

Geotechnical Engineering Report

FINAL

Sheep Dip Wash Bridge

Indian Route 8084

Many Farms, Arizona

Terracon Project No. 69095030

BIA Task Order Number: TON00090104

June 9, 2011

Prepared for:

BIA – Navajo Regional Office

Division of Transportation

Gallup, New Mexico

Prepared by:

Terracon Consultants, Inc.

Flora Vista, New Mexico

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June 9, 2011

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**Re: Final Geotechnical Engineering Report
Sheep Dip Wash Bridge – Indian Route 8084
Many Farms, Arizona
Terracon Project No. 69095030
BIA Task Order Number: TON00090104**

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the proposed Sheep Dip Wash Bridge. This study was performed in general accordance with our proposal number P69090201 dated September 18, 2009. The results of our engineering analyses, including the results of the subsurface engineering exploration and recommendations for construction of foundations for the Sheep Dip Wash Bridge and other earth connected phases on this project are presented in this report.

We appreciate being of service to you in the geotechnical engineering phase of this project, and are prepared to assist you during the construction phases as well. If you have any questions concerning this report, please do not hesitate to contact us.

Sincerely,
Terracon Consultants, Inc.

Heather M. Woods
Staff Professional

Scott D. Neely, P.E.
Principal

Copies to: Addressee (1 via email, 3 via mail)



Expires 12/31/2012



TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	i
1.0 INTRODUCTION	1
2.0 PROJECT INFORMATION	1
2.1 Project Description	1
2.2 Site Location and Description	3
3.0 SUBSURFACE CONDITIONS	3
3.1 Site Geology	3
3.2 Seismic Considerations	3
3.3 Typical Subsurface Profile	4
3.4 Field and Laboratory Test Data	5
3.5 Groundwater	5
4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION	6
4.1 Geotechnical Considerations	6
4.2 Deep Foundations	6
4.2.1 Axial Resistance Design Recommendations (Structural Strength of Steel H- Pile sections)	7
4.2.2 Lateral Loading Design Criteria	8
4.2.3 Pile Design and Construction Recommendations	11
4.3 Lateral Earth Pressures on Abutments	12
4.4 Earthwork Factors and Slopes	13
4.5 Corrosion Potential	13
5.0 CONSTRUCTION CONSIDERATIONS	13
5.1 Excavation	13
5.2 Drilled Shaft Construction Considerations	14
6.0 GENERAL COMMENTS	14



Expires 12/31/2012

APPENDICES

	EXHIBIT NO.
Appendix A – Field Exploration	
Site Location Map & Boring Location Plan.....	A1-A2
Field Exploration Description.....	A3
Boring Logs.....	A4-A19
General Notes.....	A20-A21
Unified Soil Classification System	A22
 Appendix B – Laboratory Testing	
Laboratory Test Description	B1
Atterberg Limits and Grain Size Distribution Results	B2
Consolidation Test Results.....	B3-B7
 Appendix C – Group 8.0 Analyses	
Abutment #1 and #2	
Cross Section of the Pile Group Layout.....	C1
Graph of Deflection vs. Depth of Piles in Longitudinal (Y-) and Transverse (Z-) directions	C2-C3
Graph of Shear Force vs. Depth of Piles in Y- and Z- directions	C4-C5
Graph of Bending Moment vs. Depth of Piles about Y- and (Z-) directions	C6-C7
Output file from Group 8.0	C8-C19
Nominal and Factored Axial Resistance Calculations	C20
Pier #1 and #2	
Cross Section of the Pile Group Layout.....	C21
Graph of Deflection vs. Depth of Piles in Longitudinal (Y-) and Transverse (Z-) directions	C22-C23
Graph of Shear Force vs. Depth of Piles in Y- and Z- directions	C24-C25
Graph of Bending Moment vs. Depth of Piles about Y- and (Z-) directions	C26-C27
Output file from Group 8.0	C28-C40

EXECUTIVE SUMMARY

This geotechnical executive summary should be used in conjunction with the entire report for design and/or construction purposes. It should be recognized that specific details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled General Comments should be read for an understanding of the report limitations.

A geotechnical exploration has been performed for the Sheep Dip Wash Bridge located on Indian Route 8084 at Sheep Dip Wash near Many Farms, Arizona. Terracon's geotechnical scope of work included the advancement of eight test borings to approximate depths of 30.6 to 30.8 meters below existing site grades.

Based on the information obtained from our subsurface exploration, the site is suitable for development of the proposed project. The following geotechnical considerations were identified:

Subsurface Conditions: The site surface soils and underlying subsurface soils generally consisted of clayey sand, silty sand, poorly graded sand, and lean clay. Bedrock generally consisted of claystone and shale with minor sandstone units. Groundwater was encountered at approximate depths of 5.2 and 5.5 meters in test borings B2-1 and B2-2 at the time of field exploration. Groundwater was not encountered in the remaining test borings at the time of exploration. The on-site clayey sand, silt, and clay soils are not recommended for use as structure backfill.

Foundations: At the direction of BIA personnel, and based on information provided by the project civil and structural engineers, a pre-bored, driven pile, deep foundation system has been considered to support the proposed Sheep Dip Wash Bridge. Based on the results of this geotechnical study, Terracon concurs with this foundation type at this location. Again, at the direction of BIA personnel, and based on information provided by the project civil and structural engineers, and based on Terracon's analyses, the use of HP360x152 (mm X kg/m) pile sections complies with the loads and tolerances provided to Terracon for the abutment and pier locations. The H-piles will be installed in 76.2-centimeter diameter pre-drilled bores, driven to refusal in accordance with this report, and the holes around the piles will be backfilled with structural strength concrete.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during construction

**FINAL GEOTECHNICAL ENGINEERING REPORT
SHEEP DIP WASH BRIDGE – INDIAN ROUTE 8084
MANY FARMS, ARIZONA**

Terracon Project No. 69095030
BIA Task Order Number: TON00090103
June 9, 2011

1.0 INTRODUCTION

A final geotechnical engineering report has been completed for the proposed bridge which will be constructed as part of Indian Route 8084 near Many Farms, Arizona. Eight (8) borings, designated B2-1 through B2-8, were drilled to depths of approximately 30.6 to 30.8 meters below the existing ground surface near the proposed abutment and pier locations. The boring locations and coordinates were provided on site maps by Mr. Harold Riley from the BIA in an e-mail dated September 17, 2009. Logs of the borings along with the Site Location Map (Exhibit A-1) and the Boring Location Plan (Exhibit A-2) are included in Appendix A of this report. The UTM coordinates at the boring locations were recorded in the field using a handheld GPS unit. These were provided to WHPacific, Inc. and the boring ground surface elevations were provided by WHPacific, Inc. The results of the laboratory testing performed on representative soil samples obtained from the site during the field exploration are included in Appendix B of this report. Descriptions of the field exploration and laboratory testing are included in their respective appendices. Bridge abutment and pier locations as well as the anticipated foundation types and foundation loads presented in this report were provided to Terracon by structural engineers at WHPacific, Inc.

The purpose of these services is to provide information and geotechnical engineering recommendations for the proposed bridge relative to:

- subsurface soil conditions
- groundwater conditions
- earthwork
- foundation design and construction
- seismic considerations
- lateral load analysis

2.0 PROJECT INFORMATION

2.1 Project Description

ITEM	DESCRIPTION
Site layout	Refer to the Site Location Map and Boring Location Plan (Appendix A) for the general location of the project and specific location of the borings.

ITEM	DESCRIPTION
<p>Structure / Type of construction</p>	<p>Major elements of the Sheep Dip Wash Bridge structure, as provided by the project structural engineer, include:</p> <ul style="list-style-type: none"> ■ 3 Span Bridge ■ Foundations for Abutment #1 (south) and Abutment #2 (north) will consist of pre-bored driven H-piles. The piles will consist of HP360x152 H-piles oriented with the strong axis longitudinal to the roadway centerline (strong direction transverse to the roadway centerline). H-Piles will be installed in 76.2-centimeter diameter pre-drilled bores, driven to refusal and backfilled with structural strength concrete. There are 5 piles planned for each abutment with a center-to-center spacing of 1.6 meters. ■ Foundations for Pier #1 (south) and #2 (north) will consist of pre-bored driven H-piles. The piles will consist of HP360x152 H-piles oriented with the strong axis transverse to the roadway centerline (strong direction longitudinal to the roadway centerline). H-Piles will be installed in 76.2-centimeter diameter pre-drilled bores, driven to refusal, and backfilled with structural strength concrete. There are 6 piles planned for each pier with a center-to-center spacing of 1.28 meters. ■ It is understood that the project structural engineer may include a pier wall connecting the six H-piles at the pier location. If used, the planned dimensions of the pier wall are about 8.4 meters in length, 0.61 meters thick and extend down from the top of the piles a distance of 3.99 meters. The lateral analyses for this bridge did not include the pier wall as part of the pier structural configuration. The analyses of the pier piles without the pier wall indicated the lateral deflections were within the acceptable limits. An analysis with the pier wall would yield lateral deflections less than the results without the pier wall, and therefore an analysis using the pier wall was not performed.
<p>Maximum structure loads</p>	<ul style="list-style-type: none"> ■ Abutments #1 and #2: <ul style="list-style-type: none"> ○ Axial Load: 857.6 kN ○ Lateral Load: Transverse Direction 186.4 kN Unfactored (186.4 kN Factored), Longitudinal Direction 64.1 kN Unfactored (89.9 kN Factored) ■ Pier: <ul style="list-style-type: none"> ○ Axial Load: 900.0 kN (In accordance with BIA request.), ○ Lateral Load: Transverse Direction 127.7 kN Unfactored (178.8 kN Factored), Longitudinal Direction 65.4 kN Unfactored (91.6 kN Factored)

2.2 Site Location and Description

ITEM	DESCRIPTION
Location	Indian Route 8084 at Sheep Dip Wash near Many Farms, Arizona.
Surrounding development	None. Surrounding area is undeveloped.
Existing site features	Native desert with a cleared gravel and dirt roadway crossing through the existing wash.
Current ground cover	Sparse to moderate growth of grass, weeds, cacti and creosote. Trees and bushes along the wash.
Existing topography	Gently rolling desert terrain with numerous small and large washes and drainages. There is approximately two meters of relief across the wash from the abutments to the bottom of wash.

3.0 SUBSURFACE CONDITIONS

3.1 Site Geology

The project site is located near the northern flanks of the Black Mesa Basin in the Colorado Plateau Physiographic Province. The Black Mesa Basin, formed during the Laramide orogeny of Tertiary Time, is a broad downwarped area marked by a thick accumulation of sediment, and characterized by gently folded to nearly flat-lying rocks. Tertiary volcanic activity created numerous small intrusions in this area. The project site area lies on the Triassic Chinle Formation consisting of colorful mudstone and less abundant lenses of sandstone and conglomerate.

3.2 Seismic Considerations

A review of available literature and maps relating to seismic activity in the vicinity of the site indicates that records of historical earthquake activity in the State of Arizona dates from about 1776, but records are sparse prior to the late 1800s (Arizona Geological Survey, Spring 2000 - Volume 30, No. 1). Based on this review, earthquake hazard levels are categorized as being moderate to low in the vicinity of the site and in the general region of northeast Arizona. This categorization is based upon historical earthquake activity, number of potentially active faults, and the estimated slip rates for those faults. Based on information contained in the literature, we believe that the potential of seismic activity and the potential of significant damage to structures resulting from seismic activity in the vicinity of the site to be relatively low.

Final Geotechnical Engineering Report

Sheep Dip Wash Bridge – Indian Route 8084 ■ Many Farms, Arizona
June 9, 2011 ■ Terracon Project No. 69095030



There is a 90 percent probability of non-exceedance in 50 years of a seismic event with horizontal ground movement of magnitude 0.02g at the project site (¹Lam et al, 1992). This corresponds to a return period of 475 years using the Poisson distribution used in the Lam reference.

The following table presents the seismic site classification and site coefficients based on the AASHTO LRFD Bridge Design Manual, 5th Edition.

DESCRIPTION	VALUE
Site Class	C
Site Latitude	36.327080
Site Longitude	-109.570426
PGA	0.05 ¹ g
S _s	0.11g
S ₁	0.03g
F _{pga}	1.0g
F _a	1.2g
F _v	1.7g

Notes:

¹AASHTO's recommended PGA maps have a return period of 1000 years, which corresponds to a 7% probability of exceedance in 75 years.

The Design Response Spectrum for the bridge structure at Sheep Dip Wash should be constructed based on the information presented in the table above and the procedure outlined in Section 3.10.4.1 of the AASHTO LRFD Bridge Design Manual, 5th Edition.

3.3 Typical Subsurface Profile

Specific conditions encountered at the boring locations are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for the borings can be found on the boring logs included in Appendix A of this report. Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

¹Lam, I.P., et al, 1992, *Map of Horizontal Acceleration at Bedrock for Arizona with 90 Percent Probability of Non-Exceedance in 50 Years*, Arizona Department of Transportation.

Description	Approximate Depth to Bottom of Stratum (meters)	Material Encountered	Consistency/Density/Rock Hardness
Stratum 1	3.8 to 8.5	Clayey Sand, Silty Sand, Poorly Graded Sand and Lean Clay	Very Loose to Very Dense/Medium Stiff to Very Stiff
Stratum 2	30.6 to 30.8 (Total Explored Depth)	Claystone, Shale, and Minor Sandstone	Interbedded Very Soft to Moderately Hard

3.4 Field and Laboratory Test Data

The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included in Appendix B of this report. Descriptions of the field exploration and laboratory testing are included in their respective appendices. A brief summary of the laboratory test results is provided in this section.

The soils of the southwest are typically alluvial (water deposited) and eolian (wind deposited) and may have characteristics which result in high expansion or collapse potential. Therefore, the use of a ring sampler was alternated with the split spoon sampler in order to obtain relatively undisturbed samples for the performance of expansion or collapse/consolidation testing. Laboratory test results indicate that the surface and subsurface soils exhibit slight to low compressibility potential at in-situ moisture contents. When wetted under anticipated foundation loads, the soils exhibit low expansion potentials and slight to low collapse potentials.

3.5 Groundwater

Groundwater was observed in Borings B2-1 and B2-2 at the time of field exploration at depths of approximately 5.5 and 5.2 meters respectively below existing ground surface while drilling. Groundwater was not observed in the remaining borings at the time of field exploration. This observation represents groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations. Groundwater conditions can change with varying seasonal and weather conditions, and other factors.

Zones of perched and/or trapped groundwater may also occur at times in the subsurface soils overlying bedrock, on top of the bedrock surface or within permeable fractures in the bedrock materials. The location and amount of perched water is dependent upon several factors, including hydrologic conditions, type of site development, fluctuations in water features, seasonal and weather conditions.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Geotechnical engineering recommendations for foundation design and construction of the project are outlined below. The recommendations contained in this report are based upon the results of the test borings (which are presented in Appendix A), field and laboratory testing (which are presented in Appendix B), engineering analyses, and our current understanding of the proposed project.

Terracon has completed the LRFD analyses of the deep foundations for the Sheep Dip Wash Bridge. The analysis for development of the tables and graphs related to the deep foundations was based on the ²AASHTO (2010) LRFD Bridge Design Manual (Bridge Design Manual). The axial capacity of a single H-pile was estimated as the structural strength of the steel in compression. The lateral deflections under the service loads were estimated using ³GROUP 8.0 (Ensoft, Inc., 2010). GROUP uses p-y soil strength curves to estimate lateral resistances of the soil and also accounts for group action of the piles.

4.2 Deep Foundations

In accordance with the request of the BIA, a pre-bored, driven pile, deep foundation system has been considered to support the proposed Sheep Dip Wash Bridge. The pre-bored hole will be drilled to the minimum pile tip depth. The diameter of the pre-bore in accordance with ⁴FP-03 (FHWA, 2003) is at least 150mm (6 inches) in addition to the diagonal dimension of the design H-pile section. The H-pile would then be lowered into the borehole and driven to refusal into the native claystone. The annular space between the H-Pile and the borehole will be filled with structural concrete in order to transfer the lateral loads to the native soils. The referenced composite pile refers to the combination of the H-pile and the surrounding concrete used to fill the annular space between the H-pile and the edge of the borehole. For the lateral capacity analysis, the concrete portion of the pre-bored H-pile is considered cracked and would not offer any resistance to bending. Therefore, the area of the circular pile is used, but all of the moment, shear, and deflection calculations within GROUP are using only the stiffness ($E_{steel}I$) of the H-Pile section.

²American Association of State Highway and Transportation Officials, *AASHTO LRFD Bridge Design Specifications*, 5th Edition, 2010

³ Ensoft, Incorporated, *GROUP version 8.0*, 2010

⁴U.S. Department of Transportation, Federal Highway Administration, *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects*, FP-03, 2003

Based on the information provided to Terracon by WHPacific, Inc., we understood that the abutments were to be supported on HP360x152 H-pile sections and the bridge piers were to be supported on 406.4 mm diameter steel pipe piles filled with concrete. Based on email correspondence with Mr. Corwyn Henry at the Bureau of Indian Affairs it is understood that H-piles are preferred for the support when end bearing is the mode of foundation support. Due to the load and deflection criteria presented by WHPacific, Terracon recommends the use of HP360x152 pile sections at the abutment and pier locations. All piles at this structure are recommended to be driven to refusal into the native claystone formation beneath the pre-bored depths. The piles should be considered to have reached refusal at 10 blows for less than 25.4 mm (1-inch) penetration of the pile tip or the blowcounts necessary to achieve specified pile ultimate capacity. The diameter of the pre-bore hole is recommended to be 76.2 cm (30-inches).

4.2.1 Axial Resistance Design Recommendations (Structural Strength of Steel H-Pile sections)

Terracon has completed the LRFD analyses of the pile foundations for the Sheep Dip Wash Bridge based on the procedures outlined in the AASHTO Bridge Design Manual (AASHTO, 2010). Based on Section 10.7.3.2, it is recommended that the nominal axial resistance of steel piles driven to refusal in hard rock is the compressive axial resistance of the steel pile section. The table below presents the nominal resistance and factored resistance of the steel H-pile sections in pure compression. Based on the conditions observed during drilling of the test borings, Terracon has also recommended the minimum depths of pre-boring for the piles. The piles should be driven to refusal beyond the minimum depth of pre-boring at each location.

Location	Pile Size (mm/kg/m)	Nominal Resistance ² (kN)	Factored Resistance ² (kN)	Estimated Minimum Depth of Pre-Boring (m)	Recommended Maximum Elevation of Bottom of Pre-Bore (m)
Abutment 1	HP360x152	3675	1837	10.3 ¹	1619.5
Pier 1	HP360x152	3675	1837	10.2 ¹	1618.2
Pier 2	HP360x152	3675	1837	12.0 ¹	1617.0
Abutment 2	HP360x152	3675	1837	11.8 ¹	1618.2

¹Depth is measured from pile head.

² Nominal and Factored resistances are based on assumptions that the piles are driven to refusal. Refer to Section 4.2.3 for additional design and construction considerations.

4.2.2 Lateral Resistance Design Recommendations

Based on Section 10.8.3.8 and 10.7.3.12 of AASHTO 2010 the nominal horizontal resistance of driven piles and pile groups should be based on modeling p-y curves for the soils encountered at the site. The lateral capacity of the H-Pile sections was estimated using GROUP 8.0 software (Ensoft, 2010). For the lateral capacity analysis, the concrete portion of the pre-bored H-pile is considered cracked and would not offer any resistance to bending. Therefore, the area of the circular pile is used, but all of the moment, shear, and deflection calculations within GROUP are using only the stiffness ($E_{steel}I$) of the H-Pile section. The soil stratification, p-y model and input parameters used for the analyses are presented in the table on the following page. An analysis for scour at the abutment and pier locations was performed by WHPacific, Inc. Gradation information based on the blend of materials from Borings B2-3 and B2-4 at approximate depths of 0.6 to 1.1 meters below existing ground surface was provided to WHPacific, Inc by Terracon for use in the scour analysis. The lateral resistances presented below could be affected due to scouring of the near surface soils that differs from the values presented in this report. The depths of scour are indicated in the following table. The lateral resistances of the soil were ignored above the maximum scour depth.

The piles were analyzed for the pile head connection and loads as provided by WHPacific. It is understood that the project structural engineer may plan to include a pier wall connecting the six H-piles at the pier location. If used, the planned dimensions of the pier wall are about 8.4 meters in length, 0.61 meters thick and extend down from the top of the piles a distance of 3.99 meters. The analyses for this bridge did not include the pier wall as part of the pier structural configuration. The lateral analyses of the pier piles without the pier wall indicated the lateral deflections were within the acceptable limits. An analysis with the pier wall would yield lateral deflections less than the results without the pier wall, and therefore an analysis using the pier wall was not performed. The following table summarizes the boundary conditions and loads on the pile cap and the results obtained from our analysis.

Final Geotechnical Engineering Report

Sheep Dip Wash Bridge – Indian Route 8084 ■ Many Farms, Arizona

June 9, 2011 ■ Terracon Project No. 69095030



Location /Direction	Pile Type (mm/ kg/m)	Scour Depth from Existing Ground (m)	Factored Load (kN)	Pile Head Connection	Deflection (mm)	Maximum Moment (kN-m)	Maximum Shear (kN)
Abutment – Transverse	HP360x 152 ²	0.39	186.4	Fixed	3.3	93	37
Abutment – Longitudinal			89.9	Pinned	4.8	48	36
Piers – Transverse	HP360x 152 ³	1.85	178.8	Fixed	26	81	39
Piers - Longitudinal			91.6	Pinned	7	117	26

¹The transverse direction is perpendicular to the roadway centerline; and the longitudinal direction is along the roadway centerline

²The pile is oriented with strong axis in the longitudinal loading direction.

³The pile is oriented with strong axis in the transverse loading direction.

TABLE 1

Summary of Subsurface Profile for Lateral Load Analyses of Composite Pile Foundations using GROUP

Foundation Element	Top Depth Bottom Depth (m)		Soil Type (P-y curve model) ¹	Unit Weight (kN/m ³)	Shear Strength		Compressive Strength		Subgrade Reaction k _s (MN/m ³)	Strain ε ₅₀
					Internal Friction Angle (φ)	Cohesion (kN/m ²)	Uniaxial Strength (q _u) (kN/m ²)	Elastic Modulus (E _s) (kN/m ²)		
Abutments	0.39		Sand (Reese)	18.9	30	--	--	--	--	--
	8.4									
	8.4		Weak Rock (Reese)	19.6	--	--	600	90,000	--	0.005
	10.8									
	10.8		Vuggy Limestone (Reese)	20.4	--	--	800	--	--	--
	15									
Piers	1.85		Sand (Reese)	18.9	30	--	--	--	--	--
	5.5									
	5.5		Weak Rock (Reese)	19.6	--	--	600	90,000	--	0.005
	11.0									
	11.0		Vuggy Limestone (Reese)	20.4	--	--	800	--	--	--
	15.0									

The nominal and factored axial resistance calculations and calculations and graphs obtained from the Group analyses are presented in Appendix C. The calculations and graphs are grouped according to each foundation element. There is one set of design graphs and calculations for the HP360x152 H-pile groups at the abutments and piers, respectively. The sheets are organized in the following order:

- Cross Section of the Pile Group Layout
- Graph of Deflection vs. Depth of Piles in Longitudinal (Y-) and Transverse (Z-) directions
- Graph of Shear Force vs. Depth of Piles in Y- and Z- directions
- Graph of Bending Moment vs. Depth of Piles about Y- and Z- directions.
- Output file from Group 8.0
- Nominal and Factored Axial Resistance Calculations

4.2.3 Pile Design and Construction Recommendations

- The analyses conducted and presented in this report assumes that the piles are driven to refusal into the underlying native claystone formation. The pile should be considered to have reached refusal at 10 blows for less than 25.4 mm (1-inch) penetration of the pile head or the blowcount necessary to achieve pile ultimate capacity.
- Care should be exercised in driving the piles into the hard rock. High strength pile driving shoes should be used to prevent damage to the pile section while driving. It is also recommended that the contractor select a driving hammer and cushion combination which is capable of installing the selected piling without overstressing the pile material. The contractor should submit the pile driving plan and the pile hammer-cushion combination to the engineer for evaluation of the driving stresses a minimum of two weeks prior to pile installation.
- It is recommended that a representative of the geotechnical engineer be present at the site to observe the pre-boring and the pile driving operations. Each pile should be observed and checked for buckling, crimping and alignment in addition to recording depth of pre-bore, penetration resistance, depth of embedment, and general pile driving operations.
- The diameter of the pre-bore as per Section 551.07 of FP-03 (FHWA, 2003) is recommended to be 6-inches (150-mm) in addition to the diagonal dimension of the H-Pile section. For the recommended HP360x152 H-piles this would require a minimum 30-inch (76.2 cm) diameter for the pre-bore hole.
- The depth of the pre-boring should be advanced a minimum of one meter into moderately weathered bedrock regardless of the estimated depths outlined in this report.

- The concrete grout used to fill the annular space between the borehole wall and the H-Pile is recommended to have a minimum 28-day compressive strength of at least 3000 pounds per square inch (psi) or 20 MN/m². The high strength of the concrete grout will ensure the transfer of shear forces from the H-Pile to the native soils/bedrock adequately. The modeling of this system and the actual field performance require the pile and backfill material to transfer the lateral load to the adjacent soil. This requires intimate contact with the pile and backfill system and the soil. The use of pea gravel or other less rigid materials have the potential for shifting or slight movement and will likely not provide a uniform, consistent load transfer to the adjacent soils.
- Steel H-Piles must have a minimum yield strength of 250 MN/m² (36 ksi) as specified in ASTM A36.

4.3 Lateral Earth Pressures on Abutments

Lateral earth pressures on bridge abutment walls will be dependent on the materials used as backfill. We recommend materials used for abutment and retaining wall backfill meet the requirements of FP-03 (FHWA, 2003) Structure Backfill. The on-site clayey sand, silt, and clay soils are not recommended for use as structure backfill.

Abutment and retaining walls on the project should be designed in accordance with the provisions of FP-03 (FHWA, 2003) Slope Reinforcement and Retaining Walls and Section 11 of AASHTO (2010). For soils above any free water surface, recommended lateral earth pressures and load/resistance factors in accordance with Section 11.5.5 and Table 3.4.1.2 of AASHTO for unrestrained retaining structures are:

Backfill Type	Active ¹ ((kN/m ²)/m)	Passive ((kN/m ²)/m)	At-Rest ¹ ((kN/m ²)/m)
On-site non-plastic sand soils	6.3	62.8	8.6
FP-03 Structure Backfill	5.5	69.1	7.9
Load/Resistance Factor	1.50	.75	1.35

¹ Assumes a level backfill condition at the top of the wall, values should be increased for any sloping backfill configurations

A coefficient of base friction of 0.45 may be used in the design of spread footings that will support abutment or retaining walls on the project. A resistance factor of 0.80 should be applied in the design for sliding of cast-in-place concrete bearing on undisturbed soils at the site in accordance with Table 10.5.5.2.2-1 of AASHTO.

The lateral earth pressures presented above do not include any hydrostatic loading or surcharge due to live loads acting on approach slabs. Appropriate additional loading and load factors should be applied in the design.

If FP-03 (FHWA, 2003) Structure Backfill is specified in the design, earthwork for the wall backfill should be placed in accordance with Section 204, Section 209 and Section 704 of FP-03 (FHWA, 2003) as appropriate. To reduce the potential of hydrostatic loading on retaining walls, drainage systems should be incorporated into the design where applicable. Drain systems consisting of continuous porous backfill or geocomposite as outlined in Section 714 of FP-03 (FHWA, 2003) are recommended. Drain systems should be discharged to weep holes appropriately placed along the face of the wall.

4.4 Earthwork Factors and Slopes

The following excavation factor and slopes should be used for project development:

Location	Subgrade Materials	Excavation Factors (%)	Maximum Slope Ratio (H:V)
N8084 Sheep Dip Wash Bridge	Sand soils	-10 to -15	2½:1 For Excavations and Fill Embankments less than 0.9 meters in height. 3:1 for all slopes greater than 0.9 meters in height.

4.5 Corrosion Potential

Experience with similar soils in the project area indicates that ASTM Type II Portland cement is suitable for concrete on and below grade. Foundation concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Excavation

Based on the field reconnaissance and the soil conditions encountered in the exploratory borings, it is expected that shallow excavations for the proposed construction can be accomplished with conventional earthmoving equipment. It is anticipated that excavations in the soils, weathered claystone/shale and sandstone bedrock for the proposed construction may be difficult if these materials are encountered at the necessary excavation depths. The correct equipment for site conditions should be selected by the Contractor to perform the earthwork at the site based on the information presented in this report and the contractor's on-site

observations and evaluation. Excavations should be designed and constructed by the contractor to maintain stable sides and bottom. Excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards.

5.2 Pre-Drilled Shaft Construction Considerations

The borings performed for this project were advanced using a CME-75 drill rig and 20.3-centimeter diameter hollow-stem continuous augers and air-rotary drilling methods. Pre-boring of shafts to design depths, prior to H-pile placement, may require specialized drilling equipment to penetrate the subsurface materials. The correct equipment for site conditions should be selected by the Contractor, based on the information presented in this report and the contractor's on-site observations and evaluation. Shafts may not remain open without stabilizing measures. Zones of caving soils should be anticipated. All pre-drilled shaft construction techniques should be in accordance with Section 565 of FP-03 (FHWA, 2003).

6.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between test locations, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site

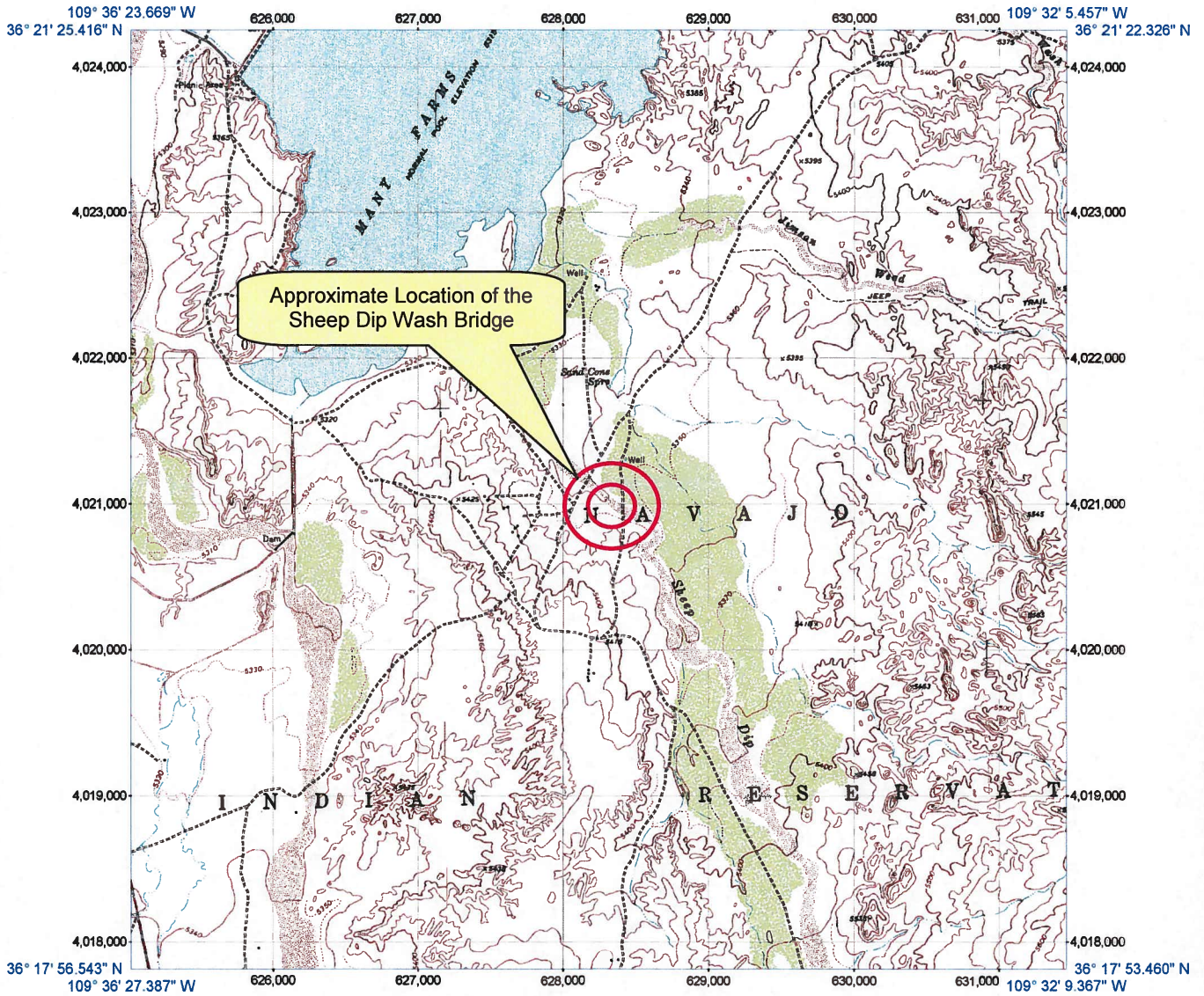
Final Geotechnical Engineering Report

Sheep Dip Wash Bridge – Indian Route 8084 ■ Many Farms, Arizona
June 9, 2011 ■ Terracon Project No. 69095030



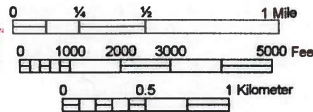
safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

MAP



1927 North American Datum; UTM grid zone 12
Generated by BigTopo7 (www.igage.com)
Map compiled from USGS Quads: Many Farms; AZ

UTM Grid and 2011 Magnetic North
Distortion at Center of Sheet
Grid (NAD 83) is 0.0077" (+/-) (0.00019 m)
TM to NAD 83 is 0.0064" (+/-) (0.00016 m)



BigTopo Map

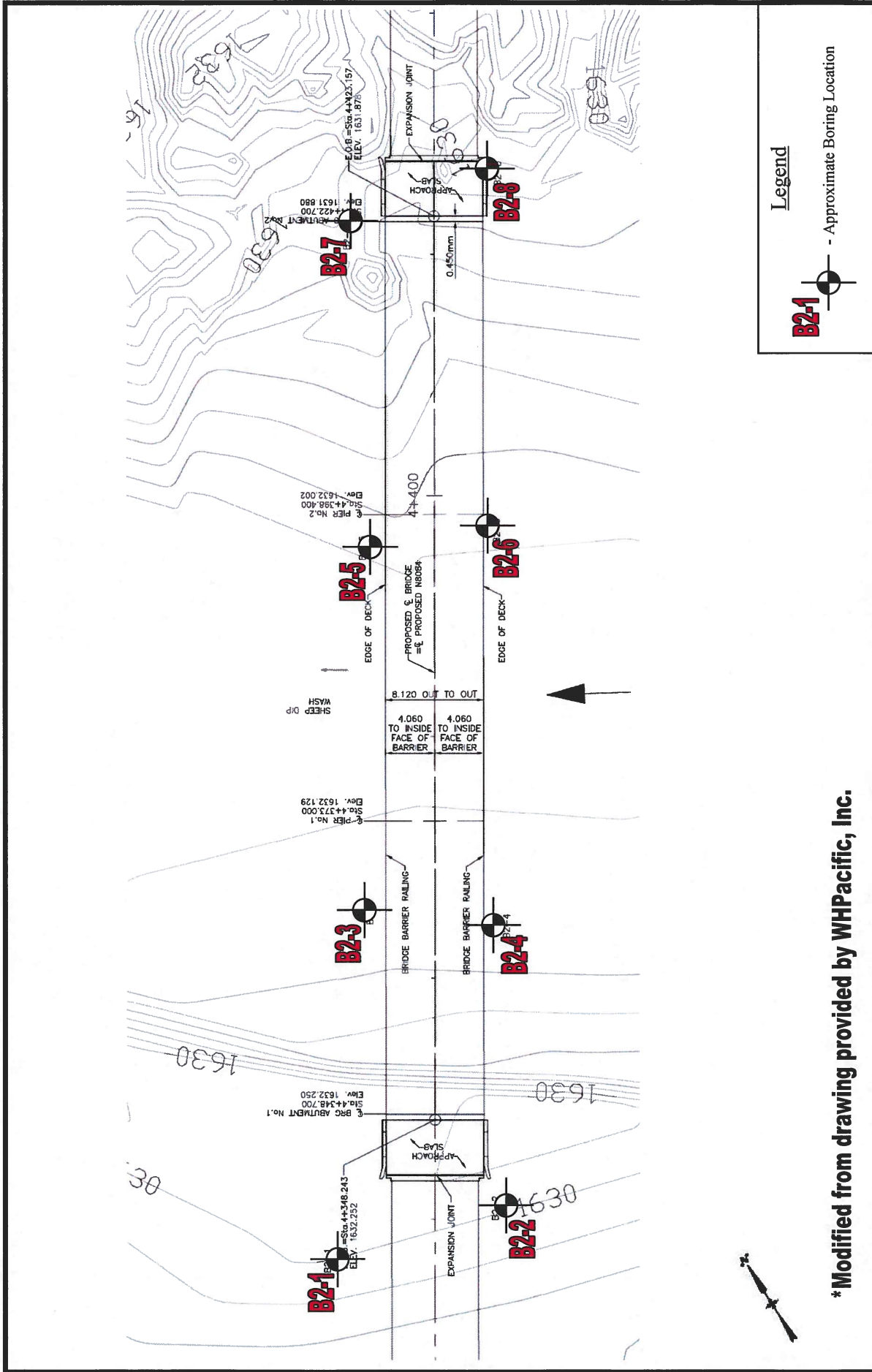
Project Mngr:	KMP
Drawn By:	HMW
Checked By:	KMP
Approved By:	KMP

Project No.	69095030
Scale	~ 1:24,000
File No.	Site Map.doc
Date:	01/11/2011

Terracon
Consulting Engineers & Scientists
#4A CR 3499
Flora Vista, New Mexico
505.334.2900 Fax: 505.334.9703

Site Location Map
BIA, Indian Route 8084
Bridge 2, Sheep Dip Wash
Many Farms, Arizona

Exhibit
A-1



***Modified from drawing provided by WHPacific, Inc.**

Project Mng'r:	KMP	Project No:	69095030	Exhibit	A-2
Drawn By:	HMW	Scale:	NTS	Boring Location Plan	
Checked By:	KMP	File No:	Boring.doc	BIA, Indian Route 8084 Bridge 2, Sheep Dip Wash Many Farms, Arizona	
Approved By:	KMP	Date:	01/19/2011		

Terracon
Consulting Engineers & Scientists

#AA CR 3499
Flora Vista, New Mexico
505.334.2900 Fax: 505.334.9703

Field Exploration Description

Eight (8) test borings were advanced in the proposed bridge location to approximate depths ranging from 30.6 to 30.8 meters below existing site grade at the approximate locations shown on the attached Boring Location Plan (Exhibit A-2). The test borings were advanced with a truck-mounted CME-75 drill rig utilizing 20.3-centimeter diameter hollow-stem augers and air-percussion drilling methods.

The borings were located in the field by Terracon personnel, by measuring from existing site features and surveyed station markings provided by others at the time of drilling. The UTM coordinates at the boring locations were recorded in the field using a handheld GPS unit. These were provided to WHPacific, Inc. and the boring ground surface elevations were provided by WHPacific, Inc. The accuracy of the boring locations should only be assumed to the level implied by the method used. The approximate boring locations are shown on the Boring Location Plan in Appendix A. Due to the site topography and vegetation, the boring locations in the field were placed as near as possible to the planned locations provided by the client.

A lithologic log of each boring was recorded by the field geologist during the drilling operations. At selected intervals, samples of the subsurface materials were taken by driving split-spoon or ring-barrel samplers.

The soils of the southwest are typically alluvial (water deposited) and eolian (wind deposited) and may have characteristics which result in expansion or collapse. Therefore, the use of a ring sampler was alternated with the split spoon sampler in order to obtain relatively-undisturbed samples for the performance of expansion or collapse/consolidation testing.

Penetration resistance measurements were obtained by driving the ring-barrel sampler into the subsurface materials with a 63.5-kilogram automatic hammer falling 76.2 centimeters. The penetration resistance value is a useful index in estimating the consistency or relative density of materials encountered.

A CME automatic hammer was used to advance the ring-barrel and SPT samplers in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the N-values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Groundwater conditions were evaluated in the borings at the time of site exploration.

LOG OF BORING NO. B2-1

CLIENT Bureau of Indian Affairs	
SITE N8084 at Sheep Dip Wash Many Farms, Arizona	PROJECT N8084 - Bridge 2; Sheep Dip Wash

GRAPHIC LOG	Boring Location: Station 4+355 5 Meters Left GPS: UTM NAD 83 Z-12 N=4021157m E=0628249m				SAMPLES		TESTS			
	DESCRIPTION		DEPTH, m.	USCS SYMBOL	CORE SIZE	RECOVERY, m	SPT-N BLOWS 10.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³	UNCONFINED STRENGTH, kPa
Approx. Surface Elev.: 1630 m										
3.8	1626.2	CLAYEY SAND ; red tan to red brown, dry to moist, dense to very dense.	1	SC	RS	0.05	25/05	16.6		
5.3	1624.7	SILTY SAND ; red brown, moist to wet, loose, clayey lenses.	2	SC	SS	0.3	43	15.3		
		CLAYSTONE ; gray tan, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses.	3	SM	RS	0.3	9	15.3		
			4		SS	0.3	49	14.8		
			5		RS	0.05	25/05	12.0		
			6		SS	0.2	86/2	13.0		
			7		RS	0.1	25/1	10.5		
			8		SS	0.08	50/08	11.5		
			9		SS	0.08	50/08	11.7		
			10		SS	0.15	50/15	9.0		
			11							
			12							
			13							
			14							
			15							
			16							

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	5.5	WD	
WL		WD	
WL		WD	



BORING STARTED		12-9-09	
BORING COMPLETED		12-10-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

BOREHOLE 99 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

LOG OF BORING NO. B2-1

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 2; Sheep Dip Wash								
SITE N8084 at Sheep Dip Wash Many Farms, Arizona										
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	SAMPLES			TESTS				
			USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS \ 0.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³	UNCONFINED STRENGTH, kPa
17	<p>CLAYSTONE; gray tan, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses.</p>			SS	0.05	50/0.05	9.5			
18				SS	0.13	50/0.13	9.1			
19										
20					SS	0.05	50/0.05	9.5		
21										
22					SS	0.13	50/0.13	7.1		
23					SS	0.08	50/0.08	8.1		
24										
25					SS	0.1	50/0.1	6.9		
26					SS	0.13	50/0.13	7.2		
27										
28					SS	0.1	50/0.01	8.2		
29					SS	0.1	50/0.1	9.3		
30										
30.6	<p>Exploration terminated at a depth of approximately 30.6 meters below existing ground surface. Groundwater encountered at a depth of about 5.49 meters.</p>	1599.4		SS	0.05	50/0.05	9.8			

BOREHOLE 99 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	▽ 5.5	WD	▽
WL	▽		▽
WL			



BORING STARTED		12-9-09	
BORING COMPLETED		12-10-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B2-2

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 2: Sheep Dip Wash							
SITE N8084 at Sheep Dip Wash Many Farms, Arizona		Boring Location: Station 4+355 5 Meters Right GPS: UTM NAD 83 Z-12 N=4021153m E=0628263m							
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	SAMPLES			TESTS			
			USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %	DRY UNIT WT KN/m ³
	Approx. Surface Elev.: 1630 m								
	CLAYEY SAND , red tan to red brown, dry to moist, medium dense to dense.	1							
		2	SC	SS	0.3	24	6.1		
		3							
		4	SC	RS	0.3	19	10.1		
		5							
	4.6 LEAN CLAY TO SANDY LEAN CLAY ; red brown, moist to wet, stiff. 1625.5	5	CL	SS	0.3	12	15.5		
		6							
	5.9 CLAYSTONE ; gray and tan, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses. 1624.1	7		RS	0.2	48/2	16.0		
		8		SS	0.13	50/13	15.8		
		9							
		10		SS	0.25	100/25	10.8		
		11							
		12		SS	0.15	50/15	12.4		
		13							
		14		SS	0.25	93/25	14.8		
		15							
		16		SS	0.2	93/2	10.3		
				SS	0.08	50/08	8.3		

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	∇ 5.2	WD	∇
WL	∇		∇
WL			



BORING STARTED		12-9-09	
BORING COMPLETED		12-9-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

BOREHOLE 99 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

LOG OF BORING NO. B2-2

CLIENT <p style="text-align: center;">Bureau of Indian Affairs</p>	
SITE <p style="text-align: center;">N8084 at Sheep Dip Wash Many Farms, Arizona</p>	PROJECT <p style="text-align: center;">N8084 - Bridge 2; Sheep Dip Wash</p>

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	SAMPLES				TESTS			
			USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS \ 0.3 m	WATER CONTENT, %	DRY UNIT WT KN/m ³	UNCONFINED STRENGTH, kPa
17	CLAYSTONE ; gray and tan, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses.	17			SS	0.13	50/13	7.4		
18		18			SS	0.05	50/05	8.8		
19		19								
20		20			SS	0.08	50/08	8.2		
21		21								
22		22			SS	0.08	50/08	8.9		
23		23			SS	0.13	50/13	10.9		
24		24								
25		25			SS	0.1	50/1	9.9		
26		INTERBEDDED CLAYSTONE AND SHALE ; gray and maroon, moist, fresh, very soft to medium hardness.	26			SS	0.13	50/13	10.8	
27	27									
28	28				SS	0.1	50/1	11.3		
29	29				SS	0.05	50/05	9.8		
30	30									
30.6	Exploration terminated at a depth of approximately 30.6 meters below existing ground surface. Groundwater encountered at a depth of about 5.18 meters.	30.6			SS	0.13	50/13	8.4		

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.




*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

BOREHOLE 89 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

WATER LEVEL OBSERVATIONS, m		BORING STARTED 12-9-09	
WL	▽ 5.2 WD ▽	BORING COMPLETED 12-9-09	
WL	▽	RIG	CME-75 FOREMAN HMW
WL		APPROVED	KMP JOB # 69095030



LOG OF BORING NO. B2-3

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 2: Sheep Dip Wash							
SITE N8084 at Sheep Dip Wash Many Farms, Arizona		Boring Location: Station 4+385 5 Meters Left GPS: UTM NAD 83 Z-12 N=4021180m E=0628266m							
GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 1628.4 m	DEPTH, m.	SAMPLES			TESTS			
			USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %	DRY UNIT WT KN/m ³
	POORLY GRADED SAND WITH CLAY; red tan to red brown, dry to moist, loose, clay lenses.	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16							
	LEAN CLAY WITH SAND; red brown, moist to wet, medium stiff, sand lenses.	1626.1 4.4 1623.9							
	CLAYSTONE; tan, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses. Thin sandstone lenses.								
Continued Next Page									

BOREHOLE 99 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			



BORING STARTED		11-3-09	
BORING COMPLETED		11-4-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B2-3

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 2: Sheep Dip Wash								
SITE N8084 at Sheep Dip Wash Many Farms, Arizona										
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³	UNCONFINED STRENGTH, kPa
		17			SS	0.05	50/05	8.9		
		18			SS	0.1	50/1	7.2		
		19								
		20			SS	0.1	50/1	12.8		
		21								
		22			SS	0.13	50/13	7.9		
		23			SS	0.13	50/13	8.4		
		24								
		25			SS	0.15	50/15	10.2		
		26	25.9	1602.4	SS	0.13	50/13	9.3		
		27								
		28			SS	0.1	50/1	8.0		
29			SS	0.1	50/1	8.6				
30										
30.6		1597.7	SS	0.15	50/15	10.4				

CLAYSTONE; tan, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses.

INTERBEDDED CLAYSTONE AND SHALE; gray and maroon, moist, fresh, very soft to medium hardness.

Exploration terminated at a depth of approximately 30.6 meters below existing ground surface. No groundwater encountered.

BOREHOLE 99 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			



BORING STARTED		11-3-09	
BORING COMPLETED		11-4-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B2-4

CLIENT Bureau of Indian Affairs										
SITE N8084 at Sheep Dip Wash Many Farms, Arizona		PROJECT N8084 - Bridge 2: Sheep Dip Wash								
GRAPHIC LOG	Boring Location: Station 4+385 5 Meters Right GPS: UTM NAD 83 Z-12 N=4021173m E=0628275m	DEPTH, m.	SAMPLES			TESTS				
	DESCRIPTION		USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS 10.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³	UNCONFINED STRENGTH, kPa
	Approx. Surface Elev.: 1628.4 m									
3.8	1624.6	1								
	POORLY GRADED SAND WITH CLAY ; red tan to red brown, dry to wet, loose, clay lenses.	2	SP SC	SS	0.3	5	14.4			
		3	SP SC	RS	0.3	4	15.6			
		4								
	CLAYSTONE ; green tan, dry to wet, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses.	5		SS	0.3	54	13.6			
		6		RS	0.13	25/13	12.6	18.1		
		7								
		8		SS	0.15	50/15	11.5			
		9								
		10		SS	0.28	83/28	14.6			
		11		SS	0.3	77	14.4			
		12								
		13		SS	0.13	50/13	12.5			
		14		SS	0.1	50/1	11.5			
		15								
		16		SS	0.13	50/13	6.8			

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m

WL	▽	NE		WD	▽
WL	▽			▽	
WL					



BORING STARTED		11-4-09	
BORING COMPLETED		11-4-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

BOREHOLE 98 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

LOG OF BORING NO. B2-4

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 2: Sheep Dip Wash						
SITE N8084 at Sheep Dip Wash Many Farms, Arizona		PROJECT N8084 - Bridge 2: Sheep Dip Wash						
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES			TESTS	
				CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %
	<p>CLAYSTONE; green tan, dry to wet, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses.</p>	17		SS	0.15	50/15	9.1	
		18		SS	0.13	50/13	10.3	
		19						
		20		SS	0.15	50/15	8.0	
		21						
		22		SS	0.13	50/13	10.9	
		23		SS	0.1	50/10	10.2	
		24						
		25		SS	0.13	50/13	8.0	
		26		SS	0.08	50/08	6.6	
27								
28		SS	0.1	50/1	10.2			
29								
29	1599.4	29		SS	0.05	50/05	7.6	
30		30						
30.8	1597.6	30.8		SS	0.05	50/05	16.3	
<p>Exploration terminated at a depth of approximately 30.8 meters below existing ground surface. No groundwater encountered.</p>								

BOREHOLE 98 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	NE	WD	
WL			
WL			



BORING STARTED		11-4-09	
BORING COMPLETED		11-4-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B2-5

CLIENT Bureau of Indian Affairs																																																																																																																																																																																																																																																																											
SITE N8084 at Sheep Dip Wash Many Farms, Arizona		PROJECT N8084 - Bridge 2: Sheep Dip Wash																																																																																																																																																																																																																																																																									
GRAPHIC LOG	Boring Location: Station 4+415 5 Meters Left GPS: UTM NAD 83 Z-12 N=4021205m E=0628283m DESCRIPTION Approx. Surface Elev.: 1628.3 m	DEPTH, m.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4">SAMPLES</th> <th colspan="4">TESTS</th> </tr> <tr> <th>USCS SYMBOL</th> <th>CORE SIZE</th> <th>RECOVERY, m</th> <th>SPT-N BLOWS 1.0.3 m</th> <th>WATER CONTENT, %</th> <th>DRY UNIT WT kN/m³</th> <th>UNCONFINED STRENGTH, kPa</th> <th></th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2</td><td>SP</td><td>SS 0.3</td><td>7</td><td>3.3</td><td></td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>5</td><td>SC</td><td>SS 0.3</td><td>20</td><td>17.5</td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td>SS 0.3</td><td>25</td><td>17.6</td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td>RS 0.23</td><td>47/23</td><td>13.7</td><td></td><td></td><td></td></tr> <tr><td>12</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>13</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>14</td><td></td><td>SS 0.2</td><td>84/2</td><td>13.8</td><td></td><td></td><td></td></tr> <tr><td>15</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>16</td><td></td><td>SS 0.25</td><td>87/25</td><td>13.1</td><td></td><td></td><td></td></tr> <tr><td>17</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>18</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>19</td><td></td><td>SS 0.13</td><td>50/13</td><td>13.7</td><td></td><td></td><td></td></tr> <tr><td>20</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>21</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>22</td><td></td><td>SS 0.08</td><td>50/08</td><td>12.0</td><td></td><td></td><td></td></tr> <tr><td>23</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>24</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>25</td><td></td><td>SS 0.05</td><td>50/05</td><td>8.2</td><td></td><td></td><td></td></tr> <tr><td>26</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>27</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>28</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>29</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>30</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	SAMPLES				TESTS				USCS SYMBOL	CORE SIZE	RECOVERY, m	SPT-N BLOWS 1.0.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³	UNCONFINED STRENGTH, kPa										1								2	SP	SS 0.3	7	3.3				3								4								5	SC	SS 0.3	20	17.5				6								7								8		SS 0.3	25	17.6				9								10								11		RS 0.23	47/23	13.7				12								13								14		SS 0.2	84/2	13.8				15								16		SS 0.25	87/25	13.1				17								18								19		SS 0.13	50/13	13.7				20								21								22		SS 0.08	50/08	12.0				23								24								25		SS 0.05	50/05	8.2				26								27								28								29								30							
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	2.3 1626 POORLY GRADED SAND ; red tan, dry to moist, loose, trace gravel.																																																																																																																																																																																																																																																																										
	5.3 1623 CLAYEY SAND ; red tan to brown, moist, loose to medium dense/stiff to very stiff, clay lenses.																																																																																																																																																																																																																																																																										
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The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

BOREHOLE 99 LOG OF BORING(GPJ) TERRACON.GDT 6/7/11

WATER LEVEL OBSERVATIONS, m			
WL	∇ NE	WD	∇
WL	∇		∇
WL			



BORING STARTED		10-21-09	
BORING COMPLETED		10-21-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B2-5

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 2: Sheep Dip Wash								
SITE N8084 at Sheep Dip Wash Many Farms, Arizona										
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	SAMPLES			TESTS				
			USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS 10.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³	UNCONFINED STRENGTH, kPa
30.6		1597.7	Exploration terminated at a depth of approximately 30.6 meters below existing ground surface. No groundwater encountered.							

CLAYSTONE; gray, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, sandy and shale lenses.

17			SS	0.05	50/0.05	8.6		
18								
19			SS	0.13	50/0.13	8.6		
20			SS	0.13	50/0.13	7.9		
21								
22			SS	0.15	50/0.15	9.2		
23			SS	0.1	50/0.10	11.0		
24								
25			SS	0.05	50/0.05	8.6		
26			SS	0.1	50/0.1	9.5		
27								
28			SS	0.05	50/0.05	7.7		
29			SS	0.08	50/0.08	11.6		
30								
			SS	0.15	50/0.15	16.9		

BOREHOLE 98 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			



BORING STARTED		10-21-09	
BORING COMPLETED		10-21-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B2-6

CLIENT <p style="text-align: center;">Bureau of Indian Affairs</p> SITE <p style="text-align: center;">N8084 at Sheep Dip Wash Many Farms, Arizona</p>		PROJECT <p style="text-align: center;">N8084 - Bridge 2: Sheep Dip Wash</p>								
GRAPHIC LOG	Boring Location: Station 4+415 5 Meters Right GPS: UTM NAD 83 Z-12 N=4021201m E=0628292m	DESCRIPTION								
	Approx. Surface Elev.: 1628.3 m	DEPTH, m.	USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³	UNCONFINED STRENGTH, kPa
	2.3 1626	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	SP SC RS RS SS SS SS SS SS	SS RS RS SS SS SS SS	0.3 0.3 0.3 0.15 0.13 0.13 0.28 0.25 0.13 0.1	7 3 14 25/15 50/13 50/13 88/28 95/25 50/13 50/10	4.5 18.1 17.8 14.0 10.0 10.6 10.4 13.5 12.3 9.9			
POORLY GRADED SAND ; red brown, dry to moist, loose.		CLAYEY SAND ; red brown, moist to wet, very loose.		CLAYSTONE ; gray and tan, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses.						

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m

WL	▽ NE	WD	▽
WL	▽		▽
WL			



BORING STARTED		10-21-09	
BORING COMPLETED		11-5-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

BOREHOLE 99 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

LOG OF BORING NO. B2-6

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 2: Sheep Dip Wash								
SITE N8084 at Sheep Dip Wash Many Farms, Arizona										
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	SAMPLES			TESTS				
			USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³	UNCONFINED STRENGTH, kPa
17	<p>CLAYSTONE; gray and tan, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses.</p> <p>Thin sandstone lenses.</p>	17		SS	0.08	50/0.08	14.3			
18		18		SS	0.13	50/0.13	10.7			
19		19								
20		20								
21		21								
22		22			SS	0.13	50/0.13	12.1		
23		23			SS	0.03	50/0.03	16.6		
24		24								
25		25			SS	0.1	50/0.1	13.7		
26		26			SS	0.03	50/0.03	12.7		
27	27									
28	28			SS	0.08	50/0.08	14.5			
29	29			SS	0.13	50/0.13	12.4			
30	30									
30.6	30.6			SS	0.13	50/0.13	14.1			
1602.4	1602.4									
1597.7	1597.7									
Exploration terminated at a depth of approximately 30.6 meters below existing ground surface. No groundwater encountered.										

BOREHOLE 98 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			



BORING STARTED		10-21-09	
BORING COMPLETED		11-5-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B2-7

CLIENT
Bureau of Indian Affairs

SITE
**N8084 at Sheep Dip Wash
Many Farms, Arizona**

PROJECT
N8084 - Bridge 2: Sheep Dip Wash

Boring Location: Station 4+430 5 Meters Left
GPS: UTM NAD 83 Z-12 N=4021229m E=0628296m

DESCRIPTION

Approx. Surface Elev.: 1629.9 m

POORLY GRADED SAND WITH CLAY; red tan to red brown, dry to moist, medium dense, trace gravel, clay lenses.

5.3 1624.6

CLAYEY SAND; red brown, dry to wet, medium dense/stiff, trace gravel to with gravel, clay lenses.

8.5 1621.4

CLAYSTONE; light gray, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses.

Switched from HSA to air rotary drilling.

Continued Next Page

DEPTH, m.	USCS SYMBOL	SAMPLES			TESTS		
		CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %	DRY UNIT WT KN/m ³
1							
2	SP SC		RS	0.3	12	2.5	
3							
4	SP SC		SS	0.3	14	2.6	
5							
6	SP SC		RS	0.3	26	2.4	
7							
8	SC		SS	0.3	10	19.8	
9							
10	SC		RS	0.3	12	8.4	20.3
11							
12			SS	0.3	66	13.2	
13							
14			SS	0.13	50/13	13.4	
15							
16			SS	0.25	85/25	12.4	
17							
18			SS	0.13	50/13	6.5	
19							
20			SS	0.28	95/28	17.7	
21							

BOREHOLE 99 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			



BORING STARTED		11-9-09	
BORING COMPLETED		11-10-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B2-7

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 2: Sheep Dip Wash							
SITE N8084 at Sheep Dip Wash Many Farms, Arizona									
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	SAMPLES				TESTS		
			USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³
17	CLAYSTONE ; light gray, dry to moist, complete weathering near top of unit decreasing to fresh, very soft to medium hardness, shale lenses.	17							
18		18			SS 0.08	50/08	8.5		
19	Sandstone lenses.	19							
20		20							
21		21			SS 0.08	50/08	15.0		
22	INTERBEDDED CLAYSTONE AND SHALE ; maroon, moist, fresh, very soft to medium hardness.	22							
23		23							
24		24			SS 0.15	50/15	15.2		
25	INTERBEDDED CLAYSTONE AND SHALE ; maroon, moist, fresh, very soft to medium hardness.	25							
26		26							
27		27			SS 0.13	50/13	14.6		
28	INTERBEDDED CLAYSTONE AND SHALE ; maroon, moist, fresh, very soft to medium hardness.	28							
29		29							
30		30			SS 0.08	50/08	13.7		
30.6	30.6	30.6	Exploration terminated at a depth of approximately 30.6 meters below existing ground surface. No groundwater encountered.						

21.3 1608.6

30.6 1599.3

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			



BORING STARTED		11-9-09	
BORING COMPLETED		11-10-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

BOREHOLE 98 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

LOG OF BORING NO. B2-8

CLIENT Bureau of Indian Affairs									
SITE N8084 at Sheep Dip Wash Many Farms, Arizona		PROJECT N8084 - Bridge 2; Sheep Dip Wash							
GRAPHIC LOG	Boring Location: Station 4+430 5 Meters Right GPS: UTM NAD 83 Z-12 N=4021226m E=0628308m	DESCRIPTION							
	Approx. Surface Elev.: 1629.9 m	DEPTH, m.	USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS 10.3 m	WATER CONTENT, %	DRY UNIT WT KN/m ³
1									
2		SP	SS	0.3	7	1.6			
3									
4		SP	RS	0.3	19	1.0			
5									
6		SC	SS	0.3	9	11.5			
7									
8		SC	RS	0.3	12	12.1	18.9		
9									
10				SS	0.03	50/3	4.2		
11									
12				SS	0.28	90/28	13.1		
13									
14				SS	0.1	50/1	7.3		
15									
16				SS	0.23	96/23	14.8		
17									
18				SS	0.3	67	13.4		
19									
20				SS	0.3	69	18.8		
21									
22									

Approx. Surface Elev.: 1629.9 m

POORLY GRADED SAND; red tan, dry to moist, loose to medium dense, clay lenses.

4.7 1625.2

CLAYEY SAND; tan to brown to red brown, dry to moist, loose to medium dense.

7.6 1622.3

INTERBEDDED SANDSTONE AND SHALE; light gray to gray, dry to moist, complete weathering to fresh, very soft to moderately hard.

8.8 1621.1

INTERBEDDED CLAYSTONE AND SHALE; light gray and maroon, dry to moist, fresh, very soft to moderately hard.

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m	
WL ∇ NE	WD ∇
WL ∇	∇
WL	



BORING STARTED		11-5-09	
BORING COMPLETED		11-6-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

BOREHOLE 99 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

LOG OF BORING NO. B2-8

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 2; Sheep Dip Wash									
SITE N8084 at Sheep Dip Wash Many Farms, Arizona											
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	SAMPLES			TESTS					
			USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³	UNCONFINED STRENGTH, kPa	
					SS	0.15	50/15	12.6			
					SS	0.3	80	15.2			
					SS	0.13	50/13	13.2			
					SS	0.15	50/15	13.0			
					SS	0.15	50/15	13.0			
					SS	0.08	50/08	11.5			
					SS	0.05	50/05	7.2			
					SS	0.13	50/13	7.2			
					SS	0.13	50/13	11.9			
					SS	0.13	50/13	12.9			
30.6	1599.3	Exploration terminated at a depth of approximately 30.6 meters below existing ground surface. No groundwater encountered.									

BOREHOLE 99 LOG OF BORING1.GPJ TERRACON.GDT 6/7/11

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*All blow counts have been converted to N-value blow counts.
**Boring elevations provided by WHPacific, Inc.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			



BORING STARTED		11-5-09	
BORING COMPLETED		11-6-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1- ³ / ₈ " I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". For 3" O.D. ring samplers (RS) the penetration value is reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer falling 30 inches, reported as "blows per foot," and is not considered equivalent to the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

<u>Unconfined Compressive Strength, Qu, psf</u>	<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Consistency</u>
< 500	0 - 1	Very Soft
500 - 1,000	2 - 4	Soft
1,000 - 2,000	4 - 8	Medium Stiff
2,000 - 4,000	8 - 15	Stiff
4,000 - 8,000	15 - 30	Very Stiff
8,000+	> 30	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Ring Sampler (RS) Blows/Ft.</u>	<u>Relative Density</u>
0 - 3	0-6	Very Loose
4 - 9	7-18	Loose
10 - 29	19-58	Medium Dense
30 - 49	59-98	Dense
> 50	> 99	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 - 12
Modifiers	> 12

PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
Non-plastic	0
Low	1-10
Medium	11-30
High	> 30

GENERAL NOTES

Description of Rock Properties

WEATHERING

Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very slight	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick.
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very severe	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete	Rock reduced to "soil". Rock "fabric" not discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.

HARDNESS (for engineering description of rock – not to be confused with Moh's scale for minerals)

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

Joint, Bedding and Foliation Spacing in Rock^a

Spacing		Joints		Bedding/Foliation	
Less than 2 in.		Very close		Very thin	
2 in. – 1 ft.		Close		Thin	
1 ft. – 3 ft.		Moderately close		Medium	
3 ft. – 10 ft.		Wide		Thick	
More than 10 ft.		Very wide		Very thick	
Rock Quality Designator (RQD) ^b			Joint Openness Descriptors		
RQD, as a percentage	Diagnostic description	Openness	Descriptor		
Exceeding 90	Excellent	No Visible Separation	Tight		
90 – 75	Good	Less than 1/32 in.	Slightly Open		
75 – 50	Fair	1/32 to 1/8 in.	Moderately Open		
50 – 25	Poor	1/8 to 3/8 in.	Open		
Less than 25	Very poor	3/8 in. to 0.1 ft.	Moderately Wide		
		Greater than 0.1 ft.	Wide		

- a. Spacing refers to the distance normal to the planes, of the described feature, which are parallel to each other or nearly so.
b. RQD (given as a percentage) = length of core in pieces 4 in. and longer/length of run.

References: American Society of Civil Engineers. Manuals and Reports on Engineering Practice - No. 56. Subsurface Investigation for Design and Construction of Foundations of Buildings. New York: American Society of Civil Engineers, 1976.
U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual.

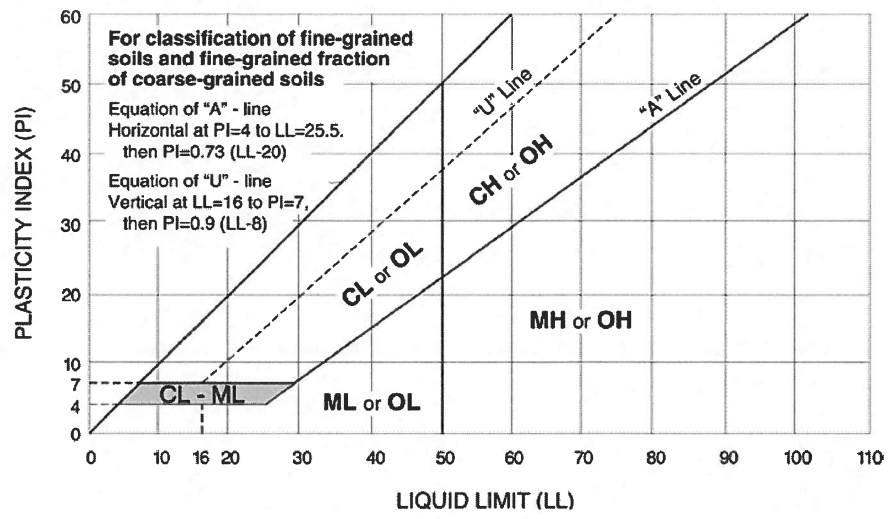
UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests^A

				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well-graded gravel ^F	
			$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel ^F	
	Sands 50% or more of coarse fraction passes No. 4 sieve	Gravels with Fines More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F,G,H}	
			Fines classify as CL or CH	GC	Clayey gravel ^{F,G,H}	
	Sands with Fines More than 12% fines ^D	Clean Sands Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand ^I	
			$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly graded sand ^I	
	Sands with Fines More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G,H,I}		
		Fines Classify as CL or CH	SC	Clayey sand ^{G,H,I}		
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	$PI > 7$ and plots on or above "A" line ^J	CL	Lean clay ^{K,L,M}	
			$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K,L,M}	
		organic	Liquid limit - oven dried < 0.75	OL	Organic clay ^{K,L,M,N}	
			Liquid limit - not dried < 0.75	OH	Organic silt ^{K,L,M,O}	
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}	
			PI plots below "A" line	MH	Elastic Silt ^{K,L,M}	
		organic	Liquid limit - oven dried < 0.75	OH	Organic clay ^{K,L,M,P}	
			Liquid limit - not dried < 0.75	OH	Organic silt ^{K,L,M,Q}	
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat	

^ABased on the material passing the 3-in. (75-mm) sieve
^BIf field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
^CGravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
^DSands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay
^E $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
^FIf soil contains $\geq 15\%$ sand, add "with sand" to group name.
^GIf fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^HIf fines are organic, add "with organic fines" to group name.
^IIf soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
^JIf Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
^KIf soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
^LIf soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.
^MIf soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.
^N $PI \geq 4$ and plots on or above "A" line.
^O $PI < 4$ or plots below "A" line.
^P PI plots on or above "A" line.
^Q PI plots below "A" line.



Laboratory Testing

Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS) described in Appendix A. At that time, the field descriptions were confirmed or modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

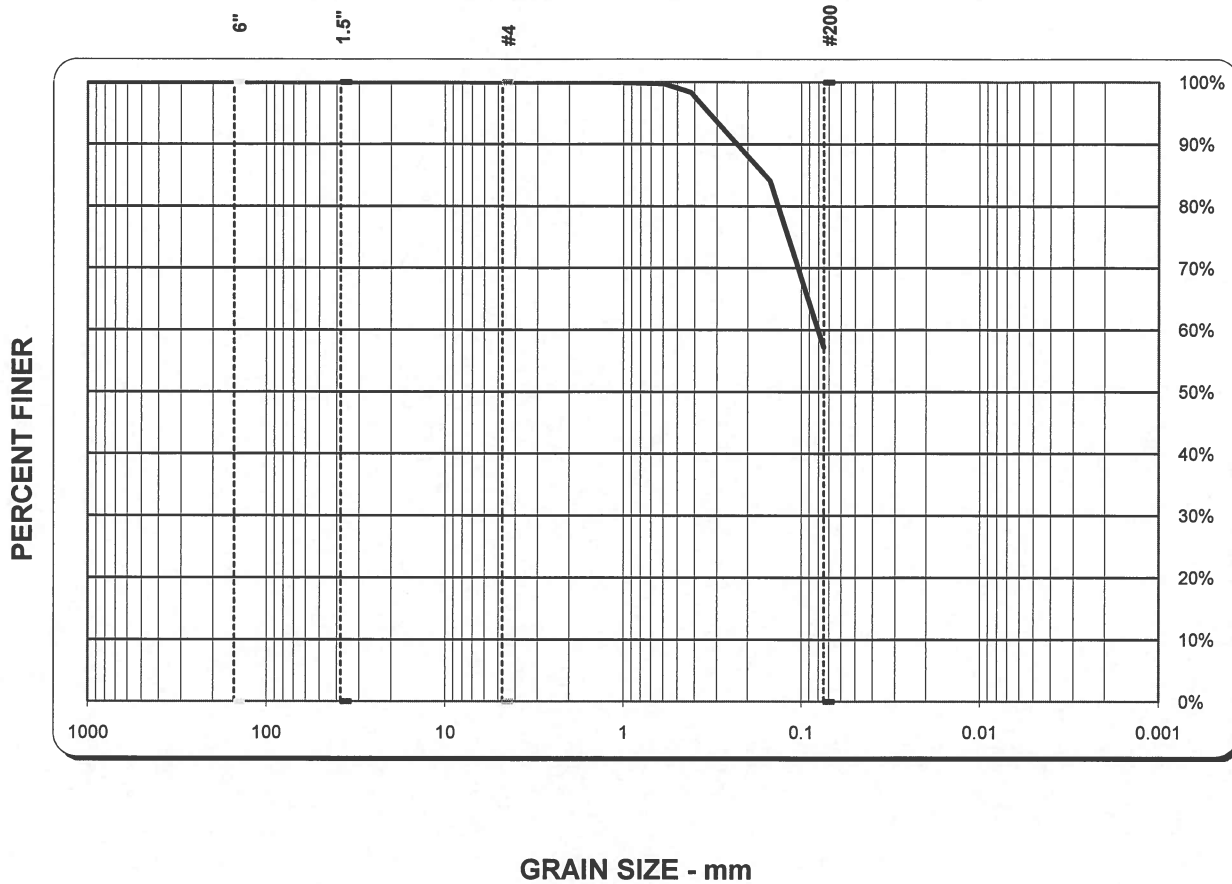
Laboratory tests were conducted on selected soil samples and the test results are presented in this appendix. The laboratory test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

- Consolidation
- Sieve Analysis
- Atterberg Limits
- In-situ Water Content
- In-situ Dry Density

Laboratory tests were conducted on selected soil samples and the test results are presented in Appendix B. Laboratory test results indicate that the surface and subsurface soils exhibit slight to low compressibility potential at in-situ moisture contents. When wetted under anticipated foundation loads, the soils exhibit low expansion potentials and slight to low collapse potentials.

GRAIN SIZE DISTRIBUTION GRAPH



TEST SUMMARY

Sieve Size	1 1/2"	3/4"	3/8"	#4	#10	#40	#100	#200
% Passing (Cumulative)	100	100	100	100	100	98	84	57.2
Specification								

% GRAVEL = 0.0	D ₈₅ = 0.2	D ₁₅ =
% SAND = 42.8	D ₆₀ = 0.1	D ₁₀ =
% SILT & CLAY = 57.2	D ₅₀ =	C _U =
	D ₃₀ =	C _C =

Sample Date: 11/3/09 - 11/4/09

Project No.: 69095030

Project Name: Sheep Dip Wash Bridge

Report Date: 6/20/2011

Sample Location: B2-3 and B2-4 @ 0.6-1.1m Blend

Liquid Limit: Not Performed

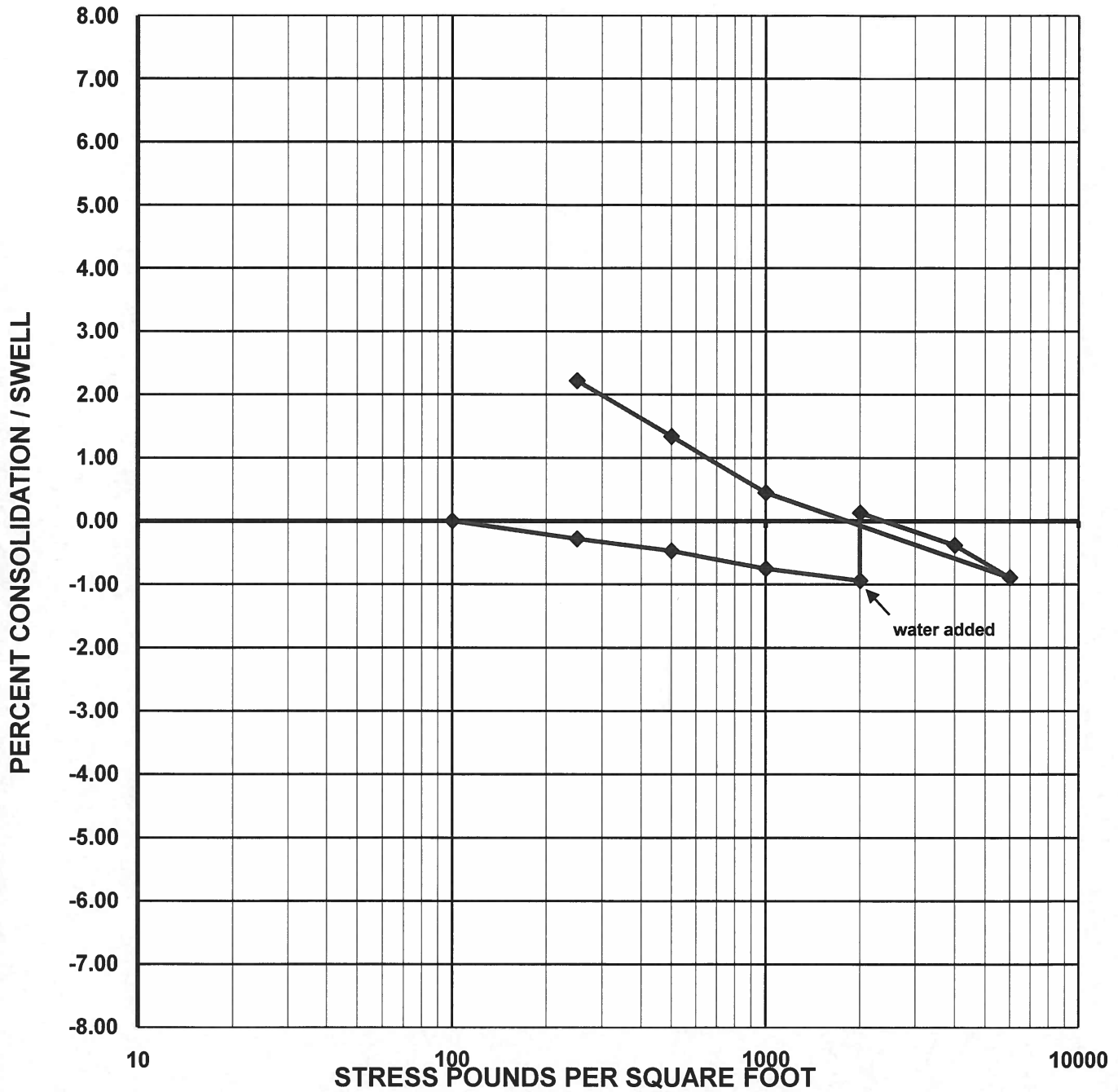
Plasticity Index: Not Performed

USCS Classification: CL

Material Description: Sandy Lean Clay



SWELL / CONSOLIDATION CHART



Sample Date: 11/3/2009

Project No.: 69095030

Project Name: BIA, Indian Route 8084, Many Farms, AZ

Report Date: 6/20/2011

Sample Location: B2-3 @ 4.6-5.0m

USCS Classification:

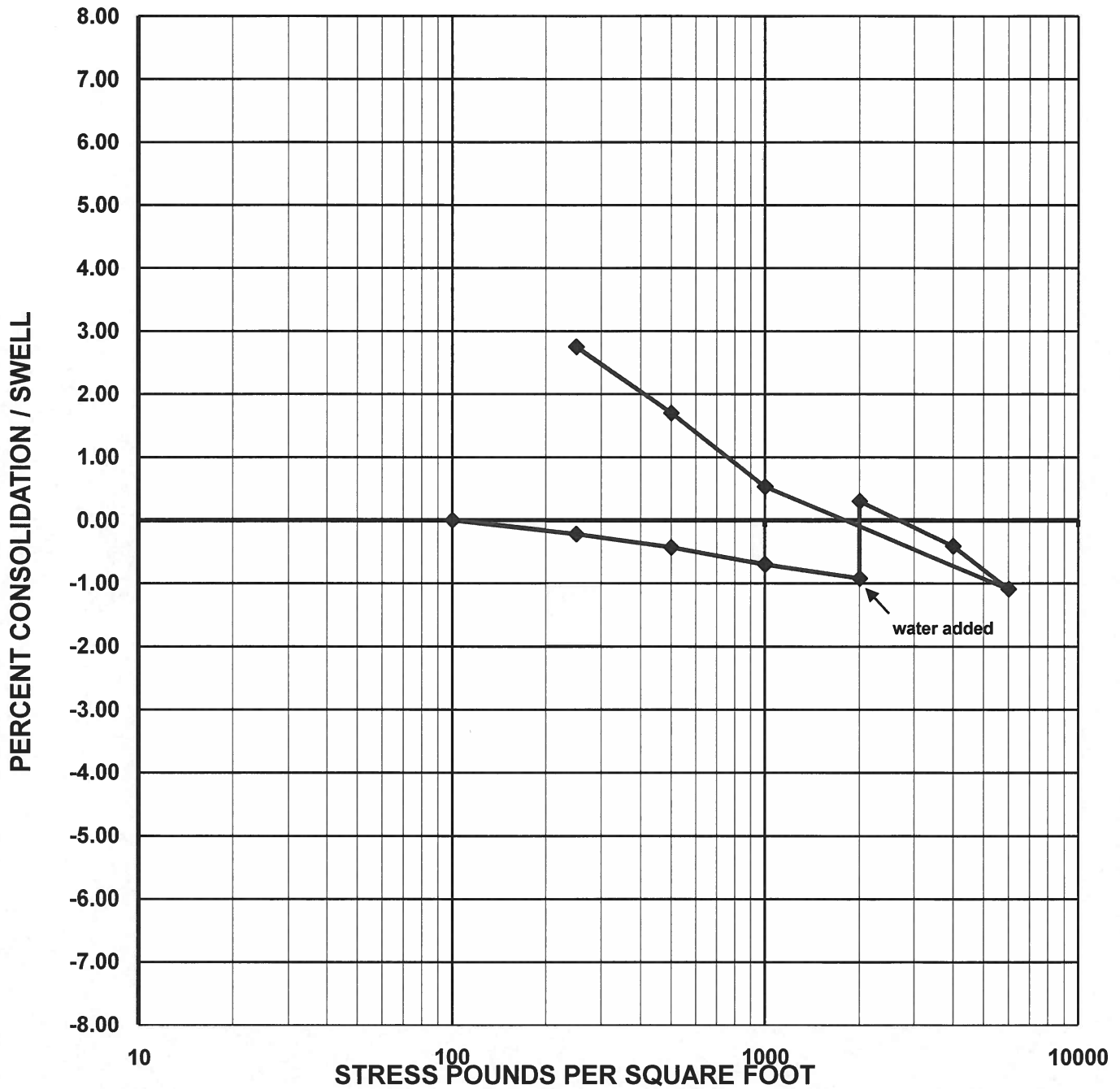
Material Description: Weathered Claystone

Dry Density: 16.8 kN/m³

Moisture Content: 15.2



SWELL / CONSOLIDATION CHART



Sample Date: 11/4/2009

Project No.: 69095030

Project Name: BIA, Indian Route 8084, Many Farms, AZ

Report Date: 6/20/2011

Sample Location: B2-4 @ 6.1-6.6m

USCS Classification:

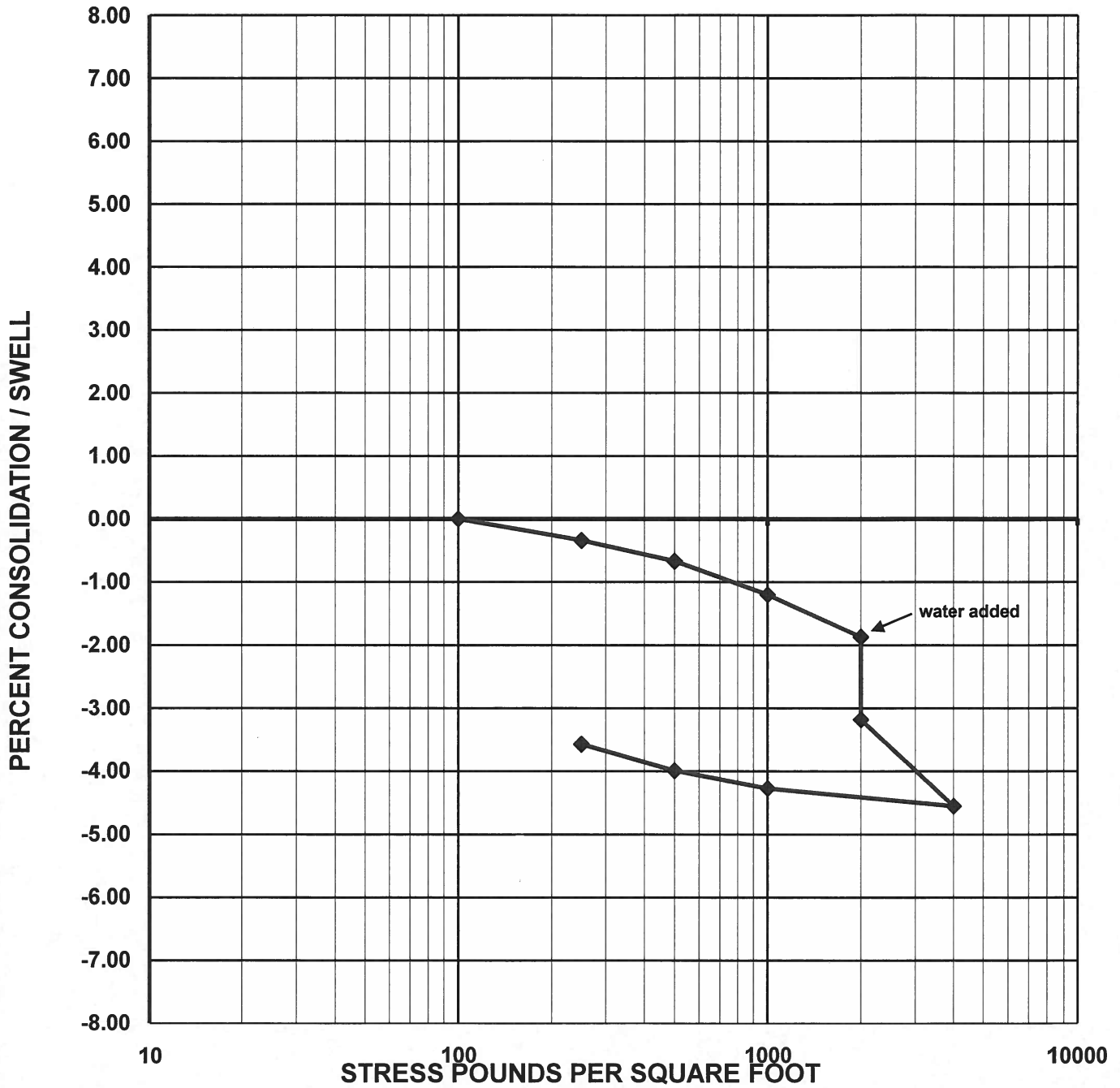
Material Description: Weathered Claystone

Dry Density: 18.1 kN/m³

Moisture Content: 12.6



SWELL / CONSOLIDATION CHART



Sample Date: 11/21/2009

Project No.: 69095030

Project Name: BIA, Indian Route 8084, Many Farms, AZ

Report Date: 6/20/2011

Sample Location: B2-6 @ 6.1-6.6m

USCS Classification:

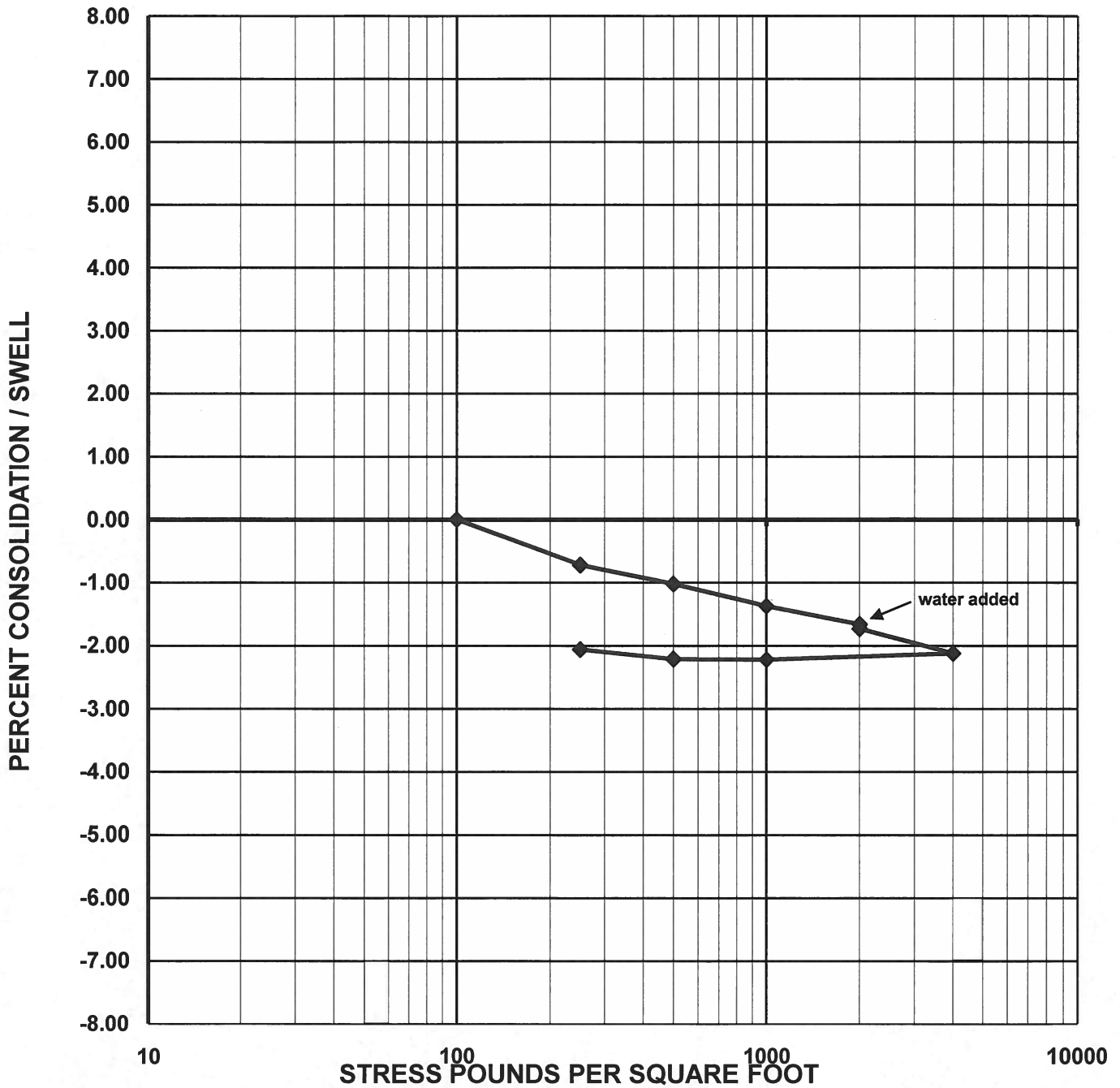
Material Description: Weathered Claystone

Dry Density: 17.6 kN/m³

Moisture Content: 14.0



SWELL / CONSOLIDATION CHART



Sample Date: 12/9/2009

Project No.: 69095030

Project Name: BIA, Indian Route 8084, Many Farms, AZ

Report Date: 6/20/2011

Sample Location: B2-7 @ 7.6-8.1m

USCS Classification: SC

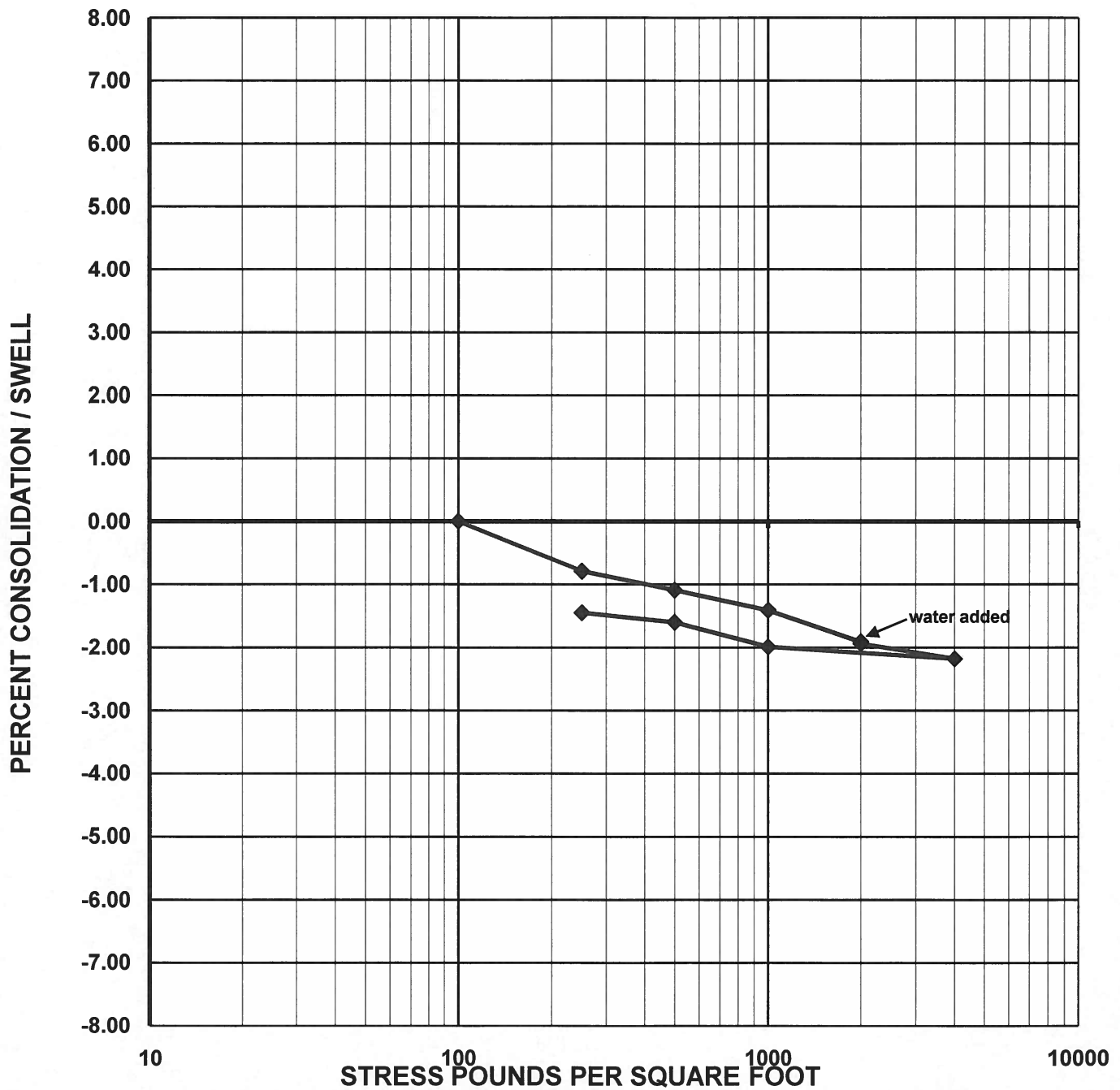
Material Description: Clayey Sand

Dry Density: 20.3 kN/m³

Moisture Content: 8.4



SWELL / CONSOLIDATION CHART



Sample Date: 11/5/2009

Project No.: 69095030

Project Name: BIA, Indian Route 8084, Many Farms, AZ

Report Date: 6/20/2011

Sample Location: B2-8 @ 6.1-8.1m

USCS Classification: SC

Material Description: Clayey Sand

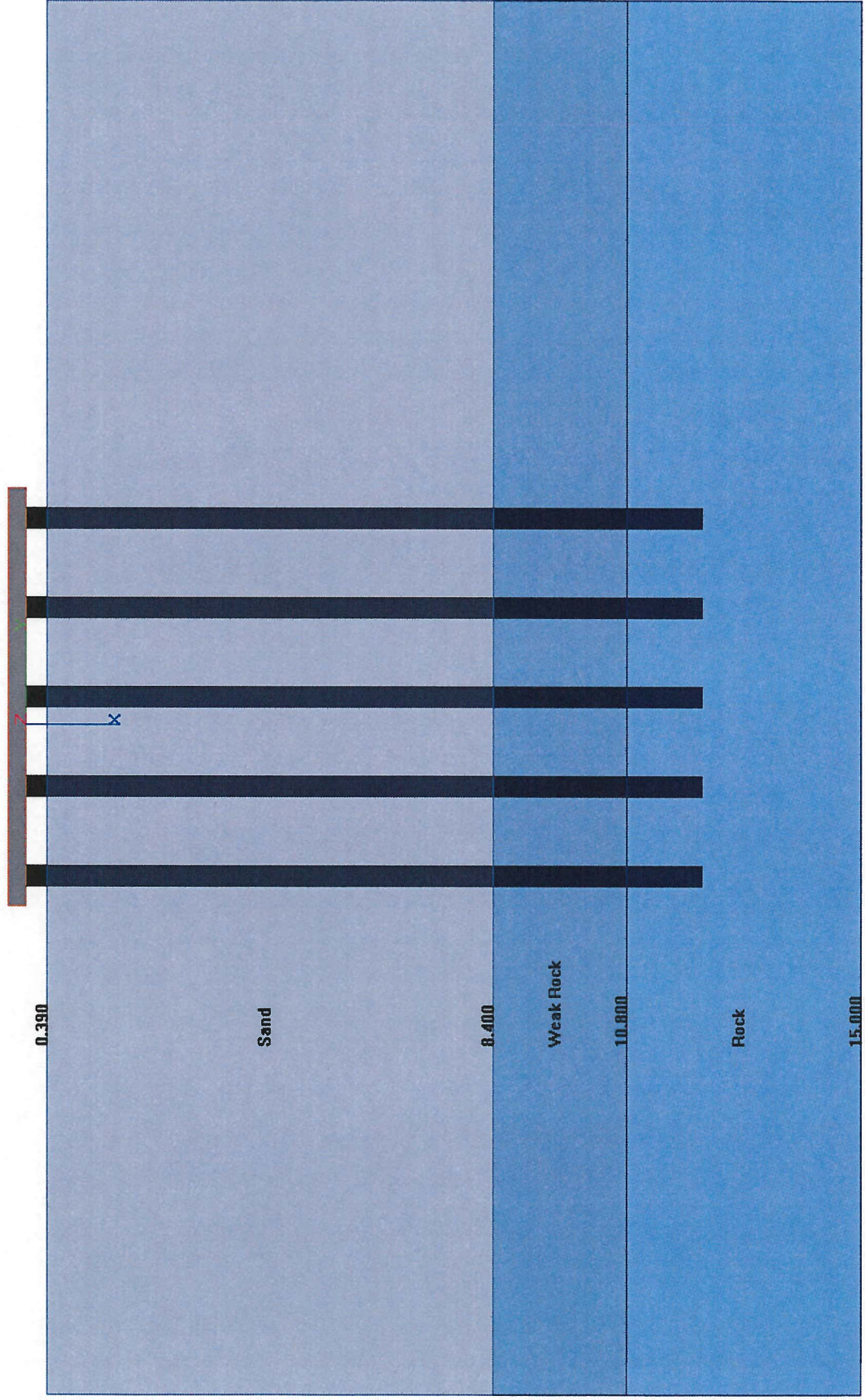
Dry Density: 18.9 kN/m³

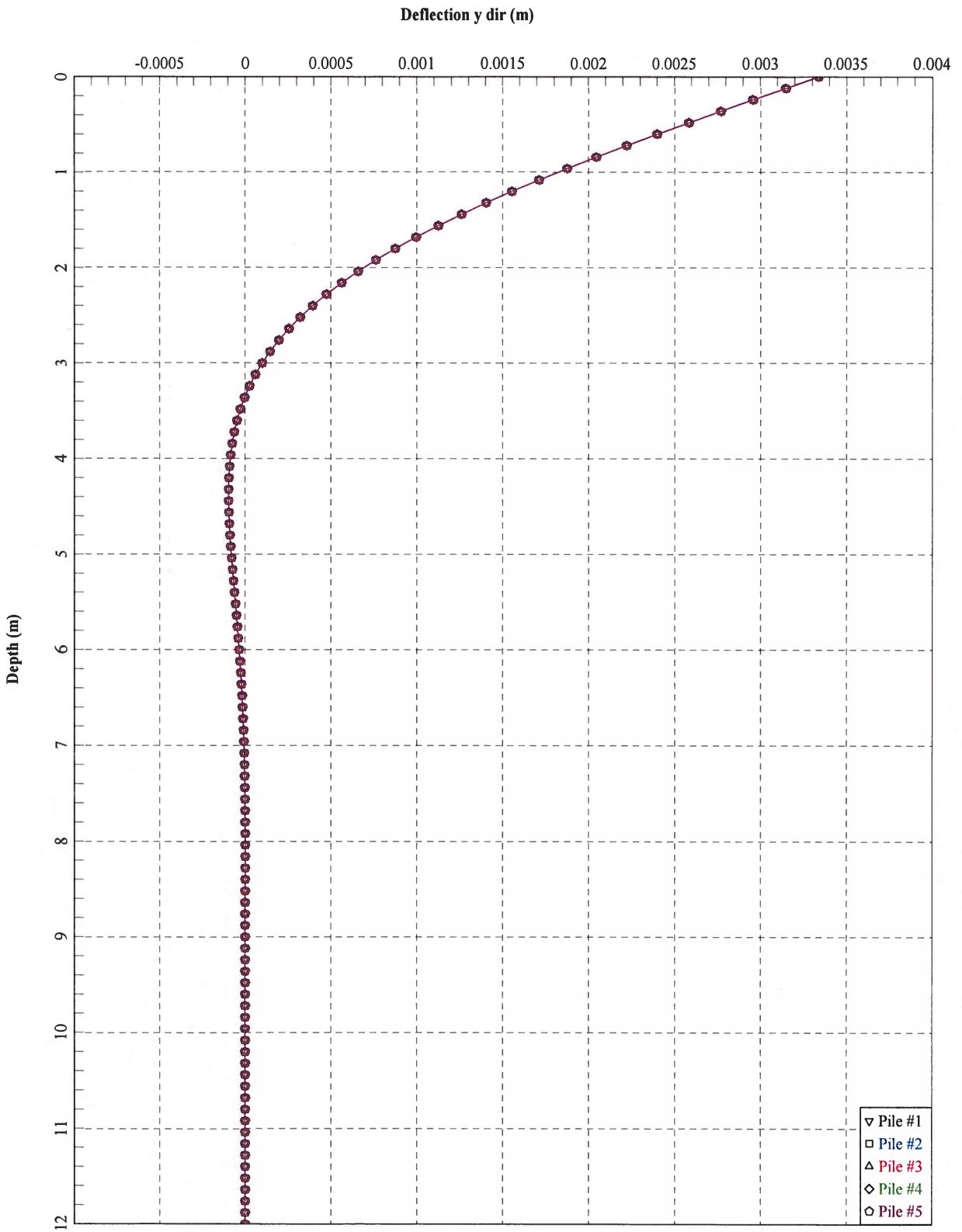
Moisture Content: 12.1

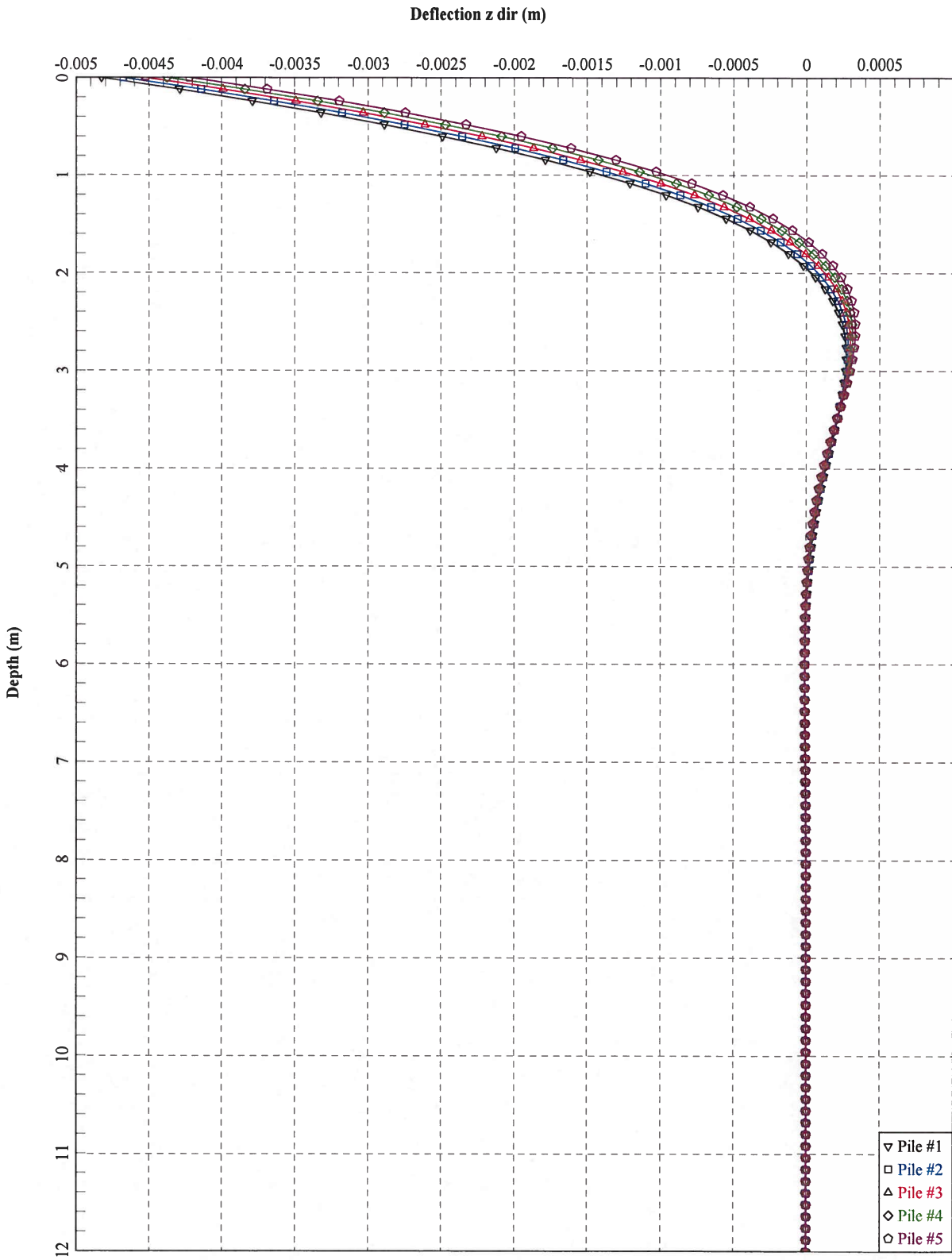


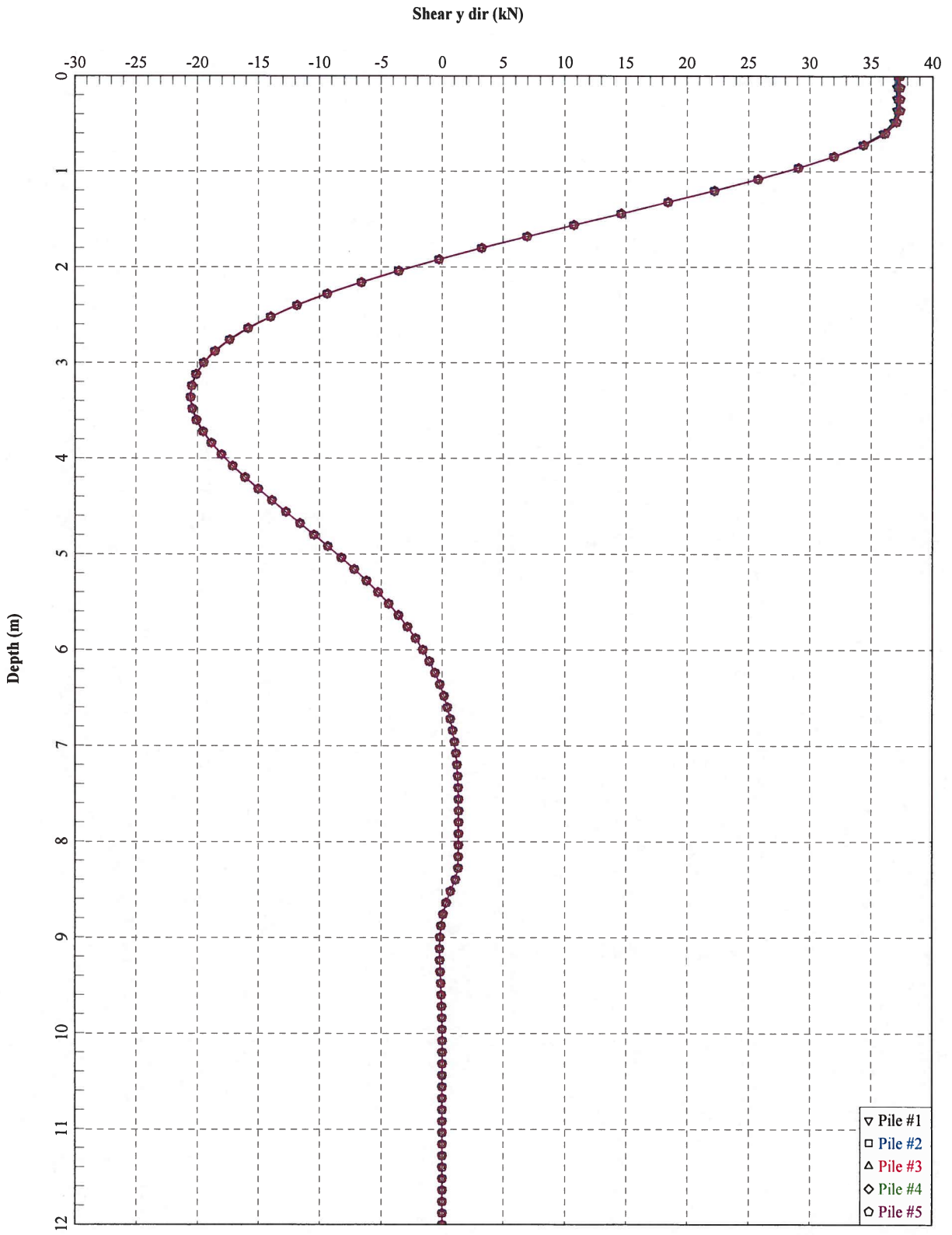
Sheep Dip Wash Bridge – Abutment Pile Group Layout

HP 14x102 – 30-inch prebore – 5 piles spaced 5.25 feet on centers

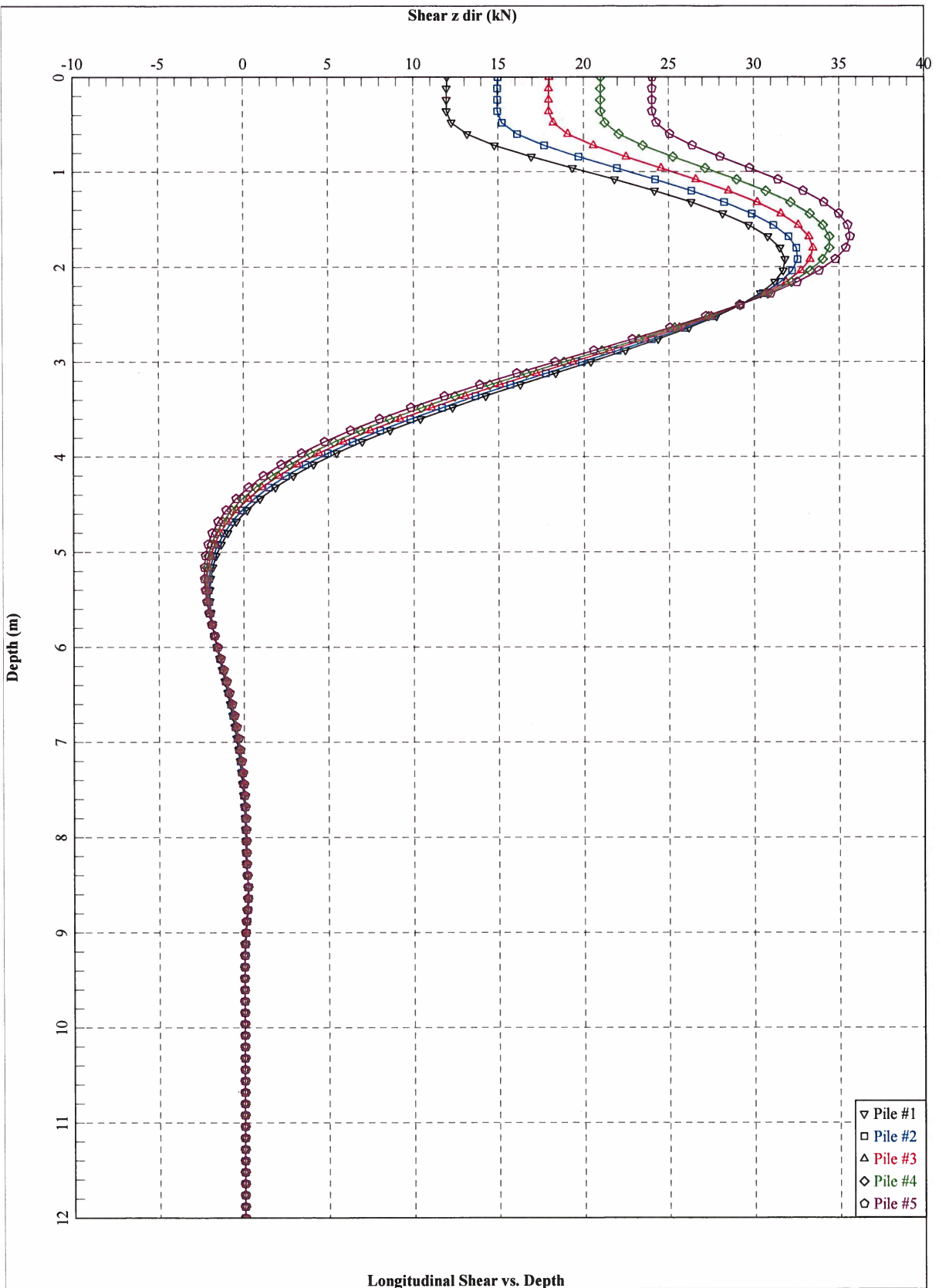


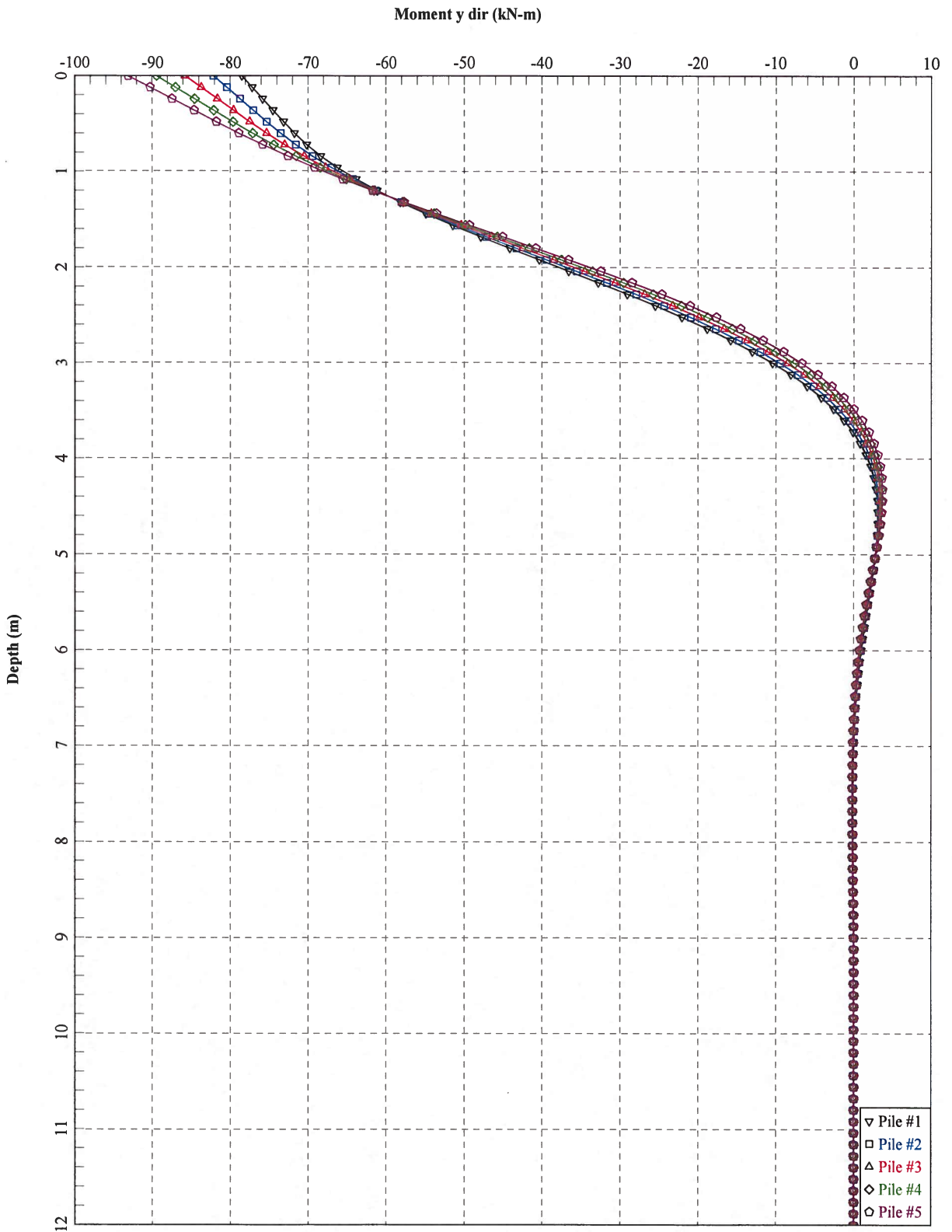




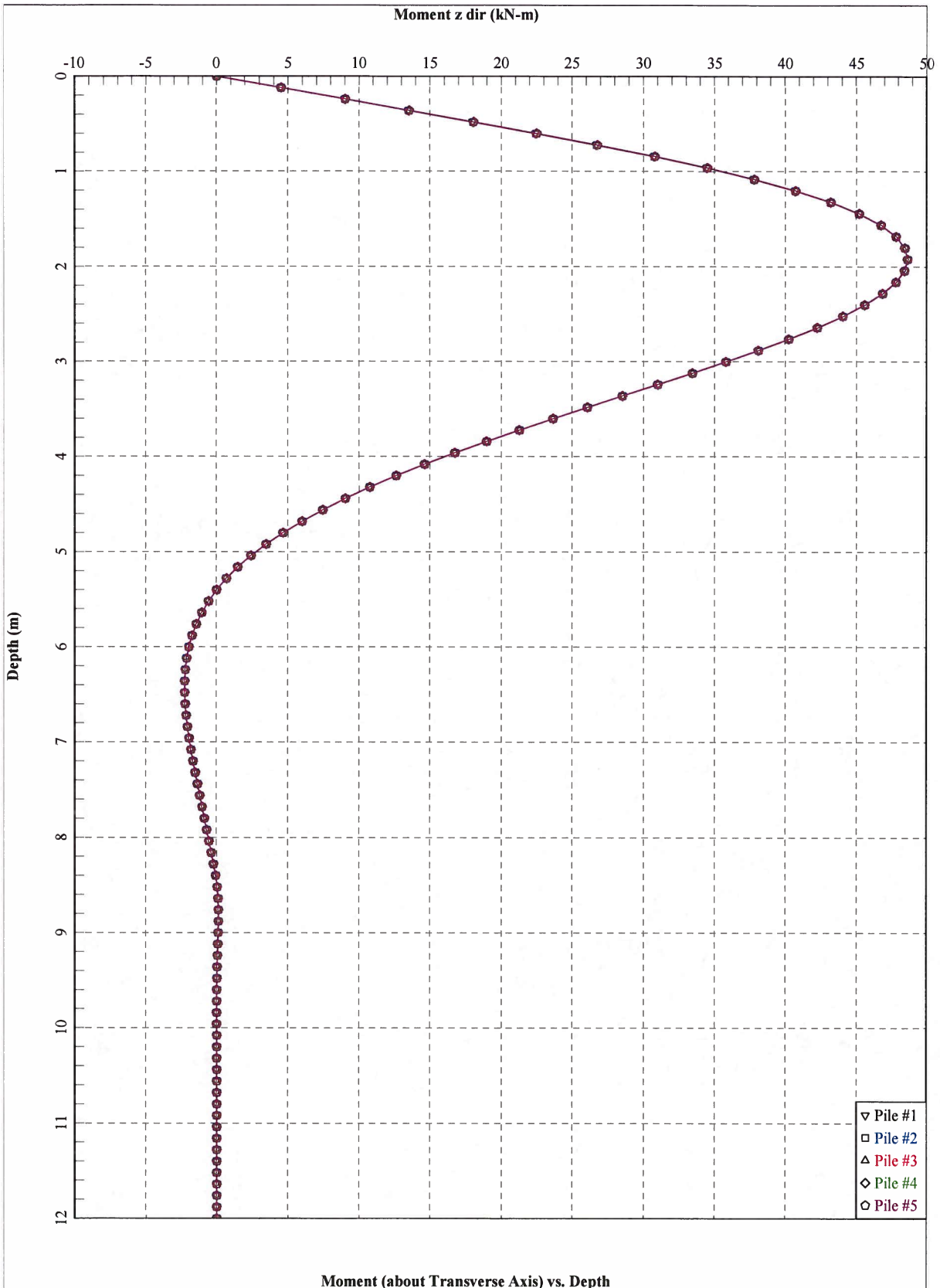


Transverse Shear vs. Depth





Moment (about Longitudinal Axis) vs. Depth



GROUP for windows, Version 8.0.7

Analysis of A Group of Piles
subjected to Axial and Lateral Loading
(C) Copyright ENSOFT, Inc., 1987-2010
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This program is licensed to :
Kaustav Bose
Terracon

Path to file locations : C:\Documents and Settings\kbose\Desktop\Sheep Dip Wash Bridge\GROUP\
Name of input data file : Abutment.gp8d
Name of output file : Abutment.gp8o
Name of output summary file : Abutment.gp8t
Name of plot output file : Abutment.gp8p
Name of runtime file : Abutment.gp8r

Time and Date of Analysis

Date: March 08, 2011 Time: 16:42:49

***** INPUT INFORMATION *****

Sheep Dip Wash - Abutment - HP 14x89 - 30 inch prebore - 5 piles @ 5.25 feet c/c

ANALYSIS TYPE = 3D ANALYSIS

UNITS SYSTEM = METR

* TABLE B * PILE CAP OPTIONS

LENGTH, YZ (M) = 7.500
WIDTH, ZX (M) = 1.000
THICKNESS, XX (M) = 0.3038

* PILE CAP DIMENSIONS ARE NOT CONSIDERED
FOR THE PILE GROUP ANALYSIS

* TABLE C * LOAD AND CONTROL PARAMETERS

** LOAD CASES **

NUMBER OF LOAD CASES : 1

LOAD CASE : 1

Abutment.gp80

CASE NAME : Dead Loads
 LOAD TYPE : Dead, DL
 SCALE FACTOR : 1.0000

* CONCENTRATED LOADS *

NL	VERT LOAD KN	HR. LOAD Y KN	HR. LOAD Z KN	MOMENT X KN-M	MOMENT Y KN-M	MOMENT Z KN-M	COORD X M	COORD Y M	COORD Z M
1	857.617	186.381	89.8541	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

* EQUIVALENT CONC. LOAD AT ORIGIN *

VER. LOAD X, KN	HOR. LOAD Y, KN	HOR. LOAD Z, KN	MOMENT X, KN-M	MOMENT Y, KN-M	MOMENT Z, KN-M
857.617	186.381	89.8541	0.00000	0.00000	0.00000

* THE LOADING IS STATIC *

* CONTROL PARAMETERS *
 TOLERANCE ON CONVERGENCE OF FOUNDATION REACTION, = 1.00000E-04
 TOLERANCE ON DETERMINATION OF DEFLECTIONS = 1.00000E-04
 MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS = 100
 MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS = 100
 FACTOR TO APPLY THE LOAD IN INCREMENTS = 1.0000
 MINIMUM FACTOR FOR LOAD INCREMENTS = 1.0000
 PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
 PRINT RESULTS EVERY 2 NODE(S)

* TABLE D * ARRANGEMENT OF PILE GROUPS

GROUP	CONNECT	CONNECTZ	PILE PROP	P-Y CURVE	L-S CURVE	T-R CURVE
1	FIX	1	0	0	0	0
2	FIX	1	0	0	0	0
3	FIX	1	0	0	0	0
4	FIX	1	0	0	0	0
5	FIX	1	0	0	0	0

GROUP	CoY, M	CoZ, M	ALPHA, DEG	BETA, DEG	GROUND, M	SPR-Y, KN-M	SPR-Z, KN-M
1	0.00000	-2.70000	0.00000	90.0000	0.39000	0.00000	0.00000
2	0.00000	-1.10000	0.00000	90.0000	0.39000	0.00000	0.00000
3	0.00000	0.50000	0.00000	90.0000	0.39000	0.00000	0.00000
4	0.00000	2.10000	0.00000	90.0000	0.39000	0.00000	0.00000
5	0.00000	3.70000	0.00000	90.0000	0.39000	0.00000	0.00000

* TABLE E * PILE GEOMETRY AND PROPERTIES
 PILE TYPE = 1 - DRIVEN PILE
 = 2 - DRILLED SHAFT

PROP	SECTS	INC	PILE TYPE	LENGTH, M	E, KN/M**2
1	1	100	1	12.000	2.0000E+08

* PILE SECTIONS *

PROP	SECT	FROM, M	TO, M	CROSS SECT
1	1	0.00000	12.0000	1

* PILE CROSS SECTIONS *

CROSS SECTION : 1
 SECTION NAME : HP
 CROSS SECTION TYPE : H SECTION

EQUIVALENT DIAMETER : 0.76200 M
 EXTERNAL WIDTH : 0.35560 M
 EXTERNAL DEPTH : 0.37392 M
 FLANGE THICKNESS : 0.0179070 M
 WEB THICKNESS : 0.0179070 M
 SHEAR MODULUS : 8.00000E+07 KN/ M**2
 HEAR MODULUS : 8.00000E+07 KN/ M**2

* PILE CROSS SECTIONS PROPERTIES *

SECT 1 DIAM. M 0.76200 AREA. M**2 0.0191896 IZ. M**4 4.32984E-04 IV. M**4 1.58700E-04 GJ. KN- M**2 47334.7 Mn. KN- M 0.00000 Vn. KN 0.00000

* TABLE F * SOIL DATA

SOILS INFORMATION

GROUND SURFACE = 0.39000 M

3 LAYER(S) OF SOIL

LAYER 1
 THE SOIL IS A SAND

	TOP OF LAYER	BOTTOM OF LAYER
X COORDINATE	0.39000	8.40000
EFFECTIVE UNIT WEIGHT	18.9000	18.9000
FRICION ANGLE (DEGREES)	32.0000	32.0000
P-Y SUBGRADE MODULUS	24400.0	24400.0
ULTIMATE UNIT SIDE FRICTION	62.7561	62.7561
ULTIMATE UNIT TIP RESISTANCE	728.489	728.489

LAYER 2
 THE LAYER IS A WEAK ROCK

	TOP OF LAYER	BOTTOM OF LAYER
X COORDINATE	8.40000	10.8000
EFFECTIVE UNIT WEIGHT	19.7000	19.7000
UNIAXIAL COMPRESSIVE STRENGTH	600.000	600.000
YOUNG MODULUS, ER	90000.0	90000.0
KRM	5.00000E-05	5.00000E-05
RQD	30.0000	30.0000
ULTIMATE UNIT SIDE FRICTION	60.0000	60.0000
ULTIMATE UNIT TIP RESISTANCE	1500.00	1500.00

LAYER 3
 THE LAYER IS A VUGGY LIMESTONE

	TOP OF LAYER	BOTTOM OF LAYER
X COORDINATE	10.8000	15.0000
EFFECTIVE UNIT WEIGHT	20.4000	20.4000
UNIAXIAL COMPRESSIVE STRENGTH	800.000	800.000
ULTIMATE UNIT SIDE FRICTION	150.000	150.000
ULTIMATE UNIT TIP RESISTANCE	2000.00	2000.00

Note : Default values will be generated for
 ULTIMATE UNIT SIDE FRICTION and ULTIMATE UNIT TIP RESISTANCE
 when input values are 0.

* TABLE H * AXIAL LOAD VS SETTLEMENT
 LOAD-SETTLEMENT CURVES GENERATED INTERNALLY

NUM OF CURVES 1

CURVE 1	NUM OF POINTS 19	POINT	AXIAL LOAD, KN	SETTLEMENT, M
---------	------------------	-------	----------------	---------------

Abutment.gp80

POINT	TORS. MOMEN. KN/ M	ROT. ANGLE, Rad.
1	-1904.86	-0.0542949
2	-1815.62	-0.0287970
3	-1771.07	-0.0160482
4	-1532.26	-5.68633E-03
5	-1365.56	-4.11234E-03
6	-356.902	-9.24495E-04
7	-184.836	-4.65821E-04
8	-37.4463	-9.34131E-05
9	0.00000	0.00000
10	3.93272	9.75042E-06
11	36.3573	9.75042E-05
12	193.842	4.86004E-04
13	374.171	9.64692E-04
14	1397.38	4.19984E-03
15	1570.03	5.79808E-03
16	1809.52	0.0161678
17	1854.07	0.0289166
18	1968.94	0.0544943
19		

* TABLE I * TORS. MOM. VS ANGLE ROT.

TORQUE-ROTATION CURVES GENERATED INTERNALLY

NUM OF CURVES 1

CURVE 1 NUM OF POINTS 19

POINT	TORS. MOMEN. KN/ M	ROT. ANGLE, Rad.
1	-446.329	-0.222298
2	-437.409	-0.15504
3	-432.878	-0.12106
4	-435.555	-0.0955773
5	-429.707	-0.0909477
6	-231.597	-0.0439684
7	-143.962	-0.0262108
8	-32.4360	-5.67933E-03
9	-3.36334	-5.82808E-04
10	0.00000	0.00000
11	3.36334	5.82808E-04
12	32.4360	5.67933E-03
13	143.962	0.0262108
14	231.597	0.0439684
15	429.707	0.0909477
16	435.555	0.0955773
17	432.878	0.12106
18	437.409	0.15504
19	446.329	0.222298

***** COMPUTATION RESULTS *****

Sheep Dip Wash - Abutment - HP 14x89 - 30 inch prebore - 5 piles @ 5.25 feet c/c

***** LOAD CASES RESULTS *****

LOAD CASE : 1
CASE NAME : Dead Loads
LOAD TYPE : Dead, DL

* TABLE L * COMPUTATION ON PILE CAP

* EQUIVALENT CONC. LOAD AT ORIGIN *

VERT. LOAD, KN	HOR. LOAD Y, KN	HOR. LOAD Z, KN
857.617	186.381	89.8541
MOMENT X, M- KN	MOMENT Y, M- KN	MOMENT Z, M- KN
0.00000	0.00000	0.00000

* DISPLACEMENT OF GROUPED PILE FOUNDATION AT ORIGIN *

VERTICAL, M	HORIZONTAL Y, M	HORIZONTAL Z, M
2.76133E-03	3.38498E-03	-4.57150E-03
ANGLE ROT. X, RAD	ANGLE ROT. Y, RAD	ANGLE ROT. Z, RAD
9.47984E-05	-4.61819E-03	4.26974E-05

NUMBER OF GLOBAL ITERATIONS = 3

* TABLE M * COMPUTATION ON INDIVIDUAL PILE

* PILE GROUP * 1

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
5.6752E-04	3.3376E-03	-4.8275E-03	9.4798E-05	-4.6182E-03	4.2697E-05
FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM X, KN- M	MOM Y, KN- M	MOM Z, KN- M
224.55	37.114	11.955	4.8045E-15	-78.467	0.0000

STR, KN/ M**2
2.0008E+05

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
5.6752E-04	3.3376E-03	-4.8275E-03	9.4798E-05	-4.6182E-03	4.2697E-05
AXIAL, KN	LAT. Y, KN	LAT. Z, KN	MOM X, KN- M	MOM Y, KN- M	MOM Z, KN- M
224.55	37.114	11.955	0.0000	-78.467	0.0000

STR, KN/ M**2
2.0008E+05

* EFFECTS FOR Laterally Loaded PILE *

X M	DEFLECTION		BENDING MOMENT		SHEAR FORCE		SOIL REACTION		TOTAL STRESS		FLEXURAL RIGIDITY	
	Y-DIR M	Z-DIR M	Z-DIR KN-M	Y-DIR KN	Z-DIR KN	Y-DIR KN/M	Z-DIR KN/M	Y-DIR KN/M	Z-DIR KN/M	KN/M ²	Z-DIR KN	Y-DIR KN
0.0000	3.3376E-03	-4.8275E-03	0.0000	37.114	11.989	0.0000	0.0000	0.0000	0.0000	2.0008E+05	8.6597E+04	3.1740E+04
0.2400	2.9575E-03	-3.7897E-03	8.9926	37.114	11.989	0.0000	0.0000	0.0000	0.0000	1.9392E+05	8.6597E+04	3.1740E+04
0.4800	2.5834E-03	-2.8895E-03	17.984	36.862	12.237	1.7011	17.011	16.253	4.7003	1.8806E+05	8.6597E+04	3.1740E+04
0.7200	2.2212E-03	-2.1221E-03	26.702	34.342	14.787	3.452	29.059	26.101	10.703	1.8181E+05	8.6597E+04	3.1740E+04
0.9600	1.8767E-03	-1.4819E-03	34.453	29.059	19.353	5.198	24.170	20.611	17.362E+05	1.7362E+05	8.6597E+04	3.1740E+04
1.2000	1.5511E-03	-9.6187E-04	40.708	24.170	24.170	6.913	20.188	19.010	24.170	1.6278E+05	8.6597E+04	3.1740E+04
1.4400	1.2605E-03	-5.5261E-04	45.198	14.593	28.186	8.585	14.593	14.158	32.726E+05	1.4940E+05	8.6597E+04	3.1740E+04
1.6800	9.9594E-04	-2.4291E-04	47.830	6.913	30.817	10.348	10.348	7.9459	32.726E+05	1.3405E+05	8.6597E+04	3.1740E+04
1.9200	7.6308E-04	-1.9997E-05	48.656	-40.337	31.822	11.882	28.487	-0.7465	32.726E+05	1.1758E+05	8.6597E+04	3.1740E+04
2.1600	5.6250E-04	-1.2972E-04	47.839	-6.6417	31.225	14.293	24.293	5.6024	32.726E+05	1.0091E+05	8.6597E+04	3.1740E+04
2.4000	3.9369E-04	-2.1996E-04	45.618	-11.882	29.238	19.308	19.308	10.788	32.726E+05	8.4881E+04	8.6597E+04	3.1740E+04
2.6400	2.5518E-04	-2.6387E-04	42.279	-18.189	26.181	14.486	14.486	16.619	32.726E+05	7.0229E+04	8.6597E+04	3.1740E+04
2.8800	1.4475E-04	-2.7354E-04	38.127	-18.614	22.426	8.7946	14.336	16.169	32.726E+05	5.7429E+04	8.6597E+04	3.1740E+04
3.1200	5.9666E-05	-2.5955E-04	33.461	-8.0741	18.336	3.9745	12.289	16.726	32.726E+05	4.6953E+04	8.6597E+04	3.1740E+04
3.3600	-3.1731E-06	2.3080E-04	28.559	-20.577	14.262	-0.2299	10.392	15.225	32.726E+05	3.8746E+04	8.6597E+04	3.1740E+04
3.6000	-4.7016E-05	1.9439E-04	23.663	-20.096	10.392	-3.6825	6.9855	13.105	32.726E+05	3.2726E+04	8.6597E+04	3.1740E+04
3.8400	-7.5110E-05	1.5686E-04	18.973	-18.883	6.9855	-6.3228	4.1302	10.666	32.726E+05	2.8272E+04	8.6597E+04	3.1740E+04
4.0800	-9.0570E-05	1.1847E-04	14.641	-17.134	4.1302	-8.1545	1.8710	8.1663	32.726E+05	2.5020E+04	8.6597E+04	3.1740E+04
4.3200	-9.6271E-05	8.5161E-05	10.774	-15.037	1.8710	-9.2316	0.1976	5.8069	32.726E+05	2.3469E+04	8.6597E+04	3.1740E+04
4.5600	-9.4784E-05	5.7071E-05	7.4351	-12.763	0.1976	-9.6440	-0.5044	3.7276	32.726E+05	2.1685E+04	8.6597E+04	3.1740E+04
4.8000	-8.8328E-05	3.4642E-05	4.6483	-10.457	-0.9416	-10.457	-1.6243	2.0092	32.726E+05	2.0071E+04	8.6597E+04	3.1740E+04
5.0400	-7.8757E-05	1.7709E-05	2.4066	-8.2392	-1.9412	-8.9358	-0.6810	1.8578E+04	32.726E+05	1.8578E+04	8.6597E+04	3.1740E+04
5.2800	-6.7564E-05	5.7073E-06	0.6782	-6.1958	-1.9412	-8.9358	-0.6810	1.7233E+04	32.726E+05	1.7233E+04	8.6597E+04	3.1740E+04
5.5200	-5.5901E-05	2.1424E-06	-0.5866	-4.3867	-1.9853	-6.9973	-0.2682	1.6087E+04	32.726E+05	1.6087E+04	8.6597E+04	3.1740E+04
5.7600	-4.4632E-05	-6.6982E-06	-1.4987	-2.8450	-1.8431	-5.8454	-0.8777	1.5187E+04	32.726E+05	1.5187E+04	8.6597E+04	3.1740E+04
6.0000	-3.4272E-05	-8.7982E-06	-1.9738	-1.5811	-1.5895	-4.6915	-1.2041	1.4345E+04	32.726E+05	1.4345E+04	8.6597E+04	3.1740E+04
6.2400	-2.5233E-05	-9.1849E-06	-2.2282	-0.3873	-1.2849	-3.6018	-1.3111	1.4123E+04	32.726E+05	1.4123E+04	8.6597E+04	3.1740E+04
6.4800	-1.7668E-05	-8.4910E-06	-2.2744	0.1580	-0.9743	-2.6254	-1.2617	1.3846E+04	32.726E+05	1.3846E+04	8.6597E+04	3.1740E+04
6.7200	-1.1610E-05	-7.2063E-06	-2.1685	0.6859	-0.6882	-1.7932	-1.1130	1.3632E+04	32.726E+05	1.3632E+04	8.6597E+04	3.1740E+04
6.9600	-6.9895E-06	-5.6924E-06	-1.9584	1.0331	-0.4447	-1.1205	-0.9125	1.3425E+04	32.726E+05	1.3425E+04	8.6597E+04	3.1740E+04
7.2000	-3.6691E-06	-4.1953E-06	-1.6829	1.2383	-0.2515	-0.6027	-0.6971	1.3200E+04	32.726E+05	1.3200E+04	8.6597E+04	3.1740E+04
7.4400	-1.4666E-06	-2.8659E-06	-1.3715	1.3396	-0.1090	-0.2523	-0.4930	1.2952E+04	32.726E+05	1.2952E+04	8.6597E+04	3.1740E+04
7.6800	-1.7570E-07	-1.7819E-06	-1.0448	1.3717	-1.2333E-02	-3.1253E-02	-0.3170	1.2690E+04	32.726E+05	1.2690E+04	8.6597E+04	3.1740E+04
7.9200	4.2031E-07	-9.6889E-07	-0.7158	1.3647	4.6468E-02	7.7224E-02	-0.1780	1.2422E+04	32.726E+05	1.2422E+04	8.6597E+04	3.1740E+04
8.1600	5.4003E-07	-4.1897E-07	-0.3908	1.3422	7.6753E-02	0.1024	-7.9432E-02	1.2166E+04	32.726E+05	1.2166E+04	8.6597E+04	3.1740E+04
8.4000	3.9935E-07	-1.0486E-07	-7.1501E-02	1.1090	0.1436	3.5959	-0.9437	1.1973E+04	32.726E+05	1.1973E+04	8.6597E+04	3.1740E+04
8.6400	2.0290E-07	1.5640E-08	9.6141E-02	1.1090	0.2210	2.5930	0.1999	1.1865E+04	32.726E+05	1.1865E+04	8.6597E+04	3.1740E+04
8.8800	6.3994E-08	2.9339E-08	0.1162	-8.8753E-02	0.1270	1.0597	0.4858	1.1810E+04	32.726E+05	1.1810E+04	8.6597E+04	3.1740E+04
9.1200	-1.4575E-10	1.3882E-08	0.1162	-8.8753E-02	0.1270	1.0597	0.4858	1.1767E+04	32.726E+05	1.1767E+04	8.6597E+04	3.1740E+04
9.3600	-1.5481E-08	2.5415E-09	7.3363E-02	-0.1506	3.1820E-02	-2.9643E-03	0.2823	1.1729E+04	32.726E+05	1.1729E+04	8.6597E+04	3.1740E+04
9.6000	-1.1260E-08	-8.5567E-10	2.8057E-02	-6.4284E-02	-1.0216E-02	-0.3141	6.1296E-02	1.1707E+04	32.726E+05	1.1707E+04	8.6597E+04	3.1740E+04
9.8400	-4.4902E-09	-7.5136E-10	4.9242E-03	-9.5690E-03	-1.8428E-03	-0.1422	-2.3801E-02	1.1706E+04	32.726E+05	1.1706E+04	8.6597E+04	3.1740E+04
10.080	-6.5479E-10	-2.0658E-10	-4.1329E-03	8.0294E-04	-1.6733E-04	-2.3217E-02	7.3248E-03	1.1705E+04	32.726E+05	1.1705E+04	8.6597E+04	3.1740E+04
10.320	4.8735E-10	1.2732E-11	-1.7156E-03	8.0294E-04	5.0034E-04	-1.9115E-02	5.0034E-04	1.1703E+04	32.726E+05	1.1703E+04	8.6597E+04	3.1740E+04
10.560	4.4242E-10	3.0324E-11	-2.4830E-04	3.6557E-03	2.2624E-04	1.9031E-02	1.3044E-03	1.1702E+04	32.726E+05	1.1702E+04	8.6597E+04	3.1740E+04
10.800	1.4284E-10	9.4709E-12	1.5448E-04	3.3769E-04	8.4088E-03	8.4088E-03	4.2619E-04	1.1702E+04	32.726E+05	1.1702E+04	8.6597E+04	3.1740E+04
11.040	1.3922E-11	-2.5788E-12	4.2245E-06	-1.8530E-04	-8.9833E-06	2.2275E-05	-4.1261E-06	1.1702E+04	32.726E+05	1.1702E+04	8.6597E+04	3.1740E+04
11.280	-8.4291E-11	-6.9354E-12	6.8639E-05	-1.7035E-04	-7.0182E-06	-1.3487E-04	-1.1097E-05	1.1702E+04	32.726E+05	1.1702E+04	8.6597E+04	3.1740E+04
11.520	-1.3653E-10	-7.1273E-12	3.2346E-05	-1.2717E-04	-4.2531E-06	-2.1844E-04	-1.1404E-05	1.1702E+04	32.726E+05	1.1702E+04	8.6597E+04	3.1740E+04
11.760	-1.6672E-10	-5.6108E-12	8.5075E-06	-6.8646E-05	-1.7869E-06	-2.6676E-04	-8.9773E-06	1.1702E+04	32.726E+05	1.1702E+04	8.6597E+04	3.1740E+04
12.000	-1.9063E-10	-3.6860E-12	1.5545E-19	-9.6597E-20	1.4198E-21	-3.0500E-04	-5.8976E-06	1.1702E+04	32.726E+05	1.1702E+04	8.6597E+04	3.1740E+04

NUMBER OF ITERATIONS IN LLP = 2

* PILE GROUP * 2

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

4.9920E-04 3.3376E-03 -4.6758E-03 9.4798E-05 -4.6182E-03 4.2697E-05
 FOR. X, KN 37.199 FOR. Y, KN 14.949 MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
 198.81 37.199 14.949 5.0274E-15 -82.107 0.0000

STR. KN/ M**2
 2.0748E+05

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M 3.3376E-03 DISP. Y, M 4.6758E-03 DISP. Z, M 9.4798E-05 ROT. X, RAD 4.2697E-05
 4.9920E-04 3.3376E-03 -4.6758E-03 9.4798E-05 -4.6182E-03 4.2697E-05
 AXIAL, KN 37.199 LAT. Z, KN 14.949 MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
 198.81 37.199 14.949 5.0274E-15 -82.107 0.0000

STR. KN/ M**2
 2.0748E+05

* EFFECTS FOR LATERALLY LOADED PILE *

X M	DEFLECTION		BENDING MOMENT		SHEAR FORCE		SOIL REACTION		TOTAL STRESS		FLEXURAL RIGIDITY	
	Y-DIR M	Z-DIR M	Z-DIR KN-M	Y-DIR KN-M	Y-DIR KN	Z-DIR KN	Y-DIR KN/M	Z-DIR KN/M	KN/M**2	KN/M**2	Z-DIR KN-M**2	Y-DIR KN-M**2
0.0000	3.3376E-03	-4.6758E-03	0.0000	-82.107	37.199	14.980	0.0000	0.0000	2.0748E+05	8.6597E+04	3.1740E+04	
0.2400	2.9574E-03	-3.6411E-03	9.0034	-78.723	37.199	14.949	0.0000	0.0000	1.9953E+05	8.6597E+04	3.1740E+04	
0.4800	2.5833E-03	-2.7494E-03	18.0066	-75.314	36.942	15.222	4.2865	-4.5622	1.9186E+05	8.6597E+04	3.1740E+04	
0.7200	2.2211E-03	-1.9943E-03	26.729	-71.905	34.371	17.680	17.365	-15.592	1.8385E+05	8.6597E+04	3.1740E+04	
0.9600	1.8766E-03	-1.3690E-03	34.473	-66.989	29.067	21.953	26.100	-19.039	1.7402E+05	8.6597E+04	3.1740E+04	
1.2000	1.5550E-03	-8.6509E-04	40.722	-61.279	22.197	26.348	32.734	-17.098	1.6178E+05	8.6597E+04	3.1740E+04	
1.4400	1.2605E-03	-4.7232E-04	45.206	-54.573	14.591	29.885	32.293	-12.101	1.4728E+05	8.6597E+04	3.1740E+04	
1.6800	9.9587E-04	-1.7851E-04	47.834	-47.116	6.9216	32.024	31.346	-5.6186	1.3114E+05	8.6597E+04	3.1740E+04	
1.9200	7.6303E-04	0.9774E-05	48.656	-39.398	-0.2825	32.561	28.485	-7.1929	1.1419E+05	8.6597E+04	3.1740E+04	
2.1600	5.6248E-04	1.6655E-04	47.836	-31.689	-6.6316	31.549	24.292	7.1929	9.7306E+04	8.6597E+04	3.1740E+04	
2.4000	3.9389E-04	2.4577E-04	45.613	-24.377	-11.872	29.218	19.308	12.054	8.1326E+04	8.6597E+04	3.1740E+04	
2.6400	2.5520E-04	4.8068E-04	42.274	-17.746	-15.871	25.899	14.010	15.409	6.9318E+04	8.6597E+04	3.1740E+04	
2.8800	1.4479E-04	8.2328E-04	38.121	-11.990	-18.604	21.962	8.7966	17.211	5.4563E+04	8.6597E+04	3.1740E+04	
3.1200	5.9710E-05	2.6401E-04	33.455	-7.2162	-20.129	17.767	3.9774	17.586	4.4518E+04	8.6597E+04	3.1740E+04	
3.3600	-3.1218E-06	2.3153E-04	28.554	-3.4483	-20.569	13.627	-0.2262	16.779	3.6815E+04	8.6597E+04	3.1740E+04	
3.6000	-4.6961E-05	1.9269E-04	23.658	0.6425	-20.089	9.7918	-3.6782	15.092	3.1236E+04	8.6597E+04	3.1740E+04	
3.8400	-7.5055E-05	1.5258E-04	18.969	1.2963	-18.877	6.4334	-6.3182	12.844	2.7340E+04	8.6597E+04	3.1740E+04	
4.0800	-9.0517E-05	1.1474E-04	14.638	2.4958	-17.119	3.6505	-8.1496	10.330	2.4567E+04	8.6597E+04	3.1740E+04	
4.3200	-9.6233E-05	8.1355E-05	10.772	3.0994	-15.033	1.4761	-9.2270	7.8013	2.2411E+04	8.6597E+04	3.1740E+04	
4.5600	-9.4741E-05	5.3548E-05	7.4340	3.2519	-12.760	-0.1101	-9.6397	5.4484	2.0546E+04	8.6597E+04	3.1740E+04	
4.8000	-8.8291E-05	3.1607E-05	4.6479	3.0883	-10.455	-1.1668	-9.5005	3.4010	1.8828E+04	8.6597E+04	3.1740E+04	
5.0400	-7.8728E-05	1.5248E-05	2.4069	2.7264	-8.2380	-1.7765	-8.9324	1.7300	1.7240E+04	8.6597E+04	3.1740E+04	
5.2800	-6.7541E-05	3.8249E-06	0.6790	2.2623	-6.1954	-2.0330	-8.0588	0.4564	1.5825E+04	8.6597E+04	3.1740E+04	
5.5200	-5.5884E-05	-3.4955E-06	-0.5856	1.7698	-4.3869	-2.0298	-6.9951	-0.4375	1.4641E+04	8.6597E+04	3.1740E+04	
5.7600	-4.4600E-05	-7.6014E-06	-1.4474	1.3006	-2.8456	-1.8532	-6.9511	-0.9960	1.3733E+04	8.6597E+04	3.1740E+04	
6.0000	-3.4264E-05	-9.3405E-06	-1.9725	0.8874	-1.5820	-1.5766	-4.6902	-1.2786	1.3108E+04	8.6597E+04	3.1740E+04	
6.2400	-2.5229E-05	-9.4610E-06	-2.2269	0.5467	-0.5884	-1.2584	-3.6012	-1.2751	1.2719E+04	8.6597E+04	3.1740E+04	
6.4800	-1.7667E-05	-9.5807E-06	-2.2732	0.2850	0.1568	-0.9416	-2.6253	-1.2473	1.2473E+04	8.6597E+04	3.1740E+04	
6.7200	-1.1610E-05	-7.1844E-06	-2.1674	9.2398E-02	0.6847	-0.6546	-1.7933	-1.1087	1.2281E+04	8.6597E+04	3.1740E+04	
6.9600	-6.9913E-06	-5.6012E-06	-1.9575	-3.4557E-02	1.0319	-0.4134	-1.1208	-0.8979	1.2085E+04	8.6597E+04	3.1740E+04	
7.2000	-3.6714E-06	-4.0808E-06	-1.6822	-0.1098	1.2372	-0.2244	-0.6100	-0.6781	1.1864E+04	8.6597E+04	3.1740E+04	
7.4400	-1.4689E-06	-2.7553E-06	-1.3710	-0.1459	1.3386	-8.6501E-02	-0.2527	-0.4740	1.1617E+04	8.6597E+04	3.1740E+04	
7.6800	-1.1775E-07	-1.6915E-06	-1.0445	-0.1545	1.3708	5.9372E-03	-3.1617E-02	-0.3009	1.1352E+04	8.6597E+04	3.1740E+04	
7.9200	-4.1875E-07	-9.0611E-07	-0.7157	-0.1546	1.3639	6.1410E-02	7.6938E-02	-0.1665	1.1081E+04	8.6597E+04	3.1740E+04	
8.1600	5.3903E-07	-3.8398E-08	-0.3909	-0.1270	1.3414	8.9519E-02	0.1022	-7.2798E-02	1.0820E+04	8.6597E+04	3.1740E+04	
8.4000	3.9906E-07	-9.1782E-08	-7.1769E-02	-0.1039	1.1085	0.1483	3.5915	-0.8260	1.0618E+04	8.6597E+04	3.1740E+04	
8.6400	2.0275E-07	-1.7254E-08	-5.5839E-02	0.3439E-02	0.3481	0.2096	2.5910	-0.2205	1.0514E+04	8.6597E+04	3.1740E+04	
8.8800	-6.3997E-08	2.7872E-08	0.1160	-1.2510E-02	0.1170	0.1170	1.0597	0.4615	1.0467E+04	8.6597E+04	3.1740E+04	
9.1200	-1.0395E-10	1.2773E-08	7.3292E-02	3.4277E-03	-8.8261E-02	2.7863E-02	-2.1144E-03	0.2598	1.0426E+04	8.6597E+04	3.1740E+04	
9.3600	-1.5450E-08	2.1972E-09	2.8048E-02	4.3361E-03	-0.1504	-7.9031E-03	-0.3726	5.2992E-02	1.0387E+04	8.6597E+04	3.1740E+04	

Abutment.gp80

9.6000	-1.1247E-08	-8.5615E-10	2.7141E-03	1.6812E-03	-6.4254E-02	-0.3138	-2.3885E-02	1.0365E+04	8.6597E+04	3.1740E+04
9.8400	-4.4878E-09	-7.0265E-10	-4.9130E-03	1.2017E-04	-9.5907E-03	-0.1422	-2.2258E-03	1.0365E+04	8.6597E+04	3.1740E+04
10.080	-6.5598E-10	-1.8566E-10	-4.1277E-03	-1.9801E-03	9.0064E-03	9.0143E-03	6.5829E-03	1.0364E+04	8.6597E+04	3.1740E+04
10.320	-4.8539E-10	-1.5012E-11	-1.7145E-03	-1.0099E-04	8.5657E-03	4.7764E-04	2.3259E-02	1.0362E+04	8.6597E+04	3.1740E+04
10.560	-4.4188E-10	2.8573E-11	-2.4866E-04	-1.4181E-05	3.6533E-03	2.0737E-04	1.9068E-02	1.0361E+04	8.6597E+04	3.1740E+04
10.800	-1.8685E-10	8.3692E-12	1.5409E-04	6.2206E-06	3.3827E-04	1.3761E-05	1.9008E-02	1.0361E+04	8.6597E+04	3.1740E+04
11.040	-1.4190E-11	3.0062E-12	1.1217E-04	4.0676E-06	-1.8476E-04	-8.8370E-06	8.4084E-03	1.0361E+04	8.6597E+04	3.1740E+04
11.280	-8.3918E-11	-6.9688E-12	6.8497E-05	2.1475E-06	-1.6993E-04	-6.7893E-06	2.2704E-05	1.0361E+04	8.6597E+04	3.1740E+04
11.520	-1.3614E-10	-6.9614E-12	3.2286E-05	8.4655E-07	-1.2690E-04	-4.0531E-06	-1.3427E-04	1.0361E+04	8.6597E+04	3.1740E+04
11.760	-1.6637E-10	-5.3450E-12	8.4934E-06	1.7794E-07	-6.8519E-05	-1.6711E-06	-2.1783E-04	1.0361E+04	8.6597E+04	3.1740E+04
12.000	-1.9032E-10	-3.3498E-12	0.0000	8.9026E-22	-6.7414E-19	4.5476E-21	-3.0450E-04	1.0361E+04	8.6597E+04	3.1740E+04

NUMBER OF ITERATIONS IN LLP = 2

* PILE GROUP * 3

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD	FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
4.3089E-04	3.3376E-03	-4.5241E-03	9.4798E-05	-4.6182E-03	4.2697E-05	171.92	37.287	17.950	5.2506E-15	-85.752	0.0000	0.0000	0.0000	0.0000

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD	AXIAL, KN	LAT. Y, KN	LAT. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
4.3089E-04	3.3376E-03	-4.5241E-03	9.4798E-05	-4.6182E-03	4.2697E-05	171.92	37.287	17.950	0.0000	-85.752	0.0000	0.0000	0.0000	0.0000

* EFFECTS FOR Laterally Loaded Pile *

X M	DEFLECTION		BENDING MOMENT		SHEAR FORCE		SOIL REACTION		TOTAL STRESS		FLEXURAL RIGIDITY	
	Y-DIR M	Z-DIR M	Z-DIR KN-M	Y-DIR KN-M	Y-DIR KN	Z-DIR KN	Y-DIR KN/M	Z-DIR KN/M	KN/M**2	M**2	Z-DIR KN-M**2	Y-DIR KN-M**2
0.0000	3.3376E-03	-4.5241E-03	0.0000	-85.752	37.287	17.978	0.0000	0.0000	2.1483E+05	8.6597E+04	3.1740E+04	
0.2400	2.9574E-03	-3.4926E-03	9.0143	-81.621	37.287	17.950	0.0000	0.0000	2.0307E+05	8.6597E+04	3.1740E+04	
0.4800	2.5822E-03	-2.6092E-03	18.028	-77.465	37.025	18.215	4.3727	-4.4168	1.9561E+05	8.6597E+04	3.1740E+04	
0.7200	2.2210E-03	-1.8664E-03	26.757	-73.013	34.401	20.575	17.723	-14.894	1.8582E+05	8.6597E+04	3.1740E+04	
0.9600	1.8765E-03	-1.2560E-03	34.494	-67.722	29.075	24.553	26.098	-17.468	1.7435E+05	8.6597E+04	3.1740E+04	
1.2000	1.5549E-03	-7.6834E-04	40.736	-61.419	22.206	28.527	30.732	-15.185	1.6071E+05	8.6597E+04	3.1740E+04	
1.4400	1.2604E-03	-3.9206E-04	45.215	-54.234	14.601	31.585	32.291	-10.044	1.4510E+05	8.6597E+04	3.1740E+04	
1.6800	9.9580E-04	-1.1412E-04	47.837	-46.457	6.9318	33.231	31.344	-3.5922	1.2817E+05	8.6597E+04	3.1740E+04	
1.9200	7.6298E-04	7.9525E-05	48.656	-38.459	-0.2718	33.300	28.484	2.9688	1.1073E+05	8.6597E+04	3.1740E+04	
2.1600	5.6246E-04	2.0336E-04	47.833	-30.618	-6.6206	31.874	24.292	8.7828	9.3663E+04	8.6597E+04	3.1740E+04	
2.4000	3.9569E-04	2.7158E-04	45.609	-23.268	-11.861	29.200	19.308	13.319	7.7742E+04	8.6597E+04	3.1740E+04	
2.6400	2.5522E-04	2.9748E-04	42.268	-16.673	-15.861	25.618	14.012	16.332	6.3599E+04	8.6597E+04	3.1740E+04	
2.8800	1.4482E-04	2.9303E-04	38.115	-11.007	-18.594	21.500	8.7989	17.803	5.1658E+04	8.6597E+04	3.1740E+04	
3.1200	5.9760E-05	2.6848E-04	33.449	-6.3589	-20.120	17.198	3.9807	17.884	4.2116E+04	8.6597E+04	3.1740E+04	

Abutment, gp80										
3.3600	-3.0653E-06	2.3227E-04	28.548	-2.7344	-20.560	13.017	16.832	3.4923E+04	8.6597E+04	3.1740E+04
3.6000	-4.6902E-05	1.9099E-04	23.654	-7.5625E-02	-20.081	9.1924	-3.6735	2.9774E+04	8.6597E+04	3.1740E+04
3.8400	-7.4986E-05	1.4948E-04	18.965	1.7233	-18.870	5.8821	12.583	2.6153E+04	8.6597E+04	3.1740E+04
4.0800	-9.0461E-05	1.1101E-04	14.655	2.7978	-17.123	3.1715	8.1447	2.3484E+04	8.6597E+04	3.1740E+04
4.3200	-9.6172E-05	7.7555E-05	10.770	3.2955	-15.029	1.0816	9.9550	2.1305E+04	8.6597E+04	3.1740E+04
4.5600	-9.4696E-05	5.0031E-05	7.4330	3.3630	-12.757	-0.4174	5.0905	1.9350E+04	8.6597E+04	3.1740E+04
4.8000	-8.8253E-05	2.8576E-05	4.6477	3.1351	-10.453	-1.3917	9.4964	1.7525E+04	8.6597E+04	3.1740E+04
5.0400	-7.8697E-05	1.2790E-05	2.4073	2.7277	-8.2369	-1.9287	1.4512	1.5842E+04	8.6597E+04	3.1740E+04
5.2800	-6.7517E-05	1.9451E-06	0.6798	2.2343	-6.1950	-2.1247	0.2321	1.4356E+04	8.6597E+04	3.1740E+04
5.5200	-5.5866E-05	4.8469E-06	-0.5844	1.7256	-4.3872	-2.0744	-0.6067	1.3134E+04	8.6597E+04	3.1740E+04
5.7600	-4.4588E-05	9.5036E-06	-1.4461	1.2500	-2.8463	-1.8634	-1.1142	1.2119E+04	8.6597E+04	3.1740E+04
6.0000	-3.4237E-05	9.8845E-06	-1.9711	0.8373	-1.5831	-1.5638	-1.3530	1.1614E+04	8.6597E+04	3.1740E+04
6.2400	-2.5252E-05	9.7371E-06	-2.2255	0.5015	-0.5897	-1.2321	-1.3899	1.1258E+04	8.6597E+04	3.1740E+04
6.4800	-1.7666E-05	8.6706E-06	-2.2719	0.2451	0.1555	-0.9090	-1.2625	1.1043E+04	8.6597E+04	3.1740E+04
6.7200	-1.1611E-05	7.1508E-06	-2.1663	6.2563E-02	0.6834	-0.6210	-1.1045	1.0871E+04	8.6597E+04	3.1740E+04
6.9600	-6.9932E-06	5.5104E-06	-1.9566	-5.6519E-02	1.0306	-0.3822	-0.8834	1.0686E+04	8.6597E+04	3.1740E+04
7.2000	-3.6738E-06	3.9667E-06	-1.6814	-0.1247	1.2360	-0.1973	-0.6591	1.0469E+04	8.6597E+04	3.1740E+04
7.4400	-1.4714E-06	2.6450E-06	-1.3704	-0.1548	1.3375	-6.4028E-02	-0.2531	1.0221E+04	8.6597E+04	3.1740E+04
7.6800	-1.7994E-07	1.6013E-06	-1.0442	-0.1586	1.3698	2.4175E-02	-0.2848	9953.6	8.6597E+04	3.1740E+04
7.9200	4.1708E-07	8.4348E-07	-0.7156	-0.1457	1.3630	7.6328E-02	-0.1550	9679.4	8.6597E+04	3.1740E+04
8.1600	5.3796E-07	3.4907E-07	-0.3910	-0.1237	1.3405	0.1023	0.1020	9413.6	8.6597E+04	3.1740E+04
8.4000	3.9835E-07	7.8732E-08	-7.2056E-02	-9.7741E-02	1.1079	0.1531	3.5868	9202.2	8.6597E+04	3.1740E+04
8.6400	2.0259E-07	1.8865E-08	9.5560E-02	-4.8753E-02	0.3484	0.1983	0.2411	9103.2	8.6597E+04	3.1740E+04
8.8800	6.4001E-08	2.6409E-08	0.1159	-1.0707E-02	-8.7737E-02	0.1070	2.5890	9064.2	8.6597E+04	3.1740E+04
9.1200	-5.9240E-11	1.1667E-09	7.3217E-02	3.5706E-03	-0.2040	2.3916E-02	0.2373	9024.1	8.6597E+04	3.1740E+04
9.3600	-1.5417E-08	1.8537E-09	2.8040E-02	4.0749E-03	-0.1502	-8.1723E-03	0.3718	8985.6	8.6597E+04	3.1740E+04
9.6000	-1.1233E-08	8.5669E-10	2.7271E-03	1.5192E-03	-6.4224E-02	-9.0134E-03	-0.3134	8963.5	8.6597E+04	3.1740E+04
9.8400	-4.4853E-09	6.5407E-10	4.9011E-03	8.3378E-05	-9.6214E-03	-3.1419E-03	-0.1421	8933.4	8.6597E+04	3.1740E+04
10.080	-6.5736E-10	4.1223E-03	-4.1223E-03	-1.9038E-04	8.9820E-03	-3.1070E-05	-2.3304E-02	8920.7	8.6597E+04	3.1740E+04
10.320	4.8465E-10	1.7220E-11	1.7135E-03	-0.2579E-05	8.5541E-03	4.5502E-04	1.9015E-02	8902.6	8.6597E+04	3.1740E+04
10.560	4.4150E-10	2.6848E-11	2.4903E-04	-1.1911E-05	3.6513E-03	1.8855E-04	1.8983E-02	8890.6	8.6597E+04	3.1740E+04
10.800	1.8685E-10	7.2699E-12	1.5368E-04	6.0563E-06	3.3889E-04	1.0759E-05	8.4081E-03	8899.5	8.6597E+04	3.1740E+04
11.040	1.4477E-11	3.4331E-12	1.1190E-04	3.9112E-06	-1.8418E-04	8.6915E-06	2.3163E-05	8899.2	8.6597E+04	3.1740E+04
11.280	-8.3520E-11	7.0026E-12	6.8347E-05	2.0403E-06	-1.6949E-04	-6.5612E-06	-1.1204E-05	8899.1	8.6597E+04	3.1740E+04
11.520	-1.3574E-10	-6.7963E-12	3.2222E-05	7.9289E-07	1.2661E-04	-3.8537E-06	-2.1718E-04	8899.1	8.6597E+04	3.1740E+04
11.760	-1.6600E-10	-5.0801E-12	8.4783E-06	1.6324E-07	-6.8384E-05	-1.5557E-06	-2.6560E-04	8899.1	8.6597E+04	3.1740E+04
12.000	-1.8999E-10	-3.0145E-12	1.5545E-19	0.0000	3.3205E-19	2.3518E-21	-3.0398E-04	8899.1	8.6597E+04	3.1740E+04

NUMBER OF ITERATIONS IN LLP = 2

* PILE GROUP * 4

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
3.6257E-04	3.3376E-03	-4.3724E-03	9.4798E-05	-4.6182E-03	4.2697E-05
FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
144.75	37.360	20.977	5.4745E-15	-89.409	0.0000

STR. KN/ M**2
2.2219E+05

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
3.6257E-04	3.3376E-03	-4.3724E-03	9.4798E-05	-4.6182E-03	4.2697E-05
AXIAL, KN	LAT. Y, KN	LAT. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
144.75	37.360	20.977	0.0000	-89.409	0.0000

Abutment.gp80

STR, KN/ M**2
2.2219E+05

* EFFECTS FOR Laterally Loaded PILE *

X M	DEFLECTION		BENDING MOMENT		SHEAR FORCE		SOIL REACTION		TOTAL STRESS KN/ M**2	FLEXURAL RIGIDITY	
	Y- M	Z- M	Z- KN	Y- KN	Y- KN	Z- KN	Y- KN/ M	Z- KN/ M		Z- KN	Y- KN
0.0000	3.3376E-03	4.3724E-03	0.0000	-89.409	37.360	21.001	0.0000	0.0000	2.2219E+05	8.6597E+04	3.1740E+04
0.2400	2.9574E-03	3.3441E-03	9.0214	-84.523	37.360	20.977	0.0000	0.0000	2.1062E+05	8.6597E+04	3.1740E+04
0.4800	2.5820E-03	2.4691E-03	18.042	-79.616	37.360	21.233	4.4608	-4.2639	1.9934E+05	8.6597E+04	3.1740E+04
0.7200	2.2209E-03	1.7386E-03	26.773	-74.426	34.427	23.480	17.883	-13.999	1.8777E+05	8.6597E+04	3.1740E+04
0.9600	1.8765E-03	1.1431E-03	34.505	-68.450	29.092	27.151	26.098	-15.898	1.7466E+05	8.6597E+04	3.1740E+04
1.2000	1.5549E-03	6.7165E-04	40.742	-61.557	22.222	30.705	32.291	-13.275	1.5961E+05	8.6597E+04	3.1740E+04
1.4400	1.2604E-03	3.1185E-04	45.217	-53.892	14.618	33.284	37.345	-7.9896	1.4291E+05	8.6597E+04	3.1740E+04
1.6800	9.9583E-04	4.9796E-05	47.836	-45.757	6.9483	34.438	41.345	-1.5674	1.2518E+05	8.6597E+04	3.1740E+04
1.9200	7.6303E-04	1.2932E-04	48.853	-37.520	-0.2553	34.040	28.485	4.8245	1.0728E+05	8.6597E+04	3.1740E+04
2.1600	5.6252E-04	2.4034E-04	47.828	-29.347	-6.6049	32.199	24.294	10.371	9.0024E+04	8.6597E+04	3.1740E+04
2.4000	3.9377E-04	2.9736E-04	45.603	-22.160	-11.846	29.182	19.312	14.584	7.4180E+04	8.6597E+04	3.1740E+04
2.6400	2.5530E-04	3.1427E-04	42.262	-15.601	-15.847	25.338	14.016	17.254	6.0322E+04	8.6597E+04	3.1740E+04
2.8800	1.4491E-04	3.0276E-04	38.109	-10.026	-18.581	21.038	8.8044	18.395	4.8820E+04	8.6597E+04	3.1740E+04
3.1200	5.9852E-05	2.7294E-04	33.444	-5.5025	-20.108	16.631	3.9868	18.181	3.9800E+04	8.6597E+04	3.1740E+04
3.3600	-2.9755E-06	2.3301E-04	28.543	0.4905	-20.550	12.409	-0.2156	16.886	3.1244E+04	8.6597E+04	3.1740E+04
3.6000	-4.6817E-05	1.8930E-04	23.650	0.4905	-20.073	8.5941	3.6669	14.827	2.3874E+04	8.6597E+04	3.1740E+04
3.8400	-7.4918E-05	1.4639E-04	18.963	2.1498	-18.863	5.3317	-6.3066	12.323	2.5009E+04	8.6597E+04	3.1740E+04
4.0800	-9.0392E-05	1.0730E-04	14.634	3.1093	-17.118	2.6933	9.1385	9.6604	2.2415E+04	8.6597E+04	3.1740E+04
4.3200	-9.6112E-05	7.3763E-05	10.770	3.4932	-15.025	0.9878	-9.2163	7.0733	2.0395E+04	8.6597E+04	3.1740E+04
4.5600	-9.4646E-05	4.6520E-05	7.4533	3.4932	-12.754	0.6878	-9.6300	4.7333	1.8142E+04	8.6597E+04	3.1740E+04
4.8000	-8.8213E-05	2.5551E-05	4.6486	3.4739	-10.452	-1.6163	-9.4921	2.7493	1.6208E+04	8.6597E+04	3.1740E+04
5.0400	-7.8666E-05	1.0337E-05	2.4086	2.7290	-8.2365	-2.0807	-8.9254	1.1728	1.4429E+04	8.6597E+04	3.1740E+04
5.2800	-6.7494E-05	6.8352E-06	0.6815	2.2065	-6.1954	-2.2164	-8.0532	8.1555E-03	1.2874E+04	8.6597E+04	3.1740E+04
5.5200	-5.5815E-05	6.1963E-06	-0.5826	1.6815	-4.3881	-2.1190	-6.9910	-0.7756	1.1612E+04	8.6597E+04	3.1740E+04
5.7600	-4.4578E-05	9.4046E-06	-1.4442	1.1995	-2.8476	-1.8736	-5.8410	-1.2323	1.0691E+04	8.6597E+04	3.1740E+04
6.0000	-3.4252E-05	1.0428E-05	-1.9693	0.7823	-1.5846	-1.5510	-4.6885	-1.4274	9.786.0	8.6597E+04	3.1740E+04
6.2400	-2.5224E-05	1.0013E-05	-2.2239	0.4564	-0.5913	-1.2058	-3.6005	-1.4293	9.076.0	8.6597E+04	3.1740E+04
6.4800	-1.7667E-05	8.7608E-06	-2.2705	0.2073	0.1538	-0.8766	-2.6253	-1.3018	9602.1	8.6597E+04	3.1740E+04
6.7200	-1.1614E-05	7.1237E-06	-2.1651	3.2788E-02	0.6818	-0.5876	-1.7938	-1.1003	9450.0	8.6597E+04	3.1740E+04
6.9600	-6.9968E-06	5.4200E-06	-1.9556	-7.8440E-02	1.0292	-0.3511	-1.1216	-0.8689	9274.3	8.6597E+04	3.1740E+04
7.2000	-3.6776E-06	3.8529E-06	-1.6807	-0.1396	1.2347	-0.1703	-0.6111	-0.6402	9059.6	8.6597E+04	3.1740E+04
7.4400	-1.4749E-06	2.5350E-06	-1.3700	-0.1637	1.3363	-4.1602E-02	-0.2537	-0.4361	8811.1	8.6597E+04	3.1740E+04
7.6800	-1.8280E-07	1.5114E-06	-1.0439	-0.1626	1.3688	4.2379E-02	-3.2516E-02	-0.2688	8541.3	8.6597E+04	3.1740E+04
7.9200	4.1500E-07	7.8103E-07	-0.7155	-0.1458	1.3620	9.1222E-02	7.6249E-02	-0.1435	8263.5	8.6597E+04	3.1740E+04
8.1600	3.3688E-07	3.1435E-07	-0.3912	-0.1205	1.3397	0.1150	-5.9579E-02	-0.1435	7992.8	8.6597E+04	3.1740E+04
8.4000	3.9792E-07	6.5713E-08	-7.2482E-02	-9.1595E-02	1.1075	0.1579	3.5813	-0.5914	7772.1	8.6597E+04	3.1740E+04
8.6400	2.0247E-07	2.0474E-08	9.5188E-02	-4.4084E-02	0.3489	0.1870	2.5867	-0.2616	7678.1	8.6597E+04	3.1740E+04
8.8800	6.4017E-08	2.4951E-08	0.1156	-8.9085E-03	-8.7075E-02	9.7088E-02	1.0601	0.4132	7647.2	8.6597E+04	3.1740E+04
9.1200	-1.6245E-12	1.0564E-08	7.3132E-02	3.7135E-03	-0.2036	1.9978E-02	-3.3041E-05	0.2148	7608.1	8.6597E+04	3.1740E+04
9.3600	-1.5376E-08	1.5109E-09	2.8033E-02	3.8146E-03	-0.1500	-8.4415E-03	-0.3708	3.6441E-02	7569.5	8.6597E+04	3.1740E+04
9.6000	-1.1217E-08	8.5729E-10	2.7443E-03	1.3576E-03	-6.4195E-02	-8.4151E-03	-0.3129	-2.3916E-02	7547.2	8.6597E+04	3.1740E+04
9.8400	-4.4828E-09	6.0564E-10	4.8866E-03	4.6667E-03	-9.6440E-03	-2.7928E-03	-0.1420	-1.9185E-02	7547.5	8.6597E+04	3.1740E+04
10.080	-6.5901E-10	1.4397E-10	8.9521E-03	1.8273E-04	8.9521E-03	3.6868E-05	-2.3366E-02	-5.1046E-02	7546.8	8.6597E+04	3.1740E+04
10.320	4.8300E-10	1.9443E-11	8.4191E-05	-8.4191E-05	5.406E-03	4.3247E-04	1.8951E-02	7.6288E-04	7544.7	8.6597E+04	3.1740E+04
10.560	4.4064E-10	2.5085E-11	9.6457E-04	3.6490E-03	3.6490E-03	1.6978E-04	1.8951E-02	1.0791E-03	7543.4	8.6597E+04	3.1740E+04
10.800	1.8687E-10	6.11734E-12	5.8928E-06	3.9974E-04	7.6252E-06	1.7625E-06	8.4092E-03	2.7780E-03	7543.4	8.6597E+04	3.1740E+04
11.040	1.4847E-11	3.8595E-12	3.7554E-06	-1.8347E-04	-8.5472E-06	6.3347E-06	2.3755E-05	-6.1752E-06	7543.3	8.6597E+04	3.1740E+04
11.280	8.3024E-11	7.0370E-12	1.9335E-06	-1.6896E-04	-6.3347E-06	-1.3284E-04	-1.3284E-04	-1.1259E-05	7543.2	8.6597E+04	3.1740E+04
11.520	-1.3524E-10	-6.6321E-12	3.2144E-05	7.3941E-07	-1.2627E-04	3.6551E-06	-2.1633E-04	-1.0511E-06	7543.2	8.6597E+04	3.1740E+04
11.760	-1.6555E-10	-4.8161E-12	4.4604E-06	1.4858E-07	-6.8224E-05	-1.4408E-06	-2.6488E-04	-7.7058E-06	7543.2	8.6597E+04	3.1740E+04
12.000	-1.8960E-10	-2.6801E-12	-1.5545E-19	-8.9026E-22	-1.9147E-19	-5.7300E-21	-3.0336E-04	-4.2882E-06	7543.2	8.6597E+04	3.1740E+04

NUMBER OF ITERATIONS IN LLP = 2

* PILE GROUP * 5

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
2.9426E-04	3.3376E-03	-4.2207E-03	9.4798E-05	-4.6182E-03	4.2697E-05
FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
117.58	37.420	24.023	5.6990E-15	-93.075	0.0000

STR. KN/ M**2
2.2958E+05

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
2.9426E-04	3.3376E-03	-4.2207E-03	9.4798E-05	-4.6182E-03	4.2697E-05
AXIAL, KN	LAT. Y, KN	LAT. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
117.58	37.420	24.023	0.0000	-93.075	0.0000

STR. KN/ M**2
2.2958E+05

* EFFECTS FOR Laterally Loaded Pile *

X M	DEFLECTION		BENDING MOMENT		SHEAR FORCE		SOIL REACTION		TOTAL STRESS		FLEXURAL RIGIDITY	
	Y-DIR M	Z-DIR M	Z-DIR KN-M	Y-DIR KN-M	Y-DIR KN	Z-DIR KN	Y-DIR KN/M	Z-DIR KN/M	KN/ M**2	KN/ M**2	Z-DIR KN-M**2	Y-DIR KN-M**2
0.0000	3.3376E-03	-4.2207E-03	0.0000	-93.075	37.420	24.044	0.0000	0.0000	2.2958E+05	8.6597E+04	8.6597E+04	
0.2400	2.9574E-03	-3.1956E-03	9.0256	-87.430	37.420	24.023	0.0000	0.0000	2.4617E+05	8.6597E+04	8.6597E+04	
0.4800	2.5832E-03	-2.3290E-03	18.050	-81.766	37.147	24.270	4.5505	-4.1028	2.0307E+05	8.6597E+04	8.6597E+04	
0.7200	2.2210E-03	-1.6108E-03	26.781	-75.835	34.450	26.393	17.883	-12.971	1.8971E+05	8.6597E+04	8.6597E+04	
0.9600	1.8765E-03	-1.0302E-03	34.508	-69.176	29.115	29.749	26.099	-14.328	1.7495E+05	8.6597E+04	8.6597E+04	
1.2000	1.5550E-03	-5.7501E-04	40.742	-61.692	22.245	32.882	32.073	-11.364	1.5851E+05	8.6597E+04	8.6597E+04	
1.4400	1.2604E-03	-2.3168E-04	45.214	-53.549	14.640	34.983	32.293	-5.9357	1.4070E+05	8.6597E+04	8.6597E+04	
1.6800	9.9592E-04	1.4500E-05	47.832	-45.057	6.9698	35.646	31.348	0.4564	1.2220E+05	8.6597E+04	8.6597E+04	
1.9200	7.6314E-04	1.7891E-04	48.647	-36.580	-0.2350	34.780	28.490	6.6792	1.0382E+05	8.6597E+04	8.6597E+04	
2.1600	5.6264E-04	2.7690E-04	47.822	-28.477	-6.5854	32.525	24.299	11.959	8.6406E+04	8.6597E+04	8.6597E+04	
2.4000	3.9390E-04	3.2314E-04	45.596	-21.052	-11.828	29.165	19.338	15.848	7.0655E+04	8.6597E+04	8.6597E+04	
2.6400	2.5435E-04	3.3106E-04	42.255	-14.329	-15.830	25.059	14.023	18.175	5.7109E+04	8.6597E+04	8.6597E+04	
2.8800	1.4504E-04	3.1250E-04	38.103	-9.0444	-18.567	20.578	8.8123	18.986	4.6073E+04	8.6597E+04	8.6597E+04	
3.1200	5.9976E-05	2.7741E-04	33.439	-4.6469	-20.096	16.064	3.9951	18.479	3.7595E+04	8.6597E+04	8.6597E+04	
3.3600	-2.8600E-06	2.3376E-04	28.540	-1.3089	-20.540	11.801	-0.2073	16.940	3.1437E+04	8.6597E+04	8.6597E+04	
3.6000	-4.6712E-05	1.8762E-04	23.648	1.0561	-20.064	7.9968	-6.6587	14.695	2.7090E+04	8.6597E+04	8.6597E+04	
3.8400	-7.4826E-05	1.4331E-04	18.962	2.5758	-18.857	4.7822	-6.2988	12.064	2.3921E+04	8.6597E+04	8.6597E+04	
4.0800	-9.0312E-05	1.0359E-04	14.634	3.4005	-17.113	2.2156	-8.1313	9.3266	2.1374E+04	8.6597E+04	8.6597E+04	
4.3200	-9.6045E-05	6.9978E-05	10.771	3.6868	-15.022	0.2944	-9.2100	6.7104	1.9095E+04	8.6597E+04	8.6597E+04	
4.5600	-9.4992E-05	4.3016E-05	7.4346	3.5848	-12.752	-1.0309	-9.6246	4.3768	1.6938E+04	8.6597E+04	8.6597E+04	
4.8000	-8.8171E-05	2.2530E-05	4.6504	3.2286	-10.451	-1.8408	-9.4876	2.4243	1.4892E+04	8.6597E+04	8.6597E+04	
5.0400	-7.8635E-05	7.8874E-06	2.4107	2.7304	-8.2368	-2.2327	-8.9219	0.8949	1.3017E+04	8.6597E+04	8.6597E+04	
5.2800	-6.7473E-05	-1.8061E-06	0.6837	2.1787	-6.1964	-2.3082	-8.0506	-0.2155	1.1392E+04	8.6597E+04	8.6597E+04	
5.5200	-5.5837E-05	-7.5444E-06	-0.5803	1.6375	-4.3896	-2.1637	-6.9892	-0.9444	1.0092E+04	8.6597E+04	8.6597E+04	
5.7600	-4.4570E-05	-1.0305E-05	-1.4420	1.1492	-2.8494	-1.8840	-5.8400	-0.9444	9164.0	8.6597E+04	8.6597E+04	
6.0000	-3.4249E-05	-1.0971E-05	-1.9673	0.7375	-1.5866	-1.5384	-4.6881	-1.5018	8603.4	8.6597E+04	8.6597E+04	
6.2400	-2.5225E-05	-1.0290E-05	-2.2221	0.4115	-0.9333	-1.1797	-3.6006	-1.4687	8317.9	8.6597E+04	8.6597E+04	
6.4800	-1.7670E-05	-8.8515E-06	-2.2690	0.1695	-0.1519	-0.8443	-2.6247	-1.3133	8164.9	8.6597E+04	8.6597E+04	
6.7200	-1.1619E-05	-7.0972E-06	-2.1639	3.0605E-03	0.6800	-0.5543	-1.7695	-1.0902	8031.3	8.6597E+04	8.6597E+04	
6.9600	-7.0017E-06	-5.3302E-06	-1.9547	-0.0.1003	1.0276	-1.0276	-1.9547	-0.8545	7864.0	8.6597E+04	8.6597E+04	
7.2000	-3.9824E-06	-3.7397E-06	-1.6801	-0.0.1545	1.2333	-0.1433	-1.1224	-0.6214	7651.4	8.6597E+04	8.6597E+04	
7.4400	-1.4791E-06	-2.4255E-06	-1.3695	-0.0.1726	1.3351	-1.9215E-02	-0.2544	-0.4172	7401.7	8.6597E+04	8.6597E+04	

7.6800	-1.8618E-07	-1.4218E-06	-1.0438	-0.1666	1.3677	6.0558E-02	-3.3116E-02	-0.2529	7129.0	8.6597E+04	3.1740E+04
7.9200	4.1260E-07	-7.1876E-07	-0.7156	-0.1458	1.3611	0.1061	7.5808E-02	-0.1321	6847.7	8.6597E+04	3.1740E+04
8.1600	5.3523E-07	-2.7952E-07	-0.3914	-0.1173	1.3388	0.1277	0.1015	-5.2994E-02	6572.1	8.6597E+04	3.1740E+04
8.4000	3.9723E-07	-5.2722E-08	-7.2901E-02	-8.5467E-02	1.1070	0.1627	3.5753	-0.4745	6342.2	8.6597E+04	3.1740E+04
8.6400	2.0223E-07	2.2082E-08	9.4762E-02	-3.9424E-02	0.3495	0.1757	2.5844	0.2822	6253.4	8.6597E+04	3.1740E+04
8.8800	6.4042E-08	2.3498E-08	7.3041E-02	-7.1137E-03	-0.2031	1.6048E-02	1.0605	0.3891	6230.2	8.6597E+04	3.1740E+04
9.1200	6.5656E-11	9.4631E-09	0.1154	3.8565E-03	-0.1498	8.7153E-02	-0.3698	0.1925	6192.2	8.6597E+04	3.1740E+04
9.3600	-1.5331E-08	1.1689E-09	2.8028E-02	3.5551E-03	-0.1498	8.7153E-02	-0.3698	0.1925	6153.4	8.6597E+04	3.1740E+04
9.6000	-1.1199E-08	-8.5798E-10	2.7647E-03	1.1964E-03	-6.4168E-02	-7.8186E-03	-0.3124	-2.3935E-02	6131.0	8.6597E+04	3.1740E+04
9.8400	-4.4804E-09	-5.5735E-10	4.8702E-03	1.0021E-05	-9.6810E-03	-2.4446E-03	-0.1419	-1.7655E-02	6131.6	8.6597E+04	3.1740E+04
10.080	-6.6113E-10	-1.2370E-10	-4.1091E-03	-1.7515E-04	8.9181E-03	1.0471E-04	-2.3441E-02	-4.3681E-03	6130.9	8.6597E+04	3.1740E+04
10.320	4.8113E-10	2.1656E-11	-1.7113E-03	-7.5828E-05	8.2257E-03	4.1002E-04	1.8878E-02	8.4970E-04	6128.8	8.6597E+04	3.1740E+04
10.560	4.3991E-10	2.3350E-11	-2.5026E-04	-7.3853E-06	3.6468E-03	1.5106E-04	1.8923E-02	1.0044E-03	6127.5	8.6597E+04	3.1740E+04
10.800	1.8692E-10	5.0793E-12	1.5259E-04	5.7302E-06	3.4076E-04	4.7720E-06	8.4112E-03	2.2857E-04	6127.4	8.6597E+04	3.1740E+04
11.040	1.5278E-11	-4.2856E-12	1.1120E-04	3.6004E-06	-1.8267E-04	-8.4041E-06	2.4445E-05	-6.8570E-06	6127.4	8.6597E+04	3.1740E+04
11.280	-8.2455E-11	-7.0721E-12	6.7961E-05	1.8271E-06	-1.6835E-04	-6.1084E-06	-1.3193E-04	-1.1315E-05	6127.3	8.6597E+04	3.1740E+04
11.520	-1.3467E-10	-6.4690E-12	3.2058E-05	6.8610E-07	-1.2588E-04	-3.4573E-06	-2.1547E-04	-1.0350E-05	6127.3	8.6597E+04	3.1740E+04
11.760	-1.6504E-10	-4.5532E-12	8.4404E-06	1.3396E-07	-6.8044E-05	-1.3260E-06	-2.6407E-04	-7.2851E-06	6127.3	8.6597E+04	3.1740E+04
12.000	-1.8917E-10	-2.3467E-12	0.0000	8.9026E-22	2.7024E-19	-6.4853E-22	3.0267E-04	-3.7547E-06	6127.3	8.6597E+04	3.1740E+04

NUMBER OF ITERATIONS IN LLP = 2

Evaluation of Compression Strength of Steel

For HP Section	14x102	Metric HP360x152	Sheep Dip Wash
$E_s =$	2.00E+08 kN/m ²	2.90E+07 psi	
$f_y =$	36 ksi		
$A_g =$	30 in ²	19354.8 mm ²	
$b_f =$	14.8 in	375.92 mm	
$t_f =$	0.705 in	17.907 mm	

$$P_0 = Q \cdot f_y \cdot A_g$$

IF $b_f / (2 \cdot t_f) < k \cdot \text{SQRT}(E_s / f_y)$ THEN $Q = 1$

$$Q = 1$$

thus

$$P_0 = 1080 \text{ kips}$$

Now,

$$P_e = (\pi^2 E_s / (Kl/r_s)^2) \cdot A_g$$

$$l = 32.5 \text{ ft}$$

$$r_s = 3.56 \text{ in}$$

$$k = 0.65$$

length of driven pile

radius of gyration of weaker section

0.65 for fixed top-fixed bottom condition

0.8 for pinned top-fixed bottom condition

$$P_e = 1693414 \text{ lb}$$

$$P_e = 1693.414 \text{ kips}$$

$$P_n = (0.658^{(P_0/P_e)}) \cdot P_0 \quad \text{if } P_e / P_0 < 0.44$$

$$P_n = 827 \text{ kips}$$

$$P_n = 3,678 \text{ kN}$$

Resistance Factor

$$\phi_c = 0.5$$

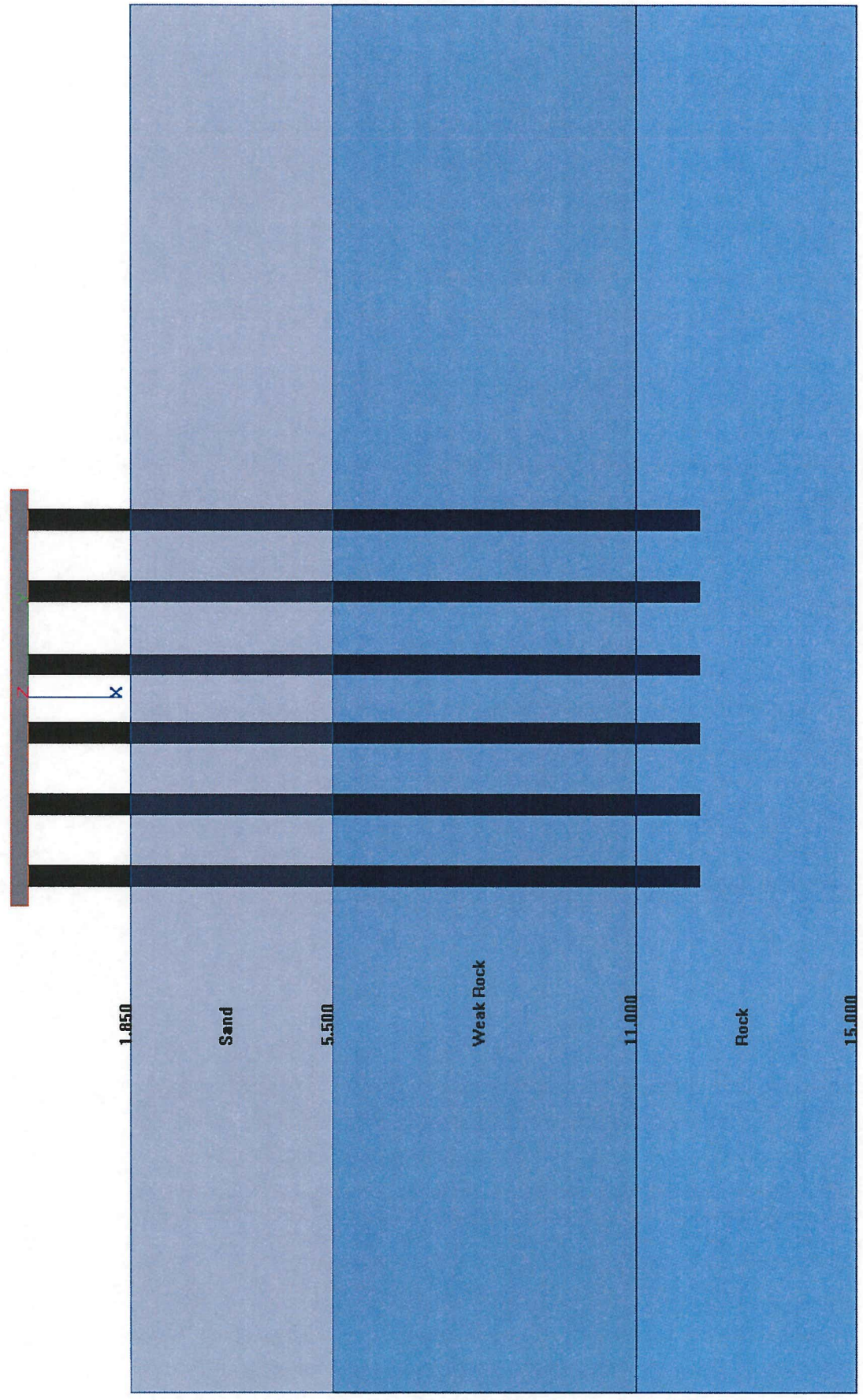
$$P_s = \phi_c \cdot P_n$$

$$P_s = 413 \text{ kips}$$

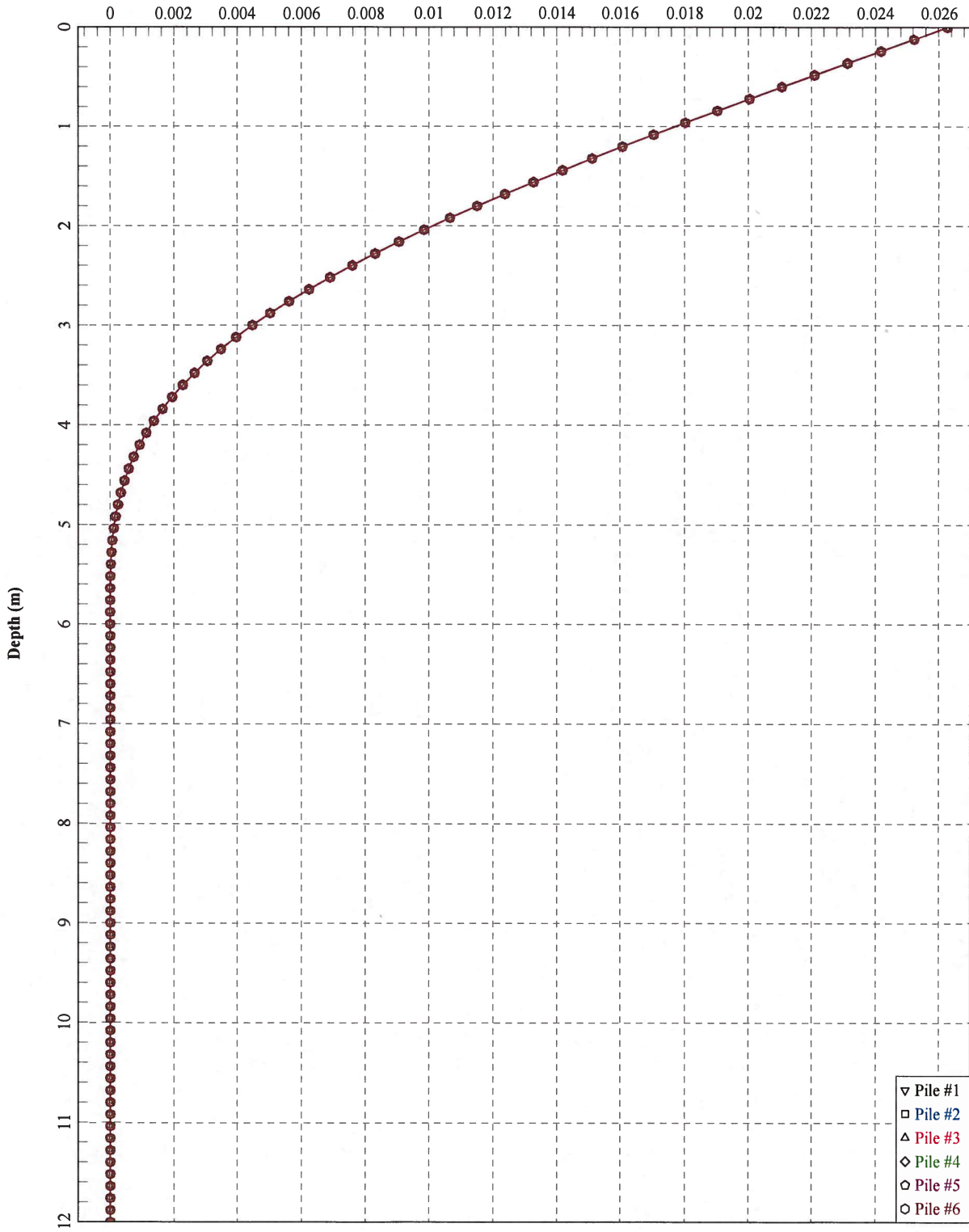
$$P_s = 1,837 \text{ kN}$$

Sheep Dip Wash Bridge – Pier Pile Group Layout

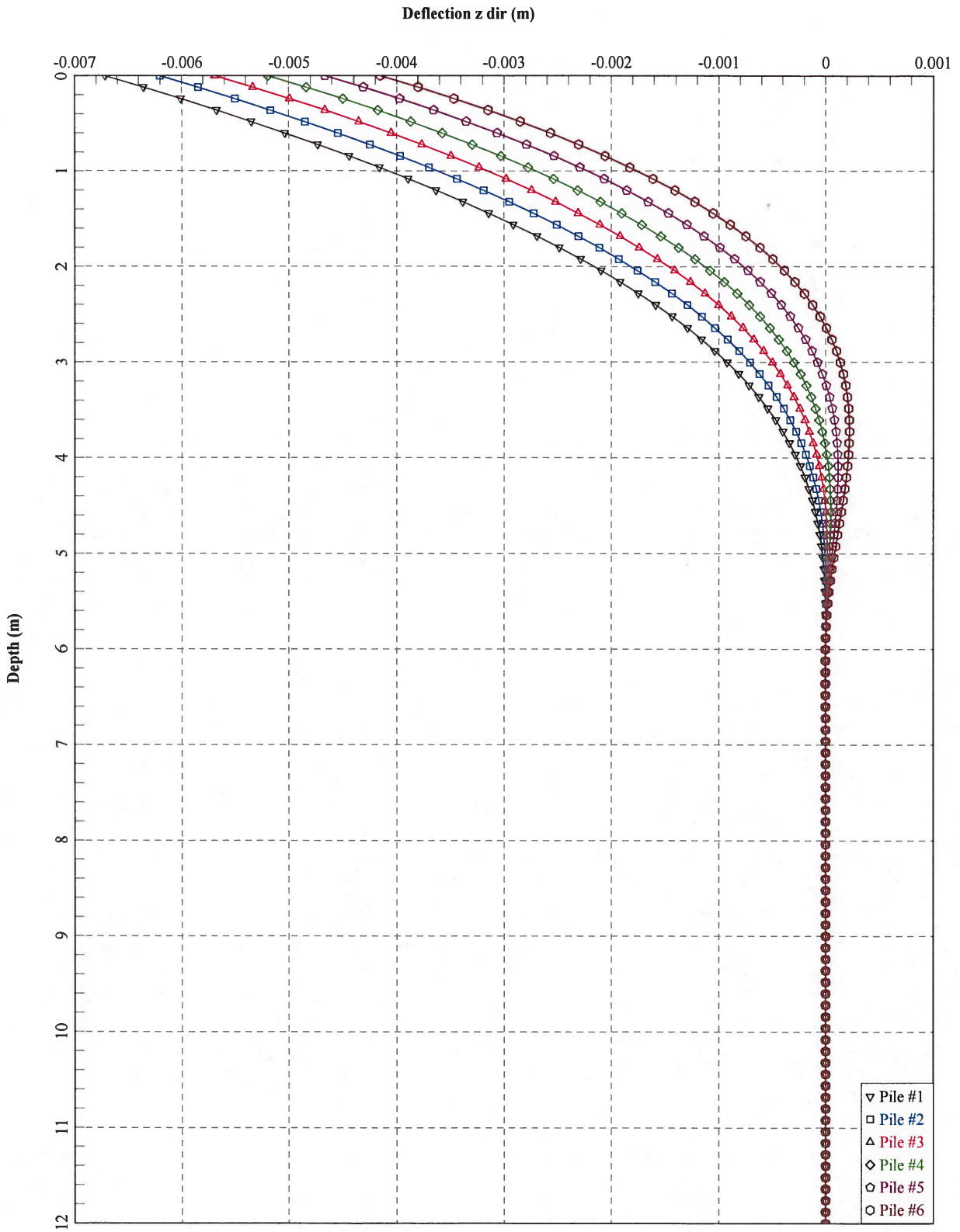
HP 14x102 – 30-inch prebore – 6 piles spaced 4.2 feet on centers



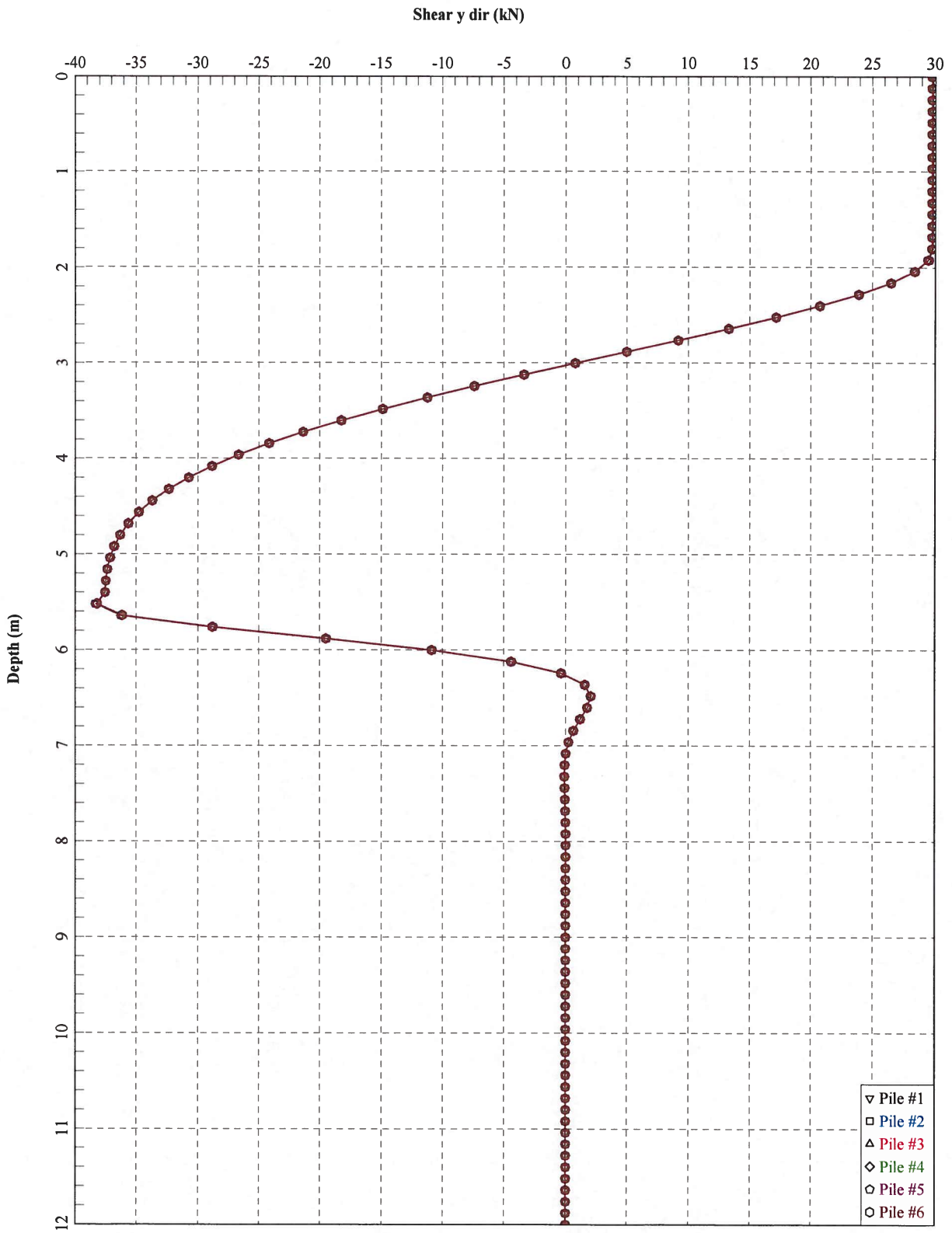
Deflection y dir (m)

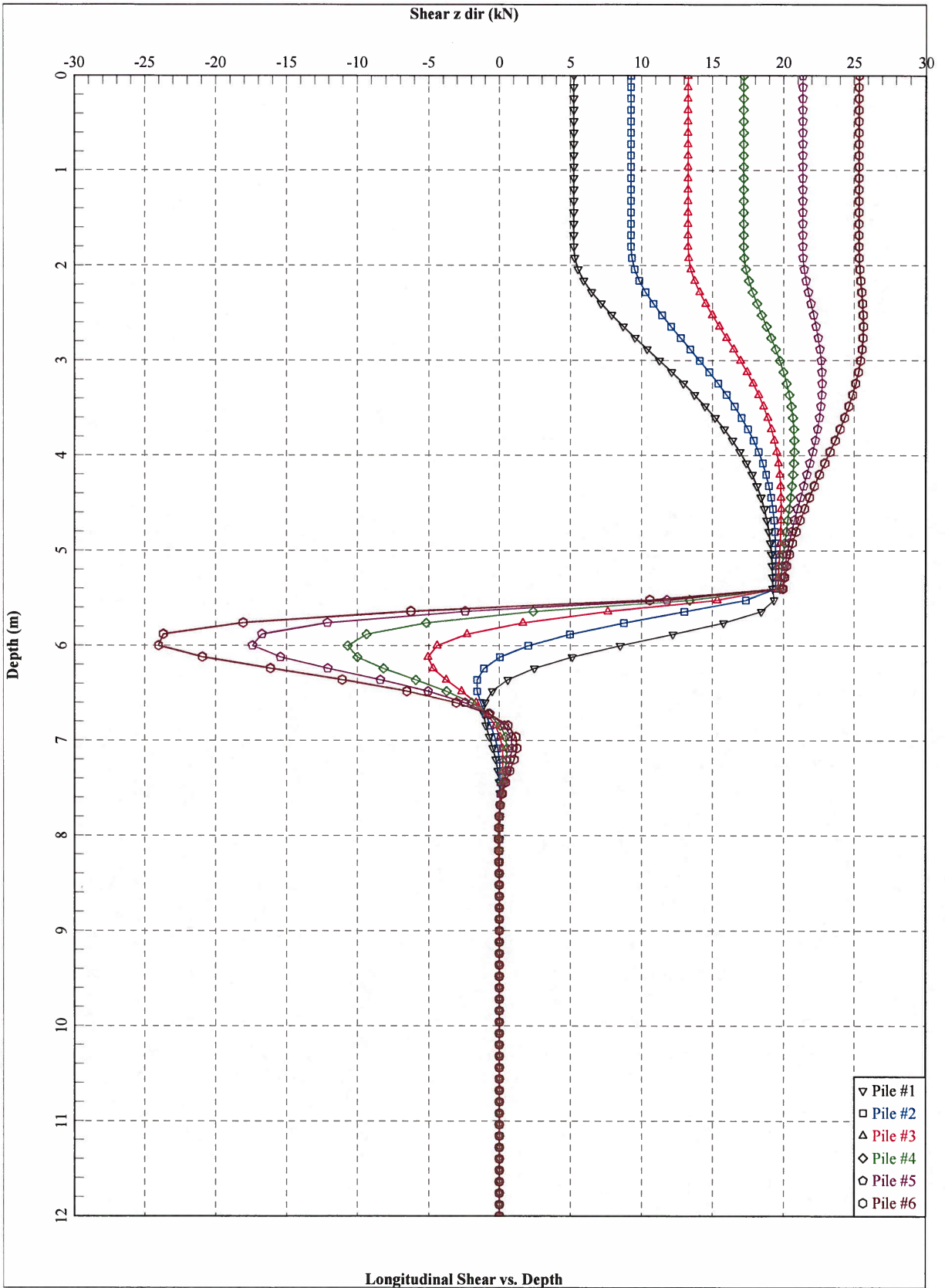


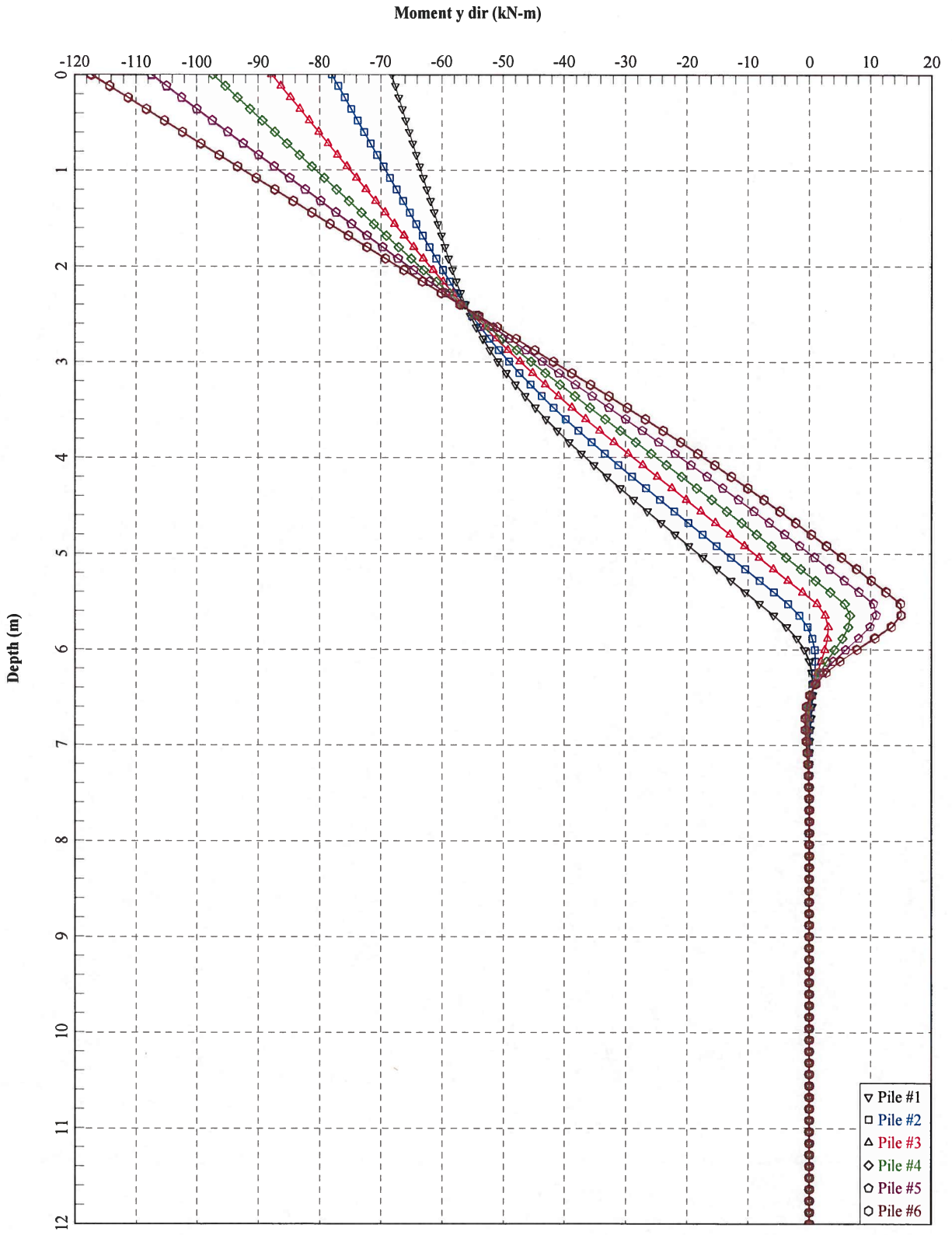
Transverse Deflection vs. Depth

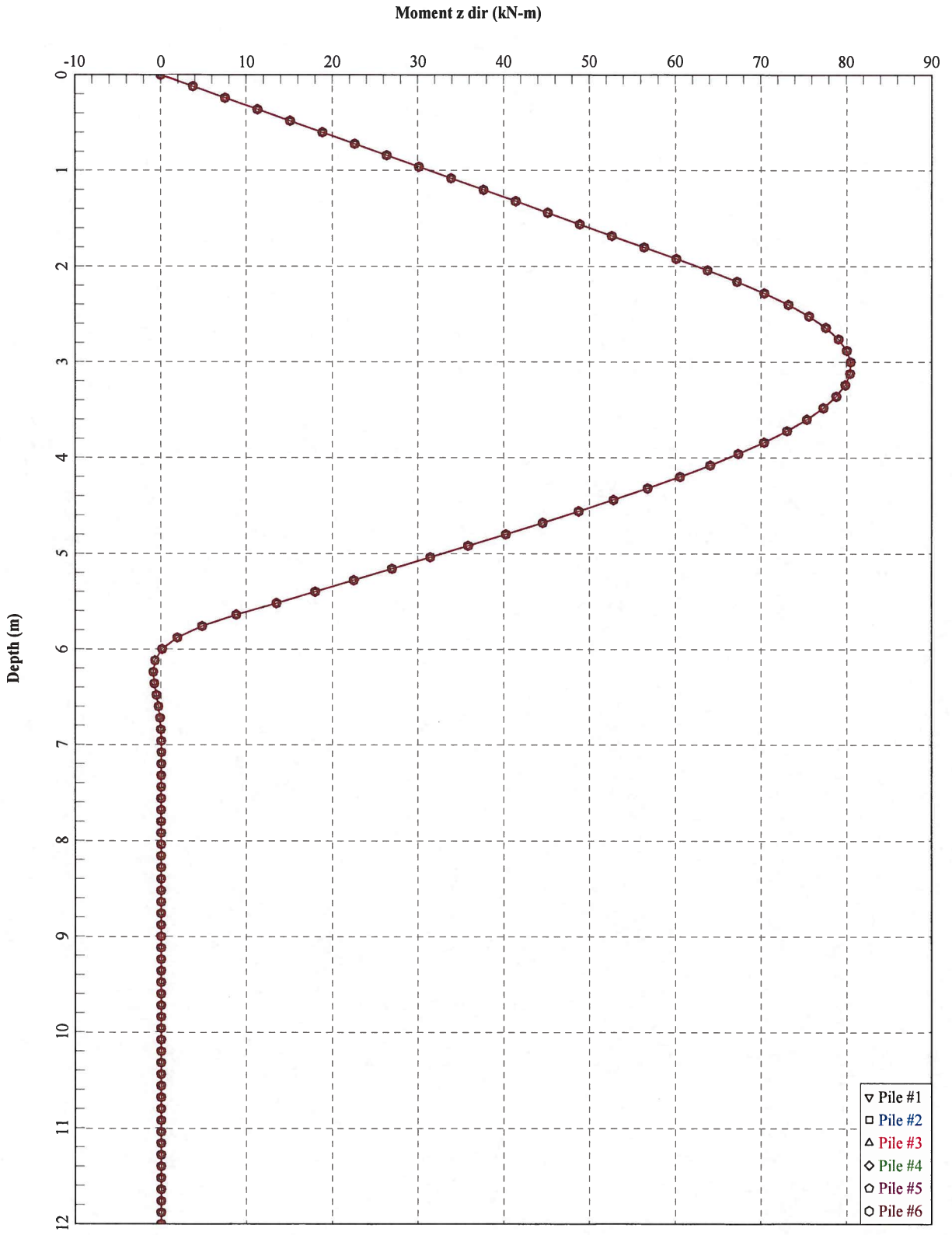


Longitudinal Deflection vs. Depth









Moments (about Transverse axis) vs. Depth

GROUP for windows, Version 8.0.7
Analysis of A Group of Piles
subjected to Axial and Lateral Loading
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This program is licensed to :
Kautav Bose
Terracon

Path to file locations : C:\Documents and Settings\kbose\Desktop\Sheep Dip Wash Bridge\GROUP\
Name of input data file : pier.gp8d
Name of output file : pier.gp8o
Name of output summary file : pier.gp8t
Name of plot output file : pier.gp8p
Name of runtime file : pier.gp8r

Time and Date of Analysis

Date: March 08, 2011 Time: 16:50:14

***** INPUT INFORMATION *****

New Group

ANALYSIS TYPE = 3D ANALYSIS
UNITS SYSTEM = METR

* TABLE B * PILE CAP OPTIONS
LENGTH,YY (M) = 7.500
WIDTH, ZZ (M) = 1.000
THICKNESS,XX (M) = 0.3048

* PILE CAP DIMENSIONS ARE NOT CONSIDERED
FOR THE PILE GROUP ANALYSIS

* TABLE C * LOAD AND CONTROL PARAMETERS

** LOAD CASES **

NUMBER OF LOAD CASES : 1

LOAD CASE : 1

Pier.gp8o

CASE NAME : Load Case
 LOAD TYPE : Dead, DL
 SCALE FACTOR : 1.0000

* CONCENTRATED LOADS *

NL	VERT. LOAD KN	HR. LOAD Y KN	HR. LOAD Z KN	MOMENT X KN-M	MOMENT Y KN-M	MOMENT Z KN-M	COORD X M	COORD Y M	COORD Z M
1	1112.06	178.819	91.6334	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

* EQUIVALENT CONC. LOAD AT ORIGIN *

VER. LOAD X, KN	HOR. LOAD Y, KN	HOR. LOAD Z, KN	MOMENT X, KN-M	MOMENT Y, KN-M	MOMENT Z, KN-M
1112.06	178.819	91.6334	0.00000	0.00000	0.00000

* THE LOADING IS STATIC *

* CONTROL PARAMETERS *
 TOLERANCE ON CONVERGENCE OF FOUNDATION REACTION, = 1.00000E-04
 TOLERANCE ON DETERMINATION OF DEFLECTIONS = 1.00000E-04
 MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS = 100
 MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS = 100
 FACTOR TO APPLY THE LOAD IN INCREMENTS = 1.0000
 MINIMUM FACTOR FOR LOAD INCREMENTS = 1.0000
 PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
 PRINT RESULTS EVERY 2 NODE(S)

* TABLE D * ARRANGEMENT OF PILE GROUPS

GROUP	CONNECT	CONNECTZ	PILE PROP	P-Y CURVE	L-S CURVE	T-R CURVE
1	PIN	FIX	1	0	0	0
2	PIN	FIX	1	0	0	0
3	PIN	FIX	1	0	0	0
4	PIN	FIX	1	0	0	0
5	PIN	FIX	1	0	0	0
6	PIN	FIX	1	0	0	0

GROUP	CorX, M	CorY, M	CorZ, M	ALPHA, DEG	BETA, DEG	GROUND, M	SPR, Y, KN-M	SPR, Z, KN-M
1	0.00000	-3.20000	0.50000	0.00000	90.00000	1.85000	0.00000	0.00000
2	0.00000	-1.92000	0.50000	0.00000	90.00000	1.85000	0.00000	0.00000
3	0.00000	-0.64000	0.50000	0.00000	90.00000	1.85000	0.00000	0.00000
4	0.00000	0.60000	0.50000	0.00000	90.00000	1.85000	0.00000	0.00000
5	0.00000	1.92000	0.50000	0.00000	90.00000	1.85000	0.00000	0.00000
6	0.00000	3.20000	0.50000	0.00000	90.00000	1.85000	0.00000	0.00000

* TABLE E * PILE GEOMETRY AND PROPERTIES
 PILE TYPE = 1 - DRIVEN PILE
 = 2 - DRILLED SHAFT

PROP	SECTS	INC	PILE TYPE	LENGTH, M	E, KN/M**2
1	1	100	2	12.000	2.0000E+08

* PILE SECTIONS *

PROP	SECT	FROM, M	TO, M	CROSS SECT
1	1	0.00000	12.0000	1

* PILE CROSS SECTIONS *

CROSS SECTION : 1

SECTION NAME : HP
 CROSS SECTION TYPE : I SECTION
 EQUIVALENT DIAMETER : 0.76200 M
 EXTERNAL WIDTH : 0.37392 M
 EXTERNAL DEPTH : 0.35560 M
 FLANGE THICKNESS : 0.0179070 M
 WEB THICKNESS : 0.0179070 M
 SHEAR MODULUS : 8.00000E+07 KN/ M**2
 HEAR MODULUS : 8.00000E+07 KN/ M**2

* PILE CROSS SECTIONS PROPERTIES *

SECT I DIAM, M AREA, M**2 IZ, M**4 IY, M**4 GJ, KN- M**2 Mn, KN- M Vn, KN
 0.76200 0.0191896 1.58700E-04 4.32984E-04 47334.7 0.00000 0.00000

* TABLE F * SOIL DATA

SOILS INFORMATION
 GROUND SURFACE = 1.85000 M
 3 LAYER(S) OF SOIL

LAYER 1
 THE SOIL IS A SAND
 X COORDINATE (M)
 EFFECTIVE UNIT WEIGHT (KN/ M**3)
 FRICTION ANGLE (DEGREES)
 P-Y SUBGRADE MODULUS (KN/ M**3)
 ULTIMATE UNIT SIDE FRICTION (KN/ M**2)
 ULTIMATE UNIT TIP RESISTANCE (KN/ M**2)

TOP OF LAYER	BOTTOM OF LAYER
1.85000	5.50000
18.9000	18.9000
30.0000	30.0000
6800.00	6800.00
21.0000	21.0000
330.000	330.000

LAYER 2
 THE LAYER IS A WEAK ROCK
 X COORDINATE (M)
 EFFECTIVE UNIT WEIGHT (KN/ M**3)
 UNIAxIAL COMPRESSIVE STRENGTH (KN/ M**2)
 YOUNG MODULUS, ER (KN/ M**2)
 KRM 90000.0
 RQD 5.00000E-05
 ULTIMATE UNIT SIDE FRICTION (KN/ M**2)
 ULTIMATE UNIT TIP RESISTANCE (KN/ M**2)

TOP OF LAYER	BOTTOM OF LAYER
5.50000	11.0000
19.6500	19.6500
600.000	600.000
90000.0	90000.0
5.00000E-05	5.00000E-05
30.0000	30.0000
60.0000	60.0000
1500.00	1500.00

LAYER 3
 THE LAYER IS A VUGGY LIMESTONE
 X COORDINATE (M)
 EFFECTIVE UNIT WEIGHT (KN/ M**3)
 UNIAxIAL COMPRESSIVE STRENGTH (KN/ M**2)
 ULTIMATE UNIT SIDE FRICTION (KN/ M**2)
 ULTIMATE UNIT TIP RESISTANCE (KN/ M**2)

TOP OF LAYER	BOTTOM OF LAYER
11.0000	15.0000
20.4000	20.4000
800.000	800.000
150.000	150.000
2000.00	2000.00

Note : Default values will be generated for
 ULTIMATE UNIT SIDE FRICTION and ULTIMATE UNIT TIP RESISTANCE
 when input values are 0.

* TABLE H * AXIAL LOAD VS SETTLEMENT
 LOAD-SETTLEMENT CURVES GENERATED INTERNALLY

NUM OF CURVES 1
 CURVE 1 NUM OF POINTS 19

POINT	AXIAL LOAD, KN	SETTLEMENT, M
1	-1278.68	-0.0536330
2	-1313.09	-0.0283133
3	-1330.27	-0.0156538
4	-1333.74	-5.51263E-03
5	-1060.93	-3.57731E-03
6	-331.879	-9.41841E-04
7	-165.941	-4.70922E-04
8	-33.1882	-9.41843E-05
9	-3.31882	-9.41843E-06
10	0.00000	0.00000
11	3.33808	9.46551E-06
12	33.3808	9.46551E-05
13	166.904	4.73276E-04
14	333.802	9.46548E-04
15	1067.36	3.59562E-03
16	1344.15	5.54456E-03
17	1358.01	0.0157406
18	1348.05	0.0284226
19	1316.00	0.0537487

* TABLE I * TORS. MOM. VS ANGLE ROT.
TORQUE-ROTATION CURVES GENERATED INTERNALLY

CURVE 1	NUM OF POINTS 19	TORS.MOMEN, KN/ M	ROT. ANGLE,Rad.
1	1	-450.157	-0.21891
2	2	-463.215	-0.15477
3	3	-469.744	-0.12269
4	4	-481.040	-0.0981845
5	5	-442.687	-0.0854561
6	6	-294.321	-0.0490322
7	7	-223.743	-0.0348213
8	8	-79.6354	-0.0111390
9	9	-8.31445	-1.14956E-03
10	10	0.00000	0.00000
11	11	8.31445	1.14956E-03
12	12	79.6354	0.0111390
13	13	223.743	0.0348213
14	14	294.321	0.0490322
15	15	442.687	0.0854561
16	16	481.040	0.0981845
17	17	469.744	0.12269
18	18	463.215	0.15477
19	19	450.157	0.21891

***** COMPUTATION RESULTS *****

New Group

***** LOAD CASES RESULTS *****

LOAD CASE : 1

CASE NAME : Load Case
LOAD TYPE : Dead, DL

* TABLE L * COMPUTATION ON PILE CAP

* EQUIVALENT CONC. LOAD AT ORIGIN *

VERT. LOAD, KN	HOR. LOAD Y, KN	HOR. LOAD Z, KN
1112.06	178.819	91.6334
MOMENT X, M- KN	MOMENT Y, M- KN	MOMENT Z, M- KN
0.00000	0.00000	0.00000

* DISPLACEMENT OF GROUPED PILE FOUNDATION AT ORIGIN *

VERTICAL, M	HORIZONTAL Y, M	HORIZONTAL Z, M
2.03986E-03	0.0264770	-5.43389E-03
ANGLE ROT. X, RAD	ANGLE ROT. Y, RAD	ANGLE ROT. Z, RAD
4.00346E-04	-3.02859E-03	-7.34503E-07

NUMBER OF GLOBAL ITERATIONS = 3

* TABLE M * COMPUTATION ON INDIVIDUAL PILE

* PILE GROUP * 1

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
5.2322E-04	2.6277E-02	-6.7150E-03	4.0035E-04	-3.0286E-03	-7.3450E-07
FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM. X, KN-M	MOM. Y, KN-M	MOM. Z, KN-M
184.52	29.809	5.2211	4.1750E-15	-68.185	0.0000

STR, KN/ M**2
6.9614E+04

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
5.2322E-04	2.6277E-02	-6.7150E-03	4.0035E-04	-3.0286E-03	-7.3450E-07
AXIAL, KN	LAT. Y, KN	LAT. Z, KN	MOM. X, KN-M	MOM. Y, KN-M	MOM. Z, KN-M
184.52	29.809	5.2211	0.0000	-68.185	0.0000

STR, KN/ M**2
6.9614E+04

* EFFECTS FOR Laterally Loaded Pile *

X	DEFLECTION		BENDING MOMENT		SHEAR FORCE		SOIL REACTION		TOTAL STRESS		FLEXURAL RIGIDITY	
	Y-DIR	Z-DIR	Y-DIR	Z-DIR	Y-DIR	Z-DIR	Y-DIR	Z-DIR	KN/MP**2	KN/MP**2	KN- MP**2	KN- MP**2
0.0000	2.6277E-02	-6.7150E-03	-68.185	29.809	5.2211	0.0000	0.0000	0.0000	6.9614E+04	3.1740E+04	8.6597E+04	
0.2400	2.4182E-02	-6.0107E-03	-67.062	29.809	5.2211	0.0000	0.0000	0.0000	7.1340E+04	3.1740E+04	8.6597E+04	
0.4800	2.2101E-02	-5.3510E-03	-65.930	29.809	5.2211	0.0000	0.0000	0.0000	7.7998E+04	3.1740E+04	8.6597E+04	
0.7200	2.0047E-02	-4.7352E-03	-64.791	29.809	5.2211	0.0000	0.0000	0.0000	8.8338E+04	3.1740E+04	8.6597E+04	
0.9600	1.8034E-02	-4.1625E-03	-63.644	29.809	5.2211	0.0000	0.0000	0.0000	1.0111E+05	3.1740E+04	8.6597E+04	
1.2000	1.6073E-02	-3.6321E-03	-62.488	29.809	5.2211	0.0000	0.0000	0.0000	1.1542E+05	3.1740E+04	8.6597E+04	
1.4400	1.4186E-02	-3.1433E-03	-61.325	29.809	5.2211	0.0000	0.0000	0.0000	1.3071E+05	3.1740E+04	8.6597E+04	
1.6800	1.2378E-02	-2.6933E-03	-60.155	29.809	5.2211	0.0000	0.0000	0.0000	1.4664E+05	3.1740E+04	8.6597E+04	
1.9200	1.0666E-02	-2.2872E-03	-58.977	29.504	5.2865	5.0770	-1.0887	0.0000	1.6298E+05	3.1740E+04	8.6597E+04	
2.1600	9.0627E-03	-1.9184E-03	-57.722	26.526	5.9197	19.104	-4.0441	0.0000	1.7883E+05	3.1740E+04	8.6597E+04	
2.4000	7.5813E-03	-1.5880E-03	-56.233	23.248	6.7248	28.354	-7.3122	0.0000	1.9229E+05	3.1740E+04	8.6597E+04	
2.6400	6.2327E-03	-1.2950E-03	-54.200	20.764	7.7620	35.182	-6.9567	0.0000	2.0201E+05	3.1740E+04	8.6597E+04	
2.8800	5.0246E-03	-1.0381E-03	-52.150	18.287	8.9155	40.408	-6.2710	0.0000	2.0720E+05	3.1740E+04	8.6597E+04	
3.1200	3.9617E-03	-8.1593E-04	-49.485	-3.3632	12.133	34.213	-7.0464	0.0000	2.0557E+05	3.1740E+04	8.6597E+04	
3.3600	3.0444E-03	-6.2564E-04	-46.409	-11.244	13.736	31.260	-6.4343	0.0000	2.0322E+05	3.1740E+04	8.6597E+04	
3.6000	2.2701E-03	-4.6819E-04	-42.957	-18.252	13.199	27.014	-5.3715	0.0000	1.9454E+05	3.1740E+04	8.6597E+04	
3.8400	1.6323E-03	-3.3831E-04	-39.180	-24.150	16.418	22.089	-4.5780	0.0000	1.8210E+05	3.1740E+04	8.6597E+04	
4.0800	1.1222E-03	-2.3448E-04	-35.134	-28.842	17.394	17.018	-3.5556	0.0000	1.6657E+05	3.1740E+04	8.6597E+04	
4.3200	7.2832E-04	-1.5400E-04	-30.879	-32.345	18.130	12.233	-2.5866	0.0000	1.4864E+05	3.1740E+04	8.6597E+04	
4.5600	4.3739E-04	-9.4062E-05	-26.471	-34.769	18.646	8.0602	-1.7334	0.0000	1.2898E+05	3.1740E+04	8.6597E+04	
4.8000	2.3489E-04	-5.1725E-05	-21.959	-36.288	18.976	4.7120	-1.0376	0.0000	1.0815E+05	3.1740E+04	8.6597E+04	
5.0400	1.0541E-04	-2.3991E-05	-17.384	-37.114	19.160	2.2865	-0.5204	0.0000	8.6645E+04	3.1740E+04	8.6597E+04	
5.2800	3.2972E-05	-7.8198E-06	-12.777	-37.467	19.344	0.7690	-0.1824	0.0000	6.4788E+04	3.1740E+04	8.6597E+04	
5.5200	1.3609E-06	-1.4621E-07	-8.1563	-38.312	19.344	-76.462	-27.571	0.0000	4.2804E+04	3.1740E+04	8.6597E+04	
5.7600	-5.8393E-06	2.1055E-06	-3.7309	-28.787	15.803	-0.4629	-0.1525	0.0000	2.1609E+04	3.1740E+04	8.6597E+04	
6.0000	-3.8204E-06	1.8096E-06	-0.1319	-10.872	8.4923	-64.465	-30.536	0.0000	1.0383E+04	3.1740E+04	8.6597E+04	
6.2400	-1.1408E-06	9.1242E-07	0.4368	-10.872	2.4659	-23.562	18.845	0.0000	1.1863E+04	3.1740E+04	8.6597E+04	
6.4800	1.8371E-08	2.6065E-07	0.5480	2.0494	-0.4993	0.4489	6.3684	0.0000	1.1028E+04	3.1740E+04	8.6597E+04	
6.7200	1.8016E-07	-1.8518E-08	0.3408	1.1851	-1.1071	5.0827	-0.5224	0.0000	1.0042E+04	3.1740E+04	8.6597E+04	
6.9600	9.9112E-08	-6.9758E-08	0.1094	0.2429	-0.7188	2.5310	-2.2317	9730.7	9730.7	3.1740E+04	8.6597E+04	
7.2000	5.9792E-09	-4.2902E-08	-3.0844E-03	-7.5310E-02	0.2506	0.3427	-1.5347	9689.4	9689.4	3.1740E+04	8.6597E+04	
7.4400	-6.2189E-09	-1.3662E-08	-2.5590E-02	-6.8876E-02	-0.1339E-03	-0.2460	-0.5403	9647.1	9647.1	3.1740E+04	8.6597E+04	
7.6800	-3.5206E-09	-1.4819E-10	-1.6272E-02	-1.2575E-02	5.1732E-02	-6.1339E-02	-6.4712E-03	9629.7	9629.7	3.1740E+04	8.6597E+04	
7.9200	-5.4287E-10	2.5543E-09	5.0887E-03	2.912E-03	3.4224E-02	3.4224E-02	-2.4420E-02	9620.8	9620.8	3.1740E+04	8.6597E+04	
8.1600	2.2255E-10	1.5968E-09	2.7747E-03	2.9705E-03	1.0996E-02	1.0996E-02	7.1835E-02	9616.4	9616.4	3.1740E+04	8.6597E+04	
8.4000	1.4560E-10	4.8568E-10	2.9785E-07	8.0651E-04	1.2377E-04	1.2377E-04	2.1855E-02	9616.3	9616.3	3.1740E+04	8.6597E+04	
8.6400	2.6385E-11	-1.1027E-11	5.1147E-05	6.0999E-04	-2.0533E-03	-3.4972E-03	-4.5366E-03	9615.9	9615.9	3.1740E+04	8.6597E+04	
8.8800	-7.7716E-12	-1.0081E-10	1.8555E-05	-1.837E-04	1.2845E-03	-3.4972E-03	-4.5366E-03	9615.5	9615.5	3.1740E+04	8.6597E+04	
9.1200	-5.9709E-12	-5.9754E-11	6.4544E-07	-3.5741E-05	-3.9097E-04	-2.6869E-04	-2.6869E-04	9615.4	9615.4	3.1740E+04	8.6597E+04	
9.3600	-1.2436E-12	-1.7163E-11	-3.9455E-05	1.1231E-06	8.7019E-06	-5.5961E-05	-7.7234E-05	9615.4	9615.4	3.1740E+04	8.6597E+04	
9.6000	2.5988E-13	3.0342E-12	-7.9589E-07	2.7793E-06	8.1048E-05	1.1699E-05	4.6337E-05	9615.4	9615.4	3.1740E+04	8.6597E+04	
9.8400	2.4228E-13	3.9594E-12	-6.3520E-06	1.5635E-06	4.8065E-05	1.0925E-05	1.7017E-04	9615.4	9615.4	3.1740E+04	8.6597E+04	
10.0800	5.7232E-14	2.2331E-12	5.1133E-07	1.4429E-06	1.3788E-05	2.5754E-06	1.0049E-04	9613.4	9613.4	3.1740E+04	8.6597E+04	
10.3200	-8.1984E-15	6.0618E-13	1.5314E-06	-1.8194E-07	-8.9672E-07	-3.6893E-07	-3.6893E-07	9613.4	9613.4	3.1740E+04	8.6597E+04	
10.5600	-9.8532E-15	-6.7396E-14	8.1509E-07	-6.6525E-08	3.2550E-06	-4.4339E-07	-3.0328E-06	9613.4	9613.4	3.1740E+04	8.6597E+04	
10.8000	-2.3248E-15	-1.9156E-13	1.8553E-07	-2.3898E-09	-1.6563E-06	-1.0461E-07	-8.6200E-06	9615.4	9615.4	3.1740E+04	8.6597E+04	
11.0400	1.5903E-15	-1.7167E-13	3.2452E-08	3.3878E-09	-1.2000E-07	2.5445E-09	-2.7467E-07	9615.4	9615.4	3.1740E+04	8.6597E+04	
11.2800	2.8082E-15	-1.2954E-13	1.1109E-08	2.4959E-09	-6.1845E-08	4.4931E-09	-2.0727E-07	9615.4	9615.4	3.1740E+04	8.6597E+04	
11.5200	2.6224E-15	-1.7952E-14	1.6600E-10	1.4319E-09	-2.1620E-08	4.1959E-09	-1.2725E-07	9615.4	9615.4	3.1740E+04	8.6597E+04	
11.7600	1.8864E-15	-2.8107E-14	-4.6605E-10	5.5980E-10	-9.5459E-10	3.0183E-09	-4.4971E-08	9615.4	9615.4	3.1740E+04	8.6597E+04	
12.0000	1.0265E-15	2.3113E-14	4.7439E-24	2.1718E-24	-3.1440E-24	1.6424E-09	3.6981E-08	9615.4	9615.4	3.1740E+04	8.6597E+04	

NUMBER OF ITERATIONS IN LLP = 3

* PILE GROUP * 2

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

DISP_X, M 5.2416E-04
 DISP_Y, M 2.6277E-02
 DISP_Z, M -6.2026E-03
 ROT_X, RAD 4.0035E-04
 ROT_Y, RAD -3.0286E-03
 ROT_Z, RAD -7.3450E-07
 FOR_X, KN 184.85
 FOR_Y, KN 29.806
 FOR_Z, KN 9.2533
 MOM_X, KN-M 4.7764E-15
 MOM_Y, KN-M -78.007
 MOM_Z, KN-M 0.0000
 STR, KN/M**2 7.8274E+04

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP_X, M 5.2416E-04
 DISP_Y, M 2.6277E-02
 DISP_Z, M -6.2026E-03
 ROT_X, RAD 4.0035E-04
 ROT_Y, RAD -3.0286E-03
 ROT_Z, RAD -7.3450E-07
 AXIAL, KN 184.85
 LAT, KN 29.806
 LAT, KN 9.2533
 MOM X, KN-M 0.0000
 MOM Y, KN-M -78.007
 MOM Z, KN-M 0.0000
 STR, KN/M**2 7.8274E+04

* EFFECTS FOR Laterally Loaded Pile *

X	Y-DIR	DEFLECTION	Z-DIR	BENDING MOMENT	Y-DIR	SHEAR FORCE	Z-DIR	SOIL REACTION	Y-DIR	Z-DIR	TOTAL STRESS	FLEXURAL RIGIDITY
M	M	M	M	KN/M	KN	KN	KN	KN/M	KN/M	KN/M	KN/M**2	KN-M**2
0.0000	2.6277E-02	-6.2026E-03	0.0000	-78.007	29.806	9.2633	0.0000	0.0000	0.0000	0.0000	7.8274E+04	8.6597E+04
0.2400	2.4182E-02	-5.5015E-03	0.2400	-75.916	29.806	9.2533	0.0000	0.0000	0.0000	0.0000	7.8844E+04	8.6597E+04
0.4800	2.2101E-02	-4.8509E-03	0.4800	-73.815	29.806	9.2533	0.0000	0.0000	0.0000	0.0000	8.3993E+04	8.6597E+04
0.7200	2.0047E-02	-4.2494E-03	0.7200	-71.706	29.806	9.2533	0.0000	0.0000	0.0000	0.0000	9.2869E+04	8.6597E+04
0.9600	1.8034E-02	-3.6956E-03	0.9600	-69.587	29.806	9.2533	0.0000	0.0000	0.0000	0.0000	1.0442E+05	8.6597E+04
1.2000	1.6076E-02	-3.1880E-03	1.2000	-67.460	29.806	9.2533	0.0000	0.0000	0.0000	0.0000	1.1778E+05	8.6597E+04
1.4400	1.4186E-02	-2.7254E-03	1.4400	-65.325	29.806	9.2533	0.0000	0.0000	0.0000	0.0000	1.3334E+05	8.6597E+04
1.6800	1.2328E-02	-2.3062E-03	1.6800	-63.182	29.806	9.2533	0.0000	0.0000	0.0000	0.0000	1.4771E+05	8.6597E+04
1.9200	1.0666E-02	-1.9290E-03	1.9200	-61.031	29.502	9.3084	5.0770	-0.9182	0.0000	0.0000	1.6562E+05	8.6597E+04
2.1600	9.0626E-03	-1.5925E-03	2.1600	-58.813	26.524	9.8771	19.104	-3.3569	0.0000	0.0000	1.7914E+05	8.6597E+04
2.4000	7.5812E-03	-1.2950E-03	2.4000	-56.398	20.762	10.834	28.354	-4.8433	0.0000	0.0000	1.9235E+05	8.6597E+04
2.6400	6.2326E-03	-1.0350E-03	2.6400	-53.700	13.285	13.285	33.481	-5.5602	0.0000	0.0000	2.0188E+05	8.6597E+04
2.8800	5.0246E-03	-8.1076E-04	2.8800	-50.677	4.9984	13.449	35.192	-5.6786	0.0000	0.0000	2.0692E+05	8.6597E+04
3.1200	3.9616E-03	-6.2020E-04	3.1200	-47.323	-3.3651	14.779	34.212	-5.3560	0.0000	0.0000	2.0718E+05	8.6597E+04
3.3600	3.0444E-03	-4.6110E-04	3.3600	-43.655	-11.246	15.993	31.260	-4.7345	0.0000	0.0000	2.0275E+05	8.6597E+04
3.6000	2.2700E-03	-3.3102E-04	3.6000	-39.710	-18.253	17.036	27.013	-3.9391	0.0000	0.0000	1.9400E+05	8.6597E+04
3.8400	1.6332E-03	-2.2735E-04	3.8400	-35.534	-24.152	17.878	22.088	-3.0765	0.0000	0.0000	1.8151E+05	8.6597E+04
4.0800	1.1222E-03	-1.4730E-04	4.0800	-31.175	-28.843	18.514	17.017	-2.2337	0.0000	0.0000	1.6594E+05	8.6597E+04
4.3200	7.2829E-04	-8.7988E-05	4.3200	-26.684	-32.346	18.958	12.232	-1.4778	0.0000	0.0000	1.4798E+05	8.6597E+04
4.5600	4.3737E-04	-4.6419E-05	4.5600	-22.104	-34.770	19.236	8.0598	-0.8554	0.0000	0.0000	1.2830E+05	8.6597E+04
4.8000	2.3488E-04	-1.9551E-05	4.8000	-17.472	-36.289	19.383	4.7117	-0.3922	0.0000	0.0000	1.0747E+05	8.6597E+04
5.0400	1.0540E-04	-4.3025E-06	5.0400	-12.814	-37.115	19.439	2.2863	-9.3330E-02	0.0000	0.0000	8.5964E+04	8.6597E+04
5.2800	3.2967E-05	-2.4228E-06	5.2800	-8.1483	-37.468	19.441	0.7689	5.6509E-02	0.0000	0.0000	6.4120E+04	8.6597E+04
5.5200	1.3593E-06	-3.7282E-06	5.5200	-3.4847	-38.312	17.344	12.662	34.728	0.0000	0.0000	4.2179E+04	8.6597E+04
5.7600	-5.8394E-06	-2.6325E-06	5.7600	0.8043	-38.785	8.7308	-76.464	34.471	0.0000	0.0000	2.1171E+04	8.6597E+04
6.0000	-3.8201E-06	-1.2166E-06	6.0000	0.1317	-10.870	2.0364	-64.460	20.528	0.0000	0.0000	1.0432E+04	8.6597E+04
6.2400	-1.1407E-06	-3.0651E-07	6.2400	-0.9226	-0.3660	-1.1155	-23.559	6.3506	0.0000	0.0000	1.0369E+04	8.6597E+04
6.4800	1.8412E-08	-5.8003E-08	6.4800	0.4617	2.0494	-1.5972	0.4499	-1.4172	0.0000	0.0000	1.1069E+04	8.6597E+04
6.7200	1.8015E-07	-1.1203E-07	6.7200	-0.11265	0.1850	-0.9804	5.0826	-2.0944	0.0000	0.0000	9960.8	8.6597E+04
6.9600	1.9105E-08	-6.5466E-08	6.9600	-9.8591E-03	0.2429	1.5101E-02	0.3426	-2.0944	0.0000	0.0000	9696.8	8.6597E+04
7.2000	9.5765E-09	-2.0447E-08	7.2000	-3.9596E-02	-7.5317E-02	1.5101E-02	-0.0260	-0.7314	0.0000	0.0000	9714.5	8.6597E+04
7.4400	6.2190E-09	-1.4851E-11	7.4400	-2.4698E-02	-6.8872E-02	7.8837E-02	-0.2460	-5.8736E-04	0.0000	0.0000	9663.8	8.6597E+04
7.6800	3.5203E-09	-3.9924E-09	7.6800	-3.9537E-04	-1.7573E-02	5.2305E-02	-0.1525	0.1730	0.0000	0.0000	9639.5	8.6597E+04
7.9200	-5.4255E-10	-2.4569E-09	7.9200	-1.3072E-03	2.2916E-03	1.6675E-02	1.0015E-02	3.3087E-02	0.0000	0.0000	9635.8	8.6597E+04
8.1600	2.2566E-10	-4.2798E-04	8.1600	-1.3072E-04	2.8706E-03	3.1800E-05	1.6675E-02	3.3087E-02	0.0000	0.0000	9634.4	8.6597E+04
8.4000	1.4529E-10	-2.3526E-11	8.4000	9.3813E-04	8.0640E-04	3.2094E-03	6.5316E-03	-1.0962E-03	0.0000	0.0000	9633.5	8.6597E+04
8.6400	2.6580E-11	-1.5733E-10	8.6400	2.7283E-04	-6.1088E-04	-1.9764E-03	1.1871E-03	-7.0797E-03	0.0000	0.0000	9632.9	8.6597E+04
8.8800	-7.7722E-12	-9.1866E-11	8.8800	1.8553E-05	-1.4171E-05	-1.1836E-04	-3.4975E-04	-4.1340E-03	0.0000	0.0000	9632.7	8.6597E+04

Pier_gp80

9.1200	-5.9705E-12	-2.5934E-11	6.4488E-07	-6.1529E-05	-3.5737E-05	1.9334E-05	-2.6867E-04	-1.1670E-03	9632.7	3.1740E+04	8.6597E+04
9.3600	-1.2434E-12	1.8675E-12	-1.9779E-06	-3.5029E-05	1.1241E-06	1.2648E-04	-5.5951E-05	8.4036E-05	9632.7	3.1740E+04	8.6597E+04
9.6000	2.6001E-13	6.1682E-12	-7.9582E-07	-9.5902E-06	4.6699E-06	7.3002E-05	1.1700E-05	2.7757E-04	9632.7	3.1740E+04	8.6597E+04
9.8400	2.4277E-13	3.4232E-12	-5.3416E-08	8.9470E-07	1.3633E-06	2.0876E-05	1.0923E-05	1.5413E-04	9632.7	3.1740E+04	8.6597E+04
10.0800	5.7233E-14	9.0822E-13	7.5464E-08	2.4053E-06	1.1383E-08	-1.4958E-06	2.5751E-06	4.0870E-05	9632.7	3.1740E+04	8.6597E+04
10.3200	-8.1999E-15	-1.0672E-13	3.3812E-08	1.3024E-06	-1.8193E-07	-4.9566E-06	-3.6899E-07	-4.8023E-06	9632.7	3.1740E+04	8.6597E+04
10.5600	9.8524E-15	-2.4387E-13	3.4631E-09	3.3557E-07	-6.6518E-08	-2.7302E-06	-4.4337E-07	-1.0974E-05	9632.7	3.1740E+04	8.6597E+04
10.8000	-2.3244E-15	-1.3153E-13	-2.3678E-09	-3.5358E-08	-2.3878E-09	-6.6403E-07	-1.0460E-07	-5.9189E-06	9632.7	3.1740E+04	8.6597E+04
11.0400	1.5904E-15	-2.8541E-14	-1.4771E-09	-6.1551E-08	3.3877E-09	9.3520E-08	2.5447E-09	-4.5666E-08	9632.7	3.1740E+04	8.6597E+04
11.2800	2.8081E-15	3.3617E-14	-7.5726E-10	-3.8614E-08	2.4958E-09	9.1747E-08	4.4930E-09	5.3788E-08	9632.7	3.1740E+04	8.6597E+04
11.5200	2.6223E-15	6.9963E-14	-2.8806E-10	-1.8622E-08	1.4318E-09	7.1413E-08	4.1957E-09	1.1194E-07	9632.7	3.1740E+04	8.6597E+04
11.7600	1.8863E-15	9.3655E-14	-5.7423E-11	-7.0057E-09	5.5975E-10	3.9825E-08	3.0181E-09	1.4985E-07	9632.7	3.1740E+04	8.6597E+04
12.0000	1.0264E-15	1.1366E-13	-4.3470E-13	7.5903E-23	-4.5223E-23	2.7702E-22	1.6422E-09	1.8185E-07	9632.7	3.1740E+04	8.6597E+04

NUMBER OF ITERATIONS IN LLP = 3

* PILE GROUP * 3

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
5.2510E-04	2.6277E-02	-5.6901E-03	4.0035E-04	-3.0286E-03	-7.3450E-07
FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
185.18	29.804	13.285	5.3778E-15	-87.829	0.0000

STR. KN/ M**2
8.6934E+04

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
5.2510E-04	2.6277E-02	-5.6901E-03	4.0035E-04	-3.0286E-03	-7.3450E-07
AXIAL, KN	LAT. Y, KN	LAT. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
185.18	29.804	13.285	0.0000	-87.829	0.0000

STR. KN/ M**2
8.6934E+04

* EFFECTS FOR LATERALLY LOADED PILE *

X	DEFLECTION	BENDING MOMENT	SHEAR FORCE	SOIL REACTION	TOTAL STRESS	FLEXURAL RIGIDITY
M	Y-DIR	Z-DIR	Y-DIR	Y-DIR	KN/ M**2	KN- M**2
0.0000	2.6277E-02	0.0000	29.804	0.0000	8.6934E+04	3.1740E+04
0.2400	2.4182E-02	7.5409	29.804	0.0000	8.6408E+04	3.1740E+04
0.4800	2.2101E-02	15.079	29.804	0.0000	9.0142E+04	3.1740E+04
0.7200	2.0047E-02	22.613	29.804	0.0000	9.7589E+04	3.1740E+04
0.9600	1.8034E-02	30.138	29.804	0.0000	1.0790E+05	3.1740E+04
1.2000	1.6076E-02	37.654	29.804	0.0000	1.2026E+05	3.1740E+04
1.4400	1.4186E-02	45.157	29.804	0.0000	1.3404E+05	3.1740E+04
1.6800	1.2378E-02	52.645	29.804	0.0000	1.4882E+05	3.1740E+04
1.9200	1.0666E-02	60.115	29.500	5.0769	1.6428E+05	3.1740E+04
2.1600	9.0656E-03	67.235	26.522	19.104	1.7945E+05	3.1740E+04
2.4000	7.5812E-03	73.250	26.522	28.354	1.9241E+05	3.1740E+04
2.6400	6.2325E-03	77.622	13.283	33.481	2.0175E+05	3.1740E+04

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD	FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
2.8800	5.0245E-03	-5.8340E-04	80.051	-49.205	4.9964	16.490	35.192	-4.0861	2.0665E+05	3.1740E+04	8.6597E+04
3.1200	3.9616E-03	-4.2446E-04	80.437	-45.161	3.3669	17.424	-3.6657	2.0881E+05	2.0665E+04	3.1740E+04	8.6597E+04
3.3600	3.0433E-03	-2.9555E-04	78.831	-40.902	-1.1248	18.230	-3.0348	1.9330E+05	2.0665E+04	3.1740E+04	8.6597E+04
3.6000	2.2700E-03	-1.9385E-04	75.404	-36.463	-18.255	18.872	-2.7015	1.9330E+05	2.0665E+04	3.1740E+04	8.6597E+04
3.8400	1.6323E-03	-1.1638E-04	70.398	-31.887	-24.153	19.337	-2.2088	1.8097E+05	2.0665E+04	3.1740E+04	8.6597E+04
4.0800	1.1222E-03	-6.0128E-05	64.096	-27.216	-28.844	19.634	-1.7016	1.6538E+05	2.0665E+04	3.1740E+04	8.6597E+04
4.3200	7.2826E-04	-2.1973E-05	56.792	-22.479	-32.347	19.825	-1.2232	1.4742E+05	2.0665E+04	3.1740E+04	8.6597E+04
4.5600	4.3735E-04	-1.2242E-06	48.761	-17.737	-34.771	19.825	2.2559E-02	1.2775E+05	2.0665E+04	3.1740E+04	8.6597E+04
4.8000	2.3486E-04	-1.2624E-05	40.247	-12.984	-36.290	19.790	4.7114	0.2532	1.0695E+05	3.1740E+04	8.6597E+04
5.0400	1.0539E-04	-1.5386E-05	31.445	-8.2430	-37.115	19.717	2.2861	0.3338	8.5490E+04	3.1740E+04	8.6597E+04
5.2800	3.2962E-05	-1.2665E-05	22.498	-3.5199	-37.469	19.640	0.7688	0.2954	6.3750E+04	3.1740E+04	8.6597E+04
5.5200	1.3576E-06	-1.7602E-06	15.495	-1.1869	-38.312	15.344	12.646	70.817	4.2066E+04	3.1740E+04	8.6597E+04
5.7600	-5.8395E-06	-3.1595E-06	4.8036	3.0160	-28.783	1.6590	-76.465	41.372	2.1844E+04	3.1740E+04	8.6597E+04
6.0000	-3.8199E-06	-6.2347E-07	0.1315	2.4631	-10.869	-4.4195	-64.456	10.520	1.1840E+04	3.1740E+04	8.6597E+04
6.2400	-1.1405E-06	-2.9939E-07	-0.9226	1.2490	-0.3655	-4.6969	-23.556	-6.1835	1.2123E+04	3.1740E+04	8.6597E+04
6.4800	1.8453E-08	-3.7665E-07	-0.5479	0.3403	2.0493	-2.6951	0.4509	-9.2027	1.0999E+04	3.1740E+04	8.6597E+04
6.7200	1.8015E-07	-2.0554E-07	-0.1265	-6.1096E-02	1.1849	5.6776E-02	5.0825	-5.7987	9958.3	3.1740E+04	8.6597E+04
6.9600	7.9097E-08	-6.1174E-08	2.6484E-02	-0.1291	-7.5324E-02	0.2428	2.5305	-1.9571	9780.1	3.1740E+04	8.6597E+04
7.2000	9.5738E-09	-2.0075E-09	3.0841E-02	-7.7254E-02	-6.8868E-02	0.2536	0.3425	7.1813E-02	9750.5	3.1740E+04	8.6597E+04
7.4400	-6.2192E-09	1.3632E-08	9.3046E-03	-2.3803E-02	8.3608E-04	0.1638	-0.2460	0.5392	9681.1	3.1740E+04	8.6597E+04
7.6800	-3.5200E-09	8.1329E-09	-3.9564E-04	8.5608E-04	1.2570E-02	5.2878E-02	-0.1525	0.3524	9651.1	3.1740E+04	8.6597E+04
7.9200	-5.4244E-10	2.3596E-09	-1.3071E-03	5.3248E-03	2.821E-03	8.7319E-04	-2.4410E-02	0.1062	9655.6	3.1740E+04	8.6597E+04
8.1600	2.2237E-10	-1.2623E-10	-4.2793E-04	3.1032E-03	2.9702E-03	-1.0933E-02	1.0016E-02	-5.6811E-03	9652.9	3.1740E+04	8.6597E+04
8.4000	1.4538E-10	-5.3440E-10	3.2281E-07	8.7400E-04	8.0630E-04	-6.5425E-03	6.5511E-03	-2.4048E-02	9650.7	3.1740E+04	8.6597E+04
8.6400	2.6375E-11	-3.0362E-10	5.1144E-05	-6.4324E-05	-6.1110E-05	-1.8996E-03	1.8699E-03	-1.3663E-02	9650.1	3.1740E+04	8.6597E+04
8.8800	-7.7777E-12	-8.2920E-11	1.8551E-05	-2.0872E-04	-1.1836E-04	1.0069E-04	-3.4977E-04	-3.7314E-03	9650.1	3.1740E+04	8.6597E+04
9.1200	-5.9702E-12	7.8868E-12	6.4432E-07	-1.1568E-04	-3.5732E-05	4.2963E-04	-2.6866E-04	3.5491E-04	9650.0	3.1740E+04	8.6597E+04
9.3600	-1.2432E-12	2.0898E-11	1.9779E-06	3.0602E-05	1.1251E-06	2.4426E-04	-5.5942E-05	9.4041E-04	9650.0	3.1740E+04	8.6597E+04
9.6000	2.6004E-13	1.1302E-11	7.9574E-07	3.6118E-06	4.6697E-06	6.6756E-05	1.1702E-05	5.0860E-04	9649.9	3.1740E+04	8.6597E+04
9.8400	5.7215E-14	2.8909E-12	5.3391E-08	8.4133E-06	1.3631E-06	6.3175E-06	1.0924E-05	1.3009E-04	9649.9	3.1740E+04	8.6597E+04
10.0800	5.7215E-14	4.1662E-13	7.5463E-08	4.0793E-06	1.3336E-06	-1.6779E-06	2.5747E-06	-1.8748E-05	9649.9	3.1740E+04	8.6597E+04
10.3200	-8.2013E-15	-8.1961E-13	3.8099E-08	1.0734E-06	-1.8193E-07	-9.0164E-06	-3.6906E-07	-3.6882E-05	9649.9	3.1740E+04	8.6597E+04
10.5600	-9.8522E-15	-4.2033E-13	3.4621E-09	-1.4394E-07	-6.6511E-08	-2.2054E-06	-4.4335E-07	-1.8915E-05	9649.9	3.1740E+04	8.6597E+04
10.8000	-2.3240E-15	-7.1506E-14	-2.3678E-09	-2.5624E-07	-3.3858E-09	3.2826E-07	-1.0458E-07	-3.2178E-06	9649.9	3.1740E+04	8.6597E+04
11.0400	1.5905E-15	1.1459E-13	-1.4770E-09	1.5555E-07	3.3878E-09	3.0704E-07	2.5448E-09	1.8334E-07	9649.9	3.1740E+04	8.6597E+04
11.2800	2.8081E-15	1.9678E-13	7.5722E-10	-8.8336E-08	2.4957E-09	2.4534E-07	4.4929E-09	3.1484E-07	9649.9	3.1740E+04	8.6597E+04
11.5200	2.6222E-15	2.1945E-13	-2.8804E-10	3.8905E-08	1.4317E-09	1.6445E-07	4.1955E-09	3.5113E-07	9649.9	3.1740E+04	8.6597E+04
11.7600	1.8862E-15	2.1541E-13	-5.7418E-11	-9.5453E-09	5.5971E-10	8.0604E-08	3.0179E-09	3.4466E-07	9649.9	3.1740E+04	8.6597E+04
12.0000	1.0263E-15	2.0420E-13	4.3470E-11	-1.5181E-11	5.9458E-10	-2.8874E-11	1.6420E-09	3.2672E-07	9649.9	3.1740E+04	8.6597E+04

Pter. gp80

NUMBER OF ITERATIONS IN LLP = 3

* PILE GROUP * 4

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD	FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
5.2601E-04	2.6277E-02	-5.1937E-03	4.0035E-04	-3.0286E-03	-7.3450E-07						
185.50	29.802	17.191	5.9604E-15	-97.344	0.0000						

STR. KN/ M**2
9.5324E+04

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
5.2601E-04	2.6277E-02	-5.1937E-03	4.0035E-04	-3.0286E-03	-7.3450E-07

AXIAL, KN 185.50 LAT, Y, KN 29.802 LAT, Z, KN 17.191 MOM X, KN-M 0.0000 MOM Y, KN-M 97.344 MOM Z, KN-M 0.0000
 STR, KN/ M**2 9.5324E+04

Pier-gp80
 KN-M 0.0000

NUMBER OF ITERATIONS IN LLP = 3

* EFFECTS FOR Laterally Loaded Pile *

X M	DEFLECTION		BENDING MOMENT		SHEAR FORCE		SOIL REACTION		TOTAL STRESS		FLEXURAL RIGIDITY	
	Y-DIR M	Z-DIR M	Y-DIR KN-M	Z-DIR KN-M	Y-DIR KN	Z-DIR KN	Y-DIR KN/M	Z-DIR KN/M	KN/ M**2	KN/ M	KN- M**2	KN- M**2
0.0000	2.6277E-02	-5.1937E-03	0.0000	-97.344	29.802	17.204	0.0000	0.0000	9.5324E+04	3.1740E+04	8.6597E+04	
0.2400	2.4182E-02	-4.4989E-03	0.2400	-89.347	29.802	17.191	0.0000	0.0000	9.6215E+04	3.1740E+04	8.6597E+04	
0.4800	2.2101E-02	-3.8661E-03	0.4800	-81.580	29.802	17.191	0.0000	0.0000	1.0231E+05	3.1740E+04	8.6597E+04	
0.7200	2.0047E-02	-3.2928E-03	0.7200	-73.819	29.802	17.191	0.0000	0.0000	1.1141E+05	3.1740E+04	8.6597E+04	
0.9600	1.8034E-02	-2.7763E-03	0.9600	-66.058	29.802	17.191	0.0000	0.0000	1.2051E+05	3.1740E+04	8.6597E+04	
1.2000	1.6076E-02	-2.3138E-03	1.2000	-58.297	29.802	17.191	0.0000	0.0000	1.2961E+05	3.1740E+04	8.6597E+04	
1.4400	1.4186E-02	-1.9027E-03	1.4400	-50.536	29.802	17.191	0.0000	0.0000	1.3871E+05	3.1740E+04	8.6597E+04	
1.6800	1.2378E-02	-1.5403E-03	1.6800	-42.775	29.802	17.191	0.0000	0.0000	1.4781E+05	3.1740E+04	8.6597E+04	
1.9200	1.0666E-02	-1.2238E-03	1.9200	-35.014	29.802	17.191	0.0000	0.0000	1.5691E+05	3.1740E+04	8.6597E+04	
2.1600	9.0625E-03	-9.5069E-04	2.1600	-27.253	29.802	17.191	0.0000	0.0000	1.6601E+05	3.1740E+04	8.6597E+04	
2.4000	7.5811E-03	-7.1809E-04	2.4000	-19.492	29.802	17.191	0.0000	0.0000	1.7511E+05	3.1740E+04	8.6597E+04	
2.6400	6.2325E-03	-5.2321E-04	2.6400	-11.731	29.802	17.191	0.0000	0.0000	1.8421E+05	3.1740E+04	8.6597E+04	
2.8800	5.0245E-03	-3.6314E-04	2.8800	-4.070	29.802	17.191	0.0000	0.0000	1.9331E+05	3.1740E+04	8.6597E+04	
3.1200	3.9615E-03	-2.3484E-04	3.1200	3.695	29.802	17.191	0.0000	0.0000	2.0241E+05	3.1740E+04	8.6597E+04	
3.3600	3.0443E-03	-1.3519E-04	3.3600	8.330	29.802	17.191	0.0000	0.0000	2.1151E+05	3.1740E+04	8.6597E+04	
3.6000	2.2699E-03	-6.0938E-05	3.6000	13.965	29.802	17.191	0.0000	0.0000	2.2061E+05	3.1740E+04	8.6597E+04	
3.8400	1.6322E-03	-3.8884E-06	3.8400	20.600	29.802	17.191	0.0000	0.0000	2.2971E+05	3.1740E+04	8.6597E+04	
4.0800	1.1221E-03	-2.4321E-05	4.0800	27.235	29.802	17.191	0.0000	0.0000	2.3881E+05	3.1740E+04	8.6597E+04	
4.3200	7.2823E-04	-1.4978E-05	4.3200	33.870	29.802	17.191	0.0000	0.0000	2.4791E+05	3.1740E+04	8.6597E+04	
4.5600	4.3732E-04	-4.7378E-05	4.5600	40.505	29.802	17.191	0.0000	0.0000	2.5701E+05	3.1740E+04	8.6597E+04	
4.8000	2.3485E-04	-4.3792E-05	4.8000	47.140	29.802	17.191	0.0000	0.0000	2.6611E+05	3.1740E+04	8.6597E+04	
5.0400	1.0538E-04	-3.4460E-05	5.0400	53.775	29.802	17.191	0.0000	0.0000	2.7521E+05	3.1740E+04	8.6597E+04	
5.2800	3.2937E-05	-2.2588E-05	5.2800	60.410	29.802	17.191	0.0000	0.0000	2.8431E+05	3.1740E+04	8.6597E+04	
5.5200	1.3561E-06	-1.1356E-05	5.5200	67.045	29.802	17.191	0.0000	0.0000	2.9341E+05	3.1740E+04	8.6597E+04	
5.7600	-5.8396E-06	3.6699E-06	5.7600	73.680	29.802	17.191	0.0000	0.0000	3.0251E+05	3.1740E+04	8.6597E+04	
6.0000	-3.1966E-06	4.8924E-06	6.0000	80.315	29.802	17.191	0.0000	0.0000	3.1161E+05	3.1740E+04	8.6597E+04	
6.2400	-1.1404E-06	-8.8636E-07	6.2400	86.950	29.802	17.191	0.0000	0.0000	3.2071E+05	3.1740E+04	8.6597E+04	
6.4800	1.8493E-08	-6.8534E-07	6.4800	93.585	29.802	17.191	0.0000	0.0000	3.2981E+05	3.1740E+04	8.6597E+04	
6.7200	1.8015E-07	-2.9612E-07	6.7200	100.220	29.802	17.191	0.0000	0.0000	3.3891E+05	3.1740E+04	8.6597E+04	
6.9600	7.9090E-08	-5.7015E-08	6.9600	106.855	29.802	17.191	0.0000	0.0000	3.4801E+05	3.1740E+04	8.6597E+04	
7.2000	9.5712E-09	2.3761E-08	7.2000	113.490	29.802	17.191	0.0000	0.0000	3.5711E+05	3.1740E+04	8.6597E+04	
7.4400	-6.2193E-09	2.6857E-08	7.4400	120.125	29.802	17.191	0.0000	0.0000	3.6621E+05	3.1740E+04	8.6597E+04	
7.6800	-3.5198E-09	1.2144E-08	7.6800	126.760	29.802	17.191	0.0000	0.0000	3.7531E+05	3.1740E+04	8.6597E+04	
7.9200	-5.4232E-10	2.2633E-09	7.9200	133.395	29.802	17.191	0.0000	0.0000	3.8441E+05	3.1740E+04	8.6597E+04	
8.1600	-2.2238E-10	-9.6083E-10	8.1600	140.030	29.802	17.191	0.0000	0.0000	3.9351E+05	3.1740E+04	8.6597E+04	
8.4000	1.4557E-10	-1.0285E-09	8.4000	146.665	29.802	17.191	0.0000	0.0000	4.0261E+05	3.1740E+04	8.6597E+04	
8.6400	2.6370E-11	-4.4535E-10	8.6400	153.300	29.802	17.191	0.0000	0.0000	4.1171E+05	3.1740E+04	8.6597E+04	
8.8800	-7.7733E-12	7.4252E-11	8.8800	160.935	29.802	17.191	0.0000	0.0000	4.2081E+05	3.1740E+04	8.6597E+04	
9.1200	-5.9698E-12	4.0650E-11	9.1200	168.570	29.802	17.191	0.0000	0.0000	4.2991E+05	3.1740E+04	8.6597E+04	
9.3600	-1.2430E-12	3.9334E-11	9.3600	176.205	29.802	17.191	0.0000	0.0000	4.3901E+05	3.1740E+04	8.6597E+04	
9.6000	2.6070E-13	1.6276E-11	9.6000	183.840	29.802	17.191	0.0000	0.0000	4.4811E+05	3.1740E+04	8.6597E+04	
9.8400	2.4274E-13	1.70734E-12	9.8400	191.475	29.802	17.191	0.0000	0.0000	4.5721E+05	3.1740E+04	8.6597E+04	
10.0800	-5.7207E-14	-1.70034E-12	10.0800	199.110	29.802	17.191	0.0000	0.0000	4.6631E+05	3.1740E+04	8.6597E+04	
10.3200	-8.2028E-15	-1.5102E-12	10.3200	206.745	29.802	17.191	0.0000	0.0000	4.7541E+05	3.1740E+04	8.6597E+04	
10.5600	-9.8518E-15	-5.9128E-13	10.5600	214.380	29.802	17.191	0.0000	0.0000	4.8451E+05	3.1740E+04	8.6597E+04	
10.8000	-2.3237E-15	-1.3357E-14	10.8000	222.015	29.802	17.191	0.0000	0.0000	4.9361E+05	3.1740E+04	8.6597E+04	
11.0400	1.59066E-15	5.3324E-13	11.0400	229.650	29.802	17.191	0.0000	0.0000	5.0271E+05	3.1740E+04	8.6597E+04	
11.2800	2.8080E-15	3.5484E-13	11.2800	237.285	29.802	17.191	0.0000	0.0000	5.1181E+05	3.1740E+04	8.6597E+04	
11.5200	6.2211E-15	5.6427E-13	11.5200	244.920	29.802	17.191	0.0000	0.0000	5.2091E+05	3.1740E+04	8.6597E+04	
11.7600	1.8861E-15	3.3337E-13	11.7600	252.555	29.802	17.191	0.0000	0.0000	5.3001E+05	3.1740E+04	8.6597E+04	
12.0000	1.0261E-15	2.9191E-13	12.0000	260.190	29.802	17.191	0.0000	0.0000	5.3911E+05	3.1740E+04	8.6597E+04	

NUMBER OF ITERATIONS IN LLP = 3

* PILE GROUP * 5

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
5.2698E-04	2.6277E-02	-4.6652E-03	4.0035E-04	-3.0286E-03	-7.3450E-07
FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
185.84	29.800	21.338	6.5791E-15	-107.45	0.0000
STR, KN/ M**2					
1.0423E+05					

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M	DISP. Y, M	DISP. Z, M	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
5.2698E-04	2.6277E-02	-4.6652E-03	4.0035E-04	-3.0286E-03	-7.3450E-07
AXIAL, KN	LAT. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M	
185.84	29.800	21.338	0.0000	-107.45	0.0000
STR, KN/ M**2					
1.0423E+05					

* EFFECTS FOR Laterally Loaded Pile *

X M	DEFLECTION		BENDING MOMENT		SHEAR FORCE		SOIL REACTION		TOTAL STRESS KN/ M**2	FLEXURAL RIGIDITY	
	Y-Dir M	Z-Dir M	Y-Dir KN-M	Z-Dir KN-M	Y-Dir KN	Z-Dir KN	Y-Dir KN/ M	Z-Dir KN/ M		Y-Dir KN/ M**2	Z-Dir KN/ M**2
0.0000	2.6277E-02	-4.6652E-03	0.0000	-107.45	29.800	21.338	0.0000	0.0000	1.0423E+05	3.1740E+04	8.6597E+04
0.2400	2.4182E-02	-3.9737E-03	7.5413	-102.46	29.800	21.338	0.0000	0.0000	1.0164E+05	3.1740E+04	8.6597E+04
0.4800	2.2101E-02	-3.3503E-03	15.080	-97.450	29.800	21.338	0.0000	0.0000	1.0276E+05	3.1740E+04	8.6597E+04
0.7200	2.0047E-02	-2.7917E-03	22.614	-92.433	29.800	21.338	0.0000	0.0000	1.0747E+05	3.1740E+04	8.6597E+04
0.9600	1.8034E-02	-2.2946E-03	30.140	-87.404	29.800	21.338	0.0000	0.0000	1.1528E+05	3.1740E+04	8.6597E+04
1.2000	1.6076E-02	-1.8557E-03	37.655	-82.365	29.800	21.338	0.0000	0.0000	1.2555E+05	3.1740E+04	8.6597E+04
1.4400	1.4186E-02	-1.4715E-03	45.159	-77.315	29.800	21.338	0.0000	0.0000	1.3768E+05	3.1740E+04	8.6597E+04
1.6800	1.2378E-02	-1.1387E-03	52.647	-72.256	29.800	21.338	0.0000	0.0000	1.5117E+05	3.1740E+04	8.6597E+04
1.9200	1.0666E-02	-8.5406E-04	60.117	-67.188	29.495	21.362	-0.4065	0.0000	1.6565E+05	3.1740E+04	8.6597E+04
2.1600	9.0625E-03	-6.1407E-04	67.237	-62.086	26.517	21.577	-1.2945	0.0000	1.8010E+05	3.1740E+04	8.6597E+04
2.4000	7.5811E-03	-4.1536E-04	73.252	-56.904	20.755	21.927	-1.5535	0.0000	1.9253E+05	3.1740E+04	8.6597E+04
2.6400	6.2325E-03	-2.5451E-04	77.623	-51.628	13.279	22.283	-1.3672	0.0000	2.0150E+05	3.1740E+04	8.6597E+04
2.8800	5.0245E-03	-1.2799E-04	80.053	-46.267	4.9922	22.558	-0.8964	0.0000	2.0614E+05	3.1740E+04	8.6597E+04
3.1200	3.9615E-03	-3.2239E-05	80.438	-40.849	-3.3710	22.700	-0.2784	0.0000	2.0611E+05	3.1740E+04	8.6597E+04
3.3600	3.0443E-03	3.6339E-05	78.832	-35.411	-11.252	22.688	0.3731	0.0000	2.0149E+05	3.1740E+04	8.6597E+04
3.6000	2.2700E-03	8.1363E-05	75.404	-29.989	-18.259	22.526	0.9682	0.0000	1.9262E+05	3.1740E+04	8.6597E+04
3.8400	1.6325E-03	1.0644E-04	70.397	-24.619	-24.157	22.235	1.4403	0.0000	1.8007E+05	3.1740E+04	8.6597E+04
4.0800	1.1222E-03	1.1513E-04	64.095	-19.329	-28.848	21.850	1.7459	0.0000	1.6450E+05	3.1740E+04	8.6597E+04
4.3200	7.2831E-04	1.1097E-04	56.790	-14.135	-32.351	21.414	1.8638	0.0000	1.4659E+05	3.1740E+04	8.6597E+04
4.5600	4.3741E-04	9.7396E-05	48.759	-9.0471	-34.775	20.972	1.7948	0.0000	1.2701E+05	3.1740E+04	8.6597E+04
4.8000	2.3493E-04	7.7802E-05	40.244	-4.0604	-36.295	20.567	1.5607	0.0000	1.0637E+05	3.1740E+04	8.6597E+04
5.0400	1.0546E-04	5.5504E-05	31.441	0.8372	-37.121	20.234	1.2040	0.0000	8.5169E+04	3.1740E+04	8.6597E+04
5.2800	3.3025E-05	3.3760E-05	22.492	5.6657	-38.275	19.994	0.7703	0.0000	6.3911E+04	3.1740E+04	8.6597E+04
5.5200	1.4026E-06	1.5782E-05	13.488	10.448	-38.275	11.816	134.36	0.0000	4.3346E+04	3.1740E+04	8.6597E+04
5.7600	-5.8206E-06	4.4323E-06	4.8103	9.8685	-28.761	-12.100	58.039	0.0000	2.4132E+04	3.1740E+04	8.6597E+04
6.0000	-3.8168E-06	4.9388E-07	0.1378	5.8462	-10.881	-17.427	-8.3338	0.0000	1.4839E+04	3.1740E+04	8.6597E+04
6.2400	-1.1420E-06	-1.5135E-06	-0.1378	2.8403	-0.1881	-12.082	-31.218	0.0000	1.2387E+04	3.1740E+04	8.6597E+04
6.4800	1.7176E-08	-1.0306E-06	0.09201	0.1276	0.20439	-5.0538	-25.182	0.0000	1.1004E+04	3.1740E+04	8.6597E+04
6.7200	1.7976E-07	-4.0462E-07	-0.1268	0.1462	1.1845	-0.6693	-11.415	0.0000	1.0191E+04	3.1740E+04	8.6597E+04
6.9600	7.9099E-08	-5.7360E-08	2.6294E-02	-0.3729	0.2435	0.8224	-1.8351	0.0000	1.0019E+04	3.1740E+04	8.6597E+04

7.2000 9.6273E-09 4.6244E-08 3.0802E-02 -0.1570 -7.4917E-02 0.3444 1.6542 8.6597E+04
 7.4400 -6.1979E-09 4.1452E-08 9.3145E-03 -2.3843E-02 -6.8799E-02 0.7676 0.3430 8.6597E+04
 7.6800 3.5185E-09 1.6875E-08 3.8648E-04 1.7739E-02 1.7599E-02 -0.2451 -0.1525 8.6597E+04
 7.9200 -5.4418E-10 2.3464E-09 -1.3049E-03 1.5949E-02 2.7222E-03 3.5392E-02 0.7312 8.6597E+04
 8.1600 2.2167E-10 -1.8271E-09 4.2822E-04 6.3562E-03 2.9664E-03 3.3283E-02 0.1056 8.6597E+04
 8.4000 1.4549E-10 -1.5760E-09 4.5873E-08 8.1391E-04 8.0728E-04 -1.3580E-02 9.9753E-03 8.6597E+04
 8.6400 2.6449E-11 -6.1374E-10 5.1045E-05 7.3110E-04 6.0298E-05 -1.8920E-03 6.5470E-03 8.6597E+04
 8.8800 -7.7349E-12 -7.1609E-11 1.8559E-05 6.0643E-04 -1.1818E-04 1.4680E-03 -3.4807E-04 8.6597E+04
 9.1200 -5.9652E-12 7.4881E-11 6.5902E-07 2.4072E-04 3.5765E-05 2.6844E-04 -2.2224E-03 8.6597E+04
 9.3600 -1.2459E-12 5.9836E-11 -1.9735E-06 2.3202E-05 1.0922E-06 4.9390E-04 -5.6064E-05 8.6597E+04
 9.6000 2.5846E-13 2.2234E-12 7.9589E-07 2.9804E-05 4.6616E-06 5.7760E-05 2.6926E-03 8.6597E+04
 9.8400 2.4251E-13 2.0601E-12 5.3972E-08 2.2982E-05 1.5641E-06 6.0167E-05 1.1631E-01 8.6597E+04
 10.0800 5.7342E-14 3.0491E-12 7.5271E-08 6.3420E-06 1.2658E-06 4.8049E-05 9.2704E-04 8.6597E+04
 10.3200 -8.1382E-15 -2.2810E-12 3.3809E-08 7.0469E-07 1.8157E-07 1.7667E-05 -1.3721E-04 8.6597E+04
 10.5600 9.8401E-15 -7.9849E-13 3.4841E-09 1.0962E-06 6.6539E-08 -1.3413E-06 -3.6613E-07 8.6597E+04
 10.8000 -2.3285E-15 4.0946E-14 -2.3607E-09 7.0922E-07 2.4373E-09 2.3011E-06 -4.2818E-07 8.6597E+04
 11.0400 1.5838E-15 4.0423E-13 -1.4753E-09 3.5184E-07 3.3820E-09 7.4938E-07 1.8426E-06 8.6597E+04
 11.2800 2.8022E-15 5.3194E-13 -2.1394E-10 1.9262E-07 2.4925E-09 5.6538E-07 6.4677E-07 8.6597E+04
 11.5200 2.6183E-15 5.2950E-13 -2.8791E-10 8.1660E-08 1.4305E-09 3.5949E-07 4.8355E-09 8.6597E+04
 11.7600 1.8846E-15 4.7071E-13 -5.7424E-11 -1.9178E-08 5.5954E-10 1.6674E-07 8.4720E-07 8.6597E+04
 12.0000 1.0270E-15 3.9736E-13 -2.1735E-25 -3.0361E-22 1.4071E-25 -1.2127E-21 1.6432E-09 8.6597E+04

NUMBER OF ITERATIONS IN LLP = 3

* PILE GROUP * 6

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

DISP. X, M DISP. Y, M DISP. Z, M ROT. X, RAD ROT. Y, RAD ROT. Z, RAD
 5.2792E-04 2.6277E-02 -4.1528E-03 4.0035E-04 -3.0286E-03 -7.3450E-07
 FOR. X, KN FOR. Y, KN FOR. Z, KN MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
 186.17 29.797 25.345 7.1771E-15 -117.21 0.0000

STR. KN/ M**2
1.1284E+05

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M DISP. Y, M DISP. Z, M ROT. X, RAD ROT. Y, RAD ROT. Z, RAD
 5.2792E-04 2.6277E-02 -4.1528E-03 4.0035E-04 -3.0286E-03 -7.3450E-07
 AXIAL, KN LAT. Z, KN MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
 186.17 29.797 25.345 0.0000 -117.21 0.0000

STR. KN/ M**2
1.1284E+05

* EFFECTS FOR Laterally Loaded Pile *

X M	DEFLECTION		BENDING MOMENT		SHEAR FORCE		SOIL REACTION		TOTAL STRESS		FLEXURAL RIGIDITY	
	Y-DIR M	Z-DIR M	Z-DIR KN-M	Y-DIR KN	Y-DIR KN	Z-DIR KN	Y-DIR KN/M	Z-DIR KN/M	KN/ M**2	KN/ M**2	Z-DIR KN- M**2	KN- M**2
0.0000	2.6277E-02	-4.1528E-03	0.0000	-117.21	29.797	25.360	0.0000	0.0000	1.1284E+05	3.1740E+04	8.6597E+04	
0.2400	2.4182E-02	-3.4644E-03	7.5414	-111.26	29.797	25.345	0.0000	0.0000	1.0926E+05	3.1740E+04	8.6597E+04	
0.4800	2.2101E-02	-2.8500E-03	15.080	-105.29	29.797	25.345	0.0000	0.0000	1.0917E+05	3.1740E+04	8.6597E+04	
0.7200	2.0047E-02	-2.3057E-03	22.614	-99.310	29.797	25.345	0.0000	0.0000	1.1258E+05	3.1740E+04	8.6597E+04	

0.9600	1.8034E-02	-1.8274E-03	30.140	-93.316	29.797	25.345	0.0000	0.0000	1.1915E+05	3.1740E+04	8.6597E+04
1.2000	1.6076E-02	-1.4112E-03	37.656	-87.311	29.797	25.345	0.0000	0.0000	1.2834E+05	3.1740E+04	8.6597E+04
1.4000	1.4186E-02	-1.0531E-03	45.159	-81.295	29.797	25.345	0.0000	0.0000	1.3959E+05	3.1740E+04	8.6597E+04
1.6800	1.2378E-02	-7.4902E-04	52.647	-75.647	29.797	25.345	0.0000	0.0000	1.5240E+05	3.1740E+04	8.6597E+04
1.9200	1.0666E-02	-4.9502E-04	60.118	-69.1234	29.797	25.345	0.0000	0.0000	1.6636E+05	3.1740E+04	8.6597E+04
2.1600	9.0624E-03	-2.8707E-04	67.238	-63.176	26.515	25.469	19.104	-0.2356	1.8043E+05	3.1740E+04	8.6597E+04
2.4000	7.5810E-03	-1.2114E-04	73.253	-57.077	20.753	25.602	33.451	-0.4531	1.9259E+05	3.1740E+04	8.6597E+04
2.6400	6.2324E-03	6.8204E-06	77.624	-50.946	13.277	25.656	33.481	3.6639E-02	2.0137E+05	3.1740E+04	8.6597E+04
2.8800	5.0244E-03	1.0090E-04	80.053	-44.812	4.9901	25.568	35.121	0.7067	2.0589E+05	3.1740E+04	8.6597E+04
3.1200	3.9615E-03	1.6517E-04	80.438	-38.713	-3.3731	25.312	34.191	1.4264	2.0589E+05	3.1740E+04	8.6597E+04
3.3600	3.0483E-03	2.0368E-04	78.832	-32.691	-11.254	24.889	31.259	2.0914	2.0113E+05	3.1740E+04	8.6597E+04
3.6000	2.2699E-03	2.2045E-04	75.404	-26.785	-18.262	24.321	27.102	2.8234	1.9226E+05	3.1740E+04	8.6597E+04
3.8400	1.6323E-03	2.1939E-04	70.397	-21.027	-24.159	23.646	22.088	2.9688	1.7972E+05	3.1740E+04	8.6597E+04
4.0800	1.1222E-03	2.0432E-04	64.095	-15.436	-28.850	22.915	17.017	3.0987	1.6418E+05	3.1740E+04	8.6597E+04
4.3200	7.2830E-04	1.7902E-04	56.789	-10.020	-32.353	22.179	12.233	3.0068	1.4632E+05	3.1740E+04	8.6597E+04
4.5600	4.3740E-04	1.4703E-04	48.758	-4.7762	-34.777	21.490	8.0604	2.7094	1.2683E+05	3.1740E+04	8.6597E+04
4.8000	2.3493E-04	1.1185E-04	40.242	0.3130	-36.296	20.894	4.7126	2.2436	1.0631E+05	3.1740E+04	8.6597E+04
5.0400	1.0545E-04	7.6871E-05	31.439	5.2734	-37.122	20.423	2.8774	1.6675	8.5321E+04	3.1740E+04	8.6597E+04
5.2800	3.3012E-05	4.5398E-05	22.490	10.137	-37.476	20.096	0.7700	1.0589	6.4426E+04	3.1740E+04	8.6597E+04
5.5200	1.3818E-06	2.0666E-05	13.486	14.939	-38.185	10.597	-76.528	155.72	4.4644E+04	3.1740E+04	8.6597E+04
5.7600	-5.8433E-06	5.4971E-06	4.8180	13.440	-28.840	-18.086	-10.412	71.981	2.6244E+04	3.1740E+04	8.6597E+04
6.0000	-3.8273E-06	-9.0469E-07	0.1348	7.7611	-10.900	-24.011	-64.583	-15.266	1.6539E+04	3.1740E+04	8.6597E+04
6.2400	-1.1439E-06	-2.1077E-06	-0.9236	2.7376	-0.3727	-16.157	-23.625	-43.531	1.2976E+04	3.1740E+04	8.6597E+04
6.4800	1.7900E-08	-1.3855E-06	-0.5491	8.3535E-02	2.0516	-6.5396	0.4374	-33.851	1.1022E+04	3.1740E+04	8.6597E+04
6.7200	1.8039E-07	-5.2664E-07	-0.1269	-0.6507	1.1875	-0.7173	5.0892	-14.858	1.0350E+04	3.1740E+04	8.6597E+04
6.9600	7.9283E-08	6.5064E-08	2.6457E-02	-0.5035	1.2437	1.1786	2.5364	-2.0815	1.0149E+04	3.1740E+04	8.6597E+04
7.2000	9.6211E-09	6.6625E-08	3.0895E-02	-0.2051	-7.5310E-02	1.0400	0.3442	2.3833	9896.9	3.1740E+04	8.6597E+04
7.4400	-6.2238E-09	5.6177E-08	9.3310E-03	-2.7532E-02	-6.8997E-02	0.4495	0.2462	2.2219	9734.8	3.1740E+04	8.6597E+04
7.6800	-3.5276E-09	2.2096E-08	-3.9229E-04	2.5531E-02	-1.7622E-02	6.8464E-02	-0.1529	0.9574	9724.3	3.1740E+04	8.6597E+04
7.9200	-5.4463E-10	2.7049E-09	-1.3092E-03	2.3590E-02	2.8822E-02	-5.1188E-02	-2.4508E-02	0.1217	9721.0	3.1740E+04	8.6597E+04
8.1600	-2.2267E-10	2.6183E-09	-4.2907E-04	8.3107E-03	2.9754E-03	-4.5110E-02	1.0020E-02	0.1178	9709.2	3.1740E+04	8.6597E+04
8.4000	1.4588E-10	-2.1311E-09	1.5171E-07	9.2143E-04	8.0864E-04	-1.7782E-02	6.5645E-03	-9.5898E-02	9702.6	3.1740E+04	8.6597E+04
8.6400	2.6471E-11	-8.0128E-10	5.1218E-05	-1.0436E-03	-6.0874E-05	-2.1815E-03	1.1912E-03	-3.6057E-02	9702.7	3.1740E+04	8.6597E+04
8.8800	-7.7733E-12	7.9264E-11	1.8598E-05	-8.1906E-04	-1.1855E-04	2.1039E-03	-3.4980E-04	3.5669E-03	9702.5	3.1740E+04	8.6597E+04
9.1200	-5.9818E-12	1.0649E-10	6.5267E-07	-3.0076E-04	-3.5831E-05	1.7140E-03	-2.6918E-04	4.7922E-03	9702.0	3.1740E+04	8.6597E+04
9.3600	-1.2473E-12	8.0726E-11	-1.9805E-06	-2.6043E-05	1.1125E-06	6.4484E-04	-5.6130E-05	3.6327E-03	9701.8	3.1740E+04	8.6597E+04
9.6000	2.5991E-13	2.8937E-11	-7.9767E-07	4.2245E-05	4.6769E-06	6.3974E-05	1.1696E-05	1.3022E-03	9701.8	3.1740E+04	8.6597E+04
9.8400	2.4321E-13	2.1289E-12	-5.3787E-08	3.0972E-05	1.5672E-06	8.5576E-05	1.0944E-05	9.5802E-05	9701.8	3.1740E+04	8.6597E+04
10.080	5.7394E-14	4.3077E-14	7.5550E-08	1.0833E-05	1.3978E-06	6.4825E-05	2.5827E-06	-1.9385E-04	9701.8	3.1740E+04	8.6597E+04
10.320	-8.1902E-15	-3.0705E-12	3.3888E-08	7.0294E-07	-1.8219E-07	-2.2982E-05	-3.6856E-07	-1.3617E-04	9701.8	3.1740E+04	8.6597E+04
10.560	9.6696E-15	-1.0349E-12	3.4804E-09	-1.5505E-06	-6.6680E-08	-1.2893E-06	-4.4413E-07	-4.6570E-04	9701.8	3.1740E+04	8.6597E+04
10.800	-2.3315E-15	8.0940E-14	-2.3700E-09	-9.5426E-07	-2.4153E-09	3.2469E-06	-1.0492E-07	3.6423E-06	9701.8	3.1740E+04	8.6597E+04
11.040	1.5911E-15	5.5332E-13	-1.4797E-09	-4.6488E-07	3.9929E-09	9.9743E-07	2.5458E-09	8.8531E-07	9701.8	3.1740E+04	8.6597E+04
11.280	2.81119E-15	7.1436E-13	-7.5870E-10	-2.5355E-07	2.5000E-09	7.4843E-07	4.4991E-09	1.1430E-06	9701.8	3.1740E+04	8.6597E+04
11.520	2.6265E-15	7.0401E-13	-2.8866E-10	-1.0706E-07	1.4345E-09	4.7335E-07	4.2024E-09	1.1264E-06	9701.8	3.1740E+04	8.6597E+04
11.760	1.8899E-15	6.1976E-13	-5.7555E-11	-2.5020E-08	5.6094E-10	2.1826E-07	3.0238E-09	9.9162E-07	9701.8	3.1740E+04	8.6597E+04
12.000	1.0290E-15	5.1649E-13	-2.1735E-11	-6.0723E-11	-1.4381E-10	2.8816E-11	1.6464E-09	8.2639E-07	9701.8	3.1740E+04	8.6597E+04

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NUMBER OF ITERATIONS IN LLP = 3