

GRL Engineers, Inc.

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TRANSMITTAL

To: Mr. Kevin Weber	From: Al Ziai
Company: Lunda Construction Co.	No. of Sheets: 55
E-mail: kweber@lundaconstruction.com	Date: April 14, 2015

RE: Dynamic Testing Results – USH 10 over Little Lake Butte des Morts
Structure B-70-403 - Pier 16
Winnebago County, Wisconsin

On April 10, 2015, Pier 16 #1, Pier 16 #36, and Pier 16 #44 at the above structure were dynamically tested during initial driving. The piles were tested during restrike on April 13. Project plans indicated the exterior row piles have a required driving resistance, or ultimate capacity, of 480 kips (240 tons) and the interior row piles have a required driving resistance of 400 kips (200 tons). The reference elevation for the piles was the top of the ring at EL 740.9. We understand the pier was excavated to an elevation of EL 718.0. The piles have a required minimum tip elevation of EL 678.0. The HP 14x73 H-piles were equipped with driving shoes and were driven with an APE D30-42 hammer (number PD 0256) reportedly operated on fuel setting 4.

Pier 16 #1 was driven to a depth of 60.2 feet, which corresponds to a pile tip elevation of EL 680.7. The blow count over the final increment of driving was 10 blows for 1 ½ inches of penetration at an average hammer stroke of 7.0 feet. The blow count at the beginning of restrike was 10 blows per inch of penetration at an average hammer stroke of 6.6 feet. Please note this pile did not achieve the minimum tip requirement at the end of initial drive. Pier 16 #1 was re-driven to a penetration depth of 64.5 feet, which corresponds to a pile tip elevation of EL 676.4. The blow count at the end of re-drive was 10 blows for 1 ½ inches at an average hammer stroke of 6.9 feet

Pier 16 #36 was driven to a depth of 63.5 feet, which corresponds to a pile tip elevation of EL 677.4. The blow count over the final increment of driving was 10 blows for 2 ½ inches of penetration at an average hammer stroke of 6.9 feet. The blow count at the beginning of restrike was 10 blows for 2 inches of penetration at an average hammer stroke of 6.5 feet.

Pier 16 #44 was driven to a depth of 67.7 feet, which corresponds to a pile tip elevation of EL 673.2. The blow count over the final increment of driving was 10 blows for 1 ¾ inches of penetration at an average hammer stroke of 7.3 feet. The blow count at the beginning of restrike was 10 blows for ¾ inch of penetration at an average hammer stroke of 7.0 feet

We recommend the production piles at Pier 16 of Structure B-70-403, driven with the APE D30-42 hammer PD0256, obtain the minimum recommended blow count, noted below, based on the field observed hammer stroke. We recommend maintaining the minimum blow count for

April 14, 2014

three consecutive inches of driving at the recommended average hammer stroke. Additionally, all production piles should achieve the minimum pile tip elevation of EL 678.0 for uplift, as indicated on the plans.

Field Observed Hammer Stroke (feet)	Exterior Piles (480 kips) Recommended Minimum Blow Count (blows per inch)	Interior Piles (400 kips) Recommended Minimum Blow Count (blows per inch)
6.5	9	6
7.0	6	5
7.5	6	5
8.0	5	4
8.5	5	4

We recommend immediately terminating driving **if the blow counts exceed 10** blows over an increment of one inch or less at hammer strokes of 8.0 feet, after satisfying any minimum tip requirements. We anticipate the production piles will terminate at depths similar to those of the test piles.

These criteria should not be used for acceptance of piles under restrike and/or re-drive conditions. After splicing or any other delays, we recommend not applying the criteria until two feet of driving has occurred beyond the termination depth associated with the delay, unless the blow count exceeds 10 blows per inch.

Please call if you have any questions on these recommendations.

GRL Engineers, Inc.



Al Ziai



Travis Coleman, P.E.

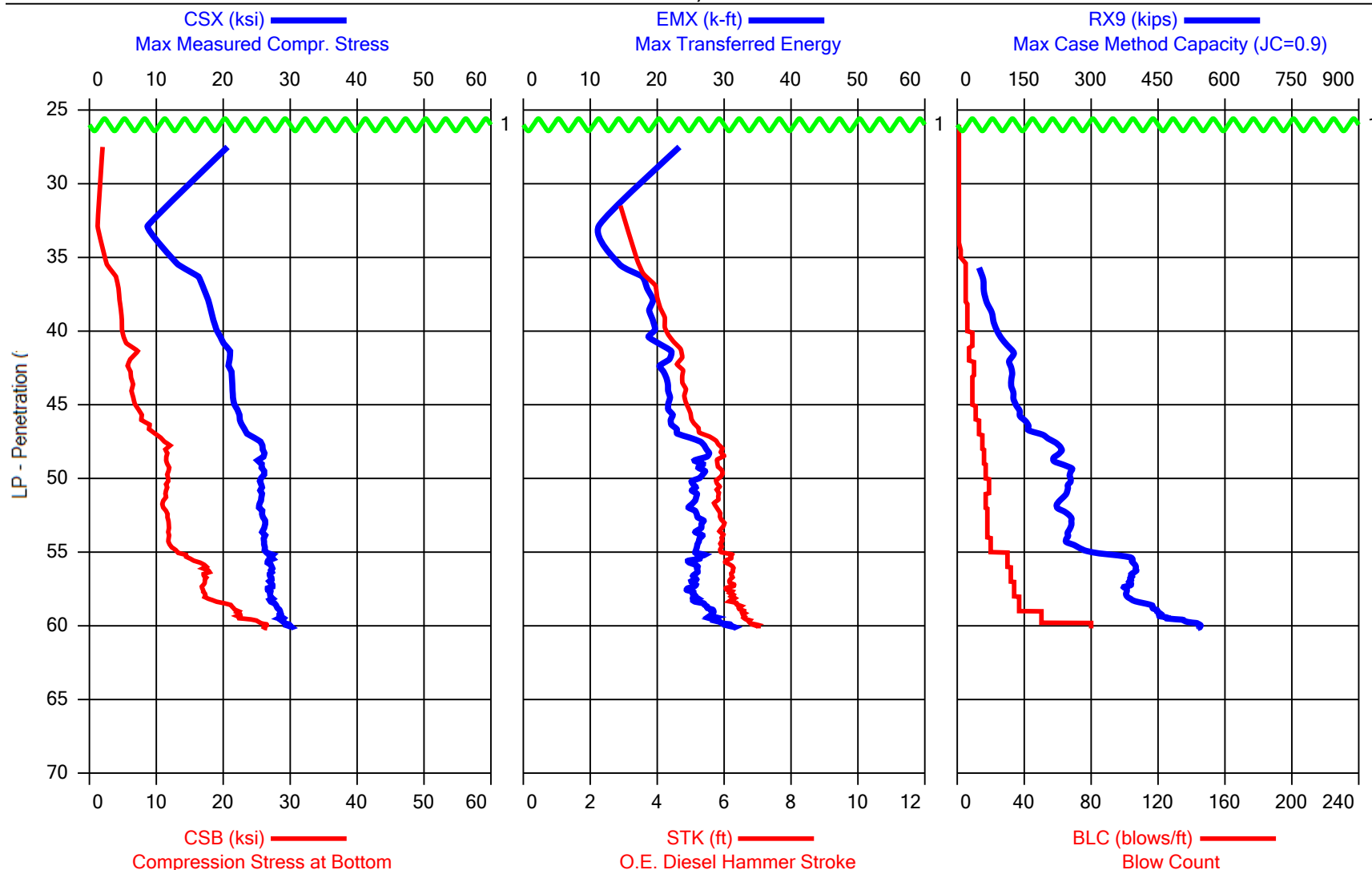
cc: Jeff Horsfall – jeffrey.horsfall@dot.wi.gov

Attachments:

Dynamic Test Results - (pages 3 – 31)
CAPWAP Analysis Results - (pages 32 – 55)



USH 10 over LLBDM - Pier 16 # 1 - EOID
APE D30-42, HP 14 x 73



USH 10 over LLBDM - Pier 16 # 1 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

AR: 21.40 in ²	SP: 0.492 k/ft ³
LE: 77.50 ft	EM: 30,000 ksi
WS: 16,807.9 f/s	JC: 1.00

CSX: Max Measured Compr. Stress	EMX: Max Transferred Energy
CSB: Compression Stress at Bottom	BPM: Blows per Minute
STK: O.E. Diesel Hammer Stroke	RX9: Max Case Method Capacity (JC=0.9)

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
1	26.00	1	AV1	21.5	2.0	**	23	**	0
			STD	0.0	0.0	**	0	**	0
			MAX	21.5	2.0	**	23	**	0
			MIN	21.5	2.0	**	23	**	0
2	27.00	1	AV1	23.6	2.1	**	23	**	0
			STD	0.0	0.0	**	0	**	0
			MAX	23.6	2.1	**	23	**	0
			MIN	23.6	2.1	**	23	**	0
3	28.00	1	AV1	23.7	2.4	**	32	**	0
			STD	0.0	0.0	**	0	**	0
			MAX	23.7	2.4	**	32	**	0
			MIN	23.7	2.4	**	32	**	0
4	29.00	1	AV1	13.8	1.3	3.1	16	65.7	0
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	13.8	1.3	3.1	16	65.7	0
			MIN	13.8	1.3	3.1	16	65.7	0
5	30.00	1	AV1	6.7	0.5	2.4	8	73.0	0
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	6.7	0.5	2.4	8	73.0	0
			MIN	6.7	0.5	2.4	8	73.0	0
8	33.00	1	AV1	14.3	1.4	3.3	18	63.5	0
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	14.3	1.4	3.3	18	63.5	0
			MIN	14.3	1.4	3.3	18	63.5	0
9	34.00	1	AV1	9.5	1.9	2.8	14	67.9	0
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	9.5	1.9	2.8	14	67.9	0
			MIN	9.5	1.9	2.8	14	67.9	0

USH 10 over LLBDM - Pier 16 # 1 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
10	34.50	2	AV1	4.3	1.1	2.4	5	73.2	0
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	4.3	1.1	2.4	5	73.2	0
			MIN	4.3	1.1	2.4	5	73.2	0
11	35.00	2	AV1	0.1	0.0	2.5	0	71.3	0
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	0.1	0.0	2.5	0	71.3	0
			MIN	0.1	0.0	2.5	0	71.3	0
13	35.40	5	AV1	25.1	4.1	5.3	31	50.8	53
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	25.1	4.1	5.3	31	50.8	53
			MIN	25.1	4.1	5.3	31	50.8	53
16	36.00	5	AV3	14.0	3.2	3.3	14	63.1	47
			STD	0.9	0.2	0.1	1	1.1	2
			MAX	14.6	3.5	3.5	16	64.4	50
			MIN	12.7	3.0	3.2	12	61.7	45
21	37.00	5	AV5	16.8	4.1	3.9	18	59.0	58
			STD	0.5	0.1	0.1	1	0.7	2
			MAX	17.4	4.2	3.9	19	60.1	60
			MIN	16.1	4.1	3.7	18	58.4	55
26	38.00	5	AV5	17.4	4.5	4.0	19	57.9	61
			STD	0.4	0.1	0.1	1	0.6	3
			MAX	18.2	4.7	4.2	21	58.6	65
			MIN	16.9	4.3	3.9	18	56.9	57
32	39.00	6	AV6	18.3	4.8	4.1	19	57.1	76
			STD	0.4	0.1	0.1	1	0.6	5
			MAX	18.8	5.0	4.2	20	58.0	82
			MIN	17.7	4.6	4.0	18	56.5	69
38	40.00	6	AV6	18.8	4.8	4.2	20	56.6	83
			STD	0.5	0.1	0.1	1	0.7	3
			MAX	19.4	5.0	4.3	21	58.1	88
			MIN	17.7	4.6	4.0	18	55.8	80
47	41.00	9	AV9	19.7	5.3	4.4	19	55.3	99

USH 10 over LLBDM - Pier 16 # 1 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
			STD	0.5	0.3	0.1	1	0.6	4
			MAX	20.4	5.8	4.5	21	56.7	104
			MIN	18.7	4.8	4.2	18	54.7	94
54	42.00	7	AV7	21.1	6.8	4.8	22	53.5	125
			STD	0.4	0.7	0.1	1	0.4	9
			MAX	21.6	8.0	4.9	24	54.3	137
			MIN	20.4	5.8	4.6	20	52.8	109
64	43.00	10	AV10	20.9	5.9	4.7	21	53.9	121
			STD	0.4	0.3	0.1	1	0.5	4
			MAX	21.5	6.3	4.8	22	54.8	127
			MIN	20.1	5.4	4.5	20	53.1	115
73	44.00	9	AV9	21.4	6.4	4.8	22	53.3	121
			STD	0.3	0.2	0.1	0	0.3	2
			MAX	21.9	6.8	4.9	22	53.9	125
			MIN	20.8	6.0	4.7	21	52.7	117
82	45.00	9	AV9	21.5	6.5	4.8	22	53.1	126
			STD	0.2	0.3	0.0	1	0.2	3
			MAX	21.8	7.0	4.9	22	53.6	131
			MIN	21.0	6.0	4.7	21	52.7	122
93	46.00	11	AV11	22.2	7.5	5.0	22	52.4	140
			STD	0.3	0.4	0.0	0	0.2	3
			MAX	22.6	8.0	5.0	23	52.8	145
			MIN	21.7	7.0	4.9	21	52.1	134
106	47.00	13	AV13	23.0	8.9	5.2	22	51.4	162
			STD	0.4	0.5	0.1	1	0.4	10
			MAX	23.9	9.9	5.4	24	52.1	189
			MIN	22.4	7.6	5.0	21	50.4	154
121	48.00	15	AV15	25.4	11.3	5.8	26	48.8	217
			STD	0.7	0.6	0.2	1	0.8	13
			MAX	26.7	12.3	6.1	29	50.2	232
			MIN	24.1	10.1	5.4	24	47.4	196
137	49.00	16	AV16	25.8	11.5	5.9	27	48.4	223
			STD	0.5	0.2	0.1	1	0.5	8

USH 10 over LLBDM - Pier 16 # 1 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
			MAX	26.7	12.0	6.1	28	49.4	239
			MIN	24.7	11.0	5.6	25	47.5	213
154	50.00	17	AV17	25.9	11.8	5.9	27	48.4	252
			STD	0.5	0.4	0.1	1	0.5	5
			MAX	26.8	12.5	6.1	28	49.3	260
			MIN	25.0	11.2	5.7	25	47.5	242
173	51.00	19	AV19	25.6	11.6	5.8	25	48.7	250
			STD	0.3	0.3	0.1	1	0.3	5
			MAX	26.1	12.1	5.9	27	49.2	258
			MIN	25.0	11.0	5.7	25	48.2	242
190	52.00	17	AV17	25.5	11.1	5.8	25	48.8	230
			STD	0.3	0.3	0.1	1	0.3	8
			MAX	26.1	11.7	5.9	26	49.4	244
			MIN	24.9	10.8	5.6	24	48.3	220
208	53.00	18	AV18	25.9	11.6	5.9	26	48.4	248
			STD	0.3	0.3	0.1	1	0.3	9
			MAX	26.7	12.0	6.1	27	48.8	259
			MIN	25.4	11.0	5.8	25	47.6	228
226	54.00	18	AV16	26.1	11.8	5.9	26	48.2	251
			STD	0.4	0.2	0.1	1	0.4	4
			MAX	26.8	12.1	6.1	28	49.1	261
			MIN	25.2	11.6	5.7	25	47.5	244
246	55.00	20	AV20	26.1	12.3	5.9	26	48.3	263
			STD	0.3	0.5	0.1	1	0.2	18
			MAX	26.6	13.4	6.0	27	48.6	293
			MIN	25.6	11.6	5.8	25	47.9	237
276	56.00	30	AV30	27.0	15.5	6.1	26	47.4	379
			STD	0.4	1.3	0.1	1	0.4	28
			MAX	27.7	17.6	6.3	28	48.5	404
			MIN	25.9	13.0	5.9	24	46.8	300
308	57.00	32	AV32	27.1	17.4	6.2	26	47.1	394
			STD	0.3	0.4	0.1	1	0.3	6
			MAX	27.6	18.4	6.4	27	47.7	406

USH 10 over LLBDM - Pier 16 # 1 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
			MIN	26.6	16.7	6.1	25	46.6	382
342	58.00	34	AV34	27.0	17.1	6.2	25	47.2	381
			STD	0.4	0.4	0.1	1	0.4	6
			MAX	27.6	17.7	6.4	26	48.1	394
			MIN	26.1	16.0	6.0	24	46.6	372
379	59.00	37	AV37	27.7	20.0	6.4	27	46.6	418
			STD	0.6	1.7	0.2	1	0.6	24
			MAX	28.9	22.4	6.7	29	47.6	454
			MIN	26.6	16.9	6.1	24	45.5	375
419	59.80	50	AV40	28.6	23.2	6.6	28	45.7	475
			STD	0.4	1.3	0.1	1	0.4	27
			MAX	29.6	25.7	6.9	31	46.5	531
			MIN	27.9	21.4	6.4	27	44.8	443
429	59.92	80	AV10	29.5	26.1	6.9	30	44.9	540
			STD	0.4	0.4	0.1	1	0.3	4
			MAX	30.2	26.9	7.1	32	45.4	547
			MIN	29.0	25.4	6.7	29	44.3	532
439	60.04	80	AV10	29.9	26.3	7.0	31	44.6	545
			STD	0.2	0.3	0.1	0	0.3	5
			MAX	30.1	26.7	7.1	31	45.3	554
			MIN	29.2	25.7	6.8	30	44.3	538
449	60.17	80	AV10	30.0	26.1	7.0	31	44.5	541
			STD	0.3	0.2	0.1	1	0.3	3
			MAX	30.7	26.6	7.2	33	45.0	547
			MIN	29.6	25.7	6.8	30	43.8	537
450	60.18	80	AV1	29.9	26.6	7.0	31	44.4	542
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	29.9	26.6	7.0	31	44.4	542
			MIN	29.9	26.6	7.0	31	44.4	542
Average				25.4	14.1	5.8	25	49.1	297
Std. Dev.				3.8	6.4	0.8	4	4.2	142
Maximum				30.7	26.9	7.2	33	73.2	554
Minimum				0.1	0.0	2.4	0	43.8	0

Total number of blows analyzed: 445

USH 10 over LLBDM - Pier 16 # 1 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL# Sensors

1-450 F3: [D815] 93.0 (1.00); F4: [F607] 93.6 (1.00); A3: [K3550] 360.0 (1.05); A4: [K2524] 360.0 (1.05)

BL# Comments

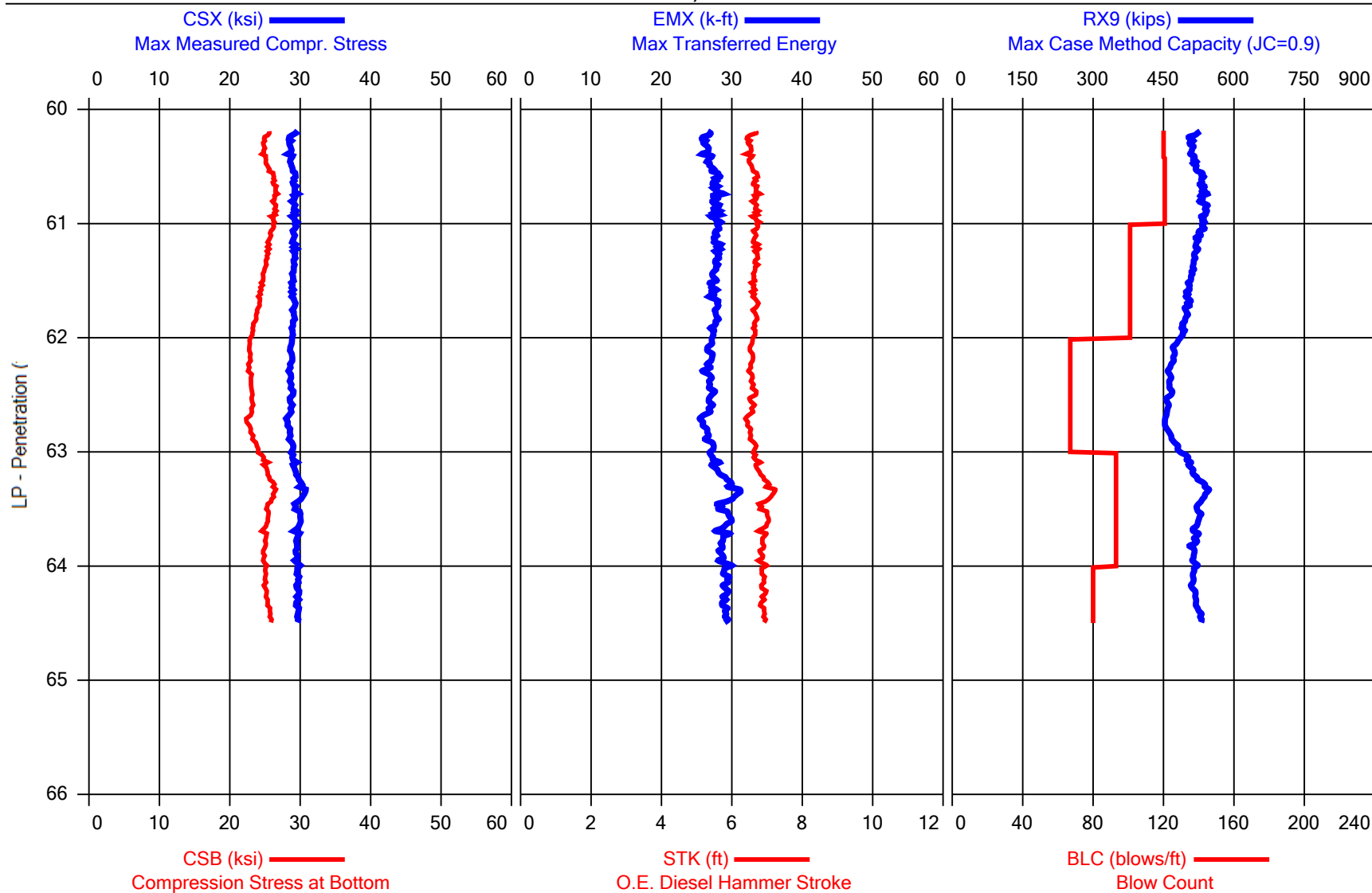
1 Reported Reference EL 740.9

Time Summary

Drive 10 minutes 14 seconds 11:22 AM - 11:32 AM BN 1 - 450



USH 10 over LLBDM - Pier 16 # 1 - EOR
APE D30-42, HP 14 x 73



USH 10 over LLBDM - Pier 16 # 1 - EOR
OP: AZ

APE D30-42, HP 14 x 73
Date: 13-April-2015

AR: 21.40 in ²	SP: 0.492 k/ft ³
LE: 65.00 ft	EM: 30,000 ksi
WS: 16,807.9 f/s	JC: 1.00

CSX: Max Measured Compr. Stress	EMX: Max Transferred Energy
CSB: Compression Stress at Bottom	BPM: Blows per Minute
STK: O.E. Diesel Hammer Stroke	RX9: Max Case Method Capacity (JC=0.9)

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
10	60.25	120	AV9	28.8	25.3	6.6	26	45.9	516
			STD	0.5	0.4	0.2	1	0.5	11
			MAX	29.7	25.9	6.8	28	46.6	536
			MIN	28.2	24.7	6.4	25	45.0	500
20	60.34	120	AV10	28.6	24.9	6.5	26	46.1	510
			STD	0.2	0.2	0.0	0	0.1	5
			MAX	29.0	25.2	6.6	27	46.4	519
			MIN	28.4	24.7	6.4	26	45.9	505
30	60.42	120	AV10	28.7	24.9	6.5	27	46.1	511
			STD	0.3	0.2	0.1	1	0.3	5
			MAX	29.0	25.2	6.6	27	46.6	519
			MIN	28.0	24.3	6.4	25	45.8	500
100	61.00	121	AV70	29.1	26.1	6.7	28	45.6	531
			STD	0.3	0.5	0.1	1	0.3	9
			MAX	29.7	26.9	6.8	29	46.3	548
			MIN	28.4	24.9	6.5	26	45.1	512
201	62.00	101	AV101	29.1	24.6	6.7	28	45.6	508
			STD	0.2	0.9	0.1	1	0.2	13
			MAX	29.6	26.4	6.8	29	46.2	541
			MIN	28.4	22.9	6.5	26	45.1	485
268	63.00	67	AV67	28.6	23.0	6.6	27	46.0	466
			STD	0.3	0.4	0.1	1	0.3	9
			MAX	29.2	24.2	6.7	28	46.7	485
			MIN	27.8	22.2	6.3	25	45.4	450
361	64.00	93	AV93	29.7	25.3	6.9	29	44.9	520
			STD	0.5	0.5	0.2	1	0.5	12
			MAX	30.9	26.7	7.3	32	46.2	548
			MIN	28.4	24.3	6.5	27	43.7	489

USH 10 over LLBDM - Pier 16 # 1 - EOR
OP: AZ

APE D30-42, HP 14 x 73
Date: 13-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
371	64.13	80	AV10	29.6	25.1	6.9	29	44.9	514
			STD	0.4	0.2	0.1	1	0.4	3
			MAX	30.4	25.3	7.1	31	45.5	519
			MIN	29.0	24.7	6.7	28	44.2	509
381	64.25	80	AV10	29.7	25.1	6.9	29	44.8	514
			STD	0.2	0.2	0.1	0	0.2	4
			MAX	30.1	25.3	7.0	30	45.1	520
			MIN	29.4	24.7	6.8	29	44.4	506
391	64.38	80	AV10	29.6	25.4	6.9	29	45.0	519
			STD	0.3	0.2	0.1	1	0.2	3
			MAX	30.1	25.8	7.0	30	45.4	525
			MIN	29.1	25.1	6.7	28	44.6	515
401	64.50	80	AV10	29.7	25.8	6.9	29	44.8	529
			STD	0.3	0.2	0.1	1	0.3	4
			MAX	30.0	26.0	7.0	30	45.1	534
			MIN	29.2	25.4	6.8	28	44.4	522
Average				29.2	24.9	6.7	28	45.5	509
Std. Dev.				0.5	1.1	0.2	1	0.6	23
Maximum				30.9	26.9	7.3	32	46.7	548
Minimum				27.8	22.2	6.3	25	43.7	450
Total number of blows analyzed: 400									

BL# Sensors

1-401 F3: [F607] 93.6 (1.00); F4: [D815] 93.0 (1.00); A3: [K2524] 360.0 (1.03); A4: [K3550] 360.0 (1.03)

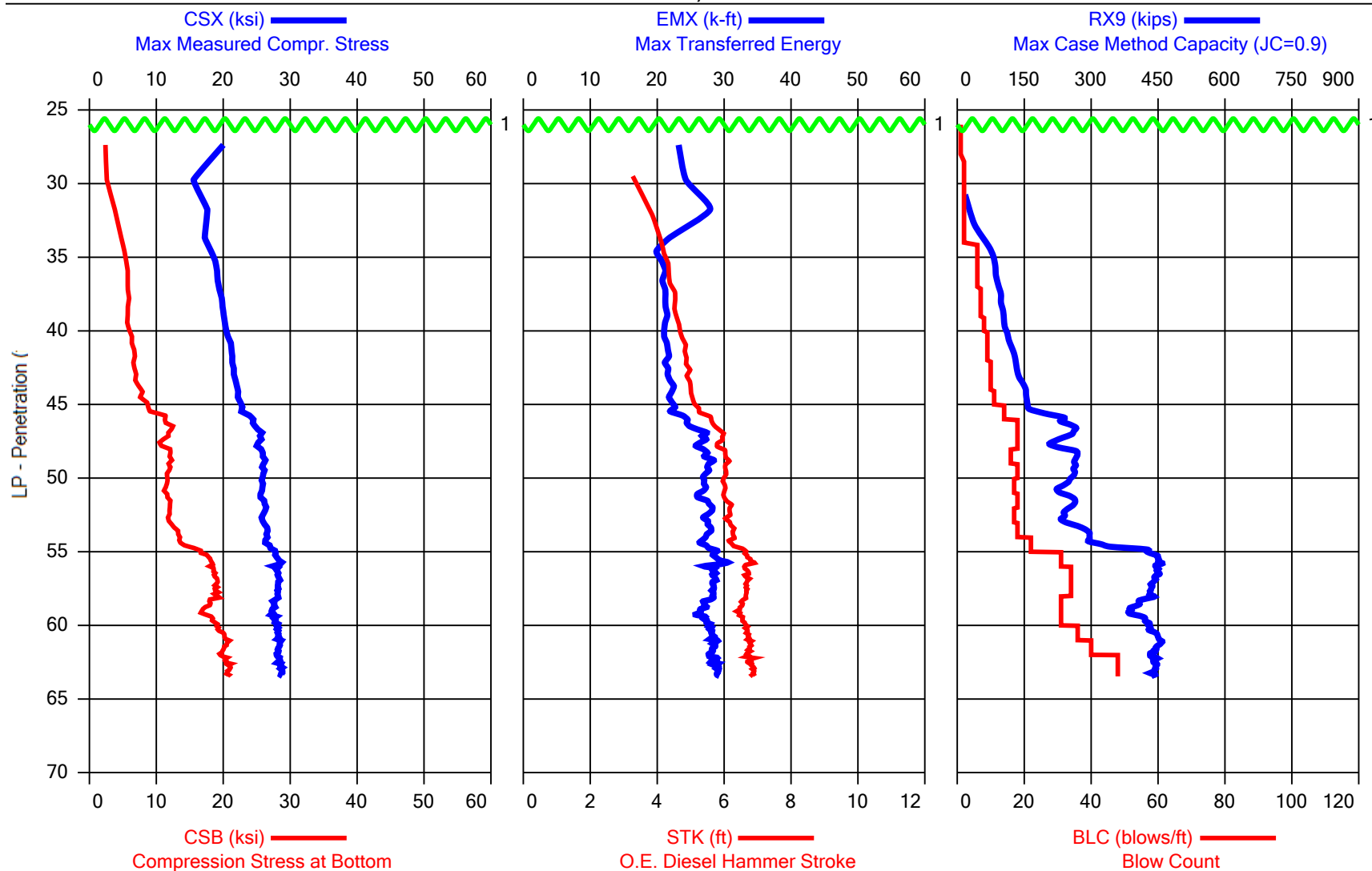
Time Summary

Drive 8 minutes 47 seconds 7:01 AM - 7:10 AM BN 1 - 401



USH 10 over LLBDM - Pier 16 # 36 - EOID

APE D30-42, HP 14 x 73



1 - Reported Reference EL 740.9

USH 10 over LLBDM - Pier 16 # 36 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

AR: 21.40 in ²	SP: 0.492 k/ft ³
LE: 77.50 ft	EM: 30,000 ksi
WS: 16,807.9 f/s	JC: 1.00

CSX: Max Measured Compr. Stress	EMX: Max Transferred Energy
CSB: Compression Stress at Bottom	BPM: Blows per Minute
STK: O.E. Diesel Hammer Stroke	RX9: Max Case Method Capacity (JC=0.9)

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
1	26.00	1	AV1	20.8	1.6	**	20	**	0
			STD	0.0	0.0	**	0	**	0
			MAX	20.8	1.6	**	20	**	0
			MIN	20.8	1.6	**	20	**	0
2	27.00	1	AV1	22.9	2.3	**	22	**	0
			STD	0.0	0.0	**	0	**	0
			MAX	22.9	2.3	**	22	**	0
			MIN	22.9	2.3	**	22	**	0
3	28.00	1	AV1	23.6	3.5	**	38	**	0
			STD	0.0	0.0	**	0	**	0
			MAX	23.6	3.5	**	38	**	0
			MIN	23.6	3.5	**	38	**	0
5	29.00	2	AV2	8.3	1.4	2.8	10	68.8	0
			STD	4.3	0.6	0.2	4	1.9	0
			MAX	12.6	2.0	2.9	13	70.7	0
			MIN	4.1	0.8	2.6	6	66.9	0
7	30.00	2	AV2	23.5	3.5	4.6	39	54.4	6
			STD	1.1	0.1	0.0	9	0.0	6
			MAX	24.6	3.7	4.6	48	54.4	13
			MIN	22.5	3.4	4.6	30	54.4	0
9	31.00	2	AV2	7.7	2.1	2.8	10	68.6	0
			STD	3.5	0.4	0.2	4	1.9	0
			MAX	11.1	2.5	3.0	14	70.5	0
			MIN	4.2	1.7	2.6	5	66.7	0
11	32.00	2	AV2	24.9	4.6	5.3	42	50.9	49
			STD	0.5	0.0	0.0	3	0.0	8
			MAX	25.4	4.6	5.3	46	50.9	57
			MIN	24.4	4.6	5.3	39	50.9	40

USH 10 over LLBDM - Pier 16 # 36 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
13	33.00	2	AV2	16.1	4.3	3.8	21	59.8	34
			STD	0.4	0.0	0.0	1	0.2	5
			MAX	16.5	4.3	3.8	22	59.9	39
			MIN	15.7	4.2	3.7	21	59.6	29
15	34.00	2	AV2	18.0	4.9	4.2	24	57.0	50
			STD	0.3	0.1	0.1	0	0.4	6
			MAX	18.4	5.0	4.2	24	57.4	57
			MIN	17.7	4.9	4.1	24	56.6	44
21	35.00	6	AV6	18.0	5.2	4.2	20	56.9	78
			STD	0.7	0.2	0.1	1	0.8	3
			MAX	19.1	5.5	4.3	21	57.9	82
			MIN	17.2	4.8	4.0	18	55.8	74
27	36.00	6	AV6	18.9	5.6	4.3	21	55.9	84
			STD	0.3	0.1	0.1	0	0.3	2
			MAX	19.4	5.8	4.4	21	56.5	87
			MIN	18.5	5.5	4.2	20	55.5	81
33	37.00	6	AV6	19.0	5.7	4.4	21	55.7	89
			STD	0.6	0.2	0.1	1	0.7	3
			MAX	19.5	6.0	4.5	22	56.8	94
			MIN	18.1	5.4	4.2	19	55.0	87
40	38.00	7	AV7	19.8	5.9	4.5	21	54.7	97
			STD	0.3	0.1	0.1	1	0.4	4
			MAX	20.3	6.0	4.6	23	55.3	104
			MIN	19.3	5.8	4.4	20	54.2	92
47	39.00	7	AV7	20.0	5.7	4.5	21	54.7	101
			STD	0.4	0.2	0.1	1	0.6	4
			MAX	20.3	6.1	4.6	22	56.0	108
			MIN	19.0	5.4	4.3	20	54.2	97
55	40.00	8	AV8	20.2	5.7	4.6	21	54.2	107
			STD	0.2	0.1	0.1	1	0.3	3
			MAX	20.5	5.9	4.7	22	54.6	112
			MIN	19.9	5.6	4.6	20	53.7	104
64	41.00	9	AV9	20.9	6.4	4.8	21	53.4	115

USH 10 over LLBDM - Pier 16 # 36 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
			STD	0.3	0.2	0.1	1	0.4	3
			MAX	21.5	6.6	4.9	22	54.0	119
			MIN	20.4	6.0	4.7	20	52.7	109
73	42.00	9	AV9	21.3	6.7	4.9	22	53.0	127
			STD	0.3	0.3	0.1	0	0.3	3
			MAX	21.7	7.2	4.9	22	53.5	132
			MIN	20.9	6.0	4.8	21	52.6	121
83	43.00	10	AV10	21.6	6.8	4.9	22	52.6	133
			STD	0.5	0.3	0.1	1	0.5	3
			MAX	22.1	7.3	5.1	23	53.6	137
			MIN	20.7	6.3	4.7	20	51.9	130
93	44.00	10	AV10	21.8	7.1	5.0	22	52.5	147
			STD	0.5	0.5	0.1	1	0.4	5
			MAX	22.4	7.9	5.0	23	53.6	152
			MIN	20.5	6.6	4.7	19	52.1	138
104	45.00	11	AV11	22.3	8.1	5.1	22	52.0	155
			STD	0.3	0.5	0.1	0	0.4	3
			MAX	22.7	9.0	5.2	23	52.7	160
			MIN	21.8	7.3	4.9	21	51.3	151
118	46.00	14	AV14	23.4	9.9	5.4	23	50.6	194
			STD	0.8	1.3	0.2	1	0.9	34
			MAX	24.9	12.1	5.7	26	51.8	247
			MIN	22.4	8.4	5.1	21	49.0	159
136	47.00	18	AV18	25.0	11.9	5.8	25	48.8	254
			STD	0.6	0.5	0.2	1	0.7	14
			MAX	25.9	12.8	6.1	28	49.9	269
			MIN	23.9	11.0	5.5	23	47.7	226
154	48.00	18	AV18	25.4	11.1	5.9	27	48.4	226
			STD	0.4	0.6	0.1	1	0.4	18
			MAX	26.3	12.2	6.1	28	49.2	258
			MIN	24.7	10.3	5.7	25	47.5	199
170	49.00	16	AV16	26.1	12.1	6.1	28	47.6	266
			STD	0.3	0.4	0.1	1	0.4	5

USH 10 over LLBDM - Pier 16 # 36 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
			MAX	26.6	12.7	6.3	29	48.5	275
			MIN	25.4	11.5	5.9	26	46.9	259
188	50.00	18	AV18	25.9	11.8	6.0	27	47.8	262
			STD	0.4	0.3	0.1	1	0.3	4
			MAX	26.5	12.3	6.2	29	48.6	268
			MIN	24.9	11.2	5.8	26	47.3	256
205	51.00	17	AV17	25.8	11.5	6.0	27	47.9	236
			STD	0.3	0.4	0.1	1	0.3	12
			MAX	26.4	12.0	6.1	28	48.5	253
			MIN	25.3	10.9	5.9	26	47.4	218
223	52.00	18	AV18	26.0	11.9	6.1	27	47.6	257
			STD	0.5	0.3	0.1	1	0.5	8
			MAX	26.9	12.7	6.3	29	48.4	267
			MIN	25.2	11.2	5.9	26	46.7	238
240	53.00	17	AV17	26.0	11.9	6.1	28	47.4	239
			STD	0.4	0.3	0.1	1	0.3	7
			MAX	26.6	12.3	6.3	29	48.2	251
			MIN	25.1	11.4	5.9	26	47.0	223
258	54.00	18	AV18	26.5	12.9	6.3	28	47.0	284
			STD	0.3	0.5	0.1	1	0.3	14
			MAX	27.2	13.7	6.4	29	47.4	299
			MIN	26.1	12.1	6.1	26	46.5	255
280	55.00	22	AV22	26.8	14.6	6.3	27	46.7	343
			STD	0.8	1.4	0.2	1	0.8	52
			MAX	28.5	17.1	6.8	30	48.3	433
			MIN	25.3	13.2	5.9	24	45.1	287
311	56.00	31	AV31	28.1	17.8	6.7	29	45.4	448
			STD	0.5	0.6	0.1	1	0.5	9
			MAX	28.9	18.6	7.0	31	46.7	468
			MIN	26.9	16.4	6.3	26	44.6	427
345	57.00	34	AV34	28.2	18.7	6.7	28	45.5	447
			STD	0.4	0.4	0.1	1	0.4	6
			MAX	29.1	19.5	6.9	30	46.2	461

USH 10 over LLBDM - Pier 16 # 36 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
			MIN	27.4	18.1	6.5	27	44.8	432
379	58.00	34	AV34	28.2	18.9	6.7	28	45.6	435
			STD	0.3	0.4	0.1	0	0.2	5
			MAX	28.7	19.7	6.8	29	46.2	444
			MIN	27.6	18.3	6.5	27	45.2	425
410	59.00	31	AV31	27.7	17.9	6.5	27	46.0	407
			STD	0.4	0.8	0.1	1	0.4	17
			MAX	28.5	19.9	6.8	29	47.0	442
			MIN	26.6	16.3	6.3	25	45.3	379
441	60.00	31	AV31	27.6	18.0	6.5	27	46.0	412
			STD	0.4	0.8	0.1	1	0.4	17
			MAX	28.6	19.3	6.8	29	46.8	434
			MIN	26.8	16.4	6.3	25	45.2	380
477	61.00	36	AV36	28.2	19.8	6.7	28	45.5	442
			STD	0.3	0.6	0.1	1	0.3	9
			MAX	28.8	21.0	6.9	30	46.3	458
			MIN	27.4	18.9	6.5	26	44.9	426
517	62.00	40	AV40	28.3	20.2	6.8	28	45.3	447
			STD	0.3	0.5	0.1	1	0.3	9
			MAX	28.9	21.1	6.9	30	45.8	464
			MIN	27.7	19.3	6.6	27	44.8	428
557	62.83	48	AV40	28.4	20.5	6.8	29	45.2	442
			STD	0.3	0.5	0.1	1	0.3	7
			MAX	29.1	21.2	7.0	30	45.9	456
			MIN	27.7	19.2	6.6	26	44.6	431
567	63.04	48	AV10	28.7	21.0	6.9	29	44.9	444
			STD	0.3	0.2	0.1	1	0.2	3
			MAX	29.2	21.5	7.0	30	45.3	450
			MIN	28.2	20.7	6.8	28	44.6	438
577	63.25	48	AV10	28.8	20.6	6.9	29	44.9	438
			STD	0.3	0.2	0.1	0	0.2	4
			MAX	29.3	20.9	7.0	30	45.4	443
			MIN	28.2	20.2	6.7	28	44.5	430

USH 10 over LLBDM - Pier 16 # 36 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
587	63.46	48	AV10	28.7	20.7	6.9	29	45.0	439
			STD	0.2	0.3	0.1	0	0.2	4
			MAX	29.0	21.1	7.0	30	45.3	447
			MIN	28.4	20.4	6.8	29	44.6	434
Average				26.0	14.7	6.1	27	47.8	324
Std. Dev.				3.2	5.3	0.8	3	3.6	133
Maximum				29.3	21.5	7.0	48	70.7	468
Minimum				4.1	0.8	2.6	5	44.5	0
Total number of blows analyzed: 587									

BL# Sensors

1-587 F3: [D815] 93.0 (1.00); F4: [F607] 93.6 (1.00); A3: [K3550] 360.0 (1.04); A4: [K2524] 360.0 (1.04)

BL# Comments

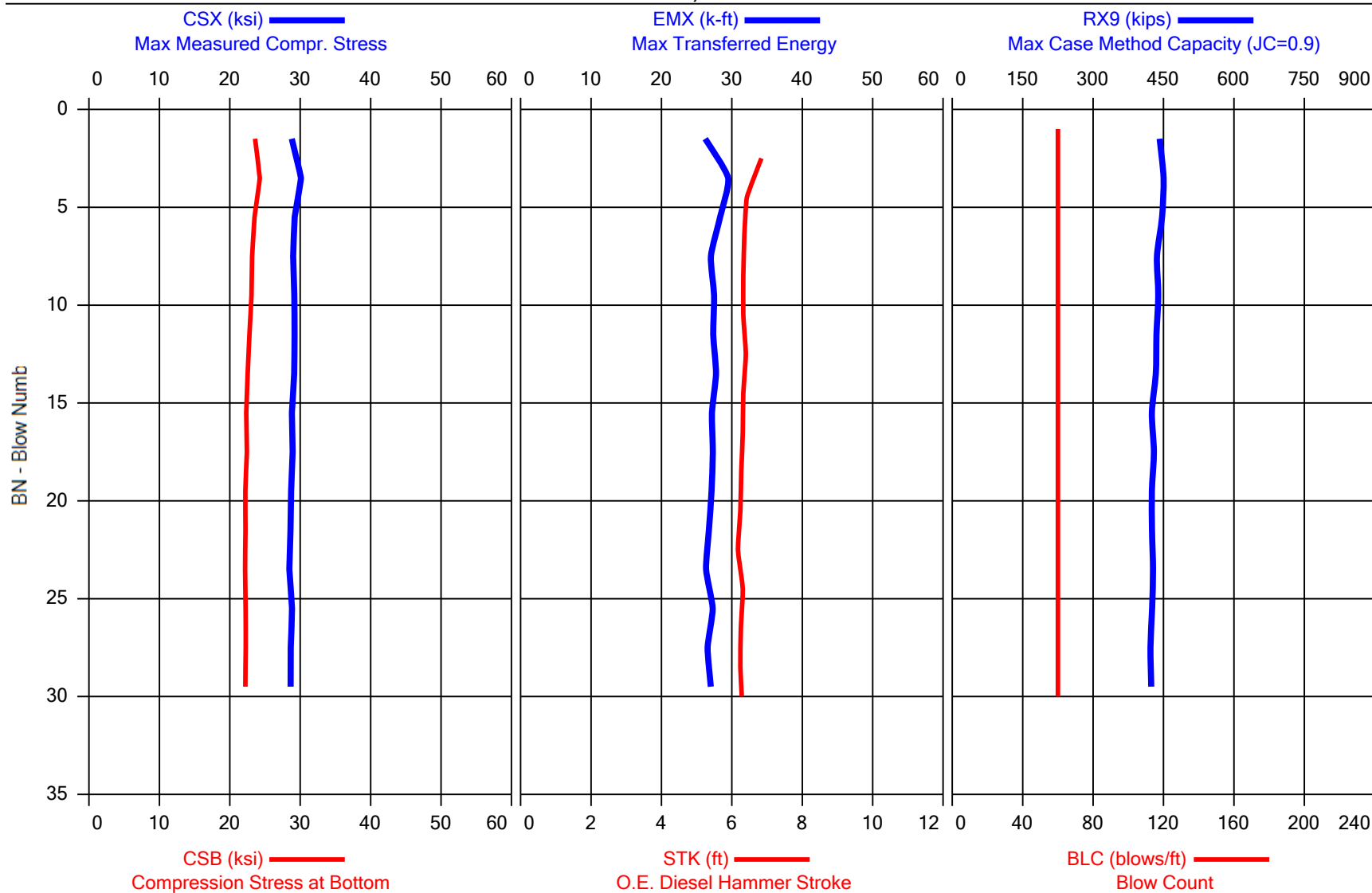
1 Reported Reference EL 740.9

Time Summary

Drive 13 minutes 18 seconds 11:47 AM - 12:00 PM BN 1 - 587



USH 10 over LLBDM - Pier 16 # 36 - BOR
APE D30-42, HP 14 x 73



USH 10 over LLBDM - Pier 16 # 36 - BOR
OP: AZ

APE D30-42, HP 14 x 73
Date: 13-April-2015

AR: 21.40 in ²	SP: 0.492 k/ft ³
LE: 68.00 ft	EM: 30,000 ksi
WS: 16,807.9 f/s	JC: 1.00

CSX: Max Measured Compr. Stress	EMX: Max Transferred Energy
CSB: Compression Stress at Bottom	BPM: Blows per Minute
STK: O.E. Diesel Hammer Stroke	RX9: Max Case Method Capacity (JC=0.9)

BL#	depth	BLC	TYPE	CSX	CSB	STK	EMX	BPM	RX9
	ft	blows/ft		ksi	ksi	ft	k-ft	bpm	kips
10	63.63	60	AV9	29.4	23.6	6.5	28	46.3	444
			STD	0.7	0.7	0.2	1	0.7	7
			MAX	31.2	24.9	7.0	31	46.9	452
			MIN	28.8	22.9	6.3	27	44.5	432
20	63.79	60	AV10	29.0	22.5	6.3	27	46.8	430
			STD	0.2	0.2	0.1	0	0.2	5
			MAX	29.4	22.9	6.5	28	47.0	439
			MIN	28.7	22.2	6.3	27	46.3	422
30	63.96	60	AV10	28.6	22.2	6.2	27	47.0	425
			STD	0.2	0.1	0.1	1	0.2	4
			MAX	28.9	22.4	6.3	28	47.5	433
			MIN	28.1	21.9	6.1	26	46.7	420
			Average	29.0	22.7	6.3	27	46.7	432
			Std. Dev.	0.5	0.7	0.2	1	0.5	9
			Maximum	31.2	24.9	7.0	31	47.5	452
			Minimum	28.1	21.9	6.1	26	44.5	420

Total number of blows analyzed: 29

BL# Sensors

1-30 F3: [F607] 93.6 (1.00); F4: [D815] 93.0 (1.00); A3: [K2524] 360.0 (1.06); A4: [K3550] 360.0 (1.06)

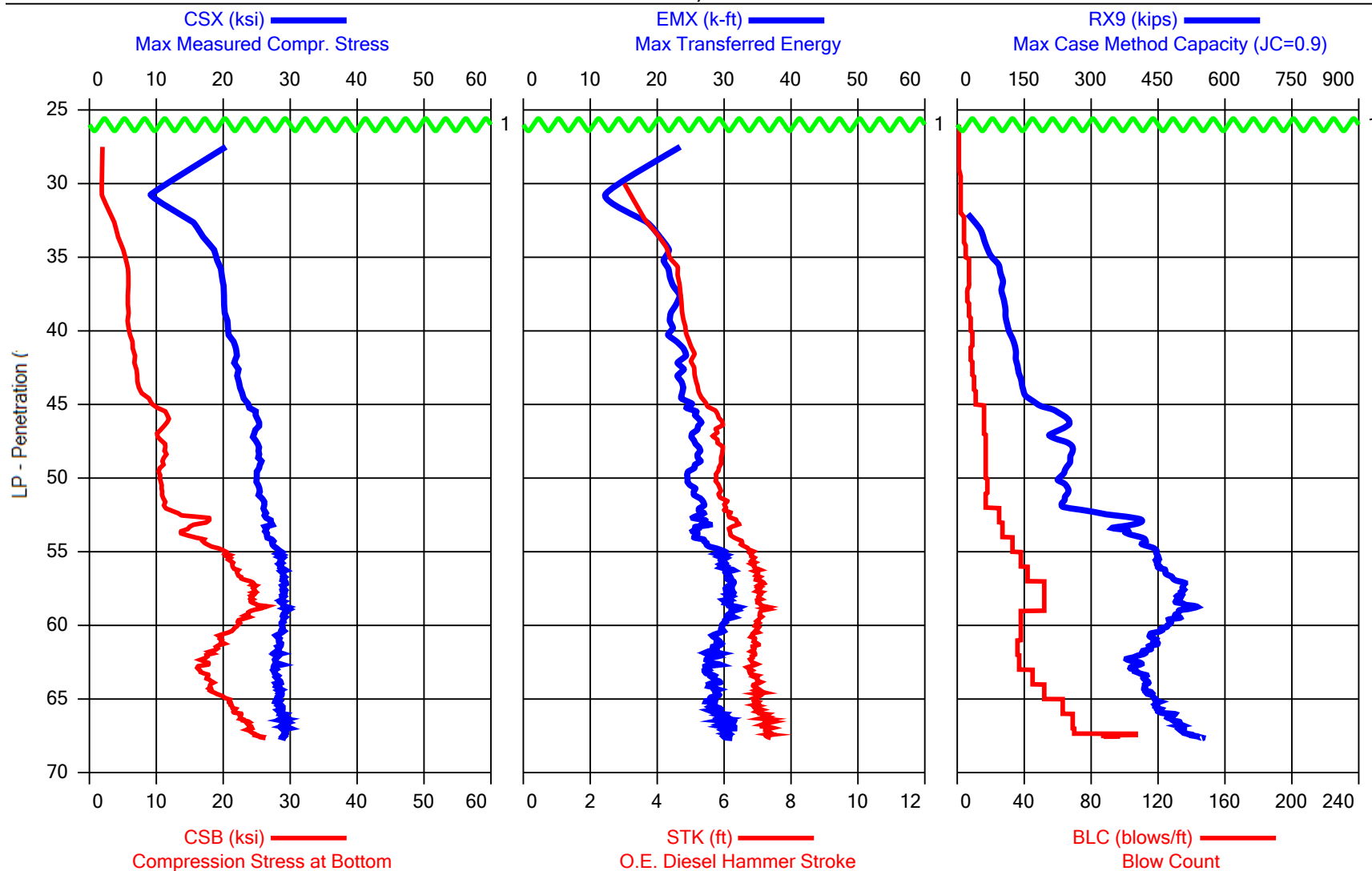
Time Summary

Drive 37 seconds 6:53 AM - 6:54 AM BN 1 - 30



USH 10 over LLBDM - Pier 16 # 44 - EOID

APE D30-42, HP 14 x 73



1 - Reported Reference EL 740.9

USH 10 over LLBDM - Pier 16 # 44 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

AR: 21.40 in ²	SP: 0.492 k/ft ³
LE: 77.50 ft	EM: 30,000 ksi
WS: 16,807.9 f/s	JC: 1.00

CSX: Max Measured Compr. Stress	EMX: Max Transferred Energy
CSB: Compression Stress at Bottom	BPM: Blows per Minute
STK: O.E. Diesel Hammer Stroke	RX9: Max Case Method Capacity (JC=0.9)

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
1	26.00	1	AV1	21.0	2.4	**	19	**	0
			STD	0.0	0.0	**	0	**	0
			MAX	21.0	2.4	**	19	**	0
			MIN	21.0	2.4	**	19	**	0
2	27.00	1	AV1	23.1	1.9	**	22	**	0
			STD	0.0	0.0	**	0	**	0
			MAX	23.1	1.9	**	22	**	0
			MIN	23.1	1.9	**	22	**	0
3	28.00	1	AV1	23.8	2.0	**	34	**	0
			STD	0.0	0.0	**	0	**	0
			MAX	23.8	2.0	**	34	**	0
			MIN	23.8	2.0	**	34	**	0
4	29.00	1	AV1	13.7	1.5	3.1	19	65.1	0
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	13.7	1.5	3.1	19	65.1	0
			MIN	13.7	1.5	3.1	19	65.1	0
6	30.00	2	AV2	3.1	0.7	2.6	5	71.4	0
			STD	2.5	0.7	0.2	4	2.3	0
			MAX	5.7	1.4	2.7	9	73.6	0
			MIN	0.6	0.0	2.4	0	69.1	0
9	31.50	2	AV1	17.0	3.1	3.8	23	59.1	16
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	17.0	3.1	3.8	23	59.1	16
			MIN	17.0	3.1	3.8	23	59.1	16
10	32.00	2	AV1	13.4	2.9	3.4	17	62.8	4
			STD	0.0	0.0	0.0	0	0.0	0
			MAX	13.4	2.9	3.4	17	62.8	4
			MIN	13.4	2.9	3.4	17	62.8	4

USH 10 over LLBDM - Pier 16 # 44 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
14	33.00	4	AV4	15.5	3.7	3.8	18	59.7	43
			STD	1.7	0.3	0.3	2	1.9	7
			MAX	17.4	4.2	4.0	20	62.7	50
			MIN	12.9	3.3	3.4	15	57.9	32
18	34.00	4	AV4	17.0	4.3	4.0	20	57.8	56
			STD	1.1	0.4	0.2	2	1.4	4
			MAX	18.3	4.9	4.3	23	59.9	62
			MIN	15.4	3.7	3.7	17	56.4	53
23	35.00	5	AV5	18.8	5.2	4.3	22	55.9	70
			STD	0.5	0.2	0.1	1	0.6	3
			MAX	19.3	5.6	4.5	23	56.7	76
			MIN	18.0	5.0	4.2	21	55.1	66
30	36.00	7	AV7	19.4	5.6	4.5	21	54.7	93
			STD	0.7	0.2	0.2	1	0.9	4
			MAX	20.0	5.9	4.7	22	56.8	98
			MIN	17.7	5.3	4.2	19	53.9	86
37	37.00	7	AV7	19.9	5.8	4.6	22	54.2	100
			STD	0.5	0.1	0.1	1	0.5	4
			MAX	20.4	6.0	4.7	23	55.4	105
			MIN	18.9	5.6	4.4	21	53.8	92
43	38.00	6	AV6	20.1	5.7	4.7	23	53.8	101
			STD	0.3	0.1	0.1	1	0.4	3
			MAX	20.3	5.8	4.8	24	54.5	107
			MIN	19.5	5.6	4.6	22	53.4	98
50	39.00	7	AV7	20.2	5.8	4.7	22	53.6	107
			STD	0.2	0.2	0.1	1	0.3	3
			MAX	20.5	6.1	4.8	23	54.2	112
			MIN	19.8	5.4	4.6	21	53.2	103
58	40.00	8	AV8	20.7	5.8	4.8	22	53.2	112
			STD	0.3	0.3	0.1	1	0.3	3
			MAX	21.2	6.1	4.9	23	53.8	117
			MIN	20.3	5.4	4.7	21	52.6	107
67	41.00	9	AV9	21.3	6.2	4.9	22	52.6	124

USH 10 over LLBDM - Pier 16 # 44 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
			STD	0.5	0.4	0.1	1	0.5	5
			MAX	22.1	6.7	5.1	23	53.5	132
			MIN	20.4	5.6	4.8	21	51.9	118
75	42.00	8	AV8	21.9	6.7	5.1	24	51.9	130
			STD	0.4	0.3	0.1	1	0.4	4
			MAX	22.4	7.0	5.2	25	52.8	135
			MIN	21.2	6.1	4.9	22	51.2	124
84	43.00	9	AV9	22.1	7.0	5.1	23	51.8	136
			STD	0.4	0.3	0.1	1	0.4	2
			MAX	22.6	7.4	5.2	25	52.5	141
			MIN	21.5	6.3	5.0	22	51.3	134
94	44.00	10	AV10	22.3	7.3	5.2	24	51.5	145
			STD	0.3	0.3	0.1	1	0.3	3
			MAX	22.7	7.6	5.2	25	52.2	149
			MIN	21.7	6.9	5.0	22	51.1	140
105	45.00	11	AV11	23.1	8.5	5.3	24	50.6	160
			STD	0.4	0.7	0.1	1	0.6	11
			MAX	23.7	9.8	5.6	26	51.3	175
			MIN	22.6	7.6	5.2	22	49.7	147
121	46.00	16	AV16	24.6	11.1	5.7	25	49.0	223
			STD	0.6	0.8	0.2	1	0.6	20
			MAX	25.4	12.0	6.0	27	50.0	248
			MIN	23.7	9.8	5.5	24	48.1	189
137	47.00	16	AV16	25.2	11.0	5.9	26	48.5	238
			STD	0.5	0.6	0.1	1	0.6	14
			MAX	25.9	12.2	6.1	28	49.5	258
			MIN	24.2	10.0	5.6	24	47.5	214
154	48.00	17	AV17	24.9	10.8	5.8	26	48.7	236
			STD	0.5	0.6	0.1	1	0.6	21
			MAX	25.6	11.7	6.0	27	49.7	260
			MIN	23.9	9.7	5.6	24	47.9	201
171	49.00	17	AV17	25.4	11.2	5.9	26	48.2	255
			STD	0.5	0.4	0.1	1	0.4	4

USH 10 over LLBDM - Pier 16 # 44 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
			MAX	26.3	11.9	6.2	28	48.9	264
			MIN	24.6	10.5	5.8	25	47.2	251
188	50.00	17	AV17	25.1	10.6	5.8	25	48.7	240
			STD	0.3	0.4	0.1	1	0.3	7
			MAX	25.5	11.5	5.9	26	49.2	248
			MIN	24.6	10.1	5.7	24	48.3	221
206	51.00	18	AV18	25.3	10.8	5.8	25	48.6	241
			STD	0.3	0.2	0.1	1	0.4	10
			MAX	25.9	11.2	6.0	26	49.1	255
			MIN	24.7	10.3	5.7	24	47.9	220
223	52.00	17	AV17	25.9	11.1	6.0	27	48.0	238
			STD	0.5	0.3	0.1	1	0.5	5
			MAX	26.9	11.5	6.3	28	48.7	245
			MIN	25.0	10.6	5.8	25	47.0	227
248	53.00	25	AV25	26.5	14.8	6.2	26	47.2	349
			STD	0.5	2.6	0.2	1	0.6	56
			MAX	27.8	19.4	6.5	28	48.3	421
			MIN	25.5	11.2	5.9	25	46.0	258
275	54.00	27	AV27	26.6	14.8	6.2	26	47.1	382
			STD	0.5	1.4	0.2	1	0.5	21
			MAX	28.0	18.1	6.7	30	47.7	413
			MIN	25.7	13.1	6.1	25	45.5	336
308	55.00	33	AV33	27.6	18.0	6.6	28	45.9	428
			STD	0.7	1.3	0.2	1	0.7	13
			MAX	29.2	20.8	7.0	31	47.3	456
			MIN	26.3	15.7	6.2	25	44.6	407
346	56.00	38	AV38	28.5	21.0	6.9	30	45.0	449
			STD	0.4	0.6	0.1	1	0.4	5
			MAX	29.1	22.0	7.0	31	45.9	461
			MIN	27.6	20.0	6.6	28	44.4	439
388	57.00	42	AV42	28.9	22.3	7.0	31	44.6	472
			STD	0.4	0.7	0.1	1	0.3	13
			MAX	29.7	24.1	7.2	32	45.2	499

USH 10 over LLBDM - Pier 16 # 44 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
			MIN	28.2	21.0	6.8	29	44.0	444
440	58.00	52	AV52	29.1	24.6	7.1	31	44.3	505
			STD	0.4	0.3	0.1	1	0.3	6
			MAX	30.1	25.2	7.4	33	45.2	517
			MIN	27.9	23.7	6.8	29	43.5	493
492	59.00	52	AV52	29.0	24.8	7.1	31	44.2	506
			STD	0.5	0.9	0.1	1	0.4	17
			MAX	30.1	27.1	7.5	33	45.1	541
			MIN	28.0	23.6	6.8	29	43.2	486
530	60.00	38	AV38	29.0	23.0	7.0	31	44.4	486
			STD	0.4	0.8	0.1	1	0.4	10
			MAX	29.6	24.3	7.3	32	45.2	503
			MIN	28.0	21.9	6.8	29	43.7	470
568	61.00	38	AV38	28.6	20.6	6.9	29	44.8	448
			STD	0.5	1.0	0.1	1	0.4	14
			MAX	29.5	22.4	7.2	31	45.6	475
			MIN	27.5	18.9	6.7	27	44.0	428
604	62.00	36	AV36	28.3	19.0	6.9	29	44.8	432
			STD	0.4	0.8	0.1	1	0.3	13
			MAX	29.1	20.6	7.1	30	45.3	453
			MIN	27.5	17.7	6.8	27	44.1	407
641	63.00	37	AV37	27.8	17.0	6.8	28	45.1	396
			STD	0.5	0.7	0.1	1	0.4	11
			MAX	29.0	18.3	7.1	30	45.9	421
			MIN	27.2	15.8	6.6	27	44.2	374
686	64.00	45	AV45	28.0	17.6	6.9	28	44.8	417
			STD	0.5	0.6	0.2	1	0.5	10
			MAX	29.0	18.8	7.2	30	45.8	433
			MIN	27.1	16.3	6.6	26	43.9	395
738	65.00	52	AV52	28.3	18.8	7.0	29	44.6	429
			STD	0.5	0.9	0.1	1	0.4	9
			MAX	29.4	20.7	7.4	31	45.4	448
			MIN	27.4	17.5	6.7	27	43.5	411

USH 10 over LLBDM - Pier 16 # 44 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL#	depth ft	BLC blows/ft	TYPE	CSX ksi	CSB ksi	STK ft	EMX k-ft	BPM bpm	RX9 kips
801	66.00	63	AV63	28.4	21.3	7.0	28	44.6	450
			STD	0.5	0.5	0.1	1	0.4	8
			MAX	29.4	23.1	7.2	31	45.6	481
			MIN	27.1	20.4	6.7	26	43.8	436
870	67.00	69	AV69	29.2	23.3	7.3	30	43.7	490
			STD	0.5	0.7	0.1	1	0.4	12
			MAX	30.1	24.6	7.6	33	44.9	512
			MIN	27.9	22.0	6.9	28	42.8	466
895	67.35	70	AV25	29.2	24.0	7.3	30	43.7	504
			STD	0.3	0.4	0.1	1	0.3	5
			MAX	30.1	24.6	7.6	32	44.2	518
			MIN	28.5	23.4	7.1	29	42.9	495
905	67.45	107	AV10	29.3	24.9	7.4	31	43.4	523
			STD	0.3	0.3	0.1	1	0.3	5
			MAX	29.7	25.4	7.6	31	43.9	529
			MIN	28.9	24.2	7.2	30	42.9	515
915	67.55	96	AV10	29.0	25.1	7.3	30	43.8	531
			STD	0.2	0.4	0.1	1	0.3	7
			MAX	29.3	25.7	7.4	31	44.2	541
			MIN	28.6	24.6	7.1	29	43.3	516
925	67.67	87	AV10	29.1	26.0	7.3	31	43.5	547
			STD	0.3	0.3	0.1	1	0.3	5
			MAX	29.5	26.4	7.5	32	44.1	555
			MIN	28.5	25.6	7.1	29	43.0	537
Average				27.1	18.0	6.6	28	46.2	389
Std. Dev.				3.0	6.1	0.8	3	3.3	131
Maximum				30.1	27.1	7.6	34	73.6	555
Minimum				0.6	0.0	2.4	0	42.8	0
Total number of blows analyzed: 923									

BL# Sensors

1-925 F3: [D815] 93.0 (1.00); F4: [F607] 93.6 (1.00); A3: [K3550] 360.0 (1.05); A4: [K2524] 360.0 (1.05)

USH 10 over LLBDM - Pier 16 # 44 - EOID
OP: AZ

APE D30-42, HP 14 x 73
Date: 10-April-2015

BL# Comments

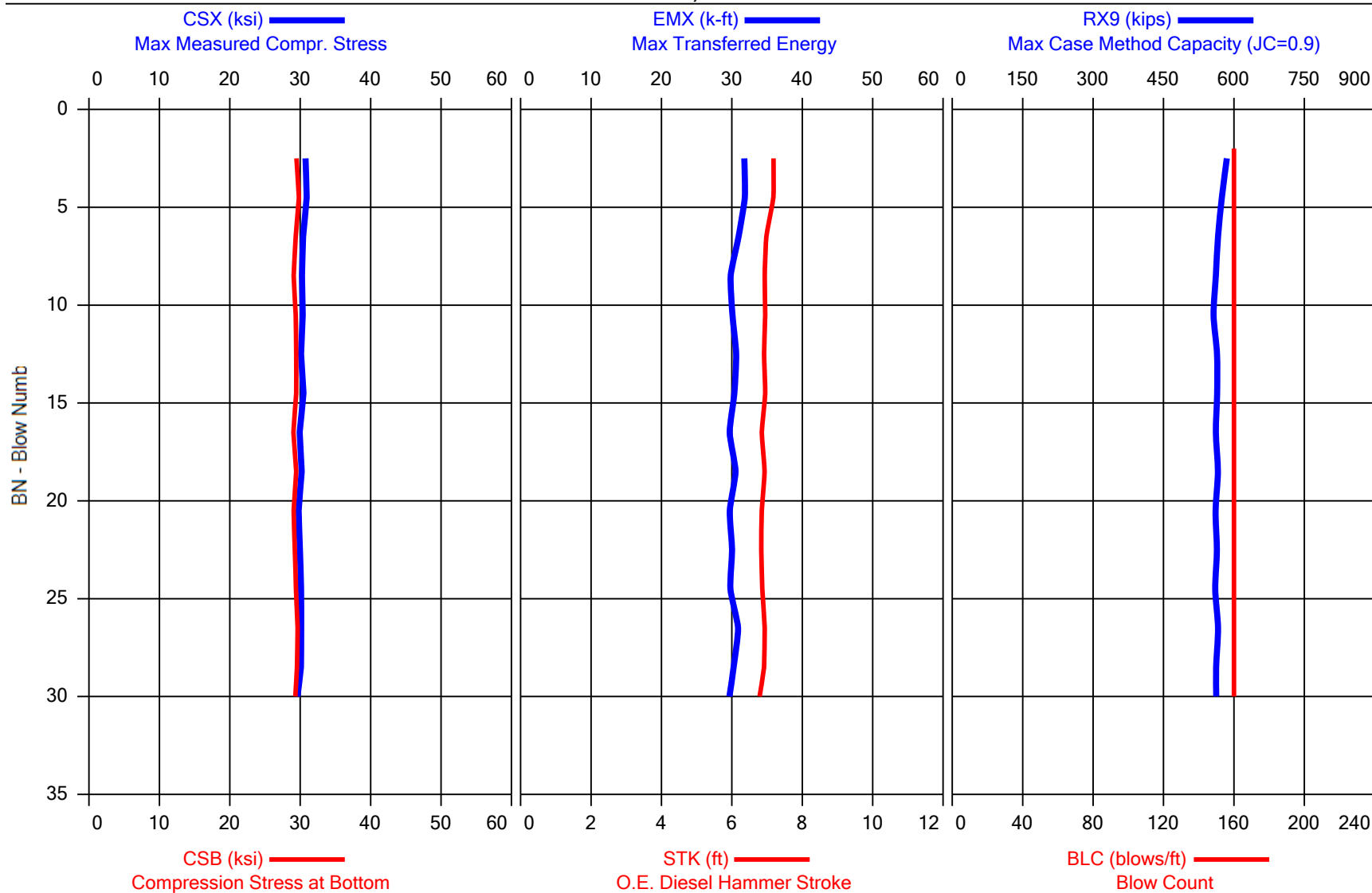
1 Reported Reference EL 740.9

Time Summary

Drive 20 minutes 54 seconds 12:13 PM - 12:34 PM BN 1 - 925



USH 10 over LLBDM - Pier 16 # 44 - BOR
APE D30-42, HP 14 x 73



USH 10 over LLBDM - Pier 16 # 44 - BOR
OP: AZ

APE D30-42, HP 14 x 73
Date: 13-April-2015

AR: 21.40 in ²	SP: 0.492 k/ft ³
LE: 72.00 ft	EM: 30,000 ksi
WS: 16,807.9 f/s	JC: 1.00

CSX: Max Measured Compr. Stress	EMX: Max Transferred Energy
CSB: Compression Stress at Bottom	BPM: Blows per Minute
STK: O.E. Diesel Hammer Stroke	RX9: Max Case Method Capacity (JC=0.9)

BL#	depth	BLC	TYPE	CSX	CSB	STK	EMX	BPM	RX9
	ft	blows/ft		ksi	ksi	ft	k-ft	bpm	kips
10	67.73	160	AV9	30.5	29.4	7.0	31	44.4	570
			STD	0.5	0.5	0.2	1	0.5	10
			MAX	31.5	30.3	7.4	33	45.1	590
			MIN	29.9	28.7	6.8	29	43.3	556
20	67.80	160	AV10	30.1	29.3	6.9	30	44.8	563
			STD	0.3	0.2	0.1	1	0.3	5
			MAX	30.7	29.6	7.0	31	45.3	570
			MIN	29.4	28.9	6.8	29	44.5	555
30	67.86	160	AV10	30.0	29.4	6.9	30	44.9	562
			STD	0.2	0.2	0.1	0	0.2	5
			MAX	30.4	30.0	7.0	31	45.2	574
			MIN	29.6	29.2	6.8	30	44.4	556
			Average	30.2	29.4	6.9	30	44.7	565
			Std. Dev.	0.4	0.3	0.1	1	0.4	8
			Maximum	31.5	30.3	7.4	33	45.3	590
			Minimum	29.4	28.7	6.8	29	43.3	555

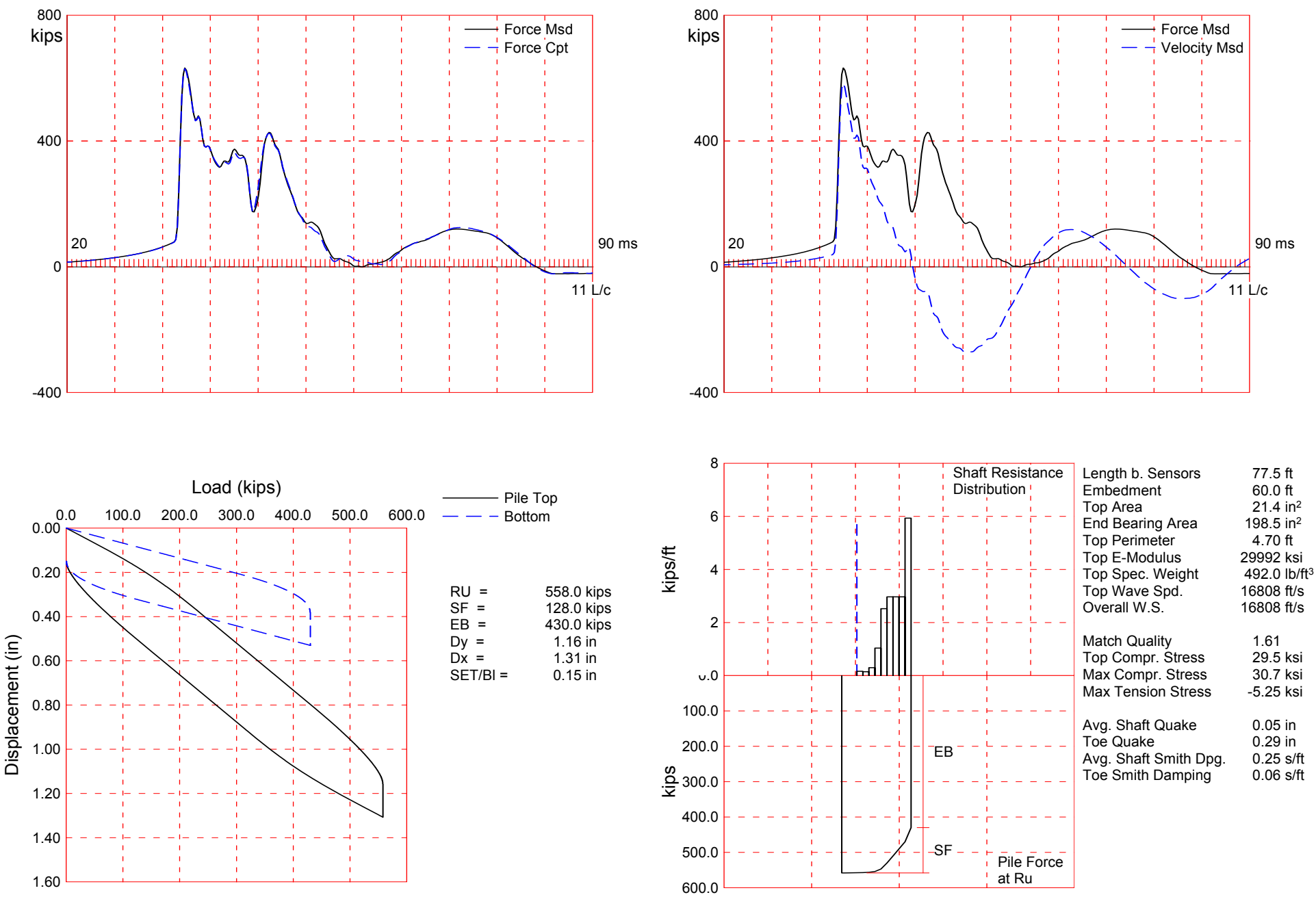
Total number of blows analyzed: 29

BL# Sensors

1-30 F3: [F607] 93.6 (1.00); F4: [D815] 93.0 (1.00); A3: [K2524] 360.0 (1.06); A4: [K3550] 360.0 (1.06)

Time Summary

Drive 38 seconds 6:45 AM - 6:46 AM BN 1 - 30



USH 10 over LLBDM; Pile: Pier 16 # 1 - EOID
 APE D30-42, HP 14 x 73; Blow: 446
 GRL Engineers, Inc.

Test: 10-Apr-2015 11:32
 CAPWAP(R) 2014-1
 OP: AZ

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 558.0; along Shaft 128.0; at Toe 430.0 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	Quake in
				558.0				
1	23.6	6.1	1.0	557.0	1.0	0.16	0.03	0.05
2	30.3	12.8	1.0	556.0	2.0	0.15	0.03	0.05
3	37.1	19.6	2.0	554.0	4.0	0.30	0.06	0.05
4	43.8	26.3	7.0	547.0	11.0	1.04	0.22	0.05
5	50.5	33.0	17.0	530.0	28.0	2.52	0.54	0.05
6	57.3	39.8	20.0	510.0	48.0	2.97	0.63	0.05
7	64.0	46.5	20.0	490.0	68.0	2.97	0.63	0.05
8	70.8	53.3	20.0	470.0	88.0	2.97	0.63	0.05
9	77.5	60.0	40.0	430.0	128.0	5.94	1.26	0.05
Avg. Shaft			14.2			2.13	0.45	0.05
Toe			430.0				311.94	0.29

Soil Model Parameters/Extensions			Shaft	Toe
Smith Damping Factor			0.25	0.06
Case Damping Factor			0.84	0.68
Damping Type			Viscous	Sm+Visc
Unloading Quake (% of loading quake)			51	33
Unloading Level (% of Ru)			39	
Resistance Gap (included in Toe Quake) (in)				0.00
Soil Plug Weight (kips)				0.028

CAPWAP match quality = 1.61 (Wave Up Match) ; RSA = 0
 Observed: Final Set = 0.15 in; Blow Count = 80 b/ft
 Computed: Final Set = 0.18 in; Blow Count = 67 b/ft
 Transducer F3(D815) CAL: 93.0; RF: 1.00; F4(F607) CAL: 93.6; RF: 1.00
 A3(K3550) CAL: 360; RF: 1.05; A4(K2524) CAL: 360; RF: 1.05
 max. Top Comp. Stress = 29.5 ksi (T= 36.1 ms, max= 1.043 x Top)
 max. Comp. Stress = 30.7 ksi (Z= 50.5 ft, T= 39.1 ms)
 max. Tens. Stress = -5.25 ksi (Z= 50.5 ft, T= 59.1 ms)
 max. Energy (EMX) = 31.1 kip-ft; max. Measured Top Displ. (DMX)= 0.92 in

USH 10 over LLBDM; Pile: Pier 16 # 1 - EOID
 APE D30-42, HP 14 x 73; Blow: 446
 GRL Engineers, Inc.

Test: 10-Apr-2015 11:32
 CAPWAP(R) 2014-1
 OP: AZ

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	631.2	-26.5	29.5	-1.24	31.1	15.3	0.92
2	6.7	632.1	-30.2	29.5	-1.41	30.9	15.3	0.90
4	13.5	634.2	-37.0	29.6	-1.73	30.4	15.2	0.86
5	16.8	635.8	-45.1	29.7	-2.11	30.0	15.1	0.84
6	20.2	638.0	-54.5	29.8	-2.55	29.5	15.1	0.81
7	23.6	640.0	-62.9	29.9	-2.94	29.0	15.0	0.78
8	27.0	637.7	-72.3	29.8	-3.38	28.3	14.9	0.76
9	30.3	640.3	-80.7	29.9	-3.77	27.8	14.8	0.73
10	33.7	639.3	-86.8	29.9	-4.05	27.0	14.7	0.70
11	37.1	644.4	-92.4	30.1	-4.32	26.3	14.6	0.67
12	40.4	643.6	-96.9	30.1	-4.53	25.4	14.4	0.64
13	43.8	657.0	-104.3	30.7	-4.87	24.8	14.1	0.61
14	47.2	641.4	-105.7	30.0	-4.94	23.1	13.6	0.57
15	50.5	658.2	-112.5	30.7	-5.25	22.4	13.2	0.54
16	53.9	604.8	-106.0	28.3	-4.95	19.5	12.7	0.51
17	57.3	620.5	-111.4	29.0	-5.20	18.8	12.3	0.48
18	60.7	559.2	-98.9	26.1	-4.62	15.9	11.8	0.45
19	64.0	573.7	-99.1	26.8	-4.63	15.2	11.4	0.42
20	67.4	509.2	-84.2	23.8	-3.93	12.6	11.6	0.39
21	70.8	525.8	-84.3	24.6	-3.94	12.0	12.8	0.36
22	74.1	511.4	-69.5	23.9	-3.25	9.7	13.3	0.33
23	77.5	525.0	-69.1	24.5	-3.23	7.1	12.5	0.30
Absolute	50.5			30.7			(T =	39.1 ms)
	50.5				-5.25		(T =	59.1 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	690.7	637.3	583.9	530.6	477.2	423.8	370.4	317.0	263.6	210.2
RX	705.4	684.8	664.1	643.5	622.8	602.5	582.7	564.1	553.0	544.8
RU	690.7	637.3	583.9	530.6	477.2	423.8	370.4	317.0	263.6	210.2

RAU = 407.2 (kips); RA2 = 591.5 (kips)

Current CAPWAP Ru = 558.0 (kips); Corresponding J(RP)= 0.25; J(RX) = 0.76

VMX ft/s	TVP ms	VT1*Z kips	FT1 kips	FMX kips	DMX in	DFN in	SET in	EMX kip-ft	QUS kips	KEB kips/in
15.4	35.89	588.2	636.4	636.4	0.92	0.15	0.15	31.2	700.6	1483

PILE PROFILE AND PILE MODEL

Depth ft	Area in ²	E-Modulus ksi	Spec. Weight lb/ft ³	Perim. ft
0.0	21.4	29992.2	492.000	4.70
77.5	21.4	29992.2	492.000	4.70

Toe Area 198.5 in²

Top Segment Length 3.37 ft, Top Impedance 38 kips/ft/s

Wave Speed: Pile Top 16807.9, Elastic 16807.9, Overall 16807.9 ft/s

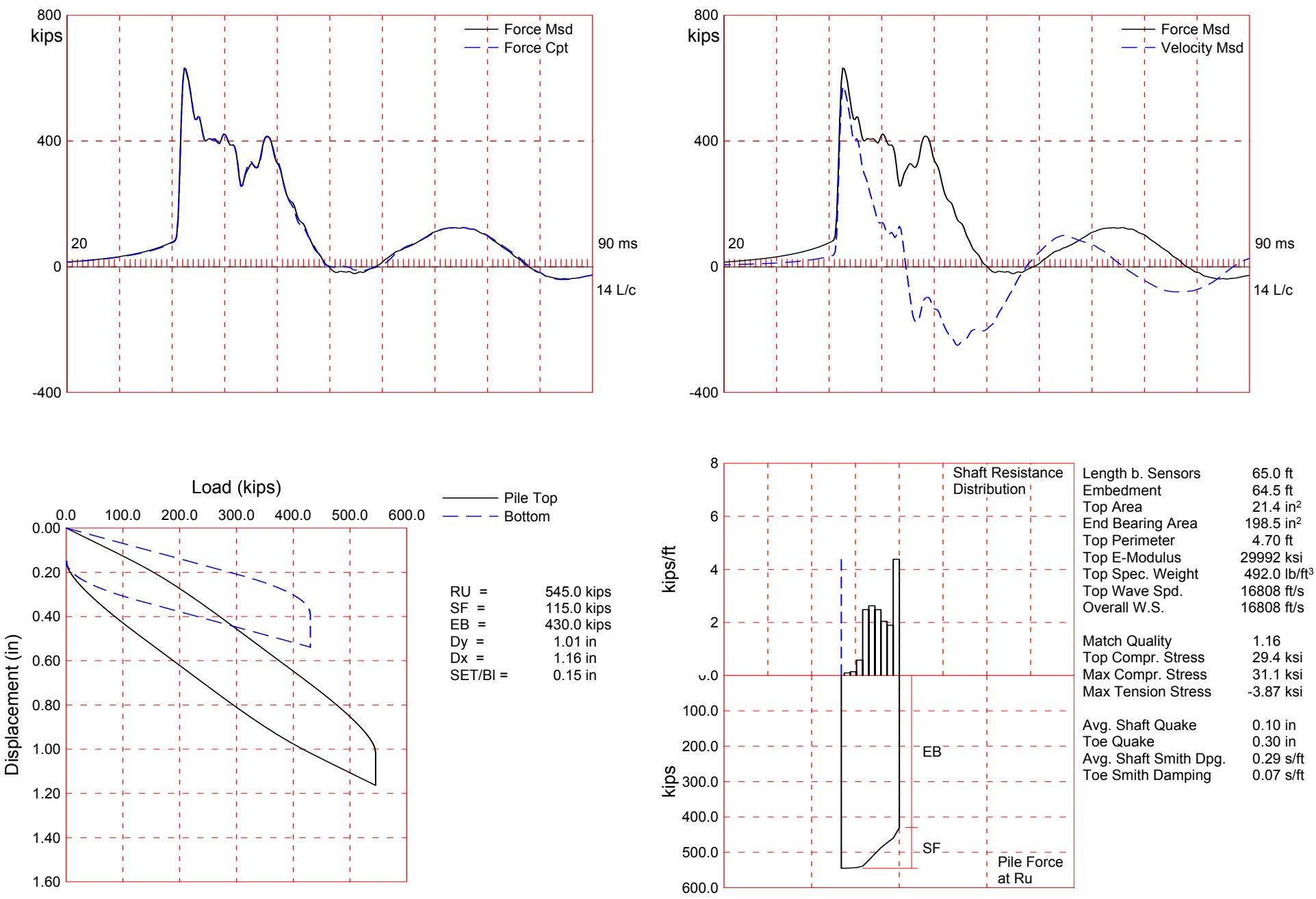
Pile Damping 1.00 %, Time Incr 0.200 ms, 2L/c 9.2 ms

Total volume: 11.517 ft³; Volume ratio considering added impedance: 1.000

USH 10 over LLBDM; Pile: Pier 16 # 1 - EOID
 APE D30-42, HP 14 x 73; Blow: 446
 GRL Engineers, Inc.

Test: 10-Apr-2015 11:32
 CAPWAP(R) 2014-1
 OP: AZ

DYNAMIC RESISTANCE TABLE								
Soil Sgmt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Damping Rd at Max. Rt kips	Max Rt (Ru+Rd) kips	Total Unit W. Resp. to Depth kips/ft	Unit Rt Resp. to Area ksf	Quake in
1	23.6	6.1	1.0	3.7	4.7	0.78	0.17	0.05
2	30.3	12.8	1.0	3.7	4.7	0.70	0.15	0.05
3	37.1	19.6	2.0	7.3	9.3	1.38	0.29	0.05
4	43.8	26.3	7.0	24.4	31.4	4.67	0.99	0.05
5	50.5	33.0	17.0	55.2	72.2	10.71	2.28	0.05
6	57.3	39.8	20.0	60.2	80.2	11.90	2.53	0.05
7	64.0	46.5	20.0	55.8	75.8	11.24	2.39	0.05
8	70.8	53.3	20.0	62.8	82.8	12.29	2.61	0.05
9	77.5	60.0	40.0	122.5	162.5	24.11	5.13	0.05
Avg. Shaft			14.2	44.0	58.2	8.73	1.86	0.05
Toe			430.0	25.5	455.5		330.45	0.29
Total					979.1			



USH 10 over LLBDM; Pile: Pier 16 #1 - EOR
 APE D30-42, HP 14 x 73; Blow: 400
 GRL Engineers, Inc.

Test: 13-Apr-2015 07:10
 CAPWAP(R) 2014-1
 OP: AZ

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity:		545.0; along Shaft	115.0; at Toe	430.0 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
				545.0			
1	10.3	9.8	1.0	544.0	1.0	0.10	0.02
2	17.1	16.6	1.0	543.0	2.0	0.15	0.03
3	23.9	23.4	4.0	539.0	6.0	0.58	0.12
4	30.8	30.3	17.0	522.0	23.0	2.48	0.53
5	37.6	37.1	18.0	504.0	41.0	2.63	0.56
6	44.5	44.0	17.0	487.0	58.0	2.48	0.53
7	51.3	50.8	14.0	473.0	72.0	2.05	0.44
8	58.2	57.7	13.0	460.0	85.0	1.90	0.40
9	65.0	64.5	30.0	430.0	115.0	4.38	0.93
Avg. Shaft			12.8			1.78	0.38
Toe			430.0				311.94

Soil Model Parameters/Extensions			Shaft	Toe
Smith Damping Factor			0.29	0.07
Quake	(in)		0.10	0.30
Case Damping Factor			0.87	0.79
Damping Type			Viscous	Sm+Visc
Unloading Quake	(% of loading quake)		68	51
Unloading Level	(% of Ru)		46	
Resistance Gap (included in Toe Quake)	(in)			0.02
Soil Plug Weight	(kips)		0.050	0.043

CAPWAP match quality = 1.16 (Wave Up Match) ; RSA = 0
 Observed: Final Set = 0.15 in; Blow Count = 80 b/ft
 Computed: Final Set = 0.16 in; Blow Count = 75 b/ft
 Transducer F3(F607) CAL: 93.6; RF: 1.00; F4(D815) CAL: 93.0; RF: 1.00
 A3(K2524) CAL: 360; RF: 1.03; A4(K3550) CAL: 360; RF: 1.03
 max. Top Comp. Stress = 29.4 ksi (T= 36.0 ms, max= 1.056 x Top)
 max. Comp. Stress = 31.1 ksi (Z= 30.8 ft, T= 37.9 ms)
 max. Tens. Stress = -3.87 ksi (Z= 30.8 ft, T= 58.0 ms)
 max. Energy (EMX) = 29.2 kip-ft; max. Measured Top Displ. (DMX)= 0.84 in

USH 10 over LLBDM; Pile: Pier 16 #1 - EOR
 APE D30-42, HP 14 x 73; Blow: 400
 GRL Engineers, Inc.

Test: 13-Apr-2015 07:10
 CAPWAP(R) 2014-1
 OP: AZ

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	630.2	-44.7	29.4	-2.09	29.2	15.1	0.83
2	6.8	632.3	-48.3	29.5	-2.26	28.9	15.0	0.80
3	10.3	634.2	-51.5	29.6	-2.40	28.5	14.9	0.78
4	13.7	631.2	-53.8	29.5	-2.52	27.8	14.8	0.75
5	17.1	634.7	-56.6	29.7	-2.64	27.3	14.8	0.73
6	20.5	636.4	-61.6	29.7	-2.88	26.6	14.6	0.70
7	23.9	649.7	-68.7	30.4	-3.21	25.9	14.3	0.67
8	27.4	650.5	-74.0	30.4	-3.46	24.6	13.8	0.63
9	30.8	665.2	-82.7	31.1	-3.87	24.0	13.4	0.60
10	34.2	606.1	-71.1	28.3	-3.32	20.8	12.8	0.57
11	37.6	624.7	-78.7	29.2	-3.68	20.1	12.3	0.54
12	41.1	568.8	-67.7	26.6	-3.16	17.1	11.7	0.51
13	44.5	580.9	-74.5	27.1	-3.48	16.5	11.2	0.48
14	47.9	516.2	-66.4	24.1	-3.10	13.8	11.0	0.45
15	51.3	522.2	-73.7	24.4	-3.44	13.2	10.9	0.42
16	54.7	477.6	-69.3	22.3	-3.24	11.2	11.3	0.39
17	58.2	497.9	-71.4	23.3	-3.33	10.6	12.4	0.36
18	61.6	497.0	-61.2	23.2	-2.86	8.9	13.1	0.33
19	65.0	510.7	-61.1	23.9	-2.85	6.9	12.3	0.30
Absolute	30.8			31.1			(T =	37.9 ms)
	30.8				-3.87		(T =	58.0 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	678.8	623.9	569.1	514.2	459.3	404.5	349.6	294.7	239.8	185.0
RX	702.9	671.4	651.0	630.6	610.2	589.8	570.1	552.3	540.4	530.8
RU	678.8	623.9	569.1	514.2	459.3	404.5	349.6	294.7	239.8	185.0
RAU =	411.2 (kips);			RA2 = 610.3 (kips)						

Current CAPWAP Ru = 545.0 (kips); Corresponding J(RP)= 0.24; J(RX) = 0.76

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
15.3	35.82	585.6	642.0	642.0	0.84	0.15	0.15	29.6	720.6	1536

PILE PROFILE AND PILE MODEL

Depth ft	Area in ²	E-Modulus ksi	Spec. Weight lb/ft ³	Perim. ft
0.0	21.4	29992.2	492.000	4.70
65.0	21.4	29992.2	492.000	4.70

Toe Area 198.5 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	Soil Plug kips
1	3.4	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000
13	44.5	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.010
14	47.9	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.020

USH 10 over LLBDM; Pile: Pier 16 #1 - EOR
 APE D30-42, HP 14 x 73; Blow: 400
 GRL Engineers, Inc.

Test: 13-Apr-2015 07:10
 CAPWAP(R) 2014-1
 OP: AZ

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	Soil Plug kips
16	54.7	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000
19	65.0	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000

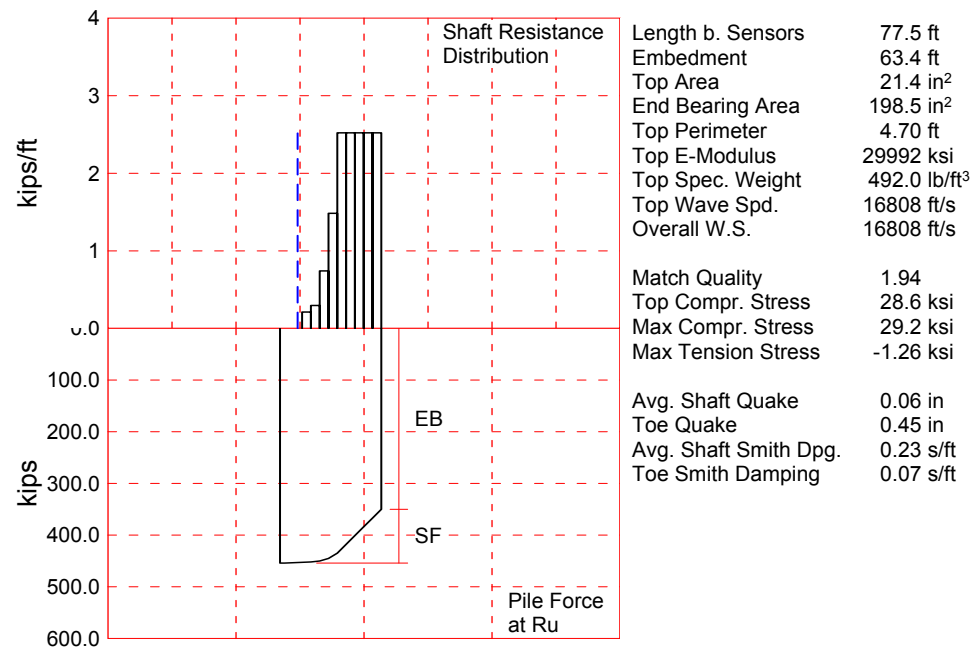
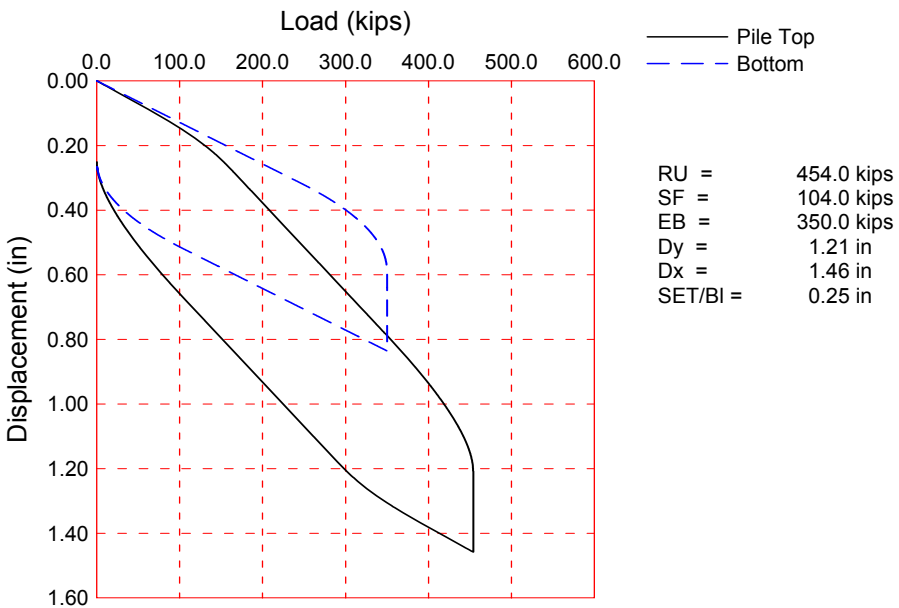
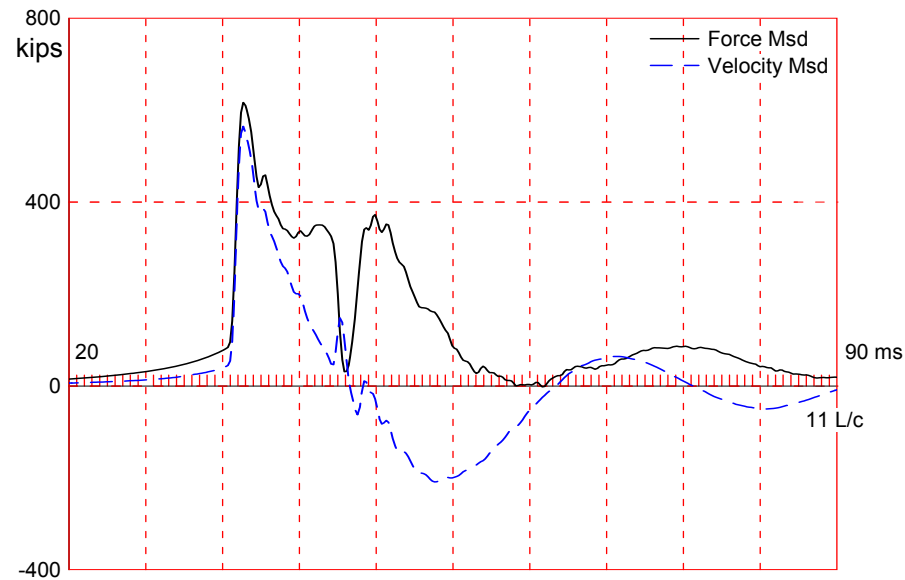
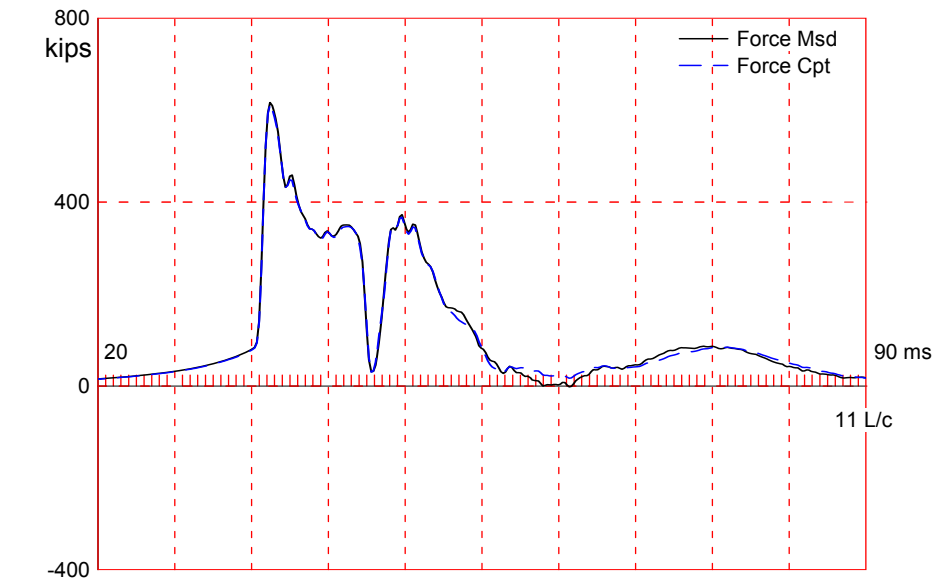
Wave Speed: Pile Top 16807.9, Elastic 16807.9, Overall 16807.9 ft/s

Pile Damping 1.00 %, Time Incr 0.204 ms, 2L/c 7.7 ms

Total volume: 9.660 ft³; Volume ratio considering added impedance: 1.000

DYNAMIC RESISTANCE TABLE

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Damping Rd at Max. Rt kips	Max Rt (Ru+Rd) kips	Total Unit W. Resp. to Depth kips/ft	Unit Rt Area ksf
1	10.3	9.8	1.0	4.3	5.3	0.55	0.12
2	17.1	16.6	1.0	4.3	5.3	0.77	0.16
3	23.9	23.4	4.0	16.6	20.6	3.01	0.64
4	30.8	30.3	17.0	64.8	81.8	11.95	2.54
5	37.6	37.1	18.0	63.1	81.1	11.85	2.52
6	44.5	44.0	17.0	53.6	70.6	10.32	2.20
7	51.3	50.8	14.0	42.9	56.9	8.32	1.77
8	58.2	57.7	13.0	46.1	59.1	8.64	1.84
9	65.0	64.5	30.0	102.3	132.3	19.34	4.12
Avg. Shaft			12.8	44.2	57.0	7.95	1.69
Toe			430.0	26.4	456.4		331.12
Total					969.4		



USH 10 over LLBDM; Pile: Pier 16 # 36 - E0ID
 APE D30-42, HP 14 x 73; Blow: 586
 GRL Engineers, Inc.

Test: 10-Apr-2015 12:00
 CAPWAP(R) 2014-1
 OP: AZ

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity:		454.0;	along Shaft	104.0;	at Toe	350.0	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
				454.0			
1	23.6	9.5	2.0	452.0	2.0	0.21	0.04
2	30.3	16.2	2.0	450.0	4.0	0.30	0.06
3	37.1	23.0	5.0	445.0	9.0	0.74	0.16
4	43.8	29.7	10.0	435.0	19.0	1.48	0.32
5	50.5	36.4	17.0	418.0	36.0	2.52	0.54
6	57.3	43.2	17.0	401.0	53.0	2.52	0.54
7	64.0	49.9	17.0	384.0	70.0	2.52	0.54
8	70.8	56.7	17.0	367.0	87.0	2.52	0.54
9	77.5	63.4	17.0	350.0	104.0	2.52	0.54
Avg. Shaft			11.6			1.64	0.35
Toe			350.0				253.90

Soil Model Parameters/Extensions		Shaft	Toe
Smith Damping Factor		0.23	0.07
Quake	(in)	0.06	0.45
Case Damping Factor		0.63	0.64
Damping Type		Viscous	Sm+Visc
Unloading Quake	(% of loading quake)	100	66
Resistance Gap (included in Toe Quake) (in)			0.03
Soil Plug Weight	(kips)	0.110	0.002

CAPWAP match quality	=	1.94	(Wave Up Match) ; RSA = 0
Observed: Final Set	=	0.25 in;	Blow Count = 48 b/ft
Computed: Final Set	=	0.26 in;	Blow Count = 46 b/ft
Transducer	F3(D815) CAL: 93.0; RF: 1.00; F4(F607) CAL: 93.6; RF: 1.00		
	A3(K3550) CAL: 360; RF: 1.04; A4(K2524) CAL: 360; RF: 1.04		
max. Top Comp. Stress	=	28.6 ksi	(T= 36.1 ms, max= 1.019 x Top)
max. Comp. Stress	=	29.2 ksi	(Z= 43.8 ft, T= 38.7 ms)
max. Tens. Stress	=	-1.26 ksi	(Z= 43.8 ft, T= 63.6 ms)
max. Energy (EMX)	=	29.6 kip-ft;	max. Measured Top Displ. (DMX)= 0.93 in

USH 10 over LLBDM; Pile: Pier 16 # 36 - E0ID
 APE D30-42, HP 14 x 73; Blow: 586
 GRL Engineers, Inc.

Test: 10-Apr-2015 12:00
 CAPWAP(R) 2014-1
 OP: AZ

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	613.0	-14.4	28.6	-0.67	29.6	14.9	0.94
2	6.7	613.9	-14.8	28.7	-0.69	29.5	14.8	0.93
4	13.5	615.8	-15.7	28.8	-0.73	29.3	14.8	0.90
5	16.8	617.7	-15.9	28.9	-0.74	29.1	14.7	0.88
6	20.2	620.6	-16.4	29.0	-0.77	28.8	14.6	0.86
7	23.6	623.1	-17.6	29.1	-0.82	28.5	14.5	0.84
8	27.0	617.2	-18.0	28.8	-0.84	27.8	14.5	0.82
9	30.3	620.9	-21.0	29.0	-0.98	27.4	14.4	0.80
10	33.7	617.8	-22.3	28.9	-1.04	26.7	14.2	0.77
11	37.1	624.1	-26.1	29.2	-1.22	26.3	14.0	0.75
12	40.4	612.3	-23.5	28.6	-1.10	25.0	13.8	0.72
13	43.8	624.5	-26.9	29.2	-1.26	24.6	13.5	0.70
14	47.2	598.6	-18.6	28.0	-0.87	22.6	13.1	0.67
15	50.5	615.8	-23.3	28.8	-1.09	22.1	12.7	0.65
16	53.9	572.0	-7.2	26.7	-0.33	19.2	12.1	0.62
17	57.3	587.2	-10.4	27.4	-0.48	18.8	11.8	0.60
18	60.7	541.3	0.0	25.3	0.00	16.1	12.3	0.57
19	64.0	552.4	-0.0	25.8	-0.00	15.7	12.2	0.55
20	67.4	495.3	-0.0	23.1	-0.00	13.2	13.9	0.52
21	70.8	446.5	-0.0	20.9	-0.00	12.8	15.3	0.50
22	74.1	395.7	-0.0	18.5	-0.00	10.4	16.0	0.47
23	77.5	411.3	-0.0	19.2	-0.00	8.9	15.3	0.45
Absolute	43.8			29.2			(T =	38.7 ms)
	43.8				-1.26		(T =	63.6 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	553.7	489.8	426.0	362.1	298.2	234.3	170.4	106.6	42.7	0.0
RX	593.5	567.5	541.5	515.5	489.5	474.5	462.7	454.5	446.4	438.2
RU	553.7	489.8	426.0	362.1	298.2	234.3	170.4	106.6	42.7	0.0

RAU = 368.4 (kips); RA2 = 513.5 (kips)

Current CAPWAP Ru = 454.0 (kips); Corresponding J(RP)= 0.16; J(RX) = 0.71

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
15.0	35.89	571.8	620.7	620.7	0.93	0.25	0.25	29.6	604.3	833

PILE PROFILE AND PILE MODEL

Depth ft	Area in ²	E-Modulus ksi	Spec. Weight lb/ft ³	Perim. ft
0.0	21.4	29992.2	492.000	4.70
77.5	21.4	29992.2	492.000	4.70
Toe Area	198.5	in ²		

USH 10 over LLBDM; Pile: Pier 16 # 36 - E0ID
 APE D30-42, HP 14 x 73; Blow: 586
 GRL Engineers, Inc.

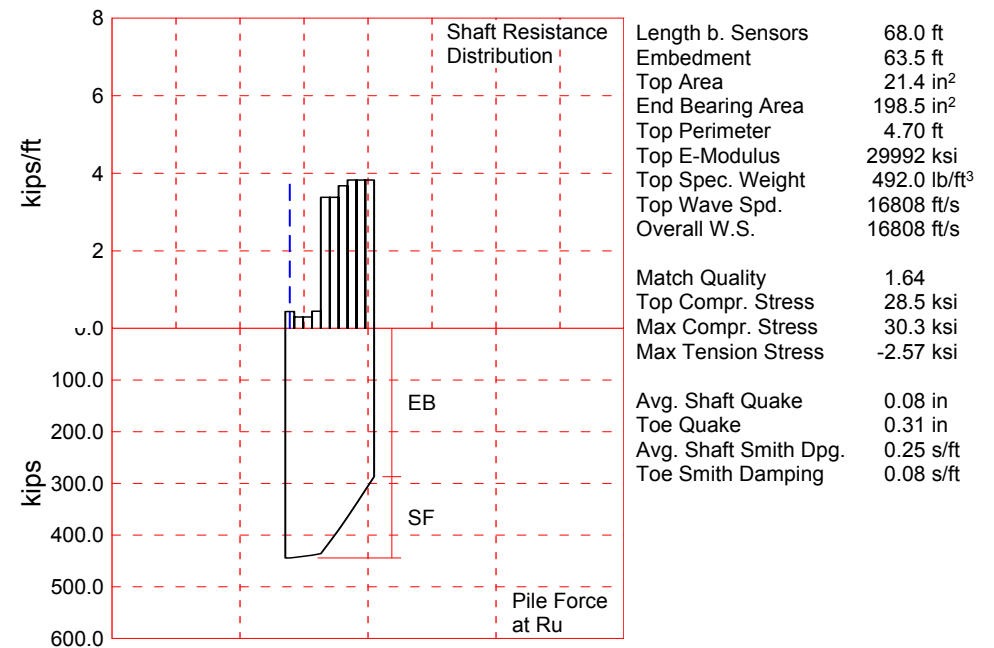
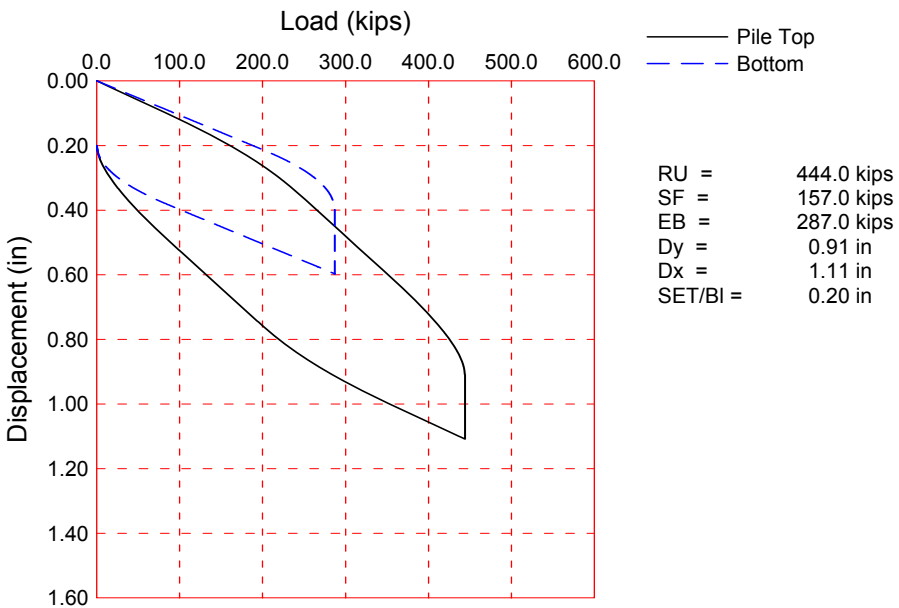
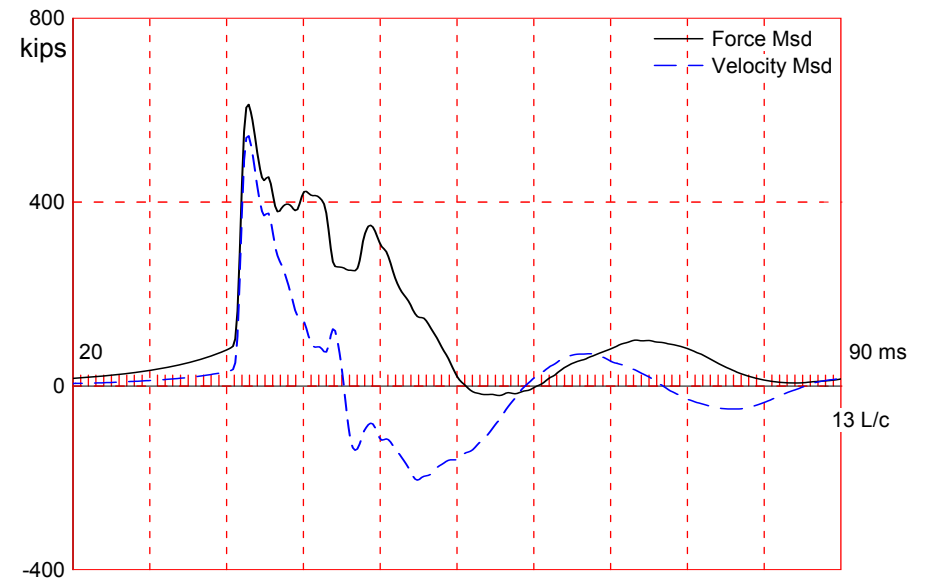
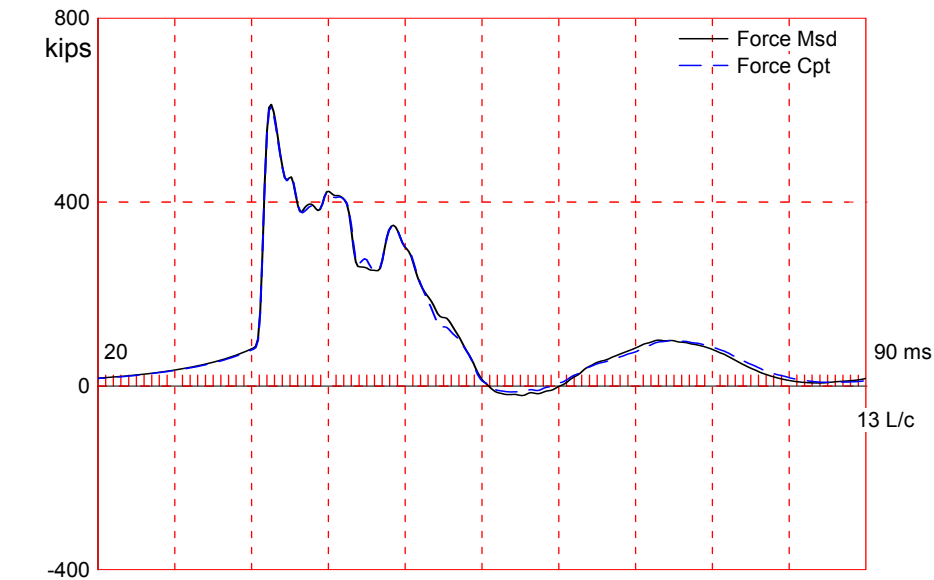
Test: 10-Apr-2015 12:00
 CAPWAP(R) 2014-1
 OP: AZ

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	Soil Plug kips
1	3.4	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000
18	60.7	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.020
20	67.4	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.030
21	70.8	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.040
22	74.1	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000
23	77.5	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000

Wave Speed: Pile Top 16807.9, Elastic 16807.9, Overall 16807.9 ft/s
 Pile Damping 1.00 %, Time Incr 0.200 ms, 2L/c 9.2 ms
 Total volume: 11.517 ft³; Volume ratio considering added impedance: 1.000

DYNAMIC RESISTANCE TABLE

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Damping Rd at Max. Rt kips	Max Rt (Ru+Rd) kips	Total Unit Rt W. Resp. to Depth Area kips/ft ksf
1	23.6	9.5	2.0	6.7	8.7	0.91
2	30.3	16.2	2.0	6.6	8.6	1.27
3	37.1	23.0	5.0	16.0	21.0	3.12
4	43.8	29.7	10.0	30.6	40.6	6.03
5	50.5	36.4	17.0	48.7	65.7	9.75
6	57.3	43.2	17.0	45.1	62.1	9.22
7	64.0	49.9	17.0	46.9	63.9	9.49
8	70.8	56.7	17.0	58.2	75.2	11.16
9	77.5	63.4	17.0	59.9	76.9	11.41
Avg. Shaft			11.6	35.4	47.0	6.67
Toe			350.0	26.7	376.7	273.30
Total					799.6	



USH 10 over LLBDM; Pile: Pier 16
 APE D30-42, HP 14 x 73; Blow: 6
 GRL Engineers, Inc.

Test: 13-Apr-2015 06:53
 CAPWAP(R) 2014-1
 OP: AZ

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 444.0; along Shaft 157.0; at Toe 287.0 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	Quake in
				444.0				
1	6.8	2.3	1.0	443.0	1.0	0.44	0.09	0.08
2	13.6	9.1	2.0	441.0	3.0	0.29	0.06	0.08
3	20.4	15.9	2.0	439.0	5.0	0.29	0.06	0.08
4	27.2	22.7	3.0	436.0	8.0	0.44	0.09	0.08
5	34.0	29.5	23.0	413.0	31.0	3.38	0.72	0.08
6	40.8	36.3	23.0	390.0	54.0	3.38	0.72	0.08
7	47.6	43.1	25.0	365.0	79.0	3.68	0.78	0.08
8	54.4	49.9	26.0	339.0	105.0	3.82	0.81	0.08
9	61.2	56.7	26.0	313.0	131.0	3.82	0.81	0.08
10	68.0	63.5	26.0	287.0	157.0	3.82	0.81	0.08
Avg. Shaft			15.7			2.47	0.53	0.08
Toe			287.0				208.20	0.31

Soil Model Parameters/Extensions		Shaft	Toe
Smith Damping Factor		0.25	0.08
Case Damping Factor		1.03	0.60
Damping Type		Viscous	Sm+Visc
Unloading Quake (% of loading quake)		94	99
Resistance Gap (included in Toe Quake) (in)			0.02
Soil Plug Weight (kips)		0.080	

CAPWAP match quality	=	1.64	(Wave Up Match) ; RSA = 0
Observed: Final Set	=	0.20 in;	Blow Count = 60 b/ft
Computed: Final Set	=	0.22 in;	Blow Count = 55 b/ft
Transducer F3(F607) CAL: 93.6; RF: 1.00; F4(D815) CAL: 93.0; RF: 1.00			
A3(K2524) CAL: 360; RF: 1.05; A4(K3550) CAL: 360; RF: 1.05			
max. Top Comp. Stress	=	28.5 ksi	(T= 36.2 ms, max= 1.065 x Top)
max. Comp. Stress	=	30.3 ksi	(Z= 34.0 ft, T= 38.0 ms)
max. Tens. Stress	=	-2.57 ksi	(Z= 34.0 ft, T= 59.5 ms)
max. Energy (EMX)	=	27.2 kip-ft;	max. Measured Top Displ. (DMX)= 0.81 in

USH 10 over LLBDM; Pile: Pier 16
 APE D30-42, HP 14 x 73; Blow: 6
 GRL Engineers, Inc.

Test: 13-Apr-2015 06:53
 CAPWAP(R) 2014-1
 OP: AZ

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	609.0	-19.5	28.5	-0.91	27.2	14.3	0.80
2	6.8	611.9	-25.6	28.6	-1.20	26.9	14.3	0.78
3	10.2	610.6	-30.6	28.5	-1.43	26.4	14.2	0.75
4	13.6	613.7	-36.5	28.7	-1.70	26.0	14.1	0.73
5	17.0	608.2	-39.4	28.4	-1.84	25.3	14.0	0.70
6	20.4	611.9	-45.7	28.6	-2.13	24.9	13.9	0.68
7	23.8	608.4	-47.8	28.4	-2.23	24.1	13.7	0.65
8	27.2	622.5	-51.9	29.1	-2.42	23.6	13.4	0.63
9	30.6	632.2	-51.4	29.5	-2.40	22.7	12.8	0.60
10	34.0	648.4	-55.0	30.3	-2.57	22.3	12.3	0.57
11	37.4	579.0	-27.3	27.0	-1.28	19.0	11.8	0.55
12	40.8	602.0	-30.6	28.1	-1.43	18.6	11.2	0.52
13	44.2	540.5	-3.4	25.3	-0.16	15.8	10.5	0.49
14	47.6	555.6	-5.8	26.0	-0.27	15.4	10.1	0.47
15	51.0	487.1	-0.0	22.8	-0.00	12.7	9.7	0.45
16	54.4	497.7	-0.0	23.2	-0.00	12.3	9.4	0.42
17	57.8	423.9	-0.0	19.8	-0.00	9.9	10.3	0.40
18	61.2	398.6	-0.0	18.6	-0.00	9.6	11.5	0.38
19	64.6	348.9	-0.0	16.3	-0.00	7.4	12.1	0.36
20	68.0	361.9	-0.0	16.9	-0.00	5.8	11.4	0.34
Absolute	34.0			30.3			(T = 38.0 ms)	
	34.0				-2.57		(T = 59.5 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	654.0	602.6	551.2	499.9	448.5	397.1	345.7	294.4	243.0	191.6
RX	660.9	611.4	570.5	548.3	526.0	503.7	481.4	464.9	454.0	443.1
RU	654.0	602.6	551.2	499.9	448.5	397.1	345.7	294.4	243.0	191.6
RAU =	324.5 (kips);		RA2 = 541.5 (kips)							

Current CAPWAP Ru = 444.0 (kips); Corresponding J(RP)= 0.41; J(RX) = 0.89

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
14.4	36.01	550.7	617.0	618.3	0.81	0.20	0.20	27.6	657.8	990

PILE PROFILE AND PILE MODEL

Depth ft	Area in ²	E-Modulus ksi	Spec. Weight lb/ft ³	Perim. ft
0.0	21.4	29992.2	492.000	4.70
68.0	21.4	29992.2	492.000	4.70

Toe Area 198.5 in²

Segmnt Number	Dist. B.G. ft	Impedance kips/ft/s	Imped. Change %	Tension Slack in	Compression Slack in	Perim. ft	Wave Speed ft/s	Soil Plug kips
1	3.4	38.20	0.00	0.00	0.000	4.70	16807.9	0.000
14	47.6	38.20	0.00	0.00	0.000	4.70	16807.9	0.020

USH 10 over LLBDM; Pile: Pier 16
 APE D30-42, HP 14 x 73; Blow: 6
 GRL Engineers, Inc.

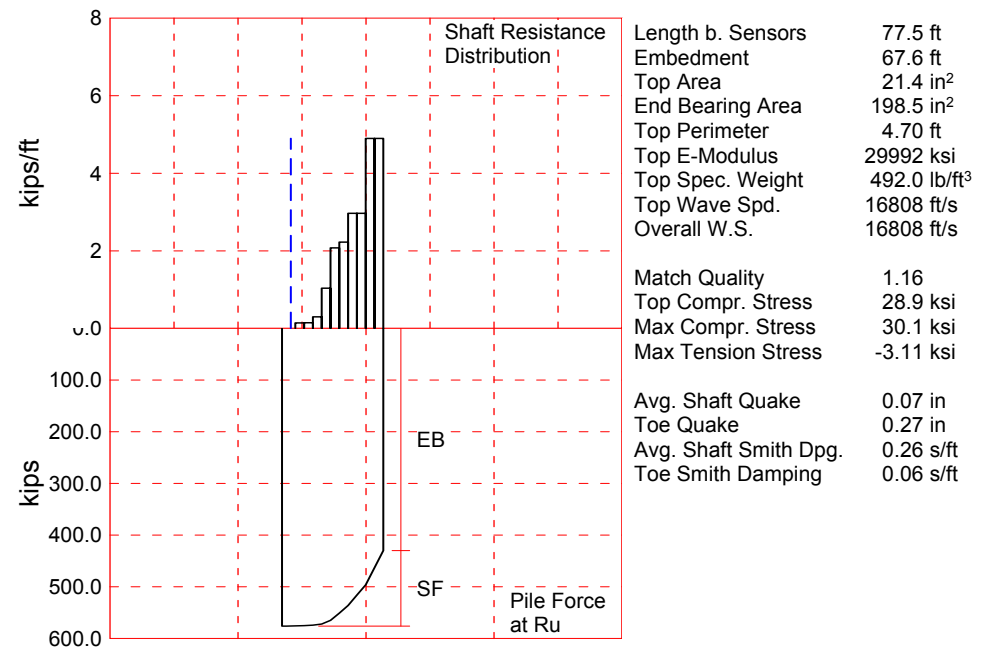
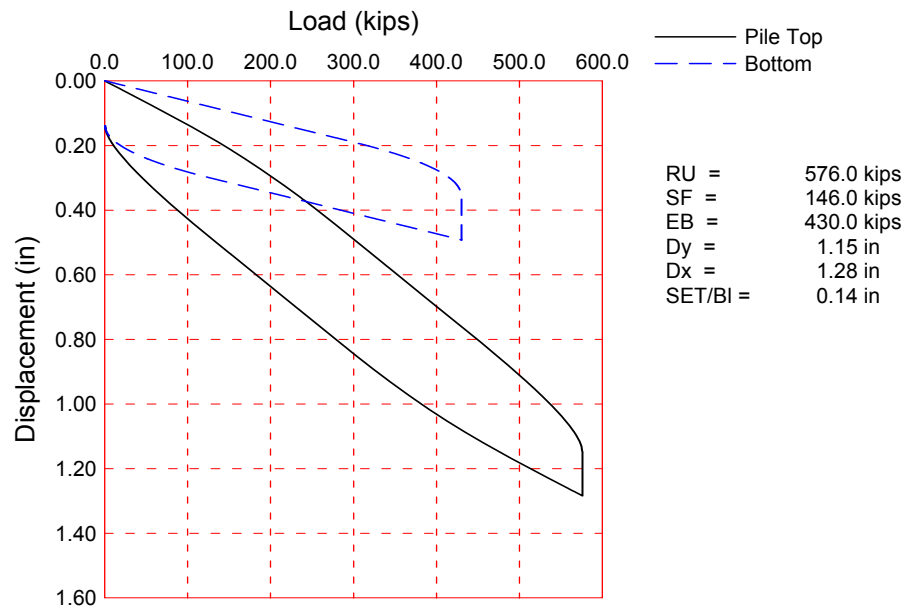
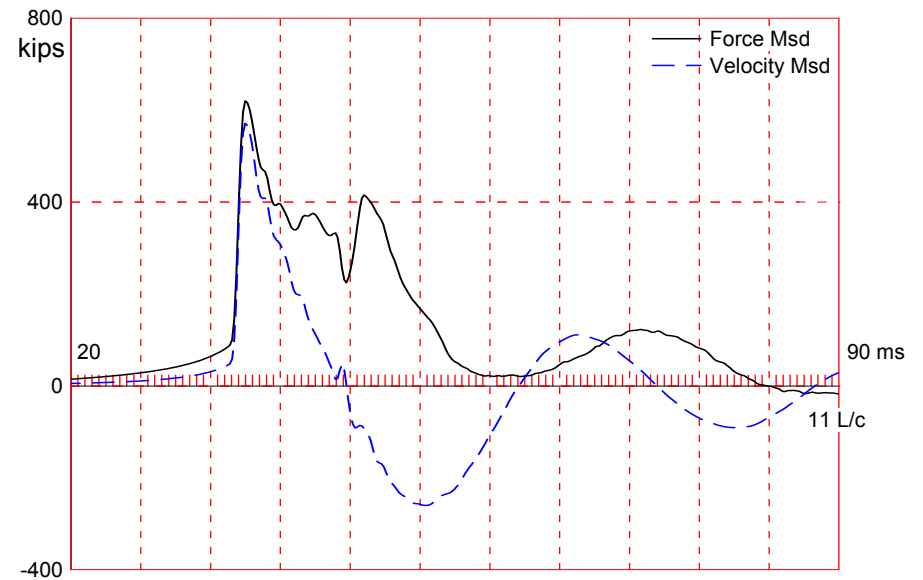
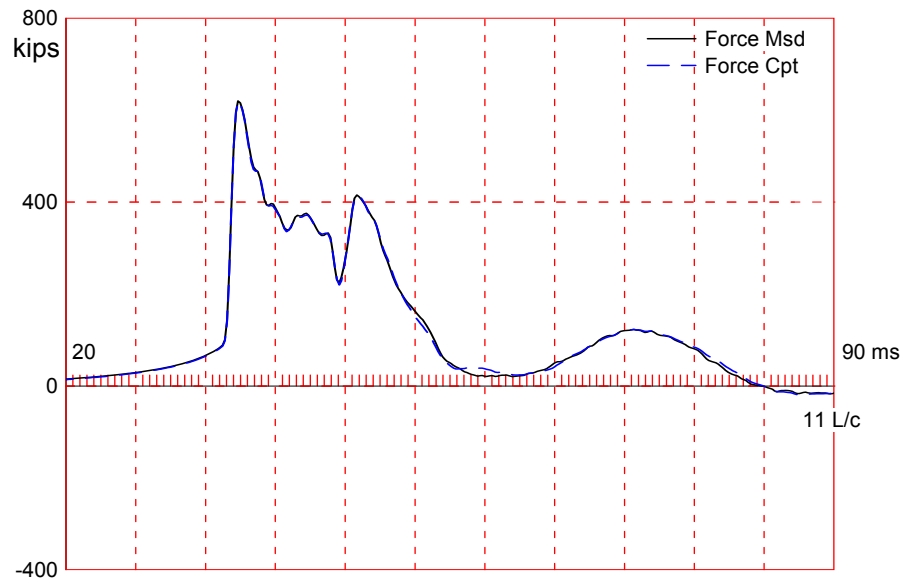
Test: 13-Apr-2015 06:53
 CAPWAP(R) 2014-1
 OP: AZ

Segmnt Number	Dist. B.G. ft	Impedance ftkips/ft/s	Imped. Change %	Slack in	Tension Eff.	Compression Slack in	Eff.	Perim. ft	Wave Speed ft/s	Soil Plug kips
18	61.2	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000
20	68.0	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000

Wave Speed: Pile Top 16807.9, Elastic 16807.9, Overall 16807.9 ft/s
 Pile Damping 1.00 %, Time Incr 0.202 ms, 2L/c 8.1 ms
 Total volume: 10.106 ft³; Volume ratio considering added impedance: 1.000

DYNAMIC RESISTANCE TABLE

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Damping Rd at Max. Rt kips	Max Rt (Ru+Rd) kips	Total Unit W. Resp. to Depth kips/ft	Unit Rt Area ksf	Quake in
1	6.8	2.3	1.0	3.6	4.6	1.99	0.42	0.08
2	13.6	9.1	2.0	7.0	9.0	1.33	0.28	0.08
3	20.4	15.9	2.0	6.9	8.9	1.31	0.28	0.08
4	27.2	22.7	3.0	10.0	13.0	1.91	0.41	0.08
5	34.0	29.5	23.0	69.3	92.3	13.57	2.89	0.08
6	40.8	36.3	23.0	62.5	85.5	12.57	2.68	0.08
7	47.6	43.1	25.0	60.4	85.4	12.56	2.67	0.08
8	54.4	49.9	26.0	58.0	84.0	12.36	2.63	0.08
9	61.2	56.7	26.0	72.6	98.6	14.50	3.09	0.08
10	68.0	63.5	26.0	73.1	99.1	14.58	3.10	0.08
Avg. Shaft			15.7	42.3	58.0	9.14	1.95	0.08
Toe			287.0	28.7	315.7		229.04	0.31
Total					896.2			



USH 10 over LLBDM; Pile: Pier 16 # 44 - E0ID
 APE D30-42, HP 14 x 73; Blow: 922
 GRL Engineers, Inc.

Test: 10-Apr-2015 12:34
 CAPWAP(R) 2014-1
 OP: AZ

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity:		576.0;	along Shaft	146.0;	at Toe	430.0	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
				576.0			
1	16.8	7.0	1.0	575.0	1.0	0.14	0.03
2	23.6	13.7	1.0	574.0	2.0	0.15	0.03
3	30.3	20.5	2.0	572.0	4.0	0.30	0.06
4	37.1	27.2	7.0	565.0	11.0	1.04	0.22
5	43.8	33.9	14.0	551.0	25.0	2.08	0.44
6	50.5	40.7	15.0	536.0	40.0	2.23	0.47
7	57.3	47.4	20.0	516.0	60.0	2.97	0.63
8	64.0	54.2	20.0	496.0	80.0	2.97	0.63
9	70.8	60.9	33.0	463.0	113.0	4.90	1.04
10	77.5	67.6	33.0	430.0	146.0	4.90	1.04
Avg. Shaft			14.6			2.16	0.46
Toe			430.0				311.94

Soil Model Parameters/Extensions			Shaft	Toe
Smith Damping Factor			0.26	0.06
Quake	(in)		0.07	0.27
Case Damping Factor			0.99	0.68
Damping Type			Viscous	Sm+Visc
Unloading Quake	(% of loading quake)		100	52
Unloading Level	(% of Ru)		49	
Resistance Gap (included in Toe Quake)	(in)			0.03
Soil Plug Weight	(kips)		0.060	0.059

CAPWAP match quality = 1.16 (Wave Up Match) ; RSA = 0
 Observed: Final Set = 0.14 in; Blow Count = 87 b/ft
 Computed: Final Set = 0.15 in; Blow Count = 78 b/ft
 Transducer F3(D815) CAL: 93.0; RF: 1.00; F4(F607) CAL: 93.6; RF: 1.00
 A3(K3550) CAL: 360; RF: 1.05; A4(K2524) CAL: 360; RF: 1.05
 max. Top Comp. Stress = 28.9 ksi (T= 36.1 ms, max= 1.041 x Top)
 max. Comp. Stress = 30.1 ksi (Z= 37.1 ft, T= 38.3 ms)
 max. Tens. Stress = -3.11 ksi (Z= 50.5 ft, T= 60.1 ms)
 max. Energy (EMX) = 30.5 kip-ft; max. Measured Top Displ. (DMX)= 0.90 in

USH 10 over LLBDM; Pile: Pier 16 # 44 - E0ID
 APE D30-42, HP 14 x 73; Blow: 922
 GRL Engineers, Inc.

Test: 10-Apr-2015 12:34
 CAPWAP(R) 2014-1
 OP: AZ

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	618.8	-22.2	28.9	-1.04	30.5	15.0	0.89
2	6.7	619.8	-25.4	29.0	-1.18	30.3	15.0	0.88
4	13.5	623.4	-31.4	29.1	-1.47	29.7	14.8	0.83
5	16.8	625.4	-34.5	29.2	-1.61	29.4	14.8	0.81
6	20.2	622.9	-36.9	29.1	-1.73	28.8	14.7	0.79
7	23.6	625.6	-40.0	29.2	-1.87	28.3	14.6	0.76
8	27.0	624.4	-42.4	29.2	-1.98	27.7	14.5	0.73
9	30.3	631.6	-46.6	29.5	-2.18	27.1	14.3	0.71
10	33.7	631.0	-52.1	29.5	-2.43	26.2	14.1	0.68
11	37.1	644.1	-58.7	30.1	-2.74	25.6	13.8	0.65
12	40.4	625.7	-59.8	29.2	-2.79	23.8	13.5	0.61
13	43.8	642.8	-65.8	30.0	-3.07	23.2	13.1	0.58
14	47.2	604.7	-61.3	28.2	-2.87	20.6	12.5	0.55
15	50.5	621.5	-66.6	29.0	-3.11	19.9	12.0	0.52
16	53.9	573.4	-60.8	26.8	-2.84	17.4	11.6	0.49
17	57.3	580.3	-66.3	27.1	-3.10	16.7	11.3	0.46
18	60.7	519.4	-60.0	24.3	-2.80	14.0	11.0	0.43
19	64.0	544.9	-64.1	25.5	-2.99	13.4	10.5	0.40
20	67.4	498.3	-54.5	23.3	-2.55	11.0	10.5	0.37
21	70.8	509.0	-55.4	23.8	-2.59	10.4	11.4	0.33
22	74.1	479.7	-37.5	22.4	-1.75	7.5	11.7	0.31
23	77.5	489.2	-38.5	22.9	-1.80	5.7	10.9	0.28
Absolute	37.1 50.5			30.1	-3.11		(T = (T =	38.3 ms 60.1 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	702.6	652.9	603.2	553.5	503.7	454.0	404.3	354.6	304.8	255.1
RX	738.7	700.1	662.1	639.3	620.8	602.4	583.9	565.5	557.0	548.5
RU	702.6	652.9	603.2	553.5	503.7	454.0	404.3	354.6	304.8	255.1

RAU = 411.5 (kips); RA2 = 619.9 (kips)

Current CAPWAP Ru = 576.0 (kips); Corresponding J(RP)= 0.25; J(RX) = 0.64

VMX ft/s	TVP ms	VT1*Z kips	FT1 kips	FMX kips	DMX in	DFN in	SET in	EMX kip-ft	QUS kips	KEB kips/in
15.1	35.89	575.8	624.1	624.1	0.90	0.14	0.14	30.8	714.3	1792

PILE PROFILE AND PILE MODEL

Depth ft	Area in ²	E-Modulus ksi	Spec. Weight lb/ft ³	Perim. ft
0.0	21.4	29992.2	492.000	4.70
77.5	21.4	29992.2	492.000	4.70
Toe Area	198.5	in ²		

USH 10 over LLBDM; Pile: Pier 16 # 44 - E0ID
 APE D30-42, HP 14 x 73; Blow: 922
 GRL Engineers, Inc.

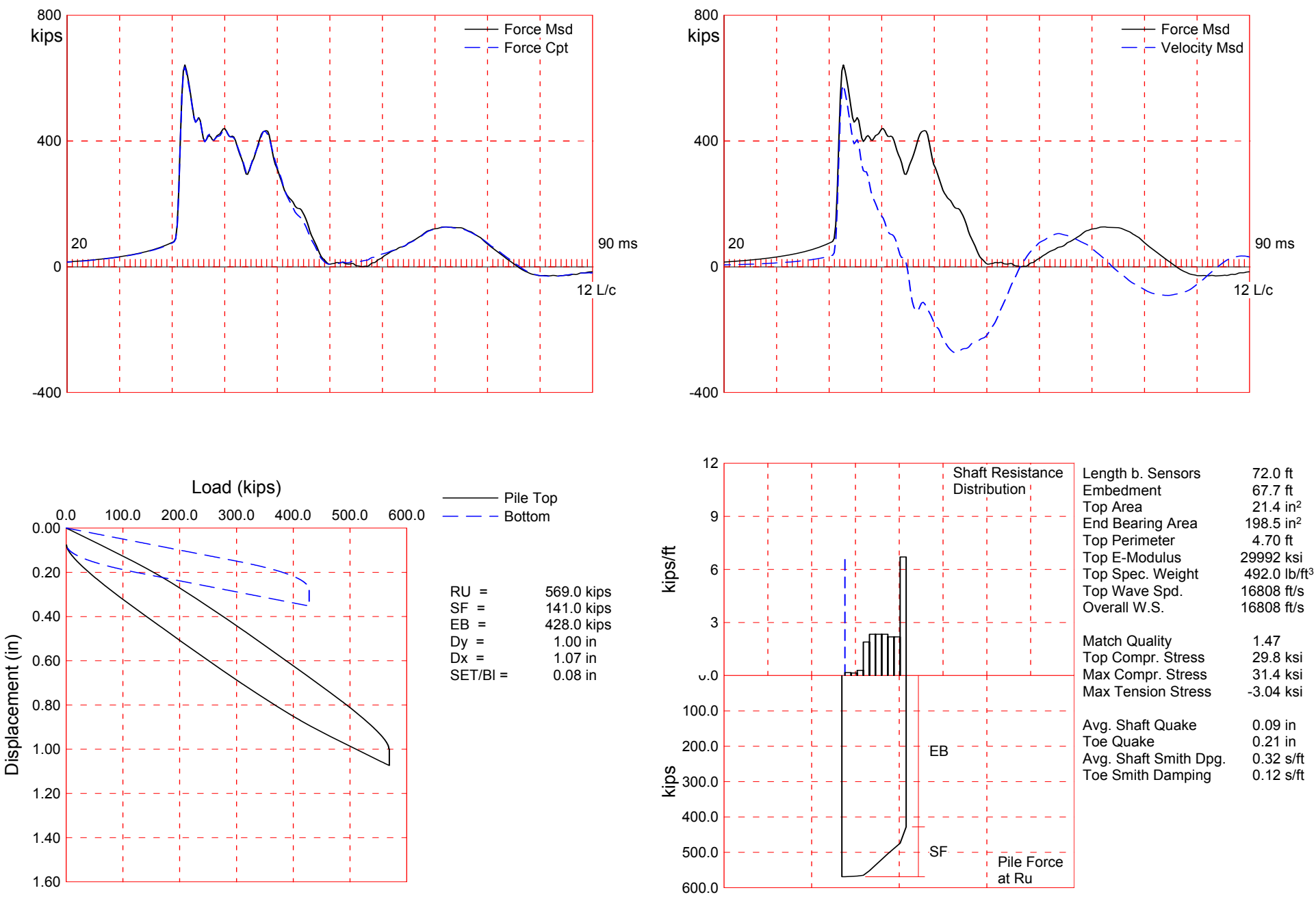
Test: 10-Apr-2015 12:34
 CAPWAP(R) 2014-1
 OP: AZ

Segmnt Number	Dist. B.G. ft	Impedance kips/ft/s	Imped. Change %	Slack in	Tension Eff.	Compression Slack in	Eff.	Perim. ft	Wave Speed ft/s	Soil Plug kips
1	3.4	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000
16	53.9	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.020
19	64.0	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000
23	77.5	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000

Wave Speed: Pile Top 16807.9, Elastic 16807.9, Overall 16807.9 ft/s
 Pile Damping 1.00 %, Time Incr 0.200 ms, 2L/c 9.2 ms
 Total volume: 11.517 ft³; Volume ratio considering added impedance: 1.000

DYNAMIC RESISTANCE TABLE

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Damping Rd at Max. Rt kips	Max Rt (Ru+Rd) kips	Total Unit W. Resp. to Depth Area kips/ft ksf
1	16.8	7.0	1.0	3.8	4.8	0.69
2	23.6	13.7	1.0	3.8	4.8	0.71
3	30.3	20.5	2.0	7.4	9.4	1.40
4	37.1	27.2	7.0	25.0	32.0	4.75
5	43.8	33.9	14.0	47.0	61.0	9.05
6	50.5	40.7	15.0	46.1	61.1	9.06
7	57.3	47.4	20.0	57.2	77.2	11.45
8	64.0	54.2	20.0	53.4	73.4	10.89
9	70.8	60.9	33.0	94.5	127.5	18.93
10	77.5	67.6	33.0	90.2	123.2	18.28
Avg. Shaft			14.6	42.9	57.5	8.49
Toe			430.0	13.9	443.9	322.00
Total					1018.4	



USH 10 over LLBDM; Pile: Pier 16 # 44 - BOR
 APE D30-42, HP 14 x 73; Blow: 7
 GRL Engineers, Inc.

Test: 13-Apr-2015 06:45
 CAPWAP(R) 2014-1
 OP: AZ

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 569.0; along Shaft 141.0; at Toe 428.0 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
				569.0			
1	10.3	6.0	1.0	568.0	1.0	0.17	0.04
2	17.1	12.8	1.0	567.0	2.0	0.15	0.03
3	24.0	19.7	2.0	565.0	4.0	0.29	0.06
4	30.9	26.6	13.0	552.0	17.0	1.90	0.40
5	37.7	33.4	16.0	536.0	33.0	2.33	0.50
6	44.6	40.3	16.0	520.0	49.0	2.33	0.50
7	51.4	47.1	16.0	504.0	65.0	2.33	0.50
8	58.3	54.0	15.0	489.0	80.0	2.19	0.47
9	65.1	60.8	15.0	474.0	95.0	2.19	0.47
10	72.0	67.7	46.0	428.0	141.0	6.71	1.43
Avg. Shaft			14.1			2.08	0.44
Toe			428.0				310.49

Soil Model Parameters/Extensions		Shaft	Toe
Smith Damping Factor		0.32	0.12
Quake	(in)	0.09	0.21
Case Damping Factor		1.18	1.34
Damping Type		Viscous	Sm+Visc
Unloading Quake	(% of loading quake)	83	98
Resistance Gap (included in Toe Quake) (in)			0.01
Soil Plug Weight	(kips)	0.080	0.080

CAPWAP match quality = 1.47 (Wave Up Match) ; RSA = 0
 Observed: Final Set = 0.08 in; Blow Count = 160 b/ft
 Computed: Final Set = 0.08 in; Blow Count = 147 b/ft
 Transducer F3(F607) CAL: 93.6; RF: 1.00; F4(D815) CAL: 93.0; RF: 1.00
 A3(K2524) CAL: 360; RF: 1.04; A4(K3550) CAL: 360; RF: 1.04
 max. Top Comp. Stress = 29.8 ksi (T= 36.1 ms, max= 1.053 x Top)
 max. Comp. Stress = 31.4 ksi (Z= 30.9 ft, T= 37.7 ms)
 max. Tens. Stress = -3.04 ksi (Z= 30.9 ft, T= 57.1 ms)
 max. Energy (EMX) = 30.0 kip-ft; max. Measured Top Displ. (DMX)= 0.84 in

USH 10 over LLBDM; Pile: Pier 16 # 44 - BOR
 APE D30-42, HP 14 x 73; Blow: 7
 GRL Engineers, Inc.

Test: 13-Apr-2015 06:45
 CAPWAP(R) 2014-1
 OP: AZ

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	637.4	-34.3	29.8	-1.60	30.0	15.3	0.83
2	6.9	639.9	-38.4	29.9	-1.79	29.7	15.2	0.81
3	10.3	642.2	-42.8	30.0	-2.00	29.3	15.1	0.79
4	13.7	639.0	-45.6	29.9	-2.13	28.6	15.0	0.76
5	17.1	642.1	-49.4	30.0	-2.31	28.1	14.9	0.73
6	20.6	640.7	-51.8	29.9	-2.42	27.3	14.8	0.70
7	24.0	650.0	-55.1	30.4	-2.57	26.7	14.6	0.67
8	27.4	656.8	-56.9	30.7	-2.66	25.6	14.1	0.64
9	30.9	671.3	-65.1	31.4	-3.04	24.9	13.7	0.60
10	34.3	622.4	-48.3	29.1	-2.26	22.0	13.1	0.57
11	37.7	638.9	-55.5	29.8	-2.59	21.3	12.7	0.54
12	41.1	585.0	-34.4	27.3	-1.61	18.3	12.0	0.50
13	44.6	605.0	-41.2	28.3	-1.92	17.6	11.5	0.47
14	48.0	547.0	-23.0	25.6	-1.07	15.0	11.0	0.44
15	51.4	560.0	-30.5	26.2	-1.43	14.2	10.7	0.40
16	54.9	510.5	-16.6	23.9	-0.77	11.9	10.4	0.37
17	58.3	522.4	-23.4	24.4	-1.09	11.2	10.2	0.34
18	61.7	513.6	-11.4	24.0	-0.53	9.4	9.8	0.31
19	65.1	532.1	-16.2	24.9	-0.76	8.7	9.9	0.28
20	68.6	522.3	-1.7	24.4	-0.08	7.2	10.2	0.24
21	72.0	531.3	-5.2	24.8	-0.24	5.1	9.2	0.21
Absolute	30.9			31.4			(T = 37.7 ms)	
	30.9				-3.04		(T = 57.1 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	774.8	728.7	682.6	636.5	590.4	544.3	498.2	452.1	405.9	359.8
RX	781.1	742.8	708.6	676.1	648.0	630.2	612.8	595.4	579.2	567.6
RU	774.8	728.7	682.6	636.5	590.4	544.3	498.2	452.1	405.9	359.8

RAU = 426.2 (kips); RA2 = 642.7 (kips)

Current CAPWAP Ru = 569.0 (kips); Corresponding J(RP)= 0.45; J(RX) = 0.89

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
15.4	35.90	586.7	649.3	649.3	0.84	0.08	0.08	30.3	796.2	2140

PILE PROFILE AND PILE MODEL

Depth ft	Area in ²	E-Modulus ksi	Spec. Weight lb/ft ³	Perim. ft
0.0	21.4	29992.2	492.000	4.70
72.0	21.4	29992.2	492.000	4.70

Toe Area 198.5 in²

Segmnt Number	Dist. B.G. ft	Impedance kips/ft/s	Imped. Change %	Slack in	Tension Eff.	Compression Slack in	Perim. ft	Wave Speed ft/s	Soil Plug kips
1	3.4	38.20	0.00	0.00	0.000	-0.00	0.000	4.7016807.9	0.000

USH 10 over LLBDM; Pile: Pier 16 # 44 - BOR
 APE D30-42, HP 14 x 73; Blow: 7
 GRL Engineers, Inc.

Test: 13-Apr-2015 06:45
 CAPWAP(R) 2014-1
 OP: AZ

Segmnt Number	Dist. B.G. ft	Impedance ftkips/ft/s	Imped. Change %	Tension Slack in	Tension Eff.	Compression Slack in	Compression Eff.	Perim. ft	Wave Speed ft/s	Soil Plug kips
14	48.0	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.020
18	61.7	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000
21	72.0	38.20	0.00	0.00	0.000	-0.00	0.000	4.70	16807.9	0.000

Wave Speed: Pile Top 16807.9, Elastic 16807.9, Overall 16807.9 ft/s
 Pile Damping 1.00 %, Time Incr 0.204 ms, 2L/c 8.6 ms
 Total volume: 10.700 ft³; Volume ratio considering added impedance: 1.000

DYNAMIC RESISTANCE TABLE

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Damping Rd at Max. Rt kips	Max Rt (Ru+Rd) kips	Total Unit Rt W. Resp. to Depth Area kips/ft ksf
1	10.3	6.0	1.0	4.8	5.8	0.97
2	17.1	12.8	1.0	4.8	5.8	0.84
3	24.0	19.7	2.0	9.3	11.3	1.65
4	30.9	26.6	13.0	56.2	69.2	10.09
5	37.7	33.4	16.0	63.9	79.9	11.66
6	44.6	40.3	16.0	57.6	73.6	10.74
7	51.4	47.1	16.0	52.7	68.7	10.02
8	58.3	54.0	15.0	47.0	62.0	9.04
9	65.1	60.8	15.0	46.7	61.7	9.00
10	72.0	67.7	46.0	116.4	162.4	23.68
Avg. Shaft			14.1	45.9	60.0	8.87
Toe			428.0	31.3	459.3	333.21
Total					1059.8	