Resource International, Inc.

HAM-75-7.85
HAM-562-0026
NORFOLK SOUTHERN RAILROAD
OVER SR-562
PID NO. 77889
HAMILTON COUNTY, OHIO

DRAFT STRUCTURE FOUNDATION EXPLORATION REPORT

Prepared For:
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5500 New Albany Road
Columbus, Ohio 43054

Prepared By:
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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 3, 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-562-0026 – Norfolk Southern Railroad over SR-562
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-562-0026 bridge structure carrying Norfolk Southern Railroad over SR-562 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

EXECUTIVE SUMMARY

Resource International, Inc. (Rii) has completed a structure foundation exploration report for the replacement of the HAM-562-0026 bridge structure carrying the Norfolk Southern Railroad over SR-562 as part of the HAM-75-7.85 project in Hamilton County, Ohio. The existing structure is a two-span steel girder and deck structure that was constructed in 1960 and is supported on concrete abutments and pier with driven pile foundations, and has a total length of approximately 89 feet and width of 74 feet. It is understood that the existing structure will be completely removed replaced with a two-span steel deck girder with ballasted, composite reinforced deck superstructure on stub abutments in back of soldier pile and lagging retaining walls and wall-type pier. The abutments of the proposed structure will be located approximately 30 feet behind the existing abutments to allow sufficient space for the widening of SR-562 and will have a total length of approximately 139 feet and width of approximately 68 feet.

Exploration and Findings

On November 16 and 17, 2011, one (1) structural boring, designated as B-003-0-11, was drilled to a completion depth of 120.0 feet at the location illustrated on the Boring Plan presented in Appendix II of the full report. In 2007, two borings, designated as B-275-0-07 and B-276-0-07, were performed for this bridge, one at each proposed abutment location, as part of a preliminary geotechnical exploration performed CTL Engineering. The borings were advanced to a depth of 125.0 and 120.0 feet, respectively, below the existing ground surface, and are also included on the boring plan.

Boring B-003 was drilled through the existing pavement of SR-562 and encountered 4.0 of asphalt overlying 8.0 inches of concrete. Beneath the surface materials, natural soils were encountered consisting of both cohesive and granular material. The cohesive soils were generally described as gray sandy silt, silt and clay, and clay (ODOT A-4a, A-6a, A-7-6). The granular soils were generally described as gray, brown and brownish gray gravel with sand, silt and clay, fine sand and sandy silt (ODOT A-2-4, A-3, A-4a).

In general, the borings performed by CTL Engineering encountered primarily soft to hard cohesive soils with granular seams and layers to a depth of 58.0 and 93.5 feet below the ground surface in borings B-275 and B-276, respectively, followed by loose to dense granular soils which extended to the boring termination depths. The cohesive soils were generally described as brown and gray sandy silt, silt, silt and clay, and clay (ODOT A-4a, A-4b, A-6a, A-7-6). The granular soils were generally described as gray gravel and sand, fine sand, coarse and fine sand, and silt (ODOT A-1-b, A-3, A-3a, A-4b).

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

Analyses and 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 507.07) 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)
			Top [3]	Tip		
B-276-0-07 Rear Abutment	528.6	14" CIP	540.4	454.4	86	125 / 165
B-003-0-11 Pier	530.0	16" CIP	521.7	455.7	66	130 / 165
B-275-0-07 Forward Abutment	545.5	14" CIP	540.6	467.6	73	110 / 165

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.*
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 five (5) days after the initial drive*** *(at the time of restrike on the pile).*

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.

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-562-0026 bridge structure carrying the Norfolk Southern Railroad over SR-562, as shown on the vicinity map and boring plan presented in Appendix II. The existing structure is a two-span steel girder and deck structure that was constructed in 1960 and is supported on concrete abutments and pier with driven pile foundations, and has a total length of approximately 89 feet and width of 74 feet. It is understood that the existing structure will be completely removed replaced with a two-span steel deck girder with ballasted, composite reinforced deck superstructure on stub abutments in back of soldier pile and lagging retaining walls and wall-type pier. The abutments of the proposed structure will be located approximately 30 feet behind the existing abutments to allow sufficient space for the widening of SR-562 and will have a total length of approximately 139 feet and width of approximately 68 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. 82286) and their findings are presented in the report dated December 14, 2007. These borings were utilized in the final 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 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 surface at the bottom of this valley is at an approximate elevation of 350 feet mean sea level (msl). According to bedrock topography mapping, the overburden soil in the vicinity of the site is approximately 190 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-562-0026 structure is located at the overpass of Norfolk Southern Railroad over I-75, approximately 2.7 miles south of the Lockland Split and approximately 1,000 feet east of the interchange with I-75. The existing structure is a two-span bridge that is approximately 80 feet wide and 90 feet long, and carries up to six railways along the Norfolk Southern Railroad into and out of the Berry Yard just north of the bridge structure. The existing SR-562 roadway that runs beneath the structure is a four-lane road that connects I-75 with I-71 to the east. The terrain in the vicinity of the structure is elevated approximately 15 to 20 feet along either side of the roadway with generally level terrain to either side roadway cut. The existing SR-562 in the vicinity of the structure dips to the lowest elevation of approximately 530 feet msl underneath the structure and gradually slopes back up to the east and west of the structure.

3.0 EXPLORATION

On November 16 and 17, 2011, one (1) structural boring, designated as B-003-0-11, was drilled to a completion depth of 120.0 feet at the location illustrated on the boring plan presented in Appendix II of this report and summarized in Table 1.

Table 1. Test Boring Summary

Boring	Station [1]	Offset [1]	Latitude	Longitude	Ground Elevation (feet)	Boring Depth
B-003-0-11	16+02.94	25.3' Lt.	39.174159297° N	84.485737826° W	530.0	120.0

1. Station and offset referenced to the centerline of SR-562.

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 30.0 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 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.

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	29
Plastic and Liquid Limits	AASHTO T89, T90	8
Sieve/Hydrometers	AASHTO T88	8

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 log in Appendix IV. 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. 82286). Their findings were published in a report dated December 14, 2007. Two borings, designated as B-275-0-07 and B-276-0-07, were performed for this bridge, one at each proposed abutment location. The borings were advanced to depths of 125.0 and 120.0 feet below the existing ground surface, and SPT sampling was performed at a maximum of 5.0-foot intervals to obtain representative soil samples for laboratory classification testing. Rii has included these soil borings 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 July 15, 2011, 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-003 was drilled through the existing pavement of SR-562 and encountered 4.0 of asphalt overlying 8.0 inches of concrete.

4.2 Subsurface Soils

Beneath the surface materials, natural soils were encountered consisting of both cohesive and granular material. The cohesive soils were generally described as gray sandy silt, silt and clay, and clay (ODOT A-4a, A-6a, A-7-6). The granular soils were generally described as gray, brown and brownish gray gravel with sand, silt and clay, fine sand and sandy silt (ODOT A-2-4, A-3, A-4a).

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 hard ($HP > 4.0$ tsf). The unconfined compressive strength of the cohesive soil samples tested, obtained from the hand penetrometer, ranged from 1.5 to over 4.5 tsf (limit of instrument). 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 medium dense ($11 \leq N_{60} \leq 30$ bpf). Blow counts recorded from the SPT sampling ranged from 1 to 36 bpf.

Natural moisture contents of the inorganic soil samples tested ranged from 9 to 32 percent. The natural moisture contents of the cohesive soil samples tested for plasticity index ranged from at their corresponding plastic limit to 10 percent above their corresponding plastic limits. In general, the soils exhibited natural moisture contents estimated to be at optimum moisture levels to significantly above optimum moisture levels.

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 boring B-003 at a depth of 35.0 feet below the ground surface. Groundwater levels at the completion of drilling 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 primarily soft to hard cohesive soils with granular seams and layers to a depth of 58.0 and 93.5 feet below the ground surface in borings B-275 and B-276, respectively, followed by loose to dense granular soils to the boring termination depths. The cohesive soils were generally described as brown and gray sandy silt, silt, silt and clay, and clay (ODOT A-4a, A-4b, A-6a, A-7-6). The granular soils were generally described as gray gravel and sand, fine sand, coarse and fine sand, and silt (ODOT A-1-b, A-3, A-3a, A-4b). Groundwater was encountered in borings B-275 and B-276 at an elevation of 503.5 and 515.1 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 the boring performed for the current exploration.

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 ballasted, composite reinforced deck superstructure with stub abutments in back of soldier pile and lagging retaining walls and wall-type pier supported on a deep foundation system comprised of driven piles. The abutments of the proposed structure will be located approximately 30 feet behind the existing abutments to allow sufficient space for the widening of SR-562 and will have a total length of approximately 139 feet and width of approximately 68 feet.

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)	Required Allowable Bearing Capacity per Pile [1] (kips)
Rear Abutment	B-276-0-07	540.4	163
Pier	B-003-0-11	521.7	165
Forward Abutment	B-275-0-07	540.6	163

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 507.07) 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.

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)
			Top [3]	Tip		
B-276-0-07 Rear Abutment	528.6	14" CIP	540.4	454.4	86	125 / 165
B-003-0-11 Pier	530.0	16" CIP	521.7	455.7	66	130 / 165
B-275-0-07 Forward Abutment	545.5	14" CIP	540.6	467.6	73	110 / 165

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.*
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 five (5) days after the initial drive** (at the time of restrike on the pile).*

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 V. The piles were analyzed utilizing DRIVEN software (Appendix V). 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 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.

We emphasize that the pile lengths and ultimate bearing values 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 5.1.2.

5.1.1 Driveability

A drivability analysis was performed using the GRLWEAP program, and results of this analysis are provided in Appendix VI. 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 = design ultimate bearing value in pounds

In our 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 and H-pile sections. Based on the results of this analysis using a minimum pile wall thickness of 0.375 inches or the minimum value as determined from ODOT Item 507.06, it appears that the driving stresses induced on the CIP pipe piles **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. Please note that the required pile wall thickness was determined using the equation provided in ODOT Item 507.06, and that the pile wall thickness utilized in the driveability analysis was rounded up to the near 1/16-inch increment unless otherwise noted in Table 4.

5.1.2 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
Soft to 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 Granular Soil	125	0	30°	0.35	0.48	2.88
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 Granular Soil	125	0	30°	0.35	0.48	2.88
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 assumed). Earth pressures on excavation support systems will be dependent on the type of sheeting and method of bracing or anchorage.

5.3 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.

5.3.1 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 7. 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

5.3.2 Groundwater Considerations

Based on the groundwater observations made during drilling, groundwater may be encountered during construction of the foundation elements for the soldier pile and lagging retaining wall. 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. In the case of drilled shafts, the utilization of casing will be required below the water table to maintain an open hole and prevent the sidewalls from collapse. In addition, concrete placed below the water table should be placed by tremie method using a rigid tremie pipe. 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

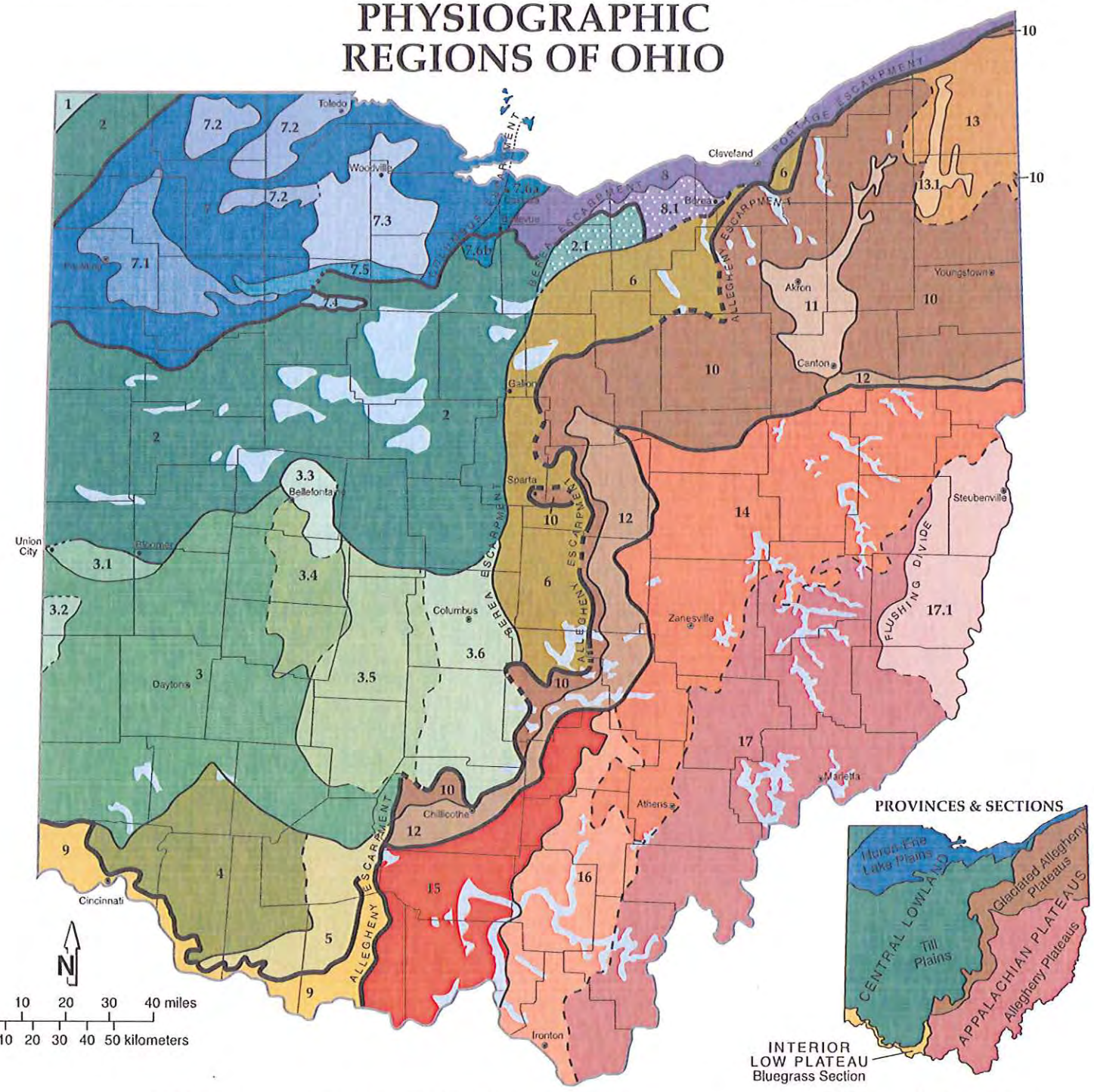
STATE GEOLOGY

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

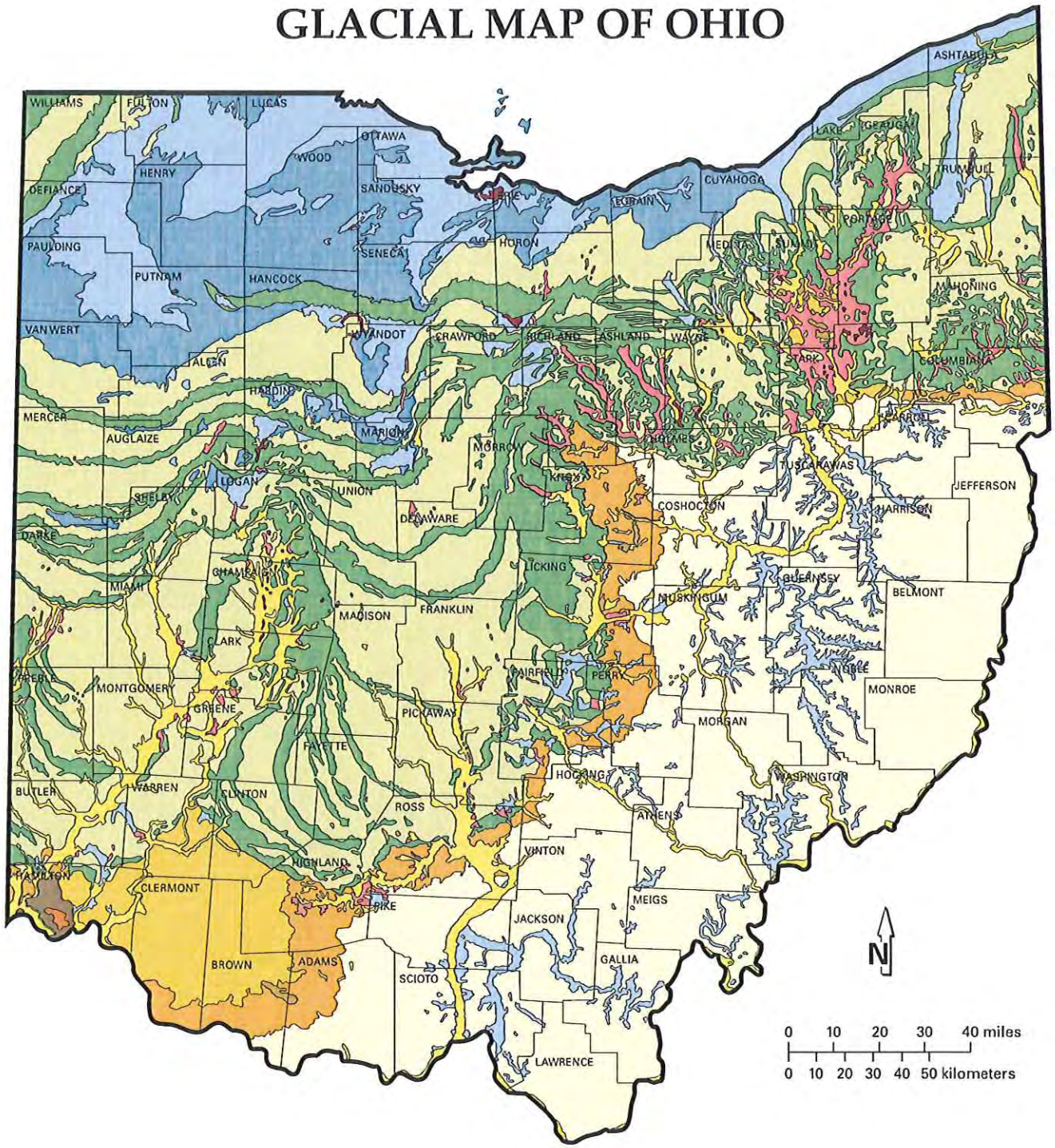
Recommended citation: Ohio Division of Geological Survey, 1998, Physiographic regions of Ohio: Ohio Department of Natural Resources, Division of Geological Survey, page-size map with text, 2 p., scale 1:2,100,00.

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



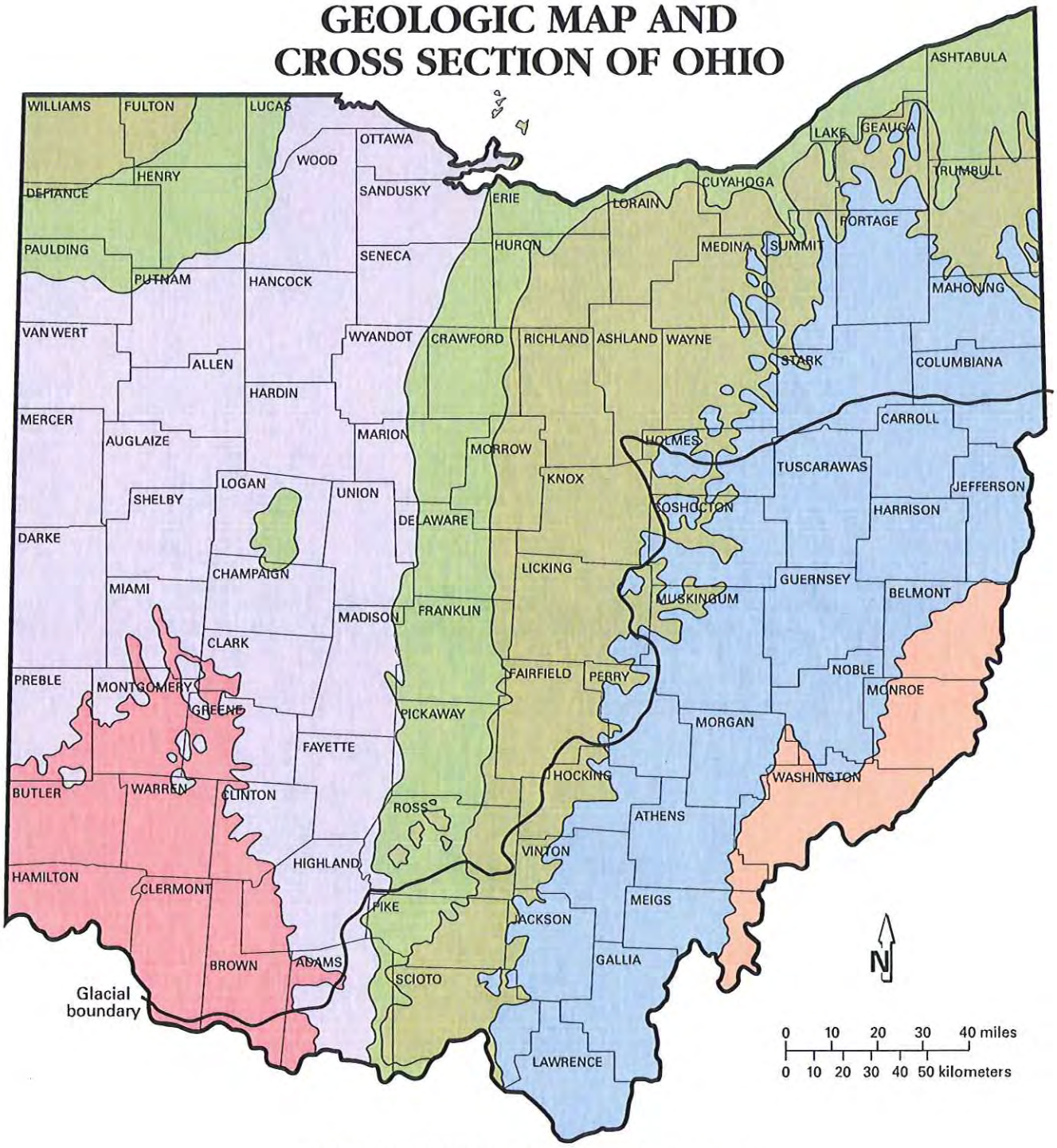
WISCONSINAN (14,000 to 24,000 years old)	ILLINOIAN (130,000 to 300,000 years old)	PRE-ILLINOIAN (older than 300,000 years)	
Ground moraine	Ground moraine	Ground moraine	Kames and eskers
Wave-planed ground moraine	Dissected ground moraine	Dissected ground moraine	Outwash
End moraine	Hummocky moraine	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

STATE OF OHIO
Bob Taft, Governor

DEPARTMENT OF NATURAL RESOURCES
Samuel W. Speck, Director

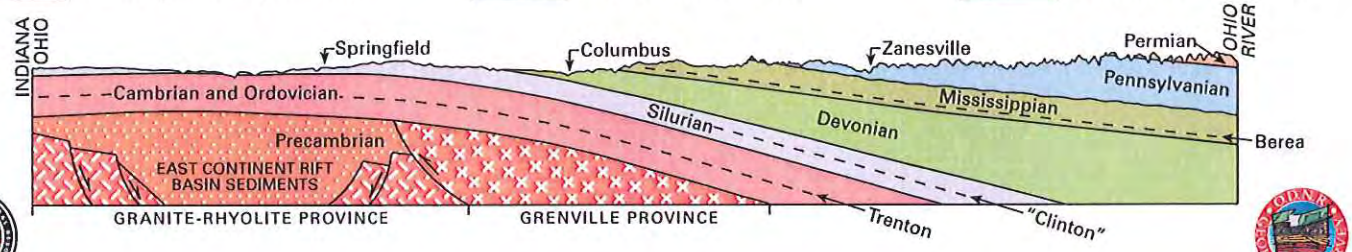
DIVISION OF GEOLOGICAL SURVEY
Thomas M. Berg, Chief

GEOLOGIC MAP AND CROSS SECTION OF OHIO



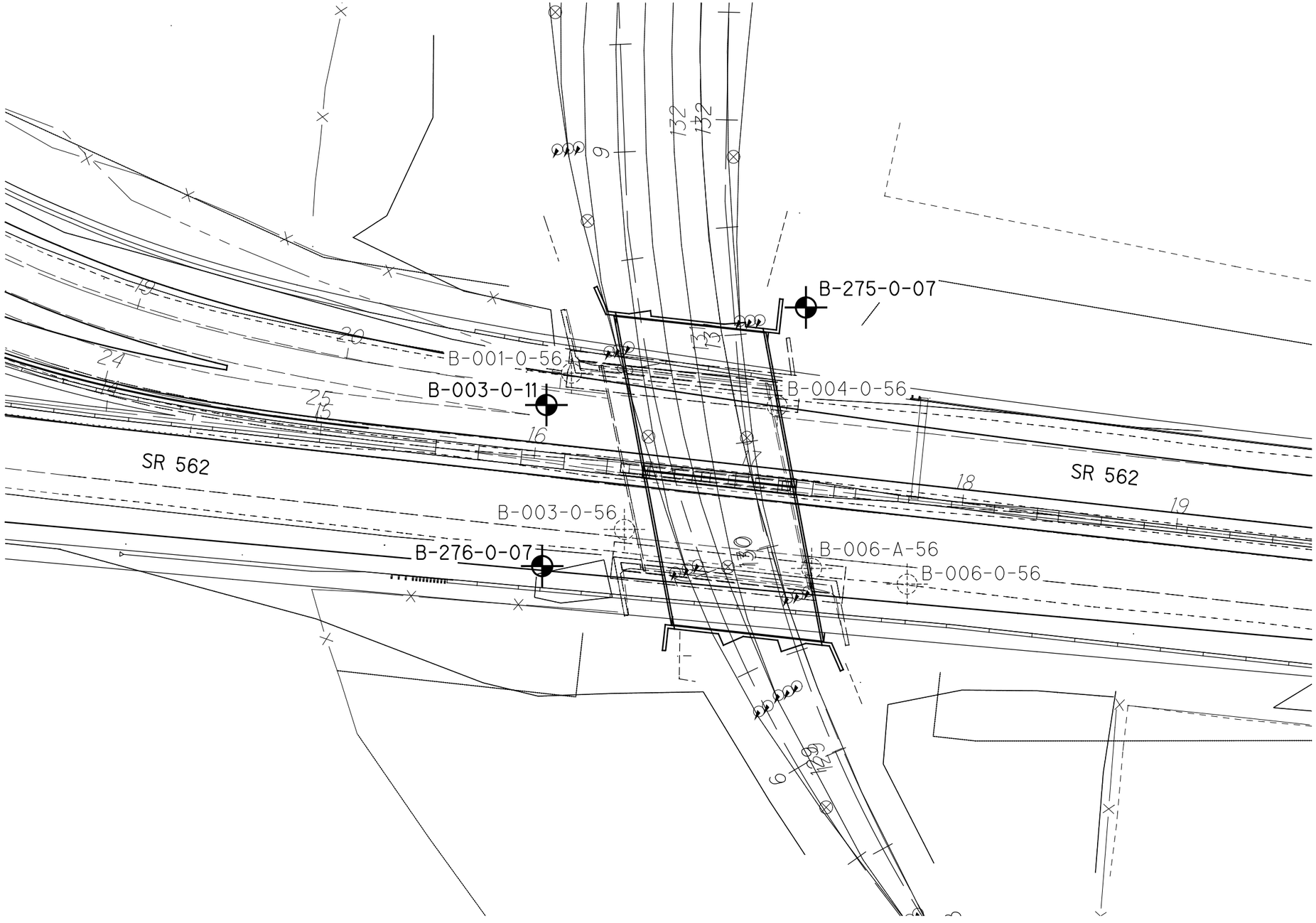
GEOLOGIC SYSTEM (million years before present)

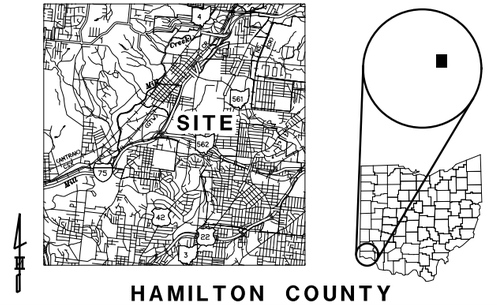
- Permian (286-245)
- Pennsylvanian (320-286)
- Mississippian (360-320)
- Devonian (408-360)
- Silurian (438-408)
- Ordovician (505-438)



APPENDIX II

VICINITY MAP AND BORING PLAN





HAMILTON COUNTY

VICINITY MAP

BORING PLAN

HAM-562-0026 - NORFOLK SOUTHERN RAILROAD OVER SR 562

HAMILTON COUNTY, OHIO

PROJECT NO. Rii B-10-020		DRAWN RRM
SCALE: 1"=50' 0 25 50	N	REVIEWED BRT
		DATE 11-3-14

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	≥ 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-003-0-11, B-275-0-07, B-276-0-07

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 / T.F.	DRILL RIG: CME-750X (SN 310218)	STATION / OFFSET: 16+02.94 / 25.3 Lt	**EXPLORATION ID B-003-0-11**	
TYPE: BRIDGE REPLACEMENT	SAMPLING FIRM / LOGGER: RII / A.D.	HAMMER: CME AUTOMATIC	ALIGNMENT: CL SR-562		
PID: 77889 BR ID: HAM-562-0026	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 5/6/11	ELEVATION: 530.0 (MSL) EOB: 120.0 ft.		PAGE 1 OF 4
START: 11/16/11 END: 11/17/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77.1	LAT / LONG: 39.174159297, 84.485737826		

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
4.0" - ASPHALT	530.0																	
8.0" - CONCRETE	529.7																	
LOOSE, BROWNISH GRAY **GRAVEL WITH SAND, SILT, AND CLAY**, DAMP.	529.0	1	3 4 4	10	33	SS-1	-	-	-	-	-	-	-	-	-	9	A-2-6 (V)	
	526.5	3																
VERY LOOSE TO MEDIUM DENSE, BROWN **SANDY SILT**, LITTLE CLAY, TRACE FINE GRAVEL, DAMP TO MOIST.		4	2 1 WOH	1	44	SS-2	-	-	-	-	-	-	-	-	-	14	A-4a (V)	
		6	2 1 2	4	50	SS-3	-	3	4	41	38	14	NP	NP	NP	20	A-4a (V)	
		8	4 7 5	15	56	SS-4	-	-	-	-	-	-	-	-	-	16	A-4a (V)	
		10	4 5 8	17	39	SS-5	-	-	-	-	-	-	-	-	-	17	A-4a (V)	
		12	8 4 5	12	67	SS-6	-	-	-	-	-	-	-	-	-	22	A-4a (V)	
	514.0	14																
STIFF TO VERY STIFF, GRAY **SANDY SILT**, AND CLAY, MOIST.		16	7 7 12	24	56	SS-7	3.00	0	1	2	49	48	29	19	10	25	A-4a (V)	
		18	4 2 7	12	44	SS-8	2.00	-	-	-	-	-	-	-	-	24	A-4a (V)	
	509.0	20																
STIFF, GRAY **CLAY**, SOME SILT, MOIST.		21	3 3 7	13	56	SS-9	2.00	-	-	-	-	-	-	-	-	24	A-7-6 (V)	
		23			0	ST-10	-	-	-	-	-	-	-	-	-	-		
	501.5	25																
VERY STIFF TO HARD, GRAY **CLAY**, SOME SILT, MOIST.		26	3 3 4	9	67	SS-11	1.50	0	0	0	25	75	48	22	26	32	A-7-6 (V)	
		28	3 5 7	15	67	SS-12	3.50	-	-	-	-	-	-	-	-	25	A-7-6 (V)	

PID: 77889	BR ID: HAM-562-0026	PROJECT: HAM-75-7.85	STATION / OFFSET: 16+02.94 / 25.3 Lt	START: 11/16/11	END: 11/17/11	PG 2 OF 4	B-003-0-11

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 TO HARD, GRAY **CLAY**, SOME SILT, MOIST. *(same as above)*	500.0																	
	493.0	W	3 4 8	15	72	SS-13	4.50	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
VERY STIFF TO HARD, GRAY **SILT AND CLAY**, MOIST.			8 12 13	32	67	SS-14	4.5+	0	0	0	41	59	34	19	15	22	A-6a (V)	
	483.0		6 7 8	19	67	SS-15	3.25	-	-	-	-	-	-	-	-	24	A-6a (V)	
VERY LOOSE, GRAY **FINE SAND**, TRACE SILT, WET.	478.0	F S	2 1 WOH	1	56	SS-16	-	-	-	-	-	-	-	-	-	21	A-3 (V)	
STIFF TO VERY STIFF, GRAY **SANDY SILT**, SOME CLAY, TRACE FINE GRAVEL, MOIST TO WET.			4 3 8	14	39	SS-17	2.50	0	6	22	46	26	21	14	7	20	A-4a (V)	
			WOH 3 4	9	61	SS-18	1.75	2	7	26	38	27	24	14	10	14	A-4a (V)	
	468.0	F S																

PID: 77889	BR ID: HAM-562-0026	PROJECT: HAM-75-7.85	STATION / OFFSET: 16+02.94 / 25.3 Lt	START: 11/16/11	END: 11/17/11	PG 3 OF 4	B-003-0-11

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
LOOSE TO MEDIUM DENSE, GRAY **FINE SAND**, LITTLE TO SOME COARSE SAND, TRACE SILT, TRACE FINE GRAVEL, MOIST TO WET. *(same as above)*	467.9	63																
		64	3 4 5	12	44	SS-19	-	-	-	-	-	-	-	-	-	22	A-3 (V)	
		65																
		66																
		67																
		68																
		69	2 3 5	10	56	SS-20	-	-	-	-	-	-	-	-	-	22	A-3 (V)	
		70																
		71																
		72																
		73																
		74	2 3 5	10	56	SS-21	-	1	12	80	7	0	NP	NP	NP	21	A-3 (V)	
		75																
		76																
		77																
		78																
		79	2 2 4	8	50	SS-22	-	-	-	-	-	-	-	-	-	24	A-3 (V)	
		80																
		81																
		82																
		83																
		84	2 1 3	5	44	SS-23	-	-	-	-	-	-	-	-	-	22	A-3 (V)	
		85																
		86																
		87																
		88																
		89	2 3 5	10	50	SS-24	-	-	-	-	-	-	-	-	-	23	A-3 (V)	
		90																
		91																
		92																
		93																
		94	5															

F S

2014 ODOT BORING LOG-RII N E - OH DOT.GDT - 11/3/14 17:52 - U:\GI8\PROJECTS\2010\B-10-020\B-10-020-BRIDGE B-003.GPJ

PID: 77889	BR ID: HAM-562-0026	PROJECT: HAM-75-7.85	STATION / OFFSET: 16+02.94 / 25.3 Lt	START: 11/16/11	END: 11/17/11	PG 4 OF 4	B-003-0-11

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
LOOSE TO MEDIUM DENSE, GRAY **FINE SAND**, LITTLE TO SOME COARSE SAND, TRACE SILT, TRACE FINE GRAVEL, MOIST TO WET. *(same as above)*	435.7	95	4 7	14	44	SS-25	-	-	-	-	-	-	-	-	-	25	A-3 (V)	
		96																
		97																
		98																
		99	7 6 4	13	39	SS-26	-	4	32	58	6	0	NP	NP	NP	22	A-3 (V)	
		100																
		101																
		102																
		103																
		104	4 6 6	15	50	SS-27	-	-	-	-	-	-	-	-	-	20	A-3 (V)	
		105																
		106																
F S		107																
		108																
		109	6 5 5	13	44	SS-28	-	-	-	-	-	-	-	-	-	20	A-3 (V)	
		110																
		111																
		112																
		113																
		114	4 6 8	18	50	SS-29	-	-	-	-	-	-	-	-	-	19	A-3 (V)	
		115																
		116																
		117																
		118																
		119	5 5 4	12	56	SS-30	-	-	-	-	-	-	-	-	-	18	A-3 (V)	
	410.0	120 EOB																

NOTES: GROUNDWATER INITIALY ENCOUNTERED @ 35.0'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 376 LBS. CEMENT/50 LBS BENTONITE/80 GAL WATER

LOG OF BORING

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

Date Started 7/11/07 Sampler: Type SS Dia. 1.375"
Date Completed 7/11/07 Casing: Length 125.0ft Dia. 3.25"

Water Elev. 503.5ft
Boring No. B-275 Station & Offset 17+17.8, 83.5 LT Surface Elev. 545.5ft

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
545.5	0														
	2														
542.0	4	10/12/13			VERY STIFF, BROWN CLAY, AND SILT, TRACE SAND, DAMP	1	0	0	1	40	59	44	22	20	A-7-6
	6														
	8														
537.0		11/16/20			8.5' DENSE, LIGHT BROWN COARSE AND FINE SAND, LITTLE SILT, TRACE CLAY, DAMP	2								6	VISUAL
	10														
	12														
532.0	14	17/23/28			13.5' HARD, BROWN SANDY SILT, LITTLE CLAY, DAMP	3	0	1	47	37	15	NP	NP	16	A-4a
	16														
	18														
527.0		19/23/32			18.5' VERY DENSE, BROWN COARSE AND FINE SAND, TRACE CLAY, DAMP	4								8	VISUAL
	20														
524.5		14/14/13			21.0' MEDIUM DENSE, LIGHT BROWN SILT, LITTLE SAND, TRACE CLAY, MOIST	5	0	0	12	84	4	NP	NP	21	A-4b
	22														
522.0	24	8/8/13			23.5' VERY STIFF, BROWN SILT, SOME CLAY, MOIST	6								20	VISUAL
519.5	26	5/5/9			26.0' STIFF, GRAY SANDY SILT, LITTLE CLAY, MOIST	7								21	VISUAL
	28														
517.0		13/13/15			28.5' MEDIUM DENSE, BROWN COARSE AND FINE SAND, LITTLE SILT, TRACE CLAY, WET	8	0	3	83	13	1	NP	NP	21	A-3a
	30														
514.5		5/6/8			31.0' VERY STIFF, GRAY SILT, LITTLE CLAY, MOIST	9								22	VISUAL
	32														
512.0	34	3/3/6			33.5' STIFF, GRAY SILT, SOME CLAY, MOIST	10								23	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-275

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)			Description	Sample No.	% Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	ODOT Class
510.5																	
509.5	36	3/3/5				36.0'	MEDIUM STIFF, GRAY SILT, TRACE SAND, TRACE CLAY, MOIST	11	0	0	1	93	6	27	7	24	A-4b
507.0	38	2/4/6				38.5'	STIFF, GRAY CLAY, TRACE TO LITTLE SILT, MOIST	12								27	VISUAL
502.0	44	3/5/5				43.5'	STIFF TO VERY STIFF, GRAY CLAY, AND SILT, TRACE SAND, MOIST	13	0	0	1	44	55	47	25	36	A-7-6
497.0	50	6/8/11						14								26	VISUAL
492.0	54	7/9/15						15								24	VISUAL
487.0	60	5/5/7				58.5'	STIFF, GRAY CLAY, SOME SILT, MOIST	16								29	VISUAL
482.0	64	5/11/17				63.5'	VERY STIFF, GRAY CLAY, AND SILT, TRACE SAND, DAMP	17	0	1	6	40	53	41	18	22	A-7-6
477.0	70	8/8/13				68.5'	VERY STIFF, GRAY SILT, SOME CLAY, DAMP	18								24	VISUAL

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

Boring No. B-275

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
474.4																	
	72																
472.0						73.5'											
	74	7/7/10					STIFF TO VERY STIFF, GRAY SILT AND CLAY, SOME SAND, MOIST	19	0	4	21	46	29	32	13	22	A-6a
	76																
	78																
467.0		5/5/9						20								22	VISUAL
	80																
	82																
462.0						83.5'											
	84	5/5/5					STIFF, BROWN SANDY SILT, TRACE CLAY, TRACE GRAVEL, MOIST	21	3	13	46	31	7	NP	NP	15	A-4a
	86																
	88																
457.0		1/2/2				88.5'	SOFT, BROWN CLAY, TRACE SAND, SOME SILT, DAMP	22								20	VISUAL
	90																
	92																
452.0						93.5'											
	94	4/4/5					LOOSE TO MEDIUM DENSE, BROWN FINE SAND, TRACE TO LITTLE GRAVEL, TRACE SILT, WET	23	1	48	46	5	0	NP	NP	25	A-3
	96																
	98																
447.0		6/8/8						24								17	VISUAL
	100					FS											
	102																
442.0																	
	104	3/4/7						25								22	VISUAL
	106																

OH DOT 2 CTL OH DOT.GDT ODOT LIBRARY BY AMC 9-14-06.GLB 041200?0G HAM-75 B BORINGS.GPJ 12/11/07

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

Boring No. B-275

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)			Description	Sample No.	% Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	ODOT Class
438.4																	
437.0	108	7/14/15						26	4	38	51	7	0	NP	NP	18	A-3
	110																
	112																
432.0	114	8/8/12			FS			27								17	VISUAL
	116																
	118																
427.0		7/7/18						28								19	VISUAL
	120																
	122																
422.0						123.5											
	124	18/24/24			FS		DENSE, BROWN FINE SAND, LITTLE GRAVEL, TRACE SILT, MOIST	29	12	35	45	8	0	NP	NP	13	A-3
420.5						125.0											

BOTTOM OF BORING = 125.0'

LOG OF BORING

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

Date Started 7/17/07 Sampler: Type SS Dia. 1.375"
Date Completed 7/17/07 Casing: Length 120.0ft Dia. 3.25"

Water Elev. 515.1ft

Boring No. B-276 Station & Offset 16+10.3, 49.3 RT Surface Elev. 528.6ft

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
528.6	0	AUGERED			0.4' TOPSOIL (.4')										VISUAL
528.1	2	4/5/6			STIFF, BROWN SILT AND CLAY, SOME SAND, TRACE GRAVEL, BRICK FRAGMENTS, DAMP -FILL 2.5'	1								12	VISUAL
525.6	4	5/6/3			STIFF, BROWN AND GRAY SANDY SILT, LITTLE CLAY, MOIST	2	0	1	45	42	12	24	10	23	A-4a
523.1	6	2/2/2			SOFT, BROWN AND GRAY SANDY SILT, LITTLE CLAY, MOIST 5.5'	3								17	VISUAL
520.1	8	3/2/4			8.0' MEDIUM STIFF, GRAY SILT, SOME SAND, TRACE CLAY, MOIST	4	0	0	28	69	3	NP	NP	22	A-4b
517.6	12	2/2/3			12.5'	5								23	VISUAL
515.1	14	3/4/5			MEDIUM STIFF TO STIFF, BROWN AND GRAY SILT AND CLAY, TRACE SAND, MOIST	6	0	1	3	48	48	32	14	20	A-6a
512.6	16	3/4/4				7								23	VISUAL
510.1	20	1/2/2			18.5' SOFT, BROWN AND GRAY SILT AND CLAY, TRACE SAND, MOIST	8								25	VISUAL
505.1	24	2/2/3			22.0' MEDIUM STIFF TO STIFF, GRAY CLAY, SOME TO LITTLE SILT, TRACE SAND, MOIST	9	0	0	1	35	64	51	29	32	A-7-6
500.1	30	3/4/5				10								26	VISUAL
495.1	34	5/6/6				11								27	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-276

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
493.6															
	36														
	38														
490.1		4/6/8				12								22	VISUAL
	40														
	42														
					43.0'										
485.1	44	2/2/3			LOOSE, GRAY AND BROWN, COARSE AND FINE SAND, LITTLE SILT, LITTLE CLAY, MOIST	13	0	9	60	19	12	16	3	15	A-3a
	46				46.0'										
	48														
480.1		2/3/3			MEDIUM STIFF, BROWN SILT, AND SAND, LITTLE CLAY, MOIST	14	0	3	34	50	13	24	8	22	A-4b
	50														
	52														
475.1	54	2/2/3				15								24	VISUAL
	56														
	58				58.0'										
470.1		4/5/6			LOOSE TO MEDIUM DENSE, GRAY COARSE AND FINE SAND, LITTLE TO TRACE SILT, TRACE CLAY, MOIST	16	0	9	72	11	8	NP	NP	15	A-3a
	60														
	62														
465.1	64	3/4/4				17								20	VISUAL
	66														
	68														
460.1		3/4/5				18								21	VISUAL
	70														

OH DOT 2 CTL OH DOT.GDT ODOT LIBRARY BY AMC 9-14-06.GLB 04120070G HAM-75 B BORINGS.GPJ 12/10/07

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

Boring No. B-276

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
457.5	72														
455.1	74	4/5/6				19	0	29	59	11	1	NP	NP	21	A-3a
	76														
450.1	78	3/4/5				20								18	VISUAL
	80														
445.1	82														
	84	9/10/12			NO RECOVERY	21									VISUAL
	86														
	88				88.0'										
440.1		7/13/15			MEDIUM DENSE, BROWN GRAVEL AND/ OR STONE FRAGMENTS WITH SAND, TRACE SILT, TRACE CLAY, MOIST	22	1	48	44	6	1	NP	NP	17	A-1-b
	90														
	92														
435.1	94	9/13/14				23								17	VISUAL
	96														
	98														
430.1		12/15/15				24								13	VISUAL
	100														
	102														
425.1	104	14/16/17			103.5 DENSE, BROWN COARSE AND FINE SAND, LITTLE SILT, TRACE GRAVEL, TRACE CLAY, MOIST	25	5	18	56	16	5	NP	NP	10	A-3a
	106														

OH DOT 2 CTL OH DOT.GDT ODOT LIBRARY BY AMC 9-14-06.GLB 04120070G HAM-75 B BORINGS.GPJ 12/10/07

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

Boring No. B-276

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
421.5															
	108														
420.1		12/15/17				26								22	VISUAL
	110														
	112														
415.1															
	114	14/17/18				27								20	VISUAL
	116														
	118														
410.1		18/19/21			118.5'										
					DENSE, BROWN GRAVEL AND/OR STONE FRAGMENTS WITH SAND, TRACE SILT, MOIST	28	12	47	34	7	0	NP	NP	12	A-1-b
408.6	120				120.0'										
					BOTTOM OF BORING = 120.0'										

APPENDIX V

DRIVEN ANALYSIS OUTPUTS

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-003.DVN
Project Name: HAM-562-0026-B-003-0-11 Project Date: 11/03/2014
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: 16.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	26.50 ft
	- Driving/Restrike	26.50 ft
	- Ultimate:	26.50 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	7.00 ft	17.00%	125.00 pcf	29.0/29.0	Nordlund
2	Cohesive	5.00 ft	17.00%	120.00 pcf	2500.00 psf	T-79 Steel
3	Cohesive	7.50 ft	50.00%	115.00 pcf	1750.00 psf	T-79 Steel
4	Cohesive	9.00 ft	50.00%	120.00 pcf	3500.00 psf	T-79 Steel
5	Cohesive	10.00 ft	33.00%	120.00 pcf	3500.00 psf	T-79 Steel
6	Cohesionless	5.00 ft	0.00%	110.00 pcf	24.0/24.0	Nordlund
7	Cohesive	10.00 ft	17.00%	115.00 pcf	1750.00 psf	T-79 Steel
8	Cohesionless	12.50 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
9	Cohesionless	2.50 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
10	Cohesionless	10.00 ft	0.00%	120.00 pcf	27.0/27.0	Nordlund
11	Cohesionless	33.50 ft	0.00%	125.00 pcf	29.0/29.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	21.24	N/A	0.00 Kips
6.99 ft	Cohesionless	436.88 psf	21.24	N/A	4.73 Kips
7.01 ft	Cohesive	N/A	N/A	1000.00 psf	4.78 Kips
11.99 ft	Cohesive	N/A	N/A	1000.00 psf	25.64 Kips
12.01 ft	Cohesive	N/A	N/A	1140.00 psf	25.73 Kips
19.49 ft	Cohesive	N/A	N/A	1184.64 psf	62.85 Kips
19.51 ft	Cohesive	N/A	N/A	845.66 psf	62.94 Kips
28.49 ft	Cohesive	N/A	N/A	955.67 psf	98.89 Kips
28.51 ft	Cohesive	N/A	N/A	955.91 psf	98.98 Kips
37.51 ft	Cohesive	N/A	N/A	1066.16 psf	139.17 Kips
38.49 ft	Cohesive	N/A	N/A	1078.17 psf	144.05 Kips
38.51 ft	Cohesionless	3868.94 psf	17.58	N/A	144.14 Kips
43.49 ft	Cohesionless	3987.46 psf	17.58	N/A	164.50 Kips
43.51 ft	Cohesive	N/A	N/A	1358.78 psf	164.60 Kips
52.51 ft	Cohesive	N/A	N/A	1424.03 psf	218.29 Kips
53.49 ft	Cohesive	N/A	N/A	1430.00 psf	224.38 Kips
53.51 ft	Cohesionless	4632.99 psf	20.51	N/A	224.51 Kips
62.51 ft	Cohesionless	4892.19 psf	20.51	N/A	286.97 Kips
65.99 ft	Cohesionless	4992.41 psf	20.51	N/A	312.89 Kips
66.01 ft	Cohesionless	5352.99 psf	20.51	N/A	313.04 Kips
68.49 ft	Cohesionless	5424.41 psf	20.51	N/A	332.13 Kips
68.51 ft	Cohesionless	5496.99 psf	19.77	N/A	332.28 Kips
77.51 ft	Cohesionless	5756.19 psf	19.77	N/A	399.27 Kips
78.49 ft	Cohesionless	5784.41 psf	19.77	N/A	406.93 Kips
78.51 ft	Cohesionless	6073.01 psf	21.24	N/A	407.10 Kips
87.51 ft	Cohesionless	6354.71 psf	21.24	N/A	495.66 Kips
96.51 ft	Cohesionless	6636.41 psf	21.24	N/A	592.06 Kips
105.51 ft	Cohesionless	6918.11 psf	21.24	N/A	696.32 Kips
111.99 ft	Cohesionless	7120.94 psf	21.24	N/A	776.25 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	18.60 Kips	0.03 Kips
6.99 ft	Cohesionless	873.75 psf	26.40	18.60 Kips	17.97 Kips
7.01 ft	Cohesive	N/A	N/A	N/A	31.42 Kips
11.99 ft	Cohesive	N/A	N/A	N/A	31.42 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
19.49 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
19.51 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
28.49 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
37.51 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
38.49 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
38.51 ft	Cohesionless	3869.18 psf	13.80	18.60 Kips	18.60 Kips
43.49 ft	Cohesionless	4106.22 psf	13.80	18.60 Kips	18.60 Kips
43.51 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
52.51 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
53.49 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
53.51 ft	Cohesionless	4633.28 psf	22.80	18.60 Kips	18.60 Kips
62.51 ft	Cohesionless	5151.68 psf	22.80	18.60 Kips	18.60 Kips
65.99 ft	Cohesionless	5352.12 psf	22.80	18.60 Kips	18.60 Kips
66.01 ft	Cohesionless	5353.28 psf	22.80	18.60 Kips	18.60 Kips
68.49 ft	Cohesionless	5496.12 psf	22.80	18.60 Kips	18.60 Kips
68.51 ft	Cohesionless	5497.28 psf	19.80	18.60 Kips	18.60 Kips
77.51 ft	Cohesionless	6015.68 psf	19.80	18.60 Kips	18.60 Kips
78.49 ft	Cohesionless	6072.12 psf	19.80	18.60 Kips	18.60 Kips
78.51 ft	Cohesionless	6073.33 psf	26.40	18.60 Kips	18.60 Kips
87.51 ft	Cohesionless	6636.73 psf	26.40	18.60 Kips	18.60 Kips
96.51 ft	Cohesionless	7200.13 psf	26.40	18.60 Kips	18.60 Kips
105.51 ft	Cohesionless	7763.53 psf	26.40	18.60 Kips	18.60 Kips
111.99 ft	Cohesionless	8169.17 psf	26.40	18.60 Kips	18.60 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.03 Kips	0.03 Kips
6.99 ft	4.73 Kips	17.97 Kips	22.70 Kips
7.01 ft	4.78 Kips	31.42 Kips	36.20 Kips
11.99 ft	25.64 Kips	31.42 Kips	57.06 Kips
12.01 ft	25.73 Kips	21.99 Kips	47.72 Kips
19.49 ft	62.85 Kips	21.99 Kips	84.84 Kips
19.51 ft	62.94 Kips	43.98 Kips	106.92 Kips
28.49 ft	98.89 Kips	43.98 Kips	142.87 Kips
28.51 ft	98.98 Kips	43.98 Kips	142.96 Kips
37.51 ft	139.17 Kips	43.98 Kips	183.16 Kips
38.49 ft	144.05 Kips	43.98 Kips	188.04 Kips
38.51 ft	144.14 Kips	18.60 Kips	162.74 Kips
43.49 ft	164.50 Kips	18.60 Kips	183.10 Kips
43.51 ft	164.60 Kips	21.99 Kips	186.59 Kips
52.51 ft	218.29 Kips	21.99 Kips	240.28 Kips
53.49 ft	224.38 Kips	21.99 Kips	246.37 Kips
53.51 ft	224.51 Kips	18.60 Kips	243.11 Kips
62.51 ft	286.97 Kips	18.60 Kips	305.57 Kips
65.99 ft	312.89 Kips	18.60 Kips	331.49 Kips
66.01 ft	313.04 Kips	18.60 Kips	331.64 Kips
68.49 ft	332.13 Kips	18.60 Kips	350.73 Kips
68.51 ft	332.28 Kips	18.60 Kips	350.88 Kips
77.51 ft	399.27 Kips	18.60 Kips	417.87 Kips
78.49 ft	406.93 Kips	18.60 Kips	425.52 Kips
78.51 ft	407.10 Kips	18.60 Kips	425.70 Kips
87.51 ft	495.66 Kips	18.60 Kips	514.25 Kips
96.51 ft	592.06 Kips	18.60 Kips	610.66 Kips
105.51 ft	696.32 Kips	18.60 Kips	714.92 Kips
111.99 ft	776.25 Kips	18.60 Kips	794.85 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	21.24	N/A	0.00 Kips
6.99 ft	Cohesionless	436.88 psf	21.24	N/A	3.92 Kips
7.01 ft	Cohesive	N/A	N/A	1000.00 psf	3.97 Kips
11.99 ft	Cohesive	N/A	N/A	1000.00 psf	21.28 Kips
12.01 ft	Cohesive	N/A	N/A	1140.00 psf	21.33 Kips
19.49 ft	Cohesive	N/A	N/A	1184.64 psf	39.89 Kips
19.51 ft	Cohesive	N/A	N/A	845.66 psf	39.93 Kips
28.49 ft	Cohesive	N/A	N/A	955.67 psf	57.91 Kips
28.51 ft	Cohesive	N/A	N/A	955.91 psf	57.97 Kips
37.51 ft	Cohesive	N/A	N/A	1066.16 psf	84.90 Kips
38.49 ft	Cohesive	N/A	N/A	1078.17 psf	88.17 Kips
38.51 ft	Cohesionless	3868.94 psf	17.58	N/A	88.26 Kips
43.49 ft	Cohesionless	3987.46 psf	17.58	N/A	108.61 Kips
43.51 ft	Cohesive	N/A	N/A	1358.78 psf	108.70 Kips
52.51 ft	Cohesive	N/A	N/A	1424.03 psf	153.26 Kips
53.49 ft	Cohesive	N/A	N/A	1430.00 psf	158.32 Kips
53.51 ft	Cohesionless	4632.99 psf	20.51	N/A	158.44 Kips
62.51 ft	Cohesionless	4892.19 psf	20.51	N/A	220.90 Kips
65.99 ft	Cohesionless	4992.41 psf	20.51	N/A	246.83 Kips
66.01 ft	Cohesionless	5352.99 psf	20.51	N/A	246.98 Kips
68.49 ft	Cohesionless	5424.41 psf	20.51	N/A	266.06 Kips
68.51 ft	Cohesionless	5496.99 psf	19.77	N/A	266.21 Kips
77.51 ft	Cohesionless	5756.19 psf	19.77	N/A	333.20 Kips
78.49 ft	Cohesionless	5784.41 psf	19.77	N/A	340.86 Kips
78.51 ft	Cohesionless	6073.01 psf	21.24	N/A	341.03 Kips
87.51 ft	Cohesionless	6354.71 psf	21.24	N/A	429.59 Kips
96.51 ft	Cohesionless	6636.41 psf	21.24	N/A	526.00 Kips
105.51 ft	Cohesionless	6918.11 psf	21.24	N/A	630.25 Kips
111.99 ft	Cohesionless	7120.94 psf	21.24	N/A	710.18 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	18.60 Kips	0.03 Kips
6.99 ft	Cohesionless	873.75 psf	26.40	18.60 Kips	17.97 Kips
7.01 ft	Cohesive	N/A	N/A	N/A	31.42 Kips
11.99 ft	Cohesive	N/A	N/A	N/A	31.42 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
19.49 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
19.51 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
28.49 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
37.51 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
38.49 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
38.51 ft	Cohesionless	3869.18 psf	13.80	18.60 Kips	18.60 Kips
43.49 ft	Cohesionless	4106.22 psf	13.80	18.60 Kips	18.60 Kips
43.51 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
52.51 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
53.49 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
53.51 ft	Cohesionless	4633.28 psf	22.80	18.60 Kips	18.60 Kips
62.51 ft	Cohesionless	5151.68 psf	22.80	18.60 Kips	18.60 Kips
65.99 ft	Cohesionless	5352.12 psf	22.80	18.60 Kips	18.60 Kips
66.01 ft	Cohesionless	5353.28 psf	22.80	18.60 Kips	18.60 Kips
68.49 ft	Cohesionless	5496.12 psf	22.80	18.60 Kips	18.60 Kips
68.51 ft	Cohesionless	5497.28 psf	19.80	18.60 Kips	18.60 Kips
77.51 ft	Cohesionless	6015.68 psf	19.80	18.60 Kips	18.60 Kips
78.49 ft	Cohesionless	6072.12 psf	19.80	18.60 Kips	18.60 Kips
78.51 ft	Cohesionless	6073.33 psf	26.40	18.60 Kips	18.60 Kips
87.51 ft	Cohesionless	6636.73 psf	26.40	18.60 Kips	18.60 Kips
96.51 ft	Cohesionless	7200.13 psf	26.40	18.60 Kips	18.60 Kips
105.51 ft	Cohesionless	7763.53 psf	26.40	18.60 Kips	18.60 Kips
111.99 ft	Cohesionless	8169.17 psf	26.40	18.60 Kips	18.60 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.03 Kips	0.03 Kips
6.99 ft	3.92 Kips	17.97 Kips	21.90 Kips
7.01 ft	3.97 Kips	31.42 Kips	35.39 Kips
11.99 ft	21.28 Kips	31.42 Kips	52.70 Kips
12.01 ft	21.33 Kips	21.99 Kips	43.32 Kips
19.49 ft	39.89 Kips	21.99 Kips	61.88 Kips
19.51 ft	39.93 Kips	43.98 Kips	83.91 Kips
28.49 ft	57.91 Kips	43.98 Kips	101.89 Kips
28.51 ft	57.97 Kips	43.98 Kips	101.95 Kips
37.51 ft	84.90 Kips	43.98 Kips	128.88 Kips
38.49 ft	88.17 Kips	43.98 Kips	132.15 Kips
38.51 ft	88.26 Kips	18.60 Kips	106.86 Kips
43.49 ft	108.61 Kips	18.60 Kips	127.21 Kips
43.51 ft	108.70 Kips	21.99 Kips	130.69 Kips
52.51 ft	153.26 Kips	21.99 Kips	175.25 Kips
53.49 ft	158.32 Kips	21.99 Kips	180.31 Kips
53.51 ft	158.44 Kips	18.60 Kips	177.04 Kips
62.51 ft	220.90 Kips	18.60 Kips	239.50 Kips
65.99 ft	246.83 Kips	18.60 Kips	265.42 Kips
66.01 ft	246.98 Kips	18.60 Kips	265.58 Kips
68.49 ft	266.06 Kips	18.60 Kips	284.66 Kips
68.51 ft	266.21 Kips	18.60 Kips	284.81 Kips
77.51 ft	333.20 Kips	18.60 Kips	351.80 Kips
78.49 ft	340.86 Kips	18.60 Kips	359.46 Kips
78.51 ft	341.03 Kips	18.60 Kips	359.63 Kips
87.51 ft	429.59 Kips	18.60 Kips	448.19 Kips
96.51 ft	526.00 Kips	18.60 Kips	544.59 Kips
105.51 ft	630.25 Kips	18.60 Kips	648.85 Kips
111.99 ft	710.18 Kips	18.60 Kips	728.78 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.62 psf	21.24	N/A	0.00 Kips
6.99 ft	Cohesionless	436.88 psf	21.24	N/A	4.73 Kips
7.01 ft	Cohesive	N/A	N/A	1000.00 psf	4.78 Kips
11.99 ft	Cohesive	N/A	N/A	1000.00 psf	25.64 Kips
12.01 ft	Cohesive	N/A	N/A	1140.00 psf	25.73 Kips
19.49 ft	Cohesive	N/A	N/A	1184.64 psf	62.85 Kips
19.51 ft	Cohesive	N/A	N/A	845.66 psf	62.94 Kips
28.49 ft	Cohesive	N/A	N/A	955.67 psf	98.89 Kips
28.51 ft	Cohesive	N/A	N/A	955.91 psf	98.98 Kips
37.51 ft	Cohesive	N/A	N/A	1066.16 psf	139.17 Kips
38.49 ft	Cohesive	N/A	N/A	1078.17 psf	144.05 Kips
38.51 ft	Cohesionless	3868.94 psf	17.58	N/A	144.14 Kips
43.49 ft	Cohesionless	3987.46 psf	17.58	N/A	164.50 Kips
43.51 ft	Cohesive	N/A	N/A	1358.78 psf	164.60 Kips
52.51 ft	Cohesive	N/A	N/A	1424.03 psf	218.29 Kips
53.49 ft	Cohesive	N/A	N/A	1430.00 psf	224.38 Kips
53.51 ft	Cohesionless	4632.99 psf	20.51	N/A	224.51 Kips
62.51 ft	Cohesionless	4892.19 psf	20.51	N/A	286.97 Kips
65.99 ft	Cohesionless	4992.41 psf	20.51	N/A	312.89 Kips
66.01 ft	Cohesionless	5352.99 psf	20.51	N/A	313.04 Kips
68.49 ft	Cohesionless	5424.41 psf	20.51	N/A	332.13 Kips
68.51 ft	Cohesionless	5496.99 psf	19.77	N/A	332.28 Kips
77.51 ft	Cohesionless	5756.19 psf	19.77	N/A	399.27 Kips
78.49 ft	Cohesionless	5784.41 psf	19.77	N/A	406.93 Kips
78.51 ft	Cohesionless	6073.01 psf	21.24	N/A	407.10 Kips
87.51 ft	Cohesionless	6354.71 psf	21.24	N/A	495.66 Kips
96.51 ft	Cohesionless	6636.41 psf	21.24	N/A	592.06 Kips
105.51 ft	Cohesionless	6918.11 psf	21.24	N/A	696.32 Kips
111.99 ft	Cohesionless	7120.94 psf	21.24	N/A	776.25 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	18.60 Kips	0.03 Kips
6.99 ft	Cohesionless	873.75 psf	26.40	18.60 Kips	17.97 Kips
7.01 ft	Cohesive	N/A	N/A	N/A	31.42 Kips
11.99 ft	Cohesive	N/A	N/A	N/A	31.42 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
19.49 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
19.51 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
28.49 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
28.51 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
37.51 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
38.49 ft	Cohesive	N/A	N/A	N/A	43.98 Kips
38.51 ft	Cohesionless	3869.18 psf	13.80	18.60 Kips	18.60 Kips
43.49 ft	Cohesionless	4106.22 psf	13.80	18.60 Kips	18.60 Kips
43.51 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
52.51 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
53.49 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
53.51 ft	Cohesionless	4633.28 psf	22.80	18.60 Kips	18.60 Kips
62.51 ft	Cohesionless	5151.68 psf	22.80	18.60 Kips	18.60 Kips
65.99 ft	Cohesionless	5352.12 psf	22.80	18.60 Kips	18.60 Kips
66.01 ft	Cohesionless	5353.28 psf	22.80	18.60 Kips	18.60 Kips
68.49 ft	Cohesionless	5496.12 psf	22.80	18.60 Kips	18.60 Kips
68.51 ft	Cohesionless	5497.28 psf	19.80	18.60 Kips	18.60 Kips
77.51 ft	Cohesionless	6015.68 psf	19.80	18.60 Kips	18.60 Kips
78.49 ft	Cohesionless	6072.12 psf	19.80	18.60 Kips	18.60 Kips
78.51 ft	Cohesionless	6073.33 psf	26.40	18.60 Kips	18.60 Kips
87.51 ft	Cohesionless	6636.73 psf	26.40	18.60 Kips	18.60 Kips
96.51 ft	Cohesionless	7200.13 psf	26.40	18.60 Kips	18.60 Kips
105.51 ft	Cohesionless	7763.53 psf	26.40	18.60 Kips	18.60 Kips
111.99 ft	Cohesionless	8169.17 psf	26.40	18.60 Kips	18.60 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.03 Kips	0.03 Kips
6.99 ft	4.73 Kips	17.97 Kips	22.70 Kips
7.01 ft	4.78 Kips	31.42 Kips	36.20 Kips
11.99 ft	25.64 Kips	31.42 Kips	57.06 Kips
12.01 ft	25.73 Kips	21.99 Kips	47.72 Kips
19.49 ft	62.85 Kips	21.99 Kips	84.84 Kips
19.51 ft	62.94 Kips	43.98 Kips	106.92 Kips
28.49 ft	98.89 Kips	43.98 Kips	142.87 Kips
28.51 ft	98.98 Kips	43.98 Kips	142.96 Kips
37.51 ft	139.17 Kips	43.98 Kips	183.16 Kips
38.49 ft	144.05 Kips	43.98 Kips	188.04 Kips
38.51 ft	144.14 Kips	18.60 Kips	162.74 Kips
43.49 ft	164.50 Kips	18.60 Kips	183.10 Kips
43.51 ft	164.60 Kips	21.99 Kips	186.59 Kips
52.51 ft	218.29 Kips	21.99 Kips	240.28 Kips
53.49 ft	224.38 Kips	21.99 Kips	246.37 Kips
53.51 ft	224.51 Kips	18.60 Kips	243.11 Kips
62.51 ft	286.97 Kips	18.60 Kips	305.57 Kips
65.99 ft	312.89 Kips	18.60 Kips	331.49 Kips
66.01 ft	313.04 Kips	18.60 Kips	331.64 Kips
68.49 ft	332.13 Kips	18.60 Kips	350.73 Kips
68.51 ft	332.28 Kips	18.60 Kips	350.88 Kips
77.51 ft	399.27 Kips	18.60 Kips	417.87 Kips
78.49 ft	406.93 Kips	18.60 Kips	425.52 Kips
78.51 ft	407.10 Kips	18.60 Kips	425.70 Kips
87.51 ft	495.66 Kips	18.60 Kips	514.25 Kips
96.51 ft	592.06 Kips	18.60 Kips	610.66 Kips
105.51 ft	696.32 Kips	18.60 Kips	714.92 Kips
111.99 ft	776.25 Kips	18.60 Kips	794.85 Kips

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-275.DVN
Project Name: HAM-562-0026-B-275-0-07 Project Date: 11/03/2014
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:	37.00 ft
	- Driving/Restrike	37.00 ft
	- Ultimate:	37.00 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	3.50 ft	50.00%	120.00 pcf	3500.00 psf	T-79 Steel
2	Cohesionless	5.00 ft	0.00%	130.00 pcf	33.0/33.0	Nordlund
3	Cohesive	7.50 ft	17.00%	125.00 pcf	4000.00 psf	T-79 Steel
4	Cohesive	5.00 ft	17.00%	120.00 pcf	3250.00 psf	T-79 Steel
5	Cohesive	12.50 ft	17.00%	115.00 pcf	1500.00 psf	T-79 Steel
6	Cohesive	8.00 ft	50.00%	115.00 pcf	1250.00 psf	T-79 Steel
7	Cohesive	9.50 ft	50.00%	120.00 pcf	2500.00 psf	T-79 Steel
8	Cohesive	5.50 ft	50.00%	115.00 pcf	1750.00 psf	T-79 Steel
9	Cohesive	7.00 ft	50.00%	125.00 pcf	3750.00 psf	T-79 Steel
10	Cohesive	5.00 ft	17.00%	120.00 pcf	2750.00 psf	T-79 Steel
11	Cohesive	4.50 ft	33.00%	120.00 pcf	2250.00 psf	T-79 Steel
12	Cohesive	2.80 ft	33.00%	120.00 pcf	2250.00 psf	T-79 Steel
13	Cohesive	7.70 ft	17.00%	115.00 pcf	1500.00 psf	T-79 Steel
14	Cohesive	5.00 ft	50.00%	110.00 pcf	500.00 psf	T-79 Steel
15	Cohesionless	13.00 ft	0.00%	120.00 pcf	29.0/29.0	Nordlund
16	Cohesionless	18.50 ft	0.00%	125.00 pcf	31.0/31.0	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	770.00 psf	0.03 Kips
3.49 ft	Cohesive	N/A	N/A	770.00 psf	9.85 Kips
3.51 ft	Cohesionless	420.65 psf	21.99	N/A	9.88 Kips
8.49 ft	Cohesionless	744.35 psf	21.99	N/A	16.33 Kips
8.51 ft	Cohesive	N/A	N/A	770.00 psf	16.37 Kips
15.99 ft	Cohesive	N/A	N/A	830.53 psf	39.14 Kips
16.01 ft	Cohesive	N/A	N/A	830.81 psf	39.21 Kips
20.99 ft	Cohesive	N/A	N/A	900.53 psf	55.65 Kips
21.01 ft	Cohesive	N/A	N/A	1122.73 psf	55.72 Kips
30.01 ft	Cohesive	N/A	N/A	1183.16 psf	94.76 Kips
33.49 ft	Cohesive	N/A	N/A	1206.53 psf	110.92 Kips
33.51 ft	Cohesive	N/A	N/A	1050.14 psf	111.00 Kips
41.49 ft	Cohesive	N/A	N/A	1094.03 psf	143.00 Kips
41.51 ft	Cohesive	N/A	N/A	1447.65 psf	143.10 Kips
50.51 ft	Cohesive	N/A	N/A	1525.00 psf	193.40 Kips
50.99 ft	Cohesive	N/A	N/A	1525.00 psf	196.09 Kips
51.01 ft	Cohesive	N/A	N/A	1430.00 psf	196.20 Kips
56.49 ft	Cohesive	N/A	N/A	1430.00 psf	224.92 Kips
56.51 ft	Cohesive	N/A	N/A	1260.00 psf	225.02 Kips
63.49 ft	Cohesive	N/A	N/A	1260.00 psf	257.25 Kips
63.51 ft	Cohesive	N/A	N/A	1430.00 psf	257.35 Kips
68.49 ft	Cohesive	N/A	N/A	1430.00 psf	283.45 Kips
68.51 ft	Cohesive	N/A	N/A	1570.00 psf	283.56 Kips
72.99 ft	Cohesive	N/A	N/A	1570.00 psf	309.34 Kips
73.01 ft	Cohesive	N/A	N/A	1570.00 psf	309.46 Kips
75.79 ft	Cohesive	N/A	N/A	1570.00 psf	325.45 Kips
75.81 ft	Cohesive	N/A	N/A	1295.00 psf	325.56 Kips
83.49 ft	Cohesive	N/A	N/A	1295.00 psf	362.01 Kips
83.51 ft	Cohesive	N/A	N/A	500.00 psf	362.08 Kips
88.49 ft	Cohesive	N/A	N/A	500.00 psf	371.20 Kips
88.51 ft	Cohesionless	7310.69 psf	19.33	N/A	371.30 Kips
97.51 ft	Cohesionless	7569.89 psf	19.33	N/A	449.86 Kips
101.49 ft	Cohesionless	7684.51 psf	19.33	N/A	486.31 Kips
101.51 ft	Cohesionless	8059.51 psf	20.66	N/A	486.52 Kips
110.51 ft	Cohesionless	8341.21 psf	20.66	N/A	592.17 Kips
119.51 ft	Cohesionless	8622.91 psf	20.66	N/A	704.96 Kips
119.99 ft	Cohesionless	8637.94 psf	20.66	N/A	711.18 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	33.67 Kips
3.49 ft	Cohesive	N/A	N/A	N/A	33.67 Kips
3.51 ft	Cohesionless	421.30 psf	47.20	53.45 Kips	13.72 Kips
8.49 ft	Cohesionless	1068.70 psf	47.20	53.45 Kips	34.81 Kips
8.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
15.99 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
16.01 ft	Cohesive	N/A	N/A	N/A	31.27 Kips
20.99 ft	Cohesive	N/A	N/A	N/A	31.27 Kips
21.01 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
30.01 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
41.49 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
41.51 ft	Cohesive	N/A	N/A	N/A	24.05 Kips
50.51 ft	Cohesive	N/A	N/A	N/A	24.05 Kips
50.99 ft	Cohesive	N/A	N/A	N/A	24.05 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
56.49 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
56.51 ft	Cohesive	N/A	N/A	N/A	36.08 Kips
63.49 ft	Cohesive	N/A	N/A	N/A	36.08 Kips
63.51 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
68.49 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
68.51 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
72.99 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
73.01 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
75.79 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
75.81 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
83.49 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
83.51 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
88.49 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
88.51 ft	Cohesionless	7310.98 psf	26.40	14.24 Kips	14.24 Kips
97.51 ft	Cohesionless	7829.38 psf	26.40	14.24 Kips	14.24 Kips
101.49 ft	Cohesionless	8058.62 psf	26.40	14.24 Kips	14.24 Kips
101.51 ft	Cohesionless	8059.83 psf	35.20	22.09 Kips	22.09 Kips
110.51 ft	Cohesionless	8623.23 psf	35.20	22.09 Kips	22.09 Kips
119.51 ft	Cohesionless	9186.63 psf	35.20	22.09 Kips	22.09 Kips
119.99 ft	Cohesionless	9216.67 psf	35.20	22.09 Kips	22.09 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.03 Kips	33.67 Kips	33.70 Kips
3.49 ft	9.85 Kips	33.67 Kips	43.52 Kips
3.51 ft	9.88 Kips	13.72 Kips	23.61 Kips
8.49 ft	16.33 Kips	34.81 Kips	51.14 Kips
8.51 ft	16.37 Kips	38.48 Kips	54.86 Kips
15.99 ft	39.14 Kips	38.48 Kips	77.63 Kips
16.01 ft	39.21 Kips	31.27 Kips	70.48 Kips
20.99 ft	55.65 Kips	31.27 Kips	86.92 Kips
21.01 ft	55.72 Kips	14.43 Kips	70.16 Kips
30.01 ft	94.76 Kips	14.43 Kips	109.19 Kips
33.49 ft	110.92 Kips	14.43 Kips	125.35 Kips
33.51 ft	111.00 Kips	12.03 Kips	123.03 Kips
41.49 ft	143.00 Kips	12.03 Kips	155.03 Kips
41.51 ft	143.10 Kips	24.05 Kips	167.15 Kips
50.51 ft	193.40 Kips	24.05 Kips	217.46 Kips
50.99 ft	196.09 Kips	24.05 Kips	220.14 Kips
51.01 ft	196.20 Kips	16.84 Kips	213.03 Kips
56.49 ft	224.92 Kips	16.84 Kips	241.75 Kips
56.51 ft	225.02 Kips	36.08 Kips	261.10 Kips
63.49 ft	257.25 Kips	36.08 Kips	293.33 Kips
63.51 ft	257.35 Kips	26.46 Kips	283.81 Kips
68.49 ft	283.45 Kips	26.46 Kips	309.91 Kips
68.51 ft	283.56 Kips	21.65 Kips	305.21 Kips
72.99 ft	309.34 Kips	21.65 Kips	330.99 Kips
73.01 ft	309.46 Kips	21.65 Kips	331.10 Kips
75.79 ft	325.45 Kips	21.65 Kips	347.10 Kips
75.81 ft	325.56 Kips	14.43 Kips	339.99 Kips
83.49 ft	362.01 Kips	14.43 Kips	376.44 Kips
83.51 ft	362.08 Kips	4.81 Kips	366.89 Kips
88.49 ft	371.20 Kips	4.81 Kips	376.01 Kips
88.51 ft	371.30 Kips	14.24 Kips	385.54 Kips
97.51 ft	449.86 Kips	14.24 Kips	464.10 Kips
101.49 ft	486.31 Kips	14.24 Kips	500.55 Kips
101.51 ft	486.52 Kips	22.09 Kips	508.61 Kips
110.51 ft	592.17 Kips	22.09 Kips	614.26 Kips
119.51 ft	704.96 Kips	22.09 Kips	727.05 Kips
119.99 ft	711.18 Kips	22.09 Kips	733.27 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	770.00 psf	0.01 Kips
3.49 ft	Cohesive	N/A	N/A	770.00 psf	4.92 Kips
3.51 ft	Cohesionless	420.65 psf	21.99	N/A	4.96 Kips
8.49 ft	Cohesionless	744.35 psf	21.99	N/A	11.40 Kips
8.51 ft	Cohesive	N/A	N/A	770.00 psf	11.44 Kips
15.99 ft	Cohesive	N/A	N/A	830.53 psf	30.34 Kips
16.01 ft	Cohesive	N/A	N/A	830.81 psf	30.39 Kips
20.99 ft	Cohesive	N/A	N/A	900.53 psf	44.04 Kips
21.01 ft	Cohesive	N/A	N/A	1122.73 psf	44.10 Kips
30.01 ft	Cohesive	N/A	N/A	1183.16 psf	76.50 Kips
33.49 ft	Cohesive	N/A	N/A	1206.53 psf	89.91 Kips
33.51 ft	Cohesive	N/A	N/A	1050.14 psf	89.95 Kips
41.49 ft	Cohesive	N/A	N/A	1094.03 psf	105.95 Kips
41.51 ft	Cohesive	N/A	N/A	1447.65 psf	106.00 Kips
50.51 ft	Cohesive	N/A	N/A	1525.00 psf	131.16 Kips
50.99 ft	Cohesive	N/A	N/A	1525.00 psf	132.50 Kips
51.01 ft	Cohesive	N/A	N/A	1430.00 psf	132.55 Kips
56.49 ft	Cohesive	N/A	N/A	1430.00 psf	146.91 Kips
56.51 ft	Cohesive	N/A	N/A	1260.00 psf	146.96 Kips
63.49 ft	Cohesive	N/A	N/A	1260.00 psf	163.08 Kips
63.51 ft	Cohesive	N/A	N/A	1430.00 psf	163.16 Kips
68.49 ft	Cohesive	N/A	N/A	1430.00 psf	184.82 Kips
68.51 ft	Cohesive	N/A	N/A	1570.00 psf	184.90 Kips
72.99 ft	Cohesive	N/A	N/A	1570.00 psf	202.17 Kips
73.01 ft	Cohesive	N/A	N/A	1570.00 psf	202.25 Kips
75.79 ft	Cohesive	N/A	N/A	1570.00 psf	212.97 Kips
75.81 ft	Cohesive	N/A	N/A	1295.00 psf	213.05 Kips
83.49 ft	Cohesive	N/A	N/A	1295.00 psf	243.31 Kips
83.51 ft	Cohesive	N/A	N/A	500.00 psf	243.34 Kips
88.49 ft	Cohesive	N/A	N/A	500.00 psf	247.90 Kips
88.51 ft	Cohesionless	7310.69 psf	19.33	N/A	248.01 Kips
97.51 ft	Cohesionless	7569.89 psf	19.33	N/A	326.56 Kips
101.49 ft	Cohesionless	7684.51 psf	19.33	N/A	363.01 Kips
101.51 ft	Cohesionless	8059.51 psf	20.66	N/A	363.22 Kips
110.51 ft	Cohesionless	8341.21 psf	20.66	N/A	468.87 Kips
119.51 ft	Cohesionless	8622.91 psf	20.66	N/A	581.66 Kips
119.99 ft	Cohesionless	8637.94 psf	20.66	N/A	587.88 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	33.67 Kips
3.49 ft	Cohesive	N/A	N/A	N/A	33.67 Kips
3.51 ft	Cohesionless	421.30 psf	47.20	53.45 Kips	13.72 Kips
8.49 ft	Cohesionless	1068.70 psf	47.20	53.45 Kips	34.81 Kips
8.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
15.99 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
16.01 ft	Cohesive	N/A	N/A	N/A	31.27 Kips
20.99 ft	Cohesive	N/A	N/A	N/A	31.27 Kips
21.01 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
30.01 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
41.49 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
41.51 ft	Cohesive	N/A	N/A	N/A	24.05 Kips
50.51 ft	Cohesive	N/A	N/A	N/A	24.05 Kips
50.99 ft	Cohesive	N/A	N/A	N/A	24.05 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
56.49 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
56.51 ft	Cohesive	N/A	N/A	N/A	36.08 Kips
63.49 ft	Cohesive	N/A	N/A	N/A	36.08 Kips
63.51 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
68.49 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
68.51 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
72.99 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
73.01 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
75.79 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
75.81 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
83.49 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
83.51 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
88.49 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
88.51 ft	Cohesionless	7310.98 psf	26.40	14.24 Kips	14.24 Kips
97.51 ft	Cohesionless	7829.38 psf	26.40	14.24 Kips	14.24 Kips
101.49 ft	Cohesionless	8058.62 psf	26.40	14.24 Kips	14.24 Kips
101.51 ft	Cohesionless	8059.83 psf	35.20	22.09 Kips	22.09 Kips
110.51 ft	Cohesionless	8623.23 psf	35.20	22.09 Kips	22.09 Kips
119.51 ft	Cohesionless	9186.63 psf	35.20	22.09 Kips	22.09 Kips
119.99 ft	Cohesionless	9216.67 psf	35.20	22.09 Kips	22.09 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.01 Kips	33.67 Kips	33.69 Kips
3.49 ft	4.92 Kips	33.67 Kips	38.60 Kips
3.51 ft	4.96 Kips	13.72 Kips	18.68 Kips
8.49 ft	11.40 Kips	34.81 Kips	46.21 Kips
8.51 ft	11.44 Kips	38.48 Kips	49.92 Kips
15.99 ft	30.34 Kips	38.48 Kips	68.82 Kips
16.01 ft	30.39 Kips	31.27 Kips	61.66 Kips
20.99 ft	44.04 Kips	31.27 Kips	75.31 Kips
21.01 ft	44.10 Kips	14.43 Kips	58.53 Kips
30.01 ft	76.50 Kips	14.43 Kips	90.93 Kips
33.49 ft	89.91 Kips	14.43 Kips	104.34 Kips
33.51 ft	89.95 Kips	12.03 Kips	101.98 Kips
41.49 ft	105.95 Kips	12.03 Kips	117.98 Kips
41.51 ft	106.00 Kips	24.05 Kips	130.05 Kips
50.51 ft	131.16 Kips	24.05 Kips	155.21 Kips
50.99 ft	132.50 Kips	24.05 Kips	156.55 Kips
51.01 ft	132.55 Kips	16.84 Kips	149.39 Kips
56.49 ft	146.91 Kips	16.84 Kips	163.75 Kips
56.51 ft	146.96 Kips	36.08 Kips	183.04 Kips
63.49 ft	163.08 Kips	36.08 Kips	199.16 Kips
63.51 ft	163.16 Kips	26.46 Kips	189.62 Kips
68.49 ft	184.82 Kips	26.46 Kips	211.28 Kips
68.51 ft	184.90 Kips	21.65 Kips	206.55 Kips
72.99 ft	202.17 Kips	21.65 Kips	223.82 Kips
73.01 ft	202.25 Kips	21.65 Kips	223.89 Kips
75.79 ft	212.97 Kips	21.65 Kips	234.61 Kips
75.81 ft	213.05 Kips	14.43 Kips	227.48 Kips
83.49 ft	243.31 Kips	14.43 Kips	257.74 Kips
83.51 ft	243.34 Kips	4.81 Kips	248.15 Kips
88.49 ft	247.90 Kips	4.81 Kips	252.71 Kips
88.51 ft	248.01 Kips	14.24 Kips	262.25 Kips
97.51 ft	326.56 Kips	14.24 Kips	340.80 Kips
101.49 ft	363.01 Kips	14.24 Kips	377.25 Kips
101.51 ft	363.22 Kips	22.09 Kips	385.31 Kips
110.51 ft	468.87 Kips	22.09 Kips	490.96 Kips
119.51 ft	581.66 Kips	22.09 Kips	603.75 Kips
119.99 ft	587.88 Kips	22.09 Kips	609.97 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	770.00 psf	0.03 Kips
3.49 ft	Cohesive	N/A	N/A	770.00 psf	9.85 Kips
3.51 ft	Cohesionless	420.65 psf	21.99	N/A	9.88 Kips
8.49 ft	Cohesionless	744.35 psf	21.99	N/A	16.33 Kips
8.51 ft	Cohesive	N/A	N/A	770.00 psf	16.37 Kips
15.99 ft	Cohesive	N/A	N/A	830.53 psf	39.14 Kips
16.01 ft	Cohesive	N/A	N/A	830.81 psf	39.21 Kips
20.99 ft	Cohesive	N/A	N/A	900.53 psf	55.65 Kips
21.01 ft	Cohesive	N/A	N/A	1122.73 psf	55.72 Kips
30.01 ft	Cohesive	N/A	N/A	1183.16 psf	94.76 Kips
33.49 ft	Cohesive	N/A	N/A	1206.53 psf	110.92 Kips
33.51 ft	Cohesive	N/A	N/A	1050.14 psf	111.00 Kips
41.49 ft	Cohesive	N/A	N/A	1094.03 psf	143.00 Kips
41.51 ft	Cohesive	N/A	N/A	1447.65 psf	143.10 Kips
50.51 ft	Cohesive	N/A	N/A	1525.00 psf	193.40 Kips
50.99 ft	Cohesive	N/A	N/A	1525.00 psf	196.09 Kips
51.01 ft	Cohesive	N/A	N/A	1430.00 psf	196.20 Kips
56.49 ft	Cohesive	N/A	N/A	1430.00 psf	224.92 Kips
56.51 ft	Cohesive	N/A	N/A	1260.00 psf	225.02 Kips
63.49 ft	Cohesive	N/A	N/A	1260.00 psf	257.25 Kips
63.51 ft	Cohesive	N/A	N/A	1430.00 psf	257.35 Kips
68.49 ft	Cohesive	N/A	N/A	1430.00 psf	283.45 Kips
68.51 ft	Cohesive	N/A	N/A	1570.00 psf	283.56 Kips
72.99 ft	Cohesive	N/A	N/A	1570.00 psf	309.34 Kips
73.01 ft	Cohesive	N/A	N/A	1570.00 psf	309.46 Kips
75.79 ft	Cohesive	N/A	N/A	1570.00 psf	325.45 Kips
75.81 ft	Cohesive	N/A	N/A	1295.00 psf	325.56 Kips
83.49 ft	Cohesive	N/A	N/A	1295.00 psf	362.01 Kips
83.51 ft	Cohesive	N/A	N/A	500.00 psf	362.08 Kips
88.49 ft	Cohesive	N/A	N/A	500.00 psf	371.20 Kips
88.51 ft	Cohesionless	7310.69 psf	19.33	N/A	371.30 Kips
97.51 ft	Cohesionless	7569.89 psf	19.33	N/A	449.86 Kips
101.49 ft	Cohesionless	7684.51 psf	19.33	N/A	486.31 Kips
101.51 ft	Cohesionless	8059.51 psf	20.66	N/A	486.52 Kips
110.51 ft	Cohesionless	8341.21 psf	20.66	N/A	592.17 Kips
119.51 ft	Cohesionless	8622.91 psf	20.66	N/A	704.96 Kips
119.99 ft	Cohesionless	8637.94 psf	20.66	N/A	711.18 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	33.67 Kips
3.49 ft	Cohesive	N/A	N/A	N/A	33.67 Kips
3.51 ft	Cohesionless	421.30 psf	47.20	53.45 Kips	13.72 Kips
8.49 ft	Cohesionless	1068.70 psf	47.20	53.45 Kips	34.81 Kips
8.51 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
15.99 ft	Cohesive	N/A	N/A	N/A	38.48 Kips
16.01 ft	Cohesive	N/A	N/A	N/A	31.27 Kips
20.99 ft	Cohesive	N/A	N/A	N/A	31.27 Kips
21.01 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
30.01 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
41.49 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
41.51 ft	Cohesive	N/A	N/A	N/A	24.05 Kips
50.51 ft	Cohesive	N/A	N/A	N/A	24.05 Kips
50.99 ft	Cohesive	N/A	N/A	N/A	24.05 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
56.49 ft	Cohesive	N/A	N/A	N/A	16.84 Kips
56.51 ft	Cohesive	N/A	N/A	N/A	36.08 Kips
63.49 ft	Cohesive	N/A	N/A	N/A	36.08 Kips
63.51 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
68.49 ft	Cohesive	N/A	N/A	N/A	26.46 Kips
68.51 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
72.99 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
73.01 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
75.79 ft	Cohesive	N/A	N/A	N/A	21.65 Kips
75.81 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
83.49 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
83.51 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
88.49 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
88.51 ft	Cohesionless	7310.98 psf	26.40	14.24 Kips	14.24 Kips
97.51 ft	Cohesionless	7829.38 psf	26.40	14.24 Kips	14.24 Kips
101.49 ft	Cohesionless	8058.62 psf	26.40	14.24 Kips	14.24 Kips
101.51 ft	Cohesionless	8059.83 psf	35.20	22.09 Kips	22.09 Kips
110.51 ft	Cohesionless	8623.23 psf	35.20	22.09 Kips	22.09 Kips
119.51 ft	Cohesionless	9186.63 psf	35.20	22.09 Kips	22.09 Kips
119.99 ft	Cohesionless	9216.67 psf	35.20	22.09 Kips	22.09 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.03 Kips	33.67 Kips	33.70 Kips
3.49 ft	9.85 Kips	33.67 Kips	43.52 Kips
3.51 ft	9.88 Kips	13.72 Kips	23.61 Kips
8.49 ft	16.33 Kips	34.81 Kips	51.14 Kips
8.51 ft	16.37 Kips	38.48 Kips	54.86 Kips
15.99 ft	39.14 Kips	38.48 Kips	77.63 Kips
16.01 ft	39.21 Kips	31.27 Kips	70.48 Kips
20.99 ft	55.65 Kips	31.27 Kips	86.92 Kips
21.01 ft	55.72 Kips	14.43 Kips	70.16 Kips
30.01 ft	94.76 Kips	14.43 Kips	109.19 Kips
33.49 ft	110.92 Kips	14.43 Kips	125.35 Kips
33.51 ft	111.00 Kips	12.03 Kips	123.03 Kips
41.49 ft	143.00 Kips	12.03 Kips	155.03 Kips
41.51 ft	143.10 Kips	24.05 Kips	167.15 Kips
50.51 ft	193.40 Kips	24.05 Kips	217.46 Kips
50.99 ft	196.09 Kips	24.05 Kips	220.14 Kips
51.01 ft	196.20 Kips	16.84 Kips	213.03 Kips
56.49 ft	224.92 Kips	16.84 Kips	241.75 Kips
56.51 ft	225.02 Kips	36.08 Kips	261.10 Kips
63.49 ft	257.25 Kips	36.08 Kips	293.33 Kips
63.51 ft	257.35 Kips	26.46 Kips	283.81 Kips
68.49 ft	283.45 Kips	26.46 Kips	309.91 Kips
68.51 ft	283.56 Kips	21.65 Kips	305.21 Kips
72.99 ft	309.34 Kips	21.65 Kips	330.99 Kips
73.01 ft	309.46 Kips	21.65 Kips	331.10 Kips
75.79 ft	325.45 Kips	21.65 Kips	347.10 Kips
75.81 ft	325.56 Kips	14.43 Kips	339.99 Kips
83.49 ft	362.01 Kips	14.43 Kips	376.44 Kips
83.51 ft	362.08 Kips	4.81 Kips	366.89 Kips
88.49 ft	371.20 Kips	4.81 Kips	376.01 Kips
88.51 ft	371.30 Kips	14.24 Kips	385.54 Kips
97.51 ft	449.86 Kips	14.24 Kips	464.10 Kips
101.49 ft	486.31 Kips	14.24 Kips	500.55 Kips
101.51 ft	486.52 Kips	22.09 Kips	508.61 Kips
110.51 ft	592.17 Kips	22.09 Kips	614.26 Kips
119.51 ft	704.96 Kips	22.09 Kips	727.05 Kips
119.99 ft	711.18 Kips	22.09 Kips	733.27 Kips

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\LEGACY\DESKTOP\B-276.DVN
Project Name: HAM-562-0026-B-276-0-07 Project Date: 11/03/2014
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:	25.50 ft
	- Driving/Restrike	25.50 ft
	- Ultimate:	25.50 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	Cohesive	12.50 ft	50.00%	115.00 pcf	1000.00 psf	T-79 Steel
2	Cohesive	5.00 ft	17.00%	115.00 pcf	1250.00 psf	T-79 Steel
3	Cohesive	7.00 ft	17.00%	110.00 pcf	500.00 psf	T-79 Steel
4	Cohesive	6.00 ft	33.00%	115.00 pcf	1000.00 psf	T-79 Steel
5	Cohesive	8.00 ft	50.00%	110.00 pcf	500.00 psf	T-79 Steel
6	Cohesive	16.50 ft	50.00%	115.00 pcf	1500.00 psf	T-79 Steel
7	Cohesionless	3.00 ft	0.00%	120.00 pcf	27.0/27.0	Nordlund
8	Cohesive	12.00 ft	17.00%	115.00 pcf	750.00 psf	T-79 Steel
9	Cohesionless	16.00 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
10	Cohesionless	9.00 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
11	Cohesionless	5.00 ft	0.00%	125.00 pcf	30.0/30.0	Nordlund
12	Cohesionless	15.50 ft	0.00%	130.00 pcf	31.0/31.0	Nordlund
13	Cohesionless	14.50 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	Cohesive	N/A	N/A	800.00 psf	0.03 Kips
9.01 ft	Cohesive	N/A	N/A	800.00 psf	26.42 Kips
12.49 ft	Cohesive	N/A	N/A	803.53 psf	36.78 Kips
12.51 ft	Cohesive	N/A	N/A	934.64 psf	36.85 Kips
17.49 ft	Cohesive	N/A	N/A	962.03 psf	54.41 Kips
17.51 ft	Cohesive	N/A	N/A	425.03 psf	54.46 Kips
24.49 ft	Cohesive	N/A	N/A	442.97 psf	65.80 Kips
24.51 ft	Cohesive	N/A	N/A	855.04 psf	65.84 Kips
30.49 ft	Cohesive	N/A	N/A	880.67 psf	85.15 Kips
30.51 ft	Cohesive	N/A	N/A	458.45 psf	85.20 Kips
38.49 ft	Cohesive	N/A	N/A	478.97 psf	99.21 Kips
38.51 ft	Cohesive	N/A	N/A	1240.23 psf	99.27 Kips
47.51 ft	Cohesive	N/A	N/A	1295.00 psf	141.99 Kips
54.99 ft	Cohesive	N/A	N/A	1295.00 psf	177.49 Kips
55.01 ft	Cohesionless	4409.49 psf	18.00	N/A	177.58 Kips
57.99 ft	Cohesionless	4495.31 psf	18.00	N/A	190.58 Kips
58.01 ft	Cohesive	N/A	N/A	750.00 psf	190.65 Kips
67.01 ft	Cohesive	N/A	N/A	750.00 psf	215.39 Kips
69.99 ft	Cohesive	N/A	N/A	750.00 psf	223.58 Kips
70.01 ft	Cohesionless	5213.49 psf	18.66	N/A	223.66 Kips
79.01 ft	Cohesionless	5472.69 psf	18.66	N/A	275.87 Kips
85.99 ft	Cohesionless	5673.71 psf	18.66	N/A	319.77 Kips
86.01 ft	Cohesionless	6135.09 psf	18.66	N/A	319.90 Kips
94.99 ft	Cohesionless	6393.71 psf	18.66	N/A	380.76 Kips
95.01 ft	Cohesionless	6653.51 psf	19.99	N/A	380.91 Kips
99.99 ft	Cohesionless	6809.39 psf	19.99	N/A	423.26 Kips
100.01 ft	Cohesionless	6966.54 psf	20.66	N/A	423.44 Kips
109.01 ft	Cohesionless	7270.74 psf	20.66	N/A	515.54 Kips
115.49 ft	Cohesionless	7489.76 psf	20.66	N/A	586.62 Kips
115.51 ft	Cohesionless	8014.34 psf	21.33	N/A	586.86 Kips
124.51 ft	Cohesionless	8318.54 psf	21.33	N/A	704.39 Kips
129.99 ft	Cohesionless	8503.76 psf	21.33	N/A	780.17 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	9.62 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
12.49 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
12.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
17.51 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
24.49 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
24.51 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
30.49 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
30.51 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
38.49 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
38.51 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
47.51 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
54.99 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
55.01 ft	Cohesionless	4409.78 psf	19.80	14.24 Kips	14.24 Kips
57.99 ft	Cohesionless	4581.42 psf	19.80	14.24 Kips	14.24 Kips
58.01 ft	Cohesive	N/A	N/A	N/A	7.22 Kips
67.01 ft	Cohesive	N/A	N/A	N/A	7.22 Kips
69.99 ft	Cohesive	N/A	N/A	N/A	7.22 Kips
70.01 ft	Cohesionless	5213.78 psf	22.80	14.24 Kips	14.24 Kips
79.01 ft	Cohesionless	5732.18 psf	22.80	14.24 Kips	14.24 Kips
85.99 ft	Cohesionless	6134.22 psf	22.80	14.24 Kips	14.24 Kips
86.01 ft	Cohesionless	6135.38 psf	22.80	14.24 Kips	14.24 Kips
94.99 ft	Cohesionless	6652.62 psf	22.80	14.24 Kips	14.24 Kips
95.01 ft	Cohesionless	6653.83 psf	30.00	14.24 Kips	14.24 Kips
99.99 ft	Cohesionless	6965.57 psf	30.00	14.24 Kips	14.24 Kips
100.01 ft	Cohesionless	6966.88 psf	35.20	22.09 Kips	22.09 Kips
109.01 ft	Cohesionless	7575.28 psf	35.20	22.09 Kips	22.09 Kips
115.49 ft	Cohesionless	8013.32 psf	35.20	22.09 Kips	22.09 Kips
115.51 ft	Cohesionless	8014.68 psf	40.40	35.28 Kips	35.28 Kips
124.51 ft	Cohesionless	8623.08 psf	40.40	35.28 Kips	35.28 Kips
129.99 ft	Cohesionless	8993.52 psf	40.40	35.28 Kips	35.28 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.03 Kips	9.62 Kips	9.65 Kips
9.01 ft	26.42 Kips	9.62 Kips	36.04 Kips
12.49 ft	36.78 Kips	9.62 Kips	46.41 Kips
12.51 ft	36.85 Kips	12.03 Kips	48.88 Kips
17.49 ft	54.41 Kips	12.03 Kips	66.44 Kips
17.51 ft	54.46 Kips	4.81 Kips	59.27 Kips
24.49 ft	65.80 Kips	4.81 Kips	70.61 Kips
24.51 ft	65.84 Kips	9.62 Kips	75.46 Kips
30.49 ft	85.15 Kips	9.62 Kips	94.77 Kips
30.51 ft	85.20 Kips	4.81 Kips	90.01 Kips
38.49 ft	99.21 Kips	4.81 Kips	104.02 Kips
38.51 ft	99.27 Kips	14.43 Kips	113.70 Kips
47.51 ft	141.99 Kips	14.43 Kips	156.42 Kips
54.99 ft	177.49 Kips	14.43 Kips	191.93 Kips
55.01 ft	177.58 Kips	14.24 Kips	191.82 Kips
57.99 ft	190.58 Kips	14.24 Kips	204.81 Kips
58.01 ft	190.65 Kips	7.22 Kips	197.86 Kips
67.01 ft	215.39 Kips	7.22 Kips	222.60 Kips
69.99 ft	223.58 Kips	7.22 Kips	230.80 Kips
70.01 ft	223.66 Kips	14.24 Kips	237.90 Kips
79.01 ft	275.87 Kips	14.24 Kips	290.11 Kips
85.99 ft	319.77 Kips	14.24 Kips	334.01 Kips
86.01 ft	319.90 Kips	14.24 Kips	334.14 Kips
94.99 ft	380.76 Kips	14.24 Kips	395.00 Kips
95.01 ft	380.91 Kips	14.24 Kips	395.15 Kips
99.99 ft	423.26 Kips	14.24 Kips	437.50 Kips
100.01 ft	423.44 Kips	22.09 Kips	445.53 Kips
109.01 ft	515.54 Kips	22.09 Kips	537.63 Kips
115.49 ft	586.62 Kips	22.09 Kips	608.71 Kips
115.51 ft	586.86 Kips	35.28 Kips	622.13 Kips
124.51 ft	704.39 Kips	35.28 Kips	739.67 Kips
129.99 ft	780.17 Kips	35.28 Kips	815.45 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	800.00 psf	0.01 Kips
9.01 ft	Cohesive	N/A	N/A	800.00 psf	13.21 Kips
12.49 ft	Cohesive	N/A	N/A	803.53 psf	18.39 Kips
12.51 ft	Cohesive	N/A	N/A	934.64 psf	18.45 Kips
17.49 ft	Cohesive	N/A	N/A	962.03 psf	33.02 Kips
17.51 ft	Cohesive	N/A	N/A	425.03 psf	33.06 Kips
24.49 ft	Cohesive	N/A	N/A	442.97 psf	42.47 Kips
24.51 ft	Cohesive	N/A	N/A	855.04 psf	42.50 Kips
30.49 ft	Cohesive	N/A	N/A	880.67 psf	55.44 Kips
30.51 ft	Cohesive	N/A	N/A	458.45 psf	55.46 Kips
38.49 ft	Cohesive	N/A	N/A	478.97 psf	62.47 Kips
38.51 ft	Cohesive	N/A	N/A	1240.23 psf	62.50 Kips
47.51 ft	Cohesive	N/A	N/A	1295.00 psf	83.86 Kips
54.99 ft	Cohesive	N/A	N/A	1295.00 psf	101.61 Kips
55.01 ft	Cohesionless	4409.49 psf	18.00	N/A	101.70 Kips
57.99 ft	Cohesionless	4495.31 psf	18.00	N/A	114.69 Kips
58.01 ft	Cohesive	N/A	N/A	750.00 psf	114.75 Kips
67.01 ft	Cohesive	N/A	N/A	750.00 psf	135.29 Kips
69.99 ft	Cohesive	N/A	N/A	750.00 psf	142.09 Kips
70.01 ft	Cohesionless	5213.49 psf	18.66	N/A	142.17 Kips
79.01 ft	Cohesionless	5472.69 psf	18.66	N/A	194.38 Kips
85.99 ft	Cohesionless	5673.71 psf	18.66	N/A	238.27 Kips
86.01 ft	Cohesionless	6135.09 psf	18.66	N/A	238.40 Kips
94.99 ft	Cohesionless	6393.71 psf	18.66	N/A	299.26 Kips
95.01 ft	Cohesionless	6653.51 psf	19.99	N/A	299.42 Kips
99.99 ft	Cohesionless	6809.39 psf	19.99	N/A	341.76 Kips
100.01 ft	Cohesionless	6966.54 psf	20.66	N/A	341.95 Kips
109.01 ft	Cohesionless	7270.74 psf	20.66	N/A	434.04 Kips
115.49 ft	Cohesionless	7489.76 psf	20.66	N/A	505.12 Kips
115.51 ft	Cohesionless	8014.34 psf	21.33	N/A	505.36 Kips
124.51 ft	Cohesionless	8318.54 psf	21.33	N/A	622.90 Kips
129.99 ft	Cohesionless	8503.76 psf	21.33	N/A	698.68 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	9.62 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
12.49 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
12.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
17.51 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
24.49 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
24.51 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
30.49 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
30.51 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
38.49 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
38.51 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
47.51 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
54.99 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
55.01 ft	Cohesionless	4409.78 psf	19.80	14.24 Kips	14.24 Kips
57.99 ft	Cohesionless	4581.42 psf	19.80	14.24 Kips	14.24 Kips
58.01 ft	Cohesive	N/A	N/A	N/A	7.22 Kips
67.01 ft	Cohesive	N/A	N/A	N/A	7.22 Kips
69.99 ft	Cohesive	N/A	N/A	N/A	7.22 Kips
70.01 ft	Cohesionless	5213.78 psf	22.80	14.24 Kips	14.24 Kips
79.01 ft	Cohesionless	5732.18 psf	22.80	14.24 Kips	14.24 Kips
85.99 ft	Cohesionless	6134.22 psf	22.80	14.24 Kips	14.24 Kips
86.01 ft	Cohesionless	6135.38 psf	22.80	14.24 Kips	14.24 Kips
94.99 ft	Cohesionless	6652.62 psf	22.80	14.24 Kips	14.24 Kips
95.01 ft	Cohesionless	6653.83 psf	30.00	14.24 Kips	14.24 Kips
99.99 ft	Cohesionless	6965.57 psf	30.00	14.24 Kips	14.24 Kips
100.01 ft	Cohesionless	6966.88 psf	35.20	22.09 Kips	22.09 Kips
109.01 ft	Cohesionless	7575.28 psf	35.20	22.09 Kips	22.09 Kips
115.49 ft	Cohesionless	8013.32 psf	35.20	22.09 Kips	22.09 Kips
115.51 ft	Cohesionless	8014.68 psf	40.40	35.28 Kips	35.28 Kips
124.51 ft	Cohesionless	8623.08 psf	40.40	35.28 Kips	35.28 Kips
129.99 ft	Cohesionless	8993.52 psf	40.40	35.28 Kips	35.28 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.01 Kips	9.62 Kips	9.64 Kips
9.01 ft	13.21 Kips	9.62 Kips	22.83 Kips
12.49 ft	18.39 Kips	9.62 Kips	28.01 Kips
12.51 ft	18.45 Kips	12.03 Kips	30.47 Kips
17.49 ft	33.02 Kips	12.03 Kips	45.05 Kips
17.51 ft	33.06 Kips	4.81 Kips	37.88 Kips
24.49 ft	42.47 Kips	4.81 Kips	47.28 Kips
24.51 ft	42.50 Kips	9.62 Kips	52.12 Kips
30.49 ft	55.44 Kips	9.62 Kips	65.06 Kips
30.51 ft	55.46 Kips	4.81 Kips	60.27 Kips
38.49 ft	62.47 Kips	4.81 Kips	67.28 Kips
38.51 ft	62.50 Kips	14.43 Kips	76.93 Kips
47.51 ft	83.86 Kips	14.43 Kips	98.29 Kips
54.99 ft	101.61 Kips	14.43 Kips	116.04 Kips
55.01 ft	101.70 Kips	14.24 Kips	115.94 Kips
57.99 ft	114.69 Kips	14.24 Kips	128.93 Kips
58.01 ft	114.75 Kips	7.22 Kips	121.97 Kips
67.01 ft	135.29 Kips	7.22 Kips	142.50 Kips
69.99 ft	142.09 Kips	7.22 Kips	149.30 Kips
70.01 ft	142.17 Kips	14.24 Kips	156.41 Kips
79.01 ft	194.38 Kips	14.24 Kips	208.62 Kips
85.99 ft	238.27 Kips	14.24 Kips	252.51 Kips
86.01 ft	238.40 Kips	14.24 Kips	252.64 Kips
94.99 ft	299.26 Kips	14.24 Kips	313.50 Kips
95.01 ft	299.42 Kips	14.24 Kips	313.66 Kips
99.99 ft	341.76 Kips	14.24 Kips	356.00 Kips
100.01 ft	341.95 Kips	22.09 Kips	364.04 Kips
109.01 ft	434.04 Kips	22.09 Kips	456.13 Kips
115.49 ft	505.12 Kips	22.09 Kips	527.21 Kips
115.51 ft	505.36 Kips	35.28 Kips	540.64 Kips
124.51 ft	622.90 Kips	35.28 Kips	658.18 Kips
129.99 ft	698.68 Kips	35.28 Kips	733.95 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	800.00 psf	0.03 Kips
9.01 ft	Cohesive	N/A	N/A	800.00 psf	26.42 Kips
12.49 ft	Cohesive	N/A	N/A	803.53 psf	36.78 Kips
12.51 ft	Cohesive	N/A	N/A	934.64 psf	36.85 Kips
17.49 ft	Cohesive	N/A	N/A	962.03 psf	54.41 Kips
17.51 ft	Cohesive	N/A	N/A	425.03 psf	54.46 Kips
24.49 ft	Cohesive	N/A	N/A	442.97 psf	65.80 Kips
24.51 ft	Cohesive	N/A	N/A	855.04 psf	65.84 Kips
30.49 ft	Cohesive	N/A	N/A	880.67 psf	85.15 Kips
30.51 ft	Cohesive	N/A	N/A	458.45 psf	85.20 Kips
38.49 ft	Cohesive	N/A	N/A	478.97 psf	99.21 Kips
38.51 ft	Cohesive	N/A	N/A	1240.23 psf	99.27 Kips
47.51 ft	Cohesive	N/A	N/A	1295.00 psf	141.99 Kips
54.99 ft	Cohesive	N/A	N/A	1295.00 psf	177.49 Kips
55.01 ft	Cohesionless	4409.49 psf	18.00	N/A	177.58 Kips
57.99 ft	Cohesionless	4495.31 psf	18.00	N/A	190.58 Kips
58.01 ft	Cohesive	N/A	N/A	750.00 psf	190.65 Kips
67.01 ft	Cohesive	N/A	N/A	750.00 psf	215.39 Kips
69.99 ft	Cohesive	N/A	N/A	750.00 psf	223.58 Kips
70.01 ft	Cohesionless	5213.49 psf	18.66	N/A	223.66 Kips
79.01 ft	Cohesionless	5472.69 psf	18.66	N/A	275.87 Kips
85.99 ft	Cohesionless	5673.71 psf	18.66	N/A	319.77 Kips
86.01 ft	Cohesionless	6135.09 psf	18.66	N/A	319.90 Kips
94.99 ft	Cohesionless	6393.71 psf	18.66	N/A	380.76 Kips
95.01 ft	Cohesionless	6653.51 psf	19.99	N/A	380.91 Kips
99.99 ft	Cohesionless	6809.39 psf	19.99	N/A	423.26 Kips
100.01 ft	Cohesionless	6966.54 psf	20.66	N/A	423.44 Kips
109.01 ft	Cohesionless	7270.74 psf	20.66	N/A	515.54 Kips
115.49 ft	Cohesionless	7489.76 psf	20.66	N/A	586.62 Kips
115.51 ft	Cohesionless	8014.34 psf	21.33	N/A	586.86 Kips
124.51 ft	Cohesionless	8318.54 psf	21.33	N/A	704.39 Kips
129.99 ft	Cohesionless	8503.76 psf	21.33	N/A	780.17 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	9.62 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
12.49 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
12.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
17.51 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
24.49 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
24.51 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
30.49 ft	Cohesive	N/A	N/A	N/A	9.62 Kips
30.51 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
38.49 ft	Cohesive	N/A	N/A	N/A	4.81 Kips
38.51 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
47.51 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
54.99 ft	Cohesive	N/A	N/A	N/A	14.43 Kips
55.01 ft	Cohesionless	4409.78 psf	19.80	14.24 Kips	14.24 Kips
57.99 ft	Cohesionless	4581.42 psf	19.80	14.24 Kips	14.24 Kips
58.01 ft	Cohesive	N/A	N/A	N/A	7.22 Kips
67.01 ft	Cohesive	N/A	N/A	N/A	7.22 Kips
69.99 ft	Cohesive	N/A	N/A	N/A	7.22 Kips
70.01 ft	Cohesionless	5213.78 psf	22.80	14.24 Kips	14.24 Kips
79.01 ft	Cohesionless	5732.18 psf	22.80	14.24 Kips	14.24 Kips
85.99 ft	Cohesionless	6134.22 psf	22.80	14.24 Kips	14.24 Kips
86.01 ft	Cohesionless	6135.38 psf	22.80	14.24 Kips	14.24 Kips
94.99 ft	Cohesionless	6652.62 psf	22.80	14.24 Kips	14.24 Kips
95.01 ft	Cohesionless	6653.83 psf	30.00	14.24 Kips	14.24 Kips
99.99 ft	Cohesionless	6965.57 psf	30.00	14.24 Kips	14.24 Kips
100.01 ft	Cohesionless	6966.88 psf	35.20	22.09 Kips	22.09 Kips
109.01 ft	Cohesionless	7575.28 psf	35.20	22.09 Kips	22.09 Kips
115.49 ft	Cohesionless	8013.32 psf	35.20	22.09 Kips	22.09 Kips
115.51 ft	Cohesionless	8014.68 psf	40.40	35.28 Kips	35.28 Kips
124.51 ft	Cohesionless	8623.08 psf	40.40	35.28 Kips	35.28 Kips
129.99 ft	Cohesionless	8993.52 psf	40.40	35.28 Kips	35.28 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.03 Kips	9.62 Kips	9.65 Kips
9.01 ft	26.42 Kips	9.62 Kips	36.04 Kips
12.49 ft	36.78 Kips	9.62 Kips	46.41 Kips
12.51 ft	36.85 Kips	12.03 Kips	48.88 Kips
17.49 ft	54.41 Kips	12.03 Kips	66.44 Kips
17.51 ft	54.46 Kips	4.81 Kips	59.27 Kips
24.49 ft	65.80 Kips	4.81 Kips	70.61 Kips
24.51 ft	65.84 Kips	9.62 Kips	75.46 Kips
30.49 ft	85.15 Kips	9.62 Kips	94.77 Kips
30.51 ft	85.20 Kips	4.81 Kips	90.01 Kips
38.49 ft	99.21 Kips	4.81 Kips	104.02 Kips
38.51 ft	99.27 Kips	14.43 Kips	113.70 Kips
47.51 ft	141.99 Kips	14.43 Kips	156.42 Kips
54.99 ft	177.49 Kips	14.43 Kips	191.93 Kips
55.01 ft	177.58 Kips	14.24 Kips	191.82 Kips
57.99 ft	190.58 Kips	14.24 Kips	204.81 Kips
58.01 ft	190.65 Kips	7.22 Kips	197.86 Kips
67.01 ft	215.39 Kips	7.22 Kips	222.60 Kips
69.99 ft	223.58 Kips	7.22 Kips	230.80 Kips
70.01 ft	223.66 Kips	14.24 Kips	237.90 Kips
79.01 ft	275.87 Kips	14.24 Kips	290.11 Kips
85.99 ft	319.77 Kips	14.24 Kips	334.01 Kips
86.01 ft	319.90 Kips	14.24 Kips	334.14 Kips
94.99 ft	380.76 Kips	14.24 Kips	395.00 Kips
95.01 ft	380.91 Kips	14.24 Kips	395.15 Kips
99.99 ft	423.26 Kips	14.24 Kips	437.50 Kips
100.01 ft	423.44 Kips	22.09 Kips	445.53 Kips
109.01 ft	515.54 Kips	22.09 Kips	537.63 Kips
115.49 ft	586.62 Kips	22.09 Kips	608.71 Kips
115.51 ft	586.86 Kips	35.28 Kips	622.13 Kips
124.51 ft	704.39 Kips	35.28 Kips	739.67 Kips
129.99 ft	780.17 Kips	35.28 Kips	815.45 Kips

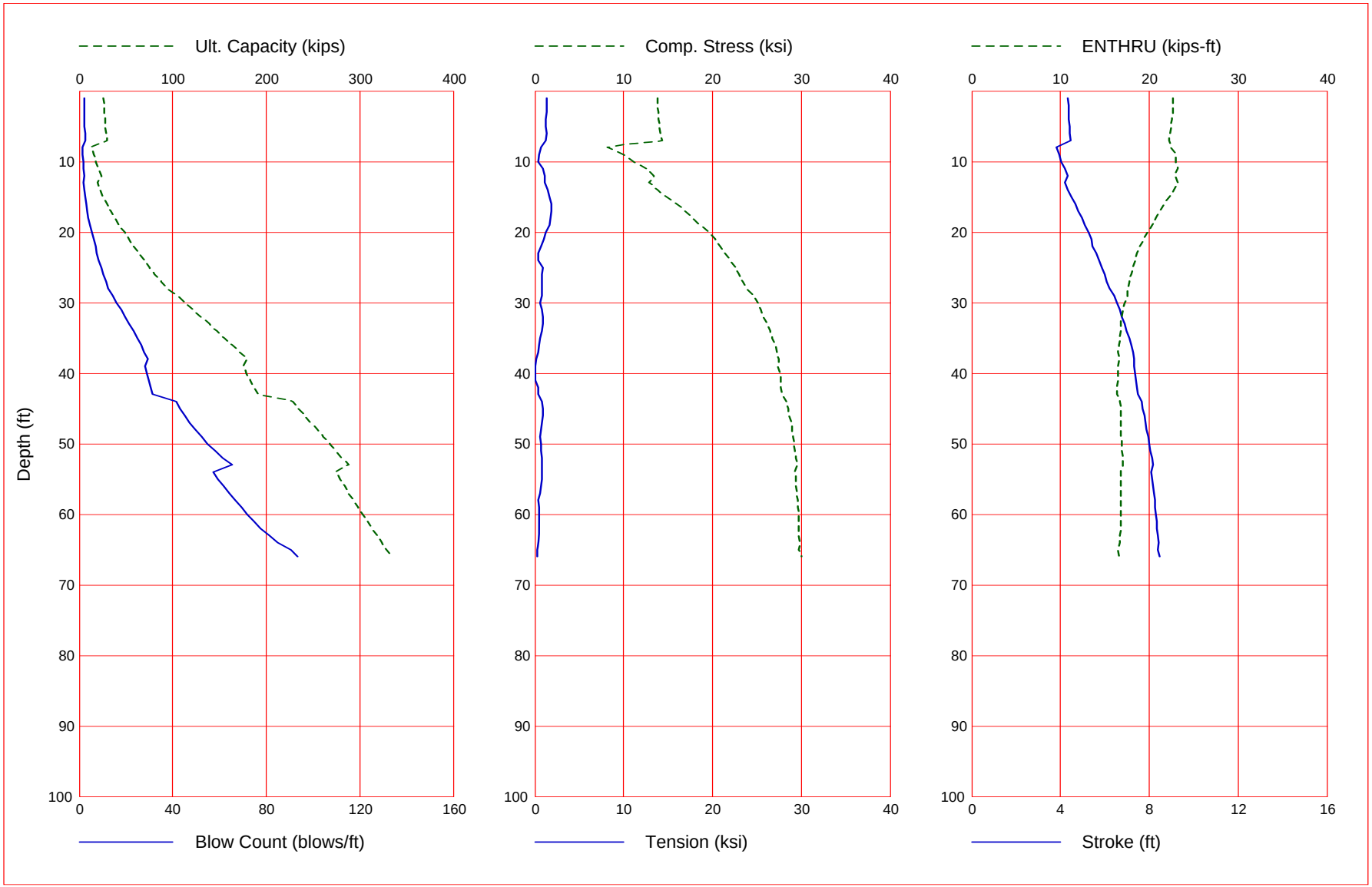
APPENDIX VI

GRLWEAP DRIVEABILITY ANALYSIS OUTPUTS

Resource International Inc
HAM-75-0026-B-003-0-11-Pier-16" CIP

Nov 03 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.250 / 0.300



Gain/Loss 1 at Shaft and Toe 1.250 / 0.300

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	26.3	0.1	26.2	2.2	13.802	-1.311	4.35	22.7
2.0	26.5	0.3	26.2	2.2	13.841	-1.315	4.36	22.7
3.0	26.9	0.6	26.2	2.3	13.894	-1.294	4.37	22.7
4.0	27.4	1.1	26.2	2.3	13.954	-1.276	4.39	22.6
5.0	28.0	1.7	26.2	2.4	14.056	-1.268	4.40	22.4
6.0	28.7	2.5	26.2	2.5	14.183	-1.284	4.43	22.3
7.0	29.7	3.4	26.2	2.6	14.327	-1.274	4.45	22.2
8.0	12.7	4.7	8.0	1.4	8.165	-0.671	3.82	22.5
9.0	15.2	6.1	9.0	1.5	9.935	-0.501	3.95	23.0
10.0	17.8	7.7	10.1	1.7	11.145	-0.371	4.04	23.0
11.0	20.6	9.5	11.1	1.9	12.506	-0.863	4.21	23.2
12.0	23.5	11.5	12.1	2.1	13.394	-1.145	4.31	22.9
13.0	19.6	14.4	5.2	1.9	12.806	-1.085	4.22	23.2
14.0	22.8	17.6	5.2	2.2	13.817	-1.421	4.34	22.8
15.0	26.2	21.1	5.2	2.5	14.844	-1.611	4.48	22.2
16.0	29.9	24.7	5.2	3.0	15.998	-1.851	4.66	21.7
17.0	33.8	28.6	5.2	3.5	16.934	-1.870	4.81	21.2
18.0	37.9	32.7	5.2	4.0	17.772	-1.786	4.95	20.7
19.0	42.2	37.0	5.2	4.6	18.577	-1.635	5.09	20.3
20.0	48.7	41.6	7.1	5.4	19.527	-1.240	5.26	19.8
21.0	53.5	46.5	7.1	6.2	20.354	-1.001	5.38	19.4
22.0	58.6	51.5	7.1	6.9	20.805	-0.678	5.46	18.9
23.0	63.9	56.8	7.1	7.6	21.417	-0.382	5.59	18.6
24.0	69.4	62.3	7.1	8.5	21.981	-0.399	5.72	18.4
25.0	75.1	68.0	7.1	9.5	22.520	-0.856	5.85	18.2
26.0	81.0	73.9	7.1	10.5	23.020	-0.841	5.98	18.0
27.0	87.1	80.0	7.1	11.4	23.444	-0.817	6.08	17.8
28.0	93.4	86.4	7.1	12.4	23.811	-0.846	6.20	17.5
29.0	106.0	93.7	12.3	14.4	24.662	-0.837	6.44	17.5
30.0	114.2	101.9	12.3	16.0	25.095	-0.616	6.56	17.2
31.0	122.4	110.1	12.3	17.9	25.482	-0.807	6.68	17.0
32.0	130.6	118.3	12.3	19.6	25.801	-0.950	6.78	16.9
33.0	138.8	126.5	12.3	21.4	26.172	-0.910	6.89	16.8
34.0	147.0	134.7	12.3	23.2	26.487	-0.747	6.99	16.8
35.0	155.2	142.9	12.3	25.0	26.746	-0.542	7.09	16.7
36.0	163.4	151.1	12.3	26.5	27.013	-0.511	7.17	16.6
37.0	171.5	159.3	12.3	27.9	27.280	-0.386	7.26	16.5
38.0	179.7	167.5	12.3	29.3	27.469	-0.162	7.33	16.6
39.0	175.2	173.5	1.7	28.2	27.390	-0.080	7.32	16.5
40.0	179.1	177.4	1.7	28.9	27.549	0.000	7.35	16.5
41.0	183.1	181.3	1.7	29.6	27.627	-0.042	7.40	16.5
42.0	187.1	185.3	1.7	30.4	27.703	-0.334	7.43	16.4
43.0	191.1	189.4	1.7	31.2	27.813	-0.339	7.47	16.4
44.0	228.6	194.3	34.3	41.4	28.353	-0.767	7.66	16.7
45.0	234.9	200.1	34.8	43.2	28.480	-0.908	7.72	16.8
46.0	241.3	206.0	35.2	45.2	28.643	-0.905	7.78	16.8
47.0	247.7	212.0	35.7	47.3	28.806	-0.816	7.84	16.8
48.0	254.2	218.1	36.1	49.5	28.912	-0.677	7.89	16.8
49.0	260.7	224.2	36.5	52.3	29.027	-0.603	7.95	16.8
50.0	267.4	230.4	37.0	54.9	29.193	-0.677	8.00	16.9
51.0	274.1	236.7	37.4	58.1	29.284	-0.734	8.06	16.9
52.0	280.9	243.0	37.9	61.5	29.370	-0.793	8.11	17.0
53.0	287.7	249.4	38.3	65.3	29.516	-0.850	8.16	17.0
54.0	274.2	255.0	19.2	57.2	29.325	-0.786	8.10	16.8

Gain/Loss 1 at Shaft and Toe 1.250 / 0.300 (Continued)

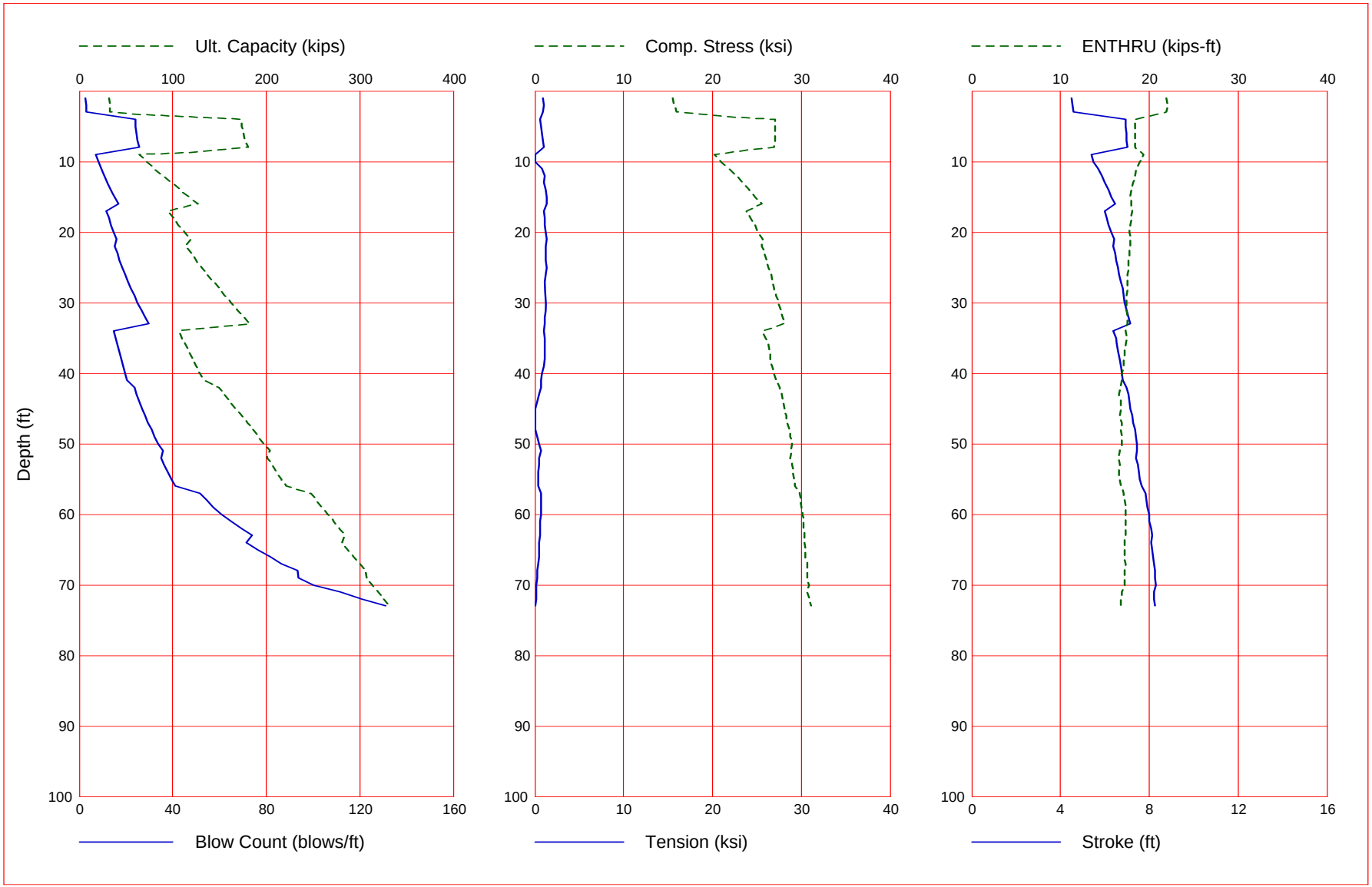
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	254.2	218.1	36.1	49.5	28.912	-0.677	7.89	16.8
49.0	260.7	224.2	36.5	52.3	29.027	-0.603	7.95	16.8
50.0	267.4	230.4	37.0	54.9	29.193	-0.677	8.00	16.9
51.0	274.1	236.7	37.4	58.1	29.284	-0.734	8.06	16.9
52.0	280.9	243.0	37.9	61.5	29.370	-0.793	8.11	17.0
53.0	287.7	249.4	38.3	65.3	29.516	-0.850	8.16	17.0
54.0	274.2	255.0	19.2	57.2	29.325	-0.786	8.10	16.8
55.0	278.9	259.6	19.2	59.5	29.343	-0.754	8.13	16.8
56.0	283.6	264.3	19.2	61.9	29.410	-0.648	8.17	16.8
57.0	288.3	269.1	19.2	64.2	29.500	-0.544	8.20	16.8
58.0	293.2	273.9	19.2	66.7	29.563	-0.426	8.24	16.8
59.0	298.0	278.8	19.2	69.3	29.608	-0.467	8.27	16.8
60.0	303.0	283.7	19.2	71.9	29.667	-0.504	8.30	16.8
61.0	308.0	288.7	19.2	74.6	29.692	-0.530	8.33	16.8
62.0	313.0	293.8	19.2	77.7	29.686	-0.522	8.34	16.8
63.0	318.1	298.9	19.2	81.3	29.754	-0.466	8.38	16.7
64.0	323.3	304.0	19.2	84.9	29.824	-0.378	8.42	16.7
65.0	328.5	309.3	19.2	90.5	29.684	-0.300	8.37	16.5
66.0	333.8	314.6	19.2	93.3	29.995	-0.228	8.49	16.6

Total Continuous Driving Time 45.00 minutes; Total Number of Blows 1918

Resource International Inc
HAM-75-0026-B-275-0-07-Fwd Abut-14" CIP

Nov 03 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.070 / 1.060



Gain/Loss 1 at Shaft and Toe 1.070 / 1.060

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	32.1	0.1	31.9	2.8	15.520	-0.900	4.49	21.9
2.0	32.5	0.5	31.9	2.9	15.761	-0.972	4.55	22.0
3.0	33.1	1.2	31.9	3.0	15.904	-0.946	4.58	21.9
4.0	172.6	2.2	170.4	23.9	27.023	-0.545	6.95	18.4
5.0	174.1	3.7	170.4	24.2	27.057	-0.640	6.95	18.4
6.0	176.0	5.6	170.4	24.6	27.032	-0.751	6.97	18.4
7.0	178.2	7.8	170.4	25.1	27.029	-0.878	6.99	18.4
8.0	180.7	10.3	170.4	25.7	26.908	-1.019	7.01	18.4
9.0	64.3	12.8	51.4	6.9	20.241	0.000	5.38	19.4
10.0	72.5	15.2	57.3	8.2	20.925	0.000	5.50	18.9
11.0	81.0	17.8	63.2	9.5	21.782	-0.827	5.68	18.6
12.0	89.8	20.6	69.1	10.7	22.659	-1.070	5.86	18.4
13.0	98.8	23.8	75.0	12.1	23.414	-1.044	6.01	18.2
14.0	108.0	27.1	80.9	13.6	24.159	-1.236	6.16	18.0
15.0	117.6	30.8	86.8	15.3	24.847	-1.300	6.31	17.9
16.0	127.3	34.6	92.7	16.9	25.551	-1.330	6.48	18.0
17.0	94.4	37.2	57.2	11.7	23.820	-1.051	5.99	18.1
18.0	100.3	39.9	60.4	12.7	24.306	-1.158	6.09	18.0
19.0	106.3	42.7	63.6	13.7	24.751	-1.173	6.18	17.9
20.0	112.5	45.7	66.8	14.9	25.170	-1.266	6.28	17.8
21.0	118.8	48.8	69.9	15.9	25.608	-1.288	6.43	17.9
22.0	114.2	51.7	62.5	15.2	25.557	-1.263	6.38	17.9
23.0	119.8	54.7	65.2	16.3	25.865	-1.213	6.46	17.8
24.0	125.5	57.8	67.8	17.4	26.079	-1.253	6.52	17.7
25.0	131.4	61.0	70.4	18.5	26.281	-1.280	6.59	17.6
26.0	137.3	64.4	73.0	19.7	26.563	-1.227	6.65	17.5
27.0	143.4	67.8	75.6	21.0	26.813	-1.131	6.72	17.5
28.0	149.6	71.4	78.2	22.2	26.963	-1.124	6.79	17.5
29.0	155.9	75.1	80.8	23.6	27.198	-1.222	6.84	17.4
30.0	162.4	79.0	83.4	25.0	27.457	-1.250	6.91	17.4
31.0	168.9	82.9	86.0	26.5	27.631	-1.236	6.99	17.4
32.0	175.6	87.0	88.6	28.0	27.845	-1.143	7.06	17.5
33.0	182.4	91.2	91.2	29.8	28.118	-1.085	7.13	17.5
34.0	106.6	95.1	11.5	14.8	25.677	-0.965	6.37	17.3
35.0	110.2	98.7	11.5	15.5	25.997	-1.100	6.50	17.4
36.0	113.8	102.3	11.5	16.3	26.244	-1.172	6.55	17.3
37.0	117.5	106.0	11.5	17.2	26.463	-1.159	6.61	17.2
38.0	121.3	109.8	11.5	18.0	26.556	-1.098	6.66	17.1
39.0	125.2	113.7	11.5	18.8	26.748	-0.973	6.71	17.1
40.0	129.1	117.6	11.5	19.7	26.948	-0.830	6.76	16.9
41.0	133.1	121.6	11.5	20.6	27.098	-0.659	6.82	16.9
42.0	149.6	126.6	23.0	23.5	27.534	-0.641	6.98	16.7
43.0	155.5	132.5	23.0	24.6	27.783	-0.516	7.04	16.6
44.0	161.5	138.5	23.0	25.6	27.976	-0.296	7.10	16.8
45.0	167.4	144.4	23.0	26.8	28.086	-0.013	7.16	16.8
46.0	173.5	150.5	23.0	28.1	28.277	0.000	7.22	16.7
47.0	179.5	156.5	23.0	29.3	28.452	0.000	7.27	16.9
48.0	185.5	162.5	23.0	30.8	28.592	0.000	7.34	16.8
49.0	191.6	168.6	23.0	32.2	28.714	-0.258	7.40	16.9
50.0	197.7	174.7	23.0	33.7	28.936	-0.530	7.45	16.9
51.0	203.9	180.9	23.0	35.9	28.834	-0.651	7.43	16.7
52.0	201.1	185.8	15.3	35.0	28.740	-0.526	7.42	16.6
53.0	206.0	190.7	15.3	36.3	28.960	-0.495	7.48	16.7
54.0	211.0	195.7	15.3	38.0	29.093	-0.433	7.53	16.6

Gain/Loss 1 at Shaft and Toe 1.070 / 1.060 (Continued)

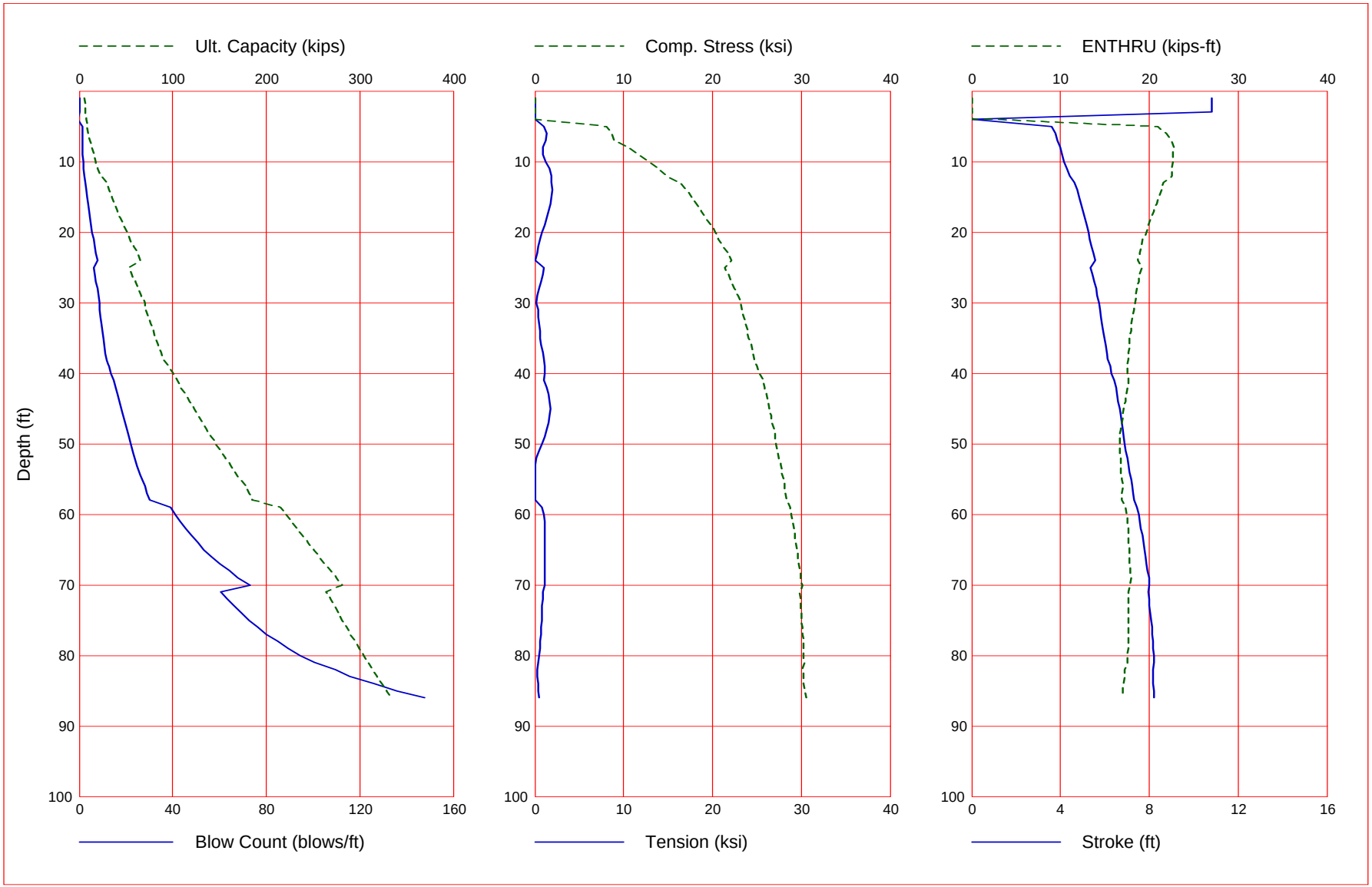
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
48.0	185.5	162.5	23.0	30.8	28.592	0.000	7.34	16.8
49.0	191.6	168.6	23.0	32.2	28.714	-0.258	7.40	16.9
50.0	197.7	174.7	23.0	33.7	28.936	-0.530	7.45	16.9
51.0	203.9	180.9	23.0	35.9	28.834	-0.651	7.43	16.7
52.0	201.1	185.8	15.3	35.0	28.740	-0.526	7.42	16.6
53.0	206.0	190.7	15.3	36.3	28.960	-0.495	7.48	16.7
54.0	211.0	195.7	15.3	38.0	29.092	-0.422	7.53	16.6
55.0	216.1	200.8	15.3	39.5	29.140	-0.415	7.58	16.7
56.0	221.2	205.9	15.3	41.1	29.312	-0.353	7.64	16.8
57.0	247.3	211.5	35.8	51.8	29.832	-0.655	7.83	17.1
58.0	253.4	217.6	35.8	54.6	29.919	-0.707	7.88	17.2
59.0	259.6	223.8	35.8	57.5	29.986	-0.705	7.93	17.3
60.0	265.7	229.9	35.8	61.1	30.182	-0.647	7.98	17.3
61.0	271.9	236.1	35.8	64.9	30.264	-0.616	8.02	17.3
62.0	278.0	242.2	35.8	69.5	30.266	-0.567	8.07	17.3
63.0	284.1	248.3	35.8	73.8	30.394	-0.548	8.11	17.3
64.0	281.3	254.5	26.8	71.4	30.396	-0.505	8.10	17.2
65.0	287.5	260.6	26.8	76.3	30.413	-0.504	8.14	17.2
66.0	293.6	266.8	26.8	81.5	30.492	-0.456	8.18	17.2
67.0	299.8	272.9	26.8	86.3	30.620	-0.373	8.21	17.3
68.0	305.9	279.1	26.8	93.2	30.646	-0.319	8.24	17.2
69.0	306.9	285.2	21.7	93.9	30.667	-0.261	8.25	17.2
70.0	313.1	291.3	21.7	100.3	30.830	-0.186	8.28	17.2
71.0	319.2	297.5	21.7	111.4	30.718	-0.140	8.22	16.9
72.0	325.3	303.6	21.7	120.9	30.849	-0.107	8.23	16.8
73.0	331.5	309.8	21.7	131.0	31.087	-0.059	8.26	16.8

Total Continuous Driving Time 58.00 minutes; Total Number of Blows 2510

Resource International Inc
HAM-75-0026-B-276-0-07-Rear Abut-14" CIP

Nov 03 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.160 / 0.320



Gain/Loss 1 at Shaft and Toe 1.160 / 0.320

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	5.9	0.1	5.8	0.0	0.000	0.000	10.81	0.0
2.0	6.3	0.5	5.8	0.0	0.000	0.000	10.81	0.0
3.0	6.8	1.0	5.8	0.0	0.000	0.000	10.81	0.0
4.0	7.6	1.9	5.8	-1.0	0.000	0.000	0.00	0.0
5.0	8.7	2.9	5.8	1.3	8.024	-1.027	3.60	21.0
6.0	10.0	4.2	5.8	1.3	8.638	-1.338	3.76	21.9
7.0	11.5	5.7	5.8	1.4	8.953	-1.251	3.86	22.4
8.0	13.2	7.4	5.8	1.5	10.507	-0.959	3.97	22.8
9.0	15.2	9.4	5.8	1.6	11.680	-0.896	4.06	22.7
10.0	17.4	11.6	5.8	1.7	12.854	-1.248	4.16	22.7
11.0	19.9	14.1	5.8	1.9	13.878	-1.687	4.29	22.6
12.0	22.5	16.7	5.8	2.1	14.775	-1.914	4.40	22.6
13.0	29.7	19.1	10.7	2.8	16.315	-1.870	4.62	21.6
14.0	32.3	20.9	11.4	3.2	17.098	-1.923	4.75	21.4
15.0	35.1	22.9	12.2	3.5	17.668	-1.853	4.85	21.1
16.0	38.0	25.0	13.0	3.8	18.223	-1.729	4.94	20.8
17.0	41.1	27.3	13.8	4.2	18.723	-1.524	5.02	20.5
18.0	44.2	29.6	14.6	4.7	19.268	-1.303	5.11	20.2
19.0	47.5	32.1	15.3	5.1	19.784	-1.075	5.19	19.9
20.0	50.9	34.8	16.1	5.5	20.338	-0.847	5.27	19.7
21.0	54.4	37.5	16.8	6.1	20.690	-0.606	5.30	19.3
22.0	58.0	40.4	17.6	6.6	21.221	-0.416	5.39	19.0
23.0	61.8	43.4	18.3	7.2	21.744	-0.220	5.48	18.9
24.0	65.7	46.6	19.1	7.8	22.182	0.000	5.57	18.7
25.0	53.3	49.8	3.5	6.1	21.362	-1.038	5.35	19.1
26.0	56.5	53.1	3.5	6.6	21.771	-0.883	5.43	18.9
27.0	59.9	56.4	3.5	7.2	22.099	-0.708	5.51	18.8
28.0	63.3	59.8	3.5	7.7	22.491	-0.505	5.59	18.6
29.0	66.7	63.3	3.5	8.2	22.856	-0.311	5.67	18.5
30.0	70.3	66.8	3.5	8.7	23.177	-0.151	5.74	18.4
31.0	71.8	69.9	1.9	8.9	23.287	-0.329	5.78	18.3
32.0	74.3	72.3	1.9	9.2	23.533	-0.418	5.83	18.1
33.0	76.8	74.8	1.9	9.6	23.724	-0.491	5.88	18.0
34.0	79.3	77.4	1.9	10.0	23.920	-0.542	5.93	18.0
35.0	81.9	80.0	1.9	10.4	24.078	-0.580	5.98	17.8
36.0	84.5	82.6	1.9	10.8	24.325	-0.697	6.03	17.8
37.0	87.2	85.3	1.9	11.2	24.494	-0.911	6.08	17.7
38.0	89.9	88.0	1.9	11.7	24.659	-1.049	6.14	17.7
39.0	96.1	91.4	4.6	12.8	24.986	-1.173	6.23	17.5
40.0	100.3	95.7	4.6	13.7	25.291	-1.086	6.31	17.5
41.0	104.7	100.0	4.6	14.6	25.710	-1.053	6.44	17.6
42.0	109.1	104.4	4.6	15.4	25.897	-1.321	6.50	17.5
43.0	113.5	108.9	4.6	16.3	26.126	-1.536	6.56	17.4
44.0	118.0	113.4	4.6	17.2	26.304	-1.656	6.61	17.3
45.0	122.6	118.0	4.6	18.2	26.406	-1.713	6.66	17.1
46.0	127.2	122.6	4.6	19.0	26.591	-1.667	6.71	17.0
47.0	131.9	127.3	4.6	19.6	26.757	-1.543	6.76	16.9
48.0	136.7	132.1	4.6	20.4	26.890	-1.353	6.81	16.8
49.0	141.5	136.9	4.6	21.2	27.063	-1.120	6.86	16.7
50.0	146.4	141.8	4.6	22.0	27.175	-0.830	6.90	16.7
51.0	151.3	146.7	4.6	22.9	27.324	-0.512	6.95	16.7
52.0	156.3	151.7	4.6	23.8	27.472	-0.150	7.01	16.8
53.0	161.4	156.8	4.6	24.7	27.649	0.000	7.06	16.8
54.0	166.5	161.9	4.6	25.8	27.792	0.000	7.13	16.8

Gain/Loss 1 at Shaft and Toe 1.160 / 0.320 (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	136.7	132.1	4.6	20.4	26.890	-1.353	6.81	16.8
49.0	141.5	136.9	4.6	21.2	27.063	-1.120	6.86	16.7
50.0	146.4	141.8	4.6	22.0	27.175	-0.830	6.90	16.7
51.0	151.3	146.7	4.6	22.9	27.324	-0.512	6.95	16.7
52.0	156.3	151.7	4.6	23.8	27.472	-0.150	7.01	16.8
53.0	161.4	156.8	4.6	24.7	27.649	0.000	7.06	16.8
54.0	166.5	161.9	4.6	25.8	27.793	0.000	7.12	16.8
55.0	171.7	167.1	4.6	26.8	27.952	0.000	7.17	16.9
56.0	177.9	170.7	7.1	28.2	28.096	0.000	7.22	17.0
57.0	181.5	174.4	7.1	29.1	28.188	0.000	7.26	16.9
58.0	185.2	178.1	7.1	30.0	28.299	0.000	7.30	16.9
59.0	215.3	183.4	31.9	39.1	28.705	-0.843	7.45	17.3
60.0	221.0	188.8	32.2	41.1	28.888	-1.048	7.51	17.4
61.0	226.7	194.2	32.5	43.2	29.027	-1.137	7.57	17.5
62.0	232.6	199.7	32.9	45.5	29.128	-1.146	7.62	17.6
63.0	238.4	205.2	33.2	48.2	29.275	-1.099	7.68	17.6
64.0	244.3	210.8	33.5	50.8	29.432	-1.090	7.73	17.6
65.0	250.3	216.5	33.8	53.4	29.506	-1.105	7.78	17.8
66.0	256.4	222.2	34.2	56.7	29.618	-1.108	7.83	17.8
67.0	262.4	227.9	34.5	60.3	29.754	-1.136	7.88	17.8
68.0	268.6	233.8	34.8	64.2	29.869	-1.161	7.93	17.9
69.0	274.8	239.6	35.2	67.9	29.948	-1.159	7.98	18.0
70.0	281.0	245.6	35.5	73.3	30.080	-1.095	8.02	17.9
71.0	264.1	249.8	14.3	60.5	29.850	-0.939	7.95	17.7
72.0	268.4	254.1	14.3	63.3	29.885	-0.888	7.99	17.7
73.0	272.7	258.4	14.3	66.2	29.955	-0.845	8.02	17.7
74.0	277.1	262.8	14.3	69.4	30.034	-0.802	8.05	17.7
75.0	281.5	267.2	14.3	72.9	30.079	-0.779	8.08	17.7
76.0	286.0	271.7	14.3	76.5	30.095	-0.730	8.11	17.7
77.0	290.5	276.2	14.3	80.0	30.172	-0.671	8.13	17.7
78.0	295.1	280.8	14.3	84.8	30.192	-0.601	8.16	17.6
79.0	299.7	285.4	14.3	89.3	30.192	-0.546	8.19	17.6
80.0	304.4	290.1	14.3	94.7	30.268	-0.454	8.21	17.5
81.0	309.1	294.8	14.3	100.7	30.310	-0.340	8.23	17.5
82.0	313.8	299.5	14.3	109.6	30.115	-0.265	8.16	17.2
83.0	318.6	304.3	14.3	115.8	30.209	-0.258	8.18	17.2
84.0	323.5	309.2	14.3	126.0	30.270	-0.342	8.19	17.1
85.0	328.4	314.1	14.3	136.1	30.369	-0.399	8.21	17.0
86.0	333.3	319.0	14.3	147.6	30.537	-0.458	8.22	17.0

Total Continuous Driving Time 63.00 minutes; Total Number of Blows 2682

APPENDIX VII

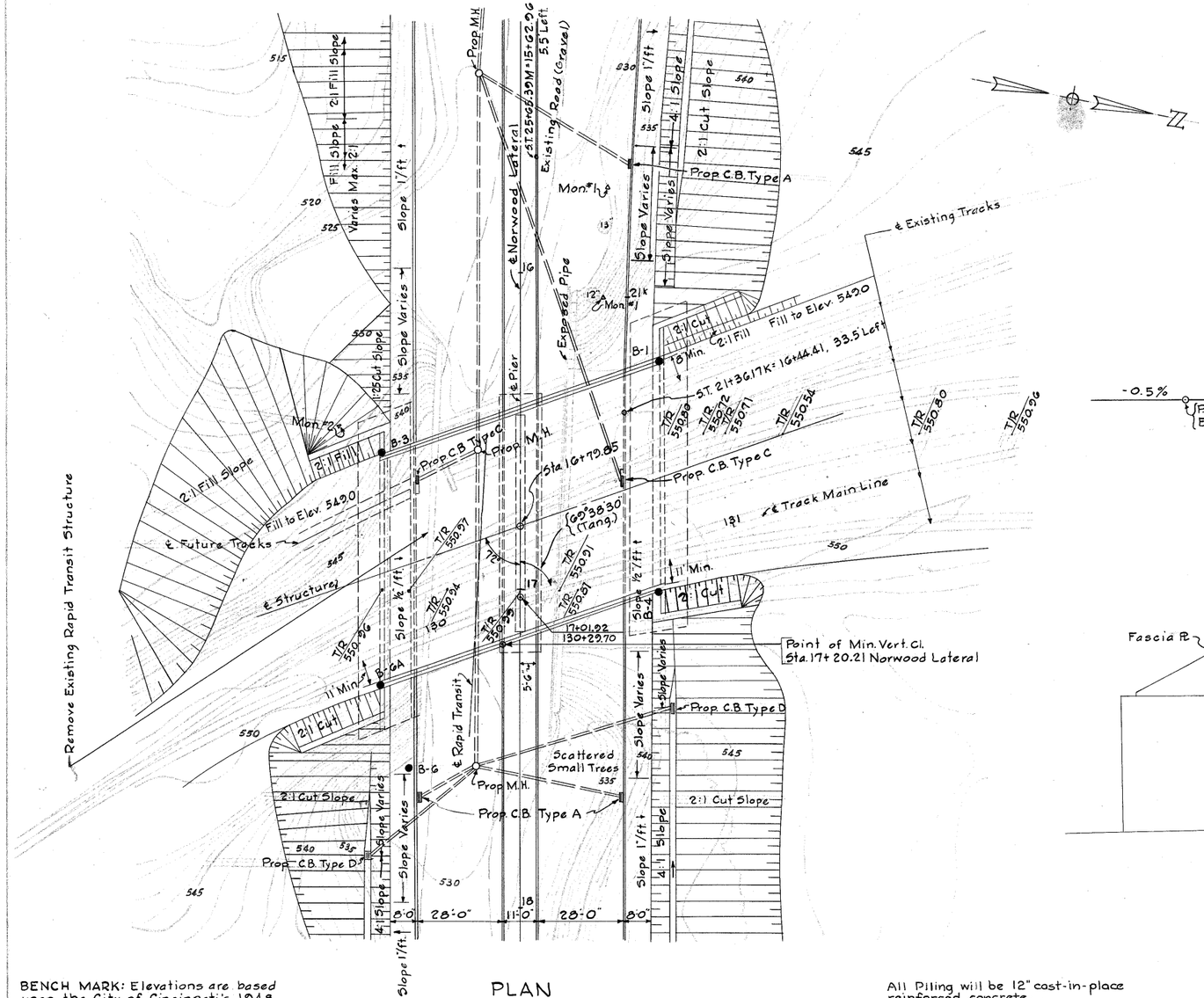
EXISTING STRUCTURE FOUNDATION PLANS

FED. RD. DIV.	STATE	PROJECT	FISCAL YEAR
2	OHIO		

321
361

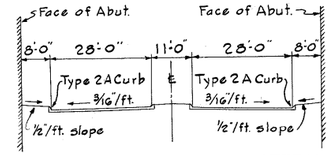
HAM-562-0.28 ; HAM-4W-7.16

Remove Existing Rapid Transit Structure

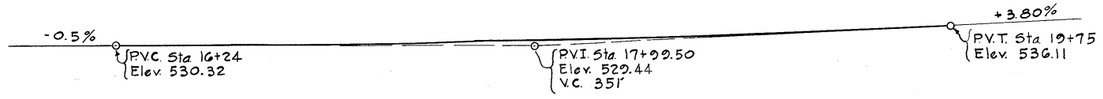


PLAN

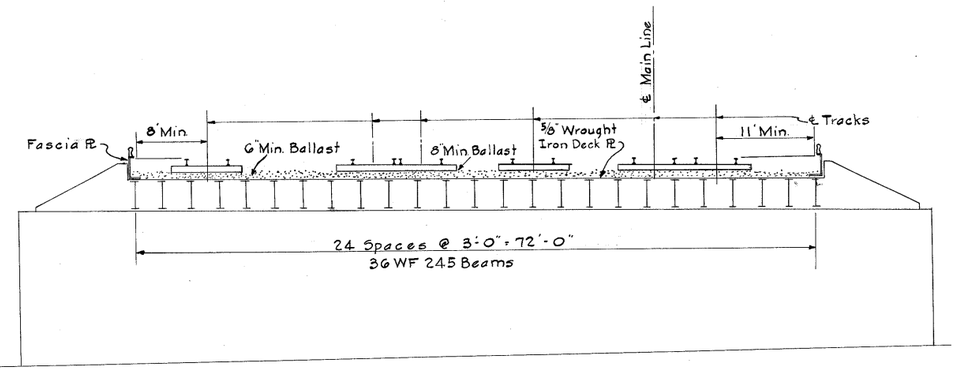
BENCH MARK: Elevations are based upon the City of Cincinnati's 1948 Bench Mark Survey.



SECTION OF NORWOOD LATERAL UNDER STRUCTURE



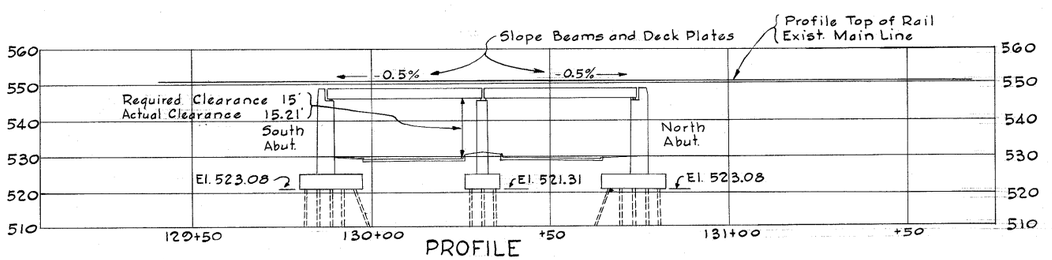
PROFILE OF NORWOOD LATERAL



SECTION THROUGH PROPOSED STRUCTURE AT NORTH ABUTMENT

FOUNDATION SOUNDINGS: Foundation design and foundation quantities are based on a study of rod soundings (and/or soil-sampling soundings) made at the site. This sounding information may be inspected in the office of the Bureau of Bridges in Columbus or in the Division Office, but the State assumes no responsibility for the accuracy thereof.

All Piling will be 12" cast-in-place reinforced concrete.
Estimated Average Pay Length for Piling is 25'



PROFILE

PROPOSED STRUCTURE

TYPE: WF Beams with metal deck & Conc. Substructure
SPANS: Two Spans @ 44'-6" c/c Brg.
LIVE LOAD: Cooper E-72
SKEW: 18°
ALIGNMENT: Tangent
DESIGN SPECIFICATIONS: A.R.E.A. 1956

EXISTING RAPID TRANSIT STRUCTURE UNDER N&W RAILWAY (TO BE REMOVED)

TYPE: Reinforced concrete slab with ballasted deck and walls (three-span box) with wingwalls and apron slabs 28' long.
SPANS: 13'-0"±; 15'-0"; 16'-0"± (at right angles to substructure).
WIDTH: 76'-6"± (4-track Structure)
SKEW: 21°±

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CONSULTING ENGINEERS
CINCINNATI, OHIO

SITE PLAN

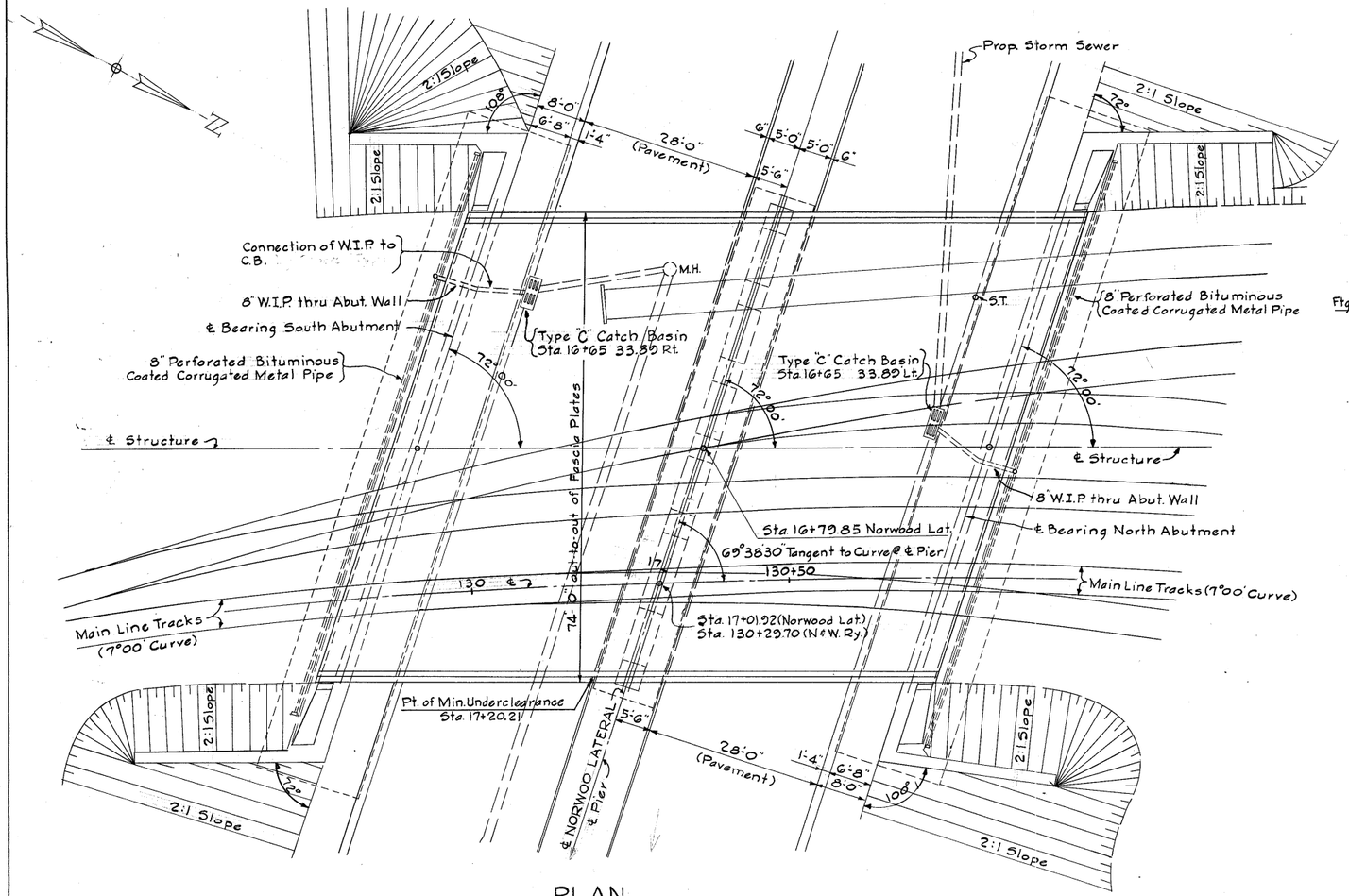
BRIDGE NO. HAM.-562-0031
NORFOLK & WESTERN RAILWAY OVER NORWOOD LATERAL
HAMILTON COUNTY
SECTION: HAM.-562-0.28
SCALE:

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE	REVISED
E.R.B.	J.L.C.	L.J.W.	W.W.C. 5-9-57	J.H.O.	10/18/57	

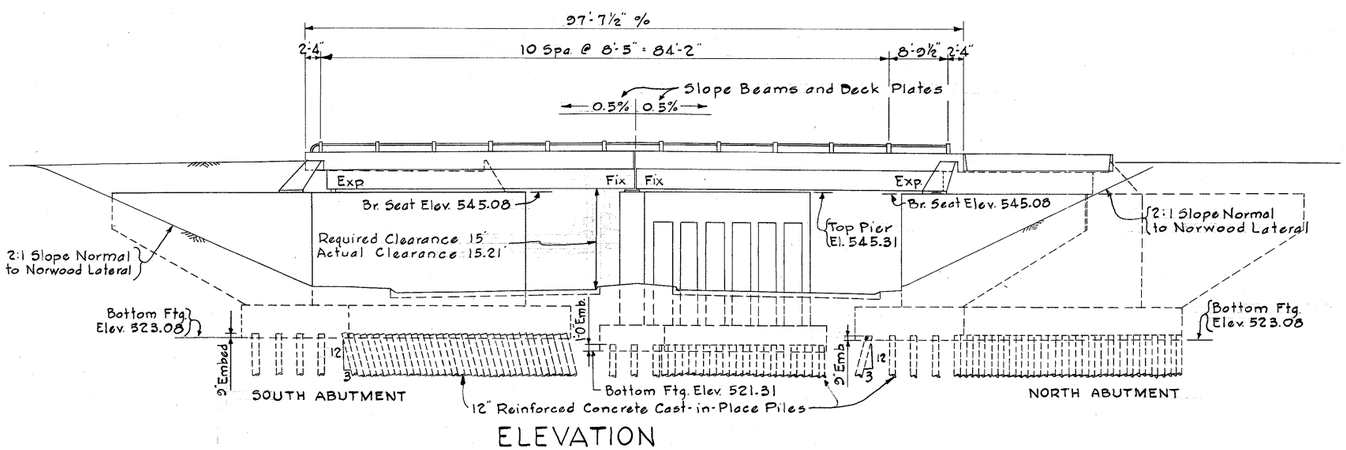
FED. RD. DIV.	STATE	PROJECT	FISCAL YEAR
2	OHIO		

322
361

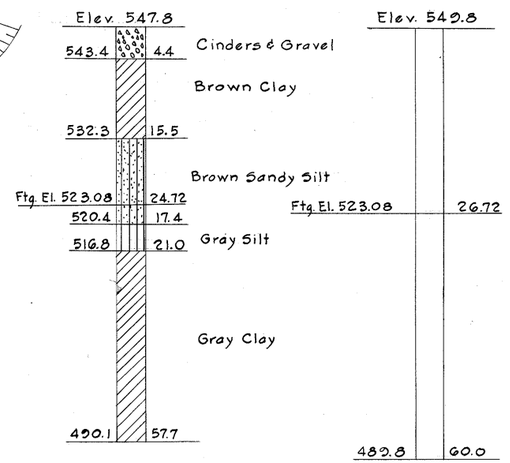
HAM-562-0.28; HAM-4W-7.16



PLAN

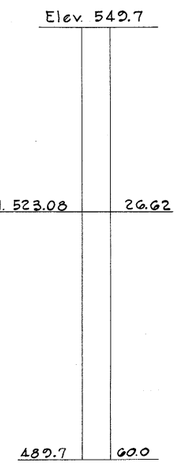


ELEVATION

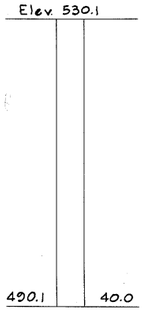


BORING NO. 1

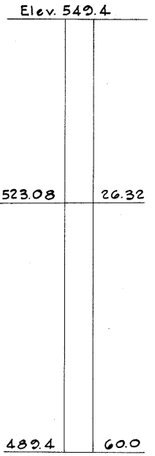
BORING NO. 3



BORING NO. 4



BORING NO. 6



BORING NO. 6A

Test borings were made between August 29 and October 18, 1956. See Sheet No. 1 for location of test borings. Test holes #2 and #5 were not drilled.

HAZELET & ERDAL
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CINCINNATI, OHIO

GENERAL PLAN & ELEVATION

BRIDGE NO. HAM-562-003L
NORFOLK & WESTERN RAILWAY OVER NORWOOD LATERAL
HAMILTON COUNTY
SECTION: HAM. 562-028
SCALE: 3/32" = 1'-0"

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE	REVISED
E.R.B.	H.L.L.	L.J.W.	W.W.C.	JHO	10/18/57	

FED. RD. DIV.	STATE	PROJECT	FISCAL YEAR
2	OHIO		

323
361

HAM-562-0.28 ; HAM - 4W - 7.16

GENERAL NOTES

Construction Specifications: State of Ohio, Department of Highways, Construction and Material Specifications dated January 1, 1957; also Supplemental Specifications S-107, revised February 16, 1955, No. S-207 dated April 28, 1955 and No. S-114 revised August 1, 1957 shall govern this project.

Design Specifications: AR.E.A. 1956 Specifications shall govern this project.

Sheeting and Bracing: Before construction is started, eight sets of prints showing details of the sheeting and bracing to be used for excavation adjacent to the falsework shall be submitted to the Director for approval by the Department of Highways and by the Railway Company.

Welding: Welding of Structural Steel shall be Class "A"

Surface Finish of Concrete: Exposed surfaces of abutments, wingwalls and piers shall receive a rubbed surface finish. All other surfaces shall be governed by the provisions of Items 51.

Perforated Corrugated Metal Pipe: Shall be bituminous coated as per Sec. M-6.4 (c) of the Specifications.

Type 'A' Waterproofing: Shall be applied to the back of the abutments and wings from top of footings to top of backwall and to finished ground line and on the top of deck of the superstructure. Payment for the asphaltic mastic used at splices in the deck plates shall be included in the unit price bid for Item S-3, Type "A" Waterproofing.

Bearing Piles: Piles shall be driven to a minimum bearing capacity of 40 tons.

Pile Test Load: Shall be in accordance with Item S-17 except that the first test load as well as the subsequent test loads shall be applied if and where directed by the Engineer.

Porous Backfill: 2' (ft.) thick shall be placed back of the abutments from top of footings up to the railroad ballast.

For additional General Notes see Sheet No. 332

Removal of Existing Structure: When no longer needed to maintain railroad traffic the existing rapid transit structure shall be removed in accordance with the provisions of Item S-24

ESTIMATED QUANTITIES

ITEM	TOTAL	UNIT	DESCRIPTION	S. ABUT.	N. ABUT.	PIER	GENERAL	AS BUILT QUANTITIES	
S-1	118	Cu. Yds.	Class "C" Concrete - Pier Columns & Cap			118			
S-1	795	Cu. Yds.	Class "E" Concrete - Abutment & Pier Footings	337	337	121			
S-1	933	Cu. Yds.	Class "E" Concrete - Abutments and Wingwalls	466	467				
S-3	102	Lin. Ft.	Waterproofing - Premolded Sealing Strip	51	51				
S-3	1465	Sq. Yds.	Type "A" Waterproofing	282	283		900		
S-4	129,921	Lbs.	Reinforcing Steel	92,556		37,365			
S-107	679,400	Lbs.	Structural Steel				679,400		
S-107	208,400	Lbs.	Wrought Iron (Deck & Fascia Plates, Brackets & Misc.)				208,400		
S-8	783,600	Lbs.	Field Painting of Structural Steel & Wrought Iron				783,600		
S-14	193	Lin. Ft.	Railing, Aluminum Rail and Supports				193		
S-16	Lump	Lump Sum	First Test Pile						
S-17	Lump	Lump Sum	First Pile Test Load						
S-17	1	Each	Subsequent Pile Test Load				1		
S-18	10,585	Lin. Ft.	12" Cast-in-Place Reinforced Concrete Piles	4205	4205	2175			
S-29	314	Cu. Yds.	Porous Backfill Including Burlap Protection	157	157				
S-29	26	Lin. Ft.	8" Wrought Iron Pipe, Including Specials	13	13				
S-29	386	Lin. Ft.	8" Bituminous Coated Perforated Corrugated Metal Pipe, Including Specials.	190	196				
S-29	36	Lin. Ft.	8" Bituminous Coated Corrugated Metal Pipe, Including Specials.	18	18				
E-2	Lump	Lump Sum	Cofferdams, Cribs and Sheeting						
E-2	1,750	Cu. Yds.	Unclassified Excavation	730	730	290			
S-24	Lump	Lump Sum	Removal of Existing Structure				Lump Sum		

CONSTRUCTION PROCEDURE

(C) Indicates construction to be done by the Contractor.

(R) Indicates construction to be done by the Railway Company on a Force Account Basis.

(R1) Remove section of all tracks except Main Track and west adjacent track in construction area.

(R2) Construct temporary trestles carrying Main Track and West adjacent track.

(C3) Remove existing Rapid Transit Structure except the portions necessary for support of falsework supporting tracks, and excavate for roadway

(C4) Excavate for foundation of abutments and pier, drive foundation piling, construct abutments and pier up to elevation of bridge seats and place backfill to bridge seat elevation at abutments.

(R5) Reconstruct falsework as necessary to permit construction of abutment back walls.

(C6) Remove remaining portions of existing Rapid Transit Structure down to an elevation that will permit erection of steel beams.

(R7) Detour Main Track to west adjacent track and remove Main Track within construction area, and remove main track temporary trestle.

(C8) Place Beam No. 18 thru No. 25 complete except for welding of deck plates.

(R9) Restore Main Track with timber blocking under tracks on deck plates and restore traffic on same.

(R10) Remove west adjacent track within construction area, and remove west adjacent track temporary trestle.

(C11) Place Beams No. 13 thru No. 17 complete except for welding of deck plates.

(R12) Restore west adjacent track with timber blocking under tracks on deck plates.

(C13) Place Beams No. 1 thru 12; weld, paint and waterproof all deck plates and complete work by Contractor.

(R14) Remove timber blocking under tracks and replace with ballast.

MODIFICATION of Construction Procedure.
To avoid delays and expedite construction, the Contractor may modify or revise Sections of the above procedure to suit unforseen conditions that may arise in the field, any change in procedure shall be approved by the Director of Highways and the Railroad Co. before that particular phase of construction is started. This modification in procedure shall also apply at Laidlaw ave structure.

FORCE ACCOUNT WORK
by
Norfolk and Western Railway Company

1. Inspection
2. Track work
3. Construction and Removal of temporary Trestles
4. Signal line changes

HAZELET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

QUANTITIES & NOTES

BRIDGE NO. HAM.-562-0031
NORFOLK & WESTERN RAILWAY OVER NORWOOD LATERAL
HAMILTON COUNTY
SECTION: HAM.-4W-7.16
SCALE:

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE	REVISED
E.R.B			W.W.C. 5-9-57	JHO	10/18/57	