DGL Consulting Engineers, LLC
Maumee, Ohio

Geotechnical Subsurface Investigation
OTIC 71-19-01 -Bridge Widening
MP 40.5 over Detroit Toledo and Irontown (DTI) Railway Right of Way (ROW)
Fulton County, Ohio

December 2019

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December 31, 2019

TTL Project No. 1852802
Rev1

Mr. Ahmed Hamid, P.E.
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Geotechnical Subsurface Investigation
OTIC 71-19-02 -Bridge Widening
MP 40.5 Detroit Toledo and Irontown (DTI) Railway Right of Way (ROW)
Fulton County, Ohio

Dear Mr. Hamid:

Following is the report of the geotechnical subsurface investigation performed by TTL Associates, Inc. (TTL) at the site of the referenced project. This investigation was performed in general accordance with TTL Proposal No. 1852802-rev2, dated July 19, 2019 and subsequent authorization.

This report contains the results of our study and provides our construction recommendations for bridge widening project.

Soil samples collected during this investigation will be stored at our laboratory for 90 days from the date of this report. The samples will be discarded after this time unless you request that they be saved or delivered to you.

Should you have any questions regarding this report or require additional information, please contact our office.

Sincerely,

TTL Associates, Inc.

Imad El Hajjar
Geotechnical Project Manager

David M. Vovak, P.E.
Cleveland Operations Director

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GEOTECHNICAL SUBSURFACE INVESTIGATION
OTIC 71-19-01 -BRIDGE WIDENING
MP 40.5 OVER DETROIT TOLEDO AND IRONTOWN (DTI)
RAILWAY RIGHT OF WAY (ROW)
FULTON COUNTY, OHIO

FOR

DGL CONSULTING ENGINEERS, LLC (DGL)
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SUBMITTED

December 31, 2019
TTL PROJECT NO. 1852802

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1.0 INTRODUCTION

This geotechnical subsurface investigation report has been prepared for the bridge widening project in Fulton County, Ohio. The project is located at mile post (MP) 40.5 of the James W. Shocknessy Ohio Turnpike (Interstate Route 90 [IR-90]) approximately ¼ mile west of State Route (SR) 109, as shown on the attached Site Location Map (Plate 1.0).

This report summarizes our understanding of the proposed construction, describes the investigative and testing procedures utilized to evaluate the subsurface conditions at the site, presents our findings from the field and laboratory testing, and provides our design and construction recommendations for the bridge widening.

This investigation was performed in general accordance with TTL Proposal No. 1852802-rev2, dated July 19, 2019 and subsequent authorization.

The purpose of this investigation was to evaluate the subsurface conditions relative to the design and construction of bridge widening.at the referenced location. To accomplish this, TTL performed two test borings, field and laboratory soil testing, a geotechnical engineering evaluation of the test results, and review of available geologic and soils data for the project area. TTL also performed 36 pavement cores for an assessment of the shoulder conditions across the project length.

This report includes:

- A description of the subsurface soil and groundwater conditions encountered in the borings.
- A description of the existing pavement cross-section encountered at the coring locations.
- Geotechnical design recommendations for the bridge widening
- Recommendations concerning soil and groundwater-related construction procedures such as site preparation, earthwork, foundation construction, and related field testing.

An asbestos survey was performed on this project and is provided under a separate cover. The scope of this study did not include an environmental assessment of the subsurface materials at this site.

2.0 INVESTIGATIVE PROCEDURES

Two test borings, designated as Borings B-1 and B-2, were drilled by TTL on November 20 and 21, 2019. Boring B-1 was performed on the east side of the existing twin bridges, and Boring B-2 was performed on the west side. The boring locations were established in the field by TTL based on a site plan provided by DGL. Ground surface elevations at the boring locations were depicted from plans that were provided by DGL. The approximate locations of the test borings are shown on the attached Test Boring Location Plan (Plate 2.0).

A total of 36 pavement cores, located on the shoulders along the project site, were obtained using a 4-inch diameter single-wall, diamond-tipped core barrel attached to the drill rig. After pavement coring was completed, pavement thickness was measured along the sidewall of the core-hole.

The test borings were performed in general accordance with geotechnical investigative procedures outlined in ASTM Standards D 1586 and D 5434. Borings B-1 and B-2 were drilled with a truck-mounted rotary drilling rig utilizing 4¼-inch inside diameter hollow-stem augers. Borings B-1 and B-2 were extended to the depth of 100 and 80 feet below existing grades, respectively.

During auger advancement, soil samples were collected at 2½-foot intervals to a depth of 10 feet and at 5-foot intervals thereafter using a split-spoon sampler. The soil samples were sealed in jars and transported to our laboratory for further classification and testing.

Split-spoon (SS) samples were obtained by the Standard Penetration Test (SPT) Method (ASTM D 1586), which consists of driving a 2-inch outside diameter split-spoon sampler into the soil with a 140-pound weight falling freely through a distance of 30 inches. The sampler was driven in three successive 6-inch increments with the number of blows per increment being recorded. The sum of the number of blows required to advance the sampler the second and third 6-inch increments is termed the Standard Penetration Resistance (N-value) and is presented on the Logs of Test Boring attached to this report. The samples were sealed in jars and shipped to our laboratory for further classification and testing.

Shelby tube samples, designated ST on the Logs of Test Borings, were obtained from 8 to 10 feet, from 16 to 18 feet, from 26 to 28 feet and from 31 to 33 feet in Boring B-2. Each of the Shelby tube samples were obtained by hydraulically advancing a 3-inch diameter, thin walled sampler approximately 24 inches beyond the hollow stem auger into relatively undisturbed soil in accordance with ASTM D 1587. The Shelby tubes were then extracted from the subsoils, and the ends were capped and sealed. The samples were transported to our laboratory where they were extruded, classified, and tested.

Soil conditions encountered in the test borings are presented in the Logs of Test Borings, along with information related to sample data, SPT results, water conditions observed in the borings, and laboratory test data. It should be noted that these logs have been prepared on the basis of laboratory classification and testing, as well as field logs of the encountered soils.

All of the recovered samples of the subsoils were visually or manually classified in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 and D 2488). All samples of the subsoils were tested in our laboratory for moisture content (ASTM D 2216). The Shelby tube samples and selected intact cohesive split-spoon samples were tested for dry density and unconfined compressive strength utilizing constant rate of strain methods (ASTM D 2166). Unconfined compressive strength estimates were obtained for the remaining intact cohesive samples using a calibrated hand penetrometer. Atterberg limits tests (ASTM D 4318) and particle size analyses (ASTM D 422) were performed on four selected samples from each boring. The results of these tests are presented on the Logs of Test Borings, and Tabulation of Test Data sheets attached to this report.

One-dimensional consolidation tests (ASTM D 2435) were performed on samples from Boring B-2 (ST-3 and ST-4). The results of these tests are attached to this report.

Experience indicates that the actual subsoil conditions at a site could vary from those generalized on the basis of test borings made at specific locations, especially at previously developed sites such as this site. Therefore, it is essential that a geotechnical engineer be retained to provide soil engineering services during the site preparation, excavation, and foundation phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations, and to allow design changes in the event subsurface conditions differ from those anticipated prior to the start of construction.

3.0 PROPOSED CONSTRUCTION

We understand that it is planned to demolish the existing twin bridges located at milepost (MP) 40.5 of the James W. Shocknessy Ohio Turnpike (Interstate Route 90 [IR-90]), approximately ¼ mile west of State Route (SR) 109, in Fulton County, Ohio. The bridges serve as an overpass over the Detroit Toledo and Irontown (DTI) Railway ROW. We understand that the project consists of replacing the existing bridge decks and widening the turnpike. The widening will be constructed within the median in the area between the existing twin bridges.

Based upon a review of the available plans noted above, the existing 3-span structures measure roughly 130 feet each in length with the abutments supported on 40-ton capacity HP 10X42 driven piles and piers supported on shallow foundations, as noted in the table below:

Abutment K Line Driven Depth (ft)	Abutment M Line Driven Depth (ft)	Abutment K Pile Top Elev. (ft)	Abutment M Pile Top Elev. (ft)	Pier Max. Soil Pressure (psf)	Pier Bearing Elev (ft)
51	45	772.7	766.0	2,600	743.0

Based upon the Original Construction Plans, Spans 1 and 3 of the duel bridges are approximately 41 feet in length and the middle span (Span 2) is approximately 48 feet in length. Existing grades below the bridges are roughly Elev. 748 to 749 feet msl, and roadway elevation across the existing bridges range from roughly Elev. 775 feet msl.

4.0 GENERAL SITE AND SUBSURFACE CONDITIONS

4.1 General Site Surface Conditions

Borings B-1 and B-2 were located in the grass median on either side of the bridge. Surface grades at the boring location ranged from 774 to 776 feet msl and roughly 8 inches of topsoil were encountered at the surface.

As stated above, ground elevations along the roadway across the bridge ranged from 775 to 776 feet msl. Ground elevations in the vicinity of the existing railroad tracks ranged from 748 to 749 feet msl indicating roughly 27 feet of grade variation between the existing roadway and the railroad embankment.

4.2 Site Geology

Published geologic maps from the Ohio Department of Natural Resources (ODNR) indicate that the project site is located within the glaciated portion of Ohio, with surface elevation ranging from approximately 773 to 776 feet, as depicted from google earth. Quaternary soil deposits consist of **Lacustrine Sand (LS)**, deposited in glacial lakes as shallow-water deltas or nearshore bars and sheets; includes many small areas of dunes. These lacustrine deposits are underlain by predominantly silty and clayey glacial till, before encountering bedrock. By comparing surface grades on the Turnpike and the surrounding agricultural fields (+/- 749 feet msl), up to about **30 feet of fill** is predicted to have been used to construct the roadway embankment.

Bedrock at the site consist of Mississippian and Upper Devonian aged **Shale** of the Sunbury and Bedford Shales undivided formations. Top of rock was reported to be roughly 600 feet msl, which is anticipated around 150 to 185 feet below existing grades. No Mining has been reported on or near the site.

4.3 Pavement Along Existing Shoulders

All the pavement cores were performed within the existing shoulder areas along the project length. The encountered surface materials and the general composition of the subgrade material at the core locations are summarized in the following table.

Table 4.3. Encountered Pavement Thickness and Conditions							
Core Number	Pavement Thickness (Inches)			Core Number	Pavement Thickness (Inches)		
	Asphalt	Base	Subgrade Soils		Asphalt	Base	Subgrade Soils
C-1	8.0	17.0	Granular	**C-21**	9.0	11.0	Granular
C-2	4.5	13.0	Granular	**C-22**	4.0	7.0	Granular
C-3	10.0	15.0	Granular	**C-23**	5.0	6.0	Granular
C-4	10.5	18.0	Granular	**C-24**	8.0	9.0	Granular
C-5	6.5	7.5	Cohesive	**C-25**	6.0	8.0	Granular
C-6	11.0	13.0	Granular	**C-26**	7.0	9.0	Granular
C-7	5.0	7.5	Granular	**C-27**	4.0 Asphalt	8.0	Granular
C-8	8.0	9.0	Granular		2.0 Concrete		
C-9	5.5	6.0	Granular	**C-28**	10.25	13.0	Granular
C-10	5.0	10.0	Cohesive	**C-29**	7.5 Asphalt	11.5	Granular
C-11	5.0	8.0	Granular		3.0 Concrete		
C-12	8.0	10.5	Granular	**C-30**	6.0	9.0	Granular
C-13	7.5	8.0	Granular	**C-31**	6.0	7.0	Cohesive
C-14	7.0	11.0	Granular	**C-32**	6.0	7.5	
C-15	4.0	6.0	Cohesive	**C-33**	5.0	7.5	Granular
C-16	4.0	7.5	Cohesive	**C-34**	6.0	8.0	Granular
C-17	10.0	11.0	Cohesive	**C-35**	7.0 Asphalt	10.0	Granular
C-18	9.0	10.0	Granular		2.0 Concrete		
C-19	8.0	10.0	Granular	**C-36**	5.0	7.0	Cohesive
C-20	9.0	10.0	Granular	**-**	-	-	-

Photographic pavement core logs are attached to this report and provided in appendix C.

In summary, the asphalt thickness encountered ranged between approximately 4 to 11 inch-thick. A layer of concrete was encountered underlying the asphalt at pavement core locations C-27, C-29 and C-35, this layer was observed to be 2 to 3 inch-thick. The encountered crushed stone base was observed to be 6 to 18 inch-thick. The encountered subgrade material underlying the pavement cores was predominantly Granular except at core locations C-5, C-10, C15 through C-17 and C-36 where the encountered subgrade material was observed to be predominantly Cohesive. The total pavement cross-section encountered in the pavement cores extended to depths ranging from 0.8 feet to 2.4 feet below existing grades.

4.4 General Soil Conditions

Based on the results of our field and laboratory tests, the subsoils encountered underlying the topsoil can generally be characterized by a layer of fill material overlying native lacustrine soils overlying a layer of cohesive glacial till. Additional descriptions of the soil stratigraphy encountered in the borings are presented on the Logs of Test Borings attached to the report.

Embankment Fill consisted of granular and cohesive fill soils and was encountered underlying the topsoil in Borings B-1 and B-2 to depths of 29 feet and 31 feet below existing grades (approximate Elev. 745 feet msl). **The cohesive fill** was encountered in Boring B-1 to depth of 3 feet (approximate Elev. 771 feet msl) and in Boring B-2 to depth of 28 feet (approximate Elev. 745 feet msl). The cohesive fill was predominantly Cohesive with varying amounts of sand, gravel, bricks and organics. SPT N-values for the cohesive fill generally ranged from 11 to 22 blows per foot (bpf), indicating stiff to very stiff consistency. Unconfined compressive greater than 4.5 tons per square foot (tsf) were recorded within this stratum using a hand penetrometer (the highest obtainable reading using a calibrated hand penetrometer). These relatively high strengths are likely indicative of desiccation. Moisture contents were on the order of 12 percent and 15 percent. A liquid limit of 27 percent and a plasticity index of 16 percent were determined for one cohesive fill sample obtained from Boring B-1 (ST-3). **The granular fill** was encountered in Boring B-1 underlying the cohesive fill to depth of roughly 29 feet and in B-2 between 28 and 31 feet below existing grades. The granular fill was predominantly sandy with varying amounts of silt and clay. SPT N-values for the granular fill generally ranged from 38 to 44 bpf, indicating dense consistency. Loose granular fill soils were encountered between 3 and 6 feet below existing grades in Boring B-1 and between 28 and 31 feet below existing grades in Boring B-2; SPT N-values of 9 bpf were recorded within these soils. Moisture contents were on the order of 9 percent and 11 percent.

Stratum I consisted of predominantly stiff to very stiff native cohesive lacustrine soils encountered underlying the embankment fill to depths of 48.5 feet below existing grade in Boring B-1 to depths of 39 feet below existing grade in Boring B-2 (approximate Elev. 725.5 and 737 feet msl, respectively). Stratum I consisted of lean clay with sand and varying amounts of gravel. SPT N-values for the Stratum I soils ranged from 16 to 26 bpf. Unconfined compressive strength greater than 4.5 tsf were recorded within this stratum using a hand penetrometer (the highest obtainable reading using a calibrated hand penetrometer). These relatively high strengths are likely indicative of desiccation. Unconfined compressive strengths of 1.80, 1.65 and 2.94 tsf were determined for three Stratum I samples obtained from Borings B-1 (SS-8 and SS-11) and B-2 (SS-8). Moisture contents ranged from 14 to 22 percent. Liquid limits ranged from 31 to 39 percent and plasticity index ranged from 13 to 24 percent were

determined for two Stratum I samples obtained from Boring B-1 (SS-8 and SS-9). These values, along with gradation results, are indicative of lean clay (CL) in accordance with USCS designations. Based correlations from moisture content results and Atterberg limits testing, these soils are considered over-consolidated and slightly to moderately compressible.

Stratum II consisted of predominantly very stiff native cohesive glacial till deposits encountered underlying Stratum I to depth of 73.5 and 79.5 feet in Borings B-1 and B-2 (approximate Elevs. 700.5 and 696.5 feet msl), respectively. Stratum II consisted predominantly of lean clay with sand and trace amounts of gravel. SPT N-values for the Stratum II soils ranged from 16 to 26 bpf. Unconfined compressive strengths ranging from 3.75 to greater than 4.5 tsf were recorded within this stratum using a hand penetrometer (the highest obtainable reading using a calibrated hand penetrometer). Unconfined compressive strengths of 2.88 and 3.63 tsf were determined for two Stratum II samples obtained from Boring B-2 (SS-12 and SS-15). Moisture contents ranged from 14 to 16 percent. Liquid limits ranged from 28 to 30 percent and plasticity index ranged from 11 to 14 percent were determined for three Stratum II samples obtained from Borings B-1 (SS-15) and B-2 (SS-12 and SS-15). These values, along with gradation results, are indicative of lean clay (CL) in accordance with USCS designations. Based correlations from moisture content results and Atterberg limits testing, these soils are considered over-consolidated and slightly compressible.

Stratum III consisted of predominantly hard native cohesive glacial till deposits encountered underlying Stratum II to depth of 81 feet in Boring B-1 (approximate Elev. 693 feet msl). Stratum III consisted predominantly of lean clay with sand and trace amounts of gravel. SPT N-values for the Stratum III soils ranged from 31 to 32 blows per foot (bpf). Unconfined compressive strength of 3.17 tsf was determined for a Stratum III sample obtained from Boring B-1 (SS-18). A liquid limit of 31 percent and plasticity index of 14 percent were determined for a Stratum III sample obtained from Boring B-1 (SS-17). These values, along with gradation results, are indicative of lean clay (CL) in accordance with USCS designations. Based correlations from moisture content results and Atterberg limits testing, these soils are considered over-consolidated and in-compressible.

Stratum IV consisted of very stiff cohesive glacial till deposits encountered underlying Stratum III to depth of 100 feet in Boring B-1 (approximate Elev. 674 feet msl). Stratum IV consisted predominantly of lean clay with varying amounts of sand and trace amounts of gravel. SPT N-values ranged from 16 to 26 blows per foot (bpf). Unconfined compressive strengths ranging from 2.5 to greater than 4.5 tsf were recorded within this stratum using a hand penetrometer (the highest obtainable reading using a calibrated hand penetrometer).

Unconfined compressive strength of 1.590 tsf was determined for a Stratum II sample obtained from Boring B-1 (SS-21). A liquid limit of 49 percent and plasticity index of 24 percent were determined for a Stratum IV sample obtained from Boring B-1 (SS-21). These values, along with gradation results, are indicative of lean clay (CL) in accordance with USCS designations. Based correlations from moisture content results and Atterberg limits testing, these soils are considered over-consolidated and slightly compressible. Boring B-1 was terminated within layer.

Stratum V consisted of medium dense granular glacial till deposits encountered underlying Stratum II to depth of 80 feet in Boring B-2 (approximate Elev. 696 feet msl. Stratum V consisted predominantly of poorly graded sand with gravel and trace amounts of silt. SPT N-value was roughly 30 bpf. Moisture content was approximately 14 percent. These values, along with gradation results, are indicative of poorly graded sand (SP) in accordance with USCS designations. Based correlations from moisture content results and Atterberg limits testing, these soils are considered and in-compressible. Boring B-1 was terminated within layer.

4.5 Groundwater Conditions

Groundwater was not initially encountered during and upon completion of the drilling operations at Borings B-1 and B-2. It should be noted that each of the borings was drilled and backfilled within the same day. As such, stabilized water levels may not have occurred over this limited time period. Instrumentation was not installed to observe long-term groundwater levels.

Based on the soil characteristics and groundwater conditions encountered in the borings, it is our opinion that the “normal” long-term groundwater table will be generally encountered at depths of approximately 50 feet or lower, corresponding to approximate Elev. 726 feet msl or deeper. However, groundwater elevations can fluctuate with seasonal and climatic influences. In particular, “perched” water may be encountered in fill materials that are underlain by relatively impermeable cohesive soils. Therefore, the groundwater conditions may vary at different times of the year from those encountered during this investigation.

5.0 DESIGN RECOMMENDATIONS

The following conclusions and recommendations are based on our understanding of the proposed construction and the data obtained during our field investigation. If the project information or location as outlined is incorrect or should change significantly, a review of these recommendations should be made by TTL. These recommendations are subject to satisfactory completion of the recommended site and subgrade preparation and fill placement operations described in Section 6.0, "Construction Recommendations."

5.1 Bridge Foundations

We understand that the existing bridges are 3-span structures, with abutments on pile foundations and piers on shallow foundations. For this specific widening project, we understand that the 2004 Bridge Design Manual (BDM) will govern in the foundation design. As such, differential settlement must be considered in the design, as detailed in the exert below from **Section 409.3.1 Widened Structures of the 2004 BDM**:

> *Differential foundation settlements shall be considered. For example, if it is required to widen a bridge adjacent to an existing spread footing, it is possible that the existing foundation has settled as much as it is going to. However, if the widened portion is placed on a new spread footing, then that portion will settle with respect to the original and distress to the structure will result. Consequently, the new portion should be placed on piling or drilled shafts in an attempt to limit differential settlement.*

Based upon the discussion above including the "attempt to limit differential settlement", there may not be an allowance for the differential settlement that is anticipated (as noted above) with shallow foundations for widening projects; nonetheless, we have provided shallow foundation design recommendations (including maximum anticipated differential settlement) for your consideration. If shallow foundations are not permitted due to design restrictions, we have also provided recommendations for pile foundations. The 2 foundation design alternatives are provided in the sections below:

5.1.1 Shallow Foundations

Based on the retrieved as-built drawings, the existing shallow pier foundations were designed for a maximum soil pressure of 2,600 psf bearing at Elev. +/- 743 feet msl with a footing width of roughly 11.25 feet. Therefore, we recommend the proposed piers for the widening be

supported on a similar shallow foundation system on the same stratum using a similar bearing capacity (2,600 psf) and foundation width (11.25 feet). We understand that due to the new standards and loading requirements or modifications in the existing structure, the bearing capacity of the widening area may vary somewhat from the existing structure; nonetheless, our calculations find that bearing capacities up to 3,000 psf are acceptable for design. Moreover, the designer may utilize linear interpolation to determine settlement between bearing capacities of 2,600 to 3,000 psf.

The table below provides estimated settlement for different bearing capacities:

Bearing Capacity (psf)	**Footing Width (ft)**	**Estimated maximum total/differential settlement (in)**
2600	11.25	0.9
3000	11.25	1.0

Settlement of the structure foundations was calculated based on conventional consolidation theory utilizing the recompression index for the over-consolidated clays. As noted in the BDM and discussed above, the differential settlement between the existing and proposed foundations is anticipated to be equal to the total settlement with a maximum range of roughly 1 inch as noted in the table above.

The bearing material should be field-verified as being native stiff to very stiff lean clay (USCS CL) consistent with what was encountered during our field explorations and shown on the attached boring logs. Although unlikely, if loose granular soils or soft cohesive soils are encountered, they will require in-place densification using a backhoe-mounted vibratory compactor (hoe-pac) or similar equipment to provide a consistent bearing stratum and reduce post-construction settlement. Otherwise, these soils could be over-excavated and replaced with new granular engineered fill or low strength mortar backfill meeting the requirements of ODOT 613. If groundwater is encountered during excavation, excessive vibratory compaction may be detrimental to the footing subgrade, and compaction by “static” methods or removal and replacement with new engineered fill would be required. Temporary lowering of elevated water levels using one or more well points will also help in modifying the granular soils in place.

We recommend that the bearing surface at the bottom of all footing excavations be inspected during construction by a TTL geotechnical engineer or qualified representative. Inspection should be performed to verify that the exposed soil conditions at the bearing elevations are consistent with the subsurface conditions encountered in the test borings and are suitable for foundation bearing. Additionally, the presence of our engineer will help facilitate the timely remediation of unsuitable soil conditions. If the results of hand penetrometer, DCP, or other strength tests indicate the exposed soil conditions are not suitable for the design bearing pressure, it may be necessary to over-excavate and backfill with engineered fill or flowable fill.

Care should be taken where over-excavation is required in the proximity of existing foundations such that the existing foundations are not undermined. Temporary bracing or sheeting may be required if over-excavation is required in these areas.

All foundations should be constructed at a minimum frost penetration depth of 3½ feet below finished exterior grades (assumed at Elev. 743 feet msl). It should be noted that use of trench footings (i.e., placement of foundation concrete without forming) is acceptable due to the cohesive nature of the bearing soils encountered in both Borings B-1 and B-2.

5.1.2 Driven Pile Foundations

Based on the retrieved as-built drawings, the abutment piles are indicated to be HP10x42 H-piles and have estimated lengths of 51 feet below approximate Elev. 773 feet msl along Pile Line "K," as well as 45 feet below approximate Elev. 765.5 feet msl along Pile Line "M." the abutment piles are indicated to have a maximum load of 40 tons. Additionally, the piles along Pile Line "M" are indicated at a battered ratio of 1 horizontal to 4 vertical (1H:4V). There appear to be roughly a 1-foot change in grades between the eastern and western abutments and the pile stickup is shown to be roughly 1 feet vertical within each footing.

Loads for the bridge expansion were unavailable at the time of preparing this report, so our analyses considered the maximum Ultimate Bearing Value of 150 tons that is prescribed by ODOT for HP 10x42 pile size, as well as lower Ultimate Bearing Values. Table 5.1.2.A show the pile driving elevation that was utilized in our analysis. These pile driving elevations were depicted from the as built drawing that were provided through DGL.

Table 5.1.2.A. Bottom of Pile Cap Elevation			
Abutment	**K Line Assumed Bottom of Pile Cap Elevation (ft)**	**M Line Assumed Bottom of Pile Cap Elevation (ft)**	**Pier Assumed Bottom of Pile Cap Elevation (ft)**
Eastern	771.5	765.0	750.0
Western	773.0	765.5	749.0

We anticipate that the bridge expansion will consist of the same structural elements and loading as the existing structure, and have performed our evaluation as such.

Pile resistance analyses were performed for each substructure location using FHWA pile analysis software DRIVEN. In the DRIVEN analyses, adhesion for cohesive soils was modeled using the Tomlinson method (1979), and capacities in the "cohesionless" soils were determined by the Peck, Hanson, and Thornburn method (1974), using SPT N-values to estimate the internal angle of friction (ϕ).

Results of the DRIVEN analyses are attached to this report, and are summarized in the following tables. Recommended minimum tip bearing elevations for the H-piles were determined from DRIVEN analyses that included a factor of safety of 2, assuming load tests will be performed. The summary table includes the estimated pile length and order length for each abutment. The estimated pile length includes the calculated length from anticipated pile cut-off elevation to pile tip elevation, rounded upward to the nearest 5 feet. The order length is the estimated length plus 5 feet.

Table 5.1.2.B. Eastern Abutment Pile Foundation Recommendations – Existing Bridge Structure Pile Line "K"							
Pile Type and Size	**Assumed Bottom of Pile Cap Elevation (feet)**	**Assumed Cut-Off Pile Elevation (feet)**	**Ultimate Bearing Value (tons)**	**Service Load (tons)**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
HP 10x42	771.5	772.5	150	75	694.0	80	85
			100	50	718.0	55	60
			80	40	727.5	45	50
			40	20	746.5	25	30

Table 5.1.2.C. Eastern Abutment Pile Foundation Recommendations – Existing Bridge Structure Pile Line "M"							
Pile Type and Size	**Assumed Bottom of Pile Cap Elevation (feet)**	**Assumed Cut-Off Pile Elevation (feet)**	**Ultimate Bearing Value (tons)**	**Service Load (tons)**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
HP 10x42	765.0	766.0	150	75	691.5	75	80
			100	50	715.5	50	55
			80	40	725.0	40	45
			40	20	744.0	25	30

Table 5.1.2.D. Eastern Piers Pile Foundation Recommendations							
Pile Type and Size	**Assumed Bottom of Pile Cap Elevation (feet)**	**Assumed Cut-Off Pile Elevation (feet)**	**Ultimate Bearing Value (tons)**	**Service Load (tons)**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
HP 10x42	750.0	751.0	150	75	680.0	70	75
			100	50	702.5	50	55
			80	40	712.5	40	45
			40	20	731.5	20	25

Table 5.1.2.E. Western Abutment Pile Foundation Recommendations – Existing Bridge Structure Pile Line "K"							
Pile Type and Size	**Assumed Bottom of Pile Cap Elevation (feet)**	**Assumed Cut-Off Pile Elevation (feet)**	**Ultimate Bearing Value (tons)**	**Service Load (tons)**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
HP 10x42	773.0	774.0	150	75	704.5	70	75
			100	50	728.9	50	55
			80	40	738.0	40	45
			40	20	754.5	25	30

Table 5.1.2.F. Western Abutment Pile Foundation Recommendations – Existing Bridge Structure Pile Line "M"							
Pile Type and Size	**Assumed Bottom of Pile Cap Elevation (feet)**	**Assumed Cut-Off Pile Elevation (feet)**	**Ultimate Bearing Value (tons)**	**Service Load (tons)**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
HP 10x42	765.5	766.5	150	75	695.5*	70*	75*
			100	50	718.5	50	55
			80	40	728.0	40	45
			40	20	745.0	25	30

*: Values extrapolated from Boring B-1

Table 5.1.2.G. Western Piers Pile Foundation Recommendations							
Pile Type and Size	**Assumed Bottom of Pile Cap Elevation (feet)**	**Assumed Cut-Off Pile Elevation (feet)**	**Ultimate Bearing Value (tons)**	**Service Load (tons)**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
HP 10x42	749.0	750.0	150	75	679.0*	70*	75*
			100	50	702.0	50	55
			80	40	712.0	40	45
			40	20	731.0	20	25

*: Values extrapolated from Boring B-1

DRIVEN analyses performed for each substructure location indicate that the HP 10x42 piles are expected to generally drive into the Stratum I, II or III consisting of predominantly stiff to hard cohesive soil to achieve the required resistance.

Battered piles are indicated for this project, it should be noted that the estimated lengths in the above table do not include additional allowance for battered piles. In any case, additional allowance for battered piles is expected to be on the order of only 1 foot for the indicated lengths, within the 5-foot add-on for order length determination, using piles battered at 1 horizontal to 4 vertical (1H:4V).

Driven piles should be installed in accordance with ODOT Construction and Material Specifications (CMS) Items 507 and 523. The bearing capacity of each pile must be substantiated in the field with dynamic driving records in accordance to ODOT Item 507.05, specifically using the results of dynamic pile testing as specified in Item 523. It should be also noted that the Ohio Building Code (OBC) requires load tests for any piles with allowable compressive load above 40 tons and, in the case of driven piles, the OBC also requires wave equation analysis to evaluate stresses during driving. For driven piles, dynamic load tests may be performed using a pile driving analyzer, in accordance with ASTM D 4945, "Standard Test Method for High-Strain Dynamic Testing of Piles." Dynamic load testing is quicker and less expensive that static load testing, and has become the more prevalent test method for driven piles. During the installation of the first pile at each of the bridge substructures, if the ultimate bearing value (R) of a driven pile does not meet or exceed the bearing capacity presented on the construction plans we recommend a pile setup period of 1 week for re-strike. It is our experience that pile setup can occur within a few days, but more typically occurs within one to three weeks. If pile capacity is still not met upon re-strike, static load test could be performed on a test pile to evaluate the ultimate bearing capacity of the pile. The static load test should be performed in accordance with ODOT Item 506 and ASTM D 1143, "Standard Test Method for Piles Under Static Axial Compressive Load." Driven piles should be installed under adequate specifications and monitored by a qualified geotechnical engineer.

Evidence of cobbles or boulders was not encountered in the limited borings drilled for this investigation. However, the presence of cobbles or boulders within the glacial till encountered in the lower soil profile at this site would not be unusual for this region, and these conditions could hamper pile-driving operations and possibly damage some piles. Review of bedrock topography maps indicates that the bedrock surface is on the order of Elevs. 600 feet msl in the vicinity of the project site, nominally 150 to 185 feet below existing grades. Therefore, bedrock is not anticipated to be encountered based on the pile order lengths recommended above. If piles are observed to meet refusal at a depth/elevation less than that indicated above,

boulder obstruction may be indicated. For an isolated occurrence, one or more replacement piles could be driven with relatively little additional cost on pile cap re-design.

5.2 Groundwater Control

As stated previously, groundwater was not encountered during or upon completing the drilling operations in Borings B-1 and B-2.

Based on the soil and groundwater conditions encountered in the borings, it is our opinion that the "normal" long-term groundwater table will be generally encountered at depths of approximately 50 feet or deeper, corresponding to approximate Elev. 726 or deeper.

It is our experience that adequate control of groundwater seepage or surface water run-off into shallow excavations should be achievable by minor dewatering systems, such as pumping from prepared sumps. Although excavations extending below the groundwater table are not expected for this project, if such excavations are performed, installation of point wells in addition to pumping from prepared sumps would likely be required for groundwater management. In the event excessive seepage is encountered during construction, TTL may be notified to evaluate whether other dewatering methods are required. Additionally, the contractor will need to exercise diligence to control seepage and runoff to maintain a stable subgrade.

5.3 Excavations and Temporary Slopes

The sides of temporary excavations for construction should be adequately sloped to provide stable sides and safe working conditions. Otherwise, the excavation must be properly braced against lateral movements. In any case, applicable OSHA safety standards must be followed.

Based on the test borings, it is likely that excavations will encounter a range of soil conditions that include the following OSHA designations:

- Type A soils (cohesive soils with unconfined compressive strengths of 3,000 pounds per square foot (psf) or greater),
- Type B soils (cohesive soils with unconfined compressive strengths greater than 1,000 psf but less than 3,000 psf), and

For temporary excavations in Type A and B soils, side slopes must be no steeper than 1 horizontal to 1 vertical (1H:1V) and 1½H:1V, respectively. For situations where a higher

strength soil is underlain by a lower strength soil and the excavation extends into the lower strength soil, the slope of the entire excavation is governed by that required for the lower strength soil. In all cases, flatter slopes may be required if lower strength soils or adverse seepage conditions are encountered during construction.

For permanent excavations and slopes, we recommend that grades be no steeper than 3H:1V without a more extensive geotechnical evaluation of the proposed construction plans and site conditions.

6.0 CONSTRUCTION RECOMMENDATIONS

6.1 Site Preparation

Site preparation activities should include the removal of topsoil, root mats, vegetation, pavements, and other deleterious non-soil materials from all proposed construction areas. Suitable topsoil may be stockpiled for later use in landscaped areas. The actual amount of required stripping should be determined in the field by a geotechnical engineer or qualified representative.

6.2 Fill

Material for engineered fill or backfill required to achieve design grades should meet ODOT Item 203 "Embankment Fill" placement and compaction requirements. In general, suitable fills may consist of any non-organic soils having a maximum dry density as determined by Supplement 1015 of 100 pounds per cubic foot (pcf) or greater. On-site soils may be used as engineered fill materials provided that they are free of organic matter, debris, excessive moisture, and rock or stone fragments larger than 3 inches in diameter. Depending on seasonal conditions, the on-site soils may be wet of optimum and may require scarification and aeration to achieve satisfactory compaction. If the construction schedule does not allow for scarification and aeration activities, it may be more practical or economical to utilize imported granular fill.

Fill should be placed in uniform layers not more than 8 inches thick (loose measure) and adequately keyed into stripped and scarified soils. All fill placed within pavement areas should be compacted to a dry density consistent with the requirements of ODOT Item 203, based on the maximum dry density as determined by Supplement 1015.

Fill placement shall be performed as symmetrical as possible across the entire site to prevent lateral stresses from developing on the existing bridge piers and their foundation components. Compaction of the new fill placement around the existing bridge piers and abutments shall be accomplished through the use of portable compaction equipment (hand operated tampers or other equipment approved by the engineer). Furthermore, it is recommended to that self-propelled heavy compaction equipment be kept at least 5 feet away from the existing substructure elements.

The on-site soils consist of native cohesive soils. For the cohesive soils, a sheepsfoot roller should provide the most effective soil compaction. For granular soils, or if new granular

engineered fill is placed, a vibratory smooth-drum roller would be required to provide effective compaction.

Scarified subgrade soils and all fill material should be within 3 percent of the optimum moisture content to facilitate compaction. Furthermore, fill material should not be frozen or placed on a frozen base. It is recommended that all earthwork and site preparation activities be conducted under adequate specifications and properly monitored in the field by a qualified geotechnical testing firm.

6.3 Foundation Excavations

As mentioned previously, shallow foundations used to support the structure should have a detailed footing inspection performed in each spread or column foundation excavation. These inspections should be performed by a TTL geotechnical engineer or qualified representative to verify that the exposed materials are similar to those encountered in the borings and/or the engineered fill has been satisfactorily placed and compacted.

We recommend that the foundation excavations be concreted as soon as practical after they are excavated and that water not be allowed to pond in any excavation. If it is necessary to leave the bearing surface open for any extended period of time, we recommend that a thin mat of lean concrete be placed over the bottom of the excavation to reduce damage to the surface from weather or construction. Foundation concrete should not be placed on frozen or saturated subgrade.

Additional foundation excavation recommendations are presented in Section 5.1.

7.0 QUALIFICATIONS OF RECOMMENDATIONS

Our evaluation of construction conditions and recommendations for the bridge widening were based on our understanding of the site and project information and the data obtained during our field investigation. The general subsurface conditions were based on interpretation of the subsurface data at specific boring locations. Regardless of the thoroughness of a subsurface investigation, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers should observe earthwork and foundation construction to confirm that the conditions anticipated in design are noted. Otherwise, TTL assumes no responsibility for construction compliance with the design concepts, specifications, or recommendations.

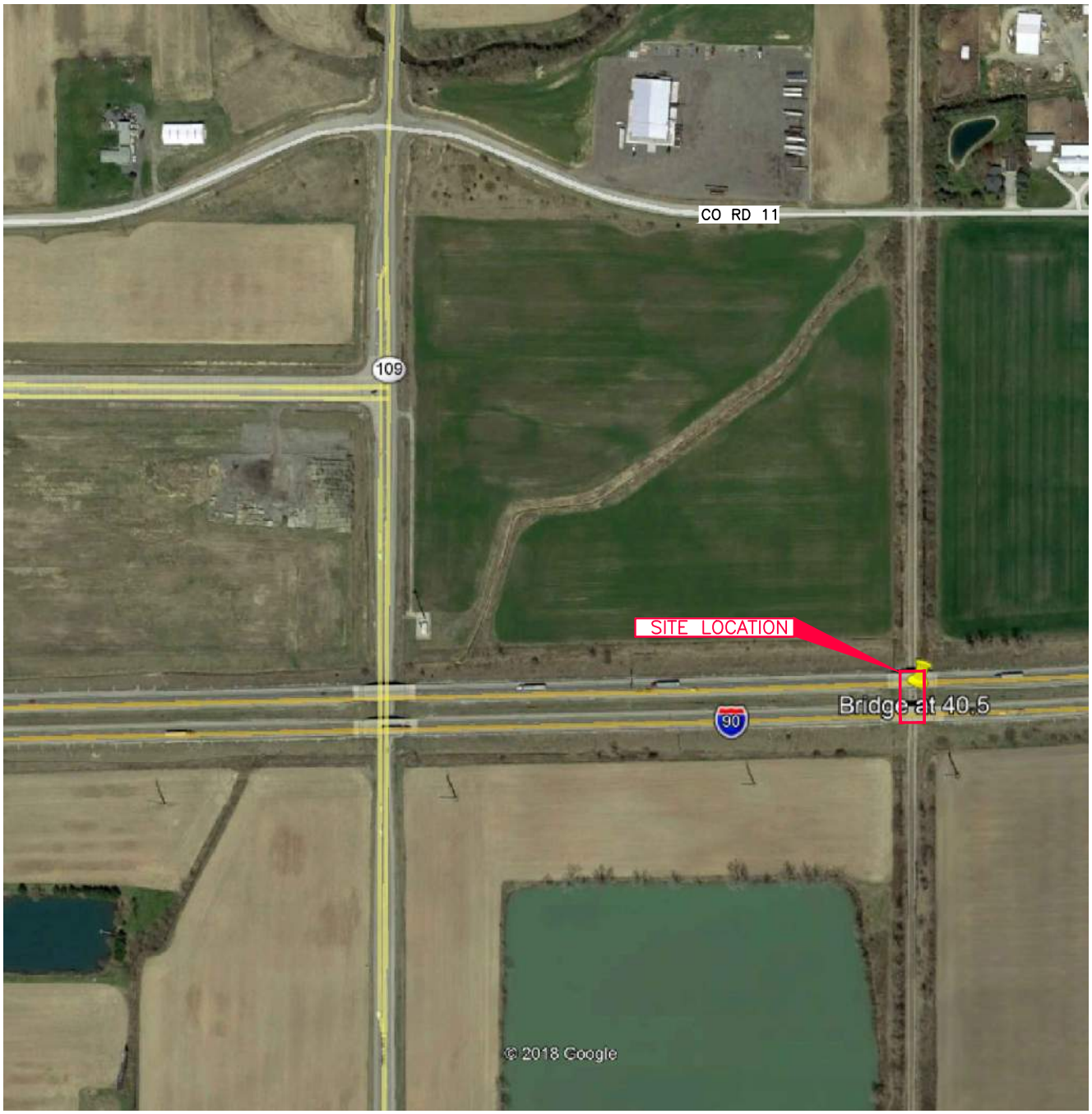
The evaluations and recommendations presented in this report have been formulated on the basis of reported or assumed data relating to the location and finished grades for the proposed structure. Any significant change in this data in the final design plans should be brought to our attention for review and evaluation with respect to the prevailing subsoil conditions.

The nature and extent of variations between the borings may not become evident until the course of construction. If such variations are encountered, it will be necessary to reevaluate the recommendations of this report after on-site observations of the conditions.

Our professional services have been performed and our findings have been derived in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. TTL is not responsible for the conclusions, opinions, or recommendations of others based on this data.

Plates

Plate 1.0	**Site Location Map**
Plate 2.0	**Test Boring Location Plan**
Plate 3.0	**Pavement Core Location Plan**
Plate 3.1	**Pavement Core Location Plan**
Plate 3.2	**Pavement Core Location Plan**



LEGEND

APPROXIMATE SITE LOCATION

N

APPROXIMATE SCALE – FEET

0 400 800

PLATE 1.0
SITE LOCATION MAP

OTIC 71–19–01 DECK REPLACEMENT EASTBOUND AND WESTBOUND MP 40.5 OVER DETROIT TOLEDO AND IRONTON (DTI) RAILWAY RIGHT OF WAY (ROW)
FULTON COUNTY, OHIO

PREPARED FOR
DGL CONSULTING ENGINEERS, LLC
MAUMEE, OHIO

DRAWN	TRR/12–17–19	CHECKED	
REVISED		APPROVED	
JOB NO.	1852802		
DRAWING NUMBER	**1852802–01.1G**		

TTL associates inc
Environmental, Geotechnical Engineering & Testing

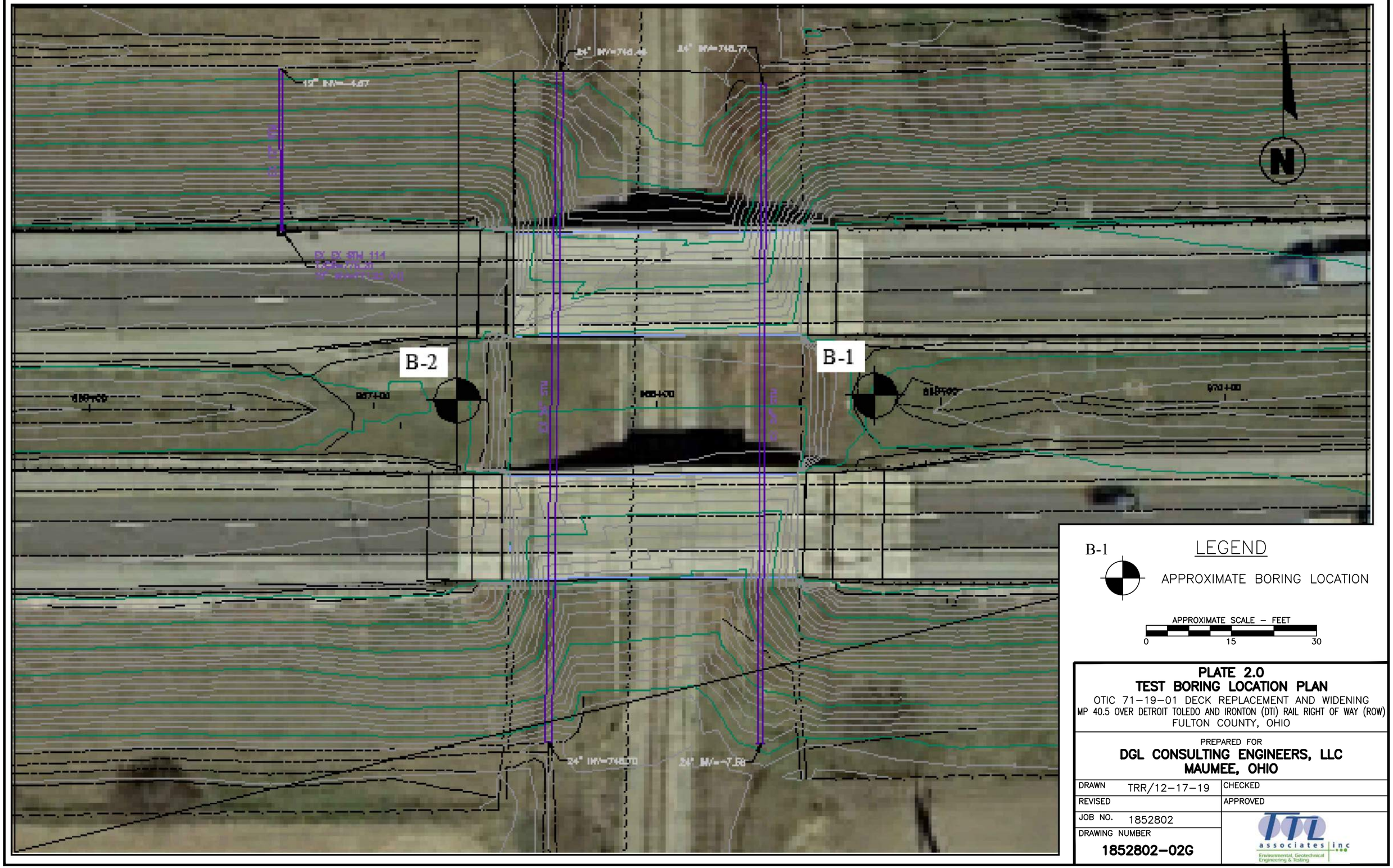


PLATE 2.0
TEST BORING LOCATION PLAN
OTIC 71–19–01 DECK REPLACEMENT AND WIDENING
MP 40.5 OVER DETROIT TOLEDO AND IRONTON (DTI) RAIL RIGHT OF WAY (ROW)
FULTON COUNTY, OHIO

PREPARED FOR
DGL CONSULTING ENGINEERS, LLC
MAUMEE, OHIO

DRAWN TRR/12–17–19	CHECKED
REVISED	APPROVED
JOB NO. 1852802	TTL associates inc — Environmental, Geotechnical Engineering & Testing
DRAWING NUMBER **1852802–02G**	

LEGEND

C-1 APPROXIMATE LOCATION OF PAVEMENT CORE

APPROXIMATE SCALE – FEET

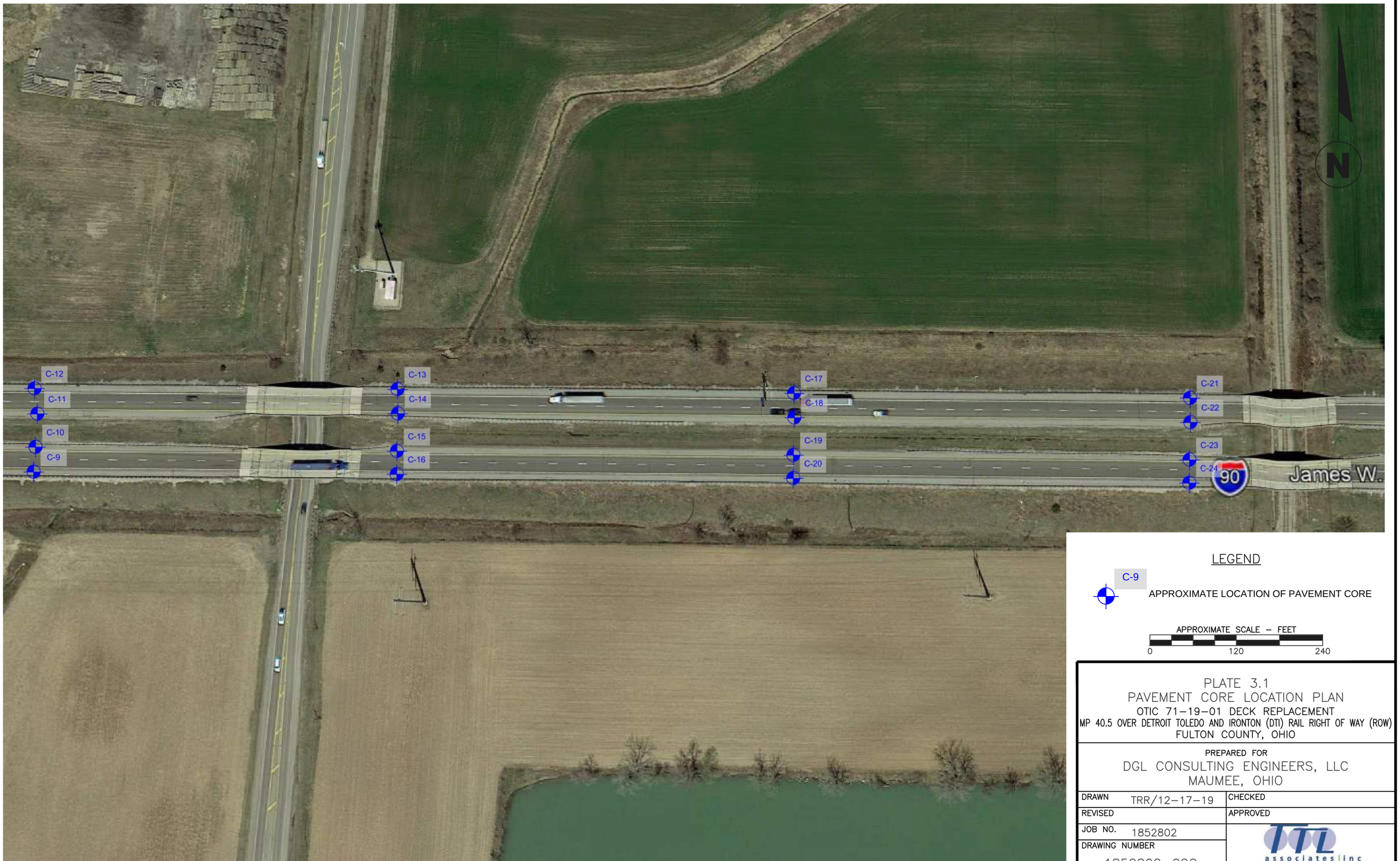
0 120 240

PLATE 3.0
PAVEMENT CORE LOCATION PLAN
OTIC 71–19–01 DECK REPLACEMENT
MP 40.5 OVER DETROIT TOLEDO AND IRONTON (DTI) RAIL RIGHT OF WAY (ROW)
FULTON COUNTY, OHIO

PREPARED FOR
DGL CONSULTING ENGINEERS, LLC
MAUMEE, OHIO

DRAWN TRR/12–17–19	CHECKED
REVISED	APPROVED
JOB NO. 1852802	
DRAWING NUMBER 1852802–02G	

TTL associates inc
Environmental, Geotechnical Engineering & Testing



LEGEND

C-9 APPROXIMATE LOCATION OF PAVEMENT CORE

APPROXIMATE SCALE – FEET

0 120 240

PLATE 3.1
PAVEMENT CORE LOCATION PLAN
OTIC 71–19–01 DECK REPLACEMENT
MP 40.5 OVER DETROIT TOLEDO AND IRONTON (DTI) RAIL RIGHT OF WAY (ROW)
FULTON COUNTY, OHIO

PREPARED FOR
DGL CONSULTING ENGINEERS, LLC
MAUMEE, OHIO

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REVISED	APPROVED
JOB NO. 1852802	TTL associates inc. Environmental, Geotechnical Engineering & Testing
DRAWING NUMBER 1852802–02G	

LEGEND

C-21 APPROXIMATE LOCATION OF PAVEMENT CORE

APPROXIMATE SCALE – FEET

0 120 240

PLATE 3.2
PAVEMENT CORE LOCATION PLAN
OTIC 71–19–01 DECK REPLACEMENT
MP 40.5 OVER DETROIT TOLEDO AND IRONTON (DTI) RAIL RIGHT OF WAY (ROW)
FULTON COUNTY, OHIO

PREPARED FOR
DGL CONSULTING ENGINEERS, LLC
MAUMEE, OHIO

DRAWN TRR/12–17–19	CHECKED
REVISED	APPROVED
JOB NO. 1852802	TTL associates inc Environmental, Geotechnical Engineering & Testing
DRAWING NUMBER 1852802–02G	

APPENDIX A

Log of Test Borings

TTL Associates, Inc.
1915 N 12th Street
Toledo, Ohio 43624
Telephone: 419-324-2222
Fax: 419-241-1808

BORING NUMBER B-1

CLIENT DGL
PROJECT NAME OTIC 71-19-01
PROJECT NUMBER 1852802
PROJECT LOCATION Delta, OH
DRILLING CONTRACTOR TTL Associates CW JP
RIG NO. 111
GROUND ELEVATION 774 ft
DRILLING METHOD 4-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 11/20/19
COMPLETED 11/20/19
AT TIME OF DRILLING None
LOGGED BY KKC
CHECKED BY
AT END OF DRILLING None
NOTES A bulk sample was taken from auger cuttings and 0 - 5'.
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL (20 40 60 80) / SPT N VALUE (20 40 60 80)
	0	TOPSOIL - 8 Inches (0.7')						
		FILL - Moist Stiff Brown/Gray LEAN CLAY w/Sand, Trace Gravel, Brick Fragments, and Organics (3.0')	SS 1	100	5-5-6 (11)	>4.5		12
770	5	FILL - Moist Loose Brown POORLY GRADED SAND w/Silt (SP/SM) (6.0')	SS 2	100	2-4-5 (9)	NP		9
		FILL - Moist Dense Brown POORLY GRADED SAND w/Silt (SP/SM)	SS 3	100	18-22-22 (44)	NP		11
765	10		SS 4	100	7-17-24 (41)	NP		9
760	15	@14.2': Brown/Gray	SS 5	100	6-16-22 (38)	NP		11
		FILL - Moist Medium Dense Brown/Gray POORLY GRADED SAND w/Silt (SP/SM) (18.0')						
755	20		SS 6	100	7-11-14 (25)	NP		9
		FILL - Moist Medium Dense Gray SILTY SAND (SM) (22.0')						
750	25		SS 7	100	6-12-14 (26)	NP		18
745	30	Moist Stiff to Very Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL) (28.8')	SS 8	100	3-5-8 (13)	1.80	107	21

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BORING NUMBER B-1

CLIENT DGL **PROJECT NAME** OTIC 71-19-01

PROJECT NUMBER 1852802 **PROJECT LOCATION** Delta, OH

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL 20 40 60 80 ▲ SPT N VALUE ▲ 20 40 60 80
			Moist Stiff to Very Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL) *(continued)*						
			@31': Very Stiff, Brown						
740	35			SS 9	100	6-12-14 (26)	>4.5		14
			@36': Gray						
735	40			SS 10	100	8-12-16 (28)	>4.5		13
730	45		@44': Stiff	SS 11	100	4-6-10 (16)	1.65	118	15
			48.5'						
725	50		Moist Vert Stiff Brown/Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 12	100	5-10-14 (24)	3.75		15
720	55		@53.5': Gray	SS 13	100	5-10-15 (25)	3.75	117	15
715	60			SS 14	100	5-8-15 (23)	3.75		16
710	65			SS 15	100	7-10-14 (24)	>4.5	118	15

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Toledo, Ohio 43624
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Fax: 419-241-1808

BORING NUMBER B-1

CLIENT DGL **PROJECT NAME** OTIC 71-19-01

PROJECT NUMBER 1852802 **PROJECT LOCATION** Delta, OH

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL (20 40 60 80) / ▲ SPT N VALUE ▲ (20 40 60 80)
			Moist Vert Stiff Brown/Gray LEAN CLAY w/Sand and Trace Gravel (CL) *(continued)*						
705	70			SS 16	100	7-12-15 (27)	3.75		15
			73.5'						
700	75		Moist Hard Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 17	100	5-13-19 (32)	NI		15
695	80			SS 18	100	9-15-16 (31)	3.17	117	16
			81.0'						
			Moist Very Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)						
690	85			SS 19	100	4-11-10 (21)	2.50	109	25
685	90			SS 20	100	5-8-11 (19)	2.75		25
680	95		@93.5': w/Trace Sand	SS 21	100	4-6-10 (16)	1.59	95	29
675	100		100.0'	SS 22	100	3-10-16 (26)	>4.5		14
			Bottom of hole at 100.0 feet.						

TTL Associates, Inc.
1915 N 12th Street
Toledo, Ohio 43624
Telephone: 419-324-2222
Fax: 419-241-1808

BORING NUMBER B-2

CLIENT DGL
PROJECT NAME OTIC 71-19-01
PROJECT NUMBER 1852802
PROJECT LOCATION Delta, OH
DRILLING CONTRACTOR TTL Associates CW JP
RIG NO. 111
GROUND ELEVATION 776 ft
DRILLING METHOD 4-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 11/21/19 **COMPLETED** 11/21/19
AT TIME OF DRILLING 79.7 ft / Elev 696.3 ft
LOGGED BY KKC **CHECKED BY**
AT END OF DRILLING None
NOTES A bulk sample was taken from auger cuttings and 0 - 5'.
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL (20 40 60 80) / SPT N VALUE (20 40 60 80)
	0	TOPSOIL - 8 Inches (0.7')						
775		FILL - Moist Stiff Brown/Gray LEAN CLAY w/Sand, Trace Gravel, Organics, and Calcite Stain Seam	SS 1	89	7-7-7 (14)	>4.5		14
		@3': w/Trace Iron Oxide Stain Seam	SS 2	100	3-5-7 (12)	>4.5		14
	5	(5.8')						
770		FILL - Moist Very Stiff Brown/Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 3	100	9-10-12 (22)	>4.5		15
	10		ST 1	83				
765								
	15		SS 4	100	6-7-9 (16)	>4.5		15
760			ST 2	92				
	20	@18.5': Gray	SS 5	100	5-9-13 (22)	>4.5		15
755								
	25		SS 6	100	5-8-11 (19)	>4.5		14
750		(26.0') FILL - Moist Very Stiff Brown/Gray SANDY LEAN CLAY w/Trace Gravel (CL) (28.0')	ST 3	50		>4.5	115	15
	30	FILL - Moist Loose Brown/Gray CLAYEY SAND w/Trace Gravel (SC)	SS 7	100	3-4-5 (9)	NP		21
745		(31.0')						

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Toledo, Ohio 43624
Telephone: 419-324-2222
Fax: 419-241-1808

BORING NUMBER B-2

CLIENT DGL **PROJECT NAME** OTIC 71-19-01

PROJECT NUMBER 1852802 **PROJECT LOCATION** Delta, OH

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL (20 40 60 80) / ▲ SPT N VALUE ▲ (20 40 60 80)
745			Moist Stiff to Very Stiff Brown SANDY LEAN CLAY w/Trace Gravel (CL)	ST 4	96			102	22
			33.5'						
	35		Moist Stiff to Very Stiff Brown LEAN CLAY w/Sand and Trace Gravel (CL)	SS 8	100	3-6-11 (17)	2.94	113	15
740									
			38.8'						
	40		Moist Very Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 9	100	7-12-14 (26)	>4.5		14
735									
	45			SS 10	100	5-11-11 (22)	>4.5		15
730									
	50			SS 11	100	5-8-13 (21)	>4.5		15
725									
	55			SS 12	100	5-8-12 (20)	2.88	114	15
720									
	60			SS 13	100	5-12-13 (25)	4.00		15
715									
	65			SS 14	100	4-9-11 (20)	>4.5		15
710									

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Toledo, Ohio 43624
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Fax: 419-241-1808

BORING NUMBER B-2

CLIENT DGL **PROJECT NAME** OTIC 71-19-01

PROJECT NUMBER 1852802 **PROJECT LOCATION** Delta, OH

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL 20 40 60 80 ▲ SPT N VALUE ▲ 20 40 60 80
			Moist Very Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL) *(continued)*						
	70			SS 15	100	4-10-14 (24)	3.63	118	15
705									
	75			SS 16	100	5-11-13 (24)	3.50		15
700									
	80		79.7'	SS 17	100	10-13-17 (30)	3.50		14
			Moist Medium Dense Gray POORLY GRADED SAND w/Gravel and Trace Silt (SP) 80.0'						

Bottom of hole at 80.0 feet.

APPENDIX B

Legend Key

LEGEND KEY

Unified Soil Classification System Soil Symbols

- GW - WELL GRADED GRAVEL Includes Gravel-Sand mixtures, little or no fines.
- GP - POORLY GRADED GRAVEL Includes Gravel-Sand mixtures, little or no fines.
- GM - SILTY GRAVEL Includes Gravel-Sand-Silt mixtures.
- GC - CLAYEY GRAVEL Includes Gravel-Sand-Clay mixtures.
- SW - WELL GRADED SAND Includes Gravelly Sands, little or no fines.
- SP - POORLY GRADED SAND Includes Gravelly Sands, little or no fines.
- SM - SILTY SAND Includes Sand-Silt mixtures.
- SC - CLAYEY SAND Includes Sand-Clay mixtures.
- ML - SILT Includes Silt with Sand and Sandy Silt.
- CL - LEAN CLAY Includes Sandy Lean Clay and Lean Clay with Sand and Gravel.
- MH - ELASTIC SILT Includes Sandy Elastic Silt and Elastic Silt with Sand.
- CH - FAT CLAY Includes Sandy Fat Clay and Fat Clay with Sand.
- CL-ML - SILTY CLAY Includes Clayey Silt of low plasticity.
- OL - ORGANIC SILT and ORGANIC CLAY of low plasticity.
- OH - ORGANIC SILT and ORGANIC CLAY of medium to high plasticity.
- Pt - PEAT Includes humus, swamp and other soils with high organic content.
- FILL MATERIAL - Includes controlled and non-controlled soil and non-soil materials.
- TOPSOIL
- ASPHALT - Bituminous Asphalt
- CONCRETE - Includes broken concrete rubble.

Sample Symbols

- SS - Split Spoon
- ST - Shelby Tube
- RC - Rock Core
- GS - Geoprobe Sleeve
- AU - Auger Cuttings
- GB - Grab

Notes:

1. Exploratory borings were drilled on November 20 and 21, 2019, using 4¼ -inch diameter hollow-stem augers.

2. These logs are subject to the limitations, conclusions, and recommendations in the report and should not be interpreted separate from the report.

3. The test borings were located in the field by TTL Associates, Inc. in accordance with a proposed boring location plan provided by DGL.

4. Unconfined Compressive Strength (tsf):
   NP = Non-Plastic
   NI = Not Intact

APPENDIX C

Pavement Core Photographic Logs

CORE LOG for C-1

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019

ASPHALT THICKNESS (in)	=	8
STONE (in)	=	17
ENCOUNTERED SUBGRADE MATERIALS	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-2

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019

ASPHALT THICKNESS (in)	=	4.5
STONE (in)	=	13
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-3

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019

ASPHALT THICKNESS (in)	=	10
STONE (in)	=	15
ENCOUNTERED SUBGRADE MATERIALS	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

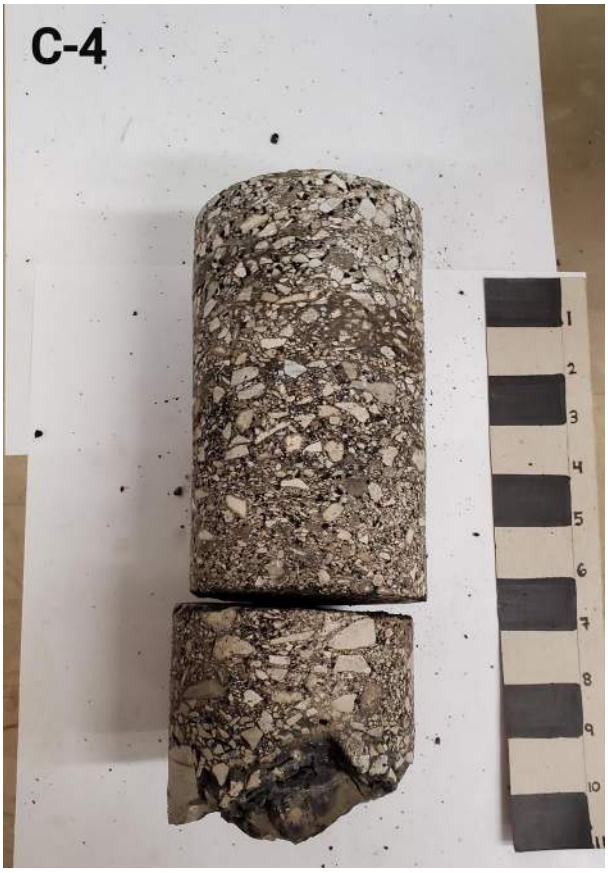
CORE LOG for C-4

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019



ASPHALT THICKNESS (in)	=	10.5
STONE (in)	=	18
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-5

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	6.5
STONE (in)	=	7
ENCOUNTERED SUBGRADE MATERIAL	=	Clayey
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-6

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019

ASPHALT THICKNESS (in)	=	11
STONE (in)	=	13
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

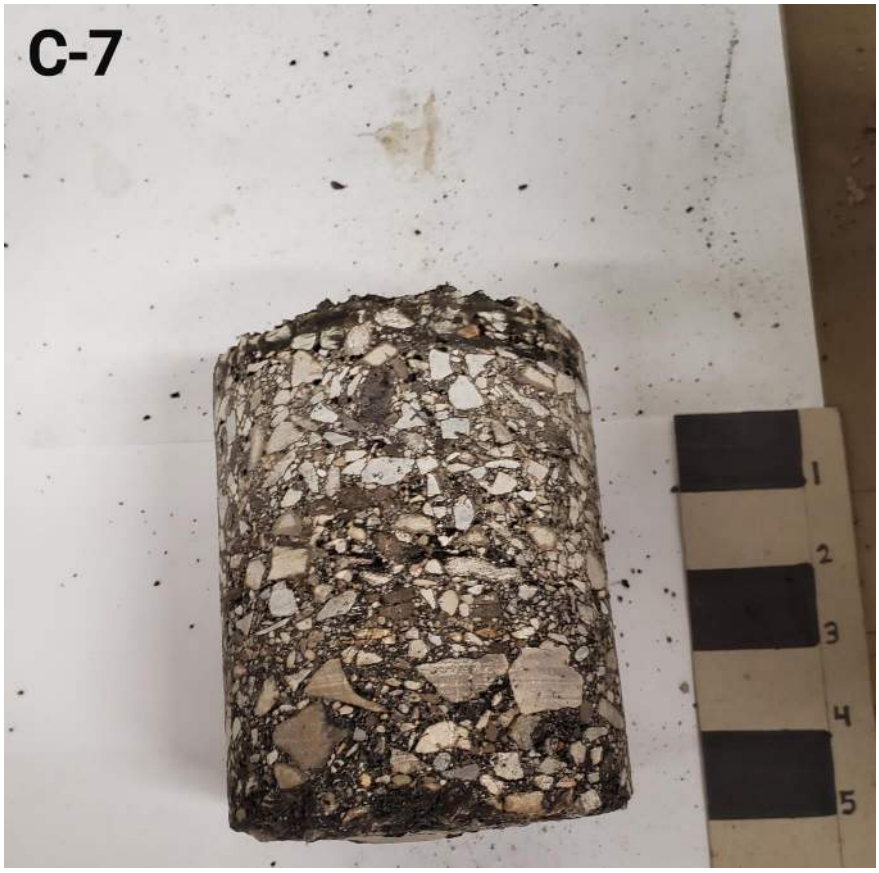
CORE LOG for C-7

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019



ASPHALT THICKNESS (in)	=	5
STONE (in)	=	7.5
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-8

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 26, 2019

ASPHALT THICKNESS (in)	=	8
STONE (in)	=	9
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-9

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	5.5
STONE (in)	=	6
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-10

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019

ASPHALT THICKNESS (in)	=	5
STONE (in)	=	10
ENCOUNTERED SUBGRADE MATERIAL	=	Clayey
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

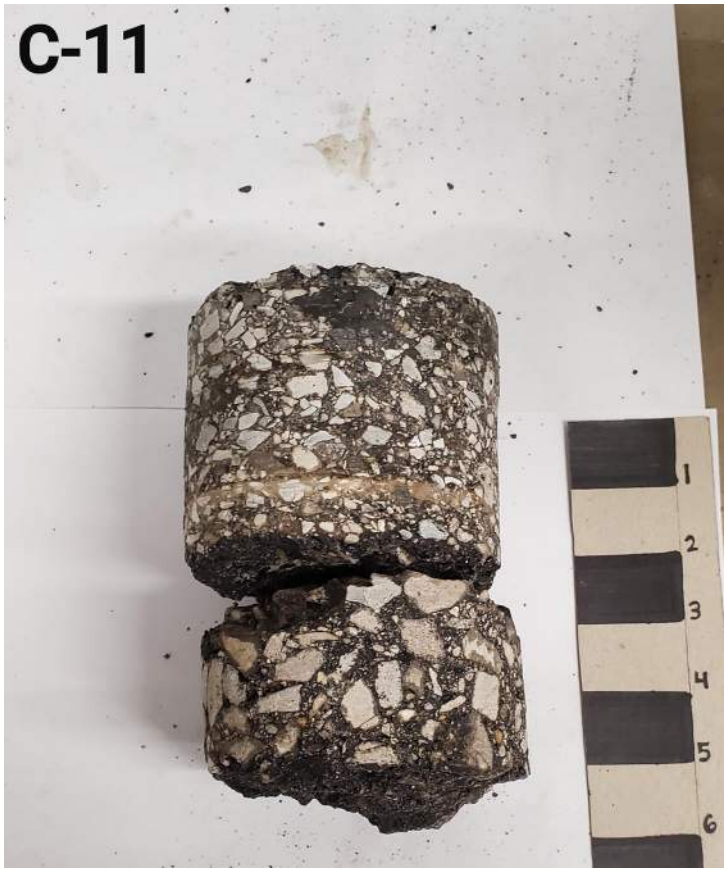
CORE LOG for C-11

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019



ASPHALT THICKNESS (in)	=	5
STONE (in)	=	8.5
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-12

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 26, 2019

ASPHALT THICKNESS (in)	=	8
STONE (in)	=	10.5
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-13

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 26, 2019

ASPHALT THICKNESS (in)	=	7.5
STONE (in)	=	8
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-14

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	7
STONE (in)	=	11
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-15

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019

ASPHALT THICKNESS (in)	=	4
STONE (in)	=	6
ENCOUNTERED SUBGRADE MATERIAL	=	Clayey
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-16

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	6
STONE (in)	=	7.5
ENCOUNTERED SUBGRADE MATERIAL	=	Clayey
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-17

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 26, 2019

ASPHALT THICKNESS (in)	=	10
STONE (in)	=	11
ENCOUNTERED SUBGRADE MATERIAL	=	Clayey
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-18

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	9
STONE (in)	=	10
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-19

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019

ASPHALT THICKNESS (in)	=	8
STONE (in)	=	10
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-20

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	9
STONE (in)	=	10
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

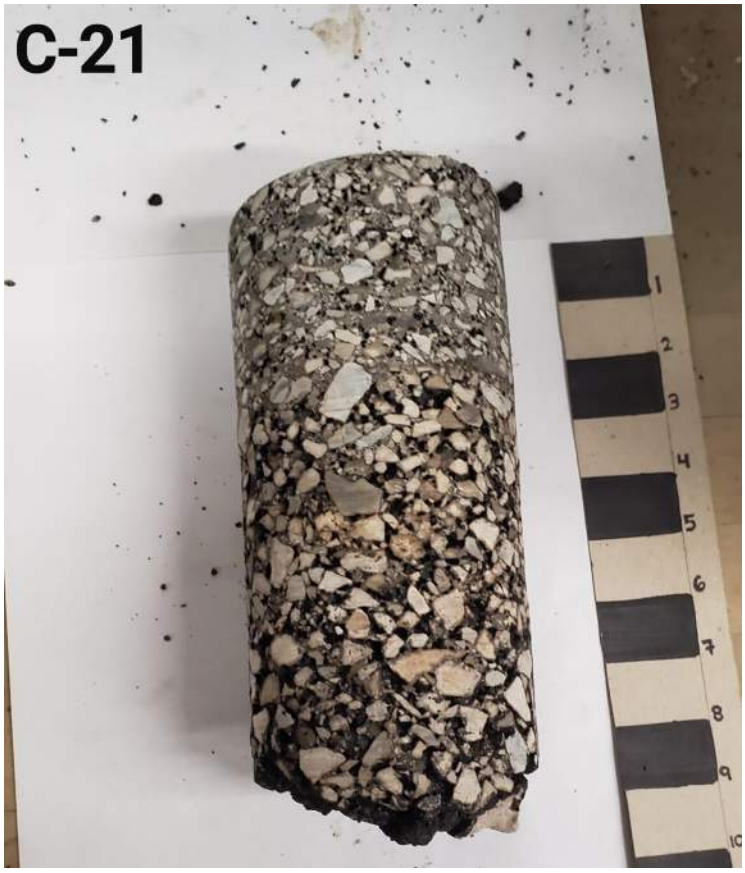
CORE LOG for C-21

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 26, 2019



ASPHALT THICKNESS (in)	=	9
STONE (in)	=	11
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-22

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	4
STONE (in)	=	7
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-23

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 26, 2019

ASPHALT THICKNESS (in)	=	5
STONE (in)	=	6
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-24

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	8
STONE (in)	=	9
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-25

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	6
STONE (in)	=	8
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-26

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019

ASPHALT THICKNESS (in)	=	7
STONE (in)	=	9
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-27

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	4
ASPHALT w/CONCRETE (in)	=	2
STONE (in)	=	8
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-28

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 26, 2019

ASPHALT THICKNESS (in)	=	10.25
STONE (in)	=	13
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-29

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	7.5
CONCRETE w/ASPHALT (in)	=	3
STONE (in)	=	11.5
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-30

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019

ASPHALT THICKNESS (in)	=	6
STONE (in)	=	9
ENCOUNTERED SUBGRADE MATERIAL	=	Clayey
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-31

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	6
STONE (in)	=	7
ENCOUNTERED SUBGRADE MATERIAL	=	Clayey
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-32

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 26, 2019

ASPHALT THICKNESS (in)	=	6
STONE (in)	=	7.5
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

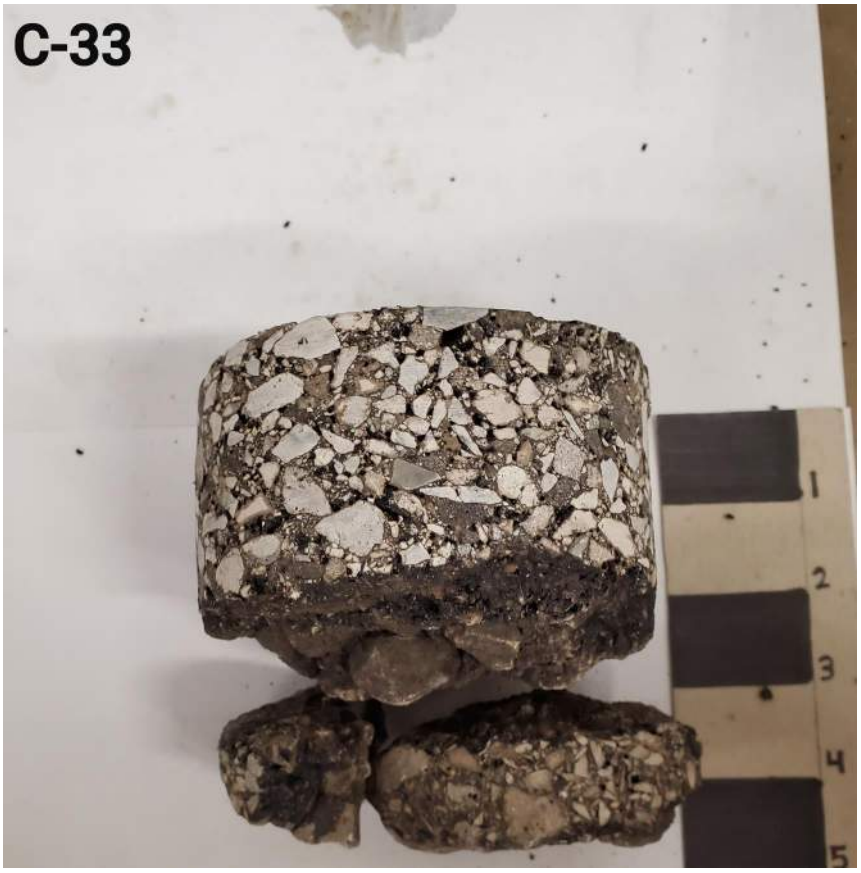
CORE LOG for C-33

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019



ASPHALT THICKNESS (in)	=	5
STONE (in)	=	7.5
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-34

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	6
STONE (in)	=	8
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-35

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 25, 2019

ASPHALT THICKNESS (in)	=	7
CONCRETE w/ASPHALT (in)	=	2
STONE (in)	=	10
ENCOUNTERED SUBGRADE MATERIAL	=	Sandy
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

CORE LOG for C-36

Project: OTIC-71-19-01 Deck Replacement and Widening

Project Location: Fulton County, Ohio

TTL Project No. 1852802

Core Date: November 22, 2019

ASPHALT THICKNESS (in)	=	5
STONE (in)	=	7
ENCOUNTERED SUBGRADE MATERIAL	=	Clayey
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

APPENDIX D

Tabulation of Test Data

PROJECT: OTIC 71-19-91 Deck Replacement and Widening, Delta, Ohio	**TTL Associates, Inc.**	PROJECT NO: 1852802

TABULATION OF TEST DATA

Boring Number	Sample Number	Sample Interval Depth (Feet)		Standard Penetration (Blows per Foot)	Natural Moisture Content (% of Dry Weight)	In-Place Dry Density (Pounds per Cubic Foot)	Unconfined Compressive Strength (Pounds per Square Foot)		Particle Size Distribution (%)						Atterberg Limits (%)			Unified Soil Classification
									Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	SS-1	1.0-2.5		11	12.0		*9,000+											
	SS-2	3.5-5.0		9	9.1													
	SS-3	6.0-7.5		44	11.1													
	SS-4	8.5-10.0		41	9.3													
	SS-5	13.5-15.0		38	10.6													
	SS-6	18.5-20.0		25	9.4													
	SS-7	23.5-25.0		26	17.8													
	SS-8	28.5-30.0		13	20.8	107.0	3,600											
	SS-9	33.5-35.0		26	14.5		*9,000+											
	SS-10	38.5-40.0		28	13.3		*9,000+											
	SS-11	43.5-45.0		16	15.0	117.5	3,290											
	SS-12	48.5-50.0		24	15.0		*7,500											
	SS-13	53.5-55.0		25	15.4	117.0	*7,500											
	SS-14	58.5-60.0		23	15.6		*7,500											
	SS-15	63.5-65.0		24	14.7	118.0	*9,000+		2	3	7	15	23	50	30	17	13	CL
	SS-16	68.5-70.0		27	14.9		*7,500											
	SS-17	73.5-75.0		32	14.6				2	5	2	7	21	63	31	17	14	CL

*Unconfined compressive strength derived from a calibrated hand penetrometer

PROJECT: OTIC 71-19-91 Deck Replacement and Widening, Delta, Ohio	**TTL Associates, Inc.**	PROJECT NO: 1852802

TABULATION OF TEST DATA

Boring Number	Sample Number	Sample Interval Depth (Feet)		Standard Penetration (Blows per Foot)	Natural Moisture Content (% of Dry Weight)	In-Place Dry Density (Pounds per Cubic Foot)	Unconfined Compressive Strength (Pounds per Square Foot)		Particle Size Distribution (%)						Atterberg Limits (%)			Unified Soil Classification
									Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	SS-18	78.5-80.0		31	15.8	117.5	6,345											
	SS-19	83.5-85.0		21	25.5	108.7	*5,000											
	SS-20	88.5-90.0		19	24.9		*5,500											
	SS-21	93.5-95.0		16	28.9	94.5	3,190		0	0	2	7	14	77	49	25	24	CL
	SS-22	98.5-100.0		26	14.1		*9,000+											
B-2	SS-1	1.0-.2.5		14	13.8		*9,000+											
	SS-2	3.5-5.0		12	14.5		*9,000+											
	SS-3	6.0-7.5		22	14.7		*9,000+											
	ST-1	8.0-10.0																
	SS-4	13.5-15.0		16	15.0		*9,000+											
	ST-2	16.0-18.0																
	SS-5	18.5-20.0		22	15.1		*9,000+											
	SS-6	23.5-25.0		19	13.8		*9,000+											
	ST-3	26.0-28.0			14.7	114.8	*9,000+		2	3	7	27	26	35	27	16	11	CL
	SS-7	28.5-30.0		9	20.7													
	ST-4	31.0-33.0			21.9	102.0			8	0	3	23	22	44	39	15	24	CL

*Unconfined compressive strength derived from a calibrated hand penetrometer

PROJECT: OTIC 71-19-91 Deck Replacement and Widening, Delta, Ohio	**TTL Associates, Inc.**	PROJECT NO: 1852802

TABULATION OF TEST DATA

Boring Number	Sample Number	Sample Interval Depth (Feet)		Standard Penetration (Blows per Foot)	Natural Moisture Content (% of Dry Weight)	In-Place Dry Density (Pounds per Cubic Foot)	Unconfined Compressive Strength (Pounds per Square Foot)		Particle Size Distribution (%)						Atterberg Limits (%)			Unified Soil Classification
									Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
B-2	SS-8	33.5-35.0		17	15.5	112.8	5,870		1	3	8	16	23	49	21	18	13	CL
	SS-9	38.5-40.0		26	13.9		*9,000+											
	SS-10	43.5-45.0		22	14.6		*9,000+											
	SS-11	48.5-50.0		21	14.7		*9,000+											
	SS-12	53.5-55.0		20	14.9	113.8	5,750		1	4	6	12	22	55	28	17	11	CL
	SS-13	58.5-60.0		25	14.8		*8,000											
	SS-14	63.5-65.0		20	15.0		*9,000+											
	SS-15	68.5-70.0		24	15.1	117.8	7,255		1	4	5	12	23	55	29	15	14	CL
	SS-16	73.5-75.0		24	15.3		*7,000											
	SS-17	78.5-80.0		30	14.3		*7,000											

*Unconfined compressive strength derived from a calibrated hand penetrometer

APPENDIX E

Laboratory Test Results

TTL Associates, Inc.
1915 N 12th Street
Toledo, Ohio 43624
Telephone: 419-324-2222
Fax: 419-241-1808

SUMMARY OF LABORATORY RESULTS

CLIENT DGL **PROJECT NAME** OTIC 71-19-01

PROJECT NUMBER 1852802 **PROJECT LOCATION** Delta, OH

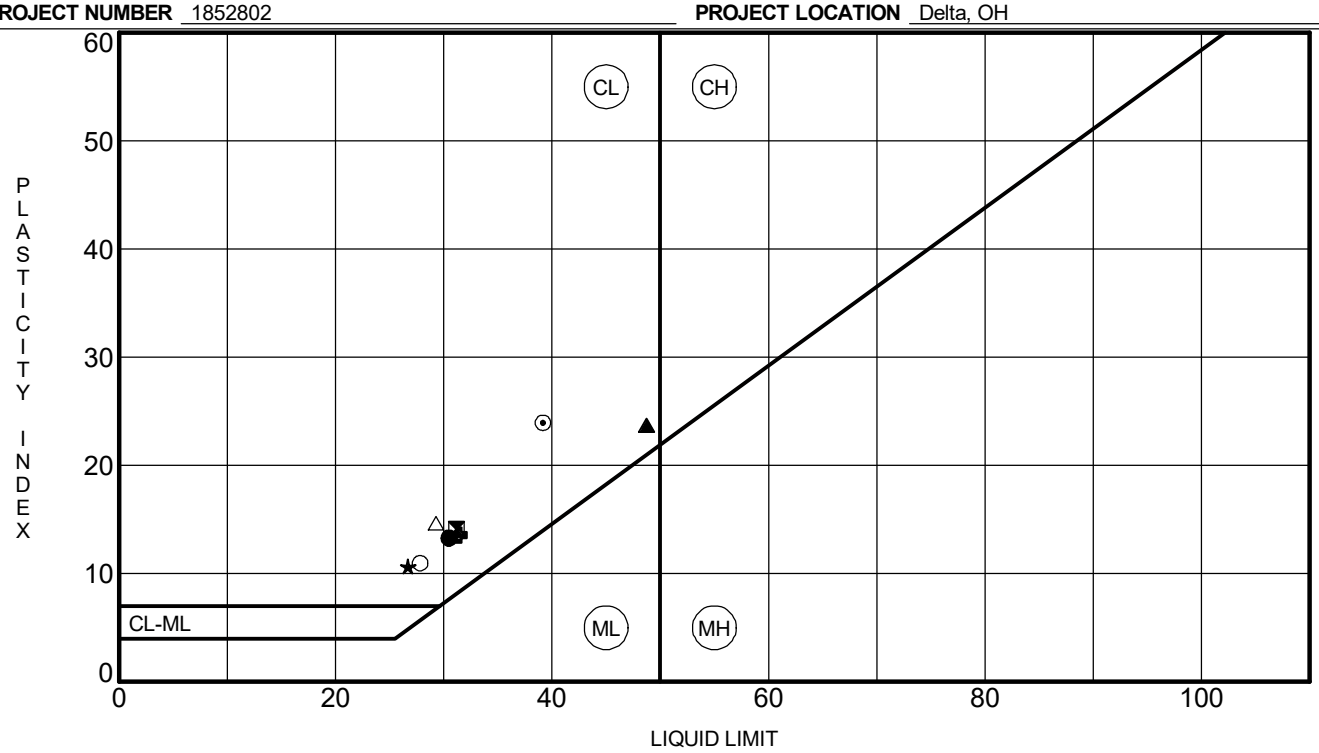
Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
B-1	1.0							12.0			
B-1	3.5							9.1			
B-1	6.0							11.1			
B-1	8.5							9.3			
B-1	13.5							10.6			
B-1	18.5							9.4			
B-1	23.5							17.8			
B-1	28.5							20.8	107.0		
B-1	33.5							14.5			
B-1	38.5							13.3			
B-1	43.5							15.0	117.5		
B-1	48.5							15.0			
B-1	53.5							15.4	117.0		
B-1	58.5							15.6			
B-1	63.5	30	17	13	19	73	CL	14.7	118.0		
B-1	68.5							14.9			
B-1	73.5	31	17	14	12.5	84	CL	14.6			
B-1	78.5							15.8	117.5		
B-1	83.5							25.5	108.7		
B-1	88.5							24.9			
B-1	93.5	49	25	24	4.75	91	CL	28.9	94.5		
B-1	98.5							14.1			
B-2	1.0							13.8			
B-2	3.5							14.5			
B-2	6.0							14.7			
B-2	13.5							15.0			
B-2	18.5							15.1			
B-2	23.5							13.8			
B-2	26.0	27	16	11	9.5	61	CL	14.7	114.8		
B-2	28.5							20.7			
B-2	31.0	39	15	24	25	66	CL	21.9	102.0		
B-2	33.5	31	18	13	9.5	72	CL	15.5	112.8		
B-2	38.5							13.9			
B-2	43.5							14.6			
B-2	48.5							14.7			
B-2	53.5	28	17	11	9.5	77	CL	14.9	113.8		
B-2	58.5							14.8			
B-2	63.5							15.0			
B-2	68.5	29	15	14	12.5	78	CL	15.1	117.8		
B-2	73.5							15.3			
B-2	78.5							14.3			

TTL Associates, Inc.
1915 N 12th Street
Toledo, Ohio 43624
Telephone: 419-324-2222
Fax: 419-241-1808

ATTERBERG LIMITS' RESULTS

CLIENT DGL **PROJECT NAME** OTIC 71-19-01

PROJECT NUMBER 1852802 **PROJECT LOCATION** Delta, OH



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-1**	**63.5**	**30**	**17**	**13**	**73**	**LEAN CLAY with SAND (CL)**
⊠	**B-1**	**73.5**	**31**	**17**	**14**	**84**	**LEAN CLAY with SAND (CL)**
▲	**B-1**	**93.5**	**49**	**25**	**24**	**91**	**LEAN CLAY (CL)**
★	**B-2**	**26.0**	**27**	**16**	**11**	**61**	**SANDY LEAN CLAY (CL)**
⊙	**B-2**	**31.0**	**39**	**15**	**24**	**66**	**SANDY LEAN CLAY (CL)**
✪	**B-2**	**33.5**	**31**	**18**	**13**	**72**	**LEAN CLAY with SAND (CL)**
○	**B-2**	**53.5**	**28**	**17**	**11**	**77**	**LEAN CLAY with SAND (CL)**
△	**B-2**	**68.5**	**29**	**15**	**14**	**78**	**LEAN CLAY with SAND (CL)**

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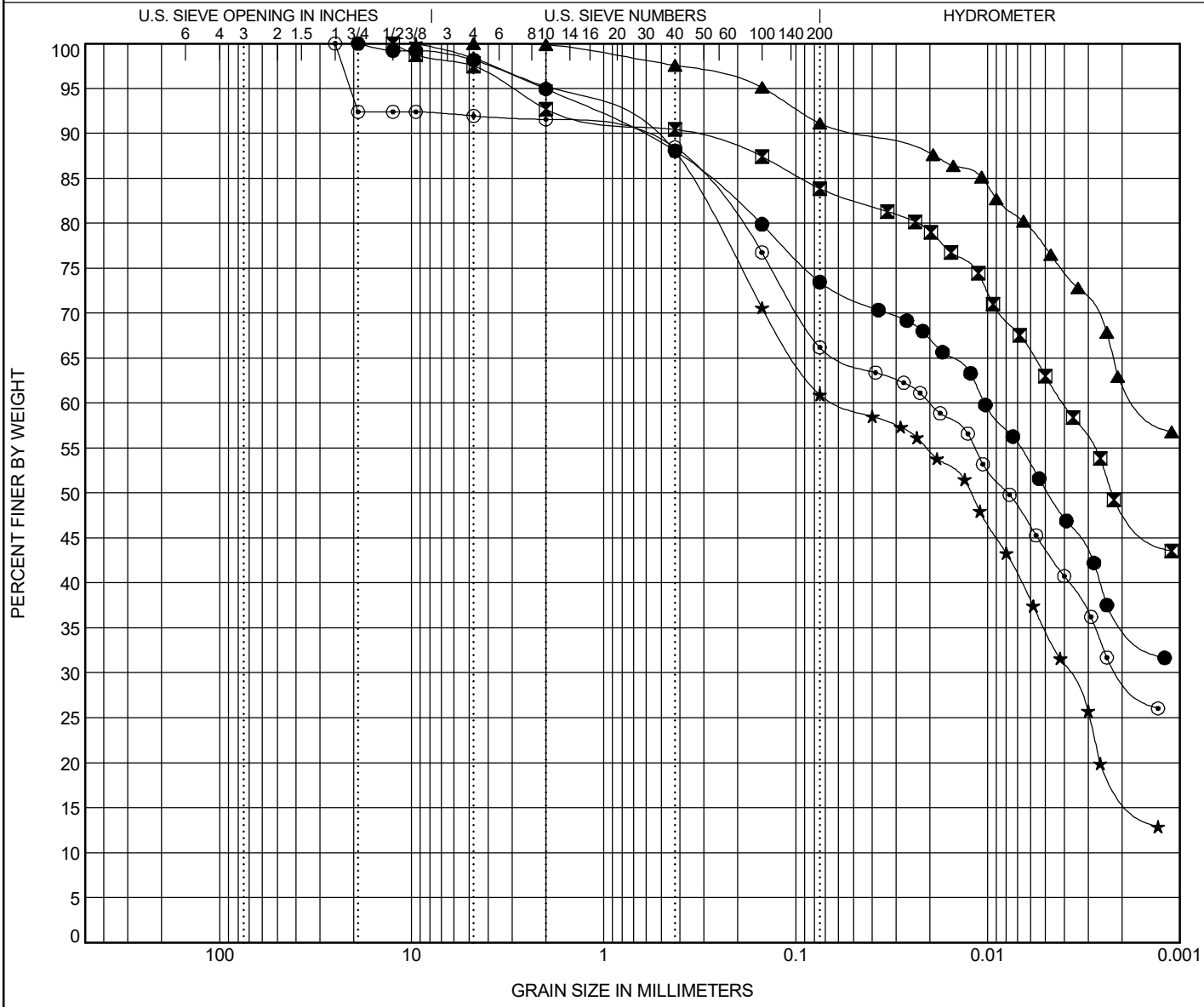
GRAIN SIZE DISTRIBUTION

CLIENT DGL **PROJECT NAME** OTIC 71-19-01

PROJECT NUMBER 1852802 **PROJECT LOCATION** Delta, OH



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
●	**B-1**	**63.5**	**LEAN CLAY with SAND (CL)**	**30**	**17**	**13**		
⊠	**B-1**	**73.5**	**LEAN CLAY with SAND (CL)**	**31**	**17**	**14**		
▲	**B-1**	**93.5**	**LEAN CLAY (CL)**	**49**	**25**	**24**		
★	**B-2**	**26.0**	**SANDY LEAN CLAY (CL)**	**27**	**16**	**11**		
⊙	**B-2**	**31.0**	**SANDY LEAN CLAY (CL)**	**39**	**15**	**24**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-1**	**63.5**	**19**	**0.01**			**1.8**	**24.7**	**23.0**	**50.5**
⊠	**B-1**	**73.5**	**12.5**	**0.004**			**2.5**	**13.6**	**20.9**	**63.0**
▲	**B-1**	**93.5**	**4.75**	**0.002**			**0.0**	**8.9**	**13.9**	**77.2**
★	**B-2**	**26.0**	**9.5**	**0.059**	**0.004**		**1.6**	**37.4**	**26.2**	**34.8**
⊙	**B-2**	**31.0**	**25**	**0.02**	**0.002**		**8.1**	**25.7**	**22.5**	**43.8**

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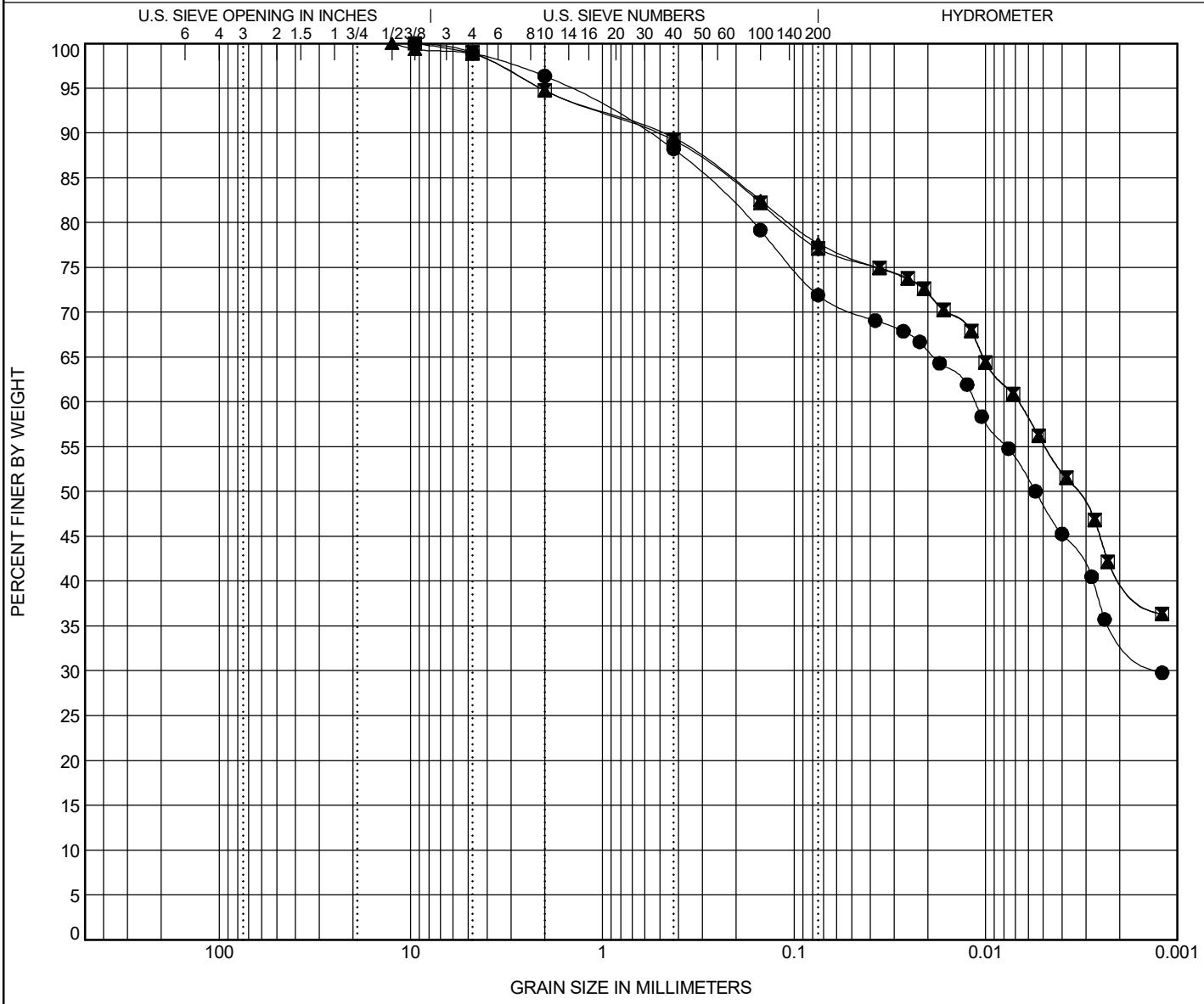
GRAIN SIZE DISTRIBUTION

CLIENT DGL **PROJECT NAME** OTIC 71-19-01

PROJECT NUMBER 1852802 **PROJECT LOCATION** Delta, OH



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
●	**B-2**	**33.5**	**LEAN CLAY with SAND (CL)**	**31**	**18**	**13**		
⊠	**B-2**	**53.5**	**LEAN CLAY with SAND (CL)**	**28**	**17**	**11**		
▲	**B-2**	**68.5**	**LEAN CLAY with SAND (CL)**	**29**	**15**	**14**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-2**	**33.5**	**9.5**	**0.011**	**0.001**		**1.1**	**27.0**	**23.3**	**48.6**
⊠	**B-2**	**53.5**	**9.5**	**0.007**			**1.0**	**21.9**	**21.7**	**55.4**
▲	**B-2**	**68.5**	**12.5**	**0.007**			**1.2**	**21.1**	**22.4**	**55.3**

Project No.: 1852802
Date: 12/6/2019
Client: DGL
Project: OTIC 71-19-01
Delta, OH
Boring No.: B-2
Sample No.: ST-3
Depth: 26.0 - 28.0'

Initial H= 1.01 inches

Pressure tsf	Final Height (in)	Initial Height (in)	DH	Average H (in)	e	Ave P (tsf)
0.125	1.01000	1.01000	0.00000	1.0100	0.421	0.0625
0.25	1.01450	1.01000	-0.00450	1.0123	0.427	0.1875
0.5	1.01120	1.01450	-0.00120	1.0129	0.422	0.375
1	1.00950	1.01120	0.00050	1.0104	0.420	0.75
2	1.00290	1.00950	0.00710	1.0062	0.411	1.5
4	0.99510	1.00290	0.01490	0.9990	0.400	3
8	0.98265	0.99510	0.02735	0.9889	0.382	6
16	0.96675	0.98265	0.04325	0.9747	0.360	12
4	0.96955	0.96675	0.04045	0.9682	0.364	10
1	0.97410	0.96955	0.03590	0.9718	0.370	2.5
0.25	0.98080	0.97410	0.02920	0.9775	0.380	0.625

Estimated Cc: 0.074
Estimated Cr: 0.011

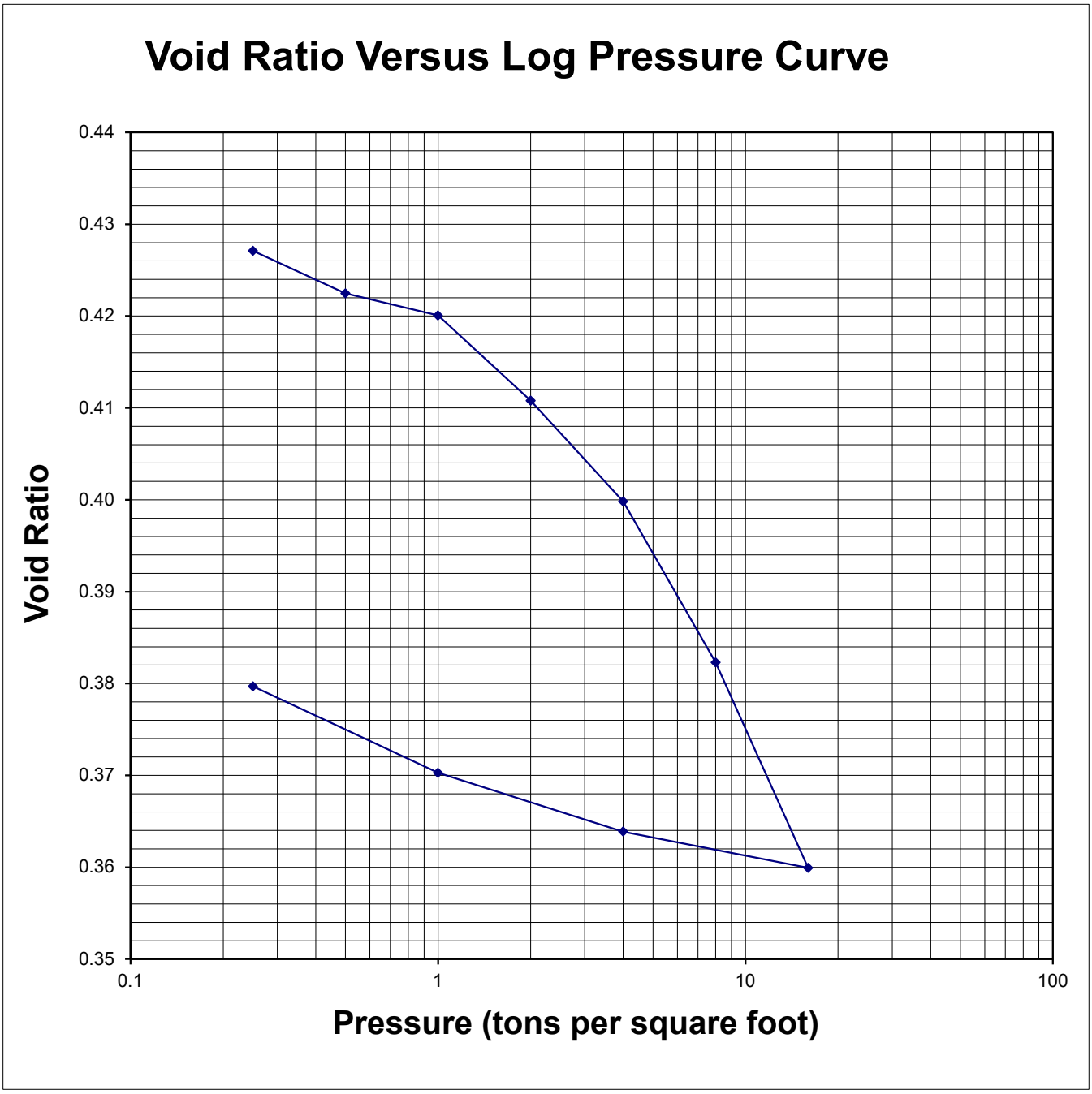
Soil Description: Brown/Gray SANDY LEAN CLAY w/Trace Gravel (CL)
Specific Gravity: 2.673
Liquid Limit: 27
Plastic Limit: 16
Plasticity Index: 11

Initial Water Content:	12.9 %	Final Water Content:	%
Inital Dry Density:	117.5 pcf	Final Dry Density:	pcf
Initial Void Ratio:	0.421	Final Void Ratio:	
Initial Degree of Saturation:	81.9 %	Final Degree of Saturation	%

Estimated Preconsolidation Pressure: tsf

The sample for the test was trimmed from a Shelby tube sample using a cutting shoe. Test Method B was used with the specimen inundated during testing. Coefficients of consolidation

Project No.: 1852802
Date: 12/6/2019
Client: DGL
Project: OTIC 71-19-01
Delta, OH
Boring No.: B-2
Sample No.: ST-3
Depth: 26.0 - 28.0'



Project No.: 1852802
Date: 11/22/2019
Client: DGL
Project: OTIC 71-19-01
Delta, OH
Boring No.: B-2
Sample No.: ST-4
Depth: 31.0 - 33.0'

Initial H= 1 inches

Pressure tsf	Final Height (in)	Initial Height (in)	DH	Average H (in)	e	Ave P (tsf)
0.125	1.00000	1.00000	0.00000	1.0000	0.626	0.0625
0.25	0.99750	1.00000	0.00250	0.9988	0.622	0.1875
0.5	0.99260	0.99750	0.00740	0.9951	0.614	0.375
1	0.98335	0.99260	0.01665	0.9880	0.599	0.75
2	0.96665	0.98335	0.03335	0.9750	0.572	1.5
4	0.94790	0.96665	0.05210	0.9573	0.542	3
8	0.92350	0.94790	0.07650	0.9357	0.502	6
16	0.89560	0.92350	0.10440	0.9096	0.456	12
4	0.90145	0.89560	0.09855	0.8985	0.466	10
1	0.91230	0.90145	0.08770	0.9069	0.484	2.5
0.25	0.92390	0.91230	0.07610	0.9181	0.502	0.625

Estimated Cc: 0.151
Estimated Cr: 0.025

Soil Description: Gray SANDY LEAN CLAY with Trace Gravel (CL)
Specific Gravity: 2.649
Liquid Limit: 39
Plastic Limit: 15
Plasticity Index: 24

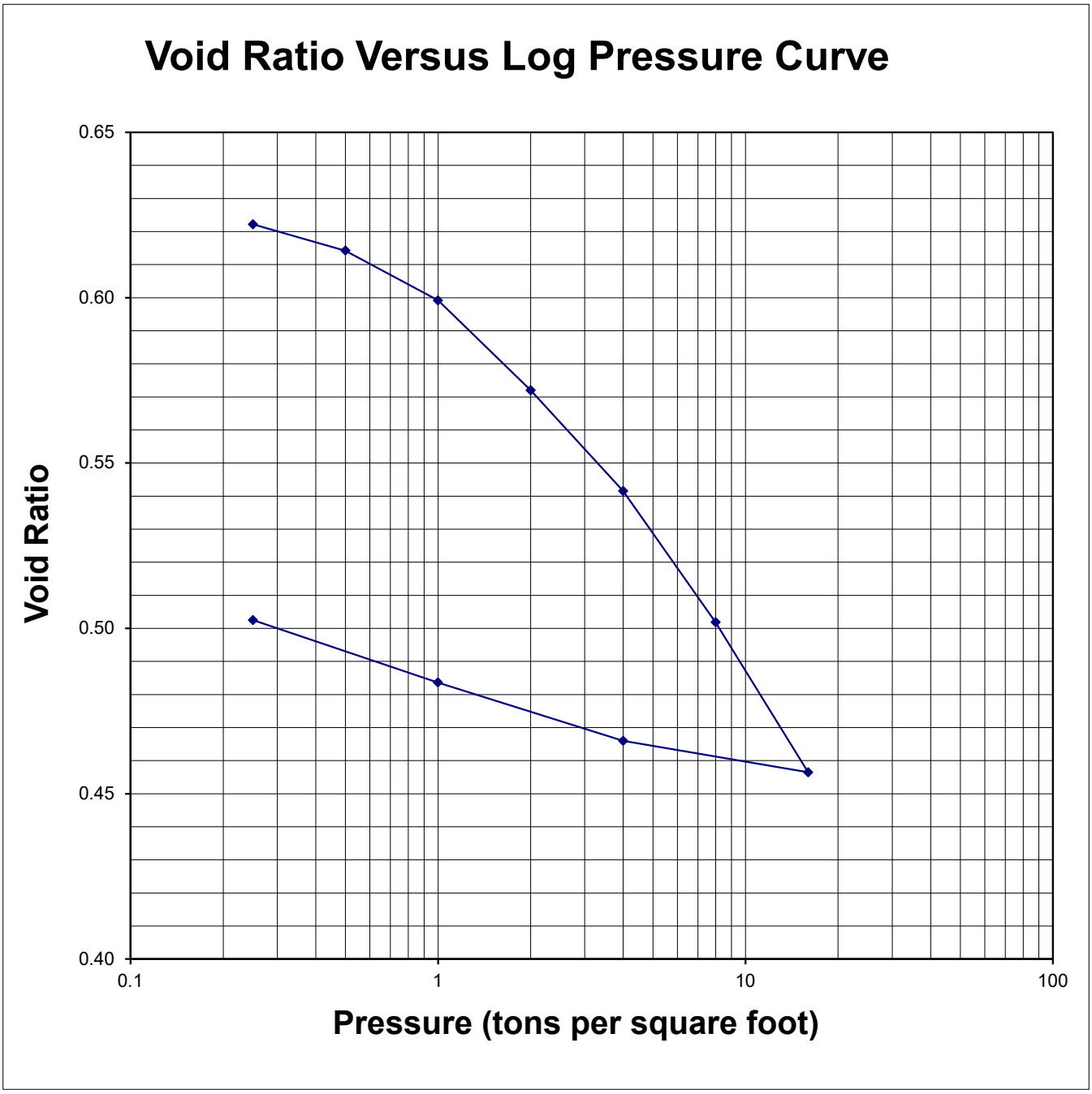
Initial Water Content: 22.9 %
Inital Dry Density: 101.7 pcf
Initial Void Ratio: 0.626
Initial Degree of Saturation: 97.1 %

Final Water Content: %
Final Dry Density: pcf
Final Void Ratio:
Final Degree of Saturation %

Estimated Preconsolidation Pressure: tsf

The sample for the test was trimmed from a Shelby tube sample using a cutting shoe. Test Method B was used with the specimen inundated during testing. Coefficients of consolidation

Project No.: 1852802
Date: 11/22/2019
Client: DGL
Project: OTIC 71-19-01
Delta, OH
Boring No.: B-2
Sample No.: ST-4
Depth: 31.0 - 33.0'



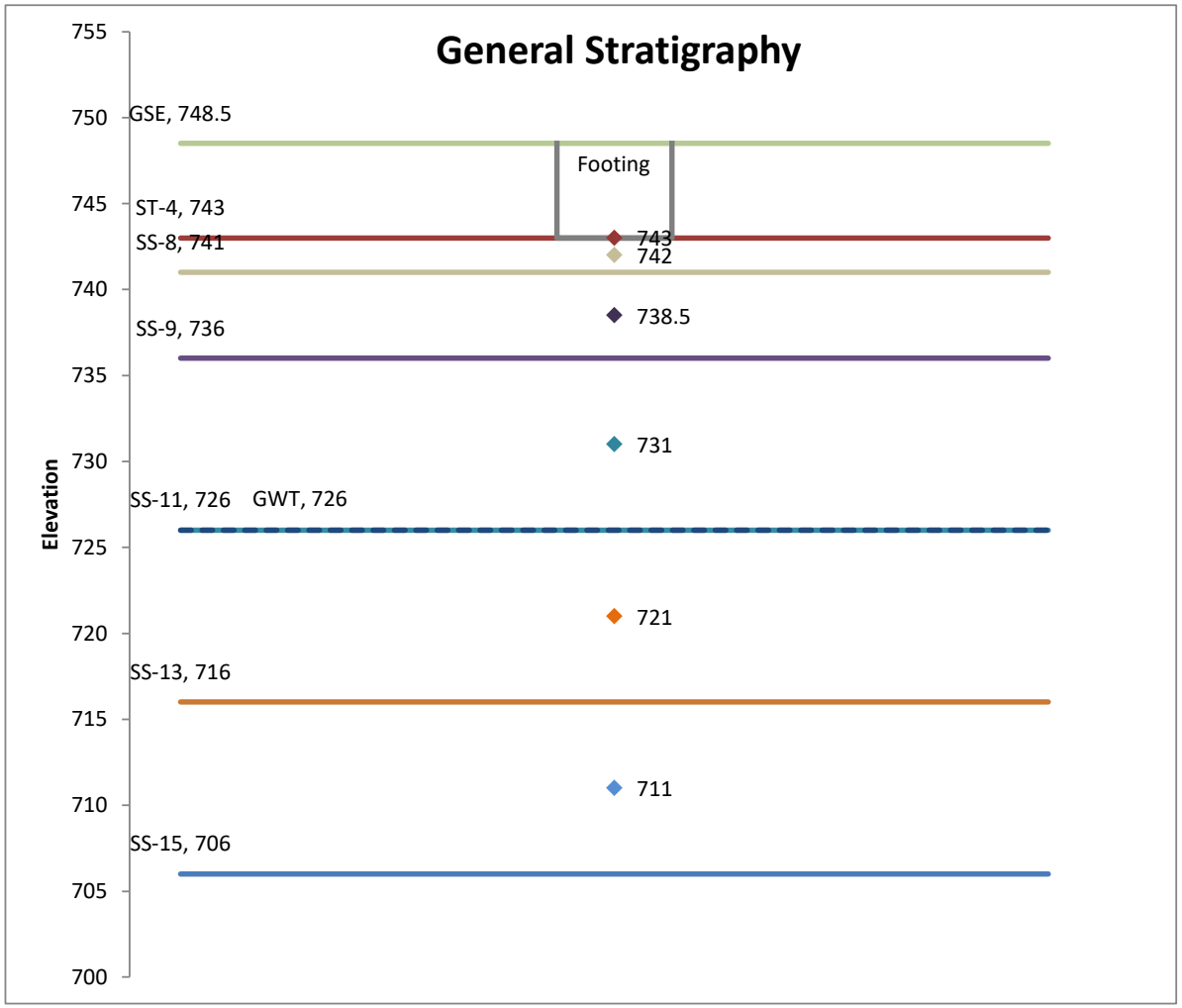
APPENDIX F

Settlement Analysis Data

Project Name: OTIC MP 40.5 Bridge Widening
Project Number: 1852802
Calculated by: IJH 12/27/19

Boring B-2
Analysis Type Boussinesq Continuous

Layer	H (feet)	C_r	e_o	sigma v (psf)	z (feet)	b (feet)	(z-Df)/b	I_z	delta p@	3000 psf	(check) sigma v+ΔP	delta H (inches)
ST-4	0	0.025	0.59	688	0	11.25	0.0	1	3000		3688	0.00
SS-8	2	0.015	0.41	813	1	11.25	0.1	1	3000		3813	0.17
SS-9	5	0.014	0.38	1250	4.5	11.25	0.4	0.9	2700		3950	0.30
SS-11	10	0.015	0.41	2188	12	11.25	1.1	0.5	1500		3688	0.29
SS-13	10	0.015	0.41	3126	22	11.25	2.0	0.3	900		4026	0.14
SS-15	10	0.015	0.41	3752	32	11.25	2.8	0.2	600		4352	0.08
											Total delta H (in.)	0.99
											+15%	1.14
											-15%	0.84

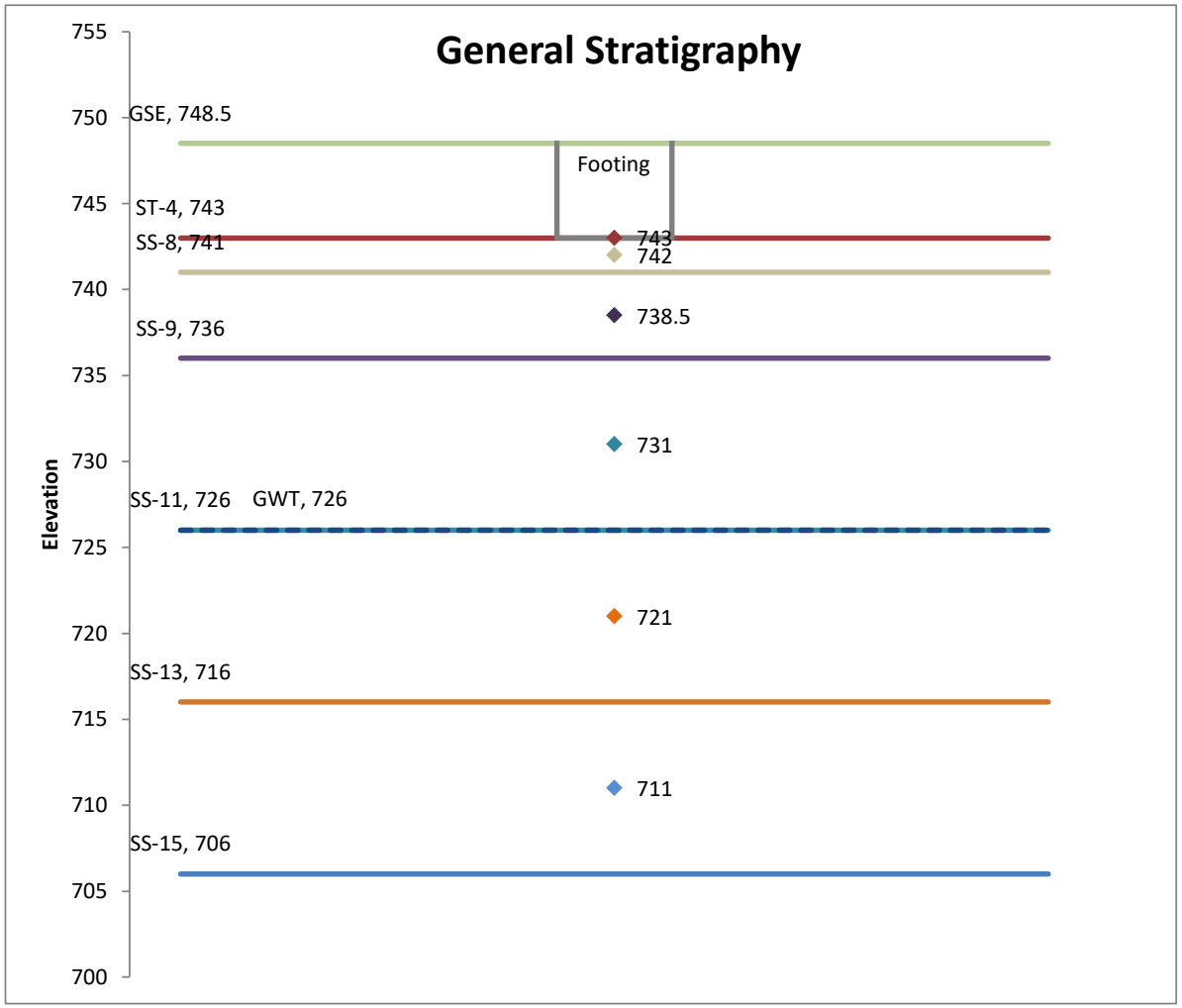


settlement q = 3000 - 11.25 ft wide strip footing.xlsx

Project Name: OTIC MP 40.5 Bridge Widening
Project Number: 1852802
Calculated by: IJH 12/27/19

Boring B-2
Analysis Type Boussinesq Continuous

Layer	H (feet)	C_r	e_o	sigma v (psf)	z (feet)	b (feet)	(z-Df)/b	I_z	delta p@	2600 psf	(check) sigma v+ΔP	delta H (inches)
ST-4	0	0.025	0.59	688	0	11.25	0.0	1	2600		3288	0.00
SS-8	2	0.015	0.41	813	1	11.25	0.1	1	2600		3413	0.16
SS-9	5	0.014	0.38	1250	4.5	11.25	0.4	0.9	2340		3590	0.28
SS-11	10	0.015	0.41	2188	12	11.25	1.1	0.5	1300		3488	0.26
SS-13	10	0.015	0.41	3126	22	11.25	2.0	0.3	780		3906	0.12
SS-15	10	0.015	0.41	3752	32	11.25	2.8	0.2	520		4272	0.07
											Total delta H (in.)	0.89
											+15%	1.03
											-15%	0.76

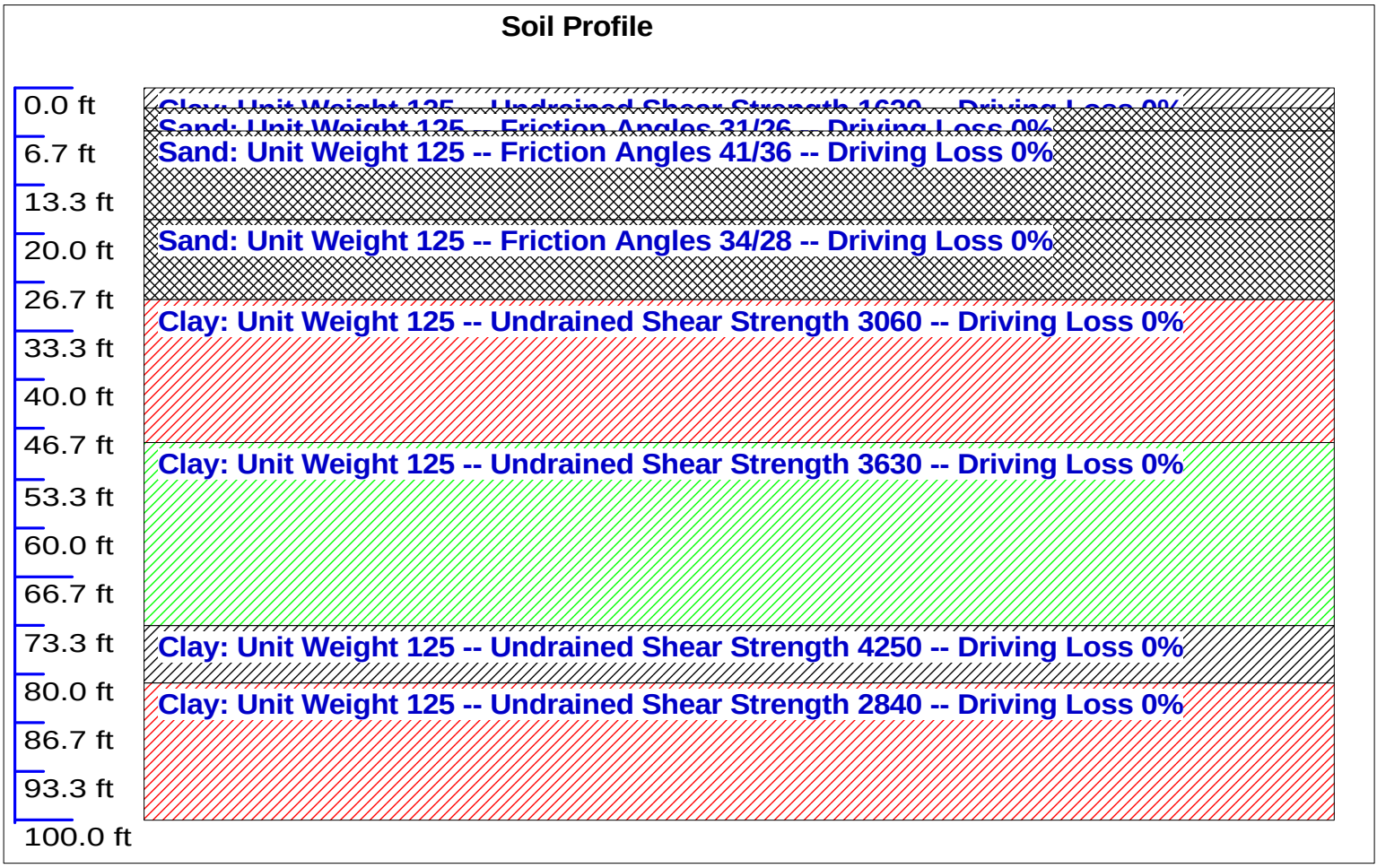


settlement q = 3000 - 11.25 ft wide strip footing.xlsx

APPENDIX G

FHWA Driven Output

Filename: T:\GEOTECH\DRIVEN\1852802\B-1.DVN



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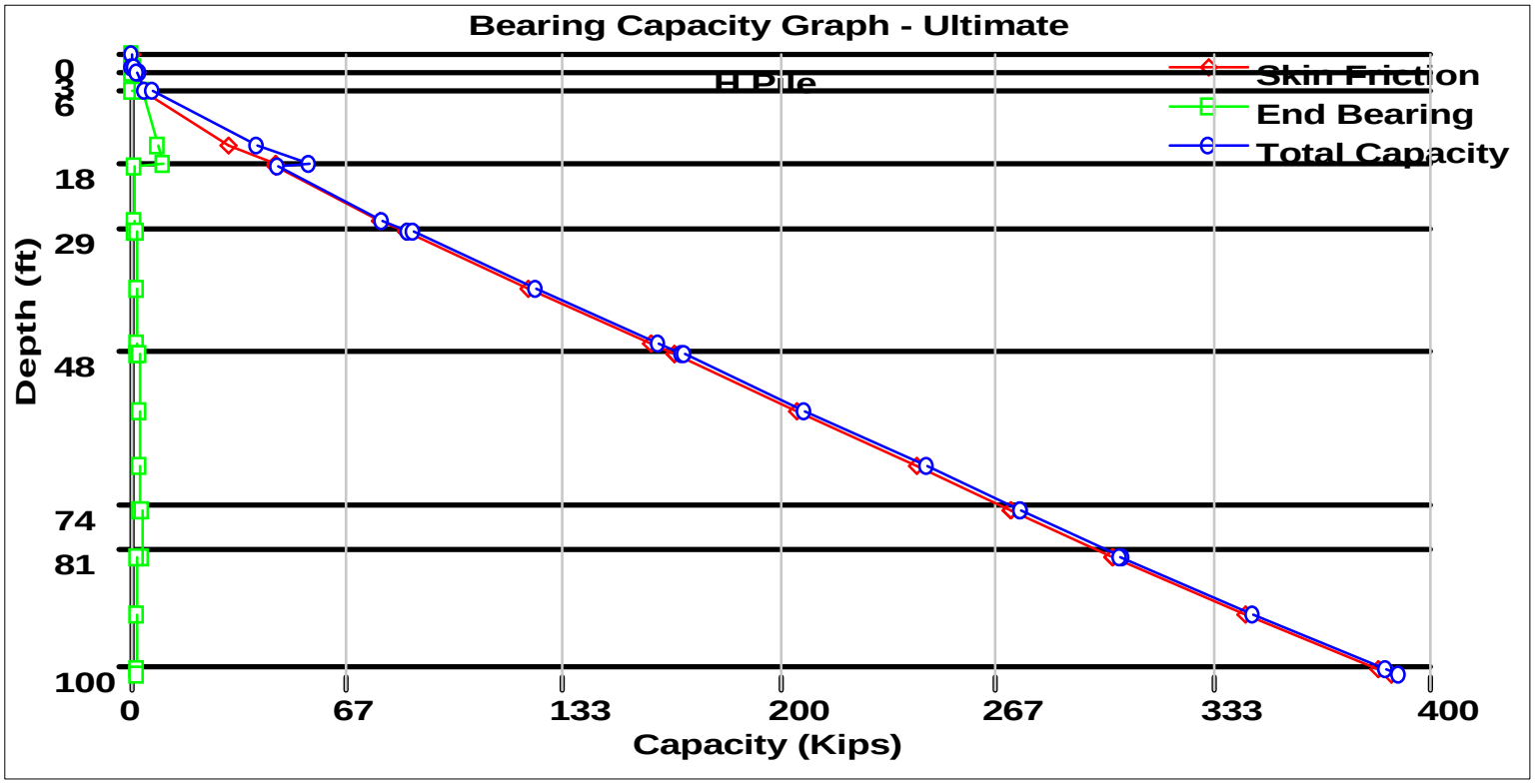

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\DRIVEN\1852802\B-1.DVN
Project Name: 71-19-01 Project Date: 12/26/2019
Project Client: DGL
Computed By: ijh
Project Manager: ijh

PILE INFORMATION

Pile Type: H Pile - HP10X42
Top of Pile: 2.50 ft
Perimeter Analysis: Box
Tip Analysis: Pile Area

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	50.00 ft
	- Driving/Restrike	50.00 ft
	- Ultimate:	50.00 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	3.00 ft	0.00%	125.00 pcf	1620.00 psf	T-79 Steel
2	Cohesionless	3.00 ft	0.00%	125.00 pcf	31.1/26.0	Nordlund
3	Cohesionless	12.00 ft	0.00%	125.00 pcf	40.8/36.0	Nordlund
4	Cohesionless	10.80 ft	0.00%	125.00 pcf	33.6/28.0	Nordlund
5	Cohesive	19.70 ft	0.00%	125.00 pcf	3060.00 psf	T-79 Steel
6	Cohesive	25.00 ft	0.00%	125.00 pcf	3630.00 psf	T-79 Steel
7	Cohesive	7.50 ft	0.00%	125.00 pcf	4250.00 psf	T-79 Steel
8	Cohesive	19.00 ft	0.00%	125.00 pcf	2840.00 psf	T-79 Steel

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.50 ft	Cohesive	N/A	N/A	1096.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	1096.00 psf	1.77 Kips
3.01 ft	Cohesionless	375.62 psf	22.83	N/A	1.81 Kips
5.99 ft	Cohesionless	561.88 psf	22.83	N/A	3.57 Kips
6.01 ft	Cohesionless	750.62 psf	29.92	N/A	3.59 Kips
15.01 ft	Cohesionless	1313.12 psf	29.92	N/A	30.41 Kips
17.99 ft	Cohesionless	1499.38 psf	29.92	N/A	44.35 Kips
18.01 ft	Cohesionless	2250.63 psf	24.61	N/A	44.43 Kips
27.01 ft	Cohesionless	2813.13 psf	24.61	N/A	76.71 Kips
28.79 ft	Cohesionless	2924.38 psf	24.61	N/A	84.62 Kips
28.81 ft	Cohesive	N/A	N/A	1181.62 psf	84.71 Kips
37.81 ft	Cohesive	N/A	N/A	1276.00 psf	122.56 Kips
46.81 ft	Cohesive	N/A	N/A	1276.00 psf	160.41 Kips
48.49 ft	Cohesive	N/A	N/A	1276.00 psf	167.47 Kips
48.51 ft	Cohesive	N/A	N/A	1260.00 psf	167.56 Kips
57.51 ft	Cohesive	N/A	N/A	1260.00 psf	204.93 Kips
66.51 ft	Cohesive	N/A	N/A	1260.00 psf	242.31 Kips
73.49 ft	Cohesive	N/A	N/A	1260.00 psf	271.29 Kips
73.51 ft	Cohesive	N/A	N/A	1260.00 psf	271.37 Kips
80.99 ft	Cohesive	N/A	N/A	1260.00 psf	302.44 Kips
81.01 ft	Cohesive	N/A	N/A	1376.00 psf	302.52 Kips
90.01 ft	Cohesive	N/A	N/A	1376.00 psf	343.34 Kips
99.01 ft	Cohesive	N/A	N/A	1376.00 psf	384.16 Kips
99.99 ft	Cohesive	N/A	N/A	1376.00 psf	388.60 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.50 ft	Cohesive	N/A	N/A	N/A	1.26 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	1.26 Kips
3.01 ft	Cohesionless	376.25 psf	17.40	1.15 Kips	0.28 Kips
5.99 ft	Cohesionless	748.75 psf	17.40	1.15 Kips	0.55 Kips
6.01 ft	Cohesionless	751.25 psf	77.60	13.05 Kips	3.48 Kips
15.01 ft	Cohesionless	1876.25 psf	77.60	13.05 Kips	8.69 Kips
17.99 ft	Cohesionless	2248.75 psf	77.60	13.05 Kips	10.41 Kips
18.01 ft	Cohesionless	2251.25 psf	22.80	1.15 Kips	1.15 Kips
27.01 ft	Cohesionless	3376.25 psf	22.80	1.15 Kips	1.15 Kips
28.79 ft	Cohesionless	3598.75 psf	22.80	1.15 Kips	1.15 Kips
28.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
37.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
46.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.49 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
57.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
66.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.49 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.51 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
80.99 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
81.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
90.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.99 ft	Cohesive	N/A	N/A	N/A	2.20 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.50 ft	0.00 Kips	1.26 Kips	1.26 Kips
2.99 ft	1.77 Kips	1.26 Kips	3.03 Kips
3.01 ft	1.81 Kips	0.28 Kips	2.09 Kips
5.99 ft	3.57 Kips	0.55 Kips	4.12 Kips
6.01 ft	3.59 Kips	3.48 Kips	7.07 Kips
15.01 ft	30.41 Kips	8.69 Kips	39.10 Kips
17.99 ft	44.35 Kips	10.41 Kips	54.76 Kips
18.01 ft	44.43 Kips	1.15 Kips	45.58 Kips
27.01 ft	76.71 Kips	1.15 Kips	77.86 Kips
28.79 ft	84.62 Kips	1.15 Kips	85.77 Kips
28.81 ft	84.71 Kips	2.37 Kips	87.08 Kips
37.81 ft	122.56 Kips	2.37 Kips	124.93 Kips
46.81 ft	160.41 Kips	2.37 Kips	162.78 Kips
48.49 ft	167.47 Kips	2.37 Kips	169.84 Kips
48.51 ft	167.56 Kips	2.81 Kips	170.37 Kips
57.51 ft	204.93 Kips	2.81 Kips	207.74 Kips
66.51 ft	242.31 Kips	2.81 Kips	245.12 Kips
73.49 ft	271.29 Kips	2.81 Kips	274.10 Kips
73.51 ft	271.37 Kips	3.29 Kips	274.67 Kips
80.99 ft	302.44 Kips	3.29 Kips	305.73 Kips
81.01 ft	302.52 Kips	2.20 Kips	304.73 Kips
90.01 ft	343.34 Kips	2.20 Kips	345.54 Kips
99.01 ft	384.16 Kips	2.20 Kips	386.36 Kips
99.99 ft	388.60 Kips	2.20 Kips	390.80 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.50 ft	Cohesive	N/A	N/A	1096.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	1096.00 psf	1.77 Kips
3.01 ft	Cohesionless	375.62 psf	22.83	N/A	1.81 Kips
5.99 ft	Cohesionless	561.88 psf	22.83	N/A	3.57 Kips
6.01 ft	Cohesionless	750.62 psf	29.92	N/A	3.59 Kips
15.01 ft	Cohesionless	1313.12 psf	29.92	N/A	30.41 Kips
17.99 ft	Cohesionless	1499.38 psf	29.92	N/A	44.35 Kips
18.01 ft	Cohesionless	2250.63 psf	24.61	N/A	44.43 Kips
27.01 ft	Cohesionless	2813.13 psf	24.61	N/A	76.71 Kips
28.79 ft	Cohesionless	2924.38 psf	24.61	N/A	84.62 Kips
28.81 ft	Cohesive	N/A	N/A	1181.62 psf	84.71 Kips
37.81 ft	Cohesive	N/A	N/A	1276.00 psf	122.56 Kips
46.81 ft	Cohesive	N/A	N/A	1276.00 psf	160.41 Kips
48.49 ft	Cohesive	N/A	N/A	1276.00 psf	167.47 Kips
48.51 ft	Cohesive	N/A	N/A	1260.00 psf	167.56 Kips
57.51 ft	Cohesive	N/A	N/A	1260.00 psf	204.93 Kips
66.51 ft	Cohesive	N/A	N/A	1260.00 psf	242.31 Kips
73.49 ft	Cohesive	N/A	N/A	1260.00 psf	271.29 Kips
73.51 ft	Cohesive	N/A	N/A	1260.00 psf	271.37 Kips
80.99 ft	Cohesive	N/A	N/A	1260.00 psf	302.44 Kips
81.01 ft	Cohesive	N/A	N/A	1376.00 psf	302.52 Kips
90.01 ft	Cohesive	N/A	N/A	1376.00 psf	343.34 Kips
99.01 ft	Cohesive	N/A	N/A	1376.00 psf	384.16 Kips
99.99 ft	Cohesive	N/A	N/A	1376.00 psf	388.60 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.50 ft	Cohesive	N/A	N/A	N/A	1.26 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	1.26 Kips
3.01 ft	Cohesionless	376.25 psf	17.40	1.15 Kips	0.28 Kips
5.99 ft	Cohesionless	748.75 psf	17.40	1.15 Kips	0.55 Kips
6.01 ft	Cohesionless	751.25 psf	77.60	13.05 Kips	3.48 Kips
15.01 ft	Cohesionless	1876.25 psf	77.60	13.05 Kips	8.69 Kips
17.99 ft	Cohesionless	2248.75 psf	77.60	13.05 Kips	10.41 Kips
18.01 ft	Cohesionless	2251.25 psf	22.80	1.15 Kips	1.15 Kips
27.01 ft	Cohesionless	3376.25 psf	22.80	1.15 Kips	1.15 Kips
28.79 ft	Cohesionless	3598.75 psf	22.80	1.15 Kips	1.15 Kips
28.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
37.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
46.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.49 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
57.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
66.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.49 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.51 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
80.99 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
81.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
90.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.99 ft	Cohesive	N/A	N/A	N/A	2.20 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.50 ft	0.00 Kips	1.26 Kips	1.26 Kips
2.99 ft	1.77 Kips	1.26 Kips	3.03 Kips
3.01 ft	1.81 Kips	0.28 Kips	2.09 Kips
5.99 ft	3.57 Kips	0.55 Kips	4.12 Kips
6.01 ft	3.59 Kips	3.48 Kips	7.07 Kips
15.01 ft	30.41 Kips	8.69 Kips	39.10 Kips
17.99 ft	44.35 Kips	10.41 Kips	54.76 Kips
18.01 ft	44.43 Kips	1.15 Kips	45.58 Kips
27.01 ft	76.71 Kips	1.15 Kips	77.86 Kips
28.79 ft	84.62 Kips	1.15 Kips	85.77 Kips
28.81 ft	84.71 Kips	2.37 Kips	87.08 Kips
37.81 ft	122.56 Kips	2.37 Kips	124.93 Kips
46.81 ft	160.41 Kips	2.37 Kips	162.78 Kips
48.49 ft	167.47 Kips	2.37 Kips	169.84 Kips
48.51 ft	167.56 Kips	2.81 Kips	170.37 Kips
57.51 ft	204.93 Kips	2.81 Kips	207.74 Kips
66.51 ft	242.31 Kips	2.81 Kips	245.12 Kips
73.49 ft	271.29 Kips	2.81 Kips	274.10 Kips
73.51 ft	271.37 Kips	3.29 Kips	274.67 Kips
80.99 ft	302.44 Kips	3.29 Kips	305.73 Kips
81.01 ft	302.52 Kips	2.20 Kips	304.73 Kips
90.01 ft	343.34 Kips	2.20 Kips	345.54 Kips
99.01 ft	384.16 Kips	2.20 Kips	386.36 Kips
99.99 ft	388.60 Kips	2.20 Kips	390.80 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.50 ft	Cohesive	N/A	N/A	1096.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	1096.00 psf	1.77 Kips
3.01 ft	Cohesionless	375.62 psf	22.83	N/A	1.81 Kips
5.99 ft	Cohesionless	561.88 psf	22.83	N/A	3.57 Kips
6.01 ft	Cohesionless	750.62 psf	29.92	N/A	3.59 Kips
15.01 ft	Cohesionless	1313.12 psf	29.92	N/A	30.41 Kips
17.99 ft	Cohesionless	1499.38 psf	29.92	N/A	44.35 Kips
18.01 ft	Cohesionless	2250.63 psf	24.61	N/A	44.43 Kips
27.01 ft	Cohesionless	2813.13 psf	24.61	N/A	76.71 Kips
28.79 ft	Cohesionless	2924.38 psf	24.61	N/A	84.62 Kips
28.81 ft	Cohesive	N/A	N/A	1181.62 psf	84.71 Kips
37.81 ft	Cohesive	N/A	N/A	1276.00 psf	122.56 Kips
46.81 ft	Cohesive	N/A	N/A	1276.00 psf	160.41 Kips
48.49 ft	Cohesive	N/A	N/A	1276.00 psf	167.47 Kips
48.51 ft	Cohesive	N/A	N/A	1260.00 psf	167.56 Kips
57.51 ft	Cohesive	N/A	N/A	1260.00 psf	204.93 Kips
66.51 ft	Cohesive	N/A	N/A	1260.00 psf	242.31 Kips
73.49 ft	Cohesive	N/A	N/A	1260.00 psf	271.29 Kips
73.51 ft	Cohesive	N/A	N/A	1260.00 psf	271.37 Kips
80.99 ft	Cohesive	N/A	N/A	1260.00 psf	302.44 Kips
81.01 ft	Cohesive	N/A	N/A	1376.00 psf	302.52 Kips
90.01 ft	Cohesive	N/A	N/A	1376.00 psf	343.34 Kips
99.01 ft	Cohesive	N/A	N/A	1376.00 psf	384.16 Kips
99.99 ft	Cohesive	N/A	N/A	1376.00 psf	388.60 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.50 ft	Cohesive	N/A	N/A	N/A	1.26 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	1.26 Kips
3.01 ft	Cohesionless	376.25 psf	17.40	1.15 Kips	0.28 Kips
5.99 ft	Cohesionless	748.75 psf	17.40	1.15 Kips	0.55 Kips
6.01 ft	Cohesionless	751.25 psf	77.60	13.05 Kips	3.48 Kips
15.01 ft	Cohesionless	1876.25 psf	77.60	13.05 Kips	8.69 Kips
17.99 ft	Cohesionless	2248.75 psf	77.60	13.05 Kips	10.41 Kips
18.01 ft	Cohesionless	2251.25 psf	22.80	1.15 Kips	1.15 Kips
27.01 ft	Cohesionless	3376.25 psf	22.80	1.15 Kips	1.15 Kips
28.79 ft	Cohesionless	3598.75 psf	22.80	1.15 Kips	1.15 Kips
28.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
37.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
46.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.49 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
57.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
66.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.49 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.51 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
80.99 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
81.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
90.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.99 ft	Cohesive	N/A	N/A	N/A	2.20 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.50 ft	0.00 Kips	1.26 Kips	1.26 Kips
2.99 ft	1.77 Kips	1.26 Kips	3.03 Kips
3.01 ft	1.81 Kips	0.28 Kips	2.09 Kips
5.99 ft	3.57 Kips	0.55 Kips	4.12 Kips
6.01 ft	3.59 Kips	3.48 Kips	7.07 Kips
15.01 ft	30.41 Kips	8.69 Kips	39.10 Kips
17.99 ft	44.35 Kips	10.41 Kips	54.76 Kips
18.01 ft	44.43 Kips	1.15 Kips	45.58 Kips
27.01 ft	76.71 Kips	1.15 Kips	77.86 Kips
28.79 ft	84.62 Kips	1.15 Kips	85.77 Kips
28.81 ft	84.71 Kips	2.37 Kips	87.08 Kips
37.81 ft	122.56 Kips	2.37 Kips	124.93 Kips
46.81 ft	160.41 Kips	2.37 Kips	162.78 Kips
48.49 ft	167.47 Kips	2.37 Kips	169.84 Kips
48.51 ft	167.56 Kips	2.81 Kips	170.37 Kips
57.51 ft	204.93 Kips	2.81 Kips	207.74 Kips
66.51 ft	242.31 Kips	2.81 Kips	245.12 Kips
73.49 ft	271.29 Kips	2.81 Kips	274.10 Kips
73.51 ft	271.37 Kips	3.29 Kips	274.67 Kips
80.99 ft	302.44 Kips	3.29 Kips	305.73 Kips
81.01 ft	302.52 Kips	2.20 Kips	304.73 Kips
90.01 ft	343.34 Kips	2.20 Kips	345.54 Kips
99.01 ft	384.16 Kips	2.20 Kips	386.36 Kips
99.99 ft	388.60 Kips	2.20 Kips	390.80 Kips

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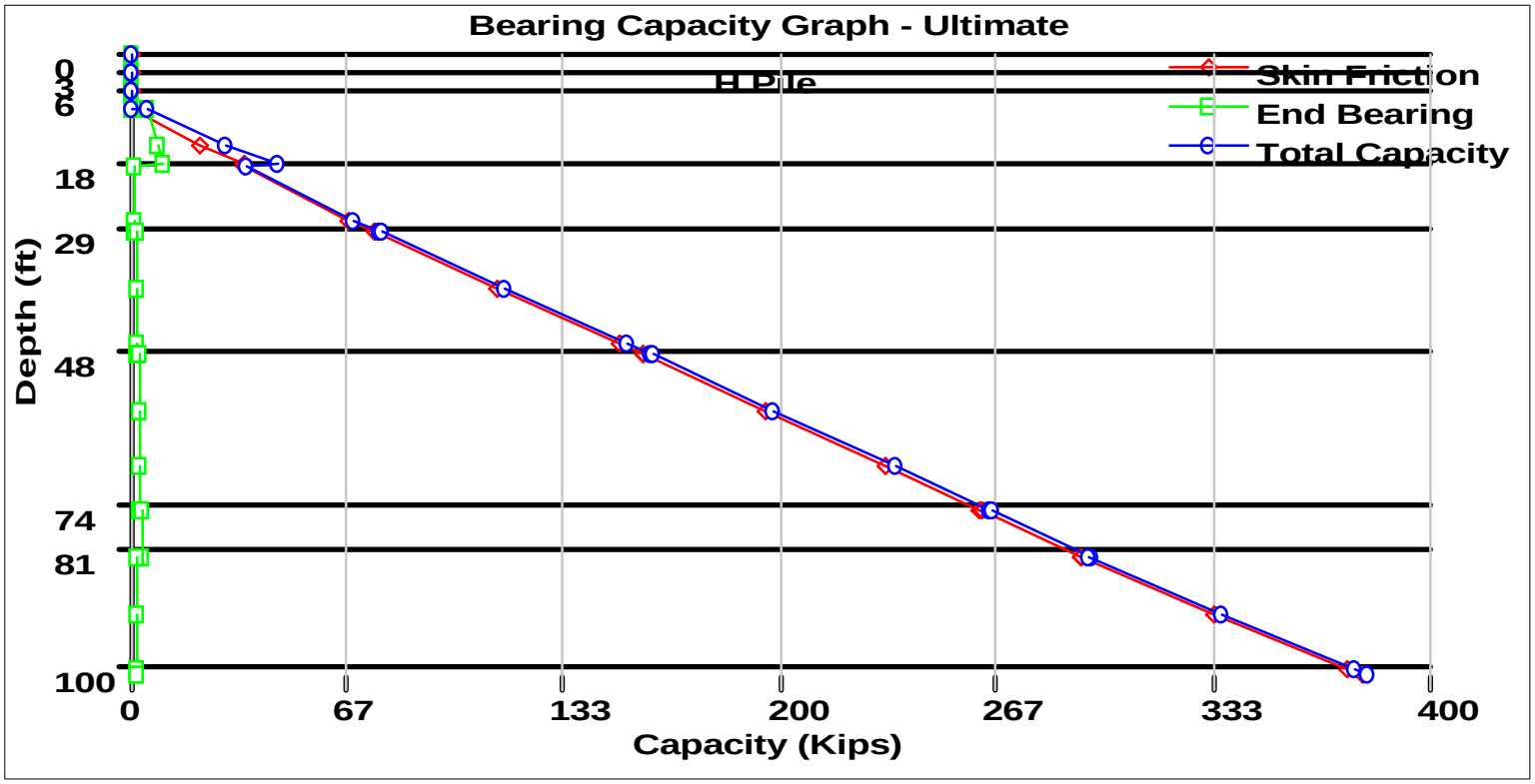

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\DRIVEN\1852802\B-1.DVN
Project Name: 71-19-01 Project Date: 12/26/2019
Project Client: DGL
Computed By: ijh
Project Manager: ijh

PILE INFORMATION

Pile Type: H Pile - HP10X42
Top of Pile: 8.80 ft
Perimeter Analysis: Box
Tip Analysis: Pile Area

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	50.00 ft
	- Driving/Restrike	50.00 ft
	- Ultimate:	50.00 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	3.00 ft	0.00%	125.00 pcf	1620.00 psf	T-79 Steel
2	Cohesionless	3.00 ft	0.00%	125.00 pcf	31.1/26.0	Nordlund
3	Cohesionless	12.00 ft	0.00%	125.00 pcf	40.8/36.0	Nordlund
4	Cohesionless	10.80 ft	0.00%	125.00 pcf	33.6/28.0	Nordlund
5	Cohesive	19.70 ft	0.00%	125.00 pcf	3060.00 psf	T-79 Steel
6	Cohesive	25.00 ft	0.00%	125.00 pcf	3630.00 psf	T-79 Steel
7	Cohesive	7.50 ft	0.00%	125.00 pcf	4250.00 psf	T-79 Steel
8	Cohesive	19.00 ft	0.00%	125.00 pcf	2840.00 psf	T-79 Steel

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
8.79 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
8.80 ft	Cohesionless	1100.00 psf	29.92	N/A	0.00 Kips
15.01 ft	Cohesionless	1488.13 psf	29.92	N/A	20.96 Kips
17.99 ft	Cohesionless	1674.38 psf	29.92	N/A	34.90 Kips
18.01 ft	Cohesionless	2250.63 psf	24.61	N/A	34.98 Kips
27.01 ft	Cohesionless	2813.13 psf	24.61	N/A	67.26 Kips
28.79 ft	Cohesionless	2924.38 psf	24.61	N/A	75.17 Kips
28.81 ft	Cohesive	N/A	N/A	1181.62 psf	75.26 Kips
37.81 ft	Cohesive	N/A	N/A	1276.00 psf	113.11 Kips
46.81 ft	Cohesive	N/A	N/A	1276.00 psf	150.96 Kips
48.49 ft	Cohesive	N/A	N/A	1276.00 psf	158.02 Kips
48.51 ft	Cohesive	N/A	N/A	1260.00 psf	158.11 Kips
57.51 ft	Cohesive	N/A	N/A	1260.00 psf	195.48 Kips
66.51 ft	Cohesive	N/A	N/A	1260.00 psf	232.86 Kips
73.49 ft	Cohesive	N/A	N/A	1260.00 psf	261.84 Kips
73.51 ft	Cohesive	N/A	N/A	1260.00 psf	261.93 Kips
80.99 ft	Cohesive	N/A	N/A	1260.00 psf	292.99 Kips
81.01 ft	Cohesive	N/A	N/A	1376.00 psf	293.08 Kips
90.01 ft	Cohesive	N/A	N/A	1376.00 psf	333.89 Kips
99.01 ft	Cohesive	N/A	N/A	1376.00 psf	374.71 Kips
99.99 ft	Cohesive	N/A	N/A	1376.00 psf	379.15 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
8.79 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
8.80 ft	Cohesionless	1100.00 psf	77.60	13.05 Kips	5.10 Kips
15.01 ft	Cohesionless	1876.25 psf	77.60	13.05 Kips	8.69 Kips
17.99 ft	Cohesionless	2248.75 psf	77.60	13.05 Kips	10.41 Kips
18.01 ft	Cohesionless	2251.25 psf	22.80	1.15 Kips	1.15 Kips
27.01 ft	Cohesionless	3376.25 psf	22.80	1.15 Kips	1.15 Kips
28.79 ft	Cohesionless	3598.75 psf	22.80	1.15 Kips	1.15 Kips
28.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
37.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
46.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.49 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
57.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
66.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.49 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.51 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
80.99 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
81.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
90.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.99 ft	Cohesive	N/A	N/A	N/A	2.20 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.79 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.80 ft	0.00 Kips	5.10 Kips	5.10 Kips
15.01 ft	20.96 Kips	8.69 Kips	29.66 Kips
17.99 ft	34.90 Kips	10.41 Kips	45.32 Kips
18.01 ft	34.98 Kips	1.15 Kips	36.13 Kips
27.01 ft	67.26 Kips	1.15 Kips	68.41 Kips
28.79 ft	75.17 Kips	1.15 Kips	76.32 Kips
28.81 ft	75.26 Kips	2.37 Kips	77.63 Kips
37.81 ft	113.11 Kips	2.37 Kips	115.48 Kips
46.81 ft	150.96 Kips	2.37 Kips	153.33 Kips
48.49 ft	158.02 Kips	2.37 Kips	160.40 Kips
48.51 ft	158.11 Kips	2.81 Kips	160.92 Kips
57.51 ft	195.48 Kips	2.81 Kips	198.30 Kips
66.51 ft	232.86 Kips	2.81 Kips	235.67 Kips
73.49 ft	261.84 Kips	2.81 Kips	264.66 Kips
73.51 ft	261.93 Kips	3.29 Kips	265.22 Kips
80.99 ft	292.99 Kips	3.29 Kips	296.28 Kips
81.01 ft	293.08 Kips	2.20 Kips	295.28 Kips
90.01 ft	333.89 Kips	2.20 Kips	336.09 Kips
99.01 ft	374.71 Kips	2.20 Kips	376.91 Kips
99.99 ft	379.15 Kips	2.20 Kips	381.35 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
8.79 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
8.80 ft	Cohesionless	1100.00 psf	29.92	N/A	0.00 Kips
15.01 ft	Cohesionless	1488.13 psf	29.92	N/A	20.96 Kips
17.99 ft	Cohesionless	1674.38 psf	29.92	N/A	34.90 Kips
18.01 ft	Cohesionless	2250.63 psf	24.61	N/A	34.98 Kips
27.01 ft	Cohesionless	2813.13 psf	24.61	N/A	67.26 Kips
28.79 ft	Cohesionless	2924.38 psf	24.61	N/A	75.17 Kips
28.81 ft	Cohesive	N/A	N/A	1181.62 psf	75.26 Kips
37.81 ft	Cohesive	N/A	N/A	1276.00 psf	113.11 Kips
46.81 ft	Cohesive	N/A	N/A	1276.00 psf	150.96 Kips
48.49 ft	Cohesive	N/A	N/A	1276.00 psf	158.02 Kips
48.51 ft	Cohesive	N/A	N/A	1260.00 psf	158.11 Kips
57.51 ft	Cohesive	N/A	N/A	1260.00 psf	195.48 Kips
66.51 ft	Cohesive	N/A	N/A	1260.00 psf	232.86 Kips
73.49 ft	Cohesive	N/A	N/A	1260.00 psf	261.84 Kips
73.51 ft	Cohesive	N/A	N/A	1260.00 psf	261.93 Kips
80.99 ft	Cohesive	N/A	N/A	1260.00 psf	292.99 Kips
81.01 ft	Cohesive	N/A	N/A	1376.00 psf	293.08 Kips
90.01 ft	Cohesive	N/A	N/A	1376.00 psf	333.89 Kips
99.01 ft	Cohesive	N/A	N/A	1376.00 psf	374.71 Kips
99.99 ft	Cohesive	N/A	N/A	1376.00 psf	379.15 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
8.79 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
8.80 ft	Cohesionless	1100.00 psf	77.60	13.05 Kips	5.10 Kips
15.01 ft	Cohesionless	1876.25 psf	77.60	13.05 Kips	8.69 Kips
17.99 ft	Cohesionless	2248.75 psf	77.60	13.05 Kips	10.41 Kips
18.01 ft	Cohesionless	2251.25 psf	22.80	1.15 Kips	1.15 Kips
27.01 ft	Cohesionless	3376.25 psf	22.80	1.15 Kips	1.15 Kips
28.79 ft	Cohesionless	3598.75 psf	22.80	1.15 Kips	1.15 Kips
28.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
37.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
46.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.49 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
57.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
66.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.49 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.51 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
80.99 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
81.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
90.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.99 ft	Cohesive	N/A	N/A	N/A	2.20 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.79 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.80 ft	0.00 Kips	5.10 Kips	5.10 Kips
15.01 ft	20.96 Kips	8.69 Kips	29.66 Kips
17.99 ft	34.90 Kips	10.41 Kips	45.32 Kips
18.01 ft	34.98 Kips	1.15 Kips	36.13 Kips
27.01 ft	67.26 Kips	1.15 Kips	68.41 Kips
28.79 ft	75.17 Kips	1.15 Kips	76.32 Kips
28.81 ft	75.26 Kips	2.37 Kips	77.63 Kips
37.81 ft	113.11 Kips	2.37 Kips	115.48 Kips
46.81 ft	150.96 Kips	2.37 Kips	153.33 Kips
48.49 ft	158.02 Kips	2.37 Kips	160.40 Kips
48.51 ft	158.11 Kips	2.81 Kips	160.92 Kips
57.51 ft	195.48 Kips	2.81 Kips	198.30 Kips
66.51 ft	232.86 Kips	2.81 Kips	235.67 Kips
73.49 ft	261.84 Kips	2.81 Kips	264.66 Kips
73.51 ft	261.93 Kips	3.29 Kips	265.22 Kips
80.99 ft	292.99 Kips	3.29 Kips	296.28 Kips
81.01 ft	293.08 Kips	2.20 Kips	295.28 Kips
90.01 ft	333.89 Kips	2.20 Kips	336.09 Kips
99.01 ft	374.71 Kips	2.20 Kips	376.91 Kips
99.99 ft	379.15 Kips	2.20 Kips	381.35 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
8.79 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
8.80 ft	Cohesionless	1100.00 psf	29.92	N/A	0.00 Kips
15.01 ft	Cohesionless	1488.13 psf	29.92	N/A	20.96 Kips
17.99 ft	Cohesionless	1674.38 psf	29.92	N/A	34.90 Kips
18.01 ft	Cohesionless	2250.63 psf	24.61	N/A	34.98 Kips
27.01 ft	Cohesionless	2813.13 psf	24.61	N/A	67.26 Kips
28.79 ft	Cohesionless	2924.38 psf	24.61	N/A	75.17 Kips
28.81 ft	Cohesive	N/A	N/A	1181.62 psf	75.26 Kips
37.81 ft	Cohesive	N/A	N/A	1276.00 psf	113.11 Kips
46.81 ft	Cohesive	N/A	N/A	1276.00 psf	150.96 Kips
48.49 ft	Cohesive	N/A	N/A	1276.00 psf	158.02 Kips
48.51 ft	Cohesive	N/A	N/A	1260.00 psf	158.11 Kips
57.51 ft	Cohesive	N/A	N/A	1260.00 psf	195.48 Kips
66.51 ft	Cohesive	N/A	N/A	1260.00 psf	232.86 Kips
73.49 ft	Cohesive	N/A	N/A	1260.00 psf	261.84 Kips
73.51 ft	Cohesive	N/A	N/A	1260.00 psf	261.93 Kips
80.99 ft	Cohesive	N/A	N/A	1260.00 psf	292.99 Kips
81.01 ft	Cohesive	N/A	N/A	1376.00 psf	293.08 Kips
90.01 ft	Cohesive	N/A	N/A	1376.00 psf	333.89 Kips
99.01 ft	Cohesive	N/A	N/A	1376.00 psf	374.71 Kips
99.99 ft	Cohesive	N/A	N/A	1376.00 psf	379.15 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
8.79 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
8.80 ft	Cohesionless	1100.00 psf	77.60	13.05 Kips	5.10 Kips
15.01 ft	Cohesionless	1876.25 psf	77.60	13.05 Kips	8.69 Kips
17.99 ft	Cohesionless	2248.75 psf	77.60	13.05 Kips	10.41 Kips
18.01 ft	Cohesionless	2251.25 psf	22.80	1.15 Kips	1.15 Kips
27.01 ft	Cohesionless	3376.25 psf	22.80	1.15 Kips	1.15 Kips
28.79 ft	Cohesionless	3598.75 psf	22.80	1.15 Kips	1.15 Kips
28.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
37.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
46.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.49 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
57.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
66.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.49 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.51 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
80.99 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
81.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
90.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.99 ft	Cohesive	N/A	N/A	N/A	2.20 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.79 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.80 ft	0.00 Kips	5.10 Kips	5.10 Kips
15.01 ft	20.96 Kips	8.69 Kips	29.66 Kips
17.99 ft	34.90 Kips	10.41 Kips	45.32 Kips
18.01 ft	34.98 Kips	1.15 Kips	36.13 Kips
27.01 ft	67.26 Kips	1.15 Kips	68.41 Kips
28.79 ft	75.17 Kips	1.15 Kips	76.32 Kips
28.81 ft	75.26 Kips	2.37 Kips	77.63 Kips
37.81 ft	113.11 Kips	2.37 Kips	115.48 Kips
46.81 ft	150.96 Kips	2.37 Kips	153.33 Kips
48.49 ft	158.02 Kips	2.37 Kips	160.40 Kips
48.51 ft	158.11 Kips	2.81 Kips	160.92 Kips
57.51 ft	195.48 Kips	2.81 Kips	198.30 Kips
66.51 ft	232.86 Kips	2.81 Kips	235.67 Kips
73.49 ft	261.84 Kips	2.81 Kips	264.66 Kips
73.51 ft	261.93 Kips	3.29 Kips	265.22 Kips
80.99 ft	292.99 Kips	3.29 Kips	296.28 Kips
81.01 ft	293.08 Kips	2.20 Kips	295.28 Kips
90.01 ft	333.89 Kips	2.20 Kips	336.09 Kips
99.01 ft	374.71 Kips	2.20 Kips	376.91 Kips
99.99 ft	379.15 Kips	2.20 Kips	381.35 Kips

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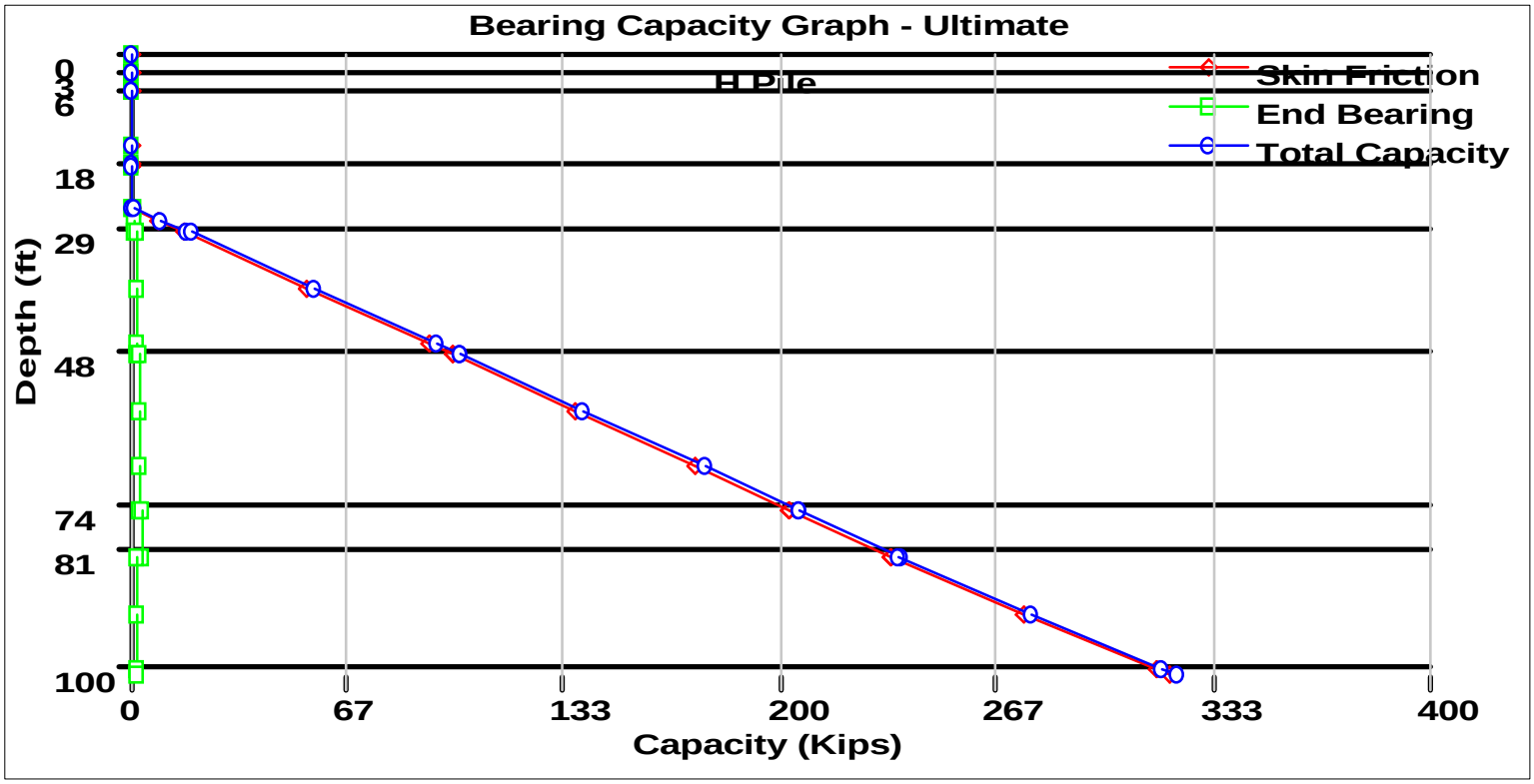

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\DRIVEN\1852802\B-1.DVN
Project Name: 71-19-01 Project Date: 12/26/2019
Project Client: DGL
Computed By: ijh
Project Manager: ijh

PILE INFORMATION

Pile Type: H Pile - HP10X42
Top of Pile: 25.00 ft
Perimeter Analysis: Box
Tip Analysis: Pile Area

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	50.00 ft
	- Driving/Restrike	50.00 ft
	- Ultimate:	50.00 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	3.00 ft	0.00%	125.00 pcf	1620.00 psf	T-79 Steel
2	Cohesionless	3.00 ft	0.00%	125.00 pcf	31.1/26.0	Nordlund
3	Cohesionless	12.00 ft	0.00%	125.00 pcf	40.8/36.0	Nordlund
4	Cohesionless	10.80 ft	0.00%	125.00 pcf	33.6/28.0	Nordlund
5	Cohesive	19.70 ft	0.00%	125.00 pcf	3060.00 psf	T-79 Steel
6	Cohesive	25.00 ft	0.00%	125.00 pcf	3630.00 psf	T-79 Steel
7	Cohesive	7.50 ft	0.00%	125.00 pcf	4250.00 psf	T-79 Steel
8	Cohesive	19.00 ft	0.00%	125.00 pcf	2840.00 psf	T-79 Steel

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
15.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
17.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
18.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
24.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
25.00 ft	Cohesionless	3125.00 psf	24.61	N/A	0.00 Kips
27.01 ft	Cohesionless	3250.63 psf	24.61	N/A	8.33 Kips
28.79 ft	Cohesionless	3361.88 psf	24.61	N/A	16.24 Kips
28.81 ft	Cohesive	N/A	N/A	1181.62 psf	16.32 Kips
37.81 ft	Cohesive	N/A	N/A	1276.00 psf	54.18 Kips
46.81 ft	Cohesive	N/A	N/A	1276.00 psf	92.03 Kips
48.49 ft	Cohesive	N/A	N/A	1276.00 psf	99.09 Kips
48.51 ft	Cohesive	N/A	N/A	1260.00 psf	99.17 Kips
57.51 ft	Cohesive	N/A	N/A	1260.00 psf	136.55 Kips
66.51 ft	Cohesive	N/A	N/A	1260.00 psf	173.92 Kips
73.49 ft	Cohesive	N/A	N/A	1260.00 psf	202.91 Kips
73.51 ft	Cohesive	N/A	N/A	1260.00 psf	202.99 Kips
80.99 ft	Cohesive	N/A	N/A	1260.00 psf	234.06 Kips
81.01 ft	Cohesive	N/A	N/A	1376.00 psf	234.14 Kips
90.01 ft	Cohesive	N/A	N/A	1376.00 psf	274.96 Kips
99.01 ft	Cohesive	N/A	N/A	1376.00 psf	315.77 Kips
99.99 ft	Cohesive	N/A	N/A	1376.00 psf	320.22 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
15.01 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
17.99 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
18.01 ft	Cohesionless	0.00 psf	22.80	1.15 Kips	0.00 Kips
24.99 ft	Cohesionless	0.00 psf	22.80	1.15 Kips	0.00 Kips
25.00 ft	Cohesionless	3125.00 psf	22.80	1.15 Kips	1.15 Kips
27.01 ft	Cohesionless	3376.25 psf	22.80	1.15 Kips	1.15 Kips
28.79 ft	Cohesionless	3598.75 psf	22.80	1.15 Kips	1.15 Kips
28.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
37.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
46.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.49 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
57.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
66.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.49 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.51 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
80.99 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
81.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
90.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.99 ft	Cohesive	N/A	N/A	N/A	2.20 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
15.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
24.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
25.00 ft	0.00 Kips	1.15 Kips	1.15 Kips
27.01 ft	8.33 Kips	1.15 Kips	9.47 Kips
28.79 ft	16.24 Kips	1.15 Kips	17.39 Kips
28.81 ft	16.32 Kips	2.37 Kips	18.70 Kips
37.81 ft	54.18 Kips	2.37 Kips	56.55 Kips
46.81 ft	92.03 Kips	2.37 Kips	94.40 Kips
48.49 ft	99.09 Kips	2.37 Kips	101.46 Kips
48.51 ft	99.17 Kips	2.81 Kips	101.99 Kips
57.51 ft	136.55 Kips	2.81 Kips	139.36 Kips
66.51 ft	173.92 Kips	2.81 Kips	176.74 Kips
73.49 ft	202.91 Kips	2.81 Kips	205.72 Kips
73.51 ft	202.99 Kips	3.29 Kips	206.29 Kips
80.99 ft	234.06 Kips	3.29 Kips	237.35 Kips
81.01 ft	234.14 Kips	2.20 Kips	236.34 Kips
90.01 ft	274.96 Kips	2.20 Kips	277.16 Kips
99.01 ft	315.77 Kips	2.20 Kips	317.98 Kips
99.99 ft	320.22 Kips	2.20 Kips	322.42 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
15.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
17.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
18.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
24.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
25.00 ft	Cohesionless	3125.00 psf	24.61	N/A	0.00 Kips
27.01 ft	Cohesionless	3250.63 psf	24.61	N/A	8.33 Kips
28.79 ft	Cohesionless	3361.88 psf	24.61	N/A	16.24 Kips
28.81 ft	Cohesive	N/A	N/A	1181.62 psf	16.32 Kips
37.81 ft	Cohesive	N/A	N/A	1276.00 psf	54.18 Kips
46.81 ft	Cohesive	N/A	N/A	1276.00 psf	92.03 Kips
48.49 ft	Cohesive	N/A	N/A	1276.00 psf	99.09 Kips
48.51 ft	Cohesive	N/A	N/A	1260.00 psf	99.17 Kips
57.51 ft	Cohesive	N/A	N/A	1260.00 psf	136.55 Kips
66.51 ft	Cohesive	N/A	N/A	1260.00 psf	173.92 Kips
73.49 ft	Cohesive	N/A	N/A	1260.00 psf	202.91 Kips
73.51 ft	Cohesive	N/A	N/A	1260.00 psf	202.99 Kips
80.99 ft	Cohesive	N/A	N/A	1260.00 psf	234.06 Kips
81.01 ft	Cohesive	N/A	N/A	1376.00 psf	234.14 Kips
90.01 ft	Cohesive	N/A	N/A	1376.00 psf	274.96 Kips
99.01 ft	Cohesive	N/A	N/A	1376.00 psf	315.77 Kips
99.99 ft	Cohesive	N/A	N/A	1376.00 psf	320.22 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
15.01 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
17.99 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
18.01 ft	Cohesionless	0.00 psf	22.80	1.15 Kips	0.00 Kips
24.99 ft	Cohesionless	0.00 psf	22.80	1.15 Kips	0.00 Kips
25.00 ft	Cohesionless	3125.00 psf	22.80	1.15 Kips	1.15 Kips
27.01 ft	Cohesionless	3376.25 psf	22.80	1.15 Kips	1.15 Kips
28.79 ft	Cohesionless	3598.75 psf	22.80	1.15 Kips	1.15 Kips
28.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
37.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
46.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.49 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
57.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
66.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.49 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.51 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
80.99 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
81.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
90.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.99 ft	Cohesive	N/A	N/A	N/A	2.20 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
15.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
24.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
25.00 ft	0.00 Kips	1.15 Kips	1.15 Kips
27.01 ft	8.33 Kips	1.15 Kips	9.47 Kips
28.79 ft	16.24 Kips	1.15 Kips	17.39 Kips
28.81 ft	16.32 Kips	2.37 Kips	18.70 Kips
37.81 ft	54.18 Kips	2.37 Kips	56.55 Kips
46.81 ft	92.03 Kips	2.37 Kips	94.40 Kips
48.49 ft	99.09 Kips	2.37 Kips	101.46 Kips
48.51 ft	99.17 Kips	2.81 Kips	101.99 Kips
57.51 ft	136.55 Kips	2.81 Kips	139.36 Kips
66.51 ft	173.92 Kips	2.81 Kips	176.74 Kips
73.49 ft	202.91 Kips	2.81 Kips	205.72 Kips
73.51 ft	202.99 Kips	3.29 Kips	206.29 Kips
80.99 ft	234.06 Kips	3.29 Kips	237.35 Kips
81.01 ft	234.14 Kips	2.20 Kips	236.34 Kips
90.01 ft	274.96 Kips	2.20 Kips	277.16 Kips
99.01 ft	315.77 Kips	2.20 Kips	317.98 Kips
99.99 ft	320.22 Kips	2.20 Kips	322.42 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
15.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
17.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
18.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
24.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
25.00 ft	Cohesionless	3125.00 psf	24.61	N/A	0.00 Kips
27.01 ft	Cohesionless	3250.63 psf	24.61	N/A	8.33 Kips
28.79 ft	Cohesionless	3361.88 psf	24.61	N/A	16.24 Kips
28.81 ft	Cohesive	N/A	N/A	1181.62 psf	16.32 Kips
37.81 ft	Cohesive	N/A	N/A	1276.00 psf	54.18 Kips
46.81 ft	Cohesive	N/A	N/A	1276.00 psf	92.03 Kips
48.49 ft	Cohesive	N/A	N/A	1276.00 psf	99.09 Kips
48.51 ft	Cohesive	N/A	N/A	1260.00 psf	99.17 Kips
57.51 ft	Cohesive	N/A	N/A	1260.00 psf	136.55 Kips
66.51 ft	Cohesive	N/A	N/A	1260.00 psf	173.92 Kips
73.49 ft	Cohesive	N/A	N/A	1260.00 psf	202.91 Kips
73.51 ft	Cohesive	N/A	N/A	1260.00 psf	202.99 Kips
80.99 ft	Cohesive	N/A	N/A	1260.00 psf	234.06 Kips
81.01 ft	Cohesive	N/A	N/A	1376.00 psf	234.14 Kips
90.01 ft	Cohesive	N/A	N/A	1376.00 psf	274.96 Kips
99.01 ft	Cohesive	N/A	N/A	1376.00 psf	315.77 Kips
99.99 ft	Cohesive	N/A	N/A	1376.00 psf	320.22 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
3.01 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	17.40	1.15 Kips	0.00 Kips
6.01 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
15.01 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
17.99 ft	Cohesionless	0.00 psf	77.60	13.05 Kips	0.00 Kips
18.01 ft	Cohesionless	0.00 psf	22.80	1.15 Kips	0.00 Kips
24.99 ft	Cohesionless	0.00 psf	22.80	1.15 Kips	0.00 Kips
25.00 ft	Cohesionless	3125.00 psf	22.80	1.15 Kips	1.15 Kips
27.01 ft	Cohesionless	3376.25 psf	22.80	1.15 Kips	1.15 Kips
28.79 ft	Cohesionless	3598.75 psf	22.80	1.15 Kips	1.15 Kips
28.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
37.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
46.81 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.49 ft	Cohesive	N/A	N/A	N/A	2.37 Kips
48.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
57.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
66.51 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.49 ft	Cohesive	N/A	N/A	N/A	2.81 Kips
73.51 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
80.99 ft	Cohesive	N/A	N/A	N/A	3.29 Kips
81.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
90.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.01 ft	Cohesive	N/A	N/A	N/A	2.20 Kips
99.99 ft	Cohesive	N/A	N/A	N/A	2.20 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
15.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
24.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
25.00 ft	0.00 Kips	1.15 Kips	1.15 Kips
27.01 ft	8.33 Kips	1.15 Kips	9.47 Kips
28.79 ft	16.24 Kips	1.15 Kips	17.39 Kips
28.81 ft	16.32 Kips	2.37 Kips	18.70 Kips
37.81 ft	54.18 Kips	2.37 Kips	56.55 Kips
46.81 ft	92.03 Kips	2.37 Kips	94.40 Kips
48.49 ft	99.09 Kips	2.37 Kips	101.46 Kips
48.51 ft	99.17 Kips	2.81 Kips	101.99 Kips
57.51 ft	136.55 Kips	2.81 Kips	139.36 Kips
66.51 ft	173.92 Kips	2.81 Kips	176.74 Kips
73.49 ft	202.91 Kips	2.81 Kips	205.72 Kips
73.51 ft	202.99 Kips	3.29 Kips	206.29 Kips
80.99 ft	234.06 Kips	3.29 Kips	237.35 Kips
81.01 ft	234.14 Kips	2.20 Kips	236.34 Kips
90.01 ft	274.96 Kips	2.20 Kips	277.16 Kips
99.01 ft	315.77 Kips	2.20 Kips	317.98 Kips
99.99 ft	320.22 Kips	2.20 Kips	322.42 Kips

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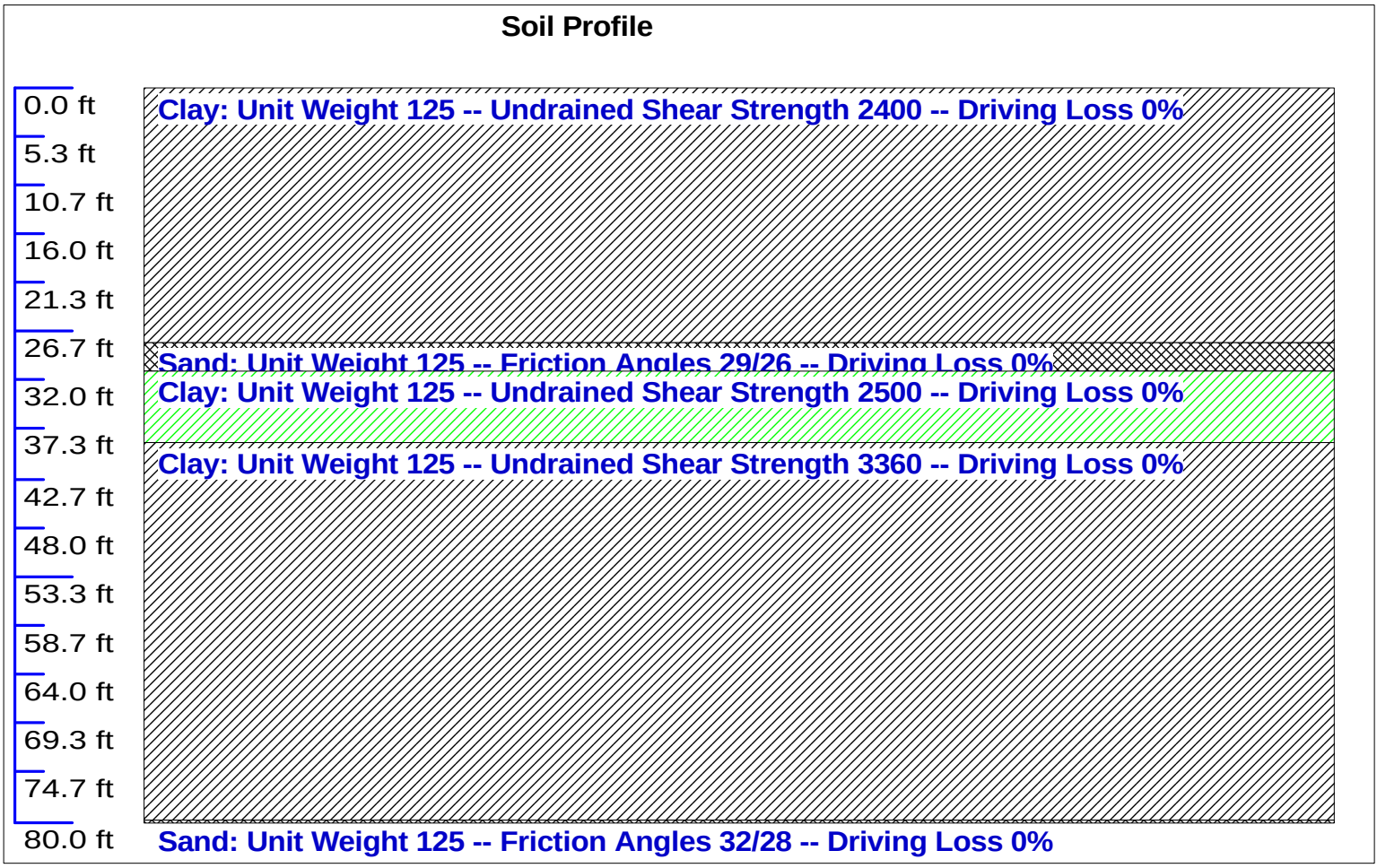

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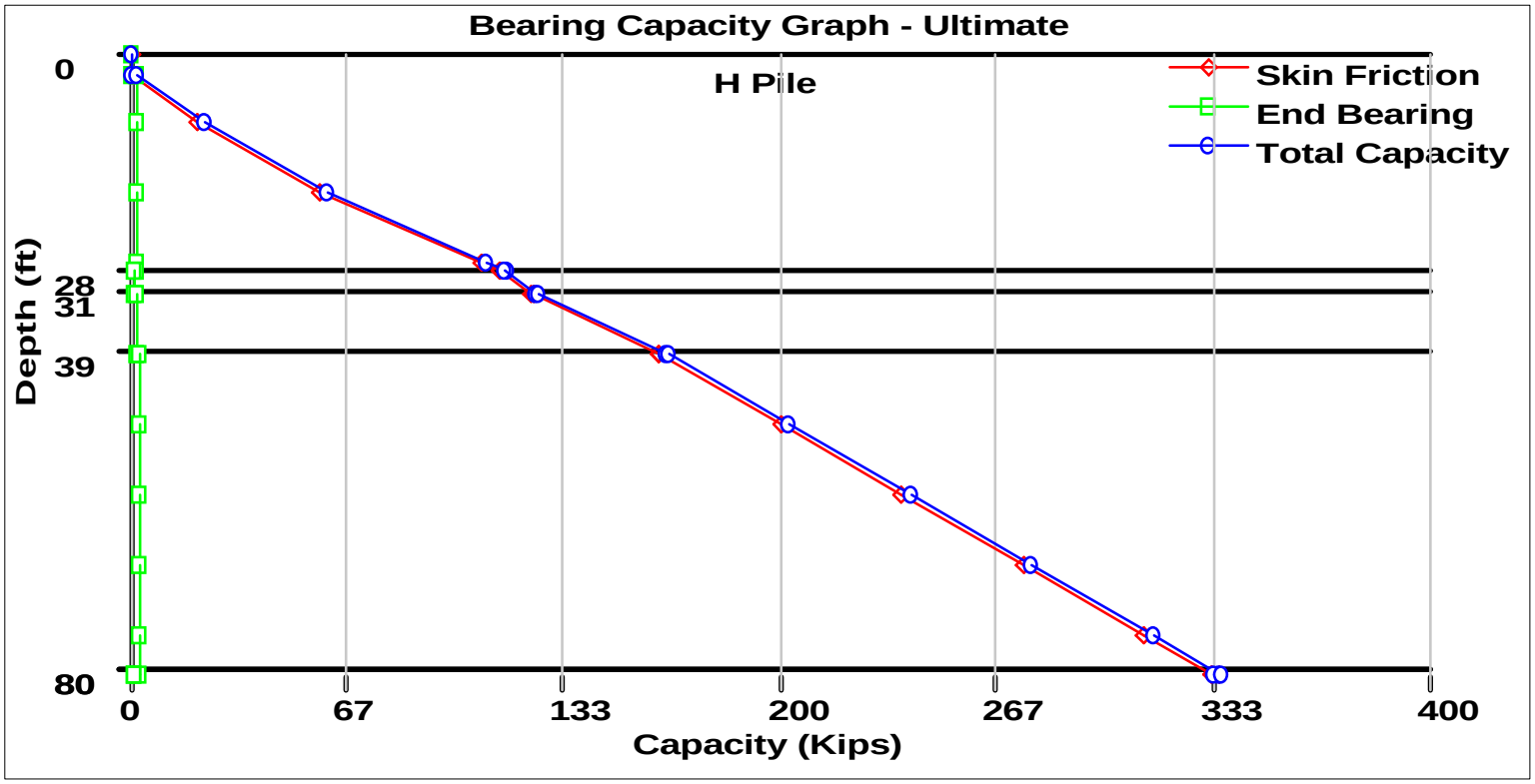

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\DRIVEN\1852802\B-2.DVN
Project Name: 71-19-01` Project Date: 12/26/2019
Project Client: DGL
Computed By: ijh
Project Manager: ijh

PILE INFORMATION

Pile Type: H Pile - HP10X42
Top of Pile: 3.00 ft
Perimeter Analysis: Box
Tip Analysis: Pile Area

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	50.00 ft
	- Driving/Restrike	50.00 ft
	- Ultimate:	50.00 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	28.00 ft	0.00%	125.00 pcf	2400.00 psf	T-79 Steel
2	Cohesionless	3.00 ft	0.00%	125.00 pcf	28.9/26.0	Nordlund
3	Cohesive	7.80 ft	0.00%	125.00 pcf	2500.00 psf	T-79 Steel
4	Cohesive	40.90 ft	0.00%	125.00 pcf	3360.00 psf	T-79 Steel
5	Cohesionless	0.30 ft	0.00%	125.00 pcf	31.8/28.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
3.00 ft	Cohesive	N/A	N/A	1050.00 psf	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	1050.00 psf	20.80 Kips
18.01 ft	Cohesive	N/A	N/A	1182.61 psf	58.50 Kips
27.01 ft	Cohesive	N/A	N/A	1363.06 psf	107.86 Kips
27.99 ft	Cohesive	N/A	N/A	1382.71 psf	113.88 Kips
28.01 ft	Cohesionless	3500.63 psf	21.20	N/A	113.98 Kips
30.99 ft	Cohesionless	3686.87 psf	21.20	N/A	123.66 Kips
31.01 ft	Cohesive	N/A	N/A	1471.36 psf	123.74 Kips
38.79 ft	Cohesive	N/A	N/A	1525.00 psf	162.85 Kips
38.81 ft	Cohesive	N/A	N/A	1260.00 psf	162.94 Kips
47.81 ft	Cohesive	N/A	N/A	1260.00 psf	200.32 Kips
56.81 ft	Cohesive	N/A	N/A	1260.00 psf	237.69 Kips
65.81 ft	Cohesive	N/A	N/A	1260.00 psf	275.07 Kips
74.81 ft	Cohesive	N/A	N/A	1260.00 psf	312.44 Kips
79.69 ft	Cohesive	N/A	N/A	1260.00 psf	332.71 Kips
79.71 ft	Cohesionless	8109.53 psf	23.31	N/A	332.84 Kips
79.99 ft	Cohesionless	8118.30 psf	23.31	N/A	335.35 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
3.00 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
18.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.99 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
28.01 ft	Cohesionless	3501.25 psf	17.40	1.15 Kips	1.15 Kips
30.99 ft	Cohesionless	3873.75 psf	17.40	1.15 Kips	1.15 Kips
31.01 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.79 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
47.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
56.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
65.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
74.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.69 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.71 ft	Cohesionless	8109.85 psf	22.80	1.15 Kips	1.15 Kips
79.99 ft	Cohesionless	8127.37 psf	22.80	1.15 Kips	1.15 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.00 ft	0.00 Kips	1.86 Kips	1.86 Kips
9.01 ft	20.80 Kips	1.86 Kips	22.66 Kips
18.01 ft	58.50 Kips	1.86 Kips	60.36 Kips
27.01 ft	107.86 Kips	1.86 Kips	109.72 Kips
27.99 ft	113.88 Kips	1.86 Kips	115.74 Kips
28.01 ft	113.98 Kips	1.15 Kips	115.12 Kips
30.99 ft	123.66 Kips	1.15 Kips	124.81 Kips
31.01 ft	123.74 Kips	1.94 Kips	125.68 Kips
38.79 ft	162.85 Kips	1.94 Kips	164.79 Kips
38.81 ft	162.94 Kips	2.60 Kips	165.55 Kips
47.81 ft	200.32 Kips	2.60 Kips	202.92 Kips
56.81 ft	237.69 Kips	2.60 Kips	240.29 Kips
65.81 ft	275.07 Kips	2.60 Kips	277.67 Kips
74.81 ft	312.44 Kips	2.60 Kips	315.04 Kips
79.69 ft	332.71 Kips	2.60 Kips	335.31 Kips
79.71 ft	332.84 Kips	1.15 Kips	333.98 Kips
79.99 ft	335.35 Kips	1.15 Kips	336.50 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
3.00 ft	Cohesive	N/A	N/A	1050.00 psf	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	1050.00 psf	20.80 Kips
18.01 ft	Cohesive	N/A	N/A	1182.61 psf	58.50 Kips
27.01 ft	Cohesive	N/A	N/A	1363.06 psf	107.86 Kips
27.99 ft	Cohesive	N/A	N/A	1382.71 psf	113.88 Kips
28.01 ft	Cohesionless	3500.63 psf	21.20	N/A	113.98 Kips
30.99 ft	Cohesionless	3686.87 psf	21.20	N/A	123.66 Kips
31.01 ft	Cohesive	N/A	N/A	1471.36 psf	123.74 Kips
38.79 ft	Cohesive	N/A	N/A	1525.00 psf	162.85 Kips
38.81 ft	Cohesive	N/A	N/A	1260.00 psf	162.94 Kips
47.81 ft	Cohesive	N/A	N/A	1260.00 psf	200.32 Kips
56.81 ft	Cohesive	N/A	N/A	1260.00 psf	237.69 Kips
65.81 ft	Cohesive	N/A	N/A	1260.00 psf	275.07 Kips
74.81 ft	Cohesive	N/A	N/A	1260.00 psf	312.44 Kips
79.69 ft	Cohesive	N/A	N/A	1260.00 psf	332.71 Kips
79.71 ft	Cohesionless	8109.53 psf	23.31	N/A	332.84 Kips
79.99 ft	Cohesionless	8118.30 psf	23.31	N/A	335.35 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
3.00 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
18.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.99 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
28.01 ft	Cohesionless	3501.25 psf	17.40	1.15 Kips	1.15 Kips
30.99 ft	Cohesionless	3873.75 psf	17.40	1.15 Kips	1.15 Kips
31.01 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.79 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
47.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
56.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
65.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
74.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.69 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.71 ft	Cohesionless	8109.85 psf	22.80	1.15 Kips	1.15 Kips
79.99 ft	Cohesionless	8127.37 psf	22.80	1.15 Kips	1.15 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.00 ft	0.00 Kips	1.86 Kips	1.86 Kips
9.01 ft	20.80 Kips	1.86 Kips	22.66 Kips
18.01 ft	58.50 Kips	1.86 Kips	60.36 Kips
27.01 ft	107.86 Kips	1.86 Kips	109.72 Kips
27.99 ft	113.88 Kips	1.86 Kips	115.74 Kips
28.01 ft	113.98 Kips	1.15 Kips	115.12 Kips
30.99 ft	123.66 Kips	1.15 Kips	124.81 Kips
31.01 ft	123.74 Kips	1.94 Kips	125.68 Kips
38.79 ft	162.85 Kips	1.94 Kips	164.79 Kips
38.81 ft	162.94 Kips	2.60 Kips	165.55 Kips
47.81 ft	200.32 Kips	2.60 Kips	202.92 Kips
56.81 ft	237.69 Kips	2.60 Kips	240.29 Kips
65.81 ft	275.07 Kips	2.60 Kips	277.67 Kips
74.81 ft	312.44 Kips	2.60 Kips	315.04 Kips
79.69 ft	332.71 Kips	2.60 Kips	335.31 Kips
79.71 ft	332.84 Kips	1.15 Kips	333.98 Kips
79.99 ft	335.35 Kips	1.15 Kips	336.50 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
3.00 ft	Cohesive	N/A	N/A	1050.00 psf	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	1050.00 psf	20.80 Kips
18.01 ft	Cohesive	N/A	N/A	1182.61 psf	58.50 Kips
27.01 ft	Cohesive	N/A	N/A	1363.06 psf	107.86 Kips
27.99 ft	Cohesive	N/A	N/A	1382.71 psf	113.88 Kips
28.01 ft	Cohesionless	3500.63 psf	21.20	N/A	113.98 Kips
30.99 ft	Cohesionless	3686.87 psf	21.20	N/A	123.66 Kips
31.01 ft	Cohesive	N/A	N/A	1471.36 psf	123.74 Kips
38.79 ft	Cohesive	N/A	N/A	1525.00 psf	162.85 Kips
38.81 ft	Cohesive	N/A	N/A	1260.00 psf	162.94 Kips
47.81 ft	Cohesive	N/A	N/A	1260.00 psf	200.32 Kips
56.81 ft	Cohesive	N/A	N/A	1260.00 psf	237.69 Kips
65.81 ft	Cohesive	N/A	N/A	1260.00 psf	275.07 Kips
74.81 ft	Cohesive	N/A	N/A	1260.00 psf	312.44 Kips
79.69 ft	Cohesive	N/A	N/A	1260.00 psf	332.71 Kips
79.71 ft	Cohesionless	8109.53 psf	23.31	N/A	332.84 Kips
79.99 ft	Cohesionless	8118.30 psf	23.31	N/A	335.35 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
2.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
3.00 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
18.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.99 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
28.01 ft	Cohesionless	3501.25 psf	17.40	1.15 Kips	1.15 Kips
30.99 ft	Cohesionless	3873.75 psf	17.40	1.15 Kips	1.15 Kips
31.01 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.79 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
47.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
56.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
65.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
74.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.69 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.71 ft	Cohesionless	8109.85 psf	22.80	1.15 Kips	1.15 Kips
79.99 ft	Cohesionless	8127.37 psf	22.80	1.15 Kips	1.15 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.00 ft	0.00 Kips	1.86 Kips	1.86 Kips
9.01 ft	20.80 Kips	1.86 Kips	22.66 Kips
18.01 ft	58.50 Kips	1.86 Kips	60.36 Kips
27.01 ft	107.86 Kips	1.86 Kips	109.72 Kips
27.99 ft	113.88 Kips	1.86 Kips	115.74 Kips
28.01 ft	113.98 Kips	1.15 Kips	115.12 Kips
30.99 ft	123.66 Kips	1.15 Kips	124.81 Kips
31.01 ft	123.74 Kips	1.94 Kips	125.68 Kips
38.79 ft	162.85 Kips	1.94 Kips	164.79 Kips
38.81 ft	162.94 Kips	2.60 Kips	165.55 Kips
47.81 ft	200.32 Kips	2.60 Kips	202.92 Kips
56.81 ft	237.69 Kips	2.60 Kips	240.29 Kips
65.81 ft	275.07 Kips	2.60 Kips	277.67 Kips
74.81 ft	312.44 Kips	2.60 Kips	315.04 Kips
79.69 ft	332.71 Kips	2.60 Kips	335.31 Kips
79.71 ft	332.84 Kips	1.15 Kips	333.98 Kips
79.99 ft	335.35 Kips	1.15 Kips	336.50 Kips

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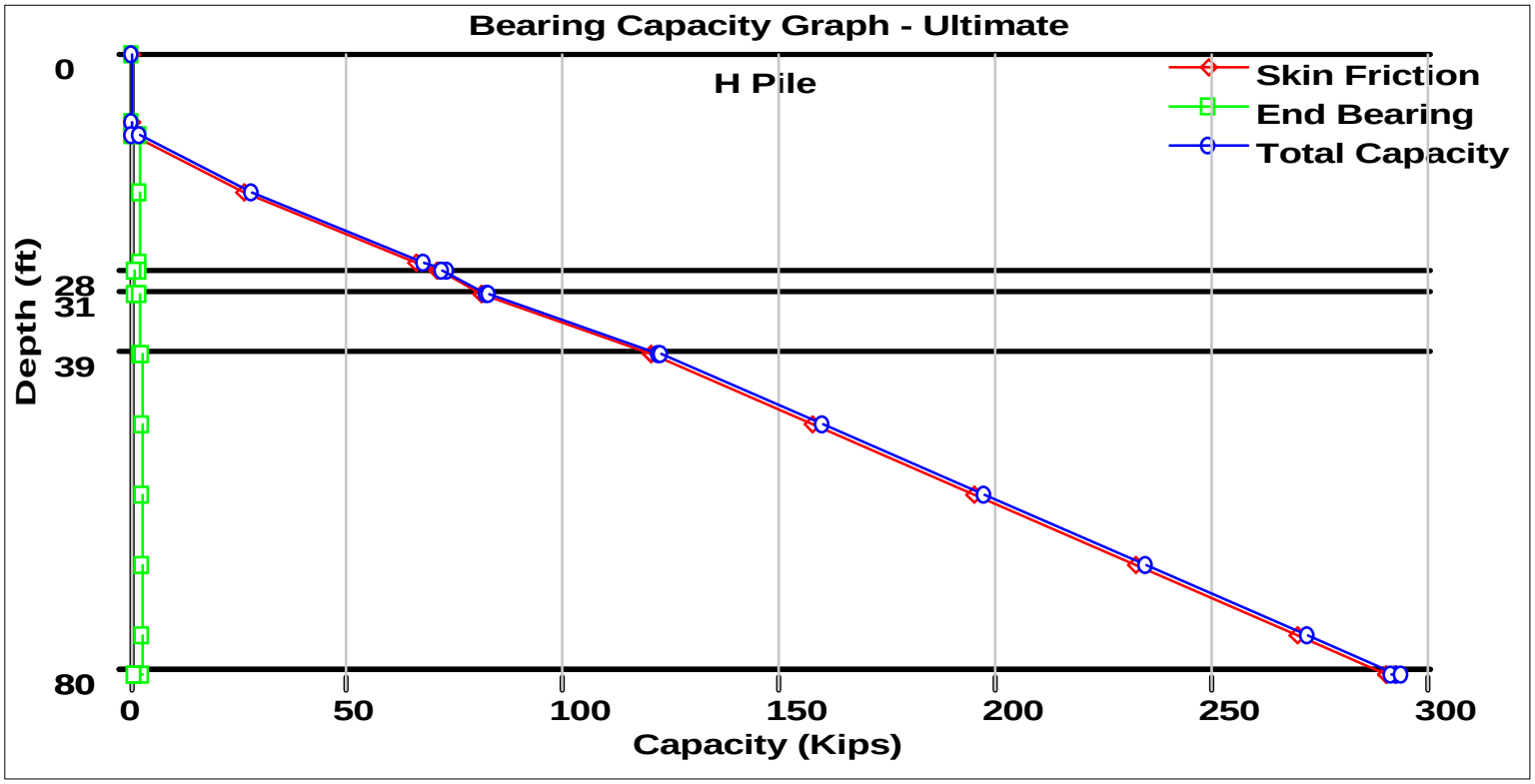

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\DRIVEN\1852802\B-2.DVN
Project Name: 71-19-01` Project Date: 12/26/2019
Project Client: DGL
Computed By: ijh
Project Manager: ijh

PILE INFORMATION

Pile Type: H Pile - HP10X42
Top of Pile: 10.50 ft
Perimeter Analysis: Box
Tip Analysis: Pile Area

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	50.00 ft
	- Driving/Restrike	50.00 ft
	- Ultimate:	50.00 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	28.00 ft	0.00%	125.00 pcf	2400.00 psf	T-79 Steel
2	Cohesionless	3.00 ft	0.00%	125.00 pcf	28.9/26.0	Nordlund
3	Cohesive	7.80 ft	0.00%	125.00 pcf	2500.00 psf	T-79 Steel
4	Cohesive	40.90 ft	0.00%	125.00 pcf	3360.00 psf	T-79 Steel
5	Cohesionless	0.30 ft	0.00%	125.00 pcf	31.8/28.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
10.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
10.50 ft	Cohesive	N/A	N/A	1050.00 psf	0.00 Kips
18.01 ft	Cohesive	N/A	N/A	1050.00 psf	25.99 Kips
27.01 ft	Cohesive	N/A	N/A	1212.69 psf	65.99 Kips
27.99 ft	Cohesive	N/A	N/A	1232.33 psf	71.04 Kips
28.01 ft	Cohesionless	3500.63 psf	21.20	N/A	71.12 Kips
30.99 ft	Cohesionless	3686.87 psf	21.20	N/A	80.80 Kips
31.01 ft	Cohesive	N/A	N/A	1471.36 psf	80.89 Kips
38.79 ft	Cohesive	N/A	N/A	1525.00 psf	119.99 Kips
38.81 ft	Cohesive	N/A	N/A	1260.00 psf	120.08 Kips
47.81 ft	Cohesive	N/A	N/A	1260.00 psf	157.46 Kips
56.81 ft	Cohesive	N/A	N/A	1260.00 psf	194.83 Kips
65.81 ft	Cohesive	N/A	N/A	1260.00 psf	232.21 Kips
74.81 ft	Cohesive	N/A	N/A	1260.00 psf	269.58 Kips
79.69 ft	Cohesive	N/A	N/A	1260.00 psf	289.85 Kips
79.71 ft	Cohesionless	8109.53 psf	23.31	N/A	289.98 Kips
79.99 ft	Cohesionless	8118.30 psf	23.31	N/A	292.50 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
10.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
10.50 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
18.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.99 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
28.01 ft	Cohesionless	3501.25 psf	17.40	1.15 Kips	1.15 Kips
30.99 ft	Cohesionless	3873.75 psf	17.40	1.15 Kips	1.15 Kips
31.01 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.79 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
47.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
56.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
65.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
74.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.69 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.71 ft	Cohesionless	8109.85 psf	22.80	1.15 Kips	1.15 Kips
79.99 ft	Cohesionless	8127.37 psf	22.80	1.15 Kips	1.15 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
9.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
10.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
10.50 ft	0.00 Kips	1.86 Kips	1.86 Kips
18.01 ft	25.99 Kips	1.86 Kips	27.85 Kips
27.01 ft	65.99 Kips	1.86 Kips	67.85 Kips
27.99 ft	71.04 Kips	1.86 Kips	72.90 Kips
28.01 ft	71.12 Kips	1.15 Kips	72.27 Kips
30.99 ft	80.80 Kips	1.15 Kips	81.95 Kips
31.01 ft	80.89 Kips	1.94 Kips	82.82 Kips
38.79 ft	119.99 Kips	1.94 Kips	121.93 Kips
38.81 ft	120.08 Kips	2.60 Kips	122.69 Kips
47.81 ft	157.46 Kips	2.60 Kips	160.06 Kips
56.81 ft	194.83 Kips	2.60 Kips	197.44 Kips
65.81 ft	232.21 Kips	2.60 Kips	234.81 Kips
74.81 ft	269.58 Kips	2.60 Kips	272.19 Kips
79.69 ft	289.85 Kips	2.60 Kips	292.45 Kips
79.71 ft	289.98 Kips	1.15 Kips	291.13 Kips
79.99 ft	292.50 Kips	1.15 Kips	293.64 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
10.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
10.50 ft	Cohesive	N/A	N/A	1050.00 psf	0.00 Kips
18.01 ft	Cohesive	N/A	N/A	1050.00 psf	25.99 Kips
27.01 ft	Cohesive	N/A	N/A	1212.69 psf	65.99 Kips
27.99 ft	Cohesive	N/A	N/A	1232.33 psf	71.04 Kips
28.01 ft	Cohesionless	3500.63 psf	21.20	N/A	71.12 Kips
30.99 ft	Cohesionless	3686.87 psf	21.20	N/A	80.80 Kips
31.01 ft	Cohesive	N/A	N/A	1471.36 psf	80.89 Kips
38.79 ft	Cohesive	N/A	N/A	1525.00 psf	119.99 Kips
38.81 ft	Cohesive	N/A	N/A	1260.00 psf	120.08 Kips
47.81 ft	Cohesive	N/A	N/A	1260.00 psf	157.46 Kips
56.81 ft	Cohesive	N/A	N/A	1260.00 psf	194.83 Kips
65.81 ft	Cohesive	N/A	N/A	1260.00 psf	232.21 Kips
74.81 ft	Cohesive	N/A	N/A	1260.00 psf	269.58 Kips
79.69 ft	Cohesive	N/A	N/A	1260.00 psf	289.85 Kips
79.71 ft	Cohesionless	8109.53 psf	23.31	N/A	289.98 Kips
79.99 ft	Cohesionless	8118.30 psf	23.31	N/A	292.50 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
10.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
10.50 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
18.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.99 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
28.01 ft	Cohesionless	3501.25 psf	17.40	1.15 Kips	1.15 Kips
30.99 ft	Cohesionless	3873.75 psf	17.40	1.15 Kips	1.15 Kips
31.01 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.79 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
47.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
56.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
65.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
74.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.69 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.71 ft	Cohesionless	8109.85 psf	22.80	1.15 Kips	1.15 Kips
79.99 ft	Cohesionless	8127.37 psf	22.80	1.15 Kips	1.15 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
9.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
10.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
10.50 ft	0.00 Kips	1.86 Kips	1.86 Kips
18.01 ft	25.99 Kips	1.86 Kips	27.85 Kips
27.01 ft	65.99 Kips	1.86 Kips	67.85 Kips
27.99 ft	71.04 Kips	1.86 Kips	72.90 Kips
28.01 ft	71.12 Kips	1.15 Kips	72.27 Kips
30.99 ft	80.80 Kips	1.15 Kips	81.95 Kips
31.01 ft	80.89 Kips	1.94 Kips	82.82 Kips
38.79 ft	119.99 Kips	1.94 Kips	121.93 Kips
38.81 ft	120.08 Kips	2.60 Kips	122.69 Kips
47.81 ft	157.46 Kips	2.60 Kips	160.06 Kips
56.81 ft	194.83 Kips	2.60 Kips	197.44 Kips
65.81 ft	232.21 Kips	2.60 Kips	234.81 Kips
74.81 ft	269.58 Kips	2.60 Kips	272.19 Kips
79.69 ft	289.85 Kips	2.60 Kips	292.45 Kips
79.71 ft	289.98 Kips	1.15 Kips	291.13 Kips
79.99 ft	292.50 Kips	1.15 Kips	293.64 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
10.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
10.50 ft	Cohesive	N/A	N/A	1050.00 psf	0.00 Kips
18.01 ft	Cohesive	N/A	N/A	1050.00 psf	25.99 Kips
27.01 ft	Cohesive	N/A	N/A	1212.69 psf	65.99 Kips
27.99 ft	Cohesive	N/A	N/A	1232.33 psf	71.04 Kips
28.01 ft	Cohesionless	3500.63 psf	21.20	N/A	71.12 Kips
30.99 ft	Cohesionless	3686.87 psf	21.20	N/A	80.80 Kips
31.01 ft	Cohesive	N/A	N/A	1471.36 psf	80.89 Kips
38.79 ft	Cohesive	N/A	N/A	1525.00 psf	119.99 Kips
38.81 ft	Cohesive	N/A	N/A	1260.00 psf	120.08 Kips
47.81 ft	Cohesive	N/A	N/A	1260.00 psf	157.46 Kips
56.81 ft	Cohesive	N/A	N/A	1260.00 psf	194.83 Kips
65.81 ft	Cohesive	N/A	N/A	1260.00 psf	232.21 Kips
74.81 ft	Cohesive	N/A	N/A	1260.00 psf	269.58 Kips
79.69 ft	Cohesive	N/A	N/A	1260.00 psf	289.85 Kips
79.71 ft	Cohesionless	8109.53 psf	23.31	N/A	289.98 Kips
79.99 ft	Cohesionless	8118.30 psf	23.31	N/A	292.50 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
10.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
10.50 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
18.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.99 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
28.01 ft	Cohesionless	3501.25 psf	17.40	1.15 Kips	1.15 Kips
30.99 ft	Cohesionless	3873.75 psf	17.40	1.15 Kips	1.15 Kips
31.01 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.79 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
47.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
56.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
65.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
74.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.69 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.71 ft	Cohesionless	8109.85 psf	22.80	1.15 Kips	1.15 Kips
79.99 ft	Cohesionless	8127.37 psf	22.80	1.15 Kips	1.15 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
9.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
10.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
10.50 ft	0.00 Kips	1.86 Kips	1.86 Kips
18.01 ft	25.99 Kips	1.86 Kips	27.85 Kips
27.01 ft	65.99 Kips	1.86 Kips	67.85 Kips
27.99 ft	71.04 Kips	1.86 Kips	72.90 Kips
28.01 ft	71.12 Kips	1.15 Kips	72.27 Kips
30.99 ft	80.80 Kips	1.15 Kips	81.95 Kips
31.01 ft	80.89 Kips	1.94 Kips	82.82 Kips
38.79 ft	119.99 Kips	1.94 Kips	121.93 Kips
38.81 ft	120.08 Kips	2.60 Kips	122.69 Kips
47.81 ft	157.46 Kips	2.60 Kips	160.06 Kips
56.81 ft	194.83 Kips	2.60 Kips	197.44 Kips
65.81 ft	232.21 Kips	2.60 Kips	234.81 Kips
74.81 ft	269.58 Kips	2.60 Kips	272.19 Kips
79.69 ft	289.85 Kips	2.60 Kips	292.45 Kips
79.71 ft	289.98 Kips	1.15 Kips	291.13 Kips
79.99 ft	292.50 Kips	1.15 Kips	293.64 Kips

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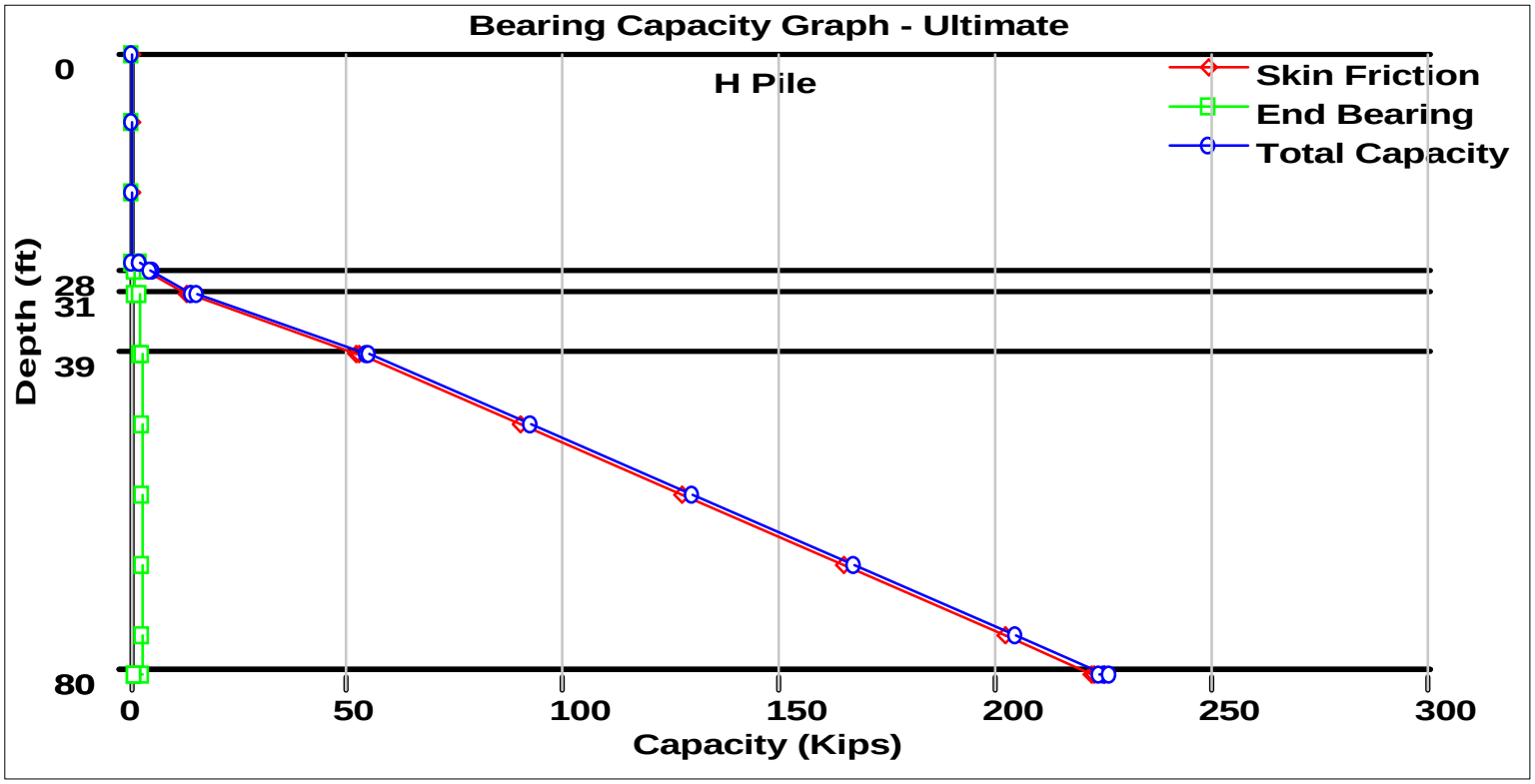

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\DRIVEN\1852802\B-2.DVN
Project Name: 71-19-01` Project Date: 12/26/2019
Project Client: DGL
Computed By: ijh
Project Manager: ijh

PILE INFORMATION

Pile Type: H Pile - HP10X42
Top of Pile: 27.00 ft
Perimeter Analysis: Box
Tip Analysis: Pile Area

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	50.00 ft
	- Driving/Restrike	50.00 ft
	- Ultimate:	50.00 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	28.00 ft	0.00%	125.00 pcf	2400.00 psf	T-79 Steel
2	Cohesionless	3.00 ft	0.00%	125.00 pcf	28.9/26.0	Nordlund
3	Cohesive	7.80 ft	0.00%	125.00 pcf	2500.00 psf	T-79 Steel
4	Cohesive	40.90 ft	0.00%	125.00 pcf	3360.00 psf	T-79 Steel
5	Cohesionless	0.30 ft	0.00%	125.00 pcf	31.8/28.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
26.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
27.00 ft	Cohesive	N/A	N/A	1050.00 psf	0.00 Kips
27.01 ft	Cohesive	N/A	N/A	1050.00 psf	0.03 Kips
27.99 ft	Cohesive	N/A	N/A	1050.00 psf	3.43 Kips
28.01 ft	Cohesionless	3500.63 psf	21.20	N/A	3.49 Kips
30.99 ft	Cohesionless	3686.87 psf	21.20	N/A	13.18 Kips
31.01 ft	Cohesive	N/A	N/A	1471.36 psf	13.26 Kips
38.79 ft	Cohesive	N/A	N/A	1525.00 psf	52.36 Kips
38.81 ft	Cohesive	N/A	N/A	1260.00 psf	52.46 Kips
47.81 ft	Cohesive	N/A	N/A	1260.00 psf	89.83 Kips
56.81 ft	Cohesive	N/A	N/A	1260.00 psf	127.21 Kips
65.81 ft	Cohesive	N/A	N/A	1260.00 psf	164.58 Kips
74.81 ft	Cohesive	N/A	N/A	1260.00 psf	201.95 Kips
79.69 ft	Cohesive	N/A	N/A	1260.00 psf	222.22 Kips
79.71 ft	Cohesionless	8109.53 psf	23.31	N/A	222.35 Kips
79.99 ft	Cohesionless	8118.30 psf	23.31	N/A	224.87 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
26.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
27.00 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.99 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
28.01 ft	Cohesionless	3501.25 psf	17.40	1.15 Kips	1.15 Kips
30.99 ft	Cohesionless	3873.75 psf	17.40	1.15 Kips	1.15 Kips
31.01 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.79 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
47.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
56.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
65.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
74.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.69 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.71 ft	Cohesionless	8109.85 psf	22.80	1.15 Kips	1.15 Kips
79.99 ft	Cohesionless	8127.37 psf	22.80	1.15 Kips	1.15 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
9.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
26.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
27.00 ft	0.00 Kips	1.86 Kips	1.86 Kips
27.01 ft	0.03 Kips	1.86 Kips	1.89 Kips
27.99 ft	3.43 Kips	1.86 Kips	5.29 Kips
28.01 ft	3.49 Kips	1.15 Kips	4.64 Kips
30.99 ft	13.18 Kips	1.15 Kips	14.32 Kips
31.01 ft	13.26 Kips	1.94 Kips	15.20 Kips
38.79 ft	52.36 Kips	1.94 Kips	54.30 Kips
38.81 ft	52.46 Kips	2.60 Kips	55.06 Kips
47.81 ft	89.83 Kips	2.60 Kips	92.43 Kips
56.81 ft	127.21 Kips	2.60 Kips	129.81 Kips
65.81 ft	164.58 Kips	2.60 Kips	167.18 Kips
74.81 ft	201.95 Kips	2.60 Kips	204.56 Kips
79.69 ft	222.22 Kips	2.60 Kips	224.82 Kips
79.71 ft	222.35 Kips	1.15 Kips	223.50 Kips
79.99 ft	224.87 Kips	1.15 Kips	226.02 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
26.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
27.00 ft	Cohesive	N/A	N/A	1050.00 psf	0.00 Kips
27.01 ft	Cohesive	N/A	N/A	1050.00 psf	0.03 Kips
27.99 ft	Cohesive	N/A	N/A	1050.00 psf	3.43 Kips
28.01 ft	Cohesionless	3500.63 psf	21.20	N/A	3.49 Kips
30.99 ft	Cohesionless	3686.87 psf	21.20	N/A	13.18 Kips
31.01 ft	Cohesive	N/A	N/A	1471.36 psf	13.26 Kips
38.79 ft	Cohesive	N/A	N/A	1525.00 psf	52.36 Kips
38.81 ft	Cohesive	N/A	N/A	1260.00 psf	52.46 Kips
47.81 ft	Cohesive	N/A	N/A	1260.00 psf	89.83 Kips
56.81 ft	Cohesive	N/A	N/A	1260.00 psf	127.21 Kips
65.81 ft	Cohesive	N/A	N/A	1260.00 psf	164.58 Kips
74.81 ft	Cohesive	N/A	N/A	1260.00 psf	201.95 Kips
79.69 ft	Cohesive	N/A	N/A	1260.00 psf	222.22 Kips
79.71 ft	Cohesionless	8109.53 psf	23.31	N/A	222.35 Kips
79.99 ft	Cohesionless	8118.30 psf	23.31	N/A	224.87 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
26.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
27.00 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.99 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
28.01 ft	Cohesionless	3501.25 psf	17.40	1.15 Kips	1.15 Kips
30.99 ft	Cohesionless	3873.75 psf	17.40	1.15 Kips	1.15 Kips
31.01 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.79 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
47.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
56.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
65.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
74.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.69 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.71 ft	Cohesionless	8109.85 psf	22.80	1.15 Kips	1.15 Kips
79.99 ft	Cohesionless	8127.37 psf	22.80	1.15 Kips	1.15 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
9.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
26.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
27.00 ft	0.00 Kips	1.86 Kips	1.86 Kips
27.01 ft	0.03 Kips	1.86 Kips	1.89 Kips
27.99 ft	3.43 Kips	1.86 Kips	5.29 Kips
28.01 ft	3.49 Kips	1.15 Kips	4.64 Kips
30.99 ft	13.18 Kips	1.15 Kips	14.32 Kips
31.01 ft	13.26 Kips	1.94 Kips	15.20 Kips
38.79 ft	52.36 Kips	1.94 Kips	54.30 Kips
38.81 ft	52.46 Kips	2.60 Kips	55.06 Kips
47.81 ft	89.83 Kips	2.60 Kips	92.43 Kips
56.81 ft	127.21 Kips	2.60 Kips	129.81 Kips
65.81 ft	164.58 Kips	2.60 Kips	167.18 Kips
74.81 ft	201.95 Kips	2.60 Kips	204.56 Kips
79.69 ft	222.22 Kips	2.60 Kips	224.82 Kips
79.71 ft	222.35 Kips	1.15 Kips	223.50 Kips
79.99 ft	224.87 Kips	1.15 Kips	226.02 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
26.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
27.00 ft	Cohesive	N/A	N/A	1050.00 psf	0.00 Kips
27.01 ft	Cohesive	N/A	N/A	1050.00 psf	0.03 Kips
27.99 ft	Cohesive	N/A	N/A	1050.00 psf	3.43 Kips
28.01 ft	Cohesionless	3500.63 psf	21.20	N/A	3.49 Kips
30.99 ft	Cohesionless	3686.87 psf	21.20	N/A	13.18 Kips
31.01 ft	Cohesive	N/A	N/A	1471.36 psf	13.26 Kips
38.79 ft	Cohesive	N/A	N/A	1525.00 psf	52.36 Kips
38.81 ft	Cohesive	N/A	N/A	1260.00 psf	52.46 Kips
47.81 ft	Cohesive	N/A	N/A	1260.00 psf	89.83 Kips
56.81 ft	Cohesive	N/A	N/A	1260.00 psf	127.21 Kips
65.81 ft	Cohesive	N/A	N/A	1260.00 psf	164.58 Kips
74.81 ft	Cohesive	N/A	N/A	1260.00 psf	201.95 Kips
79.69 ft	Cohesive	N/A	N/A	1260.00 psf	222.22 Kips
79.71 ft	Cohesionless	8109.53 psf	23.31	N/A	222.35 Kips
79.99 ft	Cohesionless	8118.30 psf	23.31	N/A	224.87 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
9.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
26.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
27.00 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.01 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
27.99 ft	Cohesive	N/A	N/A	N/A	1.86 Kips
28.01 ft	Cohesionless	3501.25 psf	17.40	1.15 Kips	1.15 Kips
30.99 ft	Cohesionless	3873.75 psf	17.40	1.15 Kips	1.15 Kips
31.01 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.79 ft	Cohesive	N/A	N/A	N/A	1.94 Kips
38.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
47.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
56.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
65.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
74.81 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.69 ft	Cohesive	N/A	N/A	N/A	2.60 Kips
79.71 ft	Cohesionless	8109.85 psf	22.80	1.15 Kips	1.15 Kips
79.99 ft	Cohesionless	8127.37 psf	22.80	1.15 Kips	1.15 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
9.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
26.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
27.00 ft	0.00 Kips	1.86 Kips	1.86 Kips
27.01 ft	0.03 Kips	1.86 Kips	1.89 Kips
27.99 ft	3.43 Kips	1.86 Kips	5.29 Kips
28.01 ft	3.49 Kips	1.15 Kips	4.64 Kips
30.99 ft	13.18 Kips	1.15 Kips	14.32 Kips
31.01 ft	13.26 Kips	1.94 Kips	15.20 Kips
38.79 ft	52.36 Kips	1.94 Kips	54.30 Kips
38.81 ft	52.46 Kips	2.60 Kips	55.06 Kips
47.81 ft	89.83 Kips	2.60 Kips	92.43 Kips
56.81 ft	127.21 Kips	2.60 Kips	129.81 Kips
65.81 ft	164.58 Kips	2.60 Kips	167.18 Kips
74.81 ft	201.95 Kips	2.60 Kips	204.56 Kips
79.69 ft	222.22 Kips	2.60 Kips	224.82 Kips
79.71 ft	222.35 Kips	1.15 Kips	223.50 Kips
79.99 ft	224.87 Kips	1.15 Kips	226.02 Kips