

Geotechnical Engineering Report

FINAL

Chinle Wash Bridge

Indian Route 8084

Many Farms, Arizona

Terracon Project No. 69095030

BIA Task Order Number: TON00090104

June 15, 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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**Re: Final Geotechnical Engineering Report
Chinle 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 Chinle 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 Chinle 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)



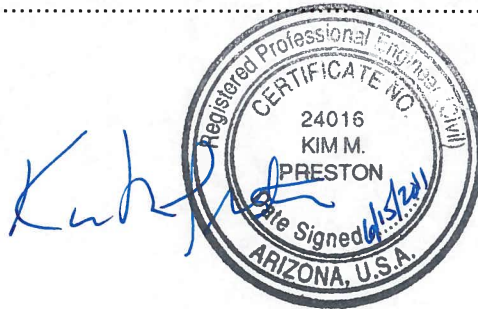
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EXECUTIVE SUMMARY

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 Chinle Wash Bridge located on Indian Route 8084 at Chinle 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:

Site Soils: The site surface soils and underlying subsurface soils generally consisted of clayey sand, poorly graded sand, and lean clay, fat clay, and completely weathered shale. Groundwater was encountered at an approximate depth of 2.4 meters in test boring B1-6 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 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 Chinle 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 HP360x174 (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. The availability of this size H-pile should be determined by the structural engineer and the BIA.

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
CHINLE WASH BRIDGE – INDIAN ROUTE 8084
MANY FARMS, ARIZONA**

**Terracon Project No. 69095030
BIA Task Order Number: TON00090104
June 15, 2011**

1.0 INTRODUCTION

A final geotechnical engineering report has been completed for the proposed Chinle Wash bridge which will be constructed as part of Indian Route 8084 near Many Farms, Arizona. Eight (8) borings, designated B1-1 through B1-8, 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.

2.2 Site Location and Description

ITEM	DESCRIPTION
Location	Indian Route 8084 at Chinle 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	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. Approximately 1 to 1.5 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 date 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.

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	36.309478
Site Longitude	-109.594433
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 Chinle 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	1.8 to 3.4	Clayey Sand, Poorly Graded Sand with Varying Amounts of Clay	Loose to Medium Dense
Stratum 2	3.8 to 5.3	Lean Clay with Varying Amounts of Sand, Fat Clay, Completely Weathered Shale	Stiff to Hard
Stratum 3	30.6 to 30.8 (Total Explored Depth)	Shale	Very Soft to Medium

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 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. The results of the consolidation tests indicate that the surface and subsurface soils exhibit slight to very high expansion potential upon wetting.

3.5 Groundwater

Groundwater was observed in Boring B1-6 at the time of field exploration at a depth of approximately 2.4 meters 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 is 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 Chinle Wash Bridge. The analyses 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 strengths 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 Chinle 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 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 shale. 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 ($E_{\text{steel}}I$) 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

⁴ U.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 HP108x343 pile sections and the bridge piers were to be supported on 40.64-cm 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 support when end bearing is the mode of foundation support. 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 HP 360x174 (mm X kg/m) pile sections complies with the loads and tolerances provided to Terracon for the abutment and pier locations. All piles at this structure are recommended to be driven to refusal into the native shale deposits beneath the pre-bored depths. The pile should be considered to have reached refusal when the pile head penetration is 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 Chinle 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 also recommends 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. The piles should be considered to have reached refusal when the pile head penetration is 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.

Location	Pile Size (mmxkg/m)	Nominal Resistance ³ (kN)	Factored Resistance ³ (kN)	Recommended Minimum Depth of Pre-Boring (m)	Recommended Maximum Elevation of Bottom of Pre-Bore (m)
Abutment 1	HP 360x174	3800	1900	8.4 ¹	1619.7
Pier 1 and 2		3800	1900	9.2 ²	1617.2
Abutment 2		3800	1900	12.2 ¹	1616.5

¹Depth is measured from pile head.

²Depth is measured from existing ground elevation.

³ Nominal and Factored resistances are based on assumptions that the piles are driven to refusal and group effects are neglected. 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 v. 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 B1-3 and B1-4 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 above the scour depth was ignored.

The piles were analyzed for the pile head connection and loads as provided by WHPacific. It is understood that the project structural engineer plans to include a pier wall connecting the six H-piles at the pier location. The planned dimensions of the pier wall are about 7.6 meters in length, 0.61 meters thick and extend down from the top of the piles a distance of 4.96 meters. . Based on scour information provided by the project civil engineer, maximum scour depth will be 2.2 meters below the planned bottom-of-pier wall elevation. The lateral analyses for this bridge included the pier wall as part of the pier structural configuration. The following table summarizes the boundary conditions and loads on the pile cap and the results obtained from our analysis.

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Chinle Wash Bridge – Indian Route 8084 ■ Many Farms, Arizona
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Location /Direction	Pile Type (mmx kg/m)	Scour Depth from Existing Ground (m)	Factor-ed Load (kN)	Pile Head Connection	Deflection (mm)	Maximum Moment (kN-m)	Maximum Shear (kN)
Abutment – Transverse	HP360x 174 ²	4.4 at Abut. 1 and 3.67 at Abut. 2	193.5	Fixed	27.2	206.4	280
Abutment – Longitudinal			70.7	Pinned	13.3	35.6	44
Piers – Transverse	HP360x 174 ³	4.93	149.5	Fixed	1.59	85.6	59
Piers - Longitudinal			111.2	Pinned	1.01	32.1	47

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

²The piles are oriented with strong axis in the transverse loading direction.

³The piles are oriented with the strong axis in the longitudinal loading direction.

NOTE: These pile orientations were confirmed in an e-mail from the project structural engineer to Terracon personnel on June 3, 2011.

TABLE 1

Summary of Subsurface Profiles for Lateral Load Analyses of Drilled Shaft 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	5.3	Weak Rock (Reese)	20.4	--	--	600	90,000	--	5E-5
	12.2								
	12.2	Hard Rock (Reese)	20.4	--	--	800	--	--	
	15.0								
Piers	2.26	Weak Rock (Reese)	20.4	--	--	600	90,000	--	5E-5
	6.53								
	6.53	Hard Rock (Reese)	20.4	--	--	800	--	--	
	10.0								

Notes:

The depths to the soil layers at the pier location is measured from the bottom of the pier wall. The pier wall is 4.96m tall.

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 HP360x174 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 assume that the piles are driven to refusal into the underlying native shale formation. The pile should be considered to have reached refusal when the pile head penetration is 10 blows for less than 25.4 mm (1-inch) penetration of the pile tip 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 a minimum of 6-inches (150-mm) greater than the diagonal dimension of the H-Pile section. For the recommended HP360x174 H-pile 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 between 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 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 Chinle 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 shale 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 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

Final Geotechnical Engineering Report

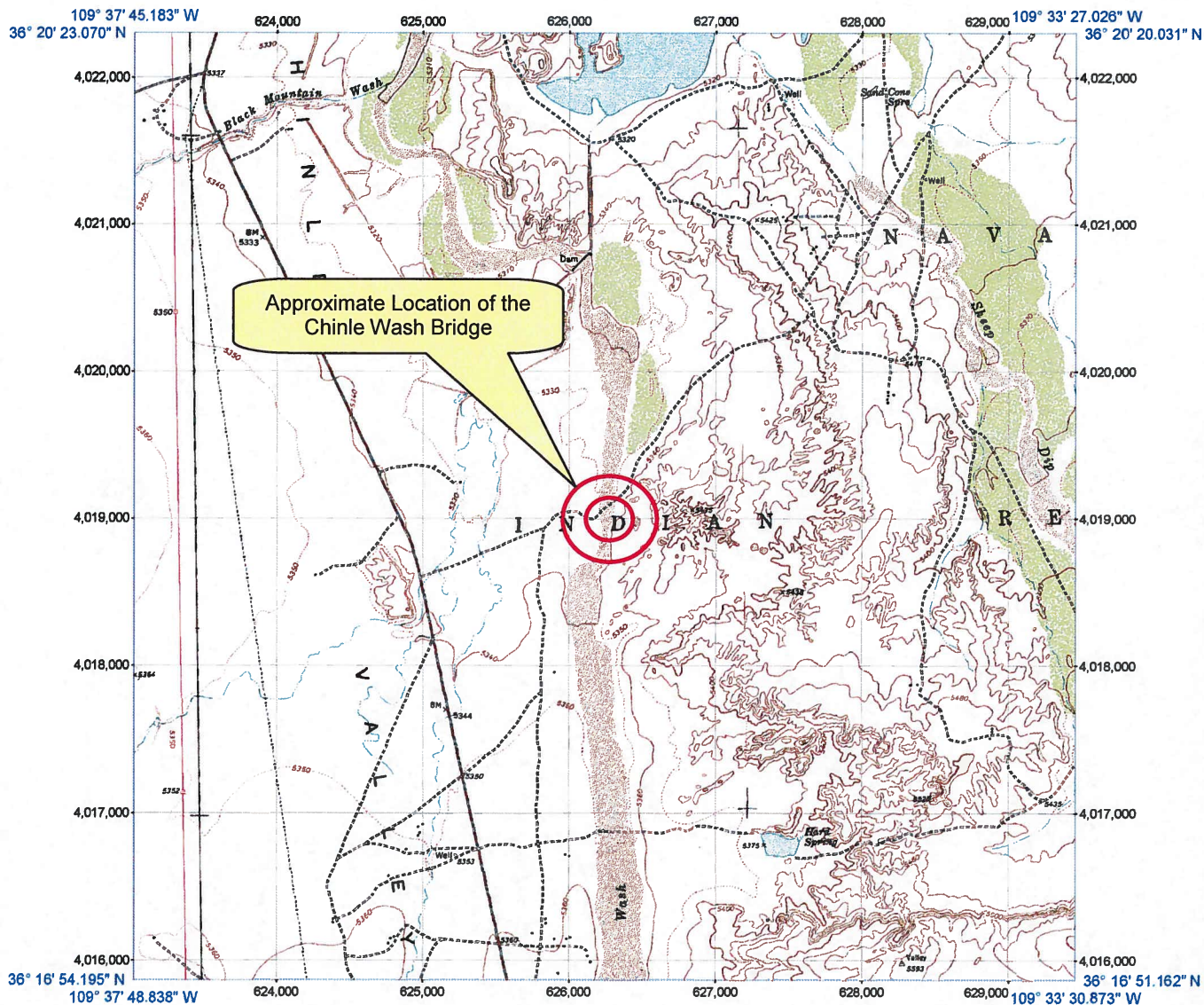
Chinle Wash Bridge – Indian Route 8084 ■ Many Farms, Arizona

June 9, 2011 ■ Terracon Project No. 69095030



valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

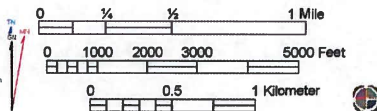
MAP



Approximate Location of the
Chinle Wash Bridge

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

UTM Grid and 2011 Magnetic North
Declination at Center of Sheet
2011 to 111 = -0.633° (-1.15 min)
111 to 101 = 0.100° (1.00 min)



BigTopo Map

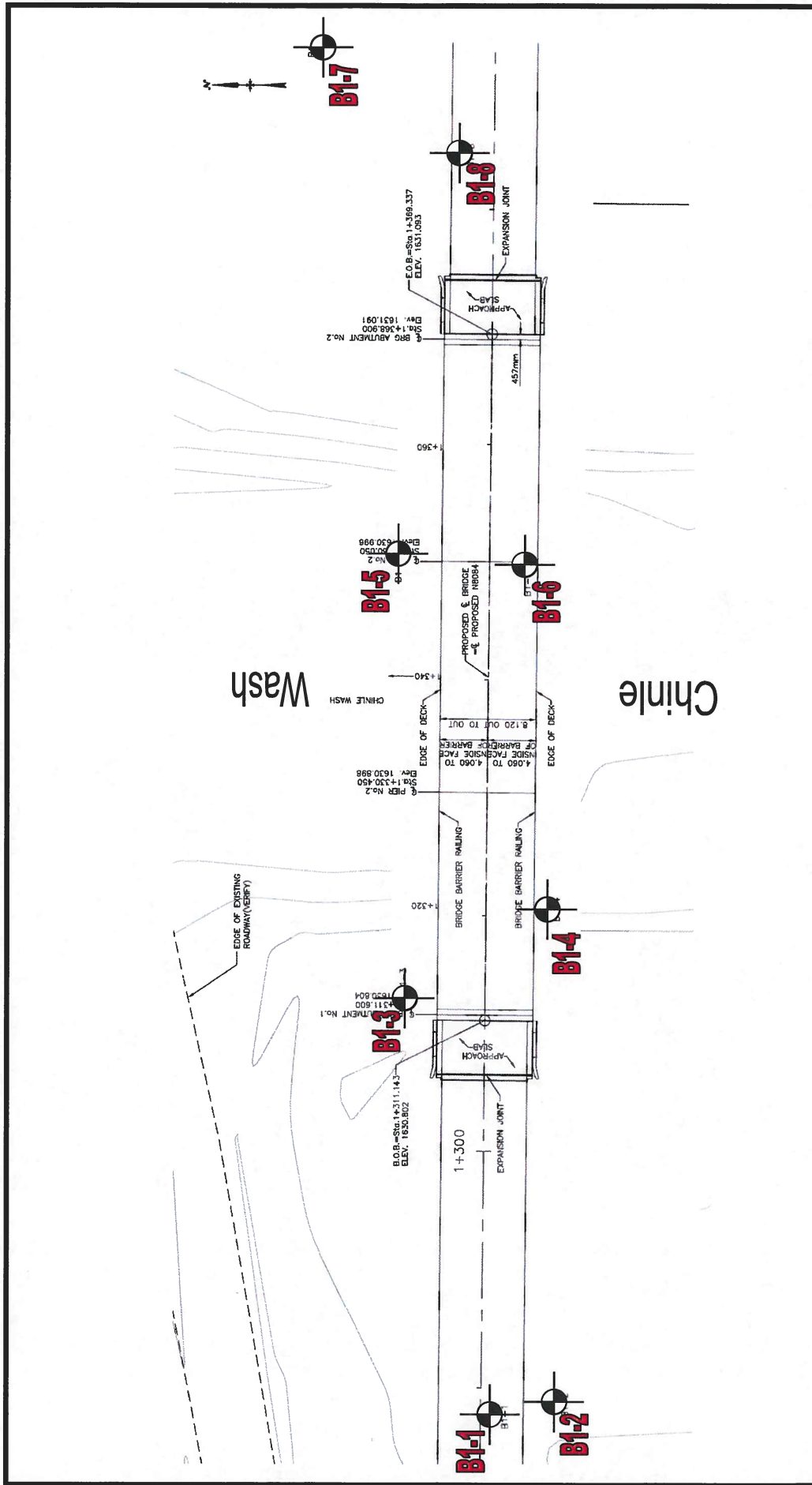
Project Mngr:	KMP
Drawn By:	HMW
Checked By:	KMP
Approved By:	KMP

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

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

Site Location Map
BIA, Indian Route 8084 Bridge 1, Chinle Wash Many Farms, Arizona

Exhibit
A-1



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

B1-1 - Approximate Boring Location

Legend

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

Project No: 69095030
 Scale: NTS
 File No: Boring.doc
 Date: 01/19/2011

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

Boring Location Plan
 BIA, Indian Route 8084
 Bridge 1, Chinle Wash
 Many Farms, Arizona

Exhibit
A-2

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. B1-1

CLIENT Bureau of Indian Affairs										
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash								
GRAPHIC LOG	Boring Location: GPS: UTM NAD 83 Z-12 N=4019178m E=0626125m	SAMPLES		TESTS						
	DESCRIPTION	DEPTH, m.	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.: 1627.1 m									
0.8	CLAYEY SAND ; red tan to red brown, dry to moist. 1626.4	1								
	POORLY GRADED SAND ; red tan, dry to moist, medium dense.	2	SP	SS	0.3	12	1.6			
3.4	COMPLETELY WEATHERED SHALE ; maroon with gray, dry to moist, complete weathering, very soft. 1623.8	3	SP	RS	0.3	15	8.3	18.7		
		4								
5.2	SHALE ; maroon and purple gray, dry to moist, complete weathering to fresh, very soft to medium hardness. 1622	5		SS	0.3	18	16.1			
		6		RS	0.25	44/25	13.9			
		7								
		8		SS	0.3	74	17.4			
		9								
		10		RS	0.08	25/08	17.9			
		11		SS	0.28	97/28	17.8			
		12								
	Switched from HSA to air rotary drilling.	13		SS	0.2	96/2	17.0			
		14								
		15								
		16		SS	0.1	50/1	13.0			

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.

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

WATER LEVEL OBSERVATIONS, m

WL	▽	NE	WD	▽
WL	▽		▽	
WL				



BORING STARTED		12-14-09	
BORING COMPLETED		12-14-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B1-1

CLIENT Bureau of Indian Affairs								
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash						
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES			TESTS	
				CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %
17	<p>SHALE; maroon and purple gray, dry to moist, complete weathering to fresh, very soft to medium hardness.</p>	17						
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
30.6	1596.5							
	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		12-14-09	
BORING COMPLETED		12-14-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B1-2

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 1: Chinle Wash							
SITE N8084 at Chinle Wash Many Farms, Arizona									
GRAPHIC LOG	Boring Location: GPS: UTM NAD 83 Z-12 N=4019173m E=0626126m	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
	Approx. Surface Elev.: 1627.1 m								
1	CLAYEY SAND ; red tan to red brown, moist, medium dense.								
2.1	1625		SC	RS	0.3	12	2.6	16.2	
3	LEAN CLAY ; red brown, moist, stiff, trace to with sand.								
3.8	1623.3		CL	SS	0.3	9	18.0		
4	COMPLETELY WEATHERED SHALE ; maroon, moist, complete weathering, very soft.								
5.2	1621.9			RS	0.3	25	18.2		
6	SHALE ; maroon with gray, purple gray, and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.								
8				RS	0.15	25/15	20.3	15.7	
10				SS	0.28	87/28	14.7		
11				RS	0.05	25/05	16.8		
12	Switched from HSA to air rotary drilling.			SS	0.13	50/13	16.6		
13									
15				SS	0.13	50/13	12.2		
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.

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

WATER LEVEL OBSERVATIONS, m

WL	▼	NE		WD	▼
WL	▼			▼	
WL					



BORING STARTED		12-13-08	
BORING COMPLETED		12-13-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B1-2

CLIENT Bureau of Indian Affairs									
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash							
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	SAMPLES			TESTS			
			USCS SYMBOL	CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS 1.0.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³
17	<p>SHALE; maroon with gray, purple gray, and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.</p>	17							
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
30.6	1596.5								
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		Terracon		BORING STARTED 12-13-08			
WL	∇ NE WD ∇	Terracon		BORING COMPLETED 12-13-09			
WL	∇			RIG	CME-75	FOREMAN	HMW
WL				APPROVED	KMP	JOB #	69095030
WL							

LOG OF BORING NO. B1-3

CLIENT Bureau of Indian Affairs		PROJECT N8084 - Bridge 1: Chinle Wash							
SITE N8084 at Chinle Wash Many Farms, Arizona									
GRAPHIC LOG	Boring Location: GPS: UTM NAD 83 Z-12 N=4019186m E=0626160m	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
	Approx. Surface Elev.: 1627.2 m								
1	POORLY GRADED SAND ; red tan to red brown, moist, medium dense.								
2.1	1625.1		SP	RS	0.3	20	1.6	15.9	
3	LEAN CLAY ; red brown, moist, stiff, trace to with sand.								
4.4	1622.8		CL	SS	0.3	10	16.8		
	SHALE ; maroon with gray, purple gray, and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.								
5				RS	0.3	15	18.9		
6				SS	0.3	68	19.6		
7									
8				RS	0.08	25/08	19.4		
9				SS	0.28	84/28	16.8		
10									
11				RS	0.2	25/2	15.2	17.8	
12				SS	0.08	50/08	15.0		
13									
14				RS	0.15	50/15	15.1		
15				SS	0.1	50/1	15.6		
16									
Switched from HSA to air rotary drilling.									

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.

BOREHOLE 98 LOG OF BORING(GP.) TERRACON.GDT 6/7/11


WATER LEVEL OBSERVATIONS, m

WL	▽	NE	WD	▽
WL	▽		▽	
WL				



BORING STARTED		12-11-09	
BORING COMPLETED		12-12-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B1-3

CLIENT Bureau of Indian Affairs									
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash							
GRAPHIC LOG	DESCRIPTION	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
	<p>SHALE; maroon with gray, purple gray, and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.</p>	17 18 19 20 21 22 23 24 25 26 27 28 29 30 30.6							
	<p>Exploration terminated at a depth of approximately 30.6 meters below existing ground surface. No groundwater encountered.</p>	1596.6							

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		12-11-09	
BORING COMPLETED		12-12-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B1-4

CLIENT Bureau of Indian Affairs											
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash									
GRAPHIC LOG	Boring Location: GPS: UTM NAD 83 Z-12 N=4019174m E=0626168m		SAMPLES			TESTS					
	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
Approx. Surface Elev.: 1626.7 m											
 <p>POORLY GRADED SAND; red tan to red brown, moist, medium dense.</p>		1									
<p>2.3 1624.4</p>		2	SP	SS	0.3	15	14.0				
 <p>CLAYEY SAND; red brown, moist, medium dense.</p>		3									
<p>3.2 1623.5</p>		3	CL	RS	0.3	11	22.0	16.5			
 <p>LEAN CLAY WITH SAND; red brown, moist, stiff.</p>		4									
<p>3.8 1622.9</p>		4									
<p>SHALE; maroon, purple gray, and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.</p>		5			SS	0.3	29	18.3			
		6									
		6			RS	0.13	25/13	21.2	16.2		
		7									
		8			SS	0.13	50/13	18.2			
		9									
		9			RS	0.23	35/23	17.5			
		10									
		11			SS	0.13	50/13	14.9			
		12									
		12			SS	0.05	50/05	16.3			
		13									
		14			SS	0.15	50/15	13.3			
		15									
		15			SS	0.05	50/05	12.1			
		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.

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

WATER LEVEL OBSERVATIONS, m

WL	∇ NE	WD	∇
WL	∇		∇
WL			



BORING STARTED		12-10-09	
BORING COMPLETED		12-11-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B1-4

CLIENT Bureau of Indian Affairs									
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash							
GRAPHIC LOG	DESCRIPTION	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
17	<p>SHALE; maroon, purple gray, and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.</p> <p>Switched from HSA to air rotary drilling.</p>	17		SS 0.15	50/15	10.9			
18		18		SS 0.13	50/13				
19		19							
20		20							
21		21							
22		22			SS 0.13	50/13	15.4		
23		23							
24		24							
25		25			SS 0.08	50/08	22.7		
26		26							
27	27								
28	28			SS 0.13	50/13	18.9			
29	29								
30	30								
30.8	30.8			SS 0.08	50/08	20.2			
	1595.9								

Exploration terminated at a depth of approximately 30.8 meters below existing ground surface. No groundwater encountered.

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 BORING1.GPJ TERRACON.GDT 6/7/11

WATER LEVEL OBSERVATIONS, m

WL	▽ NE	WD	▽
WL	▽	▽	▽
WL			



BORING STARTED		12-10-09	
BORING COMPLETED		12-11-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B1-5

CLIENT Bureau of Indian Affairs									
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash							
GRAPHIC LOG	Boring Location: GPS: UTM NAD 83 Z-12 N=4019187m E=0626198m	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.: 1626.4 m								
1	1.8	1624.5		SP SC	RS 0.3	7	29.3	14.9	
	POORLY GRADED SAND WITH CLAY ; red brown, moist.								
2	4.9	1621.5		CH	SS 0.3	16	18.1		
	FAT CLAY ; red brown, moist, stiff to hard, trace sand.								
3				CH	RS 0.28	45/28	19.6		
	SHALE ; maroon, purple gray and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.								
4				SS	0.3	74	20.7		
5									
6					RS 0.08	15/08	12.1	18.5	
7									
8				SS	0.23	93/23	17.2		
9									
10				SS	0.15	50/15	14.4		
11									
12				SS	0.13	50/13	12.8		
13									
14				SS	0.13	50/13	14.2		
15									
16				SS	0.13	50/13	11.8		
	Switched from HSA to air rotary drilling.								

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.

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

WATER LEVEL OBSERVATIONS, m

WL	▽ NE	WD	▽
WL	▽		▽
WL			



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

LOG OF BORING NO. B1-5

CLIENT Bureau of Indian Affairs									
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash							
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES			TESTS		
				CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS 1.0.3 m	WATER CONTENT, %	DRY UNIT WT kN/m ³
17	<p>SHALE; maroon, purple gray and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.</p>	17							
18									
19				SS	0.13	50/13	12.5		
20									
21									
22				SS	0.3	92	17.3		
23									
24									
25				SS	0.15	50/15	13.7		
26									
27									
28			SS	0.13	50/13	13.0			
29									
30									
30.8	1595.6			SS	0.1	50/1	14.8		
<p>Exploration terminated at a depth of approximately 30.8 meters below existing ground surface. No groundwater encountered.</p>									

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

LOG OF BORING NO. B1-6

CLIENT Bureau of Indian Affairs										
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash								
GRAPHIC LOG	Boring Location: GPS: UTM NAD 83 Z-12 N=4019176m E=0626197m	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.: 1626.3 m									
1										
2		POORLY GRADED SAND WITH CLAY; red tan to red brown, moist to wet, loose to medium dense.	SP	SS	0.3	6	15.7			
3		3.2	1623.1							
4	FAT CLAY; red brown, moist, stiff to hard.	CH	RS	0.3	11	15.4				
5		5.3	1620.9							
6	SHALE; maroon, purple gray, and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.									
7	Thin sandstone lense.									
8										
9										
10										
11										
12										
13										
14										
15										
16										
	Switched from HSA to air rotary drilling.									
Continued Next Page										

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 ∇ 2.4	WD ∇
WL ∇	∇
WL	



BORING STARTED		12-12-09	
BORING COMPLETED		12-13-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B1-6

CLIENT Bureau of Indian Affairs								
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash						
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES			TESTS	
				CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS / 0.3 m	WATER CONTENT, %
17	<p>SHALE; maroon, purple gray, and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.</p>	17						
18		18						
19		19						
20		20						
21		21						
22		22						
23		23						
24		24						
25		25						
26		26						
27	27							
28	28							
29	29							
30	30							
30.6	30.6	1595.6						
	<p>Exploration terminated at a depth of approximately 30.6 meters below existing ground surface. Groundwater encounter at a depth of about 2.4 meters.</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 ▽ 2.4	WD ▽
WL ▽	▽
WL	



BORING STARTED		12-12-09	
BORING COMPLETED		12-13-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B1-7

CLIENT Bureau of Indian Affairs										
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash								
GRAPHIC LOG	DESCRIPTION	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	UNCONFINED STRENGTH, kPa
	<p>SHALE; maroon, purple gray, and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.</p>	17								
		18								
		19			SS 0.13	50/13	12.0			
		20								
		21								
		22			SS 0.25	96/25	17.3			
23										
24										
25				SS 0.15	50/15	13.6				
26										
27										
28				SS 0.1	50/1	11.3				
29										
30										
30.6	1596.5			SS 0.15	50/15	13.8				
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	NE	WD	
WL			



BORING STARTED		12-15-09	
BORING COMPLETED		12-15-09	
RIG	CME-75	FOREMAN	HMW
APPROVED	KMP	JOB #	69095030

LOG OF BORING NO. B1-8

CLIENT Bureau of Indian Affairs								
SITE N8084 at Chinle Wash Many Farms, Arizona		PROJECT N8084 - Bridge 1: Chinle Wash						
GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES			TESTS	
				CORE SIZE	TYPE	RECOVERY, m	SPT-N BLOWS 1.0.3 m	WATER CONTENT, %
17	<p>SHALE; maroon, purple gray, and gray, dry to moist, complete weathering to fresh, very soft to medium hardness.</p>	17						
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
30.8	1596.3							
Exploration terminated at a depth of approximately 30.8 meters below existing ground surface. No groundwater encountered.								

BOREHOLE 99 LOG OF BORING: 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		12-14-09	
BORING COMPLETED		12-15-09	
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
		Gravels with Fines More than 12% fines ^C	$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel ^F
		Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines ^D	Fines classify as ML or MH Fines classify as CL or CH	GM
	Sands 50% or more of coarse fraction passes No. 4 sieve	Sands with Fines More than 12% fines ^D	Fines classify as ML or MH Fines Classify as CL or CH	GC	Clayey gravel ^{F,G,H}
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$ $Cu < 6$ and/or $1 > Cc > 3^E$	SW	Well-graded sand ^I
	Sands 50% or more of coarse fraction passes No. 4 sieve	Sands with Fines More than 12% fines ^D	Fines classify as ML or MH Fines Classify as CL or CH	SP	Poorly graded sand ^I
Fine-Grained Soils 50% or more passes the No. 200 sieve	Sils and Clays Liquid limit less than 50	inorganic	$PI > 7$ and plots on or above "A" line ^J $PI < 4$ or plots below "A" line ^J	CL	Lean clay ^{K,L,M}
		organic	Liquid limit - oven dried < 0.75 Liquid limit - not dried	OL	Organic clay ^{K,L,M,N} Organic silt ^{K,L,M,O}
		inorganic	PI plots on or above "A" line PI plots below "A" line	CH	Fat clay ^{K,L,M}
		organic	Liquid limit - oven dried < 0.75 Liquid limit - not dried	MH	Elastic Silt ^{K,L,M} Organic clay ^{K,L,M,P} Organic silt ^{K,L,M,Q}
	Sils and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line PI plots below "A" line	OH	Fat clay ^{K,L,M} Elastic Silt ^{K,L,M}
	Sils and Clays Liquid limit 50 or more	organic	Liquid limit - oven dried < 0.75 Liquid limit - not dried	OH	Organic clay ^{K,L,M,P} 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

$$^E C_u = D_{60}/D_{10} \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^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.

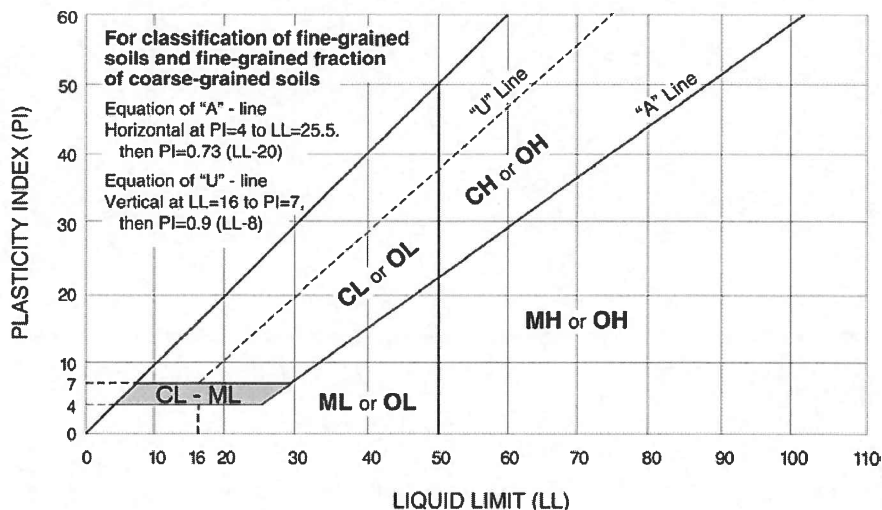
^MIf soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^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.



Final Geotechnical Engineering Report

Chinle Wash Bridge – Indian Route 8084 ■ Many Farms, Arizona
June 8, 2011 ■ Terracon Project No. 69095030



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.

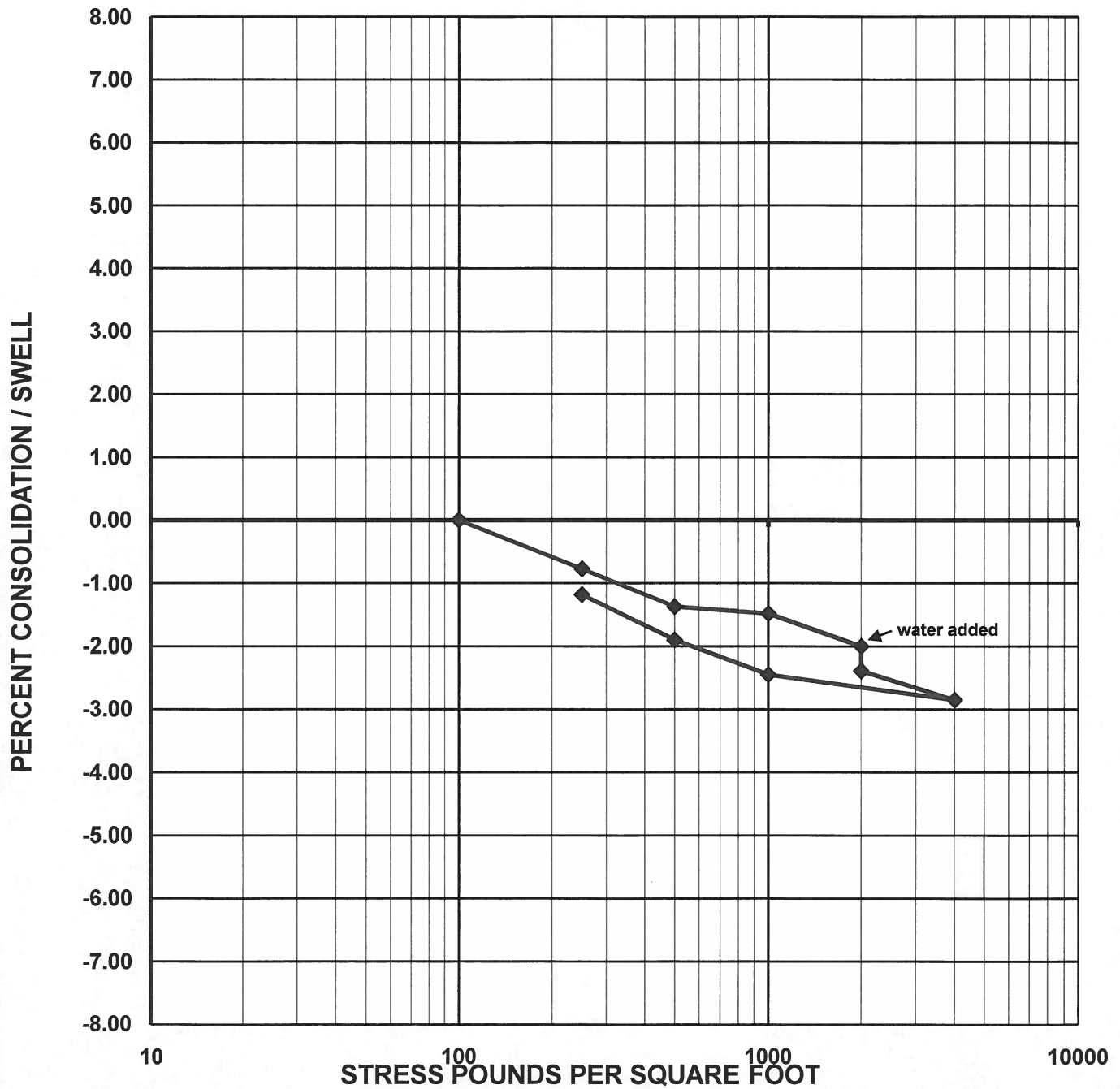
Laboratory tests were conducted on selected soil and bedrock samples and the test results are presented in this appendix. The laboratory test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in 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 severe compressibility potential at in-situ moisture contents. When wetted under anticipated foundation loads, the soils exhibit slight to very high expansion potentials.

SWELL / CONSOLIDATION CHART



Sample Date: 12/14/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-1 @ 3.0-3.5m

USCS Classification: SP

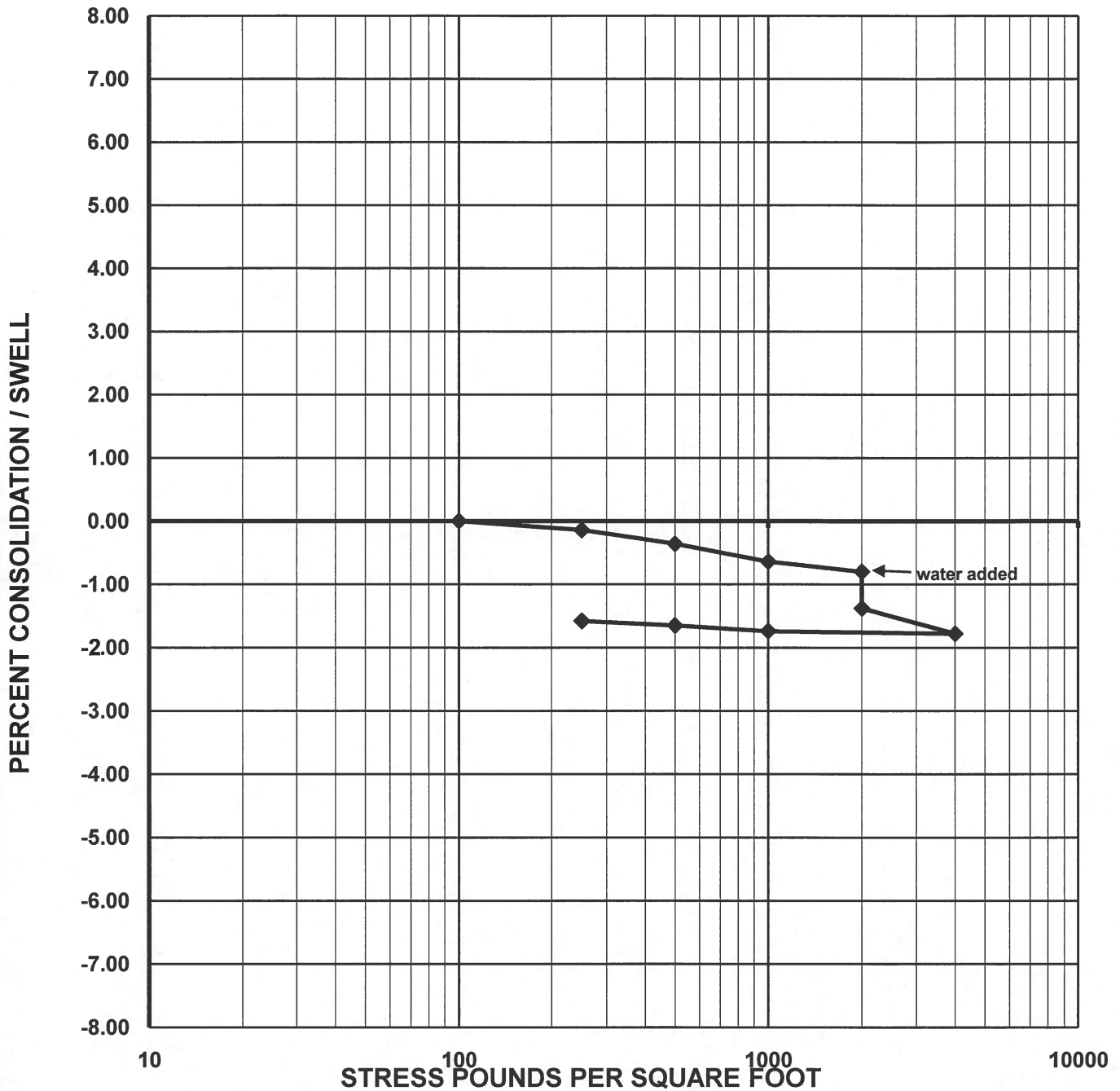
Material Description: Poorly Graded Sand

Dry Density: 18.7 kN/m³

Moisture Content: 8.3



SWELL / CONSOLIDATION CHART



Sample Date: 12/13/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-2 @ 1.5-2.0m

USCS Classification: SC

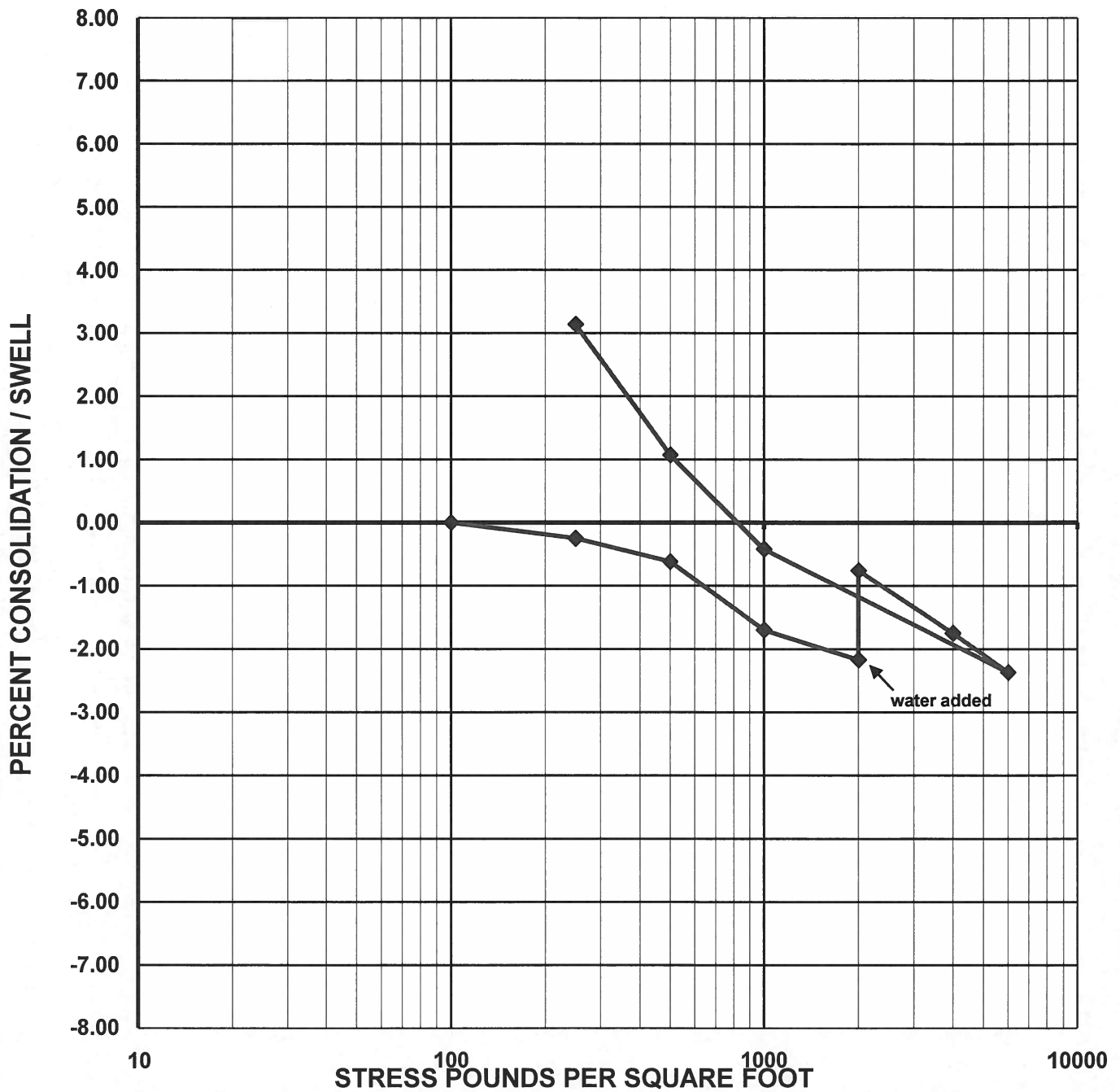
Material Description: Clayey Sand

Dry Density: 16.2 kN/m³

Moisture Content: 2.6



SWELL / CONSOLIDATION CHART



Sample Date: 12/13/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-2 @ 7.6-8.1m

USCS Classification:

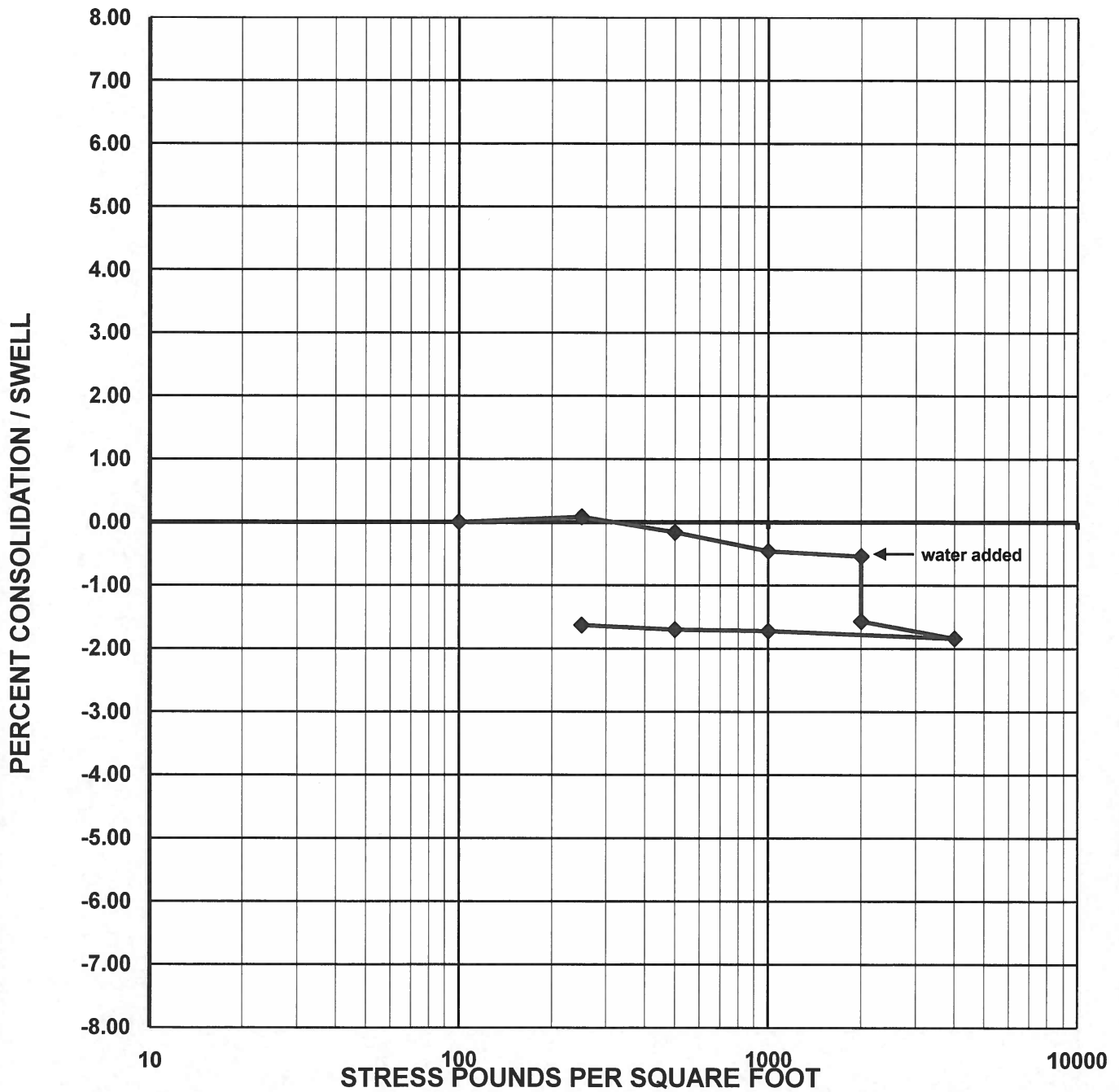
Material Description: Shale

Dry Density: 15.7 kN/m³

Moisture Content: 20.3



SWELL / CONSOLIDATION CHART



Sample Date: 12/11/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-3 @ 1.5-2.0m

USCS Classification: SP

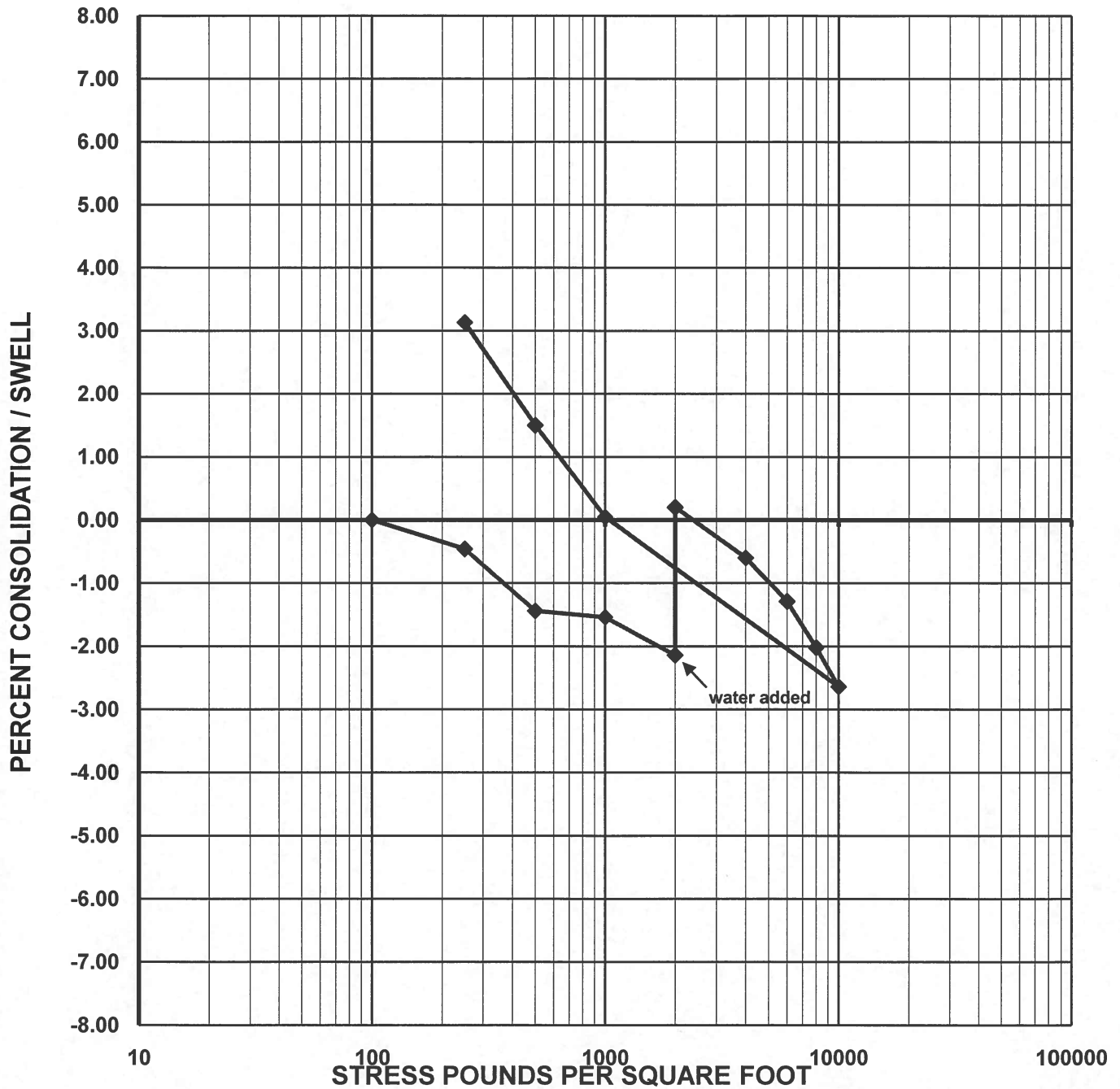
Material Description: Poorly Graded Sand

Dry Density: 15.9 kN/m³

Moisture Content: 1.6



SWELL / CONSOLIDATION CHART



Sample Date: 12/11/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-3 @ 10.7-11.1m

USCS Classification:

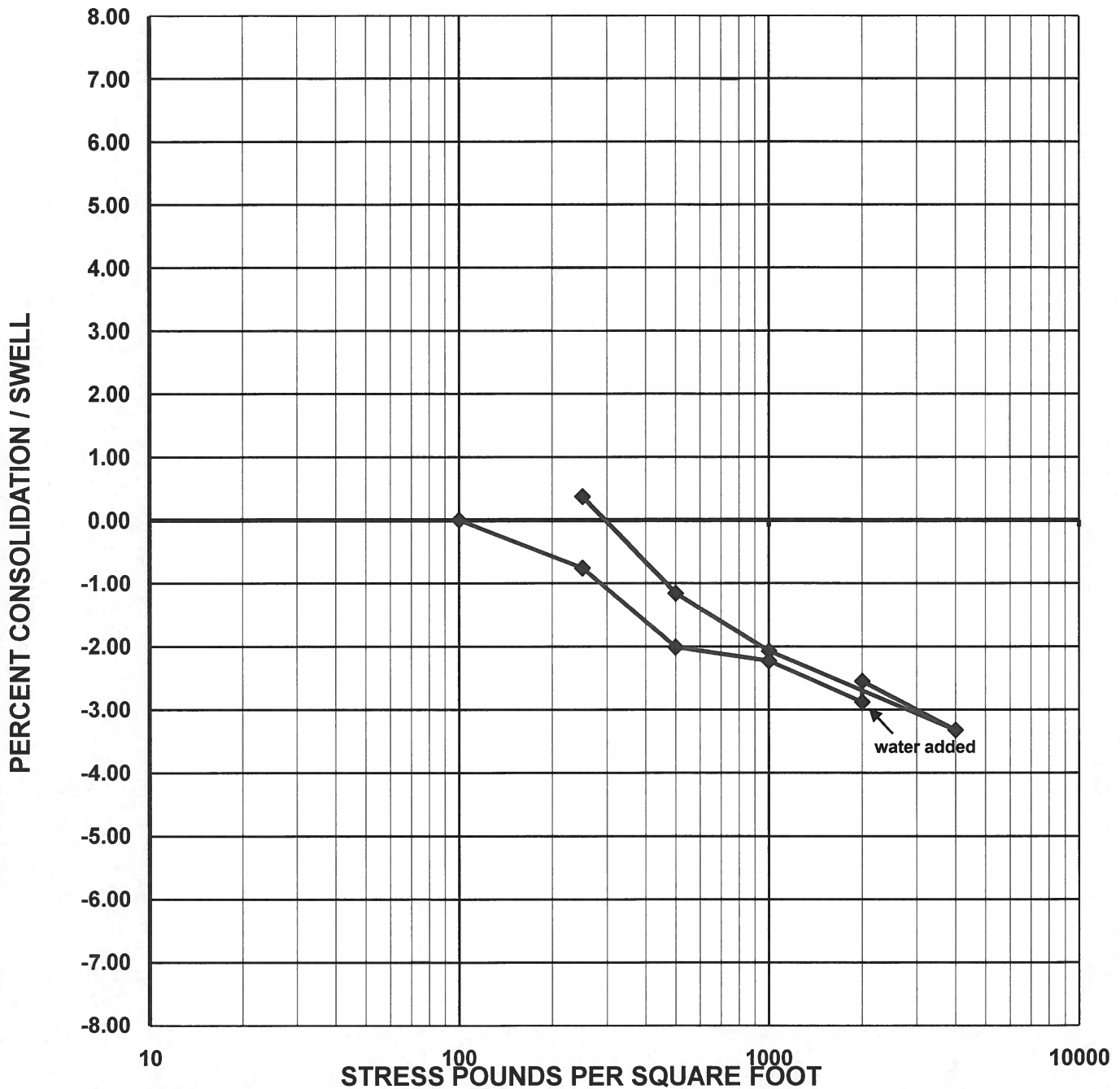
Material Description: Shale

Dry Density: 17.8 kN/m³

Moisture Content: 15.2



SWELL / CONSOLIDATION CHART



Sample Date: 12/10/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-4 @ 3.0-3.5m

USCS Classification: CL

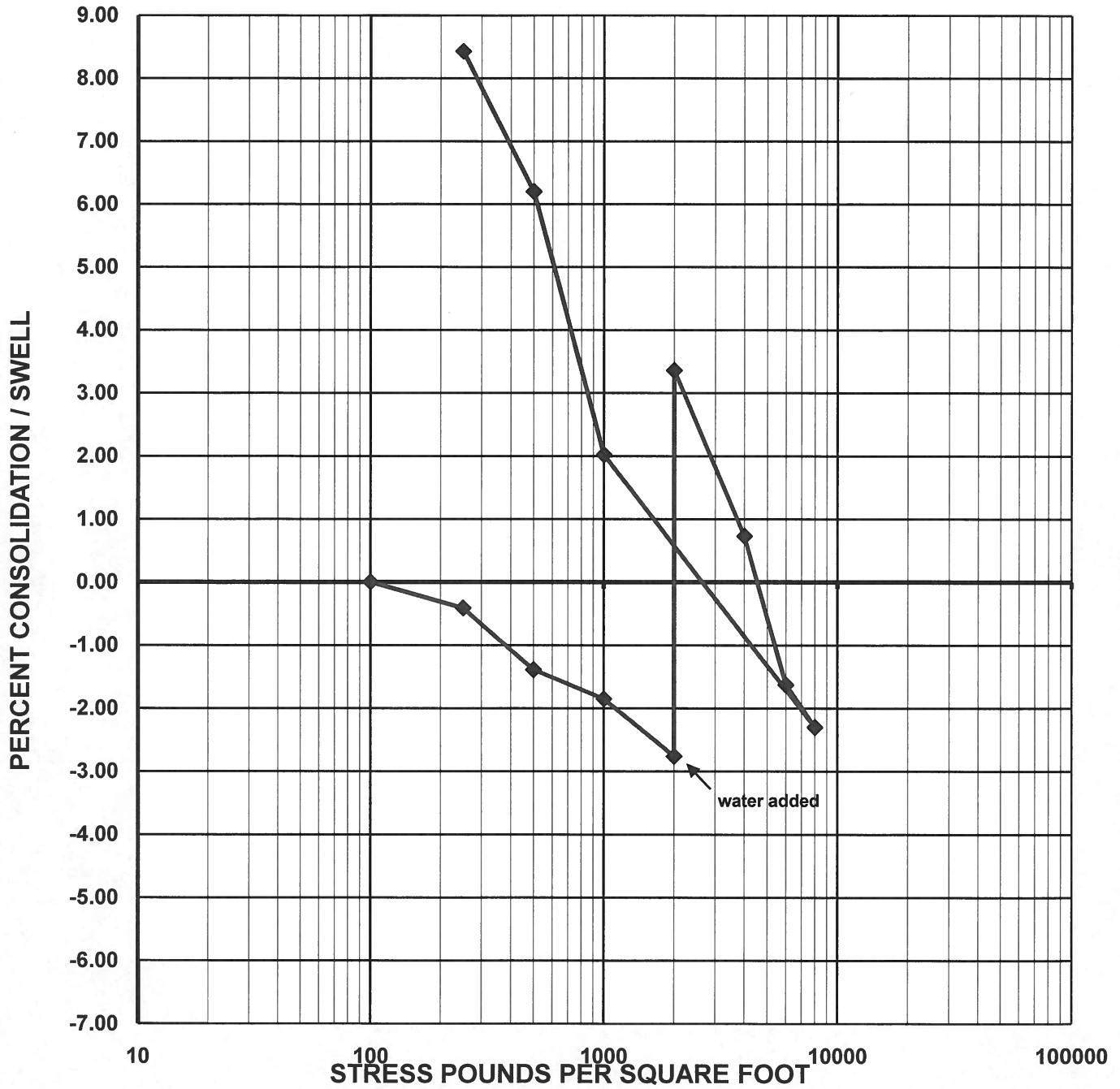
Material Description: Lean Clay with Sand

Dry Density: 16.5 kN/m³

Moisture Content: 22.0



SWELL / CONSOLIDATION CHART



Sample Date: 12/10/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-4 @ 6.1-6.6m

USCS Classification:

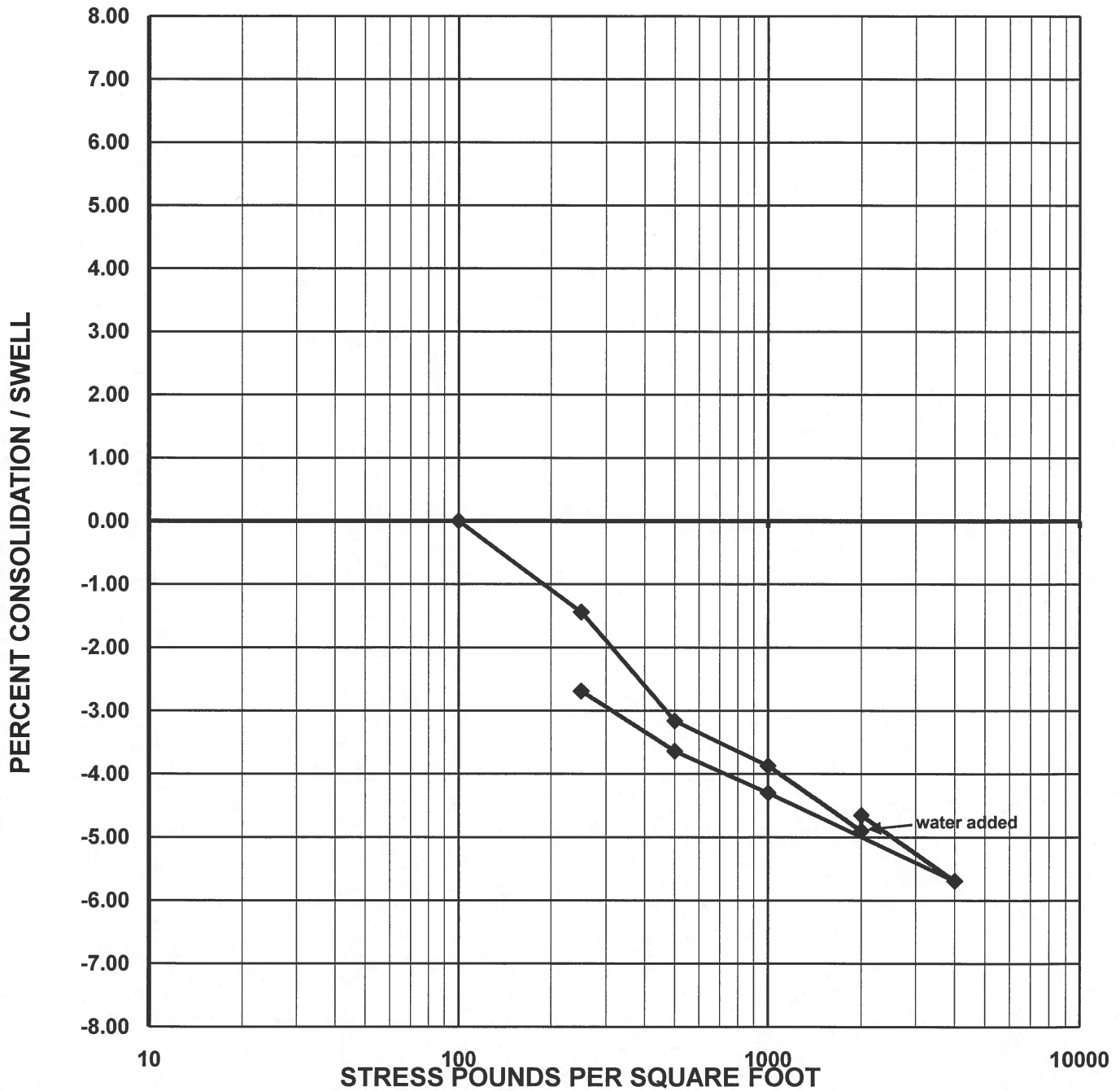
Material Description: Shale

Dry Density: 16.2 kN/m³

Moisture Content: 21.2



SWELL / CONSOLIDATION CHART



Sample Date: 12/12/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-5 @ 1.5-2.0m

USCS Classification: CH

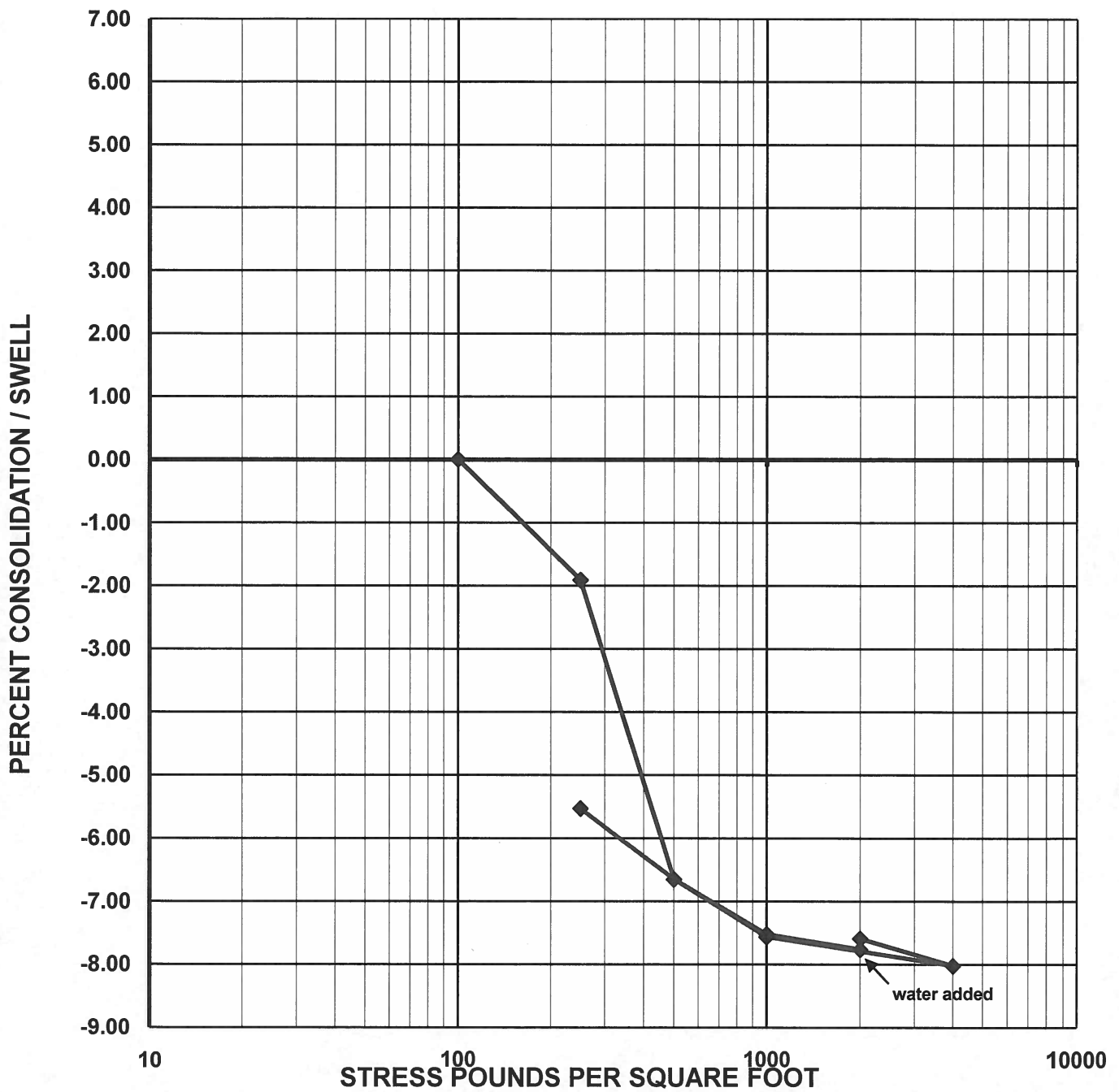
Material Description: Fat Clay

Dry Density: 14.9 kN/m³

Moisture Content: 29.3



SWELL / CONSOLIDATION CHART



Sample Date: 12/12/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-5 @ 7.6-8.1m

USCS Classification:

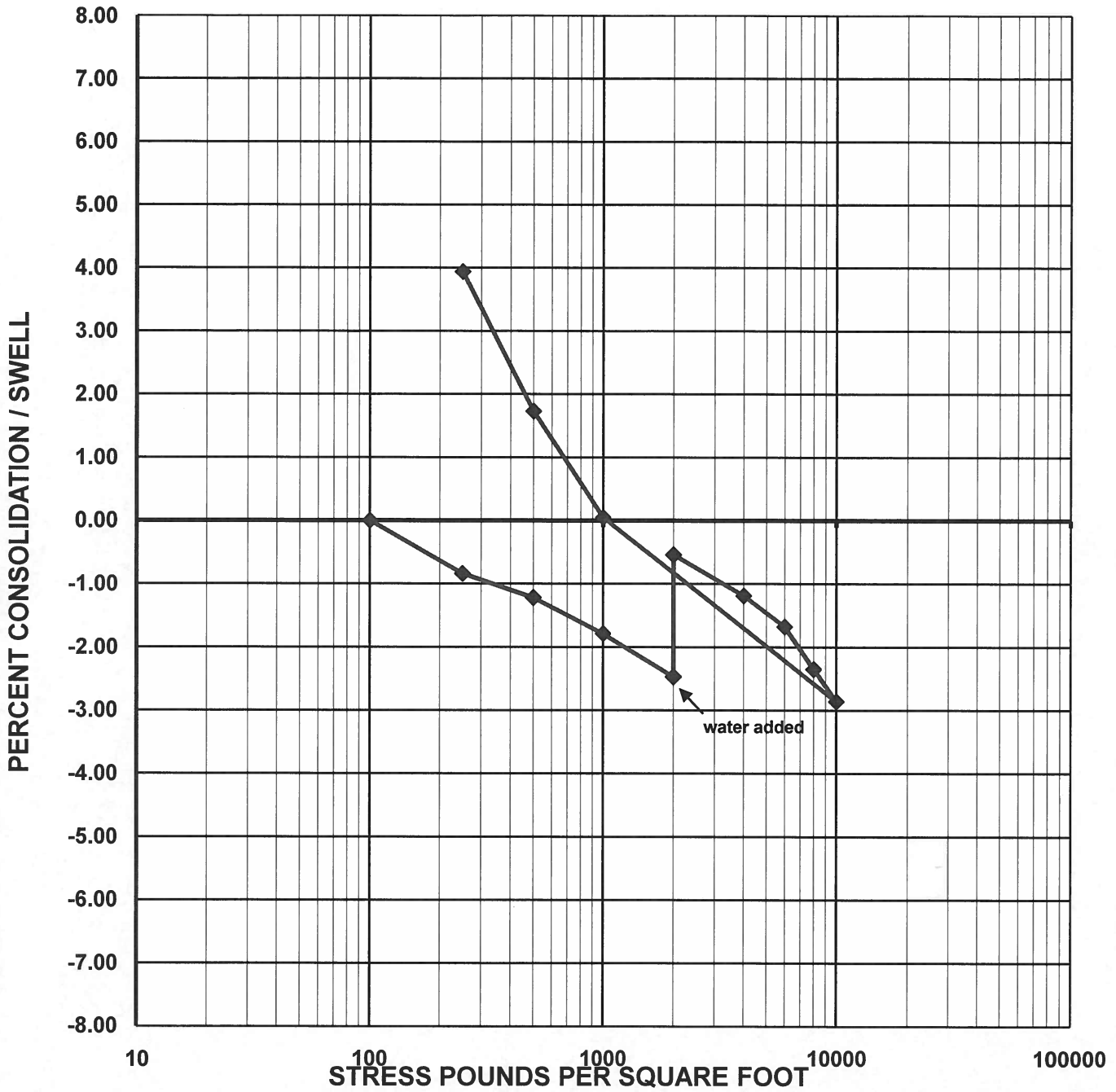
Material Description: Shale

Dry Density: 18.5 kN/m³

Moisture Content: 12.1



SWELL / CONSOLIDATION CHART



Sample Date: 12/12/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-6 @ 6.1-6.6m

USCS Classification:

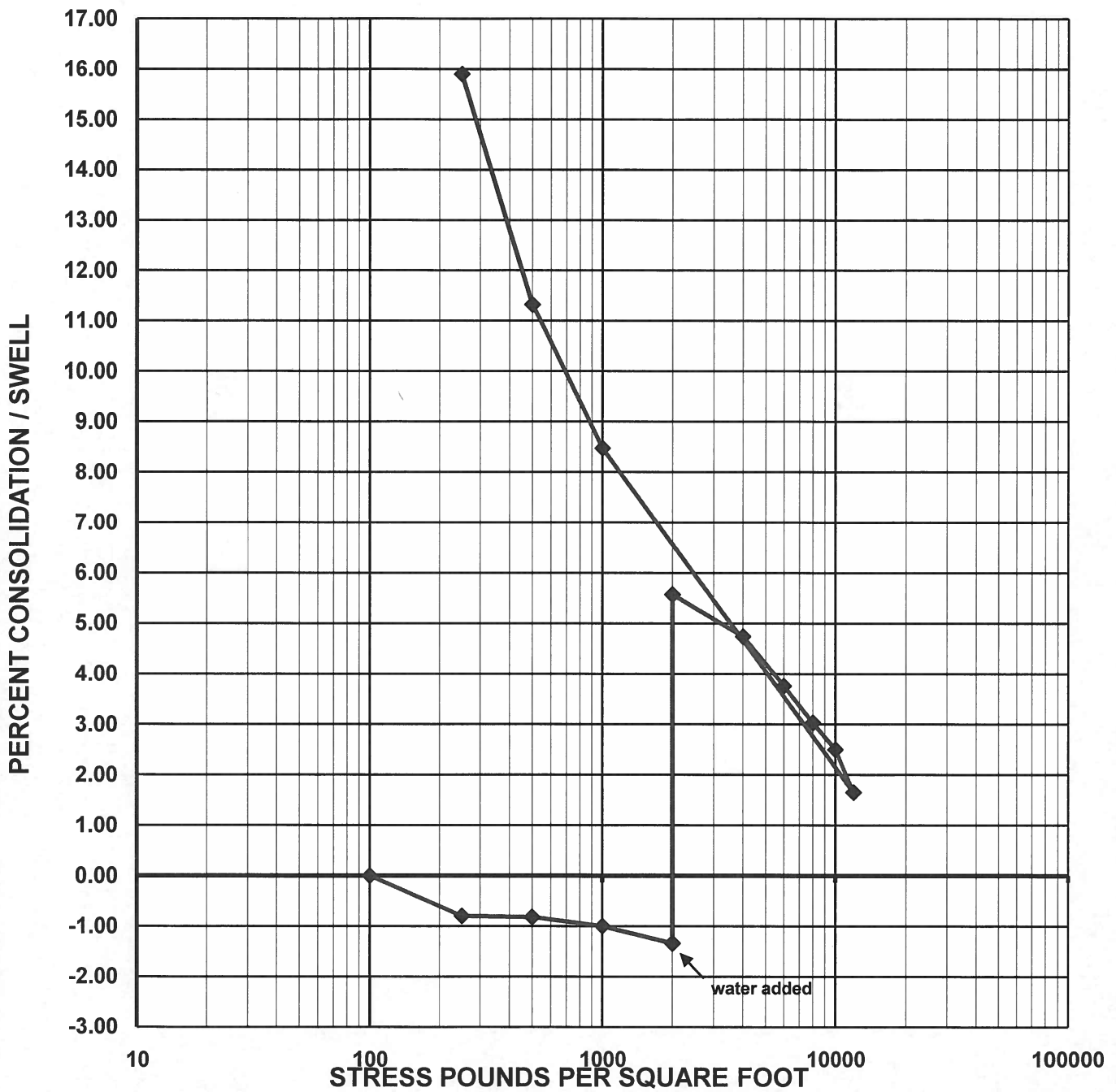
Material Description: Shale

Dry Density: 16.3 kN/m³

Moisture Content: 21.7



SWELL / CONSOLIDATION CHART



Sample Date: 12/12/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-6 @ 9.1-9.6m

USCS Classification:

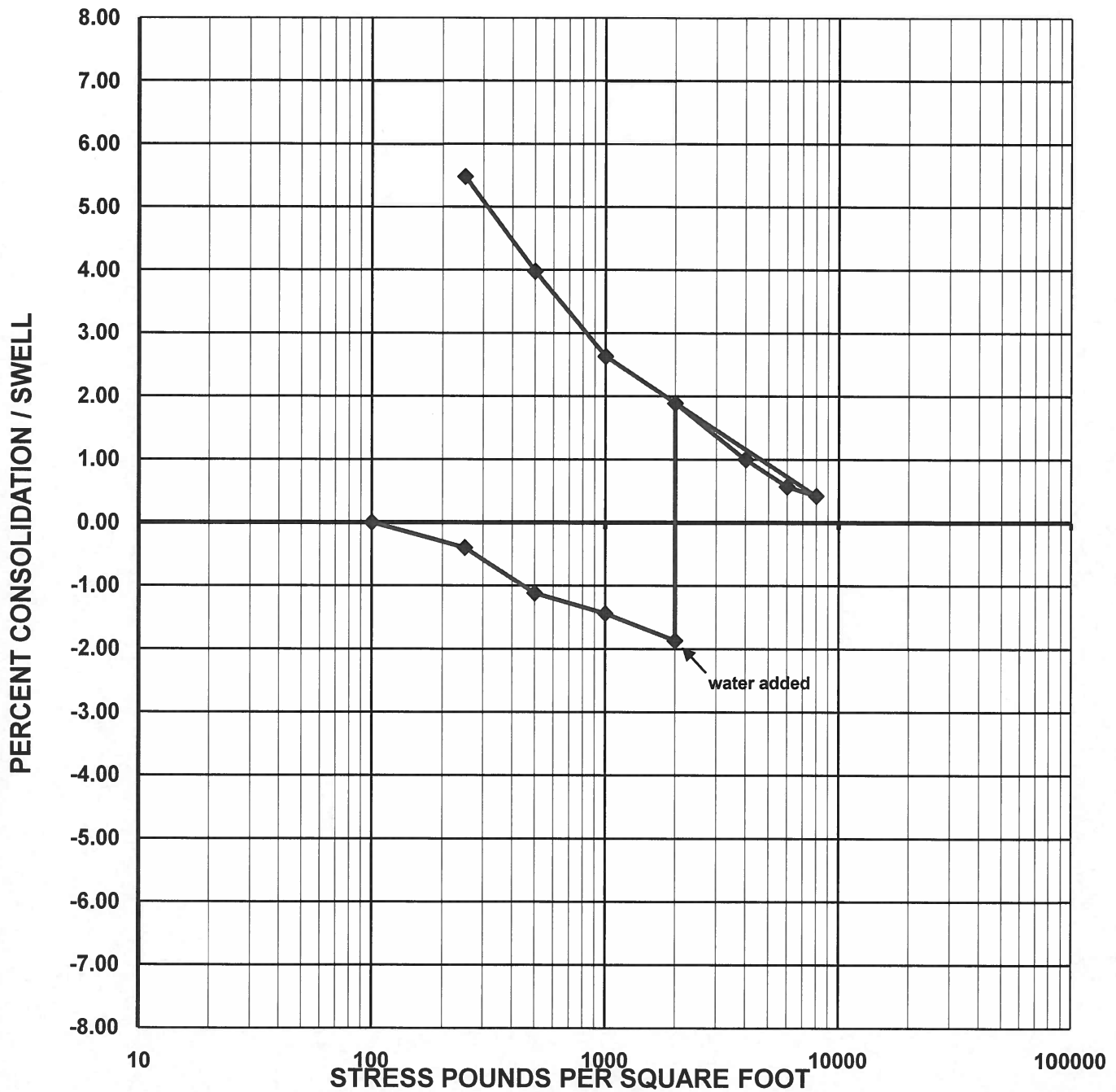
Material Description: Shale

Dry Density: 18.5 kN/m³

Moisture Content: 10.7



SWELL / CONSOLIDATION CHART



Sample Date: 12/15/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-7 @ 3.0-3.5m

USCS Classification: SC

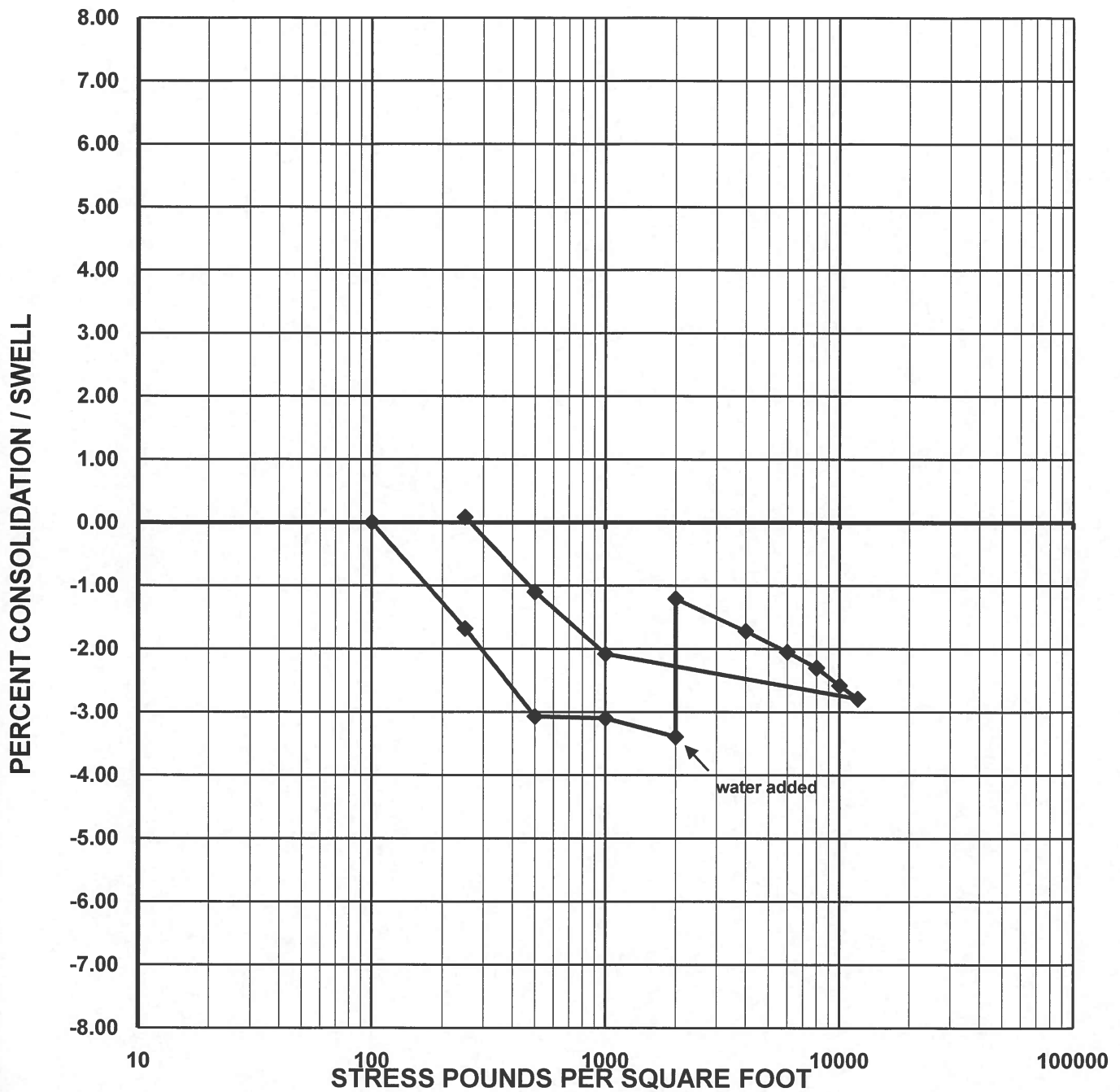
Material Description: Clayey Sand

Dry Density: 18.2 kN/m³

Moisture Content: 11.5



SWELL / CONSOLIDATION CHART



Sample Date: 12/15/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-7 @ 12.2-12.7m

USCS Classification:

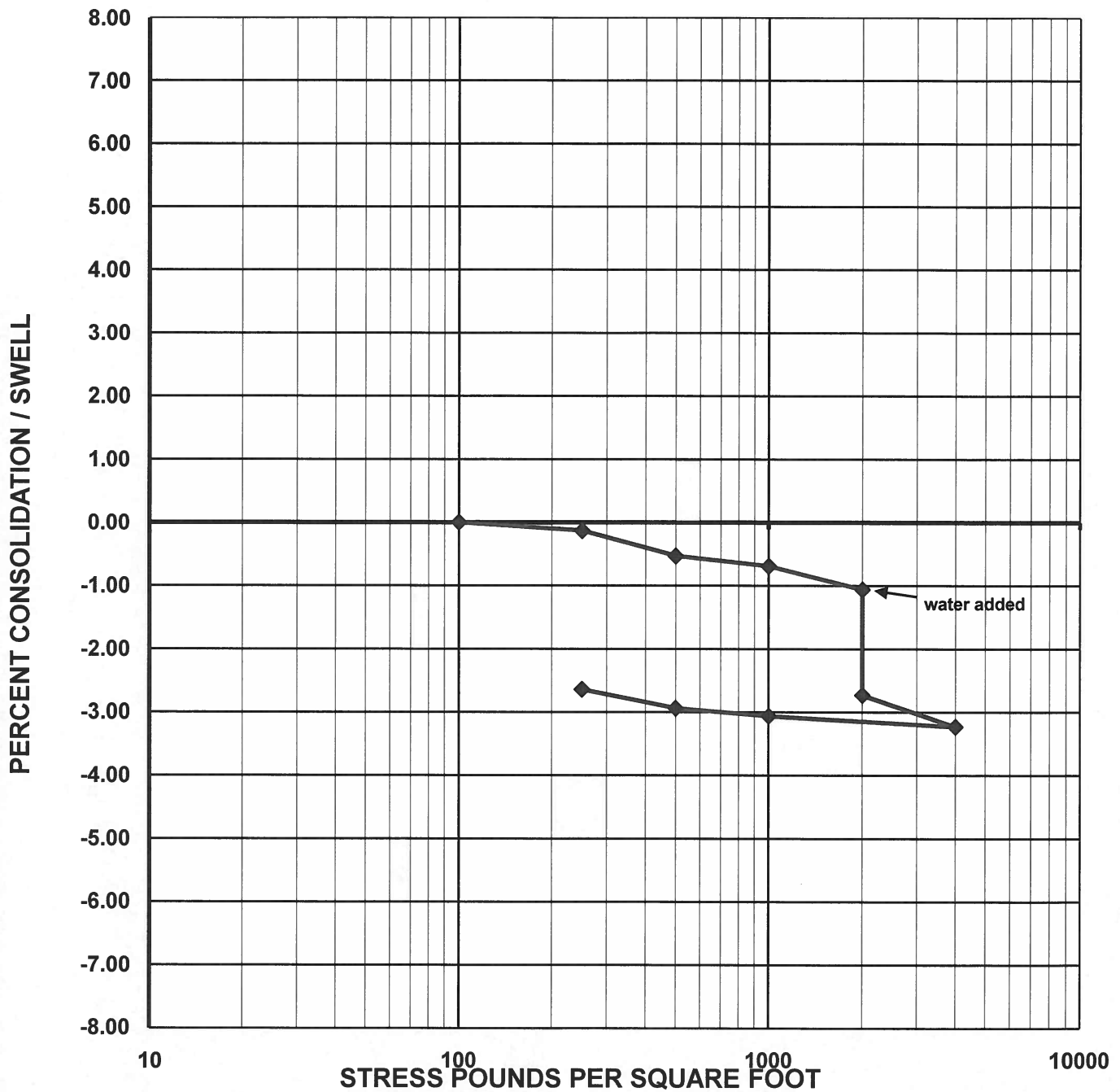
Material Description: Shale

Dry Density: 18.4 kN/m³

Moisture Content: 11.0



SWELL / CONSOLIDATION CHART



Sample Date: 12/14/2009

Project No.: 69095030

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

Report Date: 6/15/2011

Sample Location: B1-8 @ 1.5-2.0m

USCS Classification: SP

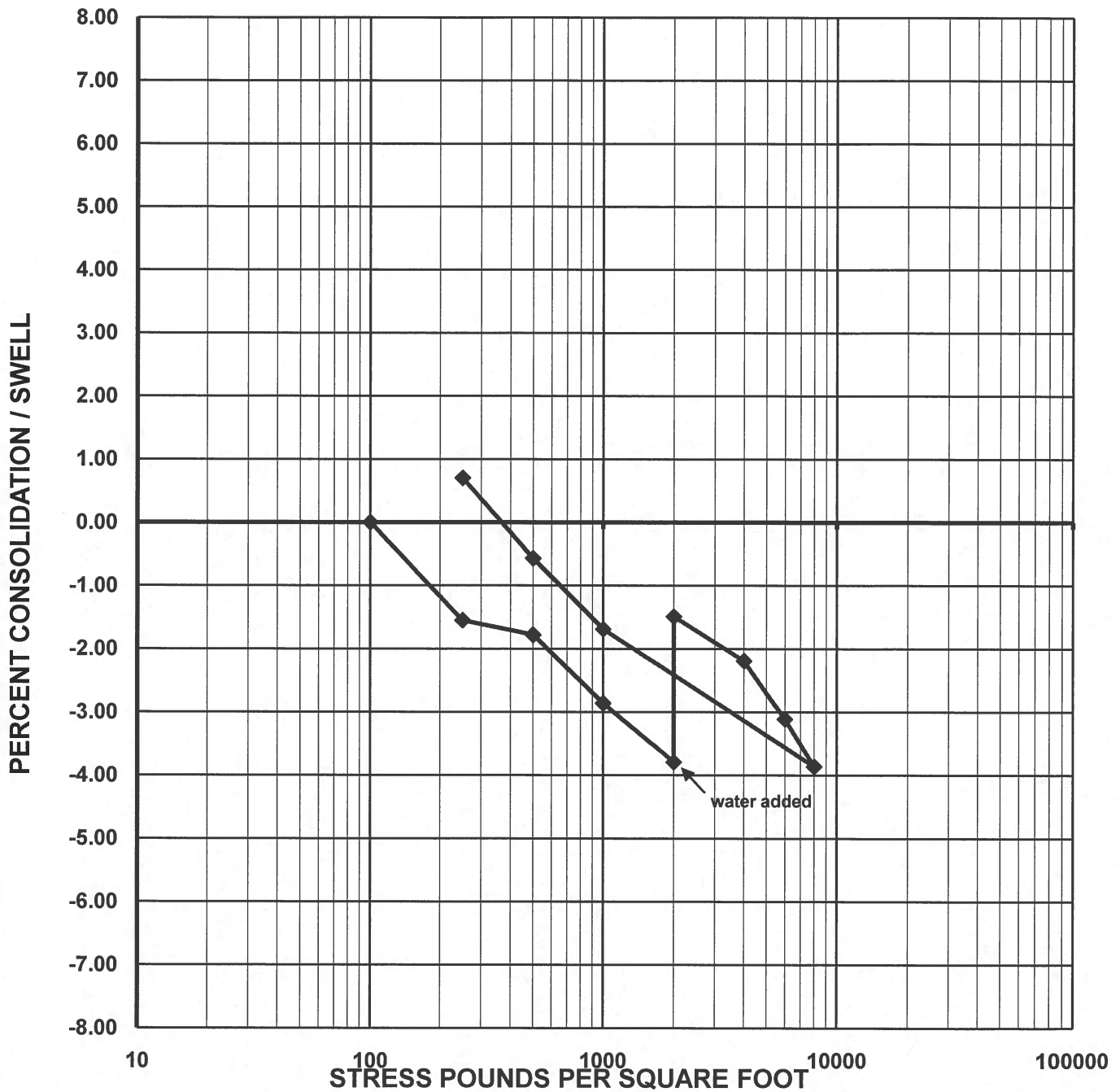
Material Description: Poorly Graded Sand

Dry Density: 15.7 kN/m³

Moisture Content: 1.5



SWELL / CONSOLIDATION CHART



Sample Date: 12/14/2009

Project No.: 69095060

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

Report Date: 6/15/2011

Sample Location: B1-8 @ 7.6-8.1m

USCS Classification:

Material Description: Shale

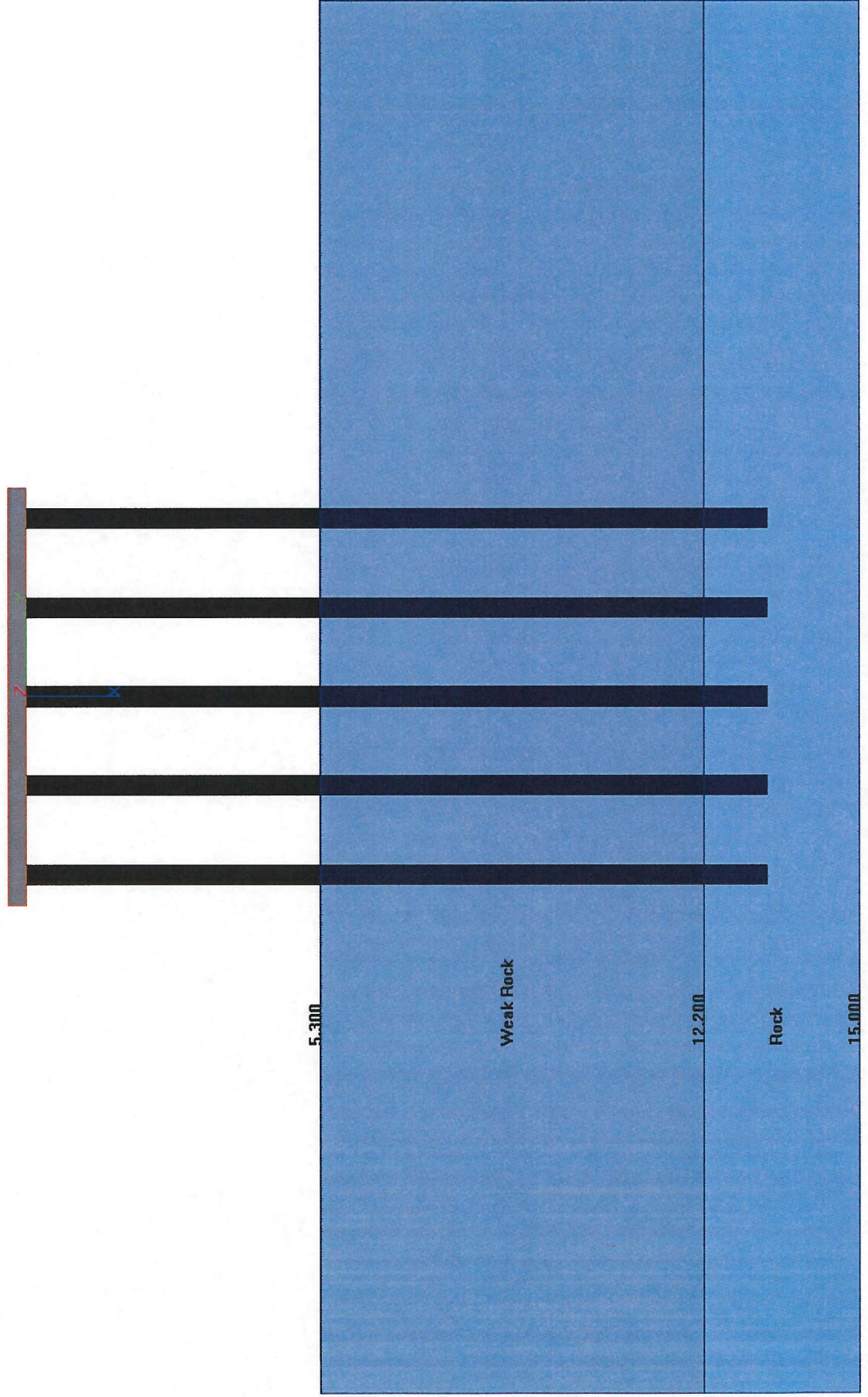
Dry Density: 16.2 kN/m³

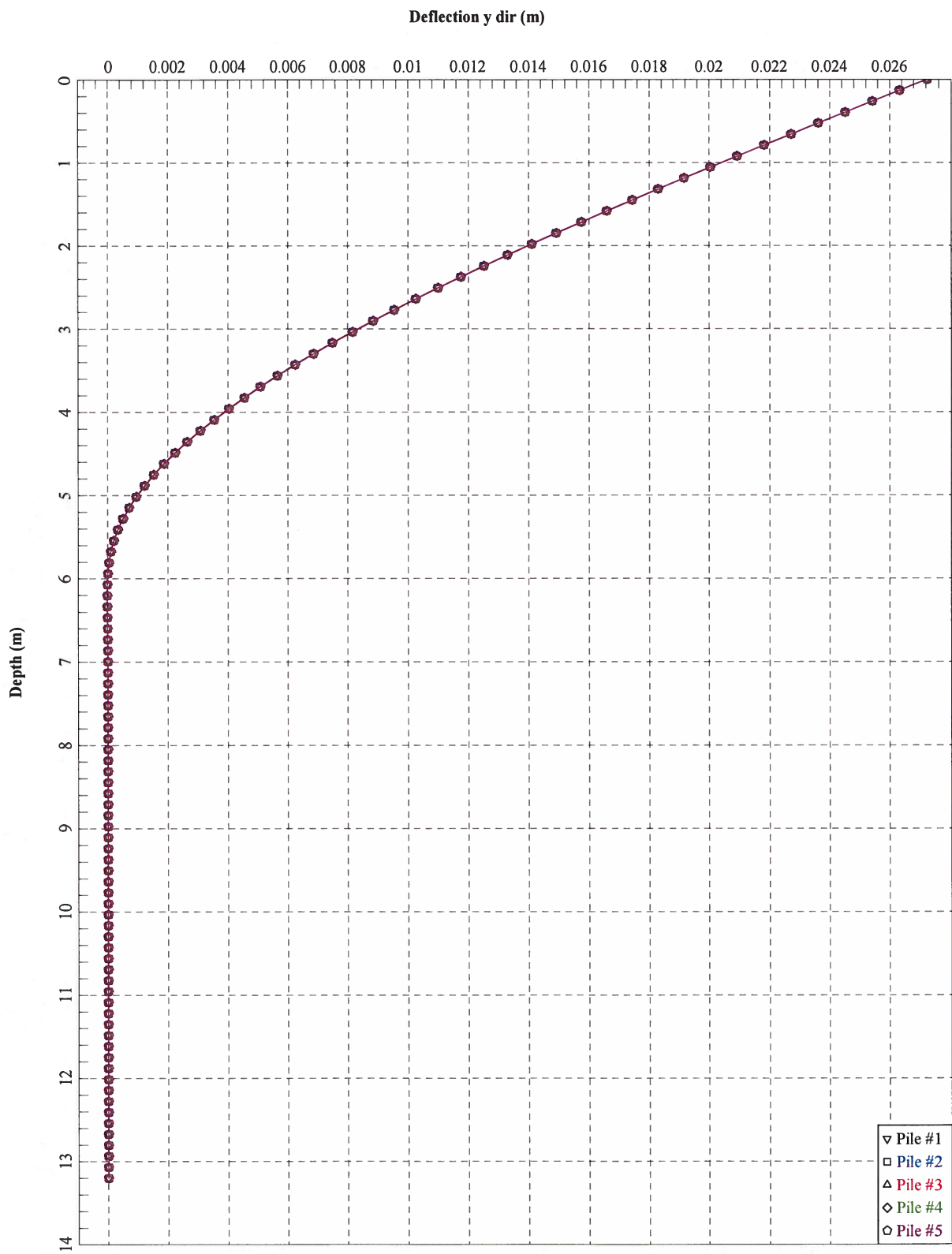
Moisture Content: 18.3



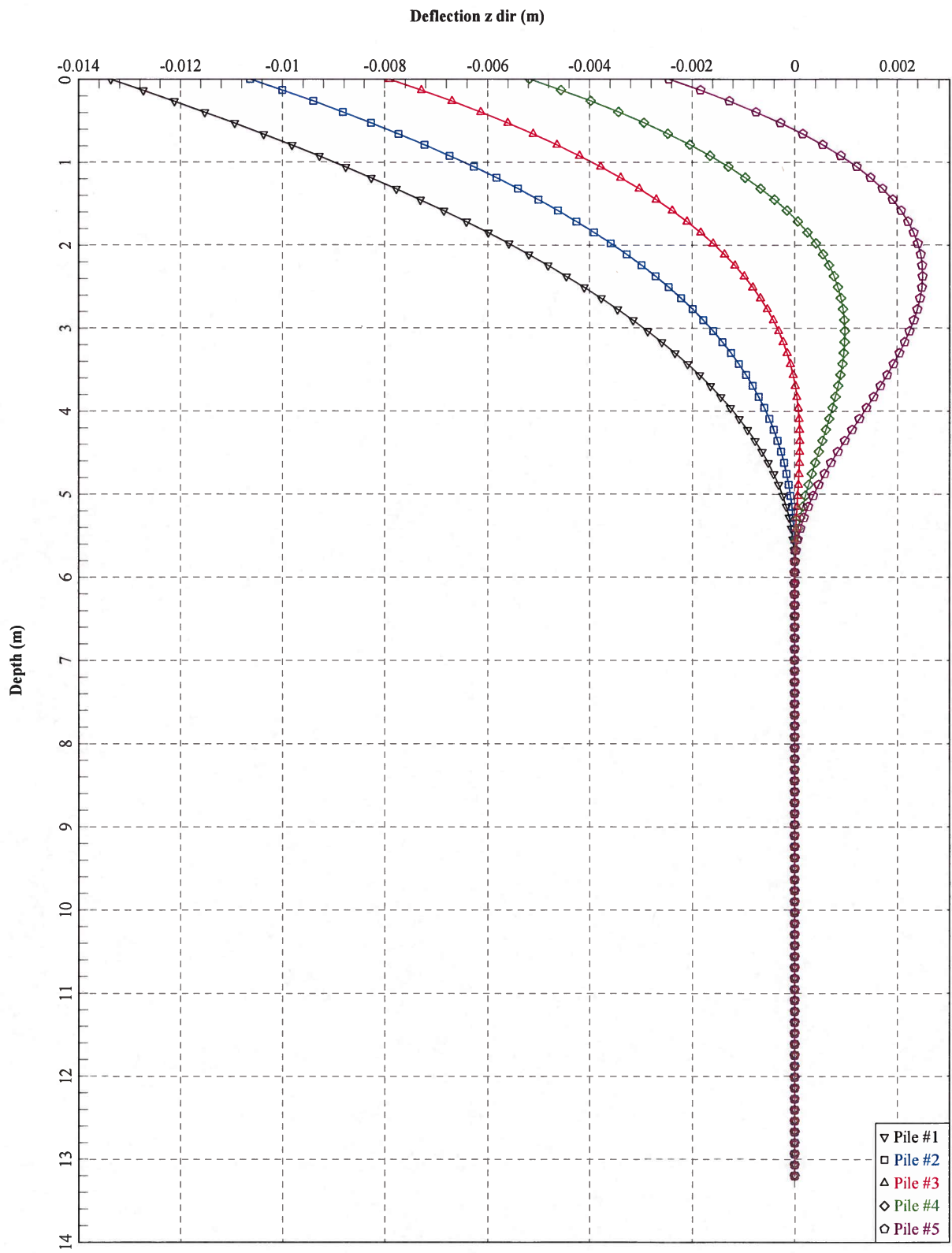
Chinle Wash Bridge – Abutments Pile Group Layout

HP 14x117 – 30-inch prebore – 5 piles spaced 5.25 feet on centers

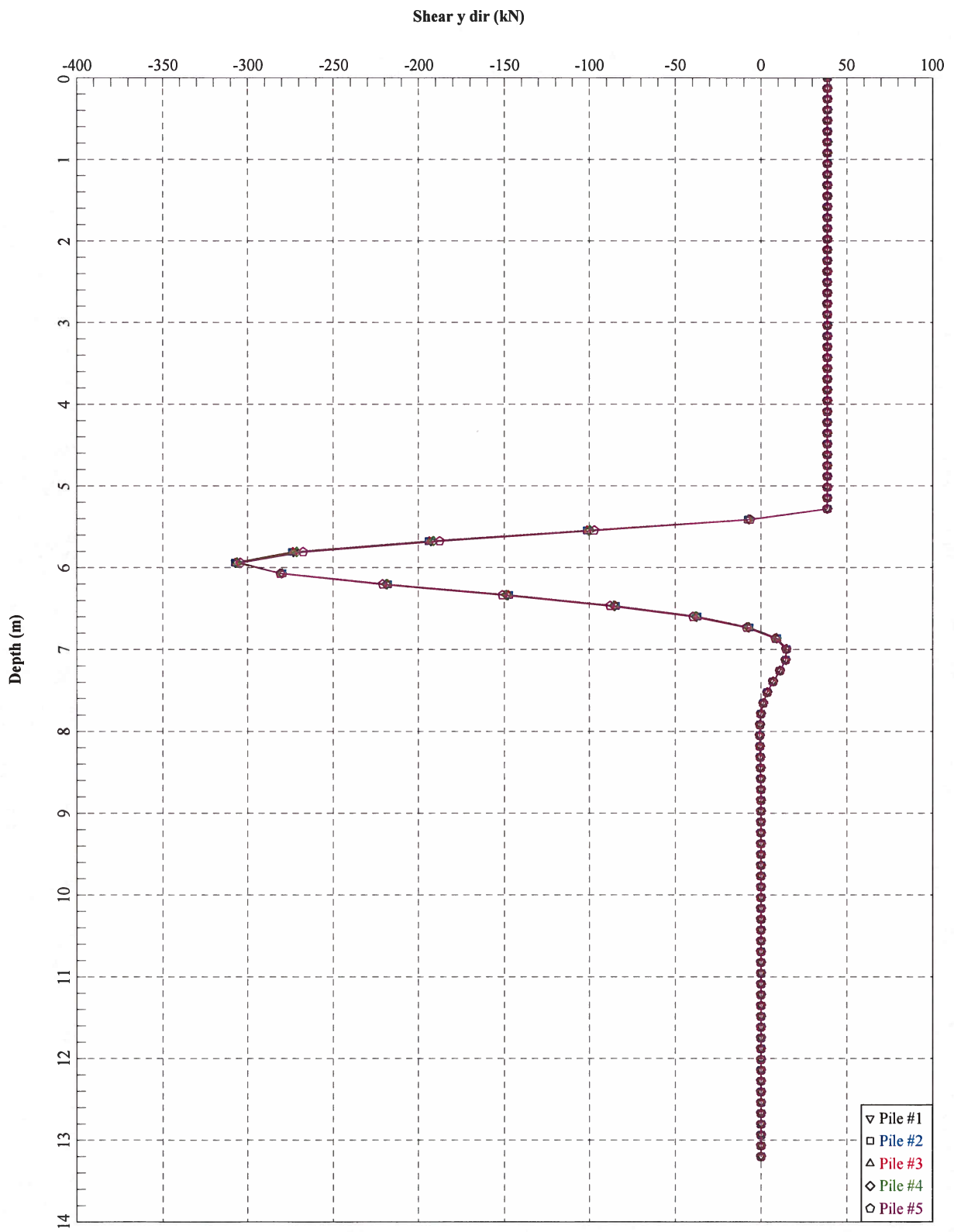




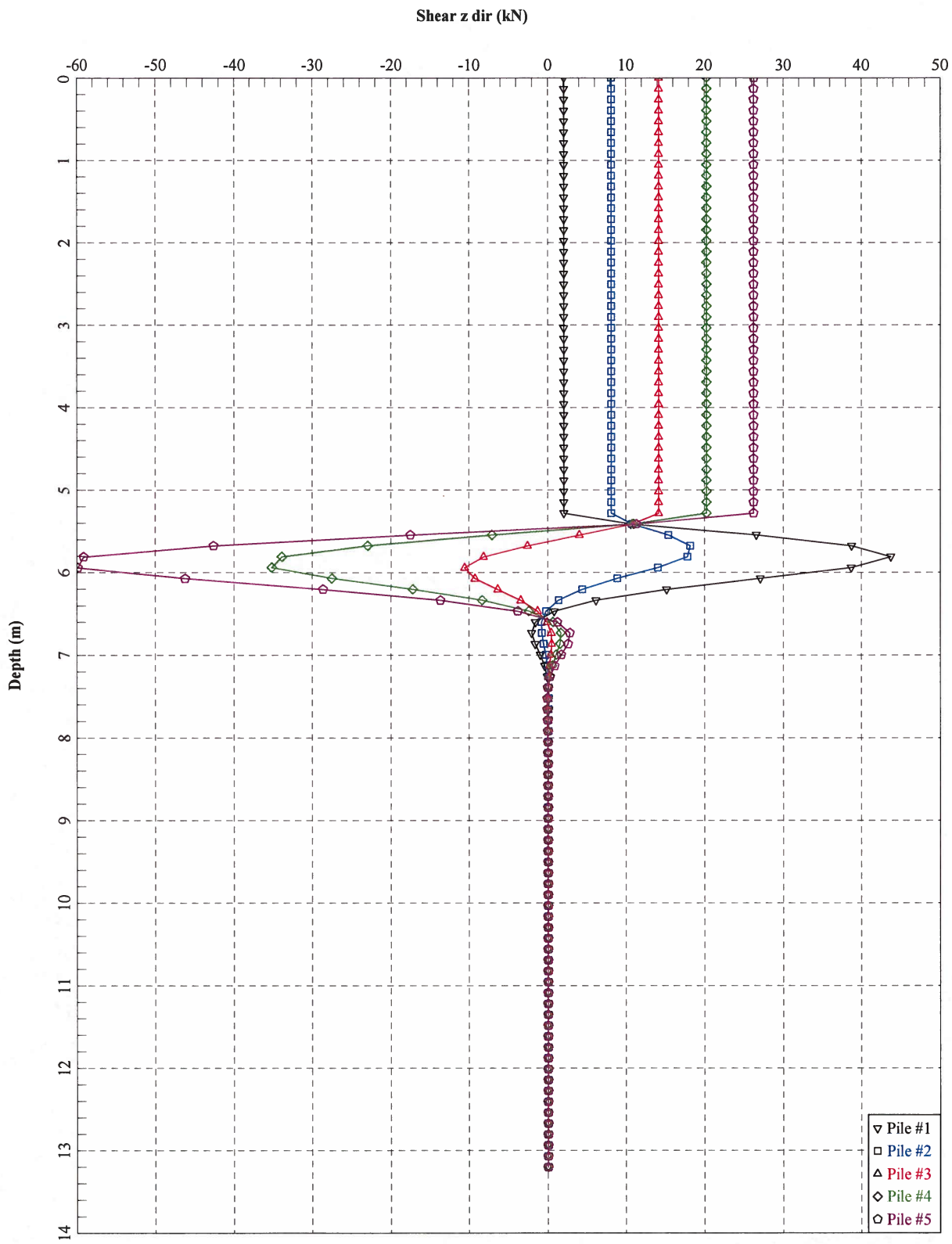
Transverse Deflection vs. Depth



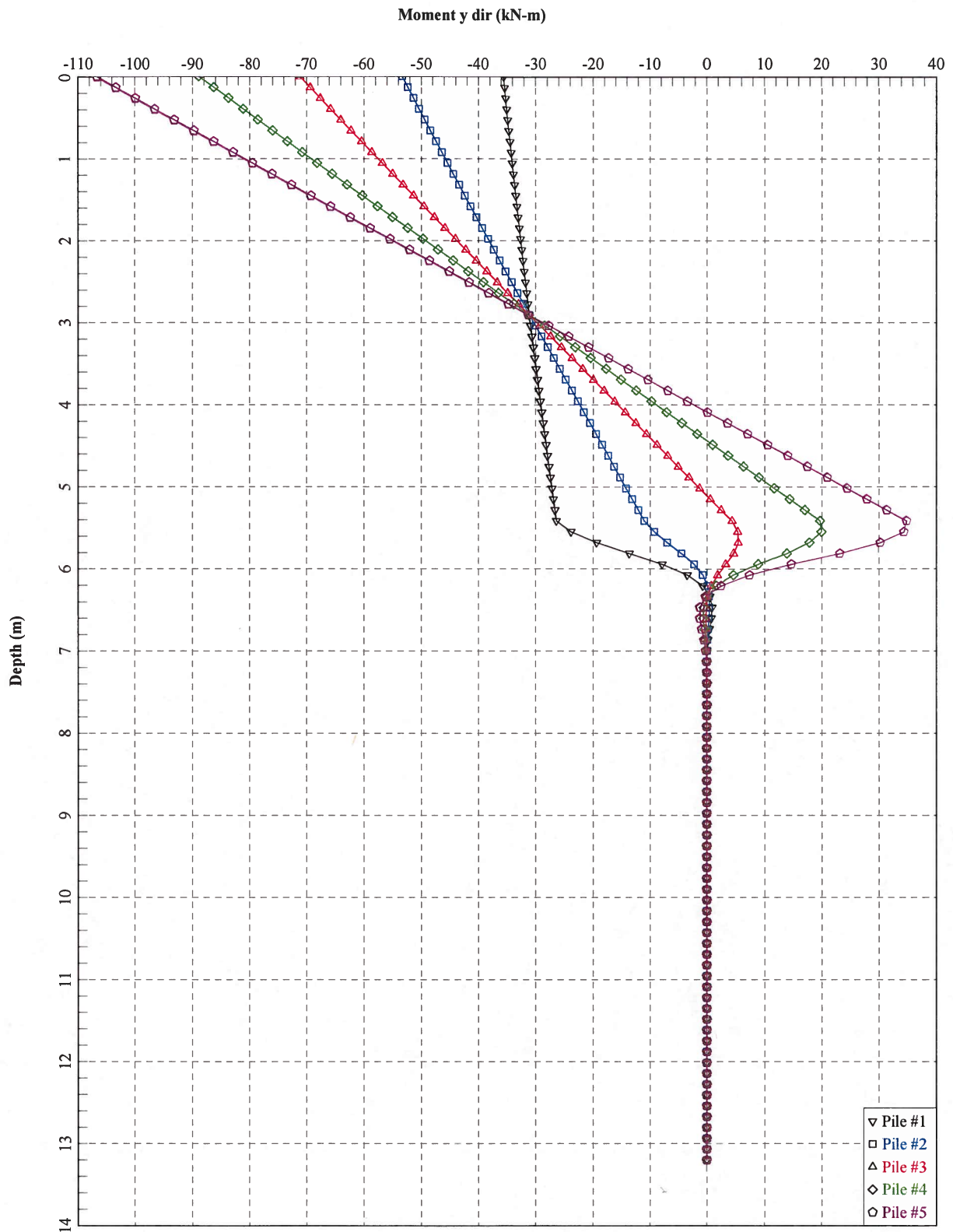
Longitudinal Deflections vs. Depth



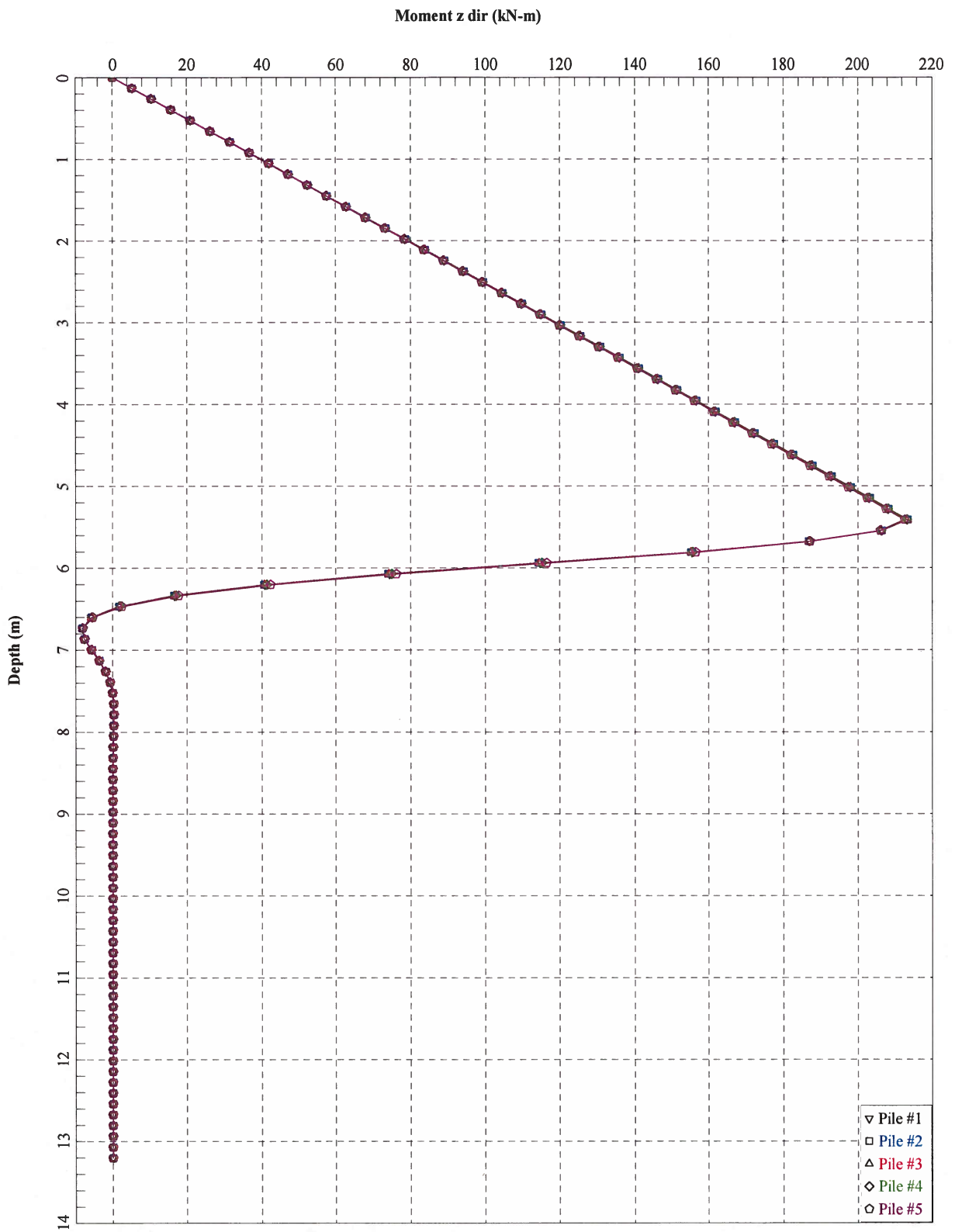
Transverse Shear vs. Depth



Longitudinal Shear vs. Depth



Moments (about Longitudinal Axis) vs. Depth



Moment (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 :

Kaustav Bose
Terracon

Path to file locations : C:\Documents and Settings\kbose\Desktop\Chinle Wash Bridge\GROUP\
Name of input data file : Abutment.gp80
Name of output file : Abutment.gp80
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: 16:25:48

***** 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) = 0.3038

* 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

EQUIVALENT DIAMETER : 0.76200 M
 EXTERNAL WIDTH : 0.36068 M
 EXTERNAL DEPTH : 0.37846 M
 FLANGE THICKNESS : 0.0204470 M
 WEB THICKNESS : 0.0204470 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 0.0220154 IZ, M**4 5.04152E-04 IY, M**4 1.84958E-04 GJ, KN- M**2 55128.8 Mn, KN- M 0.00000 Vn, KN 0.00000

* TABLE F * SOIL DATA

SOILS INFORMATION

GROUND SURFACE = 5.30000 M

2 LAYER(S) OF SOIL

LAYER 1
 THE LAYER IS A WEAK ROCK

	TOP OF LAYER	BOTTOM OF LAYER
X COORDINATE	5.30000	12.2000
EFFECTIVE UNIT WEIGHT (KN/ M**3)	20.4000	20.4000
UNIAXIAL COMPRESSIVE STRENGTH (KN/ M**2)	600.000	600.000
YOUNG MODULUS, ER (KN/ M**2)	90000.0	90000.0
KRM	5.00000E-05	5.00000E-05
RQD (%)	30.0000	30.0000
ULTIMATE UNIT SIDE FRICTION (KN/ M**2)	60.0000	60.0000
ULTIMATE UNIT TIP RESISTANCE (KN/ M**2)	1500.00	1500.00

LAYER 2
 THE LAYER IS A VUGGY LIMESTONE

	TOP OF LAYER	BOTTOM OF LAYER
X COORDINATE	12.2000	15.0000
EFFECTIVE UNIT WEIGHT (KN/ M**3)	20.4400	20.4400
UNIAXIAL COMPRESSIVE STRENGTH (KN/ M**2)	800.000	800.000
ULTIMATE UNIT SIDE FRICTION (KN/ M**2)	150.000	150.000
ULTIMATE UNIT TIP RESISTANCE (KN/ M**2)	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	-1339.31	-0.0538304
2	-1339.18	-0.0284300
3	-1339.18	-0.0157300
4	-1397.83	-5.71456E-03
5	-1358.94	-4.31097E-03
6	-357.216	-1.00654E-03
7	-173.385	-4.94450E-04
8	-34.6546	-9.88615E-05
9	-3.46546	-9.88615E-06
10	0.00000	0.00000

Abutment.gp8o

11	3.65532	1.03532E-05
12	36.5532	1.03532E-04
13	182.986	5.17945E-04
14	377.361	1.05529E-03
15	1389.14	4.40089E-03
16	1436.32	5.83174E-03
17	1383.01	0.0158614
18	1383.01	0.0285614
19	1412.36	0.0540494

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

NUM OF CURVES	CURVE 1	NUM OF POINTS	TORS. MOMEN, KN/ M	ROT. ANGLE, Rad.
1	1	19	-278.737	-0.19342
2	2	19	-278.737	-0.12676
3	3	19	-278.737	-0.0934228
4	4	19	-287.837	-0.0688255
5	5	19	-283.830	-0.0644525
6	6	19	-107.292	-0.0226378
7	7	19	-53.5092	-0.0112399
8	8	19	-10.3978	-2.19284E-03
9	9	19	-1.03978	-2.19284E-04
10	10	19	0.00000	0.00000
11	11	19	1.03978	2.19284E-04
12	12	19	10.3978	2.19284E-03
13	13	19	53.5092	0.0112399
14	14	19	107.292	0.0226378
15	15	19	283.830	0.0644525
16	16	19	287.837	0.0688255
17	17	19	278.737	0.0934228
18	18	19	278.737	0.12676
19	19	19	278.737	0.19342

***** 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

711.716 193.498 70.7267
MOMENT X, M-KN 0.00000
MOMENT Y, M-KN 0.00000
MOMENT Z, M-KN 0.00000

* DISPLACEMENT OF GROUPED PILE FOUNDATION AT ORIGIN *

VERTICAL, M HORIZONTAL Y, M HORIZONTAL Z, M
2.83291E-03 0.0280828 -7.91349E-03
ANGLE ROT. X, RAD 1.70514E-03
ANGLE ROT. Y, RAD -4.85997E-03
ANGLE ROT. Z, RAD -8.34799E-21

NUMBER OF GLOBAL ITERATIONS = 4

* 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
4.0292E-04 2.7230E-02 -1.3370E-02 1.7051E-03 -4.8600E-03 -8.3480E-21
FOR. X, KN FOR. Y, KN FOR. Z, KN MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
142.34 38.720 2.0441 2.1785E-15 -35.579 0.0000
STR, KN/M**2
7.9755E+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
4.0292E-04 2.7230E-02 -1.3370E-02 1.7051E-03 -4.8600E-03 -8.3480E-21
AXIAL, KN LAT. Y, KN LAT. Z, KN MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
142.34 38.720 2.0441 0.0000 -35.579 0.0000
STR, KN/M**2
7.9755E+04

* 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	2.7230E-02	-1.3370E-02	0.0000	-35.579	38.720	2.0531	0.0000	0.0000	7.9755E+04	1.0083E+05	1.0083E+05	3.6992E+04
0.2640	2.5413E-02	-1.2120E-02	10.481	-35.217	38.720	2.0441	0.0000	0.0000	7.9441E+04	1.0083E+05	1.0083E+05	3.6992E+04
0.5280	2.3603E-02	-1.0937E-02	20.960	-34.846	38.720	2.0441	0.0000	0.0000	7.9972E+04	1.0083E+05	1.0083E+05	3.6992E+04
0.7920	2.1807E-02	-9.8195E-03	31.438	-34.465	38.720	2.0441	0.0000	0.0000	8.1331E+04	1.0083E+05	1.0083E+05	3.6992E+04
1.0560	2.0033E-02	-8.7668E-03	41.913	-34.075	38.720	2.0441	0.0000	0.0000	8.3474E+04	1.0083E+05	1.0083E+05	3.6992E+04
1.3200	1.8288E-02	-7.7784E-03	52.383	-33.676	38.720	2.0441	0.0000	0.0000	8.6337E+04	1.0083E+05	1.0083E+05	3.6992E+04

DISP. X, M 2.7230E-02 ROT. X, RAD 1.7051E-03 ROT. Y, RAD -4.8600E-03 ROT. Z, RAD -8.3480E-21
4.0292E-04 2.7230E-02 -1.0642E-02 1.7051E-03 -4.8600E-03 -8.3480E-21
AXIAL, KN 142.34 LAT. Y, KN 38.748 LAT. Z, KN 8.0977 MOM X, KN-M 0.0000 MOM Y, KN-M -53.381 MOM Z, KN-M 0.0000

STR, KN/ M**2 1.1643E+05

* EFFECTS FOR Laterally Loaded Pile *

Table with columns: X, DEFLECTION (Y-DIR, Z-DIR), BENDING MOMENT (Y-DIR, Z-DIR), SHEAR FORCE (Y-DIR, Z-DIR), SOIL REACTION (Y-DIR, Z-DIR), TOTAL STRESS (KN/ M**2), FLEXURAL RIGIDITY (Z-DIR, Y-DIR), and TOTAL RIGIDITY (KN- M**2). The table contains multiple rows of numerical data for each parameter.

6.3360 -2.0822E-05 7.7849E-07 16.602 0.1323 -147.67 -3.4386
 6.6000 -9.9546E-06 -2.0300E-07 -5.7857 -0.2148 -37.345 -9.6203E-02
 6.8640 -2.2029E-06 1.6861E-08 -3.6245 -1.3220E-02 9.2880 0.4768
 7.1280 5.3254E-07 2.9438E-08 -0.6997 8.2999E-03 7.0811 0.2018
 7.3920 7.0210E-07 5.8797E-09 0.2711 4.3043E-03 1.3279 1.2498E-02
 7.6560 2.9933E-07 1.8810E-10 0.2711 4.3043E-03 1.3279 1.2498E-02
 7.9200 4.3403E-08 -1.0173E-09 0.2730 4.3413E-04 -0.5390 -7.5325E-03
 8.1840 -2.8334E-08 2.5287E-10 0.1054 -3.0604E-04 -0.5326 -2.8449E-04
 8.4480 -2.3369E-08 8.8360E-11 1.0426E-02 -1.4005E-04 -0.2017 7.0705E-04
 8.7120 -8.0311E-09 3.5243E-11 -1.2681E-02 -1.1245E-05 1.8846E-02 2.4833E-04
 8.9760 -3.7003E-10 9.2339E-12 -8.8814E-03 1.1189E-06 2.4887E-02 2.7252E-06
 9.2400 1.2021E-09 -1.2409E-12 4.5890E-05 4.6358E-06 1.7147E-02 -2.5160E-05
 9.5040 7.3353E-10 -1.2137E-12 4.5890E-05 4.6358E-06 1.7147E-02 -2.5160E-05
 9.7680 1.9723E-11 5.1285E-14 5.0182E-04 -4.0462E-07 5.1743E-03 -8.0621E-06
 10.032 1.8083E-11 5.1285E-14 2.2108E-04 -1.5243E-07 8.819E-07 8.4246E-07
 10.296 4.5084E-11 4.1513E-14 6.2803E-05 4.7490E-09 5.2172E-04 2.5962E-07
 10.560 2.1766E-11 7.4614E-15 1.2591E-05 1.4493E-08 -1.1867E-04 -1.2753E-08
 10.824 4.2026E-12 2.0404E-15 1.8012E-05 4.9768E-09 2.5461E-05 -3.1126E-08
 11.088 1.4804E-12 -1.4119E-15 7.8098E-06 2.0908E-11 3.4957E-05 -8.2851E-09
 11.352 1.5646E-12 -2.2264E-16 -1.1914E-06 -5.1454E-10 1.4932E-05 6.9777E-10
 11.616 6.1329E-13 7.9467E-17 6.8153E-07 1.8771E-12 -1.4915E-06 1.0793E-09
 11.880 4.9987E-14 4.7807E-17 5.3859E-07 1.4699E-11 7.4511E-07 -1.9913E-11
 12.144 -1.4780E-13 2.0263E-18 1.6585E-07 8.3360E-12 2.4370E-07 -2.2035E-11
 12.408 -2.1092E-13 -1.6808E-17 9.0343E-08 8.3360E-12 2.4370E-07 -2.2035E-11
 12.672 -2.1058E-13 -2.0092E-17 3.7910E-08 3.3381E-12 -1.5356E-07 -1.3970E-11
 12.936 -1.8302E-13 -1.6824E-17 8.7717E-09 7.3594E-13 -7.0059E-08 -6.0849E-12
 13.200 -1.4852E-13 -1.1948E-17 1.4608E-22 0.0000 -1.1359E-22 2.1332E-26

NUMBER OF ITERATIONS IN LLP = 6

* 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	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
4.0292E-04	2.7230E-02	-5.1853E-03	1.7051E-03	-4.8600E-03	-8.3480E-21			
FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M			
142.34	38.689	20.204	5.4485E-15	-88.983	0.0000			

STR. KN/ M**2
1.8976E+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	ROT. X, RAD	ROT. Y, RAD	ROT. Z, RAD
4.0292E-04	2.7230E-02	-5.1853E-03	1.7051E-03	-4.8600E-03	-8.3480E-21			
AXIAL, KN	LAT. Y, KN	LAT. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M			
142.34	38.689	20.204	0.0000	-88.983	0.0000			

STR. KN/ M**2
1.8976E+05

* 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	Z-DIR	Y-DIR

Abutment_gp80												
M	M	M	M	M	M	M	M	M	M	M	M	M
KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
0.0000	2.7230E-02	5.1853E-03	0.0000	-88.983	38.689	20.226	0.0000	0.0000	0.0000	0.0000	0.0000	1.8976E+05
0.2640	2.5413E-02	3.9848E-03	0.1000	-83.820	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.7931E+05
0.5280	2.3604E-02	2.9423E-03	0.2000	-78.635	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.6922E+05
0.7920	2.1808E-02	2.0480E-03	0.31415	-73.428	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.5957E+05
1.0560	2.0033E-02	1.2920E-03	0.41880	-68.202	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.5048E+05
1.3200	1.8290E-02	6.6451E-04	0.52342	-62.958	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.4205E+05
1.5840	1.6582E-02	1.5562E-04	0.62799	-57.697	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.3444E+05
1.8480	1.4917E-02	2.4456E-04	0.73250	-52.420	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.2781E+05
2.1120	1.3303E-02	5.4598E-04	0.83694	-47.129	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.2233E+05
2.3760	1.1746E-02	7.5860E-04	0.94129	-41.825	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.1819E+05
2.6400	1.0255E-02	8.9242E-04	1.0456	-36.511	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.1555E+05
2.9040	8.8358E-03	9.5745E-04	1.1497	-31.186	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.1452E+05
3.1680	7.4961E-03	9.6373E-04	1.2536	-25.853	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.1517E+05
3.4320	6.2431E-03	9.2130E-04	1.3577	-20.514	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.1743E+05
3.6960	5.0840E-03	8.4021E-04	1.4615	-15.168	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.2125E+05
3.9600	4.0258E-03	7.3055E-04	1.5651	-9.8188	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.2646E+05
4.2240	3.0759E-03	6.0239E-04	1.6686	-4.4668	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.3290E+05
4.4880	2.2412E-03	4.6582E-04	1.7719	0.8864	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.4039E+05
4.7520	1.5291E-03	3.3091E-04	1.8751	6.2393	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.4875E+05
5.0160	9.4657E-04	2.0775E-04	1.9781	11.591	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.5785E+05
5.2800	5.0076E-04	1.0645E-04	2.0808	16.939	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.6754E+05
5.5440	1.9879E-04	3.7051E-05	2.0808	19.939	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.6762E+05
5.8080	3.7243E-05	3.9368E-06	2.0808	13.768	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.2753E+05
6.0720	-1.8263E-05	-3.7029E-06	1.5574	4.4846	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.2753E+05
6.3360	-2.0832E-05	-2.2502E-06	17.038	-148.94	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	6.3821E+04
6.6000	-1.0036E-05	-4.5854E-07	-5.6467	-38.186	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.9342E+04
6.8640	-2.2521E-06	9.8390E-08	-7.5829	0.7142	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	1.0979E+04
7.1280	5.1808E-07	8.8131E-08	-0.7179	-1.6914E-02	14.461	0.5186	0.0000	0.0000	0.0000	0.0000	0.0000	1.2227E+04
7.3920	7.0259E-07	1.8673E-08	-0.7179	7.1408	38.689	20.204	0.0000	0.0000	0.0000	0.0000	0.0000	9228.4
7.6560	3.0214E-07	3.3981E-09	0.2664	1.3537E-02	7.1408	0.5186	0.0000	0.0000	0.0000	0.0000	0.0000	7011.3
7.9200	4.8838E-08	3.0055E-09	0.2755	1.9348E-04	1.3537	0.5186	0.0000	0.0000	0.0000	0.0000	0.0000	6668.3
8.1840	-2.3445E-08	-5.7319E-10	0.1066	1.0561E-03	-0.3300	-1.9376E-02	0.0000	0.0000	0.0000	0.0000	0.0000	6673.8
8.4480	2.3445E-08	1.3753E-10	1.0964E-02	-3.6884E-04	-0.3300	6.4217E-04	-1.2602	-2.5793E-02	2.0197	-0.1352	6546.2	6546.2
8.7120	-8.1312E-09	1.0253E-10	-1.2583E-02	6.5638E-06	-0.2040	2.2270E-03	-1.0550	6.1889E-03	-1.0550	6.1637E-03	6473.9	6473.9
8.9760	4.1239E-10	1.7290E-11	-8.9207E-03	3.6592E-05	2.4702E-02	6.2120E-04	-0.3659	4.6137E-03	0.3659	4.6137E-03	6475.1	6475.1
9.2400	1.1961E-09	5.3910E-12	-2.7560E-03	1.1998E-05	1.7225E-02	-4.1202E-05	-1.8557E-02	7.7805E-04	-1.8557E-02	7.7805E-04	6477.4	6477.4
9.5040	2.0071E-10	3.4767E-13	3.0999E-05	-1.2303E-03	5.2501E-03	-1.9727E-05	5.3826E-02	-2.4260E-04	5.3826E-02	-2.4260E-04	6467.7	6467.7
9.7680	7.0057E-10	5.1015E-13	5.0041E-04	1.2943E-06	9.9547E-03	0.0465E-06	9.0258E-03	-2.2957E-05	9.0258E-03	-2.2957E-05	6465.6	6465.6
10.032	-1.7751E-11	2.0635E-13	7.290E-04	3.8716E-07	-9.7579E-04	2.6981E-06	2.9878E-04	9.2858E-06	2.9878E-04	9.2858E-06	6465.8	6465.8
10.296	4.5037E-11	1.1720E-13	6.4065E-05	1.5847E-08	-3.2330E-04	6.1969E-07	-2.0367E-03	5.7239E-06	-2.0367E-03	5.7239E-06	6465.7	6465.7
10.560	-2.1939E-11	1.4619E-14	-1.2209E-05	4.5437E-08	-1.2111E-04	9.0370E-08	-9.8224E-04	6.5785E-07	-9.8224E-04	6.5785E-07	6465.6	6465.6
10.824	4.3068E-12	7.7529E-15	1.8021E-05	1.2385E-08	2.4733E-05	-9.3003E-08	-1.9380E-04	3.4888E-07	-1.9380E-04	3.4888E-07	6465.6	6465.6
11.088	1.4527E-12	3.9271E-15	-7.8815E-06	9.2918E-10	3.4979E-05	1.9221E-08	6.5370E-05	-1.1767E-07	6.5370E-05	-1.1767E-07	6465.6	6465.6
11.352	1.5675E-12	4.0153E-16	-1.2298E-06	1.5837E-09	1.5072E-05	3.7954E-09	7.0535E-05	-1.8069E-08	7.0535E-05	-1.8069E-08	6465.6	6465.6
11.616	6.1978E-13	2.8857E-16	6.7259E-07	-3.9355E-10	2.1541E-06	3.1718E-09	2.7890E-05	1.2986E-08	2.7890E-05	1.2986E-08	6465.6	6465.6
11.880	5.3041E-14	1.3062E-16	5.4000E-07	3.6978E-11	-1.4760E-06	5.5871E-10	-2.3869E-06	5.8779E-09	-2.3869E-06	5.8779E-09	6465.6	6465.6
12.144	-1.4763E-13	5.9024E-18	1.6783E-07	4.4178E-11	-7.4766E-07	-9.8836E-11	-6.6434E-06	-2.6561E-10	-6.6434E-06	-2.6561E-10	6465.6	6465.6
12.408	-1.2229E-13	5.7010E-17	9.1534E-08	2.3818E-11	-2.4645E-07	-6.6937E-11	-3.3967E-07	-9.1216E-11	-3.3967E-07	-9.1216E-11	6465.6	6465.6
12.672	-2.1266E-13	6.2495E-17	3.8462E-08	9.4949E-12	-1.5557E-07	-4.0954E-11	-3.4026E-07	-9.9992E-11	-3.4026E-07	-9.9992E-11	6465.6	6465.6
12.936	-1.8342E-13	4.9270E-17	8.9143E-09	2.0138E-12	-7.1117E-08	-1.7103E-11	-2.9667E-07	-7.8832E-11	-2.9667E-07	-7.8832E-11	6465.6	6465.6
13.200	-1.5113E-13	-3.1604E-17	-1.4608E-12	6.5421E-27	1.6005E-22	3.6280E-26	-2.4180E-07	-5.0567E-11	-2.4180E-07	-5.0567E-11	6465.6	6465.6

NUMBER OF ITERATIONS IN LLP = 6

* 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
4.0292E-04 2.7230E-02 -2.4570E-03 1.7051E-03 -4.8600E-03 -8.3480E-21

FOR. X, KN 142.34 FOR. Y, KN 38.604 FOR. Z, KN 26.225 MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
 4.0292E+04 2.7230E-02 -2.4570E-03 1.7051E-03 -4.8600E-03 -8.3480E-21
 6.5346E-15 -106.72 0.0000

Abutment.gp80

STR, KN/ M**2 2.2631E+05

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M 4.0292E+04 DISP. Y, M 2.7230E-02 DISP. Z, M -2.4570E-03 ROT. X, RAD 1.7051E-03 ROT. Y, RAD -4.8600E-03 ROT. Z, RAD -8.3480E-21
 AXIAL, KN 142.34 LAT. Y, KN 38.604 LAT. Z, KN 26.225 MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
 4.0292E+04 2.7230E-02 -2.4570E-03 1.7051E-03 -4.8600E-03 -8.3480E-21
 6.5346E-15 -106.72 0.0000

STR, KN/ M**2 2.2631E+05

* EFFECTS FOR Laterally Loaded Pile *

X	DEFLECTION			BENDING MOMENT			SHEAR FORCE			SOIL REACTION			TOTAL STRESS		FLEXURAL RIGIDITY	
	Y-Dir	Z-Dir	M	Y-Dir	Z-Dir	M	Y-Dir	Z-Dir	M	Y-Dir	Z-Dir	M	KN/ M**2	KN- M**2	Y-Dir	KN- M**2
0.0000	2.7230E-02	-2.4570E-03	0.0000	-106.72	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	2.2631E+05	1.0083E+05	3.6992E+04	1.0083E+05
0.2640	2.5415E-02	-1.2730E-03	10.450	-99.967	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	2.1254E+05	1.0083E+05	3.6992E+04	1.0083E+05
0.5280	2.3606E-02	-2.7722E-04	20.899	-93.186	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.9907E+05	1.0083E+05	3.6992E+04	1.0083E+05
0.7920	2.1812E-02	5.4295E-04	31.346	-86.379	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.8597E+05	1.0083E+05	3.6992E+04	1.0083E+05
1.0560	2.0040E-02	1.2004E-04	41.789	-79.549	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.7335E+05	1.0083E+05	3.6992E+04	1.0083E+05
1.3200	1.8297E-02	1.7079E-03	52.229	-72.698	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.6133E+05	1.0083E+05	3.6992E+04	1.0083E+05
1.5840	1.6590E-02	2.0785E-03	62.664	-65.827	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.5010E+05	1.0083E+05	3.6992E+04	1.0083E+05
1.8480	1.4928E-02	2.3251E-03	73.092	-58.939	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.3985E+05	1.0083E+05	3.6992E+04	1.0083E+05
2.1120	1.3312E-02	2.4606E-03	83.513	-52.035	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.3085E+05	1.0083E+05	3.6992E+04	1.0083E+05
2.3760	1.1757E-02	2.4981E-03	93.926	-45.117	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.2341E+05	1.0083E+05	3.6992E+04	1.0083E+05
2.6400	1.0266E-02	2.4505E-03	104.33	-38.186	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.1744E+05	1.0083E+05	3.6992E+04	1.0083E+05
2.9040	8.8471E-03	2.3311E-03	114.72	-31.246	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.1444E+05	1.0083E+05	3.6992E+04	1.0083E+05
3.1680	7.5078E-03	2.1527E-03	125.11	-24.297	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.1344E+05	1.0083E+05	3.6992E+04	1.0083E+05
3.4320	6.2549E-03	1.9286E-03	135.48	-17.342	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.1490E+05	1.0083E+05	3.6992E+04	1.0083E+05
3.6960	5.0950E-03	1.6718E-03	145.83	-10.382	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.1873E+05	1.0083E+05	3.6992E+04	1.0083E+05
3.9600	4.0372E-03	1.3953E-03	156.17	-3.4190	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.2470E+05	1.0083E+05	3.6992E+04	1.0083E+05
4.2240	3.0867E-03	1.1127E-03	166.50	3.5447	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.3251E+05	1.0083E+05	3.6992E+04	1.0083E+05
4.4880	2.2513E-03	8.3657E-04	176.81	10.507	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.4183E+05	1.0083E+05	3.6992E+04	1.0083E+05
4.7520	1.5381E-03	5.8025E-04	187.10	17.467	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.5237E+05	1.0083E+05	3.6992E+04	1.0083E+05
5.0160	9.5429E-04	3.5684E-04	197.38	24.423	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.6388E+05	1.0083E+05	3.6992E+04	1.0083E+05
5.2800	5.0687E-04	1.7945E-04	207.63	31.371	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.7617E+05	1.0083E+05	3.6992E+04	1.0083E+05
5.5440	2.0296E-04	6.1163E-05	206.07	34.382	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.7755E+05	1.0083E+05	3.6992E+04	1.0083E+05
5.8080	3.9385E-05	5.9155E-06	156.54	23.140	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.3401E+05	1.0083E+05	3.6992E+04	1.0083E+05
6.0720	-1.7623E-05	6.4023E-06	76.181	7.3479	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	0.5994E+04	1.0083E+05	3.6992E+04	1.0083E+05
6.3360	-2.0850E-05	5.7648E-06	17.806	-0.2097	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	0.5994E+04	1.0083E+05	3.6992E+04	1.0083E+05
6.6000	-1.0179E-05	3.9995E-07	-5.4015	-0.2148	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.9929E+04	1.0083E+05	3.6992E+04	1.0083E+05
6.8640	-2.3390E-06	1.7515E-07	-7.5886	-0.4744	38.604	26.225	38.604	26.225	0.0000	0.0000	0.0000	0.0000	1.1284E+04	1.0083E+05	3.6992E+04	1.0083E+05
7.1280	4.9256E-07	1.4809E-07	3.7104	-2.3778E-02	14.462	0.8538	18.613	5.9961	18.613	5.9961	18.613	5.9961	9270.1	1.0083E+05	3.6992E+04	1.0083E+05
7.3920	7.0346E-07	3.0309E-08	0.7500	4.0759E-02	7.2463	-1.9011E-02	29.507	1.2713	7041.2	1.0083E+05	7041.2	1.0083E+05	7041.2	1.0083E+05	3.6992E+04	1.0083E+05
7.6560	3.0711E-07	-6.0458E-09	0.2580	1.8643E-02	1.4251	-0.1073	13.820	-0.2721	6664.3	1.0083E+05	6664.3	1.0083E+05	6664.3	1.0083E+05	3.6992E+04	1.0083E+05
7.9200	4.7495E-08	5.0422E-09	0.2765	6.6400E-04	-0.5141	-3.1871E-02	2.1373	-0.2269	6674.6	1.0083E+05	6674.6	1.0083E+05	6674.6	1.0083E+05	3.6992E+04	1.0083E+05
8.1840	-2.7424E-08	-9.2549E-10	0.1086	-1.7468E-03	-0.3358	1.3853E-03	-1.2341	-4.1647E-02	6474.7	1.0083E+05	6474.7	1.0083E+05	6474.7	1.0083E+05	3.6992E+04	1.0083E+05
8.4480	-2.3580E-08	2.4189E-10	1.1912E-02	6.0946E-04	-0.2079	3.7683E-03	-1.0611	1.0885E-02	6475.0	1.0083E+05	6475.0	1.0083E+05	6475.0	1.0083E+05	3.6992E+04	1.0083E+05
8.7120	-4.5080E-09	1.7167E-10	1.2409E-02	-3.4754E-06	-2.1699E-02	2.4376E-02	-7.9352E-05	-2.1920E-02	6472.4	1.0083E+05	6472.4	1.0083E+05	6472.4	1.0083E+05	3.6992E+04	1.0083E+05
8.9760	-4.8711E-10	2.7735E-11	-8.9902E-10	6.2122E-05	2.4376E-02	1.7363E-02	-1.3120E-04	5.3351E-02	6467.7	1.0083E+05	6467.7	1.0083E+05	6467.7	1.0083E+05	3.6992E+04	1.0083E+05
9.2400	1.1856E-09	-9.4025E-12	2.8251E-03	1.9735E-07	1.7363E-02	5.3840E-03	-3.2245E-05	3.3518E-02	6465.6	1.0083E+05	6465.6	1.0083E+05	6465.6	1.0083E+05	3.6992E+04	1.0083E+05
9.5040	7.4483E-10	5.8103E-12	4.7206E-06	-3.9231E-07	5.3840E-03	-3.2245E-05	3.3518E-02	-2.6147E-04	6466.0	1.0083E+05	6466.0	1.0083E+05	6466.0	1.0083E+05	3.6992E+04	1.0083E+05
9.7680	2.0644E-10	-8.1144E-13	4.9791E-04	-2.1918E-06	-4.9262E-05	3.7710E-06	9.2900E-03	-3.6515E-05	6465.8	1.0083E+05	6465.8	1.0083E+05	6465.8	1.0083E+05	3.6992E+04	1.0083E+05
10.0320	1.5752E-11	3.5757E-13	2.7612E-04	-6.3641E-04	-9.7130E-04	4.5419E-06	-7.0884E-04	1.6091E-05	6465.7	1.0083E+05	6465.7	1.0083E+05	6465.7	1.0083E+05	3.6992E+04	1.0083E+05
10.2960	-4.4954E-11	1.9549E-13	6.6293E-05	3.2791E-08	-5.3162E-04	1.0090E-06	-2.0229E-03	8.7969E-06	6465.6	1.0083E+05	6465.6	1.0083E+05	6465.6	1.0083E+05	3.6992E+04	1.0083E+05
10.5600	-2.4243E-11	2.3083E-14	1.1534E-05	7.6772E-08	-1.2341E-04	-1.6368E-07	-1.0009E-03	1.0343E-07	6465.6	1.0083E+05	6465.6	1.0083E+05	6465.6	1.0083E+05	3.6992E+04	1.0083E+05
10.8240	-4.4906E-12	-1.3365E-14	-1.8036E-05	2.0296E-08	-1.2341E-04	-1.6368E-07	-1.0009E-03	-6.0142E-07	6465.6	1.0083E+05	6465.6	1.0083E+05	6465.6	1.0083E+05	3.6992E+04	1.0083E+05

11.088 1.4038E-12 -6.5375E-15 -8.0083E-06 -1.7646E-09 3.5018E-05 -3.1154E-08 6.3172E-05 -2.9419E-07 1.0083E+05 3.6992E+04
 11.352 1.5726E-12 -6.2041E-16 -1.2977E-06 -2.6700E-09 1.5318E-05 6.7274E-09 7.0765E-05 -2.7918E-08 1.0083E+05 3.6992E+04
 11.616 6.3126E-13 4.9530E-16 6.5683E-07 -6.4284E-10 2.2832E-06 5.3177E-09 2.8407E-05 2.2288E-08 1.0083E+05 3.6992E+04
 11.880 5.8432E-14 2.1693E-16 5.4249E-07 6.8565E-11 -1.4488E-06 8.9814E-10 2.6295E-06 9.7619E-09 1.0083E+05 3.6992E+04
 12.144 -1.4733E-13 -1.2371E-17 1.7132E-07 7.4272E-11 -2.5218E-07 -1.7412E-10 -6.6300E-06 -5.5671E-10 1.0083E+05 3.6992E+04
 12.408 -2.1472E-13 -9.7170E-17 9.3638E-08 3.9912E-11 -2.5132E-07 -1.1276E-10 -3.4354E-07 -1.5547E-10 1.0083E+05 3.6992E+04
 12.672 -2.1634E-13 -1.0550E-16 3.9437E-08 1.5853E-11 -1.5913E-07 -6.8641E-11 -3.4614E-07 -1.6879E-10 1.0083E+05 3.6992E+04
 12.936 -1.8966E-13 -8.2568E-17 9.1662E-09 3.3452E-12 -7.2987E-08 -2.8511E-11 -3.0346E-07 -1.3211E-10 1.0083E+05 3.6992E+04
 13.200 -1.5573E-13 -5.2254E-17 -1.4608E-22 0.0000 -5.9074E-23 -1.3656E-26 -2.4917E-07 -8.3606E-11 1.0083E+05 3.6992E+04

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NUMBER OF ITERATIONS IN LLP = 6

Evaluation of Compression Strength of Steel

For HP Section	HP14x117	Metric HP360x174	Chinle Wash
$E_s =$	2.00E+08 kN/m ²	2.90E+07 psi	
$f_y =$	36 ksi		
$A_g =$	34.4 in ²	22193.5 mm ²	
$b_f =$	14.9 in	378.46 mm	
$t_f =$	0.805 in	20.447 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

$$P_0 = 1238.4 \text{ kips}$$

Now,

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

$$l = 38 \text{ ft}$$

$$r_s = 3.59 \text{ in}$$

$$k = 0.65$$

length of driven pile

radius of gyration of weaker section

k

0.65 for fixed top-fixed bottom condition

0.8 for pinned top-fixed bottom condition

$$P_e = 1444404 \text{ lb}$$

$$1444.404 \text{ kips}$$

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

$$P_n = 865 \text{ kips} \quad 3848.193 \text{ kN}$$

Resistance Factor

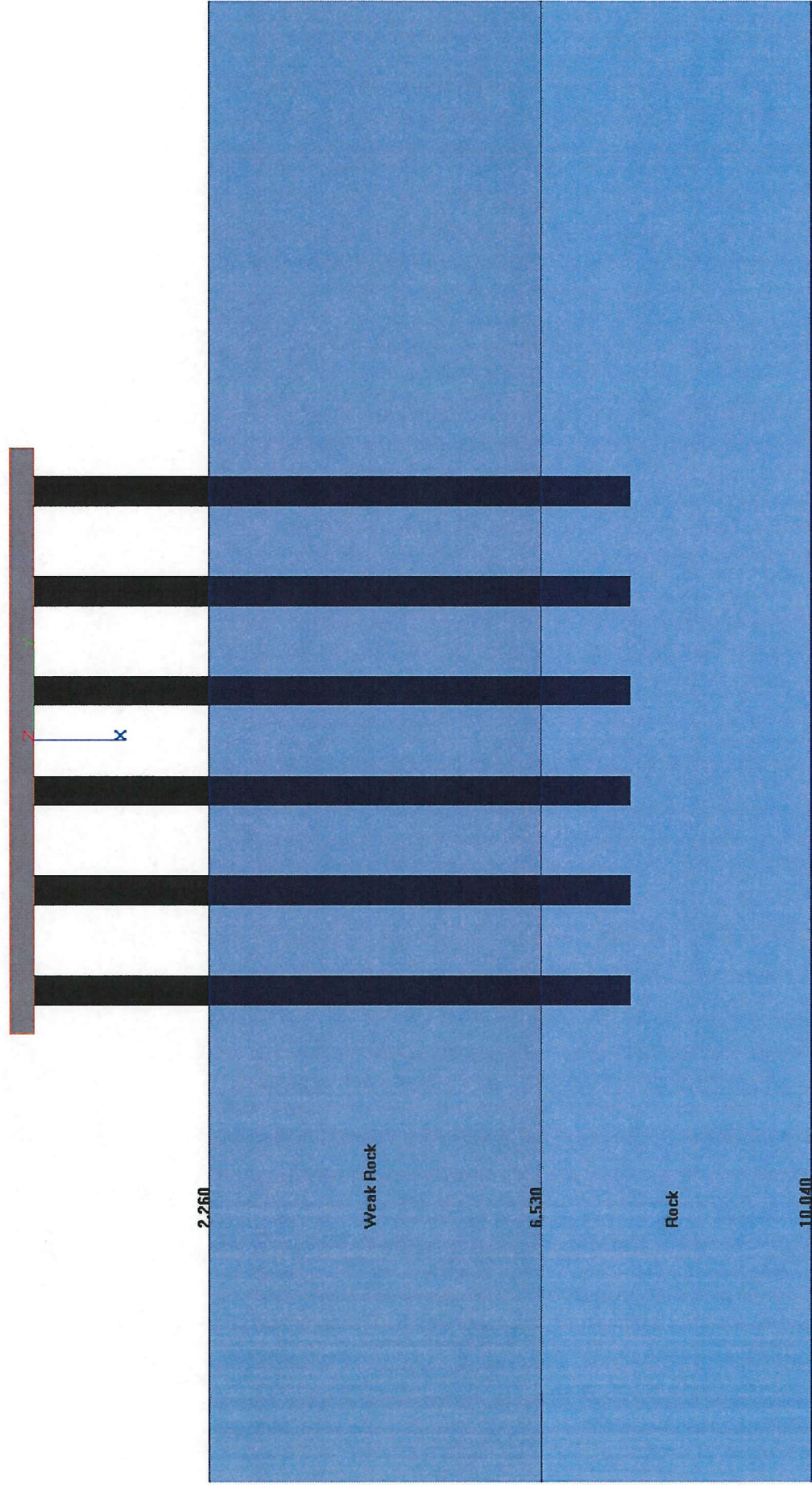
$$\phi_c = 0.5$$

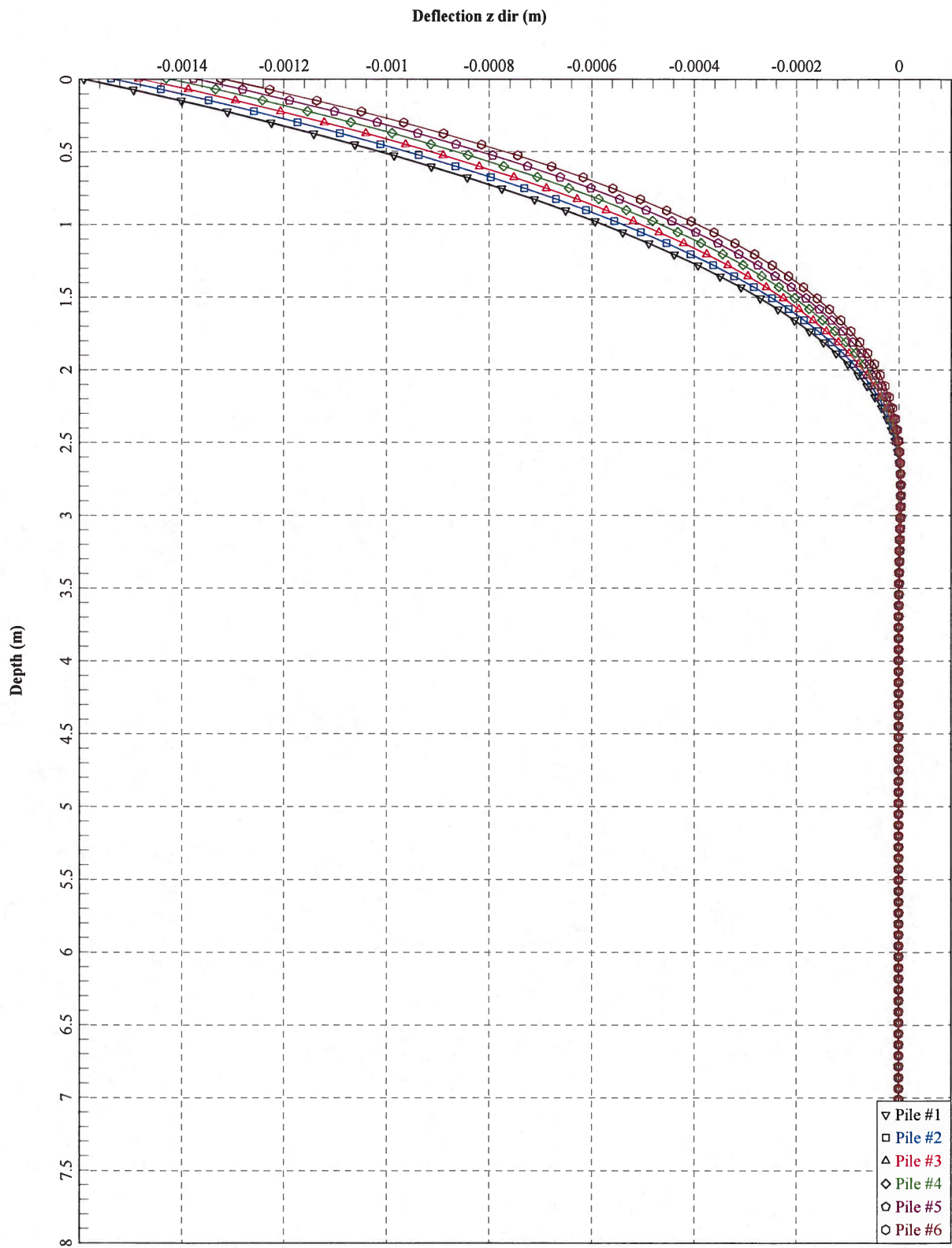
$$P_s = \phi_c \cdot P_n$$

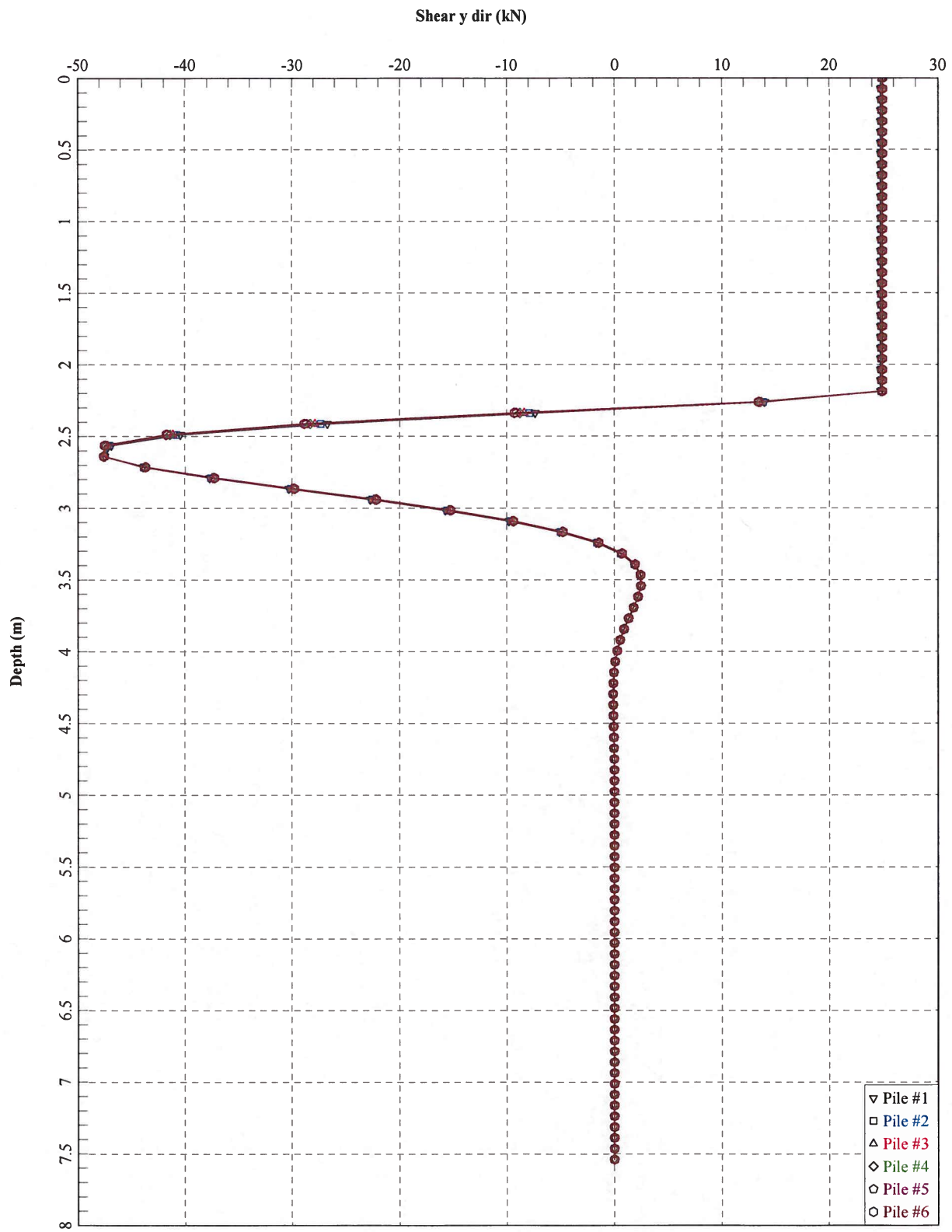
$$432 \text{ kips} \quad 1924.097 \text{ kN}$$

Chinle Wash Bridge – Piers Pile Group Layout

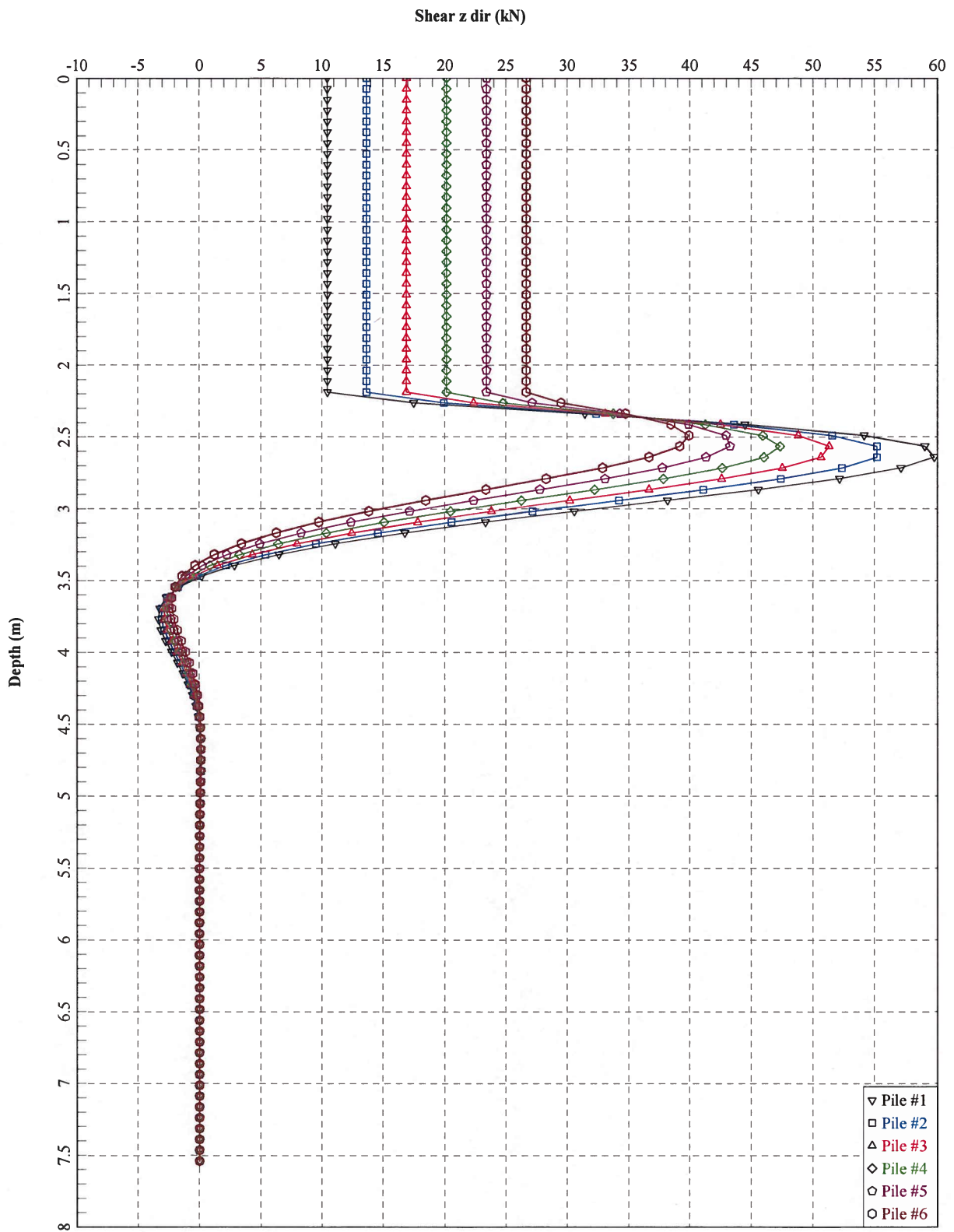
HP 14x117 – 30-inch prebore – 6 piles spaced 4.2 feet on centers



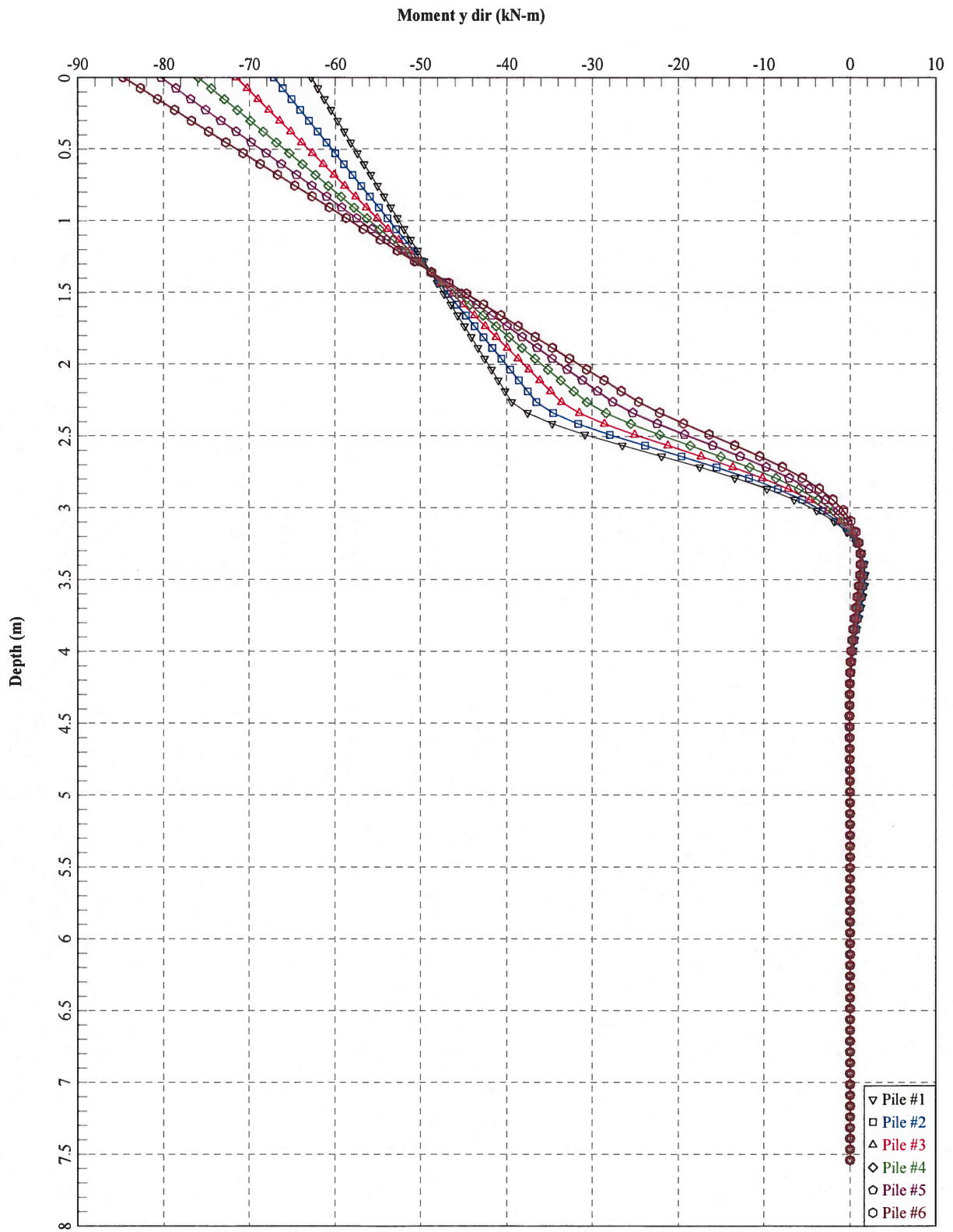




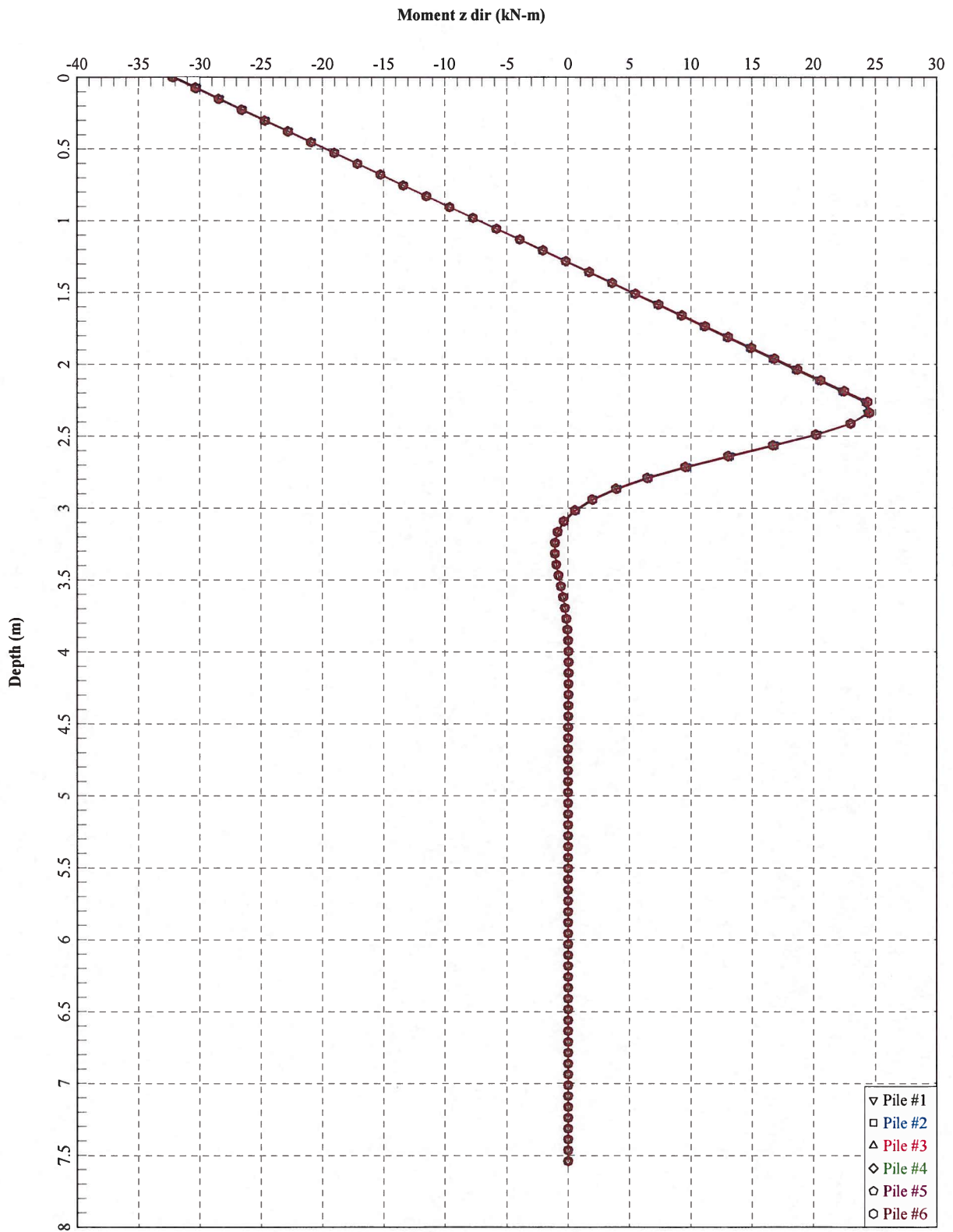
Transverse Shear vs. Depth



Longitudinal Shear vs. Depth



Moment (about Transverse Axis) 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
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This program is licensed to :

Kaustav Bose
Terracon

Path to file locations : C:\Documents and Settings\kbose\Desktop\Chinle Wash Bridge\GROUP\
Name of input data file : Pier.gp8o
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: 16:09:20

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

Chinle Wash Bridge - Piers - HP 14x117 - 6 Piles @ 4.2 feet c/c - 30 inch prebor

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

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	885.196	149.460	111.206	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
885.196	149.460	111.206	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 M
 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	CONNECT	PILE PROP	P-Y CURVE	L-S CURVE	T-R CURVE	ALPHA, DEG	BETA, DEG	GROUND, M	SPR.Y, KN-M	SPR.Z, KN-M
1	FIX	FIX	1	0	0	0	0.00000	90.0000	2.26000	0.00000	0.00000
2	FIX	FIX	1	0	0	0	0.00000	90.0000	2.26000	0.00000	0.00000
3	FIX	FIX	1	0	0	0	0.00000	90.0000	2.26000	0.00000	0.00000
4	FIX	FIX	1	0	0	0	0.00000	90.0000	2.26000	0.00000	0.00000
5	FIX	FIX	1	0	0	0	0.00000	90.0000	2.26000	0.00000	0.00000
6	FIX	FIX	1	0	0	0	0.00000	90.0000	2.26000	0.00000	0.00000

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

PROP	SECTS	INC	PILE TYPE	LENGTH, M	E, KV/ M**2
1	1	100	1	7.5400	2.0000E+08

* PILE SECTIONS *

PROP	SECT	FROM, M	TO, M	CROSS SECT
1	1	0.00000	7.54000	1

* PILE CROSS SECTIONS *

CROSS SECTION : 1

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SECTION NAME : HP
 CROSS SECTION TYPE : I SECTION
 EQUIVALENT DIAMETER : 0.76200 M
 EXTERNAL WIDTH : 0.37846 M
 EXTERNAL DEPTH : 0.36068 M
 FLANGE THICKNESS : 0.0204470 M
 WEB THICKNESS : 0.0204470 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 0.0220154
 IZ, M**4 1.84958E-04
 IV, M**4 5.04152E-04
 GJ, KN- M**2 55128.8
 Mn, KN- M 0.00000
 Vn, KN 0.00000

* TABLE F * SOIL DATA

SOILS INFORMATION

GROUND SURFACE = 2.26000 M

2 LAYER(S) OF SOIL

LAYER 1
 THE LAYER IS A WEAK ROCK

	TOP OF LAYER	BOTTOM OF LAYER
X COORDINATE (M)	2.26000	6.53000
EFFECTIVE UNIT WEIGHT (KN/ M**3)	20.4400	20.4400
UNIAXIAL COMPRESSIVE STRENGTH (KN/ M**2)	600.000	600.000
YOUNG MODULUS, ER (KN/ M**2)	90000.0	90000.0
KRM	5.00000E-05	5.00000E-05
RSD	30.0000	30.0000
ULTIMATE UNIT SIDE FRICTION (KN/ M**2)	60.0000	60.0000
ULTIMATE UNIT TIP RESISTANCE (KN/ M**2)	1500.00	1500.00

LAYER 2
 THE LAYER IS A VUGGY LIMESTONE

	TOP OF LAYER	BOTTOM OF LAYER
X COORDINATE (M)	6.53000	10.0400
EFFECTIVE UNIT WEIGHT (KN/ M**3)	20.4400	20.4400
UNIAXIAL COMPRESSIVE STRENGTH (KN/ M**2)	800.000	800.000
ULTIMATE UNIT SIDE FRICTION (KN/ M**2)	150.000	150.000
ULTIMATE UNIT TIP RESISTANCE (KN/ M**2)	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	CURVE 1	NUM OF POINTS	AXIAL LOAD, KN	SETTLEMENT, M
1	19	19	-991.774	-0.0520322
2	19	19	-991.641	-0.0266320
3	19	19	-991.641	-0.0139320
4	19	19	-1043.67	-3.83913E-03
5	19	19	-988.625	-2.48266E-03
6	19	19	-224.723	-5.20738E-04
7	19	19	-110.656	-2.58905E-04
8	19	19	-22.1311	-5.17811E-05

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9	-2.21311	-5.17811E-06
10	0.00000	0.00000
11	2.35494	5.39213E-06
12	23.5494	5.39213E-05
13	117.747	2.69607E-04
14	239.365	5.43577E-04
15	1019.21	2.53384E-03
16	1083.00	3.90700E-03
17	1035.47	0.0140071
18	1035.47	0.0267071
19	1064.83	0.0521573

* 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.
POINT			
1		-246.466	-0.16229
2		-246.466	-0.0956227
3		-246.466	-0.0622894
4		-255.615	-0.0367635
5		-251.498	-0.0327923
6		-78.8409	-9.47107E-03
7		-37.9786	-4.58477E-03
8		-7.51383	-9.09371E-04
9		-0.75138	-9.09371E-05
10		0.00000	0.00000
11		0.75138	9.09371E-05
12		7.51383	9.09371E-04
13		37.9786	4.58477E-03
14		78.8409	9.47107E-03
15		251.498	0.0327923
16		255.615	0.0367635
17		246.466	0.0622894
18		246.466	0.0956227
19		246.466	0.16229

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

Chinle Wash Bridge - Piers - HP 14x117 - 6 Piles @ 4.2 feet c/c - 30 inch prebor

***** 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 *

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VERT. LOAD, KN 885.196 HOR. LOAD Y, KN 149.460 HOR. LOAD Z, KN 111.206
 MOMENT X, M- KN 0.00000 MOMENT Y, M- KN 0.00000 MOMENT Z, M- KN 0.00000

* DISPLACEMENT OF GROUPED PILE FOUNDATION AT ORIGIN *

VERTICAL, M 9.89468E-04 HORIZONTAL Y, M 1.03337E-03 HORIZONTAL Z, M -1.45709E-03
 ANGLE ROT. X, RAD 4.17080E-05 ANGLE ROT. Y, RAD -1.30602E-03 ANGLE ROT. Z, RAD -1.51246E-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 2.8806E-04 DISP. Y, M 1.0125E-03 DISP. Z, M -1.5906E-03 ROT. X, RAD 4.1708E-05 ROT. Y, RAD -1.3060E-03 ROT. Z, RAD -1.5125E-05
 FOR. X, KN 125.97 FOR. Y, KN 24.814 FOR. Z, KN 10.451 MOM X, KN- M 0.3446 MOM Y, KN- M -62.855 MOM Z, KN- M 32.111

STR, KN/ M**2 8.7156E+04

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M 2.8806E-04 DISP. Y, M 1.0125E-03 DISP. Z, M -1.5906E-03 ROT. X, RAD 4.1708E-05 ROT. Y, RAD -1.3060E-03 ROT. Z, RAD -1.5125E-05
 AXIAL KN 125.97 LAT. Y, KN 24.814 LAT. Z, KN 10.451 MOM X, KN- M 0.3446 MOM Y, KN- M -62.855 MOM Z, KN- M 32.111

STR, KN/ M**2 8.7156E+04

* 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	1.0125E-03	-1.5906E-03	-32.111	-62.855	24.818	10.454	0.0000	0.0000	8.7156E+04	3.6992E+04	1.0083E+05	1.0083E+05
0.1508	1.0007E-03	-1.4007E-03	-28.367	-61.303	24.814	10.451	0.0000	0.0000	8.0293E+04	3.6992E+04	1.0083E+05	1.0083E+05
0.3016	9.7139E-04	-1.2248E-03	-24.621	-59.749	24.814	10.451	0.0000	0.0000	7.3628E+04	3.6992E+04	1.0083E+05	1.0083E+05
0.4524	9.2691E-04	-1.0620E-03	-20.874	-58.194	24.814	10.451	0.0000	0.0000	6.7228E+04	3.6992E+04	1.0083E+05	1.0083E+05

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8.6964E-04	8.0185E-04	8.0754E-04	8.0948E-04	1.0556E-04	1.2064E-04	1.3572E-04	1.5080E-04	1.6588E-04	1.8096E-04	1.9604E-04	2.1112E-04	2.2620E-04	2.4128E-04	2.5636E-04	2.7144E-04	2.8652E-04	3.0160E-04	3.1668E-04	3.3176E-04	3.4684E-04	3.6192E-04	3.7700E-04	3.9208E-04	4.0716E-04	4.2224E-04	4.3732E-04	4.5240E-04	4.6748E-04	4.8256E-04	4.9764E-04	5.1272E-04	5.2780E-04	5.4288E-04	5.5796E-04	5.7304E-04	5.8812E-04	6.0320E-04	6.1828E-04	6.3336E-04	6.4844E-04	6.6352E-04	6.7860E-04	6.9368E-04	7.0876E-04	7.2384E-04	7.3892E-04	7.5400E-04																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
-17.125	-13.374	-9.6225	-5.8702	-2.1175	1.6354	5.3882	9.1406	12.892	16.643	20.392	24.140	27.888	31.636	35.384	39.132	42.880	46.628	50.376	54.124	57.872	61.620	65.368	69.116	72.864	76.612	80.360	84.108	87.856	91.604	95.352	99.100	102.848	106.596	110.344	114.092	117.840	121.588	125.336	129.084	132.832	136.580	140.328	144.076	147.824	151.572	155.320	159.068	162.816	166.564	170.312	174.060	177.808	181.556	185.304	189.052	192.800	196.548	200.296	204.044	207.792	211.540	215.288	219.036	222.784	226.532	230.280	234.028	237.776	241.524	245.272	249.020	252.768	256.516	260.264	264.012	267.760	271.508	275.256	279.004	282.752	286.500	290.248	293.996	297.744	301.492	305.240	308.988	312.736	316.484	320.232	323.980	327.728	331.476	335.224	338.972	342.720	346.468	350.216	353.964	357.712	361.460	365.208	368.956	372.704	376.452	380.200	383.948	387.696	391.444	395.192	398.940	402.688	406.436	410.184	413.932	417.680	421.428	425.176	428.924	432.672	436.420	440.168	443.916	447.664	451.412	455.160	458.908	462.656	466.404	470.152	473.900	477.648	481.396	485.144	488.892	492.640	496.388	500.136	503.884	507.632	511.380	515.128	518.876	522.624	526.372	530.120	533.868	537.616	541.364	545.112	548.860	552.608	556.356	560.104	563.852	567.600	571.348	575.096	578.844	582.592	586.340	590.088	593.836	597.584	601.332	605.080	608.828	612.576	616.324	620.072	623.820	627.568	631.316	635.064	638.812	642.560	646.308	650.056	653.804	657.552	661.300	665.048	668.796	672.544	676.292	680.040	683.788	687.536	691.284	695.032	698.780	702.528	706.276	710.024	713.772	717.520	721.268	725.016	728.764	732.512	736.260	739.008	742.756	746.504	750.252	754.000	757.748	761.496	765.244	768.992	772.740	776.488	780.236	783.984	787.732	791.480	795.228	798.976	802.724	806.472	810.220	813.968	817.716	821.464	825.212	828.960	832.708	836.456	840.204	843.952	847.700	851.448	855.196	858.944	862.692	866.440	870.188	873.936	877.684	881.432	885.180	888.928	892.676	896.424	900.172	903.920	907.668	911.416	915.164	918.912	922.660	926.408	930.156	933.904	937.652	941.400	945.148	948.896	952.644	956.392	960.140	963.888	967.636	971.384	975.132	978.880	982.628	986.376	990.124	993.872	997.620	1001.368	1005.116	1008.864	1012.612	1016.360	1020.108	1023.856	1027.604	1031.352	1035.100	1038.848	1042.596	1046.344	1050.092	1053.840	1057.588	1061.336	1065.084	1068.832	1072.580	1076.328	1080.076	1083.824	1087.572	1091.320	1095.068	1098.816	1102.564	1106.312	1110.060	1113.808	1117.556	1121.304	1125.052	1128.800	1132.548	1136.296	1140.044	1143.792	1147.540	1151.288	1155.036	1158.784	1162.532	1166.280	1169.928	1173.676	1177.424	1181.172	1184.920	1188.668	1192.416	1196.164	1199.912	1203.660	1207.408	1211.156	1214.904	1218.652	1222.400	1226.148	1229.896	1233.644	1237.392	1241.140	1244.888	1248.636	1252.384	1256.132	1259.880	1263.628	1267.376	1271.124	1274.872	1278.620	1282.368	1286.116	1289.864	1293.612	1297.360	1301.108	1304.856	1308.604	1312.352	1316.100	1319.848	1323.596	1327.344	1331.092	1334.840	1338.588	1342.336	1346.084	1349.832	1353.580	1357.328	1361.076	1364.824	1368.572	1372.320	1376.068	1379.816	1383.564	1387.312	1391.060	1394.808	1398.556	1402.304	1406.052	1409.800	1413.548	1417.296	1421.044	1424.792	1428.540	1432.288	1436.036	1439.784	1443.532	1447.280	1451.028	1454.776	1458.524	1462.272	1466.020	1469.768	1473.516	1477.264	1481.012	1484.760	1488.508	1492.256	1496.004	1499.752	1503.500	1507.248	1510.996	1514.744	1518.492	1522.240	1525.988	1529.736	1533.484	1537.232	1540.980	1544.728	1548.476	1552.224	1555.972	1559.720	1563.468	1567.216	1570.964	1574.712	1578.460	1582.208	1585.956	1589.704	1593.452	1597.200	1600.948	1604.696	1608.444	1612.192	1615.940	1619.688	1623.436	1627.184	1630.932	1634.680	1638.428	1642.176	1645.924	1649.672	1653.420	1657.168	1660.916	1664.664	1668.412	1672.160	1675.908	1679.656	1683.404	1687.152	1690.900	1694.648	1698.396	1702.144	1705.892	1709.640	1713.388	1717.136	1720.884	1724.632	1728.380	1732.128	1735.876	1739.624	1743.372	1747.120	1750.868	1754.616	1758.364	1762.112	1765.860	1769.608	1773.356	1777.104	1780.852	1784.600	1788.348	1792.096	1795.844	1799.592	1803.340	1807.088	1810.836	1814.584	1818.332	1822.080	1825.828	1829.576	1833.324	1837.072	1840.820	1844.568	1848.316	1852.064	1855.812	1859.560	1863.308	1867.056	1870.804	1874.552	1878.300	1882.048	1885.796	1889.544	1893.292	1897.040	1900.788	1904.536	1908.284	1912.032	1915.780	1919.528	1923.276	1927.024	1930.772	1934.520	1938.268	1942.016	1945.764	1949.512	1953.260	1957.008	1960.756	1964.504	1968.252	1972.000	1975.748	1979.496	1983.244	1986.992	1990.740	1994.488	1998.236	2001.984	2005.732	2009.480	2013.228	2016.976	2020.724	2024.472	2028.220	2031.968	2035.716	2039.464	2043.212	2046.960	2050.708	2054.456	2058.204	2061.952	2065.700	2069.448	2073.196	2076.944	2080.692	2084.440	2088.188	2091.936	2095.684	2099.432	2103.180	2106.928	2110.676	2114.424	2118.172	2121.920	2125.668	2129.416	2133.164	2136.912	2140.660	2144.408	2148.156	2151.904	2155.652	2159.400	2163.148	2166.896	2170.644	2174.392	2178.140	2181.888	2185.636	2189.384	2193.132	2196.880	2200.628	2204.376	2208.124	2211.872	2215.620	2219.368	2223.116	2226.864	2230.612	2234.360	2238.108	2241.856	2245.604	2249.352	2253.100	2256.848	2260.596	2264.344	2268.092	2271.840	2275.588	2279.336	2283.084	2286.832	2290.580	2294.328	2298.076	2301.824	2305.572	2309.320	2313.068	2316.816	2320.564	2324.312	2328.060	2331.808	2335.556	2339.304	2343.052	2346.800	2350.548	2354.296	2358.044	2361.792	2365.540	2369.288	2373.036	2376.784	2380.532	2384.280	2388.028	2391.776	2395.524	2399.272	2403.020	2406.768	2410.516	2414.264	2418.012	2421.760	2425.508	2429.256	2433.004	2436.752	2440.500	2444.248	2447.996	2451.744	2455.492	2459.240	2462.988	2466.736	2470.484	2474.232	2477.980	2481.728	2485.476	2489.224	2492.972	2496.720	2500.468	2504.216	2507.964	2511.712	2515.460	2519.208	2522.956	2526.704	2530.452	2534.200	2537.948	2541.696	2545.444	2549.192	2552.940	2556.688	2560.436	2564.184	2567.932	2571.680	2575.428	2579.176	2582.924	2586.672	2590.420	2594.168	2597.916	2601.664	2605.412	2609.160	2612.908	2616.656	2620.404	2624.152	2627.900	2631.648	2635.396	2639.144	2642.892	2646.640	2650.388	2654.136	2657.884	2661.632	2665.380	2669.128	2672.876	2676.624	2680.372	2684.120	2687.868	2691.616	2695.364	2699.112	2702.860	2706.608	2710.356	2714.104	2717.852	2721.600	2725.348	2729.096	2732.844	2736.592	2740.340	2744.088	2747.836	2751.584	2755.332	2759.080	2762.828	2766.576	2770.324	2774.072	2777.820	2781.568	2785.316	2789.064	2792.812	2796.560	2800.308	2804.056	2807.804	2811.552	2815.300	2819.048	2822.796	2826.544	2830.292	2834.040	2837.788	2841.536	2845.284	2849.032	2852.780	2856.528	2860.276	2864.024	2867.772	2871.520	2875.268	2879.016	2882.764	2886.512	2890.260	2894.008	2897.756	2901.504	2905.252	2909.000	2912.748	2916.496	2920.244	2923.992	2927.740	2931.488	2935.236	2938.984	2942.732	2946.480	2950.228	2953.976	2957.724	2961.472	2965.220	2968.968	2972.716	2976.464	2980.212	2983.960	2987.708	2991.456	2995.204	2998.952	3002.700	3006.448	3010.196	3013.944	3017.692	3021.440	3025.188	3028.936	3032.684	3036.432	3040.180	3043.928	3047.676	3051.424	3055.172	3058.920	3062.668	3066.416	3070.164	3073.912	3077.660	3081.408	3085.156	3088.904	3092.652	3096.400	3100.148	3103.896	3107.644	3111.392	3115.140	3118.888	3122.636	3126.384	3130.132	3133.880	3137.628	3141.376	3145.124	3148.872	31

Pier.gp80

THE PILE COORDINATE SYSTEM (LOCAL AXES)

DISP. X, M 3.0742E-04 DISP. Y, M 1.0125E-03 ROT. X, RAD 4.1708E-05 ROT. Y, RAD -1.3060E-03 ROT. Z, RAD -1.5125E-05
 AXIAL, KN 134.59 LAT. Y, KN 24.862 MOM X, 0.3446 KN-M MOM Y, -67.199 KN-M MOM Z, 32.155

STR, KN/ M**2 8.9579E+04

* 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	Z-Dir KN-M	Y-Dir KN-M	Y-Dir KN	Z-Dir KN	Y-Dir KN/M	Z-Dir KN/M		Z-Dir KN-M**2	Y-Dir KN-M**2
0.0000	1.0125E-03	-1.5372E-03	-32.155	-67.199	24.862	13.665	0.0000	0.0000	8.9579E+04	3.6992E+04	1.0083E+05
0.1508	1.0006E-03	-1.3477E-03	-28.404	-65.164	24.862	13.662	0.0000	0.0000	8.2501E+04	3.6992E+04	1.0083E+05
0.3016	9.7130E-04	-1.1730E-03	-24.651	-61.089	24.862	13.662	0.0000	0.0000	7.5788E+04	3.6992E+04	1.0083E+05
0.4524	9.2681E-04	-1.0125E-03	-20.896	-59.049	24.862	13.662	0.0000	0.0000	6.9234E+04	3.6992E+04	1.0083E+05
0.6032	8.6947E-04	-8.6581E-04	-17.139	-57.006	24.862	13.662	0.0000	0.0000	6.3015E+04	3.6992E+04	1.0083E+05
0.7540	8.0160E-04	-7.3241E-04	-13.381	-54.962	24.862	13.662	0.0000	0.0000	5.7258E+04	3.6992E+04	1.0083E+05
0.9048	7.2500E-04	-6.1187E-04	-9.6213	-52.917	24.862	13.662	0.0000	0.0000	5.2136E+04	3.6992E+04	1.0083E+05
1.0556	6.4348E-04	-5.0372E-04	-5.8611	-50.869	24.862	13.662	0.0000	0.0000	4.7887E+04	3.6992E+04	1.0083E+05
1.2064	5.5786E-04	-4.0751E-04	-2.1003	-48.821	24.862	13.662	0.0000	0.0000	4.4000E+04	3.6992E+04	1.0083E+05
1.3572	4.7093E-04	-3.2278E-04	1.6606	-46.770	24.862	13.662	0.0000	0.0000	4.0617E+04	3.6992E+04	1.0083E+05
1.5080	3.8507E-04	-2.4905E-04	5.4213	-44.719	24.862	13.662	0.0000	0.0000	3.7681E+04	3.6992E+04	1.0083E+05
1.6588	3.0251E-04	-1.8587E-04	9.1817	-42.665	24.862	13.662	0.0000	0.0000	3.5116E+04	3.6992E+04	1.0083E+05
1.8096	2.2506E-04	-1.3278E-04	12.941	-40.611	24.862	13.662	0.0000	0.0000	3.2815E+04	3.6992E+04	1.0083E+05
1.9604	1.5664E-04	-8.9306E-05	16.700	-38.555	24.862	13.662	0.0000	0.0000	3.0771E+04	3.6992E+04	1.0083E+05
2.1112	9.7954E-05	-5.4994E-05	20.457	-36.499	24.862	13.662	0.0000	0.0000	2.8972E+04	3.6992E+04	1.0083E+05
2.2620	5.1841E-05	-2.9378E-05	24.212	-34.443	24.862	13.662	0.0000	0.0000	2.7399E+04	3.6992E+04	1.0083E+05
2.4128	2.0356E-05	-1.1940E-05	28.025	-32.387	24.862	13.662	0.0000	0.0000	2.6031E+04	3.6992E+04	1.0083E+05
2.5636	2.8224E-06	-1.5912E-06	36.869	-30.330	24.862	13.662	0.0000	0.0000	2.4856E+04	3.6992E+04	1.0083E+05
2.7144	4.3744E-06	3.3846E-06	46.704	-28.274	24.862	13.662	0.0000	0.0000	2.3869E+04	3.6992E+04	1.0083E+05
2.8652	5.5437E-06	4.8417E-06	58.536	-26.218	24.862	13.662	0.0000	0.0000	2.3054E+04	3.6992E+04	1.0083E+05
3.0160	4.1435E-06	4.3804E-06	72.370	-24.162	24.862	13.662	0.0000	0.0000	2.2390E+04	3.6992E+04	1.0083E+05
3.1668	2.2804E-06	3.1623E-06	88.204	-22.106	24.862	13.662	0.0000	0.0000	2.1868E+04	3.6992E+04	1.0083E+05
3.3176	8.7949E-07	1.8926E-06	106.038	-20.050	24.862	13.662	0.0000	0.0000	2.1478E+04	3.6992E+04	1.0083E+05
3.4684	1.1798E-07	9.0242E-07	125.872	-18.000	24.862	13.662	0.0000	0.0000	2.1200E+04	3.6992E+04	1.0083E+05
3.6192	1.6266E-07	2.7322E-07	147.706	-16.000	24.862	13.662	0.0000	0.0000	2.1025E+04	3.6992E+04	1.0083E+05
3.7700	1.8664E-07	4.7516E-08	172.540	-14.000	24.862	13.662	0.0000	0.0000	2.0945E+04	3.6992E+04	1.0083E+05
3.9208	1.2143E-07	-1.5952E-07	2.6961E-03	0.4941	24.862	13.662	0.0000	0.0000	2.0950E+04	3.6992E+04	1.0083E+05
4.0716	5.4142E-08	-1.5829E-07	4.5130E-02	0.1871	24.862	13.662	0.0000	0.0000	2.1025E+04	3.6992E+04	1.0083E+05
4.2224	1.2823E-08	-1.1297E-07	4.0247E-02	1.2770E-02	24.862	13.662	0.0000	0.0000	2.1171E+04	3.6992E+04	1.0083E+05
4.3732	4.2018E-09	-6.3314E-08	2.5310E-02	5.5610E-02	24.862	13.662	0.0000	0.0000	2.1390E+04	3.6992E+04	1.0083E+05
4.5240	7.2333E-09	-2.6237E-08	8.0388E-03	-7.0510E-02	24.862	13.662	0.0000	0.0000	2.1662E+04	3.6992E+04	1.0083E+05
4.6748	5.0411E-09	-4.6865E-09	5.6485E-04	-5.4068E-02	24.862	13.662	0.0000	0.0000	2.1988E+04	3.6992E+04	1.0083E+05
4.8256	-2.3033E-09	4.7375E-09	-1.7726E-03	3.2048E-02	24.862	13.662	0.0000	0.0000	2.2370E+04	3.6992E+04	1.0083E+05
4.9764	5.6467E-10	6.8652E-09	-1.6832E-03	-1.4413E-02	24.862	13.662	0.0000	0.0000	2.2800E+04	3.6992E+04	1.0083E+05
5.1272	1.6146E-10	5.6434E-09	-9.4957E-04	3.5944E-03	24.862	13.662	0.0000	0.0000	2.3280E+04	3.6992E+04	1.0083E+05
5.2780	2.9750E-10	5.5296E-09	-3.4379E-04	1.5007E-03	24.862	13.662	0.0000	0.0000	2.3810E+04	3.6992E+04	1.0083E+05
5.4288	2.1050E-10	1.7033E-09	-2.9808E-05	2.9621E-03	24.862	13.662	0.0000	0.0000	2.4390E+04	3.6992E+04	1.0083E+05
5.5796	9.7439E-11	5.2051E-10	7.3711E-05	2.6377E-03	24.862	13.662	0.0000	0.0000	2.5020E+04	3.6992E+04	1.0083E+05
5.7304	2.4642E-11	7.4909E-11	6.9789E-05	1.7425E-03	24.862	13.662	0.0000	0.0000	2.5700E+04	3.6992E+04	1.0083E+05
5.8812	-6.2244E-12	-2.7626E-10	3.9900E-05	8.9735E-04	24.862	13.662	0.0000	0.0000	2.6430E+04	3.6992E+04	1.0083E+05
6.0320	-1.2318E-11	-2.7094E-10	1.4808E-05	3.2470E-04	24.862	13.662	0.0000	0.0000	2.7220E+04	3.6992E+04	1.0083E+05
6.1828	-8.6243E-12	-1.8848E-10	1.7389E-06	2.3234E-05	24.862	13.662	0.0000	0.0000	2.8060E+04	3.6992E+04	1.0083E+05
6.3336	3.9144E-12	-9.8060E-11	-2.3690E-06	-8.5689E-05	24.862	13.662	0.0000	0.0000	2.8950E+04	3.6992E+04	1.0083E+05
6.4844	3.0701E-13	-2.5551E-11	-2.3779E-06	-9.3025E-05	24.862	13.662	0.0000	0.0000	2.9890E+04	3.6992E+04	1.0083E+05
6.6352	1.8507E-12	2.6346E-11	-1.7494E-06	3.7050E-06	24.862	13.662	0.0000	0.0000	3.0880E+04	3.6992E+04	1.0083E+05
6.7860	2.9303E-12	2.6194E-11	-1.1856E-06	3.4117E-06	24.862	13.662	0.0000	0.0000	3.1920E+04	3.6992E+04	1.0083E+05
6.9368	3.2770E-12	6.1947E-11	-7.2673E-07	3.4606E-05	24.862	13.662	0.0000	0.0000	3.3010E+04	3.6992E+04	1.0083E+05
7.0876	3.1724E-12	1.0165E-10	-3.8600E-07	-2.0024E-05	24.862	13.662	0.0000	0.0000	3.4150E+04	3.6992E+04	1.0083E+05

Pier.9p80
 7.2384 2.8261E-12 1.1301E-10 -1.6013E-07 -9.1291E-06 1.1449E-06 5.8942E-05 4.5217E-06 1.8082E-04 6113.7 3.6992E+04 1.0083E+05
 7.3892 2.3773E-12 1.2225E-10 -3.6842E-08 -2.3411E-06 5.1641E-07 3.0543E-05 3.8037E-06 1.9560E-04 6113.7 3.6992E+04 1.0083E+05
 7.5400 1.9026E-12 1.3090E-10 0.0000 0.0000 2.0110E-20 -2.5489E-18 3.0442E-06 2.0945E-04 6113.7 3.6992E+04 1.0083E+05

143.22 24.904 16.891 0.3446 -71.559 32.195
 STR, KN/ M**2
 9.2078E+04

DISP. X, M 3.2678E-04
 DISP. Y, M 1.0125E-03
 DISP. Z, M -1.4838E-03
 ROT. X, RAD 4.1708E-05
 ROT. Y, RAD -1.3060E-03
 ROT. Z, RAD -1.5125E-05
 FOR. X, KN 143.22
 FOR. Y, KN 24.904
 FOR. Z, KN 16.891
 MOM X, KN-M 0.3446
 MOM Y, KN-M -71.559
 MOM Z, KN-M 32.195

AXIAL, KN 143.22
 LAT. Y, KN 24.904
 LAT. Z, KN 16.891
 MOM X, KN-M 0.3446
 MOM Y, KN-M -71.559
 MOM Z, KN-M 32.195
 STR, KN/ M**2
 9.2078E+04

NUMBER OF ITERATIONS IN LLP = 4

* PILE GROUP * 3

* PILE TOP DISPLACEMENTS AND REACTIONS *

THE GLOBAL STRUCTURAL COORDINATE SYSTEM

THE PILE COORDINATE SYSTEM (LOCAL AXES)

* 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-M	Y- KN-M	Y- KN	Z- KN	Y- KN/M	Z- KN/M		Z- KN-M**2	Y- KN-M**2
0.0000	1.0125E-03	-1.4838E-03	-32.195	-71.559	24.904	16.891	0.0000	0.0000	9.2078E+04	3.6992E+04	1.0083E+05
0.1508	1.0008E-03	-1.2948E-03	-28.437	-69.039	24.904	16.891	0.0000	0.0000	8.4951E+04	3.6992E+04	1.0083E+05
0.3016	9.7128E-04	-1.1215E-03	-24.678	-66.517	24.904	16.891	0.0000	0.0000	7.7997E+04	3.6992E+04	1.0083E+05
0.4524	9.2672E-04	-9.6308E-04	-20.916	-63.993	24.904	16.891	0.0000	0.0000	7.1275E+04	3.6992E+04	1.0083E+05
0.6032	8.6932E-04	-8.1914E-04	-17.152	-61.466	24.904	16.891	0.0000	0.0000	6.4867E+04	3.6992E+04	1.0083E+05
0.7540	8.0138E-04	-6.8906E-04	-13.387	-58.938	24.904	16.891	0.0000	0.0000	5.8891E+04	3.6992E+04	1.0083E+05
0.9048	7.2520E-04	-5.7227E-04	-9.6203	-56.407	24.904	16.891	0.0000	0.0000	5.3515E+04	3.6992E+04	1.0083E+05
1.0556	6.4312E-04	-4.6820E-04	-5.8530	-53.875	24.904	16.891	0.0000	0.0000	4.8968E+04	3.6992E+04	1.0083E+05
1.2064	5.5743E-04	-3.7629E-04	-2.20852	-51.341	24.904	16.891	0.0000	0.0000	4.5542E+04	3.6992E+04	1.0083E+05
1.3572	4.7047E-04	-2.9595E-04	-1.6828	-48.805	24.904	16.891	0.0000	0.0000	4.3551E+04	3.6992E+04	1.0083E+05
1.5080	3.8454E-04	-2.2662E-04	-5.4506	-46.268	24.904	16.891	0.0000	0.0000	4.3230E+04	3.6992E+04	1.0083E+05
1.6588	3.0196E-04	-1.6772E-04	9.2179	-43.729	24.904	16.891	0.0000	0.0000	4.4670E+04	3.6992E+04	1.0083E+05
1.8096	2.2504E-04	-1.1869E-04	12.984	-41.189	24.904	16.891	0.0000	0.0000	4.7546E+04	3.6992E+04	1.0083E+05
1.9604	1.5611E-04	-7.8948E-05	16.750	-38.648	24.904	16.891	0.0000	0.0000	5.1711E+04	3.6992E+04	1.0083E+05
2.1112	9.7473E-05	-4.7921E-05	20.514	-36.105	24.904	16.891	0.0000	0.0000	5.6806E+04	3.6992E+04	1.0083E+05
2.2620	5.1451E-05	-2.5037E-05	24.276	-33.561	23.679	22.353	297.16	-144.89	6.2576E+04	3.6992E+04	1.0083E+05
2.4128	2.0090E-05	-9.6760E-06	23.016	-28.575	-27.862	229.16	-110.37	5.8603E+04	3.6992E+04	1.0083E+05	
2.5636	2.6786E-06	7.2402E-07	16.810	-21.216	-47.225	51.314	36.913	4.4859E+04	3.6992E+04	1.0083E+05	
2.7144	-4.4315E-06	3.4462E-06	9.6406	-13.579	-43.788	47.504	-9.9778	2.8859E+04	3.6992E+04	1.0083E+05	
2.8652	-5.5524E-06	4.5359E-06	3.9863	-7.1541	-30.025	36.643	-102.89	1.6337E+04	3.6992E+04	1.0083E+05	
3.0160	-4.1329E-06	3.9852E-06	0.6036	-2.5983	-15.458	23.805	-86.401	8829.6	3.6992E+04	1.0083E+05	
3.1668	-2.2669E-06	2.8218E-06	-0.8378	8.6788E-02	-4.9217	12.469	-52.773	8232.5	3.6992E+04	1.0083E+05	

Pier.p980										
3.3176	-8.6974E-07	1.6569E-06	-1.0733	1.2856	0.6523	4.3020	-22.313	42.509	8920.4	1.0083E+05
3.4684	-1.1293E-07	7.6838E-07	-0.7845	1.5141	2.4578	-0.4819	-3.1654	21.538	8485.5	1.0083E+05
3.6192	1.6439E-07	2.1440E-07	-0.4077	1.2441	2.2322	-2.5341	4.9981	6.5186	7766.1	1.0083E+05
3.7700	1.8670E-07	6.1087E-08	-0.1345	0.8164	1.3484	-2.8175	6.1200	-2.0024	7181.8	1.0083E+05
3.9208	1.2097E-07	1.5180E-07	3.5708E-03	0.4268	0.5535	1.3484	4.2525	-5.3364	6828.1	1.0083E+05
4.0716	5.3709E-08	1.4454E-07	4.5356E-02	0.1539	8.4873E-02	-1.3913	2.0157	-5.4244	6654.7	1.0083E+05
4.2224	1.3574E-08	1.0085E-07	4.0185E-02	2.3640E-03	-9.6457E-02	-0.8717	0.5018	-4.0732	6588.2	1.0083E+05
4.3732	4.2957E-09	5.5282E-08	2.3387E-02	-5.8076E-02	-0.1139	-0.1933	-0.1818	-2.3373	6569.1	1.0083E+05
4.5240	-7.2444E-09	-2.2092E-08	7.9486E-03	-6.4847E-02	-7.2296E-02	5.2664E-02	-0.3235	-0.9865	6557.1	1.0083E+05
4.6748	-5.0242E-09	-3.2098E-09	5.2170E-04	-4.8482E-02	-2.9872E-02	0.1327	-0.2261	-0.1444	6542.1	1.0083E+05
4.8256	-2.2857E-09	4.7839E-09	1.7844E-03	-2.8132E-02	-5.3534E-03	0.1237	-0.1029	0.2153	6527.0	1.0083E+05
4.9764	-5.5425E-10	6.3639E-09	1.6812E-03	-2.2270E-02	3.7881E-03	8.4004E-02	-2.4941E-02	0.2864	6515.3	1.0083E+05
5.1272	1.6547E-10	5.0849E-09	-9.4456E-04	-2.7435E-03	4.7619E-03	4.4513E-02	7.4446E-03	0.2288	6508.3	1.0083E+05
5.2780	2.9802E-10	3.1137E-09	-3.4003E-04	1.6194E-03	3.0310E-03	1.6691E-02	9.4411E-02	0.1401	6506.9	1.0083E+05
5.4288	2.0982E-10	1.4628E-09	-2.7084E-05	2.7726E-03	1.2690E-03	1.4007E-02	9.4411E-02	0.1401	6507.5	1.0083E+05
5.5796	9.6712E-11	4.1616E-10	7.2223E-05	2.3888E-03	2.3979E-04	-4.7172E-03	4.3570E-03	6.5827E-02	6507.3	1.0083E+05
5.7304	-2.4205E-11	9.7721E-11	6.9717E-05	1.5446E-04	-1.5016E-04	-1.6083E-03	1.0892E-03	-4.3975E-03	6506.6	1.0083E+05
5.8812	-6.3958E-12	2.6183E-10	3.9695E-05	7.7809E-04	-4.2799E-04	-4.2799E-04	-2.8781E-04	-1.1782E-02	6506.0	1.0083E+05
6.0320	-1.2343E-11	2.4668E-10	1.4653E-05	2.6824E-04	-1.2588E-04	-2.5077E-03	-5.5542E-04	-1.1100E-02	6505.6	1.0083E+05
6.1828	-8.7962E-12	1.6747E-10	1.6641E-06	6.9436E-06	-5.2397E-05	-1.0920E-03	-3.9583E-04	-7.5361E-03	6505.3	1.0083E+05
6.3336	-3.8809E-12	8.4279E-11	-2.3889E-06	-8.3078E-06	-9.6863E-06	-2.4294E-04	-1.7464E-04	-3.7976E-03	6505.5	1.0083E+05
6.4844	-2.8165E-13	1.8610E-11	-2.3763E-06	-8.5654E-05	3.7534E-06	-9.7496E-05	-1.2674E-05	-8.3746E-04	6505.5	1.0083E+05
6.6352	1.8679E-12	2.8009E-11	-1.7472E-06	-6.6259E-05	3.4102E-06	1.2655E-04	4.7050E-06	9.4815E-05	6505.5	1.0083E+05
6.7860	3.2812E-12	5.9671E-11	-1.1835E-06	-4.7847E-05	3.4102E-06	1.1578E-04	4.7050E-06	9.4815E-05	6505.5	1.0083E+05
6.9368	3.2812E-12	8.0511E-11	7.2501E-07	3.1581E-05	2.6508E-06	9.8737E-05	5.2608E-06	1.2882E-04	6505.5	1.0083E+05
7.0876	3.1726E-12	9.4187E-11	-3.8484E-07	-1.8226E-05	1.8671E-06	7.7378E-05	5.0760E-06	1.5070E-04	6505.5	1.0083E+05
7.2384	2.8224E-12	1.0370E-10	-1.5953E-07	-8.2889E-06	1.1415E-06	5.3661E-05	4.5158E-06	1.6593E-04	6505.5	1.0083E+05
7.3892	2.3702E-12	1.1130E-10	-3.6671E-08	-2.1202E-06	5.1428E-07	2.7707E-05	3.7923E-06	1.7808E-04	6505.4	1.0083E+05
7.5400	1.8921E-12	1.1836E-10	2.6280E-21	4.5846E-19	-2.3960E-21	1.0852E-18	3.0274E-06	1.8937E-04	6505.4	1.0083E+05

NUMBER OF ITERATIONS IN LLP = 4

* 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
3.4614E-04	1.0123E-03	-1.4304E-03	4.1708E-05	-1.3060E-03	-1.5125E-05
FOR. X, KN	FOR. Y, KN	FOR. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
151.85	24.938	20.137	0.3446	-75.935	32.227

STR, KN/ M**2
9.4648E+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
3.4614E-04	1.0125E-03	-1.4304E-03	4.1708E-05	-1.3060E-03	-1.5125E-05
AXIAL, KN	LAT. Y, KN	LAT. Z, KN	MOM X, KN-M	MOM Y, KN-M	MOM Z, KN-M
151.85	24.938	20.137	0.3446	-75.935	32.227

STR, KN/ M**2
9.4648E+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/M**2	M/KN	KN/M**2	M/KN
0.0000	1.0125E-03	-1.4304E-03	-75.935	24.943	20.141	0.0000	0.0000	0.0000	9.4648E+04	3.6992E+04	1.0083E+05	
0.1508	1.0005E-03	1.2419E-03	-72.927	24.938	20.137	0.0000	0.0000	0.0000	8.7368E+04	3.6992E+04	1.0083E+05	
0.3016	9.7122E-04	-1.0699E-03	-69.917	24.938	20.137	0.0000	0.0000	0.0000	8.0088E+04	3.6992E+04	1.0083E+05	
0.4524	9.2864E-04	-9.1366E-04	-66.904	24.938	20.137	0.0000	0.0000	0.0000	7.2808E+04	3.6992E+04	1.0083E+05	
0.6032	8.6919E-04	-7.7249E-04	-63.889	24.938	20.137	0.0000	0.0000	0.0000	6.5528E+04	3.6992E+04	1.0083E+05	
0.7540	8.0119E-04	-6.4574E-04	-60.872	24.938	20.137	0.0000	0.0000	0.0000	5.8248E+04	3.6992E+04	1.0083E+05	
0.9048	7.2496E-04	-5.3271E-04	-57.852	24.938	20.137	0.0000	0.0000	0.0000	5.0968E+04	3.6992E+04	1.0083E+05	
1.0556	6.4282E-04	-4.3273E-04	-54.831	24.938	20.137	0.0000	0.0000	0.0000	4.3688E+04	3.6992E+04	1.0083E+05	
1.2064	5.5708E-04	-3.4512E-04	-51.807	24.938	20.137	0.0000	0.0000	0.0000	3.6408E+04	3.6992E+04	1.0083E+05	
1.3572	4.7008E-04	-2.6919E-04	-48.782	24.938	20.137	0.0000	0.0000	0.0000	2.9128E+04	3.6992E+04	1.0083E+05	
1.5080	3.8410E-04	-2.0427E-04	-45.756	24.938	20.137	0.0000	0.0000	0.0000	2.1848E+04	3.6992E+04	1.0083E+05	
1.6588	3.0150E-04	-1.4966E-04	-42.727	24.938	20.137	0.0000	0.0000	0.0000	1.4568E+04	3.6992E+04	1.0083E+05	
1.8096	2.2458E-04	-1.0469E-04	-39.698	24.938	20.137	0.0000	0.0000	0.0000	7.2808E+04	3.6992E+04	1.0083E+05	
1.9604	1.5567E-04	-6.8672E-05	-36.666	24.938	20.137	0.0000	0.0000	0.0000	6.5528E+04	3.6992E+04	1.0083E+05	
2.1112	9.7077E-05	-4.0924E-05	-33.634	24.938	20.137	0.0000	0.0000	0.0000	5.8248E+04	3.6992E+04	1.0083E+05	
2.2620	5.1127E-05	-2.0762E-05	-30.601	13.561	24.757	301.77	-122.55	5.2091E+04	3.6992E+04	1.0083E+05		
2.4128	2.2620E-05	-7.4622E-06	-25.517	-28.311	41.278	41.278	-85.116	5.8065E+04	3.6992E+04	1.0083E+05		
2.5636	1.9870E-06	1.1013E-07	-18.591	-47.358	47.327	35.268	1.5177	4.4173E+04	3.6992E+04	1.0083E+05		
2.7144	-4.4788E-06	3.4890E-06	-9.5875	-29.913	42.635	-72.359	56.368	2.8521E+04	3.6992E+04	1.0083E+05		
2.8652	-5.590E-06	4.2218E-06	-11.653	-43.741	42.635	-103.02	78.233	1.6188E+04	3.6992E+04	1.0083E+05		
3.0160	-4.3240E-06	3.5880E-06	-1.9860	-15.355	32.242	-66.215	75.010	8817.6	3.6992E+04	1.0083E+05		
3.1668	-2.250E-06	2.4823E-06	0.2899	-4.8318	20.463	-86.215	75.010	8817.6	3.6992E+04	1.0083E+05		
3.3176	-8.6164E-07	1.4234E-06	0.2899	0.8660	10.369	-52.512	57.789	8654.4	3.6992E+04	1.0083E+05		
3.4684	1.0873E-07	6.3638E-07	1.3898	0.6860	3.2582	-22.105	36.519	9305.4	3.6992E+04	1.0083E+05		
3.6192	1.6582E-07	1.5705E-07	1.3898	2.4670	-0.7956	-3.0478	17.838	8821.0	3.6992E+04	1.0083E+05		
3.7700	1.8675E-07	-1.3803E-08	1.1086	2.2295	-2.4426	5.0416	4.7749	8080.1	3.6992E+04	1.0083E+05		
3.9208	1.2058E-07	-7.4369E-07	0.7102	1.3427	-2.5694	6.1215	-2.4192	7499.8	3.6992E+04	1.0083E+05		
4.0716	5.3350E-08	-1.3069E-07	0.3604	0.5489	-1.9715	4.2389	-5.0515	7169.7	3.6992E+04	1.0083E+05		
4.2224	1.2368E-08	8.8718E-08	4.5543E-02	-7.6357E-03	-1.2027	2.0022	-4.9046	7028.5	3.6992E+04	1.0083E+05		
4.3732	-4.3736E-09	-4.7331E-08	2.2285E-02	-5.6382E-02	-0.1443	0.4935	-3.5402	6980.1	3.6992E+04	1.0083E+05		
4.5240	-7.2533E-09	-1.8018E-08	7.8737E-03	-5.9120E-02	6.2904E-02	-0.1849	-2.0011	6959.9	3.6992E+04	1.0083E+05		
4.6748	-5.0101E-09	-1.7803E-09	4.8588E-04	-4.2906E-02	-2.9648E-02	-0.3239	-0.8045	6944.8	3.6992E+04	1.0083E+05		
4.8256	-2.2710E-09	-4.8061E-09	1.7942E-03	-2.4249E-02	5.2325E-03	0.1249	-0.1022	6929.7	3.6992E+04	1.0083E+05		
4.9764	-5.4559E-10	5.8541E-09	-1.6795E-03	-1.0161E-02	3.8292E-03	0.1114	0.2634	6915.9	3.6992E+04	1.0083E+05		
5.1272	1.6880E-10	4.5260E-09	-9.4038E-04	4.7632E-03	7.3667E-02	-2.4551E-02	0.2037	6901.7	3.6992E+04	1.0083E+05		
5.2780	2.9845E-10	2.7007E-09	3.3691E-04	1.9156E-03	3.7935E-02	7.5959E-03	0.2037	6889.6	3.6992E+04	1.0083E+05		
5.4288	2.0923E-10	1.2256E-09	2.5782E-03	1.7256E-03	1.3450E-02	1.3430E-02	0.1215	6889.2	3.6992E+04	1.0083E+05		
5.5796	9.6105E-11	3.1425E-10	2.5782E-03	1.2597E-03	1.5692E-04	9.4163E-03	5.1515E-02	6898.9	3.6992E+04	1.0083E+05		
5.7304	2.3841E-11	-1.3912E-10	1.3479E-03	-1.5392E-04	-1.6335E-03	4.3247E-03	1.4141E-02	6898.9	3.6992E+04	1.0083E+05		
5.8812	-6.5384E-12	-2.4678E-10	3.9524E-05	-1.9625E-04	-1.9625E-04	-1.0728E-03	-5.3604E-03	6898.3	3.6992E+04	1.0083E+05		
6.0320	-1.2363E-11	-2.2228E-10	1.4524E-05	-1.2545E-04	-2.1631E-03	-2.9421E-04	-1.1105E-02	6897.7	3.6992E+04	1.0083E+05		
6.1828	-8.7228E-12	-1.4656E-10	-8.6950E-06	-2.1290E-04	-5.5632E-04	-1.0003E-02	-1.0003E-02	6897.4	3.6992E+04	1.0083E+05		
6.3336	-3.8531E-12	-7.0684E-11	-2.4054E-06	-8.0190E-05	-9.0416E-04	-3.9478E-04	-6.5952E-03	6897.2	3.6992E+04	1.0083E+05		
6.4844	2.6058E-13	-1.1874E-11	-2.3751E-06	-9.4791E-06	-1.7261E-04	-1.1739E-04	-3.1808E-03	6897.3	3.6992E+04	1.0083E+05		
6.6352	1.8821E-12	2.9472E-11	-1.7455E-06	-7.8192E-05	9.9454E-05	-1.1652E-04	-5.3434E-04	6897.3	3.6992E+04	1.0083E+05		
6.7860	2.9492E-12	5.7212E-11	-1.1818E-06	-4.0052E-06	4.0052E-06	3.0114E-06	4.7155E-05	6897.3	3.6992E+04	1.0083E+05		
6.9368	3.2855E-12	7.5141E-11	-7.2358E-07	-4.3369E-05	1.0589E-04	4.7187E-06	9.1539E-05	6897.3	3.6992E+04	1.0083E+05		
7.0876	3.1727E-12	8.6597E-11	-5.8387E-07	-2.8335E-05	8.9802E-05	5.2570E-06	1.2032E-04	6897.3	3.6992E+04	1.0083E+05		
7.2384	2.8193E-12	9.4305E-11	-1.5903E-07	-1.6415E-05	7.0215E-05	1.8639E-06	1.3835E-04	6897.2	3.6992E+04	1.0083E+05		
7.3892	2.3642E-12	1.0029E-10	-3.6530E-08	-1.8988E-06	4.8352E-05	1.1387E-06	1.5089E-04	6897.2	3.6992E+04	1.0083E+05		
7.5400	1.8834E-12	1.0579E-10	-2.6280E-21	2.2923E-19	5.5136E-21	7.6717E-19	3.0135E-06	6897.2	3.6992E+04	1.0083E+05		

Pier.gp80

NUMBER OF ITERATIONS IN LLP = 4

* 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

Page 10

3.6550E-04 1.0125E-03 -1.3770E-03 4.1708E-05 -1.3060E-03 -1.5125E-05 Pier.gp80
 FOR. X, Y, Z, KN FOR. X, KN-M MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
 160.47 24.963 23.397 0.3446 -80.325 32.252

STR. KN/ M**2
 9.7282E+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
 3.6550E-04 1.0125E-03 -1.3770E-03 4.1708E-05 -1.3060E-03 -1.5125E-05
 AXIAL, KN LAT. Y, KN LAT. Z, KN MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
 160.47 24.963 23.397 0.3446 -80.325 32.252

STR. KN/ M**2
 9.7282E+04

* 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 M	Y-DIR KN-M	Z-DIR KN-M	Z-DIR KN-M	Y-DIR KN	Z-DIR KN	Z-DIR KN	Y-DIR KN/M	Z-DIR KN/M	Z-DIR KN/M	Y-DIR KN/M**2	Z-DIR KN/M**2	Z-DIR KN/M**2	Y-DIR KN-M**2	Z-DIR KN-M**2	Z-DIR KN-M**2
0.0000	1.0125E-03	-1.3770E-03	-1.3770E-03	-32.252	-80.325	24.969	23.402	0.0000	0.0000	0.0000	0.0000	0.0000	9.7282E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
0.1508	1.0008E-03	-1.1890E-03	-1.1890E-03	-28.486	-73.326	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	8.9836E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
0.3016	9.7119E-04	-1.0184E-03	-1.0184E-03	-24.716	-69.822	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	8.2542E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
0.4524	9.2638E-04	-8.6424E-04	-8.6424E-04	-20.945	-66.316	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	7.5449E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
0.6032	8.6910E-04	-7.2587E-04	-7.2587E-04	-17.171	-62.808	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	6.8631E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
0.7540	8.0106E-04	-6.0245E-04	-6.0245E-04	-13.396	-59.297	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	6.2192E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
0.9048	7.2478E-04	-4.9319E-04	-4.9319E-04	-9.6190	-55.784	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	5.6286E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
1.0556	6.4259E-04	-3.9731E-04	-3.9731E-04	-5.8413	-52.269	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	5.1130E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
1.2064	5.5681E-04	-3.1401E-04	-3.1401E-04	-2.0631	-48.753	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	4.7018E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
1.3572	4.6976E-04	-2.4250E-04	-2.4250E-04	-1.7154	-45.234	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	4.4302E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
1.5080	3.8375E-04	-1.8198E-04	-1.8198E-04	-4.936	-41.714	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	4.1474E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
1.6588	3.0114E-04	-1.3167E-04	-1.3167E-04	9.2714	-38.192	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	4.0729E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
1.8096	2.2424E-04	-9.0761E-05	-9.0761E-05	13.048	-34.669	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	5.0734E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
1.9604	1.5333E-04	-5.8468E-05	-5.8468E-05	16.824	-31.145	24.963	23.397	0.0000	0.0000	0.0000	0.0000	0.0000	5.5810E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
2.1112	9.6773E-05	-3.3994E-05	-3.3994E-05	20.598	-27.619	13.467	27.135	304.94	-99.151	6.1655E+04	3.6992E+04	3.6992E+04	6.1655E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
2.2620	5.0880E-05	-1.6544E-05	-1.6544E-05	24.369	-22.456	-28.651	39.914	34.017	-72.939	5.7618E+04	3.6992E+04	3.6992E+04	5.7618E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
2.4128	1.9702E-05	-5.2915E-06	-5.2915E-06	23.002	-15.977	-47.458	43.275	34.017	-103.12	2.8288E+04	3.6992E+04	3.6992E+04	2.8288E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
2.5636	2.4684E-06	9.1585E-07	9.1585E-07	16.724	-9.7420	-43.704	37.751	-72.939	86.073	1.6123E+04	3.6992E+04	3.6992E+04	1.6123E+04	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
2.7144	4.5147E-06	3.5159E-06	3.5159E-06	9.5470	-4.7573	-29.827	27.776	-103.12	-52.312	8854.5	8854.5	8854.5	8854.5	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
2.8652	5.5650E-06	3.9008E-06	3.9008E-06	3.9171	-1.7729E-02	-9.7965E-02	-0.4506	17.147	-86.073	9083.8	9083.8	9083.8	9083.8	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
3.0160	4.1172E-06	3.1892E-06	3.1892E-06	0.5648	-1.4850	-4.7986	8.2966	17.147	-52.312	9688.9	9688.9	9688.9	9688.9	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
3.1668	-2.2470E-06	2.1438E-06	2.1438E-06	-0.8529	0.4850	4.7986	-8.2966	-17.147	86.073	9159.8	9159.8	9159.8	9159.8	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
3.3176	-8.5547E-07	1.1918E-06	1.1918E-06	-1.0750	1.2243	0.7117	2.2358	17.147	-86.073	8398.9	8398.9	8398.9	8398.9	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
3.4684	-1.0554E-07	5.0615E-07	5.0615E-07	-0.7809	1.2638	2.4740	-1.0955	17.147	-86.073	7820.5	7820.5	7820.5	7820.5	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
3.6192	1.6690E-07	1.0096E-07	1.0096E-07	-0.4036	0.9729	2.2274	-2.3440	17.147	-86.073	7511.9	7511.9	7511.9	7511.9	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
3.7700	1.8678E-07	8.5784E-08	8.5784E-08	-0.1318	0.6046	0.6046	-2.3189	17.147	-86.073	7404.9	7404.9	7404.9	7404.9	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
3.9208	1.2028E-07	-1.3526E-07	-1.3526E-07	4.8486E-08	8.9553E-02	8.0449E-02	0.5453	17.147	-86.073	7372.6	7372.6	7372.6	7372.6	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
4.0716	5.3075E-08	-1.1676E-07	-1.1676E-07	4.5685E-02	5.4509E-02	-9.7965E-02	-0.4506	17.147	-86.073	7350.6	7350.6	7350.6	7350.6	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
4.2224	1.2210E-08	-7.6649E-08	-7.6649E-08	4.0094E-02	5.4509E-02	-9.7965E-02	-0.4506	17.147	-86.073	7332.4	7332.4	7332.4	7332.4	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
4.3732	4.4328E-09	-3.9447E-08	-3.9447E-08	3.2207E-02	5.4509E-02	-9.7965E-02	-0.4506	17.147	-86.073	7317.2	7317.2	7317.2	7317.2	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
4.5240	-7.2603E-09	1.4005E-08	1.4005E-08	7.8167E-02	5.4509E-02	-9.7965E-02	-0.4506	17.147	-86.073	7304.9	7304.9	7304.9	7304.9	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
4.6748	-4.9993E-09	-3.9119E-09	-3.9119E-09	4.5862E-04	-3.7337E-02	-2.9478E-02	0.1168	17.147	-86.073	7296.0	7296.0	7296.0	7296.0	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
4.8256	-2.2598E-09	4.8074E-09	4.8074E-09	-1.8016E-03	-2.0396E-02	-5.1405E-03	6.3368E-02	17.147	-86.073	7291.1	7291.1	7291.1	7291.1	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
4.9764	5.3899E-10	5.3368E-09	5.3368E-09	-1.6783E-03	-8.0793E-03	3.8605E-03	3.1419E-02	17.147	-86.073	7290.6	7290.6	7290.6	7290.6	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
5.1272	1.7133E-10	3.9670E-09	3.9670E-09	-9.3720E-04	-1.1074E-02	4.7642E-02	1.0260E-01	17.147	-86.073	7290.8	7290.8	7290.8	7290.8	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
5.2780	2.9877E-10	2.2902E-09	2.2902E-09	-3.3453E-04	1.8210E-03	3.0128E-03	1.0260E-01	17.147	-86.073	7290.5	7290.5	7290.5	7290.5	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
5.4288	2.0882E-10	9.9117E-10	9.9117E-10	-2.4418E-05	2.3795E-03	1.2526E-03	-6.5329E-02	17.147	-86.073	7289.9	7289.9	7289.9	7289.9	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
5.5796	9.5642E-11	2.1445E-10	2.1445E-10	7.2971E-05	1.8892E-03	2.3083E-04	-4.5332E-03	17.147	-86.073	7289.4	7289.4	7289.4	7289.4	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
5.7304	2.3564E-11	-1.3930E-10	-1.3930E-10	6.9612E-05	1.1521E-03	-1.5326E-04	-4.6428E-03	17.147	-86.073	7289.9	7289.9	7289.9	7289.9	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	
5.8812	-6.6464E-12	-2.3120E-10	-2.3120E-10	3.9394E-05	5.4093E-04	-1.9631E-04	-3.3072E-03	17.147	-86.073	7289.4	7289.4	7289.4	7289.4	3.6992E+04	1.0083E+05	1.0083E+05	1.0083E+05	

6.0320 -1.2378E-11 -1.9777E-10 1.4425E-05 1.5853E-04 -1.2513E-04 -5.5701E-04 -8.8998E-03 5.5701E-04 -8.8998E-03 1.0083E+05
 6.1828 -8.7550E-12 -1.2574E-10 1.5548E-06 -2.3773E-05 -9.1709E-05 -7.1888E-04 -3.9398E-04 -3.9398E-04 1.0083E+05
 6.3336 -3.8319E-12 -5.7249E-11 -2.4179E-06 -7.7063E-05 -9.3212E-06 -1.0393E-04 -1.7244E-04 -1.7244E-04 1.0083E+05
 6.4844 -2.4453E-13 -5.3145E-12 -2.3741E-06 -7.0654E-05 3.8242E-06 1.0093E-04 -1.1004E-05 -2.3915E-04 1.0083E+05
 6.6352 1.8930E-12 3.0762E-11 -1.7441E-06 -5.4312E-05 4.0063E-06 1.0834E-04 3.1028E-06 4.9219E-05 1.0083E+05
 6.7860 2.9557E-12 5.4596E-11 -1.1804E-06 -3.8859E-05 3.4079E-06 9.5887E-05 4.7291E-06 8.7333E-05 1.0083E+05
 6.9368 3.2886E-12 6.9637E-11 -7.2248E-07 -2.5472E-05 2.6460E-06 8.0791E-05 5.2618E-06 1.1142E-04 1.0083E+05
 7.0876 3.1728E-12 7.8899E-11 -3.8313E-07 -1.4604E-05 1.8615E-06 6.2804E-05 5.0764E-06 1.2624E-04 1.0083E+05
 7.2384 2.8170E-12 8.4826E-11 -1.5865E-07 -6.5990E-06 1.1365E-06 4.3018E-05 4.5072E-06 1.3572E-04 1.0083E+05
 7.3892 2.3597E-12 8.9221E-11 -3.6423E-08 -1.6768E-06 5.1117E-07 2.2008E-05 3.7755E-06 1.4275E-04 1.0083E+05
 7.5400 1.8768E-12 9.3193E-11 1.3140E-21 -2.2923E-19 5.3026E-21 -1.6429E-18 3.0028E-06 1.4911E-04 1.0083E+05

NUMBER OF ITERATIONS IN LLP = 4

* 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
 3.8486E-04 1.0125E-03 -1.3236E-03 4.1708E-05 -1.3060E-03 -1.5125E-05
 FOR. X, KN FOR. Y, KN FOR. Z, KN MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
 169.10 24.978 26.668 0.3446 -84.724 32.268

STR, KN/ M**2
9.9972E+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
 3.8486E-04 1.0125E-03 -1.3236E-03 4.1708E-05 -1.3060E-03 -1.5125E-05
 AXIAL, KN LAT. Y, KN LAT. Z, KN MOM X, KN-M MOM Y, KN-M MOM Z, KN-M
 169.10 24.978 26.668 0.3446 -84.724 32.268

STR, KN/ M**2
9.9972E+04

* 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	Z-DIR KN-M	Y-DIR KN-M	Y-DIR KN	Z-DIR KN	Y-DIR KN/M	Z-DIR KN/M		Z-DIR KN-M**2	Y-DIR KN-M**2
0.0000	1.0125E-03	-1.3236E-03	32.268	-84.724	24.978	26.674	0.0000	0.0000	9.9972E+04	3.6992E+04	1.0083E+05
0.1508	1.0006E-03	-1.1361E-03	-28.499	-80.734	24.978	26.668	0.0000	0.0000	9.2350E+04	3.6992E+04	1.0083E+05
0.3016	9.7118E-04	-9.6682E-04	-24.727	-76.741	24.978	26.668	0.0000	0.0000	8.4869E+04	3.6992E+04	1.0083E+05
0.4524	9.2653E-04	-8.1484E-04	-20.953	-72.746	24.978	26.668	0.0000	0.0000	7.7575E+04	3.6992E+04	1.0083E+05
0.6032	8.6904E-04	-6.7925E-04	-17.177	-68.747	24.978	26.668	0.0000	0.0000	7.0539E+04	3.6992E+04	1.0083E+05
0.7540	8.0097E-04	-5.5917E-04	-13.398	-64.746	24.978	26.668	0.0000	0.0000	6.3858E+04	3.6992E+04	1.0083E+05
0.9048	7.2466E-04	-4.5370E-04	-9.6187	-60.742	24.978	26.668	0.0000	0.0000	5.7679E+04	3.6992E+04	1.0083E+05
1.0556	6.4244E-04	-3.6192E-04	-5.8381	-56.736	24.978	26.668	0.0000	0.0000	5.2212E+04	3.6992E+04	1.0083E+05
1.2064	5.5663E-04	-2.8294E-04	-2.0569	-52.728	24.978	26.668	0.0000	0.0000	4.7753E+04	3.6992E+04	1.0083E+05
1.3572	4.6956E-04	-2.1585E-04	1.7246	-48.717	24.978	26.668	0.0000	0.0000	4.4669E+04	3.6992E+04	1.0083E+05
1.5080	3.8354E-04	-1.5975E-04	5.5058	-44.705	24.978	26.668	0.0000	0.0000	4.3319E+04	3.6992E+04	1.0083E+05
1.6588	3.0092E-04	-1.1373E-04	9.2865	-40.692	24.978	26.668	0.0000	0.0000	4.3897E+04	3.6992E+04	1.0083E+05
1.8096	2.2400E-04	-7.6889E-05	13.066	-36.676	24.978	26.668	0.0000	0.0000	4.6316E+04	3.6992E+04	1.0083E+05
1.9604	1.5511E-04	-4.8319E-05	16.845	-32.660	24.978	26.668	0.0000	0.0000	5.0262E+04	3.6992E+04	1.0083E+05

2.1112	9.6576E-05	-2.7115E-05	20.621	-28.642	24.978	26.668	0.0000	0.0000	5.5356E+04	3.6992E+04	1.0083E+05
2.2620	5.0721E-05	-1.2370E-05	24.396	-24.622	13.400	29.492	307.13	-74.903	6.1268E+04	3.6992E+04	1.0083E+05
2.4128	1.9595E-05	-3.1545E-06	22.997	-19.391	-28.869	39.448	223.50	-35.981	5.7267E+04	3.6992E+04	1.0083E+05
2.5636	2.4102E-06	1.6993E-06	16.699	-13.370	-47.521	38.174	33.215	23.418	4.3533E+04	3.6992E+04	1.0083E+05
2.7144	4.5376E-06	3.5302E-06	9.5209	-7.8438	-43.680	23.856	-73.309	57.033	2.8169E+04	3.6992E+04	1.0083E+05
2.8652	5.5684E-06	3.5738E-06	3.8979	-3.5789	-29.772	23.360	-103.19	66.225	1.6133E+04	3.6992E+04	1.0083E+05
3.0160	4.1128E-06	2.7890E-06	0.8541	-0.7055	-15.221	13.852	-85.980	58.305	8970.8	3.6992E+04	1.0083E+05
3.1668	2.2415E-06	1.8061E-06	-0.8571	0.6738	-4.7644	6.2451	-2.4511	42.046	9518.3	3.6992E+04	1.0083E+05
3.3176	8.5150E-07	9.6167E-07	-1.0754	1.1881	0.7281	1.2301	-21.183	24.672	1.0071E+04	3.6992E+04	1.0083E+05
3.4684	1.0350E-07	3.7730E-07	-0.7799	1.1365	2.4784	-1.3846	-2.9010	10.576	9502.5	3.6992E+04	1.0083E+05
3.6192	1.6759E-07	4.5871E-08	-0.4025	0.8372	2.2261	-2.2398	5.0956	1.3947	8723.8	3.6992E+04	1.0083E+05
3.7700	1.8680E-07	9.7189E-08	-0.1310	0.4995	1.3354	-2.0665	6.1231	-3.1858	8144.9	3.6992E+04	1.0083E+05
3.9208	1.2009E-07	-1.2657E-07	5.2022E-03	8.104E-02	0.2295	-1.4667	4.2218	-4.4495	7854.6	3.6992E+04	1.0083E+05
4.0716	5.2899E-08	-1.0276E-07	4.5775E-02	5.8555E-02	-9.8381E-02	-0.8292	1.9852	-3.8564	7784.8	3.6992E+04	1.0083E+05
4.2224	1.2109E-08	-6.4607E-08	4.0068E-02	-5.2497E-02	-0.1139	-0.3418	0.4832	-2.5781	7765.7	3.6992E+04	1.0083E+05
4.3732	4.4707E-09	3.1618E-08	2.2157E-02	-5.2497E-02	-0.1139	-4.9026E-02	-0.1890	-1.3368	7741.3	3.6992E+04	1.0083E+05
4.5240	7.2646E-09	1.0040E-08	7.7800E-03	-4.7512E-02	-7.1719E-02	8.1695E-02	-0.3244	-0.4483	7720.1	3.6992E+04	1.0083E+05
4.6748	4.9923E-09	9.6613E-10	4.4113E-04	-3.1773E-02	-2.9368E-02	0.1085	-0.2247	4.3476E-02	7704.8	3.6992E+04	1.0083E+05
4.8256	2.2526E-09	4.7924E-09	-1.8063E-03	-1.6565E-02	-5.0813E-03	8.67100E-02	-0.1014	0.2157	7693.9	3.6992E+04	1.0083E+05
4.9764	5.3476E-10	4.8137E-09	-1.6774E-03	-6.0201E-03	3.8805E-03	5.3099E-02	-2.4064E-02	0.2166	7686.5	3.6992E+04	1.0083E+05
5.1272	1.7295E-10	3.4078E-09	-9.3515E-04	-3.1468E-04	4.7648E-03	2.4952E-02	7.7828E-02	0.1534	7682.7	3.6992E+04	1.0083E+05
5.2780	2.9898E-10	1.8818E-09	-3.3300E-04	1.9080E-03	3.0077E-03	7.1123E-03	1.3454E-02	8.4682E-02	7682.4	3.6992E+04	1.0083E+05
5.4288	2.0854E-10	7.5899E-10	-2.3678E-05	2.1774E-03	1.2480E-03	-1.6372E-03	9.3842E-03	3.4155E-02	7682.4	3.6992E+04	1.0083E+05
5.5796	9.5343E-11	1.1629E-10	7.3178E-05	1.6386E-03	2.2834E-04	-4.4199E-03	4.2905E-03	5.2332E-03	7682.1	3.6992E+04	1.0083E+05
5.7304	6.3386E-11	1.5853E-10	6.9581E-05	9.5707E-04	-1.5412E-04	4.1331E-03	1.0534E-03	-7.1338E-03	7681.5	3.6992E+04	1.0083E+05
5.8812	6.7159E-12	-2.1521E-10	3.9510E-05	4.2394E-04	-1.9655E-04	-2.8215E-03	-3.0221E-03	-9.6846E-03	7681.1	3.6992E+04	1.0083E+05
6.0320	-1.2388E-11	-1.7318E-10	1.4362E-05	1.0492E-04	-1.2492E-04	-1.4809E-03	-5.5745E-04	-7.7930E-03	7680.9	3.6992E+04	1.0083E+05
6.1828	-8.7435E-12	-1.0498E-10	1.5245E-06	-3.8411E-05	-5.1518E-05	-5.3557E-04	-3.9346E-04	-4.7243E-03	7680.9	3.6992E+04	1.0083E+05
6.3336	3.8182E-12	-4.3939E-11	-2.4259E-06	-7.3749E-05	-9.2197E-06	3.6525E-05	-1.7182E-04	-1.9773E-03	7680.9	3.6992E+04	1.0083E+05
6.4844	-2.3421E-13	1.1070E-12	-2.3734E-06	-6.3055E-05	3.8438E-06	1.0202E-04	-1.0540E-05	4.9814E-05	7680.9	3.6992E+04	1.0083E+05
6.6352	1.9000E-12	3.1916E-11	-1.7432E-06	4.8123E-05	4.0070E-06	9.6041E-05	5.1066E-05	8.2970E-05	7680.8	3.6992E+04	1.0083E+05
6.7860	2.9599E-12	5.1856E-11	-1.1795E-06	-2.4235E-05	3.4073E-06	8.5795E-05	4.7358E-06	8.2970E-05	7680.8	3.6992E+04	1.0083E+05
6.9368	3.2905E-12	6.4028E-11	-7.2178E-07	2.2295E-05	2.6446E-06	7.1719E-05	5.2648E-06	1.0244E-04	7680.8	3.6992E+04	1.0083E+05
7.0876	3.1728E-12	7.1116E-11	-3.8266E-07	-1.2783E-05	1.8599E-06	5.5357E-05	5.0705E-06	1.1379E-04	7680.8	3.6992E+04	1.0083E+05
7.2384	2.8153E-12	7.5285E-11	-1.5841E-07	-5.7505E-06	1.1351E-06	1.8599E-06	4.5047E-06	1.2046E-04	7680.8	3.6992E+04	1.0083E+05
7.3892	2.3568E-12	7.8118E-11	-3.6355E-08	-1.4545E-06	5.1030E-07	1.9147E-05	3.7709E-06	1.2499E-04	7680.8	3.6992E+04	1.0083E+05
7.5400	1.8725E-12	8.0583E-11	0.0000	2.2923E-19	1.2212E-20	-3.1944E-19	2.9959E-06	1.2893E-04	7680.8	3.6992E+04	1.0083E+05

NUMBER OF ITERATIONS IN LLP = 4