REPORT OF SUBSURFACE EXPLORATION
AND
BRIDGE FOUNDATION INVESTIGATION

Rico-Tatum Road Over Cedar Creek
Fulton County Project No. T042
Fulton County, Georgia

WILLMER ENGINEERING INC.
Project No. ATL-171-2807

Prepared for

Wolverton & Associates, Inc.
Norcross, Georgia

Prepared by
Willmer Engineering Inc.
3772 Pleasantdale Road
Suite 165
Atlanta, Georgia 30340-4270

770.939.0089

WILLMER ENGINEERING INC.

February 4, 2005

VIA U.S. MAIL

Mr. Clint Parker, PE
Wolverton & Associates, Inc.
5300 Oakbrook Parkway, Suite 150
Norcross, Georgia, 30093

SUBJECT: Conspan Bridge Foundation Investigation Report
Rico-Tatum Road Over Cedar Creek
Fulton County Project No. T042
Fulton County, Georgia
Willmer Project No. ATL - 171-2807

Dear Mr. Parker:

Willmer Engineering Inc. (Willmer) is pleased to provide this Conspan Bridge Culvert Foundation Investigation Report for the proposed Bridge Replacement on Rico-Tatum Road over Cedar Creek project in Fulton County, Georgia. The culvert foundation investigation was performed in general accordance with Willmer Proposal PO4-251, dated June 9, 2004 and Georgia Department of Transportation (GDOT) guidance documents for bridge foundation investigations. This study is performed based on preliminary drawings received by us on December 13, 2004.

The following summary presents site and subsurface conditions, our conclusions, and recommendations related to the project design and construction.

We appreciate the opportunity to be of service on this project. If you have any questions concerning this report or require further assistance, please call.

Sincerely,

WILLMER ENGINEERING INC.

for Harshad V. Modi, PE
Senior Geotechnical Engineer

James L. Willmer, PE
Vice President/Principal Consultant

HVM/JLW:dws
Enclosures

Attachments: Culvert Foundation Survey Summary

Appendix I - Figure 1, Project Location Map
Figure 2, Boring Location Plan
Figure 3, Generalized Subsurface Profile
Boring Record Legend
Boring Records
USCS Soil Classification Legend

Appendix II Pile Deflection and Force vs. Depth
Figures 1 through 4

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CULVERT FOUNDATION INVESTIGATION	
Willmer Project Number	ATL-171-2807
Fulton County Project Number	T042
Project P.I. Number	N/A
Location	Rico-Tatum Road over Cedar Creek, Fulton County, Georgia (see Figure 1)
GENERAL INFORMATION	
Site Description	Replace the existing bridge by constructing 32 feet wide by 8 feet high pre-cast concrete, Con/span bridge.
Geologic Formation	The project is geologically sited in the Porphyritic Granite/Aluminous Schist Formation of the Georgia Piedmont region.
Proposed Structure	The construction of a precast concrete arched culvert is proposed at this site due to environmental concern. To restrict environmental disturbance to the channel, it will be supported on driven piles capped with approximately 3 feet wide by 3 feet deep concrete beam. The beam will be notched at the top to accommodate the arch culvert.
Subsurface Data	The subsoils found in borings B-1 and B-2 consist primarily of fill/ alluvial materials of recent origin, underlain by residual soils composed of medium dense to very dense silty sands, then partially weathered rock, sampled as very dense silty sands. Fill/alluvial soils extend to about elevation 806 feet to 807 feet. Partially weathered rock was encountered in boring, B-2, at elevation 790 feet Groundwater was encountered at the time of drilling at approximate elevation 817 feet. However, groundwater may fluctuate depending on the seasonal precipitation and creek water level.

PWR AND ROCK ELEVATIONS

Bents	Top of PWR	Auger Refusal
1	-	-
2	790	-

MAXIMUM PILE DESIGN LOADS

End Bearing = 100%	10 BP 42 = 55 Tons *
Friction = 0%	12 BP 53 = 70 Tons *

*Lateral pile capacity graphs for two different head fixity configurations are presented in the Appendix.

FOUNDATION RECOMMENDATIONS

BENTS	FOUNDATION TYPE	MINIMUM TIP/H-PILE	ESTIMATED TIP/ H-PILE
1(West End)	H-pile	791±	788±
2(East End)	H-pile	789±	786±

NOTES

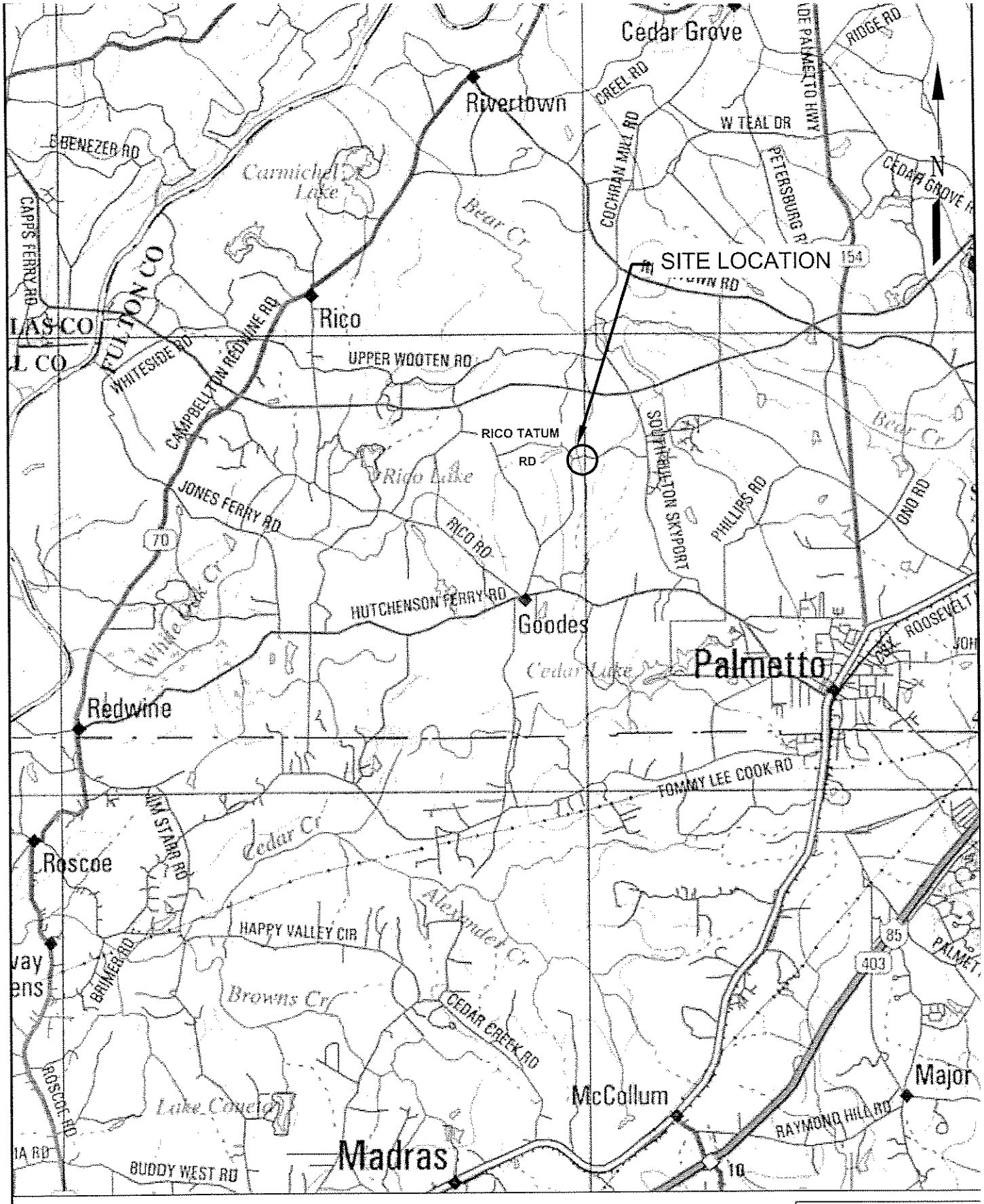
Elevations	All elevations referenced in this report are interpolated based on the provided plan dated December 13, 2004.
Lateral Earth Pressures	Based on previous experience with similar soils and construction, we recommend the following earth pressure coefficients and equivalent fluid pressures for design of stem walls.

Earth Pressure Conditions	Earth Pressure Coefficient	Recommended Equivalent Fluid Pressure (pcf)
Active (K_a)	0.3	36
At-Rest (Ko)	0.5	60
Passive (K_p)	3.0	300

No safety factors are included in these values.

Waiting Period	None required.
Shoring/Cofferdams	The top of pile caps will be near elevation 813. Since ground water is at elevation 817, temporary shoring or cofferdams will be needed to construct the pile caps. Dewatering or pumping methods will be required.
Theoretical Scour	Appears feasible for the materials encountered.
Erosion	The use of 24 inches of Type I riprap and filter fabric may be appropriate , if environmentally acceptable.
AS Built Information	It is requested that all final as built information be forwarded to the Fulton County Department of Public Works upon completion of the foundation construction
PDO	Driving resistance after Minimum Tip Elevations are achieved.
Special Problems	For safety, construction excavations should be sloped or braced in accordance with Occupational Safety and Health Standards-Excavations, OSHA regulations (29 CFR Part 1926)
Prepared By:	Harshad V. Modi, PE
Reviewed By:	James L. Willmer, PE

APPENDIX I



FULTON COUNTY	
PROJECT NUMBER	
TO42	

NTS			FIGURE 1
			SITE LOCATION MAP RICO-TATUM ROAD OVER CEDAR CREEK FULTON COUNTY, GEORGIA WILMER PROJECT No. ATL-171-2807
DRAWN BY: TRS	REVISION: 0	WILMER ENGINEERING INC. WE	GEOTECHNICAL ENGINEERING CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270
REVIEWED BY: HM	12/29/2004		

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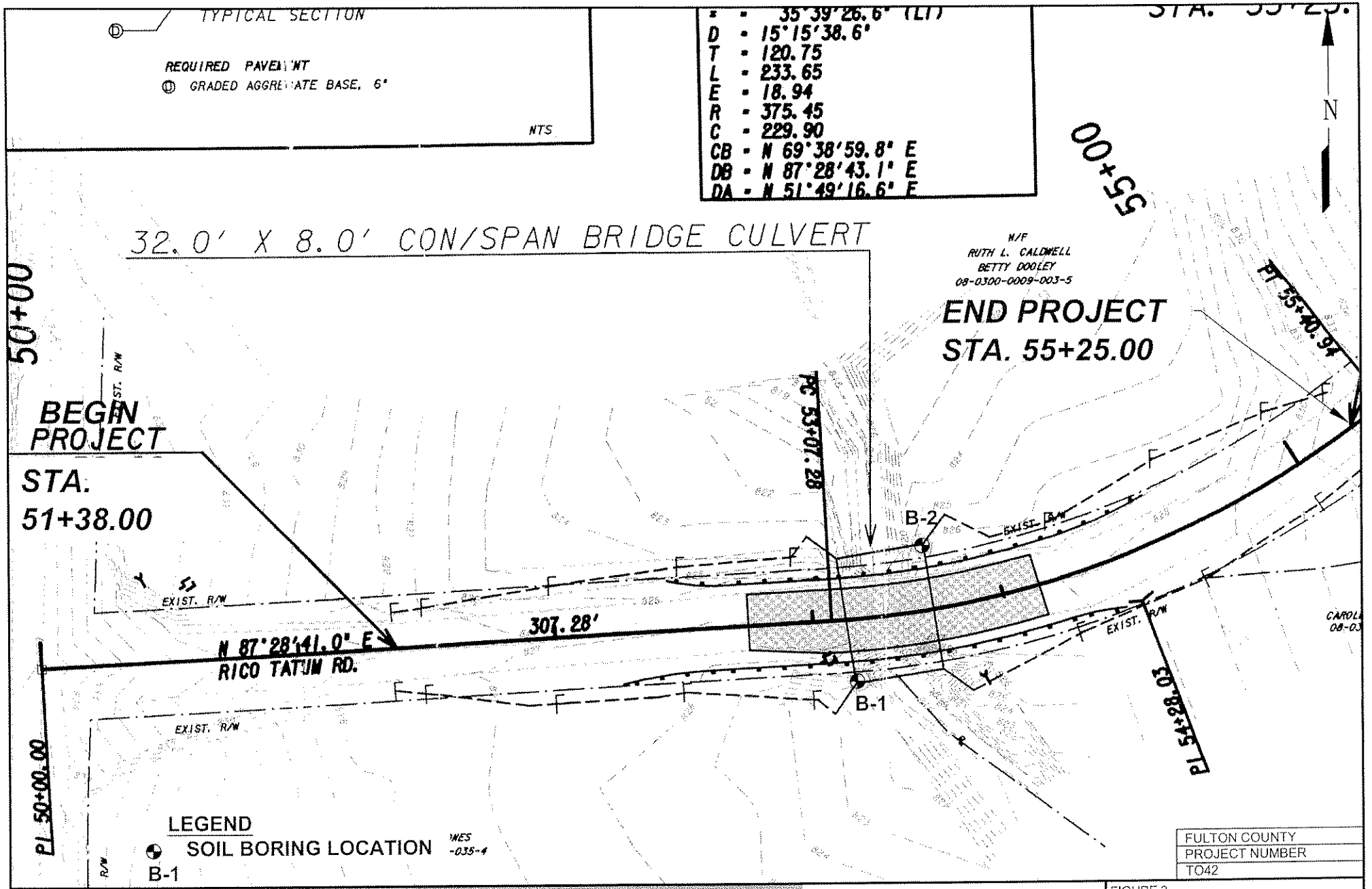
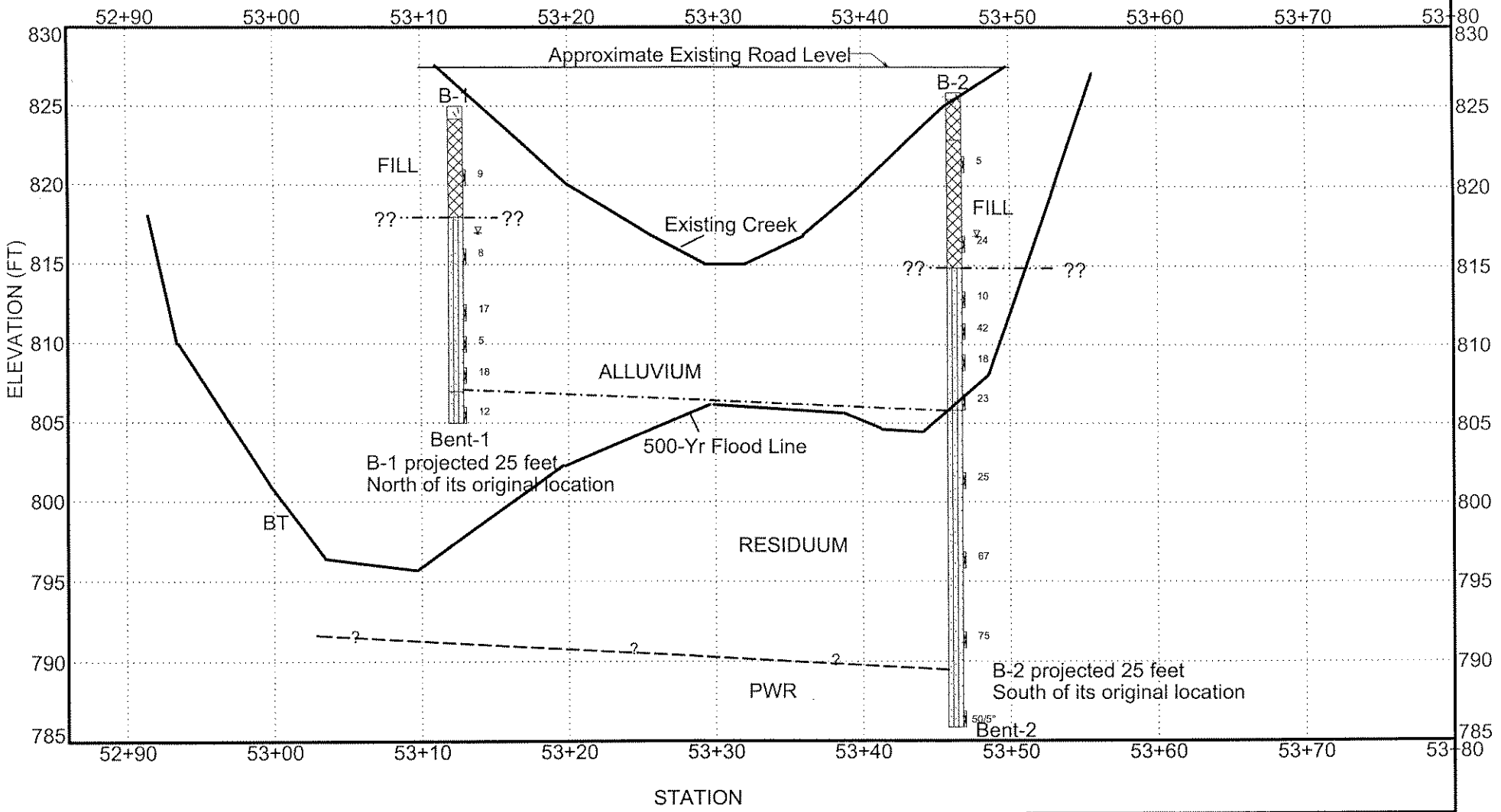


FULTON COUNTY	
PROJECT NUMBER	
TO42	

SCALE: 1" = 50'	WILLMER ENGINEERING INC.	GEOTECHNICAL ENGINEERING ▪ CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270
DRAWN BY: TRS REVISION: 0		
REVIEWED BY: HM 12/28/2004		

FIGURE 2

BORING LOCATION PLAN
RICO-TATUM RD. OVER CEDAR CREEK
FULTON COUNTY, GEORGIA
WILLMER PROJECT No. ATL-171-2807



BT = Boring Terminated
PWR = Partially Weathered Rock
Boring profile is projected to the Rico-Tatum Rd centerline.

GENERALIZED SUBSURFACE PROFILE

Rico-Tatum Road Over Cedar Creek
Fulton County, GA
Fulton County Project # T042

PROJECT #	DATE	FIGURE
ATL-171-2807	Jan 18, 2005	3

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BORING RECORD LEGEND

SM, CL, etc: - GROUP SYMBOL based on Unified Soil Classification System.
(Refer to ASTM D-2488 and Table 1 of D-2487)

N-VALUE: BLOWS PER FOOT- Standard Penetration Resistance (SPT) blow count , the sum of the second and third 6-inch increments of the SPT test.
(Refer to ASTM D-1586)

CONSISTENCY / RELATIVE DENSITY Correlated with SPT Blow Count, N:

SILTS AND CLAYS

N (blows per foot)	Consistency
0 - 2	Very Soft
3 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very Stiff
31 - 50	Hard
> 50	Very Hard

SANDS

N (blows per foot)	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
> 50	Very Dense

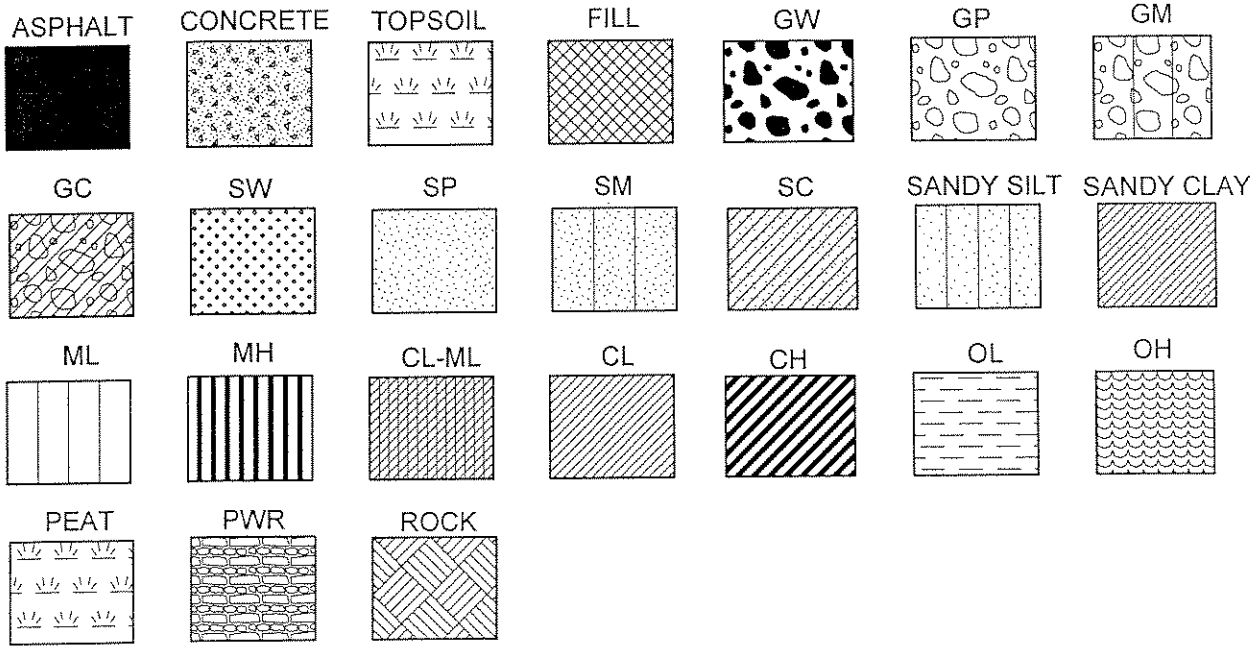
NOTES:

Groundwater Measurements:

▼ Water level at 24 hours

▽ Water level at time of boring

Caved level at 24 hours



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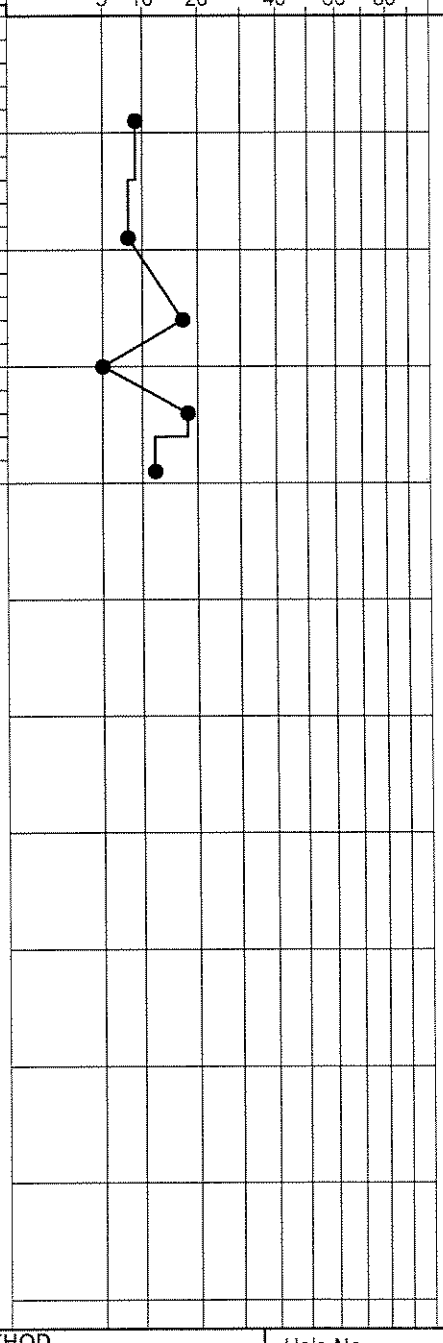
Project: **Rico-Tatum Road Over Cedar Creek**
Location: **Fulton County, GA**
Project Number: **ATL-171-2807** **Fulton County Project Number T042**

HOLE No. B-1
Sheet 1 of 1
Location: **STA 53+13, 25' S**

Azimuth: Angle from Horizontal: **90** Surface Elevation (ft): **825.00** Station: **NA**
Drilling Equipment: **CME-550** Drilling Method: **HSA**
Core Boxes: **NA** Samples: **6** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **20.0**
Logged By: **SAN** Date Drilled: **12/22/04**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	RCD%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
					Topsoil = 8 inches	825.0	
					FILL: Loose red and brown clayey medium to fine **SAND** — FILL		
5		SS				820	9
					ALLUVIUM: Loose to medium dense gray silty coarse to fine **SAND** with gravel — SM		
10		SS				815	8
		SS					17
15		SS				810	5
		SS					18
					RESIDUUM: Medium dense brown and tan silty coarse to fine **SAND** (micaceous) — SM		
20		SS				805	12

STANDARD PENETRATION TEST DATA (blows/foot)



Boring terminated @ 20 feet below existing ground surface

Groundwater encountered @ 8 feet below existing ground surface @ time of boring

SAMPLER TYPE		DRILLING METHOD		Hole No.
SS - Split Spoon	NX - Rock Core, 2-1/8"	HSA - Hollow Stem Auger	RW - Rotary Wash	B-1
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core	
NQ - Rock Core, 1-7/8"	CT - Continuous Tube	DC - Driving Casing		

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Project: **Rico-Tatum Road Over Cedar Creek** Location: **Fulton County, GA** Project Number: **ATL-171-2807** **Fulton County Project Number T042**	**HOLE No. B-2** Sheet 1 of 1 Location: **STA 53+47, 25' N**

Azimuth: Angle from Horizontal: **90** Surface Elevation (ft): **826.00** Station: **NA**

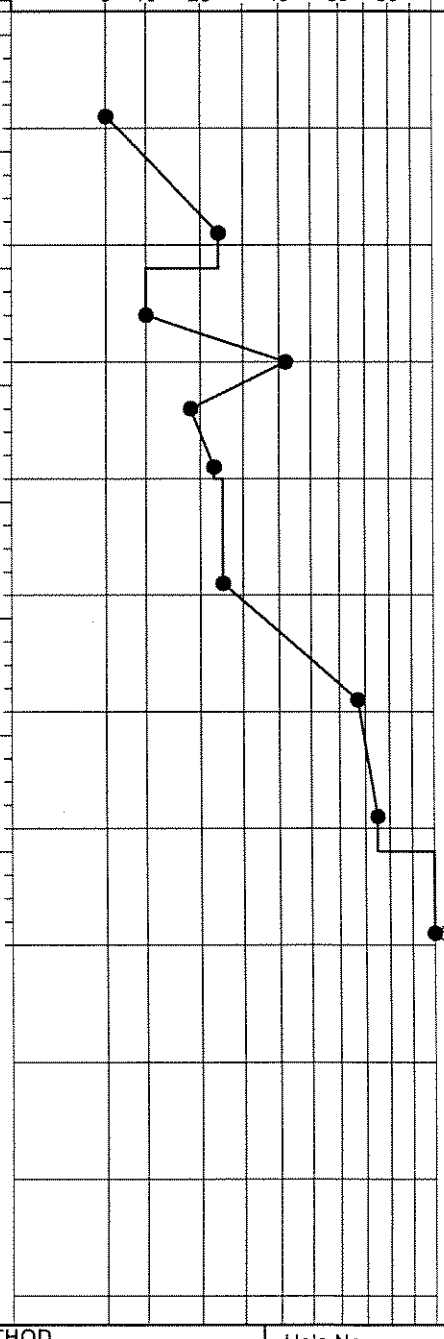
Drilling Equipment: **CME-550** Drilling Method: **HSA**

Core Boxes: **NA** Samples: **10** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **40.0**

Logged By: **SAN** Date Drilled: **12/22/04**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	RCD%	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N-VALUE
					Topsoil = 4 inches	FILL	826.0	
					FILL: Red and brown silty medium to fine **SAND**	FILL	825	
5		SS			Loose to medium dense red and brown clayey medium to fine **SAND**		820	5
10		SS					815	24
					ALLUVIUM: Loose to Dense tan, brown, and yellow silty coarse to fine **SAND** with gravel	SM		
		SS						10
15		SS					810	42
		SS						18
20		SS						23
					RESIDUUM: Medium dense to very dense brown, tan, and white silty coarse to fine **SAND**	SM	805	
25		SS					800	25
30		SS					795	67
					Color changes to brown, gray, and white (micaceous)			
35		SS					790	75
					PARTIALLY WEATHERED ROCK: Sampled as very dense brown, tan, and white silty coarse to fine **SAND** (micaceous)	PWR		
40		SS						50/5"

STANDARD PENETRATION TEST DATA (blows/foot)



Boring terminated @ 40 feet below existing ground surface

Groundwater encountered @ 9 feet below existing ground surface @ time of boring

SAMPLER TYPE		DRILLING METHOD		Hole No.
SS - Split Spoon	NX - Rock Core, 2-1/8"	HSA - Hollow Stem Auger	RW - Rotary Wash	
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core	B-2
NQ - Rock Core, 1-7/8"	CT - Continuous Tube	DC - Driving Casing		

SPTN 2807.GPJ 1/18/05

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Willmer Engineering Inc.
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Atlanta, Georgia 30340

UNIFIED SOIL CLASSIFICATION SYSTEM REFERENCE SHEET

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS LITTLE OR NO FINES	(GW)	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			(GP)	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES APPRECIABLE AMOUNT OF FINES	(GM)	SILTY GRAVELS AND GRAVEL-SAND-SILT MIXTURES
			(CG)	CLAYEY GRAVELS AND GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SAND LITTLE OR NO FINES	(SW)	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			(SP)	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES APPRECIABLE AMOUNT OF FINES	(SM)	SILTY SANDS AND SAND-SILT MIXTURES
			(SC)	CLAYEY SANDS AND SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		(ML)	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR VERY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			(CL)	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			(OL)	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		(MH)	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOLIDS
			(CH)	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			(OH)	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOLIDS			(PT)	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

APPENDIX II

PILE DEFLECTION & FORCE vs DEPTH

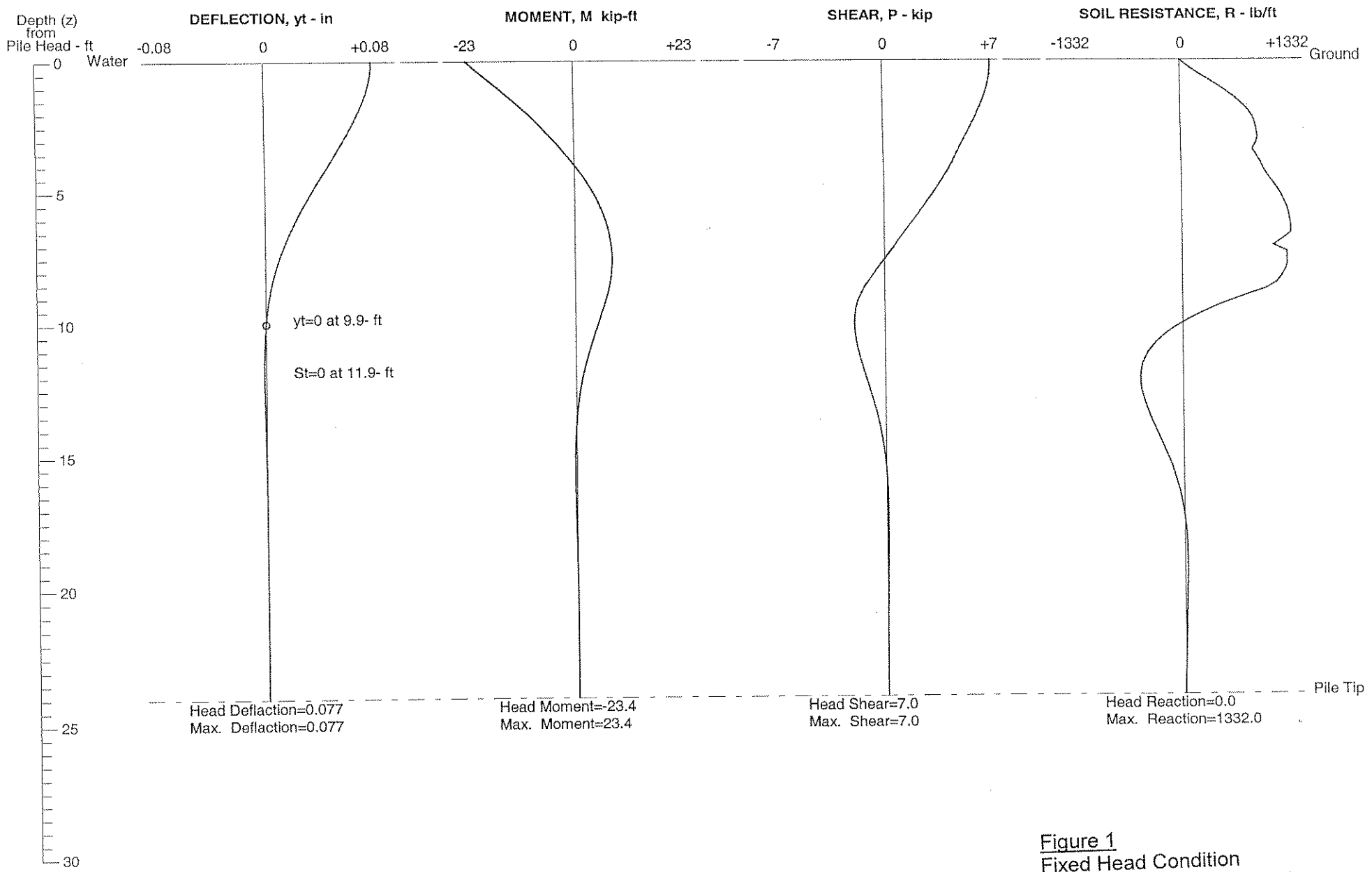

Figure 1
Fixed Head Condition
Vertical Load = 13k/ft.
Shear = 7.0k/ft.
H-pile Section = HP 10x42

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PILE DEFLECTION & FORCE vs DEPTH

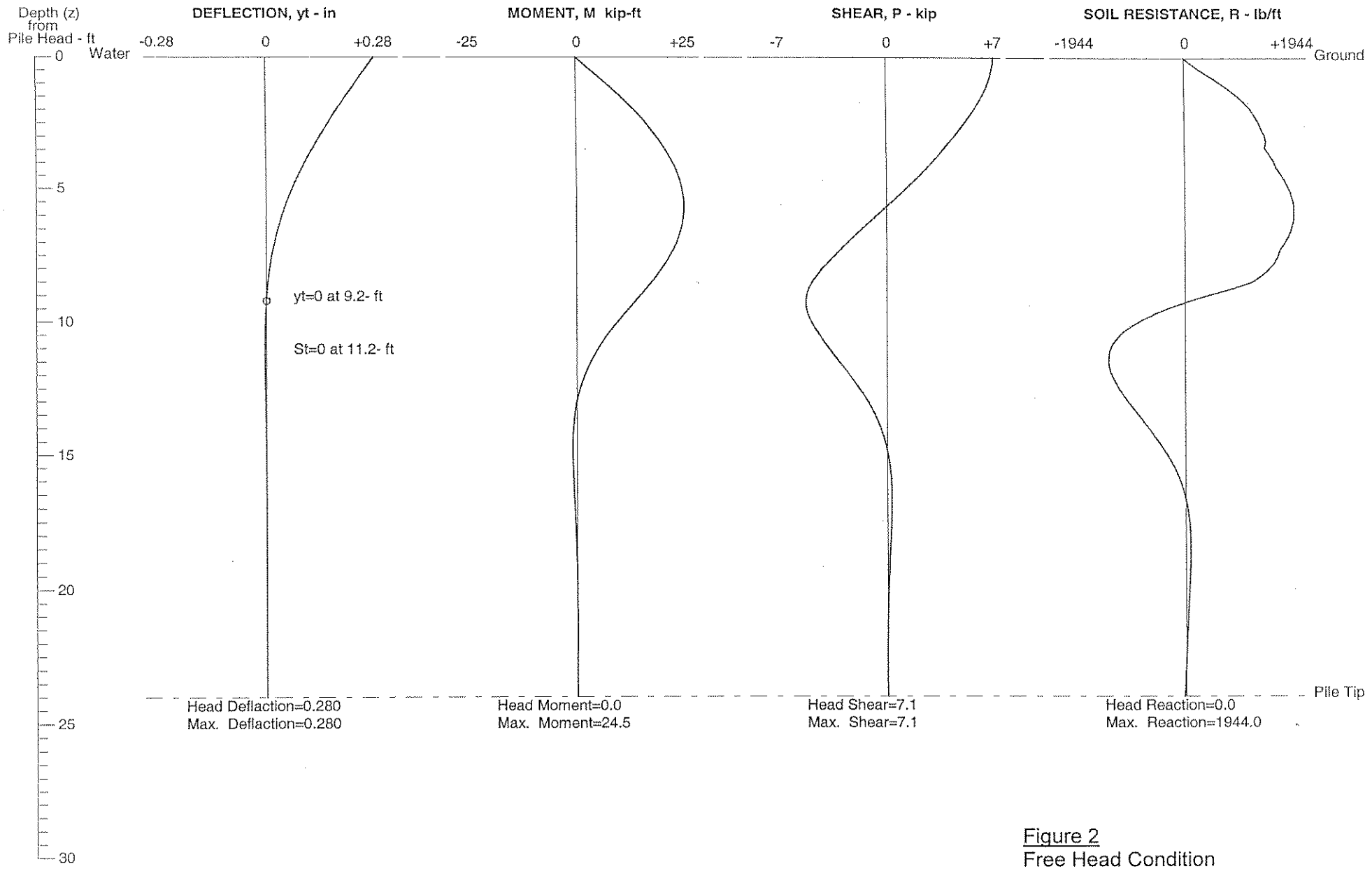

Figure 2
Free Head Condition
Vertical Load = 13k/ft.
Shear = 7.0k/ft.
H-pile Section = HP 10x42

CIVILTECH SOFTWARE

171-2807 Rico-Tatum Rd

PILE DEFLECTION & FORCE vs DEPTH

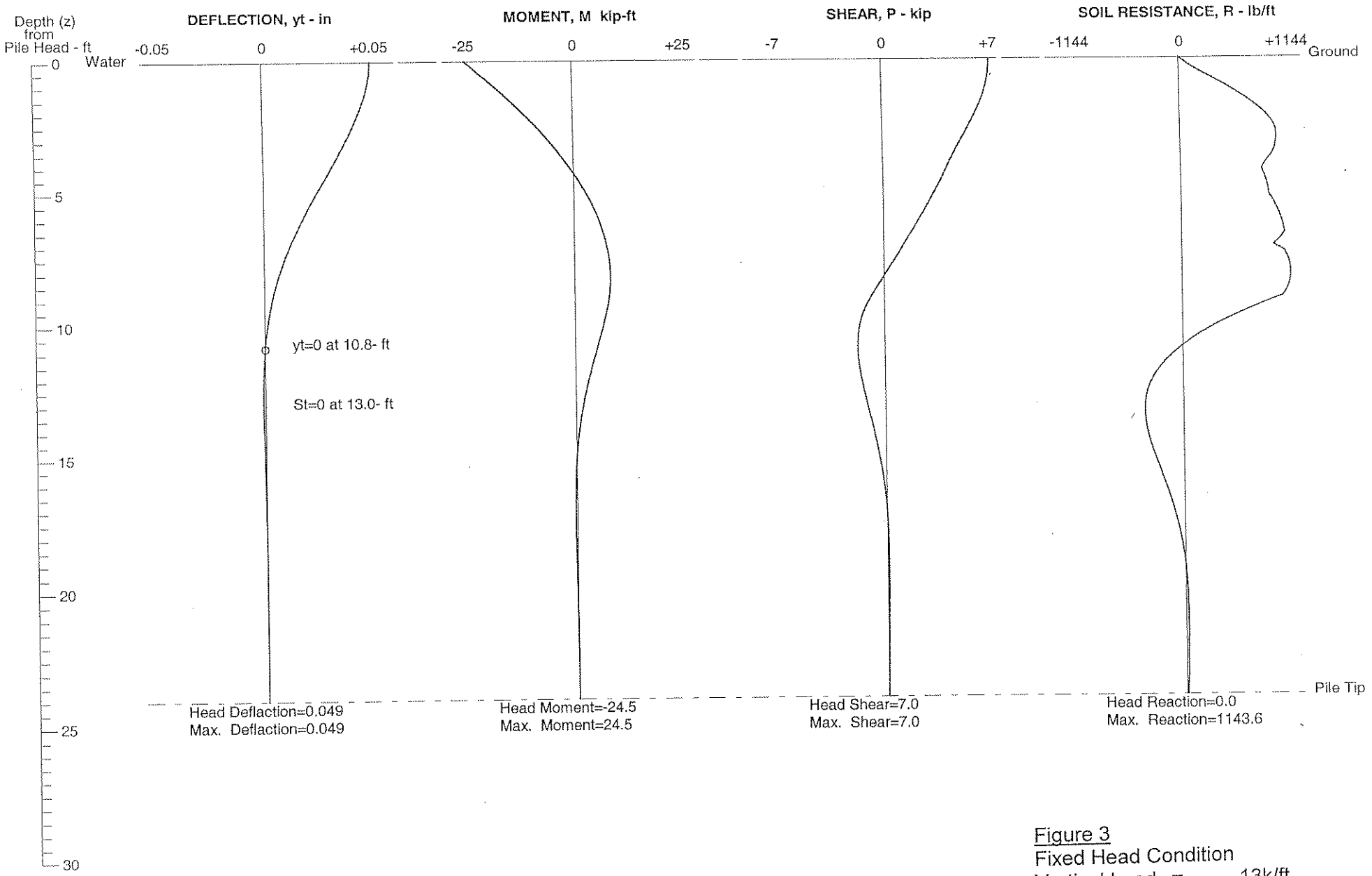

Figure 3
Fixed Head Condition
Vertical Load = 13k/ft.
Shear = 7.0k/ft.
H-pile Section = HP 12x53

CIVILTECH SOFTWARE

171-2807 Rico-Tatum Rd

PILE DEFLECTION & FORCE vs DEPTH

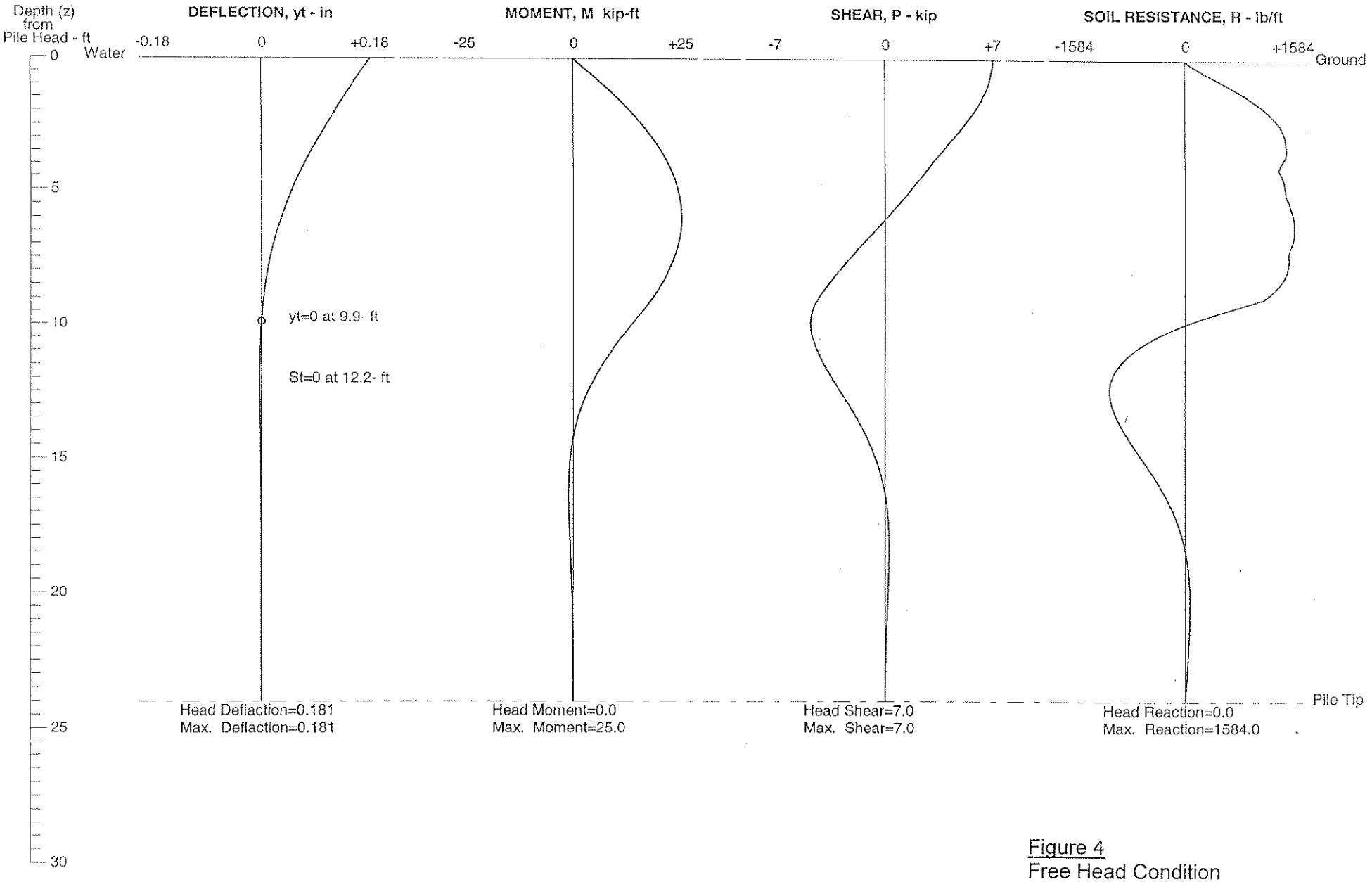

Figure 4
Free Head Condition
Vertical Load = 13k/ft.
Shear = 7.0k/ft.
H-pile Section = HP 12x53

CIVILTECH SOFTWARE

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ALL-PILE Version 3.2E CivilTech Software www.civiltech.com