3 \coloneqq .24 \qquad \gamma_{d3} \coloneqq \frac{\gamma_3}{(1 + w_3)} = 100.806 \text{ pcf} \qquad G_s \coloneqq 2.72$$

$$e_{03} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d3}} - 1 = 0.684$$

$$G_{r3} \coloneqq 0.1 \cdot .009 \cdot (LL_3 - 10) = 0.021$$

$$z_3 \coloneqq Elev_{GS} - \left(696.3 \text{ ft} - \frac{h_3}{2}\right) = 10.65 \text{ ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_3 \coloneqq \operatorname{atan}\left(\frac{-b}{z_3}\right) = -0.754 \qquad \alpha_3 \coloneqq \operatorname{atan}\left(\frac{b}{z_3}\right) - \beta_3 = 1.508$$

$$\Delta\sigma_3 \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot (\alpha_3 + \sin(\alpha_3) \cdot \cos(\alpha_3 + 2 \cdot \beta_3)) = 1.545 \text{ ksf}$$

$$\Delta H_3 \coloneqq \frac{C_{r3}}{1 + e_{03}} \cdot h_3 \cdot \log\left(\frac{\sigma_{03}' + \Delta\sigma_3}{\sigma_{03}'}\right) = 0.192 \text{ in} \qquad \Delta\sigma_{percentchange} \coloneqq \frac{\Delta\sigma_3}{\sigma_{03}'} = 2.318$$

Layer 4, Elev 693.8 to 686.3 feet, Medium Dense A-3a

 $h_4 = 693.8 \ ft - 686.3 \ ft = 7.5 \ ft$ $\gamma_4 = 0.122 \ kcf$

Estimated based on ODOT GDM Table 400-4

 $N_{60L4} = 14$ Avg. N60 for this layer

$$\sigma_{04}{'}\!\coloneqq\!\sigma_{03}{'}\!+\!\left(\gamma_{3}\!-\!\gamma_{w}\right)\!\cdot\!\frac{h_{3}}{2}\!+\!\left(\gamma_{4}\!-\!\gamma_{w}\right)\!\cdot\!\frac{h_{4}}{2}\!=\!0.968\;\textit{ksf}$$

Initial Effective Stress at midpoint of layer

$$N1_{60L4} := N_{60L4} \cdot .77 \cdot \log \left(40 \frac{\textit{ksf}}{\sigma_{04}'} \right) = 17.42$$

Based on LRFD Figure 10.6.2.4.2b-1

$$z_4 = Elev_{GS} - \left(693.8 \ \textit{ft} - \frac{h_4}{2}\right) = 15.65 \ \textit{ft}$$

depth from bottom of embankment to midpoint of layer

Boussinesq Stress at Depth z From Infinite Load

$$b := \frac{B}{2} = 10 \text{ ft}$$

$$\beta_4 = \operatorname{atan}\left(\frac{-b}{z_4}\right) = -0.569$$

$$b := \frac{B}{2} = 10 \ \text{ft}$$
 $\beta_4 := \operatorname{atan}\left(\frac{-b}{z_4}\right) = -0.569$ $\alpha_4 := \operatorname{atan}\left(\frac{b}{z_4}\right) - \beta_4 = 1.137$

$$\Delta \sigma_4 \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot (\alpha_4 + \sin(\alpha_4) \cdot \cos(\alpha_4 + 2 \cdot \beta_4)) = 1.261 \text{ ksf}$$

$$\Delta H_4 \coloneqq h_4 \cdot \frac{1}{C_4'} \cdot \log \left(\frac{\sigma_{04}' + \Delta \sigma_4}{\sigma_{04}'} \right) = 0.615 \ \textit{in} \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_4}{\sigma_{04}'} = 1.302$$

Layer 5, Elev 686.3 to 675.3 feet, Medium Dense A-4b

$$h_5 = 686.3 \ ft - 675.3 \ ft = 11 \ ft$$
 $\gamma_5 = 0.125 \ kcf$

$$\gamma_5 \coloneqq 0.125 \ \textit{kcf}$$

Estimated based on ODOT GDM Table 400-4

 $N_{60L5} = 21$ Avg. N60 for this layer

$$\sigma_{05}' \coloneqq \sigma_{04}' + \left(\gamma_4 - \gamma_w\right) \cdot \frac{h_4}{2} + \left(\gamma_5 - \gamma_w\right) \cdot \frac{h_5}{2} = 1.536 \text{ ksf}$$

Initial Effective Stress at midpoint of layer

$$N1_{60L5} := N_{60L5} \cdot .77 \cdot \log \left(40 \frac{ksf}{\sigma_{05}'} \right) = 22.89$$

$$C_5' = 45$$
 Based on LRFD Figure 10.6.2.4.2b-1

$$z_5 \coloneqq Elev_{GS} - \left(686.3 \ \textit{ft} - \frac{h_5}{2}\right) = 24.9 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

Boussinesq Stress at Depth z From Infinite Load

$$\underline{b} := \frac{B}{2} = 10 \text{ ft} \qquad \beta_5 := \operatorname{atan}\left(\frac{-b}{z_5}\right) = -0.382 \qquad \alpha_5 := \operatorname{atan}\left(\frac{b}{z_5}\right) - \beta_5 = 0.764$$

$$\Delta \sigma_5 \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot (\alpha_5 + \sin(\alpha_5) \cdot \cos(\alpha_5 + 2 \cdot \beta_5)) = 0.898 \text{ ksf}$$

$$\Delta H_5 \coloneqq h_5 \cdot \frac{1}{{C'}_5} \cdot \log \left(\frac{{\sigma_{05}}' + \Delta \sigma_5}{{\sigma_{05}}'} \right) = 0.586 \ \textit{in} \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_5}{{\sigma_{05}}'} = 0.584$$

Layer 6a, Elev 675.3 to 665.3 feet, Medium Stiff to Stiff A-6a

$$h_{6a} = 675.3 \ ft - 665.3 \ ft = 10 \ ft$$
 $\gamma_6 = 120 \ pcf$ $LL_{6ab} = 33$

$$w_{6ab}\coloneqq .26$$
 $\gamma_{d6ab}\coloneqq \frac{\gamma_6}{\left(1+w_{6ab}
ight)}=95.238$ pcf $G_s\coloneqq 2.72$

$$e_{06ab} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d6ab}} - 1 = 0.782$$

$$C_{r6ab} \coloneqq 0.1 \cdot .009 \cdot \left(LL_{6ab} - 10 \right) = 0.021$$

$$\sigma_{06a}' \coloneqq \sigma_{05}' + \left(\gamma_5 - \gamma_w\right) \cdot \frac{h_5}{2} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6a}}{2} = 2.169 \text{ ksf} \qquad \text{Initial Effective Stress at midpoint of layer}$$

$$z_{6a} \coloneqq Elev_{GS} - \left(675.3 \ \textit{ft} - \frac{h_{6a}}{2}\right) = 35.4 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$eta_{6a} := \operatorname{atan}\left(\frac{-b}{z_{6a}}\right) = -0.275$$
 $lpha_{6a} := \operatorname{atan}\left(\frac{b}{z_{6a}}\right) - eta_{6a} = 0.551$

$$\Delta \sigma_{6a} := \frac{\Delta \sigma_{Surface}}{\pi} \cdot \left(\alpha_{6a} + \sin\left(\alpha_{6a}\right) \cdot \cos\left(\alpha_{6a} + 2 \cdot \beta_{6a}\right)\right) = 0.662 \text{ ksf}$$

$$\Delta H_{6a} \coloneqq \frac{C_{r6ab}}{1 + e_{06ab}} \cdot h_{6a} \cdot \log \left(\frac{\sigma_{06a}' + \Delta \sigma_{6a}}{\sigma_{06a}'} \right) = 0.161 \ \textit{in} \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{6a}}{\sigma_{06a}'} = 0.305$$

Layer 6b, Elev 665.3 to 655.3 feet, Medium Stiff to Stiff A-6a

$$h_{6b} = 665.3 \ \mathbf{ft} - 655.3 \ \mathbf{ft} = 10 \ \mathbf{ft}$$

$$\sigma_{06b}' \coloneqq \sigma_{06a}' + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6a}}{2} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6b}}{2} = 2.745 \text{ ksf} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$z_{6b} \coloneqq Elev_{GS} - \left(665.3 \ \textit{ft} - \frac{h_{6b}}{2}\right) = 45.4 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_{6b} \coloneqq \operatorname{atan}\left(\frac{-b}{z_{6b}}\right) = -0.217$$
 $\alpha_{6b} \coloneqq \operatorname{atan}\left(\frac{b}{z_{6b}}\right) - \beta_{6b} = 0.434$

$$\Delta \sigma_{6b} \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot \left(\alpha_{6b} + \sin\left(\alpha_{6b}\right) \cdot \cos\left(\alpha_{6b} + 2 \cdot \beta_{6b}\right)\right) = 0.527 \text{ ksf}$$

$$\Delta H_{6b} \coloneqq \frac{C_{r6ab}}{1 + e_{06ab}} \cdot h_{6b} \cdot \log \left(\frac{\sigma_{06b}{'} + \Delta \sigma_{6b}}{\sigma_{06b}{'}} \right) = 0.106 \ \textit{in} \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{6b}}{\sigma_{06b}{'}} = 0.192$$

Layer 6c, Elev 655.3 to 645.8 feet, Medium Stiff to Stiff A-6a

$$h_{6c} \coloneqq 655.3 \ \textit{ft} - 645.8 \ \textit{ft} = 9.5 \ \textit{ft}$$
 $\gamma_6 \coloneqq 120 \ \textit{pcf}$ $LL_{6c} \coloneqq 36$

$$w_{6c} \coloneqq .31$$
 $\gamma_{d6c} \coloneqq \frac{\gamma_6}{\left(1 + w_{6c}\right)} = 91.603 \; \textit{pcf}$

$$e_{06c} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d6c}} - 1 = 0.853$$
 $C_{r6c} \coloneqq 0.1 \cdot .009 \cdot (LL_{6c} - 10) = 0.023$

$$\sigma_{06c}' \coloneqq \sigma_{06b}' + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6b}}{2} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6c}}{2} = 3.306 \text{ \textit{ksf}} \text{ Initial Effective Stress at midpoint of layer}$$

$$z_{6c} \coloneqq Elev_{GS} - \left(655.3 \ \textit{ft} - \frac{h_{6c}}{2}\right) = 55.15 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_{6c} := \operatorname{atan}\left(\frac{-b}{z_{6c}}\right) = -0.179$$
 $\alpha_{6c} := \operatorname{atan}\left(\frac{b}{z_{6c}}\right) - \beta_{6c} = 0.359$

$$\Delta \sigma_{6c} \coloneqq \frac{\Delta \sigma_{Surface}}{\sigma} \cdot \left(\alpha_{6c} + \sin\left(\alpha_{6c}\right) \cdot \cos\left(\alpha_{6c} + 2 \cdot \beta_{6c}\right)\right) = 0.438 \text{ ksf}$$

$$\Delta H_{6c} \coloneqq \frac{C_{r6c}}{1 + e_{06c}} \cdot h_{6c} \cdot \log \left(\frac{\sigma_{06c}' + \Delta \sigma_{6c}}{\sigma_{06c}'} \right) = 0.078 \; \textit{in} \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{6c}}{\sigma_{06c}'} = 0.132$$

Layer 7a, Elev 645.8 to 639.6 feet, Stiff to Very Stiff A-6a

$$h_{7a} := 645.8 \ ft - 639.6 \ ft = 6.2 \ ft$$
 $\gamma_7 := 122 \ pcf$ $LL_7 := 36$

$$C_{r7} := 0.1 \cdot .009 \cdot (LL_7 - 10) = 0.023$$

$$w_7 = .26$$

$$\gamma_{d7} \coloneqq \frac{\gamma_7}{(1+w_7)} = 96.825 \; extbf{pcf} \qquad e_{07} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d7}} - 1 = 0.753$$

$$e_{07} = \frac{G_s \cdot \gamma_w}{\gamma_{d7}} - 1 = 0.753$$

$$\sigma_{07a}' \coloneqq \sigma_{06c}' + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6c}}{2} + \left(\gamma_7 - \gamma_w\right) \cdot \frac{h_{7a}}{2} = 3.765 \text{ \textit{ksf}} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$z_{7a}\!\coloneqq\!Elev_{GS}\!-\!\left(\!645.8\;\textbf{\textit{ft}}\!-\!\frac{h_{7a}}{2}\!\right)\!=\!63\;\textbf{\textit{ft}}\qquad \qquad \text{depth from bottom of MSE to midpoint of layer}$$

$$\beta_{7a} = \operatorname{atan}\left(\frac{-b}{z_{7a}}\right) = -0.157$$

$$eta_{7a} \coloneqq \operatorname{atan}\left(\frac{-b}{z_{7a}}\right) = -0.157$$
 $lpha_{7a} \coloneqq \operatorname{atan}\left(\frac{b}{z_{7a}}\right) - eta_{7a} = 0.315$

$$\Delta \sigma_{7a} := \frac{\Delta \sigma_{Surface}}{\pi} \cdot \left(\alpha_{7a} + \sin\left(\alpha_{7a}\right) \cdot \cos\left(\alpha_{7a} + 2 \cdot \beta_{7a}\right)\right) = 0.385 \text{ ksf}$$

$$\Delta H_{7a} \coloneqq \frac{C_{r7}}{1 + e_{07}} \cdot h_{7a} \cdot \log \left(\frac{\sigma_{07a}{'} + \Delta \sigma_{7a}}{\sigma_{07a}{'}} \right) = 0.042 \ \textit{in} \quad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{7a}}{\sigma_{07a}{'}} = 0.102$$

Percent change in stress less than 10%, so end analysis here

Total Settlement (including granular layers)

$$S_T := \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4 + \Delta H_5 + \Delta H_{6a} + \Delta H_{6b} + \Delta H_{6c} + \Delta H_{7a} = 2.887$$
 in

Settlement of granular layers, including nonplastic silt. Assumed to occur during construction or upon completion.

$$S_{Granular} := \Delta H_1 + \Delta H_2 + \Delta H_4 + \Delta H_5 = 2.307$$
 in

Settlement of cohesive layers

$$S_{Cohesive} := \Delta H_3 + \Delta H_{6a} + \Delta H_{6b} + \Delta H_{6c} + \Delta H_{7a} = 0.579$$
 in

Estimated Rate of Consolidation - cv estimates based on 2022 NAVFAC DM7.01, Liquid Limit correlation chart, assuming the lower bound for overconsolidated clays

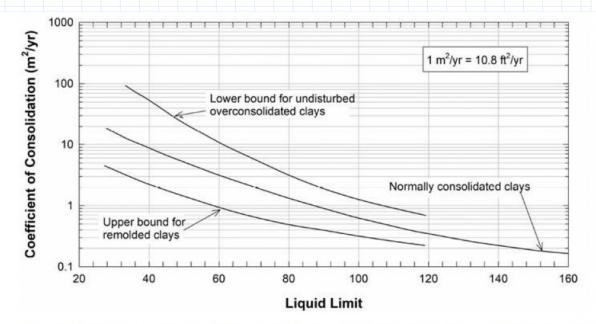


Figure 8-50 Approximate Relationship between Coefficient of Consolidation and Liquid Limit

Anticipate settlement of Layers 1, 2, 4, and 5 occurs during or at completion of construction

Considering double drainage for layer 3 and single drainage for layers 6 and 7

Layer 3, Elev 696.3 to 693.8 feet, Very Stiff A-6a

$$\Delta H_3 = 0.192 \ in$$

$$LL_3 = 33$$

$$c_{v3} = 90 \frac{\boldsymbol{m}^2}{\boldsymbol{n}r}$$

$$c_{v3} = 2.652 \frac{ft^2}{dag}$$

$$\Delta H_3\!=\!0.192 \; \emph{in} \qquad LL_3\!=\!33 \qquad c_{v3}\!\coloneqq\!90 \; \frac{\emph{m}^2}{\emph{yr}} \qquad c_{v3}\!=\!2.652 \; \frac{\emph{ft}^2}{\emph{day}}$$

$$H_{dr3}\!\coloneqq\!\frac{h_3}{2}\!=\!1.25 \; \emph{ft} \qquad \text{drainage path}$$

Layer 6a, Elev 675.3 to 665.3 feet, Medium Stiff to Stiff A-6a

$$\Delta H_{6a} = 0.161 \ in$$

$$LL_{6ab} = 33$$

$$c_{v6} = 90 \frac{\boldsymbol{m}^2}{\boldsymbol{m}^2}$$

$$c_{v6} = 2.652 \frac{f^{v}}{dt}$$

$$\Delta H_{6a}$$
 = 0.161 in LL_{6ab} = 33 c_{v6} = 90 $\frac{m{m}^2}{m{yr}}$ c_{v6} = 2.652 $\frac{m{ft}^2}{m{day}}$ H_{dr6a} := $\frac{h_{6a}}{2}$ = 5 $m{ft}$ drainage path

Layer 6b, Elev 665.3 to 655.3 feet, Medium Stiff to Stiff A-6a

$$\Delta H_{6b} = 0.106 \ in$$

$$LL_{6ab} = 33$$

$$c_{v6} = 90 \frac{m}{m}$$

$$\Delta H_{6b} \! = \! 0.106 \; extbf{in} \qquad LL_{6ab} \! = \! 33 \qquad \overline{c_{v6}} \! \coloneqq \! 90 \; rac{ extbf{m}^2}{ extbf{vr}} \qquad c_{v6} \! = \! 2.652 \; rac{ extbf{ft}^2}{ extbf{day}}$$

$$H_{dr6b} \coloneqq h_{6a} + \frac{h_{6b}}{2} = 15 \; \textbf{\textit{ft}}$$
 drainage path

Layer 6c, Elev 655.3 to 645.8 feet, Medium Stiff to Stiff A-6a

$$\Delta H_{6c} = 0.078$$
 in

$$LL_{6c} = 36$$

$$c_{v6} = 90 \frac{m^2}{m^2}$$

$$\Delta H_{6c} = 0.078 \; in \qquad LL_{6c} = 36 \qquad c_{v6} = 90 \; \frac{m^2}{vr} \qquad c_{v6} = 2.652 \; \frac{ft^2}{day}$$

Layer 7a, Elev 645.8 to 639.6 feet, Stiff to Very Stiff A-6a

$$\Delta H_{7a} = 0.042$$
 in

$$LL_7 = 36$$

$$c_{v7} = 90 \frac{m^2}{ur}$$

$$\Delta H_{7a} = 0.042 \; \emph{in} \qquad LL_7 = 36 \qquad c_{v7} \coloneqq 90 \; \dfrac{\emph{m}^2}{\emph{vr}} \qquad c_{v7} = 2.652 \; \dfrac{\emph{ft}^2}{\emph{day}}$$

$$H_{dr7a}\!\coloneqq\!h_{6a}\!+\!h_{6b}\!+\!h_{6c}\!+\!rac{h_{7a}}{2}\!=\!32.6\;{\it ft}$$
 drainage path

t	:= 0	days					
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_v	U(%)	Settlement (in)	Ultimate Settlement (in)
3	V. Stiff A-6a	2.652	1.25	0	0	0	0.192
6a	M. Stiff to Stiff A-6a	2.652	5	0	0	0	0.161
6b	M. Stiff to Stiff A-6a	2.652	15	0	0	0	0.106
6c	M. Stiff to Stiff A-6a	2.652	24.75	0	0	0	0.078
7a	Stiff to V. Stiff A-6a	2.652	32.6	0	0	0	0.042

Total S (in) 0.000 Total U(%) 0.000

t = 1 days

							Ultimate
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	Settlement (in)
3	M. Stiff to Stiff A-4b	2.652	1.25	1.6973	98	0.188	0.192
6a	M. Stiff to Stiff A-6a	2.652	5	0.1061	36	0.058	0.161
6b	M. Stiff to Stiff A-6a	2.652	15	0.0118	11	0.012	0.106
6c	M. Stiff to Stiff A-6a	2.652	24.75	0.0043	5	0.004	0.078
7a	Stiff to V. Stiff A-6a	2.652	32.6	0.0025	3	0.001	0.042

Total S (in) 0.263 Total U(%) 44.192

t = 7 days

							Ultimate
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	Settlement (in)
3	M. Stiff to Stiff A-4b	2.652	1.25	11.881	100	0.192	0.192
6a	M. Stiff to Stiff A-6a	2.652	5	0.7426	86	0.138	0.161
6b	M. Stiff to Stiff A-6a	2.652	15	0.0825	32	0.034	0.106
6c	M. Stiff to Stiff A-6a	2.652	24.75	0.0303	19	0.015	0.078
7a	Stiff to V. Stiff A-6a	2.652	32.6	0.0175	14	0.006	0.042

Total S (in) 0.385 Total U(%) 64.719

	t = 14	days					
							Ultimate
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	Settlement (in)
3	M. Stiff to Stiff A-4b	2.652	1.25	23.76192	100	0.192	0.192
6a	M. Stiff to Stiff A-6a	a 2.652	5	1.48512	97	0.156	0.161
6b	M. Stiff to Stiff A-6a	a 2.652	15	0.165013333	45	0.048	0.106
6c	M. Stiff to Stiff A-6a	a 2.652	24.75	0.060610958	27	0.021	0.078
7a	Stiff to V. Stiff A-6a	2.652	32.6	0.034935451	20	0.008	0.042

Total S (in) 0.425 Total U(%) 71.484

	t = 21	days					
		2					Ultimate
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	Settlement (in)
3	M. Stiff to Stiff A-4b	2.652	1.25	35.64288	100	0.192	0.192
6a	M. Stiff to Stiff A-6a	2.652	5	2.22768	100	0.161	0.161
6b	M. Stiff to Stiff A-6a	2.652	15	0.24752	55	0.058	0.106
6c	M. Stiff to Stiff A-6a	2.652	24.75	0.090916437	33	0.026	0.078
7a	Stiff to V Stiff A-6a	2 652	32 6	0.052403177	25	0.011	0.042

Total S (in) 0.448 Total U(%) 75.217

	t = 30	days					
							Ultimate
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	Settlement (in)
3	M. Stiff to Stiff A-4b	2.652	1.25	50.9184	100	0.192	0.192
6a	M. Stiff to Stiff A-6a	2.652	5	3.1824	100	0.161	0.161
6b	M. Stiff to Stiff A-6a	2.652	15	0.3536	66	0.070	0.106
6c	M. Stiff to Stiff A-6a	2.652	24.75	0.129880624	40	0.031	0.078
7a	Stiff to V. Stiff A-6a	2.652	32.6	0.074861681	30	0.013	0.042

Total S (in) 0.467 Total U(%) 78.447

1	t = 45	days					
Layer	Material	Cv (ft²/day	H _{dr} (ft)	T _v	U(%)	Settlement (in)	Ultimate Settlement (in)
3	M. Stiff to Stiff A-4b	2.652	1.25	76.3776	100	0.192	0.192
6a	M. Stiff to Stiff A-6a	2.652	5	4.7736	100	0.161	0.161
6b	M. Stiff to Stiff A-6a	2.652	15	0.5304	77	0.082	0.106
6c	M. Stiff to Stiff A-6a	2.652	24.75	0.194821	49	0.038	0.078
7a	Stiff to V. Stiff A-6a	2.652	32.6	0.112293	37	0.016	0.042

Total S (in) 0.488 Total U(%) 82.081

	t =	60	days					
			2					Ultimate
Layer	М	1aterial	Cv (ft²/day)	H _{dr} (ft)	T_v	U(%)	Settlement (in)	Settlement (in)
3	М	1. Stiff to Stiff A-4b	2.652	1.25	101.8368	100	0.192	0.192
6a	М	1. Stiff to Stiff A-6a	2.652	5	6.3648	100	0.161	0.161
6b	М	1. Stiff to Stiff A-6a	2.652	15	0.7072	85	0.090	0.106
6c	М	1. Stiff to Stiff A-6a	2.652	24.75	0.259761	57	0.044	0.078
7a	St	tiff to V. Stiff A-6a	2.652	32.6	0.149723	43	0.018	0.042

Total S (in) 0.506 Total U(%) 84.978

	t =	/5	days					
Layer	Mater	ial	Cv (ft²/day)	H _{dr} (ft)	T _v	U(%)	Settlement (in)	Ultimate Settlement (in)
3	M. Stit	ff to Stiff A-4b	2.652	1.25	127.296	100	0.192	0.192
6a	M. Stit	ff to Stiff A-6a	2.652	5	7.956	100	0.161	0.161
6b	M. Stif	ff to Stiff A-6a	2.652	15	0.884	90	0.095	0.106
6c	M. Stif	ff to Stiff A-6a	2.652	24.75	0.324702	63	0.049	0.078
7a	Stiff to	V. Stiff A-6a	2.652	32.6	0.187154	48	0.020	0.042

Total S (in) 0.518 Total U(%) 87.008

	t =	90	days					
								Ultimate
								Settlement
Layer	١	Material	Cv (ft ² /day)	H _{dr} (ft)	T _v	U(%)	Settlement (in)	(in)
3	1	M. Stiff to Stiff A-4b	2.652	1.25	152.7552	100	0.192	0.192
6a	1	M. Stiff to Stiff A-6a	2.652	5	9.5472	100	0.161	0.161
6b	1	M. Stiff to Stiff A-6a	2.652	15	1.0608	93	0.099	0.106
6c	1	M. Stiff to Stiff A-6a	2.652	24.75	0.389642	68	0.053	0.078
7a	5	Stiff to V. Stiff A-6a	2.652	32.6	0.224585	53	0.022	0.042

Total S (in) 0.527 Total U(%) 88.551

t = 120 days

							Ultimate
							Settlement
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	(in)
3	M. Stiff to Stiff A-4b	2.652	1.25	203.6736	100	0.192	0.192
6a	M. Stiff to Stiff A-6a	2.652	5	12.7296	100	0.161	0.161
6b	M. Stiff to Stiff A-6a	2.652	15	1.4144	96	0.102	0.106
6c	M. Stiff to Stiff A-6a	2.652	24.75	0.519522	77	0.060	0.078
7a	Stiff to V. Stiff A-6a	2.652	32.6	0.299447	61	0.026	0.042

Total S (in) 0.540 Total U(%) 90.830

t = 150 days

							Ultimate
							Settlement
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	(in)
3	M. Stiff to Stiff A-4b	2.652	1.25	254.592	100	0.192	0.192
6a	M. Stiff to Stiff A-6a	2.652	5	15.912	100	0.161	0.161
6b	M. Stiff to Stiff A-6a	2.652	15	1.768	98	0.104	0.106
6c	M. Stiff to Stiff A-6a	2.652	24.75	0.649403	83	0.065	0.078
7a	Stiff to V. Stiff A-6a	2.652	32.6	0.374308	67	0.028	0.042

Total S (in) 0.550 Total U(%) 92.397

	t = 180	days					
							Ultimate
							Settlement
Layer	Material	Cv (ft ² /day)	H _{dr} (ft)	T_{v}	U(%)	Settlement (in)	(in)
3	M. Stiff to Stiff A-4b	2.652	1.25	305.5104	100	0.192	0.192
6a	M. Stiff to Stiff A-6a	2.652	5	19.0944	100	0.161	0.161
6b	M. Stiff to Stiff A-6a	2.652	15	2.1216	100	0.106	0.106
6c	M. Stiff to Stiff A-6a	2.652	24.75	0.779284	87	0.068	0.078
7a	Stiff to V. Stiff A-6a	2.652	32.6	0.44917	73	0.031	0.042

Total S (in) 0.558 Total U(%) 93.701

Total Anticipated Settlement

0.595

			Remaining	
		Ultimate	Settlement	
Time (days)	Total Settlement (in)	Settlement (in)	(in)	% Consolidation
0	0.000	0.595	0.595	0.000
1	0.263	0.595	0.332	44.192
7	0.385	0.595	0.210	64.719
14	0.425	0.595	0.170	71.484
21	0.448	0.595	0.147	75.217
30	0.467	0.595	0.128	78.447
45	0.488	0.595	0.107	82.081
60	0.506	0.595	0.089	84.978
75	0.518	0.595	0.077	87.008
90	0.527	0.595	0.068	88.551
120	0.540	0.595	0.055	90.830
150	0.550	0.595	0.045	92.397
180	0.558	0.595	0.037	93.701

Settlement less than 0.4 inches



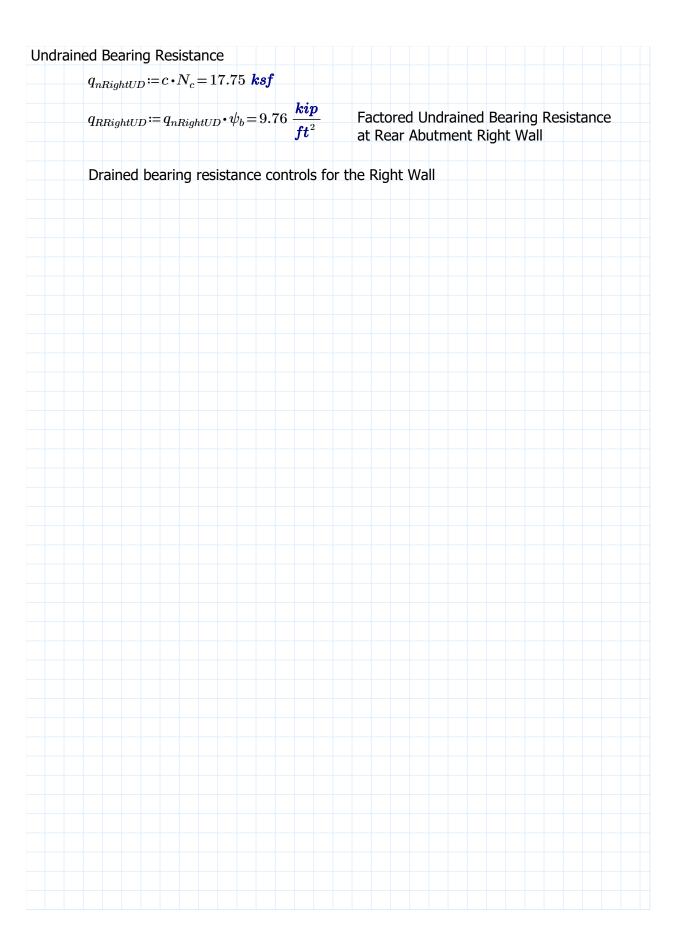
Project: CUY-17-13.5 PID: 112998 SME Project No.: 088 Prepared by: Brenda Date: 5/8/2025	3549.00	EAR ABUTMENT
Bearing Resistance	e Rear (North) Abutment	
$Elev_{BOTWallL} \coloneqq 69$	5.6 ft Elevation at E	Bottom of Left Wall
$Elev_{BOTWallR} \coloneqq 68$	87.2 ft Elevation at E	Bottom of Right Wall
$Elev_{TOPWallL} \coloneqq 70$	5.5 ft Elevation at T	op of Left Wall
$Elev_{TOPWallR} \coloneqq 69$	6.4 ft Elevation at T	op of Right Wall
$H_L\!\coloneqq\!Elev_{TOPWallI}$	$_L - Elev_{BOTWallL} = 9.9 \; ft$	Height of Left Wall
$H_R \!\coloneqq\! Elev_{TOPWallI}$	$_{R}-Elev_{BOTWallR}$ =9.2 ${m ft}$	Height of Right Wall
$B \coloneqq 7 \ \mathbf{ft}$ Wid	dth of Wall Footing	
	e (LRFD 11.10.5.4) accordance with LRFD 10.6.3	3.1 and 10.6.3.2
$q_R\!\coloneqq\!\overline{\psi_b}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace{0.1em}}{\hspace$	LRFD 10.6.3.1.1-1	
ψ_b := 0.55	LRFD Table 11.5.7-1	
The factored bear limit state shall be take	Fing resistance, q_R , at the strength en as:	
$q_R = \varphi_b q_n$	(10.6.3.1.1-1)	
where: $\phi_b = \text{resistance fact}$ $q_n = \text{nominal beari}$	tor specified in Article 10.5.5.2.2 ng resistance (ksf)	
$q_{n} = cN_{cm} + \gamma_{q}D_{f}N_{qm}$	$C_{wq} + 0.5\gamma_{\rm f}BN_{\gamma m}C_{w\gamma} $ (10.6.3.1.2a-1)	

Rear Abutment - I	_eft Wall			
$\phi_L = 33 \; deg$	Friction angle of foundation soil at Left wall			
γ_s := 120 $m{pc}$	Unit weight of backfill (assumed)			
$S_q\!\coloneqq\!1$	$S_{\gamma}\!\coloneqq\!1$ $D_{GW}\!\coloneqq\!0$ $ extit{ft}$ $C_{wq}\!\coloneqq\!.5$ $C_{w\gamma}\!\coloneqq\!.5$			
Shape factors assumed to be 1 for conservatism				
$N_q = 26.1$	N_{γ} := 35.2			
$D_f \coloneqq 3.5 \; ft$	Depth of footing			
rained Bearing Resi	stance			
	$V_s \cdot D_f \cdot N_q \cdot S_q \cdot C_{wq} + 0.5 \cdot \gamma_s \cdot B \cdot N_\gamma \cdot S_\gamma \cdot C_{w\gamma} = 12.87 \text{ ksf}$			
q_{RLeft} := q	$\eta_{nLeft} \cdot \psi_b = 7.08 \; rac{m{kip}}{m{ft}^2}$ Factored Drained Bearing Resistance at Rear Abutment Left Wall			
Granular be	aring material, so undrained condition does not apply.			
ear Abutment - Rigl	nt Wall			
$\phi_R = 32$ deg	Friction angle of foundation soil at Right wall			
γ_s = 120 $\it pcf$	Unit weight of backfill (assumed)			
$S_q = 1$	$C_{N_{\gamma}} = 1$ $C_{W_{\gamma}} = 0$ $C_{W_{\gamma}} = 0.5$ $C_{W_{\gamma}} = 0.5$			
N_q := 23.2	$N_{\gamma} \coloneqq 30.2$ assume $c \coloneqq 0.5 \; \textit{ksf}$ $N_c \coloneqq 35.5$			
$D_f = 3.5 \; extbf{\it ft}$	Depth of footing			

Drained Bearing Resistance

$$q_{nRight} \coloneqq \gamma_s \boldsymbol{\cdot} D_f \boldsymbol{\cdot} N_q \boldsymbol{\cdot} S_q \boldsymbol{\cdot} C_{wq} + 0.5 \boldsymbol{\cdot} \gamma_s \boldsymbol{\cdot} B \boldsymbol{\cdot} N_\gamma \boldsymbol{\cdot} S_\gamma \boldsymbol{\cdot} C_{w\gamma} = 11.21 \text{ ksf}$$

$$q_{RRight} \coloneqq q_{nRight} \cdot \psi_b = 6.17 \ \dfrac{\emph{kip}}{\emph{ft}^2}$$
 Factored Drained Bearing Resistance at Rear Abutment Right Wall



Project: CUY-17-13.50 PID: 112998 SME Project No.: 088549.0 Prepared by: Brendan P. L Date: 7/16/2025								
Bearing Resistance For	Bearing Resistance Forward (South) Abutment							
$Elev_{BOTWallL} \coloneqq 701.1 \; extbf{f}$	t Elevation at Bottom of Left Wall							
$Elev_{BOTWallR} \coloneqq 696.9 \; extbf{\emph{f}}$	t Elevation at Bottom of Right Wall							
$Elev_{TOPWallL} \coloneqq 708.7 \; extbf{f}$	t Elevation at Top of Left Wall							
$Elev_{TOPWallR}$:= 705.8 $m{f}$	t Elevation at Top of Right Wall							
$H_L\!\coloneqq\!Elev_{TOPWallL}\!-\!Ele$	$ev_{BOTWallL} = 7.6 \; extbf{ft}$ Height of Left Wall							
$H_R\!\coloneqq\!Elev_{TOPWallR}\!-\!El$	$ev_{BOTWallR}$ = $8.9 \ extbf{\it ft}$ Height of Right Wall							
$B \coloneqq 7 \; ft$ Width of Wall Footing								
Bearing Resistance (LRI Evaluate in accord	FD 11.10.5.4) dance with LRFD 10.6.3.1 and 10.6.3.2							
$q_R\!:=\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!$	FD 10.6.3.1.1-1							
$\psi_b\!\coloneqq\!0.55$ LR	FD Table 11.5.7-1							
The factored bearing resis	stance, q_R , at the strength							
$q_R = \varphi_b q_n$	(10.6.3.1.1-1)							
where:								
$ \phi_b = \text{resistance factor speci} q_n = \text{nominal bearing resist} $								
$q_n = cN_{cm} + \gamma_q D_f N_{qm} C_{wq} + 0.5$	$5\gamma_{\rm f}BN_{\gamma m}C_{wq} \ (10.6.3.1.2a-1)$							

Forward	d Abutment - Left V	Vall	
ϕ	:=36.5 deg	Friction angle of	foundation soil at Left wall
γ_s	:=120 pcf Un	nit weight of backfill ssumed)	
S_{ϵ}		$c_{W} \coloneqq 0$ ft $C_{wq} \coloneqq$	5 $C_{w\gamma}$:= .5
SI	nape factors assum	ned to be 1	
N	$T_q = 37.8$ N_{γ}	;=56.3	
D	$f:=3.5 \; extit{ft}$ De	epth of footing	
Drained Be	earing Resistance		
	$q_{nLeft} \coloneqq \gamma_s \! \cdot \! D_f \! \cdot \! N_s$	$_{q}\! \cdot \! S_{q}\! \cdot \! C_{wq}\! +\! 0.5\! \cdot \! \gamma_{s}\! \cdot$	$B \cdot N_{\gamma} \cdot S_{\gamma} \cdot C_{w\gamma} = 19.76$ ksf
	$q_{RLeft}\!\coloneqq\!q_{nLeft}\!\cdot\!\psi_b$	$=10.87 \frac{kip}{ft^2}$	Factored Drained Bearing Resistance of Forward Abutment Left Wall
Forward	Abutment - Right	Wall	
	$c \coloneqq 4000 \ \textit{psf}$	$N_c \coloneqq 5.14$	$S_c \coloneqq 1$ $N_{cm} \coloneqq N_c \cdot S_c = 5.14$
	$q_{nR1} \coloneqq c \cdot N_{cm} =$	=20.56 <i>ksf</i> undr	rained bearing resistance
Cons	sider 2-Layer Soil S	ystem:	
	$H_{s2}\coloneqq 3.1~{\it ft}$		
	Layer 2:		
	$\phi_R \coloneqq 33 \; deg$	Friction an	ngle of foundation soil at Right wall
	$\gamma_s = 120$ pcf	Unit weight of b	ackfill
	$S_q = 1$ S_γ		t $C_{wq}\!=\!0.5$ $C_{w\gamma}\!=\!0.5$
	N_{q2} := 26.1	$N_{\gamma 2} \!\coloneqq\! 35.2$	$g := 0.2 \text{ ksf}$ $N_c := 38.6$
	D_f =3.5 ft	Depth of footing	
	Drained Bearing F	Resistance	

$$q_{nR2} \coloneqq \gamma_s \cdot D_f \cdot N_{q2} \cdot S_q \cdot C_{wq} + 0.5 \cdot \gamma_s \cdot B \cdot N_{\gamma 2} \cdot S_\gamma \cdot C_{w\gamma} = 12.87 \text{ ksf}$$

Layer 2 has granular bearing material, so undrained condition does not apply.

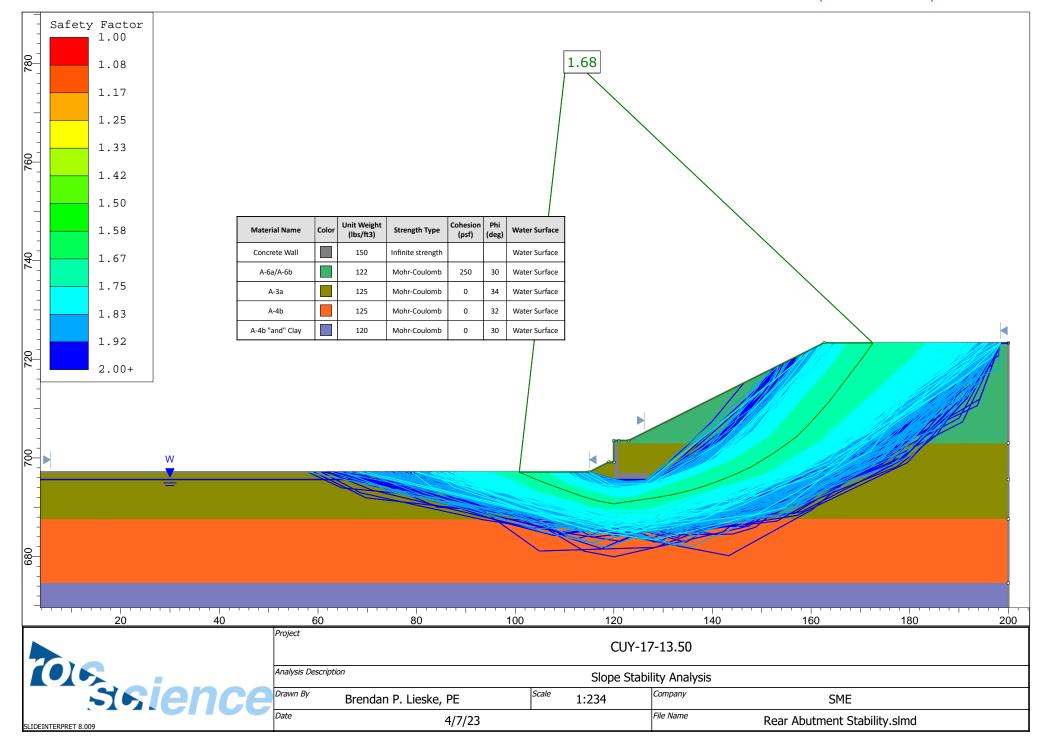
$$egin{aligned} 3 \cdot B \cdot \ln \left(rac{q_{nR1}}{q_{nR2}}
ight) \ H_{crit} \coloneqq rac{2}{2} = 4.916 \ \emph{ft} \end{aligned} \qquad H_{crit} > H_{s2Bot}$$

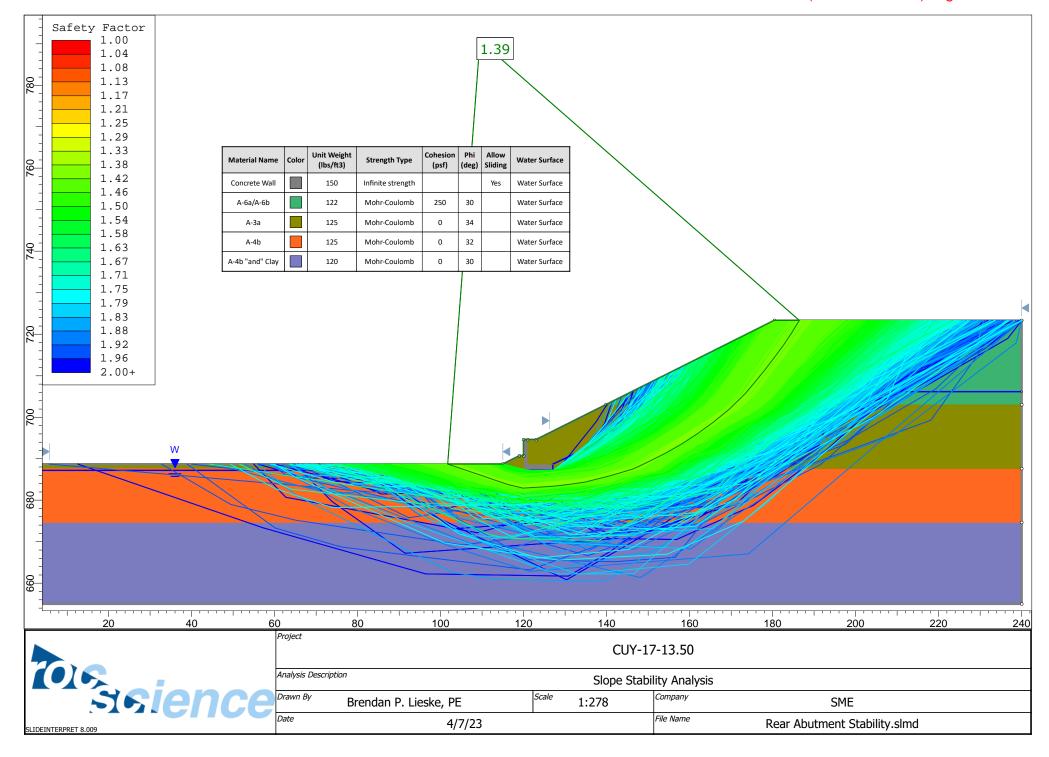
2-Layered Soil System in Drained Loading - LRFD 10.6.3.1.2f

Therefore drained bearing resistance controls: $q_{nR} = q_{nR2} = 12.87$ **ksf**

 $q_{RRight} := q_{nR} \cdot \psi_b = 7.08 \frac{kip}{ft^2}$

Factored Bearing Resistance of Forward Abutment Right Wall





: Page 1 of 9

Slide Analysis Information Rear Abutment Stability

Project Summary

File Name: Rear Abutment Stability.slmd Slide Modeler Version: 8.009

Currently Open Scenarios

ſ	Group Name	Scenario Name	Global Minimum	Compute Time
		Master Scenario	Bishop Simplified: 1.538440	00h:00m:03.34s
	NonCircular- Rear Abutment Left		Janbu Corrected: 1.574210	
1			Spencer: 1.683500	
		Master Scenario	Bishop Simplified: 1.297150	00h:00m:02.715s
	NonCircular- Rear Abutment Right		Janbu Corrected: 1.324140	
			Spencer: 1.387900	

General Settings

Units of Measurement: Imperial Units Time Units: days Permeability Units: feet/second Data Output: Standard Failure Direction: Right to Left

Analysis Options



Groundwater Analysis

All Open Scenarios				
Groundwater Method:	Water Surfaces			
Pore Fluid Unit Weight [lbs/ft3]:	62.4			
Use negative pore pressure cutoff:	Yes			
Maximum negative pore pressure [psf]:	0			
Advanced Groundwater Method:	None			

Random Numbers

All Open Scenarios
Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

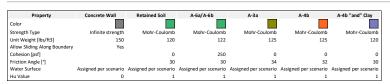
All Open Scenarios
Search Method: Cuckoo Search
Initial # of Surface Vertices: 8
Maximum Iterations: 20
Mumber of Nests: 50
Minimum Elevation: Not Defined
Minimum Depth: Not Defined
Minimum Area: Not Defined
Minimum Area: Not Defined
Convex Surfaces Only: 50
Enabled

Seismic Loading

All Open Scenarios

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Materials



Materials In Use



Global Minimums



NonCircular- Rear Abutme	ent Left 🔷	NonCircular- Rear Abutme	nt Right 🔷				
Method: bishop sin	nplified	Method: bishop sin	nplified				
FS	1.538440	FS	1.297150				
Axis Location:	110.756, 781.958	Axis Location:	110.590, 786.				
Left Slip Surface Endpoint:	101.077, 697.100	Left Slip Surface Endpoint:	105.086, 688.				
Right Slip Surface Endpoint:	172.835, 723.300	Right Slip Surface Endpoint:	185.293, 723.				
Resisting Moment:	6.04033e+06 lb-ft	Resisting Moment:	7.01588e+061				
Driving Moment:	3.92627e+06 lb-ft	Driving Moment:	5.4087e+061				
Total Slice Area:	984.909 ft2	Total Slice Area:	1107.18				
Surface Horizontal Width:	71,7584 ft	Surface Horizontal Width:	80.206				
Surface Average Height:	13.7254 ft	Surface Average Height:	13.80				
Method: janbu cor	rected	Method: janbu corrected					
FS	1.574210	FS	1.324140				
Axis Location:	111.202. 783.690	Axis Location:	110.950, 786.				
Left Slip Surface Endpoint:	100.657, 697,100	Left Slip Surface Endpoint:	105.294, 688.7				
Right Slip Surface Endpoint:	174.146, 723.300	Right Slip Surface Endpoint:	185.806, 723.3				
Resisting Horizontal Force:	65534.8 lb	Resisting Horizontal Force:	63875.				
Driving Horizontal Force:	41630.8 lb	Driving Horizontal Force:	48258.				
Total Slice Area:	1124.36 ft2	Total Slice Area:	1169.98				
Surface Horizontal Width:	73.4899 ft	Surface Horizontal Width:	80.511				
Surface Average Height:	15.2995 ft	Surface Average Height:	14.531				
Method: spend	cer	Method: spend	er				
FS	1.683500	FS	1.387900				
Axis Location:	110.479, 781.917	Axis Location:	109.463.790.				
Left Slip Surface Endpoint:	100.821.697.100	Left Slip Surface Endpoint:	101.700.688.				
Right Slip Surface Endpoint:	172.538, 723.300	Right Slip Surface Endpoint:	186.425, 723.				
Resisting Moment:	5.3512e+06 lb-ft	Resisting Moment:	7.21921e+061				
Driving Moment:	3.17861e+06 lb-ft	Driving Moment:	5.20154e+061				
Resisting Horizontal Force:	51756.5 lb	Resisting Horizontal Force:	5819				
Driving Horizontal Force:	30743.3 lb	Driving Horizontal Force:	41928				
Total Slice Area:	813.008 ft2	Total Slice Area:	1051.77				
	71.717 ft	Surface Horizontal Width:	84.725				
Surface Horizontal Width:							

Global Minimum Coordinates



51516	TICE
NonCircular- Rear Abutment	Left NonCircular- Rear Abutment Right
Method: bishop simpl	ified Method: bishop simplified
X Y	X Y
101.077 697.1	105.086 688.7
103.245 695.928 105.64 694.463	107.824 687.115 110.561 685.53
107.902 693.117	113.299 683.945
110.077 691.768 112.497 690.227	116.036 682.36 120 680.98
114.918 688.668	124.105 681.381
117.465 687.302 120.001 686.195	128.236 681.786
120.001 686.195 122.811 686.464	132.367 682.191 136.497 682.854
125.621 686.687	140.609 683.711
129.787 687.387	144.721 684.995
133.95 688.702 136.723 689.858	147.855 686.141 150.989 687.431
139.497 691.041	150.989 687.431 154.179 689.462
142.27 692.394 145.595 694.362	157.369 691.628 160.429 694.201
148.92 696.407	163.489 696.896
152.242 698.904	166.517 699.715
155.562 701.842 157.101 703.479	169.546 702.782 171.221 704.61
158.64 705.117	172.89 706.433
160.179 706.774	176.002 710.175
161.696 708.466 163.525 710.966	178.325 713.362 180.648 716.665
165.355 713.454	182.97 719.97
167.185 715.927 169.015 718.379	185.293 723.3
169.015 718.379 170.925 720.872	
172.835 723.3	Method: janbu corrected
	X Y
Method: janbu corre	105.294 688.7 107.836 687.067
X Y	110.379 685.434
100.657 697.1 104.41 694.647	112.921 683.802
104.41 694.647	115.464 682.169 119.997 680.333
111.115 690.424	123.416 680.5
114.067 688.565 117.027 686.78	126.834 680.714 130.557 680.955
119.999 685.333	134.28 681.252
122.843 685.269 125.687 685.234	138.495 682.187 142.711 683.472
125.687 685.234 128.656 685.453	142.711 683.472 145.386 684.446
131.618 685.761	148.061 685.552
135.117 686.737	150.736 686.72
138.615 687.86 142.116 689.501	153.412 688.042 156.712 690.006
145.616 691.28	160.013 692.525
148.258 693.058 150.899 694.93	163.219 695.461
153.542 697.291	166.463 698.676 169.443 701.842
156.178 699.883	172.113 704.888 174.383 707.572
158.468 702.3 160.758 704.813	174.383 707.572 176.674 710.491
163.448 708.143	178.957 713.67
166.079 711.821	181.24 716.848
168.035 714.604 169.814 717.136	183.523 720.027 185.806 723.3
171.595 719.669	103.000 723.3
174.146 723.3	Method: spencer
Method: spencer	101.7 688.7
X Y 100.821 697.1	104.452 687.765
100.821 697.1 103.855 695.794	107.203 686.83 109.954 685.895
106.889 694.62	112.705 684.96
110.19 693.411 113.491 692.229	116.294 683.74 119.819 682.912
116.793 691.257	123.579 683.125
120.004 690.69	127.338 683.359
122.459 691.053 124.795 691.399	131.097 683.816 134.824 684.374
127.131 691.744	137.734 685.088
129.256 692.058 132.359 692.627	140.643 685.833 143.553 686.67
135.462 693.391	146.462 687.584
138.565 694.333	150.302 689.373
141.668 695.479 144.772 696.751	154.161 691.323 158.02 693.509
144.772 696.751 147.877 698.187	158.02 693.509 161.873 696.025
150.18 699.569 152.484 701.018	165.761 698.816
152.484 701.018 154.788 702.612	169.673 702.064 171.508 703.823
157.077 704.346	173.346 705.654
159.422 706.659 161.574 709.017	175.748 708.499 178.092 711.361
161.574 709.017 163.727 711.517	178.092 711.361 180.435 714.437
165.763 714.186	182.778 717.548
167.8 716.854 169.836 719.521	184.602 720.361 186.425 723.3
169.836 719.521 171.187 721.328	100.423 /23.3
172.538 723.3	

Valid/Invalid Surfaces



Method: bishop simplified

Error Codes:

Error Code -108 reported for 31 surfaces Error Code -109 reported for 866 surfaces Error Code -112 reported for 171 surfaces Error Code -114 reported for 109 surfaces Error Code -121 reported for 1 surface Error Code -124 reported for 48 surfaces Error Code -1000 reported for 19748 surfaces

Method: janbu corrected

Number of Valid Surfaces: 9129 Number of Invalid Surfaces: 21040

Error Code - 108 reported for 108 surfaces Error Code - 109 reported for 866 surfaces Error Code - 111 reported for 2 surfaces Error Code - 112 reported for 164 surfaces Error Code - 112 reported for 169 surfaces Error Code - 121 reported for 190 surfaces Error Code - 121 reported for 1 surface Error Code - 124 reported for 8 surfaces Error Code - 1000 reported for 19742 surfaces

Method: spencer

Number of Valid Surfaces: 8794 Number of Invalid Surfaces: 21375

Error Codes:

Error Code - 108 reported for 103 surfaces Error Code - 109 reported for 865 surfaces Error Code - 111 reported for 86 surfaces Error Code - 112 reported for 185 surfaces Error Code - 112 reported for 180 surfaces Error Code - 121 reported for 190 surfaces Error Code - 121 reported for 1 surface Error Code - 124 reported for 1 surface Error Code - 1000 reported for 19997 surfaces

NonCircular- Rear Abutment Right Method: bishop simplified

Number of Valid Surfaces: 9120 Number of Invalid Surfaces: 21047

Error Codes: Error Code -108 reported for 9 surfaces Error Code -109 reported for 1459 surfaces Error Code -112 reported for 175 surfaces Error Code -114 reported for 123 surfaces

Error Code -114 reported for 123 surfaces Error Code -121 reported for 7 surfaces Error Code -124 reported for 38 surfaces Error Code -1000 reported for 19236 surface Method: janbu corrected

Number of Valid Surfaces: 8961 Number of Invalid Surfaces: 21206

Error Codes:

Error Code -108 reported for 21 surfaces
Error Code -109 reported for 1459 surfaces
Error Code -101 reported for 3459 surfaces
Error Code -111 reported for 28 surfaces
Error Code -112 reported for 28 surfaces
Error Code -112 reported for 27 surfaces
Error Code -121 reported for 7 surfaces
Error Code -124 reported for 3 surfaces
Error Code -104 reported for 35 surfaces
Error Code -100 reported for 3932 surface

Method: spencer

Number of Valid Surfaces: 8422 Number of Invalid Surfaces: 21745

Error Codes:

Error Code -108 reported for 75 surfaces
Error Code -109 reported for 1459 surfaces
Error Code -111 reported for 47 surfaces
Error Code -111 reported for 23 surfaces
Error Code -112 reported for 23 surfaces
Error Code -121 reported for 13 surfaces
Error Code -121 reported for 7 surfaces
Error Code -124 reported for 38 surfaces
Error Code -1000 reported for 19773 surfaces

NonCircular- Rear Abutment Left

- -108 a Total driving moment or total driving force 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
 -109 a Solitype for slice base not located. This error should occur very rarely, if at all .It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region, even though the slip surface is wholly within the soil region.
 -111 a Fine coefficient M-Alpha = cos[alpha](Hardjaba)ara/phi)/Fi > 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
 -121 a Concave failure surface, only convex surfaces have been defined as being allowed.
 -124 a Solice has a swidth less than the minimum acceptable value.
 -1000 = No valid slip surface is generated

Slice Data

II I	
II I	
II I	
II I	
II I	
II I	
II I	
II I	
II I	
II I	
II I	



	1	S																										
Slice		dth We			Base	Base Cohesion	Base Friction	Shear Stress	Shear Strength	Base Normal	Pore Pressure	Effective Normal	Base Vertical	Effective Vertical	Slice		Weight	Angle of Slice	Base	Base Cohesion	Base Friction		Shear Strength	Base Normal	Pore Pressure	Effective Normal	Base Vertical	Effective Vertical
Number				[degrees]	Material	[psf]	Angle [degrees]	[psf]	[psf]	Stress [psf]	[psf]	Stress [psf]	Stress [psf]	Stress [psf]	Number	[ft]	[lbs]	Base [degrees]	Material	[psf]	[degrees]	[psf]	[psf]	Stress [psf]	[psf]	Stress [psf]	Stress [psf]	Stress [psf]
		6847 158 5578 89.		-28.3995 -31.4481	A-3a A-3a	0		42.0993 100.028	64.7672 153.887	96.0214 228.147	0	96.0214 228.147	73.2589 166.974	73.2589 166.974			130.605 112.255	-30.0725 -30.0725	A-3a A-4b	0		51.1508 108.563	66.3503 140.822	98.3686 225.362	0	98.3686 225.362	68.7503 162.501	68.7503 162.501
3 4		5887 480 3097 420		-31.4481 -30.7528	A-3a A-3a	0	34 34		205.536 255.197	340.181 470.27	35.4614 91.925	304.72 378.345	258.477 371.571	223.016 279.646			28.345 339.006	-30.0725 -30.0725	A-4b A-4b	0		127.049 145.402	164.801 188.608	266.387 331.868	2.64897 30.0326	263.738 301.835	192.821 247.675	190.172 217.642
5	1.13	3097 515 7536 126	5.469	-30.7528 -31.8031	A-3a A-3a	0	34	190.86 231.835	293.627 356.664	569.237 725.773	133.916 196.999	435.321 528.774	455.674 582.012	321.758 385.013	5	1.36875	474.608 610.21	-30.0725 -30.0725	A-4b A-4b	0	32	178.548	231.603 274.599	450.132	79.4883 128.944	370.643 439.45	346.746 445.815	267.257 316.871
7	1.21	1013 86	4.766	-32.4848	A-3a	0	34	274.507	422.312	889.227	263.125	626.102	714.45	451.325	7	1.36875	745.812	-30.0725	A-4b	0	32	244.84	317.594	686.654	178.4	508.254	544.883	366.483
8 9		1013 98: 1016 109		-32.4848 -32.7855	A-3a A-3a	0		303.833 334.835	467.429 515.124	1004.19 1123.26	311.203 359.561	692.99 763.7	810.744 907.595	499.541 548.034	8		881.405 1050.57	-30.0725 -30.0725	A-4b A-4b	0		277.986 327.515	360.59 424.836	804.918 957.191	227.855 277.31	577.063 679.881	643.954 767.547	416.099 490.237
10 11		1016 12: 9141 234		-32.7855 -28.216	A-3a A-3a	0		364.636 408.114	560.971 627.859	1239.87 1396.7	408.2 465.856	831.675 930.841	1005.01 1177.72	596.813 711.865	10 11		1907.03 2292.11	-19.1952 -19.1952	A-4b A-4b	0		369.741 457.3	479.609 593.187	1091.1 1315.91	323.562 366.611	767.533 949.295	962.372 1156.7	638.81 790.089
12	0.555	5979 746	6.591	-28.216	A-4b	0	32	433.211	666.469	1575.07	508.501	1066.57	1342.63	834.132	12	2.05278	3693.43	5.58186	A-4b	0	32	652.076	845.84	1735.5	381.876	1353.62	1799.23	1417.35
				-23.5826 -23.5826	A-4b A-4b	0		453.132 497.338	697.116 765.125	1650.69 1794.07	535.074 569.607	1115.62 1224.46	1452.88 1576.96	917.811 1007.36	13 14		3532.85 3740.02	5.58186 5.59769	A-4b A-4b	0		621.846 668.873	806.627 867.628	1660.23 1745.28		1290.87 1388.49	1721 1810.83	1351.65 1454.05
15 16		0517 32 0517 30		5.46752 5.46752	A-4b A-4b	0		673.637 625.433	1036.35 962.191	2241.18 2114.11	582.677 574.284	1658.5 1539.83	2305.65 2173.98	1722.98 1599.69	15 16		3908.02 4091.3	5.59769 5.60089	A-4b A-4b	0		666.308 685.085	864.301 888.658	1826.87 1913.71		1383.17 1422.15	1892.18 1980.89	1448.47 1489.33
17 18	1.40	0523 30 0523 31	78.31	4.53936 4.53936	A-4b A-4b	0	32	639.034 669.672	983.115 1030.25	2139.92 2208.39	566.607 559.645	1573.31 1648.74	2190.65 2261.56	1624.04 1701.91	17 18	2.06538	4305.62 4503.4	5.60089 9.12188	A-4b A-4b	0		710.806 714.137	922.022	2014.95	539.409 583.235	1475.54 1482.46	2084.66 2180.36	1545.25 1597.12
19	1.38	8839 32	27.72	9.54278	A-4b	0	32	675.255	1038.84	2211.37	548.882	1662.49	2324.89	1776	19	2.06544	4684.4	9.12188	A-4b	0	32	735.527	954.089	2149.9	623.033	1526.86	2268	1644.96
20 21		8839 325 8839 33		9.54278 9.54278	A-4b A-4b	0		680.553 693.059	1046.99 1066.23	2228.66 2281.98	553.125 575.652	1675.54 1706.33	2343.07 2398.49	1789.95 1822.84	20 21		4829.89 4983.42	11.7767 11.7767	A-4b A-4b	0		739.64 757.68	959.424 982.824	2195.07 2265.98	659.666 693.134	1535.4 1572.85	2349.27 2423.95	1689.6 1730.81
22		3981 164 4462 429		17.5223 17.5223	A-4b A-3a	0		663.932 716.999	1021.42 1103.06	2223.9 2233.11	589.279 597.76	1634.62 1635.35	2433.52 2459.49	1844.24 1861.73	22 23		5104.87 5197.72	17.3416 17.3416	A-4b A-4b	0		738.261 748.733	957.635 971.219	2252.48 2294.37	719.945 740.099	1532.53 1554.27	2483.01 2528.17	1763.06 1788.07
24	1.74	4462 435 3868 349	55.86	17.5223	A-3a	0	34	726.71 706.215	1118	2267.49	609.996	1657.5	2496.93	1886.94	24	1.56701	4015.87	20.0703	A-4b	0	32	740.406	960.418	2292.25	755.261	1536.99	2562.77	1807.51
25 26	1.3	3868 35	13.83	22.6347 22.6347	A-3a A-3a	0	34	710.382		2227.35 2237.83	616.597 617.562	1610.75 1620.27	2521.82 2534.04	1905.23 1916.47	26	1.56702	4053.51 4084.09	22.3748	A-4b A-4b	0		746.081 736.852	967.779 955.807	2302.95		1548.77 1529.61	2586.79 2606.27	1821.36 1832.94
27 28		8672 352 8672 354		23.099 23.099	A-3a A-3a	0		711.883 715.732	1095.19 1101.11	2241.8 2250.72	618.114 618.254	1623.69 1632.46	2545.43 2555.99	1927.32 1937.73			4107.52 698.224	22.3748 32.4948	A-4b A-4b	0		740.595 680.408	960.663 882.591	2316.36 2192.85	778.979 780.41	1537.38 1412.44	2621.23 2626.23	1842.25 1845.82
29 30		8668 355 8668 355		26.0084 26.0084	A-3a A-3a	0		702.673 704.512	1081.02 1083.85	2218.41 2217.43	615.736 610.563	1602.68 1606.87	2561.26 2561.18	1945.52 1950.61	29 30	1.46198	3815.99 3776.19	32.4948 32.4948	A-3a A-3a	0		718.257 713.597		2152.66 2128.41	771.376	1381.28 1372.32	2610.15 2582.93	1838.77 1826.84
31	1.66	6241 42	39.13	30.6157	A-3a	0	34	679.13	1044.8	2148.46	599.489	1548.97	2550.35	1950.86	31	1.59492	4067.52	34.1719	A-3a	0	34	696.496	903.46	2077.45	738.018	1339.43	2550.29	1812.27
32 33		6241 420 6229 410		30.6157 31.6033	A-3a A-3a	0		677.485 669.945	1042.27 1030.67	2127.75 2092.35	582.513 564.319	1545.24 1528.03	2528.66 2504.55	1946.15 1940.23	32 33		4006.83 3762.8	34.1719 40.0636	A-3a A-3a	0		689.885 640.519	894.884 830.849	2043.88 1920.78	717.166 689	1326.72 1231.78	2512.24 2459.45	1795.07 1770.45
34 35		6229 41: 6105 40		31.6033 36.9252	A-3a A-3a	0		667.475 632.812	1026.87 973.544	2067.3 1961.78	544.906 518.44	1522.39 1443.34	2477.99 2437.34	1933.08 1918.9	34 35		3659.52 3550.51	40.0636 41.3651	A-3a A-3a	0		628.931 607.961	815.818 788.616	1863.02 1785.33		1209.5 1169.17	2391.95 2320.66	1738.42 1704.51
36	1.66	6105 395	56.77	36.9252	A-3a	0	34	625.783	962.729	1912.22	484.921	1427.3	2382.5	1897.58	36	1.52999	3435.65	41.3651	A-3a	0	34	595.186	772.046	1721.5	576.9	1144.6	2245.59	1668.69
37 38	1.66		04.15	41.5047 41.5047	A-3a A-3a	0	34	590.515 579.404	891.379	1791.37 1718.7	444.501 397.18	1346.87 1321.52	2313.9 2231.4	1869.39 1834.22	38	1.51439		42.9462	A-3a A-3a	0	34	573.056	741.458 743.34	1634.12 1548.95	446.907	1099.25 1102.05	2166.14 2082.33	1631.28 1635.43
39 40				46.7687 46.7687	A-3a A-6a/A-	0 250		537.91 592.199	827.543 911.062	1578.82 1466.41	351.936 321.416	1226.88 1144.99	2151.01 2096.35	1799.07 1774.93			3014.82 2864.36	45.3652 45.3652	A-3a A-3a	0		557.123 555.883	722.672 721.064	1426.48 1328.38		1071.41 1069.02	1990.75 1891.4	1635.68 1632.03
				46.7721	6b A-6a/A-	250		584.388	899.046	1406.13	281.954	1124.18	2027.84	1745.88	41	0.199342	365.633	47.5104 47.5104	A-3a	0 250	34	540.493 616.686	701.101	1244.14		1039.42 952.515	1834.2 1773.44	1629.49 1625.76
				47.1249	6b	250		570.154		1306.52	220.27	1086.25	1920.61	1700.34				47.5162	6b									
					6b														6b	250		614.873		997.159		948.439	1668.56	1619.84
				48.1278	6b	250		551.766		1193.84	156.587	1037.25	1809.39	1652.81				47.5162	6b	250		611.416		940.674	0	940.674	1608.3	1608.3
44				53.8051	6b	250		497.447		963.001	70.4879	892.513	1642.8	1572.31	45	1.55638	2385.95	50.2453	A-6a/A- 6b	250	30	570.044	739.433	847.725	0	847.725	1533.02	1533.02
45	0.291	1091 430	0.981	53.6675	A-6a/A- 6b	250	30	473.541	728.514	837.264	8.45398	828.81	1481.15	1472.69	46	1.55638	2178.45	50.2453	A-6a/A- 6b	250	30	531.387	689.288	760.871	0	760.871	1399.69	1399.69
46	1.53	3862 204	144.53	53.6675	A-6a/A- 6b	250	30	437.92	673.714	733.895	0	733.895	1329.34	1329.34	47	2.32265	2809.09	53.9195	A-6a/A- 6b	250	30	453.833	588.689	586.627	0	586.627	1209.43	1209.43
47	1.82	2999 192	22.15	53.495	A-6a/A- 6h	250	30	369.493	568.443	551.558	0	551.558	1050.81	1050.81	48	2.32265	2216.76	54.8835		250	30	378.176	490.551	416.646	0	416.646	954.406	954.406
48	1.83	3002 13	72.45	53.2644	A-6a/A- 6h	250	30	295.498	454.606	354.39	0	354.39	750.317	750.317	49	2.32272	1411.94	54.9		250	30	283.654	367.942	204.282	0	204.282	607.881	607.881
49	1.91	1031 856	6.448	52.5365	A-6a/A-	250	30	222.088	341.669	158.775	0	158.775	448.587	448.587	50	2.32282	471.862	55.1041		250	30	172.848	224.21	-44.6694	0	-44.6694	203.141	203.141
50	1.9	9099 282	2.918	51.8156		250	30	447.000											6b									
								147.686	227.206	-39.4805	0	-39.4805	148.3	148.3														
					6b							-39.4805	148.3	148.3				Angle	Global		Query (janbu Base			actor: 1.324: Base		Effective	Base	Effective
						Minimum (-39.4805 actor: 1.574		-39.4805	148.3	148.3	Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base	Rase	Base Cohesion	Base Eriction	Shear Stress	Shear Strength	Base Normal	Pore Pressure	Effective Normal Stress	Base Vertical Stress	Effective Vertical Stress
						Minimum (-39.4805	148.3	148.3	Number	[ft]		of Slice	Base	Base Cohesion	Base Friction Angle [degrees]	Shear	Shear	Base Normal	Pore	Normal	Vertical	Vertical
						Minimum (-39.4805	148.3	148.3	Number	[ft] 1.71279 0.622834	[lbs] 117.755 101.211	of Slice Base [degrees] -32.7096	Base Material A-3a A-4b	Base Cohesion [psf] 0	Base Friction Angle [degrees] 34 32	Shear Stress [psf] 54.0167 113.739	Shear Strength [psf] 71.5257 150.607	Base Normal Stress [psf] 106.041 241.022	Pore Pressure [psf] 0	Normal Stress [psf] 106.041 241.022	Vertical Stress [psf] 71.3506 167.976	Vertical Stress [psf] 71.3506 167.976
						Minimum (-39.4805	148.3	148.3	Number 1 2 3 4	[ft] 1.71279 0.622834 0.206811 1.27122	[lbs] 9 117.755 1 101.211 1 40.4938 2 324.324	of Slice Base [degrees] -32.7096 -32.7096 -32.7096	Base Material A-3a A-4b A-4b A-4b	Base Cohesion [psf] 0 0 0	Base Friction Angle [degrees] 34 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153 154.948	Shear Strength [psf] 71.5257 150.607 177.637 205.173	Base Normal Stress [psf] 106.041 241.022 288.415 362.099	Pore Pressure [psf] 0 0 4.13719 33.7531	Normal Stress [psf] 106.041 241.022 284.278 328.346	Vertical Stress [psf] 71.3506 167.976 202.259 262.587	Vertical Stress [psf] 71.3506 167.976 198.122 228.834
						Minimum C						-39.4805	148.3	148.3	Number 1 2 3 4 5	1.71279 0.622834 0.206811 1.27122	[lbs] 117.755 101.211 40.4938	of Slice Base [degrees] -32.7096 -32.7096 -32.7096 -32.7096	Base Material A-3a A-4b A-4b	Base Cohesion [psf] 0 0	Base Friction Angle [degrees] 34 32 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153	Shear Strength [psf] 71.5257 150.607 177.637 205.173 252.54	Base Normal Stress [psf] 106.041 241.022 288.415	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971	Normal Stress [psf] 106.041 241.022 284.278	Vertical Stress [psf] 71.3506 167.976 202.259	Vertical Stress [psf] 71.3506 167.976 198.122
						Minimum (-39.4805	148.3	148.3	1 2 3 4 5 6	[ft] 1.71279 0.622834 0.206811 1.27122 1.27122 1.27122	[lbs] 117.755 101.211 40.4938 2 324.324 2 454.053	of Slice Base [degrees] -32.7096 -32.7096 -32.7096 -32.7096 -32.7096	Base Material A-3a A-4b A-4b A-4b A-4b	Base Cohesion [psf] 0 0 0 0	Base Friction Angle [degrees] 34 32 32 32 32 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153 154.948 190.72 226.492	Shear Strength [psf] 71.5257 150.607 177.637 205.173 252.54	Base Normal Stress [psf] 106.041 241.022 288.415 362.099 488.845	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971 135.641	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148	Vertical Stress [psf] 71.3506 167.976 202.259 262.587 366.36	Vertical Stress [psf] 71.3506 167.976 198.122 228.834 281.663
						Minimum (-39.4805	148.3	148.3	1 2 3 4 5 6 7 8 9	1.71279 0.622834 0.206811 1.27122 1.27122 1.27122 1.27122 1.27122	[lbs] 9 117.755 1 101.211 1 40.4938 2 324.324 2 454.053 2 583.782 2 713.511 2 843.214 9 979.611	of Slice Base [degrees] -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.699 -32.699	Base Material A-3a A-4b A-4b A-4b A-4b A-4b A-4b A-4b	Base Cohesion [psf] 0 0 0 0 0 0 0	Base Friction Angle [degrees] 34 32 32 32 32 32 32 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153 154.948 190.72 226.492 262.264 297.969 337.42	Shear Strength [psf] 71.5257 150.607 177.637 205.173 252.54 299.907 347.274 394.553 446.791	Base Normal Stress [psf] 106.041 241.022 288.415 362.099 488.845 615.592 742.341 868.934 1003.45	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971 135.641 186.585 237.518 288.442	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.756 631.416 715.013	Vertical Stress [psf] 71.3506 167.976 202.259 262.2587 366.36 470.133 573.909 677.648 786.843	Vertical Stress [psf] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 440.13 498.401
						Minimum (-39.4805	148.3	148.3	1 2 3 4 5 6 7 8 9 10 11	[ft] 1.71279 0.622834 0.206811 1.27122 1.27122 1.27122 1.27122 1.27122 2.26686 2.26686	[lbs] 9 117.755 1 01.211 40.4938 2 324.324 2 454.053 2 583.782 2 713.511 2 843.214 2 979.611 5 2206.85 6 2757.06	of Slice Base [degrees] -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.699 -32.699 -22.0466 -22.0466	Base Material A-3a A-4b A-4b A-4b A-4b A-4b A-4b A-4b A-4b	Base Cohesion [psf] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Base Friction Angle [degrees] 34 32 32 32 32 32 32 32 32 32 32 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153 154.948 190.72 226.492 226.492 262.644 297.969 337.42 374.75 484.881	Shear Strength [psf] 71.5257 150.607 177.637 205.173 252.54 299.907 347.274 394.553 446.791 496.222 642.05	Base Normal Stress [psf] 106.041 241.022 288.415 362.099 488.845 615.592 742.341 868.934 1003.45 1136.67	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971 135.641 186.585 237.518 288.442 342.545 399.83	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.756 631.416 715.013 794.121	Vertical Stress [psf] 71.3506 167.976 202.259 262.587 366.36 470.133 573.909 677.648 786.843 984.902 1230.96	Vertical Stress [psf] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 440.13 498.401 642.357 831.129
						Minimum (-39.4805	148.3	148.3	1 2 3 4 5 6 6 7 7 8 9 10 11 12	[ft] 1.71279 0.622834 0.206811 1.27122 1.27122 1.27122 1.27122 1.27122 2.26686 2.26686 1.70912	[lbs] 117.755 101.211 40.4938 324.324 454.053 5583.782 713.511 843.214 979.611 5206.85 2757.06	of Slice Base [degrees] -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.699 -32.699 -22.0466 -22.0466	Base Material A-3a A-4b A-4b A-4b A-4b A-4b A-4b A-4b A-4b	Base Cohesion [psf] 0 0 0 0 0 0 0 0 0 0	Base Friction Angle [degrees] 34 32 32 32 32 32 32 32 32 32 32 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153 154.948 190.72 226.492 262.264 297.969 337.42 374.75 484.881 679.389	Shear Strength [psf] 71.5257 150.607 177.637 205.173 252.54 299.907 347.274 394.553 446.791 496.222	Base Normal Stress [psf] 106.041 241.022 288.415 362.099 488.845 615.592 742.341 868.934 1003.45 1136.67	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971 135.641 186.585 237.518 237.518 242.545 399.83 425.872	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.756 631.416 715.013 794.121	Vertical Stress [psf] 71.3506 167.976 202.259 262.587 366.36 470.133 573.909 677.648 786.843 984.902	Vertical Stress [psf] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 440.13 498.401 642.357 831.129 1472.79
						Minimum (-39.4805	148.3	148.3	1 2 3 4 4 5 6 6 7 8 8 9 10 11 12 13 13 14	[ft] 1.71279 0.622834 0.206811 1.27122 1.27122 1.27122 1.27122 2.26686 1.70912 1.70905	[ibs] 117.755 101.211 40.4938 2324.324 2454.053 2583.782 2713.511 2843.214 2979.611 2206.85 2757.06 23249.29 3090.7 3200.63	of Slice Base [degrees] -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.699 -22.0466 -22.0466 2.79156 3.57976	## Base Material A-3a A-4b A-4b A-4b A-4b A-4b A-4b A-4b A-4b	Base Cohesion [psf] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Base Friction Angle [degrees] 34 32 32 32 32 32 32 32 32 32 32 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153 154.948 190.72 226.492 262.649 297.969 337.42 374.75 484.881 679.389 639.053 666.862	Shear Strength [psf] 71.5257 150.607 177.637 205.173 252.54 299.907 347.274 394.553 446.791 496.222 642.05 899.606 883.018	Base Normal Stress [psf] 106.041 241.022 288.415 362.099 488.845 615.592 742.341 868.934 1036.45 1136.67 1427.32 1865.54	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971 135.641 186.585 237.518 288.442 342.545 399.83 425.872 420.672 414.736	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.756 631.416 715.013 794.121 1027.49 1439.67	Vertical Stress [psf] 71.3506 167.976 202.259 262.587 366.36 470.133 573.909 677.648 786.843 984.902 1230.96 1898.67 1896.03 1869.58	Vertical Stress [psf] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 440.13 498.401 642.357 831.129 1472.79
						Minimum (-39.4805	148.3	148.3	1 2 3 3 4 4 5 5 6 6 7 7 8 8 9 100 111 12 13 13 14 15 5 16	[ft] 1.71279 0.622834 0.206811 1.27122 1.27122 1.27122 1.27122 2.26686 1.70912 1.70902 1.70909 1.86143	[ibs] 117.755 101.211 40.4938 324.324 2454.053 2583.782 713.511 843.214 2979.611 2206.85 2205.85 22757.06 3249.29 3090.7 3200.63 3360.35 3777.54	of Slice Base [degrees] -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.699 -32.699 -22.0466 -22.0466 2.79156 3.57976 3.57976 3.7058	Base Material A-3a A-4b A-4b A-4b A-4b A-4b A-4b A-4b A-4b	Base Cohesion [psf] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Base Friction Angle [degrees] 34 32 32 32 32 32 32 32 32 32 32 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153 154.948 190.72 226.492 262.264 297.969 337.475 484.881 679.389 639.636 666.862 712.658 691.042	Shear Strength [psf] 71.5257 150.607 177.637 205.173 252.54 299.907 347.274 394.553 446.791 496.220 899.606 846.196 883.018 943.659 915.037	Base Normal Stress [psf] 106.041 241.022 288.415 362.099 488.845 615.592 742.341 1003.45 1136.67 1427.32 1865.54 1774.87 1827.82 1868.934 1981.83	Pore Pressure [psf] 0 0.13719 33.7531 84.6971 135.641 186.585 237.518 288.442 342.545 399.83 425.872 420.672 414.7364 408.064 516.966	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.756 631.416 715.013 794.121 1027.49 1439.67 1354.2 1413.12 1510.17 1464.37	Vertical Stress [psf] 71.3506 167.976 202.259 262.587 366.36 470.133 573.909 677.648 786.843 984.902 1230.96 1898.67 1806.03 1869.58 1962.82 2026.03	Vertical Stress [psf] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 440.13 498.401 642.357 831.129 1472.79 1385.36 1454.84 1554.75 1509.06
						Minimum 6						-39.4805	148.3	148.3	1 2 3 4 5 5 6 6 7 7 8 8 9 9 10 11 12 13 14 15 16 17 18	[ft] 1.71275 0.622834 0.206811 1.27122 1.27122 1.27122 1.27122 2.26686 1.70912 1.70902 1.70902 1.86143 1.86144	[ibs] 117.755 101.211 40.4938 324.324 2 454.053 2 583.782 713.511 5 2206.85 6 2757.06 3 249.29 7 3909.7 7 3200.63 3 360.35 3 3777.54 5 3999.86 6 4145.22	of Slice Base [degrees] -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.699 -32.699 -32.699 -32.699 -32.699 -32.699 -32.79156 -3.57976 3.57976 3.57976 3.70058 3.70058 4.55966	Base Material A-3a A-4b A-4b A-4b A-4b A-4b A-4b A-4b A-4b	Base Cohesion [psf] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Base Friction Angle [degrees] 34 32 32 32 32 32 32 32 32 32 32 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153 154.948 190.72 226.492 262.264 297.969 337.42 374.75 484.881 679.389 639.053 666.862 712.658 691.042 714.317 733.292	Shear Strength [psf] 71.5257 150.607 177.637 205.173 252.54 299.907 347.274 394.553 446.791 496.222 642.05 899.606 846.196 843.659 915.037 945.856 970.981	Base Normal Stress [psf] 106.041 241.022 288.415 362.099 488.845 615.592 742.341 869.341 1003.45 1136.67 1427.32 1865.54 1774.87 1827.86 1918.23 1981.33 2077.66	Pore Pressure [psf] 0 4.13719 33.7531 84.6971 135.641 186.585 237.518 288.442 342.545 399.83 425.872 420.672 414.736 408.064 516.966 553.971 610.102	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.756 631.416 715.013 794.121 1027.49 1439.67 1354.2 1413.12 1510.17 1464.37 1513.69 1553.89	Vertical Stress [psf] 71.3506 167.956 202.259 262.587 366.36 470.133 573.909 677.648 786.843 984.902 1230.96 1898.67 1806.03 1869.58 1962.82 2026.03 2123.86 2222.47	Vertical Stress [psf] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 440.13 498.401 642.357 831.129 1472.79 1385.36 1454.84 1554.75 1599.06 1599.09 1612.37
						Minimum (-39.4805	148.3	148.3	Number 1 2 3 4 5 6 7 8 8 9 10 11 12 13 14 15 16 17 18 19 20	[ft] 1.71279 0.622834 0.206811 1.27122 1.27122 1.27122 1.27122 2.26688 1.70912 1.70903 1.70903 1.86143 1.86144 1.86144 2.10788	[ibs] 117.755 101.211 40.4938 2 324.324 2 454.053 2 583.782 2 713.511 5 2206.85 5 2757.06 3 249.29 2 3090.7 3 200.63 3 3777.54 3 3959.86 4 145.22 4 327.24 5 5080.32	of Slice Base [degrees] -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.699 -32.699 -22.0466 -2.9156 3.57976 3.57976 3.57976 4.55966	Base Material A-3a A-4b A-4b A-4b A-4b A-4b A-4b A-4b A-4b	Base Cohesion [psf] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Base Friction Angle [degrees] 32 32 32 32 32 32 32 32 32 32 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153 154.948 190.72 226.492 262.264 297.969 337.42 374.75 484.881 679.389 639.053 666.862 6712.658 691.042 714.317 733.292 757.118	Shear Strength [psf] 71.5257 150.607 177.637 205.173 252.54 299.907 347.274 394.553 446.791 496.222 642.05 899.606 883.018 943.659 915.037 945.856	Base Normal Stress [psf] 106.041 241.022 288.415 362.099 488.845 615.592 742.341 868.934 1003.45 1136.67 1427.32 1865.54 1774.87 1827.86 1918.23 1981.33 2077.66	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971 135.641 186.585 237.518 288.442 342.545 399.83 425.872 420.672 414.736 408.064 516.966 563.971 610.102 655.358	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.756 631.416 715.013 794.121 1027.49 1439.67 1354.2 1413.12 1510.17	Vertical Stress [psf] 71.3506 167.976 202.259 262.587 366.36 470.133 573.909 677.648 78.6.843 984.902 1230.96 1896.58 1962.82 202.6.03 2123.86	Vertical Stress [psf] 71.3506 167.956 198.122 228.834 281.663 334.492 387.324 440.13 498.401 642.357 831.129 1472.79 1385.36 1454.84 1554.75 1509.06 1559.89
						Minimum C						-39.4805	148.3	148.3	Number 1 2 3 4 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	[ft] 1.71275 0.622834 0.206811 1.27122 1.27122 1.27122 1.27122 2.26686 2.26688 1.70912 1.70902 1.70902 1.86143 1.86144 1.86144 2.10788	[ibs] 117.755 101.211 40.4938 24.344 2454.053 2583.782 2713.511 2843.214 2979.611 20206.85 2206.85 2206.85 3249.29 309.07 3200.63 3360.35 3777.54 3959.86 4145.22 4327.24 5580.32	of Slice Base [degrees] -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.699 -32.699 -22.0466 -22.0466 -22.0466 3.57976 3.57976 3.70058 3.70058 4.55966 4.55966 12.5068	Base Material A-3a A-4b A-4b A-4b A-4b A-4b A-4b A-4b A-4b	Base Cohesion [psf] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Base Friction Angle [degrees] 32 32 32 32 32 32 32 32 32 32 32 32 32	Shear Stress [psf] 54.0167 113.739 134.153 154.948 190.72 226.492 262.264 297.969 337.42 374.75 484.881 679.389 639.053 666.862 712.658 691.042 714.317 733.292 757.118 727.852 745.131	Shear Strength [psf] 71.5257 71.5257 7150.607 177.637 205.173 252.54 299.907 347.274 394.553 446.791 496.222 642.05 883.018 943.659 915.037 945.856 970.981 1002.53	Base Normal Stress [psf] 106,041 241,022 288,415 362,099 488,845 615,592 742,341 868,934 1136,67 1427,32 1865,54 1774,87 1827,86 1918,23 1981,33 2077,66 2163,99 2259,74	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971 135.641 186.585 237.518 288.442 342.545 39.543 425.872 420.672 414.736 408.064 516.966 563.971 610.102 655.358 694.265 726.824	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.756 631.416 715.013 794.121 1027.49 1439.67 1354.2 1413.12 1510.17 1464.37 1513.69 1553.69	Vertical Stress [psf] 71.3506 167.976 202.259 262.587 366.36 470.133 573.909 677.648 786.843 984.902 1230.96 1896.67 1806.03 1869.58 1962.82 2026.03 2123.86 2232.12	Vertical Stress [psf] 71.3506 167.76 198.122 228.834 281.63 334.492 387.324 440.13 498.401 642.357 831.129 1472.79 1385.36 1454.84 1554.75 1509.06 1559.89 1612.37 1664.76
						Minimum C						-39.4805	148.3	148.3	Number 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	[ft] 1.71275 0.622834 0.206811 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27123 1.70905 1.70905 1.70905 1.86143 1.86144 2.10785 2.10788 2.10788	[lbs] 117.755 101.211 40.4938 2324.324 2454.053 5583.782 773.511 2843.214 2979.611 2843.214 2979.613 3030.35 3360.35 3360.35 3377.54 33959.86 4145.22 4327.24 5580.32 5534.82 5534.82	of Slice Base [degres] -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.7096 -32.699 -22.0466 -2.79156 3.57976 3.57976 3.70058 3.70058 4.55966 4.55966 12.5068 12.5068 16.9495	## Base Material ## A-3a ## A-4b ## A-	Base Cohesion [psf] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Base Priction Angle [degrees] 34 32 32 32 32 32 32 32 32 32 32 32 32 32	Shear Stress [psf] 134.153 154.948 190.72 226.492 262.264 297.969 337.42 374.75 484.881 679.389 639.053 666.862 712.658 691.042 771.733.292 757.118 727.852 745.131 732.294	Shear Strength [psf] 71.5257 150.607 177.637 252.54 299.907 347.274 394.553 446.791 496.222 642.05 899.606 846.196 883.018 8943.659 915.037 945.856 970.981 1002.53 963.778 986.658 964.64	Base Normal Stress [psf] 106.041 241.022 288.415 362.099 488.845 615.592 742.341 868.934 1003.45 1136.67 1427.32 1865.54 1774.87 1827.86 2163.99 2259.74 2236.63 2305.81 2305.71	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971 135.641 186.55 824.545 399.83 425.872 420.672 414.736 408.064 516.967 610.102 655.358 694.265 725.3929 775.578	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.756 631.416 715.013 794.121 1027.49 1439.67 1354.2 1413.12 1510.17 1464.37 1513.69 1553.89 1604.38 1542.37 1578.98 1551.78	Vertical Stress [psf] 71.3506 167.967 202.259 262.587 366.36 470.133 573.909 677.648 786.843 984.902 1230.96 1898.67 1806.03 1869.58 1962.82 2026.03 21238.06 2222.47 2320.12 2398.08 2471.09 2528.89 2577.59	Vertical Stress [psf] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 440.13 498.401 642.557 831.129 1472.79 1385.36 1454.84 1554.75 1599.96 1793.82 1744.27 1744.27 1749.96
						Minimum C						-39.4805	148.3	148.3	Number 1 2 3 3 4 4 5 5 6 6 7 7 8 8 9 10 111 112 13 144 15 16 17 18 19 20 21 22 23 24 25 5	[ft] 1.71275 0.622834 0.206811 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.27122 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 1.2712 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1002.53 969.666 984.4 969.404 975.679	Base Normal Stress [pst] 106.041 241.022 288.415 362.099 488.845 615.592 742.341 868.934 1003.45 1136.67 1427.32 1865.54 1774.87 1827.86 1918.23 1981.33 2077.66 2163.99 2259.74 2236.63 2305.81 2305.81 2305.95	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971 135.641 186.585 237.518 288.442 342.545 399.83 425.872 420.672 414.736 408.064 516.966 553.578 694.265 726.824 753.929 775.578 790.781 799.5316	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.756 631.416 715.013 794.121 1027.49 1439.67 1354.2 1413.12 1510.17 1464.37 1513.69 1553.89 1557.37 1578.98 1575.37 1551.37 1551.37 1551.37 1561.41	Vertical Stress [psf] 71.350 167.976 202.259 262.587 366.36 470.133 573.909 677.648 786.843 984.902 1230.96 1898.67 1806.03 1869.58 1962.82 2026.03 2123.86 2222.47 2398.08 2471.09 2528.89 2577.52 2608.97 2629.49	Vertical Stress [psf] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 440.13 498.401 642.357 831.129 1472.79 1385.36 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488.845 615.592 742.341 868.934 1003.45 1136.67 1427.32 1865.54 1774.87 1827.86 1918.23 1961.33 2077.66 2163.99 2239.94 236.63 2305.81 2305.71 2350.95	Pore Pressure [psf] 0 0 4.13719 33.7531 84.6971 135.641 186.585 237.518 288.442 342.545 399.83 425.872 414.736 408.064 563.971 610.102 655.358 694.265 726.824 753.929 775.578 790.781 799.536 806.254	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 715.013 794.121 1027.49 1439.67 1354.2 1413.12 1510.17 1464.37 1513.69 1553.88 1542.37 1573.79 1551.37	Vertical Stress [psf] 71.3506 167.976 202.259 262.587 366.36 470.133 573.909 677.648 786.843 984.902 1230.96 2022.23 1230.86 2222.47 2320.12 2398.08 2471.09 2528.89 2577.52 2608.97	Vertical Stress [psf] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 40.13 498.401 642.357 831.129 1472.79 1385.36 1454.84 1554.75 1703.82 1744.27 1774.96 1811.94 1818.19 1829.96
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Friction Angle (degrees) 32 32 32 32 32 32 32 32 32 32 32 32 32	Shear Stress (psf) 54.0167 37.018 37.42 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 37.47 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741.791	Vertical Stress [pst] 113506 1679.76 (pst) 202.759 262.587 (pst) 262.588 (pst) 262.587 (pst) 262.587 (pst) 262.588	Vertical Stress [psr] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 440.13 498.401 642.557 831.129 1472.79 1385.36 1454.84 1554.75 1509.06 1559.89 1612.37 1664.76 1703.82 1744.27 1741.96 1837.47 1851.87 1751.87 1651.56 1651.54 1643.55 1651.54 1643.55 1651.53 1615.38 1603.55 1550.51 1394.66 1815.85 1550.51 1394.66
						Minimum (-39.4805	148.3	148.3	1	[ft] 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.71	[bs] 117.755 24.64 2.01 2.01 2.01 2.01 2.01 2.01 2.01 2.01	of Silice Base [degrees] 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.7096 32.70	## Base ## Material ## A-3a ## A-4b ##	Base Cohesion	Base Friction Angle (degrees) 34 32 32 32 32 32 32 32 32 32 32 32 32 32	Shear Stress (pr] 54.0167 (pr] 54.0167 (pr] 134.153 (pr] 137.155 (pr]	Shear Strength (ip. 17) 15257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257 171.5257	Base	Pore Pressure Pore Pressure Pore Pressure Pre	Normal Stress [psf] 106.041 241.022 284.278 328.346 404.148 479.951 555.76 631.416 715.013 794.121 1027.49 1439.67 1354.2 1413.12 1510.17 1464.37 1513.69 1557.37 1578.98 1551.78 1561.41 1537.59 1540.55 1534.69 1595.49 1506.33 1483.52 27 179.166.41 1537.59 1540.05 1534.69 1595.49 1506.33 1483.52 1418.78 1194.62 1167.27 1106.78 1101.99 1071.73 934.681 191.027 876.024 741.791 561.884 405.792 187.969	Vertical Stress [pst] 113506 1679.76 (pst) 262.587 (pst) 262.588 (pst) 2	Vertical Stress [psr] 71.3506 167.976 198.122 228.834 281.663 334.492 387.324 440.13 498.401 642.557 831.129 1472.79 1385.36 1454.84 1554.75 1509.06 1559.89 1612.37 1664.76 1703.82 1744.27 1749.96 1837.47 1851.87 1751.87 1651.56 1651.54 1643.55 1651.54 1643.55 1651.54 1643.55 1651.54 1643.55 1651.58 1653.55 1550.51 1394.66 1165.85 915 564.945
						Minimum (-39.4805	148.3	148.3	1	[ft] 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 1.7127 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														Slice Number	Width [ft]	Weight [lbs]	Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	[psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
L														1 2		40.1934 120.58	-18.7704 -18.7704	A-3a A-3a	0	34 34	25.368 76.1042	35.2083 105.625	52.1985 156.595	0	52.1985 156.595	43.5771 130.731	43.5771 130.731
			Angle	G		num Query (Base		Safety Facto	or: 1.6835 Base		Effective	Base	Effective	3		61.7498	-18.7704	A-3a	0		110.426	153.26	227.217	0	227.217 278.336	189.689	189.689
Slice Number	Width [ft]	Weight	of Slice Base	Base Material	Base Cohesion	Friction Angle		Shear Strength	Normal Stress	Pore Pressure	Normal Stress	Vertical Stress	Vertical Stress	5		191.26 229.312		A-4b A-4b	0		125.315 154.537	173.924 214.482	278.336 354.78	0 11.5373	278.336 343.243	235.748 302.261	235.748 290.723
			[degrees]		[psf]	[degrees]	[psf]	6		803.872		A-4b	0		189.591	263.133	473.354	52.2536	421.1	408.921	356.668						
1		9 61.8945 9 185.684		A-3a A-3a	0		28.7487 86.2465	48.3985 145.196	71.7538	0	71.7538 215.261	59.3838 178.151	59.3838 178.151	8		522.518 602.905		A-4b A-4b	0		227.263 252.379	315.419 350.277	600.788 685.744	96.0118 125.184	504.776 560.56	523.552 599.973	427.54 474.789
3		19 88.1202		A-3a	-		117.196	197.3	292.509	0	292.509	247.161	247.161	9	1.7946	907.388	-18.7704	A-4b	0	32	281.319	390.443	783.636	158.799	624.837	688.029	529.23
4		31 276.088 31 353.586		A-3a A-3a		-	136.802	230.306 268.953	356.716 444.578	15.2747 45.8378	341.442 398.74	303.782 382.761	288.508 336.923	10 11		1096.56 1377.78		A-4b A-4b	0		336.582 385.928	467.142 535.63	944.44 1085.99	196.857 228.801	747.583 857.188	830.052 995.338	633.195 766.537
6		55 573.961		A-3a			180.639	304.106	530.84		450.856	464.667	384.683	12	1.76228	1642.12	-13.2187	A-4b	0	32	471.227	654.016	1301.27	254.631	1046.64	1190.59	935.956
7		55 698.711		A-3a			208.143		637.216		519.502	560.967	443.253	13		2856.72 2789.71		A-4b A-4b	0		629.455	873.621 853.449	1662.31 1623.38	264.222	1398.09	1697.98	1433.76
9	3.301 1.650	16 1766 34 1055.87		A-3a A-3a			246.086 261.882	414.285 440.878	787.648 879.118		614.201 653.63	699.561 801.967	526.114 576.479	15	1.87978	2931.41	3.54859	A-4b	0	32	653.164	906.527	1701.36	250.612	1450.74	1741.86	1491.25
10		34 1255.42		A-3a			318.087	535.5		255.836	793.91	956.037	700.201	16 17		3112.19	3.54859 6.943	A-4b A-4b	0		705.068 639.282	978.564 887.259	1809.37 1783.5	243.338	1566.03 1419.91	1853.09 1861.35	1609.76 1497.76
11		5 1461.54 5 1650.94		A-3a A-3a	-	-	345.304			279.847 297.522	861.839 996.965	1080.77 1224.02	800.919 926.493	18		3401.56		A-4b A-4b	0	32		917.957	1873.39	404.358	1419.91	1953.94	1549.58
13	1.227	75 2157.03	8.40908	A-3a	0		589.43		1771.85	300.697	1471.15	1858.98	1558.28	19		3530.52		A-4b	0		665.268	923.325	1920.95	443.321	1477.63	2020.6	1577.28
14		75 1968.31 78 1858.34		A-3a A-3a			531.456 531.329			289.371 278.323	1326.46 1326.14	1694.4 1683.01	1405.02 1404.69	20 21		3682.5 2968.36		A-4b A-4b	0		685.075 643.553	950.815 893.187	2002.1 1938.63	480.477 509.231	1521.62 1429.4	2104.71 2096.41	1624.23 1587.17
16		8 1907.33		A-3a			553.078	931.106	1647.97		1380.42	1729.73	1462.18	22		3035.78		A-4b	0		654.064	907.775	1982.33	529.584	1452.75	2142.68	1613.1
17		78 1965.22 78 2018.21	8.40908 8.40908	A-3a A-3a	-		577.942 601.093	972.965 1011.94		256.778 246.005	1442.48 1500.26	1784.69 1835.12	1527.92 1589.12	23 24		3101.73 3165.71		A-4b A-4b	0		658.082 667.926	913.352 927.014	2011.11	549.439 568.796	1461.67 1483.53	2179.67 2223.41	1630.23 1654.61
19		57 3751.24		A-3a			608.91	1025.1		262.698	1519.78	1872.49	1609.79	25	1.45479	3223.09	16.0557	A-4b	0		658.318	913.679	2048.91	586.715	1462.19	2238.37	1651.66
20 21		29 2853.46 29 2944.94		A-3a A-3a			609.344	1025.83 1048.58	1813.99 1871.41		1520.86 1554.58	1925.7 1985.6	1632.57 1668.77	26 27		3276.06 3325.42		A-4b A-4b	0		665.997 658.382	924.337 913.768	2082.44 2080.82	603.197 618.488	1479.25 1462.33	2274.12 2287.57	1670.92 1669.09
21		29 2944.94 37 3027.12		A-3a A-3a			605.601	1048.58	1849.01		1511.52	1985.6	1660.64	28	1.45473	3371.44	17.4339	A-4b	0	32	664.979	922.924	2109.57	632.588	1476.98	2318.4	1685.81
23		37 3099.69		A-3a A-3a			616.21		1893.09		1537.99	2044.82	1689.72	29 30	0.0340622	79.4818 4445.13		A-4b A-3a	0		590.894 636.322	820.102 883.151	1952.08 1949.18	639.642 639.855	1312.44 1309.32	2227.35 2245.61	1587.7 1605.75
24 25		57 3164.24 57 3219.56		A-3a A-3a	-		599.964	1010.04 1023.92	1867.37 1900		1497.44 1518.02	2049.53 2084.66	1679.6 1702.68	31		4455.15		A-3a	0		638.229	885.798	1953.52	640.272	1313.25	2250.84	1610.57
26		73 3265.11		A-3a	-		587.247	988.63	1856.56		1465.7	2073.47	1682.61	32 33		4518.54 4510.43		A-3a A-3a	0		619.528 619.865	859.843 860.311	1913.08 1909.43	638.31 633.968	1274.77 1275.47	2226.2 2222.73	1587.89 1588.76
27		73 3300.65 97 3330.65		A-3a A-3a			593.074 581.886	998.44 979.605	1876.79 1852.61	396.543 400.286	1480.25 1452.32	2095.85	1699.31 1690.65	34		4488.24	29.5322	A-3a	0	34	590.47	819.513	1840.93	625.949	1214.98	2175.44	1549.49
29	1.551	97 3354.09	22.2726	A-3a	0	34	586.377	987.165	1865.61	402.083	1463.53	2105.78	1703.69	35		4451.7		A-3a A-3a	0		588.591	816.906	1825.37	614.252	1211.11	2158.81	1544.56 1487.79
30		L5 3369.94 L5 3377.41		A-3a A-3a			569.368	958.531 963.366	1822.39	401.31 397.967	1421.08 1428.25	2085.8 2090.96	1684.49 1692.99	36 37		4388.29 4311.78		A-3a A-3a	0		548.881 544.332	761.792 755.479	1726.77 1695.35	597.369 575.302	1129.41 1120.04	2085.16 2050.76	1487.79
32		34 2499.76		A-3a			525.057	883.934	1700.6		1310.49	2015.73	1625.62	38		8409.13		A-3a	0		511.42	709.8	1586.45	534.132	1052.32	1953.53	1419.39
33 34		34 2481.06		A-3a		-	524.579	883.129	1687.04		1309.29	2001.88	1624.14	39 40		4037.94 3874.2		A-3a A-3a	0	34 34	494.026 508.64	685.659 705.941	1424.86 1353.58	408.324 306.976	1016.53 1046.6	1835.15 1776.01	1426.82 1469.03
35		91 2460.14 91 2436.68		A-3a A-3a			514.766 513.825		1649.15 1632.37	349.917	1284.8 1282.45	1972.87 1955.5	1608.53 1605.59	41	0.976302	1865.2	43.7774	A-3a	0	34	482.368	669.479	1219.66	227.114	992.545	1681.87	1454.75
36 37		14 2408.5		A-3a A-3a			493.691		1565.43 1541.82		1232.2	1906.86	1573.63	42	0.85886	1595.57	43.7774	A-6a/A- 6h	250	30	579.978	804.952	1133.46	172.249	961.208	1689.2	1516.95
		14 2374.62 72 1043.44		A-3a A-3a			491.822 472.098	827.983 794.777	1541.82		1227.53 1178.3	1881.96 1835.68	1567.67 1536.13	43	1.83805	3268.29	44.8932		250	30	578.475	802.865	1047.03	89.4392	957.59	1623.35	1533.91
39	1.776	11 3554.04	37.1599	A-6a/A-		30	541.864	912.228	1423.02	276.004	1147.01	1833.72	1557.71	44	0.437235	745.152	49.8233	6b A-6a/A-	250	30	543.73	754.643	890.217	16.1494	874.067	1534.17	1518.02
40	1.172	51 2272.74	44.6024	6b A-6a/A-		30	488.999	823.23	1230.18	237.31	992.866	1712.43	1475.12					6b									
	4.470			6b			405.033	047.400	4470.70	405 474	002.202	4657.46	4450.00	45	1.96505	3151.86	49.8233	A-6a/A- 6b	250	30	525.231	728.968	829.598	0	829.598	1451.64	1451.64
41	1.1/2	51 2191.08	44.6024	A-6a/A- 6b		31.	485.3//	817.133	11/8./8	196.474	982.303	1657.46	1460.99	46	2.3435	3325.04	50.6871	A-6a/A- 6b	250	30	474.951	659.184	708.728	0	708.728	1288.74	1288.74
42	1.076	22 1931.4	47.6065	A-6a/A-	250	30	462.033	777.833	1067.88	153.65	914.232	1573.99	1420.34	47	2.34335	2810.93	52.702		250	30	410.819	570.175	554.559	0	554.559	1093.87	1093.87
43	1.076	22 1847.18	47.6065			30	458.17	771.329	1011.81	108.839	902.968	1513.68	1404.84	48	2 2422	2088.98	53.0107	6b	250	20	220 705	471.601	383.825	0	383.825	834,923	834.923
	1 000	79 3003 51	40 274	6b A-6a/A-			420 027	740.617	902 007	43.2135	849 774	1403.98	1360.77	48	2.3433	2088.98	53.0107	A-6a/A- 6b	250	30	339./95	4/1.601	383.825	U	383.825	834.923	834.923
				6b		-								49	1.82367	966.813	57.0394	A-6a/A- 6h	250	30	244.559	339.424	154.886	0	154.886	532.042	532.042
45	0.2639	16 384.355	49.274	A-6a/A- 6b		30	424.345	714.384	804.335	0	804.335	1297.23	1297.23	50	1.82348	326.939	58.185	A-6a/A-	250	30	169.866	235.757	-24.6699	0	-24.6699	249.136	249.136
46	2.036	88 2595.82	52.6493	A-6a/A-	250	30	369.134	621.437	643.349	0	643.349	1127.02	1127.02					6b									
47	2.036	21 1932.8	52.6493	6b A-6a/A-		30	305.376	514.101	457.438	0	457.438	857.567	857.567														
48	2.036	7 1269.95	52.6493	6b A-6a/A-		30	241.624	406.774	271.54	0	271.54	588.136	588.136														
49	1.350	3 473,881	53.2132	6b A-6a/A-	250	3.0	186.985	314.789	112.219	0	112.219	362.286	362.286														
				6b																							
50	1.351	07 162.516	55.5828	A-6a/A- 6b		30	139.197	234.337	-27.1284	0	-27.1284	176.032	176.032														

Interslice Data





Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]	Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Ang [degrees
1	101.077	697.1	0	0	0	1	105.086	688.7	0	0	
2	103.245	695.928	203.792	0	0	2	106.986	687.6	205.377	0	
3	103.781	695.6	332.043	0	0	3	107.677	687.2	370.517	0	
4	105.64	694.463	966.886	0	0	4	107.824	687.115	411.868	0	
5	106.771	693.79	1470.78	0	0	5	109.193	686.322	873.913	0	
6	107.902	693.117	2069.51	0	0	6	110.561	685.53	1475.06	0	
7	110.077	691.768	3552.41	0	0	7	111.93	684.737	2215.3	0	
8	111.287	690.998	4569.45	0	0	8	113.299	683.945	3094.64	0	
9	112.497	690.227	5710.51	0	0	9	114.668	683.152	4113.07	0	
10	113.708	689.448	6990.9	0	0	10	116.036	682.36	5319.98	0	
11	114,918	688.668	8398.21	0	0	11	118.018	681.67	6805.38	0	
12	116.909	687.6	10702.6	0	0	12	120	680.98	8619.39	ō	
13	117.465	687.302	11413.1	0	0	13	122.052	681.18	9609.78	0	
14	118.733	686.748	12900.5	0	0	14	124.105	681.381	10553.2	0	
15	120.001	686.195	14523.3	0	0	15	126.17	681.583	11581.4	0	
16	121.406	686.329	15167.6	0	0	16	128.236	681.786	12587.8	0	
	122.406			0							
17		686.464	15761.3		0	17	130.301	681.988	13615.1	0	
18	124.216	686.575	16419.8	0		18	132.367	682.191	14675.1		
19	125.621	686.687	17113.6	0	0	19	134.432	682.523	15465	0	
20	127.01	686.92	17534.1	0	0	20	136.497	682.854	16271.2	0	
21	128.398	687.154	17958	0	0	21	138.553	683.283	16851	0	
22	129.787	687.387	18386.8	0	0	22	140.609	683.711	17437.5	0	
23	130.461	687.6	18360.6	0	0	23	142.665	684.353	17509.2	0	
24	132.205	688.151	18380.3	0	0	24	144.721	684.995	17575.6	0	
25	133.95	688.702	18398.1	0	0	25	146.288	685.568	17423.5	0	
26	135.337	689.28	18088.6	0	0	26	147.855	686.141	17267.6	0	
27	136.723	689.858	17778.8	0	0	27	149.422	686.786	16936.7	0	
28	138.11	690.45	17439.2	0	0	28	150.989	687.431	16603.1	0	
29	139.497	691.041	17099.6	0	0	29	151.255	687.6	16412.6	0	
30	140.884	691.718	16572.2	0	0	30	152.717	688.531	15458.1	0	
31	142.27	692.394	16048	0	0	31	154.179	689.462	14519.4	0	
32	143.933	693.378	15062.4	0	0	32	155.774	690.545	13380.9	0	
33	145.595	694.362	14094.5	0	0	33	157.369	691.628	12268.2	0	
34	147.257	695.385	13067.1	0	0	34	158.899	692.915	10776.7	0	
35	148.92	696.407	12061.3	0	0	35	160.429	694.201	9341.88	0	
36	150.581		10662.6	0	0	36	161.959	695.548		0	
		697.656							7866.87		
37	152.242	698.904	9314.12	0	0	37	163.489	696.896	6458.3	0	
38	153.902	700.373	7661.85	0	0	38	165.003	698.305	5020.59	0	
39	155.562	701.842	6097.9	0	0	39	166.517	699.715	3705.11	0	
40	156.651	703	4855	0	0	40	168.032	701.249	2360.83	0	
41	157.101	703.479	4418.68	0	0	41	169.546	702.782	1165.14	0	
42	158.64	705.117	3015.02	0	0	42	169.746	703	1002.13	0	
43	160.179	706.774	1726.11	0	0	43	171.221	704.61	140.139	0	
44	161.696	708.466	542.449	0	0	44	172.651	706.172	-537.742	0	
45	163.525	710.966	-956.098	0	0	45	172.89	706.433	-636.978	0	
46	163.816	711.362	-1149.77	0	0	46	174.446	708.304	-1335.89	0	
47	165.355	713.454	-2011.94	0	0	47	176.002	710.175	-1932.46	0	
48	167.185	715.927	-2700.18	0	0	48	178.325	713.362	-2748.19	0	
49	169.015	718.379	-3028.85	0	0	49	180.648	716.665	-3245.9	0	
50	170.925	720.872	-3000.77	0	0	50	182.97	719.97	-3262.18	0	
51	172.835	723.3	0	0	0	51	185.293	723.3	0	0	
		imum Query (janbu co						imum Query (janbu co			
Slice	X	Υ	Interslice	Interslice	Interslice	Slice	X	Y	Interslice	Interslice	Intersli
umber		coordinate - Bottom	Normal Force	Shear Force	Force Angle	Number		coordinate - Bottom	Normal Force		Force Ar
	[ft]	[ft] 697.1	[lbs] 0	[lbs] 0	[degrees]		[ft]	[ft] 688.7	[lbs] 0	[lbs]	[degree
1	100.657				-	1	105.294				
2	102.952	695.6	345.556	0	0	2	107.007	687.6	216.1	0	
					-						

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]	Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	100.657	697.1	0	(103)	(degrees)	1	105.294	688.7	0	(103)	[uegrees]
2	102.952	695.6	345.556	0	0	2	107.007	687.6	216.1	0	0
3	104.41	694.647	882.805	0	0	3	107.63	687.2	388.66	0	0
4	106.287	693.465	1822.07	0	0	4	107.836	687.067	456.791	0	0
5	108.164	692.283	3063.5	0	0	5	109.108	686.251	964.15	0	0
6	109.64	691.353	4251.69	0	0	6	110.379	685.434	1623.87	0	0
7	111.115	690.424	5626.66	0	0	7	111.65	684.618	2435.95	0	Ċ
8	112.591	689.494	7188.4	0	0	8	112.921	683.802	3400.38	0	0
9	114.067	688.565	8936.92	0	0	9	114.193	682.985	4516.68	0	Ċ
10	115.667	687.6	10972	0	0	10	115.464	682.169	5796.66	0	C
11	117.027	686.78	12917.1	0	0	11	117.731	681.251	7753.33	0	Ċ
12	118.513	686.057	14944.7	0	0	12	119.997	680.333	10245.2	0	C
13	119.999	685.333	17207	0	0	13	121.707	680.417	11337.9	0	C
14	121.421	685.301	18386.3	0	0	14	123,416	680.5	12364.1	0	Ċ
15	122.843	685.269	19493.4	0	0	15	125.125	680.607	13393.8	0	C
16	124.265	685.251	20583.6	0	0	16	126.834	680.714	14498	0	0
17	125.687	685.234	21729.1	0	0	17	128.695	680.834	15642.2	0	0
18	127.172	685.344	22620.4	0	0	18	130.557	680.955	16821.4	0	C
19	128.656	685.453	23523.1	0	0	19	132.418	681.103	17967.5	0	0
20	130.137	685.607	24314.9	0	0	20	134.28	681.252	19147	0	C
21	131.618	685.761	25121.1	0	0	21	136.388	681.719	19750.4	0	C
22	133.368	686.249	25235.1	0	0	22	138.495	682.187	20360.7	0	0
23	135.117	686.737	25348.1	0	0	23	140.603	682.829	20538.8	0	Ċ
24	136,461	687.169	25282.4	0	0	24	142.711	683,472	20713	0	C
25	137.806	687.6	25215.3	0	0	25	144.049	683.959	20623.9	0	Ċ
26	138.615	687.86	25223.4	0	0	26	145.386	684.446	20532.4	0	Ċ
27	140.365	688.68	24561.9	0	0	27	146,724	684.999	20280	0	Ċ
28	142.116	689.501	23903.9	0	0	28	148.061	685.552	20025.9	0	Ċ
29	145.616	691.28	22260.5	0	0	29	149.399	686.136	19695.2	0	C
30	146.937	692.169	21140.5	0	0	30	150.736	686.72	19363.5	0	C
31	148.258	693.058	20040.6	0	0	31	152.517	687.6	18678.9	0	0
32	149.578	693.994	18860.3	0	0	32	153.412	688.042	18388.8	0	C
33	150.899	694.93	17704.8	0	0	33	155.062	689.024	17485	0	0
34	152.221	696.11	16093.6	0	0	34	156.712	690.006	16594.4	0	C
35	153.542	697.291	14539.1	0	0	35	158.363	691.265	15154.6	0	Ċ
36	154.86	698.587	12841.9	0	0	36	160.013	692.525	13759.5	0	C
37	156.178	699.883	11220.7	0	0	37	161.616	693.993	12018.2	0	0
38	157.323	701.091	9747.12	0	0	38	163.219	695.461	10358.6	0	Ċ
39	158.468	702.3	8344.29	0	0	39	164.841	697.069	8577.63	0	C
40	159.106	703	7556.78	0	0	40	166.463	698.676	6952.26	0	0
41	160.758	704.813	5858.48	0	0	41	167.953	700.259	5468.26	0	0
42	162.103	706.478	4410.86	0	0	42	169.443	701.842	4144.56	0	0
43	163.448	708.143	3127.71	0	0	43	170.458	703	3251.32	0	C
44	164.764	709.982	1938.71	0	0	44	172.113	704.888	2284.26	0	C
45	166.079	711.821	1018.58	0	0	45	173.199	706.172	1747.76	0	0
46	166.591	712.55	727.987	0	0	46	174.383	707.572	1248.21	0	0
47	168.035	714.604	87.3369	0	0	47	176.674	710.491	343.997	0	C
48	169.814	717.136	-376.656	0	0	48	178.957	713.67	-377.445	0	C
49	171.595	719.669	-480.821	0	0	49	181.24	716.848	-769.741	0	0
50	172.871	721.484	-333.88	0	0	50	183.523	720.027	-702.739	0	0
	174.146	723.3	0	0	0	51	185.806	723.3	0	0	0

Global Minimum Query (spencer) - Safety Factor: 1.6835 Global Minimum Query (spencer) - Safety Factor: 1.3879

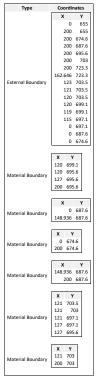


Slice	x	Y	Interslice	Interslice	Interslice	Slice	х	Y	Interslice	Interslice	Interslice
Number		coordinate - Bottom				Number		coordinate - Bottom			Force Angle
	[ft] 100.821	[ft] 697.1	[lbs]	[lbs] 0	[degrees]		[ft] 101.7	[ft] 688.7	[lbs]	[lbs]	[degrees]
1 2	100.821	696.447	90.4531	28.1969	0 17.3138	1 2	103.076	688.232	59.2993	19.7522	18.4226
3	102.338	695.794	361.813	112.787	17.3136	3	103.076	687.765	237.197	79.0089	18.4226
4	104.357	695.6	477.59	148.879	17.3137	4	104.432	687.6	328.3	109.355	18.4226
5	104.557	695.11	825.471	257.323	17.3138	5	106.114	687.2	587.128	195.569	18.4226
6	105.823	694.62	1245.45	388.241	17.3136	6	107.203	686.83	886.647	295.336	18.4226
7	108.54	694.016	1864.57	581.24	17.3137	7	107.203	685.895	1850.84	616.504	18.4226
8	110.19	693.411	2593.41	808.441	17.3138	8	111.33	685.427	2444.34	814.195	18.4226
9	113.491	692.229	4336.51	1351.82	17.3138	9	112.705	684.96	3112.1	1036.62	18.4226
10	115.142	691.743	5196.38	1619.86	17.3137	10	114.5	684.35	4094.9	1363.99	18.4226
11	116.793	691.257	6232.03	1942.7	17.3137	11	116.294	683.74	5274.95	1757.05	18.4226
12	118.398	690.974	7109.8	2216.33	17.3137	12	118.057	683.326	6404.61	2133.34	18.4226
13	120.004	690.69	8117.77	2530.54	17.3137	13	119.819	682.912	7773.71	2589.37	18.4226
14	121.232	690.872	8519.85	2655.89	17.3138	14	121.699	683.019	8779.86	2924.51	18.4226
15	122.459	691.053	8879.08	2767.87	17.3138	15	123.579	683.125	9762.83	3251.94	18.4226
16	123.627	691.226	9222.58	2874.95	17.3138	16	125.458	683.242	10792.3	3594.85	18.4226
17	124.795	691.399	9583.97	2987.6	17.3138	17	127.338	683.359	11906.8	3966.07	18.4225
18	125.963	691.571	9965.54	3106.55	17.3138	18	129.218	683.587	12700.2	4230.35	18.4226
19	127.131	691.744	10366	3231.39	17.3138	19	131.097	683.816	13514.6	4501.63	18.4226
20	129.256	692.058	11100.2	3460.26	17.3138	20	132.961	684.095	14218.1	4735.95	18.4226
21	130.808	692.342	11529.6	3594.11	17.3138	21	134.824	684.374	14935.8	4975.02	18.4226
22	132.359	692.627	11963.6	3729.41	17.3138	22	136,279	684.731	15180.6	5056.56	18.4226
23	133.91	693.009	12196.9	3802.11	17.3137	23	137.734	685.088	15425.1	5138.01	18.4226
24	135.462	693.391	12429.7	3874.69	17.3137	24	139.188	685.46	15633.1	5207.29	18.4226
25	137.013	693.862	12480.9	3890.65	17.3137	25	140.643	685.833	15840.1	5276.22	18.4225
26	138.565	694.333	12529.5	3905.81	17.3138	26	142.098	686.252	15939.9	5309.49	18.4226
27	140.117	694.906	12376.7	3858.16	17.3137	27	143,553	686.67	16036.9	5341.8	18.4226
28	141.668	695.479	12221.2	3809.72	17.3138	28	145.008	687.127	16044.1	5344.19	18.4226
29	143.22	696.115	11946.7	3724.14	17.3138	29	146,462	687.584	16047.8	5345.41	18.4226
30	144,772	696.751	11670.9	3638.15	17.3137	30	146,496	687.6	16036.9	5341.8	18.4226
31	146.324	697.469	11246	3505.7	17.3138	31	148,399	688.486	15519.9	5169.59	18.4226
32	147.877	698.187	10822.8	3373.79	17.3138	32	150.302	689.373	15002.7	4997.32	18.4226
33	149.028	698.878	10251.9	3195.83	17.3138	33	152.231	690.348	14332.5	4774.06	18.4226
34	150.18	699.569	9689.87	3020.61	17.3138	34	154.161	691.323	13666.5	4552.21	18.4225
35	151.332	700.294	9088.18	2833.05	17.3138	35	156.09	692.416	12793.5	4261.43	18.4226
36	152.484	701.018	8497.56	2648.94	17.3138	36	158.02	693.509	11933.9	3975.11	18.4226
37	153.636	701.815	7819.02	2437.42	17.3138	37	159.946	694.767	10819.3	3603.83	18.4225
38	154.788	702.612	7157.13	2231.09	17.3138	38	161.873	696.025	9735.41	3242.81	18.4226
39	155.3	703	6825.3	2127.64	17.3137	39	165.761	698.816	7296.22	2430.33	18.4226
40	157.077	704.346	5872.06	1830.49	17.3138	40	167.717	700.44	5948.15	1981.29	18.4226
41	158.249	705.503	5022.84	1565.76	17.3137	41	169.673	702.064	4744.42	1580.34	18.4226
42	159.422	706.659	4228.81	1318.24	17.3137	42	170.649	703	4074.37	1357.15	18.4226
43	160.498	707.838	3467.15	1080.81	17.3138	43	171.508	703.823	3639.69	1212.36	18.4226
44	161.574	709.017	2767.44	862.691	17.3138	44	173.346	705.654	2785.63	927.877	18.4226
45	163.463	711.211	1639.24	510.999	17.3138	45	173.783	706.172	2562.4	853.518	18.4226
46	163.727	711.517	1504.65	469.042	17.3137	46	175.748	708.499	1663.83	554.213	18.4226
47	165.763	714.186	539.743	168.254	17.3138	47	178.092	711.361	748.588	249.35	18.4226
48	167.8	716.854	-58.8935	-18.3588	17.3138	48	180.435	714.437	5.29092	1.76237	18.4226
49	169.836	719.521	-291.353	-90.8233	17.3138	49	182.778	717.548	-392.492	-130.737	18.4226
50	171.187	721.328	-241.494	-75.2807	17.3138	50	184.602	720.361	-382.102	-127.276	18.4226
51	172.538	723.3	0	0	0	51	186.425	723.3	0	0	0
					•						

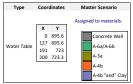
Entity Information

Group: NonCircular- Rear Abutment Left 🔷

Shared Entities



Scenario-based Entities



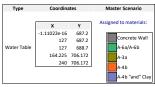


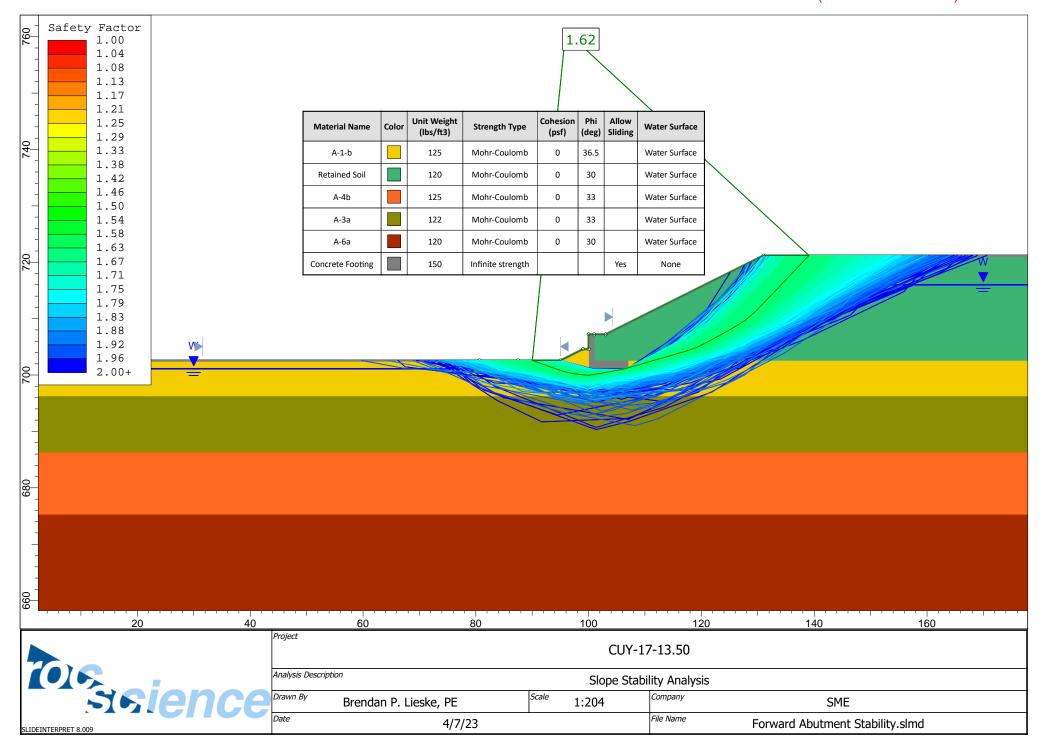
Group: NonCircular- Rear Abutment Right 🔷

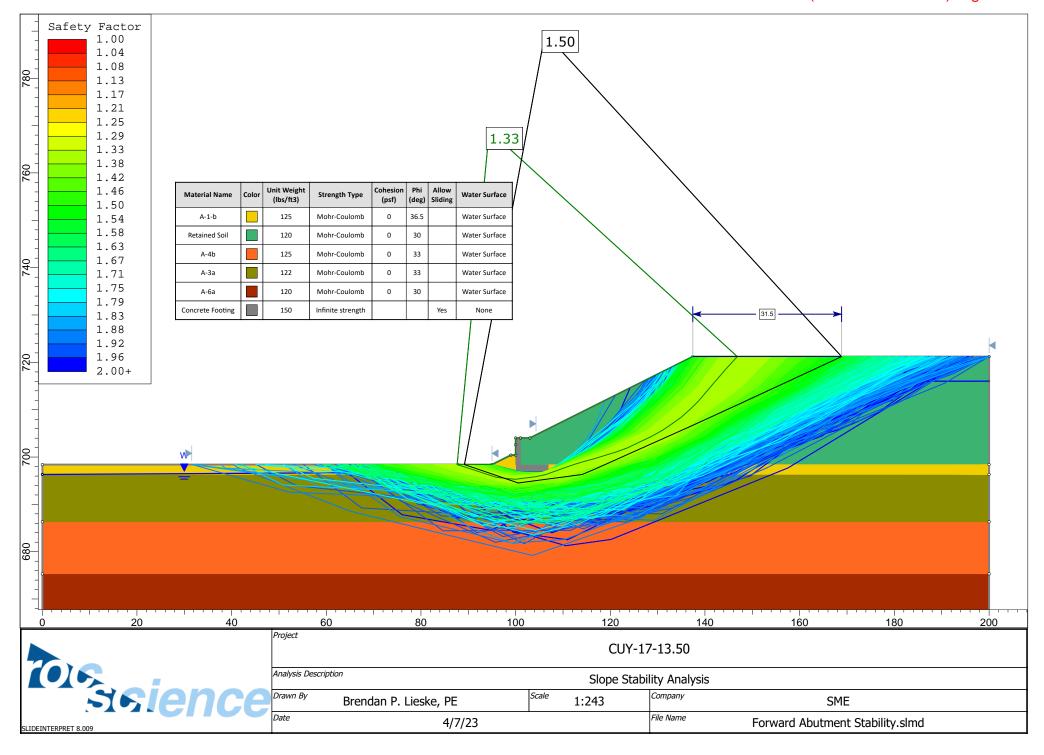
Ty	y

Туре	Coordinates
••	X Y
	0 655
	240 655
	240 674.6
	240 687.6
	240 703
	240 723.3
	180.4 723.3
	139.8 703
External Boundary	123 694.6
	121 694.6
	120 694.6
	120 690.7
	119 690.7
	115 688.7
	0 688.7
	0 687.6
	0 674.6
	X Y
	120 690.7
	120 687.6 120 687.2
Material Boundary	120 687.2
wateriai bouriuary	127 687.2
	148.936 687.6
	240 687.6
	X Y
	0 687.6
Material Boundary	120 687.6
	X Y
Material Boundary	0 674.6
iviacettal boundary	240 674.6
	X Y
	121 694.6
Material Boundary	121 688.7
Material Boundary	127 688.7
	127 687.6
	X Y
Material Boundary	139.8 703
	240 703

Scenario-based Entities







Slide Analysis Information Forward Abutment Stability

Proiect Summary

File Name: Forward Abutment Stability.sImd Slide Modeler Version: 8.009

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
	Master Scenario	Bishop Simplified: 1.526570	00h:00m:04.367s
Non-Circular- Forward Abutment Left 80 with Footing		Janbu Corrected: 1.477770	
		Spencer: 1.619470	
	Master Scenario	Bishop Simplified: 1.248030	00h:00m:04.182s
Non-Circular - Forward Abutment Right 80 with Footing		Janbu Corrected: 1.201000	
		Spencer: 1.333030	

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Data Output: Standard
Failure Direction: Right to Left

Analysis Options



Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options



Seismic Loading

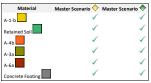
All Open Scenarios

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Materials



Materials In Use

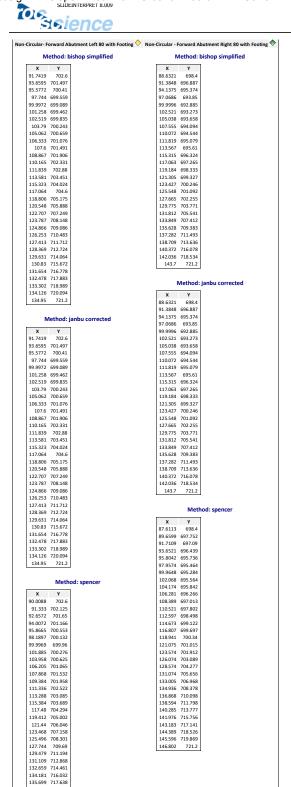


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Global Minimum Coordinates



Valid/Invalid Surfaces



Non-Circular- Forward Abutment Left 80 with Footing 🔷 Non-Circular - Forward Abutment Right 80 with Footing 🔷

Method: bishop simplified

Number of Valid Surfaces: 7255 Number of Invalid Surfaces: 22921

Error Code - 108 reported for 43 surfaces Error Code - 109 reported for 5136 surfaces Error Code - 112 reported for 150 surfaces Error Code - 113 reported for 6 surfaces Error Code - 114 reported for 6 surfaces Error Code - 121 reported for 3 surfaces Error Code - 124 reported for 3 surfaces Error Code - 120 reported for 13449 surfaces Error Code - 120 reported for 1349 surfaces

Method: janbu corrected

Number of Valid Surfaces: 7985 Number of Invalid Surfaces: 22191

Error Code:

Error Code - 108 reported for 5136 surfaces
Error Code - 101 reported for 5136 surfaces
Error Code - 111 reported for 3 surfaces
Error Code - 111 reported for 186 surfaces
Error Code - 113 reported for 186 surfaces
Error Code - 113 reported for 6 surfaces
Error Code - 121 reported for 1 surface
Error Code - 121 reported for 1 surface
Error Code - 121 reported for 1 surface
Error Code - 1000 reported for 16667 surfaces

Method: spencer

Error Code - 108 reported for 116 surfaces Error Code - 109 reported for 5136 surfaces Error Code - 111 reported for 37 surfaces Error Code - 112 reported for 171 surfaces Error Code - 113 reported for 6 surfaces Error Code -114 reported for 98 surfaces Error Code -121 reported for 1 surface Error Code -124 reported for 38 surfaces Error Code -1000 reported for 17845 surfaces

Method: bishop simplified

Number of Valid Surfaces: 8356 Number of Invalid Surfaces: 21817

Error Codes:

Error Code -108 reported for 34 surfaces Error Code -109 reported for 2631 surfaces Error Code -109 reported for 2631 surfaces Error Code -111 reported for 2 surfaces Error Code -112 reported for 246 surfaces Error Code -113 reported for 6 surfaces Error Code -114 reported for 123 surfaces Error Code -124 reported for 57 surfaces Error Code -1000 reported for 18718 surfaces

Method: janbu corrected

Number of Valid Surfaces: 8634 Number of Invalid Surfaces: 21539

Error Code - 108 reported for 71 surfaces
Error Code - 109 reported for 7631 surfaces
Error Code - 109 reported for 2631 surfaces
Error Code - 111 reported for 15 surface
Error Code - 112 reported for 275 surfaces
Error Code - 112 reported for 123 surfaces
Error Code - 114 reported for 123 surfaces
Error Code - 124 reported for 123 surfaces
Error Code - 1000 reported for 18375 surfaces

Method: spencer

Error Code - 108 reported for 118 surfaces
Error Code - 109 reported for 2631 surfaces
Error Code - 111 reported for 46 surfaces
Error Code - 112 reported for 252 surfaces
Error Code - 113 reported for 6 surfaces Error Code -114 reported for 123 surfaces Error Code -124 reported for 57 surfaces Error Code -1000 reported for 19390 surfaces

The following errors were encountered during the computation:

Slice Data

Non-Circular- Forward Abutment Left 80 with Footing ◆ Global Minimum Query (bishop simplified) - Safety Factor: 1.52657	Non-Circular - Forward Abutment Right 80 with Footing Global Minimum Query (bishop simplified) - Safety Factor: 1.24803
Global Millimulii Query [Unstidy simplinied] - Salety Foctor: 1.32037	Global Willimmul Query (bishop simplined) - Salety Foctor: 1.24805



	57	sie	nc	<u>e</u>																							
Slice Numbe		[lbs	Base [degre	e Base Material es]	Base Cohesion [psf]	Base Friction Angle [degrees]	Stress [psf]	Shear Strength [psf]	Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]	Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Material	Base Cohesion [psf]	Friction Angle [degrees]	Stress [psf]	Shear Strength [psf]	[psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
		17 99.16	57 -29.91	15 A-1-b	0	36.5	23.1683 69.5048	106.104	47.7973 143.392	0	47.7973 143.392	34.4687 103.407	34.4687 103.407	1 2	1.37635	195.244	-28.7972 -28.7972	A-1-b	0	36.5	124.771	51.9058 155.718	70.1465 210.44	0	70.1465 210.44	47.2847 141.855	47.2847 141.855
		36 113.9 75 291.1					108.716 145.437	165.962 222.019	224.285 321.563	0 21.5216	224.285 300.042	162.671 239.138	162.671 217.616	3 4		25.9668 215.118		A-1-b A-1-b	0		170.413 188.454	212.681 235.196	287.422 334.017	0 16.1681	287.422 317.849	193.744 230.423	193.744 214.255
		34 401.1 34 532.1	51 -21.43 23 -21.43				187.929 244.403	286.887 373.099	444.029 587.083	56.323 82.8689	387.706 504.214	370.235 491.114	313.912 408.245	5			-28.7979 -27.4658	A-3a A-3a	0			234.185 280.384	422.152 546.513	61.5388 114.759	360.613 431.754	319.002 429.732	257.464 314.973
	0.7510	55 439.	28 -11.79	143 A-1-b	0	36.5	260.925	398.321	639.334	101.035	538.299	584.851	483.816	7	1.46552	876.975	-27.4658	A-3a	0	33	310.698	387.76	759.903	162.807	597.096	598.4	435.593
	0.7510	55 510.0		143 A-1-b	0	36.5		442.972 459.788	709.464 741.976	110.821 120.607	598.643 621.369	648.874 679.085	538.053 558.478	9	1.46552	1311.68	-18.2187 -18.2187	A-3a A-3a	0	33	415.833	441.767 518.972	1031.89	202.138 232.75	680.262 799.145	765.892 895.026	563.754 662.276
1		82 1404. 82 1208.	28 16.48 12 16.48				423.896 367.915	647.107 561.648	988.369 849.589	113.856 90.5688	874.513 759.021	1113.84 958.49	999.984 867.922	10 11			8.73641 8.73641	A-3a A-3a	0			762.259 675.014	1416.01 1270.01	242.232 230.582	1173.78 1039.43	1509.87 1353.13	1267.63 1122.55
1:		71 587.0 71 588.1					356.981 363.042	544.956	809.027 808.808	72.5624 59.8371	736.465 748.971	923.551 925.277	850.989 865.44	12			8.70465 8.70465	A-3a A-3a	0		542.235 570.248	676.726 711.686		218.966 207.384	1042.07	1344.05 1390.59	1125.09 1183.21
1	1.271	34 1199.	71 18	.14 A-1-l	0	36.5	377.819 393.571	576.767	819.937	40.479	779.458	943.719	903.24	14	1.25838	1813.39	9.81979	A-3a	0	33	594.802	742.331	1338.11	195.017	1143.09	1441.06	1246.04
1	0.63556		19 18				393.571 404.072		832.941 841.611	20.9869 7.99359	811.954 833.618	961.883 973.994	940.896 966.001	15 16		1854.16 1888.79		A-3a A-3a	0			769.464 764.824	1366.73 1391.33	181.866 213.599	1184.87 1177.73	1473.45 1500.98	1291.58 1287.38
1		22 72.13 84 1161.					409.93 406.902	625.787 621.164	846.448 839.453	0.745086	845.703 839.453	980.75 972.763	980.005 972.763	17 18		1949.23 1383.28		A-3a A-3a	0		619.349 587.766	772.966 733.55	1438.19 1403.12	247.929 273.552	1190.26 1129.56	1549.01 1582.93	1301.08 1309.38
11		31 653.2 15 587.2				36.5 36.5	407.037 410.9	621.371 627.268	839.735 850.544	0 2.83929	839.735 847.705	973.089 985.164	973.089 982.325	19 20				A-3a A-3a	0		589.069 590.969	735.176 737.547	1422.54 1443.17	290.467 307.441	1132.07 1135.73	1602.75 1622.69	1312.29 1315.25
2	0.6485	37 646.5	53 18	.14 A-1-l	0	36.5	413.374	631.045	861.59	8.78165	852.809	997.021	988.239	21	0.873872	1435.53	16.8976		0	33	592.323	739.237	1462.8	324.473	1138.33	1642.73	1318.26
2:		37 654.5 01 839.					415.953 418.872	634.981 639.437	873.102 886.135	14.9743 21.986	858.127 864.149	1009.38 1023.37	994.403 1001.38	22 23			22.2334 22.2334	A-3a A-1-b	0		565.268 627.525	705.472 783.17	1430.24 1413.61	343.913 355.22	1086.33 1058.39	1661.31 1670.13	1317.4 1314.91
2	0.8545	41 888.6	84 18	.14 Retainer Soi		30	339.88	518.85	928.655	29.9813	898.674	1040.01	1010.03	24 25	0.873873 0.873873			A-1-b A-1-b	0		588.555 583.786	734.534 728.582	1350.39 1346.59	357.725 361.969	992.666 984.624	1667.21 1660.84	1309.48 1298.87
2	0.8708	85 921.2	26 18		0	30	343.114	523.788	945.446	38.219	907.227	1057.86	1019.64	26	1.06065	1756.54	26.7197	A-1-b	0	36.5	588.261	734.167	1359.99	367.823	992.171	1656.11	1288.29
2	0.8708	85 936.9	18 18	.14 Retainer	0	30	346.379	528.772	962.395	46.5347	915.861	1075.88	1029.34	27 28	0.143389		25.1011	A-1-b A-1-b	0	36.5	590.183	728.148 736.566	1359.32 1375.09	379.677	984.035 995.414	1653.01 1651.57	1277.72 1271.89
2	0.8708	86 952.	53 18.23		0	30	349.422	533.417	978.707	54.8025	923.905	1093.8	1039	29	0.988953	1635.27	25.1011	Retained Soil	0	30	482.355	601.993	1427.58	384.894	1042.68	1653.54	1268.64
2	0.8708	86 968.0	52 18.23	Soi 113 Retaine		30	352.655	538.353	995.477	63.0222	932.455	1111.64	1048.62	30	0.988953	1638.97	25.1011	Retained	0	30	480.314	599.446	1432.27	394.007	1038.27	1657.28	1263.27
2!	0.8708	RA 9835	18 18 29	Soi 805 Retaine		30	355,767	543 103	1011 9	71.2161	940.683	1129.42	1058.21	31	1.06065	1764.26	23.4385	Retained	0	30	485.044	605.349	1453.11	404.606	1048.5	1663.39	1258.78
				Soi Soi Sos Retaine	1		358.983			79.3841	949.186	1147.16	1058.21	32	1.06065	1773.23	23.4385		0	30	483.647	603.606	1462.17	416.691	1045.48	1671.85	1255.16
				Soi		-								33	1.06065	1784.56	21.733	Soil Retained	0	30	489.245	610.592	1487.51	429.931	1057.58	1682.53	1252.6
				05 Retaine Soi	i	30		552.923		87.5521		1164.89	1077.34	34			21.733	Soil	0			609.866		444.327	1056.32	1695.44	1251.11
3:	0.8708	77 1029.	37 18.28	05 Retaine Soi		30	365.416	557.833	1061.92	95.7201	966.195	1182.63	1086.91	35			28.7771	Soil	0			573.182		453.734	992,777	1698.76	1245.02
3.	0.8708	84 1041.	74 22.24	199 Retaine Soi		30	358.479	547.243	1049.6	101.748	947.853	1196.26	1094.51					Soil									
3-	0.8708	84 1050.	02 22.24	199 Retaine Soi	0	30	360.318	550.051	1058.35	105.635	952.717	1205.76	1100.13	36			28.7771	Soil	0		455.334			458.153	984.268	1692.51	1234.35
3:	0.719	64 867.0	23 32.24	02 Retainer		30	336.108	513.093	992.913	104.21	888.703	1204.9	1100.69	37	1.05515	1767.96	35.694	Retained Soil	0	30	423.102	528.044	1371.6	456.995	914.602	1675.56	1218.56
31	0.719	64 858.9	02 32.24	Soi 102 Retaine	I 0	30	334.72	510.974	982.504	97.4708	885.033	1193.62	1096.15	38	1.05515	1738.78	35.694	Retained Soil	0	30	415.839	518.979	1349.16	450.26	898.9	1647.9	1197.64
3'	0.719	64 850.7	81 32.24	Soi 102 Retaine		30	333.332	508.854	972.094	90.732	881.362	1182.33	1091.6	39	1.01856	1641.42	40.9942		0	30	386.922	482.89	1275.24	438.853	836.389	1611.52	1172.67
3				Soi '89 Retaine	1		310.548		896.627	75.5091	821.118	1155.17	1079.66	40	1.01856	1595.47	40.9942	Retained	0	30	377.341	470.933	1238.46	422.774	815.684	1566.41	1143.63
				Soi	l									41	1.01856	1546.45	42.5647		0	30	361.405	451.044	1186.36	405.129	781.23	1518.28	1113.15
31				91 Retaine Soi	l		301.494		847.751	50.5758	797.175	1109.73	1059.16	42	1.01856	1494.36	42.5647	Soil Retained	0	30	351.039	438.107	1144.74	385.916	758.821	1467.14	1081.22
41	1.142	33 1200.	57 45.19	132 Retaine Soi		30	282.776	431.677	766.429	18.7446	747.685	1051.12	1032.37	43	0.889155	1252 92	47 9372	Soil	0	30	320 037	399.416	1054.47	362.66	691.81	1409.13	1046.47
4	0.24470	01 246.8	58 45.19	132 Retaine Soi		30	276.358	421.88	730.717	0	730.717	1008.95	1008.95	44				Soil	0							1344.23	
4	1.160	14 1116.	55 46.65	i56 Retainer Soi		30	259.896	396.75	687.192	0	687.192	962.56	962.56	44			47.9372	Soil				385.069	1002.32		666.955		1008.87
4	0.9555	47 851.7	81 46.65	56 Retainer		30	240.717	367.472	636.481	0	636.481	891.528	891.528	45	1.65459	2043.03	51.9086	Retained Soil	0	30	275.534	343.875	883.267	287.659	595.608	1234.78	947.118
4	1.26	21 1030.	91 46.70	Soi 149 Retaine	. 0	30	220.468	336.56	582.938	0	582.938	816.933	816.933	46	1.42634	1477.57	56.3528	Retained Soil	0	30	224.273	279.9	698.964	214.165	484.799	1035.92	821.755
4	1.198	81 855.	58 53.30	Soi 122 Retaine		30	179.108	273.421	473.579	0	473.579	713.89	713.89	47	1.61056	1233.39	55.7285	Retained Soil	0	30	190.701	238	485.964	73.735	412.229	765.819	692.084
4	0.8240	47 491.0	95 53.30	Soi 122 Retaine		30	149.543	228.288	395.407	0	395.407	596.05	596.05	48	0.0531518	32.918	55.7285	Retained Soil	0	30	170.652	212.979	368.891	0	368.891	619.325	619.325
4				Soi 122 Retaine	l		116.511		308.066	0	308.066	464.389	464.389	49	1.66371	777.449	55.8827	Retained	0	30	128.462	160.324	277.689	0	277.689	467.303	467.303
4:				Soi	1									50	1.66371	266.158	58.0367		0	30	42.4995	53.0407	91.8691	0	91.8691	159.98	159.98
				022 Retaine Soi	l		83.2219		220.047	0	220.047	331.707	331.707					Soil									
4:	0.8239	58 163.9	53.30	122 Retaine Soi		-	49.9332		132.028	0	132.028	199.024	199.024				Angle			shop simplifi Base		P	200		ffective	Base	Effective
51	0.8239	58 54.65	38 53.30	022 Retaine Soi		30	16.6444	25.4088	44.0094	0	44.0094	66.3413	66.3413	Slice Number		eight o	f Slice	Base Co	Base hosion	riction Sh	ear Sh ress Stre	lear No	ormal		Normal Stress	Vertical Stress	Vertical Stress
				Global	Minimum Q	uerv (ianbı	corrected	- Safety Fai	tor: 1 4777	7						[de	egrees]		[d	egrees] LI		ostj [[psf]	[psf]	[psf]	[psf]	[psf]
				Global	Million Q	uci y guilloc	concecco	- Suicty ru						1	.,,	N/A		Retained Soil	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A
														2	N/A	N/A	N/A R	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
														3	N/A	N/A	N/A R	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
														4	N/A	N/A	N/A R		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
														5	N/A	N/A	N/A R	Retained	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
														6	N/A	N/A	N/A R	Soil Retained	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
														7	N/A	N/A	N/A R	Soil Retained	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
																		Soil									
														F				Global	Minimum C	luery (janbu	corrected) - Safety Fa	ictor: 1.201				
П														1													1

Global Minimum Query (spencer) - Safety Factor: 1.61947



2 1.374 3 0.1344 4 0.033 5 1.688 5 1.686 7 1.461 7 1.461 8 1.466 11 1.266 11 1.266 11 1.266 11 1.266 11 1.266 11 1.266 11 1.266 11 1.266 11 1.266 12 1.255 15 1.255 15 1.255 15 1.255 16 1.255 16 1.255 17 1.255 18 0.873 19 0.873 21 0.873 22 0.873 22 0.873 23 0.0592 24 0.873 25 0.873 26 0.673 27 1.666 27 1.666 27 1.666 28 0.143 28 0.133 28 0.9885 30 0.9885 31 1.066 33 1.066 34 1.066 35 1.055 36 1.055 37 1.055 38 1.055 39 1.016	635 195. 636 195. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 215. 637 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17 1.256 18 0.8734 19 0.8734 20 0.8734 21 0.8732 22 1.688 23 0.0592 24 0.8738 26 1.066 28 0.1433 29 0.9885 31 1.066 33 1.066 34 1.066 35 1.056 36 1.055 37 1.055 38 1.055 39 1.018	838 19498 872 1383 872 1418 872 1418 872 1418 872 1418 873 1456 873 1456 65 1756 953 1638 965 1764	1.25838 194 0.873872 138 0.873872 141 0.873872 143 0.873872 143 1.68853 280 0.059218 98.9 0.873873 145 1.06065 175 1.06065 175 1.06065 175 1.06085 175 1.0698953 163	23 10.1443 28 17.0105 16.6 17.0105 20 16.8976 53 16.8976 16 22.2334 13 22.2334 13 22.2334 22 28.2935 54 26.7197 25 26.7197 27 25.1011	A-3a A-3a A-3a A-3a A-3a A-3a A-1-b A-1-b A-1-b A-1-b A-1-b A-1-b A-1-c	0 0 0 0 0 0 0 0 0	33 33 33 33 33 36.5 36.5 36.5 36.5 36.5	638.946 603.689 605.027 607.022 608.412 578.719 641.392 599.198 594.342 599.505	767.374 725.031 726.638 729.033 730.703 695.041 770.312 719.637 713.805	1429.58 1390.01 1409.4 1430.05 1449.66 1414.18 1396.24 1330.26	247.929 273.552 290.467 307.441 324.473 343.913 355.22	1181.65 1116.45 1118.93 1122.61 1125.19 1070.27 1041.02	1543.9 1574.69 1594.49 1614.45 1634.48 1650.75 1658.42	1295 1301 1304 1307 1310 1306
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19 0.8738-12 20 0.8738-12 21 1.688-23 22 1.688-23 23 0.0592-24 0.8738-25 26 1.06(0.888-2) 29 0.9888-3 31 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1.06(0.33 1	872 1408 872 1418 872 1435 853 2805 218 98.91 873 1456 873 1456 1756 065 1753 389 236. 953 1638 953 1638	0.873872 140.873872 141: 0.873872 143: 1.68853 280: 0.0.059218 98.9 0.873873 145: 0.873873 145: 1.06065 175: 0.143389 236 0.988953 163:	1.6. 17.0105 16.8976 16.8976 16.8976 16.22.2334 13. 22.2334 22.2334 22.2334 22.235 28.2935 28.2935 26.7197 25.1011 27. 25.1011	A-3a A-3a A-3a A-1-b A-1-b A-1-b A-1-b A-1-b A-1-b Retained Soil Retained	0 0 0 0 0 0 0 0	33 33 33 36.5 36.5 36.5 36.5 36.5	605.027 607.022 608.412 578.719 641.392 599.198 594.342 599.505	726.638 729.033 730.703 695.041 770.312 719.637 713.805	1409.4 1430.05 1449.66 1414.18 1396.24 1330.26	290.467 307.441 324.473 343.913 355.22	1118.93 1122.61 1125.19 1070.27 1041.02	1594.49 1614.45 1634.48 1650.75 1658.42	1304 1307 1310 1306 130
20 0.8736 21 0.8736 22 1.6886 23 0.0592 24 0.8736 25 0.8736 26 1.066 27 1.066 28 0.1433 29 0.9888 31 1.066 33 1.066 34 1.066 35 1.055 36 1.055 37 1.055 38 1.055 39 1.018	872 1418 872 1435 853 2805 218 98.91 873 1456 873 1451 065 1756 065 1753 389 236. 953 1638 965 1764	0.873872 141: 0.873872 143: 1.68853 280: 0.059218 98.9: 0.873873 145: 1.06065 175: 1.06065 175: 0.143389 236: 0.988953 163:	16.8976 16.8976 16.22.2334 13.22.2334 92.28.2935 28.2935 26.7197 25.26.7197 14.25.1011 27.25.1011	A-3a A-3a A-1-b A-1-b A-1-b A-1-b A-1-b A-1-b Retained Soil Retained	0 0 0 0 0 0	33 33 36.5 36.5 36.5 36.5 36.5	607.022 608.412 578.719 641.392 599.198 594.342 599.505	729.033 730.703 695.041 770.312 719.637 713.805	1430.05 1449.66 1414.18 1396.24 1330.26	307.441 324.473 343.913 355.22	1122.61 1125.19 1070.27 1041.02	1614.45 1634.48 1650.75 1658.42	1307 1310 1306 130
21 0.8736 2 1.688 2 2 1.688 2 2 1.688 2 2 1.688 2 2 1.688 2 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2 1.686 2	872 1435 853 2805 218 98.91 873 1456 873 1451 065 1756 065 1753 389 236. 953 1638 965 1764	0.873872 143: 1.68853 280: 0.059218 98.9 0.873873 145: 0.873873 145: 1.06065 175: 1.06065 175: 0.143389 236 0.988953 163:	16.8976 16.22.2334 13.22.2334 92.28.2935 36.28.2935 54.26.7197 25.26.7197 14.25.1011	A-3a A-1-b A-1-b A-1-b A-1-b A-1-b A-1-b A-1-b A-1-b Retained Soil Retained	0 0 0 0 0 0	33 36.5 36.5 36.5 36.5 36.5	608.412 578.719 641.392 599.198 594.342 599.505	730.703 695.041 770.312 719.637 713.805	1449.66 1414.18 1396.24 1330.26	324.473 343.913 355.22	1125.19 1070.27 1041.02	1634.48 1650.75 1658.42	1310 1306 130
22 1.688.2 23 0.0592.2 24 0.8734.2 25 0.8734.2 26 1.066.2 27 1.066.2 28 0.1433.2 29 0.9888.3 31 1.066.3 33 1.066.3 34 1.066.3 35 1.055.3 36 1.055.3 37 1.055.3 38 1.055.3 39 1.018.4	853 2805 218 98.91 873 1456 873 1451 065 1756 065 1753 389 236. 953 1638 953 1638	1.68853 280 0.059218 98.9 0.873873 145 0.873873 145 1.06065 175 1.06065 175 0.143389 236 0.988953 163	16 22.2334 13 22.2334 92 28.2935 36 28.2935 54 26.7197 25 26.7197 14 25.1011 27 25.1011	A-3a A-1-b A-1-b A-1-b A-1-b A-1-b Retained Soil Retained	0 0 0 0 0 0	33 36.5 36.5 36.5 36.5 36.5	578.719 641.392 599.198 594.342 599.505	695.041 770.312 719.637 713.805	1414.18 1396.24 1330.26	343.913 355.22	1070.27 1041.02	1650.75 1658.42	1306 130
23 0.05926 24 0.8734 25 0.8734 26 1.066 28 0.1433 29 0.9885 30 0.9885 31 1.066 33 1.066 34 1.066 35 1.056 36 1.056 37 1.053 38 1.055	218 98.91 873 1456 873 1451 065 1756 065 1753 389 236. 953 1635 953 1638	0.059218 98.9 0.873873 145 0.873873 145 1.06065 175 1.06065 175 0.143389 236 0.988953 163 0.988953 163	13 22.2334 92 28.2935 36 28.2935 54 26.7197 25 26.7197 14 25.1011 27 25.1011	A-1-b A-1-b A-1-b A-1-b A-1-b A-1-b Retained Soil Retained	0 0 0 0 0	36.5 36.5 36.5 36.5 36.5	641.392 599.198 594.342 599.505	770.312 719.637 713.805	1396.24 1330.26	355.22	1041.02	1658.42	130
24 0.87362 25 0.87372 26 1.0663 27 1.0643 29 0.9888 31 1.066 32 1.066 33 1.066 36 1.058 36 1.058 37 1.055 38 1.055 39 1.018	873 1456 873 1451 065 1756 065 1753 389 2363 953 1635 953 1638	0.873873 145 0.873873 145 1.06065 175 1.06065 175 0.143389 236 0.988953 163 0.988953 163	92 28.2935 36 28.2935 54 26.7197 25 26.7197 14 25.1011 27 25.1011	A-1-b A-1-b A-1-b A-1-b Retained Soil Retained	0 0 0 0	36.5 36.5 36.5 36.5	599.198 594.342 599.505	719.637 713.805	1330.26				
25 0.87387.0 26 1.066.2 27 1.066.2 28 0.1438.2 30 0.9885.3 31 1.066.3 32 1.066.3 33 1.066.3 34 1.066.3 35 1.053.3 36 1.053.3 37 1.055.3 38 1.055.3 39 1.014.4 40 1.018.4	873 1451 065 1756 065 1753 389 2363 953 1635 953 1638	0.873873 145 1.06065 175 1.06065 175 0.143389 236 0.988953 163 0.988953 163	36 28.2935 54 26.7197 25 26.7197 14 25.1011 27 25.1011	A-1-b A-1-b A-1-b A-1-b Retained Soil Retained	0 0	36.5 36.5 36.5	594.342 599.505	713.805		357.725	972.534		
26 1.066.02 27 1.066.02 28 0.1432 29 0.9888 30 0.9888 31 1.066 32 1.066 33 1.066 35 1.056 36 1.055 37 1.055 38 1.055 39 1.018	065 1756 065 1753 389 2363 953 1635 953 1638 065 1764	1.06065 175 1.06065 175 0.143389 236 0.988953 163 0.988953 163	54 26.7197 25 26.7197 14 25.1011 27 25.1011	A-1-b A-1-b A-1-b Retained Soil Retained	0	36.5 36.5	599.505					1652.81	1295
27 1.06(2) 28 0.1432 29 0.9888 30 0.9888 31 1.066 32 1.066 33 1.066 33 1.056 36 1.058 37 1.055 38 1.055 39 1.018	065 1753 389 236, 953 1635 953 1638 065 1764	1.06065 175. 0.143389 236 0.988953 163 0.988953 163	25 26.7197 14 25.1011 27 25.1011	A-1-b A-1-b Retained Soil Retained	0	36.5			1326.62	361.969	964.653	1646.56	1284
28 0.1433/2 29 0.9885/3 30 0.9885/3 31 1.066/3 32 1.066/3 33 1.066/3 35 1.055/3 36 1.055/3 37 1.055/3 38 1.055/3 39 1.018/4	389 236. 953 1635 953 1638 065 1764	0.143389 236 0.988953 163 0.988953 163	14 25.1011 27 25.1011	A-1-b Retained Soil Retained	0			720.006	1340.85	367.823	973.029	1642.63	1274
29 0.9885 30 0.9885 31 1.066 32 1.066 33 1.066 33 1.066 36 1.058 37 1.055 38 1.055 39 1.018	953 1635 953 1638 065 1764	0.988953 163 0.988953 163	27 25.1011	Retained Soil Retained			594.591	714.104	1340.34	375.285	965.053	1639.64	1264
30 0.98883 31 1.06643 32 1.06643 33 1.066 34 1.066 35 1.055 36 1.055 38 1.055	953 1638 065 1764	0.988953 163		Soil Retained	0	36.5	602.096	723.117	1356.92	379.677	977.238	1638.97	1259
31 1.066 32 1.066 33 1.066 34 1.066 35 1.058 36 1.058 37 1.055 38 1.055 39 1.018	065 1764		, 13.1011		0	30	493.719	592.957 590.448	1411.93	384.894 394.007	1027.03	1643.21	1258
32 1.060 33 1.060 34 1.060 35 1.058 36 1.058 37 1.055 38 1.055 39 1.018			26 23.4385	Soil Retained	0	30		596.819	1438.32	404.606	1033.72	1653.76	1249
34 1.066 35 1.058 36 1.058 37 1.055 38 1.055 39 1.018		1.06065 177		Soil	0	30	495.504	595.1	1447.43	416.691	1030.74	1662.25	1245
35 1.058 36 1.058 37 1.059 38 1.059 39 1.018	065 1784	1.06065 178	56 21.733		0	30	501.719	602.565	1473.6	429.931	1043.67	1673.6	1243
36 1.058 37 1.055 38 1.055 39 1.018	065 1798	1.06065 179	25 21.733	Soil Retained Soil	0	30	501.122	601.848	1486.76	444.327	1042.43	1686.51	1242
37 1.055 38 1.055 39 1.018 40 1.018	851 1798	1.05851 179	15 28.7771		0	30	469.122	563.416	1429.6	453.734	975.868	1687.26	1233
38 1.055 39 1.018 40 1.018	851 1791	1.05851 179	53 28.7771		0	30	465.102	558.587	1425.65	458.153	967.5	1681.1	1222
39 1.018 40 1.018		1.05515 176		Soil	0	30		517.01	1352.49	456.995	895.49	1661.75	1204
40 1.018		1.05515 173		Soil	0	30	423.092	508.134	1330.37	450.26	880.112	1634.33	1184
		1.01856 164		Soil	0	30	392.444	471.325	1255.21	438.853	816.36	1596.29	1157
		1.01856 159		Retained Soil Retained	0		382.727	459.655 439.823	1218.92	422.774	796.143 761.793	1551.55 1503.26	1128
42 1.018		1.01856 149		Soil Retained	0	30	355.71	427.208	1125.86	385.916	739,949	1452.55	1096
		0.889155 125		Soil Retained	0	30	323.197	388.16	1034.97	362.66	672.31	1393.13	1030
44 0.8891	155 1195	0.889155 119	23 47.9372	Soil Retained	0	30	311.588	374.217	983.524	335.36	648.164	1328.82	993.
45 1.654	459 2043	1.65459 204	03 51.9086	Soil Retained Soil	0	30	277.511	333.291	864.937	287.659	577.278	1218.97	931.
46 1.426	634 1477	1.42634 147	57 56.3528	Retained Soil	0	30	225.157	270.413	682.532	214.165	468.367	1020.81	806
47 1.610	056 1233	1.61056 123	39 55.7285	Retained Soil	0	30	191.541	230.041	472.177	73.735	398.442	753.266	679.
48 0.05315	518 32.	.0531518 32	18 55.7285	Retained Soil	0	30	171.405	205.857	356.555	0	356.555	608.093	608.
		1.66371 777		Retained Soil	0		129.012	154.944	268.372	0	268.372	458.799	458.
50 1.663	371 266.	1.66371 266	58 58.0367	Retained Soil	0	30	42.6115	51.1764	88.6402	0	88.6402	156.93	156

					Query 1	(janbu corre	ected) - S	Safety Facto	r: -1000				
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Global Minimum Query (spencer) - Safety Factor: 1.33303

Angle of Slice B Base Ma legrees]	Weight [lbs]	Width [ft]	Slice Number
	20.7336	1.02429	1
		1.02429	
		1.02554	3
		0.809153	
		1.13201	
		0.42515 1.72697	
7.21643	455.942	1.0766	9
		1.0766	
		1.00368	
7.59221	1295.16	1.05139	13
		1.05139 1.05333	
		1.05333	
11.3792	2392.76	2.10693	17
		0.0956482	
		1.00589 1.00589	
20.3094	1253.79	1.06613	21
		1.06613	
		1.78367 0.292705	23
		2.07621	
		2.13381	
		2.13415	
		1.06706	
17.5451 R	1526.91	1.06706	29
19.7309 Re	1815.92	1.2495	30
19.7309 Re	1842.41	1.2495	31
25.2308 Re	1858.72	1.24975	32
25.2308 Re	1864.12	1.24975	33
25.4113 Re	3743.22	2.49967	34
28.8796 Re			
28.8796 Re			
34.1927 Re 34.1927 Re			
36.1434 Re			
36.1434 Re	1355.77	0.965543	40
41.6748 Re	1321.65	0.965985	41
41.6748 Re	1277.96	0.965985	42
44.5674 Re	2114.76	1.72587	43
49.4777 Re	1707.47	1.69138	44
49.4846 Re	1305.8	1.69138	45
48.9384 Re	135.726	0.212525	46

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.02429	20.7336	-17.5464	A-1-b	0	36.5	22.5878	30.1102	40.6917	0	40.6917	33.5497	33.5497
2	1.02429		-17.5464	A-1-b	0	36.5	67.7634	90.3307	122.075	0	122.075	100.649	100.649
3	1.02554		-17.8833	A-1-b	0	36.5	114.821	153.06	206.849	0	206.849	169.8	169.8
4	1.02554	146.667	-17.8833	A-1-b	0	36.5	161.546	215.345	291.022	0	291.022	238.896	238.896
5	0.809153	146.192	-18.5569	A-1-b	0	36.5	209.243	278.927	376.948	0	376.948	306.705	306.705
6 7	1.13201	250.627	-18.5569	A-1-b	0	36.5	244.216	325.547 347.018	452	12.0478 28.5069	439.952 468.968	370.017	357.969
8		107.914 532.932	-18.0792 -18.0792	A-1-b A-3a	0	36.5 33	240.16	347.018	497.475 543.776	50.8032	468.968	412.493 465.376	383.986 414.573
9		455.942	-7.21643	A-3a	0	33	243.507	324.602	572.979	73.1363	499.843	542.146	469.01
10		546.288	-7.21643	A-3a	0	33	295.434	393.823	688.454	82.0194	606.435	651.046	569.027
11	1.00368	588.392	-5.12548	A-3a	0	33	329.144	438.759	765.075	89.4453	675.63	735.553	646.107
12	1.00368		-5.12548	A-3a	0	33	354.804	472.965	823.715	95.4141	728.301	791.891	696.477
13	1.05139		7.59221	A-3a	0	33	592.134	789.333	1309.68	94.21	1215.47	1388.6	1294.39
14 15	1.05139 1.05333	1125.37 1109.94	7.59221 7.52392	A-3a A-3a	0	33 33	512.327 508.81	682.947 678.259	1137.48 1121.92	85.8332 77.4885	1051.65 1044.43	1205.77 1189.12	1119.93 1111.63
16	1.05333		7.52392	A-3a	0	33	524,606	699.316	1146.03	69.1759	1076.86	1215.32	1111.03
17		2392.76	11 3792	A-3a	0	33	530.855	707.645	1141.84	52 1583	1089.68	1248.67	1196.52
18	0.0956482	112.273	19.5153	A-3a	0	33	490.479	653.823	1045.06	38.2561	1006.8	1218.89	1180.63
19	1.00589	1175.12	19.5153	A-1-b	0	36.5	563.547	751.225	1041.49	26.2682	1015.22	1241.22	1214.95
20	1.00589		19.5153	A-1-b	0	36.5	553.219	737.458	1034.73	38.1137	996.617	1230.8	1192.69
21	1.06613		20.3094	A-1-b	0	36.5	544.317	725.591	1035.1	54.5109	980.585	1236.55	1182.03
22	1.06613		20.3094	A-1-b	0	36.5	542.366	722.99	1047.95	70.8786	977.069	1248.68	1177.8
23 24	1.78367 0.292705	2165.62 360.957	18.5299 18.5299	A-1-b Retained	0	36.5 30	557.12 432.2	742.658 576.135	1098.34 1110.79	94.6976 112.899	1003.64 997.893	1285.08 1255.66	1190.38 1142.76
24	0.292705	360.957	18.5299	Ketained	U	30	432.2	5/6.135	1110.79	112.899	997.893	1255.66	1142.76
25	2.07621	2618.01	16.7127	Retained Soil	0	30	444.954	593.137	1163.27	135.926	1027.34	1296.87	1160.94
26	2.13381	2806.62	15.0986	Retained Soil	0	30	458.612	611.344	1238.32	179.445	1058.88	1362.05	1182.61
27	2.13415		16.7745	Retained Soil	0	30	449.276	598.898	1260.78	223.456	1037.32	1396.21	1172.75
28	1.06706		17.5451	Retained Soil	0	30	444.915	593.085	1281.65	254.397	1027.26	1422.32	1167.92
29	1.06706	1526.91 1815.92	17.5451 19.7309	Retained Soil Retained	0	30	445.389 429.999	593.717 573.201	1302.72	274.37	1028.35 992.817	1443.54 1441.43	1169.17 1147.04
31		1842.41	19.7309	Soil	0	30	429.999	572.39	1305.88	314.468	992.817	1441.43	1147.04
32	1.24975		25.2308	Soil	0	30	390.567	520.637	1231.93	330.155	901.773	1415.97	1085.82
33	1.24975	1864.12	25.2308	Soil Retained	0	30	387.374	516.381	1235.85	341.456	894.395	1418.39	1076.93
34	2.49967	3743.22	25.4113	Soil Retained	0	30	381.344	508.343	1238.58	358.107	880.476	1419.75	1061.64
35	1.24998	1871.67	28.8796	Soil Retained	0	30	353.949	471.825	1188.85	371.625	817.223	1384.07	1012.45
36	1.24998	1862	28.8796	Soil Retained Soil	0	30	349.288	465.611	1183.12	376.661	806.463	1375.78	999.118
37	0.965543	1424.53	34.1927	Retained Soil	0	30	312.913	417.123	1099.75	377.273	722.478	1312.35	935.075
38	0.965543	1404.46	34.1927	Retained Soil	0	30	307.916	410.461	1084.4	373.46	710.94	1293.6	920.141
39	0.965543		36.1434	Retained Soil	0	30	291.73	388.885	1041.68	368.112	673.568	1254.75	886.64
40	0.965543		36.1434	Retained Soil	0	30	286.294	381.639	1022.25	361.229	661.022	1231.35	870.124
41	0.965985		41.6748	Retained Soil	0	30	250.853	334.394	928.714	349.528	579.186	1152.02	802.49
42	0.965985		41.6748	Retained	0	30	244.403	325.796	897.306	333.009	564.297	1114.87	781.858
43	1.72587		49.4777	Retained Soil Retained	0	30	214.12 175.115	285.429	799.265 604.779	304.886 200.461	494.379	1010.18 809.651	705.291 609.19
44	1.69138	1305.8	49.4777	Soil	0	30	160.578	214.055	447.722	76.9691	370.753	635.632	558.663
46	0.212525	135.726	48.9384	Soil	0	30	154.004	205.292	363.18	7.60455	355.575	539.957	532.352
47	0.993929	552.173	48.9384	Soil Retained	0	30	136.289	181.677	314.674	0	314.674	471.116	471.116
48	1.20645	487.408	48.9382	Soil Retained	0	30	99.1118	132.119	228.836	0	228.836	342.603	342.603
49	1.20635	289.925	48.0676	Soil Retained	0	30	59.9092	79.8607	138.323	0	138.323	205.017	205.017
50	1.20633	96.3582	47.8189	Soil Retained Soil	0	30	20.0024	26.6638	46.1831	0	46.1831	68.2573	68.2573
				2011									

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	Retained Soil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Interslice Data

Non-Circular- Forward Abutment Left 80 with Footing	Non-Circular - Forward Abutment Right 80 with Footing
Global Minimum Query (bishop simplified) - Safety Factor: 1.52657	Global Minimum Query (bishop simplified) - Safety Factor: 1.24803
Global Minimum Query (bishop simplified) - Safety Factor: 1.52657	Global Minimum Query (bishop simplified) - Safety Factor: 1.24803



Slice	X	ence	Interslice	Interslice	Interslice		х	Y	Interslice	Interslice	Interslice
umber		coordinate - Bottom [ft]	Normal Force		Force Angle [degrees]	Slice Number		coordinate - Bottor			Force Angl
1	91.7419	[π] 702.6	[lbs]	(ibs)	[degrees]	1	[π] 88.6321	[H] 698		[IDS]	[degrees
2	92.7007	702.048	48.5687	0	0	2	90.0085	697.64	3 110.312	0	
3	93.6595	701.497	194.275	0	0	3	91.3848	696.88		0	
4 5	94.3597 95.5772	701.1 700.41	359.351 758.218	0	0	4 5	91.5189 92.4524	696.81 696		0	
6	96.6606	699.985	1150.62	0	0	6	94.1375	695.37	4 1539.85	0	
7	97.744	699.559	1665.04	0	0	7	95.6031	694.61		0	
8	98.495 99.2461	699.402 699.246	1961.18 2290.28	0	0	8	97.0686 98.5341	693.8 693.36		0	
10	99.9972	699.089	2632.75	0	0	10	99.9996	692.88		0	
11	101.258	699.462	2798.1	0	0	11	101.26	693.07		0	
12	102.519 103.154	699.835 700.039	2944.69 3006.52	0	0	12 13	102.521 103.78	693.27		0	
14	103.79	700.243	3072.24	0	0	14	105.038	693.65		0	
15	105.062	700.659	3210.83	0	0	15	106.297	693.87		0	
16 17	105.697 106.333	700.868 701.076	3287.42 3368.86	0	0	16 17	107.555 108.813	694.09 694.31		0	
18	106.406	701.1	3378.6	0	0	18	110.072	694.54		0	
19	107.6	701.491	3535.81	0	0	19	110.946	694.81		0	
20 21	108.271 108.867	701.711 701.906	3624.25 3702.96	0	0	20 21	111.819 112.693	695.07 695.34		0	
22	109.516	702.119	3787.86	0	0	22	113.567	695.6		0	
23	110.165	702.331	3871.98	0	0	23	115.256	696		0	
24 25	110.985 111.839	702.6 702.88	3977.24 4007.55	0	0	24 25	115.315 116.189	696.32 696.79		0	
26	112.71	703.165	4036.47	0	0	26	117.063	697.26		0	
27	113.581	703.451	4063.39	0	0	27	118.123	697.79		0	
28 29	114.452 115.323	703.737 704.024	4086.8 4108.21	0	0	28 29	119.184 119.327	698.33 698		0	
30	116.194	704.312	4126.79	0	0	30	120.316	698.86		0	
31	117.064	704.6	4143.37	0	0	31	121.305	699.32		0	
32 33	117.935 118.806	704.887 705.175	4157.95 4170.53	0	0	32 33	122.366 123.427	699.78 700.24		0	
34	119.677	705.175	4170.53	0	0	34	123.427	700.24		0	
35	120.548	705.888	4045.19	0	0	35	125.548	701.09	2 8189.65	0	
36 37	121.268 121.987	706.342 706.795	3836.28 3631.1	0	0	36 37	126.606 127.665	701.67 702.25		0	
37 38	121.987 122.707	706.795 707.249	3631.1 3429.65	0	0	37 38	127.665 128.72	702.25 703.01		0	
39	123.787	708.148	2958.84	0	0	39	129.775	703.77	1 6300.96	0	
40	124.866	709.086	2488.88	0	0	40	130.794	704.65		0	
41 42	126.009 126.253	710.236 710.483	1930.3 1817.88	0	0	41 42	131.812 132.831	705.54 706.47		0	
43	127.413	711.712	1274.56	0	0	43	133.849	707.41	2 3399.18	0	
44	128.369	712.724	860.074	0	0	44	134.739	708.39		0	
45 46	129.631 130.83	714.064 715.672	357.325 -189.789	0	0	45 46	135.628 137.282	709.38 711.49		0	
47	131.654	716.778	-503.79	0	0	47	138.709	713.63		0	
48 49	132.478 133.302	717.883	-748.406 -923.132	0	0	48	140.319 140.372	71		0	
49 50	133.302	718.989 720.094	-923.132 -1027.97	0	0	49 50	140.372	716.07 718.53		0	
51	134.95	721.2	0	0	0	51	143.7	721		0	
	Global Mini	mum Query (janbu cor	roctod) - Safoty	Factor: 1 4777	77		0.	ery 1 (bishop simpli	ied) - Safety Facto	r -1000	
Slice	x	Y	Interslice	Interslice	Interslice	Slice	х	Y	Interslice	Interslice	Interslic
umber	[ft]	coordinate - Bottom [ft]	[lbs]	Shear Force [lbs]	Force Angle [degrees]	Number	[ft]	coordinate - Bottor [ft]	[lbs]	[lbs]	Force Ang
1 2	91.7419 92.7007	702.6 702.048	0 51.7907	0	0	1 2	N/A N/A	N/ N/		N/A N/A	1
3	93.6595	701.497	207.163	0	0	3	N/A	N/		N/A	
4	94.3597	701.1	383.129	0	0	4	N/A	N/		N/A	
5	95.5772	700.41	807.329	0	0	5	N/A	N/	A N/A	N/A	N
									A N/A A N/A		4
5 6 7 8	95.5772 96.6606 97.744 98.495	700.41 699.985 699.559 699.402	807.329 1222.27 1766.01 2079.66	0 0 0	0 0 0	5 6	N/A N/A	N/ N/	A N/A A N/A A N/A	N/A N/A	1
5 6 7 8 9	95.5772 96.6606 97.744	700.41 699.985 699.559 699.402 699.246	807.329 1222.27 1766.01 2079.66 2428.23	0 0 0	0 0 0 0	5 6 7	N/A N/A N/A N/A	N/ N/ N/ N/	A N/A A N/A A N/A A N/A	N/A N/A N/A N/A	1 1 1
5 6 7 8 9 10	95.5772 96.6606 97.744 98.495 99.2461 99.9972 101.258	700.41 699.985 699.559 699.402	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 2994.67	0 0 0 0	0 0 0 0 0 0	5 6 7 8	N/A N/A N/A N/A Global Mi	N/ N/ N/ N/ N/ nimum Query (janbu Y	A N/A A N/A A N/A A N/A Corrected) - Safet	N/A N/A N/A N/A ty Factor: 1.20:	Interslice
5 6 7 8 9 10 11	95.5772 96.6606 97.744 98.495 99.2461 99.9972 101.258 102.519	700.41 699.985 699.559 699.402 699.246 699.089 699.462	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 2994.67 3174.6	0 0 0 0 0 0	0 0 0 0 0 0	5 6 7	N/A N/A N/A N/A Global Mi X coordinate	N/ N/ N/ N/ nimum Query (janbu Y coordinate - Bottor	A N/A A N/A A N/A Corrected) - Safet Interslice Normal Force	N/A N/A N/A N/A ty Factor: 1.20: Interslice Shear Force	Interslice Force Ang
5 6 7 8 9 10	95.5772 96.6606 97.744 98.495 99.2461 99.9972 101.258 102.519 103.154	700.41 699.985 699.559 699.402 699.246 699.089 699.462 699.835 700.039	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 2994.67 3174.6 3252.78	0 0 0 0 0	0 0 0 0 0 0 0	5 6 7 8	N/A N/A N/A N/A Global Mi X coordinate [ft] 88.6321	N/ N/ N/ N/ nimum Query (janbu Y coordinate - Bottor [ft]	A N/A A N/A A N/A Corrected) - Safet Interslice Normal Force [lbs] 4 0	N/A N/A N/A N/A N/A ty Factor: 1.20: Interslice Shear Force [ibs] 0	Interslice Force Ang
5 6 7 8 9 10 11 12	95.5772 96.6606 97.744 98.495 99.2461 99.9972 101.258 102.519	700.41 699.985 699.559 699.402 699.246 699.089 699.462 699.835 700.039 700.243 700.659	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 2994.67 3174.6	0 0 0 0 0 0 0	0 0 0 0 0 0	Slice Number	N/A N/A N/A N/A Global Mi x coordinate [ft] 88.6321 90.0085	N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/	A N/A A N/A A N/A Corrected) - Safet Interslice Normal Force [ibs] 4 0 3 120.181	N/A N/A N/A N/A ty Factor: 1.20: Intersilice Shear Force [ibs] 0	Interslice Force Ang
5 6 7 8 9 10 11 12 13 14 15 16	95.5772 96.6606 97.744 98.495 99.2461 99.9972 101.258 102.519 103.154 103.79 105.062 105.697	700.41 699.985 699.559 699.402 699.246 699.089 699.462 700.039 700.243 700.658	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 2994.67 3174.6 3252.78 3335.14 3508.39	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5 6 7 8 8 Slice Number 1 2 3	N/A N/A N/A N/A Global Mi X coordinate [ft] 88.6321 90.0085 91.3848	N/ N/ N/ N/ nimum Query (janbu y coordinate - Bottor [ft] 698 697.64 696.88	A N/A A N/A A N/A Corrected) - Safet Interslice Normal Force [lbs] 4 0 3 120.181 7 480.726	N/A N/A N/A N/A N/A N/A ty Factor: 1.20: Interslice Shear Force [ibs] 0 0 0	Interslic
5 6 7 8 9 10 11 12 13 14 15	95.5772 96.6606 97.744 98.495 99.2461 99.9972 101.258 102.519 103.154 103.79 105.062	700.41 699.985 699.559 699.402 699.246 699.089 699.462 699.835 700.039 700.243 700.659	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 2994.67 3174.6 3252.78 3335.14	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Slice Number	N/A N/A N/A N/A Global Mi x coordinate [ft] 88.6321 90.0085	N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/	A N/A A N/A A N/A Corrected) - Safet Interslice Normal Force [ibs] 4 0 3 120.181 7 480.726 3 528.678	N/A N/A N/A N/A ty Factor: 1.20: Intersilice Shear Force [ibs] 0	Interslic
5 6 7 8 9 10 11 12 13 14 15 16 17 18	95.5772 96.6606 97.744 98.495 99.2461 99.9972 101.258 102.519 103.154 103.79 105.062 105.697 106.333 106.406 107.6	700.41 699.985 699.59 699.462 699.246 699.835 700.039 700.243 700.659 700.868 701.076 701.1	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 3174.6 3252.78 3335.14 3508.39 3603.02 3702.99 3714.91	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5 6 7 8 Slice Number 1 2 3 3 4 5 6	N/A N/A N/A N/A Slobal Mi X coordinate [ft] 88.6321 90.0085 91.3848 91.5189 92.4524 94.1375	N/ N/ N/ N/ N/ N/ N/ N/ N/ N/ N/ N/ N/ N	A N/A A N/A A N/A A N/A Corrected) - Safet Intersite Normal Force [lbs] 7 480.726 3 120.181 7 480.726 3 528.678 3 906.358 4 1664.69	N/A N/A N/A N/A N/A N/A ty Factor: 1.20: Interslice Shear Force [lbs] 0 0 0 0 0 0	Interslic
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	95.5772 96.6606 97.744 98.495 99.2461 99.9972 101.258 102.519 103.154 103.79 105.062 105.697 106.333 106.406 107.6	700.41 699.985 699.559 699.402 699.264 699.089 699.462 700.039 700.243 700.659 700.888 701.076 701.11 701.491 701.71	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 3174.6 3252.78 3335.14 3508.39 3603.02 3702.99 3714.91 4015.31	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Slice Number 1 2 3 4 5 6 7	N/A N/A N/A N/A Global Mi X coordinate [ft] 88.6321 90.085 91.3848 91.5189 92.4524 94.1375 95.6031	N/ N	A N/A A N/A A N/A A N/A A N/A Corrected) - Safet Interslice Normal Force [lbs] 4 0 3 120.181 7 480.726 3 528.678 3 906.358 4 1664.59 2 2460.91	N/A N/A N/A N/A N/A N/A N/A Interslice Shear Force [lbs] 0 0 0 0 0 0 0	Interslice Force Ang
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	95.5772 96.6606 97.744 98.495 99.2461 99.9972 101.258 102.519 103.154 103.79 105.062 105.697 106.333 106.406 107.6 108.271 108.867	700.41 699.985 699.559 699.402 699.264 699.089 700.243 700.659 700.888 701.076 701.11 701.491 701.711	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 3174.6 3252.78 3335.14 3508.39 3603.02 3702.99 3714.91 3907.17 4015.31	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5 6 7 8 Slice Number 1 2 3 3 4 5 6	N/A N/A N/A N/A Slobal Mi X coordinate [ft] 88.6321 90.0085 91.3848 91.5189 92.4524 94.1375	N/ N/ N/ N/ N/ N/ N/ N/ N/ N/ N/ N/ N/ N	A N/A A N/A A N/A Corrected) - Safet Interslice Normal Force [lbs] 4 0 3 120.181 7 480.726 3 996.358 4 1664.69 2 2460.91 5 3565.18	N/A N/A N/A N/A N/A N/A ty Factor: 1.20: Interslice Shear Force [lbs] 0 0 0 0 0 0	Interslice Force Ang
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	95.5772 96.6606 97.744 98.495 99.2461 99.9972 101.258 102.519 103.154 105.062 105.697 106.333 106.406 107.6 108.271 108.867 109.516 110.165	700.41 699.955 699.559 699.462 699.246 699.825 700.239 700.243 700.868 701.17 701.411 701.411 701.919 702.119	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 2994.67 3174.6 3252.78 3335.14 3508.39 3603.02 3702.99 3714.91 3907.17 4015.31 4111.7 4215.94	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$ 6 7 8 8 \$ \$ 10 6 7 8 8 \$ 10 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1	N/A N/A N/A (Slobal Mi X coordinate [ft] 88.6321 90.085 91.3848 91.5189 92.4524 94.1375 95.6031 97.0686 98.5341 99.9996	N, N	A N/A A N/A A N/A Corrected) - Safet Interslice Normal Force [lbs] 3 120.181 7 480.726 3 906.358 4 1664.69 12 2460.91 5 3565.18 8 4569.98 5 5748.12	N/A	Interslic
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	95.5772 96.6606 97.744 98.495 99.2461 99.2461 103.519 103.549 105.062 105.697 106.333 106.406 107.6 108.271 108.867 109.516 110.168	700.41 699.955 699.422 699.246 699.899 699.482 700.243 700.599 700.888 701.076 701.1 701.491 701.711 701.906 702.331	807.329 122.27 176.601 2079.66 2428.23 2790.91 2994.67 31374.6 3152.78 3335.14 3508.39 3603.02 3702.99 3714.91 3907.17 4015.31 4111.7 4215.94 4319.52	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Slice Number 1 2 3 4 5 6 6 7 8 9 10 11	N/A N/A N/A Slobal Mi X coordinate [ft] 88.6321 90.0085 91.3189 92.4524 94.1375 95.6031 97.0686 98.5341 99.9996 10126	N, N	A N/A A N/A A N/A A N/A Corrected) - Safet Interslice Interslice 4 0 3 120.181 7 480.726 3 528.678 3 906.338 4 1664.69 2 2460.91 5 3565.18 8 4569.98 5 748.12 9 6305.9 9 6305.9	N/A	Interslic
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5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	95.5772 96.6506 97.744 98.495 99.2461 99.9972 101.258 102.519 103.154 103.79 105.062 105.697 106.333 106.406 107.6 108.271 108.867 109.516 110.165 110.985 111.839 112.71	700.41 699.955 699.559 699.402 699.246 699.089 699.402 700.039 700.243 700.659 700.869 701.177 701.171 701.906 702.131 702.6 702.131 702.6 702.135 702.6 703.165 703.165 703.165 703.165 703.165 703.165 703.165 703.165	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 2994.67 3127.4 3525.78 3335.14 3508.39 371.491 3907.17 4015.31 4111.7 4215.94 4319.52 4449.57 4501.53 4552.71	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Slice Number 1 2 3 4 5 6 6 7 8 8 9 10 11 12 13 13	N/A N/A N/A N/A Global Mi X coordinate [ft] 88.6321 90.0085 91.3848 91.5189 92.4524 94.1375 95.6031 99.9996 101.26 102.521 103.78	N, N	A N/A A N/A A N/A A N/A A N/A Corrected) - Safet Intersitice Normal Force [iba] 4 0 3 1220.181 7 480.726 3 926.578 3 906.358 4 1664.69 2 2460.91 5 5 5565.18 8 1569.98 6 7596.72 9 3 6756.72 9 3 6756.72 9 3 7791.18	N/A	Interslic
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	95.5772 96.6066 97.744 98.495 99.2461 102.519 103.154 103.154 103.154 104.606 107.6 108.271 108.867 109.516 110.65 110.85 111.839 112.71 113.581	700.41 699.95 699.402 699.246 699.029 699.462 699.835 700.039 700.243 700.659 700.858 701.07 701.11 701.491 702.313 702.55 702.88 701.07 702.88 703.65 703.481 703.481	807.329 1222.27 1766.01 2079.66 2428.23 2790.91 2994.67 3174.6 3355.78 3355.14 3508.39 3603.02 3702.99 3704.99 3704.91 3907.17 4215.94 4319.52 4449.57 4501.23 4502.12	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Slice Number 1 2 3 4 5 6 6 7 8 8 9 10 11 11 12 13 14 15	N/A N/A N/A N/A Global Mi X 8.6321 90.085 91.3848 91.5189 92.4524 94.1375 95.6031 97.0686 99.9996 101.26 102.521 103.78	N, N	A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/	N/A	Interslic
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Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A

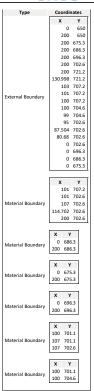
8	N/A	N/A	N/A	N/A	N/A
		Minimum Query (spen			
Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	87.6113	698.4	0	0	0
2	88.6356	698.076	36.3154	13.632	20.575
3	89.6599	697.752	145.262	54.5282	20.575
4	90.6854	697.421	331.466	124.425	20.575
5	91.7109	697.09	593.442	222.765	20.575
6	92.5201	696.819	865.143	324.756	20.5751
7	93.6521	696.439	1313.37	493.01	20.575
8	94.0773	696.3	1493.09	560.473	20.575
9	95.8042	695.736	2214.4	831.239	20.5751
10	96.8808	695.6	2554.67	958.968	20.5751
11	97.9574	695.464	2966.59	1113.59	20.575
12	98.9611	695.374	3365.82	1263.46	20.5751
13	99.9648	695.284	3796.08	1424.97	20.5751
14	101.016	695.424	4235.11	1589.77	20.5751
15	102.068	695.564	4614.36	1732.13	20.575
16	103.121	695.703	4994.23	1874.73	20.5751
17	104.174	695.842	5387.38	2022.31	20.5751
18	106.281	696.266	6021.68	2260.41	20.5751
19	106.377	696.3	6033.17	2264.72	20.575
20	107.383	696.657	6228.74	2338.14	20.5751
21	108.389	697.013	6416.33	2408.55	20.575
22	109.455	697.408	6588.23	2473.08	20.5751
23	110.521	697.802	6752.98	2534.92	20.575
24	112.305	698.4	7090.07	2661.46	20.5751
25 26	112.597 114.673	698.498 699.122	7107.6 7306.25	2668.04 2742.61	20.5751 20.5751
26					
27	116.807 118.941	699.697 700.34	7571.95 7719.72	2842.35 2897.82	20.5751
29	120.008	700.54	7762.08	2913.72	20.5751
30	121.075	701.015	7797.85	2913.72	20.5751
31	122.325	701.463	7758.28	2912.29	20.5751
32	123.574	701.912	7709.58	2894.01	20.5751
33	124.824	701.512	7472.2	2804.91	20.5751
34	126.074	703.089	7228.52	2713.43	20.5751
35	128.574	703.089	6710.9	2519.13	20.5751
36	129.824	704.277	6333.68	2377.53	20.5751
37	131.074	705.656	5954.59	2235.23	20.5751
38	132.039	706.312	5535.28	2077.83	20.5751
39	133.005	706.968	5121.22	1922.4	20.5751
40	133.97	707.673	4668.3	1752.38	20.5751
41	134.936	708.378	4223.84	1585.54	20.5751
42	135,902	709.238	3667.56	1376.72	20.575
43	136.868	710.098	3132.06	1175.71	20.5751
44	138.594	711.798	2142.85	804.381	20.5751
45	140.285	713.777	1242.31	466.337	20.5751
46	141.976	715.756	627.742	235.641	20.5751
47	142.189	716	571.874	214.669	20.575
48	143.183	717.141	348.323	130.753	20.5751
49	144.389	718.526	150.995	56.6802	20.575
50	145.596	719.869	37.5034	14.078	20.5751
51	146.802	721.2	0	0	0

Query 1 (spencer) - Safety Factor: 1.49694							
Slice Number	coordinate coordinate - Bot		Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]		
1	N/A	N/A	N/A	N/A	N/A		
2	N/A	N/A	N/A	N/A	N/A		
3	N/A	N/A	N/A	N/A	N/A		
4	N/A	N/A	N/A	N/A	N/A		
5	N/A	N/A	N/A	N/A	N/A		
6	N/A	N/A	N/A	N/A	N/A		
7	N/A	N/A	N/A	N/A	N/A		
8	N/A	N/A	N/A	N/A	N/A		

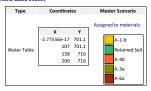
Entity Information

Group: Non-Circular- Forward Abutment Left 80 with Footing ♦
Shared Entities





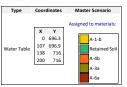
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Group: Non-Circular - Forward Abutment Right 80 with Footing ♦ Shared Entitles



Scenario-based Entities



RECOMMENDED GEOTECHNICAL PLAN NOTES

[605.3-2] <u>ITEM 203 EMBANKMENT</u>, <u>AS PER PLAN</u>: PLACE AND COMPACT EMBANKMENT MATERIAL IN 6-IN LIFTS FOR THE CONSTRUCTION OF THE BRIDGE APPROACH EMBANKMENT ALONG C.R. 97 (E. SCHAAF RD.).

[606.2-1] PILE DESIGN LOADS (ULTIMATE BEARING VALUE):

PIER PILES:

THE ULTIMATE BEARING VALUE IS 436 KIPS PER PILE

16-INCH DIAMETER CIP PILES 100 FEET LONG, ORDER LENGTH

1 DYNAMIC LOAD TESTING ITEM, AS PER PLAN

1 RESTRIKE ITEM, AS PER PLAN

PROVIDE PLAIN CYLINDRICAL CASINGS WITH A MINIMUM PILE WALL THICKNESS OF 0.312 INCH FOR THE CAST-IN-PLACE REINFORCED CONCRETE PILES.

[606.7-3] ITEM SPECIAL - STRUCTURE: PRECONSTRUCTION CONDITION SURVEY:

BEFORE PILE DRIVING BEGINS, CONDUCT A CONDITION SURVEY OF THE THREE (3) RESIDENTIAL BUILDING STRUCTURES ON EAST SCHAAF ROAD AT STATIONS 214+70, 217+35, AND 218+15, WHICH ARE LOCATED WITHIN 200-FT OF THE PILE DRIVING WORK. THE PURPOSE OF THE SURVEY IS TO DOCUMENT THE CONDITION OF THE BUILDINGS PRIOR TO PILE DRIVING, SO THAT CLAIMS OF DAMAGE CAUSED BY THE PILE DRIVING CAN BE VERIFIED.

RETAIN AN EXPERIENCED VIBRATION SPECIALIST TO PERFORM OR SUPERVISE THE CONDITION SURVEY. USE A VIBRATION SPECIALIST WHO MEETS ONE OF THE FOLLOWING CRITERIA: 1) IS A REGISTERED ENGINEER WITH AT LEAST TWO YEARS OF PROVEN EXPERIENCE IN MONITORING VIBRATIONS ON SIMILAR CONSTRUCTION PROJECTS, OR 2) HAS AT LEAST FIVE YEARS OF PROVEN EXPERIENCE IN MONITORING VIBRATIONS ON SIMILAR CONSTRUCTION PROJECTS. DO NOT USE A VIBRATION SPECIALIST THAT IS AN EMPLOYEE OF THE CONTRACTOR.

SUBMIT A RESUME OF THE CREDENTIALS OF THE PROPOSED VIBRATION SPECIALIST AT OR BEFORE THE PRECONSTRUCTION MEETING. INCLUDE IN THE RESUME A LIST OF CONSTRUCTION PROJECTS ON WHICH THE VIBRATION SPECIALIST WAS RESPONSIBLY IN CHARGE OF MONITORING THE VIBRATIONS. LIST A DESCRIPTION OF THE PROJECTS, WITH DETAILS OF THE VIBRATION INTERPRETATIONS MADE ON THE PROJECT. LIST THE NAMES AND TELEPHONE NUMBERS OF PROJECT OWNERS WITH SUFFICIENT KNOWLEDGE OF THE PROJECTS TO VERIFY THE SUBMITTED INFORMATION. OBTAIN THE ENGINEER'S ACCEPTANCE OF THE VIBRATION SPECIALIST BEFORE BEGINNING ANY PILE DRIVING WORK. ALLOW 30 DAYS FOR THE REVIEW OF THIS DOCUMENTATION.

RECORD THE CONDITION OF EXISTING STRUCTURES AND BUILDING MATERIALS, USING WRITTEN TEXT, PHOTOGRAPHS, AND VIDEO RECORDINGS. INSPECT INTERIOR WALLS, CEILINGS, AND FLOORS THAT ARE ACCESSIBLE. INSPECT THE EXTERIOR OF THE BUILDING THAT IS VISIBLE FROM GROUND LEVEL. ALSO RECORD THE LOCATION, SIZE, AND TYPE OF ALL CRACKS AND OTHER STRUCTURAL DEFICIENCIES.

IF OWNERS OR OCCUPANTS FAIL TO ALLOW ACCESS TO THE PROPERTY FOR THE PRECONSTRUCTION CONDITION SURVEY, SEND A CERTIFIED LETTER TO THE OWNER OR OCCUPANT. DOCUMENT THE NOTIFICATION EFFORT AND THE CERTIFIED LETTER IN THE REPORT. SUBMIT THREE COPIES OF A REPORT TO THE ENGINEER THAT SUMMARIZES THE PRECONSTRUCTION CONDITION OF THE BUILDINGS AND THAT IDENTIFIES AREAS OF CONCERN. THE DEPARTMENT WILL PAY FOR THIS ITEM AT THE CONTRACT LUMP SUM PRICE FOR ITEM SPECIAL – STRUCTURE: PRECONSTRUCTION CONDITION SURVEY.

[606.7-4] PILES DRIVEN TO FULL ESTIMATED LENGTH WITH PILE/SOIL SETUP

THE ULTIMATE BEARING VALUE (UBV) IS 436 KIPS PER PILE FOR THE 16-INCH DIAMETER CIP PIER PILES. PART OF THE UBV WILL BE ACHIEVED THROUGH PILE/SOIL SETUP, WHICH IS A TIME DEPENDENT INCREASE IN RESISTANCE THAT OCCURS IN SOME SOILS.

NOTIFY THE ENGINEER AT LEAST 5 DAYS BEFORE DRIVING PILES SO THAT THE ENGINEER CAN NOTIFY THE DISTRICT GEOTECHNICAL ENGINEER, THE OFFICE OF CONSTRUCTION ADMINISTRATION, AND THE OFFICE OF GEOTECHNICAL ENGINEERING.

DRIVE THE FIRST TWO PILES AT THE PIER PILES TO THE FULL ESTIMATED LENGTH OF 95 FEET. PERFORM DYNAMIC LOAD TESTING ON BOTH PILES WHILE DRIVING AT EACH SUBSTRUCTURE. AFTER DRIVING AND TESTING THE FIRST TWO PILES, DRIVE THE REMAINING PILES IN THE SUBSTRUCTURE TO THE SAME DEPTH AS THE FIRST TWO PILES. AFTER DRIVING ALL PILES TO THE ESTIMATED LENGTH AT THE PIERS, CEASE ALL DRIVING OPERATIONS AT THE SUBSTRUCTURE FOR A PERIOD OF 7 DAYS. INCLUDE THE WAITING PERIOD AS A SEPARATE ACTIVITY IN THE PROGRESS SCHEDULE. AFTER THE WAITING PERIOD, PERFORM PILE RESTRIKES ON BOTH OF THE FIRST TWO PILES (ONE RESTRIKE ITEM).

SUBMIT ALL TEST RESULTS TO THE ENGINEER. IF THE RESTRIKE TEST RESULTS INDICATE THAT BOTH PILES ACHIEVED THE REQUIRED UBV, ALL PILES IN THE SUBSTRUCTURE MAY BE ACCEPTED BY THE ENGINEER.

IF THE RESTRIKE TEST RESULTS INDICATE THAT EITHER OF THE TWO PILES DID NOT ACHIEVE THE REQUIRED UBV, IMMEDIATELY NOTIFY THE ENGINEER SO THAT THE ENGINEER CAN NOTIFY THE DISTRICT GEOTECHNICAL ENGINEER, THE OFFICE OF CONSTRUCTION ADMINISTRATION, AND THE OFFICE OF GEOTECHNICAL ENGINEERING. THE ENGINEER WILL REVIEW THE TEST RESULTS AND ESTABLISH ADDITIONAL RESTRIKE TESTING OR DRIVING CRITERIA FOR THE PILING IN THE SUBSTRUCTURE WITH THE ASSISTANCE OF THE DISTRICT GEOTECHNICAL ENGINEER, THE OFFICE OF CONSTRUCTION ADMINISTRATION, AND THE OFFICE OF GEOTECHNICAL ENGINEERING.

IF DIRECTED BY THE ENGINEER, PERFORM ADDITIONAL RESTRIKE TESTING OR DRIVE ALL PILES IN THE SUBSTRUCTURE TO THE ESTABLISHED DRIVING CRITERIA. THE DEPARTMENT WILL PAY FOR SPLICING OF THE PILES BEYOND THE ESTIMATED LENGTH PROVIDED IN THE PLANS UNDER C&MS 109.05 WITH A NEGOTIATED PRICE PER SPLICE.

THIS PLAN NOTE INCLUDES A QUANTITY OF ONE EACH ITEM 523 DYNAMIC LOAD TESTING, AS PER PLAN AND A QUANTITY OF ONE EACH ITEM 523 RESTRIKE, AS PER PLAN PER EACH SUBSTRUCTURE UNIT WITH PILE FOUNDATIONS.

FRICTION TANGENT DRILLED SHAFTS:

FRICTION DRILLED SHAFTS: THE MAXIMUM FACTORED LOAD TO BE SUPPORTED BY EACH DRILLED SHAFT IS 122 KIPS AT THE ABUTMENTS. THIS LOAD IS RESISTED BY FRICTIONAL SIDE RESISTANCE ALONG THE LENGTH OF THE DRILLED SHAFT. AT THE REAR ABUTMENT, THE FACTORED SIDE RESISTANCE IS 255 KIPS, ASSUMED TO ACT ALONG THE BOTTOM 36 FEET OF THE DRILLED SHAFT. AT THE FORWARD ABUTMENT, THE FACTORED SIDE RESISTANCE IS 177 KIPS, ASSUMED TO ACT ALONG THE BOTTOM 26 FEET OF THE DRILLED SHAFT.

LATERALLY LOADED DRILLED SHAFTS: THE MAXIMUM FACTORED LATERAL LOAD AND BENDING MOMENT ACTING AT THE TOP OF EACH DRILLED SHAFT FROM THE SUPERSTRUCTURE ARE 19 KIPS AND 64 KIP-FEET, RESPECTIVELY. THE MAXIMUM FACTORED LATERAL LOAD TO BE SUPPORTED BY EACH DRILLED SHAFT FROM EARTH LOADING BEHIND THE EXPOSED PORTION OF THE DRILLED SHAFT IS 86 KIPS ACTING AT 14.7 FEET BELOW THE TOP OF SHAFT AT THE REAR ABUTMENT AND 27 KIPS ACTING AT 8.3 FEET BELOW THE TOP OF SHAFT AT THE FORWARD ABUTMENT.

THESE LOADS AND MOMENTS PRODUCE A MAXIMUM FACTORED BENDING MOMENT OF 1123 KIP-FEET AND A MAXIMUM FACTORED SHEAR OF 105 KIPS WITHIN THE DRILLED SHAFT AT THE REAR ABUTMENT. AT THE FORWARD ABUTMENT, THESE LOADS AND MOMENTS PRODUCE A MAXIMUM FACTORED BENDING MOMENT OF 422 KIP-FEET AND A MAXIMUM FACTORED SHEAR OF 46 KIPS WITHIN THE DRILLED SHAFT.

ITEM 524 – DRILLED SHAFTS, 48" DIAMETER ABOVE BEDROCK, AS PER PLAN:

THIS WORK CONSISTS OF FURNISHING AND INSTALLING DRILLED SHAFTS FOR THE TANGENT DRILLED SHAFT WALLS. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, AND EQUIPMENT TO INSTALL THE DRILLED SHAFTS AS DETAILED IN THE PLANS IN ACCORDANCE WITH THE REQUIREMENTS OF ODOT C&MS SECTION 524, AND WITH THE ADDITIONAL REQUIREMENTS DEFINED BELOW.

ANTICIPATED DRILLED SHAFT DEFLECTIONS:

TANGENT DRILLED SHAFTS ("SHAFT", "SHAFTS") ARE INCORPORATED AS WALLS IN VARIOUS STRUCTURAL ELEMENTS FOR THIS BRIDGE. AS DESIGNED AND DETAILED THE SHAFTS ARE EXPECTED TO DEFLECT UNDER THE APPLIED PERMANENT LOADS (DC, DW, EP) AND TRANSIENT LOADS (LL, LS, TU) AT THE SERVICE LIMIT STATE.

THE MAXIMUM ANTICIPATED DEFLECTION AT THE TOP OF SHAFT DUE TO PERMANENT LOADS ARE AS FOLLOWS:

WALL 1 1.25 INCHES SHAFTS 1 THROUGH 54
WALL 2 0.125 INCHES SHAFTS 75 THROUGH 114

PERMANENT LOAD DEFLECTIONS ARE ASSUMED TO OCCUR FOLLOWING REMOVAL OF SOIL IN FRONT OF THE TANGENT SHAFT WALLS.

A "SONOTUBE" MAY BE NEEDED TO AID IN FORMING THE TOP SECTION OF THE DRILLED SHAFTS THAT ARE EXPOSED TO OPEN AIR AND ARE NOT ENTIRELY ENCASED IN SOIL. THE CONTRACTOR MAY USE OTHER MEANS AND METHODS TO COMPLETE THIS WORK. ALTERNATE METHODS SHALL BE APPROVED BY THE ENGINEER.

ANY FORMWORK USED FOR THE DRILLED SHAFT CONCRETE ABOVE GRADE MUST BE COMPLETELY REMOVED.

SEQUENCE OF INSTALLATION: INSTALL THE DRILLED SHAFTS IN A SEQUENCE SUCH THAT NO DRILLED SHAFT IS INSTALLED WITHIN SIX DRILLED SHAFT DIAMETERS OF EITHER AN OPEN DRILLED SHAFT EXCAVATION OR A DRILLED SHAFT IN WHICH THE CONCRETE HAS LESS THAN A 48-HOUR CURE. INSTALLING THE SHAFTS IN AN ALTERNATING SEQUENCE OR ANY OTHER SEQUENCE THAT MEETS THESE CRITERIA IS PERMISSIBLE. DO NOT CUT OR DAMAGE A NEIGHBORING DRILLED SHAFT.

BACKFILL BEHIND THE REAR ABUTMENT SHALL BE LIMITED TO THE TOP OF SHAFT UNTIL THE SUPERSTRUCTURE IS IN PLACE. THIS RESTRICTION DOES NOT APPLY TO THE FORWARD ABUTMENT.

THE CONTRACTOR IS RESPONSIBLE FOR THE MEANS AND METHODS USED TO CONSTRUCT THE DRILLED SHAFTS. ALL EQUIPMENT, LABOR, TEMPORARY GRADING, EXCAVATION, EMBANKMENT, AGGREGATE, DRAINAGE, SHEETING, ETC. NEEDED TO COMPLETE THE WORK IS INCLUDED IN THE BID PRICE FOR THE DRILLED SHAFTS. THE COST OF ANY EXCAVATION AND SUBSEQUENT REPLACEMENT OF EMBANKMENT (IN ACCORDANCE WITH ITEM 203 EMBANKMENT) IS INCLUDED IN THE BID ITEM FOR THE DRILLED SHAFTS, UNLESS SEPARATELY ITEMIZED. NO SEPARATE PAYMENT WILL BE MADE.

THE CORRECT LOCATION OF THE SHAFT IS CRITICAL TO ESTABLISHING AND MAINTAINING STRUCTURE GEOMETRY. POSITION THE SHAFT WITHIN 2" OF THE PLAN LOCATION IN THE HORIZONTAL PLANE AT THE PLAN ELEVATIONS FOR THE TOP OF THE SHAFT. THE CONTRACTOR SHALL EMPLOY THE SERVICES OF AN OHIO REGISTERED PROFESSIONAL SURVEYOR ("THE SURVEYOR") TO ESTABLISH, MAINTAIN, AND VERIFY HORIZONTAL AND VERTICAL SHAFT GEOMETRY. THE SURVEYOR SHALL BE READILY AVAILABLE TO ESTABLISH GEOMETRIC CONTROL

AND PERFORM THE SURVEYS REQUIRED TO MAINTAIN THE LOCATION AND ALIGNMENT OF THE SHAFTS.

THE CONTRACTOR SHALL PROVIDE AN INSTALLATION PLAN AS REQUIRED BY ODOT C&MS SECTION 524.03. THE INSTALLATION PLAN SHALL ALSO INCLUDE:

- 1. CONTRACTOR'S PROPOSED METHODS TO MAINTAIN LOCATION AND ALIGNMENT OF THE SHAFTS
- 2. CONTRACTOR'S PROPOSED METHODS FOR PERFORMING THE DRILLED SHAFT LOCATION SURVEY

MATERIALS: CONCRETE AND CONCRETE REINFORCEMENT FOR DRILLED SHAFTS SHALL CONFORM TO ODOT C&MS SECTION 524.02. THE MAXIMUM COURSE AGGREGATE SIZE SHALL BE 3/8".

PAYMENT SHALL BE PER ODOT C&MS 524.17 AND IS FULL COMPENSATION FOR CONSTRUCTING THE DRILLED SHAFTS, INCLUDING FURNISHING AND PLACING CONCRETE, AND REMOVAL OF ANY FORMS.

ITEM 894 – THERMAL INTEGRITY PROFILING (TIP) TEST

PERFORM INTEGRITY TESTING ON 6 OF THE DRILLED SHAFTS AT THE REAR ABUTMENT AND 4 OF THE DRILLED SHAFTS AT THE FORWARD ABUTMENT BY THERMAL INTEGRITY PROFILING (TIP). PERFORM TIP TESTING PER ASTM D7949, "STANDARD TEST METHODS FOR THERMAL INTEGRITY PROFILING OF CONCRETE DEEP FOUNDATIONS," METHOD B, AND PER SUPPLEMENTAL SPECIFICATION 894.

FOUNDATION BEARING RESISTANCE:

WALL FOOTINGS, AS DESIGNED, PRODUCE A MAXIMUM SERVICE LIMIT STATE BEARING PRESSURE OF 1.7 KIPS PER SQUARE FOOT AND A MAXIMUM STRENGTH LIMIT STATE BEARING PRESSURE OF 2.3 KIPS PER SQUARE FOOT. THE MINIMUM FACTORED BEARING RESISTANCE FOR WALL 1 AND WALL 2 IS 6.2 KIPS PER SQUARE FOOT AND 7.1 KIPS PER SQUARE FOOT RESPECTIVELY.

APPENDIX C

HDR TANGENT DRILLED SHAFT WALL DESIGN CALCULATIONS HDR CALCULATION SETS FOR END WALLS

Calculation Cover Sheet

Date: Monday, July 14, 2025

To: ODOT District 12

From: Alma K. Baratta, P.E. (HDR Engineering, Inc.)

Project: CUY-17-3.50, PID 112998

Project No: 10336513 Rev: 1

Calculation No: 1 Page: 1 of 448

Title: Tangent Drilled Shaft Wall Design Calculations

HDR has performed design calculations for the tangent drilled shaft walls at the rear and forward abutments of the proposed CUY-17-3.50 bridge. These calculations were developed based on changes to the design in consultation with ODOT following the Stage 2 submittal. The changes included moving the abutment locations, and supporting the rear and forward abutments on tangent drilled shaft walls instead of driven piles. All soil information and design parameters used in the HDR calculations were developed by SME and are presented in their Structure Foundation Exploration Report.

Analyses have been performed for 5 design sections in general accordance with the ODOT Geotechnical Design Manual (GDM) and Bridge Design Manual (BDM). Due to the skewed angle of the roadway to the wall, the initial backfill slope angle has been noted as 2H:1V (perpendicular to the roadway), but the backslope measurements have been taken perpendicular to the wall.

- Rear Abutment (B-003-0-22) 4'-Diameter Drilled Shafts:
 - 1) 22' height with horizontal backslope (Wall Sta. 1+00), 3 sub-cases:
 - Loading during construction, prior to abutment loading (free-head, active earth pressures)
 - ii. Loading during construction, after abutment construction, prior to superstructure installation (free-head, active earth pressures) – soil backfill was limited to the top of the drilled shafts prior to superstructure installation to reduce shaft deflections
 - iii. Post-construction (fixed-head, active and at-rest earth pressures)
 - 2) 22' height with skewed 2H:1V backslope (Wall Sta. 0+96)
 - 3) 17' height with skewed 2H:1V backslope (Wall Sta. 0+83)

- Forward Abutment (B-002-0-22) 4'-Diameter Drilled Shafts:
 - 4) 12.5' height with horizontal backslope (Wall Sta. 1+06), 3-sub cases:
 - i. Loading during construction, prior to abutment loading (free-head, active earth pressures)
 - ii. Loading during construction, after abutment construction, prior to superstructure installation (free-head, active earth pressures)
 - iii. Post-construction (fixed-head, active and at-rest earth pressures)
 - 5) 10' height skewed 2H:1V backslope (Wall Sta. 1+02)

Service and Strength loading are both included in the same file for each case. A design summary is presented on the following page.

Tangent Drilled Shaft Wall Design Summary

Lateral Analyses											
Ab.,.t.,	Danian Cantina	Cons		Wall Station End	Shaft Diameter	Design Wall	Maximum	Maximum Moment	Deflection (in)	Minimum Shaft	Minimum Shaft
Abutment	Design Section	Case	Begin	-	(ft.)	Height (ft.)	Shear (kips)	(in-kips)	Deflection (in)	Length (ft.)	Embedment (ft.)
Rear	3	Outside Abutment, 17' Wall	0+37	0+83	4	17	52	7365	0.41	47	30
	2	Outside Abutment, 22' Wall	0+83	1+00		22	81	12617	2.35	58	36
	1	Abutment Section					78	12171	1.85	58	36
		Construction (No Abutment Loading)									
	1	Abutment Section					78	12274	1.82		
		Construction (Abutment Loading)	1+00	1+00 2+44							
		Soil Backfill Limited to Top of Shafts									
	1	Abutment Section					105	13481	1.17		
		Post-Construction									
	3	Outside Abutment, 17' Wall	2+44	2+62		17	52	7365	0.41	47	30
	5	Outside Abutment, 10' Wall	0+88	1+05		10	30	2565	0.06	31	21
	4	Abutment Section	1+05 2	2+41	4	12.5	23	2017	0.05	40	27.5
Forward		Construction (No Abutment Loading)									
	4	Abutment Section					28	2983	0.18		
		Construction (Abutment Loading)									
	4	Abutment Section						5066	0.00		
		Post-Construction					46		0.06		
	5	Outside Abutment, 10' Wall	2+41	2+55		10	30	2565	0.06	31	21

Highlighted values indicate the maximum shear, moment, and deflection cases for each design section.

Design wall heights are from the top of the drilled shaft to the bottom of the excavation for the wall drainage system (3.5 feet below finished grade).

Minimum shaft embedment lengths are below the bottom of the excavation for the wall drainage system (3.5 feet below finished grade).

Reference Information

From Stage 3 plans

BENCHMARK D. (May 14, 2025)

€ CONST. C.R. 97 (E. SCHAFF RD.), CONC. MON. W/ ALUM. DISC

FOR ADDITIONAL BENCHMARK INFORMATION, SEE ROADWAY PLANS.

- 1. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.
- 2. TOE/TOE WIDTH TYPICAL THROUGH APPROACH PAVEMENT.

2026 ADTT = 235 2056 ADTT = 235

• 15'-6" REQUIRED MINIMUM VERTICAL CLEARANCE 17'-6" ACTUAL MINIMUM VERTICAL CLEARANCE (S.R. 17 WB)

15'-9" ACTUAL MINIMUM VERTICAL CLEARANCE (S.R. 17 EB)

MGS BTA = MIDWEST GUARDRAIL SYSTEM BRIDGE TERMINAL ASSEMBLY

BORING DATA					
BORING	€ CONST. C.R. 97 STATION	OFFSET	TOP OF ROCK ELEVATION		
B-001-0-22	218+21.19	7.49 RT.	586.7		
B-002-0-22	217+33.37	48.82' LT.	587.8		
B-003-0-22	215+09.56	25.36' RT.	585.6		
B-004-0-22	213+33.22	7.50' RT	587.9		

EXISTING STRUCTURE

TYPE: FOUR-SPAN CONTINUOUS STEEL GIRDERS WITH NON-COMPOSITE REINFORCED CONCRETE DECK ON STUB ABUTMENTS AND SINGLE

SPANS: 76'-0"±, 94'-0"±, 80'-0"±, 70'-0"± C/C BEARINGS

WEARING SURFACE: 3"± SUPERPLASTICIZED DENSE CONCRETE OVERLAY APPROACH SLABS: 15'-0"± LONG, VARIES 12"± MAX. THICK (AS-44-S, TYPE II

STRUCTURE FILE NUMBER: 1802437

PROPOSED STRUCTURE

TWO-SPAN CONTINUOUS STEEL PLATE GIRDERS WITH COMPOSITE REINFORCED CONCRETE DECK ON SEMI-INTEGRAL STUB ABUTMENTS SUPPORTED BY TANGENT DRILLED SHAFT WALLS AND A CAP AND

ROADWAY: 34'-0" TOE OF BRIDGE RAILING TO TOE OF CURB LOADING: HL93 AND 0.060 KSF FUTURE WEARING SURFACE

WEARING SURFACE: 1" MONOLITHIC CONCRETE

30'-0" LONG, 17" THICK (AS-1-15)

TYPE C INSTALLATION (AS-2-15)

COORDINATES: LATITUDE N41°24'55.08"

1802438

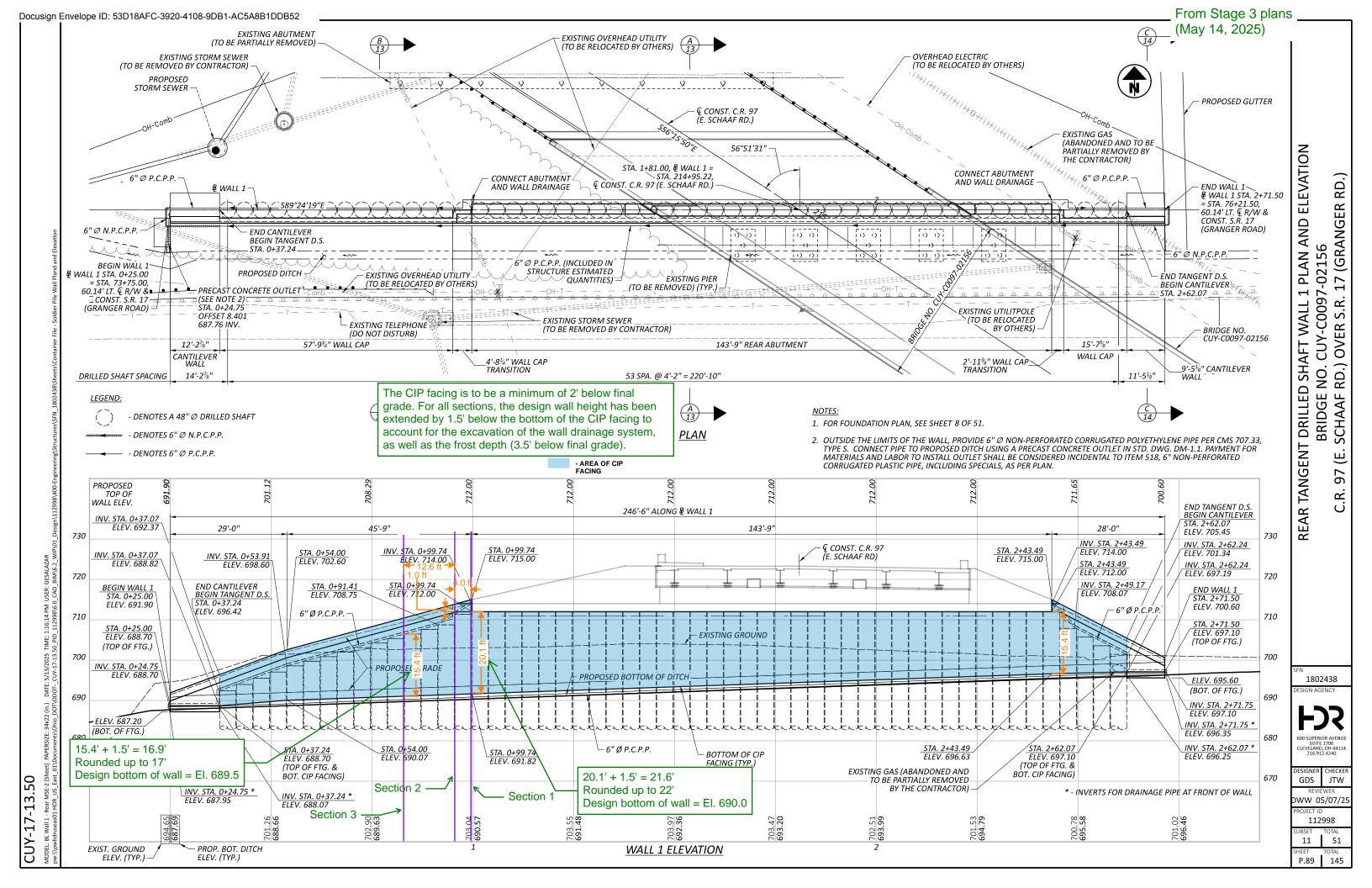
SUITE 1700 CLEVELAND, OH 441 216.912.4240

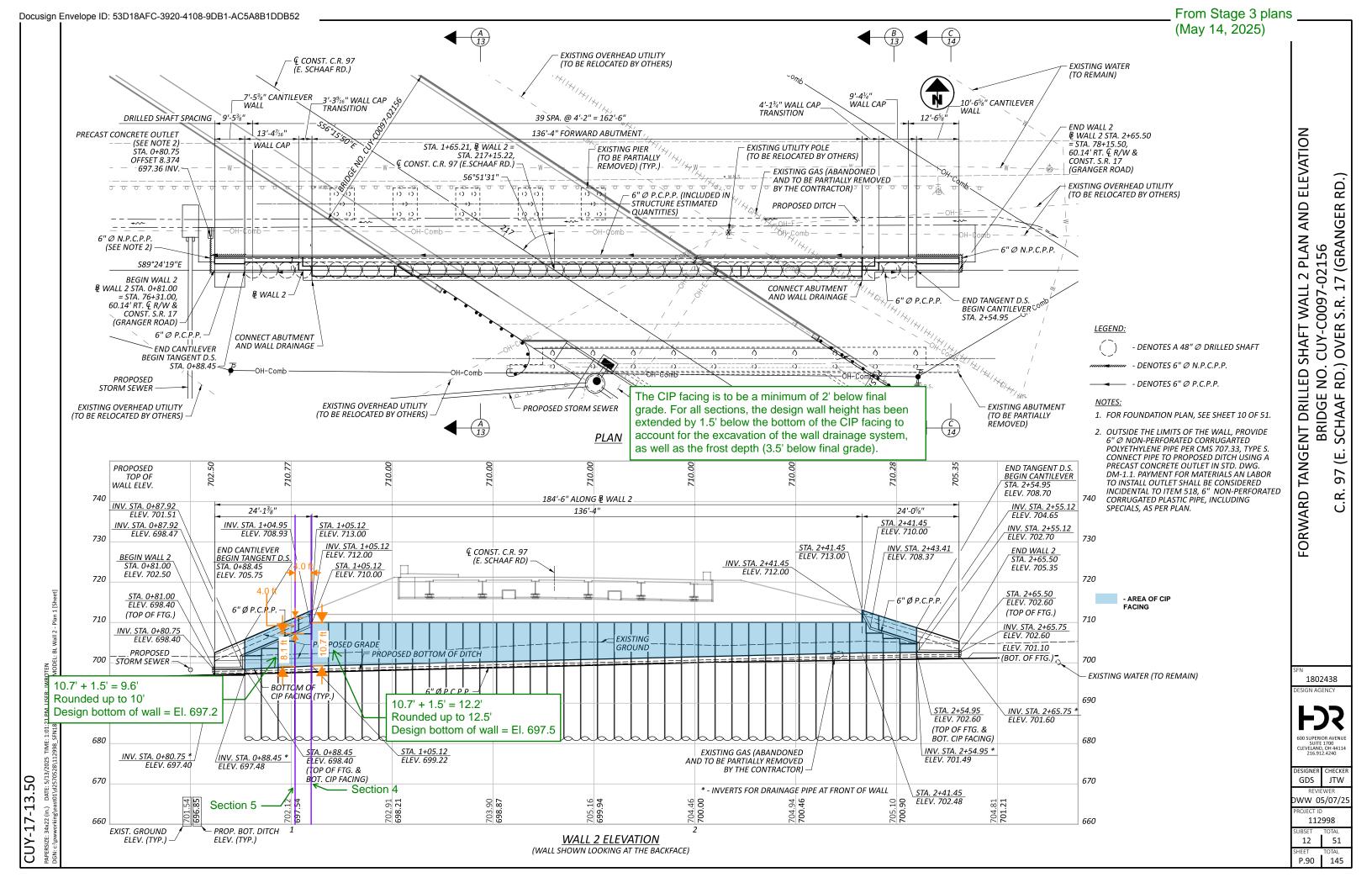
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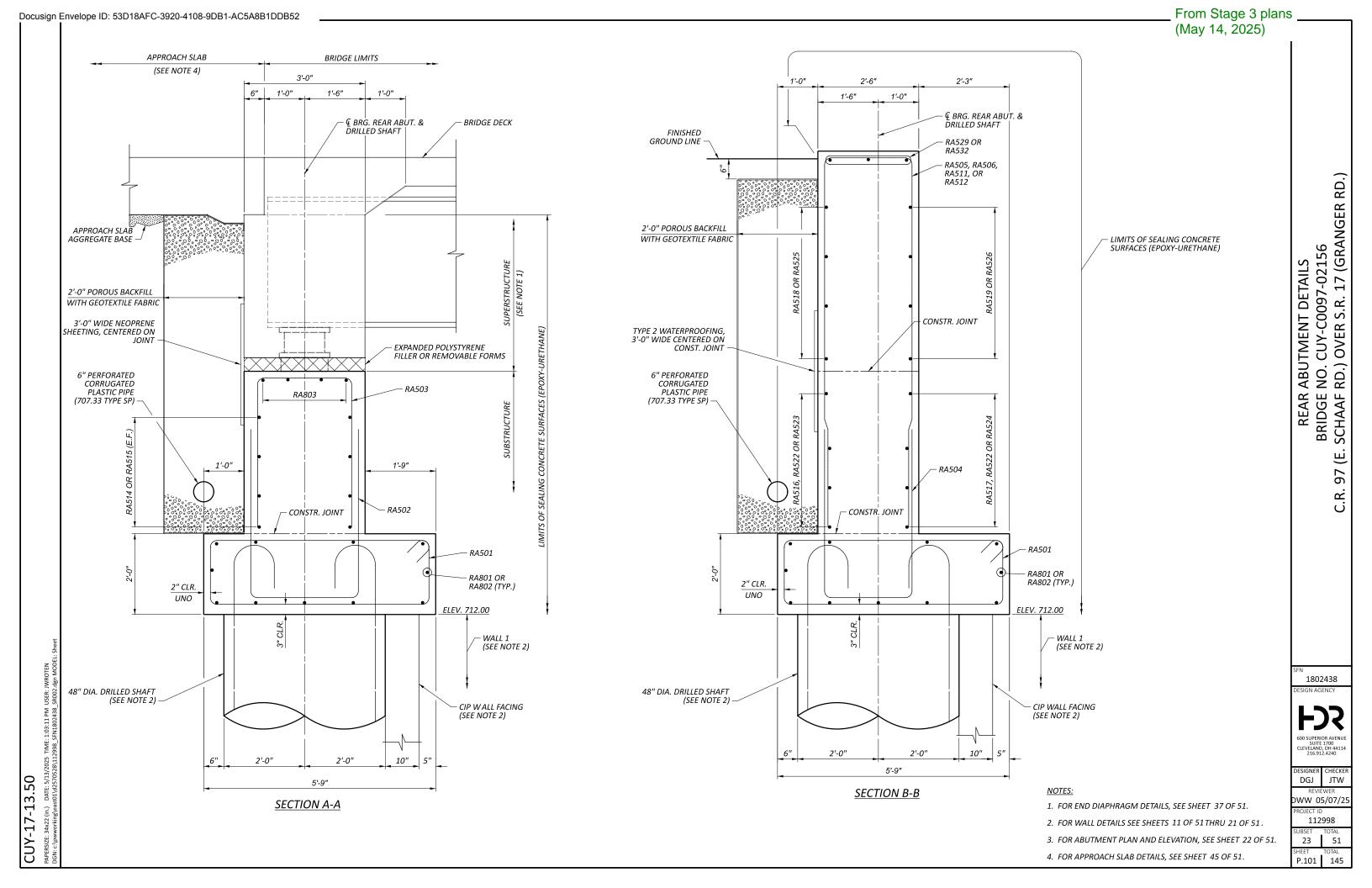
WW 05/07/2 112998 P.79 145

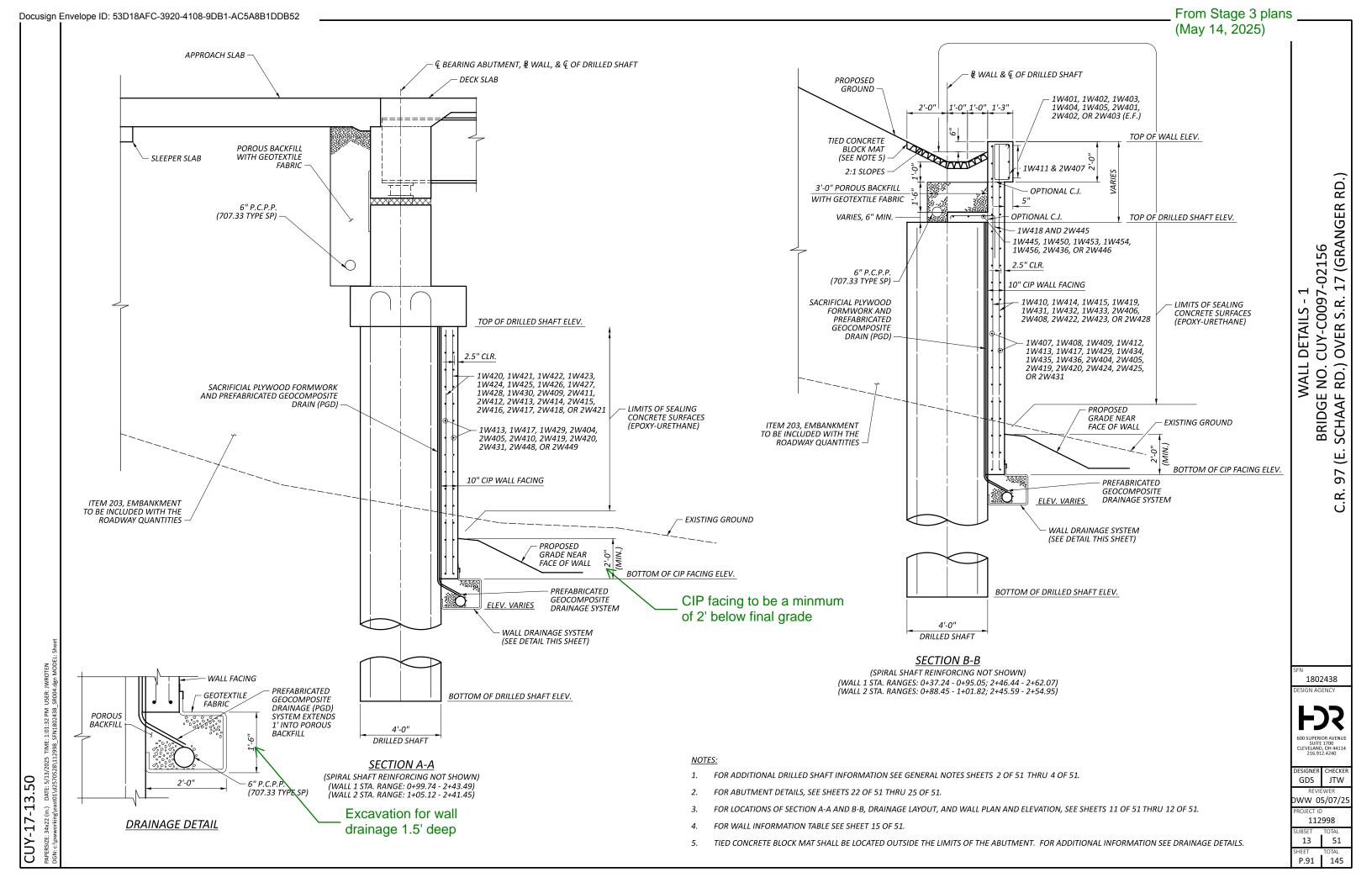
DGJ

OVER S.R. 17 (GRANGER RD.) CUY-C0097-02156 SITE PLAN Š. SCHAAF RD.) BRIDGE Ē. 97 خ





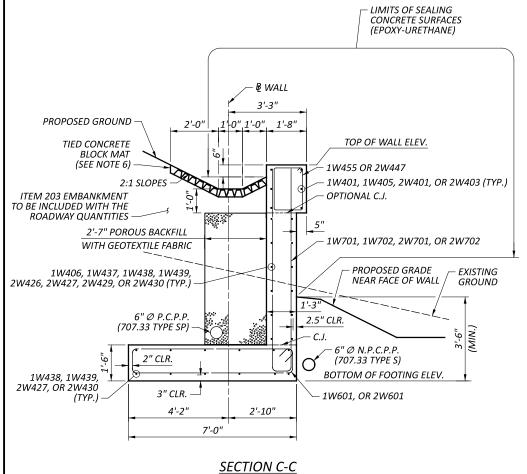




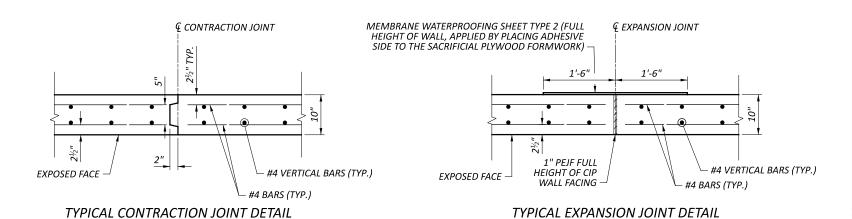
- 4'-0" DIA. DRILLED SHAFT (TYP.)

#4 HORIZONTAL BARS

#4 VERTICAL BARS (TYP.)



(WALL 1 STA. RANGES: 0+25.00 - 0+37.24; 2+62.07 - 2+71.50) (WALL 2 STA. RANGES: 0+81.00 - 0+88.45; 2+54.95 - 2+65.50)



NOTES:

- 1. FOR FOUNDATION PLAN SEE SHEETS 8 THRU 10 OF 51.
- 2. FOR LOCATION OF SECTION C-C, DRAINAGE LAYOUT, AND WALL PLAN AND ELEVATION, SEE SHEET 11 OF 51 THRU 12 OF 51.
- 3. FOR ADDITIONAL DRILLED SHAFT DETAILS, SEE GENERAL NOTES ON SHEET 3 OF 51.
- 4. DOWELS SHALL BE SPACED @ 12" MINIMUM C/C VERTICALLY AND OFFSET 6" BELOW THE TOP OF THE SHAFT AND 6" ABOVE THE BOTTOM OF THE CIP WALL FACING. A 12.5" MIN. EMBEDMENT IS REQUIRED. USE A PACHOMETER OR OTHER METHODS TO LOCATE AND AVOID DRILLED SHAFT REINFORCING. DOWELS SHALL BE UNCOATED STEEL REINFORCING PER C&MS 509. FOR ADDITIONAL DOWEL INFORMATION, SEE GENERAL NOTES, SHEET 2 OF 51.
- . FOR WALL INFORMATION TABLE, INCLUDING THE NUMBER OF DOWELS PER SHAFT, SEE SHEET 15 OF 51.
- 6. FOR ADDITIONAL TIED CONCRETE BLOCK MAT INFORMATION, SEE DRAINAGE DETAILS.

CUY-17-13.50
PAPERSIZE: 3422 (iii.) DATE: 5/13/2025 TIME: 1:01:39 PM U

600 SUPERIOR AVENUE SUITE 1700 CLEVELAND, 0H 441114 216.912.4240

DESIGNER GDS JTW

REVIEWER

DWW 05/07/25

PROJECT ID

112998

SUBSET TOTAL

14 51

P.92 145

1802438

Baratta, Alma

From: Wroten, Jacob

Sent: Wednesday, March 19, 2025 9:21 AM

To: Baratta, Alma

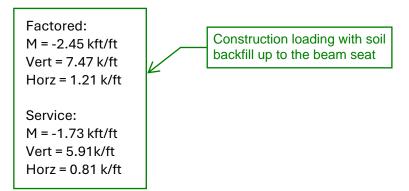
Cc: Voegele, Douglas M.; Shaner, Joanne **Subject:** RE: CUY-17 Tangent Drilled Shaft Wall

Alma, Sustained (dead) load only

Here are the max dead/sustained loading from the abutment for factored and service load combinations.

Factored S	ummary	<u>Ser</u>	vice Summary
Max Moment =	10.89 k-ft per ft	Max Moment =	5.47 k-ft per ft
Max Vertical Loads =	19.84 kips perft	Max Vertical Loads =	15.54 kips perft
Max Horizontal Loads =	3.87 kips perft	Max Horizontal Loads =	2.58 kips perft

Here are the loads per our conversation yesterday about the construction case where the contractor backfills up to the beam seat before they construct the superstructure.



Note the negative moment means it is acting opposite of the final condition moments and is bending in the direction of the retained soil. This is because the vertical soil on the heel causes a higher moment then the moment due to lateral earth pressure.

Let me know if you need anything else.

Thanks, Jacob

Jacob Wroten, PE **D** 216.912.4250 **M** 216.659.0730

hdrinc.com/follow-us

Baratta, Alma

From: Wroten, Jacob

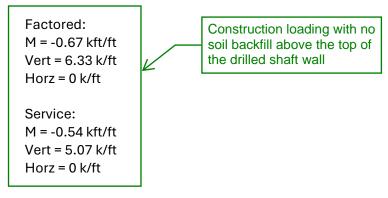
Sent: Thursday, July 3, 2025 1:56 PM

To: Baratta, Alma

Subject: FW: CUY-17 Tangent Drilled Shaft Wall

Alma,

Per our discussion here is the construction loading on the abutment assuming we restrict the backfill to the top of the shaft (bottom of footing). In this construction case there is no horizontal or vertical soil loading on the abutment and there is no superstructure constructed. These are the maximum loads for the abutment and wingwall.



Thanks, Jacob

Jacob Wroten, PE **D** 216.912.4250 **M** 216.659.0730

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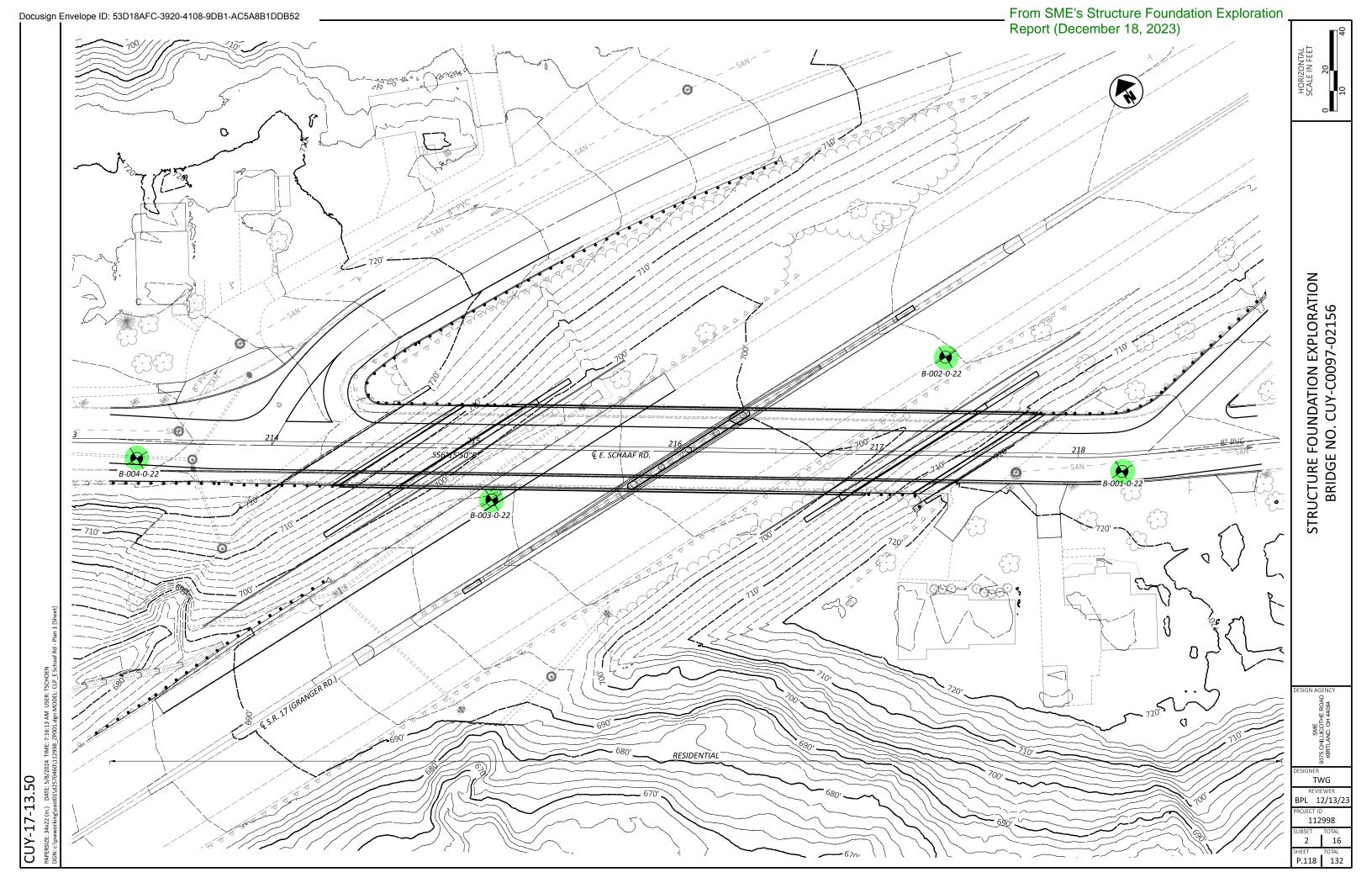
Docusign Envelope ID: 53D18AFC	-3920-4108-9	9DB1-AC5A8B1DDB52				
Ľ	Project:	CUY-17-13.50	Computed:	DGJ/GDS	Date:	2/27/2025
トノく	Subject:	Stage 3 Substructure	Checked:	JTW	Date:	2/28/2025
	Task:	Abutment Drilled Shaft Loading	Page:		of:	
	Job#:	10336513	No.:			

				Semi-Integ	ral Abutment D	esign on Pile	Foundation		
	Max Vertica	l + Max. Horizo	ntal	Max Vert	tical + Min. Horiz	ontal*	Min. Ve	rtical + Max. Horizonta	4
		Construction-	Final-	Construction-	Construction-	Final-			Final
	Construction Case 1	Case 2	Condition	Case 1	Case 2	Condition	Construction Case 1	Construction Case 2	Condition
ΣM _{vert} (k-ft)	525.51	525.51	525.51	525.51	525.51	525.51	378.18	378.18	378.18
ΣM _{horiz} (k-ft)	10.02	10.02	21.73	6.01	6.01	17.72	10.02	10.02	21.73
ΣΡ _{vert,} (kips)	156.33	156.33	156.33	156.33	156.33	156.33	112.39	112.39	112.39
X Bar (ft.)	3.30	3.30	3.22	3.32	3.32	3.25	3.28	3.28	3.17
e (ft.)	-0.05	-0.05	0.03	-0.07	-0.07	0.00	-0.03	-0.03	0.08
M _{c.c.} (k-ft)	7.82	-7.82	4.69	-10.94	-10.94	0.00	-3.37	-3.37	8.99
P _{front} (kips)	12.66	12.66	13.25	12.51	12.51	13.03	9.21	9.21	9.79
P _{beck} (kips)	13.4	13.40	12.80	13.55	13.55	13.03	9.53	9.53	8.94
P _{total} (kips)	26.06	26.06	26.05	26.06	26.06	26.06	18.74	18.74	18.73
Pile Check:	OK	OK	OK	OK	OK	OK	OK	OK	OK
ΣΡ _{horiz} (kips)	20.04	10.02	17.83	12.02	6.01	13.82	20.04	10.02	17.83
lin. horizontal ass	sumes the friction force	acts in the opp	osite directio	n as the horizon	tal earth & live k	oad surcharge	forces		
Max Total V	ertical Pile Reaction =	13.55	kips	$P = \frac{R}{r}$	Re(ybar – y	<u>',)</u>			
Max Horizont	al Force on Footing =	20.04	kips	$I_i = \frac{1}{n} + \frac{1}{n}$	I_{σ}				

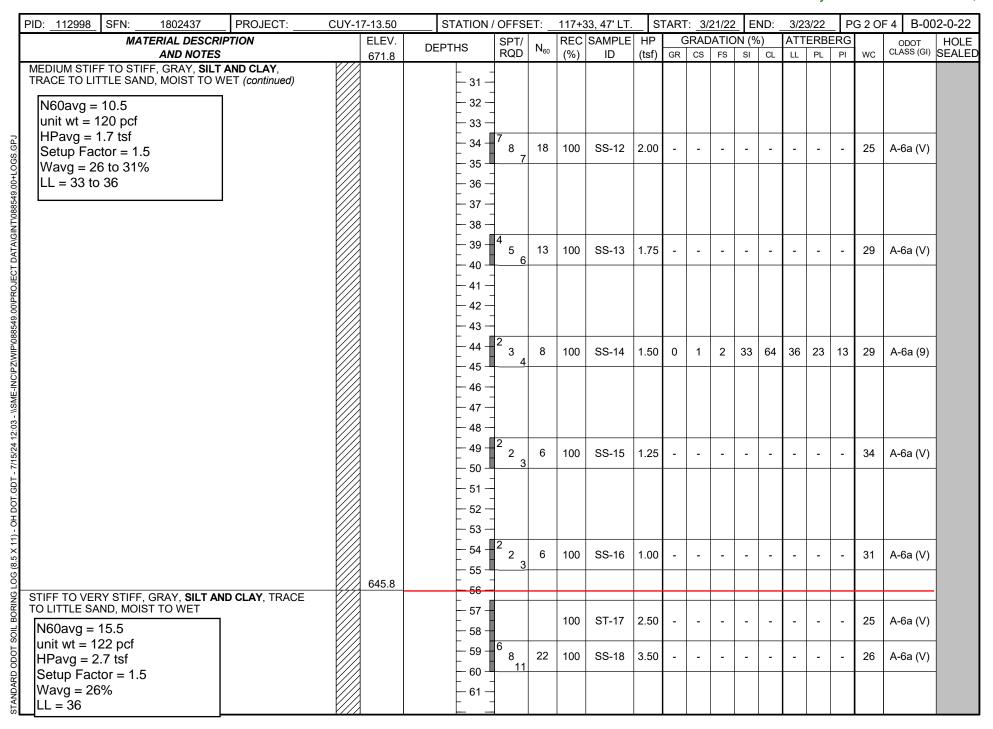
Summary:

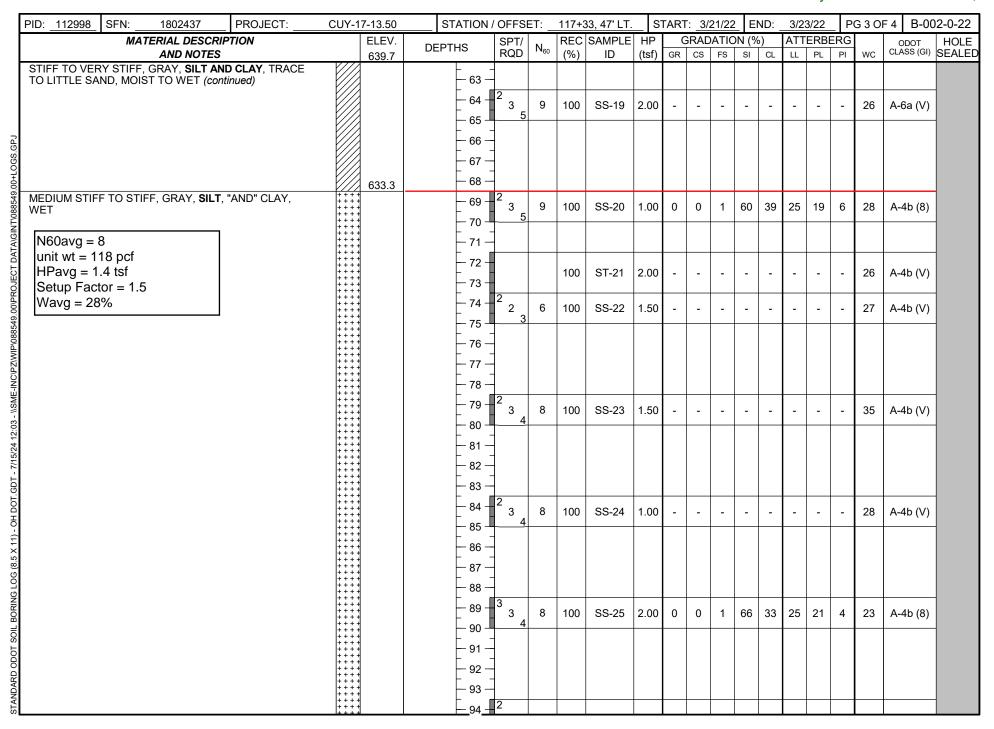
Max Front Row Pile Reaction = Max Back Row Pile Reaction = Total Max Horizontal Force =	371.71 kips 13.55 kips 4.43 kips/ft	(Total for abutment and both wir	ngwalls)		Summary Drilled Shaft Loading from Abutment
	ed Summary	,	Service Summary	*	
Max Moment =	15.40 k-ft per	ft Max Moment =	8.05 k-ft per ft		
Max Vertical Loads =	29.22 kips pe	ft Max Vertical Loads =	20.39 kips per ft		
Max Horizontal Loads =	4.59 kips pe	ft Max Horizontal Loads =	2.99 kips per ft	<u></u>	
]	Post-construction loa

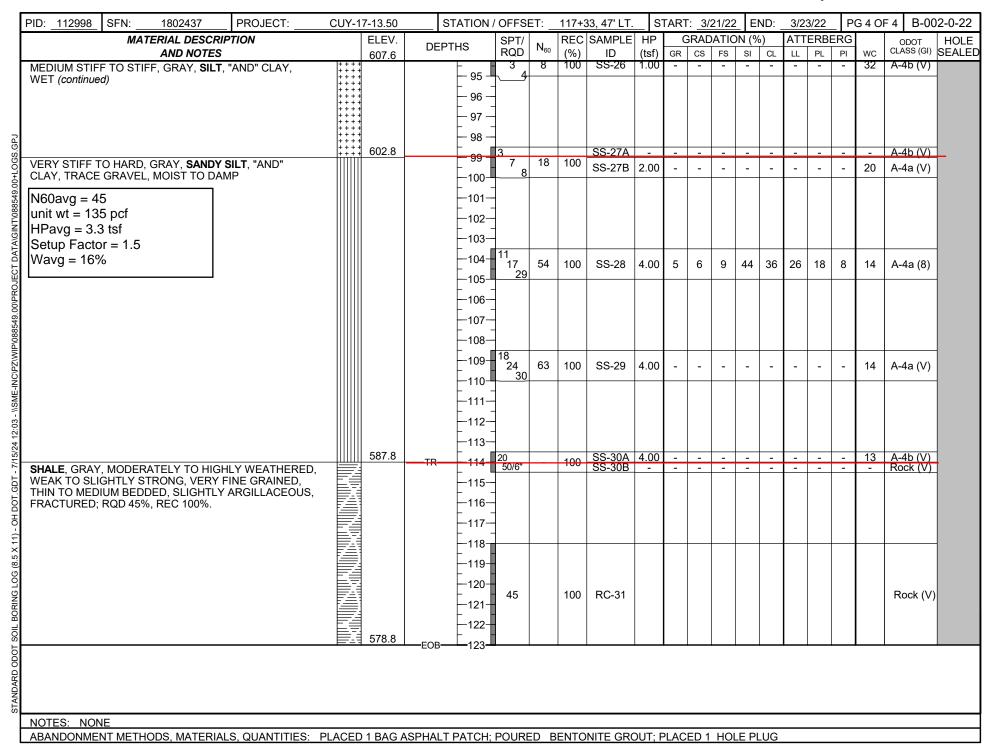
Post-construction loading



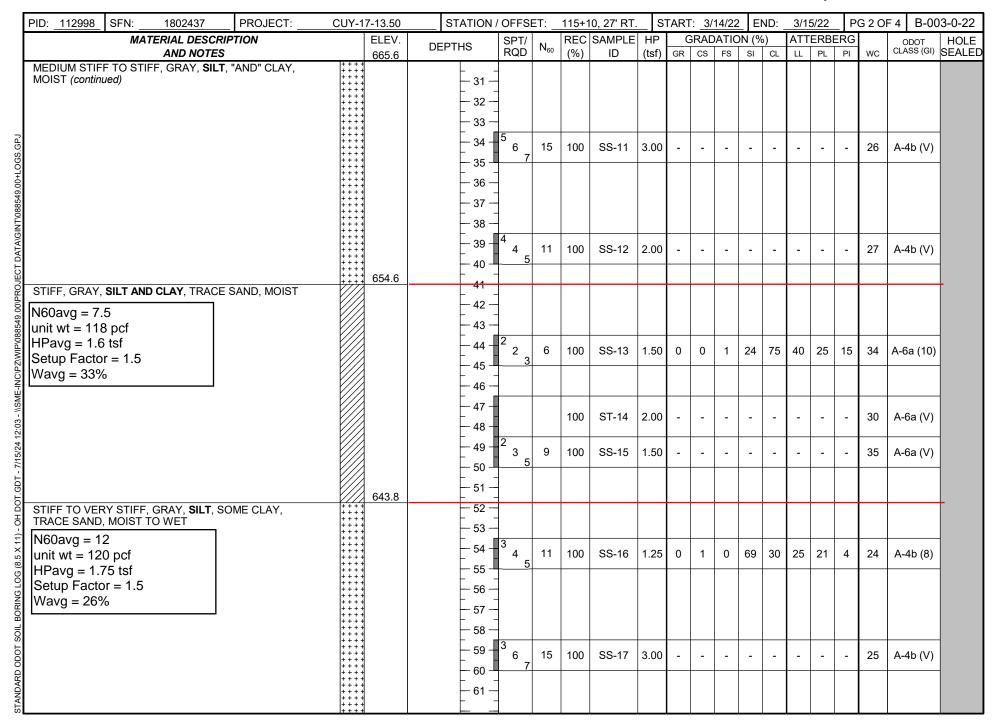
PROJECT: TYPE:	CUY-17-13.50 BRIDGE	DRILLING FIRM / OPEI	_	SME / RM SME / APP	- 1	L RIG:		ME550 AT			STAT ALIGN								EXPLOR B-002	ATION 2-0-22
PID: 112998	SFN: 1802437	DRILLING METHOD3.7		IUD ROTARY/ NW	LECALI	BRATI	ON D	ATE:	9/3/20		ELEV	ATIC	N: _7	701.8	(MS	L) E	OB:	12		PAGE
START: <u>3/2</u>		SAMPLING METHOD:		SPT	-	RGY R			70		LAT /							.6595	16	1 OF 4
	MATERIAL DESCRIP	TION	ELEV.	DEPTHS	SPT/ RQD	N ₆₀		SAMPLE			RADA			,	ATT				ODOT CLASS (GI)	HOL
E" ACDALI T	AND NOTES OVER 10" CONCRETE	IXX	701.8	'		00	(%)	ID	(tsf)	GR	cs	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEAL
5 ASPARLI	OVER 10 CONCRETE		700.6	N60avg = 20.5																
	ISE, BROWN, GRAVEL AND	D/OR STONE		unit wt = 125 p			100	00.4											A 4 L 0.0	
FRAGMENTS	, WITH SAND, DAMP	0.1	73	Setup Factor =	1.0		100	SS-1	-	-	-	-	-	-	-	-	-	7	A-1-b (V)	
			• 1	k = 60 pci																
			5 9	phi = 36.5 deg			56	SS-2		7	49	31	9	4	NP	NP	NP	5	A-1-b (0)	
			0000	NO0- 45			<u> </u>	00-2		,	43	31		-	141	141	141	3	A-1-b (0)	
VERY STIFE	BROWN, SILT AND CLAY,	LITTLE SAND	696.3	N60avg = 15	~t															_
DAMP	DITOWN, OIL! AND OLA!,	ETTTLE OAIND,		unit wt = 125 p HPavg = 4.0 ts			67	SS-3	4.00									24	A 60 (\/)	
		(//		Setup Factor =			07	33-3	4.00	-	-	-	-	-	-	-	-	24	A-6a (V)	
MEDILIM DEN	ICE DECIVINI COARCE AND	D FINE CAND	693.8	E50 = .005	1.5															
LITTLE SILT.	ISE, BROWN, COARSE ANI TRACE CLAY, MOIST TO V	VET		<u> </u>	4 _	10		00.					46						4.0 (2)	
					5 6	13	67	SS-4	-	0	3	81	12	4	NP	NP	NP	8	A-3a (0)	
N60avg =				W 691.3 - 10 -																
unit wt = 1					5															
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Wavg = 1				13 -	0															
phi = 33 d	eg	••••			4															
				_ 14 -	6	14	67	SS-6	-	-	-	-	-	-	-	-	-	28	A-3a (V)	
			686.3	15 ⁻¹	6															_
	ISE, BROWN, SILT , SOME	TO AND SAND,	+ +	— 16 –	8															
TRACE CLAY	, MOIST TO WET	+++++++++++++++++++++++++++++++++++++++		- 17	9	21	100	SS-7	-	0	0	35	57	8	NP	NP	NP	31	A-4b (6)	
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	ISE, GRAY, SILT , LITTLE S	AND, LITTLE	+ +		5															
CLAY, MOIST		+ + + + + + + + + + + + + + + + + + +	+ + + +	- 21 -	1															
N60avg =		+++	: #	-	-															
unit wt = 1		+++ +++ +++		22																
Setup Fac		+++	+ +	- 23 -	-															
Wavg = 2		+++ +++ +++		_ 24 -	6		00	00.0				47	74	40	N.D	ND	,,,	47	A 41- (C)	
phi= 33 de	eg	+ + +	+ +	_ 25	10 15	29	89	SS-9	_	U	0	1/	71	12	NP	NΡ	NΡ	17	A-4b (8)	
		+ + + + + + + + + + + + + + + + + + +		-																
		+++	675.3	26																
	FF TO STIFF, GRAY, SILT A			 27 -			460	OT 10	0.50									0.7		
IRACE IU LI	TTLE SAND, MOIST TO WE	=1	A	- - 28 -			100	ST-10	2.50	-	-	-	-	-	-	-	-	25	A-6a (V)	
		\//.		l ⊢ h	4															
				_ 29 _	5	12	100	SS-11	2.00	0	2	8	36	54	33	18	15	23	A-6a (10)	



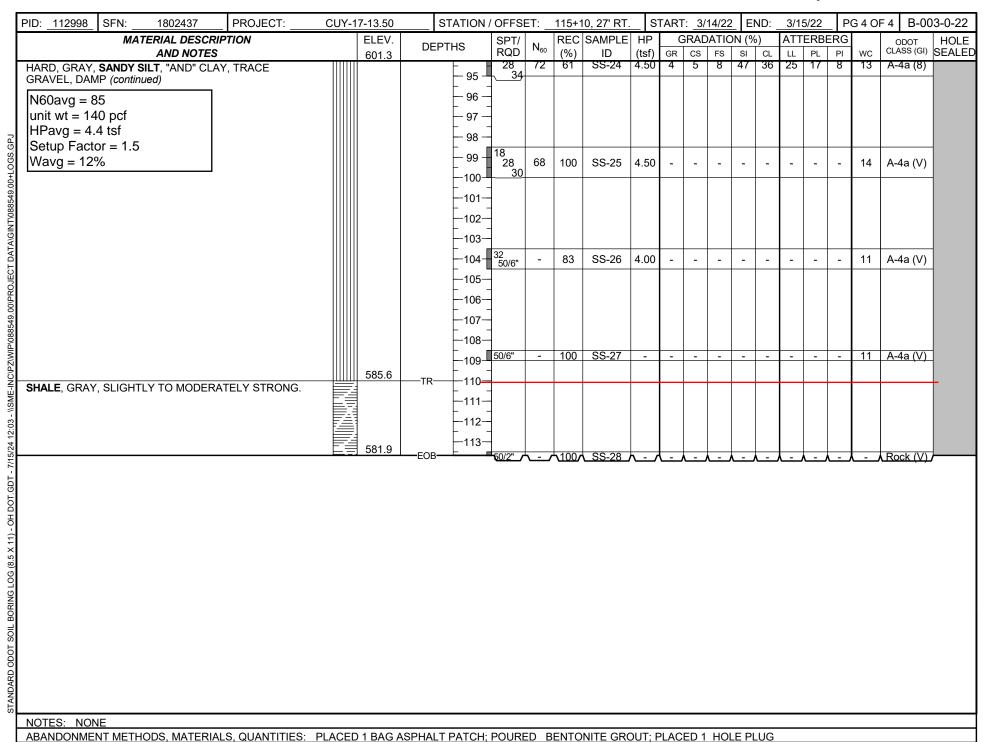




EXPLORATION ID PROJECT: CUY-17-13.50 DRILLING FIRM / OPERATOR: SME / RM DRILL RIG: CME550 ATV 525 STATION / OFFSET: 115+10, 27' RT. B-003-0-22 TYPE: BRIDGE SAMPLING FIRM / LOGGER: SME / APP HAMMER: CME AUTOMATIC ALIGNMENT: E. SCHAAF RD. CL PAGE DRILLING METHOD3.75" HSA / MUD ROTARY/ NWL CALIBRATION DATE: ELEVATION: 695.6 (MSL) EOB: 113.67 ft. PID: 112998 SFN: 1802437 9/3/20 1 OF 4 START: 3/14/22 SAMPLING METHOD: SPT **ENERGY RATIO (%):** LAT / LONG: 41.415218, -81.660343 END: 3/15/22 70 **MATERIAL DESCRIPTION** ELEV. REC SAMPLE **GRADATION (%)** ATTERBERG SPT/ HOLE ODOT **DEPTHS** N_{60} CLASS (GI) RQD SEALED (%) GR CS | FS | SI CL LL PL Ы **AND NOTES** ID (tsf) WC 695.6 3" ASPHALT OVER 10" CONCRETE 694.6 MEDIUM DENSE, BROWN, COARSE AND FINE SAND, 25 SS-1 2 8 59 20 NP NP NP 10 89 11 11 A-3a (0) LITTLE TO SOME, LITTLE CLAY, TRACE GRAVEL, DAMP 3 N60avg = 14unit wt = 122 pcf18 SS-2 33 A-3a (V) Setup Factor = 1.0 5 Wavg = 14% phi = 33 deq6 100 6 14 SS-3 A-3a (V) 687.6 MEDIUM DENSE, BROWN, SILT, SOME SAND, LITTLE CLAY, MOIST 9 NP 15 0 24 NP 6 100 SS-4 1 64 11 NP 21 A-4b (8) N60ava = 18 unit wt = 125 pcf **₩** 684.6 Setup Factor = 1.5 SS-5 8 18 56 A-4b (V) 12 lWava = 24% lphi = 32 dea 13 681.1 15 6 100 SS-6 A-4b (V) MEDIUM DENSE, GRAY, SILT, LITTLE SAND, TRACE 15 CLAY, MOIST 16 8 23 100 SS-7 0 0 17 75 8 NP NP NP 20 A-4b (8) 18 19 8 18 SS-8 100 A-4b (V) 20 674.6 MEDIUM STIFF TO STIFF, GRAY, SILT, "AND" CLAY, MOIST 22 N60avg = 1323 unit wt = 120 pcf24 HPavg = 2.3 tsf4 12 100 SS-9 1.25 0 0 0 55 45 30 20 10 25 A-4b (8) Setup Factor = 1.5 25 Wavg = 26%26 27 28 29 5 13 67 SS-10 3.00 24 A-4b (V)



PID: <u>112998</u>	SFN: _	1802437		PROJE	CT:	CUY-1	7-13.50		STATION	OFFSE	T: _		0, 27' RT.			Γ: <u>3/</u>		_	ND: _		5/22	_	G 3 O	F 4 B-00	3-0-2
	MA	ERIAL DES		ION			ELEV.	DEP	THS	SPT/	N ₆₀		SAMPLE			RAD				_		ERG	_	ODOT CLASS (CI)	HOL
		AND NOT			_	14.4.4.	633.4	J.	1110	RQD	1 460	(%)	ID	(tsf)	GR	cs	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEA
STIFF TO VER TRACE SAND,	RY STIFF, MOIST T	GRAY, SIL 1 O WET <i>(cor</i>	Γ, SOM ntinued,	IE CLA	7,	+ + + + + + + + + + + + + + + + + + +			- 63 - 64 - 65	4 5 6	13	100	SS-18	2.00	0	0	1	73	26	27	20	7	27	A-4b (8)	-
						+ + + - + + + - + + + - + + + - + + + -			- 66 - - 67 -	-															
						+ + + + + + + + + + + + + + + + + + +			- 68 - - 69 - - 70	3 4 5	11	100	SS-19	1.50	-	-	-	-	-	-	-	-	28	A-4b (V)	-
						+ + + + + + + + + + + + + + + + + + +			- 71 - - 72 -	- - - -															
						+ + + - + + + - + + + - + + + - + + + -			- 73 - - 74 - - 75	2 2 3	6	100	SS-20	1.50	-	-	-	-	-	-	-	-	32	A-4b (V)	-
						+ + + + + + + + + + + + + + + + + + +			- 76 - - 77 -	-															
STIFF, GRAY, GRAVEL, MOI	SILT , "AN ST	ID" CLAY, T	RACE	SAND,	TRACE	+++-	617.1		- 78 - - 79 - - 80	3 3 4	8	100	SS-21	1.50	1	1	2	51	45	27	21	6	24	A-4b (8)	-
						+++-			- 81 - 82 83 -	-															
						+ + + + + + + + + + + + + + + + + + +			- 84 - 85	3 4 5	11	33	SS-22	2.00	-	-	-	-	-	-	-	-	24	A-4b (V)	_
						+ + + - + + + - + + + - + + + - + + + -			- 86 - - 87 - - 88 -																
						+ + + - + + + -	H		- m	5 7 10	20	100	SS-23	1.50	-	-	-	-	-	-	-	-	20	A-4b (V)	-
HARD, GRAY, GRAVEL, DAN	SANDY S	ILT, "AND" (CLAY,	TRACE		+++-	604.6		91 — - 92 — - 93 —																
									93 -	15															



Project: CUY-17-13.50
PID: 112998
Date: 10/14/2024

Forward Abutment and Pier Profile

B-002-0-22 Parameters

Layer											11				
Number		Bottom	Layer			Avg. N_{60}					φ'		Setup		
(No.)	Top Elev. (ft)	Elev. (ft)	Depth (ft)	Soil Class	Soil Type	(bpf)	Consistency or Density	Qu (tsf)	Qu (psf)	Su (psf)	(degrees)	γ _{soil} (pcf)	Factor	E50	k (pci)
1	701.8	700.6	1.2	Pavement											
2	700.6	696.3	5.5	A-1-b	Granular	20.5	Med. Dense				36.5	125	1		60
3	696.3	693.8	8 .	A-6a	Cohesive	15	Very Stiff		4 80	00 400	0	125	1.5	0.00	5
4	693.8	686.3	15.5	A-3a	Granular	14	Med. Dense				33	122	1		60
5	686.3	675.3	26.5	A-4b	Granular	21	Med. Dense				33	125	1.5		60
6	675.3	645.8	56	A-6a	Cohesive	10.5	Med. Stiff to Stiff	1.	7 34	170	D	120	1.5	0.00	7
7	645.8	633.3	68.5	A-6a	Cohesive	15.5	Stiff to Very Stiff	2.	7 54	0 270	D	122	1.5	0.00	5
8	633.3	602.8	99 .	A-4b	Cohesive	8	Med. Stiff to Stiff	1.	4 28	00 140	0	118	1.5	0.00	7
9	602.8	587.8	114	A-4a	Cohesive	45	Very Stiff to Hard	3.	3 66	330	0	135	1.5	0.00	5
10	587.8			Rock			Weak to Slightly Strong								

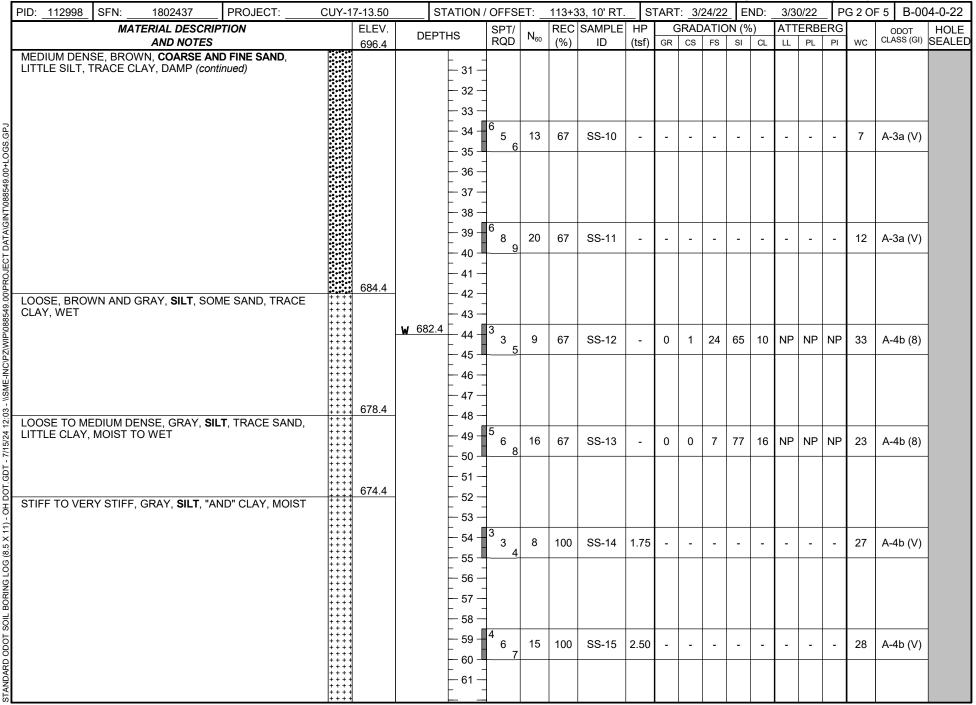
Rear Abutment Profile B-003-0-22 Parameters

Layer											יג					
Number		Bottom	Layer			Avg. N_{60}					Ψ		Setup			
(No.)	Top Elev. (ft)	Elev. (ft)	Depth (ft)	Soil Class	Soil Type	(bpf)	Consistency or Density	Qu (tsf)	Qu (psf)	Su (psf)	(degrees)	γ _{soil} (pcf)	Factor	E50	k (pci)	1
1	695.6	694.6	1 (Pavement												
2	694.6	687.6	8 /	4-3a	Granular	14	Med. Dense				33	122	1	L		60
3	687.6	674.6	21 /	4-4b	Granular	18	Med. Dense				32	125	1.5	5		60
4	674.6	654.6	41 /	4-4b	Cohesive	13	Med. Stiff to Stiff	2.3	4600	2300		120	1.5	5	0.005	
5	654.6	643.8	51.8 /	4-6a	Cohesive	7.5	Stiff	1.6	3200	1600		118	1.5	5	0.007	
6	643.8	604.6	91 /	4-4b	Cohesive	12	Stiff to Very Stiff	1.75	3500	1750		120	1.5	5	0.007	
7	604.6	585.6	110 /	4-4a	Cohesive	85	Hard	4.4	8800	4400		140	1.5	5	0.004	
8	585.6		ı	Rock			Slightly to Moderately Stro	ong								

Hillside boring behind the Rear Abutment From SME's Structure Foundation Exploration Report (December 18, 2023)

PROJECT: TYPE:	CUY-17-13.50 BRIDGE	DRILLING FIRM / OPER SAMPLING FIRM / LOG	_	SME / RM SME / APP	- I	L RIG	_	ME550 AT			STAT ALIGI		/ OFF	SET	Г: _1	13+3		RT.	EXPLORA B-004	ATION ID
PID: 112998		DRILLING METHOD3.75			_				9/3/20										4.0 ft.	PAGE
START: 3/24/2	22 END: <u>3/30/22</u>	SAMPLING METHOD:		SPT	ENE		RATIO	` '	70		LAT /	LON	IG: _		41.4	1553	1, -81	.6608	37	1 OF 5
	MATERIAL DESCRIPT	TION	ELEV.	DEPTHS	SPT/	N ₆₀		SAMPLE			RAD			,	ATT				ODOT	HOLE
O OF!! A OF!! A! T	AND NOTES	O SHOONODETE NY	726.4	32	RQD	. 460	(%)	ID	(tsf)	GR	cs	FS	SI	CL	LL	PL	PI	WC	CLASS (GI)	SEALED
	OVER 2.75" BRICK OVER		725.4	- 1 -	_															
TO LITTLE SAN	Y STIFF, BROWN, SILT AN ID, TRACE GRAVEL, MOIS			_ 2 -	4 4 2	7	67	SS-1	2.00	-	-	-	-	-	-	-	-	13	A-6a (V)	
				- 3 - - 4 - - 5 -	2 2 3	6	39	SS-2	2.00	1	5	11	48	35	33	21	12	33	A-6a (9)	
				- 6 - - 7 -	- 4 5 5	12	100	SS-3	3.50	-	-	-	-	-	-	-	-	22	A-6a (V)	
				- 8 - - 9 - - 10 -	4 6 8	16	100	SS-4	3.00	1	3	2	48	46	33	22	11	27	A-6a (8)	
				- - 11 - - - 12 -	6 8	16	100	SS-5	3.50	-	-	-	-	-	-	-	-	26	A-6a (V)	
VERY STIFF, B	ROWN, SILTY CLAY , MOIS	ST	712.9		5 8 9	20	100	SS-6	2.50	-	-	-	-	-	-	-	-	28	A-6b (V)	
				- - 16 - - - 17 - - - 18 -	- - - - -															
				- 19 - 20 -	5 6 7	15	100	SS-7	3.50	0	0	0	41	59	38	21	17	24	A-6b (11)	
			703.4	- 21 - - 21 - - 22 - 23 -	-															
LITTLE SILT, TI	E, BROWN, COARSE AND RACE CLAY, DAMP	FINE SAND,		- 24 - - 25 - - 25 -	5 6 9	18	67	SS-8	-	-	-	-	-	-	-	-	-	4	A-3a (V)	
				- - 26 - - - 27 - - - 28 -	- - - -															
				- 29 -	5 7 8	18	67	SS-9	-	0	4	78	13	5	NP	NP	NP	5	A-3a (0)	

From SME's Structure Foundation Exploration Report (December 18, 2023)

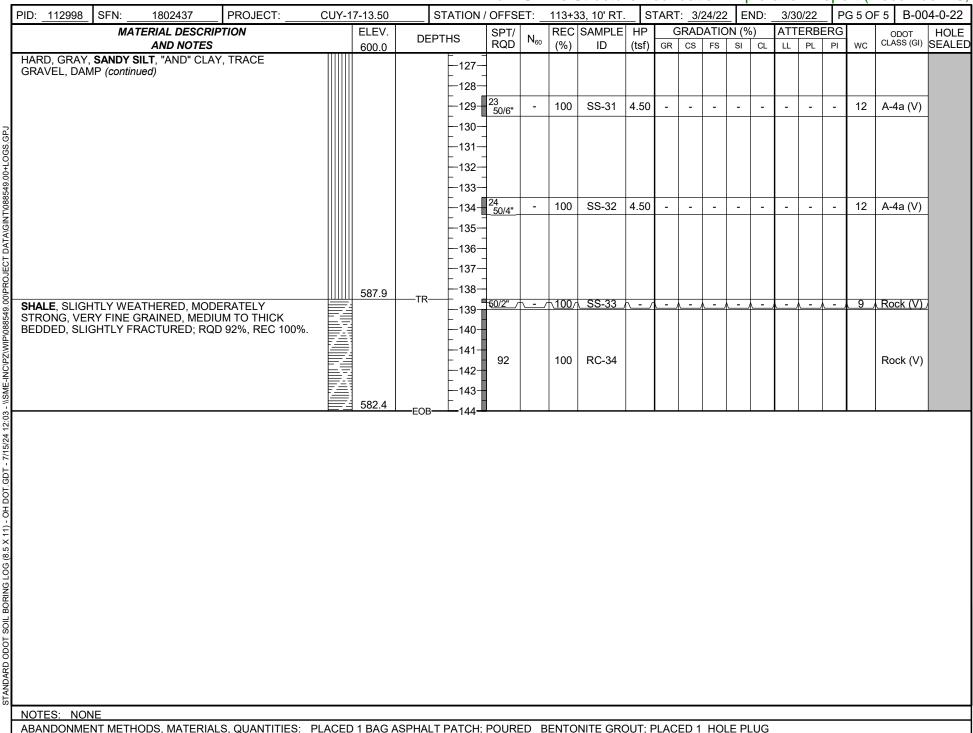


Hillside boring behind the Rear Abutment From SME's Structure Foundation Exploration Report (December 18, 2023)

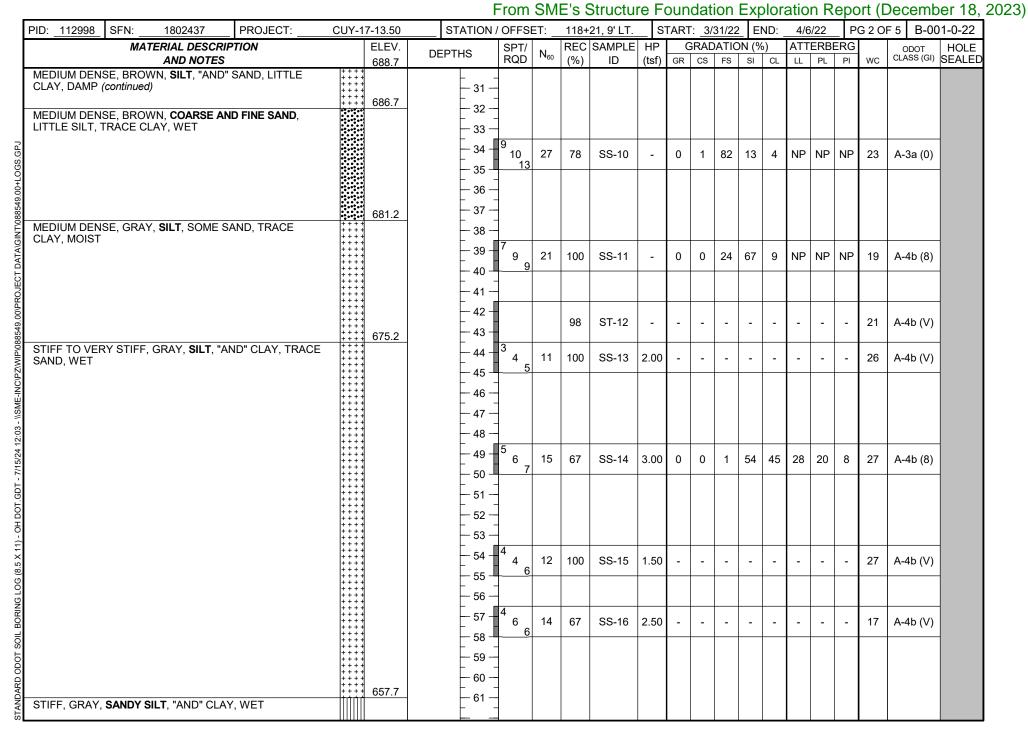
PIE): 112998	SFN:	1802437	PROJECT:	CUY-1	17-13.50	s	TATION	OFFSE	T:	113+3	33, 10' RT.			: 3/2		TEI	ND:		0/22	 -	G 3 O	F 5 B-00	4-0-22
		_	ERIAL DESCR			ELEV.			SPT/			SAMPLE			RAD		_				ERG			
			AND NOTES			664.3	DEPT	HS	RQD	N ₆₀	(%)	ID	(tsf)			FS	SI		LL	_		wc	ODOT CLASS (GI)	SEALED
	TIFF TO VEF ontinued)	RY STIFF,	GRAY, SILT , "/	AND" CLAY, MOIST	+ + + - + + + - + + + - + + + -	+ + + + +		63			. ,		, ,											
					+ + + + - + + + - + + + - + + + -	+ + + + +		- 64 - 65	5 6 8	16	100	SS-16	3.00	-	-	-	-	-	-	-	-	24	A-4b (V)	
S.GPJ					+ + + + - + + + - + + + - + + + -	+ + + + +		66																
.00+LOGS.GP.					+ + + - + + + - + + + - + + + -	657.9		- 67 - - 68 -																
	TIFF TO VEF AND, TRACE			ND CLAY, TRACE				69 - 70	3 3 4	8	100	SS-17	2.50	2	3	5	29	61	36	21	15	30	A-6a (10)	
)ATA\GIN								71 -	-															
ROJECT								- 72 - - 73 -																
549.00\PF								- 74 - - 75	3 4 4	9	100	SS-18	1.50	-	-		-	-	-	-	-	34	A-6a (V)	
WIP\088								- - 76 -																
E-INC/PZ								- 77 - - 78 -	-															
03 - \\SMI								- 79 - - 80	2 3 3	7	100	SS-19	1.50	-	-	-	-	-	-	-	-	32	A-6a (V)	
15/24 12:								81 -	-															
.GDT - 7/								- 82 - - 83 -																
- OH DOI								- 84 - 85	6 8 9	20	100	SS-20	3.50	-	-	-	-	-	-	-	-	23	A-6a (V)	
STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT								86 -																
NG LOG (- 87 - - 88			100	ST-21	3.00	-	-	-	-	-	-	-	-	26	A-6a (V)	
OIL BORIL								- 89 - 90	6 7 9	19	100	SS-22	3.00	-	-	-	-	-	-	-	-	26	A-6a (V)	
орот эс								91 -																
ANDARD								- 92 - - 93 -																
ST.						1		<u> </u>	4															

ſ	PID: _112998_	SFN:	1802437	PROJECT:	CUY-1	7-13.50	ST	ATION /	OFFSI	ET:		3, 10' RT			T: 3/2			ND:		0/22	- -	G 4 O		4-0-22
ļ		MAT	TERIAL DESCRIP	TION		ELEV.	DEPTI		SPT/	N ₆₀		SAMPLE	HP	(SRAD	ATIC	N (%	b)	ATT		ERG		ODOT CLASS (GI)	HOLE
ļ	07155 70 1/55		AND NOTES		1///	632.1	DLI II	10	RQD		(%)	ID SS-23	(tsf)		CS -	FS	SI -	CL	LL	PL	PI	WC		SEALED
	STIFF TO VEF SAND, TRACE	KY STIFF, E GRAVEL	GRAY, SILT AND , MOIST (continue	ed)				_ ₉₅ _	10	20	100	33-23	1.00	Ë	-	-	-	-	-	-	-	26	A-6a (V)	
	,		(,				- 96																
								- 97																
						1																		
GP.								- 98 -	4															
990								99	⁷ 5 5	12	100	SS-24	2.50	1	1	2	31	65	35	21	14	25	A-6a (10)	
.00+L								_100_																
8549								-101-																
T/08								-102-																
4\GIN								_ 103																
DAT/								_ 104_	3	4.4	400	22.25												
ECT								105	4 5	11	100	SS-25	1.50	-	-	-	-	-	-	-	-	27	A-6a (V)	
- 7/15/24 12:03 - \\SME-INC\PZ\WIP\088549.00\PROJECT DATA\GINT\088549.00+LOGS.GPJ								105 106																
.00\F																								
8546								—107 -			96	ST-26	4.50	_	_	_	_	_	_	_	_	22	A-6a (V)	
1P\08								_108_															, ,	
PZW								-109	7	16	100	SS-27	2.00	-	-	-	_	_	-	_	_	25	A-6a (V)	
NC/								- ₁₁₀ -	7														, ,	
SME-								- 111																
3-11								- 112																
12:0								- 112 113																
5/24								1	5															
								_114	7 10	20	33	SS-28	2.00	-	-	-	-	-	-	-	-	21	A-6a (V)	
GD.						1		—115— -	10															
он рот. срт								116																
户								117																
5	HADD CDAY	CANDY	HT WAND! OLAN	, TDACE		608.4		_ 118																
8.5 X	GRAVEL, DAN	, SandyS MP	SILT, "AND" CLAY	, IRACE					9		400	22.22		_		_								
) 90	,							120	15 23	44	100	SS-29	4.00	5	4	8	39	44	26	17	9	16	A-4a (8)	
NGL								<u> </u>																
BOR								121 -																
								—122— -																
OT S								-123-																
000								-124	23 35 50/6"	_	100	SS-30	4.50	_	_	_	_	-	_	_	_	15	A-4a (V)	
STANDARD ODOT SOIL BORING LOG (8.5								₁₂₅	50/6"		1.00		7.00			•					_		/ +a (v)	
TAN								_ 126																
S					ШШ			120		<u> </u>	I													

From SME's Structure Foundation Exploration Report (December 18, 2023)

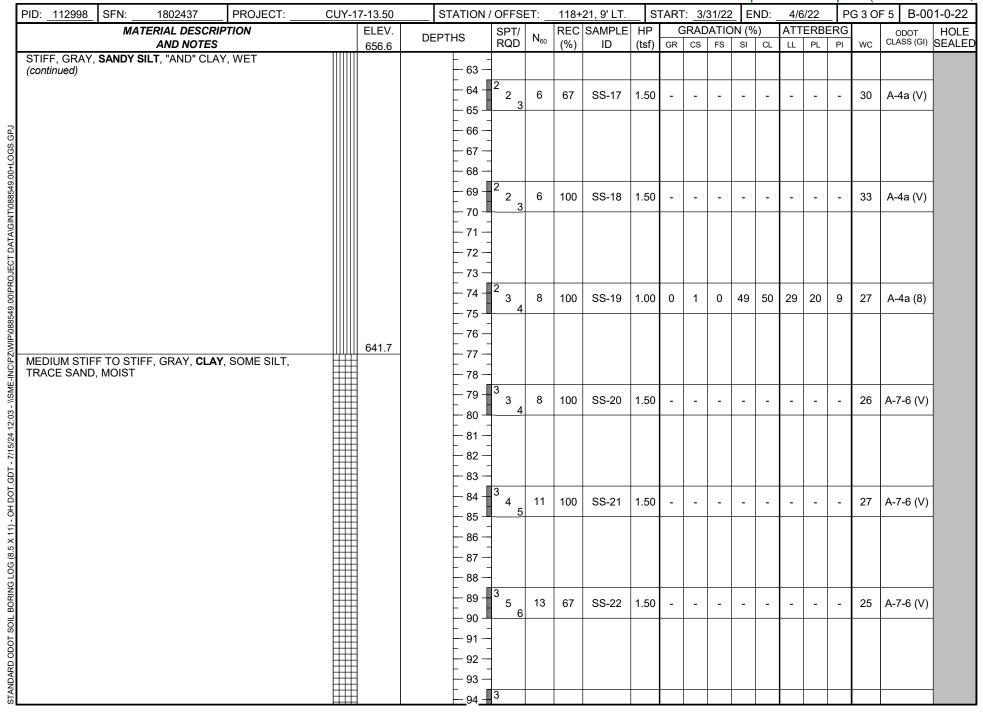


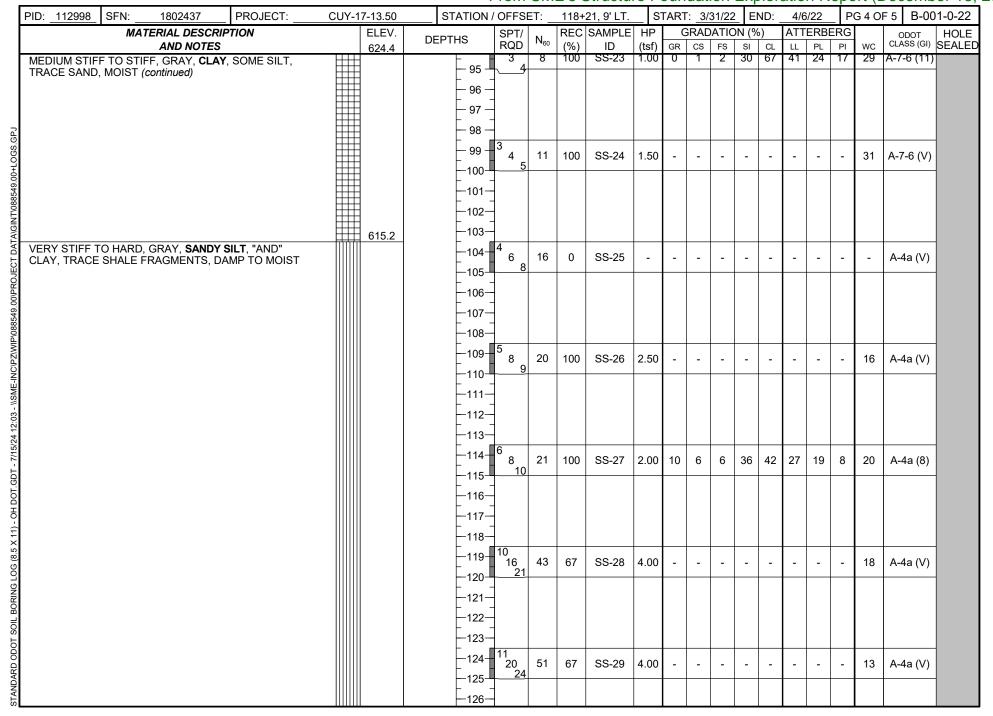
			10111	Civii				<u> </u>	dati	011		,,,,,,,	atio		ОРС	,,,,	Jecenne	01 10
PROJECT: CUY-17-13.50 TYPE: BRIDGE	DRILLING FIRM / OPERATOR: SAMPLING FIRM / LOGGER:	SME / RM SME / APP				ME550 AT		_	STAT ALIG						21, 9' RD.		EXPLORA B-001	ATION I -0-22
PID: 112998 SFN: 1802437	DRILLING METHOD3.75" HSA /						9/3/20										9.0 ft.	PAGE
START: 3/31/22 END: 4/6/22	SAMPLING METHOD:	SPT	· I		RATIO		70		LAT							.6593		1 OF 5
MATERIAL DESCRIPT	<u> </u>		SPT/			SAMPLE		_	GRAD					ERBI				HOLE
AND NOTES	718.7	I DEPTHS	RQD	N ₆₀	(%)	ID	(tsf)	-	_		SI	_	LL		PI	wc	ODOT CLASS (GI)	SFALE
4" ASPHALT OVER 12" CONCRETE	7 18.7				(70)	10	(101)	OIX	00	10	0.	OL	-			****		02, 122
1 Mei Timer even 12 een en er e	717.4	- 1 -																
HARD, BROWN AND GRAY, SANDY SILT,		7 ⊢ ■	10															
CLAY, SOME GRAVEL, SOME ASPHALT	FRAGMENTS.	_ 2 +	9 ,	19	100	SS-1	4.50	-	-	-	-	-	-	-	-	11	A-4a (V)	
SLIGHTLY ORGANIC, DAMP	715.7	- - 3 - 																-
STIFF TO VERY STIFF, BROWN AND GR	RAY, SILT AND		4															-
CLAY, TRACE SAND, MOIST		4	5 _	14	100	SS-2	3.00	-	-	-	-	-	-	-	-	24	A-6a (V)	
		<u></u> 5 <u></u> ■	/															-
		6																
			4	9	100	SS-3	2.00	0	0	2	46	52	38	23	15	29	A-6a (10)	
			4 4	9	100	33-3	2.00	١٠	0	~	40	52	30	23	15	29	A-0a (10)	
		- 8 -																
			4															_
		9 +	5	11	100	SS-4	3.50	-	-	-	-	-	-	-	-	29	A-6a (V)	
		<u></u> 10 <u></u> ■	4															-
		-																
		11 -																
		- 12 -																
	705.7	13			100	ST-5	4.00	-	-	-	-	-	-	-	-	21	A-6a (V)	
MEDIUM DENSE, BROWN, COARSE AND	FINE SAND,		C															-
LITTLE SILT, TRACE CLAY, DAMP	0	<u> </u>	6 7	16	33	SS-6	_	0	7	76	12	5	NP	NP	NP	6	A-3a (0)	
		_ ₁₅ _	7														- (-/	
	0	-																
		_ 16 _																
	0	- 17																
		- 18 -																
	0	l ⊢ −																
		- 19 -	6 7	18	72	SS-7	_	۱ ـ	_	_	_	_	۱.	l _	_	5	A-3a (V)	
	0	_ 20 _	8															
	0	_ 21 _																
	•••••	- 22 -																
	•••••																	
	695.2	23																
MEDIUM DENSE, BROWN, SILT, "AND" S	SAND, LITTLE	- 24 -	7 8	21	100	SS-8		0	4	33	50	12	ND	ND	$ _{ND} $	13	A-4b (6)	
CLAY, DAMP	+ + + + + + + +	- 25	°10		100		_	Ľ_		55	30	13	LINE	INF	INF	13	V-40 (0)	
	+ + + + + + + +																	
	+ + + + + + + +	— 26 —																
	++++	_ 27 _																
	+ + + +	N 600 7 -																
	T T T T	20						L					L					
	* * * * * * * * * * * * * * * * * * *	29	9	10	400	00.0										_	A 41- 0.0	
	+ + + +		8	18	100	SS-9	-	l -	-	-	-	-	l -	-	-	7	A-4b (V)	



Hillside boring behind the Forward Abutment

From SME's Structure Foundation Exploration Report (December 18, 2023)





OGS.GPJ

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 1 BAG ASPHALT PATCH; POURED BENTONITE GROUT; PLACED 1 HOLE PLUG

	Encountered Material Types Above El. 690 (Approx. Bottom of Rear Abutment Wall El.)														
	B-001	0-22			B-002	P-0-22 B-003-0-22			B-004-0-22						
			Layer				Layer				Layer				Layer
Top El. (ft.)	Bot. El. (ft.)	Soil Type	Thickness (ft)	Top El. (ft.)	Bot. El. (ft.)	Soil Type	Thickness (ft)	Top El. (ft.)	Bot. El. (ft.)	Soil Type	Thickness (ft)	Top El. (ft.)	Bot. El. (ft.)	Soil Type	Thickness (ft)
717.4	715.7	A-4a	1.7	700.6	696.3	A-1-b	4.3	694.6	690	A-3a	4.6	725.4	712.9	A-6a	12.5
715.7	705.7	A-6a	10	696.3	693.8	A-6a	2.5					712.9	703.4	A-6b	9.5
705.7	695.2	A-3a	10.5	693.8	690	A-3a	3.8					703.4	690	A-3a	13.4
695.2	690	A-4b	5.2					•			•				

B-00	B-001-0-22		B-002-0-22		B-003-0-22		B-004-0-22		Total	
	Total									
Soil Type	Thickness (ft)									
A-1-b	0	A-1-b	4.3	A-1-b	0	A-1-b	0	A-1-b	4.3	
A-3a	10.5	A-3a	3.8	A-3a	4.6	A-3a	13.4	A-3a	32.3	
A-4a	1.7	A-4a	0	A-4a	0	A-4a	0	A-4a	1.7	
A-4b	5.2	A-4b	0	A-4b	0	A-4b	0	A-4b	5.2	
A-6a	10	A-6a	2.5	A-6a	0	A-6a	12.5	A-6a	25	
A-6b	0	A-6b	0	A-6b	0	A-6b	9.5	A-6b	9.5	

Borrow material is anticipated for Item 203 embankment fill. Per Section 501 of the ODOT GDM, it is assumed the embankment fill materials will be the same as the materials encountered above the roadway elevation, approx. El. 690. In this zone, the total thickness of A-6a and A-6b, which use the same parameters, is 34.5 ft. and slightly greater than the A-3a materials. As such, it is assumed the Item 203 embankment fill behind the wall will consist of A-6a or A-6b materials.

Drilled Shaft LPile Analyses

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Rear Abutment

Section within Abutment/Wingwalls, 22' height, horizontal backslope, during construction (prior to abutment construction, includes 250 psf construction traffic, free-head)

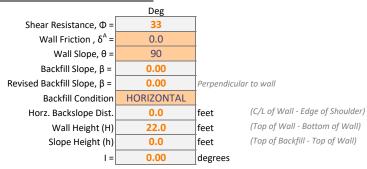
Geometry

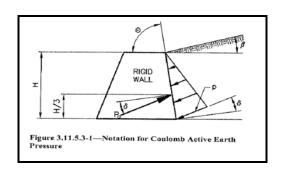
	Flouration (ft)			Horiz. Distance	
	Elevation (ft)	_		from C/L (ft)	
Top of Backfill =	723.3	at Outside Edge of Shoulder	Start of Wall Backfill =		at Outside Edge of Shoulder
Top of Wall =	712.0	at C/L of Wall	Wall =		at C/L of Wall
Existing Ground Surface =	703.0	at C/L of Wall			
Bottom of Wall =	690.0	at C/L of Wall	Backfill Slope Angle =		H:1V

Wall Loading Profile

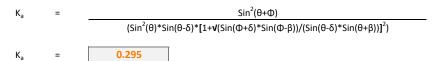
_	Top Elev.	Thickness (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	
Item 203	712.0	9.0	250	28	125	A-6a/A-6b per GDM
Medium Dense Granular	703.0	13.0	0	33	122	
Bottom of Wall	690.0					•
Weighted Value		22.0	100	31	125	

Earth Pressure Coefficients





Active Earth Coefficient



At-Rest Earth Coefficient

 $K_o = (1-Sin(\phi))*(1+Sin(\beta))$ $K_o = 0.456$

Notes:

A. Wall friction neglected

- B. Figure and Equation for Active Earth Pressure from AASHTO 3.11.5.3 (LRFD Design Manual).
- C. The wall backfill will consist of proposed fill and granular overburden. Using the soil layer thicknesses and respective soil parameters as provided by SME, a weighted average was determined and assumed for the entire backfill (c' = 100 psf and $\phi' = 31^\circ$. The parameters were converted to equivalent soil strength parameters c' = 0 psf and $\phi' = 33^\circ$ for computing earth pressures based on a 1 degree increase in friction angle for every 50 psf decrease in cohesion up to 150 psf (Ref: Hall's Thesis).

<u>Soil Lateral Design Profile</u>							
	Top Elev	Depth (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	ε50	k
Medium Dense Granular	690.0	22.0	0	33	59.6	N/A	60
Medium Dense Silt	687.6	24.4	0	32	62.6	N/A	60
Medium Stiff to Stiff Silt	674.6	37.4	2300	0	57.6	0.005	N/A
Stiff Cohesive	654.6	57.4	1600	0	55.6	0.007	N/A
Stiff to Very Stiff Silt	643.8	68.2	1750	0	57.6	0.007	N/A
Hard Silt	604.6	107.4	4400	0	77.6	0.004	N/A
Bedrock	585.6	126.4	N/A	N/A	N/A	N/A	N/A

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)

Restraint Condition = ACTIVE

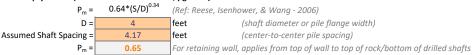
Ka = 0.295

(Active or At-Rest)

3) Determine Equivalent Fluid Weight (G_H)

 $G_H = (\gamma_m)^* (K_a)$ Soil loading only, does not include hydrostatic pressures $G_H = 37$ For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust

6) Resolve horizontal earth force to distributed triangular load (for LPILE)

w =	2*P _{SH} /H	
w =	3384	lbs/foot per shaft (Earth - Service Limit)
w =	282	lbs/inch per shaft (Earth - Service Limit)
$\gamma_E =$	1.5	Earth Load Factor
w =	$(2*P_{SH}/H)*\gamma_E$	_
w =	423	lbs/inch per shaft (Earth - Strength Limit)

7) Determine live-load traffic surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)

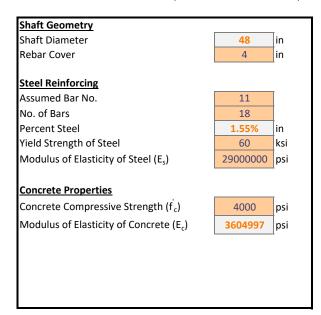
w =	P _s /H	
w =	308	lbs/foot per shaft (surcharge - unfactored)
w =	26	lbs/inch per shaft (surcharge - unfactored)
γ _s =	1.75	Surcharge Load Factor - Strength I
w =	$(P_S/L)*\gamma_S$	
w =	45	lbs/inch per shaft (Surcharge - Strength I)

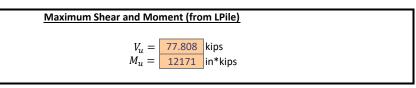
Distributed Lateral Loads for LPILE

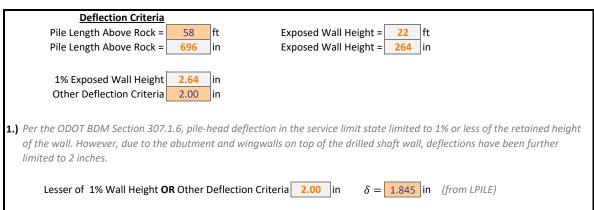
CONVENTIONAL					
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)			
0	26	45			
22.0	308	468			

Shear, Moment, and Deflection Results

Maximum Shear and Moment output from LPile service case provided to HDR's structural engineers for capacity checks. Final reinforcing layout to be confirmed in structural analyses.







Load Case 1 = Service Case Load Case 2 = Strength Case

LPile for Version 2022-12.012

License ID : 202613844 License Type : (Network 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:

HDR

LPILE Global, Global License

This model was prepared by: abaratta

Files Used for Analysis

Path to file locations: \pwworking\east01\d4381065\

Name of input data file:

1a. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Const. No Abt.lp12d

Name of output report file:

1a. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Const. No Abt.lp12o

Name of plot output file:

1a. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Const. No Abt.lp12p

Name of runtime message file:

1a. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Const. No Abt.lp12r
Date and Time of Analysis
Date: July 10, 2025 Time: 13:19:38
Problem Title
Project Name: CUY-17-13.50
Job Number:
Client:
Engineer: HDR
Description: Rear Abt., 22' Ht., 4' Dia., Const. w/o Abt. Load
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
- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- Analysis includes loading by multiple distributed lateral loads acting on pile
- 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 = 58.000 ft
Depth of ground surface below top of pile = 22.0000 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.

	Depth Below	Pile
Point	Pile Head	Diameter
No.	feet	inches
1	0.000	48.0000
2	58.000	48.0000

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 = 58.000000 ft

Shaft Diameter = 48.000000 in
```

Soil and Rock Layering Information

The soil profile is modelled using 6 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 22.000000 ft
Distance from top of pile to bottom of layer = 24.400000 ft
Effective unit weight at top of layer = 59.600000 pcf
Effective unit weight at bottom of layer = 59.600000 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

Layer 2 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	=	37.400000	ft
Effective unit weight at top of layer	=	62.600000	pcf
Effective unit weight at bottom of layer	=	62.600000	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

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer	=	37.400000 ft
Distance from top of pile to bottom of layer	=	57.400000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	2300. psf
Undrained cohesion at bottom of layer	=	2300. 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	=	57.400000 ft
Distance from top of pile to bottom of layer	=	68.200000 ft
Effective unit weight at top of layer	=	55.600000 pcf
Effective unit weight at bottom of layer	=	55.600000 pcf
Undrained cohesion at top of layer	=	1600. psf
Undrained cohesion at bottom of layer	=	1600. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	68.200000 ft
Distance from top of pile to bottom of layer	=	107.400000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1750. psf
Undrained cohesion at bottom of layer	=	1750. psf
Epsilon-50 at top of layer	=	0.007000

Epsilon-50 at bottom of layer

= 0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer	=	107.400000 ft
Distance from top of pile to bottom of layer	=	126.400000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Undrained cohesion at top of layer	=	4400. psf
Undrained cohesion at bottom of layer	=	4400. psf
Epsilon-50 at top of layer	=	0.004000
Epsilon-50 at bottom of layer	=	0.004000

(Depth of the lowest soil layer extends 68.400 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand	22.0000	59.6000		33.0000		60.0000
	(Reese, et al.)	24.4000	59.6000		33.0000		60.0000
2	Sand	24.4000	62.6000		32.0000		60.0000
	(Reese, et al.)	37.4000	62.6000		32.0000		60.0000
3	Stiff Clay	37.4000	57.6000	2300.		0.00500	
	w/o Free Water	57.4000	57.6000	2300.		0.00500	
4	Stiff Clay	57.4000	55.6000	1600.		0.00700	
	w/o Free Water	68.2000	55.6000	1600.		0.00700	
5	Stiff Clay	68.2000	57.6000	1750.		0.00700	
	w/o Free Water	107.4000	57.6000	1750.		0.00700	
6	Stiff Clay	107.4000	77.6000	4400.		0.00400	
	w/o Free Water	126.4000	77.6000	4400.		0.00400	

Modification Factors for p-y Curves

Distribution of p-y modifiers with depth defined using 2 points

Point	Depth X	p-mult	y-mult
No.	ft		
1	22.000	0.6500	1.0000
2	126.400	0.6500	1.0000

Static Loading Type

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

Distributed Lateral Loading for Individual Load Cases

Distributed lateral load intensity for Load Case 1 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	26.000
2	22.000	308.000

Distributed lateral load intensity for Load Case 2 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	45.000
2	22.000	468.000

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load No.	Load Type		Condition 1	Condition 2		Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	1	V =	0.0000 lbs	M =	0.0000 in-lbs	0.000000	Yes	Yes
2	1	V =	0.0000 lbs	M =	0.0000 in-lbs	0.000000	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	=	58.000000	ft
Shaft Diameter	=	48.000000	in
Concrete Cover Thickness (to edge of long. rebar)	=	4.000000	in
Number of Reinforcing Bars	=	18	bars
Yield Stress of Reinforcing Bars	=	60000.	psi
Modulus of Elasticity of Reinforcing Bars	=	29000000.	psi
Gross Area of Shaft	=	1810.	sq. in.
Total Area of Reinforcing Steel	=	28.080000	sq. in.
Area Ratio of Steel Reinforcement	=	1.55	percent
Edge-to-Edge Bar Spacing	=	5.291083	in
Maximum Concrete Aggregate Size	=	0.750000	in
Ratio of Bar Spacing to Aggregate Size	=	7.05	
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 7741.823 kips
Tensile Load for Cracking of Concrete = -834.882 kips
Nominal Axial Tensile Capacity = -1684.800 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar	Bar Diam.	Bar Area	Χ	Υ
Number	inches	sq. in.	inches	inches
1	1.410000	1.560000	19.295000	0.00000
2	1.410000	1.560000	18.131369	6.599279
3	1.410000	1.560000	14.780828	12.402587
4	1.410000	1.560000	9.647500	16.709960
5	1.410000	1.560000	3.350542	19.001866
6	1.410000	1.560000	-3.35054	19.001866
7	1.410000	1.560000	-9.64750	16.709960
8	1.410000	1.560000	-14.78083	12.402587
9	1.410000	1.560000	-18.13137	6.599279
10	1.410000	1.560000	-19.29500	0.00000
11	1.410000	1.560000	-18.13137	-6.59928
12	1.410000	1.560000	-14.78083	-12.40259
13	1.410000	1.560000	-9.64750	-16.70996
14	1.410000	1.560000	-3.35054	-19.00187
15	1.410000	1.560000	3.350542	-19.00187

16	1.410000	1.560000	9.647500	-16.70996
17	1.410000	1.560000	14.780828	-12.40259
18	1.410000	1,560000	18.131369	-6.59928

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

Minimum spacing between any two bars not equal to zero = 5.291 inches between bars 14 and 15.

Ratio of bar spacing to maximum aggregate size = 7.05

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 = 1

Number	Axial Thrust Force
	kips
1	0.000

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 = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Run Stress Msg ksi
6.25000E-07	769.8616625	1231778660.	23.9999721	0.00001500	-0.00001500	0.0627334	-0.361051
0.00000125	1536.	1228854295.	23.9999720	0.00003000	-0.00003000	0.1249710	-0.722101
0.00000188	2299.	1225929930.	23.9999719	0.00004500	-0.00004500	0.1867128	-1.083152
0.00000250	3058.	1223005565.	23.9999718	0.00006000	-0.00006000	0.2479587	-1.444202
0.00000313	3813.	1220081200.	23.9999717	0.00007500	-0.00007500	0.3087088	-1.805253
0.00000375	4564.	1217156835.	23.9999716	0.00009000	-0.00009000	0.3689631	-2.166303
0.00000438	5312.	1214232470.	23.9999715	0.0001050	-0.000105	0.4287215	-2.527354
0.00000500	5312.	1062453411.	13.1113393	0.00006556	-0.000174	0.2682916	-4.467256 C
0.00000563	5312.	944403032.	13.1160171	0.00007378	-0.000196	0.3012805	-5.024900 C
0.00000625	5312.	849962729.	13.1207064	0.00008200	-0.000218	0.3341471	-5.582372 C
0.00000688	5312.	772693390.	13.1254073	0.00009024	-0.000240	0.3668909	-6.139672 C
0.00000750	5312.	708302274.	13.1301199	0.00009848	-0.000262	0.3995119	-6.696799 C
0.00000813	5312.	653817484.	13.1348442	0.0001067	-0.000283	0.4320098	-7.253752 C
0.00000875	5312.	607116235.	13.1395802	0.0001150	-0.000305	0.4643842	-7.810531 C
0.00000938	5312.	566641819.	13.1443281	0.0001232	-0.000327	0.4966351	-8.367136 C
0.00001000	5312.	531226705.	13.1490880	0.0001315	-0.000349	0.5287621	-8.923564 C
0.00001063	5312.	499978076.	13.1538597	0.0001398	-0.000370	0.5607651	-9.479817 C
0.00001125	5312.	472201516.	13.1586435	0.0001480	-0.000392	0.5926437	-10.035893 C
0.00001188	5312.	447348805.	13.1634394	0.0001563	-0.000414	0.6243977	-10.591791 C
0.00001250	5312.	424981364.	13.1682474	0.0001646	-0.000435	0.6560269	-11.147510 C
0.00001313	5312.	404744157.	13.1730676	0.0001729	-0.000457	0.6875310	-11.703051 C
0.00001375	5312.	386346695.	13.1779000	0.0001812	-0.000479	0.7189099	-12.258412 C
0.00001438	5312.	369549013.	13.1827448	0.0001895	-0.000500	0.7501631	-12.813593 C
0.00001500	5312.	354151137.	13.1876020	0.0001978	-0.000522	0.7812906	-13.368593 C
0.00001563	5312.	339985092.	13.1924717	0.0002061	-0.000544	0.8122920	-13.923411 C
0.00001625	5312.	326908742.	13.1973538	0.0002145	-0.000566	0.8431670	-14.478047 C
0.00001688	5312.	314801011.	13.2021386	0.0002228	-0.000587	0.8739105	-15.032539 C
0.00001750	5488.	313597483.	13.2068703	0.0002311	-0.000609	0.9045205	-15.586898 C
0.00001813	5682.	313492310.	13.2116139	0.0002395	-0.000631	0.9350028	-16.141079 C

0.00001875	5876.	313386909.	13.2163694	0.0002478	-0.000652	0.9653569	-16.695082 C
0.00001938	6070.	313281281.	13.2211368	0.0002562	-0.000674	0.9955827	-17.248905 C
0.00002000	6264.	313175424.	13.2259163	0.0002645	-0.000695	1.0256799	-17.802549 C
0.00002063	6457.	313069337.	13.2307079	0.0002729	-0.000717	1.0556482	-18.356012 C
0.00002125	6650.	312963019.	13.2355117	0.0002813	-0.000739	1.0854874	-18.909294 C
0.00002188	6844.	312856469.	13.2403276	0.0002896	-0.000760	1.1151972	-19.462395 C
0.00002250	7037.	312749685.	13.2451559	0.0002980	-0.000782	1.1447774	-20.015312 C
0.00002313	7230.	312642667.	13.2499965	0.0003064	-0.000804	1.1742276	-20.568047 C
0.00002375	7423.	312535413.	13.2548495	0.0003148	-0.000825	1.2035477	-21.120597 C
0.00002438	7615.	312427922.	13.2597150	0.0003232	-0.000847	1.2327374	-21.672962 C
0.00002563	8000.	312212227.	13.2694837	0.0003400	-0.000890	1.2907244	-22.777136 C
0.00002688	8385.	311995570.	13.2793031	0.0003569	-0.000933	1.3481864	-23.880562 C
0.00002813	8769.	311777944.	13.2891737	0.0003738	-0.000976	1.4051213	-24.983235 C
0.00002938	9152.	311559337.	13.2990962	0.0003907	-0.001019	1.4615268	-26.085147 C
0.00003063	9535.	311339741.	13.3090709	0.0004076	-0.001062	1.5174008	-27.186294 C
0.00003188	9917.	311119145.	13.3190986	0.0004245	-0.001105	1.5727410	-28.286669 C
0.00003313	10298.	310897540.	13.3291797	0.0004415	-0.001148	1.6275450	-29.386265 C
0.00003438	10679.	310674915.	13.3393149	0.0004585	-0.001191	1.6818107	-30.485076 C
0.00003563	11060.	310451260.	13.3495048	0.0004756	-0.001234	1.7355356	-31.583097 C
0.00003688	11440.	310226565.	13.3597499	0.0004926	-0.001277	1.7887174	-32.680319 C
0.00003813	11819.	310000817.	13.3700509	0.0005097	-0.001320	1.8413536	-33.776737 C
0.00003938	12197.	309774008.	13.3804084	0.0005269	-0.001363	1.8934420	-34.872344 C
0.00004063	12575.	309546125.	13.3908230	0.0005440	-0.001406	1.9449800	-35.967132 C
0.00004188	12953.	309317158.	13.4012954	0.0005612	-0.001449	1.9959651	-37.061095 C
0.00004313	13329.	309087094.	13.4118262	0.0005784	-0.001492	2.0463949	-38.154226 C
0.00004438	13705.	308855923.	13.4224161	0.0005956	-0.001534	2.0962667	-39.246517 C
0.00004563	14081.	308623632.	13.4330658	0.0006129	-0.001577	2.1455781	-40.337962 C
0.00004688	14456.	308390209.	13.4437760	0.0006302	-0.001620	2.1943263	-41.428552 C
0.00004813	14830.	308155642.	13.4545473	0.0006475	-0.001662	2.2425088	-42.518280 C
0.00004938	15204.	307919919.	13.4653806	0.0006649	-0.001705	2.2901228	-43.607139 C
0.00005063	15576.	307683027.	13.4762764	0.0006822	-0.001748	2.3371657	-44.695120 C
0.00005188	15949.	307444953.	13.4872357	0.0006997	-0.001790	2.3836348	-45.782217 C
0.00005313	16320.	307205684.	13.4982590	0.0007171	-0.001833	2.4295271	-46.868419 C
0.00005438	16691.	306965206.	13.5093472	0.0007346	-0.001875	2.4748400	-47.953721 C
0.00005563	17061.	306723507.	13.5205012	0.0007521	-0.001918	2.5195705	-49.038112 C
0.00005688	17431.	306480571.	13.5317216	0.0007696	-0.001960	2.5637157	-50.121586 C
0.00005813	17800.	306236385.	13.5430092	0.0007872	-0.002003	2.6072727	-51.204132 C
0.00005938	18168.	305990935.	13.5543650	0.0008048	-0.002045	2.6502386	-52.285743 C
0.00006063	18536.	305744206.	13.5657898	0.0008224	-0.002088	2.6926102	-53.366409 C
0.00006188	18903.	305496182.	13.5772844	0.0008401	-0.002130	2.7343846	-54.446122 C
0.00006313	19269.	305246850.	13.5888497	0.0008578	-0.002172	2.7755586	-55.524872 C
0.00006438	19634.	304996191.	13.6005359	0.0008755	-0.002214	2.8161290	-56.602650 C

0.00006563	19999.	304744197.	13.6122391	0.0008933	-0.002257	2.8560928	-57.679445 C
0.00006688	20363.	304490843.	13.6240221	0.0009111	-0.002299	2.8954466	-58.755250 C
0.00006813	20726.	304236117.	13.6358794	0.0009289	-0.002341	2.9341871	-59.830054 C
0.00006938	21088.	303974848.	13.6477319	0.0009468	-0.002383	2.9722991	-60.000000 CY
0.00007063	21420.	303285079.	13.6528788	0.0009642	-0.002426	3.0087792	-60.000000 CY
0.00007188	21706.	301995711.	13.6483378	0.0009810	-0.002469	3.0431839	-60.000000 CY
0.00007313	21970.	300439980.	13.6393439	0.0009974	-0.002513	3.0762942	-60.000000 CY
0.00007438	22232.	298920905.	13.6308573	0.0010138	-0.002556	3.1088541	-60.000000 CY
0.00007938	23066.	290596313.	13.5556801	0.0010760	-0.002734	3.2267621	-60.000000 CY
0.00008438	23750.	281487169.	13.4630812	0.0011359	-0.002914	3.3324596	-60.000000 CY
0.00008938	24408.	273092284.	13.3795821	0.0011958	-0.003094	3.4302159	-60.000000 CY
0.00009438	24850.	263314057.	13.2603532	0.0012514	-0.003279	3.5140439	-60.000000 CY
0.00009938	25239.	253981887.	13.1424928	0.0013060	-0.003464	3.5897497	-60.000000 CY
0.0001044	25624.	245499007.	13.0356493	0.0013606	-0.003649	3.6590425	-60.000000 CY
0.0001094	26005.	237758936.	12.9414881	0.0014155	-0.003835	3.7222565	-60.000000 CY
0.0001144	26378.	230624482.	12.8569064	0.0014705	-0.004019	3.7791612	-60.000000 CY
0.0001194	26644.	223199645.	12.7554203	0.0015227	-0.004207	3.8270409	-60.000000 CY
0.0001244	26835.	215758232.	12.6416792	0.0015723	-0.004398	3.8671104	-60.000000 CY
0.0001294	27018.	208838509.	12.5351073	0.0016217	-0.004588	3.9018230	-60.000000 CY
0.0001344	27200.	202416602.	12.4382892	0.0016714	-0.004779	3.9314291	-60.000000 CY
0.0001394	27379.	196438539.	12.3500126	0.0017213	-0.004969	3.9558498	-60.000000 CY
0.0001444	27555.	190857831.	12.2722663	0.0017718	-0.005158	3.9750035	-60.000000 CY
0.0001494	27728.	185626651.	12.1971805	0.0018220	-0.005348	3.9887202	-60.000000 CY
0.0001544	27898.	180713050.	12.1248144	0.0018718	-0.005538	3.9970486	-60.000000 CY
0.0001594	28065.	176092353.	12.0617589	0.0019223	-0.005728	3.9999954	-60.000000 CY
0.0001644	28226.	171717638.	12.0033879	0.0019731	-0.005917	3.9988808	-60.000000 CY
0.0001694	28371.	167504007.	11.9450134	0.0020232	-0.006107	3.9953078	-60.000000 CY
0.0001744	28482.	163339318.	11.8815680	0.0020718	-0.006298	3.9993700	-60.000000 CY
0.0001794	28557.	159200705.	11.8116291	0.0021187	-0.006491	3.9946616	-60.000000 CY
0.0001844	28621.	155233536.	11.7424013	0.0021650	-0.006685	3.9989285	-60.000000 CY
0.0001894	28681.	151451014.	11.6753912	0.0022110	-0.006879	3.9979288	-60.000000 CY
0.0001944	28739.	147854809.	11.6124229	0.0022572	-0.007073	3.9973058	-60.000000 CY
0.0001994	28797.	144434223.	11.5535362	0.0023035	-0.007267	3.9997971	-60.000000 CY
0.0002044	28852.	141174110.	11.4986080	0.0023500	-0.007460	3.9935453	-60.000000 CY
0.0002094	28907.	138064429.	11.4463640	0.0023966	-0.007653	3.9979971	-60.000000 CY
0.0002144	28961.	135095994.	11.3990908	0.0024437	-0.007846	3.9999192	-60.000000 CY
0.0002194	29014.	132256693.	11.3545952	0.0024909	-0.008039	3.9928397	-60.000000 CY
0.0002244	29066.	129540045.	11.3118594	0.0025381	-0.008232	3.9974034	-60.000000 CY
0.0002294	29116.	126937793.	11.2724757	0.0025856	-0.008424	3.9997014	-60.000000 CY
0.0002344	29165.	124437742.	11.2323176	0.0026326	-0.008617	3.9952766	-60.000000 CY
0.0002394	29213.	122038401.	11.1947498	0.0026797	-0.008810	3.9947591	-60.000000 CY
0.0002444	29260.	119735126.	11.1592066	0.0027270	-0.009003	3.9982910	-60.000000 CY

0.0002494	29307.	117522100.	11.1256232	0.0027745	-0.009196	3.9998971	-60.000000 CY
0.0002544	29353.	115392310.	11.0942033	0.0028221	-0.009388	3.9937085	-60.000000 CY
0.0002594	29398.	113342192.	11.0645875	0.0028699	-0.009580	3.9937365	-60.000000 CY
0.0002644	29443.	111368034.	11.0365329	0.0029178	-0.009772	3.9975022	-60.000000 CY
0.0002694	29487.	109465582.	11.0099589	0.0029658	-0.009964	3.9995719	-60.000000 CY
0.0002744	29531.	107630235.	10.9845505	0.0030139	-0.010156	3.9974084	-60.000000 CYT
0.0003044	29768.	97801409.	10.8540605	0.0033037	-0.011306	3.9907561	-60.000000 CYT
0.0003344	29896.	89408788.	10.7026782	0.0035787	-0.012471	3.9975924	60.0000000 CYT
0.0003644	29936.	82156365.	10.5623694	0.0038487	-0.013641	3.9973108	60.0000000 CYT

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.	Max. Tens.
No.	kips	in-kip	Strain	Strain
1	0.000	29518.409	0.00300000	-0.01010068

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	0.0000	29518.	0.0000	19187.	305302516.

1	0.75	0.0000	29518.	0.0000	22139.	299461472.
1	0.90	0.0000	29518.	0.0000	26567.	225367401.

Layering Correction Equivalent Depths of Soil & Rock Layers

	Top of	Equivalent				
	Layer	Top Depth	Same Layer	Layer is	FØ	F1
Layer	Below	Below	Type As	Rock or	Integral	Integral
No.	Pile Head	Grnd Surf	Layer	is Below	for Layer	for Layer
	ft	ft	Above	Rock Layer	lbs	1bs
1	22.0000	0.00	N.A.	No	0.00	7082.
2	24.4000	2.4677	Yes	No	7082.	303908.
3	37.4000	9.1476	No	No	310989.	1084139.
4	57.4000	36.5473	Yes	No	1395129.	34481.
5	68.2000	46.2000	No	No	1429609.	0.00
6	107.4000	85.4000	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 = 0.0 lbs
Applied moment at pile head = 0.0 in-lbs

Axial thrust load on pile head

Depth X	Deflect.	Bending Moment	Shear Force	Slope S		_		Soil Spr. Es*H	Distrib. Lat. Load
feet	inches		lbs	radians	psi*			lb/inch	lb/inch
0.00	1.8453	1.75E-04	0.00	-0.00483	0.00	1.23E+12	0.00	0.00	27.8586
0.5800	1.8117	674.7583	213.3002	-0.00483	0.00	1.23E+12	0.00	0.00	33.4345
1.1600	1.7781	2969.	471.8769	-0.00483	0.00	1.23E+12	0.00	0.00	40.8691
1.7400	1.7445	7243.	782.1980	-0.00483	0.00	1.23E+12	0.00	0.00	48.3036
2.3200	1.7109	13857.	1144.	-0.00483	0.00	1.23E+12	0.00	0.00	55.7382
2.9000	1.6773	23171.	1558.	-0.00483	0.00	1.23E+12	0.00	0.00	63.1727
3.4800	1.6436	35546 .	2024.	-0.00483	0.00	1.23E+12	0.00	0.00	70.6073
4.0600	1.6100	51340.	2541.	-0.00483	0.00	1.23E+12	0.00	0.00	78.0418
4.6400	1.5764 1.5428	70915. 94631.	3110. 3731.	-0.00483	0.00 0.00	1.23E+12 1.23E+12	0.00 0.00	0.00 0.00	85.4764 92.9109
5.2200 5.8000	1.5428	122848.	4403.	-0.00483 -0.00483	0.00	1.23E+12 1.23E+12	0.00	0.00	100.3455
6.3800	1.4756	155925.	5128.	-0.00483	0.00	1.23E+12 1.23E+12	0.00	0.00	100.3433
6.9600	1.4420	194223.	5904.	-0.00483	0.00	1.23E+12 1.23E+12	0.00	0.00	115.2145
7.5400	1.4084	238103.	6731.	-0.00482	0.00	1.23E+12 1.23E+12	0.00	0.00	122.6491
8.1200	1.3749	287924.	7611.	-0.00482	0.00	1.23E+12 1.23E+12	0.00	0.00	130.0836
8.7000	1.3413	344046.	8542.	-0.00482	0.00	1.23E+12 1.23E+12	0.00	0.00	137.5182
9.2800	1.3077	406830.	9525.	-0.00482	0.00	1.23E+12	0.00	0.00	144.9527
9.8600	1.2742	476636.	10560.	-0.00482	0.00	1.23E+12	0.00	0.00	152.3873
10.4400	1.2407	553823.	11646.	-0.00481	0.00	1.23E+12	0.00	0.00	159.8218
11.0200	1.2072	638753.	12785.	-0.00481	0.00	1.23E+12	0.00	0.00	167.2564
11.6000	1.1737	731785.	13975.	-0.00481	0.00	1.23E+12	0.00	0.00	174.6909
12.1800	1.1403	833279.	15216.	-0.00480	0.00	1.23E+12	0.00	0.00	182.1255
12.7600	1.1069	943595.	16510.	-0.00480	0.00	1.23E+12	0.00	0.00	189.5600
13.3400	1.0735	1063094.	17855.	-0.00479	0.00	1.23E+12	0.00	0.00	196.9945
13.9200	1.0402	1192136.	19252.	-0.00479	0.00	1.23E+12	0.00	0.00	204.4291
14.5000	1.0069	1331081.	20701.	-0.00478	0.00	1.23E+12	0.00	0.00	211.8636
15.0800	0.9737	1480288.	22201.	-0.00477	0.00	1.23E+12	0.00	0.00	219.2982
15.6600	0.9405	1640119.	23753.	-0.00476	0.00	1.23E+12	0.00	0.00	226.7327
16.2400	0.9074	1810934.	25357.	-0.00475	0.00	1.23E+12	0.00	0.00	234.1673
16.8200	0.8744	1993091.	27013.	-0.00474	0.00	1.23E+12	0.00	0.00	241.6018
17.4000	0.8414	2186952.	28720.	-0.00473	0.00	1.23E+12	0.00	0.00	249.0364
17.9800	0.8085	2392877.	30479.	-0.00472	0.00	1.23E+12	0.00	0.00	256.4709
18.5600	0.7758	2611226.	32290.	-0.00470	0.00	1.22E+12	0.00	0.00	263.9055
19.1400	0.7431	2842359.	34153.	-0.00469	0.00	1.22E+12	0.00	0.00	271.3400
19.7200	0.7105	3086636.	36067.	-0.00467	0.00	1.22E+12	0.00	0.00	278.7745
20.3000	0.6781	3344417.	38034.	-0.00465	0.00	1.22E+12	0.00	0.00	286.2091

0.0 lbs

20.8800	0.6458	3616062.	40051.	-0.00463	0.00	1.22E+12	0.00	0.00	293.6436
21.4600	0.6136	3901933.	42121.	-0.00461	0.00	1.22E+12	0.00	0.00	301.0782
22.0400	0.5816	4202388.	43617.	-0.00459	0.00	1.22E+12	-3.169	37.9235	132.0680
22.6200	0.5498	4509086.	43886.	-0.00456	0.00	1.22E+12	-51.606	653.3013	0.00
23.2000	0.5181	4813286.	43347.	-0.00453	0.00	1.22E+12	-103.411	1389.	0.00
23.7800	0.4867	5112475.	42442.	-0.00451	0.00	1.21E+12	-156.735	2242.	0.00
24.3600	0.4554	5404073.	41163.	-0.00443	0.00	3.14E+11	-210.617	3219.	0.00
24.9400	0.4250	5685467.	39539.	-0.00431	0.00	3.13E+11	-256.232	4197.	0.00
25.5200	0.3954	5954450.	37583.	-0.00418	0.00	3.13E+11	-305.815	5383.	0.00
26.1000	0.3668	6208618.	35293.	-0.00404	0.00	3.13E+11	-352.101	6681.	0.00
26.6800	0.3391	6445730.	32693.	-0.00390	0.00	3.13E+11	-395.039	8108.	0.00
27.2600	0.3124	6663705.	29813.	-0.00376	0.00	3.13E+11	-432.639	9638.	0.00
27.8400	0.2868	6860723.	26693.	-0.00361	0.00	3.13E+11	-463.950	11259.	0.00
28.4200	0.2622	7035266.	23362.	-0.00345	0.00	3.13E+11	-493.015	13086.	0.00
29.0000	0.2387	7185927.	19850.	-0.00330	0.00	3.13E+11	-516.304	15053.	0.00
29.5800	0.2163	7311577.	16201.	-0.00313	0.00	3.13E+11	-532.341	17126.	0.00
30.1600	0.1951	7411440.	12458.	-0.00297	0.00	3.13E+11	-543.214	19378.	0.00
30.7400	0.1750	7484989.	8650.	-0.00280	0.00	3.13E+11	-550.882	21908.	0.00
31.3200	0.1561	7531852.	4814.	-0.00264	0.00	3.12E+11	-551.358	24587.	0.00
31.9000	0.1383	7552006.	1001.	-0.00247	0.00	3.12E+11	-544.435	27397.	0.00
32.4800	0.1217	7545787.	-2742.	-0.00230	0.00	3.12E+11	-531.156	30374.	0.00
33.0600	0.1063	7513838.	-6365.	-0.00213	0.00	3.12E+11	-509.954	33394.	0.00
33.6400	0.09202	7457186.	-9813.	-0.00197	0.00	3.13E+11	-480.926	36374.	0.00
34.2200	0.07892	7377238.	-13053.	-0.00180	0.00	3.13E+11	-450.114	39697.	0.00
34.8000	0.06695	7275485.	-16015.	-0.00164	0.00	3.13E+11	-401.084	41693.	0.00
35.3800	0.05612	7154303.	-18634.	-0.00148	0.00	3.13E+11	-351.410	43582.	0.00
35.9600	0.04639	7016097.	-20912.	-0.00132	0.00	3.13E+11	-303.096	45472.	0.00
36.5400	0.03775	6863210.	-22861.	-0.00117	0.00	3.13E+11	-256.895	47361.	0.00
37.1200	0.03018	6697878.	-24498.	-0.00101	0.00	3.13E+11	-213.524	49250.	0.00
37.7000	0.02363	6522203.	-26954.	-8.67E-04	0.00	3.13E+11	-492.387	145000.	0.00
38.2800	0.01810	6322676.	-30302.	-7.24E-04	0.00	3.13E+11	-469.719	180588.	0.00
38.8600	0.01355	6100394.	-33487.	-5.86E-04	0.00	3.13E+11	-445.349	228752.	0.00
39.4400	0.00994	5856540.	-36498.	-4.54E-04	0.00	3.13E+11	-419.975	294056.	0.00
40.0200	0.00724	5592341.	-39335.	-3.27E-04	0.00	3.14E+11	-395.142	380081.	0.00
40.6000	0.00540	5309000.	-42011.	-2.42E-04	0.00	8.20E+11	-373.897	482338.	0.00
41.1800	0.00387	5007548.	-44531.	-2.05E-04	0.00	1.22E+12	-350.223	630151.	0.00
41.7600	0.00254	4689130.	-46866.	-1.77E-04	0.00	1.22E+12	-320.844	878894.	0.00
42.3400	0.00140	4355170.	-48961.	-1.51E-04	0.00	1.22E+12	-281.223	1398020.	0.00
42.9200	4.33E-04	4007587.	-50348.	-1.28E-04	0.00	1.22E+12	-117.260	1886688.	0.00
43.5000	-3.76E-04	3654324.	-50396.	-1.06E-04	0.00	1.22E+12	103.5412	1918218.	0.00
44.0800	-0.00104	3306076.	-49081.	-8.59E-05	0.00	1.22E+12	274.2732	1837435.	0.00
44.6600	-0.00157	2971115.	-47051.	-6.80E-05	0.00	1.22E+12	309.0778	1369239.	0.00

45.2400	-0.00199	2651126.	-44817.	-5.20E-05	0.00	1.22E+12	332.9286	1167004.	0.00
45.8200	-0.00230	2347265.	-42438.	-3.78E-05	0.00	1.23E+12	350.6184	1063222.	0.00
46.4000	-0.00251	2060388.	-39951.	-2.53E-05	0.00	1.23E+12	364.1513	1008937.	0.00
46.9800	-0.00265	1791151.	-37380.	-1.44E-05	0.00	1.23E+12	374.5664	984689.	0.00
47.5600	-0.00271	1540059.	-34745.	-4.95E-06	0.00	1.23E+12	382.4722	981452.	0.00
48.1400	-0.00272	1307494.	-32063.	3.11E-06	0.00	1.23E+12	388.2524	994786.	0.00
48.7200	-0.00267	1093737.	-29348.	9.91E-06	0.00	1.23E+12	392.1571	1022648.	0.00
49.3000	-0.00258	898976.	-26610.	1.55E-05	0.00	1.23E+12	394.3515	1064468.	0.00
49.8800	-0.00245	723319.	-23864.	2.01E-05	0.00	1.23E+12	394.9400	1120776.	0.00
50.4600	-0.00230	566793.	-21118.	2.38E-05	0.00	1.23E+12	393.9784	1193126.	0.00
51.0400	-0.00212	429352.	-18385.	2.66E-05	0.00	1.23E+12	391.4769	1284246.	0.00
51.6200	-0.00193	310875.	-15674.	2.87E-05	0.00	1.23E+12	387.3988	1398412.	0.00
52.2000	-0.00172	211164.	-12998.	3.02E-05	0.00	1.23E+12	381.6504	1542219.	0.00
52.7800	-0.00151	129941.	-10368.	3.11E-05	0.00	1.23E+12	374.0600	1726038.	0.00
53.3600	-0.00129	66838.	-7799.	3.17E-05	0.00	1.23E+12	364.3386	1966959.	0.00
53.9400	-0.00107	21384.	-5306.	3.19E-05	0.00	1.23E+12	352.0036	2295199.	0.00
54.5200	-8.45E-04	-7019.	-3018.	3.20E-05	0.00	1.23E+12	305.4757	2516686.	0.00
55.1000	-6.22E-04	-20623.	-1162.	3.19E-05	0.00	1.23E+12	227.8944	2548165.	0.00
55.6800	-4.01E-04	-23189.	148.5925	3.18E-05	0.00	1.23E+12	148.6025	2579642.	0.00
56.2600	-1.80E-04	-18555.	901.1472	3.16E-05	0.00	1.23E+12	67.6489	2611118.	0.00
56.8400	3.96E-05	-10645.	1084.	3.16E-05	0.00	1.23E+12	-15.023	2642593.	0.00
57.4200	2.59E-04	-3462.	764.6951	3.15E-05	0.00	1.23E+12	-76.813	2063875.	0.00
58.0000	4.78E-04	0.00	0.00	3.15E-05	0.00	1.23E+12	-142.927	1039754.	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:

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Pile-head deflection = 1.84532758 inches

Computed slope at pile head = -0.0048298 radians

Maximum bending moment = 7552006. inch-lbs

Maximum shear force = -50396. lbs

Depth of maximum bending moment = 31.90000000 feet below pile head

Depth of maximum shear force = 43.50000000 feet below pile head

Number of iterations = 83

Number of zero deflection points = 2
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Pile deflection at ground = 0.58383074 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
E0 00000	1 04522750	7552006	E0206
58.00000	1.84532758	7552006.	-50396.
55.10000	1.85267602	7551654.	-50794.
52.20000	1.85584791	7534974.	-56146.
49.30000	2.04740158	7418090.	-63068.
46.40000	2.83609644	7181972.	-67986.
43.50000	5.24798422	6834852.	-72154.
40.60000	20.97193187	6701373.	-87801.

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

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
Χ	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch

0.00	3.8005	3.39E-05	8.11E-07	-0.00970	0.00	1.23E+12	0.00	0.00	47.7880
0.5800	3.7330	1157.	361.7104	-0.00970	0.00	1.23E+12	0.00	0.00	56.1518
1.1600	3.6655	5035.	791.3354	-0.00970	0.00	1.23E+12	0.00	0.00	67.3036
1.7400	3.5979	12173.	1299.	-0.00970	0.00	1.23E+12	0.00	0.00	78.4555
2.3200	3.5304	23111.	1883.	-0.00970	0.00	1.23E+12	0.00	0.00	89.6073
2.9000	3.4629	38390.	2546.	-0.00970	0.00	1.23E+12	0.00	0.00	100.7591
3.4800	3.3954	58550.	3286.	-0.00970	0.00	1.23E+12	0.00	0.00	111.9109
4.0600	3.3278	84131.	4104.	-0.00970	0.00	1.23E+12	0.00	0.00	123.0627
4.6400	3.2603	115674.	4999.	-0.00970	0.00	1.23E+12	0.00	0.00	134.2145
5.2200	3.1928	153718.	5972.	-0.00970	0.00	1.23E+12	0.00	0.00	145.3664
5.8000	3.1253	198804.	7023.	-0.00970	0.00	1.23E+12	0.00	0.00	156.5182
6.3800	3.0578	251472.	8151.	-0.00970	0.00	1.23E+12	0.00	0.00	167.6700
6.9600	2.9903	312262.	9357.	-0.00970	0.00	1.23E+12	0.00	0.00	178.8218
7.5400	2.9228	381714.	10640.	-0.00969	0.00	1.23E+12	0.00	0.00	189.9736
8.1200	2.8553	460369.	12001.	-0.00969	0.00	1.23E+12	0.00	0.00	201.1255
8.7000	2.7879	548767.	13440.	-0.00969	0.00	1.23E+12	0.00	0.00	212.2773
9.2800	2.7204	647448.	14956.	-0.00969	0.00	1.23E+12	0.00	0.00	223.4291
9.8600	2.6530	756952.	16550.	-0.00968	0.00	1.23E+12	0.00	0.00	234.5809
10.4400	2.5857	877820.	18221.	-0.00968	0.00	1.23E+12	0.00	0.00	245.7327
11.0200	2.5183	1010591.	19970.	-0.00967	0.00	1.23E+12	0.00	0.00	256.8845
11.6000	2.4510	1155807.	21797.	-0.00967	0.00	1.23E+12	0.00	0.00	268.0364
12.1800	2.3838	1314006.	23701.	-0.00966	0.00	1.23E+12	0.00	0.00	279.1882
12.7600	2.3166	1485730.	25683.	-0.00965	0.00	1.23E+12	0.00	0.00	290.3400
13.3400	2.2494	1671518.	27743.	-0.00964	0.00	1.23E+12	0.00	0.00	301.4918
13.9200	2.1823	1871911.	29880.	-0.00963	0.00	1.23E+12	0.00	0.00	312.6436
14.5000	2.1153	2087449.	32095.	-0.00962	0.00	1.23E+12	0.00	0.00	323.7955
15.0800	2.0484	2318672.	34387.	-0.00961	0.00	1.23E+12	0.00	0.00	334.9473
15.6600	1.9816	2566121.	36757.	-0.00959	0.00	1.22E+12	0.00	0.00	346.0991
16.2400	1.9149	2830335.	39205.	-0.00958	0.00	1.22E+12	0.00	0.00	357.2509
16.8200	1.8482	3111855.	41730.	-0.00956	0.00	1.22E+12	0.00	0.00	368.4027
17.4000	1.7818	3411221.	44333.	-0.00954	0.00	1.22E+12	0.00	0.00	379.5545
17.9800	1.7154	3728973.	47014.	-0.00952	0.00	1.22E+12	0.00	0.00	390.7064
18.5600	1.6492	4065652.	49772.	-0.00950	0.00	1.22E+12	0.00	0.00	401.8582
19.1400	1.5831	4421797.	52608.	-0.00948	0.00	1.22E+12	0.00	0.00	413.0100
19.7200	1.5173	4797949.	55521.	-0.00945	0.00	1.22E+12	0.00	0.00	424.1618
20.3000	1.4516	5194648.	58512.	-0.00942	0.00	1.21E+12	0.00	0.00	435.3136
20.8800	1.3861	5612435.	61580.	-0.00934	0.00	3.14E+11	0.00	0.00	446.4655
21.4600	1.3215	6051849.	64727.	-0.00922	0.00	3.13E+11	0.00	0.00	457.6173
22.0400	1.2578	6513430.	67004.	-0.00908	0.00	3.13E+11	-3.950	21.8574	200.6882
22.6200	1.1952	6984542.	67464.	-0.00893	0.00	3.13E+11	-64.472	375.4467	0.00
23.2000	1.1336	7452531.	66789.	-0.00876	0.00	3.13E+11	-129.652	796.0333	0.00

23.7800	1.0732	7914240.	65650.	-0.00859	0.00	3.12E+11	-197.498	1281.	0.00
24.3600	1.0140	8366381.	64036.	-0.00841	0.00	3.12E+11	-266.377	1828.	0.00
24.9400	0.9561	8805618.	61977.	-0.00822	0.00	3.12E+11	-325.154	2367.	0.00
25.5200	0.8995	9229105.	59489.	-0.00802	0.00	3.12E+11	-389.748	3016.	0.00
26.1000	0.8444	9633711.	56563.	-0.00781	0.00	3.11E+11	-451.191	3719.	0.00
26.6800	0.7908	1.00E+07	53220.	-0.00759	0.00	3.11E+11	-509.400	4483.	0.00
27.2600	0.7388	1.04E+07	49492.	-0.00736	0.00	3.11E+11	-561.968	5294.	0.00
27.8400	0.6884	1.07E+07	45422.	-0.00712	0.00	3.11E+11	-607.549	6143.	0.00
28.4200	0.6396	1.10E+07	41040.	-0.00688	0.00	3.10E+11	-651.547	7090.	0.00
29.0000	0.5926	1.13E+07	36374.	-0.00663	0.00	3.10E+11	-689.334	8096.	0.00
29.5800	0.5473	1.15E+07	31473.	-0.00638	0.00	3.10E+11	-718.927	9142.	0.00
30.1600	0.5039	1.17E+07	26388.	-0.00611	0.00	3.10E+11	-742.363	10255.	0.00
30.7400	0.4622	1.19E+07	21154.	-0.00585	0.00	3.10E+11	-761.620	11469.	0.00
31.3200	0.4224	1.20E+07	15816.	-0.00558	0.00	3.10E+11	-772.254	12724.	0.00
31.9000	0.3845	1.21E+07	10436.	-0.00531	0.00	3.10E+11	-773.830	14007.	0.00
32.4800	0.3485	1.22E+07	5054.	-0.00504	0.00	3.10E+11	-772.528	15429.	0.00
33.0600	0.3144	1.22E+07	-285.003	-0.00477	0.00	3.10E+11	-761.797	16866.	0.00
33.6400	0.2822	1.22E+07	-5515.	-0.00449	0.00	3.10E+11	-740.944	18277.	0.00
34.2200	0.2518	1.21E+07	-10594.	-0.00422	0.00	3.10E+11	-718.776	19864.	0.00
34.8000	0.2234	1.20E+07	-15519.	-0.00395	0.00	3.10E+11	-696.382	21694.	0.00
35.3800	0.1969	1.19E+07	-20257.	-0.00368	0.00	3.10E+11	-665.068	23513.	0.00
35.9600	0.1722	1.17E+07	-24747.	-0.00342	0.00	3.10E+11	-625.138	25270.	0.00
36.5400	0.1493	1.15E+07	-28931.	-0.00316	0.00	3.10E+11	-577.187	26904.	0.00
37.1200	0.1283	1.13E+07	-32757.	-0.00290	0.00	3.10E+11	-522.149	28335.	0.00
37.7000	0.1090	1.11E+07	-37085.	-0.00265	0.00	3.10E+11	-721.517	46087.	0.00
38.2800	0.09140	1.08E+07	-42046.	-0.00240	0.00	3.11E+11	-704.112	53617.	0.00
38.8600	0.07552	1.05E+07	-46877.	-0.00216	0.00	3.11E+11	-684.282	63063.	0.00
39.4400	0.06128	1.01E+07	-51562.	-0.00193	0.00	3.11E+11	-661.756	75164.	0.00
40.0200	0.04861	9774717.	-56078.	-0.00171	0.00	3.11E+11	-636.161	91077.	0.00
40.6000	0.03747	9369003.	-60404.	-0.00150	0.00	3.11E+11	-606.962	112731.	0.00
41.1800	0.02779	8933887.	-64512.	-0.00129	0.00	3.12E+11	-573.342	143594.	0.00
41.7600	0.01949	8470997.	-68365.	-0.00110	0.00	3.12E+11	-533.944	190630.	0.00
42.3400	0.01251	7982242.	-71915.	-9.14E-04	0.00	3.12E+11	-486.198	270395.	0.00
42.9200	0.00677	7469935.	-75083.	-7.42E-04	0.00	3.13E+11	-424.096	435777.	0.00
43.5000	0.00219	6937084.	-77690.	-5.81E-04	0.00	3.13E+11	-325.084	1033149.	0.00
44.0800	-0.00132	6388486.	-77808.	-4.33E-04	0.00	3.13E+11	291.2947	1536889.	0.00
44.6600	-0.00384	5853998.	-75449.	-2.97E-04	0.00	3.13E+11	386.5300	700597.	0.00
45.2400	-0.00546	5338235.	-72612.	-1.73E-04	0.00	3.15E+11	428.6999	546889.	0.00
45.8200	-0.00625	4843238.	-69553.	-1.00E-04	0.00	1.22E+12	450.4490	501631.	0.00
46.4000	-0.00685	4370062.	-66356.	-7.39E-05	0.00	1.22E+12	468.0089	475461.	0.00
46.9800	-0.00728	3919557.	-63049.	-5.02E-05	0.00	1.22E+12	482.3492	461265.	0.00
47.5600	-0.00755	3492417.	-59651.	-2.91E-05	0.00	1.22E+12	494.0618	455472.	0.00

48.1400	-0.00768	3089211.	-56180.	-1.03E-05	0.00	1.22E+12	503.5304	456165.	0.00
48.7200	-0.00769	2710397.	-52649.	6.18E-06	0.00	1.22E+12	511.0137	462305.	0.00
49.3000	-0.00760	2356337.	-49073.	2.06E-05	0.00	1.23E+12	516.6875	473383.	0.00
49.8800	-0.00741	2027306.	-45463.	3.30E-05	0.00	1.23E+12	520.6699	489253.	0.00
50.4600	-0.00714	1723497.	-41831.	4.37E-05	0.00	1.23E+12	523.0347	510055.	0.00
51.0400	-0.00680	1445025.	-38187.	5.26E-05	0.00	1.23E+12	523.8186	536198.	0.00
51.6200	-0.00640	1191928.	-34544.	6.01E-05	0.00	1.23E+12	523.0245	568385.	0.00
52.2000	-0.00596	964166.	-30913.	6.62E-05	0.00	1.23E+12	520.6198	607683.	0.00
52.7800	-0.00548	761625.	-27303.	7.11E-05	0.00	1.23E+12	516.5322	655654.	0.00
53.3600	-0.00497	584105.	-23729.	7.49E-05	0.00	1.23E+12	510.6397	714591.	0.00
53.9400	-0.00444	431321.	-20202.	7.77E-05	0.00	1.23E+12	502.7521	787928.	0.00
54.5200	-0.00389	302891.	-16738.	7.98E-05	0.00	1.23E+12	492.5817	881010.	0.00
55.1000	-0.00333	198323.	-13355.	8.12E-05	0.00	1.23E+12	479.6889	1002611.	0.00
55.6800	-0.00276	116991.	-10073.	8.21E-05	0.00	1.23E+12	463.3797	1168237.	0.00
56.2600	-0.00219	58107.	-6921.	8.26E-05	0.00	1.23E+12	442.4906	1408322.	0.00
56.8400	-0.00161	20657.	-3937.	8.28E-05	0.00	1.23E+12	414.8659	1792723.	0.00
57.4200	-0.00103	3304.	-1484.	8.29E-05	0.00	1.23E+12	290.0093	1952666.	0.00
58.0000	-4.57E-04	0.00	0.00	8.29E-05	0.00	1.23E+12	136.4242	1039754.	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	=	3.80054657	inches
Computed slope at pile head	=	-0.0097030	radians
Maximum bending moment	=	12170970.	inch-lbs
Maximum shear force	=	-77808.	lbs
Depth of maximum bending moment	=	33.06000000	feet below pile head
Depth of maximum shear force	=	44.08000000	feet below pile head
Number of iterations	=	99	
Number of zero deflection points	=	2	
Pile deflection at ground	=	1.26222442	inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
58.00000	3.80054657	12170970.	-77808.
55.10000	3.82579487	12152950.	-82018.
52.20000	4.16700836	11981380.	-91131.
49.30000	5.31600074	11594435.	-98271.
46.40000	8.93041609	11251820.	-106003.
43.50000	90.17848198	11245474.	-140104.

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

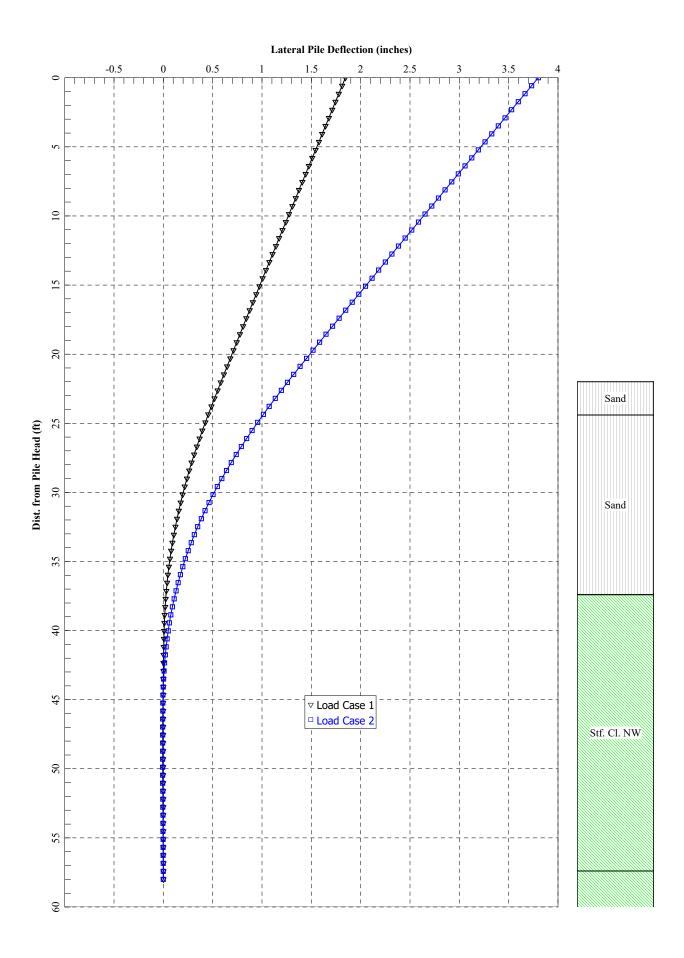
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad. Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

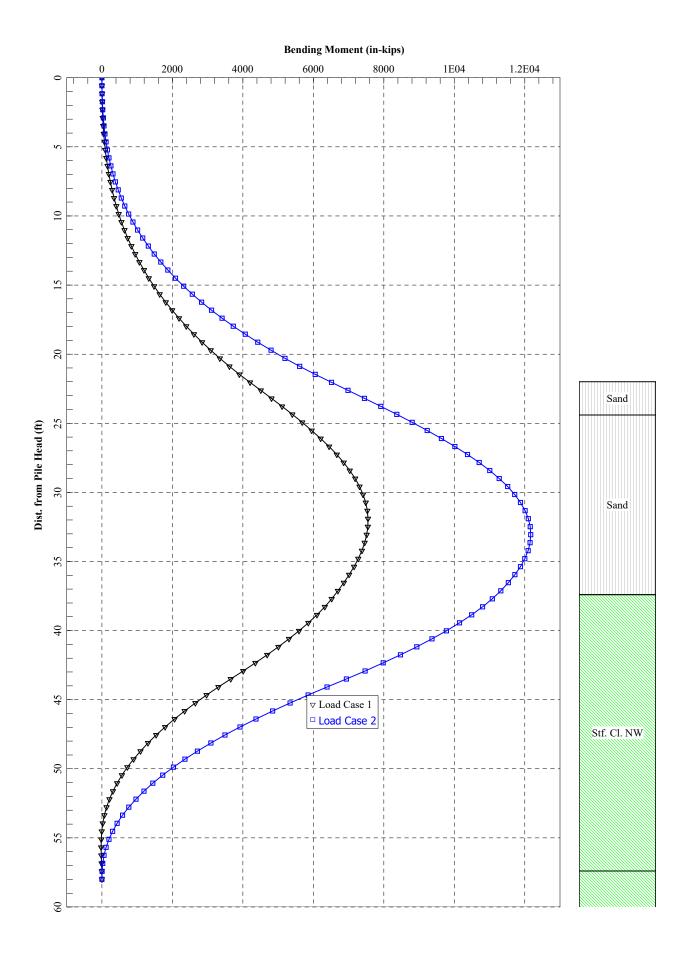
Load Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	1bs	inches	radians	lbs	in-lbs
					<u></u>			
1 V, lb	0.00	M, in-lb	0.00	0.00	1.8453	-0.00483	-50396.	7552006.
2 V, 1b	0.00	M, in-lb	0.00	0.00	3.8005	-0.00970	-77808.	1.22E+07

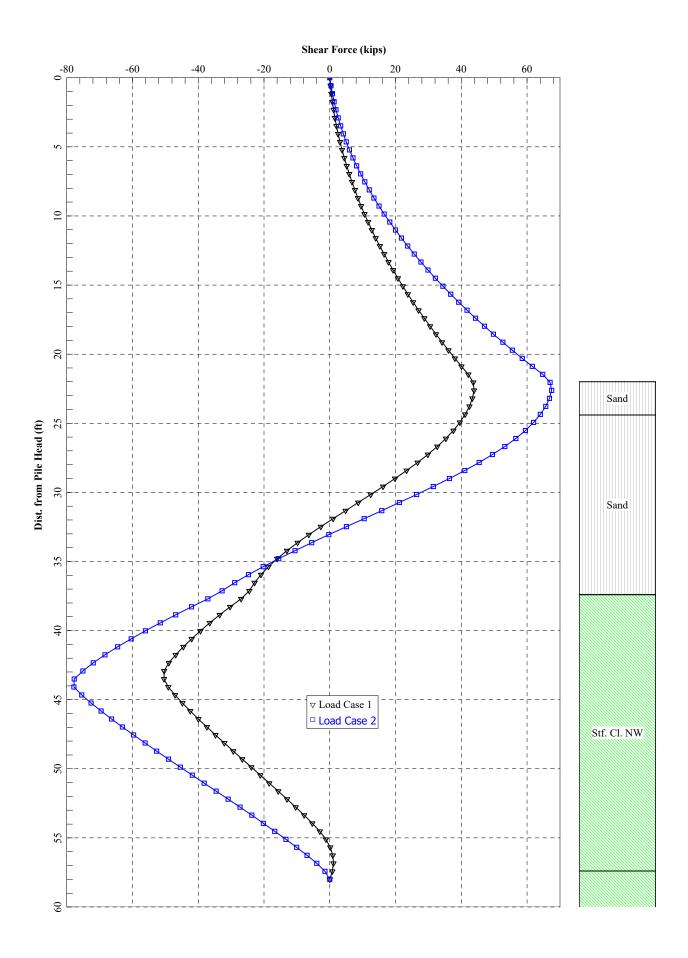
```
Maximum pile-head deflection = 3.8005465674 inches

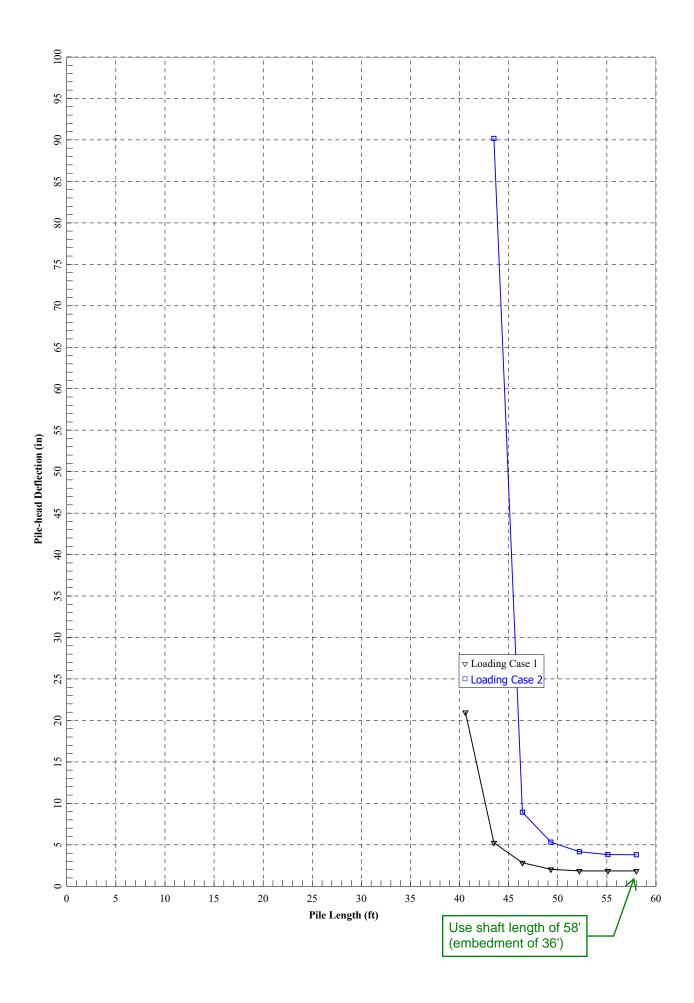
Maximum pile-head rotation = -0.0097030106 radians = -0.555942 deg.
```

The analysis ended normally.









Section within Abutment/Wingwalls, 22' height, horizontal backslope, during construction (after abutment construction, prior to superstructure installation, includes abutment/wingwall/fill loading, free-head)

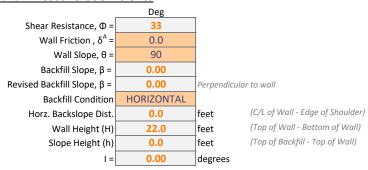
Geometry

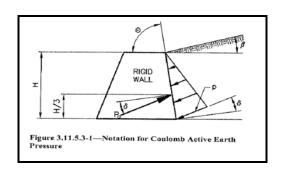
	Flouration (ft)			Horiz. Distance	
	Elevation (ft)	_		from C/L (ft)	
Top of Backfill =	723.3	at Outside Edge of Shoulder	Start of Wall Backfill =		at Outside Edge of Shoulder
Top of Wall =	712.0	at C/L of Wall	Wall =		at C/L of Wall
Existing Ground Surface =	703.0	at C/L of Wall			
Bottom of Wall =	690.0	at C/L of Wall	Backfill Slope Angle =		H:1V

Wall Loading Profile

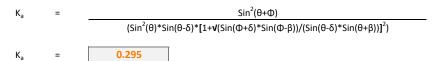
_	Top Elev.	Thickness (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	
Item 203	712.0	9.0	250	28	125	A-6a/A-6b per GDM
Medium Dense Granular	703.0	13.0	0	33	122	
Bottom of Wall	690.0					•
Weighted Value		22.0	100	31	125	

Earth Pressure Coefficients





Active Earth Coefficient



At-Rest Earth Coefficient

 $K_o = (1-Sin(\phi))*(1+Sin(\beta))$ $K_o = 0.456$

Notes:

A. Wall friction neglected

- B. Figure and Equation for Active Earth Pressure from AASHTO 3.11.5.3 (LRFD Design Manual).
- C. The wall backfill will consist of proposed fill and granular overburden. Using the soil layer thicknesses and respective soil parameters as provided by SME, a weighted average was determined and assumed for the entire backfill (c' = 100 psf and $\phi' = 31^\circ$. The parameters were converted to equivalent soil strength parameters c' = 0 psf and $\phi' = 33^\circ$ for computing earth pressures based on a 1 degree increase in friction angle for every 50 psf decrease in cohesion up to 150 psf (Ref: Hall's Thesis).

<u>Soil Lateral Design Profile</u>							
	Top Elev	Depth (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	ε50	k
Medium Dense Granular	690.0	22.0	0	33	59.6	N/A	60
Medium Dense Silt	687.6	24.4	0	32	62.6	N/A	60
Medium Stiff to Stiff Silt	674.6	37.4	2300	0	57.6	0.005	N/A
Stiff Cohesive	654.6	57.4	1600	0	55.6	0.007	N/A
Stiff to Very Stiff Silt	643.8	68.2	1750	0	57.6	0.007	N/A
Hard Silt	604.6	107.4	4400	0	77.6	0.004	N/A
Bedrock	585.6	126.4	N/A	N/A	N/A	N/A	N/A

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)

Restraint Condition = ACTIVE

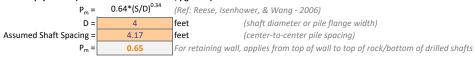
Ka = 0.295

(Active or At-Rest)

3) Determine Equivalent Fluid Weight (G_H)

 $G_H = (\gamma_m)^* (K_a)$ Soil loading only, does not include hydrostatic pressures $G_H = 37$ For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust

$$\label{eq:conventional Earth Pressure Theory} \begin{split} & \textit{Exposed Wall Height (H)} = & \textit{22} \\ & \textit{P} = & \textit{1/2} * \textit{G}_{\text{H}} * \textit{H}^2 \\ & \textit{P} = & \textit{8935} \\ & \textit{P}_{\text{SH}} = & \textit{P*(Shaft Spacing)} \end{split} \qquad \textit{(earth loading)} \\ & \textit{P}_{\text{SH}} = & \textit{37228} \qquad \textit{lbs/shaft} \end{split}$$

6) Resolve horizontal earth force to distributed triangular load (for LPILE)

w =	2*P _{SH} /H	
w =	3384	lbs/foot per shaft (Earth - Service Limit)
w =	282	lbs/inch per shaft (Earth - Service Limit)
$\gamma_E =$	1.5	Earth Load Factor
w =	$(2*P_{SH}/H)*\gamma_E$	_
w =	423	lbs/inch per shaft (Earth - Strength Limit)

7) Determine live-load traffic surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)

w =	P _s /H	
w =	308	lbs/foot per shaft (surcharge - unfactored)
w =	26	lbs/inch per shaft (surcharge - unfactored)
$\gamma_s =$	1.75	Surcharge Load Factor - Strength I
w =	$(P_S/L)*\gamma_S$	
w =	45	lbs/inch per shaft (Surcharge - Strength I)

Distributed Lateral Loads for LPILE

	CONVENTION	AL
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)
0	26	45
22.0	308	468

9) Pile Heading Loading (for LPILE, from HDR Structures)

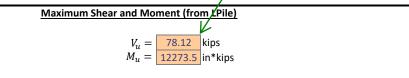
	Service	Strength		
Shear =	0	0	kips/ft	Does not include soil loading above the top of the shafts
Moment =	-0.54	-0.67	kip-ft/ft	
Axial Load =	5.07	6.33	kips/ft	
Shear =	0	0	lbs	
Moment =	-27000	-33500	lb-in	Checked with and without moment loading due to negative direction
Axial Load =	21125	26375	lbs	

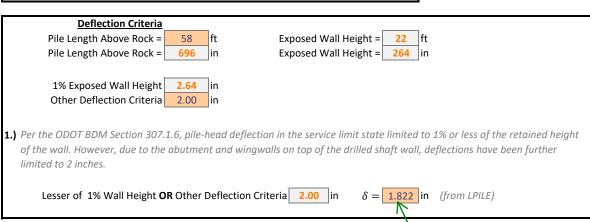
Shear, Moment, and Deflection Results

Governing maximum moment and shear based on Load Case 4 = Service Case (No Applied Moment)

Maximum Shear and Moment output from LPile service case provided to HDR's structural engineers for capacity checks/Final reinforcing layout to be confirmed in structural analyses.

Shaft Geometry		_
Shaft Diameter	48	in
Rebar Cover	4	in
Steel Reinforcing		
Assumed Bar No.	11	Ī
No. of Bars	18	
Percent Steel	1.55%	in
Yield Strength of Steel	60	ksi
Modulus of Elasticity of Steel (E _s)	29000000	psi
		•
Concrete Properties		T
Concrete Compressive Strength (f _c)	4000	psi
Modulus of Elasticity of Concrete (E _c)	3604997	psi





Governing deflection based on Load Case 3 = Service Case (No Applied Moment) ______

LPile for Version 2022-12.012

Load Case 1 = Service Case (Applied Moment)

Load Case 2 = Strength Case (Applied Moment) Load Case 3 = Service Case (No Applied Moment)

Load Case 4 = Strength Case (No Applied Moment)

License ID : 202613844 License Type : (Network 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:

HDR

LPILE Global, Global License

This model was prepared by: abaratta

File Head Com Amalusia

Files Used for Analysis

Path to file locations: \pwworking\east01\d4381065\

Name of input data file:

1b. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Const. w Abt. No Soil.lp12d

Name of output report file:

1b. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Const. w Abt. No Soil.lp12o

Name of plot output file:

1b. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Const. w Abt. No Soil.lp12p

Name of runtime message file:

1b. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Const. w Abt. No Soil.lp12r

Date and Time of Analysis
Date: July 10, 2025 Time: 13:30:49
Problem Title
Project Name: CUY-17-13.50
Job Number:
Client:
Engineer: HDR
Description: Rear Abt., 22' Ht., 4' Dia., Const. w/ Abt. Load
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
- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- Analysis includes loading by multiple distributed lateral loads acting on pile
- 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 = 58.000 ft
Depth of ground surface below top of pile = 22.0000 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.

Depth Below

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	48.0000
2	58.000	48.0000

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 = 58.000000 ft

Shaft Diameter = 48.000000 in
```

Soil and Rock Layering Information

The soil profile is modelled using 6 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 22.000000 ft

Distance from top of pile to bottom of layer = 24.400000 ft

Effective unit weight at top of layer = 59.600000 pcf

Effective unit weight at bottom of layer = 59.600000 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

Layer 2 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 = 37.400000 ft

Effective unit weight at top of layer = 62.600000 pcf

Effective unit weight at bottom of layer = 62.600000 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

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer	=	37.400000 ft
Distance from top of pile to bottom of layer	=	57.400000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	2300. psf
Undrained cohesion at bottom of layer	=	2300. 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	=	57.400000 ft
Distance from top of pile to bottom of layer	=	68.200000 ft
Effective unit weight at top of layer	=	55.600000 pcf
Effective unit weight at bottom of layer	=	55.600000 pcf
Undrained cohesion at top of layer	=	1600. psf
Undrained cohesion at bottom of layer	=	1600. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	68.200000 ft
Distance from top of pile to bottom of layer	=	107.400000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1750. psf
Undrained cohesion at bottom of layer	=	1750. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer = 107.400000 ft
Distance from top of pile to bottom of layer = 126.400000 ft
Effective unit weight at top of layer = 77.600000 pcf
Effective unit weight at bottom of layer = 77.600000 pcf
Undrained cohesion at top of layer = 4400. psf
Undrained cohesion at bottom of layer = 4400. psf
Epsilon-50 at top of layer = 0.004000
Epsilon-50 at bottom of layer = 0.004000

(Depth of the lowest soil layer extends 68.400 ft below the pile tip)

Summary of Input Soil Properties

Layer	Soil Type	Layer	Effective	Cohesion	Angle of	E50	
Num.	Name	Depth	Unit Wt.		Friction	or	kpy
	(p-y Curve Type)	ft	pcf	psf	deg.	krm	pci
1	Sand	22.0000	59.6000		33.0000		60.0000
	(Reese, et al.)	24.4000	59.6000		33.0000		60.0000
2	Sand	24.4000	62.6000		32.0000		60.0000
	(Reese, et al.)	37.4000	62.6000		32.0000		60.0000
3	Stiff Clay	37.4000	57.6000	2300.		0.00500	
	w/o Free Water	57.4000	57.6000	2300.		0.00500	
4	Stiff Clay	57.4000	55.6000	1600.		0.00700	
	w/o Free Water	68.2000	55.6000	1600.		0.00700	
5	Stiff Clay	68.2000	57.6000	1750.		0.00700	
	w/o Free Water	107.4000	57.6000	1750.		0.00700	
6	Stiff Clay	107.4000	77.6000	4400.		0.00400	
	w/o Free Water	126.4000	77.6000	4400.		0.00400	

Modification Factors for p-y Curves

Distribution of p-y modifiers with depth defined using 2 points

Point Depth X p-mult y-mult

No.	ft		
1	22.000	0.6500	1.0000
2	126.400	0.6500	1.0000

Static Loading Type

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

Distributed Lateral Loading for Individual Load Cases

Distributed lateral load intensity for Load Case 1 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	26.000
2	22.000	308.000

Distributed lateral load intensity for Load Case 2 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	45.000
2	22.000	468.000

Distributed lateral load intensity for Load Case 3 defined using 2 points

No.	ft	lb/in
Point	Depth X	Dist. Load

1	0.000	26.000
2	22.000	308.000

Distributed lateral load intensity for Load Case 4 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	45.000
2	22.000	468.000

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 4

Load	Load		Condition		Condition	Axial Thrust	Compute Top y	Run Analysis
No.	Type		1		2	Force, 1bs	vs. Pile Length	-
1	1	V =	0.0000 lbs	M =	-27000. in-lbs	21125.	Yes	Yes
2	1	V =	0.0000 lbs	M =	-33500. in-lbs	26375.	Yes	Yes
3	1	V =	0.0000 lbs	M =	0.0000 in-lbs	21125.	Yes	Yes
4	1	V =	0.0000 lbs	M =	0.0000 in-lbs	26375.	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.

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	=	58.000000	ft
Shaft Diameter	=	48.000000	in
Concrete Cover Thickness (to edge of long. rebar)	=	4.000000	in
Number of Reinforcing Bars	=	18	bars
Yield Stress of Reinforcing Bars	=	60000.	psi
Modulus of Elasticity of Reinforcing Bars	=	29000000.	psi
Gross Area of Shaft	=	1810.	sq. in.
Total Area of Reinforcing Steel	=	28.080000	sq. in.
Area Ratio of Steel Reinforcement	=	1.55	percent
Edge-to-Edge Bar Spacing	=	5.291083	in
Maximum Concrete Aggregate Size	=	0.750000	in
Ratio of Bar Spacing to Aggregate Size	=	7.05	
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 7741.823 kips Tensile Load for Cracking of Concrete = -834.882 kips Nominal Axial Tensile Capacity = -1684.800 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar	Bar Diam.	Bar Area	Χ	Υ
Number	inches	sq. in.	inches	inches
1	1.410000	1.560000	19.295000	0.00000
2	1.410000	1.560000	18.131369	6.599279
3	1.410000	1.560000	14.780828	12.402587
4	1.410000	1.560000	9.647500	16.709960

5	1.410000	1.560000	3.350542	19.001866
6	1.410000	1.560000	-3.35054	19.001866
7	1.410000	1.560000	-9.64750	16.709960
8	1.410000	1.560000	-14.78083	12.402587
9	1.410000	1.560000	-18.13137	6.599279
10	1.410000	1.560000	-19.29500	0.00000
11	1.410000	1.560000	-18.13137	-6.59928
12	1.410000	1.560000	-14.78083	-12.40259
13	1.410000	1.560000	-9.64750	-16.70996
14	1.410000	1.560000	-3.35054	-19.00187
15	1.410000	1.560000	3.350542	-19.00187
16	1.410000	1.560000	9.647500	-16.70996
17	1.410000	1.560000	14.780828	-12.40259
18	1.410000	1.560000	18.131369	-6.59928

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

Minimum spacing between any two bars not equal to zero = 5.291 inches between bars 14 and 15.

Ratio of bar spacing to maximum aggregate size = 7.05

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 = 2

Number	Axial Thrust Force
	kips
1	21.125
2	26.375

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 = 21.125 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Run Stress Msg ksi
6.25000E-07	769.7328321	1231572531.	28.0507437	0.00001753	-0.00001247	0.0733792	0.4344697
0.00000125	1536.	1228750039.	26.0315031	0.00003254	-0.00002746	0.1355643	0.7957420
0.00000188	2298.	1225859929.	25.3584677	0.00004755	-0.00004245	0.1972534	1.1570167
0.00000250	3057.	1222952724.	25.0219728	0.00006255	-0.00005745	0.2584463	1.5182930
0.00000313	3813.	1220038659.	24.8200923	0.00007756	-0.00007244	0.3191431	1.8795709
0.00000375	4564.	1217121162.	24.6855189	0.00009257	-0.00008743	0.3793438	2.2408502
0.00000438	5312.	1214201702.	24.5894065	0.0001076	-0.000102	0.4390483	2.6021310
0.00000500	5312.	1062426489.	14.7388549	0.00007369	-0.000166	0.3015525	-4.231266 C
0.00000563	5312.	944379101.	14.5730776	0.00008197	-0.000188	0.3346308	-4.787217 C
0.00000625	5312.	849941191.	14.4386662	0.00009024	-0.000210	0.3675155	-5.343491 C
0.00000688	5312.	772673810.	14.3294919	0.00009852	-0.000231	0.4002741	-5.899606 C
0.00000750	5312.	708284326.	14.2392446	0.0001068	-0.000253	0.4329062	-6.455562 C
0.00000813	5312.	653800916.	14.1635589	0.0001151	-0.000275	0.4654118	-7.011358 C
0.00000875	5312.	607100851.	14.0972322	0.0001234	-0.000297	0.4977174	-7.567527 C
0.00000938	5312.	566627461.	14.0402354	0.0001316	-0.000318	0.5298933	-8.123561 C
0.00001000	5312.	531213245.	13.9909239	0.0001399	-0.000340	0.5619431	-8.679429 C
0.00001063	5312.	499965407.	13.9479599	0.0001482	-0.000362	0.5938666	-9.235131 C
0.00001125	5312.	472189551.	13.9102802	0.0001565	-0.000384	0.6256637	-9.790667 C
0.00001188	5312.	447337469.	13.8770523	0.0001648	-0.000405	0.6573339	-10.346035 C

0.00001250	5312.	424970596.	13.8476100	0.0001731	-0.000427	0.6888772	-10.901235 C
0.00001313	5312.	404733901.	13.8214142	0.0001814	-0.000449	0.7202932	-11.456267 C
0.00001375	5312.	386336905.	13.7980236	0.0001897	-0.000470	0.7515818	-12.011130 C
0.00001438	5312.	369539648.	13.7770738	0.0001980	-0.000492	0.7827427	-12.565823 C
0.00001500	5312.	354142163.	13.7582612	0.0002064	-0.000514	0.8137756	-13.120346 C
0.00001563	5312.	339976476.	13.7413306	0.0002147	-0.000535	0.8446803	-13.674698 C
0.00001625	5325.	327678442.	13.7260662	0.0002230	-0.000557	0.8754566	-14.228879 C
0.00001688	5519.	327048105.	13.7122842	0.0002314	-0.000579	0.9061042	-14.782887 C
0.00001750	5713.	326455012.	13.6998270	0.0002397	-0.000600	0.9366228	-15.336722 C
0.00001813	5907.	325895287.	13.6885588	0.0002481	-0.000622	0.9670123	-15.890384 C
0.00001875	6101.	325365526.	13.6783327	0.0002565	-0.000644	0.9972683	-16.443904 C
0.00001938	6294.	324862653.	13.6687759	0.0002648	-0.000665	1.0273749	-16.997406 C
0.00002000	6488.	324384338.	13.6601245	0.0002732	-0.000687	1.0573524	-17.550728 C
0.00002063	6681.	323928327.	13.6523015	0.0002816	-0.000708	1.0872008	-18.103867 C
0.00002125	6874.	323492629.	13.6452351	0.0002900	-0.000730	1.1169197	-18.656824 C
0.00002188	7067.	323075484.	13.6388615	0.0002984	-0.000752	1.1465088	-19.209597 C
0.00002250	7260.	322675324.	13.6331241	0.0003067	-0.000773	1.1759679	-19.762186 C
0.00002313	7453.	322290751.	13.6279723	0.0003151	-0.000795	1.2052968	-20.314591 C
0.00002375	7646.	321920515.	13.6233610	0.0003236	-0.000816	1.2344951	-20.866810 C
0.00002438	7838.	321563494.	13.6192497	0.0003320	-0.000838	1.2635626	-21.418843 C
0.00002563	8223.	320885154.	13.6123844	0.0003488	-0.000881	1.3213042	-22.522347 C
0.00002688	8607.	320248761.	13.6071250	0.0003657	-0.000924	1.3785193	-23.625097 C
0.00002813	8990.	319648582.	13.6032647	0.0003826	-0.000967	1.4352057	-24.727087 C
0.00002938	9373.	319079860.	13.6006321	0.0003995	-0.001010	1.4913613	-25.828312 C
0.00003063	9755.	318538610.	13.5990838	0.0004165	-0.001054	1.5469836	-26.928764 C
0.00003188	10137.	318021474.	13.5984992	0.0004335	-0.001097	1.6020706	-28.028437 C
0.00003313	10518.	317525596.	13.5987758	0.0004505	-0.001140	1.6566199	-29.127326 C
0.00003438	10899.	317048536.	13.5998262	0.0004675	-0.001183	1.7106291	-30.225423 C
0.00003563	11278.	316588192.	13.6015752	0.0004846	-0.001225	1.7640959	-31.322723 C
0.00003688	11658.	316142750.	13.6039581	0.0005016	-0.001268	1.8170178	-32.419217 C
0.00003813	12036.	315710627.	13.6069187	0.0005188	-0.001311	1.8693926	-33.514900 C
0.00003938	12415.	315290443.	13.6104080	0.0005359	-0.001354	1.9212177	-34.609765 C
0.00004063	12792.	314880985.	13.6143831	0.0005531	-0.001397	1.9724906	-35.703805 C
0.00004188	13169.	314481184.	13.6188064	0.0005703	-0.001440	2.0232089	-36.797012 C
0.00004313	13545.	314090093.	13.6236447	0.0005875	-0.001482	2.0733700	-37.889379 C
0.00004438	13921.	313706870.	13.6288686	0.0006048	-0.001525	2.1229713	-38.980900 C
0.00004563	14296.	313330764.	13.6344520	0.0006221	-0.001568	2.1720103	-40.071566 C
0.00004688	14670.	312961102.	13.6403718	0.0006394	-0.001611	2.2204842	-41.161370 C
0.00004813	15044.	312597281.	13.6466072	0.0006567	-0.001653	2.2683905	-42.250304 C
0.00004938	15417.	312238755.	13.6531397	0.0006741	-0.001696	2.3157264	-43.338360 C
0.00005063	15789.	311885034.	13.6599527	0.0006915	-0.001738	2.3624891	-44.425532 C
0.00005188	16161.	311535670.	13.6670313	0.0007090	-0.001781	2.4086759	-45.511810 C
0.00005313	16532.	311190259.	13.6743621	0.0007265	-0.001824	2.4542840	-46.597186 C

0.00005438	16902.	310848485.	13.6818311	0.0007439	-0.001866	2.4993001	-47.681767 C
0.00005563	17272.	310510144.	13.6893350	0.0007615	-0.001909	2.5436999	-48.765794 C
0.00005688	17641.	310174779.	13.6970481	0.0007790	-0.001951	2.5875103	-49.848932 C
0.00005813	18010.	309842106.	13.7049616	0.0007966	-0.001993	2.6307284	-50.931173 C
0.00005938	18377.	309511865.	13.7130678	0.0008142	-0.002036	2.6733512	-52.012509 C
0.00006063	18744.	309183816.	13.7213594	0.0008319	-0.002078	2.7153759	-53.092931 C
0.00006188	19111.	308857736.	13.7298299	0.0008495	-0.002120	2.7567993	-54.172430 C
0.00006313	19476.	308533420.	13.7384734	0.0008672	-0.002163	2.7976186	-55.250999 C
0.00006438	19841.	308210675.	13.7472845	0.0008850	-0.002205	2.8378306	-56.328628 C
0.00006563	20205.	307889323.	13.7562583	0.0009028	-0.002247	2.8774321	-57.405309 C
0.00006688	20569.	307569199.	13.7653904	0.0009206	-0.002289	2.9164201	-58.481032 C
0.00006813	20931.	307250146.	13.7746768	0.0009384	-0.002332	2.9547913	-59.555788 C
0.00006938	21293.	306928429.	13.7840598	0.0009563	-0.002374	2.9925345	-60.000000 CY
0.00007063	21633.	306306328.	13.7889702	0.0009738	-0.002416	3.0289735	-60.000000 CY
0.00007188	21931.	305126554.	13.7852763	0.0009908	-0.002459	3.0634995	-60.000000 CY
0.00007313	22199.	303571427.	13.7757058	0.0010073	-0.002503	3.0965069	-60.000000 CY
0.00007438	22461.	302002784.	13.7658443	0.0010238	-0.002546	3.1288376	-60.000000 CY
0.00007938	23320.	293796415.	13.6923667	0.0010868	-0.002723	3.2468613	-60.000000 CY
0.00008438	24003.	284481981.	13.5934697	0.0011469	-0.002903	3.3513829	-60.000000 CY
0.00008938	24670.	276024573.	13.5064891	0.0012071	-0.003083	3.4482242	-60.000000 CY
0.00009438	25126.	266234533.	13.3849513	0.0012632	-0.003267	3.5312731	-60.000000 CY
0.00009938	25515.	256754518.	13.2645162	0.0013182	-0.003452	3.6060625	-60.000000 CY
0.0001044	25900.	248139347.	13.1561965	0.0013732	-0.003637	3.6744280	-60.000000 CY
0.0001094	26279.	240267066.	13.0574071	0.0014282	-0.003822	3.7362448	-60.000000 CY
0.0001144	26653.	233027438.	12.9692094	0.0014834	-0.004007	3.7917768	-60.000000 CY
0.0001194	26936.	225639035.	12.8684643	0.0015362	-0.004194	3.8387346	-60.000000 CY
0.0001244	27132.	218146742.	12.7565024	0.0015866	-0.004383	3.8779204	-60.000000 CY
0.0001294	27316.	211135158.	12.6489929	0.0016365	-0.004574	3.9113204	-60.000000 CY
0.0001344	27496.	204619847.	12.5493435	0.0016863	-0.004764	3.9393841	-60.000000 CY
0.0001394	27674.	198554903.	12.4586937	0.0017364	-0.004954	3.9622315	-60.000000 CY
0.0001444	27849.	192893141.	12.3761507	0.0017868	-0.005143	3.9797793	-60.000000 CY
0.0001494	28022.	187593657.	12.3009506	0.0018375	-0.005333	3.9919411	-60.000000 CY
0.0001544	28192.	182619520.	12.2319253	0.0018883	-0.005522	3.9986215	-60.000000 CY
0.0001594	28358.	177930541.	12.1654739	0.0019389	-0.005711	3.9956578	-60.000000 CY
0.0001644	28520.	173506186.	12.1047535	0.0019897	-0.005900	3.9997504	-60.000000 CY
0.0001694	28670.	169271709.	12.0465944	0.0020404	-0.006090	3.9972866	-60.000000 CY
0.0001744	28784.	165068268.	11.9820305	0.0020894	-0.006281	3.9999575	-60.000000 CY
0.0001794	28865.	160918486.	11.9127774	0.0021369	-0.006473	3.9971026	-60.000000 CY
0.0001844	28931.	156916156.	11.8429546	0.0021835	-0.006666	3.9998312	-60.000000 CY
0.0001894	28992.	153095622.	11.7792501	0.0022307	-0.006859	3.9953050	-60.000000 CY
0.0001944	29051.	149456915.	11.7156886	0.0022772	-0.007053	3.9990621	-60.000000 CY
0.0001994	29107.	145991547.	11.6549613	0.0023237	-0.007246	3.9978721	-60.000000 CY
0.0002044	29162.	142688500.	11.5984218	0.0023704	-0.007440	3.9965511	-60.000000 CY

0.0002094	29216.	139539316.	11.5454302	0.0024173	-0.007633	3.9994708	-60.000000 CY
0.0002144	29269.	136531934.	11.4957796	0.0024644	-0.007826	3.9961745	-60.000000 CY
0.0002194	29321.	133656185.	11.4489643	0.0025116	-0.008018	3.9960896	-60.000000 CY
0.0002244	29372.	130905540.	11.4059691	0.0025592	-0.008211	3.9991740	-60.000000 CY
0.0002294	29422.	128271270.	11.3650355	0.0026069	-0.008403	3.9984530	-60.000000 CY
0.0002344	29471.	125744126.	11.3268589	0.0026547	-0.008595	3.9936275	-60.000000 CY
0.0002394	29520.	123320190.	11.2908321	0.0027027	-0.008787	3.9976952	-60.000000 CY
0.0002444	29567.	120989867.	11.2548180	0.0027504	-0.008980	3.9997255	-60.000000 CY
0.0002494	29613.	118748171.	11.2201288	0.0027980	-0.009172	3.9956111	-60.000000 CY
0.0002544	29658.	116591516.	11.1875295	0.0028458	-0.009364	3.9931087	-60.000000 CY
0.0002594	29703.	114516381.	11.1550148	0.0028933	-0.009557	3.9971024	-60.000000 CY
0.0002644	29747.	112518144.	11.1273436	0.0029418	-0.009748	3.9993988	-60.000000 CY
0.0002694	29791.	110592083.	11.0996947	0.0029900	-0.009940	3.9985392	-60.000000 CY
0.0002744	29834.	108732995.	11.0737771	0.0030384	-0.010132	3.9897607	-60.000000 CYT
0.0003044	30072.	98797560.	10.9388064	0.0033295	-0.011281	3.9907268	60.0000000 CYT
0.0003344	30215.	90361197.	10.8038903	0.0036126	-0.012437	3.9871362	60.0000000 CYT
0.0003644	30215.	82921510.	10.7069188	0.0039013	-0.013589	3.9988360	60.0000000 CYT

Axial Thrust Force = 26.375 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Run Stress Msg ksi
6.25000E-07 0.00000125	769.6614654 1536.	1231458345. 1228691794.	29.0575674 26.5364116	0.00001816 0.00003317	-0.00001184 -0.00002683	0.0760230 0.1381948	0.4527184 0.8140449
0.00000188	2298.	1225820761.	25.6960958	0.00004818	-0.00004182	0.1998708	1.1753752
0.00000250	3057.	1222923140.	25.2759689	0.00006319	-0.00005681	0.2610505	1.5367078
0.00000313	3813.	1220014837.	25.0239144	0.00007820	-0.00007180	0.3217341	1.8980423
0.00000375	4564.	1217101182.	24.8558950	0.00009321	-0.00008679	0.3819214	2.2593786
0.00000438	5312.	1214184467.	24.7358958	0.0001082	-0.000102	0.4416125	2.6207168
0.00000500	5312.	1062411409.	15.1181234	0.00007559	-0.000164	0.3092820	-4.176272 C
0.00000563	5312.	944365697.	14.9127386	0.00008388	-0.000186	0.3423836	-4.731809 C
0.00000625	5312.	849929127.	14.7492991	0.00009218	-0.000208	0.3753578	-5.287190 C
0.00000688	5312.	772662843.	14.6155554	0.0001005	-0.000230	0.4081822	-5.842574 C
0.00000750	5312.	708274273.	14.5017614	0.0001088	-0.000251	0.4407873	-6.398465 C
0.00000813	5312.	653791636.	14.4061567	0.0001171	-0.000273	0.4732656	-6.954197 C
0.00000875	5312.	607092234.	14.3248419	0.0001253	-0.000295	0.5056171	-7.509768 C
0.00000938	5312.	566619418.	14.2549612	0.0001336	-0.000316	0.5378414	-8.065178 C
0.00001000	5312.	531205704.	14.1943724	0.0001419	-0.000338	0.5699383	-8.620427 C
0.00001063	5312.	499958310.	14.1408125	0.0001502	-0.000360	0.6018808	-9.175712 C
0.00001125	5312.	472182848.	14.0926378	0.0001585	-0.000381	0.6336498	-9.731177 C

0.00001188	5312.	447331120.	14.0500207	0.0001668	-0.000403	0.6652920	-10.286474 C
0.00001250	5312.	424964564.	14.0121175	0.0001752	-0.000425	0.6968070	-10.841603 C
0.00001313	5312.	404728156.	13.9782765	0.0001835	-0.000447	0.7281948	-11.396563 C
0.00001375	5312.	386331421.	13.9479365	0.0001918	-0.000468	0.7594551	-11.951354 C
0.00001438	5312.	369534403.	13.9206423	0.0002001	-0.000490	0.7905875	-12.505975 C
0.00001500	5312.	354137136.	13.8960147	0.0002084	-0.000512	0.8215919	-13.060426 C
0.00001563	5312.	339971651.	13.8737350	0.0002168	-0.000533	0.8524681	-13.614705 C
0.00001625	5381.	331118795.	13.8535337	0.0002251	-0.000555	0.8832157	-14.168812 C
0.00001688	5575.	330358073.	13.8351811	0.0002335	-0.000577	0.9138345	-14.722747 C
0.00001750	5769.	329643899.	13.8184803	0.0002418	-0.000598	0.9443244	-15.276509 C
0.00001813	5963.	328971433.	13.8032618	0.0002502	-0.000620	0.9746850	-15.830097 C
0.00001875	6156.	328336481.	13.7893784	0.0002586	-0.000641	1.0049160	-16.383511 C
0.00001938	6350.	327735390.	13.7767022	0.0002669	-0.000663	1.0350173	-16.936749 C
0.00002000	6543.	327164963.	13.7651211	0.0002753	-0.000685	1.0649886	-17.489812 C
0.00002063	6737.	326622391.	13.7545365	0.0002837	-0.000706	1.0948296	-18.042699 C
0.00002125	6930.	326105195.	13.7448618	0.0002921	-0.000728	1.1245401	-18.595408 C
0.00002188	7123.	325611180.	13.7360198	0.0003005	-0.000750	1.1541198	-19.147940 C
0.00002250	7316.	325138393.	13.7279423	0.0003089	-0.000771	1.1835684	-19.700294 C
0.00002313	7508.	324685094.	13.7205683	0.0003173	-0.000793	1.2128857	-20.252468 C
0.00002375	7701.	324249724.	13.7138433	0.0003257	-0.000814	1.2420715	-20.804463 C
0.00002438	7893.	323830887.	13.7077182	0.0003341	-0.000836	1.2711255	-21.356278 C
0.00002563	8278.	323037895.	13.6970960	0.0003510	-0.000879	1.3288368	-22.459363 C
0.00002688	8662.	322297437.	13.6883981	0.0003679	-0.000922	1.3860176	-23.561718 C
0.00002813	9045.	321602373.	13.6813749	0.0003848	-0.000965	1.4426658	-24.663338 C
0.00002938	9428.	320946733.	13.6757184	0.0004017	-0.001008	1.4987640	-25.764347 C
0.00003063	9810.	320325614.	13.6713011	0.0004187	-0.001051	1.5543237	-26.864626 C
0.00003188	10192.	319734844.	13.6680741	0.0004357	-0.001094	1.6093475	-27.964124 C
0.00003313	10573.	319170862.	13.6659095	0.0004527	-0.001137	1.6638333	-29.062836 C
0.00003438	10953.	318630622.	13.6646978	0.0004697	-0.001180	1.7177785	-30.160754 C
0.00003563	11333.	318111506.	13.6643452	0.0004868	-0.001223	1.7711809	-31.257873 C
0.00003688	11712.	317611248.	13.6647705	0.0005039	-0.001266	1.8240381	-32.354186 C
0.00003813	12091.	317127879.	13.6659035	0.0005210	-0.001309	1.8763477	-33.449685 C
0.00003938	12468.	316659677.	13.6676828	0.0005382	-0.001352	1.9281071	-34.544365 C
0.00004063	12846.	316205131.	13.6700546	0.0005553	-0.001395	1.9793140	-35.638217 C
0.00004188	13223.	315762908.	13.6729718	0.0005726	-0.001437	2.0299657	-36.731235 C
0.00004313	13599.	315331830.	13.6763928	0.0005898	-0.001480	2.0800598	-37.823411 C
0.00004438	13974.	314910853.	13.6802478	0.0006071	-0.001523	2.1295924	-38.914752 C
0.00004563	14349.	314499096.	13.6844094	0.0006244	-0.001566	2.1785425	-40.005435 C
0.00004688	14723.	314095690.	13.6889600	0.0006417	-0.001608	2.2269244	-41.095288 C
0.00004813	15097.	313699884.	13.6938746	0.0006590	-0.001651	2.2747355	-42.184303 C
0.00004938	15470.	313311005.	13.6991305	0.0006764	-0.001694	2.3219733	-43.272473 C
0.00005063	15842.	312928444.	13.7047074	0.0006938	-0.001736	2.3686349	-44.359790 C
0.00005188	16214.	312551648.	13.7105872	0.0007112	-0.001779	2.4147178	-45.446248 C

0.00005313	16585.	312180117.	13.7167534	0.0007287	-0.001821	2.4602192	-46.531837 C
0.00005438	16955.	311813395.	13.7231912	0.0007462	-0.001864	2.5051363	-47.616552 C
0.00005563	17324.	311451063.	13.7298870	0.0007637	-0.001906	2.5494663	-48.700384 C
0.00005688	17693.	311092741.	13.7368288	0.0007813	-0.001949	2.5932063	-49.783324 C
0.00005813	18062.	310738079.	13.7440054	0.0007989	-0.001991	2.6363535	-50.865365 C
0.00005938	18429.	310386755.	13.7514069	0.0008165	-0.002034	2.6789050	-51.946499 C
0.00006063	18796.	310038472.	13.7590241	0.0008341	-0.002076	2.7208577	-53.026717 C
0.00006188	19162.	309692955.	13.7668486	0.0008518	-0.002118	2.7622088	-54.106011 C
0.00006313	19528.	309349951.	13.7748728	0.0008695	-0.002160	2.8029550	-55.184371 C
0.00006438	19892.	309009225.	13.7830900	0.0008873	-0.002203	2.8430935	-56.261790 C
0.00006563	20257.	308670557.	13.7914937	0.0009051	-0.002245	2.8826209	-57.338258 C
0.00006688	20620.	308333744.	13.8000782	0.0009229	-0.002287	2.9215342	-58.413766 C
0.00006813	20982.	307998594.	13.8088381	0.0009407	-0.002329	2.9598302	-59.488305 C
0.00006938	21344.	307661728.	13.8177207	0.0009586	-0.002371	2.9974984	-60.000000 CY
0.00007063	21686.	307052885.	13.8225726	0.0009762	-0.002414	3.0339256	-60.000000 CY
0.00007188	21986.	305895841.	13.8189791	0.0009932	-0.002457	3.0684633	-60.000000 CY
0.00007313	22255.	304348203.	13.8092287	0.0010098	-0.002500	3.1014480	-60.000000 CY
0.00007438	22518.	302764977.	13.7988988	0.0010263	-0.002544	3.1337030	-60.000000 CY
0.00007938	23383.	294586423.	13.7250970	0.0010894	-0.002721	3.2516343	-60.000000 CY
0.00008438	24066.	285225413.	13.6259794	0.0011497	-0.002900	3.3560587	-60.000000 CY
0.00008938	24735.	276752554.	13.5381571	0.0012100	-0.003080	3.4526701	-60.000000 CY
0.00009438	25194.	266959698.	13.4160466	0.0012661	-0.003264	3.5355225	-60.000000 CY
0.00009938	25583.	257440202.	13.2942762	0.0013211	-0.003449	3.6099881	-60.000000 CY
0.0001044	25968.	248794848.	13.1862444	0.0013763	-0.003634	3.6782118	-60.000000 CY
0.0001094	26347.	240889725.	13.0862925	0.0014313	-0.003819	3.7396793	-60.000000 CY
0.0001144	26720.	233621750.	12.9971728	0.0014866	-0.004003	3.7948600	-60.000000 CY
0.0001194	27008.	226244740.	12.8966886	0.0015395	-0.004190	3.8415904	-60.000000 CY
0.0001244	27205.	218735321.	12.7840806	0.0015900	-0.004380	3.8804485	-60.000000 CY
0.0001294	27389.	211705378.	12.6772957	0.0016401	-0.004570	3.9136176	-60.000000 CY
0.0001344	27569.	205166848.	12.5768003	0.0016900	-0.004760	3.9412951	-60.000000 CY
0.0001394	27747.	199080312.	12.4853722	0.0017401	-0.004950	3.9637483	-60.000000 CY
0.0001444	27922.	193398407.	12.4021119	0.0017906	-0.005139	3.9808937	-60.000000 CY
0.0001494	28094.	188080096.	12.3262425	0.0018412	-0.005329	3.9926445	-60.000000 CY
0.0001544	28264.	183089639.	12.2570981	0.0018922	-0.005518	3.9989104	-60.000000 CY
0.0001594	28430.	178386727.	12.1911729	0.0019430	-0.005707	3.9962112	-60.000000 CY
0.0001644	28593.	173950077.	12.1300875	0.0019939	-0.005896	3.9998704	-60.000000 CY
0.0001694	28743.	169700404.	12.0714320	0.0020446	-0.006085	3.9977314	-60.000000 CY
0.0001744	28858.	165495745.	12.0070669	0.0020937	-0.006276	3.9999964	-60.000000 CY
0.0001794	28941.	161344954.	11.9380973	0.0021414	-0.006469	3.9975979	-60.000000 CY
0.0001844	29008.	157333107.	11.8687863	0.0021883	-0.006662	3.9999343	-60.000000 CY
0.0001894	29069.	153500016.	11.8037963	0.0022353	-0.006855	3.9959561	-60.000000 CY
0.0001944	29128.	149854628.	11.7415599	0.0022823	-0.007048	3.9993602	-60.000000 CY
0.0001994	29184.	146377795.	11.6803352	0.0023288	-0.007241	3.9962806	-60.000000 CY

0.0002044	29239.	143064451.	11.6234217	0.0023755	-0.007434	3.9971579	-60.000000 CY
0.0002094	29293.	139905447.	11.5695408	0.0024224	-0.007628	3.9996918	-60.000000 CY
0.0002144	29345.	136888202.	11.5200021	0.0024696	-0.007820	3.9945478	-60.000000 CY
0.0002194	29397.	134003620.	11.4728313	0.0025169	-0.008013	3.9967510	-60.000000 CY
0.0002244	29448.	131244522.	11.4293697	0.0025645	-0.008206	3.9994630	-60.000000 CY
0.0002294	29498.	128601656.	11.3881461	0.0026122	-0.008398	3.9967910	-60.000000 CY
0.0002344	29547.	126066872.	11.3496022	0.0026601	-0.008590	3.9944979	-60.000000 CY
0.0002394	29595.	123635603.	11.3132266	0.0027081	-0.008782	3.9982087	-60.000000 CY
0.0002444	29643.	121301307.	11.2787993	0.0027563	-0.008974	3.9998928	-60.000000 CY
0.0002494	29689.	119052309.	11.2438686	0.0028039	-0.009166	3.9937550	-60.000000 CY
0.0002544	29734.	116889198.	11.2109339	0.0028518	-0.009358	3.9941169	-60.000000 CY
0.0002594	29778.	114807858.	11.1797210	0.0028997	-0.009550	3.9977456	-60.000000 CY
0.0002644	29822.	112803622.	11.1501232	0.0029478	-0.009742	3.9996712	-60.000000 CY
0.0002694	29866.	110871309.	11.1222857	0.0029961	-0.009934	3.9966312	-60.000000 CY
0.0002744	29909.	109006750.	11.0961103	0.0030445	-0.010126	3.9902925	-60.000000 CYT
0.0003044	30147.	99044858.	10.9600728	0.0033360	-0.011274	3.9920015	60.0000000 CYT
0.0003344	30292.	90593168.	10.8266477	0.0036202	-0.012430	3.9859329	60.0000000 CYT
0.0003644	30292.	83134383.	10.7325637	0.0039107	-0.013579	3.9959063	60.0000000 CYT

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain	Max. Tens. Strain
21.125	29799.620	0.00300000	-0.00997970
26.375	29869.433	0.00300000	-0.00994950
	21.125	kips in-kip 21.125 29799.620	kips in-kip Strain 21.125 29799.620 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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	21.125000	29800.	13.731250	19370.	308627822.
2	0.65	26.375000	29869.	17.143750	19415.	309455616.
1	0.75	21.125000	29800.	15.843750	22350.	302669775.
2	0.75	26.375000	29869.	19.781250	22402.	303464548.
1	0.90	21.125000	29800.	19.012500	26820.	228665968.
2	0.90	26.375000	29869.	23.737500	26882.	229464592.

Layering Correction Equivalent Depths of Soil & Rock Layers

	Top of	Equivalent				
	Layer	Top Depth	Same Layer	Layer is	FØ	F1
Layer	Below	Below	Type As	Rock or	Integral	Integral
No.	Pile Head	Grnd Surf	Layer	is Below	for Layer	for Layer
	ft	ft	Above	Rock Layer	lbs	lbs
1	22.0000	0.00	N.A.	No	0.00	7082.
2	24.4000	2.4677	Yes	No	7082.	303908.
3	37.4000	9.1476	No	No	310989.	1084139.
4	57.4000	36.5473	Yes	No	1395129.	34481.
5	68.2000	46.2000	No	No	1429609.	0.00
6	107.4000	85.4000	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 = 0.0 lbs
Applied moment at pile head = -27000.0 in-lbs
Axial thrust load on pile head = 21125.0 lbs

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	•	Distrib.
X	У	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
 0.00	1.8110	-27000.	-2.77E-07	-0.00473	0.00	1.23E+12	0.00	0.00	27.8586
0.5800	1.7781	-25630.	213.3003	-0.00473	0.00	1.23E+12	0.00	0.00	33.4345
1.1600	1.7451	-22640.	471.8769	-0.00473	0.00	1.23E+12	0.00	0.00	40.8691
1.7400	1.7122	-17671.	782.1980	-0.00473	0.00	1.23E+12	0.00	0.00	48.3036
2.3200	1.6793	-10361.	1144.	-0.00473	0.00	1.23E+12	0.00	0.00	55.7382
2.9000	1.6464	-351.787	1558.	-0.00473	0.00	1.23E+12	0.00	0.00	63.1727
3.4800	1.6135	12718.	2024.	-0.00473	0.00	1.23E+12	0.00	0.00	70.6073
4.0600	1.5806	29208.	2541.	-0.00473	0.00	1.23E+12	0.00	0.00	78.0418
4.6400	1.5476	49478.	3110.	-0.00473	0.00	1.23E+12	0.00	0.00	85.4764
5.2200	1.5147	73889.	3731.	-0.00473	0.00	1.23E+12	0.00	0.00	92.9109
5.8000	1.4818	102801.	4403.	-0.00473	0.00	1.23E+12	0.00	0.00	100.3455
6.3800	1.4489	136574.	5128.	-0.00473	0.00	1.23E+12	0.00	0.00	107.7800
6.9600	1.4160	175567.	5904.	-0.00473	0.00	1.23E+12	0.00	0.00	115.2145
7.5400	1.3831	220141.	6731.	-0.00473	0.00	1.23E+12	0.00	0.00	122.6491
8.1200	1.3502	270657.	7611.	-0.00472	0.00	1.23E+12	0.00	0.00	130.0836
8.7000	1.3174	327474.	8542.	-0.00472	0.00	1.23E+12	0.00	0.00	137.5182
9.2800	1.2845	390952.	9525.	-0.00472	0.00	1.23E+12	0.00	0.00	144.9527
9.8600	1.2516	461452.	10560.	-0.00472	0.00	1.23E+12	0.00	0.00	152.3873
10.4400	1.2188	539333.	11646.	-0.00472	0.00	1.23E+12	0.00	0.00	159.8218
11.0200	1.1860	624955.	12785.	-0.00471	0.00	1.23E+12	0.00	0.00	167.2564
11.6000	1.1532	718680.	13975.	-0.00471	0.00	1.23E+12	0.00	0.00	174.6909
12.1800	1.1205	820866.	15216.	-0.00470	0.00	1.23E+12	0.00	0.00	182.1255
12.7600	1.0877	931873.	16510.	-0.00470	0.00	1.23E+12	0.00	0.00	189.5600
13.3400	1.0551	1052063.	17855.	-0.00469	0.00	1.23E+12	0.00	0.00	196.9945
13.9200	1.0224	1181794.	19252.	-0.00469	0.00	1.23E+12	0.00	0.00	204.4291
14.5000	0.9898	1321428.	20701.	-0.00468	0.00	1.23E+12	0.00	0.00	211.8636

15.0800	0.9573	1471323.	22201.	-0.00467	0.00	1.23E+12	0.00	0.00	219.2982
15.6600	0.9248	1631840.	23753.	-0.00466	0.00	1.23E+12	0.00	0.00	226.7327
16.2400	0.8924	1803339.	25357.	-0.00465	0.00	1.23E+12	0.00	0.00	234.1673
16.8200	0.8600	1986180.	27013.	-0.00464	0.00	1.23E+12	0.00	0.00	241.6018
17.4000	0.8277	2180723.	28720.	-0.00463	0.00	1.23E+12	0.00	0.00	249.0364
17.9800	0.7955	2387328.	30479.	-0.00462	0.00	1.23E+12	0.00	0.00	256.4709
18.5600	0.7635	2606355.	32290.	-0.00460	0.00	1.22E+12	0.00	0.00	263.9055
19.1400	0.7315	2838163.	34153.	-0.00459	0.00	1.22E+12	0.00	0.00	271.3400
19.7200	0.6996	3083114.	36067.	-0.00457	0.00	1.22E+12	0.00	0.00	278.7745
20.3000	0.6678	3341566.	38034.	-0.00455	0.00	1.22E+12	0.00	0.00	286.2091
20.8800	0.6362	3613879.	40051.	-0.00453	0.00	1.22E+12	0.00	0.00	293.6436
21.4600	0.6047	3900415.	42121.	-0.00451	0.00	1.22E+12	0.00	0.00	301.0782
22.0400	0.5734	4201531.	43617.	-0.00449	0.00	1.22E+12	-3.158	38.3264	132.0680
22.6200	0.5422	4508889.	43887.	-0.00446	0.00	1.22E+12	-51.417	659.9714	0.00
23.2000	0.5113	4813752.	43350.	-0.00444	0.00	1.22E+12	-103.037	1403.	0.00
23.7800	0.4805	5113620.	42448.	-0.00441	0.00	1.21E+12	-156.175	2262.	0.00
24.3600	0.4499	5405918.	41174.	-0.00434	0.00	3.27E+11	-209.888	3247.	0.00
24.9400	0.4201	5688032.	39554.	-0.00422	0.00	3.27E+11	-255.384	4231.	0.00
25.5200	0.3912	5957757.	37605.	-0.00409	0.00	3.26E+11	-304.853	5424.	0.00
26.1000	0.3631	6212696.	35322.	-0.00396	0.00	3.25E+11	-351.058	6729.	0.00
26.6800	0.3360	6450609.	32730.	-0.00383	0.00	3.24E+11	-393.951	8161.	0.00
27.2600	0.3098	6669418.	29857.	-0.00369	0.00	3.24E+11	-431.544	9694.	0.00
27.8400	0.2847	6867302.	26744.	-0.00354	0.00	3.24E+11	-462.891	11318.	0.00
28.4200	0.2605	7042741.	23421.	-0.00339	0.00	3.23E+11	-492.025	13145.	0.00
29.0000	0.2374	7194323.	19915.	-0.00324	0.00	3.23E+11	-515.426	15109.	0.00
29.5800	0.2154	7320914.	16272.	-0.00308	0.00	3.23E+11	-531.622	17175.	0.00
30.1600	0.1945	7421729.	12533.	-0.00292	0.00	3.22E+11	-542.698	19417.	0.00
30.7400	0.1747	7496231.	8728.	-0.00276	0.00	3.22E+11	-550.613	21931.	0.00
31.3200	0.1561	7544037.	4893.	-0.00260	0.00	3.22E+11	-551.377	24587.	0.00
31.9000	0.1386	7565110.	1079.	-0.00244	0.00	3.22E+11	-544.780	27366.	0.00
32.4800	0.1222	7559769.	-2668.	-0.00227	0.00	3.22E+11	-531.872	30302.	0.00
33.0600	0.1069	7528638.	-6298.	-0.00211	0.00	3.22E+11	-511.079	33271.	0.00
33.6400	0.09279	7472727.	-9755.	-0.00195	0.00	3.22E+11	-482.485	36189.	0.00
34.2200	0.07980	7393419.	-13008.	-0.00179	0.00	3.22E+11	-452.141	39437.	0.00
34.8000	0.06791	7292185.	-15997.	-0.00163	0.00	3.23E+11	-406.811	41693.	0.00
35.3800	0.05712	7171222.	-18657.	-0.00147	0.00	3.23E+11	-357.672	43582.	0.00
35.9600	0.04740	7032910.	-20980.	-0.00132	0.00	3.23E+11	-309.706	45472.	0.00
36.5400	0.03874	6879573.	-22975.	-0.00117	0.00	3.23E+11	-263.639	47361.	0.00
37.1200	0.03111	6713443.	-24659.	-0.00102	0.00	3.24E+11	-220.160	49250.	0.00
37.7000	0.02449	6536627.	-27154.	-8.82E-04	0.00	3.24E+11	-496.782	141204.	0.00
38.2800	0.01884	6335725.	-30533.	-7.44E-04	0.00	3.25E+11	-474.421	175294.	0.00
38.8600	0.01413	6111822.	-33751.	-6.11E-04	0.00	3.25E+11	-450.065	221659.	0.00
39.4400	0.01034	5866097.	-36793.	-4.83E-04	0.00	3.26E+11	-424.108	285554.	0.00

40.0200	0.00741	5599810.	-39652.	-3.60E-04	0.00	3.27E+11	-397.544	373203.	0.00
40.6000	0.00532	5314247.	-42332.	-2.60E-04	0.00	4.51E+11	-372.572	487348.	0.00
41.1800	0.00380	5010625.	-44842.	-2.04E-04	0.00	1.22E+12	-348.594	638778.	0.00
41.7600	0.00248	4690112.	-47164.	-1.77E-04	0.00	1.22E+12	-318.716	896156.	0.00
42.3400	0.00134	4354155.	-49241.	-1.51E-04	0.00	1.22E+12	-278.056	1445143.	0.00
42.9200	3.76E-04	4004726.	-50563.	-1.27E-04	0.00	1.22E+12	-101.977	1886688.	0.00
43.5000	-4.28E-04	3650353.	-50508.	-1.05E-04	0.00	1.22E+12	117.8613	1918218.	0.00
44.0800	-0.00109	3301687.	-49132.	-8.53E-05	0.00	1.22E+12	277.4133	1776901.	0.00
44.6600	-0.00161	2966456.	-47084.	-6.74E-05	0.00	1.22E+12	311.2280	1341537.	0.00
45.2400	-0.00203	2646299.	-44836.	-5.15E-05	0.00	1.22E+12	334.5991	1149878.	0.00
45.8200	-0.00233	2342349.	-42447.	-3.73E-05	0.00	1.23E+12	351.9975	1050940.	0.00
46.4000	-0.00254	2055447.	-39951.	-2.48E-05	0.00	1.23E+12	365.3307	999308.	0.00
46.9800	-0.00268	1786242.	-37372.	-1.39E-05	0.00	1.23E+12	375.5977	976675.	0.00
47.5600	-0.00274	1535229.	-34731.	-4.51E-06	0.00	1.23E+12	383.3875	974489.	0.00
48.1400	-0.00274	1302787.	-32043.	3.53E-06	0.00	1.23E+12	389.0727	988537.	0.00
48.7200	-0.00269	1089191.	-29322.	1.03E-05	0.00	1.23E+12	392.8967	1016896.	0.00
49.3000	-0.00260	894627.	-26580.	1.59E-05	0.00	1.23E+12	395.0203	1059067.	0.00
49.8800	-0.00247	719197.	-23829.	2.05E-05	0.00	1.23E+12	395.5448	1115624.	0.00
50.4600	-0.00231	562928.	-21079.	2.41E-05	0.00	1.23E+12	394.5232	1188154.	0.00
51.0400	-0.00213	425770.	-18342.	2.69E-05	0.00	1.23E+12	391.9638	1279411.	0.00
51.6200	-0.00194	307598.	-15628.	2.90E-05	0.00	1.23E+12	387.8279	1393700.	0.00
52.2000	-0.00173	208214.	-12949.	3.04E-05	0.00	1.23E+12	382.0192	1537652.	0.00
52.7800	-0.00151	127334.	-10317.	3.14E-05	0.00	1.23E+12	374.3632	1721703.	0.00
53.3600	-0.00129	64590.	-7746.	3.19E-05	0.00	1.23E+12	364.5667	1963070.	0.00
53.9400	-0.00107	19505.	-5252.	3.21E-05	0.00	1.23E+12	352.1401	2292245.	0.00
54.5200	-8.45E-04	-8521.	-2963.	3.22E-05	0.00	1.23E+12	305.5810	2516686.	0.00
55.1000	-6.21E-04	-21744.	-1108.	3.21E-05	0.00	1.23E+12	227.4739	2548165.	0.00
55.6800	-3.98E-04	-23948.	197.8429	3.20E-05	0.00	1.23E+12	147.6595	2579642.	0.00
56.2600	-1.76E-04	-19000.	942.0119	3.18E-05	0.00	1.23E+12	66.1821	2611118.	0.00
56.8400	4.48E-05	-10845.	1113.	3.18E-05	0.00	1.23E+12	-17.019	2642593.	0.00
57.4200	2.66E-04	-3515.	779.7540	3.17E-05	0.00	1.23E+12	-78.769	2063875.	0.00
58.0000	4.86E-04	0.00	0.00	3.17E-05	0.00	1.23E+12	-145.298	1039754.	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.

Pile-head deflection = 1.81097747 inches
Computed slope at pile head = -0.0047290 radians
Maximum bending moment = 7565110. inch-lbs
Maximum shear force = -50563. lbs

Depth of maximum bending moment = 31.90000000 feet below pile head
Depth of maximum shear force = 42.92000000 feet below pile head

Number of iterations = 176 Number of zero deflection points = 2

Pile deflection at ground = 0.57556261 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs
Moment = -27000. in-lbs
Axial Load = 21125. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
	4 04007747	7565440	50563
58.00000	1.81097747	7565110.	-50563.
55.10000	1.80683958	7571646.	-50857.
52.20000	1.82223681	7547948.	-56260.
49.30000	2.01362502	7432936.	-63318.
46.40000	2.82317433	7204018.	-68297.
43.50000	5.33482498	6889151.	-72923.

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

0.0 lbs

Applied moment at pile head Axial thrust load on pile head

= -33500.0 in-lbs

= 26375.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	3.7330	-33500.	1.23E-06	-0.00952	0.00	1.23E+12	0.00	0.00	47.7880
0.5800	3.6667	-30595.	361.7104	-0.00952	0.00	1.23E+12	0.00	0.00	56.1518
1.1600	3.6005	-24970.	791.3354	-0.00952	0.00	1.23E+12	0.00	0.00	67.3036
1.7400	3.5342	-16085.	1299.	-0.00952	0.00	1.23E+12	0.00	0.00	78.4555
2.3200	3.4679	-3399.	1883.	-0.00952	0.00	1.23E+12	0.00	0.00	89.6073
2.9000	3.4017	13628.	2546.	-0.00952	0.00	1.23E+12	0.00	0.00	100.7591
3.4800	3.3354	35535.	3286.	-0.00952	0.00	1.23E+12	0.00	0.00	111.9109
4.0600	3.2692	62864.	4104.	-0.00952	0.00	1.23E+12	0.00	0.00	123.0627
4.6400	3.2029	96154.	4999.	-0.00952	0.00	1.23E+12	0.00	0.00	134.2145
5.2200	3.1367	135945.	5972.	-0.00952	0.00	1.23E+12	0.00	0.00	145.3664
5.8000	3.0704	182778.	7023.	-0.00952	0.00	1.23E+12	0.00	0.00	156.5182
6.3800	3.0042	237193.	8151.	-0.00952	0.00	1.23E+12	0.00	0.00	167.6700
6.9600	2.9380	299730.	9357.	-0.00951	0.00	1.23E+12	0.00	0.00	178.8218
7.5400	2.8717	370929.	10640.	-0.00951	0.00	1.23E+12	0.00	0.00	189.9736
8.1200	2.8055	451330.	12001.	-0.00951	0.00	1.23E+12	0.00	0.00	201.1255
8.7000	2.7394	541474.	13440.	-0.00951	0.00	1.23E+12	0.00	0.00	212.2773
9.2800	2.6732	641900.	14956.	-0.00950	0.00	1.23E+12	0.00	0.00	223.4291
9.8600	2.6071	753148.	16550.	-0.00950	0.00	1.23E+12	0.00	0.00	234.5809
10.4400	2.5410	875760.	18221.	-0.00950	0.00	1.23E+12	0.00	0.00	245.7327
11.0200	2.4749	1010274.	19970.	-0.00949	0.00	1.23E+12	0.00	0.00	256.8845
11.6000	2.4088	1157231.	21797.	-0.00948	0.00	1.23E+12	0.00	0.00	268.0364
12.1800	2.3429	1317170.	23701.	-0.00948	0.00	1.23E+12	0.00	0.00	279.1882
12.7600	2.2769	1490633.	25683.	-0.00947	0.00	1.23E+12	0.00	0.00	290.3400
13.3400	2.2110	1678159.	27743.	-0.00946	0.00	1.23E+12	0.00	0.00	301.4918
13.9200	2.1452	1880288.	29880.	-0.00945	0.00	1.23E+12	0.00	0.00	312.6436
14.5000	2.0795	2097560.	32095.	-0.00944	0.00	1.23E+12	0.00	0.00	323.7955
15.0800	2.0138	2330514.	34387.	-0.00943	0.00	1.23E+12	0.00	0.00	334.9473
15.6600	1.9483	2579692.	36757.	-0.00941	0.00	1.22E+12	0.00	0.00	346.0991
16.2400	1.8828	2845633.	39205.	-0.00940	0.00	1.22E+12	0.00	0.00	357.2509
16.8200	1.8175	3128876.	41730.	-0.00938	0.00	1.22E+12	0.00	0.00	368.4027
17.4000	1.7523	3429962.	44333.	-0.00936	0.00	1.22E+12	0.00	0.00	379.5545
17.9800	1.6872	3749431.	47014.	-0.00934	0.00	1.22E+12	0.00	0.00	390.7064
18.5600	1.6222	4087822.	49772.	-0.00932	0.00	1.22E+12	0.00	0.00	401.8582
19.1400	1.5575	4445676.	52608.	-0.00929	0.00	1.22E+12	0.00	0.00	413.0100
19.7200	1.4929	4823532.	55521.	-0.00927	0.00	1.22E+12	0.00	0.00	424.1618
20.3000	1.4284	5221930.	58512.	-0.00924	0.00	1.21E+12	0.00	0.00	435.3136

20.8800	1.3642	5641410.	61580.	-0.00916	0.00	3.30E+11	0.00	0.00	446.4655
21.4600	1.3009	6082495.	64727.	-0.00904	0.00	3.29E+11	0.00	0.00	457.6173
22.0400	1.2384	6545725.	67004.	-0.00891	0.00	3.27E+11	-3.929	22.0790	200.6882
22.6200	1.1769	7018460.	67465.	-0.00876	0.00	3.26E+11	-64.126	379.2331	0.00
23.2000	1.1164	7488061.	66794.	-0.00861	0.00	3.25E+11	-128.971	804.0189	0.00
23.7800	1.0571	7951385.	65661.	-0.00844	0.00	3.24E+11	-196.481	1294.	0.00
24.3600	0.9989	8405161.	64055.	-0.00826	0.00	3.23E+11	-265.048	1847.	0.00
24.9400	0.9420	8846063.	62006.	-0.00808	0.00	3.22E+11	-323.591	2391.	0.00
25.5200	0.8865	9271255.	59530.	-0.00788	0.00	3.21E+11	-387.949	3046.	0.00
26.1000	0.8323	9677617.	56617.	-0.00768	0.00	3.21E+11	-449.195	3756.	0.00
26.6800	0.7796	1.01E+07	53289.	-0.00746	0.00	3.20E+11	-507.219	4528.	0.00
27.2600	0.7284	1.04E+07	49576.	-0.00724	0.00	3.19E+11	-559.561	5346.	0.00
27.8400	0.6788	1.08E+07	45524.	-0.00701	0.00	3.19E+11	-604.944	6202.	0.00
28.4200	0.6309	1.11E+07	41161.	-0.00677	0.00	3.18E+11	-648.746	7157.	0.00
29.0000	0.5846	1.13E+07	36515.	-0.00653	0.00	3.18E+11	-686.362	8172.	0.00
29.5800	0.5400	1.16E+07	31635.	-0.00628	0.00	3.18E+11	-715.817	9225.	0.00
30.1600	0.4973	1.18E+07	26572.	-0.00602	0.00	3.18E+11	-739.148	10346.	0.00
30.7400	0.4563	1.19E+07	21361.	-0.00576	0.00	3.17E+11	-758.335	11568.	0.00
31.3200	0.4171	1.21E+07	16046.	-0.00550	0.00	3.17E+11	-768.939	12832.	0.00
31.9000	0.3798	1.22E+07	10688.	-0.00523	0.00	3.17E+11	-770.526	14122.	0.00
32.4800	0.3443	1.22E+07	5330.	-0.00496	0.00	3.17E+11	-769.195	15550.	0.00
33.0600	0.3107	1.22E+07	13.8674	-0.00469	0.00	3.17E+11	-758.476	16992.	0.00
33.6400	0.2789	1.22E+07	-5193.	-0.00442	0.00	3.17E+11	-737.686	18406.	0.00
34.2200	0.2491	1.22E+07	-10250.	-0.00416	0.00	3.17E+11	-715.597	19995.	0.00
34.8000	0.2211	1.21E+07	-15153.	-0.00389	0.00	3.17E+11	-693.303	21826.	0.00
35.3800	0.1949	1.20E+07	-19870.	-0.00363	0.00	3.17E+11	-662.156	23643.	0.00
35.9600	0.1706	1.18E+07	-24341.	-0.00337	0.00	3.17E+11	-622.462	25395.	0.00
36.5400	0.1481	1.16E+07	-28507.	-0.00311	0.00	3.18E+11	-574.819	27020.	0.00
37.1200	0.1273	1.14E+07	-32318.	-0.00286	0.00	3.18E+11	-520.158	28437.	0.00
37.7000	0.1083	1.12E+07	-36635.	-0.00261	0.00	3.18E+11	-720.408	46301.	0.00
38.2800	0.09098	1.09E+07	-41589.	-0.00237	0.00	3.19E+11	-703.297	53805.	0.00
38.8600	0.07532	1.06E+07	-46417.	-0.00213	0.00	3.19E+11	-683.822	63193.	0.00
39.4400	0.06126	1.03E+07	-51099.	-0.00191	0.00	3.20E+11	-661.728	75176.	0.00
40.0200	0.04877	9887348.	-55617.	-0.00169	0.00	3.20E+11	-636.670	90864.	0.00
40.6000	0.03777	9485120.	-59949.	-0.00148	0.00	3.21E+11	-608.158	112076.	0.00
41.1800	0.02820	9053394.	-64068.	-0.00128	0.00	3.22E+11	-575.453	142034.	0.00
41.7600	0.01999	8593756.	-67941.	-0.00109	0.00	3.22E+11	-537.349	187057.	0.00
42.3400	0.01308	8108054.	-71522.	-9.06E-04	0.00	3.23E+11	-491.624	261600.	0.00
42.9200	0.00738	7598505.	-74741.	-7.37E-04	0.00	3.24E+11	-433.343	408641.	0.00
43.5000	0.00282	7067934.	-77454.	-5.80E-04	0.00	3.26E+11	-346.279	855880.	0.00
44.0800	-6.98E-04	6520561.	-77979.	-4.36E-04	0.00	3.27E+11	195.4757	1949743.	0.00
44.6600	-0.00325	5982632.	-76009.	-3.03E-04	0.00	3.29E+11	370.5658	794500.	0.00
45.2400	-0.00491	5462631.	-73266.	-1.82E-04	0.00	3.31E+11	417.5719	591486.	0.00

45.8200	-0.00578	4962836.	-70276.	-1.10E-04	0.00	1.22E+12	441.7041	531794.	0.00
46.4000	-0.00645	4484433.	-67134.	-8.34E-05	0.00	1.22E+12	460.9729	497385.	0.00
46.9800	-0.00694	4028355.	-63872.	-5.91E-05	0.00	1.22E+12	476.6352	477898.	0.00
47.5600	-0.00727	3595362.	-60510.	-3.73E-05	0.00	1.22E+12	489.4296	468389.	0.00
48.1400	-0.00746	3186074.	-57067.	-1.80E-05	0.00	1.22E+12	499.8247	466261.	0.00
48.7200	-0.00752	2800995.	-53559.	-9.58E-07	0.00	1.22E+12	508.1321	470097.	0.00
49.3000	-0.00747	2440528.	-50000.	1.39E-05	0.00	1.23E+12	514.5648	479155.	0.00
49.8800	-0.00733	2104985.	-46403.	2.68E-05	0.00	1.23E+12	519.2684	493119.	0.00
50.4600	-0.00710	1794594.	-42778.	3.79E-05	0.00	1.23E+12	522.3393	511992.	0.00
51.0400	-0.00680	1509503.	-39137.	4.73E-05	0.00	1.23E+12	523.8349	536048.	0.00
51.6200	-0.00644	1249787.	-35491.	5.51E-05	0.00	1.23E+12	523.7788	565837.	0.00
52.2000	-0.00603	1015442.	-31852.	6.15E-05	0.00	1.23E+12	522.1608	602227.	0.00
52.7800	-0.00559	806390.	-28229.	6.66E-05	0.00	1.23E+12	518.9357	646501.	0.00
53.3600	-0.00511	622476.	-24634.	7.07E-05	0.00	1.23E+12	514.0161	700524.	0.00
53.9400	-0.00460	463460.	-21080.	7.38E-05	0.00	1.23E+12	507.2598	767046.	0.00
54.5200	-0.00408	329017.	-17580.	7.60E-05	0.00	1.23E+12	498.4485	850226.	0.00
55.1000	-0.00354	218719.	-14150.	7.75E-05	0.00	1.23E+12	487.2512	956648.	0.00
55.6800	-0.00300	132024.	-10808.	7.85E-05	0.00	1.23E+12	473.1569	1097369.	0.00
56.2600	-0.00245	68249.	-7576.	7.91E-05	0.00	1.23E+12	455.3430	1292597.	0.00
56.8400	-0.00190	26532.	-4487.	7.94E-05	0.00	1.23E+12	432.3875	1583953.	0.00
57.4200	-0.00135	5760.	-1904.	7.95E-05	0.00	1.23E+12	309.8968	1601201.	0.00
58.0000	-7.94E-04	0.00	0.00	7.95E-05	0.00	1.23E+12	237.2049	1039754.	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
                                       3.73297475 inches
Computed slope at pile head
                                       -0.0095193 radians
Maximum bending moment
                                        12242562. inch-lbs
Maximum shear force
                                          -77979. lbs
Depth of maximum bending moment =
                                      33.06000000 feet below pile head
Depth of maximum shear force
                                      44.08000000 feet below pile head
Number of iterations
                                               46
Number of zero deflection points =
Pile deflection at ground
                                       1.24271343 inches
```

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

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Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = -33500. in-lbs Axial Load = 26375. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
58.00000 55.10000	3.73297475 3.76439370	12242562. 12221424.	-77979. -82577.
52.20000	4.12427779	12046048.	-91793.
49.30000	5.31715173	11671036.	-99069.
46.40000	9.28041479	11418133.	-108137.

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 = 0.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 21125.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force 1bs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	1.8217	-1.92E-04	-1.83E-07	-0.00476	0.00	1.23E+12	0.00	0.00	27.8586
0.5800	1.7886	1374.	213.3003	-0.00476	0.00	1.23E+12	0.00	0.00	33.4345
1.1600	1.7555	4369.	471.8769	-0.00476	0.00	1.23E+12	0.00	0.00	40.8691
1.7400	1.7224	9342.	782.1980	-0.00476	0.00	1.23E+12	0.00	0.00	48.3036

2.3200	1.6892	16656.	1144.	-0.00476	0.00	1.23E+12	0.00	0.00	55.7382
2.9000	1.6561	26670.	1558.	-0.00476	0.00	1.23E+12	0.00	0.00	63.1727
3.4800	1.6230	39744.	2024.	-0.00476	0.00	1.23E+12	0.00	0.00	70.6073
4.0600	1.5899	56238.	2541.	-0.00476	0.00	1.23E+12	0.00	0.00	78.0418
4.6400	1.5568	76513.	3110.	-0.00476	0.00	1.23E+12	0.00	0.00	85.4764
5.2200	1.5237	100928.	3731.	-0.00476	0.00	1.23E+12	0.00	0.00	92.9109
5.8000	1.4905	129844.	4403.	-0.00476	0.00	1.23E+12	0.00	0.00	100.3455
6.3800	1.4574	163620.	5128.	-0.00476	0.00	1.23E+12	0.00	0.00	107.7800
6.9600	1.4243	202618.	5904.	-0.00475	0.00	1.23E+12	0.00	0.00	115.2145
7.5400	1.3913	247197.	6731.	-0.00475	0.00	1.23E+12	0.00	0.00	122.6491
8.1200	1.3582	297716.	7611.	-0.00475	0.00	1.23E+12	0.00	0.00	130.0836
8.7000	1.3251	354537.	8542.	-0.00475	0.00	1.23E+12	0.00	0.00	137.5182
9.2800	1.2921	418019.	9525.	-0.00475	0.00	1.23E+12	0.00	0.00	144.9527
9.8600	1.2590	488523.	10560.	-0.00475	0.00	1.23E+12	0.00	0.00	152.3873
10.4400	1.2260	566408.	11646.	-0.00474	0.00	1.23E+12	0.00	0.00	159.8218
11.0200	1.1930	652035.	12785.	-0.00474	0.00	1.23E+12	0.00	0.00	167.2564
11.6000	1.1600	745763.	13975.	-0.00473	0.00	1.23E+12	0.00	0.00	174.6909
12.1800	1.1271	847953.	15216.	-0.00473	0.00	1.23E+12	0.00	0.00	182.1255
12.7600	1.0942	958964.	16510.	-0.00473	0.00	1.23E+12	0.00	0.00	189.5600
13.3400	1.0613	1079158.	17855.	-0.00472	0.00	1.23E+12	0.00	0.00	196.9945
13.9200	1.0285	1208893.	19252.	-0.00471	0.00	1.23E+12	0.00	0.00	204.4291
14.5000	0.9957	1348530.	20701.	-0.00471	0.00	1.23E+12	0.00	0.00	211.8636
15.0800	0.9630	1498429.	22201.	-0.00470	0.00	1.23E+12	0.00	0.00	219.2982
15.6600	0.9303	1658950.	23753.	-0.00469	0.00	1.23E+12	0.00	0.00	226.7327
16.2400	0.8977	1830453.	25357.	-0.00468	0.00	1.23E+12	0.00	0.00	234.1673
16.8200	0.8652	2013298.	27013.	-0.00467	0.00	1.23E+12	0.00	0.00	241.6018
17.4000	0.8327	2207845.	28720.	-0.00466	0.00	1.23E+12	0.00	0.00	249.0364
17.9800	0.8004	2414453.	30479.	-0.00464	0.00	1.23E+12	0.00	0.00	256.4709
18.5600	0.7681	2633484.	32290.	-0.00463	0.00	1.22E+12	0.00	0.00	263.9055
19.1400	0.7359	2865296.	34153.	-0.00461	0.00	1.22E+12	0.00	0.00	271.3400
19.7200	0.7039	3110250.	36067.	-0.00460	0.00	1.22E+12	0.00	0.00	278.7745
20.3000	0.6720	3368706.	38034.	-0.00458	0.00	1.22E+12	0.00	0.00	286.2091
20.8800	0.6402	3641023.	40051.	-0.00456	0.00	1.22E+12	0.00	0.00	293.6436
21.4600	0.6085	3927562.	42121.	-0.00454	0.00	1.22E+12	0.00	0.00	301.0782
22.0400	0.5770	4228682.	43617.	-0.00451	0.00	1.22E+12	-3.163	38.1476	132.0680
22.6200	0.5457	4536043.	43887.	-0.00449	0.00	1.22E+12	-51.504	656.8931	0.00
23.2000	0.5146	4840905.	43348.	-0.00446	0.00	1.22E+12	-103.217	1396.	0.00
23.7800	0.4836	5140763.	42445.	-0.00443	0.00	1.21E+12	-156.460	2252.	0.00
24.3600	0.4529	5433038.	41168.	-0.00436	0.00	3.27E+11	-210.283	3232.	0.00
24.9400	0.4229	5715109.	39546.	-0.00424	0.00	3.26E+11	-255.877	4211.	0.00
25.5200	0.3938	5984767.	37593.	-0.00412	0.00	3.26E+11	-305.459	5398.	0.00
26.1000	0.3656	6239610.	35306.	-0.00399	0.00	3.25E+11	-351.775	6696.	0.00
26.6800	0.3384	6477392.	32708.	-0.00385	0.00	3.24E+11	-394.778	8121.	0.00

27.2600	0.3120	6696030.	29829.	-0.00371	0.00	3.24E+11	-432.480	9646.	0.00
27.8400	0.2867	6893697.	26709.	-0.00356	0.00	3.23E+11	-463.928	11261.	0.00
28.4200	0.2625	7068869.	23378.	-0.00341	0.00	3.23E+11	-493.169	13078.	0.00
29.0000	0.2393	7220128.	19864.	-0.00326	0.00	3.23E+11	-516.675	15030.	0.00
29.5800	0.2171	7346336.	16211.	-0.00310	0.00	3.23E+11	-532.967	17084.	0.00
30.1600	0.1961	7446703.	12463.	-0.00294	0.00	3.22E+11	-544.133	19313.	0.00
30.7400	0.1762	7520688.	8648.	-0.00278	0.00	3.22E+11	-552.130	21810.	0.00
31.3200	0.1574	7567902.	4802.	-0.00262	0.00	3.22E+11	-552.967	24449.	0.00
31.9000	0.1398	7588307.	976.5037	-0.00245	0.00	3.22E+11	-546.430	27208.	0.00
32.4800	0.1233	7582216.	-2782.	-0.00229	0.00	3.22E+11	-533.599	30124.	0.00
33.0600	0.1079	7550254.	-6424.	-0.00212	0.00	3.22E+11	-512.869	33074.	0.00
33.6400	0.09371	7493423.	-9894.	-0.00196	0.00	3.22E+11	-484.315	35972.	0.00
34.2200	0.08062	7413108.	-13159.	-0.00180	0.00	3.22E+11	-454.006	39197.	0.00
34.8000	0.06864	7310776.	-16170.	-0.00164	0.00	3.23E+11	-411.156	41693.	0.00
35.3800	0.05775	7188504.	-18859.	-0.00149	0.00	3.23E+11	-361.649	43582.	0.00
35.9600	0.04795	7048690.	-21208.	-0.00133	0.00	3.23E+11	-313.282	45472.	0.00
36.5400	0.03921	6893678.	-23227.	-0.00118	0.00	3.23E+11	-266.784	47361.	0.00
37.1200	0.03149	6725721.	-24931.	-0.00104	0.00	3.24E+11	-222.844	49250.	0.00
37.7000	0.02478	6546948.	-27440.	-8.93E-04	0.00	3.24E+11	-498.288	139928.	0.00
38.2800	0.01906	6344016.	-30830.	-7.55E-04	0.00	3.25E+11	-475.793	173782.	0.00
38.8600	0.01427	6118016.	-34056.	-6.22E-04	0.00	3.25E+11	-451.181	220018.	0.00
39.4400	0.01040	5870141.	-37104.	-4.94E-04	0.00	3.26E+11	-424.758	284244.	0.00
40.0200	0.00740	5601671.	-39965.	-3.71E-04	0.00	3.27E+11	-397.370	373694.	0.00
40.6000	0.00523	5313935.	-42639.	-2.65E-04	0.00	3.94E+11	-371.001	493566.	0.00
41.1800	0.00372	5008213.	-45137.	-2.03E-04	0.00	1.22E+12	-346.693	649347.	0.00
41.7600	0.00240	4685692.	-47444.	-1.76E-04	0.00	1.22E+12	-316.263	917162.	0.00
42.3400	0.00127	4347847.	-49499.	-1.50E-04	0.00	1.22E+12	-274.424	1503258.	0.00
42.9200	3.14E-04	3996705.	-50751.	-1.26E-04	0.00	1.22E+12	-85.138	1886688.	0.00
43.5000	-4.84E-04	3641436.	-50583.	-1.04E-04	0.00	1.22E+12	133.2892	1918218.	0.00
44.0800	-0.00114	3292620.	-49143.	-8.45E-05	0.00	1.22E+12	280.5612	1717718.	0.00
44.6600	-0.00166	2957392.	-47076.	-6.67E-05	0.00	1.22E+12	313.3627	1314294.	0.00
45.2400	-0.00206	2637341.	-44815.	-5.08E-05	0.00	1.22E+12	336.2270	1133250.	0.00
45.8200	-0.00237	2333576.	-42416.	-3.66E-05	0.00	1.23E+12	353.3115	1039255.	0.00
46.4000	-0.00258	2046923.	-39911.	-2.42E-05	0.00	1.23E+12	366.4261	990371.	0.00
46.9800	-0.00270	1778020.	-37326.	-1.34E-05	0.00	1.23E+12	376.5290	969445.	0.00
47.5600	-0.00276	1527354.	-34678.	-4.00E-06	0.00	1.23E+12	384.1886	968405.	0.00
48.1400	-0.00276	1295298.	-31985.	3.99E-06	0.00	1.23E+12	389.7663	983269.	0.00
48.7200	-0.00271	1082121.	-29259.	1.07E-05	0.00	1.23E+12	393.4983	1012240.	0.00
49.3000	-0.00261	888006.	-26513.	1.63E-05	0.00	1.23E+12	395.5407	1054893.	0.00
49.8800	-0.00248	713050.	-23759.	2.08E-05	0.00	1.23E+12	395.9916	1111853.	0.00
50.4600	-0.00232	557276.	-21007.	2.44E-05	0.00	1.23E+12	394.9013	1184746.	0.00
51.0400	-0.00214	420632.	-18267.	2.72E-05	0.00	1.23E+12	392.2758	1276362.	0.00
51.6200	-0.00194	302989.	-15552.	2.92E-05	0.00	1.23E+12	388.0742	1391049.	0.00

52.2000	-0.00173	204145.	-12871.	3.06E-05	0.00	1.23E+12	382.1977	1535500.	0.00
52.7800	-0.00152	123816.	-10238.	3.16E-05	0.00	1.23E+12	374.4685	1720254.	0.00
53.3600	-0.00129	61626.	-7666.	3.21E-05	0.00	1.23E+12	364.5886	1962720.	0.00
53.9400	-0.00107	17097.	-5172.	3.23E-05	0.00	1.23E+12	352.0605	2293804.	0.00
54.5200	-8.43E-04	-10378.	-2886.	3.23E-05	0.00	1.23E+12	304.8036	2516686.	0.00
55.1000	-6.18E-04	-23087.	-1038.	3.22E-05	0.00	1.23E+12	226.2810	2548165.	0.00
55.6800	-3.94E-04	-24835.	257.8479	3.21E-05	0.00	1.23E+12	146.0606	2579642.	0.00
56.2600	-1.71E-04	-19507.	989.4881	3.20E-05	0.00	1.23E+12	64.1808	2611118.	0.00
56.8400	5.12E-05	-11070.	1145.	3.19E-05	0.00	1.23E+12	-19.425	2642593.	0.00
57.4200	2.73E-04	-3575.	795.9626	3.19E-05	0.00	1.23E+12	-80.942	2063875.	0.00
58.0000	4.95E-04	0.00	0.00	3.18E-05	0.00	1.23E+12	-147.783	1039754.	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 1.82173028 inches Computed slope at pile head -0.0047589 radians Maximum bending moment 7588307. inch-lbs Maximum shear force -50751. lbs Depth of maximum bending moment = 31.90000000 feet below pile head Depth of maximum shear force 42.92000000 feet below pile head Number of iterations 179 Number of zero deflection points = Pile deflection at ground = 0.57920171 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 21125. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-1bs	lbs
58.00000	1.82173028	7588307.	-50751.
55.10000	1.81406130	7596845.	-50986.
52.20000	1.83482105	7570475.	-56229.
49.30000	2.02456529	7457469.	-63483.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 4

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

Shear force at pile head = 0.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 26375.0 lbs

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
X	У	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	3.7448	4.52E-04	8.26E-07	-0.00955	0.00	1.23E+12	0.00	0.00	47.7880
0.5800	3.6783	2911.	361.7104	-0.00955	0.00	1.23E+12	0.00	0.00	56.1518
1.1600	3.6118	8543.	791.3354	-0.00955	0.00	1.23E+12	0.00	0.00	67.3036
1.7400	3.5453	17435.	1299.	-0.00955	0.00	1.23E+12	0.00	0.00	78.4555
2.3200	3.4788	30127.	1883.	-0.00955	0.00	1.23E+12	0.00	0.00	89.6073
2.9000	3.4123	47160.	2546.	-0.00955	0.00	1.23E+12	0.00	0.00	100.7591
3.4800	3.3458	69074.	3286.	-0.00955	0.00	1.23E+12	0.00	0.00	111.9109
4.0600	3.2793	96409.	4104.	-0.00955	0.00	1.23E+12	0.00	0.00	123.0627
4.6400	3.2128	129705.	4999.	-0.00955	0.00	1.23E+12	0.00	0.00	134.2145
5.2200	3.1463	169502.	5972.	-0.00955	0.00	1.23E+12	0.00	0.00	145.3664
5.8000	3.0798	216342.	7023.	-0.00955	0.00	1.23E+12	0.00	0.00	156.5182
6.3800	3.0133	270763.	8151.	-0.00955	0.00	1.23E+12	0.00	0.00	167.6700
6.9600	2.9469	333305.	9357.	-0.00955	0.00	1.23E+12	0.00	0.00	178.8218
7.5400	2.8804	404510.	10640.	-0.00955	0.00	1.23E+12	0.00	0.00	189.9736
8.1200	2.8140	484918.	12001.	-0.00954	0.00	1.23E+12	0.00	0.00	201.1255
8.7000	2.7476	575067.	13440.	-0.00954	0.00	1.23E+12	0.00	0.00	212.2773

9.2800	2.6812	675499.	14956.	-0.00954	0.00	1.23E+12	0.00	0.00	223.4291
9.8600	2.6149	786753.	16550.	-0.00953	0.00	1.23E+12	0.00	0.00	234.5809
10.4400	2.5485	909371.	18221.	-0.00953	0.00	1.23E+12	0.00	0.00	245.7327
11.0200	2.4822	1043891.	19970.	-0.00952	0.00	1.23E+12	0.00	0.00	256.8845
11.6000	2.4160	1190853.	21797.	-0.00952	0.00	1.23E+12	0.00	0.00	268.0364
12.1800	2.3498	1350799.	23701.	-0.00951	0.00	1.23E+12	0.00	0.00	279.1882
12.7600	2.2836	1524267.	25683.	-0.00950	0.00	1.23E+12	0.00	0.00	290.3400
13.3400	2.2175	1711799.	27743.	-0.00949	0.00	1.23E+12	0.00	0.00	301.4918
13.9200	2.1515	1913933.	29880.	-0.00948	0.00	1.23E+12	0.00	0.00	312.6436
14.5000	2.0855	2131211.	32095.	-0.00947	0.00	1.23E+12	0.00	0.00	323.7955
15.0800	2.0197	2364171.	34387.	-0.00946	0.00	1.23E+12	0.00	0.00	334.9473
15.6600	1.9539	2613354.	36757.	-0.00944	0.00	1.22E+12	0.00	0.00	346.0991
16.2400	1.8882	2879300.	39205.	-0.00943	0.00	1.22E+12	0.00	0.00	357.2509
16.8200	1.8227	3162549.	41730.	-0.00941	0.00	1.22E+12	0.00	0.00	368.4027
17.4000	1.7573	3463641.	44333.	-0.00939	0.00	1.22E+12	0.00	0.00	379.5545
17.9800	1.6920	3783115.	47014.	-0.00937	0.00	1.22E+12	0.00	0.00	390.7064
18.5600	1.6268	4121512.	49772.	-0.00935	0.00	1.22E+12	0.00	0.00	401.8582
19.1400	1.5618	4479371.	52608.	-0.00932	0.00	1.22E+12	0.00	0.00	413.0100
19.7200	1.4970	4857232.	55521.	-0.00930	0.00	1.22E+12	0.00	0.00	424.1618
20.3000	1.4324	5255635.	58512.	-0.00927	0.00	1.21E+12	0.00	0.00	435.3136
20.8800	1.3680	5675120.	61580.	-0.00919	0.00	3.30E+11	0.00	0.00	446.4655
21.4600	1.3045	6116211.	64727.	-0.00907	0.00	3.28E+11	0.00	0.00	457.6173
22.0400	1.2418	6579445.	67004.	-0.00893	0.00	3.27E+11	-3.932	22.0396	200.6882
22.6200	1.1801	7052185.	67465.	-0.00879	0.00	3.26E+11	-64.187	378.5554	0.00
23.2000	1.1195	7521788.	66793.	-0.00863	0.00	3.25E+11	-129.092	802.5801	0.00
23.7800	1.0600	7985108.	65659.	-0.00847	0.00	3.24E+11	-196.663	1291.	0.00
24.3600	1.0017	8438870.	64051.	-0.00829	0.00	3.23E+11	-265.288	1843.	0.00
24.9400	0.9446	8879747.	62001.	-0.00810	0.00	3.22E+11	-323.876	2386.	0.00
25.5200	0.8889	9304900.	59523.	-0.00790	0.00	3.21E+11	-388.279	3040.	0.00
26.1000	0.8346	9711207.	56607.	-0.00770	0.00	3.20E+11	-449.564	3749.	0.00
26.6800	0.7817	1.01E+07	53276.	-0.00748	0.00	3.20E+11	-507.629	4520.	0.00
27.2600	0.7304	1.05E+07	49561.	-0.00726	0.00	3.19E+11	-560.017	5336.	0.00
27.8400	0.6807	1.08E+07	45505.	-0.00703	0.00	3.19E+11	-605.444	6191.	0.00
28.4200	0.6326	1.11E+07	41138.	-0.00679	0.00	3.18E+11	-649.290	7144.	0.00
29.0000	0.5862	1.14E+07	36488.	-0.00654	0.00	3.18E+11	-686.947	8157.	0.00
29.5800	0.5415	1.16E+07	31605.	-0.00629	0.00	3.18E+11	-716.439	9209.	0.00
30.1600	0.4986	1.18E+07	26537.	-0.00604	0.00	3.17E+11	-739.801	10327.	0.00
30.7400	0.4575	1.20E+07	21321.	-0.00577	0.00	3.17E+11	-759.016	11547.	0.00
31.3200	0.4182	1.21E+07	16001.	-0.00551	0.00	3.17E+11	-769.640	12809.	0.00
31.9000	0.3808	1.22E+07	10639.	-0.00524	0.00	3.17E+11	-771.242	14097.	0.00
32.4800	0.3452	1.23E+07	5276.	-0.00498	0.00	3.17E+11	-769.937	15523.	0.00
33.0600	0.3115	1.23E+07	-45.883	-0.00471	0.00	3.17E+11	-759.239	16963.	0.00
33.6400	0.2797	1.23E+07	-5258.	-0.00444	0.00	3.17E+11	-738.463	18375.	0.00

34.2200	0.2498	1.22E+07	-10321.	-0.00417	0.00	3.17E+11	-716.389	19963.	0.00
34.8000	0.2217	1.21E+07	-15229.	-0.00390	0.00	3.17E+11	-694.111	21791.	0.00
35.3800	0.1955	1.20E+07	-19952.	-0.00364	0.00	3.17E+11	-662.971	23606.	0.00
35.9600	0.1711	1.18E+07	-24428.	-0.00338	0.00	3.17E+11	-623.273	25357.	0.00
36.5400	0.1485	1.17E+07	-28600.	-0.00312	0.00	3.18E+11	-575.614	26981.	0.00
37.1200	0.1277	1.14E+07	-32416.	-0.00286	0.00	3.18E+11	-520.924	28398.	0.00
37.7000	0.1086	1.12E+07	-36738.	-0.00262	0.00	3.18E+11	-720.927	46201.	0.00
38.2800	0.09124	1.09E+07	-41696.	-0.00238	0.00	3.19E+11	-703.811	53688.	0.00
38.8600	0.07554	1.06E+07	-46527.	-0.00214	0.00	3.19E+11	-684.329	63053.	0.00
39.4400	0.06145	1.03E+07	-51213.	-0.00191	0.00	3.20E+11	-662.227	75007.	0.00
40.0200	0.04892	9910703.	-55735.	-0.00169	0.00	3.20E+11	-637.160	90654.	0.00
40.6000	0.03789	9507650.	-60070.	-0.00148	0.00	3.21E+11	-608.637	111811.	0.00
41.1800	0.02829	9075075.	-64192.	-0.00128	0.00	3.22E+11	-575.921	141688.	0.00
41.7600	0.02006	8614565.	-68068.	-0.00109	0.00	3.22E+11	-537.804	186582.	0.00
42.3400	0.01313	8127969.	-71652.	-9.09E-04	0.00	3.23E+11	-492.067	260895.	0.00
42.9200	0.00741	7617505.	-74874.	-7.40E-04	0.00	3.24E+11	-433.777	407416.	0.00
43.5000	0.00283	7085998.	-77590.	-5.82E-04	0.00	3.26E+11	-346.741	852465.	0.00
44.0800	-6.94E-04	6537666.	-78120.	-4.37E-04	0.00	3.27E+11	194.5465	1949743.	0.00
44.6600	-0.00325	5998733.	-76152.	-3.04E-04	0.00	3.29E+11	370.7291	793447.	0.00
45.2400	-0.00493	5477735.	-73408.	-1.83E-04	0.00	3.31E+11	417.8322	590379.	0.00
45.8200	-0.00580	4976957.	-70416.	-1.11E-04	0.00	1.22E+12	442.0179	530661.	0.00
46.4000	-0.00647	4497585.	-67272.	-8.39E-05	0.00	1.22E+12	461.3308	496226.	0.00
46.9800	-0.00696	4040556.	-64007.	-5.95E-05	0.00	1.22E+12	477.0319	476706.	0.00
47.5600	-0.00730	3606632.	-60642.	-3.77E-05	0.00	1.22E+12	489.8620	467149.	0.00
48.1400	-0.00749	3196433.	-57196.	-1.83E-05	0.00	1.22E+12	500.2908	464957.	0.00
48.7200	-0.00755	2810466.	-53685.	-1.18E-06	0.00	1.22E+12	508.6311	468713.	0.00
49.3000	-0.00751	2449134.	-50123.	1.38E-05	0.00	1.23E+12	515.0964	477671.	0.00
49.8800	-0.00736	2112752.	-46521.	2.67E-05	0.00	1.23E+12	519.8332	491511.	0.00
50.4600	-0.00713	1801550.	-42892.	3.78E-05	0.00	1.23E+12	522.9385	510232.	0.00
51.0400	-0.00683	1515678.	-39247.	4.72E-05	0.00	1.23E+12	524.4702	534100.	0.00
51.6200	-0.00648	1255210.	-35597.	5.51E-05	0.00	1.23E+12	524.4528	563655.	0.00
52.2000	-0.00607	1020146.	-31952.	6.15E-05	0.00	1.23E+12	522.8772	599751.	0.00
52.7800	-0.00562	810411.	-28324.	6.67E-05	0.00	1.23E+12	519.6994	643650.	0.00
53.3600	-0.00514	625849.	-24724.	7.07E-05	0.00	1.23E+12	514.8339	697186.	0.00
53.9400	-0.00463	466226.	-21164.	7.38E-05	0.00	1.23E+12	508.1408	763057.	0.00
54.5200	-0.00411	331218.	-17658.	7.61E-05	0.00	1.23E+12	499.4058	845339.	0.00
55.1000	-0.00358	220402.	-14221.	7.76E-05	0.00	1.23E+12	488.3035	950466.	0.00
55.6800	-0.00303	133239.	-10871.	7.86E-05	0.00	1.23E+12	474.3327	1089213.	0.00
56.2600	-0.00248	69054.	-7631.	7.92E-05	0.00	1.23E+12	456.6888	1281181.	0.00
56.8400	-0.00193	26992.	-4531.	7.95E-05	0.00	1.23E+12	433.9861	1566475.	0.00
57.4200	-0.00137	5952.	-1937.	7.96E-05	0.00	1.23E+12	311.4592	1577164.	0.00
58.0000	-8.20E-04	0.00	0.00	7.96E-05	0.00	1.23E+12	245.1352	1039754.	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. 4:

Pile-head deflection = 3.74475598 inches

Computed slope at pile head = -0.0095546 radians

Maximum bending moment = 12273518. inch-lbs

Maximum shear force = -78120. lbs

Depth of maximum bending moment = 33.06000000 feet below pile head

Depth of maximum shear force = 44.08000000 feet below pile head

Number of iterations = 44

Number of zero deflection points = 1

Pile deflection at ground = 1.24613773 inches

Pile-head Deflection vs. Pile Length for Load Case 4

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs
Moment = 0. in-lbs
Axial Load = 26375. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
58.00000	3.74475598	12273518.	-78120.
55.10000	3.77697015	12252058.	-82750.
52.20000	4.13920208	12076334.	-91979.
49.30000	5.33826470	11700835.	-99264.
46.40000	9.34353806	11452865.	-108447.

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

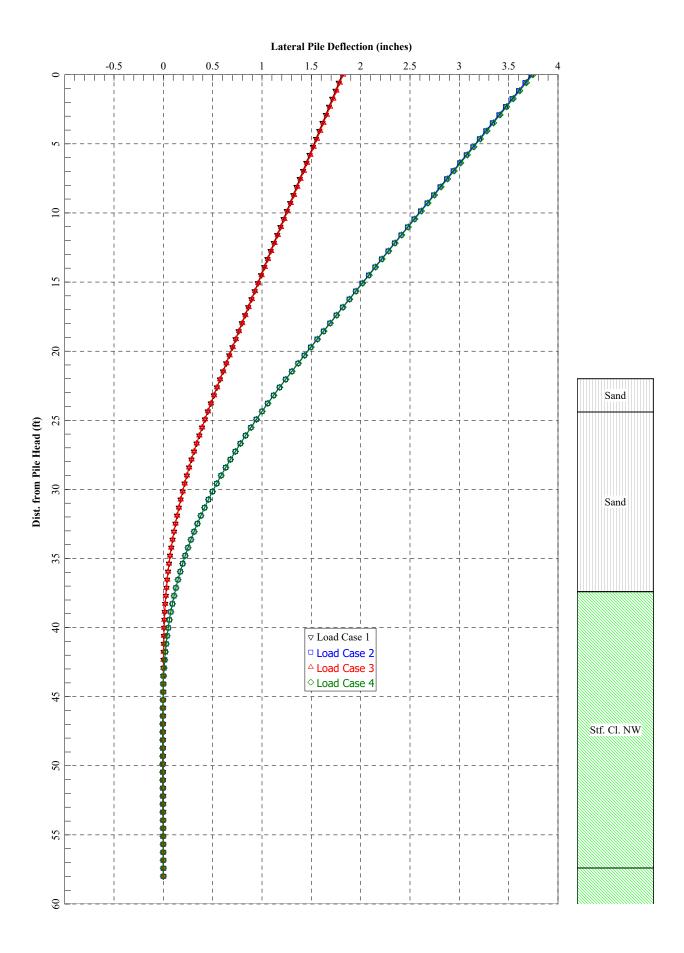
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad. Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs

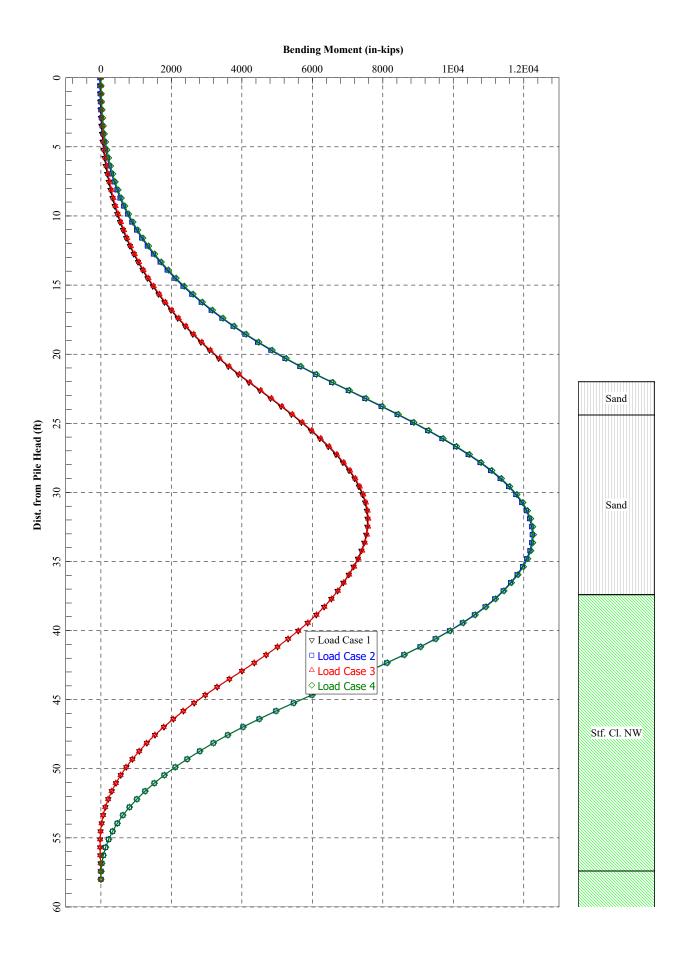
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

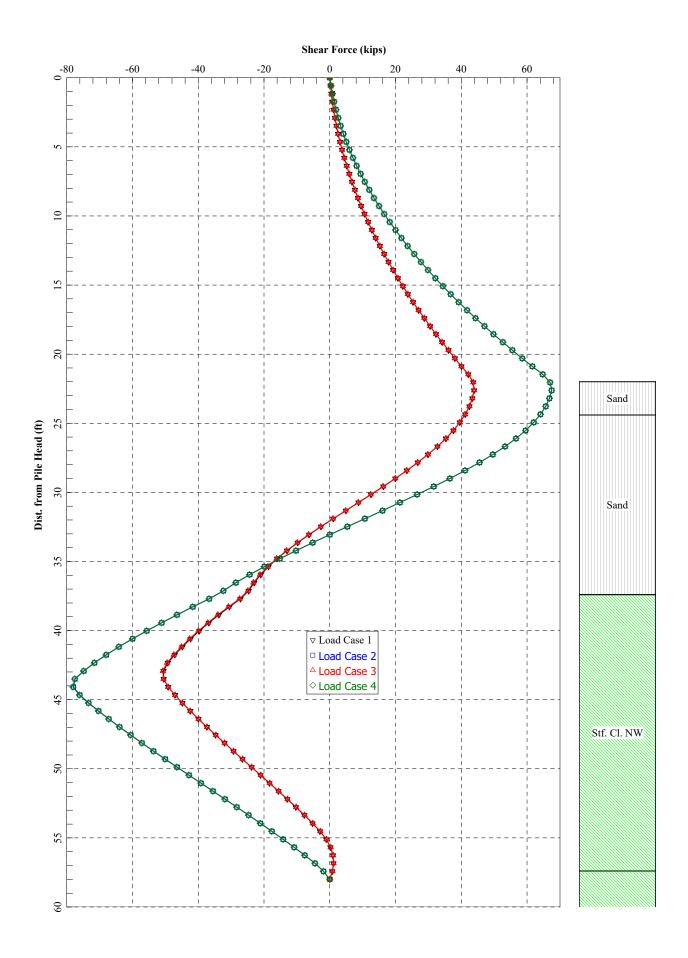
Load Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	lbs	inches	radians	lbs	in-lbs
1 V, lb	0.00	M, in-lb	-27000.	21125.	1.8110	-0.00473	-50563.	7565110.
2 V, 1b	0.00	M, in-lb	-33500.	26375.	<u>3.7330</u>	-0.00952	-77979.	1.22E+07
3 V, 1b	0.00	M, in-lb	0.00	21125.	1.8217	-0.00476	-50751.	7588307.
4 V, 1b	0.00	M, in-lb	0.00	26375.	3.7448	-0.00955	-78120.	1.23E+07

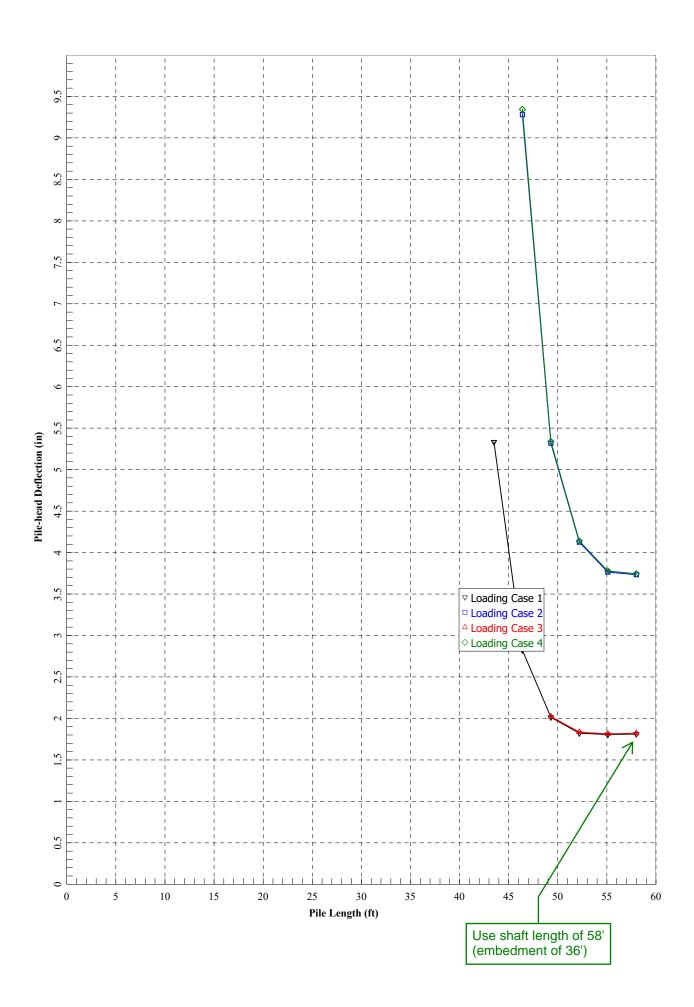
Maximum pile-head deflection = 3.7447559801 inches
Maximum pile-head rotation = -0.0095546202 radians = -0.547439 deg.

The analysis ended normally.









Section within Abutment/Wingwalls, 22' height, horizontal backslope, post-construction (includes full structure loading, fixed-head)

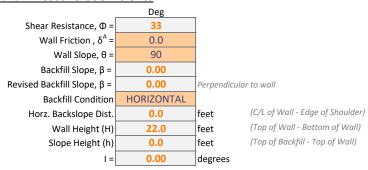
Geometry

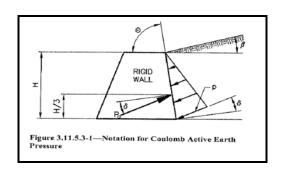
	Flouration (ft)			Horiz. Distance	
	Elevation (ft)	_		from C/L (ft)	
Top of Backfill =	723.3	at Outside Edge of Shoulder	Start of Wall Backfill =		at Outside Edge of Shoulder
Top of Wall =	712.0	at C/L of Wall	Wall =		at C/L of Wall
Existing Ground Surface =	703.0	at C/L of Wall			
Bottom of Wall =	690.0	at C/L of Wall	Backfill Slope Angle =		H:1V

Wall Loading Profile

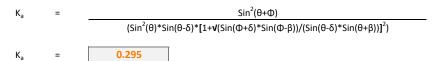
_	Top Elev.	Thickness (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	
Item 203	712.0	9.0	250	28	125	A-6a/A-6b per GDM
Medium Dense Granular	703.0	13.0	0	33	122	
Bottom of Wall	690.0					•
Weighted Value		22.0	100	31	125	

Earth Pressure Coefficients





Active Earth Coefficient



At-Rest Earth Coefficient

 $K_o = (1-Sin(\phi))*(1+Sin(\beta))$ $K_o = 0.456$

Notes:

A. Wall friction neglected

- B. Figure and Equation for Active Earth Pressure from AASHTO 3.11.5.3 (LRFD Design Manual).
- C. The wall backfill will consist of proposed fill and granular overburden. Using the soil layer thicknesses and respective soil parameters as provided by SME, a weighted average was determined and assumed for the entire backfill (c' = 100 psf and $\phi' = 31^\circ$. The parameters were converted to equivalent soil strength parameters c' = 0 psf and $\phi' = 33^\circ$ for computing earth pressures based on a 1 degree increase in friction angle for every 50 psf decrease in cohesion up to 150 psf (Ref: Hall's Thesis).

<u>Soil Lateral Design Profile</u>							
	Top Elev	Depth (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	ε50	k
Medium Dense Granular	690.0	22.0	0	33	59.6	N/A	60
Medium Dense Silt	687.6	24.4	0	32	62.6	N/A	60
Medium Stiff to Stiff Silt	674.6	37.4	2300	0	57.6	0.005	N/A
Stiff Cohesive	654.6	57.4	1600	0	55.6	0.007	N/A
Stiff to Very Stiff Silt	643.8	68.2	1750	0	57.6	0.007	N/A
Hard Silt	604.6	107.4	4400	0	77.6	0.004	N/A
Bedrock	585.6	126.4	N/A	N/A	N/A	N/A	N/A

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)

Restraint Condition = ACTIVE

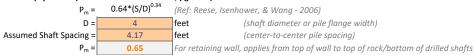
Ka = 0.295

(Active or At-Rest)

3) Determine Equivalent Fluid Weight (GH)

 $G_H = (\gamma_m)^* (K_a)$ Soil loading only, does not include hydrostatic pressures $G_H = 37$ For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust

$$\label{eq:conventional Earth Pressure Theory} \begin{split} \text{Exposed Wall Height (H) = } & \text{22} \\ \text{P = } & \text{1/2 * G}_{\text{H}} * \text{H}^2 \\ \text{P = } & \text{8935} \\ \text{P}_{\text{SH}} = & \text{P*(Shaft Spacing)} \\ \text{P}_{\text{SH}} = & \text{37228} \end{split} \ \text{lbs/shaft} \end{split}$$

6) Resolve horizontal earth force to distributed triangular load (for LPILE)

w =	2*P _{SH} /H	
w =	3384	lbs/foot per shaft (Earth - Service Limit)
w =	282	lbs/inch per shaft (Earth - Service Limit)
$\gamma_E =$	1.5	Earth Load Factor
w =	$(2*P_{SH}/H)*\gamma_E$	_
w =	423	lbs/inch per shaft (Earth - Strength Limit)

7) Determine live-load traffic surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)

w =	P _s /H	
w =	0	lbs/foot per shaft (surcharge - unfactored)
w =	0	lbs/inch per shaft (surcharge - unfactored)
$\gamma_s =$	1.75	Surcharge Load Factor - Strength I
w =	$(P_S/L)*\gamma_S$	
w =	0	lbs/inch per shaft (Surcharge - Strength I)

Distributed Lateral Loads for LPILE

CONVENTIONAL					
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)			
0	0	0			
22.0	282	423			

9) Pile Heading Loading (for LPILE, from HDR Structures)

	Service	Strength		
Shear =	2.99	4.59	kips/ft	
Moment =	8.05	15.4	kip-ft/ft	
Axial Load =	20.39	29.22	kips/ft	
Shear =	12458	19125	lbs	
Moment =	402500	770000	lb-in	Moment not applied due to modeling as fixed-head condition
Axial Load =	84958	121750	lbs	

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)

Restraint Condition = AT-REST

Ko = 0.456

(Active or At-Rest)

3) Determine Equivalent Fluid Weight (GH)

 $G_H = (\gamma_m)^* (K_a)$ Soil loading only, does not include hydrostatic pressures $G_H = 57$ For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust

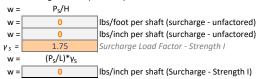
6) Resolve horizontal earth force to distributed triangular load (for LPILE)

w =	2*P _{SH} /H	
w =	5225	lbs/foot per shaft (Earth - Service Limit)
w =	435	lbs/inch per shaft (Earth - Service Limit)
$\gamma_E =$	1.5	Earth Load Factor
w =	$(2*P_{SH}/H)*\gamma_E$	_
w =	653	lbs/inch per shaft (Earth - Strength Limit

7) Determine live-load traffic surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)



Distributed Lateral Loads for LPILE

CONVENTIONAL							
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)					
0	0	0					
22.0	435	653					

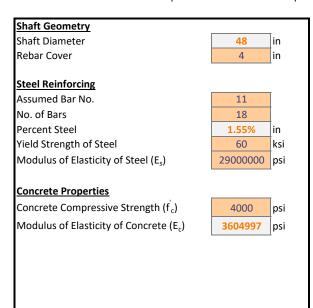
9) Pile Heading Loading (for LPILE, from HDR Structures)

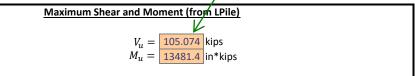
	Service	Strength		
Shear =	2.99	4.59	kips/ft	
Moment =	8.05	15.4	kip-ft/ft	
Axial Load =	20.39	29.22	kips/ft	
			_	
Shear =	12458	19125	lbs	
Moment =	402500	770000	lb-in	Moment not applied due to modeling as fixed-head condition
Axial Load =	84958	121750	lbs	

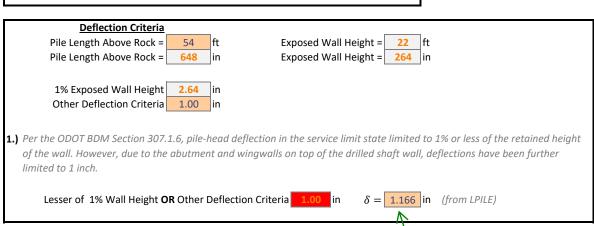
Shear, Moment, and Deflection Results

Governing maximum moment and shear based on Load Case 4 = Service Case (At-Rest Earth Pressures)

Maximum Shear and Moment output from LPile service case provided to HDR's structural engineers for capacity checks. Final reinforcing layout to be confirmed in structural analyses.







Considered acceptable based on correspondence with HDR structures.
Governing deflection based on Load Case 3 = Service Case (At-Rest Earth Pressures)

LPile for Version 2022-12.012

License ID : 202613844 License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts Subjected to Lateral Loading Using the p-y Method © 1985-2024 by Ensoft, Inc. All Rights Reserved

This software is licensed for exclusive use by:

HDR

LPILE Global, Global License

This model was prepared by: abaratta

Files Used for Analysis

Path to file locations: \pwworking\east01\d4381065\

Name of input data file:

1c. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Post-Const.lp12d

Name of output report file:

1c. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Post-Const.lp12o

Name of plot output file:

1c. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Post-Const.lp12p

Name of runtime message file:

1c. Rear Abt. B-003 22' Height 4' Shaft Abt. Section Post-Const.lp12r

Load Case 1 = Service Case (Active Earth Pressures)

Load Case 2 = Strength Case (Active Earth Pressures)

Load Case 3 = Service Case (At-Rest Earth Pressures)

Load Case 4 = Strength Case (At-Rest Earth Pressures)

Date and Time of Analysis							
Date: July 9, 2025 Time: 13:41:52							
Duahlam T2+1a							
Problem Title							
Project Name: CUY-17-13.50							
Job Number:							
Client:							
Engineer: HDR							
Description: Rear Abt., 22' Ht., 4' Dia., Post-Const.							
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
- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- Analysis includes loading by multiple distributed lateral loads acting on pile
- 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 = 58.000 ft
Depth of ground surface below top of pile = 22.0000 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.

Depth Below

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	48.0000
2	58.000	48.0000

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 = 58.000000 ft

Shaft Diameter = 48.000000 in
```

Soil and Rock Layering Information

The soil profile is modelled using 6 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 22.000000 ft

Distance from top of pile to bottom of layer = 24.400000 ft

Effective unit weight at top of layer = 59.600000 pcf

Effective unit weight at bottom of layer = 59.600000 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

Layer 2 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 = 37.400000 ft
Effective unit weight at top of layer = 62.600000 pcf
Effective unit weight at bottom of layer = 62.600000 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

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer	=	37.400000 ft
Distance from top of pile to bottom of layer	=	57.400000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	2300. psf
Undrained cohesion at bottom of layer	=	2300. 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	=	57.400000 ft
Distance from top of pile to bottom of layer	=	68.200000 ft
Effective unit weight at top of layer	=	55.600000 pcf
Effective unit weight at bottom of layer	=	55.600000 pcf
Undrained cohesion at top of layer	=	1600. psf
Undrained cohesion at bottom of layer	=	1600. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	68.200000 ft
Distance from top of pile to bottom of layer	=	107.400000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1750. psf
Undrained cohesion at bottom of layer	=	1750. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer = 107.400000 ft
Distance from top of pile to bottom of layer = 126.400000 ft
Effective unit weight at top of layer = 77.600000 pcf
Effective unit weight at bottom of layer = 77.600000 pcf
Undrained cohesion at top of layer = 4400. psf
Undrained cohesion at bottom of layer = 4400. psf
Epsilon-50 at top of layer = 0.004000
Epsilon-50 at bottom of layer = 0.004000

(Depth of the lowest soil layer extends 68.400 ft below the pile tip)

Summary of Input Soil Properties

Layer	Soil Type	Layer	Effective	Cohesion	Angle of	E50	
Num.	Name	Depth	Unit Wt.		Friction	or	kpy
	(p-y Curve Type)	ft	pcf	psf	deg.	krm	pci
1	Sand	22.0000	59.6000		33.0000		60.0000
	(Reese, et al.)	24.4000	59.6000		33.0000		60.0000
2	Sand	24.4000	62.6000		32.0000		60.0000
	(Reese, et al.)	37.4000	62.6000		32.0000		60.0000
3	Stiff Clay	37.4000	57.6000	2300.		0.00500	
	w/o Free Water	57.4000	57.6000	2300.		0.00500	
4	Stiff Clay	57.4000	55.6000	1600.		0.00700	
	w/o Free Water	68.2000	55.6000	1600.		0.00700	
5	Stiff Clay	68.2000	57.6000	1750.		0.00700	
	w/o Free Water	107.4000	57.6000	1750.		0.00700	
6	Stiff Clay	107.4000	77.6000	4400.		0.00400	
	w/o Free Water	126.4000	77.6000	4400.		0.00400	

Modification Factors for p-y Curves

Distribution of p-y modifiers with depth defined using 2 points

Point Depth X p-mult y-mult

No.	ft		
1	22.000	0.6500	1.0000
2	126.400	0.6500	1.0000

Static Loading Type

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

Distributed Lateral Loading for Individual Load Cases

Distributed lateral load intensity for Load Case 1 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	0.000
2	22.000	282.000

Distributed lateral load intensity for Load Case 2 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	0.000
2	22.000	423.000

Distributed lateral load intensity for Load Case 3 defined using 2 points

No.	ft	lb/in
Point	Depth X	Dist. Load

1	0.000	0.000
2	22.000	435.000

Distributed lateral load intensity for Load Case 4 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	0.000
2	22.000	653.000

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 4

Load	Load		Condition	Condition		Axial Thrust	Compute Top y	Run Analysis	
No.	Type		1		2	Force, lbs	vs. Pile Length		
1	2	V =	12458. lbs	S =	0.0000 in/in	84958.	Yes	Yes	
2	2	V =	19125. lbs	S =	0.0000 in/in	121750.	Yes	Yes	
3	2	V =	12458. lbs	S =	0.0000 in/in	84958.	Yes	Yes	
4	2	V =	19125. lbs	S =	0.0000 in/in	121750.	Yes	Yes	

Slope = 0 for fixed-head condition

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.

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	=	58.000000	ft
Shaft Diameter	=	48.000000	in
Concrete Cover Thickness (to edge of long. rebar)	=	4.000000	in
Number of Reinforcing Bars	=	18	bars
Yield Stress of Reinforcing Bars	=	60000.	psi
Modulus of Elasticity of Reinforcing Bars	=	29000000.	psi
Gross Area of Shaft	=	1810.	sq. in.
Total Area of Reinforcing Steel	=	28.080000	sq. in.
Area Ratio of Steel Reinforcement	=	1.55	percent
Edge-to-Edge Bar Spacing	=	5.291083	in
Maximum Concrete Aggregate Size	=	0.750000	in
Ratio of Bar Spacing to Aggregate Size	=	7.05	
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 7741.823 kips Tensile Load for Cracking of Concrete = -834.882 kips Nominal Axial Tensile Capacity = -1684.800 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar	Bar Diam.	Bar Area	Χ	Υ
Number	inches	sq. in.	inches	inches
1	1.410000	1.560000	19.295000	0.00000
2	1.410000	1.560000	18.131369	6.599279
3	1.410000	1.560000	14.780828	12.402587
4	1.410000	1.560000	9.647500	16.709960

5	1.410000	1.560000	3.350542	19.001866
6	1.410000	1.560000	-3.35054	19.001866
7	1.410000	1.560000	-9.64750	16.709960
8	1.410000	1.560000	-14.78083	12.402587
9	1.410000	1.560000	-18.13137	6.599279
10	1.410000	1.560000	-19.29500	0.00000
11	1.410000	1.560000	-18.13137	-6.59928
12	1.410000	1.560000	-14.78083	-12.40259
13	1.410000	1.560000	-9.64750	-16.70996
14	1.410000	1.560000	-3.35054	-19.00187
1 5	1.410000	1.560000	3.350542	-19.00187
16	1.410000	1.560000	9.647500	-16.70996
17	1.410000	1.560000	14.780828	-12.40259
18	1.410000	1.560000	18.131369	-6.59928

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

Minimum spacing between any two bars not equal to zero = 5.291 inches between bars 14 and 15.

Ratio of bar spacing to maximum aggregate size = 7.05

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 = 2

Number	Axial Thrust Force
	kips
1	84.958
2	121.750

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 = 84.958 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Run Stress Msg ksi
	· ·						
6.25000E-07	767.9866726	1228778676.	40.3014446	0.00002519	-0.00000481	0.1054874	0.6565137
0.00000125	1534.	1227207439.	32.1728632	0.00004022	-0.00001978	0.1674998	1.0183663
0.00000188	2297.	1224807365.	29.4646322	0.00005525	-0.00003475	0.2290245	1.3802894
0.00000250	3055.	1222153671.	28.1108278	0.00007028	-0.00004972	0.2900545	1.7422350
0.00000313	3811.	1219393694.	27.2986834	0.00008531	-0.00006469	0.3505884	2.1041932
0.00000375	4562.	1216579553.	26.7573379	0.0001003	-0.00007966	0.4106256	2.4661605
0.00000438	5310.	1213734163.	26.3707234	0.0001154	-0.00009463	0.4701659	2.8281355
0.00000500	5310.	1062017393.	18.8313923	0.00009416	-0.000146	0.3845321	-3.637848 C
0.00000563	5310.	944015460.	18.2935962	0.0001029	-0.000167	0.4191036	-4.180307 C
0.00000625	5310.	849613914.	17.8522956	0.0001116	-0.000188	0.4532328	-4.724772 C
0.00000688	5310.	772376286.	17.4843222	0.0001202	-0.000210	0.4870098	-5.270613 C
0.00000750	5310.	708011595.	17.1707196	0.0001288	-0.000231	0.5204188	-5.817968 C
0.00000813	5310.	653549165.	16.9021848	0.0001373	-0.000253	0.5535664	-6.366073 C
0.00000875	5310.	606867082.	16.6694158	0.0001459	-0.000274	0.5864665	-6.914836 C
0.00000938	5310.	566409276.	16.4654266	0.0001544	-0.000296	0.6191263	-7.464212 C
0.00001000	5310.	531008696.	16.2845264	0.0001628	-0.000317	0.6515357	-8.014286 C
0.00001063	5310.	499772891.	16.1254218	0.0001713	-0.000339	0.6838099	-8.564204 C
0.00001125	5310.	472007730.	15.9814351	0.0001798	-0.000360	0.7158171	-9.114957 C
0.00001188	5310.	447165218.	15.8517685	0.0001882	-0.000382	0.7476313	-9.665996 C

0.00001250	5310.	424806957.	15.7355095	0.0001967	-0.000403	0.7793116	-10.216876 C
0.00001313	5310.	404578054.	15.6307422	0.0002052	-0.000425	0.8108577	-10.767596 C
0.00001375	5310.	386188143.	15.5338070	0.0002136	-0.000446	0.8421605	-11.318993 C
0.00001438	5418.	376920686.	15.4447664	0.0002220	-0.000468	0.8732804	-11.870611 C
0.00001500	5612.	374166331.	15.3635204	0.0002305	-0.000490	0.9042672	-12.422066 C
0.00001563	5807.	371623204.	15.2891348	0.0002389	-0.000511	0.9351207	-12.973358 C
0.00001625	6001.	369266905.	15.2208194	0.0002473	-0.000533	0.9658405	-13.524485 C
0.00001688	6194.	367076652.	15.1579006	0.0002558	-0.000554	0.9964265	-14.075448 C
0.00001750	6388.	365031626.	15.0991301	0.0002642	-0.000576	1.0268346	-14.626591 C
0.00001813	6581.	363114537.	15.0435323	0.0002727	-0.000597	1.0570306	-15.178193 C
0.00001875	6775.	361317670.	14.9919357	0.0002811	-0.000619	1.0870936	-15.729626 C
0.00001938	6968.	359629366.	14.9439829	0.0002895	-0.000640	1.1170233	-16.280889 C
0.00002000	7161.	358039427.	14.8993364	0.0002980	-0.000662	1.1468196	-16.831981 C
0.00002063	7354.	356538888.	14.8576684	0.0003064	-0.000684	1.1764820	-17.382903 C
0.00002125	7546.	355119839.	14.8187299	0.0003149	-0.000705	1.2060105	-17.933653 C
0.00002188	7739.	353775276.	14.7822878	0.0003234	-0.000727	1.2354046	-18.484230 C
0.00002250	7931.	352498972.	14.7481350	0.0003318	-0.000748	1.2646642	-19.034635 C
0.00002313	8123.	351285371.	14.7160869	0.0003403	-0.000770	1.2937891	-19.584866 C
0.00002375	8316.	350129505.	14.6859781	0.0003488	-0.000791	1.3227788	-20.134924 C
0.00002438	8508.	349026914.	14.6576605	0.0003573	-0.000813	1.3516333	-20.684806 C
0.00002563	8891.	346962603.	14.6046921	0.0003742	-0.000856	1.4088300	-21.784938 C
0.00002688	9274.	345067027.	14.5570032	0.0003912	-0.000899	1.4654354	-22.884786 C
0.00002813	9656.	343319058.	14.5144235	0.0004082	-0.000942	1.5214996	-23.983904 C
0.00002938	10037.	341699715.	14.4763484	0.0004252	-0.000985	1.5770205	-25.082287 C
0.00003063	10418.	340193123.	14.4422149	0.0004423	-0.001028	1.6319958	-26.179930 C
0.00003188	10799.	338785890.	14.4115653	0.0004594	-0.001071	1.6864232	-27.276827 C
0.00003313	11179.	337466646.	14.3840404	0.0004765	-0.001114	1.7403004	-28.372972 C
0.00003438	11558.	336225674.	14.3592530	0.0004936	-0.001156	1.7936253	-29.468359 C
0.00003563	11936.	335054618.	14.3369443	0.0005108	-0.001199	1.8463954	-30.562982 C
0.00003688	12314.	333946253.	14.3168680	0.0005279	-0.001242	1.8986084	-31.656835 C
0.00003813	12692.	332894303.	14.2988100	0.0005451	-0.001285	1.9502619	-32.749912 C
0.00003938	13068.	331893284.	14.2825836	0.0005624	-0.001328	2.0013535	-33.842207 C
0.00004063	13444.	330938387.	14.2680251	0.0005796	-0.001370	2.0518808	-34.933713 C
0.00004188	13820.	330025376.	14.2549904	0.0005969	-0.001413	2.1018414	-36.024424 C
0.00004313	14195.	329150505.	14.2433523	0.0006142	-0.001456	2.1512326	-37.114333 C
0.00004438	14569.	328310448.	14.2329979	0.0006316	-0.001498	2.2000521	-38.203434 C
0.00004563	14942.	327502242.	14.2238268	0.0006490	-0.001541	2.2482972	-39.291720 C
0.00004688	15315.	326723239.	14.2157493	0.0006664	-0.001584	2.2959653	-40.379184 C
0.00004813	15687.	325971066.	14.2086852	0.0006838	-0.001626	2.3430540	-41.465820 C
0.00004938	16059.	325243586.	14.2025625	0.0007013	-0.001669	2.3895604	-42.551619 C
0.00005063	16430.	324538874.	14.1973162	0.0007187	-0.001711	2.4354819	-43.636576 C
0.00005188	16800.	323855189.	14.1928880	0.0007363	-0.001754	2.4808159	-44.720682 C
0.00005313	17170.	323190951.	14.1892248	0.0007538	-0.001796	2.5255595	-45.803930 C

0.00005438	17538.	322544726.	14.1862786	0.0007714	-0.001839	2.5697100	-46.886314 C
0.00005563	17907.	321915207.	14.1840058	0.0007890	-0.001881	2.6132645	-47.967824 C
0.00005688	18274.	321301199.	14.1823668	0.0008066	-0.001923	2.6562202	-49.048454 C
0.00005813	18641.	320701610.	14.1813252	0.0008243	-0.001966	2.6985743	-50.128196 C
0.00005938	19007.	320115438.	14.1808481	0.0008420	-0.002008	2.7403237	-51.207041 C
0.00006063	19372.	319541763.	14.1809378	0.0008597	-0.002050	2.7814655	-52.284981 C
0.00006188	19737.	318979737.	14.1815023	0.0008775	-0.002093	2.8219967	-53.362009 C
0.00006313	20101.	318428579.	14.1825477	0.0008953	-0.002135	2.8619143	-54.438115 C
0.00006438	20464.	317887566.	14.1840506	0.0009131	-0.002177	2.9012151	-55.513292 C
0.00006563	20826.	317356029.	14.1859893	0.0009310	-0.002219	2.9398960	-56.587530 C
0.00006688	21188.	316833348.	14.1883440	0.0009488	-0.002261	2.9779538	-57.660820 C
0.00006813	21549.	316318948.	14.1910965	0.0009668	-0.002303	3.0153854	-58.733154 C
0.00006938	21909.	315812292.	14.1942296	0.0009847	-0.002345	3.0521874	-59.804523 C
0.00007063	22269.	315307997.	14.1976559	0.0010027	-0.002387	3.0883462	-60.000000 CY
0.00007188	22599.	314425667.	14.1956541	0.0010203	-0.002430	3.1230447	-60.000000 CY
0.00007313	22887.	312986835.	14.1853271	0.0010373	-0.002473	3.1558748	-60.000000 CY
0.00007438	23149.	311242303.	14.1703298	0.0010539	-0.002516	3.1873659	-60.000000 CY
0.00007938	24078.	303347151.	14.0924606	0.0011186	-0.002691	3.3041711	-60.000000 CY
0.00008438	24760.	293457074.	13.9777806	0.0011794	-0.002871	3.4055822	-60.000000 CY
0.00008938	25432.	284558110.	13.8789587	0.0012404	-0.003050	3.4994188	-60.000000 CY
0.00009438	25955.	275014781.	13.7620851	0.0012988	-0.003231	3.5815102	-60.000000 CY
0.00009938	26342.	265074269.	13.6294494	0.0013544	-0.003416	3.6528465	-60.000000 CY
0.0001044	26723.	256032585.	13.5086375	0.0014100	-0.003600	3.7174190	-60.000000 CY
0.0001094	27101.	247782200.	13.4016622	0.0014658	-0.003784	3.7756585	-60.000000 CY
0.0001144	27475.	240215813.	13.3048844	0.0015217	-0.003968	3.8274520	-60.000000 CY
0.0001194	27807.	232936095.	13.2129211	0.0015773	-0.004153	3.8718467	-60.000000 CY
0.0001244	28020.	225289261.	13.0955119	0.0016288	-0.004341	3.9071633	-60.000000 CY
0.0001294	28203.	217992347.	12.9810884	0.0016794	-0.004531	3.9363900	-60.000000 CY
0.0001344	28383.	211219449.	12.8769310	0.0017303	-0.004720	3.9602206	-60.000000 CY
0.0001394	28560.	204913711.	12.7819585	0.0017815	-0.004909	3.9785677	-60.000000 CY
0.0001444	28734.	199021142.	12.6945162	0.0018328	-0.005097	3.9912999	-60.000000 CY
0.0001494	28903.	193492565.	12.6124696	0.0018840	-0.005286	3.9983652	-60.000000 CY
0.0001544	29069.	188304181.	12.5365161	0.0019353	-0.005475	3.9962365	-60.000000 CY
0.0001594	29233.	183422680.	12.4673244	0.0019870	-0.005663	3.9997784	-60.000000 CY
0.0001644	29393.	178819057.	12.4040313	0.0020389	-0.005851	3.9977687	-60.000000 CY
0.0001694	29548.	174450294.	12.3458217	0.0020911	-0.006039	3.9995131	-60.000000 CY
0.0001744	29685.	170237066.	12.2883601	0.0021428	-0.006227	3.9985074	-60.000000 CY
0.0001794	29793.	166090692.	12.2258691	0.0021930	-0.006417	3.9983087	-60.000000 CY
0.0001844	29861.	161957310.	12.1530475	0.0022407	-0.006609	3.9978430	-60.000000 CY
0.0001894	29922.	158001499.	12.0821380	0.0022881	-0.006802	3.9999427	-60.000000 CY
0.0001944	29978.	154229101.	12.0167503	0.0023358	-0.006994	3.9954446	-60.000000 CY
0.0001994	30034.	150640606.	11.9550674	0.0023835	-0.007186	3.9990494	-60.000000 CY
0.0002044	30089.	147222580.	11.8973212	0.0024315	-0.007378	3.9982147	-60.000000 CY

0.0002094	30142.	143960717.	11.8435011	0.0024797	-0.007570	3.9959825	-60.000000 CY
0.0002144	30194.	140847446.	11.7924565	0.0025280	-0.007762	3.9991807	-60.000000 CY
0.0002194	30245.	137869445.	11.7444188	0.0025764	-0.007954	3.9982095	-60.000000 CY
0.0002244	30294.	135013178.	11.6965351	0.0026244	-0.008146	3.9945524	-60.000000 CY
0.0002294	30341.	132278933.	11.6513406	0.0026725	-0.008337	3.9982464	-60.000000 CY
0.0002344	30389.	129658852.	11.6086738	0.0027208	-0.008529	3.9999041	-60.000000 CY
0.0002394	30435.	127143834.	11.5687187	0.0027693	-0.008721	3.9933404	-60.000000 CY
0.0002444	30481.	124728939.	11.5305906	0.0028178	-0.008912	3.9951884	-60.000000 CY
0.0002494	30526.	122409001.	11.4949615	0.0028666	-0.009103	3.9984559	-60.000000 CY
0.0002544	30570.	120178387.	11.4615938	0.0029155	-0.009294	3.9999173	-60.000000 CY
0.0002594	30614.	118030235.	11.4299268	0.0029646	-0.009485	3.9936929	-60.000000 CY
0.0002644	30657.	115961183.	11.3999947	0.0030139	-0.009676	3.9931695	-60.000000 CYT
0.0002694	30700.	113967560.	11.3715565	0.0030632	-0.009867	3.9970292	-60.000000 CYT
0.0002744	30742.	112045222.	11.3445640	0.0031127	-0.010057	3.9993110	-60.000000 CYT
0.0003044	30984.	101797031.	11.2031902	0.0034100	-0.011200	3.9998796	60.0000000 CYT
0.0003344	31137.	93119886.	11.0764908	0.0037037	-0.012346	3.9991212	60.0000000 CYT
0.0003644	31137.	85453068.	11.0065412	0.0040105	-0.013479	3.9957095	60.0000000 CYT

Axial Thrust Force = 121.750 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Run Stress Msg ksi
6.25000E-07	766.4493028	1226318885.	47.3770899	0.00002961	-3.89319E-07	0.1239721	0.7847598
0.00000125	1532.	1225572115.	35.7165630	0.00004465	-0.00001535	0.1858669	1.1468254
0.00000188	2294.	1223654516.	31.8331372	0.00005969	-0.00003031	0.2472900	1.5090768
0.00000250	3053.	1221268573.	29.8922055	0.00007473	-0.00004527	0.3082223	1.8713849
0.00000313	3808.	1218675533.	28.7279558	0.00008977	-0.00006023	0.3686599	2.2337210
0.00000375	4560.	1215974783.	27.9519576	0.0001048	-0.00007518	0.4286011	2.5960754
0.00000438	5308.	1213211215.	27.3977835	0.0001199	-0.00009013	0.4880455	2.9584438
0.00000500	5308.	1061559813.	20.8264113	0.0001041	-0.000136	0.4246415	-3.348570 C
0.00000563	5308.	943608723.	20.1291646	0.0001132	-0.000157	0.4604166	-3.880880 C
0.00000625	5308.	849247850.	19.5541132	0.0001222	-0.000178	0.4955837	-4.416317 C
0.00000688	5308.	772043500.	19.0702066	0.0001311	-0.000199	0.5302111	-4.954428 C
0.00000750	5308.	707706542.	18.6569721	0.0001399	-0.000220	0.5643725	-5.494709 C
0.00000813	5308.	653267577.	18.3004679	0.0001487	-0.000241	0.5981473	-6.036602 C
0.00000875	5308.	606605607.	17.9909794	0.0001574	-0.000263	0.6316220	-6.579489 C
0.00000938	5308.	566165234.	17.7159871	0.0001661	-0.000284	0.6646855	-7.124216 C
0.00001000	5308.	530779906.	17.4746866	0.0001747	-0.000305	0.6975595	-7.669141 C
0.00001063	5308.	499557559.	17.2574525	0.0001834	-0.000327	0.7300947	-8.215397 C
0.00001125	5308.	471804361.	17.0648441	0.0001920	-0.000348	0.7624899	-8.761494 C

0.00001188	5308.	446972553.	16.8887148	0.0002006	-0.000369	0.7945525	-9.308899 C
0.00001250	5308.	424623925.	16.7299898	0.0002091	-0.000391	0.8264458	-9.856378 C
0.00001313	5412.	412344552.	16.5868027	0.0002177	-0.000412	0.8582005	-10.403698 C
0.00001375	5607.	407777454.	16.4538202	0.0002262	-0.000434	0.8896509	-10.952138 C
0.00001438	5802.	403590505.	16.3320252	0.0002348	-0.000455	0.9209230	-11.500735 C
0.00001500	5996.	399742490.	16.2207567	0.0002433	-0.000477	0.9520577	-12.049170 C
0.00001563	6191.	396192708.	16.1187445	0.0002519	-0.000498	0.9830549	-12.597443 C
0.00001625	6385.	392894153.	16.0231470	0.0002604	-0.000520	1.0138084	-13.146391 C
0.00001688	6578.	389822981.	15.9338100	0.0002689	-0.000541	1.0443538	-13.695740 C
0.00001750	6772.	386962726.	15.8511792	0.0002774	-0.000563	1.0747629	-14.244924 C
0.00001813	6965.	384291544.	15.7745620	0.0002859	-0.000584	1.1050354	-14.793942 C
0.00001875	7159.	381790504.	15.7033579	0.0002944	-0.000606	1.1351709	-15.342794 C
0.00001938	7352.	379443117.	15.6370525	0.0003030	-0.000627	1.1651693	-15.891480 C
0.00002000	7545.	377230403.	15.5743488	0.0003115	-0.000649	1.1949716	-16.440478 C
0.00002063	7737.	375138248.	15.5145650	0.0003200	-0.000670	1.2245526	-16.989998 C
0.00002125	7930.	373162214.	15.4585774	0.0003285	-0.000692	1.2539976	-17.539348 C
0.00002188	8122.	371292326.	15.4060587	0.0003370	-0.000713	1.2833061	-18.088527 C
0.00002250	8314.	369519720.	15.3567208	0.0003455	-0.000734	1.3124780	-18.637535 C
0.00002313	8506.	367836487.	15.3103066	0.0003541	-0.000756	1.3415130	-19.186370 C
0.00002375	8698.	366235551.	15.2665862	0.0003626	-0.000777	1.3704107	-19.735032 C
0.00002438	8890.	364710564.	15.2253532	0.0003711	-0.000799	1.3991711	-20.283520 C
0.00002563	9273.	361866133.	15.1496247	0.0003882	-0.000842	1.4562783	-21.379974 C
0.00002688	9655.	359258692.	15.0805376	0.0004053	-0.000885	1.5127137	-22.476756 C
0.00002813	10037.	356858053.	15.0175234	0.0004224	-0.000928	1.5685114	-23.573578 C
0.00002938	10418.	354641172.	14.9607274	0.0004395	-0.000971	1.6237580	-24.669674 C
0.00003063	10798.	352585419.	14.9093909	0.0004566	-0.001013	1.6784512	-25.765039 C
0.00003188	11178.	350671713.	14.8628777	0.0004738	-0.001056	1.7325888	-26.859668 C
0.00003313	11557.	348883849.	14.8206474	0.0004909	-0.001099	1.7861684	-27.953554 C
0.00003438	11935.	347207981.	14.7822386	0.0005081	-0.001142	1.8391878	-29.046692 C
0.00003563	12313.	345632202.	14.7472545	0.0005254	-0.001185	1.8916446	-30.139076 C
0.00003688	12690.	344146219.	14.7153525	0.0005426	-0.001227	1.9435365	-31.230700 C
0.00003813	13067.	342741089.	14.6862345	0.0005599	-0.001270	1.9948611	-32.321559 C
0.00003938	13443.	341409000.	14.6596409	0.0005772	-0.001313	2.0456159	-33.411647 C
0.00004063	13818.	340142775.	14.6351991	0.0005946	-0.001355	2.0957785	-34.501156 C
0.00004188	14193.	338935518.	14.6121848	0.0006119	-0.001398	2.1452876	-35.590678 C
0.00004313	14567.	337783302.	14.5911549	0.0006292	-0.001441	2.1942246	-36.679387 C
0.00004438	14940.	336681370.	14.5719411	0.0006466	-0.001483	2.2425868	-37.767276 C
0.00004563	15313.	335625485.	14.5544098	0.0006640	-0.001526	2.2903715	-38.854338 C
0.00004688	15685.	334611862.	14.5384269	0.0006815	-0.001569	2.3375763	-39.940566 C
0.00004813	16056.	333637106.	14.5238769	0.0006990	-0.001611	2.3841984	-41.025953 C
0.00004938	16427.	332698166.	14.5106560	0.0007165	-0.001654	2.4302352	-42.110492 C
0.00005063	16797.	331792290.	14.4986707	0.0007340	-0.001696	2.4756839	-43.194175 C
0.00005188	17166.	330916989.	14.4878368	0.0007516	-0.001738	2.5205417	-44.276995 C

0.00005313	17535.	330070009.	14.4780778	0.0007691	-0.001781	2.5648058	-45.358944 C
0.00005438	17903.	329249300.	14.4693245	0.0007868	-0.001823	2.6084735	-46.440015 C
0.00005563	18270.	328452997.	14.4615141	0.0008044	-0.001866	2.6515418	-47.520199 C
0.00005688	18637.	327679394.	14.4545891	0.0008221	-0.001908	2.6940078	-48.599489 C
0.00005813	19003.	326926935.	14.4484972	0.0008398	-0.001950	2.7358686	-49.677877 C
0.00005938	19368.	326194189.	14.4431907	0.0008576	-0.001992	2.7771212	-50.755354 C
0.00006063	19732.	325479845.	14.4386256	0.0008753	-0.002035	2.8177625	-51.831912 C
0.00006188	20096.	324782694.	14.4347619	0.0008932	-0.002077	2.8577895	-52.907543 C
0.00006313	20459.	324101624.	14.4315626	0.0009110	-0.002119	2.8971991	-53.982237 C
0.00006438	20821.	323435606.	14.4289936	0.0009289	-0.002161	2.9359881	-55.055986 C
0.00006563	21183.	322783689.	14.4270238	0.0009468	-0.002203	2.9741534	-56.128782 C
0.00006688	21543.	322144991.	14.4256241	0.0009647	-0.002245	3.0116916	-57.200614 C
0.00006813	21903.	321518694.	14.4247680	0.0009827	-0.002287	3.0485995	-58.271474 C
0.00006938	22263.	320904036.	14.4244306	0.0010007	-0.002329	3.0848737	-59.341352 C
0.00007063	22621.	320298022.	14.4245553	0.0010187	-0.002371	3.1205062	-60.000000 CY
0.00007188	22964.	319504709.	14.4221875	0.0010366	-0.002413	3.1550793	-60.000000 CY
0.00007313	23270.	318219123.	14.4125240	0.0010539	-0.002456	3.1879323	-60.000000 CY
0.00007438	23541.	316523993.	14.3966705	0.0010708	-0.002499	3.2192258	-60.000000 CY
0.00007938	24505.	308726086.	14.3174288	0.0011364	-0.002674	3.3353971	-60.000000 CY
0.00008438	25194.	298595234.	14.1981024	0.0011980	-0.002852	3.4355840	-60.000000 CY
0.00008938	25866.	289406220.	14.0911352	0.0012594	-0.003031	3.5274625	-60.000000 CY
0.00009438	26422.	279972596.	13.9732320	0.0013187	-0.003211	3.6084047	-60.000000 CY
0.00009938	26813.	269817053.	13.8349870	0.0013749	-0.003395	3.6779044	-60.000000 CY
0.0001044	27195.	260552998.	13.7120005	0.0014312	-0.003579	3.7408383	-60.000000 CY
0.0001094	27571.	252081734.	13.5990123	0.0014874	-0.003763	3.7968142	-60.000000 CY
0.0001144	27943.	244309483.	13.4971802	0.0015437	-0.003946	3.8461107	-60.000000 CY
0.0001194	28288.	236966799.	13.4009203	0.0015997	-0.004130	3.8883191	-60.000000 CY
0.0001244	28528.	229368119.	13.2894508	0.0016529	-0.004317	3.9220942	-60.000000 CY
0.0001294	28711.	221921289.	13.1742155	0.0017044	-0.004506	3.9490398	-60.000000 CY
0.0001344	28889.	214987323.	13.0646853	0.0017556	-0.004694	3.9701475	-60.000000 CY
0.0001394	29064.	208531736.	12.9640739	0.0018069	-0.004883	3.9857153	-60.000000 CY
0.0001444	29237.	202504347.	12.8725010	0.0018585	-0.005072	3.9956498	-60.000000 CY
0.0001494	29406.	196861692.	12.7914600	0.0019107	-0.005259	3.9998540	-60.000000 CY
0.0001544	29573.	191562926.	12.7159026	0.0019630	-0.005447	3.9986694	-60.000000 CY
0.0001594	29734.	186564117.	12.6427809	0.0020149	-0.005635	3.9956350	-60.000000 CY
0.0001644	29892.	181850753.	12.5757689	0.0020671	-0.005823	3.9997007	-60.000000 CY
0.0001694	30047.	177397666.	12.5154506	0.0021198	-0.006010	3.9970741	-60.000000 CY
0.0001744	30190.	173132993.	12.4570685	0.0021722	-0.006198	3.9999446	-60.000000 CY
0.0001794	30303.	168935616.	12.3948062	0.0022233	-0.006387	3.9971440	-60.000000 CY
0.0001844	30388.	164814935.	12.3276396	0.0022729	-0.006577	3.9998533	-60.000000 CY
0.0001894	30453.	160809891.	12.2617757	0.0023221	-0.006768	3.9953743	-60.000000 CY
0.0001944	30510.	156962527.	12.1940116	0.0023702	-0.006960	3.9990408	-60.000000 CY
0.0001994	30564.	153298250.	12.1290171	0.0024182	-0.007152	3.9982437	-60.000000 CY

0.0002044	30617.	149805962.	12.0684085	0.0024665	-0.007344	3.9962924	-60.000000 CY
0.0002094	30669.	146476800.	12.0115806	0.0025149	-0.007535	3.9993199	-60.000000 CY
0.0002144	30720.	143298376.	11.9580974	0.0025635	-0.007726	3.9973577	-60.000000 CY
0.0002194	30769.	140259111.	11.9080502	0.0026123	-0.007918	3.9954505	-60.000000 CY
0.0002244	30818.	137352454.	11.8614296	0.0026614	-0.008109	3.9988043	-60.000000 CY
0.0002294	30867.	134569678.	11.8171390	0.0027106	-0.008299	3.9999976	-60.000000 CY
0.0002344	30914.	131900070.	11.7758082	0.0027600	-0.008490	3.9923360	-60.000000 CY
0.0002394	30960.	129336030.	11.7347515	0.0028090	-0.008681	3.9967321	-60.000000 CY
0.0002444	31004.	126872549.	11.6945951	0.0028579	-0.008872	3.9992716	-60.000000 CY
0.0002494	31049.	124505621.	11.6566176	0.0029069	-0.009063	3.9990130	-60.000000 CY
0.0002544	31092.	122227780.	11.6210348	0.0029561	-0.009254	3.9908695	-60.000000 CY
0.0002594	31134.	120036340.	11.5872320	0.0030054	-0.009445	3.9954553	-60.000000 CYT
0.0002644	31177.	117926356.	11.5551319	0.0030549	-0.009635	3.9984665	-60.000000 CYT
0.0002694	31219.	115893276.	11.5246241	0.0031044	-0.009826	3.9998836	-60.000000 CYT
0.0002744	31260.	113931648.	11.4959060	0.0031542	-0.010016	3.9947428	-60.000000 CYT
0.0003044	31499.	103487033.	11.3512297	0.0034550	-0.011155	3.9890857	60.0000000 CYT
0.0003344	31663.	94692014.	11.2431883	0.0037594	-0.012291	3.9914028	60.0000000 CYT
0.0003644	31663.	86895759.	11.2815464	0.0041107	-0.013379	3.9880257	60.0000000 CYT

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain	Max. Tens. Strain
1	84.958	30645.080	0.00300000	-0.00962237
2	121.750	31129.715	0.00300000	-0.00942355

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	84.958000	30645.	55.222700	19919.	318703454.
2	0.65	121.750000	31130.	79.137500	20234.	324523041.
1	0.75	84.958000	30645.	63.718500	22984.	312342032.
2	0.75	121.750000	31130.	91.312500	23347.	317735518.
1	0.90	84.958000	30645.	76.462200	27581.	237894445.
2	0.90	121.750000	31130.	109.575000	28017.	242737862.

Layering Correction Equivalent Depths of Soil & Rock Layers

Top of	Equivalent				
Layer	Top Depth	Same Layer	Layer is	FØ	F1
Below	Below	Type As	Rock or	Integral	Integral
Pile Head	Grnd Surf	Layer	is Below	for Layer	for Layer
ft	ft	Above	Rock Layer	lbs	lbs
22.0000	0.00	N.A.	No	0.00	7082.
24.4000	2.4677	Yes	No	7082.	303908.
37.4000	9.1476	No	No	310989.	1084139.
57.4000	36.5473	Yes	No	1395129.	34481.
68.2000	46.2000	No	No	1429609.	0.00
107.4000	85.4000	No	No	0.00	N.A.
	Layer Below Pile Head ft 22.0000 24.4000 37.4000 57.4000 68.2000	Layer Top Depth Below Pile Head Grnd Surf ft ft	Layer Below Type As Pile Head Grnd Surf Layer ft ft Above	Layer Below Below Type As Rock or Pile Head Grnd Surf Layer is Below ft Above Rock Layer 22.0000 0.00 N.A. No 24.4000 2.4677 Yes No 37.4000 9.1476 No No 57.4000 36.5473 Yes No 68.2000 46.2000 No No No	Layer Top Depth Same Layer Layer is F0 Below Below Type As Rock or Integral Pile Head Grnd Surf Layer is Below for Layer ft ft Above Rock Layer lbs 22.0000 0.00 N.A. No 0.00 24.4000 2.4677 Yes No 7082. 37.4000 9.1476 No No 310989. 57.4000 36.5473 Yes No 1395129. 68.2000 46.2000 No No 1429609.

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 Pile-head Rotation (Loading Type 2)

Shear force at pile head = 12458.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 84958.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force 1bs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5160	-6061475.	12458.	0.00	0.00	3.69E+11	0.00	0.00	1.8586
0.5800	0.5156	-5974688.	12490.	-1.14E-04	0.00	3.69E+11	0.00	0.00	7.4345
1.1600	0.5144	-5887475.	12568.	-2.25E-04	0.00	3.71E+11	0.00	0.00	14.8691
1.7400	0.5124	-5799476.	12697.	-3.35E-04	0.00	3.72E+11	0.00	0.00	22.3036
2.3200	0.5097	-5710332.	12878.	-4.43E-04	0.00	3.73E+11	0.00	0.00	29.7382
2.9000	0.5063	-5619685.	13111.	-5.48E-04	0.00	3.74E+11	0.00	0.00	37.1727
3.4800	0.5021	-5527175.	13396.	-6.52E-04	0.00	3.75E+11	0.00	0.00	44.6073
4.0600	0.4972	-5432444.	13732.	-7.53E-04	0.00	3.77E+11	0.00	0.00	52.0418
4.6400	0.4916	-5335132.	14120.	-8.52E-04	0.00	3.84E+11	0.00	0.00	59.4764
5.2200	0.4854	-5234882.	14560.	-9.15E-04	0.00	1.21E+12	0.00	0.00	66.9109
5.8000	0.4789	-5131373.	15052.	-9.45E-04	0.00	1.21E+12	0.00	0.00	74.3455
6.3800	0.4722	-5024246.	15595.	-9.74E-04	0.00	1.21E+12	0.00	0.00	81.7800
6.9600	0.4653	-4913139.	16190.	-0.00100	0.00	1.22E+12	0.00	0.00	89.2145
7.5400	0.4583	-4797695.	16837.	-0.00103	0.00	1.22E+12	0.00	0.00	96.6491
8.1200	0.4510	-4677552.	17535.	-0.00106	0.00	1.22E+12	0.00	0.00	104.0836
8.7000	0.4436	-4552352.	18286.	-0.00108	0.00	1.22E+12	0.00	0.00	111.5182
9.2800	0.4359	-4421734.	19088.	-0.00111	0.00	1.22E+12	0.00	0.00	118.9527
9.8600	0.4281	-4285338.	19942.	-0.00113	0.00	1.22E+12	0.00	0.00	126.3873
10.4400	0.4201	-4142806.	20847.	-0.00116	0.00	1.22E+12	0.00	0.00	133.8218
11.0200	0.4120	-3993778.	21804.	-0.00118	0.00	1.22E+12	0.00	0.00	141.2564
11.6000	0.4037	-3837893.	22813.	-0.00120	0.00	1.22E+12	0.00	0.00	148.6909
12.1800	0.3952	-3674792.	23874.	-0.00123	0.00	1.22E+12	0.00	0.00	156.1255
12.7600	0.3866	-3504116.	24987.	-0.00125	0.00	1.22E+12	0.00	0.00	163.5600
13.3400	0.3779	-3325505.	26151.	-0.00127	0.00	1.22E+12	0.00	0.00	170.9945

13.9200	0.3690	-3138600.	27367.	-0.00128	0.00	1.22E+12	0.00	0.00	178.4291
14.5000	0.3600	-2943041.	28635.	-0.00130	0.00	1.22E+12	0.00	0.00	185.8636
15.0800	0.3509	-2738468.	29954.	-0.00132	0.00	1.22E+12	0.00	0.00	193.2982
15.6600	0.3417	-2524522.	31325.	-0.00133	0.00	1.22E+12	0.00	0.00	200.7327
16.2400	0.3324	-2300844.	32748.	-0.00135	0.00	1.22E+12	0.00	0.00	208.1673
16.8200	0.3230	-2067075.	34223.	-0.00136	0.00	1.23E+12	0.00	0.00	215.6018
17.4000	0.3135	-1822854.	35749.	-0.00137	0.00	1.23E+12	0.00	0.00	223.0364
17.9800	0.3039	-1567823.	37328.	-0.00138	0.00	1.23E+12	0.00	0.00	230.4709
18.5600	0.2943	-1301622.	38958.	-0.00139	0.00	1.23E+12	0.00	0.00	237.9055
19.1400	0.2846	-1023893.	40639.	-0.00139	0.00	1.23E+12	0.00	0.00	245.3400
19.7200	0.2749	-734275.	42373.	-0.00140	0.00	1.23E+12	0.00	0.00	252.7745
20.3000	0.2651	-432410.	44158.	-0.00140	0.00	1.23E+12	0.00	0.00	260.2091
20.8800	0.2554	-117939.	45995.	-0.00140	0.00	1.23E+12	0.00	0.00	267.6436
21.4600	0.2456	209498.	47884.	-0.00140	0.00	1.23E+12	0.00	0.00	275.0782
22.0400	0.2358	550259.	49253.	-0.00140	0.00	1.23E+12	-2.510	74.0692	120.8611
22.6200	0.2261	896752.	49523.	-0.00140	0.00	1.23E+12	-40.771	1255.	0.00
23.2000	0.2164	1241266.	49097.	-0.00139	0.00	1.23E+12	-81.503	2621.	0.00
23.7800	0.2067	1581829.	48385.	-0.00138	0.00	1.23E+12	-123.239	4149.	0.00
24.3600	0.1971	1916416.	47379.	-0.00137	0.00	1.23E+12	-165.767	5852.	0.00
24.9400	0.1876	2242966.	46098.	-0.00136	0.00	1.22E+12	-202.204	7501.	0.00
25.5200	0.1782	2559714.	44552.	-0.00135	0.00	1.22E+12	-242.070	9454.	0.00
26.1000	0.1689	2864728.	42737.	-0.00133	0.00	1.22E+12	-279.660	11526.	0.00
26.6800	0.1597	3156184.	40667.	-0.00131	0.00	1.22E+12	-315.077	13735.	0.00
27.2600	0.1506	3432367.	38364.	-0.00130	0.00	1.22E+12	-346.569	16019.	0.00
27.8400	0.1416	3691750.	35859.	-0.00128	0.00	1.22E+12	-373.332	18347.	0.00
28.4200	0.1328	3933035.	33173.	-0.00125	0.00	1.22E+12	-398.564	20886.	0.00
29.0000	0.1242	4155001.	30370.	-0.00123	0.00	1.22E+12	-406.772	22801.	0.00
29.5800	0.1157	4357247.	27527.	-0.00121	0.00	1.22E+12	-410.380	24690.	0.00
30.1600	0.1074	4539600.	24672.	-0.00118	0.00	1.22E+12	-410.044	26579.	0.00
30.7400	0.09924	4702074.	21832.	-0.00115	0.00	1.22E+12	-405.936	28469.	0.00
31.3200	0.09130	4844868.	19034.	-0.00113	0.00	1.22E+12	-398.231	30358.	0.00
31.9000	0.08355	4968354.	16301.	-0.00110	0.00	1.21E+12	-387.109	32247.	0.00
32.4800	0.07600	5073071.	13656.	-0.00107	0.00	1.21E+12	-372.752	34136.	0.00
33.0600	0.06865	5159715.	11122.	-0.00104	0.00	1.21E+12	-355.343	36026.	0.00
33.6400	0.06151	5229128.	8720.	-0.00101	0.00	1.21E+12	-335.066	37915.	0.00
34.2200	0.05457	5282291.	6468.	-9.81E-04	0.00	1.21E+12	-312.104	39804.	0.00
34.8000	0.04785	5320318.	4384.	-9.38E-04	0.00	6.67E+11	-286.640	41693.	0.00
35.3800	0.04151	5344427.	2482.	-8.62E-04	0.00	3.83E+11	-259.947	43582.	0.00
35.9600	0.03585	5355887.	762.2276	-7.65E-04	0.00	3.82E+11	-234.228	45472.	0.00
36.5400	0.03087	5355942.	-783.871	-6.67E-04	0.00	3.82E+11	-210.054	47361.	0.00
37.1200	0.02656	5345764.	-2169.	-5.70E-04	0.00	3.83E+11	-187.978	49250.	0.00
37.7000	0.02294	5326423.	-4524.	-4.73E-04	0.00	3.85E+11	-488.743	148304.	0.00
38.2800	0.01998	5283349.	-7900.	-4.04E-04	0.00	8.71E+11	-481.499	167733.	0.00

38.8600	0.01732	5216926.	-11224.	-3.68E-04	0.00	1.21E+12	-473.561	190345.	0.00
39.4400	0.01486	5127545.	-14488.	-3.38E-04	0.00	1.21E+12	-464.440	217525.	0.00
40.0200	0.01261	5015649.	-17685.	-3.09E-04	0.00	1.21E+12	-454.048	250621.	0.00
40.6000	0.01056	4881740.	-20804.	-2.81E-04	0.00	1.22E+12	-442.269	291540.	0.00
41.1800	0.00870	4726391.	-23836.	-2.53E-04	0.00	1.22E+12	-428.954	343084.	0.00
41.7600	0.00703	4550247.	-26769.	-2.27E-04	0.00	1.22E+12	-413.893	409544.	0.00
42.3400	0.00555	4354038.	-29590.	-2.01E-04	0.00	1.22E+12	-396.786	497860.	0.00
42.9200	0.00423	4138593.	-32283.	-1.77E-04	0.00	1.22E+12	-377.174	620105.	0.00
43.5000	0.00308	3904863.	-34829.	-1.54E-04	0.00	1.22E+12	-354.298	799502.	0.00
44.0800	0.00209	3653957.	-37199.	-1.32E-04	0.00	1.22E+12	-326.767	1087948.	0.00
44.6600	0.00124	3387210.	-39351.	-1.12E-04	0.00	1.22E+12	-291.530	1634119.	0.00
45.2400	5.27E-04	3106329.	-40896.	-9.38E-05	0.00	1.22E+12	-152.495	2012781.	0.00
45.8200	-6.39E-05	2818051.	-41361.	-7.69E-05	0.00	1.22E+12	18.7696	2044294.	0.00
46.4000	-5.43E-04	2530672.	-40732.	-6.17E-05	0.00	1.22E+12	162.0930	2075804.	0.00
46.9800	-9.23E-04	2251137.	-39195.	-4.81E-05	0.00	1.22E+12	279.4294	2107311.	0.00
47.5600	-0.00121	1985130.	-37134.	-3.61E-05	0.00	1.23E+12	312.7793	1794262.	0.00
48.1400	-0.00143	1734268.	-34896.	-2.55E-05	0.00	1.23E+12	330.4329	1613675.	0.00
48.7200	-0.00157	1499407.	-32551.	-1.64E-05	0.00	1.23E+12	343.3699	1523540.	0.00
49.3000	-0.00165	1281175.	-30128.	-8.47E-06	0.00	1.23E+12	352.8724	1485911.	0.00
49.8800	-0.00169	1080032.	-27649.	-1.78E-06	0.00	1.23E+12	359.6626	1484264.	0.00
50.4600	-0.00168	896307.	-25130.	3.82E-06	0.00	1.23E+12	364.1840	1510928.	0.00
51.0400	-0.00163	730222.	-22586.	8.43E-06	0.00	1.23E+12	366.7213	1562705.	0.00
51.6200	-0.00156	581898.	-20031.	1.21E-05	0.00	1.23E+12	367.4570	1639172.	0.00
52.2000	-0.00146	451373.	-17477.	1.51E-05	0.00	1.23E+12	366.4990	1742099.	0.00
52.7800	-0.00135	338600.	-14935.	1.73E-05	0.00	1.23E+12	363.8936	1875483.	0.00
53.3600	-0.00122	243454.	-12417.	1.90E-05	0.00	1.23E+12	359.6256	2046145.	0.00
53.9400	-0.00109	165728.	-9935.	2.01E-05	0.00	1.23E+12	353.6074	2265123.	0.00
54.5200	-9.43E-04	105130.	-7518.	2.09E-05	0.00	1.23E+12	341.0686	2516686.	0.00
55.1000	-7.96E-04	61054.	-5317.	2.14E-05	0.00	1.23E+12	291.3589	2548165.	0.00
55.6800	-6.46E-04	31092.	-3470.	2.16E-05	0.00	1.23E+12	239.4234	2579642.	0.00
56.2600	-4.95E-04	12727.	-1991.	2.17E-05	0.00	1.23E+12	185.6728	2611118.	0.00
56.8400	-3.43E-04	3357.	-890.769	2.18E-05	0.00	1.23E+12	130.3652	2642593.	0.00
57.4200	-1.92E-04	302.0047	-239.319	2.18E-05	0.00	1.23E+12	56.8331	2063875.	0.00
58.0000	-4.00E-05	0.00	0.00	2.18E-05	0.00	1.23E+12	11.9367	1039754.	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 = 0.51598228 inches

Computed slope at pile head = 0.000000 radians

Maximum bending moment = -6061475. inch-lbs

Maximum shear force = 49523. lbs

Depth of maximum bending moment = 0.000000 feet below pile head

Depth of maximum shear force = 22.62000000 feet below pile head

Number of iterations = 117

Number of zero deflection points = 2

Pile deflection at ground = 0.23651288 inches

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

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Boundary Condition Type 2, Shear and Slope

Shear = 12458. lbs Slope = 0.00000 Axial Load = 84958. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
58.00000	0.51598228	-6061475.	49523.
55.10000	0.50930858	-6079631.	49538.
52.20000	0.49694419	-5981351.	49591.
49.30000	0.56906395	-6135077.	49542.
46.40000	0.79638692	-6693579.	49626.
43.50000	1.10357748	-7612336.	49589.
40.60000	1.40789851	-8761295.	49613.
37.70000	1.64974251	-9904723.	49634.
34.80000	1.72527172	-10494102.	49632.
31.90000	1.77939685	-10449188.	49621.

for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head =
Rotation of pile head =
Axial load at pile head =

(Zero slope for this load indicates fixed-head conditions)

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	1.3333	-9846887.	19125.	0.00	0.00	3.58E+11	0.00	0.00	2.7880
0.5800	1.3327	-9713628.	19174.	-1.90E-04	0.00	3.58E+11	0.00	0.00	11.1518
1.1600	1.3307	-9579670.	19290.	-3.77E-04	0.00	3.60E+11	0.00	0.00	22.3036
1.7400	1.3274	-9444473.	19484.	-5.61E-04	0.00	3.61E+11	0.00	0.00	33.4555
2.3200	1.3229	-9307502.	19756.	-7.42E-04	0.00	3.62E+11	0.00	0.00	44.6073
2.9000	1.3171	-9168218.	20105.	-9.19E-04	0.00	3.63E+11	0.00	0.00	55.7591
3.4800	1.3101	-9026084.	20532.	-0.00109	0.00	3.64E+11	0.00	0.00	66.9109
4.0600	1.3019	-8880562.	21036.	-0.00126	0.00	3.65E+11	0.00	0.00	78.0627
4.6400	1.2925	-8731115.	21618.	-0.00143	0.00	3.66E+11	0.00	0.00	89.2145
5.2200	1.2819	-8577205.	22278.	-0.00160	0.00	3.67E+11	0.00	0.00	100.3664
5.8000	1.2702	-8418296.	23016.	-0.00176	0.00	3.69E+11	0.00	0.00	111.5182
6.3800	1.2575	-8253851.	23831.	-0.00191	0.00	3.70E+11	0.00	0.00	122.6700
6.9600	1.2436	-8083331.	24723.	-0.00207	0.00	3.72E+11	0.00	0.00	133.8218
7.5400	1.2287	-7906200.	25693.	-0.00222	0.00	3.73E+11	0.00	0.00	144.9736
8.1200	1.2127	-7721922.	26741.	-0.00236	0.00	3.75E+11	0.00	0.00	156.1255
8.7000	1.1958	-7529960.	27867.	-0.00250	0.00	3.77E+11	0.00	0.00	167.2773
9.2800	1.1779	-7329776.	29070.	-0.00264	0.00	3.80E+11	0.00	0.00	178.4291
9.8600	1.1590	-7120836.	30350.	-0.00277	0.00	3.82E+11	0.00	0.00	189.5809
10.4400	1.1393	-6902602.	31709.	-0.00290	0.00	3.85E+11	0.00	0.00	200.7327
11.0200	1.1187	-6674538.	33145.	-0.00302	0.00	3.88E+11	0.00	0.00	211.8845
11.6000	1.0972	-6436109.	34658.	-0.00314	0.00	3.92E+11	0.00	0.00	223.0364
12.1800	1.0750	-6186779.	36249.	-0.00325	0.00	3.96E+11	0.00	0.00	234.1882
12.7600	1.0520	-5926013.	37918.	-0.00336	0.00	4.01E+11	0.00	0.00	245.3400
13.3400	1.0283	-5653275.	39664.	-0.00346	0.00	4.07E+11	0.00	0.00	256.4918
13.9200	1.0039	-5368029.	41488.	-0.00355	0.00	4.18E+11	0.00	0.00	267.6436
14.5000	0.9789	-5069743.	43390.	-0.00361	0.00	1.21E+12	0.00	0.00	278.7955
15.0800	0.9537	-4757927.	45369.	-0.00364	0.00	1.22E+12	0.00	0.00	289.9473
15.6600	0.9283	-4432043.	47426.	-0.00366	0.00	1.22E+12	0.00	0.00	301.0991

19125.0 lbs

121750.0 lbs

0.000E+00 radians

16.2400	0.9027	-4091551.	49560.	-0.00369	0.00	1.22E+12	0.00	0.00	312.2509
16.8200	0.8769	-3735914.	51773.	-0.00371	0.00	1.22E+12	0.00	0.00	323.4027
17.4000	0.8511	-3364592.	54062.	-0.00373	0.00	1.22E+12	0.00	0.00	334.5545
17.9800	0.8250	-2977048.	56430.	-0.00375	0.00	1.22E+12	0.00	0.00	345.7064
18.5600	0.7989	-2572742.	58874.	-0.00376	0.00	1.22E+12	0.00	0.00	356.8582
19.1400	0.7726	-2151138.	61397.	-0.00378	0.00	1.22E+12	0.00	0.00	368.0100
19.7200	0.7463	-1711696.	63997.	-0.00379	0.00	1.22E+12	0.00	0.00	379.1618
20.3000	0.7199	-1253879.	66675.	-0.00380	0.00	1.23E+12	0.00	0.00	390.3136
20.8800	0.6935	-777148.	69430.	-0.00380	0.00	1.23E+12	0.00	0.00	401.4655
21.4600	0.6670	-280966.	72263.	-0.00380	0.00	1.23E+12	0.00	0.00	412.6173
22.0400	0.6405	235206.	74319.	-0.00380	0.00	1.23E+12	-3.249	35.3062	181.2916
22.6200	0.6140	760000.	74753.	-0.00380	0.00	1.23E+12	-53.141	602.3508	0.00
23.2000	0.5876	1282217.	74196.	-0.00380	0.00	1.23E+12	-107.021	1268.	0.00
23.7800	0.5612	1799244.	73256.	-0.00379	0.00	1.22E+12	-163.136	2023.	0.00
24.3600	0.5349	2308359.	71921.	-0.00378	0.00	1.22E+12	-220.535	2870.	0.00
24.9400	0.5086	2806780.	70214.	-0.00376	0.00	1.22E+12	-269.926	3694.	0.00
25.5200	0.4825	3292112.	68146.	-0.00374	0.00	1.22E+12	-324.204	4677.	0.00
26.1000	0.4565	3761723.	65711.	-0.00372	0.00	1.22E+12	-375.751	5729.	0.00
26.6800	0.4307	4213114.	62926.	-0.00370	0.00	1.22E+12	-424.436	6859.	0.00
27.2600	0.4050	4643924.	59820.	-0.00368	0.00	1.22E+12	-468.139	8045.	0.00
27.8400	0.3795	5052034.	56431.	-0.00365	0.00	1.21E+12	-505.753	9275.	0.00
28.4200	0.3542	5435620.	52786.	-0.00359	0.00	4.12E+11	-541.627	10643.	0.00
29.0000	0.3296	5792891.	48910.	-0.00349	0.00	4.04E+11	-572.042	12081.	0.00
29.5800	0.3056	6122367.	44848.	-0.00339	0.00	3.97E+11	-595.332	13558.	0.00
30.1600	0.2824	6422913.	40641.	-0.00328	0.00	3.92E+11	-613.545	15121.	0.00
30.7400	0.2600	6693642.	36318.	-0.00316	0.00	3.88E+11	-628.631	16829.	0.00
31.3200	0.2384	6933817.	31916.	-0.00304	0.00	3.85E+11	-636.354	18578.	0.00
31.9000	0.2177	7143059.	27487.	-0.00291	0.00	3.82E+11	-636.353	20344.	0.00
32.4800	0.1979	7321365.	23075.	-0.00278	0.00	3.80E+11	-631.549	22211.	0.00
33.0600	0.1790	7468965.	18724.	-0.00264	0.00	3.78E+11	-618.516	24045.	0.00
33.6400	0.1611	7586485.	14495.	-0.00250	0.00	3.77E+11	-596.931	25785.	0.00
34.2200	0.1442	7674971.	10420.	-0.00236	0.00	3.76E+11	-573.998	27707.	0.00
34.8000	0.1282	7735531.	6505.	-0.00222	0.00	3.75E+11	-550.806	29893.	0.00
35.3800	0.1133	7769288.	2777.	-0.00208	0.00	3.75E+11	-520.627	31982.	0.00
35.9600	0.09936	7777702.	-719.083	-0.00193	0.00	3.75E+11	-483.946	33901.	0.00
36.5400	0.08642	7762551.	-3940.	-0.00179	0.00	3.75E+11	-441.507	35557.	0.00
37.1200	0.07449	7725890.	-6848.	-0.00164	0.00	3.75E+11	-394.322	36845.	0.00
37.7000	0.06355	7670006.	-10415.	-0.00150	0.00	3.76E+11	-630.537	69056.	0.00
38.2800	0.05360	7583458.	-14753.	-0.00136	0.00	3.77E+11	-616.180	80007.	0.00
38.8600	0.04463	7466942.	-18986.	-0.00122	0.00	3.78E+11	-599.973	93564.	0.00
39.4400	0.03661	7321246.	-23098.	-0.00108	0.00	3.80E+11	-581.825	110599.	0.00
40.0200	0.02953	7147252.	-27078.	-9.52E-04	0.00	3.82E+11	-561.638	132364.	0.00
40.6000	0.02336	6945940.	-30909.	-8.24E-04	0.00	3.85E+11	-539.313	160710.	0.00

41.1800	0.01806	6718398.	-34577.	-7.01E-04	0.00	3.88E+11	-514.764	198428.	0.00
41.7600	0.01359	6465816.	-38066.	-5.84E-04	0.00	3.92E+11	-487.948	249818.	0.00
42.3400	0.00993	6189501.	-41362.	-4.72E-04	0.00	3.96E+11	-458.934	321578.	0.00
42.9200	0.00703	5890862.	-44448.	-3.66E-04	0.00	4.02E+11	-428.067	423922.	0.00
43.5000	0.00483	5571400.	-47317.	-2.68E-04	0.00	4.09E+11	-396.341	570707.	0.00
44.0800	0.00330	5232658.	-49971.	-2.05E-04	0.00	1.21E+12	-366.183	772418.	0.00
44.6600	0.00197	4876153.	-52384.	-1.76E-04	0.00	1.21E+12	-327.277	1153657.	0.00
45.2400	8.44E-04	4503770.	-54372.	-1.50E-04	0.00	1.22E+12	-244.028	2012781.	0.00
45.8200	-1.07E-04	4119544.	-55112.	-1.25E-04	0.00	1.22E+12	31.5503	2044294.	0.00
46.4000	-8.95E-04	3736826.	-54073.	-1.02E-04	0.00	1.22E+12	266.8542	2075804.	0.00
46.9800	-0.00153	3367017.	-52007.	-8.22E-05	0.00	1.22E+12	326.7711	1483045.	0.00
47.5600	-0.00204	3013022.	-49631.	-6.40E-05	0.00	1.22E+12	356.1266	1215808.	0.00
48.1400	-0.00242	2676263.	-47078.	-4.78E-05	0.00	1.22E+12	377.3686	1083399.	0.00
48.7200	-0.00270	2357771.	-44396.	-3.35E-05	0.00	1.22E+12	393.4363	1012744.	0.00
49.3000	-0.00289	2058327.	-41615.	-2.09E-05	0.00	1.22E+12	405.7651	977186.	0.00
49.8800	-0.00299	1778529.	-38758.	-1.00E-05	0.00	1.22E+12	415.1669	964858.	0.00
50.4600	-0.00303	1518833.	-35844.	-6.30E-07	0.00	1.23E+12	422.1444	969933.	0.00
51.0400	-0.00300	1279580.	-32889.	7.32E-06	0.00	1.23E+12	427.0262	989522.	0.00
51.6200	-0.00293	1061006.	-29906.	1.40E-05	0.00	1.23E+12	430.0321	1022427.	0.00
52.2000	-0.00281	863258.	-26909.	1.94E-05	0.00	1.23E+12	431.3080	1068581.	0.00
52.7800	-0.00266	686400.	-23908.	2.38E-05	0.00	1.23E+12	430.9450	1128854.	0.00
53.3600	-0.00248	530414.	-20916.	2.73E-05	0.00	1.23E+12	428.9869	1205065.	0.00
53.9400	-0.00228	395206.	-17942.	2.99E-05	0.00	1.23E+12	425.4319	1300188.	0.00
54.5200	-0.00206	280605.	-14999.	3.18E-05	0.00	1.23E+12	420.2272	1418793.	0.00
55.1000	-0.00183	186360.	-12099.	3.31E-05	0.00	1.23E+12	413.2558	1567903.	0.00
55.6800	-0.00160	112132.	-9254.	3.40E-05	0.00	1.23E+12	404.3100	1758630.	0.00
56.2600	-0.00136	57488.	-6479.	3.45E-05	0.00	1.23E+12	393.0424	2009497.	0.00
56.8400	-0.00112	21885.	-3793.	3.47E-05	0.00	1.23E+12	378.8699	2353843.	0.00
57.4200	-8.78E-04	4634.	-1568.	3.48E-05	0.00	1.23E+12	260.4597	2063875.	0.00
58.0000	-6.36E-04	0.00	0.00	3.48E-05	0.00	1.23E+12	190.0969	1039754.	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 = 1.33332412 inches
Computed slope at pile head = 0.000000 radians

Maximum bending moment = -9846887. inch-lbs Maximum shear force = 74753. lbs

Depth of maximum bending moment = 0.000000 feet below pile head Depth of maximum shear force = 22.62000000 feet below pile head

Number of iterations = 85 Number of zero deflection points = 1

Pile deflection at ground = 0.64233781 inches

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

Boundary Condition Type 2, Shear and Slope

Shear = 19125. lbs Slope = 0.00000 Axial Load = 121750. lbs

Pile Length	Pile Head Deflection	Maximum Moment	Maximum Shear
feet	inches	ln-lbs	lbs
58.00000	1.33332412	-9846887.	74753.
55.10000	1.33935293	-9854480.	74772.
52.20000	1.42227454	-10029760.	74840.
49.30000	1.63474076	-10527245.	74756.
46.40000	1.98669826	-11477925.	74888.
43.50000	2.45503029	-13294878.	74829.
40.60000	2.83265147	-14956370.	74873.
37.70000	3.04312403	-16290822.	74900.
34.80000	3.06729214	-16837872.	74899.
31.90000	3.50947275	-16059042.	74882.

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 Pile-head Rotation (Loading Type 2)

Shear force at pile head Rotation of pile head Axial load at pile head = 12458.0 lbs = 0.000E+00 radians = 84958.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Es*H	Distrib. Lat. Load lb/inch
0.00	1.1662	-8285477.	12458.	0.00	0.00	3.50E+11	0.00	0.00	2.8670
0.5800	1.1657	-8198651.	12508.	-1.64E-04	0.00	3.50E+11	0.00	0.00	11.4682
1.1600	1.1640	-8111173.	12628.	-3.26E-04	0.00	3.51E+11	0.00	0.00	22.9364
1.7400	1.1611	-8022489.	12827.	-4.85E-04	0.00	3.52E+11	0.00	0.00	34.4045
2.3200	1.1572	-7932045.	13107.	-6.43E-04	0.00	3.52E+11	0.00	0.00	45.8727
2.9000	1.1522	-7839286.	13466.	-7.98E-04	0.00	3.53E+11	0.00	0.00	57.3409
3.4800	1.1461	-7743658.	13905.	-9.52E-04	0.00	3.54E+11	0.00	0.00	68.8091
4.0600	1.1389	-7644607.	14424.	-0.00110	0.00	3.54E+11	0.00	0.00	80.2773
4.6400	1.1307	-7541578.	15022.	-0.00125	0.00	3.55E+11	0.00	0.00	91.7455
5.2200	1.1215	-7434018.	15701.	-0.00140	0.00	3.56E+11	0.00	0.00	103.2136
5.8000	1.1113	-7321371.	16459.	-0.00154	0.00	3.57E+11	0.00	0.00	114.6818
6.3800	1.1000	-7203085.	17297.	-0.00168	0.00	3.58E+11	0.00	0.00	126.1500
6.9600	1.0878	-7078605.	18215.	-0.00182	0.00	3.59E+11	0.00	0.00	137.6182
7.5400	1.0747	-6947378.	19213.	-0.00196	0.00	3.60E+11	0.00	0.00	149.0864
8.1200	1.0606	-6808849.	20290.	-0.00209	0.00	3.61E+11	0.00	0.00	160.5545
8.7000	1.0455	-6662465.	21448.	-0.00222	0.00	3.62E+11	0.00	0.00	172.0227
9.2800	1.0296	-6507672.	22685.	-0.00235	0.00	3.64E+11	0.00	0.00	183.4909
9.8600	1.0129	-6343917.	24002.	-0.00247	0.00	3.65E+11	0.00	0.00	194.9591
10.4400	0.9952	-6170646.	25399.	-0.00259	0.00	3.67E+11	0.00	0.00	206.4273
11.0200	0.9768	-5987307.	26875.	-0.00270	0.00	3.69E+11	0.00	0.00	217.8955
11.6000	0.9576	-5793345.	28432.	-0.00281	0.00	3.72E+11	0.00	0.00	229.3636
12.1800	0.9376	-5588209.	30068.	-0.00292	0.00	3.74E+11	0.00	0.00	240.8318
12.7600	0.9170	-5371345.	31784.	-0.00302	0.00	3.81E+11	0.00	0.00	252.3000
13.3400	0.8956	-5142201.	33580.	-0.00309	0.00	1.21E+12	0.00	0.00	263.7682
13.9200	0.8740	-4900263.	35456.	-0.00311	0.00	1.22E+12	0.00	0.00	275.2364
14.5000	0.8522	-4644975.	37411.	-0.00314	0.00	1.22E+12	0.00	0.00	286.7045
15.0800	0.8303	-4375783.	39447.	-0.00317	0.00	1.22E+12	0.00	0.00	298.1727
15.6600	0.8081	-4092132.	41562.	-0.00319	0.00	1.22E+12	0.00	0.00	309.6409
16.2400	0.7858	-3793468.	43757.	-0.00321	0.00	1.22E+12	0.00	0.00	321.1091
16.8200	0.7634	-3479235.	46032.	-0.00323	0.00	1.22E+12	0.00	0.00	332.5773
17.4000	0.7408	-3148881.	48386.	-0.00325	0.00	1.22E+12	0.00	0.00	344.0455
17.9800	0.7181	-2801850.	50821.	-0.00327	0.00	1.22E+12	0.00	0.00	355.5136

18.5600	0.6953	-2437588.	53335.	-0.00329	0.00	1.22E+12	0.00	0.00	366.9818
19.1400	0.6724	-2055540.	55929.	-0.00330	0.00	1.23E+12	0.00	0.00	378.4500
19.7200	0.6494	-1655153.	58603.	-0.00331	0.00	1.23E+12	0.00	0.00	389.9182
20.3000	0.6263	-1235872.	61357.	-0.00332	0.00	1.23E+12	0.00	0.00	401.3864
20.8800	0.6032	-797143.	64190.	-0.00332	0.00	1.23E+12	0.00	0.00	412.8545
21.4600	0.5801	-338412.	67104.	-0.00333	0.00	1.23E+12	0.00	0.00	424.3227
22.0400	0.5569	140875.	69218.	-0.00333	0.00	1.23E+12	-3.134	39.1651	186.4347
22.6200	0.5338	629041.	69678.	-0.00332	0.00	1.23E+12	-51.203	667.6668	0.00
23.2000	0.5106	1114724.	69141.	-0.00332	0.00	1.23E+12	-103.002	1404.	0.00
23.7800	0.4875	1595414.	68237.	-0.00331	0.00	1.23E+12	-156.817	2239.	0.00
24.3600	0.4645	2068503.	66954.	-0.00330	0.00	1.23E+12	-211.818	3174.	0.00
24.9400	0.4416	2531323.	65316.	-0.00329	0.00	1.22E+12	-259.099	4084.	0.00
25.5200	0.4188	2981584.	63332.	-0.00327	0.00	1.22E+12	-311.006	5169.	0.00
26.1000	0.3960	3416769.	60996.	-0.00325	0.00	1.22E+12	-360.222	6331.	0.00
26.6800	0.3735	3834493.	58327.	-0.00323	0.00	1.22E+12	-406.653	7579.	0.00
27.2600	0.3510	4232505.	55352.	-0.00321	0.00	1.22E+12	-448.229	8887.	0.00
27.8400	0.3288	4608790.	52108.	-0.00319	0.00	1.22E+12	-483.884	10244.	0.00
28.4200	0.3067	4961619.	48623.	-0.00316	0.00	1.21E+12	-517.768	11750.	0.00
29.0000	0.2848	5289350.	44920.	-0.00313	0.00	1.21E+12	-546.104	13346.	0.00
29.5800	0.2631	5590609.	41046.	-0.00306	0.00	3.74E+11	-567.177	15002.	0.00
30.1600	0.2422	5864331.	37042.	-0.00295	0.00	3.71E+11	-583.287	16763.	0.00
30.7400	0.2220	6109733.	32937.	-0.00284	0.00	3.68E+11	-596.375	18697.	0.00
31.3200	0.2026	6326177.	28766.	-0.00272	0.00	3.66E+11	-602.286	20687.	0.00
31.9000	0.1841	6513375.	24579.	-0.00260	0.00	3.64E+11	-600.697	22711.	0.00
32.4800	0.1664	6671400.	20423.	-0.00247	0.00	3.62E+11	-593.764	24832.	0.00
33.0600	0.1496	6800586.	16342.	-0.00235	0.00	3.61E+11	-578.798	26920.	0.00
33.6400	0.1338	6901657.	12395.	-0.00221	0.00	3.60E+11	-555.599	28906.	0.00
34.2200	0.1188	6975735.	8613.	-0.00208	0.00	3.60E+11	-530.929	31095.	0.00
34.8000	0.1048	7024014.	5005.	-0.00194	0.00	3.59E+11	-505.851	33582.	0.00
35.3800	0.09179	7047708.	1595.	-0.00181	0.00	3.59E+11	-474.242	35960.	0.00
35.9600	0.07969	7048348.	-1575.	-0.00167	0.00	3.59E+11	-436.703	38142.	0.00
36.5400	0.06854	7027753.	-4467.	-0.00153	0.00	3.59E+11	-394.093	40020.	0.00
37.1200	0.05834	6987987.	-7047.	-0.00140	0.00	3.59E+11	-347.546	41464.	0.00
37.7000	0.04908	6931306.	-10314.	-0.00126	0.00	3.60E+11	-591.089	83824.	0.00
38.2800	0.04075	6845911.	-14373.	-0.00113	0.00	3.61E+11	-575.370	98266.	0.00
38.8600	0.03335	6732567.	-18317.	-9.99E-04	0.00	3.62E+11	-557.805	116428.	0.00
39.4400	0.02684	6592125.	-22131.	-8.71E-04	0.00	3.63E+11	-538.364	139605.	0.00
40.0200	0.02121	6425530.	-25804.	-7.47E-04	0.00	3.65E+11	-517.061	169635.	0.00
40.6000	0.01644	6233814.	-29323.	-6.26E-04	0.00	3.67E+11	-494.006	209107.	0.00
41.1800	0.01249	6018098.	-32676.	-5.11E-04	0.00	3.69E+11	-469.497	261535.	0.00
41.7600	0.00934	5779572.	-35855.	-4.00E-04	0.00	3.72E+11	-444.195	331152.	0.00
42.3400	0.00693	5519464.	-38861.	-2.94E-04	0.00	3.75E+11	-419.439	421246.	0.00
42.9200	0.00524	5238978.	-41704.	-2.28E-04	0.00	1.21E+12	-397.709	528608.	0.00

43.5000	0.00375	4939208.	-44383.	-1.99E-04	0.00	1.22E+12	-372.022	690119.	0.00
44.0800	0.00246	4621400.	-46862.	-1.72E-04	0.00	1.22E+12	-340.416	961464.	0.00
44.6600	0.00136	4287086.	-49085.	-1.46E-04	0.00	1.22E+12	-298.194	1525320.	0.00
45.2400	4.28E-04	3938312.	-50553.	-1.23E-04	0.00	1.22E+12	-123.665	2012781.	0.00
45.8200	-3.49E-04	3583535.	-50627.	-1.01E-04	0.00	1.22E+12	102.4753	2044294.	0.00
46.4000	-9.83E-04	3233710.	-49268.	-8.19E-05	0.00	1.22E+12	288.0138	2038998.	0.00
46.9800	-0.00149	2897826.	-47137.	-6.44E-05	0.00	1.22E+12	324.3727	1516110.	0.00
47.5600	-0.00188	2577645.	-44793.	-4.89E-05	0.00	1.22E+12	348.9929	1291840.	0.00
48.1400	-0.00217	2274361.	-42302.	-3.51E-05	0.00	1.22E+12	367.0271	1177533.	0.00
48.7200	-0.00237	1988849.	-39700.	-2.30E-05	0.00	1.23E+12	380.6222	1118466.	0.00
49.3000	-0.00249	1721768.	-37015.	-1.24E-05	0.00	1.23E+12	390.8895	1093004.	0.00
49.8800	-0.00254	1473617.	-34268.	-3.37E-06	0.00	1.23E+12	398.4786	1091187.	0.00
50.4600	-0.00254	1244764.	-31476.	4.34E-06	0.00	1.23E+12	403.7968	1108200.	0.00
51.0400	-0.00248	1035467.	-28654.	1.08E-05	0.00	1.23E+12	407.1082	1141934.	0.00
51.6200	-0.00239	845887.	-25815.	1.61E-05	0.00	1.23E+12	408.5835	1191990.	0.00
52.2000	-0.00226	676098.	-22973.	2.04E-05	0.00	1.23E+12	408.3257	1259299.	0.00
52.7800	-0.00210	526085.	-20137.	2.38E-05	0.00	1.23E+12	406.3811	1346109.	0.00
53.3600	-0.00192	395757.	-17322.	2.65E-05	0.00	1.23E+12	402.7412	1456263.	0.00
53.9400	-0.00173	284937.	-14537.	2.84E-05	0.00	1.23E+12	397.3370	1595850.	0.00
54.5200	-0.00153	193364.	-11797.	2.97E-05	0.00	1.23E+12	390.0207	1774509.	0.00
55.1000	-0.00132	120683.	-9116.	3.06E-05	0.00	1.23E+12	380.5316	2008030.	0.00
55.6800	-0.00110	66436.	-6509.	3.12E-05	0.00	1.23E+12	368.4272	2323942.	0.00
56.2600	-8.85E-04	30035.	-4072.	3.14E-05	0.00	1.23E+12	332.1072	2611118.	0.00
56.8400	-6.66E-04	9722.	-2036.	3.15E-05	0.00	1.23E+12	252.8269	2642593.	0.00
57.4200	-4.46E-04	1657.	-695.760	3.16E-05	0.00	1.23E+12	132.3002	2063875.	0.00
58.0000	-2.26E-04	0.00	0.00	3.16E-05	0.00	1.23E+12	67.6308	1039754.	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 = 1.16623554 inches

Computed slope at pile head = 0.000000 radians

Maximum bending moment = -8285477. inch-lbs

Maximum shear force = 69678. lbs

Depth of maximum bending moment = 0.000000 feet below pile head

Depth of maximum shear force = 22.62000000 feet below pile head

Number of iterations = 80 Number of zero deflection points = 1

Pile deflection at ground = 0.55850265 inches

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

Boundary Condition Type 2, Shear and Slope

Shear = 12458. lbs Slope = 0.00000 Axial Load = 84958. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
58.00000	1.16623554	-8285477.	69678.
55.10000	1.17443513	-8340130.	69696.
52.20000	1.22185862	-8366234.	69762.
49.30000	1.38477655	-8737092.	69671.
46.40000	1.68330477	-9490442.	69809.
43.50000	2.12493323	-11110215.	69746.
40.60000	2.48837033	-12673106.	69794.
37.70000	2.70327454	-13969149.	69820.
34.80000	2.73963357	-14527795.	69819.
31.90000	3.09438222	-13921082.	69799.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 4

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head Rotation of pile head Axial load at pile head = 19125.0 lbs = 0.000E+00 radians

= 121750.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	2.2602	-1.35E+07	19125.	0.00	0.00	3.41E+11	0.00	0.00	4.3039
0.5800	2.2592	-1.33E+07	19200.	-2.74E-04	0.00	3.41E+11	0.00	0.00	17.2155
1.1600	2.2564	-1.32E+07	19380.	-5.44E-04	0.00	3.42E+11	0.00	0.00	34.4309
1.7400	2.2516	-1.31E+07	19679.	-8.11E-04	0.00	3.43E+11	0.00	0.00	51.6464
2.3200	2.2451	-1.29E+07	20099.	-0.00108	0.00	3.43E+11	0.00	0.00	68.8618
2.9000	2.2367	-1.28E+07	20638.	-0.00134	0.00	3.44E+11	0.00	0.00	86.0773
3.4800	2.2265	-1.26E+07	21297.	-0.00159	0.00	3.44E+11	0.00	0.00	103.2927
4.0600	2.2145	-1.25E+07	22076.	-0.00185	0.00	3.45E+11	0.00	0.00	120.5082
4.6400	2.2008	-1.23E+07	22974.	-0.00210	0.00	3.46E+11	0.00	0.00	137.7236
5.2200	2.1853	-1.22E+07	23993.	-0.00234	0.00	3.46E+11	0.00	0.00	154.9391
5.8000	2.1681	-1.20E+07	25131.	-0.00259	0.00	3.47E+11	0.00	0.00	172.1545
6.3800	2.1493	-1.18E+07	26389.	-0.00283	0.00	3.48E+11	0.00	0.00	189.3700
6.9600	2.1288	-1.16E+07	27767.	-0.00306	0.00	3.49E+11	0.00	0.00	206.5855
7.5400	2.1067	-1.14E+07	29265.	-0.00329	0.00	3.49E+11	0.00	0.00	223.8009
8.1200	2.0830	-1.12E+07	30882.	-0.00352	0.00	3.50E+11	0.00	0.00	241.0164
8.7000	2.0578	-1.10E+07	32620.	-0.00374	0.00	3.52E+11	0.00	0.00	258.2318
9.2800	2.0310	-1.08E+07	34477.	-0.00395	0.00	3.53E+11	0.00	0.00	275.4473
9.8600	2.0028	-1.05E+07	36454.	-0.00416	0.00	3.54E+11	0.00	0.00	292.6627
10.4400	1.9731	-1.02E+07	38551.	-0.00436	0.00	3.56E+11	0.00	0.00	309.8782
11.0200	1.9420	-9960869.	40767.	-0.00456	0.00	3.57E+11	0.00	0.00	327.0936
11.6000	1.9096	-9665259.	43104.	-0.00475	0.00	3.59E+11	0.00	0.00	344.3091
12.1800	1.8759	-9352812.	45560.	-0.00493	0.00	3.61E+11	0.00	0.00	361.5245
12.7600	1.8409	-9022699.	48136.	-0.00511	0.00	3.64E+11	0.00	0.00	378.7400
13.3400	1.8048	-8674093.	50832.	-0.00528	0.00	3.66E+11	0.00	0.00	395.9555
13.9200	1.7674	-8306166.	53648.	-0.00544	0.00	3.70E+11	0.00	0.00	413.1709
14.5000	1.7290	-7918092.	56584.	-0.00559	0.00	3.73E+11	0.00	0.00	430.3864
15.0800	1.6896	-7509045.	59639.	-0.00574	0.00	3.78E+11	0.00	0.00	447.6018
15.6600	1.6492	-7078198.	62814.	-0.00587	0.00	3.83E+11	0.00	0.00	464.8173
16.2400	1.6079	-6624725.	66109.	-0.00599	0.00	3.89E+11	0.00	0.00	482.0327
16.8200	1.5658	-6147802.	69524.	-0.00611	0.00	3.97E+11	0.00	0.00	499.2482
17.4000	1.5229	-5646602.	73059.	-0.00621	0.00	4.07E+11	0.00	0.00	516.4636
17.9800	1.4794	-5120303.	76713.	-0.00627	0.00	1.21E+12	0.00	0.00	533.6791
18.5600	1.4356	-4568126.	80488.	-0.00630	0.00	1.22E+12	0.00	0.00	550.8945
19.1400	1.3917	-3989241.	84382.	-0.00632	0.00	1.22E+12	0.00	0.00	568.1100
19.7200	1.3476	-3382817.	88396.	-0.00634	0.00	1.22E+12	0.00	0.00	585.3255
20.3000	1.3034	-2748022.	92529.	-0.00636	0.00	1.22E+12	0.00	0.00	602.5409

20.8800	1.2591	-2084026.	96783.	-0.00638	0.00	1.22E+12	0.00	0.00	619.7564
21.4600	1.2147	-1389998.	101156.	-0.00639	0.00	1.23E+12	0.00	0.00	636.9718
22.0400	1.1702	-665107.	104334.	-0.00639	0.00	1.23E+12	-3.853	22.9151	279.8663
22.6200	1.1257	73158.	105074.	-0.00639	0.00	1.23E+12	-63.159	390.5006	0.00
23.2000	1.0812	808363.	104411.	-0.00639	0.00	1.23E+12	-127.573	821.2209	0.00
23.7800	1.0367	1537384.	103287.	-0.00638	0.00	1.23E+12	-195.194	1310.	0.00
24.3600	0.9924	2256942.	101688.	-0.00637	0.00	1.22E+12	-264.465	1855.	0.00
24.9400	0.9480	2963678.	99639.	-0.00636	0.00	1.22E+12	-324.260	2381.	0.00
25.5200	0.9039	3654692.	97152.	-0.00634	0.00	1.22E+12	-390.344	3006.	0.00
26.1000	0.8598	4326779.	94215.	-0.00632	0.00	1.22E+12	-453.724	3673.	0.00
26.6800	0.8159	4976867.	90846.	-0.00629	0.00	1.21E+12	-514.222	4386.	0.00
27.2600	0.7723	5602020.	87075.	-0.00623	0.00	4.08E+11	-569.583	5133.	0.00
27.8400	0.7292	6199501.	82940.	-0.00613	0.00	3.96E+11	-618.436	5902.	0.00
28.4200	0.6870	6766932.	78470.	-0.00601	0.00	3.87E+11	-666.263	6750.	0.00
29.0000	0.6456	7301985.	73686.	-0.00588	0.00	3.80E+11	-708.360	7637.	0.00
29.5800	0.6051	7802610.	68636.	-0.00574	0.00	3.74E+11	-742.674	8542.	0.00
30.1600	0.5657	8267136.	63368.	-0.00559	0.00	3.70E+11	-771.185	9489.	0.00
30.7400	0.5273	8694173.	57915.	-0.00543	0.00	3.66E+11	-795.824	10505.	0.00
31.3200	0.4900	9082519.	52320.	-0.00526	0.00	3.63E+11	-812.051	11533.	0.00
31.9000	0.4540	9431380.	46642.	-0.00508	0.00	3.61E+11	-819.338	12560.	0.00
32.4800	0.4193	9740397.	40920.	-0.00490	0.00	3.59E+11	-825.107	13697.	0.00
33.0600	0.3858	1.00E+07	35188.	-0.00471	0.00	3.57E+11	-821.790	14824.	0.00
33.6400	0.3537	1.02E+07	29515.	-0.00451	0.00	3.56E+11	-808.480	15907.	0.00
34.2200	0.3231	1.04E+07	23936.	-0.00431	0.00	3.55E+11	-794.731	17122.	0.00
34.8000	0.2938	1.06E+07	18450.	-0.00410	0.00	3.54E+11	-781.806	18521.	0.00
35.3800	0.2660	1.07E+07	13084.	-0.00389	0.00	3.53E+11	-759.952	19885.	0.00
35.9600	0.2396	1.08E+07	7902.	-0.00368	0.00	3.53E+11	-729.183	21178.	0.00
36.5400	0.2148	1.08E+07	2964.	-0.00347	0.00	3.53E+11	-689.740	22352.	0.00
37.1200	0.1914	1.08E+07	-1671.	-0.00325	0.00	3.52E+11	-642.132	23351.	0.00
37.7000	0.1695	1.08E+07	-6709.	-0.00304	0.00	3.53E+11	-805.786	33088.	0.00
38.2800	0.1491	1.07E+07	-12283.	-0.00283	0.00	3.53E+11	-795.729	37150.	0.00
38.8600	0.1301	1.06E+07	-17780.	-0.00262	0.00	3.54E+11	-784.017	41931.	0.00
39.4400	0.1127	1.05E+07	-23190.	-0.00241	0.00	3.54E+11	-770.575	47609.	0.00
40.0200	0.09660	1.03E+07	-28500.	-0.00221	0.00	3.55E+11	-755.313	54421.	0.00
40.6000	0.08195	1.01E+07	-33697.	-0.00201	0.00	3.57E+11	-738.124	62689.	0.00
41.1800	0.06867	9839460.	-38768.	-0.00181	0.00	3.58E+11	-718.877	72858.	0.00
41.7600	0.05673	9553678.	-43696.	-0.00162	0.00	3.60E+11	-697.407	85565.	0.00
42.3400	0.04607	9233957.	-48467.	-0.00144	0.00	3.62E+11	-673.497	101752.	0.00
42.9200	0.03664	8881460.	-53062.	-0.00127	0.00	3.65E+11	-646.855	122862.	0.00
43.5000	0.02840	8497485.	-57460.	-0.00110	0.00	3.68E+11	-617.064	151233.	0.00
44.0800	0.02127	8083482.	-61638.	-9.48E-04	0.00	3.72E+11	-583.501	190917.	0.00
44.6600	0.01520	7641085.	-65566.	-8.02E-04	0.00	3.76E+11	-545.147	249634.	0.00
45.2400	0.01011	7172160.	-69204.	-6.66E-04	0.00	3.82E+11	-500.162	344314.	0.00

45.8200	0.00593	6678896.	-72492.	-5.40E-04	0.00	3.88E+11	-444.608	521660.	0.00
46.4000	0.00259	6163993.	-75316.	-4.27E-04	0.00	3.97E+11	-366.895	987167.	0.00
46.9800	-5.62E-06	5631225.	-76587.	-3.24E-04	0.00	4.07E+11	1.7024	2107311.	0.00
47.5600	-0.00193	5098459.	-75359.	-2.62E-04	0.00	1.21E+12	351.1653	1267571.	0.00
48.1400	-0.00365	4582678.	-72682.	-2.34E-04	0.00	1.22E+12	417.9275	797517.	0.00
48.7200	-0.00518	4087121.	-69617.	-2.09E-04	0.00	1.22E+12	462.9573	621585.	0.00
49.3000	-0.00656	3613969.	-66272.	-1.87E-04	0.00	1.22E+12	498.0150	528564.	0.00
49.8800	-0.00779	3164926.	-62705.	-1.68E-04	0.00	1.22E+12	527.2271	471170.	0.00
50.4600	-0.00889	2741406.	-58947.	-1.51E-04	0.00	1.22E+12	552.5876	432485.	0.00
51.0400	-0.00989	2344642.	-55022.	-1.36E-04	0.00	1.22E+12	575.2367	404863.	0.00
51.6200	-0.01079	1975731.	-50946.	-1.24E-04	0.00	1.22E+12	595.9018	384305.	0.00
52.2000	-0.01162	1635678.	-46732.	-1.14E-04	0.00	1.23E+12	615.0827	368503.	0.00
52.7800	-0.01238	1325412.	-42388.	-1.05E-04	0.00	1.23E+12	633.1427	356020.	0.00
53.3600	-0.01309	1045810.	-37922.	-9.88E-05	0.00	1.23E+12	650.3567	345913.	0.00
53.9400	-0.01375	797708.	-33338.	-9.35E-05	0.00	1.23E+12	666.9383	337535.	0.00
54.5200	-0.01439	581909.	-28640.	-8.96E-05	0.00	1.23E+12	683.0566	330431.	0.00
55.1000	-0.01500	399196.	-23831.	-8.68E-05	0.00	1.23E+12	698.8457	324271.	0.00
55.6800	-0.01560	250334.	-18912.	-8.50E-05	0.00	1.23E+12	714.4117	318817.	0.00
56.2600	-0.01618	136078.	-13886.	-8.39E-05	0.00	1.23E+12	729.8366	313895.	0.00
56.8400	-0.01676	57176.	-8753.	-8.33E-05	0.00	1.23E+12	745.1810	309384.	0.00
57.4200	-0.01734	14372.	-4118.	-8.31E-05	0.00	1.23E+12	586.9519	235556.	0.00
58.0000	-0.01792	0.00	0.00	-8.31E-05	0.00	1.23E+12	596.2696	115787.	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. 4:

```
Pile-head deflection
                                       2.26016572 inches
Computed slope at pile head
                                         0.000000 radians
Maximum bending moment
                                       -13481368. inch-lbs
Maximum shear force
                                          105074. lbs
Depth of maximum bending moment =
                                         0.000000 feet below pile head
Depth of maximum shear force
                                      22.62000000 feet below pile head
Number of iterations
                                               31
Number of zero deflection points =
Pile deflection at ground
                                       1.17325763 inches
```

Pile-head Deflection v	vs. Pile Length for Load Case 4

Boundary Condition Type 2, Shear and Slope

Shear = 19125. lbs Slope = 0.00000 Axial Load = 121750. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
58.00000	2.26016572	-13481368.	105074.
55.10000	2.34151123	-13613642.	105093.
52.20000	2.60202698	-14188686.	105170.
49.30000	3.04804842	-15392115.	105018.
46.40000	3.62086366	-17128303.	105232.
43.50000	4.21478305	-19391061.	105138.
40.60000	4.65613748	-21395101.	105226.
37.70000	4.82842366	-22785012.	105257.
34.80000	4.83994827	-23022544.	105254.

.....

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

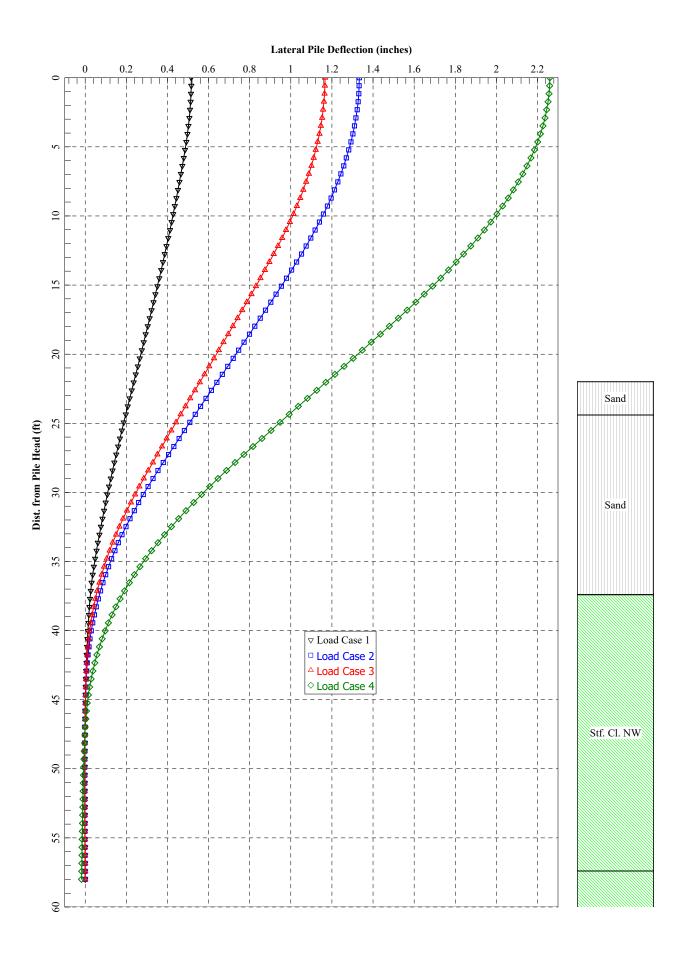
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad. Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

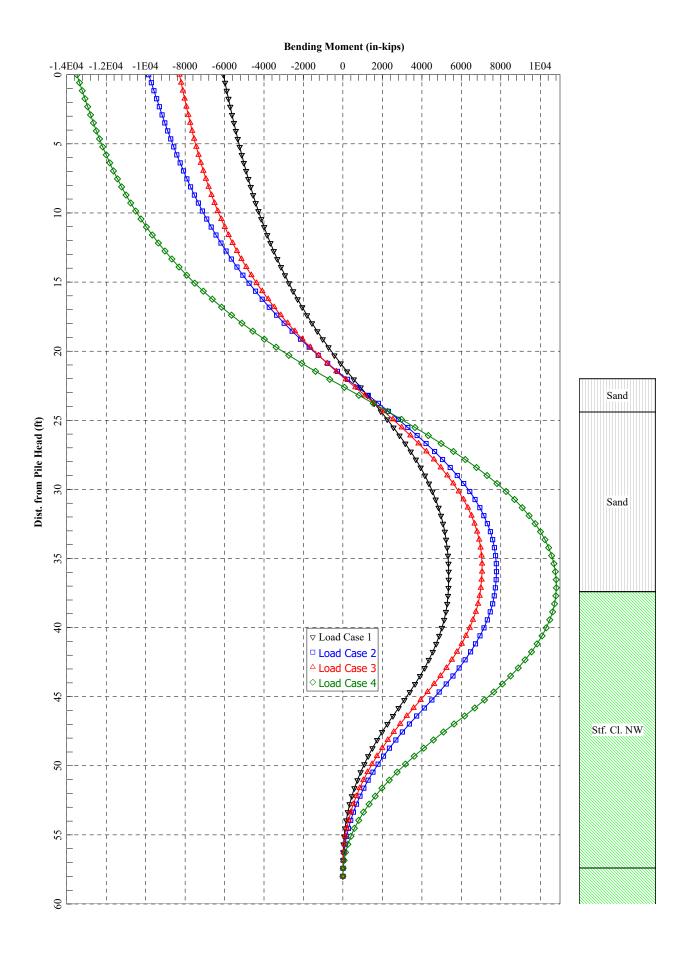
Load Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	1bs	inches	radians	lbs	in-lbs

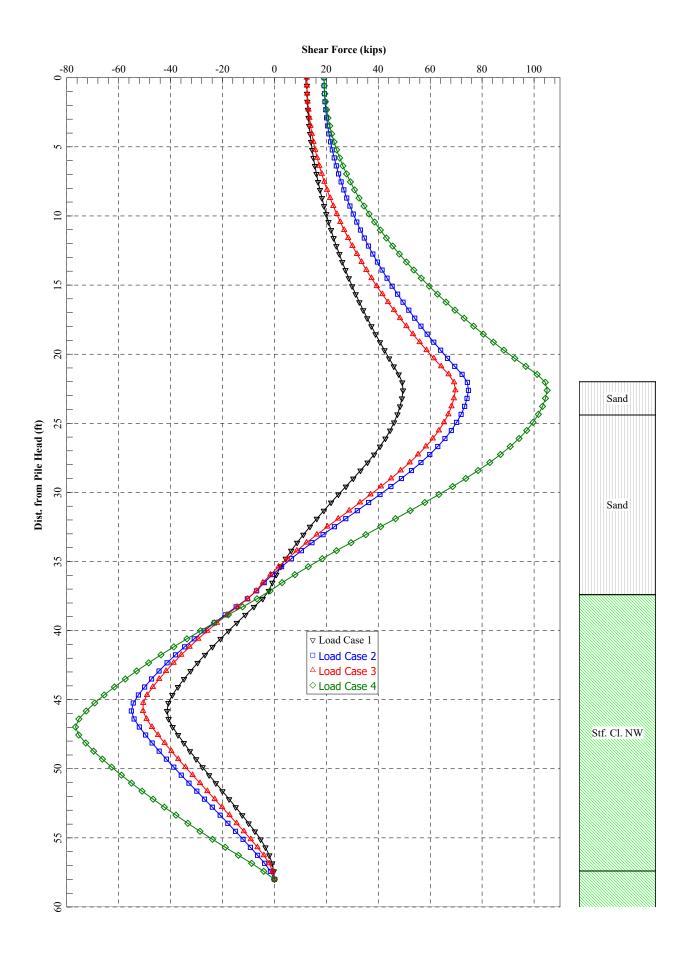
1	V, lb	12458.	S, rad	0.00	84958.	0.5160	0.00	49523.	-6061475.
2	V, lb	19125.	S, rad	0.00	121750.	1.3333	0.00	74753.	-9846887.
3	V, lb	12458.	S, rad	0.00	84958.	1.1662	0.00	69678.	-8285477.
4	V, lb	19125.	S, rad	0.00	121750.	2.2602	0.00	<mark>105074.</mark>	-1.35E+07

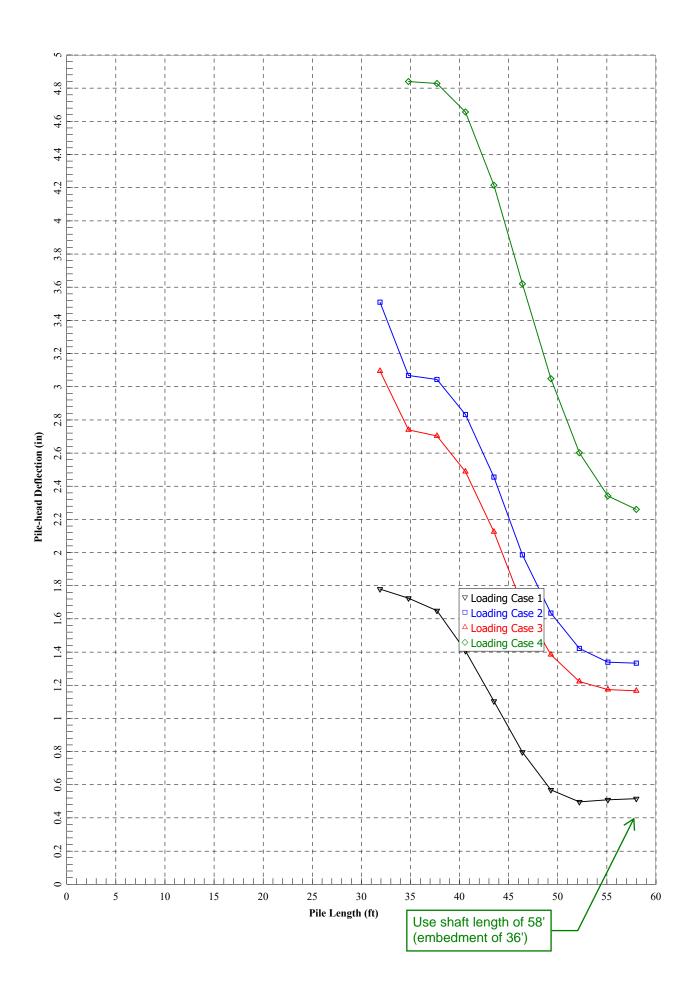
```
Maximum pile-head deflection = 2.2601657249 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.0000000 deg.
```

The analysis ended normally.









Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Section outside Abutment/Wingwalls, 22' height, 2H:1V skewed backslope, (free-head)

Geometry

Horiz. Distance from C/L (ft)

Start of Wall Backfill = 23.3 at Outside Edge of Shoulder

Wall = 58.5 at C/L of Wall

Horizontal distances measured perpendicular to wall

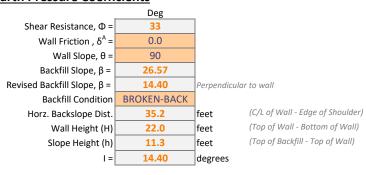
Backfill Slope Angle = 2.0 H:1V

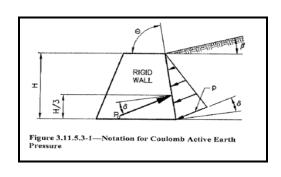
Maximum backfill slope perpendicular to roadway C/L

Wall Loading Profile

_	Top Elev.	Thickness (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	_
Item 203	712.0	9.0	250	28	125	A-6a/A-6b per GDM
Medium Dense Granular	703.0	13.0	0	33	122	
Bottom of Wall	690.0					-
Weighted Value		22.0	100	31	125	

Earth Pressure Coefficients





Active Earth Coefficient

 $K_{a} = \frac{\sin^{2}(\theta+\Phi)}{(\sin^{2}(\theta)*\sin(\theta-\delta)*[1+v(\sin(\Phi+\delta)*\sin(\Phi-\beta))/(\sin(\theta-\delta)*\sin(\theta+\beta))]^{2})}$ $K_{a} = \frac{0.348}{(\sin^{2}(\theta)+\Phi)}$

At-Rest Earth Coefficient

 $K_o = (1-Sin(\phi))*(1+Sin(\beta))$ $K_o = 0.569$

Notes:

A. Wall friction neglected

B. Figure and Equation for Active Earth Pressure from AASHTO 3.11.5.3 (LRFD Design Manual).

C. The wall backfill will consist of proposed fill and granular overburden. Using the soil layer thicknesses and respective soil parameters as provided by SME, a weighted average was determined and assumed for the entire backfill (c' = 100 psf and $\phi' = 31^\circ$. The parameters were converted to equivalent soil strength parameters c' = 0 psf and $\phi' = 33^\circ$ for computing earth pressures based on a 1 degree increase in friction angle for every 50 psf decrease in cohesion up to 150 psf (Ref: Hall's Thesis).

Soil Lateral Design Profile							
	Top Elev	Depth (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	ε50	k
Medium Dense Granular	690.0	22.0	0	33	59.6	N/A	60
Medium Dense Silt	687.6	24.4	0	32	62.6	N/A	60
Medium Stiff to Stiff Silt	674.6	37.4	2300	0	57.6	0.005	N/A
Stiff Cohesive	654.6	57.4	1600	0	55.6	0.007	N/A
Stiff to Very Stiff Silt	643.8	68.2	1750	0	57.6	0.007	N/A
Hard Silt	604.6	107.4	4400	0	77.6	0.004	N/A
Bedrock	585.6	126.4	N/A	N/A	N/A	N/A	N/A

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)

Restraint Condition = ACTIVE

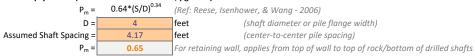
Ka = 0.348

(Active or At-Rest)

3) Determine Equivalent Fluid Weight (G_H)

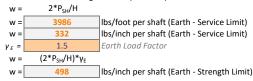
 $G_H = (\gamma_m)^* (K_a)$ Soil loading only, does not include hydrostatic pressures $G_H = 43$ For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust

6) Resolve horizontal earth force to distributed triangular load (for LPILE)



7) Determine live-load surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)

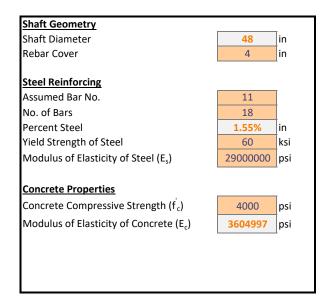
w =	P _s /H	
w =	181	lbs/foot per shaft (surcharge - unfactored)
w =	15	lbs/inch per shaft (surcharge - unfactored)
γ _s =	1.5	Surcharge Load Factor - Strength I (Earth Surcharge)
w =	$(P_S/L)*\gamma_S$	•
w =	23	lbs/inch per shaft (Surcharge - Strength I)

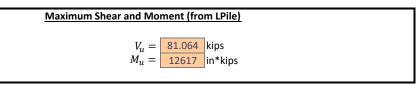
Distributed Lateral Loads for LPILE

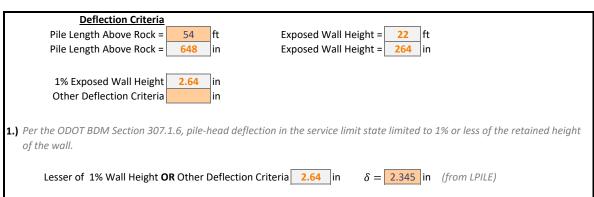
CONVENTIONAL						
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)				
0	15	23				
22.0	347	521				

Shear, Moment, and Deflection Results

Maximum Shear and Moment output from LPile service case provided to HDR's structural engineers for capacity checks. Final reinforcing layout to be confirmed in structural analyses.







LPile for Version 2022-12.012

License ID : 202613844 License Type : (Network 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:

HDR

LPILE Global, Global License

This model was prepared by: abaratta

Files Head Con Analysis

Files Used for Analysis

Path to file locations: \pwworking\east01\d4381065\

Name of input data file:

2. Rear Abt. B-003 22' Height 4' Shaft Skewed 2H1V Backslope.lp12d

Name of output report file:

2. Rear Abt. B-003 22' Height 4' Shaft Skewed 2H1V Backslope.lp12o

Name of plot output file:

2. Rear Abt. B-003 22' Height 4' Shaft Skewed 2H1V Backslope.lp12p

Name of runtime message file:

2. Rear Abt. B-003 22' Height 4' Shaft Skewed 2H1V Backslope.lp12r

Load Case 1 = Service Case Load Case 2 = Strength Case

Data and Time of Applicate							
Date and Time of Analysis							
Date: July 10, 2025 Time: 13:43:09							
Problem Title							
Project Name: CUY-17-13.50							
Job Number:							
Client:							
Engineer: HDR							
Description: Rear Abt., 22' Ht., 4' Dia., Wall Only							
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
- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- Analysis includes loading by multiple distributed lateral loads acting on pile
- 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 $% \left(1\right) =\left(1\right) \left(1\right) \left($
- 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 = 58.000 ft
Depth of ground surface below top of pile = 22.0000 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.

Depth Below

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	48.0000
2	58.000	48.0000

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 = 58.000000 ft

Shaft Diameter = 48.000000 in
```

Soil and Rock Layering Information

The soil profile is modelled using 6 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 22.000000 ft

Distance from top of pile to bottom of layer = 24.400000 ft

Effective unit weight at top of layer = 59.600000 pcf

Effective unit weight at bottom of layer = 59.600000 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

Layer 2 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 = 37.400000 ft

Effective unit weight at top of layer = 62.600000 pcf

Effective unit weight at bottom of layer = 62.600000 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

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer	=	37.400000 ft
Distance from top of pile to bottom of layer	=	57.400000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	2300. psf
Undrained cohesion at bottom of layer	=	2300. 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	=	57.400000 ft
Distance from top of pile to bottom of layer	=	68.200000 ft
Effective unit weight at top of layer	=	55.600000 pcf
Effective unit weight at bottom of layer	=	55.600000 pcf
Undrained cohesion at top of layer	=	1600. psf
Undrained cohesion at bottom of layer	=	1600. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	68.200000 ft
Distance from top of pile to bottom of layer	=	107.400000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1750. psf
Undrained cohesion at bottom of layer	=	1750. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer = 107.400000 ft
Distance from top of pile to bottom of layer = 126.400000 ft
Effective unit weight at top of layer = 77.600000 pcf
Effective unit weight at bottom of layer = 77.600000 pcf
Undrained cohesion at top of layer = 4400. psf
Undrained cohesion at bottom of layer = 4400. psf
Epsilon-50 at top of layer = 0.004000
Epsilon-50 at bottom of layer = 0.004000

(Depth of the lowest soil layer extends 68.400 ft below the pile tip)

Summary of Input Soil Properties

Layer	Soil Type	Layer	Effective	Cohesion	Angle of	E50	
Num.	Name	Depth	Unit Wt.		Friction	or	kpy
	(p-y Curve Type)	ft	pcf	psf	deg.	krm	pci
1	Sand	22.0000	59.6000		33.0000		60.0000
	(Reese, et al.)	24.4000	59.6000		33.0000		60.0000
2	Sand	24.4000	62.6000		32.0000		60.0000
	(Reese, et al.)	37.4000	62.6000		32.0000		60.0000
3	Stiff Clay	37.4000	57.6000	2300.		0.00500	
	w/o Free Water	57.4000	57.6000	2300.		0.00500	
4	Stiff Clay	57.4000	55.6000	1600.		0.00700	
	w/o Free Water	68.2000	55.6000	1600.		0.00700	
5	Stiff Clay	68.2000	57.6000	1750.		0.00700	
	w/o Free Water	107.4000	57.6000	1750.		0.00700	
6	Stiff Clay	107.4000	77.6000	4400.		0.00400	
	w/o Free Water	126.4000	77.6000	4400.		0.00400	

Modification Factors for p-y Curves

Distribution of p-y modifiers with depth defined using 2 points

Point Depth X p-mult y-mult

No.	ft		
1	22.000	0.6500	1.0000
2	126.400	0.6500	1.0000

Static Loading Type

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

Distributed Lateral Loading for Individual Load Cases

Distributed lateral load intensity for Load Case 1 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	15.000
2	22.000	347.000

Distributed lateral load intensity for Load Case 2 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	23.000
2	22.000	521.000

Number of loads specified = 2

Load No.	Load Type		Condition 1		Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	1	V =	0.0000 lbs	M =	0.0000 in-lbs	0.0000000	Yes	Yes
2	1	V =	0.0000 lbs	M =	0.0000 in-lbs	0.000000	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 = 58.000000 ft
Shaft Diameter = 48.000000 in
Concrete Cover Thickness (to edge of long. rebar) = 4.000000 in
Number of Reinforcing Bars = 18 bars
Yield Stress of Reinforcing Bars = 60000. psi
Modulus of Elasticity of Reinforcing Bars = 29000000. psi
Gross Area of Shaft = 1810. sq. in.
Total Area of Reinforcing Steel = 22.860000 sq. in.

Area Ratio of Steel Reinforcement = 1.26 percent

Edge-to-Edge Bar Spacing = 5.455394 in

Maximum Concrete Aggregate Size = 0.750000 in

Ratio of Bar Spacing to Aggregate Size = 7.27

Offset of Center of Rebar Cage from Center of Pile = 0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 7446.371 kips
Tensile Load for Cracking of Concrete = -819.588 kips
Nominal Axial Tensile Capacity = -1371.600 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar	Bar Diam.	Bar Area	Χ	Υ
Number	inches	sq. in.	inches	inches
1	1.270000	1.270000	19.365000	0.00000
2	1.270000	1.270000	18.197148	6.623220
3	1.270000	1.270000	14.834451	12.447582
4	1.270000	1.270000	9.682500	16.770582
5	1.270000	1.270000	3.362697	19.070802
6	1.270000	1.270000	-3.36270	19.070802
7	1.270000	1.270000	-9.68250	16.770582
8	1.270000	1.270000	-14.83445	12.447582
9	1.270000	1.270000	-18.19715	6.623220
10	1.270000	1.270000	-19.36500	0.00000
11	1.270000	1.270000	-18.19715	-6.62322
12	1.270000	1.270000	-14.83445	-12.44758
13	1.270000	1.270000	-9.68250	-16.77058
14	1.270000	1.270000	-3.36270	-19.07080
15	1.270000	1.270000	3.362697	-19.07080
16	1.270000	1.270000	9.682500	-16.77058
17	1.270000	1.270000	14.834451	-12.44758
18	1.270000	1.270000	18.197148	-6.62322

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

Minimum spacing between any two bars not equal to zero = 5.455 inches between bars 12 and 13.

Ratio of bar spacing to maximum aggregate size = 7.27

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 = 1

Number	Axial Thrust Force
	kips
1	0.000

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 = 0.000 kips

Bending Bending Depth to Max Comp Max Tens Max Conc Max Steel Run

Curvature	Moment	Stiffness	N Axis	Strain	Strain	Stress		Msg
rad/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi	
6.25000E-07	755.2795930	1208447349.	24.0000600	0.00001500	-0.00001500	0.0627337	0.3610511	
0.00000125	1507.	1205512303.	24.0000602	0.00003000	-0.00001300	0.1249715	0.7221022	
0.00000188	2255.	1202577256.	24.0000604	0.00004500	-0.00004500	0.1867135	1.0831533	
0.00000250	2999.	1199642210.	24.0000607	0.00006000	-0.00006000	0.2479596	1.4442044	
0.00000313	3740.	1196707164.	24.0000609	0.00007500	-0.00007500	0.3087099	1.8052555	
0.00000375	4477.	1193772117.	24.0000611	0.00009000	-0.00009000	0.3689644	2.1663067	
0.00000438	5210.	1190837071.	24.0000614	0.0001050	-0.000105	0.4287231	2.5273578	
0.00000500	5210.	1041982437.	12.3594431	0.00006180	-0.000178	0.2528759	-4.576275	C
0.00000563	5210.	926206611.	12.3636647	0.00006955	-0.000200	0.2840021	-5.147619	C
0.00000625	5210.	833585950.	12.3678964	0.00007730	-0.000223	0.3150202	-5.718809	C
0.00000688	5210.	757805409.	12.3721382	0.00008506	-0.000245	0.3459300	-6.289844	C
0.00000750	5210.	694654958.	12.3763903	0.00009282	-0.000267	0.3767314	-6.860722	C
0.00000813	5210.	641219961.	12.3806525	0.0001006	-0.000289	0.4074242	-7.431443	C
0.00000875	5210.	595418536.	12.3849250	0.0001084	-0.000312	0.4380081	-8.002007	C
0.00000938	5210.	555723966.	12.3892079	0.0001161	-0.000334	0.4684829	-8.572414	C
0.00001000	5210.	520991219.	12.3935011	0.0001239	-0.000356	0.4988485	-9.142661	C
0.00001063	5210.	490344676.	12.3978048	0.0001317	-0.000378	0.5291046	-9.712750	C
0.00001125	5210.	463103305.	12.4021189	0.0001395	-0.000400	0.5592511	-10.282680	
0.00001188	5210.	438729447.	12.4064435	0.0001473	-0.000423	0.5892877	-10.852449	C
0.00001250	5210.	416792975.	12.4107788	0.0001551	-0.000445	0.6192143	-11.422058	
0.00001313	5210.	396945690.	12.4151246	0.0001629	-0.000467	0.6490306	-11.991505	
0.00001375	5210.	378902704.	12.4194812	0.0001708	-0.000489	0.6787363	-12.560790	
0.00001438	5210.	362428674.	12.4238484	0.0001786	-0.000511	0.7083314	-13.129913	
0.00001500	5210.	347327479.	12.4282265	0.0001864	-0.000534	0.7378156	-13.698872	
0.00001563	5210.	333434380.	12.4326154	0.0001943	-0.000556	0.7671887	-14.267668	
0.00001625	5210.	320609981.	12.4370151	0.0002021	-0.000578	0.7964504	-14.836300	
0.00001688	5210.	308735537.	12.4414259	0.0002099	-0.000600	0.8256006	-15.404766	
0.00001750	5210.	297709268.	12.4459755	0.0002178	-0.000622	0.8546390	-15.973068	
0.00001813	5210.	287443431.	12.4504119	0.0002257	-0.000644	0.8835655	-16.541202	
0.00001875	5210.	277861983.	12.4548593	0.0002335	-0.000666	0.9123798	-17.109170	
0.00001938	5210.	268898693.	12.4593178	0.0002414	-0.000689	0.9410816	-17.676971	
0.00002000	5351.	267537781.	12.4637875	0.0002493	-0.000711	0.9696709	-18.244603	
0.00002063	5516.	267456086.	12.4682684	0.0002572	-0.000733	0.9981473	-18.812067	
0.00002125	5682.	267374213.	12.4727606	0.0002650	-0.000755	1.0265106	-19.379361	
0.00002188	5847.	267292164.	12.4772641	0.0002729	-0.000777	1.0547606	-19.946486	
0.00002250	6012.	267209935.	12.4817791	0.0002808	-0.000799	1.0828971	-20.513439	
0.00002313	6177.	267127528.	12.4863054	0.0002887	-0.000821	1.1109198	-21.080222	
0.00002375	6342.	267044940.	12.4908433	0.0002967	-0.000843	1.1388286	-21.646832	
0.00002438	6507.	266962172.	12.4953928	0.0003046	-0.000865	1.1666232	-22.213269	
0.00002563	6837.	266796088.	12.5045266	0.0003204	-0.000910	1.2218688	-23.345624	C

0.00002688	7166.	266629270.	12.5137075	0.0003363	-0.000954	1.2766549	-24.477279 C
0.00002813	7494.	266461718.	12.5228555	0.0003522	-0.000998	1.3309795	-25.608230 C
0.00002938	7822.	266293408.	12.5321302	0.0003681	-0.001042	1.3848407	-26.738472 C
0.00003063	8150.	266124343.	12.5414536	0.0003841	-0.001086	1.4382367	-27.867997 C
0.00003188	8477.	265954513.	12.5508260	0.0004001	-0.001130	1.4911655	-28.996801 C
0.00003313	8804.	265783906.	12.5603347	0.0004161	-0.001174	1.5436251	-30.124879 C
0.00003438	9130.	265612526.	12.5698083	0.0004321	-0.001218	1.5956136	-31.252222 C
0.00003563	9456.	265440359.	12.5793326	0.0004481	-0.001262	1.6471290	-32.378827 C
0.00003688	9782.	265267397.	12.5889081	0.0004642	-0.001306	1.6981691	-33.504686 C
0.00003813	10107.	265093631.	12.5985354	0.0004803	-0.001350	1.7487320	-34.629794 C
0.00003938	10431.	264919054.	12.6082150	0.0004964	-0.001394	1.7988156	-35.754145 C
0.00004063	10755.	264743656.	12.6179475	0.0005126	-0.001437	1.8484178	-36.877731 C
0.00004188	11079.	264567431.	12.6277336	0.0005288	-0.001481	1.8975364	-38.000546 C
0.00004313	11402.	264390368.	12.6375737	0.0005450	-0.001525	1.9461693	-39.122584 C
0.00004438	11724.	264212459.	12.6474686	0.0005612	-0.001569	1.9943143	-40.243839 C
0.00004563	12047.	264033695.	12.6574189	0.0005775	-0.001613	2.0419692	-41.364303 C
0.00004688	12368.	263854066.	12.6674252	0.0005938	-0.001656	2.0891318	-42.483969 C
0.00004813	12689.	263673565.	12.6774880	0.0006101	-0.001700	2.1357997	-43.602831 C
0.00004938	13010.	263492180.	12.6876082	0.0006265	-0.001744	2.1819707	-44.720881 C
0.00005063	13330.	263309903.	12.6977863	0.0006428	-0.001787	2.2276425	-45.838112 C
0.00005188	13650.	263126724.	12.7080231	0.0006592	-0.001831	2.2728126	-46.954518 C
0.00005313	13969.	262942633.	12.7182535	0.0006757	-0.001874	2.3174788	-48.070089 C
0.00005438	14287.	262757949.	12.7282105	0.0006921	-0.001918	2.3615850	-49.185392 C
0.00005563	14606.	262572436.	12.7381882	0.0007086	-0.001961	2.4051701	-50.299994 C
0.00005688	14923.	262386024.	12.7482224	0.0007251	-0.002005	2.4482421	-51.413779 C
0.00005813	15240.	262198702.	12.7583136	0.0007416	-0.002048	2.4907985	-52.526740 C
0.00005938	15557.	262010460.	12.7684625	0.0007581	-0.002092	2.5328368	-53.638870 C
0.00006063	15873.	261821289.	12.7786700	0.0007747	-0.002135	2.5743545	-54.750161 C
0.00006188	16188.	261631179.	12.7889365	0.0007913	-0.002179	2.6153491	-55.860606 C
0.00006313	16503.	261440118.	12.7992629	0.0008080	-0.002222	2.6558182	-56.970197 C
0.00006438	16818.	261248097.	12.8096498	0.0008246	-0.002265	2.6957590	-58.078926 C
0.00006563	17132.	261055104.	12.8200981	0.0008413	-0.002309	2.7351690	-59.186785 C
0.00006688	17445.	260859310.	12.8305785	0.0008580	-0.002352	2.7740407	-60.000000 CY
0.00006813	17744.	260469464.	12.8379883	0.0008746	-0.002395	2.8118686	-60.000000 CY
0.00006938	18004.	259519872.	12.8358817	0.0008905	-0.002440	2.8476592	-60.000000 CY
0.00007063	18237.	258218927.	12.8277030	0.0009060	-0.002484	2.8819310	-60.000000 CY
0.00007188	18464.	256893916.	12.8190619	0.0009214	-0.002529	2.9155627	-60.000000 CY
0.00007313	18688.	255562410.	12.8102230	0.0009367	-0.002573	2.9485999	-60.000000 CY
0.00007438	18883.	253882540.	12.7948407	0.0009516	-0.002618	2.9800401	-60.000000 CY
0.00007938	19489.	245531048.	12.6999095	0.0010081	-0.002802	3.0949056	-60.000000 CY
0.00008438	20079.	237972612.	12.6137774	0.0010643	-0.002986	3.2025274	-60.000000 CY
0.00008938	20535.	229757769.	12.5067018	0.0011178	-0.003172	3.2984899	-60.000000 CY
0.00009438	20875.	221192930.	12.3854525	0.0011689	-0.003361	3.3843083	-60.000000 CY

0.00009938	21213.	213463106.	12.2789138	0.0012202	-0.003550	3.4649133	-60.000000 CY
0.0001044	21547.	206438435.	12.1819528	0.0012715	-0.003739	3.5397641	-60.000000 CY
0.0001094	21877.	200014059.	12.0938399	0.0013228	-0.003927	3.6089859	-60.000000 CY
0.0001144	22111.	193323562.	11.9889836	0.0013712	-0.004119	3.6691787	-60.000000 CY
0.0001194	22280.	186638116.	11.8767045	0.0014178	-0.004312	3.7221526	-60.000000 CY
0.0001244	22445.	180460838.	11.7744527	0.0014644	-0.004506	3.7706548	-60.000000 CY
0.0001294	22606.	174731793.	11.6754626	0.0015105	-0.004699	3.8141365	-60.000000 CY
0.0001344	22765.	169413804.	11.5876449	0.0015571	-0.004893	3.8531402	-60.000000 CY
0.0001394	22922.	164464948.	11.5062603	0.0016037	-0.005086	3.8877142	-60.000000 CY
0.0001444	23078.	159846639.	11.4320892	0.0016505	-0.005279	3.9177934	-60.000000 CY
0.0001494	23232.	155525385.	11.3644427	0.0016976	-0.005472	3.9433102	-60.000000 CY
0.0001544	23383.	151470862.	11.3026584	0.0017448	-0.005665	3.9641908	-60.000000 CY
0.0001594	23525.	147608799.	11.2414352	0.0017916	-0.005858	3.9801384	-60.000000 CY
0.0001644	23630.	143755609.	11.1715110	0.0018363	-0.006054	3.9910141	-60.000000 CY
0.0001694	23698.	139912418.	11.0942320	0.0018791	-0.006251	3.9974275	-60.000000 CY
0.0001744	23759.	136253145.	11.0194080	0.0019215	-0.006448	3.9999541	-60.000000 CY
0.0001794	23819.	132787836.	10.9523905	0.0019646	-0.006645	3.9970947	-60.000000 CY
0.0001844	23877.	129504191.	10.8889215	0.0020076	-0.006842	3.9998545	-60.000000 CY
0.0001894	23934.	126386076.	10.8301201	0.0020510	-0.007039	3.9955991	-60.000000 CY
0.0001944	23989.	123417861.	10.7733170	0.0020941	-0.007236	3.9992714	-60.000000 CY
0.0001994	24042.	120587584.	10.7180361	0.0021369	-0.007433	3.9964296	-60.000000 CY
0.0002044	24094.	117889587.	10.6663147	0.0021799	-0.007630	3.9972314	-60.000000 CY
0.0002094	24144.	115316514.	10.6185260	0.0022233	-0.007827	3.9997550	-60.000000 CY
0.0002144	24194.	112857897.	10.5731389	0.0022666	-0.008023	3.9936231	-60.000000 CY
0.0002194	24242.	110506832.	10.5320291	0.0023105	-0.008220	3.9972283	-60.000000 CY
0.0002244	24290.	108257343.	10.4921637	0.0023542	-0.008416	3.9996909	-60.000000 CY
0.0002294	24337.	106101361.	10.4555841	0.0023982	-0.008612	3.9947602	-60.000000 CY
0.0002344	24383.	104033325.	10.4223230	0.0024427	-0.008807	3.9956382	-60.000000 CY
0.0002394	24428.	102049130.	10.3903162	0.0024872	-0.009003	3.9989169	-60.000000 CY
0.0002444	24473.	100143552.	10.3602475	0.0025318	-0.009198	3.9998856	-60.000000 CY
0.0002494	24516.	98309533.	10.3324227	0.0025766	-0.009393	3.9913590	-60.000000 CY
0.0002544	24558.	96544033.	10.3048268	0.0026213	-0.009589	3.9961354	-60.000000 CY
0.0002594	24600.	94843373.	10.2776120	0.0026658	-0.009784	3.9990040	-60.000000 CY
0.0002644	24641.	93205224.	10.2519624	0.0027104	-0.009980	3.9999994	-60.000000 CY
0.0002694	24679.	91615398.	10.2269853	0.0027549	-0.010175	3.9911670	-60.000000 CY
0.0002744	24714.	90075033.	10.2021085	0.0027992	-0.010371	3.9937170	-60.000000 CY
0.0003044	24845.	81626799.	10.0410468	0.0030562	-0.011554	3.9942059	-60.000000 CYT
0.0003344	24899.	74464324.	9.8856466	0.0033055	-0.012744	3.9874878	-60.000000 CYT
0.0003644	24943.	68454816.	9.7516667	0.0035533	-0.013937	3.9982927	-60.000000 CYT
0.0003944	24981.	63343749.	9.6380868	0.0038010	-0.015129	3.9941136	60.0000000 CYT

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.	Max. Tens.
No.	kips	in-kip	Strain	Strain
1	0.000	24816.532	0.00300000	-0.01129491

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	0.0000	24817.	0.0000	16131.	261665936.
1	0.75	0.0000	24817.	0.0000	18612.	256012307.
1	0.90	0.0000	24817.	0.0000	22335.	184579402.

Layering Correction Equivalent Depths of Soil & Rock Layers

Top of Equivalent Layer Top Depth Same Layer Layer is F0

Layer No.	Below Pile Head ft	Below Grnd Surf ft	Type As Layer Above	Rock or is Below Rock Layer	Integral for Layer lbs	Integral for Layer lbs
1	22.0000	0.00	N.A.	No	0.00	7082.
2	24.4000	2.4677	Yes	No	7082.	303908.
3	37.4000	9.1476	No	No	310989.	1084139.
4	57.4000	36.5473	Yes	No	1395129.	34481.
5	68.2000	46.2000	No	No	1429609.	0.00
6	107.4000	85.4000	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 = 0.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X	Deflect.	Bending Moment	Shear Force	Slope	Total Stress	Bending Stiffness	Soil Res. p	Soil Spr. Es*H	Distrib. Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	2.3450	-1.77E-04	0.00	-0.00612	0.00	1.21E+12	0.00	0.00	17.1882
0.5800	2.3024	416.3113	142.4744	-0.00612	0.00	1.21E+12	0.00	0.00	23.7527
1.1600	2.2598	1983.	338.2528	-0.00612	0.00	1.21E+12	0.00	0.00	32.5055
1.7400	2.2172	5125.	594.9503	-0.00612	0.00	1.21E+12	0.00	0.00	41.2582
2.3200	2.1746	10265.	912.5667	-0.00612	0.00	1.21E+12	0.00	0.00	50.0109
2.9000	2.1319	17828.	1291.	-0.00612	0.00	1.21E+12	0.00	0.00	58.7636
3.4800	2.0893	28237.	1731.	-0.00612	0.00	1.21E+12	0.00	0.00	67.5164
4.0600	2.0467	41917.	2231.	-0.00612	0.00	1.21E+12	0.00	0.00	76.2691

4.6400	2.0041	59292.	2792.	-0.00612	0.00	1.21E+12	0.00	0.00	85.0218
5.2200	1.9615	80785.	3414.	-0.00612	0.00	1.21E+12	0.00	0.00	93.7745
5.8000	1.9189	106821.	4098.	-0.00612	0.00	1.21E+12	0.00	0.00	102.5273
6.3800	1.8763	137823.	4842.	-0.00612	0.00	1.21E+12	0.00	0.00	111.2800
6.9600	1.8337	174216.	5647.	-0.00612	0.00	1.21E+12	0.00	0.00	120.0327
7.5400	1.7911	216423.	6512.	-0.00612	0.00	1.21E+12	0.00	0.00	128.7855
8.1200	1.7485	264869.	7439.	-0.00612	0.00	1.21E+12	0.00	0.00	137.5382
8.7000	1.7059	319978.	8427.	-0.00612	0.00	1.21E+12	0.00	0.00	146.2909
9.2800	1.6633	382173.	9476.	-0.00611	0.00	1.21E+12	0.00	0.00	155.0436
9.8600	1.6208	451879.	10585.	-0.00611	0.00	1.21E+12	0.00	0.00	163.7964
10.4400	1.5783	529519.	11756.	-0.00611	0.00	1.21E+12	0.00	0.00	172.5491
11.0200	1.5358	615518.	12987.	-0.00611	0.00	1.21E+12	0.00	0.00	181.3018
11.6000	1.4933	710300.	14279.	-0.00610	0.00	1.21E+12	0.00	0.00	190.0545
12.1800	1.4508	814288.	15633.	-0.00610	0.00	1.21E+12	0.00	0.00	198.8073
12.7600	1.4084	927906.	17047.	-0.00609	0.00	1.21E+12	0.00	0.00	207.5600
13.3400	1.3660	1051579.	18522.	-0.00609	0.00	1.21E+12	0.00	0.00	216.3127
13.9200	1.3237	1185731.	20058.	-0.00608	0.00	1.21E+12	0.00	0.00	225.0655
14.5000	1.2814	1330785.	21655.	-0.00607	0.00	1.21E+12	0.00	0.00	233.8182
15.0800	1.2391	1487166.	23313.	-0.00606	0.00	1.21E+12	0.00	0.00	242.5709
15.6600	1.1970	1655297.	25031.	-0.00606	0.00	1.20E+12	0.00	0.00	251.3236
16.2400	1.1548	1835602.	26811.	-0.00605	0.00	1.20E+12	0.00	0.00	260.0764
16.8200	1.1128	2028507.	28652.	-0.00603	0.00	1.20E+12	0.00	0.00	268.8291
17.4000	1.0708	2234433.	30553.	-0.00602	0.00	1.20E+12	0.00	0.00	277.5818
17.9800	1.0290	2453807.	32516.	-0.00601	0.00	1.20E+12	0.00	0.00	286.3345
18.5600	0.9872	2687050.	34539.	-0.00599	0.00	1.20E+12	0.00	0.00	295.0873
19.1400	0.9456	2934588.	36623.	-0.00598	0.00	1.20E+12	0.00	0.00	303.8400
19.7200	0.9040	3196845.	38768.	-0.00596	0.00	1.20E+12	0.00	0.00	312.5927
20.3000	0.8626	3474244.	40974.	-0.00594	0.00	1.20E+12	0.00	0.00	321.3455
20.8800	0.8213	3767210.	43242.	-0.00592	0.00	1.20E+12	0.00	0.00	330.0982
21.4600	0.7802	4076166.	45569.	-0.00590	0.00	1.20E+12	0.00	0.00	338.8509
22.0400	0.7392	4401537.	47255.	-0.00587	0.00	1.19E+12	-3.372	31.7451	148.7559
22.6200	0.6985	4733950.	47569.	-0.00584	0.00	1.19E+12	-54.988	547.9410	0.00
23.2000	0.6579	5063700.	46994.	-0.00582	0.00	1.19E+12	-110.370	1168.	0.00
23.7800	0.6175	5388103.	46026.	-0.00573	0.00	2.68E+11	-167.577	1889.	0.00
24.3600	0.5781	5704388.	44659.	-0.00559	0.00	2.67E+11	-225.493	2715.	0.00
24.9400	0.5397	6009751.	42918.	-0.00543	0.00	2.67E+11	-274.607	3541.	0.00
25.5200	0.5025	6301810.	40821.	-0.00527	0.00	2.67E+11	-328.079	4545.	0.00
26.1000	0.4663	6577977.	38363.	-0.00511	0.00	2.67E+11	-378.129	5644.	0.00
26.6800	0.4314	6835827.	35570.	-0.00493	0.00	2.67E+11	-424.644	6851.	0.00
27.2600	0.3977	7073107.	32472.	-0.00475	0.00	2.67E+11	-465.551	8148.	0.00
27.8400	0.3653	7287834.	29112.	-0.00456	0.00	2.67E+11	-499.828	9524.	0.00
28.4200	0.3342	7478349.	25522.	-0.00437	0.00	2.66E+11	-531.848	11077.	0.00
29.0000	0.3044	7643101.	21730.	-0.00417	0.00	2.66E+11	-557.797	12753.	0.00

29.5800	0.2761	7780831.	17784.	-0.00397	0.00	2.66E+11	-576.071	14522.	0.00
30.1600	0.2492	7890656.	13731.	-0.00377	0.00	2.66E+11	-588.764	16447.	0.00
30.7400	0.2237	7971961.	9601.	-0.00356	0.00	2.66E+11	-597.860	18604.	0.00
31.3200	0.1996	8024304.	5435.	-0.00335	0.00	2.66E+11	-599.249	20893.	0.00
31.9000	0.1770	8047618.	1287.	-0.00314	0.00	2.66E+11	-592.689	23300.	0.00
32.4800	0.1559	8042222.	-2794.	-0.00293	0.00	2.66E+11	-580.152	25896.	0.00
33.0600	0.1363	8008722.	-6759.	-0.00272	0.00	2.66E+11	-559.096	28555.	0.00
33.6400	0.1181	7948139.	-10547.	-0.00251	0.00	2.66E+11	-529.482	31210.	0.00
34.2200	0.1013	7861907.	-14122.	-0.00230	0.00	2.66E+11	-497.871	34198.	0.00
34.8000	0.08601	7751557.	-17474.	-0.00210	0.00	2.66E+11	-465.263	37650.	0.00
35.3800	0.07210	7618669.	-20576.	-0.00190	0.00	2.66E+11	-426.119	41135.	0.00
35.9600	0.05957	7465139.	-23386.	-0.00170	0.00	2.66E+11	-381.386	44557.	0.00
36.5400	0.04841	7293134.	-25860.	-0.00151	0.00	2.67E+11	-329.398	47361.	0.00
37.1200	0.03857	7105173.	-27956.	-0.00132	0.00	2.67E+11	-272.896	49250.	0.00
37.7000	0.03001	6903992.	-30724.	-0.00114	0.00	2.67E+11	-522.720	121212.	0.00
38.2800	0.02272	6677490.	-34274.	-9.61E-04	0.00	2.67E+11	-497.170	152319.	0.00
38.8600	0.01663	6426904.	-37635.	-7.91E-04	0.00	2.67E+11	-468.779	196166.	0.00
39.4400	0.01171	6153609.	-40789.	-6.27E-04	0.00	2.67E+11	-437.576	260009.	0.00
40.0200	0.00791	5859118.	-43718.	-4.70E-04	0.00	2.67E+11	-404.043	355521.	0.00
40.6000	0.00517	5545054.	-46411.	-3.22E-04	0.00	2.67E+11	-369.891	498100.	0.00
41.1800	0.00343	5213073.	-48881.	-2.23E-04	0.00	6.80E+11	-339.860	689324.	0.00
41.7600	0.00207	4864627.	-51124.	-1.82E-04	0.00	1.19E+12	-304.631	1026305.	0.00
42.3400	8.98E-04	4501425.	-53017.	-1.55E-04	0.00	1.19E+12	-239.344	1855153.	0.00
42.9200	-8.73E-05	4126629.	-53768.	-1.30E-04	0.00	1.20E+12	23.6686	1886688.	0.00
43.5000	-9.05E-04	3752979.	-52817.	-1.07E-04	0.00	1.20E+12	249.5062	1918218.	0.00
44.0800	-0.00157	3391416.	-50890.	-8.58E-05	0.00	1.20E+12	304.2000	1347387.	0.00
44.6600	-0.00210	3044589.	-48675.	-6.72E-05	0.00	1.20E+12	332.3664	1101409.	0.00
45.2400	-0.00251	2713862.	-46290.	-5.05E-05	0.00	1.20E+12	352.9015	980032.	0.00
45.8200	-0.00280	2400230.	-43779.	-3.56E-05	0.00	1.20E+12	368.5839	915314.	0.00
46.4000	-0.00300	2104453.	-41172.	-2.26E-05	0.00	1.20E+12	380.7598	882655.	0.00
46.9800	-0.00312	1827121.	-38489.	-1.12E-05	0.00	1.20E+12	390.1864	871147.	0.00
47.5600	-0.00316	1568689.	-35748.	-1.43E-06	0.00	1.21E+12	397.3289	875451.	0.00
48.1400	-0.00314	1329506.	-32965.	6.94E-06	0.00	1.21E+12	402.4892	892926.	0.00
48.7200	-0.00306	1109819.	-30152.	1.40E-05	0.00	1.21E+12	405.8673	922474.	0.00
49.3000	-0.00294	909793.	-27321.	1.98E-05	0.00	1.21E+12	407.5940	964038.	0.00
49.8800	-0.00279	729512.	-24484.	2.45E-05	0.00	1.21E+12	407.7486	1018413.	0.00
50.4600	-0.00260	568982.	-21650.	2.83E-05	0.00	1.21E+12	406.3665	1087261.	0.00
51.0400	-0.00239	428138.	-18832.	3.11E-05	0.00	1.21E+12	403.4402	1173298.	0.00
51.6200	-0.00217	306837.	-16040.	3.33E-05	0.00	1.21E+12	398.9150	1280690.	0.00
52.2000	-0.00193	204860.	-13285.	3.47E-05	0.00	1.21E+12	392.6770	1415815.	0.00
52.7800	-0.00168	121905.	-10581.	3.57E-05	0.00	1.21E+12	384.5296	1588726.	0.00
53.3600	-0.00143	57577.	-7940.	3.62E-05	0.00	1.21E+12	374.1491	1816077.	0.00
53.9400	-0.00118	11374.	-5382.	3.64E-05	0.00	1.21E+12	360.9987	2127617.	0.00

54.5200	-9.27E-04	-17342.	-2959.	3.64E-05	0.00	1.21E+12	335.3727	2516686.	0.00
55.1000	-6.75E-04	-29812.	-931.993	3.62E-05	0.00	1.21E+12	247.0352	2548165.	0.00
55.6800	-4.23E-04	-30315.	473.5427	3.61E-05	0.00	1.21E+12	156.8544	2579642.	0.00
56.2600	-1.73E-04	-23220.	1245.	3.59E-05	0.00	1.21E+12	64.8542	2611118.	0.00
56.8400	7.65E-05	-12984.	1370.	3.58E-05	0.00	1.21E+12	-29.057	2642593.	0.00
57.4200	3.25E-04	-4155.	932.7450	3.57E-05	0.00	1.21E+12	-96.494	2063875.	0.00
58.0000	5.74E-04	0.00	0.00	3.57E-05	0.00	1.21E+12	-171.536	1039754.	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 = 2.34503465 inches

Computed slope at pile head = -0.0061236 radians

Maximum bending moment = 8047618. inch-lbs

Maximum shear force = -53768. lbs

Depth of maximum bending moment = 31.90000000 feet below pile head

Depth of maximum shear force = 42.92000000 feet below pile head

Number of iterations = 113

Number of zero deflection points = 2

Pile deflection at ground = 0.74207016 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 0. lbs

Pile Pile Head Maximum Maximum Length Deflection Moment Shear

feet	inches	ln-lbs	lbs
58.00000	2.34503465	8047618.	-53768.
55.10000	2.34937561	8048875.	-53761.
52.20000	2.40253166	8020855.	-59137.
49.30000	2.62008837	7906678.	-66998.
46.40000	3.58984878	7648663.	-72548.

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

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
Χ	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	4.5909	9.08E-04	1.59E-06	-0.01174	0.00	1.21E+12	0.00	0.00	26.2823
0.5800	4.5091	636.5774	217.1915	-0.01174	0.00	1.21E+12	0.00	0.00	36.1291
1.1600	4.4274	3023.	514.3393	-0.01174	0.00	1.21E+12	0.00	0.00	49.2582
1.7400	4.3457	7796.	902.8654	-0.01174	0.00	1.21E+12	0.00	0.00	62.3873
2.3200	4.2640	15591.	1383.	-0.01174	0.00	1.21E+12	0.00	0.00	75.5164
2.9000	4.1823	27044.	1954.	-0.01174	0.00	1.21E+12	0.00	0.00	88.6455
3.4800	4.1005	42792.	2617.	-0.01174	0.00	1.21E+12	0.00	0.00	101.7745
4.0600	4.0188	63469.	3371.	-0.01174	0.00	1.21E+12	0.00	0.00	114.9036
4.6400	3.9371	89713.	4216.	-0.01174	0.00	1.21E+12	0.00	0.00	128.0327
5.2200	3.8554	122158.	5153.	-0.01174	0.00	1.21E+12	0.00	0.00	141.1618
5.8000	3.7737	161442.	6181.	-0.01174	0.00	1.21E+12	0.00	0.00	154.2909
6.3800	3.6920	208200.	7301.	-0.01174	0.00	1.21E+12	0.00	0.00	167.4200
6.9600	3.6103	263068.	8512.	-0.01174	0.00	1.21E+12	0.00	0.00	180.5491
7.5400	3.5286	326682.	9814.	-0.01174	0.00	1.21E+12	0.00	0.00	193.6782
8.1200	3.4469	399678.	11208.	-0.01173	0.00	1.21E+12	0.00	0.00	206.8073
8.7000	3.3653	482692.	12693.	-0.01173	0.00	1.21E+12	0.00	0.00	219.9364
9.2800	3.2836	576360.	14269.	-0.01173	0.00	1.21E+12	0.00	0.00	233.0655
9.8600	3.2020	681318.	15937.	-0.01172	0.00	1.21E+12	0.00	0.00	246.1945
10.4400	3.1204	798203.	17696.	-0.01172	0.00	1.21E+12	0.00	0.00	259.3236

11.0200	3.0389	927649.	19547.	-0.01171	0.00	1.21E+12	0.00	0.00	272.4527
11.6000	2.9574	1070294.	21489.	-0.01171	0.00	1.21E+12	0.00	0.00	285.5818
12.1800	2.8759	1226772.	23522.	-0.01170	0.00	1.21E+12	0.00	0.00	298.7109
12.7600	2.7945	1397721.	25647.	-0.01169	0.00	1.21E+12	0.00	0.00	311.8400
13.3400	2.7131	1583775.	27863.	-0.01169	0.00	1.21E+12	0.00	0.00	324.9691
13.9200	2.6318	1785572.	30170.	-0.01168	0.00	1.20E+12	0.00	0.00	338.0982
14.5000	2.5506	2003746.	32569.	-0.01167	0.00	1.20E+12	0.00	0.00	351.2273
15.0800	2.4694	2238935.	35059.	-0.01165	0.00	1.20E+12	0.00	0.00	364.3564
15.6600	2.3884	2491774.	37641.	-0.01164	0.00	1.20E+12	0.00	0.00	377.4855
16.2400	2.3074	2762898.	40314.	-0.01162	0.00	1.20E+12	0.00	0.00	390.6145
16.8200	2.2266	3052945.	43078.	-0.01161	0.00	1.20E+12	0.00	0.00	403.7436
17.4000	2.1458	3362549.	45934.	-0.01159	0.00	1.20E+12	0.00	0.00	416.8727
17.9800	2.0653	3692348.	48881.	-0.01157	0.00	1.20E+12	0.00	0.00	430.0018
18.5600	1.9848	4042976.	51920.	-0.01155	0.00	1.20E+12	0.00	0.00	443.1309
19.1400	1.9045	4415071.	55050.	-0.01152	0.00	1.19E+12	0.00	0.00	456.2600
19.7200	1.8244	4809267.	58271.	-0.01149	0.00	1.19E+12	0.00	0.00	469.3891
20.3000	1.7445	5226202.	61584.	-0.01141	0.00	2.69E+11	0.00	0.00	482.5182
20.8800	1.6656	5666510.	64988.	-0.01127	0.00	2.67E+11	0.00	0.00	495.6473
21.4600	1.5877	6130829.	68483.	-0.01112	0.00	2.67E+11	0.00	0.00	508.7764
22.0400	1.5108	6619793.	71016.	-0.01095	0.00	2.67E+11	-4.231	19.4927	223.3493
22.6200	1.4352	7119372.	71538.	-0.01077	0.00	2.67E+11	-69.008	334.6500	0.00
23.2000	1.3609	7615607.	70816.	-0.01058	0.00	2.66E+11	-138.670	709.2013	0.00
23.7800	1.2880	8105126.	69599.	-0.01037	0.00	2.66E+11	-211.086	1141.	0.00
24.3600	1.2165	8584419.	67875.	-0.01016	0.00	2.66E+11	-284.293	1627.	0.00
24.9400	1.1466	9049940.	65680.	-0.00992	0.00	2.66E+11	-346.383	2103.	0.00
25.5200	1.0783	9498683.	63032.	-0.00968	0.00	2.65E+11	-414.395	2675.	0.00
26.1000	1.0118	9927351.	59924.	-0.00943	0.00	2.65E+11	-478.770	3293.	0.00
26.6800	0.9471	1.03E+07	56381.	-0.00916	0.00	2.65E+11	-539.385	3964.	0.00
27.2600	0.8843	1.07E+07	52436.	-0.00888	0.00	2.65E+11	-594.156	4676.	0.00
27.8400	0.8234	1.11E+07	48134.	-0.00860	0.00	2.65E+11	-642.065	5427.	0.00
28.4200	0.7646	1.14E+07	43502.	-0.00830	0.00	2.64E+11	-688.934	6271.	0.00
29.0000	0.7079	1.17E+07	38567.	-0.00800	0.00	2.64E+11	-729.398	7172.	0.00
29.5800	0.6533	1.19E+07	33379.	-0.00769	0.00	2.64E+11	-761.304	8111.	0.00
30.1600	0.6008	1.21E+07	27992.	-0.00737	0.00	2.64E+11	-786.654	9112.	0.00
30.7400	0.5506	1.23E+07	22445.	-0.00705	0.00	2.64E+11	-807.416	10205.	0.00
31.3200	0.5027	1.24E+07	16784.	-0.00672	0.00	2.64E+11	-819.092	11340.	0.00
31.9000	0.4571	1.25E+07	11076.	-0.00639	0.00	2.64E+11	-821.218	12505.	0.00
32.4800	0.4137	1.26E+07	5360.	-0.00606	0.00	2.64E+11	-821.199	13815.	0.00
33.0600	0.3727	1.26E+07	-320.685	-0.00573	0.00	2.64E+11	-811.316	15151.	0.00
33.6400	0.3340	1.26E+07	-5896.	-0.00540	0.00	2.64E+11	-790.737	16479.	0.00
34.2200	0.2976	1.25E+07	-11323.	-0.00506	0.00	2.64E+11	-768.821	17982.	0.00
34.8000	0.2635	1.24E+07	-16597.	-0.00473	0.00	2.64E+11	-746.641	19723.	0.00
35.3800	0.2317	1.23E+07	-21683.	-0.00441	0.00	2.64E+11	-714.817	21475.	0.00

35.9600	0.2021	1.21E+07	-26514.	-0.00409	0.00	2.64E+11	-673.586	23196.	0.00
36.5400	0.1748	1.19E+07	-31028.	-0.00377	0.00	2.64E+11	-623.499	24828.	0.00
37.1200	0.1496	1.17E+07	-35166.	-0.00346	0.00	2.64E+11	-565.469	26300.	0.00
37.7000	0.1267	1.14E+07	-39741.	-0.00315	0.00	2.64E+11	-749.171	41169.	0.00
38.2800	0.1058	1.12E+07	-44889.	-0.00286	0.00	2.65E+11	-730.271	48059.	0.00
38.8600	0.08690	1.08E+07	-49897.	-0.00257	0.00	2.65E+11	-708.728	56761.	0.00
39.4400	0.07003	1.05E+07	-54744.	-0.00229	0.00	2.65E+11	-684.222	68001.	0.00
40.0200	0.05507	1.01E+07	-59409.	-0.00202	0.00	2.65E+11	-656.303	82948.	0.00
40.6000	0.04195	9628975.	-63866.	-0.00176	0.00	2.65E+11	-624.316	103593.	0.00
41.1800	0.03058	9169346.	-68082.	-0.00151	0.00	2.66E+11	-587.227	133655.	0.00
41.7600	0.02089	8681270.	-72016.	-0.00128	0.00	2.66E+11	-543.238	181028.	0.00
42.3400	0.01277	8166880.	-75607.	-0.00106	0.00	2.66E+11	-488.718	266274.	0.00
42.9200	0.00615	7628815.	-78749.	-8.52E-04	0.00	2.66E+11	-414.001	468579.	0.00
43.5000	9.12E-04	7070695.	-81064.	-6.60E-04	0.00	2.67E+11	-251.234	1918218.	0.00
44.0800	-0.00304	6500405.	-80690.	-4.83E-04	0.00	2.67E+11	358.8014	820981.	0.00
44.6600	-0.00582	5947496.	-77949.	-3.21E-04	0.00	2.67E+11	428.7322	513094.	0.00
45.2400	-0.00751	5415355.	-74841.	-1.73E-04	0.00	2.68E+11	464.3242	430237.	0.00
45.8200	-0.00823	4905707.	-71546.	-8.84E-05	0.00	1.19E+12	482.4387	408162.	0.00
46.4000	-0.00874	4419429.	-68137.	-6.12E-05	0.00	1.19E+12	497.3788	395977.	0.00
46.9800	-0.00908	3957245.	-64632.	-3.68E-05	0.00	1.20E+12	509.7176	390761.	0.00
47.5600	-0.00925	3519752.	-61049.	-1.51E-05	0.00	1.20E+12	519.8289	390928.	0.00
48.1400	-0.00929	3107441.	-57403.	4.17E-06	0.00	1.20E+12	527.9653	395605.	0.00
48.7200	-0.00920	2720705.	-53706.	2.11E-05	0.00	1.20E+12	534.2997	404347.	0.00
49.3000	-0.00900	2359852.	-49971.	3.58E-05	0.00	1.20E+12	538.9485	417004.	0.00
49.8800	-0.00870	2025106.	-46210.	4.85E-05	0.00	1.20E+12	541.9856	433656.	0.00
50.4600	-0.00832	1716614.	-42432.	5.93E-05	0.00	1.20E+12	543.4490	454591.	0.00
51.0400	-0.00787	1434449.	-38650.	6.84E-05	0.00	1.21E+12	543.3445	480321.	0.00
51.6200	-0.00737	1178603.	-34874.	7.59E-05	0.00	1.21E+12	541.6454	511627.	0.00
52.2000	-0.00682	948996.	-31116.	8.21E-05	0.00	1.21E+12	538.2883	549647.	0.00
52.7800	-0.00623	745465.	-27388.	8.70E-05	0.00	1.21E+12	533.1658	596032.	0.00
53.3600	-0.00561	567761.	-23701.	9.07E-05	0.00	1.21E+12	526.1121	653213.	0.00
53.9400	-0.00496	415542.	-20072.	9.36E-05	0.00	1.21E+12	516.8789	724886.	0.00
54.5200	-0.00430	288362.	-16515.	9.56E-05	0.00	1.21E+12	505.0942	816931.	0.00
55.1000	-0.00363	185650.	-13052.	9.70E-05	0.00	1.21E+12	490.1868	939315.	0.00
55.6800	-0.00295	106683.	-9706.	9.78E-05	0.00	1.21E+12	471.2370	1110467.	0.00
56.2600	-0.00227	50543.	-6512.	9.83E-05	0.00	1.21E+12	446.6426	1369026.	0.00
56.8400	-0.00159	16040.	-3519.	9.84E-05	0.00	1.21E+12	413.2258	1813614.	0.00
57.4200	-9.00E-04	1554.	-1152.	9.85E-05	0.00	1.21E+12	266.9671	2063875.	0.00
58.0000	-2.15E-04	0.00	0.00	9.85E-05	0.00	1.21E+12	64.1511	1039754.	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 = 4.59086545 inches
Computed slope at pile head = -0.0117418 radians
Maximum bending moment = 12616952. inch-lbs
Maximum shear force = -81064. lbs

Depth of maximum bending moment = 33.06000000 feet below pile head Depth of maximum shear force = 43.50000000 feet below pile head

Number of iterations = 481 Number of zero deflection points = 2

Pile deflection at ground = 1.51613339 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 0. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
58.00000	4.59086545	12616952.	-81064.
55.10000	4.61196101	12600705.	-84801.
52.20000	4.97358285	12422878.	-94250.
49.30000	6.21837637	12024170.	-101816.
46.40000	10.98556535	11788669.	-112172.

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

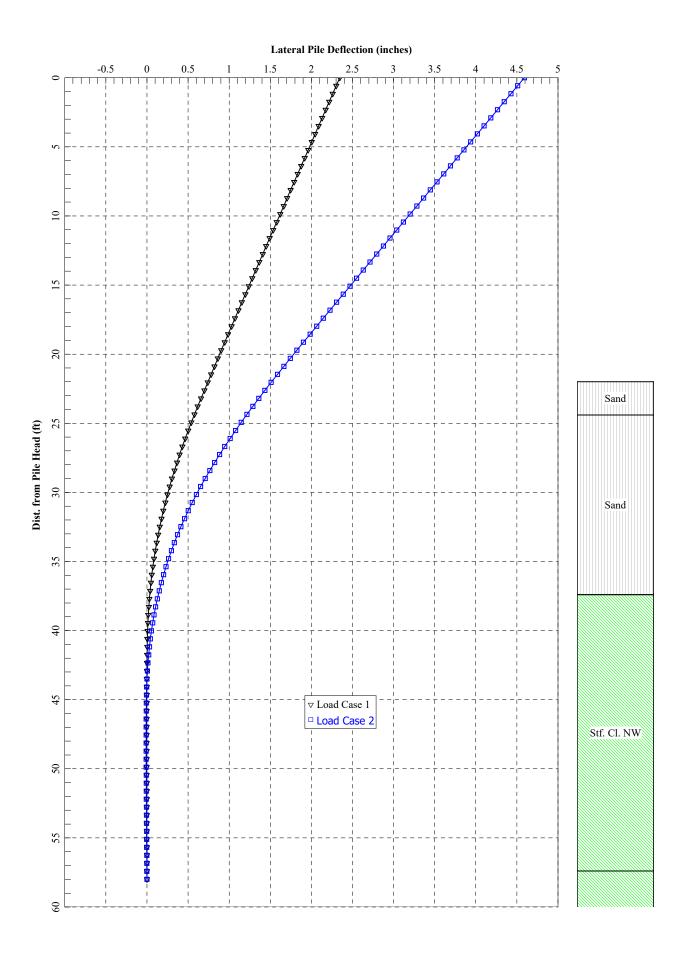
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Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians
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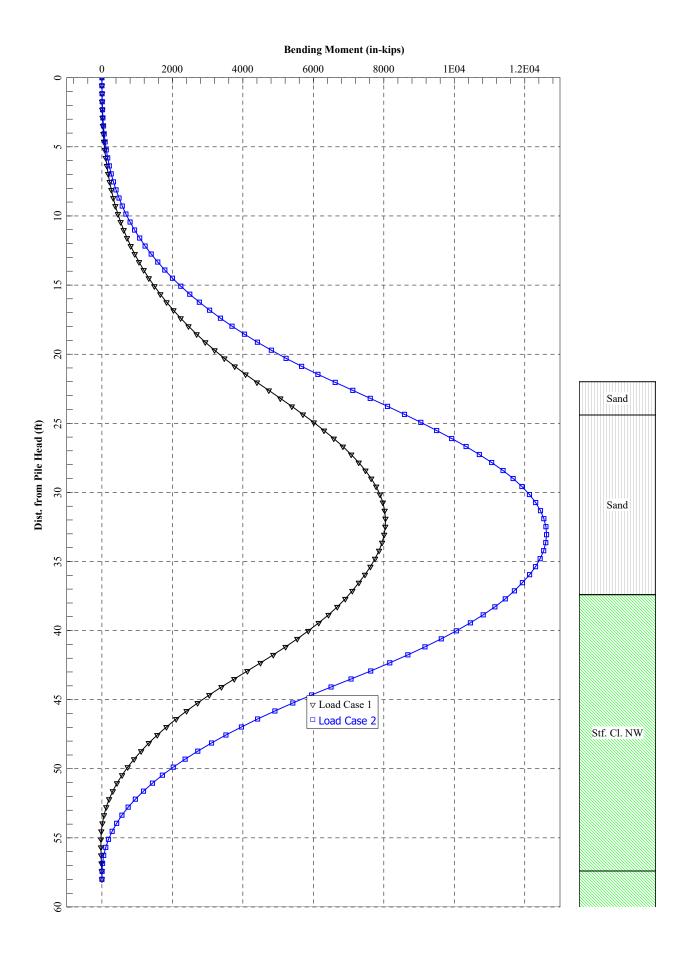
Load Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	lbs	inches	radians	lbs	in-lbs
1 V, lb	0.00	M, in-lb	0.00	0.00	2.3450	-0.00612	-53768.	8047618.
2 V, 1b	0.00	M, in-lb	0.00	0.00	4.5909	-0.01174	-81064.	1.26E+07

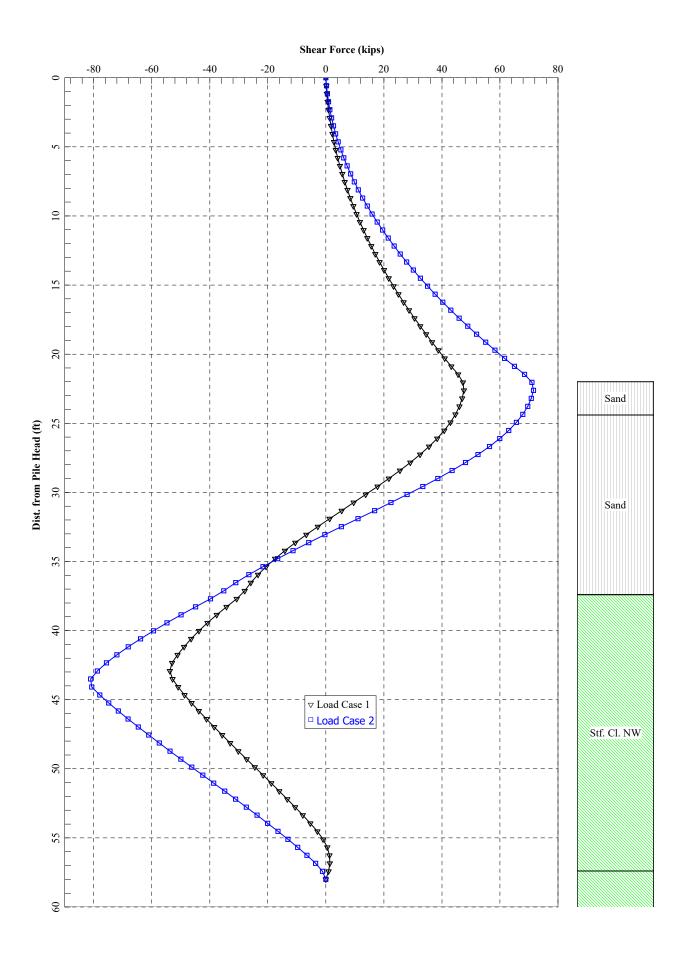
Maximum pile-head deflection = 4.5908654481 inches

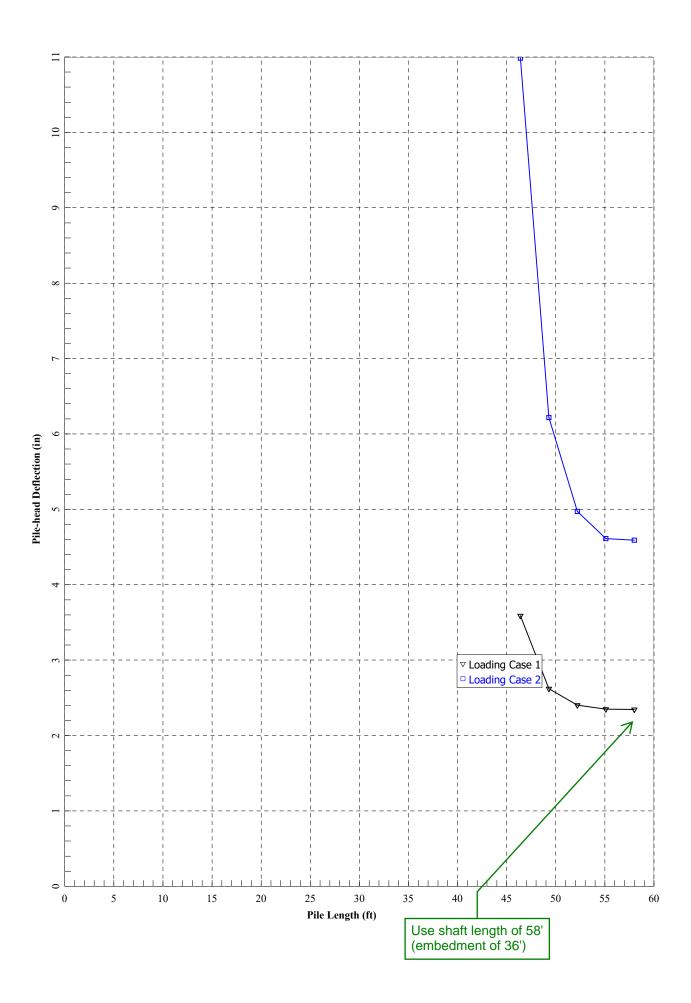
Maximum pile-head rotation = -0.0117417931 radians = -0.672755 deg.

The analysis ended normally.









Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Section outside Abutment/Wingwalls, 17' height, 2H:1V skewed backslope, (free-head)

Geometry

Horiz. Distance
from C/L (ft)

Start of Wall Backfill = 23.3 at Outside Edge of Shoulder
Wall = 73.3 at C/L of Wall

Horizontal distances measured perpendicular to wall

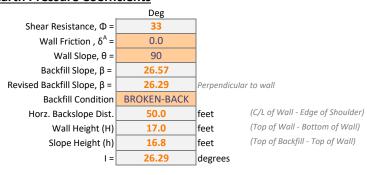
Backfill Slope Angle = 2.0 H:1V

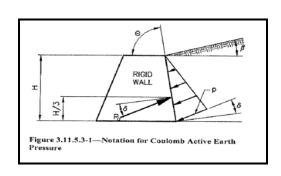
Maximum backfill slope perpendicular to roadway C/L

Wall Loading Profile

_	Top Elev.	Thickness (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	_
Item 203	706.5	3.7	250	28	125	A-6a/A-6b per GDM
Medium Dense Granular	702.8	13.3	0	33	122	
Bottom of Wall	689.5					•
Weighted Value		17.0	55	32	125	

Earth Pressure Coefficients





Active Earth Coefficient

At-Rest Earth Coefficient

 $K_o = (1-Sin(\phi))*(1+Sin(\beta))$ $K_o = 0.659$

Notes:

A. Wall friction neglected

B. Figure and Equation for Active Earth Pressure from AASHTO 3.11.5.3 (LRFD Design Manual).

C. The wall backfill will consist of proposed fill and granular overburden. Using the soil layer thicknesses and respective soil parameters as provided by SME, a weighted average was determined and assumed for the entire backfill (c' = 55 psf and $\phi' = 32^\circ$. The parameters were converted to equivalent soil strength parameters c' = 0 psf and $\phi' = 33^\circ$ for computing earth pressures based on a 1 degree increase in friction angle for every 50 psf decrease in cohesion up to 150 psf (Ref: Hall's Thesis).

	Soil Lateral Design Profile								
	Top Elev	Depth (ft)	ε50	k					
Medium Dense Granular	689.5	17.0	0	33	59.6	N/A	60		
Medium Dense Silt	687.6	18.9	0	32	62.6	N/A	60		
Medium Stiff to Stiff Silt	674.6	31.9	2300	0	57.6	0.005	N/A		
Stiff Cohesive	654.6	51.9	1600	0	55.6	0.007	N/A		
Stiff to Very Stiff Silt	643.8	62.7	1750	0	57.6	0.007	N/A		
Hard Silt	604.6	101.9	4400	0	77.6	0.004	N/A		
Bedrock	585.6	120.9	N/A	N/A	N/A	N/A	N/A		

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)



(Active or At-Rest)

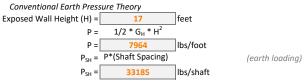
3) Determine Equivalent Fluid Weight (G_H)

G _H =	$(\gamma_m) * (K_a)$	Soil loading only, does not include hydrostatic pressures
G _H =	55	For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust



6) Resolve horizontal earth force to distributed triangular load (for LPILE)

w =	2*P _{SH} /H	
w =	3904	lbs/foot per shaft (Earth - Service Limit)
w =	325	lbs/inch per shaft (Earth - Service Limit)
γ _E =	1.5	Earth Load Factor
w =	$(2*P_{SH}/H)*\gamma_E$	_
w =	488	lbs/inch per shaft (Earth - Strength Limit)

7) Determine live-load traffic surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)

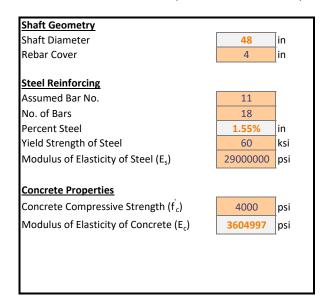
w =	P _S /H	
w =	0	lbs/foot per shaft (surcharge - unfactored)
w =	0	lbs/inch per shaft (surcharge - unfactored)
$\gamma_S =$	1.75	Surcharge Load Factor - Strength I
w =	$(P_S/L)*\gamma_S$	
w =	0	lbs/inch per shaft (Surcharge - Strength I)

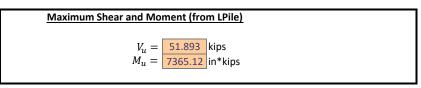
Distributed Lateral Loads for LPILE

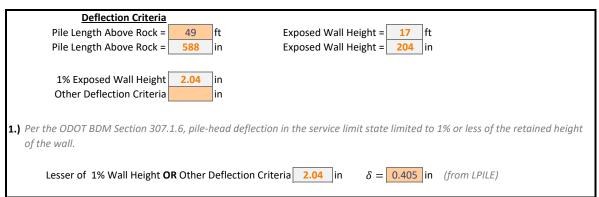
CONVENTIONAL					
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)			
0	0	0			
17.0	325	488			

Shear, Moment, and Deflection Results

Maximum Shear and Moment output from LPile service case provided to HDR's structural engineers for capacity checks. Final reinforcing layout to be confirmed in structural analyses.







LPile for Version 2022-12.012

License ID : 202613844 License Type : (Network 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:

HDR

LPILE Global, Global License

This model was prepared by: abaratta

Files Used for Analysis

Path to file locations: \pwworking\east01\d4381065\

Name of input data file:

3. Rear Abt. B-003 17' Height 4' Shaft Skewed 2H1V Backslope.lp12d

Name of output report file:

3. Rear Abt. B-003 17' Height 4' Shaft Skewed 2H1V Backslope.lp12o

Name of plot output file:

3. Rear Abt. B-003 17' Height 4' Shaft Skewed 2H1V Backslope.lp12p

Name of runtime message file:

3. Rear Abt. B-003 17' Height 4' Shaft Skewed 2H1V Backslope.lp12r

Load Case 1 = Service Case Load Case 2 = Strength Case

Date and Time of Analysis							
Date and Time of Analysis							
Date: July 10, 2025 Time: 13:47:41							
Problem Title							
Project Name: CUY-17-13.50							
Job Number:							
Client:							
Engineer: HDR							
Description: Rear Abt., 17' Ht., 4' Dia., Wall Only							
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
- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- Analysis includes loading by multiple distributed lateral loads acting on pile
- 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 = 49.000 ft
Depth of ground surface below top of pile = 17.0000 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.

Depth Below

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	48.0000
2	49.000	48.0000

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 = 49.000000 ft

Shaft Diameter = 48.000000 in

Soil and Rock Layering Information

The soil profile is modelled using 6 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 17.000000 ft

Distance from top of pile to bottom of layer = 18.900000 ft

Effective unit weight at top of layer = 59.600000 pcf

Effective unit weight at bottom of layer = 59.600000 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

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 18.900000 ft

Distance from top of pile to bottom of layer = 31.900000 ft

Effective unit weight at top of layer = 62.600000 pcf

Effective unit weight at bottom of layer = 62.600000 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

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer	=	31.900000 ft
Distance from top of pile to bottom of layer	=	51.900000 ft
Effective unit weight at top of layer	=	57.600000 pcf
·		•
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	2300. psf
Undrained cohesion at bottom of layer	=	2300. 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	=	51.900000 ft
Distance from top of pile to bottom of layer	=	62.700000 ft
Effective unit weight at top of layer	=	55.600000 pcf
Effective unit weight at bottom of layer	=	55.600000 pcf
Undrained cohesion at top of layer	=	1600. psf
Undrained cohesion at bottom of layer	=	1600. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	62.700000 ft
Distance from top of pile to bottom of layer	=	101.900000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1750. psf
Undrained cohesion at bottom of layer	=	1750. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer = 101.900000 ft
Distance from top of pile to bottom of layer = 120.900000 ft
Effective unit weight at top of layer = 77.600000 pcf
Effective unit weight at bottom of layer = 77.600000 pcf
Undrained cohesion at top of layer = 4400. psf
Undrained cohesion at bottom of layer = 4400. psf
Epsilon-50 at top of layer = 0.004000
Epsilon-50 at bottom of layer = 0.004000

(Depth of the lowest soil layer extends 71.900 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
	(
1	Sand	17.0000	59.6000		33.0000		60.0000
	(Reese, et al.)	18.9000	59.6000		33.0000		60.0000
2	Sand	18.9000	62.6000		32.0000		60.0000
	(Reese, et al.)	31.9000	62.6000		32.0000		60.0000
3	Stiff Clay	31.9000	57.6000	2300.		0.00500	
	w/o Free Water	51.9000	57.6000	2300.		0.00500	
4	Stiff Clay	51.9000	55.6000	1600.		0.00700	
	w/o Free Water	62.7000	55.6000	1600.		0.00700	
5	Stiff Clay	62.7000	57.6000	1750.		0.00700	
	w/o Free Water	101.9000	57.6000	1750.		0.00700	
6	Stiff Clay	101.9000	77.6000	4400.		0.00400	
	w/o Free Water	120.9000	77.6000	4400.		0.00400	

Modification Factors for p-y Curves

Distribution of p-y modifiers with depth defined using 2 points

Point Depth X p-mult y-mult

No.	ft		
1	17.000	0.6500	1.0000
2	120.900	0.6500	1.0000

Static Loading Type

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

Distributed Lateral Loading for Individual Load Cases

Distributed lateral load intensity for Load Case 1 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	0.000
2	17.000	325.000

Distributed lateral load intensity for Load Case 2 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	0.000
2	17.000	488.000

Number of loads specified = 2

Load No.	Load Type		Condition 1		Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	1	V =	0.0000 lbs	M =	0.0000 in-lbs	0.0000000	Yes	Yes
2	1	V =	0.0000 lbs	M =	0.0000 in-lbs	0.000000	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 = 49.000000 ft
Shaft Diameter = 48.000000 in
Concrete Cover Thickness (to edge of long. rebar) = 4.000000 in
Number of Reinforcing Bars = 18 bars
Yield Stress of Reinforcing Bars = 60000. psi
Modulus of Elasticity of Reinforcing Bars = 29000000. psi
Gross Area of Shaft = 1810. sq. in.
Total Area of Reinforcing Steel = 22.860000 sq. in.

Area Ratio of Steel Reinforcement = 1.26 percent

Edge-to-Edge Bar Spacing = 5.455394 in

Maximum Concrete Aggregate Size = 0.750000 in

Ratio of Bar Spacing to Aggregate Size = 7.27

Offset of Center of Rebar Cage from Center of Pile = 0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 7446.371 kips
Tensile Load for Cracking of Concrete = -819.588 kips
Nominal Axial Tensile Capacity = -1371.600 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar	Bar Diam.	Bar Area	Χ	Υ
Number	inches	sq. in.	inches	inches
1	1.270000	1.270000	19.365000	0.00000
2	1.270000	1.270000	18.197148	6.623220
3	1.270000	1.270000	14.834451	12.447582
4	1.270000	1.270000	9.682500	16.770582
5	1.270000	1.270000	3.362697	19.070802
6	1.270000	1.270000	-3.36270	19.070802
7	1.270000	1.270000	-9.68250	16.770582
8	1.270000	1.270000	-14.83445	12.447582
9	1.270000	1.270000	-18.19715	6.623220
10	1.270000	1.270000	-19.36500	0.00000
11	1.270000	1.270000	-18.19715	-6.62322
12	1.270000	1.270000	-14.83445	-12.44758
13	1.270000	1.270000	-9.68250	-16.77058
14	1.270000	1.270000	-3.36270	-19.07080
1 5	1.270000	1.270000	3.362697	-19.07080
16	1.270000	1.270000	9.682500	-16.77058
17	1.270000	1.270000	14.834451	-12.44758
18	1.270000	1.270000	18.197148	-6.62322

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

Minimum spacing between any two bars not equal to zero = 5.455 inches between bars 12 and 13.

Ratio of bar spacing to maximum aggregate size = 7.27

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 = 1

Number	Axial Thrust Force
	kips
1	0.000

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 = 0.000 kips

Bending Bending Depth to Max Comp Max Tens Max Conc Max Steel Run

Curvature	Moment	Stiffness	N Axis	Strain	Strain	Stress		Msg
rad/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi	
6.25000E-07	755.2795930	1208447349.	24.0000600	0.00001500	-0.00001500	0.0627337	0.3610511	
0.00000125	1507.	1205512303.	24.0000602	0.00003000	-0.00001300	0.1249715	0.7221022	
0.00000188	2255.	1202577256.	24.0000604	0.00004500	-0.00004500	0.1867135	1.0831533	
0.00000250	2999.	1199642210.	24.0000607	0.00006000	-0.00006000	0.2479596	1.4442044	
0.00000313	3740.	1196707164.	24.0000609	0.00007500	-0.00007500	0.3087099	1.8052555	
0.00000375	4477.	1193772117.	24.0000611	0.00009000	-0.00009000	0.3689644	2.1663067	
0.00000438	5210.	1190837071.	24.0000614	0.0001050	-0.000105	0.4287231	2.5273578	
0.00000500	5210.	1041982437.	12.3594431	0.00006180	-0.000178	0.2528759	-4.576275	C
0.00000563	5210.	926206611.	12.3636647	0.00006955	-0.000200	0.2840021	-5.147619	C
0.00000625	5210.	833585950.	12.3678964	0.00007730	-0.000223	0.3150202	-5.718809	C
0.00000688	5210.	757805409.	12.3721382	0.00008506	-0.000245	0.3459300	-6.289844	C
0.00000750	5210.	694654958.	12.3763903	0.00009282	-0.000267	0.3767314	-6.860722	C
0.00000813	5210.	641219961.	12.3806525	0.0001006	-0.000289	0.4074242	-7.431443	C
0.00000875	5210.	595418536.	12.3849250	0.0001084	-0.000312	0.4380081	-8.002007	C
0.00000938	5210.	555723966.	12.3892079	0.0001161	-0.000334	0.4684829	-8.572414	C
0.00001000	5210.	520991219.	12.3935011	0.0001239	-0.000356	0.4988485	-9.142661	C
0.00001063	5210.	490344676.	12.3978048	0.0001317	-0.000378	0.5291046	-9.712750	C
0.00001125	5210.	463103305.	12.4021189	0.0001395	-0.000400	0.5592511	-10.282680	
0.00001188	5210.	438729447.	12.4064435	0.0001473	-0.000423	0.5892877	-10.852449	C
0.00001250	5210.	416792975.	12.4107788	0.0001551	-0.000445	0.6192143	-11.422058	
0.00001313	5210.	396945690.	12.4151246	0.0001629	-0.000467	0.6490306	-11.991505	
0.00001375	5210.	378902704.	12.4194812	0.0001708	-0.000489	0.6787363	-12.560790	
0.00001438	5210.	362428674.	12.4238484	0.0001786	-0.000511	0.7083314	-13.129913	
0.00001500	5210.	347327479.	12.4282265	0.0001864	-0.000534	0.7378156	-13.698872	
0.00001563	5210.	333434380.	12.4326154	0.0001943	-0.000556	0.7671887	-14.267668	
0.00001625	5210.	320609981.	12.4370151	0.0002021	-0.000578	0.7964504	-14.836300	
0.00001688	5210.	308735537.	12.4414259	0.0002099	-0.000600	0.8256006	-15.404766	
0.00001750	5210.	297709268.	12.4459755	0.0002178	-0.000622	0.8546390	-15.973068	
0.00001813	5210.	287443431.	12.4504119	0.0002257	-0.000644	0.8835655	-16.541202	
0.00001875	5210.	277861983.	12.4548593	0.0002335	-0.000666	0.9123798	-17.109170	
0.00001938	5210.	268898693.	12.4593178	0.0002414	-0.000689	0.9410816	-17.676971	
0.00002000	5351.	267537781.	12.4637875	0.0002493	-0.000711	0.9696709	-18.244603	
0.00002063	5516.	267456086.	12.4682684	0.0002572	-0.000733	0.9981473	-18.812067	
0.00002125	5682.	267374213.	12.4727606	0.0002650	-0.000755	1.0265106	-19.379361	
0.00002188	5847.	267292164.	12.4772641	0.0002729	-0.000777	1.0547606	-19.946486	
0.00002250	6012.	267209935.	12.4817791	0.0002808	-0.000799	1.0828971	-20.513439	
0.00002313	6177.	267127528.	12.4863054	0.0002887	-0.000821	1.1109198	-21.080222	
0.00002375	6342.	267044940.	12.4908433	0.0002967	-0.000843	1.1388286	-21.646832	
0.00002438	6507.	266962172.	12.4953928	0.0003046	-0.000865	1.1666232	-22.213269	
0.00002563	6837.	266796088.	12.5045266	0.0003204	-0.000910	1.2218688	-23.345624	C

0.00002688	7166.	266629270.	12.5137075	0.0003363	-0.000954	1.2766549	-24.477279 C
0.00002813	7494.	266461718.	12.5228555	0.0003522	-0.000998	1.3309795	-25.608230 C
0.00002938	7822.	266293408.	12.5321302	0.0003681	-0.001042	1.3848407	-26.738472 C
0.00003063	8150.	266124343.	12.5414536	0.0003841	-0.001086	1.4382367	-27.867997 C
0.00003188	8477.	265954513.	12.5508260	0.0004001	-0.001130	1.4911655	-28.996801 C
0.00003313	8804.	265783906.	12.5603347	0.0004161	-0.001174	1.5436251	-30.124879 C
0.00003438	9130.	265612526.	12.5698083	0.0004321	-0.001218	1.5956136	-31.252222 C
0.00003563	9456.	265440359.	12.5793326	0.0004481	-0.001262	1.6471290	-32.378827 C
0.00003688	9782.	265267397.	12.5889081	0.0004642	-0.001306	1.6981691	-33.504686 C
0.00003813	10107.	265093631.	12.5985354	0.0004803	-0.001350	1.7487320	-34.629794 C
0.00003938	10431.	264919054.	12.6082150	0.0004964	-0.001394	1.7988156	-35.754145 C
0.00004063	10755.	264743656.	12.6179475	0.0005126	-0.001437	1.8484178	-36.877731 C
0.00004188	11079.	264567431.	12.6277336	0.0005288	-0.001481	1.8975364	-38.000546 C
0.00004313	11402.	264390368.	12.6375737	0.0005450	-0.001525	1.9461693	-39.122584 C
0.00004438	11724.	264212459.	12.6474686	0.0005612	-0.001569	1.9943143	-40.243839 C
0.00004563	12047.	264033695.	12.6574189	0.0005775	-0.001613	2.0419692	-41.364303 C
0.00004688	12368.	263854066.	12.6674252	0.0005938	-0.001656	2.0891318	-42.483969 C
0.00004813	12689.	263673565.	12.6774880	0.0006101	-0.001700	2.1357997	-43.602831 C
0.00004938	13010.	263492180.	12.6876082	0.0006265	-0.001744	2.1819707	-44.720881 C
0.00005063	13330.	263309903.	12.6977863	0.0006428	-0.001787	2.2276425	-45.838112 C
0.00005188	13650.	263126724.	12.7080231	0.0006592	-0.001831	2.2728126	-46.954518 C
0.00005313	13969.	262942633.	12.7182535	0.0006757	-0.001874	2.3174788	-48.070089 C
0.00005438	14287.	262757949.	12.7282105	0.0006921	-0.001918	2.3615850	-49.185392 C
0.00005563	14606.	262572436.	12.7381882	0.0007086	-0.001961	2.4051701	-50.299994 C
0.00005688	14923.	262386024.	12.7482224	0.0007251	-0.002005	2.4482421	-51.413779 C
0.00005813	15240.	262198702.	12.7583136	0.0007416	-0.002048	2.4907985	-52.526740 C
0.00005938	15557.	262010460.	12.7684625	0.0007581	-0.002092	2.5328368	-53.638870 C
0.00006063	15873.	261821289.	12.7786700	0.0007747	-0.002135	2.5743545	-54.750161 C
0.00006188	16188.	261631179.	12.7889365	0.0007913	-0.002179	2.6153491	-55.860606 C
0.00006313	16503.	261440118.	12.7992629	0.0008080	-0.002222	2.6558182	-56.970197 C
0.00006438	16818.	261248097.	12.8096498	0.0008246	-0.002265	2.6957590	-58.078926 C
0.00006563	17132.	261055104.	12.8200981	0.0008413	-0.002309	2.7351690	-59.186785 C
0.00006688	17445.	260859310.	12.8305785	0.0008580	-0.002352	2.7740407	-60.000000 CY
0.00006813	17744.	260469464.	12.8379883	0.0008746	-0.002395	2.8118686	-60.000000 CY
0.00006938	18004.	259519872.	12.8358817	0.0008905	-0.002440	2.8476592	-60.000000 CY
0.00007063	18237.	258218927.	12.8277030	0.0009060	-0.002484	2.8819310	-60.000000 CY
0.00007188	18464.	256893916.	12.8190619	0.0009214	-0.002529	2.9155627	-60.000000 CY
0.00007313	18688.	255562410.	12.8102230	0.0009367	-0.002573	2.9485999	-60.000000 CY
0.00007438	18883.	253882540.	12.7948407	0.0009516	-0.002618	2.9800401	-60.000000 CY
0.00007938	19489.	245531048.	12.6999095	0.0010081	-0.002802	3.0949056	-60.000000 CY
0.00008438	20079.	237972612.	12.6137774	0.0010643	-0.002986	3.2025274	-60.000000 CY
0.00008938	20535.	229757769.	12.5067018	0.0011178	-0.003172	3.2984899	-60.000000 CY
0.00009438	20875.	221192930.	12.3854525	0.0011689	-0.003361	3.3843083	-60.000000 CY

0.00009938	21213.	213463106.	12.2789138	0.0012202	-0.003550	3.4649133	-60.000000 CY
0.0001044	21547.	206438435.	12.1819528	0.0012715	-0.003739	3.5397641	-60.000000 CY
0.0001094	21877.	200014059.	12.0938399	0.0013228	-0.003927	3.6089859	-60.000000 CY
0.0001144	22111.	193323562.	11.9889836	0.0013712	-0.004119	3.6691787	-60.000000 CY
0.0001194	22280.	186638116.	11.8767045	0.0014178	-0.004312	3.7221526	-60.000000 CY
0.0001244	22445.	180460838.	11.7744527	0.0014644	-0.004506	3.7706548	-60.000000 CY
0.0001294	22606.	174731793.	11.6754626	0.0015105	-0.004699	3.8141365	-60.000000 CY
0.0001344	22765.	169413804.	11.5876449	0.0015571	-0.004893	3.8531402	-60.000000 CY
0.0001394	22922.	164464948.	11.5062603	0.0016037	-0.005086	3.8877142	-60.000000 CY
0.0001444	23078.	159846639.	11.4320892	0.0016505	-0.005279	3.9177934	-60.000000 CY
0.0001494	23232.	155525385.	11.3644427	0.0016976	-0.005472	3.9433102	-60.000000 CY
0.0001544	23383.	151470862.	11.3026584	0.0017448	-0.005665	3.9641908	-60.000000 CY
0.0001594	23525.	147608799.	11.2414352	0.0017916	-0.005858	3.9801384	-60.000000 CY
0.0001644	23630.	143755609.	11.1715110	0.0018363	-0.006054	3.9910141	-60.000000 CY
0.0001694	23698.	139912418.	11.0942320	0.0018791	-0.006251	3.9974275	-60.000000 CY
0.0001744	23759.	136253145.	11.0194080	0.0019215	-0.006448	3.9999541	-60.000000 CY
0.0001794	23819.	132787836.	10.9523905	0.0019646	-0.006645	3.9970947	-60.000000 CY
0.0001844	23877.	129504191.	10.8889215	0.0020076	-0.006842	3.9998545	-60.000000 CY
0.0001894	23934.	126386076.	10.8301201	0.0020510	-0.007039	3.9955991	-60.000000 CY
0.0001944	23989.	123417861.	10.7733170	0.0020941	-0.007236	3.9992714	-60.000000 CY
0.0001994	24042.	120587584.	10.7180361	0.0021369	-0.007433	3.9964296	-60.000000 CY
0.0002044	24094.	117889587.	10.6663147	0.0021799	-0.007630	3.9972314	-60.000000 CY
0.0002094	24144.	115316514.	10.6185260	0.0022233	-0.007827	3.9997550	-60.000000 CY
0.0002144	24194.	112857897.	10.5731389	0.0022666	-0.008023	3.9936231	-60.000000 CY
0.0002194	24242.	110506832.	10.5320291	0.0023105	-0.008220	3.9972283	-60.000000 CY
0.0002244	24290.	108257343.	10.4921637	0.0023542	-0.008416	3.9996909	-60.000000 CY
0.0002294	24337.	106101361.	10.4555841	0.0023982	-0.008612	3.9947602	-60.000000 CY
0.0002344	24383.	104033325.	10.4223230	0.0024427	-0.008807	3.9956382	-60.000000 CY
0.0002394	24428.	102049130.	10.3903162	0.0024872	-0.009003	3.9989169	-60.000000 CY
0.0002444	24473.	100143552.	10.3602475	0.0025318	-0.009198	3.9998856	-60.000000 CY
0.0002494	24516.	98309533.	10.3324227	0.0025766	-0.009393	3.9913590	-60.000000 CY
0.0002544	24558.	96544033.	10.3048268	0.0026213	-0.009589	3.9961354	-60.000000 CY
0.0002594	24600.	94843373.	10.2776120	0.0026658	-0.009784	3.9990040	-60.000000 CY
0.0002644	24641.	93205224.	10.2519624	0.0027104	-0.009980	3.9999994	-60.000000 CY
0.0002694	24679.	91615398.	10.2269853	0.0027549	-0.010175	3.9911670	-60.000000 CY
0.0002744	24714.	90075033.	10.2021085	0.0027992	-0.010371	3.9937170	-60.000000 CY
0.0003044	24845.	81626799.	10.0410468	0.0030562	-0.011554	3.9942059	-60.000000 CYT
0.0003344	24899.	74464324.	9.8856466	0.0033055	-0.012744	3.9874878	-60.000000 CYT
0.0003644	24943.	68454816.	9.7516667	0.0035533	-0.013937	3.9982927	-60.000000 CYT
0.0003944	24981.	63343749.	9.6380868	0.0038010	-0.015129	3.9941136	60.0000000 CYT

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.	Max. Tens.
No.	kips	in-kip	Strain	Strain
1	0.000	24816.532	0.00300000	-0.01129491

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	0.0000	24817.	0.0000	16131.	261665936.
1	0.75	0.0000	24817.	0.0000	18612.	256012307.
1	0.90	0.0000	24817.	0.0000	22335.	184579402.

Layering Correction Equivalent Depths of Soil & Rock Layers

Top of Equivalent Layer Top Depth Same Layer Layer is F0

Layer No.	Below Pile Head ft	Below Grnd Surf ft	Type As Layer Above	Rock or is Below Rock Layer	Integral for Layer lbs	Integral for Layer lbs
1	17.0000	0.00	N.A.	No	0.00	4331.
2	18.9000	1.9524	Yes	No	4331.	287322.
3	31.9000	8.6646	No	No	291653.	881702.
4	51.9000	34.9000	No	No	1173355.	0.00
5	62.7000	45.7000	No	No	0.00	0.00
6	101.9000	84.9000	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 = 0.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X	Deflect.	Bending Moment	Shear Force	Slope	Total Stress	Bending Stiffness	Soil Res.	Soil Spr. Es*H	Distrib.
	у			3			р		Lat. Load
feet 	inches	in-lbs 	lbs	radians	psi* 	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.4051	9.70E-06	-1.65E-07	-0.00118	0.00	1.21E+12	0.00	0.00	2.3419
0.4900	0.3981	40.4851	34.4261	-0.00118	0.00	1.21E+12	0.00	0.00	9.3676
0.9800	0.3911	404.8510	117.0487	-0.00118	0.00	1.21E+12	0.00	0.00	18.7353
1.4700	0.3842	1417.	254.7532	-0.00118	0.00	1.21E+12	0.00	0.00	28.1029
1.9600	0.3772	3401.	447.5393	-0.00118	0.00	1.21E+12	0.00	0.00	37.4706
2.4500	0.3703	6680.	695.4073	-0.00118	0.00	1.21E+12	0.00	0.00	46.8382
2.9400	0.3633	11579.	998.3570	-0.00118	0.00	1.21E+12	0.00	0.00	56.2059
3.4300	0.3564	18421.	1356.	-0.00118	0.00	1.21E+12	0.00	0.00	65.5735

3.9200	0.3494	27530.	1770.	-0.00118	0.00	1.21E+12	0.00	0.00	74.9412
4.4100	0.3425	39230.	2238.	-0.00118	0.00	1.21E+12	0.00	0.00	84.3088
4.9000	0.3355	53845.	2761.	-0.00118	0.00	1.21E+12	0.00	0.00	93.6765
5.3900	0.3286	71699.	3339.	-0.00118	0.00	1.21E+12	0.00	0.00	103.0441
5.8800	0.3216	93116.	3973.	-0.00118	0.00	1.21E+12	0.00	0.00	112.4118
6.3700	0.3147	118419.	4661.	-0.00118	0.00	1.21E+12	0.00	0.00	121.7794
6.8600	0.3077	147933.	5405.	-0.00118	0.00	1.21E+12	0.00	0.00	131.1471
7.3500	0.3008	181981.	6204.	-0.00118	0.00	1.21E+12	0.00	0.00	140.5147
7.8400	0.2939	220887.	7057.	-0.00118	0.00	1.21E+12	0.00	0.00	149.8824
8.3300	0.2869	264975.	7966.	-0.00118	0.00	1.21E+12	0.00	0.00	159.2500
8.8200	0.2800	314569.	8930.	-0.00118	0.00	1.21E+12	0.00	0.00	168.6176
9.3100	0.2731	369993.	9949.	-0.00117	0.00	1.21E+12	0.00	0.00	177.9853
9.8000	0.2662	431571.	11023.	-0.00117	0.00	1.21E+12	0.00	0.00	187.3529
10.2900	0.2593	499627.	12152.	-0.00117	0.00	1.21E+12	0.00	0.00	196.7206
10.7800	0.2525	574484.	13337.	-0.00117	0.00	1.21E+12	0.00	0.00	206.0882
11.2700	0.2456	656466.	14576.	-0.00116	0.00	1.21E+12	0.00	0.00	215.4559
11.7600	0.2388	745897.	15870.	-0.00116	0.00	1.21E+12	0.00	0.00	224.8235
12.2500	0.2320	843102.	17220.	-0.00116	0.00	1.21E+12	0.00	0.00	234.1912
12.7400	0.2252	948404.	18625.	-0.00115	0.00	1.21E+12	0.00	0.00	243.5588
13.2300	0.2184	1062127.	20084.	-0.00115	0.00	1.21E+12	0.00	0.00	252.9265
13.7200	0.2117	1184594.	21599.	-0.00114	0.00	1.21E+12	0.00	0.00	262.2941
14.2100	0.2050	1316130.	23169.	-0.00114	0.00	1.21E+12	0.00	0.00	271.6618
14.7000	0.1983	1457059.	24794.	-0.00113	0.00	1.21E+12	0.00	0.00	281.0294
15.1900	0.1917	1607704.	26474.	-0.00112	0.00	1.20E+12	0.00	0.00	290.3971
15.6800	0.1851	1768389.	28209.	-0.00111	0.00	1.20E+12	0.00	0.00	299.7647
16.1700	0.1786	1939439.	29999.	-0.00110	0.00	1.20E+12	0.00	0.00	309.1324
16.6600	0.1721	2121176.	31844.	-0.00109	0.00	1.20E+12	0.00	0.00	318.5000
17.1500	0.1657	2313926.	32940.	-0.00108	0.00	1.20E+12	-8.693	308.4406	62.8341
17.6400	0.1594	2508547.	32986.	-0.00107	0.00	1.20E+12	-38.423	1418.	0.00
18.1300	0.1531	2701840.	32669.	-0.00106	0.00	1.20E+12	-69.541	2671.	0.00
18.6200	0.1469	2892729.	32166.	-0.00105	0.00	1.20E+12	-101.214	4051.	0.00
19.1100	0.1408	3080118.	31489.	-0.00103	0.00	1.20E+12	-129.188	5394.	0.00
19.6000	0.1348	3263041.	30636.	-0.00102	0.00	1.20E+12	-161.004	7023.	0.00
20.0900	0.1289	3440397.	29615.	-9.99E-04	0.00	1.20E+12	-186.378	8503.	0.00
20.5800	0.1231	3611309.	28461.	-9.82E-04	0.00	1.20E+12	-206.175	9852.	0.00
21.0700	0.1173	3775092.	27197.	-9.63E-04	0.00	1.20E+12	-223.500	11200.	0.00
21.5600	0.1117	3931149.	25839.	-9.44E-04	0.00	1.20E+12	-238.435	12548.	0.00
22.0500	0.1062	4078961.	24400.	-9.25E-04	0.00	1.20E+12	-251.065	13897.	0.00
22.5400	0.1009	4218094.	22893.	-9.04E-04	0.00	1.19E+12	-261.480	15245.	0.00
23.0300	0.09559	4348185.	21331.	-8.83E-04	0.00	1.19E+12	-269.773	16594.	0.00
23.5200	0.09046	4468950.	19727.	-8.62E-04	0.00	1.19E+12	-276.039	17942.	0.00
24.0100	0.08546	4580170.	18091.	-8.39E-04	0.00	1.19E+12	-280.376	19290.	0.00
24.5000	0.08059	4681697.	16435.	-8.16E-04	0.00	1.19E+12	-282.885	20639.	0.00

24.9900	0.07586	4773443.	14769.	-7.93E-04	0.00	1.19E+12	-283.668	21987.	0.00
25.4800	0.07127	4855381.	13104.	-7.69E-04	0.00	1.19E+12	-282.830	23336.	0.00
25.9700	0.06681	4927541.	11447.	-7.45E-04	0.00	1.19E+12	-280.476	24684.	0.00
26.4600	0.06250	4990004.	9809.	-7.21E-04	0.00	1.19E+12	-276.712	26032.	0.00
26.9500	0.05834	5042899.	8197.	-6.96E-04	0.00	1.19E+12	-271.645	27381.	0.00
27.4400	0.05432	5086402.	6618.	-6.71E-04	0.00	1.19E+12	-265.382	28729.	0.00
27.9300	0.05044	5120730.	5079.	-6.46E-04	0.00	1.19E+12	-258.031	30078.	0.00
28.4200	0.04672	5146137.	3587.	-6.21E-04	0.00	1.19E+12	-249.698	31426.	0.00
28.9100	0.04315	5162911.	2146.	-5.95E-04	0.00	1.19E+12	-240.490	32774.	0.00
29.4000	0.03972	5171369.	760.8514	-5.70E-04	0.00	1.19E+12	-230.513	34123.	0.00
29.8900	0.03645	5171858.	-563.277	-5.44E-04	0.00	1.19E+12	-219.871	35471.	0.00
30.3800	0.03332	5164745.	-1823.	-5.19E-04	0.00	1.19E+12	-208.667	36820.	0.00
30.8700	0.03035	5150418.	-3016.	-4.93E-04	0.00	1.19E+12	-197.004	38168.	0.00
31.3600	0.02753	5129279.	-4139.	-4.68E-04	0.00	1.19E+12	-184.982	39516.	0.00
31.8500	0.02485	5101744.	-5190.	-4.42E-04	0.00	1.19E+12	-172.698	40865.	0.00
32.3400	0.02232	5068239.	-7109.	-4.17E-04	0.00	1.19E+12	-479.743	126373.	0.00
32.8300	0.01994	5018147.	-9913.	-3.92E-04	0.00	1.19E+12	-474.270	139845.	0.00
33.3200	0.01771	4951657.	-12684.	-3.68E-04	0.00	1.19E+12	-468.014	155419.	0.00
33.8100	0.01562	4868986.	-15415.	-3.44E-04	0.00	1.19E+12	-460.929	173565.	0.00
34.3000	0.01367	4770378.	-18102.	-3.20E-04	0.00	1.19E+12	-452.959	194902.	0.00
34.7900	0.01185	4656110.	-20739.	-2.97E-04	0.00	1.19E+12	-444.032	220263.	0.00
35.2800	0.01018	4526489.	-23320.	-2.74E-04	0.00	1.19E+12	-434.056	250789.	0.00
35.7700	0.00863	4381862.	-25840.	-2.52E-04	0.00	1.19E+12	-422.910	288106.	0.00
36.2600	0.00721	4222612.	-28290.	-2.31E-04	0.00	1.19E+12	-410.429	334603.	0.00
36.7500	0.00592	4049172.	-30662.	-2.11E-04	0.00	1.20E+12	-396.380	393970.	0.00
37.2400	0.00474	3862028.	-32946.	-1.91E-04	0.00	1.20E+12	-380.419	472257.	0.00
37.7300	0.00367	3661731.	-35128.	-1.73E-04	0.00	1.20E+12	-362.011	580206.	0.00
38.2200	0.00271	3448917.	-37193.	-1.55E-04	0.00	1.20E+12	-340.254	739155.	0.00
38.7100	0.00184	3224340.	-39115.	-1.39E-04	0.00	1.20E+12	-313.430	999295.	0.00
39.2000	0.00107	2988925.	-40852.	-1.24E-04	0.00	1.20E+12	-277.568	1518494.	0.00
39.6900	3.92E-04	2743914.	-41997.	-1.09E-04	0.00	1.20E+12	-111.584	1675891.	0.00
40.1800	-2.13E-04	2495046.	-42144.	-9.67E-05	0.00	1.20E+12	61.4603	1698385.	0.00
40.6700	-7.45E-04	2248302.	-41322.	-8.51E-05	0.00	1.20E+12	218.1140	1720876.	0.00
41.1600	-0.00121	2009099.	-39793.	-7.47E-05	0.00	1.20E+12	302.0169	1463888.	0.00
41.6500	-0.00162	1780338.	-37938.	-6.54E-05	0.00	1.20E+12	328.9803	1191701.	0.00
42.1400	-0.00198	1562952.	-35941.	-5.72E-05	0.00	1.21E+12	350.2176	1038871.	0.00
42.6300	-0.00230	1357674.		-5.01E-05	0.00	1.21E+12	367.8989	942020.	0.00
43.1200	-0.00257	1165116.	-31621.		0.00	1.21E+12	383.1560	876084.	0.00
43.6100	-0.00281	985805.	-29329.	-3.87E-05	0.00	1.21E+12	396.6697	829019.	0.00
44.1000	-0.00303	820209.	-26960.	-3.43E-05	0.00	1.21E+12	408.8909	794259.	0.00
44.5900	-0.00322	668750.	-24523.	-3.07E-05	0.00	1.21E+12	420.1397	767879.	0.00
45.0800	-0.00339	531817.	-22022.	-2.78E-05	0.00	1.21E+12	430.6543	747373.	0.00
45.5700	-0.00354	409774.	-19460.	-2.55E-05	0.00	1.21E+12	440.6187	731054.	0.00
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46.0600	-0.00369	302965.	-16841.	-2.38E-05	0.00	1.21E+12	450.1785	717740.	0.00
46.5500	-0.00382	211721.	-14167.	-2.25E-05	0.00	1.21E+12	459.4498	706583.	0.00
47.0400	-0.00395	136362.	-11439.	-2.17E-05	0.00	1.21E+12	468.5256	696965.	0.00
47.5300	-0.00408	77202.	-8657.	-2.11E-05	0.00	1.21E+12	477.4787	688438.	0.00
48.0200	-0.00420	34550.	-5824.	-2.09E-05	0.00	1.21E+12	486.3640	680682.	0.00
48.5100	-0.00432	8714.	-2938.	-2.08E-05	0.00	1.21E+12	495.2201	673483.	0.00
49.0000	-0.00445	0.00	0.00	-2.07E-05	0.00	1.21E+12	504.0701	333354.	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 = 0.40505078 inches

Computed slope at pile head = -0.0011826 radians

Maximum bending moment = 5171858. inch-lbs

Maximum shear force = -42144. lbs

Depth of maximum bending moment = 29.89000000 feet below pile head

Depth of maximum shear force = 40.18000000 feet below pile head

Number of iterations = 19

Number of zero deflection points = 1

Pile deflection at ground = 0.16768507 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 0. lbs

Pile Pile Head Maximum Maximum Length Deflection Moment Shear

feet	inches	ln-lbs	lbs
49.00000	0.40505078	5171858.	-42144.
46.55000 44.10000	0.42648194 0.48297245	5012305. 4795569.	-44715. -45519.
41.65000	0.61515193	4631871.	-46215.
39.20000	1.04136470	4431718.	-47597.
36.75000	2.18361545	4209908.	-49608.
34.30000	5.51180001	3946839.	-53036.
31.85000	30.22092250	3908533.	-68591.

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

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
X	У	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	1.6958	-1.32E-04	0.00	-0.00509	0.00	1.21E+12	0.00	0.00	3.5165
0.4900	1.6659	60.7899	51.6921	-0.00509	0.00	1.21E+12	0.00	0.00	14.0659
0.9800	1.6359	607.8993	175.7532	-0.00509	0.00	1.21E+12	0.00	0.00	28.1318
1.4700	1.6060	2128.	382.5217	-0.00509	0.00	1.21E+12	0.00	0.00	42.1976
1.9600	1.5760	5106.	671.9975	-0.00509	0.00	1.21E+12	0.00	0.00	56.2635
2.4500	1.5460	10030.	1044.	-0.00509	0.00	1.21E+12	0.00	0.00	70.3294
2.9400	1.5161	17386.	1499.	-0.00509	0.00	1.21E+12	0.00	0.00	84.3953
3.4300	1.4861	27659.	2037.	-0.00509	0.00	1.21E+12	0.00	0.00	98.4612
3.9200	1.4562	41337.	2657.	-0.00509	0.00	1.21E+12	0.00	0.00	112.5271
4.4100	1.4262	58905.	3360.	-0.00509	0.00	1.21E+12	0.00	0.00	126.5929
4.9000	1.3963	80851.	4146.	-0.00509	0.00	1.21E+12	0.00	0.00	140.6588
5.3900	1.3663	107659.	5014.	-0.00509	0.00	1.21E+12	0.00	0.00	154.7247
5.8800	1.3364	139817.	5965.	-0.00509	0.00	1.21E+12	0.00	0.00	168.7906
6.3700	1.3064	177811.	6999.	-0.00509	0.00	1.21E+12	0.00	0.00	182.8565
6.8600	1.2765	222126.	8116.	-0.00509	0.00	1.21E+12	0.00	0.00	196.9224
7.3500	1.2465	273251.	9315.	-0.00509	0.00	1.21E+12	0.00	0.00	210.9882

7.8400	1.2166	331670.	10597.	-0.00509	0.00	1.21E+12	0.00	0.00	225.0541
8.3300	1.1867	397870.	11962.	-0.00509	0.00	1.21E+12	0.00	0.00	239.1200
8.8200	1.1568	472338.	13409.	-0.00508	0.00	1.21E+12	0.00	0.00	253.1859
9.3100	1.1269	555559.	14939.	-0.00508	0.00	1.21E+12	0.00	0.00	267.2518
9.8000	1.0970	648021.	16552.	-0.00508	0.00	1.21E+12	0.00	0.00	281.3176
10.2900	1.0672	750209.	18247.	-0.00508	0.00	1.21E+12	0.00	0.00	295.3835
10.7800	1.0373	862609.	20026.	-0.00507	0.00	1.21E+12	0.00	0.00	309.4494
11.2700	1.0075	985709.	21886.	-0.00507	0.00	1.21E+12	0.00	0.00	323.5153
11.7600	0.9778	1119994.	23830.	-0.00506	0.00	1.21E+12	0.00	0.00	337.5812
12.2500	0.9480	1265950.	25856.	-0.00506	0.00	1.21E+12	0.00	0.00	351.6471
12.7400	0.9183	1424065.	27965.	-0.00505	0.00	1.21E+12	0.00	0.00	365.7129
13.2300	0.8886	1594824.	30157.	-0.00504	0.00	1.21E+12	0.00	0.00	379.7788
13.7200	0.8590	1778713.	32432.	-0.00503	0.00	1.20E+12	0.00	0.00	393.8447
14.2100	0.8294	1976220.	34789.	-0.00503	0.00	1.20E+12	0.00	0.00	407.9106
14.7000	0.7999	2187830.	37229.	-0.00501	0.00	1.20E+12	0.00	0.00	421.9765
15.1900	0.7704	2414029.	39751.	-0.00500	0.00	1.20E+12	0.00	0.00	436.0424
15.6800	0.7411	2655304.	42357.	-0.00499	0.00	1.20E+12	0.00	0.00	450.1082
16.1700	0.7118	2912142.	45045.	-0.00498	0.00	1.20E+12	0.00	0.00	464.1741
16.6600	0.6825	3185028.	47815.	-0.00496	0.00	1.20E+12	0.00	0.00	478.2400
17.1500	0.6534	3474448.	49462.	-0.00495	0.00	1.20E+12	-12.413	111.7037	94.3479
17.6400	0.6244	3766702.	49541.	-0.00493	0.00	1.20E+12	-55.208	519.9313	0.00
18.1300	0.5954	4057047.	49083.	-0.00491	0.00	1.20E+12	-100.578	993.2295	0.00
18.6200	0.5666	4343915.	48354.	-0.00489	0.00	1.19E+12	-147.398	1530.	0.00
19.1100	0.5379	4625686.	47364.	-0.00487	0.00	1.19E+12	-189.273	2069.	0.00
19.6000	0.5094	4900913.	46114.	-0.00484	0.00	1.19E+12	-235.983	2724.	0.00
20.0900	0.4810	5167982.	44592.	-0.00482	0.00	1.19E+12	-281.472	3441.	0.00
20.5800	0.4527	5425318.	42810.	-0.00475	0.00	2.68E+11	-324.861	4219.	0.00
21.0700	0.4252	5671423.	40779.	-0.00462	0.00	2.67E+11	-365.773	5058.	0.00
21.5600	0.3984	5904881.	38515.	-0.00450	0.00	2.67E+11	-404.465	5970.	0.00
22.0500	0.3723	6124355.	36034.	-0.00436	0.00	2.67E+11	-439.400	6940.	0.00
22.5400	0.3470	6328638.	33360.	-0.00423	0.00	2.67E+11	-469.958	7963.	0.00
23.0300	0.3226	6516671.	30519.	-0.00409	0.00	2.67E+11	-496.371	9048.	0.00
23.5200	0.2990	6687543.	27526.	-0.00394	0.00	2.67E+11	-521.859	10263.	0.00
24.0100	0.2763	6840372.	24397.	-0.00379	0.00	2.67E+11	-542.389	11545.	0.00
24.5000	0.2544	6974449.	21163.	-0.00364	0.00	2.67E+11	-557.551	12887.	0.00
24.9900	0.2335	7089248.	17855.	-0.00348	0.00	2.67E+11	-567.465	14292.	0.00
25.4800	0.2134	7184427.	14491.	-0.00333	0.00	2.67E+11	-577.003	15896.	0.00
25.9700	0.1943	7259657.	11085.	-0.00317	0.00	2.67E+11	-581.273	17587.	0.00
26.4600	0.1762	7314790.	7671.	-0.00301	0.00	2.67E+11	-580.102	19360.	0.00
26.9500	0.1590	7349866.	4280.	-0.00284	0.00	2.67E+11	-573.381	21206.	0.00
27.4400	0.1427	7365118.	939.8873	-0.00268	0.00	2.67E+11	-562.573	23175.	0.00
27.9300	0.1274	7360919.	-2319.	-0.00252	0.00	2.67E+11	-545.753	25180.	0.00
28.4200	0.1131	7337852.	-5461.	-0.00236	0.00	2.67E+11	-522.982	27189.	0.00

20 0100	0 00073	7206702	0.453	0 00220	0.00	2 (75,11	404 442	20156	0.00
28.9100	0.09972	7296702.	-8452.	-0.00220	0.00	2.67E+11	-494.442	29156.	0.00
29.4000	0.08727	7238457.	-11287.	-0.00204	0.00	2.67E+11	-469.888	31658.	0.00
29.8900	0.07577	7163966.	-13966.	-0.00188	0.00	2.67E+11	-441.344	34249.	0.00
30.3800	0.06520	7074216.	-16464.	-0.00172	0.00	2.67E+11	-408.266	36820.	0.00
30.8700	0.05554	6970351.	-18724.	-0.00157	0.00	2.67E+11	-360.537	38168.	0.00
31.3600	0.04679	6854020.	-20709.	-0.00141	0.00	2.67E+11	-314.451	39516.	0.00
31.8500	0.03893	6726817.	-22428.	-0.00126	0.00	2.67E+11	-270.524	40865.	0.00
32.3400	0.03193	6590261.	-24766.	-0.00112	0.00	2.67E+11	-524.642	96607.	0.00
32.8300	0.02579	6435566.	-27796.	-9.73E-04	0.00	2.67E+11	-505.755	115296.	0.00
33.3200	0.02049	6263385.	-30710.	-8.33E-04	0.00	2.67E+11	-485.370	139306.	0.00
33.8100	0.01599	6074422.	-33500.	-6.98E-04	0.00	2.67E+11	-463.660	170480.	0.00
34.3000	0.01228	5869428.	-36159.	-5.66E-04	0.00	2.67E+11	-441.018	211121.	0.00
34.7900	0.00933	5649187.	-38686.	-4.40E-04	0.00	2.67E+11	-418.249	263504.	0.00
35.2800	0.00711	5414485.	-41082.	-3.18E-04	0.00	2.68E+11	-396.865	328038.	0.00
35.7700	0.00559	5166061.	-43364.	-2.46E-04	0.00	1.19E+12	-379.437	398827.	0.00
36.2600	0.00422	4904519.	-45536.	-2.21E-04	0.00	1.19E+12	-359.037	499733.	0.00
36.7500	0.00300	4630563.	-47574.	-1.97E-04	0.00	1.19E+12	-334.397	656033.	0.00
37.2400	0.00190	4345046.	-49448.	-1.75E-04	0.00	1.19E+12	-302.897	935397.	0.00
37.7300	9.37E-04	4049056.	-51081.	-1.55E-04	0.00	1.20E+12	-252.633	1585890.	0.00
38.2200	8.64E-05	3744331.	-51893.	-1.35E-04	0.00	1.20E+12	-23.647	1608394.	0.00
38.7100	-6.56E-04	3438789.	-51428.	-1.18E-04	0.00	1.20E+12	181.8414	1630896.	0.00
39.2000	-0.00130	3139534.	-50038.	-1.02E-04	0.00	1.20E+12	291.1314	1318433.	0.00
39.6900	-0.00185	2850345.	-48234.	-8.69E-05	0.00	1.20E+12	322.4263	1024428.	0.00
40.1800	-0.00232	2572303.	-46269.	-7.37E-05	0.00	1.20E+12	345.7767	876063.	0.00
40.6700	-0.00272	2306216.	-44181.	-6.17E-05	0.00	1.20E+12	364.4325	788717.	0.00
41.1600	-0.00305	2052730.	-41993.	-5.11E-05	0.00	1.20E+12	379.9216	733238.	0.00
41.6500	-0.00332	1812379.	-39720.	-4.16E-05	0.00	1.20E+12	393.1024	696749.	0.00
42.1400	-0.00354	1585619.	-37375.	-3.33E-05	0.00	1.21E+12	404.5151	672626.	0.00
42.6300	-0.00371	1372845.	-34967.	-2.61E-05	0.00	1.21E+12	414.5293	657084.	0.00
43.1200	-0.00384	1174403.	-32504.	-1.99E-05	0.00	1.21E+12	423.4141	647786.	0.00
43.6100	-0.00394	990601.	-29991.	-1.46E-05	0.00	1.21E+12	431.3753	643192.	0.00
44.1000	-0.00402	821713.	-27433.	-1.02E-05	0.00	1.21E+12	438.5779	642230.	0.00
44.5900	-0.00406	667988.	-24835.	-6.60E-06	0.00	1.21E+12	445.1583	644112.	0.00
45.0800	-0.00409	529655.	-22199.	-3.68E-06	0.00	1.21E+12	451.2323	648239.	0.00
45.5700	-0.00411	406923.	-19530.	-1.40E-06	0.00	1.21E+12	456.8999	654132.	0.00
46.0600	-0.00411	299988.	-16827.	3.17E-07	0.00	1.21E+12	462.2484	661398.	0.00
46.5500	-0.00410	209034.	-14094.	1.55E-06	0.00	1.21E+12	467.3542	669706.	0.00
47.0400	-0.00409	134240.	-11332.	2.39E-06	0.00	1.21E+12	472.2832	678776.	0.00
47.5300	-0.00408	75774.	-8541.	2.90E-06	0.00	1.21E+12	477.0911	688374.	0.00
48.0200	-0.00406	33803.	-5721.	3.17E-06	0.00	1.21E+12	481.8229	698310.	0.00
48.5100	-0.00404	8491.	-2874.	3.27E-06	0.00	1.21E+12	486.5119	708443.	0.00
49.0000	-0.00402	0.00	0.00	3.27E-06	0.00	1.21E+12 1.21E+12	491.1789	359341.	0.00
49.0000	-0.00402	0.00	0.00	J. ZJL-00	0.00	1, 41 L T L T L	491.1/OJ	JJJJ41.	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 = 1.69583369 inches

Computed slope at pile head = -0.0050949 radians

Maximum bending moment = 7365118. inch-lbs

Maximum shear force = -51893. lbs

Depth of maximum bending moment = 27.44000000 feet below pile head

Depth of maximum shear force = 38.22000000 feet below pile head

Number of iterations = 62

Number of zero deflection points = 1

Pile deflection at ground = 0.66230906 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 0. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
49.00000 46.55000 44.10000 41.65000 39.20000 36.75000	1.69583369 1.73842434 1.92917967 2.50024952 3.99434032 8.59309324	7365118. 7328661. 7202433. 6974421. 6649063. 6403321.	-51893. -57707. -63758. -67991. -70967.

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

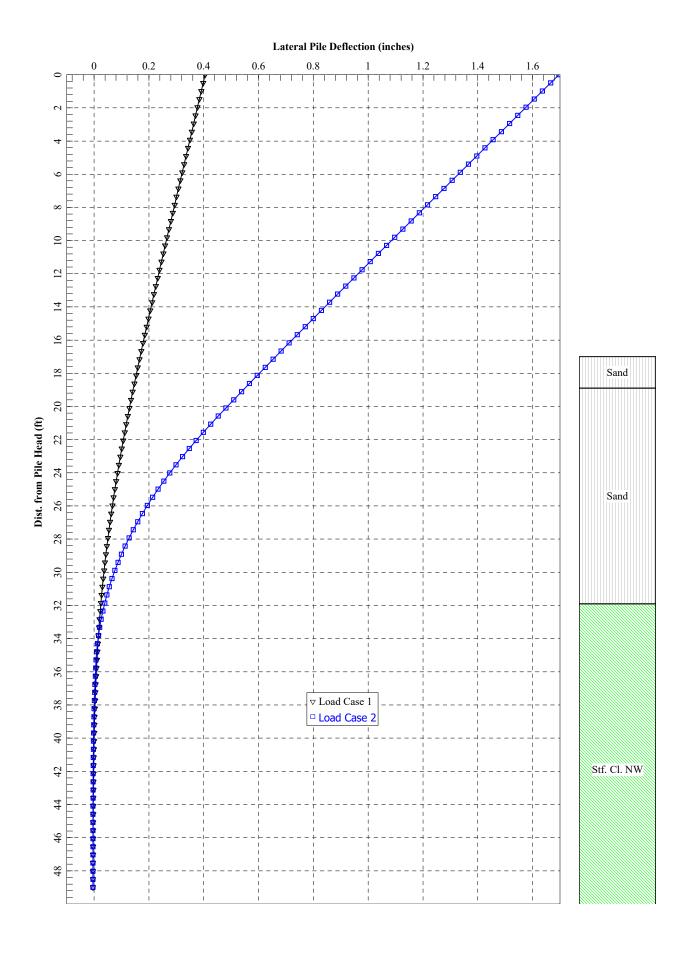
```
Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs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

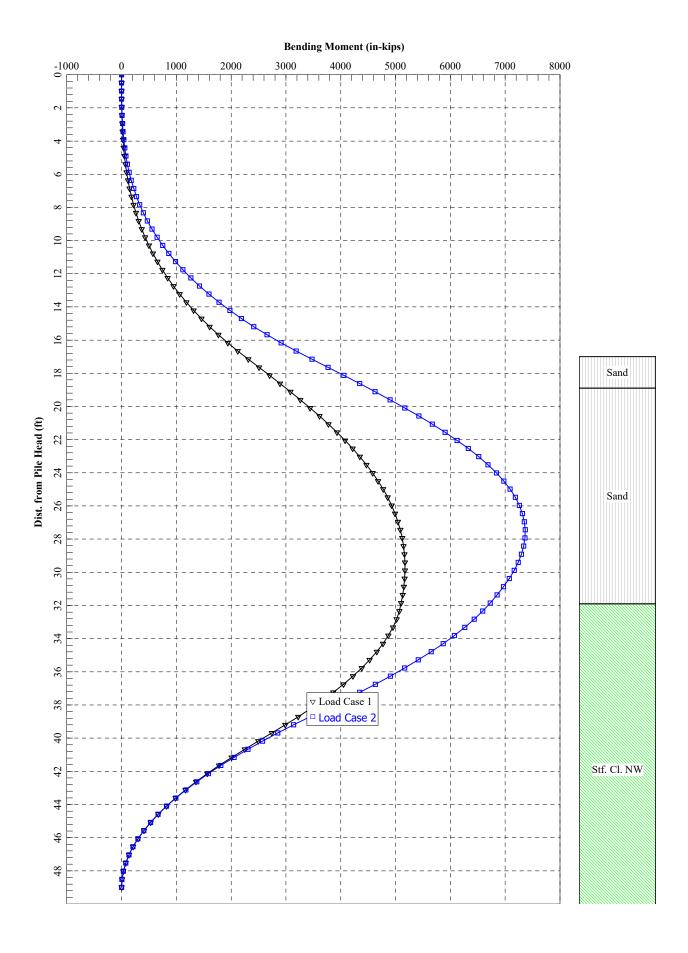
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

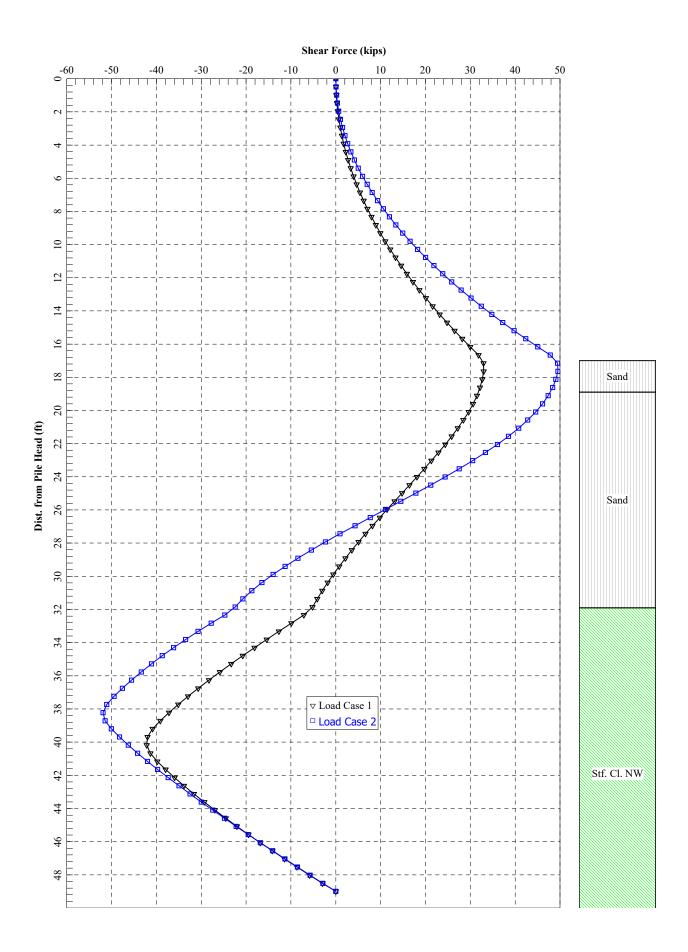
Load Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	lbs	inches	radians	lbs	in-lbs
1 V, lb	0.00	M, in-lb	0.00	0.00	0.4051	-0.00118	-42144.	5171858.
2 V, 1b	0.00	M, in-lb	0.00	0.00	1.6958	-0.00509	-51893 .	7365118.

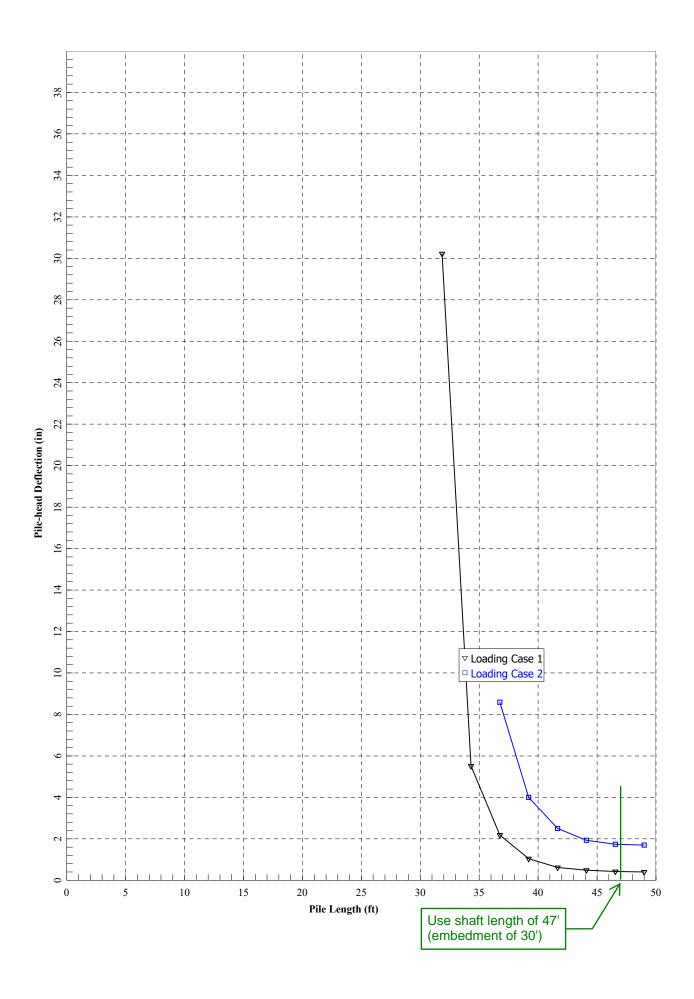
Maximum pile-head deflection = 1.6958336934 inches
Maximum pile-head rotation = -0.0050949150 radians = -0.291917 deg.

The analysis ended normally.









Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Forward Abutment

Section within Abutment/Wingwalls, 12.5' height, horizontal backslope, during construction (prior to abutment construction, includes 250 psf construction traffic, free-head)

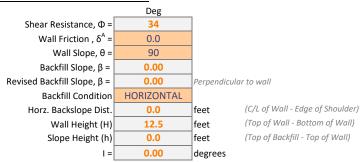
Geometry

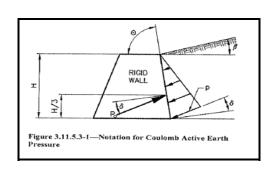
				Horiz. Distance	
	Elevation (ft)	_		from C/L (ft)	
Top of Backfill =	721.1	at Outside Edge of Shoulder	Start of Wall Backfill =		at Outside Edge of Shoulder
Top of Wall =	710.0	at C/L of Wall	Wall =		at C/L of Wall
Existing Ground Surface =	702.3	at C/L of Wall		_	
Bottom of Wall =	697.5	at C/L of Wall	Backfill Slope Angle =		H:1V

Wall Loading Profile

	Top Elev.	Thickness (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	_
Item 203	710.0	7.7	250	28	125	A-6a/A-6b per GDM
Medium Dense Granular	702.3	4.8	0	36.5	125	
Bottom of Wall	697.5					•
Weighted Value		12.5	155	31	125	

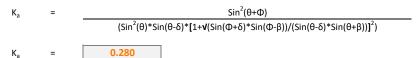
Earth Pressure Coefficients





Horiz Distance

Active Earth Coefficient



At-Rest Earth Coefficient

 $K_o = (1-Sin(\phi))*(1+Sin(\beta))$ $K_o = 0.437$

Notes:

A. Wall friction neglected

- B. Figure and Equation for Active Earth Pressure from AASHTO 3.11.5.3 (LRFD Design Manual).
- C. The wall backfill will consist of proposed fill and granular overburden. Using the soil layer thicknesses and respective soil parameters as provided by SME, a weighted average was determined and assumed for the entire backfill (c' = 155 psf and φ' = 31°. The parameters were converted to equivalent soil strength parameters c' = 0 psf and φ' = 34° for computing earth pressures based on a 1 degree increase in friction angle for every 50 psf decrease in cohesion up to 150 psf (Ref: Hall's Thesis).

Soil Lateral Design Profile							
	Top Elev	Depth (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	ε50	k
Medium Dense Granular	697.5	12.5	0	36.5	62.6	N/A	125
Very Stiff Cohesive	696.3	13.7	4000	0	62.6	0.005	N/A
Medium Dense Granular	693.8	16.2	0	33	59.6	N/A	60
Medium Dense Silt	686.3	23.7	0	33	62.6	N/A	60
Medium Stiff to Stiff Cohesive	675.3	34.7	1700	0	57.6	0.007	N/A
Stiff to Very Stiff Cohesive	645.8	64.2	2700	0	59.6	0.005	N/A
Medium Stiff to Stiff Silt	633.3	76.7	1400	0	55.6	0.007	N/A
Very Stiff to Hard Silt	602.8	107.2	3300	0	72.6	0.005	N/A
Bedrock	587.8	122.2	N/A	N/A	N/A	N/A	N/A

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)

Restraint Condition = ACTIVE

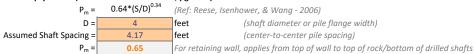
Ka = 0.280

(Active or At-Rest)

3) Determine Equivalent Fluid Weight (G_H)

 $G_H = (\gamma_m)^* (K_a)$ Soil loading only, does not include hydrostatic pressures $G_H = 35$ For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust

6) Resolve horizontal earth force to distributed triangular load (for LPILE)

w =	2*P _{SH} /H	
w =	1820	lbs/foot per shaft (Earth - Service Limit)
w =	152	lbs/inch per shaft (Earth - Service Limit)
$\gamma_E =$	1.5	Earth Load Factor
w =	$(2*P_{SH}/H)*\gamma_E$	_
w =	228	lbs/inch per shaft (Earth - Strength Limit)

7) Determine live-load traffic surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)

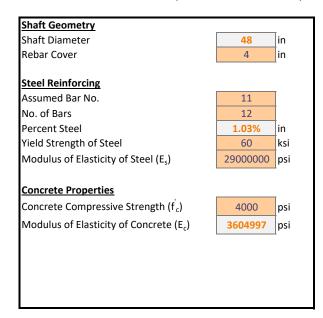
w =	P _S /H	
w =	291	lbs/foot per shaft (surcharge - unfactored)
w =	24	lbs/inch per shaft (surcharge - unfactored)
γ _S =	1.75	Surcharge Load Factor - Strength I
w =	$(P_S/L)*\gamma_S$	
w =	42	Ibs/inch per shaft (Surcharge - Strength I)

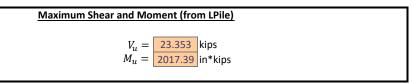
Distributed Lateral Loads for LPILE

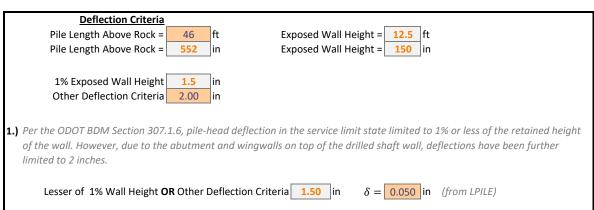
	CONVENTION	AL
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)
0	24	42
12.5	176	270

Shear, Moment, and Deflection Results

Maximum Shear and Moment output from LPile service case provided to HDR's structural engineers for capacity checks. Final reinforcing layout to be confirmed in structural analyses.







LPile for Version 2022-12.012

License ID : 202613844 License Type : (Network 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:

HDR

LPILE Global, Global License

This model was prepared by: abaratta

Files Head Con Analysis

Files Used for Analysis

Path to file locations: \pwworking\east01\d4381065\

Name of input data file:

4a. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Const. No Abt.lp12d

Name of output report file:

4a. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Const. No Abt.lp12o

Name of plot output file:

4a. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Const. No Abt.lp12p

Name of runtime message file:

4a. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Const. No Abt.lp12r

Load Case 1 = Service Case Load Case 2 = Strength Case

Date and Time of Analysis
Date: July 9, 2025 Time: 14:45:11
Problem Title
Project Name: CUY-17-13.50
Job Number:
Client:
Engineer: HDR
Description, End Abt. 12 El Ut. 41 Dis. Compt. 1/2 Abt. Load
Description: Fwd. Abt., 12.5' Ht., 4' Dia., Const. w/o Abt. Load
Dungung Outions and Cattings
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
- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- Analysis includes loading by multiple distributed lateral loads acting on pile
- 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 = 46.000 ft
Depth of ground surface below top of pile = 12.5000 ft

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

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

Depth Below

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	48.0000
2	46.000	48.0000

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 = 46.000000 ft

Shaft Diameter = 48.000000 in

Soil and Rock Layering Information

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 12.500000 ft

Distance from top of pile to bottom of layer = 13.700000 ft

Effective unit weight at top of layer = 62.600000 pcf

Effective unit weight at bottom of layer = 62.600000 pcf

Friction angle at top of layer = 36.500000 deg.

Friction angle at bottom of layer = 36.500000 deg.

Subgrade k at top of layer = 125.000000 pci

Subgrade k at bottom of layer = 125.000000 pci

Layer 2 is stiff clay without free water

Distance from top of pile to top of layer = 13.700000 ft
Distance from top of pile to bottom of layer = 16.200000 ft
Effective unit weight at top of layer = 62.600000 pcf
Effective unit weight at bottom of layer = 62.600000 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 sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	16.200000 ft
Distance from top of pile to bottom of layer	=	23.700000 ft
Effective unit weight at top of layer	=	59.600000 pcf
Effective unit weight at bottom of layer	=	59.600000 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

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

Distance from top of pile to top of layer	=	23.700000 ft
Distance from top of pile to bottom of layer	=	34.700000 ft
Effective unit weight at top of layer	=	62.600000 pcf
Effective unit weight at bottom of layer	=	62.600000 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

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	34.700000 ft
Distance from top of pile to bottom of layer	=	64.200000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1700. psf
Undrained cohesion at bottom of layer	=	1700. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer	=	64.200000 ft
Distance from top of pile to bottom of layer	=	76.700000 ft
Effective unit weight at top of layer	=	59.600000 pcf
Effective unit weight at bottom of layer	=	59.600000 pcf
Undrained cohesion at top of layer	=	2700. psf
Undrained cohesion at bottom of layer	=	2700. psf
Epsilon-50 at top of layer	=	0.005000
Epsilon-50 at bottom of layer	=	0.005000

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer	=	76.700000 ft
Distance from top of pile to bottom of layer	=	107.200000 ft
Effective unit weight at top of layer	=	55.600000 pcf
Effective unit weight at bottom of layer	=	55.600000 pcf
Undrained cohesion at top of layer	=	1400. psf
Undrained cohesion at bottom of layer	=	1400. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 8 is stiff clay without free water

Distance from top of pile to top of layer	=	107.200000 ft
Distance from top of pile to bottom of layer	=	122.000000 ft
Effective unit weight at top of layer	=	72.600000 pcf
Effective unit weight at bottom of layer	=	72.600000 pcf
Undrained cohesion at top of layer	=	3300. psf
Undrained cohesion at bottom of layer	=	3300. psf
Epsilon-50 at top of layer	=	0.005000
Epsilon-50 at bottom of layer	=	0.005000

(Depth of the lowest soil layer extends 76.000 ft below the pile tip)

```
Summary of Input Soil Properties
```

E50

Layer Soil Type Layer Effective Cohesion Angle of

Num.	Name (p-y Curve Type)	Depth ft	Unit Wt. pcf	psf	Friction deg.	or krm	kpy pci
1	Sand	12.5000	62.6000		36.5000		125.0000
	(Reese, et al.)	13.7000	62.6000		36.5000		125.0000
2	Stiff Clay	13.7000	62.6000	4000.		0.00500	
	w/o Free Water	16.2000	62.6000	4000.		0.00500	
3	Sand	16.2000	59.6000		33.0000		60.0000
	(Reese, et al.)	23.7000	59.6000		33.0000		60.0000
4	Sand	23.7000	62.6000		33.0000		60.0000
	(Reese, et al.)	34.7000	62.6000		33.0000		60.0000
5	Stiff Clay	34.7000	57.6000	1700.		0.00700	
	w/o Free Water	64.2000	57.6000	1700.		0.00700	
6	Stiff Clay	64.2000	59.6000	2700.		0.00500	
	w/o Free Water	76.7000	59.6000	2700.		0.00500	
7	Stiff Clay	76.7000	55.6000	1400.		0.00700	
	w/o Free Water	107.2000	55.6000	1400.		0.00700	
8	Stiff Clay	107.2000	72.6000	3300.		0.00500	
	w/o Free Water	122.0000	72.6000	3300.		0.00500	

Modification Factors for p-y Curves

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult	
1	12.500	0.6500	1.0000	
2	122.200	0.6500	1.0000	

Static Loading Type

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

Distributed Lateral Loading for Individual Load Cases

Distributed lateral load intensity for Load Case 1 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	24.000
2	12.500	176.000

Distributed lateral load intensity for Load Case 2 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	42.000
2	12.500	270.000

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load	Load		Condition		Condition	Axial Thrust	Compute Top y	Run Analysis
No.	Type		1		2	Force, lbs	vs. Pile Length	
1	1	V =	0.0000 lbs	M =	0.0000 in-lbs	0.0000000	Yes	Yes
2	1	V =	0.0000 lbs	M =	0.0000 in-lbs	0.000000	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

------ Computations of Momental Planette Capacity and Monitinear Dending Scittiness

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 = 46.000000 ft
Shaft Diameter = 48.000000 in
Concrete Cover Thickness (to edge of long. rebar) = 4.000000 in
Number of Reinforcing Bars = 12 bars
Yield Stress of Reinforcing Bars = 60000. psi
Modulus of Elasticity of Reinforcing Bars = 29000000. psi
Gross Area of Shaft = 1810. sq. in.
Total Area of Reinforcing Steel = 18.720000 sq. in.
Area Ratio of Steel Reinforcement = 1.03 percent
Edge-to-Edge Bar Spacing = 8.577827 in
Maximum Concrete Aggregate Size = 0.750000 in
Ratio of Bar Spacing to Aggregate Size = 11.44
Offset of Center of Rebar Cage from Center of Pile = 0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 7212.047 kips
Tensile Load for Cracking of Concrete = -807.459 kips
Nominal Axial Tensile Capacity = -1123.200 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar	Bar Diam.	Bar Area	Χ	Υ
Number	inches	sq. in.	inches	inches
1	1.410000	1.560000	19.295000	0.00000
2	1.410000	1.560000	16.709960	9.647500
3	1.410000	1.560000	9.647500	16.709960
4	1.410000	1.560000	0.00000	19.295000
5	1.410000	1.560000	-9.64750	16.709960
6	1.410000	1.560000	-16.70996	9.647500
7	1.410000	1.560000	-19.29500	0.00000
8	1.410000	1.560000	-16.70996	-9.64750
9	1.410000	1.560000	-9.64750	-16.70996
10	1.410000	1.560000	0.00000	-19.29500
11	1.410000	1.560000	9.647500	-16.70996
12	1.410000	1.560000	16.709960	-9.64750

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

Minimum spacing between any two bars not equal to zero = 8.578 inches between bars 7 and 8.

Ratio of bar spacing to maximum aggregate size = 11.44

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 = 1

Number	Axial Thrust Force
	kips
1	0.000

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 = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Run Stress Msg ksi
6.25000E-07	742.9255266	1188680843.	23.9999803	0.00001500	-0.00001500	0.0627334	-0.361050
0.00000125	1482.	1185736482.	23.9999802	0.00003000	-0.00003000	0.1249711	-0.722101
0.00000188	2218.	1182792121.	23.9999801	0.00004500	-0.00004500	0.1867128	-1.083151
0.00000250	2950.	1179847760.	23.9999800	0.00006000	-0.00006000	0.2479588	-1.444201
0.00000313	3678.	1176903399.	23.9999799	0.00007500	-0.00007500	0.3087089	-1.805252
0.00000375	4402.	1173959038.	23.9999799	0.00009000	-0.00009000	0.3689632	-2.166302
0.00000438	5123.	1171014677.	23.9999798	0.0001050	-0.000105	0.4287216	-2.527353
0.00000500	5123.	1024637842.	11.6492821	0.00005825	-0.000182	0.2382851	-4.679254 C
0.00000563	5123.	910789193.	11.6532320	0.00006555	-0.000204	0.2676473	-5.263517 C
0.00000625	5123.	819710274.	11.6571911	0.00007286	-0.000227	0.2969148	-5.847634 C
0.00000688	5123.	745191158.	11.6611596	0.00008017	-0.000250	0.3260875	-6.431606 C
0.00000750	5123.	683091895.	11.6651375	0.00008749	-0.000273	0.3551652	-7.015433 C
0.00000813	5123.	630546364.	11.6691248	0.00009481	-0.000295	0.3841477	-7.599112 C
0.00000875	5123.	585507338.	11.6731215	0.0001021	-0.000318	0.4130349	-8.182645 C
0.00000938	5123.	546473516.	11.6771277	0.0001095	-0.000341	0.4418266	-8.766031 C
0.00001000	5123.	512318921.	11.6811435	0.0001168	-0.000363	0.4705226	-9.349268 C
0.00001063	5123.	482182514.	11.6851689	0.0001242	-0.000386	0.4991227	-9.932357 C
0.00001125	5123.	455394596.	11.6892039	0.0001315	-0.000408	0.5276268	-10.515297 C

0.00001188	5123.	431426460.	11.6932486	0.0001389	-0.000431	0.5560347	-11.098087 C
0.00001250	5123.	409855137.	11.6973031	0.0001462	-0.000454	0.5843462	-11.680728 C
0.00001313	5123.	390338226.	11.7013673	0.0001536	-0.000476	0.6125611	-12.263217 C
0.00001375	5123.	372595579.	11.7054414	0.0001609	-0.000499	0.6406793	-12.845555 C
0.00001438	5123.	356395771.	11.7095253	0.0001683	-0.000522	0.6687005	-13.427742 C
0.00001500	5123.	341545947.	11.7136192	0.0001757	-0.000544	0.6966246	-14.009776 C
0.00001563	5123.	327884109.	11.7177231	0.0001831	-0.000567	0.7244515	-14.591657 C
0.00001625	5123.	315273182.	11.7218369	0.0001905	-0.000590	0.7521809	-15.173384 C
0.00001688	5123.	303596398.	11.7259609	0.0001979	-0.000612	0.7798126	-15.754958 C
0.00001750	5123.	292753669.	11.7300950	0.0002053	-0.000635	0.8073465	-16.336377 C
0.00001813	5123.	282658715.	11.7342392	0.0002127	-0.000657	0.8347823	-16.917640 C
0.00001875	5123.	273236758.	11.7383937	0.0002201	-0.000680	0.8621200	-17.498748 C
0.00001938	5123.	264422669.	11.7425585	0.0002275	-0.000702	0.8893592	-18.079700 C
0.00002000	5123.	256159461.	11.7467336	0.0002349	-0.000725	0.9164998	-18.660494 C
0.00002063	5123.	248397053.	11.7509029	0.0002424	-0.000748	0.9435417	-19.241131 C
0.00002125	5123.	241091257.	11.7550035	0.0002498	-0.000770	0.9704846	-19.821610 C
0.00002188	5123.	234202935.	11.7591142	0.0002572	-0.000793	0.9973283	-20.401930 C
0.00002250	5123.	227697298.	11.7631584	0.0002647	-0.000815	1.0240601	-20.982191 C
0.00002313	5259.	227435331.	11.7671977	0.0002721	-0.000838	1.0506892	-21.562318 C
0.00002375	5400.	227371798.	11.7712469	0.0002796	-0.000860	1.0772178	-22.142291 C
0.00002438	5541.	227308133.	11.7753059	0.0002870	-0.000883	1.1036457	-22.722110 C
0.00002563	5821.	227180403.	11.7834536	0.0003020	-0.000928	1.1561985	-23.881285 C
0.00002688	6102.	227052139.	11.7916413	0.0003169	-0.000973	1.2083463	-25.039838 C
0.00002813	6382.	226923335.	11.7998695	0.0003319	-0.001018	1.2600874	-26.197763 C
0.00002938	6662.	226793986.	11.8081384	0.0003469	-0.001063	1.3114203	-27.355057 C
0.00003063	6942.	226664087.	11.8164485	0.0003619	-0.001108	1.3623433	-28.511714 C
0.00003188	7221.	226533633.	11.8248001	0.0003769	-0.001153	1.4128549	-29.667730 C
0.00003313	7500.	226402618.	11.8331938	0.0003920	-0.001198	1.4629535	-30.823100 C
0.00003438	7778.	226271037.	11.8416299	0.0004071	-0.001243	1.5126373	-31.977818 C
0.00003563	8056.	226138885.	11.8501089	0.0004222	-0.001288	1.5619047	-33.131881 C
0.00003688	8334.	226006156.	11.8586311	0.0004373	-0.001333	1.6107541	-34.285281 C
0.00003813	8611.	225872845.	11.8671970	0.0004524	-0.001378	1.6591838	-35.438015 C
0.00003938	8888.	225738946.	11.8758071	0.0004676	-0.001422	1.7071919	-36.590077 C
0.00004063	9165.	225604453.	11.8844619	0.0004828	-0.001467	1.7547769	-37.741462 C
0.00004188	9442.	225469361.	11.8931617	0.0004980	-0.001512	1.8019368	-38.892165 C
0.00004313	9718.	225333663.	11.9021103	0.0005133	-0.001557	1.8486700	-40.042179 C
0.00004438	9993.	225197354.	11.9109068	0.0005285	-0.001601	1.8949747	-41.191499 C
0.00004563	10268.	225060427.	11.9197498	0.0005438	-0.001646	1.9408490	-42.340121 C
0.00004688	10543.	224922876.	11.9286398	0.0005592	-0.001691	1.9862911	-43.488036 C
0.00004813	10818.	224784695.	11.9375773	0.0005745	-0.001736	2.0312991	-44.635242 C
0.00004938	11092.	224645877.	11.9465628	0.0005899	-0.001780	2.0758711	-45.781730 C
0.00005063	11366.	224506417.	11.9555969	0.0006053	-0.001825	2.1200052	-46.927495 C
0.00005188	11639.	224366306.	11.9646800	0.0006207	-0.001869	2.1636996	-48.072531 C

0.00005313	11912.	224225540.	11.9738128	0.0006361	-0.001914	2.2069521	-49.216832 C
0.00005438	12185.	224084109.	11.9829958	0.0006516	-0.001958	2.2497609	-50.360392 C
0.00005563	12457.	223942009.	11.9922294	0.0006671	-0.002003	2.2921240	-51.503204 C
0.00005688	12729.	223799231.	12.0015144	0.0006826	-0.002047	2.3340392	-52.645262 C
0.00005813	13000.	223655769.	12.0108513	0.0006981	-0.002092	2.3755047	-53.786559 C
0.00005938	13271.	223511614.	12.0202407	0.0007137	-0.002136	2.4165182	-54.927088 C
0.00006063	13542.	223366761.	12.0296831	0.0007293	-0.002181	2.4570776	-56.066843 C
0.00006188	13812.	223221200.	12.0391793	0.0007449	-0.002225	2.4971809	-57.205816 C
0.00006313	14082.	223074925.	12.0487298	0.0007606	-0.002269	2.5368258	-58.344002 C
0.00006438	14351.	222927927.	12.0583352	0.0007763	-0.002314	2.5760102	-59.481392 C
0.00006563	14615.	222701531.	12.0665714	0.0007919	-0.002358	2.6144991	-60.000000 CY
0.00006688	14857.	222160930.	12.0690855	0.0008071	-0.002403	2.6515720	-60.000000 CY
0.00006813	15074.	221275452.	12.0654110	0.0008220	-0.002448	2.6870932	-60.000000 CY
0.00006938	15288.	220361158.	12.0609316	0.0008367	-0.002493	2.7220199	-60.000000 CY
0.00007063	15499.	219452776.	12.0565084	0.0008515	-0.002539	2.7564583	-60.000000 CY
0.00007188	15692.	218323180.	12.0472921	0.0008659	-0.002584	2.7896431	-60.000000 CY
0.00007313	15844.	216665099.	12.0276354	0.0008795	-0.002630	2.8204959	-60.000000 CY
0.00007438	15964.	214646019.	12.0000930	0.0008925	-0.002677	2.8495427	-60.000000 CY
0.00007938	16413.	206783776.	11.8924585	0.0009440	-0.002866	2.9610094	-60.000000 CY
0.00008438	16860.	199820523.	11.8004957	0.0009957	-0.003054	3.0673167	-60.000000 CY
0.00008938	17303.	193600147.	11.7198032	0.0010475	-0.003243	3.1680163	-60.000000 CY
0.00009438	17699.	187537650.	11.6347823	0.0010980	-0.003432	3.2607958	-60.000000 CY
0.00009938	17902.	180145661.	11.5040280	0.0011432	-0.003627	3.3388576	-60.000000 CY
0.0001044	18078.	173198921.	11.3805044	0.0011878	-0.003822	3.4115999	-60.000000 CY
0.0001094	18252.	166872112.	11.2695088	0.0012326	-0.004017	3.4802848	-60.000000 CY
0.0001144	18422.	161067540.	11.1635101	0.0012768	-0.004213	3.5440065	-60.000000 CY
0.0001194	18591.	155737464.	11.0680857	0.0013213	-0.004409	3.6038210	-60.000000 CY
0.0001244	18759.	150824426.	10.9821568	0.0013659	-0.004604	3.6596767	-60.000000 CY
0.0001294	18925.	146279843.	10.9044195	0.0014108	-0.004799	3.7115202	-60.000000 CY
0.0001344	19090.	142062354.	10.8338818	0.0014558	-0.004994	3.7592963	-60.000000 CY
0.0001394	19252.	138131966.	10.7677638	0.0015008	-0.005189	3.8026646	-60.000000 CY
0.0001444	19412.	134458779.	10.7040007	0.0015454	-0.005385	3.8416389	-60.000000 CY
0.0001494	19566.	130989121.	10.6470174	0.0015904	-0.005580	3.8762907	-60.000000 CY
0.0001544	19691.	127551423.	10.5829910	0.0016337	-0.005776	3.9057325	-60.000000 CY
0.0001594	19768.	124035596.	10.5068892	0.0016745	-0.005975	3.9297450	-60.000000 CY
0.0001644	19819.	120569938.	10.4266357	0.0017139	-0.006176	3.9495479	-60.000000 CY
0.0001694	19864.	117275984.	10.3494024	0.0017529	-0.006377	3.9660259	-60.000000 CY
0.0001744	19906.	114157714.	10.2757125	0.0017918	-0.006578	3.9791182	-60.000000 CY
0.0001794	19947.	111203090.	10.2037961	0.0018303	-0.006780	3.9889782	-60.000000 CY
0.0001844	19987.	108404702.	10.1363885	0.0018689	-0.006981	3.9957381	-60.000000 CY
0.0001894	20026.	105750074.	10.0739956	0.0019078	-0.007182	3.9993550	-60.000000 CY
0.0001944	20065.	103227536.	10.0147217	0.0019466	-0.007383	3.9956560	-60.000000 CY
0.0001994	20102.	100826965.	9.9609279	0.0019860	-0.007584	3.9978395	-60.000000 CY

0.0002044	20139.	98540246.	9.9097448	0.0020253	-0.007785	3.9999270	-60.000000 CY
0.0002094	20175.	96357628.	9.8610171	0.0020647	-0.007985	3.9940821	-60.000000 CY
0.0002144	20209.	94269723.	9.8159026	0.0021043	-0.008186	3.9982692	-60.000000 CY
0.0002194	20242.	92270728.	9.7700208	0.0021433	-0.008387	3.9999565	-60.000000 CY
0.0002244	20274.	90356443.	9.7272422	0.0021825	-0.008587	3.9926839	-60.000000 CY
0.0002294	20305.	88522954.	9.6870588	0.0022220	-0.008788	3.9972286	-60.000000 CY
0.0002344	20336.	86765449.	9.6484824	0.0022614	-0.008989	3.9996161	-60.000000 CY
0.0002394	20366.	85078271.	9.6138290	0.0023013	-0.009189	3.9959581	-60.000000 CY
0.0002444	20395.	83457004.	9.5804180	0.0023412	-0.009389	3.9940362	-60.000000 CY
0.0002494	20424.	81898967.	9.5492346	0.0023813	-0.009589	3.9978705	-60.000000 CY
0.0002544	20452.	80400389.	9.5187341	0.0024213	-0.009789	3.9997775	-60.000000 CY
0.0002594	20479.	78956801.	9.4910419	0.0024617	-0.009988	3.9951130	-60.000000 CY
0.0002644	20506.	77565450.	9.4666525	0.0025027	-0.010187	3.9925374	-60.000000 CY
0.0002694	20533.	76224359.	9.4422632	0.0025435	-0.010386	3.9967326	-60.000000 CY
0.0002744	20559.	74930763.	9.4192303	0.0025844	-0.010586	3.9992271	-60.000000 CY
0.0003044	20705.	68025154.	9.3006367	0.0028309	-0.011779	3.9999714	-60.000000 CY
0.0003344	20837.	62316594.	9.2124259	0.0030804	-0.012970	3.9998963	-60.000000 CYT
0.0003644	20954.	57507723.	9.1476765	0.0033332	-0.014157	3.9982255	-60.000000 CYT
0.0003944	21034.	53334388.	9.0797154	0.0035808	-0.015349	3.9878853	-60.000000 CYT
0.0004244	21067.	49641257.	8.9957010	0.0038176	-0.016552	3.9999839	60.0000000 CYT

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.	Max. Tens.
No.	kips	in-kip	Strain	Strain
1	0.000	20794.591	0.00300000	-0.01258598

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	0.0000	20795.	0.0000	13516.	223380210.
1	0.75	0.0000	20795.	0.0000	15596.	218884892.
1	0.90	0.0000	20795.	0.0000	18715.	152103957.

Layering Correction Equivalent Depths of Soil & Rock Layers

Top of Equivalent Layer Top Depth Same Layer Layer is FØ F1 Layer Below Below Type As Rock or Integral Integral Pile Head Grnd Surf Layer is Below for Layer for Layer No. ft ft Above Rock Layer lbs lbs 12.5000 0.00 0.00 2115. 1 N.A. No 2 13.7000 127280. 0.04400 No No 2115. 3 16.2000 9.4226 271970. No No 129395. 4 23.7000 17.0583 Yes No 401365. 932337. 5 34.7000 34.1111 No No 1333701. 686163. 6 64.2000 51.7000 No No 2019864. 0.00 7 76.7000 64.2000 No No 0.00 0.00 0.00 8 107.2000 94.7000 No No 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 = 0.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

	Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
	X	У	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
	feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
-	0.00	0.05004	-2.98E-06	0.00	-2.13E-04	0.00	1.19E+12	0.00	0.00	25.3984
	0.4600	0.04887	386.9497	151.7779	-2.13E-04	0.00	1.19E+12	0.00	0.00	29.5936
	0.9200	0.04769	1676.	330.5729	-2.13E-04	0.00	1.19E+12	0.00	0.00	35.1872
	1.3800	0.04652	4036.	540.2446	-2.13E-04	0.00	1.19E+12	0.00	0.00	40.7808
	1.8400	0.04535	7640.	780.7930	-2.13E-04	0.00	1.19E+12	0.00	0.00	46.3744
	2.3000	0.04417	12656.	1052.	-2.13E-04	0.00	1.19E+12	0.00	0.00	51.9680
	2.7600	0.04300	19256.	1355.	-2.13E-04	0.00	1.19E+12	0.00	0.00	57.5616
	3.2200	0.04182	27610.	1688.	-2.12E-04	0.00	1.19E+12	0.00	0.00	63.1552
	3.6800	0.04065	37889.	2052.	-2.12E-04	0.00	1.19E+12	0.00	0.00	68.7488
	4.1400	0.03948	50262.	2447.	-2.12E-04	0.00	1.19E+12	0.00	0.00	74.3424
	4.6000	0.03831	64900.	2872.	-2.12E-04	0.00	1.19E+12	0.00	0.00	79.9360
	5.0600	0.03714	81974.	3329.	-2.12E-04	0.00	1.19E+12	0.00	0.00	85.5296
	5.5200	0.03597	101654.	3817.	-2.11E-04	0.00	1.19E+12	0.00	0.00	91.1232
	5.9800	0.03481	124111.	4335.	-2.11E-04	0.00	1.19E+12	0.00	0.00	96.7168
	6.4400	0.03365	149514.	4884.	-2.10E-04	0.00	1.19E+12	0.00	0.00	102.3104
	6.9000	0.03249	178036.	5465.	-2.09E-04	0.00	1.19E+12	0.00	0.00	107.9040
	7.3600	0.03134	209845.	6076.	-2.08E-04	0.00	1.19E+12	0.00	0.00	113.4976
	7.8200	0.03019	245112.	6718.	-2.07E-04	0.00	1.19E+12	0.00	0.00	119.0912
	8.2800	0.02905	284008.	7391.	-2.06E-04	0.00	1.19E+12	0.00	0.00	124.6848
	8.7400	0.02792	326703.	8094.	-2.05E-04	0.00	1.19E+12	0.00	0.00	130.2784
	9.2000	0.02679	373368.	8829.	-2.03E-04	0.00	1.19E+12	0.00	0.00	135.8720
	9.6600	0.02568	424173.	9594.	-2.01E-04	0.00	1.19E+12	0.00	0.00	141.4656
	10.1200	0.02457	479289.	10391.	-1.99E-04	0.00	1.19E+12	0.00	0.00	147.0592
	10.5800	0.02348	538885.	11218.	-1.97E-04	0.00	1.19E+12	0.00	0.00	152.6528
	11.0400	0.02240	603133.	12076.	-1.94E-04	0.00	1.19E+12	0.00	0.00	158.2464
	11.5000	0.02134	672203.	12965.	-1.91E-04	0.00	1.19E+12	0.00	0.00	163.8400

11.9600	0.02030	746265.	13885.	-1.88E-04	0.00	1.19E+12	0.00	0.00	169.4336
12.4200	0.01927	825489.	14676.	-1.84E-04	0.00	1.19E+12	0.00	0.00	117.3385
12.8800	0.01826	908289.	14981.	-1.80E-04	0.00	1.19E+12	-6.766	2045.	0.00
13.3400	0.01728	990883.	14924.	-1.76E-04	0.00	1.19E+12	-14.153	4521.	0.00
13.8000	0.01632	1073046.	13417.	-1.71E-04	0.00	1.19E+12	-531.635	179774.	0.00
14.2600	0.01539	1139009.	10473.	-1.66E-04	0.00	1.19E+12	-535.129	191877.	0.00
14.7200	0.01449	1188667.	7511.	-1.60E-04	0.00	1.19E+12	-538.189	204955.	0.00
15.1800	0.01363	1221926.	4533.	-1.55E-04	0.00	1.19E+12	-540.819	219099.	0.00
15.6400	0.01279	1238706.	1541.	-1.49E-04	0.00	1.19E+12	-543.022	234409.	0.00
16.1000	0.01198	1238940.	-1461.	-1.43E-04	0.00	1.19E+12	-544.797	251000.	0.00
16.5600	0.01121	1222574.	-3024.	-1.37E-04	0.00	1.19E+12	-21.294	10488.	0.00
17.0200	0.01046	1205559.	-3144.	-1.32E-04	0.00	1.19E+12	-22.135	11677.	0.00
17.4800	0.00975	1187869.	-3267.	-1.26E-04	0.00	1.19E+12	-22.728	12865.	0.00
17.9400	0.00907	1169487.	-3394.	-1.21E-04	0.00	1.19E+12	-23.092	14053.	0.00
18.4000	0.00842	1150402.	-3522.	-1.15E-04	0.00	1.19E+12	-23.246	15242.	0.00
18.8600	0.00780	1130608.	-3650.	-1.10E-04	0.00	1.19E+12	-23.207	16430.	0.00
19.3200	0.00720	1110107.	-3777.	-1.05E-04	0.00	1.19E+12	-22.993	17619.	0.00
19.7800	0.00664	1088905.	-3903.	-9.97E-05	0.00	1.19E+12	-22.621	18807.	0.00
20.2400	0.00610	1067014.	-4027.	-9.47E-05	0.00	1.19E+12	-22.107	19995.	0.00
20.7000	0.00559	1044450.	-4147.	-8.98E-05	0.00	1.19E+12	-21.467	21184.	0.00
21.1600	0.00511	1021231.	-4263.	-8.50E-05	0.00	1.19E+12	-20.717	22372.	0.00
21.6200	0.00466	997381.	-4375.	-8.03E-05	0.00	1.19E+12	-19.871	23560.	0.00
22.0800	0.00423	972926.	-4483.	-7.57E-05	0.00	1.19E+12	-18.943	24749.	0.00
22.5400	0.00382	947893.	-4584.	-7.13E-05	0.00	1.19E+12	-17.947	25937.	0.00
23.0000	0.00344	922314.	-4681.	-6.69E-05	0.00	1.19E+12	-16.897	27125.	0.00
23.4600	0.00308	896219.	-4771.	-6.27E-05	0.00	1.19E+12	-15.803	28314.	0.00
23.9200	0.00275	869644.	-4855.	-5.86E-05	0.00	1.19E+12	-14.679	29502.	0.00
24.3800	0.00243	842621.	-4933.	-5.46E-05	0.00	1.19E+12	-13.534	30690.	0.00
24.8400	0.00214	815185.	-5004.	-5.07E-05	0.00	1.19E+12	-12.380	31879.	0.00
25.3000	0.00187	787372.	-5070.	-4.70E-05	0.00	1.19E+12	-11.226	33067.	0.00
25.7600	0.00162	759218.	-5128.	-4.34E-05	0.00	1.19E+12	-10.082	34255.	0.00
26.2200	0.00139	730756.	-5181.	-4.00E-05	0.00	1.19E+12	-8.954	35444.	0.00
26.6800	0.00118	702021.	-5227.	-3.66E-05	0.00	1.19E+12	-7.852	36632.	0.00
27.1400	9.90E-04	673047.	-5268.	-3.35E-05	0.00	1.19E+12	-6.783	37820.	0.00
27.6000	8.14E-04	643866.	-5302.	-3.04E-05	0.00	1.19E+12	-5.752	39009.	0.00
28.0600	6.54E-04	614510.		-2.75E-05	0.00	1.19E+12	-4.765	40197.	0.00
28.5200	5.11E-04	585009.	-5355.		0.00	1.19E+12	-3.828	41385.	0.00
28.9800	3.82E-04	555391.	-5374.	-2.20E-05	0.00	1.19E+12	-2.945	42574.	0.00
29.4400	2.67E-04	525684.	-5388.	-1.95E-05	0.00	1.19E+12	-2.119	43762.	0.00
29.9000	1.66E-04	495911.	-5397.	-1.72E-05	0.00	1.19E+12	-1.353	44950.	0.00
30.3600	7.78E-05	466098.	-5403.	-1.49E-05	0.00	1.19E+12	-0.651	46139.	0.00
30.8200	1.44E-06	436265.	-5405.	-1.28E-05	0.00	1.19E+12	-0.01231	47327.	0.00
31.2800	-6.38E-05	406431.	-5403.		0.00	1.19E+12	0.5607	48516.	0.00

31.7400	-1.19E-04	376615.	-5399.	-9.06E-06	0.00	1.19E+12	1.0680	49704.	0.00
32.2000	-1.64E-04	346831.	-5391.	-7.38E-06	0.00	1.19E+12	1.5098	50892.	0.00
32.6600	-2.00E-04	317093.	-5382.	-5.83E-06	0.00	1.19E+12	1.8873	52081.	0.00
33.1200	-2.28E-04	287412.	-5371.	-4.43E-06	0.00	1.19E+12	2.2019	53269.	0.00
33.5800	-2.49E-04	257799.	-5358.	-3.16E-06	0.00	1.19E+12	2.4559	54457.	0.00
34.0400	-2.63E-04	228261.	-5344.	-2.04E-06	0.00	1.19E+12	2.6523	55646.	0.00
34.5000	-2.71E-04	198803.	-5329.	-1.04E-06	0.00	1.19E+12	2.7945	56834.	0.00
34.9600	-2.75E-04	169430.	-5093.	-1.89E-07	0.00	1.19E+12	82.7323	1662901.	0.00
35.4200	-2.74E-04	142579.	-4635.	5.35E-07	0.00	1.19E+12	83.0923	1677024.	0.00
35.8800	-2.69E-04	118259.	-4179.	1.14E-06	0.00	1.19E+12	82.3271	1691150.	0.00
36.3400	-2.61E-04	96448.	-3729.	1.64E-06	0.00	1.19E+12	80.6010	1705281.	0.00
36.8000	-2.51E-04	77092.	-3291.	2.04E-06	0.00	1.19E+12	78.0650	1719415.	0.00
37.2600	-2.38E-04	60116.	-2869.	2.36E-06	0.00	1.19E+12	74.8559	1733553.	0.00
37.7200	-2.25E-04	45420.	-2466.	2.61E-06	0.00	1.19E+12	71.0962	1747694.	0.00
38.1800	-2.10E-04	32890.	-2086.	2.79E-06	0.00	1.19E+12	66.5338	1752344.	0.00
38.6400	-1.94E-04	22388.	-1733.	2.92E-06	0.00	1.19E+12	61.5146	1752344.	0.00
39.1000	-1.77E-04	13761.	-1408.	3.00E-06	0.00	1.19E+12	56.3133	1752344.	0.00
39.5600	-1.61E-04	6849.	-1111.	3.05E-06	0.00	1.19E+12	50.9999	1752344.	0.00
40.0200	-1.44E-04	1491.	-844.687	3.07E-06	0.00	1.19E+12	45.6308	1752344.	0.00
40.4800	-1.27E-04	-2477.	-607.657	3.07E-06	0.00	1.19E+12	40.2496	1752344.	0.00
40.9400	-1.10E-04	-5218.	-400.276	3.05E-06	0.00	1.19E+12	34.8885	1752344.	0.00
41.4000	-9.31E-05	-6896.	-222.371	3.02E-06	0.00	1.19E+12	29.5699	1752344.	0.00
41.8600	-7.66E-05	-7673.	-73.670	2.99E-06	0.00	1.19E+12	24.3074	1752344.	0.00
42.3200	-6.02E-05	-7709.	46.1550	2.95E-06	0.00	1.19E+12	19.1073	1752344.	0.00
42.7800	-4.40E-05	-7163.	137.4484	2.92E-06	0.00	1.19E+12	13.9700	1752344.	0.00
43.2400	-2.80E-05	-6192.	200.5447	2.88E-06	0.00	1.19E+12	8.8910	1752344.	0.00
43.7000	-1.22E-05	-4949.	235.7437	2.86E-06	0.00	1.19E+12	3.8623	1752344.	0.00
44.1600	3.55E-06	-3589.	243.2957	2.84E-06	0.00	1.19E+12	-1.126	1752344.	0.00
44.6200	1.92E-05	-2263.	223.3924	2.82E-06	0.00	1.19E+12	-6.085	1752344.	0.00
45.0800	3.47E-05	-1123.	176.1653	2.82E-06	0.00	1.19E+12	-11.026	1752344.	0.00
45.5400	5.03E-05	-318.213	101.6904	2.81E-06	0.00	1.19E+12	-15.958	1752344.	0.00
46.0000	6.58E-05	0.00	0.00	2.81E-06	0.00	1.19E+12	-20.887	876172.	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.

Pile-head deflection = 0.05004260 inches
Computed slope at pile head = -0.0002128 radians
Maximum bending moment = 1238940. inch-lbs
Maximum shear force = 14981. lbs
Depth of maximum bending moment = 16.10000000 feet belo

Depth of maximum bending moment = 16.10000000 feet below pile head Depth of maximum shear force = 12.88000000 feet below pile head Number of iterations = 18

Number of iterations = 18 Number of zero deflection points = 2

Pile deflection at ground = 0.01909354 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
46.00000	0.05004260	1238940.	14981.
43.70000	0.05356136	1267167.	14951.
41.40000	0.05687262	1279452.	14982.
39.10000	0.06050491	1275752.	14976.
36.80000	0.05631995	1267234.	14981.
34.50000	0.08104003	1217465.	14982.
32.20000	0.09136305	1222129.	14966.
29.90000	0.11165609	1202499.	14965.
27.60000	0.18223083	1189681.	14981.
25.30000	0.31541905	1193731.	14985.
23.00000	0.68398838	1158131.	-16684.
20.70000	2.46763794	1141326.	-23788.
18.40000	31.33683866	1094375.	-38699.

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

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.1105	1.19E-05	0.00	-4.26E-04	0.00	1.19E+12	0.00	0.00	44.0976
0.4600	0.1082	671.8358	260.7869	-4.26E-04	0.00	1.19E+12	0.00	0.00	50.3904
0.9200	0.1058	2879.	562.0994	-4.26E-04	0.00	1.19E+12	0.00	0.00	58.7808
1.3800	0.1035	6877.	909.7269	-4.26E-04	0.00	1.19E+12	0.00	0.00	67.1712
1.8400	0.1011	12922.	1304.	-4.26E-04	0.00	1.19E+12	0.00	0.00	75.5616
2.3000	0.09877	21270.	1744.	-4.26E-04	0.00	1.19E+12	0.00	0.00	83.9520
2.7600	0.09642	32175.	2230.	-4.26E-04	0.00	1.19E+12	0.00	0.00	92.3424
3.2200	0.09407	45895.	2763.	-4.26E-04	0.00	1.19E+12	0.00	0.00	100.7328
3.6800	0.09172	62683.	3343.	-4.26E-04	0.00	1.19E+12	0.00	0.00	109.1232
4.1400	0.08937	82797.	3968.	-4.25E-04	0.00	1.19E+12	0.00	0.00	117.5136
4.6000	0.08703	106491.	4640.	-4.25E-04	0.00	1.19E+12	0.00	0.00	125.9040
5.0600	0.08468	134022.	5358.	-4.24E-04	0.00	1.19E+12	0.00	0.00	134.2944
5.5200	0.08234	165644.	6123.	-4.23E-04	0.00	1.19E+12	0.00	0.00	142.6848
5.9800	0.08001	201615.	6933.	-4.23E-04	0.00	1.19E+12	0.00	0.00	151.0752
6.4400	0.07768	242188.	7790.	-4.22E-04	0.00	1.19E+12	0.00	0.00	159.4656
6.9000	0.07535	287621.	8694.	-4.20E-04	0.00	1.19E+12	0.00	0.00	167.8560
7.3600	0.07304	338168.	9644.	-4.19E-04	0.00	1.19E+12	0.00	0.00	176.2464
7.8200	0.07073	394086.	10640.	-4.17E-04	0.00	1.19E+12	0.00	0.00	184.6368
8.2800	0.06843	455629.	11682.	-4.15E-04	0.00	1.19E+12	0.00	0.00	193.0272
8.7400	0.06614	523054.	12771.	-4.13E-04	0.00	1.19E+12	0.00	0.00	201.4176
9.2000	0.06387	596617.	13906.	-4.10E-04	0.00	1.19E+12	0.00	0.00	209.8080
9.6600	0.06161	676572.	15087.	-4.07E-04	0.00	1.19E+12	0.00	0.00	218.1984
10.1200	0.05937	763176.	16315.	-4.04E-04	0.00	1.19E+12	0.00	0.00	226.5888
10.5800	0.05715	856684.	17588.	-4.00E-04	0.00	1.19E+12	0.00	0.00	234.9792
11.0400	0.05495	957352.	18909.	-3.96E-04	0.00	1.19E+12	0.00	0.00	243.3696
11.5000	0.05278	1065436.	20275.	-3.91E-04	0.00	1.19E+12	0.00	0.00	251.7600
11.9600	0.05063	1181191.	21688.	-3.86E-04	0.00	1.19E+12	0.00	0.00	260.1504
12.4200	0.04852	1304873.	22903.	-3.80E-04	0.00	1.19E+12	0.00	0.00	180.0512
12.8800	0.04643	1434041.	23353.	-3.74E-04	0.00	1.19E+12	-17.204	2045.	0.00

13.3400	0.04439	1562684.	23205.	-3.67E-04	0.00	1.19E+12	-36.353	4521.	0.00
13.8000	0.04238	1690220.	21242.	-3.59E-04	0.00	1.18E+12	-674.761	87885.	0.00
14.2600	0.04042	1797196.	17500.	-3.51E-04	0.00	1.18E+12	-681.096	93018.	0.00
14.7200	0.03850	1883419.	13724.	-3.43E-04	0.00	1.18E+12	-686.988	98492.	0.00
15.1800	0.03663	1948709.	9917.	-3.34E-04	0.00	1.18E+12	-692.439	104335.	0.00
15.6400	0.03482	1992900.	6081.	-3.25E-04	0.00	1.18E+12	-697.447	110575.	0.00
16.1000	0.03305	2015839.	2218.	-3.15E-04	0.00	1.18E+12	-702.013	117247.	0.00
16.5600	0.03134	2017388.	116.2476	-3.06E-04	0.00	1.18E+12	-59.542	10488.	0.00
17.0200	0.02967	2017122.	-221.335	-2.96E-04	0.00	1.18E+12	-62.771	11677.	0.00
17.4800	0.02806	2014944.	-575.102	-2.87E-04	0.00	1.18E+12	-65.406	12865.	0.00
17.9400	0.02650	2010773.	-941.864	-2.78E-04	0.00	1.18E+12	-67.479	14053.	0.00
18.4000	0.02500	2004546.	-1319.	-2.68E-04	0.00	1.18E+12	-69.024	15242.	0.00
18.8600	0.02354	1996216.	-1703.	-2.59E-04	0.00	1.18E+12	-70.074	16430.	0.00
19.3200	0.02214	1985750.	-2091.	-2.50E-04	0.00	1.18E+12	-70.662	17619.	0.00
19.7800	0.02079	1973132.	-2481.	-2.40E-04	0.00	1.18E+12	-70.819	18807.	0.00
20.2400	0.01948	1958355.	-2872.	-2.31E-04	0.00	1.18E+12	-70.578	19995.	0.00
20.7000	0.01823	1941428.	-3260.	-2.22E-04	0.00	1.18E+12	-69.970	21184.	0.00
21.1600	0.01703	1922369.	-3643.	-2.13E-04	0.00	1.18E+12	-69.025	22372.	0.00
21.6200	0.01588	1901207.	-4021.	-2.04E-04	0.00	1.18E+12	-67.774	23560.	0.00
22.0800	0.01478	1877980.	-4391.	-1.95E-04	0.00	1.18E+12	-66.247	24749.	0.00
22.5400	0.01372	1852734.	-4751.	-1.87E-04	0.00	1.18E+12	-64.472	25937.	0.00
23.0000	0.01271	1825523.	-5102.	-1.78E-04	0.00	1.18E+12	-62.477	27125.	0.00
23.4600	0.01175	1796409.	-5441.	-1.70E-04	0.00	1.18E+12	-60.289	28314.	0.00
23.9200	0.01084	1765458.	-5767.	-1.61E-04	0.00	1.18E+12	-57.935	29502.	0.00
24.3800	0.00997	1732741.	-6080.	-1.53E-04	0.00	1.18E+12	-55.441	30690.	0.00
24.8400	0.00915	1698336.	-6379.	-1.45E-04	0.00	1.18E+12	-52.829	31879.	0.00
25.3000	0.00837	1662320.	-6663.	-1.37E-04	0.00	1.18E+12	-50.125	33067.	0.00
25.7600	0.00763	1624777.	-6932.	-1.30E-04	0.00	1.18E+12	-47.350	34255.	0.00
26.2200	0.00693	1585792.	-7185.	-1.22E-04	0.00	1.19E+12	-44.525	35444.	0.00
26.6800	0.00628	1545449.	-7423.	-1.15E-04	0.00	1.19E+12	-41.672	36632.	0.00
27.1400	0.00566	1503837.	-7646.	-1.08E-04	0.00	1.19E+12	-38.809	37820.	0.00
27.6000	0.00509	1461043.	-7852.	-1.01E-04	0.00	1.19E+12	-35.954	39009.	0.00
28.0600	0.00455	1417153.	-8043.	-9.43E-05	0.00	1.19E+12	-33.125	40197.	0.00
28.5200	0.00405	1372253.	-8218.	-8.79E-05	0.00	1.19E+12	-30.336	41385.	0.00
28.9800	0.00358	1326429.	-8378.	-8.16E-05	0.00	1.19E+12	-27.603	42574.	0.00
29.4400	0.00315	1279765.		-7.55E-05	0.00	1.19E+12	-24.939	43762.	0.00
29.9000	0.00275	1232340.	-8653.		0.00	1.19E+12	-22.355	44950.	0.00
30.3600	0.00238	1184234.	-8770.	-6.40E-05	0.00	1.19E+12	-19.865	46139.	0.00
30.8200	0.00204	1135523.	-8873.	-5.86E-05	0.00	1.19E+12	-17.476	47327.	0.00
31.2800	0.00173	1086279.	-8963.	-5.35E-05	0.00	1.19E+12	-15.197	48516.	0.00
31.7400	0.00145	1036572.	-9041.	-4.85E-05	0.00	1.19E+12	-13.037	49704.	0.00
32.2000	0.00119	986468.	-9107.	-4.38E-05	0.00	1.19E+12	-11.001	50892.	0.00
32.6600	9.64E-04	936029.	-9163.		0.00	1.19E+12	-9.094	52081.	0.00

22 1200	7 505 04	005313	0200	2 515 05	0.00	1 105,13	7 221	F2260	0.00
33.1200	7.59E-04	885313.	-9208.	-3.51E-05	0.00	1.19E+12	-7.321	53269.	0.00
33.5800	5.76E-04	834373.	-9244.	-3.11E-05	0.00	1.19E+12	-5.683	54457.	0.00
34.0400	4.15E-04	783261.	-9271.	-2.74E-05	0.00	1.19E+12	-4.182	55646.	0.00
34.5000	2.74E-04	732021.	-9290.	-2.39E-05	0.00	1.19E+12	-2.818	56834.	0.00
34.9600	1.51E-04	680695.	-9424.	-2.06E-05	0.00	1.19E+12	-45.592	1662901.	0.00
35.4200	4.64E-05	627980.	-9589.	-1.75E-05	0.00	1.19E+12	-14.110	1677024.	0.00
35.8800	-4.24E-05	574835.	-9592.	-1.48E-05	0.00	1.19E+12	12.9778	1691150.	0.00
36.3400	-1.16E-04	522085.	-9457.	-1.22E-05	0.00	1.19E+12	35.9679	1705281.	0.00
36.8000	-1.77E-04	470432.	-9205.	-9.90E-06	0.00	1.19E+12	55.1686	1719415.	0.00
37.2600	-2.26E-04	420459.	-8857.	-7.83E-06	0.00	1.19E+12	70.8932	1733553.	0.00
37.7200	-2.64E-04	372647.	-8431.	-5.99E-06	0.00	1.19E+12	83.4546	1747694.	0.00
38.1800	-2.92E-04	327377.	-7945.	-4.37E-06	0.00	1.19E+12	92.6592	1752344.	0.00
38.6400	-3.12E-04	284931.	-7416.	-2.94E-06	0.00	1.19E+12	98.9777	1752344.	0.00
39.1000	-3.24E-04	245501.	-6859.	-1.71E-06	0.00	1.19E+12	102.9776	1752344.	0.00
39.5600	-3.31E-04	209208.	-6285.	-6.57E-07	0.00	1.19E+12	104.9797	1752344.	0.00
40.0200	-3.32E-04	176114.	-5705.	2.38E-07	0.00	1.19E+12	105.2794	1752344.	0.00
40.4800	-3.28E-04	146229.	-5127.	9.86E-07	0.00	1.19E+12	104.1459	1752344.	0.00
40.9400	-3.21E-04	119516.	-4558.	1.60E-06	0.00	1.19E+12	101.8225	1752344.	0.00
41.4000	-3.10E-04	95906.	-4005.	2.10E-06	0.00	1.19E+12	98.5265	1752344.	0.00
41.8600	-2.98E-04	75298.	-3473.	2.50E-06	0.00	1.19E+12	94.4501	1752344.	0.00
42.3200	-2.83E-04	57569.	-2964.	2.81E-06	0.00	1.19E+12	89.7609	1752344.	0.00
42.7800	-2.67E-04	42574.	-2483.	3.04E-06	0.00	1.19E+12	84.6033	1752344.	0.00
43.2400	-2.49E-04	30157.	-2031.	3.21E-06	0.00	1.19E+12	79.0992	1752344.	0.00
43.7000	-2.31E-04	20150.	-1610.	3.33E-06	0.00	1.19E+12	73.3497	1752344.	0.00
44.1600	-2.12E-04	12379.	-1222.	3.40E-06	0.00	1.19E+12	67.4363	1752344.	0.00
44.6200	-1.93E-04	6662.	-866.143	3.45E-06	0.00	1.19E+12	61.4221	1752344.	0.00
45.0800	-1.74E-04	2816.	-543.842	3.47E-06	0.00	1.19E+12	55.3537	1752344.	0.00
45.5400	-1.55E-04	657.6383	-255.102	3.48E-06	0.00	1.19E+12	49.2624	1752344.	0.00
46.0000	-1.36E-04	0.00	0.00	3.48E-06	0.00	1.19E+12	43.1657	876172.	0.00
		2.30	5.50	3	2.30	= • = - · 	,	· · · · · ·	2.00

^{*} 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 = 0.11053634 inches
Computed slope at pile head = -0.0004262 radians
Maximum bending moment = 2017388. inch-lbs

Maximum shear force = 23353. lbs

Depth of maximum bending moment = 16.56000000 feet below pile head Depth of maximum shear force = 12.88000000 feet below pile head

Number of iterations = 16 Number of zero deflection points = 1

Pile deflection at ground = 0.04815405 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
46.00000 43.70000 41.40000 39.10000 36.80000 34.50000 32.20000 29.90000 27.60000 25.30000 23.00000	0.11053634 0.11620205 0.12206746 0.13116178 0.13447352 0.19218274 0.22833532 0.29371963 0.48752959 0.92872494 2.16587983	2017388. 2063440. 2089124. 2087917. 2044482. 1969735. 1971489. 1936667. 1916339. 1913468. 1849512.	23353. 23304. 23357. 23343. 23349. 23366. 23337. 23342. 23375. -23629.
20.70000	9.19572747	1810749.	-41081.

Summary of Pile-head Responses for Conventional Analyses

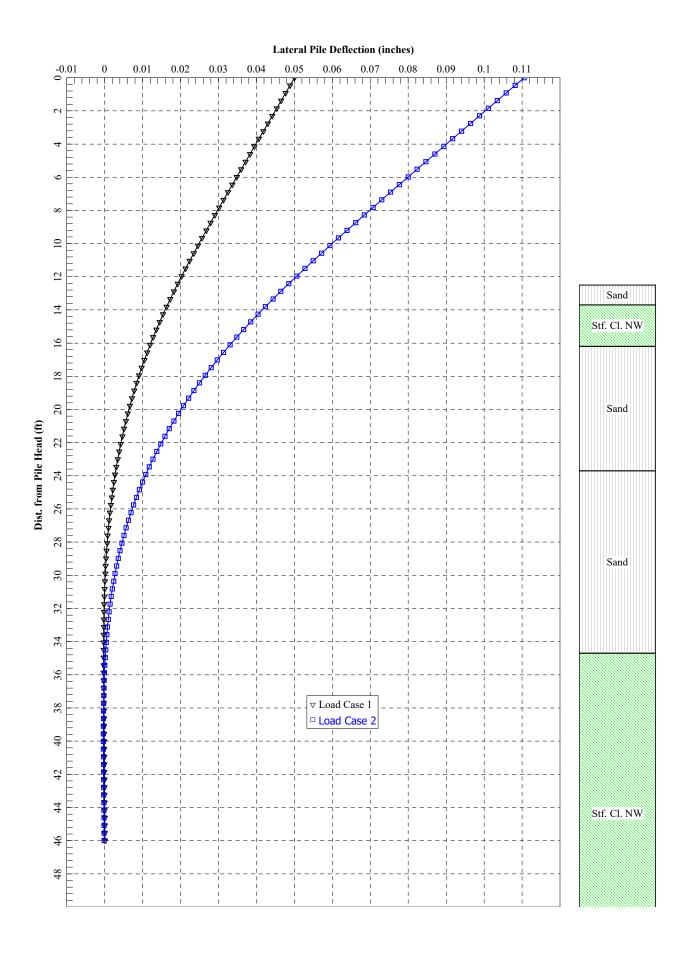
Definitions of Pile-head Loading Conditions:

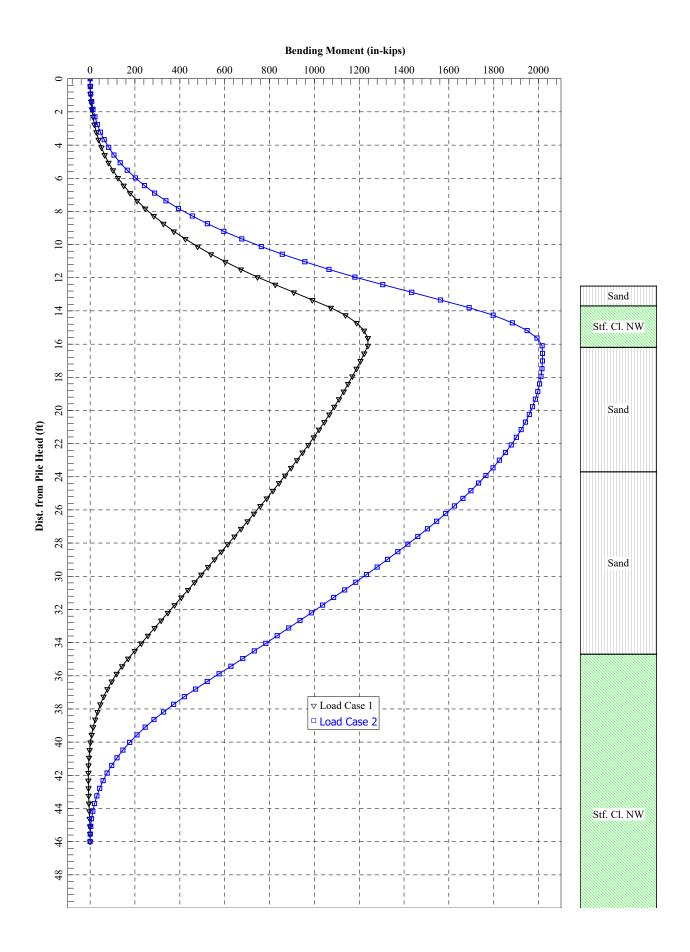
```
Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs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

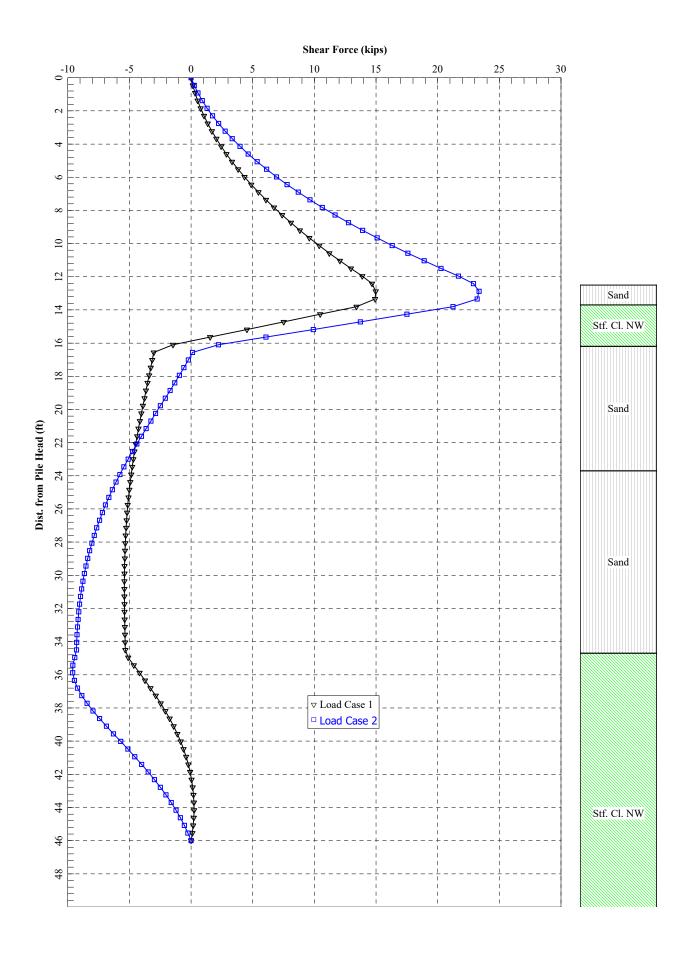
, ,	Pile-head	Load Type	Pile-head	U	Deflection		in Pile	in Pile
No. 1	Load 1	2	Load 2	lbs	inches	radians	lbs	in-lbs
1 V, lb	0.00	M, in-lb	0.00	0.00	0.05004	-2.13E-04	14981.	1238940.
2 V, 1b	0.00	M, in-lb	0.00	0.00	0.1105	-4.26E-04	23353.	2017388.

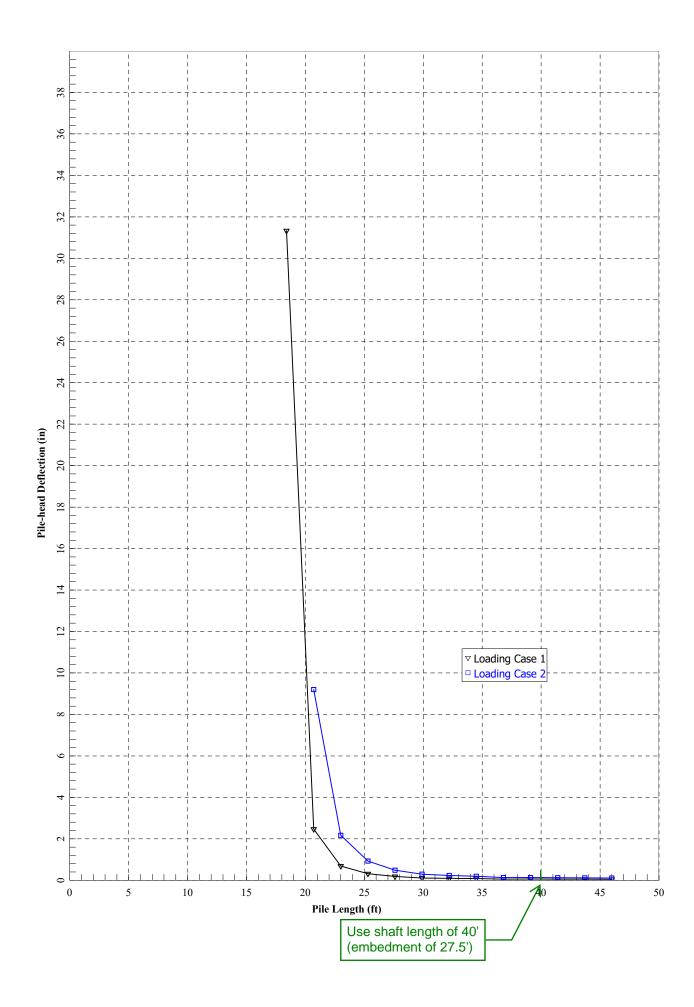
Maximum pile-head deflection = 0.1105363424 inches
Maximum pile-head rotation = -0.0004262392 radians = -0.024422 deg.

The analysis ended normally.









Section within Abutment/Wingwalls, 12.5' height, horizontal backslope, during construction (after abutment construction, prior to superstructure installation, includes abutment/wingwall/fill loading, free-head)

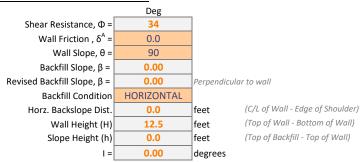
Geometry

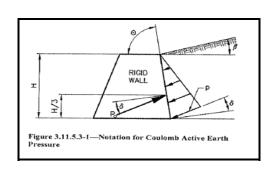
				Horiz. Distance	
	Elevation (ft)	_		from C/L (ft)	
Top of Backfill =	721.1	at Outside Edge of Shoulder	Start of Wall Backfill =		at Outside Edge of Shoulder
Top of Wall =	710.0	at C/L of Wall	Wall =		at C/L of Wall
Existing Ground Surface =	702.3	at C/L of Wall		_	
Bottom of Wall =	697.5	at C/L of Wall	Backfill Slope Angle =		H:1V

Wall Loading Profile

	Top Elev.	Thickness (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	_
Item 203	710.0	7.7	250	28	125	A-6a/A-6b per GDM
Medium Dense Granular	702.3	4.8	0	36.5	125	
Bottom of Wall	697.5					•
Weighted Value		12.5	155	31	125	

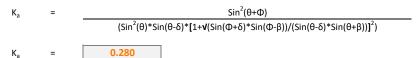
Earth Pressure Coefficients





Horiz Distance

Active Earth Coefficient



At-Rest Earth Coefficient

 $K_o = (1-Sin(\phi))*(1+Sin(\beta))$ $K_o = 0.437$

Notes:

A. Wall friction neglected

- B. Figure and Equation for Active Earth Pressure from AASHTO 3.11.5.3 (LRFD Design Manual).
- C. The wall backfill will consist of proposed fill and granular overburden. Using the soil layer thicknesses and respective soil parameters as provided by SME, a weighted average was determined and assumed for the entire backfill (c' = 155 psf and φ' = 31°. The parameters were converted to equivalent soil strength parameters c' = 0 psf and φ' = 34° for computing earth pressures based on a 1 degree increase in friction angle for every 50 psf decrease in cohesion up to 150 psf (Ref: Hall's Thesis).

Soil Lateral Design Profile							
	Top Elev	Depth (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	ε50	k
Medium Dense Granular	697.5	12.5	0	36.5	62.6	N/A	125
Very Stiff Cohesive	696.3	13.7	4000	0	62.6	0.005	N/A
Medium Dense Granular	693.8	16.2	0	33	59.6	N/A	60
Medium Dense Silt	686.3	23.7	0	33	62.6	N/A	60
Medium Stiff to Stiff Cohesive	675.3	34.7	1700	0	57.6	0.007	N/A
Stiff to Very Stiff Cohesive	645.8	64.2	2700	0	59.6	0.005	N/A
Medium Stiff to Stiff Silt	633.3	76.7	1400	0	55.6	0.007	N/A
Very Stiff to Hard Silt	602.8	107.2	3300	0	72.6	0.005	N/A
Bedrock	587.8	122.2	N/A	N/A	N/A	N/A	N/A

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)

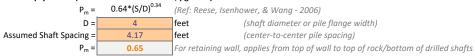
Restraint Condition = ACTIVE (Active or At-Rest)

Ka = 0.280

3) Determine Equivalent Fluid Weight (GH)

 $G_H = (\gamma_m)^* (K_a)$ Soil loading only, does not include hydrostatic pressures $G_H = 35$ For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust

$$\label{eq:conventional Earth Pressure Theory} \begin{split} \text{Exposed Wall Height (H)} &= \underbrace{ \ \ \, 12.5 \ }_{\text{Feet}} \text{ feet} \\ P &= \ \ \, 1/2 * G_{\text{H}} * \text{H}^2 \\ P &= \underbrace{ \ \ \, 2730 \ }_{\text{SSH}} \text{ lbs/foot} \\ P_{\text{SH}} &= \ \ \, P^*(\text{Shaft Spacing}) \\ P_{\text{SH}} &= \underbrace{ \ \ \, 11376 \ }_{\text{Ibs/shaft}} \text{ lbs/shaft} \end{split}$$

6) Resolve horizontal earth force to distributed triangular load (for LPILE)

w =	2*P _{SH} /H	
w =	1820	lbs/foot per shaft (Earth - Service Limit)
w =	152	lbs/inch per shaft (Earth - Service Limit)
$\gamma_E =$	1.5	Earth Load Factor
w =	$(2*P_{SH}/H)*\gamma_E$	_
w =	228	lbs/inch per shaft (Earth - Strength Limit)

7) Determine live-load traffic surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)

w =	P _s /H	
w =	291	lbs/foot per shaft (surcharge - unfactored)
w =	24	lbs/inch per shaft (surcharge - unfactored)
$\gamma_S =$	1.75	Surcharge Load Factor - Strength I
w =	$(P_S/L)*\gamma_S$	
w =	42	lbs/inch per shaft (Surcharge - Strength I)

Distributed Lateral Loads for LPILE

CONVENTIONAL						
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)				
0	24	42				
12.5	176	270				

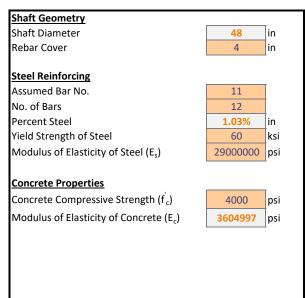
9) Pile Heading Loading (for LPILE, from HDR Structures)

	Service	Strength		
Shear =	0.81	1.21	kips/ft	
Moment =	-1.73	-2.45	kip-ft/ft	
Axial Load =	5.91	7.47	kips/ft	
			_	
Shear =	3375	5042	lbs	
Moment =	-86500	-122500	lb-in	Checked with and without moment loading due to negative direction
Axial Load =	24625	31125	lbs	

Governing maximum shear based on Load Case 2 = Strength Case (Applied Moment)

Shear, Moment, and Deflection Results

Maximum Shear and Moment output from LPile service case provided to HDR's structural engineers for capacity checks. Final reinforcing layout to be confirmed in structural analyses.





LPile for Version 2022-12.012

License ID : 202613844 License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts Subjected to Lateral Loading Using the p-y Method © 1985-2024 by Ensoft, Inc. All Rights Reserved

This software is licensed for exclusive use by:

HDR

LPILE Global, Global License

This model was prepared by: abaratta

Files Used for Analysis

Path to file locations: \pwworking\east01\d4381065\

Name of input data file:

4b. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Const. w Abt.lp12d

Name of output report file:

4b. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Const. w Abt.lp12o

Name of plot output file:

4b. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Const. w Abt.lp12p

Name of runtime message file:

4b. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Const. w Abt.lp12r

Load Case 1 = Service Case (Applied Moment)

Load Case 2 = Strength Case (Applied Moment)

Load Case 3 = Service Case (No Applied Moment)

Load Case 4 = Strength Case (No Applied Moment)

Date and Time of Analysis					
Date: July 9, 2025 Time: 14:51:16					
Problem Title					
Project Name: CUY-17-13.50					
Job Number:					
Client:					
Engineer: HDR					
Description: Fwd. Abt., 12.5' Ht., 4' Dia., Const. w/ Abt. Load					
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
- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- Analysis includes loading by multiple distributed lateral loads acting on pile
- 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 = 46.000 ft
Depth of ground surface below top of pile = 12.5000 ft

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

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

Depth Below

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	48.0000
2	46.000	48.0000

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 = 46.000000 ft

Shaft Diameter = 48.000000 in

Soil and Rock Layering Information

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 12.500000 ft

Distance from top of pile to bottom of layer = 13.700000 ft

Effective unit weight at top of layer = 62.600000 pcf

Effective unit weight at bottom of layer = 62.600000 pcf

Friction angle at top of layer = 36.500000 deg.

Friction angle at bottom of layer = 36.500000 deg.

Subgrade k at top of layer = 125.000000 pci

Subgrade k at bottom of layer = 125.000000 pci

Layer 2 is stiff clay without free water

Distance from top of pile to top of layer = 13.700000 ft
Distance from top of pile to bottom of layer = 16.200000 ft
Effective unit weight at top of layer = 62.600000 pcf
Effective unit weight at bottom of layer = 62.600000 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 sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	16.200000 ft
Distance from top of pile to bottom of layer	=	23.700000 ft
Effective unit weight at top of layer	=	59.600000 pcf
Effective unit weight at bottom of layer	=	59.600000 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

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

Distance from top of pile to top of layer	=	23.700000 ft
Distance from top of pile to bottom of layer	=	34.700000 ft
Effective unit weight at top of layer	=	62.600000 pcf
Effective unit weight at bottom of layer	=	62.600000 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

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	34.700000 ft
Distance from top of pile to bottom of layer	=	64.200000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1700. psf
Undrained cohesion at bottom of layer	=	1700. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer	=	64.200000 ft
Distance from top of pile to bottom of layer	=	76.700000 ft
Effective unit weight at top of layer	=	59.600000 pcf
Effective unit weight at bottom of layer	=	59.600000 pcf
Undrained cohesion at top of layer	=	2700. psf
Undrained cohesion at bottom of layer	=	2700. psf
Epsilon-50 at top of layer	=	0.005000
Epsilon-50 at bottom of layer	=	0.005000

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer	=	76.700000 ft
Distance from top of pile to bottom of layer	=	107.200000 ft
Effective unit weight at top of layer	=	55.600000 pcf
Effective unit weight at bottom of layer	=	55.600000 pcf
Undrained cohesion at top of layer	=	1400. psf
Undrained cohesion at bottom of layer	=	1400. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 8 is stiff clay without free water

Distance from top of pile to top of layer	=	107.200000 ft
Distance from top of pile to bottom of layer	=	122.000000 ft
Effective unit weight at top of layer	=	72.600000 pcf
Effective unit weight at bottom of layer	=	72.600000 pcf
Undrained cohesion at top of layer	=	3300. psf
Undrained cohesion at bottom of layer	=	3300. psf
Epsilon-50 at top of layer	=	0.005000
Epsilon-50 at bottom of layer	=	0.005000

(Depth of the lowest soil layer extends 76.000 ft below the pile tip)

```
Summary of Input Soil Properties
```

E50

Layer Soil Type Layer Effective Cohesion Angle of

Num.	Name (p-y Curve Type)	Depth ft	Unit Wt. pcf	psf	Friction deg.	or krm	kpy pci
1	Sand	12.5000	62.6000		36.5000		125.0000
	(Reese, et al.)	13.7000	62.6000		36.5000		125.0000
2	Stiff Clay	13.7000	62.6000	4000.		0.00500	
	w/o Free Water	16.2000	62.6000	4000.		0.00500	
3	Sand	16.2000	59.6000		33.0000		60.0000
	(Reese, et al.)	23.7000	59.6000		33.0000		60.0000
4	Sand	23.7000	62.6000		33.0000		60.0000
	(Reese, et al.)	34.7000	62.6000		33.0000		60.0000
5	Stiff Clay	34.7000	57.6000	1700.		0.00700	
	w/o Free Water	64.2000	57.6000	1700.		0.00700	
6	Stiff Clay	64.2000	59.6000	2700.		0.00500	
	w/o Free Water	76.7000	59.6000	2700.		0.00500	
7	Stiff Clay	76.7000	55.6000	1400.		0.00700	
	w/o Free Water	107.2000	55.6000	1400.		0.00700	
8	Stiff Clay	107.2000	72.6000	3300.		0.00500	
	w/o Free Water	122.0000	72.6000	3300.		0.00500	

Modification Factors for p-y Curves

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult
1	12.500	0.6500	1.0000
2	122.200	0.6500	1.0000

Static Loading Type

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

Distributed La	teral Loading	for Individual L	oad Cases

Distributed lateral load intensity for Load Case 1 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	24.000
2	12.500	176.000

Distributed lateral load intensity for Load Case 2 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	42.000
2	12.500	270.000

Distributed lateral load intensity for Load Case 3 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	24.000
2	12.500	176.000

Distributed lateral load intensity for Load Case 4 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	42.000
2	12.500	270.000

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 4

Load No.	Load Type	Condition 1		Condition 2		Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	1	V =	3375. lbs	M =	-86500. in-lbs	24625.	Yes	Yes
2	1	V =	5042. lbs	M =	-122500. in-lbs	31125.	Yes	Yes
3	1	V =	3375. lbs	M =	0.0000 in-lbs	24625.	Yes	Yes
4	1	V =	5042. lbs	M =	0.0000 in-lbs	31125.	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 = 46.000000 ft Shaft Diameter = 48.000000 in

Concrete Cover Thickness (to edge of long. rebar) = 4.000000 in

Number of Reinforcing Bars	=	12	bars
Yield Stress of Reinforcing Bars	=	60000.	psi
Modulus of Elasticity of Reinforcing Bars	=	29000000.	psi
Gross Area of Shaft	=	1810.	sq. in.
Total Area of Reinforcing Steel	=	18.720000	sq. in.
Area Ratio of Steel Reinforcement	=	1.03	percent
Edge-to-Edge Bar Spacing	=	8.577827	in
Maximum Concrete Aggregate Size	=	0.750000	in
Ratio of Bar Spacing to Aggregate Size	=	11.44	
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 7212.047 kips
Tensile Load for Cracking of Concrete = -807.459 kips
Nominal Axial Tensile Capacity = -1123.200 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar	Bar Diam.	Bar Area	Χ	Υ
Number	inches	sq. in.	inches	inches
1	1.410000	1.560000	19.295000	0.00000
2	1.410000	1.560000	16.709960	9.647500
3	1.410000	1.560000	9.647500	16.709960
4	1.410000	1.560000	0.00000	19.295000
5	1.410000	1.560000	-9.64750	16.709960
6	1.410000	1.560000	-16.70996	9.647500
7	1.410000	1.560000	-19.29500	0.00000
8	1.410000	1.560000	-16.70996	-9.64750
9	1.410000	1.560000	-9.64750	-16.70996
10	1.410000	1.560000	0.00000	-19.29500
11	1.410000	1.560000	9.647500	-16.70996
12	1.410000	1.560000	16.709960	-9.64750

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

Minimum spacing between any two bars not equal to zero = 8.578 inches between bars 7 and 8.

Ratio of bar spacing to maximum aggregate size = 11.44

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 = 2

Number	Axial Thrust Force
	kips
1	24.625
2	31.125

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 = 24.625 kips

Bending Bending Depth to Max Comp Max Tens Max Conc Max Steel Run

Curvature	Moment	Stiffness	N Axis	Strain	Strain	Stress		Msg
rad/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi	
6.25000E-07	742.7393333	1188382933.	28.8569679	0.00001804	-0.00001196	0.0754963	0.4490825	
0.00000125	1482.	1185585423.	26.4360792	0.00003305	-0.00001130	0.1376722	0.8104079	
0.00000188	2218.	1182690631.	25.6291834	0.00004805	-0.00004195	0.1993521	1.1717369	
0.00000250	2949.	1179771119.	25.2257666	0.00006306	-0.00005694	0.2605359	1.5330681	
0.00000313	3678.	1176841681.	24.9837384	0.00007807	-0.00007193	0.3212234	1.8944013	
0.00000375	4402.	1173907269.	24.8224038	0.00009308	-0.00008692	0.3814148	2.2557364	
0.00000438	5123.	1170970015.	24.7071798	0.0001081	-0.000102	0.4411099	2.6170735	
0.00000500	5123.	1024598763.	13.9459670	0.00006973	-0.000170	0.2853675	-4.346232	С
0.00000563	5123.	910754456.	13.7179132	0.00007716	-0.000193	0.3150761	-4.926711	
0.00000625	5123.	819679011.	13.5306867	0.00008457	-0.000215	0.3445434	-5.508063	
0.00000688	5123.	745162737.	13.3769085	0.00009197	-0.000238	0.3738773	-6.089523	
0.00000750	5123.	683065842.	13.2493726	0.00009937	-0.000261	0.4031110	-6.670853	
0.00000813	5123.	630522316.	13.1397108	0.0001068	-0.000283	0.4321682	-7.252606	С
0.00000875	5123.	585485008.	13.0444969	0.0001141	-0.000306	0.4610660	-7.834659	С
0.00000938	5123.	546452674.	12.9624712	0.0001215	-0.000328	0.4898648	-8.416578	С
0.00001000	5123.	512299382.	12.8910783	0.0001289	-0.000351	0.5185642	-8.998363	C
0.00001063	5123.	482164124.	12.8286327	0.0001363	-0.000374	0.5471642	-9.580013	C
0.00001125	5123.	455377228.	12.7735010	0.0001437	-0.000396	0.5756645	-10.161527	C
0.00001188	5123.	431410006.	12.7245660	0.0001511	-0.000419	0.6040650	-10.742906	C
0.00001250	5123.	409839505.	12.6793292	0.0001585	-0.000442	0.6322857	-11.324743	C
0.00001313	5123.	390323338.	12.6385385	0.0001659	-0.000464	0.6603986	-11.906506	C
0.00001375	5123.	372581368.	12.6018100	0.0001733	-0.000487	0.6884124	-12.488128	C
0.00001438	5123.	356382178.	12.5686151	0.0001807	-0.000509	0.7163270	-13.069609	C
0.00001500	5123.	341532921.	12.5385131	0.0001881	-0.000532	0.7441422	-13.650947	C
0.00001563	5123.	327871604.	12.5111341	0.0001955	-0.000555	0.7718578	-14.232142	C
0.00001625	5123.	315261158.	12.4861648	0.0002029	-0.000577	0.7994737	-14.813195	
0.00001688	5123.	303584819.	12.4633385	0.0002103	-0.000600	0.8269896	-15.394104	
0.00001750	5123.	292742504.	12.4424266	0.0002177	-0.000622	0.8544055	-15.974869	
0.00001813	5123.	282647935.	12.4230851	0.0002252	-0.000645	0.8817210	-16.555489	
0.00001875	5123.	273226337.	12.4054283	0.0002326	-0.000667	0.9089361	-17.135964	
0.00001938	5123.	264412584.	12.3891692	0.0002400	-0.000690	0.9360506	-17.716293	
0.00002000	5123.	256149691.	12.3741777	0.0002475	-0.000713	0.9630642	-18.296477	
0.00002063	5123.	248387579.	12.3603394	0.0002549	-0.000735	0.9899768	-18.876514	
0.00002125	5135.	241638920.	12.3475533	0.0002624	-0.000758	1.0167882	-19.456403	
0.00002188	5276.	241166202.	12.3357302	0.0002698	-0.000780	1.0434982	-20.036145	
0.00002250	5416.	240716055.	12.3247905	0.0002773	-0.000803	1.0701067	-20.615739	
0.00002313	5557.	240286640.	12.3146634	0.0002848	-0.000825	1.0966134	-21.195184	
0.00002375	5697.	239876309.	12.3052856	0.0002923	-0.000848	1.1230182	-21.774480	
0.00002438	5837.	239483583.	12.2966001	0.0002997	-0.000870	1.1493208	-22.353627	
0.00002563	6118.	238745753.	12.2812387	0.0003147	-0.000915	1.2016189	-23.511468	C

0.00002688 0.00002813	6398. 6678.	238063972.	12.2679706	0.0003297	-0.000960	1.2535062	-24.668703 C
	6678.	227420602					
		237430692.	12.2566291	0.0003447	-0.001005	1.3049812	-25.825329 C
0.00002938	6957.	236839648.	12.2469733	0.0003598	-0.001050	1.3560422	-26.981341 C
0.00003063	7236.	236285580.	12.2387783	0.0003748	-0.001095	1.4066829	-28.136775 C
0.00003188	7515.	235764003.	12.2317440	0.0003899	-0.001140	1.4568780	-29.291832 C
0.00003313	7793.	235271281.	12.2258082	0.0004050	-0.001185	1.5066581	-30.446233 C
0.00003438	8071.	234804199.	12.2209660	0.0004201	-0.001230	1.5560217	-31.599974 C
0.00003563	8349.	234359992.	12.2171072	0.0004352	-0.001275	1.6049670	-32.753051 C
0.00003688	8626.	233936268.	12.2141368	0.0004504	-0.001320	1.6534922	-33.905457 C
0.00003813	8903.	233530949.	12.2119721	0.0004656	-0.001364	1.7015958	-35.057188 C
0.00003938	9180.	233142220.	12.2105412	0.0004808	-0.001409	1.7492758	-36.208238 C
0.00004063	9456.	232768488.	12.2097810	0.0004960	-0.001454	1.7965306	-37.358602 C
0.00004188	9732.	232408350.	12.2096360	0.0005113	-0.001499	1.8433583	-38.508273 C
0.00004313	10008.	232060564.	12.2100572	0.0005266	-0.001543	1.8897573	-39.657247 C
0.00004438	10283.	231724028.	12.2110012	0.0005419	-0.001588	1.9357255	-40.805518 C
0.00004563	10558.	231397759.	12.2124294	0.0005572	-0.001633	1.9812612	-41.953079 C
0.00004688	10832.	231080881.	12.2143074	0.0005725	-0.001677	2.0263625	-43.099926 C
0.00004813	11106.	230772604.	12.2166045	0.0005879	-0.001722	2.0710276	-44.246051 C
0.00004938	11380.	230472219.	12.2192930	0.0006033	-0.001767	2.1152544	-45.391450 C
0.00005063	11653.	230179088.	12.2223482	0.0006188	-0.001811	2.1590410	-46.536115 C
0.00005188	11926.	229892632.	12.2257477	0.0006342	-0.001856	2.2023855	-47.680041 C
0.00005313	12198.	229612325.	12.2294713	0.0006497	-0.001900	2.2452859	-48.823221 C
0.00005438	12470.	229337691.	12.2335008	0.0006652	-0.001945	2.2877402	-49.965648 C
0.00005563	12742.	229068293.	12.2377723	0.0006807	-0.001989	2.3297463	-51.107317 C
0.00005688	13013.	228803777.	12.2422046	0.0006963	-0.002034	2.3712853	-52.248401 C
0.00005813	13284.	228543792.	12.2468350	0.0007118	-0.002078	2.4123544	-53.388909 C
0.00005938	13555.	228287969.	12.2517010	0.0007274	-0.002123	2.4529664	-54.528675 C
0.00006063	13825.	228036002.	12.2567915	0.0007431	-0.002167	2.4931194	-55.667693 C
0.00006188	14094.	227787610.	12.2620965	0.0007587	-0.002211	2.5328113	-56.805957 C
0.00006313	14364.	227542531.	12.2676068	0.0007744	-0.002256	2.5720399	-57.943461 C
0.00006438	14632.	227300525.	12.2733140	0.0007901	-0.002300	2.6108030	-59.080197 C
0.00006563	14899.	227033871.	12.2788487	0.0008058	-0.002344	2.6490215	-60.000000 CY
0.00006688	15149.	226527199.	12.2800624	0.0008212	-0.002389	2.6860769	-60.000000 CY
0.00006813	15373.	225665188.	12.2751295	0.0008362	-0.002434	2.7216047	-60.000000 CY
0.00006938	15587.	224675791.	12.2679243	0.0008511	-0.002479	2.7562451	-60.000000 CY
0.00007063	15799.	223706606.	12.2611270	0.0008659	-0.002524	2.7904321	-60.000000 CY
0.00007188	16007.	222703710.	12.2537255	0.0008807	-0.002569	2.8239972	-60.000000 CY
0.00007313	16175.	221196330.	12.2364952	0.0008948	-0.002615	2.8553899	-60.000000 CY
0.00007438	16302.	219189238.	12.2078763	0.0009080	-0.002662	2.8843958	-60.000000 CY
0.00007938	16750.	211025147.	12.0885781	0.0009595	-0.002850	2.9943798	-60.000000 CY
0.00008438	17195.	203795459.	11.9865449	0.0010114	-0.003039	3.0991756	-60.000000 CY
0.00008938	17637.	197342636.	11.8988394	0.0010635	-0.003227	3.1987076	-60.000000 CY
0.00009438	18053.	191286666.	11.8164742	0.0011152	-0.003415	3.2917124	-60.000000 CY

0.00009938	18273.	183883703.	11.6865235	0.0011613	-0.003609	3.3696935	-60.000000 CY
0.0001044	18448.	176749001.	11.5550102	0.0012061	-0.003804	3.4408364	-60.000000 CY
0.0001094	18621.	170253258.	11.4375156	0.0012510	-0.003999	3.5080058	-60.000000 CY
0.0001144	18793.	164312418.	11.3318708	0.0012961	-0.004194	3.5711500	-60.000000 CY
0.0001194	18962.	158848096.	11.2339812	0.0013411	-0.004389	3.6297710	-60.000000 CY
0.0001244	19129.	153802020.	11.1422663	0.0013858	-0.004584	3.6838563	-60.000000 CY
0.0001294	19294.	149134519.	11.0593550	0.0014308	-0.004779	3.7338984	-60.000000 CY
0.0001344	19458.	144803099.	10.9841190	0.0014760	-0.004974	3.7798410	-60.000000 CY
0.0001394	19620.	140771353.	10.9158222	0.0015214	-0.005169	3.8216257	-60.000000 CY
0.0001444	19781.	137007908.	10.8537770	0.0015670	-0.005363	3.8591923	-60.000000 CY
0.0001494	19938.	133474674.	10.7966011	0.0016127	-0.005557	3.8923950	-60.000000 CY
0.0001544	20074.	130032294.	10.7335318	0.0016570	-0.005753	3.9202788	-60.000000 CY
0.0001594	20164.	126516313.	10.6590679	0.0016988	-0.005951	3.9427154	-60.000000 CY
0.0001644	20217.	122991386.	10.5763492	0.0017385	-0.006152	3.9605892	-60.000000 CY
0.0001694	20261.	119620987.	10.4962970	0.0017778	-0.006352	3.9750080	-60.000000 CY
0.0001744	20304.	116439228.	10.4219591	0.0018173	-0.006553	3.9862005	-60.000000 CY
0.0001794	20347.	113430233.	10.3524233	0.0018570	-0.006753	3.9941223	-60.000000 CY
0.0001844	20387.	110573335.	10.2852780	0.0018963	-0.006954	3.9986872	-60.000000 CY
0.0001894	20425.	107856689.	10.2196191	0.0019353	-0.007155	3.9988651	-60.000000 CY
0.0001944	20463.	105274661.	10.1580873	0.0019745	-0.007356	3.9969981	-60.000000 CY
0.0001994	20499.	102818447.	10.1012046	0.0020139	-0.007556	3.9997160	-60.000000 CY
0.0002044	20535.	100477579.	10.0477980	0.0020535	-0.007756	3.9936967	-60.000000 CY
0.0002094	20570.	98244362.	9.9972055	0.0020932	-0.007957	3.9978037	-60.000000 CY
0.0002144	20604.	96112182.	9.9501089	0.0021331	-0.008157	3.9998822	-60.000000 CY
0.0002194	20637.	94072534.	9.9075525	0.0021735	-0.008357	3.9925613	-60.000000 CY
0.0002244	20670.	92120479.	9.8666245	0.0022138	-0.008556	3.9972598	-60.000000 CY
0.0002294	20701.	90249209.	9.8271510	0.0022541	-0.008756	3.9996550	-60.000000 CY
0.0002344	20731.	88450637.	9.7874783	0.0022939	-0.008956	3.9956359	-60.000000 CY
0.0002394	20760.	86724065.	9.7503161	0.0023340	-0.009156	3.9945949	-60.000000 CY
0.0002444	20788.	85066307.	9.7152549	0.0023742	-0.009356	3.9982053	-60.000000 CY
0.0002494	20816.	83473188.	9.6821766	0.0024145	-0.009556	3.9998777	-60.000000 CY
0.0002544	20843.	81939600.	9.6510603	0.0024550	-0.009755	3.9939427	-60.000000 CY
0.0002594	20870.	80462969.	9.6219984	0.0024957	-0.009954	3.9936320	-60.000000 CY
0.0002644	20896.	79040765.	9.5942312	0.0025365	-0.010154	3.9974511	-60.000000 CY
0.0002694	20922.	77669926.	9.5687522	0.0025776	-0.010352	3.9995576	-60.000000 CY
0.0002744	20948.	76347102.	9.5443443	0.0026187	-0.010551	3.9974578	-60.000000 CY
0.0003044	21091.	69291816.	9.4251199	0.0028688	-0.011741	3.9897007	-60.000000 CY
0.0003344	21220.	63463073.	9.3388031	0.0031227	-0.012927	3.9897662	-60.000000 CYT
0.0003644	21337.	58556815.	9.2695596	0.0033776	-0.014112	3.9985339	-60.000000 CYT
0.0003944	21423.	54322616.	9.2045050	0.0036300	-0.015300	3.9966503	-60.000000 CYT
0.0004244	21464.	50578395.	9.1273000	0.0038734	-0.016497	3.9836620	60.0000000 CYT

Axial Thrust Force = 31.125 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Run Stress Msg ksi
6.25000E-07	742.6297252	1188207560.	30.1392519	0.00001884	-0.00001116	0.0788623	0.4723239
0.00000125	1482.	1185495386.	27.0791700	0.00003385	-0.00002615	0.1410216	0.8337199
0.00000188	2217.	1182630002.	26.0592536	0.00004886	-0.00004114	0.2026851	1.1951219
0.00000250	2949.	1179725299.	25.5493396	0.00006387	-0.00005613	0.2638523	1.5565271
0.00000313	3678.	1176804767.	25.2434204	0.00007889	-0.00007111	0.3245233	1.9179350
0.00000375	4402.	1173876302.	25.0394973	0.00009390	-0.00008610	0.3846980	2.2793453
0.00000438	5123.	1170943295.	24.8938568	0.0001089	-0.000101	0.4443764	2.6407581
0.00000500	5123.	1024575383.	14.4898726	0.00007245	-0.000168	0.2964739	-4.267368 C
0.00000563	5123.	910733674.	14.2105478	0.00007993	-0.000190	0.3263474	-4.846352 C
0.00000625	5123.	819660306.	13.9816264	0.00008739	-0.000213	0.3559612	-5.426330 C
0.00000688	5123.	745145733.	13.7934461	0.00009483	-0.000235	0.3854320	-6.006475 C
0.00000750	5123.	683050255.	13.6356315	0.0001023	-0.000258	0.4147514	-6.586850 C
0.00000813	5123.	630507928.	13.4989016	0.0001097	-0.000280	0.4438493	-7 . 167965 C
0.00000875	5123.	585471647.	13.3822364	0.0001171	-0.000303	0.4728466	-7.748948 C
0.00000938	5123.	546440204.	13.2816089	0.0001245	-0.000325	0.5017433	-8.329800 C
0.00001000	5123.	512287691.	13.1938260	0.0001319	-0.000348	0.5305295	-8.910590 C
0.00001063	5123.	482153121.	13.1138447	0.0001393	-0.000371	0.5590929	-9.492147 C
0.00001125	5123.	455366837.	13.0431661	0.0001467	-0.000393	0.5875565	-10.073567 C
0.00001188	5123.	431400161.	12.9803226	0.0001541	-0.000416	0.6159202	-10.654851 C
0.00001250	5123.	409830153.	12.9240925	0.0001616	-0.000438	0.6441839	-11.235999 C
0.00001313	5123.	390314432.	12.8736141	0.0001690	-0.000461	0.6723473	-11.817010 C
0.00001375	5123.	372572867.	12.8280687	0.0001764	-0.000484	0.7004103	-12.397883 C
0.00001438	5123.	356374046.	12.7868139	0.0001838	-0.000506	0.7283727	-12.978619 C
0.00001500	5123.	341525128.	12.7493144	0.0001912	-0.000529	0.7562343	-13.559216 C
0.00001563	5123.	327864123.	12.7149992	0.0001987	-0.000551	0.7839830	-14.139766 C
0.00001625	5123.	315253964.	12.6824134	0.0002061	-0.000574	0.8115606	-14.720713 C
0.00001688	5123.	303577891.	12.6525357	0.0002135	-0.000596	0.8390383	-15.301515 C
0.00001750	5123.	292735824.	12.6250768	0.0002209	-0.000619	0.8664157	-15.882173 C
0.00001813	5123.	282641485.	12.5997876	0.0002284	-0.000642	0.8936927	-16.462687 C
0.00001875	5123.	273220102.	12.5764519	0.0002358	-0.000664	0.9208692	-17.043054 C
0.00001938	5123.	264406550.	12.5548817	0.0002433	-0.000687	0.9479449	-17.623276 C
0.00002000	5123.	256143846.	12.5349123	0.0002507	-0.000709	0.9749197	-18.203351 C
0.00002063	5123.	248381911.	12.5163990	0.0002582	-0.000732	1.0017934	-18.783279 C
0.00002125	5213.	245329941.	12.4992142	0.0002656	-0.000754	1.0285658	-19.363059 C
0.00002188	5354.	244749335.	12.4832448	0.0002731	-0.000777	1.0552367	-19.942692 C
0.00002250	5494.	244197286.	12.4683904	0.0002805	-0.000799	1.0818059	-20.522175 C
0.00002313	5635.	243671468.	12.4545613	0.0002880	-0.000822	1.1082733	-21.101510 C

0.00002375	5775.	243169814.	12.4414917	0.0002955	-0.000845	1.1346386	-21.680695 C
0.00002438	5916.	242690429.	12.4294730	0.0003030	-0.000867	1.1609017	-22.259729 C
0.00002563	6196.	241791940.	12.4078024	0.0003179	-0.000912	1.2131204	-23.417346 C
0.00002688	6476.	240964415.	12.3889256	0.0003330	-0.000957	1.2649279	-24.574355 C
0.00002813	6756.	240198318.	12.3726082	0.0003480	-0.001002	1.3163225	-25.730752 C
0.00002938	7035.	239485734.	12.3582888	0.0003630	-0.001047	1.3673029	-26.886534 C
0.00003063	7314.	238820038.	12.3458367	0.0003781	-0.001092	1.4178672	-28.041694 C
0.00003188	7592.	238195646.	12.3350373	0.0003932	-0.001137	1.4680141	-29.196229 C
0.00003313	7871.	237607816.	12.3257082	0.0004083	-0.001182	1.5177417	-30.350135 C
0.00003438	8149.	237052491.	12.3176938	0.0004234	-0.001227	1.5670486	-31.503405 C
0.00003563	8426.	236526188.	12.3108604	0.0004386	-0.001271	1.6159330	-32.656037 C
0.00003688	8703.	236025892.	12.3050923	0.0004538	-0.001316	1.6643934	-33.808024 C
0.00003813	8980.	235548983.	12.3002893	0.0004689	-0.001361	1.7124279	-34.959362 C
0.00003938	9257.	235093174.	12.2963636	0.0004842	-0.001406	1.7600350	-36.110045 C
0.00004063	9533.	234656459.	12.2932387	0.0004994	-0.001451	1.8072128	-37.260070 C
0.00004188	9809.	234237069.	12.2908471	0.0005147	-0.001495	1.8539596	-38.409430 C
0.00004313	10084.	233833441.	12.2891291	0.0005300	-0.001540	1.9002737	-39.558121 C
0.00004438	10359.	233444186.	12.2880318	0.0005453	-0.001585	1.9461533	-40.706137 C
0.00004563	10634.	233068068.	12.2875083	0.0005606	-0.001629	1.9915966	-41.853473 C
0.00004688	10908.	232703981.	12.2875167	0.0005760	-0.001674	2.0366018	-43.000124 C
0.00004813	11182.	232350934.	12.2880193	0.0005914	-0.001719	2.0811669	-44.146083 C
0.00004938	11455.	232008035.	12.2889827	0.0006068	-0.001763	2.1252902	-45.291346 C
0.00005063	11729.	231674480.	12.2903764	0.0006222	-0.001808	2.1689698	-46.435907 C
0.00005188	12001.	231349541.	12.2921732	0.0006377	-0.001852	2.2122037	-47.579760 C
0.00005313	12274.	231032559.	12.2943484	0.0006531	-0.001897	2.2549900	-48.722899 C
0.00005438	12546.	230722933.	12.2968796	0.0006686	-0.001941	2.2973268	-49.865318 C
0.00005563	12817.	230420117.	12.2999166	0.0006842	-0.001986	2.3392121	-51.007012 C
0.00005688	13088.	230123612.	12.3031055	0.0006997	-0.002030	2.3806438	-52.147974 C
0.00005813	13359.	229832961.	12.3065949	0.0007153	-0.002075	2.4216200	-53.288198 C
0.00005938	13629.	229547745.	12.3103695	0.0007309	-0.002119	2.4621386	-54.427678 C
0.00006063	13899.	229267579.	12.3144153	0.0007466	-0.002163	2.5021975	-55.566407 C
0.00006188	14169.	228992107.	12.3187193	0.0007622	-0.002208	2.5417946	-56.704379 C
0.00006313	14438.	228721002.	12.3232699	0.0007779	-0.002252	2.5809278	-57.841587 C
0.00006438	14707.	228453962.	12.3280562	0.0007936	-0.002296	2.6195949	-58.978025 C
0.00006563	14974.	228176248.	12.3329185	0.0008093	-0.002341	2.6577532	-60.000000 CY
0.00006688	15226.	227677468.	12.3338414	0.0008248	-0.002385	2.6948018	-60.000000 CY
0.00006813	15452.	226819927.	12.3285603	0.0008399	-0.002430	2.7303141	-60.000000 CY
0.00006938	15666.	225811378.	12.3205947	0.0008547	-0.002475	2.7648682	-60.000000 CY
0.00007063	15878.	224820409.	12.3130028	0.0008696	-0.002520	2.7989580	-60.000000 CY
0.00007188	16086.	223803607.	12.3049630	0.0008844	-0.002566	2.8324482	-60.000000 CY
0.00007313	16260.	222358902.	12.2885726	0.0008986	-0.002611	2.8640425	-60.000000 CY
0.00007438	16391.	220383514.	12.2615305	0.0009120	-0.002658	2.8933561	-60.000000 CY
0.00007938	16839.	212143393.	12.1406075	0.0009637	-0.002846	3.0031400	-60.000000 CY

0.00008438	17284.	204843414.	12.0358963	0.0010155	-0.003034	3.1075341	-60.000000 CY
0.00008938	17726.	198328070.	11.9458286	0.0010677	-0.003222	3.2066562	-60.000000 CY
0.00009438	18145.	192269532.	11.8628075	0.0011196	-0.003410	3.2994948	-60.000000 CY
0.00009938	18371.	184869540.	11.7348943	0.0011662	-0.003604	3.3777602	-60.000000 CY
0.0001044	18546.	177685230.	11.6013601	0.0012109	-0.003799	3.4484773	-60.000000 CY
0.0001094	18719.	171144381.	11.4820009	0.0012558	-0.003994	3.5152147	-60.000000 CY
0.0001144	18890.	165162338.	11.3746788	0.0013010	-0.004189	3.5779201	-60.000000 CY
0.0001194	19060.	159668261.	11.2779457	0.0013463	-0.004384	3.6365212	-60.000000 CY
0.0001244	19227.	154587074.	11.1848270	0.0013911	-0.004579	3.6901344	-60.000000 CY
0.0001294	19392.	149887124.	11.1005478	0.0014361	-0.004774	3.7396961	-60.000000 CY
0.0001344	19555.	145525648.	11.0240664	0.0014814	-0.004969	3.7851496	-60.000000 CY
0.0001394	19717.	141465948.	10.9546229	0.0015268	-0.005163	3.8264360	-60.000000 CY
0.0001444	19877.	137676441.	10.8915194	0.0015725	-0.005358	3.8634947	-60.000000 CY
0.0001494	20035.	134124662.	10.8338876	0.0016183	-0.005552	3.8962345	-60.000000 CY
0.0001544	20175.	130686275.	10.7717720	0.0016629	-0.005747	3.9239482	-60.000000 CY
0.0001594	20268.	127170428.	10.6985692	0.0017051	-0.005945	3.9459499	-60.000000 CY
0.0001644	20322.	123629898.	10.6161901	0.0017450	-0.006145	3.9633036	-60.000000 CY
0.0001694	20366.	120239321.	10.5352700	0.0017844	-0.006346	3.9771710	-60.000000 CY
0.0001744	20409.	117038512.	10.4600109	0.0018240	-0.006546	3.9878038	-60.000000 CY
0.0001794	20451.	114011523.	10.3896656	0.0018636	-0.006746	3.9951570	-60.000000 CY
0.0001844	20492.	111144088.	10.3245076	0.0019036	-0.006946	3.9991847	-60.000000 CY
0.0001894	20530.	108411752.	10.2585523	0.0019427	-0.007147	3.9965536	-60.000000 CY
0.0001944	20568.	105814281.	10.1963421	0.0019819	-0.007348	3.9977982	-60.000000 CY
0.0001994	20604.	103343374.	10.1386526	0.0020214	-0.007549	3.9999202	-60.000000 CY
0.0002044	20639.	100988124.	10.0846624	0.0020611	-0.007749	3.9944177	-60.000000 CY
0.0002094	20674.	98741680.	10.0335555	0.0021008	-0.007949	3.9984922	-60.000000 CY
0.0002144	20708.	96596871.	9.9858990	0.0021407	-0.008149	3.9999923	-60.000000 CY
0.0002194	20741.	94544711.	9.9426483	0.0021812	-0.008349	3.9939018	-60.000000 CY
0.0002244	20773.	92581234.	9.9011725	0.0022216	-0.008548	3.9980517	-60.000000 CY
0.0002294	20804.	90700766.	9.8619703	0.0022621	-0.008748	3.9998996	-60.000000 CY
0.0002344	20835.	88894371.	9.8245606	0.0023026	-0.008947	3.9929111	-60.000000 CY
0.0002394	20863.	87157760.	9.7868584	0.0023427	-0.009147	3.9958726	-60.000000 CY
0.0002444	20892.	85490372.	9.7512841	0.0023830	-0.009347	3.9989091	-60.000000 CY
0.0002494	20920.	83887987.	9.7177212	0.0024234	-0.009547	3.9999972	-60.000000 CY
0.0002544	20946.	82344958.	9.6864481	0.0024640	-0.009746	3.9911348	-60.000000 CY
0.0002594	20973.	80859873.	9.6568670	0.0025047	-0.009945	3.9950657	-60.000000 CY
0.0002644	20999.	79429522.	9.6287723	0.0025456	-0.010144	3.9983296	-60.000000 CY
0.0002694	21025.	78050821.	9.6010458	0.0025863	-0.010344	3.9998710	-60.000000 CY
0.0002744	21050.	76719854.	9.5779773	0.0026280	-0.010542	3.9945646	-60.000000 CY
0.0003044	21192.	69624344.	9.4567106	0.0028784	-0.011732	3.9879257	-60.000000 CY
0.0003344	21321.	63764174.	9.3712615	0.0031335	-0.012916	3.9863634	-60.000000 CYT
0.0003644	21437.	58832622.	9.3025537	0.0033896	-0.014100	3.9947650	-60.000000 CYT
0.0003944	21526.	54582985.	9.2381959	0.0036433	-0.015287	3.9980820	-60.000000 CYT

0.0004244

21526.

50724394.

9.2212900

0.0039133

-0.016457

3.9859392

60.0000000 CYT

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.	Max. Tens.
No.	kips	in-kip	Strain	Strain
1	24.625	21157.770	0.00300000	-0.01235429
2	31.125	21253.513	0.00300000	-0.01229641

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	24.625000	21158.	16.006250	13753.	228103296.
2	0.65	31.125000	21254.	20.231250	13815.	229355343.
1	0.75	24.625000	21158.	18.468750	15868.	223372959.
2	0.75	31.125000	21254.	23.343750	15940.	224516294.
1	0.90	24.625000	21158.	22.162500	19042.	156440608.
2	0.90	31.125000	21254.	28.012500	19128.	157598656.

Layering Correction Equivalent Depths of Soil & Rock Layers

	Top of	Equivalent				
	Layer	Top Depth	Same Layer	Layer is	FØ	F1
Layer	Below	Below	Type As	Rock or	Integral	Integral
No.	Pile Head	Grnd Surf	Layer	is Below	for Layer	for Layer
	ft	ft	Above	Rock Layer	lbs	lbs
1	12.5000	0.00	N.A.	No	0.00	2115.
2	13.7000	0.04400	No	No	2115.	127280.
3	16.2000	9.4226	No	No	129395.	271970.
4	23.7000	17.0583	Yes	No	401365.	932337.
5	34.7000	34.1111	No	No	1333701.	686163.
6	64.2000	51.7000	No	No	2019864.	0.00
7	76.7000	64.2000	No	No	0.00	0.00
8	107.2000	94.7000	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 = 3375.0 lbs
Applied moment at pile head = -86500.0 in-lbs
Axial thrust load on pile head = 24625.0 lbs

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
Χ	У	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load

feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.08253	-86500 .	3375.	-3.41E-04	0.00	1.19E+12	0.00	0.00	25.3984
0.4600	0.08065	-67437.	3527.		0.00	1.19E+12	0.00		29.5936
0.9200	0.07876	-47472.	3706.		0.00	1.19E+12		0.00	35.1872
1.3800	0.07688	-26434.	3915.	-3.42E-04	0.00	1.19E+12	0.00	0.00	40.7808
1.8400	0.07499	-4154.	4156.		0.00	1.19E+12	0.00	0.00	46.3744
2.3000	0.07310	19539.	4427.	-3.42E-04	0.00	1.19E+12	0.00	0.00	51.9680
2.7600	0.07121	44815.	4730.	-3.42E-04	0.00	1.19E+12	0.00	0.00	57.5616
3.2200	0.06933	71845.	5063.	-3.41E-04	0.00	1.19E+12	0.00	0.00	63.1552
3.6800	0.06745	100800.	5427.	-3.41E-04	0.00	1.19E+12	0.00	0.00	68.7488
4.1400	0.06557	131849.	5822.	-3.40E-04	0.00	1.19E+12	0.00	0.00	74.3424
4.6000	0.06369	165164.	6247.	-3.40E-04	0.00	1.19E+12	0.00	0.00	79.9360
5.0600	0.06181	200914.	6704.	-3.39E-04	0.00	1.19E+12	0.00	0.00	85.5296
5.5200	0.05995	239270.	7192.	-3.38E-04	0.00	1.19E+12	0.00	0.00	91.1232
5.9800	0.05808	280403.	7710.	-3.37E-04	0.00	1.19E+12	0.00	0.00	96.7168
6.4400	0.05623	324482.	8259.	-3.35E-04	0.00	1.19E+12	0.00	0.00	102.3104
6.9000	0.05438	371679.	8840.	-3.34E-04	0.00	1.19E+12	0.00	0.00	107.9040
7.3600	0.05255	422163.	9451.	-3.32E-04	0.00	1.19E+12	0.00	0.00	113.4976
7.8200	0.05072	476105.	10093.	-3.30E-04	0.00	1.19E+12	0.00	0.00	119.0912
8.2800	0.04891	533676.	10766.	-3.27E-04	0.00	1.19E+12	0.00	0.00	124.6848
8.7400	0.04711	595046.	11469.	-3.25E-04	0.00	1.19E+12	0.00	0.00	130.2784
9.2000	0.04532	660384.	12204.	-3.22E-04	0.00	1.19E+12	0.00	0.00	135.8720
9.6600	0.04355	729863.	12969.	-3.19E-04	0.00	1.19E+12	0.00	0.00	141.4656
10.1200	0.04180	803652.	13766.	-3.15E-04	0.00	1.19E+12	0.00	0.00	147.0592
10.5800	0.04007	881921.	14593.	-3.11E-04	0.00	1.19E+12	0.00	0.00	152.6528
11.0400	0.03837	964840.	15451.	-3.07E-04	0.00	1.19E+12	0.00	0.00	158.2464
11.5000	0.03669	1052582.	16340.	-3.02E-04	0.00	1.19E+12	0.00	0.00	163.8400
11.9600	0.03503	1145314.	17260.	-2.97E-04	0.00	1.19E+12	0.00	0.00	169.4336
12.4200	0.03341	1243209.	18051.	-2.91E-04	0.00	1.19E+12	0.00	0.00	117.3385
12.8800	0.03181	1344678.	18342.	-2.85E-04	0.00	1.19E+12	-11.787	2045.	0.00
13.3400	0.03026	1445787.	18242.	-2.79E-04	0.00	1.19E+12	-24.779	4521.	0.00
13.8000	0.02873	1546141.	16483.	-2.72E-04	0.00	1.19E+12	-612.310	117628.	0.00
14.2600	0.02725	1627836.	13090.		0.00	1.18E+12	-617.206	125014.	0.00
14.7200	0.02581	1690723.	9670.	-2.57E-04	0.00	1.18E+12	-621.659	132939.	0.00
15.1800	0.02442	1734667.	6228.	-2.49E-04	0.00	1.18E+12	-625.672	141448.	0.00
15.6400	0.02307	1759546.	2764.	-2.41E-04	0.00	1.18E+12	-629.245	150591.	0.00
16.1000	0.02176	1765250.	-717.843	-2.33E-04	0.00	1.18E+12	-632.378	160427.	0.00
16.5600	0.02050	1751684.	-2571.	-2.24E-04	0.00	1.18E+12	-38.948	10488.	0.00
17.0200	0.01928	1736930.	-2791.	-2.16E-04	0.00	1.18E+12	-40.789	11677.	0.00
17.4800	0.01811	1720932.	-3020.	-2.08E-04	0.00	1.18E+12	-42.211	12865.	0.00
17.9400	0.01698	1703647.	-3256.	-2.00E-04	0.00	1.18E+12	-43.241	14053.	0.00
18.4000	0.01590	1685044.	-3496.	-1.92E-04	0.00	1.18E+12	-43.907	15242.	0.00

18.8600	0.01486	1665101.	-3740.	-1.84E-04	0.00	1.18E+12	-44.236	16430.	0.00
19.3200	0.01386	1643810.	-3984.	-1.77E-04	0.00	1.18E+12	-44.254	17619.	0.00
19.7800	0.01291	1621169.	-4227.	-1.69E-04	0.00	1.18E+12	-43.986	18807.	0.00
20.2400	0.01200	1597187.	-4469.	-1.62E-04	0.00	1.18E+12	-43.459	19995.	0.00
20.7000	0.01113	1571879.	-4706.	-1.54E-04	0.00	1.19E+12	-42.696	21184.	0.00
21.1600	0.01029	1545270.	-4939.	-1.47E-04	0.00	1.19E+12	-41.722	22372.	0.00
21.6200	0.00950	1517388.	-5167.	-1.40E-04	0.00	1.19E+12	-40.559	23560.	0.00
22.0800	0.00875	1488269.	-5387.	-1.33E-04	0.00	1.19E+12	-39.231	24749.	0.00
22.5400	0.00804	1457955.	-5599.	-1.26E-04	0.00	1.19E+12	-37.758	25937.	0.00
23.0000	0.00736	1426488.	-5803.	-1.19E-04	0.00	1.19E+12	-36.161	27125.	0.00
23.4600	0.00672	1393919.	-5998.	-1.13E-04	0.00	1.19E+12	-34.461	28314.	0.00
23.9200	0.00611	1360299.	-6183.	-1.06E-04	0.00	1.19E+12	-32.677	29502.	0.00
24.3800	0.00554	1325683.	-6359.	-1.00E-04	0.00	1.19E+12	-30.827	30690.	0.00
24.8400	0.00501	1290126.	-6524.	-9.40E-05	0.00	1.19E+12	-28.929	31879.	0.00
25.3000	0.00451	1253687.	-6678.	-8.81E-05	0.00	1.19E+12	-26.998	33067.	0.00
25.7600	0.00404	1216425.	-6822.	-8.23E-05	0.00	1.19E+12	-25.051	34255.	0.00
26.2200	0.00360	1178399.	-6955.	-7.68E-05	0.00	1.19E+12	-23.103	35444.	0.00
26.6800	0.00319	1139668.	-7077.	-7.14E-05	0.00	1.19E+12	-21.166	36632.	0.00
27.1400	0.00281	1100291.	-7188.	-6.62E-05	0.00	1.19E+12	-19.254	37820.	0.00
27.6000	0.00246	1060327.	-7289.	-6.11E-05	0.00	1.19E+12	-17.378	39009.	0.00
28.0600	0.00214	1019832.	-7380.	-5.63E-05	0.00	1.19E+12	-15.549	40197.	0.00
28.5200	0.00184	978864.	-7461.	-5.16E-05	0.00	1.19E+12	-13.778	41385.	0.00
28.9800	0.00157	937474.	-7533.	-4.72E-05	0.00	1.19E+12	-12.072	42574.	0.00
29.4400	0.00132	895717.	-7595.	-4.29E-05	0.00	1.19E+12	-10.439	43762.	0.00
29.9000	0.00109	853641.	-7648.	-3.89E-05	0.00	1.19E+12	-8.886	44950.	0.00
30.3600	8.88E-04	811293.	-7693.	-3.50E-05	0.00	1.19E+12	-7.420	46139.	0.00
30.8200	7.05E-04	768719.	-7730.	-3.13E-05	0.00	1.19E+12	-6.044	47327.	0.00
31.2800	5.42E-04	725960.	-7760.	-2.78E-05	0.00	1.19E+12	-4.763	48516.	0.00
31.7400	3.98E-04	683056.	-7783.	-2.46E-05	0.00	1.19E+12	-3.579	49704.	0.00
32.2000	2.71E-04	640042.	-7800.	-2.15E-05	0.00	1.19E+12	-2.495	50892.	0.00
32.6600	1.60E-04	596951.	-7811.	-1.86E-05	0.00	1.19E+12	-1.511	52081.	0.00
33.1200	6.49E-05	553815.	-7817.	-1.60E-05	0.00	1.19E+12	-0.627	53269.	0.00
33.5800	-1.61E-05	510658.	-7818.	-1.35E-05	0.00	1.19E+12	0.1585	54457.	0.00
34.0400	-8.40E-05	467507.	-7815.	-1.12E-05	0.00	1.19E+12	0.8464	55646.	0.00
34.5000	-1.40E-04	424381.	-7809.	-9.14E-06	0.00	1.19E+12	1.4401	56834.	0.00
34.9600	-1.85E-04	381298.	-7651.	-7.27E-06	0.00	1.19E+12	55.6991	1662901.	0.00
35.4200	-2.20E-04	339912.	-7313.	-5.60E-06	0.00	1.19E+12	66.8813	1677024.	0.00
35.8800	-2.47E-04	300564.	-6920.	-4.11E-06	0.00	1.19E+12	75.5740	1691150.	0.00
36.3400	-2.66E-04	263519.	-6485.	-2.80E-06	0.00	1.19E+12	82.0219	1705281.	0.00
36.8000	-2.78E-04	228973.	-6020.	-1.66E-06	0.00	1.19E+12	86.4618	1719415.	0.00
37.2600	-2.84E-04	197061.	-5535.	-6.66E-07	0.00	1.19E+12	89.1200	1733553.	0.00
37.7200	-2.85E-04	167864.	-5040.	1.82E-07	0.00	1.19E+12	90.2103	1747694.	0.00
38.1800	-2.82E-04	141417.	-4544.	9.00E-07	0.00	1.19E+12	89.4483	1752344.	0.00

38.6400	-2.75E-04	117694.	-4057.	1.50E-06	0.00	1.19E+12	87.2952	1752344.	0.00
39.1000	-2.65E-04	96632.	-3583.	2.00E-06	0.00	1.19E+12	84.1841	1752344.	0.00
39.5600	-2.53E-04	78134.	-3129.	2.41E-06	0.00	1.19E+12	80.2865	1752344.	0.00
40.0200	-2.39E-04	62083.	-2699.	2.73E-06	0.00	1.19E+12	75.7529	1752344.	0.00
40.4800	-2.23E-04	48340.	-2294.	2.99E-06	0.00	1.19E+12	70.7140	1752344.	0.00
40.9400	-2.06E-04	36751.	-1919.	3.19E-06	0.00	1.19E+12	65.2816	1752344.	0.00
41.4000	-1.88E-04	27152.	-1575.	3.33E-06	0.00	1.19E+12	59.5500	1752344.	0.00
41.8600	-1.69E-04	19367.	-1262.	3.44E-06	0.00	1.19E+12	53.5975	1752344.	0.00
42.3200	-1.50E-04	13216.	-983.273	3.52E-06	0.00	1.19E+12	47.4873	1752344.	0.00
42.7800	-1.30E-04	8511.	-738.304	3.57E-06	0.00	1.19E+12	41.2696	1752344.	0.00
43.2400	-1.10E-04	5064.	-527.849	3.60E-06	0.00	1.19E+12	34.9825	1752344.	0.00
43.7000	-9.03E-05	2683.	-352.211	3.62E-06	0.00	1.19E+12	28.6543	1752344.	0.00
44.1600	-7.03E-05	1175.	-211.566	3.63E-06	0.00	1.19E+12	22.3042	1752344.	0.00
44.6200	-5.02E-05	346.0262	-105.999	3.63E-06	0.00	1.19E+12	15.9446	1752344.	0.00
45.0800	-3.02E-05	3.3364	-35.545	3.63E-06	0.00	1.19E+12	9.5821	1752344.	0.00
45.5400	-1.01E-05	-47.383	-0.213	3.63E-06	0.00	1.19E+12	3.2196	1752344.	0.00
46.0000	9.90E-06	0.00	0.00	3.63E-06	0.00	1.19E+12	-3.143	876172.	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 = 0.08252996 inches

Computed slope at pile head = -0.0003410 radians

Maximum bending moment = 1765250. inch-lbs

Maximum shear force = 18342. lbs

Depth of maximum bending moment = 16.10000000 feet below pile head

Depth of maximum shear force = 12.88000000 feet below pile head

Number of iterations = 17

Number of zero deflection points = 2

Pile deflection at ground = 0.03312998 inches

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

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

Boundary Condition Type 1, Shear and Moment

Shear = 3375. lbs
Moment = -86500. in-lbs
Axial Load = 24625. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
46.00000	0.08252996	1765250.	18342.
43.70000	0.08723716	1799050.	18312.
41.40000	0.09181540	1813364.	18345.
39.10000	0.09748572	1807699.	18335.
36.80000	0.09553987	1793862.	18341.
34.50000	0.13777383	1731670.	18344.
32.20000	0.16036734	1736171.	18319.
29.90000	0.20349351	1711431.	18323.
27.60000	0.33690763	1700187.	18352.
25.30000	0.63218683	1706464.	-19940.
23.00000	1.51394805	1676997.	-25557.
20.70000	7.69474190	1774343.	-40230.

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 = 5042.0 lbs
Applied moment at pile head = -122500.0 in-lbs
Axial thrust load on pile head = 31125.0 lbs

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
Χ	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.1692	-122500 .	5042.	-6.48E-04	0.00	1.19E+12	0.00	0.00	44.0976
0.4600	0.1656	-93885.	5303.	-6.49E-04	0.00	1.19E+12	0.00	0.00	50.3904

0.9200	0.1620	-63734.	5604.	-6.49E-04	0.00	1.19E+12	0.00	0.00	58.7808
1.3800	0.1584	-31793.	5952.	-6.49E-04	0.00	1.19E+12	0.00	0.00	67.1712
1.8400	0.1549	2196.	6346.	-6.49E-04	0.00	1.19E+12	0.00	0.00	75.5616
2.3000	0.1513	38487.	6786.	-6.49E-04	0.00	1.19E+12	0.00	0.00	83.9520
2.7600	0.1477	77335.	7272.	-6.49E-04	0.00	1.19E+12	0.00	0.00	92.3424
3.2200	0.1441	118998.	7805.	-6.48E-04	0.00	1.19E+12	0.00	0.00	100.7328
3.6800	0.1405	163730.	8385.	-6.48E-04	0.00	1.19E+12	0.00	0.00	109.1232
4.1400	0.1370	211786.	9010.	-6.47E-04	0.00	1.19E+12	0.00	0.00	117.5136
4.6000	0.1334	263423.	9682.	-6.46E-04	0.00	1.19E+12	0.00	0.00	125.9040
5.0600	0.1298	318897.	10400.	-6.44E-04	0.00	1.19E+12	0.00	0.00	134.2944
5.5200	0.1263	378462.	11165.	-6.43E-04	0.00	1.19E+12	0.00	0.00	142.6848
5.9800	0.1227	442374.	11975.	-6.41E-04	0.00	1.19E+12	0.00	0.00	151.0752
6.4400	0.1192	510890.	12832.	-6.39E-04	0.00	1.19E+12	0.00	0.00	159.4656
6.9000	0.1157	584264.	13736.	-6.36E-04	0.00	1.19E+12	0.00	0.00	167.8560
7.3600	0.1122	662752.	14686.	-6.33E-04	0.00	1.19E+12	0.00	0.00	176.2464
7.8200	0.1087	746610.	15682.	-6.30E-04	0.00	1.19E+12	0.00	0.00	184.6368
8.2800	0.1052	836093.	16724.	-6.26E-04	0.00	1.19E+12	0.00	0.00	193.0272
8.7400	0.1018	931457.	17813.	-6.22E-04	0.00	1.19E+12	0.00	0.00	201.4176
9.2000	0.09835	1032958.	18948.	-6.18E-04	0.00	1.19E+12	0.00	0.00	209.8080
9.6600	0.09496	1140851.	20129.	-6.12E-04	0.00	1.19E+12	0.00	0.00	218.1984
10.1200	0.09159	1255391.	21357.	-6.07E-04	0.00	1.19E+12	0.00	0.00	226.5888
10.5800	0.08826	1376835.	22630.	-6.01E-04	0.00	1.19E+12	0.00	0.00	234.9792
11.0400	0.08496	1505438.	23951.	-5.94E-04	0.00	1.19E+12	0.00	0.00	243.3696
11.5000	0.08170	1641455.	25317.	-5.87E-04	0.00	1.18E+12	0.00	0.00	251.7600
11.9600	0.07848	1785142.	26730.	-5.79E-04	0.00	1.18E+12	0.00	0.00	260.1504
12.4200	0.07531	1936754.	27945.	-5.70E-04	0.00	1.18E+12	0.00	0.00	180.0512
12.8800	0.07219	2093851.	28379.	-5.61E-04	0.00	1.18E+12	-22.853	1747.	0.00
13.3400	0.06912	2250250.	28172.	-5.51E-04	0.00	1.18E+12	-52.202	4169.	0.00
13.8000	0.06611	2405056.	25946.	-5.40E-04	0.00	1.18E+12	-754.072	62963.	0.00
14.2600	0.06316	2536884.	21763.	-5.28E-04	0.00	1.18E+12	-761.492	66550.	0.00
14.7200	0.06028	2645507.	17541.	-5.16E-04	0.00	1.18E+12	-768.437	70368.	0.00
15.1800	0.05747	2730713.	13281.	-5.03E-04	0.00	1.18E+12	-774.904	74436.	0.00
15.6400	0.05472	2792305.	8987.	-4.91E-04	0.00	1.18E+12	-780.892	78772.	0.00
16.1000	0.05205	2830101.	4662.	-4.77E-04	0.00	1.18E+12	-786.397	83400.	0.00
16.5600	0.04945	2843933.	2232.	-4.64E-04	0.00	1.18E+12	-93.961	10488.	0.00
17.0200	0.04693	2854899.	1698.	-4.51E-04	0.00	1.18E+12	-99.265	11677.	0.00
17.4800	0.04447	2862839.	1138.	-4.37E-04	0.00	1.18E+12	-103.653	12865.	0.00
17.9400	0.04210	2867618.	556.5348	-4.24E-04	0.00	1.18E+12	-107.174	14053.	0.00
18.4000	0.03979	2869129.	-42.526	-4.11E-04	0.00	1.18E+12	-109.876	15242.	0.00
18.8600	0.03756	2867290.	-654.372	-3.97E-04	0.00	1.18E+12	-111.807	16430.	0.00
19.3200	0.03541	2862041.	-1275.	-3.84E-04	0.00	1.18E+12	-113.014	17619.	0.00
19.7800	0.03333	2853347.	-1900.	-3.70E-04	0.00	1.18E+12	-113.545	18807.	0.00
20.2400	0.03132	2841190.	-2527.	-3.57E-04	0.00	1.18E+12	-113.447	19995.	0.00

20.7000	0.02938	2825575.	-3151.	-3.44E-04	0.00	1.18E+12	-112.765	21184.	0.00
21.1600	0.02752	2806521.	-3770.	-3.31E-04	0.00	1.18E+12	-111.546	22372.	0.00
21.6200	0.02573	2784066.	-4381.	-3.18E-04	0.00	1.18E+12	-109.836	23560.	0.00
22.0800	0.02402	2758263.	-4981.	-3.05E-04	0.00	1.18E+12	-107.677	24749.	0.00
22.5400	0.02237	2729176.	-5569.	-2.92E-04	0.00	1.18E+12	-105.113	25937.	0.00
23.0000	0.02080	2696884.	-6141.	-2.79E-04	0.00	1.18E+12	-102.187	27125.	0.00
23.4600	0.01929	2661476.	-6696.	-2.67E-04	0.00	1.18E+12	-98.939	28314.	0.00
23.9200	0.01785	2623051.	-7232.	-2.54E-04	0.00	1.18E+12	-95.410	29502.	0.00
24.3800	0.01648	2581717.	-7749.	-2.42E-04	0.00	1.18E+12	-91.639	30690.	0.00
24.8400	0.01518	2537589.	-8244.	-2.30E-04	0.00	1.18E+12	-87.663	31879.	0.00
25.3000	0.01394	2490787.	-8716.	-2.18E-04	0.00	1.18E+12	-83.518	33067.	0.00
25.7600	0.01277	2441439.	-9165.	-2.07E-04	0.00	1.18E+12	-79.238	34255.	0.00
26.2200	0.01166	2389674.	-9591.	-1.96E-04	0.00	1.18E+12	-74.858	35444.	0.00
26.6800	0.01061	2335627.	-9991.	-1.85E-04	0.00	1.18E+12	-70.409	36632.	0.00
27.1400	0.00962	2279432.	-10368.	-1.74E-04	0.00	1.18E+12	-65.921	37820.	0.00
27.6000	0.00869	2221226.	-10719.	-1.63E-04	0.00	1.18E+12	-61.422	39009.	0.00
28.0600	0.00782	2161148.	-11046.	-1.53E-04	0.00	1.18E+12	-56.940	40197.	0.00
28.5200	0.00700	2099332.	-11348.	-1.43E-04	0.00	1.18E+12	-52.499	41385.	0.00
28.9800	0.00624	2035916.	-11626.	-1.33E-04	0.00	1.18E+12	-48.124	42574.	0.00
29.4400	0.00553	1971031.	-11879.	-1.24E-04	0.00	1.18E+12	-43.836	43762.	0.00
29.9000	0.00487	1904809.	-12110.	-1.15E-04	0.00	1.18E+12	-39.656	44950.	0.00
30.3600	0.00426	1837377.	-12318.	-1.06E-04	0.00	1.18E+12	-35.601	46139.	0.00
30.8200	0.00370	1768859.	-12503.	-9.79E-05	0.00	1.18E+12	-31.689	47327.	0.00
31.2800	0.00318	1699374.	-12668.	-8.98E-05	0.00	1.18E+12	-27.935	48516.	0.00
31.7400	0.00270	1629036.	-12812.	-8.21E-05	0.00	1.18E+12	-24.352	49704.	0.00
32.2000	0.00227	1557955.	-12937.	-7.46E-05	0.00	1.19E+12	-20.950	50892.	0.00
32.6600	0.00188	1486235.	-13044.	-6.76E-05	0.00	1.19E+12	-17.741	52081.	0.00
33.1200	0.00153	1413972.	-13134.	-6.08E-05	0.00	1.19E+12	-14.731	53269.	0.00
33.5800	0.00121	1341260.	-13207.	-5.44E-05	0.00	1.19E+12	-11.928	54457.	0.00
34.0400	9.26E-04	1268183.	-13266.	-4.83E-05	0.00	1.19E+12	-9.335	55646.	0.00
34.5000	6.76E-04	1194821.	-13311.	-4.26E-05	0.00	1.19E+12	-6.956	56834.	0.00
34.9600	4.56E-04	1121246.	-13709.	-3.72E-05	0.00	1.19E+12	-137.342	1662901.	0.00
35.4200	2.65E-04	1043485.	-14310.	-3.22E-05	0.00	1.19E+12	-80.501	1677024.	0.00
35.8800	1.01E-04	963270.	-14618.	-2.75E-05	0.00	1.19E+12	-30.892	1691150.	0.00
36.3400	-3.86E-05	882113.	-14670.	-2.32E-05	0.00	1.19E+12	11.9173	1705281.	0.00
	-1.55E-04	801319.		-1.93E-05	0.00	1.19E+12	48.3896	1719415.	0.00
37.2600	-2.52E-04	721998.	-14152.		0.00	1.19E+12	79.0046	1733553.	0.00
37.7200	-3.29E-04	645084.	-13646.	-1.26E-05	0.00	1.19E+12	104.2507	1747694.	0.00
38.1800	-3.90E-04	571346.	-13017.	-9.75E-06	0.00	1.19E+12	123.9435	1752344.	0.00
38.6400	-4.37E-04	501385.	-12292.	-7.26E-06	0.00	1.19E+12	138.7079	1752344.	0.00
39.1000	-4.71E-04	435649.	-11496.	-5.08E-06	0.00	1.19E+12	149.3905	1752344.	0.00
39.5600	-4.93E-04	374465.	-10652.	-3.20E-06	0.00	1.19E+12	156.5266	1752344.	0.00
	-5.06E-04	318050.	-9777.		0.00	1.19E+12	160.6143	1752344.	0.00

40.4800	-5.11E-04	266529.	-8886.	-2.36E-07	0.00	1.19E+12	162.1128	1752344.	0.00
40.9400	-5.09E-04	219948.	-7993.	8.94E-07	0.00	1.19E+12	161.4416	1752344.	0.00
41.4000	-5.01E-04	178285.	-7109.	1.82E-06	0.00	1.19E+12	158.9798	1752344.	0.00
41.8600	-4.88E-04	141466.	-6242.	2.56E-06	0.00	1.19E+12	155.0666	1752344.	0.00
42.3200	-4.73E-04	109373.	-5400.	3.14E-06	0.00	1.19E+12	150.0018	1752344.	0.00
42.7800	-4.54E-04	81849.	-4588.	3.59E-06	0.00	1.19E+12	144.0466	1752344.	0.00
43.2400	-4.33E-04	58715.	-3812.	3.92E-06	0.00	1.19E+12	137.4251	1752344.	0.00
43.7000	-4.11E-04	39768.	-3073.	4.14E-06	0.00	1.19E+12	130.3255	1752344.	0.00
44.1600	-3.87E-04	24793.	-2374.	4.29E-06	0.00	1.19E+12	122.9023	1752344.	0.00
44.6200	-3.63E-04	13562.	-1716.	4.38E-06	0.00	1.19E+12	115.2772	1752344.	0.00
45.0800	-3.39E-04	5843.	-1101.	4.43E-06	0.00	1.19E+12	107.5417	1752344.	0.00
45.5400	-3.14E-04	1402.	-529.155	4.44E-06	0.00	1.19E+12	99.7587	1752344.	0.00
46.0000	-2.90E-04	0.00	0.00	4.45E-06	0.00	1.19E+12	91.9642	876172.	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 = 0.16917819 inches

Computed slope at pile head = -0.0006480 radians

Maximum bending moment = 2869129. inch-lbs

Maximum shear force = 28379. lbs

Depth of maximum bending moment = 18.40000000 feet below pile head

Depth of maximum shear force = 12.88000000 feet below pile head

Number of iterations = 15

Number of zero deflection points = 1

Pile deflection at ground = 0.07476733 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 5042. lbs

Moment = -122500. in-lbs Axial Load = 31125. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
46.00000	0.16917819	2869129.	28379.
43.70000	0.17618160	2933309.	28341.
41.40000	0.18537955	2966467.	28391.
39.10000	0.20066735	2963845.	28378.
36.80000	0.22009380	2875518.	28384.
34.50000	0.30029532	2786425.	28403.
32.20000	0.36701150	2781943.	28371.
29.90000	0.48814178	2735934.	28375.
27.60000	0.85625542	2715426.	-29171.
25.30000	1.76241787	2724027.	-35894.
23.00000	4.90302490	2712374.	-46715.

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 = 3375.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 24625.0 lbs

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil Res.	Soil Spr.	Distrib.
Χ	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.08658	1.14E-05	3375.	-3.65E-04	0.00	1.19E+12	0.00	0.00	25.3984
0.4600	0.08457	19067.	3527.	-3.65E-04	0.00	1.19E+12	0.00	0.00	29.5936
0.9200	0.08255	39035.	3706.	-3.65E-04	0.00	1.19E+12	0.00	0.00	35.1872
1.3800	0.08054	60075.	3915.	-3.64E-04	0.00	1.19E+12	0.00	0.00	40.7808
1.8400	0.07853	82358.	4156.	-3.64E-04	0.00	1.19E+12	0.00	0.00	46.3744
2.3000	0.07652	106054.	4427.	-3.64E-04	0.00	1.19E+12	0.00	0.00	51.9680
2.7600	0.07452	131333.	4730.	-3.63E-04	0.00	1.19E+12	0.00	0.00	57.5616

3.2200	0.07251	158367.	5063.	-3.62E-04	0.00	1.19E+12	0.00	0.00	63.1552
3.6800	0.07052	187324.	5427.	-3.62E-04	0.00	1.19E+12	0.00	0.00	68.7488
4.1400	0.06852	218376.	5822.	-3.61E-04	0.00	1.19E+12	0.00	0.00	74.3424
4.6000	0.06653	251694.	6247.	-3.60E-04	0.00	1.19E+12	0.00	0.00	79.9360
5.0600	0.06455	287446.	6704.	-3.58E-04	0.00	1.19E+12	0.00	0.00	85.5296
5.5200	0.06258	325805.	7192.	-3.57E-04	0.00	1.19E+12	0.00	0.00	91.1232
5.9800	0.06061	366940.	7710.	-3.55E-04	0.00	1.19E+12	0.00	0.00	96.7168
6.4400	0.05866	411022.	8259.	-3.53E-04	0.00	1.19E+12	0.00	0.00	102.3104
6.9000	0.05671	458221.	8840.	-3.51E-04	0.00	1.19E+12	0.00	0.00	107.9040
7.3600	0.05478	508708.	9451.	-3.49E-04	0.00	1.19E+12	0.00	0.00	113.4976
7.8200	0.05286	562652.	10093.	-3.47E-04	0.00	1.19E+12	0.00	0.00	119.0912
8.2800	0.05095	620225.	10766.	-3.44E-04	0.00	1.19E+12	0.00	0.00	124.6848
8.7400	0.04906	681597.	11469.	-3.41E-04	0.00	1.19E+12	0.00	0.00	130.2784
9.2000	0.04719	746938.	12204.	-3.38E-04	0.00	1.19E+12	0.00	0.00	135.8720
9.6600	0.04533	816419.	12969.	-3.34E-04	0.00	1.19E+12	0.00	0.00	141.4656
10.1200	0.04350	890210.	13766.	-3.30E-04	0.00	1.19E+12	0.00	0.00	147.0592
10.5800	0.04169	968481.	14593.	-3.26E-04	0.00	1.19E+12	0.00	0.00	152.6528
11.0400	0.03990	1051402.	15451.	-3.21E-04	0.00	1.19E+12	0.00	0.00	158.2464
11.5000	0.03814	1139145.	16340.	-3.16E-04	0.00	1.19E+12	0.00	0.00	163.8400
11.9600	0.03642	1231880.	17260.	-3.10E-04	0.00	1.19E+12	0.00	0.00	169.4336
12.4200	0.03472	1329776.	18051.	-3.04E-04	0.00	1.19E+12	0.00	0.00	117.3385
12.8800	0.03305	1431247.	18341.	-2.98E-04	0.00	1.19E+12	-12.247	2045.	0.00
13.3400	0.03143	1532344.	18236.	-2.91E-04	0.00	1.19E+12	-25.740	4521.	0.00
13.8000	0.02984	1632656.	16459.	-2.84E-04	0.00	1.18E+12	-618.118	114339.	0.00
14.2600	0.02830	1714132.	13034.	-2.76E-04	0.00	1.18E+12	-623.024	121540.	0.00
14.7200	0.02680	1776623.	9582.	-2.68E-04	0.00	1.18E+12	-627.483	129267.	0.00
15.1800	0.02534	1819994.	6108.	-2.59E-04	0.00	1.18E+12	-631.496	137565.	0.00
15.6400	0.02393	1844121.	2612.	-2.51E-04	0.00	1.18E+12	-635.064	146484.	0.00
16.1000	0.02257	1848897.	-902.303	-2.42E-04	0.00	1.18E+12	-638.185	156081.	0.00
16.5600	0.02126	1834226.	-2775.	-2.34E-04	0.00	1.18E+12	-40.390	10488.	0.00
17.0200	0.01999	1818323.	-3003.	-2.25E-04	0.00	1.18E+12	-42.287	11677.	0.00
17.4800	0.01877	1801130.	-3241.	-2.17E-04	0.00	1.18E+12	-43.749	12865.	0.00
17.9400	0.01760	1782603.	-3485.	-2.08E-04	0.00	1.18E+12	-44.803	14053.	0.00
18.4000	0.01647	1762710.	-3734.	-2.00E-04	0.00	1.18E+12	-45.479	15242.	0.00
18.8600	0.01539	1741430.	-3986.	-1.92E-04	0.00	1.18E+12	-45.805	16430.	0.00
19.3200	0.01435	1718753.		-1.84E-04	0.00	1.18E+12	-45.808	17619.	0.00
19.7800	0.01336	1694679.	-4491.		0.00	1.18E+12	-45.515	18807.	0.00
20.2400	0.01241	1669217.	-4741.		0.00	1.18E+12	-44.953	19995.	0.00
20.7000	0.01150	1642385.	-4987.		0.00	1.18E+12	-44.147	21184.	0.00
21.1600	0.01064	1614206.	-5228.	-1.53E-04	0.00	1.18E+12	-43.121	22372.	0.00
21.6200	0.00982	1584712.	-5462.	-1.45E-04	0.00	1.19E+12	-41.901	23560.	0.00
22.0800	0.00904	1553941.	-5690.	-1.38E-04	0.00	1.19E+12	-40.509	24749.	0.00
22.5400	0.00829	1521934.	-5909.	-1.31E-04	0.00	1.19E+12	-38.969	25937.	0.00

23.0000	0.00759	1488739.	-6120.	-1.24E-04	0.00	1.19E+12	-37.301	27125.	0.00
23.4600	0.00693	1454406.	-6321.	-1.17E-04	0.00	1.19E+12	-35.527	28314.	0.00
23.9200	0.00630	1418990.	-6512.	-1.10E-04	0.00	1.19E+12	-33.667	29502.	0.00
24.3800	0.00571	1382547.	-6692.	-1.04E-04	0.00	1.19E+12	-31.739	30690.	0.00
24.8400	0.00515	1345136.	-6862.	-9.74E-05	0.00	1.19E+12	-29.763	31879.	0.00
25.3000	0.00463	1306818.	-7021.	-9.13E-05	0.00	1.19E+12	-27.754	33067.	0.00
25.7600	0.00415	1267652.	-7168.	-8.53E-05	0.00	1.19E+12	-25.730	34255.	0.00
26.2200	0.00369	1227703.	-7305.	-7.95E-05	0.00	1.19E+12	-23.705	35444.	0.00
26.6800	0.00327	1187030.	-7430.	-7.38E-05	0.00	1.19E+12	-21.693	36632.	0.00
27.1400	0.00288	1145695.	-7544.	-6.84E-05	0.00	1.19E+12	-19.709	37820.	0.00
27.6000	0.00251	1103759.	-7648.	-6.32E-05	0.00	1.19E+12	-17.763	39009.	0.00
28.0600	0.00218	1061281.	-7741.	-5.81E-05	0.00	1.19E+12	-15.868	40197.	0.00
28.5200	0.00187	1018319.	-7823.	-5.33E-05	0.00	1.19E+12	-14.033	41385.	0.00
28.9800	0.00159	974929.	-7896.	-4.87E-05	0.00	1.19E+12	-12.267	42574.	0.00
29.4400	0.00133	931164.	-7959.	-4.42E-05	0.00	1.19E+12	-10.579	43762.	0.00
29.9000	0.00110	887076.	-8013.	-4.00E-05	0.00	1.19E+12	-8.975	44950.	0.00
30.3600	8.93E-04	842715.	-8058.	-3.60E-05	0.00	1.19E+12	-7.461	46139.	0.00
30.8200	7.05E-04	798125.	-8095.	-3.22E-05	0.00	1.19E+12	-6.042	47327.	0.00
31.2800	5.37E-04	753351.	-8125.	-2.86E-05	0.00	1.19E+12	-4.723	48516.	0.00
31.7400	3.89E-04	708432.	-8148.	-2.52E-05	0.00	1.19E+12	-3.505	49704.	0.00
32.2000	2.59E-04	663407.	-8164.	-2.20E-05	0.00	1.19E+12	-2.391	50892.	0.00
32.6600	1.46E-04	618308.	-8174.	-1.90E-05	0.00	1.19E+12	-1.381	52081.	0.00
33.1200	4.93E-05	573166.	-8180.	-1.63E-05	0.00	1.19E+12	-0.476	53269.	0.00
33.5800	-3.30E-05	528010.	-8180.	-1.37E-05	0.00	1.19E+12	0.3259	54457.	0.00
34.0400	-1.02E-04	482863.	-8176.	-1.13E-05	0.00	1.19E+12	1.0269	55646.	0.00
34.5000	-1.58E-04	437747.	-8169.	-9.21E-06	0.00	1.19E+12	1.6300	56834.	0.00
34.9600	-2.04E-04	392681.	-7995.	-7.28E-06	0.00	1.19E+12	61.3171	1662901.	0.00
35.4200	-2.39E-04	349482.	-7626.	-5.56E-06	0.00	1.19E+12	72.5188	1677024.	0.00
35.8800	-2.65E-04	308493.	-7202.	-4.03E-06	0.00	1.19E+12	81.1554	1691150.	0.00
36.3400	-2.83E-04	269977.	-6736.	-2.69E-06	0.00	1.19E+12	87.4826	1705281.	0.00
36.8000	-2.95E-04	234127.	-6242.	-1.51E-06	0.00	1.19E+12	91.7475	1719415.	0.00
37.2600	-3.00E-04	201071.	-5728.	-5.04E-07	0.00	1.19E+12	94.1855	1733553.	0.00
37.7200	-3.00E-04	170886.	-5206.	3.60E-07	0.00	1.19E+12	95.0189	1747694.	0.00
38.1800	-2.96E-04	143595.	-4685.	1.09E-06	0.00	1.19E+12	93.9460	1752344.	0.00
38.6400	-2.88E-04	119167.	-4173.	1.70E-06	0.00	1.19E+12	91.4514	1752344.	0.00
39.1000	-2.77E-04	97526.	-3678.	2.20E-06	0.00	1.19E+12	87.9870	1752344.	0.00
39.5600	-2.64E-04	78565.	-3204.	2.61E-06	0.00	1.19E+12	83.7287	1752344.	0.00
40.0200	-2.48E-04	62156.	-2755.	2.94E-06	0.00	1.19E+12	78.8309	1752344.	0.00
40.4800	-2.31E-04	48149.	-2335.	3.20E-06	0.00	1.19E+12	73.4271	1752344.	0.00
40.9400	-2.13E-04	36379.	-1946.	3.39E-06	0.00	1.19E+12	67.6315	1752344.	0.00
41.4000	-1.94E-04	26669.	-1589.	3.54E-06	0.00	1.19E+12	61.5398	1752344.	0.00
41.8600	-1.74E-04	18835.	-1267.	3.64E-06	0.00	1.19E+12	55.2310	1752344.	0.00
42.3200	-1.54E-04	12684.	-979.667	3.72E-06	0.00	1.19E+12	48.7689	1752344.	0.00

42.7800	-1.33E-04	8019.	-728.583	3.77E-06	0.00	1.19E+12	42.2035	1752344.	0.00
43.2400	-1.12E-04	4639.	-513.921	3.79E-06	0.00	1.19E+12	35.5729	1752344.	0.00
43.7000	-9.11E-05	2344.	-335.963	3.81E-06	0.00	1.19E+12	28.9045	1752344.	0.00
44.1600	-7.00E-05	929.2508	-194.868	3.82E-06	0.00	1.19E+12	22.2170	1752344.	0.00
44.6200	-4.89E-05	191.5410	-90.708	3.82E-06	0.00	1.19E+12	15.5220	1752344.	0.00
45.0800	-2.78E-05	-73.209	-23.510	3.82E-06	0.00	1.19E+12	8.8254	1752344.	0.00
45.5400	-6.71E-06	-69.046	6.7253	3.82E-06	0.00	1.19E+12	2.1294	1752344.	0.00
46.0000	1.44E-05	0.00	0.00	3.82E-06	0.00	1.19E+12	-4.566	876172.	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 = 0.08657936 inches Computed slope at pile head = -0.0003648 radians Maximum bending moment = 1848897. inch-lbs Maximum shear force 18341. lbs Depth of maximum bending moment = 16.10000000 feet below pile head Depth of maximum shear force = 12.88000000 feet below pile head Number of iterations 17 Number of zero deflection points =

Pile deflection at ground = 0.03442880 inches

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

Boundary Condition Type 1, Shear and Moment

Shear 3375. lbs Moment 0. in-lbs Axial Load = 24625. lbs

Length	Deflection inches	Moment	Shear
feet		ln-lbs	lbs
46.00000	0.08657936	1848897.	18341.
43.70000	0.09136167	1882884.	18311.
41.40000	0.09602356	1897434.	18344.
39.10000	0.10184162	1891976.	18334.
36.80000	0.10035538	1877258.	18339.
34.50000	0.14420504	1816037.	18344.
32.20000	0.16846777	1819934.	18318.
29.90000	0.21457001	1795238.	18322.
27.60000	0.35603189	1784036.	18352.
25.30000	0.67734968	1791095.	-20979.
23.00000	1.64325095	1762835.	-26961.
20.70000	8.70608468	1878141.	-42747.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 4

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

Shear force at pile head = 5042.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 31125.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.1756	1.08E-05	5042.	-6.84E-04	0.00	1.19E+12	0.00	0.00	44.0976
0.4600	0.1718	28621.	5303.	-6.84E-04	0.00	1.19E+12	0.00	0.00	50.3904
0.9200	0.1681	58778.	5604.	-6.83E-04	0.00	1.19E+12	0.00	0.00	58.7808
1.3800	0.1643	90725.	5952.	-6.83E-04	0.00	1.19E+12	0.00	0.00	67.1712
1.8400	0.1605	124719.	6346.	-6.83E-04	0.00	1.19E+12	0.00	0.00	75.5616
2.3000	0.1567	161016.	6786.	-6.82E-04	0.00	1.19E+12	0.00	0.00	83.9520
2.7600	0.1530	199870.	7272.	-6.81E-04	0.00	1.19E+12	0.00	0.00	92.3424
3.2200	0.1492	241538.	7805.	-6.80E-04	0.00	1.19E+12	0.00	0.00	100.7328
3.6800	0.1455	286276.	8385.	-6.79E-04	0.00	1.19E+12	0.00	0.00	109.1232
4.1400	0.1417	334338.	9010.	-6.77E-04	0.00	1.19E+12	0.00	0.00	117.5136
4.6000	0.1380	385980.	9682.	-6.76E-04	0.00	1.19E+12	0.00	0.00	125.9040

5.0600	0.1343	441458.	10400.	-6.74E-04	0.00	1.19E+12	0.00	0.00	134.2944
5.5200	0.1306	501029.	11165.	-6.72E-04	0.00	1.19E+12	0.00	0.00	142.6848
5.9800	0.1269	564946.	11975.	-6.69E-04	0.00	1.19E+12	0.00	0.00	151.0752
6.4400	0.1232	633466.	12832.	-6.66E-04	0.00	1.19E+12	0.00	0.00	159.4656
6.9000	0.1195	706845.	13736.	-6.63E-04	0.00	1.19E+12	0.00	0.00	167.8560
7.3600	0.1158	785338.	14686.	-6.60E-04	0.00	1.19E+12	0.00	0.00	176.2464
7.8200	0.1122	869200.	15682.	-6.56E-04	0.00	1.19E+12	0.00	0.00	184.6368
8.2800	0.1086	958688.	16724.	-6.52E-04	0.00	1.19E+12	0.00	0.00	193.0272
8.7400	0.1050	1054056.	17813.	-6.47E-04	0.00	1.19E+12	0.00	0.00	201.4176
9.2000	0.1015	1155561.	18948.	-6.42E-04	0.00	1.19E+12	0.00	0.00	209.8080
9.6600	0.09793	1263458.	20129.	-6.36E-04	0.00	1.19E+12	0.00	0.00	218.1984
10.1200	0.09444	1378003.	21357.	-6.30E-04	0.00	1.19E+12	0.00	0.00	226.5888
10.5800	0.09098	1499450.	22630.	-6.23E-04	0.00	1.19E+12	0.00	0.00	234.9792
11.0400	0.08756	1628057.	23951.	-6.16E-04	0.00	1.18E+12	0.00	0.00	243.3696
11.5000	0.08418	1764078.	25317.	-6.08E-04	0.00	1.18E+12	0.00	0.00	251.7600
11.9600	0.08084	1907768.	26730.	-6.00E-04	0.00	1.18E+12	0.00	0.00	260.1504
12.4200	0.07755	2059384.	27945.	-5.90E-04	0.00	1.18E+12	0.00	0.00	180.0512
12.8800	0.07432	2216484.	28378.	-5.80E-04	0.00	1.18E+12	-23.028	1710.	0.00
13.3400	0.07115	2372881.	28170.	-5.70E-04	0.00	1.18E+12	-52.608	4082.	0.00
13.8000	0.06803	2527674.	25928.	-5.58E-04	0.00	1.18E+12	-759.493	61623.	0.00
14.2600	0.06498	2659322.	21715.	-5.46E-04	0.00	1.18E+12	-766.921	65146.	0.00
14.7200	0.06200	2767599.	17463.	-5.33E-04	0.00	1.18E+12	-773.869	68896.	0.00
15.1800	0.05909	2852294.	13173.	-5.20E-04	0.00	1.18E+12	-780.335	72891.	0.00
15.6400	0.05626	2913210.	8849.	-5.07E-04	0.00	1.18E+12	-786.317	77152.	0.00
16.1000	0.05350	2950164.	4494.	-4.93E-04	0.00	1.18E+12	-791.811	81699.	0.00
16.5600	0.05081	2962989.	2042.	-4.79E-04	0.00	1.18E+12	-96.552	10488.	0.00
17.0200	0.04821	2972870.	1494.	-4.65E-04	0.00	1.18E+12	-101.976	11677.	0.00
17.4800	0.04568	2979641.	918.5240	-4.51E-04	0.00	1.18E+12	-106.456	12865.	0.00
17.9400	0.04322	2983165.	320.9871	-4.38E-04	0.00	1.18E+12	-110.043	14053.	0.00
18.4000	0.04085	2983335.	-294.020	-4.24E-04	0.00	1.18E+12	-112.786	15242.	0.00
18.8600	0.03855	2980065.	-921.976	-4.10E-04	0.00	1.18E+12	-114.735	16430.	0.00
19.3200	0.03632	2973297.	-1559.	-3.96E-04	0.00	1.18E+12	-115.940	17619.	0.00
19.7800	0.03418	2962993.	-2200.	-3.82E-04	0.00	1.18E+12	-116.449	18807.	0.00
20.2400	0.03211	2949140.	-2842.	-3.68E-04	0.00	1.18E+12	-116.312	19995.	0.00
20.7000	0.03012	2931739.	-3482.	-3.54E-04	0.00	1.18E+12	-115.576	21184.	0.00
21.1600	0.02820	2910815.	-4117.	-3.41E-04	0.00	1.18E+12	-114.289	22372.	0.00
21.6200	0.02636	2886406.	-4743.	-3.27E-04	0.00	1.18E+12	-112.498	23560.	0.00
22.0800	0.02459	2858566.	-5358.	-3.14E-04	0.00	1.18E+12	-110.247	24749.	0.00
22.5400	0.02290	2827366.	-5959.	-3.00E-04	0.00	1.18E+12	-107.582	25937.	0.00
23.0000	0.02128	2792884.	-6544.	-2.87E-04	0.00	1.18E+12	-104.547	27125.	0.00
23.4600	0.01973	2755215.	-7112.	-2.74E-04	0.00	1.18E+12	-101.184	28314.	0.00
23.9200	0.01825	2714461.	-7661.	-2.61E-04	0.00	1.18E+12	-97.534	29502.	0.00
24.3800	0.01684	2670733.	-8188.	-2.49E-04	0.00	1.18E+12	-93.638	30690.	0.00

24.8400	0.01550	2624149.	-8694.	-2.36E-04	0.00	1.18E+12	-89.533	31879.	0.00
25.3000	0.01423	2574835.	-9176.	-2.24E-04	0.00	1.18E+12	-85.258	33067.	0.00
25.7600	0.01303	2522921.	-9635.	-2.12E-04	0.00	1.18E+12	-80.848	34255.	0.00
26.2200	0.01189	2468541.	-10068.	-2.01E-04	0.00	1.18E+12	-76.337	35444.	0.00
26.6800	0.01081	2411834.	-10477.	-1.89E-04	0.00	1.18E+12	-71.759	36632.	0.00
27.1400	0.00980	2352938.	-10861.	-1.78E-04	0.00	1.18E+12	-67.143	37820.	0.00
27.6000	0.00885	2291995.	-11218.	-1.67E-04	0.00	1.18E+12	-62.519	39009.	0.00
28.0600	0.00795	2229144.	-11551.	-1.57E-04	0.00	1.18E+12	-57.916	40197.	0.00
28.5200	0.00712	2164527.	-11858.	-1.46E-04	0.00	1.18E+12	-53.358	41385.	0.00
28.9800	0.00634	2098283.	-12140.	-1.37E-04	0.00	1.18E+12	-48.871	42574.	0.00
29.4400	0.00561	2030547.	-12398.	-1.27E-04	0.00	1.18E+12	-44.475	43762.	0.00
29.9000	0.00494	1961455.	-12631.	-1.18E-04	0.00	1.18E+12	-40.193	44950.	0.00
30.3600	0.00431	1891137.	-12842.	-1.09E-04	0.00	1.18E+12	-36.043	46139.	0.00
30.8200	0.00374	1819719.	-13030.	-9.99E-05	0.00	1.18E+12	-32.042	47327.	0.00
31.2800	0.00321	1747323.	-13196.	-9.16E-05	0.00	1.18E+12	-28.204	48516.	0.00
31.7400	0.00273	1674066.	-13342.	-8.36E-05	0.00	1.18E+12	-24.544	49704.	0.00
32.2000	0.00229	1600060.	-13468.	-7.60E-05	0.00	1.18E+12	-21.074	50892.	0.00
32.6600	0.00189	1525411.	-13575.	-6.87E-05	0.00	1.19E+12	-17.801	52081.	0.00
33.1200	0.00153	1450218.	-13665.	-6.18E-05	0.00	1.19E+12	-14.736	53269.	0.00
33.5800	0.00120	1374574.	-13738.	-5.52E-05	0.00	1.19E+12	-11.883	54457.	0.00
34.0400	9.17E-04	1298568.	-13796.	-4.90E-05	0.00	1.19E+12	-9.248	55646.	0.00
34.5000	6.64E-04	1222279.	-13841.	-4.31E-05	0.00	1.19E+12	-6.832	56834.	0.00
34.9600	4.41E-04	1145780.	-14226.	-3.76E-05	0.00	1.19E+12	-132.907	1662901.	0.00
35.4200	2.48E-04	1065231.	-14801.	-3.25E-05	0.00	1.19E+12	-75.412	1677024.	0.00
35.8800	8.26E-05	982384.	-15079.	-2.77E-05	0.00	1.19E+12	-25.310	1691150.	0.00
36.3400	-5.78E-05	898764.	-15100.	-2.33E-05	0.00	1.19E+12	17.8476	1705281.	0.00
36.8000	-1.75E-04	815688.	-14900.	-1.94E-05	0.00	1.19E+12	54.5396	1719415.	0.00
37.2600	-2.71E-04	734272.	-14514.	-1.58E-05	0.00	1.19E+12	85.2607	1733553.	0.00
37.7200	-3.49E-04	655454.	-13974.	-1.25E-05	0.00	1.19E+12	110.5141	1747694.	0.00
38.1800	-4.10E-04	580003.	-13310.	-9.66E-06	0.00	1.19E+12	130.0955	1752344.	0.00
38.6400	-4.56E-04	508515.	-12552.	-7.13E-06	0.00	1.19E+12	144.6612	1752344.	0.00
39.1000	-4.89E-04	441435.	-11724.	-4.92E-06	0.00	1.19E+12	155.0872	1752344.	0.00
39.5600	-5.10E-04	379081.	-10849.	-3.02E-06	0.00	1.19E+12	161.9195	1752344.	0.00
40.0200	-5.22E-04	321659.	-9945.	-1.39E-06	0.00	1.19E+12	165.6659	1752344.	0.00
40.4800	-5.25E-04	269285.	-9028.	-1.81E-08	0.00	1.19E+12	166.7937	1752344.	0.00
40.9400	-5.22E-04	221994.	-8110.	1.12E-06	0.00	1.19E+12	165.7292	1752344.	0.00
41.4000	-5.13E-04	179752.	-7203.	2.06E-06	0.00	1.19E+12	162.8576	1752344.	0.00
41.8600	-4.99E-04	142472.	-6316.	2.80E-06	0.00	1.19E+12	158.5227	1752344.	0.00
42.3200	-4.82E-04	110022.	-5456.	3.39E-06	0.00	1.19E+12	153.0279	1752344.	0.00
42.7800	-4.62E-04	82235.	-4629.	3.84E-06	0.00	1.19E+12	146.6375	1752344.	0.00
43.2400	-4.40E-04	58916.	-3839.	4.17E-06	0.00	1.19E+12	139.5776	1752344.	0.00
43.7000	-4.16E-04	39850.	-3089.	4.40E-06	0.00	1.19E+12	132.0380	1752344.	0.00
44.1600	-3.91E-04	24807.	-2382.	4.55E-06	0.00	1.19E+12	124.1741	1752344.	0.00

44.6200	-3.66E-04	13548.	-1719.	4.63E-06	0.00	1.19E+12	116.1082	1752344.	0.00
45.0800	-3.40E-04	5827.	-1101.	4.68E-06	0.00	1.19E+12	107.9320	1752344.	0.00
45.5400	-3.14E-04	1394.	-527.662	4.70E-06	0.00	1.19E+12	99.7084	1752344.	0.00
46.0000	-2.88E-04	0.00	0.00	4.70E-06	0.00	1.19E+12	91.4735	876172.	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. 4:

Pile-head deflection = 0.17560192 inches

Computed slope at pile head = -0.0006837 radians

Maximum bending moment = 2983335. inch-lbs

Maximum shear force = 28378. lbs

Depth of maximum bending moment = 18.40000000 feet below pile head

Depth of maximum shear force = 12.88000000 feet below pile head Number of iterations = 15

Number of Iterations = 13

Number of zero deflection points = 1

Pile deflection at ground = 0.07699267 inches

Pile-head Deflection vs. Pile Length for Load Case 4

Boundary Condition Type 1, Shear and Moment

Shear = 5042. lbs
Moment = 0. in-lbs
Axial Load = 31125. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
46.00000	0.17560192	2983335.	28378.

0.18269982	3047026.	28341.
0.19213377	3079514.	28390.
0.20786443	3077577.	28377.
0.22906964	2992059.	28383.
0.31098493	2904482.	28403.
0.38085712	2901278.	28370.
0.50927765	2855149.	28374.
0.89816947	2834737.	-30437.
1.86443312	2845176.	-37509.
5.33808932	2839097.	-48936.
	0.19213377 0.20786443 0.22906964 0.31098493 0.38085712 0.50927765 0.89816947 1.86443312	0.192133773079514.0.207864433077577.0.229069642992059.0.310984932904482.0.380857122901278.0.509277652855149.0.898169472834737.1.864433122845176.

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

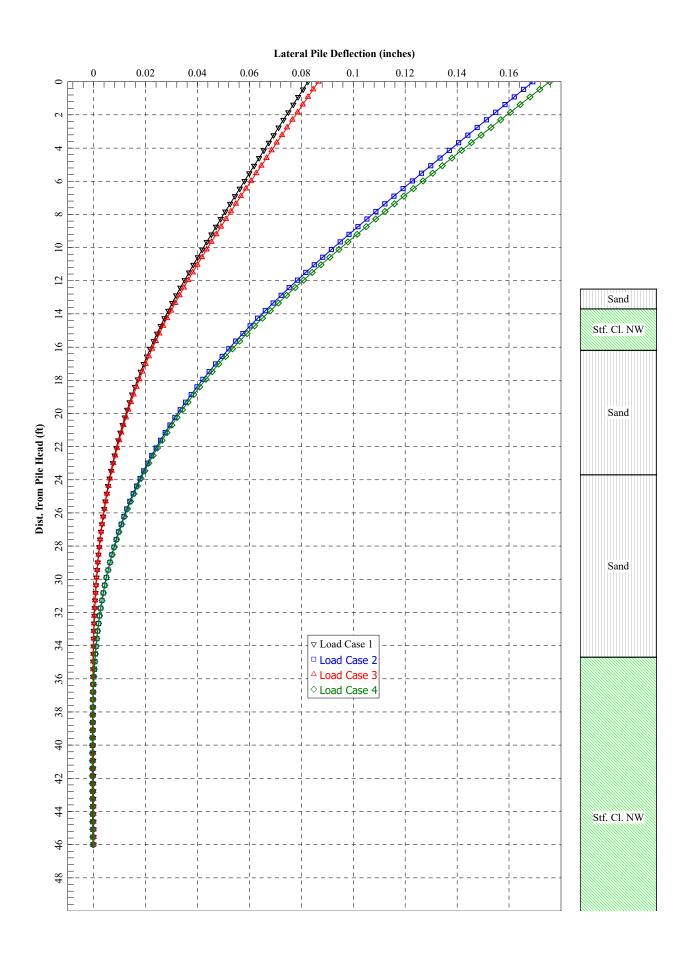
```
Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs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

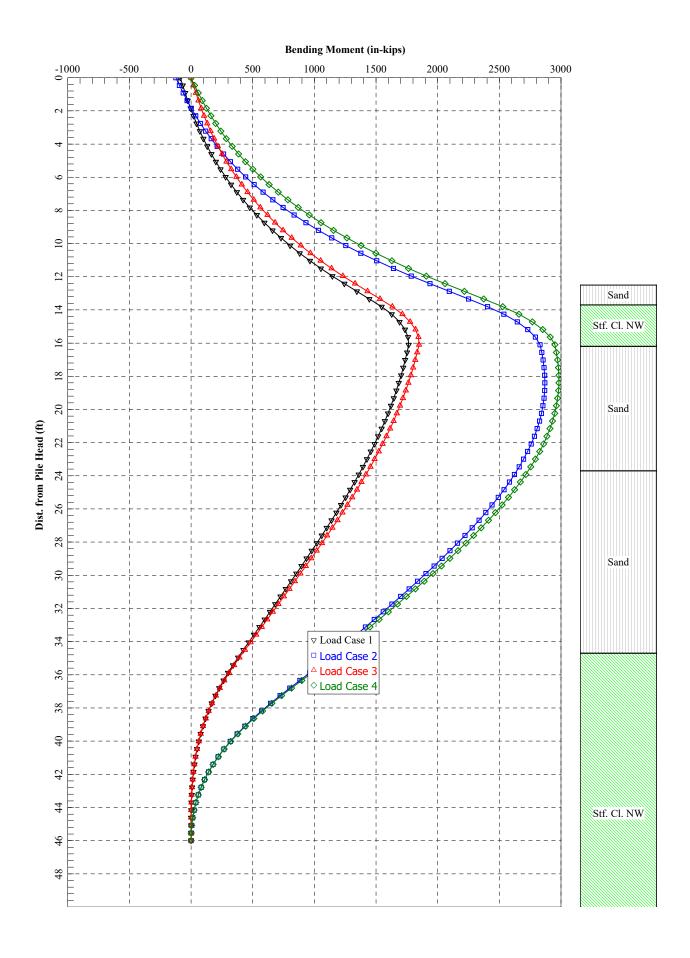
Load Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	1bs	inches	radians	lbs	in-lbs
					<u></u>			
1 V, lb	3375.	M, in-lb	-86500.	24625.	0.08253	-3.41E-04	18342.	1765250.
2 V, 1b	5042.	M, in-lb	-122500.	31125.	0.1692	-6.48E-04	<mark>28379</mark> .	2869129.
3 V, 1b	3375.	M, in-lb	0.00	24625.	0.08658	-3.65E-04	18341.	<u> 1848897.</u>
4 V, 1b	5042.	M, in-lb	0.00	31125.	0.1756	-6.84E-04	28378.	2983335.

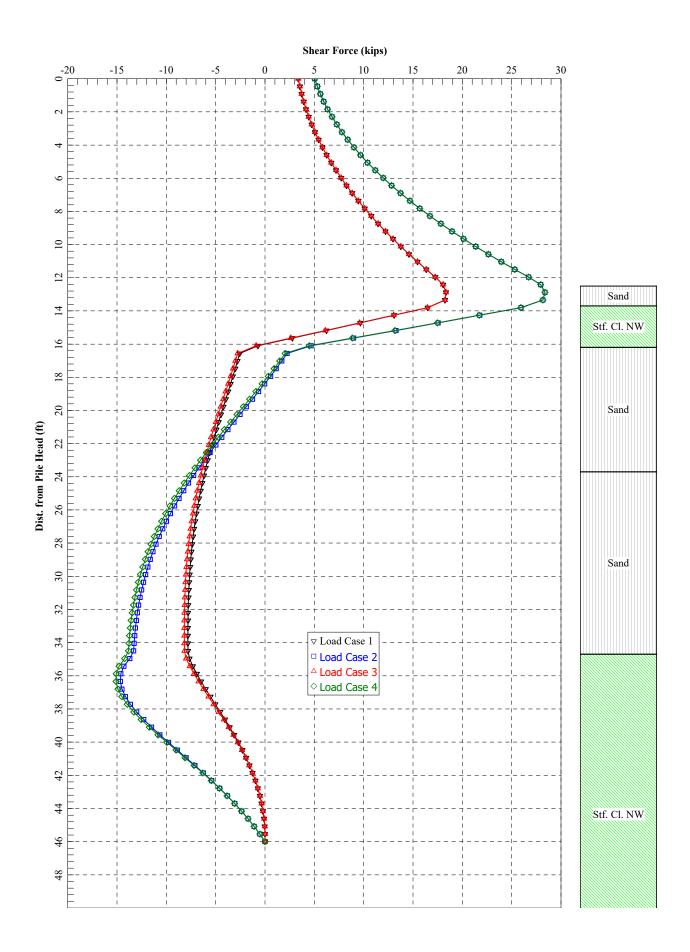
```
Maximum pile-head deflection = 0.1756019196 inches

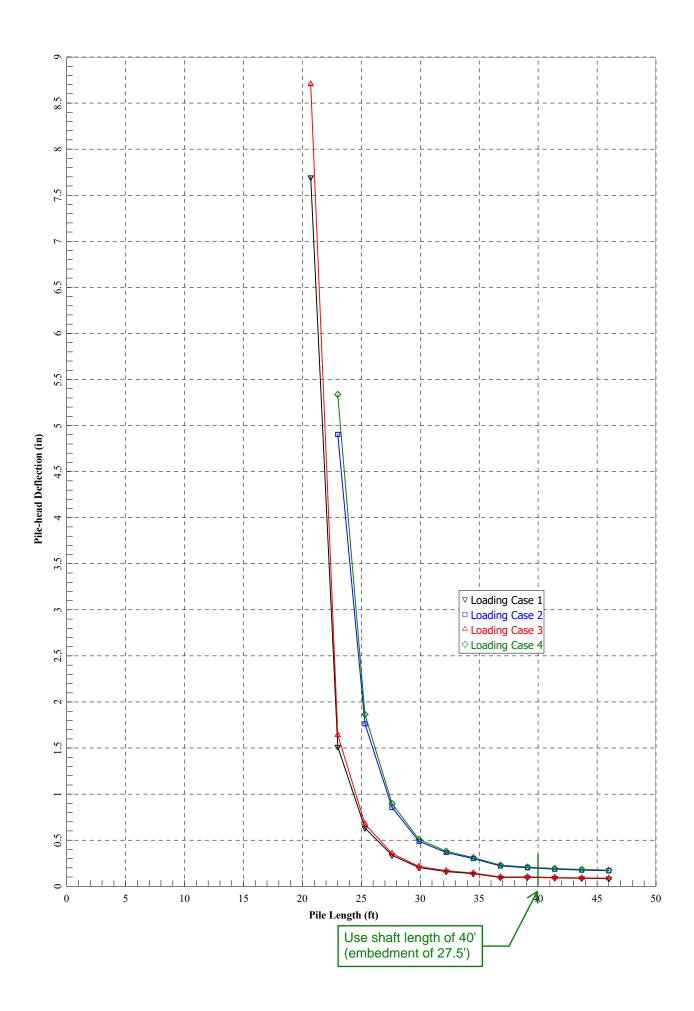
Maximum pile-head rotation = -0.0006837426 radians = -0.039176 deg.
```

The analysis ended normally.









Section within Abutment/Wingwalls, 12.5' height, horizontal backslope, post-construction (includes full structure loading, fixed-head)

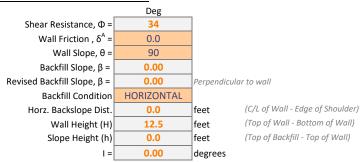
Geometry

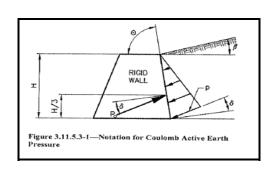
				Horiz. Distance	
	Elevation (ft)	_		from C/L (ft)	
Top of Backfill =	721.1	at Outside Edge of Shoulder	Start of Wall Backfill =		at Outside Edge of Shoulder
Top of Wall =	710.0	at C/L of Wall	Wall =		at C/L of Wall
Existing Ground Surface =	702.3	at C/L of Wall		_	
Bottom of Wall =	697.5	at C/L of Wall	Backfill Slope Angle =		H:1V

Wall Loading Profile

	Top Elev.	Thickness (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	_
Item 203	710.0	7.7	250	28	125	A-6a/A-6b per GDM
Medium Dense Granular	702.3	4.8	0	36.5	125	
Bottom of Wall	697.5					•
Weighted Value		12.5	155	31	125	

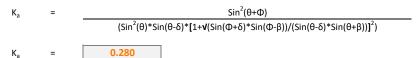
Earth Pressure Coefficients





Horiz Distance

Active Earth Coefficient



At-Rest Earth Coefficient

 $K_o = (1-Sin(\phi))*(1+Sin(\beta))$ $K_o = 0.437$

Notes:

A. Wall friction neglected

- B. Figure and Equation for Active Earth Pressure from AASHTO 3.11.5.3 (LRFD Design Manual).
- C. The wall backfill will consist of proposed fill and granular overburden. Using the soil layer thicknesses and respective soil parameters as provided by SME, a weighted average was determined and assumed for the entire backfill (c' = 155 psf and φ' = 31°. The parameters were converted to equivalent soil strength parameters c' = 0 psf and φ' = 34° for computing earth pressures based on a 1 degree increase in friction angle for every 50 psf decrease in cohesion up to 150 psf (Ref: Hall's Thesis).

		Soil Lateral	Design Profile				
_	Top Elev	Depth (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	ε50	k
Medium Dense Granular	697.5	12.5	0	36.5	62.6	N/A	125
Very Stiff Cohesive	696.3	13.7	4000	0	62.6	0.005	N/A
Medium Dense Granular	693.8	16.2	0	33	59.6	N/A	60
Medium Dense Silt	686.3	23.7	0	33	62.6	N/A	60
Medium Stiff to Stiff Cohesive	675.3	34.7	1700	0	57.6	0.007	N/A
Stiff to Very Stiff Cohesive	645.8	64.2	2700	0	59.6	0.005	N/A
Medium Stiff to Stiff Silt	633.3	76.7	1400	0	55.6	0.007	N/A
Very Stiff to Hard Silt	602.8	107.2	3300	0	72.6	0.005	N/A
Bedrock	587.8	122.2	N/A	N/A	N/A	N/A	N/A

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)

Restraint Condition = ACTIVE

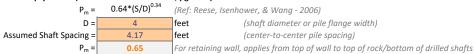
Ka = 0.280

(Active or At-Rest)

3) Determine Equivalent Fluid Weight (GH)

 $G_H = (\gamma_m)^* (K_a)$ Soil loading only, does not include hydrostatic pressures $G_H = 35$ For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust

6) Resolve horizontal earth force to distributed triangular load (for LPILE)

w =	2*P _{SH} /H	
w =	1820	lbs/foot per shaft (Earth - Service Limit)
w =	152	lbs/inch per shaft (Earth - Service Limit)
$\gamma_E =$	1.5	Earth Load Factor
w =	$(2*P_{SH}/H)*\gamma_E$	_
w =	228	lbs/inch per shaft (Earth - Strength Limit)

7) Determine live-load traffic surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)

w =	P _s /H	
w =	0	lbs/foot per shaft (surcharge - unfactored)
w =	0	lbs/inch per shaft (surcharge - unfactored)
$\gamma_S =$	1.75	Surcharge Load Factor - Strength I
w =	$(P_S/L)*\gamma_S$	
w =	0	lbs/inch per shaft (Surcharge - Strength I)

Distributed Lateral Loads for LPILE

	CONVENTION	AL
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)
0	0	0
12.5	152	228

9) Pile Heading Loading (for LPILE, from HDR Structures)

	Service	Strength		
Shear =	2.99	4.59	kips/ft	
Moment =	8.05	15.4	kip-ft/ft	
Axial Load =	20.39	29.22	kips/ft	
Shear =	12458	19125	lbs	
Moment =	402500	770000	lb-in	Moment not applied due to modeling as fixed-head condition
Axial Load =	84958	121750	lbs	

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)

Restraint Condition = AT-REST

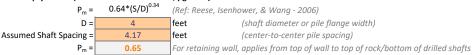
Ko = 0.437

(Active or At-Rest)

3) Determine Equivalent Fluid Weight (GH)

 $G_H = (\gamma_m)^* (K_a)$ Soil loading only, does not include hydrostatic pressures $G_H = 55$ For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust

$$\label{eq:conventional Earth Pressure Theory} \begin{split} & \textit{Exposed Wall Height (H)} = & \textbf{12.5} & \text{feet} \\ & P = & \textbf{1/2} * G_H * H^2 \\ & P = & \textbf{4268} & \text{lbs/foot} \\ & P_{\text{SH}} = & P^*(\text{Shaft Spacing}) & \textit{(earth loading)} \\ & P_{\text{SH}} = & \textbf{17781} & \text{lbs/shaft} \end{split}$$

6) Resolve horizontal earth force to distributed triangular load (for LPILE)



7) Determine live-load traffic surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)

w =	P _s /H	
w =	0	lbs/foot per shaft (surcharge - unfactored)
w =	0	lbs/inch per shaft (surcharge - unfactored)
$\gamma_s =$	1.75	Surcharge Load Factor - Strength I
w =	$(P_S/L)*\gamma_S$	
w =	0	lbs/inch per shaft (Surcharge - Strength I)

Distributed Lateral Loads for LPILE

	CONVENTION	AL
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)
0	0	0
12.5	237	356

9) Pile Heading Loading (for LPILE, from HDR Structures)

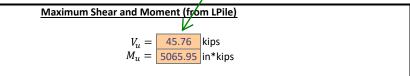
	Service	Strength		
Shear =	2.99	4.59	kips/ft	
Moment =	8.05	15.4	kip-ft/ft	
Axial Load =	20.39	29.22	kips/ft	
Shear =	12458	19125	lbs	
Moment =	402500	770000	lb-in	Moment not applied due to modeling as fixed-head condition
Axial Load =	84958	121750	lbs	

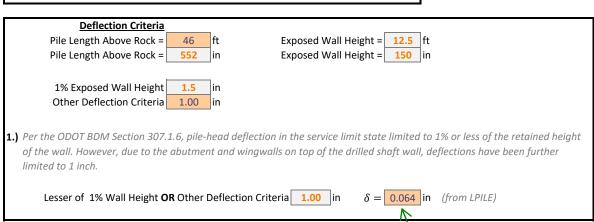
Shear, Moment, and Deflection Results

Governing maximum moment and shear based on Load Case 4 = Service Case (At-Rest Earth Pressures)

Maximum Shear and Moment output from LPile service case provided to HDR's structural engineers for capacity checks. Final reinforcing layout to be confirmed in structural analyses.

Shaft Geometry		
Shaft Diameter	48	in
Rebar Cover	4	in
Steel Reinforcing		
Assumed Bar No.	11	
No. of Bars	12	
Percent Steel	1.03%	in
Yield Strength of Steel	60	ksi
Modulus of Elasticity of Steel (E _s)	29000000	psi
Concrete Properties		_
Concrete Compressive Strength (f'c)	4000	psi
Modulus of Elasticity of Concrete (E _c)	3604997	psi





Governing deflection based on Load Case 3 = Service Case (At-Rest Earth Pressures) ______

LPile for Version 2022-12.012

License ID : 202613844 License Type : (Network 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:

HDR

LPILE Global, Global License

This model was prepared by: abaratta

Files Used for Analysis

Path to file locations: \pwworking\east01\d4381065\

Name of input data file:

4c. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Post-Const.lp12d

Name of output report file:

4c. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Post-Const.lp12o

Name of plot output file:

4c. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Post-Const.lp12p

Name of runtime message file:

4c. Fwd. Abt. B-002 12.5' Height 4' Shaft Abt. Section Post-Const.lp12r

Load Case 1 = Service Case (Active Earth Pressures)

Load Case 2 = Strength Case (Active Earth Pressures)

Load Case 3 = Service Case (At-Rest Earth Pressures)

Load Case 4 = Strength Case (At-Rest Earth Pressures)

Date and Time of Analysis						
Date: July 9, 2025 Time: 15:17:05						
Problem Title						
Project Name: CUY-17-13.50						
Job Number:						
Client:						
Engineer: HDR						
Description: Fwd. Abt., 12.5' Ht., 4' Dia., Post-Const.						
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
- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- Analysis includes loading by multiple distributed lateral loads acting on pile
- 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 = 46.000 ft
Depth of ground surface below top of pile = 12.5000 ft

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

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

Depth Below

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	48.0000
2	46.000	48.0000

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 = 46.000000 ft

Shaft Diameter = 48.000000 in

Soil and Rock Layering Information

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 12.500000 ft

Distance from top of pile to bottom of layer = 13.700000 ft

Effective unit weight at top of layer = 62.600000 pcf

Effective unit weight at bottom of layer = 62.600000 pcf

Friction angle at top of layer = 36.500000 deg.

Friction angle at bottom of layer = 36.500000 deg.

Subgrade k at top of layer = 125.000000 pci

Subgrade k at bottom of layer = 125.000000 pci

Layer 2 is stiff clay without free water

Distance from top of pile to top of layer = 13.700000 ft
Distance from top of pile to bottom of layer = 16.200000 ft
Effective unit weight at top of layer = 62.600000 pcf
Effective unit weight at bottom of layer = 62.600000 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 sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	16.200000 ft
Distance from top of pile to bottom of layer	=	23.700000 ft
Effective unit weight at top of layer	=	59.600000 pcf
Effective unit weight at bottom of layer	=	59.600000 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

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

Distance from top of pile to top of layer	=	23.700000 ft
Distance from top of pile to bottom of layer	=	34.700000 ft
Effective unit weight at top of layer	=	62.600000 pcf
Effective unit weight at bottom of layer	=	62.600000 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

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	34.700000 ft
Distance from top of pile to bottom of layer	=	64.200000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1700. psf
Undrained cohesion at bottom of layer	=	1700. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer	=	64.200000 ft
Distance from top of pile to bottom of layer	=	76.700000 ft
Effective unit weight at top of layer	=	59.600000 pcf
Effective unit weight at bottom of layer	=	59.600000 pcf
Undrained cohesion at top of layer	=	2700. psf
Undrained cohesion at bottom of layer	=	2700. psf
Epsilon-50 at top of layer	=	0.005000
Epsilon-50 at bottom of layer	=	0.005000

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer	=	76.700000 ft
Distance from top of pile to bottom of layer	=	107.200000 ft
Effective unit weight at top of layer	=	55.600000 pcf
Effective unit weight at bottom of layer	=	55.600000 pcf
Undrained cohesion at top of layer	=	1400. psf
Undrained cohesion at bottom of layer	=	1400. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 8 is stiff clay without free water

Distance from top of pile to top of layer	=	107.200000 ft
Distance from top of pile to bottom of layer	=	122.000000 ft
Effective unit weight at top of layer	=	72.600000 pcf
Effective unit weight at bottom of layer	=	72.600000 pcf
Undrained cohesion at top of layer	=	3300. psf
Undrained cohesion at bottom of layer	=	3300. psf
Epsilon-50 at top of layer	=	0.005000
Epsilon-50 at bottom of layer	=	0.005000

(Depth of the lowest soil layer extends 76.000 ft below the pile tip)

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Summary of Input Soil Properties
```

E50

Layer Soil Type Layer Effective Cohesion Angle of

Num.	Name (p-y Curve Type)	Depth ft	Unit Wt. pcf	psf	Friction deg.	or krm	kpy pci
1	Sand	12.5000	62.6000		36.5000		125.0000
	(Reese, et al.)	13.7000	62.6000		36.5000		125.0000
2	Stiff Clay	13.7000	62.6000	4000.		0.00500	
	w/o Free Water	16.2000	62.6000	4000.		0.00500	
3	Sand	16.2000	59.6000		33.0000		60.0000
	(Reese, et al.)	23.7000	59.6000		33.0000		60.0000
4	Sand	23.7000	62.6000		33.0000		60.0000
	(Reese, et al.)	34.7000	62.6000		33.0000		60.0000
5	Stiff Clay	34.7000	57.6000	1700.		0.00700	
	w/o Free Water	64.2000	57.6000	1700.		0.00700	
6	Stiff Clay	64.2000	59.6000	2700.		0.00500	
	w/o Free Water	76.7000	59.6000	2700.		0.00500	
7	Stiff Clay	76.7000	55.6000	1400.		0.00700	
	w/o Free Water	107.2000	55.6000	1400.		0.00700	
8	Stiff Clay	107.2000	72.6000	3300.		0.00500	
	w/o Free Water	122.0000	72.6000	3300.		0.00500	

Modification Factors for p-y Curves

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult
1	12.500	0.6500	1.0000
2	122.200	0.6500	1.0000

Static Loading Type

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

Distributed	Lateral	Loading	for	Individual	Load	Cases	

Distributed lateral load intensity for Load Case 1 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	0.000
2	12.500	152.000

Distributed lateral load intensity for Load Case 2 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	0.000
2	12.500	228.000

Distributed lateral load intensity for Load Case 3 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	0.000
2	12.500	237.000

Distributed lateral load intensity for Load Case 4 defined using 2 points

Point	Depth X	Dist. Load		
No.	ft	lb/in		
1	0.000	0.000		
2	12.500	356.000		

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 4

Load No.	Load Type		Condition 1		Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	2	V =	12458. lbs	S =	0.0000 in/in	84958.	Yes	Yes
2	2	V =	19125. lbs	S =	0.0000 in/in	121750.	Yes	Yes
3	2	V =	12458. lbs	S =	0.0000 in/in	84958.	Yes	Yes
4	2	V =	19125. lbs	S =	0.0000 in/in	121750.	Yes	Yes

Slope = 0 for fixed-head condition

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 = 46.000000 ft Shaft Diameter = 48.000000 in Concrete Cover Thickness (to edge of long. rebar) = 4.000000 in

Number of Reinforcing Bars	=	12	bars
Yield Stress of Reinforcing Bars	=	60000.	psi
Modulus of Elasticity of Reinforcing Bars	=	29000000.	psi
Gross Area of Shaft	=	1810.	sq. in.
Total Area of Reinforcing Steel	=	18.720000	sq. in.
Area Ratio of Steel Reinforcement	=	1.03	percent
Edge-to-Edge Bar Spacing	=	8.577827	in
Maximum Concrete Aggregate Size	=	0.750000	in
Ratio of Bar Spacing to Aggregate Size	=	11.44	
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 7212.047 kips
Tensile Load for Cracking of Concrete = -807.459 kips
Nominal Axial Tensile Capacity = -1123.200 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar	Bar Diam.	Bar Area	Χ	Υ
Number	inches	sq. in.	inches	inches
1	1.410000	1.560000	19.295000	0.00000
2	1.410000	1.560000	16.709960	9.647500
3	1.410000	1.560000	9.647500	16.709960
4	1.410000	1.560000	0.00000	19.295000
5	1.410000	1.560000	-9.64750	16.709960
6	1.410000	1.560000	-16.70996	9.647500
7	1.410000	1.560000	-19.29500	0.00000
8	1.410000	1.560000	-16.70996	-9.64750
9	1.410000	1.560000	-9.64750	-16.70996
10	1.410000	1.560000	0.00000	-19.29500
11	1.410000	1.560000	9.647500	-16.70996
12	1.410000	1.560000	16.709960	-9.64750

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

Minimum spacing between any two bars not equal to zero = 8.578 inches between bars 7 and 8.

Ratio of bar spacing to maximum aggregate size = 11.44

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 = 2

Number	Axial Thrust Force
	kips
1	84.958
2	121.750

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 = 84.958 kips

Curvature	Moment	Stiffness	N Axis	Strain	Strain	Stress	Stress Ms	g
rad/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi	
6.25000E-07	740.9410361	1185505658.	40.7684944	0.00002548	-0.00000452	0.1067089	0.6649790	-
0.00000125	1480.	1183984564.	32.4076750	0.00004051	-0.00000432	0.1687182	1.0268782	
0.00000188	2215.	1181596595.	29.6221873	0.00005554	-0.00003446	0.2302409	1.3888564	
0.00000250	2947.	1178940044.	28.2297918	0.00007057	-0.00004943	0.2912692	1.7508599	
0.00000313	3676.	1176170588.	27.3945083	0.00008561	-0.00006439	0.3518014	2.1128773	
0.00000375	4400.	1173343535.	26.8377457	0.0001006	-0.00007936	0.4118369	2.4749049	
0.00000438	5121.	1170483238.	26.4401257	0.0001157	-0.00009432	0.4713756	2.8369410	
0.00000500	5121.	1024172833.	18.3483800	0.00009174	-0.000148	0.3747876	-3.707885 C	
0.00000563	5121.	910375852.	17.7486762	0.00009984	-0.000170	0.4067929	-4.269197 C	
0.00000625	5121.	819338267.	17.2527265	0.0001078	-0.000192	0.4382515	-4.833443 C	
0.00000688	5121.	744852970.	16.8351395	0.0001157	-0.000214	0.4692482	-5.400044 C	
0.00000750	5121.	682781889.	16.4793120	0.0001236	-0.000236	0.4998763	-5.968349 C	
0.00000813	5121.	630260205.	16.1709352	0.0001314	-0.000259	0.5301370	-6.538372 C	
0.00000875	5121.	585241619.	15.9011314	0.0001391	-0.000281	0.5600775	-7.109787 C	
0.00000938	5121.	546225511.	15.6650461	0.0001469	-0.000303	0.5898057	-7.681814 C	
0.00001000	5121.	512086417.	15.4538740	0.0001545	-0.000325	0.6192256	-8.255173 C	
0.00001063	5121.	481963686.	15.2659316	0.0001622	-0.000348	0.6484512	-8.829033 C	
0.00001125	5121.	455187926.	15.0985232	0.0001699	-0.000370	0.6775346	-9.403007 C	
0.00001188	5121.	431230667.	14.9443418	0.0001775	-0.000393	0.7062914	-9 . 978487 C	
0.00001250	5121.	409669133.	14.8059525	0.0001851	-0.000415	0.7349408	-10.553834 C	
0.00001313	5121.	390161079.	14.6810919	0.0001927	-0.000437	0.7634826	-11.129048 C	
0.00001375	5121.	372426485.	14.5653684	0.0002003	-0.000460	0.7917816	-11.705159 C	
0.00001438	5121.	356234029.	14.4586401	0.0002078	-0.000482	0.8199008	-12.281697 C	
0.00001500	5121.	341390944.	14.3611273	0.0002154	-0.000505	0.8479136	-12.858099 C	
0.00001563	5121.	327735307.	14.2717130	0.0002230	-0.000527	0.8758200	-13.434366 C	
0.00001625	5121.	315130103.	14.1894634	0.0002306	-0.000549	0.9036198	-14.010498 C	
0.00001688	5121.	303458617.	14.1119169	0.0002381	-0.000572	0.9312056	-14.587331 C	
0.00001750	5121.	292620809.	14.0391386	0.0002457	-0.000594	0.9586203	-15.164537 C	
0.00001813	5155.	284431186.	13.9715814	0.0002532	-0.000617	0.9859295	-15.741605 C	
0.00001875	5296.	282463920.	13.9088735	0.0002608	-0.000639	1.0131330	-16.318535 C	
0.00001938	5437.	280619043.	13.8504224	0.0002684	-0.000662	1.0402307	-16.895326 C	
0.00002000	5578.	278885067.	13.7958643	0.0002759	-0.000684	1.0672224	-17.471978 C	
0.00002063	5718.	277251897.	13.7448461	0.0002835	-0.000707	1.0941078	-18.048489 C	
0.00002125	5859.	275710629.	13.6970562	0.0002911	-0.000729	1.1208869	-18.624861 C	
0.00002188	5999.	274249513.	13.6511635	0.0002986	-0.000751	1.1474727	-19.201793 C	
0.00002250	6139.	272863438.	13.6073537	0.0003062	-0.000774	1.1739012	-19.779002 C	
0.00002313	6280.	271548506.	13.5661269	0.0003137	-0.000796	1.2002244	-20.356066 C	
0.00002375	6420.	270299089.	13.5272801	0.0003213	-0.000819	1.2264421	-20.932986 C	
0.00002438	6560.	269110145.	13.4905518	0.0003288	-0.000841	1.2525540	-21.509760 C	
0.00002563	6839.	266895907.	13.4231905	0.0003440	-0.000886	1.3044598	-22.662872 C	

0.00002688	7119.	264874442.	13.3628462	0.0003591	-0.000931	1.3559404	-23.815397 C
0.00002813	7397.	263019971.	13.3085881	0.0003743	-0.000976	1.4069942	-24.967331 C
0.00002938	7676.	261311104.	13.2597313	0.0003895	-0.001020	1.4576196	-26.118671 C
0.00003063	7954.	259729940.	13.2154643	0.0004047	-0.001065	1.5078151	-27.269412 C
0.00003188	8232.	258259147.	13.1743355	0.0004199	-0.001110	1.5574677	-28.420524 C
0.00003313	8509.	256887159.	13.1362927	0.0004351	-0.001155	1.6066248	-29.571599 C
0.00003438	8786.	255604411.	13.1016476	0.0004504	-0.001200	1.6553527	-30.722045 C
0.00003563	9063.	254401442.	13.0700470	0.0004656	-0.001244	1.7036496	-31.871858 C
0.00003688	9339.	253270077.	13.0411857	0.0004809	-0.001289	1.7515138	-33.021032 C
0.00003813	9615.	252203222.	13.0146841	0.0004962	-0.001334	1.7989438	-34.169563 C
0.00003938	9891.	251194654.	12.9905299	0.0005115	-0.001378	1.8459377	-35.317447 C
0.00004063	10166.	250238941.	12.9684154	0.0005268	-0.001423	1.8924937	-36.464678 C
0.00004188	10441.	249331290.	12.9481621	0.0005422	-0.001468	1.9386102	-37.611251 C
0.00004313	10715.	248467464.	12.9296121	0.0005576	-0.001512	1.9842853	-38.757161 C
0.00004438	10989.	247643703.	12.9126254	0.0005730	-0.001557	2.0295173	-39.902404 C
0.00004563	11263.	246856658.	12.8970775	0.0005884	-0.001602	2.0743043	-41.046973 C
0.00004688	11536.	246103337.	12.8829840	0.0006039	-0.001646	2.1186445	-42.190865 C
0.00004813	11809.	245381057.	12.8699983	0.0006194	-0.001691	2.1625359	-43.334073 C
0.00004938	12081.	244687406.	12.8581510	0.0006349	-0.001735	2.2059769	-44.476591 C
0.00005063	12354.	244020211.	12.8473615	0.0006504	-0.001780	2.2489653	-45.618416 C
0.00005188	12625.	243377507.	12.8375571	0.0006659	-0.001824	2.2914993	-46.759540 C
0.00005313	12896.	242757513.	12.8286718	0.0006815	-0.001868	2.3335770	-47.899959 C
0.00005438	13167.	242158611.	12.8206459	0.0006971	-0.001913	2.3751964	-49.039666 C
0.00005563	13438.	241579328.	12.8134251	0.0007127	-0.001957	2.4163554	-50.178657 C
0.00005688	13708.	241018320.	12.8069598	0.0007284	-0.002002	2.4570521	-51.316924 C
0.00005813	13978.	240474358.	12.8012048	0.0007441	-0.002046	2.4972844	-52 . 454462 C
0.00005938	14247.	239946315.	12.7961188	0.0007598	-0.002090	2.5370502	-53.591265 C
0.00006063	14516.	239433158.	12.7916639	0.0007755	-0.002135	2.5763475	-54.727326 C
0.00006188	14784.	238933934.	12.7878054	0.0007912	-0.002179	2.6151741	-55.862640 C
0.00006313	15052.	238447767.	12.7845112	0.0008070	-0.002223	2.6535279	-56.997201 C
0.00006438	15320.	237973848.	12.7817519	0.0008228	-0.002267	2.6914067	-58.131000 C
0.00006563	15587.	237511429.	12.7795005	0.0008387	-0.002311	2.7288083	-59.264033 C
0.00006688	15850.	237010514.	12.7768962	0.0008545	-0.002356	2.7655991	-60.000000 CY
0.00006813	16095.	236258395.	12.7702547	0.0008700	-0.002400	2.8011978	-60.000000 CY
0.00006938	16316.	235179180.	12.7582587	0.0008851	-0.002445	2.8353691	-60.000000 CY
0.00007063	16527.	234015431.	12.7448312	0.0009001	-0.002490	2.8687677	-60.000000 CY
0.00007188	16738.	232880906.	12.7320925	0.0009151	-0.002535	2.9017128	-60.000000 CY
0.00007313	16942.	231687937.	12.7183374	0.0009300	-0.002580	2.9339326	-60.000000 CY
0.00007438	17108.	230019043.	12.6945662	0.0009442	-0.002626	2.9639984	-60.000000 CY
0.00007938	17568.	221333768.	12.5581262	0.0009968	-0.002813	3.0720768	-60.000000 CY
0.00008438	18012.	213471817.	12.4375432	0.0010494	-0.003001	3.1741412	-60.000000 CY
0.00008938	18452.	206455300.	12.3336125	0.0011023	-0.003188	3.2707497	-60.000000 CY
0.00009438	18885.	200104278.	12.2423136	0.0011554	-0.003375	3.3616293	-60.000000 CY

0.00009938	19172.	192927858.	12.1176866	0.0012042	-0.003566	3.4397655	-60.000000	CY
0.0001044	19349.	185375420.	11.9758926	0.0012500	-0.003760	3.5083585	-60.000000	CY
0.0001094	19522.	178490547.	11.8492568	0.0012960	-0.003954	3.5727184	-60.000000	CY
0.0001144	19694.	172187696.	11.7337718	0.0013421	-0.004148	3.6325961	-60.000000	CY
0.0001194	19862.	166381154.	11.6243296	0.0013877	-0.004342	3.6874579	-60.000000	CY
0.0001244	20028.	161028582.	11.5254275	0.0014335	-0.004537	3.7381164	-60.000000	CY
0.0001294	20192.	156077075.	11.4358275	0.0014795	-0.004730	3.7845118	-60.000000	CY
0.0001344	20355.	151481582.	11.3545479	0.0015258	-0.004924	3.8265828	-60.000000	CY
0.0001394	20516.	147203533.	11.2807174	0.0015722	-0.005118	3.8642660	-60.000000	CY
0.0001444	20674.	143198340.	11.2082375	0.0016182	-0.005312	3.8970285	-60.000000	CY
0.0001494	20830.	139449887.	11.1433247	0.0016645	-0.005505	3.9254068	-60.000000	CY
0.0001544	20979.	135899389.	11.0817104	0.0017107	-0.005699	3.9491954	-60.000000	CY
0.0001594	21100.	132393403.	11.0156130	0.0017556	-0.005894	3.9679267	-60.000000	CY
0.0001644	21178.	128839113.	10.9395568	0.0017982	-0.006092	3.9817156	-60.000000	CY
0.0001694	21229.	125335483.	10.8596328	0.0018394	-0.006291	3.9913793	-60.000000	CY
0.0001744	21272.	121990749.	10.7818727	0.0018801	-0.006490	3.9974064	-60.000000	CY
0.0001794	21312.	118814607.	10.7046339	0.0019201	-0.006690	3.9999054	-60.000000	CY
0.0001844	21352.	115804830.	10.6323385	0.0019603	-0.006890	3.9961397	-60.000000	CY
0.0001894	21390.	112949234.	10.5656274	0.0020009	-0.007089	3.9994693	-60.000000	CY
0.0001944	21427.	110235216.	10.5033145	0.0020416	-0.007288	3.9951837	-60.000000	CY
0.0001994	21463.	107652061.	10.4446231	0.0020824	-0.007488	3.9979183	-60.000000	CY
0.0002044	21499.	105191568.	10.3901342	0.0021235	-0.007687	3.9999290	-60.000000	CY
0.0002094	21533.	102842982.	10.3398434	0.0021649	-0.007885	3.9939899	-60.000000	CY
0.0002144	21565.	100595369.	10.2895694	0.0022058	-0.008084	3.9981476	-60.000000	CY
0.0002194	21596.	98444070.	10.2404952	0.0022465	-0.008283	3.9999223	-60.000000	CY
0.0002244	21626.	96384206.	10.1946685	0.0022874	-0.008483	3.9924099	-60.000000	CY
0.0002294	21656.	94411303.	10.1516115	0.0023285	-0.008681	3.9968188	-60.000000	CY
0.0002344	21684.	92520376.	10.1101635	0.0023696	-0.008880	3.9994182	-60.000000	CY
0.0002394	21713.	90705665.	10.0728876	0.0024112	-0.009079	3.9975296	-60.000000	CY
0.0002444	21740.	88961642.	10.0370827	0.0024528	-0.009277	3.9930606	-60.000000	CY
0.0002494	21767.	87285838.	10.0035694	0.0024946	-0.009475	3.9971919	-60.000000	CY
0.0002544	21793.	85674193.	9.9709394	0.0025364	-0.009674	3.9994922	-60.000000	CY
0.0002594	21819.	84122421.	9.9409729	0.0025784	-0.009872	3.9976034	-60.000000	CY
0.0002644	21844.	82626390.	9.9138648	0.0026210	-0.010069	3.9908649	-60.000000	CY
0.0002694	21869.	81184581.	9.8873731	0.0026634	-0.010267	3.9954940	-60.000000	CY
0.0002744	21893.	79794011.	9.8622921	0.0027060	-0.010464	3.9985142	-60.000000	CY
0.0003044	22027.	72368906.	9.7264624	0.0029605	-0.011650	3.9994789	-60.000000	CY
0.0003344	22149.	66238642.	9.6268468	0.0032190	-0.012831	3.9988853	-60.000000	CYT
0.0003644	22260.	61092041.	9.5554021	0.0034817	-0.014008	3.9950923	-60.000000	CYT
0.0003944	22356.	56687915.	9.5018143	0.0037473	-0.015183	3.9819944	60.0000000	CYT
0.0004244	22356.	52680522.	9.4952878	0.0040296	-0.016340	3.9986074	60.0000000	CYT

Axial Thrust Force = 121.750 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Run Stress Msg ksi
6.25000E-07	739.3373833	1182939813.	48.0483022	0.00003003	3.01889E-08	0.1257233	0.7969255
0.00000125	1478.	1182251526.	36.0535961	0.00004507	-0.00001493	0.1876115	1.1590429
0.00000188	2213.	1180370889.	32.0591601	0.00006011	-0.00002989	0.2490307	1.5213668
0.00000250	2945.	1177997850.	30.0628208	0.00007516	-0.00004484	0.3099600	1.8837545
0.00000313	3673.	1175405629.	28.8653637	0.00009020	-0.00005980	0.3703949	2.2461736
0.00000375	4398.	1172699068.	28.0672457	0.0001053	-0.00007475	0.4303335	2.6086130
0.00000438	5118.	1169925770.	27.4972843	0.0001203	-0.00008970	0.4897752	2.9710680
0.00000500	5118.	1023685049.	20.5362480	0.0001027	-0.000137	0.4188225	-3.390638 C
0.00000563	5118.	909942266.	19.7766852	0.0001112	-0.000159	0.4525019	-3.938378 C
0.00000625	5118.	818948039.	19.1445105	0.0001197	-0.000180	0.4854137	-4.490557 C
0.00000688	5118.	744498217.	18.6099294	0.0001279	-0.000202	0.5177002	-5.046195 C
0.00000750	5118.	682456699.	18.1507839	0.0001361	-0.000224	0.5494341	-5.604805 C
0.00000813	5118.	629960030.	17.7519824	0.0001442	-0.000246	0.5806948	-6.165839 C
0.00000875	5118.	584962885.	17.4030061	0.0001523	-0.000268	0.6115691	-6.728687 C
0.00000938	5118.	545965359.	17.0945950	0.0001603	-0.000290	0.6420862	-7.293157 C
0.00001000	5118.	511842524.	16.8180904	0.0001682	-0.000312	0.6722081	-7.859554 C
0.00001063	5118.	481734141.	16.5729671	0.0001761	-0.000334	0.7021474	-8.426304 C
0.00001125	5118.	454971133.	16.3485138	0.0001839	-0.000356	0.7316683	-8.995196 C
0.00001188	5118.	431025284.	16.1476952	0.0001918	-0.000378	0.7610565	-9.564087 C
0.00001250	5118.	409474019.	15.9633690	0.0001995	-0.000400	0.7901418	-10.134277 C
0.00001313	5118.	389975257.	15.7948023	0.0002073	-0.000423	0.8190069	-10.705151 C
0.00001375	5118.	372249109.	15.6419015	0.0002151	-0.000445	0.8477593	-11.275888 C
0.00001438	5118.	356064365.	15.4990906	0.0002228	-0.000467	0.8762086	-11.847960 C
0.00001500	5118.	341228350.	15.3671157	0.0002305	-0.000489	0.9044685	-12.420502 C
0.00001563	5118.	327579216.	15.2459892	0.0002382	-0.000512	0.9326176	-12.992907 C
0.00001625	5166.	317926679.	15.1344703	0.0002459	-0.000534	0.9606555	-13.565175 C
0.00001688	5308.	314534781.	15.0282295	0.0002536	-0.000556	0.9883785	-14.138910 C
0.00001750	5449.	311376388.	14.9293155	0.0002613	-0.000579	1.0159600	-14.712760 C
0.00001813	5590.	308430676.	14.8375012	0.0002689	-0.000601	1.0434319	-15.286473 C
0.00001875	5731.	305676364.	14.7520614	0.0002766	-0.000623	1.0707941	-15.860047 C
0.00001938	5872.	303094916.	14.6724093	0.0002843	-0.000646	1.0980464	-16.433482 C
0.00002000	6013.	300661432.	14.5964359	0.0002919	-0.000668	1.1250783	-17.007667 C
0.00002063	6154.	298364690.	14.5241565	0.0002996	-0.000690	1.1519192	-17.582375 C
0.00002125	6294.	296198732.	14.4563734	0.0003072	-0.000713	1.1786515	-18.156943 C
0.00002188	6435.	294152337.	14.3926855	0.0003148	-0.000735	1.2052750	-18.731370 C
0.00002250	6575.	292215529.	14.3327523	0.0003225	-0.000758	1.2317895	-19.305654 C
0.00002313	6715.	290379412.	14.2762699	0.0003301	-0.000780	1.2581948	-19.879797 C

0.00002375	6855.	288636024.	14.2229666	0.0003378	-0.000802	1.2844907	-20.453798 C
0.00002438	6995.	286978222.	14.1725985	0.0003455	-0.000825	1.3106771	-21.027655 C
0.00002563	7274.	283881177.	14.0768596	0.0003607	-0.000869	1.3624539	-22.177184 C
0.00002688	7553.	281056706.	13.9902640	0.0003760	-0.000914	1.4137566	-23.326464 C
0.00002813	7832.	278470192.	13.9121069	0.0003913	-0.000959	1.4646238	-24.475156 C
0.00002938	8110.	276091185.	13.8412951	0.0004066	-0.001003	1.5150541	-25.623257 C
0.00003063	8388.	273894201.	13.7769338	0.0004219	-0.001048	1.5650459	-26.770761 C
0.00003188	8665.	271857757.	13.7182685	0.0004373	-0.001093	1.6145974	-27.917665 C
0.00003313	8942.	269961721.	13.6641069	0.0004526	-0.001137	1.6636397	-29.064567 C
0.00003438	9219.	268188302.	13.6129931	0.0004679	-0.001182	1.7120811	-30.212297 C
0.00003563	9495.	266528815.	13.5660722	0.0004833	-0.001227	1.7600835	-31.359402 C
0.00003688	9771.	264971609.	13.5229218	0.0004987	-0.001271	1.8076453	-32.505876 C
0.00003813	10046.	263506573.	13.4831353	0.0005140	-0.001316	1.8547647	-33.651714 C
0.00003938	10321.	262124851.	13.4464671	0.0005295	-0.001361	1.9014399	-34.796913 C
0.00004063	10596.	260818698.	13.4126018	0.0005449	-0.001405	1.9476693	-35.941468 C
0.00004188	10870.	259581288.	13.3812923	0.0005603	-0.001450	1.9934510	-37.085374 C
0.00004313	11144.	258406584.	13.3523201	0.0005758	-0.001494	2.0387833	-38.228626 C
0.00004438	11417.	257289231.	13.3254917	0.0005913	-0.001539	2.0836644	-39.371219 C
0.00004563	11690.	256224458.	13.3006345	0.0006068	-0.001583	2.1280923	-40.513149 C
0.00004688	11963.	255208002.	13.2775945	0.0006224	-0.001628	2.1720653	-41.654409 C
0.00004813	12235.	254236045.	13.2562337	0.0006380	-0.001672	2.2155815	-42.794996 C
0.00004938	12507.	253305153.	13.2364283	0.0006535	-0.001716	2.2586389	-43.934904 C
0.00005063	12778.	252412229.	13.2180665	0.0006692	-0.001761	2.3012358	-45.074127 C
0.00005188	13049.	251554477.	13.2010476	0.0006848	-0.001805	2.3433700	-46.212661 C
0.00005313	13320.	250728483.	13.1847373	0.0007004	-0.001850	2.3849456	-47.351514 C
0.00005438	13590.	249932875.	13.1694845	0.0007161	-0.001894	2.4260522	-48.489719 C
0.00005563	13860.	249165617.	13.1553708	0.0007318	-0.001938	2.4666951	-49.627192 C
0.00005688	14129.	248424789.	13.1423247	0.0007475	-0.001983	2.5068724	-50.763928 C
0.00005813	14398.	247708633.	13.1302812	0.0007632	-0.002027	2.5465818	-51.899920 C
0.00005938	14667.	247015544.	13.1191423	0.0007789	-0.002071	2.5858213	-53.035161 C
0.00006063	14935.	246344036.	13.1089269	0.0007947	-0.002115	2.6245888	-54 . 169646 C
0.00006188	15202.	245692755.	13.0995493	0.0008105	-0.002159	2.6628820	-55.303367 C
0.00006313	15469.	245060448.	13.0909634	0.0008264	-0.002204	2.7006987	-56.436318 C
0.00006438	15736.	244445960.	13.0831268	0.0008422	-0.002248	2.7380368	-57.568493 C
0.00006563	16003.	243848222.	13.0760001	0.0008581	-0.002292	2.7748939	-58.699885 C
0.00006688	16268.	243266245.	13.0695470	0.0008740	-0.002336	2.8112678	-59.830486 C
0.00006813	16526.	242577366.	13.0616832	0.0008898	-0.002380	2.8468322	-60.000000 CY
0.00006938	16756.	241521813.	13.0477408	0.0009052	-0.002425	2.8808681	-60.000000 CY
0.00007063	16968.	240254280.	13.0301624	0.0009203	-0.002470	2.9137705	-60.000000 CY
0.00007188	17178.	239002015.	13.0131794	0.0009353	-0.002515	2.9461654	-60.000000 CY
0.00007313	17386.	237758131.	12.9965676	0.0009504	-0.002560	2.9780330	-60.000000 CY
0.00007438	17573.	236277309.	12.9755813	0.0009651	-0.002605	3.0086378	-60.000000 CY
0.00007938	18063.	227561923.	12.8377329	0.0010190	-0.002791	3.1168562	-60.000000 CY

0.00008438	18506.	219328224.	12.7088268	0.0010723	-0.002978	3.2176404	-60.000000 CY
0.00008938	18944.	211961312.	12.5916672	0.0011254	-0.003165	3.3119284	-60.000000 CY
0.00009438	19379.	205341267.	12.4899600	0.0011787	-0.003351	3.4006295	-60.000000 CY
0.00009938	19711.	198349061.	12.3737013	0.0012296	-0.003540	3.4794309	-60.000000 CY
0.0001044	19893.	190593882.	12.2305441	0.0012766	-0.003733	3.5470315	-60.000000 CY
0.0001094	20066.	183456484.	12.0934671	0.0013227	-0.003927	3.6089313	-60.000000 CY
0.0001144	20236.	176928448.	11.9702236	0.0013691	-0.004121	3.6665453	-60.000000 CY
0.0001194	20405.	170932891.	11.8590994	0.0014157	-0.004314	3.7198133	-60.000000 CY
0.0001244	20572.	165405037.	11.7587666	0.0014625	-0.004508	3.7686636	-60.000000 CY
0.0001294	20735.	160271749.	11.6617507	0.0015087	-0.004701	3.8123234	-60.000000 CY
0.0001344	20896.	155507750.	11.5736492	0.0015552	-0.004895	3.8516080	-60.000000 CY
0.0001394	21056.	151073004.	11.4935412	0.0016019	-0.005088	3.8864514	-60.000000 CY
0.0001444	21213.	146933013.	11.4206401	0.0016489	-0.005281	3.9167852	-60.000000 CY
0.0001494	21369.	143057902.	11.3542516	0.0016960	-0.005474	3.9425388	-60.000000 CY
0.0001544	21523.	139418228.	11.2935974	0.0017434	-0.005667	3.9636271	-60.000000 CY
0.0001594	21660.	135908356.	11.2288526	0.0017896	-0.005860	3.9796127	-60.000000 CY
0.0001644	21756.	132354023.	11.1566415	0.0018339	-0.006056	3.9905161	-60.000000 CY
0.0001694	21810.	128766565.	11.0733682	0.0018756	-0.006254	3.9970350	-60.000000 CY
0.0001744	21853.	125320182.	10.9922497	0.0019168	-0.006453	3.9998554	-60.000000 CY
0.0001794	21894.	122058091.	10.9163431	0.0019581	-0.006652	3.9963199	-60.000000 CY
0.0001844	21935.	118967357.	10.8464869	0.0019998	-0.006850	3.9995864	-60.000000 CY
0.0001894	21973.	116029495.	10.7789575	0.0020413	-0.007049	3.9941494	-60.000000 CY
0.0001944	22009.	113227977.	10.7131263	0.0020824	-0.007248	3.9984479	-60.000000 CY
0.0001994	22044.	110563108.	10.6508936	0.0021235	-0.007446	3.9999955	-60.000000 CY
0.0002044	22077.	108022473.	10.5930400	0.0021650	-0.007645	3.9952994	-60.000000 CY
0.0002094	22110.	105599828.	10.5380471	0.0022064	-0.007844	3.9988873	-60.000000 CY
0.0002144	22142.	103286842.	10.4870079	0.0022482	-0.008042	3.9993983	-60.000000 CY
0.0002194	22173.	101073886.	10.4404575	0.0022904	-0.008240	3.9945319	-60.000000 CY
0.0002244	22203.	98956979.	10.3958138	0.0023326	-0.008437	3.9983467	-60.000000 CY
0.0002294	22233.	96929787.	10.3535931	0.0023749	-0.008635	3.9999481	-60.000000 CY
0.0002344	22262.	94983833.	10.3141778	0.0024174	-0.008833	3.9922044	-60.000000 CY
0.0002394	22289.	93111630.	10.2734044	0.0024592	-0.009031	3.9960833	-60.000000 CY
0.0002444	22315.	91314261.	10.2348723	0.0025011	-0.009229	3.9989696	-60.000000 CY
0.0002494	22341.	89587165.	10.1984576	0.0025432	-0.009427	3.9999979	-60.000000 CY
0.0002544	22366.	87924285.	10.1644843	0.0025856	-0.009624	3.9912935	-60.000000 CY
0.0002594	22390.	86324043.	10.1323189	0.0026281	-0.009822	3.9948853	-60.000000 CY
0.0002644	22414.	84782960.	10.1016274	0.0026706	-0.010019	3.9981609	-60.000000 CY
0.0002694	22438.	83297711.	10.0718697	0.0027131	-0.010217	3.9998007	-60.000000 CY
0.0002744	22462.	81864287.	10.0458705	0.0027563	-0.010414	3.9956060	-60.000000 CY
0.0003044	22592.	74225097.	9.9114891	0.0030168	-0.011593	3.9890906	-60.000000 CYT
0.0003344	22710.	67918643.	9.8102063	0.0032803	-0.012770	3.9905554	-60.000000 CYT
0.0003644	22818.	62621673.	9.7308158	0.0035457	-0.013944	3.9999949	-60.000000 CYT
0.0003944	22909.	58090071.	9.6741570	0.0038152	-0.015115	3.9961840	60.0000000 CYT

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.	Max. Tens.
No.	kips	in-kip	Strain	Strain
1	84.958	22045.820	0.00300000	-0.01183010
2	121.750	22583.826	0.00300000	-0.01151707

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	84.958000	22046.	55.222700	14330.	239787932.
2	0.65	121.750000	22584.	79.137500	14679.	246983130.
1	0.75	84.958000	22046.	63.718500	16534.	233977654.
2	0.75	121.750000	22584.	91.312500	16938.	240433856.
1	0.90	84.958000	22046.	76.462200	19841.	167091038.
2	0.90	121.750000	22584.	109.575000	20325.	173760627.

Layering Correction Equivalent Depths of Soil & Rock Layers

	Top of	Equivalent				
	Layer	Top Depth	Same Layer	Layer is	FØ	F1
Layer	Below	Below	Type As	Rock or	Integral	Integral
No.	Pile Head	Grnd Surf	Layer	is Below	for Layer	for Layer
	ft	ft	Above	Rock Layer	1bs	1bs
1	12.5000	0.00	N.A.	No	0.00	2115.
2	13.7000	0.04400	No	No	2115.	127280.
3	16.2000	9.4226	No	No	129395.	271970.
4	23.7000	17.0583	Yes	No	401365.	932337.
5	34.7000	34.1111	No	No	1333701.	686163.
6	64.2000	51.7000	No	No	2019864.	0.00
7	76.7000	64.2000	No	No	0.00	0.00
8	107.2000	94.7000	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 Pile-head Rotation (Loading Type 2)

Shear force at pile head Rotation of pile head

Axial load at pile head

= 12458.0 lbs = 0.000E+00 radians

= 84958.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth Deflect. Bending Shear Slope Total Bending Soil Res. Soil Spr. Distrib.

Х	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*				lb/inch
0.00	0.04532	-2489220.	12458.	0.00	0.00	1.18E+12	0.00		1.3984
0.4600	0.04529	-2420428.		-1.15E-05	0.00	1.18E+12	0.00	0.00	5.5936
0.9200	0.04519	-2351460.	12524.		0.00	1.18E+12			11.1872
1.3800	0.04504	-2282146.	12601.		0.00	1.18E+12	0.00	0.00	16.7808
1.8400	0.04482	-2212316.	12709.		0.00	1.18E+12	0.00	0.00	22.3744
2.3000	0.04455	-2141799.	12848.		0.00	1.18E+12	0.00	0.00	27.9680
2.7600	0.04422	-2070425.	13018.	-6.40E-05	0.00	1.18E+12	0.00	0.00	33.5616
3.2200	0.04384	-1998024.	13218.	-7.35E-05	0.00	1.18E+12	0.00	0.00	39.1552
3.6800	0.04341	-1924426.	13450.	-8.26E-05	0.00	1.18E+12	0.00	0.00	44.7488
4.1400	0.04293	-1849460.	13712.	-9.14E-05	0.00	1.18E+12	0.00	0.00	50.3424
4.6000	0.04240	-1772955.	14006.	-9.99E-05	0.00	1.18E+12	0.00	0.00	55.9360
5.0600	0.04183	-1694743.	14330.	-1.08E-04	0.00	1.18E+12	0.00	0.00	61.5296
5.5200	0.04121	-1614652.	14685.	-1.16E-04	0.00	1.18E+12	0.00	0.00	67.1232
5.9800	0.04055	-1532512.	15071.	-1.23E-04	0.00	1.18E+12	0.00	0.00	72.7168
6.4400	0.03985	-1448154.	15488.	-1.30E-04	0.00	1.18E+12	0.00	0.00	78.3104
6.9000	0.03912	-1361405.	15935.	-1.37E-04	0.00	1.18E+12	0.00	0.00	83.9040
7.3600	0.03835	-1272098.	16414.	-1.43E-04	0.00	1.18E+12	0.00	0.00	89.4976
7.8200	0.03754	-1180060.	16924.	-1.48E-04	0.00	1.18E+12	0.00	0.00	95.0912
8.2800	0.03671	-1085123.	17464.	-1.54E-04	0.00	1.18E+12	0.00	0.00	100.6848
8.7400	0.03585	-987115.	18035.	-1.58E-04	0.00	1.18E+12	0.00	0.00	106.2784
9.2000	0.03496	-885867.	18637.	-1.63E-04	0.00	1.19E+12	0.00	0.00	111.8720
9.6600	0.03405	-781207.	19270.		0.00	1.19E+12	0.00	0.00	117.4656
10.1200	0.03312	-672967.	19934.	-1.70E-04	0.00	1.19E+12	0.00	0.00	123.0592
10.5800	0.03217	-560976.	20629.	-1.73E-04	0.00	1.19E+12		0.00	128.6528
11.0400	0.03121	-445064.	21354.		0.00	1.19E+12	0.00	0.00	134.2464
11.5000	0.03023	-325060.	22111.		0.00	1.19E+12	0.00	0.00	139.8400
11.9600	0.02925	-200794.	22898.		0.00	1.19E+12	0.00	0.00	145.4336
12.4200	0.02826	-72097.	23579.		0.00	1.19E+12	0.00	0.00	101.1646
12.8800	0.02728	59683.	23830.		0.00	1.19E+12	-10.106	2045.	0.00
13.3400	0.02629	191155.	23743.		0.00	1.19E+12	-21.530	4521.	0.00
13.8000	0.02531	321971.	22046.	-1.77E-04	0.00	1.19E+12	-593.223	129400.	0.00
14.2600	0.02433	434710.		-1.75E-04	0.00	1.19E+12	-600.015		0.00
14.7200	0.02337	529166.		-1.73E-04	0.00	1.19E+12	-606.447	143251.	0.00
15.1800	0.02242	605142.	12059.		0.00	1.19E+12	-612.522	150813.	0.00
15.6400	0.02149	662452.	8662.		0.00	1.19E+12	-618.242	158838.	0.00
16.1000	0.02057	700923.	5234.		0.00	1.19E+12	-623.607	167359.	0.00
16.5600	0.01967	720391.	3410.	-1.61E-04	0.00	1.19E+12	-37.374	10488.	0.00
17.0200	0.01879	738719.	3197.	-1.58E-04	0.00	1.19E+12	-39.746	11677.	0.00
17.4800	0.01793	755834.	2972.		0.00	1.19E+12	-41.783	12865.	0.00
17.9400	0.01709	771674.	2737.		0.00	1.19E+12	-43.499	14053.	0.00

18.4000	0.01626	786187.	2493.	-1.47E-04	0.00	1.19E+12	-44.908	15242.	0.00
18.8600	0.01546	799330.	2242.	-1.43E-04	0.00	1.19E+12	-46.022	16430.	0.00
19.3200	0.01468	811069.	1985.	-1.40E-04	0.00	1.19E+12	-46.857	17619.	0.00
19.7800	0.01392	821378.	1725.	-1.36E-04	0.00	1.19E+12	-47.426	18807.	0.00
20.2400	0.01318	830241.	1462.	-1.32E-04	0.00	1.19E+12	-47.745	19995.	0.00
20.7000	0.01246	837647.	1199.	-1.28E-04	0.00	1.19E+12	-47.827	21184.	0.00
21.1600	0.01177	843593.	934.9700	-1.24E-04	0.00	1.19E+12	-47.687	22372.	0.00
21.6200	0.01109	848085.	672.6968	-1.20E-04	0.00	1.19E+12	-47.340	23560.	0.00
22.0800	0.01044	851133.	412.8720	-1.16E-04	0.00	1.19E+12	-46.800	24749.	0.00
22.5400	0.00981	852752.	156.5199	-1.12E-04	0.00	1.19E+12	-46.081	25937.	0.00
23.0000	0.00920	852966.	-95.415	-1.08E-04	0.00	1.19E+12	-45.199	27125.	0.00
23.4600	0.00861	851801.	-342.065	-1.04E-04	0.00	1.19E+12	-44.167	28314.	0.00
23.9200	0.00805	849287.	-582.644	-1.00E-04	0.00	1.19E+12	-42.999	29502.	0.00
24.3800	0.00750	845462.	-816.439	-9.65E-05	0.00	1.19E+12	-41.709	30690.	0.00
24.8400	0.00698	840365.	-1043.	-9.26E-05	0.00	1.19E+12	-40.311	31879.	0.00
25.3000	0.00648	834037.	-1261.	-8.87E-05	0.00	1.19E+12	-38.817	33067.	0.00
25.7600	0.00600	826524.	-1471.	-8.48E-05	0.00	1.19E+12	-37.241	34255.	0.00
26.2200	0.00554	817875.	-1672.	-8.10E-05	0.00	1.19E+12	-35.596	35444.	0.00
26.6800	0.00511	808139.	-1864.	-7.72E-05	0.00	1.19E+12	-33.893	36632.	0.00
27.1400	0.00469	797369.	-2046.	-7.34E-05	0.00	1.19E+12	-32.144	37820.	0.00
27.6000	0.00430	785618.	-2219.	-6.98E-05	0.00	1.19E+12	-30.361	39009.	0.00
28.0600	0.00392	772940.	-2381.	-6.61E-05	0.00	1.19E+12	-28.555	40197.	0.00
28.5200	0.00357	759390.	-2534.	-6.26E-05	0.00	1.19E+12	-26.737	41385.	0.00
28.9800	0.00323	745024.	-2677.	-5.91E-05	0.00	1.19E+12	-24.916	42574.	0.00
29.4400	0.00291	729897.	-2809.	-5.56E-05	0.00	1.19E+12	-23.103	43762.	0.00
29.9000	0.00262	714064.	-2932.	-5.23E-05	0.00	1.19E+12	-21.306	44950.	0.00
30.3600	0.00234	697581.	-3044.	-4.90E-05	0.00	1.19E+12	-19.535	46139.	0.00
30.8200	0.00208	680501.	-3147.	-4.58E-05	0.00	1.19E+12	-17.796	47327.	0.00
31.2800	0.00183	662877.	-3241.	-4.26E-05	0.00	1.19E+12	-16.099	48516.	0.00
31.7400	0.00160	644761.	-3325.	-3.96E-05	0.00	1.19E+12	-14.451	49704.	0.00
32.2000	0.00139	626204.	-3401.	-3.66E-05	0.00	1.19E+12	-12.857	50892.	0.00
32.6600	0.00120	607253.	-3467.	-3.38E-05	0.00	1.19E+12	-11.325	52081.	0.00
33.1200	0.00102	587956.	-3526.	-3.10E-05	0.00	1.19E+12	-9.860	53269.	0.00
33.5800	8.58E-04	568357.	-3576.	-2.83E-05	0.00	1.19E+12	-8.467	54457.	0.00
34.0400	7.09E-04	548499.	-3619.	-2.57E-05	0.00	1.19E+12	-7.150	55646.	0.00
34.5000	5.75E-04	528422.	-3656.	-2.32E-05	0.00	1.19E+12	-5.915	56834.	0.00
34.9600	4.53E-04	508163.	-4049.	-2.08E-05	0.00	1.19E+12	-136.557	1662901.	0.00
35.4200	3.45E-04	483743.	-4715.	-1.85E-05	0.00	1.19E+12	-104.859	1677024.	0.00
35.8800	2.49E-04	456126.	-5215.	-1.63E-05	0.00	1.19E+12	-76.416	1691150.	0.00
36.3400	1.65E-04	426180.	-5567.	-1.42E-05	0.00	1.19E+12	-51.106	1705281.	0.00
36.8000	9.24E-05	394676.	-5788.	-1.23E-05	0.00	1.19E+12	-28.778	1719415.	0.00
37.2600	2.95E-05	362294.	-5893.	-1.06E-05	0.00	1.19E+12	-9.261	1733553.	0.00
37.7200	-2.41E-05	329629.	-5897.	-8.94E-06	0.00	1.19E+12	7.6291	1747694.	0.00

-6.92E-05	297196.	-5816.	-7.48E-06	0.00	1.19E+12	21.9710	1752344.	0.00
-1.07E-04	265431.	-5662.	-6.17E-06	0.00	1.19E+12	33.8677	1752344.	0.00
-1.37E-04	234698.	-5448.	-5.01E-06	0.00	1.19E+12	43.5987	1752344.	0.00
-1.62E-04	205293.	-5185.	-3.98E-06	0.00	1.19E+12	51.4147	1752344.	0.00
-1.81E-04	177454.	-4885.	-3.09E-06	0.00	1.19E+12	57.5556	1752344.	0.00
-1.96E-04	151368.	-4554.	-2.33E-06	0.00	1.19E+12	62.2487	1752344.	0.00
-2.07E-04	127179.	-4201.	-1.68E-06	0.00	1.19E+12	65.7066	1752344.	0.00
-2.15E-04	104992.	-3832.	-1.14E-06	0.00	1.19E+12	68.1269	1752344.	0.00
-2.20E-04	84880.	-3451.	-6.95E-07	0.00	1.19E+12	69.6905	1752344.	0.00
-2.22E-04	66892.	-3064.	-3.41E-07	0.00	1.19E+12	70.5615	1752344.	0.00
-2.23E-04	51053.	-2674.	-6.67E-08	0.00	1.19E+12	70.8867	1752344.	0.00
-2.23E-04	37375.	-2283.	1.39E-07	0.00	1.19E+12	70.7954	1752344.	0.00
-2.22E-04	25853.	-1893.	2.86E-07	0.00	1.19E+12	70.3991	1752344.	0.00
-2.20E-04	16477.	-1506.	3.85E-07	0.00	1.19E+12	69.7919	1752344.	0.00
-2.18E-04	9227.	-1123.	4.45E-07	0.00	1.19E+12	69.0502	1752344.	0.00
-2.15E-04	4081.	-743.886	4.76E-07	0.00	1.19E+12	68.2333	1752344.	0.00
-2.12E-04	1014.	-369.585	4.88E-07	0.00	1.19E+12	67.3831	1752344.	0.00
-2.10E-04	0.00	0.00	4.90E-07	0.00	1.19E+12	66.5245	876172.	0.00
	-1.07E-04 -1.37E-04 -1.62E-04 -1.81E-04 -1.96E-04 -2.07E-04 -2.15E-04 -2.20E-04 -2.22E-04 -2.23E-04 -2.22E-04 -2.22E-04 -2.22E-04 -2.22E-04 -2.25E-04 -2.25E-04 -2.15E-04 -2.15E-04	-1.07E-04 2654311.37E-04 2346981.62E-04 2052931.81E-04 1774541.96E-04 1513682.07E-04 1271792.15E-04 1049922.20E-04 848802.22E-04 668922.23E-04 510532.23E-04 373752.22E-04 258532.22E-04 92272.15E-04 40812.12E-04 1014.	-1.07E-04 26543156621.37E-04 23469854481.62E-04 20529351851.81E-04 17745448851.96E-04 15136845542.07E-04 12717942012.15E-04 10499238322.20E-04 8488034512.22E-04 6689230642.23E-04 5105326742.23E-04 3737522832.22E-04 2585318932.22E-04 1647715062.18E-04 922711232.15E-04 4081743.886 -2.12E-04 1014369.585	-1.07E-04 26543156626.17E-06 -1.37E-04 23469854485.01E-06 -1.62E-04 20529351853.98E-06 -1.81E-04 17745448853.09E-06 -1.96E-04 15136845542.33E-06 -2.07E-04 12717942011.68E-06 -2.15E-04 10499238321.14E-06 -2.20E-04 8488034516.95E-07 -2.22E-04 6689230643.41E-07 -2.23E-04 5105326746.67E-08 -2.23E-04 373752283. 1.39E-07 -2.22E-04 258531893. 2.86E-07 -2.22E-04 92271123. 4.45E-07 -2.18E-04 92271123. 4.45E-07 -2.15E-04 4081743.886 4.76E-07 -2.12E-04 1014369.585 4.88E-07	-1.07E-04 26543156626.17E-06 0.00 -1.37E-04 23469854485.01E-06 0.00 -1.62E-04 20529351853.98E-06 0.00 -1.81E-04 17745448853.09E-06 0.00 -1.96E-04 15136845542.33E-06 0.00 -2.07E-04 12717942011.68E-06 0.00 -2.15E-04 10499238321.14E-06 0.00 -2.20E-04 8488034516.95E-07 0.00 -2.22E-04 6689230643.41E-07 0.00 -2.23E-04 5105326746.67E-08 0.00 -2.23E-04 373752283. 1.39E-07 0.00 -2.22E-04 258531893. 2.86E-07 0.00 -2.20E-04 164771506. 3.85E-07 0.00 -2.18E-04 92271123. 4.45E-07 0.00 -2.15E-04 4081743.886 4.76E-07 0.00 -2.12E-04 1014369.585 4.88E-07 0.00	-1.07E-04 26543156626.17E-06 0.00 1.19E+12 -1.37E-04 23469854485.01E-06 0.00 1.19E+12 -1.62E-04 20529351853.98E-06 0.00 1.19E+12 -1.81E-04 17745448853.09E-06 0.00 1.19E+12 -1.96E-04 15136845542.33E-06 0.00 1.19E+12 -2.07E-04 12717942011.68E-06 0.00 1.19E+12 -2.15E-04 10499238321.14E-06 0.00 1.19E+12 -2.20E-04 8488034516.95E-07 0.00 1.19E+12 -2.22E-04 6689230643.41E-07 0.00 1.19E+12 -2.23E-04 5105326746.67E-08 0.00 1.19E+12 -2.23E-04 373752283. 1.39E-07 0.00 1.19E+12 -2.22E-04 258531893. 2.86E-07 0.00 1.19E+12 -2.22E-04 92271123. 4.45E-07 0.00 1.19E+12 -2.18E-04 92271123. 4.45E-07 0.00 1.19E+12 -2.15E-04 4081743.886 4.76E-07 0.00 1.19E+12 -2.15E-04 1014369.585 4.88E-07 0.00 1.19E+12	-1.07E-04 26543156626.17E-06 0.00 1.19E+12 33.8677 -1.37E-04 23469854485.01E-06 0.00 1.19E+12 43.5987 -1.62E-04 20529351853.98E-06 0.00 1.19E+12 51.4147 -1.81E-04 17745448853.09E-06 0.00 1.19E+12 57.5556 -1.96E-04 15136845542.33E-06 0.00 1.19E+12 62.2487 -2.07E-04 12717942011.68E-06 0.00 1.19E+12 65.7066 -2.15E-04 10499238321.14E-06 0.00 1.19E+12 68.1269 -2.20E-04 8488034516.95E-07 0.00 1.19E+12 69.6905 -2.22E-04 6689230643.41E-07 0.00 1.19E+12 70.5615 -2.23E-04 5105326746.67E-08 0.00 1.19E+12 70.8867 -2.23E-04 373752283. 1.39E-07 0.00 1.19E+12 70.3991 -2.22E-04 164771506. 3.85E-07 0.00 1.19E+12 69.7919 -2.18E-04 92271123. 4.45E-07 0.00 1.19E+12 69.0502 -2.15E-04 4081743.886 4.76E-07 0.00 1.19E+12 68.2333 -2.12E-04 1014369.585 4.88E-07 0.00 1.19E+12 67.3831	-1.07E-04 26543156626.17E-06 0.00 1.19E+12 33.8677 17523441.37E-04 23469854485.01E-06 0.00 1.19E+12 43.5987 17523441.62E-04 20529351853.98E-06 0.00 1.19E+12 51.4147 17523441.81E-04 17745448853.09E-06 0.00 1.19E+12 57.5556 17523441.96E-04 15136845542.33E-06 0.00 1.19E+12 62.2487 17523442.07E-04 12717942011.68E-06 0.00 1.19E+12 65.7066 17523442.15E-04 10499238321.14E-06 0.00 1.19E+12 68.1269 17523442.20E-04 8488034516.95E-07 0.00 1.19E+12 69.6905 17523442.22E-04 6689230643.41E-07 0.00 1.19E+12 70.5615 17523442.23E-04 5105326746.67E-08 0.00 1.19E+12 70.8867 17523442.23E-04 373752283. 1.39E-07 0.00 1.19E+12 70.7954 17523442.22E-04 258531893. 2.86E-07 0.00 1.19E+12 70.3991 17523442.22E-04 164771506. 3.85E-07 0.00 1.19E+12 69.7919 17523442.18E-04 92271123. 4.45E-07 0.00 1.19E+12 69.0502 17523442.15E-04 4081743.886 4.76E-07 0.00 1.19E+12 68.2333 17523442.15E-04 1014369.585 4.88E-07 0.00 1.19E+12 67.3831 1752344.

^{*} 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 0.04531831 inches Computed slope at pile head 0.000000 radians Maximum bending moment -2489220. inch-lbs Maximum shear force 23830. lbs Depth of maximum bending moment = 0.000000 feet below pile head Depth of maximum shear force 12.88000000 feet below pile head Number of iterations 14 Number of zero deflection points = 1 Pile deflection at ground 0.02809295 inches

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Boundary Condition Type 2, Shear and Slope

Shear = 12458. lbs Slope = 0.00000 Axial Load = 84958. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
46.00000	0.04531831	-2489220.	23830.
43.70000	0.04760026	-2537522.	23804.
41.40000	0.05016849	-2580797.	23833.
39.10000	0.05398172	-2629672.	23824.
36.80000	0.05227362	-2589526.	23829.
34.50000	0.06188632	-2878433.	23836.
32.20000	0.06162152	-2952621.	23821.
29.90000	0.06127043	-3037203.	23827.
27.60000	0.06646057	-3239519.	23845.
25.30000	0.06597061	-3322805.	23849.
23.00000	0.06548429	-3317762.	23850.
20.70000	0.06861728	-3291435.	23851.
18.40000	0.07213198	-3204437.	23847.
16.10000	0.10991707	-3130926.	23838.

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

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 19125.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 121750.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth Deflect. Bending Shear Slope Total Bending Soil Res. Soil Spr. Distrib.

X	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0 00722	4155043	10125	0.00	0.00	1 175,12	0.00		2 0076
0.00 0.4600	0.08723 0.08717	-4155843. -4050235.	19125.	0.00 -1.93E-05	0.00 0.00	1.17E+12 1.17E+12	0.00 0.00	0.00 0.00	2.0976 8.3904
0.9200	0.08717	-3944358.	19223.		0.00	1.17E+12 1.17E+12	0.00	0.00	16.7808
1.3800	0.08701	-39 44 338.	19339.		0.00	1.17E+12 1.17E+12	0.00	0.00	25.1712
1.8400	0.08639	-3730777.	19501.		0.00	1.17E+12 1.18E+12	0.00	0.00	33.5616
2.3000	0.08593	-3622563.	19710.		0.00	1.18E+12	0.00	0.00	41.9520
2.7600	0.08538	-3513059.	19964.	-1.08E-04	0.00	1.18E+12	0.00	0.00	50.3424
3.2200	0.08474	-3402010.	20266.		0.00	1.18E+12	0.00	0.00	58.7328
3.6800	0.08401	-3289160.	20613.		0.00	1.18E+12	0.00	0.00	67.1232
4.1400	0.08319	-3174255.	21007.		0.00	1.18E+12	0.00	0.00	75.5136
4.6000	0.08229	-3057039.	21447.		0.00	1.18E+12	0.00	0.00	83.9040
5.0600	0.08132	-2937257.	21933.		0.00	1.18E+12	0.00	0.00	92.2944
5.5200	0.08026	-2814653.	22465.		0.00	1.18E+12	0.00	0.00	100.6848
5.9800	0.07914	-2688973.	23044.		0.00	1.18E+12	0.00	0.00	109.0752
6.4400	0.07794	-2559961.	23670.		0.00	1.18E+12	0.00	0.00	117.4656
6.9000	0.07668	-2427361.	24341.		0.00	1.18E+12	0.00	0.00	125.8560
7.3600	0.07536	-2290919.	25059.		0.00	1.18E+12	0.00	0.00	134.2464
7.8200	0.07397	-2150379.	25823.		0.00	1.18E+12	0.00	0.00	142.6368
8.2800	0.07253	-2005486.	26634.		0.00	1.18E+12	0.00	0.00	151.0272
8.7400	0.07104	-1855984.	27491.		0.00	1.18E+12	0.00	0.00	159.4176
9.2000	0.06950	-1701620.	28394.	-2.83E-04	0.00	1.18E+12	0.00	0.00	167.8080
9.6600	0.06792	-1542137.	29343.	-2.90E-04	0.00	1.18E+12	0.00	0.00	176.1984
10.1200	0.06630	-1377280.	30339.	-2.97E-04	0.00	1.18E+12	0.00	0.00	184.5888
10.5800	0.06464	-1206795.	31381.	-3.03E-04	0.00	1.18E+12	0.00	0.00	192.9792
11.0400	0.06295	-1030425.	32470.	-3.08E-04	0.00	1.18E+12	0.00	0.00	201.3696
11.5000	0.06124	-847917.	33604.	-3.13E-04	0.00	1.18E+12	0.00	0.00	209.7600
11.9600	0.05950	-659014.	34785.	-3.16E-04	0.00	1.18E+12	0.00	0.00	218.1504
12.4200	0.05774	-463462.	35806.	-3.19E-04	0.00	1.18E+12	0.00	0.00	151.7469
12.8800	0.05598	-263285.	36168.	-3.21E-04	0.00	1.18E+12	-20.740	2045.	0.00
13.3400	0.05421	-63740.	35988.	-3.21E-04	0.00	1.18E+12	-44.394	4521.	0.00
13.8000	0.05243	134454.	33901.	-3.21E-04	0.00	1.18E+12	-711.625	74921.	0.00
14.2600	0.05066	310963.	29948.	-3.20E-04	0.00	1.18E+12	-720.651	78524.	0.00
14.7200	0.04890	465513.	25946.	-3.18E-04	0.00	1.18E+12	-729.279	82330.	0.00
15.1800	0.04715	597840.	21898.	-3.16E-04	0.00	1.18E+12	-737.505	86351.	0.00
15.6400	0.04541	707694.	17806.	-3.13E-04	0.00	1.18E+12	-745.327	90603.	0.00
16.1000	0.04369	794834.	13671.	-3.09E-04	0.00	1.18E+12	-752.743	95101.	0.00
16.5600	0.04199	859036.	11373.	-3.05E-04	0.00	1.18E+12	-79.793	10488.	0.00
17.0200	0.04032	920803.	10917.	-3.01E-04	0.00	1.18E+12	-85.291	11677.	0.00
17.4800	0.03867	979969.	10433.	-2.97E-04	0.00	1.18E+12	-90.122	12865.	0.00
17.9400	0.03704	1036386.	9924.	-2.92E-04	0.00	1.18E+12	-94.307	14053.	0.00

18.4000	0.03544	1089926.	9394.	-2.87E-04	0.00	1.18E+12	-97.866	15242.	0.00
18.8600	0.03387	1140481.	8846.	-2.82E-04	0.00	1.18E+12	-100.819	16430.	0.00
19.3200	0.03233	1187959.	8282.	-2.77E-04	0.00	1.18E+12	-103.190	17619.	0.00
19.7800	0.03082	1232290.	7708.	-2.71E-04	0.00	1.18E+12	-105.001	18807.	0.00
20.2400	0.02934	1273418.	7125.	-2.65E-04	0.00	1.18E+12	-106.277	19995.	0.00
20.7000	0.02789	1311303.	6536.	-2.59E-04	0.00	1.18E+12	-107.042	21184.	0.00
21.1600	0.02648	1345923.	5944.	-2.53E-04	0.00	1.18E+12	-107.321	22372.	0.00
21.6200	0.02510	1377268.	5352.	-2.46E-04	0.00	1.18E+12	-107.139	23560.	0.00
22.0800	0.02376	1405345.	4763.	-2.40E-04	0.00	1.18E+12	-106.523	24749.	0.00
22.5400	0.02245	1430171.	4178.	-2.33E-04	0.00	1.18E+12	-105.500	25937.	0.00
23.0000	0.02118	1451778.	3599.	-2.27E-04	0.00	1.18E+12	-104.095	27125.	0.00
23.4600	0.01995	1470209.	3029.	-2.20E-04	0.00	1.18E+12	-102.335	28314.	0.00
23.9200	0.01876	1485517.	2470.	-2.13E-04	0.00	1.18E+12	-100.247	29502.	0.00
24.3800	0.01760	1497766.	1923.	-2.06E-04	0.00	1.18E+12	-97.858	30690.	0.00
24.8400	0.01648	1507028.	1391.	-1.99E-04	0.00	1.18E+12	-95.194	31879.	0.00
25.3000	0.01540	1513385.	873.1263	-1.92E-04	0.00	1.18E+12	-92.282	33067.	0.00
25.7600	0.01437	1516925.	372.3811	-1.85E-04	0.00	1.18E+12	-89.147	34255.	0.00
26.2200	0.01337	1517744.	-110.519	-1.78E-04	0.00	1.18E+12	-85.816	35444.	0.00
26.6800	0.01240	1515944.	-574.560	-1.71E-04	0.00	1.18E+12	-82.314	36632.	0.00
27.1400	0.01148	1511630.	-1019.	-1.64E-04	0.00	1.18E+12	-78.666	37820.	0.00
27.6000	0.01060	1504915.	-1443.	-1.56E-04	0.00	1.18E+12	-74.896	39009.	0.00
28.0600	0.00975	1495913.	-1845.	-1.49E-04	0.00	1.18E+12	-71.028	40197.	0.00
28.5200	0.00895	1484742.	-2227.	-1.43E-04	0.00	1.18E+12	-67.086	41385.	0.00
28.9800	0.00818	1471523.	-2586.	-1.36E-04	0.00	1.18E+12	-63.091	42574.	0.00
29.4400	0.00745	1456376.	-2923.	-1.29E-04	0.00	1.18E+12	-59.067	43762.	0.00
29.9000	0.00676	1439425.	-3238.	-1.22E-04	0.00	1.18E+12	-55.035	44950.	0.00
30.3600	0.00610	1420793.	-3531.	-1.15E-04	0.00	1.18E+12	-51.014	46139.	0.00
30.8200	0.00548	1400601.	-3801.	-1.09E-04	0.00	1.18E+12	-47.025	47327.	0.00
31.2800	0.00490	1378973.	-4050.	-1.02E-04	0.00	1.18E+12	-43.088	48516.	0.00
31.7400	0.00436	1356027.	-4277.	-9.59E-05	0.00	1.18E+12	-39.219	49704.	0.00
32.2000	0.00384	1331881.	-4483.	-8.96E-05	0.00	1.18E+12	-35.438	50892.	0.00
32.6600	0.00337	1306652.	-4669.	-8.35E-05	0.00	1.18E+12	-31.759	52081.	0.00
33.1200	0.00292	1280451.	-4834.	-7.74E-05	0.00	1.18E+12	-28.201	53269.	0.00
33.5800	0.00251	1253387.	-4980.	-7.15E-05	0.00	1.18E+12	-24.776	54457.	0.00
34.0400	0.00213	1225564.	-5108.	-6.57E-05	0.00	1.18E+12	-21.500	55646.	0.00
34.5000	0.00179	1197082.		-6.01E-05	0.00	1.18E+12	-18.387		0.00
34.9600	0.00147	1168036.	-6157.	-5.45E-05	0.00	1.18E+12	-321.743	1208460.	0.00
35.4200	0.00118	1129182.	-7893.	-4.92E-05	0.00	1.18E+12	-307.387	1433570.	0.00
35.8800	9.27E-04	1080959.	-9525.	-4.40E-05	0.00	1.18E+12	-283.894	1691150.	0.00
36.3400	6.98E-04	1024082.	-10904.	-3.91E-05	0.00	1.18E+12	-215.490	1705281.	0.00
36.8000	4.95E-04	960636.	-11924.	-3.45E-05	0.00	1.18E+12	-154.133	1719415.	0.00
37.2600	3.17E-04	892490.	-12624.	-3.02E-05	0.00	1.18E+12	-99.510	1733553.	0.00
37.7200	1.62E-04	821310.	-13040.	-2.62E-05	0.00	1.18E+12	-51.256	1747694.	0.00

38.1800	2.81E-05	748565.	-13206.	-2.25E-05	0.00	1.18E+12	-8.913	1752344.	0.00
38.6400	-8.65E-05	675546.	-13155.	-1.92E-05	0.00	1.18E+12	27.4459	1752344.	0.00
39.1000	-1.84E-04	603361.	-12918.	-1.62E-05	0.00	1.18E+12	58.2805	1752344.	0.00
39.5600	-2.65E-04	532950.	-12525.	-1.35E-05	0.00	1.18E+12	84.1813	1752344.	0.00
40.0200	-3.33E-04	465103.	-12001.	-1.12E-05	0.00	1.18E+12	105.7242	1752344.	0.00
40.4800	-3.89E-04	400475.	-11368.	-9.19E-06	0.00	1.18E+12	123.4640	1752344.	0.00
40.9400	-4.34E-04	339609.	-10647.	-7.46E-06	0.00	1.18E+12	137.9291	1752344.	0.00
41.4000	-4.71E-04	282944.	-9853.	-6.01E-06	0.00	1.18E+12	149.6171	1752344.	0.00
41.8600	-5.01E-04	230837.	-9002.	-4.81E-06	0.00	1.18E+12	158.9915	1752344.	0.00
42.3200	-5.24E-04	183574.	-8103.	-3.84E-06	0.00	1.18E+12	166.4784	1752344.	0.00
42.7800	-5.43E-04	141383.	-7168.	-3.09E-06	0.00	1.18E+12	172.4642	1752344.	0.00
43.2400	-5.58E-04	104446.	-6202.	-2.51E-06	0.00	1.18E+12	177.2939	1752344.	0.00
43.7000	-5.71E-04	72911.	-5213.	-2.10E-06	0.00	1.18E+12	181.2695	1752344.	0.00
44.1600	-5.82E-04	46900.	-4203.	-1.82E-06	0.00	1.18E+12	184.6489	1752344.	0.00
44.6200	-5.91E-04	26515.	-3175.	-1.65E-06	0.00	1.18E+12	187.6448	1752344.	0.00
45.0800	-6.00E-04	11847.	-2132.	-1.56E-06	0.00	1.18E+12	190.4240	1752344.	0.00
45.5400	-6.08E-04	2981.	-1073.	-1.52E-06	0.00	1.18E+12	193.1062	1752344.	0.00
46.0000	-6.17E-04	0.00	0.00	-1.52E-06	0.00	1.18E+12	195.7641	876172.	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
                                     0.08722642 inches
Computed slope at pile head
                                       0.000000 radians
Maximum bending moment
                                     -4155843. inch-lbs
Maximum shear force
                                         36168. lbs
Depth of maximum bending moment =
                                       0.000000 feet below pile head
Depth of maximum shear force
                                    12.88000000 feet below pile head
Number of iterations
                                             13
Number of zero deflection points =
                                              1
Pile deflection at ground
                                  0.05743748 inches
```

Boundary Condition Type 2, Shear and Slope

Shear = 19125. lbs Slope = 0.00000 Axial Load = 121750. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
46.00000	0.08722642	-4155843.	36168.
43.70000	0.09074064	-4218624.	36138.
41.40000	0.09612549	-4289193.	36177.
39.10000	0.10351032	-4389724.	36165.
36.80000	0.10386946	-4407880.	36172.
34.50000	0.12013638	-4896094.	36191.
32.20000	0.12144060	-5055294.	36166.
29.90000	0.13215346	-5121564.	36172.
27.60000	0.15459185	-5334084.	36204.
25.30000	0.16544231	-5398692.	36211.
23.00000	0.16142419	-5356351.	36212.
20.70000	0.15877363	-5241010.	36215.
18.40000	0.17862444	-5000894.	36208.
16.10000	0.46528597	-4777907.	36195.

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

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 12458.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 84958.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth Deflect. Bending Shear Slope Total Bending Soil Res. Soil Spr. Distrib.

X	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	1bs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.06403	2051560	12450	0.00	0.00	1 105.13	0.00	0.00	2 1004
0.00 0.4600	0.06403 0.06399	-3051560. -2982755.	12458.	0.00 -1.41E-05	0.00 0.00	1.18E+12 1.18E+12	0.00 0.00	0.00 0.00	2.1804 8.7216
0.9200	0.06387	-2902733. -2913678.	12560.		0.00	1.18E+12 1.18E+12	0.00	0.00	17.4432
1.3800	0.06368	-2844063.	12681.		0.00	1.18E+12 1.18E+12	0.00	0.00	26.1648
1.8400	0.06341	-2773645.	12849.		0.00	1.18E+12	0.00	0.00	34.8864
2.3000	0.06308	-2773043. -2702157.	13066.		0.00	1.18E+12	0.00	0.00	43.6080
2.7600	0.06267	-2629335.	13331.	-7.98E-05	0.00	1.18E+12	0.00	0.00	52.3296
3.2200	0.06220	-2554912.	13644.	-9.20E-05	0.00	1.18E+12	0.00	0.00	61.0512
3.6800	0.06166	-2478624.	14005.	-1.04E-04	0.00	1.18E+12	0.00	0.00	69.7728
4.1400	0.06105	-2400204.	14414.		0.00	1.18E+12	0.00	0.00	78.4944
4.6000	0.06038	-2319387.	14871.		0.00	1.18E+12	0.00	0.00	87.2160
5.0600	0.05966	-2235908.		-1.37E-04	0.00	1.18E+12	0.00	0.00	95.9376
5.5200	0.05887	-2149501.	15930.		0.00	1.18E+12	0.00	0.00	104.6592
5.9800	0.05803	-2059899.	16532.		0.00	1.18E+12	0.00	0.00	113.3808
6.4400	0.05714	-1966839.	17182.		0.00	1.18E+12	0.00	0.00	122.1024
6.9000	0.05620	-1870053.	17880.		0.00	1.18E+12	0.00	0.00	130.8240
7.3600	0.05521	-1769278.	18626.		0.00	1.18E+12	0.00	0.00	139.5456
7.8200	0.05417	-1664246.	19421.		0.00	1.18E+12	0.00	0.00	148.2672
8.2800	0.05309	-1554693.	20263.		0.00	1.18E+12	0.00	0.00	156.9888
8.7400	0.05197	-1440353.	21154.		0.00	1.18E+12	0.00	0.00	165.7104
9.2000	0.05081	-1320961.	22093.	-2.13E-04	0.00	1.18E+12	0.00	0.00	174.4320
9.6600	0.04962	-1196251.	23080.	-2.19E-04	0.00	1.18E+12	0.00	0.00	183.1536
10.1200	0.04840	-1065957.	24115.	-2.24E-04	0.00	1.18E+12	0.00	0.00	191.8752
10.5800	0.04715	-929815.	25198.	-2.28E-04	0.00	1.18E+12	0.00	0.00	200.5968
11.0400	0.04588	-787558.	26329.	-2.32E-04	0.00	1.19E+12	0.00	0.00	209.3184
11.5000	0.04458	-638922.	27509.	-2.36E-04	0.00	1.19E+12	0.00	0.00	218.0400
11.9600	0.04327	-483640.	28736.	-2.38E-04	0.00	1.19E+12	0.00	0.00	226.7616
12.4200	0.04195	-321448.	29798.	-2.40E-04	0.00	1.19E+12	0.00	0.00	157.7369
12.8800	0.04062	-154449.	30191.	-2.41E-04	0.00	1.19E+12	-15.050	2045.	0.00
13.3400	0.03929	12092.	30061.	-2.42E-04	0.00	1.19E+12	-32.176	4521.	0.00
13.8000	0.03795	177653.	28161.	-2.41E-04	0.00	1.19E+12	-656.449	95477.	0.00
14.2600	0.03662	323211.	24515.	-2.40E-04	0.00	1.19E+12	-664.561	100166.	0.00
14.7200	0.03530	448518.	20825.	-2.38E-04	0.00	1.19E+12	-672.296	105124.	0.00
15.1800	0.03399	553340.	17093.	-2.36E-04	0.00	1.19E+12	-679.653	110369.	0.00
15.6400	0.03270	637451.	13322.	-2.33E-04	0.00	1.19E+12	-686.632	115921.	0.00
16.1000	0.03142	700639.	9514.		0.00	1.19E+12	-693.231	121800.	0.00
16.5600	0.03016	742702.	7443.		0.00	1.19E+12	-57.299	10488.	0.00
17.0200	0.02891	783018.	7116.		0.00	1.19E+12	-61.164	11677.	0.00
17.4800	0.02769	821468.	6769.		0.00	1.19E+12	-64.541	12865.	0.00
17.9400	0.02649	857950.	6404.	-2.16E-04	0.00	1.19E+12	-67.446	14053.	0.00

18.4000	0.02531	892375.	6025.	-2.11E-04	0.00	1.18E+12	-69.894	15242.	0.00
18.8600	0.02416	924668.	5634.	-2.07E-04	0.00	1.18E+12	-71.903	16430.	0.00
19.3200	0.02303	954768.	5233.	-2.03E-04	0.00	1.18E+12	-73.491	17619.	0.00
19.7800	0.02192	982627.	4824.	-1.98E-04	0.00	1.18E+12	-74.674	18807.	0.00
20.2400	0.02084	1008208.	4409.	-1.94E-04	0.00	1.18E+12	-75.473	19995.	0.00
20.7000	0.01978	1031488.	3992.	-1.89E-04	0.00	1.18E+12	-75.905	21184.	0.00
21.1600	0.01875	1052452.	3572.	-1.84E-04	0.00	1.18E+12	-75.989	22372.	0.00
21.6200	0.01775	1071099.	3154.	-1.79E-04	0.00	1.18E+12	-75.746	23560.	0.00
22.0800	0.01677	1087435.	2737.	-1.74E-04	0.00	1.18E+12	-75.195	24749.	0.00
22.5400	0.01582	1101478.	2324.	-1.69E-04	0.00	1.18E+12	-74.355	25937.	0.00
23.0000	0.01491	1113253.	1917.	-1.64E-04	0.00	1.18E+12	-73.247	27125.	0.00
23.4600	0.01402	1122793.	1516.	-1.59E-04	0.00	1.18E+12	-71.890	28314.	0.00
23.9200	0.01315	1130141.	1124.	-1.53E-04	0.00	1.18E+12	-70.304	29502.	0.00
24.3800	0.01232	1135343.	740.6294	-1.48E-04	0.00	1.18E+12	-68.509	30690.	0.00
24.8400	0.01152	1138456.	367.9346	-1.43E-04	0.00	1.18E+12	-66.525	31879.	0.00
25.3000	0.01075	1139539.	6.6649	-1.38E-04	0.00	1.18E+12	-64.370	33067.	0.00
25.7600	0.01000	1138659.	-342.292	-1.32E-04	0.00	1.18E+12	-62.064	34255.	0.00
26.2200	0.00929	1135884.	-678.154	-1.27E-04	0.00	1.18E+12	-59.625	35444.	0.00
26.6800	0.00860	1131291.	-1000.	-1.22E-04	0.00	1.18E+12	-57.073	36632.	0.00
27.1400	0.00794	1124956.	-1308.	-1.16E-04	0.00	1.18E+12	-54.424	37820.	0.00
27.6000	0.00732	1116960.	-1601.	-1.11E-04	0.00	1.18E+12	-51.698	39009.	0.00
28.0600	0.00672	1107386.	-1879.	-1.06E-04	0.00	1.18E+12	-48.910	40197.	0.00
28.5200	0.00615	1096320.	-2141.	-1.01E-04	0.00	1.18E+12	-46.078	41385.	0.00
28.9800	0.00560	1083847.	-2387.	-9.57E-05	0.00	1.18E+12	-43.217	42574.	0.00
29.4400	0.00509	1070056.	-2618.	-9.07E-05	0.00	1.18E+12	-40.345	43762.	0.00
29.9000	0.00460	1055032.	-2833.	-8.58E-05	0.00	1.18E+12	-37.474	44950.	0.00
30.3600	0.00414	1038864.	-3032.	-8.09E-05	0.00	1.18E+12	-34.621	46139.	0.00
30.8200	0.00371	1021639.	-3215.	-7.61E-05	0.00	1.18E+12	-31.799	47327.	0.00
31.2800	0.00330	1003443.	-3383.	-7.14E-05	0.00	1.18E+12	-29.022	48516.	0.00
31.7400	0.00292	984361.	-3535.	-6.67E-05	0.00	1.18E+12	-26.302	49704.	0.00
32.2000	0.00257	964475.	-3673.	-6.22E-05	0.00	1.18E+12	-23.651	50892.	0.00
32.6600	0.00223	943866.	-3797.	-5.78E-05	0.00	1.18E+12	-21.081	52081.	0.00
33.1200	0.00193	922613.	-3906.	-5.34E-05	0.00	1.18E+12	-18.602	53269.	0.00
33.5800	0.00164	900790.	-4002.	-4.92E-05	0.00	1.18E+12	-16.226	54457.	0.00
34.0400	0.00138	878472.	-4086.	-4.50E-05	0.00	1.19E+12	-13.961	55646.	0.00
34.5000	0.00115	855726.	-4157.	-4.10E-05	0.00	1.19E+12	-11.817	56834.	0.00
34.9600	9.33E-04	832618.	-4965.	-3.70E-05	0.00	1.19E+12	-280.935	1662901.	0.00
35.4200	7.39E-04	800949.	-6360.	-3.32E-05	0.00	1.19E+12	-224.449	1677024.	0.00
35.8800	5.66E-04	762438.	-7457.	-2.96E-05	0.00	1.19E+12	-173.280	1691150.	0.00
36.3400	4.12E-04	718646.	-8287.	-2.62E-05	0.00	1.19E+12	-127.279	1705281.	0.00
36.8000	2.77E-04	670974.	-8876.	-2.29E-05	0.00	1.19E+12	-86.246	1719415.	0.00
37.2600	1.59E-04	620673.	-9252.	-1.99E-05	0.00	1.19E+12	-49.936	1733553.	0.00
37.7200	5.71E-05	568848.	-9440.	-1.71E-05	0.00	1.19E+12	-18.074	1747694.	0.00

38.1800	-3.02E-05	516472.	-9463.	-1.46E-05	0.00	1.19E+12	9.5922	1752344.	0.00
38.6400	-1.04E-04	464387.	-9346.	-1.23E-05	0.00	1.19E+12	33.0922	1752344.	0.00
39.1000	-1.66E-04	413309.	-9108.	-1.03E-05	0.00	1.19E+12	52.8031	1752344.	0.00
39.5600	-2.18E-04	363839.	-8772.	-8.48E-06	0.00	1.19E+12	69.1417	1752344.	0.00
40.0200	-2.60E-04	316476.	-8353.	-6.89E-06	0.00	1.19E+12	82.5116	1752344.	0.00
40.4800	-2.94E-04	271625.	-7868.	-5.52E-06	0.00	1.19E+12	93.2993	1752344.	0.00
40.9400	-3.21E-04	229617.	-7329.	-4.36E-06	0.00	1.19E+12	101.8707	1752344.	0.00
41.4000	-3.42E-04	190713.	-6749.	-3.38E-06	0.00	1.19E+12	108.5686	1752344.	0.00
41.8600	-3.58E-04	155116.	-6135.	-2.57E-06	0.00	1.19E+12	113.7103	1752344.	0.00
42.3200	-3.70E-04	122984.	-5497.	-1.93E-06	0.00	1.19E+12	117.5865	1752344.	0.00
42.7800	-3.79E-04	94434.	-4840.	-1.42E-06	0.00	1.19E+12	120.4591	1752344.	0.00
43.2400	-3.86E-04	69555.	-4169.	-1.04E-06	0.00	1.19E+12	122.5613	1752344.	0.00
43.7000	-3.91E-04	48410.	-3488.	-7.63E-07	0.00	1.19E+12	124.0959	1752344.	0.00
44.1600	-3.95E-04	31046.	-2800.	-5.78E-07	0.00	1.19E+12	125.2355	1752344.	0.00
44.6200	-3.97E-04	17498.	-2106.	-4.65E-07	0.00	1.19E+12	126.1219	1752344.	0.00
45.0800	-4.00E-04	7793.	-1408.	-4.06E-07	0.00	1.19E+12	126.8654	1752344.	0.00
45.5400	-4.02E-04	1953.	-705.883	-3.83E-07	0.00	1.19E+12	127.5454	1752344.	0.00
46.0000	-4.04E-04	0.00	0.00	-3.79E-07	0.00	1.19E+12	128.2094	876172.	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 0.06402757 inches Computed slope at pile head 0.000000 radians Maximum bending moment -3051560. inch-lbs Maximum shear force 30191. lbs Depth of maximum bending moment = 0.000000 feet below pile head Depth of maximum shear force 12.88000000 feet below pile head Number of iterations 13 Number of zero deflection points = 1 Pile deflection at ground 0.04172043 inches

Boundary Condition Type 2, Shear and Slope

Shear = 12458. lbs Slope = 0.00000 Axial Load = 84958. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
46.00000	0.06402757	-3051560.	30191.
43.70000	0.06684399	-3107731.	30149.
41.40000	0.07065266	-3162314.	30196.
39.10000	0.07627791	-3234747.	30183.
36.80000	0.07522184	-3209900.	30189.
34.50000	0.08813495	-3599574.	30202.
32.20000	0.08840635	-3708050.	30179.
29.90000	0.08814875	-3816234.	30186.
27.60000	0.09416298	-4042738.	30215.
25.30000	0.09350218	-4100307.	30220.
23.00000	0.09402802	-4038372.	30221.
20.70000	0.10209653	-3942339.	30224.
18.40000	0.11837337	-3775238.	30218.
16.10000	0.24016491	-3635211.	30208.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 4

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 19125.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 121750.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth Deflect. Bending Shear Slope Total Bending Soil Res. Soil Spr. Distrib.

Χ	у	Moment	Force	S	Stress	Stiffness	р	Es*H	Lat. Load
feet	inches	in-lbs	1bs	radians	psi*	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0 1102	E06E046	10125	0.00	0.00	1.17E+12	0.00	0 00	3.2752
0.00 0.4600	0.1192 0.1192	-5065946. -4960318.		0.00 -2.36E-05	0.00 0.00	1.17E+12 1.17E+12	0.00 0.00	0.00 0.00	13.1008
0.9200	0.1192	-4854275.	19279.		0.00	1.17E+12 1.17E+12	0.00	0.00	26.2016
1.3800	0.1130	-4747418.	19459.		0.00	1.17E+12 1.17E+12	0.00	0.00	39.3024
1.8400	0.1182	-4639349 .	19713.		0.00	1.17E+12 1.17E+12	0.00	0.00	52.4032
2.3000	0.1177	-4529669.	20038.	-1.13E-04	0.00	1.17E+12	0.00	0.00	65.5040
2.7600	0.1170	-4417978 .	20436.	-1.34E-04	0.00	1.17E+12	0.00	0.00	78.6048
3.2200	0.1162	-4303878.	20906.		0.00	1.17E+12		0.00	91.7056
3.6800	0.1153	-4186970.	21448.		0.00	1.17E+12		0.00	104.8064
4.1400	0.1142	-4066855.	22063.		0.00	1.17E+12	0.00	0.00	117.9072
4.6000	0.1131	-3943135.		-2.13E-04	0.00	1.17E+12	0.00	0.00	131.0080
5.0600	0.1119	-3815410.		-2.31E-04	0.00	1.17E+12	0.00	0.00	144.1088
5.5200	0.1106	-3683283.	24341.		0.00	1.18E+12	0.00	0.00	157.2096
5.9800	0.1091	-3546353.	25245.		0.00	1.18E+12	0.00	0.00	170.3104
6.4400	0.1076	-3404223.	26221.		0.00	1.18E+12	0.00	0.00	183.4112
6.9000	0.1060	-3256494.	27270.		0.00	1.18E+12		0.00	196.5120
7.3600	0.1043	-3102766.	28391.		0.00	1.18E+12	0.00	0.00	209.6128
7.8200	0.1026	-2942642.	29584.		0.00	1.18E+12	0.00	0.00	222.7136
8.2800	0.1007	-2775722.	30849.		0.00	1.18E+12	0.00	0.00	235.8144
8.7400	0.09883	-2601609.	32187.		0.00	1.18E+12	0.00	0.00	248.9152
9.2000	0.09685	-2419902.	33597.		0.00	1.18E+12	0.00	0.00	262.0160
9.6600	0.09480	-2230204.	35080.	-3.75E-04	0.00	1.18E+12	0.00	0.00	275.1168
10.1200	0.09270	-2032116.	36635.		0.00	1.18E+12		0.00	288.2176
10.5800	0.09055	-1825240.	38262.		0.00	1.18E+12		0.00	301.3184
11.0400	0.08835	-1609177.		-4.02E-04	0.00	1.18E+12	0.00	0.00	314.4192
11.5000	0.08611	-1383528.	41733.		0.00	1.18E+12	0.00	0.00	327.5200
11.9600	0.08383	-1147895.	43577.		0.00	1.18E+12	0.00	0.00	340.6208
12.4200	0.08152	-901880.	45171.		0.00	1.18E+12	0.00	0.00	236.9381
12.8800	0.07919	-648642.	45760.	-4.24E-04	0.00	1.18E+12	-23.414	1632.	0.00
13.3400	0.07684	-396116.	45548.	-4.26E-04	0.00	1.18E+12	-53.705	3858.	0.00
13.8000	0.07449	-145225.	43255.	-4.27E-04	0.00	1.18E+12	-776.897	57573.	0.00
14.2600	0.07213	81995.	38938.	-4.28E-04	0.00	1.18E+12	-787.175	60245.	0.00
14.7200	0.06977	285228.	34566.	-4.27E-04	0.00	1.18E+12	-797.031	63061.	0.00
15.1800	0.06742	464175.	30140.	-4.25E-04	0.00	1.18E+12	-806.461	66033.	0.00
15.6400	0.06508	618547.	25664.	-4.22E-04	0.00	1.18E+12	-815.461	69171.	0.00
16.1000	0.06275	748070.	21139.	-4.19E-04	0.00	1.18E+12	-824.027	72486.	0.00
16.5600	0.06045	852481.	18547.	-4.15E-04	0.00	1.18E+12	-114.855	10488.	0.00
17.0200	0.05816	953391.	17891.	-4.11E-04	0.00	1.18E+12	-123.040	11677.	0.00
17.4800	0.05591	1050549.	17192.	-4.07E-04	0.00	1.18E+12	-130.299	12865.	0.00
17.9400	0.05368	1143733.	16455.	-4.01E-04	0.00	1.18E+12	-136.655	14053.	0.00

18.4000	0.05147	1232749.	15685.	-3.96E-04	0.00	1.18E+12	-142.132	15242.	0.00
18.8600	0.04931	1317431.	14888.	-3.90E-04	0.00	1.18E+12	-146.755	16430.	0.00
19.3200	0.04717	1397637.	14067.	-3.84E-04	0.00	1.18E+12	-150.553	17619.	0.00
19.7800	0.04507	1473251.	13228.	-3.77E-04	0.00	1.18E+12	-153.554	18807.	0.00
20.2400	0.04301	1544181.	12374.	-3.70E-04	0.00	1.18E+12	-155.789	19995.	0.00
20.7000	0.04099	1610360.	11510.	-3.63E-04	0.00	1.18E+12	-157.288	21184.	0.00
21.1600	0.03901	1671741.	10640.	-3.55E-04	0.00	1.18E+12	-158.085	22372.	0.00
21.6200	0.03707	1728300.	9767.	-3.47E-04	0.00	1.18E+12	-158.214	23560.	0.00
22.0800	0.03518	1780033.	8895.	-3.39E-04	0.00	1.18E+12	-157.708	24749.	0.00
22.5400	0.03333	1826955.	8027.	-3.30E-04	0.00	1.18E+12	-156.603	25937.	0.00
23.0000	0.03153	1869099.	7168.	-3.22E-04	0.00	1.18E+12	-154.935	27125.	0.00
23.4600	0.02978	1906516.	6318.	-3.13E-04	0.00	1.18E+12	-152.739	28314.	0.00
23.9200	0.02808	1939274.	5483.	-3.04E-04	0.00	1.18E+12	-150.052	29502.	0.00
24.3800	0.02642	1967453.	4663.	-2.95E-04	0.00	1.18E+12	-146.910	30690.	0.00
24.8400	0.02482	1991150.	3862.	-2.85E-04	0.00	1.18E+12	-143.350	31879.	0.00
25.3000	0.02327	2010472.	3081.	-2.76E-04	0.00	1.18E+12	-139.408	33067.	0.00
25.7600	0.02177	2025540.	2324.	-2.67E-04	0.00	1.18E+12	-135.121	34255.	0.00
26.2200	0.02033	2036485.	1591.	-2.57E-04	0.00	1.18E+12	-130.525	35444.	0.00
26.6800	0.01893	2043446.	883.5362	-2.48E-04	0.00	1.18E+12	-125.654	36632.	0.00
27.1400	0.01759	2046572.	204.0250	-2.38E-04	0.00	1.18E+12	-120.545	37820.	0.00
27.6000	0.01631	2046018.	-446.722	-2.29E-04	0.00	1.18E+12	-115.232	39009.	0.00
28.0600	0.01507	2041947.	-1068.	-2.19E-04	0.00	1.18E+12	-109.750	40197.	0.00
28.5200	0.01389	2034526.	-1658.	-2.09E-04	0.00	1.18E+12	-104.130	41385.	0.00
28.9800	0.01276	2023925.	-2217.	-2.00E-04	0.00	1.18E+12	-98.407	42574.	0.00
29.4400	0.01168	2010319.	-2744.	-1.91E-04	0.00	1.18E+12	-92.611	43762.	0.00
29.9000	0.01066	1993885.	-3239.	-1.81E-04	0.00	1.18E+12	-86.773	44950.	0.00
30.3600	0.00968	1974801.	-3702.	-1.72E-04	0.00	1.18E+12	-80.924	46139.	0.00
30.8200	0.00876	1953244.	-4133.	-1.63E-04	0.00	1.18E+12	-75.093	47327.	0.00
31.2800	0.00789	1929394.	-4531.	-1.54E-04	0.00	1.18E+12	-69.307	48516.	0.00
31.7400	0.00706	1903425.	-4898.	-1.45E-04	0.00	1.18E+12	-63.593	49704.	0.00
32.2000	0.00629	1875513.	-5234.	-1.36E-04	0.00	1.18E+12	-57.978	50892.	0.00
32.6600	0.00556	1845829.	-5538.	-1.27E-04	0.00	1.18E+12	-52.486	52081.	0.00
33.1200	0.00488	1814539.	-5813.	-1.19E-04	0.00	1.18E+12	-47.141	53269.	0.00
33.5800	0.00425	1781807.	-6059.	-1.10E-04	0.00	1.18E+12	-41.966	54457.	0.00
34.0400	0.00367	1747791.	-6277.	-1.02E-04	0.00	1.18E+12	-36.982	55646.	0.00
34.5000	0.00313	1712643.	-6468.	-9.38E-05	0.00	1.18E+12	-32.211	56834.	0.00
34.9600	0.00263	1676508.	-7585.	-8.59E-05	0.00	1.18E+12	-372.228	780490.	0.00
35.4200	0.00218	1629025.	-9600.	-7.82E-05	0.00	1.18E+12	-358.099	906802.	0.00
35.8800	0.00177	1570626.	-11535.	-7.07E-05	0.00	1.18E+12	-342.761	1069460.	0.00
36.3400	0.00140	1501778.	-13380.	-6.36E-05	0.00	1.18E+12	-325.933	1286080.	0.00
36.8000	0.00107	1422994.	-15128.	-5.67E-05	0.00	1.18E+12	-307.162	1588425.	0.00
37.2600	7.73E-04	1334847.	-16645.	-5.03E-05	0.00	1.18E+12	-242.634	1733553.	0.00
37.7200	5.12E-04	1239302.	-17762.	-4.43E-05	0.00	1.18E+12	-162.158	1747694.	0.00

38.1800	2.84E-04	1138812.	-18458.	-3.87E-05	0.00	1.18E+12	-90.052	1752344.	0.00
38.6400	8.45E-05	1035574.	-18781.	-3.37E-05	0.00	1.18E+12	-26.832	1752344.	0.00
39.1000	-8.79E-05	931516.	-18778.	-2.91E-05	0.00	1.18E+12	27.9181	1752344.	0.00
39.5600	-2.36E-04	828305.	-18494.	-2.50E-05	0.00	1.18E+12	75.0491	1752344.	0.00
40.0200	-3.64E-04	727379.	-17968.	-2.13E-05	0.00	1.18E+12	115.4062	1752344.	0.00
40.4800	-4.72E-04	629966.	-17236.	-1.82E-05	0.00	1.18E+12	149.8155	1752344.	0.00
40.9400	-5.64E-04	537117.	-16328.	-1.54E-05	0.00	1.18E+12	179.0735	1752344.	0.00
41.4000	-6.42E-04	449723.	-15271.	-1.31E-05	0.00	1.18E+12	203.9395	1752344.	0.00
41.8600	-7.09E-04	368541.	-14087.	-1.12E-05	0.00	1.18E+12	225.1282	1752344.	0.00
42.3200	-7.66E-04	294218.	-12794.	-9.69E-06	0.00	1.18E+12	243.3032	1752344.	0.00
42.7800	-8.16E-04	227307.	-11408.	-8.47E-06	0.00	1.18E+12	259.0724	1752344.	0.00
43.2400	-8.60E-04	168290.	-9939.	-7.55E-06	0.00	1.18E+12	272.9829	1752344.	0.00
43.7000	-8.99E-04	117590.	-8398.	-6.88E-06	0.00	1.18E+12	285.5173	1752344.	0.00
44.1600	-9.36E-04	75590.	-6790.	-6.43E-06	0.00	1.18E+12	297.0902	1752344.	0.00
44.6200	-9.70E-04	42641.	-5126.	-6.15E-06	0.00	1.18E+12	305.7011	1739011.	0.00
45.0800	-0.00100	19008.	-3431.	-6.01E-06	0.00	1.18E+12	308.3098	1695475.	0.00
45.5400	-0.00104	4769.	-1722.	-5.95E-06	0.00	1.18E+12	310.8173	1654986.	0.00
46.0000	-0.00107	0.00	0.00	-5.94E-06	0.00	1.18E+12	313.2566	808412.	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. 4:

Pile-head deflection	=	0.11924948	inches		
Computed slope at pile head	=	0.000000	radians		
Maximum bending moment	=	-5065946.	inch-lbs		
Maximum shear force	=	45760.	lbs		
Depth of maximum bending moment	=	0.000000	feet below	pile	head
Depth of maximum shear force	=	12.88000000	feet below	pile	head
Number of iterations	=	13			
Number of zero deflection points	=	1			
Pile deflection at ground	=	0.08111676	inches		

.....

Boundary Condition Type 2, Shear and Slope

Shear = 19125. lbs Slope = 0.00000 Axial Load = 121750. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
46.00000 43.70000 41.40000 39.10000 36.80000 34.50000 32.20000 29.90000 27.60000 23.00000	0.11924948 0.12568668 0.13925855 0.15718839 0.16120073 0.21407353 0.23779642 0.26460564 0.31623419 0.34405350 0.34294577	-5065946. -5125348. -5122229. -5135699. -5265382. -5485731. -5630513. -5799825. -6110264. -6313892. -6353348.	45760. 45700. 45772. 45759. 45766. 45787. 45756. 45763. 45801. 45808.
20.70000	0.34539903	-6245686.	45813.
18.40000	0.37584837	-5920832.	45805.
16.10000	1.16702711	-5542213.	45786.

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

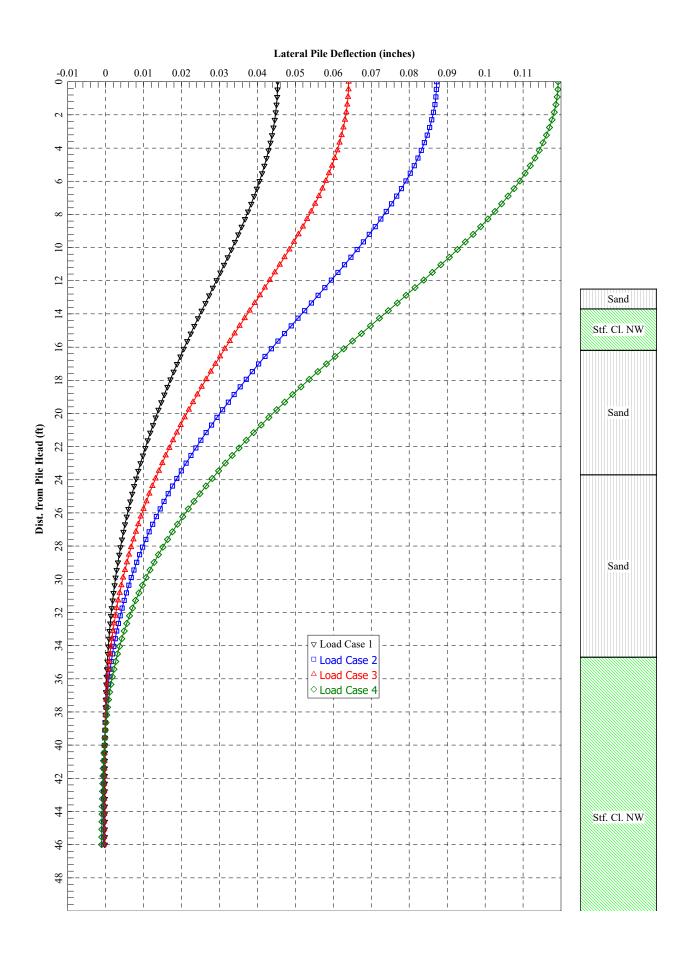
Load Load Load Axial Pile-head Pile-head Max Shear Max Moment Case Type Pile-head Type Pile-head Loading Deflection Rotation in Pile in Pile

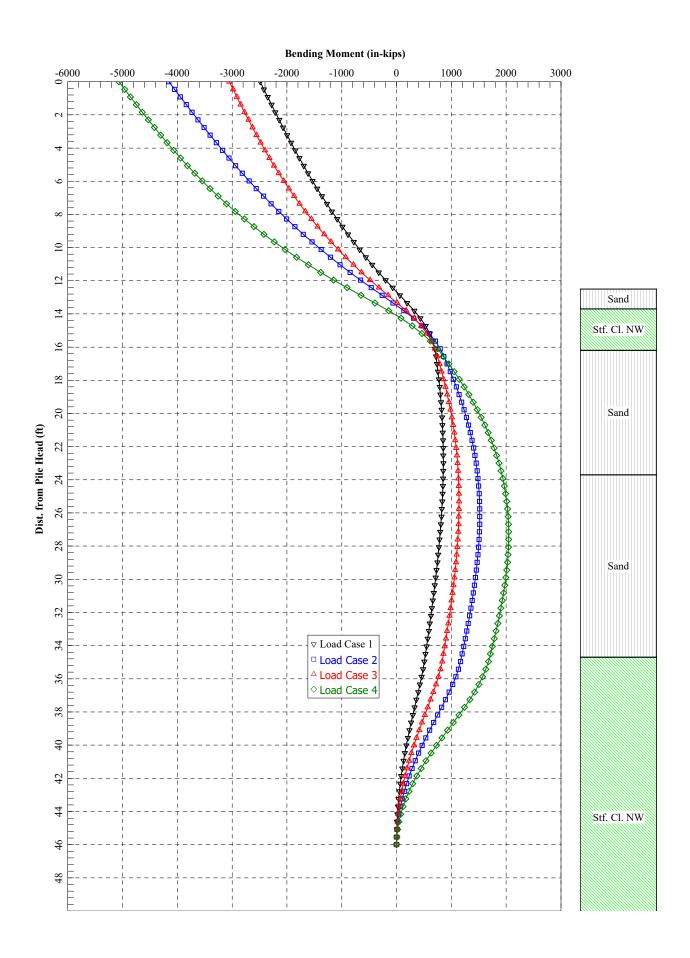
Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

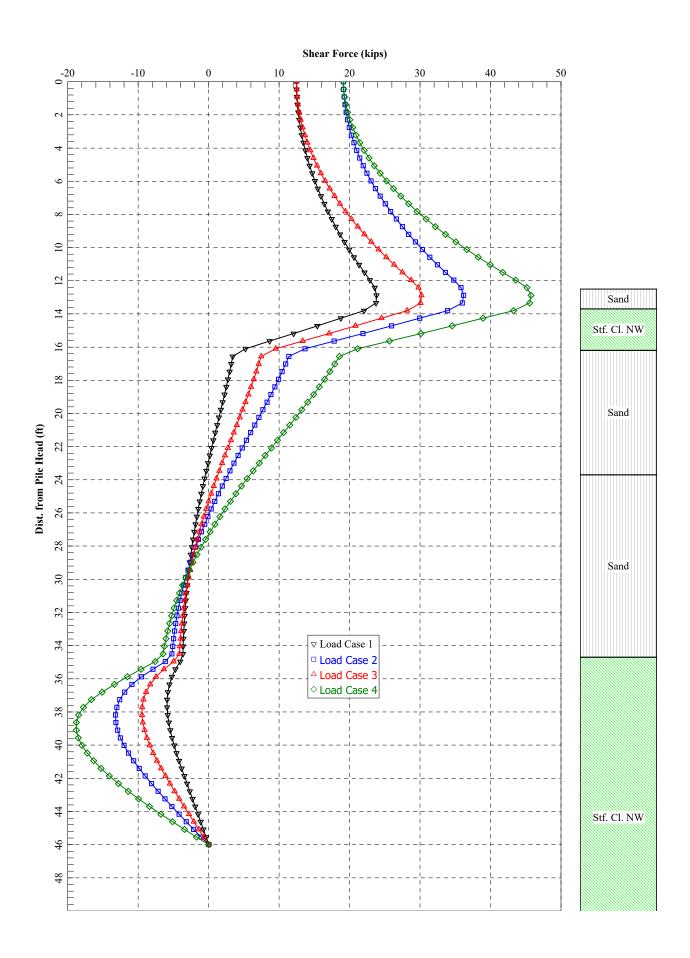
No. 1	Load 1	2	Load 2	1bs	inches	radians	lbs	in-lbs
1 V, lb	12458.	S, rad	0.00	84958.	0.04532	0.00	23830.	-2489220.
2 V, 1b	19125.	S, rad	0.00	121750.	0.08723	0.00	36168.	-4155843.
3 V, 1b	12458.	S, rad	0.00	84958.	0.06403	0.00	30191.	-3051560.
4 V, 1b	19125.	S, rad	0.00	121750.	0.1192	0.00	45760.	-5065946.

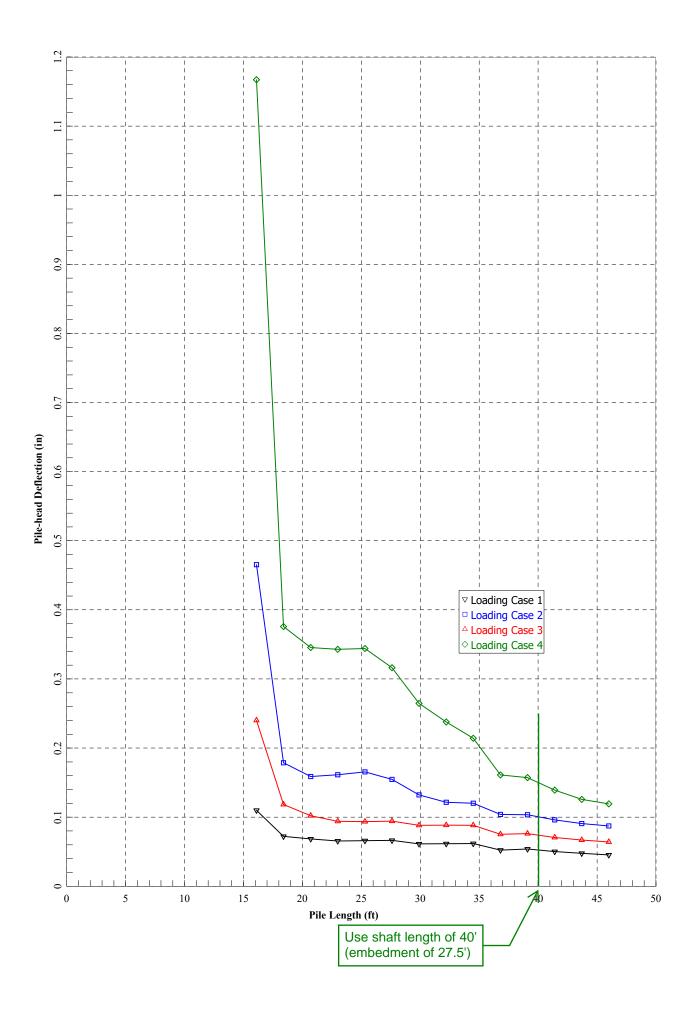
Maximum pile-head deflection = 0.1192494833 inches
Maximum pile-head rotation = -0.0000000000 radians = -0.0000000 deg.

The analysis ended normally.









Section outside Abutment/Wingwalls, 10' height, 2H:1V skewed backslope, (free-head)

Geometry

	HUITZ. DISTAILLE	
	from C/L (ft)	
Start of Wall Backfill =	25.3	at Outside Edge of Shoulder
Wall =	61.4	at C/L of Wall

Hariz Distance

Horizontal distances measured perpendicular to wall

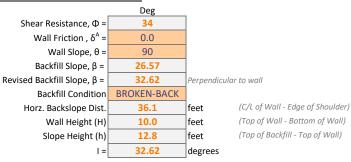
Backfill Slope Angle = 2.0 H:1V

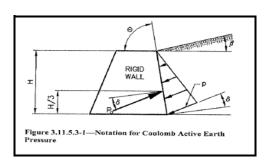
Maximum backfill slope perpendicular to roadway C/L

Wall Loading Profile

	Top Elev.	Thickness (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	_
Item 203	707.2	5.0	250	28	125	A-6a/A-6b per GDM
Medium Dense Granular	702.2	5.0	0	36.5	125	
Bottom of Wall	697.2					-
Weighted Value		10.0	125	32	125	

Earth Pressure Coefficients





Active Earth Coefficient

$$K_{a} = \frac{\sin^{2}(\theta+\Phi)}{\left(\sin^{2}(\theta)*\sin(\theta-\delta)*\left[1+\sqrt{\sin(\Phi+\delta)*\sin(\Phi-\beta)}/(\sin(\theta-\delta)*\sin(\theta+\beta))\right]^{2}\right)}$$

$$K_{a} = \frac{0.528}{\left(\sin^{2}(\theta+\Phi)+\sin(\theta-\delta)+\sin(\theta-\delta)+\sin(\theta+\beta)\right)^{2}}$$

At-Rest Earth Coefficient

 $K_o = (1-Sin(\phi))*(1+Sin(\beta))$ $K_o = 0.673$

Notes:

- A. Wall friction neglected
- B. Figure and Equation for Active Earth Pressure from AASHTO 3.11.5.3 (LRFD Design Manual).
- C. The wall backfill will consist of proposed fill and granular overburden. Using the soil layer thicknesses and respective soil parameters as provided by SME, a weighted average was determined and assumed for the entire backfill (c' = 125 psf and $\phi' = 32^\circ$. The parameters were converted to equivalent soil strength parameters c' = 0 psf and $\phi' = 34^\circ$ for computing earth pressures based on a 1 degree increase in friction angle for every 50 psf decrease in cohesion up to 150 psf (Ref: Hall's Thesis).

Soil Lateral Design Profile							
_	Top Elev	Depth (ft)	Cohesion (psf)	Phi (deg)	Unit Wt (pcf)	ε50	k
Medium Dense Granular	697.2	10.0	0	36.5	62.6	N/A	125
Very Stiff Cohesive	696.3	10.9	4000	0	62.6	0.005	N/A
Medium Dense Granular	693.8	13.4	0	33	59.6	N/A	60
Medium Dense Silt	686.3	20.9	0	33	62.6	N/A	60
Medium Stiff to Stiff Cohesive	675.3	31.9	1700	0	57.6	0.007	N/A
Stiff to Very Stiff Cohesive	645.8	61.4	2700	0	59.6	0.005	N/A
Medium Stiff to Stiff Silt	633.3	73.9	1400	0	55.6	0.007	N/A
Very Stiff to Hard Silt	602.8	104.4	3300	0	72.6	0.005	N/A
Bedrock	587.8	119.4	N/A	N/A	N/A	N/A	N/A

Wall Loading Computations

Earth Pressure Model = CONVENTIONAL

1) Soil Unit Weight = 125 pcf

Weighted Average Along Cantilevered Wall Height

2) Determine Coefficient of Earth Pressure (K)

Restraint Condition = ACTIVE

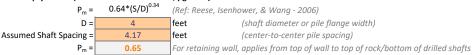
Ka = 0.528

(Active or At-Rest)

3) Determine Equivalent Fluid Weight (GH)

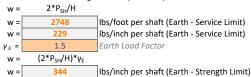
 $G_H = (\gamma_m)^* (K_a)$ Soil loading only, does not include hydrostatic pressures $G_H = 66$ For application to CONVENTIONAL Earth Pressure Model

4) Modification of p-y curves (ODOT GDM Section 903.2, pg. 9-13)



5) Determine Lateral Thrust

6) Resolve horizontal earth force to distributed triangular load (for LPILE)



7) Determine live-load traffic surcharge force (P_s)



8) Resolve surcharge to distributed rectangular load (for LPILE)

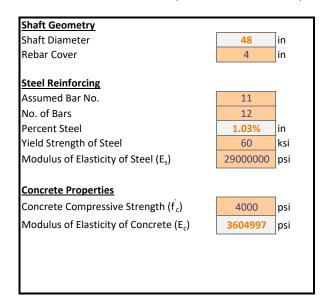
w =	P _S /H	
w =	1099	lbs/foot per shaft (surcharge - unfactored)
w =	92	lbs/inch per shaft (surcharge - unfactored)
γ _s =	1.75	Surcharge Load Factor - Strength I
w =	$(P_S/L)*\gamma_S$	
w =	160	lbs/inch per shaft (Surcharge - Strength I)

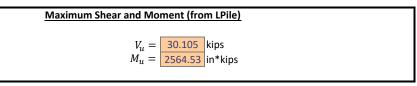
Distributed Lateral Loads for LPILE

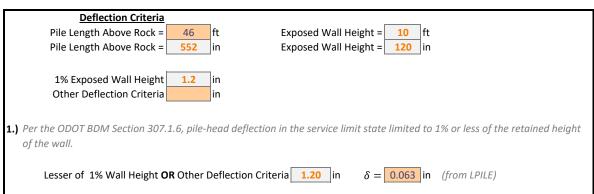
CONVENTIONAL				
Depth (ft.)	Service (lb/in)	Strength-I (lb/in)		
0	92	160		
10.0	229	344		

Shear, Moment, and Deflection Results

Maximum Shear and Moment output from LPile service case provided to HDR's structural engineers for capacity checks. Final reinforcing layout to be confirmed in structural analyses.







Load Case 1 = Service Case Load Case 2 = Strength Case

LPile for Version 2022-12.012

License ID : 202613844 License Type : (Network License)

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

LPILE Global, Global License

This model was prepared by: abaratta

Files Head for Analysis

Files Used for Analysis

Path to file locations: \pwworking\east01\d4381065\

Name of input data file:

5. Fwd. Abt. B-002 10' Height 4' Shaft Skewed 2H1V Backslope.lp12d

Name of output report file:

5. Fwd. Abt. B-002 10' Height 4' Shaft Skewed 2H1V Backslope.lp12o

Name of plot output file:

5. Fwd. Abt. B-002 10' Height 4' Shaft Skewed 2H1V Backslope.lp12p

Name of runtime message file:

5. Fwd. Abt. B-002 10' Height 4' Shaft Skewed 2H1V Backslope.lp12r

Date and Time of Analysis
Date: July 10, 2025 Time: 14:16:41
Problem Title
rroblem fille
Project Name: CUY-17-13.50
Job Number:
Client:
Engineer: HDR
Description: Fwd. Abt., 10' Ht., 4' Dia., Wall Only
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
- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- Analysis includes loading by multiple distributed lateral loads acting on pile
- 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 = 46.000 ft
Depth of ground surface below top of pile = 10.0000 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.

Depth Below

Point	Pile Head	Diameter
No.	feet	inches
1	0.000	48.0000
2	46.000	48.0000

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 = 46.000000 ft

Shaft Diameter = 48.000000 in

Soil and Rock Layering Information

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 10.000000 ft

Distance from top of pile to bottom of layer = 10.900000 ft

Effective unit weight at top of layer = 62.600000 pcf

Effective unit weight at bottom of layer = 62.600000 pcf

Friction angle at top of layer = 36.500000 deg.

Friction angle at bottom of layer = 36.500000 deg.

Subgrade k at top of layer = 125.000000 pci

Subgrade k at bottom of layer = 125.000000 pci

Layer 2 is stiff clay without free water

Distance from top of pile to top of layer = 10.900000 ft
Distance from top of pile to bottom of layer = 13.400000 ft
Effective unit weight at top of layer = 62.600000 pcf
Effective unit weight at bottom of layer = 62.600000 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 sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	13.400000 ft
Distance from top of pile to bottom of layer	=	20.900000 ft
Effective unit weight at top of layer	=	59.600000 pcf
Effective unit weight at bottom of layer	=	59.600000 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

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

		_
Distance from top of pile to top of layer	=	20.900000 ft
Distance from top of pile to bottom of layer	=	31.900000 ft
Effective unit weight at top of layer	=	62.600000 pcf
Effective unit weight at bottom of layer	=	62.600000 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

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	31.900000 ft
Distance from top of pile to bottom of layer	=	61.400000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	1700. psf
Undrained cohesion at bottom of layer	=	1700. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer	=	61.400000 ft
Distance from top of pile to bottom of layer	=	73.900000 ft
Effective unit weight at top of layer	=	59.600000 pcf
Effective unit weight at bottom of layer	=	59.600000 pcf
Undrained cohesion at top of layer	=	2700. psf
Undrained cohesion at bottom of layer	=	2700. psf
Epsilon-50 at top of layer	=	0.005000
Epsilon-50 at bottom of layer	=	0.005000

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer	=	73.900000	ft
Distance from top of pile to bottom of layer	=	104.400000	ft
Effective unit weight at top of layer	=	55.600000	pcf
Effective unit weight at bottom of layer	=	55.600000	pcf
Undrained cohesion at top of layer	=	1400.	psf
Undrained cohesion at bottom of layer	=	1400.	psf
Epsilon-50 at top of layer	=	0.007000	
Epsilon-50 at bottom of layer	=	0.007000	

Layer 8 is stiff clay without free water

Distance from top of pile to top of layer	=	104.400000	ft
Distance from top of pile to bottom of layer	=	119.200000	ft
Effective unit weight at top of layer	=	72.600000	pcf
Effective unit weight at bottom of layer	=	72.600000	pcf
Undrained cohesion at top of layer	=	3300.	psf
Undrained cohesion at bottom of layer	=	3300.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	

(Depth of the lowest soil layer extends 73.200 ft below the pile tip)

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Summary of Input Soil Properties
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Layer Soil Type Layer Effective Cohesion Angle of

E50

Num.	Name (p-y Curve Type)	Depth ft	Unit Wt. pcf	psf	Friction deg.	or krm	kpy pci
1	Cand	10.0000	62 6000		36 5000		125 0000
1	Sand	10.0000	62.6000		36.5000		125.0000
	(Reese, et al.)	10.9000	62.6000		36.5000		125.0000
2	Stiff Clay	10.9000	62.6000	4000.		0.00500	
	w/o Free Water	13.4000	62.6000	4000.		0.00500	
3	Sand	13.4000	59.6000		33.0000		60.0000
	(Reese, et al.)	20.9000	59.6000		33.0000		60.0000
4	Sand	20.9000	62.6000		33.0000		60.0000
	(Reese, et al.)	31.9000	62.6000		33.0000		60.0000
5	Stiff Clay	31.9000	57.6000	1700.		0.00700	
	w/o Free Water	61.4000	57.6000	1700.		0.00700	
6	Stiff Clay	61.4000	59.6000	2700.		0.00500	
	w/o Free Water	73.9000	59.6000	2700.		0.00500	
7	Stiff Clay	73.9000	55.6000	1400.		0.00700	
	w/o Free Water	104.4000	55.6000	1400.		0.00700	
8	Stiff Clay	104.4000	72.6000	3300.		0.00500	
	w/o Free Water	119.2000	72.6000	3300.		0.00500	

Modification Factors for p-y Curves

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult	
1	10.000	0.6500	1.0000	
2	119.200	0.6500	1.0000	

Static Loading Type

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

Distributed Lateral Loading for Individual Load Cases

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Distributed lateral load intensity for Load Case 1 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	92.000
2	10.000	229.000

Distributed lateral load intensity for Load Case 2 defined using 2 points

Point	Depth X	Dist. Load
No.	ft	lb/in
1	0.000	160.000
2	10.000	344.000

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load	Load		Condition Condition		Condition		Axial Thrust	Compute Top y	Run Analysis
No.	Type		1		2	Force, lbs	vs. Pile Length		
1	1	V =	0.0000 lbs	M =	0.0000 in-lbs	0.0000000	Yes	Yes	
2	1	V =	0.0000 lbs	M =	0.0000 in-lbs	0.000000	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 = 46.000000 ft
Shaft Diameter = 48.000000 in
Concrete Cover Thickness (to edge of long. rebar) = 4.000000 in
Number of Reinforcing Bars = 12 bars
Yield Stress of Reinforcing Bars = 60000. psi
Modulus of Elasticity of Reinforcing Bars = 29000000. psi
Gross Area of Shaft = 1810. sq. in.
Total Area of Reinforcing Steel = 18.720000 sq. in.
Area Ratio of Steel Reinforcement = 1.03 percent
Edge-to-Edge Bar Spacing = 8.577827 in
Maximum Concrete Aggregate Size = 0.750000 in
Ratio of Bar Spacing to Aggregate Size = 11.44
Offset of Center of Rebar Cage from Center of Pile = 0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 7212.047 kips
Tensile Load for Cracking of Concrete = -807.459 kips
Nominal Axial Tensile Capacity = -1123.200 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.410000	1.560000	19.295000	0.00000
2	1.410000	1.560000	16.709960	9.647500
3	1.410000	1.560000	9.647500	16.709960
4	1.410000	1.560000	0.00000	19.295000
5	1.410000	1.560000	-9.64750	16.709960
6	1.410000	1.560000	-16.70996	9.647500
7	1.410000	1.560000	-19.29500	0.00000
8	1.410000	1.560000	-16.70996	-9.64750
9	1.410000	1.560000	-9.64750	-16.70996
10	1.410000	1.560000	0.00000	-19.29500
11	1.410000	1.560000	9.647500	-16.70996
12	1.410000	1.560000	16.709960	-9.64750

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

Minimum spacing between any two bars not equal to zero = 8.578 inches between bars 7 and 8.

Ratio of bar spacing to maximum aggregate size = 11.44

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 = 1

Number	Axial Thrust Force
	kips
1	0.000

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 = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Run Stress Msg ksi
6.25000E-07	742.9255266	1188680843.	23.9999803	0.00001500	-0.00001500	0.0627334	-0.361050
0.00000125	1482.	1185736482.	23.9999802	0.00003000	-0.00003000	0.1249711	-0.722101
0.00000188	2218.	1182792121.	23.9999801	0.00004500	-0.00004500	0.1867128	-1.083151
0.00000250	2950.	1179847760.	23.9999800	0.00006000	-0.00006000	0.2479588	-1.444201
0.00000313	3678.	1176903399.	23.9999799	0.00007500	-0.00007500	0.3087089	-1.805252
0.00000375	4402.	1173959038.	23.9999799	0.00009000	-0.00009000	0.3689632	-2.166302
0.00000438	5123.	1171014677.	23.9999798	0.0001050	-0.000105	0.4287216	-2.527353
0.00000500	5123.	1024637842.	11.6492821	0.00005825	-0.000182	0.2382851	-4.679254 C
0.00000563	5123.	910789193.	11.6532320	0.00006555	-0.000204	0.2676473	-5.263517 C
0.00000625	5123.	819710274.	11.6571911	0.00007286	-0.000227	0.2969148	-5.847634 C
0.00000688	5123.	745191158.	11.6611596	0.00008017	-0.000250	0.3260875	-6.431606 C
0.00000750	5123.	683091895.	11.6651375	0.00008749	-0.000273	0.3551652	-7.015433 C
0.00000813	5123.	630546364.	11.6691248	0.00009481	-0.000295	0.3841477	-7.599112 C
0.00000875	5123.	585507338.	11.6731215	0.0001021	-0.000318	0.4130349	-8.182645 C
0.00000938	5123.	546473516.	11.6771277	0.0001095	-0.000341	0.4418266	-8.766031 C
0.00001000	5123.	512318921.	11.6811435	0.0001168	-0.000363	0.4705226	-9.349268 C
0.00001063	5123.	482182514.	11.6851689	0.0001242	-0.000386	0.4991227	-9.932357 C
0.00001125	5123.	455394596.	11.6892039	0.0001315	-0.000408	0.5276268	-10.515297 C

0.00001188	5123.	431426460.	11.6932486	0.0001389	-0.000431	0.5560347	-11.098087 C
0.00001250	5123.	409855137.	11.6973031	0.0001462	-0.000454	0.5843462	-11.680728 C
0.00001313	5123.	390338226.	11.7013673	0.0001536	-0.000476	0.6125611	-12.263217 C
0.00001375	5123.	372595579.	11.7054414	0.0001609	-0.000499	0.6406793	-12.845555 C
0.00001438	5123.	356395771.	11.7095253	0.0001683	-0.000522	0.6687005	-13.427742 C
0.00001500	5123.	341545947.	11.7136192	0.0001757	-0.000544	0.6966246	-14.009776 C
0.00001563	5123.	327884109.	11.7177231	0.0001831	-0.000567	0.7244515	-14.591657 C
0.00001625	5123.	315273182.	11.7218369	0.0001905	-0.000590	0.7521809	-15.173384 C
0.00001688	5123.	303596398.	11.7259609	0.0001979	-0.000612	0.7798126	-15.754958 C
0.00001750	5123.	292753669.	11.7300950	0.0002053	-0.000635	0.8073465	-16.336377 C
0.00001813	5123.	282658715.	11.7342392	0.0002127	-0.000657	0.8347823	-16.917640 C
0.00001875	5123.	273236758.	11.7383937	0.0002201	-0.000680	0.8621200	-17.498748 C
0.00001938	5123.	264422669.	11.7425585	0.0002275	-0.000702	0.8893592	-18.079700 C
0.00002000	5123.	256159461.	11.7467336	0.0002349	-0.000725	0.9164998	-18.660494 C
0.00002063	5123.	248397053.	11.7509029	0.0002424	-0.000748	0.9435417	-19.241131 C
0.00002125	5123.	241091257.	11.7550035	0.0002498	-0.000770	0.9704846	-19.821610 C
0.00002188	5123.	234202935.	11.7591142	0.0002572	-0.000793	0.9973283	-20.401930 C
0.00002250	5123.	227697298.	11.7631584	0.0002647	-0.000815	1.0240601	-20.982191 C
0.00002313	5259.	227435331.	11.7671977	0.0002721	-0.000838	1.0506892	-21.562318 C
0.00002375	5400.	227371798.	11.7712469	0.0002796	-0.000860	1.0772178	-22.142291 C
0.00002438	5541.	227308133.	11.7753059	0.0002870	-0.000883	1.1036457	-22.722110 C
0.00002563	5821.	227180403.	11.7834536	0.0003020	-0.000928	1.1561985	-23.881285 C
0.00002688	6102.	227052139.	11.7916413	0.0003169	-0.000973	1.2083463	-25.039838 C
0.00002813	6382.	226923335.	11.7998695	0.0003319	-0.001018	1.2600874	-26.197763 C
0.00002938	6662.	226793986.	11.8081384	0.0003469	-0.001063	1.3114203	-27.355057 C
0.00003063	6942.	226664087.	11.8164485	0.0003619	-0.001108	1.3623433	-28.511714 C
0.00003188	7221.	226533633.	11.8248001	0.0003769	-0.001153	1.4128549	-29.667730 C
0.00003313	7500.	226402618.	11.8331938	0.0003920	-0.001198	1.4629535	-30.823100 C
0.00003438	7778.	226271037.	11.8416299	0.0004071	-0.001243	1.5126373	-31.977818 C
0.00003563	8056.	226138885.	11.8501089	0.0004222	-0.001288	1.5619047	-33.131881 C
0.00003688	8334.	226006156.	11.8586311	0.0004373	-0.001333	1.6107541	-34.285281 C
0.00003813	8611.	225872845.	11.8671970	0.0004524	-0.001378	1.6591838	-35.438015 C
0.00003938	8888.	225738946.	11.8758071	0.0004676	-0.001422	1.7071919	-36.590077 C
0.00004063	9165.	225604453.	11.8844619	0.0004828	-0.001467	1.7547769	-37.741462 C
0.00004188	9442.	225469361.	11.8931617	0.0004980	-0.001512	1.8019368	-38.892165 C
0.00004313	9718.	225333663.	11.9021103	0.0005133	-0.001557	1.8486700	-40.042179 C
0.00004438	9993.	225197354.	11.9109068	0.0005285	-0.001601	1.8949747	-41.191499 C
0.00004563	10268.	225060427.	11.9197498	0.0005438	-0.001646	1.9408490	-42.340121 C
0.00004688	10543.	224922876.	11.9286398	0.0005592	-0.001691	1.9862911	-43.488036 C
0.00004813	10818.	224784695.	11.9375773	0.0005745	-0.001736	2.0312991	-44.635242 C
0.00004938	11092.	224645877.	11.9465628	0.0005899	-0.001780	2.0758711	-45.781730 C
0.00005063	11366.	224506417.	11.9555969	0.0006053	-0.001825	2.1200052	-46.927495 C
0.00005188	11639.	224366306.	11.9646800	0.0006207	-0.001869	2.1636996	-48.072531 C

0.00005313	11912.	224225540.	11.9738128	0.0006361	-0.001914	2.2069521	-49.216832 C
0.00005438	12185.	224084109.	11.9829958	0.0006516	-0.001958	2.2497609	-50.360392 C
0.00005563	12457.	223942009.	11.9922294	0.0006671	-0.002003	2.2921240	-51.503204 C
0.00005688	12729.	223799231.	12.0015144	0.0006826	-0.002047	2.3340392	-52.645262 C
0.00005813	13000.	223655769.	12.0108513	0.0006981	-0.002092	2.3755047	-53.786559 C
0.00005938	13271.	223511614.	12.0202407	0.0007137	-0.002136	2.4165182	-54.927088 C
0.00006063	13542.	223366761.	12.0296831	0.0007293	-0.002181	2.4570776	-56.066843 C
0.00006188	13812.	223221200.	12.0391793	0.0007449	-0.002225	2.4971809	-57.205816 C
0.00006313	14082.	223074925.	12.0487298	0.0007606	-0.002269	2.5368258	-58.344002 C
0.00006438	14351.	222927927.	12.0583352	0.0007763	-0.002314	2.5760102	-59.481392 C
0.00006563	14615.	222701531.	12.0665714	0.0007919	-0.002358	2.6144991	-60.000000 CY
0.00006688	14857.	222160930.	12.0690855	0.0008071	-0.002403	2.6515720	-60.000000 CY
0.00006813	15074.	221275452.	12.0654110	0.0008220	-0.002448	2.6870932	-60.000000 CY
0.00006938	15288.	220361158.	12.0609316	0.0008367	-0.002493	2.7220199	-60.000000 CY
0.00007063	15499.	219452776.	12.0565084	0.0008515	-0.002539	2.7564583	-60.000000 CY
0.00007188	15692.	218323180.	12.0472921	0.0008659	-0.002584	2.7896431	-60.000000 CY
0.00007313	15844.	216665099.	12.0276354	0.0008795	-0.002630	2.8204959	-60.000000 CY
0.00007438	15964.	214646019.	12.0000930	0.0008925	-0.002677	2.8495427	-60.000000 CY
0.00007938	16413.	206783776.	11.8924585	0.0009440	-0.002866	2.9610094	-60.000000 CY
0.00008438	16860.	199820523.	11.8004957	0.0009957	-0.003054	3.0673167	-60.000000 CY
0.00008938	17303.	193600147.	11.7198032	0.0010475	-0.003243	3.1680163	-60.000000 CY
0.00009438	17699.	187537650.	11.6347823	0.0010980	-0.003432	3.2607958	-60.000000 CY
0.00009938	17902.	180145661.	11.5040280	0.0011432	-0.003627	3.3388576	-60.000000 CY
0.0001044	18078.	173198921.	11.3805044	0.0011878	-0.003822	3.4115999	-60.000000 CY
0.0001094	18252.	166872112.	11.2695088	0.0012326	-0.004017	3.4802848	-60.000000 CY
0.0001144	18422.	161067540.	11.1635101	0.0012768	-0.004213	3.5440065	-60.000000 CY
0.0001194	18591.	155737464.	11.0680857	0.0013213	-0.004409	3.6038210	-60.000000 CY
0.0001244	18759.	150824426.	10.9821568	0.0013659	-0.004604	3.6596767	-60.000000 CY
0.0001294	18925.	146279843.	10.9044195	0.0014108	-0.004799	3.7115202	-60.000000 CY
0.0001344	19090.	142062354.	10.8338818	0.0014558	-0.004994	3.7592963	-60.000000 CY
0.0001394	19252.	138131966.	10.7677638	0.0015008	-0.005189	3.8026646	-60.000000 CY
0.0001444	19412.	134458779.	10.7040007	0.0015454	-0.005385	3.8416389	-60.000000 CY
0.0001494	19566.	130989121.	10.6470174	0.0015904	-0.005580	3.8762907	-60.000000 CY
0.0001544	19691.	127551423.	10.5829910	0.0016337	-0.005776	3.9057325	-60.000000 CY
0.0001594	19768.	124035596.	10.5068892	0.0016745	-0.005975	3.9297450	-60.000000 CY
0.0001644	19819.	120569938.	10.4266357	0.0017139	-0.006176	3.9495479	-60.000000 CY
0.0001694	19864.	117275984.	10.3494024	0.0017529	-0.006377	3.9660259	-60.000000 CY
0.0001744	19906.	114157714.	10.2757125	0.0017918	-0.006578	3.9791182	-60.000000 CY
0.0001794	19947.	111203090.	10.2037961	0.0018303	-0.006780	3.9889782	-60.000000 CY
0.0001844	19987.	108404702.	10.1363885	0.0018689	-0.006981	3.9957381	-60.000000 CY
0.0001894	20026.	105750074.	10.0739956	0.0019078	-0.007182	3.9993550	-60.000000 CY
0.0001944	20065.	103227536.	10.0147217	0.0019466	-0.007383	3.9956560	-60.000000 CY
0.0001994	20102.	100826965.	9.9609279	0.0019860	-0.007584	3.9978395	-60.000000 CY

0.0002044	20139.	98540246.	9.9097448	0.0020253	-0.007785	3.9999270	-60.000000 CY
0.0002094	20175.	96357628.	9.8610171	0.0020647	-0.007985	3.9940821	-60.000000 CY
0.0002144	20209.	94269723.	9.8159026	0.0021043	-0.008186	3.9982692	-60.000000 CY
0.0002194	20242.	92270728.	9.7700208	0.0021433	-0.008387	3.9999565	-60.000000 CY
0.0002244	20274.	90356443.	9.7272422	0.0021825	-0.008587	3.9926839	-60.000000 CY
0.0002294	20305.	88522954.	9.6870588	0.0022220	-0.008788	3.9972286	-60.000000 CY
0.0002344	20336.	86765449.	9.6484824	0.0022614	-0.008989	3.9996161	-60.000000 CY
0.0002394	20366.	85078271.	9.6138290	0.0023013	-0.009189	3.9959581	-60.000000 CY
0.0002444	20395.	83457004.	9.5804180	0.0023412	-0.009389	3.9940362	-60.000000 CY
0.0002494	20424.	81898967.	9.5492346	0.0023813	-0.009589	3.9978705	-60.000000 CY
0.0002544	20452.	80400389.	9.5187341	0.0024213	-0.009789	3.9997775	-60.000000 CY
0.0002594	20479.	78956801.	9.4910419	0.0024617	-0.009988	3.9951130	-60.000000 CY
0.0002644	20506.	77565450.	9.4666525	0.0025027	-0.010187	3.9925374	-60.000000 CY
0.0002694	20533.	76224359.	9.4422632	0.0025435	-0.010386	3.9967326	-60.000000 CY
0.0002744	20559.	74930763.	9.4192303	0.0025844	-0.010586	3.9992271	-60.000000 CY
0.0003044	20705.	68025154.	9.3006367	0.0028309	-0.011779	3.9999714	-60.000000 CY
0.0003344	20837.	62316594.	9.2124259	0.0030804	-0.012970	3.9998963	-60.000000 CYT
0.0003644	20954.	57507723.	9.1476765	0.0033332	-0.014157	3.9982255	-60.000000 CYT
0.0003944	21034.	53334388.	9.0797154	0.0035808	-0.015349	3.9878853	-60.000000 CYT
0.0004244	21067.	49641257.	8.9957010	0.0038176	-0.016552	3.9999839	60.0000000 CYT

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003 or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.	Max. Tens.
No.	kips	in-kip	Strain	Strain
1	0.000	20794.591	0.00300000	-0.01258598

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 Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	0.0000	20795.	0.0000	13516.	223380210.
1	0.75	0.0000	20795.	0.0000	15596.	218884892.
1	0.90	0.0000	20795.	0.0000	18715.	152103957.

Layering Correction Equivalent Depths of Soil & Rock Layers

	Top of	Equivalent				
	Layer	Top Depth	Same Layer	Layer is	FØ	F1
Layer	Below	Below	Type As	Rock or	Integral	Integral
No.	Pile Head	Grnd Surf	Layer	is Below	for Layer	for Layer
	ft	ft	Above	Rock Layer	lbs	lbs
1	10.0000	0.00	N.A.	No	0.00	1162.
2	10.9000	0.02418	No	No	1162.	127169.
3	13.4000	9.3835	No	No	128330.	270845.
4	20.9000	17.0213	Yes	No	399175.	929199.
5	31.9000	34.0194	No	No	1328375.	857194.
6	61.4000	51.4000	No	No	2185569.	0.00
7	73.9000	63.9000	No	No	0.00	0.00
8	104.4000	94.4000	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 = 0.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X	Deflect. y	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. p	Soil Spr. Es*H	Distrib. Lat. Load
feet	inches	in-lbs 	lbs	radians 	psi* 	lb-in^2	lb/inch	lb/inch	lb/inch
0.00	0.06342	-2.17E-06	0.00	-2.85E-04	0.00	1.19E+12	0.00	0.00	93.5755
0.4600	0.06185	1426.	529.5819	-2.85E-04	0.00	1.19E+12	0.00	0.00	98.3020
0.9200	0.06028	5847.	1090.	-2.85E-04	0.00	1.19E+12	0.00	0.00	104.6040
1.3800	0.05871	13455.	1684.	-2.85E-04	0.00	1.19E+12	0.00	0.00	110.9060
1.8400	0.05714	24442.	2314.	-2.85E-04	0.00	1.19E+12	0.00	0.00	117.2080
2.3000	0.05557	39001.	2978.	-2.84E-04	0.00	1.19E+12	0.00	0.00	123.5100
2.7600	0.05400	57324.	3678.	-2.84E-04	0.00	1.19E+12	0.00	0.00	129.8120
3.2200	0.05243	79602.	4412.	-2.84E-04	0.00	1.19E+12	0.00	0.00	136.1140
3.6800	0.05087	106027.	5180.	-2.83E-04	0.00	1.19E+12	0.00	0.00	142.4160
4.1400	0.04930	136792.	5984.	-2.83E-04	0.00	1.19E+12	0.00	0.00	148.7180
4.6000	0.04774	172088.	6822.	-2.82E-04	0.00	1.19E+12	0.00	0.00	155.0200
5.0600	0.04619	212108.	7695.	-2.81E-04	0.00	1.19E+12	0.00	0.00	161.3220
5.5200	0.04464	257043.	8603.	-2.80E-04	0.00	1.19E+12	0.00	0.00	167.6240
5.9800	0.04310	307086.	9546.	-2.79E-04	0.00	1.19E+12	0.00	0.00	173.9260
6.4400	0.04156	362428.	10523.	-2.77E-04	0.00	1.19E+12	0.00	0.00	180.2280
6.9000	0.04003	423262.	11535.	-2.75E-04	0.00	1.19E+12	0.00	0.00	186.5300
7.3600	0.03852	489780.	12583.	-2.73E-04	0.00	1.19E+12	0.00	0.00	192.8320
7.8200	0.03702	562174.	13664.	-2.71E-04	0.00	1.19E+12	0.00	0.00	199.1340
8.2800	0.03553	640635.	14781.	-2.68E-04	0.00	1.19E+12	0.00	0.00	205.4360
8.7400	0.03406	725355.	15932.	-2.65E-04	0.00	1.19E+12	0.00	0.00	211.7380
9.2000	0.03260	816528.	17119.	-2.61E-04	0.00	1.19E+12	0.00	0.00	218.0400
9.6600	0.03117	914344.	18340.	-2.57E-04	0.00	1.19E+12	0.00	0.00	224.3420
10.1200	0.02976	1018996.	19100.	-2.53E-04	0.00	1.19E+12	-3.482	645.8400	54.5807
10.5800	0.02838	1125205.	19196.	-2.48E-04	0.00	1.19E+12	-16.050	3122.	0.00
11.0400	0.02703	1230926.	17486.	-2.42E-04	0.00	1.19E+12	-603.592	123273.	0.00
11.5000	0.02571	1318254.	14140.	-2.36E-04	0.00	1.19E+12	-608.830	130738.	0.00

11.9600	0.02442	1387031.	10766.	-2.30E-04	0.00	1.19E+12	-613.652	138724.	0.00
12.4200	0.02317	1437110.	7366.	-2.24E-04	0.00	1.19E+12	-618.058	147274.	0.00
12.8800	0.02195	1468356.	3944.	-2.17E-04	0.00	1.19E+12	-622.051	156434.	0.00
13.3400	0.02077	1480648.	500.1169	-2.10E-04	0.00	1.19E+12	-625.630	166254.	0.00
13.8000	0.01963	1473877.	-1323.	-2.03E-04	0.00	1.19E+12	-34.915	9817.	0.00
14.2600	0.01853	1466043.	-1521.	-1.96E-04	0.00	1.19E+12	-36.944	11005.	0.00
14.7200	0.01747	1457082.	-1730.	-1.89E-04	0.00	1.19E+12	-38.583	12193.	0.00
15.1800	0.01644	1446946.	-1946.	-1.83E-04	0.00	1.19E+12	-39.854	13382.	0.00
15.6400	0.01545	1435595.	-2169.	-1.76E-04	0.00	1.19E+12	-40.781	14570.	0.00
16.1000	0.01450	1423002.	-2396.	-1.69E-04	0.00	1.19E+12	-41.388	15758.	0.00
16.5600	0.01358	1409148.	-2625.	-1.63E-04	0.00	1.19E+12	-41.696	16947.	0.00
17.0200	0.01270	1394023.	-2855.	-1.56E-04	0.00	1.19E+12	-41.729	18135.	0.00
17.4800	0.01186	1377627.	-3085.	-1.50E-04	0.00	1.19E+12	-41.509	19324.	0.00
17.9400	0.01105	1359966.	-3313.	-1.43E-04	0.00	1.19E+12	-41.057	20512.	0.00
18.4000	0.01028	1341054.	-3538.	-1.37E-04	0.00	1.19E+12	-40.394	21700.	0.00
18.8600	0.00954	1320911.	-3758.	-1.31E-04	0.00	1.19E+12	-39.540	22889.	0.00
19.3200	0.00883	1299563.	-3974.	-1.25E-04	0.00	1.19E+12	-38.517	24077.	0.00
19.7800	0.00816	1277042.	-4183.	-1.19E-04	0.00	1.19E+12	-37.342	25265.	0.00
20.2400	0.00752	1253383.	-4386.	-1.13E-04	0.00	1.19E+12	-36.035	26454.	0.00
20.7000	0.00691	1228626.	-4581.	-1.07E-04	0.00	1.19E+12	-34.615	27642.	0.00
21.1600	0.00634	1202814.	-4767.	-1.01E-04	0.00	1.19E+12	-33.097	28830.	0.00
21.6200	0.00579	1175994.	-4946.	-9.59E-05	0.00	1.19E+12	-31.500	30019.	0.00
22.0800	0.00528	1148213.	-5115.	-9.05E-05	0.00	1.19E+12	-29.840	31207.	0.00
22.5400	0.00479	1119524.	-5275.	-8.52E-05	0.00	1.19E+12	-28.131	32395.	0.00
23.0000	0.00434	1089977.	-5425.	-8.01E-05	0.00	1.19E+12	-26.388	33584.	0.00
23.4600	0.00391	1059627.	-5566.	-7.51E-05	0.00	1.19E+12	-24.625	34772.	0.00
23.9200	0.00351	1028526.	-5697.	-7.02E-05	0.00	1.19E+12	-22.855	35960.	0.00
24.3800	0.00313	996728.	-5819.	-6.55E-05	0.00	1.19E+12	-21.089	37149.	0.00
24.8400	0.00278	964289.	-5930.	-6.10E-05	0.00	1.19E+12	-19.341	38337.	0.00
25.3000	0.00246	931259.	-6032.	-5.66E-05	0.00	1.19E+12	-17.619	39525.	0.00
25.7600	0.00216	897693.	-6125.	-5.23E-05	0.00	1.19E+12	-15.934	40714.	0.00
26.2200	0.00188	863642.	-6208.	-4.82E-05	0.00	1.19E+12	-14.295	41902.	0.00
26.6800	0.00163	829154.	-6283.	-4.43E-05	0.00	1.19E+12	-12.709	43090.	0.00
27.1400	0.00139	794280.	-6349.	-4.05E-05	0.00	1.19E+12	-11.184	44279.	0.00
27.6000	0.00118	759065.	-6406.	-3.69E-05	0.00	1.19E+12	-9.726	45467.	0.00
28.0600	9.87E-04	723553.	-6456.	-3.35E-05	0.00	1.19E+12	-8.340	46655.	0.00
28.5200	8.11E-04	687787.	-6499.	-3.02E-05	0.00	1.19E+12	-7.032	47844.	0.00
28.9800	6.53E-04	651808.	-6534.		0.00	1.19E+12	-5.805	49032.	0.00
29.4400	5.12E-04	615651.	-6563.		0.00	1.19E+12	-4.661	50221.	0.00
29.9000	3.87E-04	579352.	-6586.		0.00	1.19E+12	-3.604	51409.	0.00
30.3600	2.77E-04	542943.	-6603.	-1.88E-05	0.00	1.19E+12	-2.635	52597.	0.00
30.8200	1.80E-04	506454.	-6615.	-1.63E-05	0.00	1.19E+12	-1.754	53786.	0.00
31.2800	9.64E-05	469912.	-6623.	-1.41E-05	0.00	1.19E+12	-0.960	54974.	0.00

31.7400	2.49E-05	433340.	-6626.	-1.20E-05	0.00	1.19E+12	-0.253	56162.	0.00
32.2000	-3.56E-05	396761.	-6597 .	-1.20E-05	0.00	1.19E+12 1.19E+12	10.7017	1661195.	0.00
32.6600	-8.58E-05	360508.	-6496.	-8.27E-06	0.00	1.19E+12 1.19E+12	26.0454	1675315.	0.00
33.1200	-1.27E-04	325048.	-6317.	-6.68E-06	0.00	1.19E+12	38.8179	1689439.	0.00
33.5800	-1.60E-04	290771.	-6074.	-5.25E-06	0.00	1.19E+12	49.2290	1703567.	0.00
34.0400	-1.85E-04	257994.	-5779.	-3.97E-06	0.00	1.19E+12	57.4881	1717699.	0.00
34.5000	-2.03E-04	226969.	-5444.	-2.85E-06	0.00	1.19E+12	63.8017	1731835.	0.00
34.9600	-2.16E-04	197888.	-5080.	-1.86E-06	0.00	1.19E+12	68.3705	1745975.	0.00
35.4200	-2.24E-04	170890.	-4695.	-1.00E-06	0.00	1.19E+12	71.0723	1752344.	0.00
35.8800	-2.27E-04	146058.	-4299.	-2.67E-07	0.00	1.19E+12	72.1340	1752344.	0.00
36.3400	-2.27E-04	123424.	-3902.	3.59E-07	0.00	1.19E+12	72.0072	1752344.	0.00
36.8000	-2.23E-04	102984.	-3507.	8.85E-07	0.00	1.19E+12	70.8760	1752344.	0.00
37.2600	-2.17E-04	84703.	-3122.	1.32E-06	0.00	1.19E+12	68.9068	1752344.	0.00
37.7200	-2.09E-04	68522.	-2748.	1.68E-06	0.00	1.19E+12	66.2483	1752344.	0.00
38.1800	-1.99E-04	54360.	-2392.	1.96E-06	0.00	1.19E+12	63.0322	1752344.	0.00
38.6400	-1.87E-04	42118.	-2054.	2.19E-06	0.00	1.19E+12	59.3737	1752344.	0.00
39.1000	-1.74E-04	31686.	-1737.	2.36E-06	0.00	1.19E+12	55.3725	1752344.	0.00
39.5600	-1.61E-04	22940.	-1443.	2.48E-06	0.00	1.19E+12	51.1135	1752344.	0.00
40.0200	-1.47E-04	15753.	-1173.	2.57E-06	0.00	1.19E+12	46.6678	1752344.	0.00
40.4800	-1.33E-04	9987.	-928.366	2.63E-06	0.00	1.19E+12	42.0939	1752344.	0.00
40.9400	-1.18E-04	5503.	-708.856	2.67E-06	0.00	1.19E+12	37.4387	1752344.	0.00
41.4000	-1.03E-04	2161.	-515.167	2.69E-06	0.00	1.19E+12	32.7387	1752344.	0.00
41.8600	-8.83E-05	-184.059	-347.469	2.69E-06	0.00	1.19E+12	28.0212	1752344.	0.00
42.3200	-7.34E-05	-1675.	-205.809	2.69E-06	0.00	1.19E+12	23.3051	1752344.	0.00
42.7800	-5.86E-05	-2456.	-90.143	2.68E-06	0.00	1.19E+12	18.6027	1752344.	0.00
43.2400	-4.38E-05	-2670.	-0.380	2.67E-06	0.00	1.19E+12	13.9203	1752344.	0.00
43.7000	-2.92E-05	-2460.	63.5968	2.65E-06	0.00	1.19E+12	9.2596	1752344.	0.00
44.1600	-1.45E-05	-1968.	101.9015	2.64E-06	0.00	1.19E+12	4.6189	1752344.	0.00
44.6200	1.81E-08	-1335.	114.6338	2.64E-06	0.00	1.19E+12	-0.00574	1752344.	0.00
45.0800	1.46E-05	-702.695	101.8681	2.63E-06	0.00	1.19E+12	-4.620	1752344.	0.00
45.5400	2.91E-05	-210.763	63.6500	2.63E-06	0.00	1.19E+12	-9.228	1752344.	0.00
46.0000	4.36E-05	0.00	0.00	2.63E-06	0.00	1.19E+12	-13.834	876172.	0.00
.0.000		3.30	0.00	03_ 00	0.00		±3.03+	0,01,2.	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.

Pile-head deflection 0.06342248 inches Computed slope at pile head = -0.0002847 radians Maximum bending moment = 1480648. inch-lbs Maximum shear force 19196. lbs Depth of maximum bending moment = 13.34000000 feet below pile head Depth of maximum shear force = 10.58000000 feet below pile head Number of iterations 17 Number of zero deflection points = 2 Pile deflection at ground = 0.03013137 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 0. lbs

Pile	Pile Head	Maximum	Maximum
Length	Deflection	Moment	Shear
feet	inches	ln-lbs	lbs
46.00000	0.06342248	1480648.	19196.
43.70000	0.06586029	1452458.	19214.
41.40000	0.07074260	1501438.	19232.
39.10000	0.06378739	1466723.	19208.
36.80000	0.06911295	1479069.	19238.
34.50000	0.07694671	1469058.	19232.
32.20000	0.09602508	1438153.	19233.
29.90000	0.13143305	1442418.	19243.
27.60000	0.16469589	1429825.	19239.
25.30000	0.26706248	1425912.	19239.
23.00000	0.38784765	1397077.	19248.
20.70000	0.82440480	1356208.	19245.
18.40000	2.65473428	1335407.	-26377.
16.10000	21.53523777	1271658.	-40663.

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

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.1394	-3.25E-06	0.00	-5.76E-04	0.00	1.19E+12	0.00	0.00	162.1160
0.4600	0.1363	2470.	912.4008	-5.76E-04	0.00	1.19E+12	0.00	0.00	168.4640
0.9200	0.1331	10073.	1866.	-5.76E-04	0.00	1.19E+12	0.00	0.00	176.9280
1.3800	0.1299	23067.	2866.	-5.76E-04	0.00	1.19E+12	0.00	0.00	185.3920
1.8400	0.1267	41710.	3912.	-5.76E-04	0.00	1.19E+12	0.00	0.00	193.8560
2.3000	0.1235	66260.	5006.	-5.75E-04	0.00	1.19E+12	0.00	0.00	202.3200
2.7600	0.1204	96975.	6146.	-5.75E-04	0.00	1.19E+12	0.00	0.00	210.7840
3.2200	0.1172	134112.	7333.	-5.75E-04	0.00	1.19E+12	0.00	0.00	219.2480
3.6800	0.1140	177930.	8567.	-5.74E-04	0.00	1.19E+12	0.00	0.00	227.7120
4.1400	0.1109	228687.	9847.	-5.73E-04	0.00	1.19E+12	0.00	0.00	236.1760
4.6000	0.1077	286639.	11174.	-5.72E-04	0.00	1.19E+12	0.00	0.00	244.6400
5.0600	0.1045	352046.	12548.	-5.70E-04	0.00	1.19E+12	0.00	0.00	253.1040
5.5200	0.1014	425166.	13968.	-5.68E-04	0.00	1.19E+12	0.00	0.00	261.5680
5.9800	0.09827	506255.	15435.	-5.66E-04	0.00	1.19E+12	0.00	0.00	270.0320
6.4400	0.09515	595572.	16949.	-5.64E-04	0.00	1.19E+12	0.00	0.00	278.4960
6.9000	0.09204	693376.	18510.	-5.61E-04	0.00	1.19E+12	0.00	0.00	286.9600
7.3600	0.08896	799923.	20117.	-5.57E-04	0.00	1.19E+12	0.00	0.00	295.4240
7.8200	0.08589	915471.	21771.	-5.53E-04	0.00	1.19E+12	0.00	0.00	303.8880
8.2800	0.08285	1040280.	23472.	-5.49E-04	0.00	1.19E+12	0.00	0.00	312.3520
8.7400	0.07983	1174605.	25220.	-5.44E-04	0.00	1.19E+12	0.00	0.00	320.8160
9.2000	0.07685	1318707.	27014.	-5.38E-04	0.00	1.19E+12	0.00	0.00	329.2800
9.6600	0.07390	1472841.	28855.	-5.31E-04	0.00	1.19E+12	0.00	0.00	337.7440
10.1200	0.07098	1637267.	29994.	-5.24E-04	0.00	1.18E+12	-6.972	542.1621	82.0189
10.5800	0.06811	1803979.	30105.	-5.16E-04	0.00	1.18E+12	-35.065	2842.	0.00
11.0400	0.06529	1969623.	27931.	-5.07E-04	0.00	1.18E+12	-752.421	63618.	0.00
11.5000	0.06251	2112340.	23756.	-4.98E-04	0.00	1.18E+12	-760.227	67130.	0.00
11.9600	0.05979	2231893.	19540.	-4.88E-04	0.00	1.18E+12	-767.572	70862.	0.00
12.4200	0.05713	2328058.	15284.	-4.77E-04	0.00	1.18E+12	-774.456	74830.	0.00

12.8800	0.05453	2400625.	10991.	-4.66E-04	0.00	1.18E+12	-780.877	79051.	0.00
13.3400	0.05199	2449398.	6664.	-4.55E-04	0.00	1.18E+12	-786.830	83546.	0.00
13.8000	0.04951	2474196.	4249.	-4.43E-04	0.00	1.18E+12	-88.047	9817.	0.00
14.2600	0.04710	2496311.	3747.	-4.31E-04	0.00	1.18E+12	-93.894	11005.	0.00
14.7200	0.04475	2515565.	3215.	-4.20E-04	0.00	1.18E+12	-98.843	12193.	0.00
15.1800	0.04246	2531808.	2658.	-4.08E-04	0.00	1.18E+12	-102.939	13382.	0.00
15.6400	0.04024	2544913.	2081.	-3.96E-04	0.00	1.18E+12	-106.223	14570.	0.00
16.1000	0.03809	2554783.	1488.	-3.84E-04	0.00	1.18E+12	-108.739	15758.	0.00
16.5600	0.03600	2561338.	882.5927	-3.72E-04	0.00	1.18E+12	-110.530	16947.	0.00
17.0200	0.03398	2564526.	269.4024	-3.60E-04	0.00	1.18E+12	-111.640	18135.	0.00
17.4800	0.03203	2564313.	-348.150	-3.48E-04	0.00	1.18E+12	-112.111	19324.	0.00
17.9400	0.03014	2560683.	-966.656	-3.36E-04	0.00	1.18E+12	-111.986	20512.	0.00
18.4000	0.02831	2553641.	-1583.	-3.24E-04	0.00	1.18E+12	-111.307	21700.	0.00
18.8600	0.02656	2543207.	-2194.	-3.12E-04	0.00	1.18E+12	-110.116	22889.	0.00
19.3200	0.02486	2529418.	-2797.	-3.01E-04	0.00	1.18E+12	-108.455	24077.	0.00
19.7800	0.02324	2512325.	-3390.	-2.89E-04	0.00	1.18E+12	-106.364	25265.	0.00
20.2400	0.02168	2491990.	-3971.	-2.77E-04	0.00	1.18E+12	-103.884	26454.	0.00
20.7000	0.02018	2468490.	-4536.	-2.65E-04	0.00	1.18E+12	-101.053	27642.	0.00
21.1600	0.01875	2441911.	-5085.	-2.54E-04	0.00	1.18E+12	-97.910	28830.	0.00
21.6200	0.01738	2412349.	-5616.	-2.43E-04	0.00	1.18E+12	-94.492	30019.	0.00
22.0800	0.01607	2379907.	-6128.	-2.31E-04	0.00	1.18E+12	-90.835	31207.	0.00
22.5400	0.01482	2344698.	-6619.	-2.20E-04	0.00	1.18E+12	-86.975	32395.	0.00
23.0000	0.01363	2306838.	-7088.	-2.10E-04	0.00	1.18E+12	-82.946	33584.	0.00
23.4600	0.01251	2266451.	-7534.	-1.99E-04	0.00	1.18E+12	-78.781	34772.	0.00
23.9200	0.01144	2223664.	-7957.	-1.88E-04	0.00	1.18E+12	-74.511	35960.	0.00
24.3800	0.01043	2178606.	-8356.	-1.78E-04	0.00	1.18E+12	-70.166	37149.	0.00
24.8400	0.00947	2131410.	-8732.	-1.68E-04	0.00	1.18E+12	-65.775	38337.	0.00
25.3000	0.00857	2082210.	-9082.	-1.58E-04	0.00	1.18E+12	-61.366	39525.	0.00
25.7600	0.00772	2031140.	-9409.	-1.49E-04	0.00	1.18E+12	-56.964	40714.	0.00
26.2200	0.00693	1978335.	-9711.	-1.39E-04	0.00	1.18E+12	-52.596	41902.	0.00
26.6800	0.00619	1923927.	-9990.	-1.30E-04	0.00	1.18E+12	-48.282	43090.	0.00
27.1400	0.00549	1868047.	-10245.	-1.21E-04	0.00	1.18E+12	-44.046	44279.	0.00
27.6000	0.00484	1810826.	-10476.	-1.13E-04	0.00	1.18E+12	-39.907	45467.	0.00
28.0600	0.00425	1752388.	-10686.	-1.05E-04	0.00	1.18E+12	-35.883	46655.	0.00
28.5200	0.00369	1692858.	-10873.	-9.65E-05	0.00	1.18E+12	-31.993	47844.	0.00
28.9800	0.00318	1632352.	-11039.	-8.87E-05	0.00	1.18E+12	-28.250	49032.	0.00
29.4400	0.00271	1570986.	-11185.	-8.13E-05	0.00	1.19E+12	-24.669	50221.	0.00
29.9000	0.00228	1508867.	-11312.	-7.41E-05	0.00	1.19E+12	-21.263	51409.	0.00
30.3600	0.00189	1446101.	-11420.	-6.72E-05	0.00	1.19E+12	-18.041	52597.	0.00
30.8200	0.00154	1382786.	-11512.	-6.06E-05	0.00	1.19E+12	-15.014	53786.	0.00
31.2800	0.00122	1319013.	-11587.	-5.44E-05	0.00	1.19E+12	-12.189	54974.	0.00
31.7400	9.41E-04	1254868.	-11647.	-4.84E-05	0.00	1.19E+12	-9.572	56162.	0.00
32.2000	6.90E-04	1190432.	-12246.	-4.27E-05	0.00	1.19E+12	-207.642	1661195.	0.00

32.6600	4.70E-04	1119669.	-13213.	-3.73E-05	0.00	1.19E+12	-142.550	1675315.	0.00
33.1200	2.78E-04	1044562.	-13841.	-3.23E-05	0.00	1.19E+12	-85.130	1689439.	0.00
33.5800	1.13E-04	966861.	-14173.	-2.76E-05	0.00	1.19E+12	-35.005	1703567.	0.00
34.0400	-2.65E-05	888094.	-14247.	-2.33E-05	0.00	1.19E+12	8.2415	1717699.	0.00
34.5000	-1.44E-04	809578.	-14100.	-1.93E-05	0.00	1.19E+12	45.0567	1731835.	0.00
34.9600	-2.40E-04	732434.	-13766.	-1.58E-05	0.00	1.19E+12	75.9052	1745975.	0.00
35.4200	-3.18E-04	657604.	-13278.	-1.25E-05	0.00	1.19E+12	100.8137	1752344.	0.00
35.8800	-3.78E-04	585845.	-12668.	-9.64E-06	0.00	1.19E+12	120.0940	1752344.	0.00
36.3400	-4.24E-04	517746.	-11965.	-7.08E-06	0.00	1.19E+12	134.6070	1752344.	0.00
36.8000	-4.56E-04	453748.	-11194.	-4.82E-06	0.00	1.19E+12	144.9068	1752344.	0.00
37.2600	-4.77E-04	394166.	-10376.	-2.86E-06	0.00	1.19E+12	151.5143	1752344.	0.00
37.7200	-4.88E-04	339200.	-9530.	-1.15E-06	0.00	1.19E+12	154.9142	1752344.	0.00
38.1800	-4.90E-04	288955.	-8673.	3.06E-07	0.00	1.19E+12	155.5538	1752344.	0.00
38.6400	-4.85E-04	243449.	-7819.	1.54E-06	0.00	1.19E+12	153.8421	1752344.	0.00
39.1000	-4.73E-04	202631.	-6980.	2.58E-06	0.00	1.19E+12	150.1492	1752344.	0.00
39.5600	-4.56E-04	166388.	-6166.	3.43E-06	0.00	1.19E+12	144.8075	1752344.	0.00
40.0200	-4.35E-04	134557.	-5385.	4.13E-06	0.00	1.19E+12	138.1118	1752344.	0.00
40.4800	-4.11E-04	106935.	-4644.	4.69E-06	0.00	1.19E+12	130.3211	1752344.	0.00
40.9400	-3.83E-04	83284.	-3949.	5.14E-06	0.00	1.19E+12	121.6602	1752344.	0.00
41.4000	-3.54E-04	63340.	-3303.	5.48E-06	0.00	1.19E+12	112.3216	1752344.	0.00
41.8600	-3.23E-04	46818.	-2710.	5.73E-06	0.00	1.19E+12	102.4676	1752344.	0.00
42.3200	-2.91E-04	33418.	-2173.	5.92E-06	0.00	1.19E+12	92.2325	1752344.	0.00
42.7800	-2.57E-04	22829.	-1693.	6.05E-06	0.00	1.19E+12	81.7256	1752344.	0.00
43.2400	-2.24E-04	14730.	-1271.	6.14E-06	0.00	1.19E+12	71.0328	1752344.	0.00
43.7000	-1.90E-04	8796.	-908.896	6.19E-06	0.00	1.19E+12	60.2202	1752344.	0.00
44.1600	-1.55E-04	4696.	-606.520	6.22E-06	0.00	1.19E+12	49.3361	1752344.	0.00
44.6200	-1.21E-04	2100.	-364.331	6.24E-06	0.00	1.19E+12	38.4137	1752344.	0.00
45.0800	-8.65E-05	673.7854	-182.481	6.24E-06	0.00	1.19E+12	27.4742	1752344.	0.00
45.5400	-5.21E-05	85.0667	-61.031	6.25E-06	0.00	1.19E+12	16.5292	1752344.	0.00
46.0000	-1.76E-05	0.00	0.00	6.25E-06	0.00	1.19E+12	5.5836	876172.	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 = 0.13943116 inches Computed slope at pile head = -0.0005760 radians Maximum bending moment = 2564526. inch-lbs Maximum shear force = 30105. lbs

Depth of maximum bending moment = 17.02000000 feet below pile head Depth of maximum shear force = 10.58000000 feet below pile head

Number of iterations = 15 Number of zero deflection points = 2

Pile deflection at ground = 0.07174305 inches

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

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs Moment = 0. in-lbs Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
46,00000	0.12042446	2564526	204.05
46.00000	0.13943116	2564526.	30105.
43.70000	0.14298450	2574988.	30147.
41.40000	0.15047938	2668974.	30187.
39.10000	0.14184199	2540322.	30156.
36.80000	0.15551390	2564582.	30199.
34.50000	0.18205333	2542395.	30192.
32.20000	0.23159767	2408101.	30200.
29.90000	0.31079310	2409317.	30218.
27.60000	0.40566403	2366366.	30213.
25.30000	0.67274191	2353587.	30211.
23.00000	1.11672853	2290190.	30224.
20.70000	2.51358362	2215343.	-35406.
18.40000	9.77727225	2160571.	-47227.

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

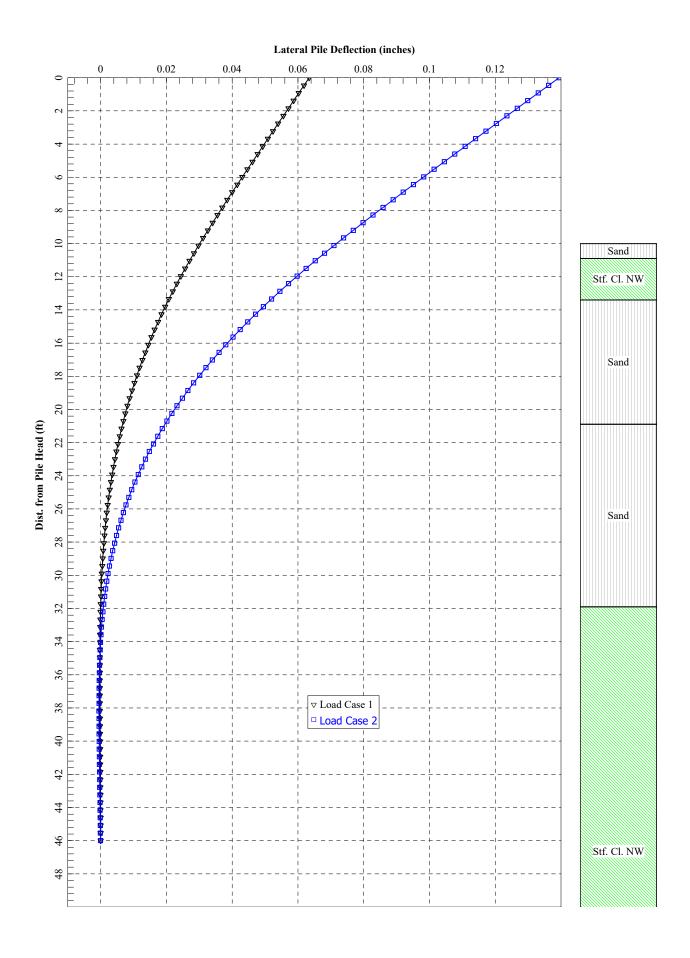
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Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection,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

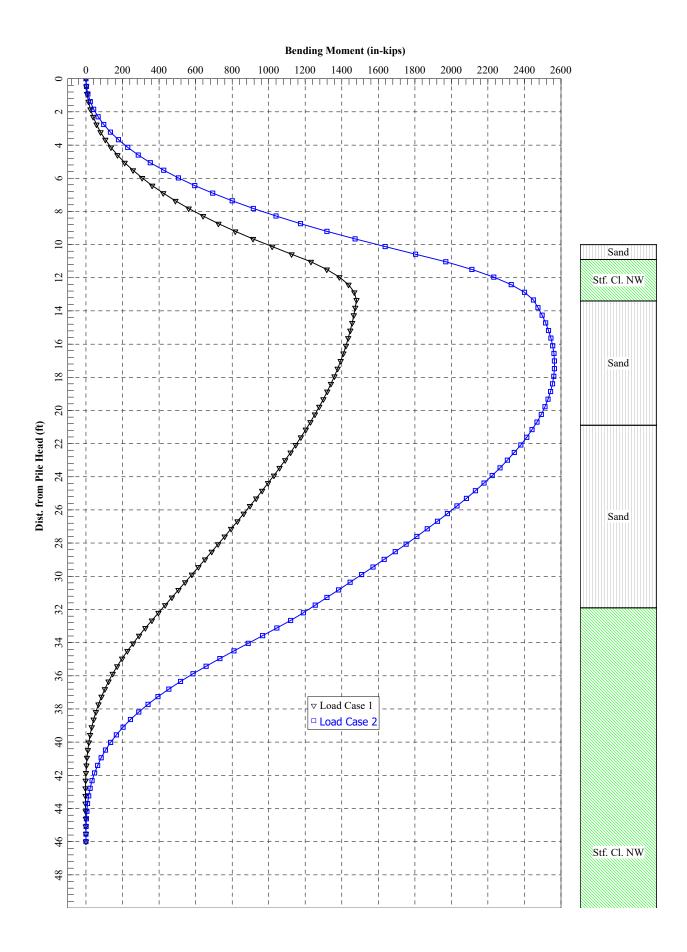
Load Load		Load		Axial	Pile-head	Pile-head	Max Shear	Max Moment
Case Type	Pile-head	Type	Pile-head	Loading	Deflection	Rotation	in Pile	in Pile
No. 1	Load 1	2	Load 2	lbs	inches	radians	lbs	in-lbs
					<u></u>			
1 V, lb	0.00	M, in-lb	0.00	0.00	0.06342	-2.85E-04	19196.	1480648.
2 V, 1b	0.00	M, in-lb	0.00	0.00	0.1394	-5.76E-04	30105.	2564526.

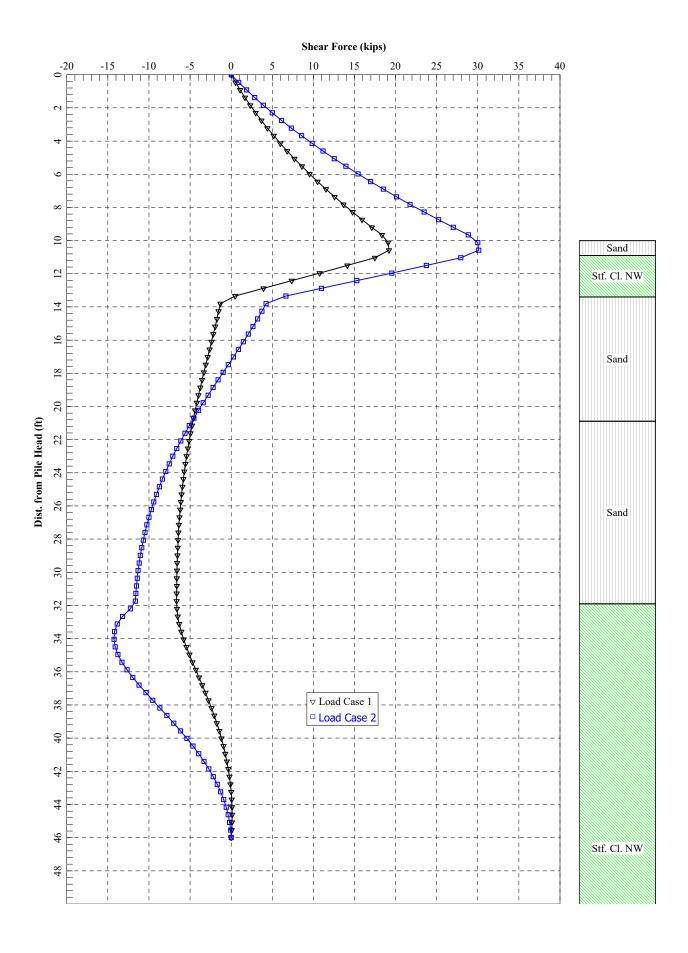
Maximum pile-head deflection = 0.1394311649 inches

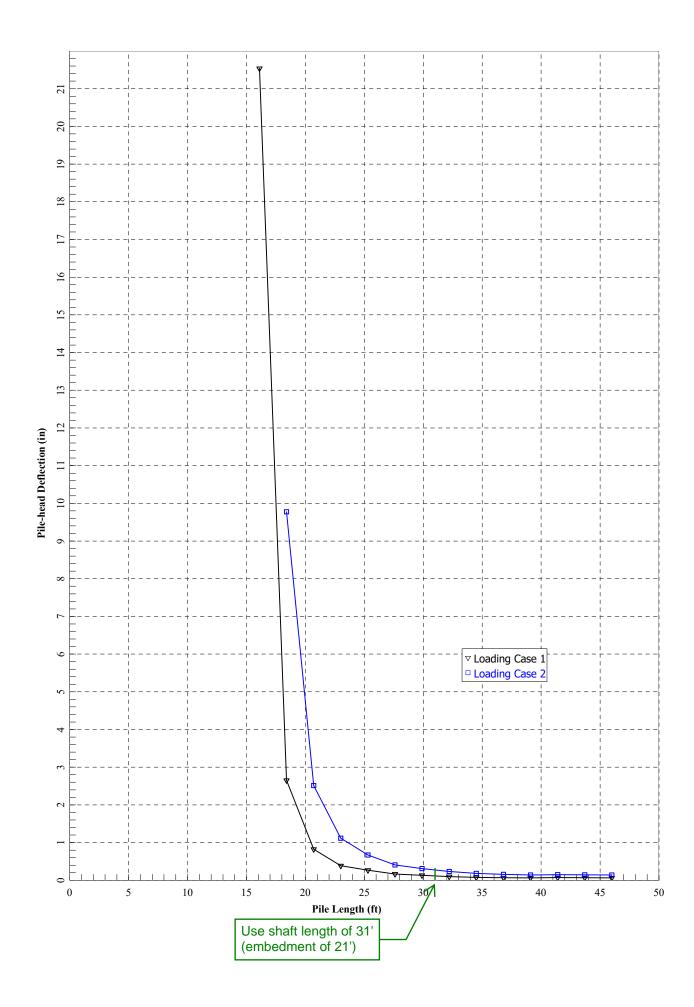
Maximum pile-head rotation = -0.0005759934 radians = -0.033002 deg.

The analysis ended normally.









Drilled Shaft Axial Capacity

Tangent Drilled Shaft Wall Design Summary

	60								
	Axial Analyses for Abutment Sections (Determined from Axial Analysis)								
		Shaft Diameter	Design Wall Height	Factored Axial Design	Minimum Shaft	Factored Axial Resistance	Minimum Shaft		
Abutment	Controlling Case	(ft.)	(ft.)	Load per Shaft (kips)	Length (ft)	per Shaft (kips)	Embedment (ft)		
Rear	Single Shaft without Group Efficiency Factors (Side Only)	4	22	122	40	128	18		
Forward	Single Shaft without Group Efficiency Factors (Side Only)	4	14	122	30	122	16		

The design wall height at the forward abutment is 1.5 feet taller for the axial analyses than the lateral analyses due to omitting the top 5 feet from axial resistance analyses, rather than the 3.5 feet used for the lateral analyses.

Minimum shaft embedment lengths are below the bottom of the exclusion zone for the design wall height (3.5 feet below finished grade at the rear abutment, 5 feet below finished grade at the forward abutment).

As the required shaft lengths for axial resistance are less than the total shaft lengths required from the lateral analyses, use total shaft lengths determined from the lateral analyses for design.

	Values for Design							
Ab. 1	Controlling Coo	Shaft Diameter	Design Wall Height	Factored Axial Design Load per Shaft (kips)	Minimum Shaft Length (ft)	Factored Axial Resistance	Minimum Shaft Embedment (ft)	
Abutment	Controlling Case	(ft.)	(ft.)	Load per Shart (kips)	Length (It)	per Shaft (kips)	Embeament (11)	
Rear	Depth from Lateral Analysis	4	22	122	58	255	36	
Forward	Depth from Lateral Analysis	4	14	122	40	177	26	

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Rear Abutment

Project:CUY-17-13.50Computed By:AKBDate:7/9/2025Structure:Rear AbutmentChecked By:DMVDate:7/12/2025

4' Diameter Drilled Shaft Axial Loading Analyses (Single Shaft with Group Efficiency Factors)

Axial loading calculations were performed using SHAFT software in accordance with the methods in AASHTO LRFD Article 10.8, per guidance in the ODOT GDM Sections 1306 and 1505. Group Efficiency Factors as determined from AASHTO LRFD Articles 10.7.3.9 (cohesive soils) and 10.8.3.6.3 (granular soils) were applied to the resistance values from SHAFT.

Depths are referenced to the elevation of the top of the wall. As the soil within the uppermost 5 feet of the bottom of the wall is comprised of granular soils, the side resistance was only excluded to the frost depth (3.5 feet below final grade) in the shaft resistance calculations.

Shaft Diameter (D)
Individual Shaft Perimeter
Individual Shaft End Area
Shaft Spacing
Top of Shaft El.
Design Bottom of Wall El.

12.57 ft²
4.17 ft
712.0 ft
690.0 ft

ft

12.57

1

1.04 diameters

Design Bottom of Wall El. η_{cohesive}

ft Final grade - 3.5 feet for frost depth considerations

Group Efficiency Factor for cohesive soils using a spacing of 1.04 diameters per AASHTO LRFD 10.7.3.9 with the pile

 η_{granular}

cap not in firm contact with the ground and stiff surface soil

O.8 Group Efficiency Factor for granular soils using a spacing of 1.04 diameters per AASHTO LRFD 10.8.3.6.3 with a single row of shafts

 $\begin{aligned} &\phi_{\text{side cohesive}} \\ &\phi_{\text{tip cohesive}} \\ &\phi_{\text{side granular}} \end{aligned}$

0.45 0.4 0.55 0.5

AASHTO LRFD Table 10.5.5.2.4-1

 $\phi_{\text{tip granular}}$ $\phi_{\text{side cohesive}} * \eta_{\text{cohesive}}$

 $\phi_{\text{tip cohesive}} * \eta_{\text{cohesive}}$

 $\begin{array}{l} {\phi_{\text{side granular}}}^* \eta_{\text{granular}} \\ {\phi_{\text{tip granular}}}^* \eta_{\text{granular}} \end{array}$

0.45 0.4 0.44 0.4

Used for input into SHAFT

 $Q_U = Q_S + Q_B$ unfactored total resistance

 Q_S = unfactored side resistance Q_B = unfactored end bearing

Soil Profile (Referenced to Top of Wall)

			Top Depth	Bottom
Layer No.	Top El.	Bottom El.	(ft)	Depth (ft)
Item 203	712.0	703.0	0	9
2	703.0	687.6	9	24.4
3	687.6	674.6	24.4	37.4
4	674.6	654.6	37.4	57.4
5	654.6	643.8	57.4	68.2
6	643.8	604.6	68.2	107.4
7	604.6	585.6	107.4	126.4

		Output from SHAFT				Single Shaft Resistances					
				Factored	Factored			Factored	Factored		Factored Q _U
Elevation (ft)	Depth (ft)	Q _s (tons)	Q _B (tons)	Q _s (tons)	Q _B (tons)	Q _s (kips)	Q _B (kips)	Q _s (kips)	Q _B (kips)	Q _∪ (kips)	(kips)
689	23	9.3	96.6	4.1	38.6	18.6	193.2	8.2	77.3	212	85
688	24	18.7	100.0	8.2	40.0	37.4	200.0	16.5	80.0	237	96
687	25	24.1	103.4	10.6	41.4	48.1	206.8	21.2	82.7	255	104
686	26	29.5	106.8	13.0	42.7	59.0	213.6	26.0	85.4	273	111
685	27	35.1	110.2	15.4	44.1	70.2	220.3	30.9	88.1	291	119
684	28	40.8	113.6	17.9	45.4	81.5	227.1	35.9	90.9	309	127
683	29	46.6	117.0	20.5	46.8	93.2	233.9	41.0	93.6	327	135
682	30	52.5	120.5	23.1	48.2	105.0	241.0	46.2	96.4	346	143
681	31	58.5	123.6	25.8	49.4	117.1	247.2	51.5	98.9	364	150
680	32	64.7	126.1	28.5	50.5	129.4	252.2	56.9	100.9	382	158
679	33	71.0	128.0	31.2	51.2	141.9	256.1	62.4	102.4	398	165
678	34	77.3	129.2	34.0	51.7	154.7	258.5	68.1	103.4	413	171
677	35	83.8	129.9	36.9	51.9	167.7	259.7	73.8	103.9	427	178
676	36	90.4	130.1	39.8	52.0	180.9	260.2	79.6	104.1	441	184
675	37	97.2	130.1	42.8	52.0	194.3	260.2	85.5	104.1	455	190
674	38	105.1	130.1	46.3	52.0	210.2	260.2	92.7	104.1	470	197
673	39	113.1	130.1	49.9	52.0	226.1	260.2	99.8	104.1	486	204
672	40	121.0	130.1	53.5	52.0	242.0	260.2	107.0	104.1	502	211
671	41	129.0	130.1	57.1	52.0	257.9	260.2	114.1	104.1	518	218
670	42	136.9	130.1	60.6	52.0	273.8	260.2	121.3	104.1	534	225
669	43	144.9	130.1	64.2	52.0	289.7	260.2	128.4	104.1	550	233
668	44	152.8	130.1	67.8	52.0	305.6	260.2	135.6	104.1	566	240
667	45	160.8	130.1	71.4	52.0	321.5	260.2	142.7	104.1	582	247
666	46	168.7	130.1	75.0	52.0	337.4	260.2	149.9	104.1	598	254
665	47	176.7	130.1	78.5	52.0	353.3	260.2	157.1	104.1	613	261
664	48	184.6	130.1	82.1	52.0	369.2	260.2	164.2	104.1	629	268
663	49	192.6	130.1	85.7	52.0	385.1	260.2	171.4	104.1	645	275
662	50	200.5	124.1	89.3	49.7	401.0	248.3	178.5	99.3	649	278
661	51	208.5	117.5	92.8	47.0	416.9	235.1	185.7	94.0	652	280
660	52	216.4	110.3	96.4	44.1	432.8	220.6	192.8	88.2	653	281
659	53	224.4	102.4	100.0	41.0	448.7	204.7	200.0	81.9	653	282
658	54	232.3	96.4	103.6	38.6	464.6	192.9	207.1	77.1	657	284
657	55	240.3	92.5	107.1	37.0	480.5	184.9	214.3	74.0	665	288
656	56	248.2	90.5	110.7	36.2	496.4	181.0	221.4	72.4	677	294
655	57	256.2	90.5	114.3	36.2	512.3	181.0	228.6	72.4	693	301
654	58	261.7	90.5	116.8	36.2	523.4	181.0	233.6	72.4	704	306
<u> </u>											7

Bottom of drilled shaft based on the lateral analyses

SHAFT Version 2023.9.05

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VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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This model was prepared by: abaratta

Path to file locations : c:\pwworking\east01\d4381066\
Name of input data file : CUY-17 Rear Abt. B-003 Group.sf9d
Name of output file : CUY-17 Rear Abt. B-003 Group.sf9p
Name of runtime file : CUY-17 Rear Abt. B-003 Group.sf9r

Time and Date of Analysis

Date: July 10, 2025 Time: 14:25:32

CUY-17-13.50 Rear Abt. w/ Group Efficiency Factors

PROPOSED DEPTH = 58.0 FT

NUMBER OF LAYERS = 7

WATER TABLE DEPTH = 22.0 FT.

SOIL INFORMATION

LAYER NO 1----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 6.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 2.500E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 0.000E+00	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 8.700E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 2.500E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 9.000E+00	

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

LAYER NO 2---SAND

AT THE TOP

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD		
PRECONSOLIDATION STRESS EXPONENT - M	= 8.000E-01	
OVER CONSOLIDATION RATIO - OCR	= 7.300E+00	(*)
INTERNAL FRICTION ANGLE, DEG.	= 3.300E+01	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 1.400E+01	
SOIL UNIT WEIGHT, LB/CU FT	= 1.220E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 9.000E+00	

AT THE BOTTOM

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD PRECONSOLIDATION STRESS EXPONENT - M OVER CONSOLIDATION RATIO - OCR INTERNAL FRICTION ANGLE, DEG. BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 8.000E-01 = 2.899E+00 = 3.300E+01 = 1.400E+01 = 1.220E+02 = No Limit = 2.440E+01	(*)
LRFD RESISTANCE FACTOR (SIDE FRICTION) LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 4.400E-01 = 4.000E-01	

LAYER NO 3----SAND

AT THE TOP

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD OVER CONSOLIDATION RATIO - OCR = 1.000E+00INTERNAL FRICTION ANGLE, DEG. = 3.200E+01BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 1.800E+01 SOIL UNIT WEIGHT, LB/CU FT = 1.250E+02MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT = No Limit DEPTH, FT = 2.440E+01

AT THE BOTTOM

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD OVER CONSOLIDATION RATIO - OCR = 1.000E+00INTERNAL FRICTION ANGLE, DEG. = 3.200E+01BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 1.800E+01 SOIL UNIT WEIGHT, LB/CU FT = 1.250E+02MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT = No Limit DEPTH, FT = 3.740E+01LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.400E-01LRFD RESISTANCE FACTOR (SIDE FRICTION)
LRFD RESISTANCE FACTOR (TIP RESISTANCE)

LAYER NO 4----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA = 5.500E-01 (*)END BEARING COEFFICIENT-No = 9.000E+00 (*)UNDRAINED SHEAR STRENGTH, LB/SQ FT = 2.300E+03BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00 SOIL UNIT WEIGHT, LB/CU FT = 1.200E+02MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT = No Limit DEPTH, FT = 3.740E+01

= 4.000E-01

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA = 5.500E-01 (*)END BEARING COEFFICIENT-NC = 9.000E+00UNDRAINED SHEAR STRENGTH, LB/SQ FT = 2.300E+03BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00 SOIL UNIT WEIGHT, LB/CU FT = 1.200E+02MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT = No Limit = 5.740E+01DEPTH, FT

LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.500E-01= 4.000E-01

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 1.600E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.180E + 02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 5.740E+01	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 1.600E + 03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.180E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 6.820E+01	

LRFD	RESISTANCE	FACTOR	(SIDE FRICTION)	=	4.500E-01
LRFD	RESISTANCE	FACTOR	(TIP RESISTANCE)	=	4.000E-01

LAYER NO 6----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 1.750E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.200E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 6.820E+01	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 1.750E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.200E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 1.074E+02	

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01 LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 4.921E-01 (*)
END BEARING COEFFICIENT-Nc	= 9.000E+00 (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 4.400E+03
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 1.400E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 1.074E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 4.921E-01 (*)
END BEARING COEFFICIENT-Nc	= 9.000E+00 (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 4.400E+03
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 1.400E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 1.264E+02

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS

INPUT DRILLED SHAFT INFORMATION

MINIMUM SHAFT DIAMETER = 4.000 FT.

MAXIMUM SHAFT DIAMETER = 4.000 FT.

RATIO BASE/SHAFT DIAMETER = 0.000 FT.

ANGLE OF BELL = 0.000 DEG.

IGNORED TOP PORTION = 22.000 FT.

IGNORED BOTTOM PORTION = 0.000 FT.

ELASTIC MODULUS, Ec = 3.605E+06 LB/SQ IN

COMPUTATION RESULTS

- CASE ANALYZED : 1 VARIATION LENGTH : 1 VARIATION DIAMETER : 1

DRILLED SHAFT INFORMATION

DIAMETER OF STEM = 4.000 FT. DIAMETER OF BASE = 4.000 FT. = 0.000 FT. Ignored wall height and frost END OF STEM TO BASE depth only, as top 5' of soil ANGLE OF BELL 0.000 DEG. profile is granular. IGNORED TOP PORTION = 22.000 FT. \swarrow IGNORED BOTTOM PORTION = 0.000 FT. 18.098 SQ.IN. AREA OF ONE PERCENT STEEL = ELASTIC MODULUS, EC = 3.605E+06 LB/SQ IN VOLUME OF UNDERREAM = 0.000 CU.YDS. SHAFT LENGTH 58.000 FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;

QB = ULTIMATE BASE RESISTANCE;

WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);

QU = TOTAL ULTIMATE RESISTANCE;

LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR

TO THE ULTIMATE SIDE RESISTANCE;

 ${\sf LRFD}\ {\sf QB}\ =\ {\sf TOTAL}\ {\sf BASE}\ {\sf BEARING}\ {\sf USING}\ {\sf LRFD}\ {\sf RESISTANCE}\ {\sf FACTOR}$

TO THE ULTIMATE BASE RESISTANCE

LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH	VOLUME	QS	QB	QU	LRFD QS	LRFD QB	LRFD QU
(FT)	(CU.YDS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)
23.0	10.71	9.31	96.60	105.91	4.10	38.64	42.74
24.0	11.17	18.71	99.99	118.70	8.23	40.00	48.23
25.0	11.64	24.05	103.38	127.44	10.58	41.35	51.94
26.0	12.10	29.51	106.78	136.29	12.98	42.71	55.70
27.0	12.57	35.08	110.17	145.25	15.44	44.07	59.50
28.0	13.03	40.77	113.56	154.34	17.94	45.43	63.37
29.0	13.50	46.58	116.96	163.53	20.49	46.78	67.28
30.0	13.96	52.50	120.52	173.02	23.10	48.21	71.31
31.0	14.43	58.53	123.59	182.12	25.75	49.44	75.19
32.0	14.90	64.68	126.12	190.80	28.46	50.45	78.91
33.0	15.36	70.95	128.04	198.99	31.22	51.22	82.43
34.0	15.83	77.33	129.23	206.56	34.03	51.69	85.72
35.0	16.29	83.83	129.85	213.68	36.88	51.94	88.83
36.0	16.76	90.44	130.08	220.52	39.79	52.03	91.83
37.0	17.22	97.17	130.08	227.25	42.75	52.03	94.79
38.0	17.69	105.12	130.08	235.20	46.33	52.03	98.36
39.0	18.15	113.07	130.08	243.15	49.91	52.03	101.94
40.0	18.62	121.02	130.08	251.10	53.49	52.03	105.52
41.0	19.08	128.97	130.08	259.05	57.06	52.03	109.09
42.0	19.55	136.92	130.08	266.99	60.64	52.03	112.67
43.0	20.02	144.87	130.08	274.94	64.22	52.03	116.25
44.0	20.48	152.81	130.08	282.89	67.79	52.03	119.83
45.0	20.95	160.76	130.08	290.84	71.37	52.03	123.40

46.0	21.41	168.71	130.08	298.79	74.95	52.03	126.98
				230.73	74.33		120.90
47.0	21.88	176.66	130.08	306.74	78.53	52.03	130.56
48.0	22.34	184.61	130.08	314.69	82.10	52.03	134.13
49.0	22.81	192.56	130.08	322.64	85.68	52.03	137.71
50.0	23.27	200.51	124.14	324.65	89.26	49.66	138.91
51.0	23.74	208.46	117.54	326.00	92.83	47.02	139.85
52.0	24.21	216.41	110.28	326.69	96.41	44.11	140.53
53.0	24.67	224.36	102.37	326.72	99.99	40.95	140.94
54.0	25.14	232.31	96.43	328.73	103.57	38.57	142.14
55.0	25.60	240.26	92.47	332.73	107.14	36.99	144.13
56.0	26.07	248.21	90.49	338.70	110.72	36.20	146.92
57.0	26.53	256.15	90.49	346.64	114.30	36.20	150.49
58.0	27.00	261.68	90.49	352.17	116.79	36.20	152.98

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP	LOAD	TOP MOVEMENT	TIP LOAD	TIP	MOVEMENT
Т	ON	IN.	TON	-	IN.
2.674	3E-02	1.4242E-05	1.4893E-03	1.000	00E-05
1.337	2E-01	7.1212E-05	7.4465E-03	5.000	00E-05
2.674	3E-01	1.4242E-04	1.4893E-02	1.000	00E-04
1.341	7E+01	7.1274E-03	7.4465E-01	5.000	00E-03
2.012	8E+01	1.0691E-02	1.1170E+00	7.500	00E-03
2.683	9E+ 01	1.4256E-02	1.4893E+00	1.000	00E-02
6.710	4E+01	3.5640E-02	3.7233E+00	2.500	90E-02
1.290	3E+02	7.0515E-02	7.4465E+00	5.000	00E-02
1.637	2E+02	1.0089E-01	1.1170E+01	7.500	00E-02
1.948	7E+02	1.3084E-01	1.4893E+01	1.000	00E-01
2.719	0E+02	2.9355E-01	3.6366E+01	2.500	00E-01
2.952	1E+02	5.4777E-01	5.1730E+01	5.000	00E-01
2.991	0E+02	6.7369E-01	5.8328E+01	6.25	00E-01
3.050	1E+02	1.2505E+00	7.8274E+01	1.200	90E+00
3.142	4E+02	2.4525E+00	8.7775E+01	2.400	90E+00

RESULT FROM UPPER-BOUND LINE

TOP	LOAD	TOP MOVEMENT	TIP LOAD	TIP MOVEMENT
Т	ON	IN.	TON	IN.
3.889	9E-02	1.6185E-05	2.2245E-03	1.0000E-05
1.945	0E-01	8.0923E-05	1.1123E-02	5.0000E-05
3.889	9E-01	1.6185E-04	2.2245E-02	1.0000E-04
1.954	7E+01	8.1055E-03	1.1123E+00	5.0000E-03
2.932	6E+01	1.2159E-02	1.6684E+00	7.5000E-03
3.910	1E+01	1.6212E-02	2.2245E+00	1.0000E-02
9.775	7E+01	4.0532E-02	5.5613E+00	2.5000E-02
1.841	2E+02	7.9390E-02	1.1123E+01	5.0000E-02
2.214	9E+02	1.1008E-01	1.6684E+01	7.5000E-02
2.500	8E+02	1.3964E-01	2.2245E+01	1.0000E-01

3.1295E+02	3.0077E-01	5.3992E+01	2.5000E-01
3.2756E+02	5.5384E-01	6.8697E+01	5.0000E-01
3.2968E+02	6.7942E-01	7.3881E+01	6.2500E-01
3.3140E+02	1.2552E+00	8.6870E+01	1.2000E+00
3.3457E+02	2.4559E+00	9.0037E+01	2.4000E+00

RESULT FROM LOWER-BOUND LINE

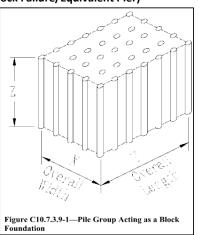
TOP LOAD	TOP MOVEMENT	TIP LOAD	TIP MOVEMENT
TON	IN.	TON	IN.
1.5407E-02	1.2420E-05	7.5408E-04	1.0000E-05
7.7037E-02	6.2101E-05	3.7704E-03	5.0000E-05
1.5407E-01	1.2420E-04	7.5408E-03	1.0000E-04
7.7168E+00	6.2118E-03	3.7704E-01	5.0000E-03
1.1578E+01	9.3182E-03	5.6556E-01	7.5000E-03
1.5439E+01	1.2424E-02	7.5408E-01	1.0000E-02
3.8601E+01	3.1062E-02	1.8852E+00	2.5000E-02
7.6157E+01	6.1976E-02	3.7704E+00	5.0000E-02
1.0727E+02	9.1878E-02	5.6556E+00	7.5000E-02
1.3658E+02	1.2153E-01	7.5408E+00	1.0000E-01
2.3046E+02	2.8629E-01	1.8739E+01	2.5000E-01
2.6283E+02	5.4170E-01	3.4763E+01	5.0000E-01
2.6672E+02	6.6765E-01	4.2775E+01	6.2500E-01
2.7863E+02	1.2458E+00	6.9677E+01	1.2000E+00
2.9346E+02	2.4490E+00	8.5060E+01	2.4000E+00

Date: 7/10/2025 Project: CUY-17-13.50 Computed By: AKB Structure: Rear Abutment Checked By: DMV Date: 7/12/2025

4' Diameter Drilled Shaft Group Capacity End Bearing Analyses (Block Failure/Equivalent Pier)

Block failure calculations consider a single row of tangent drilled shafts across the abutment and wingwall width as discussed in AASHTO LRFD Section 10.7.3.9 per guidance in the ODOT GDM Section 1505. The block failure/equivalent pier resistances were only performed within cohesive layers, as AASHTO indicates the nominal resistances of the individual piles controls the group resistance in cohesionless soils. The total block $foundation/equivalent\ pier\ resistance\ was\ divided\ by\ the\ number\ of\ shafts\ to$ determine the resistance per shaft.

Depths are referenced to the elevation at the bottom of the wall. As the soil within the uppermost 5 feet of the bottom of the wall is comprised of granular soils, the side resistance was only excluded to the frost depth (3.5 feet below final grade) in the shaft resistance calculations.



Abutment Geometry

Shaft Diameter (D) Shaft Spacing Abutment Width (X) Abutment Length (Y) 143.75 Number of Shafts Design Bottom of Wall Elevation 690.0 0.45 $\phi_{\text{side cohesive}}$ $\phi_{\text{tip cohesive}}$

0.4 AASHTO LRFD Table 10.5.5.2.4-1 $\phi_{\text{side granular}}$ 0.55

0.5

Soil Profile

			Top Depth	Bottom	
Layer No.	Top El.	Bottom El.	(ft)	Depth (ft)	Su (psf)
2	690	687.6	0	2.4	0
3	687.6	674.6	2.4	15.4	0
4	674.6	654.6	15.4	35.4	2300
5	654.6	643.8	35.4	46.2	1600
6	643.8	604.6	46.2	85.4	1750
7	604.6	EOE 6	OE A	104.4	4400

Granular Values from

Block Failure/Equivalent Pier Calculations in Cohesive Layers

 $Q_S = (2X + 2Y)Z\overline{S_u}$ $Q_B = XYN_cS_u$

AASHTO LRFD Eq. C10.7.3.9-1 (Split into side and tip resistance)

for $\frac{Z}{X} \le 2.5$, $N_c = 5\left(1 + \frac{0.2X}{Y}\right)\left(1 + \frac{0.2Z}{X}\right)$

AASHTO LRFD Eq. C10.7.3.9-2

for $\frac{Z}{V} > 2.5$, $N_c = 7.5 \left(1 + \frac{0.2X}{V}\right)$

AASHTO LRFD Eq. C10.7.3.9-3

 $S_u = undrained shear strength at the base of the group (ksf)$

 $S_u = \begin{cases} average \ undrained \ shear \ strength \ along \ the \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ the \ piles \ depth \ of \ penetration \ of \ pe$

					Cal		l. Fail		Granular va			Chi	d Cabaai a	d C		
					<u>Con</u>	Cohesive (Block Failure) Values Cohesive G			Granular	SHAFT Combined Cohesive and Granular Values			ilues			
								C=h==!		Casacilaa		Factored	Commendation	Factored	Fastanad	F
					Cohesive		Incremental	Cohesive	Incremental	Granular	Incremental	Incremental	Cumulative	Cumulative	Factored	Factored
			_		Incremental	Cohesive	Q _s /Shaft	Q _B /Shaft	Q _s /Shaft	Q _B /Shaft	Q₅/Shaft	Q _s /Shaft	Q _s /Shaft	Q _s /Shaft	Q _B /Shaft	Q _U /Shaft
Elevation (ft)	Depth (Z, ft)	S _u (psf)	S _u (psf)	N_c	Q _s (kips)	Q _B (kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)
689	1	0	0	5.28	N/A	N/A	N/A	N/A	18.6	193.2	18.6	8.2	18.6	8.2	77.3	85
688	2	0	0	5.53	N/A	N/A	N/A	N/A	18.8	200.0	18.8	8.3	37.4	16.5	80.0	96
687	3	0	0	5.78	N/A	N/A	N/A	N/A	10.7	206.8	10.7	4.7	48.1	21.2	82.7	104
686	4	0	0	6.03	N/A	N/A	N/A	N/A	10.9	213.6	10.9	4.8	59.0	26.0	85.4	111
685	5	0	0	6.28	N/A	N/A	N/A	N/A	11.1	220.3	11.1	4.9	70.2	30.9	88.1	119
684	6	0	0	6.54	N/A	N/A	N/A	N/A	11.4	227.1	11.4	5.0	81.5	35.9	90.9	127
683	7	0	0	6.79	N/A	N/A	N/A	N/A	11.6	233.9	11.6	5.1	93.2	41.0	93.6	135
682	8	0	0	7.04	N/A	N/A	N/A	N/A	11.8	241.0	11.8	5.2	105.0	46.2	96.4	143
681	9	0	0	7.29	N/A	N/A	N/A	N/A	12.1	247.2	12.1	5.3	117.1	51.5	98.9	150
680	10	0	0	7.54	N/A	N/A	N/A	N/A	12.3	252.2	12.3	5.4	129.4	56.9	100.9	158
679	11	0	0	7.54	N/A	N/A	N/A	N/A	12.5	256.1	12.5	5.5	141.9	62.4	102.4	165
678	12	0	0	7.54	N/A	N/A	N/A	N/A	12.8	258.5	12.8	5.6	154.7	68.1	103.4	171
677	13	0	0	7.54	N/A	N/A	N/A	N/A	13.0	259.7	13.0	5.7	167.7	73.8	103.9	178
676	14	0	0	7.54	N/A	N/A	N/A	N/A	13.2	260.2	13.2	5.8	180.9	79.6	104.1	184
675	15	0	0	7.54	N/A	N/A	N/A	N/A	13.5	260.2	13.5	5.9	194.3	85.5	104.1	190
674	16	0	0	7.54	N/A	N/A	N/A	N/A	15.9	260.2	15.9	7.2	210.2	92.7	104.1	197
			0								15.9		226.1			
673	17	0		7.54	N/A	N/A	N/A	N/A	15.9	260.2		7.2		99.8	104.1	204
672	18	0	0	7.54	N/A	N/A	N/A	N/A	15.9	260.2	15.9	7.2	242.0	107.0	104.1	211
671	19	2300	121	7.54	36	9974	1.0	285.0	N/A	N/A	1.0	0.5	243.1	107.4	114.0	221
670	20	2300	230	7.54	68	9974	1.9	285.0	N/A	N/A	1.9	0.9	245.0	108.3	114.0	222
669	21	2300	329	7.54	97	9974	2.8	285.0	N/A	N/A	2.8	1.2	247.8	109.6	114.0	224
668	22	2300	418	7.54	124	9974	3.5	285.0	N/A	N/A	3.5	1.6	251.3	111.2	114.0	225
667	23	2300	500	7.54	148	9974	4.2	285.0	N/A	N/A	4.2	1.9	255.5	113.1	114.0	227
666	24	2300	575	7.54	170	9974	4.9	285.0	N/A	N/A	4.9	2.2	260.4	115.2	114.0	229
665	25	2300	644	7.54	190	9974	5.4	285.0	N/A	N/A	5.4	2.4	265.8	117.7	114.0	232
664	26	2300	708	7.54	209	9974	6.0	285.0	N/A	N/A	6.0	2.7	271.8	120.4	114.0	234
663	27	2300	767	7.54	227	9974	6.5	285.0	N/A	N/A	6.5	2.9	278.3	123.3	114.0	237
662	28		821	7.54	243	9974	6.9				6.9		285.2			240
		2300						285.0	N/A	N/A		3.1		126.4	114.0	
661	29	2300	872	7.54	258	9974	7.4	285.0	N/A	N/A	7.4	3.3	292.6	129.7	114.0	244
660	30	2300	920	7.54	272	9974	7.8	285.0	N/A	N/A	7.8	3.5	300.3	133.2	114.0	247
659	31	2300	965	7.54	285	9974	8.1	285.0	N/A	N/A	8.1	3.7	308.5	136.9	114.0	251
658	32	2300	1006	7.54	297	9974	8.5	285.0	N/A	N/A	8.5	3.8	317.0	140.7	114.0	255
657	33	2300	1045	7.54	309	9974	8.8	285.0	N/A	N/A	8.8	4.0	325.8	144.7	114.0	259
656	34	2300	1082	7.54	320	9974	9.1	285.0	N/A	N/A	9.1	4.1	334.9	148.8	114.0	263
655	35	2300	1117	7.54	330	9974	9.4	285.0	N/A	N/A	9.4	4.2	344.4	153.0	114.0	267
654	36	2300	1150	7.54	340	9974	9.7	285.0	N/A	N/A	9,7	4.4	354.1	157.4	114.0	271
653	37	2300	1181	7.54	349	9974	10.0	285.0	N/A	N/A	10.0	4.5	364.1	161.9	114.0	276
652	38	2300	1211	7.54	358	9974	10.2	285.0	N/A	N/A	10.2	4.6	374.3	166.5	114.0	280
651	39	1600	1221	7.54	361	6938	10.2	198.2	N/A	N/A	10.2	4.6	384.6	171.1	79.3	250
										-						
650	40	1600	1230	7.54	363	6938	10.4	198.2	N/A	N/A	10.4	4.7	395.0	175.8	79.3	255
649	41	1600	1239	7.54	366	6938	10.5	198.2	N/A	N/A	10.5	4.7	405.4	180.5	79.3	260
648	42	1600	1248	7.54	369	6938	10.5	198.2	N/A	N/A	10.5	4.7	416.0	185.2	79.3	265
647	43	1600	1256	7.54	371	6938	10.6	198.2	N/A	N/A	10.6	4.8	426.6	190.0	79.3	269
646	44	1600	1264	7.54	373	6938	10.7	198.2	N/A	N/A	10.7	4.8	437.2	194.8	79.3	274
645		1500	1271	7.54	376	6938	10.7	198.2	N/A	N/A	10.7	4.8	448.0	199.6	79.3	279
043	45	1600		7.00.					N/A	N/A	10.8	4.9	458.8	204.5	79.3	284
644	45	1600	1278	7.54	378	6938	10.8	198.2	IN/A	IN/A	10.0	7.5	450.0	204.5		
						6938 6938	10.8 10.8	198.2 198.2		_	10.8	4.9		209.4	79.3	289
644 643	46 47	1600 1600	1278 1285	7.54 7.54	378 380	6938	10.8	198.2	N/A	N/A	10.8	4.9	469.6	209.4		
644 643 642	46 47 48	1600 1600 1600	1278 1285 1292	7.54 7.54 7.54	378 380 382	6938 6938	10.8 10.9	198.2 198.2	N/A N/A	N/A N/A	10.8 10.9	4.9 4.9	469.6 480.5	209.4 214.3	79.3	294
644 643 642 641	46 47 48 49	1600 1600 1600 1600	1278 1285 1292 1298	7.54 7.54 7.54 7.54	378 380 382 384	6938 6938 6938	10.8 10.9 11.0	198.2 198.2 198.2	N/A N/A N/A	N/A N/A N/A	10.8 10.9 11.0	4.9 4.9 4.9	469.6 480.5 491.5	209.4 214.3 219.2	79.3 79.3	294 299
644 643 642 641 640	46 47 48 49 50	1600 1600 1600 1600 1750	1278 1285 1292 1298 1307	7.54 7.54 7.54 7.54 7.54	378 380 382 384 386	6938 6938 6938 7589	10.8 10.9 11.0 11.0	198.2 198.2 198.2 216.8	N/A N/A N/A N/A	N/A N/A N/A N/A	10.8 10.9 11.0 11.0	4.9 4.9 4.9 5.0	469.6 480.5 491.5 502.5	209.4 214.3 219.2 224.2	79.3 79.3 86.7	294 299 311
644 643 642 641 640 639	46 47 48 49 50 51	1600 1600 1600 1600 1750 1750	1278 1285 1292 1298 1307 1316	7.54 7.54 7.54 7.54 7.54 7.54	378 380 382 384 386 389	6938 6938 6938 7589 7589	10.8 10.9 11.0 11.0	198.2 198.2 198.2 216.8 216.8	N/A N/A N/A N/A	N/A N/A N/A N/A	10.8 10.9 11.0 11.0	4.9 4.9 4.9 5.0	469.6 480.5 491.5 502.5 513.6	209.4 214.3 219.2 224.2 229.2	79.3 79.3 86.7 86.7	294 299 311 316
644 643 642 641 640 639 638	46 47 48 49 50 51 52	1600 1600 1600 1600 1750 1750	1278 1285 1292 1298 1307 1316 1324	7.54 7.54 7.54 7.54 7.54 7.54 7.54 7.54	378 380 382 384 386 389 391	6938 6938 6938 7589 7589 7589	10.8 10.9 11.0 11.0 11.1 11.2	198.2 198.2 198.2 216.8 216.8 216.8	N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A N/A	10.8 10.9 11.0 11.0 11.1 11.1	4.9 4.9 4.9 5.0 5.0	469.6 480.5 491.5 502.5 513.6 524.8	209.4 214.3 219.2 224.2 229.2 234.2	79.3 79.3 86.7 86.7 86.7	294 299 311 316 321
644 643 642 641 640 639	46 47 48 49 50 51 52 53	1600 1600 1600 1600 1750 1750	1278 1285 1292 1298 1307 1316	7.54 7.54 7.54 7.54 7.54 7.54	378 380 382 384 386 389	6938 6938 6938 7589 7589	10.8 10.9 11.0 11.0	198.2 198.2 198.2 216.8 216.8	N/A N/A N/A N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A N/A	10.8 10.9 11.0 11.0	4.9 4.9 4.9 5.0	469.6 480.5 491.5 502.5 513.6	209.4 214.3 219.2 224.2 229.2	79.3 79.3 86.7 86.7	294 299 311 316
644 643 642 641 640 639 638	46 47 48 49 50 51 52	1600 1600 1600 1600 1750 1750	1278 1285 1292 1298 1307 1316 1324	7.54 7.54 7.54 7.54 7.54 7.54 7.54 7.54	378 380 382 384 386 389 391	6938 6938 6938 7589 7589 7589	10.8 10.9 11.0 11.0 11.1 11.2	198.2 198.2 198.2 216.8 216.8 216.8	N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A N/A	10.8 10.9 11.0 11.0 11.1 11.1	4.9 4.9 4.9 5.0 5.0	469.6 480.5 491.5 502.5 513.6 524.8	209.4 214.3 219.2 224.2 229.2 234.2	79.3 79.3 86.7 86.7 86.7	294 299 311 316 321

Bottom of drilled shaft based on the lateral analyses

 Project:
 CUY-17-13.50
 Computed By:
 AKB
 Date:
 7/10/2025

 Structure:
 Rear Abutment
 Checked By:
 DMV
 Date:
 7/12/2025

4' Diameter Drilled Shaft Axial Loading Analyses (Single Shaft with No Efficiency Factors)

Axial loading calculations were performed using SHAFT software in accordance with the methods in AASHTO LRFD Article 10.8, per guidance in the ODOT GDM Sections 1306 and 1505, considering side resistance only. These were compared to the per-shaft values calcuated for a single shaft considering group effects and a single shaft considering block failure. The lowest value was used for determination of the required shaft length.

Depths are referenced to the elevation of the top of the wall. As the soil within the uppermost 5 feet of the bottom of the wall is comprised of granular soils, the side resistance was only excluded to the frost depth (3.5 feet below final grade) in the shaft resistance calculations.

Shaft Diameter (D)
Shaft Perimeter
Shaft Spacing
Abutment Length
Number of Shafts
Top of Shaft El.

4 ft
12.57 ft
4.17 ft
143.75 ft
35
712.0 ft

 $\begin{array}{l} \phi_{\text{side cohesive}} \\ \phi_{\text{tip cohesive}} \\ \phi_{\text{side granular}} \end{array}$

 $\phi_{\text{tip granular}}$

0.45
0.4
AASHTO LRFD Table
0.55
10.5.5.2.4-1
0.5

 $Q_U = Q_S + Q_B$

unfactored total resistance

 $Q_S =$ unfactored side resistance $Q_B =$ unfactored end bearing

Factored Unit Axial Load (from HDR Structures)
Factored Axial Load per Shaft

Required shaft length is less than that required for lateral support (58 ft).

Required Shaft Length 40 ft

Output from SHAFT (No Group Efficiency, Side Resistance Only)

29.22

Factored Q_S Factored

Factored Q_u Values per Shaft (kips)

Comparison for Design

Group Group Block Design

Elevation (ft)	Depth (ft)	Q _s (tons)	(tons)	Qu (kips)
689	23	9.31	5.12	10
688	24	18.71	10.29	21
687	25	24.05	13.23	26
686	26	29.51	16.23	32
685	27	35.08	19.3	39
684	28	40.77	22.42	45
683	29	46.58	25.62	51
682	30	52.5	28.87	58
681	31	58.53	32.19	64
680	32	64.68	35.57	71
679	33	70.95	39.02	78
678	34	77.33	42.53	85
677	35	83.83	46.11	92
676	36	90.44	49.74	99
675	37	97.17	53.44	107
674	38	105.12	57.02	114
673	39	113.07	60.6	121
672	40	121.02	64.17	128
671	41	128.97	67.75	136
670	42	136.92	71.33	143
669	43	144.87	74.91	150
668	44	152.81	78.48	157
667	45	160.76	82.06	164
666	46	168.71	85.64	171
665	47	176.66	89.21	178
664	48	184.61	92.79	186
663	49	192.56	96.37	193
662	50	200.51	99.95	200
661	51	208.46	103.52	207
660	52	216.41	107.1	214
659	53	224.36	110.68	221
658	54	232.31	114.26	229
657	55	240.26	117.83	236
656	56	248.21	121.41	243
655	57	256.15	124.99	250
654	58	261.68	127.47	255

No Group	Group	Block	Design
Efficiency	Efficiency	Failure	Value
10	85	85	10
21	96	96	21
26	104	104	26
32	111	111	32
39	119	119	39
45	127	127	45
51	135	135	51
58	143	143	58
64	150	150	64
71	158	158	71
78	165	165	78
85	171	171	85
92	178	178	92
99	184	184	99
107	190	190	107
114	197	197	114
121	204	204	121
128	211	211	128
136	218	221	136
143	225	222	143
150	233	224	150
157	240	225	157
164	247	227	164
171	254	229	171
178	261	232	178
186	268	234	186
193	275	237	193
200	278	240	200
207	280	244	207
214	281	247	214
221	282	251	221
229	284	255	229
236	288	259	236
243	294	263	243
250	301	267	250
255	306	271	255
		7	

Bottom of drilled shaft based on the lateral analyses

SHAFT Version 2023.9.05

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This model was prepared by: abaratta

Path to file locations : c:\pwworking\east01\d4381066\
Name of input data file : CUY-17 Rear Abt. B-003 No Group.sf9d
Name of output file : CUY-17 Rear Abt. B-003 No Group.sf9p
Name of runtime file : CUY-17 Rear Abt. B-003 No Group.sf9p
CUY-17 Rear Abt. B-003 No Group.sf9r

Time and Date of Analysis

Date: July 10, 2025 Time: 14:26:03

CUY-17-13.50 Rear Abt. w/o Group Efficiency Factors

PROPOSED DEPTH = 58.0 FT

NUMBER OF LAYERS = 7

WATER TABLE DEPTH = 22.0 FT.

SOIL INFORMATION

LAYER NO 1----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 6.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 2.500E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 0.000E+00	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 8.700E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 2.500E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 9.000E+00	

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

LAYER NO 2---SAND

AT THE TOP

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD	
PRECONSOLIDATION STRESS EXPONENT - M	= 8.000E-01
OVER CONSOLIDATION RATIO - OCR	= 7.300E+00 (*)
INTERNAL FRICTION ANGLE, DEG.	= 3.300E+01
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 1.400E+01
SOIL UNIT WEIGHT, LB/CU FT	= 1.220E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 9.000E+00

AT THE BOTTOM

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD	
PRECONSOLIDATION STRESS EXPONENT - M	= 8.000E-01
OVER CONSOLIDATION RATIO - OCR	= 2.899E+00 (*)
INTERNAL FRICTION ANGLE, DEG.	= 3.300E+01
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 1.400E+01
SOIL UNIT WEIGHT, LB/CU FT	= 1.220E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 2.440E+01
LRFD RESISTANCE FACTOR (SIDE FRICTION)	= 5.500E-01
LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 5.000E-01

LAYER NO 3----SAND

AT THE TOP

AT THE BOTTOM

LAYER NO 4----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA = 5.500E-01 (*)
END BEARING COEFFICIENT-NC = 9.000E+00 (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 2.300E+03
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 1.200E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT = No Limit
DEPTH, FT = 3.740E+01

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA = 5.500E-01 (*)
END BEARING COEFFICIENT-NC = 9.000E+00 (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 2.300E+03
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 1.200E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT = No Limit
DEPTH, FT = 5.740E+01

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01 LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 1.600E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.180E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 5.740E+01	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 1.600E + 03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.180E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 6.820E+01	

LRFD	RESISTANCE	FACTOR	(SIDE FRICTION)	=	4.500E-01
LRFD	RESISTANCE	FACTOR	(TIP RESISTANCE)	=	4.000E-01

LAYER NO 6----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 1.750E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.200E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 6.820E+01	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 1.750E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.200E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 1.074E+02	

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01 LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 4.921E-01 (*)
END BEARING COEFFICIENT-Nc	= 9.000E+00 (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 4.400E+03
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 1.400E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 1.074E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 4.921E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 4.400E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.400E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 1.264E+02	

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS

INPUT DRILLED SHAFT INFORMATION

MINIMUM SHAFT DIAMETER = 4.000 FT.

MAXIMUM SHAFT DIAMETER = 4.000 FT.

RATIO BASE/SHAFT DIAMETER = 0.000 FT.

ANGLE OF BELL = 0.000 DEG.

IGNORED TOP PORTION = 22.000 FT.

IGNORED BOTTOM PORTION = 0.000 FT.

ELASTIC MODULUS, Ec = 3.605E+06 LB/SQ IN

COMPUTATION RESULTS

- CASE ANALYZED : 1 VARIATION LENGTH : 1 VARIATION DIAMETER : 1

DRILLED SHAFT INFORMATION

DIAMETER OF STEM = 4.000 FT. DIAMETER OF BASE = 4.000 FT. = 0.000 FT. Ignored wall height and frost END OF STEM TO BASE depth only, as top 5' of soil ANGLE OF BELL 0.000 DEG profile is granular. = 22.000 FT. IGNORED TOP PORTION IGNORED BOTTOM PORTION = 0.000 FT. 18.098 SQ.IN. AREA OF ONE PERCENT STEEL = ELASTIC MODULUS, EC = 3.605E+06 LB/SQ IN VOLUME OF UNDERREAM = 0.000 CU.YDS. SHAFT LENGTH 58.000 FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;

QB = ULTIMATE BASE RESISTANCE;

WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);

QU = TOTAL ULTIMATE RESISTANCE;

LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR

TO THE ULTIMATE SIDE RESISTANCE;

 ${\sf LRFD}\ {\sf QB}\ =\ {\sf TOTAL}\ {\sf BASE}\ {\sf BEARING}\ {\sf USING}\ {\sf LRFD}\ {\sf RESISTANCE}\ {\sf FACTOR}$

TO THE ULTIMATE BASE RESISTANCE

LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH	VOLUME	QS	QB	QU	LRFD QS	LRFD QB	LRFD QU
(FT)	(CU.YDS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)
23.0	10.71	9.31	96.60	105.91	5.12	48.30	53.42
24.0	11.17	18.71	99.99	118.70	10.29	50.00	60.29
25.0	11.64	24.05	103.38	127.44	13.23	51.69	64.92
26.0	12.10	29.51	106.78	136.29	16.23	53.39	69.62
27.0	12.57	35.08	110.17	145.25	19.30	55.09	74.38
28.0	13.03	40.77	113.56	154.34	22.42	56.78	79.21
29.0	13.50	46.58	116.96	163.53	25.62	58.48	84.10
30.0	13.96	52.50	120.52	173.02	28.87	60.26	89.13
31.0	14.43	58.53	123.59	182.12	32.19	61.80	93.99
32.0	14.90	64.68	126.12	190.80	35.57	63.06	98.63
33.0	15.36	70.95	128.04	198.99	39.02	64.02	103.04
34.0	15.83	77.33	129.23	206.56	42.53	64.62	107.15
35.0	16.29	83.83	129.85	213.68	46.11	64.93	111.03
36.0	16.76	90.44	130.08	220.52	49.74	65.04	114.78
37.0	17.22	97.17	130.08	227.25	53.44	52.03	105.47
38.0	17.69	105.12	130.08	235.20	57.02	52.03	109.05
39.0	18.15	113.07	130.08	243.15	60.60	52.03	112.63
40.0	18.62	121.02	130.08	251.10	64.17	52.03	116.21
41.0	19.08	128.97	130.08	259.05	67.75	52.03	119.78
42.0	19.55	136.92	130.08	266.99	71.33	52.03	123.36
43.0	20.02	144.87	130.08	274.94	74.91	52.03	126.94
44.0	20.48	152.81	130.08	282.89	78.48	52.03	130.51
45.0	20.95	160.76	130.08	290.84	82.06	52.03	134.09

21.41	168.71	130.08	298.79	85.64	52.03	137.67
21.88	176.66	130.08	306.74	89.21	52.03	141.25
22.34	184.61	130.08	314.69	92.79	52.03	144.82
22.81	192.56	130.08	322.64	96.37	52.03	148.40
23.27	200.51	124.14	324.65	99.95	49.66	149.60
23.74	208.46	117.54	326.00	103.52	47.02	150.54
24.21	216.41	110.28	326.69	107.10	44.11	151.21
24.67	224.36	102.37	326.72	110.68	40.95	151.62
25.14	232.31	96.43	328.73	114.26	38.57	152.83
25.60	240.26	92.47	332.73	117.83	36.99	154.82
26.07	248.21	90.49	338.70	121.41	36.20	157.61
26.53	256.15	90.49	346.64	124.99	36.20	161.18
27.00	261.68	90.49	352.17	127.47	36.20	163.67
	21.88 22.34 22.81 23.27 23.74 24.21 24.67 25.14 25.60 26.07 26.53	21.88 176.66 22.34 184.61 22.81 192.56 23.27 200.51 23.74 208.46 24.21 216.41 24.67 224.36 25.14 232.31 25.60 240.26 26.07 248.21 26.53 256.15	21.88 176.66 130.08 22.34 184.61 130.08 22.81 192.56 130.08 23.27 200.51 124.14 23.74 208.46 117.54 24.21 216.41 110.28 24.67 224.36 102.37 25.14 232.31 96.43 25.60 240.26 92.47 26.07 248.21 90.49 26.53 256.15 90.49	21.88 176.66 130.08 306.74 22.34 184.61 130.08 314.69 22.81 192.56 130.08 322.64 23.27 200.51 124.14 324.65 23.74 208.46 117.54 326.00 24.21 216.41 110.28 326.69 24.67 224.36 102.37 326.72 25.14 232.31 96.43 328.73 25.60 240.26 92.47 332.73 26.07 248.21 90.49 338.70 26.53 256.15 90.49 346.64	21.88 176.66 130.08 306.74 89.21 22.34 184.61 130.08 314.69 92.79 22.81 192.56 130.08 322.64 96.37 23.27 200.51 124.14 324.65 99.95 23.74 208.46 117.54 326.00 103.52 24.21 216.41 110.28 326.69 107.10 24.67 224.36 102.37 326.72 110.68 25.14 232.31 96.43 328.73 114.26 25.60 240.26 92.47 332.73 117.83 26.07 248.21 90.49 338.70 121.41 26.53 256.15 90.49 346.64 124.99	21.88 176.66 130.08 306.74 89.21 52.03 22.34 184.61 130.08 314.69 92.79 52.03 22.81 192.56 130.08 322.64 96.37 52.03 23.27 200.51 124.14 324.65 99.95 49.66 23.74 208.46 117.54 326.00 103.52 47.02 24.21 216.41 110.28 326.69 107.10 44.11 24.67 224.36 102.37 326.72 110.68 40.95 25.14 232.31 96.43 328.73 114.26 38.57 25.60 240.26 92.47 332.73 117.83 36.99 26.07 248.21 90.49 338.70 121.41 36.20 26.53 256.15 90.49 346.64 124.99 36.20

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP	LOAD	TOP MOVEMENT	TIP LOAD	TIP	MOVEMENT
Т	ON	IN.	TON	I	N.
2.674	3E-02	1.4242E-05	1.4893E-03	1.000	0E-05
1.337	2E-01	7.1212E-05	7.4465E-03	5.000	0E-05
2.674	3E-01	1.4242E-04	1.4893E-02	1.000	0E-04
1.341	7E+01	7.1274E-03	7.4465E-01	5.000	0E-03
2.012	8E+01	1.0691E-02	1.1170E+00	7.500	0E-03
2.683	9E+01	1.4256E-02	1.4893E+00	1.000	0E-02
6.710	4E+01	3.5640E-02	3.7233E+00	2.500	0E-02
1.290	3E+02	7.0515E-02	7.4465E+00	5.000	0E-02
1.637	2E+02	1.0089E-01	1.1170E+01	7.500	0E-02
1.948	7E+02	1.3084E-01	1.4893E+01	1.000	0E-01
2.719	0E+02	2.9355E-01	3.6366E+01	2.500	0E-01
2.952	1E+02	5.4777E-01	5.1730E+01	5.000	0E-01
2.991	0E+02	6.7369E-01	5.8328E+01	6.250	0E-01
3.050	1E+02	1.2505E+00	7.8274E+01	1.200	0E+00
3.142	4E+02	2.4525E+00	8.7775E+01	2.400	0E+00

RESULT FROM UPPER-BOUND LINE

TOP	LOAD	TOP MOVEMENT	TIP LOAD	TIP MOVEMENT
Т	ON	IN.	TON	IN.
3.889	9E-02	1.6185E-05	2.2245E-03	1.0000E-05
1.945	0E-01	8.0923E-05	1.1123E-02	5.0000E-05
3.889	9E-01	1.6185E-04	2.2245E-02	1.0000E-04
1.954	7E+01	8.1055E-03	1.1123E+00	5.0000E-03
2.932	6E+01	1.2159E-02	1.6684E+00	7.5000E-03
3.910	1E+01	1.6212E-02	2.2245E+00	1.0000E-02
9.775	7E+01	4.0532E-02	5.5613E+00	2.5000E-02
1.841	2E+02	7.9390E-02	1.1123E+01	5.0000E-02
2.214	9E+02	1.1008E-01	1.6684E+01	7.5000E-02
2.500	8E+02	1.3964E-01	2.2245E+01	1.0000E-01

3.1295E+02	3.0077E-01	5.3992E+01	2.5000E-01
3.2756E+02	5.5384E-01	6.8697E+01	5.0000E-01
3.2968E+02	6.7942E-01	7.3881E+01	6.2500E-01
3.3140E+02	1.2552E+00	8.6870E+01	1.2000E+00
3.3457E+02	2.4559E+00	9.0037E+01	2.4000E+00

RESULT FROM LOWER-BOUND LINE

TOP LOAD	TOP MOVEMENT	TIP LOAD	TIP MOVEMENT
TON	IN.	TON	IN.
1.5407E-02	1.2420E-05	7.5408E-04	1.0000E-05
7.7037E-02	6.2101E-05	3.7704E-03	5.0000E-05
1.5407E-01	1.2420E-04	7.5408E-03	1.0000E-04
7.7168E+00	6.2118E-03	3.7704E-01	5.0000E-03
1.1578E+01	9.3182E-03	5.6556E-01	7.5000E-03
1.5439E+01	1.2424E-02	7.5408E-01	1.0000E-02
3.8601E+01	3.1062E-02	1.8852E+00	2.5000E-02
7.6157E+01	6.1976E-02	3.7704E+00	5.0000E-02
1.0727E+02	9.1878E-02	5.6556E+00	7.5000E-02
1.3658E+02	1.2153E-01	7.5408E+00	1.0000E-01
2.3046E+02	2.8629E-01	1.8739E+01	2.5000E-01
2.6283E+02	5.4170E-01	3.4763E+01	5.0000E-01
2.6672E+02	6.6765E-01	4.2775E+01	6.2500E-01
2.7863E+02	1.2458E+00	6.9677E+01	1.2000E+00
2.9346E+02	2.4490E+00	8.5060E+01	2.4000E+00

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Forward Abutment

Project: CUY-17-13.50 **Structure: Forward Abutment** Computed By: Date: 7/9/2025 AKB Checked By: DMV Date: 7/12/2025

4' Diameter Drilled Shaft Axial Loading Analyses (Single Shaft with Group Efficiency Factors)

Axial loading calculations were performed using SHAFT software in accordance with the methods in AASHTO LRFD Article 10.8, per guidance in the ODOT GDM Sections 1306 and 1505. Group Efficiency Factors as determined from AASHTO LRFD Articles 10.7.3.9 (cohesive soils) and 10.8.3.6.3 (granular soils) were applied to the resistance values from SHAFT.

Depths are referenced to the elevation of the top of the wall. As the soil within the uppermost 5 feet of the bottom of the wall is comprised of mixed granular and cohesive soils, the side resistance was excluded to 5 feet below final grade in the shaft resistance calculations.

Shaft Diameter (D) **Individual Shaft Perimeter** Individual Shaft End Area **Shaft Spacing** Top of Shaft El. Design Bottom of Wall El.

ft² 12.57 4.17 ft 710.0 ft 696.0 ft

12.57

1

8.0

ft

1.04 diameters

Final grade - 5 feet for soil disturbance considerations

 η_{cohesive}

Group Efficiency Factor for cohesive soils using a spacing of 1.04 diameters per AASHTO LRFD 10.7.3.9 with the pile cap not in firm contact with the ground and stiff surface soil

Group Efficiency Factor for granular soils using a spacing of 1.04 diameters per AASHTO LRFD 10.8.3.6.3 with a

 $\eta_{granular}$ single row of shafts

0.45 $\phi_{\text{side cohesive}}$ 0.4 $\phi_{\text{tip cohesive}}$ 0.55 $\phi_{\text{side granular}}$ 0.5 $\phi_{\text{tip granular}}$

AASHTO LRFD Table 10.5.5.2.4-1

 $\phi_{\text{side cohesive}} * \eta_{\text{cohesive}}$ $\phi_{\text{tip cohesive}} * \eta_{\text{cohesive}}$

 $\phi_{\text{side granular}} * \eta_{\text{granular}}$ ${\phi_{\text{tip granular}}}^*\eta_{\text{granular}}$

0.45 0.4 Used for input into SHAFT 0.44 0.4

 $Q_U = Q_S + Q_B$ unfactored total resistance

 $Q_S = unfactored side resistance$ $Q_B = unfactored end bearing$

Soil Profile (Referenced to Top of Wall)

			rop Depth	Bottom
Layer No.	Top El.	Bottom El.	(ft)	Depth (ft)
Item 203	710.0	702.3	0	7.7
2	702.3	696.3	7.7	13.7
3	696.3	693.8	13.7	16.2
4	693.8	686.3	16.2	23.7
5	686.3	675.3	23.7	34.7
6	675.3	645.8	34.7	64.2
7	645.8	633.3	64.2	76.7
8	633.3	602.8	76.7	107.2
9	602.8	587.8	107.2	122.2

Output from SHAFT			Single Shaft Resistances								
			Output II		Fasta and al					<u>.es</u>	Factored Q _{II}
51 ··· (61)	5 11 (61)	0 /	0 (1)	Factored		o (1:)	o (II:)	Factored	Factored	0 (1:)	ū
Elevation (ft)		Q _s (tons)			Q _B (tons)	Q _s (kips)	Q _B (kips)	Q _s (kips)	Q _B (kips)	Q _∪ (kips)	(kips)
695	15	12.9	54.0	5.8	21.6	25.7	108.0	11.6	43.2	134	55
694	16	25.7	56.7	11.6	22.7	51.4	113.3	23.1	45.3	165	68
693	17	33.2	64.2	14.9	25.7	66.5	128.5	29.8	51.4	195	81
692	18	40.9	72.6	18.3	29.0	81.8	145.2	36.5	58.1	227	95
691	19	48.7	81.7	21.7	32.7	97.4	163.4	43.4	65.3	261	109
690	20	56.6	91.6	25.2	36.6	113.1	183.2	50.3	73.3	296	124
689	21	64.6	100.1	28.7	40.0	129.1	200.2	57.3	80.1	329	137
688	22	72.7	107.2	32.2	42.9	145.4	214.3	64.5	85.7	360	150
687	23	80.9	112.7	35.9	45.1	161.8	225.4	71.7	90.2	387	162
686	24	89.2	116.7	39.5	46.7	178.4	233.3	79.0	93.3	412	172
685	25	93.4	120.6	41.3	48.3	186.7	241.2	82.7	96.5	428	179
684	26	97.6	124.6	43.2	49.8	195.3	249.1	86.4	99.7	444	186
683	27	102.0	128.5	45.1	51.4	204.0	257.1	90.3	102.8	461	193
682	28	106.5	125.5	47.1	50.2	213.0	251.1	94.2	100.4	464	195
681	29	111.1	121.2	49.2	48.5	222.2	242.3	98.3	96.9	465	195
680	30	115.9	115.4	51.2	46.2	231.7	230.7	102.5	92.3	462	195
679	31	120.7	108.1	53.4	43.2	241.4	216.2	106.7	86.5	458	193
678	32	125.7	102.3	55.6	40.9	251.3	204.6	111.1	81.8	456	193
677	33	130.7	98.3	57.8	39.3	261.5	196.5	115.6	78.6	458	194
676	34	135.9	96.2	60.1	38.5	271.9	192.3	120.1	76.9	464	197
675	35	141.2	96.2	62.4	38.5	282.5	192.3	124.8	76.9	475	202
674	36	147.1	96.2	65.1	38.5	294.2	192.3	130.1	76.9	487	207
673	37	153.0	96.2	67.7	38.5	306.0	192.3	135.4	76.9	498	212
672	38	158.9	96.2	70.3	38.5	317.7	192.3	140.7	76.9	510	218
671	39	164.7	96.2	73.0	38.5	329.5	192.3	146.0	76.9	522	223
670	40	170.6	96.2	75.6	38.5	341.2	192.3	151.2	76.9	534	228
669	41	176.5	96.2	78.3	38.5	353.0	192.3	156.5	76.9	545	233
668	42	182.4	96.2	80.9	38.5	364.7	192.3	161.8	76.9	557	239
667	43	188.2	96.2	83.6	38.5	376.5	192.3	167.1	76.9	569	244
666	44	194.1	96.2	86.2	38.5	388.2	192.3	172.4	76.9	581	249
665	45	200.0	96.2	88.8	38.5	400.0	192.3	177.7	76.9	592	255
664	46	205.9	96.2	91.5	38.5	411.7	192.3	183.0	76.9	604	260

Bottom of drilled shaft based on the lateral analyses

SHAFT Version 2023.9.05

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VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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This model was prepared by: abaratta

Path to file locations : c:\pwworking\east01\d4381066\
Name of input data file : CUY-17 Fwd. Abt. B-002 Group.sf9d
Name of output file : CUY-17 Fwd. Abt. B-002 Group.sf9p
Name of runtime file : CUY-17 Fwd. Abt. B-002 Group.sf9r

Time and Date of Analysis

Date: July 10, 2025 Time: 14:33:44

CUY-17-13.50 Fwd. Abt. w/ Group Efficiency Factors

PROPOSED DEPTH = 46.0 FT

NUMBER OF LAYERS = 9

WATER TABLE DEPTH = 11.0 FT.

SOIL INFORMATION

LAYER NO 1----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 6.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 2.500E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 0.000E+00	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 8.310E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 2.500E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 7.700E+00	

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

LAYER NO 2---SAND

AT THE TOP

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD	
OVER CONSOLIDATION RATIO - OCR	= 1.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 3.650E+01
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 2.000E+01
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 7.700E+00

AT THE BOTTOM

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD OVER CONSOLIDATION RATIO - OCR INTERNAL FRICTION ANGLE, DEG. BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 1.000E+00 = 3.650E+01 = 2.000E+01 = 1.250E+02 = No Limit
DEPTH, FT LRFD RESISTANCE FACTOR (SIDE FRICTION)	= 1.370E+01 = 4.400E-01
LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 4.000E-01

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.110E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 4.000E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 1.370E+01	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.110E-01 (*)
END BEARING COEFFICIENT-Nc	= 9.000E+00 (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 4.000E+03
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 1.620E+01

LRFD RESISTANCE	FACTOR	(SIDE FRICTION)	= 4.500E-01
LRFD RESISTANCE	FACTOR	(TIP RESISTANCE)	= 4.000E-01

LAYER NO 4---SAND

AT THE TOP

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD	
PRECONSOLIDATION STRESS EXPONENT - M	= 8.000E-01
OVER CONSOLIDATION RATIO - OCR	= 4.865E+00 (*)
INTERNAL FRICTION ANGLE, DEG.	= 3.300E+01
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 1.400E+01
SOIL UNIT WEIGHT, LB/CU FT	= 1.220E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 1.620E+01

AT THE BOTTOM

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD PRECONSOLIDATION STRESS EXPONENT - M OVER CONSOLIDATION RATIO - OCR INTERNAL FRICTION ANGLE, DEG. BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 8.000E-01 = 3.896E+00 = 3.300E+01 = 1.400E+01 = 1.220E+02 = No Limit = 2.370E+01	(*)
LRFD RESISTANCE FACTOR (SIDE FRICTION) LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 4.400E-01 = 4.000E-01	
· · · · · · · · · · · · · · · · · · ·		

AT THE TOP

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD OVER CONSOLIDATION RATIO - OCR = 1.000E+00INTERNAL FRICTION ANGLE, DEG. = 3.300E+01BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 2.100E+01 SOIL UNIT WEIGHT, LB/CU FT = 1.250E+02MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT = No Limit DEPTH, FT = 2.370E+01

AT THE BOTTOM

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD OVER CONSOLIDATION RATIO - OCR = 1.000E+00= 3.300E+01INTERNAL FRICTION ANGLE, DEG. BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 2.100E+01 SOIL UNIT WEIGHT, LB/CU FT = 1.250E+02= No Limit MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT = 3.470E+01= 4.400E-01 = 4.000E-01 LRFD RESISTANCE FACTOR (SIDE FRICTION)

LAYER NO 6----CLAY USING FHWA 1999

LRFD RESISTANCE FACTOR (TIP RESISTANCE)

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 1.700E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.200E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 3.470E+01	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01 (*)
END BEARING COEFFICIENT-Nc	= 9.000E+00 (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 1.700E+03
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 1.200E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 6.420E+01

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01

LRED RESISTANCE FACTOR (TTP RESISTANCE) = 4.000E-01 LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

LAYER NO 7----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA END BEARING COEFFICIENT-NC UNDRAINED SHEAR STRENGTH, LB/SQ FT BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 5.500E-01 = 9.000E+00 = 2.700E+03 = 0.000E+00 = 1.220E+02 = No Limit = 6.420E+01	
AT THE BOTTOM		
STRENGTH REDUCTION FACTOR-ALPHA END BEARING COEFFICIENT-Nc UNDRAINED SHEAR STRENGTH, LB/SQ FT BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 5.500E-01 = 9.000E+00 = 2.700E+03 = 0.000E+00 = 1.220E+02 = No Limit = 7.670E+01	
,	= 4.500E-01 = 4.000E-01	
LAYER NO 8CLAY USING FHWA 1999		
AT THE TOP		
	= 5.500E-01 = 9.000E+00 = 1.400E+03 = 0.000E+00 = 1.180E+02 = No Limit = 7.670E+01	
AT THE BOTTOM		
STRENGTH REDUCTION FACTOR-ALPHA END BEARING COEFFICIENT-Nc UNDRAINED SHEAR STRENGTH, LB/SQ FT BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 5.500E-01 = 9.000E+00 = 1.400E+03 = 0.000E+00 = 1.180E+02 = No Limit = 1.072E+02	
LRFD RESISTANCE FACTOR (SIDE FRICTION) LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 4.500E-01 = 4.000E-01	

LAYER NO 9----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.441E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 3.300E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.350E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 1.072E+02	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.441E-01 (*)
END BEARING COEFFICIENT-Nc	= 9.000E+00 (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 3.300E+03
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 1.350E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 1.222E+02

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS

INPUT DRILLED SHAFT INFORMATION

MINIMUM SHAFT DIAMETER = 4.000 FT.

MAXIMUM SHAFT DIAMETER = 4.000 FT.

RATIO BASE/SHAFT DIAMETER = 0.000 FT.

ANGLE OF BELL = 0.000 DEG.

IGNORED TOP PORTION = 14.000 FT.

IGNORED BOTTOM PORTION = 0.000 FT.

ELASTIC MODULUS, Ec = 3.605E+06 LB/SQ IN

COMPUTATION RESULTS

- CASE ANALYZED : 1 VARIATION LENGTH : 1 VARIATION DIAMETER : 1

DRILLED SHAFT INFORMATION

DIAMETER OF STEM = 4.000 FT. DIAMETER OF BASE = 4.000 FT. END OF STEM TO BASE = 0.000 FT. Ignored wall height and top 5' of soil profile, as it is mixed ANGLE OF BELL 0.000 DEG. = granular and cohesive. IGNORED TOP PORTION = 14.000 FT. IGNORED BOTTOM PORTION = 0.000 FT. AREA OF ONE PERCENT STEEL = 18.098 SQ.IN. ELASTIC MODULUS, EC = 3.605E+06 LB/SQ IN VOLUME OF UNDERREAM = 0.000 CU.YDS. SHAFT LENGTH = 46.000 FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE; QB = ULTIMATE BASE RESISTANCE;

WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);

QU = TOTAL ULTIMATE RESISTANCE;

 $\mathsf{LRFD}\ \mathsf{QS}\ =\ \mathsf{TOTAL}\ \mathsf{SIDE}\ \mathsf{FRICTION}\ \mathsf{USING}\ \mathsf{LRFD}\ \mathsf{RESISTANCE}\ \mathsf{FACTOR}$

TO THE ULTIMATE SIDE RESISTANCE;

 ${\sf LRFD}\ {\sf QB}\ =\ {\sf TOTAL}\ {\sf BASE}\ {\sf BEARING}\ {\sf USING}\ {\sf LRFD}\ {\sf RESISTANCE}\ {\sf FACTOR}$

TO THE ULTIMATE BASE RESISTANCE

LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

VOLUME	QS	QB	QU	LRFD QS	LRFD QB	LRFD QU
(CU.YDS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)
6.98	12.85	54.02	66.86	5.78	21.61	27.39
7.45	25.69	56.66	82.35	11.56	22.66	34.22
7.91	33.24	64.24	97.48	14.88	25.70	40.58
8.38	40.90	72.58	113.48	18.25	29.03	47.29
8.84	48.68	81.69	130.37	21.68	32.67	54.35
9.31	56.57	91.58	148.16	25.15	36.63	61.78
9.78	64.57	100.09	164.67	28.67	40.04	68.71
10.24	72.68	107.15	179.84	32.24	42.86	75.10
10.71	80.90	112.70	193.60	35.85	45.08	80.93
11.17	89.22	116.66	205.88	39.51	46.66	86.18
11.64	93.37	120.62	213.98	41.34	48.25	89.59
12.10	97.63	124.57	222.21	43.22	49.83	93.05
12.57	102.01	128.53	230.55	45.14	51.41	96.56
13.03	106.51	125.54	232.05	47.12	50.21	97.34
13.50	111.12	121.17	232.29	49.15	48.47	97.62
13.96	115.85	115.37	231.23	51.23	46.15	97.38
14.43	120.70	108.08	228.78	53.36	43.23	96.60
14.90	125.66	102.31	227.97	55.55	40.92	96.47
15.36	130.74	98.27	229.00	57.78	39.31	97.09
15.83	135.93	96.15	232.08	60.07	38.46	98.53
16.29	141.24	96.15	237.38	62.40	38.46	100.86
16.76	147.11	96.15	243.26	65.05	38.46	103.50
17.22	152.99	96.15	249.13	67.69	38.46	106.15
17.69	158.86	96.15	255.01	70.33	38.46	108.79
18.15	164.74	96.15	260.88	72.98	38.46	111.44
	(CU.YDS) 6.98 7.45 7.91 8.38 8.84 9.31 9.78 10.24 10.71 11.17 11.64 12.10 12.57 13.03 13.50 13.96 14.43 14.90 15.36 15.83 16.29 16.76 17.22 17.69	(CU.YDS) (TONS) 6.98 12.85 7.45 25.69 7.91 33.24 8.38 40.90 8.84 48.68 9.31 56.57 9.78 64.57 10.24 72.68 10.71 80.90 11.17 89.22 11.64 93.37 12.10 97.63 12.57 102.01 13.03 106.51 13.50 111.12 13.96 115.85 14.43 120.70 14.90 125.66 15.36 130.74 15.83 135.93 16.29 141.24 16.76 147.11 17.22 152.99 17.69 158.86	(CU.YDS) (TONS) (TONS) 6.98 12.85 54.02 7.45 25.69 56.66 7.91 33.24 64.24 8.38 40.90 72.58 8.84 48.68 81.69 9.31 56.57 91.58 9.78 64.57 100.09 10.24 72.68 107.15 10.71 80.90 112.70 11.17 89.22 116.66 11.64 93.37 120.62 12.10 97.63 124.57 12.57 102.01 128.53 13.03 106.51 125.54 13.50 111.12 121.17 13.96 115.85 115.37 14.43 120.70 108.08 14.90 125.66 102.31 15.36 130.74 98.27 15.83 135.93 96.15 16.76 147.11 96.15 17.69 158.86 96.15	(CU.YDS) (TONS) (TONS) (TONS) 6.98 12.85 54.02 66.86 7.45 25.69 56.66 82.35 7.91 33.24 64.24 97.48 8.38 40.90 72.58 113.48 8.84 48.68 81.69 130.37 9.31 56.57 91.58 148.16 9.78 64.57 100.09 164.67 10.24 72.68 107.15 179.84 10.71 80.90 112.70 193.60 11.17 89.22 116.66 205.88 11.64 93.37 120.62 213.98 12.10 97.63 124.57 222.21 12.57 102.01 128.53 230.55 13.03 106.51 125.54 232.05 13.50 111.12 121.17 232.29 13.96 115.85 115.37 231.23 14.43 120.70 108.08 228.78	(CU.YDS) (TONS) (TONS) (TONS) 6.98 12.85 54.02 66.86 5.78 7.45 25.69 56.66 82.35 11.56 7.91 33.24 64.24 97.48 14.88 8.38 40.90 72.58 113.48 18.25 8.84 48.68 81.69 130.37 21.68 9.31 56.57 91.58 148.16 25.15 9.78 64.57 100.09 164.67 28.67 10.24 72.68 107.15 179.84 32.24 10.71 80.90 112.70 193.60 35.85 11.17 89.22 116.66 205.88 39.51 11.64 93.37 120.62 213.98 41.34 12.10 97.63 124.57 222.21 43.22 12.57 102.01 128.53 230.55 45.14 13.03 106.51 125.54 232.05 47.12 13.96	(CU.YDS) (TONS) (TONS) (TONS) (TONS) 6.98 12.85 54.02 66.86 5.78 21.61 7.45 25.69 56.66 82.35 11.56 22.66 7.91 33.24 64.24 97.48 14.88 25.70 8.38 40.90 72.58 113.48 18.25 29.03 8.84 48.68 81.69 130.37 21.68 32.67 9.31 56.57 91.58 148.16 25.15 36.63 9.78 64.57 100.09 164.67 28.67 40.04 10.24 72.68 107.15 179.84 32.24 42.86 10.71 80.90 112.70 193.60 35.85 45.08 11.17 89.22 116.66 205.88 39.51 46.66 11.64 93.37 120.62 213.98 41.34 48.25 12.10 97.63 124.57 222.21 43.22 49.83

40.0	18.62	170.61	96.15	266.76	75.62	38.46	114.08
41.0	19.08	176.49	96.15	272.64	78.27	38.46	116.72
42.0	19.55	182.37	96.15	278.51	80.91	38.46	119.37
43.0	20.02	188.24	96.15	284.39	83.55	38.46	122.01
44.0	20.48	194.12	96.15	290.26	86.20	38.46	124.66
45.0	20.95	199.99	96.15	296.14	88.84	38.46	127.30
46.0	21.41	205.87	96.15	302.01	91.49	38.46	129.94

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD	TOP MOVEMENT	TIP LOAD	TIP MOVEMENT
TON	IN.	TON	IN.
1.9823E-02	1.2209E-05	1.5824E-03	1.0000E-05
9.9113E-02	6.1044E-05	7.9119E-03	5.0000E-05
1.9823E-01	1.2209E-04	1.5824E-02	1.0000E-04
9.9314E+00	6.1059E-03	7.9119E-01	5.0000E-03
1.4901E+01	9.1594E-03	1.1868E+00	7.5000E-03
1.9869E+01	1.2213E-02	1.5824E+00	1.0000E-02
4.9677E+01	3.0533E-02	3.9560E+00	2.5000E-02
9.6065E+01	6.0761E-02	7.9119E+00	5.0000E-02
1.2519E+02	8.9019E-02	1.1868E+01	7.5000E-02
1.5170E+02	1.1704E-01	1.5824E+01	1.0000E-01
2.2245E+02	2.7584E-01	3.8638E+01	2.5000E-01
2.4866E+02	5.2954E-01	5.4963E+01	5.0000E-01
2.5451E+02	6.5558E-01	6.1974E+01	6.2500E-01
2.6788E+02	1.2332E+00	8.3166E+01	1.2000E+00
2.7763E+02	2.4349E+00	9.3261E+01	2.4000E+00

RESULT FROM UPPER-BOUND LINE

TOP LOAD	TOP MOVEMENT	TIP LOAD	TIP MOVEMENT
TON	IN.	TON	IN.
2.8400E-02	1.3170E-05	2.3636E-03	1.0000E-05
1.4200E-01	6.5848E-05	1.1818E-02	5.0000E-05
2.8400E-01	1.3170E-04	2.3636E-02	1.0000E-04
1.4245E+01	6.5886E-03	1.1818E+00	5.0000E-03
2.1371E+01	9.8835E-03	1.7727E+00	7.5000E-03
2.8497E+01	1.3178E-02	2.3636E+00	1.0000E-02
7.1244E+01	3.2946E-02	5.9089E+00	2.5000E-02
1.3534E+02	6.5254E-02	1.1818E+01	5.0000E-02
1.6922E+02	9.4057E-02	1.7727E+01	7.5000E-02
1.9693E+02	1.2231E-01	2.3636E+01	1.0000E-01
2.6115E+02	2.8107E-01	5.7367E+01	2.5000E-01
2.7762E+02	5.3379E-01	7.2990E+01	5.0000E-01
2.8147E+02	6.5952E-01	7.8499E+01	6.2500E-01
2.8926E+02	1.2361E+00	9.2299E+01	1.2000E+00
2.9262E+02	2.4367E+00	9.5664E+01	2.4000E+00

RESULT FROM LOWER-BOUND LINE

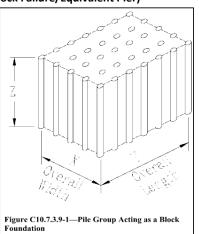
TOP	LOAD	TOP MOVEMENT	TIP LOAD	TIP MOVEMENT
T	ON	IN.	TON	IN.
1.171	5E-02	1.1292E-05	8.0121E-04	1.0000E-05
5.857	4E-02	5.6459E-05	4.0061E-03	5.0000E-05
1.171	5E-01	1.1292E-04	8.0121E-03	1.0000E-04
5.862	3E+00	5.6462E-03	4.0061E-01	5.0000E-03
8.796	4E+00	8.4696E-03	6.0091E-01	7.5000E-03
1.173	0E+01	1.1293E-02	8.0121E-01	1.0000E-02
2.932	9E+01	2.8233E-02	2.0030E+00	2.5000E-02
5.795	2E+01	5.6399E-02	4.0061E+00	5.0000E-02
8.187	3E+01	8.4057E-02	6.0091E+00	7.5000E-02
1.045	4E+02	1.1160E-01	8.0121E+00	1.0000E-01
1.834	3E+02	2.7059E-01	1.9910E+01	2.5000E-01
2.196	8E+02	5.2530E-01	3.6936E+01	5.0000E-01
2.265	5E+02	6.5152E-01	4.5449E+01	6.2500E-01
2.465	0E+02	1.2303E+00	7.4032E+01	1.2000E+00
2.621	5E+02	2.4330E+00	9.0376E+01	2.4000E+00

Project: CUY-17-13.50 Computed By: AKB Date: 7/10/2025 Checked By: Structure: Forward Abutment DMV Date: 7/12/2025

4' Diameter Drilled Shaft Group Capacity End Bearing Analyses (Block Failure/Equivalent Pier)

Block failure calculations consider a single row of tangent drilled shafts across the abutment and wingwall width as discussed in AASHTO LRFD Section 10.7.3.9 per guidance in the ODOT GDM Section 1505. The block failure/equivalent pier resistances were only performed within cohesive layers, as AASHTO indicates the nominal resistances of the individual piles controls the group resistance in cohesionless soils. The total block $foundation/equivalent\ pier\ resistance\ was\ divided\ by\ the\ number\ of\ shafts\ to$ determine the resistance per shaft.

Depths are referenced to the elevation at the bottom of the wall. As the soil within the uppermost 5 feet of the bottom of the wall is comprised of mixed granular and cohesive soils, the side resistance was excluded to 5 feet below final grade in the shaft resistance calculations.



Abutment Geometry

Shaft Diameter (D) Shaft Spacing Abutment Width (X) Abutment Length (Y) 136.25 Number of Shafts Design Bottom of Wall Elevation 0.45 $\phi_{\text{tip cohesive}}$

0.4 AASHTO LRFD Table 10.5.5.2.4-1 0.55

Soil Profile

			Top Depth	Bottom	
Layer No.	Top El.	Bottom El.	(ft)	Depth (ft)	Su (psf)
3	696	693.8	0	2.2	4000
4	693.8	686.3	2.2	9.7	0
5	686.3	675.3	9.7	20.7	0
6	675.3	645.8	20.7	50.2	1700
7	645.8	633.3	50.2	62.7	2700
8	633.3	602.8	62.7	93.2	1400
9	602.8	587.8	93.2	108.2	3300

Block Failure/Equivalent Pier Calculations in Cohesive Layers

 $Q_S = (2X + 2Y)Z\overline{S_u}$ $Q_B = XYN_cS_u$

AASHTO LRFD Eq. C10.7.3.9-1 (Split into side and tip resistance)

 $\phi_{\text{side granular}}$

for $\frac{Z}{X} \le 2.5$, $N_c = 5\left(1 + \frac{0.2X}{Y}\right)\left(1 + \frac{0.2Z}{X}\right)$

AASHTO LRFD Eq. C10.7.3.9-2

for $\frac{Z}{X} > 2.5$, $N_c = 7.5 \left(1 + \frac{0.2X}{Y} \right)$

AASHTO LRFD Eq. C10.7.3.9-3

 $S_u = undrained shear strength at the base of the group (ksf)$

0.5

 $\bar{S}_u = egin{array}{l} average \ undrained \ shear \ strength \ along \ the \ depth \ of \ penetration \ of \ the \ piles \ (ksf) \end{array}$

	(ksf)								Granular Va	lues from						
					Coh	esive (Bloc	k Failure) Valu	es	SHA	FT		Combine	d Cohesive an	d Granular Va	lues	
							Cohesive		Granular		•	Factored		Factored		
					Cohesive		Incremental	Cohesive	Incremental	Granular	Incremental	Incremental	Cumulative	Cumulative	Factored	Factored
					Incremental	Cohesive	Q _s /Shaft	Q _B /Shaft	Q _s /Shaft	Q _B /Shaft	Q _s /Shaft	Q _s /Shaft	Q _s /Shaft	Q₅/Shaft	Q _B /Shaft	Q _U /Shaft
Elevation (ft)	Depth (Z, ft)	S _u (psf)	\overline{S}_{u} (psf)	N_c	Q _s (kips)	Q _B (kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)
695	1	4000	4000	5.28	1122	11512	34	349	N/A	N/A	34.0	15.3	34.0	15.3	139.5	155
694	2	4000	4000	5.53	1122	12060	34	365	N/A	N/A	34.0	15.3	68.0	30.6	146.2	177
693	3	0	2667	5.78	N/A	N/A	N/A	N/A	15.1	128.5	15.1	6.6	83.1	37.2	51.4	89
692	4	0	2000	6.04	N/A	N/A	N/A	N/A	15.3	145.2	15.3	6.7	98.4	44.0	58.1	102
691	5	0	1600	6.29	N/A	N/A	N/A	N/A	15.6	163.4	15.6	6.9	114.0	50.8	65.3	116
690	6	0	1333	6.54	N/A	N/A	N/A	N/A	15.8	183.2	15.8	6.9	129.8	57.8	73.3	131
689	7	0	1143	6.79	N/A	N/A	N/A	N/A	16.0	200.2	16.0	7.0	145.8	64.8	80.1	145
688	8	0	1000	7.04	N/A	N/A	N/A	N/A	16.2	214.3	16.2	7.1	162.0	72.0	85.7	158
687	9	0	889	7.29	N/A	N/A	N/A	N/A	16.4	225.4	16.4	7.2	178.4	79.2	90.2	169
686	10	0	800	7.54	N/A	N/A	N/A	N/A	16.6	233.3	16.6	7.3	195.1	86.5	93.3	180
685	11	0	727	7.54	N/A	N/A	N/A	N/A	8.3	241.2	8.3	3.7	203.4	90.2	96.5	187
684	12	0	667	7.54	N/A	N/A	N/A	N/A	8.5	249.1	8.5	3.8	211.9	93.9	99.7	194
683	13	0	615	7.54	N/A	N/A	N/A	N/A	8.8	257.1	8.8	3.8	220.6	97.8	102.8	201
682	14	0	571	7.54	N/A	N/A	N/A	N/A	9.0	251.1	9.0	4.0	229.6	101.7	100.4	202
681	15	0	533	7.54	N/A	N/A	N/A	N/A	9.2	242.3	9.2	4.1	238.9	105.8	96.9	203
680	16	0	500	7.54	N/A	N/A	N/A	N/A	9.5	230.7	9.5	4.2	248.3	109.9	92.3	202
679	17	0	471	7.54	N/A	N/A	N/A	N/A	9.7	216.2	9.7	4.3	258.0	114.2	86.5	201
678	18	0	444	7.54	N/A	N/A	N/A	N/A	9.9	204.6	9.9	4.4	267.9	118.6	81.8	200
677	19	0	421	7.54	N/A	N/A	N/A	N/A	10.2	196.5	10.2	4.5	278.1	123.0	78.6	202
676	20	0	400	7.54	N/A	N/A	N/A	N/A	10.4	192.3	10.4	4.6	288.5	127.6	76.9	205
675	21	1700	462	7.54	130	6990	3.9	211.8	N/A	N/A	3.9	1.8	292.4	129.4	84.7	214
674	22	1700	518	7.54	145	6990	4.4	211.8	N/A	N/A	4.4	2.0	296.8	131.4	84.7	216
673	23	1700	570	7.54	160	6990	4.8	211.8	N/A	N/A	4.8	2.2	301.7	133.5	84.7	218
672	24	1700	617	7.54	173	6990	5.2	211.8	N/A	N/A	5.2	2.4	306.9	135.9	84.7	221
671	25	1700	660	7.54	185	6990	5.6	211.8	N/A	N/A	5.6	2.5	312.5	138.4	84.7	223
670	26	1700	700	7.54	196	6990	6.0	211.8	N/A	N/A	6.0	2.7	318.5	141.1	84.7	226
669	27	1700	737	7.54	207	6990	6.3	211.8	N/A	N/A	6.3	2.8	324.7	143.9	84.7	229
668	28	1700	771	7.54	216	6990	6.6	`211.8	N/A	N/A	6.6	3.0	331.3	146.9	84.7	232
667	29	1700	803	7.54	225	6990	6.8	211.8	N/A	N/A	6.8	3.1	338.1	150.0	84.7	235
666	30	1700	833	7.54	234	6990	7.1	211.8	N/A	N/A	7.1	3.2	345.2	153.1	84.7	238
665	31	1700	861	7.54	242	6990	7.3	211.8	N/A	N/A	7.3	3.3	352.5	156.4	84.7	241
664	32	1700	888	7.54	249	6990	7.5	211.8	N/A	N/A	7.5	3.4	360.1	159.8	84.7	245

Bottom of drilled shaft based on the lateral analyses

Project: CUY-17-13.50 Date: 7/10/2025 Computed By: AKB Checked By: Date: 7/12/2025 **Structure:** Forward Abutment DMV

4' Diameter Drilled Shaft Axial Loading Analyses (Single Shaft with No Efficiency Factors)

Axial loading calculations were performed using SHAFT software in accordance with the methods in AASHTO LRFD Article 10.8, per guidance in the ODOT GDM Sections 1306 and 1505, considering side resistance only. These were compared to the per-shaft values calcuated for a single shaft considering group effects and a single shaft considering block failure. The lowest value was used for determination of the required shaft length.

Depths are referenced to the elevation of the top of the wall. As the soil within the uppermost 5 feet of the bottom of the wall is comprised of mixed granular and cohesive soils, the side resistance was excluded to 5 feet below final grade in the shaft resistance calculations.

Shaft Diameter (D) **Shaft Perimeter Shaft Spacing** Abutment Length Number of Shafts Top of Shaft El.

ft 12.57 ft 4.17 ft 136.25 ft **33** 710.0

 $\phi_{\text{side cohesive}}$ $\phi_{\text{tip cohesive}}$ $\phi_{\text{side granular}}$

 $\phi_{\text{tip granular}}$

0.45 0.4 AASHTO LRFD Table 0.55 10.5.5.2.4-1 0.5

 $Q_U = Q_S + Q_B$ unfactored total resistance unfactored side resistance

 $Q_B =$ unfactored end bearing

Factored Unit Axial Load (from HDR Structures) Factored Axial Load per Shaft Required shaft length is less than that required for lateral support (40 ft). **Required Shaft Length**

Output from SHAFT (No Group Efficiency, Side Resistance Only)

29.22

122

Factored Q_S

Factored

Factored Q _u Values per Shaft (kips)							
No Group	Group	Block	Design				
Efficiency	Efficiency	Failure	Value				
12	55	155	12				

Elevation (ft)	Depth (ft)	Q _s (tons)	(tons)	Qu (kips)	Efficienc
695	15	12.85	5.78	12	12
694	16	25.69	11.56	23	23
693	17	33.24	15.71	31	31
692	18	40.9	19.93	40	40
691	19	48.68	24.21	48	48
690	20	56.57	28.55	57	57
689	21	64.57	32.95	66	66
688	22	72.68	37.41	75	75
687	23	80.9	41.92	84	84
686	24	89.22	46.5	93	93
685	25	93.37	48.78	98	98
684	26	97.63	51.13	102	102
683	27	102.01	53.54	107	107
682	28	106.51	56.01	112	112
681	29	111.12	58.55	117	117
680	30	115.85	61.15	122	122
679	31	120.7	63.81	128	128
678	32	125.66	66.54	133	133
677	33	130.74	69.34	139	139
676	34	135.93	72.19	144	144
675	35	141.24	75.11	150	150
674	36	147.11	77.76	156	156
673	37	152.99	80.4	161	161
672	38	158.86	83.04	166	166
671	39	164.74	85.69	171	171
670	40	170.61	88.33	177	177
669	41	176.49	90.98	182	182
668	42	182.37	93.62	187	187
667	43	188.24	96.26	193	193
666	44	194.12	98.91	198	198
665	45	199.99	101.55	203	203
664	46	205.87	104.2	208	208

Efficiency	Efficiency	Failure	value
12	55	155	12
23	68	177	23
31	81	89	31
40	95	102	40
48	109	116	48
57	124	131	57
66	137	145	66
75	150	158	75
84	162	169	84
93	172	180	93
98	179	187	98
102	186	194	102
107	193	201	107
112	195	202	112
117	195	203	117
122	195	202	122
128	193	201	128
133	193	200	133
139	194	202	139
144	197	205	144
150	202	214	150
156	207	216	156
161	212	218	161
166	218	221	166
171	223	223	171
177	228	226	177
182	233	↑ 229	182
187	239	232	187
193	244	235	193
198	249	238	198
203	255	241	203
208	260	245	208

Bottom of drilled shaft based on the lateral analyses

SHAFT Version 2023.9.05

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This model was prepared by: abaratta

Path to file locations : c:\pwworking\east01\d4381066\
Name of input data file : CUY-17 Fwd. Abt. B-002 No Group.sf9d
Name of output file : CUY-17 Fwd. Abt. B-002 No Group.sf9p
Name of runtime file : CUY-17 Fwd. Abt. B-002 No Group.sf9p
CUY-17 Fwd. Abt. B-002 No Group.sf9r

Time and Date of Analysis

Date: July 10, 2025 Time: 14:32:27

CUY-17-13.50 Fwd. Abt. w/o Group Efficiency Factors

PROPOSED DEPTH = 46.0 FT

NUMBER OF LAYERS = 9

WATER TABLE DEPTH = 11.0 FT.

SOIL INFORMATION

LAYER NO 1----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 6.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 2.500E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 0.000E+00	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.500E-01	(*)
END BEARING COEFFICIENT-Nc	= 8.310E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 2.500E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 7.700E+00	

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

LAYER NO 2---SAND

AT THE TOP

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD	
OVER CONSOLIDATION RATIO - OCR	= 1.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 3.650E+01
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 2.000E+01
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 7.700E+00

AT THE BOTTOM

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD OVER CONSOLIDATION RATIO - OCR INTERNAL FRICTION ANGLE, DEG. BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 1.000E+00 = 3.650E+01 = 2.000E+01 = 1.250E+02 = No Limit = 1.370E+01
LRFD RESISTANCE FACTOR (SIDE FRICTION) LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 5.500E-01 = 5.000E-01

AT THE TOP

= 5.110E-01	(*)
= 9.000E+00	(*)
= 4.000E+03	
= 0.000E+00	
= 1.250E+02	
= No Limit	
= 1.370E+01	
	= 0.000E+00 = 1.250E+02 = No Limit

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.110E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 4.000E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.250E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 1.620E+01	

LRFD	RESISTANCE	FACTOR	(SIDE FRICTION)	=	4.500E-01
LRFD	RESISTANCE	FACTOR	(TIP RESISTANCE)	=	4.000E-01

LAYER NO 4---SAND

AT THE TOP

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD	
PRECONSOLIDATION STRESS EXPONENT - M	= 8.000E-01
OVER CONSOLIDATION RATIO - OCR	= 4.865E+00 (*)
INTERNAL FRICTION ANGLE, DEG.	= 3.300E+01
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 1.400E+01
SOIL UNIT WEIGHT, LB/CU FT	= 1.220E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit
DEPTH, FT	= 1.620E+01

AT THE BOTTOM

SIDE FRICTION PROCEDURE, FHWA GEC10 METHOD PRECONSOLIDATION STRESS EXPONENT - M OVER CONSOLIDATION RATIO - OCR INTERNAL FRICTION ANGLE, DEG. BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 8.000E-01 = 3.896E+00 = 3.300E+01 = 1.400E+01 = 1.220E+02 = No Limit = 2.370E+01	(*)
LRFD RESISTANCE FACTOR (SIDE FRICTION) LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 5.500E-01 = 5.000E-01	

AT THE TOP

AT THE BOTTOM

LAYER NO 6----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA = 5.500E-01 (*)
END BEARING COEFFICIENT-NC = 9.000E+00 (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 1.700E+03
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 1.200E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT = No Limit
DEPTH, FT = 3.470E+01

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA = 5.500E-01 (*)
END BEARING COEFFICIENT-Nc = 9.000E+00 (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 1.700E+03
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 1.200E+02
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT = No Limit
DEPTH, FT = 6.420E+01

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01 LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

LAYER NO 7----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA END BEARING COEFFICIENT-Nc UNDRAINED SHEAR STRENGTH, LB/SQ FT BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 5.500E-01 = 9.000E+00 = 2.700E+03 = 0.000E+00 = 1.220E+02 = No Limit = 6.420E+01	` '
AT THE BOTTOM		
STRENGTH REDUCTION FACTOR-ALPHA END BEARING COEFFICIENT-Nc UNDRAINED SHEAR STRENGTH, LB/SQ FT BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 5.500E-01 = 9.000E+00 = 2.700E+03 = 0.000E+00 = 1.220E+02 = No Limit = 7.670E+01	
LRFD RESISTANCE FACTOR (SIDE FRICTION) LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 4.500E-01 = 4.000E-01	
LAYER NO 8CLAY USING FHWA 1999		
AT THE TOP		
STRENGTH REDUCTION FACTOR-ALPHA END BEARING COEFFICIENT-NC UNDRAINED SHEAR STRENGTH, LB/SQ FT BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 5.500E-01 = 9.000E+00 = 1.400E+03 = 0.000E+00 = 1.180E+02 = No Limit = 7.670E+01	
AT THE BOTTOM		
STRENGTH REDUCTION FACTOR-ALPHA END BEARING COEFFICIENT-Nc UNDRAINED SHEAR STRENGTH, LB/SQ FT BLOWS PER FOOT FROM STANDARD PENETRATION TEST SOIL UNIT WEIGHT, LB/CU FT MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT DEPTH, FT	= 5.500E-01 = 9.000E+00 = 1.400E+03 = 0.000E+00 = 1.180E+02 = No Limit = 1.072E+02	
LRFD RESISTANCE FACTOR (SIDE FRICTION) LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 4.500E-01 = 4.000E-01	

LAYER NO 9----CLAY USING FHWA 1999

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 5.441E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 3.300E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.350E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 1.072E+02	

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 5.441E-01	(*)
END BEARING COEFFICIENT-Nc	= 9.000E+00	(*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 3.300E+03	
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00	
SOIL UNIT WEIGHT, LB/CU FT	= 1.350E+02	
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= No Limit	
DEPTH, FT	= 1.222E+02	

LRFD RESISTANCE FACTOR (SIDE FRICTION) = 4.500E-01 LRFD RESISTANCE FACTOR (TIP RESISTANCE) = 4.000E-01

(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS

INPUT DRILLED SHAFT INFORMATION

MINIMUM SHAFT DIAMETER = 4.000 FT.

MAXIMUM SHAFT DIAMETER = 4.000 FT.

RATIO BASE/SHAFT DIAMETER = 0.000 FT.

ANGLE OF BELL = 0.000 DEG.

IGNORED TOP PORTION = 14.000 FT.

IGNORED BOTTOM PORTION = 0.000 FT.

ELASTIC MODULUS, Ec = 3.605E+06 LB/SQ IN

COMPUTATION RESULTS

- CASE ANALYZED : 1 VARIATION LENGTH : 1 VARIATION DIAMETER : 1

DRILLED SHAFT INFORMATION

DIAMETER OF STEM = 4.000 FT.

DIAMETER OF BASE = 4.000 FT.

END OF STEM TO BASE = 0.000 FT.

ANGLE OF BELL = 0.000 DEG.

IGNORED TOP PORTION = 14.000 FT.

IGNORED BOTTOM PORTION = 0.000 FT. AREA OF ONE PERCENT STEEL = 18.098 SQ.IN. ELASTIC MODULUS, EC = 3.605E+06 LB/SQ IN VOLUME OF UNDERREAM = 0.000 CU.YDS. SHAFT LENGTH = 46.000 FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;

QB = ULTIMATE BASE RESISTANCE; WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY); QU = TOTAL ULTIMATE RESISTANCE;

LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR

TO THE ULTIMATE SIDE RESISTANCE;

LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR

TO THE ULTIMATE BASE RESISTANCE

LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH	VOLUME	QS	QB	QU	LRFD QS	LRFD QB	LRFD QU
(FT)	(CU.YDS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)
15.0	6.98	12.85	54.02	66.86	5.78	21.61	27.39
16.0	7.45	25.69	56.66	82.35	11.56	28.33	39.89
17.0	7.91	33.24	64.24	97.48	15.71	32.12	47.83
18.0	8.38	40.90	72.58	113.48	19.93	36.29	56.22
19.0	8.84	48.68	81.69	130.37	24.21	40.84	65.05
20.0	9.31	56.57	91.58	148.16	28.55	45.79	74.34
21.0	9.78	64.57	100.09	164.67	32.95	50.05	82.99
22.0	10.24	72.68	107.15	179.84	37.41	53.58	90.98
23.0	10.71	80.90	112.70	193.60	41.92	56.35	98.27
24.0	11.17	89.22	116.66	205.88	46.50	58.33	104.83
25.0	11.64	93.37	120.62	213.98	48.78	60.31	109.09
26.0	12.10	97.63	124.57	222.21	51.13	62.29	113.42
27.0	12.57	102.01	128.53	230.55	53.54	64.27	117.81
28.0	13.03	106.51	125.54	232.05	56.01	62.77	118.78
29.0	13.50	111.12	121.17	232.29	58.55	60.59	119.13
30.0	13.96	115.85	115.37	231.23	61.15	57.69	118.84
31.0	14.43	120.70	108.08	228.78	63.81	54.04	117.85
32.0	14.90	125.66	102.31	227.97	66.54	51.15	117.70
33.0	15.36	130.74	98.27	229.00	69.34	49.13	118.47
34.0	15.83	135.93	96.15	232.08	72.19	48.07	120.27
35.0	16.29	141.24	96.15	237.38	75.11	38.46	113.57
36.0	16.76	147.11	96.15	243.26	77.76	38.46	116.21
37.0	17.22	152.99	96.15	249.13	80.40	38.46	118.86
38.0	17.69	158.86	96.15	255.01	83.04	38.46	121.50
39.0	18.15	164.74	96.15	260.88	85.69	38.46	124.15

9.43
2.08
4.72
7.37
0.01
2.65
2

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD	TOP MOVEMENT	TIP LOAD	TIP MOVEMENT
TON	IN.	TON	IN.
1.9823E-02	1.2209E-05	1.5824E-03	1.0000E-05
9.9113E-02	6.1044E-05	7.9119E-03	5.0000E-05
1.9823E-01	1.2209E-04	1.5824E-02	1.0000E-04
9.9314E+00	6.1059E-03	7.9119E-01	5.0000E-03
1.4901E+01	9.1594E-03	1.1868E+00	7.5000E-03
1.9869E+01	1.2213E-02	1.5824E+00	1.0000E-02
4.9677E+01	3.0533E-02	3.9560E+00	2.5000E-02
9.6065E+01	6.0761E-02	7.9119E+00	5.0000E-02
1.2519E+02	8.9019E-02	1.1868E+01	7.5000E-02
1.5170E+02	1.1704E-01	1.5824E+01	1.0000E-01
2.2245E+02	2.7584E-01	3.8638E+01	2.5000E-01
2.4866E+02	5.2954E-01	5.4963E+01	5.0000E-01
2.5451E+02	6.5558E-01	6.1974E+01	6.2500E-01
2.6788E+02	1.2332E+00	8.3166E+01	1.2000E+00
2.7763E+02	2.4349E+00	9.3261E+01	2.4000E+00

RESULT FROM UPPER-BOUND LINE

TOP LOAD	TOP MOVEMENT	TIP LOAD	TIP MOVEMENT
TON	IN.	TON	IN.
2.8400E-02	1.3170E-05	2.3636E-03	1.0000E-05
1.4200E-01	6.5848E-05	1.1818E-02	5.0000E-05
2.8400E-01	1.3170E-04	2.3636E-02	1.0000E-04
1.4245E+01	6.5886E-03	1.1818E+00	5.0000E-03
2.1371E+01	9.8835E-03	1.7727E+00	7.5000E-03
2.8497E+01	1.3178E-02	2.3636E+00	1.0000E-02
7.1244E+01	3.2946E-02	5.9089E+00	2.5000E-02
1.3534E+02	6.5254E-02	1.1818E+01	5.0000E-02
1.6922E+02	9.4057E-02	1.7727E+01	7.5000E-02
1.9693E+02	1.2231E-01	2.3636E+01	1.0000E-01
2.6115E+02	2.8107E-01	5.7367E+01	2.5000E-01
2.7762E+02	5.3379E-01	7.2990E+01	5.0000E-01
2.8147E+02	6.5952E-01	7.8499E+01	6.2500E-01
2.8926E+02	1.2361E+00	9.2299E+01	1.2000E+00
2.9262E+02	2.4367E+00	9.5664E+01	2.4000E+00

RESULT FROM LOWER-BOUND LINE

TOP LOAD	TOP MOVEMENT	TIP LOAD	TIP MOVEMENT
TON	IN.	TON	IN.
1.1715E-02	1.1292E-05	8.0121E-04	1.0000E-05
5.8574E-02	5.6459E-05	4.0061E-03	5.0000E-05
1.1715E-01	1.1292E-04	8.0121E-03	1.0000E-04
5.8623E+00	5.6462E-03	4.0061E-01	5.0000E-03
8.7964E+00	8.4696E-03	6.0091E-01	7.5000E-03
1.1730E+01	1.1293E-02	8.0121E-01	1.0000E-02
2.9329E+01	2.8233E-02	2.0030E+00	2.5000E-02
5.7952E+01	5.6399E-02	4.0061E+00	5.0000E-02
8.1873E+01	8.4057E-02	6.0091E+00	7.5000E-02
1.0454E+02	1.1160E-01	8.0121E+00	1.0000E-01
1.8343E+02	2.7059E-01	1.9910E+01	2.5000E-01
2.1968E+02	5.2530E-01	3.6936E+01	5.0000E-01
2.2655E+02	6.5152E-01	4.5449E+01	6.2500E-01
2.4650E+02	1.2303E+00	7.4032E+01	1.2000E+00
2.6215E+02	2.4330E+00	9.0376E+01	2.4000E+00

Drilled Shaft Downdrag

Reference Information

Baratta, Alma

From: Wroten, Jacob

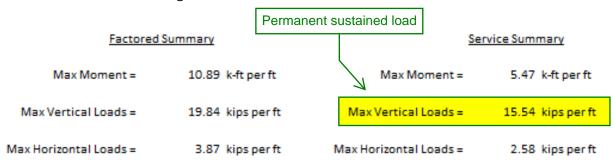
Sent: Wednesday, March 19, 2025 9:21 AM

To: Baratta, Alma

Cc: Voegele, Douglas M.; Shaner, Joanne **Subject:** RE: CUY-17 Tangent Drilled Shaft Wall

Alma,

Here are the max dead/sustained loading from the abutment for factored and service load combinations.



Here are the loads per our conversation yesterday about the construction case where the contractor backfills up to the beam seat before they construct the superstructure.

Factored:

M = -2.45 kft/ft

Vert = 7.47 k/ft

Horz = 1.21 k/ft

Service:

M = -1.73 kft/ft

Vert = 5.91k/ft

Horz = 0.81 k/ft

Note the negative moment means it is acting opposite of the final condition moments and is bending in the direction of the retained soil. This is because the vertical soil on the heel causes a higher moment then the moment due to lateral earth pressure.

Let me know if you need anything else.

Thanks,

Jacob

Jacob Wroten, PE

D 216.912.4250 M 216.659.0730

hdrinc.com/follow-us

Project: CUY-17-13.50	Rear Abutment Settlement Analysis
PID: 112998	Based on B-003-0-22 Profile

SME Project No.: 088549.00

Prepared by: Brendan P. Lieske, PE

Date: 10/31/24

Settlement Analysis, in accordance with LRFD 11.6.2, following the Hough Method from LRFD 10.6.2.4.2b for cohesionless soils and LRFD 10.6.2.4.3 for cohesive soils

$$Elev_{Road} = 723.3$$
 ft

$$Elev_{TOP} = 713 \; \textit{ft}$$
 Elevation at top of SPL wall at rear abutment

$$Elev_{GS} = 706.0 \ ft$$
 Existing Elevation of Ground Surface at Piles

$$\gamma_r\!\coloneqq\!125$$
 pcf Unit Weight of Retained Soil Layer

$$B = 20 \ ft$$
 Approximate width of embankment for Boussinesq Contours. Based on 2V:1H zone of influence below abutment footing.

$$S_{e} = \sum_{i=1}^{n} \Delta H_{i}$$
 (10.6.2.4.2b-1)

in which:

$$\Delta H_i = H_c \frac{1}{C'} \log \left(\frac{\sigma_o' + \Delta \sigma_v}{\sigma_o'} \right)$$
 (10.6.2.4.2b-2)

where:

n = number of soil layers within zone of stress influence of the footing

 ΔH_i = elastic settlement of layer i (ft) H_c = initial height of layer i (ft)

C' = bearing capacity index from Figure 10.6.2.4.2b-1 (dim)

 σ'_{o} = initial vertical effective stress at the midpoint of layer i (ksf)

 $\Delta \sigma_v = \text{increase in vertical stress at the midpoint of layer } i \text{ (ksf)}$

CORRECTED SPT VALUE [M1]

eference: Hough, "Compressibility as a Besic for Soil Bearing Value" ASCE 1959

Figure 10.6.2.4.2b-1—Bearing Capacity Index versus Corrected *SPT* (Hough, 1959, as modified in Samtani and Nowatzki, 2006)

 $\Delta \sigma_{Surface} := (Elev_{Road} - Elev_{GS}) \cdot \gamma_r = 2.162 \text{ ksf}$

Change in Stress at each layer is based on Bouessinesq stress contours for an infinitely long, uniformly loaded foundation (L/B > 5).

Assume groundwater at bottom of abutment footing

Layer 1, Elev 706.0 to 703.4 feet, Very Stiff A-6a

Layer 2, Elev 703.4 to 694.6 feet, Medium Dense A-3a

Layer 3, Elev 694.6 to 687.6 feet, Medium Dense A-3a

Layer 4, Elev 687.6 to 674.6 feet, Medium Dense A-4b

Layer 5, Elev 674.6 to 654.6 feet, Medium Stiff to Stiff A-4b

Layer 6, Elev 654.6 to 643.8 feet, Stiff A-6a

Layer 7, Elev 643.8 to 604.6 feet, Stiff to Very Stiff A-4b

Layer 1, Elev 706.0 to 703.4 feet, Very Stiff A-6a

$$h_1 := 706.0 \ ft - 703.4 \ ft = 2.6 \ ft$$
 $\gamma_1 := 122 \ pcf$

$$LL_1 := 38$$

$$w_1$$
:=.26

$$w_1 \coloneqq .26$$
 $\gamma_{d1} \coloneqq \frac{\gamma_1}{ig(1+w_1ig)} = 96.825 \; extbf{pcf}$ $G_s \coloneqq 2.72$ $\gamma_w \coloneqq 62.4 \; extbf{pcf}$

$$G_s = 2.72$$

$$\gamma_w \coloneqq 62.4 \ \textit{pcf}$$

$$e_{01} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d1}} - 1 = 0.753$$

$$e_{01} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d1}} - 1 = 0.753$$
 $C_{r1} \coloneqq 0.1 \cdot .009 \cdot \left(LL_1 - 10\right) = 0.025$

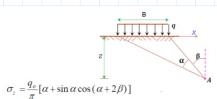
$$\sigma_{01}' \coloneqq (\gamma_1 - \gamma_w) \cdot \frac{h_1}{2} = 0.077 \ \textit{ksf}$$

Initial Effective Stress at midpoint of layer

$$z_1 = \frac{h_1}{2} = 1.3 \ ft$$

depth from bottom of embankment to midpoint of layer

Boussinesq Stress at Depth z From Infinite Load



$$b = \frac{B}{2} = 10 \ ft$$

$$\beta_1 \coloneqq \operatorname{atan}\left(\frac{-b}{z_1}\right) = -1.442 \qquad \qquad \alpha_1 \coloneqq \operatorname{atan}\left(\frac{b}{z_1}\right) - \beta_1 = 2.883$$

$$\Delta \sigma_1 \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot (\alpha_1 + \sin(\alpha_1) \cdot \cos(\alpha_1 + 2 \cdot \beta_1)) = 2.161 \text{ ksf}$$

$$\Delta H_1 \coloneqq \frac{C_{r1}}{1 + e_{01}} \cdot h_1 \cdot \log \left(\frac{\sigma_{01}' + \Delta \sigma_1}{\sigma_{01}'} \right) = 0.655 \text{ in}$$

$$\Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_1}{\sigma_{01}'} = 27.9$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_1}{\sigma_{01}'} = 27.9$$

Layer 2, Elev 703.4 to 694.6 feet, Medium Dense A-3a

$$h_2 = 703.4 \ \mathbf{ft} - 694.6 \ \mathbf{ft} = 8.8 \ \mathbf{ft}$$
 $\gamma_2 = 125 \ \mathbf{pcf}$

Estimated based on ODOT GDM Table 400-4

 $N_{60L2} = 18$ Avg. N60 for this layer

$$\sigma_{02}' \coloneqq \sigma_{01}' + \left(\gamma_1 - \gamma_w\right) \cdot \frac{h_1}{2} + \left(\gamma_2 - \gamma_w\right) \cdot \frac{h_2}{2} = 0.43 \text{ ksf} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$N1_{60L2} := N_{60L2} \cdot .77 \cdot \log \left(40 \frac{\textit{ksf}}{\sigma_{02}} \right) = 27.279$$

$$C'_2 = 70$$
 Based on LRFD Figure 10.6.2.4.2b-1

$$z_2 \coloneqq Elev_{GS} - \left(703.4 \ \textit{ft} - \frac{h_2}{2}\right) = 7 \ \textit{ft}$$
 depth from bottom of embankment to midpoint of layer

$$\beta_2 := \operatorname{atan}\left(\frac{-b}{z_2}\right) = -0.96$$
 $\alpha_2 := \operatorname{atan}\left(\frac{b}{z_2}\right) - \beta_2 = 1.92$

$$\Delta \sigma_2 \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot (\alpha_2 + \sin(\alpha_2) \cdot \cos(\alpha_2 + 2 \cdot \beta_2)) = 1.968 \text{ ksf}$$

$$\Delta H_2 \coloneqq h_2 \cdot \frac{1}{C'_2} \cdot \log \left(\frac{\sigma_{02}' + \Delta \sigma_2}{\sigma_{02}'} \right) = 1.126 \ \emph{in}$$
 $\Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_2}{\sigma_{02}'} = 4.574$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_2}{\sigma_{02}'} = 4.574$$

Layer 3, Elev 694.6 to 687.6 feet, Medium Dense A-3a

$$h_3 = 694.6 \ ft - 687.6 \ ft = 7 \ ft$$
 $\gamma_3 = 122 \ pcf$

$$\gamma_3 \coloneqq 122 \ \textit{pcf}$$

Estimated based on ODOT GDM Table 400-4

$$N_{60L3} \coloneqq 14$$
 Avg. N60 for this layer

$$\sigma_{03}{'} \coloneqq \sigma_{02}{'} + \left(\gamma_2 - \gamma_w\right) \cdot \frac{h_2}{2} + \left(\gamma_3 - \gamma_w\right) \cdot \frac{h_3}{2} = 0.914 \text{ \textit{ksf}} \text{ Initial Effective Stress at midpoint of layer}$$

$$N1_{60L3} := N_{60L3} \cdot .77 \cdot \log \left(40 \frac{ksf}{\sigma_{03}} \right) = 17.689$$

Based on LRFD Figure 10.6.2.4.2b-1

$$z_3 \coloneqq Elev_{GS} - \left(694.6 \ \textit{ft} - \frac{h_3}{2}\right) = 14.9 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_3 = \operatorname{atan}\left(\frac{-b}{z_3}\right) = -0.591$$
 $\alpha_3 = \operatorname{atan}\left(\frac{b}{z_3}\right) - \beta_3 = 1.182$

$$\Delta\sigma_{3} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot (\alpha_{3} + \sin(\alpha_{3}) \cdot \cos(\alpha_{3} + 2 \cdot \beta_{3})) = 1.451 \text{ ksf}$$

$$\Delta H_3 := h_3 \cdot \frac{1}{C'_3} \cdot \log \left(\frac{\sigma_{03}' + \Delta \sigma_3}{\sigma_{03}'} \right) = 0.654 \ in$$

 $\Delta \sigma_{percentchange} := \frac{\Delta \sigma_3}{\sigma_{22}} = 1.587$

Layer 4, Elev 687.6 to 674.6 feet, Medium Dense A-4b

$$h_4 = 687.6 \ \mathbf{ft} - 674.6 \ \mathbf{ft} = 13 \ \mathbf{ft}$$
 $\gamma_4 = 125 \ \mathbf{pcf}$

$$\gamma_4 \coloneqq 125 \ pc$$

Estimated based on ODOT GDM Table 400-4

Avg. N60 for this layer $N_{60L4} = 18$

$$\sigma_{04}{'} \coloneqq \sigma_{03}{'} + \left(\gamma_3 - \gamma_w\right) \cdot \frac{h_3}{2} + \left(\gamma_4 - \gamma_w\right) \cdot \frac{h_4}{2} = 1.53 \text{ ksf}$$

Initial Effective Stress at midpoint of layer

$$N1_{60L4} := N_{60L4} \cdot .77 \cdot \log \left(40 \frac{\textit{ksf}}{\sigma_{04}'} \right) = 19.645$$

 $C'_4 \coloneqq 40$

Based on LRFD Figure 10.6.2.4.2b-1

$$z_4 = Elev_{GS} - \left(687.6 \ \textit{ft} - \frac{h_4}{2}\right) = 24.9 \ \textit{ft}$$

depth from bottom of embankment to midpoint of layer

$$eta_4 \coloneqq \operatorname{atan}\left(\frac{-b}{z_4}\right) = -0.382$$
 $\alpha_4 \coloneqq \operatorname{atan}\left(\frac{b}{z_4}\right) - \beta_4 = 0.764$

$$\Delta\sigma_{4} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot \left(\alpha_{4} + \sin\left(\alpha_{4}\right) \cdot \cos\left(\alpha_{4} + 2 \cdot \beta_{4}\right)\right) = 1.002 \text{ ksf}$$

$$\Delta H_4 \coloneqq h_4 \cdot \frac{1}{C_4'} \cdot \log \left(\frac{\sigma_{04}' + \Delta \sigma_4}{\sigma_{04}'} \right) = 0.853 \ \textit{in} \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_4}{\sigma_{04}'} = 0.655$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_4}{\sigma_{04}} = 0.655$$

$$h_{5a} := 674.6 \ \mathbf{ft} - 664.6 \ \mathbf{ft} = 10 \ \mathbf{ft}$$
 $\gamma_5 := 120 \ \mathbf{pcf}$

$$LL_5 := 30$$

$$w_5 = .26$$

$$w_5 \coloneqq .26$$
 $\gamma_{d5} \coloneqq \frac{\gamma_5}{(1+w_5)} = 95.238 \; \textit{pcf}$

$$G_s = 2.72$$

$$e_{05} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d5}} - 1 = 0.782$$

$$C_{r5} \coloneqq 0.1 \cdot .009 \cdot (LL_5 - 10) = 0.018$$

$$\sigma_{05a}{'} \coloneqq \sigma_{04}{'} + \left(\gamma_4 - \gamma_w\right) \cdot \frac{h_4}{2} + \left(\gamma_5 - \gamma_w\right) \cdot \frac{h_{5a}}{2} = 2.225 \ \textit{ksf} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$z_{5a} \coloneqq Elev_{GS} - \left(674.6 \ \textit{ft} - \frac{h_{5a}}{2}\right) = 36.4 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_{5a} := \operatorname{atan}\left(\frac{-b}{z_{5a}}\right) = -0.268$$

$$\beta_{5a} \coloneqq \operatorname{atan}\left(\frac{-b}{z_{5a}}\right) = -0.268$$
 $\alpha_{5a} \coloneqq \operatorname{atan}\left(\frac{b}{z_{5a}}\right) - \beta_{5a} = 0.536$

$$\Delta \sigma_{5a} \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot \left(\alpha_{5a} + \sin\left(\alpha_{5a}\right) \cdot \cos\left(\alpha_{5a} + 2 \cdot \beta_{5a}\right)\right) = 0.721 \text{ ksf}$$

$$\Delta H_{5a} := \frac{C_{r5}}{1 + e_{05}} \cdot h_{5a} \cdot \log \left(\frac{\sigma_{05a}' + \Delta \sigma_{5a}}{\sigma_{05a}'} \right) = 0.148 \ \textit{in}$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{5a}}{\sigma_{05a}'} = 0.324$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{5a}}{\sigma_{05a}'} = 0.324$$

Layer 5b, Elev 664.6 to 654.6 feet, Medium Stiff to Stiff A-4b

$$h_{5b} \coloneqq 664.6 \ \mathbf{ft} - 654.6 \ \mathbf{ft} = 10 \ \mathbf{ft}$$

$$\sigma_{05b}' \coloneqq \sigma_{05a}' + (\gamma_5 - \gamma_w) \cdot h_{5a} + (\gamma_5 - \gamma_w) \cdot \frac{h_{5b}}{2} = 3.089 \text{ ksf}$$

Initial Effective Stress at midpoint of layer

$$z_{5b} \coloneqq Elev_{GS} - \left(664.6 \ \textit{ft} - \frac{h_{5b}}{2}\right) = 46.4 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_{5b} := \operatorname{atan}\left(\frac{-b}{z_{5b}}\right) = -0.212$$
 $\alpha_{5b} := \operatorname{atan}\left(\frac{b}{z_{5b}}\right) - \beta_{5b} = 0.425$

$$\alpha_{5b} \coloneqq \operatorname{atan}\left(\frac{b}{z_{5b}}\right) - \beta_{5b} = 0.425$$

$$\Delta\sigma_{5b} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot \left(\alpha_{5b} + \sin\left(\alpha_{5b}\right) \cdot \cos\left(\alpha_{5b} + 2 \cdot \beta_{5b}\right)\right) = 0.576 \text{ ksf}$$

$$\Delta H_{5b} \coloneqq \frac{C_{r5}}{1 + e_{05}} \cdot h_{5b} \cdot \log \left(\frac{\sigma_{05b}' + \Delta \sigma_{5b}}{\sigma_{05b}'} \right) = 0.09 \ \textit{in}$$

$$\Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{5b}}{\sigma_{05b}'} = 0.186$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{5b}}{\sigma_{05b}} = 0.186$$

Layer 6, Elev 654.6 to 643.8 feet, Stiff A-6a

$$h_6 := 654.6 \ \mathbf{ft} - 643.8 \ \mathbf{ft} = 10.8 \ \mathbf{ft}$$
 $\gamma_6 := 118 \ \mathbf{pcf}$

$$\gamma_6 \coloneqq 118 \ pcf$$

$$LL_6 := 40$$

$$w_6 \coloneqq .33$$

$$\gamma_{d6} := \frac{\gamma_6}{(1+w_6)} = 88.722 \ pcf$$

$$G_s$$
:= 2.72

$$e_{06} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d6}} - 1 = 0.913$$

$$C_{r6} := 0.1 \cdot .009 \cdot (LL_6 - 10) = 0.027$$

$$\sigma_{06}' \coloneqq \sigma_{05b}' + \left(\gamma_5 - \gamma_w\right) \cdot \frac{h_{5b}}{2} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_6}{2} = 3.677 \text{ ksf} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$z_6 \coloneqq Elev_{GS} - \left(654.6 \ \textit{ft} - \frac{h_6}{2}\right) = 56.8 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_6 \coloneqq \operatorname{atan}\left(\frac{-b}{z_6}\right) = -0.174$$
 $\alpha_6 \coloneqq \operatorname{atan}\left(\frac{b}{z_6}\right) - \beta_6 = 0.349$

$$\alpha_6 \coloneqq \operatorname{atan}\left(\frac{b}{z_6}\right) - \beta_6 = 0.349$$

$$\Delta\sigma_{6} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot \left(\alpha_{6} + \sin\left(\alpha_{6}\right) \cdot \cos\left(\alpha_{6} + 2 \cdot \beta_{6}\right)\right) = 0.475 \text{ ksf}$$

$$\Delta H_6 \coloneqq \frac{C_{r6}}{1 + e_{06}} \cdot h_6 \cdot \log \left(\frac{\sigma_{06}' + \Delta \sigma_6}{\sigma_{06}'} \right) = 0.097 \ \textit{in} \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_6}{\sigma_{06}'} = 0.129$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_6}{\sigma_{06}'} = 0.129$$

Layer 7a, Elev 643.8 to 633.8 feet, Stiff to Very Stiff A-4b

$$h_{7a} := 643.8 \ \mathbf{ft} - 633.8 \ \mathbf{ft} = 10 \ \mathbf{ft}$$
 $\gamma_7 := 120 \ \mathbf{pcf}$ $LL_7 := 25$

$$LL_7 \coloneqq 25$$

$$w_7 = .26$$

$$w_7 \coloneqq .26$$
 $\gamma_{d7} \coloneqq \frac{\gamma_7}{\left(1 + w_7\right)} = 95.238 \; \textit{pcf}$ $G_s \coloneqq 2.72$

$$G_s = 2.72$$

$$e_{07} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d7}} - 1 = 0.782$$

$$C_{r7} := 0.1 \cdot .009 \cdot (LL_7 - 10) = 0.014$$

$$\sigma_{07a}{'} \coloneqq \sigma_{06}{'} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_6}{2} + \left(\gamma_7 - \gamma_w\right) \cdot \frac{h_{7a}}{2} = 4.265 \text{ ksf} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$z_{7a} = Elev_{GS} - \left(643.8 \ \textit{ft} - \frac{h_{7a}}{2}\right) = 67.2 \ \textit{ft}$$

depth from bottom of embankment to midpoint of layer

$$\beta_{7a} := \operatorname{atan}\left(\frac{-b}{z_{7a}}\right) = -0.148$$
 $\alpha_{7a} := \operatorname{atan}\left(\frac{b}{z_{7a}}\right) - \beta_{7a} = 0.295$

$$\alpha_{7a} := \operatorname{atan}\left(\frac{b}{z_{7a}}\right) - \beta_{7a} = 0.295$$

$$\Delta \sigma_{7a} \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot \left(\alpha_{7a} + \sin\left(\alpha_{7a}\right) \cdot \cos\left(\alpha_{7a} + 2 \cdot \beta_{7a}\right)\right) = 0.404 \text{ ksf}$$

$$\Delta H_{7a} \coloneqq \frac{C_{r7}}{1 + e_{07}} \cdot h_{7a} \cdot \log \left(\frac{\sigma_{07a}' + \Delta \sigma_{7a}}{\sigma_{07a}'} \right) = 0.036 \ \textit{in}$$

$$\Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{7a}}{\sigma_{07a}'} = 0.095$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{7a}}{\sigma_{07a}'} = 0.095$$

Percent change in stress at 10%, so end analysis here

Total Settlement (including granular layers)

$$S_T = \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4 + \Delta H_{5a} + \Delta H_{5b} + \Delta H_6 + \Delta H_{7a} = 3.658$$
 in

Settlement of granular layers, including nonplastic silt. Assumed to occur during construction or upon completion.

$$S_{Granular} := \Delta H_2 + \Delta H_3 + \Delta H_4 = 2.633$$
 in

Settlement of cohesive layers

$$S_{Cohesive} \coloneqq \Delta H_1 + \Delta H_{5a} + \Delta H_{5b} + \Delta H_6 + \Delta H_{7a} = 1.025 ~\textit{in}$$

Estimated Rate of Consolidation - cv estimates based on 2022 NAVFAC DM7.01, Liquid Limit correlation chart, assuming the lower bound for overconsolidated clays

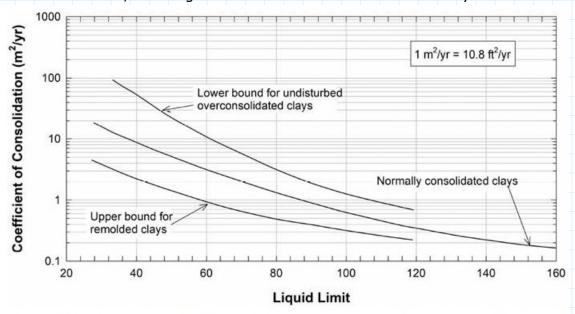


Figure 8-50 Approximate Relationship between Coefficient of Consolidation and Liquid Limit

Anticipate settlement of Layer 2, 3, and 4 occurs during or at completion of construction

Considering double drainage for Layer 1 and single drainage for Layers 5, 6, and 7

PID: 112998

Project: CUY-17-13.50

Forward Abutment Settlement Analysis

Based on B-002-0-22 Profile

110.112.			Dasca on D	002 0 22 1 TOTILE	
SME Proje	ect No.:	088549.00			
Prepared	by: Brer	ndan P. Lieske			
Date: 10/	/29/24				
11	1.6	lb	lb	lb	lb
<u>Units</u>	plf :=	ft	$psf:=rac{lb}{ft^2}$	$pcf:=rac{lb}{ft^3}$	$oldsymbol{psi}\coloneqq rac{oldsymbol{lb}}{oldsymbol{in}^2}$
		<i>J</i> •	Je		616
			kin	kin	kin
	$oldsymbol{kip} \coloneqq$	1000 <i>lb</i>	$klf \coloneqq \frac{kip}{ft}$	$ksf:=rac{kip}{ft^2}$	$m{kcf} \coloneqq rac{m{kip}}{m{ft}^3}$
			Jt	Jt	Jτ
		ton	ton	laim	loim
	tlf := -	ton	$oldsymbol{tsf}\coloneqq rac{oldsymbol{ton}}{oldsymbol{ft}^2}$	$oldsymbol{ksi} \coloneqq rac{oldsymbol{kip}}{oldsymbol{in}^2}$	$oldsymbol{kci} \coloneqq rac{oldsymbol{kip}}{oldsymbol{in}^3}$
		ft	$oldsymbol{ft}^2$	$oxed{in}^2$	in^3

Settlement Analysis, in accordance with LRFD 11.6.2, following the Hough Method from LRFD 10.6.2.4.2b for cohesionless soils and LRFD 10.6.2.4.3 for cohesive soils

$$Elev_{Road} = 721.2 \ \textbf{ft}$$

 $Elev_{TOP} := 711 \; ft$ Elevation at top of SPL Wall at forward abutment

 $Elev_{GS} = 705.7 \; ft$ Existing Elevation of Ground Surface at Piles

 $\gamma_r = 125 \; pcf$ Unit Weight of Retained Embankment

 $B = 20 \ ft$ Approximate width of Embankment Fill for Boussinesq Contours. Based on 2V:1H zone of influence below abutment footing.

$$S_e = \sum_{i=1}^{n} \Delta H_i$$
 (10.6.2.4.2b-1)

in which:

$$\Delta H_i = H_c \frac{1}{C'} \log \left(\frac{\sigma_o' + \Delta \sigma_v}{\sigma_o'} \right)$$
 (10.6.2.4.2b-2)

where:

n = number of soil layers within zone of stress influence of the footing

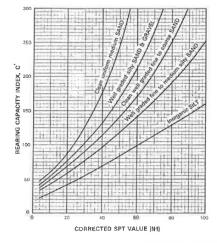
 ΔH_i = elastic settlement of layer i (ft)

 H_c = initial height of layer i (ft)

= bearing capacity index from Figure 10.6.2.4.2b-1 (dim)

 σ'_{o} = initial vertical effective stress at the midpoint of layer i (ksf)

 $\Delta \sigma_v$ = increase in vertical stress at the midpoint of layer i (ksf)



Reference: Hough, "Compressibility as a Basic for Soil Bearing Value" ASCE 1959

Figure 10.6.2.4.2b-1—Bearing Capacity Index versus Corrected *SPT* (Hough, 1959, as modified in Samtani and Nowatzki, 2006)

 $\Delta \sigma_{Surface} \coloneqq \left(Elev_{Road} - Elev_{GS} \right) \cdot \gamma_r = 1.937 \ \textit{ksf}$

Change in Stress at each layer is based on Bouessinesq stress contours for an infinitely long, uniformly loaded foundation (L/B > 5).

Assume groundwater at bottom of abutment footing

Layer 1, Elev 705.7 to 700.6 feet, Medium Dense A-3a

Layer 2, Elev 700.6 to 696.3 feet, Medium Dense A-1-b

Layer 3, Elev 696.3 to 693.8 feet, Very Stiff A-6a

Layer 4, Elev 693.8 to 686.3 feet, Medium Dense A-3a

Layer 5, Elev 686.3 to 675.3 feet, Medium Dense A-4b

Layer 6, Elev 675.3 to 645.8 feet, Medium Stiff to Stiff A-6a

Layer 7, Elev 645.8 to 633.3 feet, Stiff to Very Stiff A-6a

Layer 8, Elev 633.3 to 602.8 feet, Medium Stiff to Stiff A-4b

Layer 1, Elev 705.7 to 700.6 feet, Medium Dense A-3a

$$\gamma_1 \coloneqq 125 \ \textit{pcf}$$
 $\gamma_w \coloneqq 62.4 \ \textit{pcf}$

$$h_1 = 705.7 \ \mathbf{ft} - 700.6 \ \mathbf{ft} = 5.1 \ \mathbf{ft}$$

$$N_{60L1} = 17$$
 Avg. N60 for this layer

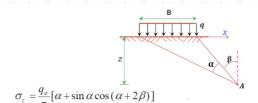
$$\sigma_{01}' \coloneqq \left(\gamma_1 - \gamma_w\right) \cdot \frac{h_1}{2} = 0.16 \text{ ksf}$$
 Initial Effective Stress at midpoint of layer

$$N1_{60L1} := N_{60L1} \cdot .77 \cdot \log \left(40 \frac{\textit{ksf}}{\sigma_{01}'} \right) = 31.402$$
 LRFD 10.4.6.2.4-1

$$C'_1 = 90$$
 Based on LRFD Figure 10.6.2.4.2b-1

$$z_1 \coloneqq \frac{h_1}{2} = 2.55 \; \textit{ft}$$
 depth from bottom of embankment to midpoint of layer





$$\beta_1 := \operatorname{atan}\left(\frac{-b}{z_1}\right) = -1.321$$
 $\alpha_1 := \operatorname{atan}\left(\frac{b}{z_1}\right) - \beta_1 = 2.642$

$$\Delta\sigma_{1} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot \left(\alpha_{1} + \sin\left(\alpha_{1}\right) \cdot \cos\left(\alpha_{1} + 2 \cdot \beta_{1}\right)\right) = 1.925 \text{ ksf}$$

$$\Delta H_1 \coloneqq h_1 \cdot \frac{1}{{C'}_1} \cdot \log \left(\frac{{\sigma_{01}}' + \Delta \sigma_1}{{\sigma_{01}}'} \right) = 0.759 \ \textit{in} \qquad \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_1}{{\sigma_{01}}'} = 12.1$$

 $b \coloneqq \frac{B}{2} = 10 \; \mathbf{ft}$

Layer 2, Elev 700.6 to 696.3 feet, Medium Dense A-1-b

$$h_2 = 700.6 \ ft - 696.3 \ ft = 4.3 \ ft$$
 $\gamma_2 = 0.125 \ kcf$

$$\gamma_2 = 0.125 \ kcf$$

Estimated based on ODOT GDM Table 400-4

 $N_{60L2} = 20.5$ Avg. N60 for this layer

$$\sigma_{02}' := (\gamma_1 - \gamma_w) \cdot h_1 + (\gamma_2 - \gamma_w) \cdot \frac{h_2}{2} = 0.454 \text{ ksf}$$

Initial Effective Stress at midpoint of layer

$$N1_{60L2} := N_{60L2} \cdot .77 \cdot \log \left(40 \frac{\textit{ksf}}{\sigma_{02}'} \right) = 30.704$$

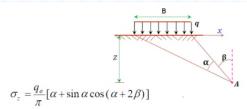
 $C'_2 := 102$

Based on LRFD Figure 10.6.2.4.2b-1

$$z_2 = Elev_{GS} - \left(700.6 \ \textit{ft} - \frac{h_2}{2}\right) = 7.25 \ \textit{ft}$$

depth from bottom of embankment to midpoint of layer

Boussinesq Stress at Depth z From Infinite Load



$$\hat{b} := \frac{B}{2} = 10$$
 ft

$$eta_2 \coloneqq \operatorname{atan}\left(\frac{-b}{z_2}\right) = -0.943$$
 $\alpha_2 \coloneqq \operatorname{atan}\left(\frac{b}{z_2}\right) - \beta_2 = 1.887$

$$\Delta\sigma_{2} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot (\alpha_{2} + \sin(\alpha_{2}) \cdot \cos(\alpha_{2} + 2 \cdot \beta_{2})) = 1.75 \text{ ksf}$$

$$\Delta H_2 \coloneqq h_2 \cdot \frac{1}{C'_2} \cdot \log \left(\frac{\sigma_{02}{'} + \Delta \sigma_2}{\sigma_{02}{'}} \right) = 0.347 \ \textit{in} \qquad \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_2}{\sigma_{02}{'}} = 3.856$$

Layer 3, Elev 696.3 to 693.8 feet, Very Stiff A-6a

$$h_3 = 696.3 \ ft - 693.8 \ ft = 2.5 \ ft$$
 $\gamma_3 = 0.125 \ kcf$

$$N_{60L3}\!\coloneqq\!15$$
 Avg. N60 for this layer

$$\sigma_{03}' \coloneqq \sigma_{02}' + \left(\gamma_2 - \gamma_w\right) \cdot \frac{h_2}{2} + \left(\gamma_3 - \gamma_w\right) \cdot \frac{h_3}{2} = 0.667 \text{ ksf} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$LL_3 \coloneqq 33$$
 $w_3 \coloneqq .24$ $\gamma_{d3} \coloneqq \frac{\gamma_3}{\left(1 + w_3\right)} = 100.806 \; \textit{pcf}$ $G_s \coloneqq 2.72$

$$e_{03} := \frac{G_s \cdot \gamma_w}{\gamma_{d3}} - 1 = 0.684$$

$$C_{r3} := 0.1 \cdot .009 \cdot (LL_3 - 10) = 0.021$$

$$z_3 \coloneqq Elev_{GS} - \left(696.3 \ \textit{ft} - \frac{h_3}{2}\right) = 10.65 \ \textit{ft}$$
 depth from bottom of embankment to midpoint of layer

$$\beta_3 := \operatorname{atan}\left(\frac{-b}{z_3}\right) = -0.754$$
 $\alpha_3 := \operatorname{atan}\left(\frac{b}{z_3}\right) - \beta_3 = 1.508$

$$\Delta\sigma_{3} \coloneqq \frac{\Delta\sigma_{Surface}}{\pi} \cdot (\alpha_{3} + \sin{(\alpha_{3})} \cdot \cos{(\alpha_{3} + 2 \cdot \beta_{3})}) = 1.545 \text{ ksf}$$

$$\Delta H_3 \coloneqq \frac{C_{r3}}{1 + e_{03}} \cdot h_3 \cdot \log \left(\frac{\sigma_{03}' + \Delta \sigma_3}{\sigma_{03}'} \right) = 0.192 \ \textit{in}$$

$$\Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_3}{\sigma_{03}'} = 2.318$$

Layer 4, Elev 693.8 to 686.3 feet, Medium Dense A-3a

 $h_4\!\coloneqq\!693.8~{\it ft}-686.3~{\it ft}=7.5~{\it ft}$ $\gamma_4\!\coloneqq\!0.122~{\it kcf}$ Estimated based on ODOT GDM Table 400-4

 $N_{60L4} = 14$ Avg. N60 for this layer

$$\sigma_{04}' \coloneqq \sigma_{03}' + \left(\gamma_3 - \gamma_w\right) \cdot \frac{h_3}{2} + \left(\gamma_4 - \gamma_w\right) \cdot \frac{h_4}{2} = 0.968 \text{ ksf} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$N1_{60L4} := N_{60L4} \cdot .77 \cdot \log \left(40 \frac{ksf}{\sigma_{04}'} \right) = 17.42$$

 $C'_4 = 53$ Based on LRFD Figure 10.6.2.4.2b-1

$$z_4 \coloneqq Elev_{GS} - \left(693.8 \ \textit{ft} - \frac{h_4}{2}\right) = 15.65 \ \textit{ft}$$
 depth from bottom of embankment to midpoint of layer

Boussinesq Stress at Depth z From Infinite Load

$$\underline{b} \coloneqq \frac{B}{2} = 10 \text{ } \text{ } \text{ } ft \qquad \qquad \beta_4 \coloneqq \operatorname{atan} \left(\frac{-b}{z_4} \right) = -0.569 \qquad \alpha_4 \coloneqq \operatorname{atan} \left(\frac{b}{z_4} \right) - \beta_4 = 1.137$$

$$\Delta \sigma_4 := \frac{\Delta \sigma_{Surface}}{\pi} \cdot (\alpha_4 + \sin(\alpha_4) \cdot \cos(\alpha_4 + 2 \cdot \beta_4)) = 1.261 \text{ ksf}$$

$$\Delta H_4 \coloneqq h_4 \cdot \frac{1}{C_4'} \cdot \log \left(\frac{\sigma_{04}' + \Delta \sigma_4}{\sigma_{04}'} \right) = 0.615 \ \textit{in} \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_4}{\sigma_{04}'} = 1.302$$

Layer 5, Elev 686.3 to 675.3 feet, Medium Dense A-4b

$$h_5\!\coloneqq\!686.3~{\it ft}-675.3~{\it ft}\!=\!11~{\it ft}$$
 $\gamma_5\!\coloneqq\!0.125~{\it kcf}$ Estimated based on ODOT GDM Table 400-4

 $N_{60L5} \coloneqq 21$ Avg. N60 for this layer

$$\sigma_{05}{'} \coloneqq \sigma_{04}{'} + \left(\gamma_4 - \gamma_w\right) \cdot \frac{h_4}{2} + \left(\gamma_5 - \gamma_w\right) \cdot \frac{h_5}{2} = 1.536 \text{ ksf} \qquad \text{Initial Effective Stress at midpoint of layer}$$

$$N1_{60L5} := N_{60L5} \cdot .77 \cdot \log \left(40 \frac{ksf}{\sigma_{05}'} \right) = 22.89$$

Based on LRFD Figure 10.6.2.4.2b-1

$$z_5 = Elev_{GS} - \left(686.3 \ \textbf{ft} - \frac{h_5}{2}\right) = 24.9 \ \textbf{ft}$$

depth from bottom of embankment to midpoint of layer

Boussinesq Stress at Depth z From Infinite Load

$$\underline{b} := \frac{B}{2} = 10 \text{ ft} \qquad \beta_5 := \operatorname{atan}\left(\frac{-b}{z_5}\right) = -0.382 \qquad \alpha_5 := \operatorname{atan}\left(\frac{b}{z_5}\right) - \beta_5 = 0.764$$

$$\Delta \sigma_5 \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot (\alpha_5 + \sin(\alpha_5) \cdot \cos(\alpha_5 + 2 \cdot \beta_5)) = 0.898 \text{ ksf}$$

$$\Delta H_5 \coloneqq h_5 \cdot \frac{1}{C_5'} \cdot \log \left(\frac{\sigma_{05}' + \Delta \sigma_5}{\sigma_{05}'} \right) = 0.586 \quad in \qquad \Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_5}{\sigma_{05}'} = 0.584$$

Layer 6a, Elev 675.3 to 665.3 feet, Medium Stiff to Stiff A-6a

$$h_{6a} = 675.3 \ ft - 665.3 \ ft = 10 \ ft$$
 $\gamma_6 = 120 \ pcf$ $LL_{6ab} = 33$

$$\gamma_6 = 120 \ pcf$$

$$LL_{eab} := 33$$

$$w_{6ab}\coloneqq .26$$
 $\gamma_{d6ab}\coloneqq rac{\gamma_6}{\left(1+w_{6ab}
ight)}=95.238$ $extbf{\it pcf}$ $extbf{\it G}_s\coloneqq 2.72$

$$G_s = 2.72$$

$$e_{06ab} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d6ab}} - 1 = 0.782$$

$$C_{r6ab} \coloneqq 0.1 \cdot .009 \cdot \left(LL_{6ab} - 10 \right) = 0.021$$

$$\sigma_{06a}{'} \coloneqq \sigma_{05}{'} + \left(\gamma_5 - \gamma_w\right) \cdot \frac{h_5}{2} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6a}}{2} = 2.169 \; extbf{\textit{ksf}}$$

Initial Effective Stress at midpoint of layer

$$z_{6a} \coloneqq Elev_{GS} - \left(675.3 \ \textit{ft} - \frac{h_{6a}}{2}\right) = 35.4 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$eta_{6a} := \operatorname{atan}\left(\frac{-b}{z_{6a}}\right) = -0.275$$
 $lpha_{6a} := \operatorname{atan}\left(\frac{b}{z_{6a}}\right) - eta_{6a} = 0.551$

$$\Delta \sigma_{6a} \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot \left(\alpha_{6a} + \sin\left(\alpha_{6a}\right) \cdot \cos\left(\alpha_{6a} + 2 \cdot \beta_{6a}\right)\right) = 0.662 \text{ ksf}$$

$$\Delta H_{6a} \coloneqq \frac{C_{r6ab}}{1 + e_{06ab}} \cdot h_{6a} \cdot \log \left(\frac{\sigma_{06a}' + \Delta \sigma_{6a}}{\sigma_{06a}'} \right) = 0.161 \ \textit{in}$$

$$\Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{6a}}{\sigma_{06a}'} = 0.305$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{6a}}{\sigma_{06a'}} = 0.305$$

Layer 6b, Elev 665.3 to 655.3 feet, Medium Stiff to Stiff A-6a

$$h_{6b} = 665.3 \ \mathbf{ft} - 655.3 \ \mathbf{ft} = 10 \ \mathbf{ft}$$

$$\sigma_{06b}{'} \coloneqq \sigma_{06a}{'} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6a}}{2} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6b}}{2} = 2.745 \text{ ksf} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$z_{6b} \coloneqq Elev_{GS} - \left(665.3 \ \textit{ft} - \frac{h_{6b}}{2}\right) = 45.4 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_{6b} \coloneqq \operatorname{atan}\left(\frac{-b}{z_{6b}}\right) = -0.217$$
 $\alpha_{6b} \coloneqq \operatorname{atan}\left(\frac{b}{z_{6b}}\right) - \beta_{6b} = 0.434$

$$\Delta \sigma_{6b} \coloneqq \frac{\Delta \sigma_{Surface}}{\pi} \cdot \left(\alpha_{6b} + \sin\left(\alpha_{6b}\right) \cdot \cos\left(\alpha_{6b} + 2 \cdot \beta_{6b}\right)\right) = 0.527 \text{ ksf}$$

$$\Delta H_{6b} := \frac{C_{r6ab}}{1 + e_{06ab}} \cdot h_{6b} \cdot \log \left(\frac{\sigma_{06b}' + \Delta \sigma_{6b}}{\sigma_{06b}'} \right) = 0.106 \ \textit{in}$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{6b}}{\sigma_{06b}'} = 0.192$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{6b}}{\sigma_{06b}'} = 0.192$$

Layer 6c, Elev 655.3 to 645.8 feet, Medium Stiff to Stiff A-6a

$$h_{6c} \coloneqq 655.3 \ \textit{ft} - 645.8 \ \textit{ft} = 9.5 \ \textit{ft}$$
 $\gamma_6 \coloneqq 120 \ \textit{pcf}$ $LL_{6c} \coloneqq 36$

$$\gamma_6 = 120 \ pct$$

$$LL_{e_a} = 36$$

$$w_{6c} \coloneqq .31$$
 $\gamma_{d6c} \coloneqq \frac{\gamma_6}{\langle 1 + w_{6c} \rangle} = 91.603 \; \textit{pcf}$

$$e_{06c} := \frac{G_s \cdot \gamma_w}{\gamma_{d6c}} - 1 = 0.853$$
 $C_{r6c} := 0.1 \cdot .009 \cdot (LL_{6c} - 10) = 0.023$

$$\sigma_{06c}' \coloneqq \sigma_{06b}' + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6b}}{2} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6c}}{2} = 3.306 \text{ \textit{ksf}} \text{ Initial Effective Stress at midpoint of layer}$$

$$z_{6c} \coloneqq Elev_{GS} - \left(655.3 \ \textit{ft} - \frac{h_{6c}}{2}\right) = 55.15 \ \textit{ft} \qquad \text{depth from bottom of embankment to midpoint of layer}$$

$$\beta_{6c} \coloneqq \operatorname{atan}\left(\frac{-b}{z_{6c}}\right) = -0.179$$
 $\alpha_{6c} \coloneqq \operatorname{atan}\left(\frac{b}{z_{6c}}\right) - \beta_{6c} = 0.359$

$$\Delta \sigma_{6c} \coloneqq \frac{\Delta \sigma_{Surface}}{\sigma} \cdot \left(\alpha_{6c} + \sin\left(\alpha_{6c}\right) \cdot \cos\left(\alpha_{6c} + 2 \cdot \beta_{6c}\right)\right) = 0.438 \text{ ksf}$$

$$\Delta H_{6c} \coloneqq \frac{C_{r6c}}{1 + e_{06c}} \cdot h_{6c} \cdot \log \left(\frac{\sigma_{06c}' + \Delta \sigma_{6c}}{\sigma_{06c}'} \right) = 0.078 \ \textit{in}$$

$$\Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{6c}}{\sigma_{06c}'} = 0.132$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{6c}}{\sigma_{06c}} = 0.132$$

Layer 7a, Elev 645.8 to 639.6 feet, Stiff to Very Stiff A-6a

$$h_{7a} = 645.8 \ ft - 639.6 \ ft = 6.2 \ ft$$
 $\gamma_7 = 122 \ pcf$ $LL_7 = 36$

$$LL_7 := 36$$

$$C_{r7} = 0.1 \cdot .009 \cdot (LL_7 - 10) = 0.023$$

$$w_7 = .2$$

$$\gamma_{d7} \coloneqq \frac{\gamma_7}{(1+w_7)} = 96.825 \; \textit{pcf} \qquad e_{07} \coloneqq \frac{G_s \cdot \gamma_w}{\gamma_{d7}} - 1 = 0.753$$

$$e_{07} = \frac{G_s \cdot \gamma_w}{\gamma_{d7}} - 1 = 0.753$$

$$\sigma_{07a}{'} \coloneqq \sigma_{06c}{'} + \left(\gamma_6 - \gamma_w\right) \cdot \frac{h_{6c}}{2} + \left(\gamma_7 - \gamma_w\right) \cdot \frac{h_{7a}}{2} = 3.765 \text{ \textit{ksf}} \quad \text{Initial Effective Stress at midpoint of layer}$$

$$z_{7a}\!\coloneqq\!Elev_{GS}\!-\!\left(\!645.8\;\textbf{\textit{ft}}\!-\!\frac{h_{7a}}{2}\!\right)\!=\!63\;\textbf{\textit{ft}}\qquad \qquad \text{depth from bottom of MSE to midpoint of layer}$$

$$\beta_{7a} := \operatorname{atan}\left(\frac{-b}{z_{7a}}\right) = -0.157$$

$$eta_{7a} \coloneqq \operatorname{atan}\left(\frac{-b}{z_{7a}}\right) = -0.157$$
 $lpha_{7a} \coloneqq \operatorname{atan}\left(\frac{b}{z_{7a}}\right) - eta_{7a} = 0.315$

$$\Delta\sigma_{7a} := \frac{\Delta\sigma_{Surface}}{\pi} \cdot \left(\alpha_{7a} + \sin\left(\alpha_{7a}\right) \cdot \cos\left(\alpha_{7a} + 2 \cdot \beta_{7a}\right)\right) = 0.385 \text{ ksf}$$

$$\Delta H_{7a} \coloneqq \frac{C_{r7}}{1 + e_{07}} \cdot h_{7a} \cdot \log \left(\frac{\sigma_{07a}' + \Delta \sigma_{7a}}{\sigma_{07a}'} \right) = 0.042 \ \textit{in}$$

$$\Delta \sigma_{percentchange} \coloneqq \frac{\Delta \sigma_{7a}}{\sigma_{07a}'} = 0.102$$

$$\Delta \sigma_{percentchange} := \frac{\Delta \sigma_{7a}}{\sigma_{07a'}} = 0.102$$

Percent change in stress less than 10%, so end analysis here

Total Settlement (including granular layers)

$$S_T := \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4 + \Delta H_5 + \Delta H_{6a} + \Delta H_{6b} + \Delta H_{6c} + \Delta H_{7a} = 2.887$$
 in

Settlement of granular layers, including nonplastic silt. Assumed to occur during construction or upon completion.

$$S_{Granular} := \Delta H_1 + \Delta H_2 + \Delta H_4 + \Delta H_5 = 2.307$$
 in

Settlement of cohesive layers

$$S_{Cohesive} \coloneqq \Delta H_3 + \Delta H_{6a} + \Delta H_{6b} + \Delta H_{6c} + \Delta H_{7a} = 0.579 ~ \textit{in}$$

Estimated Rate of Consolidation - cv estimates based on 2022 NAVFAC DM7.01, Liquid Limit correlation chart, assuming the lower bound for overconsolidated clays

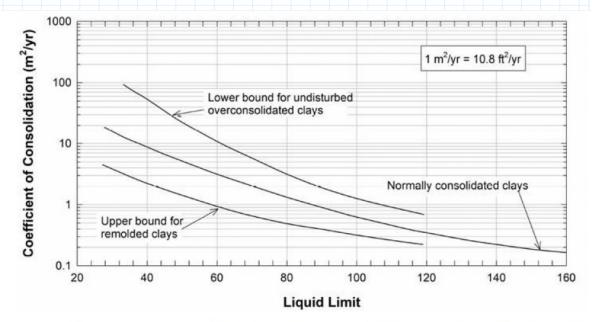


Figure 8-50 Approximate Relationship between Coefficient of Consolidation and Liquid Limit

Drilled Shaft Downdrag and Settlement Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Rear Abutment

Project: CUY-17-13.50 **Structure:** Rear Abutment

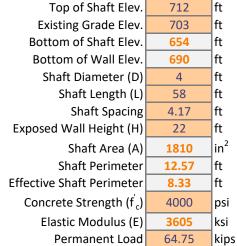
Computed By: AKB
Checked By: DCM
Updated By: AKB
Checked By: DMV

Date: 4/2/2025
Date: 4/3/2025
Date: 7/10/2025
Date: 7/12/2025

4' Diameter Drilled Shaft Downdrag Analyses

SME's abutment settlement analysis indicates 1.03 inches of settlement predicted at the rear abutment after construction. As this is greater than the settlement threshold of 0.4 inches, drilled shaft downdrag calculations have been performed in general accordance with ODOT GDM Sections 1304.5 and 1306.2.2, and ODOT BDM Section 305.4.1.2. Load Transfer values were obtained from the t-z curves (side resistance) and Q-w curves (tip resistance) in the SHAFT analysis. The side friction values were adjusted to use the box perimeter, considering the shafts will be tangent. The assumed shaft settlement was iteratively adjusted until the sum of the permanent load and skin friction above the neutral plane was approximately equal to the sum of the tip resistance and side resistance below the neutral plane.

Shaft Properties



Top of Shaft - Bottom of Shaft

Top of Shaft - Bottom of Wall

Assumed Shaft Settlement 0.57 inches

110.85

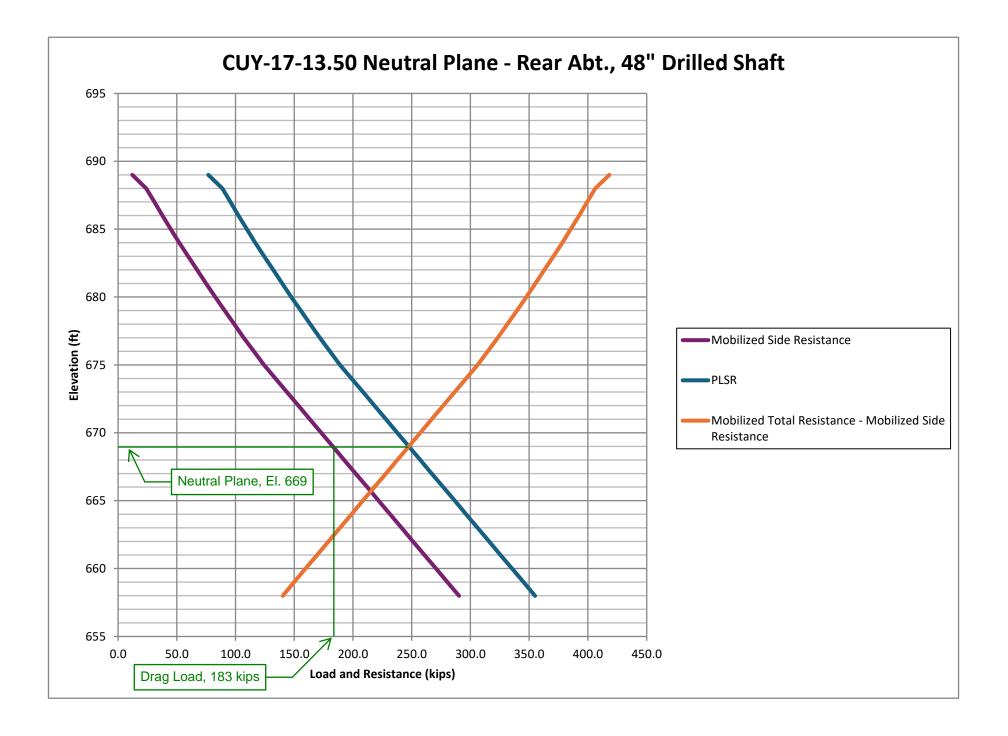
kips

Neutral Plane Elev. 669 ft
Permanent Load + Side Resistance
Above NP
Tip Resistance + Side Resistance
Below NP
Drag Load 182.8 kips

Mobilized Tip Resistance

15.54 kips/ft per HDR Structures

		Assumed Shaft Settlement of 0.57 inches								
				Incremental	Permanent Load + Mobilized Total					
				Side	Mobilized Side	Mobilized Side	Resistance -			
			Unit Load	Resistance	Resistance	Resistance (PLSR)	Mobilized Side			
Lavor	Elev. (ft)	Depth (ft)	Transfer, t (psi)	(kips)	(kips)	(kips)	Resistance (kips)			
Layer 3	689	23	10.02	12.0	12.0	76.8	418.3			
3	688	24	10.02	12.0	24.0	88.8	406.2			
4	687	25	5.69	6.8	30.9	95.6	399.4			
4	686	26	5.69	6.8	37.7	102.5	392.6			
4	685	27	5.97	7.2	44.9	102.5	385.4			
4	684	28	5.97	7.2	52.0	116.8	378.2			
4	683	29	6.37	7.6	59.7	124.4	370.6			
4	682	30	6.37	7.6	67.3	132.1	363.0			
4	681	31	6.37	7.6	75.0	139.7	355.3			
4	680	32	6.37	7.6	82.6	147.4	347.7			
4	679	33	6.77	8.1	90.8	155.5	339.5			
4	678	34	6.77	8.1	98.9	163.6	331.4			
4	677	35	6.77	8.1	107.0	171.8	323.3			
4	676	36	7.17	8.6	115.6	180.4	314.7			
4	675	37	7.17	8.6	124.2	189.0	306.1			
5a	674	38	8.13	9.8	134.0	198.7	296.3			
5a	673	39	8.13	9.8	143.7	208.5	286.5			
5a	672	40	8.13	9.8	153.5	218.3	276.8			
5a	671	41	8.13	9.8	163.3	228.0	267.0			
5a	670	42	8.13	9.8	173.0	237.8	257.3			
5a	669	43	8.13	9.8	182.8	247.5	247.5			
5a	668	44	8.13	9.8	192.5	257.3	237.7			
5a	667	45	8.13	9.8	202.3	267.1	228.0			
5a	666	46	8.13	9.8	212.1	276.8	218.2			
5a	665	47	8.13	9.8	221.8	286.6	208.5			
5b	664	48	8.13	9.8	231.6	296.3	198.7			
5b	663	49	8.13	9.8	241.3	306.1	188.9			
5b	662	50	8.13	9.8	251.1	315.9	179.2			
5b	661	51	8.13	9.8	260.9	325.6	169.4			
5b	660	52	8.13	9.8	270.6	335.4	159.7			
5b	659	53	8.13	9.8	280.4	345.1	149.9			
5b	658	54	8.13	9.8	290.2	354.9	140.1			
5b	657	55	8.13	9.8	299.9	364.7	130.4			
5b	656	56	8.13	9.8	309.7	374.4	120.6			
5b	655	57	8.13	9.8	319.4	384.2	110.8			
6	654	58	5.66	6.8	326.2	391.0	104.1			
	037	3	5.00	0.0	520.2	331.0	10-7.1			



Rear Abutment t-z Curve Output from SHAFT

t-z curves (averaged)

X Axial Displacement, z (in)Y Unit Load Transfer, t (lbs/in^2)

	D=24 ft	D=25 ft	D=27.25 ft	D=30.5 ft	D=33.75 ft	D=37 ft	D=38 ft	D=42 ft	D=47 ft	D=52 ft	D=57 ft	D=58 ft
х	Υ	Υ	Υ	Y	Y	Υ	Υ	Υ	Υ	Υ	Υ	Y
0	0	0	0	0	0	0	0	0	0	0	0	0
0.048	3.480	1.978	2.074	2.213	2.352	2.491	4.480	4.480	4.480	4.480	4.480	3.117
0.096	6.025	3.424	3.591	3.831	4.072	4.313	6.325	6.325	6.325	6.325	6.325	4.400
0.144	7.479	4.251	4.457	4.756	5.055	5.354	7.906	7.906	7.906	7.906	7.906	5.500
0.24	8.934	5.077	5.324	5.681	6.038	6.395	8.126	8.126	8.126	8.126	8.126	5.653
0.288	9.453	5.372	5.634	6.011	6.389	6.767	8.302	8.302	8.302	8.302	8.302	5.775
0.384	9.869	5.608	5.881	6.276	6.670	7.064	8.389	8.389	8.389	8.389	8.389	5.836
0.576	10.025	5.697	5.974	6.375	6.775	7.175	8.126	8.126	8.126	8.126	8.126	5.653
0.768	9.973	5.667	5.943	6.342	6.740	7.138	7.906	7.906	7.906	7.906	7.906	5.500
4.8	9.869	5.608	5.881	6.276	6.670	7.064	7.335	7.335	7.335	7.335	7.335	5.103

For assumed drilled shaft settlement of 0.57 inches:

	D=24 ft	D=25 ft	D=27.25 ft	D=30.5 ft	D=33.75 ft	D=37 ft	D=38 ft	D=42 ft	D=47 ft	D=52 ft	D=57 ft	D=58 ft
х	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ
0.57	10.020	5.694	5.971	6.372	6.772	7.172	8.134	8.134	8.134	8.134	8.134	5.659

Rear Abutment Q-w Curve Output from SHAFT

Q-w curves (averaged)

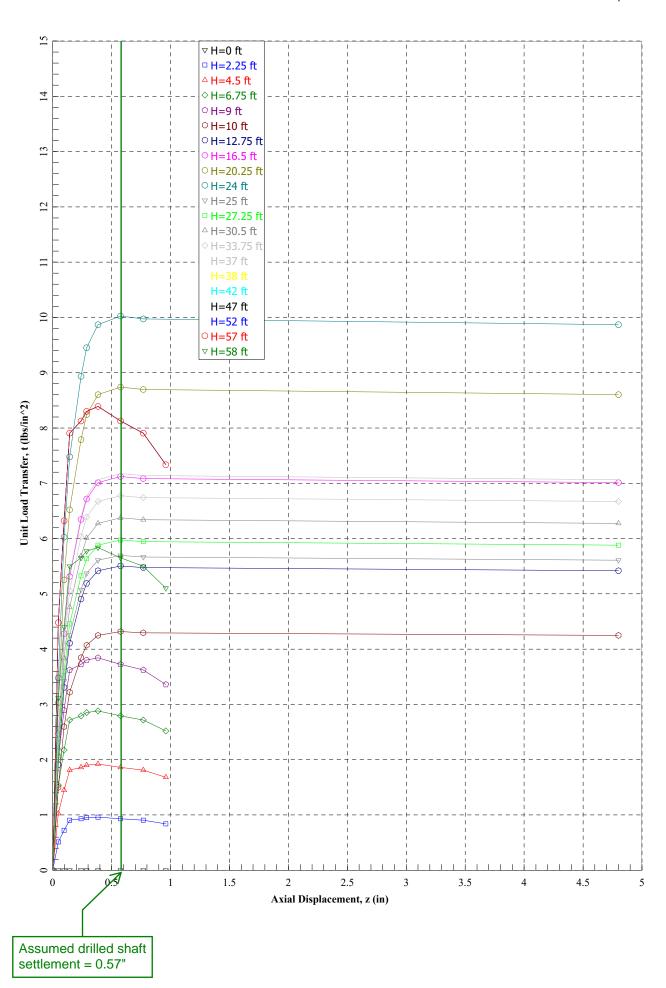
X Tip Displacement, w (in) Y Tip Load, Q (tons)

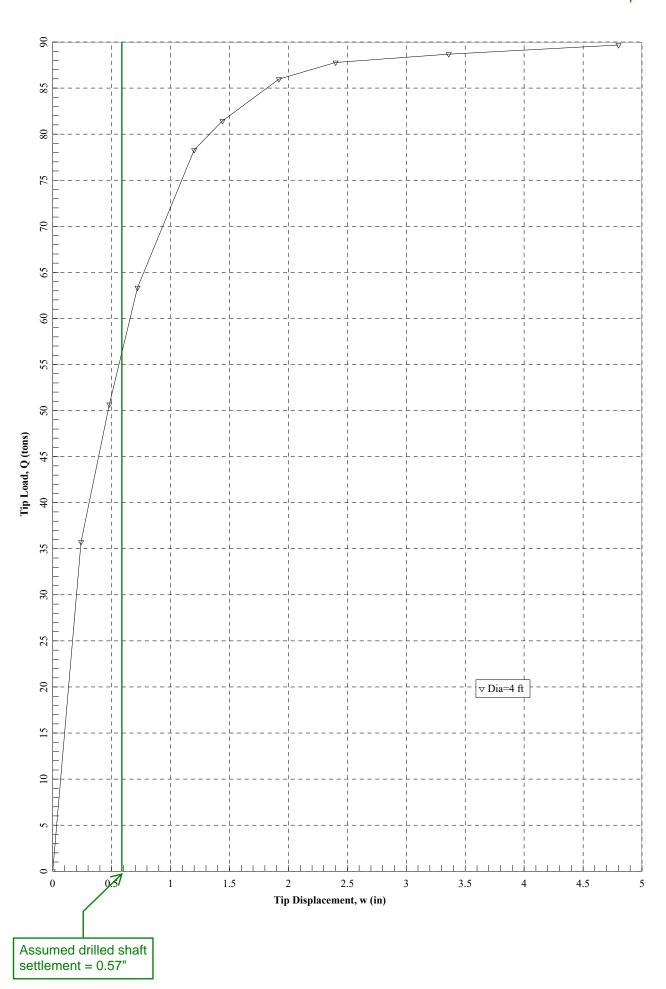
Dia=4 ft

X	Y
0	0
0.240	35.743
0.480	50.674
0.720	63.343
1.200	78.274
1.440	81.441
1.920	85.965
2.400	87.775
3.360	88.680
4.800	89.675

For assumed drilled shaft settlement of 0.57 inches:

X	Υ
0.57	55.425





 Project:
 CUY-17-13.50
 Computed By:
 AKB
 Date:
 4/2/2025

 Structure:
 Rear Abutment
 Checked By:
 DCM
 Date:
 4/3/2025

 Updated By:
 AKB
 Date:
 7/10/2025

 Checked By:
 DMV
 Date:
 7/12/2025

4' Diameter Drilled Shaft Settlement

Top of Shaft Elev.	712	ft
Neutral Plane Elev.	669	ft
Permanent Load	64.8	kips
Drag Force	182.8	kips
Shaft Area (A)	1810	in ²
Elastic Modulus (E)	3605	ksi

Compression = Unfactored Axial Load * Shaft Length

Shaft Area * Elastic Modulus

Total Shaft Settlement

0.29 in

Total settlement includes elastic compression of the shaft above the neutral plane and settlement of the underlying soil below the neutral plane per the ODOT BDM, Section 305.4.1.2 and 305.3.2.2.

Soil Layers, Type, and Settlement (Per SME)

Juli Layers, Type, and Je	thement (rei 3iv	<u> </u>				
				Incremental	Тор	Bottom
			Layer Thickness	Consolidation	Consolidation	Consolidation
Layer	Top Elev. (ft)	Bottom Elev. (ft)	(ft)	Settlement (in)	Settlement (in)	Settlement (in)
1	706	703.4	2.6	0.655	1.026	0.371
2	703.4	694.6	8.8	0	0.371	0.371
3	694.6	687.6	7	0	0.371	0.371
4	687.6	674.6	13	0	0.371	0.371
5a	674.6	664.6	10	0.148	0.371	0.223
5b	664.6	654.6	10	0.09	0.223	0.133
6	654.6	643.8	10.8	0.097	0.133	0.036
7a	643.8	633.8	10	0.036	0.036	0

Immediate settlement is assumed to occur during construction.

Shaft Settlement

643.8	633.8	10	0.036	0.036	0
				Incremental	Ī
		Total Soil	Incremental Soil	Elastic	
		Consolidation	Consolidation	Compression of	
Soil Layer	Elevation (ft)	Settlement (in)	Settlement (in)	Shaft (in)	
New Fill	712	0.37	0.00	0.0005	Top of Shaft
New Fill	711	0.37	0.00	0.0005	Top or share
New Fill	710	0.37	0.00	0.0005	
New Fill	709	0.37	0.00	0.0005	
New Fill	708	0.37	0.00	0.0005	
New Fill	707	0.37	0.00	0.0005	†
New Fill	706	0.37	0.00	0.0005	
New Fill	705	0.37	0.00	0.0005	
New Fill	704	0.37	0.00	0.0005	
New Fill	703	0.37	0.00	0.0005	
2	702	0.37	0.00	0.0005	
2	701	0.37	0.00	0.0005	
2	700	0.37	0.00	0.0005	
2	699	0.37	0.00	0.0005	
2	698	0.37	0.00	0.0005	
2	697	0.37	0.00	0.0005	
2	696	0.37	0.00	0.0005	
2	695	0.37	0.00	0.0005	
3	694	0.37	0.00	0.0005	
3	693	0.37	0.00	0.0005	
3	692	0.37	0.00	0.0005	
3	691	0.37	0.00	0.0005	
3	690	0.37	0.00	0.0005	
3	689	0.37	0.00	0.0005	
3	688	0.37	0.00	0.0005	
4	687	0.37	0.00	0.0005	
4	686	0.37	0.00	0.0005	
4	685	0.37	0.00	0.0005	
4	684 683	0.37 0.37	0.00	0.0005 0.0005	
4	682	0.37	0.00	0.0005	
4	681	0.37	0.00	0.0005	
4	680	0.37	0.00	0.0005	
4	679	0.37	0.00	0.0005	
4	678	0.37	0.00	0.0005	
4	677	0.37	0.00	0.0005	†
4	676	0.37	0.00	0.0005	
4	675	0.37	0.00	0.0005	†
5a	674	0.36	0.00	0.0005	
5a	673	0.35	0.00	0.0005	
5a	672	0.33	0.00	0.0005	
5a	671	0.32	0.00	0.0005	
5a	670	0.30	0.00	0.0005	
5a	669	0.29	0.00	0.0005	Neutral Plane
5a	668	0.27	0.01	0.0000	
5a	667	0.26	0.01	0.0000	
5a	666	0.24	0.01	0.0000	
5a	665	0.23	0.01	0.0000	
5b	664	0.22	0.01	0.0000	
5b	663	0.21	0.01	0.0000	
5b	662	0.20	0.01	0.0000	
5b	661	0.19	0.01	0.0000	
5b	660	0.18	0.01	0.0000	
5b	659	0.17	0.01	0.0000	
5b	658	0.16	0.16	0.0000	
5b	657	0.15	0.15	0.0000	
5b 5b	656 655	0.15 0.14	0.15 0.14	0.0000	
6	654	0.14	0.14	0.0000	
0	034	0.13	0.13	5.0000	Į

Docusign Envelope ID: 53D18AFC-3920-4108-9DB1-AC5A8B1DDB52

Forward Abutment

<u>Project:</u> CUY-17-13.50<u>Structure:</u> Forward Abutment

Computed By: AKB
Checked By: DCM
Updated By: AKB
Checked By: DMV

Date: 4/2/2025
Date: 4/3/2025
Date: 7/10/2025
Date: 7/12/2025

4' Diameter Drilled Shaft Downdrag Analyses

SME's abutment settlement analysis indicates 0.58 inches of settlement predicted at the forward abutment after construction. As this is greater than the settlement threshold of 0.4 inches, drilled shaft downdrag calculations have been performed in general accordance with ODOT GDM Sections 1304.5 and 1306.2.2, and ODOT BDM Section 305.4.1.2. Load Transfer values were obtained from the t-z curves (side resistance) and Q-w curves (tip resistance) in the SHAFT analysis. The side friction values were adjusted to use the box perimeter, considering the shafts will be tangent. The assumed shaft settlement was iteratively adjusted until the sum of the permanent load and skin friction above the neutral plane was approximately equal to the sum of the tip resistance and side resistance below the neutral plane.

Shaft Properties

Top of Shaft Elev. 710 ft Existing Grade Elev. 702.3 ft Bottom of Shaft Elev. **670** ft 697.5 Bottom of Wall Elev. ft Shaft Diameter (D) 4 ft Shaft Length (L) 40 ft **Shaft Spacing** 4.17 ft Exposed Wall Height (H) 12.5 ft in² Shaft Area (A) 1810 **Shaft Perimeter** 12.57 ft **Effective Shaft Perimeter** ft 8.33 Concrete Strength (f_c) 4000 psi Elastic Modulus (E) 3605 ksi Permanent Load 64.75 kips

Top of Shaft - Bottom of Shaft

Top of Shaft - Bottom of Wall

15.54 kips/ft per HDR Structures

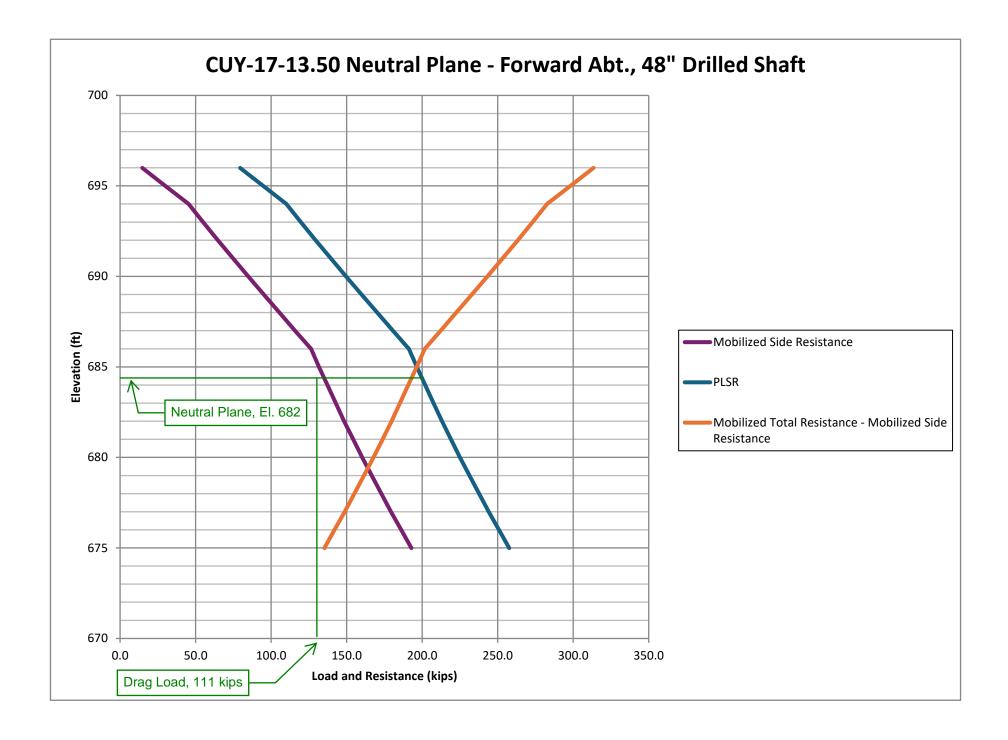
Assumed Shaft Settlement 0.73 inches
Mobilized Tip Resistance 135.26 kips

Neutral Plane Elev. 685 ft

Permanent Load + Side Resistance
 Above NP

Tip Resistance + Side Resistance
 Below NP
 Drag Load 131.7 kips

Layer				Incremental		Permanent Load +	Mobilized Total
Layer						T Cillianciic Load 1	Widdinzed Total
Layer				Side	Mobilized Side	Mobilized Side	Resistance -
Layer			Unit Load	Resistance	Resistance	Resistance (PLSR)	Mobilized Side
	Elev. (ft)	Depth (ft)	Transfer, t (psi)	(kips)	(kips)	(kips)	Resistance (kips)
4	696	14	12.23	14.7	14.7	79.4	313.5
4	695	15	12.72	15.3	29.9	94.7	298.2
4	694	16	12.85	15.4	45.3	110.1	282.8
4	693	17	8.02	9.6	55.0	119.7	273.2
4	692	18	8.14	9.8	64.7	129.5	263.4
4	691	19	8.38	10.1	74.8	139.5	253.4
4	690	20	8.38	10.1	84.8	149.6	243.3
5	689	21	8.61	10.3	95.2	159.9	233.0
5	688	22	8.61	10.3	105.5	170.3	222.6
5	687	23	8.61	10.3	115.8	180.6	212.3
5	686	24	8.84	10.6	126.5	191.2	201.7
5	685	25	4.40	5.3	131.7	196.5	196.4
5	684	26	4.62	5.5	137.3	202.0	190.9
5	683	27	4.62	5.5	142.8	207.6	185.3
5	682	28	4.62	5.5	148.4	213.1	179.8
5	681	29	4.96	6.0	154.3	219.1	173.8
5	680	30	4.96	6.0	160.3	225.0	167.9
5	679	31	5.30	6.4	166.6	231.4	161.5
5a	678	32	5.30	6.4	173.0	237.8	155.1
6a	677	33	5.30	6.4	179.4	244.1	148.8
6a	676	34	5.63	6.8	186.1	250.9	142.0
6a	675	35	5.63	6.8	192.9	257.6	135.3
6a	674	36	5.63	6.8	199.6	264.4	128.5
6a	673	37	5.63	6.8	206.4	271.2	121.7
6a	672	38	5.63	6.8	213.2	277.9	115.0
6a	671	39	5.63	6.8	219.9	284.7	108.2
6a	670	40	5.63	6.8	226.7	291.4	101.5



Forward Abutment t-z Curve Output from SHAFT

t-z curves (averaged)

X Axial Displacement, z (in)
Y Unit Load Transfer, t (lbs/in^2)

	D=14.27 ft	D=14.85 ft	D=16 ft	D=17 ft	D=18 ft	D=20 ft	D=22 ft	D=24 ft	D=25 ft	D=26.75 ft	D=29.5 ft	D=32.25 ft	D=35 ft	D=36 ft	D=42.25 ft
X	Υ	Υ	Υ	Υ	Υ	Y	Υ	Υ	Υ	Υ	Υ	Υ	Y	Y	Y
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.048	6.890	7.167	7.240	2.795	2.838	2.921	3.002	3.082	1.535	1.611	1.729	1.848	1.964	3.311	3.311
0.096	9.727	10.119	10.221	4.838	4.913	5.057	5.197	5.335	2.658	2.789	2.994	3.199	3.400	4.675	4.675
0.144	12.158	12.648	12.776	6.006	6.099	6.278	6.452	6.623	3.300	3.462	3.717	3.971	4.220	5.844	5.844
0.24	12.496	12.999	13.131	7.174	7.284	7.499	7.707	7.911	3.942	4.135	4.439	4.743	5.041	6.006	6.006
0.288	12.766	13.281	13.415	7.591	7.708	7.935	8.155	8.371	4.171	4.376	4.697	5.019	5.334	6.136	6.136
0.384	12.901	13.421	13.557	7.925	8.047	8.284	8.513	8.739	4.354	4.568	4.904	5.240	5.569	6.201	6.201
0.576	12.496	12.999	13.131	8.050	8.174	8.415	8.647	8.877	4.423	4.640	4.981	5.322	5.657	6.006	6.006
0.768	12.158	12.648	12.776	8.008	8.131	8.371	8.603	8.831	4.400	4.616	4.955	5.295	5.627	5.844	5.844
0.96	11.280	11.735	11.853	7.925	8.047	8.284	8.513	8.739	4.354	4.568	4.904	5.240	5.569	5.422	5.422

For assumed drilled shaft settlement of 0.73 inches:

	D=14.27 ft	D=14.85 ft	D=16 ft	D=17 ft	D=18 ft	D=20 ft	D=22 ft	D=24 ft	D=25 ft	D=26.75 ft	D=29.5 ft	D=32.25 ft	D=35 ft	D=36 ft	D=42.25 ft
х	Υ	Υ	Υ	Υ	Y	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Y
0.73	12.225	12.718	12.846	8.017	8.140	8.380	8.612	8.840	4.405	4.621	4.961	5.300	5.633	5.876	5.876

Forward Abutment Q-w Curve Output from SHAFT

Q-w curves (averaged)

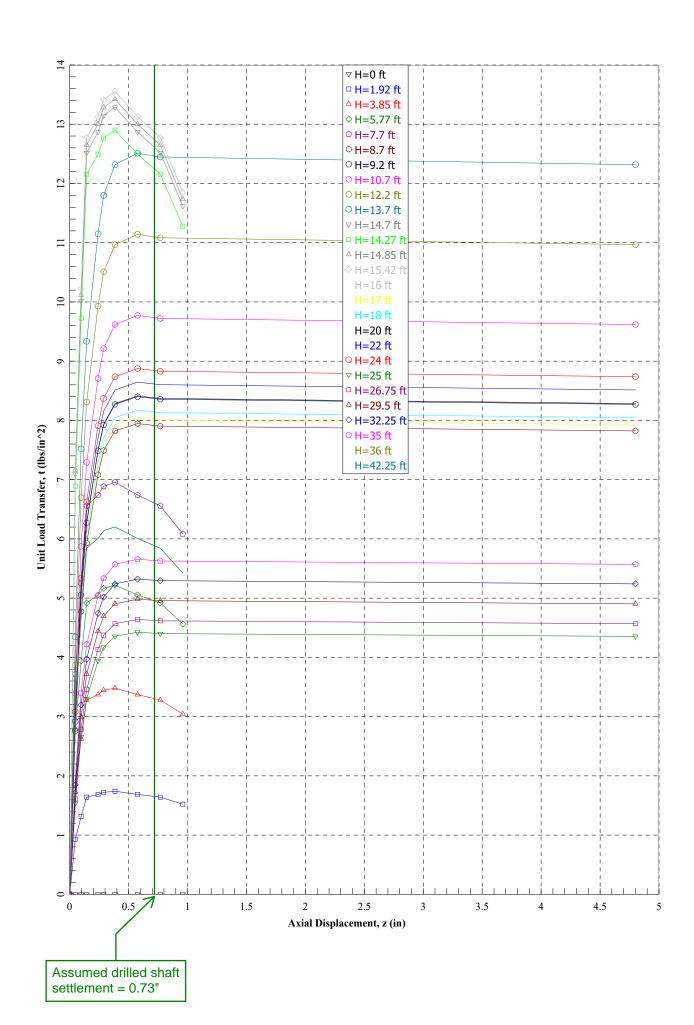
X Tip Displacement, w (in)
Y Tip Load, Q (tons)

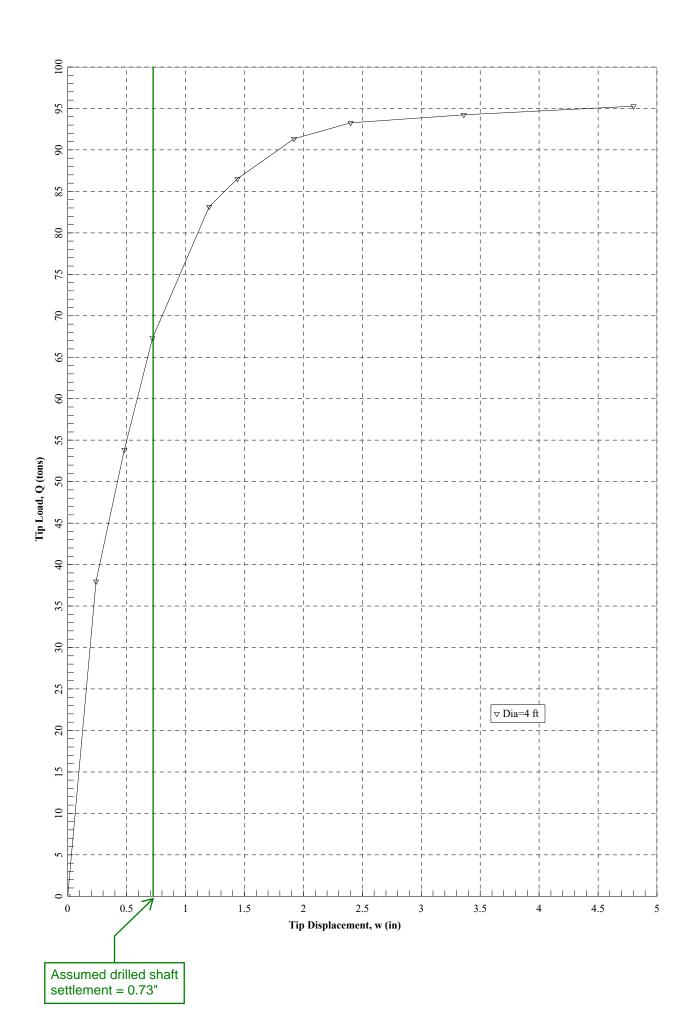
Dia=4 ft

X	Υ
0	0
0.240	37.977
0.480	53.841
0.720	67.302
1.200	83.166
1.440	86.531
1.920	91.338
2.400	93.261
3.360	94.222
4.800	95.280

For assumed drilled shaft settlement of 0.73 inches:

Х	Υ
0.73	67 632





Project: Structure: CUY-17-13.50 Forward Abutment

lin

Computed By: AKB
Checked By: DCM
Updated By: AKB
Checked By: DMV

Date: 4/2/2025
Date: 4/3/2025
Date: 7/10/2025
Date: 7/12/2025

4' Diameter Drilled Shaft Settlement

Compression =

Top of Shaft Elev.	710	ft
Neutral Plane Elev.	685	ft
Permanent Load	64.8	kips
Drag Force	131.7	kips
Shaft Area (A)	1810	in ²
Elastic Modulus (E)	3605	ksi

Unfactored Axial Load * Shaft Length
Shaft Area * Elastic Modulus

Total Shaft Settlement 0.40

Total settlement includes elastic compression of the shaft above the neutral plane and settlement of the underlying soil below the neutral plane per the ODOT BDM, Section 305.4.1.2 and 305.3.2.2. Immediate settlement is assumed to occur during construction.

Soil Layers, Type, and Settlement (Per SME)

son eavers, Type, and settlement (1 et sivie)								
				Incremental	Тор	Bottom		
		Bottom Elev.	Layer Thickness	Consolidation	Consolidation	Consolidation		
Layer	Top Elev. (ft)	(ft)	(ft)	Settlement (in)	Settlement (in)	Settlement (in)		
1	705.7	700.6	5.1	0	0.579	0.579		
2	700.6	696.3	4.3	0	0.579	0.579		
3	696.3	693.8	2.5	0.192	0.579	0.387		
4	693.8	686.3	7.5	0	0.387	0.387		
5	686.3	675.3	11	0	0.387	0.387		
6a	675.3	665.3	10	0.161	0.387	0.226		
6b	665.3	655.3	10	0.106	0.226	0.12		
6c	655.3	645.8	9.5	0.078	0.12	0.042		
7a	645.8	639.6	6.2	0.042	0.042	0		

Shaft Settlement

		Total Soil	Incremental Soil	Incremental	
		Consolidation	Consolidation	Elastic	
		Settlement (in)	Settlement (in)	Compression of	
Soil Layer	Elevation (ft)	Settlement (m)	Settlement (m)	Shaft (in)	
New Fill	710	0.58	0.00	0.0004	Top of Shaft
New Fill	709	0.58	0.00	0.0004	
New Fill	708	0.58	0.00	0.0004	
New Fill	707	0.58	0.00	0.0004	
New Fill	706	0.58	0.00	0.0004	
New Fill	705	0.58	0.00	0.0004	
New Fill	704	0.58	0.00	0.0004	
New Fill	703	0.58	0.00	0.0004	
New Fill	702	0.58	0.00	0.0004	
1	701	0.58	0.00	0.0004	
2	700	0.58	0.00	0.0004	
2	699	0.58	0.00	0.0004	
2	698	0.58	0.00	0.0004	
2	697	0.58	0.00	0.0004	
3	696	0.56	0.00	0.0004	
3	695	0.48	0.00	0.0004	
3	694	0.40	0.00	0.0004	
4	693	0.39	0.00	0.0004	
4	692	0.39	0.00	0.0004	
4	691	0.39	0.00	0.0004	
4	690	0.39	0.00	0.0004	
4	689	0.39	0.00	0.0004	
4	688	0.39	0.00	0.0004	
4	687	0.39	0.00	0.0004	
5	686	0.39	0.00	0.0004	
5	685	0.39	0.00	0.0004	Neutral Plane
5	684	0.39	0.00	0.0000	
5	683	0.39	0.00	0.0000	
5	682	0.39	0.00	0.0000	
5	681	0.39	0.00	0.0000	
5	680	0.39	0.00	0.0000	
5	679	0.39	0.00	0.0000	
5	678	0.39	0.00	0.0000	
5	677	0.39	0.00	0.0000	
5	676	0.39	0.00	0.0000	
6a	675	0.38	0.02	0.0000	
6a	674	0.37	0.02	0.0000	
6a	673	0.35	0.02	0.0000	
6a	672	0.33	0.33	0.0000	
6a	671	0.32	0.32	0.0000	
6a	670	0.30	0.30	0.0000	

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Global Unit Definitions:

$$lb \equiv lbf \quad k \equiv 1000 \quad lb \quad ksi \equiv \frac{k}{in^2} \quad klf \equiv \frac{k}{ft} \quad ksf \equiv \frac{k}{ft^2} \quad kcf \equiv \frac{k}{ft^3} \quad psi \equiv \frac{lb}{in^2} \quad psf \equiv \frac{lb}{ft^2} \quad plf \equiv \frac{lb}{ft} \quad pcf \equiv \frac{lb}{ft^3}$$

Design Criteria:

- AASHTO LRFD Bridge Design Specifications, 9th Edition 2020 (LRFD)
- ODOT BDM 2020 (BDM) (Dated 1/17/2025)

Methodology & Assumptions:

- Determine geometry based on wall lengths and elevations shown from Stage 3 submission.

General Inputs:

Concrete Compressive Strength: $f_c := 4000 \cdot psi$ BDM 304.2.1, Class QC1

Reinforcing Yield Strength: $f_v = 60 \cdot ksi$

Concrete Unit Weight: $w_c := 0.145 \cdot kcf$ (For property calculations)

Concrete Self-Weight: $\gamma_c = 0.150 \cdot kcf$ (For weight calculations)

Subject: Stage 3 Design Task: Cantilever Wall Design Job #: 10336513 Computed by: GDS Date: 5/28/25 Checked: JTW Date: 5/29/22

Wall Design:

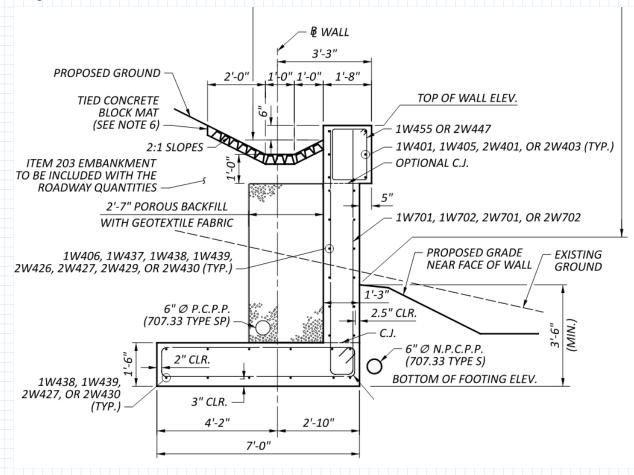
Design wall for the following according to BDM 307.1:

- Resistance to Horizontal Forces (LRFD 10.6.3.4)
- Limiting Eccentricity & Overturning Resistance (LRFD 11.6.3.3)
- Bearing Resistance (LRFD 10.6.3.1)
- Structural Resistance to Applied Loads (LRFD Section 5)

Design Section Location & Dimensions:

- Use geometry at Wall 1 station 2+62.07, because it is the tallest. Round up to nearest foot in height and assume 80% of the height for designing the earth load to account for height of wall sloping down and being integral with the tangent drilled shaft wall facing.
- Design based on the Wall 1. Wall 2 is shorter and design will be conservative.

Design Section Sketch:



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Wall Loading:

Wall & Footing Self-Weight:

Height of Stem for earth:

Wall Thickness:

Weight of Wall Stem:

Footing Depth:

Width of Footing Toe:

Width of Footing Heel:

Footing Width:

Weight of Wall Footing:

Cutoff Wall Depth:

Cutoff Wall Thickness:

Weight of Cutoff Wall:

 $H_{stem} := 6 \, ft + 9 \, in$

 $t_{wall} := 1$ ft + 3 in

 $w_{stem} := \gamma_c \cdot \left(H_{stem} \cdot t_{wall} + \left(5 \ \mathbf{in} \cdot 2 \ \mathbf{ft} \right) \right)$

 $t_{foot} := 1$ ft + 6 in

 $b_{toe} \coloneqq 0 \, ft + 0 \, in$

 $b_{heel} := 5 \, ft + 9 \, in$

 $b_{foot} := b_{toe} + t_{wall} + b_{heel}$

 $w_{foot} := \gamma_c \cdot (t_{foot} \cdot b_{foot})$

 $d_{cw} := 0.0 \, \text{ft}$

 $t_{cw} := 0$ ft

 $w_{cw} := \gamma_c \cdot (d_{cw} \cdot t_{cw})$

 $H_{stem} = 6.75 \, ft$

 $t_{wall} = 1.25 \ ft$

 $w_{stem} = 1.39 \ klf$

 $t_{foot} = 1.50 ft$

 $b_{toe} = 0.00 \, ft$

 $b_{heel} = 5.75 \, ft$

 $b_{foot} = 7.00 \, ft$

 $w_{foot} = 1.58 \ klf$

for passive resistance

 $w_{cw} = 0.00 \ klf$

Horizontal Earth Pressure:

rces. Use properties shown for

BDM 307.1 & LRFD 3.11.5

- Use soil properties shown in BDM Table 307-1 to compute horizontal earth forces. Use properties shown for CIP or Precast Semi-gravity Wall Infill.
- Assume backfill slopes up at 2H:1V until it reaches the existing ground surface.

Soil Unit Weight:

 $\gamma_s := 120 \ pcf$

BDM Table 307-1

Soil Friction Angle:

 $\phi' := 32 \ deg$

BDM Table 307-1

Wall/Soil Friction Angle:

 $\delta := 0.67 \cdot \phi' = 21.44 \ deg$

BDM 307.1.1

Assumed Backfill Angle:

 $\beta \coloneqq 26.6 \text{ deg}$

Notional Backfill Angle:

 $\beta' \coloneqq 26.6 \ deg$

BDM 307.1.1

Wall Face Angle:

 $\theta = 90 \text{ deg}$

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Horizontal Earth Pressure (Cont'd):

BDM 307.1 & LRFD 3.11.5

$$\Gamma := \left(1 + \sqrt{\frac{\sin(\phi' + \delta) \cdot \sin(\phi' - \beta')}{\sin(\theta - \delta) \cdot \sin(\theta + \beta')}}\right)^2 = 1.69$$

LRFD Eqn. 3.11.5.3-2

Active Earth Pressure Coefficient:

$$k_a := \frac{\sin(\theta + \phi')^2}{\Gamma \cdot \left(\sin(\theta)^2 \cdot \sin(\theta - \delta)\right)} = 0.46$$

LRFD Eqn. 3.11.5.3-1

Height of Pressure Diagram:

$$h := (t_{foot} + H_{stem}) + (b_{heel} \cdot \tan(\beta)) = 11.13$$
 ft

BDM Figure 307-1

Earth Pressure at Base of Footing:

$$p_a := k_a \cdot \gamma_s \cdot h = 0.609 \text{ ksf}$$

LRFD Eqn. 3.11.5.1-1

Horizontal Earth Resultant:

$$R_{EH} := \frac{1}{2} \cdot p_a \cdot h$$

 $R_{EH} = 3.39 \ klf$

Resultant Horizontal Component:

$$R_{EH\ horiz} := R_{EH} \cdot \cos(\delta)$$

 $R_{EH,horiz} = 3.16 \ klf$

Resultant Vertical Component:

$$R_{EH,vert} := R_{EH} \cdot \sin(\delta)$$

 $R_{EH\ vert} = 1.24\ klf$

Live Load Surcharge:

LRFD 3.11.6.4

- The walls are located at the ends of Wall 1 and 2 and are outside the influence of LL.

Equivalent Height of Soil:

$$h_{eq} := 0$$
 ft

LRFD Table 3.11.6.4-2

Unit Weight of Soil for LS:

$$\gamma_{s,LS} := 125 \cdot pcf$$

BDM 307.1.1

Live Load Surcharge Pressure:

$$\Delta_p := k_a \cdot \gamma_{s.LS} \cdot h_{eq} = 0.000 \text{ ksf}$$

LRFD Eqn. 3.11.6.4-1

Live Load Surcharge Resultant:

$$R_{LS} := \Delta_n \cdot h$$

 $R_{LS} = 0.00 \ klf$

Resultant Horizontal Component:

$$R_{LS horiz} := R_{LS} \cdot \cos(\delta)$$

 $R_{LS,horiz} = 0.00 \ klf$

Resultant Vertical Component:

$$R_{IS \, vert} := R_{IS} \cdot \sin(\delta)$$

 $R_{LS,vert} = 0.00 \ klf$

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Vertical Earth Load:

LRFD 3.5.1

Vertical Earth Load, Area 1:

$$W_I := \gamma_s \cdot ((H_{stem} - 12 \ in) \cdot b_{heel})$$

$$W_1 = 3.97 \ klf$$

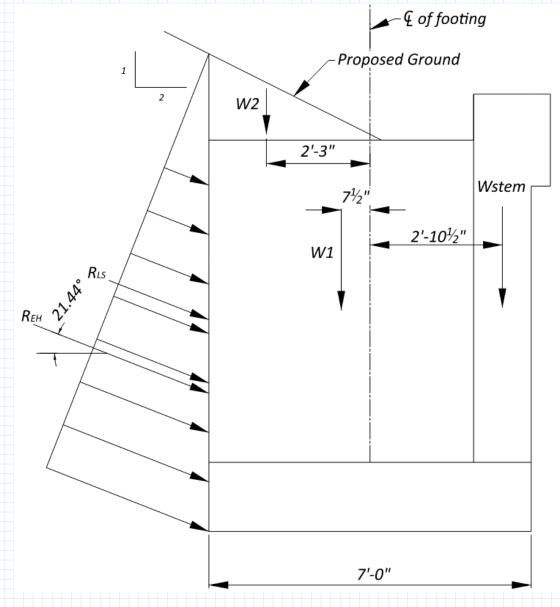
Conservative to remove, the top 12" of soil at top of wall for vertical force (if ditch is required behind wall), due to sliding being the controlling check even though the full height of the wall is assumed for horizontal earth pressure calculations.

Vertical Earth Load, Area 2:

$$W_2 := \gamma_s \cdot \left(\frac{1}{2} \cdot (b_{heel} - 2 \text{ ft}) \cdot ((b_{heel} - 2 \text{ ft}) \cdot \tan(\beta))\right) \qquad W_2 = 0.42 \text{ klf}$$

Conservatively assume first 2 feet of backfill are flat before 2:1 Slope for ditch

Wall Loading Sketch:



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BDM 307.1.3 & LRFD

10.6.3.4

Check Resistance to Horizontal Forces:

Horizontal Forces:

- Earth Pressure, EH
- Live Load Surcharge, LS
- Assume soil supporting the wall is cohesionless.
- Utilize passive pressure on the cutoff wall to resist sliding (if present).
- The Strength III & Strength V load combinations have lower load factors for LS compared to Strength I. Strength I will control.

DC Load Factor (Min.):	$\gamma_{DC_min} := 0.90$	LRFD Table 3.4.1-2		
EH Load Factor:	$\gamma_{EH} := 1.50$	LRFD Table 3.4.1-2		
LS Load Factor:	$\gamma_{LS} := 1.75$	LRFD Table 3.4.1-1		
EV Load Factor (Min.):	$\gamma_{EV_min} := 1.00$	LRFD Table 3.4.1-2		
Depth of Cutoff Wall:	$d_{cw} = 0.00 \text{ft}$	(for passive resistance)		
Passive Pressure Coefficient:	$K_p := 7.5$	LRFD Figure 3.11.5.4-1		
Coefficient Reduction Factor:	R := 0.83	Interpolated from LRFD Figure 3.11.5.4-1		
Passive Earth Pressure Coefficient:	$k_p := R \cdot K_p = 6.23$			
Resultant Passive Pressure:	$R_{pas} := \frac{1}{2} \cdot k_p \cdot \gamma_s \cdot d_{cw}^2$	$R_{pas} = 0.00 \ klf$		
Factored Horizontal EH Force:	$F_{EH.horiz} \coloneqq \gamma_{EH} \cdot R_{EH.horiz}$	$F_{EH.horiz} = 4.73 \text{ klf}$		
Factored Horizontal LS Force:	$F_{LS.horiz} := \gamma_{LS} \cdot R_{LS.horiz}$	$F_{LS.horiz} = 0.00 \ klf$		
Factored Passive EH Force:	$F_{EH.pas} := \gamma_{EH} \cdot R_{pas}$	$F_{EH,pas} = 0.00 \text{ klf}$		
Total Factored Horizontal Force:	$F_{horiz} \coloneqq F_{EH.horiz} + F_{LS.horiz}$	$F_{horiz} = 4.73 \ klf$		

Computed by: GDS Date: 5/28/25 Checked: JTW Date: 5/29/22

<u>Check Resistance to Horizontal Forces (Cont'd):</u>

BDM 307.1.3 & LRFD 10.6.3.4

Factored Wall Weight:

$$V_{wall\ min} := \gamma_{DC\ min} \cdot \left(w_{stem} + w_{foot} + w_{cw} \right)$$

$$V_{wall\ min} = 2.67\ klf$$

Factored Soil Weight:

$$V_{soil\ min} := \gamma_{EV\ min} \cdot (W_1 + W_2)$$

$$V_{soil\ min} = 4.39\ klf$$

Factored Vertical EH Force:

$$F_{EH.vert} := \gamma_{EH} \cdot R_{EH.vert}$$

$$F_{EH.vert} = 1.86 \ klf$$

Factored Vertical LS Force:

$$F_{LS,vert} := \gamma_{LS} \cdot R_{LS,vert}$$

$$F_{LS,vert} = 0.00 \ klf$$

Total Factored Vertical Force (Min.):

$$V_{total\ min} := V_{wall\ min} + V_{soil\ min} + F_{EH.vert} + F_{LS.vert}$$

$$V_{total\ min} = 8.92\ klf$$

Sliding Resistance Coefficient:

$$C := 1.0$$

Coefficient of Friction:

$$tan\delta := 0.60$$

Per geotechnical info, the effective friction angle for the in-situ soil around elevations 684.4 to 703.4 is 33 degrees. Conservatively use 0.60 which would correlate to "Clean gravel, gravel-sand mixture, coarse sand"

Nominal Sliding Resistance:

$$R_{\tau} := C \cdot V_{total\ min} \cdot tan\delta = 5.35\ klf$$

Sliding Resistance Factor:

$$\phi_{\tau} := 1.0$$

Nominal Passive Resistance:

$$R_{ep} := F_{EH,pas} = 0.00 \ klf$$

Passive Resistance Factor:

$$\phi_{ep} := 0.50$$

Factored Sliding Resistance:

$$R_R := \phi_\tau \cdot R_\tau + \phi_{ep} \cdot R_{ep} = 5.35 \text{ klf}$$

Check Sliding:

Sliding :=
$$\| \text{if } R_R \ge F_{horiz} \|$$
 "OK" $\| \text{else} \|$ "No Good"

Sliding Performance Ratio:

$$PR_{sliding} := \frac{F_{horiz}}{R_R} = 0.88$$

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Check Bearing Resistance (Factored):

LRFD 11.6.3.2

- From the geotechnical report, the minimum factored bearing resistance for Wall 1 and Wall 2 is 6.2 ksf and 7.1 ksf respectively. Use the factored bearing resistance of 6.2 ksf as this is the controlling value for all locations.
- Check bearing resistance at the strength limit state based on factored loads per LRFD 11.6.3.2.
- By inspection, the Strength I load combination has the largest factor for live load surcharge, while the load factors for EH, EV & DC will remain the same for Strength III & Strength V. Strength I will control.

Factored Bearing	Resistance:	$q_R := 6.2 \cdot ksf$

Bearing Resistance Factor:
$$\phi_b = 0.55$$
 LRFD Table 11.5.7-1

Nominal Bearing Resistance:
$$q_n := \frac{q_R}{\phi_b} = 11.27 \text{ ksf}$$

DC Load Factor (Max.):
$$\gamma_{DC max} := 1.25$$
 LRFD Table 3.4.1-2

EV Load Factor (Max.):
$$\gamma_{EV max} := 1.35$$
 LRFD Table 3.4.1-2

Factored Wall Weight:
$$V_{wall\ max} := \gamma_{DC\ max} \cdot (w_{stem} + w_{foot} + w_{cw})$$
 $V_{wall\ max} = 3.71\ klf$

Factored Soil Weight:
$$V_{soil\ max} := \gamma_{EV\ max} \cdot (W_1 + W_2)$$
 $V_{soil\ max} = 5.93\ klf$

Factored Vertical EH Force:
$$F_{EH.vert} := \gamma_{EH} \cdot R_{EH.vert}$$
 $F_{EH.vert} = 1.86 \ klf$

Factored Vertical LS Force:
$$F_{LS,vert} := \gamma_{LS} \cdot R_{LS,vert}$$
 $F_{LS,vert} = 0.00 \ klf$

Total Factored Vertical Force (Max):
$$V_{total\ max} := V_{wall\ max} + V_{soil\ max} + F_{EH.vert} + F_{LS.vert}$$
 $V_{total\ max} = 11.49\ klf$

Stem Eccentricity:
$$x_{stem} = 2 \text{ ft} + 10.5 \text{ in}$$
 See Loading Sketch

Cutoff Wall Eccentricity:
$$x_{cw} = 0$$
 ft + 0 in

Soil Area 1 Eccentricity:
$$x_{wl} = 0$$
 ft + 7.5 in

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LRFD 11.6.3.2

Max. Vert. Load Factors

Min. Vert. Load Factors

Check Bearing Resistance (Factored) (Cont'd):

 $x_{lat} := \frac{b_{foot}}{2} = 3.50 \text{ ft}$ Vertical EH & LS Eccentricity:

 $y_{EH} := \frac{h}{2} = 3.71 \text{ ft}$ **EH Horizontal Eccentricity:**

 $y_{LS} := \frac{h}{2} = 5.56 \text{ ft}$ LS Horizontal Eccentricity:

Factored Stem Weight: $F_{stem\ max} := \gamma_{DC\ max} \cdot w_{stem} = 1.74\ klf$

 $F_{stem\ min} := \gamma_{DC\ min} \cdot w_{stem} = 1.25\ klf$

Factored Cutoff Wall Weight: $F_{cw\ max} := \gamma_{DC\ max} \cdot w_{cw} = 0.00 \ klf$

 $F_{cw\ min} := \gamma_{DC\ min} \cdot w_{cw} = 0.00\ klf$

Factored Soil Area 1 Weight: $F_{wl max} := \gamma_{EV max} \cdot W_l = 5.36 \ klf$

 $F_{wl min} := \gamma_{EV min} \cdot W_l = 3.97 \ klf$

Factored Soil Area 2 Weight: $F_{w2 max} := \gamma_{EV max} \cdot W_2 = 0.57 klf$

 $F_{w2 min} := \gamma_{EV min} \cdot W_2 = 0.42 klf$

Factored Horizontal EH Force: $F_{EH,horiz} = 4.73 \ klf$

Factored Horizontal LS Force: $F_{LShoriz} = 0.00 \ klf$

Factored Vertical EH Force: $F_{EH \, vert} = 1.86 \, klf$

 $F_{LS\,vert} = 0.00 \, klf$ Factored Vertical LS Force:

Resultant Eccentricity:

- Calculate eccentricity of the resultant of vertical forces according to the equation shown in LRFD Figure 11.6.3.2-1.
- Sum moments about the centerline of the footing at the footing base. Positive moments act counterclockwise.

Positive Moments About Base

(Max. Vert. Load Factors):

Positive Moments About Base (Min. Vert. Load Factors):

 $M_{pos\ max} := (F_{EH.horiz} \cdot y_{EH}) + (F_{LS.horiz} \cdot y_{LS}) + (F_{cw\ max} \cdot x_{cw}) + (F_{stem\ max} \cdot x_{stem})$

 $M_{pos\ min} := (F_{EH,horiz} \cdot y_{EH}) + (F_{LS,horiz} \cdot y_{LS}) + (F_{cw\ min} \cdot x_{cw}) + (F_{stem\ min} \cdot x_{stem})$

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Check Bearing Resistance (Factored) (Cont'd):

LRFD 11.6.3.2

Negative Moments About Base (Max. Vert. Load Factors):

 $M_{neg_max} \coloneqq \left(F_{wl_max} \cdot x_{wl}\right) + \left(F_{w2_max} \cdot x_{w2}\right) + \left(F_{EH.vert} \cdot x_{lat}\right) + \left(F_{LS.vert} \cdot x_{lat}\right)$

Negative Moments About Base

 $M_{neg\ min} := \left(F_{w1\ min} \cdot x_{w1}\right) + \left(F_{w2\ min} \cdot x_{w2}\right) + \left(F_{EH.vert} \cdot x_{lat}\right) + \left(F_{LS.vert} \cdot x_{lat}\right)$

(Min. Vert. Load Factors):

Resultant Eccentricity:

 $e_{R_max} \coloneqq \frac{M_{pos_max} - M_{neg_max}}{V_{total_max}} = 11.93 \text{ in}$

See LRFD Figure 11.6.3.2-1

Factored Vertical Stress:

$$\sigma_{v} := \frac{V_{total_max}}{b_{foot} - \left(2 \cdot e_{R_max}\right)} = 2.29 \text{ ksf}$$

LRFD Eqn. 11.6.3.2-1

Check Bearing Resistance:

$$Bearing := \left\| \begin{array}{c} \text{if } q_R \geq \sigma_v \\ \left\| \text{"OK"} \\ \text{else} \\ \left\| \text{"No Good"} \right\| \end{array} \right\|$$

Bearing = "OK"

Bearing Performance Ratio:

$$PR_{bearing} := \frac{\sigma_v}{q_R} = 0.37$$

Check Eccentricity Limits:

LRFD 11.6.3.3

- Resultant location is required to fall within the middle two-thirds of the footing width.

Allowable Resultant Width:

$$b_{res} := b_{foot} \cdot \frac{2}{3} = 4.67 \text{ ft}$$

Resultant Eccentricity

(using minimum vertical load factors):

$$e_{R_min} := \frac{M_{pos_min} - M_{neg_min}}{V_{total_min}} = 15.10 in$$

See LRFD Figure 11.6.3.2-1

Check Eccentricity:

Eccentricity = ``OK''

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Check Bearing Resistance (Service):

LRFD 11.6.3.2

- From the geotechnical report, the minimum factored bearing resistance for Wall 1 and Wall 2 is 6.2 ksf and 7.1 ksf respectively. Use the factored bearing resistance of 6.2 ksf as this is the controlling value for all locations.
- Check bearing resistance at the service limit state.

Service Bearing Resistance:

$$q_R |_{SRV} := 6.2 \cdot ksf$$

Bearing Resistance Factor:

$$\phi_b := 0.55$$

Nominal Bearing Resistance:

$$q_{n_SRV} := \frac{q_{R_SRV}}{\phi_b} = 11.27 \text{ ksf}$$

DC Load Factor (SRV.):

$$\gamma_{DC SRV} := 1.0$$

EV Load Factor (SRV.):

$$\gamma_{EV SRV} := 1.0$$

Service Wall Weight:

$$V_{wall_SRV} := \gamma_{DC_SRV} \cdot \left(w_{stem} + w_{foot} + w_{cw} \right)$$

$$V_{wall\ SRV} = 2.97\ klf$$

Service Soil Weight:

$$V_{soil\ SRV} := \gamma_{EV\ SRV} \cdot (W_1 + W_2)$$

$$V_{soil\ SRV} = 4.39\ klf$$

Service Vertical EH Force:

$$F_{EH,vert,SRV} := R_{EH,vert}$$

$$F_{EH,vert,SRV} = 1.24 \ klf$$

Service Vertical LS Force:

$$F_{LS,vert,SRV} := R_{LS,vert}$$

$$F_{LS,vert} = 0.00 \ klf$$

Total Service Vertical Force (Max):

$$V_{total_SRV} \coloneqq V_{wall_SRV} + V_{soil_SRV} + F_{EH,vert_SRV} + F_{LS,vert_SRV} - V_{total_SRV} = 8.59 \ klf$$

$$V_{\text{total SDV}} = 8.59 \text{ klf}$$

Stem Eccentricity:

$$x_{stem} := 2 \, ft + 10.5 \, in$$

Cutoff Wall Eccentricity:

$$x_{cw} := 0$$
 ft + 0 in

Soil Area 1 Eccentricity:

$$x_{wl} := 0 \, ft + 7.5 \, in$$

Soil Area 2 Eccentricity:

$$x_{w2} := 2 \, ft + 3 \, in$$

Computed by: GDS Date: 5/28/25 Checked: JTW Date: 5/29/22

Check Bearing Resistance (Service) (Cont'd):

LRFD 11.6.3.2

Vertical EH & LS Eccentricity:

$$x_{lat} := \frac{b_{foot}}{2} = 3.50 \text{ ft}$$

EH Horizontal Eccentricity:

$$y_{EH} := \frac{h}{3} = 3.71 \text{ ft}$$

LS Horizontal Eccentricity:

$$y_{LS} := \frac{h}{2} = 5.56 \text{ ft}$$

Service Stem Weight:

$$F_{stem SRV} := w_{stem} = 1.39 \ klf$$

Service Cutoff Wall Weight:

$$F_{cw SRV} = w_{cw} = 0.00 \ klf$$

Service Soil Area 1 Weight:

$$F_{wl} := W_l = 3.97 \ klf$$

Service Soil Area 2 Weight:

$$F_{w2} := W_2 = 0.42 \text{ klf}$$

Service Horizontal EH Force:

$$F_{EH.horiz}$$
 $SRV := R_{EH.horiz} = 3.16$ klf

Service Horizontal LS Force:

$$F_{LS.horiz} = R_{LS.horiz} = 0.00 \text{ klf}$$

Service Vertical EH Force:

$$F_{EH\ vert\ SRV} = 1.24\ klf$$

Service Vertical LS Force:

$$F_{LS,vert\ SRV} = 0.00\ klf$$

Resultant Eccentricity:

- Calculate eccentricity of the resultant of vertical forces according to the equation shown in LRFD Figure 11.6.3.2-1.
- Sum moments about the centerline of the footing at the footing base. Positive moments act counterclockwise.

Positive Moments About Base (SRV. Vert. Load Factors):

$$M_{pos_SRV} \coloneqq \left(F_{EH.horiz_SRV} \cdot y_{EH}\right) + \left(F_{LS.horiz_SRV} \cdot y_{LS}\right) + \left(F_{cw_SRV} \cdot x_{cw}\right) + \left(F_{stem_SRV} \cdot x_{stem}\right)$$

Computed by: GDS Date: 5/28/25 Checked: JTW Date: 5/29/22

Check Bearing Resistance (Service) (Cont'd):

Negative Moments About Base (SRV. Vert. Load Factors):

$$M_{neg_SRV} \coloneqq \left(F_{w1_SRV} \cdot x_{w1}\right) + \left(F_{w2_SRV} \cdot x_{w2}\right) + \left(F_{EH.vert_SRV} \cdot x_{lat}\right) + \left(F_{LS.vert_SRV} \cdot x_{lat}\right)$$

Resultant Eccentricity:

$$e_{R_SRV} := \frac{M_{pos_SRV} - M_{neg_SRV}}{V_{total_SRV}} = 11.08$$
 in

See LRFD Figure 11.6.3.2-1

Factored Vertical Stress:

$$e_{R_SRV} \coloneqq \frac{M_{pos_SRV} - M_{neg_SRV}}{V_{total_SRV}} = 11.08 \text{ in}$$

$$\sigma_{v_SRV} \coloneqq \frac{V_{total_SRV}}{b_{foot} - \left(2 \cdot e_{R_SRV}\right)} = 1.67 \text{ ksf}$$

LRFD Eqn. 11.6.3.2-1

Check Bearing Resistance:

SRV Bearing="OK"

Bearing Performance Ratio:

$$\underbrace{PR_{bearing}}_{PR_{bearing}} := \frac{\sigma_{v_SRV}}{q_{R_SRV}} = 0.27$$

Check Eccentricity Limits:

LRFD 11.6.3.3

- Resultant location is required to fall within the middle two-thirds of the footing width.

Allowable Resultant Width:

$$b_{res} := b_{foot} \cdot \frac{2}{3} = 4.67 \text{ ft}$$

Resultant Eccentricity

$$\underbrace{e_{R_SRV}}_{:=} := \frac{M_{pos_SRV} - M_{neg_SRV}}{V_{total_SRV}} = 11.08 \text{ in}$$

See LRFD Figure 11.6.3.2-1

Check Eccentricity:

Eccentricity:=
$$\| \text{if } e_{R_SRV} \leq \frac{b_{res}}{2} \| \text{"OK"} \|$$
 else $\| \text{"No Good"} \|$

Eccentricity = "OK"

APPENDIX D IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL ENGINEERING REPORT GENERAL COMMENTS

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative - interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. **Active involvement in the Geoprofessional Business** Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civilworks constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared solely for the client. Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full*.

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- · project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be,* and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation*.

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnicalengineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- · confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, but be certain to note conspicuously that you've included the material for informational purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated subsurface environmental problems have led to project failures. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are not building-envelope or mold specialists.



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GENERAL COMMENTS

BASIS OF GEOTECHNICAL REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practices to assist in the design and/or evaluation of this project. If the project plans, design criteria, and other project information referenced in this report and utilized by SME to prepare our recommendations are changed, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions and recommendations of this report are modified or approved in writing by our office.

The discussions and recommendations submitted in this report are based on the available project information, described in this report, and the geotechnical data obtained from the field exploration at the locations indicated in the report. Variations in the soil and groundwater conditions commonly occur between or away from sampling locations. The nature and extent of the variations may not become evident until the time of construction. If significant variations are observed during construction, SME should be contacted to reevaluate the recommendations of this report. SME should be retained to continue our services through construction to observe and evaluate the actual subsurface conditions relative to the recommendations made in this report.

In the process of obtaining and testing samples and preparing this report, procedures are followed that represent reasonable and accepted practice in the field of soil and foundation engineering. Specifically, field logs are prepared during the field exploration that describe field occurrences, sampling locations, and other information. Samples obtained in the field are frequently subjected to additional testing and reclassification in the laboratory and differences may exist between the field logs and the report logs. The engineer preparing the report reviews the field logs, laboratory classifications, and test data and then prepares the report logs. Our recommendations are based on the contents of the report logs and the information contained therein.

REVIEW OF DESIGN DETAILS, PLANS, AND SPECIFICATIONS

SME should be retained to review the design details, project plans, and specifications to verify those documents are consistent with the recommendations contained in this report.

REVIEW OF REPORT INFORMATION WITH PROJECT TEAM

Implementation of our recommendations may affect the design, construction, and performance of the proposed improvements, along with the potential inherent risks involved with the proposed construction. The client and key members of the design team, including SME, should discuss the issues covered in this report so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk, and expectations for performance and maintenance.

FIELD VERIFICATION OF GEOTECHNICAL CONDITIONS

SME should be retained to verify the recommendations of this report are properly implemented during construction. This may avoid misinterpretation of our recommendations by other parties and will allow us to review and modify our recommendations if variations in the site subsurface conditions are encountered.

PROJECT INFORMATION FOR CONTRACTOR

This report and any future addenda or other reports regarding this site should be made available to prospective contractors prior to submitting their proposals for their information only and to supply them with facts relative to the subsurface evaluation and laboratory test results. If the selected contractor encounters subsurface conditions during construction, which differ from those presented in this report, the contractor should promptly describe the nature and extent of the differing conditions in writing and SME should be notified so that we can verify those conditions. The construction contract should include provisions for dealing with differing conditions and contingency funds should be reserved for potential problems during earthwork and foundation construction. We would be pleased to assist you in developing the contract provisions based on our experience.

The contractor should be prepared to handle environmental conditions encountered at this site, which may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers. Any Environmental Assessment reports prepared for this site should be made available for review by bidders and the successful contractor.

THIRD PARTY RELIANCE/REUSE OF THIS REPORT

This report has been prepared solely for the use of our Client for the project specifically described in this report. This report cannot be relied upon by other parties not involved in the project, unless specifically allowed by SME in writing. SME also is not responsible for the interpretation by other parties of the geotechnical data and the recommendations provided herein.