Applied Foundation Testing

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Report of High-Strain Dynamic Pile Testing and Axial Static Compressive Load Testing
TP-10A-1 & TP-10A-2
I-10 over Mobile River and Bayway
Load Test Program
Mobile Country, Alabama
AFT Project No.: 118008

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INTRODUCTION

The proposed I-10 Mobile River Bridge and Bayway project includes the construction of a new six-lane bridge across the Mobile River and a new eight-lane Bayway. A load test program has been conducted in advance of the construction contract to optimize the foundation design. Foundation types included in the load test program include two HP14x89 steel H-piles, two 18-inch square prestressed concrete piles, one 30-inch square prestressed concrete pile, five 54-inch diameter spun-cast concrete cylinder piles, one 60-inch diameter steel pipe pile, and one 72-inch diameter drilled shaft.

This report summarizes the installation and testing of the HP14x89 steel H-piles at locations TP-10A-1 and TP-10A-2. High-strain dynamic pile testing, also known as PDA, was performed during initial drives of the two piles, 1 day restrikes on both test piles, and a 7 day restrike on TP-10A-2. Axial compressive static load testing was performed approximately 11 days after the initial drive of TP-10A-1. A 12 day restrike was subsequently performed on TP-10A-1 the day after static load testing. A summary of the test dates is included in Table 1 below.

Table 1: Summary of Test Dates

Test Pile	Test Description	Test Date
TP-10A-1	Initial Drive	2/22/2018
	1 Day Restrike	2/23/2018
	Static Load Testing	3/5/2018
	12 Day Restrike	3/6/2018
TP-10A-2	Initial Drive	2/22/2018
	1 Day Restrike	2/23/2018
	7 Day Restrike	3/1/2018

The project plans indicate test piles TP-10A-1 and TP-10A-2 were located at station 469+20.00 near the Texas Street at I-10 intersection. Please refer to the project source documents for a site plan of the actual location of the test piles. The HP14x89 steel H-piles were 86 feet in length. Prior to axial compressive static load testing, 5 feet was cut-off of TP-10A-1 to facilitate testing.

Installation of the test piles was performed by Jordan Pile Driving, Inc. In addition, Jordan Pile Driving, Inc. provided the reaction system and necessary office and field support to carry out the load testing. Applied Foundation Testing (AFT) was the specialty engineering firm performing the dynamic pile testing and monitoring the axial compressive static load test. Dynamic pile testing was performed by Mr. Josias Ouedraogo, E.I. or Mr. Michael Worsham, P.E. Mr. Andrew Best and Mr. Michael Worsham, P.E. performed the axial compressive static load testing. Data analysis and reporting was performed by Mr. Michael Worsham, P.E. and Mr. Joe Bailey, P.E. Mr. Donald Robertson, P.E. provided quality assurance oversight for the data analysis and reporting.

This report contains a compilation of the results for the dynamic pile testing and axial compressive static load testing. This report includes an overview of the testing program, graphical representations of the data, discussion of the results, and instrumentation calibrations.

GENERALIZED SOIL CONDITIONS

Thompson Engineering performed the subsurface exploration as part of this project. The subsurface exploration consisted of drilling a single Standard Penetration Test (SPT) boring near each of the proposed foundation load test locations identified for the project. The nearest soil boring to TP-10A-1 and TP-10A-2 is boring TH-10 located at station 470+55.32 offset right 106.31 feet.

A copy of soil boring TH-10 is included in Appendix E. Detailed descriptions of the subsurface conditions encountered are presented in this attached soil boring. A summary of the soil conditions given below represents a summary of conditions as indicated in the provided materials and is included only to assist in evaluation of the load test data. For further details regarding the soil conditions at the test site and elsewhere, the reader should reference the project source documents.

The water surface elevation measurements noted in boring log TH-10 at the time of drilling (ATD) was +11.1 feet, and the 24-hour delayed water surface was -7.1 feet with respect to NAVD (North American Vertical Datum of 1988). Table 2 below provides a summary of the subsurface conditions.

Table 2: Description of Subsurface Soil Conditions(1)

Average Elevation From- To(2)	Material Description	Typical N-Value Range
+12.9 to +1.2	Silty Sand; Sand with Silt (SM, SP-SM)	3 to 15
+1.2 to -8.8	Sandy Fat Clay; Lean Clay with Sand (CH, CL)	1
-8.8 to -88.8	Sand with Silt; Silt with Sand; Sand (SP-SM, SP)	11 to 46
-88.8 to -108.8	Fat Clay; Lean Clay with Sand (CH, CL)	7 to 13
-108.8 to -133.8	Sand; Silty Sand (SP, SM)	31 to 76
-133.8 to -153.8	Sandy Lean Clay; Fat Clay (CL, CH)	23 to 39
-153.8 to -167.1	Silty Sand; Sand with Silt (SM, SP-SM)	45 to 50/6”

Note 1: Table created from Thompson Engineering Test Boring Record TH-10 contained in the project plans.
Note 2: Elevations are referenced to North American Vertical Datum of 1988 (NAVD)

HIGH-STRAIN DYNAMIC PILE TESTING (PDA)

The test piles were installed by Jordan Pile Driving, Inc. Each test pile was prepared for high-strain dynamic testing by drilling holes for gage attachment approximately two pile diameters, or 28 inches, below the pile top.

The test piles were impact driven using a Delmag D19-32 open-ended diesel pile driving hammer. The Delmag D19-32 diesel hammer has a maximum rated energy of 42,800 foot-pounds (ram weight of 4,190 pounds at a stroke height of 10.2 feet). We understand the Delmag D19-32 hammer utilized a hammer cushion consisting of 6 inches of micarta and aluminum.

Applied Foundation Testing performed dynamic pile testing using a Pile Driving Analyzer Model PAX manufactured by Pile Dynamics, Inc. Dynamic testing was accomplished by externally attaching two piezo-resistive accelerometers and two strain transducers and taking measurements during the initial drive and subsequent restrikes. Calibration information for the sensors utilized is included in Appendix F. The dynamic pile testing was performed in general accordance with the project plans and special provisions and ASTM D4945 *"Standard Test Method for High-Strain Dynamic Testing of Deep Foundations"*. During the initial drive, TP-10A-1 and TP-10A-2 were driven approximately to the estimated tip elevation of -65 feet as shown in the project plans.

Plots and tabular summaries of the dynamic testing results are included in Appendix B. In general, these summaries include blows per foot (BLC), penetration depth below reference, maximum Case method resistance, maximum compressive stress (CSX), compressive stress at the bottom of pile (CSB), maximum tensile stress (TSX), stroke (STK), maximum transfer energy (EMX), and beta pile integrity factor (BTA). A string line was used as a reference for measuring penetration depth during the initial drive and restrikes. A summary of the test pile installation is provided in Tables 3 and 4 below.

Table 3: Summary of Pile Driving Information

Test Pile	Hammer Model	Approximate Reference Elevation (feet)	Approximate Ground Elevation (feet)	Approximate Final Tip Elevation(1) (feet)
TP-10A-1	Delmag D19-32	+14.3	+13.1	-65.3
TP-10A-2	Delmag D19-32	+14.2	+13.1	-65.4

Note 1: Approximate final tip elevation based on inspector's final pile top survey measurement. Approximate reference elevation adjusted slightly (between 0.1 and 0.2 feet) based on these final pile top elevation measurements.

Table 4: Summary of Dynamic Pile Testing Results

Test Pile	EOD or BOR(1)	Blows per Foot at EOD or Blows per Inch for Restrike	Max. CSX Stress (ksi)	Avg. CSX Stress (ksi)	Max. TSX Stress (ksi)	Avg. TSX Stress (ksi)	Max. CSB Stress (ksi)	Avg. CSB Stress (ksi)	Avg. Transfer Energy (k-ft) / Approx. Stroke (ft.)
TP-10A-1	EOD	36BL/1'	24.59	19.14	13.84	5.92	10.23	7.84	10.9/5.51
	1 Day RS	3BL/1", 2BL/1", 2BL/1", 2BL/1"	27.43	24.36	7.21	5.73	14.29	13.12	16.8/7.70
	12 Day RS	4BL/1", 3BL/1", 4BL/1", 1BL/0.25"	28.83	24.81	5.17	3.65	16.56	14.04	15.2/7.12

Test Pile	EOD or BOR(1)	Blows per Foot at EOD or Blows per Inch for Restrike	Max. CSX Stress (ksi)	Avg. CSX Stress (ksi)	Max. TSX Stress (ksi)	Avg. TSX Stress (ksi)	Max. CSB Stress (ksi)	Avg. CSB Stress (ksi)	Avg. Transfer Energy (k-ft) / Approx. Stroke (ft.)
TP-10A-2	EOD	39BL/1’	23.53	18.98	14.18	6.27	10.68	7.51	11.3/5.50
	1 Day RS	4BL/1”, 2BL/1”, 3BL/1”, 1BL/0.33”	24.74	22.32	7.26	5.31	12.32	11.60	13.3/6.54
	7 Day RS	4BL/1”, 3BL/1”, 2BL/1”, 2BL/0.75”	27.17	24.16	7.19	5.52	15.43	13.57	15.9/7.36

Note 1: EOD – End of Initial Drive; RS – Restrike

The dynamic pile testing measurements indicate the maximum compression stress (CSX), maximum compression stress at the toe (CSB), and maximum tensile stress (TSX) were below the allowable stress limits during the initial drives and restrikes. Neither pile tested showed signs of integrity problems. The dynamic pile testing data indicates beta values lower than 100; however, these lower values are not an indication of pile damage and were due to either the pile impedance increase at the pile splice, or due to high frequency noise from the steel on steel, hammer to pile, impact driving.

SIGNAL MATCHING ANALYSIS

Signal matching analyses were performed using the computer program CAPWAP (version 2014) to further evaluate the field measurements. Summaries of these analyses are presented in Table 5 below. The complete analyses are included in Appendix C. Signal matching analysis is considered a standard procedure to estimate the total ultimate resistance as well as estimate the resistance distribution (shaft and toe) from the dynamic pile testing data. The signal matching approach is used to back calculate various soil parameters. The program uses the data measured during a single blow as a boundary condition and the user performs many iterations on soil parameters to make a calculated wave-up match the measured one.

Table 5: Signal Matching Results Summary

Test Pile	EOD or Restrike	Blow No.	R_{ult} (kips)	R_{shaft} (kips)	R_{end} (kips)	Max. Case Method JC Damping Factor	EMX (k-ft) / Stroke (feet)	Qs (in)	Qt (in)	Ss (s/ft)	St (s/ft)	Match Quality
TP-10A-1	EOD	1531	179	133	46	0.70	11.6/5.75	0.04	0.28	0.21	0.25	2.13
	1 Day Restrike	2	230	186	44	0.75	22.0/6.61	0.04	0.33	0.22	0.25	2.18
	12 Day Restrike	2	238	194	44	0.65	17.2/7.91	0.04	0.35	0.31	0.15	1.93
TP-10A-2	EOD	1412	188	139	49	0.75	13.0/6.14	0.04	0.28	0.22	0.25	2.21
	1 Day Restrike	4	206	157	49	0.75	14.5/6.76	0.04	0.36	0.24	0.25	2.63
	7 Day Restrike	2	242	187	55	0.75	17.1/7.46	0.04	0.28	0.25	0.11	1.77

The results of the CAPWAP signal matching analyses generally have the most confidence in the total resistance value, and to a lesser extent the resistance distribution in side resistance along the length of the pile and end bearing resistance at the pile bottom. This is generally attributed to intricacies in separating side resistance and end bearing resistance from the total resistance using signal matching techniques.

The signal matching analysis for TP-10A-1 indicated a total ultimate resistance of 179 kips at EOD, 230 kips during the 1 day restrike; and 255 kips during the 12 day restrike (1 day after static load testing). The signal matching analysis for TP-10A-2 indicated a total ultimate resistance of 188 kips at EOD, 207 kips during the 1 day restrike; and 242 kips during the 7 day restrike. Based on the set measurements during EOD and restrikes for TP-10A-1 and TP-10A-2, the resistance values presented in this report are considered fully mobilized.

AXIAL COMPRESSIVE STATIC LOAD TESTING

The axial static compression load testing was performed on TP-10A-1 in general accordance with the project plans and special provisions and ASTM D1143, *"Standard Test Methods for Deep Foundations Under Static Axial Compressive Load"*. Loading was applied using a hydraulic jacking system acting against a weighted platform.

The "Quick Test" loading sequence was followed as detailed in the project special provisions. The test pile was loaded in 10 increments with increases in load of approximately 30 kips per increment or 10% of the target nominal resistance load of 300 kips as shown in the plans. The maximum test load achieved was 367 kips. At the maximum test load, the loading was stopped due to reaching the maximum capacity of the static load testing load frame. During each load increment/decrement the load was maintained for approximately four minutes. After reaching and maintaining the maximum load for four minutes, the applied load was removed in four, approximately equal, decrements.

The load curve shown in Figure 1 of Appendix D is based on the continuous readings from the load cell and the average pile top displacement based on the electronic LVDT's. The Davisson Failure Criterion is also plotted in this figure. Parameters used in computing the theoretical elastic compression line included pile length, pile diameter/width, pile area, and pile material elastic modulus. The pile length, pile diameter/width, and pile area utilized was 81 feet (78 feet below grade and ~ 3 feet above grade), 14.7 inches, and 26.1 square inches, respectively. The pile material elastic modulus utilized was 30,000 kips per square inch for the steel pile. The Davisson Failure Criteria offset was calculated to be 0.27 inches.

A summary of the load versus displacement information for the test pile is presented in Table 6 below. The maximum applied load was 367 kips and the maximum displacement was 0.598 inches. The final permanent displacement (after unloading) was 0.210 inches.

As shown in Figure 1 of Appendix D, the pile top did not displace below the Davisson Failure Criterion. Therefore, the failure load based on the Davisson Failure Criterion cannot be determined from this load test.

Table 6. Summary of Load Versus Displacement

Test Pile	Maximum Load (kips)	Maximum Pile Top Displacement (inches)	Permanent Pile Top Displacement (inches)
TP-10A-1	367	0.598	0.210

Additional comments on the test set up and measurements are discussed as follows:

The load based on the continuous readings from the load cell was used in the field and this report as the governing load measurement. Only minor variations between the loads provided by the calibrated load cell and the calibrated hydraulic jacking system existed. The two independent devices had good agreement throughout the load test. A variation between the load cell and calculated load from hydraulic jack pressure is not unusual during pile load testing and typically expected. This is due to some load eccentricity and/or friction between the bearing plates and load cell. This variation between the loads provided by the load cell and the calibrated hydraulic jacking system is well within acceptable industry standard.

The top of pile movement was measured using two LVDT's at axisymmetric points (180-degree separation) placed in the center of each H-beam flange approximately 1 foot below the top of the pile. LVDT 108207 was mounted on the northwest side of the pile and LVDT 108208 was mounted on the southeast side of the pile. A piece of smooth lubricated glass was placed beneath the LVDT's and affixed to the independent reference beam.

In addition to the two LVDT's, a digital survey with an invar rod affixed to the hydraulic jack was utilized as a back-up to continuously record pile top movement. The invar rod was placed on the south side of the hydraulic jack. Back-up manual survey readings of the pile top movement were also taken by the contractor during the load test using an auto level and ruler affixed to the hydraulic jack. The three independent devices (LVDT's, manual survey, and digital survey) had excellent agreement throughout the load test. Some minor variations in pile top movement between the digital survey and LVDT's up to approximately 0.07 inches were measured during testing. Because the digital survey invar rod was placed on the hydraulic jack we believe this minor variation in measurements was due to slight movement of the hydraulic jack as the pile was loaded. Therefore, the digital survey measurement data was not included in average pile top displacement on the Figure 1 load curve.

SUMMARY AND CONCLUSIONS

The load test program included the installation of two HP14x89 steel H-piles at locations TP-10A-1 and TP-10A-2. These two test piles were subjected to dynamic pile testing during initial drive and restrikes. TP-10A-1 was also subjected to axial compressive static load testing. A summary of the load test results is provided below:

TP-10A-1 Load Testing Summary:

- The signal matching analysis of the dynamic testing data for TP-10A-1 indicated a total ultimate resistance of 179 kips at EOD, 230 kips for the 1 day restrike, and 255 kips for the 12 day restrike (1 day after static load testing).

- TP-10A-1 was subjected to axial compressive static load testing with a maximum load of 367 kips with a maximum displacement of 0.598 inches and a permanent displacement of 0.210 inches.
- During the axial compressive static load test, the pile top did not displace below the Davisson Failure Criterion. Therefore, the failure load based on the Davisson Failure Criterion was not achieved and cannot be determined from the measurements.

TP-10A-2 Load Testing Summary:

- The signal matching analysis of the dynamic testing data for TP-10A-2 indicated a total ultimate resistance of 188 kips at EOD, 207 kips for the 1 day restrike, and 242 kips for the 7 day restrike.
- This pile was not subjected to axial compressive static load testing.

The purpose of this test pile program is to determine the pile bearing resistances (ultimate, side resistance and end bearing) achievable for the pile type, size, and lengths installed. In addition, the designers may choose to use the results to optimize their foundation design and/or to minimize the risk of constructability issues. However, the design team would also need to consider the scope of the test pile program, the methods used for pile installation, and potential variability of soils along the bridge length when using the information gathered.

Some points to consider from the test pile program for the HP14x89 steel H-piles at locations TP-10A-1 and TP-10A-2 are as follows:

- The dynamic pile testing results indicated lower ultimate total resistances than measured during the axial compressive static load test at TP-10A-1. This may be due to plugging behavior of the H-pile, where, the response measured during static load testing may be due to a plugged condition, and the response from dynamic pile testing may be due to an unplugged condition. Given the relatively high set/per blow measurements during initial drive and restrikes it is possible there was full shearing at the soil and pile interface with no plugging developing during impact driving and restrikes. This is further reinforced by the dynamic test data signal matching analyses which did not indicate plugging during the impact driving and restrikes.
- Plugging behavior of non-displacement piles can be difficult to predict with dynamic testing methods. During production phase dynamic pile testing it may not be possible to verify the higher resistances achieved in the static test.
- Because the failure load based on the Davisson Failure Criterion was not reached in the load test on TP-10A-1, the deviation between the static and dynamic capacities would likely be larger. Additionally, attempting to utilize higher resistances similar to those measured during static load testing in the dynamic test data signal matching analysis yielded poor match qualities so this approach was not utilized. The dynamic testing analyses included in this report are based on typical methods which produce good match qualities, and do not represent an attempt to match the static load test results.
- Dynamic pile testing on production piles is recommended to determine bearing resistances, measure pile driving stresses, and determine hammer driving system suitability. Driving criteria may be developed based on this testing with

recommendations provided to control tensile and compressive stresses at or below allowable levels.

- Signal matching analyses of the production pile dynamic test data is recommended to confirm and/or to provide a better estimate of the ultimate pile bearing resistance.

Below is a summary of the Appendix contents:

- Appendix A – Inspector's Pile Driving Records
- Appendix B – Dynamic Pile Testing Data Summaries
- Appendix C – CAPWAP Signal Matching Analysis Output
- Appendix D – Axial Compressive Static Load Testing Graphical Results
    - Figure 1 – Average Pile Top Displacement versus Applied Load with Davisson Failure Criterion
    - Figure 2 – Comparison Plot of Applied Load (from load cell and load based on relating the hydraulic pressure to the jack calibration) versus Elapsed Time
    - Figure 3 – Comparison Plot of Pile Top Displacement (LVDT's and digital survey) versus Elapsed Time
- Appendix E – Relevant Project Documents
- Appendix F – Instrument Calibrations

CLOSURE

We want to thank you for the opportunity to be involved in this project. We also want to thank you for all your support in setting up the test. Please do not hesitate to call us if you have any questions regarding the information in this report.

LIMITATIONS

This report presents test measurements made by Applied Foundation Testing, Inc. Interpretations were made based upon the measurements made by AFT with the latest techniques available and currently accepted standards of care recognized by Geotechnical Engineering professionals. Applied Foundation Testing is an independent agency and is not the Geotechnical Engineer of Record. The Geotechnical Engineer of Record should ultimately make final recommendations for foundation design and construction.

Appendix A

Inspector's Pile Driving Records
TP-10A-1 and TP-10A-2

I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

FORM C-15A
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
TEST PILE RECORD

Project Number: IM-I010(341)	County: Mobile	Division: Southwest Region
Bridge: Station 469+20 to Station 469+20		Bridge Identification Number:
Road Between: Texas St and I-10		Lane (if applicable): EB
Contractor: Jordan Pile Driving	Inspector: Donald Hector	
Date: 2/22/2018	Bent No.& Lane: TEST PILE	Pile No.: TP-10A-1 / Kind of Soil: Silty Sand
Kind of Pile: Steel	Size of Pile: 14X89	Total Length (ft): 86
Elev. Ground Line at Pile: 13.1	Final Elev. At Top of Pile: 21.0	Tip Elevation: -65.0
Hammer Make: APE	Hammer Model: D-19-32	Hammer Kind: Diesel
Hammer Type: Open	Hammer Action: Single	Rated Energy (ft.-lbs.): 42,800 @ 10.2 Stroke
Weight of Hammer (lbs.): 4,190	Design Load (from plans) (tons):	
Hammer Cushion: Material: Foster Lon	Thickness (in.): 3	Area (sq. in.): 272.25
Pile Cushion (Before Driving): Material: N/A	Thickness (in.):	Area (sq. in.):
Pile Cushion (After Driving): Material: N/A	Thickness (in.):	Area (sq. in.):
Pile Cap Weight (lbs.): 1,350		

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft.-lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
	0	8	24	
	0	10	25	
	0	9	26	
	0	13	27	

REMARKS

1. When using open type and gravity hammers, record weight of hammer and height of fall of hammer. Show rated energy when using closed type hammers.
2. Energy delivered to pile should be maintained practically constant once record keeping has begun unless specified otherwise by the Engineer.
3. Pile cushion is only required with concrete piling.
4. Pile cushion thickness after driving must be at least one-half the original thickness.
5. The bearing should be determined from the graph of Blows/Foot versus Bearing which is provided from the Wave Equation Analysis or Dynamic Formula of the driving system. If a graph is not provided, refer to Item 505.03(b)2 of the specifications to estimate the bearing capacity using the Dynamic Formula.
6. Driving should be continuous. Note any interruptions exceeding one hour.
7. Draw a sketch on back of this sheet showing location of test pile.
8. For continuation of test pile record, use Form C-15C-2.
9. Test pile (check one): Static Load Tested ___x___ Dynamic Load Test ___x___ (If static load tested, load test report shall be attached to this report).

Correct _____
Project Manager

Approved _____
Division Construction Engineer

FORM C-15A
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
CONTINUATION OF TEST PILE RECORD

Project Number	County	Division
IM-I010(341)	Mobile	Southwest Region

Bridge: Station	to Station	Bridge Identification Number
469+20	469+20	N/A

Date	Bent No.& Lane	Pile No.	Kind of Soil
2/22/2018	TEST PILE	TP-10A-1	Silty Sand

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft.-lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
	0	14	28	
	0	17	29	
	0	18	30	
	0	19	31	
	0	20	32	
	0	23	33	
	0	25	34	
	0	27	35	
	0	29	36	
	0	30	37	
	0	32	38	
	0	34	39	
	0	35	40	
6.17	25,852	24	41	
5.48	22,961	29	42	
5.50	23,045	29	43	
5.42	22,710	38	44	
5.23	21,914	24	45	
5.50	23,045	30	46	
5.23	21,914	30	47	
5.35	22,417	30	48	
5.33	22,333	30	49	

FORM C-15A
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
CONTINUATION OF TEST PILE RECORD

Project Number	County	Division
IM-I010(341)	Mobile	9

Bridge: Station	to Station	Bridge Identification Number
469+20	469+20	N/A

Date	Bent No.& Lane	Pile No.	Kind of Soil
2/22/2018	TEST PILE	TP-10A-1	Silty Sand

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft.-lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
5.52	23,129	27	50	
5.37	22,500	29	51	
5.25	21,998	26	52	
5.39	22,584	31	53	
5.32	22,291	33	54	
5.46	22,877	25	55	
5.37	22,500	30	56	
5.35	22,417	28	57	
5.38	22,542	32	58	
5.47	22,919	30	59	
5.50	23,045	32	60	
5.46	22,877	30	61	
5.26	22,039	30	62	
5.41	22,668	31	63	
5.34	22,375	34	64	
5.25	21,998	31	65	
5.45	22,836	29	66	
5.38	22,542	33	67	
5.31	22,249	29	68	
5.44	22,794	36	69	
5.34	22,375	30	70	

FORM C-15A
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
CONTINUATION OF TEST PILE RECORD

Project Number	County	Division
IM-I010(341)	Mobile	9

Bridge: Station	to Station	Bridge Identification Number
469+20	469+20	N/A

Date	Bent No.& Lane	Pile No.	Kind of Soil
2/22/2018	TEST PILE	TP-10A-1	Silty Sand

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft. lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
5.37	22,500	31	71	
5.34	22,375	31	72	
5.46	22,877	26	73	
5.20	21,788	42	74	
5.39	22,584	36	75	
5.34	22,375	38	76	
5.13	21,495	39	77	
5.48	22,961	34	78	

FORM C-15A
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
TEST PILE RECORD

Project Number: IM-I010(341)	County: Mobile	Division: Southwest Region
Bridge: Station 469+24 to Station 469+24		Bridge Identification Number:
Road Between: Texas St and I-10		Lane (if applicable): EB
Contractor: Jordan Pile Driving	Inspector: Donald Hector	
Date: 2/22/2018	Bent No.& Lane: TEST PILE HP-14X89	Pile No.: TP-10A-2 / Kind of Soil: Silty Sand
Kind of Pile: Steel	Size of Pile: 14X89	Total Length (ft): 86
Elev. Ground Line at Pile: 13.1	Final Elev. At Top of Pile: 21.0	Tip Elevation: -65.0
Hammer Make: APE	Hammer Model: D-19-32	Hammer Kind: Diesel
Hammer Type: Open	Hammer Action: Single	Rated Energy (ft.-lbs.): 42,800 @ 10.2 Stroke
Weight of Hammer (lbs.): 4,190	Design Load (from plans) (tons):	
Hammer Cushion: Material: Foster Lon	Thickness (in.): 3	Area (sq. in.): 272.25
Pile Cushion (Before Driving): Material: N/A	Thickness (in.):	Area (sq. in.):
Pile Cushion (After Driving): Material: N/A	Thickness (in.):	Area (sq. in.):
Pile Cap Weight (lbs.): 1,350		

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft.-lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
5.42	22,710	24	24	
6.01	25,182	6	25	
4.87	20,405	6	26	
5.45	22,836	10	27	

REMARKS

1. When using open type and gravity hammers, record weight of hammer and height of fall of hammer. Show rated energy when using closed type hammers.
2. Energy delivered to pile should be maintained practically constant once record keeping has begun unless specified otherwise by the Engineer.
3. Pile cushion is only required with concrete piling.
4. Pile cushion thickness after driving must be at least one-half the original thickness.
5. The bearing should be determined from the graph of Blows/Foot versus Bearing which is provided from the Wave Equation Analysis or Dynamic Formula of the driving system. If a graph is not provided, refer to Item 505.03(b)2 of the specifications to estimate the bearing capacity using the Dynamic Formula.
6. Driving should be continuous. Note any interruptions exceeding one hour.
7. Draw a sketch on back of this sheet showing location of test pile.
8. For continuation of test pile record, use Form C-15C-2.
9. Test pile (check one): Static Load Tested _____ Dynamic Load Test ___x___ (If static load tested, load test report shall be attached to this report).

Correct _____
Project Manager

Approved _____
Division Construction Engineer

FORM C-15A
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
CONTINUATION OF TEST PILE RECORD

Project Number	County	Division
IM-I010(341)	Mobile	Southwest Region

Bridge: Station	to Station	Bridge Identification Number
469+24	469+24	N/A

Date	Bent No.& Lane	Pile No.	Kind of Soil
2/22/2018	TEST PILE HP-14X89	TP-10A-2	Silty Sand

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft.-lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
5.31	22,249	11	28	
5.24	21,956	15	29	
5.27	22,081	14	30	
4.91	20,573	13	31	
4.91	20,573	9	32	
5.14	21,537	10	33	
5.07	21,243	20	34	
5.19	21,746	24	35	
5.21	21,830	28	36	
5.29	22,165	19	37	
5.34	22,375	16	38	
5.36	22,458	24	39	
5.35	22,417	30	40	
5.39	22,584	25	41	
5.43	22,752	30	42	
5.44	22,794	27	43	
5.37	22,500	31	44	
5.30	22,207	32	45	
5.28	22,123	28	46	
5.32	22,291	30	47	
5.37	22,500	27	48	
5.39	22,584	29	49	

FORM C-15A
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
CONTINUATION OF TEST PILE RECORD

Project Number	County	Division
IM-I010(341)	Mobile	Southwest Region

Bridge: Station	to Station	Bridge Identification Number
469+24	469+24	N/A

Date	Bent No.& Lane	Pile No.	Kind of Soil
2/22/2018	TEST PILE HP-14X89	TP-10A-2	Silty Sand

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft.-lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
5.44	22,794	27	50	
5.41	22,668	27	51	
5.34	22,375	27	52	
5.34	22,375	29	53	
5.39	22,584	28	54	
5.33	22,333	28	55	
5.42	22,710	29	56	
5.51	23,087	27	57	
5.55	23,255	27	58	
5.60	23,464	28	59	
5.57	23,338	27	60	
5.60	23,464	28	61	
5.54	23,213	28	62	
5.63	23,590	28	63	
5.52	23,129	28	64	
5.67	23,757	25	65	
5.65	23,674	28	66	
5.62	23,548	27	67	
5.48	22,961	30	68	
6.53	27,361	23	69	
6.25	26,188	22	70	

FORM C-15A
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
CONTINUATION OF TEST PILE RECORD

Project Number	County	Division
IM-I010(341)	Baldwin	Southwest Region

Bridge: Station	to Station	Bridge Identification Number
469+20	469+20	0

Date	Bent No.& Lane	Pile No.	Kind of Soil
2/22/2018	TEST PILE	10A-2	?

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft.-lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
5.90	24,721	22	71	
5.40	22,626	29	72	
5.24	21,956	32	73	
5.38	22,542	32	74	
5.46	22,877	33	75	
5.50	23,045	36	76	
5.56	23,296	36	77	
5.65	23,674	40	78	
5.68	23,799	38	79	

Appendix B

Dynamic Pile Testing Data Summaries
TP-10A-1 and TP-10A-2

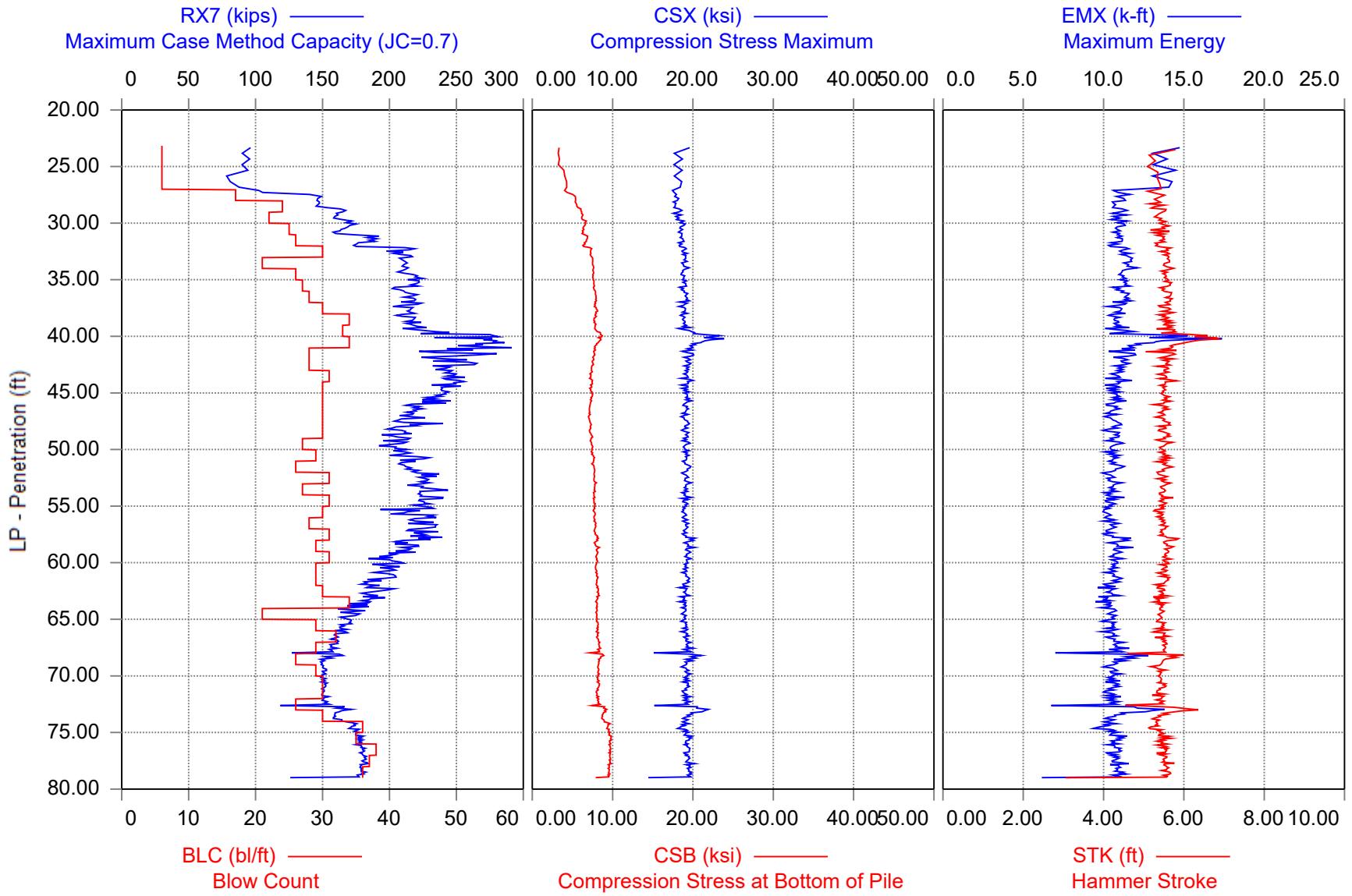
I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

Applied Foundation Testing, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 12-March-2018 Test started: 22-February-2018

118008 - I10 OVER MOBILE RIVER - TP-10A-1



118008 - I10 OVER MOBILE RIVER - TP-10A-1 HP14x89, 86' LONG
OP: AFT Date: 22-February-2018

AR: 26.10 in² SP: 0.492 k/ft³
LE: 83.67 ft EM: 30,000.00 ksi
WS: 16,807.9 f/s JC: 0.70

RX7: Maximum Case Method Capacity (JC=0.7)
RX8: Maximum Case Method Capacity (JC=0.8)
RA2: Auto Capacity Friction Piles
CSX: Compression Stress Maximum
CSB: Compression Stress at Bottom of Pile
TSX: Tension Stress Maximum - Full Record Search
EMX: Maximum Energy
STK: Hammer Stroke
BTA: Integrity Factor (1)

BL#	Depth	BLC	TYPE	RX7	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
6	24.00	6	AV6	93	93	52	18.63	3.28	11.57	13.9	5.46	76
			STD	6	6	9	1.59	0.10	1.32	1.4	0.55	5
			MAX	102	102	64	21.57	3.39	13.84	16.7	6.40	81
			MIN	84	83	39	16.37	3.10	9.68	12.4	4.72	68
12	25.00	6	AV6	93	93	60	18.16	3.30	11.06	13.5	5.21	75
			STD	4	4	11	0.87	0.12	0.76	0.6	0.25	4
			MAX	98	98	74	18.91	3.46	11.71	14.2	5.47	82
			MIN	87	87	38	16.31	3.10	9.42	12.3	4.70	71
18	26.00	6	AV6	86	85	47	18.17	3.98	10.46	13.8	5.32	77
			STD	11	11	14	0.65	0.19	0.55	0.9	0.19	5
			MAX	105	105	71	19.12	4.20	11.35	14.8	5.66	83
			MIN	73	73	35	17.26	3.60	9.71	12.2	5.10	70
24	27.00	6	AV6	84	80	56	18.50	4.27	10.77	14.2	5.45	77
			STD	5	5	23	0.41	0.06	0.40	0.6	0.12	5
			MAX	91	87	106	18.97	4.36	11.24	14.8	5.59	83
			MIN	76	72	40	17.72	4.19	10.09	13.0	5.22	69
41	28.00	17	AV17	130	130	131	17.76	4.88	9.44	11.0	5.29	79
			STD	21	21	18	0.75	0.56	0.77	0.7	0.25	5
			MAX	155	154	153	19.39	5.48	10.81	12.5	5.80	84
			MIN	97	97	98	15.91	3.96	8.13	9.6	4.65	68
65	29.00	24	AV24	154	154	153	18.03	5.71	9.00	10.9	5.39	79
			STD	9	9	9	0.74	0.30	0.63	0.7	0.23	3
			MAX	169	169	169	19.25	6.26	10.54	12.2	5.86	83
			MIN	142	141	142	16.62	5.22	7.98	9.5	4.95	74
87	30.00	22	AV22	163	163	170	18.20	6.31	8.43	10.9	5.40	81
			STD	5	5	10	0.63	0.24	0.45	0.6	0.19	2
			MAX	174	174	190	19.78	6.89	9.85	12.9	5.91	84
			MIN	156	155	158	16.94	5.98	7.58	10.0	4.97	76
112	31.00	25	AV25	166	166	180	18.59	6.38	8.36	11.0	5.45	82
			STD	7	7	8	0.88	0.17	0.68	0.8	0.26	1
			MAX	179	179	198	20.51	6.70	9.83	12.5	6.04	85
			MIN	153	152	162	16.86	6.01	6.97	9.6	4.91	79
138	32.00	26	AV26	183	182	200	18.56	6.66	7.74	10.9	5.42	81
			STD	9	9	7	0.56	0.21	0.48	0.5	0.17	2
			MAX	202	202	214	20.02	7.02	8.94	12.0	5.80	85
			MIN	166	165	185	17.59	6.20	6.87	9.9	5.10	76

118008 - I10 OVER MOBILE RIVER - TP-10A-1 HP14x89, 86' LONG
OP: AFT Date: 22-February-2018

BL#	Depth	BLC	TYPE	RX7	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
168	33.00	30	AV30	207	204	220	18.90	7.19	7.28	11.2	5.55	81
			STD	14	13	12	0.58	0.31	0.47	0.6	0.18	2
			MAX	228	224	238	19.99	7.51	8.18	12.2	5.88	83
			MIN	164	164	184	17.31	6.15	6.18	9.7	5.08	77
189	34.00	21	AV21	211	208	220	19.00	7.54	6.80	11.7	5.60	82
			STD	8	9	9	0.50	0.09	0.37	0.5	0.15	1
			MAX	228	228	231	20.44	7.73	7.70	12.8	6.04	84
			MIN	189	186	196	17.98	7.41	6.07	10.6	5.31	79
215	35.00	26	AV26	215	215	229	18.75	7.57	6.27	11.2	5.54	81
			STD	8	7	12	0.34	0.09	0.30	0.3	0.10	2
			MAX	227	224	250	19.20	7.81	6.84	11.7	5.71	84
			MIN	191	191	198	18.03	7.40	5.80	10.4	5.33	77
242	36.00	27	AV27	214	213	229	18.89	7.68	5.91	11.2	5.57	82
			STD	10	11	11	0.41	0.08	0.36	0.4	0.13	2
			MAX	231	231	255	19.81	7.89	6.42	12.2	5.86	84
			MIN	198	197	198	17.89	7.53	4.96	10.2	5.27	78
270	37.00	28	AV28	215	212	236	19.10	7.89	5.62	11.3	5.62	82
			STD	7	8	7	0.49	0.10	0.38	0.5	0.16	2
			MAX	226	224	255	19.97	8.13	6.39	12.0	5.88	84
			MIN	197	191	219	17.65	7.67	4.46	9.8	5.16	78
300	38.00	30	AV30	215	211	240	18.94	7.92	5.28	11.0	5.58	82
			STD	9	10	10	0.56	0.20	0.41	0.6	0.19	2
			MAX	230	230	256	20.05	8.19	6.22	12.1	5.91	84
			MIN	198	194	226	17.52	7.47	4.25	9.5	5.16	76
334	39.00	34	AV34	215	210	238	18.81	7.78	5.15	10.7	5.54	82
			STD	8	8	8	0.53	0.18	0.40	0.5	0.17	2
			MAX	232	227	259	19.94	8.15	6.16	11.6	5.86	84
			MIN	197	192	221	17.33	7.47	4.05	9.3	5.01	77
367	40.00	33	AV33	236	233	255	20.02	8.15	5.55	11.7	5.80	77
			STD	25	27	25	1.62	0.37	1.01	1.7	0.41	6
			MAX	285	285	307	24.04	8.94	8.44	15.8	6.85	84
			MIN	189	179	212	17.36	7.51	4.02	9.3	5.12	66
401	41.00	34	AV34	270	268	264	21.11	8.19	6.71	13.2	6.14	78
			STD	23	25	17	1.48	0.42	1.07	1.8	0.49	5
			MAX	318	318	299	24.59	9.00	9.31	18.5	7.60	86
			MIN	202	193	224	18.20	6.89	4.30	10.7	5.38	65
429	42.00	28	AV28	248	246	245	19.50	7.69	5.77	11.4	5.57	80
			STD	25	26	14	0.86	0.16	0.55	0.9	0.27	4
			MAX	293	292	259	20.91	8.04	6.70	12.9	5.96	86
			MIN	196	193	211	17.13	7.32	4.21	9.0	4.83	73
457	43.00	28	AV28	249	247	247	19.36	7.47	5.88	11.2	5.56	80
			STD	18	19	8	0.74	0.16	0.52	0.7	0.23	4
			MAX	274	273	264	20.83	7.75	6.89	12.5	6.01	86

118008 - I10 OVER MOBILE RIVER - TP-10A-1 HP14x89, 86' LONG
OP: AFT Date: 22-February-2018

BL#	Depth	BLC	TYPE	RX7	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
			MIN	204	199	236	17.29	7.13	4.59	9.1	4.91	73
488	44.00	31	AV31	246	245	243	19.27	7.32	5.93	10.9	5.54	79
			STD	11	12	7	0.57	0.16	0.38	0.6	0.18	4
			MAX	272	272	254	20.42	7.59	6.91	12.1	5.93	85
			MIN	229	225	227	18.00	6.94	5.07	9.6	5.14	72
518	45.00	30	AV30	244	243	235	19.13	7.35	5.80	10.7	5.51	80
			STD	14	15	4	0.47	0.13	0.34	0.4	0.14	4
			MAX	278	277	245	19.92	7.69	6.42	11.5	5.73	85
			MIN	216	212	228	17.88	7.04	4.93	9.5	5.16	71
548	46.00	30	AV30	234	232	233	19.28	7.35	5.90	10.8	5.53	81
			STD	14	14	7	0.46	0.14	0.34	0.5	0.14	4
			MAX	270	270	249	20.71	7.63	6.94	12.3	5.96	85
			MIN	209	208	221	18.58	7.09	5.31	10.1	5.29	73
578	47.00	30	AV30	217	216	223	19.08	7.12	5.92	10.5	5.47	81
			STD	12	12	7	0.44	0.10	0.28	0.5	0.15	3
			MAX	245	245	237	20.14	7.31	6.64	11.6	5.80	85
			MIN	198	194	198	18.08	6.89	5.40	9.5	5.12	75
608	48.00	30	AV30	215	215	222	19.08	7.16	5.90	10.6	5.51	82
			STD	14	14	5	0.50	0.16	0.31	0.5	0.16	3
			MAX	245	245	233	19.87	7.41	6.35	11.5	5.78	85
			MIN	192	190	210	18.07	6.93	5.25	9.7	5.20	76
638	49.00	30	AV30	206	204	223	19.12	7.27	5.95	10.7	5.52	83
			STD	10	11	5	0.44	0.15	0.29	0.5	0.15	2
			MAX	234	234	231	20.12	7.64	6.54	11.6	5.88	85
			MIN	193	188	213	18.11	7.01	5.22	9.6	5.18	78
665	50.00	27	AV27	205	203	221	19.08	7.37	5.94	10.6	5.49	83
			STD	11	12	5	0.48	0.13	0.29	0.5	0.17	2
			MAX	232	232	229	19.92	7.60	6.44	11.6	5.80	85
			MIN	189	186	211	17.98	7.14	5.35	9.7	5.12	77
694	51.00	29	AV29	214	212	228	19.21	7.55	5.95	10.6	5.53	83
			STD	12	13	4	0.33	0.15	0.26	0.4	0.11	2
			MAX	242	240	236	19.75	7.83	6.54	11.4	5.71	85
			MIN	197	191	219	18.45	7.29	5.38	9.9	5.29	78
720	52.00	26	AV26	214	213	229	19.24	7.65	5.85	10.8	5.52	83
			STD	12	12	6	0.48	0.14	0.31	0.4	0.14	2
			MAX	240	239	245	20.33	7.85	6.47	11.8	5.83	85
			MIN	193	189	219	18.35	7.25	5.15	9.9	5.24	78
751	53.00	31	AV31	228	226	233	19.14	7.73	5.75	10.4	5.46	83
			STD	13	13	4	0.49	0.11	0.29	0.4	0.15	2
			MAX	247	247	245	20.26	8.09	6.32	11.5	5.80	85
			MIN	202	202	222	17.93	7.51	4.99	9.4	5.08	79
778	54.00	27	AV27	225	224	232	19.07	7.74	5.72	10.5	5.48	84

118008 - I10 OVER MOBILE RIVER - TP-10A-1 HP14x89, 86' LONG
OP: AFT Date: 22-February-2018

BL#	Depth	BLC	TYPE	RX7	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
			STD	15	15	5	0.50	0.10	0.34	0.5	0.16	1
			MAX	251	250	240	19.85	7.91	6.27	11.3	5.71	86
			MIN	196	190	221	17.92	7.47	4.85	9.5	5.12	80
809	55.00	31	AV31	227	226	235	19.10	7.71	5.85	10.5	5.49	85
			STD	16	17	5	0.55	0.11	0.35	0.5	0.18	1
			MAX	255	255	251	21.33	8.06	7.18	12.8	6.25	86
			MIN	197	197	227	18.30	7.55	5.22	9.8	5.24	82
839	56.00	30	AV30	219	217	231	18.88	7.72	5.69	10.2	5.40	85
			STD	18	19	5	0.59	0.12	0.39	0.5	0.19	1
			MAX	257	256	238	19.91	8.02	6.28	11.1	5.73	87
			MIN	188	183	212	17.08	7.44	4.52	8.7	4.85	82
867	57.00	28	AV28	227	224	231	19.12	7.82	5.75	10.5	5.50	86
			STD	16	16	6	0.45	0.12	0.31	0.4	0.14	1
			MAX	251	248	241	20.29	8.08	6.51	11.6	5.86	87
			MIN	190	188	212	18.30	7.62	5.18	9.6	5.22	83
898	58.00	31	AV31	224	221	230	19.23	7.93	5.72	10.6	5.54	85
			STD	16	17	9	0.62	0.19	0.37	0.7	0.20	1
			MAX	255	252	248	20.99	8.33	6.84	12.5	6.14	87
			MIN	189	186	195	18.24	7.66	5.14	9.5	5.22	82
927	59.00	29	AV29	212	209	228	19.39	7.97	5.82	10.9	5.58	87
			STD	16	16	6	0.46	0.19	0.29	0.5	0.15	1
			MAX	244	240	245	20.80	8.43	6.42	12.6	6.06	88
			MIN	182	180	212	18.39	7.65	5.09	9.9	5.31	85
958	60.00	31	AV31	202	199	226	19.34	8.04	5.66	10.8	5.56	85
			STD	13	13	5	0.36	0.10	0.24	0.4	0.12	1
			MAX	228	226	238	20.08	8.23	6.09	11.6	5.80	88
			MIN	177	174	213	18.28	7.77	5.07	9.7	5.24	81
987	61.00	29	AV29	198	195	221	19.06	7.94	5.50	10.6	5.51	87
			STD	12	12	4	0.42	0.10	0.29	0.4	0.14	2
			MAX	223	221	228	19.75	8.11	5.98	11.3	5.75	89
			MIN	171	168	208	17.96	7.76	4.77	9.4	5.14	82
1016	62.00	29	AV29	192	189	220	19.23	8.04	5.53	10.6	5.51	86
			STD	13	14	5	0.41	0.09	0.28	0.5	0.14	2
			MAX	213	209	229	19.96	8.19	6.04	11.5	5.75	89
			MIN	167	162	203	17.86	7.84	4.71	9.3	5.10	80
1046	63.00	30	AV30	189	185	218	19.06	8.19	5.35	10.4	5.46	86
			STD	12	12	4	0.46	0.11	0.32	0.5	0.14	3
			MAX	211	206	230	20.04	8.47	5.93	11.5	5.73	89
			MIN	166	159	206	18.06	7.93	4.61	9.3	5.12	80
1080	64.00	34	AV34	181	177	214	18.86	8.04	5.37	10.2	5.40	87
			STD	11	11	5	0.49	0.12	0.33	0.5	0.14	2
			MAX	201	199	225	19.92	8.26	6.00	11.2	5.68	90
			MIN	160	154	204	17.82	7.80	4.70	9.1	5.08	80

118008 - I10 OVER MOBILE RIVER - TP-10A-1 HP14x89, 86' LONG
OP: AFT Date: 22-February-2018

BL#	Depth ft	BLC bl/ft	TYPE	RX7 kips	RX8 kips	RA2 kips	CSX ksi	CSB ksi	TSX ksi	EMX k-ft	STK ft	BTA (%)
1101	65.00	21	AV21	170	166	216	18.97	8.02	5.55	10.6	5.43	88
			STD	10	11	3	0.37	0.09	0.27	0.4	0.11	2
			MAX	189	185	222	19.51	8.18	5.97	11.1	5.63	90
			MIN	155	150	210	18.37	7.85	5.07	10.1	5.24	82
1130	66.00	29	AV29	167	161	214	19.05	8.12	5.59	10.5	5.44	86
			STD	7	9	4	0.45	0.11	0.30	0.5	0.14	3
			MAX	188	182	221	19.69	8.34	6.07	11.2	5.63	90
			MIN	157	144	204	17.91	7.85	4.82	9.3	5.08	80
1162	67.00	32	AV32	161	153	211	19.11	8.14	5.60	10.5	5.45	87
			STD	6	8	4	0.51	0.14	0.34	0.5	0.16	3
			MAX	180	175	218	19.99	8.42	6.24	11.3	5.73	90
			MIN	155	142	203	18.07	7.85	4.82	9.5	5.16	80
1191	68.00	29	AV29	155	144	206	18.96	8.20	5.45	10.5	5.43	86
			STD	14	14	22	2.15	0.59	0.92	1.8	0.50	3
			MAX	168	162	219	20.45	8.62	6.26	12.1	5.86	90
			MIN	86	76	100	7.90	5.17	0.95	1.8	2.93	79
1217	69.00	26	AV26	154	142	203	19.73	8.45	5.73	11.3	5.60	86
			STD	7	8	7	0.76	0.24	0.47	0.8	0.24	3
			MAX	171	162	219	21.51	9.05	6.81	13.4	6.20	90
			MIN	145	131	192	18.29	8.09	4.94	9.9	5.16	80
1246	70.00	29	AV29	151	137	197	19.13	8.20	5.30	10.5	5.38	86
			STD	2	3	4	0.50	0.12	0.32	0.5	0.15	3
			MAX	156	145	205	20.00	8.42	5.83	11.4	5.61	90
			MIN	147	132	188	17.96	7.95	4.59	9.4	5.03	82
1276	71.00	30	AV30	151	137	197	19.28	8.22	5.40	10.7	5.46	87
			STD	2	3	4	0.46	0.13	0.32	0.4	0.13	3
			MAX	156	144	204	20.08	8.45	5.92	11.3	5.66	90
			MIN	147	133	188	18.31	7.93	4.65	9.7	5.16	80
1306	72.00	30	AV30	151	137	190	19.04	8.09	5.41	10.4	5.39	89
			STD	2	2	4	0.47	0.14	0.33	0.5	0.14	3
			MAX	155	143	197	20.10	8.45	6.15	11.5	5.71	100
			MIN	147	133	180	18.09	7.80	4.65	9.5	5.12	83
1332	73.00	26	AV26	153	140	188	19.36	8.42	5.53	10.8	5.50	87
			STD	17	17	21	2.65	0.80	1.20	2.3	0.67	3
			MAX	178	168	209	22.78	9.42	7.34	14.3	6.54	90
			MIN	86	74	98	7.46	5.06	0.66	1.5	2.83	80
1362	74.00	30	AV30	161	148	190	19.74	8.83	5.57	11.1	5.51	87
			STD	3	5	6	0.95	0.20	0.61	1.0	0.30	3
			MAX	170	162	205	22.51	9.26	7.43	14.3	6.48	90
			MIN	155	142	179	18.43	8.52	4.73	9.8	5.14	80
1398	75.00	36	AV36	173	158	185	18.87	9.43	4.55	10.2	5.31	86
			STD	4	4	6	0.61	0.25	0.37	0.6	0.18	3

118008 - I10 OVER MOBILE RIVER - TP-10A-1 HP14x89, 86' LONG
OP: AFT Date: 22-February-2018

BL#	Depth ft	BLC bl/ft	TYPE	RX7 kips	RX8 kips	RA2 kips	CSX ksi	CSB ksi	TSX ksi	EMX k-ft	STK ft	BTA (%)
			MAX	181	166	196	19.86	9.89	5.13	11.2	5.59	90
			MIN	163	149	175	17.08	8.64	3.39	8.6	4.83	79
1433	76.00	35	AV35	177	162	190	19.30	9.69	4.70	10.8	5.46	87
			STD	3	3	7	0.48	0.19	0.28	0.5	0.15	5
			MAX	183	168	210	20.46	10.11	5.28	11.8	5.78	100
			MIN	170	154	179	18.24	9.34	4.16	9.8	5.16	79
1471	77.00	38	AV38	180	165	194	19.32	9.68	4.69	10.7	5.50	90
			STD	3	3	6	0.50	0.17	0.30	0.6	0.15	6
			MAX	187	172	210	20.39	10.01	5.33	11.8	5.83	100
			MIN	169	156	182	17.94	9.25	3.88	9.3	5.10	82
1508	78.00	37	AV37	181	167	199	19.47	9.65	4.79	10.8	5.54	92
			STD	3	3	6	0.46	0.17	0.33	0.5	0.15	6
			MAX	191	177	221	21.22	10.23	5.88	12.7	6.12	100
			MIN	175	161	189	18.55	9.38	4.02	10.0	5.27	84
1544	79.00	36	AV36	176	161	196	19.28	9.44	4.89	10.7	5.51	91
			STD	14	14	18	1.75	0.52	0.73	1.5	0.43	6
			MAX	183	169	212	20.19	9.79	6.05	11.6	5.75	100
			MIN	100	84	98	9.11	6.43	0.99	2.2	3.05	83
			Average	197	192	214	19.14	7.84	5.92	10.9	5.51	84
			Std. Dev.	36	39	32	0.94	1.03	1.22	1.0	0.26	5
			Maximum	318	318	307	24.59	10.23	13.84	18.5	7.60	100
			Minimum	73	72	35	7.46	3.10	0.66	1.5	2.83	65

Total number of blows analyzed: 1544

BL#	Sensors
1-354	F3: [E653] 94.3 (1.00); F4: [K474] 93.2 (1.00); A3: [K4281] 360.0 (1.00); A4: [K5201] 338.0 (1.00)
355-371	F3: off; ; F4: [K474] 93.2 (1.00); A3: [K4281] 360.0 (1.00); A4: [K5201] 338.0 (1.00)
372-1544	F3: [B095] 96.7 (1.00); F4: [K474] 93.2 (1.00); A3: [K4281] 360.0 (1.00); A4: [K5201] 338.0 (1.00)

BL#	Comments
355	F3 Strain Gage Starting to Clip
360	Request Contractor to Stop Drive.
371	Stop Drive to Replace F3 Strain Gage
372	Continue Drive
1191	Stop Drive to Remove Rigging from Pile
1192	Continue Drive
1322	Stopped Drive to Verify Fuel Setting
1323	Continue Drive
1544	End of Intital Drive (Tip Elevation = -65.0 feet)

Time Summary

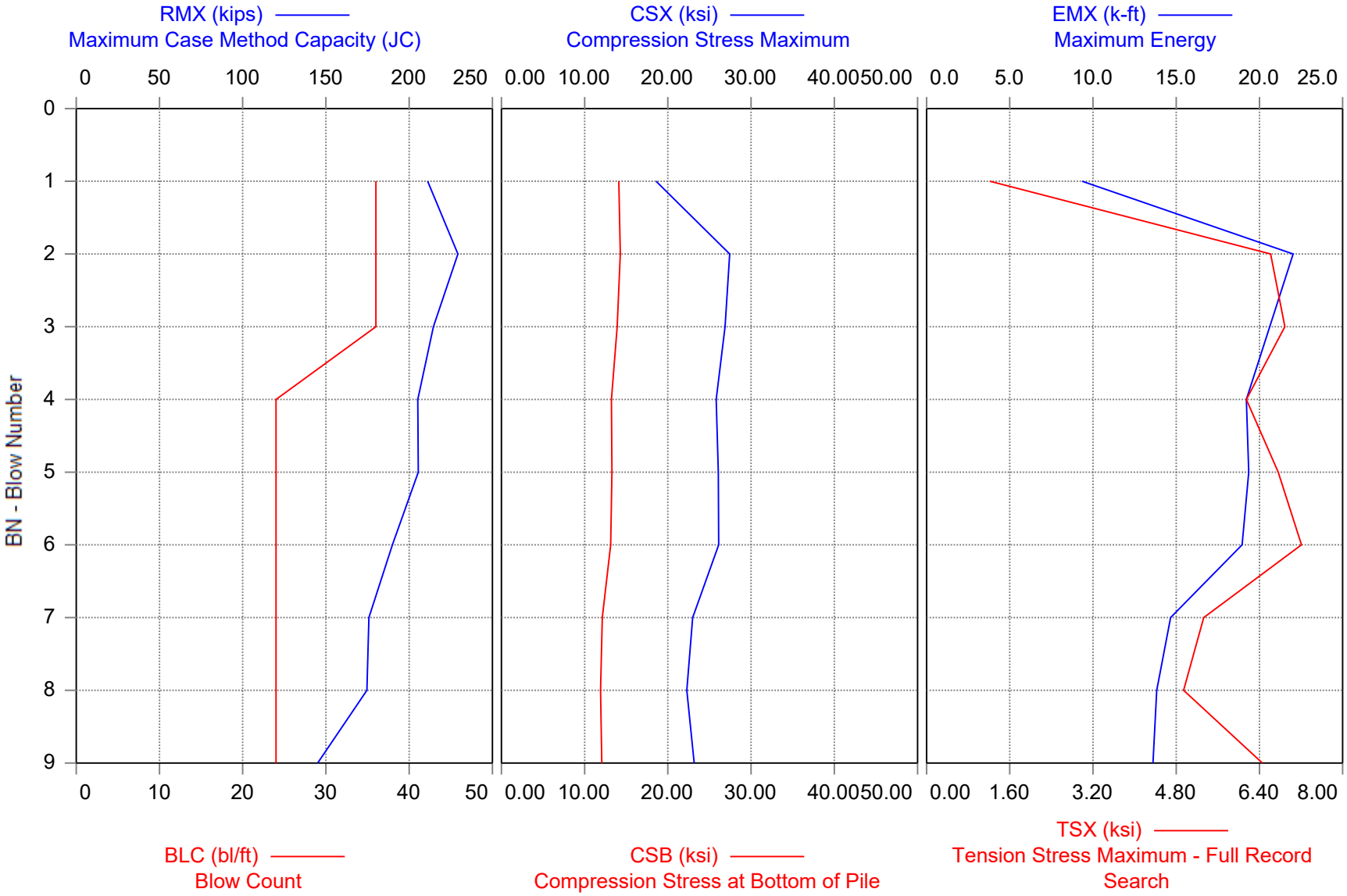
Drive	7 minutes 14 seconds	11:35 AM - 11:42 AM (2/22/2018) BN 1 - 360
Stop	21 minutes 17 seconds	11:42 AM - 12:04 PM
Drive	12 seconds	12:04 PM - 12:04 PM BN 361 - 371
Stop	27 minutes 27 seconds	12:04 PM - 12:31 PM
Drive	31 minutes 18 seconds	12:31 PM - 1:03 PM BN 372 - 1544

Total time [01:27:29] = (Driving [00:38:45] + Stop [00:48:44])

Applied Foundation Testing, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 19-March-2018 Test started: 23-February-2018

118008 - I10 OVER MOBILE RIVER - TP-10A-1 1 DAY RESTRIKE



118008 - I10 OVER MOBILE RIVER - TP-10A-1 1 DAY RESTRIKE HP14x89, 86' LONG
OP: AFT Date: 23-February-2018

AR: 26.10 in² SP: 0.492 k/ft³
LE: 83.67 ft EM: 30,000.00 ksi
WS: 16,807.9 f/s JC: 0.75

RMX: Maximum Case Method Capacity (JC)
RX8: Maximum Case Method Capacity (JC=0.8)
RA2: Auto Capacity Friction Piles
CSX: Compression Stress Maximum
CSB: Compression Stress at Bottom of Pile
TSX: Tension Stress Maximum - Full Record Search
EMX: Maximum Energy
STK: Hammer Stroke
BTA: Integrity Factor (1)

BL#	BLC	RMX	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	bl/ft	kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
1	36	211	197	210	18.58	14.11	1.22	9.3	0.00	89
2	36	229	215	248	27.43	14.29	6.61	22.0	8.98	88
3	36	215	202	224	26.87	13.91	6.89	20.6	8.57	100
4	24	205	192	220	25.81	13.21	6.15	19.2	8.03	85
5	24	206	195	220	26.06	13.28	6.76	19.4	8.07	90
6	24	190	176	206	26.11	13.13	7.21	19.0	8.03	90
7	24	176	164	192	22.99	12.12	5.33	14.7	6.72	90
8	24	175	163	194	22.27	11.92	4.94	13.8	6.42	86
9	24	145	132	173	23.16	12.06	6.46	13.6	6.76	89
Average		195	182	210	24.36	13.12	5.73	16.8	7.70	90
Std. Dev.		24	24	21	2.69	0.85	1.74	3.9	0.88	4
Maximum		229	215	248	27.43	14.29	7.21	22.0	8.98	100
Minimum		145	132	173	18.58	11.92	1.22	9.3	6.42	85

Total number of blows analyzed: 9

BL# Sensors

1-9 F3: [B095] 96.7 (1.00); F4: [K474] 93.2 (1.00); A3: [K4281] 360.0 (1.00); A4: [K5201] 338.0 (1.00)

BL# Comments

9 3BL/1", 2BL/1", 2BL/1", 2BL/1"

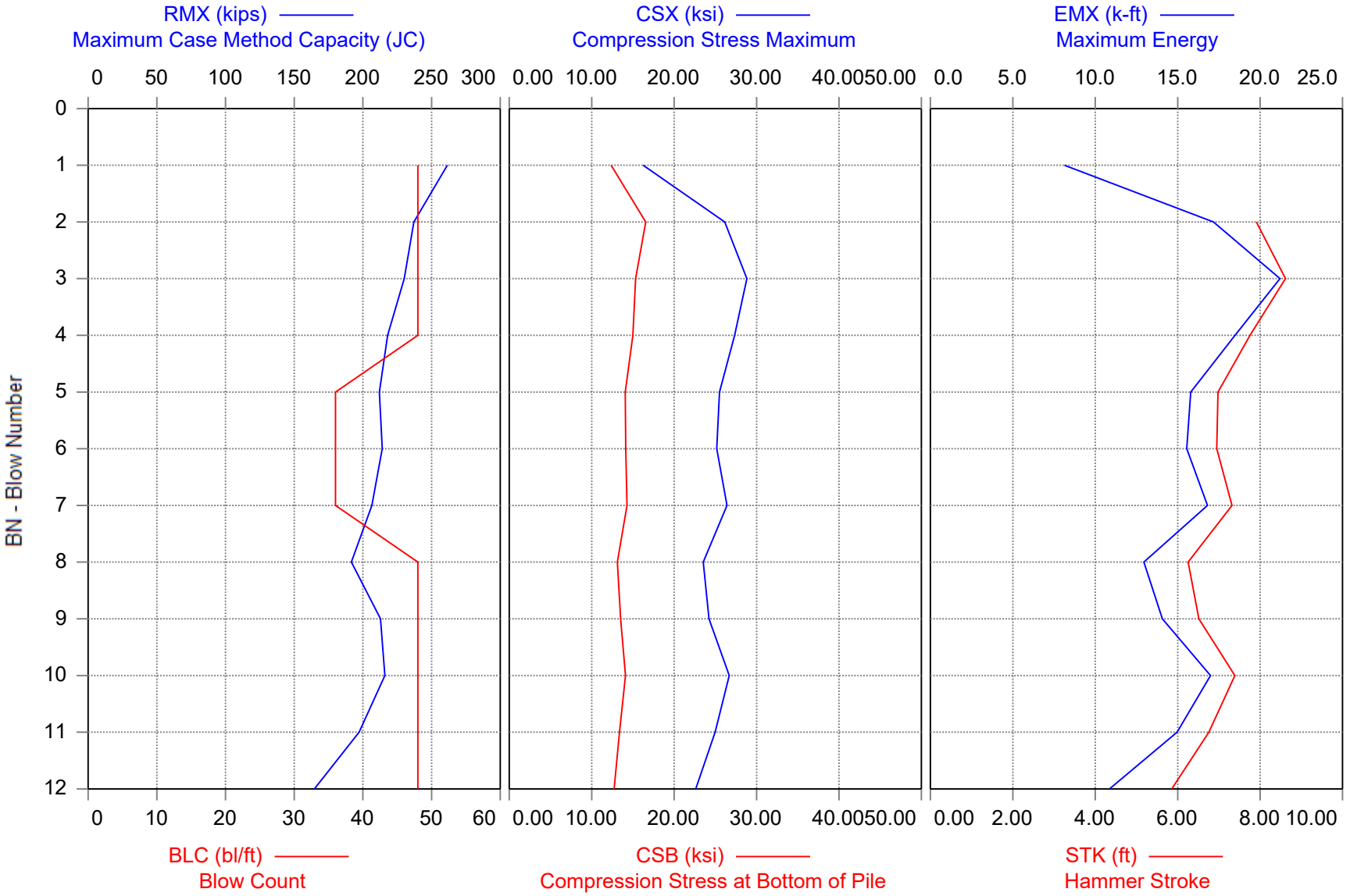
Time Summary

Drive 11 seconds 9:32 AM - 9:32 AM BN 1 - 9

Applied Foundation Testing, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 19-March-2018 Test started: 06-March-2018

I-10 OVER MOBILE RIVER - TP-10A-1 12 DAY RESTRIKE



I-10 OVER MOBILE RIVER - TP-10A-1 12 DAY RESTRIKE HP14x89, 86' LONG
OP: AFT Date: 06-March-2018

AR: 26.10 in² SP: 0.492 k/ft³
LE: 78.67 ft EM: 30,000.00 ksi
WS: 16,807.9 f/s JC: 0.65

RMX: Maximum Case Method Capacity (JC)
RX7: Maximum Case Method Capacity (JC=0.7)
RA2: Auto Capacity Friction Piles
CSX: Compression Stress Maximum
CSB: Compression Stress at Bottom of Pile
TSX: Tension Stress Maximum - Full Record Search
EMX: Maximum Energy
STK: Hammer Stroke
BTA: Integrity Factor (1)

BL#	BLC	RMX	RX7	RA2	CSX	CSB	TSX	EMX	STK	BTA
	bl/ft	kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
1	48	261	247	214	16.23	12.36	0.31	8.1	0.00	72
2	48	237	221	253	26.13	16.56	0.96	17.2	7.91	78
3	48	230	211	265	28.83	15.32	4.17	21.2	8.61	87
4	48	218	203	265	27.34	14.99	4.66	18.5	7.75	88
5	36	212	196	242	25.51	14.07	4.02	15.8	6.98	89
6	36	214	199	258	25.16	14.12	3.84	15.6	6.95	88
7	36	207	192	265	26.41	14.28	4.83	16.8	7.32	88
8	48	192	176	247	23.53	13.11	3.00	13.0	6.25	90
9	48	213	198	257	24.23	13.51	3.59	14.1	6.51	88
10	48	216	203	251	26.69	14.09	5.17	17.0	7.39	88
11	48	197	185	255	24.98	13.37	4.39	15.0	6.76	88
12	48	165	149	199	22.63	12.71	4.92	10.9	5.86	89
Average		213	198	248	24.81	14.04	3.65	15.2	7.12	86
Std. Dev.		23	23	20	3.05	1.12	1.48	3.3	0.75	5
Maximum		261	247	265	28.83	16.56	5.17	21.2	8.61	90
Minimum		165	149	199	16.23	12.36	0.31	8.1	5.86	72

Total number of blows analyzed: 12

BL# Sensors

1-12 F3: [P454] 145.3 (1.00); F4: [P455] 145.8 (1.00); A3: [K5647] 334.0 (1.00); A4: [K5362] 346.0 (1.00)

BL# Comments

12 4BL/1", 3BL/1", 4BL/1", 1BL/0.25"

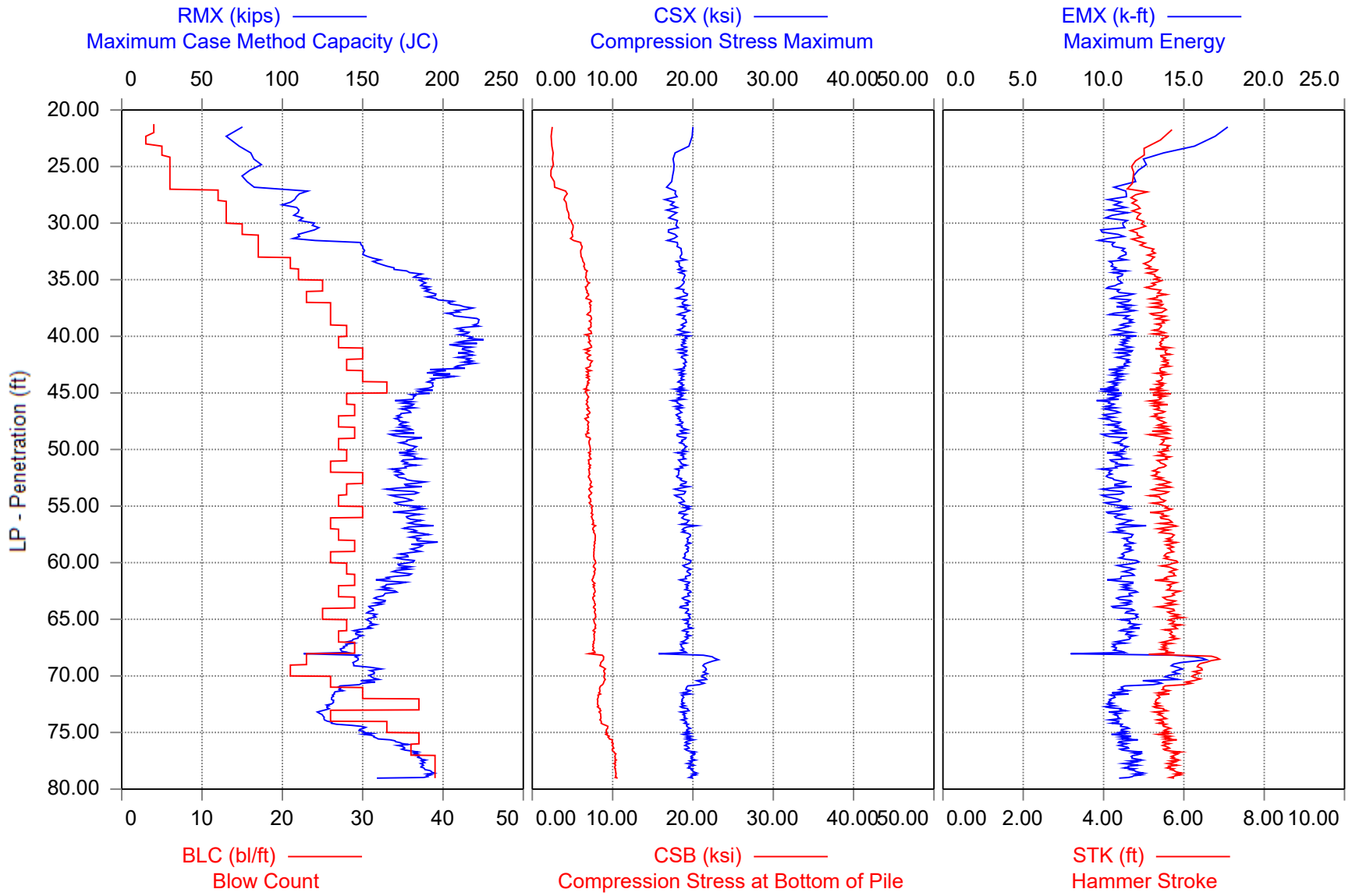
Time Summary

Drive 14 seconds 1:08 PM - 1:08 PM BN 1 - 12

Applied Foundation Testing, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 09-March-2018 Test started: 22-February-2018

118008 - I10 OVER MOBILE RIVER - TP-10A-2



118008 - I10 OVER MOBILE RIVER - TP-10A-2 HP14X89, 86' LONG
OP: AFT Date: 22-February-2018

AR: 26.10 in² SP: 0.492 k/ft³
LE: 83.67 ft EM: 30,000.00 ksi
WS: 16,807.9 f/s JC: 0.75

RMX: Maximum Case Method Capacity (JC)
RX8: Maximum Case Method Capacity (JC=0.8)
RA2: Auto Capacity Friction Piles
CSX: Compression Stress Maximum
CSB: Compression Stress at Bottom of Pile
TSX: Tension Stress Maximum - Full Record Search
EMX: Maximum Energy
STK: Hammer Stroke
BTA: Integrity Factor (1)

BL#	Depth	BLC	TYPE	RMX	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
4	22.00	4	AV4	73	73	64	20.09	2.47	12.62	17.5	5.70	75
			STD	5	5	16	1.35	0.09	1.32	0.8	0.41	6
			MAX	80	80	80	22.15	2.63	14.18	18.8	6.23	81
			MIN	67	67	38	18.69	2.40	10.81	16.6	5.22	66
7	23.00	3	AV3	64	64	64	19.75	2.37	13.09	17.4	5.42	74
			STD	2	2	2	0.22	0.10	0.29	0.7	0.06	5
			MAX	67	66	67	19.94	2.51	13.39	18.3	5.47	78
			MIN	61	61	62	19.43	2.29	12.70	16.8	5.33	67
12	24.00	5	AV5	79	79	57	18.37	2.51	12.03	14.0	5.02	72
			STD	8	8	3	1.28	0.24	1.17	1.1	0.38	4
			MAX	91	91	62	19.71	2.88	13.72	15.2	5.45	80
			MIN	66	66	53	16.20	2.20	10.31	11.8	4.40	67
18	25.00	6	AV6	85	84	46	17.58	2.57	11.36	12.6	4.79	76
			STD	5	5	5	1.03	0.12	0.88	1.1	0.31	5
			MAX	91	91	55	18.68	2.76	12.39	13.7	5.12	84
			MIN	75	74	41	15.70	2.37	9.63	10.6	4.22	71
24	26.00	6	AV6	77	77	42	17.53	2.32	11.47	12.0	4.75	79
			STD	4	4	7	0.43	0.12	0.34	0.5	0.12	4
			MAX	83	83	56	18.22	2.51	11.94	12.7	4.89	82
			MIN	71	71	35	16.91	2.13	11.08	11.4	4.56	71
30	27.00	6	AV6	80	80	46	17.03	2.75	10.49	11.3	4.63	81
			STD	4	3	11	0.60	0.29	0.64	0.8	0.14	2
			MAX	87	86	57	18.07	3.30	11.52	12.5	4.83	82
			MIN	75	75	24	16.03	2.32	9.47	10.0	4.37	78
42	28.00	12	AV12	111	110	111	17.53	4.12	9.75	11.1	4.83	80
			STD	9	9	6	1.03	0.20	0.98	0.8	0.26	3
			MAX	124	124	122	19.18	4.43	11.43	12.1	5.27	83
			MIN	96	96	100	14.95	3.77	7.46	9.0	4.19	73
55	29.00	13	AV13	106	106	111	17.37	4.28	9.25	10.9	4.80	81
			STD	10	10	4	0.89	0.12	0.89	0.8	0.25	2
			MAX	127	127	119	19.05	4.49	10.93	11.8	5.33	82
			MIN	96	95	103	15.65	4.12	7.39	9.5	4.37	76
68	30.00	13	AV13	112	111	119	17.84	4.65	9.32	11.1	4.93	81
			STD	6	7	6	0.89	0.16	0.85	0.9	0.25	1
			MAX	124	124	132	19.22	4.89	10.82	12.0	5.33	82
			MIN	104	102	111	16.37	4.38	7.68	9.7	4.56	77

118008 - I10 OVER MOBILE RIVER - TP-10A-2 HP14X89, 86' LONG
OP: AFT Date: 22-February-2018

BL#	Depth	BLC	TYPE	RMX	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
83	31.00	15	AV15	118	117	133	17.48	5.02	8.64	10.6	4.85	81
			STD	6	6	6	0.70	0.10	0.65	0.8	0.18	1
			MAX	130	130	141	19.01	5.16	10.05	12.0	5.22	83
			MIN	107	106	122	16.45	4.77	7.81	9.4	4.56	79
100	32.00	17	AV17	127	127	148	17.68	5.40	8.36	10.4	4.88	82
			STD	19	19	23	0.63	0.58	0.65	0.8	0.18	1
			MAX	153	153	175	18.71	6.15	9.47	12.1	5.16	83
			MIN	105	104	117	16.02	4.60	7.20	9.1	4.43	81
117	33.00	17	AV17	151	151	171	18.50	6.09	8.41	11.2	5.18	81
			STD	3	3	4	0.67	0.14	0.66	0.7	0.20	1
			MAX	156	156	178	19.86	6.34	9.52	13.1	5.59	83
			MIN	145	145	164	17.45	5.87	7.36	10.3	4.89	78
138	34.00	21	AV21	161	160	187	18.43	6.37	8.03	10.7	5.14	82
			STD	5	5	6	0.45	0.16	0.43	0.5	0.14	1
			MAX	173	173	198	19.32	6.70	8.77	11.7	5.42	83
			MIN	154	154	177	17.80	6.02	7.22	9.8	4.93	80
160	35.00	22	AV22	181	180	203	18.72	6.70	7.73	10.9	5.26	82
			STD	8	8	5	0.59	0.15	0.58	0.6	0.18	2
			MAX	194	194	209	19.57	7.02	8.74	12.2	5.54	84
			MIN	164	163	189	17.29	6.38	6.55	9.7	4.83	79
185	36.00	25	AV25	188	187	211	18.65	6.81	7.26	10.8	5.28	83
			STD	6	6	4	0.56	0.23	0.53	0.5	0.18	1
			MAX	198	197	218	19.62	7.23	8.17	11.6	5.59	84
			MIN	176	174	203	17.39	6.19	6.22	9.3	4.89	81
208	37.00	23	AV23	196	195	217	18.87	6.99	7.01	11.2	5.37	83
			STD	7	7	5	0.70	0.30	0.66	0.7	0.20	1
			MAX	215	214	227	20.01	7.51	8.01	12.4	5.73	85
			MIN	186	185	209	16.80	6.36	4.89	9.8	4.82	82
234	38.00	26	AV26	210	208	223	18.93	7.16	6.58	11.3	5.41	83
			STD	7	7	6	0.56	0.20	0.47	0.6	0.18	1
			MAX	223	222	231	19.85	7.55	7.44	12.2	5.73	84
			MIN	196	195	202	17.78	6.79	5.67	9.8	5.08	81
260	39.00	26	AV26	217	216	225	18.85	7.23	6.27	11.4	5.41	84
			STD	9	9	8	0.60	0.25	0.45	0.6	0.18	1
			MAX	233	232	235	20.10	7.55	7.42	12.5	5.80	85
			MIN	197	197	197	17.53	6.42	5.43	9.8	5.01	80
288	40.00	28	AV28	214	213	230	18.73	7.14	5.97	11.2	5.41	84
			STD	8	8	7	0.59	0.26	0.48	0.6	0.17	1
			MAX	230	229	238	19.76	7.46	6.74	12.2	5.75	86
			MIN	200	199	211	17.49	6.52	4.87	10.1	5.03	82
315	41.00	27	AV27	215	213	232	18.89	7.16	5.91	11.4	5.46	85
			STD	9	9	4	0.35	0.20	0.35	0.4	0.11	1
			MAX	234	232	241	19.81	7.49	6.74	12.3	5.80	86

118008 - I10 OVER MOBILE RIVER - TP-10A-2 HP14X89, 86' LONG
OP: AFT Date: 22-February-2018

BL#	Depth ft	BLC bl/ft	TYPE	RMX kips	RX8 kips	RA2 kips	CSX ksi	CSB ksi	TSX ksi	EMX k-ft	STK ft	BTA (%)
			MIN	200	199	226	18.27	6.73	5.17	10.8	5.33	81
345	42.00	30	AV30	214	213	237	18.79	6.90	5.58	11.3	5.51	86
			STD	9	9	10	0.64	0.37	0.46	0.7	0.20	1
			MAX	239	237	253	20.61	7.63	6.96	12.8	6.04	87
			MIN	202	200	208	17.49	6.14	4.77	9.6	5.10	85
373	43.00	28	AV28	211	209	234	18.89	7.12	5.53	11.2	5.52	86
			STD	11	11	10	0.54	0.34	0.37	0.6	0.16	1
			MAX	236	234	248	20.18	7.57	6.34	12.6	5.96	87
			MIN	187	185	207	17.66	6.17	4.86	9.7	5.18	83
403	44.00	30	AV30	197	195	223	18.58	6.96	5.45	10.8	5.44	86
			STD	8	9	9	0.46	0.26	0.32	0.4	0.14	1
			MAX	221	220	235	19.59	7.30	6.11	11.9	5.73	87
			MIN	181	179	203	17.72	6.23	4.85	10.0	5.24	84
436	45.00	33	AV33	191	189	218	18.45	6.78	5.34	10.5	5.38	85
			STD	5	5	8	0.56	0.28	0.40	0.5	0.16	1
			MAX	203	200	234	19.76	7.27	6.24	11.5	5.75	87
			MIN	179	177	199	16.88	5.80	4.33	9.0	4.95	82
464	46.00	28	AV28	180	178	208	18.29	6.84	5.43	10.5	5.37	85
			STD	7	6	7	0.68	0.19	0.43	0.7	0.19	1
			MAX	195	191	221	19.67	7.19	6.31	11.8	5.71	87
			MIN	165	163	193	16.92	6.41	4.52	9.1	4.95	83
493	47.00	29	AV29	178	176	211	18.33	6.96	5.51	10.5	5.39	85
			STD	6	6	5	0.55	0.18	0.43	0.6	0.16	1
			MAX	194	191	223	19.87	7.28	6.74	11.9	5.83	87
			MIN	169	166	198	17.52	6.61	4.90	9.4	5.14	83
520	48.00	27	AV27	174	172	211	18.40	6.87	5.68	10.6	5.42	86
			STD	5	5	6	0.50	0.21	0.34	0.6	0.16	1
			MAX	190	188	218	19.33	7.30	6.41	11.6	5.71	87
			MIN	167	165	191	17.21	6.43	4.75	9.4	5.03	85
549	49.00	29	AV29	176	175	206	18.62	6.87	6.04	10.7	5.45	85
			STD	8	8	5	0.68	0.22	0.45	0.7	0.21	1
			MAX	190	190	214	19.71	7.38	6.90	12.0	5.86	86
			MIN	163	162	195	17.18	6.52	5.06	9.1	5.01	84
576	50.00	27	AV27	179	179	208	18.84	7.14	6.13	11.2	5.53	85
			STD	4	4	2	0.39	0.10	0.30	0.3	0.11	1
			MAX	186	185	214	19.50	7.31	6.67	11.8	5.73	86
			MIN	168	168	203	17.97	6.98	5.43	10.4	5.33	83
604	51.00	28	AV28	179	179	210	18.67	7.15	5.97	10.9	5.48	85
			STD	6	6	4	0.52	0.13	0.37	0.6	0.16	1
			MAX	188	188	216	19.35	7.35	6.40	11.6	5.73	86
			MIN	168	167	194	17.14	6.85	4.81	9.3	4.97	84
630	52.00	26	AV26	175	175	210	18.47	7.09	5.87	10.7	5.41	85

118008 - I10 OVER MOBILE RIVER - TP-10A-2 HP14X89, 86' LONG
OP: AFT Date: 22-February-2018

BL#	Depth	BLC	TYPE	RMX	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
			STD	6	6	3	0.50	0.11	0.35	0.6	0.16	0
			MAX	184	184	215	19.25	7.29	6.44	11.6	5.68	86
			MIN	165	165	199	17.36	6.89	5.01	9.3	5.08	84
660	53.00	30	AV30	177	177	210	18.45	7.15	5.94	10.6	5.42	85
			STD	7	7	4	0.52	0.13	0.35	0.5	0.16	1
			MAX	191	189	217	19.48	7.42	6.58	11.5	5.71	86
			MIN	166	164	201	17.34	6.93	5.10	9.4	5.08	83
688	54.00	28	AV28	177	177	211	18.62	7.23	6.07	10.8	5.46	85
			STD	7	7	5	0.57	0.13	0.31	0.6	0.17	1
			MAX	192	189	219	19.66	7.49	6.62	12.0	5.80	86
			MIN	164	163	202	17.54	6.95	5.38	9.8	5.16	84
715	55.00	27	AV27	175	174	211	18.55	7.19	5.97	10.6	5.39	85
			STD	6	6	6	0.59	0.16	0.34	0.6	0.16	1
			MAX	190	187	222	19.65	7.46	6.60	11.6	5.66	87
			MIN	159	159	191	16.98	6.86	5.18	9.1	4.99	85
745	56.00	30	AV30	180	179	214	18.93	7.42	6.10	10.9	5.50	85
			STD	7	6	7	0.53	0.10	0.34	0.5	0.16	1
			MAX	192	189	224	19.73	7.63	6.67	11.6	5.75	87
			MIN	164	164	191	17.65	7.24	5.22	9.5	5.08	84
771	57.00	26	AV26	182	180	213	19.22	7.59	6.38	11.4	5.60	85
			STD	8	7	6	0.72	0.15	0.48	0.7	0.22	1
			MAX	202	199	228	21.36	7.99	7.85	13.5	6.25	86
			MIN	169	168	192	17.72	7.35	5.38	10.1	5.14	83
798	58.00	27	AV27	184	182	213	19.26	7.74	6.37	11.4	5.61	86
			STD	7	6	6	0.56	0.13	0.41	0.6	0.17	0
			MAX	199	196	222	20.57	7.93	7.20	12.7	6.04	86
			MIN	169	169	184	17.78	7.36	5.22	9.9	5.16	85
827	59.00	29	AV29	186	184	217	19.34	7.72	6.43	11.6	5.67	85
			STD	7	6	4	0.41	0.09	0.26	0.4	0.14	1
			MAX	200	197	226	20.24	7.88	7.00	12.6	5.98	87
			MIN	176	176	210	18.70	7.53	5.86	10.9	5.45	84
853	60.00	26	AV26	177	175	221	19.23	7.72	6.29	11.5	5.64	86
			STD	6	5	6	0.46	0.11	0.26	0.5	0.15	1
			MAX	191	188	231	20.03	7.91	6.77	12.4	5.91	88
			MIN	166	164	198	18.20	7.47	5.77	10.4	5.35	85
881	61.00	28	AV28	175	173	222	19.33	7.75	6.37	11.5	5.68	86
			STD	5	4	3	0.39	0.12	0.25	0.4	0.13	1
			MAX	185	182	230	20.09	8.01	6.87	12.2	5.93	87
			MIN	167	166	216	18.60	7.47	5.84	10.8	5.42	84
910	62.00	29	AV29	169	167	217	19.15	7.59	6.22	11.3	5.62	87
			STD	7	6	4	0.46	0.13	0.30	0.6	0.16	0
			MAX	184	181	223	19.78	7.81	6.71	12.2	5.86	88
			MIN	156	155	209	17.87	7.27	5.47	9.6	5.20	86

118008 - I10 OVER MOBILE RIVER - TP-10A-2 HP14X89, 86' LONG
OP: AFT Date: 22-February-2018

BL#	Depth ft	BLC bl/ft	TYPE	RMX kips	RX8 kips	RA2 kips	CSX ksi	CSB ksi	TSX ksi	EMX k-ft	STK ft	BTA (%)
937	63.00	27	AV27	165	164	213	19.41	7.72	6.42	11.6	5.71	87
			STD	4	4	4	0.34	0.10	0.25	0.4	0.11	0
			MAX	173	172	222	20.14	7.94	7.00	12.5	5.91	88
			MIN	159	159	204	18.93	7.50	5.97	11.0	5.59	86
966	64.00	29	AV29	159	158	208	19.01	7.67	6.16	11.2	5.59	87
			STD	4	4	4	0.54	0.15	0.34	0.6	0.16	0
			MAX	170	168	217	20.04	8.00	6.90	12.3	5.91	88
			MIN	153	151	201	17.79	7.43	5.34	9.9	5.22	86
991	65.00	25	AV25	156	155	204	19.42	7.82	6.48	11.8	5.75	87
			STD	4	3	4	0.39	0.11	0.26	0.5	0.13	1
			MAX	162	162	211	20.17	8.01	6.97	12.6	6.04	88
			MIN	147	147	196	18.77	7.61	5.94	11.1	5.56	85
1019	66.00	28	AV28	153	153	200	19.30	7.76	6.40	11.6	5.73	88
			STD	4	4	5	0.45	0.14	0.27	0.5	0.14	1
			MAX	159	159	207	20.05	7.99	6.91	12.5	5.96	89
			MIN	144	143	181	18.20	7.47	5.75	10.5	5.38	84
1046	67.00	27	AV27	146	145	194	19.21	7.72	6.31	11.5	5.70	88
			STD	3	2	3	0.33	0.09	0.23	0.3	0.10	1
			MAX	151	150	200	19.92	7.88	6.83	12.2	5.93	89
			MIN	141	141	189	18.71	7.57	5.96	10.8	5.54	86
1075	68.00	29	AV29	139	138	186	18.76	7.63	6.00	10.9	5.55	88
			STD	3	3	4	0.45	0.13	0.31	0.5	0.14	1
			MAX	148	146	195	19.75	7.88	6.73	11.8	5.83	89
			MIN	133	132	174	17.77	7.40	5.25	9.8	5.22	86
1098	69.00	23	AV23	142	138	193	21.46	8.53	7.75	14.5	6.45	86
			STD	15	16	22	3.00	0.75	1.67	3.1	0.81	2
			MAX	156	150	206	23.53	9.02	8.98	16.9	7.04	89
			MIN	75	69	93	8.41	5.26	0.71	2.2	3.00	82
1119	70.00	21	AV21	155	150	204	21.47	8.88	7.39	14.5	6.35	85
			STD	5	5	4	0.31	0.22	0.23	0.4	0.10	2
			MAX	164	159	208	22.15	9.10	7.82	15.1	6.51	87
			MIN	142	140	194	21.04	8.38	6.98	14.0	6.23	79
1145	71.00	26	AV26	150	146	197	20.81	8.84	6.87	13.2	6.07	86
			STD	9	9	10	1.01	0.23	0.70	1.2	0.34	2
			MAX	167	162	215	22.69	9.24	8.26	15.6	6.72	88
			MIN	132	131	183	19.03	8.39	5.23	11.1	5.42	80
1175	72.00	30	AV30	133	127	182	19.07	8.32	5.78	10.9	5.46	88
			STD	3	4	4	0.54	0.14	0.33	0.6	0.16	1
			MAX	141	136	191	20.44	8.56	6.51	12.5	5.88	89
			MIN	130	121	174	18.30	8.09	5.12	10.2	5.27	86
1212	73.00	37	AV37	130	122	170	18.77	8.19	5.52	10.5	5.34	87
			STD	2	2	3	0.39	0.13	0.22	0.4	0.11	1

118008 - I10 OVER MOBILE RIVER - TP-10A-2 HP14X89, 86' LONG
OP: AFT Date: 22-February-2018

BL#	Depth ft	BLC bl/ft	TYPE	RMX kips	RX8 kips	RA2 kips	CSX ksi	CSB ksi	TSX ksi	EMX k-ft	STK ft	BTA (%)
			MAX	134	126	175	19.72	8.46	6.10	11.3	5.61	89
			MIN	126	117	164	18.05	7.98	5.08	9.8	5.16	83
1238	74.00	26	AV26	125	116	170	18.94	8.48	5.44	10.8	5.44	89
			STD	2	2	2	0.47	0.11	0.29	0.5	0.14	1
			MAX	130	121	173	20.04	8.70	6.00	11.8	5.80	90
			MIN	121	112	164	18.11	8.28	4.81	10.0	5.20	87
1271	75.00	33	AV33	143	135	183	19.29	9.08	5.17	11.1	5.53	88
			STD	8	8	9	0.32	0.31	0.34	0.4	0.11	1
			MAX	153	145	195	19.86	9.50	5.86	11.8	5.73	89
			MIN	128	120	169	18.61	8.50	4.27	10.4	5.33	86
1308	76.00	37	AV37	162	154	195	19.37	9.64	4.78	11.3	5.57	88
			STD	8	8	7	0.51	0.31	0.44	0.6	0.17	1
			MAX	176	168	208	20.49	10.19	5.79	12.6	5.93	89
			MIN	146	138	178	18.09	8.93	4.01	9.7	5.14	85
1344	77.00	36	AV36	178	170	205	19.55	10.11	4.46	11.6	5.65	89
			STD	4	4	5	0.61	0.20	0.36	0.6	0.18	1
			MAX	187	179	217	20.60	10.49	5.13	12.9	6.04	90
			MIN	171	162	197	18.29	9.68	3.62	10.3	5.29	87
1383	78.00	39	AV39	187	178	211	19.81	10.31	4.55	11.8	5.73	89
			STD	3	3	5	0.57	0.16	0.33	0.6	0.18	1
			MAX	193	185	221	21.26	10.68	5.27	13.4	6.20	90
			MIN	181	173	202	18.68	9.90	3.76	10.6	5.35	87
1422	79.00	39	AV39	190	182	213	19.91	10.35	4.42	11.9	5.76	89
			STD	3	3	5	0.49	0.11	0.30	0.5	0.15	1
			MAX	196	187	220	21.11	10.56	5.12	13.0	6.14	90
			MIN	184	177	202	18.89	10.02	3.94	10.8	5.42	87
1423	79.03	39	AV1	159	150	188	20.01	10.63	4.98	11.0	5.75	90
			STD	0	0	0	0.00	0.00	0.00	0.0	0.00	0
			MAX	159	150	188	20.01	10.63	4.98	11.0	5.75	90
			MIN	159	150	188	20.01	10.63	4.98	11.0	5.75	90
			Average	169	167	200	18.98	7.51	6.27	11.3	5.50	86
			Std. Dev.	30	30	33	1.00	1.42	1.39	1.1	0.34	3
			Maximum	239	237	253	23.53	10.68	14.18	18.8	7.04	90
			Minimum	61	61	24	8.41	2.13	0.71	2.2	3.00	66

Total number of blows analyzed: 1423

BL# Sensors

1-1423 F3: [B095] 96.7 (1.00); F4: [K474] 93.2 (1.00); A3: [K4281] 360.0 (1.00);
A4: [K5201] 338.0 (1.00)

BL# Comments

1129 Stop Drive to Remove Pile Rigging
1423 End of Initial Drive

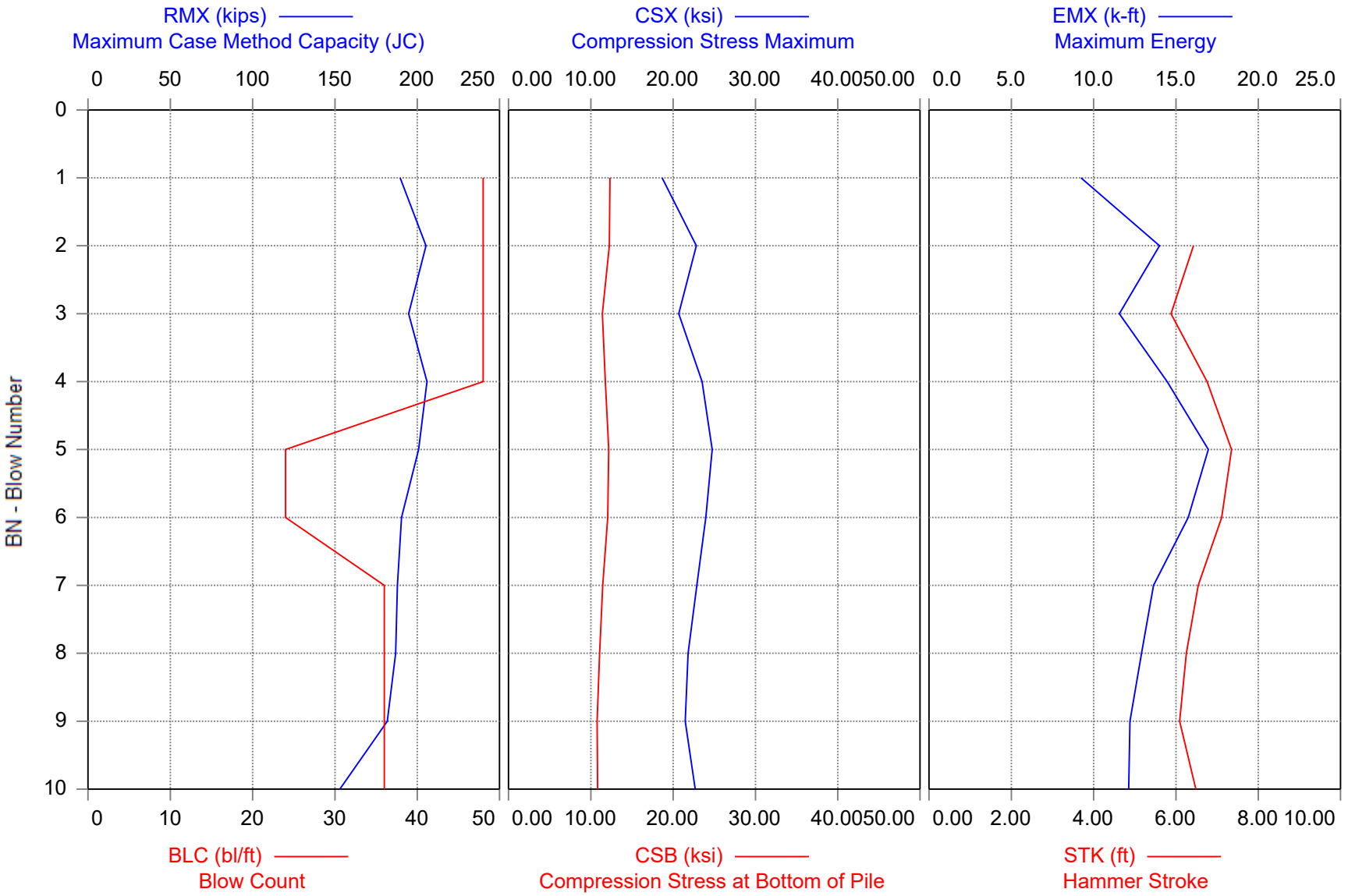
Time Summary

Drive 36 minutes 11 seconds 3:13 PM - 3:49 PM BN 1 - 1423

Applied Foundation Testing, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 19-March-2018 Test started: 23-February-2018

118008 - I10 OVER MOBILE RIVER - TP-10A-2 1 DAY RESTRIKE



118008 - I10 OVER MOBILE RIVER - TP-10A-2 1 DAY RESTRIKE HP14X89, 86' LONG
OP: AFT Date: 23-February-2018

AR: 26.10 in² SP: 0.492 k/ft³
LE: 83.67 ft EM: 30,000.00 ksi
WS: 16,807.9 f/s JC: 0.75

RMX: Maximum Case Method Capacity (JC)
RX8: Maximum Case Method Capacity (JC=0.8)
RA2: Auto Capacity Friction Piles
CSX: Compression Stress Maximum
CSB: Compression Stress at Bottom of Pile
TSX: Tension Stress Maximum - Full Record Search
EMX: Maximum Energy
STK: Hammer Stroke
BTA: Integrity Factor (1)

BL#	BLC	RMX	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	bl/ft	kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
1	48	190	178	198	18.67	12.32	2.19	9.2	0.00	100
2	48	205	197	217	22.81	12.24	4.68	14.0	6.42	89
3	48	195	186	221	20.68	11.40	3.54	11.6	5.88	100
4	48	206	198	199	23.52	11.76	5.56	14.5	6.76	84
5	24	201	192	231	24.74	12.17	6.87	17.0	7.35	90
6	24	190	182	220	23.97	12.05	6.60	15.7	7.11	90
7	36	188	179	209	22.88	11.45	5.77	13.6	6.54	83
8	36	187	179	207	21.82	11.06	5.41	12.9	6.25	100
9	36	182	174	189	21.46	10.76	5.24	12.2	6.09	87
10	36	153	144	181	22.68	10.82	7.26	12.1	6.48	86
Average		190	181	207	22.32	11.60	5.31	13.3	6.54	91
Std. Dev.		14	14	15	1.66	0.56	1.47	2.1	0.44	6
Maximum		206	198	231	24.74	12.32	7.26	17.0	7.35	100
Minimum		153	144	181	18.67	10.76	2.19	9.2	5.88	83

Total number of blows analyzed: 10

BL# Sensors

1-10 F3: [B095] 96.7 (1.00); F4: [K474] 93.2 (1.00); A3: [K4281] 360.0 (1.00); A4: [K5201] 338.0 (1.00)

BL# Comments

10 4BL/1", 2BL/1", 3BL/1", 1BL/0.33"

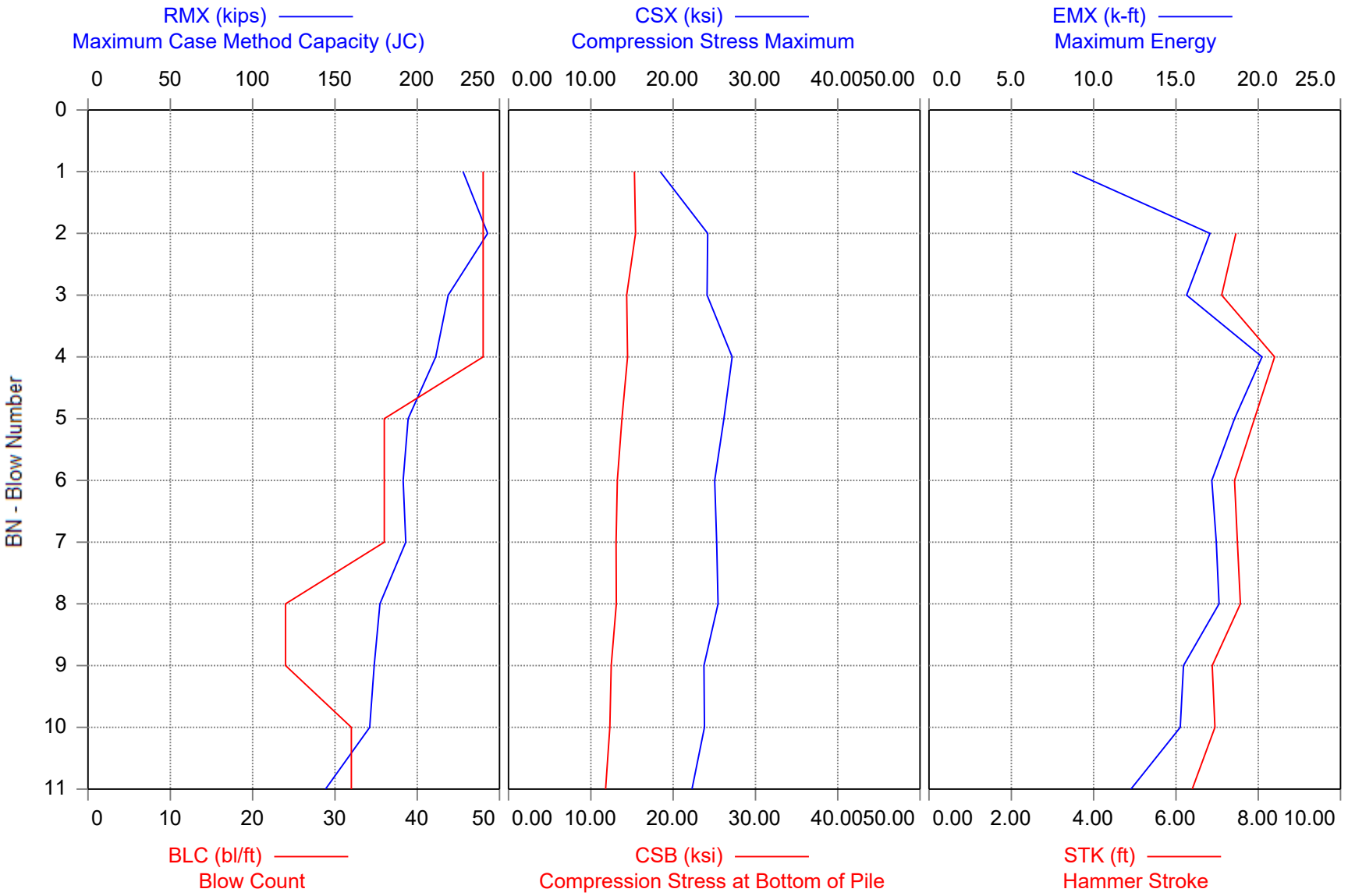
Time Summary

Drive 11 seconds 9:50 AM - 9:50 AM BN 1 - 10

Applied Foundation Testing, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 09-March-2018 Test started: 01-March-2018

I-10 OVER MOBILE RIVER - TP-10A-2 7 DAY RESTRIKE



I-10 OVER MOBILE RIVER - TP-10A-2 7 DAY RESTRIKE HP14x89, 86' LONG
OP: AFT Date: 01-March-2018

AR: 26.10 in² SP: 0.492 k/ft³
LE: 83.67 ft EM: 30,000.00 ksi
WS: 16,807.9 f/s JC: 0.75

RMX: Maximum Case Method Capacity (JC)
RX8: Maximum Case Method Capacity (JC=0.8)
RA2: Auto Capacity Friction Piles
CSX: Compression Stress Maximum
CSB: Compression Stress at Bottom of Pile
TSX: Tension Stress Maximum - Full Record Search
EMX: Maximum Energy
STK: Hammer Stroke
BTA: Integrity Factor (1)

BL#	BLC	RMX	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	bl/ft	kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
1	48	228	208	180	18.42	15.30	1.32	8.7	0.00	81
2	48	243	232	237	24.19	15.43	3.01	17.1	7.46	90
3	48	219	209	258	24.12	14.36	3.60	15.6	7.11	90
4	48	211	200	230	27.17	14.46	6.39	20.2	8.40	90
5	36	194	184	225	26.17	13.77	6.76	18.6	7.91	84
6	36	191	181	216	25.05	13.21	6.23	17.2	7.42	89
7	36	193	183	219	25.29	13.07	6.67	17.5	7.49	90
8	24	177	167	205	25.45	13.09	7.17	17.6	7.57	85
9	24	174	164	197	23.75	12.48	6.13	15.5	6.88	88
10	32	171	161	198	23.81	12.31	6.25	15.3	6.95	90
11	32	144	133	164	22.29	11.79	7.19	12.3	6.40	89
Average		195	184	212	24.16	13.57	5.52	15.9	7.36	88
Std. Dev.		27	26	25	2.21	1.15	1.86	3.0	0.53	3
Maximum		243	232	258	27.17	15.43	7.19	20.2	8.40	90
Minimum		144	133	164	18.42	11.79	1.32	8.7	6.40	81

Total number of blows analyzed: 11

BL# Sensors

1-11 F3: [P454] 145.3 (1.00); F4: [P455] 145.8 (1.00); A3: [K5647] 334.0 (1.00);
A4: [K5362] 346.0 (1.00)

BL# Comments

11 4BL/1", 3BL/1", 2BL/1", 2BL/0.75"

Time Summary

Drive 13 seconds 11:31 AM - 11:32 AM BN 1 - 11

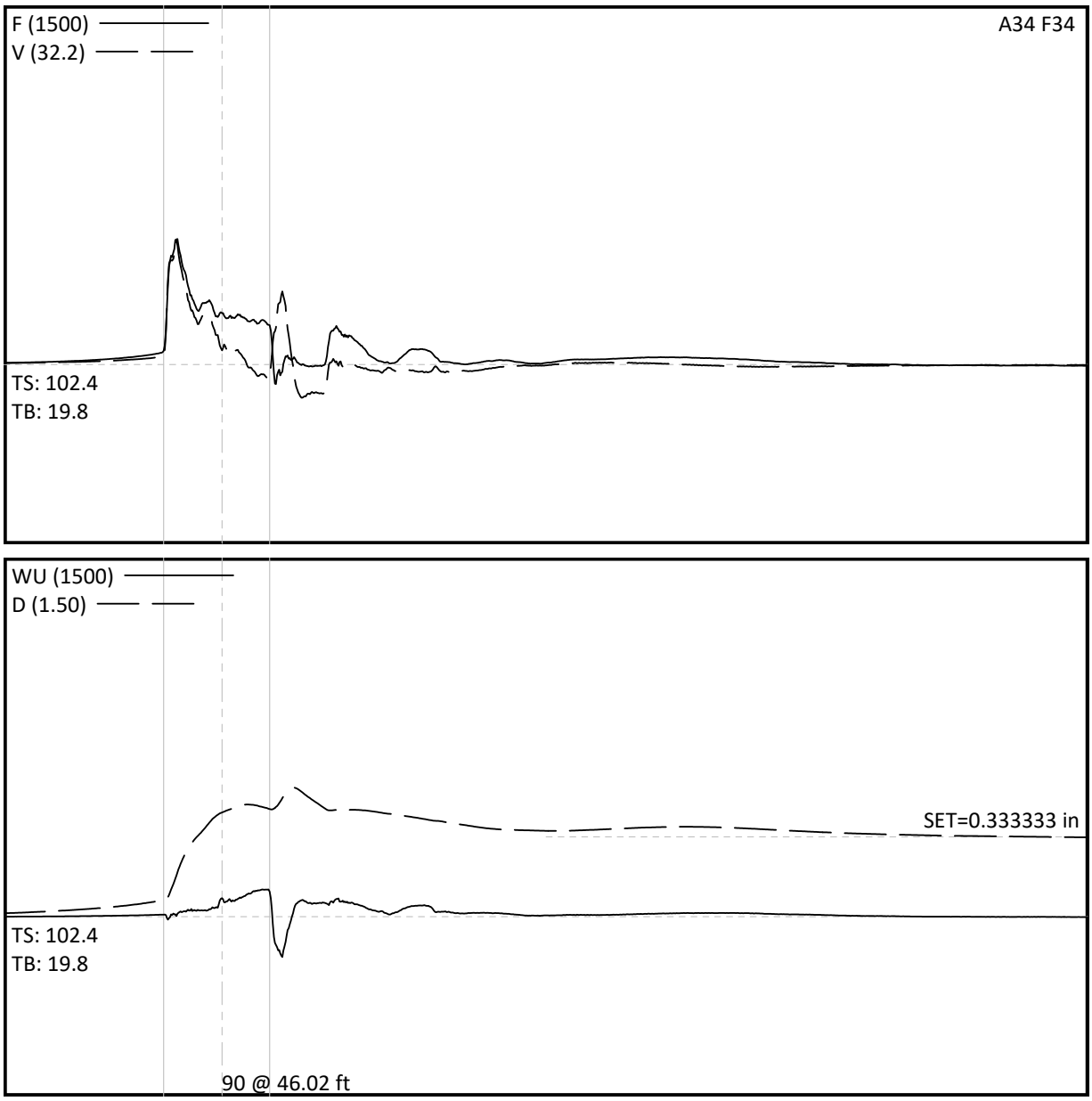
Appendix C

CAPWAP Signal Matching Analysis Output
TP-10A-1 and TP-10A-2

I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

118008 - I10 OVER MOBILE RIVER TP-10A-1



Project Information

PROJECT: 118008 - I10 OVER MOBILE RIVER
PILE NAME: TP-10A-1
DESCR: HP14x89, 86' LONG
OPERATOR: AFT
FILE: TP-10A-1
2/22/2018 1:02:56 PM
Blow Number 1531

Pile Properties

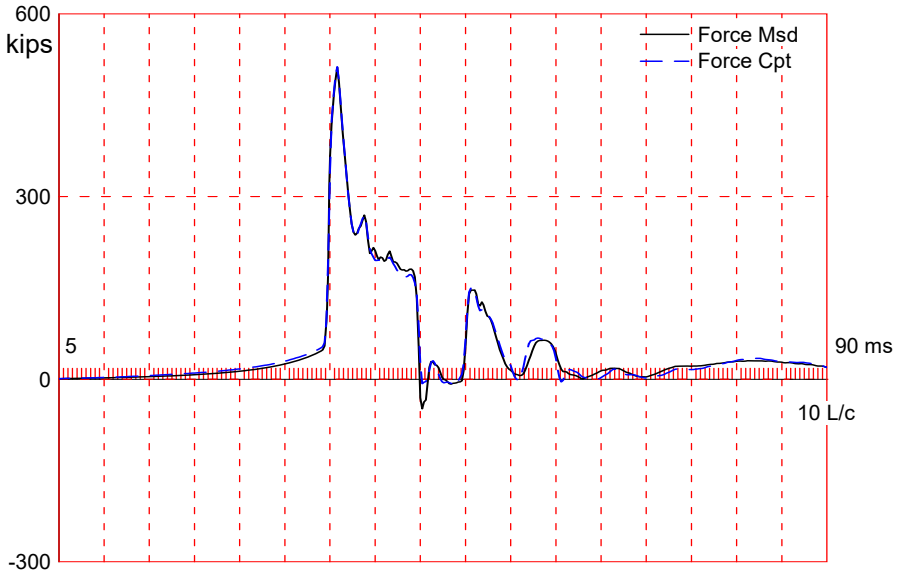
LE	83.67 ft
AR	26.10 in^2
EM	30000.00 ksi
SP	0.492 k/ft3
WS	16807.9 f/s
EA/C	46.6 ksec/ft
2L/C	10.00 ms
JC	0.70 []
LP	78.64 ft

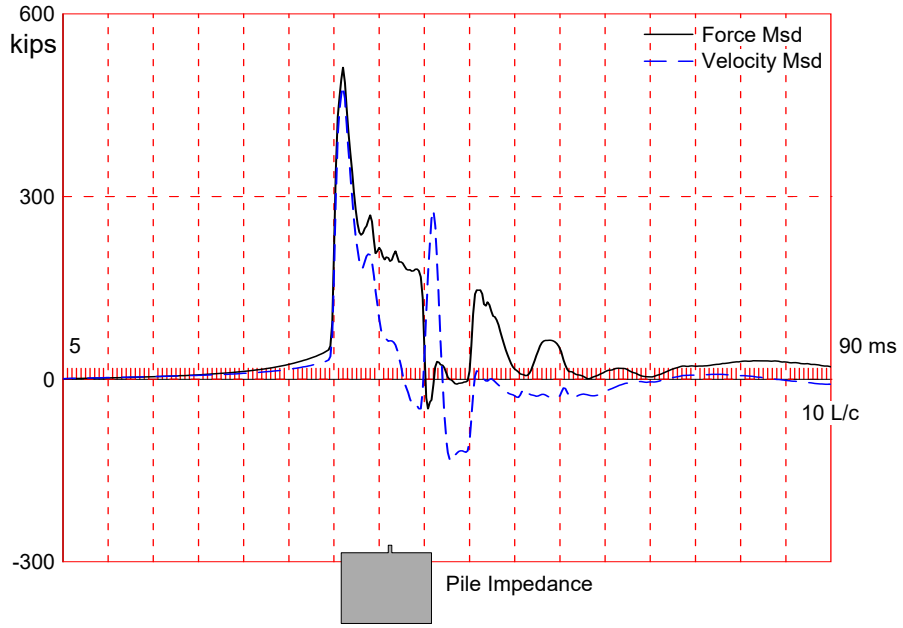
Quantity Results

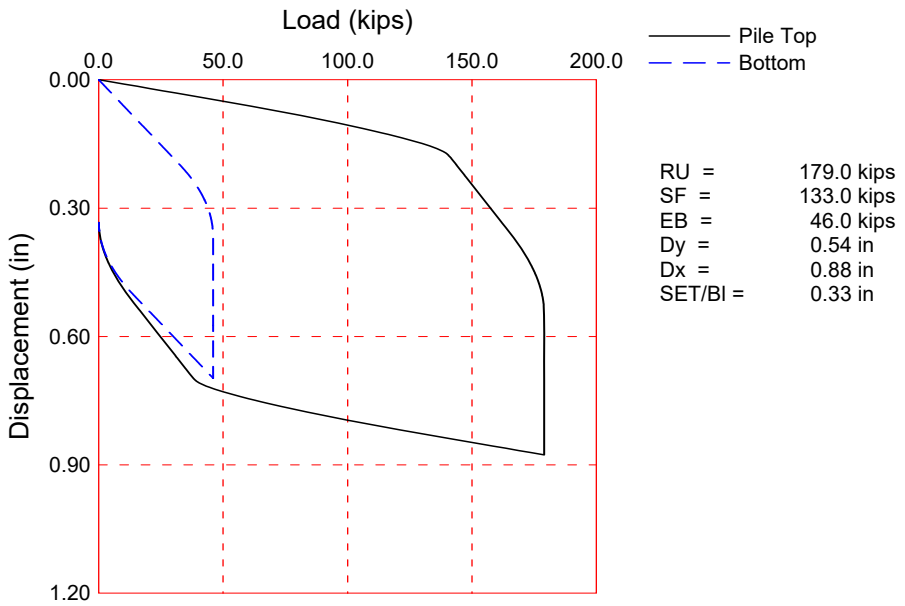
RX7	182 kips
RX8	168 kips
RA2	211 kips
CSX	20.09 ksi
CSB	9.79 ksi
TSX	5.30 ksi
EMX	11.6 k-ft
STK	5.75 ft
BTA	90 (%)

Sensors

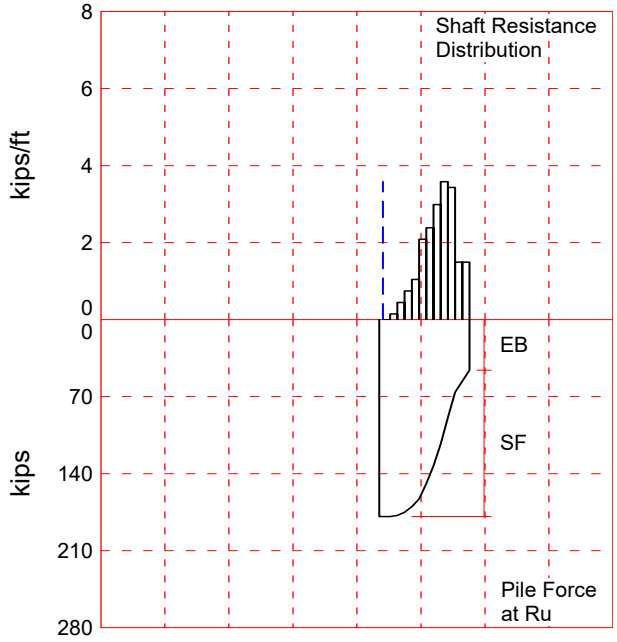
F3: [B095] 96.7 (1)
F4: [K474] 93.2 (1)
A3: [K4281] 360 mv/5000g's (1)
A4: [K5201] 338 mv/5000g's (1)
CLIP: OK







RU =	179.0 kips
SF =	133.0 kips
EB =	46.0 kips
Dy =	0.54 in
Dx =	0.88 in
SET/Bl =	0.33 in



Length b. Sensors	83.7 ft
Embedment	77.5 ft
Top Area	26.1 in^2
End Bearing Area	203.2 in^2
Top Perimeter	4.75 ft
Top E-Modulus	30000 ksi
Top Spec. Weight	492.0 lb/ft^3
Top Wave Spd.	16808 ft/s
Overall W.S.	16734 ft/s
Match Quality	2.13
Top Compr. Stress	19.7 ksi
Max Compr. Stress	20.3 ksi
Max Tension Stress	-4.17 ksi
Avg. Shaft Quake	0.04 in
Toe Quake	0.28 in
Avg. Shaft Smith Dpg.	0.21 s/ft
Toe Smith Damping	0.25 s/ft

About the CAPWAP Results

The CAPWAP program performs a signal matching or reverse analysis based on measurements taken on a deep foundation under an impact load. The program is based on a one-dimensional mathematical model. Under certain conditions, the model only crudely approximates the often complex dynamic situations.

The CAPWAP analysis relies on the input of accurately measured dynamic data plus additional parameters describing pile and soil behavior. If the field measurements of force and velocity are incorrect or were taken under inappropriate conditions (e.g., at an inappropriate time or with too much or too little energy) or if the input pile model is incorrect, then the solution cannot represent the actual soil behavior.

Generally the CAPWAP analysis is used to estimate the axial compressive pile capacity and the soil resistance distribution. The long-term capacity is best evaluated with restrike tests since they incorporate soil strength changes (set-up gains or relaxation losses) that occur after installation. The calculated load settlement graph does not consider creep or long term consolidation settlements. When uplift is a controlling factor in the design, use of the CAPWAP results to assess uplift capacity should be made only after very careful analysis of only good measurement quality, and further used only with longer pile lengths and with nominally higher safety factors.

CAPWAP is also used to evaluate driving stresses along the length of the pile. However, it should be understood that the analysis is one dimensional and does not take into account bending effects or local contact stresses at the pile toe.

Furthermore, if the user of this software was not able to produce a solution with satisfactory signal “match quality” (MQ), then the associated CAPWAP results may be unreliable. There is no absolute scale for solution acceptability but solutions with MQ above 5 are generally considered less reliable than those with lower MQ values and every effort should be made to improve the analysis, for example, by getting help from other independent experts.

Considering the CAPWAP model limitations, the nature of the input parameters, the complexity of the analysis procedure, and the need for a responsible application of the results to actual construction projects, it is recommended that at least one static load test be performed on sites where little experience exists with dynamic behavior of the soil resistance or when the experience of the analyzing engineer with both program use and result application is limited.

Finally, the CAPWAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of structure and other factors. The CAPWAP results should be reviewed by the Engineer of Record with consideration of applicable geotechnical conditions including, but not limited to, group effects, potential settlement from underlying compressible layers, soil resistances provided from any layers unsuitable for long term support, as well as effective stress changes due to soil surcharges, excavation or change in water table elevation.

The CAPWAP analysis software is one of many means by which the capacity of a deep foundation can be assessed. The engineer performing the analysis is responsible for proper software application and the analysis results. Pile Dynamics accepts no liability whatsoever of any kind for the analysis solution and/or the application of the analysis result.

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 179.0; along Shaft 133.0; at Toe 46.0 kips

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf	Smith Damping Factor s/ft
				179.0				
1	10.0	3.9	0.0	179.0	0.0	0.00	0.00	0.00
2	16.7	10.6	1.0	178.0	1.0	0.15	0.03	0.21
3	23.4	17.3	3.0	175.0	4.0	0.45	0.09	0.21
4	30.1	24.0	5.0	170.0	9.0	0.75	0.16	0.21
5	36.8	30.6	7.0	163.0	16.0	1.05	0.22	0.21
6	43.5	37.3	14.0	149.0	30.0	2.09	0.44	0.21
7	50.2	44.0	16.0	133.0	46.0	2.39	0.50	0.21
8	56.9	50.7	20.0	113.0	66.0	2.99	0.63	0.21
9	63.6	57.4	24.0	89.0	90.0	3.59	0.75	0.21
10	70.3	64.1	23.0	66.0	113.0	3.44	0.72	0.21
11	77.0	70.8	10.0	56.0	123.0	1.49	0.31	0.21
12	83.7	77.5	10.0	46.0	133.0	1.49	0.31	0.21
Avg. Shaft			11.1			1.72	0.36	0.21
Toe			46.0				32.59	0.25

Soil Model Parameters/Extensions		Shaft	Toe
Quake	(in)	0.04	0.28
Case Damping Factor		0.59	0.25
Damping Type		Viscous	Sm+Visc
Unloading Quake	(% of loading quake)	30	116
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	27	
Resistance Gap (included in Toe Quake)	(in)		0.13

CAPWAP match quality = 2.13 (Wave Up Match) ; RSA = 0
Observed: Final Set = 0.33 in; Blow Count = 36 b/ft
Computed: Final Set = 0.33 in; Blow Count = 36 b/ft

max. Top Comp. Stress = 19.7 ksi (T= 36.2 ms, max= 1.033 x Top)
max. Comp. Stress = 20.3 ksi (Z= 36.8 ft, T= 38.2 ms)
max. Tens. Stress = -4.17 ksi (Z= 66.9 ft, T= 42.0 ms)
max. Energy (EMX) = 11.4 kip-ft; max. Measured Top Displ. (DMX)= 0.54 in

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages ft	max. Force kips	min. Force kips	max. Comp. Stress ksi	max. Tens. Stress ksi	max. Trnsfd. Energy kip-ft	max. Veloc. ft/s	max. Displ. in
1	3.3	514.0	-59.9	19.7	-2.29	11.4	10.3	0.51
2	6.7	514.8	-93.4	19.7	-3.58	11.4	10.3	0.51
4	13.4	517.5	-67.6	19.8	-2.59	11.3	10.2	0.50
6	20.1	519.3	-65.8	19.9	-2.52	11.2	10.1	0.49
8	26.8	517.2	-49.6	19.8	-1.90	10.9	9.9	0.47
9	30.1	522.5	-31.7	20.0	-1.21	10.9	9.8	0.47
10	33.5	513.5	-24.3	19.7	-0.93	10.5	9.6	0.46
11	36.8	530.7	-20.6	20.3	-0.79	10.5	9.3	0.45
12	40.2	514.3	-33.6	19.7	-1.29	9.9	9.2	0.44
13	43.5	519.7	-27.8	19.9	-1.07	9.9	9.1	0.44
14	46.9	486.8	-52.6	18.7	-2.02	8.8	8.9	0.43
15	50.2	498.0	-58.0	19.1	-2.22	8.8	8.7	0.43
16	53.5	464.9	-56.1	17.8	-2.15	7.6	8.4	0.42
17	56.9	477.1	-54.6	18.3	-2.09	7.6	8.2	0.41
18	60.2	436.7	-46.1	16.7	-1.77	6.2	8.2	0.41
19	63.6	447.8	-47.4	17.2	-1.82	6.2	8.0	0.40
20	66.9	397.8	-109.0	15.2	-4.17	4.5	8.0	0.40
21	70.3	403.1	-81.7	15.4	-3.13	4.5	8.9	0.40
22	73.6	330.5	-97.3	12.7	-3.73	2.9	10.2	0.39
23	77.0	288.4	-40.3	11.1	-1.54	2.9	11.6	0.39
24	80.3	174.7	-10.3	6.7	-0.40	2.1	12.7	0.39
25	83.7	111.1	0.0	4.3	0.00	1.3	13.2	0.39
Absolute	36.8			20.3			(T =	38.2 ms)
	66.9				-4.17		(T =	42.0 ms)

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	366.5	302.3	238.1	173.9	109.6	45.4	0.0	0.0	0.0	0.0
RX	366.5	304.9	276.0	251.6	232.3	213.1	194.0	179.4	167.8	162.8
RU	379.7	316.8	253.9	191.0	128.1	65.2	2.3	0.0	0.0	0.0

RAU = 40.8 (kips); RA2 = 219.6 (kips)

Current CAPWAP Ru = 179.0 (kips); Corresponding J(RP)= 0.29; J(RX) = 0.70

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS	KEB
ft/s	ms	kips	kips	kips	in	in	in	kip-ft	kips	kips/in
10.4	36.00	486.1	522.6	522.6	0.54	0.32	0.33	11.5	317.4	314

PILE PROFILE AND PILE MODEL

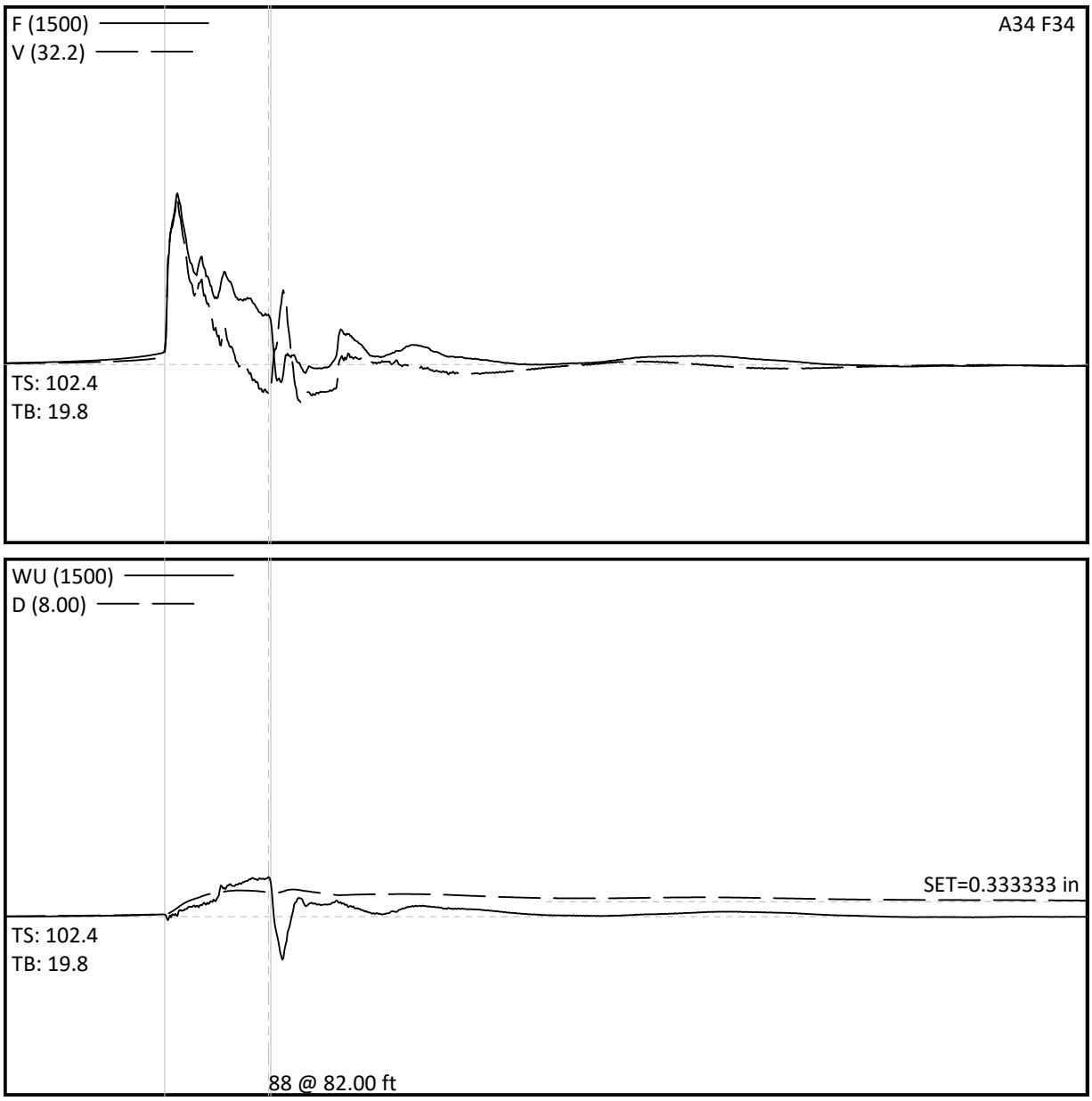
Depth ft	Area in²	E-Modulus ksi	Spec. Weight lb/ft³	Perim. ft
0.0	26.1	30000.0	492.000	4.75
83.7	26.1	30000.0	492.000	4.75

Toe Area 203.2 in²

Segmnt Number	Dist. B.G. ft	Impedance kips/ft/s	Imped. Change %	Tension Slack in	Tension Eff.	Compression Slack in	Compression Eff.	Perim. ft	Wave Speed ft/s
1	3.3	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16734.0
14	46.9	51.59	10.73	0.00	0.000	-0.00	0.000	4.75	16734.0
15	50.2	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16734.0
25	83.7	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16734.0

Wave Speed: Pile Top 16807.9, Elastic 16807.9, Overall 16734.0 ft/s
Pile Damping 1.00 %, Time Incr 0.200 ms, 2L/c 10.0 ms
Total volume: 15.230 ft³; Volume ratio considering added impedance: 1.004

118008 - I10 OVER MOBILE RIVER TP-10A-1 1 DAY RESTRIKE



Project Information

PROJECT: 118008 - I10 OVER MOBILE RIVER
PILE NAME: TP-10A-1 1 DAY RESTRIKE
DESCR: HP14x89, 86' LONG
OPERATOR: AFT
FILE: TP-10A-1 1 DAY RESTRIKE
2/23/2018 9:32:19 AM
Blow Number 2

Pile Properties

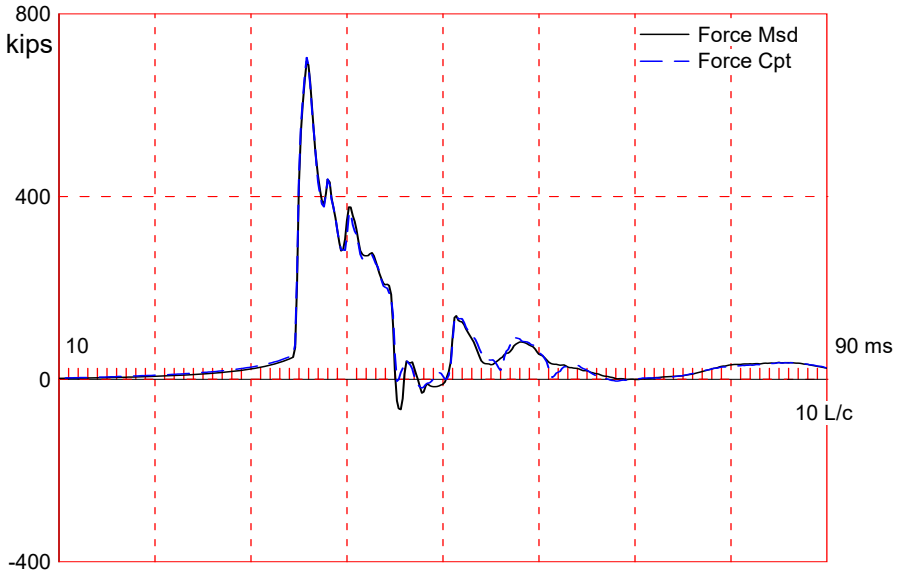
LE	83.67 ft
AR	26.10 in^2
EM	30000.00 ksi
SP	0.492 k/ft3
WS	16807.9 f/s
EA/C	46.6 ksec/ft
2L/C	10.00 ms
JC	0.75 []
LP	79.06 ft

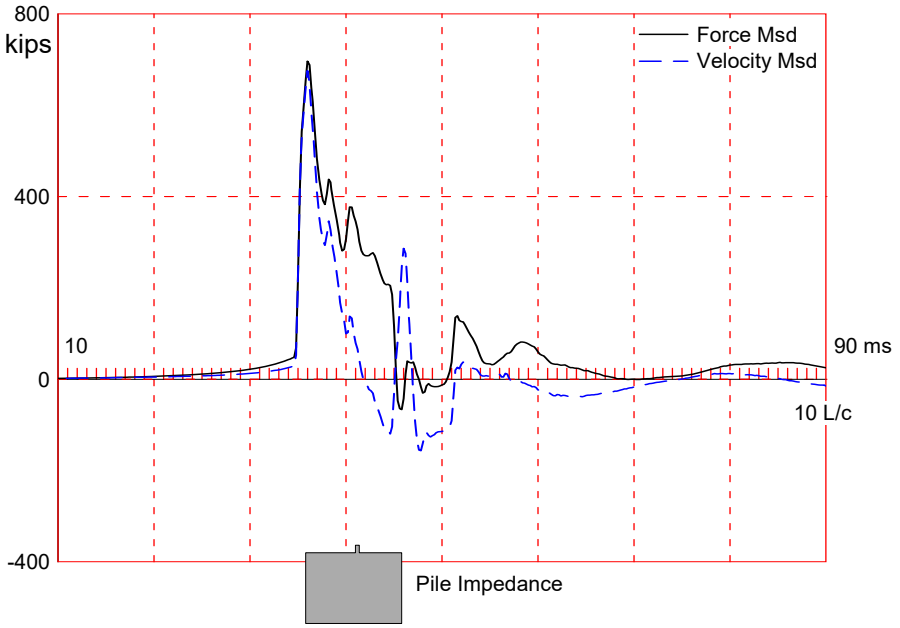
Quantity Results

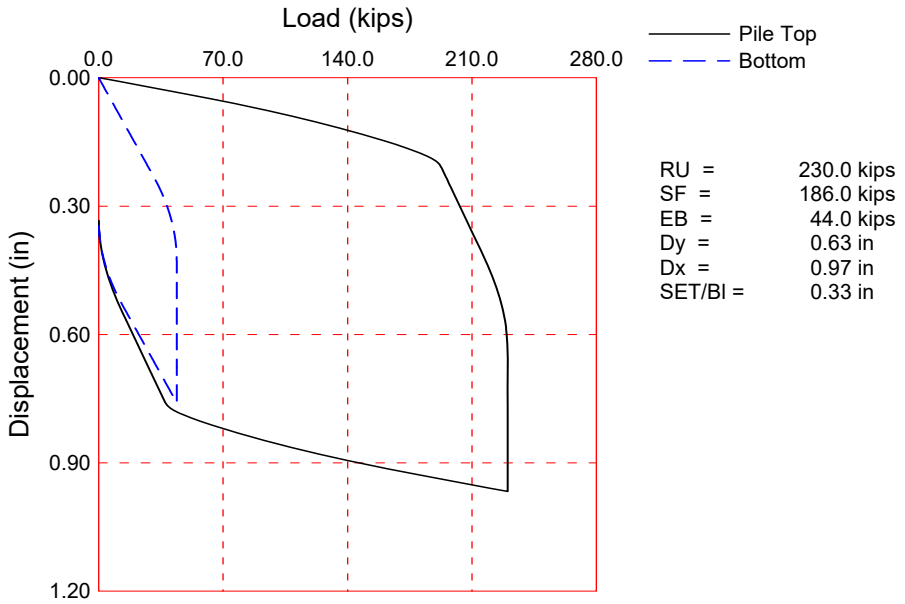
RMX	230 kips
RX8	215 kips
RA2	248 kips
CSX	27.43 ksi
CSB	14.29 ksi
TSX	6.61 ksi
EMX	22.0 k-ft
STK	8.98 ft
BTA	88 (%)

Sensors

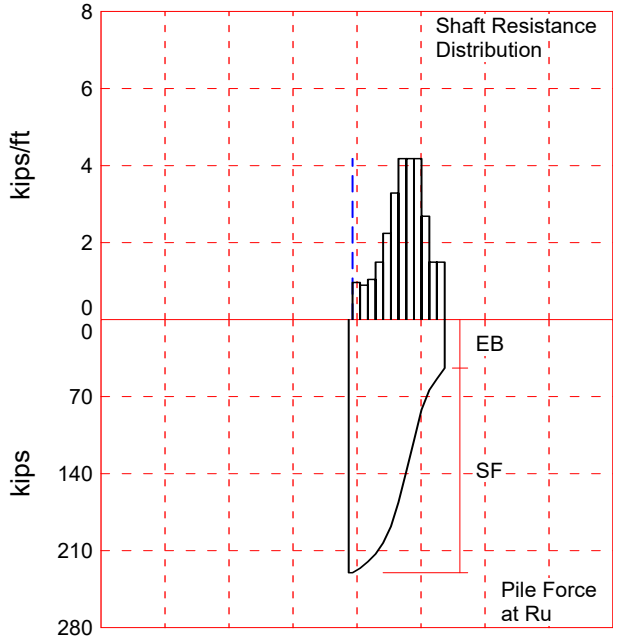
F3: [B095] 96.7 (1)
F4: [K474] 93.2 (1)
A3: [K4281] 360 mv/5000g's (1)
A4: [K5201] 338 mv/5000g's (1)
CLIP: OK







RU =	230.0 kips
SF =	186.0 kips
EB =	44.0 kips
Dy =	0.63 in
Dx =	0.97 in
SET/Bl =	0.33 in



Length b. Sensors	83.7 ft
Embedment	77.8 ft
Top Area	26.1 in^2
End Bearing Area	203.2 in^2
Top Perimeter	4.75 ft
Top E-Modulus	30000 ksi
Top Spec. Weight	492.0 lb/ft^3
Top Wave Spd.	16808 ft/s
Overall W.S.	16734 ft/s
Match Quality	2.18
Top Compr. Stress	27.2 ksi
Max Compr. Stress	27.5 ksi
Max Tension Stress	-4.82 ksi
Avg. Shaft Quake	0.04 in
Toe Quake	0.33 in
Avg. Shaft Smith Dpg.	0.22 s/ft
Toe Smith Damping	0.25 s/ft

About the CAPWAP Results

The CAPWAP program performs a signal matching or reverse analysis based on measurements taken on a deep foundation under an impact load. The program is based on a one-dimensional mathematical model. Under certain conditions, the model only crudely approximates the often complex dynamic situations.

The CAPWAP analysis relies on the input of accurately measured dynamic data plus additional parameters describing pile and soil behavior. If the field measurements of force and velocity are incorrect or were taken under inappropriate conditions (e.g., at an inappropriate time or with too much or too little energy) or if the input pile model is incorrect, then the solution cannot represent the actual soil behavior.

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CAPWAP is also used to evaluate driving stresses along the length of the pile. However, it should be understood that the analysis is one dimensional and does not take into account bending effects or local contact stresses at the pile toe.

Furthermore, if the user of this software was not able to produce a solution with satisfactory signal “match quality” (MQ), then the associated CAPWAP results may be unreliable. There is no absolute scale for solution acceptability but solutions with MQ above 5 are generally considered less reliable than those with lower MQ values and every effort should be made to improve the analysis, for example, by getting help from other independent experts.

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Finally, the CAPWAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of structure and other factors. The CAPWAP results should be reviewed by the Engineer of Record with consideration of applicable geotechnical conditions including, but not limited to, group effects, potential settlement from underlying compressible layers, soil resistances provided from any layers unsuitable for long term support, as well as effective stress changes due to soil surcharges, excavation or change in water table elevation.

The CAPWAP analysis software is one of many means by which the capacity of a deep foundation can be assessed. The engineer performing the analysis is responsible for proper software application and the analysis results. Pile Dynamics accepts no liability whatsoever of any kind for the analysis solution and/or the application of the analysis result.

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 230.0; along Shaft 186.0; at Toe 44.0 kips

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf
				230.0			
1	10.0	4.1	4.0	226.0	4.0	0.97	0.20
2	16.7	10.8	6.0	220.0	10.0	0.90	0.19
3	23.4	17.5	7.0	213.0	17.0	1.05	0.22
4	30.1	24.2	10.0	203.0	27.0	1.49	0.31
5	36.8	30.9	15.0	188.0	42.0	2.24	0.47
6	43.5	37.6	22.0	166.0	64.0	3.29	0.69
7	50.2	44.3	28.0	138.0	92.0	4.18	0.88
8	56.9	51.0	28.0	110.0	120.0	4.18	0.88
9	63.6	57.7	28.0	82.0	148.0	4.18	0.88
10	70.3	64.4	18.0	64.0	166.0	2.69	0.57
11	77.0	71.1	10.0	54.0	176.0	1.49	0.31
12	83.7	77.8	10.0	44.0	186.0	1.49	0.31
Avg. Shaft			15.5			2.39	0.50
Toe			44.0				31.18

Soil Model Parameters/Extensions		Shaft	Toe
Smith Damping Factor		0.22	0.25
Quake	(in)	0.04	0.33
Case Damping Factor		0.88	0.23
Damping Type		Viscous	Sm+Visc
Unloading Quake	(% of loading quake)	91	226
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	13	
Resistance Gap (included in Toe Quake)	(in)		0.17

CAPWAP match quality = 2.18 (Wave Up Match) ; RSA = 0
Observed: Final Set = 0.33 in; Blow Count = 36 b/ft
Computed: Final Set = 0.36 in; Blow Count = 33 b/ft

max. Top Comp. Stress = 27.2 ksi (T= 36.2 ms, max= 1.013 x Top)
max. Comp. Stress = 27.5 ksi (Z= 10.0 ft, T= 36.6 ms)
max. Tens. Stress = -4.82 ksi (Z= 73.6 ft, T= 41.8 ms)
max. Energy (EMX) = 21.8 kip-ft; max. Measured Top Displ. (DMX)= 0.61 in

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages ft	max. Force kips	min. Force kips	max. Comp. Stress ksi	max. Tens. Stress ksi	max. Trnsfd. Energy kip-ft	max. Veloc. ft/s	max. Displ. in
1	3.3	709.1	-52.6	27.2	-2.02	21.8	14.2	0.58
2	6.7	711.8	-85.2	27.3	-3.26	21.6	14.2	0.57
4	13.4	706.1	-69.0	27.1	-2.64	20.7	13.9	0.56
6	20.1	694.8	-58.2	26.6	-2.23	20.0	13.6	0.55
8	26.8	684.6	-22.6	26.2	-0.87	19.1	13.2	0.53
9	30.1	698.8	-19.8	26.8	-0.76	19.1	12.9	0.53
10	33.5	673.7	-21.5	25.8	-0.82	17.9	12.6	0.52
11	36.8	703.3	-28.8	26.9	-1.10	17.9	11.9	0.52
12	40.2	657.8	-29.4	25.2	-1.13	16.3	11.7	0.51
13	43.5	676.8	-49.3	25.9	-1.89	16.2	11.3	0.51
14	46.9	616.8	-59.6	23.6	-2.29	14.0	11.0	0.51
15	50.2	637.8	-66.4	24.4	-2.55	14.0	10.5	0.50
16	53.5	565.9	-85.8	21.7	-3.29	11.3	10.2	0.50
17	56.9	585.2	-58.6	22.4	-2.25	11.2	9.7	0.49
18	60.2	515.3	-67.8	19.7	-2.60	8.5	9.6	0.49
19	63.6	527.6	-46.3	20.2	-1.77	8.5	10.7	0.48
20	66.9	455.5	-91.0	17.5	-3.49	5.8	10.9	0.48
21	70.3	462.6	-101.7	17.7	-3.90	5.8	10.6	0.48
22	73.6	406.3	-125.7	15.6	-4.82	4.0	12.3	0.48
23	77.0	338.0	-66.0	12.9	-2.53	3.9	13.8	0.48
24	80.3	211.3	-24.5	8.1	-0.94	2.8	15.0	0.47
25	83.7	120.6	0.0	4.6	0.00	1.7	15.6	0.47
Absolute	10.0			27.5			(T =	36.6 ms)
	73.6				-4.82		(T =	41.8 ms)

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	539.3	450.6	361.9	273.1	184.4	95.7	7.0	0.0	0.0	0.0
RX	539.3	465.6	400.5	361.9	332.5	303.1	273.7	244.4	215.0	185.6
RU	661.9	585.5	509.1	432.6	356.2	279.7	203.3	126.9	50.4	0.0

RAU = 16.3 (kips); RA2 = 248.1 (kips)

Current CAPWAP Ru = 230.0 (kips); Corresponding J(RP)= 0.35; J(RX) = 0.75

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS	KEB
ft/s	ms	kips	kips	kips	in	in	in	kip-ft	kips	kips/in
15.2	36.00	710.4	716.0	716.0	0.61	0.32	0.33	22.0	561.1	283

PILE PROFILE AND PILE MODEL

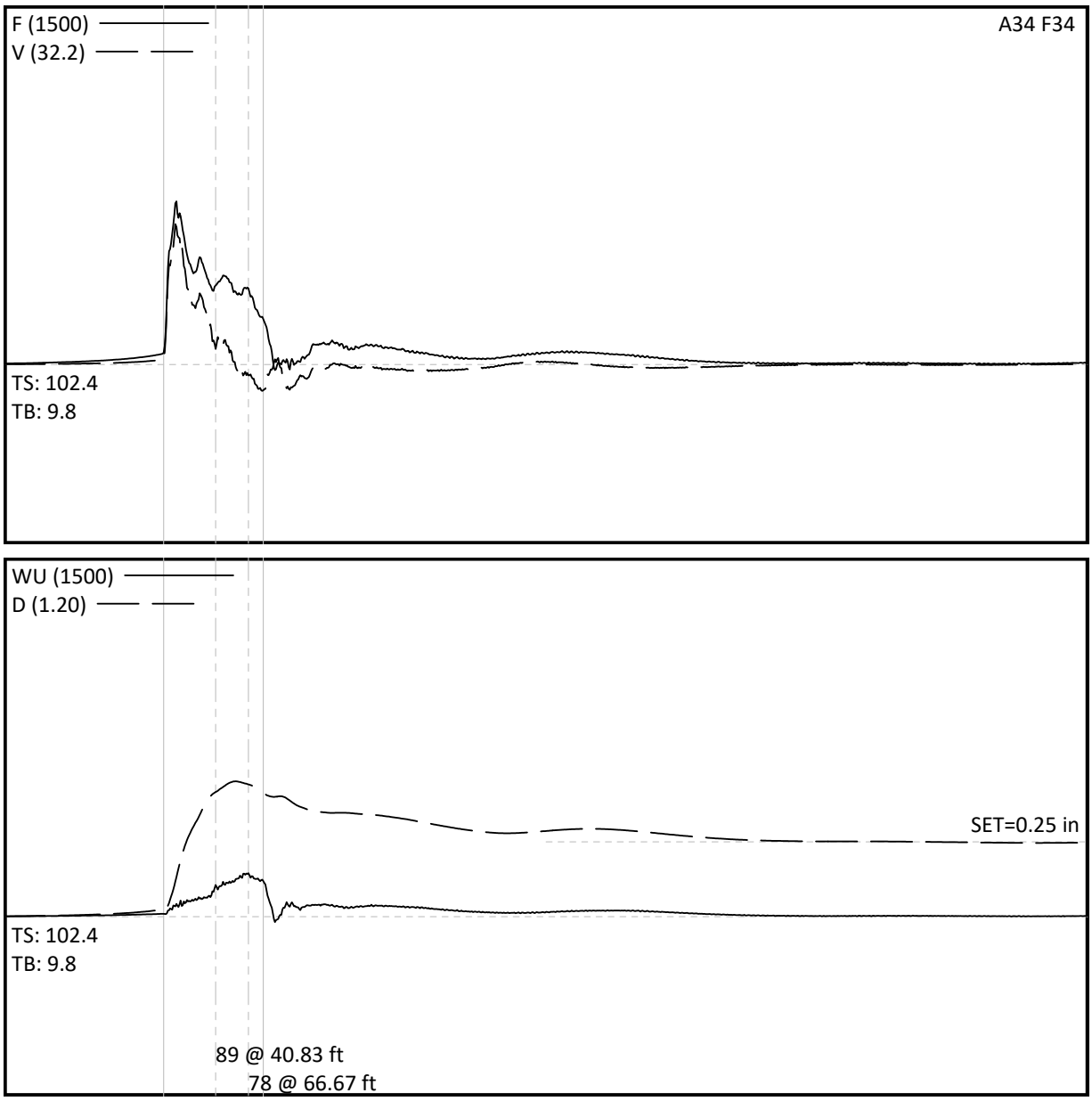
Depth ft	Area in^2	E-Modulus ksi	Spec. Weight lb/ft^3	Perim. ft
0.0	26.1	30000.0	492.000	4.75
83.7	26.1	30000.0	492.000	4.75

Toe Area 203.2 in^2

Segmnt Number	Dist. B.G. ft	Impedance kips/ft/s	Imped. Change %	Tension Slack in	Tension Eff.	Compression Slack in	Compression Eff.	Perim. ft	Wave Speed ft/s
1	3.3	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16734.0
14	46.9	51.59	10.73	0.00	0.000	-0.00	0.000	4.75	16734.0
15	50.2	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16734.0
25	83.7	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16734.0

Wave Speed: Pile Top 16807.9, Elastic 16807.9, Overall 16734.0 ft/s
Pile Damping 1.00 %, Time Incr 0.200 ms, 2L/c 10.0 ms
Total volume: 15.230 ft^3; Volume ratio considering added impedance: 1.004

I-10 OVER MOBILE RIVER TP-10A-1 12 DAY RESTRIKE



Project Information

PROJECT: I-10 OVER MOBILE RIVER
PILE NAME: TP-10A-1 12 DAY RESTRIKE
DESCR: HP14x89, 86' LONG
OPERATOR: AFT
FILE: TP-10A1 12 DAY RS ana
3/6/2018 1:08:40 PM
Blow Number 2

Pile Properties

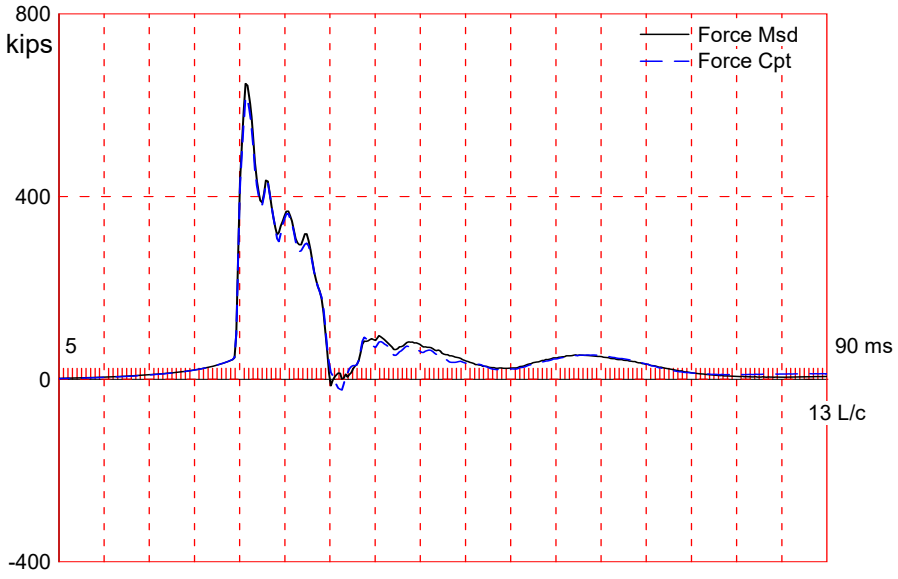
LE	78.67 ft
AR	26.10 in^2
EM	30000.00 ksi
SP	0.492 k/ft3
WS	16807.9 f/s
EA/C	46.6 ksec/ft
2L/C	9.44 ms
JC	0.65 []
LP	78.04 ft

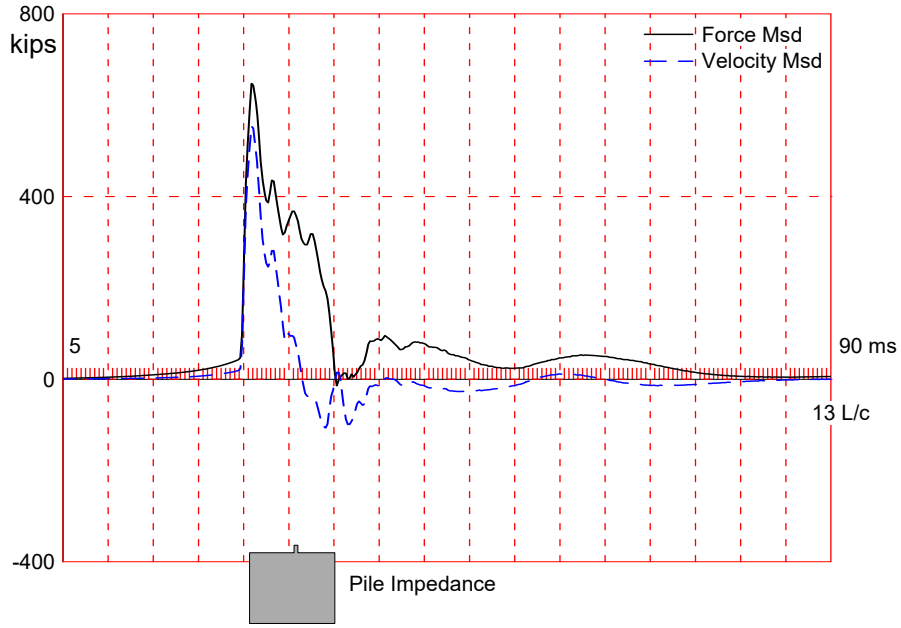
Quantity Results

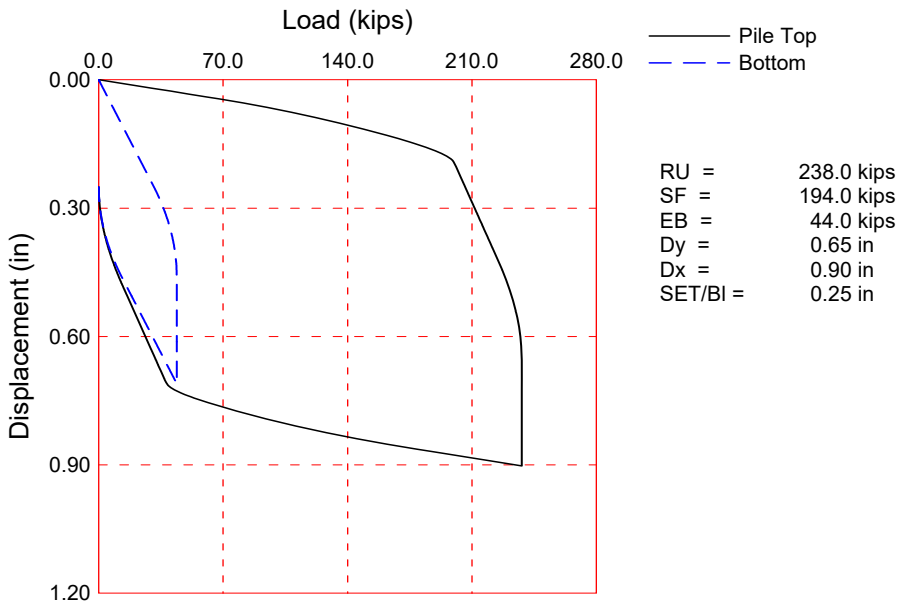
RMX	237 kips
RX7	221 kips
RA2	253 kips
CSX	26.13 ksi
CSB	16.56 ksi
TSX	0.96 ksi
EMX	17.2 k-ft
STK	7.91 ft
BTA	78 (%)

Sensors

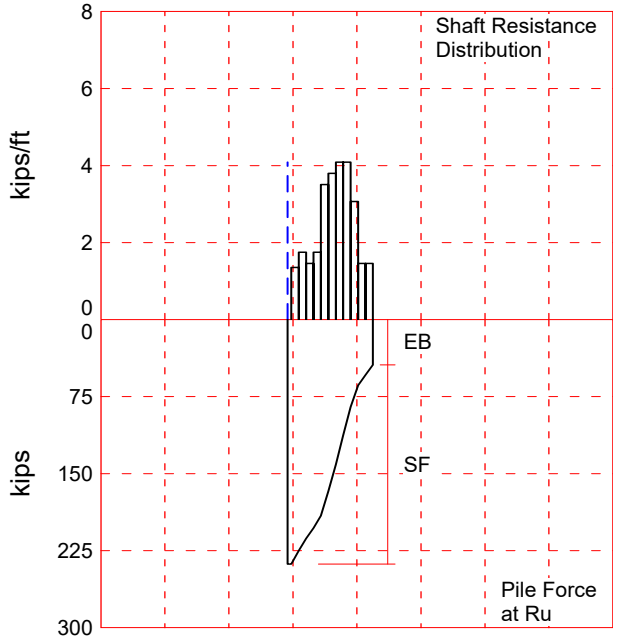
F3: [P454] 145.3 (1)
F4: [P455] 145.8 (1)
A3: [K5647] 334 mv/5000g's (1)
A4: [K5362] 346 mv/5000g's (1)
CLIP: OK







RU =	238.0 kips
SF =	194.0 kips
EB =	44.0 kips
Dy =	0.65 in
Dx =	0.90 in
SET/Bl =	0.25 in



Length b. Sensors	78.7 ft
Embedment	78.0 ft
Top Area	26.1 in^2
End Bearing Area	203.2 in^2
Top Perimeter	4.75 ft
Top E-Modulus	30000 ksi
Top Spec. Weight	492.0 lb/ft^3
Top Wave Spd.	16808 ft/s
Overall W.S.	16667 ft/s
Match Quality	1.93
Top Compr. Stress	24.2 ksi
Max Compr. Stress	25.1 ksi
Max Tension Stress	-2.67 ksi
Avg. Shaft Quake	0.04 in
Toe Quake	0.35 in
Avg. Shaft Smith Dpg.	0.31 s/ft
Toe Smith Damping	0.15 s/ft

About the CAPWAP Results

The CAPWAP program performs a signal matching or reverse analysis based on measurements taken on a deep foundation under an impact load. The program is based on a one-dimensional mathematical model. Under certain conditions, the model only crudely approximates the often complex dynamic situations.

The CAPWAP analysis relies on the input of accurately measured dynamic data plus additional parameters describing pile and soil behavior. If the field measurements of force and velocity are incorrect or were taken under inappropriate conditions (e.g., at an inappropriate time or with too much or too little energy) or if the input pile model is incorrect, then the solution cannot represent the actual soil behavior.

Generally the CAPWAP analysis is used to estimate the axial compressive pile capacity and the soil resistance distribution. The long-term capacity is best evaluated with restrike tests since they incorporate soil strength changes (set-up gains or relaxation losses) that occur after installation. The calculated load settlement graph does not consider creep or long term consolidation settlements. When uplift is a controlling factor in the design, use of the CAPWAP results to assess uplift capacity should be made only after very careful analysis of only good measurement quality, and further used only with longer pile lengths and with nominally higher safety factors.

CAPWAP is also used to evaluate driving stresses along the length of the pile. However, it should be understood that the analysis is one dimensional and does not take into account bending effects or local contact stresses at the pile toe.

Furthermore, if the user of this software was not able to produce a solution with satisfactory signal “match quality” (MQ), then the associated CAPWAP results may be unreliable. There is no absolute scale for solution acceptability but solutions with MQ above 5 are generally considered less reliable than those with lower MQ values and every effort should be made to improve the analysis, for example, by getting help from other independent experts.

Considering the CAPWAP model limitations, the nature of the input parameters, the complexity of the analysis procedure, and the need for a responsible application of the results to actual construction projects, it is recommended that at least one static load test be performed on sites where little experience exists with dynamic behavior of the soil resistance or when the experience of the analyzing engineer with both program use and result application is limited.

Finally, the CAPWAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of structure and other factors. The CAPWAP results should be reviewed by the Engineer of Record with consideration of applicable geotechnical conditions including, but not limited to, group effects, potential settlement from underlying compressible layers, soil resistances provided from any layers unsuitable for long term support, as well as effective stress changes due to soil surcharges, excavation or change in water table elevation.

The CAPWAP analysis software is one of many means by which the capacity of a deep foundation can be assessed. The engineer performing the analysis is responsible for proper software application and the analysis results. Pile Dynamics accepts no liability whatsoever of any kind for the analysis solution and/or the application of the analysis result.

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 238.0; along Shaft 194.0; at Toe 44.0 kips

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf
				238.0			
1	10.3	9.6	13.0	225.0	13.0	1.36	0.29
2	17.1	16.4	12.0	213.0	25.0	1.75	0.37
3	23.9	23.3	10.0	203.0	35.0	1.46	0.31
4	30.8	30.1	12.0	191.0	47.0	1.75	0.37
5	37.6	37.0	24.0	167.0	71.0	3.51	0.74
6	44.5	43.8	26.0	141.0	97.0	3.80	0.80
7	51.3	50.6	28.0	113.0	125.0	4.09	0.86
8	58.1	57.5	28.0	85.0	153.0	4.09	0.86
9	65.0	64.3	21.0	64.0	174.0	3.07	0.65
10	71.8	71.2	10.0	54.0	184.0	1.46	0.31
11	78.7	78.0	10.0	44.0	194.0	1.46	0.31
Avg. Shaft			17.6			2.49	0.52
Toe			44.0				31.18

Soil Model Parameters/Extensions		Shaft	Toe
Smith Damping Factor		0.31	0.15
Quake	(in)	0.04	0.35
Case Damping Factor		1.29	0.14
Damping Type		Viscous	Sm+Visc
Unloading Quake	(% of loading quake)	65	133
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	3	
Resistance Gap (included in Toe Quake)	(in)		0.21
Soil Plug Weight	(kips)		0.064

CAPWAP match quality = 1.93 (Wave Up Match) ; RSA = 0
Observed: Final Set = 0.25 in; Blow Count = 48 b/ft
Computed: Final Set = 0.25 in; Blow Count = 48 b/ft

max. Top Comp. Stress = 24.2 ksi (T= 26.3 ms, max= 1.040 x Top)
max. Comp. Stress = 25.1 ksi (Z= 10.3 ft, T= 26.7 ms)
max. Tens. Stress = -2.67 ksi (Z= 68.4 ft, T= 31.6 ms)
max. Energy (EMX) = 17.0 kip-ft; max. Measured Top Displ. (DMX)= 0.45 in

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages ft	max. Force kips	min. Force kips	max. Comp. Stress ksi	max. Tens. Stress ksi	max. Trnsfd. Energy kip-ft	max. Veloc. ft/s	max. Displ. in
1	3.4	630.7	-2.7	24.2	-0.11	17.0	12.3	0.46
2	6.8	640.9	-0.2	24.6	-0.01	16.8	12.0	0.44
4	13.7	606.7	0.0	23.2	0.00	14.9	11.5	0.42
5	17.1	619.2	0.0	23.7	0.00	14.9	11.2	0.42
6	20.5	575.2	0.0	22.0	0.00	13.7	11.0	0.42
7	23.9	588.7	0.0	22.6	0.00	13.7	10.7	0.41
8	27.4	557.6	0.0	21.4	0.00	12.8	10.5	0.41
9	30.8	581.8	-2.6	22.3	-0.10	12.7	10.1	0.40
10	34.2	561.2	0.0	21.5	0.00	11.7	9.5	0.40
11	37.6	578.7	0.0	22.2	0.00	11.7	9.0	0.40
12	41.0	506.1	0.0	19.4	0.00	9.8	8.6	0.39
13	44.5	527.1	-1.7	20.2	-0.06	9.8	8.3	0.39
14	47.9	455.5	0.0	17.5	0.00	7.8	7.8	0.38
15	51.3	476.9	0.0	18.3	0.00	7.8	7.4	0.38
16	54.7	403.4	-14.0	15.5	-0.54	5.8	7.0	0.37
17	58.1	420.4	0.0	16.1	0.00	5.7	7.2	0.37
18	61.6	347.6	-7.3	13.3	-0.28	3.7	7.6	0.37
19	65.0	357.4	-15.5	13.7	-0.59	3.7	7.3	0.37
20	68.4	292.3	-69.6	11.2	-2.67	2.2	8.2	0.36
21	71.8	251.7	-41.4	9.6	-1.59	2.1	9.4	0.36
22	75.2	166.7	-34.8	6.4	-1.33	1.2	10.2	0.36
23	78.7	62.9	0.0	2.4	0.00	0.4	10.8	0.35
Absolute	10.3			25.1			(T =	26.7 ms)
	68.4				-2.67		(T =	31.6 ms)

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	607.5	542.2	477.0	411.7	346.5	281.2	215.9	150.7	85.4	20.2
RX	613.7	549.4	485.0	420.7	356.3	300.9	253.5	220.6	187.7	154.8
RU	684.1	626.6	569.0	511.4	453.8	396.2	338.6	281.0	223.5	165.9

RAU = 80.0 (kips); RA2 = 253.2 (kips)

Current CAPWAP Ru = 238.0 (kips); Corresponding J(RP)= 0.57; J(RX) = 0.65

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS	KEB
ft/s	ms	kips	kips	kips	in	in	in	kip-ft	kips	kips/in
12.6	25.86	586.7	673.3	682.0	0.45	0.25	0.25	17.2	586.8	305

PILE PROFILE AND PILE MODEL

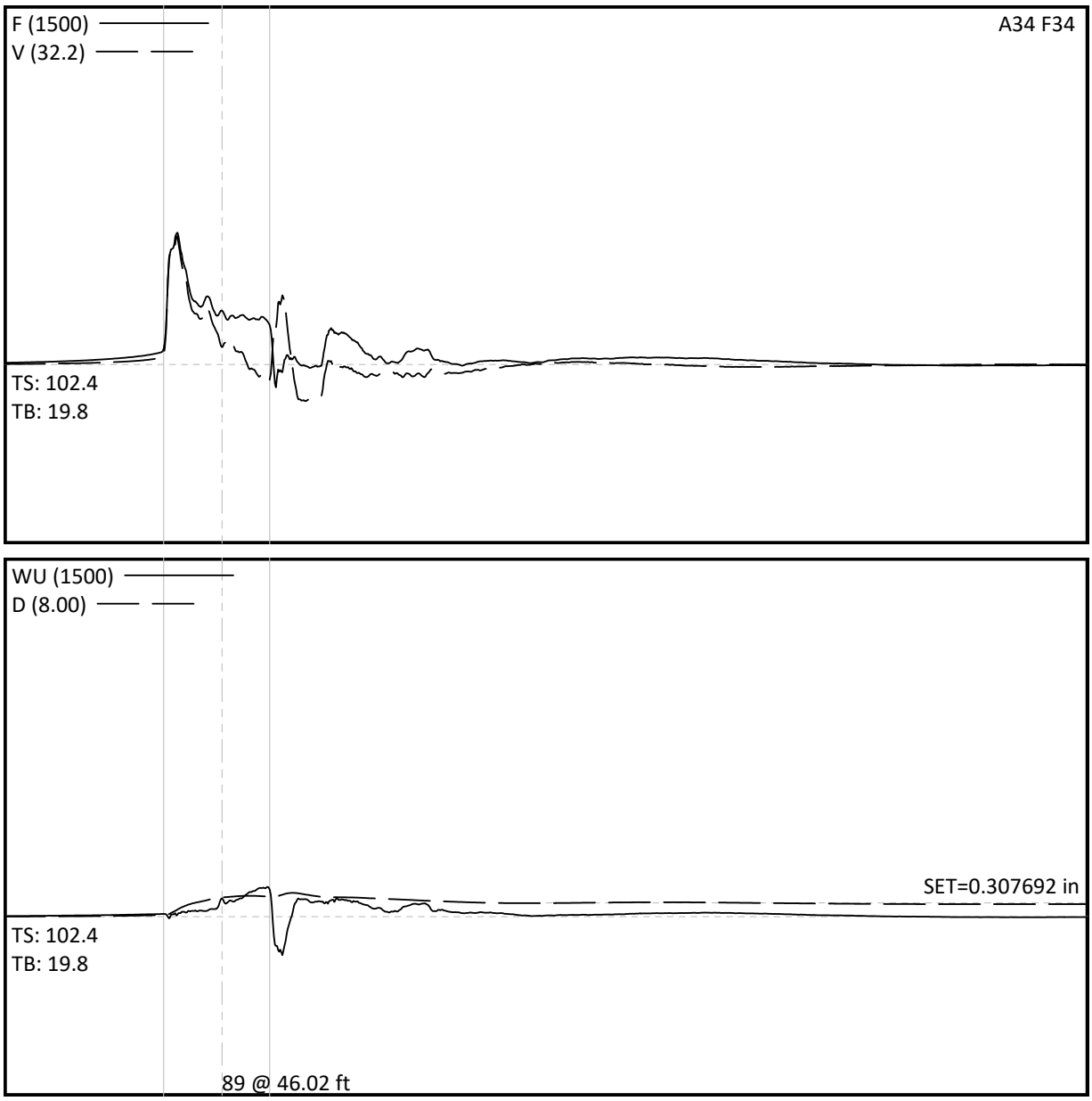
Depth ft	Area in^2	E-Modulus ksi	Spec. Weight lb/ft^3	Perim. ft
0.0	26.1	30000.0	492.000	4.75
78.7	26.1	30000.0	492.000	4.75

Toe Area 203.2 in^2

Segmnt Number	Dist. B.G. ft	Impedance kips/ft/s	Imped. Change %	Tension Slack in	Tension Eff.	Compression Slack in	Compression Eff.	Perim. ft	Wave Speed ft/s
1	3.4	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16666.7
13	44.5	51.59	10.73	0.00	0.000	-0.00	0.000	4.75	16666.7
14	47.9	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16666.7
23	78.7	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16666.7

Wave Speed: Pile Top 16807.9, Elastic 16807.9, Overall 16666.7 ft/s
Pile Damping 1.00 %, Time Incr 0.205 ms, 2L/c 9.4 ms
Total volume: 14.325 ft^3; Volume ratio considering added impedance: 1.005

118008 - I10 OVER MOBILE RIVER TP-10A-2



Project Information

PROJECT: 118008 - I10 OVER MOBILE RIVER
PILE NAME: TP-10A-2
DESCR: HP 14x89 by 86 Feet
OPERATOR: AFT
FILE: TP-10A-2
2/22/2018 3:49:27 PM
Blow Number 1412

Pile Properties

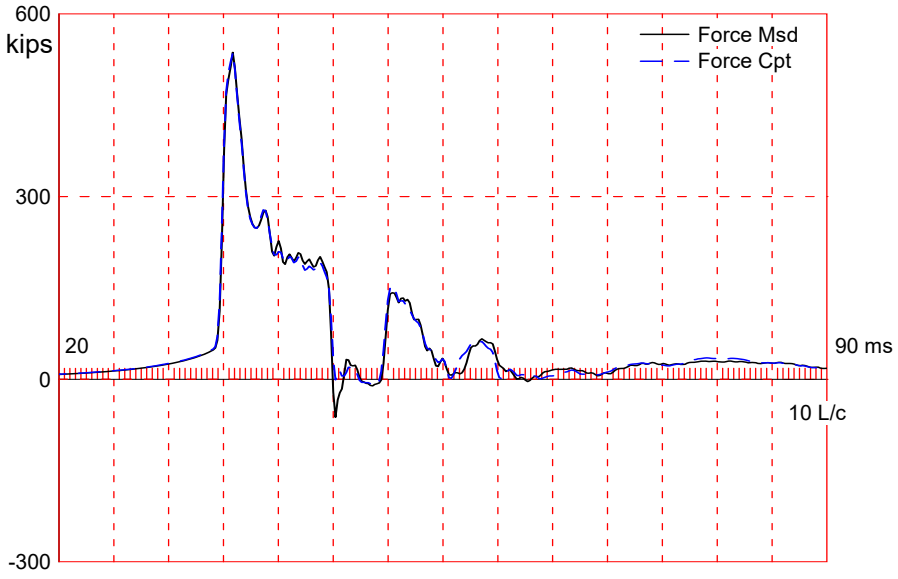
LE	83.67 ft
AR	26.10 in^2
EM	30000.00 ksi
SP	0.492 k/ft3
WS	16807.9 f/s
EA/C	46.6 ksec/ft
2L/C	10.00 ms
JC	0.75 []
LP	78.74 ft

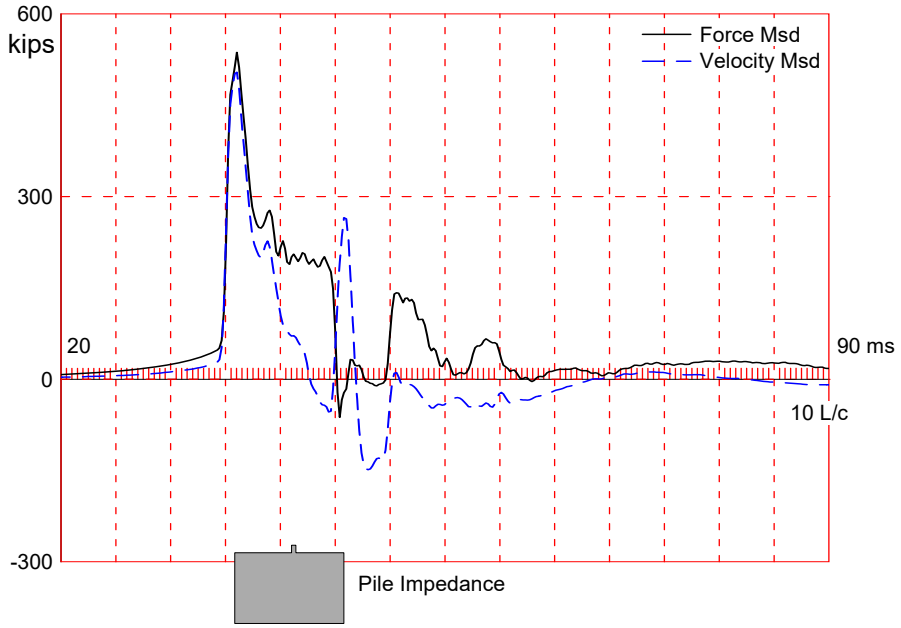
Quantity Results

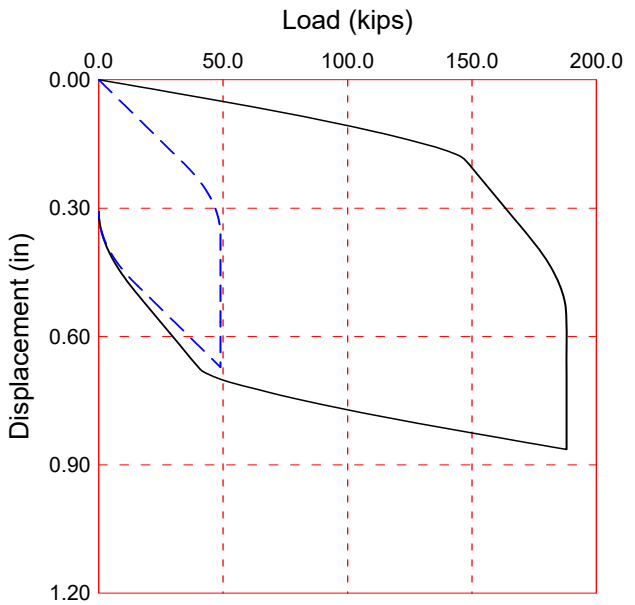
RMX	195 kips
RX8	187 kips
RA2	218 kips
CSX	21.11 ksi
CSB	10.56 ksi
TSX	5.12 ksi
EMX	13.0 k-ft
STK	6.14 ft
BTA	89 (%)

Sensors

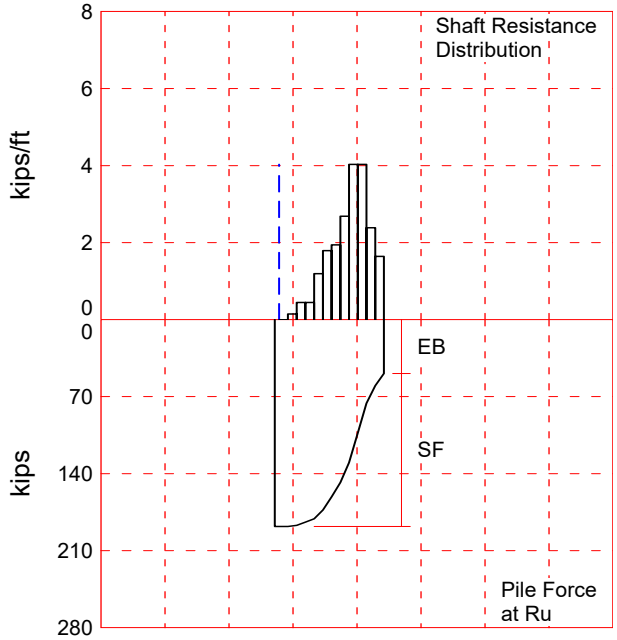
F3: [B095] 96.7 (1)
F4: [K474] 93.2 (1)
A3: [K4281] 360 mv/5000g's (1)
A4: [K5201] 338 mv/5000g's (1)
CLIP: OK







RU =	188.0 kips
SF =	139.0 kips
EB =	49.0 kips
Dy =	0.56 in
Dx =	0.86 in
SET/Bl =	0.31 in



Length b. Sensors	83.7 ft
Embedment	78.0 ft
Top Area	26.1 in^2
End Bearing Area	203.2 in^2
Top Perimeter	4.75 ft
Top E-Modulus	30000 ksi
Top Spec. Weight	492.0 lb/ft^3
Top Wave Spd.	16808 ft/s
Overall W.S.	16768 ft/s
Match Quality	2.21
Top Compr. Stress	20.5 ksi
Max Compr. Stress	21.5 ksi
Max Tension Stress	-3.88 ksi
Avg. Shaft Quake	0.04 in
Toe Quake	0.28 in
Avg. Shaft Smith Dpg.	0.22 s/ft
Toe Smith Damping	0.25 s/ft

About the CAPWAP Results

The CAPWAP program performs a signal matching or reverse analysis based on measurements taken on a deep foundation under an impact load. The program is based on a one-dimensional mathematical model. Under certain conditions, the model only crudely approximates the often complex dynamic situations.

The CAPWAP analysis relies on the input of accurately measured dynamic data plus additional parameters describing pile and soil behavior. If the field measurements of force and velocity are incorrect or were taken under inappropriate conditions (e.g., at an inappropriate time or with too much or too little energy) or if the input pile model is incorrect, then the solution cannot represent the actual soil behavior.

Generally the CAPWAP analysis is used to estimate the axial compressive pile capacity and the soil resistance distribution. The long-term capacity is best evaluated with restrike tests since they incorporate soil strength changes (set-up gains or relaxation losses) that occur after installation. The calculated load settlement graph does not consider creep or long term consolidation settlements. When uplift is a controlling factor in the design, use of the CAPWAP results to assess uplift capacity should be made only after very careful analysis of only good measurement quality, and further used only with longer pile lengths and with nominally higher safety factors.

CAPWAP is also used to evaluate driving stresses along the length of the pile. However, it should be understood that the analysis is one dimensional and does not take into account bending effects or local contact stresses at the pile toe.

Furthermore, if the user of this software was not able to produce a solution with satisfactory signal “match quality” (MQ), then the associated CAPWAP results may be unreliable. There is no absolute scale for solution acceptability but solutions with MQ above 5 are generally considered less reliable than those with lower MQ values and every effort should be made to improve the analysis, for example, by getting help from other independent experts.

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The CAPWAP analysis software is one of many means by which the capacity of a deep foundation can be assessed. The engineer performing the analysis is responsible for proper software application and the analysis results. Pile Dynamics accepts no liability whatsoever of any kind for the analysis solution and/or the application of the analysis result.

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 188.0; along Shaft 139.0; at Toe 49.0 kips

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf	Smith Damping Factor s/ft
				188.0				
1	10.0	4.4	0.0	188.0	0.0	0.00	0.00	0.00
2	16.7	11.1	1.0	187.0	1.0	0.15	0.03	0.22
3	23.4	17.8	3.0	184.0	4.0	0.45	0.09	0.22
4	30.1	24.5	3.0	181.0	7.0	0.45	0.09	0.22
5	36.8	31.1	8.0	173.0	15.0	1.20	0.25	0.22
6	43.5	37.8	12.0	161.0	27.0	1.79	0.38	0.22
7	50.2	44.5	13.0	148.0	40.0	1.94	0.41	0.22
8	56.9	51.2	18.0	130.0	58.0	2.69	0.57	0.22
9	63.6	57.9	27.0	103.0	85.0	4.03	0.85	0.22
10	70.3	64.6	27.0	76.0	112.0	4.03	0.85	0.22
11	77.0	71.3	16.0	60.0	128.0	2.39	0.50	0.22
12	83.7	78.0	11.0	49.0	139.0	1.64	0.35	0.22
Avg. Shaft			11.6			1.78	0.37	0.22
Toe			49.0				34.72	0.25

Soil Model Parameters/Extensions		Shaft	Toe
Quake	(in)	0.04	0.28
Case Damping Factor		0.66	0.26
Damping Type		Viscous	Sm+Visc
Unloading Quake	(% of loading quake)	30	158
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	11	
Resistance Gap (included in Toe Quake)	(in)		0.18

CAPWAP match quality = 2.21 (Wave Up Match) ; RSA = 0
Observed: Final Set = 0.31 in; Blow Count = 39 b/ft
Computed: Final Set = 0.31 in; Blow Count = 39 b/ft

max. Top Comp. Stress = 20.5 ksi (T= 36.2 ms, max= 1.046 x Top)
max. Comp. Stress = 21.5 ksi (Z= 36.8 ft, T= 38.2 ms)
max. Tens. Stress = -3.88 ksi (Z= 73.6 ft, T= 41.8 ms)
max. Energy (EMX) = 12.8 kip-ft; max. Measured Top Displ. (DMX)= 0.55 in

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages ft	max. Force kips	min. Force kips	max. Comp. Stress ksi	max. Tens. Stress ksi	max. Trnsfd. Energy kip-ft	max. Veloc. ft/s	max. Displ. in
1	3.3	535.7	-43.0	20.5	-1.65	12.8	10.8	0.53
2	6.7	536.7	-65.7	20.6	-2.52	12.7	10.8	0.53
4	13.4	539.7	-52.9	20.7	-2.03	12.6	10.7	0.52
6	20.1	541.5	-46.3	20.7	-1.77	12.4	10.6	0.50
8	26.8	537.9	-33.0	20.6	-1.27	12.1	10.5	0.49
9	30.1	544.7	-22.4	20.9	-0.86	12.1	10.3	0.48
10	33.5	542.9	-14.0	20.8	-0.54	11.8	10.1	0.47
11	36.8	560.3	-15.9	21.5	-0.61	11.8	9.8	0.46
12	40.2	536.8	-18.4	20.6	-0.71	11.1	9.7	0.46
13	43.5	542.3	-23.0	20.8	-0.88	11.0	9.6	0.45
14	46.9	512.0	-27.5	19.6	-1.05	10.0	9.5	0.44
15	50.2	524.0	-40.9	20.1	-1.57	10.0	9.2	0.44
16	53.5	496.3	-52.8	19.0	-2.02	8.9	9.0	0.43
17	56.9	512.0	-54.6	19.6	-2.09	8.9	8.6	0.42
18	60.2	475.0	-47.9	18.2	-1.83	7.5	8.3	0.42
19	63.6	489.5	-50.4	18.8	-1.93	7.5	8.0	0.41
20	66.9	429.3	-76.2	16.4	-2.92	5.5	7.9	0.41
21	70.3	437.0	-59.3	16.7	-2.27	5.5	9.1	0.40
22	73.6	350.8	-101.1	13.4	-3.88	3.4	10.5	0.40
23	77.0	304.3	-39.0	11.7	-1.49	3.4	12.0	0.40
24	80.3	178.5	-23.5	6.8	-0.90	2.1	12.8	0.40
25	83.7	118.0	0.0	4.5	0.00	1.2	13.3	0.39
Absolute	36.8			21.5			(T =	38.2 ms)
	73.6				-3.88		(T =	41.8 ms)

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	387.7	321.0	254.2	187.5	120.7	54.0	0.0	0.0	0.0	0.0
RX	395.3	342.9	304.1	280.2	256.6	235.6	216.4	197.4	179.5	162.1
RU	405.5	340.6	275.6	210.7	145.7	80.8	15.8	0.0	0.0	0.0

RAU = 31.0 (kips); RA2 = 216.8 (kips)

Current CAPWAP Ru = 188.0 (kips); Corresponding J(RP)= 0.30; J(RX) = 0.75

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS	KEB
ft/s	ms	kips	kips	kips	in	in	in	kip-ft	kips	kips/in
10.9	36.04	508.8	546.3	546.3	0.55	0.31	0.31	12.9	362.4	490

PILE PROFILE AND PILE MODEL

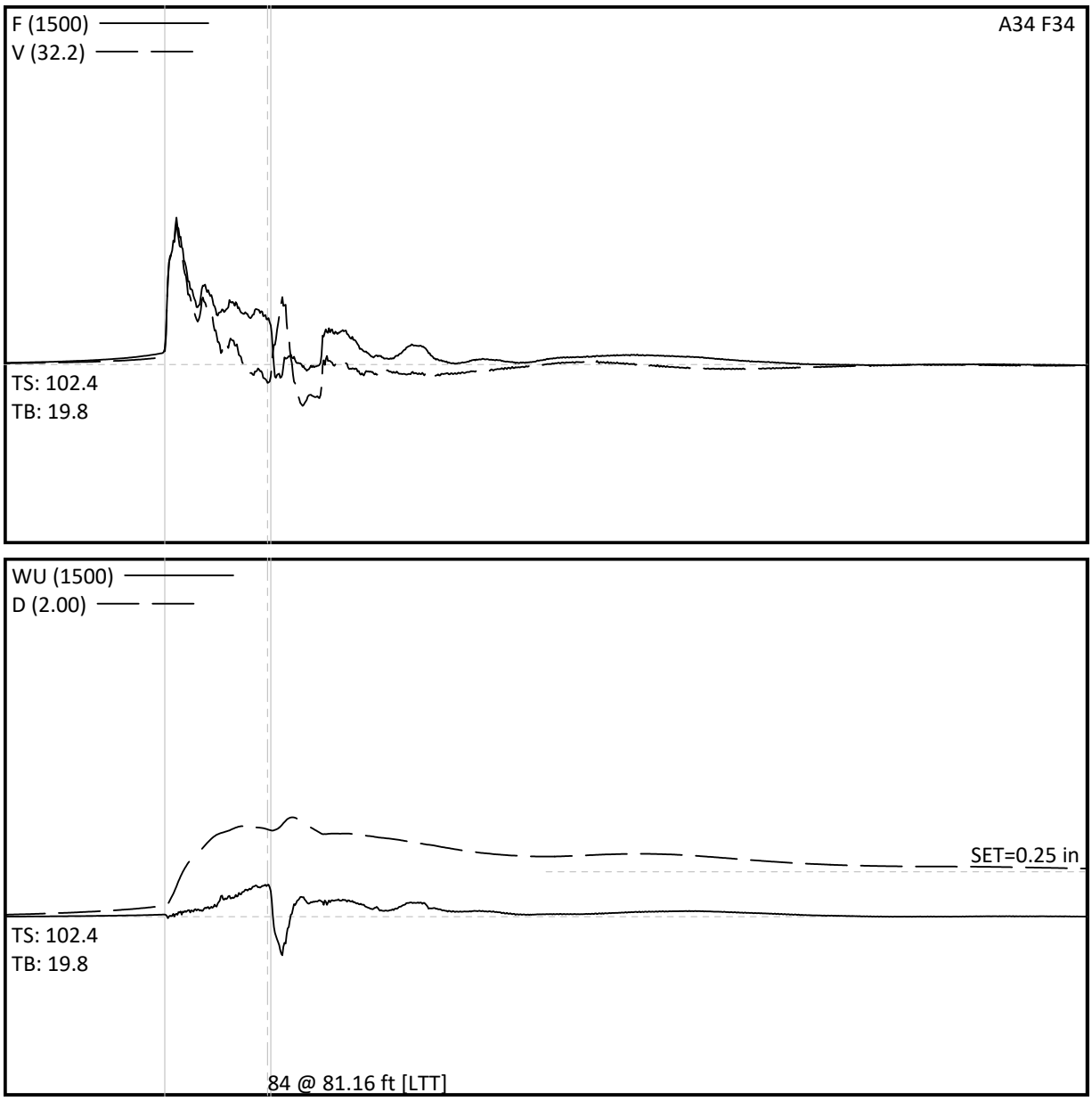
Depth ft	Area in²	E-Modulus ksi	Spec. Weight lb/ft³	Perim. ft
0.0	26.1	30000.0	492.000	4.75
83.7	26.1	30000.0	492.000	4.75

Toe Area 203.2 in²

Segmnt Number	Dist. B.G. ft	Impedance kips/ft/s	Imped. Change %	Tension Slack in	Tension Eff.	Compression Slack in	Compression Eff.	Perim. ft	Wave Speed ft/s
1	3.3	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16807.9
14	46.9	51.59	10.73	0.00	0.000	-0.00	0.000	4.75	16807.9
15	50.2	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16807.9
25	83.7	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16807.9

Wave Speed: Pile Top 16807.9, Elastic 16807.8, Overall 16767.7 ft/s
Pile Damping 1.00 %, Time Incr 0.199 ms, 2L/c 10.0 ms
Total volume: 15.230 ft³; Volume ratio considering added impedance: 1.004

118008 - I10 OVER MOBILE RIVER TP-10A-2 1 DAY RESTRIKE



Project Information

PROJECT: 118008 - I10 OVER MOBILE RIVER
PILE NAME: TP-10A-2 1 DAY RESTRIKE
DESCR: HP 14X89
OPERATOR: AFT
FILE: TP-10A-2 1 DAY RESTRIKE
2/23/2018 9:50:45 AM
Blow Number 4

Pile Properties

LE	83.67 ft
AR	26.10 in^2
EM	30000.00 ksi
SP	0.492 k/ft3
WS	16807.9 f/s
EA/C	46.6 ksec/ft
2L/C	10.00 ms
JC	0.75 []
LP	79.06 ft

Quantity Results

RMX	206 kips
RX8	198 kips
RA2	199 kips
CSX	23.52 ksi
CSB	11.76 ksi
TSX	5.56 ksi
EMX	14.5 k-ft
STK	6.76 ft
BTA	84 (%)

Sensors

F3: [B095] 96.7 (1)
F4: [K474] 93.2 (1)
A3: [K4281] 360 mv/5000g's (1)
A4: [K5201] 338 mv/5000g's (1)
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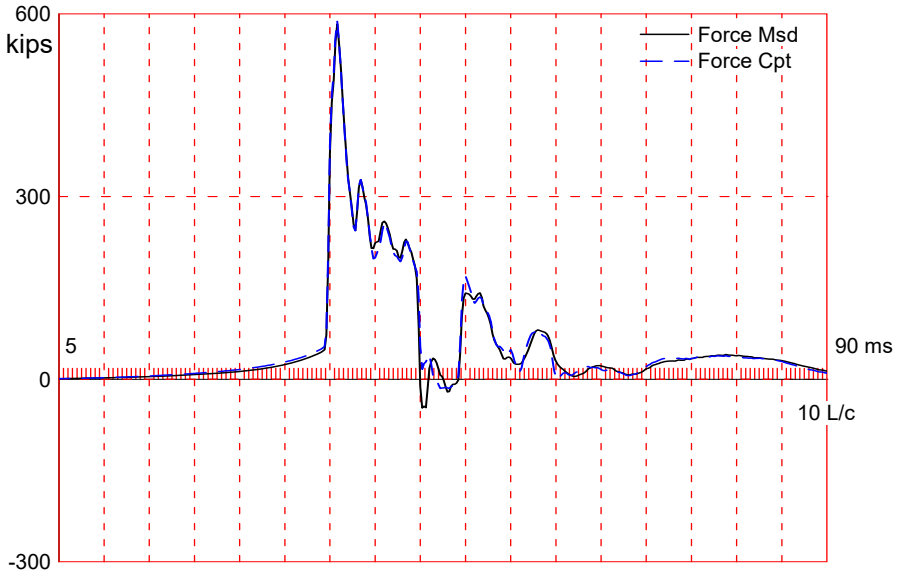
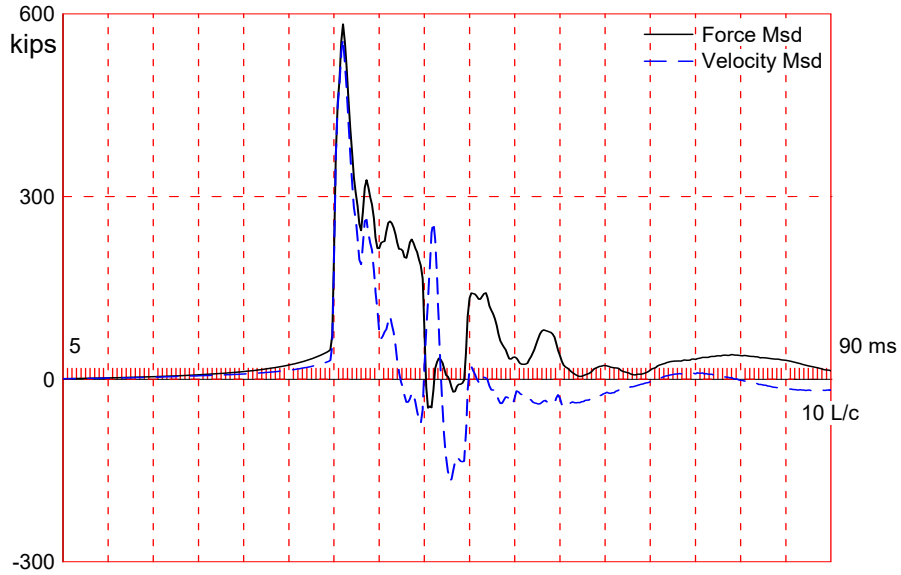
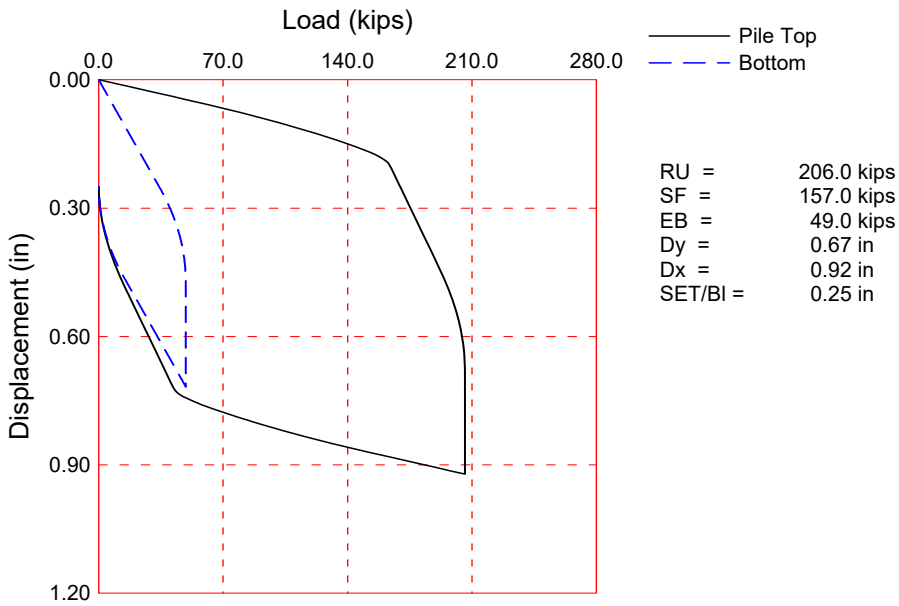
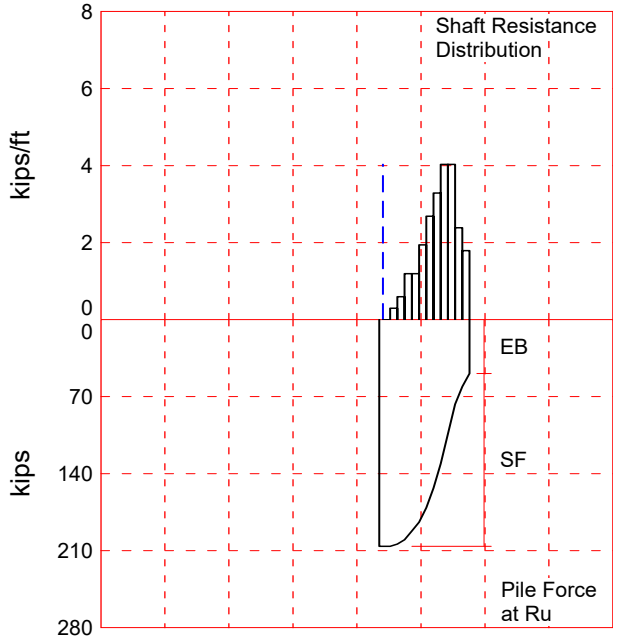






RU =	206.0 kips
SF =	157.0 kips
EB =	49.0 kips
Dy =	0.67 in
Dx =	0.92 in
SET/Bl =	0.25 in



Length b. Sensors	83.7 ft
Embedment	78.1 ft
Top Area	26.1 in^2
End Bearing Area	203.2 in^2
Top Perimeter	4.75 ft
Top E-Modulus	30000 ksi
Top Spec. Weight	492.0 lb/ft^3
Top Wave Spd.	16808 ft/s
Overall W.S.	16734 ft/s
Match Quality	2.63
Top Compr. Stress	22.6 ksi
Max Compr. Stress	23.0 ksi
Max Tension Stress	-3.63 ksi
Avg. Shaft Quake	0.04 in
Toe Quake	0.36 in
Avg. Shaft Smith Dpg.	0.24 s/ft
Toe Smith Damping	0.25 s/ft

About the CAPWAP Results

The CAPWAP program performs a signal matching or reverse analysis based on measurements taken on a deep foundation under an impact load. The program is based on a one-dimensional mathematical model. Under certain conditions, the model only crudely approximates the often complex dynamic situations.

The CAPWAP analysis relies on the input of accurately measured dynamic data plus additional parameters describing pile and soil behavior. If the field measurements of force and velocity are incorrect or were taken under inappropriate conditions (e.g., at an inappropriate time or with too much or too little energy) or if the input pile model is incorrect, then the solution cannot represent the actual soil behavior.

Generally the CAPWAP analysis is used to estimate the axial compressive pile capacity and the soil resistance distribution. The long-term capacity is best evaluated with restrike tests since they incorporate soil strength changes (set-up gains or relaxation losses) that occur after installation. The calculated load settlement graph does not consider creep or long term consolidation settlements. When uplift is a controlling factor in the design, use of the CAPWAP results to assess uplift capacity should be made only after very careful analysis of only good measurement quality, and further used only with longer pile lengths and with nominally higher safety factors.

CAPWAP is also used to evaluate driving stresses along the length of the pile. However, it should be understood that the analysis is one dimensional and does not take into account bending effects or local contact stresses at the pile toe.

Furthermore, if the user of this software was not able to produce a solution with satisfactory signal “match quality” (MQ), then the associated CAPWAP results may be unreliable. There is no absolute scale for solution acceptability but solutions with MQ above 5 are generally considered less reliable than those with lower MQ values and every effort should be made to improve the analysis, for example, by getting help from other independent experts.

Considering the CAPWAP model limitations, the nature of the input parameters, the complexity of the analysis procedure, and the need for a responsible application of the results to actual construction projects, it is recommended that at least one static load test be performed on sites where little experience exists with dynamic behavior of the soil resistance or when the experience of the analyzing engineer with both program use and result application is limited.

Finally, the CAPWAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of structure and other factors. The CAPWAP results should be reviewed by the Engineer of Record with consideration of applicable geotechnical conditions including, but not limited to, group effects, potential settlement from underlying compressible layers, soil resistances provided from any layers unsuitable for long term support, as well as effective stress changes due to soil surcharges, excavation or change in water table elevation.

The CAPWAP analysis software is one of many means by which the capacity of a deep foundation can be assessed. The engineer performing the analysis is responsible for proper software application and the analysis results. Pile Dynamics accepts no liability whatsoever of any kind for the analysis solution and/or the application of the analysis result.

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 206.0; along Shaft 157.0; at Toe 49.0 kips

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf	Smith Damping Factor s/ft
				206.0				
1	10.0	4.4	0.0	206.0	0.0	0.00	0.00	0.00
2	16.7	11.1	2.0	204.0	2.0	0.30	0.06	0.24
3	23.4	17.8	4.0	200.0	6.0	0.60	0.13	0.24
4	30.1	24.5	8.0	192.0	14.0	1.20	0.25	0.24
5	36.8	31.2	8.0	184.0	22.0	1.20	0.25	0.24
6	43.5	37.9	13.0	171.0	35.0	1.94	0.41	0.24
7	50.2	44.6	18.0	153.0	53.0	2.69	0.57	0.24
8	56.9	51.3	22.0	131.0	75.0	3.29	0.69	0.24
9	63.6	58.0	27.0	104.0	102.0	4.03	0.85	0.24
10	70.3	64.7	27.0	77.0	129.0	4.03	0.85	0.24
11	77.0	71.4	16.0	61.0	145.0	2.39	0.50	0.24
12	83.7	78.1	12.0	49.0	157.0	1.79	0.38	0.24
Avg. Shaft			13.1			2.01	0.42	0.24
Toe			49.0				34.72	0.25

Soil Model Parameters/Extensions		Shaft	Toe
Quake	(in)	0.04	0.36
Case Damping Factor		0.81	0.26
Damping Type		Viscous	Sm+Visc
Unloading Quake	(% of loading quake)	66	142
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	2	
Resistance Gap (included in Toe Quake)	(in)		0.20

CAPWAP match quality = 2.63 (Wave Up Match) ; RSA = 0
Observed: Final Set = 0.25 in; Blow Count = 48 b/ft
Computed: Final Set = 0.25 in; Blow Count = 48 b/ft

max. Top Comp. Stress = 22.6 ksi (T= 36.2 ms, max= 1.020 x Top)
max. Comp. Stress = 23.0 ksi (Z= 23.4 ft, T= 37.4 ms)
max. Tens. Stress = -3.63 ksi (Z= 73.6 ft, T= 42.0 ms)
max. Energy (EMX) = 14.3 kip-ft; max. Measured Top Displ. (DMX)= 0.55 in

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages ft	max. Force kips	min. Force kips	max. Comp. Stress ksi	max. Tens. Stress ksi	max. Trnsfd. Energy kip-ft	max. Veloc. ft/s	max. Displ. in
1	3.3	588.6	-28.4	22.6	-1.09	14.3	11.9	0.52
2	6.7	589.4	-51.6	22.6	-1.98	14.2	11.9	0.52
4	13.4	593.4	-26.6	22.7	-1.02	14.0	11.8	0.50
6	20.1	592.9	-9.2	22.7	-0.35	13.8	11.6	0.49
8	26.8	590.1	-20.8	22.6	-0.80	13.4	11.3	0.48
9	30.1	598.5	-22.5	22.9	-0.86	13.3	11.1	0.47
10	33.5	574.2	-12.8	22.0	-0.49	12.6	11.0	0.46
11	36.8	585.8	-21.3	22.4	-0.82	12.5	10.7	0.46
12	40.2	565.0	-19.7	21.6	-0.75	11.8	10.5	0.45
13	43.5	580.0	-21.9	22.2	-0.84	11.8	10.2	0.44
14	46.9	545.9	-24.4	20.9	-0.93	10.6	10.0	0.44
15	50.2	563.1	-27.8	21.6	-1.06	10.6	9.6	0.43
16	53.5	516.9	-42.8	19.8	-1.64	9.1	9.3	0.42
17	56.9	535.9	-54.3	20.5	-2.08	9.1	8.9	0.42
18	60.2	482.6	-48.8	18.5	-1.87	7.3	8.6	0.41
19	63.6	500.7	-49.6	19.2	-1.90	7.3	8.2	0.41
20	66.9	435.2	-86.9	16.7	-3.33	5.3	7.9	0.40
21	70.3	447.7	-67.7	17.2	-2.59	5.2	8.5	0.40
22	73.6	369.2	-94.6	14.1	-3.63	3.2	10.1	0.39
23	77.0	303.9	-46.6	11.6	-1.79	3.2	11.5	0.39
24	80.3	188.3	-32.5	7.2	-1.25	1.8	12.6	0.39
25	83.7	95.3	0.0	3.7	0.00	0.7	13.3	0.39
Absolute	23.4			23.0			(T =	37.4 ms)
	73.6				-3.63		(T =	42.0 ms)

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	440.3	364.0	287.7	211.4	135.1	58.8	0.0	0.0	0.0	0.0
RX	441.3	380.1	332.8	295.7	269.4	247.8	230.3	214.1	197.8	181.6
RU	469.5	396.2	322.8	249.4	176.0	102.6	29.2	0.0	0.0	0.0

RAU = 44.2 (kips); RA2 = 198.9 (kips)

Current CAPWAP Ru = 206.0 (kips); Corresponding J(RP)= 0.31; J(RX) = 0.75

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS	KEB
ft/s	ms	kips	kips	kips	in	in	in	kip-ft	kips	kips/in
12.7	36.00	589.5	613.9	613.9	0.55	0.23	0.25	14.5	432.1	306

PILE PROFILE AND PILE MODEL

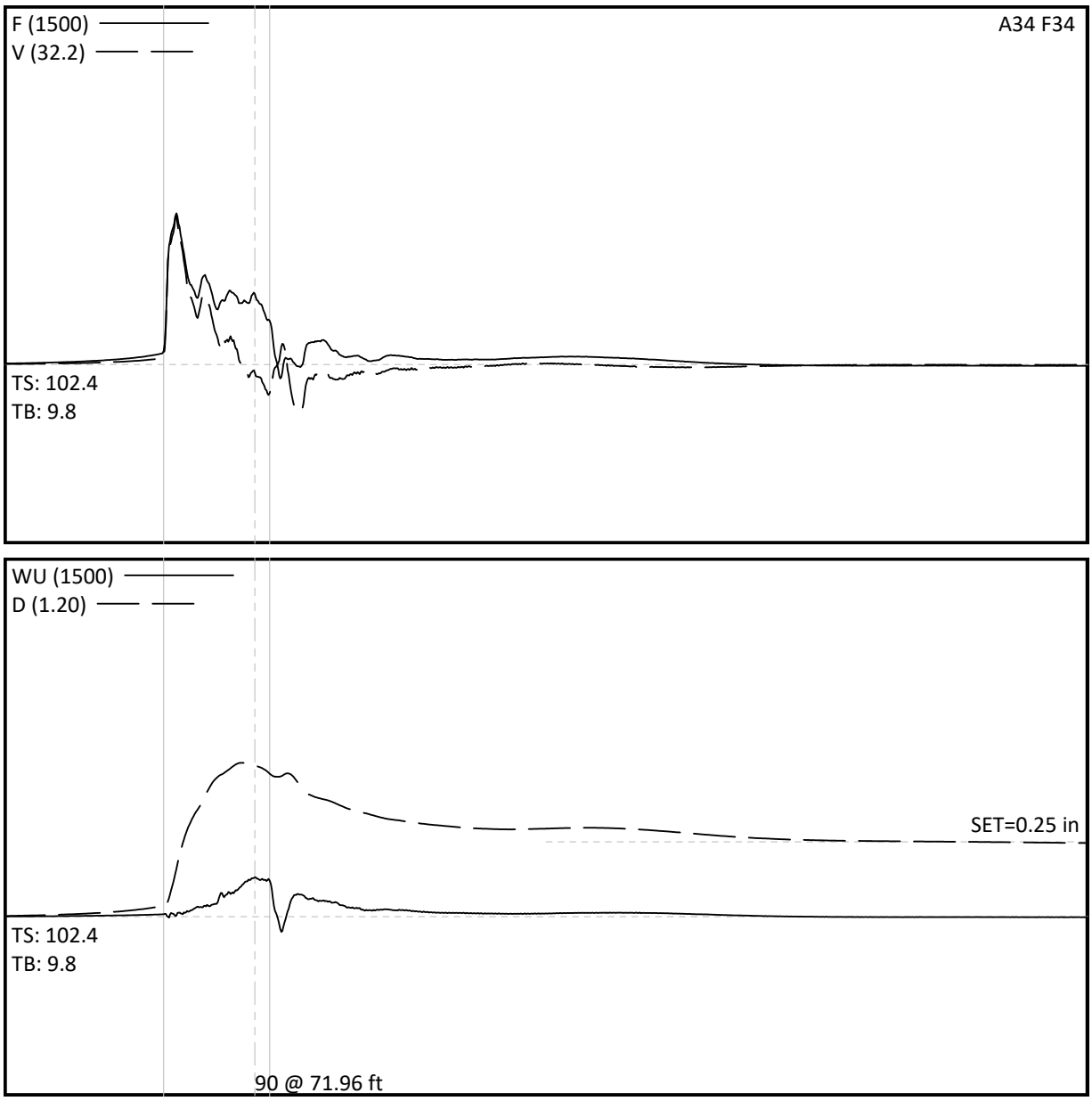
Depth ft	Area in^2	E-Modulus ksi	Spec. Weight lb/ft^3	Perim. ft
0.0	26.1	30000.0	492.000	4.75
83.7	26.1	30000.0	492.000	4.75

Toe Area 203.2 in^2

Top Segment Length 3.35 ft, Top Impedance 47 kips/ft/s

Wave Speed: Pile Top 16807.9, Elastic 16807.9, Overall 16734.0 ft/s
Pile Damping 1.00 %, Time Incr 0.200 ms, 2L/c 10.0 ms
Total volume: 15.165 ft^3; Volume ratio considering added impedance: 1.000

I-10 OVER MOBILE RIVER TP-10A-2 7 DAY RESTRIKE



Project Information

PROJECT: I-10 OVER MOBILE RIVER
PILE NAME: TP-10A-2 7 DAY RESTRIKE
DESCR: HP14x89
OPERATOR: AFT
FILE: TP-10A2 7 DAY RS ana
3/1/2018 11:31:52 AM
Blow Number 2

Pile Properties

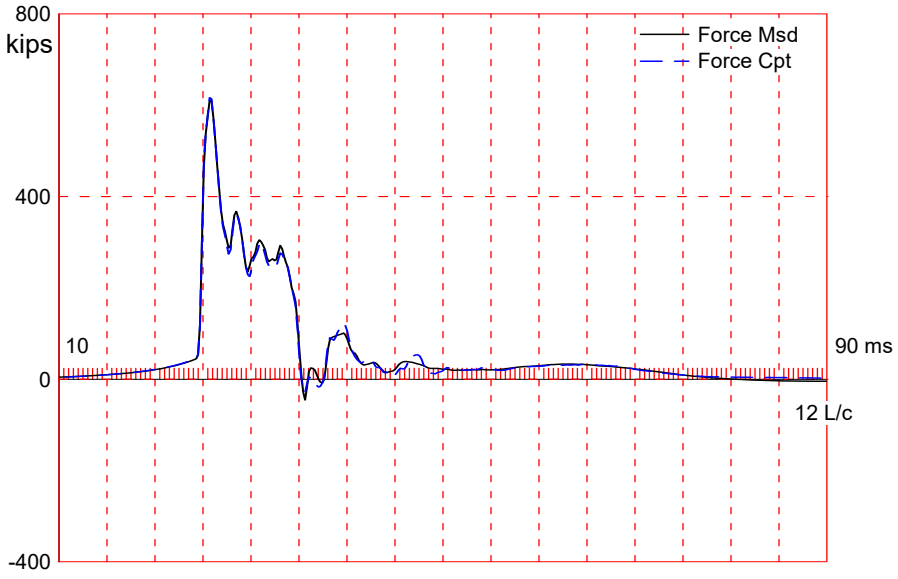
LE	83.67 ft
AR	26.10 in^2
EM	30000.00 ksi
SP	0.492 k/ft3
WS	16807.9 f/s
EA/C	46.6 ksec/ft
2L/C	10.00 ms
JC	0.75 []
LP	78.54 ft

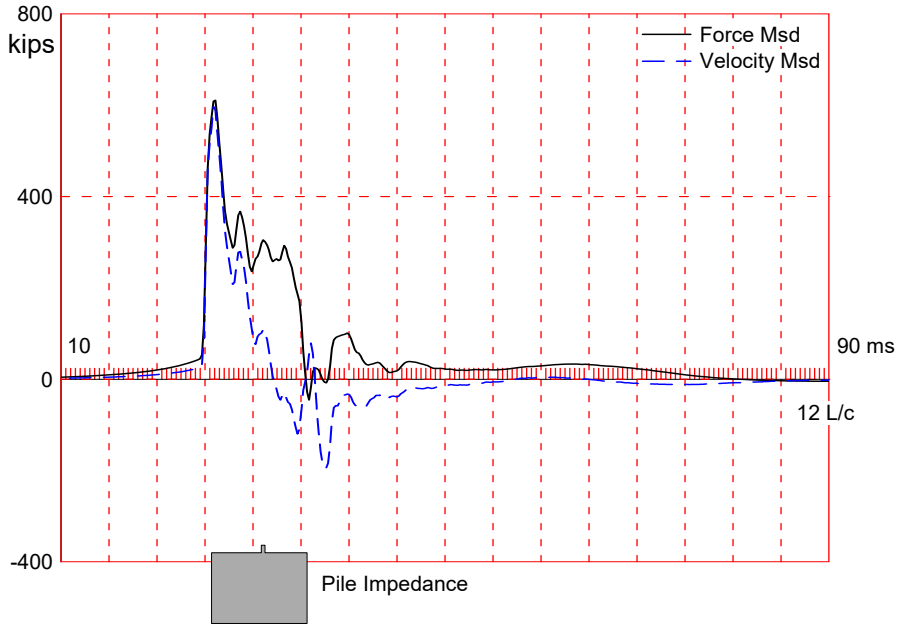
Quantity Results

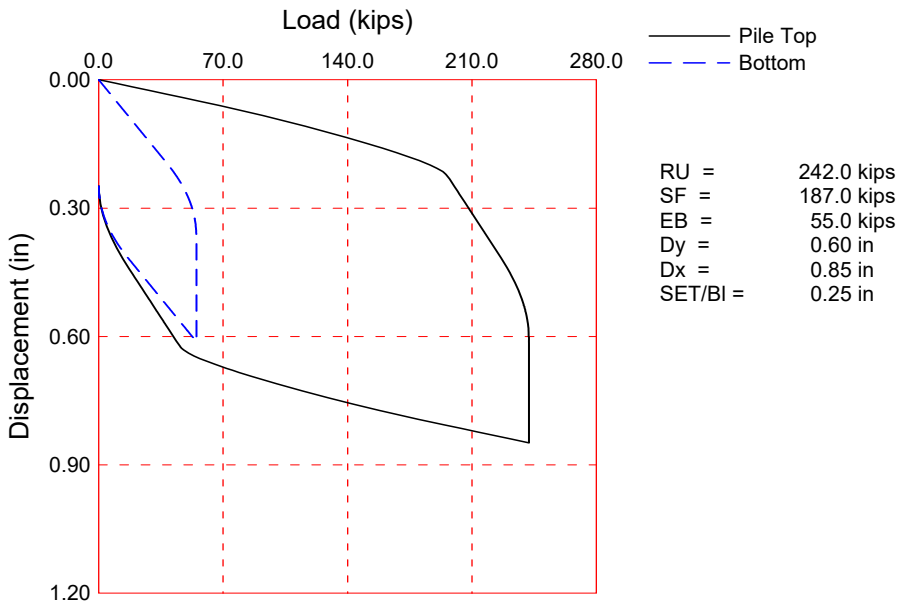
RMX	243 kips
RX8	232 kips
RA2	237 kips
CSX	24.19 ksi
CSB	15.43 ksi
TSX	3.01 ksi
EMX	17.1 k-ft
STK	7.46 ft
BTA	90 (%)

Sensors

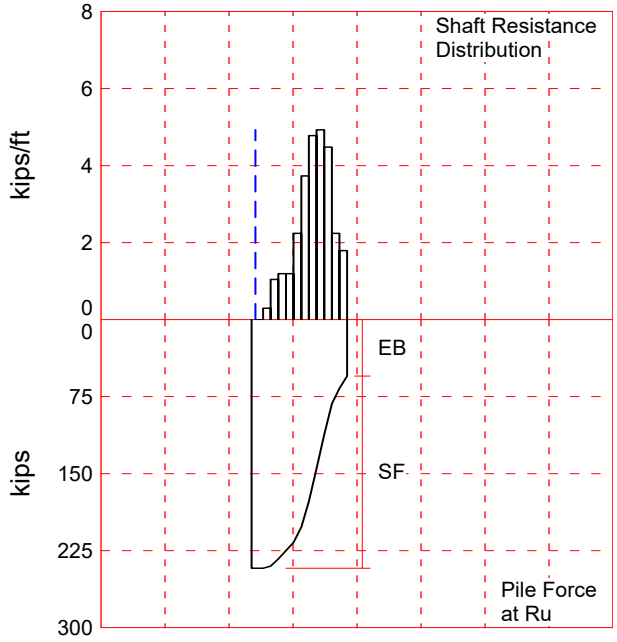
F3: [P454] 145.3 (1)
F4: [P455] 145.8 (1)
A3: [K5647] 334 mv/5000g's (1)
A4: [K5362] 346 mv/5000g's (1)
CLIP: OK







RU =	242.0 kips
SF =	187.0 kips
EB =	55.0 kips
Dy =	0.60 in
Dx =	0.85 in
SET/Bl =	0.25 in



Length b. Sensors	83.7 ft
Embedment	78.5 ft
Top Area	26.1 in^2
End Bearing Area	203.2 in^2
Top Perimeter	4.75 ft
Top E-Modulus	30000 ksi
Top Spec. Weight	492.0 lb/ft^3
Top Wave Spd.	16808 ft/s
Overall W.S.	16705 ft/s
Match Quality	1.77
Top Compr. Stress	23.7 ksi
Max Compr. Stress	24.4 ksi
Max Tension Stress	-3.32 ksi
Avg. Shaft Quake	0.04 in
Toe Quake	0.28 in
Avg. Shaft Smith Dpg.	0.25 s/ft
Toe Smith Damping	0.11 s/ft

About the CAPWAP Results

The CAPWAP program performs a signal matching or reverse analysis based on measurements taken on a deep foundation under an impact load. The program is based on a one-dimensional mathematical model. Under certain conditions, the model only crudely approximates the often complex dynamic situations.

The CAPWAP analysis relies on the input of accurately measured dynamic data plus additional parameters describing pile and soil behavior. If the field measurements of force and velocity are incorrect or were taken under inappropriate conditions (e.g., at an inappropriate time or with too much or too little energy) or if the input pile model is incorrect, then the solution cannot represent the actual soil behavior.

Generally the CAPWAP analysis is used to estimate the axial compressive pile capacity and the soil resistance distribution. The long-term capacity is best evaluated with restrike tests since they incorporate soil strength changes (set-up gains or relaxation losses) that occur after installation. The calculated load settlement graph does not consider creep or long term consolidation settlements. When uplift is a controlling factor in the design, use of the CAPWAP results to assess uplift capacity should be made only after very careful analysis of only good measurement quality, and further used only with longer pile lengths and with nominally higher safety factors.

CAPWAP is also used to evaluate driving stresses along the length of the pile. However, it should be understood that the analysis is one dimensional and does not take into account bending effects or local contact stresses at the pile toe.

Furthermore, if the user of this software was not able to produce a solution with satisfactory signal “match quality” (MQ), then the associated CAPWAP results may be unreliable. There is no absolute scale for solution acceptability but solutions with MQ above 5 are generally considered less reliable than those with lower MQ values and every effort should be made to improve the analysis, for example, by getting help from other independent experts.

Considering the CAPWAP model limitations, the nature of the input parameters, the complexity of the analysis procedure, and the need for a responsible application of the results to actual construction projects, it is recommended that at least one static load test be performed on sites where little experience exists with dynamic behavior of the soil resistance or when the experience of the analyzing engineer with both program use and result application is limited.

Finally, the CAPWAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of structure and other factors. The CAPWAP results should be reviewed by the Engineer of Record with consideration of applicable geotechnical conditions including, but not limited to, group effects, potential settlement from underlying compressible layers, soil resistances provided from any layers unsuitable for long term support, as well as effective stress changes due to soil surcharges, excavation or change in water table elevation.

The CAPWAP analysis software is one of many means by which the capacity of a deep foundation can be assessed. The engineer performing the analysis is responsible for proper software application and the analysis results. Pile Dynamics accepts no liability whatsoever of any kind for the analysis solution and/or the application of the analysis result.

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 242.0; along Shaft 187.0; at Toe 55.0 kips

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf	Smith Damping Factor s/ft
				242.0				
1	10.0	4.9	0.0	242.0	0.0	0.00	0.00	0.00
2	16.7	11.6	2.0	240.0	2.0	0.30	0.06	0.25
3	23.4	18.3	7.0	233.0	9.0	1.05	0.22	0.25
4	30.1	25.0	8.0	225.0	17.0	1.20	0.25	0.25
5	36.8	31.7	8.0	217.0	25.0	1.20	0.25	0.25
6	43.5	38.4	15.0	202.0	40.0	2.24	0.47	0.25
7	50.2	45.1	25.0	177.0	65.0	3.73	0.79	0.25
8	56.9	51.8	32.0	145.0	97.0	4.78	1.01	0.25
9	63.6	58.5	33.0	112.0	130.0	4.93	1.04	0.25
10	70.3	65.2	30.0	82.0	160.0	4.48	0.94	0.25
11	77.0	71.8	15.0	67.0	175.0	2.24	0.47	0.25
12	83.7	78.5	12.0	55.0	187.0	1.79	0.38	0.25
Avg. Shaft			15.6			2.38	0.50	0.25
Toe			55.0				38.97	0.11

Soil Model Parameters/Extensions		Shaft	Toe
Quake	(in)	0.04	0.28
Case Damping Factor		1.00	0.13
Damping Type		Viscous	Sm+Visc
Unloading Quake	(% of loading quake)	30	92
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	0	
Resistance Gap (included in Toe Quake)	(in)		0.13
Soil Plug Weight	(kips)		0.000

CAPWAP match quality = 1.77 (Wave Up Match) ; RSA = 0
Observed: Final Set = 0.25 in; Blow Count = 48 b/ft
Computed: Final Set = 0.25 in; Blow Count = 48 b/ft

max. Top Comp. Stress = 23.7 ksi (T= 26.1 ms, max= 1.033 x Top)
max. Comp. Stress = 24.4 ksi (Z= 23.4 ft, T= 27.5 ms)
max. Tens. Stress = -3.32 ksi (Z= 73.6 ft, T= 31.7 ms)
max. Energy (EMX) = 16.9 kip-ft; max. Measured Top Displ. (DMX)= 0.51 in

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages ft	max. Force kips	min. Force kips	max. Comp. Stress ksi	max. Tens. Stress ksi	max. Trnsfd. Energy kip-ft	max. Veloc. ft/s	max. Displ. in
1	3.3	617.5	-47.6	23.7	-1.82	16.9	12.6	0.51
2	6.7	618.1	-27.5	23.7	-1.05	16.7	12.6	0.50
4	13.4	622.8	-29.9	23.9	-1.14	16.4	12.5	0.49
6	20.1	627.9	-12.8	24.1	-0.49	16.1	12.2	0.48
8	26.8	615.1	-36.4	23.6	-1.40	15.3	11.8	0.47
9	30.1	624.7	-46.7	23.9	-1.79	15.2	11.7	0.46
10	33.5	602.7	-42.6	23.1	-1.63	14.4	11.5	0.45
11	36.8	630.0	-41.4	24.1	-1.59	14.3	11.1	0.44
12	40.2	601.7	-42.7	23.1	-1.64	13.5	10.8	0.43
13	43.5	621.2	-49.3	23.8	-1.89	13.5	10.5	0.43
14	46.9	582.4	-57.7	22.3	-2.21	12.2	10.2	0.42
15	50.2	608.4	-60.2	23.3	-2.31	12.1	9.7	0.41
16	53.5	543.9	-48.0	20.8	-1.84	10.1	9.2	0.40
17	56.9	568.3	-46.3	21.8	-1.77	10.1	8.8	0.40
18	60.2	487.8	-42.0	18.7	-1.61	7.7	8.3	0.39
19	63.6	508.4	-52.1	19.5	-2.00	7.7	7.9	0.39
20	66.9	428.3	-66.1	16.4	-2.53	5.3	7.5	0.38
21	70.3	439.2	-50.4	16.8	-1.93	5.3	8.3	0.38
22	73.6	351.8	-86.7	13.5	-3.32	3.1	10.0	0.37
23	77.0	303.4	-34.5	11.6	-1.32	3.1	11.3	0.37
24	80.3	207.1	-7.5	7.9	-0.29	1.9	12.1	0.37
25	83.7	98.3	0.0	3.8	0.00	1.0	12.6	0.36
Absolute	23.4			24.4			(T =	27.5 ms)
	73.6				-3.32		(T =	31.7 ms)

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	561.1	493.8	426.5	359.2	291.9	224.6	157.3	89.9	22.6	0.0
RX	561.1	493.8	432.2	383.9	345.3	309.5	279.5	253.9	230.5	209.5
RU	611.0	548.7	486.4	424.1	361.8	299.5	237.1	174.8	112.5	50.2

RAU = 56.8 (kips); RA2 = 245.3 (kips)

Current CAPWAP Ru = 242.0 (kips); Corresponding J(RP)= 0.47; J(RX) = 0.75

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS	KEB
ft/s	ms	kips	kips	kips	in	in	in	kip-ft	kips	kips/in
13.1	25.89	610.9	623.2	623.2	0.51	0.24	0.25	17.0	533.8	375

PILE PROFILE AND PILE MODEL

Depth ft	Area in^2	E-Modulus ksi	Spec. Weight lb/ft^3	Perim. ft
0.0	26.1	30000.0	492.000	4.75
83.7	26.1	30000.0	492.000	4.75

Toe Area 203.2 in^2

Segmnt Number	Dist. B.G. ft	Impedance kips/ft/s	Imped. Change %	Tension Slack in	Tension Eff.	Compression Slack in	Compression Eff.	Perim. ft	Wave Speed ft/s
1	3.3	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16807.9
14	46.9	51.59	10.73	0.00	0.000	-0.00	0.000	4.75	16807.9
15	50.2	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16807.9
25	83.7	46.59	0.00	0.00	0.000	-0.00	0.000	4.75	16807.9

Wave Speed: Pile Top 16807.9, Elastic 16807.8, Overall 16704.9 ft/s
Pile Damping 1.00 %, Time Incr 0.199 ms, 2L/c 10.0 ms
Total volume: 15.230 ft^3; Volume ratio considering added impedance: 1.004

Appendix D

Axial Compressive Static Load Testing Graphical Results
TP-10A-1

I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

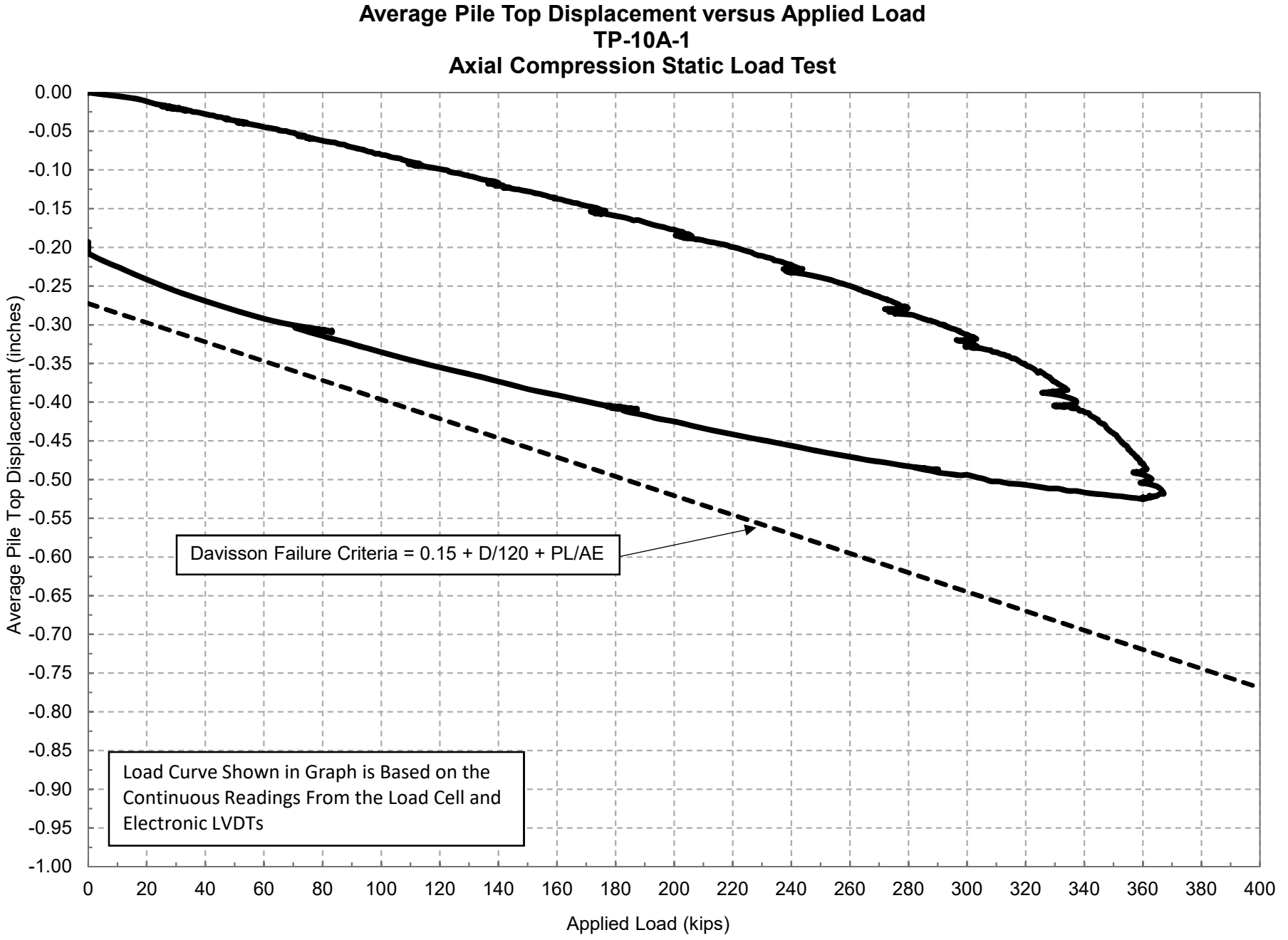


Figure 1

Applied Foundation Testing, Inc.

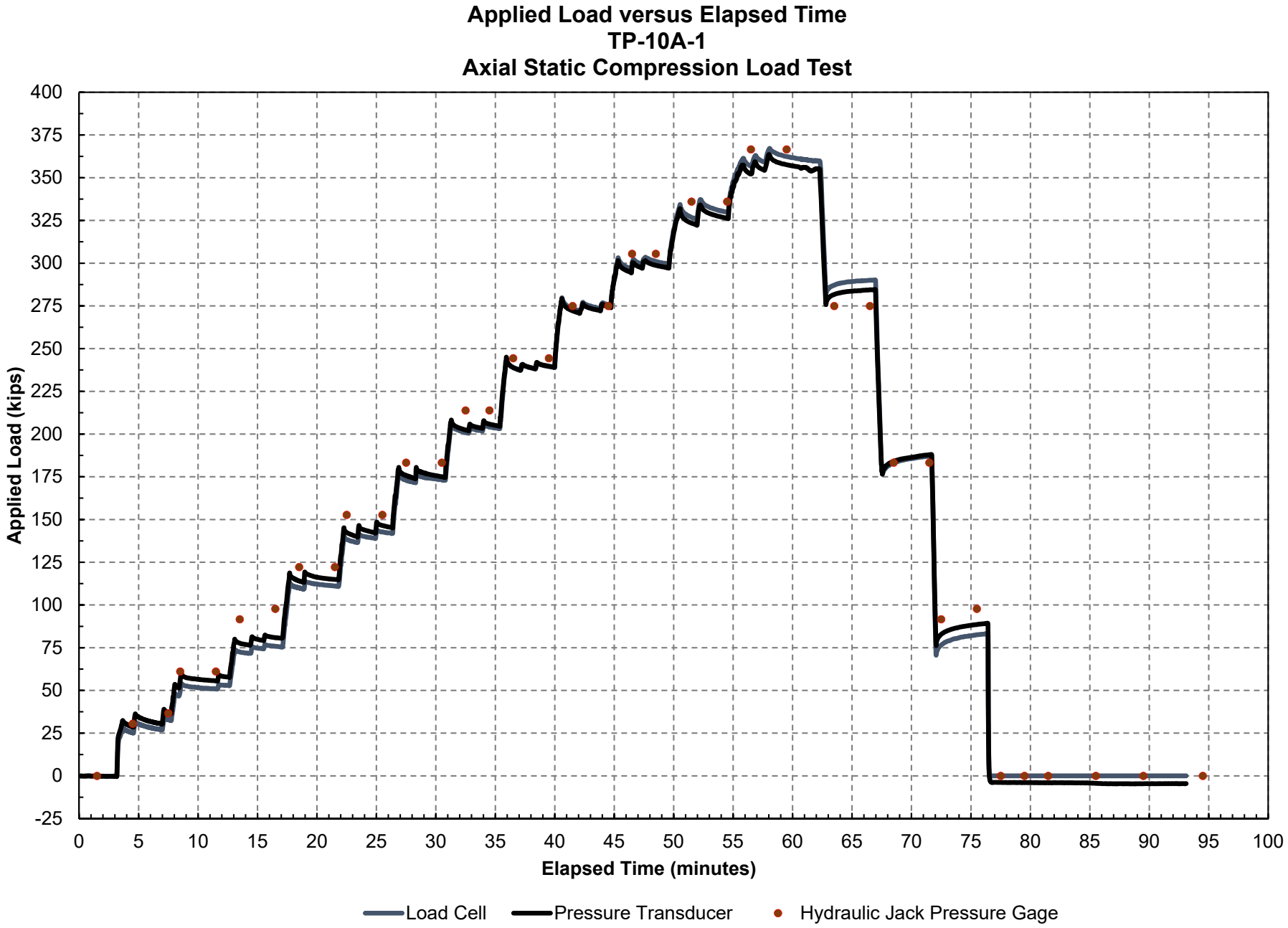

Applied Load versus Elapsed Time
TP-10A-1
Axial Static Compression Load Test
Applied Load (kips)
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0
-25
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
Elapsed Time (minutes)
Load Cell
Pressure Transducer
Hydraulic Jack Pressure Gage

Figure 2

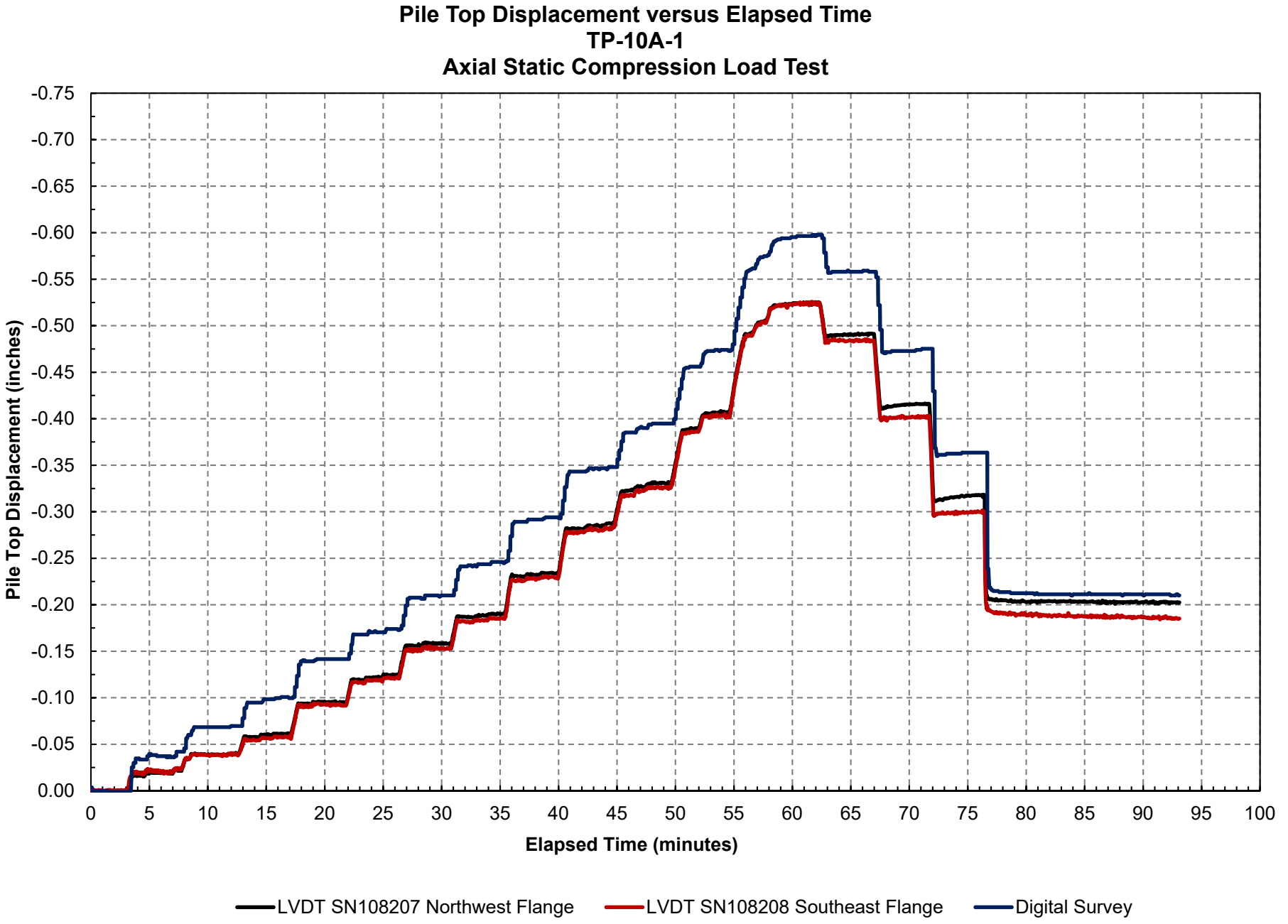


Figure 3

Applied Foundation Testing, Inc.

Appendix E

Relevant Project Documents
TP-10A-1 and TP-10A-2

I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

REFERENCE PROJECT NO.	FISCAL YEAR	SHEET NO.
IM-1010(341)	2018	2

GENERAL PROJECT NOTES

200 THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS DIRECTLY TO THE MATERIALS AND TESTS ENGINEER OF ALL RAPID LOAD TESTS, SHAFT LOAD TESTS AND STATIC LOAD TESTS FOR APPROVAL.

201 THE CONTRACTOR SHALL PROVIDE REPORTS TO THE MATERIALS AND TESTS ENGINEER OF ALL STATIC LOAD TESTS, RAPID LOAD TESTS AND DYNAMIC TESTS, PREPARED BY SPECIALTY ENGINEERING FIRMS.

202 THE CONTRACTOR SHALL SUBMIT AN INSTALLATION PLAN FOR REVIEW AND APPROVAL FOR ALL TEST PILES IN THIS PROJECT.

301 LOCATION TP-10:

ALL FOUR TEST PILES SHALL BE IMPACT DRIVEN WITH PDA MONITORING TO PLANNED TIP ELEVATION OR TO REFUSAL, WHICHEVER COMES FIRST (NO JETTING).
CONTRACTOR SHALL PLAN TO RESTRIKE MEASUREMENT ON EACH PILE FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS AT APPROXIMATELY 1 DAY AFTER INITIAL DRIVE.
CONTRACTOR SHALL PLAN FOR RESTRIKE MEASUREMENT ON PILES TP-10A-1 AND TP-10B-1 FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS AT APPROXIMATELY 7 DAYS AFTER INITIAL DRIVE.
CONTRACTOR SHALL PERFORM STATIC LOAD TEST ON PILES TP-10A-2 AND TP-10B-2 IN ACCORDANCE WITH APPLICABLE SPECIAL PROVISIONS
CONTRACTOR SHALL PLAN FOR RESTRIKE MEASUREMENT ON PILES TP-10A-2 AND TP-10B-2 FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS WITHIN 7 DAYS AFTER STATIC LOAD TEST.

302 LOCATION TP-WPA STEEL PIPE PILE:

PILE MAY BE INSTALLED WITH ONE SPLICE, AND FINAL PIECE SHALL NOT BE LESS THAN 75 FT IN LENGTH.

VIBRATORY HAMMER MAY BE USED TO INSTALL FIRST PIECE, AFTER SPLICING THE PILE SHALL BE DRIVEN TO THE TARGET TIP ELEVATION USING IMPACT HAMMER.

CONTRACTOR TO PROVIDE HAMMER SUFFICIENT TO DRIVE PILE TO TIP WITH WAVE EQUATION ANALYSIS PER ALDOT SPECS, WITH TARGETED DRIVING RESISTANCE AT END OF INITIAL DRIVE NOT MORE THAN 10 BLOWS PER INCH.

DYNAMIC MONITORING OF PILE USING PDA DURING INSTALLATION AFTER SPLICE, WITH SIGNAL MATCHING ANALYSIS ON SELECTED BLOWS NEAR END OF INITIAL DRIVE.

RAPID LOAD TEST OF PILE USING 19MN RAPID LOAD TEST DEVICE BETWEEN 10 AND 21 DAYS AFTER INITIAL DRIVE.

RESTRIKE BLOWS FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS WITHIN ONE WEEK AFTER COMPLETION OF RAPID LOAD TEST (RLT).

303 LOCATION TP-WPB DRILLED SHAFT:

CONTRACTOR TO PERFORM LATERAL RAPID LOAD TESTS USING RAPD LOAD TEST DEVICE AFTER COMPLETION OF AXIAL LOAD TEST(S); LATERAL RLT SHALL BE CAPABLE TO APPLY A LATERAL FORCE OF AT LEAST 1000 KIPS. LATERAL RLT SHALL BE PERFORMED IN FOUR PROGRESSIVELY LARGER INCREMENTS UP TO MAXIMUM FORCE.

LATERAL RLT SHALL INCLUDE MEASUREMENTS OF FORCE AND TOP OF SHAFT DISPLACEMENT AND OF DISPLACEMENT AT NOT LESS THAN 6 ELEVATIONS BELOW TOP OF SHAFT.

TEST SHAFT SHALL BE CONSTRUCTED USING POLYMER BASED DRILLING FLUIDS, WITH ON-SITE SUPPORT FROM FLUID SUPPLIER.

304 LOCATION TP-04:

JETTING OF TP-04 ALLOWED (BUT NOT REQUIRED) TO ELEVATION -70FT
PILE SHALL BE IMPACT DRIVEN WITH PDA MONITORING TO TIP ELEVATION -110FT OR TO REFUSAL, WHICHEVER COMES FIRST
CONTRACTOR SHALL PLAN FOR UP TO TWO RESTRIKE MEASUREMENTS ON THIS PILE AT APPROXIMATELY 1 DAY AND 14 DAYS AFTER INITIAL DRIVE FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS.

305 LOCATION TP-23:

JETTING OF TP-23A SHOULD BE PERFORMED TO ELEVATION -100FT
JETTING OF TP-23B AND TP-23C ALLOWED (BUT NOT REQUIRED) TO ELEVATION -70FT
PILE SHALL BE IMPACT DRIVEN WITH PDA MONITORING TO PLANNED TIP ELEVATION OR TO REFUSAL, WHICHEVER COMES FIRST. PLANNED TIP ELEVATION:
TP-23A: -130
TP-23B: -100
TP-23C: -100
CONTRACTOR SHALL PLAN FOR RESTRIKE MEASUREMENT ON EACH PILE FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS AT ONE DAY AFTER INITIAL DRIVE AND WITHIN ONE WEEK AFTER COMPLETION OF RAPID LOAD TEST (RLT).
RAPID LOAD TEST OF EACH PILE USING 19MN RAPID LOAD TEST DEVICE NOT SOONER THAN 2 WEEKS AFTER INITIAL DRIVE.

306 LOCATION TP-111:

FOR TP-111A, JETTING IS ALLOWED (BUT NOT REQUIRED) TO ELEVATION -60FT
FOR TP-111B, JETTING SHALL BE PERFORMED TO ELEVATION -90FT
BOTH PILES SHALL BE IMPACT DRIVEN WITH PDA MONITORING TO TIP ELEVATION -120FT OR TO REFUSAL, WHICHEVER COMES FIRST
CONTRACTOR SHALL PLAN FOR UP TO TWO RESTRIKE MEASUREMENTS ON THESE PILES AT APPROXIMATELY 1 DAY AND 14 DAYS AFTER INITIAL DRIVE FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS.

307 TEST PILES TP-WPA AND TP-WPB SHALL BE PLACED WITHIN THE LIMITS AN EXPLORATION TRENCH. IF REQUIRED SPACING IS NOT ADEQUATE IN ONE TRENCH, ONE OF THE PILES MAY BE PLACED IN AN ADJACENT EXPLORATION TRENCH.

308 THE CONTRACTOR SHALL CONTACT BILL TURNER (334-242-6144) WITH THE ENVIRONMENTAL TECHNICAL SECTION OF THE ALABAMA DEPARTMENT OF TRANSPORTATION NO LATER THAN TWO (2) WEEKS PRIOR TO STARTING WORK IN ORDER TO MAKE SURE THE EXPLORATION TRENCHES ARE MARKED AND VISIBLE.

800 IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE VARIOUS UTILITY OWNERS AND DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES ON THIS PROJECT WHETHER SHOWN ON THE PLANS OR NOT. THE LOCATION OF ANY REQUIRED GUARDRAIL, SIGNS, FOOTINGS OF ANY NATURE AND/OR ELECTRICAL/COMMUNICATIONS CONDUITS MAY BE ADJUSTED AS DIRECTED BY THE ENGINEER TO PREVENT ANY CONFLICTS WITH THESE UTILITIES. UTILITY LINE LOCATE REQUESTS WILL BE LIMITED TO INCREMENTS NOT TO EXCEED 2000 LINEAR FEET PER WORKING DAY OPERATIONS. MULTIPLE REQUESTS WILL BE REQUIRED FOR PROJECTS GREATER THAN 2000 LINEAR FEET IN LENGTH.

900 NPDES PERMIT COVERAGE NOT REQUIRED FOR THIS PROJECT.

901 THERE SHALL BE NO FUEL TANKS STORED ON THE RIGHT OF WAY. IN ADDITION, FUEL TRUCKS OR VEHICLES TRANSPORTING CHEMICALS, FERTILIZER, ETC., NOT SHALL BE LEFT UNATTENDED ON THE RIGHT OF WAY.

902 THE CONTRACTOR SHALL FOLLOW ALL REQUIREMENTS CONTAINED WITHIN THE ARMY CORPS OF ENGINEERS PERMIT AND ANY REQUIREMENTS FROM U.S. FISH AND WILDLIFE SERVICE.

903 THE CONTRACTOR SHALL FOLLOW THE ALDOT STANDARD MANTEE CONSTRUCTION CONDITIONS LISTED BELOW:

A. THE LEAD PROJECT PROPONENT/CONTRACTOR SHALL INSTRUCT ALL PERSONNEL ASSOCIATED WITH THE PROJECT OF THE POTENTIAL PRESENCE OF MANATEES AND THE NEED TO AVOID COLLISIONS WITH MANATEES. ALL CONSTRUCTION PERSONNEL ARE RESPONSIBLE FOR OBSERVING WATER-RELATED ACTIVITIES FOR THE PRESENCE OF MANATEES. THE U.S. FISH AND WILDLIFE SERVICE WOULD RECOMMEND HIRING AN INDIVIDUAL FAMILIAR WITH THIS SPECIES TO ACT AS A SPOTTER FOR MANATEES DURING IN-WATER ACTIVITIES.

B. THE LEAD PROJECT PROPONENT/CONTRACTOR SHALL ADVISE ALL CONSTRUCTION PERSONNEL THAT THERE ARE CIVIL AND CRIMINAL PENALTIES FOR HARMING, HARASSING, OR KILLING MANATEES WHICH ARE PROTECTED UNDER THE MARINE MAMMAL PROTECTION ACT OF 1972 AND THE ENDANGERED SPECIES ACT OF 1973.

C. SILTATION BARRIERS SHALL BE MADE OF MATERIAL IN WHICH MANATEES CANNOT BECOME ENTANGLED, ARE PROPERLY SECURED, AND ARE REGULARLY MONITORED TO AVOID MANATEE ENTRAPMENT. BARRIERS MUST NOT BLOCK MANATEE ENTRY TO, OR EXIT FROM, ESSENTIAL HABITAT.

D. ALL VESSELS ASSOCIATED WITH THE CONSTRUCTION PROJECT SHALL OPERATE AT "NO WAKE/IDLE" SPEEDS AT ALL TIMES WHILE IN THE CONSTRUCTION AREA AND WHILE IN WATER WHERE THE DRAFT OF THE VESSEL PROVIDES LESS THAN A FOUR-FOOT CLEARANCE FROM THE BOTTOM. ALL VESSELS WILL FOLLOW ROUTES OF DEEP WATER WHENEVER POSSIBLE.

E. IF MANATEES ARE SEEN WITHIN 100 YARDS OF THE ACTIVE DAILY CONSTRUCTION/DREDGING OPERATION OR VESSEL MOVEMENT, ALL APPROPRIATE PRECAUTIONS SHALL BE IMPLEMENTED TO ENSURE THEIR PROTECTION. THESE PRECAUTIONS SHALL INCLUDE THE OPERATION OF ALL MOVING EQUIPMENT NO CLOSER THAN 50 FEET OF A MANATEE. OPERATION OF ANY EQUIPMENT CLOSER THAN 50 FEET TO A MANATEE SHALL NECESSITATE IMMEDIATE SHUTDOWN OF THAT EQUIPMENT. ACTIVITIES WILL NOT RESUME UNTIL THE MANATEE(S) HAS DEPARTED THE PROJECT AREA OF ITS OWN VOLITION.

F. ANY COLLISION WITH AND/OR INJURY TO A MANATEE SHALL BE REPORTED IMMEDIATELY TO THE U.S. FISH AND WILDLIFE SERVICE IN DAPHNE (251-441-5181).

G. TEMPORARY SIGNS CONCERNING THE MANATEES SHALL BE POSTED PRIOR TO AND DURING ALL CONSTRUCTION/DREDGING ACTIVITIES. ALL SIGNS ARE TO BE REMOVED BY THE LEAD PROJECT PROPONENT/CONTRACTOR UPON COMPLETION OF THE PROJECT. A SIGN MEASURING AT LEAST 3 FT. BY 4 FT. WHICH READS CAUTION: MANATEE AREA WILL BE POSTED IN A LOCATION PROMINENTLY VISIBLE TO WATER RELATED CONSTRUCTION CREWS. A SECOND SIGN SHOULD BE POSTED IF VESSELS ARE ASSOCIATED WITH THE CONSTRUCTION, AND SHOULD BE PLACED VISIBLE TO THE VESSEL OPERATOR. THE SECOND SIGN SHOULD BE AT LEAST 8" BY 11" WHICH READS CAUTION: MANATEE HABITAT. IDLE SPEED IS REQUIRED IF OPERATING A VESSEL IN THE CONSTRUCTION AREA. ALL EQUIPMENT MUST BE SHUTDOWN IF A MANATEE COMES WITHIN 50 FEET OF OPERATION. ANY COLLISION WITH AND/OR INJURY TO A MANATEE SHALL BE REPORTED IMMEDIATELY TO THE U.S. FISH AND WILDLIFE SERVICE IN DAPHNE (251-441-5181).

904-914 OMIT

915 BASIN BOOM SHALL BE REUSED AS NECESSARY AT EACH LOCATION (WATER).

CURRENT ALABAMA DEPARTMENT OF TRANSPORTATION

REVISIONS

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 COLISEUM BOULEVARD
MONTGOMERY, AL 36130-3050

GENERAL PROJECT NOTES

DRAWN BY: _____
DATE DRAWN: _____

SPECIAL DRAWING NO.

INDEX NO.

PILE TIP ELEVATIONS

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
IM-I010(341)	2018	2A

PILE TIP ELEVATIONS AND TARGETED NOMINAL RESISTANCE

TEST PILE	PILE TYPE	STATION	SIDE	OFFSET	PILE LENGTH (FT)	TARGETED NOMINAL RESISTANCE (kips)	ESTIMATED TIP ELEVATION (FT)	MINIMUM TIP ELEVATION (FT)
TP-10A-1	HP 14X89	STATION 469+20.00	RT	110	82	300	-65	
TP-10A-2	HP 14X89	STATION 469+20.00	RT	111	82	300	-65	
TP-10B-1	18" PPC SQUARE	STATION 469+60.00	RT	110	77	650	-60	
TP-10B-2	18" PPC SQUARE	STATION 469+60.00	RT	110	77	650	-60	
TP-WPA	60" STEEL PIPE	STATION 513+33.00	LT	100	175	3100	-170	
TP-WPB	72" DRILLED SHAFT	STATION 513+53.00	LT	100	177	N/A	-170	
TP-04	54" PPC CYLINDRICAL	STATION 574+00.00	LT	150	120	3100	-110	-80
TP-23A	54" PPC CYLINDRICAL	STATION 629+57.00	LT	150	140	3100	-130	
TP-23B	54" PPC CYLINDRICAL	STATION 630+00.00	LT	150	110	3100	-100	
TP-23C	30" PPC SQUARE	STATION 630+43.00	LT	150	110	1500	-100	
TP-111A	54" PPC CYLINDRICAL	STATION 897+50.00	RT	150	130	3100	-120	
TP-111B	54" PPC CYLINDRICAL	STATION 898+00.00	RT	150	130	3100	-120	

RESPONSIBLE PE:	SUPERVISOR:	DESIGNER:	PLAN SUBMITTAL	ALABAMA DEPARTMENT OF TRANSPORTATION		SHEET TITLE	ROUTE
DATE:	DATE:	DATE:				PILE TIP ELEVATIONS	I-10

PLAN SHEET

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
IM-I010(341)	2018	4

BEGIN PROJECT
℄ CONSTRUCTION (I-10)
STA 465+00.00

(2) TP-10A-1,
TP-10A-2
HP 14X89
LOAD TESTS

(2) TP-10B-1,
TP-10B-2
18" PPC SQUARE
PILE LOAD
TESTS

NOTE: SEE SHEET 2A FOR PILE TIP ELEVATIONS

RESPONSIBLE PE:	SUPERVISOR:	DESIGNER:	PLAN SUBMITTAL
DATE:	DATE:	DATE:	

ALABAMA DEPARTMENT OF TRANSPORTATION

HORIZ 50 0 50 SCALE (FEET)

SHEET TITLE	ROUTE
PLAN SHEET STA 461+00 TO STA 475+00	I-10

REFERENCE PROJECT NUMBER	FISCAL YEAR	SHEET NUMBER
IM-I010(341)	2018	16

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	TH-10	**Boring Location:**	470+55.32	**Offset:**	106.31' RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	12.9 ft.	**Northing:**	245999.249	**Easting:**	1797615.33	**Date Started:**	9/7/2017
Total Depth:	180.0 ft.	**Soil Depth:**	180.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	9/8/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 45C	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	86%
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 1.8 ft.	**24 HR**	20.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows/foot) PL MC LL; FINES CONTENT (%) 10 20 30 40 50 60 70 80 90
0.0		Loose, light blue and brown, fine grained, with trace gravel and wood, SILTY SAND (SM, A-2-4(0)), LL=NP PL=NP PI=NP NMC=17.8 %#200=18.3		0.0	SS-1	2	4	6	10	
	10.0	Medium dense, reddish brown, fine grained, POORLY GRADED SAND with SILT (SP-SM)		1.5	SS-2	4	8	7	15	
5.0		Medium dense, pale brown, fine grained, POORLY GRADED SAND with SILT (SP-SM, A-2-4(0)), LL=NP PL=NP PI=NP NMC=21.1 %#200=10.9		3.0	SS-3	5	8	6	14	
		Medium dense, moist, gray		4.5	SS-4	5	6	6	12	
		Loose		6.0	SS-5	3	4	3	7	
10.0	5.0	Very loose		8.5	SS-6	1	2	1	3	
	0.0	Very soft, moist, dark gray, with trace gravel, SANDY FAT CLAY (CH, A-7-6(14)), LL=55 PL=23 PI=31 NMC=51.7 %#200=54.0		13.5	SS-7	0	0	1	1	
15.0										
	-5.0	Undisturbed sample obtained from 18.0 to 20.0 feet. Approximately 24 inches of recovery. Moist, dark gray and reddish brown, LEAN CLAY with SAND (CL, A-6(15)), LL=39 PL=16 PI=22 NMC=48.7 %#200=73.8		18.0	ST-1					
20.0										
	-10.0	Medium dense, moist, white, fine to medium grained, POORLY GRADED SAND with SILT (SP-SM, A-3(0)), LL=NP PL=NP PI=NP NMC=26.4 %#200=5.6		23.5	SS-8	9	14	15	29	
25.0										
	-15.0	Medium dense, moist, white and pale brown, fine grained, POORLY GRADED SAND with SILT		28.5	SS-9	8	10	13	23	
30.0										

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	TH-10	**Boring Location:**	470+55.32	**Offset:**	106.31' RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	12.9 ft.	**Northing:**	245999.249	**Easting:**	1797615.33	**Date Started:**	9/7/2017
Total Depth:	180.0 ft.	**Soil Depth:**	180.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	9/8/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 45C	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	86%
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 1.8 ft.	**24 HR**	20.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows/foot) PL MC LL; FINES CONTENT (%) 10 20 30 40 50 60 70 80 90
30.0		(SP-SM, A-3(0)), LL=NP PL=NP PI=NP NMC=23.7 %#200=6.9								
	-20.0	Dense, moist, reddish brown, fine grained, POORLY GRADED SILT WITH SAND (SP-SM)		33.5	SS-10	8	17	18	35	
35.0										
	-25.0	Dense, reddish brown and pale brown		38.5	SS-11	9	15	18	33	
40.0										
	-30.0	Dense, moist, red and pale brown, fine to medium grained, POORLY GRADED SAND with SILT (SP-SM, A-3(0)), LL=NP PL=NP PI=NP NMC=22.4 %#200=5.6		43.5	SS-12	9	16	15	31	
45.0										
	-35.0	Medium dense		48.5	SS-13	7	13	16	29	
50.0										
	-40.0	Medium dense, fine grained		53.5	SS-14	12	12	15	27	
55.0										
	-45.0	Medium dense, moist, red and pale brown, fine to medium grained, POORLY GRADED SAND with SILT		58.5	SS-15	6	6	5	11	
60.0										

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	TH-10	**Boring Location:**	470+55.32	**Offset:**	106.31' RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	12.9 ft.	**Northing:**	245999.249	**Easting:**	1797615.33	**Date Started:**	9/7/2017
Total Depth:	180.0 ft.	**Soil Depth:**	180.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	9/8/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 45C	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	86%
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 1.8 ft.	**24 HR**	20.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows/foot) PL MC LL; FINES CONTENT (%) 10 20 30 40 50 60 70 80 90
60.0		(SP-SM, A-3(0)), LL=NP PL=NP PI=NP NMC=22.8 %#200=5.2								
	-50.0	Dense, fine grained		63.5	SS-16	7	15	19	34	
65.0										
	-55.0	Medium dense		68.5	SS-17	4	8	8	16	
70.0										
	-60.0	Medium dense, moist, red and pale brown, fine to medium grained, POORLY GRADED SAND (SP, A-3(0)), LL=NP PL=NP PI=NP NMC=19.9 %#200=3.7		73.5	SS-18	10	10	14	24	
75.0										
	-65.0	Dense		78.5	SS-19	12	14	17	31	
80.0										
	-70.0	Medium dense, pale brown and reddish brown, with trace gravel		83.5	SS-20	6	7	10	17	
85.0										
	-75.0	Medium dense, moist, pale brown and reddish brown, fine to medium grained, POORLY GRADED SAND		88.5	SS-21	6	6	7	13	
90.0										

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

STRATA SYMBOLS

- SAND (SP)
- SILT (MH)
- FAT CLAY (CH)
- SILTY SAND (SM)
- POORLY GRADED SAND with SILT (SP-SM)
- ORGANIC SOILS (OL)
- Paving
- GRAVEL (GP)
- SANDY SILT (ML)
- LEAN CLAY (CL)
- TOPSOIL
- CLAYEY SAND (SC)
- CLAYEY SILTY SAND (SC-SM)
- WELL GRADED SAND with SILT and GRAVEL (SW-SM)
- SANDSTONE
- DOLOMITE
- CLAYEY GRAVEL (GC)
- POORLY GRADED GRAVEL with SILT and SAND (GP-GM)
- SILTY CLAY (CL-ML)
- Ground Water, ATD
- 24 Hr./Delayed Ground Water
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- MR - Mud Rotary

NO - Not Obtained

NE - Not Encountered

REC Recovery

RQD Rock Quality Designation

pp - Pocket Penetrometer

SS - Split Spoon

ST - Shelby Tube

DCP - Dynamic Cone Penetrometer

AC - Auger Cuttings

GB - Grab Bag

NQ - Rock Core

Alabama Department of Transportation

Bridge Sheet of

thompson ENGINEERING
2970 COTTAGE HILL RD.
MOBILE, AL 36606

APPROVED : SAM STERNBERG III, P.E.

GEOTECHNICAL ENGINEER

DATE :

PROJECT NO. 17-1101-0145
I-10 MOBILE RIVER BRIDGE
LOAD TEST PROGRAM
MOBILE COUNTY, ALABAMA

Preliminary Project No:

TEST BORING RECORD
Sheet 1 of 12

REFERENCE PROJECT NUMBER	FISCAL YEAR	SHEET NUMBER
IM-I010(341)	2018	17

RECORD OF TEST BORING

thompson ENGINEERING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	TH-10	**Boring Location:**	470+55.32	**Offset:**	106.31' RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	12.9 ft.	**Northing:**	245999.249	**Easting:**	1797615.33	**Date Started:**	9/7/2017
Total Depth:	180.0 ft.	**Soil Depth:**	180.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	9/8/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 45C	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	86%
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 1.8 ft.	**24 HR**	20.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows/foot) PL MC LL; FINES CONTENT (%) 10 20 30 40 50 60 70 80 90
90.0		(SP, A-3(0)), LL=NP PL=NP PI=NP NMC=24.0 %#200=4.7								
	-80.0	Dense		93.5	SS-22	8	16	21	37	
95.0										
	-85.0	Dense		98.5	SS-23	16	22	24	46	
100.0										
	-90.0	Firm, moist, dark gray, FAT CLAY (CH)		103.5	SS-24	2	3	4	7	
105.0										
	-95.0	Undisturbed sample obtained from 108.0 to 110.0 feet. Approximately 24 inches of recovery. Moist, greenish gray, with trace sand, FAT CLAY (CH, A-7-6(66)), LL=85 PL=23 PI=62 NMC=39.5 %#200=93.7		108.0	ST-2					
110.0										
	-100.0	Stiff, moist, greenish gray, LEAN CLAY with SAND (CL)		113.5	SS-25	2	5	8	13	
115.0										
	-105.0	Undisturbed sample obtained from 118.0 to 120.0 feet. Approximately 24 inches of recovery. Moist, greenish gray, LEAN CLAY with SAND (CL,		118.0	ST-3					
120.0										

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

RECORD OF TEST BORING

thompson ENGINEERING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	TH-10	**Boring Location:**	470+55.32	**Offset:**	106.31' RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	12.9 ft.	**Northing:**	245999.249	**Easting:**	1797615.33	**Date Started:**	9/7/2017
Total Depth:	180.0 ft.	**Soil Depth:**	180.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	9/8/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 45C	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	86%
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 1.8 ft.	**24 HR**	20.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows/foot) PL MC LL; FINES CONTENT (%) 10 20 30 40 50 60 70 80 90
120.0		A-6(12)), LL=33 PL=17 PI=16 NMC=30.4 %#200=83.4								
	-110.0	Dense, moist, pale brown, fine to medium grained, SAND (SP), with gravel		123.5	SS-26	9	16	15	31	
125.0										
	-115.0	Dense, pale brown, medium to coarse grained		128.5	SS-27	9	19	18	37	
130.0										
	-120.0	Very dense, moist, pale brown, fine to medium grained, with trace gravel, SILTY SAND (SM, A-2-4(0)), LL=NP PL=NP PI=NP NMC=16.9 %#200=13.5		133.5	SS-28	16	37	39	76	
135.0										
	-125.0	Dense		138.5	SS-29	13	20	22	42	
140.0										
	-130.0	Very dense, with trace gravel		143.5	SS-30	16	28	31	59	
145.0										
	-135.0	Very stiff, moist, bluish gray, SANDY LEAN CLAY (CL, A-6(8)), LL=32 PL=14 PI=17 NMC=22.8		148.5	SS-31	8	11	12	23	
150.0										

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

RECORD OF TEST BORING

thompson ENGINEERING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	TH-10	**Boring Location:**	470+55.32	**Offset:**	106.31' RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	12.9 ft.	**Northing:**	245999.249	**Easting:**	1797615.33	**Date Started:**	9/7/2017
Total Depth:	180.0 ft.	**Soil Depth:**	180.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	9/8/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 45C	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	86%
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 1.8 ft.	**24 HR**	20.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows/foot) PL MC LL; FINES CONTENT (%) 10 20 30 40 50 60 70 80 90
150.0		%#200=62.6								
	-140.0	Hard, moist, bluish gray, FAT CLAY (CH, A-7-6(42)), LL=57 PL=14 PI=43 NMC=18.1 %#200=92.3		158.5	SS-32	9	17	22	39	
155.0										
	-145.0									
160.0										
	-150.0									
165.0										
	-155.0	Dense, moist, grayish brown, fine to medium grained, with trace clay and trace gravel, SILTY SAND (SM, A-2-4(0)), LL=NP PL=NP PI=NP NMC=15.1 %#200=19.5		168.5	SS-33	6	18	27	45	
170.0										
	-160.0									
175.0										
	-165.0	Very dense, wet, brownish gray, fine grained, POORLY GRADED SAND with SILT (SP-SM)		178.5	SS-34	30	50/6	X	50/6	
180.0										

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

STRATA SYMBOLS

- SAND (SP)
- SILT (MH)
- FAT CLAY (CH)
- SILTY SAND (SM)
- POORLY GRADED SAND with SILT (SP-SM)
- ORGANIC SOILS (OL)
- Paving
- GRAVEL (GP)
- SANDY SILT (ML)
- LEAN CLAY (CL)
- TOPSOIL
- CLAYEY SAND (SC)
- CLAYEY SILTY SAND (SC-SM)
- WELL GRADED SAND with SILT and GRAVEL (SW-SM)
- SANDSTONE
- DOLOMITE
- CLAYEY GRAVEL (GC)
- POORLY GRADED GRAVEL with SILT and SAND (GP-GM)
- SILTY CLAY (CL-ML)
- Ground Water, ATD
- 24 Hr./Delayed Ground Water
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- MR - Mud Rotary

NO - Not Obtained

NE - Not Encountered

REC Recovery

RQD Rock Quality Designation

pp - Pocket Penetrometer

SS - Split Spoon

ST - Shelby Tube

DCP - Dynamic Cone Penetrometer

AC - Auger Cuttings

GB - Grab Bag

NQ - Rock Core

Alabama Department of Transportation

Bridge Sheet of

thompson ENGINEERING
2970 COTTAGE HILL RD.
MOBILE, AL 36606

APPROVED : SAM STERNBERG III, P.E.

GEOTECHNICAL ENGINEER

DATE :

PROJECT NO. 17-1101-0145
I-10 MOBILE RIVER BRIDGE
LOAD TEST PROGRAM
MOBILE COUNTY, ALABAMA

Preliminary Project No:

TEST BORING RECORD
Sheet 2 of 12

REFERENCE PROJECT NUMBER	FISCAL YEAR	SHEET NUMBER
IM-I010(341)	2018	18

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	TH-10	**Boring Location:**	470+55.32	**Offset:**	106.31' RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	12.9 ft.	**Northing:**	245999.249	**Easting:**	1797615.33	**Date Started:**	9/7/2017
Total Depth:	180.0 ft.	**Soil Depth:**	180.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	9/8/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 45C	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	86%
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 1.8 ft.	**24 HR**	20.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE (blows/foot) PL MC LL ▲ FINES CONTENT (%) ▲ 10 20 30 40 50 60 70 80 90
		Boring Terminated at 180.0 feet. *Groundwater depth TOB most likely influenced by drilling method.								

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	MB-1	**Boring Location:**	514+25.88	**Offset:**	18.84' LT	**Alignment:**	I-10 Main Span
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	B.Ellis/C.Tisher
Elev.:	2.9 ft.	**Northing:**	249675.65	**Easting:**	1799417.497	**Date Started:**	4/20/2016
Total Depth:	300.0 ft.	**Soil Depth:**	300.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	4/27/2016
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	88%
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 0.0 ft.	**24 HR**	0.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE (blows/foot) PL MC LL ▲ FINES CONTENT (%) ▲ 10 20 30 40 50 60 70 80 90
0.0	0.0	Loose, moist, dark brown, fine to coarse grained, SILTY SAND with GRAVEL (SM)		0.0	SS-1	4	4	4	8	
		Medium dense, wet, dark brown, fine to medium grained, with wood, SILTY SAND with GRAVEL (SM, A-2-4(0)), LL=NP PL=NP PI=NP NMC=57.0 %#200=17.6		1.5	SS-2	4	5	7	12	
				3.0	SS-3	4	2	2	4	
		Very loose, wet, dark brown, fine to coarse grained, POORLY GRADED GRAVEL with SILT and SAND (GP-GM)		4.5	SS-4	2	2	5	7	
5.0		Loose, most likely fall in		6.0	SS-5	3	3	3	6	
	-5.0	Loose, most likely fall in								
		Very loose, most likely fall in		8.5	SS-6	2	1	1	2	
10.0										
	-10.0	Very loose, wet, dark brown, fine to coarse grained, POORLY GRADED GRAVEL with SILT and SAND (GP-GM, A-1-a(0)), LL=NP PL=NP PI=NP NMC=18.9 %#200=10.9		13.5	SS-7	1	2	2	4	
15.0										
	-15.0	Loose, wet, gray and brown, fine grained, POORLY GRADED SAND with GRAVEL (SP, A-1-b(0)), LL=NP PL=NP PI=NP NMC=16.9 %#200=4.7		18.5	SS-8	5	5	4	9	
20.0										
	-20.0	Loose, dark brown and gray, fine to medium grained		23.5	SS-9	4	5	5	10	
25.0										
	-25.0	Medium dense, gray and light gray		28.5	SS-10	8	12	11	23	
30.0										

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	MB-1	**Boring Location:**	514+25.88	**Offset:**	18.84' LT	**Alignment:**	I-10 Main Span
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	B.Ellis/C.Tisher
Elev.:	2.9 ft.	**Northing:**	249675.65	**Easting:**	1799417.497	**Date Started:**	4/20/2016
Total Depth:	300.0 ft.	**Soil Depth:**	300.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	4/27/2016
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	88%
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 0.0 ft.	**24 HR**	0.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE (blows/foot) PL MC LL ▲ FINES CONTENT (%) ▲ 10 20 30 40 50 60 70 80 90
30.0										
	-30.0	Medium dense, wet, yellowish brown and brown, fine grained, POORLY GRADED SAND with GRAVEL (SP, A-3(0)), LL=NP PL=NP PI=NP NMC=28.7 %#200=3.4		33.5	SS-11	6	5	6	11	
35.0										
	-35.0	Loose, with trace shells		38.5	SS-12	5	4	5	9	
40.0										
	-40.0	Medium dense, wet, pale brown, fine to medium grained, with trace gravel, POORLY GRADED SAND (SP, A-1-b(0)), LL=NP PL=NP PI=NP NMC=22.2 %#200=2.1		43.5	SS-13	4	6	8	14	
45.0										
	-45.0	Loose, wet, pale brown, fine to medium grained, POORLY GRADED GRAVEL with SAND (GP, A-1-a(0)), LL=NP PL=NP PI=NP NMC=11.7 %#200=3.1		48.5	SS-14	6	5	4	9	
50.0										
	-50.0	Loose, light brown		53.5	SS-15	4	3	4	7	
55.0										
	-55.0	Medium dense, wet, pale brown, fine to medium grained, POORLY GRADED SAND with SILT		58.5	SS-16	8	10	6	16	
60.0										

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

STRATA SYMBOLS

- SAND (SP)
- SILT (MH)
- FAT CLAY (CH)
- SILTY SAND (SM)
- POORLY GRADED SAND with SILT (SP-SM)
- ORGANIC SOILS (OL)
- Paving
- GRAVEL (GP)
- SANDY SILT (ML)
- LEAN CLAY (CL)
- TOPSOIL
- CLAYEY SAND (SC)
- CLAYEY SILTY SAND (SC-SM)
- WELL GRADED SAND with SILT and GRAVEL (SW-SM)
- SANDSTONE
- DOLOMITE
- CLAYEY GRAVEL (GC)
- POORLY GRADED GRAVEL with SILT and SAND (GP-GM)
- SILTY CLAY (CL-ML)
- Ground Water, ATD
- 24 Hr./Delayed Ground Water
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- MR - Mud Rotary

NO - Not Obtained

NE - Not Encountered

REC Recovery

RQD Rock Quality Designation

pp - Pocket Penetrometer

SS - Split Spoon

ST - Shelby Tube

DCP - Dynamic Cone Penetrometer

AC - Auger Cuttings

GB - Grab Bag

NQ - Rock Core

Alabama Department of Transportation

Bridge Sheet of

thompson ENGINEERING
2970 COTTAGE HILL RD.
MOBILE, AL 36606

APPROVED : SAM STERNBERG III, P.E.

GEOTECHNICAL ENGINEER

DATE :

PROJECT NO. 17-1101-0145
I-10 MOBILE RIVER BRIDGE
LOAD TEST PROGRAM
MOBILE COUNTY, ALABAMA

Preliminary Project No:

TEST BORING RECORD

Sheet 3 of 12

Appendix F

Instrument Calibrations
TP-10A-1 and TP-10A-2

I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

Pile Dynamics, Inc.

Certificate of Calibration

Transducer Model: BDI ST350

Serial Number: E653

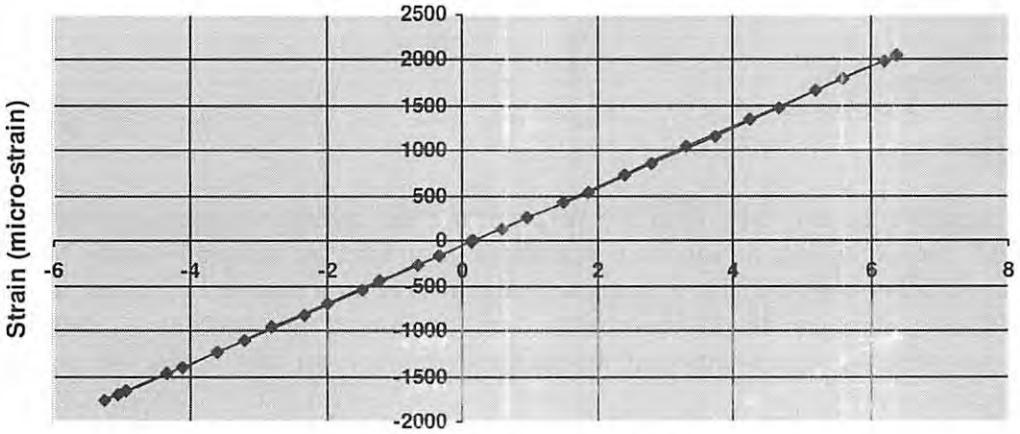
PDI Gage Factor: 94.3 με/V

General Gage Factor: 327.3 $\mu\varepsilon/mV/V_{ext}$
Initial Offset Voltage: 0.103 mV/V_{ext}

Table 1 – Representative Calibration Data

Applied Strain (με)	Transducer Output (mV/V_{ext})	Applied Strain (με)	Transducer Output (mV/V_{ext})
-5	0.134	253	0.958
-163	-0.360	545	1.869
-447	-1.232	854	2.811
-691	-1.990	1163	3.744
-964	-2.822	1477	4.681
-1223	-3.606	1792	5.618
-1473	-4.356	2048	6.373
-1709	-5.053	1996	6.214
-1776	-5.249	1667	5.230
-1662	-4.941	1344	4.260
-1396	-4.120	1040	3.328
-1108	-3.226	733	2.402
-821	-2.339	437	1.490
-542	-1.481	142	0.577
-268	-0.648	-6	0.132
-3	0.164	-5	0.127

Calibration Curve



Mean Linear Correlation Coefficient (LCC): 9.999807E-1

LCC Standard Deviation: 2.523106E-6

Calibrated By: KT

Signature: Kay Tol

Date/Time: 1/18/2018 10:44 AM

Temperature (°C): 25.4

Pile Dynamics, Inc.

Certificate of Calibration

Transducer Model: BDI ST350

Serial Number: B095

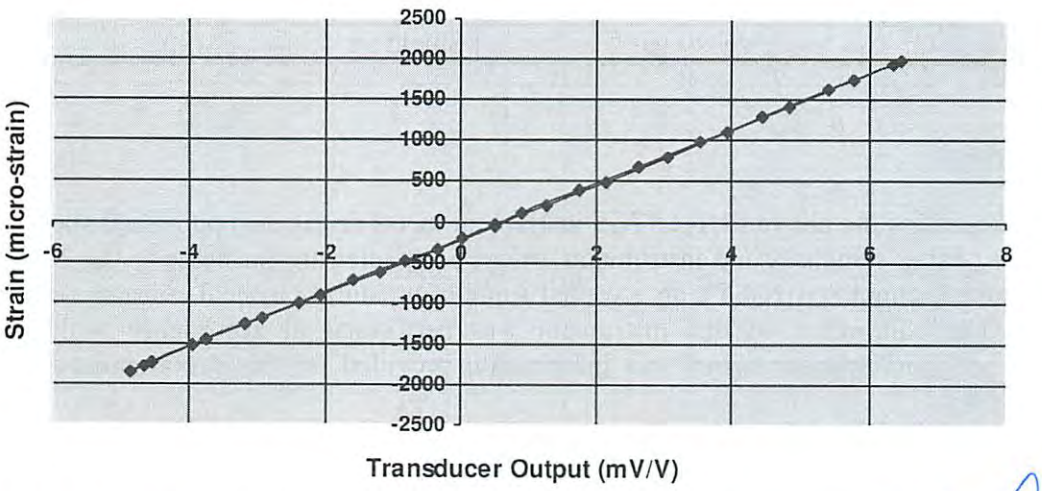
PDI Gage Factor: 96.7 με/V

General Gage Factor: 335.9 $\mu\varepsilon/mV/V_{ext}$
Initial Offset Voltage: 0.250 mV/V_{ext}

Table 1 – Representative Calibration Data

Applied Strain (με)	Transducer Output (mV/V_{ext})	Applied Strain (με)	Transducer Output (mV/V_{ext})
-44	0.501	196	1.280
-199	0.025	490	2.155
-482	-0.832	793	3.050
-733	-1.588	1099	3.948
-1003	-2.389	1412	4.861
-1275	-3.190	1732	5.778
-1536	-3.952	1976	6.458
-1782	-4.671	1935	6.341
-1849	-4.856	1613	5.409
-1735	-4.550	1292	4.461
-1468	-3.751	982	3.541
-1190	-2.920	676	2.632
-908	-2.070	382	1.763
-627	-1.210	95	0.913
-343	-0.348	-44	0.505
-64	0.498	-44	0.505

Calibration Curve



Mean Linear Correlation Coefficient (LCC): 9.999624E-1

LCC Standard Deviation: 5.087168E-6

Calibrated By: ES

Signature: _____

Date/Time: 12/18/2017 10:24 AM

Temperature (°C): 25.7

Pile Dynamics, Inc.

Certificate of Calibration

Transducer Model: BDI ST350

Serial Number: K474

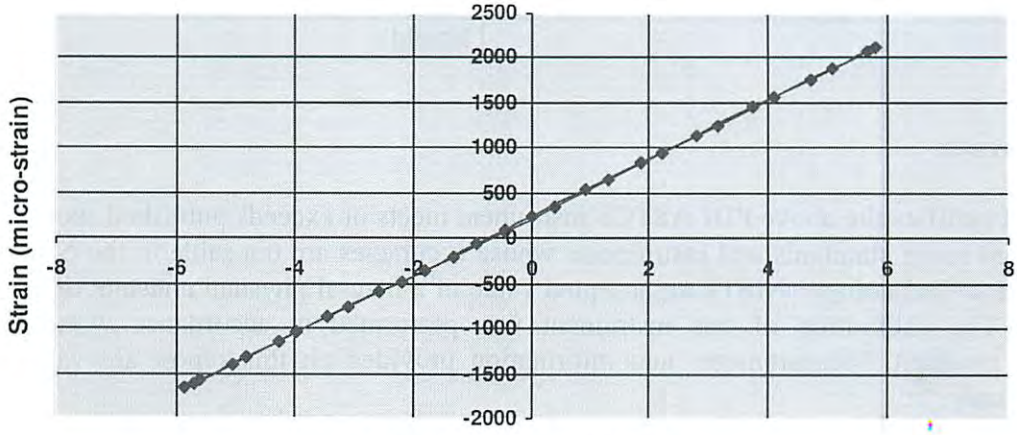
PDI Gage Factor: 93.2 με/V

General Gage Factor: 323.4 $\mu\varepsilon/mV/V_{ext}$
Initial Offset Voltage: -0.204 mV/V_{ext}

Table 1 – Representative Calibration Data

Applied Strain (με)	Transducer Output (mV/V_{ext})	Applied Strain (με)	Transducer Output (mV/V_{ext})
87	-0.437	347	0.405
-68	-0.933	635	1.299
-349	-1.802	938	2.228
-603	-2.584	1242	3.159
-879	-3.441	1555	4.115
-1147	-4.274	1872	5.071
-1394	-5.037	2116	5.779
-1612	-5.704	2081	5.666
-1668	-5.861	1759	4.716
-1576	-5.609	1448	3.749
-1318	-4.823	1142	2.807
-1048	-3.967	834	1.857
-772	-3.095	532	0.931
-488	-2.197	234	0.018
-205	-1.305	87	-0.431
76	-0.440	85	-0.430

Calibration Curve



Mean Linear Correlation Coefficient (LCC): 9.999749E-1

LCC Standard Deviation: 1.854495E-6

Calibrated By: ES

Signature: _____

Date/Time: 8/7/2017 10:31 AM

Temperature (°C): 24.3

Pile Dynamics, Inc.

Certificate of Calibration

Transducer Model: BDI ST350

Serial Number: P454

PDI Gage Factor: 145.3 με/V

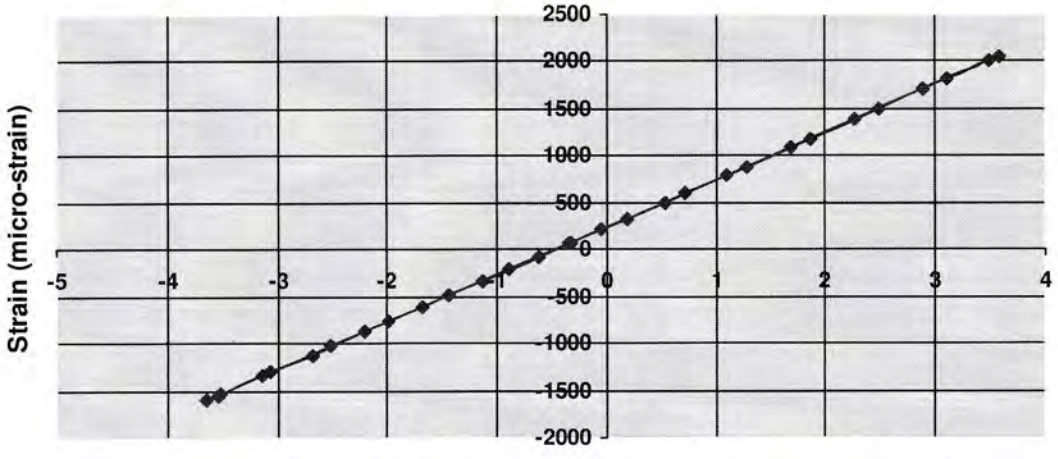
General Gage Factor: 504.7 $\mu\varepsilon/mV/V_{ext}$

Initial Offset Voltage: -0.113 mV/V_{ext}

Table 1 – Representative Calibration Data

Applied Strain (με)	Transducer Output (mV/V_{ext})	Applied Strain (με)	Transducer Output (mV/V_{ext})
65	-0.330	335	0.184
-83	-0.628	598	0.709
-331	-1.125	889	1.284
-607	-1.670	1188	1.872
-876	-2.202	1497	2.487
-1115	-2.687	1814	3.109
-1344	-3.136	2058	3.573
-1543	-3.541	2013	3.492
-1597	-3.646	1700	2.888
-1525	-3.515	1387	2.272
-1288	-3.058	1088	1.683
-1023	-2.521	794	1.100
-753	-1.982	502	0.529
-483	-1.439	210	-0.047
-210	-0.893	71	-0.319
70	-0.337	70	-0.321

Calibration Curve



Mean Linear Correlation Coefficient (LCC): 9.999805E-1

LCC Standard Deviation: 1.224288E-6

Calibrated By: Vanna Thach

Signature: Thach

Date/Time: 1/26/2018 8:12 AM

Temperature (°C): 24.3

Pile Dynamics, Inc.

Certificate of Calibration

Transducer Model: BDI ST350

Serial Number: P455

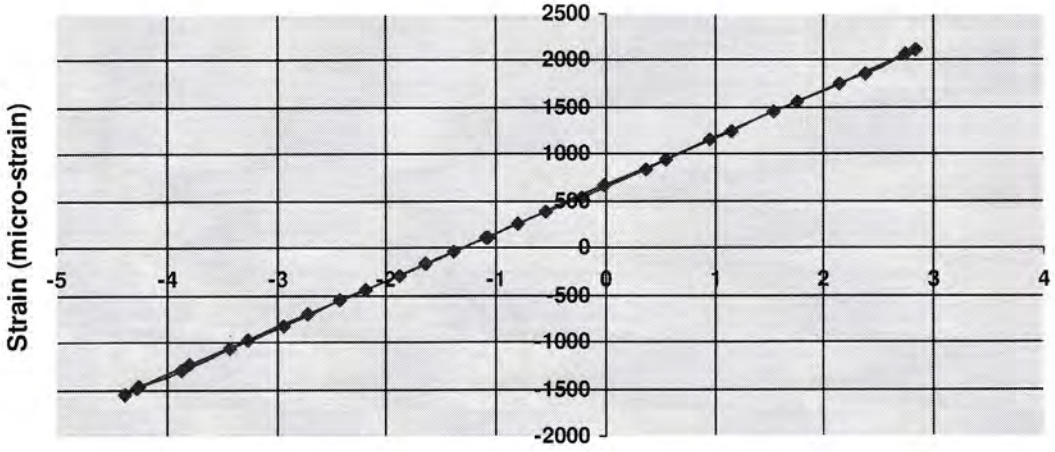
PDI Gage Factor: 145.8 με/V

General Gage Factor: 506.2 $\mu\varepsilon/mV/V_{ext}$
Initial Offset Voltage: -0.434 mV/V_{ext}

Table 1 – Representative Calibration Data

Applied Strain (με)	Transducer Output (mV/V_{ext})	Applied Strain (με)	Transducer Output (mV/V_{ext})
110	-1.082	389	-0.551
-42	-1.386	657	-0.021
-288	-1.881	947	0.552
-560	-2.418	1246	1.143
-828	-2.945	1556	1.751
-1070	-3.431	1869	2.371
-1290	-3.866	2115	2.834
-1489	-4.264	2069	2.749
-1547	-4.375	1752	2.143
-1473	-4.243	1446	1.542
-1238	-3.788	1147	0.958
-976	-3.260	845	0.360
-707	-2.726	548	-0.218
-440	-2.191	255	-0.796
-163	-1.641	114	-1.075
118	-1.086	114	-1.076

Calibration Curve



Mean Linear Correlation Coefficient (LCC): 9.999817E-1

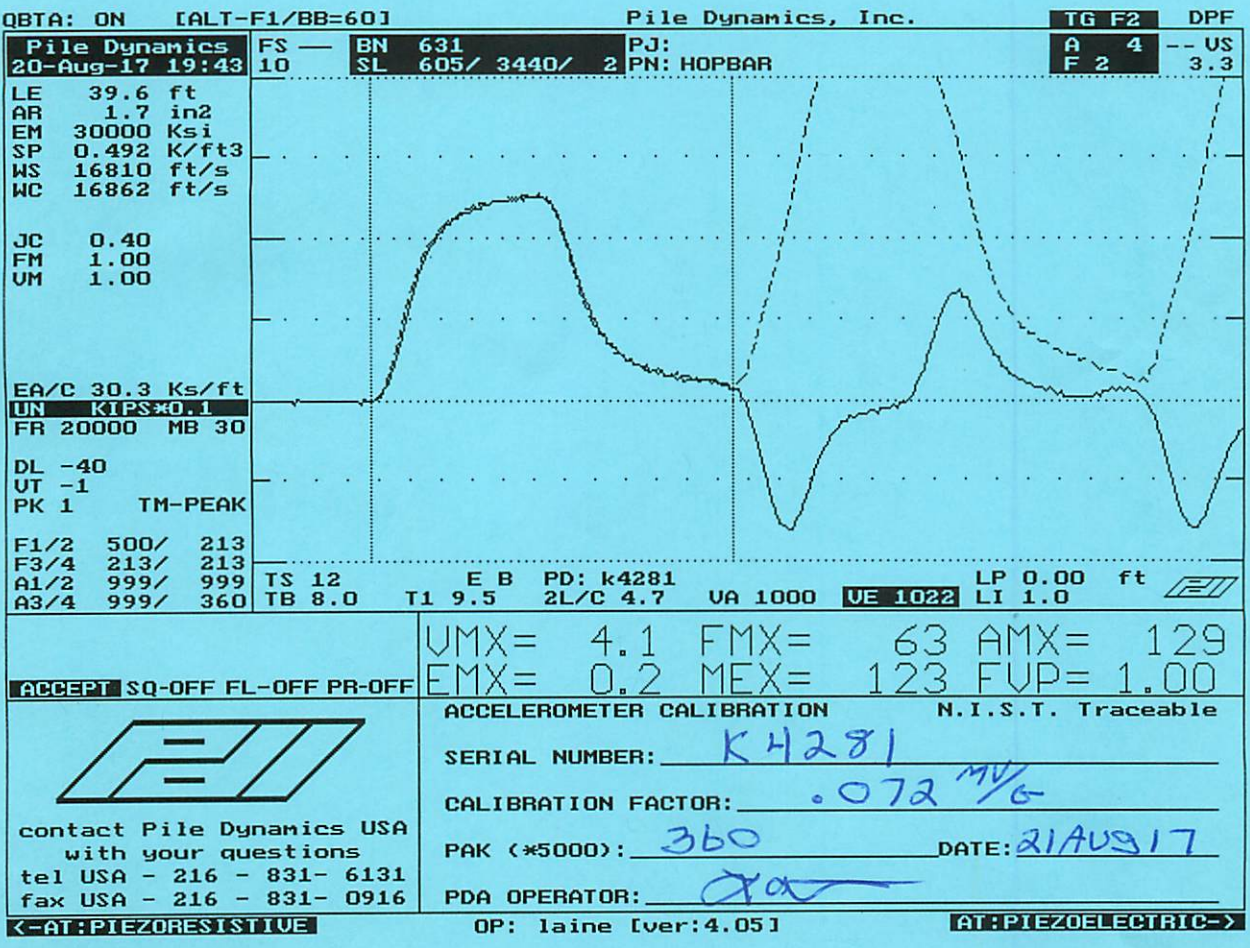
LCC Standard Deviation: 3.891526E-7

Calibrated By: Vanna Thach

Signature: Thach

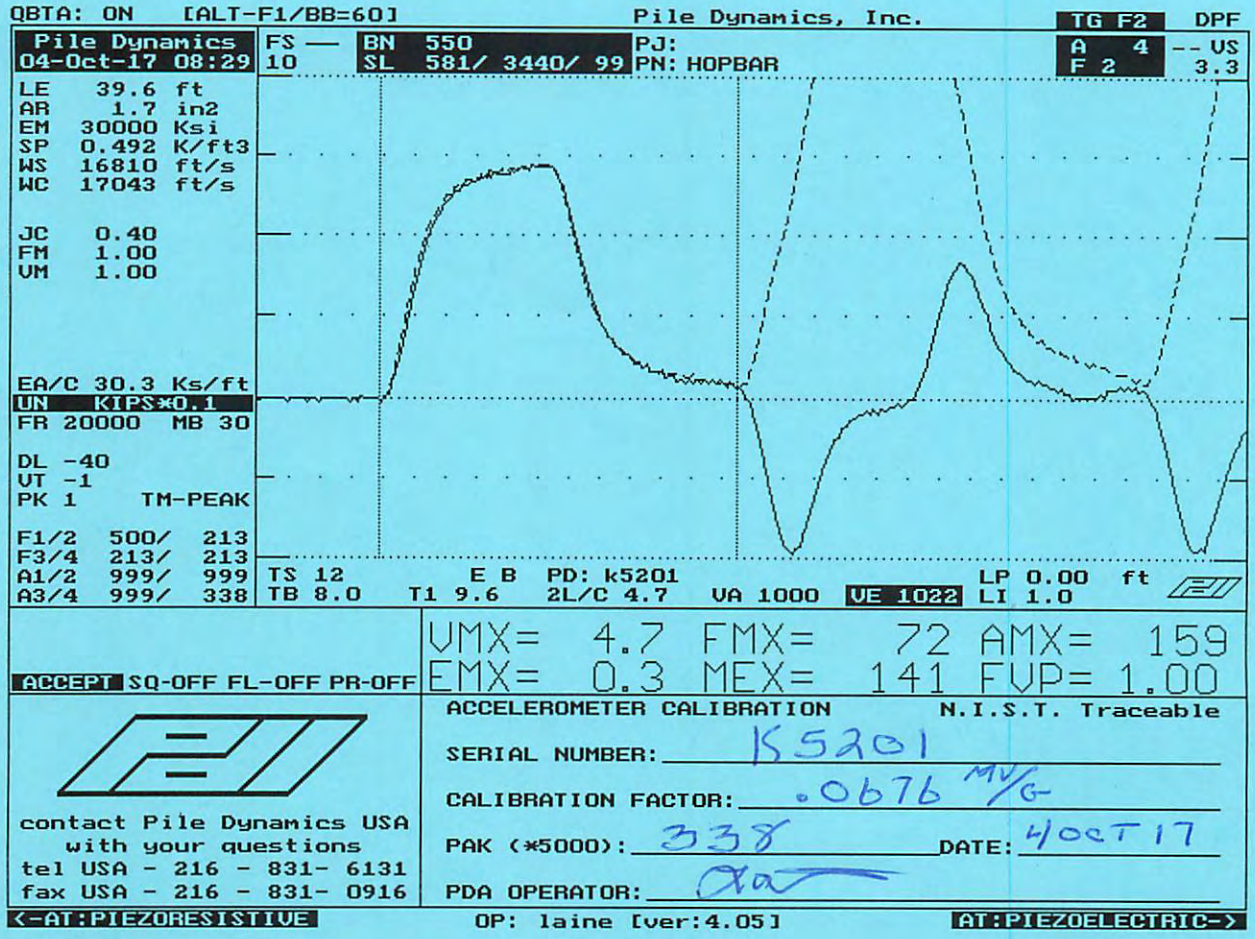
Date/Time: 1/26/2018 7:26 AM

Temperature (°C): 23.6



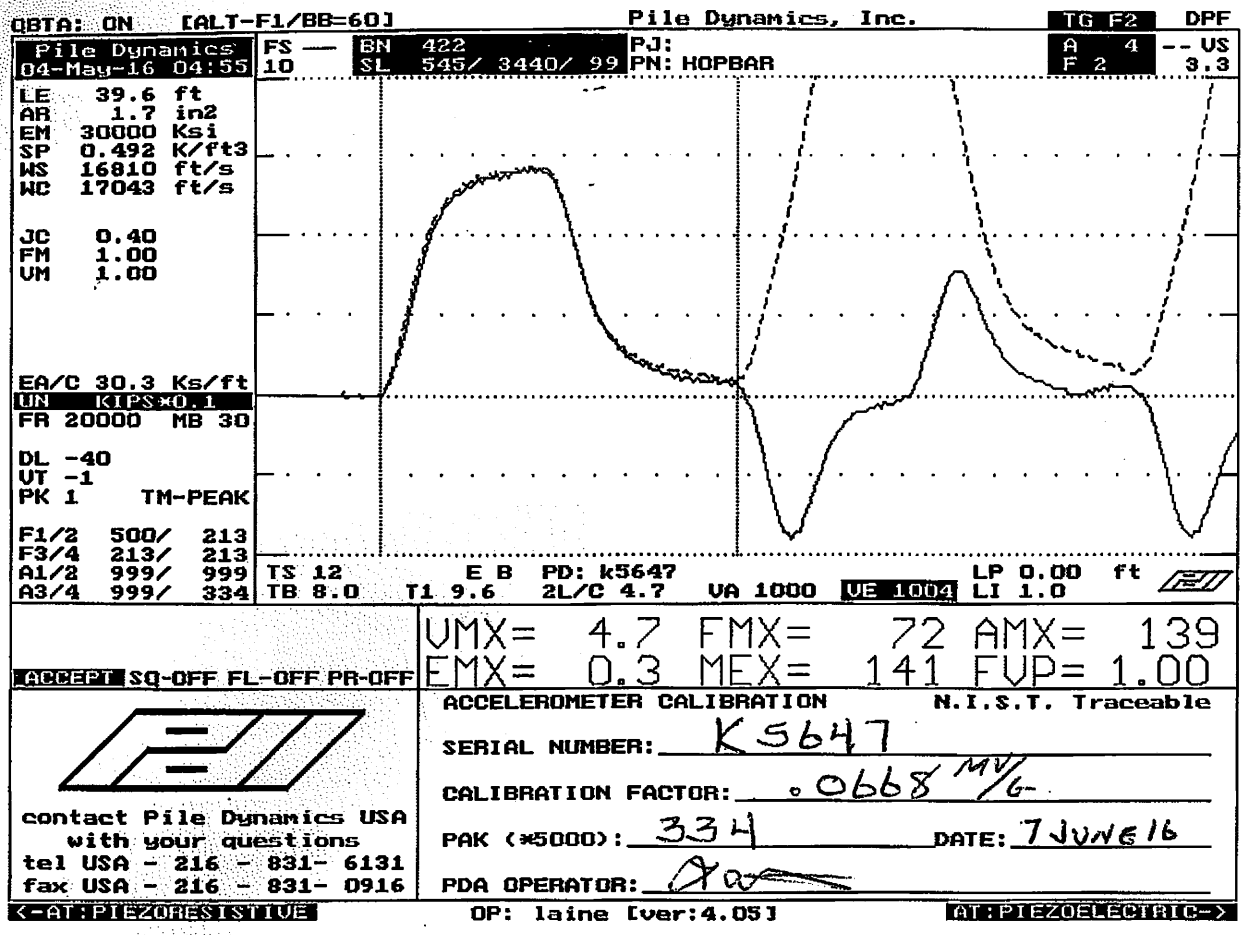
Smart Sensor

Smart Chip Programmed By J.M.N. **on** 21AUG17 **CRC Value** 1B48



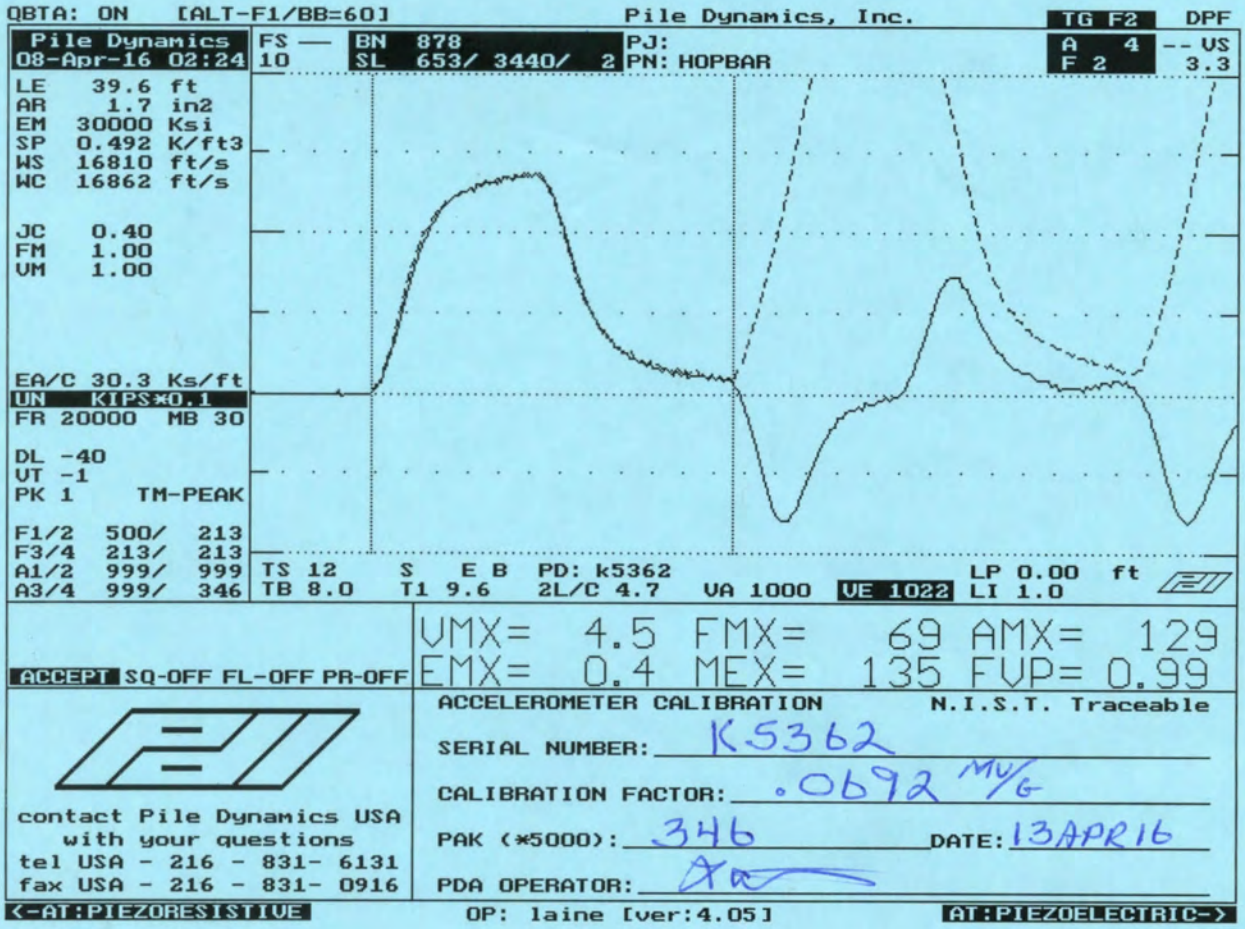
Smart Sensor

Smart Chip Programmed By J.M.W. **on** 4OCT17 **CRC Value** 046B



Smart Sensor

Smart Chip Programmed By M.W. **on** 7JUN16 **CRC Value** 34B5



Smart Sensor

Smart Chip Programmed By A.M.W. **on** 13APR16 **CRC Value** 1022

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Load Cell Calibration Report

Model Number: 3000X-4448kN-4.5

Calibration Date: February 06, 2018

Serial Number: 2202

This calibration has been verified/validated as of 02/07/2018

Max. Range (kN): 4448

Calibration Instruction: CI-3000

Cable Length: N/A

Technician:

Initial Cycling Data

Load (kN):	0	0	6672	0
Reading:	0.4690	0.4675	2.2425	0.4675

Calibration

Applied Load in kN	Readings from GK-501 or GK-502 readout box / 4000				Linearity % Max Load	Polynomial Error (%FS)
	Cycle 1	Cycle 2	Average	Change		
0	0.4675	0.4690	0.4683		-0.09	-0.04
445	0.5868	0.5873	0.5870	0.1187	-0.05	-0.02
890	0.7058	0.7063	0.7060	0.1190	0.01	0.02
1334	0.8235	0.8260	0.8248	0.1188	0.05	0.05
1779	0.9418	0.9425	0.9421	0.1173	-0.03	-0.05
2224	1.0603	1.0615	1.0609	0.1188	0.01	-0.01
2669	1.1793	1.1805	1.1799	0.1190	0.07	0.05
3114	1.2968	1.2968	1.2968	0.1169	-0.05	-0.07
3558	1.4153	1.4165	1.4159	0.1191	0.02	0.01
4003	1.5335	1.5350	1.5343	0.1184	0.02	0.04
4448	1.6508	1.6528	1.6518	0.1175	-0.04	-0.02
0	0.4690	0.4683	0.4686			

GK-501 or GK-502 Readout / 4000

Linear Gage Factor (G): 0.0002660 mV/V/kN

Regression Zero (R_0):* 0.4693

Polynomial Gage Factors: A: 7.376 B: 3744 C: -1756

Polynomial, $L = AR_1^2 + BR_1 + C$

Full Scale mV/ V: 1.184 mV/ V

Calculate C by setting L=0 and R_1 = initial field zero reading in the polynomial equation

* Note: The above calibration uses a linear regression method. The Regression Zero Reading shown is ideal for straight line computation and does not usually agree with the actual no-load reading.

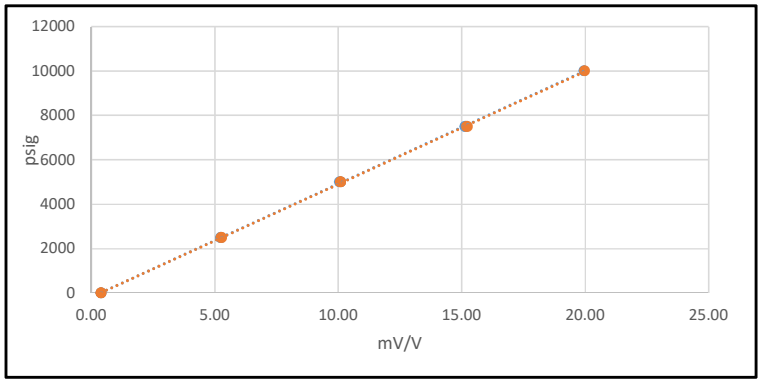
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Applied Foundation Testing, Inc.
4035 J. Louis Street
Green Cove Springs, Fl 32043
P: (904) 284-1337
F: (904) 284-1339

Pressure Transducer Calibration Report

Calibration Date	9/25/2017
Calibration Due	9/25/2018
Technician	William H. Richardson
Ambient	26 C / 75% RH

Description	Omega 10kpsi	
Model	PX329-10KGV	
Serial Number	060807D176	
Range	10000	psig



Calibrating Equipment		
Item	**Description**	**Serial**
Pressure Reference	CEJN 30kpsi	CP285481
Data Acquisition	NI 9219	1A4225C
30kpsi Hand Pump	Enerpac HPN2000	N/A

Load Cycle 1			Load Cycle 2			Average
Reference (psig)	**Found As (mV/V)**	**Left As (mV/V)**	**Reference (psig)**	**Found As (mV/V)**	**Left As (mV/V)**	**Nonlinearity (%)**
0	0.40	0.40	0	0.40	0.40	0.19%
2500	5.24	5.24	2500	5.28	5.28	-0.06%
5000	10.05	10.05	5000	10.10	10.10	-0.54%
7500	15.16	15.16	7500	15.23	15.23	0.54%
10000	19.95	19.95	10000	19.98	19.98	-0.17%
7500	15.13	15.13	7500	15.20	15.20	0.38%
5000	10.10	10.10	5000	10.09	10.09	-0.43%
2500	5.24	5.24	2500	5.26	5.26	-0.11%
0	0.40	0.40	0	0.40	0.40	0.19%

Linear Gage Factor	**509.2362**	**psig/mV/V**
Regression Zero	**-184.2194**	**psig**
Maximum Nonlinearity	**-0.54%**	
Sensitivity	**20.3660**	**mV/V**

Applied Foundation Testing, Inc. hereby certifies that this instrument meets or exceeds all requirements for its intended use and the reported calibration factors are accurate to within the limits of the calibrating procedure. Reference standards and calibrations are traceable to the National Institute of Standards and Technology (NIST) where applicable.

Technician:

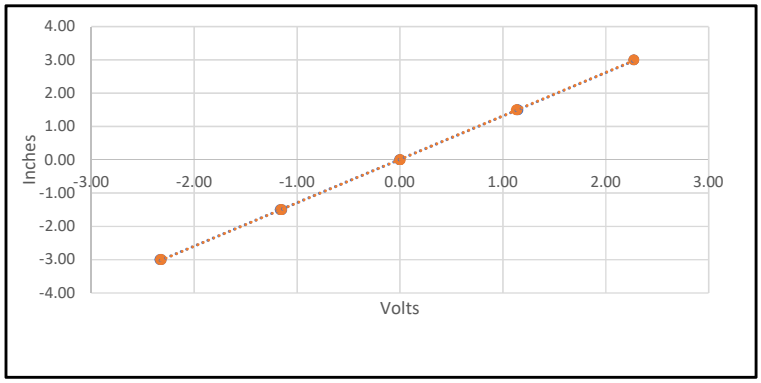
Approved:

Applied Foundation Testing, Inc.
2345 Success Drive
Odessa, Fl 33556
P: (727) 376-5040
F: (727) 376-5018

Displacement Transducer Calibration Report

Calibration Date	10/9/2017
Calibration Due	10/9/2018
Technician	A. Bates-Mendonca
Ambient	31°c / 55% RH

Description	RDP 6 inch LVDT	
Model	LDC3000C	
Serial Number	108207	
Range	6	in



Calibrating Equipment		
Item	**Description**	**Serial**
Digital Multimeter	Fluke 15B+	29022241WS14
Traceable Rule	Fowler 12 inch	251010207
Benchtop PS	LWPS305D	020253984

Displacement Cycle 1			Displacement Cycle 2			Average
Reference (in)	**Found As (VDC)**	**Left As (VDC)**	**Reference (in)**	**Found As (VDC)**	**Left As (VDC)**	**Nonlinearity (%)**
-3.00	-2.33	-2.33	-3.00	-2.32	-2.32	-0.29%
-1.50	-1.16	-1.16	-1.50	-1.16	-1.16	0.05%
0.00	0.00	0.00	0.00	0.00	0.00	0.23%
1.50	1.14	1.14	1.50	1.13	1.13	-0.09%
3.00	2.27	2.27	3.00	2.27	2.27	-0.35%
1.50	1.15	1.15	1.50	1.14	1.14	0.11%
0.00	0.00	0.00	0.00	0.00	0.00	0.27%
-1.50	-1.15	-1.15	-1.50	-1.15	-1.15	0.29%
-3.00	-2.32	-2.32	-3.00	-2.33	-2.33	-0.22%

Linear Gage Factor	**1.3037**	**in/V**
Regression Zero	**0.0156**	**in**
Maximum Nonlinearity	**-0.35%**	
Sensitivity	**4.5903**	**V**

Applied Foundation Testing, Inc. hereby certifies that this instrument meets or exceeds all requirements for its intended use and the reported calibration factors are accurate to within the limits of the calibrating procedure. Reference standards and calibrations are traceable to the National Institute of Standards and Technology (NIST) where applicable.

Technician:

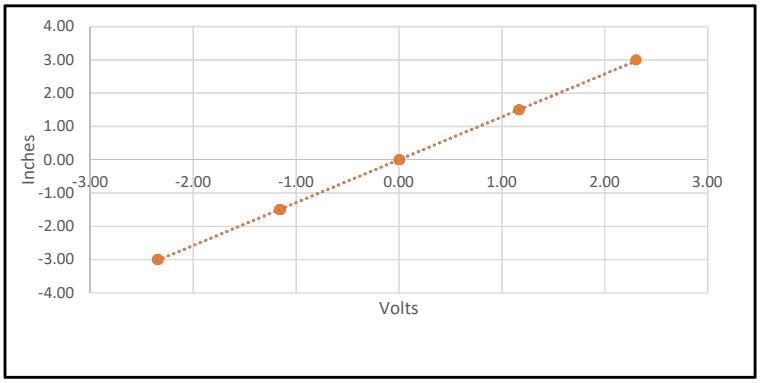
Approved:

Applied Foundation Testing, Inc.
2345 Success Drive
Odessa, Fl 33556
P: (727) 376-5040
F: (727) 376-5018

Displacement Transducer Calibration Report

Calibration Date	10/9/2017
Calibration Due	10/9/2018
Technician	W. Richardson
Ambient	31°c / 55% RH

Description	RDP 6 inch LVDT	
Model	LDC3000C	
Serial Number	108208	
Range	6	in



Calibrating Equipment		
Item	**Description**	**Serial**
Digital Multimeter	Fluke 15B+	29022241WS14
Traceable Rule	Fowler 12 inch	251010207
Benchtop PS	LWPS305D	020253984

Displacement Cycle 1			Displacement Cycle 2			Average
Reference (in)	**Found As (VDC)**	**Left As (VDC)**	**Reference (in)**	**Found As (VDC)**	**Left As (VDC)**	**Nonlinearity (%)**
-3.00	-2.35	-2.35	-3.00	-2.34	-2.34	-0.29%
-1.50	-1.16	-1.16	-1.50	-1.16	-1.16	0.21%
0.00	0.01	0.01	0.00	0.00	0.00	0.14%
1.50	1.17	1.17	1.50	1.17	1.17	0.13%
3.00	2.31	2.31	3.00	2.31	2.31	-0.42%
1.50	1.17	1.17	1.50	1.17	1.17	0.11%
0.00	0.01	0.01	0.00	0.00	0.00	0.13%
-1.50	-1.15	-1.15	-1.50	-1.16	-1.16	0.22%
-3.00	-2.34	-2.34	-3.00	-2.34	-2.34	-0.22%

Linear Gage Factor	**1.2886**	**in/V**
Regression Zero	**0.0039**	**in**
Maximum Nonlinearity	**-0.42%**	
Sensitivity	**4.6533**	**V**

Applied Foundation Testing, Inc. hereby certifies that this instrument meets or exceeds all requirements for its intended use and the reported calibration factors are accurate to within the limits of the calibrating procedure. Reference standards and calibrations are traceable to the National Institute of Standards and Technology (NIST) where applicable.

Technician:

Approved: