Resource International, Inc.

HAM-75-7.85
HAM-75-0834
NORFOLK SOUTHERN RAILROAD
OVER I-75
PID NO. 77889
HAMILTON COUNTY, OHIO

DRAFT STRUCTURE FOUNDATION EXPLORATION REPORT

Prepared For:
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Columbus, Ohio 43054

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Rii Project No. B-10-020

November, 2014

RESOURCE INTERNATIONAL, INC.
ISO 9001:2008
Certified QMS
An ISO 9001:2008 QMS Certified Firm

Planning

Engineering

Construction Management

Technology

January 31, 2014 (Revised November 12, 2014)

Mr. Edward D. Kagel, P.E.
Director of Transportation
EMH&T
5500 New Albany Road
Columbus, OH 43054

Re: Draft Structure Foundation Exploration
HAM-75-7.85
HAM-75-0834 – Norfolk Southern Railroad over I-75
PID No. 77889
Rii Project No. B-10-020

Mr. Kagel:

Resource International, Inc. (Rii) is pleased to submit this DRAFT structure foundation exploration report for the referenced project. Engineering logs have been prepared and are attached to this report along with the results of laboratory testing. This report includes recommendations for the design and construction of the proposed HAM-75-0834 bridge structure carrying the Norfolk Southern Railroad over I-75 as part of the HAM-75-7.85 project in Hamilton County, Ohio.

We sincerely appreciate the opportunity to be of service to you on this project. If you have any questions regarding the structure foundation exploration or this report, please contact us.

Sincerely,

RESOURCE INTERNATIONAL, INC.

Brian R. Trenner, P.E.
Project Engineer

Jonathan P. Sterenberg, P.E.
Director – Geotechnical Services

Enclosure: DRAFT Structure Foundation Exploration Report

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TABLE OF CONTENTS

APPENDICIES

Appendix I	**State Geology**
Appendix II	**Vicinity Map and Boring Plan**
Appendix III	**Description of Soil Terms**
Appendix IV	**Project Boring Logs: B-006-1-12, B-008-0-11, B-172-0-07 and B-173-0-07**
Appendix V	**Laboratory Test Results**
Appendix VI	**DRIVEN Analysis Outputs**
Appendix VII	**GRLWEAP Driveability Analysis Outputs**
Appendix VIII	**Settlement Calculations**
Appendix IX	**Slope Stability Results**

EXECUTIVE SUMMARY

Resource International, Inc. (Rii) has completed a structure foundation exploration report for the replacement of the HAM-75-0834 bridge structure carrying the Norfolk Southern Railroad over I-75 as part of the HAM-75-7.85 project in Hamilton County, Ohio. The existing structure is a two-span steel girder with concrete deck structure that was originally constructed in 1958 and is supported on concrete abutments and pier, and has a span length of approximately 117 feet and width of 20 feet. It is understood that the existing structure will be completely removed and that the proposed structure will be located approximately 90 feet north. The proposed structure will consist of a two-span steel deck girder with a ballasted, composite reinforced deck superstructure on full-height, wall-type abutments and wall type pier and will have a span length of approximately 208 feet and width of 31 feet.

Exploration and Findings

Between October 25, 2011, and July 9, 2014, two (2) structural borings, designated as B-006-1-14 and B-008-0-11, were drilled to a completion depth of 25.0 and 100.0 feet below the existing ground surface, respectively, at the location illustrated on the boring plan presented in Appendix II of the full report. In 2007, two borings, designated as B-172-0-07 and B-173-0-07, were performed for this bridge, one at each proposed abutment location, as part of the preliminary geotechnical exploration performed by CTL Engineering. The borings were advanced to a depth of 90.0 and 95.0 feet below the existing ground surface, respectively, and are also included on the boring plan.

Boring B-006-1 was drilled at the southwest end of the property located at 51211 Fishwick Drive and encountered 3.0 inches of topsoil at the ground surface. Boring B-008 was drilled through the existing pavement of I-75 near the proposed pier location and encountered 7.0 of asphalt overlying 9.0 inches of concrete at the ground surface.

Beneath the pavement section in boring B-008, material identified as existing fill consisting of brown and brownish gray gravel with sand and silt and sandy silt (ODOT A-2-4, A-4a) was encountered extending to a depth of 5.5 feet below the ground surface.

Underlying the surface material in boring B-006-1 and existing fill in boring B-008, natural soils were encountered consisting primarily of granular soils with seams and layers of cohesive material. The granular soils were generally described as brown, gray and brownish gray gravel and sand, gravel with sand, silt and clay, fine sand and coarse and fine sand (ODOT A-1-b, A-2-6, A-3, A-3a). The cohesive soils were generally described as gray, brown and brownish gray sandy silt, silt and clay, silty clay and clay (ODOT A-4a, A-6a, A-6b, A-7-6).

In general, the borings performed by CTL Engineering encountered medium stiff to very stiff cohesive soils generally described as brown and gray sandy silt, silt and clay, silty clay elastic clay and clay (ODOT A-4a, A-6a, A-6b, A-7-5, A-7-6) to a depth of 42.0 and 53.5 feet below the ground surface in borings B-172 and B-173, respectively, overlying medium dense to dense granular soil generally described as brown gavel, gravel and sand, fine sand and coarse and fine sand (ODOT A-1-a, A-1-b, A-3, A-3a) which extended to the boring termination depths. A thick layer if coarse and fine sand (ODOT A-3a) was encountered above the cohesive materials in boring B-173, which extended to a depth of 33.0 feet below the ground surface.

Bedrock was not encountered in any of the borings performed during the preliminary or current exploration.

Analyses and Recommendations

Design details of the structure proposed were provided to Rii by Gannett Fleming. It is understood that the new structure will consist of a two-span steel deck girder with a ballasted, composite reinforced deck superstructure on full-height, wall-type abutments and wall-type pier supported on a deep foundation system comprised of driven piles. The proposed structure will be located approximately 90 feet north of the existing structure, which will be completely removed.

It is recommended that a deep foundation system consisting of driven piles be employed for support of the proposed bridge foundation elements. Based on the soil encountered at this site, it is recommended that cast-in-place (CIP) pipe piles (ODOT Item 507.06) be employed for foundation support. Per the American Railway Engineering and Maintenance-of-Way Association (AREMA) specifications, Section 4.3 of Chapter 8, the bridge structure should be designed using allowable stress design (ASD) criteria. The following table shows the recommended pile length of CIP pipe piles and the corresponding allowable pile capacity.

Pile Recommendations

Substructure Element	Ground Elevation [1]	Pile Size [2]	Pile Elevation		Embedment Depth [4] (feet)	Allowable Pile Capacity [5,6,7] (kips/pile)	Downdrag Load [8] (kips/pile)
			Top [3]	Tip			
B-172-0-07 Rear Abutment	529.9	14” CIP	519.5	446.5	73 [9]	199 / 203 [9]	0 [9]
B-172-0-07 Rear Wingwall	529.9	12” CIP	521.5	447.5	74 [10]	140 / 144 [10]	0 [10]
B-008-0-11 Pier	529.0	12” CIP	520.5	472.5	48	104 / 112	N/A

Substructure Element	Ground Elevation [1]	Pile Size [2]	Pile Elevation		Embedment Depth [4] (feet)	Allowable Pile Capacity [5,6,7] (kips/pile)	Downdrag Load [8] (kips/pile)
			Top [3]	Tip			
B-173-0-07 Forward Abutment	543.1	14" CIP	519.5	459.5	60	172 / 186	0
B-173-0-07 Forward Wingwall	543.1	12" CIP	521.5	459.5	62	130 / 142	0

1. *Ground elevation listed is the ground elevation at the respective boring location.*
2. *The pile wall thickness utilized in the analysis was determined in accordance with the equation provided in ODOT Item 507.06 and was rounded up to the nearest 1/16-inch increment. A minimum pile wall thickness of 0.375 inches is required per direction from Gannett Fleming, based on structural requirements.*
3. *Top of pile elevation is at the proposed bottom of footing elevation.*
4. *Embedment depths represent the length of pile in contact with the soil.*
5. *A factor-of-safety of 2.0 was utilized in the analysis. The allowable bearing capacity provided accounts for the maximum design service loading plus the capacity reduction due to downdrag.*
6. *The embedment depth and corresponding allowable bearing capacity listed above are based on the structural loading information in the Stage 2 design plans provided by Gannett Fleming.*
7. *Where multiple values are listed, the first value listed is the allowable bearing capacity during the driven condition (immediately after driving the pile). The second value listed is the allowable bearing capacity after soil setup has occurred following **a minimum waiting period of seven (7) days after the initial drive** (at the time of restrike on the pile).*
8. *These values represent the negative side resistance due to settlement of the soils within the downdrag zone. These values also represent the amount of side resistance required to be overcome during driving through the downdrag zone. Determination of the depth and magnitude of downdrag is outlined in Section 5.1.1 of the full report.*
9. *Due to excessive downdrag forces estimated at this substructure unit, it is recommended that prebored holes be provided at each pile location and pile sleeves installed through the anticipated downdrag depth, estimated to be 18.0 feet (bottom of prebore El. 502.0 feet msl), and driving the piles to the design tip elevation through the pile sleeves.*
10. *Due to excessive downdrag forces estimated at this substructure unit, it is recommended that prebored holes be provided at each pile location and pile sleeves installed through the anticipated downdrag depth, estimated to be 20.0 feet (bottom of prebore El. 502.0 feet msl), and driving the piles to the design tip elevation through the pile sleeves.*

NOTE: The top of pile elevation coincides with the bottom of footing elevations, and the estimated pile lengths reflect exclusively the length of the pile in contact with the soil. **Embedment length of the pile into the footing is not included.** Estimated pile lengths are rounded up to the nearest foot.

Due to excessive downdrag loads estimated at the rear abutment and wingwall substructure units, it is recommended that the piles be prebored to a depth of 18.0 feet and 20.0 feet for the abutment and wingwall substructure units, respectively, to eliminate the anticipated downdrag loads. These depths represent the estimated depth that downdrag loads will develop due to consolidation of the underlying elastic clay and clay (ODOT A-7-5, A-7-6) soils, which extend to an elevation of 502 feet msl, as

outlined in Section 5.1.1 of the full report. Pile sleeves should be installed within the prebored holes and the piles should be driven through the sleeves to the required capacity and tip elevation provided in the table above. The annular space between the pile and the sleeve should be backfilled with clean sand following installation to the final tip elevation. Additional discussion and alternative recommendations for pile installation to accommodate the downdrag forces are provided in Section 5.1 of the full report.

A settlement analysis was performed at both abutment locations as well as at boring B-106-1 along the eastern portion of the realigned section of railroad embankment to predict the long term consolidation settlement that will result after the embankment fill has been placed. Based on soil profile and cross section information provided by Gannett Fleming, fill heights of approximately 15 to 28 feet are anticipated along the proposed realigned portion of the railroad alignment, which includes approximately 25 to 28 feet of fill near the abutments of the proposed structure. Results of the settlement analysis indicate that total settlements of 5.75 and 3.87 inches are anticipated near the rear and forward abutments, respectively, and 3.80 inches is anticipated at boring B-006-1 due to the weight of the new embankment fill. Long term settlement of the natural soils and embankment fill following the completion of construction is expected to be on the order of approximately 1.0 to 2.0 inches.

A slope stability analysis was performed at station 152+50 (boring B-006-1-12) and 154+00 (boring B-172-0-07), referenced to the proposed centerline of NS Railroad Mainline track, to evaluate the stability of the embankment slopes. For slopes not supporting a structural foundation, the minimum factor-of-safety against slope stability is 1.3. The resulting factor-of-safety under drained (long-term stability) and undrained (short-term stability) conditions was greater than 1.3. Based on the results of the analyses, the stability of the proposed embankment slopes will be within acceptable limits.

Please note that this executive summary does not contain all the information presented in the report. The unabridged subsurface exploration report should be read in its entirety to obtain a more complete understanding of the information presented.

1.0 INTRODUCTION

The overall purpose of this project is to provide detailed subsurface information and recommendations for the design and construction of the HAM-75-7.85 project in Hamilton County, Ohio. This project represents the northern portion of HAM-75-2.30 Mill Creek Expressway improvements. The overall project will consist of roadway improvements, and several retaining wall and bridge replacements along I-75 from Vine Street to SR-126. The project site is located in the community limits of St. Bernard, Elmwood Place, Roselawn, and Cincinnati, in Hamilton County, Ohio.

This report is a presentation of the structure foundation exploration performed for the HAM-75-0834 bridge structure carrying the Norfolk Southern Railroad over I-75, as shown on the Vicinity Map and Boring Plan presented in Appendix II. The existing structure is a two-span steel girder with concrete deck structure that was originally constructed in 1958 and is supported on concrete abutments and pier, and has a span length of approximately 117 feet and width of 20 feet. It is understood that the existing structure will be completely removed and that the proposed structure will be located approximately 90 feet north. The proposed structure will consist of a two-span steel deck girder with a ballasted, composite reinforced deck superstructure on full-height, wall-type abutments and wall type pier and will have a span length of approximately 208 feet and width of 31 feet.

A preliminary structure foundation exploration was performed by CTL Engineering for this bridge replacement as part of the HAM-75-2.30 Step 7 Preliminary Engineering Phase (PID No. 77889) and their findings are presented in the report dated December 14, 2007. These borings were utilized in the design recommendations presented in this report. For a complete summary of the field operations and findings for the borings performed by CTL Engineering, please reference the December 2007 report.

2.0 GEOLOGY AND OBSERVATIONS OF THE PROJECT

2.1 Site Geology

Both the Illinoian and Wisconsinan glaciers advanced over two-thirds of the State of Ohio, leaving behind glacial features such as moraines, kame deposits, lacustrine deposits and outwash terraces. The glacial and non-glacial regions comprise five physiographic sections grouped by age, depositional process and geomorphic occurrence. Physiographically, the site lies within the Illinoian Till Plain of the Till Plains Section. This area is characterized by rolling ground moraine deposits with many buried valleys alternating between broad floodplains and bedrock gorges. The site area contains silty loam till deposited as ground moraine covered with loess and dissected by the modern day Mill Creek. Ground moraines are deposited during the retreat of a glacier which results in an undifferentiated mixture of clay, silt, sand and gravel. The valley area also contains outwash and alluvium which eroded from hills and valleys with moderate relief. Outwash deposits consist of undifferentiated sand and gravel deposited

by meltwater in front of glacial ice and often occurs as valley terraces or low plains. Alluvium and alluvial terrace deposits range in composition from silty clay size particles to cobbles, usually deposited in present and former floodplain areas.

Based on bedrock geology and topography maps of the area, obtained from the Ohio Department of Natural Resources (ODNR), the underlying bedrock consists of the Ordovician-aged Point Pleasant Formation. The Point Pleasant Formation, encountered in the bedrock valleys, is comprised of interbedded limestone and shale, averaging 60 percent limestone and 40 percent shale, and ranges from 0 to 80 feet thick. The bedrock surface forms a narrow valley roughly beneath, and following, SR-562 and is aligned northwest to southeast in the vicinity of the site. The bedrock valley continues crossing under I-75 to the west of the site where the alignment of the valley changes to northeast to southwest, roughly following the existing Mill Creek Valley. The bedrock underneath the site slopes downward to the southwest and the bedrock surface beneath the proposed structure is at an approximate elevation of 420 feet mean sea level (msl). According to bedrock topography mapping, the overburden soil in the vicinity of the site is approximately 105 feet thick. An illustration of the general geology of Ohio is presented in Appendix I.

2.2 Existing Conditions

The site for the proposed HAM-75-0834 structure is located approximately 70 feet north of the existing overpass of Norfolk Southern Railroad over I-75, approximately 2.2 miles south of the Lockland Split. The existing structure is a two-span bridge that is approximately 18 feet wide and 117 feet long, and carries a single railway along the Norfolk Southern Railroad into and out of the Berry Yard just south and east of the bridge structure. The existing I-75 roadway that runs beneath the structure is a six-lane, asphalt paved roadway. The terrain in the vicinity of the structure is elevated approximately 10 feet along the west side of I-75 and slopes gradually upward east of I-75. The existing I-75 in the vicinity of the structure dips to the lowest elevation of approximately 528.5 feet msl underneath the structure and gradually slopes back up to the east and west of the structure.

3.0 EXPLORATION

Between October 25 and 27, 2011, one (1) structural boring, designated as B-008-0-11, was drilled to a completion depth of 100.0 feet below the existing ground surface at the location illustrated on the boring plan presented in Appendix II of this report and summarized in Table 1. On July 9, 2014, one additional boring, designated as B-006-1-12, was drilled to a completion depth of 25.0 feet below the ground surface along the eastern portion of the proposed realignment of Norfolk Southern railroad to evaluate the stability and settlement potential of the new embankment fill.

Table 1. Test Boring Summary

Boring	Station	Offset	Latitude	Longitude	Ground Elevation (feet)	Boring Depth
B-006-1-12	439+47.84	328.2' Rt.	39.180159023° N	84.484493474° W	538.5	25.0
B-008-0-11	440+47.80	22.5' Lt.	39.180792305° N	84.485491076° W	529.0	100.0

1. Station and offset referenced to the proposed centerline of I-75.

The boring location was determined by and located in the field by Rii representatives. Geographic latitude and longitude coordinates as well as ground surface elevations at the boring locations are included on the boring logs provided in Appendix IV.

The boring was drilled using an all-terrain vehicle (ATV)-mounted rotary drilling machine, utilizing a 4.25-inch inside diameter, continuous hollow-stem auger to advance the hole. Standard penetration testing (SPT) and split spoon sampling were performed in the boring at 2.5-foot increments of depth to 30 feet and at 5.0-foot increments thereafter to the boring termination depth. The SPT, per the American Society for Testing and Materials (ASTM) designation D1586, is conducted using a 140-pound hammer free falling 30.0 inches to drive a 2.0-inch outside diameter split spoon sampler 18.0 inches. Rii utilized a calibrated automatic drop hammer to generate consistent energy transfer to the sampler. Driving resistance is recorded on the boring logs in terms of blows per 6.0-inch interval of the driving distance. The second and third intervals are added to obtain the number of blows per foot (N). Standard penetration blow counts aid in determining soil properties applicable in foundation system design. Measured blow count (N) values are corrected to an equivalent (60%) energy ratio, N_{60}, by the following equation. Both values are represented on boring logs in Appendix IV.

$$N_{60} = N_m*(ER/60)$$

Where:
N_m = measured N value
ER = drill rod energy ratio, expressed as a percent, for the system used

The hammer for the CME 750X ATV-mounted drill rig used for this project was calibrated on May 6, 2011, and has a drill rod energy ratio of 77.1 percent, and the hammer for the Mobile B-53 truck-mounted drill rig was calibrated on April 23, 2013, and has a drill rod energy ratio of 77.7 percent.

During drilling, Rii personnel prepared a field log showing the encountered subsurface conditions. Soil samples obtained from the drilling operation were preserved and sealed in glass jars and delivered to the soil laboratory. In the laboratory, the soil samples were visually classified and select samples were tested, as noted in Table 2.

Table 2. Laboratory Test Schedule

Laboratory Test	Test Designation	Number of Tests Performed
Natural Moisture Content	ASTM D 2216	33
Plastic and Liquid Limits	AASHTO T89, T90	8
Sieve/Hydrometers	AASHTO T88	8
Unconfined Compression Test	ASTM D2166	1
Consolidation Test	ASTM D2435	2

The tests performed are necessary to classify existing soil according to the Ohio Department of Transportation (ODOT) classification system and to estimate engineering properties of importance in determining foundation design and construction recommendations. Results of the laboratory testing are presented on the boring logs in Appendix IV and also in Appendix V. A description of the soil terms used throughout this report is presented in Appendix III.

Hand penetrometer readings, which provide a rough estimate of the unconfined compressive strength of the soil, were reported on the boring log in units of tons per square foot (tsf) and were utilized to classify the consistency of the cohesive soil in each layer. An indirect estimate of the unconfined compressive strength of the cohesive split spoon samples can also be made from a correlation with the blow counts (N_{60}). Please note that split-spoon samples are considered to be disturbed and the laboratory determination of their shear strengths may vary from undisturbed conditions.

A preliminary geotechnical exploration was performed within this project study area by CTL Engineering for the HAM-75-2.30 project (PID No. 77889). Their findings were published in a report dated December 14, 2007. Two borings, designated as B-172-0-07 and B-173-0-07, were performed for this bridge, one at each proposed abutment location. The borings were advanced to a depth of 90.0 and 95.0 feet below the existing ground surface, respectively, and SPT sampling was performed at a maximum of 5.0-foot intervals to obtain representative soil samples for laboratory classification testing. The boring locations are shown on the boring plan in Appendix II.

4.0 FINDINGS

An interpreted engineering log has been prepared from the field log, visual examination of samples, and laboratory testing. Classification follows the current version of the ODOT Specifications for Geotechnical Explorations (SGE). The following is a summary of what was found in the test borings and what is represented on the boring logs.

4.1 Surficial Material

Boring B-006-1 was drilled at the southwest end of the property located at 51211 Fishwick Drive and encountered 3.0 inches of topsoil at the ground surface. Boring B-008 was drilled through the existing pavement of I-75 at the proposed pier location and encountered 7.0 of asphalt overlying 9.0 inches of concrete at the ground surface.

4.2 Subsurface Soils

Beneath the pavement section in boring B-008, material identified as existing fill consisting of brown and brownish gray gravel with sand and silt and sandy silt (ODOT A-2-4, A-4a) was encountered extending to a depth of 5.5 feet below the ground surface.

Underlying the surface material in boring B-006-1 and existing fill in boring B-008, natural soils were encountered consisting primarily of granular soils with seams and layers of cohesive material. The granular soils were generally described as brown, gray and brownish gray gravel and sand, gravel with sand, silt and clay, fine sand and coarse and fine sand (ODOT A-1-b, A-2-6, A-3, A-3a). The cohesive soils were generally described as gray, brown and brownish gray sandy silt, silt and clay, silty clay and clay (ODOT A-4a, A-6a, A-6b, A-7-6).

The relative density of granular soils is primarily derived from SPT blow counts (N_{60}). Based on the SPT blow counts obtained, the granular soil encountered ranged from very loose (N_{60} < 5 blows per foot [bpf]) to very dense (N_{60} > 50 bpf). Blow counts recorded from the SPT sampling ranged from 3 to 72 bpf, generally increasing with depth. The shear strength and consistency of the cohesive soils are primarily derived from the hand penetrometer values (HP). The cohesive soil encountered ranged from stiff (1.0 < HP $\leq$ 2.0 tsf) to very stiff (2.0 < HP $\leq$ 4.0 tsf). The unconfined compressive strength of the cohesive soil samples tested, obtained from the hand penetrometer, ranged from 1.5 to 4.0 tsf.

Natural moisture contents of the inorganic soil samples tested ranged from 6 to 29 percent. The natural moisture content of sample ST-10, tested for plasticity index, was 1 percent below the corresponding plastic limit. The soil exhibited a natural moisture content estimated to be at the optimum moisture level.

4.3 Bedrock

Bedrock was not encountered in any of the borings performed during the preliminary or current exploration.

4.4 Groundwater

Groundwater was encountered initially during the drilling process in borings B-006-1 and B-008 at a depth of 24.0 and 45.0 feet below the ground surface, respectively. Boring B-006-1 was observed to be dry at the completion of drilling, meaning that no measurable amount of groundwater accumulated in the borehole at the completion of drilling prior to backfilling. The groundwater level at the completion of drilling in boring B-008 could not be obtained due to the addition of mud as a drilling fluid. Please note that short-term water level readings, especially in cohesive soils, are not necessarily an accurate indication of the actual groundwater level. In addition, groundwater levels or the presence of groundwater are considered to be dependent on seasonal fluctuations in precipitation.

A more comprehensive description of what was encountered during the drilling process may be found on the boring log in Appendix IV.

4.5 CTL Engineering Borings

In general, the borings performed by CTL Engineering encountered medium stiff to very stiff cohesive soils generally described as brown and gray sandy silt, silt and clay, silty clay elastic clay and clay (ODOT A-4a, A-6a, A-6b, A-7-5, A-7-6) to a depth of 42.0 and 53.5 feet below the ground surface in borings B-172 and B-173, respectively, overlying medium dense to dense granular soil generally described as brown gavel, gravel and sand, fine sand and coarse and fine sand (ODOT A-1-a, A-1-b, A-3, A-3a) which extended to the boring termination depths. A thick layer if coarse and fine sand (ODOT A-3a) was encountered above the cohesive materials in boring B-173, which extended to a depth of 33.0 feet below the ground surface. Groundwater was encountered in borings B-172 and B-173 at an elevation of 496.6 and 448.1 feet msl, respectively. In general, the subsurface conditions encountered in the borings performed by CTL Engineering matched relatively closely with the subsurface conditions encountered in boring B-008.

5.0 ANALYSES AND RECOMMENDATIONS

Data obtained from the drilling and testing programs have been used to determine the foundation support capabilities and the settlement potential for the soil encountered at the site. These parameters have been used to provide guidelines for the design of foundation systems for the subject bridge, as well as the construction specifications related to the placement of foundation systems and general earthwork recommendations, which are discussed in the following paragraphs. Allowable bearing capacity considers the gross loading, which includes weight of foundation concrete for elements placed below the existing ground and the loading from the superstructures.

Design details of the structure proposed were provided to Rii by Gannett Fleming. It is understood that the new structure will consist of a two-span steel deck girder with a ballasted, composite reinforced deck superstructure on full-height, wall-type abutments and wall-type pier supported on a deep foundation system comprised of driven piles. The proposed structure will be located approximately 90 feet north of the existing structure, which will be completely removed.

Proposed design elevations and structural loading information was obtained from design details provided by Gannett Fleming and are included in Table 3.

Table 3. Structure & Bridge Design Elevations

Substructure Unit	Boring Number	Proposed Bottom of Footing Elevation [1] (feet msl)	Design Maximum Service Load [1] (kips/pile)
Rear Abutment	B-172-0-07	519.5	199
Rear Wingwall		521.5	137
Pier	B-008-0-11	520.5	110
Forward Abutment	B-173-0-07	519.5	180
Forward Wingwall		521.5	137

1. *Elevations and proposed structural loading based on design information provided by Gannett Fleming.*

5.1 Foundation Recommendations

It is recommended that a deep foundation system consisting of driven piles be employed for support of the proposed bridge foundation elements. Based on the soil encountered at this site, it is recommended that cast-in-place (CIP) pipe piles (ODOT Item 507.06) be employed for foundation support. Per the American Railway Engineering and Maintenance-of-Way Association (AREMA) specifications, Section 4.3 of Chapter 8, the bridge structure should be designed using allowable stress design (ASD) criteria. Table 4 shows recommended pile lengths of CIP pipe piles and the corresponding allowable pile capacity and downdrag loading.

Table 4. Pile Recommendations

Substructure Element	Ground Elevation [1]	Pile Size [2]	Pile Elevation		Embedment Depth [4] (feet)	Allowable Pile Capacity [5,6,7] (kips/pile)	Downdrag Load [8] (kips/pile)
			Top [3]	Tip			
B-172-0-07 Rear Abutment	529.9	14" CIP	519.5	440.5	78	244 / 266 [9,10]	67
B-172-0-07 Rear Wingwall	529.9	12" CIP	521.5	440.5	81	187 / 205 [9]	66
B-008-0-11 Pier	529.0	12" CIP	520.5	472.5	48	104 / 112	N/A
B-173-0-07 Forward Abutment	543.1	14" CIP	519.5	459.5	60	172 / 186	0
B-173-0-07 Forward Wingwall	543.1	12" CIP	521.5	459.5	62	130 / 142	0

1. *Ground elevation listed is the ground elevation at the respective boring location.*
2. *The pile wall thickness utilized in the analysis was determined in accordance with the equation provided in ODOT Item 507.06 and was rounded up to the nearest 1/16-inch increment. A minimum pile wall thickness of 0.375 (3/8) and 0.4375 (7/16) inches is required for 12 and 14 inch CIP pipe piles, respectively, per direction from Gannett Fleming, based on structural requirements.*
3. *Top of pile elevation is at the proposed bottom of footing elevation.*
4. *Embedment depths represent the length of pile in contact with the soil.*
5. *A factor-of-safety of 2.0 was utilized in the analysis. The allowable bearing capacity provided accounts for the maximum design service loading plus the capacity reduction due to downdrag.*
6. *The embedment depth and corresponding allowable bearing capacity listed above are based on the structural loading information in the Stage 2 design plans provided by Gannett Fleming.*
7. *Where multiple values are listed, the first value listed is the allowable bearing capacity during the driven condition (immediately after driving the pile). The second value listed is the allowable bearing capacity after soil setup has occurred following **a minimum waiting period of seven (7) days after the initial drive** (at the time of restrike on the pile).*
8. *These values represent the negative side resistance due to settlement of the soils within the downdrag zone. These values also represent the amount of side resistance required to be overcome during driving through the downdrag zone. Determination of the depth and magnitude of downdrag is outlined in Section 5.1.1.*
9. *A pile wall thickness of 0.5 (1/2) inches was required to satisfy driveability requirements. If it is not desired to utilize a larger pile wall thickness, then ASTM A252, Grade 3 steel (f_y = 45 ksi, 0.9f_y = 40.5 ksi) should be specified to satisfy driveability requirements.*
10. *A hammer size larger than a Delmag 19-42 hammer system will be required to drive the pile to the required embedment and capacity.*

NOTE: The top of pile elevation coincides with the bottom of footing elevations, and the estimated pile lengths reflect exclusively the length of the pile in contact with the soil. **Embedment length of the pile into the footing is not included.** Estimated pile lengths are rounded up to the nearest foot.

The piles were analyzed utilizing the DRIVEN software program and the results of the analysis are provided in Appendix VI. Per Chapter 8, Section 4.2.3(b) of the AREMA manual, a factor-of-safety of 2.0 should be utilized when sufficient geotechnical information is available to characterize the subsurface profile, otherwise a factor-of-safety of 2.5 should be utilized. As borings were performed at each substructure unit per ODOT SGE requirements, a factor-of-safety of 2.0 was utilized in the analysis. The bearing capacity listed for the piles represents the calculated capacity at the end of driving the pile (driven condition) and at after soil setup has occurred following a specified waiting period (at restrike), respectively. If it is not intended to verify the pile capacity after a specified waiting period has passed, and through dynamic testing (restrike of the driven pile), then the capacity for the driven condition should be specified in the design documents and utilized in the foundation design. If a dynamic restrike of the pile is specified, then the capacity at restrike should be specified in the design documents and utilized in the foundation design. Based on the subsurface conditions encountered, it is recommended that a minimum hold period of five (5) days be specified between the end of driving the pile and the time of restrike to allow adequate soil setup to occur. However, if dynamic testing indicates that the required capacity is achieved at the end of driving the pile, a restrike of the pile will not be required. Settlement is estimated to be less than 1.0 inch for CIP piles driven to the frictional capacities provided in Table 4.

As outlined in Section 5.1.2, due to the increased pile capacities required at the rear abutment and wingwalls to account for the estimated magnitude of the downdrag loads, a pile wall thickness of 0.5 (1/2) inches is required for the 12-inch and 14-inch CIP pipe piles that are to be installed for the rear wingwall and abutment substructures, respectively, in order to satisfy driveability requirements. As an alternative, ASTM A252, Grade 3 steel (fy = 45 ksi, 0.9fy = 40.5 ksi) may be utilized with the required minimum pile wall thickness of 0.375 (3/8) inches and 0.5 (1/2) inches for the 12-inch and 14-inch CIP pipe piles, respectively. Section 5.1.1 outlines several alternatives for reducing or eliminating the downdrag loads, which would eliminate the need for larger pile wall thicknesses or higher grade steel.

We emphasize that the pile lengths and bearing capacities presented in Table 4 are estimates using empirical equations based on the derived characteristics of the soils encountered in the subject borings drilled. The most accurate method for determining pile capacities and lengths is to drive test piling at the site and perform static load testing in accordance with the ASTM D1143 procedure. Dynamic pile load testing should be performed in accordance with ASTM 4945. The actual pile capacities should be verified using static or dynamic pile load testing as detailed in the 2007 ODOT BDM and Chapter 8, Section 4.3.8 of the AREMA manual. Further installation considerations are presented in Section 5.1.3.

5.1.1 Downdrag Considerations

Downdrag was evaluated using the traditional method to determine the depth of downdrag. Per the traditional method for calculating the depth of downdrag, downdrag loads will develop along the portion of the pile above the interface where the relative soil movement from consolidation with respect to the pile is greater than 0.40 inches. The anticipated settlement below the foundations at the rear and forward abutments due to the placement of the embankment soils behind the abutments are 0.50 inches and 0.35 inches, respectively, within the anticipated pile embedment length. Using the traditional method criterion, the depth of downdrag at the rear and forward abutment for 100 percent of primary consolidation is calculated to be 18.0 and 0.0 feet below the bottom of footing elevation, respectively. The anticipated settlement below the foundations at the rear and forward wingwalls due to the placement of the embankment soils behind the wingwalls are 0.52 inches and 0.37 inches, respectively, within the anticipated pile embedment length. The depth of downdrag at the rear and forward wingwalls for 100 percent of primary consolidation is calculated to be 20.0 and 0.0 feet below the bottom of footing elevation, respectively. Based on the results of the settlement analysis, downdrag loads will be developed along the piles driven for support of the proposed rear abutment and wingwalls. The downdrag depths noted above for the rear abutment and wingwall represent the estimated depth that downdrag loads will develop due to consolidation of the underlying elastic clay and clay (ODOT A-7-5, A-7-6) soils encountered in all of the structure borings, which extend to an elevation of 502 feet msl.

The downdrag force induced on the piles was calculated using static analysis and is equal to the magnitude of the side resistance over the length of the pile within the downdrag zone provided above. Table 4 lists the downdrag loads that are anticipated at the rear abutment and associated wingwall structures. Please note that the downdrag loads presented in Table 4 represent the magnitude of the downdrag load only. These values also represent the amount of side resistance required to be overcome during driving through the downdrag zone. The required allowable pile capacity provided in Table 4 was determined using the following equation:

$$R_{all} = \frac{FS\left(\sum \eta_i Q_i\right) + DD + R_{Sdd}}{FS}$$

Where:

R_{all} = required allowable bearing capacity (kips)

$\Sigma\eta_i Q_i$ = total maximum service load per pile at each substructure unit, not including downdrag (kips)

DD = downdrag load per pile at each substructure unit (kips)

R_{Sdd} = side friction that must be overcome during driving through the downdrag zone (kips)

FS = factor-of-safety

If the magnitude of the downdrag loads and resulting pile capacities, as well as the additional pile length and large pile wall thicknesses or higher grade steel, are not the most economic design or will not be feasible to install, then methods will need to be employed to reduce or eliminate the potential downdrag loads. To reduce the magnitude of the downdrag loads, consideration can be given to preboring holes at each pile location and installing pile sleeves through the downdrag depth provided above and driving the piles to the design tip through the pile sleeves. The annular space between the pile and the sleeve should be backfilled with clean sand following installation to the final tip elevation. This will eliminate the negative side resistance (downdrag) load within this zone, but will also not provide any positive side resistance within this zone. As an alternative to preboring holes at each pile location, a bitumen coating may also be applied to the sides of the piles within the downdrag depth. The prebored holes or bitumen coating should extend through the entire downdrag zone for both the rear abutment and wingwall, which results in an estimated bottom of brebore or bitumen coating elevation of 502 feet msl. If either of these methods are utilized, then the piles will need to be installed to an embedment depth of 73 feet below the bottom of footing elevation at the rear abutment, which will result in an allowable capacity of 199 kips/pile for the driven condition and 203 kips/pile at restrike. For the rear wingwalls, the piles will need to be installed to an embedment depth of 74 feet below the bottom of footing elevation, which will result in an allowable capacity of 140 kips/pile for the driven condition and 144 kips/pile at restrike.

As an alternative to reducing the magnitude of the downdrag loads, consideration can also be given to preloading the site and allowing for a hold period such that the primary consolidation will be completed, and then removing the preload and installing the piles to the design tip elevation from the proposed bottom of footing elevation. For this scenario, the preload will need to consist of sufficient overburden loading within the footprint of the proposed foundations required to simulate the total embankment loading that will be induced from the construction of the approach embankments. A hold period of 30 days is estimated based on conditions encountered. For this scenario, no downdrag depth will need to be accounted for, as the soils have already undergone consolidation from the preloading process, and therefore positive side resistance will be developed along the entire embedded length of the pile. If this method of eliminating downdrag is utilized, then piles will need to be installed to an embedment depth of 67 feet below the bottom of footing elevation at the rear abutment, which will result in an allowable capacity of 181 kips/pile for the driven condition and 200 kips/pile at restrike. For the rear wingwalls, the piles will need to be installed to an embedment depth of 63 feet below the bottom of footing elevation, which will result in an allowable capacity of 120 kips/pile for the driven condition and 137 kips/pile at restrike.

5.1.2 Driveability

A drivability analysis was performed using the GRLWEAP program, and results of this analysis are provided Appendix VII. The pile wall thickness utilized in the driveability analysis was determined from the following equation per ODOT Item 507.06. Based on information provided by Gannett Fleming, a minimum pile wall thickness of 0.375 inches

is required based on structural requirements Please note that the ultimate bearing value utilized in the equation below is twice the allowable pile capacity listed in Table 4.

$$t = UBV / 900{,}000$$

Where:
t = pile wall thickness in inches
UBV = ultimate bearing value in pounds (allowable bearing capacity multiplied by the factor-of-safety utilized in the analysis)

In the driveability analysis, a Delmag 19-42 hammer with a rated energy of approximately 43,000 ft-lbs was used in conjunction with both CIP pipe pile sections. Based on the results of this analysis using a minimum pile wall thickness of 0.375 (3/8) inches or the minimum value as determined from ODOT Item 507.06, it appears that the driving stresses induced on the CIP pipe piles driven at the forward abutment and wingwall **would not exceed** 90 percent of the yield stress for A252, Grade 2 steel (f_y = 35 ksi, $0.9f_y$ = 31.5 ksi) if driven to the depths provided in Table 4 for the respective pile size. However, the driving stresses induced on the CIP pipe piles driven at the rear abutment and wingwall **would exceed** 90 percent of the yield stress for A252, Grade 2 steel (f_y = 35 ksi, $0.9f_y$ = 31.5 ksi) if driven to the depths provided in Table 4 for the respective pile size. To satisfy driveability requirements, it is recommended that a pile wall thickness of 0.5 (1/2) inches be utilized for the 12-inch and 14-inch CIP pipe piles installed at the forward wingwall and abutment, respectively, if the piles will need to be driven to account for the full downdrag load provided in Table 4. For the preload and prebore/bitumen coating alternatives, a pile wall thickness of 0.4375 (7/16) inches will be required at the forward abutment to satisfy driveability requirements.

As an alternative to increasing the pile wall thickness, the required minimum pile wall thickness of 0.375 (3/8) inches may be maintained for both pile sizes, and ASTM A252, Grade 3 steel (f_y = 45 ksi, $0.9f_y$ = 40.5 ksi) should be specified in the design specifications. However, please note that the predicted number of blow counts required to advance the piles to the required capacities for both the forward wingwall and abutment will become excessive prior to achieving the required embedment depth and capacity to account for the downdrag loads using the Delmag 19-42 hammer. Should it be desired to install the piles to these capacities, it is recommended that a larger hammer be provided to advance the piles. If a larger hammer is provided, then ASTM A252, Grade 3 steel (f_y = 45 ksi, $0.9f_y$ = 40.5 ksi) should be specified.

5.1.3 Driven Pile Considerations

Proper pile installation is as important as pile design in order to obtain a cost effective and safe product. Driven piles must be installed to develop adequate soil resistance without structural damage. Because piles cannot be visually inspected after installation, direct quality control of the finished product is impossible. Consequently, substantial control must be exercised over peripheral operations leading to the pile placement within the foundation. It is essential that installation be considered during the design

stage to insure that piles shown on the plans can be installed. Construction monitoring should be employed in (1) pile materials, (2) installation equipment, and (3) the estimation of the static load capacity.

It is recommended that the contractor submit a wave equation analysis (bearing graph) of his driving equipment, or the necessary pile driving and equipment data to perform the wave equation analysis, for hammer approval. A constant capacity wave equation analysis (inspector's chart) should also be performed to assist field personnel during inspection in accordance with the 2007 ODOT BDM.

5.2 Lateral Earth Pressure

For the soil types encountered in the borings, the "in-situ" unit weight (γ), cohesion (c), effective angle of friction (φ'), and lateral earth pressure coefficients for at-rest conditions (k_o), active conditions (k_a), and passive conditions (k_p) have been estimated and are provided in Table 5 and Table 6.

Table 5. Estimated Undrained (Short-term) Soil Parameters for Design

Soil Type	γ (pcf) [1]	c (psf)	φ	k_a	k_o	k_p
Medium Stiff Cohesive Soil	110	750	0°	N/A	N/A	N/A
Stiff Cohesive Soil	115	1,500	0°	N/A	N/A	N/A
Very Stiff to Hard Cohesive Soil	120	2,500	0°	N/A	N/A	N/A
Very Loose to Loose Granular Soil	120	0	28°	0.36	0.53	2.77
Medium Dense to Dense Granular Soil	125	0	31°	0.32	0.48	3.12
Very Dense Granular Soil	135	0	34°	0.28	0.44	3.54
Compacted Cohesive Engineered Fill	125	1,500	0°	N/A	N/A	N/A
Compacted Granular Engineered Fill	135	0	33°	0.30	0.46	3.39

1. *When below groundwater table, use effective unit weight, $\gamma' = \gamma - 62.4$ pcf and add hydrostatic water pressure.*

Table 6. Estimated Drained (Long-term) Soil Parameters for Design

Soil Type	γ (pcf) [1]	c (psf)	φ	k_a	k_o	k_p
Natural Cohesive Soil	115	0	26°	0.39	0..56	2.56
Very Loose to Loose Granular Soil	120	0	28°	0.36	0.53	2.77
Medium Dense to Dense Granular Soil	125	0	31°	0.32	0.48	3.12
Very Dense Granular Soil	135	0	34°	0.28	0.44	3.54
Compacted Cohesive Engineered Fill	125	0	28°	0.36	0.53	2.77
Compacted Granular Engineered Fill	135	0	33°	0.30	0.46	3.39

1. *When below groundwater table, use effective unit weight, $\gamma' = \gamma - 62.4$ pcf and add hydrostatic water pressure.*

These parameters are considered appropriate for the design of subsurface walls and excavation support systems. Subsurface structures (where the top of the structure is restrained from movement) should be designed based on at-rest (k_o) conditions. For proposed wingwalls or temporary retaining structures (where the top of the structure is allowed to move), earth pressure distributions should be based on active (k_a) and passive (k_p) conditions. The values in these tables have been estimated from correlation charts based on minimum standards specified for compacted engineered fill materials. These recommendations do not take into consideration the effect of any surcharge loading or a sloped ground surface (a flat surface is considered). Earth pressures on excavation support systems will be dependent on the type of sheeting and method of bracing or anchorage.

5.3 Settlement Considerations

5.3.1 Compressibility Parameters

The compressibility parameters from laboratory testing are provided in Table 7.

Table 7. Compressibility Parameters Utilized in Settlement Analysis

Boring Number	Soil Classification	Preconsolidation Stress, σ_p' (psf)	Compression Index, C_c	Recompression Index, C_r	Initial Void Ratio, e_o
B-006-1-12	Silt and Clay (ODOT A-6a)	3,751	0.113	0.028	0.433
B-008-0-11	Clay (ODOT A-7-6)	4,886	0.230	0.068	0.771

At the time of this report, the type of embankment material being considered for the earthen embankment is unknown. For the analysis, it is considered that the earthen embankment will consist of cohesive material comprised of sandy silt, silt and clay or silty clay (ODOT A-4a, A-6a, A-6b). The compressibility parameters for the natural cohesive soils were determined from consolidation tests performed on undisturbed samples for the material tested, and compressibility parameters for other material types were determined based on correlations with the liquid limit of cohesive soils. Settlement of granular soils was determined using the Schmertmann Method. The laboratory consolidation test results are provided in Appendix V.

5.3.2 Settlement Analysis

A settlement analysis was performed at both abutment locations as well as at boring B-106-1 along the eastern portion of the realigned section of railroad embankment to predict the long term consolidation settlement that will result after the embankment fill has been placed. Based on soil profile and cross section information provided by Gannett Fleming, fill heights of approximately 15 to 28 feet are anticipated along the proposed realigned portion of the railroad alignment, which includes approximately 25 to 28 feet of fill near the abutments of the proposed structure. Results of the settlement analysis indicate that total settlements of 5.75 and 3.87 inches are anticipated near the rear and forward abutments, respectively, and 3.80 inches is anticipated at boring B-006-1 due to the weight of the new embankment fill. Results of the settlement analysis are provided in Appendix VIII. Some settlement of the embankment fill itself will also take place during construction of the embankment. This settlement is unable to be accurately quantified at this time, due to the unknown nature or origin of the fill to be placed. However, provided the embankment fill is placed and compacted in accordance with ODOT Item 203, the settlement of the embankment fill is expected to be minimal. Long term settlement of the natural soils and embankment fill following the completion of construction is expected to be on the order of approximately 1.0 to 2.0 inches.

5.4 Slope Stability Considerations

5.4.1 Strength Parameters

The shear strength parameters utilized in the slope stability analysis for the placement of the embankment fill to bring the site to the final grade are provided in Table 8.

Table 8. Shear Strength Parameters Utilized in Stability Analyses

Material Type	Unit Weight, γ (pcf)	Effective Stress Friction Angle, φ' (°)	Effective Stress Cohesion, c' (psf)	Undrained Shear Strength, s_u (psf)
Prepared Stone Ballast	140	45	0	N/A
Item Special 900 Subballast	135	38	0	N/A
Item 203 Embankment	125	30	400	2,000
Very Loose to Dense Granular Soils (A-1-b, A-2-4, A-3a, A-4a)	120 to 130	27 to 33	0	N/A
Stiff to Very Stiff Silt and Clay (A-6a)	120 to 125	27	0	2,000 to 4,000
Medium Stiff to Stiff Silty Clay (A-6b)	115	26	0	1,500
Medium Stiff to Stiff Elastic Clay and Clay [1] (A-7-5, A-7-6)	115	21	0	1,250

1. *Based on laboratory consolidated undrained triaxial testing performed on an undisturbed samples from the adjacent HAM-75-12.60 Part I project (PID 82288).*

Shear strength parameters for new embankment fill were determined using ODOT Geotechnical Bulletin 6 (GB-6) as a guide. The shear strength parameters for the embankment fill listed in Table 8 above are the limiting values based on the assumption that the embankment fill utilized will consist of sandy silt, silt and clay or silty clay (ODOT A-4a, A-6a, A-6b). If granular embankment is utilized, it should be tested to ensure that it has a minimum friction angle of 33 degrees.

The long term shear strength parameters (drained/effective stress) for the natural cohesive soils were determined from consolidated undrained (CU) triaxial compression tests performed on undisturbed samples from the HAM-75-12.60 Part I project that is adjacent to this project location to the north or from correlations with the plasticity index (PI)_of the soil. The undrained shear strength for the soils is based on hand penetrometer values and indirect correlations with SPT blow counts of the soil. The friction angle for the natural granular soil encountered were determined based on correlations with the N-values from the SPT testing of the soil.

5.4.2 Slope Stability Analysis

A slope stability analysis was performed at station 152+50 (boring B-006-1-12) and 154+00 (boring B-172-0-07), referenced to the proposed centerline of NS Railroad Mainline track, to evaluate the stability of the embankment slopes. The slope geometry was determined using proposed cross section information provided by Gannett Fleming. Soil parameters utilized in the slope stability analysis are presented in Table 8. For slopes not supporting a structural foundation, the minimum factor-of-safety against slope stability is 1.3. The resulting factor-of-safety under drained (long-term stability) and undrained (short-term stability) conditions was greater than 1.3. Based on the results of the analyses, the stability of the proposed embankment slopes will be within acceptable limits. Calculations for slope stability of the proposed embankment slope are provided in Appendix IX.

5.5 Construction Considerations

All site work shall conform to local codes and to the latest ODOT Construction and Materials Specifications (CMS) as well as any applicable guidelines in the latest edition of American Railway Engineering and Maintenance-of-Way Association (AREMA) specifications and Norfolk Southern (NS) Standard Specifications for Design and Construction. All excavation and embankment preparation and construction should follow ODOT Item 200 (Earthwork) or NS Section GR – Grading.

Fill soil placed for foundation support should be placed in loose lifts not to exceed 8.0 inches. **All embankment fill should be placed and compacted in general accordance to Item 203 of the latest ODOT CMS**. Fill soil containing excess moisture shall be required to dry prior to or during compaction to a moisture content not greater than 3.0 percent above or below optimum. However, for material that displays pronounced elasticity or deformation under the action of loaded rubber tire construction equipment, the moisture content shall be reduced to optimum if necessary to secure stability. Drying of wet soil shall be expedited by the use of plows, discs or by other approved methods when so ordered by the site geotechnical engineer.

Generally, materials utilized for engineered fill should free of waste construction debris and other deleterious materials and meet the following requirements:

- Maximum Dry Density per ASTM D698 > 110 pcf
- Liquid Limit < 40
- Plasticity Index < 15
- Organic Matter < 3 percent
- Maximum Particle Size < 3 inches
- Silt Content (between 0.075 and 0.005 mm) < 45 percent

Compacted granular fill shall meet the above specification and additionally shall have a maximum 35 percent passing the No. 200 sieve.

Per the NS Standard Specifications, after stripping topsoil and organic material, the entire area which the embankment is to be placed shall be scarified for a minimum depth of 6.0 inches. This surface and all future fill layers shall be compacted to 95 percent of maximum dry density obtained by the Standard Proctor Test (ASTM D698-T and AASHTO T99), or 90 percent of maximum dry density obtained by the Modified Proctor Test (ASTM D-1557 and AASHTO T180), except that a minimum of the top 2.0 feet of fill shall be compacted to 100 percent of maximum dry density obtained by the Standard Proctor Test. Fill soil placed for track foundation support should be placed in loose lifts not to exceed 6.0 inches. All ballast and subballast materials should be placed and compacted in strict accordance to the NS Standards.

5.5.1 Excavation Considerations

All excavations should be shored / braced or laid back at a safe angle in accordance to Occupational Safety and Health Administration (OSHA) guidelines. During excavation, if slopes cannot be laid back to OSHA Standards due to adjacent structures or other obstructions, temporary shoring may be required. The following table should be utilized as a general guide for implementing OSHA guidelines when estimating excavation back slopes at the various boring locations. Actual excavation back slopes must be field verified by qualified personnel at the time of excavation in strict accordance with OSHA guidelines.

Table 9. Excavation Back Slopes

Soil	Maximum Back Slope	Notes
Soft to Medium Stiff Cohesive	1.5 : 1.0	Above Ground Water Table and No Seepage
Stiff Cohesive	1.0 : 1.0	Above Ground Water Table and No Seepage
Very Stiff to Hard Cohesive	0.75 : 1.0	Above Ground Water Table and No Seepage
All Granular & Cohesive Soil Below Ground Water Table or with Seepage	1.5 : 1.0	None
Rock to 3.0' +/- below Auger Refusal	0.75 : 1.0	Above Ground Water Table and No Seepage
Stable Rock	Vertical	Above Ground Water Table and No Seepage

5.5.2 Groundwater Considerations

Based on the groundwater observations made during drilling, little to no groundwater seepage is anticipated during construction. However, where/if groundwater is encountered, proper groundwater control should be employed and maintained to prevent disturbance to excavation bottoms consisting of cohesive soil, and to prevent the possible development of a quick or "boiling" condition where soft silts and/or fine sands are encountered. It is preferable that the groundwater level, if encountered, be maintained at least 36 inches below the deepest excavation. Any seepage or groundwater encountered at this site should be able to be controlled by pumping from temporary sumps. Additional measures may be required depending on seasonal fluctuations of the groundwater level. Note that determining and maintaining actual groundwater levels during construction is the responsibility of the contractor.

6.0 LIMITATIONS OF STUDY

The above recommendations are predicated upon construction inspection by a qualified soil technician under the direct supervision of a professional geotechnical engineer. Adequate testing and inspection during construction are considered necessary to assure an adequate foundation system and are part of our recommendations.

The recommendations for this project were developed utilizing soil and bedrock information obtained from the test borings that were made at the proposed site for the current exploration. Resource International is not responsible for the data, conclusions, opinions or recommendations made by others during previous explorations at this site. At this time we would like to point out that soil borings only depict the soil and bedrock conditions at the specific locations and time at which they were made. The conditions at other locations on the site may differ from those occurring at the boring locations.

The conclusions and recommendations herein have been based upon the available soil and bedrock information and the design details furnished by a representative of the owner of the proposed project. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the attention of the geotechnical engineer to determine whether any changes in the foundation or earthwork recommendations are necessary. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of the geotechnical engineer.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater or surface water within or beyond the site studied. Any statements in this report or on the test boring logs regarding odors, staining of soils or other unusual conditions observed are strictly for the information of our client.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. Resource International is not responsible for the conclusions, opinions or recommendations made by others based upon the data included.

APPENDIX I

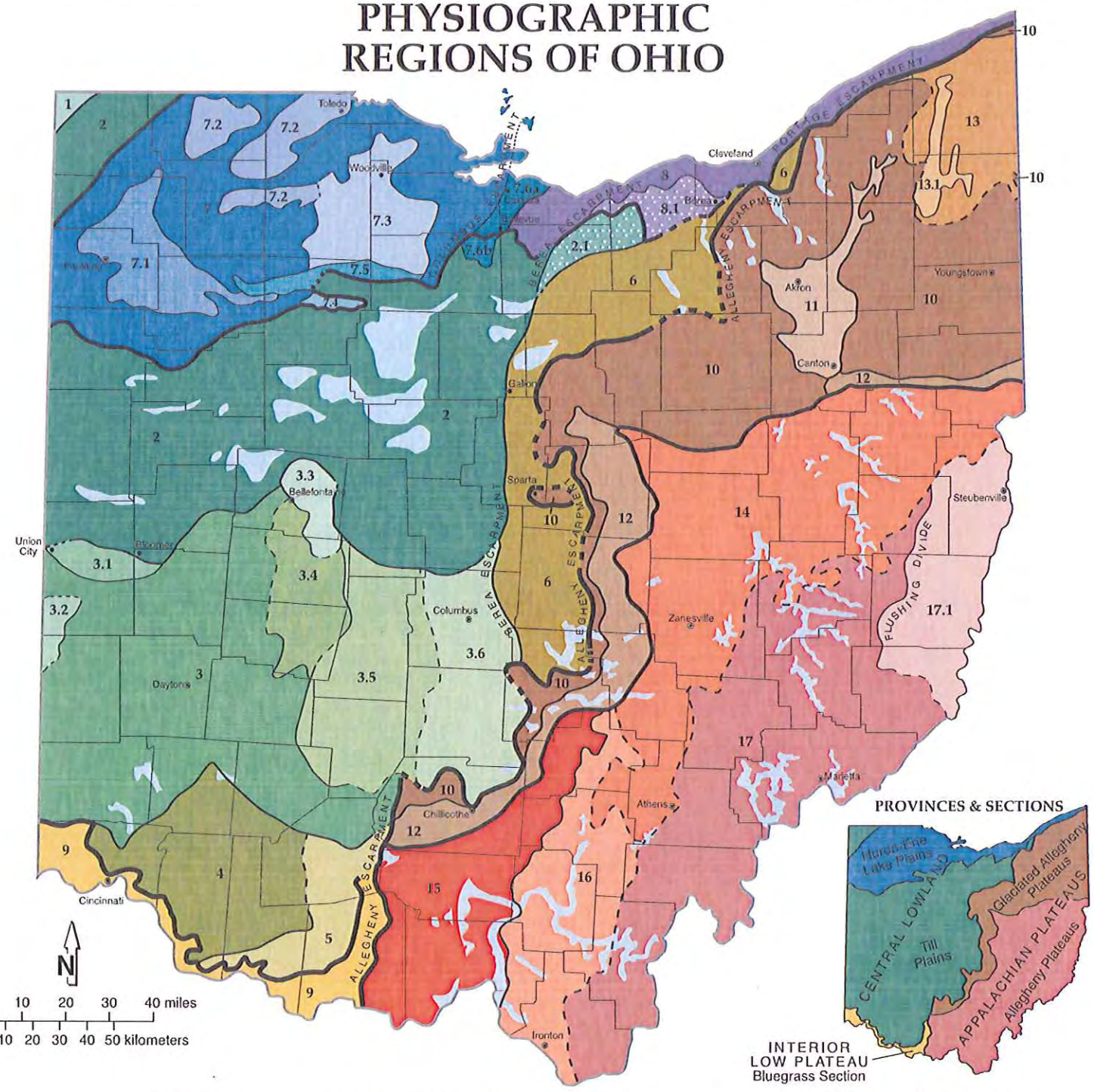
STATE GEOLOGY

STATE OF OHIO
Ted Strickland, Governor

DEPARTMENT OF NATURAL RESOURCES
Sean D. Logan, Director

DIVISION OF GEOLOGICAL SURVEY
Lawrence H. Wickstrom, Chief

PHYSIOGRAPHIC REGIONS OF OHIO



Till Plains

- 1. Steuben Till Plain
- 2. Central Ohio Clayey Till Plain
  - 2.1. Berea Headlands of the Till Plain
- 3. Southern Ohio Loamy Till Plain
  - 3.1. Union City-Bloomer Transitional Terrain
  - 3.2. Whitewater Interlobate Plain
  - 3.3. Bellefontaine Upland
  - 3.4. Mad River Interlobate Plain
  - 3.5. Darby Plain
  - 3.6. Columbus Lowland
- 4. Illinoian Till Plain
- 5. Dissected Illinoian Till Plain
- 6. Galion Glaciated Low Plateau

Transitional boundary

Lake basin/deposits outside Huron-Erie Lake Plains

Huron-Erie Lake Plains

- 7. Maumee Lake Plains
  - 7.1. Paulding Clay Basin
  - 7.2. Maumee Sand Plains
  - 7.3. Woodville Lake-Plain Reefs
  - 7.4. Findlay Embayment
  - 7.5. Fostoria Lake-Plain Shoals
  - 7.6a and 7.6b. Bellevue-Castalia Karst Plain
- 8. Erie Lake Plain
  - 8.1. Berea Headlands of the Erie Lake Plain

Bluegrass Section

- 9. Outer Bluegrass Region

Glaciated Allegheny Plateaus

- 10. Killbuck-Glaciated Pittsburgh Plateau
- 11. Akron-Canton Interlobate Plateau
- 12. Illinoian Glaciated Allegheny Plateau
- 13. Grand River Low Plateau
  - 13.1 Grand River Finger-Lake Plain

Allegheny Plateaus

- 14. Muskingum-Pittsburgh Plateau
- 15. Shawnee-Mississippian Plateau
- 16. Ironton Plateau
- 17. Marietta Plateau
  - 17.1. Little Switzerland Plateau

4/98

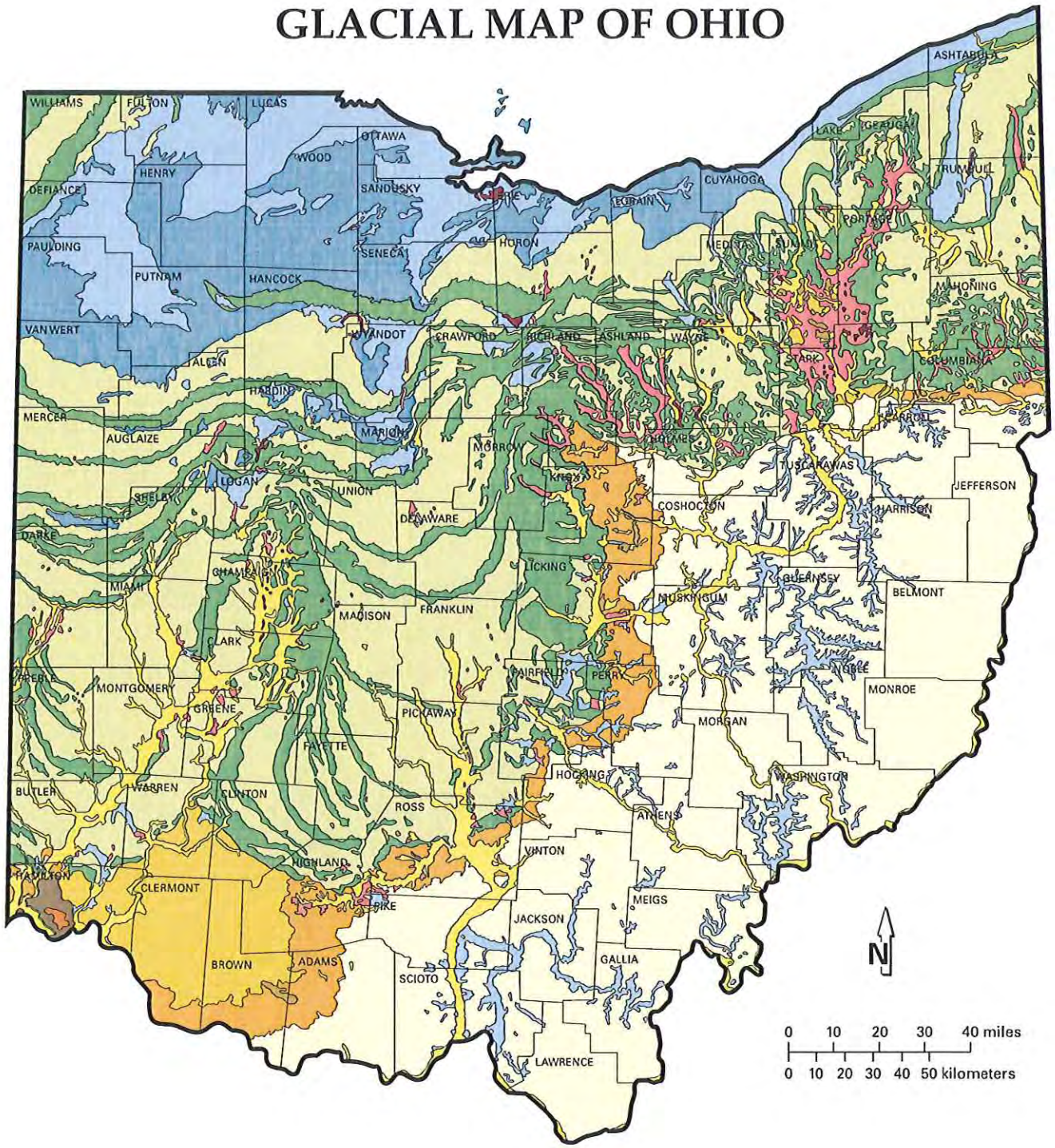
Recommended citation: Ohio Division of Geological Survey, 1998, Physiographic regions of Ohio: Ohio Department of Natural Resources, Division of Geological Survey, page-size map with text, 2 p., scale 1:2,100,00.

STATE OF OHIO
Bob Taft, Governor

DEPARTMENT OF NATURAL RESOURCES
Samuel W. Speck, Director

DIVISION OF GEOLOGICAL SURVEY
Thomas M. Berg, Chief

GLACIAL MAP OF OHIO



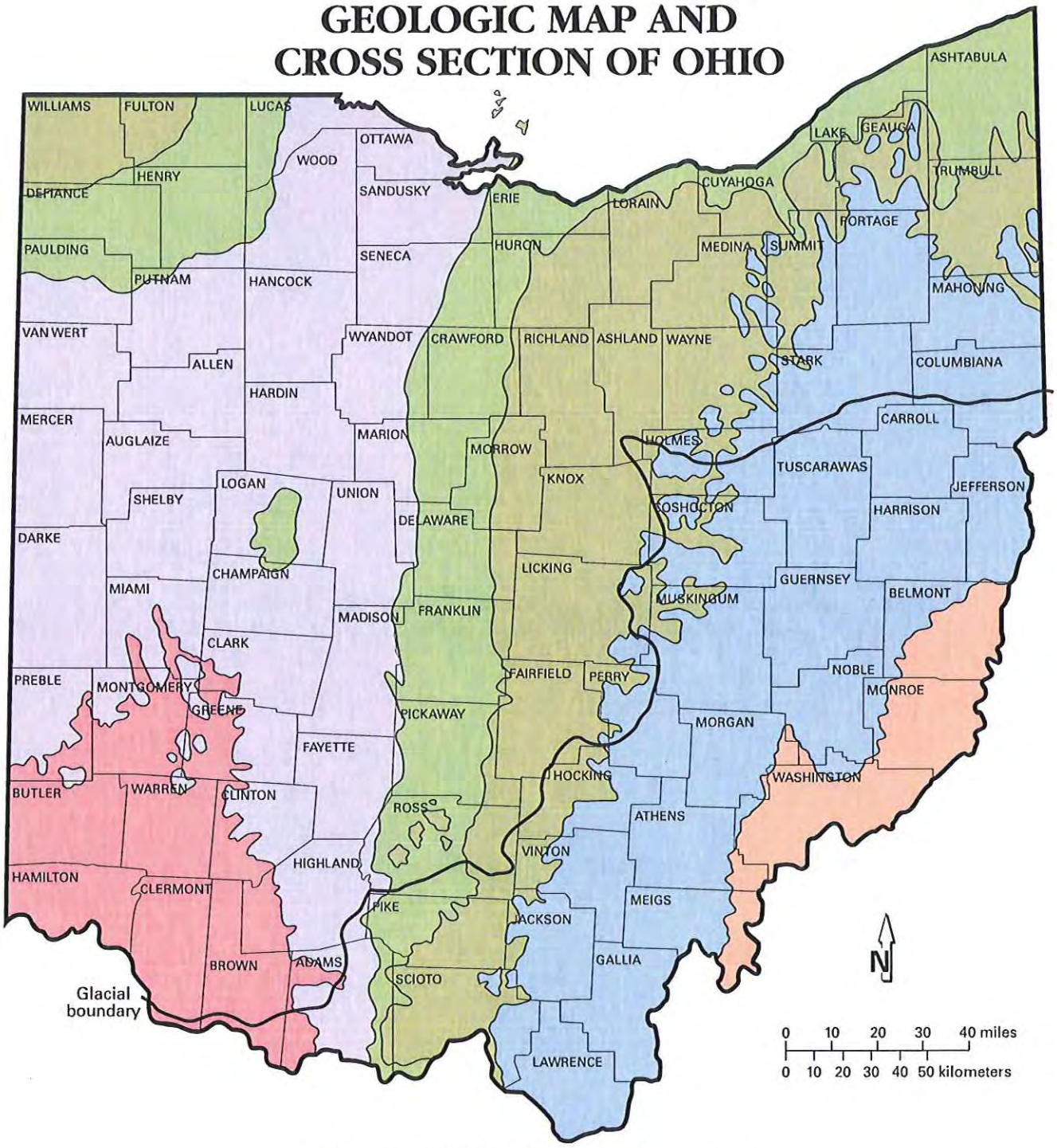
WISCONSINAN (14,000 to 24,000 years old)	ILLINOIAN (130,000 to 300,000 years old)	PRE-ILLINOIAN (older than 300,000 years)	
Ground moraine	Ground moraine	Ground moraine	Kames and eskers
Wave-planed ground moraine	Dissected ground moraine	Dissected ground moraine	Outwash
End moraine	Hummocky moraine		Lake deposits
			Peat
			Colluvium

STATE OF OHIO
Bob Taft, Governor

DEPARTMENT OF NATURAL RESOURCES
Samuel W. Speck, Director

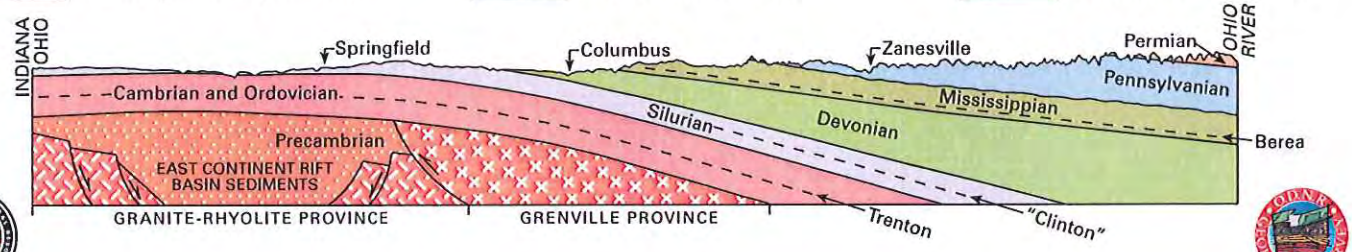
DIVISION OF GEOLOGICAL SURVEY
Thomas M. Berg, Chief

GEOLOGIC MAP AND CROSS SECTION OF OHIO



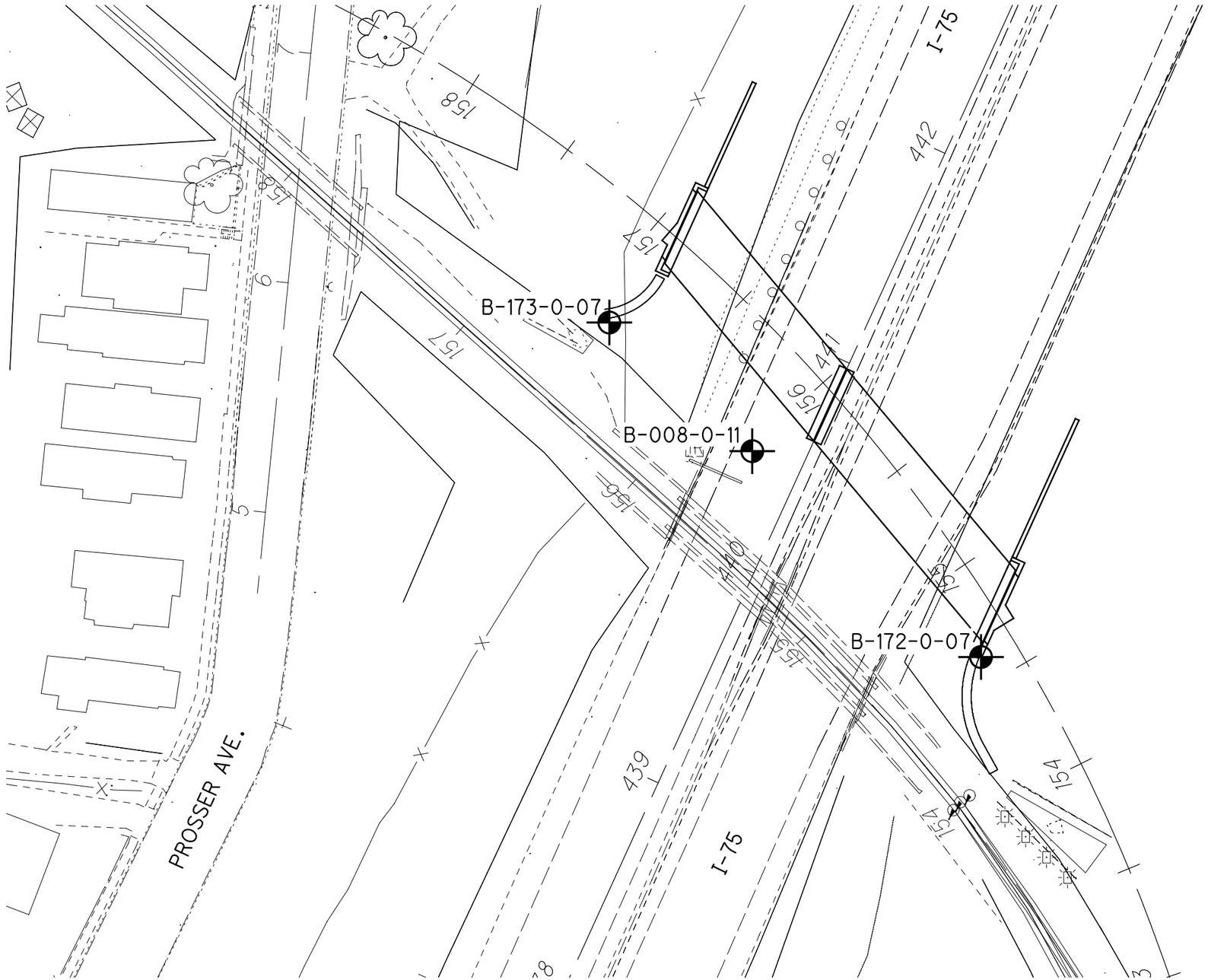
GEOLOGIC SYSTEM (million years before present)

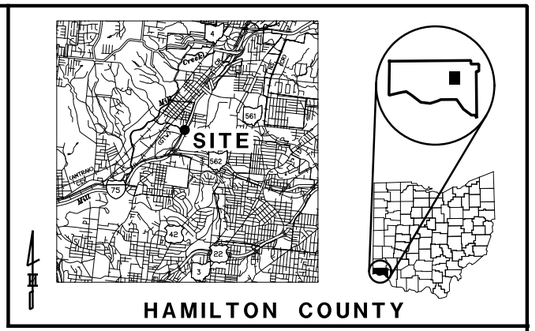
- Permian (286-245)
- Pennsylvanian (320-286)
- Mississippian (360-320)
- Devonian (408-360)
- Silurian (438-408)
- Ordovician (505-438)



APPENDIX II

VICINITY MAP AND BORING PLAN





VICINITY MAP

BORING PLAN

HAM-75-0834 - NORFOLK SOUTHERN RAILROAD OVER I-75
HAMILTON COUNTY, OHIO

PROJECT NO. Rii B-10-020		DRAWN RRM
SCALE: 1"=50' 0 25 50	N	REVIEWED BRT
		DATE 11-4-14

RESOURCE INTERNATIONAL, INC.

APPENDIX III

DESCRIPTION OF SOIL TERMS

DESCRIPTION OF SOIL TERMS

The following terminology was used to describe soils throughout this report and is generally adapted from ASTM 2487/2488 and ODOT Specifications for Geotechnical Explorations.

Granular Soils - The relative compactness of granular soils is described as:
ODOT A-1, A-2, A-3, A-4 (non-plastic) or USCS GW, GP, GM, GC, SW, SP, SM, SC, ML (non-plastic)

Description	Blows per foot – SPT (N_{60})		
Very Loose	Below		5
Loose	5	-	10
Medium Dense	11	-	30
Dense	31	-	50
Very Dense	Over		50

Cohesive Soils - The relative consistency of cohesive soils is described as:
ODOT A-4, A-5, A-6, A-7, A-8 or USCS ML, CL, OL, MH, CH, OH, PT

Description	Blows per foot – SPT (N_{60})			Unconfined Compression (tsf)
Very Soft	Below		2	UCS ≤ 0.25
Soft	2	-	4	0.25 < UCS ≤ 0.5
Medium Stiff	5	-	8	0.5 < UCS ≤ 1.0
Stiff	9	-	15	1.0 < UCS ≤ 2.0
Very Stiff	16	-	30	2.0 < UCS ≤ 4.0
Hard	Over		30	UCS > 4.0

Gradation - The following size-related denominations are used to describe soils:

Soil Fraction		USCS Size	ODOT Size
Boulders		Larger than 12”	Larger than 12”
Cobbles		12” to 3”	12” to 3”
Gravel	coarse	3” to ¾”	3” to ¾“
	fine	¾” to 4.75 mm (¾” to #4 Sieve)	¾” to 2.0 mm (¾” to #10 Sieve)
Sand	coarse	4.75 mm to 2.0 mm (#4 to #10 Sieve)	2.0 mm to 0.42 mm (#10 to #40 Sieve)
	medium	2.0 mm to 0.42 mm (#10 to #40 Sieve)	-
	fine	0.42 mm to 0.074 mm (#40 to #200 Sieve)	0.42 mm to 0.074 mm (#40 to #200 Sieve)
Silt		0.074 mm to 0.005 mm (#200 to 0.005 mm)	0.074 mm to 0.005 mm (#200 to 0.005 mm)
Clay		Smaller than 0.005 mm	Smaller than 0.005 mm

Modifiers of Components - Modifiers of components are as follows:

Term	Range		
Trace	0%	-	10%
Little	10%	-	20%
Some	20%	-	35%
And	35%	-	50%

Moisture Table - The following moisture-related denominations are used to describe cohesive soils:

Term	Range - USCS	Range - ODOT
Dry	0% to 10%	Well below Plastic Limit
Damp	>2% below Plastic Limit	Below Plastic Limit
Moist	2% below to 2% above Plastic Limit	Above PL to 3% below LL
Very Moist	>2% above Plastic Limit	
Wet	[3] Liquid Limit	3% below LL to above LL

Organic Content – The following terms are used to describe organic soils:

Term	Organic Content (%)
Slightly organic	2-4
Moderately organic	4-10
Highly organic	>10

Bedrock – The following terms are used to describe bedrock hardness:

Term		Blows per foot – SPT (N)		
Very Soft		Below		50
Soft		50/5”	–	50/6”
Medium Hard		50/3”	–	50/4”
Hard		50/1”	–	50/2”
Very Hard	50/0”			

CLASSIFICATION OF SOILS

Ohio Department of Transportation

(The classification of a soil is found by proceeding from top to bottom of the chart.
The first classification that the test data fits is the correct classification.)

SYMBOL	DESCRIPTION	Classifcation		$LL_0/LL \times 100$*	% Pass #40	% Pass #200	Liquid Limit (LL)	Plastic Index (PI)	Group Index Max.	REMARKS
		AASHTO	OHIO							
	Gravel and/or Stone Fragments	A-1-a			30 Max.	15 Max.		6 Max.	0	Min. of 50% combined gravel, cobble and boulder sizes
	Gravel and/or Stone Fragments with Sand	A-1-b			50 Max.	25 Max.		6 Max.	0	
F S	Fine Sand	A-3			51 Min.	10 Max.	NON-PLASTIC		0	
	Coarse and Fine Sand	--	A-3a			35 Max.		6 Max.	0	Min. of 50% combined coarse and fine sand sizes
	Gravel and/or Stone Fragments with Sand and Silt	A-2-4				35 Max.	40 Max.	10 Max.	0	
		A-2-5					41 Min.			
	Gravel and/or Stone Fragments with Sand, Silt and Clay	A-2-6				35 Max.	40 Max.	11 Min.	4	
		A-2-7					41 Min.			
	Sandy Silt	A-4	A-4a	76 Min.		36 Min.	40 Max.	10 Max.	8	Less than 50% silt sizes
	Silt	A-4	A-4b	76 Min.		50 Min.	40 Max.	10 Max.	8	50% or more silt sizes
	Elastic Silt and Clay	A-5		76 Min.		36 Min.	41 Min.	10 Max.	12	
	Silt and Clay	A-6	A-6a	76 Min.		36 Min.	40 Max.	11 - 15	10	
	Silty Clay	A-6	A-6b	76 Min.		36 Min.	40 Max.	16 Min.	16	
	Elastic Clay	A-7-5		76 Min.		36 Min.	41 Min.	≦LL-30	20	
	Clay	A-7-6		76 Min.		36 Min.	41 Min.	>LL-30	20	
	Organic Silt	A-8	A-8a	75 Max.		36 Min.				W/o organics would classify as A-4a or A-4b
	Organic Clay	A-8	A-8b	75 Max.		36 Min.				W/o organics would classify as A-5, A-6a, A-6b, A-7-5 or A-7-6

MATERIAL CLASSIFIED BY VISUAL INSPECTION

- Sod and Topsoil
- Pavement or Base
- Uncontrolled Fill (Describe)
- Bouldery Zone
- Peat, S-Sedimentary W-Woody F-Fibrous L-Loamy & etc

* Only perform the oven-dried liquid limit test and this calculation if organic material is present in the sample.

APPENDIX IV

PROJECT BORING LOGS:

B-006-1-12, B-008-0-11, B-172-0-07 and B-173-0-07

BORING LOGS

Definitions of Abbreviations

AS = Auger sample

GI = Group index as determined from the Ohio Department of Transportation classification system

HP = Unconfined compressive strength as determined by a hand penetrometer (tons per square foot)

LOI = Percent organic content (by weight) as determined by ASTM D2974 (loss on ignition test)

PID = Photo-ionization detector reading (parts per million)

QR = Unconfined compressive strength of intact rock core sample as determined by ASTM D2938 (pounds per square inch)

QU = Unconfined compressive strength of soil sample as determined by ASTM D2166 (pounds per square foot)

RC = Rock core sample

REC = Ratio of total length of recovered soil or rock to the total sample length, expressed as a percentage

RQD = Rock quality designation – estimate of the degree of jointing or fracture in a rock mass, expressed as a percentage:

$$\frac{\sum \text{segments equal to or longer than 4.0 inches}}{\text{core run length}} \text{ x } 100$$

S = Sulfate content (parts per million)

SPT = Standard penetration test blow counts, per ASTM D1586. Driving resistance recorded in terms of blows per 6-inch interval while letting a 140-pound hammer free fall 30 inches to drive a 2-inch outer diameter (O.D.) split spoon sampler a total of 18 inches. The second and third intervals are added to obtain the number of blows per foot (N_m).

N_{60} = Measured blow counts corrected to an equivalent (60 percent) energy ratio (ER) by the following equation: $N_{60} = N_m*(ER/60)$

SS = Split spoon sample

2S = For instances of no recovery from standard SS interval, a 2.5 inch O.D. split spoon is driven the full length of the standard SS interval plus an additional 6.0 inches to obtain a representative sample. Only the final 6.0 inches of sample is retained. Blow counts from 2S sampling are not correlated with N_{60} values.

3S = Same as 2S, but using a 3.0 inch O.D. split spoon sampler.

TR = Top of rock

W = Initial water level measured during drilling

▼ = Water level measured at completion of drilling

Classification Test Data

Gradation (as defined on Description of Soil Terms):

GR = % Gravel
SA = % Sand
SI = % Silt
CL = % Clay

Atterberg Limits:

LL = Liquid limit
PL = Plastic limit
PI = Plasticity Index

WC = Water content (%)

RESOURCE INTERNATIONAL, INC.

PROJECT: HAM-75-7.85	DRILLING FIRM / OPERATOR: RII / J.K.	DRILL RIG: MOBILE B-53 (SN 624400)	STATION / OFFSET: 439+47.81 / 328.2' RT	**EXPLORATION ID B-006-1-12**	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: RII / T.F.	HAMMER: AUTOMATIC	ALIGNMENT: PR CL I-75		
PID: 77889 BR ID: N/A	DRILLING METHOD: 4.5" - CFA	CALIBRATION DATE: 4/26/13	ELEVATION: 538.5 (MSL) EOB: 25.0 ft.		PAGE 1 OF 1
START: 7/9/14 END: 7/9/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77.7	LAT / LONG : 39.180159023 ° N / 84.484493474 ° W		

MATERIAL DESCRIPTION AND NOTES	ELEV. 538.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
0.3' - TOPSOIL (3.0")	538.2																	
VERY STIFF, BROWN TO BROWNISH GRAY **SILT AND CLAY**, SOME COARSE TO FINE SAND, TRACE FINE GRAVEL, DAMP TO MOIST.			6 7 7	18	78	SS-1	4.00	5	5	28	31	31	28	14	14	12	A-6a (7)	
			5 7 7	18	89	SS-2	4.00	-	-	-	-	-	-	-	-	16	A-6a (V)	
-CONSOLIDATION TEST PERFORMED @ 5.0'					83	ST-3	3.00	9	10	19	29	33	27	14	13	16	A-6a (7)	
-TRACE ORGANICS PRESENT IN SS-4			5 6 6	16	78	SS-4	3.00	-	-	-	-	-	-	-	-	15	A-6a (V)	
	526.5																	
VERY LOOSE, BROWN **GRAVEL WITH SAND, SILT, AND CLAY**, MOIST.			2 1 1	3	61	SS-5	-	-	-	-	-	-	-	-	-	10	A-2-6 (V)	
	521.5																	
LOOSE TO MEDIUM DENSE, BROWN **GRAVEL AND SAND**, LITTLE SILT, TRACE CLAY, MOIST.			3 1 3	5	100	SS-6	-	19	33	25	18	5	NP	NP	NP	7	A-1-b (0)	
		W	5 8 7	19	72	SS-7	-	-	-	-	-	-	-	-	-	11	A-1-b (V)	
	513.5	EOB																

NOTES: GROUNDWATER INITIALLY ENCOUNTERED @ 24.0'; CAVE-IN DEPTH @ 22.3'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: COMPACTED WITH THE AUGER 50 LBS BENTONITE CHIPS AND SOIL CUTTINGS

RESOURCE INTERNATIONAL, INC.

PROJECT: HAM-75-7.85	DRILLING FIRM / OPERATOR: RII / T.F.	DRILL RIG: CME-750X (SN 310218)	STATION / OFFSET: 440+47.80 / 22.5' Lt	**EXPLORATION ID B-008-0-11**	
TYPE: BRIDGE REPLACEMENT	SAMPLING FIRM / LOGGER: RII / S.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: PR CL I-75		
PID: 77889 BR ID: HAM-75-0834	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 5/6/11	ELEVATION: 529.0 (MSL) EOB: 100.0 ft.		PAGE 1 OF 4
START: 10/25/11 END: 10/27/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77.1	LAT / LONG : 39.180792305 ° N / 84.485491076 ° W		

MATERIAL DESCRIPTION AND NOTES	ELEV. 529.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
0.6' - ASPHALT (7.0")	528.4																	
0.7' - CONCRETE (9.0")	527.7																	
FILL: STIFF, BROWN **SANDY SILT**, LITTLE FINE GRAVEL, MOIST.	525.5	1 2 3	5 4 4	10	67	SS-1	1.50	-	-	-	-	-	-	-	-	16	A-4a (V)	
FILL: DENSE, BROWNISH GRAY **GRAVEL WITH SAND AND SILT**, DRY.	523.5	4 5	16 14 10	31	0	SS-2	-	-	-	-	-	-	-	-	-	-		
HARD, BROWN **SILT AND CLAY**, LITTLE COARSE TO FINE SAND, TRACE FINE GRAVEL, DRY.	520.5	5 6 7 8	18	-	100	3S-2A	-	-	-	-	-	-	-	-	-	8	A-2-4 (V)	
			18 30 26	72	0	SS-3	-	-	-	-	-	-	-	-	-	-		
			16	-	100	3S-3A	-	-	-	-	-	-	-	-	-	7	A-6a (V)	
VERY LOOSE, BROWN **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE FINE GRAVEL, DRY.	518.5	9 10	2 1 1	3	72	SS-4	-	6	24	45	16	9	NP	NP	NP	7	A-3a (0)	
MEDIUM DENSE, BROWN **GRAVEL AND SAND**, LITTLE SILT, TRACE CLAY, DRY TO WET.		11 12 13	4 7 7	18	78	SS-5	-	-	-	-	-	-	-	-	-	10	A-1-b (V)	
-COBBLES PRESENT THROUGHOUT		14 15 16 17 18	7 6 8	18	78	SS-6	-	-	-	-	-	-	-	-	-	7	A-1-b (V)	
			7 8 8	21	78	SS-7	-	31	20	32	11	6	NP	NP	NP	6	A-1-b (0)	
	508.5	19 20	6 2 8	13	78	SS-8	-	-	-	-	-	-	-	-	-	27	A-1-b (V)	
STIFF TO VERY STIFF, GRAY **CLAY**, TRACE SILT, DAMP TO MOIST.		21 22 23	2 3 6	12	83	SS-9	2.00	-	-	-	-	-	-	-	-	29	A-7-6 (V)	
-CONSOLIDATION TEST PERFORMED @ 24.0'		24 25			100	ST-10	1.75	0	0	0	9	91	54	23	31	22	A-7-6 (19)	
-qu @ 25.3' = 3,256 psf		26 27	3 6 10	21	100	SS-11	3.50	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
	500.5	28																
VERY STIFF, GRAY **SANDY SILT**, TRACE FINE GRAVEL, TRACE CLAY, DAMP.		29	5 8 10	23	89	SS-12	3.00	-	-	-	-	-	-	-	-	13	A-4a (V)	

PID: 77889	BR ID: HAM-75-0834	PROJECT: HAM-75-7.85	STATION / OFFSET: 440+47.80 / 22.5 Lt	START: 10/25/11	END: 10/27/11	PG 2 OF 4	B-008-0-11

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
VERY STIFF, GRAY **SANDY SILT**, TRACE FINE GRAVEL, TRACE CLAY, DAMP. *(same as above)*	499.0	31																
	497.0	32																
VERY STIFF, GRAY **SILTY CLAY**, TRACE COARSE TO FINE SAND, TRACE FINE GRAVEL, MOIST.		33																
		34	3 6 5	14	89	SS-13	2.50	-	-	-	-	-	-	-	-	22	A-6b (V)	
		35																
		36																
	492.0	37																
DENSE, GRAY **GRAVEL WITH SAND, SILT, AND CLAY**, DAMP.		38																
		39	32 12 15	35	83	SS-14	-	-	-	-	-	-	-	-	-	12	A-2-6 (V)	
-COBBLES PRESENT THROUGHOUT		40																
	487.0	41																
MEDIUM DENSE TO VERY DENSE, BROWN CHANGING TO GRAY **GRAVEL AND SAND**, LITTLE SILT, TRACE CLAY, DRY TO MOIST.		42																
		43																
		44	16 14 15	37	89	SS-15	-	-	-	-	-	-	-	-	-	15	A-1-b (V)	
-INTRODUCED MUD @ 45.0'		45																
		46																
		47																
		48																
		49	13 8 7	19	78	SS-16	-	-	-	-	-	-	-	-	-	13	A-1-b (V)	
-COBBLES PRESENT THROUGHOUT		50																
		51																
		52																
		53																
		54	8 19 17	46	67	SS-17	-	44	22	20	12	2	NP	NP	NP	13	A-1-b (0)	
		55																
		56																
		57																
		58																
		59	4 21 19	51	72	SS-18	-	-	-	-	-	-	-	-	-	7	A-1-b (V)	
		60																
		61																

PID: 77889	BR ID: HAM-75-0834	PROJECT: HAM-75-7.85	STATION / OFFSET: 440+47.80 / 22.5 Lt	START: 10/25/11	END: 10/27/11	PG 3 OF 4	B-008-0-11

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
MEDIUM DENSE TO VERY DENSE, BROWN CHANGING TO GRAY **GRAVEL AND SAND**, LITTLE SILT, TRACE CLAY, DRY TO MOIST. *(same as above)*	466.9	63																
		64	13 14 12	33	67	SS-19	-	-	-	-	-	-	-	-	-	12	A-1-b (V)	
-COBBLES PRESENT THROUGHOUT		65																
		66																
		67																
		68																
		69	13 12 12	31	78	SS-20	-	-	-	-	-	-	-	-	-	8	A-1-b (V)	
		70																
		71																
	457.0	72																
MEDIUM DENSE TO DENSE, BROWNISH GRAY **FINE SAND**, TRACE COARSE SAND, TRACE FINE GRAVEL, TRACE SILT, MOIST TO WET.		73																
		74	4 7 9	21	67	SS-21	-	-	-	-	-	-	-	-	-	22	A-3 (V)	
		75																
		76																
		77																
		78																
		79	8 9 7	21	78	SS-22	-	-	-	-	-	-	-	-	-	17	A-3 (V)	
-COBBLES PRESENT THROUGHOUT		80																
		81																
		82																
F S		83																
		84	4 13 14	35	78	SS-23	-	1	4	86	9	0	NP	NP	NP	23	A-3 (0)	
		85																
		86																
		87																
		88																
-SHALE FRAGMENTS PRESENT FROM 88.5' TO 90.0'		89	6 12 14	33	72	SS-24	-	-	-	-	-	-	-	-	-	23	A-3 (V)	
		90																
		91																
		92																
		93																
		94	5															

PID: 77889	BR ID: HAM-75-0834	PROJECT: HAM-75-7.85	STATION / OFFSET: 440+47.80 / 22.5 Lt	START: 10/25/11	END: 10/27/11	PG 4 OF 4	B-008-0-11

MATERIAL DESCRIPTION AND NOTES		ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
-COBBLES PRESENT THROUGHOUT MEDIUM DENSE TO DENSE, BROWNISH GRAY **FINE SAND**, TRACE COARSE SAND, TRACE FINE GRAVEL, TRACE SILT, MOIST TO WET. *(same as above)*	F S	434.7	95	14 13	35	83	SS-25	-	-	-	-	-	-	-	-	-	24	A-3 (V)	
			96																
			97																
			98																
			99	6 12 14	33	89	SS-26	-	-	-	-	-	-	-	-	-	25	A-3 (V)	
		429.0	EOB 100																

NOTES: GROUNDWATER INITIALY ENCOUNTERED @ 45.0'; SEEPAGE ENCOUNTERED @ 30.0'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 168 LBS. CEMENT/50 LBS BENTONITE/45 GAL WATER

LOG OF BORING

Project Identification: HAM-75-2.30 PID 76257
Hamilton County, Ohio

Date Started 8/8/07 Sampler: Type SS Dia. 1.375"
Date Completed 8/8/07 Casing: Length 90.0ft Dia. 3.25"

Water Elev. 496.9ft
Boring No. B-172 Station & Offset 440+05.0, 106.5 RT Surface Elev. 529.9ft

CTL Project No. 04120070g

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)	Description	Sample No.	Physical Characteristics % Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	ODOT Class
529.9	0	AUGERED			0.2' TOPSOIL (.2')										VISUAL
528.9	2	6/9/12			VERY STIFF, LIGHT BROWN SANDY SILT, LITTLE CLAY, LITTLE GRAVEL, DAMP	1								8	VISUAL
526.4	4	5/6/7			3.0' MEDIUM STIFF TO STIFF, BROWN SILTY CLAY, TRACE SAND, DAMP TO MOIST	2	0	2	5	53	40	40	22	19	A-6b
523.9	6	4/5/6				3								14	VISUAL
521.4	8	3/4/4				4								13	VISUAL
518.9	10	4/4/6			11.0' STIFF, BROWN SILT AND CLAY, TRACE GRAVEL, SOME SAND, DAMP	5	9	7	18	43	23	30	14	15	A-6a
516.4	12	9/11/10			13.0' MEDIUM DENSE, BROWN COARSE AND FINE SAND, SOME GRAVEL, TRACE SILT, MOIST	6								13	VISUAL
513.9	16	4/5/5			16.0' STIFF, GRAY CLAY, SOME SILT, MOIST - SILT LAYERS ARE INTERBEDDED	7								23	VISUAL
511.4	18	3/4/6			18.5' MEDIUM STIFF TO STIFF, GRAY ELASTIC CLAY, AND SILT, DAMP TO MOIST	8	0	0	0	39	61	46	11	25	A-7-5
506.4	24	3/4/4				9								27	VISUAL
501.4	28	4/5/8			28.5' STIFF, GRAY SANDY SILT, TRACE CLAY, TRACE GRAVEL, MOIST	10	1	6	49	41	3	NP	NP	12	A-4a
496.4	34	7/9/12			33.0' MEDIUM DENSE, BROWN COARSE AND FINE SAND, LITTLE SILT, MOIST	11								16	VISUAL

Particle Sizes: Agg => 2.00mm, Coarse Sand = 2.00-0.42mm, Fine Sand = 0.42-0.074mm, Silt = 0.074-0.005mm, Clay =< 0.005mm.

Project Identification: HAM-75-2.30 PID 76257
Hamilton County, Ohio

Boring No. B-172

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)	Description	Sample No.	Physical Characteristics % Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	ODOT Class
494.9	36														
					37.0'										
491.4	38	10/12/15			VERY STIFF, GRAY TO BROWN SILT AND CLAY, AND GRAVEL, SOME SAND, DAMP	12	40	11	12	26	11	31	15	6	A-6a
	40														
	42				42.0'										
486.4	44	7/11/16			MEDIUM DENSE, BROWN GRAVEL AND/ OR STONE FRAGMENTS, SOME SAND, LITTLE SILT, MOIST	13								9	VISUAL
	46														
	48														
481.4		12/9/14				14	61	18	10	11	0	NP	NP	11	A-1-a
	50														
	52				52.0'										
476.4	54	9/12/13			MEDIUM DENSE TO DENSE, BROWN COARSE AND FINE SAND, LITTLE SILT, TRACE GRAVEL, TRACE CLAY, WET	15								21	VISUAL
	56														
	58														
471.4		10/11/11				16	4	37	41	12	6	NP	NP	20	A-3a
	60														
	62														
466.4	64	14/17/21				17								15	VISUAL
	66														
	68														
461.4		5/9/11				18								19	VISUAL
	70														

OH DOT 2 CTL OH DOT.GDT ODOT LIBRARY BY AMC 9-14-05 GLB 04120070G HAM-75 B BORINGS.GPJ 12/11/07

Project Identification: HAM-75-2.30 PID 76257
Hamilton County, Ohio

Boring No. B-172

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)			Description	Sample No.	Physical Characteristics % Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	ODOT Class
458.8																	
	72																
456.4						73.5'											
	74	6/10/13					MEDIUM DENSE, BROWN FINE SAND, TRACE GRAVEL, TRACE SILT, TRACE CLAY, WET	19	2	9	81	4	4	NP	NP	16	A-3
	76																
	78																
451.4		7/10/15						20								23	VISUAL
	80																
					FS												
	82																
446.4																	
	84	11/14/16						21								20	VISUAL
	86																
	88																
441.4		12/15/18				88.5'											
439.9	90					90.0'	DENSE, BROWN COARSE AND FINE SAND, TRACE GRAVEL, TRACE SILT, TRACE CLAY, WET	22	1	6	75	10	8	NP	NP	20	A-3a
							BOTTOM OF BORING = 90.0'										

LOG OF BORING

Project Identification: HAM-75-2.30 PID 76257
Hamilton County, Ohio

Date Started 8/1/07 Sampler: Type SS Dia. 1.375"
Date Completed 8/1/07 Casing: Length 95ft Dia. 3.25"

Water Elev. 448.1ft
Boring No. B-173 Station & Offset 440+73.2, 101.8 LT Surface Elev. 543.1ft

CTL Project No. 04120070g

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)	Description	Sample No.	Physical Characteristics % Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	ODOT Class
543.1	0	AUGERED			0.2' TOPSOIL (.2')										VISUAL
542.1	2	4/6/7			STIFF TO VERY STIFF, BROWN SILTY CLAY, LITTLE TO SOME SAND, LITTLE GRAVEL, DAMP	1								9	VISUAL
539.6	4	12/10/10				2	11	8	22	42	17	34	18	12	A-6b
537.1	6	3/4/5			6.0' LOOSE TO MEDIUM DENSE, BROWN COARSE AND FINE SAND, TRACE GRAVEL, TRACE TO LITTLE SILT, TRACE CLAY, DAMP TO DRY	3	2	26	61	7	4	NP	NP	6	A-3a
534.6	8	4/4/5				4								4	VISUAL
532.1	10	3/5/6				5								5	VISUAL
529.6	12	3/4/5				6	8	36	43	13	0	NP	NP	9	A-3a
527.1	14	4/5/6				7								8	VISUAL
524.6	16	4/4/4				8								5	VISUAL
519.6	18	4/5/7				9	0	36	52	12	0	NP	NP	4	A-3a
515.1	20	5/6/7				10								10	VISUAL
509.6	22	6/8/9			33.5' VERY STIFF TO STIFF, BLUISH GRAY CLAY, LITTLE TO SOME SILT, TRACE SAND, MOIST	11	0	0	2	35	63	48	27	31	A-7-6

Particle Sizes: Agg => 2.00mm, Coarse Sand = 2.00-0.42mm, Fine Sand = 0.42-0.074mm, Silt = 0.074-0.005mm, Clay =< 0.005mm.

Project Identification: HAM-75-2.30 PID 76257
Hamilton County, Ohio

Boring No. B-173

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)	Description	Sample No.	Physical Characteristics % Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	ODOT Class
508.1	36														
	38														
504.6		5/6/8				12								29	VISUAL
	40														
	42				42.0'										
499.6	44	5/6/7			STIFF, GRAY AND BROWN SANDY SILT, LITTLE CLAY, MOIST	13	0	3	38	46	13	20	5	18	A-4a
	46				47.0'										
	48														
494.6		3/4/5			STIFF, GRAY SILT AND CLAY, TRACE SAND, MOIST	14								22	VISUAL
	50														
	52				53.5'										
489.6	54	11/13/15			MEDIUM DENSE TO DENSE, BROWN GRAVEL AND/ OR STONE FRAGMENTS, LITTLE SAND, TRACE SILT, MOIST TO WET	15	76	14	6	4	0	NP	NP	24	A-1-a
	56														
	58														
484.6		10/14/17				16								9	VISUAL
	60														
	62														
479.6	64	9/12/15				17								13	VISUAL
	66														
	68				68.5'										
474.6		12/8/10			MEDIUM DENSE, BROWN FINE SAND, LITTLE GRAVEL, TRACE SILT, WET	18	13	29	48	10	0	NP	NP	20	A-3
	70				FS										

OH DOT 2 CTL OH DOT.GDT ODOT LIBRARY BY AMC 9-14-06.GLB 04120070G HAM-75 B BORINGS.GPJ 12/11/07

Project Identification: HAM-75-2.30 PID 76257
Hamilton County, Ohio

Boring No. B-173

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)			Description	Sample No.	Physical Characteristics % Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	ODOT Class
472.0																	
	72																
469.6	74	6/7/10			FS			19								15	VISUAL
	76																
	78																
464.6		4/6/8				78.5'	MEDIUM DENSE, BROWN GRAVEL AND/ OR STONE FRAGMENTS WITH SAND, LITTLE SILT, TRACE CLAY, WET	20	33	29	25	12	1	NP	NP	42	A-1-b
	80																
	82																
459.6	84	8/10/13						21								23	VISUAL
	86																
	88																
454.6		9/11/14						22								22	VISUAL
	90																
	92																
449.6	94	8/12/12				93.5'	MEDIUM DENSE, BROWN COARSE AND FINE SAND, LITTLE SILT, TRACE CLAY, WET	23	0	5	81	13	1	NP	NP	18	A-3a
448.1						95.0'	BOTTOM OF BORING = 95.0'										

APPENDIX V

LABORATORY TEST RESULTS

One-Dimensional Consolidation Test Report (ASTM D2435)

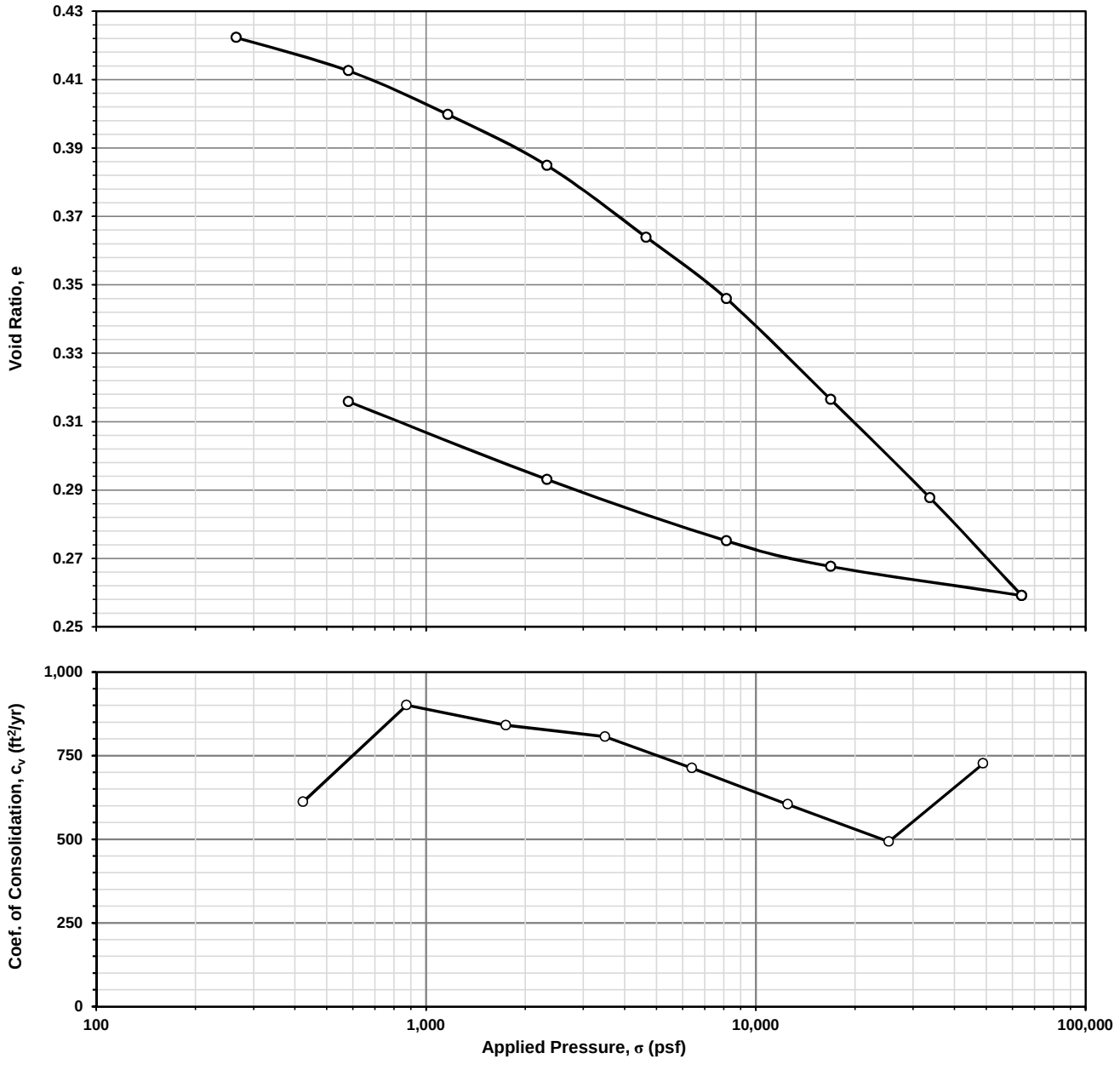
Project Number:	B-10-020	Boring Number:	B-006-1-12
Project Name:	HAM-75-7.85	Sample No. / Depth:	ST-3
Project Location:	Hamilton County, Ohio	Date of Testing:	07/14/2014 to 07/30/2014
Client:	EMH&T	Technician:	K.R.

Soil Description: Brownish gray SILT AND CLAY, some coarse to fine sand, trace fine gravel.

Soil Classification: ODOT A-6a

Physical Characteristics	L.L.	P.L.	P.I.	Gravel%	C. Sand%	F. Sand%	Silt%	Clay%
	27	14	13	9	10	19	29	33

Natural		γ_d (pcf)	γ_{sat} (pcf)	σ_{vo}' (psf)	S_G	e_o	σ_p' (psf)	c_c	c_r
S_o	w_o								
92.2%	15.5%	116.3	133.7	600	2.67	0.433	3,751	0.113	0.028



One-Dimensional Consolidation Test Report (ASTM D2435)

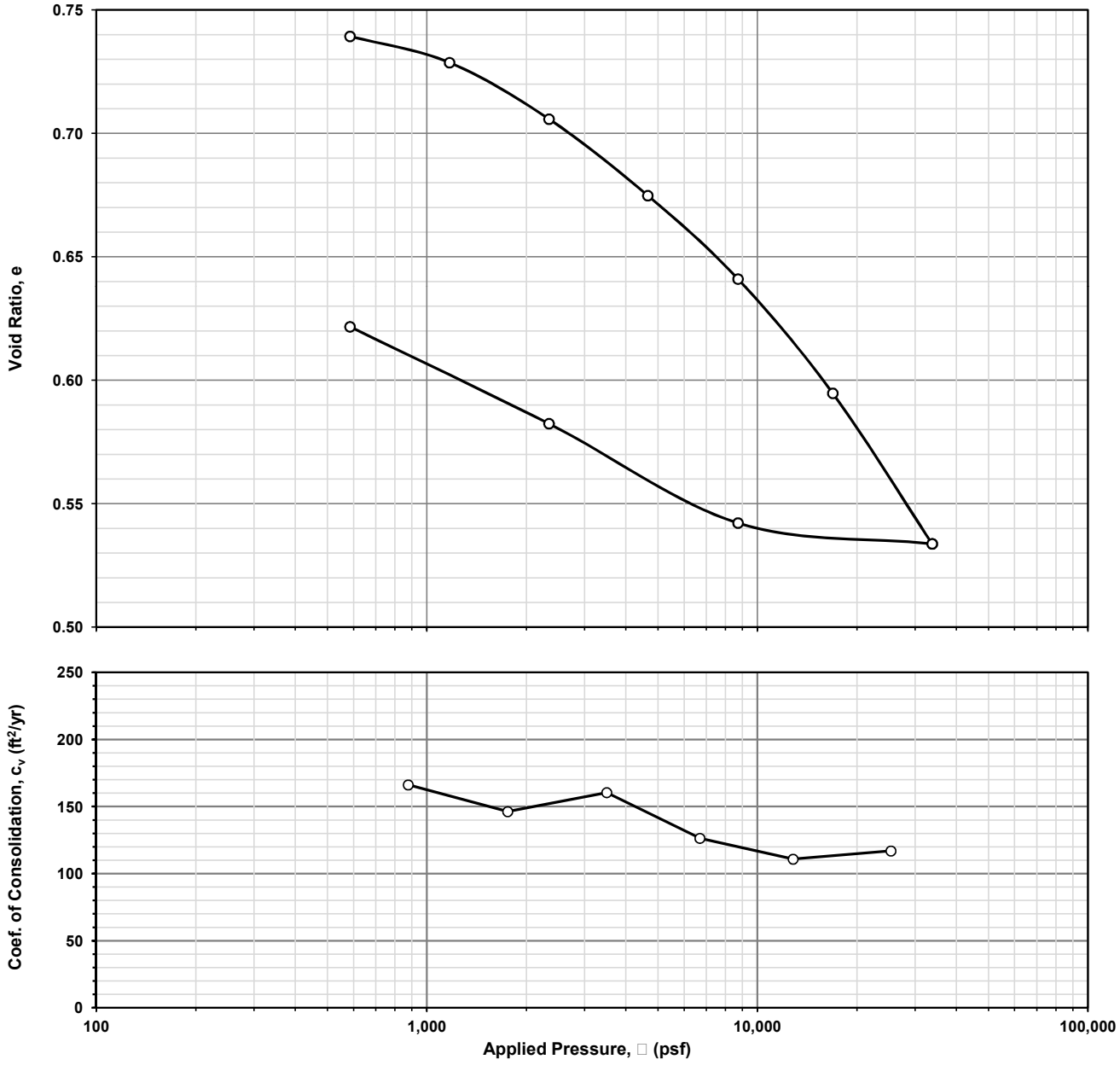
Project Number:	B-10-020	Boring Number:	B-008-0-11
Project Name:	HAM-75-7.85	Sample No. / Depth:	ST-10 / 24.0 ft
Project Location:	Hamilton County, Ohio	Date of Testing:	11/3/2011 to 11/16/2011
Client:	EMH&T	Technician:	JJH

Soil Description: Gray CLAY, trace silt

Soil Classification: ODOT A-7-6

Physical Characteristics	L.L.	P.L.	P.I.	Gravel%	C. Sand%	F. Sand%	Silt%	Clay%
	54	23	31	0	0	0	8	91

Natural S_o	Natural w_o	γ_d (pcf)	γ_{sat} (pcf)	σ_{vo}' (psf)	S_G	e_o	σ_p' (psf)	c_c	c_r
102.2%	28.9%	94.1	121.9	2880	2.67	0.771	4886	0.230	0.068



6350 Presidential Gateway
Columbus, Ohio 43231
Telephone: (614) 823-4949
Fax Number: (614) 823-4990

UNCONFINED COMPRESSION

ASTM D -2166

PROJECT	HAM-75-7.85
JOB No.	B-10-020
STATION & OFFSET	440+47.80 / 22.5' Lt.
BORING / SAMPLE No.	B-008-0-11 / ST-10
SAMPLE DEPTH	25.3 ft
DATE OF TESTING	11/3/2011
TESTED BY	J.H.

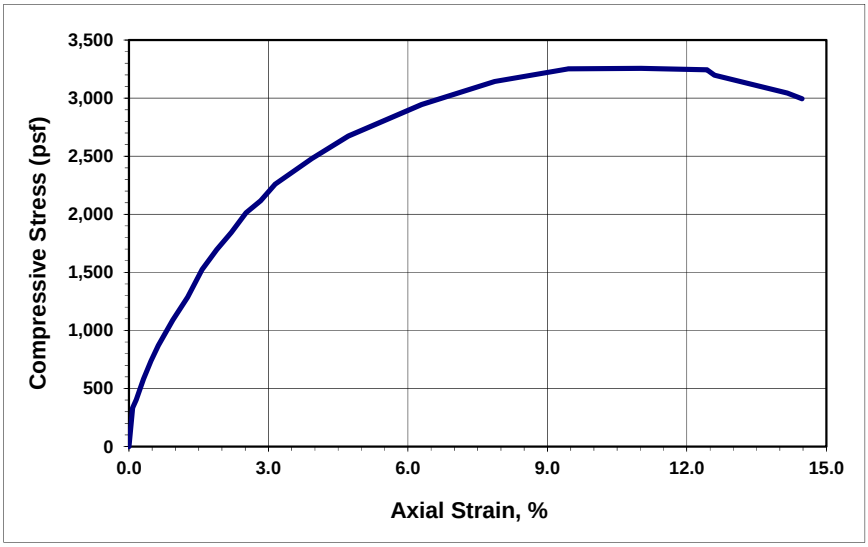
Soil Description: Gray CLAY, trace silt.
Soil Classification: ODOT A-7-6

PHYSICAL CHARACTERISTICS	Gravel %	C. Sand %	F. Sand %	Silt %	Clay %	LL	PL	PI
	0	0	0	9	91	54	23	31

DIAMETER, D_0	2.858 in	72.6 mm	STRAIN RATE	1.00	%/min
AREA, A_0	6.415 in^2	41.4 cm^2	WET SOIL + PAN MASS	1361.9	g
HEIGHT, L_0	6.355 in	161.4 mm	PAN MASS	56.2	g
VOLUME, V_0	40.769 in^3	668.1 cm^3	DRY SOIL + PAN MASS	1057.0	g
MACH. RATE	0.635	in/min	WET DENSITY	122.01	lb/ft^3
WATER CONT.	30.47	%	DRY DENSITY	93.52	lb/ft^3
UNCONFINED COMPRESSION STRESS, q_u			**3,256** psf	1.63	tsf
HAND PENETROMETER				1.75	tsf

Failure Sketch

Unconfined Compression Test



APPENDIX VI

DRIVEN ANALYSIS OUTPUTS

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-008-~1.DVN
Project Name: B-008 - Pier Project Date: 11/07/2014
Project Client: EMHT
Computed By: BRT
Project Manager: JPS

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	36.50 ft
	- Driving/Restrike	36.50 ft
	- Ultimate:	36.50 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	12.00 ft	0.00%	125.00 pcf	30.0/30.0	Nordlund
2	Cohesive	5.00 ft	33.00%	115.00 pcf	1750.00 psf	T-79 Steel
3	Cohesive	6.50 ft	17.00%	120.00 pcf	3000.00 psf	T-79 Steel
4	Cohesive	5.00 ft	33.00%	120.00 pcf	2500.00 psf	T-79 Steel
5	Cohesionless	5.00 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
6	Cohesionless	5.00 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
7	Cohesionless	5.00 ft	0.00%	125.00 pcf	30.0/30.0	Nordlund
8	Cohesionless	4.50 ft	0.00%	135.00 pcf	34.0/34.0	Nordlund
9	Cohesionless	5.50 ft	0.00%	135.00 pcf	34.0/34.0	Nordlund
10	Cohesionless	10.00 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
11	Cohesionless	10.00 ft	0.00%	125.00 pcf	30.0/30.0	Nordlund
12	Cohesionless	18.00 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	17.64	N/A	0.00 Kips
9.01 ft	Cohesionless	563.12 psf	17.64	N/A	4.39 Kips
11.99 ft	Cohesionless	749.38 psf	17.64	N/A	7.77 Kips
12.01 ft	Cohesive	N/A	N/A	1159.43 psf	7.82 Kips
16.99 ft	Cohesive	N/A	N/A	1207.57 psf	26.72 Kips
17.01 ft	Cohesive	N/A	N/A	909.17 psf	26.78 Kips
23.49 ft	Cohesive	N/A	N/A	1019.33 psf	47.54 Kips
23.51 ft	Cohesive	N/A	N/A	1236.43 psf	47.61 Kips
28.49 ft	Cohesive	N/A	N/A	1323.57 psf	68.32 Kips
28.51 ft	Cohesionless	3455.65 psf	19.41	N/A	68.41 Kips
33.49 ft	Cohesionless	3779.35 psf	19.41	N/A	90.61 Kips
33.51 ft	Cohesionless	4105.65 psf	19.41	N/A	90.71 Kips
36.49 ft	Cohesionless	4299.35 psf	19.41	N/A	105.83 Kips
36.51 ft	Cohesionless	4495.34 psf	19.41	N/A	105.93 Kips
38.49 ft	Cohesionless	4562.26 psf	19.41	N/A	116.59 Kips
38.51 ft	Cohesionless	4630.51 psf	17.64	N/A	116.68 Kips
43.49 ft	Cohesionless	4786.39 psf	17.64	N/A	137.30 Kips
43.51 ft	Cohesionless	4943.56 psf	19.99	N/A	137.41 Kips
47.99 ft	Cohesionless	5106.19 psf	19.99	N/A	166.85 Kips
48.01 ft	Cohesionless	5270.26 psf	19.99	N/A	166.99 Kips
53.49 ft	Cohesionless	5469.19 psf	19.99	N/A	205.57 Kips
53.51 ft	Cohesionless	5669.54 psf	18.82	N/A	205.70 Kips
62.51 ft	Cohesionless	5973.74 psf	18.82	N/A	263.41 Kips
63.49 ft	Cohesionless	6006.86 psf	18.82	N/A	270.05 Kips
63.51 ft	Cohesionless	6345.51 psf	17.64	N/A	270.17 Kips
72.51 ft	Cohesionless	6627.21 psf	17.64	N/A	321.76 Kips
73.49 ft	Cohesionless	6657.89 psf	17.64	N/A	327.64 Kips
73.51 ft	Cohesionless	6971.54 psf	19.41	N/A	327.79 Kips
82.51 ft	Cohesionless	7275.74 psf	19.41	N/A	405.04 Kips
91.49 ft	Cohesionless	7579.26 psf	19.41	N/A	488.55 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.25 psf	30.00	10.46 Kips	0.02 Kips
9.01 ft	Cohesionless	1126.25 psf	30.00	10.46 Kips	10.46 Kips
11.99 ft	Cohesionless	1498.75 psf	30.00	10.46 Kips	10.46 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
16.99 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	21.21 Kips
23.49 ft	Cohesive	N/A	N/A	N/A	21.21 Kips
23.51 ft	Cohesive	N/A	N/A	N/A	17.67 Kips
28.49 ft	Cohesive	N/A	N/A	N/A	17.67 Kips
28.51 ft	Cohesionless	3456.30 psf	47.20	39.27 Kips	39.27 Kips
33.49 ft	Cohesionless	4103.70 psf	47.20	39.27 Kips	39.27 Kips
33.51 ft	Cohesionless	4106.30 psf	47.20	39.27 Kips	39.27 Kips
36.49 ft	Cohesionless	4493.70 psf	47.20	39.27 Kips	39.27 Kips
36.51 ft	Cohesionless	4495.68 psf	47.20	39.27 Kips	39.27 Kips
38.49 ft	Cohesionless	4629.52 psf	47.20	39.27 Kips	39.27 Kips
38.51 ft	Cohesionless	4630.83 psf	30.00	10.46 Kips	10.46 Kips
43.49 ft	Cohesionless	4942.57 psf	30.00	10.46 Kips	10.46 Kips
43.51 ft	Cohesionless	4943.93 psf	55.60	57.74 Kips	57.74 Kips
47.99 ft	Cohesionless	5269.17 psf	55.60	57.74 Kips	57.74 Kips
48.01 ft	Cohesionless	5270.63 psf	55.60	57.74 Kips	57.74 Kips
53.49 ft	Cohesionless	5668.47 psf	55.60	57.74 Kips	57.74 Kips
53.51 ft	Cohesionless	5669.88 psf	40.40	25.92 Kips	25.92 Kips
62.51 ft	Cohesionless	6278.28 psf	40.40	25.92 Kips	25.92 Kips
63.49 ft	Cohesionless	6344.52 psf	40.40	25.92 Kips	25.92 Kips
63.51 ft	Cohesionless	6345.83 psf	30.00	10.46 Kips	10.46 Kips
72.51 ft	Cohesionless	6909.23 psf	30.00	10.46 Kips	10.46 Kips
73.49 ft	Cohesionless	6970.57 psf	30.00	10.46 Kips	10.46 Kips
73.51 ft	Cohesionless	6971.88 psf	47.20	39.27 Kips	39.27 Kips
82.51 ft	Cohesionless	7580.28 psf	47.20	39.27 Kips	39.27 Kips
91.49 ft	Cohesionless	8187.32 psf	47.20	39.27 Kips	39.27 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
9.01 ft	4.39 Kips	10.46 Kips	14.85 Kips
11.99 ft	7.77 Kips	10.46 Kips	18.23 Kips
12.01 ft	7.82 Kips	12.37 Kips	20.19 Kips
16.99 ft	26.72 Kips	12.37 Kips	39.09 Kips
17.01 ft	26.78 Kips	21.21 Kips	47.99 Kips
23.49 ft	47.54 Kips	21.21 Kips	68.74 Kips
23.51 ft	47.61 Kips	17.67 Kips	65.28 Kips
28.49 ft	68.32 Kips	17.67 Kips	85.99 Kips
28.51 ft	68.41 Kips	39.27 Kips	107.68 Kips
33.49 ft	90.61 Kips	39.27 Kips	129.88 Kips
33.51 ft	90.71 Kips	39.27 Kips	129.98 Kips
36.49 ft	105.83 Kips	39.27 Kips	145.10 Kips
36.51 ft	105.93 Kips	39.27 Kips	145.20 Kips
38.49 ft	116.59 Kips	39.27 Kips	155.86 Kips
38.51 ft	116.68 Kips	10.46 Kips	127.15 Kips
43.49 ft	137.30 Kips	10.46 Kips	147.76 Kips
43.51 ft	137.41 Kips	57.74 Kips	195.15 Kips
47.99 ft	166.85 Kips	57.74 Kips	224.60 Kips
48.01 ft	166.99 Kips	57.74 Kips	224.73 Kips
53.49 ft	205.57 Kips	57.74 Kips	263.31 Kips
53.51 ft	205.70 Kips	25.92 Kips	231.62 Kips
62.51 ft	263.41 Kips	25.92 Kips	289.33 Kips
63.49 ft	270.05 Kips	25.92 Kips	295.97 Kips
63.51 ft	270.17 Kips	10.46 Kips	280.63 Kips
72.51 ft	321.76 Kips	10.46 Kips	332.22 Kips
73.49 ft	327.64 Kips	10.46 Kips	338.11 Kips
73.51 ft	327.79 Kips	39.27 Kips	367.06 Kips
82.51 ft	405.04 Kips	39.27 Kips	444.31 Kips
91.49 ft	488.55 Kips	39.27 Kips	527.82 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	17.64	N/A	0.00 Kips
9.01 ft	Cohesionless	563.12 psf	17.64	N/A	4.39 Kips
11.99 ft	Cohesionless	749.38 psf	17.64	N/A	7.77 Kips
12.01 ft	Cohesive	N/A	N/A	1159.43 psf	7.80 Kips
16.99 ft	Cohesive	N/A	N/A	1207.57 psf	20.46 Kips
17.01 ft	Cohesive	N/A	N/A	909.17 psf	20.52 Kips
23.49 ft	Cohesive	N/A	N/A	1019.33 psf	37.75 Kips
23.51 ft	Cohesive	N/A	N/A	1236.43 psf	37.80 Kips
28.49 ft	Cohesive	N/A	N/A	1323.57 psf	51.67 Kips
28.51 ft	Cohesionless	3455.65 psf	19.41	N/A	51.76 Kips
33.49 ft	Cohesionless	3779.35 psf	19.41	N/A	73.96 Kips
33.51 ft	Cohesionless	4105.65 psf	19.41	N/A	74.06 Kips
36.49 ft	Cohesionless	4299.35 psf	19.41	N/A	89.18 Kips
36.51 ft	Cohesionless	4495.34 psf	19.41	N/A	89.28 Kips
38.49 ft	Cohesionless	4562.26 psf	19.41	N/A	99.94 Kips
38.51 ft	Cohesionless	4630.51 psf	17.64	N/A	100.03 Kips
43.49 ft	Cohesionless	4786.39 psf	17.64	N/A	120.65 Kips
43.51 ft	Cohesionless	4943.56 psf	19.99	N/A	120.76 Kips
47.99 ft	Cohesionless	5106.19 psf	19.99	N/A	150.20 Kips
48.01 ft	Cohesionless	5270.26 psf	19.99	N/A	150.34 Kips
53.49 ft	Cohesionless	5469.19 psf	19.99	N/A	188.92 Kips
53.51 ft	Cohesionless	5669.54 psf	18.82	N/A	189.05 Kips
62.51 ft	Cohesionless	5973.74 psf	18.82	N/A	246.76 Kips
63.49 ft	Cohesionless	6006.86 psf	18.82	N/A	253.40 Kips
63.51 ft	Cohesionless	6345.51 psf	17.64	N/A	253.52 Kips
72.51 ft	Cohesionless	6627.21 psf	17.64	N/A	305.11 Kips
73.49 ft	Cohesionless	6657.89 psf	17.64	N/A	310.99 Kips
73.51 ft	Cohesionless	6971.54 psf	19.41	N/A	311.14 Kips
82.51 ft	Cohesionless	7275.74 psf	19.41	N/A	388.39 Kips
91.49 ft	Cohesionless	7579.26 psf	19.41	N/A	471.90 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.25 psf	30.00	10.46 Kips	0.02 Kips
9.01 ft	Cohesionless	1126.25 psf	30.00	10.46 Kips	10.46 Kips
11.99 ft	Cohesionless	1498.75 psf	30.00	10.46 Kips	10.46 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
16.99 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	21.21 Kips
23.49 ft	Cohesive	N/A	N/A	N/A	21.21 Kips
23.51 ft	Cohesive	N/A	N/A	N/A	17.67 Kips
28.49 ft	Cohesive	N/A	N/A	N/A	17.67 Kips
28.51 ft	Cohesionless	3456.30 psf	47.20	39.27 Kips	39.27 Kips
33.49 ft	Cohesionless	4103.70 psf	47.20	39.27 Kips	39.27 Kips
33.51 ft	Cohesionless	4106.30 psf	47.20	39.27 Kips	39.27 Kips
36.49 ft	Cohesionless	4493.70 psf	47.20	39.27 Kips	39.27 Kips
36.51 ft	Cohesionless	4495.68 psf	47.20	39.27 Kips	39.27 Kips
38.49 ft	Cohesionless	4629.52 psf	47.20	39.27 Kips	39.27 Kips
38.51 ft	Cohesionless	4630.83 psf	30.00	10.46 Kips	10.46 Kips
43.49 ft	Cohesionless	4942.57 psf	30.00	10.46 Kips	10.46 Kips
43.51 ft	Cohesionless	4943.93 psf	55.60	57.74 Kips	57.74 Kips
47.99 ft	Cohesionless	5269.17 psf	55.60	57.74 Kips	57.74 Kips
48.01 ft	Cohesionless	5270.63 psf	55.60	57.74 Kips	57.74 Kips
53.49 ft	Cohesionless	5668.47 psf	55.60	57.74 Kips	57.74 Kips
53.51 ft	Cohesionless	5669.88 psf	40.40	25.92 Kips	25.92 Kips
62.51 ft	Cohesionless	6278.28 psf	40.40	25.92 Kips	25.92 Kips
63.49 ft	Cohesionless	6344.52 psf	40.40	25.92 Kips	25.92 Kips
63.51 ft	Cohesionless	6345.83 psf	30.00	10.46 Kips	10.46 Kips
72.51 ft	Cohesionless	6909.23 psf	30.00	10.46 Kips	10.46 Kips
73.49 ft	Cohesionless	6970.57 psf	30.00	10.46 Kips	10.46 Kips
73.51 ft	Cohesionless	6971.88 psf	47.20	39.27 Kips	39.27 Kips
82.51 ft	Cohesionless	7580.28 psf	47.20	39.27 Kips	39.27 Kips
91.49 ft	Cohesionless	8187.32 psf	47.20	39.27 Kips	39.27 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
9.01 ft	4.39 Kips	10.46 Kips	14.85 Kips
11.99 ft	7.77 Kips	10.46 Kips	18.23 Kips
12.01 ft	7.80 Kips	12.37 Kips	20.17 Kips
16.99 ft	20.46 Kips	12.37 Kips	32.83 Kips
17.01 ft	20.52 Kips	21.21 Kips	41.73 Kips
23.49 ft	37.75 Kips	21.21 Kips	58.95 Kips
23.51 ft	37.80 Kips	17.67 Kips	55.47 Kips
28.49 ft	51.67 Kips	17.67 Kips	69.34 Kips
28.51 ft	51.76 Kips	39.27 Kips	91.03 Kips
33.49 ft	73.96 Kips	39.27 Kips	113.23 Kips
33.51 ft	74.06 Kips	39.27 Kips	113.33 Kips
36.49 ft	89.18 Kips	39.27 Kips	128.45 Kips
36.51 ft	89.28 Kips	39.27 Kips	128.55 Kips
38.49 ft	99.94 Kips	39.27 Kips	139.21 Kips
38.51 ft	100.03 Kips	10.46 Kips	110.49 Kips
43.49 ft	120.65 Kips	10.46 Kips	131.11 Kips
43.51 ft	120.76 Kips	57.74 Kips	178.50 Kips
47.99 ft	150.20 Kips	57.74 Kips	207.95 Kips
48.01 ft	150.34 Kips	57.74 Kips	208.08 Kips
53.49 ft	188.92 Kips	57.74 Kips	246.66 Kips
53.51 ft	189.05 Kips	25.92 Kips	214.97 Kips
62.51 ft	246.76 Kips	25.92 Kips	272.68 Kips
63.49 ft	253.40 Kips	25.92 Kips	279.32 Kips
63.51 ft	253.52 Kips	10.46 Kips	263.98 Kips
72.51 ft	305.11 Kips	10.46 Kips	315.57 Kips
73.49 ft	310.99 Kips	10.46 Kips	321.46 Kips
73.51 ft	311.14 Kips	39.27 Kips	350.41 Kips
82.51 ft	388.39 Kips	39.27 Kips	427.66 Kips
91.49 ft	471.90 Kips	39.27 Kips	511.17 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	17.64	N/A	0.00 Kips
9.01 ft	Cohesionless	563.12 psf	17.64	N/A	4.39 Kips
11.99 ft	Cohesionless	749.38 psf	17.64	N/A	7.77 Kips
12.01 ft	Cohesive	N/A	N/A	1159.43 psf	7.82 Kips
16.99 ft	Cohesive	N/A	N/A	1207.57 psf	26.72 Kips
17.01 ft	Cohesive	N/A	N/A	909.17 psf	26.78 Kips
23.49 ft	Cohesive	N/A	N/A	1019.33 psf	47.54 Kips
23.51 ft	Cohesive	N/A	N/A	1236.43 psf	47.61 Kips
28.49 ft	Cohesive	N/A	N/A	1323.57 psf	68.32 Kips
28.51 ft	Cohesionless	3455.65 psf	19.41	N/A	68.41 Kips
33.49 ft	Cohesionless	3779.35 psf	19.41	N/A	90.61 Kips
33.51 ft	Cohesionless	4105.65 psf	19.41	N/A	90.71 Kips
36.49 ft	Cohesionless	4299.35 psf	19.41	N/A	105.83 Kips
36.51 ft	Cohesionless	4495.34 psf	19.41	N/A	105.93 Kips
38.49 ft	Cohesionless	4562.26 psf	19.41	N/A	116.59 Kips
38.51 ft	Cohesionless	4630.51 psf	17.64	N/A	116.68 Kips
43.49 ft	Cohesionless	4786.39 psf	17.64	N/A	137.30 Kips
43.51 ft	Cohesionless	4943.56 psf	19.99	N/A	137.41 Kips
47.99 ft	Cohesionless	5106.19 psf	19.99	N/A	166.85 Kips
48.01 ft	Cohesionless	5270.26 psf	19.99	N/A	166.99 Kips
53.49 ft	Cohesionless	5469.19 psf	19.99	N/A	205.57 Kips
53.51 ft	Cohesionless	5669.54 psf	18.82	N/A	205.70 Kips
62.51 ft	Cohesionless	5973.74 psf	18.82	N/A	263.41 Kips
63.49 ft	Cohesionless	6006.86 psf	18.82	N/A	270.05 Kips
63.51 ft	Cohesionless	6345.51 psf	17.64	N/A	270.17 Kips
72.51 ft	Cohesionless	6627.21 psf	17.64	N/A	321.76 Kips
73.49 ft	Cohesionless	6657.89 psf	17.64	N/A	327.64 Kips
73.51 ft	Cohesionless	6971.54 psf	19.41	N/A	327.79 Kips
82.51 ft	Cohesionless	7275.74 psf	19.41	N/A	405.04 Kips
91.49 ft	Cohesionless	7579.26 psf	19.41	N/A	488.55 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.25 psf	30.00	10.46 Kips	0.02 Kips
9.01 ft	Cohesionless	1126.25 psf	30.00	10.46 Kips	10.46 Kips
11.99 ft	Cohesionless	1498.75 psf	30.00	10.46 Kips	10.46 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
16.99 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	21.21 Kips
23.49 ft	Cohesive	N/A	N/A	N/A	21.21 Kips
23.51 ft	Cohesive	N/A	N/A	N/A	17.67 Kips
28.49 ft	Cohesive	N/A	N/A	N/A	17.67 Kips
28.51 ft	Cohesionless	3456.30 psf	47.20	39.27 Kips	39.27 Kips
33.49 ft	Cohesionless	4103.70 psf	47.20	39.27 Kips	39.27 Kips
33.51 ft	Cohesionless	4106.30 psf	47.20	39.27 Kips	39.27 Kips
36.49 ft	Cohesionless	4493.70 psf	47.20	39.27 Kips	39.27 Kips
36.51 ft	Cohesionless	4495.68 psf	47.20	39.27 Kips	39.27 Kips
38.49 ft	Cohesionless	4629.52 psf	47.20	39.27 Kips	39.27 Kips
38.51 ft	Cohesionless	4630.83 psf	30.00	10.46 Kips	10.46 Kips
43.49 ft	Cohesionless	4942.57 psf	30.00	10.46 Kips	10.46 Kips
43.51 ft	Cohesionless	4943.93 psf	55.60	57.74 Kips	57.74 Kips
47.99 ft	Cohesionless	5269.17 psf	55.60	57.74 Kips	57.74 Kips
48.01 ft	Cohesionless	5270.63 psf	55.60	57.74 Kips	57.74 Kips
53.49 ft	Cohesionless	5668.47 psf	55.60	57.74 Kips	57.74 Kips
53.51 ft	Cohesionless	5669.88 psf	40.40	25.92 Kips	25.92 Kips
62.51 ft	Cohesionless	6278.28 psf	40.40	25.92 Kips	25.92 Kips
63.49 ft	Cohesionless	6344.52 psf	40.40	25.92 Kips	25.92 Kips
63.51 ft	Cohesionless	6345.83 psf	30.00	10.46 Kips	10.46 Kips
72.51 ft	Cohesionless	6909.23 psf	30.00	10.46 Kips	10.46 Kips
73.49 ft	Cohesionless	6970.57 psf	30.00	10.46 Kips	10.46 Kips
73.51 ft	Cohesionless	6971.88 psf	47.20	39.27 Kips	39.27 Kips
82.51 ft	Cohesionless	7580.28 psf	47.20	39.27 Kips	39.27 Kips
91.49 ft	Cohesionless	8187.32 psf	47.20	39.27 Kips	39.27 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
9.01 ft	4.39 Kips	10.46 Kips	14.85 Kips
11.99 ft	7.77 Kips	10.46 Kips	18.23 Kips
12.01 ft	7.82 Kips	12.37 Kips	20.19 Kips
16.99 ft	26.72 Kips	12.37 Kips	39.09 Kips
17.01 ft	26.78 Kips	21.21 Kips	47.99 Kips
23.49 ft	47.54 Kips	21.21 Kips	68.74 Kips
23.51 ft	47.61 Kips	17.67 Kips	65.28 Kips
28.49 ft	68.32 Kips	17.67 Kips	85.99 Kips
28.51 ft	68.41 Kips	39.27 Kips	107.68 Kips
33.49 ft	90.61 Kips	39.27 Kips	129.88 Kips
33.51 ft	90.71 Kips	39.27 Kips	129.98 Kips
36.49 ft	105.83 Kips	39.27 Kips	145.10 Kips
36.51 ft	105.93 Kips	39.27 Kips	145.20 Kips
38.49 ft	116.59 Kips	39.27 Kips	155.86 Kips
38.51 ft	116.68 Kips	10.46 Kips	127.15 Kips
43.49 ft	137.30 Kips	10.46 Kips	147.76 Kips
43.51 ft	137.41 Kips	57.74 Kips	195.15 Kips
47.99 ft	166.85 Kips	57.74 Kips	224.60 Kips
48.01 ft	166.99 Kips	57.74 Kips	224.73 Kips
53.49 ft	205.57 Kips	57.74 Kips	263.31 Kips
53.51 ft	205.70 Kips	25.92 Kips	231.62 Kips
62.51 ft	263.41 Kips	25.92 Kips	289.33 Kips
63.49 ft	270.05 Kips	25.92 Kips	295.97 Kips
63.51 ft	270.17 Kips	10.46 Kips	280.63 Kips
72.51 ft	321.76 Kips	10.46 Kips	332.22 Kips
73.49 ft	327.64 Kips	10.46 Kips	338.11 Kips
73.51 ft	327.79 Kips	39.27 Kips	367.06 Kips
82.51 ft	405.04 Kips	39.27 Kips	444.31 Kips
91.49 ft	488.55 Kips	39.27 Kips	527.82 Kips

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-172-~1.DVN
Project Name: B-172 - Forward Abutment
Project Date: 11/07/2014
Project Client: EMHT
Computed By: BRT
Project Manager: JPS

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 14.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	22.60 ft
	- Driving/Restrike	22.60 ft
	- Ultimate:	22.60 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil: (Downdrag Condition)	18.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	5.50 ft	33.00%	115.00 pcf	1750.00 psf	T-79 Steel
2	Cohesive	9.50 ft	50.00%	115.00 pcf	1250.00 psf	T-79 Steel
3	Cohesive	7.50 ft	50.00%	115.00 pcf	1250.00 psf	T-79 Steel
4	Cohesionless	4.00 ft	0.00%	125.00 pcf	31.0/31.0	Nordlund
5	Cohesive	5.00 ft	33.00%	125.00 pcf	4000.00 psf	T-79 Steel
6	Cohesionless	20.00 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
7	Cohesionless	5.00 ft	0.00%	135.00 pcf	34.0/34.0	Nordlund
8	Cohesionless	10.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
9	Cohesionless	4.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
10	Cohesionless	6.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
11	Cohesionless	1.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	0.04 Kips
5.49 ft	Cohesive	N/A	N/A	1140.00 psf	22.94 Kips
5.51 ft	Cohesive	N/A	N/A	930.00 psf	23.01 Kips
14.51 ft	Cohesive	N/A	N/A	945.64 psf	54.21 Kips
14.99 ft	Cohesive	N/A	N/A	948.28 psf	55.96 Kips
15.01 ft	Cohesive	N/A	N/A	948.39 psf	56.04 Kips
22.49 ft	Cohesive	N/A	N/A	989.53 psf	83.17 Kips
22.51 ft	Cohesionless	2588.13 psf	20.66	N/A	83.24 Kips
22.59 ft	Cohesionless	2593.12 psf	20.66	N/A	83.53 Kips
22.61 ft	Cohesionless	2600.31 psf	20.66	N/A	83.61 Kips
26.49 ft	Cohesionless	2721.76 psf	20.66	N/A	98.47 Kips
26.51 ft	Cohesive	N/A	N/A	977.81 psf	98.54 Kips
31.49 ft	Cohesive	N/A	N/A	1047.53 psf	117.67 Kips
31.51 ft	Cohesionless	3157.48 psf	21.33	N/A	117.76 Kips
40.51 ft	Cohesionless	3461.68 psf	21.33	N/A	166.67 Kips
49.51 ft	Cohesionless	3765.88 psf	21.33	N/A	224.18 Kips
51.49 ft	Cohesionless	3832.80 psf	21.33	N/A	237.99 Kips
51.51 ft	Cohesionless	4509.50 psf	22.66	N/A	238.14 Kips
56.49 ft	Cohesionless	4690.28 psf	22.66	N/A	282.65 Kips
56.51 ft	Cohesionless	4872.48 psf	21.33	N/A	282.82 Kips
65.51 ft	Cohesionless	5176.68 psf	21.33	N/A	355.96 Kips
66.99 ft	Cohesionless	5226.70 psf	21.33	N/A	368.82 Kips
67.01 ft	Cohesionless	5582.28 psf	21.33	N/A	368.99 Kips
71.49 ft	Cohesionless	5733.70 psf	21.33	N/A	409.32 Kips
71.51 ft	Cohesionless	5886.48 psf	21.99	N/A	409.51 Kips
77.99 ft	Cohesionless	6105.50 psf	21.99	N/A	478.20 Kips
78.01 ft	Cohesionless	6325.88 psf	21.99	N/A	478.42 Kips
79.49 ft	Cohesionless	6375.90 psf	21.99	N/A	494.80 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
5.49 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
5.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
14.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
14.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
22.49 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
22.51 ft	Cohesionless	2588.75 psf	35.20	22.09 Kips	22.09 Kips
22.59 ft	Cohesionless	2598.75 psf	35.20	22.09 Kips	22.09 Kips
22.61 ft	Cohesionless	2600.63 psf	35.20	22.09 Kips	22.09 Kips
26.49 ft	Cohesionless	2843.51 psf	35.20	22.09 Kips	22.09 Kips
26.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.49 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.51 ft	Cohesionless	3157.82 psf	40.40	35.28 Kips	35.28 Kips
40.51 ft	Cohesionless	3766.22 psf	40.40	35.28 Kips	35.28 Kips
49.51 ft	Cohesionless	4374.62 psf	40.40	35.28 Kips	35.28 Kips
51.49 ft	Cohesionless	4508.46 psf	40.40	35.28 Kips	35.28 Kips
51.51 ft	Cohesionless	4509.87 psf	55.60	78.59 Kips	78.59 Kips
56.49 ft	Cohesionless	4871.41 psf	55.60	78.59 Kips	78.59 Kips
56.51 ft	Cohesionless	4872.82 psf	40.40	35.28 Kips	35.28 Kips
65.51 ft	Cohesionless	5481.22 psf	40.40	35.28 Kips	35.28 Kips
66.99 ft	Cohesionless	5581.26 psf	40.40	35.28 Kips	35.28 Kips
67.01 ft	Cohesionless	5582.62 psf	40.40	35.28 Kips	35.28 Kips
71.49 ft	Cohesionless	5885.46 psf	40.40	35.28 Kips	35.28 Kips
71.51 ft	Cohesionless	5886.82 psf	47.20	53.45 Kips	53.45 Kips
77.99 ft	Cohesionless	6324.86 psf	47.20	53.45 Kips	53.45 Kips
78.01 ft	Cohesionless	6326.22 psf	47.20	53.45 Kips	53.45 Kips
79.49 ft	Cohesionless	6426.26 psf	47.20	53.45 Kips	53.45 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.04 Kips	16.84 Kips	16.88 Kips
5.49 ft	22.94 Kips	16.84 Kips	39.78 Kips
5.51 ft	23.01 Kips	12.03 Kips	35.04 Kips
14.51 ft	54.21 Kips	12.03 Kips	66.24 Kips
14.99 ft	55.96 Kips	12.03 Kips	67.99 Kips
15.01 ft	56.04 Kips	12.03 Kips	68.06 Kips
22.49 ft	83.17 Kips	12.03 Kips	95.19 Kips
22.51 ft	83.24 Kips	22.09 Kips	105.33 Kips
22.59 ft	83.53 Kips	22.09 Kips	105.62 Kips
22.61 ft	83.61 Kips	22.09 Kips	105.70 Kips
26.49 ft	98.47 Kips	22.09 Kips	120.56 Kips
26.51 ft	98.54 Kips	38.48 Kips	137.03 Kips
31.49 ft	117.67 Kips	38.48 Kips	156.15 Kips
31.51 ft	117.76 Kips	35.28 Kips	153.04 Kips
40.51 ft	166.67 Kips	35.28 Kips	201.95 Kips
49.51 ft	224.18 Kips	35.28 Kips	259.46 Kips
51.49 ft	237.99 Kips	35.28 Kips	273.27 Kips
51.51 ft	238.14 Kips	78.59 Kips	316.74 Kips
56.49 ft	282.65 Kips	78.59 Kips	361.24 Kips
56.51 ft	282.82 Kips	35.28 Kips	318.10 Kips
65.51 ft	355.96 Kips	35.28 Kips	391.24 Kips
66.99 ft	368.82 Kips	35.28 Kips	404.09 Kips
67.01 ft	368.99 Kips	35.28 Kips	404.27 Kips
71.49 ft	409.32 Kips	35.28 Kips	444.60 Kips
71.51 ft	409.51 Kips	53.45 Kips	462.96 Kips
77.99 ft	478.20 Kips	53.45 Kips	531.65 Kips
78.01 ft	478.42 Kips	53.45 Kips	531.87 Kips
79.49 ft	494.80 Kips	53.45 Kips	548.25 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	0.03 Kips
5.49 ft	Cohesive	N/A	N/A	1140.00 psf	15.37 Kips
5.51 ft	Cohesive	N/A	N/A	930.00 psf	15.41 Kips
14.51 ft	Cohesive	N/A	N/A	945.64 psf	31.00 Kips
14.99 ft	Cohesive	N/A	N/A	948.28 psf	31.88 Kips
15.01 ft	Cohesive	N/A	N/A	948.39 psf	31.92 Kips
22.49 ft	Cohesive	N/A	N/A	989.53 psf	45.48 Kips
22.51 ft	Cohesionless	2588.13 psf	20.66	N/A	45.56 Kips
22.59 ft	Cohesionless	2593.12 psf	20.66	N/A	45.85 Kips
22.61 ft	Cohesionless	2600.31 psf	20.66	N/A	45.92 Kips
26.49 ft	Cohesionless	2721.76 psf	20.66	N/A	60.79 Kips
26.51 ft	Cohesive	N/A	N/A	977.81 psf	60.84 Kips
31.49 ft	Cohesive	N/A	N/A	1047.53 psf	73.65 Kips
31.51 ft	Cohesionless	3157.48 psf	21.33	N/A	73.74 Kips
40.51 ft	Cohesionless	3461.68 psf	21.33	N/A	122.65 Kips
49.51 ft	Cohesionless	3765.88 psf	21.33	N/A	180.16 Kips
51.49 ft	Cohesionless	3832.80 psf	21.33	N/A	193.97 Kips
51.51 ft	Cohesionless	4509.50 psf	22.66	N/A	194.13 Kips
56.49 ft	Cohesionless	4690.28 psf	22.66	N/A	238.63 Kips
56.51 ft	Cohesionless	4872.48 psf	21.33	N/A	238.80 Kips
65.51 ft	Cohesionless	5176.68 psf	21.33	N/A	311.95 Kips
66.99 ft	Cohesionless	5226.70 psf	21.33	N/A	324.80 Kips
67.01 ft	Cohesionless	5582.28 psf	21.33	N/A	324.97 Kips
71.49 ft	Cohesionless	5733.70 psf	21.33	N/A	365.30 Kips
71.51 ft	Cohesionless	5886.48 psf	21.99	N/A	365.49 Kips
77.99 ft	Cohesionless	6105.50 psf	21.99	N/A	434.18 Kips
78.01 ft	Cohesionless	6325.88 psf	21.99	N/A	434.40 Kips
79.49 ft	Cohesionless	6375.90 psf	21.99	N/A	450.78 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
5.49 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
5.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
14.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
14.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
22.49 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
22.51 ft	Cohesionless	2588.75 psf	35.20	22.09 Kips	22.09 Kips
22.59 ft	Cohesionless	2598.75 psf	35.20	22.09 Kips	22.09 Kips
22.61 ft	Cohesionless	2600.63 psf	35.20	22.09 Kips	22.09 Kips
26.49 ft	Cohesionless	2843.51 psf	35.20	22.09 Kips	22.09 Kips
26.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.49 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.51 ft	Cohesionless	3157.82 psf	40.40	35.28 Kips	35.28 Kips
40.51 ft	Cohesionless	3766.22 psf	40.40	35.28 Kips	35.28 Kips
49.51 ft	Cohesionless	4374.62 psf	40.40	35.28 Kips	35.28 Kips
51.49 ft	Cohesionless	4508.46 psf	40.40	35.28 Kips	35.28 Kips
51.51 ft	Cohesionless	4509.87 psf	55.60	78.59 Kips	78.59 Kips
56.49 ft	Cohesionless	4871.41 psf	55.60	78.59 Kips	78.59 Kips
56.51 ft	Cohesionless	4872.82 psf	40.40	35.28 Kips	35.28 Kips
65.51 ft	Cohesionless	5481.22 psf	40.40	35.28 Kips	35.28 Kips
66.99 ft	Cohesionless	5581.26 psf	40.40	35.28 Kips	35.28 Kips
67.01 ft	Cohesionless	5582.62 psf	40.40	35.28 Kips	35.28 Kips
71.49 ft	Cohesionless	5885.46 psf	40.40	35.28 Kips	35.28 Kips
71.51 ft	Cohesionless	5886.82 psf	47.20	53.45 Kips	53.45 Kips
77.99 ft	Cohesionless	6324.86 psf	47.20	53.45 Kips	53.45 Kips
78.01 ft	Cohesionless	6326.22 psf	47.20	53.45 Kips	53.45 Kips
79.49 ft	Cohesionless	6426.26 psf	47.20	53.45 Kips	53.45 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.03 Kips	16.84 Kips	16.86 Kips
5.49 ft	15.37 Kips	16.84 Kips	32.21 Kips
5.51 ft	15.41 Kips	12.03 Kips	27.43 Kips
14.51 ft	31.00 Kips	12.03 Kips	43.03 Kips
14.99 ft	31.88 Kips	12.03 Kips	43.91 Kips
15.01 ft	31.92 Kips	12.03 Kips	43.94 Kips
22.49 ft	45.48 Kips	12.03 Kips	57.51 Kips
22.51 ft	45.56 Kips	22.09 Kips	67.65 Kips
22.59 ft	45.85 Kips	22.09 Kips	67.94 Kips
22.61 ft	45.92 Kips	22.09 Kips	68.01 Kips
26.49 ft	60.79 Kips	22.09 Kips	82.88 Kips
26.51 ft	60.84 Kips	38.48 Kips	99.32 Kips
31.49 ft	73.65 Kips	38.48 Kips	112.13 Kips
31.51 ft	73.74 Kips	35.28 Kips	109.02 Kips
40.51 ft	122.65 Kips	35.28 Kips	157.93 Kips
49.51 ft	180.16 Kips	35.28 Kips	215.44 Kips
51.49 ft	193.97 Kips	35.28 Kips	229.25 Kips
51.51 ft	194.13 Kips	78.59 Kips	272.72 Kips
56.49 ft	238.63 Kips	78.59 Kips	317.22 Kips
56.51 ft	238.80 Kips	35.28 Kips	274.08 Kips
65.51 ft	311.95 Kips	35.28 Kips	347.22 Kips
66.99 ft	324.80 Kips	35.28 Kips	360.07 Kips
67.01 ft	324.97 Kips	35.28 Kips	360.25 Kips
71.49 ft	365.30 Kips	35.28 Kips	400.58 Kips
71.51 ft	365.49 Kips	53.45 Kips	418.94 Kips
77.99 ft	434.18 Kips	53.45 Kips	487.63 Kips
78.01 ft	434.40 Kips	53.45 Kips	487.85 Kips
79.49 ft	450.78 Kips	53.45 Kips	504.23 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	-0.04 Kips
5.49 ft	Cohesive	N/A	N/A	1140.00 psf	-22.94 Kips
5.51 ft	Cohesive	N/A	N/A	930.00 psf	-23.01 Kips
14.51 ft	Cohesive	N/A	N/A	945.64 psf	-54.21 Kips
14.99 ft	Cohesive	N/A	N/A	948.28 psf	-55.96 Kips
15.01 ft	Cohesive	N/A	N/A	948.39 psf	-56.04 Kips
17.99 ft	Cohesive	N/A	N/A	964.78 psf	-66.57 Kips
18.00 ft	Cohesive	N/A	N/A	964.83 psf	-66.61 Kips
22.49 ft	Cohesive	N/A	N/A	989.53 psf	-50.33 Kips
22.51 ft	Cohesionless	2588.13 psf	20.66	N/A	-50.25 Kips
22.59 ft	Cohesionless	2593.12 psf	20.66	N/A	-49.96 Kips
22.61 ft	Cohesionless	2600.31 psf	20.66	N/A	-49.89 Kips
26.49 ft	Cohesionless	2721.76 psf	20.66	N/A	-35.02 Kips
26.51 ft	Cohesive	N/A	N/A	977.81 psf	-34.95 Kips
31.49 ft	Cohesive	N/A	N/A	1047.53 psf	-15.82 Kips
31.51 ft	Cohesionless	3157.48 psf	21.33	N/A	-15.73 Kips
40.51 ft	Cohesionless	3461.68 psf	21.33	N/A	33.18 Kips
49.51 ft	Cohesionless	3765.88 psf	21.33	N/A	90.69 Kips
51.49 ft	Cohesionless	3832.80 psf	21.33	N/A	104.50 Kips
51.51 ft	Cohesionless	4509.50 psf	22.66	N/A	104.65 Kips
56.49 ft	Cohesionless	4690.28 psf	22.66	N/A	149.16 Kips
56.51 ft	Cohesionless	4872.48 psf	21.33	N/A	149.33 Kips
65.51 ft	Cohesionless	5176.68 psf	21.33	N/A	222.47 Kips
66.99 ft	Cohesionless	5226.70 psf	21.33	N/A	235.32 Kips
67.01 ft	Cohesionless	5582.28 psf	21.33	N/A	235.50 Kips
71.49 ft	Cohesionless	5733.70 psf	21.33	N/A	275.83 Kips
71.51 ft	Cohesionless	5886.48 psf	21.99	N/A	276.02 Kips
77.99 ft	Cohesionless	6105.50 psf	21.99	N/A	344.71 Kips
78.01 ft	Cohesionless	6325.88 psf	21.99	N/A	344.92 Kips
79.49 ft	Cohesionless	6375.90 psf	21.99	N/A	361.31 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
14.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
14.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.00 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
22.49 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
22.51 ft	Cohesionless	2588.75 psf	35.20	22.09 Kips	22.09 Kips
22.59 ft	Cohesionless	2598.75 psf	35.20	22.09 Kips	22.09 Kips
22.61 ft	Cohesionless	2600.63 psf	35.20	22.09 Kips	22.09 Kips
26.49 ft	Cohesionless	2843.51 psf	35.20	22.09 Kips	22.09 Kips
26.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.49 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.51 ft	Cohesionless	3157.82 psf	40.40	35.28 Kips	35.28 Kips
40.51 ft	Cohesionless	3766.22 psf	40.40	35.28 Kips	35.28 Kips
49.51 ft	Cohesionless	4374.62 psf	40.40	35.28 Kips	35.28 Kips
51.49 ft	Cohesionless	4508.46 psf	40.40	35.28 Kips	35.28 Kips
51.51 ft	Cohesionless	4509.87 psf	55.60	78.59 Kips	78.59 Kips
56.49 ft	Cohesionless	4871.41 psf	55.60	78.59 Kips	78.59 Kips
56.51 ft	Cohesionless	4872.82 psf	40.40	35.28 Kips	35.28 Kips
65.51 ft	Cohesionless	5481.22 psf	40.40	35.28 Kips	35.28 Kips
66.99 ft	Cohesionless	5581.26 psf	40.40	35.28 Kips	35.28 Kips
67.01 ft	Cohesionless	5582.62 psf	40.40	35.28 Kips	35.28 Kips
71.49 ft	Cohesionless	5885.46 psf	40.40	35.28 Kips	35.28 Kips
71.51 ft	Cohesionless	5886.82 psf	47.20	53.45 Kips	53.45 Kips
77.99 ft	Cohesionless	6324.86 psf	47.20	53.45 Kips	53.45 Kips
78.01 ft	Cohesionless	6326.22 psf	47.20	53.45 Kips	53.45 Kips
79.49 ft	Cohesionless	6426.26 psf	47.20	53.45 Kips	53.45 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	-0.04 Kips	0.00 Kips	-0.04 Kips
5.49 ft	-22.94 Kips	0.00 Kips	-22.94 Kips
5.51 ft	-23.01 Kips	0.00 Kips	-23.01 Kips
14.51 ft	-54.21 Kips	0.00 Kips	-54.21 Kips
14.99 ft	-55.96 Kips	0.00 Kips	-55.96 Kips
15.01 ft	-56.04 Kips	0.00 Kips	-56.04 Kips
17.99 ft	-66.57 Kips	0.00 Kips	-66.57 Kips
18.00 ft	-66.61 Kips	12.03 Kips	-54.58 Kips
22.49 ft	-50.33 Kips	12.03 Kips	-38.30 Kips
22.51 ft	-50.25 Kips	22.09 Kips	-28.16 Kips
22.59 ft	-49.96 Kips	22.09 Kips	-27.87 Kips
22.61 ft	-49.89 Kips	22.09 Kips	-27.80 Kips
26.49 ft	-35.02 Kips	22.09 Kips	-12.93 Kips
26.51 ft	-34.95 Kips	38.48 Kips	3.54 Kips
31.49 ft	-15.82 Kips	38.48 Kips	22.66 Kips
31.51 ft	-15.73 Kips	35.28 Kips	19.54 Kips
40.51 ft	33.18 Kips	35.28 Kips	68.46 Kips
49.51 ft	90.69 Kips	35.28 Kips	125.97 Kips
51.49 ft	104.50 Kips	35.28 Kips	139.77 Kips
51.51 ft	104.65 Kips	78.59 Kips	183.25 Kips
56.49 ft	149.16 Kips	78.59 Kips	227.75 Kips
56.51 ft	149.33 Kips	35.28 Kips	184.60 Kips
65.51 ft	222.47 Kips	35.28 Kips	257.75 Kips
66.99 ft	235.32 Kips	35.28 Kips	270.60 Kips
67.01 ft	235.50 Kips	35.28 Kips	270.78 Kips
71.49 ft	275.83 Kips	35.28 Kips	311.10 Kips
71.51 ft	276.02 Kips	53.45 Kips	329.47 Kips
77.99 ft	344.71 Kips	53.45 Kips	398.16 Kips
78.01 ft	344.92 Kips	53.45 Kips	398.38 Kips
79.49 ft	361.31 Kips	53.45 Kips	414.76 Kips

DRIVEN 1.2

Forward Abutment - Prebore Holes or Bitumen Coating Capacity

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-172-~1.DVN
Project Name: B-172 - Forward Abutment
Project Date: 11/07/2014
Project Client: EMHT
Computed By: BRT
Project Manager: JPS

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 14.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	22.60 ft
	- Driving/Restrike	22.60 ft
	- Ultimate:	22.60 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil: (Downdrag Condition)	18.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	5.50 ft	33.00%	115.00 pcf	0.00 psf	T-79 Steel
2	Cohesive	12.50 ft	50.00%	115.00 pcf	0.00 psf	T-79 Steel
3	Cohesionless	4.50 ft	17.00%	115.00 pcf	29.0/29.0	Nordlund
4	Cohesionless	4.00 ft	0.00%	125.00 pcf	31.0/31.0	Nordlund
5	Cohesive	5.00 ft	33.00%	125.00 pcf	4000.00 psf	T-79 Steel
6	Cohesionless	20.00 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
7	Cohesionless	5.00 ft	0.00%	135.00 pcf	34.0/34.0	Nordlund
8	Cohesionless	10.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
9	Cohesionless	4.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
10	Cohesionless	1.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
11	Cohesionless	6.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
14.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.01 ft	Cohesionless	2070.58 psf	19.33	N/A	0.02 Kips
22.49 ft	Cohesionless	2328.17 psf	19.33	N/A	12.05 Kips
22.51 ft	Cohesionless	2588.13 psf	20.66	N/A	12.12 Kips
22.59 ft	Cohesionless	2593.12 psf	20.66	N/A	12.41 Kips
22.61 ft	Cohesionless	2600.31 psf	20.66	N/A	12.48 Kips
26.49 ft	Cohesionless	2721.76 psf	20.66	N/A	27.35 Kips
26.51 ft	Cohesive	N/A	N/A	977.81 psf	27.42 Kips
31.49 ft	Cohesive	N/A	N/A	1047.53 psf	46.55 Kips
31.51 ft	Cohesionless	3157.48 psf	21.33	N/A	46.64 Kips
40.51 ft	Cohesionless	3461.68 psf	21.33	N/A	95.55 Kips
49.51 ft	Cohesionless	3765.88 psf	21.33	N/A	153.06 Kips
51.49 ft	Cohesionless	3832.80 psf	21.33	N/A	166.87 Kips
51.51 ft	Cohesionless	4509.50 psf	22.66	N/A	167.02 Kips
56.49 ft	Cohesionless	4690.28 psf	22.66	N/A	211.53 Kips
56.51 ft	Cohesionless	4872.48 psf	21.33	N/A	211.70 Kips
65.51 ft	Cohesionless	5176.68 psf	21.33	N/A	284.84 Kips
66.99 ft	Cohesionless	5226.70 psf	21.33	N/A	297.69 Kips
67.01 ft	Cohesionless	5582.28 psf	21.33	N/A	297.87 Kips
71.49 ft	Cohesionless	5733.70 psf	21.33	N/A	338.20 Kips
71.51 ft	Cohesionless	5886.48 psf	21.99	N/A	338.39 Kips
72.99 ft	Cohesionless	5936.50 psf	21.99	N/A	353.64 Kips
73.01 ft	Cohesionless	5987.88 psf	21.99	N/A	353.85 Kips
79.49 ft	Cohesionless	6206.90 psf	21.99	N/A	423.68 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
14.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.01 ft	Cohesionless	2071.15 psf	26.40	14.24 Kips	14.24 Kips
22.49 ft	Cohesionless	2586.35 psf	26.40	14.24 Kips	14.24 Kips
22.51 ft	Cohesionless	2588.75 psf	35.20	22.09 Kips	22.09 Kips
22.59 ft	Cohesionless	2598.75 psf	35.20	22.09 Kips	22.09 Kips
22.61 ft	Cohesionless	2600.63 psf	35.20	22.09 Kips	22.09 Kips
26.49 ft	Cohesionless	2843.51 psf	35.20	22.09 Kips	22.09 Kips
26.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.49 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.51 ft	Cohesionless	3157.82 psf	40.40	35.28 Kips	35.28 Kips
40.51 ft	Cohesionless	3766.22 psf	40.40	35.28 Kips	35.28 Kips
49.51 ft	Cohesionless	4374.62 psf	40.40	35.28 Kips	35.28 Kips
51.49 ft	Cohesionless	4508.46 psf	40.40	35.28 Kips	35.28 Kips
51.51 ft	Cohesionless	4509.87 psf	55.60	78.59 Kips	78.59 Kips
56.49 ft	Cohesionless	4871.41 psf	55.60	78.59 Kips	78.59 Kips
56.51 ft	Cohesionless	4872.82 psf	40.40	35.28 Kips	35.28 Kips
65.51 ft	Cohesionless	5481.22 psf	40.40	35.28 Kips	35.28 Kips
66.99 ft	Cohesionless	5581.26 psf	40.40	35.28 Kips	35.28 Kips
67.01 ft	Cohesionless	5582.62 psf	40.40	35.28 Kips	35.28 Kips
71.49 ft	Cohesionless	5885.46 psf	40.40	35.28 Kips	35.28 Kips
71.51 ft	Cohesionless	5886.82 psf	47.20	53.45 Kips	53.45 Kips
72.99 ft	Cohesionless	5986.86 psf	47.20	53.45 Kips	53.45 Kips
73.01 ft	Cohesionless	5988.22 psf	47.20	53.45 Kips	53.45 Kips
79.49 ft	Cohesionless	6426.26 psf	47.20	53.45 Kips	53.45 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
14.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.01 ft	0.02 Kips	14.24 Kips	14.26 Kips
22.49 ft	12.05 Kips	14.24 Kips	26.29 Kips
22.51 ft	12.12 Kips	22.09 Kips	34.21 Kips
22.59 ft	12.41 Kips	22.09 Kips	34.50 Kips
22.61 ft	12.48 Kips	22.09 Kips	34.57 Kips
26.49 ft	27.35 Kips	22.09 Kips	49.44 Kips
26.51 ft	27.42 Kips	38.48 Kips	65.91 Kips
31.49 ft	46.55 Kips	38.48 Kips	85.03 Kips
31.51 ft	46.64 Kips	35.28 Kips	81.91 Kips
40.51 ft	95.55 Kips	35.28 Kips	130.83 Kips
49.51 ft	153.06 Kips	35.28 Kips	188.34 Kips
51.49 ft	166.87 Kips	35.28 Kips	202.14 Kips
51.51 ft	167.02 Kips	78.59 Kips	245.62 Kips
56.49 ft	211.53 Kips	78.59 Kips	290.12 Kips
56.51 ft	211.70 Kips	35.28 Kips	246.98 Kips
65.51 ft	284.84 Kips	35.28 Kips	320.12 Kips
66.99 ft	297.69 Kips	35.28 Kips	332.97 Kips
67.01 ft	297.87 Kips	35.28 Kips	333.15 Kips
71.49 ft	338.20 Kips	35.28 Kips	373.47 Kips
71.51 ft	338.39 Kips	53.45 Kips	391.84 Kips
72.99 ft	353.64 Kips	53.45 Kips	407.10 Kips
73.01 ft	353.85 Kips	53.45 Kips	407.30 Kips
79.49 ft	423.68 Kips	53.45 Kips	477.13 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
14.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.01 ft	Cohesionless	2070.58 psf	19.33	N/A	0.02 Kips
22.49 ft	Cohesionless	2328.17 psf	19.33	N/A	10.00 Kips
22.51 ft	Cohesionless	2588.13 psf	20.66	N/A	10.07 Kips
22.59 ft	Cohesionless	2593.12 psf	20.66	N/A	10.36 Kips
22.61 ft	Cohesionless	2600.31 psf	20.66	N/A	10.44 Kips
26.49 ft	Cohesionless	2721.76 psf	20.66	N/A	25.30 Kips
26.51 ft	Cohesive	N/A	N/A	977.81 psf	25.35 Kips
31.49 ft	Cohesive	N/A	N/A	1047.53 psf	38.16 Kips
31.51 ft	Cohesionless	3157.48 psf	21.33	N/A	38.25 Kips
40.51 ft	Cohesionless	3461.68 psf	21.33	N/A	87.17 Kips
49.51 ft	Cohesionless	3765.88 psf	21.33	N/A	144.68 Kips
51.49 ft	Cohesionless	3832.80 psf	21.33	N/A	158.48 Kips
51.51 ft	Cohesionless	4509.50 psf	22.66	N/A	158.64 Kips
56.49 ft	Cohesionless	4690.28 psf	22.66	N/A	203.14 Kips
56.51 ft	Cohesionless	4872.48 psf	21.33	N/A	203.31 Kips
65.51 ft	Cohesionless	5176.68 psf	21.33	N/A	276.46 Kips
66.99 ft	Cohesionless	5226.70 psf	21.33	N/A	289.31 Kips
67.01 ft	Cohesionless	5582.28 psf	21.33	N/A	289.49 Kips
71.49 ft	Cohesionless	5733.70 psf	21.33	N/A	329.81 Kips
71.51 ft	Cohesionless	5886.48 psf	21.99	N/A	330.01 Kips
72.99 ft	Cohesionless	5936.50 psf	21.99	N/A	345.26 Kips
73.01 ft	Cohesionless	5987.88 psf	21.99	N/A	345.47 Kips
79.49 ft	Cohesionless	6206.90 psf	21.99	N/A	415.29 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
14.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.01 ft	Cohesionless	2071.15 psf	26.40	14.24 Kips	14.24 Kips
22.49 ft	Cohesionless	2586.35 psf	26.40	14.24 Kips	14.24 Kips
22.51 ft	Cohesionless	2588.75 psf	35.20	22.09 Kips	22.09 Kips
22.59 ft	Cohesionless	2598.75 psf	35.20	22.09 Kips	22.09 Kips
22.61 ft	Cohesionless	2600.63 psf	35.20	22.09 Kips	22.09 Kips
26.49 ft	Cohesionless	2843.51 psf	35.20	22.09 Kips	22.09 Kips
26.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.49 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.51 ft	Cohesionless	3157.82 psf	40.40	35.28 Kips	35.28 Kips
40.51 ft	Cohesionless	3766.22 psf	40.40	35.28 Kips	35.28 Kips
49.51 ft	Cohesionless	4374.62 psf	40.40	35.28 Kips	35.28 Kips
51.49 ft	Cohesionless	4508.46 psf	40.40	35.28 Kips	35.28 Kips
51.51 ft	Cohesionless	4509.87 psf	55.60	78.59 Kips	78.59 Kips
56.49 ft	Cohesionless	4871.41 psf	55.60	78.59 Kips	78.59 Kips
56.51 ft	Cohesionless	4872.82 psf	40.40	35.28 Kips	35.28 Kips
65.51 ft	Cohesionless	5481.22 psf	40.40	35.28 Kips	35.28 Kips
66.99 ft	Cohesionless	5581.26 psf	40.40	35.28 Kips	35.28 Kips
67.01 ft	Cohesionless	5582.62 psf	40.40	35.28 Kips	35.28 Kips
71.49 ft	Cohesionless	5885.46 psf	40.40	35.28 Kips	35.28 Kips
71.51 ft	Cohesionless	5886.82 psf	47.20	53.45 Kips	53.45 Kips
72.99 ft	Cohesionless	5986.86 psf	47.20	53.45 Kips	53.45 Kips
73.01 ft	Cohesionless	5988.22 psf	47.20	53.45 Kips	53.45 Kips
79.49 ft	Cohesionless	6426.26 psf	47.20	53.45 Kips	53.45 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
14.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.01 ft	0.02 Kips	14.24 Kips	14.26 Kips
22.49 ft	10.00 Kips	14.24 Kips	24.24 Kips
22.51 ft	10.07 Kips	22.09 Kips	32.16 Kips
22.59 ft	10.36 Kips	22.09 Kips	32.45 Kips
22.61 ft	10.44 Kips	22.09 Kips	32.53 Kips
26.49 ft	25.30 Kips	22.09 Kips	47.39 Kips
26.51 ft	25.35 Kips	38.48 Kips	63.83 Kips
31.49 ft	38.16 Kips	38.48 Kips	76.65 Kips
31.51 ft	38.25 Kips	35.28 Kips	73.53 Kips
40.51 ft	87.17 Kips	35.28 Kips	122.44 Kips
49.51 ft	144.68 Kips	35.28 Kips	179.95 Kips
51.49 ft	158.48 Kips	35.28 Kips	193.76 Kips
51.51 ft	158.64 Kips	78.59 Kips	237.23 Kips
56.49 ft	203.14 Kips	78.59 Kips	281.74 Kips
56.51 ft	203.31 Kips	35.28 Kips	238.59 Kips
65.51 ft	276.46 Kips	35.28 Kips	311.74 Kips
66.99 ft	289.31 Kips	35.28 Kips	324.59 Kips
67.01 ft	289.49 Kips	35.28 Kips	324.76 Kips
71.49 ft	329.81 Kips	35.28 Kips	365.09 Kips
71.51 ft	330.01 Kips	53.45 Kips	383.46 Kips
72.99 ft	345.26 Kips	53.45 Kips	398.71 Kips
73.01 ft	345.47 Kips	53.45 Kips	398.92 Kips
79.49 ft	415.29 Kips	53.45 Kips	468.74 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
14.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
18.00 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
18.01 ft	Cohesionless	2070.58 psf	19.33	N/A	0.02 Kips
22.49 ft	Cohesionless	2328.17 psf	19.33	N/A	12.05 Kips
22.51 ft	Cohesionless	2588.13 psf	20.66	N/A	12.12 Kips
22.59 ft	Cohesionless	2593.12 psf	20.66	N/A	12.41 Kips
22.61 ft	Cohesionless	2600.31 psf	20.66	N/A	12.48 Kips
26.49 ft	Cohesionless	2721.76 psf	20.66	N/A	27.35 Kips
26.51 ft	Cohesive	N/A	N/A	977.81 psf	27.42 Kips
31.49 ft	Cohesive	N/A	N/A	1047.53 psf	46.55 Kips
31.51 ft	Cohesionless	3157.48 psf	21.33	N/A	46.64 Kips
40.51 ft	Cohesionless	3461.68 psf	21.33	N/A	95.55 Kips
49.51 ft	Cohesionless	3765.88 psf	21.33	N/A	153.06 Kips
51.49 ft	Cohesionless	3832.80 psf	21.33	N/A	166.87 Kips
51.51 ft	Cohesionless	4509.50 psf	22.66	N/A	167.02 Kips
56.49 ft	Cohesionless	4690.28 psf	22.66	N/A	211.53 Kips
56.51 ft	Cohesionless	4872.48 psf	21.33	N/A	211.70 Kips
65.51 ft	Cohesionless	5176.68 psf	21.33	N/A	284.84 Kips
66.99 ft	Cohesionless	5226.70 psf	21.33	N/A	297.69 Kips
67.01 ft	Cohesionless	5582.28 psf	21.33	N/A	297.87 Kips
71.49 ft	Cohesionless	5733.70 psf	21.33	N/A	338.20 Kips
71.51 ft	Cohesionless	5886.48 psf	21.99	N/A	338.39 Kips
72.99 ft	Cohesionless	5936.50 psf	21.99	N/A	353.64 Kips
73.01 ft	Cohesionless	5987.88 psf	21.99	N/A	353.85 Kips
79.49 ft	Cohesionless	6206.90 psf	21.99	N/A	423.68 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
14.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.99 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
18.00 ft	Cohesionless	2070.00 psf	0.00	0.00 Kips	0.00 Kips
18.01 ft	Cohesionless	2071.15 psf	26.40	14.24 Kips	14.24 Kips
22.49 ft	Cohesionless	2586.35 psf	26.40	14.24 Kips	14.24 Kips
22.51 ft	Cohesionless	2588.75 psf	35.20	22.09 Kips	22.09 Kips
22.59 ft	Cohesionless	2598.75 psf	35.20	22.09 Kips	22.09 Kips
22.61 ft	Cohesionless	2600.63 psf	35.20	22.09 Kips	22.09 Kips
26.49 ft	Cohesionless	2843.51 psf	35.20	22.09 Kips	22.09 Kips
26.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.49 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.51 ft	Cohesionless	3157.82 psf	40.40	35.28 Kips	35.28 Kips
40.51 ft	Cohesionless	3766.22 psf	40.40	35.28 Kips	35.28 Kips
49.51 ft	Cohesionless	4374.62 psf	40.40	35.28 Kips	35.28 Kips
51.49 ft	Cohesionless	4508.46 psf	40.40	35.28 Kips	35.28 Kips
51.51 ft	Cohesionless	4509.87 psf	55.60	78.59 Kips	78.59 Kips
56.49 ft	Cohesionless	4871.41 psf	55.60	78.59 Kips	78.59 Kips
56.51 ft	Cohesionless	4872.82 psf	40.40	35.28 Kips	35.28 Kips
65.51 ft	Cohesionless	5481.22 psf	40.40	35.28 Kips	35.28 Kips
66.99 ft	Cohesionless	5581.26 psf	40.40	35.28 Kips	35.28 Kips
67.01 ft	Cohesionless	5582.62 psf	40.40	35.28 Kips	35.28 Kips
71.49 ft	Cohesionless	5885.46 psf	40.40	35.28 Kips	35.28 Kips
71.51 ft	Cohesionless	5886.82 psf	47.20	53.45 Kips	53.45 Kips
72.99 ft	Cohesionless	5986.86 psf	47.20	53.45 Kips	53.45 Kips
73.01 ft	Cohesionless	5988.22 psf	47.20	53.45 Kips	53.45 Kips
79.49 ft	Cohesionless	6426.26 psf	47.20	53.45 Kips	53.45 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
14.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.00 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.01 ft	0.02 Kips	14.24 Kips	14.26 Kips
22.49 ft	12.05 Kips	14.24 Kips	26.29 Kips
22.51 ft	12.12 Kips	22.09 Kips	34.21 Kips
22.59 ft	12.41 Kips	22.09 Kips	34.50 Kips
22.61 ft	12.48 Kips	22.09 Kips	34.57 Kips
26.49 ft	27.35 Kips	22.09 Kips	49.44 Kips
26.51 ft	27.42 Kips	38.48 Kips	65.91 Kips
31.49 ft	46.55 Kips	38.48 Kips	85.03 Kips
31.51 ft	46.64 Kips	35.28 Kips	81.91 Kips
40.51 ft	95.55 Kips	35.28 Kips	130.83 Kips
49.51 ft	153.06 Kips	35.28 Kips	188.34 Kips
51.49 ft	166.87 Kips	35.28 Kips	202.14 Kips
51.51 ft	167.02 Kips	78.59 Kips	245.62 Kips
56.49 ft	211.53 Kips	78.59 Kips	290.12 Kips
56.51 ft	211.70 Kips	35.28 Kips	246.98 Kips
65.51 ft	284.84 Kips	35.28 Kips	320.12 Kips
66.99 ft	297.69 Kips	35.28 Kips	332.97 Kips
67.01 ft	297.87 Kips	35.28 Kips	333.15 Kips
71.49 ft	338.20 Kips	35.28 Kips	373.47 Kips
71.51 ft	338.39 Kips	53.45 Kips	391.84 Kips
72.99 ft	353.64 Kips	53.45 Kips	407.10 Kips
73.01 ft	353.85 Kips	53.45 Kips	407.30 Kips
79.49 ft	423.68 Kips	53.45 Kips	477.13 Kips

DRIVEN 1.2 Forward Abutment - Preload Site Capacity

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-172-~1.DVN
Project Name: B-172 - Forward Abutment Project Date: 11/07/2014
Project Client: EMHT
Computed By: BRT
Project Manager: JPS

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 14.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	22.60 ft
	- Driving/Restrike	22.60 ft
	- Ultimate:	22.60 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	5.50 ft	33.00%	115.00 pcf	1750.00 psf	T-79 Steel
2	Cohesive	12.50 ft	50.00%	115.00 pcf	1250.00 psf	T-79 Steel
3	Cohesionless	4.50 ft	17.00%	115.00 pcf	29.0/29.0	Nordlund
4	Cohesionless	4.00 ft	0.00%	125.00 pcf	31.0/31.0	Nordlund
5	Cohesive	5.00 ft	33.00%	125.00 pcf	4000.00 psf	T-79 Steel
6	Cohesionless	20.00 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
7	Cohesionless	5.00 ft	0.00%	135.00 pcf	34.0/34.0	Nordlund
8	Cohesionless	10.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
9	Cohesionless	4.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
10	Cohesionless	1.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
11	Cohesionless	6.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	0.04 Kips
5.49 ft	Cohesive	N/A	N/A	1140.00 psf	22.94 Kips
5.51 ft	Cohesive	N/A	N/A	930.00 psf	23.01 Kips
14.51 ft	Cohesive	N/A	N/A	945.64 psf	54.21 Kips
17.99 ft	Cohesive	N/A	N/A	964.78 psf	67.15 Kips
18.01 ft	Cohesionless	2070.58 psf	19.33	N/A	67.21 Kips
22.49 ft	Cohesionless	2328.17 psf	19.33	N/A	79.24 Kips
22.51 ft	Cohesionless	2588.13 psf	20.66	N/A	79.30 Kips
22.59 ft	Cohesionless	2593.12 psf	20.66	N/A	79.60 Kips
22.61 ft	Cohesionless	2600.31 psf	20.66	N/A	79.67 Kips
26.49 ft	Cohesionless	2721.76 psf	20.66	N/A	94.53 Kips
26.51 ft	Cohesive	N/A	N/A	977.81 psf	94.61 Kips
31.49 ft	Cohesive	N/A	N/A	1047.53 psf	113.73 Kips
31.51 ft	Cohesionless	3157.48 psf	21.33	N/A	113.82 Kips
40.51 ft	Cohesionless	3461.68 psf	21.33	N/A	162.74 Kips
49.51 ft	Cohesionless	3765.88 psf	21.33	N/A	220.25 Kips
51.49 ft	Cohesionless	3832.80 psf	21.33	N/A	234.05 Kips
51.51 ft	Cohesionless	4509.50 psf	22.66	N/A	234.21 Kips
56.49 ft	Cohesionless	4690.28 psf	22.66	N/A	278.71 Kips
56.51 ft	Cohesionless	4872.48 psf	21.33	N/A	278.88 Kips
65.51 ft	Cohesionless	5176.68 psf	21.33	N/A	352.03 Kips
66.99 ft	Cohesionless	5226.70 psf	21.33	N/A	364.88 Kips
67.01 ft	Cohesionless	5582.28 psf	21.33	N/A	365.05 Kips
71.49 ft	Cohesionless	5733.70 psf	21.33	N/A	405.38 Kips
71.51 ft	Cohesionless	5886.48 psf	21.99	N/A	405.58 Kips
72.99 ft	Cohesionless	5936.50 psf	21.99	N/A	420.83 Kips
73.01 ft	Cohesionless	5987.88 psf	21.99	N/A	421.04 Kips
79.49 ft	Cohesionless	6206.90 psf	21.99	N/A	490.86 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
5.49 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
5.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
14.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
17.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
18.01 ft	Cohesionless	2071.15 psf	26.40	14.24 Kips	14.24 Kips
22.49 ft	Cohesionless	2586.35 psf	26.40	14.24 Kips	14.24 Kips
22.51 ft	Cohesionless	2588.75 psf	35.20	22.09 Kips	22.09 Kips
22.59 ft	Cohesionless	2598.75 psf	35.20	22.09 Kips	22.09 Kips
22.61 ft	Cohesionless	2600.63 psf	35.20	22.09 Kips	22.09 Kips
26.49 ft	Cohesionless	2843.51 psf	35.20	22.09 Kips	22.09 Kips
26.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.49 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.51 ft	Cohesionless	3157.82 psf	40.40	35.28 Kips	35.28 Kips
40.51 ft	Cohesionless	3766.22 psf	40.40	35.28 Kips	35.28 Kips
49.51 ft	Cohesionless	4374.62 psf	40.40	35.28 Kips	35.28 Kips
51.49 ft	Cohesionless	4508.46 psf	40.40	35.28 Kips	35.28 Kips
51.51 ft	Cohesionless	4509.87 psf	55.60	78.59 Kips	78.59 Kips
56.49 ft	Cohesionless	4871.41 psf	55.60	78.59 Kips	78.59 Kips
56.51 ft	Cohesionless	4872.82 psf	40.40	35.28 Kips	35.28 Kips
65.51 ft	Cohesionless	5481.22 psf	40.40	35.28 Kips	35.28 Kips
66.99 ft	Cohesionless	5581.26 psf	40.40	35.28 Kips	35.28 Kips
67.01 ft	Cohesionless	5582.62 psf	40.40	35.28 Kips	35.28 Kips
71.49 ft	Cohesionless	5885.46 psf	40.40	35.28 Kips	35.28 Kips
71.51 ft	Cohesionless	5886.82 psf	47.20	53.45 Kips	53.45 Kips
72.99 ft	Cohesionless	5986.86 psf	47.20	53.45 Kips	53.45 Kips
73.01 ft	Cohesionless	5988.22 psf	47.20	53.45 Kips	53.45 Kips
79.49 ft	Cohesionless	6426.26 psf	47.20	53.45 Kips	53.45 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.04 Kips	16.84 Kips	16.88 Kips
5.49 ft	22.94 Kips	16.84 Kips	39.78 Kips
5.51 ft	23.01 Kips	12.03 Kips	35.04 Kips
14.51 ft	54.21 Kips	12.03 Kips	66.24 Kips
17.99 ft	67.15 Kips	12.03 Kips	79.17 Kips
18.01 ft	67.21 Kips	14.24 Kips	81.45 Kips
22.49 ft	79.24 Kips	14.24 Kips	93.48 Kips
22.51 ft	79.30 Kips	22.09 Kips	101.39 Kips
22.59 ft	79.60 Kips	22.09 Kips	101.69 Kips
22.61 ft	79.67 Kips	22.09 Kips	101.76 Kips
26.49 ft	94.53 Kips	22.09 Kips	116.62 Kips
26.51 ft	94.61 Kips	38.48 Kips	133.09 Kips
31.49 ft	113.73 Kips	38.48 Kips	152.22 Kips
31.51 ft	113.82 Kips	35.28 Kips	149.10 Kips
40.51 ft	162.74 Kips	35.28 Kips	198.01 Kips
49.51 ft	220.25 Kips	35.28 Kips	255.52 Kips
51.49 ft	234.05 Kips	35.28 Kips	269.33 Kips
51.51 ft	234.21 Kips	78.59 Kips	312.80 Kips
56.49 ft	278.71 Kips	78.59 Kips	357.31 Kips
56.51 ft	278.88 Kips	35.28 Kips	314.16 Kips
65.51 ft	352.03 Kips	35.28 Kips	387.30 Kips
66.99 ft	364.88 Kips	35.28 Kips	400.16 Kips
67.01 ft	365.05 Kips	35.28 Kips	400.33 Kips
71.49 ft	405.38 Kips	35.28 Kips	440.66 Kips
71.51 ft	405.58 Kips	53.45 Kips	459.03 Kips
72.99 ft	420.83 Kips	53.45 Kips	474.28 Kips
73.01 ft	421.04 Kips	53.45 Kips	474.49 Kips
79.49 ft	490.86 Kips	53.45 Kips	544.31 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	0.03 Kips
5.49 ft	Cohesive	N/A	N/A	1140.00 psf	15.37 Kips
5.51 ft	Cohesive	N/A	N/A	930.00 psf	15.41 Kips
14.51 ft	Cohesive	N/A	N/A	945.64 psf	31.00 Kips
17.99 ft	Cohesive	N/A	N/A	964.78 psf	37.47 Kips
18.01 ft	Cohesionless	2070.58 psf	19.33	N/A	37.52 Kips
22.49 ft	Cohesionless	2328.17 psf	19.33	N/A	47.51 Kips
22.51 ft	Cohesionless	2588.13 psf	20.66	N/A	47.57 Kips
22.59 ft	Cohesionless	2593.12 psf	20.66	N/A	47.87 Kips
22.61 ft	Cohesionless	2600.31 psf	20.66	N/A	47.94 Kips
26.49 ft	Cohesionless	2721.76 psf	20.66	N/A	62.80 Kips
26.51 ft	Cohesive	N/A	N/A	977.81 psf	62.85 Kips
31.49 ft	Cohesive	N/A	N/A	1047.53 psf	75.67 Kips
31.51 ft	Cohesionless	3157.48 psf	21.33	N/A	75.76 Kips
40.51 ft	Cohesionless	3461.68 psf	21.33	N/A	124.67 Kips
49.51 ft	Cohesionless	3765.88 psf	21.33	N/A	182.18 Kips
51.49 ft	Cohesionless	3832.80 psf	21.33	N/A	195.99 Kips
51.51 ft	Cohesionless	4509.50 psf	22.66	N/A	196.14 Kips
56.49 ft	Cohesionless	4690.28 psf	22.66	N/A	240.65 Kips
56.51 ft	Cohesionless	4872.48 psf	21.33	N/A	240.82 Kips
65.51 ft	Cohesionless	5176.68 psf	21.33	N/A	313.96 Kips
66.99 ft	Cohesionless	5226.70 psf	21.33	N/A	326.81 Kips
67.01 ft	Cohesionless	5582.28 psf	21.33	N/A	326.99 Kips
71.49 ft	Cohesionless	5733.70 psf	21.33	N/A	367.32 Kips
71.51 ft	Cohesionless	5886.48 psf	21.99	N/A	367.51 Kips
72.99 ft	Cohesionless	5936.50 psf	21.99	N/A	382.76 Kips
73.01 ft	Cohesionless	5987.88 psf	21.99	N/A	382.97 Kips
79.49 ft	Cohesionless	6206.90 psf	21.99	N/A	452.80 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
5.49 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
5.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
14.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
17.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
18.01 ft	Cohesionless	2071.15 psf	26.40	14.24 Kips	14.24 Kips
22.49 ft	Cohesionless	2586.35 psf	26.40	14.24 Kips	14.24 Kips
22.51 ft	Cohesionless	2588.75 psf	35.20	22.09 Kips	22.09 Kips
22.59 ft	Cohesionless	2598.75 psf	35.20	22.09 Kips	22.09 Kips
22.61 ft	Cohesionless	2600.63 psf	35.20	22.09 Kips	22.09 Kips
26.49 ft	Cohesionless	2843.51 psf	35.20	22.09 Kips	22.09 Kips
26.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.49 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.51 ft	Cohesionless	3157.82 psf	40.40	35.28 Kips	35.28 Kips
40.51 ft	Cohesionless	3766.22 psf	40.40	35.28 Kips	35.28 Kips
49.51 ft	Cohesionless	4374.62 psf	40.40	35.28 Kips	35.28 Kips
51.49 ft	Cohesionless	4508.46 psf	40.40	35.28 Kips	35.28 Kips
51.51 ft	Cohesionless	4509.87 psf	55.60	78.59 Kips	78.59 Kips
56.49 ft	Cohesionless	4871.41 psf	55.60	78.59 Kips	78.59 Kips
56.51 ft	Cohesionless	4872.82 psf	40.40	35.28 Kips	35.28 Kips
65.51 ft	Cohesionless	5481.22 psf	40.40	35.28 Kips	35.28 Kips
66.99 ft	Cohesionless	5581.26 psf	40.40	35.28 Kips	35.28 Kips
67.01 ft	Cohesionless	5582.62 psf	40.40	35.28 Kips	35.28 Kips
71.49 ft	Cohesionless	5885.46 psf	40.40	35.28 Kips	35.28 Kips
71.51 ft	Cohesionless	5886.82 psf	47.20	53.45 Kips	53.45 Kips
72.99 ft	Cohesionless	5986.86 psf	47.20	53.45 Kips	53.45 Kips
73.01 ft	Cohesionless	5988.22 psf	47.20	53.45 Kips	53.45 Kips
79.49 ft	Cohesionless	6426.26 psf	47.20	53.45 Kips	53.45 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.03 Kips	16.84 Kips	16.86 Kips
5.49 ft	15.37 Kips	16.84 Kips	32.21 Kips
5.51 ft	15.41 Kips	12.03 Kips	27.43 Kips
14.51 ft	31.00 Kips	12.03 Kips	43.03 Kips
17.99 ft	37.47 Kips	12.03 Kips	49.50 Kips
18.01 ft	37.52 Kips	14.24 Kips	51.76 Kips
22.49 ft	47.51 Kips	14.24 Kips	61.75 Kips
22.51 ft	47.57 Kips	22.09 Kips	69.66 Kips
22.59 ft	47.87 Kips	22.09 Kips	69.96 Kips
22.61 ft	47.94 Kips	22.09 Kips	70.03 Kips
26.49 ft	62.80 Kips	22.09 Kips	84.89 Kips
26.51 ft	62.85 Kips	38.48 Kips	101.34 Kips
31.49 ft	75.67 Kips	38.48 Kips	114.15 Kips
31.51 ft	75.76 Kips	35.28 Kips	111.03 Kips
40.51 ft	124.67 Kips	35.28 Kips	159.95 Kips
49.51 ft	182.18 Kips	35.28 Kips	217.46 Kips
51.49 ft	195.99 Kips	35.28 Kips	231.26 Kips
51.51 ft	196.14 Kips	78.59 Kips	274.74 Kips
56.49 ft	240.65 Kips	78.59 Kips	319.24 Kips
56.51 ft	240.82 Kips	35.28 Kips	276.10 Kips
65.51 ft	313.96 Kips	35.28 Kips	349.24 Kips
66.99 ft	326.81 Kips	35.28 Kips	362.09 Kips
67.01 ft	326.99 Kips	35.28 Kips	362.27 Kips
71.49 ft	367.32 Kips	35.28 Kips	402.59 Kips
71.51 ft	367.51 Kips	53.45 Kips	420.96 Kips
72.99 ft	382.76 Kips	53.45 Kips	436.22 Kips
73.01 ft	382.97 Kips	53.45 Kips	436.42 Kips
79.49 ft	452.80 Kips	53.45 Kips	506.25 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	0.04 Kips
5.49 ft	Cohesive	N/A	N/A	1140.00 psf	22.94 Kips
5.51 ft	Cohesive	N/A	N/A	930.00 psf	23.01 Kips
14.51 ft	Cohesive	N/A	N/A	945.64 psf	54.21 Kips
17.99 ft	Cohesive	N/A	N/A	964.78 psf	67.15 Kips
18.01 ft	Cohesionless	2070.58 psf	19.33	N/A	67.21 Kips
22.49 ft	Cohesionless	2328.17 psf	19.33	N/A	79.24 Kips
22.51 ft	Cohesionless	2588.13 psf	20.66	N/A	79.30 Kips
22.59 ft	Cohesionless	2593.12 psf	20.66	N/A	79.60 Kips
22.61 ft	Cohesionless	2600.31 psf	20.66	N/A	79.67 Kips
26.49 ft	Cohesionless	2721.76 psf	20.66	N/A	94.53 Kips
26.51 ft	Cohesive	N/A	N/A	977.81 psf	94.61 Kips
31.49 ft	Cohesive	N/A	N/A	1047.53 psf	113.73 Kips
31.51 ft	Cohesionless	3157.48 psf	21.33	N/A	113.82 Kips
40.51 ft	Cohesionless	3461.68 psf	21.33	N/A	162.74 Kips
49.51 ft	Cohesionless	3765.88 psf	21.33	N/A	220.25 Kips
51.49 ft	Cohesionless	3832.80 psf	21.33	N/A	234.05 Kips
51.51 ft	Cohesionless	4509.50 psf	22.66	N/A	234.21 Kips
56.49 ft	Cohesionless	4690.28 psf	22.66	N/A	278.71 Kips
56.51 ft	Cohesionless	4872.48 psf	21.33	N/A	278.88 Kips
65.51 ft	Cohesionless	5176.68 psf	21.33	N/A	352.03 Kips
66.99 ft	Cohesionless	5226.70 psf	21.33	N/A	364.88 Kips
67.01 ft	Cohesionless	5582.28 psf	21.33	N/A	365.05 Kips
71.49 ft	Cohesionless	5733.70 psf	21.33	N/A	405.38 Kips
71.51 ft	Cohesionless	5886.48 psf	21.99	N/A	405.58 Kips
72.99 ft	Cohesionless	5936.50 psf	21.99	N/A	420.83 Kips
73.01 ft	Cohesionless	5987.88 psf	21.99	N/A	421.04 Kips
79.49 ft	Cohesionless	6206.90 psf	21.99	N/A	490.86 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
5.49 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
5.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
14.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
17.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
18.01 ft	Cohesionless	2071.15 psf	26.40	14.24 Kips	14.24 Kips
22.49 ft	Cohesionless	2586.35 psf	26.40	14.24 Kips	14.24 Kips
22.51 ft	Cohesionless	2588.75 psf	35.20	22.09 Kips	22.09 Kips
22.59 ft	Cohesionless	2598.75 psf	35.20	22.09 Kips	22.09 Kips
22.61 ft	Cohesionless	2600.63 psf	35.20	22.09 Kips	22.09 Kips
26.49 ft	Cohesionless	2843.51 psf	35.20	22.09 Kips	22.09 Kips
26.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.49 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
31.51 ft	Cohesionless	3157.82 psf	40.40	35.28 Kips	35.28 Kips
40.51 ft	Cohesionless	3766.22 psf	40.40	35.28 Kips	35.28 Kips
49.51 ft	Cohesionless	4374.62 psf	40.40	35.28 Kips	35.28 Kips
51.49 ft	Cohesionless	4508.46 psf	40.40	35.28 Kips	35.28 Kips
51.51 ft	Cohesionless	4509.87 psf	55.60	78.59 Kips	78.59 Kips
56.49 ft	Cohesionless	4871.41 psf	55.60	78.59 Kips	78.59 Kips
56.51 ft	Cohesionless	4872.82 psf	40.40	35.28 Kips	35.28 Kips
65.51 ft	Cohesionless	5481.22 psf	40.40	35.28 Kips	35.28 Kips
66.99 ft	Cohesionless	5581.26 psf	40.40	35.28 Kips	35.28 Kips
67.01 ft	Cohesionless	5582.62 psf	40.40	35.28 Kips	35.28 Kips
71.49 ft	Cohesionless	5885.46 psf	40.40	35.28 Kips	35.28 Kips
71.51 ft	Cohesionless	5886.82 psf	47.20	53.45 Kips	53.45 Kips
72.99 ft	Cohesionless	5986.86 psf	47.20	53.45 Kips	53.45 Kips
73.01 ft	Cohesionless	5988.22 psf	47.20	53.45 Kips	53.45 Kips
79.49 ft	Cohesionless	6426.26 psf	47.20	53.45 Kips	53.45 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.04 Kips	16.84 Kips	16.88 Kips
5.49 ft	22.94 Kips	16.84 Kips	39.78 Kips
5.51 ft	23.01 Kips	12.03 Kips	35.04 Kips
14.51 ft	54.21 Kips	12.03 Kips	66.24 Kips
17.99 ft	67.15 Kips	12.03 Kips	79.17 Kips
18.01 ft	67.21 Kips	14.24 Kips	81.45 Kips
22.49 ft	79.24 Kips	14.24 Kips	93.48 Kips
22.51 ft	79.30 Kips	22.09 Kips	101.39 Kips
22.59 ft	79.60 Kips	22.09 Kips	101.69 Kips
22.61 ft	79.67 Kips	22.09 Kips	101.76 Kips
26.49 ft	94.53 Kips	22.09 Kips	116.62 Kips
26.51 ft	94.61 Kips	38.48 Kips	133.09 Kips
31.49 ft	113.73 Kips	38.48 Kips	152.22 Kips
31.51 ft	113.82 Kips	35.28 Kips	149.10 Kips
40.51 ft	162.74 Kips	35.28 Kips	198.01 Kips
49.51 ft	220.25 Kips	35.28 Kips	255.52 Kips
51.49 ft	234.05 Kips	35.28 Kips	269.33 Kips
51.51 ft	234.21 Kips	78.59 Kips	312.80 Kips
56.49 ft	278.71 Kips	78.59 Kips	357.31 Kips
56.51 ft	278.88 Kips	35.28 Kips	314.16 Kips
65.51 ft	352.03 Kips	35.28 Kips	387.30 Kips
66.99 ft	364.88 Kips	35.28 Kips	400.16 Kips
67.01 ft	365.05 Kips	35.28 Kips	400.33 Kips
71.49 ft	405.38 Kips	35.28 Kips	440.66 Kips
71.51 ft	405.58 Kips	53.45 Kips	459.03 Kips
72.99 ft	420.83 Kips	53.45 Kips	474.28 Kips
73.01 ft	421.04 Kips	53.45 Kips	474.49 Kips
79.49 ft	490.86 Kips	53.45 Kips	544.31 Kips

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-172-~1.DVN
Project Name: B-172 - Forward Wingwall
Project Date: 11/07/2014
Project Client: EMHT
Computed By: BRT
Project Manager: JPS

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	24.60 ft
	- Driving/Restrike	24.60 ft
	- Ultimate:	24.60 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil: (Downdrag Condition)	20.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	7.50 ft	33.00%	115.00 pcf	1750.00 psf	T-79 Steel
2	Cohesive	12.50 ft	50.00%	115.00 pcf	1250.00 psf	T-79 Steel
3	Cohesionless	4.50 ft	17.00%	115.00 pcf	29.0/29.0	Nordlund
4	Cohesionless	4.00 ft	0.00%	125.00 pcf	31.0/31.0	Nordlund
5	Cohesive	5.00 ft	33.00%	125.00 pcf	4000.00 psf	T-79 Steel
6	Cohesionless	20.00 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
7	Cohesionless	5.00 ft	0.00%	135.00 pcf	34.0/34.0	Nordlund
8	Cohesionless	4.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
9	Cohesionless	10.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
10	Cohesionless	7.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
11	Cohesionless	0.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	0.04 Kips
7.49 ft	Cohesive	N/A	N/A	1140.00 psf	26.82 Kips
7.51 ft	Cohesive	N/A	N/A	930.00 psf	26.89 Kips
16.51 ft	Cohesive	N/A	N/A	971.77 psf	54.37 Kips
19.99 ft	Cohesive	N/A	N/A	994.10 psf	65.87 Kips
20.01 ft	Cohesionless	2300.58 psf	17.05	N/A	65.92 Kips
24.49 ft	Cohesionless	2558.17 psf	17.05	N/A	75.11 Kips
24.51 ft	Cohesionless	2818.13 psf	18.23	N/A	75.16 Kips
24.59 ft	Cohesionless	2823.12 psf	18.23	N/A	75.38 Kips
24.61 ft	Cohesionless	2830.31 psf	18.23	N/A	75.44 Kips
28.49 ft	Cohesionless	2951.76 psf	18.23	N/A	86.53 Kips
28.51 ft	Cohesive	N/A	N/A	1072.33 psf	86.59 Kips
33.49 ft	Cohesive	N/A	N/A	1153.67 psf	104.64 Kips
33.51 ft	Cohesionless	3387.48 psf	18.82	N/A	104.72 Kips
42.51 ft	Cohesionless	3691.68 psf	18.82	N/A	140.38 Kips
51.51 ft	Cohesionless	3995.88 psf	18.82	N/A	181.92 Kips
53.49 ft	Cohesionless	4062.80 psf	18.82	N/A	191.85 Kips
53.51 ft	Cohesionless	4739.50 psf	19.99	N/A	191.96 Kips
58.49 ft	Cohesionless	4920.28 psf	19.99	N/A	223.50 Kips
58.51 ft	Cohesionless	5102.48 psf	18.82	N/A	223.62 Kips
62.99 ft	Cohesionless	5253.90 psf	18.82	N/A	248.88 Kips
63.01 ft	Cohesionless	5406.68 psf	18.82	N/A	249.00 Kips
72.01 ft	Cohesionless	5710.88 psf	18.82	N/A	304.17 Kips
73.49 ft	Cohesionless	5760.90 psf	18.82	N/A	313.80 Kips
73.51 ft	Cohesionless	6116.48 psf	19.41	N/A	313.94 Kips
80.99 ft	Cohesionless	6369.30 psf	19.41	N/A	370.14 Kips
81.01 ft	Cohesionless	6623.48 psf	19.41	N/A	370.30 Kips
81.49 ft	Cohesionless	6639.70 psf	19.41	N/A	374.06 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
7.49 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
7.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
16.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
19.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
20.01 ft	Cohesionless	2301.15 psf	26.40	10.46 Kips	10.46 Kips
24.49 ft	Cohesionless	2816.35 psf	26.40	10.46 Kips	10.46 Kips
24.51 ft	Cohesionless	2818.75 psf	35.20	16.23 Kips	16.23 Kips
24.59 ft	Cohesionless	2828.75 psf	35.20	16.23 Kips	16.23 Kips
24.61 ft	Cohesionless	2830.63 psf	35.20	16.23 Kips	16.23 Kips
28.49 ft	Cohesionless	3073.51 psf	35.20	16.23 Kips	16.23 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.51 ft	Cohesionless	3387.82 psf	40.40	25.92 Kips	25.92 Kips
42.51 ft	Cohesionless	3996.22 psf	40.40	25.92 Kips	25.92 Kips
51.51 ft	Cohesionless	4604.62 psf	40.40	25.92 Kips	25.92 Kips
53.49 ft	Cohesionless	4738.46 psf	40.40	25.92 Kips	25.92 Kips
53.51 ft	Cohesionless	4739.87 psf	55.60	57.74 Kips	57.74 Kips
58.49 ft	Cohesionless	5101.41 psf	55.60	57.74 Kips	57.74 Kips
58.51 ft	Cohesionless	5102.82 psf	40.40	25.92 Kips	25.92 Kips
62.99 ft	Cohesionless	5405.66 psf	40.40	25.92 Kips	25.92 Kips
63.01 ft	Cohesionless	5407.02 psf	40.40	25.92 Kips	25.92 Kips
72.01 ft	Cohesionless	6015.42 psf	40.40	25.92 Kips	25.92 Kips
73.49 ft	Cohesionless	6115.46 psf	40.40	25.92 Kips	25.92 Kips
73.51 ft	Cohesionless	6116.82 psf	47.20	39.27 Kips	39.27 Kips
80.99 ft	Cohesionless	6622.46 psf	47.20	39.27 Kips	39.27 Kips
81.01 ft	Cohesionless	6623.82 psf	47.20	39.27 Kips	39.27 Kips
81.49 ft	Cohesionless	6656.26 psf	47.20	39.27 Kips	39.27 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.04 Kips	12.37 Kips	12.41 Kips
7.49 ft	26.82 Kips	12.37 Kips	39.19 Kips
7.51 ft	26.89 Kips	8.84 Kips	35.73 Kips
16.51 ft	54.37 Kips	8.84 Kips	63.20 Kips
19.99 ft	65.87 Kips	8.84 Kips	74.70 Kips
20.01 ft	65.92 Kips	10.46 Kips	76.38 Kips
24.49 ft	75.11 Kips	10.46 Kips	85.58 Kips
24.51 ft	75.16 Kips	16.23 Kips	91.39 Kips
24.59 ft	75.38 Kips	16.23 Kips	91.61 Kips
24.61 ft	75.44 Kips	16.23 Kips	91.67 Kips
28.49 ft	86.53 Kips	16.23 Kips	102.76 Kips
28.51 ft	86.59 Kips	28.27 Kips	114.87 Kips
33.49 ft	104.64 Kips	28.27 Kips	132.92 Kips
33.51 ft	104.72 Kips	25.92 Kips	130.64 Kips
42.51 ft	140.38 Kips	25.92 Kips	166.30 Kips
51.51 ft	181.92 Kips	25.92 Kips	207.84 Kips
53.49 ft	191.85 Kips	25.92 Kips	217.76 Kips
53.51 ft	191.96 Kips	57.74 Kips	249.70 Kips
58.49 ft	223.50 Kips	57.74 Kips	281.24 Kips
58.51 ft	223.62 Kips	25.92 Kips	249.54 Kips
62.99 ft	248.88 Kips	25.92 Kips	274.80 Kips
63.01 ft	249.00 Kips	25.92 Kips	274.92 Kips
72.01 ft	304.17 Kips	25.92 Kips	330.08 Kips
73.49 ft	313.80 Kips	25.92 Kips	339.72 Kips
73.51 ft	313.94 Kips	39.27 Kips	353.21 Kips
80.99 ft	370.14 Kips	39.27 Kips	409.41 Kips
81.01 ft	370.30 Kips	39.27 Kips	409.57 Kips
81.49 ft	374.06 Kips	39.27 Kips	413.33 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	0.02 Kips
7.49 ft	Cohesive	N/A	N/A	1140.00 psf	17.97 Kips
7.51 ft	Cohesive	N/A	N/A	930.00 psf	18.01 Kips
16.51 ft	Cohesive	N/A	N/A	971.77 psf	31.74 Kips
19.99 ft	Cohesive	N/A	N/A	994.10 psf	37.49 Kips
20.01 ft	Cohesionless	2300.58 psf	17.05	N/A	37.54 Kips
24.49 ft	Cohesionless	2558.17 psf	17.05	N/A	45.17 Kips
24.51 ft	Cohesionless	2818.13 psf	18.23	N/A	45.22 Kips
24.59 ft	Cohesionless	2823.12 psf	18.23	N/A	45.44 Kips
24.61 ft	Cohesionless	2830.31 psf	18.23	N/A	45.49 Kips
28.49 ft	Cohesionless	2951.76 psf	18.23	N/A	56.58 Kips
28.51 ft	Cohesive	N/A	N/A	1072.33 psf	56.63 Kips
33.49 ft	Cohesive	N/A	N/A	1153.67 psf	68.72 Kips
33.51 ft	Cohesionless	3387.48 psf	18.82	N/A	68.79 Kips
42.51 ft	Cohesionless	3691.68 psf	18.82	N/A	104.46 Kips
51.51 ft	Cohesionless	3995.88 psf	18.82	N/A	146.00 Kips
53.49 ft	Cohesionless	4062.80 psf	18.82	N/A	155.92 Kips
53.51 ft	Cohesionless	4739.50 psf	19.99	N/A	156.04 Kips
58.49 ft	Cohesionless	4920.28 psf	19.99	N/A	187.58 Kips
58.51 ft	Cohesionless	5102.48 psf	18.82	N/A	187.70 Kips
62.99 ft	Cohesionless	5253.90 psf	18.82	N/A	212.96 Kips
63.01 ft	Cohesionless	5406.68 psf	18.82	N/A	213.08 Kips
72.01 ft	Cohesionless	5710.88 psf	18.82	N/A	268.24 Kips
73.49 ft	Cohesionless	5760.90 psf	18.82	N/A	277.88 Kips
73.51 ft	Cohesionless	6116.48 psf	19.41	N/A	278.01 Kips
80.99 ft	Cohesionless	6369.30 psf	19.41	N/A	334.22 Kips
81.01 ft	Cohesionless	6623.48 psf	19.41	N/A	334.37 Kips
81.49 ft	Cohesionless	6639.70 psf	19.41	N/A	338.13 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
7.49 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
7.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
16.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
19.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
20.01 ft	Cohesionless	2301.15 psf	26.40	10.46 Kips	10.46 Kips
24.49 ft	Cohesionless	2816.35 psf	26.40	10.46 Kips	10.46 Kips
24.51 ft	Cohesionless	2818.75 psf	35.20	16.23 Kips	16.23 Kips
24.59 ft	Cohesionless	2828.75 psf	35.20	16.23 Kips	16.23 Kips
24.61 ft	Cohesionless	2830.63 psf	35.20	16.23 Kips	16.23 Kips
28.49 ft	Cohesionless	3073.51 psf	35.20	16.23 Kips	16.23 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.51 ft	Cohesionless	3387.82 psf	40.40	25.92 Kips	25.92 Kips
42.51 ft	Cohesionless	3996.22 psf	40.40	25.92 Kips	25.92 Kips
51.51 ft	Cohesionless	4604.62 psf	40.40	25.92 Kips	25.92 Kips
53.49 ft	Cohesionless	4738.46 psf	40.40	25.92 Kips	25.92 Kips
53.51 ft	Cohesionless	4739.87 psf	55.60	57.74 Kips	57.74 Kips
58.49 ft	Cohesionless	5101.41 psf	55.60	57.74 Kips	57.74 Kips
58.51 ft	Cohesionless	5102.82 psf	40.40	25.92 Kips	25.92 Kips
62.99 ft	Cohesionless	5405.66 psf	40.40	25.92 Kips	25.92 Kips
63.01 ft	Cohesionless	5407.02 psf	40.40	25.92 Kips	25.92 Kips
72.01 ft	Cohesionless	6015.42 psf	40.40	25.92 Kips	25.92 Kips
73.49 ft	Cohesionless	6115.46 psf	40.40	25.92 Kips	25.92 Kips
73.51 ft	Cohesionless	6116.82 psf	47.20	39.27 Kips	39.27 Kips
80.99 ft	Cohesionless	6622.46 psf	47.20	39.27 Kips	39.27 Kips
81.01 ft	Cohesionless	6623.82 psf	47.20	39.27 Kips	39.27 Kips
81.49 ft	Cohesionless	6656.26 psf	47.20	39.27 Kips	39.27 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.02 Kips	12.37 Kips	12.39 Kips
7.49 ft	17.97 Kips	12.37 Kips	30.34 Kips
7.51 ft	18.01 Kips	8.84 Kips	26.84 Kips
16.51 ft	31.74 Kips	8.84 Kips	40.58 Kips
19.99 ft	37.49 Kips	8.84 Kips	46.33 Kips
20.01 ft	37.54 Kips	10.46 Kips	48.00 Kips
24.49 ft	45.17 Kips	10.46 Kips	55.63 Kips
24.51 ft	45.22 Kips	16.23 Kips	61.45 Kips
24.59 ft	45.44 Kips	16.23 Kips	61.67 Kips
24.61 ft	45.49 Kips	16.23 Kips	61.72 Kips
28.49 ft	56.58 Kips	16.23 Kips	72.81 Kips
28.51 ft	56.63 Kips	28.27 Kips	84.90 Kips
33.49 ft	68.72 Kips	28.27 Kips	96.99 Kips
33.51 ft	68.79 Kips	25.92 Kips	94.71 Kips
42.51 ft	104.46 Kips	25.92 Kips	130.38 Kips
51.51 ft	146.00 Kips	25.92 Kips	171.91 Kips
53.49 ft	155.92 Kips	25.92 Kips	181.84 Kips
53.51 ft	156.04 Kips	57.74 Kips	213.78 Kips
58.49 ft	187.58 Kips	57.74 Kips	245.32 Kips
58.51 ft	187.70 Kips	25.92 Kips	213.61 Kips
62.99 ft	212.96 Kips	25.92 Kips	238.88 Kips
63.01 ft	213.08 Kips	25.92 Kips	238.99 Kips
72.01 ft	268.24 Kips	25.92 Kips	294.16 Kips
73.49 ft	277.88 Kips	25.92 Kips	303.79 Kips
73.51 ft	278.01 Kips	39.27 Kips	317.28 Kips
80.99 ft	334.22 Kips	39.27 Kips	373.49 Kips
81.01 ft	334.37 Kips	39.27 Kips	373.64 Kips
81.49 ft	338.13 Kips	39.27 Kips	377.40 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	-0.04 Kips
7.49 ft	Cohesive	N/A	N/A	1140.00 psf	-26.82 Kips
7.51 ft	Cohesive	N/A	N/A	930.00 psf	-26.89 Kips
16.51 ft	Cohesive	N/A	N/A	971.77 psf	-54.37 Kips
19.99 ft	Cohesive	N/A	N/A	994.10 psf	-65.87 Kips
19.99 ft	Cohesionless	994.10 psf	0.00	N/A	-65.87 Kips
20.00 ft	Cohesionless	994.17 psf	0.00	N/A	-65.90 Kips
20.01 ft	Cohesionless	2300.58 psf	17.05	N/A	-65.88 Kips
24.49 ft	Cohesionless	2558.17 psf	17.05	N/A	-56.69 Kips
24.51 ft	Cohesionless	2818.13 psf	18.23	N/A	-56.64 Kips
24.59 ft	Cohesionless	2823.12 psf	18.23	N/A	-56.42 Kips
24.61 ft	Cohesionless	2830.31 psf	18.23	N/A	-56.37 Kips
28.49 ft	Cohesionless	2951.76 psf	18.23	N/A	-45.27 Kips
28.51 ft	Cohesive	N/A	N/A	1072.33 psf	-45.21 Kips
33.49 ft	Cohesive	N/A	N/A	1153.67 psf	-27.16 Kips
33.51 ft	Cohesionless	3387.48 psf	18.82	N/A	-27.08 Kips
42.51 ft	Cohesionless	3691.68 psf	18.82	N/A	8.58 Kips
51.51 ft	Cohesionless	3995.88 psf	18.82	N/A	50.12 Kips
53.49 ft	Cohesionless	4062.80 psf	18.82	N/A	60.04 Kips
53.51 ft	Cohesionless	4739.50 psf	19.99	N/A	60.16 Kips
58.49 ft	Cohesionless	4920.28 psf	19.99	N/A	91.70 Kips
58.51 ft	Cohesionless	5102.48 psf	18.82	N/A	91.82 Kips
62.99 ft	Cohesionless	5253.90 psf	18.82	N/A	117.08 Kips
63.01 ft	Cohesionless	5406.68 psf	18.82	N/A	117.20 Kips
72.01 ft	Cohesionless	5710.88 psf	18.82	N/A	172.36 Kips
73.49 ft	Cohesionless	5760.90 psf	18.82	N/A	182.00 Kips
73.51 ft	Cohesionless	6116.48 psf	19.41	N/A	182.14 Kips
80.99 ft	Cohesionless	6369.30 psf	19.41	N/A	238.34 Kips
81.01 ft	Cohesionless	6623.48 psf	19.41	N/A	238.50 Kips
81.49 ft	Cohesionless	6639.70 psf	19.41	N/A	242.26 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
16.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.99 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
20.00 ft	Cohesionless	2300.00 psf	0.00	8.84 Kips	8.84 Kips
20.01 ft	Cohesionless	2301.15 psf	26.40	10.46 Kips	10.46 Kips
24.49 ft	Cohesionless	2816.35 psf	26.40	10.46 Kips	10.46 Kips
24.51 ft	Cohesionless	2818.75 psf	35.20	16.23 Kips	16.23 Kips
24.59 ft	Cohesionless	2828.75 psf	35.20	16.23 Kips	16.23 Kips
24.61 ft	Cohesionless	2830.63 psf	35.20	16.23 Kips	16.23 Kips
28.49 ft	Cohesionless	3073.51 psf	35.20	16.23 Kips	16.23 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.51 ft	Cohesionless	3387.82 psf	40.40	25.92 Kips	25.92 Kips
42.51 ft	Cohesionless	3996.22 psf	40.40	25.92 Kips	25.92 Kips
51.51 ft	Cohesionless	4604.62 psf	40.40	25.92 Kips	25.92 Kips
53.49 ft	Cohesionless	4738.46 psf	40.40	25.92 Kips	25.92 Kips
53.51 ft	Cohesionless	4739.87 psf	55.60	57.74 Kips	57.74 Kips
58.49 ft	Cohesionless	5101.41 psf	55.60	57.74 Kips	57.74 Kips
58.51 ft	Cohesionless	5102.82 psf	40.40	25.92 Kips	25.92 Kips
62.99 ft	Cohesionless	5405.66 psf	40.40	25.92 Kips	25.92 Kips
63.01 ft	Cohesionless	5407.02 psf	40.40	25.92 Kips	25.92 Kips
72.01 ft	Cohesionless	6015.42 psf	40.40	25.92 Kips	25.92 Kips
73.49 ft	Cohesionless	6115.46 psf	40.40	25.92 Kips	25.92 Kips
73.51 ft	Cohesionless	6116.82 psf	47.20	39.27 Kips	39.27 Kips
80.99 ft	Cohesionless	6622.46 psf	47.20	39.27 Kips	39.27 Kips
81.01 ft	Cohesionless	6623.82 psf	47.20	39.27 Kips	39.27 Kips
81.49 ft	Cohesionless	6656.26 psf	47.20	39.27 Kips	39.27 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	-0.04 Kips	0.00 Kips	-0.04 Kips
7.49 ft	-26.82 Kips	0.00 Kips	-26.82 Kips
7.51 ft	-26.89 Kips	0.00 Kips	-26.89 Kips
16.51 ft	-54.37 Kips	0.00 Kips	-54.37 Kips
19.99 ft	-65.87 Kips	0.00 Kips	-65.87 Kips
19.99 ft	-65.87 Kips	0.00 Kips	-65.87 Kips
20.00 ft	-65.90 Kips	8.84 Kips	-57.07 Kips
20.01 ft	-65.88 Kips	10.46 Kips	-55.42 Kips
24.49 ft	-56.69 Kips	10.46 Kips	-46.23 Kips
24.51 ft	-56.64 Kips	16.23 Kips	-40.41 Kips
24.59 ft	-56.42 Kips	16.23 Kips	-40.19 Kips
24.61 ft	-56.37 Kips	16.23 Kips	-40.14 Kips
28.49 ft	-45.27 Kips	16.23 Kips	-29.05 Kips
28.51 ft	-45.21 Kips	28.27 Kips	-16.94 Kips
33.49 ft	-27.16 Kips	28.27 Kips	1.11 Kips
33.51 ft	-27.08 Kips	25.92 Kips	-1.17 Kips
42.51 ft	8.58 Kips	25.92 Kips	34.50 Kips
51.51 ft	50.12 Kips	25.92 Kips	76.03 Kips
53.49 ft	60.04 Kips	25.92 Kips	85.96 Kips
53.51 ft	60.16 Kips	57.74 Kips	117.90 Kips
58.49 ft	91.70 Kips	57.74 Kips	149.44 Kips
58.51 ft	91.82 Kips	25.92 Kips	117.74 Kips
62.99 ft	117.08 Kips	25.92 Kips	143.00 Kips
63.01 ft	117.20 Kips	25.92 Kips	143.11 Kips
72.01 ft	172.36 Kips	25.92 Kips	198.28 Kips
73.49 ft	182.00 Kips	25.92 Kips	207.92 Kips
73.51 ft	182.14 Kips	39.27 Kips	221.40 Kips
80.99 ft	238.34 Kips	39.27 Kips	277.61 Kips
81.01 ft	238.50 Kips	39.27 Kips	277.77 Kips
81.49 ft	242.26 Kips	39.27 Kips	281.52 Kips

DRIVEN 1.2

Forward Wingwall - Prebore Holes or Bitumen Coating Capacity

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-172-~1.DVN
Project Name: B-172 - Forward Wingwall
Project Date: 11/07/2014
Project Client: EMHT
Computed By: BRT
Project Manager: JPS

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	24.60 ft
	- Driving/Restrike	24.60 ft
	- Ultimate:	24.60 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil: (Downdrag Condition)	20.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	7.50 ft	33.00%	115.00 pcf	0.00 psf	T-79 Steel
2	Cohesive	12.50 ft	50.00%	115.00 pcf	0.00 psf	T-79 Steel
3	Cohesionless	4.50 ft	17.00%	115.00 pcf	29.0/29.0	Nordlund
4	Cohesionless	4.00 ft	0.00%	125.00 pcf	31.0/31.0	Nordlund
5	Cohesive	5.00 ft	33.00%	125.00 pcf	4000.00 psf	T-79 Steel
6	Cohesionless	20.00 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
7	Cohesionless	5.00 ft	0.00%	135.00 pcf	34.0/34.0	Nordlund
8	Cohesionless	4.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
9	Cohesionless	10.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
10	Cohesionless	7.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
11	Cohesionless	0.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
16.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
20.01 ft	Cohesionless	2300.58 psf	17.05	N/A	0.02 Kips
24.49 ft	Cohesionless	2558.17 psf	17.05	N/A	9.21 Kips
24.51 ft	Cohesionless	2818.13 psf	18.23	N/A	9.26 Kips
24.59 ft	Cohesionless	2823.12 psf	18.23	N/A	9.48 Kips
24.61 ft	Cohesionless	2830.31 psf	18.23	N/A	9.54 Kips
28.49 ft	Cohesionless	2951.76 psf	18.23	N/A	20.63 Kips
28.51 ft	Cohesive	N/A	N/A	1072.33 psf	20.69 Kips
33.49 ft	Cohesive	N/A	N/A	1153.67 psf	38.74 Kips
33.51 ft	Cohesionless	3387.48 psf	18.82	N/A	38.82 Kips
42.51 ft	Cohesionless	3691.68 psf	18.82	N/A	74.48 Kips
51.51 ft	Cohesionless	3995.88 psf	18.82	N/A	116.02 Kips
53.49 ft	Cohesionless	4062.80 psf	18.82	N/A	125.95 Kips
53.51 ft	Cohesionless	4739.50 psf	19.99	N/A	126.06 Kips
58.49 ft	Cohesionless	4920.28 psf	19.99	N/A	157.60 Kips
58.51 ft	Cohesionless	5102.48 psf	18.82	N/A	157.72 Kips
62.99 ft	Cohesionless	5253.90 psf	18.82	N/A	182.98 Kips
63.01 ft	Cohesionless	5406.68 psf	18.82	N/A	183.10 Kips
72.01 ft	Cohesionless	5710.88 psf	18.82	N/A	238.26 Kips
73.49 ft	Cohesionless	5760.90 psf	18.82	N/A	247.90 Kips
73.51 ft	Cohesionless	6116.48 psf	19.41	N/A	248.04 Kips
80.99 ft	Cohesionless	6369.30 psf	19.41	N/A	304.24 Kips
81.01 ft	Cohesionless	6623.48 psf	19.41	N/A	304.40 Kips
81.49 ft	Cohesionless	6639.70 psf	19.41	N/A	308.16 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
16.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
20.01 ft	Cohesionless	2301.15 psf	26.40	10.46 Kips	10.46 Kips
24.49 ft	Cohesionless	2816.35 psf	26.40	10.46 Kips	10.46 Kips
24.51 ft	Cohesionless	2818.75 psf	35.20	16.23 Kips	16.23 Kips
24.59 ft	Cohesionless	2828.75 psf	35.20	16.23 Kips	16.23 Kips
24.61 ft	Cohesionless	2830.63 psf	35.20	16.23 Kips	16.23 Kips
28.49 ft	Cohesionless	3073.51 psf	35.20	16.23 Kips	16.23 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.51 ft	Cohesionless	3387.82 psf	40.40	25.92 Kips	25.92 Kips
42.51 ft	Cohesionless	3996.22 psf	40.40	25.92 Kips	25.92 Kips
51.51 ft	Cohesionless	4604.62 psf	40.40	25.92 Kips	25.92 Kips
53.49 ft	Cohesionless	4738.46 psf	40.40	25.92 Kips	25.92 Kips
53.51 ft	Cohesionless	4739.87 psf	55.60	57.74 Kips	57.74 Kips
58.49 ft	Cohesionless	5101.41 psf	55.60	57.74 Kips	57.74 Kips
58.51 ft	Cohesionless	5102.82 psf	40.40	25.92 Kips	25.92 Kips
62.99 ft	Cohesionless	5405.66 psf	40.40	25.92 Kips	25.92 Kips
63.01 ft	Cohesionless	5407.02 psf	40.40	25.92 Kips	25.92 Kips
72.01 ft	Cohesionless	6015.42 psf	40.40	25.92 Kips	25.92 Kips
73.49 ft	Cohesionless	6115.46 psf	40.40	25.92 Kips	25.92 Kips
73.51 ft	Cohesionless	6116.82 psf	47.20	39.27 Kips	39.27 Kips
80.99 ft	Cohesionless	6622.46 psf	47.20	39.27 Kips	39.27 Kips
81.01 ft	Cohesionless	6623.82 psf	47.20	39.27 Kips	39.27 Kips
81.49 ft	Cohesionless	6656.26 psf	47.20	39.27 Kips	39.27 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
16.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
20.01 ft	0.02 Kips	10.46 Kips	10.48 Kips
24.49 ft	9.21 Kips	10.46 Kips	19.67 Kips
24.51 ft	9.26 Kips	16.23 Kips	25.49 Kips
24.59 ft	9.48 Kips	16.23 Kips	25.71 Kips
24.61 ft	9.54 Kips	16.23 Kips	25.77 Kips
28.49 ft	20.63 Kips	16.23 Kips	36.86 Kips
28.51 ft	20.69 Kips	28.27 Kips	48.96 Kips
33.49 ft	38.74 Kips	28.27 Kips	67.02 Kips
33.51 ft	38.82 Kips	25.92 Kips	64.74 Kips
42.51 ft	74.48 Kips	25.92 Kips	100.40 Kips
51.51 ft	116.02 Kips	25.92 Kips	141.94 Kips
53.49 ft	125.95 Kips	25.92 Kips	151.86 Kips
53.51 ft	126.06 Kips	57.74 Kips	183.80 Kips
58.49 ft	157.60 Kips	57.74 Kips	215.34 Kips
58.51 ft	157.72 Kips	25.92 Kips	183.64 Kips
62.99 ft	182.98 Kips	25.92 Kips	208.90 Kips
63.01 ft	183.10 Kips	25.92 Kips	209.02 Kips
72.01 ft	238.26 Kips	25.92 Kips	264.18 Kips
73.49 ft	247.90 Kips	25.92 Kips	273.82 Kips
73.51 ft	248.04 Kips	39.27 Kips	287.31 Kips
80.99 ft	304.24 Kips	39.27 Kips	343.51 Kips
81.01 ft	304.40 Kips	39.27 Kips	343.67 Kips
81.49 ft	308.16 Kips	39.27 Kips	347.43 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
16.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
20.01 ft	Cohesionless	2300.58 psf	17.05	N/A	0.02 Kips
24.49 ft	Cohesionless	2558.17 psf	17.05	N/A	7.65 Kips
24.51 ft	Cohesionless	2818.13 psf	18.23	N/A	7.70 Kips
24.59 ft	Cohesionless	2823.12 psf	18.23	N/A	7.92 Kips
24.61 ft	Cohesionless	2830.31 psf	18.23	N/A	7.97 Kips
28.49 ft	Cohesionless	2951.76 psf	18.23	N/A	19.06 Kips
28.51 ft	Cohesive	N/A	N/A	1072.33 psf	19.10 Kips
33.49 ft	Cohesive	N/A	N/A	1153.67 psf	31.20 Kips
33.51 ft	Cohesionless	3387.48 psf	18.82	N/A	31.27 Kips
42.51 ft	Cohesionless	3691.68 psf	18.82	N/A	66.94 Kips
51.51 ft	Cohesionless	3995.88 psf	18.82	N/A	108.47 Kips
53.49 ft	Cohesionless	4062.80 psf	18.82	N/A	118.40 Kips
53.51 ft	Cohesionless	4739.50 psf	19.99	N/A	118.51 Kips
58.49 ft	Cohesionless	4920.28 psf	19.99	N/A	150.05 Kips
58.51 ft	Cohesionless	5102.48 psf	18.82	N/A	150.17 Kips
62.99 ft	Cohesionless	5253.90 psf	18.82	N/A	175.44 Kips
63.01 ft	Cohesionless	5406.68 psf	18.82	N/A	175.55 Kips
72.01 ft	Cohesionless	5710.88 psf	18.82	N/A	230.72 Kips
73.49 ft	Cohesionless	5760.90 psf	18.82	N/A	240.35 Kips
73.51 ft	Cohesionless	6116.48 psf	19.41	N/A	240.49 Kips
80.99 ft	Cohesionless	6369.30 psf	19.41	N/A	296.70 Kips
81.01 ft	Cohesionless	6623.48 psf	19.41	N/A	296.85 Kips
81.49 ft	Cohesionless	6639.70 psf	19.41	N/A	300.61 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
16.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
20.01 ft	Cohesionless	2301.15 psf	26.40	10.46 Kips	10.46 Kips
24.49 ft	Cohesionless	2816.35 psf	26.40	10.46 Kips	10.46 Kips
24.51 ft	Cohesionless	2818.75 psf	35.20	16.23 Kips	16.23 Kips
24.59 ft	Cohesionless	2828.75 psf	35.20	16.23 Kips	16.23 Kips
24.61 ft	Cohesionless	2830.63 psf	35.20	16.23 Kips	16.23 Kips
28.49 ft	Cohesionless	3073.51 psf	35.20	16.23 Kips	16.23 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.51 ft	Cohesionless	3387.82 psf	40.40	25.92 Kips	25.92 Kips
42.51 ft	Cohesionless	3996.22 psf	40.40	25.92 Kips	25.92 Kips
51.51 ft	Cohesionless	4604.62 psf	40.40	25.92 Kips	25.92 Kips
53.49 ft	Cohesionless	4738.46 psf	40.40	25.92 Kips	25.92 Kips
53.51 ft	Cohesionless	4739.87 psf	55.60	57.74 Kips	57.74 Kips
58.49 ft	Cohesionless	5101.41 psf	55.60	57.74 Kips	57.74 Kips
58.51 ft	Cohesionless	5102.82 psf	40.40	25.92 Kips	25.92 Kips
62.99 ft	Cohesionless	5405.66 psf	40.40	25.92 Kips	25.92 Kips
63.01 ft	Cohesionless	5407.02 psf	40.40	25.92 Kips	25.92 Kips
72.01 ft	Cohesionless	6015.42 psf	40.40	25.92 Kips	25.92 Kips
73.49 ft	Cohesionless	6115.46 psf	40.40	25.92 Kips	25.92 Kips
73.51 ft	Cohesionless	6116.82 psf	47.20	39.27 Kips	39.27 Kips
80.99 ft	Cohesionless	6622.46 psf	47.20	39.27 Kips	39.27 Kips
81.01 ft	Cohesionless	6623.82 psf	47.20	39.27 Kips	39.27 Kips
81.49 ft	Cohesionless	6656.26 psf	47.20	39.27 Kips	39.27 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
16.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
20.01 ft	0.02 Kips	10.46 Kips	10.48 Kips
24.49 ft	7.65 Kips	10.46 Kips	18.11 Kips
24.51 ft	7.70 Kips	16.23 Kips	23.93 Kips
24.59 ft	7.92 Kips	16.23 Kips	24.14 Kips
24.61 ft	7.97 Kips	16.23 Kips	24.20 Kips
28.49 ft	19.06 Kips	16.23 Kips	35.29 Kips
28.51 ft	19.10 Kips	28.27 Kips	47.38 Kips
33.49 ft	31.20 Kips	28.27 Kips	59.47 Kips
33.51 ft	31.27 Kips	25.92 Kips	57.19 Kips
42.51 ft	66.94 Kips	25.92 Kips	92.85 Kips
51.51 ft	108.47 Kips	25.92 Kips	134.39 Kips
53.49 ft	118.40 Kips	25.92 Kips	144.32 Kips
53.51 ft	118.51 Kips	57.74 Kips	176.26 Kips
58.49 ft	150.05 Kips	57.74 Kips	207.80 Kips
58.51 ft	150.17 Kips	25.92 Kips	176.09 Kips
62.99 ft	175.44 Kips	25.92 Kips	201.36 Kips
63.01 ft	175.55 Kips	25.92 Kips	201.47 Kips
72.01 ft	230.72 Kips	25.92 Kips	256.64 Kips
73.49 ft	240.35 Kips	25.92 Kips	266.27 Kips
73.51 ft	240.49 Kips	39.27 Kips	279.76 Kips
80.99 ft	296.70 Kips	39.27 Kips	335.97 Kips
81.01 ft	296.85 Kips	39.27 Kips	336.12 Kips
81.49 ft	300.61 Kips	39.27 Kips	339.88 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
16.51 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
20.00 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
20.01 ft	Cohesionless	2300.58 psf	17.05	N/A	0.02 Kips
24.49 ft	Cohesionless	2558.17 psf	17.05	N/A	9.21 Kips
24.51 ft	Cohesionless	2818.13 psf	18.23	N/A	9.26 Kips
24.59 ft	Cohesionless	2823.12 psf	18.23	N/A	9.48 Kips
24.61 ft	Cohesionless	2830.31 psf	18.23	N/A	9.54 Kips
28.49 ft	Cohesionless	2951.76 psf	18.23	N/A	20.63 Kips
28.51 ft	Cohesive	N/A	N/A	1072.33 psf	20.69 Kips
33.49 ft	Cohesive	N/A	N/A	1153.67 psf	38.74 Kips
33.51 ft	Cohesionless	3387.48 psf	18.82	N/A	38.82 Kips
42.51 ft	Cohesionless	3691.68 psf	18.82	N/A	74.48 Kips
51.51 ft	Cohesionless	3995.88 psf	18.82	N/A	116.02 Kips
53.49 ft	Cohesionless	4062.80 psf	18.82	N/A	125.95 Kips
53.51 ft	Cohesionless	4739.50 psf	19.99	N/A	126.06 Kips
58.49 ft	Cohesionless	4920.28 psf	19.99	N/A	157.60 Kips
58.51 ft	Cohesionless	5102.48 psf	18.82	N/A	157.72 Kips
62.99 ft	Cohesionless	5253.90 psf	18.82	N/A	182.98 Kips
63.01 ft	Cohesionless	5406.68 psf	18.82	N/A	183.10 Kips
72.01 ft	Cohesionless	5710.88 psf	18.82	N/A	238.26 Kips
73.49 ft	Cohesionless	5760.90 psf	18.82	N/A	247.90 Kips
73.51 ft	Cohesionless	6116.48 psf	19.41	N/A	248.04 Kips
80.99 ft	Cohesionless	6369.30 psf	19.41	N/A	304.24 Kips
81.01 ft	Cohesionless	6623.48 psf	19.41	N/A	304.40 Kips
81.49 ft	Cohesionless	6639.70 psf	19.41	N/A	308.16 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
16.51 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.99 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
20.00 ft	Cohesionless	2300.00 psf	0.00	0.00 Kips	0.00 Kips
20.01 ft	Cohesionless	2301.15 psf	26.40	10.46 Kips	10.46 Kips
24.49 ft	Cohesionless	2816.35 psf	26.40	10.46 Kips	10.46 Kips
24.51 ft	Cohesionless	2818.75 psf	35.20	16.23 Kips	16.23 Kips
24.59 ft	Cohesionless	2828.75 psf	35.20	16.23 Kips	16.23 Kips
24.61 ft	Cohesionless	2830.63 psf	35.20	16.23 Kips	16.23 Kips
28.49 ft	Cohesionless	3073.51 psf	35.20	16.23 Kips	16.23 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.51 ft	Cohesionless	3387.82 psf	40.40	25.92 Kips	25.92 Kips
42.51 ft	Cohesionless	3996.22 psf	40.40	25.92 Kips	25.92 Kips
51.51 ft	Cohesionless	4604.62 psf	40.40	25.92 Kips	25.92 Kips
53.49 ft	Cohesionless	4738.46 psf	40.40	25.92 Kips	25.92 Kips
53.51 ft	Cohesionless	4739.87 psf	55.60	57.74 Kips	57.74 Kips
58.49 ft	Cohesionless	5101.41 psf	55.60	57.74 Kips	57.74 Kips
58.51 ft	Cohesionless	5102.82 psf	40.40	25.92 Kips	25.92 Kips
62.99 ft	Cohesionless	5405.66 psf	40.40	25.92 Kips	25.92 Kips
63.01 ft	Cohesionless	5407.02 psf	40.40	25.92 Kips	25.92 Kips
72.01 ft	Cohesionless	6015.42 psf	40.40	25.92 Kips	25.92 Kips
73.49 ft	Cohesionless	6115.46 psf	40.40	25.92 Kips	25.92 Kips
73.51 ft	Cohesionless	6116.82 psf	47.20	39.27 Kips	39.27 Kips
80.99 ft	Cohesionless	6622.46 psf	47.20	39.27 Kips	39.27 Kips
81.01 ft	Cohesionless	6623.82 psf	47.20	39.27 Kips	39.27 Kips
81.49 ft	Cohesionless	6656.26 psf	47.20	39.27 Kips	39.27 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
16.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
20.00 ft	0.00 Kips	0.00 Kips	0.00 Kips
20.01 ft	0.02 Kips	10.46 Kips	10.48 Kips
24.49 ft	9.21 Kips	10.46 Kips	19.67 Kips
24.51 ft	9.26 Kips	16.23 Kips	25.49 Kips
24.59 ft	9.48 Kips	16.23 Kips	25.71 Kips
24.61 ft	9.54 Kips	16.23 Kips	25.77 Kips
28.49 ft	20.63 Kips	16.23 Kips	36.86 Kips
28.51 ft	20.69 Kips	28.27 Kips	48.96 Kips
33.49 ft	38.74 Kips	28.27 Kips	67.02 Kips
33.51 ft	38.82 Kips	25.92 Kips	64.74 Kips
42.51 ft	74.48 Kips	25.92 Kips	100.40 Kips
51.51 ft	116.02 Kips	25.92 Kips	141.94 Kips
53.49 ft	125.95 Kips	25.92 Kips	151.86 Kips
53.51 ft	126.06 Kips	57.74 Kips	183.80 Kips
58.49 ft	157.60 Kips	57.74 Kips	215.34 Kips
58.51 ft	157.72 Kips	25.92 Kips	183.64 Kips
62.99 ft	182.98 Kips	25.92 Kips	208.90 Kips
63.01 ft	183.10 Kips	25.92 Kips	209.02 Kips
72.01 ft	238.26 Kips	25.92 Kips	264.18 Kips
73.49 ft	247.90 Kips	25.92 Kips	273.82 Kips
73.51 ft	248.04 Kips	39.27 Kips	287.31 Kips
80.99 ft	304.24 Kips	39.27 Kips	343.51 Kips
81.01 ft	304.40 Kips	39.27 Kips	343.67 Kips
81.49 ft	308.16 Kips	39.27 Kips	347.43 Kips

DRIVEN 1.2 Forward Wingwall - Preload Site Capacity

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-172-~1.DVN
Project Name: B-172 - Forward Wingwall Project Date: 11/07/2014
Project Client: EMHT
Computed By: BRT
Project Manager: JPS

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	24.60 ft
	- Driving/Restrike	24.60 ft
	- Ultimate:	24.60 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	7.50 ft	33.00%	115.00 pcf	1750.00 psf	T-79 Steel
2	Cohesive	12.50 ft	50.00%	115.00 pcf	1250.00 psf	T-79 Steel
3	Cohesionless	4.50 ft	17.00%	115.00 pcf	29.0/29.0	Nordlund
4	Cohesionless	4.00 ft	0.00%	125.00 pcf	31.0/31.0	Nordlund
5	Cohesive	5.00 ft	33.00%	125.00 pcf	4000.00 psf	T-79 Steel
6	Cohesionless	20.00 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
7	Cohesionless	5.00 ft	0.00%	135.00 pcf	34.0/34.0	Nordlund
8	Cohesionless	4.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
9	Cohesionless	10.50 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund
10	Cohesionless	7.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
11	Cohesionless	0.50 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	0.04 Kips
7.49 ft	Cohesive	N/A	N/A	1140.00 psf	26.82 Kips
7.51 ft	Cohesive	N/A	N/A	930.00 psf	26.89 Kips
16.51 ft	Cohesive	N/A	N/A	971.77 psf	54.37 Kips
19.99 ft	Cohesive	N/A	N/A	994.10 psf	65.87 Kips
20.01 ft	Cohesionless	2300.58 psf	17.05	N/A	65.92 Kips
24.49 ft	Cohesionless	2558.17 psf	17.05	N/A	75.11 Kips
24.51 ft	Cohesionless	2818.13 psf	18.23	N/A	75.16 Kips
24.59 ft	Cohesionless	2823.12 psf	18.23	N/A	75.38 Kips
24.61 ft	Cohesionless	2830.31 psf	18.23	N/A	75.44 Kips
28.49 ft	Cohesionless	2951.76 psf	18.23	N/A	86.53 Kips
28.51 ft	Cohesive	N/A	N/A	1072.33 psf	86.59 Kips
33.49 ft	Cohesive	N/A	N/A	1153.67 psf	104.64 Kips
33.51 ft	Cohesionless	3387.48 psf	18.82	N/A	104.72 Kips
42.51 ft	Cohesionless	3691.68 psf	18.82	N/A	140.38 Kips
51.51 ft	Cohesionless	3995.88 psf	18.82	N/A	181.92 Kips
53.49 ft	Cohesionless	4062.80 psf	18.82	N/A	191.85 Kips
53.51 ft	Cohesionless	4739.50 psf	19.99	N/A	191.96 Kips
58.49 ft	Cohesionless	4920.28 psf	19.99	N/A	223.50 Kips
58.51 ft	Cohesionless	5102.48 psf	18.82	N/A	223.62 Kips
62.99 ft	Cohesionless	5253.90 psf	18.82	N/A	248.88 Kips
63.01 ft	Cohesionless	5406.68 psf	18.82	N/A	249.00 Kips
72.01 ft	Cohesionless	5710.88 psf	18.82	N/A	304.17 Kips
73.49 ft	Cohesionless	5760.90 psf	18.82	N/A	313.80 Kips
73.51 ft	Cohesionless	6116.48 psf	19.41	N/A	313.94 Kips
80.99 ft	Cohesionless	6369.30 psf	19.41	N/A	370.14 Kips
81.01 ft	Cohesionless	6623.48 psf	19.41	N/A	370.30 Kips
81.49 ft	Cohesionless	6639.70 psf	19.41	N/A	374.06 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
7.49 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
7.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
16.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
19.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
20.01 ft	Cohesionless	2301.15 psf	26.40	10.46 Kips	10.46 Kips
24.49 ft	Cohesionless	2816.35 psf	26.40	10.46 Kips	10.46 Kips
24.51 ft	Cohesionless	2818.75 psf	35.20	16.23 Kips	16.23 Kips
24.59 ft	Cohesionless	2828.75 psf	35.20	16.23 Kips	16.23 Kips
24.61 ft	Cohesionless	2830.63 psf	35.20	16.23 Kips	16.23 Kips
28.49 ft	Cohesionless	3073.51 psf	35.20	16.23 Kips	16.23 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.51 ft	Cohesionless	3387.82 psf	40.40	25.92 Kips	25.92 Kips
42.51 ft	Cohesionless	3996.22 psf	40.40	25.92 Kips	25.92 Kips
51.51 ft	Cohesionless	4604.62 psf	40.40	25.92 Kips	25.92 Kips
53.49 ft	Cohesionless	4738.46 psf	40.40	25.92 Kips	25.92 Kips
53.51 ft	Cohesionless	4739.87 psf	55.60	57.74 Kips	57.74 Kips
58.49 ft	Cohesionless	5101.41 psf	55.60	57.74 Kips	57.74 Kips
58.51 ft	Cohesionless	5102.82 psf	40.40	25.92 Kips	25.92 Kips
62.99 ft	Cohesionless	5405.66 psf	40.40	25.92 Kips	25.92 Kips
63.01 ft	Cohesionless	5407.02 psf	40.40	25.92 Kips	25.92 Kips
72.01 ft	Cohesionless	6015.42 psf	40.40	25.92 Kips	25.92 Kips
73.49 ft	Cohesionless	6115.46 psf	40.40	25.92 Kips	25.92 Kips
73.51 ft	Cohesionless	6116.82 psf	47.20	39.27 Kips	39.27 Kips
80.99 ft	Cohesionless	6622.46 psf	47.20	39.27 Kips	39.27 Kips
81.01 ft	Cohesionless	6623.82 psf	47.20	39.27 Kips	39.27 Kips
81.49 ft	Cohesionless	6656.26 psf	47.20	39.27 Kips	39.27 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.04 Kips	12.37 Kips	12.41 Kips
7.49 ft	26.82 Kips	12.37 Kips	39.19 Kips
7.51 ft	26.89 Kips	8.84 Kips	35.73 Kips
16.51 ft	54.37 Kips	8.84 Kips	63.20 Kips
19.99 ft	65.87 Kips	8.84 Kips	74.70 Kips
20.01 ft	65.92 Kips	10.46 Kips	76.38 Kips
24.49 ft	75.11 Kips	10.46 Kips	85.58 Kips
24.51 ft	75.16 Kips	16.23 Kips	91.39 Kips
24.59 ft	75.38 Kips	16.23 Kips	91.61 Kips
24.61 ft	75.44 Kips	16.23 Kips	91.67 Kips
28.49 ft	86.53 Kips	16.23 Kips	102.76 Kips
28.51 ft	86.59 Kips	28.27 Kips	114.87 Kips
33.49 ft	104.64 Kips	28.27 Kips	132.92 Kips
33.51 ft	104.72 Kips	25.92 Kips	130.64 Kips
42.51 ft	140.38 Kips	25.92 Kips	166.30 Kips
51.51 ft	181.92 Kips	25.92 Kips	207.84 Kips
53.49 ft	191.85 Kips	25.92 Kips	217.76 Kips
53.51 ft	191.96 Kips	57.74 Kips	249.70 Kips
58.49 ft	223.50 Kips	57.74 Kips	281.24 Kips
58.51 ft	223.62 Kips	25.92 Kips	249.54 Kips
62.99 ft	248.88 Kips	25.92 Kips	274.80 Kips
63.01 ft	249.00 Kips	25.92 Kips	274.92 Kips
72.01 ft	304.17 Kips	25.92 Kips	330.08 Kips
73.49 ft	313.80 Kips	25.92 Kips	339.72 Kips
73.51 ft	313.94 Kips	39.27 Kips	353.21 Kips
80.99 ft	370.14 Kips	39.27 Kips	409.41 Kips
81.01 ft	370.30 Kips	39.27 Kips	409.57 Kips
81.49 ft	374.06 Kips	39.27 Kips	413.33 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	0.02 Kips
7.49 ft	Cohesive	N/A	N/A	1140.00 psf	17.97 Kips
7.51 ft	Cohesive	N/A	N/A	930.00 psf	18.01 Kips
16.51 ft	Cohesive	N/A	N/A	971.77 psf	31.74 Kips
19.99 ft	Cohesive	N/A	N/A	994.10 psf	37.49 Kips
20.01 ft	Cohesionless	2300.58 psf	17.05	N/A	37.54 Kips
24.49 ft	Cohesionless	2558.17 psf	17.05	N/A	45.17 Kips
24.51 ft	Cohesionless	2818.13 psf	18.23	N/A	45.22 Kips
24.59 ft	Cohesionless	2823.12 psf	18.23	N/A	45.44 Kips
24.61 ft	Cohesionless	2830.31 psf	18.23	N/A	45.49 Kips
28.49 ft	Cohesionless	2951.76 psf	18.23	N/A	56.58 Kips
28.51 ft	Cohesive	N/A	N/A	1072.33 psf	56.63 Kips
33.49 ft	Cohesive	N/A	N/A	1153.67 psf	68.72 Kips
33.51 ft	Cohesionless	3387.48 psf	18.82	N/A	68.79 Kips
42.51 ft	Cohesionless	3691.68 psf	18.82	N/A	104.46 Kips
51.51 ft	Cohesionless	3995.88 psf	18.82	N/A	146.00 Kips
53.49 ft	Cohesionless	4062.80 psf	18.82	N/A	155.92 Kips
53.51 ft	Cohesionless	4739.50 psf	19.99	N/A	156.04 Kips
58.49 ft	Cohesionless	4920.28 psf	19.99	N/A	187.58 Kips
58.51 ft	Cohesionless	5102.48 psf	18.82	N/A	187.70 Kips
62.99 ft	Cohesionless	5253.90 psf	18.82	N/A	212.96 Kips
63.01 ft	Cohesionless	5406.68 psf	18.82	N/A	213.08 Kips
72.01 ft	Cohesionless	5710.88 psf	18.82	N/A	268.24 Kips
73.49 ft	Cohesionless	5760.90 psf	18.82	N/A	277.88 Kips
73.51 ft	Cohesionless	6116.48 psf	19.41	N/A	278.01 Kips
80.99 ft	Cohesionless	6369.30 psf	19.41	N/A	334.22 Kips
81.01 ft	Cohesionless	6623.48 psf	19.41	N/A	334.37 Kips
81.49 ft	Cohesionless	6639.70 psf	19.41	N/A	338.13 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
7.49 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
7.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
16.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
19.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
20.01 ft	Cohesionless	2301.15 psf	26.40	10.46 Kips	10.46 Kips
24.49 ft	Cohesionless	2816.35 psf	26.40	10.46 Kips	10.46 Kips
24.51 ft	Cohesionless	2818.75 psf	35.20	16.23 Kips	16.23 Kips
24.59 ft	Cohesionless	2828.75 psf	35.20	16.23 Kips	16.23 Kips
24.61 ft	Cohesionless	2830.63 psf	35.20	16.23 Kips	16.23 Kips
28.49 ft	Cohesionless	3073.51 psf	35.20	16.23 Kips	16.23 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.51 ft	Cohesionless	3387.82 psf	40.40	25.92 Kips	25.92 Kips
42.51 ft	Cohesionless	3996.22 psf	40.40	25.92 Kips	25.92 Kips
51.51 ft	Cohesionless	4604.62 psf	40.40	25.92 Kips	25.92 Kips
53.49 ft	Cohesionless	4738.46 psf	40.40	25.92 Kips	25.92 Kips
53.51 ft	Cohesionless	4739.87 psf	55.60	57.74 Kips	57.74 Kips
58.49 ft	Cohesionless	5101.41 psf	55.60	57.74 Kips	57.74 Kips
58.51 ft	Cohesionless	5102.82 psf	40.40	25.92 Kips	25.92 Kips
62.99 ft	Cohesionless	5405.66 psf	40.40	25.92 Kips	25.92 Kips
63.01 ft	Cohesionless	5407.02 psf	40.40	25.92 Kips	25.92 Kips
72.01 ft	Cohesionless	6015.42 psf	40.40	25.92 Kips	25.92 Kips
73.49 ft	Cohesionless	6115.46 psf	40.40	25.92 Kips	25.92 Kips
73.51 ft	Cohesionless	6116.82 psf	47.20	39.27 Kips	39.27 Kips
80.99 ft	Cohesionless	6622.46 psf	47.20	39.27 Kips	39.27 Kips
81.01 ft	Cohesionless	6623.82 psf	47.20	39.27 Kips	39.27 Kips
81.49 ft	Cohesionless	6656.26 psf	47.20	39.27 Kips	39.27 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.02 Kips	12.37 Kips	12.39 Kips
7.49 ft	17.97 Kips	12.37 Kips	30.34 Kips
7.51 ft	18.01 Kips	8.84 Kips	26.84 Kips
16.51 ft	31.74 Kips	8.84 Kips	40.58 Kips
19.99 ft	37.49 Kips	8.84 Kips	46.33 Kips
20.01 ft	37.54 Kips	10.46 Kips	48.00 Kips
24.49 ft	45.17 Kips	10.46 Kips	55.63 Kips
24.51 ft	45.22 Kips	16.23 Kips	61.45 Kips
24.59 ft	45.44 Kips	16.23 Kips	61.67 Kips
24.61 ft	45.49 Kips	16.23 Kips	61.72 Kips
28.49 ft	56.58 Kips	16.23 Kips	72.81 Kips
28.51 ft	56.63 Kips	28.27 Kips	84.90 Kips
33.49 ft	68.72 Kips	28.27 Kips	96.99 Kips
33.51 ft	68.79 Kips	25.92 Kips	94.71 Kips
42.51 ft	104.46 Kips	25.92 Kips	130.38 Kips
51.51 ft	146.00 Kips	25.92 Kips	171.91 Kips
53.49 ft	155.92 Kips	25.92 Kips	181.84 Kips
53.51 ft	156.04 Kips	57.74 Kips	213.78 Kips
58.49 ft	187.58 Kips	57.74 Kips	245.32 Kips
58.51 ft	187.70 Kips	25.92 Kips	213.61 Kips
62.99 ft	212.96 Kips	25.92 Kips	238.88 Kips
63.01 ft	213.08 Kips	25.92 Kips	238.99 Kips
72.01 ft	268.24 Kips	25.92 Kips	294.16 Kips
73.49 ft	277.88 Kips	25.92 Kips	303.79 Kips
73.51 ft	278.01 Kips	39.27 Kips	317.28 Kips
80.99 ft	334.22 Kips	39.27 Kips	373.49 Kips
81.01 ft	334.37 Kips	39.27 Kips	373.64 Kips
81.49 ft	338.13 Kips	39.27 Kips	377.40 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	1140.00 psf	0.04 Kips
7.49 ft	Cohesive	N/A	N/A	1140.00 psf	26.82 Kips
7.51 ft	Cohesive	N/A	N/A	930.00 psf	26.89 Kips
16.51 ft	Cohesive	N/A	N/A	971.77 psf	54.37 Kips
19.99 ft	Cohesive	N/A	N/A	994.10 psf	65.87 Kips
20.01 ft	Cohesionless	2300.58 psf	17.05	N/A	65.92 Kips
24.49 ft	Cohesionless	2558.17 psf	17.05	N/A	75.11 Kips
24.51 ft	Cohesionless	2818.13 psf	18.23	N/A	75.16 Kips
24.59 ft	Cohesionless	2823.12 psf	18.23	N/A	75.38 Kips
24.61 ft	Cohesionless	2830.31 psf	18.23	N/A	75.44 Kips
28.49 ft	Cohesionless	2951.76 psf	18.23	N/A	86.53 Kips
28.51 ft	Cohesive	N/A	N/A	1072.33 psf	86.59 Kips
33.49 ft	Cohesive	N/A	N/A	1153.67 psf	104.64 Kips
33.51 ft	Cohesionless	3387.48 psf	18.82	N/A	104.72 Kips
42.51 ft	Cohesionless	3691.68 psf	18.82	N/A	140.38 Kips
51.51 ft	Cohesionless	3995.88 psf	18.82	N/A	181.92 Kips
53.49 ft	Cohesionless	4062.80 psf	18.82	N/A	191.85 Kips
53.51 ft	Cohesionless	4739.50 psf	19.99	N/A	191.96 Kips
58.49 ft	Cohesionless	4920.28 psf	19.99	N/A	223.50 Kips
58.51 ft	Cohesionless	5102.48 psf	18.82	N/A	223.62 Kips
62.99 ft	Cohesionless	5253.90 psf	18.82	N/A	248.88 Kips
63.01 ft	Cohesionless	5406.68 psf	18.82	N/A	249.00 Kips
72.01 ft	Cohesionless	5710.88 psf	18.82	N/A	304.17 Kips
73.49 ft	Cohesionless	5760.90 psf	18.82	N/A	313.80 Kips
73.51 ft	Cohesionless	6116.48 psf	19.41	N/A	313.94 Kips
80.99 ft	Cohesionless	6369.30 psf	19.41	N/A	370.14 Kips
81.01 ft	Cohesionless	6623.48 psf	19.41	N/A	370.30 Kips
81.49 ft	Cohesionless	6639.70 psf	19.41	N/A	374.06 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
7.49 ft	Cohesive	N/A	N/A	N/A	12.37 Kips
7.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
16.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
19.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
20.01 ft	Cohesionless	2301.15 psf	26.40	10.46 Kips	10.46 Kips
24.49 ft	Cohesionless	2816.35 psf	26.40	10.46 Kips	10.46 Kips
24.51 ft	Cohesionless	2818.75 psf	35.20	16.23 Kips	16.23 Kips
24.59 ft	Cohesionless	2828.75 psf	35.20	16.23 Kips	16.23 Kips
24.61 ft	Cohesionless	2830.63 psf	35.20	16.23 Kips	16.23 Kips
28.49 ft	Cohesionless	3073.51 psf	35.20	16.23 Kips	16.23 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
33.51 ft	Cohesionless	3387.82 psf	40.40	25.92 Kips	25.92 Kips
42.51 ft	Cohesionless	3996.22 psf	40.40	25.92 Kips	25.92 Kips
51.51 ft	Cohesionless	4604.62 psf	40.40	25.92 Kips	25.92 Kips
53.49 ft	Cohesionless	4738.46 psf	40.40	25.92 Kips	25.92 Kips
53.51 ft	Cohesionless	4739.87 psf	55.60	57.74 Kips	57.74 Kips
58.49 ft	Cohesionless	5101.41 psf	55.60	57.74 Kips	57.74 Kips
58.51 ft	Cohesionless	5102.82 psf	40.40	25.92 Kips	25.92 Kips
62.99 ft	Cohesionless	5405.66 psf	40.40	25.92 Kips	25.92 Kips
63.01 ft	Cohesionless	5407.02 psf	40.40	25.92 Kips	25.92 Kips
72.01 ft	Cohesionless	6015.42 psf	40.40	25.92 Kips	25.92 Kips
73.49 ft	Cohesionless	6115.46 psf	40.40	25.92 Kips	25.92 Kips
73.51 ft	Cohesionless	6116.82 psf	47.20	39.27 Kips	39.27 Kips
80.99 ft	Cohesionless	6622.46 psf	47.20	39.27 Kips	39.27 Kips
81.01 ft	Cohesionless	6623.82 psf	47.20	39.27 Kips	39.27 Kips
81.49 ft	Cohesionless	6656.26 psf	47.20	39.27 Kips	39.27 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.04 Kips	12.37 Kips	12.41 Kips
7.49 ft	26.82 Kips	12.37 Kips	39.19 Kips
7.51 ft	26.89 Kips	8.84 Kips	35.73 Kips
16.51 ft	54.37 Kips	8.84 Kips	63.20 Kips
19.99 ft	65.87 Kips	8.84 Kips	74.70 Kips
20.01 ft	65.92 Kips	10.46 Kips	76.38 Kips
24.49 ft	75.11 Kips	10.46 Kips	85.58 Kips
24.51 ft	75.16 Kips	16.23 Kips	91.39 Kips
24.59 ft	75.38 Kips	16.23 Kips	91.61 Kips
24.61 ft	75.44 Kips	16.23 Kips	91.67 Kips
28.49 ft	86.53 Kips	16.23 Kips	102.76 Kips
28.51 ft	86.59 Kips	28.27 Kips	114.87 Kips
33.49 ft	104.64 Kips	28.27 Kips	132.92 Kips
33.51 ft	104.72 Kips	25.92 Kips	130.64 Kips
42.51 ft	140.38 Kips	25.92 Kips	166.30 Kips
51.51 ft	181.92 Kips	25.92 Kips	207.84 Kips
53.49 ft	191.85 Kips	25.92 Kips	217.76 Kips
53.51 ft	191.96 Kips	57.74 Kips	249.70 Kips
58.49 ft	223.50 Kips	57.74 Kips	281.24 Kips
58.51 ft	223.62 Kips	25.92 Kips	249.54 Kips
62.99 ft	248.88 Kips	25.92 Kips	274.80 Kips
63.01 ft	249.00 Kips	25.92 Kips	274.92 Kips
72.01 ft	304.17 Kips	25.92 Kips	330.08 Kips
73.49 ft	313.80 Kips	25.92 Kips	339.72 Kips
73.51 ft	313.94 Kips	39.27 Kips	353.21 Kips
80.99 ft	370.14 Kips	39.27 Kips	409.41 Kips
81.01 ft	370.30 Kips	39.27 Kips	409.57 Kips
81.49 ft	374.06 Kips	39.27 Kips	413.33 Kips

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-173-~1.DVN
Project Name: B-173 - Forward Abutment Project Date: 11/06/2014
Project Client: EMHT
Computed By: BRT
Project Manager: JPS

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 14.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	81.90 ft
	- Driving/Restrike	81.90 ft
	- Ultimate:	81.90 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	10.00 ft	0.00%	125.00 pcf	29.0/29.0	Nordlund
2	Cohesive	8.50 ft	50.00%	120.00 pcf	2750.00 psf	T-79 Steel
3	Cohesive	5.00 ft	17.00%	120.00 pcf	2250.00 psf	T-79 Steel
4	Cohesive	6.50 ft	33.00%	115.00 pcf	1250.00 psf	T-79 Steel
5	Cohesionless	15.00 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
6	Cohesionless	10.00 ft	0.00%	125.00 pcf	31.0/31.0	Nordlund
7	Cohesionless	5.00 ft	0.00%	125.00 pcf	30.0/30.0	Nordlund
8	Cohesionless	11.00 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	19.33	N/A	0.00 Kips
9.01 ft	Cohesionless	563.12 psf	19.33	N/A	5.85 Kips
9.99 ft	Cohesionless	624.38 psf	19.33	N/A	7.19 Kips
10.01 ft	Cohesive	N/A	N/A	878.75 psf	7.24 Kips
18.49 ft	Cohesive	N/A	N/A	986.22 psf	37.89 Kips
18.51 ft	Cohesive	N/A	N/A	1197.93 psf	37.98 Kips
23.49 ft	Cohesive	N/A	N/A	1263.74 psf	61.05 Kips
23.51 ft	Cohesive	N/A	N/A	995.14 psf	61.13 Kips
29.99 ft	Cohesive	N/A	N/A	1030.78 psf	85.62 Kips
30.01 ft	Cohesionless	3618.15 psf	21.99	N/A	85.72 Kips
39.01 ft	Cohesionless	4203.15 psf	21.99	N/A	151.40 Kips
44.99 ft	Cohesionless	4591.85 psf	21.99	N/A	205.14 Kips
45.01 ft	Cohesionless	5568.12 psf	20.66	N/A	205.32 Kips
54.01 ft	Cohesionless	6130.62 psf	20.66	N/A	282.98 Kips
54.99 ft	Cohesionless	6191.88 psf	20.66	N/A	292.29 Kips
55.01 ft	Cohesionless	6818.12 psf	19.99	N/A	292.47 Kips
59.99 ft	Cohesionless	7129.38 psf	19.99	N/A	336.81 Kips
60.01 ft	Cohesionless	7443.15 psf	21.33	N/A	337.02 Kips
69.01 ft	Cohesionless	8028.15 psf	21.33	N/A	450.46 Kips
70.99 ft	Cohesionless	8156.85 psf	21.33	N/A	477.63 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.25 psf	26.40	14.24 Kips	0.02 Kips
9.01 ft	Cohesionless	1126.25 psf	26.40	14.24 Kips	14.24 Kips
9.99 ft	Cohesionless	1248.75 psf	26.40	14.24 Kips	14.24 Kips
10.01 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
18.49 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
18.51 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
23.49 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
23.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
29.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
30.01 ft	Cohesionless	3618.80 psf	47.20	53.45 Kips	53.45 Kips
39.01 ft	Cohesionless	4788.80 psf	47.20	53.45 Kips	53.45 Kips
44.99 ft	Cohesionless	5566.20 psf	47.20	53.45 Kips	53.45 Kips
45.01 ft	Cohesionless	5568.75 psf	35.20	22.09 Kips	22.09 Kips
54.01 ft	Cohesionless	6693.75 psf	35.20	22.09 Kips	22.09 Kips
54.99 ft	Cohesionless	6816.25 psf	35.20	22.09 Kips	22.09 Kips
55.01 ft	Cohesionless	6818.75 psf	30.00	14.24 Kips	14.24 Kips
59.99 ft	Cohesionless	7441.25 psf	30.00	14.24 Kips	14.24 Kips
60.01 ft	Cohesionless	7443.80 psf	40.40	35.28 Kips	35.28 Kips
69.01 ft	Cohesionless	8613.80 psf	40.40	35.28 Kips	35.28 Kips
70.99 ft	Cohesionless	8871.20 psf	40.40	35.28 Kips	35.28 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
9.01 ft	5.85 Kips	14.24 Kips	20.09 Kips
9.99 ft	7.19 Kips	14.24 Kips	21.43 Kips
10.01 ft	7.24 Kips	26.46 Kips	33.70 Kips
18.49 ft	37.89 Kips	26.46 Kips	64.35 Kips
18.51 ft	37.98 Kips	21.65 Kips	59.63 Kips
23.49 ft	61.05 Kips	21.65 Kips	82.70 Kips
23.51 ft	61.13 Kips	12.03 Kips	73.16 Kips
29.99 ft	85.62 Kips	12.03 Kips	97.64 Kips
30.01 ft	85.72 Kips	53.45 Kips	139.17 Kips
39.01 ft	151.40 Kips	53.45 Kips	204.85 Kips
44.99 ft	205.14 Kips	53.45 Kips	258.59 Kips
45.01 ft	205.32 Kips	22.09 Kips	227.41 Kips
54.01 ft	282.98 Kips	22.09 Kips	305.07 Kips
54.99 ft	292.29 Kips	22.09 Kips	314.38 Kips
55.01 ft	292.47 Kips	14.24 Kips	306.71 Kips
59.99 ft	336.81 Kips	14.24 Kips	351.05 Kips
60.01 ft	337.02 Kips	35.28 Kips	372.30 Kips
69.01 ft	450.46 Kips	35.28 Kips	485.74 Kips
70.99 ft	477.63 Kips	35.28 Kips	512.91 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	19.33	N/A	0.00 Kips
9.01 ft	Cohesionless	563.12 psf	19.33	N/A	5.85 Kips
9.99 ft	Cohesionless	624.38 psf	19.33	N/A	7.19 Kips
10.01 ft	Cohesive	N/A	N/A	878.75 psf	7.21 Kips
18.49 ft	Cohesive	N/A	N/A	986.22 psf	22.54 Kips
18.51 ft	Cohesive	N/A	N/A	1197.93 psf	22.61 Kips
23.49 ft	Cohesive	N/A	N/A	1263.74 psf	41.76 Kips
23.51 ft	Cohesive	N/A	N/A	995.14 psf	41.82 Kips
29.99 ft	Cohesive	N/A	N/A	1030.78 psf	58.22 Kips
30.01 ft	Cohesionless	3618.15 psf	21.99	N/A	58.32 Kips
39.01 ft	Cohesionless	4203.15 psf	21.99	N/A	124.00 Kips
44.99 ft	Cohesionless	4591.85 psf	21.99	N/A	177.75 Kips
45.01 ft	Cohesionless	5568.12 psf	20.66	N/A	177.92 Kips
54.01 ft	Cohesionless	6130.62 psf	20.66	N/A	255.58 Kips
54.99 ft	Cohesionless	6191.88 psf	20.66	N/A	264.90 Kips
55.01 ft	Cohesionless	6818.12 psf	19.99	N/A	265.08 Kips
59.99 ft	Cohesionless	7129.38 psf	19.99	N/A	309.42 Kips
60.01 ft	Cohesionless	7443.15 psf	21.33	N/A	309.63 Kips
69.01 ft	Cohesionless	8028.15 psf	21.33	N/A	423.06 Kips
70.99 ft	Cohesionless	8156.85 psf	21.33	N/A	450.24 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.25 psf	26.40	14.24 Kips	0.02 Kips
9.01 ft	Cohesionless	1126.25 psf	26.40	14.24 Kips	14.24 Kips
9.99 ft	Cohesionless	1248.75 psf	26.40	14.24 Kips	14.24 Kips
10.01 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
18.49 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
18.51 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
23.49 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
23.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
29.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
30.01 ft	Cohesionless	3618.80 psf	47.20	53.45 Kips	53.45 Kips
39.01 ft	Cohesionless	4788.80 psf	47.20	53.45 Kips	53.45 Kips
44.99 ft	Cohesionless	5566.20 psf	47.20	53.45 Kips	53.45 Kips
45.01 ft	Cohesionless	5568.75 psf	35.20	22.09 Kips	22.09 Kips
54.01 ft	Cohesionless	6693.75 psf	35.20	22.09 Kips	22.09 Kips
54.99 ft	Cohesionless	6816.25 psf	35.20	22.09 Kips	22.09 Kips
55.01 ft	Cohesionless	6818.75 psf	30.00	14.24 Kips	14.24 Kips
59.99 ft	Cohesionless	7441.25 psf	30.00	14.24 Kips	14.24 Kips
60.01 ft	Cohesionless	7443.80 psf	40.40	35.28 Kips	35.28 Kips
69.01 ft	Cohesionless	8613.80 psf	40.40	35.28 Kips	35.28 Kips
70.99 ft	Cohesionless	8871.20 psf	40.40	35.28 Kips	35.28 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
9.01 ft	5.85 Kips	14.24 Kips	20.09 Kips
9.99 ft	7.19 Kips	14.24 Kips	21.43 Kips
10.01 ft	7.21 Kips	26.46 Kips	33.67 Kips
18.49 ft	22.54 Kips	26.46 Kips	49.00 Kips
18.51 ft	22.61 Kips	21.65 Kips	44.26 Kips
23.49 ft	41.76 Kips	21.65 Kips	63.41 Kips
23.51 ft	41.82 Kips	12.03 Kips	53.84 Kips
29.99 ft	58.22 Kips	12.03 Kips	70.25 Kips
30.01 ft	58.32 Kips	53.45 Kips	111.77 Kips
39.01 ft	124.00 Kips	53.45 Kips	177.45 Kips
44.99 ft	177.75 Kips	53.45 Kips	231.20 Kips
45.01 ft	177.92 Kips	22.09 Kips	200.01 Kips
54.01 ft	255.58 Kips	22.09 Kips	277.67 Kips
54.99 ft	264.90 Kips	22.09 Kips	286.99 Kips
55.01 ft	265.08 Kips	14.24 Kips	279.32 Kips
59.99 ft	309.42 Kips	14.24 Kips	323.66 Kips
60.01 ft	309.63 Kips	35.28 Kips	344.90 Kips
69.01 ft	423.06 Kips	35.28 Kips	458.34 Kips
70.99 ft	450.24 Kips	35.28 Kips	485.52 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	19.33	N/A	0.00 Kips
9.01 ft	Cohesionless	563.12 psf	19.33	N/A	5.85 Kips
9.99 ft	Cohesionless	624.38 psf	19.33	N/A	7.19 Kips
10.01 ft	Cohesive	N/A	N/A	878.75 psf	7.24 Kips
18.49 ft	Cohesive	N/A	N/A	986.22 psf	37.89 Kips
18.51 ft	Cohesive	N/A	N/A	1197.93 psf	37.98 Kips
23.49 ft	Cohesive	N/A	N/A	1263.74 psf	61.05 Kips
23.51 ft	Cohesive	N/A	N/A	995.14 psf	61.13 Kips
29.99 ft	Cohesive	N/A	N/A	1030.78 psf	85.62 Kips
30.01 ft	Cohesionless	3618.15 psf	21.99	N/A	85.72 Kips
39.01 ft	Cohesionless	4203.15 psf	21.99	N/A	151.40 Kips
44.99 ft	Cohesionless	4591.85 psf	21.99	N/A	205.14 Kips
45.01 ft	Cohesionless	5568.12 psf	20.66	N/A	205.32 Kips
54.01 ft	Cohesionless	6130.62 psf	20.66	N/A	282.98 Kips
54.99 ft	Cohesionless	6191.88 psf	20.66	N/A	292.29 Kips
55.01 ft	Cohesionless	6818.12 psf	19.99	N/A	292.47 Kips
59.99 ft	Cohesionless	7129.38 psf	19.99	N/A	336.81 Kips
60.01 ft	Cohesionless	7443.15 psf	21.33	N/A	337.02 Kips
69.01 ft	Cohesionless	8028.15 psf	21.33	N/A	450.46 Kips
70.99 ft	Cohesionless	8156.85 psf	21.33	N/A	477.63 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.25 psf	26.40	14.24 Kips	0.02 Kips
9.01 ft	Cohesionless	1126.25 psf	26.40	14.24 Kips	14.24 Kips
9.99 ft	Cohesionless	1248.75 psf	26.40	14.24 Kips	14.24 Kips
10.01 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
18.49 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
18.51 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
23.49 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
23.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
29.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
30.01 ft	Cohesionless	3618.80 psf	47.20	53.45 Kips	53.45 Kips
39.01 ft	Cohesionless	4788.80 psf	47.20	53.45 Kips	53.45 Kips
44.99 ft	Cohesionless	5566.20 psf	47.20	53.45 Kips	53.45 Kips
45.01 ft	Cohesionless	5568.75 psf	35.20	22.09 Kips	22.09 Kips
54.01 ft	Cohesionless	6693.75 psf	35.20	22.09 Kips	22.09 Kips
54.99 ft	Cohesionless	6816.25 psf	35.20	22.09 Kips	22.09 Kips
55.01 ft	Cohesionless	6818.75 psf	30.00	14.24 Kips	14.24 Kips
59.99 ft	Cohesionless	7441.25 psf	30.00	14.24 Kips	14.24 Kips
60.01 ft	Cohesionless	7443.80 psf	40.40	35.28 Kips	35.28 Kips
69.01 ft	Cohesionless	8613.80 psf	40.40	35.28 Kips	35.28 Kips
70.99 ft	Cohesionless	8871.20 psf	40.40	35.28 Kips	35.28 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
9.01 ft	5.85 Kips	14.24 Kips	20.09 Kips
9.99 ft	7.19 Kips	14.24 Kips	21.43 Kips
10.01 ft	7.24 Kips	26.46 Kips	33.70 Kips
18.49 ft	37.89 Kips	26.46 Kips	64.35 Kips
18.51 ft	37.98 Kips	21.65 Kips	59.63 Kips
23.49 ft	61.05 Kips	21.65 Kips	82.70 Kips
23.51 ft	61.13 Kips	12.03 Kips	73.16 Kips
29.99 ft	85.62 Kips	12.03 Kips	97.64 Kips
30.01 ft	85.72 Kips	53.45 Kips	139.17 Kips
39.01 ft	151.40 Kips	53.45 Kips	204.85 Kips
44.99 ft	205.14 Kips	53.45 Kips	258.59 Kips
45.01 ft	205.32 Kips	22.09 Kips	227.41 Kips
54.01 ft	282.98 Kips	22.09 Kips	305.07 Kips
54.99 ft	292.29 Kips	22.09 Kips	314.38 Kips
55.01 ft	292.47 Kips	14.24 Kips	306.71 Kips
59.99 ft	336.81 Kips	14.24 Kips	351.05 Kips
60.01 ft	337.02 Kips	35.28 Kips	372.30 Kips
69.01 ft	450.46 Kips	35.28 Kips	485.74 Kips
70.99 ft	477.63 Kips	35.28 Kips	512.91 Kips

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-173-~1.DVN
Project Name: B-173 - Forward Wingwall Project Date: 11/07/2014
Project Client: EMHT
Computed By: BRT
Project Manager: JPS

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	73.50 ft
	- Driving/Restrike	73.50 ft
	- Ultimate:	73.50 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	12.00 ft	0.00%	125.00 pcf	29.0/29.0	Nordlund
2	Cohesive	8.50 ft	50.00%	120.00 pcf	2750.00 psf	T-79 Steel
3	Cohesive	5.00 ft	17.00%	120.00 pcf	2250.00 psf	T-79 Steel
4	Cohesive	6.50 ft	33.00%	115.00 pcf	1250.00 psf	T-79 Steel
5	Cohesionless	15.00 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
6	Cohesionless	10.00 ft	0.00%	125.00 pcf	31.0/31.0	Nordlund
7	Cohesionless	5.00 ft	0.00%	125.00 pcf	30.0/30.0	Nordlund
8	Cohesionless	11.00 ft	0.00%	130.00 pcf	32.0/32.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	17.05	N/A	0.00 Kips
9.01 ft	Cohesionless	563.12 psf	17.05	N/A	4.07 Kips
11.99 ft	Cohesionless	749.38 psf	17.05	N/A	7.21 Kips
12.01 ft	Cohesive	N/A	N/A	915.68 psf	7.25 Kips
20.49 ft	Cohesive	N/A	N/A	1071.50 psf	35.80 Kips
20.51 ft	Cohesive	N/A	N/A	1269.53 psf	35.88 Kips
25.49 ft	Cohesive	N/A	N/A	1346.30 psf	56.94 Kips
25.51 ft	Cohesive	N/A	N/A	1029.52 psf	57.02 Kips
31.99 ft	Cohesive	N/A	N/A	1071.10 psf	78.83 Kips
32.01 ft	Cohesionless	3868.15 psf	19.41	N/A	78.91 Kips
41.01 ft	Cohesionless	4453.15 psf	19.41	N/A	126.19 Kips
46.99 ft	Cohesionless	4841.85 psf	19.41	N/A	164.48 Kips
47.01 ft	Cohesionless	5818.12 psf	18.23	N/A	164.60 Kips
56.01 ft	Cohesionless	6380.62 psf	18.23	N/A	220.21 Kips
56.99 ft	Cohesionless	6441.88 psf	18.23	N/A	226.86 Kips
57.01 ft	Cohesionless	7068.12 psf	17.64	N/A	226.99 Kips
61.99 ft	Cohesionless	7379.38 psf	17.64	N/A	258.78 Kips
62.01 ft	Cohesionless	7693.15 psf	18.82	N/A	258.93 Kips
71.01 ft	Cohesionless	8278.15 psf	18.82	N/A	338.89 Kips
72.99 ft	Cohesionless	8406.85 psf	18.82	N/A	358.00 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.25 psf	26.40	10.46 Kips	0.01 Kips
9.01 ft	Cohesionless	1126.25 psf	26.40	10.46 Kips	10.46 Kips
11.99 ft	Cohesionless	1498.75 psf	26.40	10.46 Kips	10.46 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	19.44 Kips
20.49 ft	Cohesive	N/A	N/A	N/A	19.44 Kips
20.51 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
25.49 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
25.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
31.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
32.01 ft	Cohesionless	3868.80 psf	47.20	39.27 Kips	39.27 Kips
41.01 ft	Cohesionless	5038.80 psf	47.20	39.27 Kips	39.27 Kips
46.99 ft	Cohesionless	5816.20 psf	47.20	39.27 Kips	39.27 Kips
47.01 ft	Cohesionless	5818.75 psf	35.20	16.23 Kips	16.23 Kips
56.01 ft	Cohesionless	6943.75 psf	35.20	16.23 Kips	16.23 Kips
56.99 ft	Cohesionless	7066.25 psf	35.20	16.23 Kips	16.23 Kips
57.01 ft	Cohesionless	7068.75 psf	30.00	10.46 Kips	10.46 Kips
61.99 ft	Cohesionless	7691.25 psf	30.00	10.46 Kips	10.46 Kips
62.01 ft	Cohesionless	7693.80 psf	40.40	25.92 Kips	25.92 Kips
71.01 ft	Cohesionless	8863.80 psf	40.40	25.92 Kips	25.92 Kips
72.99 ft	Cohesionless	9121.20 psf	40.40	25.92 Kips	25.92 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.01 Kips	0.01 Kips
9.01 ft	4.07 Kips	10.46 Kips	14.53 Kips
11.99 ft	7.21 Kips	10.46 Kips	17.67 Kips
12.01 ft	7.25 Kips	19.44 Kips	26.69 Kips
20.49 ft	35.80 Kips	19.44 Kips	55.24 Kips
20.51 ft	35.88 Kips	15.90 Kips	51.78 Kips
25.49 ft	56.94 Kips	15.90 Kips	72.85 Kips
25.51 ft	57.02 Kips	8.84 Kips	65.85 Kips
31.99 ft	78.83 Kips	8.84 Kips	87.66 Kips
32.01 ft	78.91 Kips	39.27 Kips	118.18 Kips
41.01 ft	126.19 Kips	39.27 Kips	165.46 Kips
46.99 ft	164.48 Kips	39.27 Kips	203.75 Kips
47.01 ft	164.60 Kips	16.23 Kips	180.83 Kips
56.01 ft	220.21 Kips	16.23 Kips	236.44 Kips
56.99 ft	226.86 Kips	16.23 Kips	243.09 Kips
57.01 ft	226.99 Kips	10.46 Kips	237.45 Kips
61.99 ft	258.78 Kips	10.46 Kips	269.24 Kips
62.01 ft	258.93 Kips	25.92 Kips	284.84 Kips
71.01 ft	338.89 Kips	25.92 Kips	364.81 Kips
72.99 ft	358.00 Kips	25.92 Kips	383.92 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	17.05	N/A	0.00 Kips
9.01 ft	Cohesionless	563.12 psf	17.05	N/A	4.07 Kips
11.99 ft	Cohesionless	749.38 psf	17.05	N/A	7.21 Kips
12.01 ft	Cohesive	N/A	N/A	915.68 psf	7.23 Kips
20.49 ft	Cohesive	N/A	N/A	1071.50 psf	21.50 Kips
20.51 ft	Cohesive	N/A	N/A	1269.53 psf	21.57 Kips
25.49 ft	Cohesive	N/A	N/A	1346.30 psf	39.05 Kips
25.51 ft	Cohesive	N/A	N/A	1029.52 psf	39.10 Kips
31.99 ft	Cohesive	N/A	N/A	1071.10 psf	53.71 Kips
32.01 ft	Cohesionless	3868.15 psf	19.41	N/A	53.79 Kips
41.01 ft	Cohesionless	4453.15 psf	19.41	N/A	101.08 Kips
46.99 ft	Cohesionless	4841.85 psf	19.41	N/A	139.37 Kips
47.01 ft	Cohesionless	5818.12 psf	18.23	N/A	139.49 Kips
56.01 ft	Cohesionless	6380.62 psf	18.23	N/A	195.10 Kips
56.99 ft	Cohesionless	6441.88 psf	18.23	N/A	201.75 Kips
57.01 ft	Cohesionless	7068.12 psf	17.64	N/A	201.88 Kips
61.99 ft	Cohesionless	7379.38 psf	17.64	N/A	233.66 Kips
62.01 ft	Cohesionless	7693.15 psf	18.82	N/A	233.81 Kips
71.01 ft	Cohesionless	8278.15 psf	18.82	N/A	313.78 Kips
72.99 ft	Cohesionless	8406.85 psf	18.82	N/A	332.89 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.25 psf	26.40	10.46 Kips	0.01 Kips
9.01 ft	Cohesionless	1126.25 psf	26.40	10.46 Kips	10.46 Kips
11.99 ft	Cohesionless	1498.75 psf	26.40	10.46 Kips	10.46 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	19.44 Kips
20.49 ft	Cohesive	N/A	N/A	N/A	19.44 Kips
20.51 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
25.49 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
25.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
31.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
32.01 ft	Cohesionless	3868.80 psf	47.20	39.27 Kips	39.27 Kips
41.01 ft	Cohesionless	5038.80 psf	47.20	39.27 Kips	39.27 Kips
46.99 ft	Cohesionless	5816.20 psf	47.20	39.27 Kips	39.27 Kips
47.01 ft	Cohesionless	5818.75 psf	35.20	16.23 Kips	16.23 Kips
56.01 ft	Cohesionless	6943.75 psf	35.20	16.23 Kips	16.23 Kips
56.99 ft	Cohesionless	7066.25 psf	35.20	16.23 Kips	16.23 Kips
57.01 ft	Cohesionless	7068.75 psf	30.00	10.46 Kips	10.46 Kips
61.99 ft	Cohesionless	7691.25 psf	30.00	10.46 Kips	10.46 Kips
62.01 ft	Cohesionless	7693.80 psf	40.40	25.92 Kips	25.92 Kips
71.01 ft	Cohesionless	8863.80 psf	40.40	25.92 Kips	25.92 Kips
72.99 ft	Cohesionless	9121.20 psf	40.40	25.92 Kips	25.92 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.01 Kips	0.01 Kips
9.01 ft	4.07 Kips	10.46 Kips	14.53 Kips
11.99 ft	7.21 Kips	10.46 Kips	17.67 Kips
12.01 ft	7.23 Kips	19.44 Kips	26.67 Kips
20.49 ft	21.50 Kips	19.44 Kips	40.94 Kips
20.51 ft	21.57 Kips	15.90 Kips	37.47 Kips
25.49 ft	39.05 Kips	15.90 Kips	54.96 Kips
25.51 ft	39.10 Kips	8.84 Kips	47.94 Kips
31.99 ft	53.71 Kips	8.84 Kips	62.55 Kips
32.01 ft	53.79 Kips	39.27 Kips	93.06 Kips
41.01 ft	101.08 Kips	39.27 Kips	140.35 Kips
46.99 ft	139.37 Kips	39.27 Kips	178.64 Kips
47.01 ft	139.49 Kips	16.23 Kips	155.72 Kips
56.01 ft	195.10 Kips	16.23 Kips	211.33 Kips
56.99 ft	201.75 Kips	16.23 Kips	217.98 Kips
57.01 ft	201.88 Kips	10.46 Kips	212.34 Kips
61.99 ft	233.66 Kips	10.46 Kips	244.13 Kips
62.01 ft	233.81 Kips	25.92 Kips	259.73 Kips
71.01 ft	313.78 Kips	25.92 Kips	339.70 Kips
72.99 ft	332.89 Kips	25.92 Kips	358.81 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	17.05	N/A	0.00 Kips
9.01 ft	Cohesionless	563.12 psf	17.05	N/A	4.07 Kips
11.99 ft	Cohesionless	749.38 psf	17.05	N/A	7.21 Kips
12.01 ft	Cohesive	N/A	N/A	915.68 psf	7.25 Kips
20.49 ft	Cohesive	N/A	N/A	1071.50 psf	35.80 Kips
20.51 ft	Cohesive	N/A	N/A	1269.53 psf	35.88 Kips
25.49 ft	Cohesive	N/A	N/A	1346.30 psf	56.94 Kips
25.51 ft	Cohesive	N/A	N/A	1029.52 psf	57.02 Kips
31.99 ft	Cohesive	N/A	N/A	1071.10 psf	78.83 Kips
32.01 ft	Cohesionless	3868.15 psf	19.41	N/A	78.91 Kips
41.01 ft	Cohesionless	4453.15 psf	19.41	N/A	126.19 Kips
46.99 ft	Cohesionless	4841.85 psf	19.41	N/A	164.48 Kips
47.01 ft	Cohesionless	5818.12 psf	18.23	N/A	164.60 Kips
56.01 ft	Cohesionless	6380.62 psf	18.23	N/A	220.21 Kips
56.99 ft	Cohesionless	6441.88 psf	18.23	N/A	226.86 Kips
57.01 ft	Cohesionless	7068.12 psf	17.64	N/A	226.99 Kips
61.99 ft	Cohesionless	7379.38 psf	17.64	N/A	258.78 Kips
62.01 ft	Cohesionless	7693.15 psf	18.82	N/A	258.93 Kips
71.01 ft	Cohesionless	8278.15 psf	18.82	N/A	338.89 Kips
72.99 ft	Cohesionless	8406.85 psf	18.82	N/A	358.00 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.25 psf	26.40	10.46 Kips	0.01 Kips
9.01 ft	Cohesionless	1126.25 psf	26.40	10.46 Kips	10.46 Kips
11.99 ft	Cohesionless	1498.75 psf	26.40	10.46 Kips	10.46 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	19.44 Kips
20.49 ft	Cohesive	N/A	N/A	N/A	19.44 Kips
20.51 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
25.49 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
25.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
31.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
32.01 ft	Cohesionless	3868.80 psf	47.20	39.27 Kips	39.27 Kips
41.01 ft	Cohesionless	5038.80 psf	47.20	39.27 Kips	39.27 Kips
46.99 ft	Cohesionless	5816.20 psf	47.20	39.27 Kips	39.27 Kips
47.01 ft	Cohesionless	5818.75 psf	35.20	16.23 Kips	16.23 Kips
56.01 ft	Cohesionless	6943.75 psf	35.20	16.23 Kips	16.23 Kips
56.99 ft	Cohesionless	7066.25 psf	35.20	16.23 Kips	16.23 Kips
57.01 ft	Cohesionless	7068.75 psf	30.00	10.46 Kips	10.46 Kips
61.99 ft	Cohesionless	7691.25 psf	30.00	10.46 Kips	10.46 Kips
62.01 ft	Cohesionless	7693.80 psf	40.40	25.92 Kips	25.92 Kips
71.01 ft	Cohesionless	8863.80 psf	40.40	25.92 Kips	25.92 Kips
72.99 ft	Cohesionless	9121.20 psf	40.40	25.92 Kips	25.92 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.01 Kips	0.01 Kips
9.01 ft	4.07 Kips	10.46 Kips	14.53 Kips
11.99 ft	7.21 Kips	10.46 Kips	17.67 Kips
12.01 ft	7.25 Kips	19.44 Kips	26.69 Kips
20.49 ft	35.80 Kips	19.44 Kips	55.24 Kips
20.51 ft	35.88 Kips	15.90 Kips	51.78 Kips
25.49 ft	56.94 Kips	15.90 Kips	72.85 Kips
25.51 ft	57.02 Kips	8.84 Kips	65.85 Kips
31.99 ft	78.83 Kips	8.84 Kips	87.66 Kips
32.01 ft	78.91 Kips	39.27 Kips	118.18 Kips
41.01 ft	126.19 Kips	39.27 Kips	165.46 Kips
46.99 ft	164.48 Kips	39.27 Kips	203.75 Kips
47.01 ft	164.60 Kips	16.23 Kips	180.83 Kips
56.01 ft	220.21 Kips	16.23 Kips	236.44 Kips
56.99 ft	226.86 Kips	16.23 Kips	243.09 Kips
57.01 ft	226.99 Kips	10.46 Kips	237.45 Kips
61.99 ft	258.78 Kips	10.46 Kips	269.24 Kips
62.01 ft	258.93 Kips	25.92 Kips	284.84 Kips
71.01 ft	338.89 Kips	25.92 Kips	364.81 Kips
72.99 ft	358.00 Kips	25.92 Kips	383.92 Kips

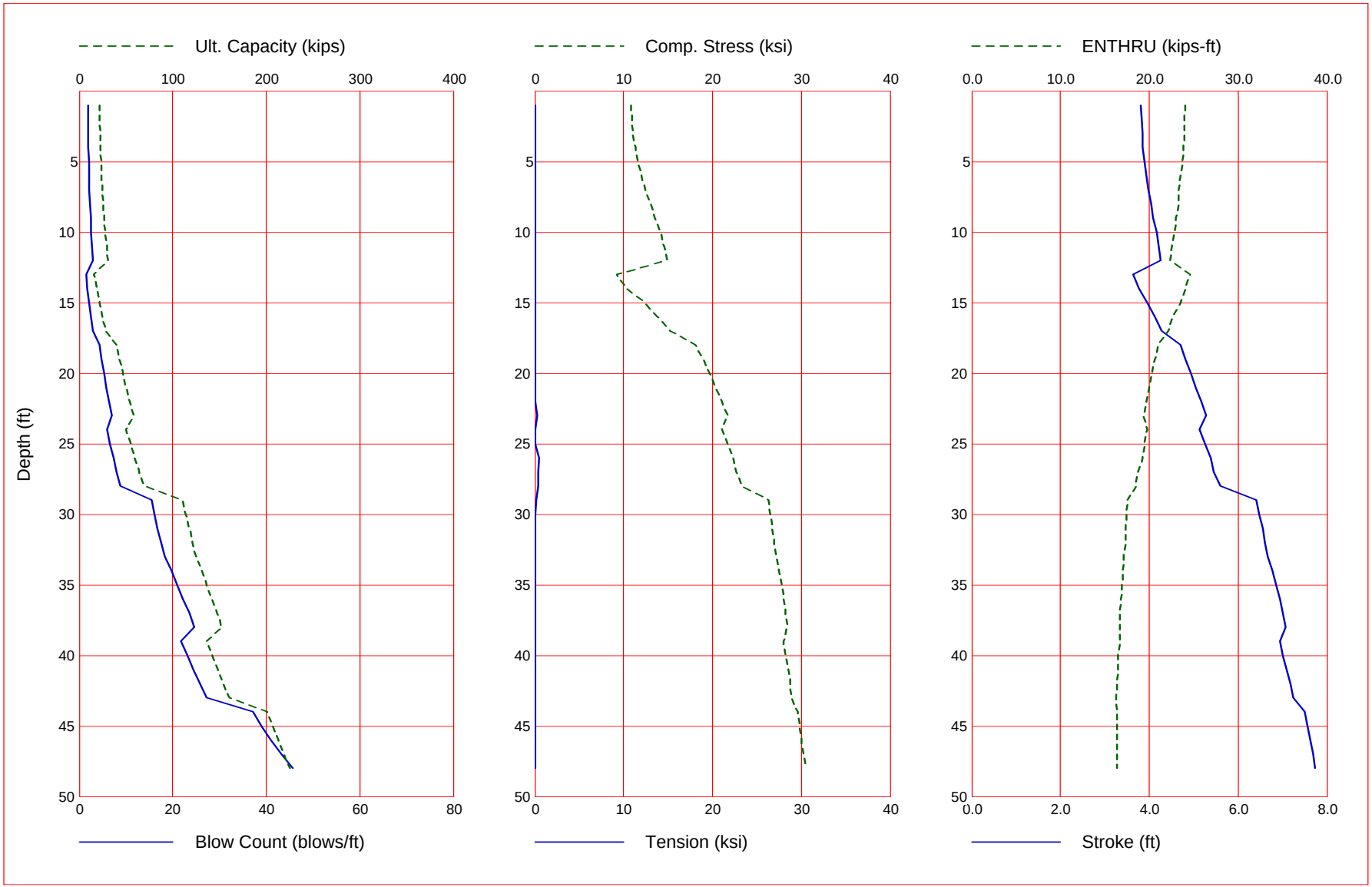
APPENDIX VII

GRLWEAP DRIVEABILITY ANALYSIS OUTPUTS

Resource International Inc
HAM-75-0834 - B-008 - Pier - 12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.390 / 0.370



Gain/Loss 1 at Shaft and Toe 1.390 / 0.370

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
1.0	21.9	0.1	21.8	1.9	10.793	0.000	3.81	24.0
2.0	22.1	0.3	21.8	1.9	10.882	0.000	3.82	23.9
3.0	22.4	0.6	21.8	1.9	11.048	0.000	3.84	23.9
4.0	22.9	1.0	21.8	2.0	11.326	0.000	3.86	23.8
5.0	23.4	1.6	21.8	2.1	11.625	0.000	3.90	23.7
6.0	24.1	2.3	21.8	2.1	11.992	0.000	3.93	23.5
7.0	24.9	3.1	21.8	2.2	12.415	0.000	3.97	23.3
8.0	25.9	4.0	21.8	2.4	13.076	0.000	4.05	23.3
9.0	26.9	5.1	21.8	2.5	13.502	0.000	4.09	23.0
10.0	28.1	6.3	21.8	2.6	14.144	0.000	4.16	22.9
11.0	29.4	7.6	21.8	2.8	14.536	0.000	4.21	22.6
12.0	30.9	9.0	21.8	3.0	14.844	0.000	4.25	22.3
13.0	15.7	11.8	3.9	1.6	9.260	0.000	3.64	24.6
14.0	18.6	14.7	3.9	1.8	10.269	0.000	3.77	24.1
15.0	21.8	17.9	3.9	2.2	12.380	0.000	3.95	23.5
16.0	25.1	21.2	3.9	2.6	13.852	0.000	4.12	22.7
17.0	28.7	24.8	3.9	3.0	15.209	0.000	4.28	22.1
18.0	40.0	27.3	12.8	4.4	18.107	0.000	4.70	21.0
19.0	43.4	29.9	13.5	4.8	18.895	0.000	4.82	20.6
20.0	46.9	32.7	14.2	5.3	19.652	0.000	4.94	20.3
21.0	50.5	35.7	14.8	5.8	20.372	0.000	5.05	20.0
22.0	54.3	38.8	15.5	6.3	21.101	0.000	5.17	19.7
23.0	58.2	42.0	16.2	6.9	21.729	-0.294	5.28	19.4
24.0	50.4	45.8	4.6	5.9	21.027	0.000	5.12	19.8
25.0	54.8	50.2	4.6	6.6	21.703	-0.027	5.25	19.5
26.0	59.5	54.9	4.6	7.3	22.320	-0.469	5.38	19.2
27.0	64.3	59.7	4.6	8.0	22.715	-0.402	5.45	18.7
28.0	69.2	64.7	4.6	8.8	23.274	-0.388	5.59	18.5
29.0	111.2	68.8	42.5	15.5	26.298	-0.154	6.42	17.5
30.0	114.4	71.9	42.5	16.1	26.508	-0.099	6.48	17.4
31.0	117.7	75.2	42.5	16.8	26.710	-0.026	6.55	17.3
32.0	121.1	78.6	42.5	17.5	26.918	0.000	6.61	17.3
33.0	124.6	82.1	42.5	18.3	27.142	0.000	6.67	17.1
34.0	131.3	86.4	44.9	19.8	27.481	0.000	6.77	17.0
35.0	136.5	91.6	44.9	21.0	27.751	0.000	6.86	16.9
36.0	141.8	96.9	44.9	22.2	27.956	0.000	6.94	16.8
37.0	147.2	102.3	44.9	23.5	28.239	0.000	7.01	16.7
38.0	152.8	107.8	44.9	24.6	28.454	0.000	7.08	16.7
39.0	136.6	113.5	23.1	21.7	27.982	0.000	6.94	16.7
40.0	142.4	119.4	23.1	23.2	28.180	0.000	7.01	16.5
41.0	148.3	125.3	23.1	24.5	28.496	0.000	7.10	16.5
42.0	154.3	131.2	23.1	25.8	28.707	0.000	7.18	16.4
43.0	160.3	137.3	23.1	27.2	28.838	0.000	7.24	16.3
44.0	201.4	143.2	58.3	37.2	29.632	-0.066	7.50	16.4

Gain/Loss 1 at Shaft and Toe 1.390 / 0.370 (Continued)

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
45.0	207.2	149.0	58.3	39.0	29.857	-0.061	7.56	16.4
46.0	213.1	154.8	58.3	41.0	30.011	-0.066	7.62	16.4
47.0	219.1	160.8	58.3	43.3	30.212	-0.051	7.68	16.4
48.0	225.1	166.8	58.3	45.6	30.465	-0.029	7.73	16.4

Total Continuous Driving Time 13.00 minutes; Total Number of Blows 609

Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

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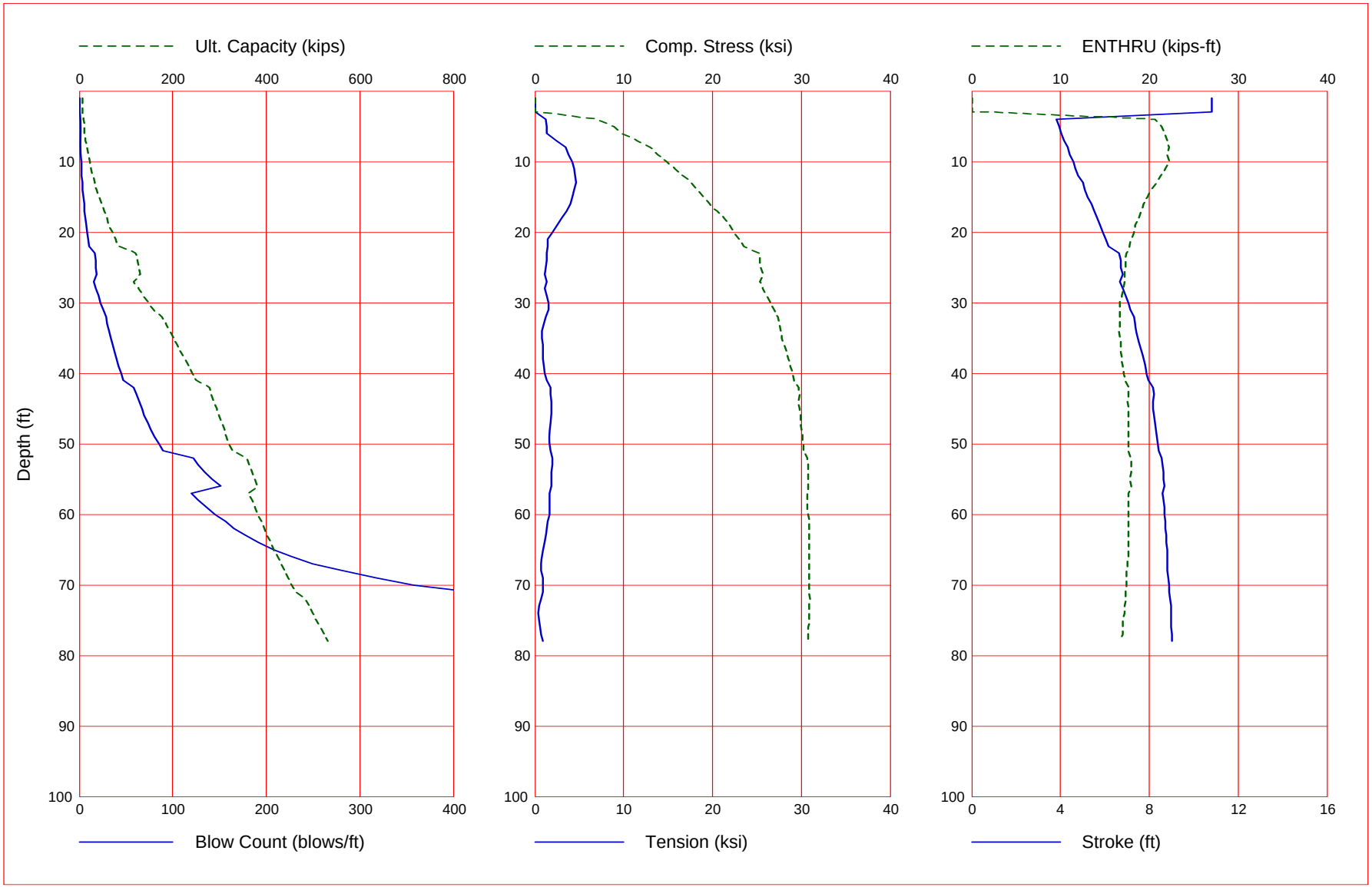
Gain/Loss 1 at Shaft and Toe 1.920 / 0.310



Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.920 / 0.310

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
1.0	6.2	0.2	6.0	0.0	0.000	0.000	10.81	0.0
2.0	6.8	0.8	6.0	0.0	0.000	0.000	10.81	0.0
3.0	7.8	1.8	6.0	0.0	0.000	0.000	10.81	0.0
4.0	9.1	3.2	6.0	1.3	6.997	-1.182	3.81	20.6
5.0	10.9	4.9	6.0	1.4	8.904	-1.356	3.94	21.4
6.0	11.8	6.9	4.9	1.5	9.778	-1.327	4.02	21.7
7.0	13.9	9.1	4.9	1.6	11.414	-2.380	4.16	22.0
8.0	16.4	11.6	4.9	1.7	12.976	-3.421	4.34	22.2
9.0	19.2	14.4	4.9	1.9	13.849	-3.811	4.43	22.0
10.0	22.3	17.5	4.9	2.1	14.846	-4.207	4.57	22.2
11.0	25.8	20.9	4.9	2.4	15.761	-4.418	4.69	21.8
12.0	29.5	24.7	4.9	2.8	16.651	-4.545	4.82	21.3
13.0	33.6	28.8	4.9	3.3	17.691	-4.670	5.02	20.9
14.0	38.0	33.2	4.9	3.9	18.271	-4.428	5.10	20.2
15.0	42.7	37.9	4.9	4.5	18.987	-4.256	5.24	19.8
16.0	47.8	42.9	4.9	5.2	19.677	-3.993	5.38	19.4
17.0	53.2	48.3	4.9	6.0	20.526	-3.573	5.51	19.1
18.0	58.8	54.0	4.9	6.8	21.282	-3.080	5.64	18.8
19.0	64.8	60.0	4.9	7.7	21.904	-2.543	5.77	18.4
20.0	71.2	66.3	4.9	8.6	22.463	-2.008	5.91	18.3
21.0	77.8	73.0	4.9	9.7	22.980	-1.411	6.04	18.0
22.0	84.8	79.9	4.9	10.8	23.552	-1.410	6.17	17.8
23.0	121.2	85.2	36.0	16.8	25.205	-1.339	6.65	17.4
24.0	124.5	88.6	36.0	17.4	25.322	-1.318	6.70	17.3
25.0	128.0	92.0	36.0	18.1	25.480	-1.238	6.74	17.3
26.0	131.5	95.5	36.0	18.9	25.692	-1.124	6.79	17.2
27.0	115.5	102.8	12.7	16.0	25.290	-1.290	6.66	17.2
28.0	126.6	113.9	12.7	18.2	25.686	-1.116	6.79	17.1
29.0	137.6	124.9	12.7	20.5	26.127	-1.324	6.92	16.9
30.0	148.6	135.9	12.7	23.0	26.518	-1.547	7.04	16.7
31.0	159.6	146.9	12.7	25.5	26.904	-1.555	7.15	16.7
32.0	177.6	156.1	21.5	28.7	27.339	-1.221	7.31	16.7
33.0	185.1	163.7	21.5	30.2	27.595	-1.013	7.38	16.7
34.0	192.8	171.4	21.5	32.0	27.647	-0.789	7.39	16.6
35.0	200.7	179.2	21.5	33.7	27.832	-0.805	7.48	16.7
36.0	208.7	187.2	21.5	35.5	28.104	-0.900	7.56	16.8
37.0	216.8	195.4	21.5	37.6	28.365	-0.931	7.65	16.8
38.0	225.1	203.7	21.5	39.7	28.517	-0.925	7.73	16.9
39.0	233.6	212.2	21.5	42.0	28.779	-0.974	7.81	17.0
40.0	242.2	220.8	21.5	44.7	29.014	-1.154	7.89	17.1
41.0	251.0	229.6	21.5	47.5	29.214	-1.317	7.97	17.2
42.0	278.1	236.5	41.5	58.5	29.663	-1.770	8.16	17.7
43.0	283.2	241.7	41.5	61.1	29.816	-1.788	8.20	17.7
44.0	288.4	246.9	41.5	64.2	29.721	-1.858	8.16	17.5
45.0	293.7	252.2	41.5	67.0	29.767	-1.902	8.19	17.6
46.0	299.1	257.6	41.5	69.8	29.871	-1.856	8.23	17.6
47.0	304.6	263.1	41.5	73.1	29.967	-1.762	8.27	17.6

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Gain/Loss 1 at Shaft and Toe 1.920 / 0.310 (Continued)

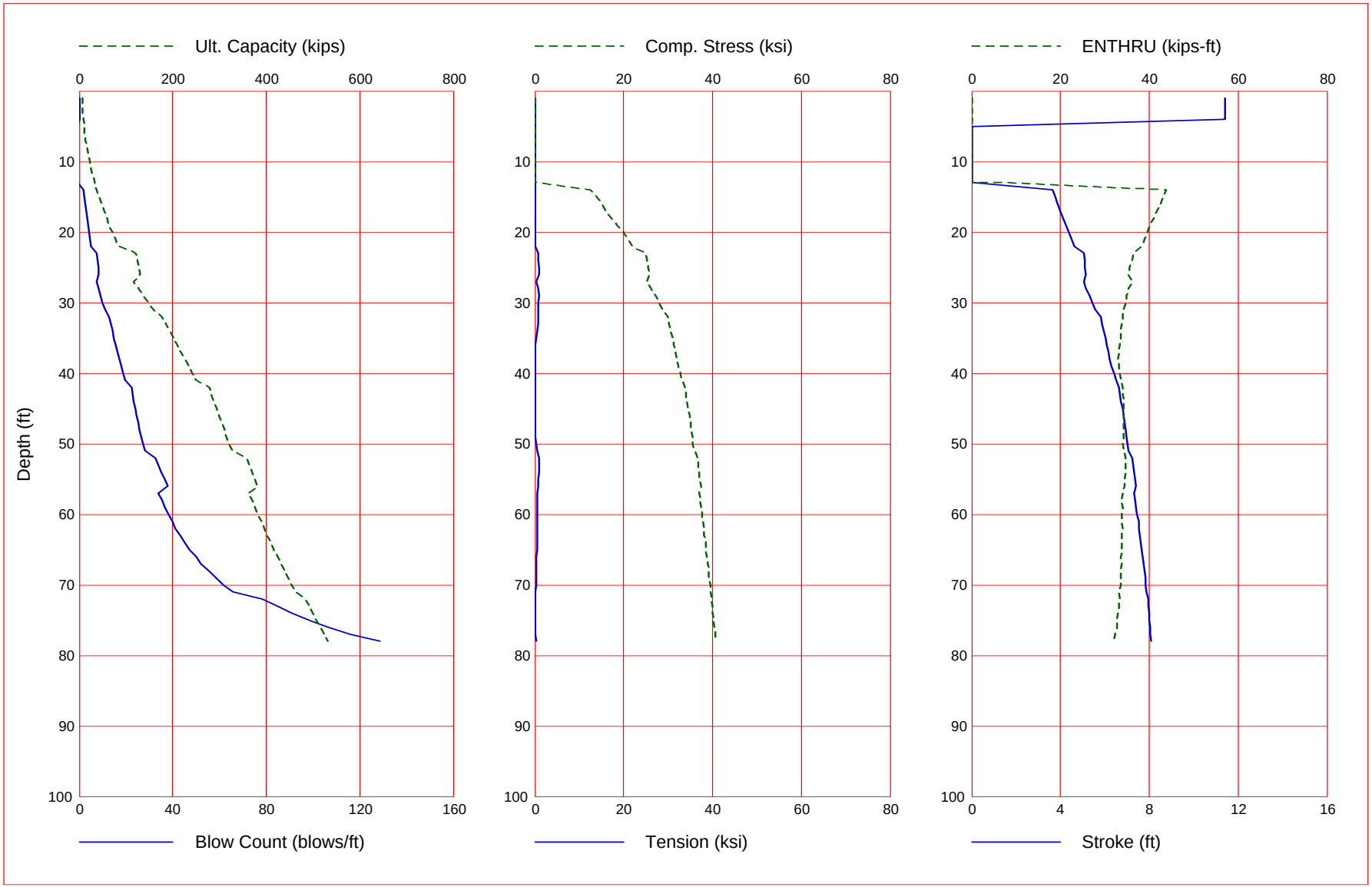
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	310.2	268.6	41.5	76.8	30.055	-1.635	8.30	17.6
49.0	315.8	274.3	41.5	80.8	30.093	-1.628	8.34	17.6
50.0	321.6	280.0	41.5	85.2	30.235	-1.677	8.38	17.7
51.0	327.4	285.9	41.5	89.2	30.275	-1.741	8.42	17.7
52.0	358.2	291.8	66.4	121.6	30.620	-1.984	8.57	17.9
53.0	364.1	297.7	66.4	127.1	30.741	-1.974	8.60	18.0
54.0	370.1	303.7	66.4	134.4	30.790	-1.917	8.62	18.0
55.0	376.2	309.8	66.4	142.7	30.796	-1.855	8.63	17.9
56.0	382.4	316.0	66.4	151.0	30.803	-1.832	8.67	18.0
57.0	362.5	322.4	40.1	120.5	30.643	-1.691	8.60	17.7
58.0	369.0	328.9	40.1	127.4	30.698	-1.704	8.63	17.7
59.0	375.6	335.5	40.1	135.7	30.694	-1.656	8.67	17.7
60.0	382.4	342.2	40.1	145.4	30.781	-1.600	8.68	17.7
61.0	389.1	349.0	40.1	156.3	30.853	-1.483	8.71	17.7
62.0	396.0	355.9	40.1	165.2	30.841	-1.359	8.73	17.7
63.0	403.0	362.9	40.1	177.7	30.853	-1.222	8.75	17.7
64.0	410.1	369.9	40.1	192.0	30.891	-1.094	8.77	17.6
65.0	417.2	377.1	40.1	208.0	30.903	-0.929	8.79	17.6
66.0	424.5	384.3	40.1	227.5	30.851	-0.785	8.81	17.6
67.0	431.8	391.6	40.1	250.0	30.891	-0.678	8.82	17.5
68.0	439.2	399.1	40.1	281.4	30.879	-0.744	8.83	17.4
69.0	446.7	406.6	40.1	317.0	30.847	-0.878	8.85	17.4
70.0	454.3	414.2	40.1	357.8	30.853	-0.937	8.88	17.4
71.0	462.0	421.9	40.1	418.6	30.914	-0.878	8.90	17.3
72.0	483.6	429.6	54.0	711.5	30.939	-0.734	8.94	17.3
73.0	491.4	437.4	54.0	864.1	30.872	-0.515	8.96	17.2
74.0	499.3	445.3	54.0	1087.3	30.899	-0.411	8.97	17.2
75.0	507.3	453.3	54.0	1489.3	30.852	-0.472	8.98	17.0
76.0	515.4	461.4	54.0	2190.3	30.803	-0.611	9.00	17.0
77.0	523.5	469.6	54.0	3985.3	30.723	-0.746	9.01	17.0
78.0	531.8	477.8	54.0	9999.0	30.732	-0.857	9.01	16.8

Refusal occurred; no driving time output possible

Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.920 / 0.310



Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.920 / 0.310

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
1.0	6.2	0.2	6.0	0.0	0.000	0.000	11.42	0.0
2.0	6.8	0.8	6.0	0.0	0.000	0.000	11.42	0.0
3.0	7.8	1.8	6.0	0.0	0.000	0.000	11.42	0.0
4.0	9.1	3.2	6.0	0.0	0.000	0.000	11.42	0.0
5.0	10.9	4.9	6.0	-1.0	0.000	0.000	0.00	0.0
6.0	11.8	6.9	4.9	-1.0	0.000	0.000	0.00	0.0
7.0	13.9	9.1	4.9	-1.0	0.000	0.000	0.00	0.0
8.0	16.4	11.6	4.9	-1.0	0.000	0.000	0.00	0.0
9.0	19.2	14.4	4.9	-1.0	0.000	0.000	0.00	0.0
10.0	22.3	17.5	4.9	-1.0	0.000	0.000	0.00	0.0
11.0	25.8	20.9	4.9	-1.0	0.000	0.000	0.00	0.0
12.0	29.5	24.7	4.9	-1.0	0.000	0.000	0.00	0.0
13.0	33.6	28.8	4.9	-1.0	0.000	0.000	0.00	0.0
14.0	38.0	33.2	4.9	2.0	12.556	0.000	3.65	43.8
15.0	42.7	37.9	4.9	2.2	14.002	0.000	3.76	43.3
16.0	47.8	42.9	4.9	2.6	15.002	0.000	3.87	42.5
17.0	53.2	48.3	4.9	2.9	15.811	0.000	4.00	41.7
18.0	58.8	54.0	4.9	3.3	17.096	0.000	4.13	41.0
19.0	64.8	60.0	4.9	3.7	18.541	0.000	4.25	40.2
20.0	71.2	66.3	4.9	4.1	19.866	0.000	4.38	39.6
21.0	77.8	73.0	4.9	4.6	20.927	0.000	4.50	38.9
22.0	84.8	79.9	4.9	5.1	21.904	0.000	4.62	38.3
23.0	121.2	85.2	36.0	7.6	24.917	-0.644	5.06	36.3
24.0	124.5	88.6	36.0	7.9	25.324	-0.795	5.11	36.1
25.0	128.0	92.0	36.0	8.2	25.463	-0.878	5.10	35.5
26.0	131.5	95.5	36.0	8.5	26.002	-0.887	5.16	35.4
27.0	115.5	102.8	12.7	7.4	25.369	-0.416	5.06	36.2
28.0	126.6	113.9	12.7	8.3	26.215	-0.821	5.15	35.2
29.0	137.6	124.9	12.7	9.2	27.188	-0.869	5.31	34.9
30.0	148.6	135.9	12.7	10.1	28.070	-0.671	5.45	34.6
31.0	159.6	146.9	12.7	11.1	28.763	-0.728	5.58	34.3
32.0	177.6	156.1	21.5	12.8	29.905	-0.836	5.82	34.1
33.0	185.1	163.7	21.5	13.5	30.243	-0.758	5.88	33.9
34.0	192.8	171.4	21.5	14.2	30.579	-0.586	5.95	33.6
35.0	200.7	179.2	21.5	14.9	30.982	-0.328	6.02	33.5
36.0	208.7	187.2	21.5	15.7	31.358	-0.070	6.09	33.3
37.0	216.8	195.4	21.5	16.5	31.668	0.000	6.16	33.1
38.0	225.1	203.7	21.5	17.3	31.816	0.000	6.19	32.9
39.0	233.6	212.2	21.5	18.0	32.378	0.000	6.30	33.2
40.0	242.2	220.8	21.5	18.8	32.760	0.000	6.40	33.3
41.0	251.0	229.6	21.5	19.6	33.258	0.000	6.51	33.7
42.0	278.1	236.5	41.5	22.3	33.835	0.000	6.65	34.0
43.0	283.2	241.7	41.5	22.8	34.050	0.000	6.69	34.1
44.0	288.4	246.9	41.5	23.3	34.287	0.000	6.74	34.2
45.0	293.7	252.2	41.5	23.9	34.529	0.000	6.79	34.2
46.0	299.1	257.6	41.5	24.5	34.793	0.000	6.83	34.2
47.0	304.6	263.1	41.5	25.2	35.014	0.000	6.89	34.2

Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.920 / 0.310 (Continued)

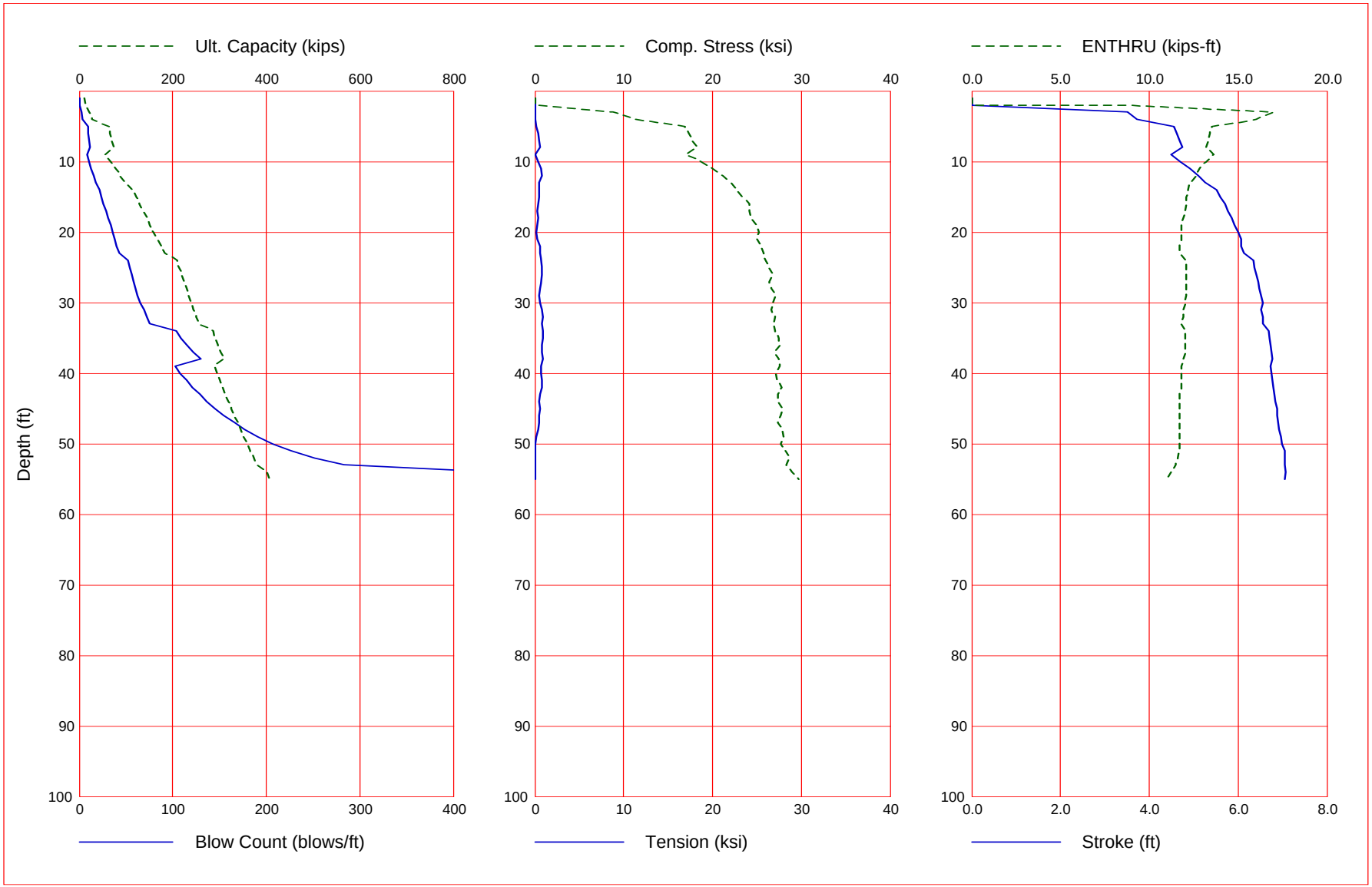
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	310.2	268.6	41.5	25.9	35.136	0.000	6.93	34.2
49.0	315.8	274.3	41.5	26.5	35.441	-0.139	6.98	34.3
50.0	321.6	280.0	41.5	27.4	35.575	-0.335	7.02	34.1
51.0	327.4	285.9	41.5	28.1	35.852	-0.533	7.07	34.2
52.0	358.2	291.8	66.4	32.8	36.511	-0.960	7.24	34.7
53.0	364.1	297.7	66.4	33.9	36.756	-0.913	7.29	34.7
54.0	370.1	303.7	66.4	35.1	36.920	-0.857	7.32	34.6
55.0	376.2	309.8	66.4	36.5	36.978	-0.829	7.36	34.4
56.0	382.4	316.0	66.4	37.7	37.371	-0.810	7.42	34.5
57.0	362.5	322.4	40.1	33.9	37.008	-0.549	7.33	34.0
58.0	369.0	328.9	40.1	35.4	37.194	-0.562	7.37	33.8
59.0	375.6	335.5	40.1	36.5	37.489	-0.608	7.42	34.0
60.0	382.4	342.2	40.1	38.2	37.703	-0.574	7.46	33.9
61.0	389.1	349.0	40.1	39.7	37.889	-0.567	7.51	33.9
62.0	396.0	355.9	40.1	41.3	38.001	-0.572	7.55	34.0
63.0	403.0	362.9	40.1	43.2	38.184	-0.542	7.59	33.9
64.0	410.1	369.9	40.1	45.1	38.466	-0.490	7.63	33.9
65.0	417.2	377.1	40.1	47.3	38.550	-0.458	7.66	33.8
66.0	424.5	384.3	40.1	49.9	38.781	-0.397	7.71	33.7
67.0	431.8	391.6	40.1	52.2	39.037	-0.346	7.75	33.8
68.0	439.2	399.1	40.1	55.1	39.149	-0.294	7.78	33.7
69.0	446.7	406.6	40.1	58.4	39.214	-0.246	7.82	33.5
70.0	454.3	414.2	40.1	61.7	39.541	-0.216	7.85	33.5
71.0	462.0	421.9	40.1	66.0	39.558	-0.150	7.88	33.2
72.0	483.6	429.6	54.0	78.2	39.839	-0.150	7.94	33.3
73.0	491.4	437.4	54.0	84.3	40.033	-0.080	7.95	33.1
74.0	499.3	445.3	54.0	91.0	40.079	0.000	8.00	32.9
75.0	507.3	453.3	54.0	98.6	40.203	0.000	8.01	32.8
76.0	515.4	461.4	54.0	106.3	40.413	-0.011	8.04	32.7
77.0	523.5	469.6	54.0	116.0	40.586	-0.156	8.06	32.4
78.0	531.8	477.8	54.0	128.5	40.569	-0.295	8.08	32.0

Total Continuous Driving Time 47.00 minutes; Total Number of Blows 2039

Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

Nov 12 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.790 / 0.310



Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

Nov 12 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.790 / 0.310

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
1.0	10.2	5.3	4.9	-1.0	0.000	0.000	0.00	0.0
2.0	15.8	10.9	4.9	-1.0	0.000	0.000	0.00	0.0
3.0	21.7	16.8	4.9	2.5	8.834	0.000	3.50	17.0
4.0	27.8	23.0	4.9	3.4	11.404	0.000	3.73	16.0
5.0	63.7	27.7	36.0	9.3	16.876	-0.135	4.55	13.5
6.0	66.8	30.8	36.0	9.9	17.336	-0.368	4.62	13.4
7.0	70.0	34.0	36.0	10.6	17.782	-0.486	4.69	13.3
8.0	73.2	37.2	36.0	11.3	18.258	-0.557	4.75	13.2
9.0	56.7	44.0	12.7	8.5	17.065	0.000	4.50	13.6
10.0	67.0	54.3	12.7	10.5	18.670	-0.366	4.71	13.2
11.0	77.3	64.6	12.7	12.8	20.005	-0.729	4.91	12.8
12.0	87.6	74.9	12.7	15.3	21.142	-0.824	5.10	12.6
13.0	97.8	85.1	12.7	17.5	22.069	-0.465	5.25	12.3
14.0	115.2	93.7	21.5	21.8	22.824	-0.473	5.52	12.2
15.0	122.1	100.7	21.5	24.0	23.465	-0.443	5.61	12.1
16.0	129.3	107.8	21.5	26.1	24.162	-0.425	5.70	12.1
17.0	136.5	115.1	21.5	28.4	24.126	-0.307	5.78	12.0
18.0	144.0	122.5	21.5	31.0	24.368	-0.341	5.85	11.9
19.0	151.5	130.1	21.5	33.7	25.023	-0.319	5.92	11.8
20.0	159.2	137.8	21.5	36.0	25.193	-0.112	6.01	11.8
21.0	167.1	145.6	21.5	38.0	25.045	-0.291	6.06	11.8
22.0	175.1	153.7	21.5	40.5	25.472	-0.563	6.07	11.7
23.0	183.3	161.8	21.5	42.8	25.779	-0.539	6.14	11.7
24.0	209.8	168.3	41.5	52.3	25.927	-0.690	6.34	12.1
25.0	214.6	173.0	41.5	54.1	26.392	-0.765	6.37	12.1
26.0	219.4	177.9	41.5	55.9	26.812	-0.776	6.41	12.1
27.0	224.3	182.8	41.5	58.2	26.364	-0.699	6.45	12.1
28.0	229.3	187.8	41.5	60.1	26.643	-0.604	6.48	12.1
29.0	234.4	192.8	41.5	62.6	27.167	-0.530	6.51	12.1
30.0	239.5	198.0	41.5	65.4	26.825	-0.639	6.55	12.0
31.0	244.8	203.2	41.5	69.1	26.575	-0.812	6.51	11.9
32.0	250.1	208.6	41.5	72.1	27.083	-0.895	6.55	11.9
33.0	255.5	214.0	41.5	75.8	26.956	-0.797	6.57	11.8
34.0	285.9	219.4	66.4	103.6	26.996	-0.880	6.69	12.0
35.0	291.4	224.9	66.4	109.2	27.462	-0.893	6.71	12.0
36.0	296.9	230.5	66.4	114.9	27.547	-0.817	6.73	12.0
37.0	302.6	236.1	66.4	122.4	27.031	-0.843	6.76	12.0
38.0	308.3	241.9	66.4	130.0	27.457	-0.902	6.77	11.9
39.0	287.9	247.8	40.1	102.4	27.605	-0.724	6.73	11.8
40.0	294.0	253.8	40.1	108.2	27.104	-0.737	6.75	11.8
41.0	300.1	260.0	40.1	114.6	27.295	-0.801	6.77	11.8
42.0	306.3	266.2	40.1	121.5	27.795	-0.799	6.80	11.8
43.0	312.6	272.5	40.1	129.3	27.381	-0.551	6.82	11.7
44.0	319.0	278.9	40.1	136.6	27.323	-0.500	6.84	11.7
45.0	325.5	285.3	40.1	145.0	27.842	-0.551	6.87	11.7
46.0	332.0	291.9	40.1	154.2	27.658	-0.441	6.89	11.7
47.0	338.7	298.5	40.1	166.2	27.338	-0.443	6.90	11.7

Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

Nov 12 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.790 / 0.310 (Continued)

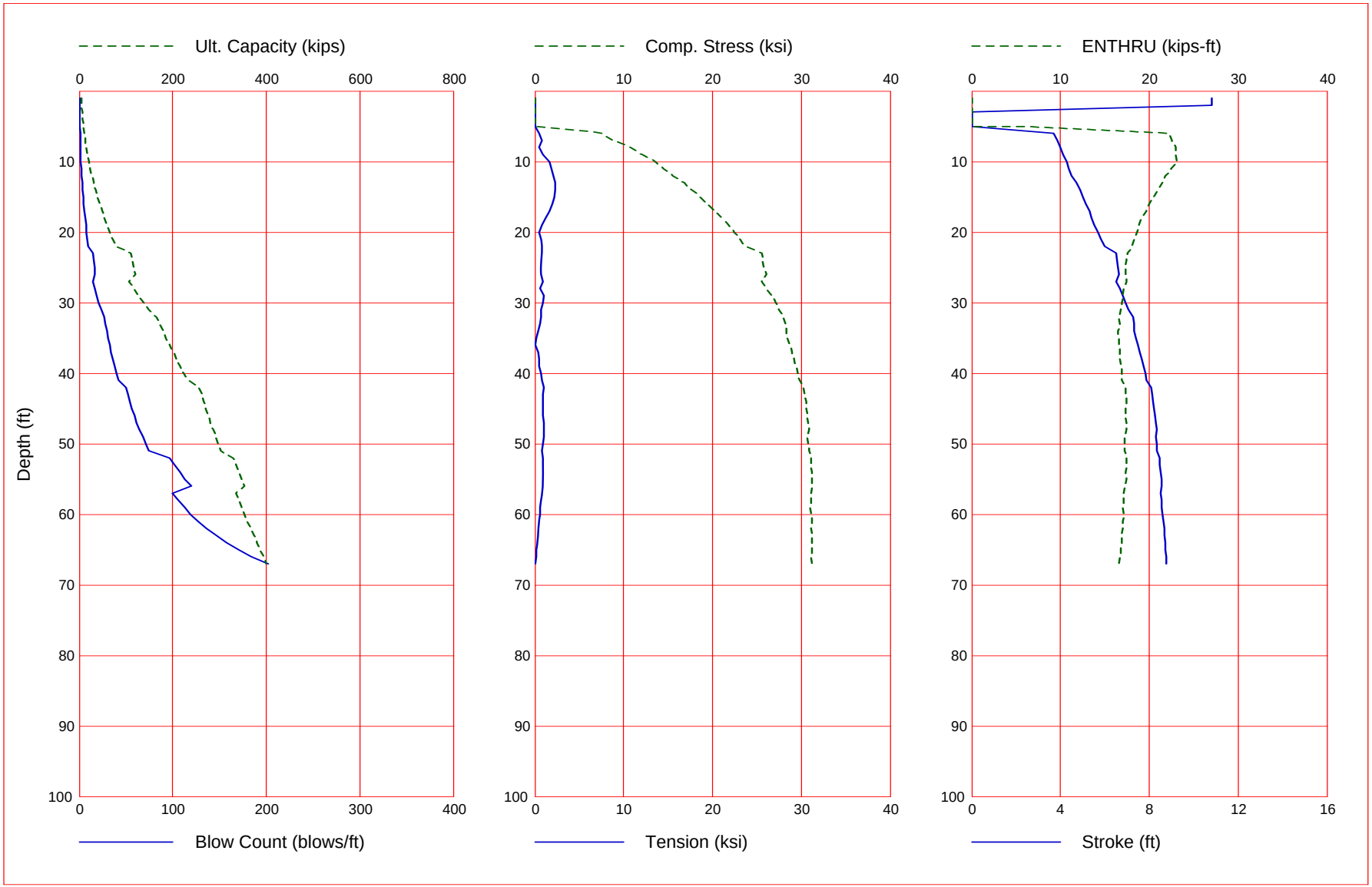
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	345.4	305.2	40.1	177.1	27.894	-0.387	6.93	11.7
49.0	352.2	312.0	40.1	191.2	27.973	-0.139	6.96	11.7
50.0	359.1	318.9	40.1	207.5	27.642	-0.076	6.99	11.7
51.0	366.0	325.9	40.1	226.0	28.209	-0.028	7.04	11.7
52.0	373.1	332.9	40.1	251.8	28.591	0.000	7.05	11.6
53.0	380.2	340.0	40.1	282.8	28.329	0.000	7.05	11.5
54.0	401.2	347.2	54.0	446.3	28.993	0.000	7.07	11.2
55.0	408.5	354.5	54.0	541.6	29.697	0.000	7.06	11.0

Total Continuous Driving Time 107.00 minutes; Total Number of Blows 4870

Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.790 / 0.270



Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.790 / 0.270

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
1.0	5.4	0.2	5.2	0.0	0.000	0.000	10.81	0.0
2.0	5.9	0.7	5.2	0.0	0.000	0.000	10.81	0.0
3.0	6.9	1.7	5.2	-1.0	0.000	0.000	0.00	0.0
4.0	8.1	2.9	5.2	-1.0	0.000	0.000	0.00	0.0
5.0	9.8	4.6	5.2	-1.0	0.000	0.000	0.00	0.0
6.0	10.7	6.5	4.2	1.3	7.568	-0.496	3.70	22.2
7.0	12.7	8.5	4.2	1.5	8.864	-0.755	3.84	22.6
8.0	15.0	10.8	4.2	1.6	10.707	-0.468	3.98	23.0
9.0	17.6	13.4	4.2	1.7	12.103	-0.870	4.10	23.0
10.0	20.5	16.3	4.2	2.0	13.580	-1.654	4.28	23.1
11.0	23.7	19.5	4.2	2.3	14.480	-1.873	4.39	22.5
12.0	27.2	23.0	4.2	2.7	15.503	-2.051	4.52	21.8
13.0	31.0	26.8	4.2	3.1	16.749	-2.309	4.72	21.5
14.0	35.1	30.9	4.2	3.7	17.699	-2.283	4.87	21.0
15.0	39.5	35.3	4.2	4.2	18.578	-2.152	5.02	20.5
16.0	44.3	40.0	4.2	4.9	19.389	-1.940	5.16	20.0
17.0	49.3	45.0	4.2	5.6	20.314	-1.687	5.30	19.7
18.0	54.6	50.3	4.2	6.4	21.047	-1.201	5.39	19.1
19.0	60.2	55.9	4.2	7.1	21.777	-0.846	5.53	18.8
20.0	66.1	61.8	4.2	8.0	22.416	-0.504	5.68	18.6
21.0	72.3	68.0	4.2	9.0	23.056	-0.667	5.83	18.3
22.0	78.8	74.5	4.2	10.1	23.677	-0.830	5.98	18.1
23.0	110.8	79.4	31.3	15.0	25.506	-0.797	6.49	17.5
24.0	113.9	82.6	31.3	15.7	25.666	-0.720	6.54	17.4
25.0	117.1	85.8	31.3	16.4	25.813	-0.679	6.59	17.3
26.0	120.4	89.1	31.3	17.1	26.051	-0.745	6.64	17.3
27.0	106.9	95.9	11.1	14.6	25.586	-0.867	6.50	17.4
28.0	117.2	106.1	11.1	16.7	26.063	-0.614	6.66	17.1
29.0	127.5	116.4	11.1	18.9	26.623	-0.985	6.80	17.0
30.0	137.8	126.7	11.1	21.1	27.098	-0.944	6.95	16.9
31.0	148.0	137.0	11.1	23.4	27.494	-0.721	7.08	16.8
32.0	164.2	145.6	18.7	26.9	27.998	-0.665	7.26	16.6
33.0	171.3	152.6	18.7	28.1	28.234	-0.542	7.33	16.7
34.0	178.4	159.8	18.7	29.7	28.279	-0.360	7.33	16.5
35.0	185.8	167.1	18.7	31.1	28.454	-0.111	7.41	16.6
36.0	193.2	174.5	18.7	32.6	28.750	0.000	7.49	16.6
37.0	200.8	182.1	18.7	34.2	28.975	-0.322	7.58	16.7
38.0	208.6	189.9	18.7	36.0	29.161	-0.499	7.66	16.7
39.0	216.5	197.8	18.7	37.8	29.368	-0.483	7.73	16.9
40.0	224.5	205.8	18.7	40.1	29.623	-0.708	7.81	16.9
41.0	232.7	214.0	18.7	42.4	29.819	-0.835	7.89	16.9
42.0	256.7	220.5	36.2	50.5	30.262	-0.962	8.08	17.3
43.0	261.5	225.3	36.2	52.3	30.385	-0.855	8.12	17.3
44.0	266.3	230.2	36.2	54.1	30.516	-0.858	8.17	17.4
45.0	271.3	235.1	36.2	56.5	30.559	-0.867	8.21	17.3
46.0	276.3	240.1	36.2	59.0	30.687	-0.870	8.25	17.3
47.0	281.4	245.3	36.2	61.3	30.752	-0.964	8.29	17.4

Resource International Inc
HAM-75-0834-B-172-Rear Abutment-14" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.790 / 0.270 (Continued)

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	286.6	250.5	36.2	64.3	30.842	-1.032	8.33	17.4
49.0	291.9	255.7	36.2	68.3	30.675	-1.017	8.28	17.2
50.0	297.3	261.1	36.2	71.1	30.786	-0.910	8.32	17.2
51.0	302.7	266.5	36.2	74.5	30.829	-0.794	8.35	17.2
52.0	329.9	272.0	57.9	96.5	31.053	-0.882	8.47	17.4
53.0	335.4	277.5	57.9	101.9	31.134	-0.902	8.49	17.4
54.0	341.0	283.1	57.9	108.0	31.162	-0.890	8.52	17.3
55.0	346.7	288.8	57.9	113.0	31.153	-0.927	8.54	17.4
56.0	352.5	294.6	57.9	120.1	31.189	-0.890	8.56	17.3
57.0	335.5	300.5	35.0	99.5	31.080	-0.814	8.52	17.1
58.0	341.6	306.6	35.0	105.7	31.067	-0.706	8.54	17.1
59.0	347.8	312.8	35.0	113.0	31.021	-0.635	8.57	17.0
60.0	354.0	319.0	35.0	118.9	31.100	-0.588	8.60	17.1
61.0	360.3	325.4	35.0	127.1	31.189	-0.508	8.65	17.0
62.0	366.8	331.8	35.0	135.8	31.137	-0.417	8.67	17.0
63.0	373.3	338.3	35.0	146.8	31.182	-0.337	8.70	16.9
64.0	379.8	344.9	35.0	157.7	31.198	-0.235	8.72	16.9
65.0	386.5	351.5	35.0	170.2	31.148	-0.167	8.74	16.8
66.0	393.3	358.3	35.0	184.2	31.131	-0.110	8.75	16.7
67.0	400.1	365.1	35.0	202.0	31.225	-0.035	8.77	16.6

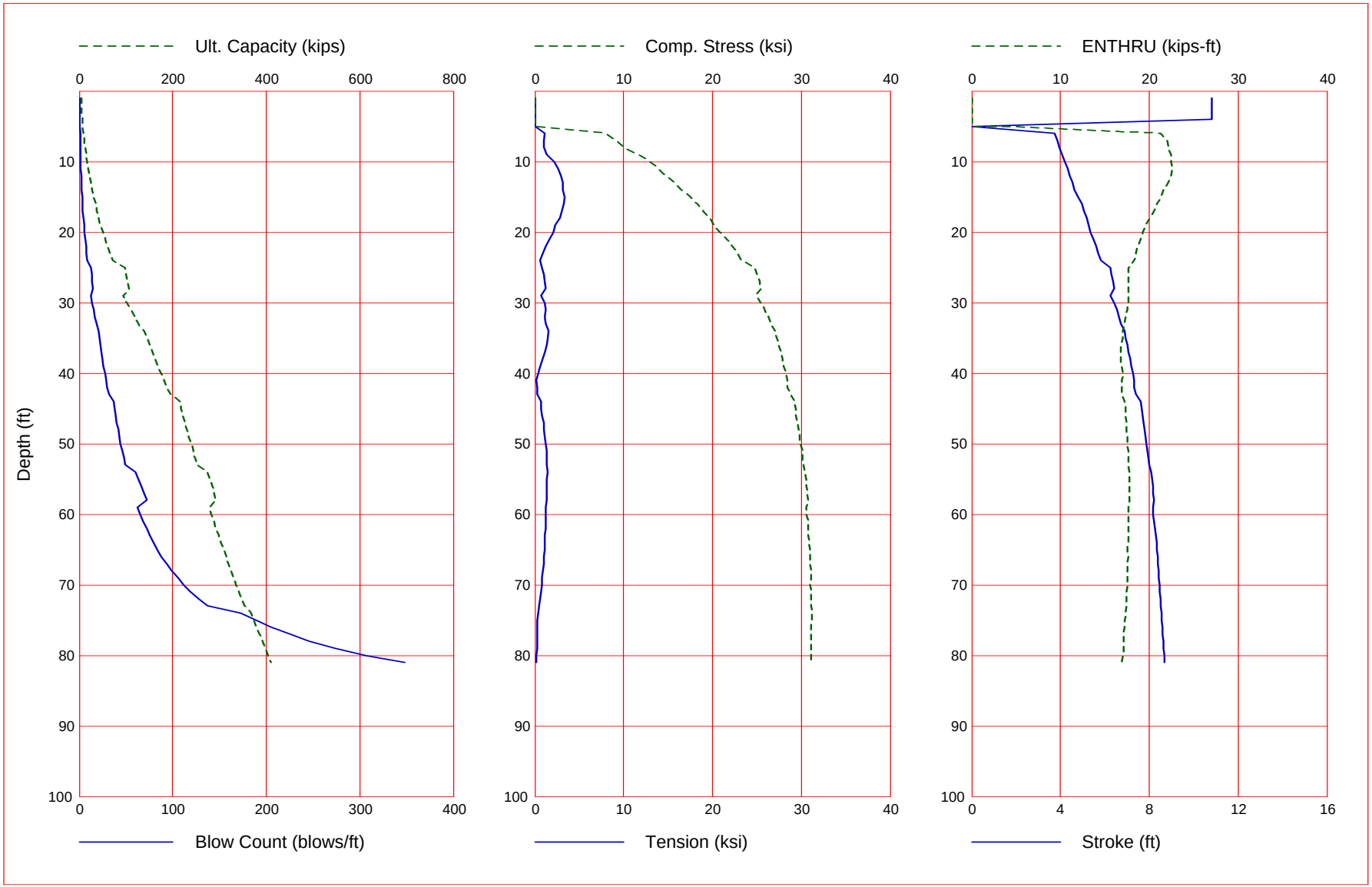
Total Continuous Driving Time 77.00 minutes; Total Number of Blows 3184

Rear Wingwall with Downdrag - 0.5 in Pile Wall Thickness - Delmag 19-42 Hammer

Resource International Inc
HAM-75-0834-B-172-Rear Wingwall-12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.600 / 0.310



Resource International Inc
HAM-75-0834-B-172-Rear Wingwall-12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.600 / 0.310

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
1.0	4.5	0.1	4.4	0.0	0.000	0.000	10.81	0.0
2.0	5.0	0.6	4.4	0.0	0.000	0.000	10.81	0.0
3.0	5.7	1.3	4.4	0.0	0.000	0.000	10.81	0.0
4.0	6.6	2.3	4.4	0.0	0.000	0.000	10.81	0.0
5.0	7.9	3.5	4.4	-1.0	0.000	0.000	0.00	0.0
6.0	9.5	5.1	4.4	1.3	7.894	-1.126	3.73	21.3
7.0	11.3	6.9	4.4	1.4	9.089	-0.998	3.88	22.0
8.0	12.4	8.8	3.6	1.5	10.001	-0.978	3.93	22.1
9.0	14.4	10.8	3.6	1.6	11.643	-1.377	4.07	22.4
10.0	16.6	13.0	3.6	1.7	13.010	-2.179	4.21	22.5
11.0	19.0	15.4	3.6	1.9	13.905	-2.600	4.31	22.6
12.0	21.7	18.1	3.6	2.1	14.810	-2.920	4.43	22.5
13.0	24.6	21.0	3.6	2.3	15.695	-3.110	4.54	22.1
14.0	27.7	24.1	3.6	2.7	16.505	-3.161	4.65	21.6
15.0	31.0	27.4	3.6	3.1	17.526	-3.324	4.82	21.3
16.0	34.5	31.0	3.6	3.5	18.267	-3.223	4.95	20.9
17.0	38.3	34.8	3.6	4.0	18.983	-3.072	5.07	20.5
18.0	42.3	38.8	3.6	4.6	19.638	-2.805	5.18	20.1
19.0	46.5	43.0	3.6	5.2	20.153	-2.343	5.25	19.6
20.0	51.0	47.4	3.6	5.8	20.886	-2.030	5.36	19.3
21.0	55.7	52.1	3.6	6.4	21.592	-1.667	5.48	19.0
22.0	60.6	57.0	3.6	7.2	22.226	-1.230	5.60	18.7
23.0	65.7	62.1	3.6	7.9	22.752	-0.941	5.71	18.5
24.0	71.0	67.5	3.6	8.8	23.211	-0.620	5.83	18.3
25.0	98.0	71.5	26.4	12.7	24.798	-0.847	6.25	17.7
26.0	100.6	74.2	26.4	13.2	24.971	-0.970	6.29	17.6
27.0	103.3	76.9	26.4	13.6	25.336	-1.130	6.39	17.7
28.0	106.1	79.6	26.4	14.2	25.472	-1.233	6.43	17.7
29.0	94.3	85.0	9.3	12.3	24.902	-0.708	6.25	17.6
30.0	102.2	92.8	9.3	13.7	25.493	-1.128	6.42	17.6
31.0	110.0	100.7	9.3	15.2	25.905	-1.198	6.54	17.5
32.0	117.9	108.6	9.3	16.8	26.254	-1.086	6.65	17.3
33.0	125.8	116.5	9.3	18.3	26.646	-1.268	6.74	17.2
34.0	139.0	123.2	15.8	21.1	27.088	-1.516	6.89	17.0
35.0	144.7	129.0	15.8	22.1	27.281	-1.473	6.95	17.0
36.0	150.6	134.8	15.8	23.1	27.438	-1.294	7.00	16.8
37.0	156.5	140.8	15.8	24.0	27.706	-1.089	7.07	16.8
38.0	162.6	146.8	15.8	25.1	27.884	-0.897	7.14	16.8
39.0	168.8	153.0	15.8	26.2	28.050	-0.634	7.20	16.9
40.0	175.1	159.3	15.8	27.4	28.278	-0.343	7.26	17.0
41.0	181.5	165.7	15.8	28.8	28.438	-0.174	7.33	16.9
42.0	188.0	172.2	15.8	30.3	28.457	-0.240	7.33	16.9
43.0	194.6	178.9	15.8	31.7	28.713	-0.237	7.42	16.9
44.0	214.7	184.1	30.5	36.8	29.251	-0.649	7.60	17.2
45.0	218.5	188.0	30.5	37.9	29.347	-0.644	7.65	17.3
46.0	222.5	192.0	30.5	39.1	29.438	-0.801	7.69	17.3
47.0	226.5	196.0	30.5	40.1	29.585	-0.977	7.74	17.4

Resource International Inc
HAM-75-0834-B-172-Rear Wingwall-12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.600 / 0.310 (Continued)

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	230.6	200.1	30.5	41.7	29.709	-1.055	7.78	17.4
49.0	234.8	204.2	30.5	43.1	29.767	-1.100	7.82	17.5
50.0	239.0	208.5	30.5	44.5	29.942	-1.228	7.87	17.5
51.0	243.2	212.7	30.5	46.0	30.081	-1.332	7.91	17.6
52.0	247.6	217.1	30.5	47.6	30.161	-1.362	7.96	17.6
53.0	252.0	221.5	30.5	49.3	30.244	-1.283	8.00	17.7
54.0	274.7	225.9	48.8	60.6	30.472	-1.405	8.08	17.8
55.0	279.2	230.3	48.8	62.9	30.536	-1.331	8.11	17.8
56.0	283.7	234.9	48.8	66.0	30.555	-1.295	8.15	17.8
57.0	288.3	239.5	48.8	69.0	30.690	-1.283	8.18	17.8
58.0	292.9	244.1	48.8	72.3	30.791	-1.329	8.22	17.8
59.0	278.4	248.9	29.5	62.4	30.548	-1.203	8.16	17.6
60.0	283.3	253.8	29.5	65.4	30.609	-1.249	8.19	17.6
61.0	288.2	258.7	29.5	68.4	30.736	-1.274	8.22	17.6
62.0	293.2	263.8	29.5	72.0	30.781	-1.219	8.25	17.6
63.0	298.3	268.8	29.5	75.6	30.805	-1.173	8.29	17.6
64.0	303.5	274.0	29.5	79.1	30.902	-1.143	8.32	17.6
65.0	308.7	279.2	29.5	83.8	30.934	-1.078	8.34	17.5
66.0	314.0	284.5	29.5	88.0	30.939	-1.062	8.37	17.6
67.0	319.3	289.8	29.5	93.5	30.978	-1.003	8.39	17.5
68.0	324.7	295.2	29.5	98.7	31.079	-0.944	8.42	17.5
69.0	330.2	300.7	29.5	105.4	31.051	-0.850	8.44	17.5
70.0	335.7	306.2	29.5	111.4	31.034	-0.763	8.47	17.5
71.0	341.3	311.8	29.5	119.3	31.122	-0.667	8.49	17.4
72.0	346.9	317.4	29.5	128.6	31.141	-0.553	8.51	17.4
73.0	352.6	323.2	29.5	137.5	31.043	-0.476	8.52	17.4
74.0	368.6	328.9	39.7	172.7	31.156	-0.404	8.56	17.3
75.0	374.4	334.7	39.7	189.4	31.148	-0.300	8.57	17.2
76.0	380.3	340.6	39.7	205.5	31.100	-0.272	8.58	17.2
77.0	386.2	346.5	39.7	225.9	31.053	-0.303	8.60	17.1
78.0	392.2	352.5	39.7	245.6	31.107	-0.319	8.63	17.1
79.0	398.3	358.6	39.7	273.7	31.106	-0.276	8.65	17.1
80.0	404.4	364.7	39.7	307.1	31.065	-0.204	8.67	17.0
81.0	410.6	370.9	39.7	348.3	31.093	-0.126	8.68	16.9

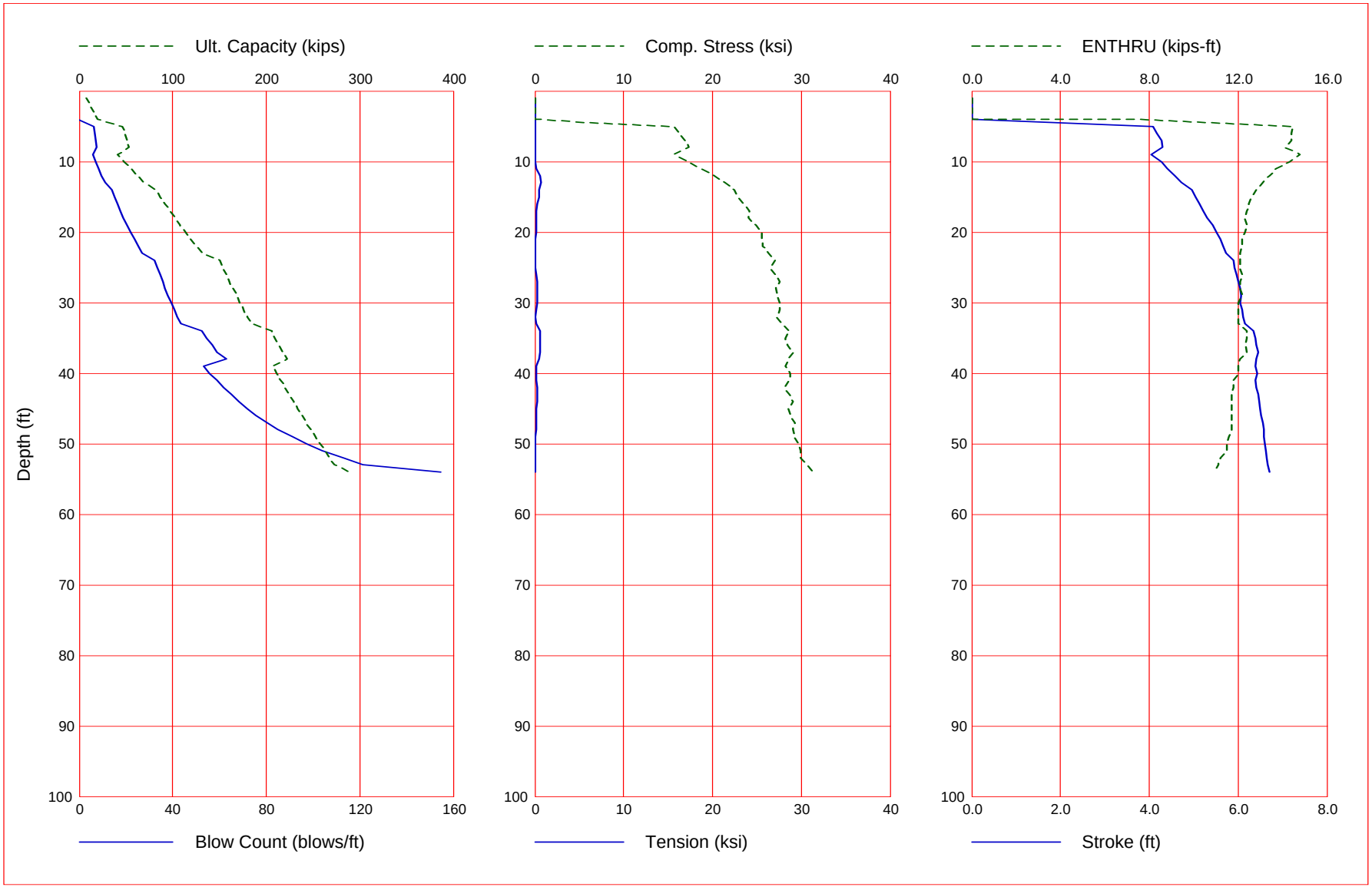
Total Continuous Driving Time 107.00 minutes; Total Number of Blows 4404

Rear Wingwall with Prebore - 0.375 in Pile Wall Thickness - Delmag 19-42 Hammer

Resource International Inc
HAM-75-0834-B-172-Rear Wingwall-12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.430 / 0.310



Resource International Inc
HAM-75-0834-B-172-Rear Wingwall-12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.430 / 0.310

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
1.0	7.4	3.8	3.6	-1.0	0.000	0.000	0.00	0.0
2.0	11.4	7.9	3.6	-1.0	0.000	0.000	0.00	0.0
3.0	15.7	12.1	3.6	-1.0	0.000	0.000	0.00	0.0
4.0	20.1	16.5	3.6	-1.0	0.000	0.000	0.00	0.0
5.0	46.3	19.9	26.4	6.3	15.722	0.000	4.09	14.5
6.0	48.7	22.2	26.4	6.7	16.259	0.000	4.16	14.4
7.0	51.1	24.6	26.4	7.1	16.932	0.000	4.27	14.4
8.0	53.5	27.0	26.4	7.6	17.285	0.000	4.29	14.1
9.0	41.1	31.8	9.3	5.7	15.664	0.000	4.05	14.8
10.0	48.2	38.8	9.3	6.9	17.382	0.000	4.27	14.3
11.0	55.2	45.9	9.3	8.3	18.748	-0.213	4.41	13.7
12.0	62.2	52.9	9.3	9.7	20.198	-0.557	4.57	13.4
13.0	69.3	59.9	9.3	11.2	21.376	-0.648	4.72	13.1
14.0	81.7	65.9	15.8	13.9	22.454	-0.488	4.95	12.8
15.0	86.8	71.0	15.8	15.1	22.896	-0.448	5.04	12.6
16.0	92.0	76.2	15.8	16.3	23.570	-0.307	5.13	12.5
17.0	97.2	81.5	15.8	17.6	24.173	-0.184	5.22	12.4
18.0	102.6	86.8	15.8	19.0	24.037	-0.155	5.30	12.3
19.0	108.1	92.3	15.8	20.4	24.854	-0.199	5.43	12.4
20.0	113.7	97.9	15.8	22.1	25.510	-0.165	5.52	12.3
21.0	119.3	103.6	15.8	23.6	25.541	0.000	5.59	12.2
22.0	125.1	109.3	15.8	25.3	25.656	0.000	5.66	12.2
23.0	131.0	115.2	15.8	27.0	26.268	0.000	5.73	12.1
24.0	150.4	119.9	30.5	32.3	26.991	0.000	5.90	12.1
25.0	153.8	123.3	30.5	33.5	26.558	-0.033	5.93	12.1
26.0	157.3	126.8	30.5	34.6	27.080	-0.190	5.97	12.2
27.0	160.9	130.4	30.5	35.7	27.569	-0.249	6.00	12.1
28.0	164.5	134.0	30.5	36.7	27.186	-0.234	6.04	12.1
29.0	168.2	137.7	30.5	37.9	27.257	-0.243	6.07	12.2
30.0	171.9	141.4	30.5	39.4	27.587	-0.234	6.04	12.0
31.0	175.7	145.2	30.5	40.7	27.554	-0.150	6.08	12.0
32.0	179.5	149.0	30.5	42.0	27.289	-0.071	6.12	12.0
33.0	183.4	152.9	30.5	43.4	27.829	-0.148	6.16	12.0
34.0	205.7	156.9	48.8	52.4	28.667	-0.632	6.35	12.4
35.0	209.6	160.8	48.8	54.5	28.226	-0.583	6.38	12.4
36.0	213.6	164.8	48.8	57.0	28.460	-0.563	6.41	12.3
37.0	217.7	168.9	48.8	58.8	29.055	-0.592	6.45	12.4
38.0	221.8	173.0	48.8	62.8	28.524	-0.508	6.42	12.1
39.0	206.7	177.2	29.5	53.4	28.166	-0.126	6.38	12.0
40.0	211.1	181.6	29.5	55.7	28.751	-0.198	6.43	12.0
41.0	215.5	186.0	29.5	59.1	28.605	-0.195	6.39	11.8
42.0	219.9	190.4	29.5	61.6	28.088	-0.249	6.42	11.8
43.0	224.4	194.9	29.5	65.0	28.602	-0.272	6.45	11.7
44.0	229.0	199.5	29.5	68.1	29.024	-0.262	6.47	11.7
45.0	233.6	204.1	29.5	72.0	28.559	-0.204	6.50	11.7
46.0	238.3	208.8	29.5	75.7	28.720	-0.212	6.52	11.7
47.0	243.0	213.6	29.5	80.4	29.236	-0.213	6.55	11.7

Resource International Inc
HAM-75-0834-B-172-Rear Wingwall-12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.430 / 0.310 (Continued)

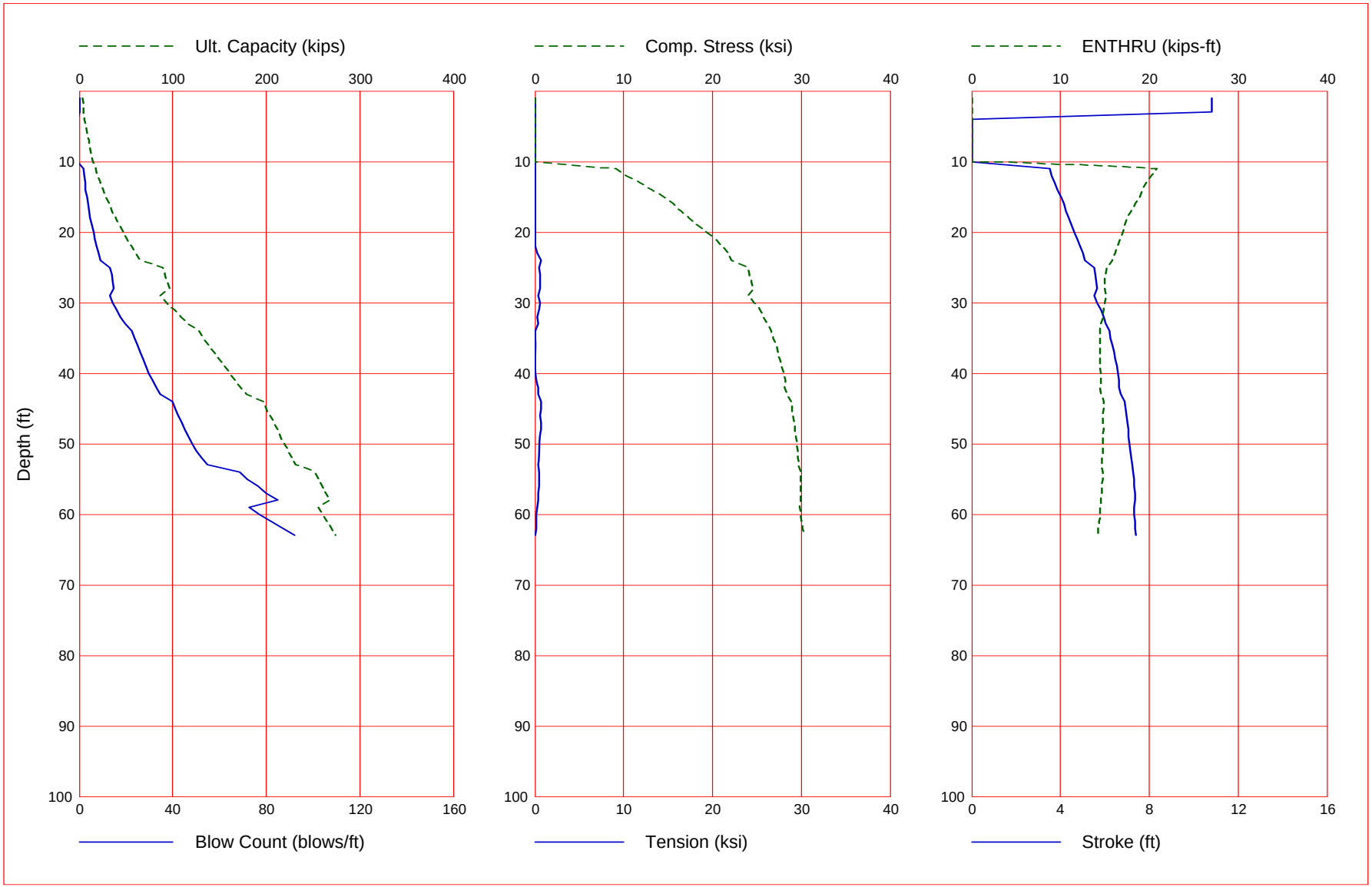
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	247.8	218.3	29.5	85.0	29.082	-0.107	6.58	11.7
49.0	252.7	223.2	29.5	91.2	29.130	-0.100	6.59	11.6
50.0	257.6	228.1	29.5	97.6	29.691	-0.101	6.61	11.5
51.0	262.6	233.1	29.5	104.1	29.965	-0.008	6.63	11.5
52.0	267.6	238.1	29.5	113.3	29.908	0.000	6.65	11.2
53.0	272.7	243.2	29.5	121.5	30.590	0.000	6.66	11.1
54.0	288.0	248.3	39.7	154.5	31.423	0.000	6.70	10.9

Total Continuous Driving Time 47.00 minutes; Total Number of Blows 2211

Resource International Inc
HAM-75-0834-B-172-Rear Wingwall-12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.480 / 0.270



Resource International Inc
HAM-75-0834-B-172-Rear Wingwall-12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.480 / 0.270

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
1.0	4.0	0.1	3.8	0.0	0.000	0.000	10.81	0.0
2.0	4.3	0.5	3.8	0.0	0.000	0.000	10.81	0.0
3.0	5.0	1.2	3.8	0.0	0.000	0.000	10.81	0.0
4.0	5.9	2.1	3.8	-1.0	0.000	0.000	0.00	0.0
5.0	7.1	3.3	3.8	-1.0	0.000	0.000	0.00	0.0
6.0	8.5	4.7	3.8	-1.0	0.000	0.000	0.00	0.0
7.0	10.2	6.4	3.8	-1.0	0.000	0.000	0.00	0.0
8.0	11.3	8.2	3.1	-1.0	0.000	0.000	0.00	0.0
9.0	13.1	10.0	3.1	-1.0	0.000	0.000	0.00	0.0
10.0	15.1	12.0	3.1	-1.0	0.000	0.000	0.00	0.0
11.0	17.4	14.3	3.1	1.8	9.123	0.000	3.52	20.8
12.0	19.9	16.7	3.1	2.1	10.277	0.000	3.62	20.2
13.0	22.5	19.4	3.1	2.5	11.811	0.000	3.74	19.7
14.0	25.4	22.3	3.1	2.8	13.184	0.000	3.88	19.2
15.0	28.5	25.4	3.1	3.3	14.533	0.000	4.04	18.9
16.0	31.8	28.6	3.1	3.7	15.599	0.000	4.16	18.4
17.0	35.3	32.1	3.1	4.3	16.512	0.000	4.26	18.0
18.0	39.0	35.8	3.1	4.8	17.373	0.000	4.38	17.5
19.0	42.9	39.8	3.1	5.4	18.251	0.000	4.49	17.2
20.0	47.0	43.9	3.1	6.1	19.360	0.000	4.65	17.0
21.0	51.3	48.2	3.1	6.8	20.312	0.000	4.77	16.7
22.0	55.8	52.7	3.1	7.5	21.079	0.000	4.89	16.4
23.0	60.6	57.5	3.1	8.3	21.718	-0.237	5.01	16.2
24.0	65.5	62.4	3.1	9.3	22.104	-0.651	5.08	15.8
25.0	89.2	66.2	23.0	13.3	23.971	-0.483	5.51	15.2
26.0	91.6	68.6	23.0	13.8	24.200	-0.537	5.56	15.1
27.0	94.1	71.1	23.0	14.3	24.390	-0.582	5.61	15.0
28.0	96.7	73.7	23.0	14.8	24.561	-0.598	5.66	15.0
29.0	86.7	78.6	8.1	13.1	24.078	-0.399	5.52	15.1
30.0	94.0	85.9	8.1	14.5	24.650	-0.555	5.65	15.0
31.0	101.3	93.2	8.1	16.0	25.282	-0.456	5.84	14.9
32.0	108.6	100.4	8.1	17.8	25.751	-0.259	5.95	14.8
33.0	115.8	107.7	8.1	19.7	26.144	-0.389	6.05	14.6
34.0	127.7	114.0	13.7	22.3	26.662	-0.086	6.20	14.5
35.0	133.0	119.3	13.7	23.5	26.861	0.000	6.27	14.5
36.0	138.4	124.7	13.7	24.9	27.156	0.000	6.34	14.4
37.0	143.9	130.2	13.7	26.2	27.359	0.000	6.40	14.4
38.0	149.6	135.8	13.7	27.3	27.536	0.000	6.47	14.5
39.0	155.3	141.5	13.7	28.5	27.766	0.000	6.53	14.5
40.0	161.1	147.4	13.7	29.8	27.966	0.000	6.58	14.6
41.0	167.0	153.3	13.7	31.3	28.162	-0.173	6.65	14.6
42.0	173.1	159.3	13.7	33.0	28.125	-0.328	6.65	14.5
43.0	179.2	165.5	13.7	34.6	28.377	-0.378	6.72	14.6
44.0	196.9	170.3	26.6	39.8	28.890	-0.664	6.88	14.9
45.0	200.5	173.9	26.6	41.0	28.983	-0.641	6.94	14.9
46.0	204.2	177.6	26.6	42.4	29.058	-0.634	6.96	14.8
47.0	207.9	181.3	26.6	43.8	29.187	-0.653	7.00	14.8

Resource International Inc
HAM-75-0834-B-172-Rear Wingwall-12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.480 / 0.270 (Continued)

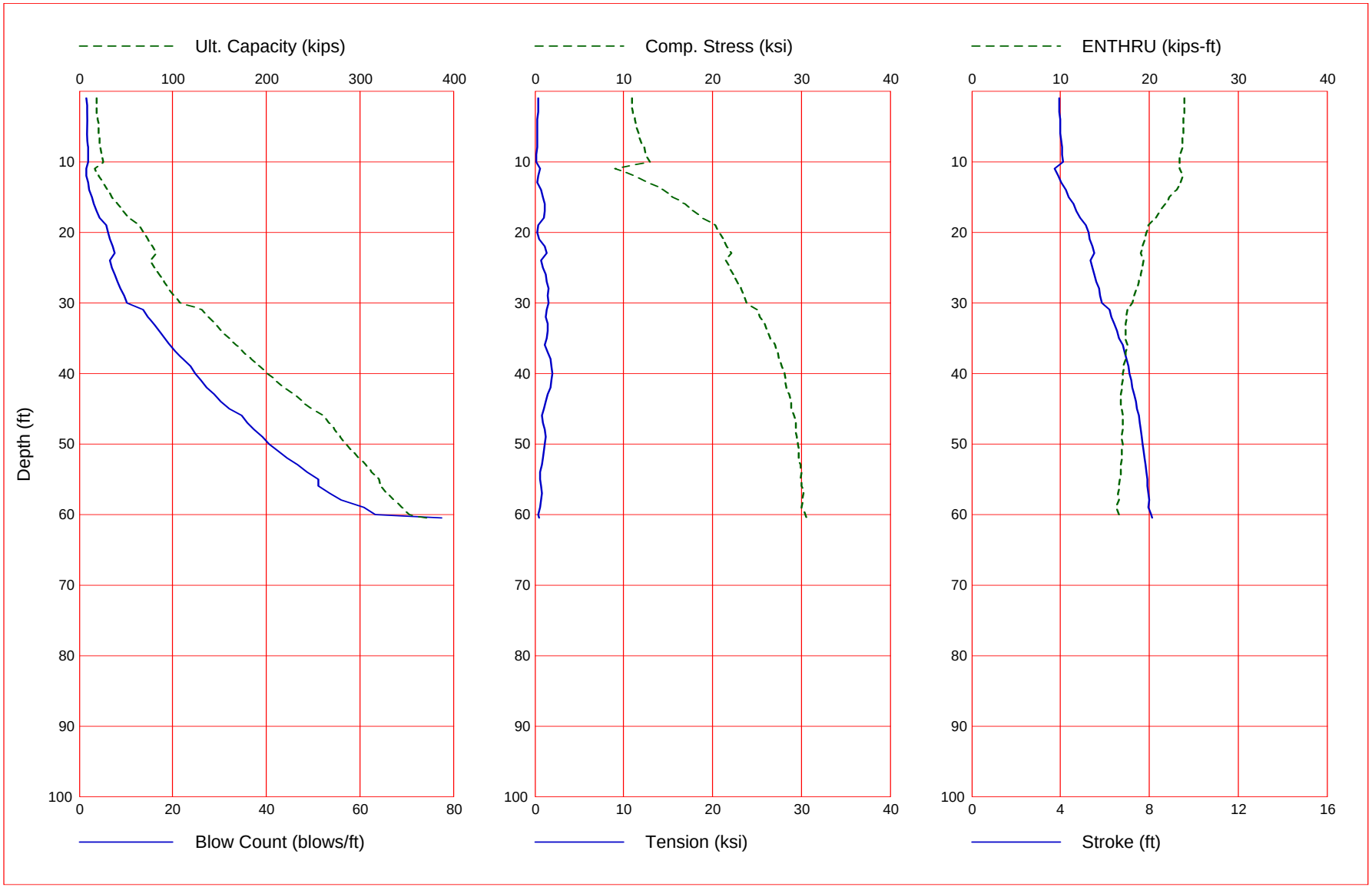
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	211.7	185.1	26.6	45.1	29.283	-0.644	7.04	14.9
49.0	215.5	188.9	26.6	46.8	29.363	-0.572	7.08	14.8
50.0	219.4	192.8	26.6	48.3	29.497	-0.515	7.12	14.8
51.0	223.3	196.8	26.6	50.2	29.591	-0.519	7.15	14.8
52.0	227.4	200.8	26.6	52.5	29.573	-0.477	7.19	14.7
53.0	231.4	204.9	26.6	54.7	29.728	-0.404	7.23	14.7
54.0	251.5	208.9	42.5	68.7	29.878	-0.514	7.28	14.8
55.0	255.6	213.1	42.5	71.9	29.872	-0.503	7.30	14.8
56.0	259.8	217.3	42.5	76.2	29.909	-0.458	7.32	14.7
57.0	264.0	221.5	42.5	80.2	29.968	-0.396	7.34	14.7
58.0	268.3	225.8	42.5	85.0	29.954	-0.367	7.35	14.6
59.0	255.9	230.2	25.7	72.8	29.789	-0.279	7.30	14.5
60.0	260.4	234.7	25.7	77.3	29.878	-0.208	7.32	14.4
61.0	265.0	239.3	25.7	82.1	29.984	-0.166	7.35	14.3
62.0	269.7	244.0	25.7	87.3	30.117	-0.116	7.37	14.2
63.0	274.4	248.7	25.7	92.2	30.365	-0.047	7.40	14.2

Total Continuous Driving Time 38.00 minutes; Total Number of Blows 1702

Resource International Inc
HAM-75-0834-B-173-Forward Abut-14" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.540 / 0.260



Gain/Loss 1 at Shaft and Toe 1.540 / 0.260

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
1.0	18.6	0.1	18.6	1.6	10.895	-0.397	3.93	23.9
2.0	18.9	0.3	18.6	1.7	10.973	-0.390	3.94	23.9
3.0	19.2	0.6	18.6	1.7	11.091	-0.361	3.95	23.9
4.0	19.7	1.1	18.6	1.7	11.238	-0.316	3.97	23.8
5.0	20.3	1.7	18.6	1.7	11.420	-0.287	3.98	23.8
6.0	21.1	2.5	18.6	1.8	11.671	-0.255	4.00	23.8
7.0	22.0	3.4	18.6	1.8	11.924	-0.218	4.03	23.7
8.0	23.0	4.4	18.6	1.9	12.322	-0.215	4.06	23.7
9.0	24.2	5.6	18.6	2.0	12.490	-0.182	4.06	23.4
10.0	25.5	6.9	18.6	2.0	12.916	-0.196	4.12	23.4
11.0	16.9	10.7	6.3	1.5	9.019	-0.559	3.74	23.4
12.0	21.0	14.8	6.3	1.6	11.268	-0.358	3.90	23.8
13.0	25.5	19.2	6.3	1.9	12.772	-0.296	4.05	23.5
14.0	30.3	24.0	6.3	2.2	14.462	-0.702	4.26	23.1
15.0	35.4	29.1	6.3	2.7	15.562	-0.865	4.37	22.2
16.0	40.9	34.6	6.3	3.2	16.867	-1.153	4.58	21.8
17.0	46.7	40.4	6.3	3.7	17.862	-1.119	4.73	21.2
18.0	52.9	46.6	6.3	4.3	18.797	-1.044	4.89	20.7
19.0	64.5	51.6	13.0	5.7	20.310	-0.407	5.16	19.9
20.0	68.8	55.2	13.6	6.1	20.783	-0.230	5.25	19.7
21.0	73.3	59.0	14.3	6.6	21.218	-0.524	5.33	19.5
22.0	78.0	63.0	15.0	7.1	21.631	-1.138	5.42	19.2
23.0	82.8	67.2	15.6	7.6	22.085	-1.318	5.51	19.0
24.0	75.2	71.8	3.4	6.5	21.489	-0.641	5.34	19.4
25.0	80.1	76.7	3.4	7.0	21.942	-0.939	5.43	19.2
26.0	85.2	81.7	3.4	7.6	22.375	-1.222	5.53	19.0
27.0	90.4	87.0	3.4	8.2	22.778	-1.336	5.63	18.8
28.0	95.9	92.5	3.4	8.9	23.226	-1.574	5.73	18.6
29.0	101.5	98.1	3.4	9.7	23.483	-1.462	5.78	18.3
30.0	107.4	103.9	3.4	10.3	23.882	-1.530	5.87	18.1
31.0	131.4	110.5	20.9	13.7	24.978	-1.332	6.21	17.5
32.0	138.3	117.4	20.9	14.7	25.386	-1.179	6.30	17.4
33.0	145.3	124.5	20.9	15.8	25.814	-1.453	6.41	17.3
34.0	152.7	131.8	20.9	17.1	26.183	-1.411	6.53	17.3
35.0	160.2	139.3	20.9	18.4	26.463	-1.283	6.64	17.3
36.0	168.0	147.1	20.9	19.4	27.069	-1.137	6.80	17.5
37.0	176.0	155.1	20.9	20.8	27.390	-1.405	6.89	17.3
38.0	184.2	163.3	20.9	22.2	27.442	-1.741	6.97	17.3
39.0	192.7	171.8	20.9	23.8	27.750	-1.918	7.04	17.1
40.0	201.4	180.5	20.9	24.9	28.063	-1.957	7.11	17.0
41.0	210.4	189.5	20.9	26.0	28.181	-1.872	7.18	17.0
42.0	219.5	198.6	20.9	27.2	28.360	-1.720	7.25	16.9
43.0	228.9	208.1	20.9	28.8	28.644	-1.493	7.32	16.8
44.0	238.6	217.7	20.9	30.3	28.866	-1.238	7.39	16.8
45.0	248.5	227.6	20.9	32.1	28.885	-1.053	7.46	16.9
46.0	260.3	233.6	26.7	34.7	29.207	-0.790	7.54	17.0
47.0	266.4	239.7	26.7	36.0	29.436	-0.880	7.59	17.0

Gain/Loss 1 at Shaft and Toe 1.540 / 0.260 (Continued)

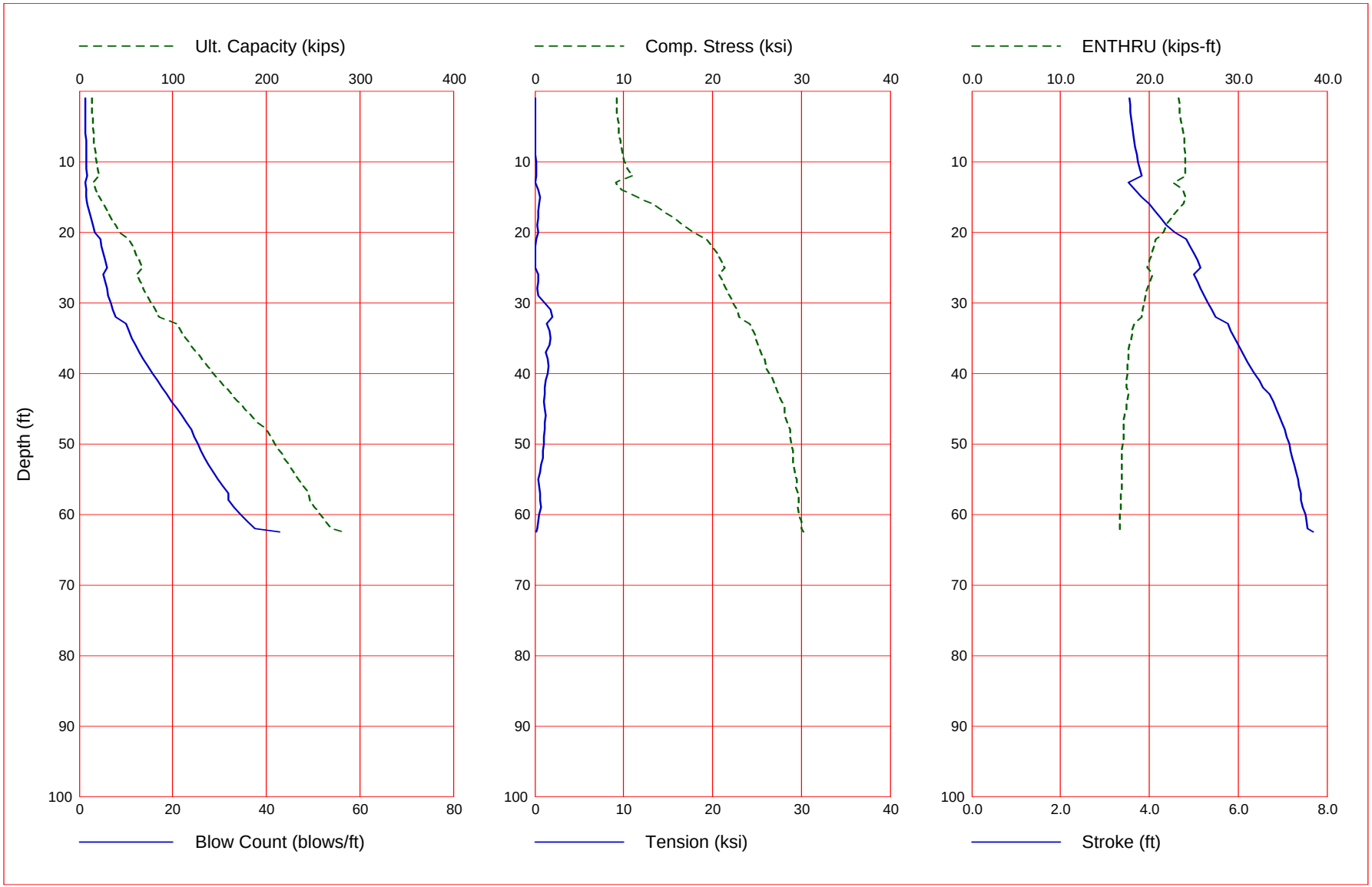
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	272.6	245.9	26.7	37.4	29.349	-1.138	7.63	17.0
49.0	279.0	252.3	26.7	39.1	29.440	-1.248	7.66	16.9
50.0	285.5	258.8	26.7	40.6	29.652	-1.163	7.70	17.0
51.0	292.2	265.5	26.7	42.4	29.675	-0.963	7.74	16.9
52.0	299.0	272.3	26.7	44.4	29.684	-0.879	7.79	16.9
53.0	305.9	279.2	26.7	46.6	29.875	-0.764	7.83	16.8
54.0	312.9	286.2	26.7	48.8	30.037	-0.606	7.87	16.8
55.0	320.1	293.4	26.7	51.1	29.896	-0.598	7.91	16.7
56.0	321.8	300.9	20.9	51.1	29.996	-0.701	7.92	16.6
57.0	329.4	308.5	20.9	53.6	30.250	-0.825	7.96	16.5
58.0	337.1	316.2	20.9	56.1	30.144	-0.707	8.00	16.6
59.0	345.0	324.1	20.9	60.9	30.013	-0.566	7.96	16.3
60.0	353.0	332.1	20.9	63.2	30.473	-0.412	8.08	16.6
60.5	372.7	337.8	34.8	77.5	30.607	-0.533	8.12	16.6

Total Continuous Driving Time 27.00 minutes; Total Number of Blows 1174

Resource International Inc
HAM-75-0834-B-173-Fwd Wingwall-12" CIP

Nov 11 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.300 / 0.260



Gain/Loss 1 at Shaft and Toe 1.300 / 0.260

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
1.0	13.7	0.0	13.6	1.4	9.222	0.000	3.56	23.3
2.0	13.8	0.2	13.6	1.4	9.237	0.000	3.57	23.4
3.0	14.1	0.4	13.6	1.4	9.274	0.000	3.57	23.4
4.0	14.4	0.8	13.6	1.4	9.315	0.000	3.59	23.5
5.0	14.8	1.2	13.6	1.4	9.390	0.000	3.61	23.7
6.0	15.4	1.7	13.6	1.4	9.447	0.000	3.63	23.8
7.0	16.0	2.4	13.6	1.5	9.607	0.000	3.65	23.9
8.0	16.7	3.1	13.6	1.5	9.712	0.000	3.68	23.9
9.0	17.5	3.9	13.6	1.5	9.881	0.000	3.72	24.0
10.0	18.4	4.8	13.6	1.6	10.074	-0.117	3.75	24.1
11.0	19.5	5.8	13.6	1.6	10.434	-0.180	3.79	24.0
12.0	20.6	6.9	13.6	1.7	11.037	-0.206	3.83	24.0
13.0	14.7	10.1	4.6	1.3	9.079	0.000	3.52	22.7
14.0	18.1	13.5	4.6	1.5	9.753	-0.352	3.68	23.7
15.0	21.7	17.1	4.6	1.6	11.561	-0.542	3.83	24.0
16.0	25.6	21.0	4.6	1.8	13.245	-0.482	4.01	23.8
17.0	29.7	25.1	4.6	2.2	14.443	-0.396	4.12	23.1
18.0	34.1	29.5	4.6	2.6	15.674	-0.350	4.26	22.5
19.0	38.7	34.1	4.6	3.0	16.695	-0.274	4.38	21.9
20.0	43.5	38.9	4.6	3.4	17.838	-0.327	4.57	21.6
21.0	53.4	42.8	10.5	4.5	19.412	-0.159	4.84	20.7
22.0	56.8	45.8	11.0	4.8	19.983	-0.059	4.92	20.5
23.0	60.3	48.8	11.5	5.2	20.505	0.000	5.00	20.3
24.0	64.0	52.0	12.0	5.6	20.953	0.000	5.08	20.0
25.0	67.8	55.3	12.5	6.0	21.357	0.000	5.16	19.8
26.0	61.3	58.8	2.5	5.1	20.705	-0.403	5.00	20.3
27.0	65.0	62.5	2.5	5.5	21.125	-0.360	5.08	20.1
28.0	68.8	66.3	2.5	5.9	21.514	-0.224	5.16	19.8
29.0	72.8	70.2	2.5	6.2	21.916	-0.349	5.24	19.6
30.0	76.9	74.3	2.5	6.7	22.345	-1.095	5.32	19.4
31.0	81.1	78.5	2.5	7.2	22.737	-1.722	5.41	19.2
32.0	85.4	82.9	2.5	7.7	23.038	-1.983	5.49	19.1
33.0	103.3	87.9	15.4	10.1	24.185	-1.348	5.76	18.3
34.0	108.5	93.1	15.4	10.7	24.545	-1.607	5.84	18.1
35.0	113.9	98.5	15.4	11.3	24.861	-1.712	5.92	18.0
36.0	119.4	104.0	15.4	12.0	25.070	-1.607	6.00	17.8
37.0	125.1	109.7	15.4	12.8	25.444	-1.269	6.08	17.7
38.0	131.0	115.6	15.4	13.7	25.821	-1.390	6.17	17.6
39.0	137.0	121.7	15.4	14.6	26.026	-1.580	6.26	17.5
40.0	143.2	127.9	15.4	15.6	26.438	-1.447	6.37	17.5
41.0	149.6	134.2	15.4	16.8	26.822	-1.252	6.47	17.4
42.0	156.1	140.8	15.4	17.8	27.099	-1.103	6.56	17.4
43.0	162.8	147.5	15.4	18.7	27.511	-1.103	6.71	17.6
44.0	169.7	154.3	15.4	19.8	27.839	-1.064	6.79	17.4
45.0	176.7	161.4	15.4	20.9	28.085	-1.132	6.85	17.4
46.0	183.9	168.6	15.4	21.9	28.087	-1.179	6.92	17.2
47.0	191.3	175.9	15.4	22.9	28.382	-1.166	6.98	17.1

Gain/Loss 1 at Shaft and Toe 1.300 / 0.260 (Continued)

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	200.1	180.5	19.6	24.1	28.720	-1.076	7.05	17.1
49.0	204.7	185.1	19.6	24.7	28.694	-1.006	7.10	17.1
50.0	209.4	189.8	19.6	25.4	28.832	-0.962	7.15	17.0
51.0	214.2	194.6	19.6	26.1	29.042	-0.954	7.18	16.9
52.0	219.1	199.5	19.6	26.9	29.090	-0.897	7.22	16.9
53.0	224.1	204.5	19.6	27.7	29.079	-0.739	7.26	16.9
54.0	229.2	209.6	19.6	28.7	29.321	-0.577	7.31	16.9
55.0	234.4	214.8	19.6	29.6	29.455	-0.373	7.34	16.9
56.0	239.7	220.1	19.6	30.6	29.355	-0.482	7.38	16.9
57.0	245.1	225.5	19.6	31.8	29.547	-0.637	7.41	16.8
58.0	246.4	231.1	15.4	31.8	29.694	-0.639	7.42	16.8
59.0	252.1	236.8	15.4	33.1	29.611	-0.668	7.46	16.8
60.0	257.9	242.6	15.4	34.5	29.757	-0.527	7.51	16.7
61.0	263.8	248.4	15.4	35.9	29.988	-0.341	7.54	16.7
62.0	269.8	254.4	15.4	37.6	29.978	-0.260	7.57	16.7
62.5	284.3	258.7	25.6	42.9	30.188	-0.199	7.68	16.8

Total Continuous Driving Time 17.00 minutes; Total Number of Blows 791

APPENDIX VIII

SETTLEMENT CALCULATIONS

B-10-020 HAM-75-7.85 (HAM-75-0834 Bridge Structure)

Railroad Embankment Settlement

Calculated By: BRT Date: 11/6/2014

Checked By: JPS Date: 11/7/2014

Boring B-006-1-12

15.5' net embankment height considered - Existing grade is at 539.0 and proposed profile grade is at 554.5 for a net embankment height of 15.5'

H=	15.5	ft	
B=	50.0	ft	
γ_{BF} =	120	pcf	
D_w =	24.0	ft	Below Ground Surface
$\Delta\sigma$ =	1,860	psf	At Ground Surface

															Total Embankment Settlement				
Layer	Soil Type	Layer Depth (ft)		Layer Thickness H (ft)	Depth to Midpoint (ft)	γ (pcf)	LL	C_c [1]	C_r [2]	e_o [4]	σ_p' [5] (psf)	σ_{vo} Bottom (psf)	σ_{vo} Midpoint (psf)	σ_{vo}' Midpoint (psf)	Z_f/B	I [6]	$\Delta\sigma_v$ [7] (psf)	σ_{vf}' Midpoint (psf)	S_c [8] (ft)	S_c (in)
1	A-6a	0.0	3.0	3.0	1.5	120	30	0.113	0.028	0.433	4,180	360	180	180	0.03	1.000	1,860	2,040	0.062	0.742
		3.0	6.0	3.0	4.5	120	30	0.113	0.028	0.433	4,540	720	540	540	0.09	0.998	1,856	2,396	0.038	0.455
		6.0	9.0	3.0	7.5	120	30	0.113	0.028	0.433	4,900	1,080	900	900	0.15	0.990	1,841	2,741	0.028	0.340
		9.0	12.0	3.0	10.5	120	30	0.113	0.028	0.433	5,260	1,440	1,260	1,260	0.21	0.974	1,812	3,072	0.023	0.272
2	A-1-b/A-2-4	12.0	25.0	13.0	18.5	120	Calculated Separately				6,220	3,000	2,220	2,220	0.37	Calculated Separately			0.166	1.992
																		Total Settlement:		3.801 in

1. C_c = 0.009(LL-10); Ref. Table 26, FHWA GEC 5
2. C_r = 0.10(C_c); Ref. Section 5.4.2.5 of FHWA GEC 5
3. e_o = (C_c/1.15)+0.35; Ref. Table 8-2, Holtz and Kovacs 1981
4. σ_p' = σ_{vo}'+σ_m; Estimate σ_m of 4,000 psf for slightly to moderately overconsolidated soil deposit; Ref. Table 11.2, Coduto 2003
5. Influence factor for strip loaded footing
6. $\Delta\sigma_v$ = q_e(I)
7. S_c = [C_c/(1+e_o)](H)log(σ_{vf}'/σ_{vo}')for σ_p' ≤ σ_{vo}' < σ_{vf}'; [C_r/(1+e_o)](H)log(σ_p'/σ_{vo}') for σ_{vo}' < σ_{vf}' ≤ σ_p'; [Cr/(1+e_o)](H)log(σ_p'/σ_{vo}')+[C_c/(1+e_o)](H)log(σ_{vf}'/σ_p') for σ_{vo}' < σ_p' < σ_{vf}'

B-10-020 HAM-75-7.85 (HAM-75-0834 Bridge Structure)

Railroad Embankment Settlement

Calculated By: BRT Date: 11/6/2014

Checked By: JPS Date: 11/7/2014

Boring B-172-0-07 (HAM-75-0834 Rear Abutment)

28.0' net embankment height considered - Existing grade is at 530.0 and proposed profile grade is at 558.0 for a net embankment height of 28.0'

H=	28.0	ft	
B=	50.0	ft	
γ_{BF} =	120	pcf	
D_w =	33.0	ft	Below Ground Surface
$\Delta\sigma$ =	3,360	psf	At Ground Surface

															Total Embankment Settlement				
Layer	Soil Type	Layer Depth (ft)		Layer Thickness H (ft)	Depth to Midpoint (ft)	γ (pcf)	LL	C_c [1]	C_r [2]	e_o [4]	σ_p' [5] (psf)	σ_{vo} Bottom (psf)	σ_{vo} Midpoint (psf)	σ_{vo}' Midpoint (psf)	Z_f/B	I [6]	$\Delta\sigma_v$ [7] (psf)	σ_{vf}' Midpoint (psf)	S_c [8] (ft)	S_c (in)
1	A-6a	0.0	6.0	6.0	3.0	120	30	0.113	0.028	0.433	4,360	720	360	360	0.06	0.999	3,358	3,718	0.119	1.426
		6.0	13.0	7.0	9.5	120	30	0.113	0.028	0.433	5,140	1,560	1,140	1,140	0.19	0.980	3,293	4,433	0.081	0.968
2	A-3a	13.0	16.0	3.0	14.5	125	Calculated Separately				5,748	1,935	1,748	1,748	0.29	Calculated Separately			0.015	0.183
3	A-7-5 / A-7-6	16.0	22.0	6.0	19.0	115	46	0.324	0.032	0.632	6,280	2,625	2,280	2,280	0.38	0.893	3,000	5,280	0.043	0.521
		22.0	28.5	6.5	25.3	115	46	0.324	0.032	0.632	6,999	3,373	2,999	2,999	0.51	0.815	2,739	5,738	0.036	0.436
4	A-3a / A-4a	28.5	37.0	8.5	32.8	125	Calculated Separately				7,904	4,435	3,904	3,904	0.66	Calculated Separately			0.073	0.876
5	A-6a	37.0	42.0	5.0	39.5	125	31	0.113	0.028	0.433	8,342	5,060	4,748	4,342	0.79	0.647	2,174	6,516	0.017	0.207
6	A-1-b / A-3 / A-3a	42.0	90.0	48.0	66.0	130	Calculated Separately				10,121	11,300	8,180	6,121	1.32	Calculated Separately			0.094	1.130
																		Total Settlement:		5.748 in

1. C_c = 0.009(LL-10); Ref. Table 26, FHWA GEC 5
2. C_r = 0.10(C_c); Ref. Section 5.4.2.5 of FHWA GEC 5
3. e_o = (C_c/1.15)+0.35; Ref. Table 8-2, Holtz and Kovacs 1981
4. σ_p' = σ_{vo}'+σ_m; Estimate σ_m of 2,000 psf for slightly overconsolidated soil deposit; Ref. Table 11.2, Coduto 2003
5. Influence factor for strip loaded footing
6. $\Delta\sigma_v = q_e(I)$
7. $S_c = [C_c/(1+e_o)](H)\log(\sigma_{vf}'/\sigma_{vo}')$for $\sigma_p' \le \sigma_{vo}' < \sigma_{vf}'$; $[C_r/(1+e_o)](H)\log(\sigma_p'/\sigma_{vo}')$ for $\sigma_{vo}' < \sigma_{vf}' \le \sigma_p'$; $[Cr/(1+e_o)](H)\log(\sigma_p'/\sigma_{vo}')+[C_c/(1+e_o)](H)\log(\sigma_{vf}'/\sigma_p')$ for $\sigma_{vo}' < \sigma_p' < \sigma_{vf}'$

B-10-020 HAM-75-7.85 (HAM-75-0834 Bridge Structure)

Downdrag Analysis - Abutment

Calculated By: BRT Date: 11/6/2014

Checked By: JPS Date: 11/7/2014

Boring B-172-0-07 (HAM-75-0834 Rear Abutment)

28.0' net embankment height considered - Existing grade is at 530.0 and proposed profile grade is at 558.0 for a net embankment height of 28.0'

H=	28.0	ft	
B=	50.0	ft	
γ_{BF} =	120	pcf	
D_w =	22.6	ft	Below Ground Surface
$\Delta\sigma$ =	3,360	psf	At Ground Surface

															Embankment Settlement at Abutment for Downdrag Analysis					
Layer	Soil Type	Layer Depth (ft)		Layer Thickness H (ft)	Depth to Midpoint (ft)	γ (pcf)	LL	C_c [1]	C_r [2]	e_o [4]	σ_p' [5] (psf)	σ_{vo} Bottom (psf)	σ_{vo} Midpoint (psf)	σ_{vo}' Midpoint (psf)	Z_f/B	I [5]	$\Delta\sigma_v$ [6] (psf)	σ_{vf}' Midpoint (psf)	S_c [7] (ft)	S_c (in)	Cumulative Settlement (in)
																					0.496
1	A-6a	0.0	2.5	2.5	1.3	120	30	0.113	0.028	0.433	2,150	300	150	150	0.03	0.000	0	150	0.000	0.000	0.496
2	A-3a	2.5	5.5	3.0	4.0	125	Calculated Separately				2,488	675	488	488	0.08	Calculated Separately			0.000	0.000	0.496
3	A-7-5 / A-7-6	5.5	11.5	6.0	8.5	115	46	0.324	0.032	0.632	3,020	1,365	1,020	1,020	0.17	0.005	18	1,038	0.001	0.011	0.485
		11.5	18.0	6.5	14.8	115	46	0.324	0.032	0.632	3,739	2,113	1,739	1,739	0.30	0.023	76	1,815	0.002	0.029	0.456
4	A-3a / A-4a	18.0	26.5	8.5	22.3	125	Calculated Separately				4,644	3,175	2,644	2,644	0.45	Calculated Separately			0.004	0.050	0.406
5	A-6a	26.5	31.5	5.0	29.0	125	31	0.113	0.028	0.433	5,088	3,800	3,488	3,088	0.58	0.090	302	3,391	0.004	0.048	0.359
6	A-1-b / A-3 / A-3a	31.5	79.0	47.5	55.3	130	Calculated Separately				6,850	9,975	6,888	4,850	1.11	Calculated Separately			0.030	0.359	0.000
																			Total Settlement:		0.496 in

1. C_c = 0.009(LL-10); Ref. Table 26, FHWA GEC 5
2. C_r = 0.10(C_c); Ref. Section 5.4.2.5 of FHWA GEC 5
3. e_o = (C_c/1.15)+0.35; Ref. Table 8-2, Holtz and Kovacs 1981
4. σ_p' = σ_{vo}'+σ_m; Estimate σ_m of 2,000 psf for slightly overconsolidated soil deposit; Ref. Table 11.2, Coduto 2003
5. Influence factor for strip loaded footing
6. $\Delta\sigma_v$ = q_e(I)
7. S_c = $[C_c/(1+e_o)](H)\log(\sigma_{vf}'/\sigma_{vo}')$ for $\sigma_p' \le \sigma_{vo}' < \sigma_{vf}'$; $[C_r/(1+e_o)](H)\log(\sigma_p'/\sigma_{vo}')$ for $\sigma_{vo}' < \sigma_{vf}' \le \sigma_p'$; $[Cr/(1+e_o)](H)\log(\sigma_p'/\sigma_{vo}')+[C_c/(1+e_o)](H)\log(\sigma_{vf}'/\sigma_p')$ for $\sigma_{vo}' < \sigma_p' < \sigma_{vf}'$
8. Downdrag occurs along pile length above interface with relative soil movement greater than 0.40 inches.

Depth of Downdrag [8]: 18 ft.

B-10-020 HAM-75-7.85 (HAM-75-0834 Bridge Structure)

Downdrag Analysis - Wingwall

Calculated By: BRT Date: 11/6/2014

Checked By: JPS Date: 11/7/2014

Boring B-172-0-07 (HAM-75-0834 Rear Abutment)

28.0' net embankment height considered - Existing grade is at 530.0 and proposed profile grade is at 558.0 for a net embankment height of 28.0'

H=	28.0	ft	
B=	50.0	ft	
γ_{BF} =	120	pcf	
D_w =	24.6	ft	Below Ground Surface
$\Delta\sigma$ =	3,360	psf	At Ground Surface

															Embankment Settlement at Abutment for Downdrag Analysis					
Layer	Soil Type	Layer Depth (ft)		Layer Thickness H (ft)	Depth to Midpoint (ft)	γ (pcf)	LL	C_c [1]	C_r [2]	e_o [4]	σ_p' [5] (psf)	σ_{vo} Bottom (psf)	σ_{vo} Midpoint (psf)	σ_{vo}' Midpoint (psf)	Z_f/B	I [5]	$\Delta\sigma_v$ [6] (psf)	σ_{vf}' Midpoint (psf)	S_c [7] (ft)	S_c (in)	Cumulative Settlement (in)
																					0.520
1	A-6a	0.0	4.5	4.5	2.3	120	30	0.113	0.028	0.433	2,270	540	270	270	0.05	0.000	0	270	0.000	0.000	0.520
2	A-3a	4.5	7.5	3.0	6.0	125	Calculated Separately				2,728	915	728	728	0.12	Calculated Separately			0.000	0.000	0.519
3	A-7-5 / A-7-6	7.5	13.5	6.0	10.5	115	46	0.324	0.032	0.632	3,260	1,605	1,260	1,260	0.21	0.007	25	1,285	0.001	0.012	0.507
		13.5	20.0	6.5	16.8	115	46	0.324	0.032	0.632	3,979	2,353	1,979	1,979	0.34	0.025	83	2,062	0.002	0.028	0.479
4	A-3a / A-4a	20.0	28.5	8.5	24.3	125	Calculated Separately				4,884	3,415	2,884	2,884	0.49	Calculated Separately				0.050	0.429
5	A-6a	28.5	33.5	5.0	31.0	125	31	0.113	0.028	0.433	5,328	4,040	3,728	3,328	0.62	0.086	288	3,616	0.004	0.042	0.387
6	A-1-b / A-3 / A-3a	33.5	63.0	29.5	48.3	130	Calculated Separately				6,482	7,875	5,958	4,482	0.97	Calculated Separately			0.032	0.387	0.000
																			Total Settlement:		0.520 in

1. C_c = 0.009(LL-10); Ref. Table 26, FHWA GEC 5
2. C_r = 0.10(C_c); Ref. Section 5.4.2.5 of FHWA GEC 5
3. e_o = (C_c/1.15)+0.35; Ref. Table 8-2, Holtz and Kovacs 1981
4. σ_p' = σ_{vo}'+σ_m; Estimate σ_m of 2,000 psf for slightly overconsolidated soil deposit; Ref. Table 11.2, Coduto 2003
5. Influence factor for strip loaded footing
6. $\Delta\sigma_v$ = q_e(I)
7. S_c = [C_c/(1+e_o)](H)log(σ_{vf}'/σ_{vo}')for $\sigma_p' \le \sigma_{vo}' < \sigma_{vf}'$; [$C_r$/(1+$e_o$)](H)log($\sigma_p'$/$\sigma_{vo}'$) for $\sigma_{vo}' < \sigma_{vf}' \le \sigma_p'$; [Cr/(1+$e_o$)](H)log($\sigma_p'$/$\sigma_{vo}'$)+[$C_c$/(1+$e_o$)](H)log($\sigma_{vf}'$/$\sigma_p'$) for $\sigma_{vo}' < \sigma_p' < \sigma_{vf}'$
8. Downdrag occurs along pile length above interface with relative soil movement greater than 0.40 inches.

Depth of Downdrag [8]: 20 ft.

B-10-020 HAM-75-7.85 (HAM-75-0834 Bridge Structure)

Railroad Embankment Settlement

Calculated By: BRT Date: 11/6/2014

Checked By: JPS Date: 11/7/2014

Boring B-273-0-07 (HAM-75-0834 Forward Abutment)

18.6' net embankment height considered - Existing grade is at 538.7 and proposed profile grade is at 557.3 for a net embankment height of 18.6'

H=	18.6	ft	
B=	50.0	ft	
γ_{BF} =	120	pcf	
D_w =	81.9	ft	Below Ground Surface
$\Delta\sigma$ =	2,232	psf	At Ground Surface

															Total Embankment Settlement				
Layer	Soil Type	Layer Depth (ft)		Layer Thickness H (ft)	Depth to Midpoint (ft)	γ (pcf)	LL	C_c (1)	C_r (2)	e_o (4)	σ_p' (5) (psf)	σ_{vo} Bottom (psf)	σ_{vo} Midpoint (psf)	σ_{vo}' Midpoint (psf)	Z_f/B	I (6)	$\Delta\sigma_v$ (7) (psf)	σ_{vf}' Midpoint (psf)	S_c (8) (ft)	S_c (in)
1	A-6b	0.0	6.0	6.0	3.0	120	34	0.216	0.022	0.538	2,360	720	360	360	0.06	0.999	2,230	2,590	0.103	1.235
2	A-3a	6.0	33.5	27.5	19.8	125	Calculated Separately				4,439	4,158	2,439	2,439	0.40	Calculated Separately			0.131	1.566
3	A-7-6	33.5	37.5	4.0	35.5	120	48	0.342	0.034	0.647	6,398	4,638	4,398	4,398	0.71	0.690	1,541	5,938	0.011	0.130
		37.5	42.0	4.5	39.8	120	48	0.342	0.034	0.647	6,908	5,178	4,908	4,908	0.80	0.644	1,438	6,346	0.010	0.125
4	A-4a	42.0	47.0	5.0	44.5	120	20	0.090	0.009	0.428	7,478	5,778	5,478	5,478	0.89	0.598	1,334	6,812	0.003	0.036
5	A-6a	47.0	53.5	6.5	50.3	115	27	0.113	0.028	0.433	8,151	6,525	6,151	6,151	1.01	0.548	1,223	7,374	0.010	0.120
6	A-1-b/A-3a	53.5	95.0	41.5	74.3	130	Calculated Separately				11,223	11,920	9,223	9,223	1.49	Calculated Separately			0.055	0.658
																		Total Settlement:		3.870 in

1. C_c = 0.009(LL-10); Ref. Table 26, FHWA GEC 5
2. C_r = 0.10(C_c); Ref. Section 5.4.2.5 of FHWA GEC 5
3. e_o = (C_c/1.15)+0.35; Ref. Table 8-2, Holtz and Kovacs 1981
4. σ_p' = σ_{vo}'+$\sigma_{m;}$ Estimate σ_m of 2,000 psf for slightly overconsolidated soil deposit; Ref. Table 11.2, Coduto 2003
5. Influence factor for strip loaded footing
6. $\Delta\sigma_v$ = q_e(I)
7. S_c = [C_c/(1+e_o)](H)log(σ_{vf}'/σ_{vo}')for σ_p' ≤ σ_{vo}' < σ_{vf}'; [C_r/(1+e_o)](H)log(σ_p'/σ_{vo}') for σ_{vo}' < σ_{vf}' ≤ σ_p'; [Cr/(1+e_o)](H)log(σ_p'/σ_{vo}')+[C_c/(1+e_o)](H)log(σ_{vf}'/σ_p') for σ_{vo}' < σ_p' < σ_{vf}'

B-10-020 HAM-75-7.85 (HAM-75-0834 Bridge Structure)

Downdrag Analysis - Abutment

Calculated By: BRT Date: 11/6/2014

Checked By: JPS Date: 11/7/2014

Boring B-273-0-07 (HAM-75-0834 Forward Abutment)

18.6' net embankment height considered - Existing grade is at 538.7 and proposed profile grade is at 557.3 for a net embankment height of 18.6'

H=	18.6	ft	
B=	50.0	ft	
γ_{BF} =	120.0	pcf	
D_w =	71.4	ft	Below Ground Surface
$\Delta\sigma$ =	2,232	psf	At Ground Surface

															Embankment Settlement at Abutment for Downdrag Analysis					
Layer	Soil Type	Layer Depth (ft)		Layer Thickness H (ft)	Depth to Midpoint (ft)	γ (pcf)	LL	C_c [1]	C_r [2]	e_o [4]	σ_p' [5] (psf)	σ_{vo} Bottom (psf)	σ_{vo} Midpoint (psf)	σ_{vo}' Midpoint (psf)	Z_f/B	I [5]	$\Delta\sigma_v$ [6] (psf)	σ_{vf}' Midpoint (psf)	S_c [7] (ft)	S_c (in)	Cumulative Settlement (in)
																					0.354
1	A-3a	0.0	10.0	10.0	5.0	125	Calculated Separately				2,625	1,250	625	625	0.10	Calculated Separately			0.000	0.003	0.352
2	A-7-6	10.0	14.0	4.0	12.0	120	48	0.342	0.034	0.647	3,490	1,730	1,490	1,490	0.24	0.026	59	1,549	0.001	0.017	0.335
		14.0	18.5	4.5	16.3	120	48	0.342	0.034	0.647	4,000	2,270	2,000	2,000	0.33	0.052	116	2,116	0.002	0.027	0.308
3	A-4a	18.5	23.5	5.0	21.0	120	20	0.090	0.009	0.428	4,570	2,870	2,570	2,570	0.42	0.084	188	2,758	0.001	0.012	0.296
4	A-6a	23.5	30.0	6.5	26.8	115	27	0.113	0.028	0.433	5,244	3,618	3,244	3,244	0.54	0.122	272	3,515	0.004	0.053	0.243
5	A-1-b/A-3a	30.0	60.0	30.0	45.0	130	Calculated Separately				7,568	7,518	5,568	5,568	0.90	Calculated Separately			0.020	0.243	0.000
																		Total Settlement:		0.354 in	

1. C_c = 0.009(LL-10); Ref. Table 26, FHWA GEC 5
2. C_r = 0.10(C_c); Ref. Section 5.4.2.5 of FHWA GEC 5
3. e_o = (C_c/1.15)+0.35; Ref. Table 8-2, Holtz and Kovacs 1981
4. σ_p' = σ_{vo}'+σ_m; Estimate σ_m of 2,000 psf for slightly overconsolidated soil deposit; Ref. Table 11.2, Coduto 2003
5. Influence factor for strip loaded footing
6. $\Delta\sigma_v$ = q_e(I)
7. S_c = [C_c/(1+e_o)](H)log(σ_{vf}'/σ_{vo}')for $\sigma_p' \le \sigma_{vo}' < \sigma_{vf}'$; [$C_r$/(1+$e_o$)](H)log($\sigma_p'$/$\sigma_{vo}'$) for $\sigma_{vo}' < \sigma_{vf}' \le \sigma_p'$; [Cr/(1+$e_o$)](H)log($\sigma_p'$/$\sigma_{vo}'$)+[$C_c$/(1+$e_o$)](H)log($\sigma_{vf}'$/$\sigma_p'$) for $\sigma_{vo}' < \sigma_p' < \sigma_{vf}'$
8. Downdrag occurs along pile length above interface with relative soil movement greater than 0.40 inches.

Depth of Downdrag [8]: 0 ft.

B-10-020 HAM-75-7.85 (HAM-75-0834 Bridge Structure)

Downdrag Analysis - Wingwall

Calculated By: BRT Date: 11/6/2014

Checked By: JPS Date: 11/7/2014

Boring B-273-0-07 (HAM-75-0834 Forward Abutment)

18.6' net embankment height considered - Existing grade is at 538.7 and proposed profile grade is at 557.3 for a net embankment height of 18.6'

H=	18.6	ft	
B=	50.0	ft	
γ_{BF} =	120.0	pcf	
D_w =	73.4	ft	Below Ground Surface
$\Delta\sigma$ =	2,232	psf	At Ground Surface

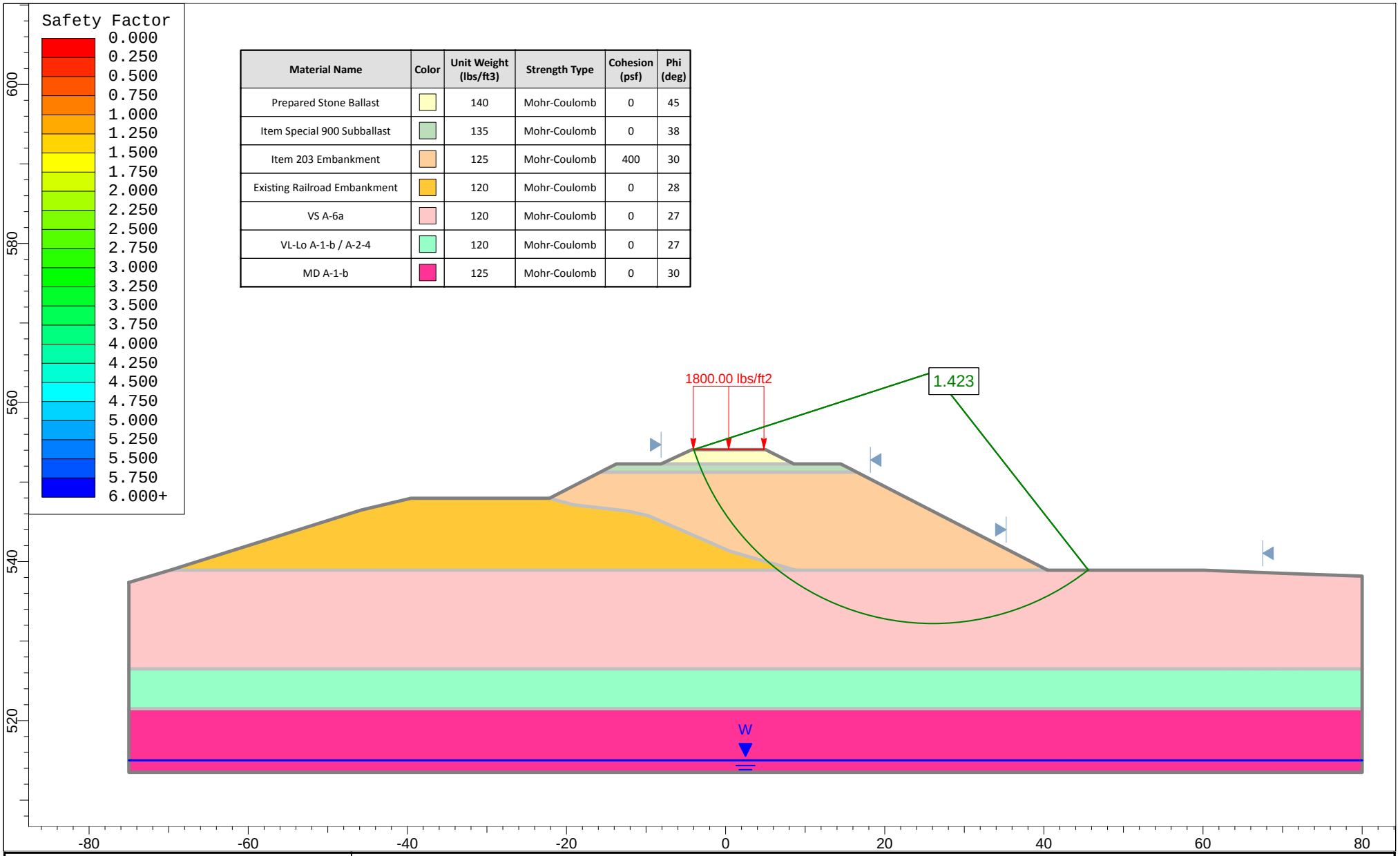
															Embankment Settlement at Abutment for Downdrag Analysis					
Layer	Soil Type	Layer Depth (ft)		Layer Thickness H (ft)	Depth to Midpoint (ft)	γ (pcf)	LL	C_c [1]	C_r [2]	e_o [4]	σ_p' [5] (psf)	σ_{vo} Bottom (psf)	σ_{vo} Midpoint (psf)	σ_{vo}' Midpoint (psf)	Z_f/B	I [5]	$\Delta\sigma_v$ [6] (psf)	σ_{vf}' Midpoint (psf)	S_c [7] (ft)	S_c (in)	Cumulative Settlement (in)
																					0.371
1	A-3a	0.0	12.0	12.0	6.0	125	Calculated Separately				2,750	1,500	750	750	0.12	Calculated Separately			0.000	0.005	0.366
2	A-7-6	12.0	16.0	4.0	14.0	120	48	0.342	0.034	0.647	3,740	1,980	1,740	1,740	0.28	0.038	84	1,824	0.002	0.020	0.345
		16.0	20.5	4.5	18.3	120	48	0.342	0.034	0.647	4,250	2,520	2,250	2,250	0.37	0.065	146	2,396	0.003	0.031	0.315
3	A-4a	20.5	25.5	5.0	23.0	120	20	0.090	0.009	0.428	4,820	3,120	2,820	2,820	0.46	0.098	218	3,038	0.001	0.012	0.303
4	A-6a	25.5	32.0	6.5	28.8	115	27	0.113	0.028	0.433	5,494	3,868	3,494	3,494	0.58	0.134	298	3,792	0.005	0.054	0.249
5	A-1-b/A-3a	32.0	62.0	30.0	47.0	130	Calculated Separately				7,818	7,768	5,818	5,818	0.94	Calculated Separately			0.021	0.249	0.000
																		Total Settlement:		0.371 in	

1. C_c = 0.009(LL-10); Ref. Table 26, FHWA GEC 5
2. C_r = 0.10(C_c); Ref. Section 5.4.2.5 of FHWA GEC 5
3. e_o = (C_c/1.15)+0.35; Ref. Table 8-2, Holtz and Kovacs 1981
4. σ_p' = σ_{vo}'+σ_m; Estimate σ_m of 2,000 psf for slightly overconsolidated soil deposit; Ref. Table 11.2, Coduto 2003
5. Influence factor for strip loaded footing
6. $\Delta\sigma_v$ = q_e(I)
7. S_c = [C_c/(1+e_o)](H)log(σ_{vf}'/σ_{vo}')for $\sigma_p' \le \sigma_{vo}' < \sigma_{vf}'$; [$C_r$/(1+$e_o$)](H)log($\sigma_p'$/$\sigma_{vo}'$) for $\sigma_{vo}' < \sigma_{vf}' \le \sigma_p'$; [Cr/(1+$e_o$)](H)log($\sigma_p'$/$\sigma_{vo}'$)+[$C_c$/(1+$e_o$)](H)log($\sigma_{vf}'$/$\sigma_p'$) for $\sigma_{vo}' < \sigma_p' < \sigma_{vf}'$
8. Downdrag occurs along pile length above interface with relative soil movement greater than 0.40 inches.

Depth of Downdrag [8]: 0 ft.

APPENDIX IX

SLOPE STABILITY RESULTS



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Prepared Stone Ballast		140	Mohr-Coulomb	0	45
Item Special 900 Subballast		135	Mohr-Coulomb	0	38
Item 203 Embankment		125	Mohr-Coulomb	400	30
Existing Railroad Embankment		120	Mohr-Coulomb	0	28
VS A-6a		120	Mohr-Coulomb	0	27
VL-Lo A-1-b / A-2-4		120	Mohr-Coulomb	0	27
MD A-1-b		125	Mohr-Coulomb	0	30

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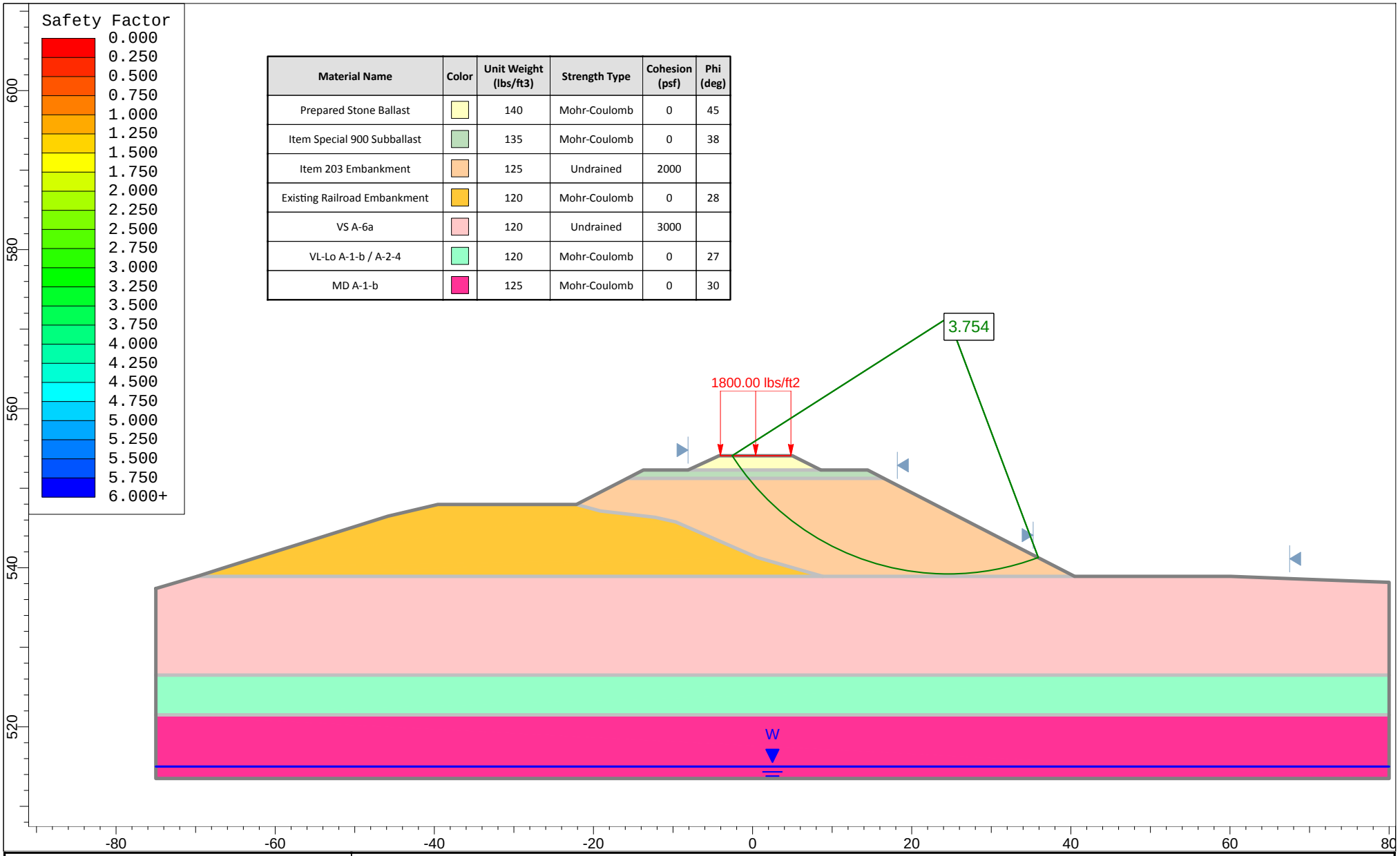
SLIDEINTERPRET 6.029

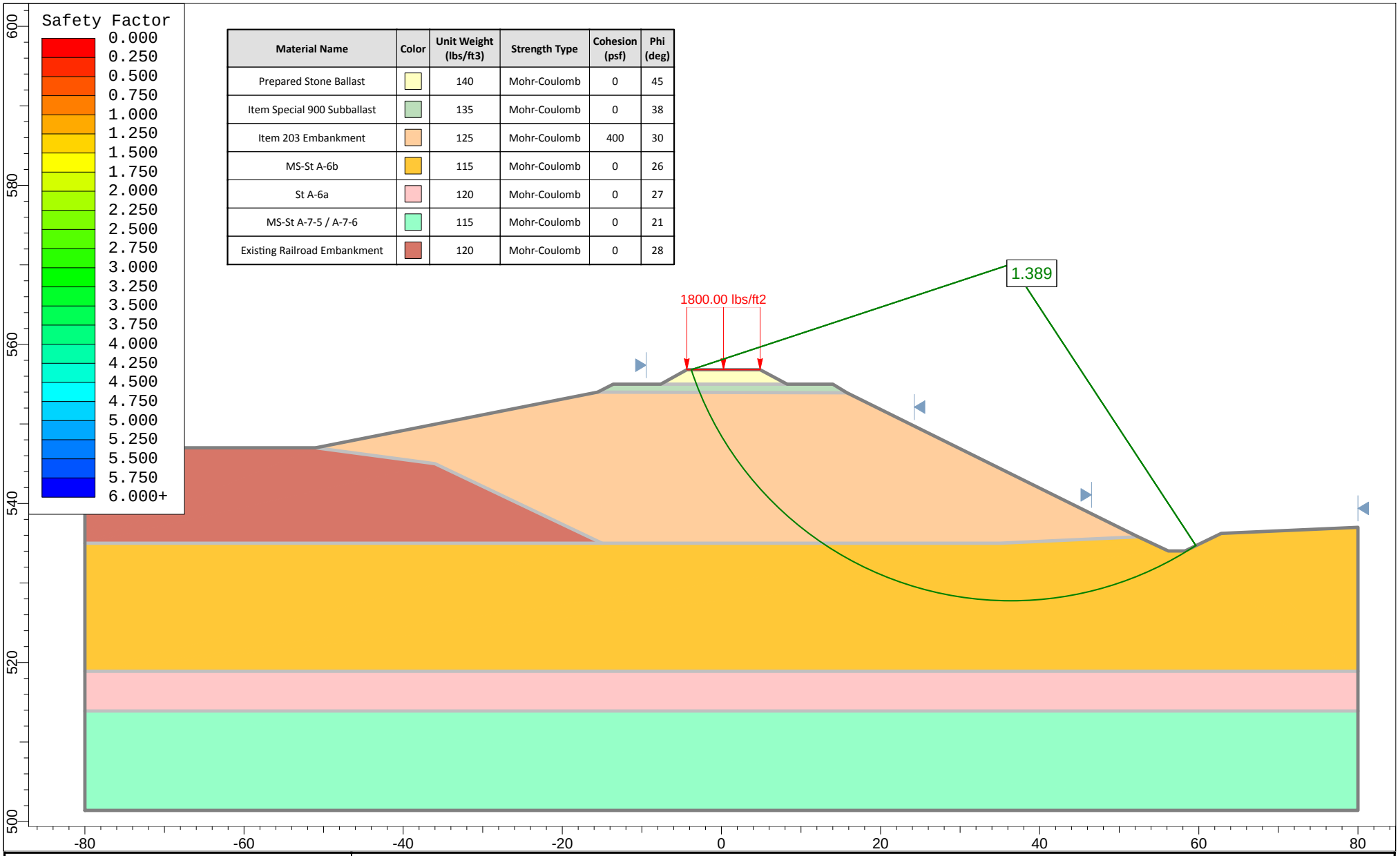
Project	B-10-020 - HAM-75-7.85 - HAM-75-0834 - Railroad Embankment Stability		
Analysis Description	PR CL NS Railroad Mainline - Sta. 152+50 (B-006-1-12) - Drained - Circular - Jambu		
Drawn By	ALM / BRT	*Scale* 1:200	*Company* Resource International, Inc.
Date	11/7/2014, 10:46:04 AM		*File Name* Embankment Stability - Sta. 152+50.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Prepared Stone Ballast		140	Mohr-Coulomb	0	45
Item Special 900 Subballast		135	Mohr-Coulomb	0	38
Item 203 Embankment		125	Undrained	2000	
Existing Railroad Embankment		120	Mohr-Coulomb	0	28
VS A-6a		120	Undrained	3000	
VL-Lo A-1-b / A-2-4		120	Mohr-Coulomb	0	27
MD A-1-b		125	Mohr-Coulomb	0	30

SLIDEINTERPRET 6.029

Project	B-10-020 - HAM-75-7.85 - HAM-75-0834 - Railroad Embankment Stability		
Analysis Description	PR CL NS Railroad Mainline - Sta. 152+50 (B-006-1-12) - Undrained - Circular - Jambu		
Drawn By	ALM / BRT	*Scale* 1:200	*Company* Resource International, Inc.
Date	11/7/2014, 10:46:04 AM		*File Name* Embankment Stability - Sta. 152+50.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Prepared Stone Ballast		140	Mohr-Coulomb	0	45
Item Special 900 Subballast		135	Mohr-Coulomb	0	38
Item 203 Embankment		125	Mohr-Coulomb	400	30
MS-St A-6b		115	Mohr-Coulomb	0	26
St A-6a		120	Mohr-Coulomb	0	27
MS-St A-7-5 / A-7-6		115	Mohr-Coulomb	0	21
Existing Railroad Embankment		120	Mohr-Coulomb	0	28

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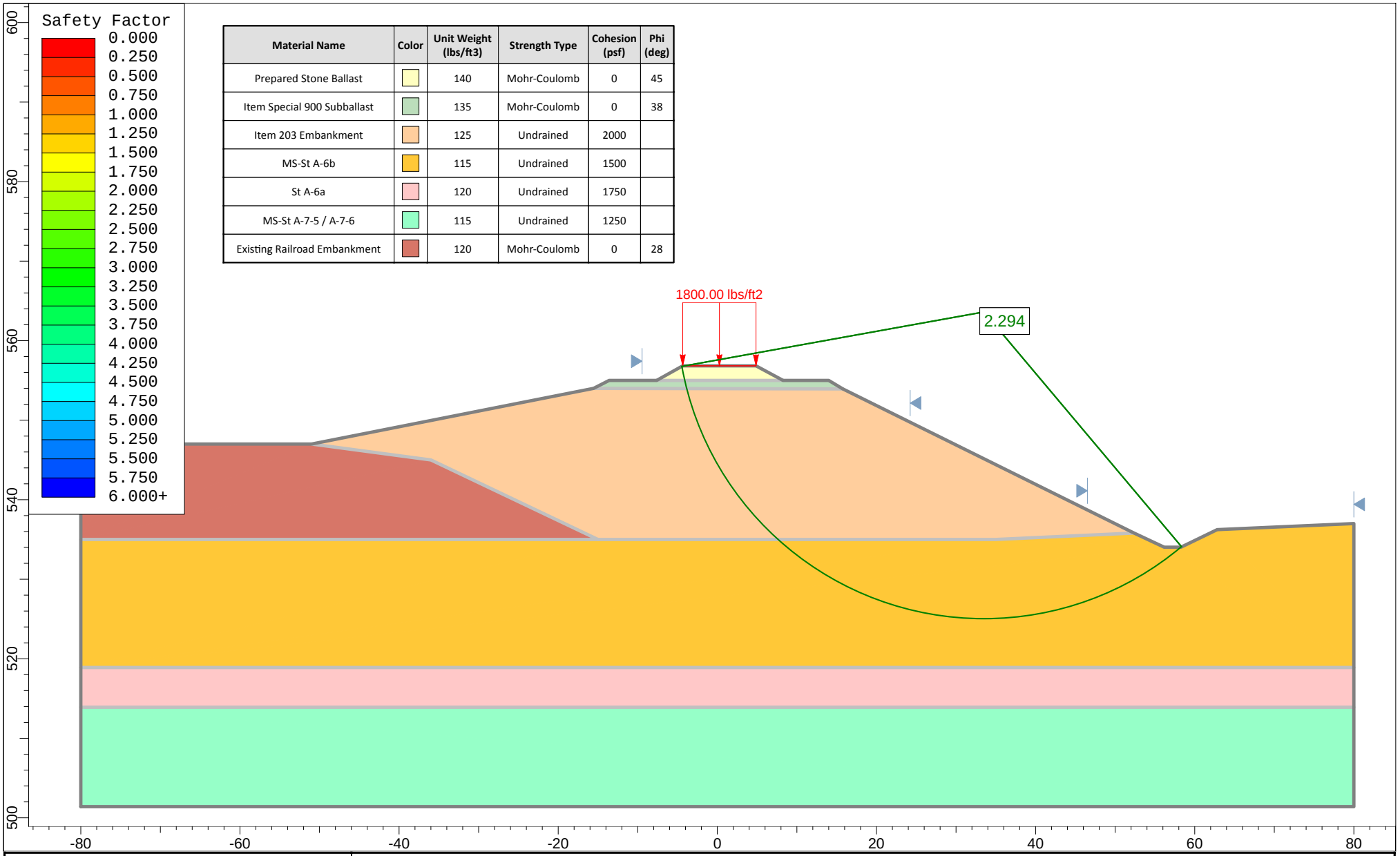
SLIDEINTERPRET 6.029

Project	B-10-020 - HAM-75-7.85 - HAM-75-0834 - Railroad Embankment Stability		
Analysis Description	PR CL NS Railroad Mainline - Sta. 154+00 (B-172-0-07) - Drained - Circular - Jambu		
Drawn By	ALM / BRT	*Scale* 1:200	*Company* Resource International, Inc.
Date	11/7/2014, 11:45:19 AM		*File Name* Embankment Stability - Sta. 154+00.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Prepared Stone Ballast		140	Mohr-Coulomb	0	45
Item Special 900 Subballast		135	Mohr-Coulomb	0	38
Item 203 Embankment		125	Undrained	2000	
MS-St A-6b		115	Undrained	1500	
St A-6a		120	Undrained	1750	
MS-St A-7-5 / A-7-6		115	Undrained	1250	
Existing Railroad Embankment		120	Mohr-Coulomb	0	28

SLIDEINTERPRET 6.029

Project	B-10-020 - HAM-75-7.85 - HAM-75-0834 - Railroad Embankment Stability		
Analysis Description	PR CL NS Railroad Mainline - Sta. 154+00 (B-172-0-07) - Undrained - Circular - Jambu		
Drawn By	ALM / BRT	*Scale* 1:200	*Company* Resource International, Inc.
Date	11/7/2014, 11:45:19 AM		*File Name* Embankment Stability - Sta. 154+00.slim