OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

ADDENDUM NO. 1

PROJECT NO. 43-19-02
BRIDGE DECK REPAIR AND REHABILITATION
OHIO TURNPIKE OVER ABANDONED RAILROAD M.P. 34.2,
OHIO TURNPIKE OVER STATE ROUTE 108 M.P. 34.5,
COUNTY ROUTE 14 OVER OHIO TURNPIKE M.P. 35.2
FULTON COUNTY, OHIO

OPENING DATE: 2:00 P.M. (EASTERN TIME), FEBRUARY 13, 2019

ATTENTION OF BIDDERS IS DIRECTED TO:
ANSWERS TO QUESTIONS RECEIVED THROUGH 3:00 PM ON FEBRUARY 6, 2019

-AND-

GEOTECHNICAL REPORTS

-AND-

MODIFICATIONS TO THE CONTRACT DOCUMENTS

Plan Sheets:
4, 5, 6, 11, 13, 16, 20, 29, 30, 31, 40, 42, 44, and 51 of 123.

Bid Schedule of Items and Estimated Quantities Worksheet:
Ref. Nos. 12, 26, 107 and 113

General Conditions:
Article 15.1

Issued by the Ohio Turnpike and Infrastructure Commission by Anthony D. Yacobucci, Chief Engineer, and Mark R. Musson, Director of Contracts Administration.

Anthony D. Yacobucci 2/6/19
Anthony D. Yacobucci Date

Mark R. Musson 2/6/19
Mark R. Musson Date

ANSWERS TO QUESTIONS RECEIVED THROUGH 3:00 P.M. ON FEBRUARY 6, 2019:

Q#1 Can we use QC2 concrete in lieu of HP4 concrete?

A#1 Class QC2 concrete is acceptable as a replacement for Class HP4 concrete at no additional cost to the Commission. Where appearing throughout the Contract Documents "Class HP 4 Concrete" is supplemented with "or Class QC2 Concrete" through this Addendum No. 1. All applicable provisions of Item 511 of the Specifications shall apply except as modified in SP 511B for both HP4 and QC2.

Q#2 The maintenance of traffic notes do not specify restrictions or durations for shutting down SR 108. Can SR 108 be shut down for the duration of construction?

A#2 The "Maintaining Traffic" Note No. 13 on Plan Sheet 11 of 123 has been revised to include clarification on the closing of State Route 108. During the period when County Route 14 is closed and detoured, two-way traffic shall be maintained at all times on State Route 108. The use of temporary single-lane closures shall be minimized and no temporary closures of both lanes on State Roue 108 will be pemitted during this period. To accommodate traffic before, during and after the Fulton County Fair, two lanes of traffic without restriction shall be maintained on State Route 108 during the periods of 8/23/2019 thru 9/7/2019 and 8/28/2020 thru 9/12/2020. Closures outside of these times will require approval by The Ohio Department of Transportation and Fulton County. Revised Plan Sheet 11 of 123 is included as part of this Addendum No. 1.

Q#3 Since this project has pay item SPEC 536 – CONCRETE WEATHER PROOFING, MEDIAN WALL – 1785 SY, will the requirement in CBR-2 page 1 of 3 note 7 (Cure and Seal wall with Chemmasters Silencure A or Approved Equal) be waived? With the wall getting Concrete Weather Proofing we assume that at the time of the Median Wall installation it should be cured per 622.07 (511.14, Method B Membrane Curing), which would then be removed at time of Weather Proofing installation. Silencure A is a costly material to use if it's going to be removed so Weather Proofing can be put on wall.

A#3 Plan Sheets 40 and 42 of 123 have been revised to remove Item SP 536 – Concrete Weatherproofing, Median Wall – 1785 Sq. Yd. Note #7 on the OTIC Standard Drawing CBR-2 includes the curing and sealing requirements. In addition, the quantity for Reference No. 26, Item SP 536 – Concrete Weatherproofing, Median Wall has been removed from the Bid Schedule of Items and Estimated Quantities Worksheet. Revised Plan Sheets 40 and 42 of 123, the Bid Schedule of Items and Estimated Quantities Worksheet are included as part of this Addendum No. 1.

Q#4 PCB-9 is called on twice on sheet 30 of 123 on EB and WB sides of the roadway and respective stationing is not represented in the MOT subsummary. Please indicate which sheet should be used for LS pricing.

A#4 The PCB-9 callout in the westbound direction on Plan Sheet 30 of 123 should have been labeled as PCB-10. PCB-10 is represented correctly on MOT Subsummary Plan Sheet 20 of 123. In addition, the eastbound PCB-9 is incorrectly listed as STA 630+05 to STA 641+50 RT on Plan Sheet 20 of 123. This station range error affects the quantity of Item 614, Object Marker, One Way. Plan Sheet 20 of 126 was revised to correct the station range, which is STA 627+50 to STA 630+57, as well as the Item 614, Object Marker, One Way quantity from 24 to 7. Furthermore, MOT General Summary Plan Sheet 16 of 123 was revised to correct the Item 614, Object Marker, One Way quantity for Plan Sheet 20 from 153 to 136 and the Grand Total from 264 to 247. Reference No. 113, Item 614, Object Marker, One Way quantity was revised from 264 to 247 on the Bid Schedule of Items and Estimated Quantities Worksheet. Revised Plan Sheets 16, 20 and 30 of 123, the Bid Schedule of Items and Estimated Quantities Worksheet are included as part of this Addendum No. 1.

Q#5 PCB-12 is shown on the MOT plan sheet 31/123 as starting at station 641+50 and ending at 650+50 however the leader notes on sheet 31/123 states the ending at station 654+00. Which is correct?

A#5 The ending station for the PCB-12 callout on Plan Sheet 31 of 123 is incorrectly listed as STA 654+00. The correct stationing is "STA 641+50 to STA 650+50". MOT Subsummary Plan Sheet 20 of 123 lists the station range correctly as STA 641+50 to STA 650+50. Revised Plan Sheets 31 of 123 is included as part of this Addendum No. 1.

Q#6 Please confirm and clarify the note on general summary sheet 13/126 regarding the estimated quantity for PCMS. Is the quantity of days to be priced 480 days based on 2 PCMS x240 days?

A#6 The Item 614 Portable Changeable Message Sign, As Per Plan note on Plan Sheet 13 of 123 is intended to mean two (2) Portable Changeable Message Signs at 240 days each for a total of 480 days. The portion of the note that indicates 960 days is incorrect while the second portion of the note and the General Summary quantity are correct at 480 days. The Item 614 Portable Changeable Message Sign, As Per Plan note on Plan Sheet 13 of 123 has been revised and is included as part of this Addendum No. 1.

Q#7 Can the Turnpike please provide soil borings for the SR 108 bridges?

A#7 The Geotechnical Subsurface Investigation Reports, which include the soil borings, for the bridge at MP 34.2 as well as the bridge at MP 34.5 (State Route 108) are provided in accordance with IB Art. 2.1.4 through this Addendum No. 1.

Q#8 Bid item 49- Erosion Control: is this Lump Sum item meant to be an allowance per ODOT 832?

A#8 The Commission will respond to this question in Addendum No. 2.

Q#9 Typical sections make reference to "Item 206- Chemically Stabilized Subgrade, As Per Plan" but there are no stabilization bid items. Please clarify whether or not the subgrade is to be chemically stabilized and if so please set up corresponding bid items.

A#9 Chemically Stabilized Subgrade is not being used. This has been replaced by Item 204 – Subgrade Compaction. Plan Sheets 4, 5, and 6 of 123 have been revised to remove Item 8 – Chemically Stabilized Subgrade, As Per Plan and replace it with Item 204 – Subgrade Compaction. In addition, the quantities for Item 204 – Subgrade Compaction on Plan Sheets 40 and 44 of 123 has been revised to incorporate the additional area, as well as the quantity for Reference No. 12 on the Bid Schedule of Items and Estimated Quantities Worksheet. Revised Plan Sheets 4, 5, 6, 40 and 44 of 123, the Bid Schedule of Items and Estimated Quantities Worksheet are included as part of this Addendum No. 1.

Q#10 With the work types that can be controlled by the prime contractor, and also needing to provide 11% DBE/EDGE/SBE participation, Would the OTIC consider lowering the Limits on Subcontracting per 15.1 to 35% from the 55% that is presently called for?

A#10 After reconsidering the limits on subcontracting, the Commission will approve the Contractor to subcontract up to the amount requested. Accordingly, GC Article 15 is modified through this Addendum No. 1 to provide that the Contractor shall perform with the Contractor's own organization, Work amounting to not less than thirty-five percent (35%) of the total Contract Price.

Q#11 Bid item 107- Water Work Misc: Fulton County Public Utility Charges: this bid item has notes on plan sheet 69 giving an approximate amount with final adjustment paid by change order. Should this bid item be in the proposal to be bid at a fixed amount of $5000, treated similar to an erosion control allowance?

A#11 An allowance value of $5,000.00 has been placed in the Bid Schedule of Items and Estimated Quantities Worksheet for Reference No. 107, Item 638 - Water Work Misc: Fulton County Public Utility Charges.

Q#12 Bid item 127- Pavement For Maintaining Traffic, Class A, As Per Plan: plan sheet 13 note says to refer to median crossover shown on plan sheets 22-23. Plan sheets 22-23 show typical median section not including the crossover. Note also makes reference to "Resurfacing" of existing median crossover. Please provide corrected sheet number, confirmation plan stations for the limits of this item, and what portion gets rebuilt as opposed to resurfaced.

A#12 On Plan Sheet 13 of 123, plan note Item 615 - Pavement For Maintaining Traffic, Class A, As Per Plan, the references to Plan Sheets 22 and 23 of 123 are incorrect. The portions of the existing crossover to be resurfaced were illustrated with cross hatching on Plan Sheets 31 and 32 of 123. Additional details and revised plan sheets regarding the crossover resurfacing will be provided in Addendum 2.

Q#13 Bid items 133 and 134 are Lump Sum for Portable Barrier with and without glare screen. From review of maintenance of traffic plans, there does not appear to be any footage of barrier with glare screen. Please either remove bid item 134 or specify what stations in what phase have portable barrier wall with glare screen requirements.

A#13 To prevent headlight glare from opposing traffic, provide Portable Barrier with Glare Screen to PCB-7 (STA. 624+31 to STA. 627+50) on Plan Sheet 29 of 123, PCB-8 (STA. 627+50 to STA. 633+73) on Plan Sheet 30 of 123 and PCB-14 (STA. 652+23 to STA. 655+02) on Plan Sheet 31 of 123 during Phase 2 Maintenance of Traffic. Revised Plan Sheets 29, 30, and 31 of 123 are included as part of this Addendum No. 1.

Q#14 Plan sheet 11, Pre-Phase 1, note #2 states to install temporary pavement on EB exit ramp to SR 108 (exit 34) which is also stated in Pre-Phase 2 note #1. Please clarify which phase this work will be performed in. Also, sheets 17 & 18 do not have quantity in column 615, Pavement for Maintaining Traffic, Class A, APP. Would you please provide pavement calculations for this work item.

A#14 The Commission will respond to this question in Addendum No. 2.

Q#15 Plan sheet 13, Item 615 – Pavement for Maintaining Traffic, Class A, APP states resurfacing of the existing cross over as shown on sheets 22-23 which are not the correct sheets. Please provide additional information as it pertains to this note.

A#15 See the response to Q#12.

Q#16 There are no plan sheets or quantities for maintenance of traffic phasing/schematics for SR 108. Please provide this missing information.

A#16 The Commission will respond to this question in Addendum No. 2.

Q#17 Item 204 Subgrade compaction is only called for under the new approach slabs at the SR-108 bridge, Is the Subgrade compaction incidental to the SP-304 in all other areas?

A#17 See the response to Q#9.

Q#18 Is it acceptable for the contractor use QC2 concrete in lieu of HP4?

A#18 See the response to Q#1.

Q#19 Bid item 127- the plan quantity of 1970 sy appears to be greatly understated as compared to what is shown on plan sheets 29-32. Since no source of quantity was given, please provide more concise information on how this quantity was derived.

A#19 The Commission will respond to this question in Addendum No. 2.

Q#20 Plan sheets 29-30 show temporary pavement in between the newly constructed phase 1 pavement and the proposed inside shoulder reconstructed 615 pavement in an area west of the abandoned railroad bridge. How is this proposed pavement to be paid for?

A#20 The Commission will respond to this question in Addendum No. 2.

Q#21 Please provide more detail for Pavement for Maintaining Traffic Class A, APP. The note does not include milling depth or required mix type.

A#21 See the response to Q#12.

Q#22 Sheet 30/123 and 31/123 have areas hatched for crossovers but no legend for the item of work to be performed?

A#22 See the response to Q#12.

Q#23 Pavement for Maintaining Traffic Class A, APP quantity appears to include the resurfacing of the East & West crossovers shown on sheets 30/123 & 31/123. Although, there is no existing crossover at the west end near sta. 632+00. Please advise the intent of this work.

A#23 See the response to Q#12.

Q#24 Shoulder details on sheet 6/123 show stabilization limits, but there are no stabilization work items in the general summary.

A#24 See the response to Q#9.

Q#25 Item 90 – Asphalt Surface Course with Crushed Slag is called out with 70-22 binder in the proposal and 76-22 binder in the general summary. What binder is to be used for this item?

A#25 The Commission will respond to this question in Addendum No. 2.

Q#26 Please revise the call outs on the MOT plan sheets for PCB. It appears there are errors with stationing and duplicated quantities in the sub summary.

A#26 See the responses to Q#4 and Q#13.

Q#27 Can an estimated quantity be provided for PCB with/without Glare Screen?

A#27 See the response to Q#13.

Q#28 Regarding the Temporary Wirewalls- will OTIC require final stamped engineer drawings per ODOT 870 specification which is referenced on the plans?

A#28 Yes.

MODIFIED CONTRACT DOCUMENTS

With this Addendum No. 1, the Commission substitutes the enclosed material for the following Contract Documents:

Plan Sheets: 4, 5, 6, 11, 13, 16, 20, 29, 30, 31, 40, 42, 44, and 51 of 123.

with additions to the Plan Drawings are called out with a cloud and a revision triangle as thus:

With this Addendum No. 1, the Commission modifies the Bid Schedule of Items for the following Reference Numbers: 12, 26, 107 and 113

Receipt of Addendum No. 1
Project No. 43-19-02 is hereby acknowledged:

(Firm Name) _____

(Signature) _____

(Printed Name) _____

(Date) _____

BIDDERS MUST RETURN THE ABOVE ACKNOWLEDGEMENT OF RECEIPT OF ADDENDUM NO. 1 WITH THEIR BID.

GPD Group
Cleveland, Ohio

Geotechnical Subsurface Investigation
OTIC MP 34.2 Bridge Demolition
Wauseon, Fulton County, Ohio

December 2017

1915 North 12th Street
Toledo, OH 43604-5305
T 419-324-2222
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December 1, 2017 **TTL Project No. 1580701**

Mr. Tom Washko, P.E.
GPD Group
5595 Transportation Boulevard, Suite 100
Cleveland, Ohio 44125

Geotechnical Subsurface Investigation
OTIC MP 34.2 Bridge Demolition
Wauseon, Fulton County, Ohio

Dear Mr. Washko:

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. 15807.01R, dated June 29, 2017, and authorized by you on October 13, 2017.

This final report contains the results of our study, incorporates furnished ground surface elevations into the boring logs, and provides our construction recommendations for embankment fill placement.

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.

Katherine C. Hennicken, P.E.
Geotechnical Engineer

David M. Vovak, P.E.
Transportation Director

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GEOTECHNICAL SUBSURFACE INVESTIGATION
OTIC MP 34.2 BRIDGE DEMOLITION
WAUSEON, FULTON COUNTY, OHIO

FOR

GPD GROUP
5595 TRANSPORTATION BOULEVARD, SUITE 100
CLEVELAND, OHIO 44125

SUBMITTED

DECEMBER 1, 2017
TTL PROJECT NO. 1580701

TTL ASSOCIATES, INC.
1915 NORTH 12TH STREET
TOLEDO, OHIO 43604
(419) 324-2222
(419) 321-6257 (FAX)

TABLE OF CONTENTS

1.0 INTRODUCTION

This geotechnical subsurface investigation report has been prepared for the bridge demolition project in Fulton County, Ohio. The project is located at mile post (MP) 34.2 of the James W. Shocknessy Ohio Turnpike (Interstate Route 90 [IR-90]) approximately ¼ mile west of State Route (SR) 108, 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 embankment construction.

This investigation was performed in general accordance with TTL Proposal No. 15807.01R, dated June 29, 2017, and authorized by Mr. Tom Washko, P.E. of GPD Group on October 13, 2017.

The purpose of this investigation was to evaluate the subsurface conditions relative to the design and construction of embankments 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.

This report includes:

- A description of the subsurface soil and groundwater conditions encountered in the borings.
- Design recommendations for embankments.
- Recommendations concerning soil and groundwater-related construction procedures such as site preparation, earthwork, foundation construction, and related field testing.

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 October 31 and November 2, 2017. Boring B-1 was performed on the north side of the existing twin bridges, and Boring B-2 was performed on the south side. The boring locations were established in the field by TTL based on direction from GPD Group. Ground surface elevations at the boring locations were estimated to the nearest foot based on topographic contours shown on plan drawings provided by GPD Group. The approximate locations of the test borings are shown on the attached Test Boring Location Plan (Plate 2.0).

The test borings were performed in general accordance with Ohio Department of Transportation (ODOT) "Specifications for Geotechnical Explorations" (July 2017). The test borings performed during this investigation were drilled with an ATV-mounted rotary drilling rig utilizing 3¼-inch inside diameter hollow-stem augers. Both borings were extended to a depth of 80 feet below existing grade.

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 intervals with the number of blows per increment being recorded at each depth interval, and these data are presented under the "Std. Pen." column on the Logs of Test Borings attached to this report. 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, or N_m-value, and is typically reported in blows per foot (bpf). The N_m-values were corrected to an equivalent rod energy ratio of 60 percent, N_{60}. The calibrated hammer/rod energy ratio for the drill rig utilized for this project was 80.3 percent, and was last calibrated on January 10, 2017. The N_{60} values are presented on the attached Logs of Test Borings and Tabulation of Test Data sheets. In conjunction with published data and typical correlations, the N_{60}-value can be evaluated as a measure of soil compactness/consistency as well as shear strength and bearing capacity.

Shelby tube samples, designated ST on the Logs of Test Borings, were obtained from 26 to 28 feet and from 51 to 53 feet in Boring B-1, as well as from 16 to 18 feet and from 46 to 48 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 subsoil samples were classified in accordance with the ODOT soil classification system. Where gradation and plasticity tests were not performed for a "direct" mechanical determination of the appropriate ODOT classification, the soils were classified using visual-manual procedures. 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-1 (ST-8 and ST-14). 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) 34.2 of the James W. Shocknessy Ohio Turnpike (Interstate Route 90 [IR-90]), approximately ¼ mile west of State Route (SR) 108, in Fulton County, Ohio. The bridges formerly served as an overpass over the Detroit, Toledo, and Ironton railroad, and the railroad has since been demolished. Prior to bridge demolition, grades below the bridges will be raised to match existing embankment grades. We further understand that this work will be phased to accommodate traffic as needed, and that the Ohio Turnpike Infrastructure Commission (OTIC) can accommodate construction over multiple years if needed to allow for settlement of the new embankment.

We further understand that the existing bridges are 3-span structures, with abutments on pile foundations and piers on shallow foundations. Spans 1 and 3 are indicated to be approximately 30 feet long, and the middle span (Span 2) is indicated to be approximately 39 feet long. Based on the as-built drawings, the abutment piles are indicated to be 10BP42 bearing piles (modern day HP10x42 H-piles) and have estimated lengths of 28 to 32 feet below Elev. 810.62, as well as 30 to 34 feet below Elevs. 815.86 and 815.62. From these lengths, these piles are anticipated to be predominantly friction piles driven to approximate Elevs. 786 to 779. The shallow pier foundations are indicated to bear at Elev. 787.

Existing grades below the bridges are on the order of Elev. 795 to 793. Grades along the bridges are on the order of Elev. 820. Approximately 25 to 27 feet of fill is anticipated to raise grades below the existing bridges to match roadway grade.

4.0 GENERAL SITE AND SUBSURFACE CONDITIONS

4.1 General Site Conditions

Existing grades below the bridges are on the order of Elev. 795 to 793. Grades along the bridges are on the order of Elev. 820.

The surface materials encountered in Borings B-1 and B-2 consisted of topsoil on the order of 12 inches thick.

4.2 Site Geology

Published geologic maps from the Ohio Department of Natural Resources (ODNR) indicate that the project site is located within the Maumee Sand Plains District of the Maumee Lake Plains Physiographic Region of Ohio. These regions include upper profile soils consisting of sands deposited in glacial lakes in the form of low dunes, beach ridges, and sand bars, as well as silty and clayey lacustrine deposits. The sands and lacustrine deposits are underlain by predominantly silty and clayey glacial till, before encountering bedrock.

Bedrock at the site is Silurian age, broadly mapped as the Olentangy shale formation. Based on available bedrock topography maps, the top of bedrock can be expected from Elevs. 600 to 580, approximately 195 to 205 feet below native soil grades, and approximately 220 to 240 feet below pavement grades.

The USDA Natural Resources Conservation Services (NRCS) Web Soil Survey indicates that soils in the project area are mapped as predominantly Blount-Rimer complex soils and Tedrow loamy fine sand, with areas of Ottokee-Glynwood complex soils to the west. The Blount-Rimer complex soils consist of till formed on flats or rises on end moraines or on ground moraines. These soils are considered somewhat poorly drained and have moderately low to moderately high permeability. The Tedrow fine sands formed in dunes or beach ridges on outwash plains or on lake plains, and consist of sandy glaciolacustrine deposits. These soils are considered somewhat poorly drained with high to very high permeabilities. The Ottokee-Glynwood complex soils formed in ridges or dunes on lake plains, and consist of eolian deposits. These soils are considered moderately well drained with high to very high permeabilities.

4.3 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 native granular 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.

Stratum I consisted of predominantly medium dense granular soils encountered underlying the topsoil in Borings B-1 and B-2 to depths of 12½ feet and 14½ feet below existing grades (approximate Elevs. 780 and 778), respectively. The granular soils consisted of coarse and fine sand (ODOT A-3a). SPT N_{60}-values typically varied between 12 to 23 blows per foot (bpf). Moisture contents of 7 percent and 11 percent were determined for samples obtained above encountered groundwater, and varied between 20 to 25 percent below it. These granular soils are generally considered incompressible.

Stratum II consisted of predominantly very stiff cohesive soils encountered underlying Stratum I in Borings B-1 and B-2 to depths of 23 feet and 28½ feet (approximate Elevs. 769 and 764), respectively. The cohesive soils consisted of silt and clay (ODOT A-6a). SPT N_{60}-values ranged from 15 to 29 bpf. Unconfined compressive strengths generally ranged from 6,295 to 9,000 pounds per square foot (psf). Moisture contents ranged from 13 to 17 percent. Based correlations from moisture content results and Atterberg limits testing, these soils are considered overconsolidated and very slightly compressible.

Stratum III consisted of predominantly stiff cohesive glacial till deposits encountered underlying Stratum II in Borings B-1 and B-2. Stratum III was encountered to a depth 73 feet (approximate Elev. 719) in Boring B-2, and was encountered to a termination depth of 80 feet in Boring B-1. The Stratum III till deposits consisted of silt and clay (A-6a). SPT N_{60}-values generally ranged from 9 to 13 bpf. Unconfined compressive strengths ranged from approximately 2,000 to 4,000 psf. Moisture contents ranged from 17 to 19 percent. Based on the results of one-dimensional consolidation testing, these soils are considered overconsolidated and very slightly compressible.

Stratum IV consisted of **soft** to medium stiff cohesive glacial till deposits encountered underlying Stratum III to boring termination at a depth of 80 feet in Boring B-2. The Stratum II cohesive soils consisted of silt and clay (A-6a). SPT N_{60}-values ranged from of 5 bpf and 4 bpf and moisture contents of 20 percent and 21 percent were determined for the recovered samples. Unconfined compressive strengths were on the order of 1,000 psf. Based

correlations from moisture content results and Atterberg limits testing, these soils are considered overconsolidated and very slightly compressible.

4.4 Groundwater Conditions

Groundwater was initially encountered during drilling at depths of 3 feet and 6 feet below existing grades (approximate Elevs. 786 and 789) in Borings B-1 and B-2, respectively. Groundwater was not observed upon completion of drilling operations in either boring. 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. The groundwater conditions encountered in the borings are summarized in the following table.

Table 4.4. Encountered Groundwater Conditions

Boring Number	Approximate Ground Surface Elevation	Groundwater Initially Encountered During Drilling		Groundwater Observed Upon Completion of Drilling Operations	
		Depth (feet)	Approximate Elevation (feet)	Depth (feet)	Approximate Elevation (feet)
B-1	644.9	3	786	N.E.	-
B-2	637.0	6	789	N.E.	-

N.E. – Not Encountered.

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 3 feet or lower, corresponding to approximate Elev. 789 or deeper. However, groundwater elevations can fluctuate with seasonal and climatic influences. In particular, "perched" water may be encountered in fill materials or granular soils 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 New Embankment Fill

Fill will be placed below the existing bridge to create a new embankment at the project location. Maximum fill heights are anticipated to be on the order of 25 to 28 feet.

For each of the encountered soil strata, soil compressibility parameters were evaluated for use in embankment settlement calculations. The compressibility parameters were evaluated using one-dimensional consolidation test results, as well as correlations with moisture contents and Atterberg limits test results. As discussed in Section 4.3, Stratum I contained granular soils which are generally considered incompressible, and Strata II, III, and IV contained cohesive soils which are very slightly compressible.

Settlement was evaluated based on maximum embankment fill heights and widths, assumed to match the existing embankments at the bridge structures. Existing grades below the bridges are on the order of Elev. 795 to 792. Grades along the bridges are on the order of Elev. 820. Maximum fill heights are anticipated to be on the order of 25 to 28 feet. Calculated settlements are summarized in the following table, and our calculations are attached to this report.

Table 5.1. Calculated Settlements from New Embankment Fill

Location	Calculated Total Settlement	Abutment/Pier Differential Settlement
Abutments	1 to 2 inches	1 to 2 inches
Piers	2 to 3 inches	

The calculated settlements for the fill heights indicated above are not anticipated to be problematic for the proposed project. It should be noted that field observations of actual settlement generally tend to be less in magnitude than the theoretical calculated settlement.

Based on consolidation test results and correlations with soil index properties, as well as the indicated fill heights and range of compressible cohesive soil layer thicknesses, the time required to achieve 90 percent consolidation was generally calculated to be on the order of 6 to 10 weeks. Based on our experience in Northwest Ohio, the time required for 90 percent consolidation is anticipated to be toward the lower end of this range, likely on the order of 6 weeks. It should be noted for the embankment heights and settlement magnitudes indicated above, after 90 percent consolidation, the remaining foundation/embankment settlement would be less than ¼ inch.

The estimated 6 to 10 weeks time rate of settlement is based on the "clock" starting at time t=0 when all of the fill is in place (in effect, assuming the surcharge load is applied instantly over the area). In reality, construction of the fill is expected to require one to two weeks (or more), so some of the consolidation and settlement will be initiated and occurring during the fill placement period, thereby shortening the post-fill-placement waiting period. For this reason, it is imperative that the planned settlement plates are installed and surveyed at the very beginning of surcharge fill placement.

It is our experience that wick drains are usually not cost-effective unless settlements are approaching 6 inches or more, and/or consolidation times are estimated to be on the order of 6 months to 1 year or greater. Therefore, based on calculated settlements of up to 3 inches and an estimated 2½ months of settlement, we do not recommend wick drains to accelerate settlement for this project.

5.1.1 Instrumentation

Piezometers are recommended to monitor settlement. The pore pressure data gathered from piezometers will provide information regarding settlement that has occurred during construction, as well as indicate if additional settlement may be expected well after construction has been completed.

Likewise, settlement platforms are also recommended for this project to monitor settlement as fill is placed.

Additional discussion regarding instrumentation is provided in Section 6.2.1 of this report.

5.1.2 Downdrag

Downdrag on the foundations due to settlement could result in additional loading on the exposed foundation elements in excess of 400 kips per pier. Therefore, we recommend protecting the exposed foundation elements from the effect of downdrag.

It was indicated by GPD Group that the exposed portions of the bridge substructures shall be isolated from the proposed fill by coating the portions of the abutments and piers that are above existing grade with low viscosity bituminous asphalt and then covering or wrapping those components with a durable thick plastic visqueen). Therefore, downdrag would not develop along the exposed portions.

The existing piles were driven to approximate Elevs. 786 to 779. Based on the encountered conditions, incompressible Stratum I granular soils were encountered to approximate Elevs. 778 and 780. Potential downdrag loads on piles due to settlement associated with the new embankment construction at the abutment locations was evaluated using the traditional method per AASHTO LRFD Bridge Design Specifications (BDS) Section 3.11.8. Downdrag was considered for portions of the pile within soil layers with calculated settlement of 0.4 inches or greater. Based on our settlement evaluations, for the thin layer of Stratum II very slightly compressible cohesive soils (1½ feet or less) that the existing piles may bear in (depending on variations from the provided drawings and/or any variations in the soil profile between borings), considerably less than 0.4 inches of settlement is expected in this zone due the new fill placement. Therefore, downdrag would not develop along the piles at the abutments.

5.2 Groundwater Control

As stated previously, groundwater was initially encountered during drilling at depths of 3 feet and 6 feet below existing grades (approximate Elevs. 786 and 789) in Borings B-1 and B-2, respectively.

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 3 feet or lower, corresponding to approximate Elev. 789 or deeper. Therefore, construction planning should include potential remedial measures to be implemented where excessive groundwater seepage or unstable subgrades are encountered if excavations extend to approximate Elev. 789. Dewatering methods may include multiple sumps or a system of well points. The type of dewatering system utilized will depend on construction practices,

soil conditions encountered in the foundation excavations, seasonal conditions, and the depth of excavation. Additionally, the contractor will need to exercise diligence to control seepage and runoff to maintain a stable subgrade.

5.3 Excavations and 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
- Type C soils (granular soils).

For temporary excavations in Type A, B, and C soils, side slopes must be no steeper than ¾ horizontal to 1 vertical (¾H:1V), 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.

New embankment slopes are anticipated to match existing embankment slopes which are indicated at 2 horizontal to 1 vertical (2H:1V). Regardless of overall global slope stability, slopes graded steeper than 3H:1V may be prone to shallow surface sloughing. This type of shallow sliding is generally not problematic (by itself), but left unchecked, it can lead to progressive slope movements that eventually impact overall performance of the embankment.

In addition to slope protection, such as well-established vegetative cover and rock-lined channels in surface run-off collection ditches and swales, we recommend that surface drainage from pavement areas on the crest of the embankment should be directed to catch basins or storm drains and not allowed to sheet flow over the slope.

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 Embankment Construction for Replacement of Bridge Structures

Prior to placement of fill, the exposed portions of the bridge substructures shall be isolated from the proposed fill by coating the portions of the abutments and piers that are above existing grade with low viscosity bituminous asphalt and then covering or wrapping those components with a durable thick plastic visqueen). Fill placement can then occur according to ODOT Item 840 as high as possible and deemed practical by the contractor under the existing bridge superstructures with special provisions as defined below. It has been assumed that this stage of fill placement will reach within 8 feet of the bottom of the existing bridge beams.

6.2.1 Instrumentation

Settlement platforms and vibrating wire piezometers shall be installed prior to beginning the placement of the backfill. Survey points at each substructure unit shall be established and monitored on a regular basis. Bridge structure ride-ablility criteria, in the form of differential settlement monitoring between spans, shall be established and monitored during all phases of embankment construction. The maximum differential settlement between spans shall be determined by the structural engineer, and all fill activities shall stop until settlement levels balance if differential settlement exceeds tolerances set by the structural engineer. The structural engineer may also elect to jack the bridge if differential settlement levels exceeds tolerances. After such an event, fill placement shall be limited theoretically to a maximum of two (2) compacted 8-inch lifts per day across the site. Fill placement limitation will be based on actual settlement monitoring. A fill settlement rate of 0.01 ft/day is acceptable.

TTL would be pleased to review construction plans to provide a recommendation on the quantity and locations of settlement platforms and piezometers.

Vibrating wire piezometers shall be installed per manufacturer instructions and specifications and per ODOT Geotechnical Bulletin 4 guidelines. The piezometers shall provide pore water pressure readings at about 5-foot intervals from 5 feet to 80 feet below existing grades (approximate Elevs. 787 to 712). The pore water pressure readings shall be reported to the project engineer on a daily basis. When pore water pressure is developed, record and report the values to the engineer for evaluation. If the pressures exceed acceptable levels (to be determined at a later date), or if settlement exceeds the anticipated 3 inches during fill placement, fill placement shall be suspended until pressures dissipate. In any case, TTL shall be notified to provide further guidance.

Likewise, settlement platforms are also recommended for this project to monitor settlement as fill is placed. Settlement platforms shall be fabricated and installed in general accordance with ASTM D 6598. We recommend that each platform be surveyed by the contractor's surveyor three times per week during fill operations and an average of once per week throughout the monitoring period. Surveys of the platforms will also need to be performed immediately prior to and immediately after installing extensions during fill placement activities. Each settlement monitor survey record should include a record of the top of fill elevation adjacent to the settlement monitor.

6.3 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 90 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 granular and 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.

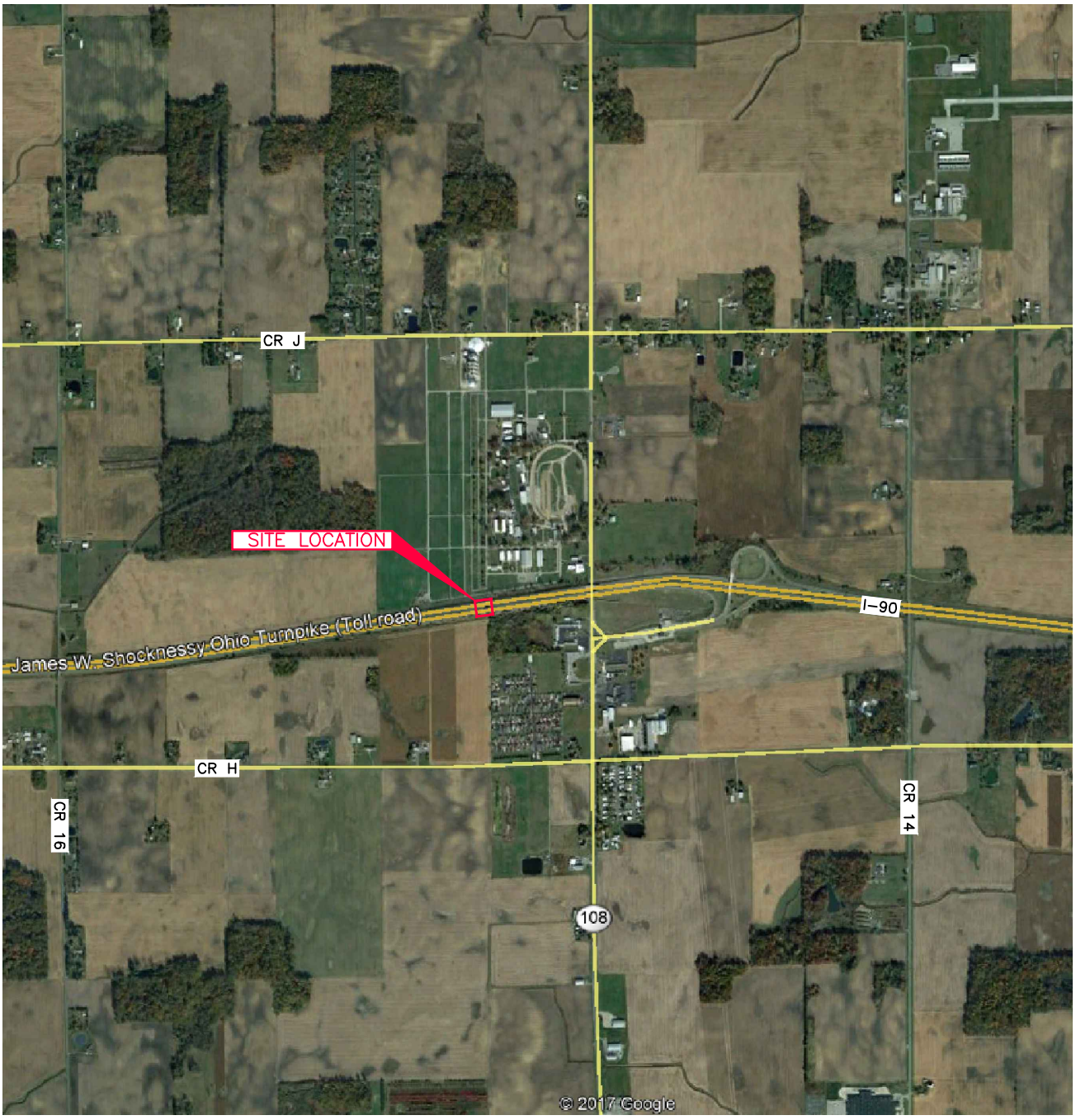
7.0 QUALIFICATIONS OF RECOMMENDATIONS

Our evaluation of construction conditions for embankment fill placement has been 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.



LEGEND

APPROXIMATE SITE LOCATION

N

APPROXIMATE SCALE – FEET

0 2,000 4,000

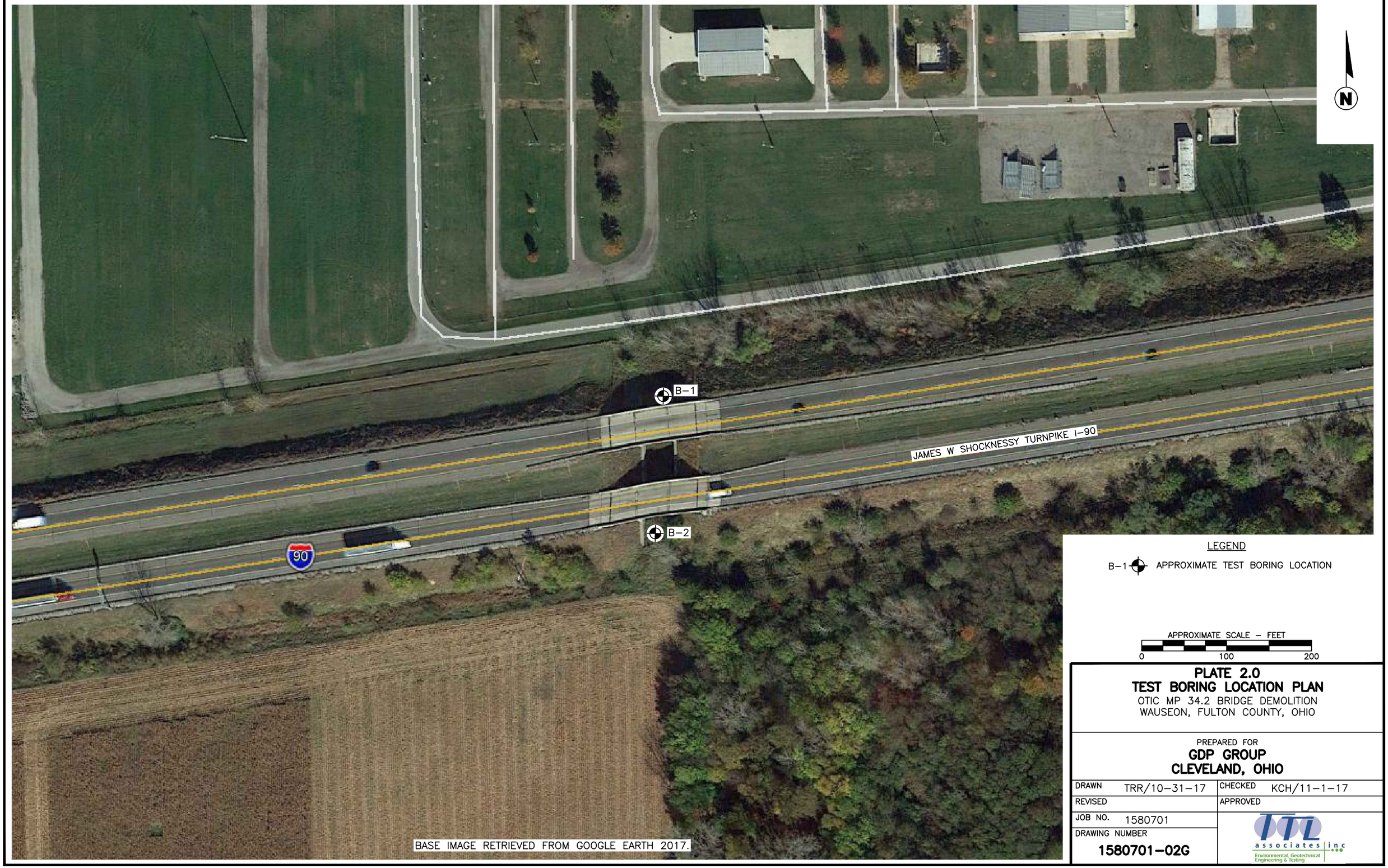
PLATE 1.0
SITE LOCATION MAP

OTIC MP 34.2 BRIDGE DEMOLITION
WAUSEON, FULTON COUNTY, OHIO

PREPARED FOR
GDP GROUP
CLEVELAND, OHIO

DRAWN TRR/10–31–17	CHECKED KCH/11–1–17
REVISED	APPROVED
JOB NO. 1580701	
DRAWING NUMBER **1580701–01G**	

TTL associates inc
Environmental, Geotechnical Engineering & Testing



BASE IMAGE RETRIEVED FROM GOOGLE EARTH 2017.

LEGEND

B-1 ⊕ APPROXIMATE TEST BORING LOCATION

APPROXIMATE SCALE – FEET

0 100 200

PLATE 2.0
TEST BORING LOCATION PLAN

OTIC MP 34.2 BRIDGE DEMOLITION
WAUSEON, FULTON COUNTY, OHIO

PREPARED FOR
GDP GROUP
CLEVELAND, OHIO

DRAWN	TRR/10-31-17	CHECKED	KCH/11-1-17
REVISED		APPROVED	
JOB NO.	1580701		
DRAWING NUMBER	**1580701-02G**		

ITL associates inc
Environmental, Geotechnical Engineering & Testing

PROJECT: OTIC MP 34.2 BRIDGE DEMO.	DRILLING FIRM / OPERATOR: TTL / TB	DRILL RIG: CME 550X ATV	STATION / OFFSET:
TYPE: BRIDGE REPLACEMENT	SAMPLING FIRM / LOGGER: TTL / KKC	HAMMER: CME AUTOMATIC	ALIGNMENT:
PID: BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/10/17	ELEVATION: 792.0 (MSL) EOB: 80.0 ft.
START: 11/2/17 END: 11/2/17	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 80.3	LAT / LONG: Not Recorded

EXPLORATION ID B-1

PAGE 1 OF 3

MATERIAL DESCRIPTION AND NOTES	ELEV. 792.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL - 12 INCHES	791.0																	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND TRACE CLAY, MOIST			3 4 5	12	78	SS-1	NP	-	-	-	-	-	-	-	-	11	A-3a (V)	
@3': WET, SOME SILT, (FREE WATER NOTED IN JAR)		W	3 4 5	12	89	SS-2	NP	-	-	-	-	-	-	-	-	21	A-3a (V)	
@6': (FREE WATER NOTED IN JAR)			3 4 5	12	89	SS-3	NP	-	-	-	-	-	-	-	-	23	A-3a (V)	
@9.6': GRAY/BROWN, (FREE WATER NOTED IN JAR)	779.5		6 8 9	23	100	SS-4	NP	0	1	66	32	1	NP	NP	NP	25	A-3a (0)	
VERY STIFF, BROWN/GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST			4 7 10	23	78	SS-5	3.15*	6	6	12	21	55	27	13	14	15	A-6a (10)	
@17': GRAY	769.0		6 9 13	29	100	SS-6	4.00	-	-	-	-	-	-	-	-	15	A-6a (V)	
STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST			3 4 6	13	100	SS-7	1.75	-	-	-	-	-	-	-	-	18	A-6a (V)	
					88	ST-8	2.12*	7	5	7	20	61	30	15	15	17	A-6a (10)	
			3 3 4	9	100	SS-9	1.50	-	-	-	-	-	-	-	-	18	A-6a (V)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/30/17 16:26 - S:\PROJECTS\15807.01.GPJ

PID:	BR ID:	PROJECT: OTIC MP 34.2 BRIDGE DEMO	STATION / OFFSET:	START: 11/2/17	END: 11/2/17	PG 2 OF 3	B-1

MATERIAL DESCRIPTION AND NOTES	ELEV. 761.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST *(continued)*		32																
@32': SOME SAND		33																
		34	2 3 5	11	100	SS-10	1.50	-	-	-	-	-	-	-	-	17	A-6a (V)	
		35																
		36																
		37																
		38																
@38': LITTLE SAND		39	2 3 6	12	100	SS-11	1.50	-	-	-	-	-	-	-	-	18	A-6a (V)	
		40																
		41																
		42																
		43																
		44	3 4 6	13	100	SS-12	1.50	-	-	-	-	-	-	-	-	18	A-6a (V)	
		45																
		46																
		47																
		48																
		49	2 4 6	13	100	SS-13	1.50	-	-	-	-	-	-	-	-	18	A-6a (V)	
		50																
@51': VERY STIFF		51																
		52			100	ST-14	2.20*	6	3	10	19	62	29	16	13	17	A-6a (9)	
		53																
@53.5': STIFF		54	3 4 6	13	100	SS-15	1.75	-	-	-	-	-	-	-	-	18	A-6a (V)	
		55																
		56																
		57																
		58																
		59	3 4 6	13	100	SS-16	1.75	-	-	-	-	-	-	-	-	18	A-6a (V)	
		60																
		61																
		62																
		63																
		64	2															

PID:	BR ID:	PROJECT: OTIC MP 34.2 BRIDGE DEMO	STATION / OFFSET:	START: 11/2/17	END: 11/2/17	PG 3 OF 3	B-1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST *(continued)*	727.8	65	4 6	13	100	SS-17	1.75	-	-	-	-	-	-	-	-	18	A-6a (V)	
		66																
		67																
		68																
		69	3 4 5	12	100	SS-18	1.50	5	4	9	20	62	28	15	13	18	A-6a (9)	
		70																
		71																
		72																
		73																
@73.5': MEDIUM STIFF TO STIFF		74	1 3 5	11	100	SS-19	0.91*	-	-	-	-	-	-	-	-	17	A-6a (V)	
		75																
		76																
		77																
		78																
@78.5': STIFF		79	2 3 5	11	100	SS-20	1.25	-	-	-	-	-	-	-	-	18	A-6a (V)	
	712.0	EOB 80																

NOTES: "*" - UNCONFINED STRENGTH DETERMINED BY ASTM D 2166. "NP" - NON PLASTIC

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 4 BAGS BENTONITE CHIPS

PROJECT: OTIC MP 34.2 BRIDGE DEMO.	DRILLING FIRM / OPERATOR: TTL / TB	DRILL RIG: CME 550X ATV	STATION / OFFSET:
TYPE: BRIDGE REPLACEMENT	SAMPLING FIRM / LOGGER: TTL / KKC	HAMMER: CME AUTOMATIC	ALIGNMENT:
PID: BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/10/17	ELEVATION: 792.0 (MSL) EOB: 80.0 ft.
START: 10/31/17 END: 10/31/17	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 80.3	LAT / LONG: Not Recorded

EXPLORATION ID: B-2

MATERIAL DESCRIPTION AND NOTES	ELEV. 792.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL - 12 INCHES	791.0																	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, AND GRAVEL, MOIST			2 4 6	13	78	SS-1	NP	-	-	-	-	-	-	-	-	7	A-3a (V)	
@4': WET (FREE WATER NOTED IN JAR)	786.0	W	3 5 11	21	100	SS-2	NP	1	3	76	19	1	NP	NP	NP	20	A-3a (0)	
DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND TRACE GRAVEL, WET (FREE WATER NOTED IN JAR)	784.0		10 15 16	41	100	SS-3	NP	-	-	-	-	-	-	-	-	22	A-3a (V)	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND TRACE GRAVEL, WET (FREE WATER NOTED IN JAR)			8 8 9	23	100	SS-4	NP	-	-	-	-	-	-	-	-	20	A-3a (V)	
@12': GRAY	777.5		4 5 6	15	89	SS-5	1.75	-	-	-	-	-	-	-	-	17	A-6a (V)	
STIFF, GRAY, **SILT AND CLAY**, SOME SAND AND GRAVEL, MOIST	774.5				88	ST-6	1.44*	20	7	15	20	38	25	14	11	15	A-6a (5)	
VERY STIFF TO HARD, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, DAMP	770.0		5 9 12	28	100	SS-7	4.50	-	-	-	-	-	-	-	-	13	A-6a (V)	
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST	763.5		3 6 8	19	100	SS-8	1.65*	-	-	-	-	-	-	-	-	17	A-6a (V)	
MEDIUM STIFF TO STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST			4 4 4	11	100	SS-9	0.94*	3	3	10	20	64	30	15	15	19	A-6a (10)	

PID:	BR ID:	PROJECT: OTIC MP 34.2 BRIDGE DEMO	STATION / OFFSET:	START: 10/31/17	END: 10/31/17	PG 2 OF 3	B-2

MATERIAL DESCRIPTION AND NOTES	ELEV. 761.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
	760.0	32																
STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST		33																
		34	3 4 5	12	100	SS-10	1.25	-	-	-	-	-	-	-	-	17	A-6a (V)	
		35																
		36																
		37																
		38																
		39	2 4 5	12	100	SS-11	1.00	-	-	-	-	-	-	-	-	19	A-6a (V)	
		40																
		41																
		42																
		43																
		44	2 4 6	13	100	SS-12	1.00	-	-	-	-	-	-	-	-	19	A-6a (V)	
		45																
		46																
		47			100	ST-13	1.63*	3	4	9	21	63	30	15	15	18	A-6a (10)	
		48																
		49	3 4 5	12	100	SS-14	1.25	-	-	-	-	-	-	-	-	18	A-6a (V)	
		50																
		51																
		52																
		53																
		54	3 4 5	12	100	SS-15	1.00	-	-	-	-	-	-	-	-	19	A-6a (V)	
		55																
		56																
		57																
		58																
		59	3 4 5	12	100	SS-16	1.00	-	-	-	-	-	-	-	-	19	A-6a (V)	
		60																
		61																
		62																
		63																
		64	1															

PID:	BR ID:	PROJECT: OTIC MP 34.2 BRIDGE DEMO	STATION / OFFSET:	START: 10/31/17	END: 10/31/17	PG 3 OF 3	B-2

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST *(continued)*	727.8	65	3 5	11	100	SS-17	1.00	-	-	-	-	-	-	-	-	17	A-6a (V)	
		66																
		67																
		68																
		69	1 3 5	11	100	SS-18	1.00	-	-	-	-	-	-	-	-	17	A-6a (V)	
		70																
		71																
		72																
	719.0	73																
SOFT TO MEDIUM STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST		74	0 1 3	5	100	SS-19	0.50	-	-	-	-	-	-	-	-	20	A-6a (V)	
		75																
		76																
		77																
		78																
		79	0 1 2	4	100	SS-20	0.50	3	6	12	22	57	30	15	15	21	A-6a (10)	
	712.0	EOB 80																

NOTES: "*" - UNCONFINED STRENGTH DETERMINED BY ASTM D 2166. "NP" - NON PLASTIC

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 4 BAGS BENTONITE CHIPS

LEGEND KEY

Ohio Department of Transportation Soil Symbols


A-1-a - Gravel and/or Stone Fragments


A-1-b - Gravel and/or Stone Fragments with Sand


A-2-4,A-2-5 - Gravel and/or Stone Fragments with Sand and Silt


A-2-6,A-2-7 - Gravel and/or Stone Fragments with Sand, Silt and Clay


A-3 - Fine Sand


A-3a - Coarse and Fine Sand


A-4a - Sandy Silt


A-4b - Silt


A-5 - Elastic Silt and Clay


A-6a - Silt and Clay


A-6b - Silty Clay


A-7-5 - Elastic Clay


A-7-6 - Clay


A-8a - Organic Silt


A-8b - Organic Clay


Asphalt


Sod and/or Topsoil


Concrete


Random Fill


Peat


Dolomite


Weathered Dolomite


Limestone


Weathered Limestone


Sandstone


Weathered Sandstone


Shale


Weathered Shale

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 during on October 31 and November 2, 2017, using 3¼-inch inside 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 boring locations were established in the field by TTL based on direction from GPD Group. Ground surface elevations at the boring locations were estimated to the nearest foot based on topographic contours shown on plan drawings provided by GPD Group.

4. Unconfined Compressive Strength (tsf):
   * = Unconfined Compressive Strength determined by ASTM D 2166.
   NP = Non Pastic

PROJECT: OTIC MP 34.2 Bridge Demolition, Fulton County, OH	**TTL Associates, Inc.**	PROJECT NO: 15807.01

TABULATION OF TEST DATA

Boring Number	Sample Number	Sample Interval Depth (Feet)	Measured Standard Penetration, N_m (Blows per Foot)	Corrected Standard Penetration, N_{60} (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 (%)			ODOT Soil Classification
									Gravel	Coarse Sand	Fine Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	SS-1	1.0-2.5	9	12	10.9												
	SS-2	3.5-5.0	9	12	21.2												
	SS-3	6.0-7.5	9	12	23.1												
	SS-4	8.5-10.0	17	23	24.7												
	SS-5	13.5-15.0	17	23	14.6	115.7	*6,295										
	SS-6	18.5-20.0	22	29	15.1		8,000										
	SS-7	23.5-25.0	10	13	17.5		3,500										
	ST-8	26.0-28.0			17.1	116.7	*4,250										
	SS-9	28.5-30.0	7	9	18.4		3,000										
	SS-10	33.5-35.0	8	11	16.5		3,000										
	SS-11	38.5-40.0	9	12	18.1		3,000										
	SS-12	43.5-45.0	10	13	18.1		3,000										
	SS-13	48.5-50.0	10	13	18.0		3,000										
	ST-14	51.0-53.0			17.2	112.7	*4,395										
	SS-15	53.5-55.0	10	13	18.1		3,500										
	SS-16	58.5-60.0	10	13	17.5		3,500										

SSR = Split-Spoon Refusal

Unconfined compressive strength (UCS) generally derived from a calibrated hand penetrometer. UCS denoted with "*" determined by ASTM D 2166.

PROJECT: OTIC MP 34.2 Bridge Demolition, Fulton County, OH	**TTL Associates, Inc.**	PROJECT NO: 15807.01

TABULATION OF TEST DATA

Boring Number	Sample Number	Sample Interval Depth (Feet)	Measured Standard Penetration, N_m (Blows per Foot)	Corrected Standard Penetration, N_{60} (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 (%)			ODOT Soil Classification
									Gravel	Coarse Sand	Fine Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	SS-17	63.5-65.0	10	13	17.8		3,500										
	SS-18	68.5-70.0	9	12	17.8		3,000										
	SS-19	73.5-75.0	8	11	17.0	105.3	*1,815										
	SS-20	78.5-80.0	8	11	18.3		2,500										
B-2	SS-1	1.0-2.5	10	13	7.1												
	SS-2	3.5-5.0	16	21	20.3				1	3	76	19	1	NON-PLASTIC			A-3a (0)
	SS-3	6.0-7.5	31	41	21.8												
	SS-4	8.5-10.0	17	23	20.2												
	SS-5	13.5-15.0	11	15	16.7		3,500										
	ST-6	16.0-18.0			14.8	117.6	*2,875		20	7	15	20	38	25	14	11	A-6a (5)
	SS-7	18.5-20.0	21	28	13.2		9,000										
	SS-8	23.5-25.0	14	19	16.9	111.6	*3,305										
	SS-9	28.5-30.0	8	11	18.5	103.1	*1,885		3	3	10	20	64	30	15	15	A-6a (10)
	SS-10	33.5-35.0	9	12	17.4		2,500										
	SS-11	38.5-40.0	9	12	18.5		2,000										

SSR = Split-Spoon Refusal

Unconfined compressive strength (UCS) generally derived from a calibrated hand penetrometer. UCS denoted with "*" determined by ASTM D 2166.

PROJECT: OTIC MP 34.2 Bridge Demolition, Fulton County, OH	**TTL Associates, Inc.**	PROJECT NO: 15807.01

TABULATION OF TEST DATA

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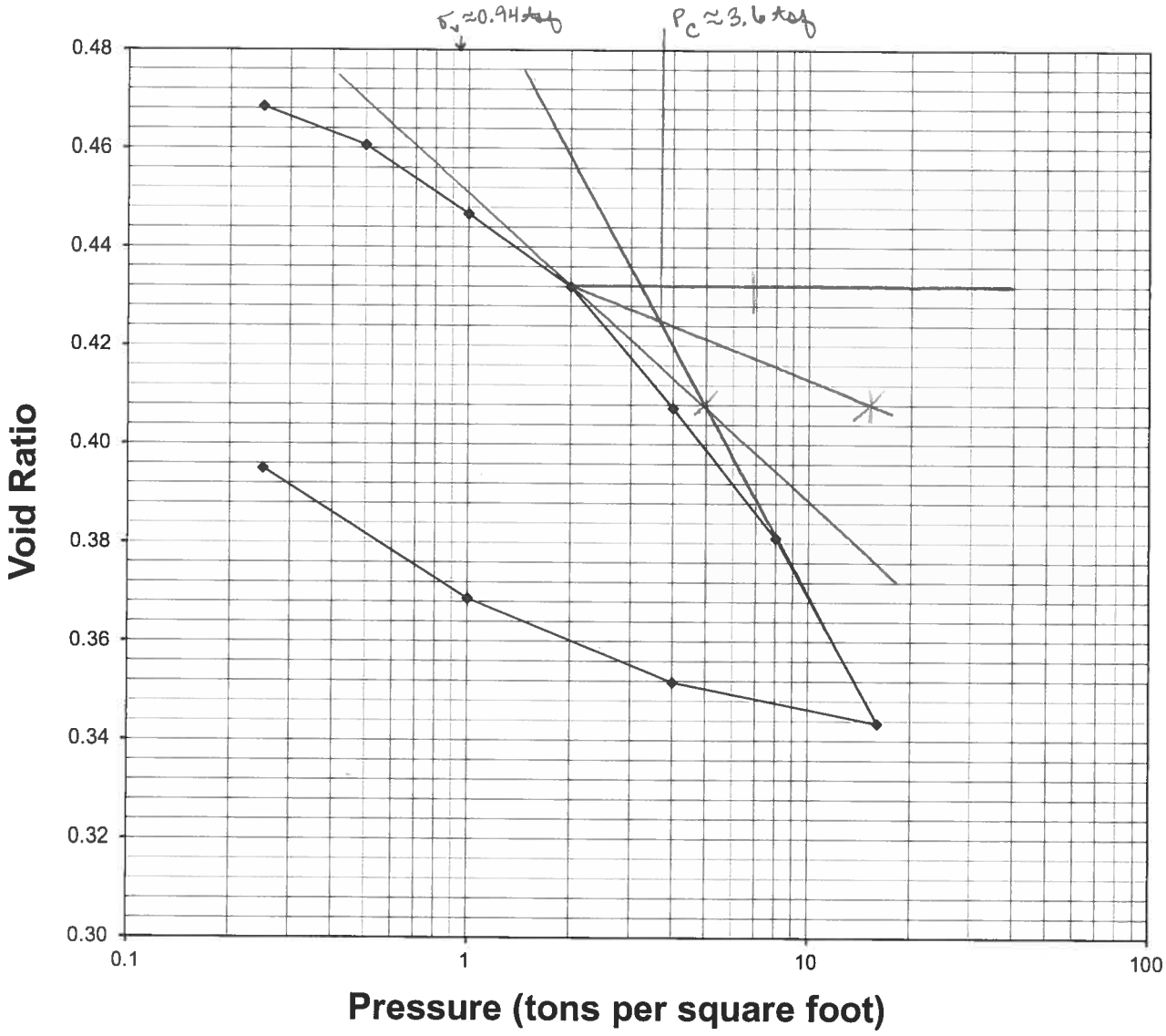
									Gravel	Coarse Sand	Fine Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
B-2	SS-12	43.5-45.0	10	13	18.6		2,000										
	ST-13	46.0-48.0			18.0	111.0	*3,250		3	4	9	21	63	30	15	15	A-6a (10)
	SS-14	48.5-50.0	9	12	17.6		2,500										
	SS-15	53.5-55.0	9	12	18.5		2,000										
	SS-16	58.5-60.0	9	12	19.0		2,000										
	SS-17	63.5-65.0	8	11	17.3		2,000										
	SS-18	68.5-70.0	8	11	17.4		2,000										
	SS-19	73.5-75.0	4	5	19.7		1,000										
	SS-20	78.5-80.0	3	4	20.5		1,000		3	6	12	22	57	30	15	15	A-6a (10)

SSR = Split-Spoon Refusal

Unconfined compressive strength (UCS) generally derived from a calibrated hand penetrometer. UCS denoted with "*" determined by ASTM D 2166.

Project No.: 15807.01
Date: 11/10/2017
Client: GPD Group
Project: OTIC MP 34.2 Bridge Demolition
Wauseon, Fulton County, Ohio
Boring No.: B-1
Sample No.: ST-8
Depth: 26.0 to 28.0 feet

Void Ratio Versus Log Pressure Curve



Project No.: 15807.01
Date: 11/10/2017
Client: GPD Group
Project: OTIC MP 34.2 Bridge Demolition
Wauseon, Fulton County, Ohio
Boring No.: B-1
Sample No.: ST-8
Depth: 26.0 to 28.0 feet

Initial H= 1.011 inches

Pressure tsf	Final Height	Initial Height	DH	Average H	e	t_{50} (min)	Ave P	Cv (in2/s)	Cv (ft2/d)
0.25	1.00270	1.01100	0.00830	1.0069	0.468	6.8	0.125	0.000122	0.073
0.5	0.99740	1.00270	0.01360	1.0001	0.461	3.4	0.375	0.000241	0.145
1	0.98790	0.99740	0.02310	0.9927	0.447	5.0	0.75	0.000162	0.097
2	0.97780	0.98790	0.03320	0.9829	0.432	4.0	1.5	0.000198	0.119
4	0.96100	0.97780	0.05000	0.9694	0.407	3.1	3	0.000249	0.149
8	0.94300	0.96100	0.06800	0.9520	0.381	3.1	6	0.000240	0.144
16	0.91740	0.94300	0.09360	0.9302	0.343	3.0	12	0.000237	0.142
4	0.92305	0.91740	0.08795	0.9202	0.352		10		
1	0.93460	0.92305	0.07640	0.9288	0.369		2.5		
0.25	0.95260	0.93460	0.05840	0.9436	0.395		0.625		

Estimated Cc: 0.125
Estimated Cr: 0.029

Soil Description: Gray SILT and CLAY with Little Sand and Trace Gravel A-6a (10)
Specific Gravity: 2.68
Liquid Limit: 30
Plastic Limit: 15
Plasticity Index: 15

Initial Water Content:	18.6 %	Final Water Content:	17.0 %
Inital Dry Density:	113.1 pcf	Final Dry Density:	120.0 pcf
Initial Void Ratio:	0.481	Final Void Ratio:	0.395
Initial Degree of Saturation:	103.6 %	Final Degree of Saturation	115.4 %

Estimated Preconsolidation Pressure: 3.6 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 were computed by log of time method.

Consolidation Laboratory Calculations

Consolidometer:	1				
Method:	ASTM D 2435 Method B				
Project No. :	15807.01				
Client:	GPD Group				
Project:	OTIC MP 34.2 Bridge Demolition				
Location:	Wauseon, Fulton County, Ohio				
Boring No. :	B-1		Visual Description:	Gray SILT and CLAY with Little Sand and Trace Gravel A-6a (10)	
Sample No.:	ST-8		Liquid Limit:	30 %	
Depth:	26.0 to 28.0 feet		Plastic Limit:	15 %	
Date of Test:	11/10/2017		Plasticity Index:	15 %	
Initial Sample Data			***Final Sample Data***		
Initial Height	1.011 in.		Final Height	0.953 in.	
Ring Dia.	2.493 in.		Ring Dia.	2.493 in.	
Area of Ring	4.8813 in^2		Area of Ring	4.8813 in^2	
Initial Volume	4.9350 in^3	0.00286 ft^3	Final Volume	4.6499 in^3	0.00269 ft^3
Specific Gravity	2.682				
			Final wet mass soil, pan & ring	368.1 g	
			Wt of Pan	50.1 g	
Initial wet mass soil & ring	320.3 g		Final wet mass soil & ring	318.0	
Mass of ring	146.6 g		Mass of ring	146.6 g	
			Final dry mass of soil, pan & ring	343.2 g	
Initial wet mass soil	173.7 g	0.38294 lb	Final wet mass soil	171.4 g	0.37787 lb
			Weight of water	24.9 g	0.05490 lb
Initial Water Content					
Mass can & wet soil	297.8 g				
Mass can & dry soil	258 g				
Mass of can	40.4 g				
Mass of water	39.8 g				
Mass of soil	217.6 g				
Initial water content	18.29 % (trimmings)				
Initial water content	18.57 % (based on final dry weight)		Final water content	17.00 % (based on final dry weight)	
			Final weight of solids (Md)	146.5 g	0.32298 lb
Initial dry density	113.1 pcf		Final dry density	120.0 pcf	
			Final volume of solids (Vs)	3.3332 in^3	0.00193 ft^3
			Final height of solids (Hs)	0.6829 in.	
Initial void ratio (eo)	0.481		Final void ratio (ef)	0.395	
Initial volume of voids (Vvo)	1.6017 in^3	0.00093 ft^3	Final volume of voids (Vvf)	1.3167 in^3	0.00076 ft^3
Initial volume of water (Vwo)	1.6598 in^3	0.00096 ft^3	Final volume of water (Vwf)	1.5194 in^3	0.00088 ft^3
Initial degree of saturation (So)	103.62 %		Final degree of saturation (Sf)	115.40 %	

Project No. : 15807.01
Boring No. : B-1

Sample No.: ST-8
Depth: 26.0 to 28.0 feet

0.25 ton Load

initial height= 1.011 inches

Do=D1-(D2-D1)

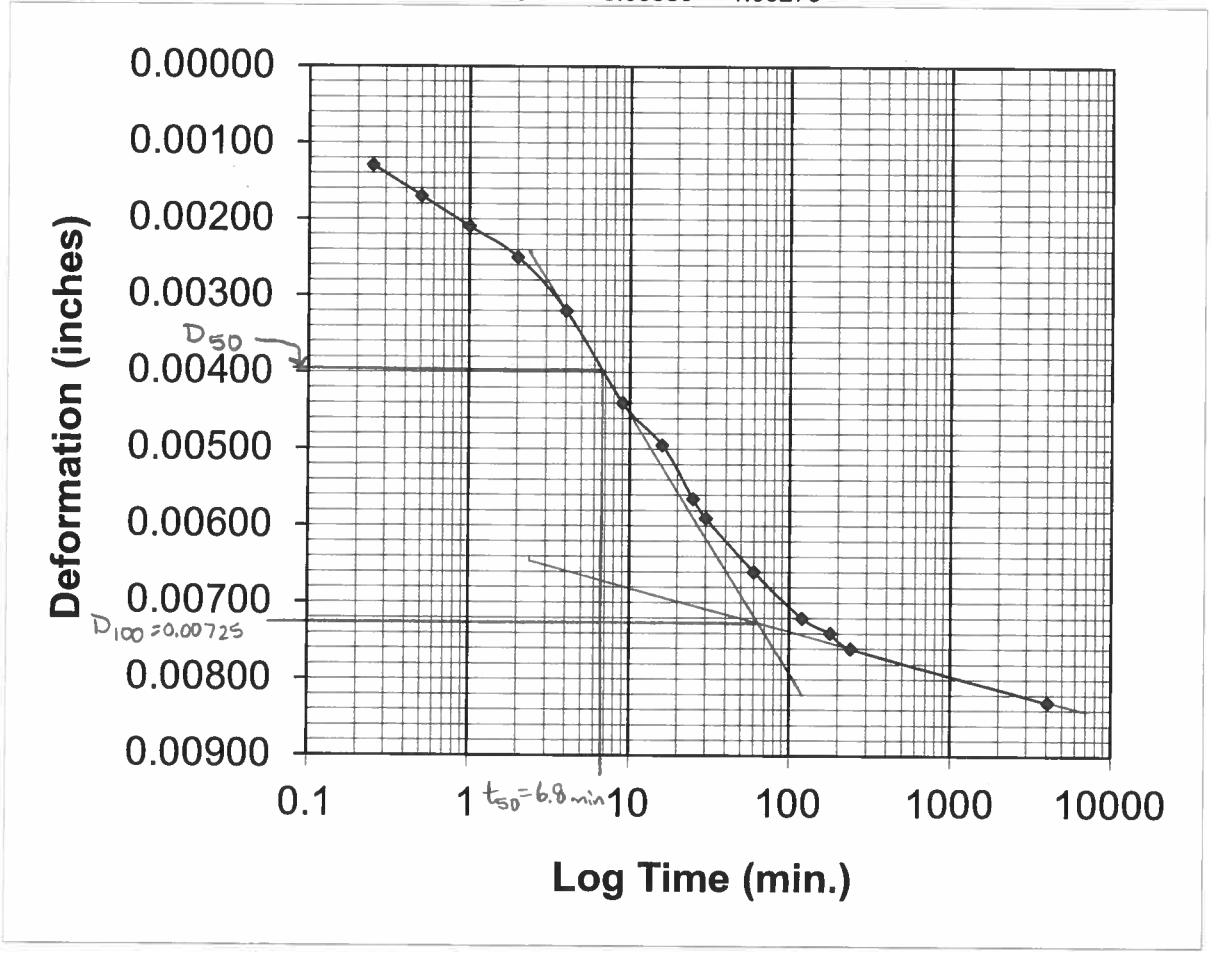
1) 0.25 to 1.0:	0.00050
2) 0.5 to 2.0:	0.00090
3) 1.0 to 4.0:	0.00100
Do Avg 1&2:	0.00070
Do Avg 1-3:	0.00080

D100= 0.00725

D50=D100+0.5(Do-D100)

D_{50} = 0.003975

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.39450				
0.25	0.39100	0.00350	0.00220	0.00130	1.00970
0.5	0.39060	0.00390	0.00220	0.00170	1.00930
1	0.39020	0.00430	0.00220	0.00210	1.00890
2	0.38980	0.00470	0.00220	0.00250	1.00850
4	0.38910	0.00540	0.00220	0.00320	1.00780
9	0.38790	0.00660	0.00220	0.00440	1.00660
16	0.38735	0.00715	0.00220	0.00495	1.00605
25	0.38665	0.00785	0.00220	0.00565	1.00535
30	0.38640	0.00810	0.00220	0.00590	1.00510
60	0.38570	0.00880	0.00220	0.00660	1.00440
120	0.38510	0.00940	0.00220	0.00720	1.00380
180	0.38490	0.00960	0.00220	0.00740	1.00360
240	0.38470	0.00980	0.00220	0.00760	1.00340
4055	0.38400	0.01050	0.00220	0.00830	1.00270



Project No. : 15807.01 Sample No.: ST-8

Boring No. : B-1 Depth: 26.0 to 28.0 feet

0.5 ton Load

initial height= 1.0027 inches

Do=D1-(D2-D1)

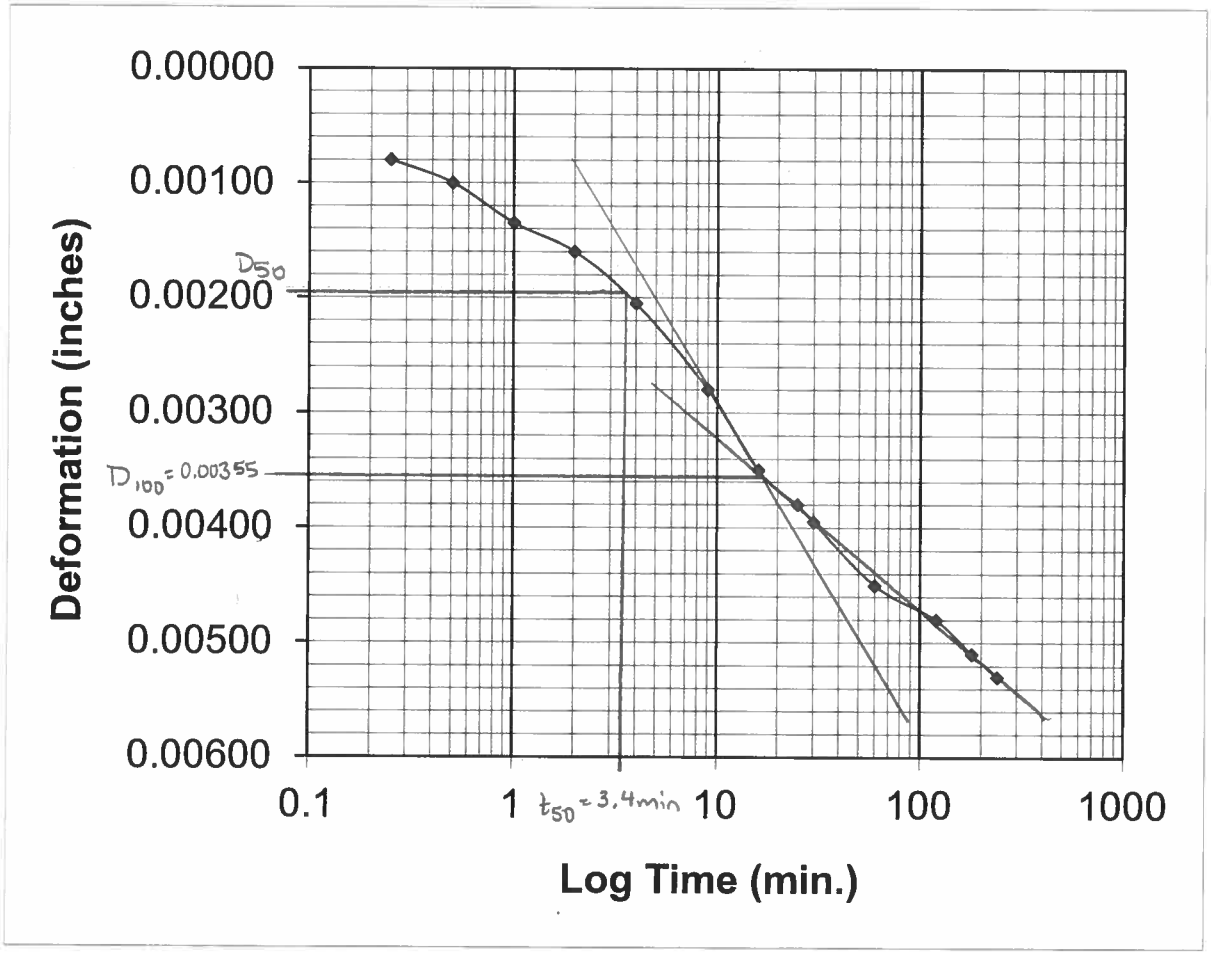
1) 0.25 to 1.0:	0.00025
2) 0.5 to 2.0:	0.00040
3) 1.0 to 4.0:	0.00065
Do Avg 1&2:	0.00033
Do Avg 1-3:	0.00043

D100= 0.00355

D50=D100+0.5(Do-D100)

$D_{50} = 0.00194$

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.38400				
0.25	0.38320	0.00080	0.00000	0.00080	1.00190
0.5	0.38300	0.00100	0.00000	0.00100	1.00170
1	0.38265	0.00135	0.00000	0.00135	1.00135
2	0.38240	0.00160	0.00000	0.00160	1.00110
4	0.38195	0.00205	0.00000	0.00205	1.00065
9	0.38120	0.00280	0.00000	0.00280	0.99990
16	0.38050	0.00350	0.00000	0.00350	0.99920
25	0.38020	0.00380	0.00000	0.00380	0.99890
30	0.38005	0.00395	0.00000	0.00395	0.99875
60	0.37950	0.00450	0.00000	0.00450	0.99820
120	0.37920	0.00480	0.00000	0.00480	0.99790
180	0.37890	0.00510	0.00000	0.00510	0.99760
240	0.37870	0.00530	0.00000	0.00530	0.99740



Project No. : 15807.01 Sample No.: ST-8

Boring No. : B-1 Depth: 26.0 to 28.0 feet

1.0 ton Load

initial height= 0.9974 inches

Do=D1-(D2-D1)

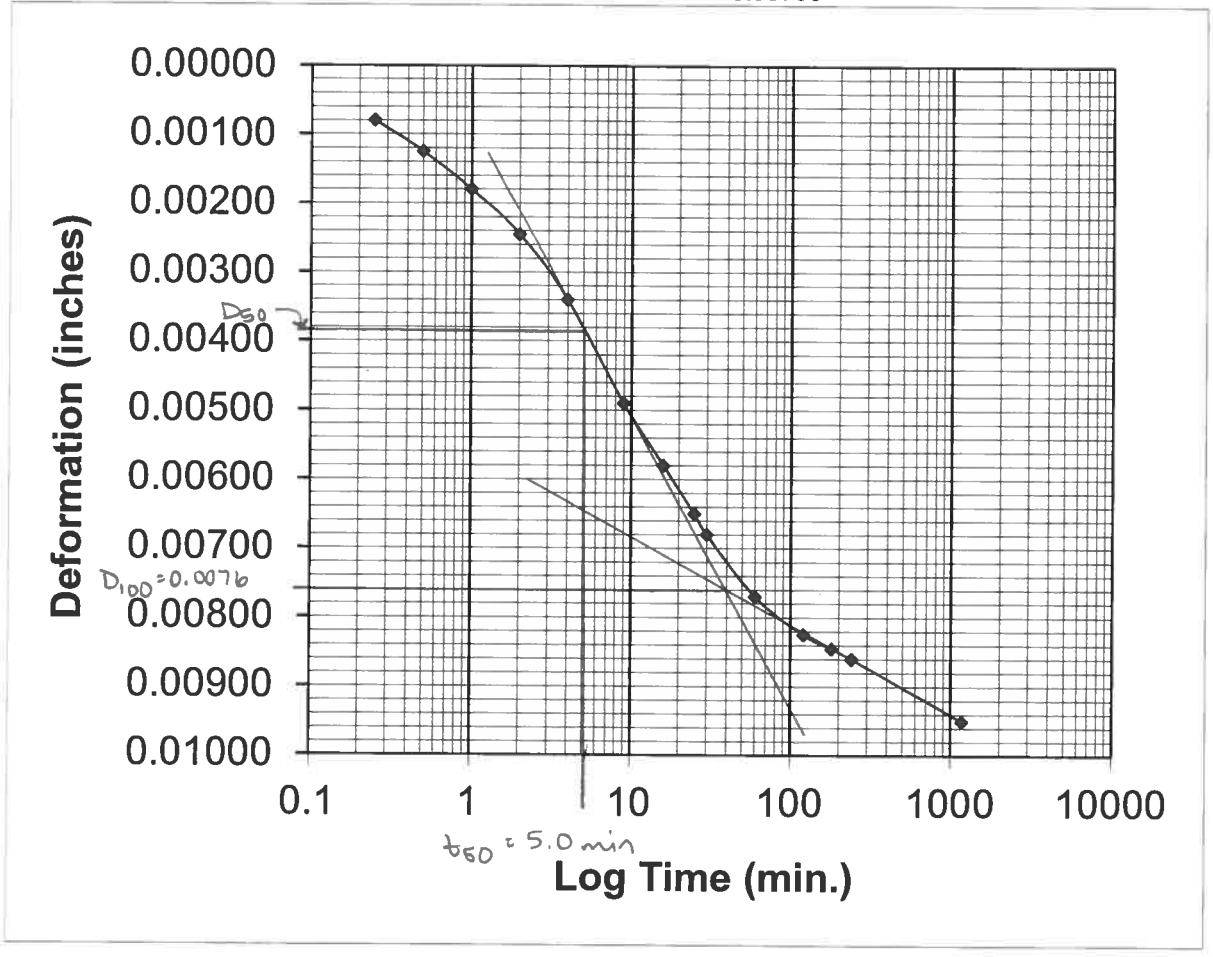
1) 0.25 to 1.0:	-0.00020
2) 0.5 to 2.0:	0.00005
3) 1.0 to 4.0:	0.00020
Do Avg 1&2:	-0.00008
Do Avg 1-3:	0.00002

D100= 0.0076

D50=D100+0.5(Do-D100)

$D_{50} = 0.003825$

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.37870				
0.25	0.37600	0.00270	0.00190	0.00080	0.99660
0.5	0.37555	0.00315	0.00190	0.00125	0.99615
1	0.37500	0.00370	0.00190	0.00180	0.99560
2	0.37435	0.00435	0.00190	0.00245	0.99495
4	0.37340	0.00530	0.00190	0.00340	0.99400
9	0.37190	0.00680	0.00190	0.00490	0.99250
16	0.37100	0.00770	0.00190	0.00580	0.99160
25	0.37030	0.00840	0.00190	0.00650	0.99090
30	0.37000	0.00870	0.00190	0.00680	0.99060
60	0.36910	0.00960	0.00190	0.00770	0.98970
120	0.36855	0.01015	0.00190	0.00825	0.98915
180	0.36835	0.01035	0.00190	0.00845	0.98895
240	0.36820	0.01050	0.00190	0.00860	0.98880
1175	0.36730	0.01140	0.00190	0.00950	0.98790



Project No. : 15807.01
Boring No. : B-1

Sample No.: ST-8
Depth: 26.0 to 28.0 feet

2.0 ton Load

initial height= 0.9879 inches

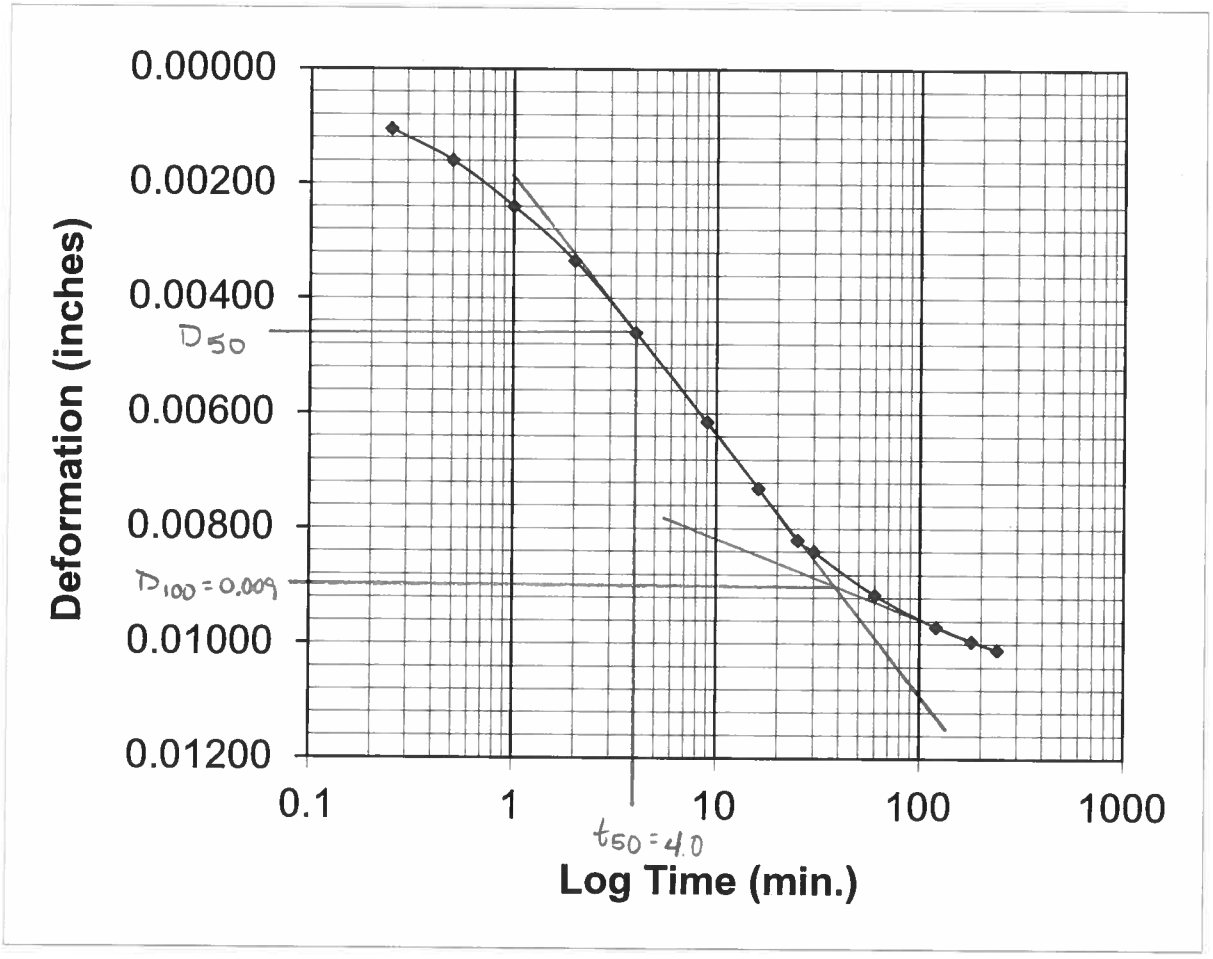
Do=D1-(D2-D1)

1) 0.25 to 1.0: -0.00030
2) 0.5 to 2.0: -0.00015
3) 1.0 to 4.0: 0.00020
Do Avg 1&2: -0.00023
Do Avg 1-3: -0.00008

D100= 0.009
D50=D100+0.5(Do-D100)

$D_{50} = 0.0046$

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.36730				
0.25	0.36425	0.00305	0.00200	0.00105	0.98685
0.5	0.36370	0.00360	0.00200	0.00160	0.98630
1	0.36290	0.00440	0.00200	0.00240	0.98550
2	0.36195	0.00535	0.00200	0.00335	0.98455
4	0.36070	0.00660	0.00200	0.00460	0.98330
9	0.35915	0.00815	0.00200	0.00615	0.98175
16	0.35800	0.00930	0.00200	0.00730	0.98060
25	0.35710	0.01020	0.00200	0.00820	0.97970
30	0.35690	0.01040	0.00200	0.00840	0.97950
60	0.35615	0.01115	0.00200	0.00915	0.97875
120	0.35560	0.01170	0.00200	0.00970	0.97820
180	0.35535	0.01195	0.00200	0.00995	0.97795
240	0.35520	0.01210	0.00200	0.01010	0.97780



Project No. : 15807.01 Sample No.: ST-8

Boring No. : B-1 Depth: 26.0 to 28.0 feet

4.0 ton Load

initial height= 0.9778 inches

Do=D1-(D2-D1)

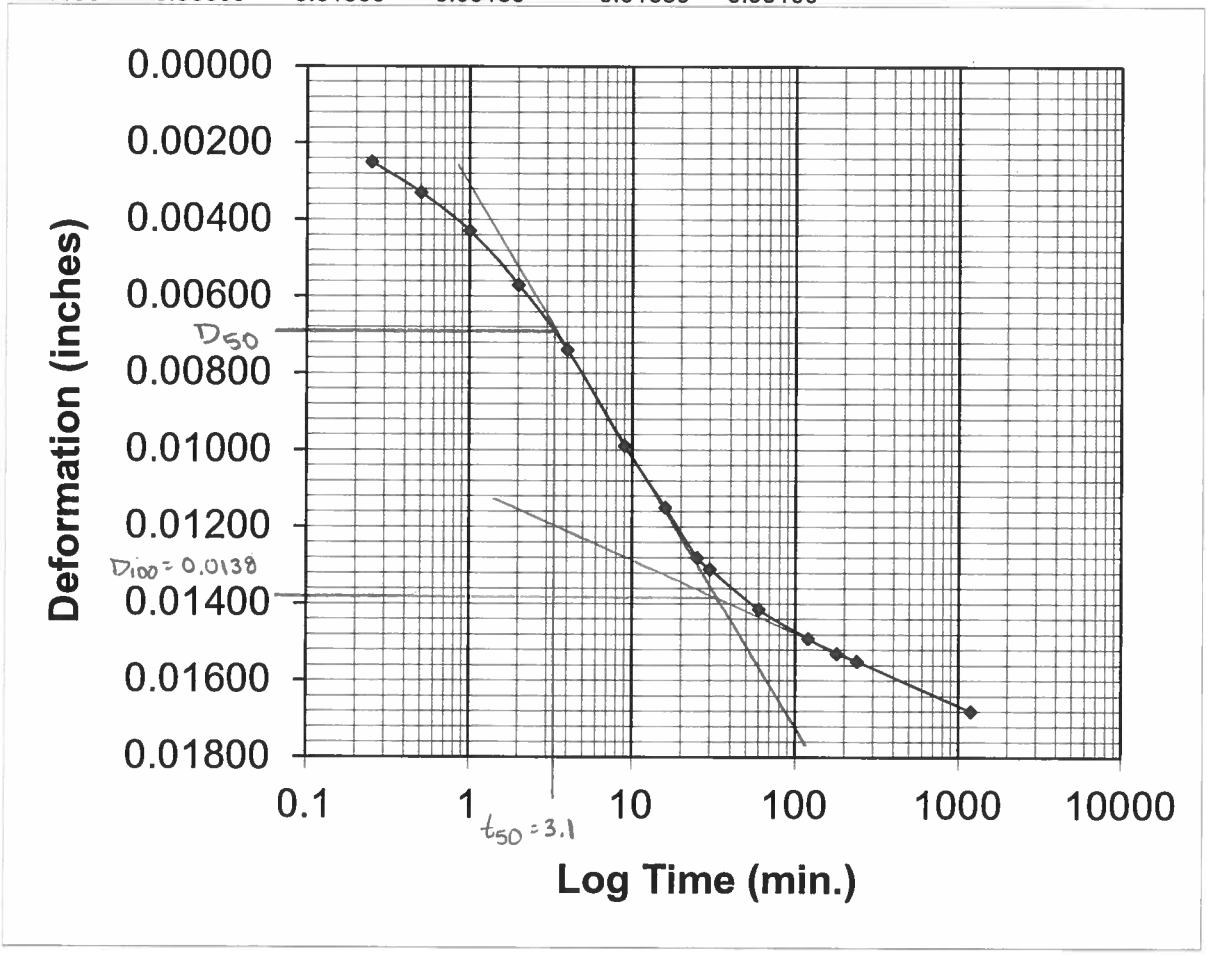
1) 0.25 to 1.0:	0.00070
2) 0.5 to 2.0:	0.00090
3) 1.0 to 4.0:	0.00120
Do Avg 1&2:	0.00080
Do Avg 1-3:	0.00093

D100= 0.0138

D50=D100+0.5(Do-D100)

D_{50} = 0.0069

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.35520				
0.25	0.35090	0.00430	0.00180	0.00250	0.97530
0.5	0.35010	0.00510	0.00180	0.00330	0.97450
1	0.34910	0.00610	0.00180	0.00430	0.97350
2	0.34770	0.00750	0.00180	0.00570	0.97210
4	0.34600	0.00920	0.00180	0.00740	0.97040
9	0.34350	0.01170	0.00180	0.00990	0.96790
16	0.34190	0.01330	0.00180	0.01150	0.96630
25	0.34060	0.01460	0.00180	0.01280	0.96500
30	0.34030	0.01490	0.00180	0.01310	0.96470
60	0.33925	0.01595	0.00180	0.01415	0.96365
120	0.33850	0.01670	0.00180	0.01490	0.96290
180	0.33810	0.01710	0.00180	0.01530	0.96250
240	0.33790	0.01730	0.00180	0.01550	0.96230
1195	0.33660	0.01860	0.00180	0.01680	0.96100



Project No. : 15807.01 Sample No.: ST-8

Boring No. : B-1 Depth: 26.0 to 28.0 feet

8.0 ton Load

initial height= 0.96100 inches

Do=D1-(D2-D1)

1) 0.25 to 1.0: ~~-0.00015~~ Say 0

2) 0.5 to 2.0: 0.00085

3) 1.0 to 4.0: 0.00040

Do Avg 1&2: 0.00035

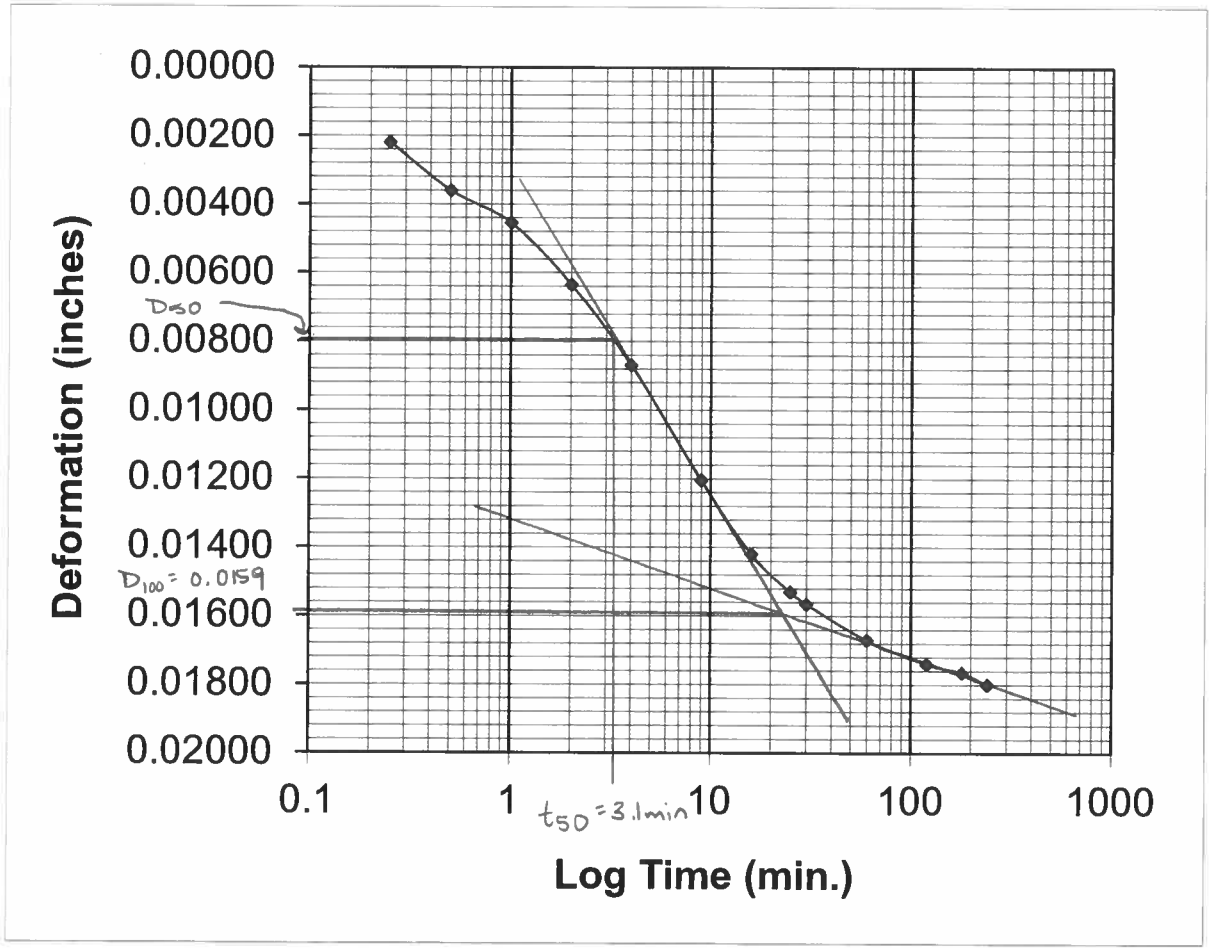
Do Avg 1-3: 0.00037

D100= 0.0159

D50=D100+0.5(Do-D100)

D_{50} = 0.00795

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.33660				
0.25	0.33250	0.00410	0.00190	0.00220	0.95880
0.5	0.33110	0.00550	0.00190	0.00360	0.95740
1	0.33015	0.00645	0.00190	0.00455	0.95645
2	0.32835	0.00825	0.00190	0.00635	0.95465
4	0.32600	0.01060	0.00190	0.00870	0.95230
9	0.32265	0.01395	0.00190	0.01205	0.94895
16	0.32050	0.01610	0.00190	0.01420	0.94680
25	0.31940	0.01720	0.00190	0.01530	0.94570
30	0.31905	0.01755	0.00190	0.01565	0.94535
60	0.31800	0.01860	0.00190	0.01670	0.94430
120	0.31730	0.01930	0.00190	0.01740	0.94360
180	0.31705	0.01955	0.00190	0.01765	0.94335
240	0.31670	0.01990	0.00190	0.01800	0.94300



Project No. : 15807.01 Sample No.: ST-8

Boring No. : B-1 Depth: 26.0 to 28.0 feet

16 ton Load

initial height= 0.943 inches

Do=D1-(D2-D1)

1) 0.25 to 1.0:	-0.00030
2) 0.5 to 2.0:	-0.00020
3) 1.0 to 4.0:	0.00010
Do Avg 1&2:	-0.00025
Do Avg 1-3:	-0.00013

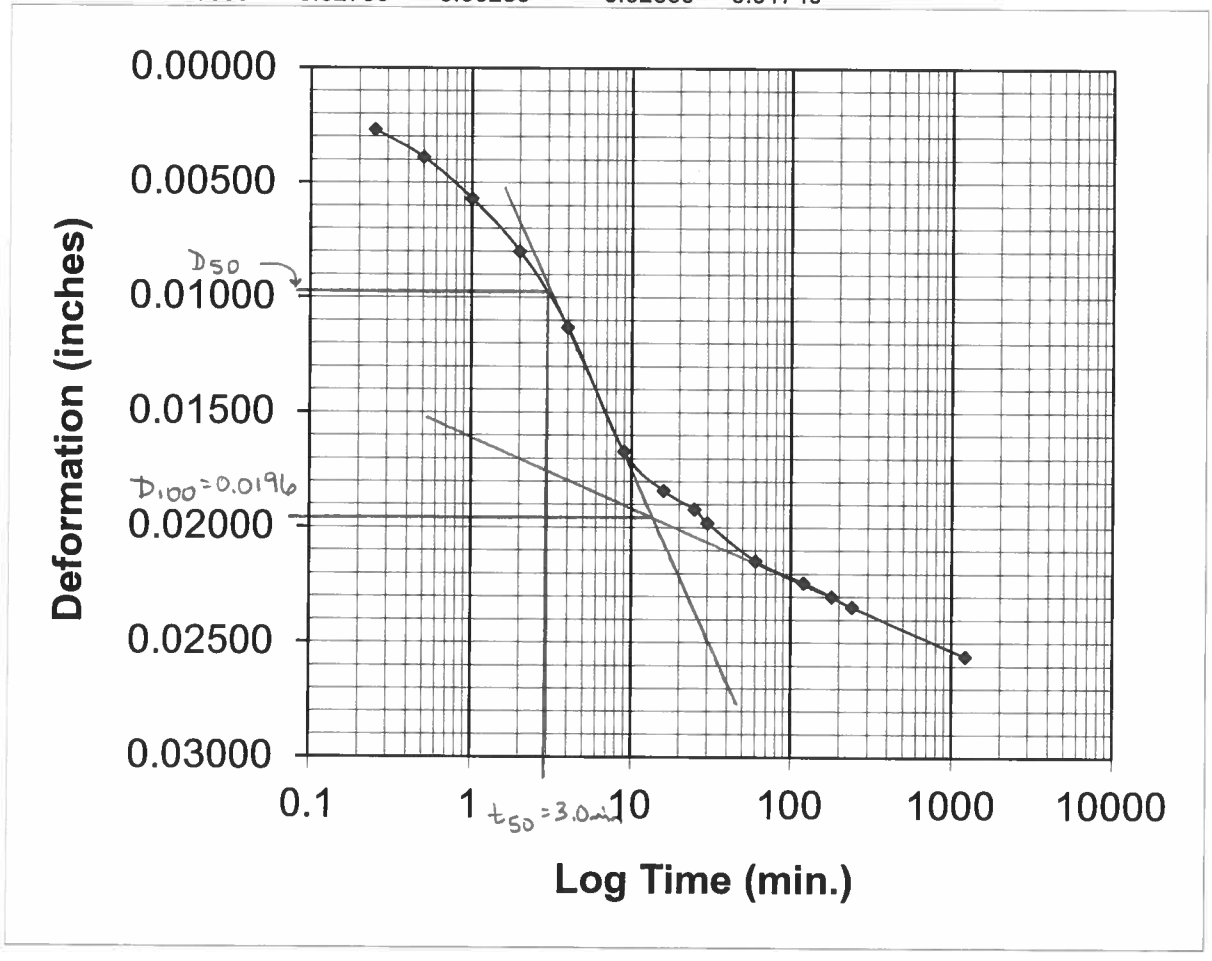
Say 0

D100= 0.0196

D50=D100+0.5(Do-D100)

D_{50} = 0.0098

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.31670				
0.25	0.31170	0.00500	0.00230	0.00270	0.94030
0.5	0.31050	0.00620	0.00230	0.00390	0.93910
1	0.30870	0.00800	0.00230	0.00570	0.93730
2	0.30640	0.01030	0.00230	0.00800	0.93500
4	0.30310	0.01360	0.00230	0.01130	0.93170
9	0.29770	0.01900	0.00230	0.01670	0.92630
16	0.29600	0.02070	0.00230	0.01840	0.92460
25	0.29520	0.02150	0.00230	0.01920	0.92380
30	0.29460	0.02210	0.00230	0.01980	0.92320
60	0.29295	0.02375	0.00230	0.02145	0.92155
120	0.29200	0.02470	0.00230	0.02240	0.92060
180	0.29140	0.02530	0.00230	0.02300	0.92000
240	0.29095	0.02575	0.00230	0.02345	0.91955
1215	0.28880	0.02790	0.00230	0.02560	0.91740

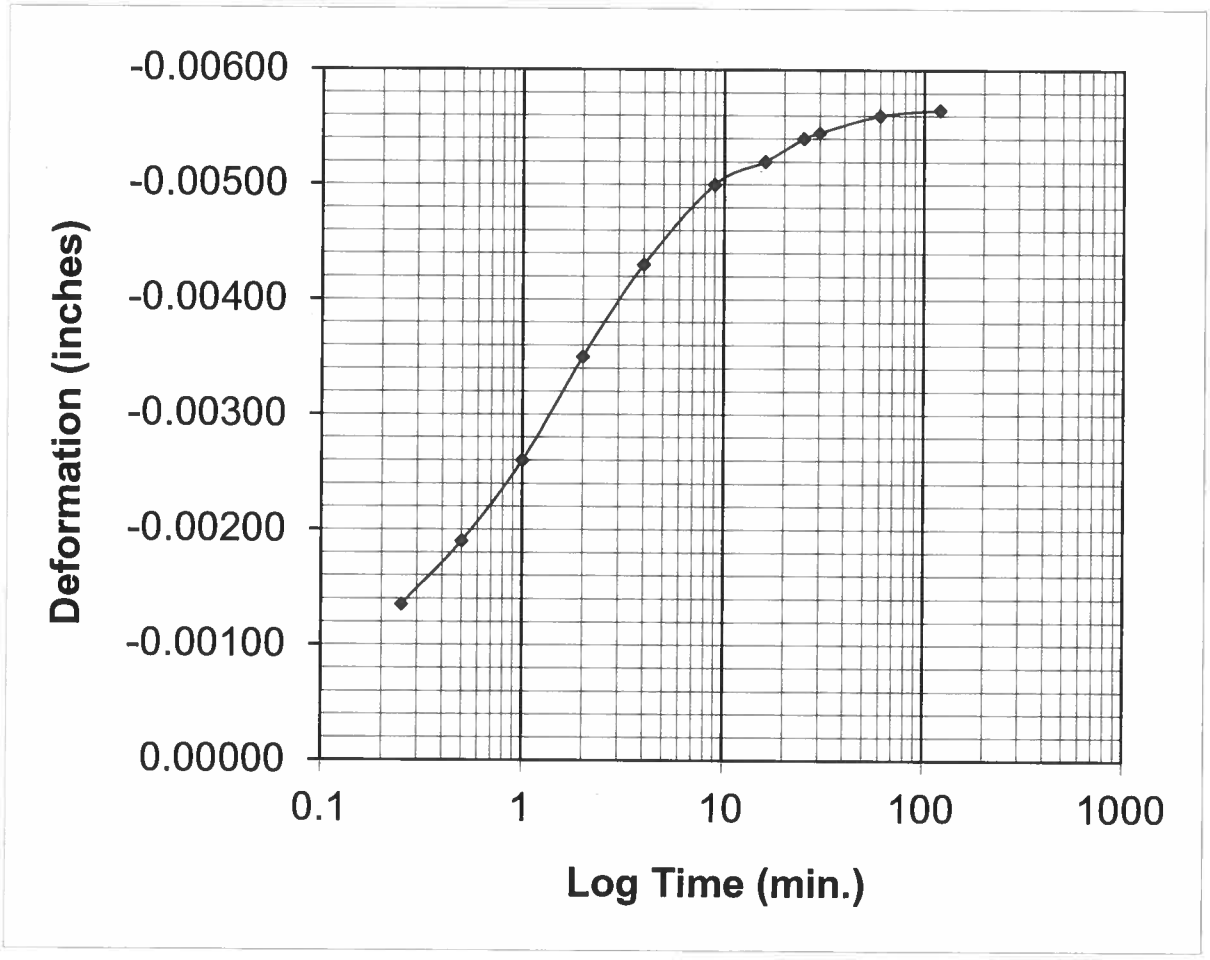


Project No. : 15807.01 Sample No.: ST-8
Boring No. : B-1 Depth: 26.0 to 28.0 feet

4.0 ton Unload

initial height= 0.9174 inches

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.28880				
0.25	0.29145	-0.00265	-0.00130	-0.00135	0.91875
0.5	0.29200	-0.00320	-0.00130	-0.00190	0.91930
1	0.29270	-0.00390	-0.00130	-0.00260	0.92000
2	0.29360	-0.00480	-0.00130	-0.00350	0.92090
4	0.29440	-0.00560	-0.00130	-0.00430	0.92170
9	0.29510	-0.00630	-0.00130	-0.00500	0.92240
16	0.29530	-0.00650	-0.00130	-0.00520	0.92260
25	0.29550	-0.00670	-0.00130	-0.00540	0.92280
30	0.29555	-0.00675	-0.00130	-0.00545	0.92285
60	0.29570	-0.00690	-0.00130	-0.00560	0.92300
120	0.29575	-0.00695	-0.00130	-0.00565	0.92305

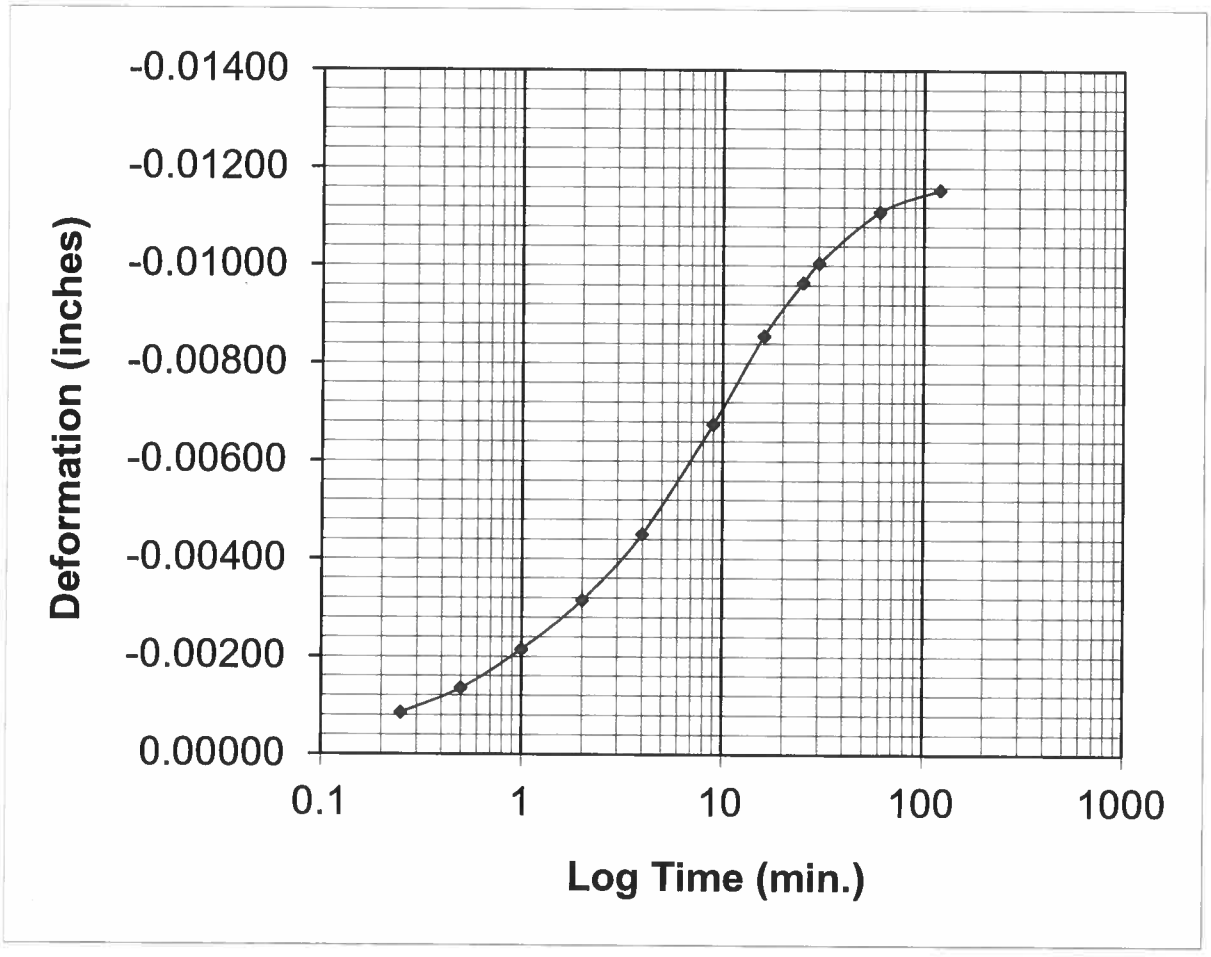


Project No. : 15807.01 Sample No.: ST-8
Boring No. : B-1 Depth: 26.0 to 28.0 feet

1.0 ton Unload

initial height= 0.92305 inches

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.29575				
0.25	0.29810	-0.00235	-0.00150	-0.00085	0.92390
0.5	0.29860	-0.00285	-0.00150	-0.00135	0.92440
1	0.29940	-0.00365	-0.00150	-0.00215	0.92520
2	0.30040	-0.00465	-0.00150	-0.00315	0.92620
4	0.30175	-0.00600	-0.00150	-0.00450	0.92755
9	0.30400	-0.00825	-0.00150	-0.00675	0.92980
16	0.30580	-0.01005	-0.00150	-0.00855	0.93160
25	0.30690	-0.01115	-0.00150	-0.00965	0.93270
30	0.30730	-0.01155	-0.00150	-0.01005	0.93310
60	0.30835	-0.01260	-0.00150	-0.01110	0.93415
120	0.30880	-0.01305	-0.00150	-0.01155	0.93460

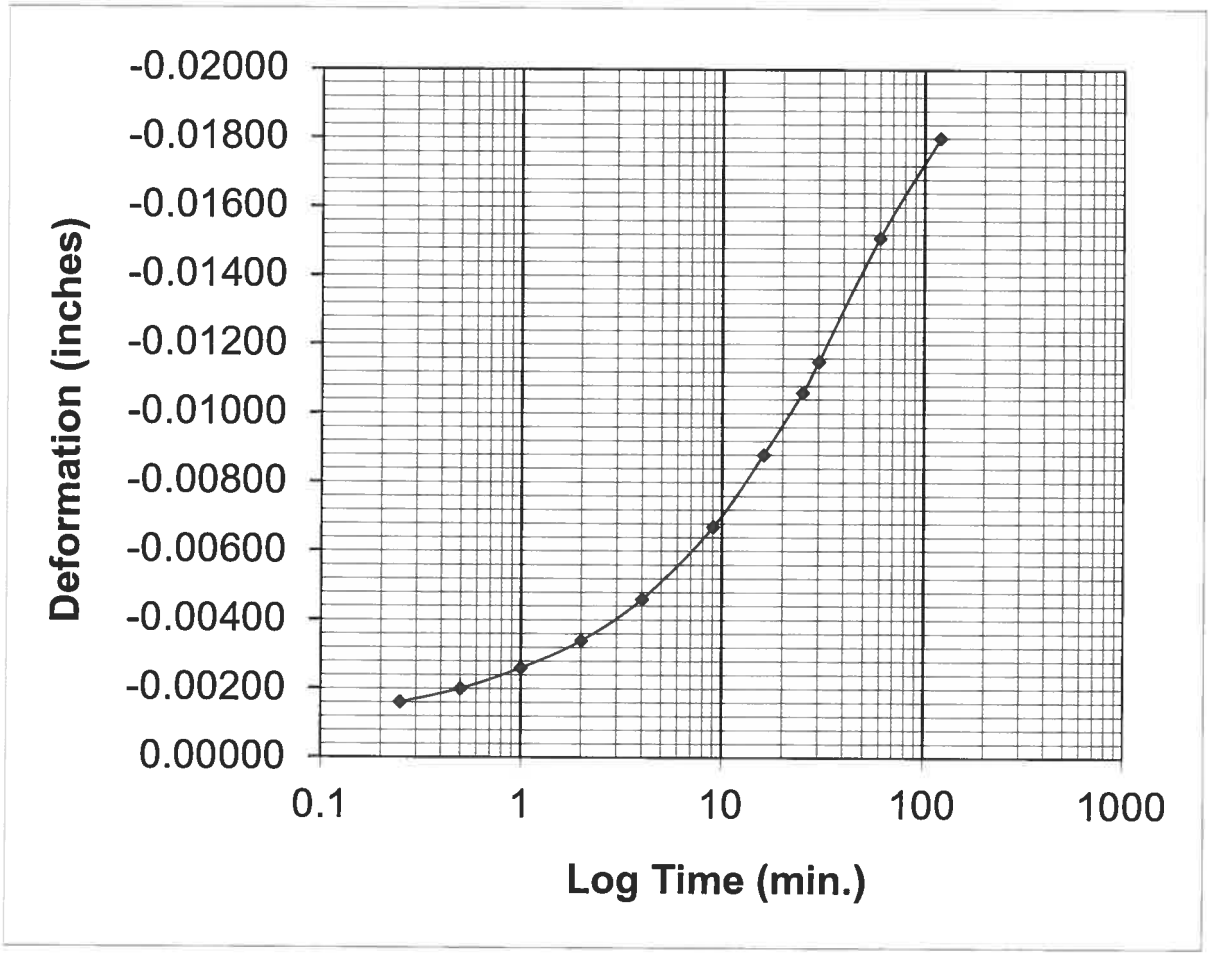


Project No. : 15807.01 Sample No.: ST-8
Boring No. : B-1 Depth: 26.0 to 28.0 feet

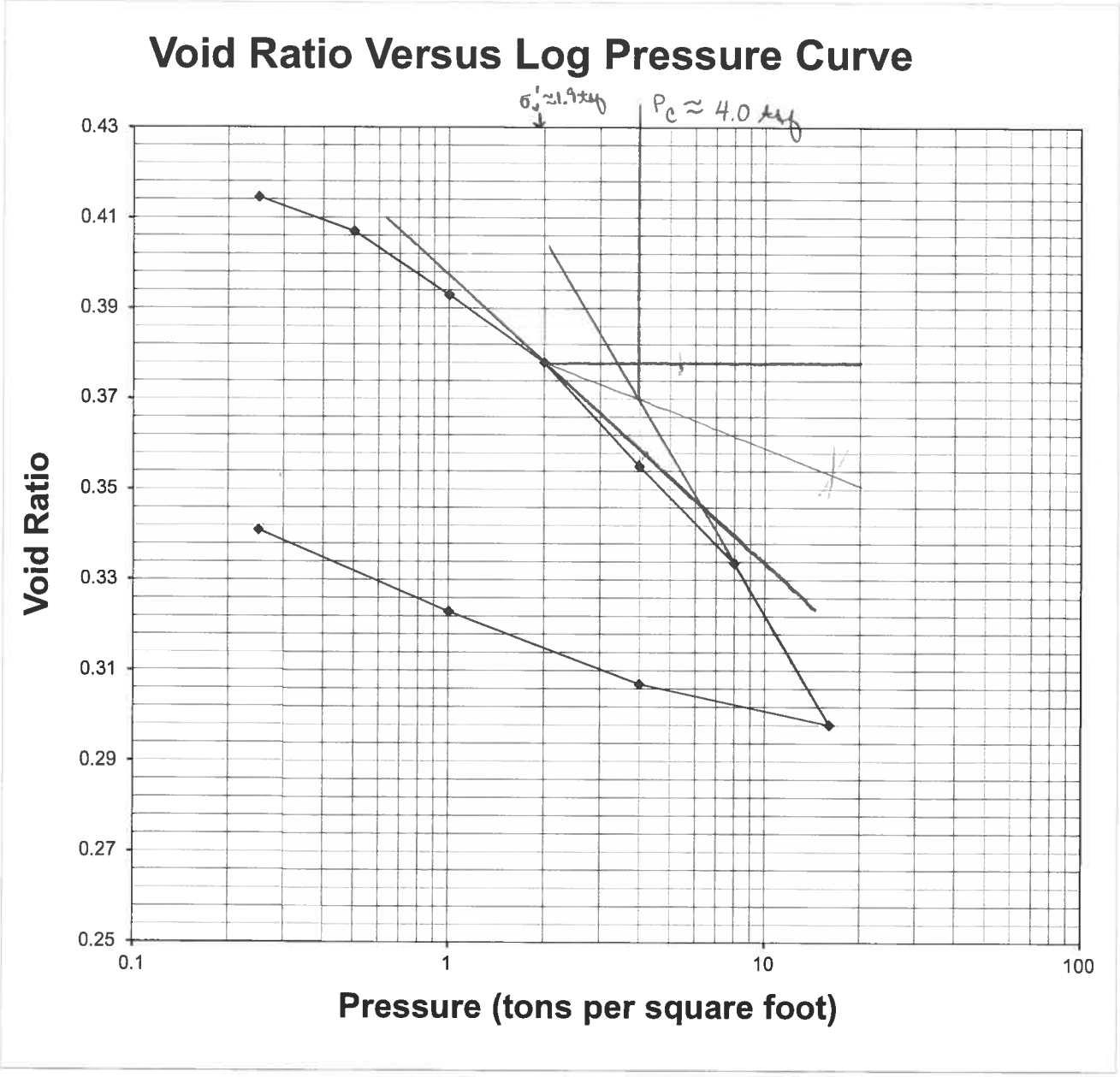
0.25 ton Unload

initial height= 0.9346 inches

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.30880				
0.25	0.31040	-0.00160	0.00000	-0.00160	0.93620
0.5	0.31080	-0.00200	0.00000	-0.00200	0.93660
1	0.31140	-0.00260	0.00000	-0.00260	0.93720
2	0.31220	-0.00340	0.00000	-0.00340	0.93800
4	0.31340	-0.00460	0.00000	-0.00460	0.93920
9	0.31550	-0.00670	0.00000	-0.00670	0.94130
16	0.31760	-0.00880	0.00000	-0.00880	0.94340
25	0.31940	-0.01060	0.00000	-0.01060	0.94520
30	0.32030	-0.01150	0.00000	-0.01150	0.94610
60	0.32390	-0.01510	0.00000	-0.01510	0.94970
120	0.32680	-0.01800	0.00000	-0.01800	0.95260



Project No.: 15807.01
Date: 11/10/2017
Client: GPD Group
Project: OTIC MP 34.2 Bridge Demolition
Wauseon, Fulton County, Ohio
Boring No.: B-1
Sample No.: ST-14
Depth: 51.0 to 53.0 feet



Project No.: 15807.01
Date: 11/10/2017
Client: GPD Group
Project: OTIC MP 34.2 Bridge Demolition
Wauseon, Fulton County, Ohio
Boring No.: B-1
Sample No.: ST-14
Depth: 51.0 to 53.0 feet

Initial H= 1.013 inches

Pressure tsf	Final Height	Initial Height	DH	Average H	e	t_{50} (min)	Ave P	Cv (in2/s)	Cv (ft2/d)
0.25	0.99650	1.01300	0.01650	1.0048	0.414	3.2	0.125	0.000259	0.155
0.5	0.99115	0.99650	0.02185	0.9938	0.407	0.3	0.375	0.002702	1.621
1	0.98130	0.99115	0.03170	0.9862	0.393	1.2	0.75	0.000665	0.399
2	0.97080	0.98130	0.04220	0.9761	0.378	3.2	1.5	0.000244	0.147
4	0.95465	0.97080	0.05835	0.9627	0.355	11.1	3	0.000069	0.041
8	0.93960	0.95465	0.07340	0.9471	0.334	2.2	6	0.000335	0.201
16	0.91445	0.93960	0.09855	0.9270	0.298	3.1	12	0.000228	0.137
4	0.92080	0.91445	0.09220	0.9176	0.307		10		
1	0.93200	0.92080	0.08100	0.9264	0.323		2.5		
0.25	0.94470	0.93200	0.06830	0.9384	0.341		0.625		

Estimated Cc: 0.119
Estimated Cr: 0.024

Soil Description: Gray SILT and CLAY with Little Sand and Trace Gravel A-6a (9)
Specific Gravity: 2.699
Liquid Limit: 29
Plastic Limit: 16
Plasticity Index: 13

Initial Water Content:	18.0 %	Final Water Content:	16.6 %
Inital Dry Density:	117.2 pcf	Final Dry Density:	125.7 pcf
Initial Void Ratio:	0.438	Final Void Ratio:	0.341
Initial Degree of Saturation:	111.0 %	Final Degree of Saturation	131.2 %

Estimated Preconsolidation Pressure: 4.0 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 were computed by log of time method.

Consolidation Laboratory Calculations

Consolidometer:	2				
Method:	ASTM D 2435 Method B				
Project No. :	15807.01				
Client:	GPD Group				
Project:	OTIC MP 34.2 Bridge Demolition				
Location:	Wauseon, Fulton County, Ohio				
Boring No. :	B-1		Visual Description:	Gray SILT and CLAY with Little Sand and Trace Gravel A-6a (9)	
Sample No.:	ST-14		Liquid Limit:	29 %	
Depth:	51.0 to 53.0 feet		Plastic Limit:	16 %	
Date of Test:	11/10/2017		Plasticity Index:	13 %	
Initial Sample Data			***Final Sample Data***		
Initial Height	1.013 in.		Final Height	0.945 in.	
Ring Dia.	2.493 in.		Ring Dia.	2.493 in.	
Area of Ring	4.8813 in^2		Area of Ring	4.8813 in^2	
Initial Volume	4.9447 in^3	0.00286 ft^3	Final Volume	4.6114 in^3	0.00267 ft^3
Specific Gravity	2.699				
			Final wet mass soil, pan & ring	372.3 g	
			Wt of Pan	50.3 g	
Initial wet mass soil & ring	324.2 g		Final wet mass soil & ring	322.0	
Mass of ring	144.7 g		Mass of ring	144.7 g	
			Final dry mass of soil, pan & ring	347.1 g	
Initial wet mass soil	179.5 g	0.39573 lb	Final wet mass soil	177.3 g	0.39088 lb
			Weight of water	25.2 g	0.05556 lb
Initial Water Content					
Mass can & wet soil	300 g				
Mass can & dry soil	261.8 g				
Mass of can	39.5 g				
Mass of water	38.2 g				
Mass of soil	222.3 g				
Initial water content	17.18 % (trimmings)				
Initial water content	18.01 % (based on final dry weight)		Final water content	16.57 % (based on final dry weight)	
			Final weight of solids (Md)	152.1 g	0.33532 lb
Initial dry density	117.2 pcf		Final dry density	125.7 pcf	
			Final volume of solids (Vs)	3.4389 in^3	0.00199 ft^3
			Final height of solids (Hs)	0.7045 in.	
Initial void ratio (eo)	0.438		Final void ratio (ef)	0.341	
Initial volume of voids (Vvo)	1.5059 in^3	0.00087 ft^3	Final volume of voids (Vvf)	1.1725 in^3	0.00068 ft^3
Initial volume of water (Vwo)	1.6720 in^3	0.00097 ft^3	Final volume of water (Vwf)	1.5378 in^3	0.00089 ft^3
Initial degree of saturation (So)	111.03 %		Final degree of saturation (Sf)	131.15 %	

Project No. : 15807.01 Sample No.: ST-14

Boring No. : B-1 Depth: 51.0 to 53.0 feet

0.25 ton Load

initial height= 1.013 inches

Do=D1-(D2-D1)

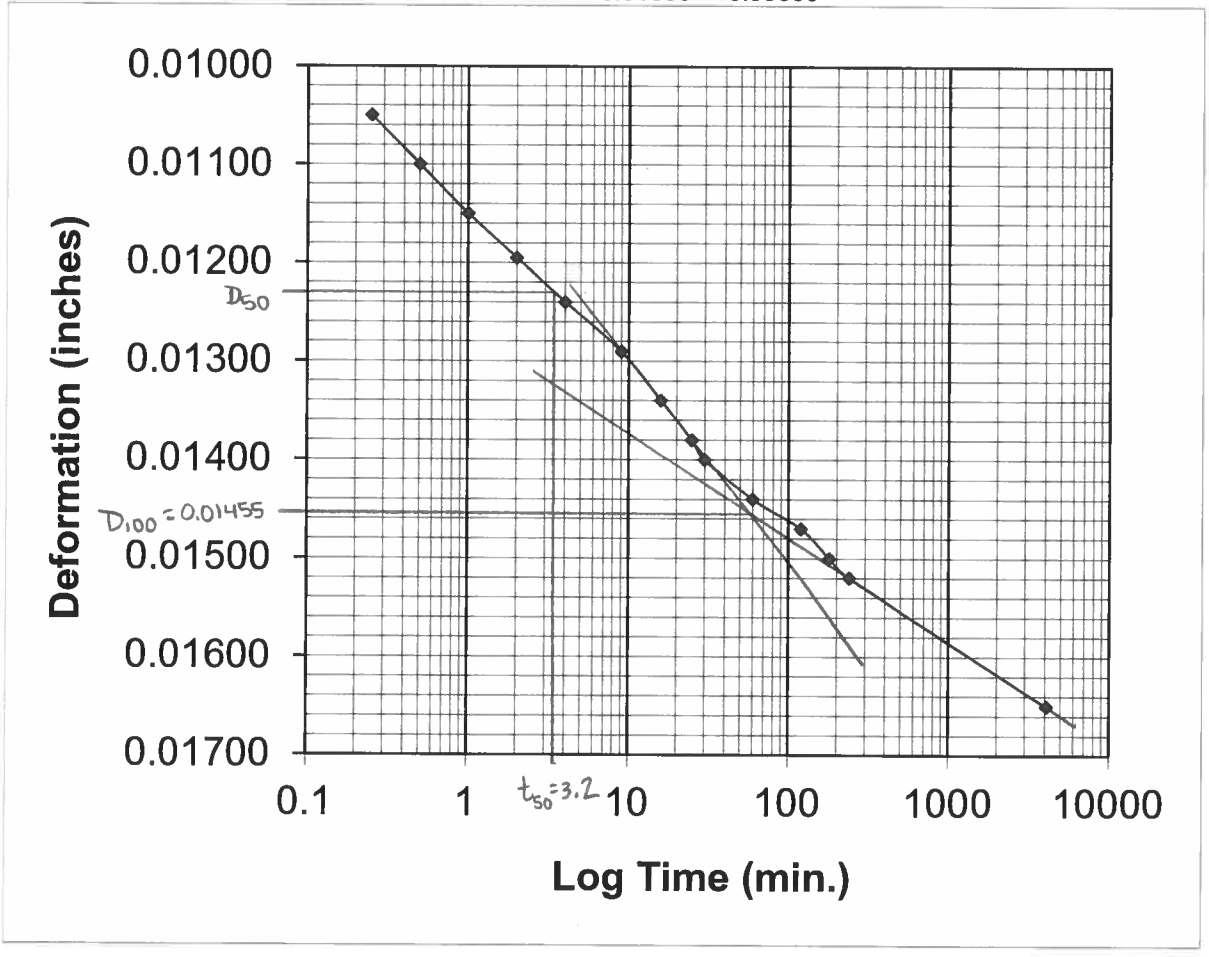
1) 0.25 to 1.0:	0.00950
2) 0.5 to 2.0:	0.01005
3) 1.0 to 4.0:	0.01060
Do Avg 1&2:	0.00977
Do Avg 1-3:	0.01005

D100= 0.01455

D50=D100+0.5(Do-D100)

$D_{50} = 0.0123$

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.39420				
0.25	0.38150	0.01270	0.00220	0.01050	1.00250
0.5	0.38100	0.01320	0.00220	0.01100	1.00200
1	0.38050	0.01370	0.00220	0.01150	1.00150
2	0.38005	0.01415	0.00220	0.01195	1.00105
4	0.37960	0.01460	0.00220	0.01240	1.00060
9	0.37910	0.01510	0.00220	0.01290	1.00010
16	0.37860	0.01560	0.00220	0.01340	0.99960
25	0.37820	0.01600	0.00220	0.01380	0.99920
30	0.37800	0.01620	0.00220	0.01400	0.99900
60	0.37760	0.01660	0.00220	0.01440	0.99860
120	0.37730	0.01690	0.00220	0.01470	0.99830
180	0.37700	0.01720	0.00220	0.01500	0.99800
240	0.37680	0.01740	0.00220	0.01520	0.99780
4055	0.37550	0.01870	0.00220	0.01650	0.99650



Project No. : 15807.01
Boring No. : B-1

Sample No.: ST-14
Depth: 51.0 to 53.0 feet

0.5 ton Load

initial height= 0.9965 inches

Do=D1-(D2-D1)

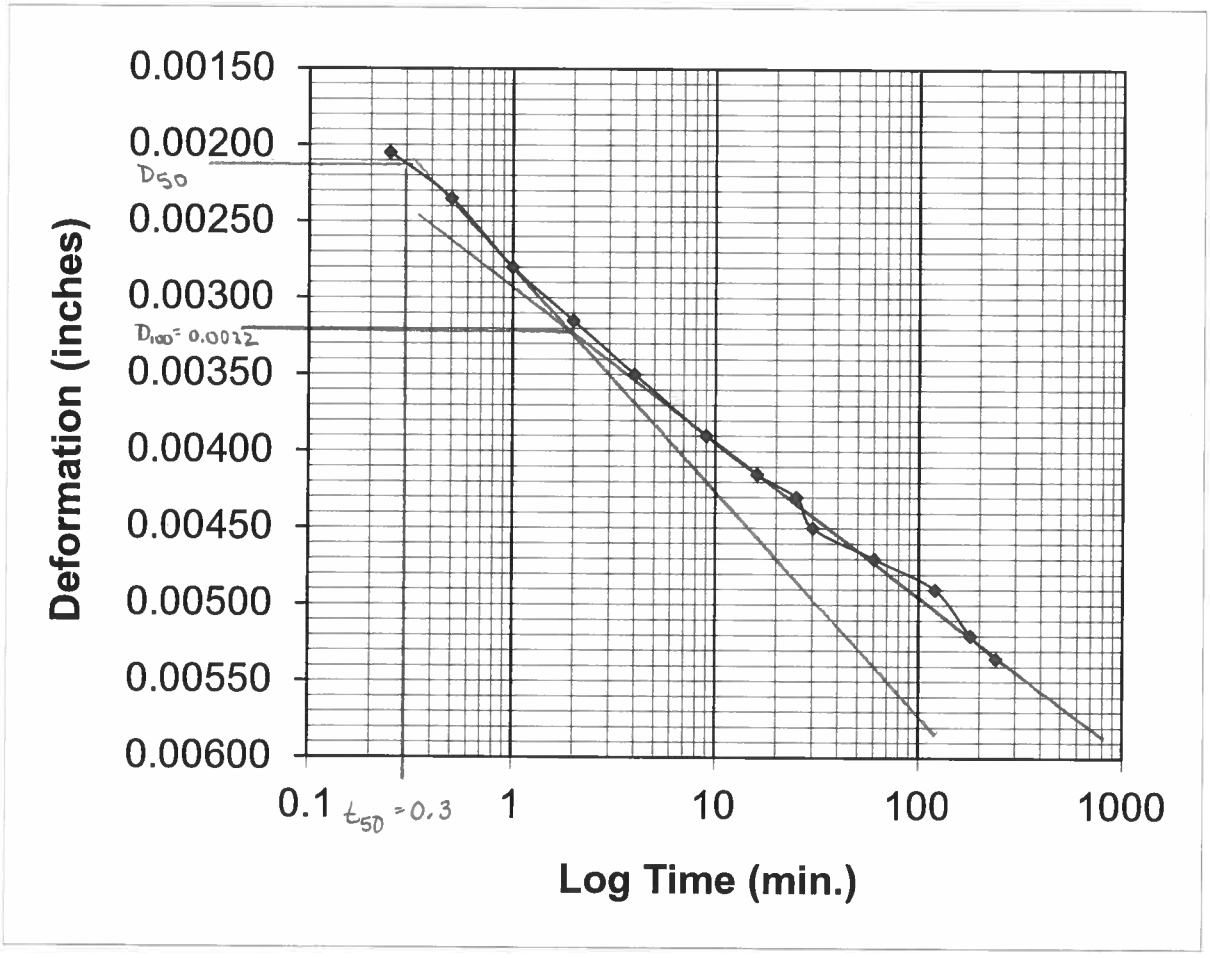
1) 0.25 to 1.0:	0.00130
2) 0.5 to 2.0:	0.00155
3) 1.0 to 4.0:	0.00210
Do Avg 1&2:	0.00143
Do Avg 1-3:	0.00165

D100= 0.0032

D50=D100+0.5(Do-D100)

D_{50} = 0.00225

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.37550				
0.25	0.37345	0.00205	0.00000	0.00205	0.99445
0.5	0.37315	0.00235	0.00000	0.00235	0.99415
1	0.37270	0.00280	0.00000	0.00280	0.99370
2	0.37235	0.00315	0.00000	0.00315	0.99335
4	0.37200	0.00350	0.00000	0.00350	0.99300
9	0.37160	0.00390	0.00000	0.00390	0.99260
16	0.37135	0.00415	0.00000	0.00415	0.99235
25	0.37120	0.00430	0.00000	0.00430	0.99220
30	0.37100	0.00450	0.00000	0.00450	0.99200
60	0.37080	0.00470	0.00000	0.00470	0.99180
120	0.37060	0.00490	0.00000	0.00490	0.99160
180	0.37030	0.00520	0.00000	0.00520	0.99130
240	0.37015	0.00535	0.00000	0.00535	0.99115



Project No. : 15807.01 Sample No.: ST-14
Boring No. : B-1 Depth: 51.0 to 53.0 feet

1.0 ton Load

initial height= 0.99115 inches

Do=D1-(D2-D1)

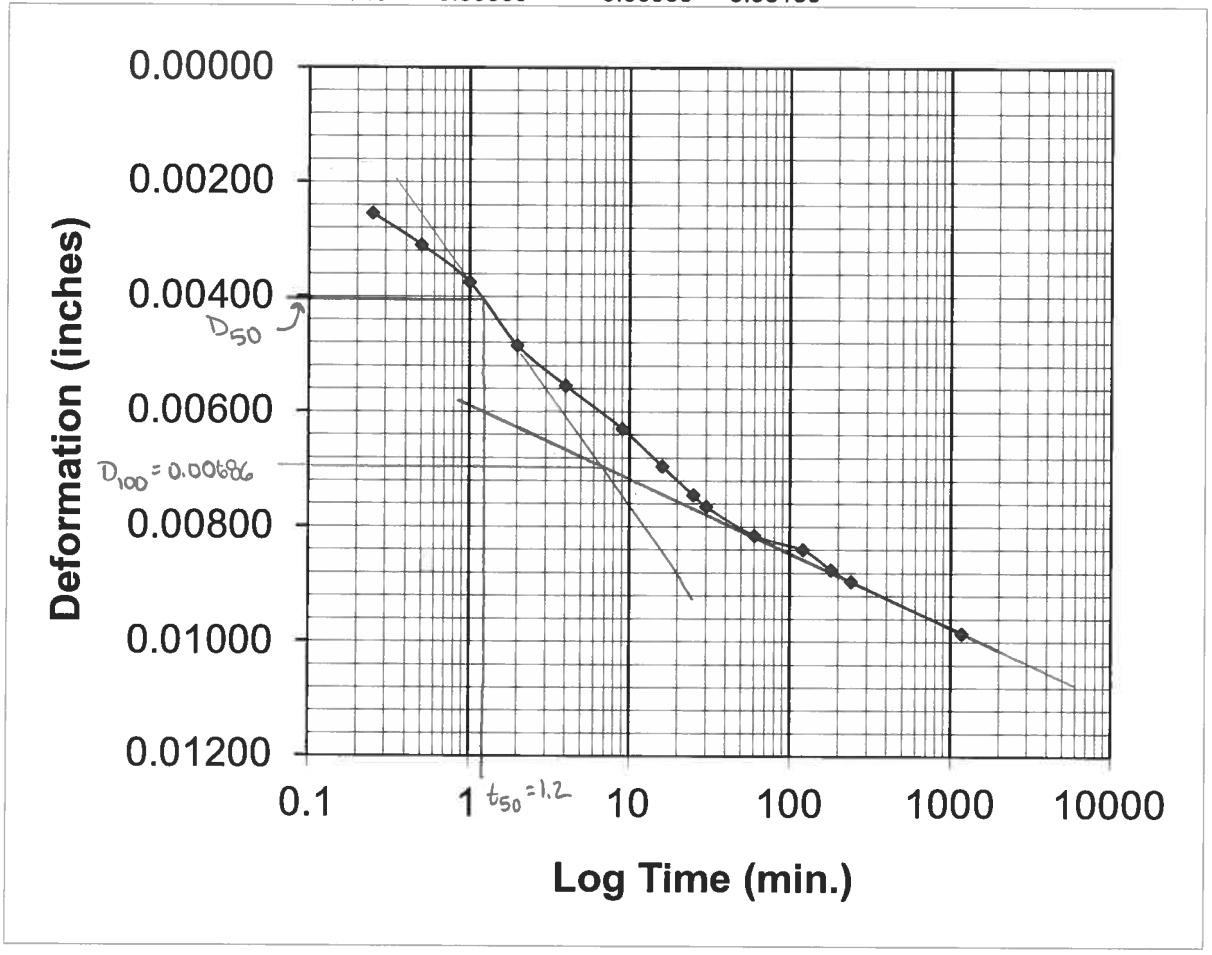
1) 0.25 to 1.0:	0.00135
2) 0.5 to 2.0:	0.00135
3) 1.0 to 4.0:	0.00195
Do Avg 1&2:	0.00135
Do Avg 1-3:	0.00155

D100= 0.00686

D50=D100+0.5(Do-D100)

$D_{50} = 0.00411$

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.37015				
0.25	0.36400	0.00615	0.00360	0.00255	0.98860
0.5	0.36345	0.00670	0.00360	0.00310	0.98805
1	0.36280	0.00735	0.00360	0.00375	0.98740
2	0.36170	0.00845	0.00360	0.00485	0.98630
4	0.36100	0.00915	0.00360	0.00555	0.98560
9	0.36025	0.00990	0.00360	0.00630	0.98485
16	0.35960	0.01055	0.00360	0.00695	0.98420
25	0.35910	0.01105	0.00360	0.00745	0.98370
30	0.35890	0.01125	0.00360	0.00765	0.98350
60	0.35840	0.01175	0.00360	0.00815	0.98300
120	0.35815	0.01200	0.00360	0.00840	0.98275
180	0.35780	0.01235	0.00360	0.00875	0.98240
240	0.35760	0.01255	0.00360	0.00895	0.98220
1175	0.35670	0.01345	0.00360	0.00985	0.98130



Project No. : 15807.01 Sample No.: ST-14

Boring No. : B-1 Depth: 51.0 to 53.0 feet

2.0 ton Load

initial height= 0.9813 inches

Do=D1-(D2-D1)

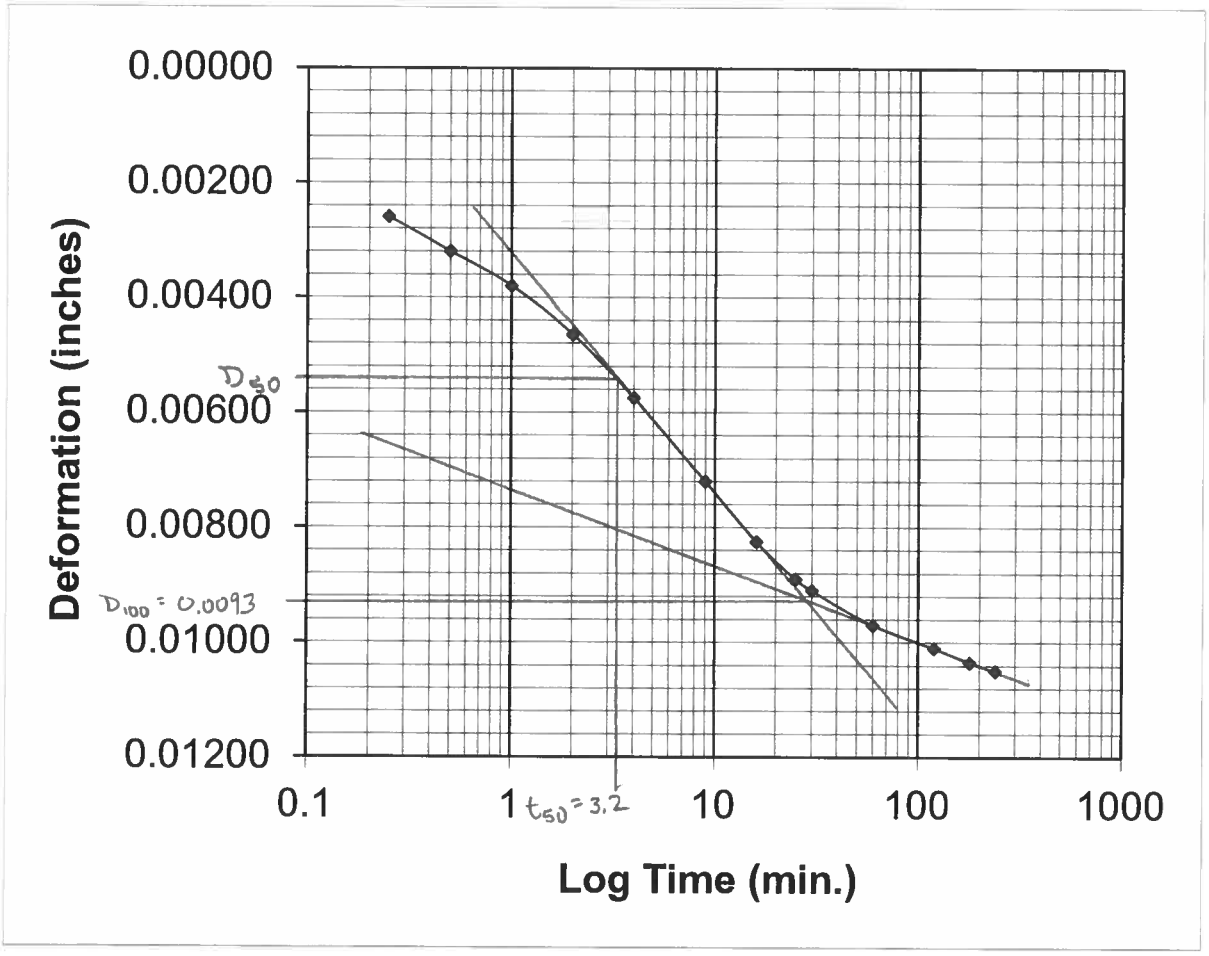
1) 0.25 to 1.0:	0.00140
2) 0.5 to 2.0:	0.00175
3) 1.0 to 4.0:	0.00185
Do Avg 1&2:	0.00157
Do Avg 1-3:	0.00167

D100= 0.0093

D50=D100+0.5(Do-D100)

$D_{50} = 0.0054$

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.35670				
0.25	0.35170	0.00500	0.00240	0.00260	0.97870
0.5	0.35110	0.00560	0.00240	0.00320	0.97810
1	0.35050	0.00620	0.00240	0.00380	0.97750
2	0.34965	0.00705	0.00240	0.00465	0.97665
4	0.34855	0.00815	0.00240	0.00575	0.97555
9	0.34710	0.00960	0.00240	0.00720	0.97410
16	0.34605	0.01065	0.00240	0.00825	0.97305
25	0.34540	0.01130	0.00240	0.00890	0.97240
30	0.34520	0.01150	0.00240	0.00910	0.97220
60	0.34460	0.01210	0.00240	0.00970	0.97160
120	0.34420	0.01250	0.00240	0.01010	0.97120
180	0.34395	0.01275	0.00240	0.01035	0.97095
240	0.34380	0.01290	0.00240	0.01050	0.97080



Project No. : 15807.01
Boring No. : B-1

Sample No.: ST-14
Depth: 51.0 to 53.0 feet

4.0 ton Load

initial height= 0.9708 inches

Do=D1-(D2-D1)

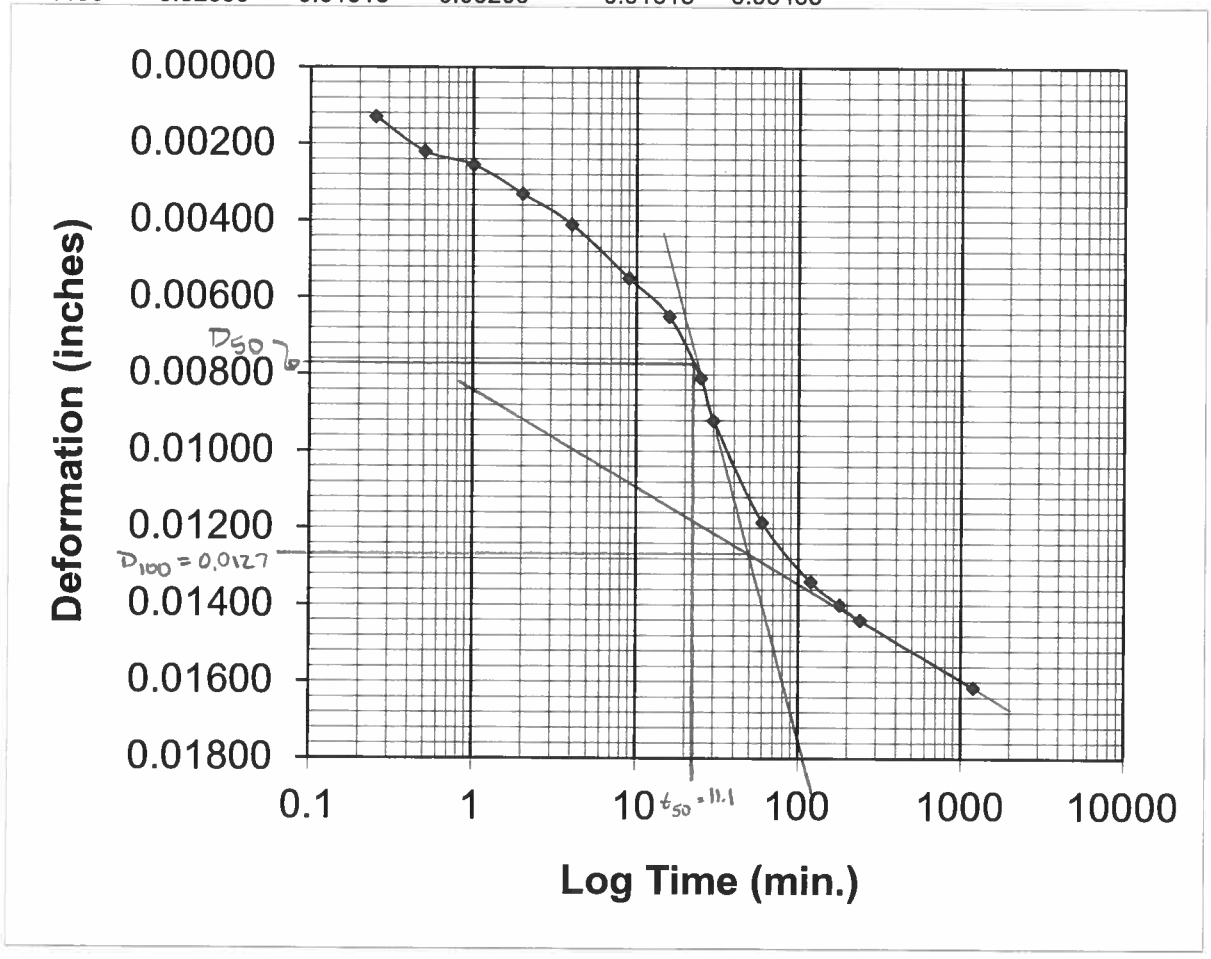
1) 0.25 to 1.0:	0.00005
2) 0.5 to 2.0:	0.00110
3) 1.0 to 4.0:	0.00100
Do Avg 1&2:	0.00057
Do Avg 1-3:	0.00072

D100= 0.0127

D50=D100+0.5(Do-D100)

$D_{50} = 0.0067$

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.34380				
0.25	0.34050	0.00330	0.00200	0.00130	0.96950
0.5	0.33960	0.00420	0.00200	0.00220	0.96860
1	0.33925	0.00455	0.00200	0.00255	0.96825
2	0.33850	0.00530	0.00200	0.00330	0.96750
4	0.33770	0.00610	0.00200	0.00410	0.96670
9	0.33630	0.00750	0.00200	0.00550	0.96530
16	0.33530	0.00850	0.00200	0.00650	0.96430
25	0.33370	0.01010	0.00200	0.00810	0.96270
30	0.33260	0.01120	0.00200	0.00920	0.96160
60	0.32995	0.01385	0.00200	0.01185	0.95895
120	0.32840	0.01540	0.00200	0.01340	0.95740
180	0.32780	0.01600	0.00200	0.01400	0.95680
240	0.32740	0.01640	0.00200	0.01440	0.95640
1195	0.32565	0.01815	0.00200	0.01615	0.95465



Project No. : 15807.01
Boring No. : B-1

Sample No.: ST-14
Depth: 51.0 to 53.0 feet

8.0 ton Load

initial height= 0.95465 inches

Do=D1-(D2-D1)

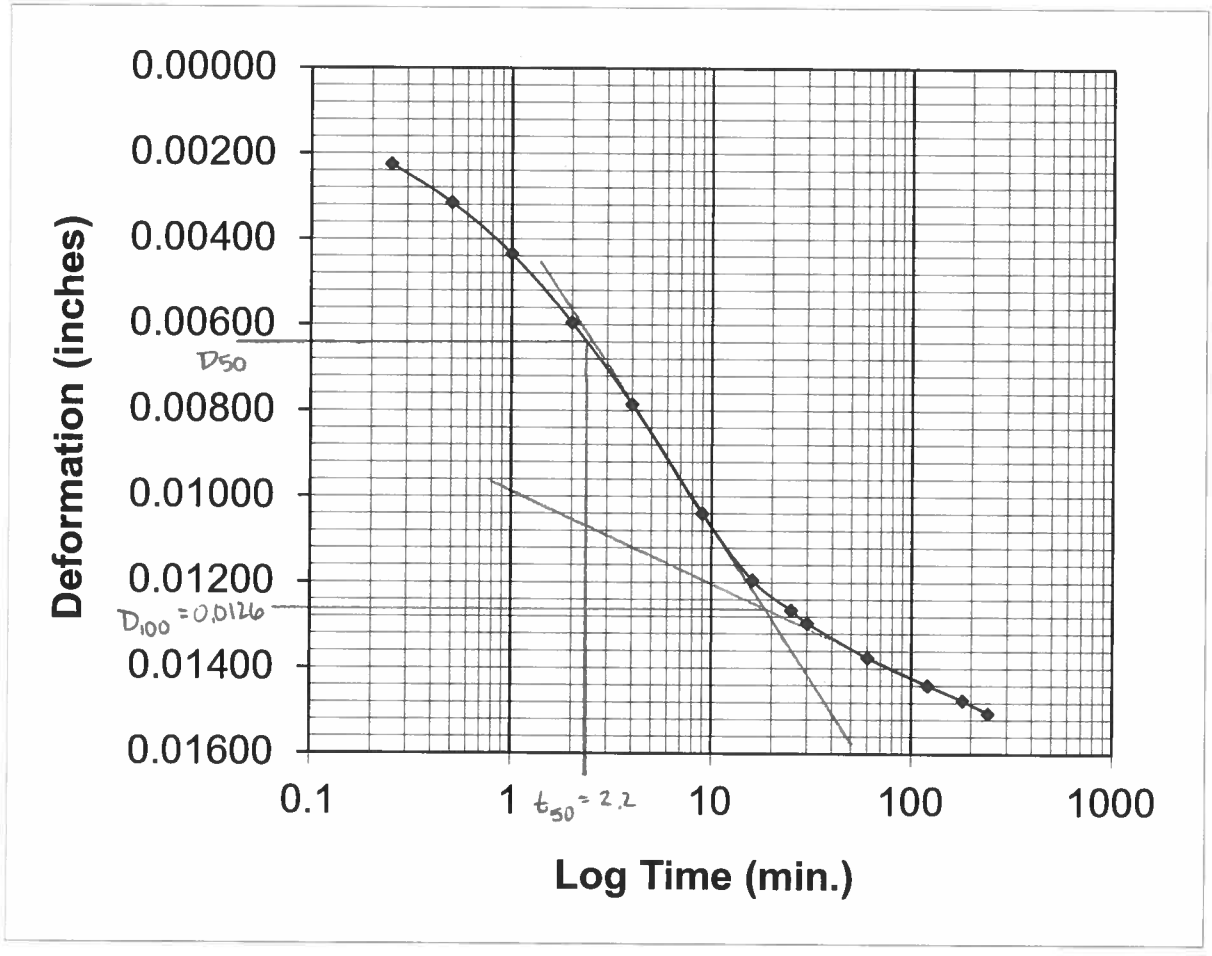
1) 0.25 to 1.0:	0.00015
2) 0.5 to 2.0:	0.00035
3) 1.0 to 4.0:	0.00085
Do Avg 1&2:	0.00025
Do Avg 1-3:	0.00045

D100= 0.0126

D50=D100+0.5(Do-D100)

D_{50} = 0.00614

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.32565				
0.25	0.32150	0.00415	0.00190	0.00225	0.95240
0.5	0.32060	0.00505	0.00190	0.00315	0.95150
1	0.31940	0.00625	0.00190	0.00435	0.95030
2	0.31780	0.00785	0.00190	0.00595	0.94870
4	0.31590	0.00975	0.00190	0.00785	0.94680
9	0.31335	0.01230	0.00190	0.01040	0.94425
16	0.31180	0.01385	0.00190	0.01195	0.94270
25	0.31110	0.01455	0.00190	0.01265	0.94200
30	0.31080	0.01485	0.00190	0.01295	0.94170
60	0.31000	0.01565	0.00190	0.01375	0.94090
120	0.30935	0.01630	0.00190	0.01440	0.94025
180	0.30900	0.01665	0.00190	0.01475	0.93990
240	0.30870	0.01695	0.00190	0.01505	0.93960



Project No. : 15807.01 Sample No.: ST-14

Boring No. : B-1 Depth: 51.0 to 53.0 feet

16 ton Load

initial height= 0.9396 inches

Do=D1-(D2-D1)

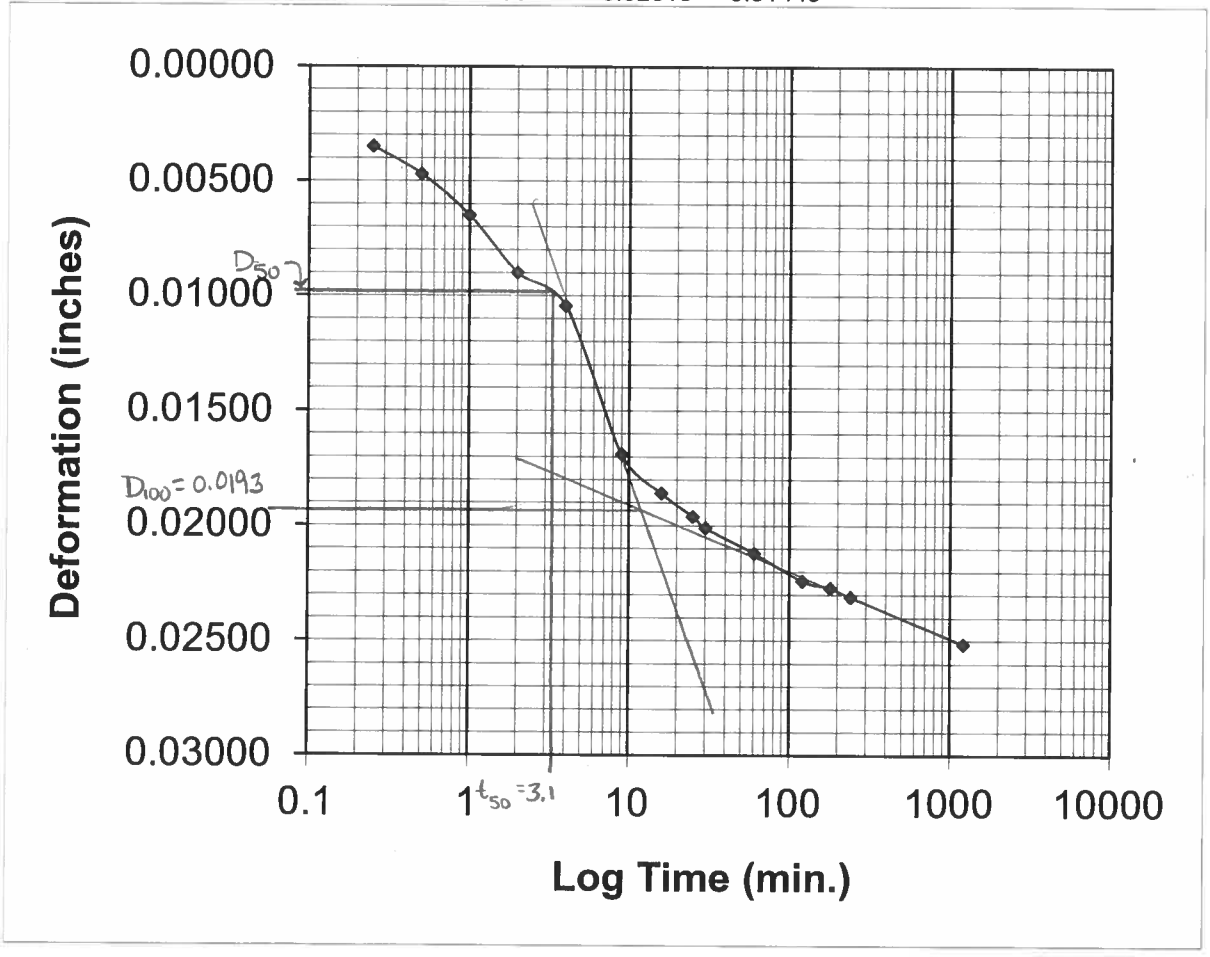
1) 0.25 to 1.0: 0.00050
2) 0.5 to 2.0: 0.00040
3) 1.0 to 4.0: 0.00255
Do Avg 1&2: 0.00045
Do Avg 1-3: 0.00115

D100= 0.0193

D50=D100+0.5(Do-D100)

$D_{100} = 0.0099$

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.30870				
0.25	0.30320	0.00550	0.00200	0.00350	0.93610
0.5	0.30200	0.00670	0.00200	0.00470	0.93490
1	0.30020	0.00850	0.00200	0.00650	0.93310
2	0.29770	0.01100	0.00200	0.00900	0.93060
4	0.29625	0.01245	0.00200	0.01045	0.92915
9	0.28980	0.01890	0.00200	0.01690	0.92270
16	0.28810	0.02060	0.00200	0.01860	0.92100
25	0.28710	0.02160	0.00200	0.01960	0.92000
30	0.28660	0.02210	0.00200	0.02010	0.91950
60	0.28550	0.02320	0.00200	0.02120	0.91840
120	0.28430	0.02440	0.00200	0.02240	0.91720
180	0.28400	0.02470	0.00200	0.02270	0.91690
240	0.28360	0.02510	0.00200	0.02310	0.91650
1215	0.28155	0.02715	0.00200	0.02515	0.91445

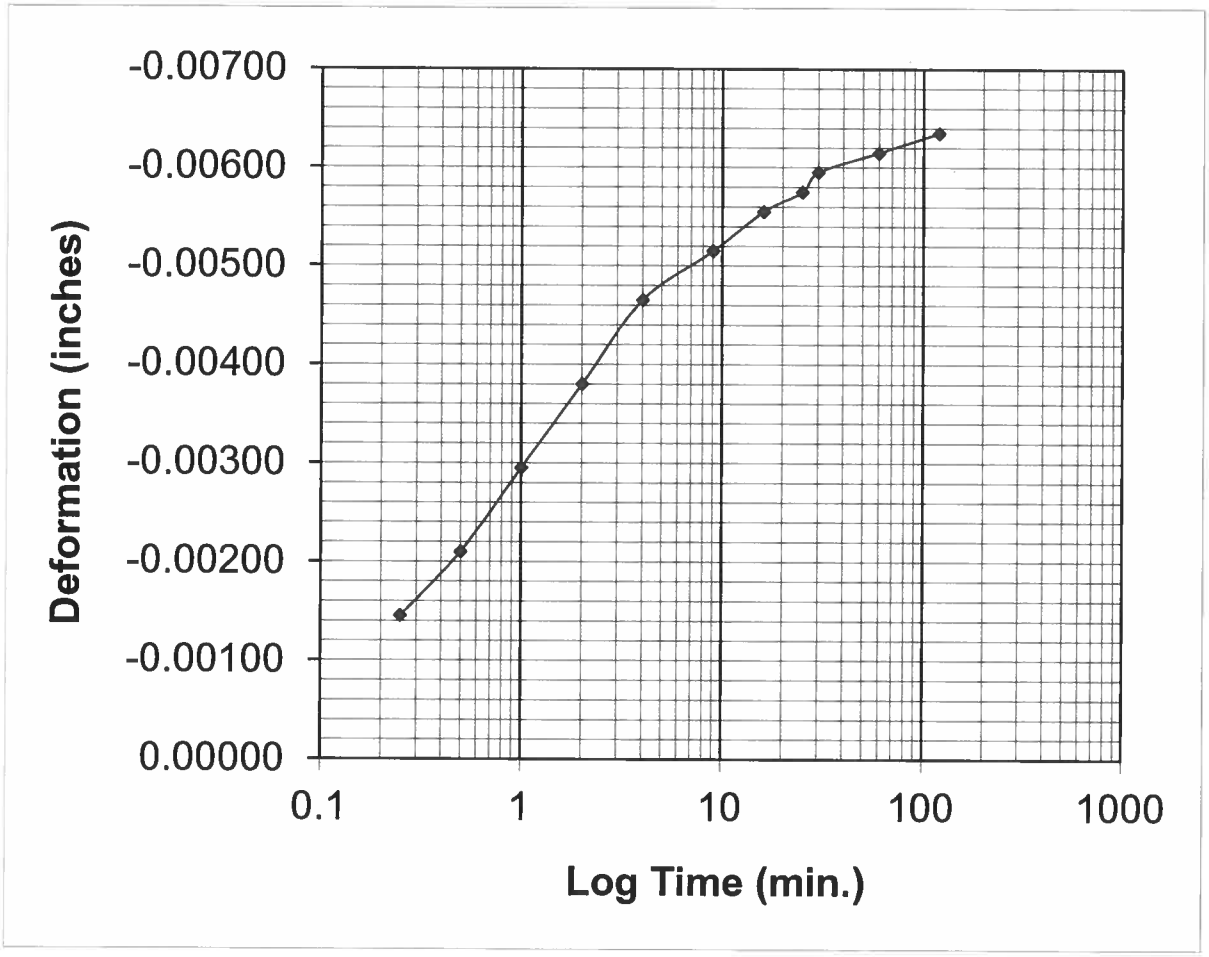


Project No. : 15807.01 Sample No.: ST-14
Boring No. : B-1 Depth: 51.0 to 53.0 feet

4.0 ton Unload

initial height= 0.91445 inches

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.28155				
0.25	0.28430	-0.00275	-0.00130	-0.00145	0.91590
0.5	0.28495	-0.00340	-0.00130	-0.00210	0.91655
1	0.28580	-0.00425	-0.00130	-0.00295	0.91740
2	0.28665	-0.00510	-0.00130	-0.00380	0.91825
4	0.28750	-0.00595	-0.00130	-0.00465	0.91910
9	0.28800	-0.00645	-0.00130	-0.00515	0.91960
16	0.28840	-0.00685	-0.00130	-0.00555	0.92000
25	0.28860	-0.00705	-0.00130	-0.00575	0.92020
30	0.28880	-0.00725	-0.00130	-0.00595	0.92040
60	0.28900	-0.00745	-0.00130	-0.00615	0.92060
120	0.28920	-0.00765	-0.00130	-0.00635	0.92080

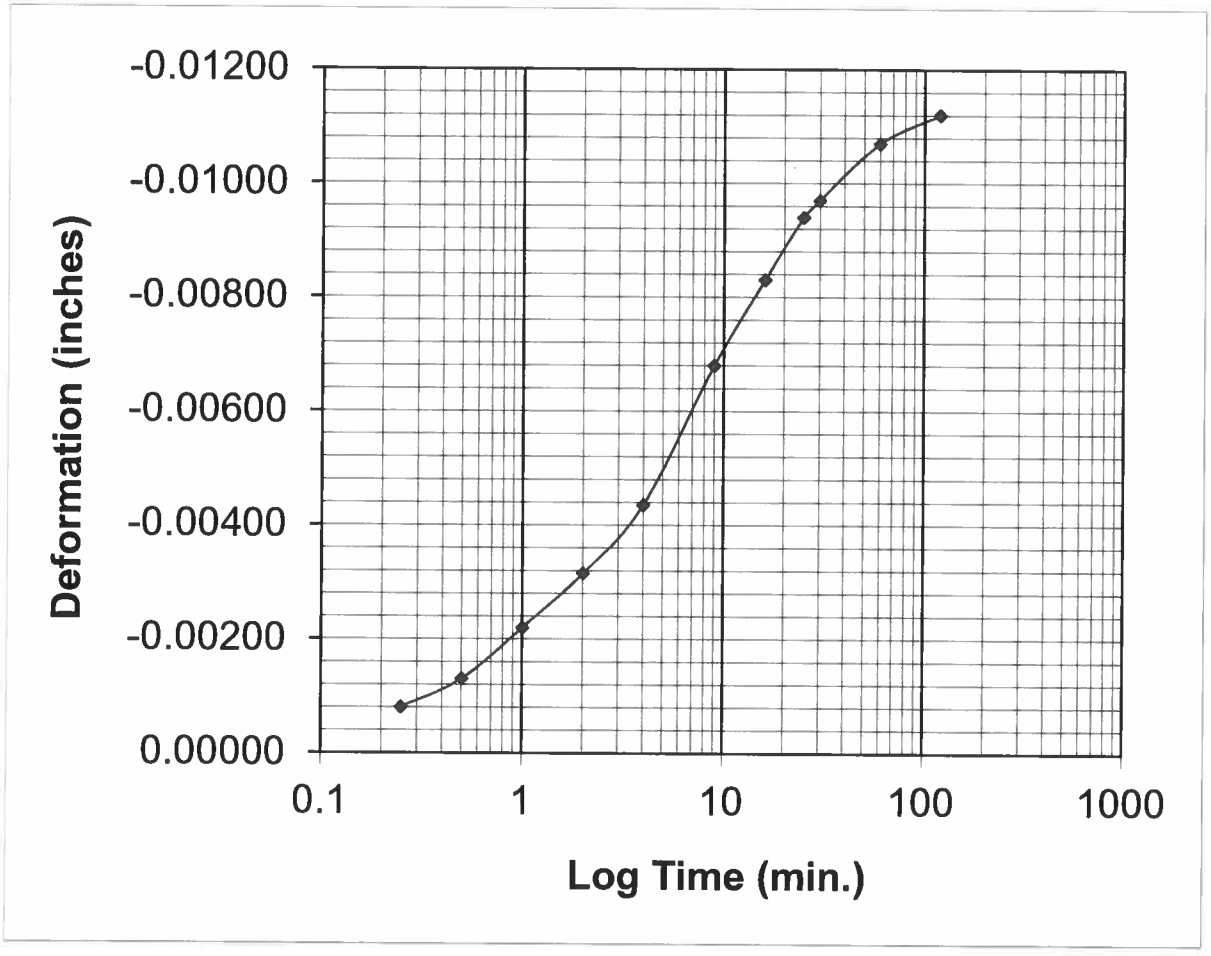


Project No. : 15807.01 Sample No.: ST-14
Boring No. : B-1 Depth: 51.0 to 53.0 feet

1.0 ton Unload

initial height= 0.9208 inches

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.28920				
0.25	0.29160	-0.00240	-0.00160	-0.00080	0.92160
0.5	0.29210	-0.00290	-0.00160	-0.00130	0.92210
1	0.29300	-0.00380	-0.00160	-0.00220	0.92300
2	0.29395	-0.00475	-0.00160	-0.00315	0.92395
4	0.29515	-0.00595	-0.00160	-0.00435	0.92515
9	0.29760	-0.00840	-0.00160	-0.00680	0.92760
16	0.29910	-0.00990	-0.00160	-0.00830	0.92910
25	0.30020	-0.01100	-0.00160	-0.00940	0.93020
30	0.30050	-0.01130	-0.00160	-0.00970	0.93050
60	0.30150	-0.01230	-0.00160	-0.01070	0.93150
120	0.30200	-0.01280	-0.00160	-0.01120	0.93200

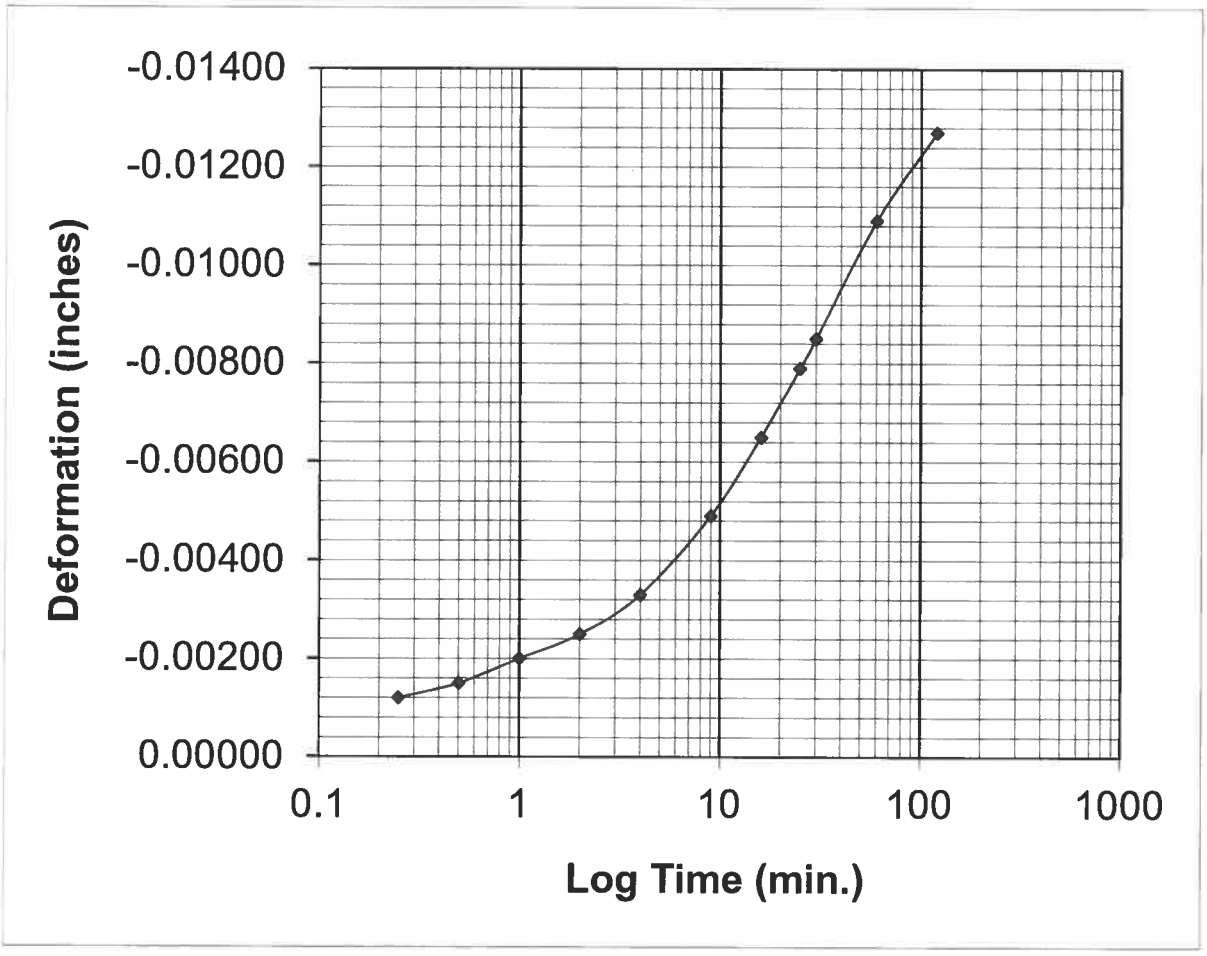


Project No. : 15807.01 Sample No.: ST-14
Boring No. : B-1 Depth: 51.0 to 53.0 feet

0.25 ton Unload

initial height= 0.932 inches

Interval Minutes	Dial Reading	ΔH	Deformation Constant	TRUE ΔH	Height of Sample
0	0.30200				
0.25	0.30320	-0.00120	0.00000	-0.00120	0.93320
0.5	0.30350	-0.00150	0.00000	-0.00150	0.93350
1	0.30400	-0.00200	0.00000	-0.00200	0.93400
2	0.30450	-0.00250	0.00000	-0.00250	0.93450
4	0.30530	-0.00330	0.00000	-0.00330	0.93530
9	0.30690	-0.00490	0.00000	-0.00490	0.93690
16	0.30850	-0.00650	0.00000	-0.00650	0.93850
25	0.30990	-0.00790	0.00000	-0.00790	0.93990
30	0.31050	-0.00850	0.00000	-0.00850	0.94050
60	0.31290	-0.01090	0.00000	-0.01090	0.94290
120	0.31470	-0.01270	0.00000	-0.01270	0.94470



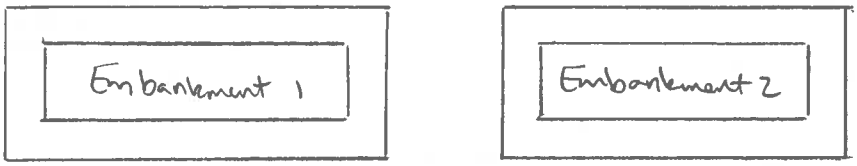
TTL associates, Inc
Environmental, Geotechnical Engineering & Testing

Date 11/30/17
Page 1 of 1

Project Name OTIC MP 34.2 Bridge Demolition Project No. 15/80701

By KCH Checked by/Date

Subject Settlement



$\delta_{net} = \delta_{infinite} - \delta_1 - \delta_2$

Abutment

$\delta_1 = 5.24$ in
$\delta_2 = 1.58$ in @ toe (over predicts @ abutment) say ~0 in @ abut
$\delta_{infinite} = 6.85$ in

$\delta_{net} = 6.85\text{ in} - 5.24\text{ in} - 0\text{ in}$
$= 1.61$ in (or less) **say 1½ in**

Pier

$\delta_1 = 2.87$ in
$\delta_2 = 1.58$ in (still overpredicts, but less so)
$\delta_{infinite} = 6.85$ in

$\delta_{net} = 6.85\text{ in} - 2.87\text{ in} - 1.58\text{ in}$
$= 2.4$ in **say 2½ in**

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Date 11/14/17
Page 1 of 1

Project Name OTIC MP 34.2 Bridge Demolition Project No. 1580701
By KCH Checked by/Date
Subject preconsolidation pressures & coefficients of consolidation

Stratum II Predom V Stiff Cohesive

$\sigma_v'(B-1) = (12.5\ ft)(125\ pcf) + (10.5\ ft)(135\ pcf) - (12.25\ ft)(62.4\ pcf)$
$= 1160\ psf$ @ midpoint

$\sigma_v'(B-2) = (14.5\ ft)(125\ pcf) + (3.75\ ft)(135\ pcf) - (13.25\ ft)(62.4\ pcf)$
$= 1490\ psf$ @ midpoint $= 0.745\ tsf$

LL = 27, 25
PL = 13, 14
PI = 14, 11

$q_u = 3.15\ tsf,\ 1.44\ tsf$ ← more typical for layer

$\omega_o = 15$

$P_c = \frac{C}{0.11 + 0.0037\ PI} = \frac{(3.15\ tsf)/2}{0.11 + 0.0037(14)} = 9.7\ tsf$

$LI = \frac{\omega_o - PL}{PI} = \frac{15-13}{14} = 0.14 \rightarrow P_c = 5\ tsf$

~~use $P_c = 5\ tsf$~~ → 80 ft of soil @ 125 pcf above mid point ∴ all C_r

$C_c = 0.009(LL-10) = 0.009(27-10) = 0.153$ ← use

use $P_c = 3.6\ tsf - 0.745\ tsf = 2.9\ tsf$

$C_c \approx \omega_o/100 = 0.15$

$C_r \approx \omega_o/1000 = 0.015$

Stratum III Predom Stiff

ω_o = 17 to 19

$C_r \approx \omega_o/1000 = 0.019$

$C_c = 0.009(30-10) = 0.18$

$C_c \approx \omega_o/1000 = 0.19$

from Consol (ST-8)
$C_c = 0.125$
$C_r = 0.029$
$P_c = 3.6\ tsf$

Stratum IV Soft to med stiff (B-2)

ω_o = 20, 21

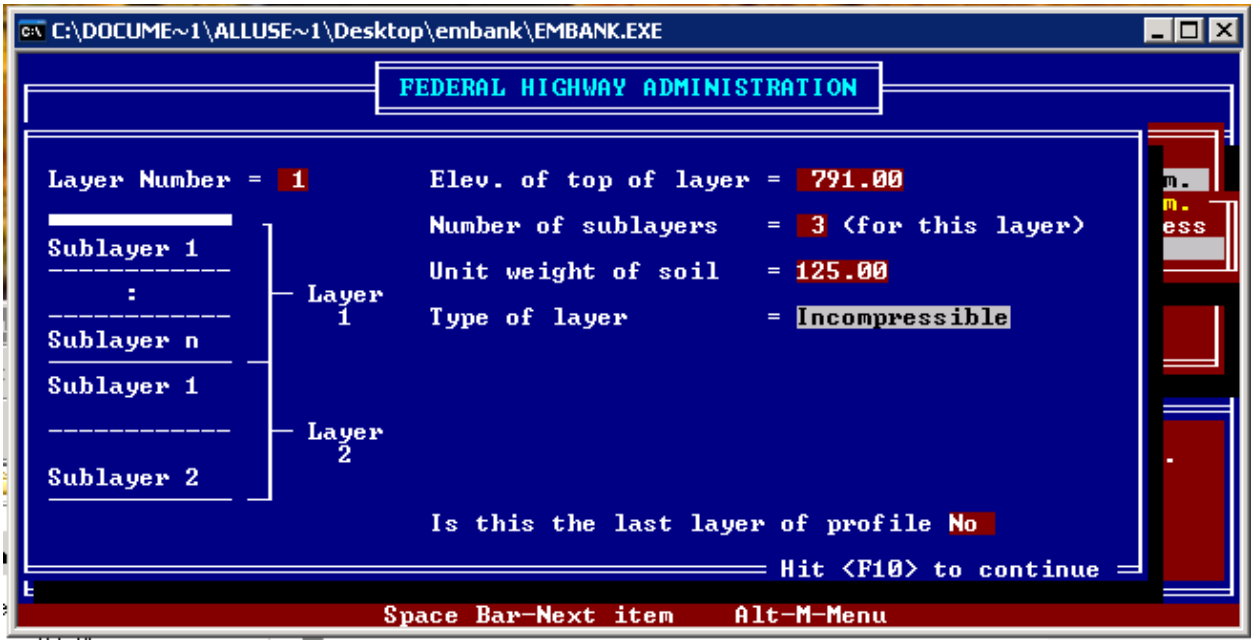
$C_r \approx \omega_o/1000 = 0.021$

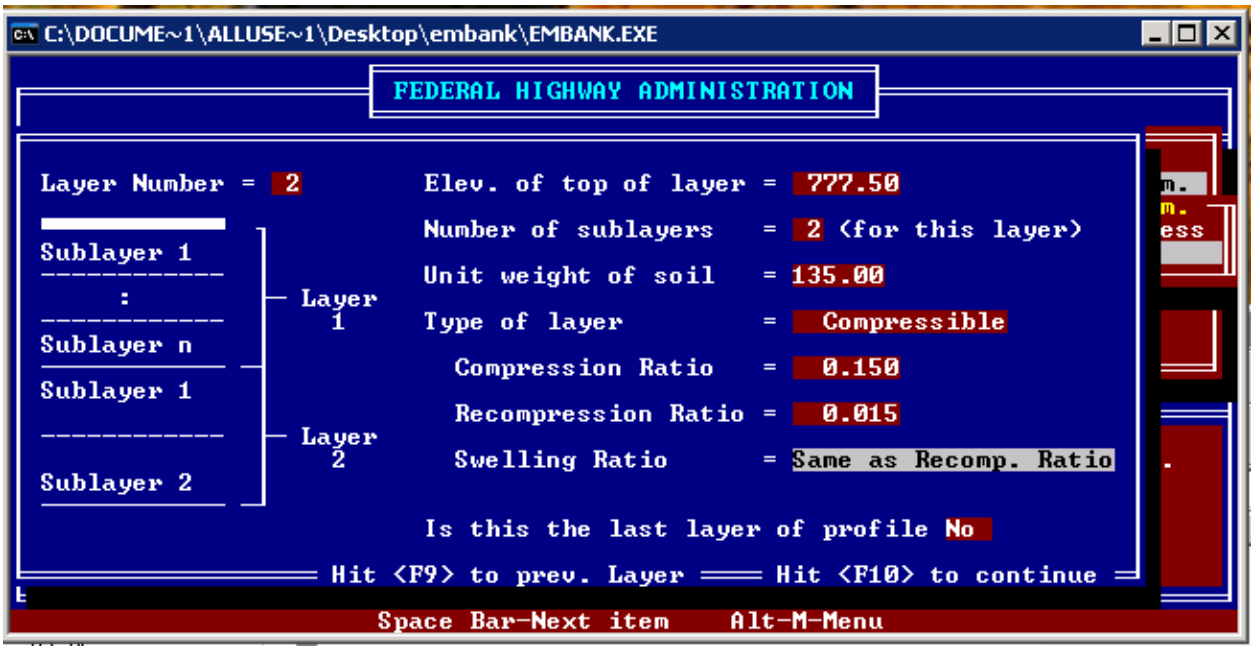
$C_c = 0.009(30-10) = 0.18$

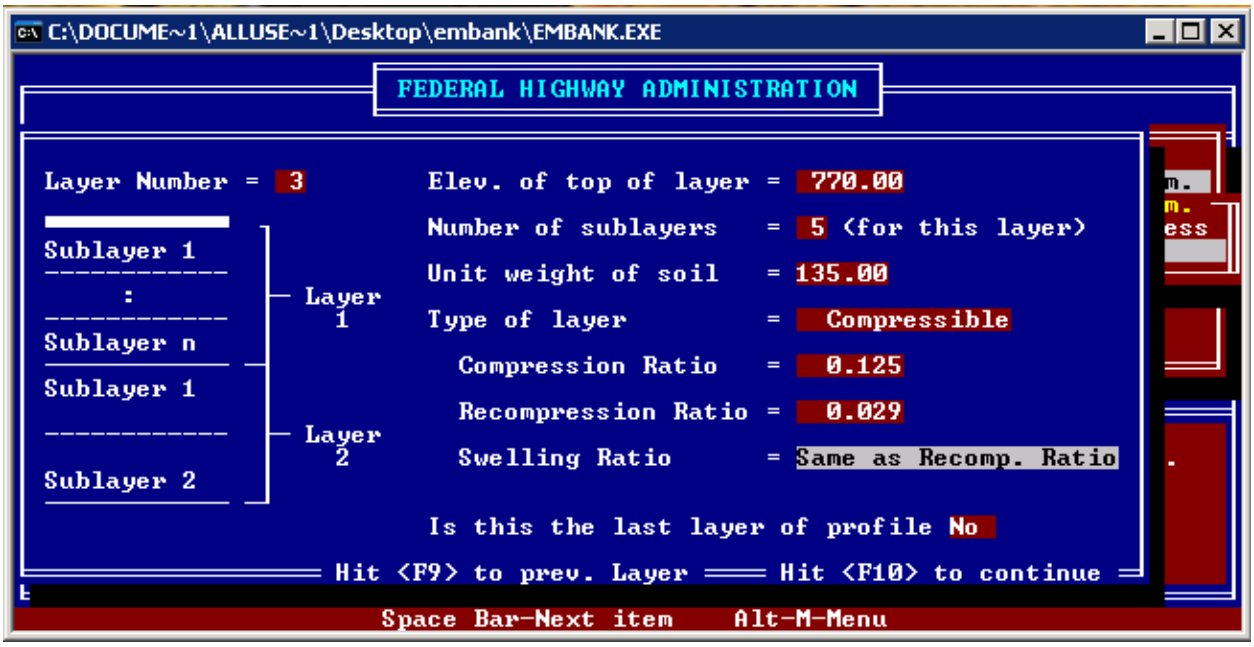
$C_c \approx \omega_o/1000 = 0.21$ ← use

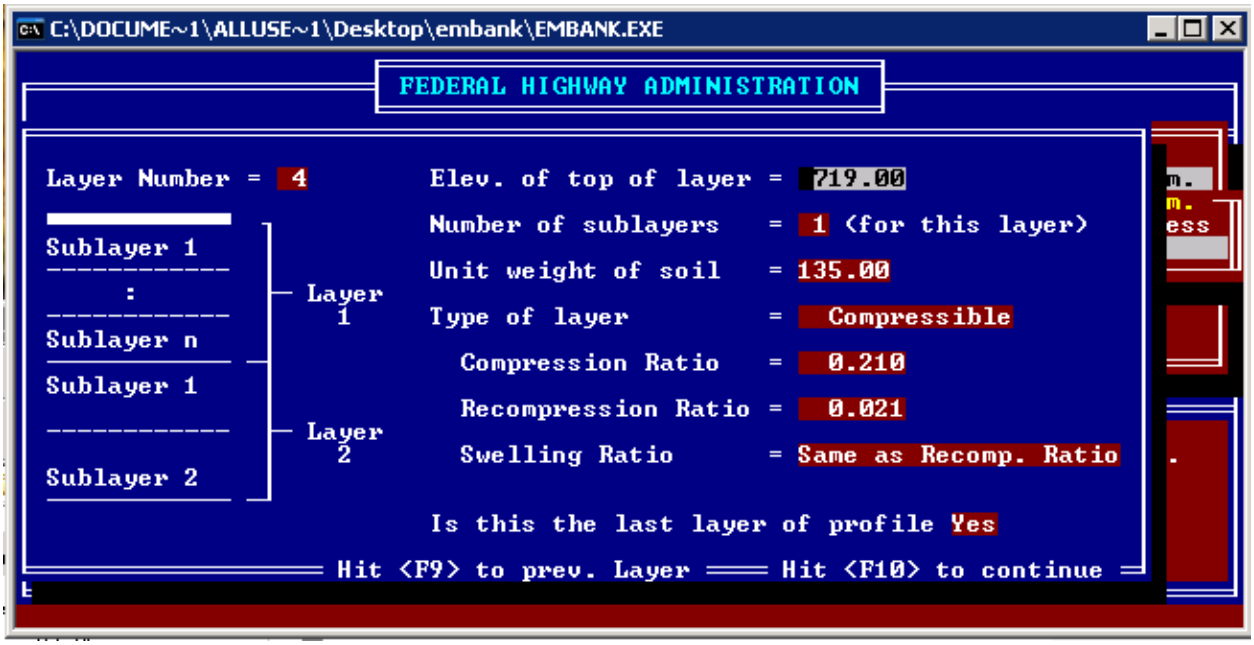
Embank software input

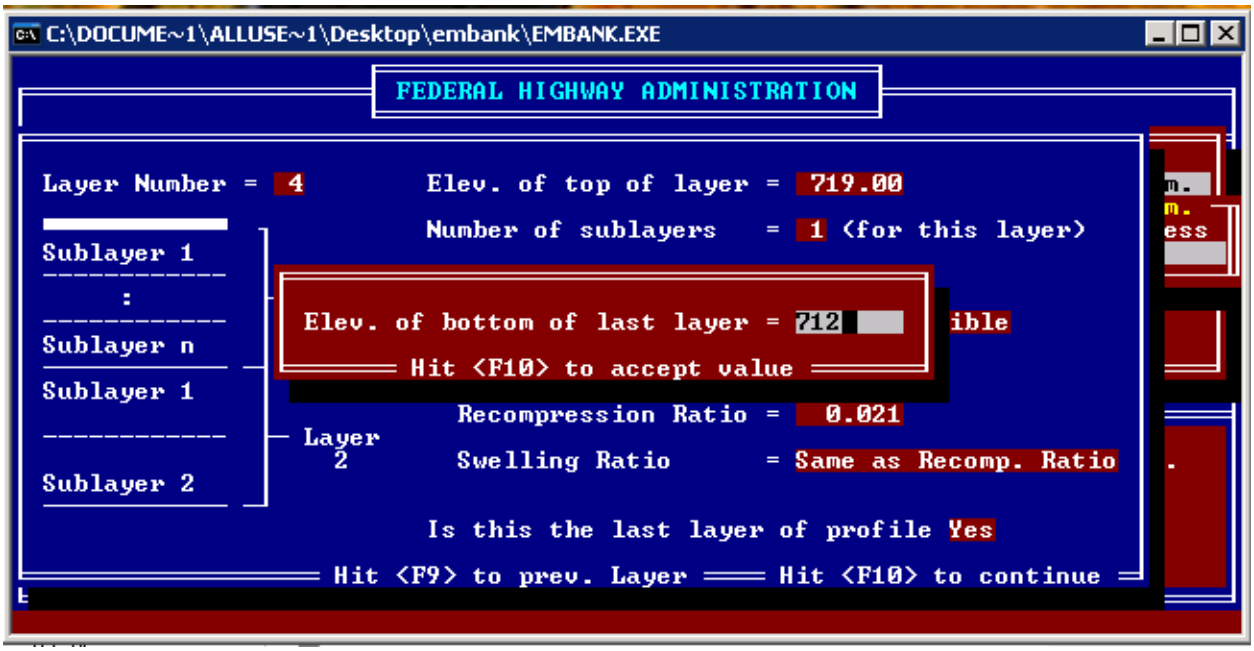
Model 1: Existing Settlement

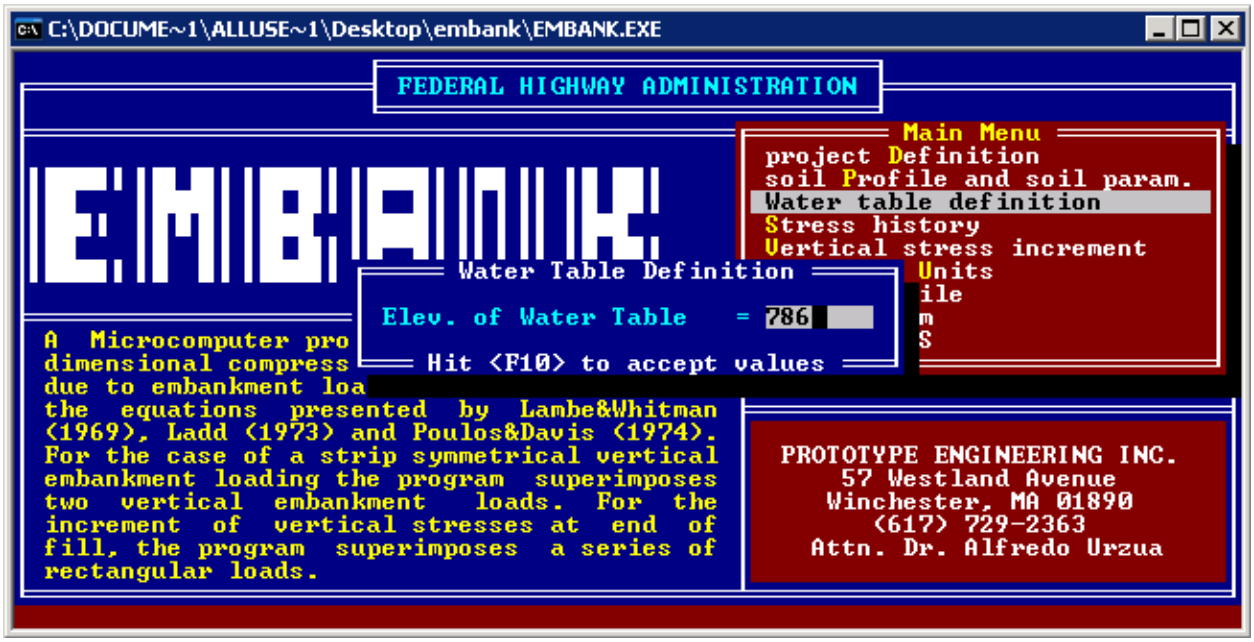




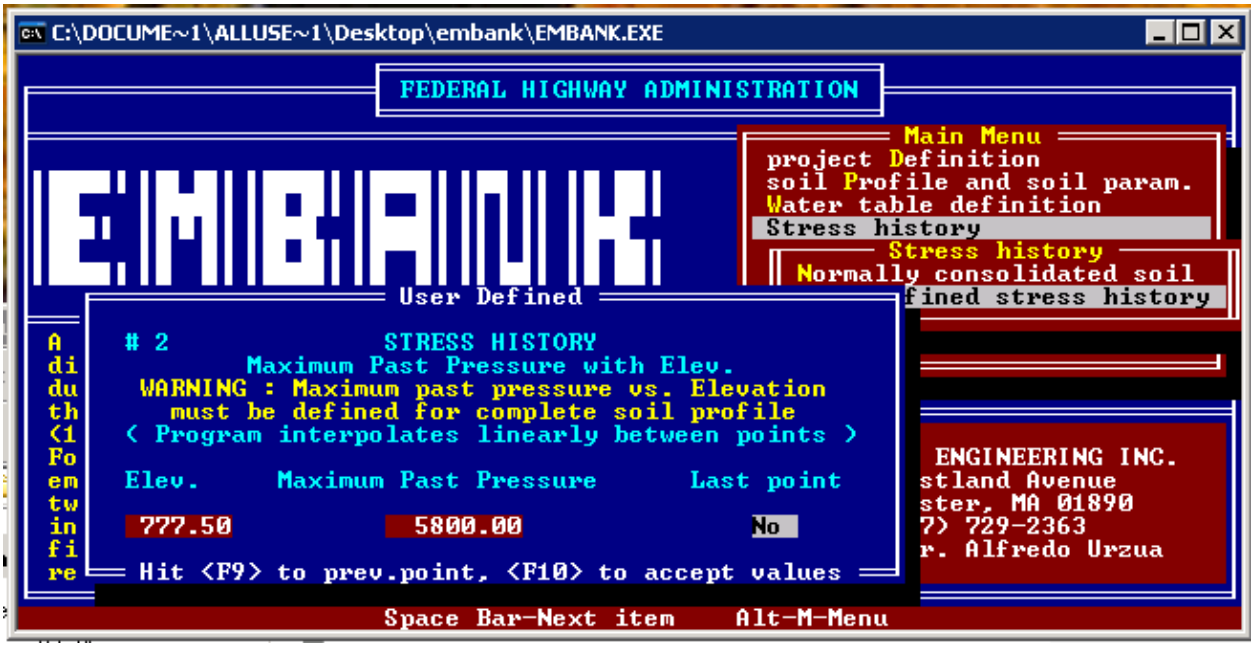

C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
FEDERAL HIGHWAY ADMINISTRATION
Layer Number = 3
Sublayer 1
:
Sublayer n
Layer 1
Sublayer 1
Sublayer 2
Layer 2
Elev. of top of layer = 770.00
Number of sublayers = 5 (for this layer)
Unit weight of soil = 135.00
Type of layer = Compressible
Compression Ratio = 0.125
Recompression Ratio = 0.029
Swelling Ratio = Same as Recomp. Ratio
Is this the last layer of profile No
Hit <F9> to prev. Layer
Hit <F10> to continue
Space Bar-Next item
Alt-M-Menu


C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
FEDERAL HIGHWAY ADMINISTRATION
Layer Number = 4
Sublayer 1
:
Sublayer n
Layer 1
Sublayer 1
Sublayer 2
Layer 2
Elev. of top of layer = 719.00
Number of sublayers = 1 (for this layer)
Unit weight of soil = 135.00
Type of layer = Compressible
Compression Ratio = 0.210
Recompression Ratio = 0.021
Swelling Ratio = Same as Recomp. Ratio
Is this the last layer of profile Yes
Hit <F9> to prev. Layer
Hit <F10> to continue


C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
FEDERAL HIGHWAY ADMINISTRATION
Layer Number = 4
Elev. of top of layer = 719.00
Number of sublayers = 1 (for this layer)
Sublayer 1
:
Sublayer n
Sublayer 1
Sublayer 2
Layer 2
Elev. of bottom of last layer = 712
Hit <F10> to accept value
Recompression Ratio = 0.021
Swelling Ratio = Same as Recomp. Ratio
Is this the last layer of profile Yes
Hit <F9> to prev. Layer
Hit <F10> to continue

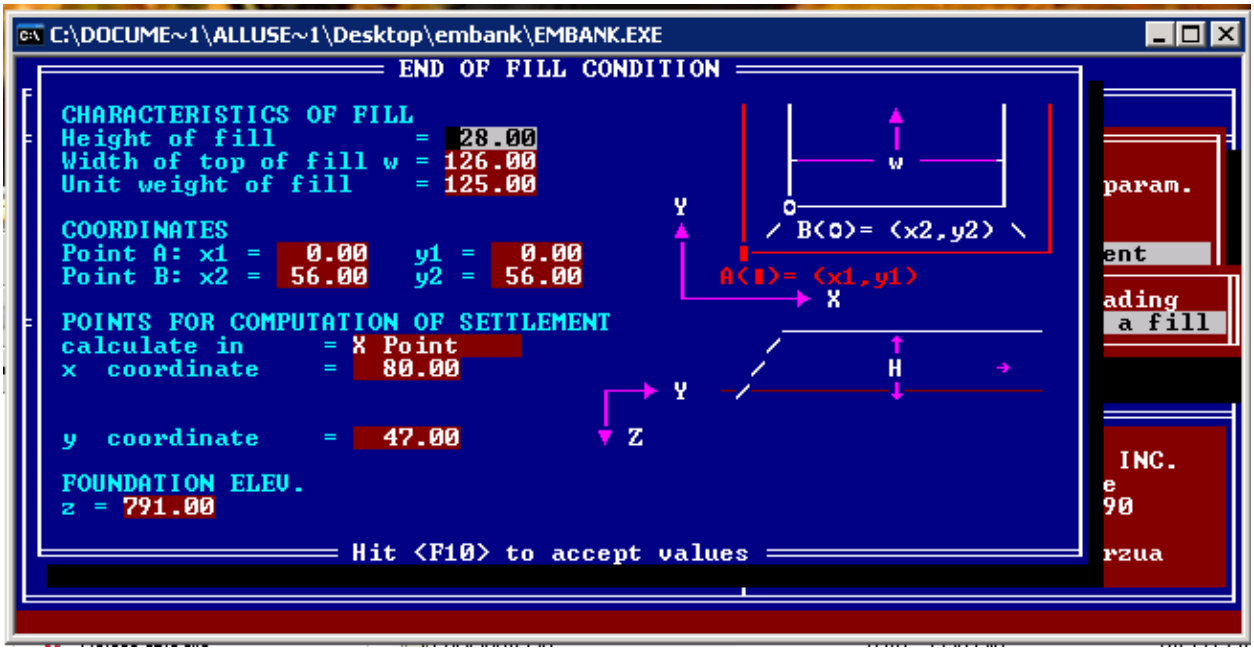

C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
FEDERAL HIGHWAY ADMINISTRATION
EMBANK
Main Menu
project Definition
soil Profile and soil param.
Water table definition
Stress history
Vertical stress increment
Units
Water Table Definition
Elev. of Water Table = 786
Hit <F10> to accept values
A Microcomputer pro
dimensional compress
due to embankment loa
the equations presented by Lambe&Whitman (1969), Ladd (1973) and Poulos&Davis (1974). For the case of a strip symmetrical vertical embankment loading the program superimposes two vertical embankment loads. For the increment of vertical stresses at end of fill, the program superimposes a series of rectangular loads.
PROTOTYPE ENGINEERING INC.
57 Westland Avenue
Winchester, MA 01890
(617) 729-2363
Attn. Dr. Alfredo Urzua


C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
FEDERAL HIGHWAY ADMINISTRATION
EMBANK
Main Menu
project Definition
soil Profile and soil param.
Water table definition
Stress history
Stress history
Normally consolidated soil
fined stress history
User Defined
1 STRESS HISTORY
Maximum Past Pressure with Elev.
WARNING : Maximum past pressure vs. Elevation
must be defined for complete soil profile
(Program interpolates linearly between points)
Elev. Maximum Past Pressure Last point
791.00 5800 No
Hit <F10> to accept values
ENGINEERING INC.
stland Avenue
ster, MA 01890
7) 729-2363
r. Alfredo Urzua


C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
FEDERAL HIGHWAY ADMINISTRATION
EMBANK
Main Menu
project Definition
soil Profile and soil param.
Water table definition
Stress history
Stress history
Normally consolidated soil
fined stress history
User Defined
2 STRESS HISTORY
Maximum Past Pressure with Elev.
WARNING : Maximum past pressure vs. Elevation
must be defined for complete soil profile
(Program interpolates linearly between points)
Elev. Maximum Past Pressure Last point
777.50 5800.00 No
Hit <F9> to prev.point, <F10> to accept values
Space Bar-Next item Alt-M-Menu
ENGINEERING INC.
stland Avenue
ster, MA 01890
7) 729-2363
r. Alfredo Urzua

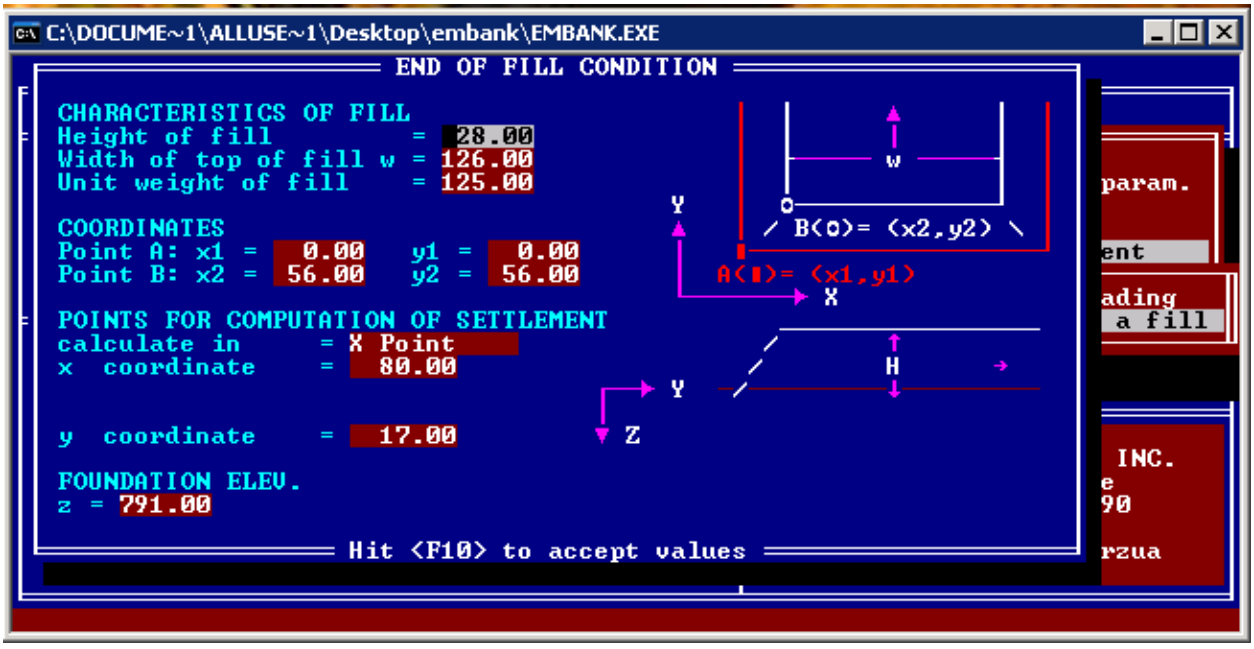
At the abutment:

EXISTA.emb



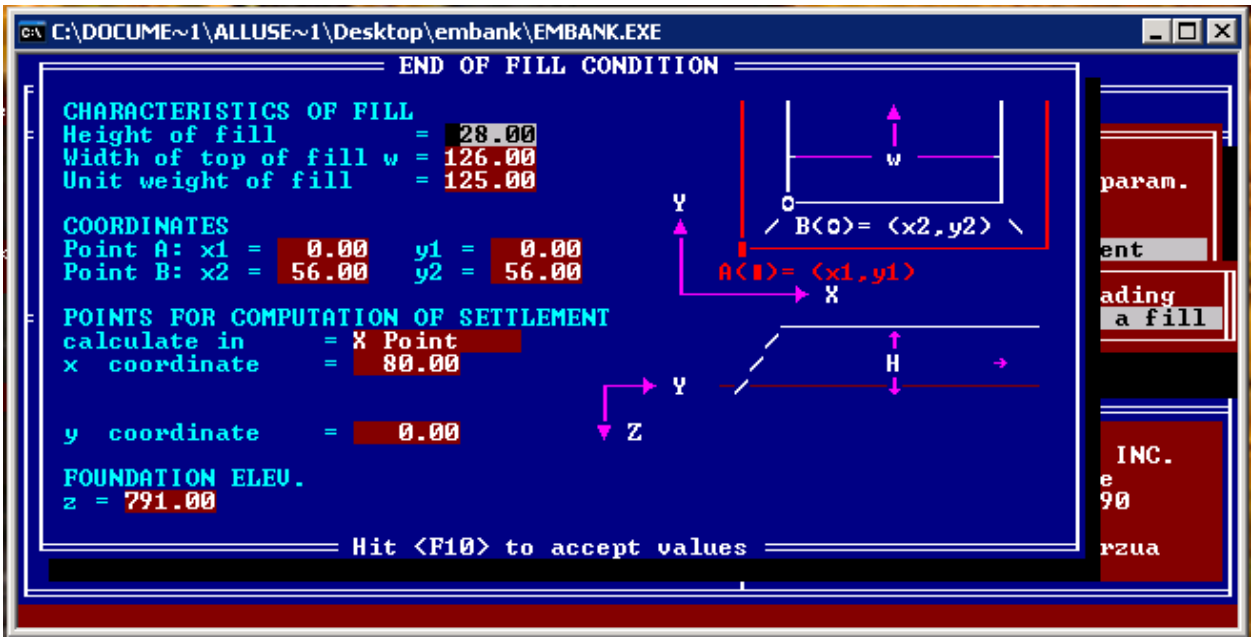
At the pier:

EXISTP.emb



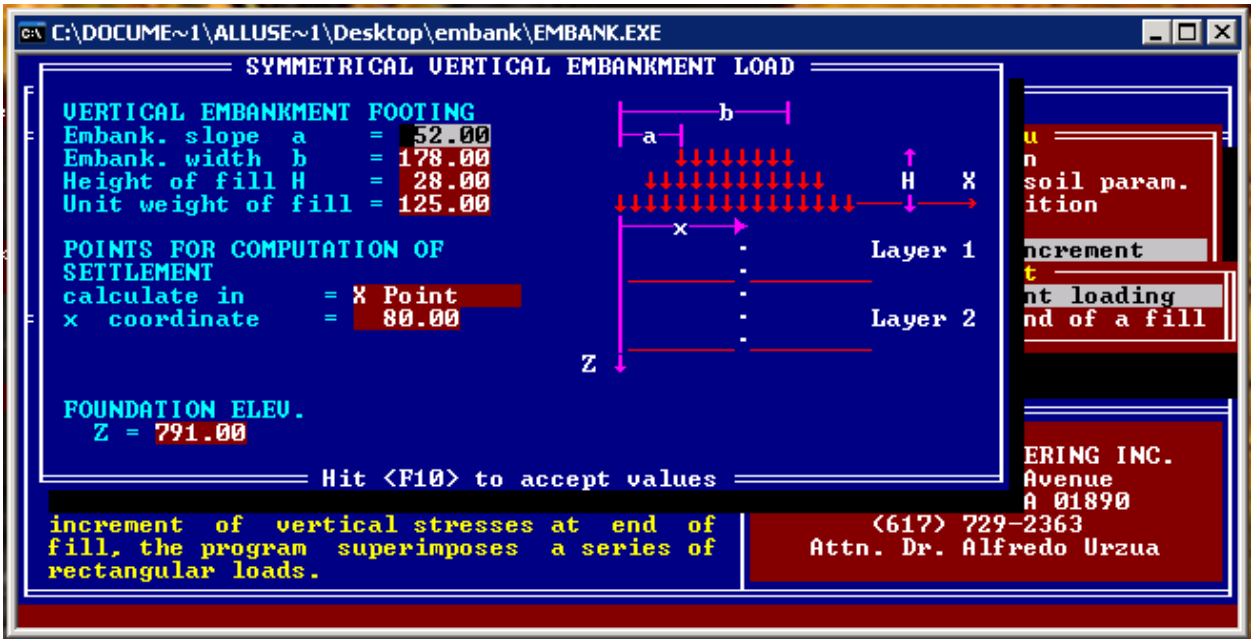
At the toe (estimate influence from adjacent embankment):

EXISTT.emb



Model 2: Infinite Embankment

INFINP.emb

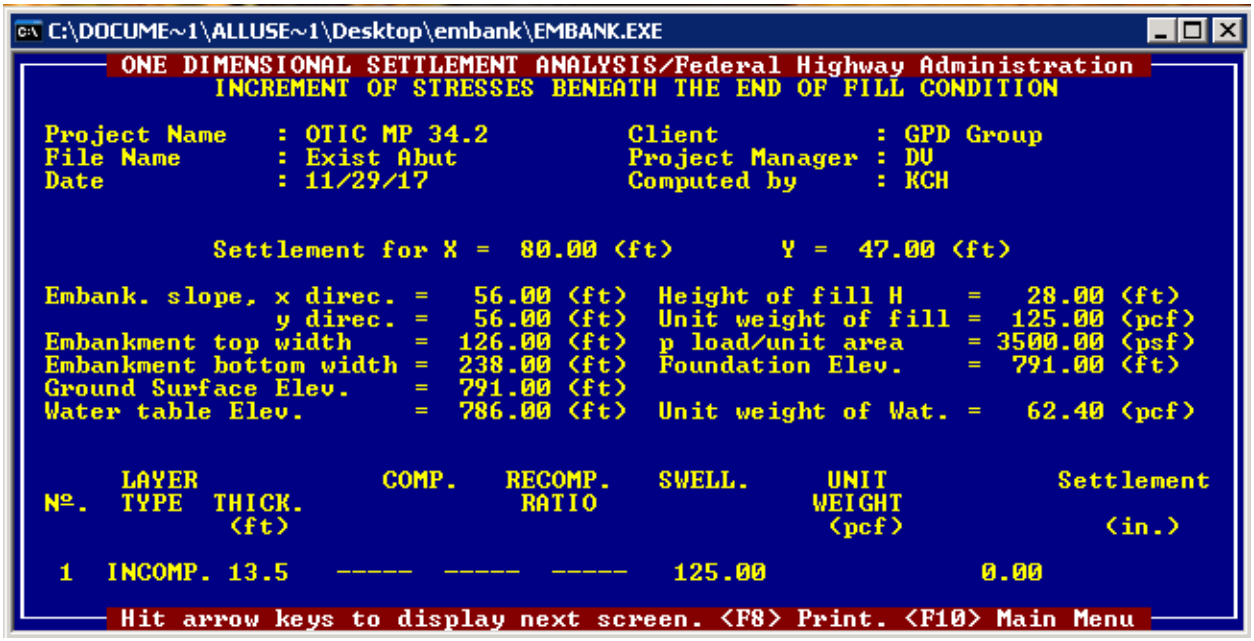


EMBANK software output:

Model 1: Existing Embankment

At the abutment:

EXISTA.emb



```
C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
     ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration
           INCREMENT OF STRESSES BENEATH THE END OF FILL CONDITION

Project Name    : OTIC MP 34.2          Client          : GPD Group
File Name       : Exist Abut            Project Manager : DV
Date            : 11/29/17              Computed by     : KCH

           Settlement for X =  80.00 (ft)       Y =  47.00 (ft)

Embank. slope, x direc. =   56.00 (ft)  Height of fill H     =   28.00 (ft)
               y direc. =   56.00 (ft)  Unit weight of fill =  125.00 (pcf)
Embankment top width    =  126.00 (ft)  p load/unit area     = 3500.00 (psf)
Embankment bottom width =  238.00 (ft)  Foundation Elev.     =  791.00 (ft)
Ground Surface Elev.    =  791.00 (ft)
Water table Elev.       =  786.00 (ft)  Unit weight of Wat. =   62.40 (pcf)

     LAYER              COMP.   RECOMP.   SWELL.     UNIT           Settlement
Nº.  TYPE  THICK.               RATIO              WEIGHT
           (ft)                                    (pcf)             (in.)

 1  INCOMP. 13.5    -----   -----   -----    125.00              0.00

     Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu
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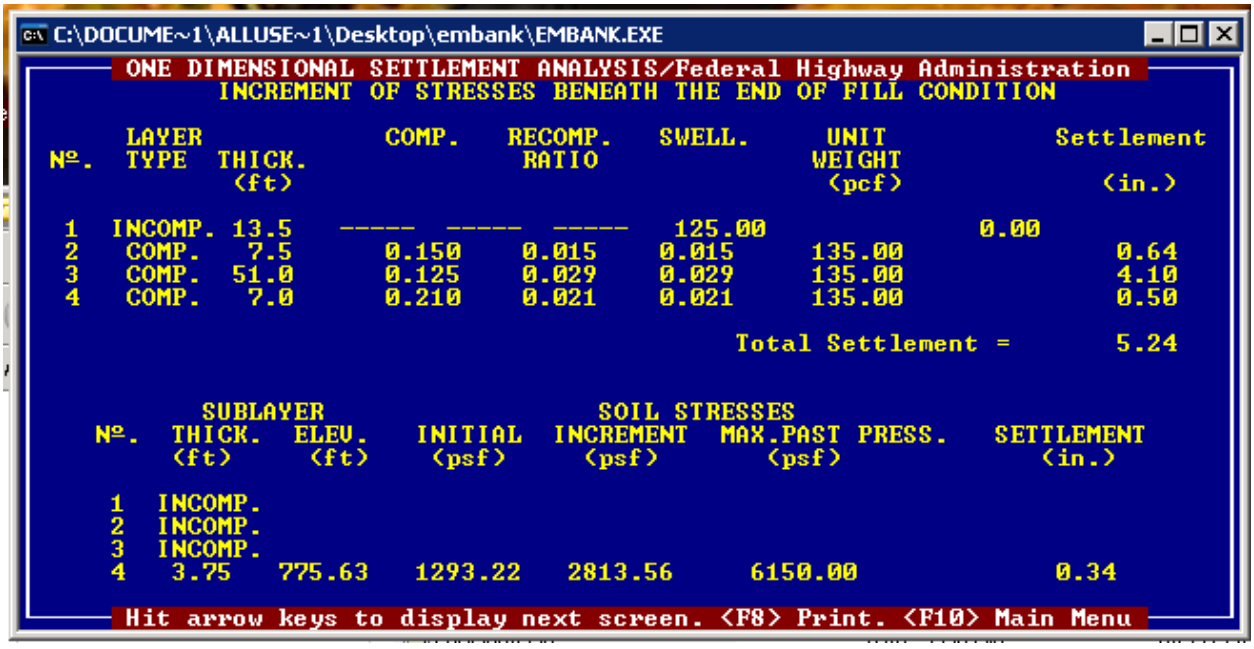

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     ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration
           INCREMENT OF STRESSES BENEATH THE END OF FILL CONDITION

     LAYER              COMP.   RECOMP.   SWELL.     UNIT           Settlement
Nº.  TYPE  THICK.               RATIO              WEIGHT
           (ft)                                    (pcf)             (in.)

 1  INCOMP. 13.5    -----   -----   -----    125.00              0.00
 2   COMP.   7.5      0.150   0.015   0.015    135.00                    0.64
 3   COMP.  51.0      0.125   0.029   0.029    135.00                    4.10
 4   COMP.   7.0      0.210   0.021   0.021    135.00                    0.50

                                              Total Settlement =        5.24


        SUBLAYER                    SOIL STRESSES
   Nº.  THICK.  ELEV.    INITIAL  INCREMENT  MAX.PAST PRESS.    SETTLEMENT
        (ft)     (ft)     (psf)     (psf)       (psf)              (in.)

    1  INCOMP.
    2  INCOMP.
    3  INCOMP.
    4   3.75   775.63   1293.22   2813.56     6150.00                0.34

     Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu
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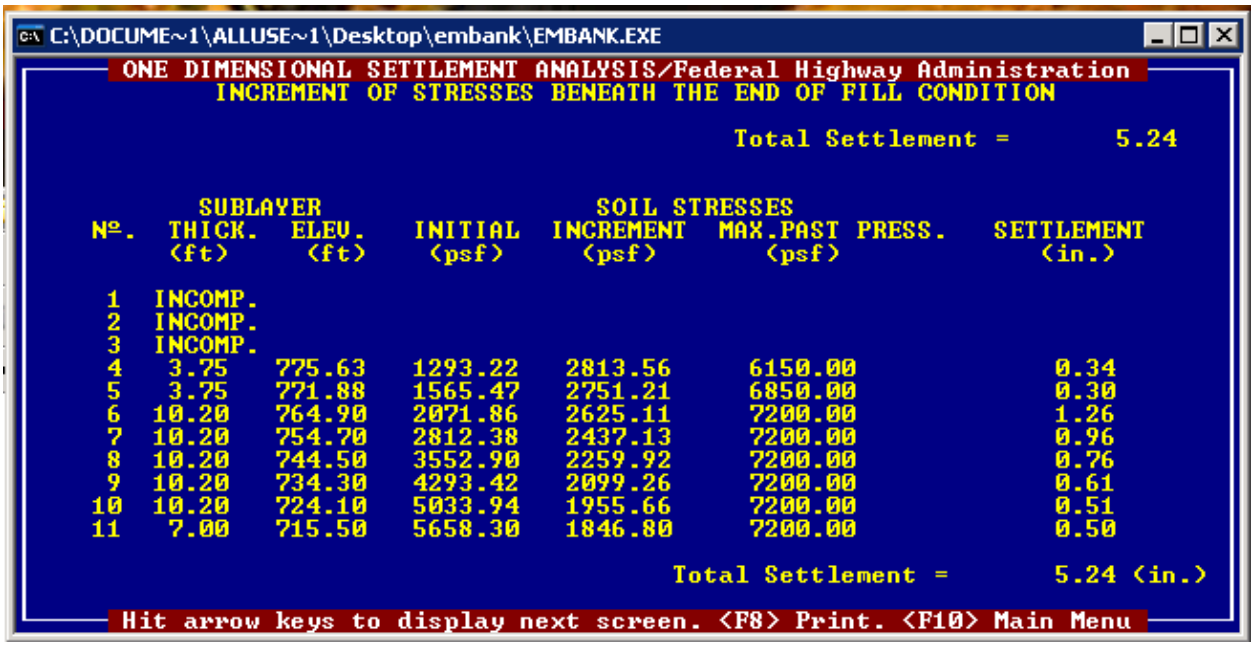


C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE

ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration
INCREMENT OF STRESSES BENEATH THE END OF FILL CONDITION

Total Settlement = 5.24

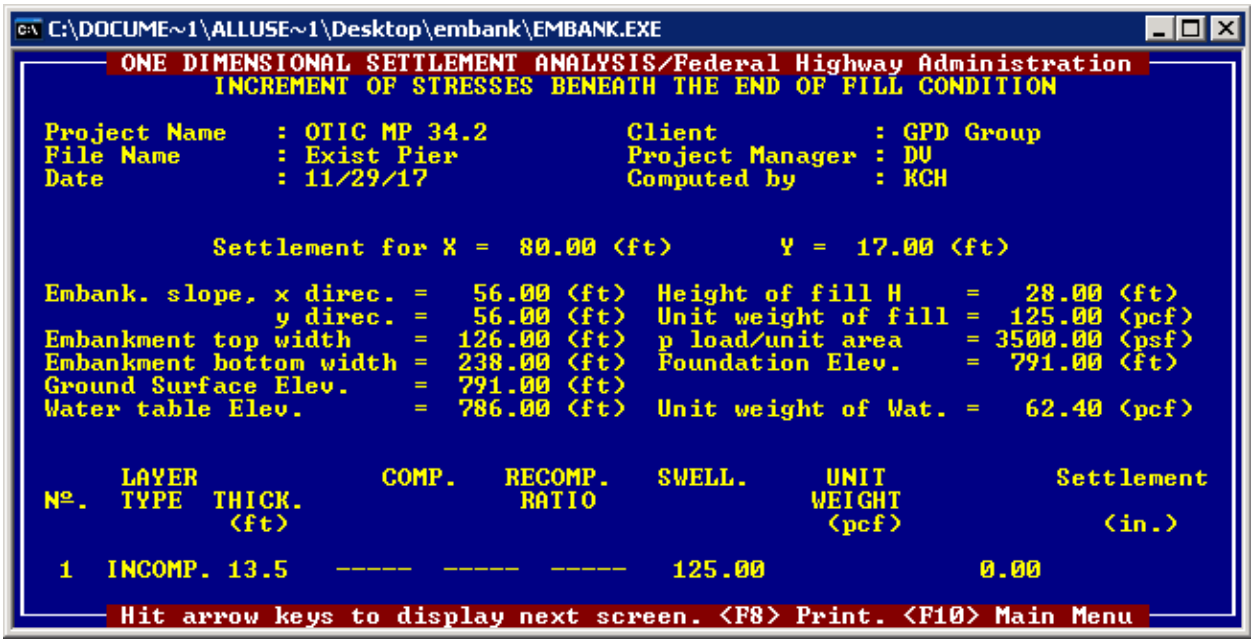
Nº.	SUBLAYER THICK. (ft)	ELEV. (ft)	SOIL STRESSES INITIAL (psf)	INCREMENT (psf)	MAX.PAST PRESS. (psf)	SETTLEMENT (in.)
1	INCOMP.					
2	INCOMP.					
3	INCOMP.					
4	3.75	775.63	1293.22	2813.56	6150.00	0.34
5	3.75	771.88	1565.47	2751.21	6850.00	0.30
6	10.20	764.90	2071.86	2625.11	7200.00	1.26
7	10.20	754.70	2812.38	2437.13	7200.00	0.96
8	10.20	744.50	3552.90	2259.92	7200.00	0.76
9	10.20	734.30	4293.42	2099.26	7200.00	0.61
10	10.20	724.10	5033.94	1955.66	7200.00	0.51
11	7.00	715.50	5658.30	1846.80	7200.00	0.50

Total Settlement = 5.24 (in.)

Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu

At the pier:

EXISTP.emb



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C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
      ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration
            INCREMENT OF STRESSES BENEATH THE END OF FILL CONDITION

Project Name    : OTIC MP 34.2          Client          : GPD Group
File Name       : Exist Pier            Project Manager : DV
Date            : 11/29/17              Computed by     : KCH

           Settlement for X =  80.00 (ft)       Y =  17.00 (ft)

Embank. slope, x direc. =   56.00 (ft)  Height of fill H     =   28.00 (ft)
               y direc. =   56.00 (ft)  Unit weight of fill =  125.00 (pcf)
Embankment top width    =  126.00 (ft)  p load/unit area     = 3500.00 (psf)
Embankment bottom width =  238.00 (ft)  Foundation Elev.     =  791.00 (ft)
Ground Surface Elev.    =  791.00 (ft)
Water table Elev.       =  786.00 (ft)  Unit weight of Wat. =   62.40 (pcf)

     LAYER              COMP.    RECOMP.    SWELL.     UNIT            Settlement
Nº.  TYPE  THICK.                RATIO                 WEIGHT
           (ft)                                        (pcf)             (in.)

 1  INCOMP. 13.5    -----  -----  -----    125.00              0.00

      Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu
```

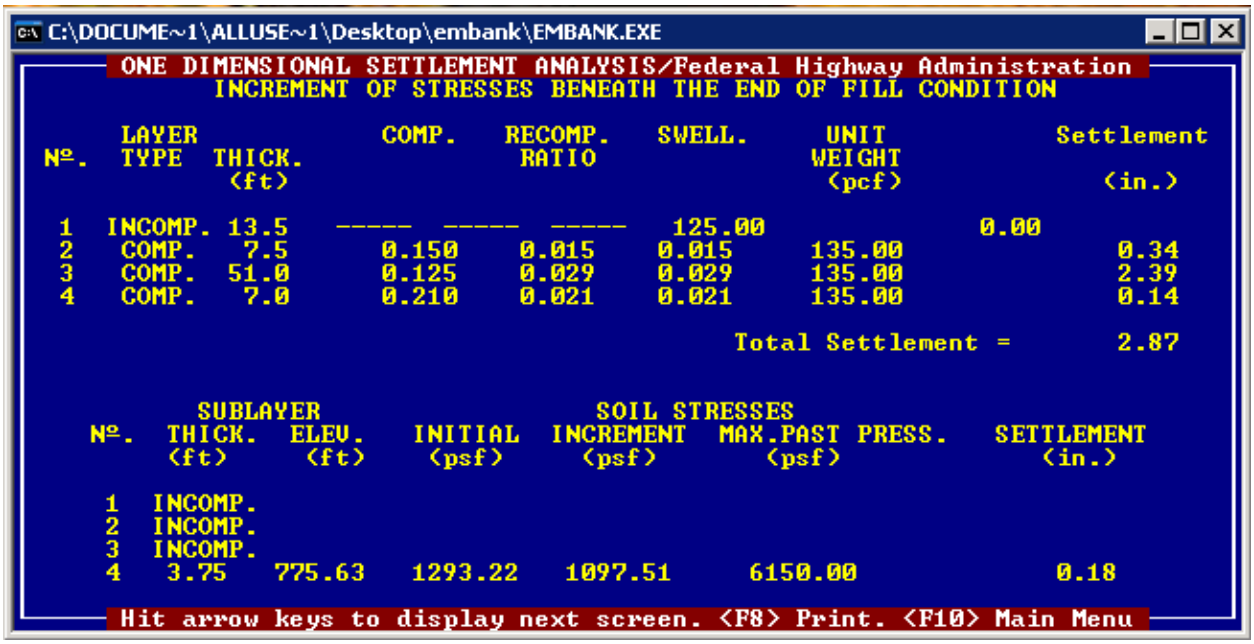

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C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
      ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration
            INCREMENT OF STRESSES BENEATH THE END OF FILL CONDITION

     LAYER              COMP.    RECOMP.    SWELL.     UNIT            Settlement
Nº.  TYPE  THICK.                RATIO                 WEIGHT
           (ft)                                        (pcf)             (in.)

 1  INCOMP. 13.5    -----  -----  -----    125.00              0.00
 2   COMP.   7.5      0.150    0.015    0.015     135.00              0.34
 3   COMP.  51.0      0.125    0.029    0.029     135.00              2.39
 4   COMP.   7.0      0.210    0.021    0.021     135.00              0.14

                                                Total Settlement =      2.87

        SUBLAYER                    SOIL STRESSES
   Nº.  THICK.  ELEV.    INITIAL  INCREMENT  MAX.PAST PRESS.    SETTLEMENT
        (ft)    (ft)     (psf)     (psf)       (psf)              (in.)

    1  INCOMP.
    2  INCOMP.
    3  INCOMP.
    4   3.75   775.63   1293.22   1097.51     6150.00              0.18

      Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu
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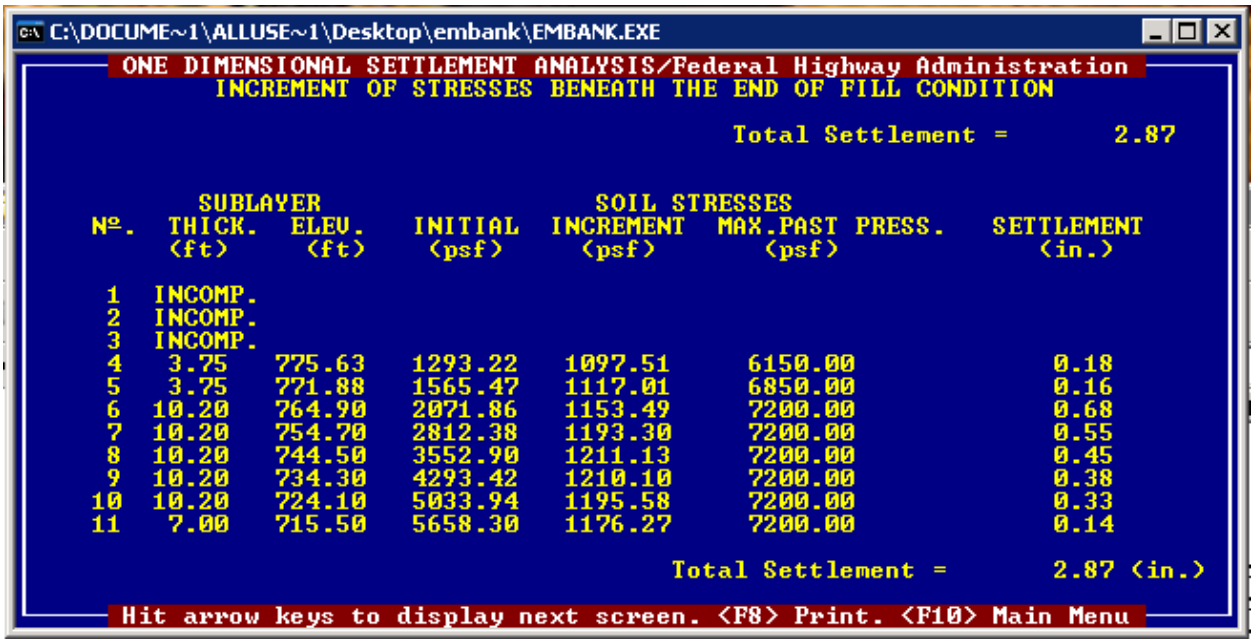
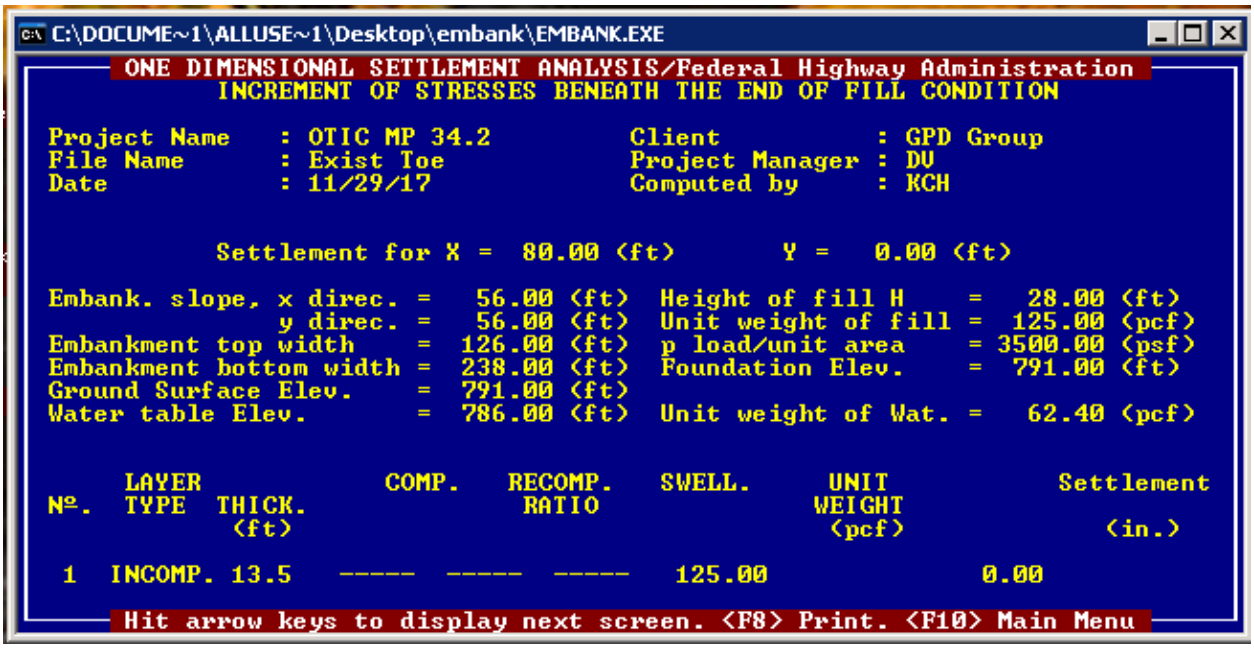
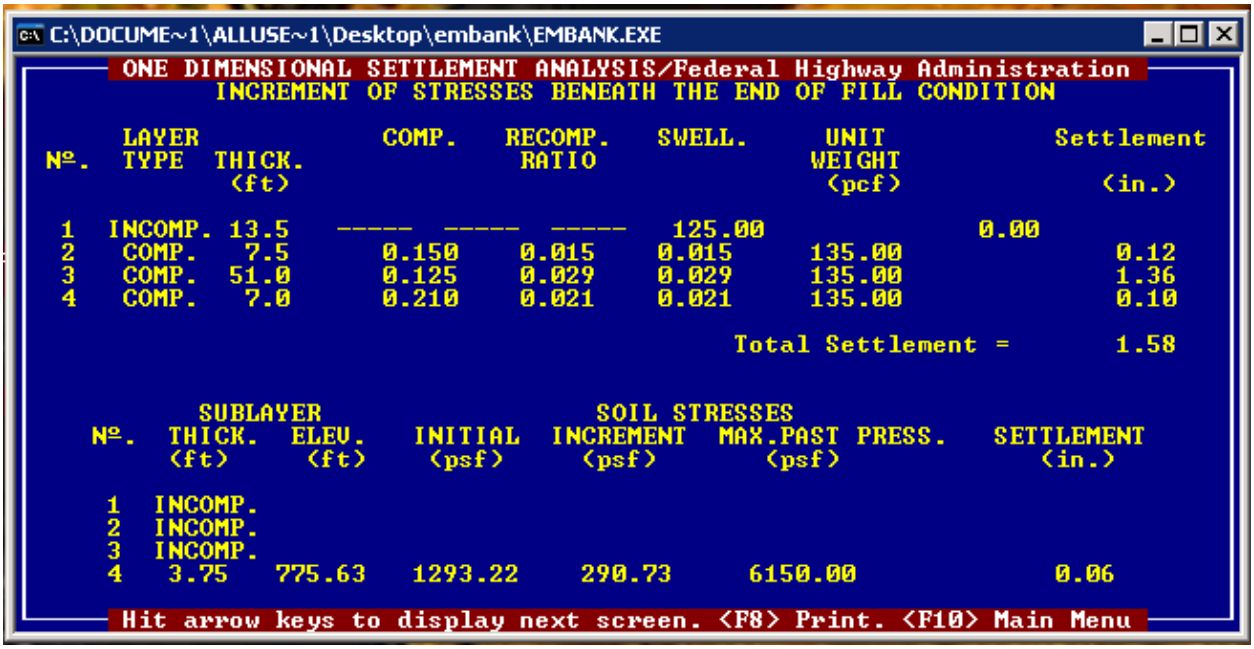
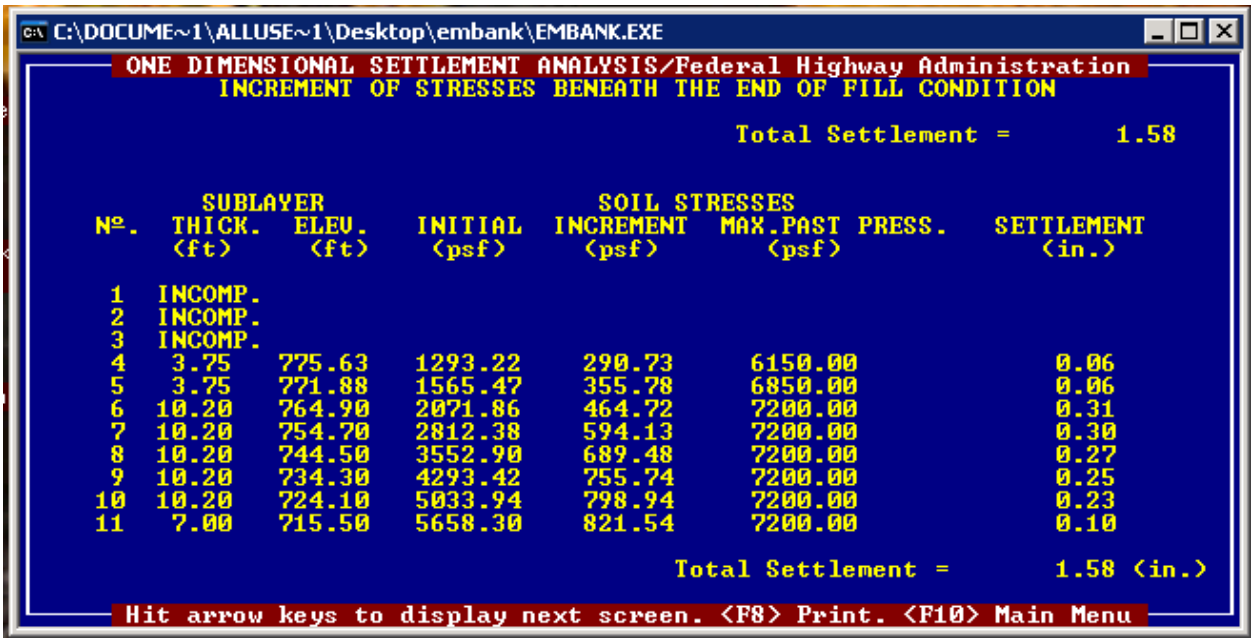

C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration
INCREMENT OF STRESSES BENEATH THE END OF FILL CONDITION
Total Settlement = 2.87
SUBLAYER
SOIL STRESSES
Nº. THICK. (ft) ELEV. (ft) INITIAL (psf) INCREMENT (psf) MAX.PAST PRESS. (psf) SETTLEMENT (in.)
1 INCOMP.
2 INCOMP.
3 INCOMP.
4 3.75 775.63 1293.22 1097.51 6150.00 0.18
5 3.75 771.88 1565.47 1117.01 6850.00 0.16
6 10.20 764.90 2071.86 1153.49 7200.00 0.68
7 10.20 754.70 2812.38 1193.30 7200.00 0.55
8 10.20 744.50 3552.90 1211.13 7200.00 0.45
9 10.20 734.30 4293.42 1210.10 7200.00 0.38
10 10.20 724.10 5033.94 1195.58 7200.00 0.33
11 7.00 715.50 5658.30 1176.27 7200.00 0.14
Total Settlement = 2.87 (in.)
Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu

At the toe (estimate influence from adjacent embankment):

EXISTT.emb

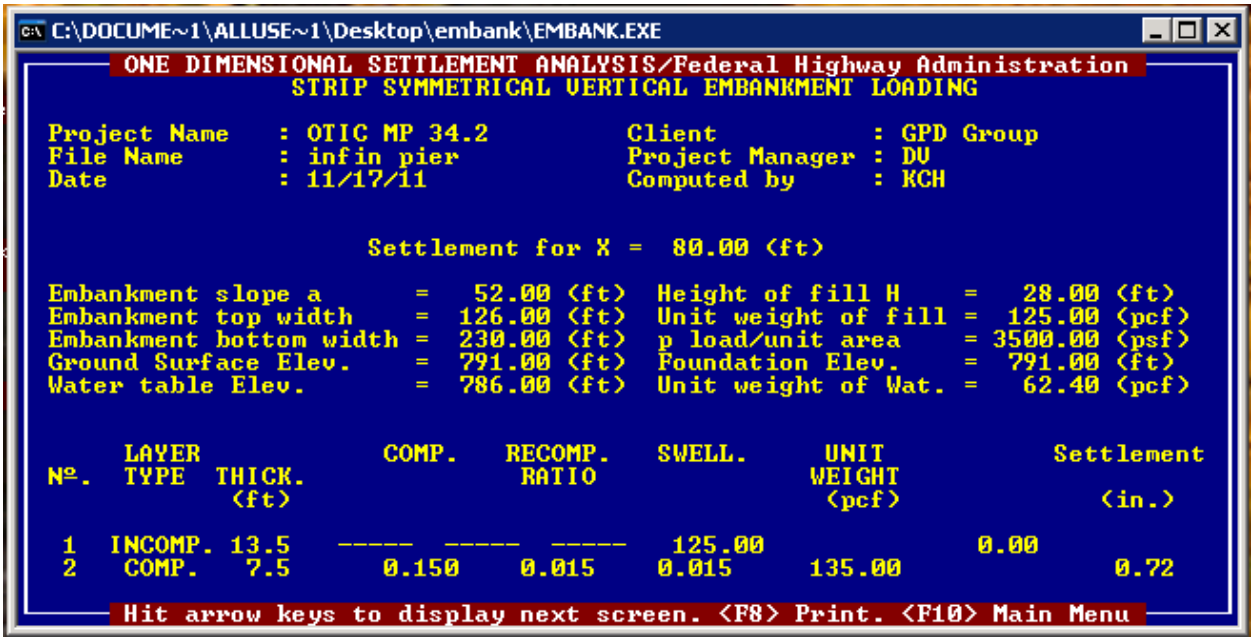


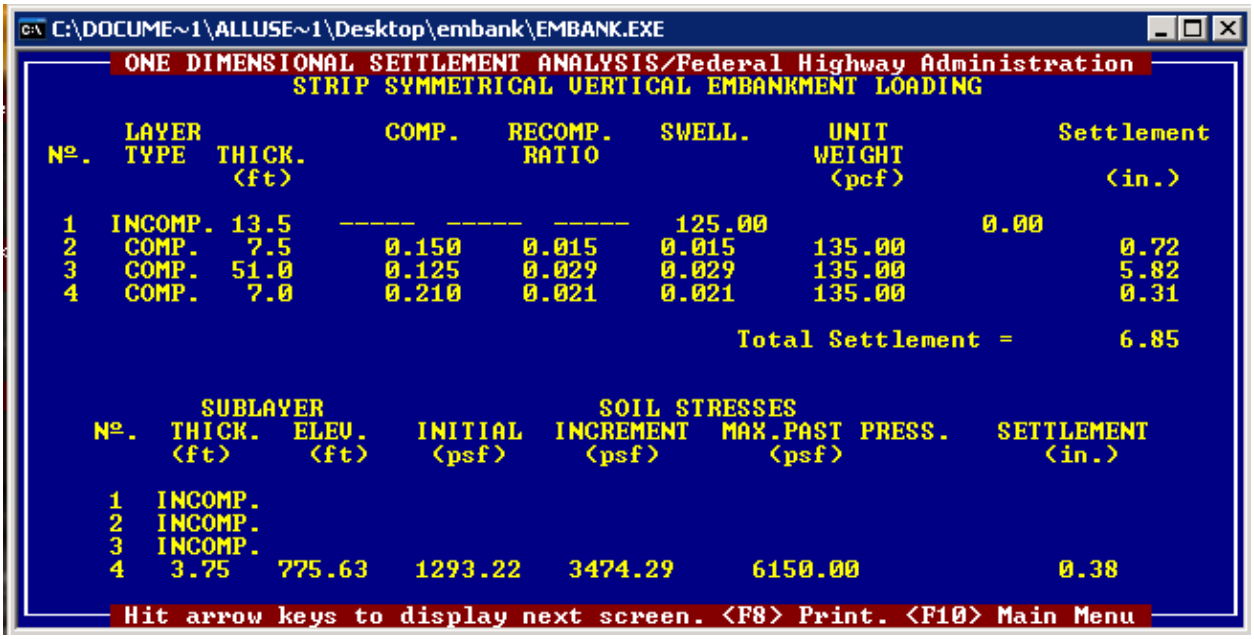


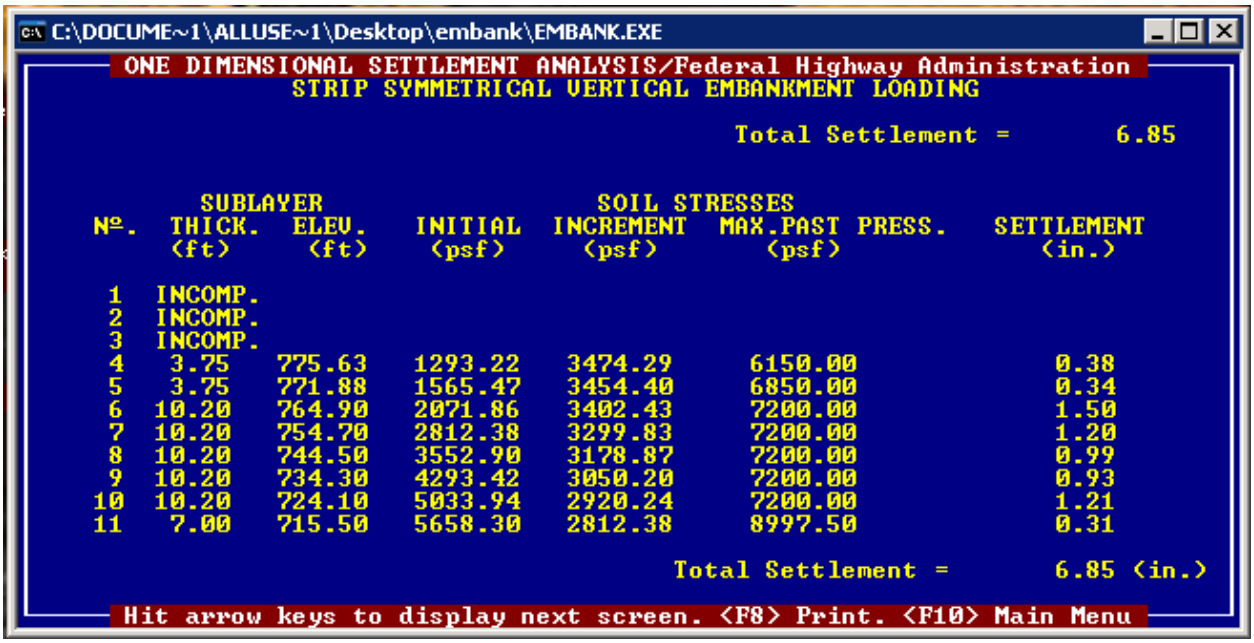

C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration
INCREMENT OF STRESSES BENEATH THE END OF FILL CONDITION
Total Settlement = 1.58
SUBLAYER
Nº. THICK. (ft) ELEV. (ft) INITIAL (psf) SOIL STRESSES INCREMENT (psf) MAX.PAST PRESS. (psf) SETTLEMENT (in.)
1 INCOMP.
2 INCOMP.
3 INCOMP.
4 3.75 775.63 1293.22 290.73 6150.00 0.06
5 3.75 771.88 1565.47 355.78 6850.00 0.06
6 10.20 764.90 2071.86 464.72 7200.00 0.31
7 10.20 754.70 2812.38 594.13 7200.00 0.30
8 10.20 744.50 3552.90 689.48 7200.00 0.27
9 10.20 734.30 4293.42 755.74 7200.00 0.25
10 10.20 724.10 5033.94 798.94 7200.00 0.23
11 7.00 715.50 5658.30 821.54 7200.00 0.10
Total Settlement = 1.58 (in.)
Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu

Model 2: Infinite Embankment

infinp.emb






C:\DOCUME~1\ALLUSE~1\Desktop\embank\EMBANK.EXE
ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration
STRIP SYMMETRICAL VERTICAL EMBANKMENT LOADING
Total Settlement = 6.85
SUBLAYER SOIL STRESSES
Nº. THICK. (ft) ELEV. (ft) INITIAL (psf) INCREMENT (psf) MAX.PAST PRESS. (psf) SETTLEMENT (in.)
1 INCOMP.
2 INCOMP.
3 INCOMP.
4 3.75 775.63 1293.22 3474.29 6150.00 0.38
5 3.75 771.88 1565.47 3454.40 6850.00 0.34
6 10.20 764.90 2071.86 3402.43 7200.00 1.50
7 10.20 754.70 2812.38 3299.83 7200.00 1.20
8 10.20 744.50 3552.90 3178.87 7200.00 0.99
9 10.20 734.30 4293.42 3050.20 7200.00 0.93
10 10.20 724.10 5033.94 2920.24 7200.00 1.21
11 7.00 715.50 5658.30 2812.38 8997.50 0.31
Total Settlement = 6.85 (in.)
Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu

Project Name: OTIC MP 34.2 Bridge Demolition
Project Number: 1580701
Calculated by: KCH 11/21/2017

Embankment Parameters

Height	Pressure @ 125 pcf	
28 feet	3500 psf	1.75 tsf

Coefficient of Consolidation from NAVFAC Figure 4 (7.1-144)

Stratum	LL	Virgin Compression		Recompression		Average
		C_v (cm^2/sec)	C_v (ft^2/day)	C_v (cm^2/sec)	C_v (ft^2/day)	C_v (ft^2/day)
II	27	>0.05	>0.5	>0.3	>2	2
II	25	>0.05	>0.5	>0.3	>2	
III	30	0.05	4.7	>0.3	>2	2
III	29	>0.05	>0.5	>0.3	>2	
III	28	>0.05	>0.5	>0.3	>2	
III	30	0.05	4.7	>0.3	>2	
III	30	0.05	4.7	>0.3	>2	
IV	38	0.03	3.0	0.2	17	17

Coefficient of Consolidation from Tested Values

Stratum	Pressure (tsf)	Virgin Compression		Recompression		Cv for 1.75 tsf
		C_v (cm^2/sec)	C_v (ft^2/day)	C_v (cm^2/sec)	C_v (ft^2/day)	
B-1 (ST-8)	1.0	-		-	0.10	0.12
III	2.0	-		-	0.12	
B-1 (ST-14)	1.0	-		-	0.40	0.21
III	2.0	-		-	0.15	

Project Name: OTIC MP 34.2 Bridge Demolition
Project Number: 1580701
Calculated: KCH 11/21/2017

Encountered Conditions

Low H_{dr} (feet)	High H_{dr} (feet)
3	10.5
3	20
7	7

Stratum II layer thicknesses: 10.5, 3, 4.5
Stratum III layer thicknesses: 57, 3, 41
Stratum IV layer thickness: 7

Assume double drainage between strata layers

Time for 90% Consolidation

$$t = \frac{T\ (H_{dr})^2}{C_v}$$

where T = 0.848 for 90% consolidation

Results Based on Low End H_{dr}

Stratum	From NAVFAC Cv Values			From Lab Cv Values		
	t (days)	t (weeks)	t (months)	t (days)	t (weeks)	t (months)
II	3.82	0.545	0.127			
III	3.8	0.545	0.127	66	9.5	2.2
IV	2.4	0.34	0.08			

Results Based on High End H_{dr}

Stratum	From NAVFAC Cv Values			From Lab Cv Values			
	t (days)	t (weeks)	t (months)	t (days)	t (weeks)	t (months)	t (years)
II	46.7	6.68	1.558				
III	170	24	6	2950	421	98	8
IV	2.4	0.34	0.08				

Final Conclusions

High end results not realistic for Stratum III
Expect 1.5 to 2.5 months for 90% consolidation

GPD Group
Cleveland, Ohio

Geotechnical Subsurface Investigation
OTIC MP 34.5 Bridge Widening
Wauseon, Fulton County, Ohio

December 2017

1915 North 12th Street
Toledo, OH 43604-5305
T 419-324-2222
F 419-241-1808
www.ttlassoc.com

December 29, 2017

TTL Project No. 1580702

Mr. Tom Washko, P.E.
GPD Group
5595 Transportation Boulevard, Suite 100
Cleveland, Ohio 44125

Geotechnical Subsurface Investigation
OTIC MP 34.5 Bridge Widening
Wauseon, Fulton County, Ohio

Dear Mr. Washko:

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. 15807.02R2, dated August 9, 2017, and authorized by you on October 13, 2017.

This final report contains the results of our study, incorporates furnished ground surface elevations into the boring logs, and provides our design and construction recommendations for foundations.

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.

Katherine C. Hennicken, P.E.
Geotechnical Engineer

David M. Vovak, P.E.
Transportation Director

T:\Geotech\Projects 2017\15807.01_02…\Report - OTIC MP 34.5 Bridge Widening\1580702 TTL Geotech Report OTIC MP 34.5 Bridge Widening Fulton County OH.docx

GEOTECHNICAL SUBSURFACE INVESTIGATION
OTIC MP 34.5 BRIDGE WIDENING
WAUSEON, FULTON COUNTY, OHIO

FOR

GPD GROUP
5595 TRANSPORTATION BOULEVARD, SUITE 100
CLEVELAND, OHIO 44125

SUBMITTED

DECEMBER 29, 2017
TTL PROJECT NO. 1580702

TTL ASSOCIATES, INC.
1915 NORTH 12TH STREET
TOLEDO, OHIO 43604
(419) 324-2222
(419) 321-6257 (FAX)

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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) 34.5 of the James W. Shocknessy Ohio Turnpike (Interstate Route 90 [IR-90]) over State Route (SR) 108, 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 bridge foundations.

This investigation was performed in general accordance with TTL Proposal No. 15807.02R2, dated August 9, 2017, and authorized by Mr. Tom Washko, P.E. of GPD Group on October 13, 2017.

The purpose of this investigation was to evaluate the subsurface conditions relative to the design and construction of foundations at the referenced location. To accomplish this, 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 were performed.

This report includes:

- A description of the subsurface soil and groundwater conditions encountered in the borings.
- Design recommendations for bridge pier and abutment foundations.
- Recommendations concerning soil and groundwater-related construction procedures such as site preparation, earthwork, foundation construction, and related field testing.

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 October 30 and November 1, 2017. Boring B-1 was performed at the location of the western abutment of the proposed bridge, and Boring B-2 was performed at the location of the eastern abutment. The boring locations were established in the field by TTL based on direction from GPD Group. Ground surface elevations at the boring locations were estimated to the nearest foot based on existing bridge elevations shown on drawings provided by GPD group. The approximate locations of the test borings are shown on the attached Test Boring Location Plan (Plate 2.0).

The test borings were performed in general accordance with Ohio Department of Transportation (ODOT) "Specifications for Geotechnical Explorations" (July 2017). The test borings performed during this investigation were drilled with an ATV-mounted rotary drilling rig utilizing 3¼-inch inside diameter hollow-stem augers. Both borings were extended to a depth of 80 feet below existing grade.

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 intervals with the number of blows per increment being recorded at each depth interval, and these data are presented under the "Std. Pen." column on the Logs of Test Borings attached to this report. 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, or N_m-value, and is typically reported in blows per foot (bpf). The N_m-values were corrected to an equivalent rod energy ratio of 60 percent, N_{60}. The calibrated hammer/rod energy ratio for the drill rig utilized for this project was 80.3 percent, and was last calibrated on January 10, 2017. The N_{60} values are presented on the attached Logs of Test Borings and Tabulation of Test Data sheets. In conjunction with published data and typical correlations, the N_{60}-value can be evaluated as a measure of soil compactness/consistency as well as shear strength and bearing capacity.

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 subsoil samples were classified in accordance with the ODOT soil classification system. Where gradation and plasticity tests were not performed for a "direct" mechanical determination of the appropriate ODOT classification, the soils were classified using visual-manual procedures. All samples of the subsoils were tested in our laboratory for moisture content (ASTM D 2216). 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. Particle size analyses were also performed on one selected granular soil sample from each boring. The results of these tests are presented on the Logs of Test Borings, Tabulation of Test Data sheets, and Grain Size Distribution sheets 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 widen the existing twin bridges located at MP 34.5 of the James W. Shocknessy Ohio Turnpike (Interstate Route 90 [IR-90]) over State Route (SR) 108 in Fulton County, Ohio. We further understand that the inside lanes of each bridge structure will be widened 6 to 7 feet and will include one additional beam line and associated substructure widening.

The existing bridges are indicated to be 3-span structures, with abutments on pile foundations and piers on shallow foundations. Total length of the bridges is indicated to be approximately 124 feet. Based on the retrieved as-built drawings, the abutment piles are indicated to be HP10x42 H-piles and have estimated lengths of 33 feet below approximate Elev. 805 with a maximum load of 21 tons along Pile Line "N," as well as 28 feet below approximate Elev. 796 with a maximum load of 18 tons along Pile Line "M." Additionally, the piles along Pile Line "M" are indicated at a battered ratio of 1 horizontal to 4 vertical (1H:4V). Stickup is shown to be 1 foot vertical within each footing. Based on these lengths, and based on bedrock on the order of 210 to 230 feet below existing grades (approximate Elevs. 600 to 580), these piles are anticipated to be friction piles driven to approximate Elevs. 772 to 768. The shallow foundations are indicated to bear at Elev. 782.

It is indicated that during construction, a temporary single-span Acrow type bridge will be placed within the OTIC median for maintenance of traffic purposes, and will bear on a pile cap foundation.

4.0 GENERAL SITE AND SUBSURFACE CONDITIONS

4.1 General Site Conditions

The indicated bridge clearance between the bridges and SR 108 is indicated to be on the order of 15 feet. Grades along the bridges are on the order of Elevs. 808 to 807.

The surface materials encountered in Borings B-1 and B-2 consisted of topsoil with thicknesses of 12 inches and 10 inches, respectively.

4.2 Site Geology

Published geologic maps from the Ohio Department of Natural Resources (ODNR) indicate that the project site is located within the Maumee Sand Plains District of the Maumee Lake Plains Physiographic Region of Ohio. These regions include upper profile soils consisting of sands deposited in glacial lakes in the form of low dunes, beach ridges, and sand bars, as well as silty and clayey lacustrine deposits. The sands and lacustrine deposits are underlain by predominantly silty and clayey glacial till, before encountering bedrock.

Bedrock at the site is Silurian age, broadly mapped as the Olentangy shale formation. Based on available bedrock topography maps, the top of bedrock can be expected from Elevs. 600 to 580, approximately 210 to 230 feet below existing grades.

4.3 General Soil Conditions

Based on the results of our field and laboratory tests, the subsoils encountered underlying the topsoil consists of cohesive embankment fills underlain by native soils which can generally be characterized a layer of granular soils overlying 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.

Granular embankment **fill** materials were encountered underlying the surface materials in in Borings B-1 and B-2 to depths of approximately 17½ feet and 19 feet below existing grades (approximate Elev. 789), respectively. The fill materials consisted of coarse and fine sand. Non-soil materials encountered in the fill consisted of concrete fragments in the uppermost sample from Boring B-1, in trace amounts. SPT N_{60}-values generally ranged from 8 to 23 blows per foot (bpf), indicating predominantly medium dense compactness, encountered to a

depth of 8 feet and 6 feet (approximate Elevs. 798 and 802), in Borings B-1 and B-2 respectively. Below these depths, SPT N_{60}-values within the fill generally ranged from 35 to 87 bpf, indicating very dense compactness. Moisture contents ranged from approximately 5 to 10 percent in the predominantly medium dense fill materials, and from 8 to 15 percent in the lower, very dense fill materials.

Stratum I consisted of medium dense to dense native granular soils encountered underlying the embankment fill in Boring B-1 to a depth of 28 feet below existing grade (approximate Elev. 778). The granular soils consisted of coarse and fine sand (ODOT A-3a). SPT N_{60}-values of 44 blows per foot (bpf) and 23 bpf, as well as moisture contents of 20 percent and 15 percent, were determined for the recovered samples from this stratum.

Stratum II consisted of predominantly stiff cohesive soils encountered underlying the embankment fill in Boring B-2 to a depth of 23 feet (approximate Elev. 785). The cohesive soils consisted of silt and clay (ODOT A-6a). An SPT N_{60}-value of 13 bpf and a moisture content of 22 percent were determined for the recovered sample from this stratum.

Stratum III consisted of very stiff to hard cohesive soil encountered underlying Stratum I in Boring B-1, as well as underlying Stratum II in Boring B-2, to depths of 42 feet and 33½ feet (approximate Elevs. 764 and 775), respectively. The Stratum III till deposits consisted of silt and clay (A-6a). SPT N_{60}-values ranged from 19 to 29 bpf. Unconfined compressive strengths ranged from approximately 5,000 to 9,000 pounds per square foot (psf). Moisture contents ranged from 13 to 16 percent.

Stratum IV consisted of predominantly stiff cohesive soil encountered underlying Stratum III to boring termination at a depth of 80 feet in each of the borings. The Stratum II cohesive soils consisted of silt and clay (A-6a), as well as silt (A-4b). SPT N_{60}-values ranged from 9 to 17 bpf. Unconfined compressive strengths generally ranged from approximately 1,500 to 3,000 psf. Moisture contents typically ranged from 16 to 18 percent.

4.4 Groundwater Conditions

Groundwater was initially encountered during drilling at depths of 18.8 feet and 23 feet below existing grades (approximate Elevs. 787 and 785) in Borings B-1 and B-2, respectively. Groundwater was not observed upon completion of drilling operations in either boring. 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 19 feet or lower, corresponding to approximate Elev. 787 or deeper. However, groundwater elevations can fluctuate with seasonal and climatic influences. In particular, "perched" water may be encountered in fill materials or granular soils 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 Temporary Bridge Structure Foundations

We understand that the temporary bridge structure will be designed using LRFD specifications. For piles not driven to refusal on bedrock, the ODOT Bridge Design Manual (BDM) indicates that piles should be specified as CIP concrete piles with driven pipe shells. We have evaluated closed-end pipe shells. It is our recent experience that H-piles may be an economical alternative for the abutments. Therefore, we have also included recommendations in this report for use of H-piles.

It was assumed that there will be 2 feet of pile stick-up embedded in the pile caps. At the time of this report, LRFD Total Factored Loads were not available. Our analyses considered maximum Ultimate Bearing Values (R_{ndr}) prescribed by ODOT for commonly used pile sizes as summarized in the following table.

Table 5.1.A. ODOT Prescribed Maximum Ultimate Bearing Values (R_{ndr}) for Common Pile Sizes

Pile Type/Size	Maximum R_{ndr} (kips)
12-Inch CIP Pipe Pile	330
14-Inch CIP Pipe Pile	390
16-Inch CIP Pipe Pile	450
HP 10x42 H-pile	350

In every instance of our analysis, the maximum R_{ndr} was not encountered within the depth of exploration (i.e., the maximum R_{ndr} would be encountered at depths below the bottom of the borings). Therefore, our analyses considered lower R_{ndr} values.

ODOT Bridge Design Manual (BDM) Section 202.2.3.2.b indicates that, for piles not driven to refusal on bedrock, a dynamic resistance factor of 0.70 is to be utilized for piles installed in accordance with ODOT Construction and Materials Specifications (CMS) 507 and CMS 523. As such, maximum total factored loads (TFLs) for a certain pile size and type are

70 percent of the maximum R_{ndr} values presented in this section.

Pile resistance analyses were performed using FHWA pile analysis software DRIVEN. In the DRIVEN analyses, adhesion for cohesive soils was modeled using the Tomlinson method (1979), and resistance in the "cohesionless" soils were determined by the Peck, Hanson, and Thornburn method (1974), using SPT N_{60}-values.

Results of the DRIVEN analyses are attached to this report, and are summarized in the following table. The summary table below includes the estimated pile length and order length based on an **assumed** bottom of pile cap elevation. The estimated pile length includes the calculated length from anticipated pile cut-off elevation to pile tip elevation, rounded to the nearest 5 feet. The order length is the estimated length plus 5 feet.

Table 5.1.B. West (Rear) Abutment Pile Foundation Recommendations – Temporary Bridge Structure

Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	R_{ndr} (kips)	Pile Type and Size	Recommended (Minimum) Pile Tip Elevation (feet)	Estimated Pile Length (feet)	Order Pile Length (feet)
805	807	300	12" CIP	-	-	-
			14" CIP	-	-	-
			16" CIP	743	65	70
			HP 10x42	-	-	-
		250	12" CIP	-	-	-
			14" CIP	748	65	70
			16" CIP	754	55	60
			HP 10x42	730	80	85
		200	12" CIP	770	65	70
			14" CIP	755	55	60
			16" CIP	764	45	50
			HP 10x42	744	65	70
		150	12" CIP	757	50	55
			14" CIP	767	40	45
			16" CIP	775	35	40
			HP 10x42	756	50	55
		100	12" CIP	743	40	45
			14" CIP	777	30	35
			16" CIP	-	-	-
			HP 10x42	770	40	45

Table 5.1.C. East (Forward) Abutment Pile Foundation Recommendations – Temporary Bridge Structure						
Assumed Bottom of Pile Cap Elevation (feet)	**Assumed Cut-Off Pile Elevation (feet)**	**R_{ndr} (kips)**	**Pile Type and Size**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
803	805	300	12" CIP	-	-	-
			14" CIP	-	-	-
			16" CIP	729	75	80
			HP 10x42	-	-	-
		250	12" CIP	-	-	-
			14" CIP	733	75	80
			16" CIP	740	65	70
			HP 10x42	-	-	-
		200	12" CIP	737	70	75
			14" CIP	745	60	65
			16" CIP	751	55	60
			HP 10x42	740	65	70
		150	12" CIP	751	55	60
			14" CIP	757	50	55
			16" CIP	762	45	50
			HP 10x42	754	50	55
		100	12" CIP	765	40	45
			14" CIP	769	35	40
			16" CIP	-	-	-
			HP 10x42	767	35	40

DRIVEN analyses indicate that the CIP piles and H-piles are expected to achieve the required resistance upon being driven to the Stratum IV predominantly stiff cohesive soil.

Since skin friction resistance was not considered within the existing embankment fill materials in the upper 8½ feet (extending to Elev. 582±), varying the bottom of abutment elevation and/or the pile stick-up in the pile cap will not result in a different minimum recommended pile tip elevation from what is presented in the above table, provided the bottom of abutment elevation is at or above Elev. 582. However, the estimated and order pile lengths in the above table would require re-evaluation.

ODOT specifications indicate that the maximum center-to-center spacing of driven piles should be 8 feet in capped pile abutments. The maximum center-to-center spacing of driven piles should be 7 feet for the front row of wall-type abutments. Although close pile spacing is not anticipated, we recommend that the minimum center-to-center spacing for piles be 3 pile diameters to avoid superposition of stresses and possible reduction in group resistance due to close spacing.

A static pile load test (ASTM D 1143) is required only if the total pile order length for an individual structure exceeds 10,000 feet for piling of the same size and R_{ndr}. As such, a static pile load test is not expected to be required for this project. As mentioned previously, pile design is based on piles installed in accordance with ODOT CMS Item 523 "Dynamic Load Test." ODOT requires dynamic load testing to establish the driving criteria (i.e., blow count) for all piling not driven to refusal on bedrock. For an individual structure, the designer shall specify one dynamic load testing item for each pile size. If multiple pile capacities are required for a given pile size, the designer shall specify one testing item for each R_{ndr}. Although not anticipated, if static load tests are required, additional provisions include two dynamic load testing items **and** two restrike items for each static load test item. One dynamic load testing item consists of testing a minimum of two piles and performing a Case Pile Wave Analysis Program (CAPWAP) analysis on one of the two piles. One restrike item consists of performing dynamic testing on two piles and performing CAPWAP analysis on one of the two piles. Driven piles should be installed under adequate specifications and monitored by a qualified geotechnical engineer.

Although cobbles and/or boulders were not encountered during this investigation, they are not uncommon in glacial till soils, particularly in the lower-profile very stiff to hard soils. If cobbles or boulders are encountered, these conditions could hamper pile-driving operations and possibly damage some piles. If piles are observed to meet refusal at a depth/elevation less than that indicated above, cobble or 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. If persistent boulder conditions are indicated, a static pile load test should be performed in accordance with the standard referenced above to evaluate the bearing resistance of the pile(s).

5.2 Bridge Foundations

We understand that the existing bridges are 3-span structures, with abutments on pile foundations and piers on shallow foundations.

5.2.1 Shallow Foundations

Based on the retrieved as-built drawings, the shallow pier foundations are indicated to bear at Elev. 782. We understand that the proposed foundations will be tied into the existing foundations.

Based on the results of the field and laboratory testing for the borings performed for this investigation, the soils encountered at the anticipated foundation bearing elevation of Elev. 782 are expected to consist of Stratum I medium dense granular soils as well as Stratum III very stiff to hard cohesive soil, which are considered generally suitable for support of the proposed foundations. If loose granular 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, the granular soils could be over-excavated and replaced with new granular engineered fill as described below.

It should be noted that foundation bearing materials may also consist of new engineered fill utilized to achieve design grades after stripping and removal of topsoil, depending on site grading.

If the excavated subgrade reveals loose soils at footing bearing elevation, additional in-place modification must be performed using a backhoe-mounted vibratory compactor (hoe-pac) or similar equipment to achieve a consistent bearing stratum. However, if groundwater is present 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 wellpoints will also help in modifying the granular soils in place.

Suitable compaction/bearing of granular foundation soils can be verified as:

- Exhibiting a compacted (in-situ) dry density of at least 100 percent of the maximum dry density determined by Supplement 1015,
- A dynamic cone penetrometer (DCP) reading of at least 12 blows per increment (average over three increments), or
- Other methods to demonstrate an equivalent SPT N-value of 15 bpf or greater.

Although not anticipated to be prevalent, if granular soils cannot be suitably re-compacted in-place, or other unsuitable foundation soils are encountered, over-excavation should extend through these materials to suitable bearing soils. The over-excavated areas should be backfilled with a low strength mortar backfill meeting the requirements of ODOT 613.

Following the satisfactory completion of the site preparation and footing excavation inspections outlined in Section 6.0 of this report, the proposed structures may be supported

on conventional shallow spread foundation systems consisting of wall (strip) and/or column (square) footings. Shallow foundations may be designed utilizing a net allowable bearing pressure of 4,000 pounds per square foot (psf). In using a net allowable soil pressure, the weight of the footings, backfill over the footings or floor slabs need not be included in the structural loads for dimensioning footings. The bearing materials should be field-verified as being native silt and clay (ODOT A-6a) exhibiting an unconfined compressive strength of 4,000 psf or greater, native coarse and fine sand (A-3a) meeting the above compaction/density requirements, or properly placed and compacted new engineered fill.

Due to the existing development and high groundwater table, we strongly 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 increase the footing size to accommodate the lower bearing strengths or 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 exterior footings and footings in unheated areas should be constructed at a minimum frost penetration depth of 3½ feet below finished exterior grades (assumed at Elev. 782). It should be noted that use of trench footings (i.e., placement of foundation concrete without forming) may not be feasible due to the granular nature of the bearing soils encountered in Boring B-1, along with the high groundwater table. Forming of footings and backfilling around CMU or poured foundation walls should be anticipated in areas of granular bearing soils.

Settlement of the structure foundations was calculated based on conventional consolidation theory utilizing the recompression index for the over-consolidated clays. Utilizing a maximum net allowable bearing pressure of 4,000 psf, the differential settlement associated with the structure should not exceed ¼ inch.

5.2.2 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 33 feet below approximate Elev. 805 with a maximum load of 21 tons along Pile Line "N," as well as 28 feet below approximate Elev. 796 with a maximum load of 18 tons along Pile Line "M." Additionally, the piles along Pile Line "M" are indicated at a battered ratio of 1 horizontal to 4 vertical (1H:4V). Stickup is shown to be 1 foot vertical within each footing.

For our analyses, we considered the inside lanes of the existing bridges with average Pile Line "N" elevations of Elev. 805 at the west (rear) abutment and Elev. 803 at the east (forward) abutment, and average Pile Line "M" elevations of Elev. 798 at the west (rear) abutment and Elev. 797 at the east (forward) abutment. Loads for the bridge expansion were unavailable at the time of preparing this report, so our analyses considered the maximum Ultimate Bearing Values prescribed by ODOT for commonly used pile sizes, as well as lower Ultimate Bearing Values. Additionally, we conservatively considered a more common pile stickup of 2 feet.

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 table. 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 5.2.2.A. West (Rear) Abutment Pile Foundation Recommendations – Existing Bridge Structure Pile Line "N"							
Assumed Bottom of Pile Cap Elevation (feet)	**Assumed Cut-Off Pile Elevation (feet)**	**Ultimate Bearing Value (kips)**	**Service Load (kips)**	**Pile Type and Size**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
805	807	300	150	12" CIP	-	-	-
				14" CIP	-	-	-
				16" CIP	743	65	70
				HP 10x42	-	-	-
		250	125	12" CIP	-	-	-
				14" CIP	748	65	70
				16" CIP	754	55	60
				HP 10x42	730	80	85
		200	100	12" CIP	770	65	70
				14" CIP	755	55	60
				16" CIP	764	45	50
				HP 10x42	744	65	70
		150	75	12" CIP	757	50	55
				14" CIP	767	40	45
				16" CIP	775	35	40
				HP 10x42	756	50	55
		100	50	12" CIP	743	40	45
				14" CIP	777	30	35
				16" CIP	-	-	-
				HP 10x42	770	40	45

Table 5.2.2.B. West (Rear) Abutment Pile Foundation Recommendations – Existing Bridge Structure Pile Line "M"							
Assumed Bottom of Pile Cap Elevation (feet)	**Assumed Cut-Off Pile Elevation (feet)**	**Ultimate Bearing Value (kips)**	**Service Load (kips)**	**Pile Type and Size**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
798	800	300	150	12" CIP	-	-	-
				14" CIP	-	-	-
				16" CIP	743	60	65
				HP 10x42	-	-	-
		250	125	12" CIP	-	-	-
				14" CIP	748	60	65
				16" CIP	754	45	50
				HP 10x42	730	70	75
		200	100	12" CIP	770	60	65
				14" CIP	755	45	50
				16" CIP	764	40	45
				HP 10x42	744	55	60
		150	75	12" CIP	757	45	50
				14" CIP	767	35	40
				16" CIP	775	25	30
				HP 10x42	756	45	50
		100	50	12" CIP	743	30	35
				14" CIP	777	25	30
				16" CIP	-	-	-
				HP 10x42	770	30	35

Table 5.2.2.C. East (Forward) Abutment Pile Foundation Recommendations – Existing Bridge Structure Pile Line "N"							
Assumed Bottom of Pile Cap Elevation (feet)	**Assumed Cut-Off Pile Elevation (feet)**	**Ultimate Bearing Value (kips)**	**Service Load (kips)**	**Pile Type and Size**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
803	805	300	150	12" CIP	-	-	-
				14" CIP	-	-	-
				16" CIP	729	75	80
				HP 10x42	-	-	-
		250	125	12" CIP	-	-	-
				14" CIP	733	75	80
				16" CIP	740	65	70
				HP 10x42	-	-	-
		200	100	12" CIP	737	70	75
				14" CIP	745	60	65
				16" CIP	751	55	60
				HP 10x42	740	65	70
		150	75	12" CIP	751	55	60
				14" CIP	757	50	55
				16" CIP	762	45	50
				HP 10x42	754	50	55
		100	50	12" CIP	765	40	45
				14" CIP	769	35	40
				16" CIP	-	-	-
				HP 10x42	767	35	40

Table 5.2.2.D. East (Forward) Abutment Pile Foundation Recommendations – Existing Bridge Structure Pile Line "M"							
Assumed Bottom of Pile Cap Elevation (feet)	**Assumed Cut-Off Pile Elevation (feet)**	**Ultimate Bearing Value (kips)**	**Service Load (kips)**	**Pile Type and Size**	**Recommended (Minimum) Pile Tip Elevation (feet)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
797	799	300	150	12" CIP	-	-	-
				14" CIP	-	-	-
				16" CIP	729	70	75
				HP 10x42	-	-	-
		250	125	12" CIP	-	-	-
				14" CIP	733	65	70
				16" CIP	740	60	65
				HP 10x42	-	-	-
		200	100	12" CIP	737	65	70
				14" CIP	745	55	60
				16" CIP	751	50	55
				HP 10x42	740	60	65
		150	75	12" CIP	751	50	55
				14" CIP	757	45	50
				16" CIP	762	40	45
				HP 10x42	754	45	50
		100	50	12" CIP	765	35	40
				14" CIP	769	30	35
				16" CIP	-	-	-
				HP 10x42	767	35	40

DRIVEN analyses performed for each substructure location indicate that the HP 10x42 piles are expected to generally drive into the Stratum IV predominantly stiff 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 that a static load test 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 to 580 in the vicinity of the project site, nominally 210 to 230 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.

5.3 Groundwater Control

As stated previously, groundwater was initially encountered during drilling at depths of 18.8 feet and 23 feet below existing grades (approximate Elevs. 787 and 785) in Borings B-1 and B-2, respectively.

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 19 feet or lower, corresponding to approximate Elev. 787 or deeper. Therefore, construction planning should include potential remedial measures to be implemented where excessive groundwater seepage or unstable subgrades are encountered in the foundation excavations. Dewatering methods may include multiple sumps or a system of

well points. The type of dewatering system utilized will depend on construction practices, soil conditions encountered in the foundation excavations, seasonal conditions, and the depth of excavation. Additionally, the contractor will need to exercise diligence to control seepage and runoff to maintain a stable subgrade.

5.4 Excavations and Slopes

The sides of temporary excavations for foundations, utility installations, and other 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
- Type C soils (fill materials and granular soils).

For temporary excavations in Type A, B, and C soils, side slopes must be no steeper than ¾ horizontal to 1 vertical (¾H:1V), 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 90 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.

The on-site soils consist of granular fill materials underlain by native granular and 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 design and construction conditions for bridge foundations has been 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.

LEGEND

APPROXIMATE SITE LOCATION

N

APPROXIMATE SCALE – FEET

0 2,000 4,000

PLATE 1.0
SITE LOCATION MAP

OTIC MP 34.5 BRIDGE WIDENING
WAUSEON, FULTON COUNTY, OHIO

PREPARED FOR
GDP GROUP
CLEVELAND, OHIO

DRAWN TRR/10–31–17	CHECKED KCH/11–1–17
REVISED	APPROVED
JOB NO. 1580702	
DRAWING NUMBER **1580702–01G**	

TTL associates inc
Environmental, Geotechnical Engineering & Testing

N

LEGEND

B-1 APPROXIMATE TEST BORING LOCATION

APPROXIMATE SCALE – FEET

0 100 200

PLATE 2.0
TEST BORING LOCATION PLAN

OTIC MP 34.5 BRIDGE WIDENING
WAUSEON, FULTON COUNTY, OHIO

PREPARED FOR
GDP GROUP
CLEVELAND, OHIO

DRAWN	TRR/10-31-17	CHECKED	KCH/11-1-17
REVISED		APPROVED	
JOB NO.	1580702		
DRAWING NUMBER	**1580702-02G**		

ITL associates inc
Environmental, Geotechnical Engineering & Testing

PROJECT: OTIC MP 34.5	DRILLING FIRM / OPERATOR: TTL / TB	DRILL RIG: CME 550X ATV	STATION / OFFSET:	EXPLORATION ID B-1	
TYPE: BRIDGE WIDENING	SAMPLING FIRM / LOGGER: TTL / KKC	HAMMER: CME AUTOMATIC	ALIGNMENT:		
PID: BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/10/17	ELEVATION: 806.0 (MSL) EOB: 80.0 ft.	PAGE 1 OF 3	
START: 11/1/17 END: 11/1/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80.3	LAT / LONG: Not Recorded		

MATERIAL DESCRIPTION AND NOTES	ELEV. 806.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL - 12 INCHES	805.0																	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND TRACE CONCRETE FRAGMENTS, MOIST **EMBANKMENT FILL**	803.0		3 10 5	20	100	SS-1	NP	-	-	-	-	-	-	-	-	5	A-3a (V)	
LOOSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND TRACE GRAVEL, MOIST **EMBANKMENT FILL**	800.0		3 3 3	8	100	SS-2	NP	-	-	-	-	-	-	-	-	9	A-3a (V)	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND TRACE GRAVEL, MOIST **EMBANKMENT FILL**	798.0		3 4 7	15	100	SS-3	NP	-	-	-	-	-	-	-	-	10	A-3a (V)	
VERY DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, MOIST **EMBANKMENT FILL**			13 18 20	51	100	SS-4	NP	-	-	-	-	-	-	-	-	10	A-3a (V)	
@12': GRAY/BROWN	788.5		12 17 23	54	100	SS-5	NP	-	-	-	-	-	-	-	-	10	A-3a (V)	
DENSE, GRAY, **COARSE AND FINE SAND**, LITTLE SILT, WET (FREE WATER NOTED IN JAR)	783.0	W	9 15 18	44	100	SS-6	NP	-	-	-	-	-	-	-	-	20	A-3a (V)	
MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, SOME SILT AND TRACE CLAY, MOIST	778.0		4 6 11	23	100	SS-7	NP	0	2	65	32	1	NP	NP	NP	15	A-3a (0)	
VERY STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST			4 6 10	21	100	SS-8	3.00	3	6	11	23	57	26	15	11	15	A-6a (8)	

PID:	BR ID:	PROJECT: OTIC MP 34.5	STATION / OFFSET:	START: 11/1/17	END: 11/1/17	PG 2 OF 3	B-1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
VERY STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST *(continued)*	775.0	32																
		33																
		34	4 9 13	29	100	SS-9	3.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
		35																
		36																
		37																
		38																
		39	5 6 10	21	100	SS-10	2.51*	-	-	-	-	-	-	-	-	16	A-6a (V)	
		40																
		41																
	764.0	42																
STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST		43																
		44	2 4 5	12	100	SS-11	1.00	4	5	11	23	57	27	14	13	17	A-6a (9)	
		45																
		46																
		47																
		48																
		49	3 4 6	13	100	SS-12	1.50	-	-	-	-	-	-	-	-	17	A-6a (V)	
		50																
		51																
		52																
		53																
		54	2 4 6	13	100	SS-13	1.09*	-	-	-	-	-	-	-	-	17	A-6a (V)	
		55																
		56																
		57																
		58																
@58.5': SOME SAND		59	3 4 6	13	100	SS-14	NI	4	7	14	21	54	27	13	14	17	A-6a (10)	
		60																
		61																
		62																
		63																
		64	3															

PID:	BR ID:	PROJECT: OTIC MP 34.5	STATION / OFFSET:	START: 11/1/17	END: 11/1/17	PG 3 OF 3	B-1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST *(continued)*	741.8	65	5 6	15	100	SS-15	1.50	-	-	-	-	-	-	-	-	18	A-6a (V)	
		66																
		67																
		68																
		69	3 4 5	12	100	SS-16	1.50	-	-	-	-	-	-	-	-	18	A-6a (V)	
		70																
		71																
		72																
		73																
MEDIUM STIFF TO STIFF, GRAY, **SILT AND CLAY**, LITTLE GRAVEL AND SAND, MOIST	732.5	74	3 4 6	13	100	SS-17	0.75	14	4	8	18	56	28	14	14	16	A-6a (9)	
		75																
		76																
		77																
		78																
		79	1 3 4	9	100	SS-18	0.68*	-	-	-	-	-	-	-	-	17	A-6a (V)	
	726.0	EOB 80																

NOTES: "*" - UNCONFINED STRENGTH DETERMINED BY ASTM D 2166. "NP" - NON-PLASTIC. "NI" - NOT INTACT.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 4 BAGS BENTONITE CHIPS

PROJECT: OTIC MP 34.5	DRILLING FIRM / OPERATOR: TTL / TB	DRILL RIG: CME 550X ATV	STATION / OFFSET:	EXPLORATION ID B-2
TYPE: BRIDGE WIDENING	SAMPLING FIRM / LOGGER: TTL / KKC	HAMMER: CME AUTOMATIC	ALIGNMENT:	
PID: BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/10/17	ELEVATION: 808.0 (MSL) EOB: 80.0 ft.	PAGE 1 OF 3
START: 10/30/17 END: 10/30/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80.3	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL - 10 INCHES	808.0 807.2																	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND TRACE CLAY, MOIST **EMBANKMENT FILL**			2 4 9	17	78	SS-1	NP	0	2	82	15	1	NP	NP	NP	9	A-3a (0)	
			6 7 10	23	89	SS-2	NP	-	-	-	-	-	-	-	-	10	A-3a (V)	
	802.0		8 12 14	35	100	SS-3	NP	-	-	-	-	-	-	-	-	10	A-3a (V)	
VERY DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND TRACE CLAY, MOIST **EMBANKMENT FILL**			10 18 26	59	100	SS-4	NP	-	-	-	-	-	-	-	-	8	A-3a (V)	
			11 26 39	87	100	SS-5	NP	-	-	-	-	-	-	-	-	15	A-3a (V)	
	789.0		3 4 6	13	100	SS-6	NI	0	2	23	27	48	31	17	14	22	A-6a (10)	
STIFF, GRAY/BROWN, **SILT AND CLAY**, SOME SAND, MOIST	785.0	W																
VERY STIFF TO HARD, GRAY, **SILT AND CLAY**, SOME SAND AND TRACE GRAVEL, DAMP			3 6 8	19	100	SS-7	4.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
			3 6 9	20	100	SS-8	3.60*	6	8	17	29	40	27	14	13	13	A-6a (8)	

PID:	BR ID:	PROJECT: OTIC MP 34.5	STATION / OFFSET:	START: 10/30/17	END: 10/30/17	PG 2 OF 3	B-2

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
VERY STIFF TO HARD, GRAY, **SILT AND CLAY**, SOME SAND AND TRACE GRAVEL, DAMP *(continued)*	777.0	32																
	774.5	33																
MEDIUM STIFF TO STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST		34	3 3 4	9	100	SS-9	0.75	-	-	-	-	-	-	-	-	18	A-6a (V)	
	771.0	35																
		36																
STIFF, GRAY, **SILT**, "AND" SAND, TRACE CLAY, MOIST		37																
	766.0	38																
		39	3 4 5	12	100	SS-10	0.50	0	4	35	53	8	23	14	9	14	A-4b (5)	
STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST		40																
		41																
		42																
		43																
		44	3 3 5	11	100	SS-11	NI	-	-	-	-	-	-	-	-	18	A-6a (V)	
		45																
		46																
		47																
		48																
		49	3 3 4	9	100	SS-12	1.00	-	-	-	-	-	-	-	-	18	A-6a (V)	
		50																
		51																
		52																
		53																
		54	3 4 5	12	100	SS-13	1.00	6	5	12	27	50	31	17	14	19	A-6a (10)	
		55																
		56																
		57																
		58																
		59	3 4 5	12	100	SS-14	1.00	-	-	-	-	-	-	-	-	18	A-6a (V)	
		60																
		61																
		62																
		63																
MOIST @63.5': MEDIUM STIFF TO STIFF		64	0															

PID:	BR ID:	PROJECT: OTIC MP 34.5	STATION / OFFSET:	START: 10/30/17	END: 10/30/17	PG 3 OF 3	B-2

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND AND TRACE GRAVEL, MOIST *(continued)*	743.8	65	2 4	8	100	SS-15	1.25	-	-	-	-	-	-	-	-	18	A-6a (V)	
		66																
		67																
		68																
MOIST @68.5': STIFF		69	3 5 6	15	100	SS-16	1.00	-	-	-	-	-	-	-	-	18	A-6a (V)	
		70																
		71																
		72																
		73																
		74	3 4 6	13	100	SS-17	1.00	-	-	-	-	-	-	-	-	18	A-6a (V)	
		75																
		76																
		77																
		78																
@78.5': STIFF TO VERY STIFF		79	3 6 7	17	100	SS-18	1.25	-	-	-	-	-	-	-	-	18	A-6a (V)	
	728.0	EOB 80																

NOTES: "*" - UNCONFINED STRENGTH DETERMINED BY ASTM D 2166. "NP" - NON-PLASTIC. "NI" - NOT INTACT.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 4 BAGS BENTONITE CHIPS

LEGEND KEY

Ohio Department of Transportation Soil Symbols


A-1-a - Gravel and/or Stone Fragments


A-1-b - Gravel and/or Stone Fragments with Sand


A-2-4,A-2-5 - Gravel and/or Stone Fragments with Sand and Silt


A-2-6,A-2-7 - Gravel and/or Stone Fragments with Sand, Silt and Clay


A-3 - Fine Sand


A-3a - Coarse and Fine Sand


A-4a - Sandy Silt


A-4b - Silt


A-5 - Elastic Silt and Clay


A-6a - Silt and Clay


A-6b - Silty Clay


A-7-5 - Elastic Clay


A-7-6 - Clay


A-8a - Organic Silt


A-8b - Organic Clay


Asphalt


Sod and/or Topsoil


Concrete


Random Fill


Peat


Dolomite


Weathered Dolomite


Limestone


Weathered Limestone


Sandstone


Weathered Sandstone


Shale


Weathered Shale

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 during on October 30 and November 1, 2017, using 3¼-inch inside 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 boring locations were established in the field by TTL based on direction from GPD Group. Ground surface elevations at the boring locations were estimated to the nearest foot based on existing bridge elevations shown on drawings provided by GPD group.

4. Unconfined Compressive Strength (tsf):
   * = Unconfined Compressive Strength determined by ASTM D 2166.
   NP = Non Pastic
   NI = Not Intact

PROJECT: OTIC MP 34.5 Bridge Widening, Fulton County, OH	**TTL Associates, Inc.**	PROJECT NO: 1580702

TABULATION OF TEST DATA

Boring Number	Sample Number	Sample Interval Depth (Feet)	Measured Standard Penetration, N_m (Blows per Foot)	Corrected Standard Penetration, N_{60} (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 (%)			ODOT Soil Classification
									Gravel	Coarse Sand	Fine Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	SS-1	1.0-2.5	15	20	5.2												
	SS-2	3.5-5.0	6	8	8.9												
	SS-3	6.0-7.5	11	15	10.4												
	SS-4	8.5-10.0	38	51	9.9												
	SS-5	13.5-15.0	40	54	9.6												
	SS-6	18.5-20.0	33	44	20.0												
	SS-7	23.5-25.0	17	23	14.5				0	2	65	32	1	NON-PLASTIC			A-3a (0)
	SS-8	28.5-30.0	16	21	15.1		6,000		3	6	11	23	57	26	15	11	A-6a (8)
	SS-9	33.5-35.0	22	29	14.9		7,000										
	SS-10	38.5-40.0	16	21	15.7	119.2	*5,030										
	SS-11	43.5-45.0	9	12	16.9	112.5	2,000		4	5	11	23	57	27	14	13	A-6a (9)
	SS-12	48.5-50.0	10	13	17.0		3,000										
	SS-13	53.5-55.0	10	13	17.1	112.5	*2,180										
	SS-14	58.5-60.0	10	13	16.5				4	7	14	21	54	27	13	14	A-6a (10)
	SS-15	63.5-65.0	11	15	17.9		3,000										
	SS-16	68.5-70.0	9	12	17.6		3,000										

SSR = Split-Spoon Refusal

Unconfined compressive strength (UCS) generally derived from a calibrated hand penetrometer. UCS denoted with "*" determined by ASTM D 2166.

PROJECT: OTIC MP 34.5 Bridge Widening, Fulton County, OH	**TTL Associates, Inc.**	PROJECT NO: 1580702

TABULATION OF TEST DATA

Boring Number	Sample Number	Sample Interval Depth (Feet)	Measured Standard Penetration, N_m (Blows per Foot)	Corrected Standard Penetration, N_{60} (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 (%)			ODOT Soil Classification
									Gravel	Coarse Sand	Fine Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	SS-17	73.5-75.0	10	13	16.1		1,500		14	4	8	18	56	28	14	14	A-6a (9)
	SS-18	78.5-80.0	7	9	16.9	106.4	*1,350										
B-2	SS-1	1.0-2.5	13	17	8.6				0	2	82	15	1	NON-PLASTIC			A-3a (0)
	SS-2	3.5-5.0	17	23	9.8												
	SS-3	6.0-7.5	26	35	10.2												
	SS-4	8.5-10.0	44	59	7.5												
	SS-5	13.5-15.0	65	87	14.7												
	SS-6	18.5-20.0	10	13	21.8	106.7			0	2	23	27	48	31	17	14	A-6a (10)
	SS-7	23.5-25.0	14	19	14.7		9,000										
	SS-8	28.5-30.0	15	20	12.7	114.5	*7,200		6	8	17	29	40	27	14	13	A-6a (8)
	SS-9	33.5-35.0	7	9	17.7		1,500										
	SS-10	38.5-40.0	9	12	14.1		1,000		0	4	35	53	8	23	14	9	A-4b (5)
	SS-11	43.5-45.0	8	11	18.3	105.0											
	SS-12	48.5-50.0	7	9	18.0		2,000										
	SS-13	53.5-55.0	9	12	18.5		2,000		6	5	12	27	50	31	17	14	A-6a (10)

SSR = Split-Spoon Refusal

Unconfined compressive strength (UCS) generally derived from a calibrated hand penetrometer. UCS denoted with "*" determined by ASTM D 2166.

PROJECT: OTIC MP 34.5 Bridge Widening, Fulton County, OH	**TTL Associates, Inc.**	PROJECT NO: 1580702

TABULATION OF TEST DATA

Boring Number	Sample Number	Sample Interval Depth (Feet)	Measured Standard Penetration, N_m (Blows per Foot)	Corrected Standard Penetration, N_{60} (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 (%)			ODOT Soil Classification
									Gravel	Coarse Sand	Fine Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
B-2	SS-14	58.5-60.0	9	12	17.7		2,000										
	SS-15	63.5-65.0	6	8	17.8		2,500										
	SS-16	68.5-70.0	11	15	17.8		2,000										
	SS-17	73.5-75.0	10	13	17.8		2,000										
	SS-18	78.5-80.0	13	17	17.9		2,500										

SSR = Split-Spoon Refusal

Unconfined compressive strength (UCS) generally derived from a calibrated hand penetrometer. UCS denoted with "*" determined by ASTM D 2166.

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\PROJEC~4\B1-12CIP.DVN
Project Name: MP 34.5 Bridge Widening
Project Date: 10/31/2017
Project Client: OTIC
Computed By: KCH
Project Manager:

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft Neglect contribution from fill
Diameter of Pile: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.00 ft
	- Driving/Restrike	23.00 ft
	- Ultimate:	23.00 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	8.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
2	Cohesive	9.50 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
3	Cohesionless	10.50 ft	0.00%	135.00 pcf	36.4/36.4	Nordlund
4	Cohesive	14.00 ft	0.00%	135.00 pcf	2000.00 psf	T-79 Steel
5	Cohesive	38.00 ft	0.00%	135.00 pcf	1250.00 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
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	21.39	N/A	0.04 Kips
22.99 ft	Cohesionless	2558.07 psf	21.39	N/A	23.67 Kips
23.01 ft	Cohesionless	2930.36 psf	21.39	N/A	23.77 Kips
27.99 ft	Cohesionless	3111.14 psf	21.39	N/A	49.88 Kips
28.01 ft	Cohesive	N/A	N/A	1375.12 psf	49.98 Kips
37.01 ft	Cohesive	N/A	N/A	1480.12 psf	91.83 Kips
41.99 ft	Cohesive	N/A	N/A	1515.00 psf	116.52 Kips
42.01 ft	Cohesive	N/A	N/A	1122.50 psf	116.60 Kips
51.01 ft	Cohesive	N/A	N/A	1122.50 psf	148.34 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	180.08 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	211.82 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	243.56 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	250.54 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.75	133.55 Kips	99.35 Kips
22.99 ft	Cohesionless	2928.65 psf	82.75	133.55 Kips	132.88 Kips
23.01 ft	Cohesionless	2930.73 psf	82.75	133.55 Kips	132.97 Kips
27.99 ft	Cohesionless	3292.27 psf	82.75	133.55 Kips	133.55 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.04 Kips	99.35 Kips	99.38 Kips
22.99 ft	23.67 Kips	132.88 Kips	156.54 Kips
23.01 ft	23.77 Kips	132.97 Kips	156.74 Kips
27.99 ft	49.88 Kips	133.55 Kips	183.43 Kips
28.01 ft	49.98 Kips	14.14 Kips	64.12 Kips
37.01 ft	91.83 Kips	14.14 Kips	105.97 Kips
41.99 ft	116.52 Kips	14.14 Kips	130.66 Kips
42.01 ft	116.60 Kips	8.84 Kips	125.44 Kips
51.01 ft	148.34 Kips	8.84 Kips	157.18 Kips
60.01 ft	180.08 Kips	8.84 Kips	188.92 Kips
69.01 ft	211.82 Kips	8.84 Kips	220.65 Kips
78.01 ft	243.56 Kips	8.84 Kips	252.39 Kips
79.99 ft	250.54 Kips	8.84 Kips	259.37 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	21.39	N/A	0.04 Kips
22.99 ft	Cohesionless	2558.07 psf	21.39	N/A	23.67 Kips
23.01 ft	Cohesionless	2930.36 psf	21.39	N/A	23.77 Kips
27.99 ft	Cohesionless	3111.14 psf	21.39	N/A	49.88 Kips
28.01 ft	Cohesive	N/A	N/A	1375.12 psf	49.98 Kips
37.01 ft	Cohesive	N/A	N/A	1480.12 psf	91.83 Kips
41.99 ft	Cohesive	N/A	N/A	1515.00 psf	116.52 Kips
42.01 ft	Cohesive	N/A	N/A	1122.50 psf	116.60 Kips
51.01 ft	Cohesive	N/A	N/A	1122.50 psf	148.34 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	180.08 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	211.82 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	243.56 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	250.54 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.75	133.55 Kips	99.35 Kips
22.99 ft	Cohesionless	2928.65 psf	82.75	133.55 Kips	132.88 Kips
23.01 ft	Cohesionless	2930.73 psf	82.75	133.55 Kips	132.97 Kips
27.99 ft	Cohesionless	3292.27 psf	82.75	133.55 Kips	133.55 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.04 Kips	99.35 Kips	99.38 Kips
22.99 ft	23.67 Kips	132.88 Kips	156.54 Kips
23.01 ft	23.77 Kips	132.97 Kips	156.74 Kips
27.99 ft	49.88 Kips	133.55 Kips	183.43 Kips
28.01 ft	49.98 Kips	14.14 Kips	64.12 Kips
37.01 ft	91.83 Kips	14.14 Kips	105.97 Kips
41.99 ft	116.52 Kips	14.14 Kips	130.66 Kips
42.01 ft	116.60 Kips	8.84 Kips	125.44 Kips
51.01 ft	148.34 Kips	8.84 Kips	157.18 Kips
60.01 ft	180.08 Kips	8.84 Kips	188.92 Kips
69.01 ft	211.82 Kips	8.84 Kips	220.65 Kips
78.01 ft	243.56 Kips	8.84 Kips	252.39 Kips
79.99 ft	250.54 Kips	8.84 Kips	259.37 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	21.39	N/A	0.04 Kips
22.99 ft	Cohesionless	2558.07 psf	21.39	N/A	23.67 Kips
23.01 ft	Cohesionless	2930.36 psf	21.39	N/A	23.77 Kips
27.99 ft	Cohesionless	3111.14 psf	21.39	N/A	49.88 Kips
28.01 ft	Cohesive	N/A	N/A	1375.12 psf	49.98 Kips
37.01 ft	Cohesive	N/A	N/A	1480.12 psf	91.83 Kips
41.99 ft	Cohesive	N/A	N/A	1515.00 psf	116.52 Kips
42.01 ft	Cohesive	N/A	N/A	1122.50 psf	116.60 Kips
51.01 ft	Cohesive	N/A	N/A	1122.50 psf	148.34 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	180.08 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	211.82 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	243.56 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	250.54 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.75	133.55 Kips	99.35 Kips
22.99 ft	Cohesionless	2928.65 psf	82.75	133.55 Kips	132.88 Kips
23.01 ft	Cohesionless	2930.73 psf	82.75	133.55 Kips	132.97 Kips
27.99 ft	Cohesionless	3292.27 psf	82.75	133.55 Kips	133.55 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips

OTIC MP 34.5 Bridge Widening
12" Diameter CIP
Boring B-1

ULTIMATE - SUMMARY OF CAPACITIES

Depth (GSE = Elev. 806)	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.04 Kips	99.35 Kips	99.38 Kips
22.99 ft	23.67 Kips	132.88 Kips	156.54 Kips
23.01 ft	23.77 Kips	132.97 Kips	156.74 Kips
27.99 ft	49.88 Kips	133.55 Kips	183.43 Kips
28.01 ft	49.98 Kips	14.14 Kips	64.12 Kips ← C @ 35.72 ft Elev. 770±
37.01 ft	91.83 Kips	14.14 Kips	105.97 Kips
41.99 ft	116.52 Kips	14.14 Kips	130.66 Kips
42.01 ft	116.60 Kips	8.84 Kips	125.44 Kips ← B @ 48.97 ft Elev. 757±
51.01 ft	148.34 Kips	8.84 Kips	157.18 Kips
60.01 ft	180.08 Kips	8.84 Kips	188.92 Kips ← A @ 63.15 ft Elev. 743±
69.01 ft	211.82 Kips	8.84 Kips	220.65 Kips
78.01 ft	243.56 Kips	8.84 Kips	252.39 Kips
79.99 ft	250.54 Kips	8.84 Kips	259.37 Kips

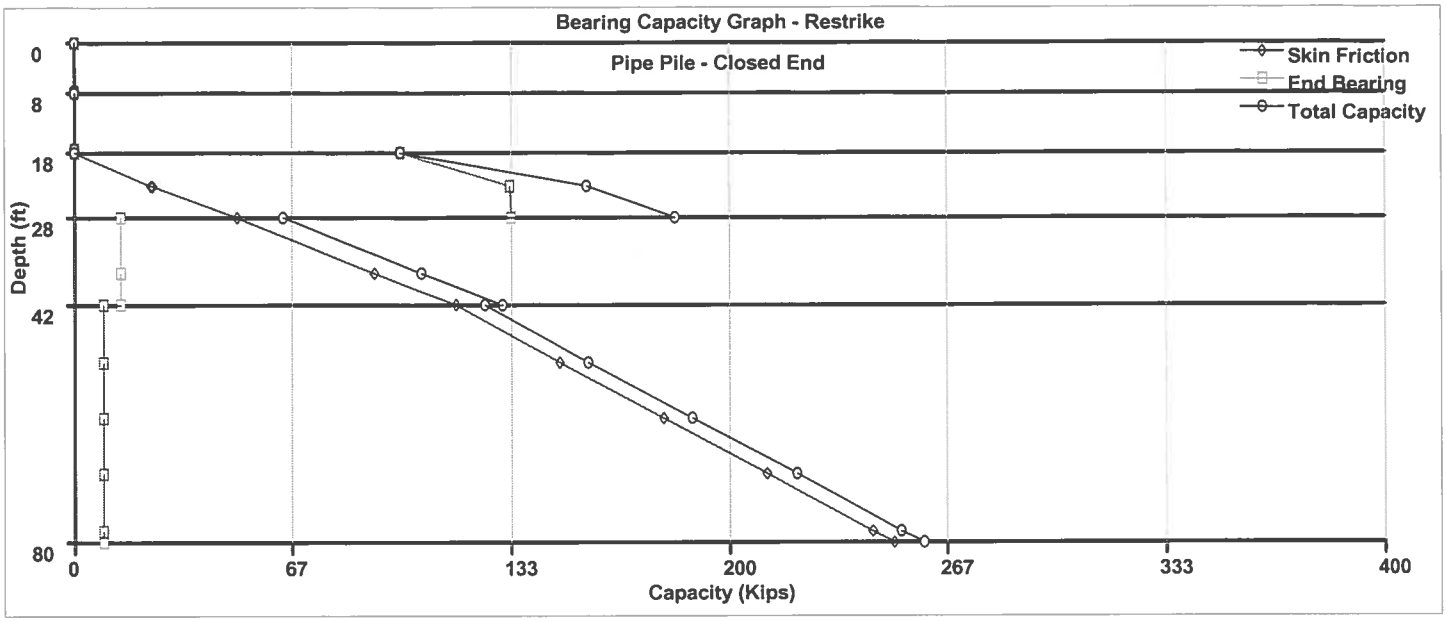
Temporary Bridge Structure Abutments - LRFD

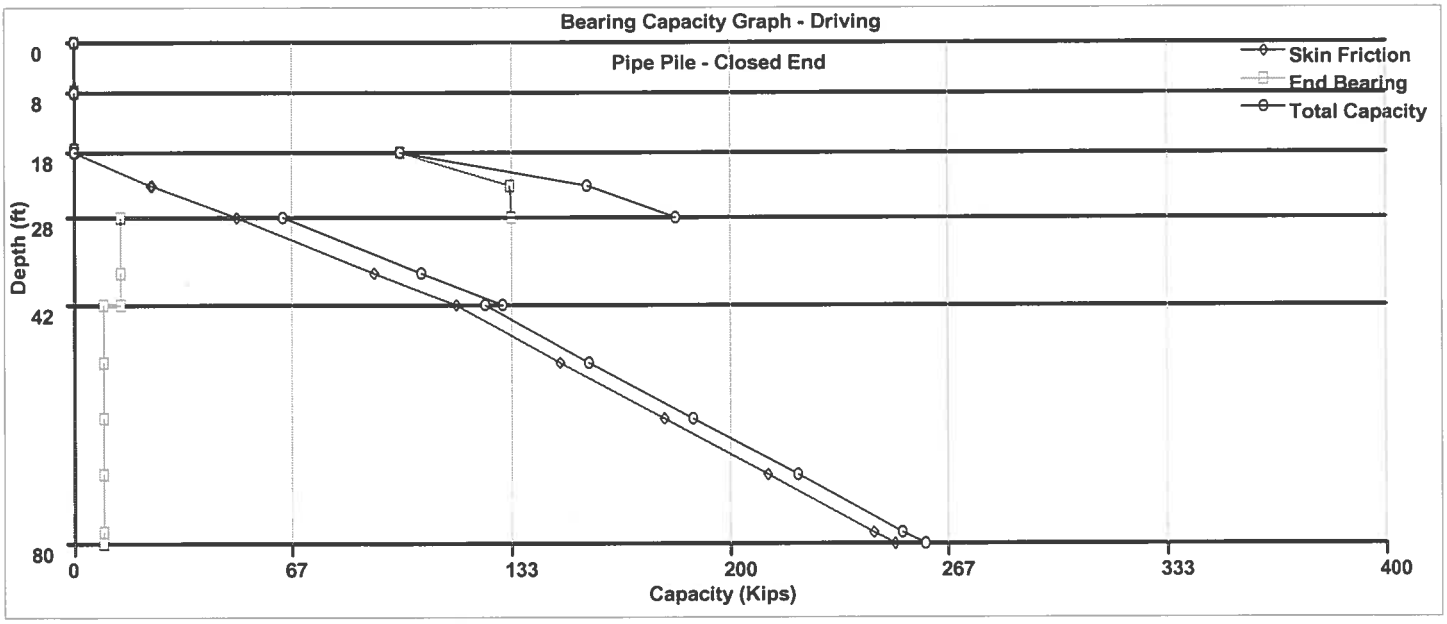
Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	R_{ndr} Max (kips)	Max TFL (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)
West (Rear) Abutment	B-1	805	807	330	231	> Bottom of Boring	

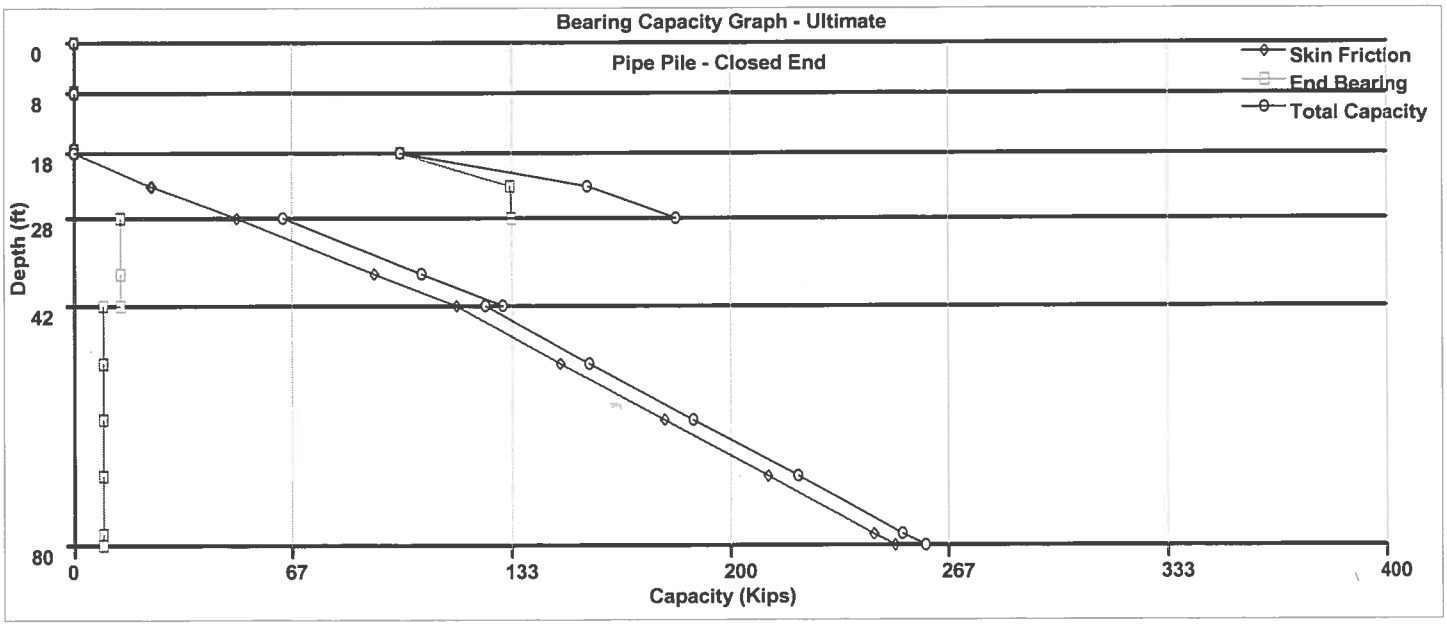
→ Cutoff - Elev. of capacity

Existing Bridge Structure Abutments - ASD

Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	ASD Ultimate Bearing Value (kips) or R_{ndr} for LRFD	ASD Unfactored Design Load (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)	LRFD TFL (Kips)
West (Rear) Abutment	B-1	805	807	A. 200	100	65	70	140
				B. 150	75	50	55	105
				C. 100	50	40	45	70
		798	800	A. 200	100	60	65	140
				B. 150	75	45	50	105
				C. 100	50	30	35	70


Bearing Capacity Graph - Restrike
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
67
133
200
267
333
400
Capacity (Kips)


Bearing Capacity Graph - Driving
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
67
133
200
267
333
400
Capacity (Kips)


Bearing Capacity Graph - Ultimate
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
67
133
200
267
333
400
Capacity (Kips)

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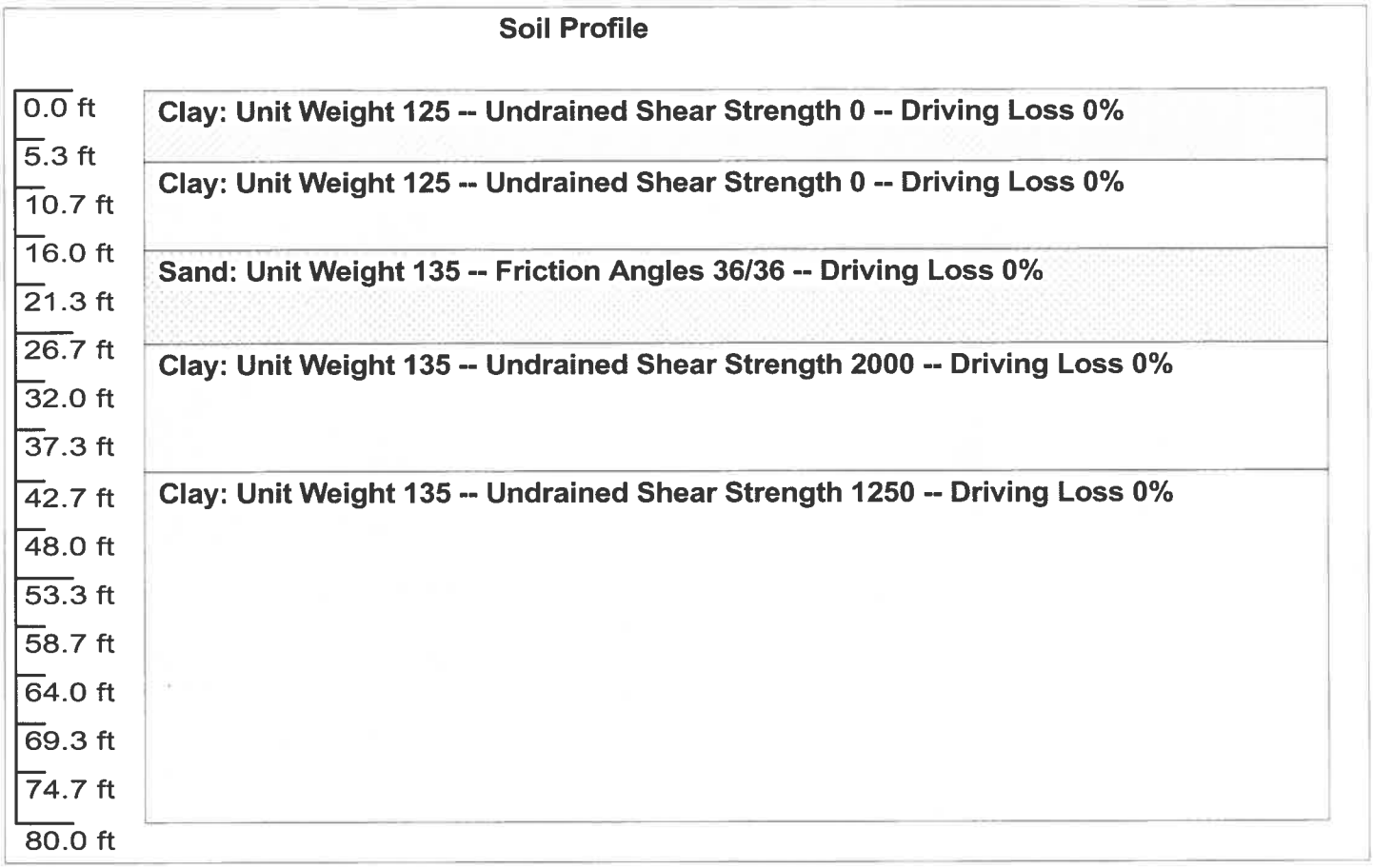


DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\PROJEC~4\B1-14CIP.DVN
Project Name: MP 34.5 Bridge Widening
Project Date: 10/31/2017
Project Client: OTIC
Computed By: KCH
Project Manager:

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft Neglect contribution from fill
Diameter of Pile: 14.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.00 ft
	- Driving/Restrike	23.00 ft
	- Ultimate:	23.00 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	8.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
2	Cohesive	9.50 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
3	Cohesionless	10.50 ft	0.00%	135.00 pcf	36.4/36.4	Nordlund
4	Cohesive	14.00 ft	0.00%	135.00 pcf	2000.00 psf	T-79 Steel
5	Cohesive	38.00 ft	0.00%	135.00 pcf	1250.00 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
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	24.25	N/A	0.06 Kips
22.99 ft	Cohesionless	2558.07 psf	24.25	N/A	35.64 Kips
23.01 ft	Cohesionless	2930.36 psf	24.25	N/A	35.79 Kips
27.99 ft	Cohesionless	3111.14 psf	24.25	N/A	75.11 Kips
28.01 ft	Cohesive	N/A	N/A	1328.43 psf	75.25 Kips
37.01 ft	Cohesive	N/A	N/A	1418.43 psf	122.04 Kips
41.99 ft	Cohesive	N/A	N/A	1468.23 psf	150.48 Kips
42.01 ft	Cohesive	N/A	N/A	1096.89 psf	150.58 Kips
51.01 ft	Cohesive	N/A	N/A	1122.50 psf	187.61 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	224.64 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	261.66 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	298.69 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	306.84 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.77	181.87 Kips	135.26 Kips
22.99 ft	Cohesionless	2928.65 psf	82.77	181.87 Kips	180.97 Kips
23.01 ft	Cohesionless	2930.73 psf	82.77	181.87 Kips	181.10 Kips
27.99 ft	Cohesionless	3292.27 psf	82.77	181.87 Kips	181.87 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips

RESTRIKE - SUMMARY OF CAPACITIES

OTIC MP 34.5 Bridge Widening
14" Diameter CIP
Boring B-1

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.06 Kips	135.26 Kips	135.31 Kips
22.99 ft	35.64 Kips	180.97 Kips	216.61 Kips
23.01 ft	35.79 Kips	181.10 Kips	216.89 Kips
27.99 ft	75.11 Kips	181.87 Kips	256.98 Kips
28.01 ft	75.25 Kips	19.24 Kips	94.49 Kips
37.01 ft	122.04 Kips	19.24 Kips	141.28 Kips
41.99 ft	150.48 Kips	19.24 Kips	169.72 Kips
42.01 ft	150.58 Kips	12.03 Kips	162.61 Kips
51.01 ft	187.61 Kips	12.03 Kips	199.64 Kips
60.01 ft	224.64 Kips	12.03 Kips	236.66 Kips
69.01 ft	261.66 Kips	12.03 Kips	273.69 Kips
78.01 ft	298.69 Kips	12.03 Kips	310.72 Kips
79.99 ft	306.84 Kips	12.03 Kips	318.86 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	24.25	N/A	0.06 Kips
22.99 ft	Cohesionless	2558.07 psf	24.25	N/A	35.64 Kips
23.01 ft	Cohesionless	2930.36 psf	24.25	N/A	35.79 Kips
27.99 ft	Cohesionless	3111.14 psf	24.25	N/A	75.11 Kips
28.01 ft	Cohesive	N/A	N/A	1328.43 psf	75.25 Kips
37.01 ft	Cohesive	N/A	N/A	1418.43 psf	122.04 Kips
41.99 ft	Cohesive	N/A	N/A	1468.23 psf	150.48 Kips
42.01 ft	Cohesive	N/A	N/A	1096.89 psf	150.58 Kips
51.01 ft	Cohesive	N/A	N/A	1122.50 psf	187.61 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	224.64 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	261.66 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	298.69 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	306.84 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.77	181.87 Kips	135.26 Kips
22.99 ft	Cohesionless	2928.65 psf	82.77	181.87 Kips	180.97 Kips
23.01 ft	Cohesionless	2930.73 psf	82.77	181.87 Kips	181.10 Kips
27.99 ft	Cohesionless	3292.27 psf	82.77	181.87 Kips	181.87 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.06 Kips	135.26 Kips	135.31 Kips
22.99 ft	35.64 Kips	180.97 Kips	216.61 Kips
23.01 ft	35.79 Kips	181.10 Kips	216.89 Kips
27.99 ft	75.11 Kips	181.87 Kips	256.98 Kips
28.01 ft	75.25 Kips	19.24 Kips	94.49 Kips
37.01 ft	122.04 Kips	19.24 Kips	141.28 Kips
41.99 ft	150.48 Kips	19.24 Kips	169.72 Kips
42.01 ft	150.58 Kips	12.03 Kips	162.61 Kips
51.01 ft	187.61 Kips	12.03 Kips	199.64 Kips
60.01 ft	224.64 Kips	12.03 Kips	236.66 Kips
69.01 ft	261.66 Kips	12.03 Kips	273.69 Kips
78.01 ft	298.69 Kips	12.03 Kips	310.72 Kips
79.99 ft	306.84 Kips	12.03 Kips	318.86 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	24.25	N/A	0.06 Kips
22.99 ft	Cohesionless	2558.07 psf	24.25	N/A	35.64 Kips
23.01 ft	Cohesionless	2930.36 psf	24.25	N/A	35.79 Kips
27.99 ft	Cohesionless	3111.14 psf	24.25	N/A	75.11 Kips
28.01 ft	Cohesive	N/A	N/A	1328.43 psf	75.25 Kips
37.01 ft	Cohesive	N/A	N/A	1418.43 psf	122.04 Kips
41.99 ft	Cohesive	N/A	N/A	1468.23 psf	150.48 Kips
42.01 ft	Cohesive	N/A	N/A	1096.89 psf	150.58 Kips
51.01 ft	Cohesive	N/A	N/A	1122.50 psf	187.61 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	224.64 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	261.66 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	298.69 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	306.84 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.77	181.87 Kips	135.26 Kips
22.99 ft	Cohesionless	2928.65 psf	82.77	181.87 Kips	180.97 Kips
23.01 ft	Cohesionless	2930.73 psf	82.77	181.87 Kips	181.10 Kips
27.99 ft	Cohesionless	3292.27 psf	82.77	181.87 Kips	181.87 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth GSE = Elev. 806	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.06 Kips	135.26 Kips	135.31 Kips
22.99 ft	35.64 Kips	180.97 Kips	216.61 Kips
23.01 ft	35.79 Kips	181.10 Kips	216.89 Kips
27.99 ft	75.11 Kips	181.87 Kips	256.98 Kips
28.01 ft	75.25 Kips	19.24 Kips	94.49 Kips ← E @ 29.07 ft (Elev 777±)
37.01 ft	122.04 Kips	19.24 Kips	141.28 Kips
41.99 ft	150.48 Kips	19.24 Kips	169.72 Kips ← D @ 38.53 ft (Elev 767±)
42.01 ft	150.58 Kips	12.03 Kips	162.61 Kips
51.01 ft	187.61 Kips	12.03 Kips	199.64 Kips ← C @ 51.10 ft (Elev. 755±)
60.01 ft	224.64 Kips	12.03 Kips	236.66 Kips ← B @ 63.25 ft (Elev. 743±)
69.01 ft	261.66 Kips	12.03 Kips	273.69 Kips ← A @ 70.54 ft (Elev. 735±)
78.01 ft	298.69 Kips	12.03 Kips	310.72 Kips
79.99 ft	306.84 Kips	12.03 Kips	318.86 Kips

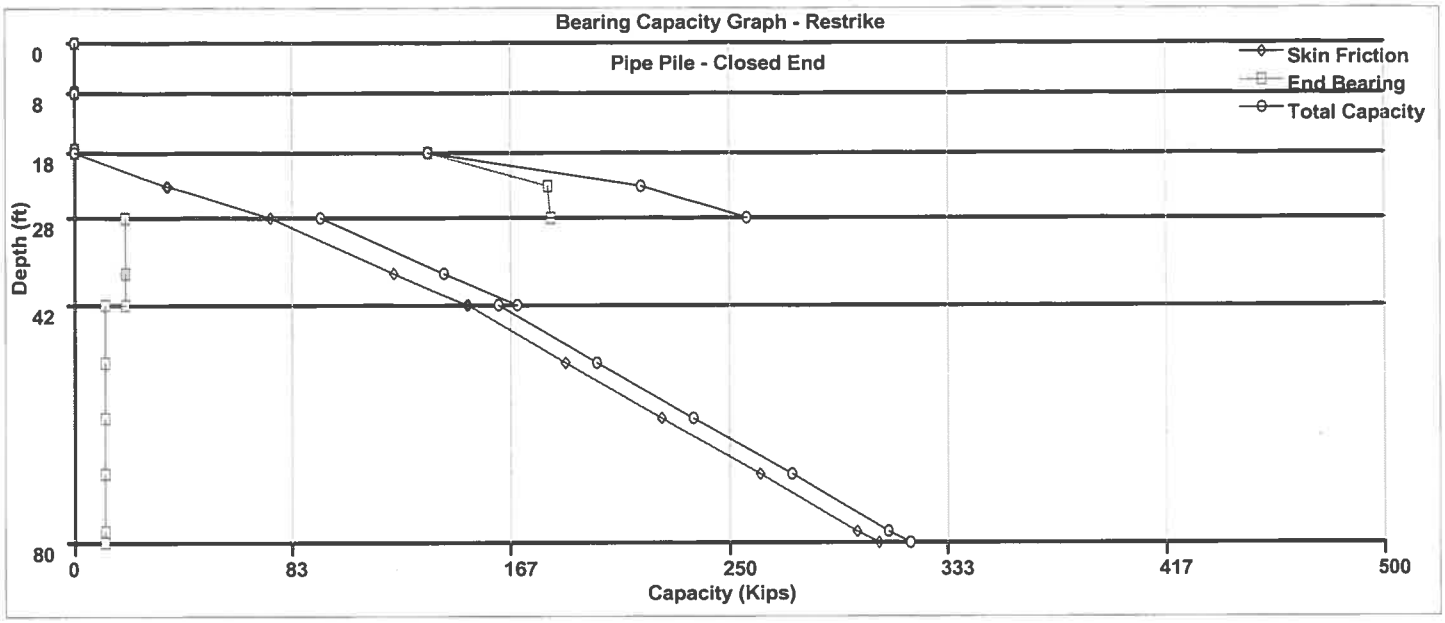
Temporary Bridge Structure Abutments - LRFD

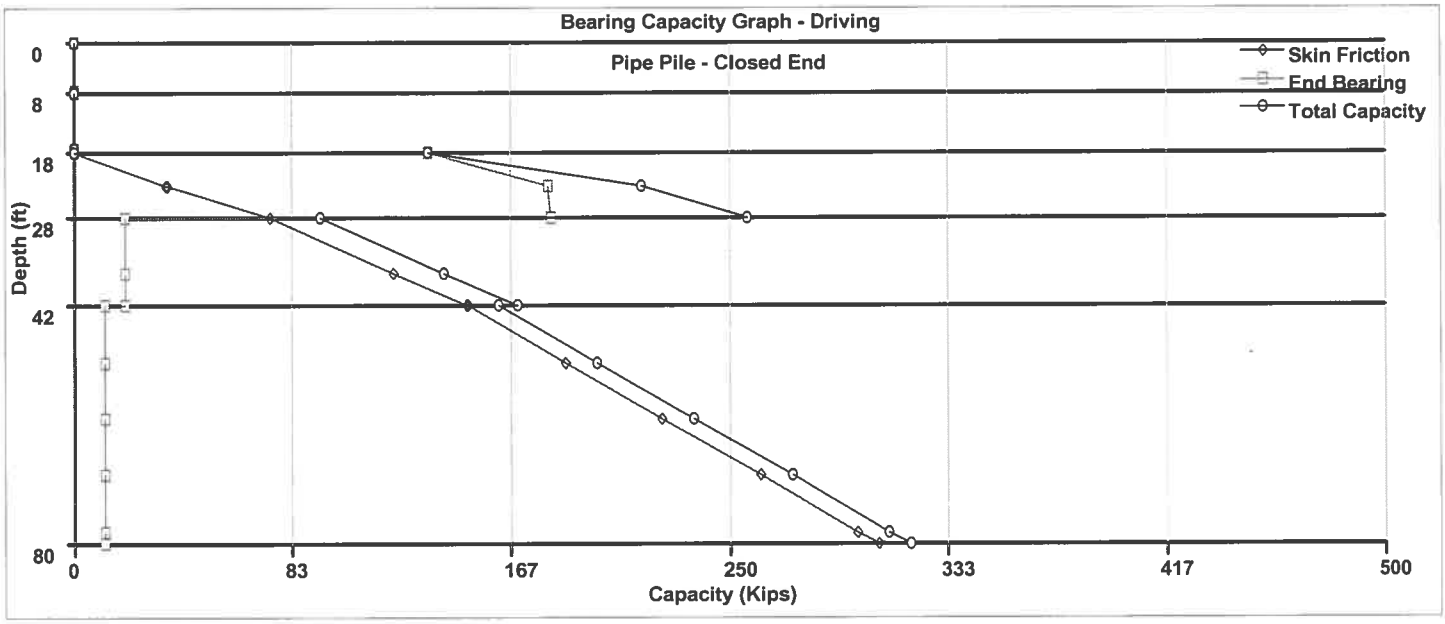
Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	R_{ndr} Max (kips)	Max TFL (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)
West (Rear) Abutment	B-1	805	807	390	273	> Bottom of Boring	

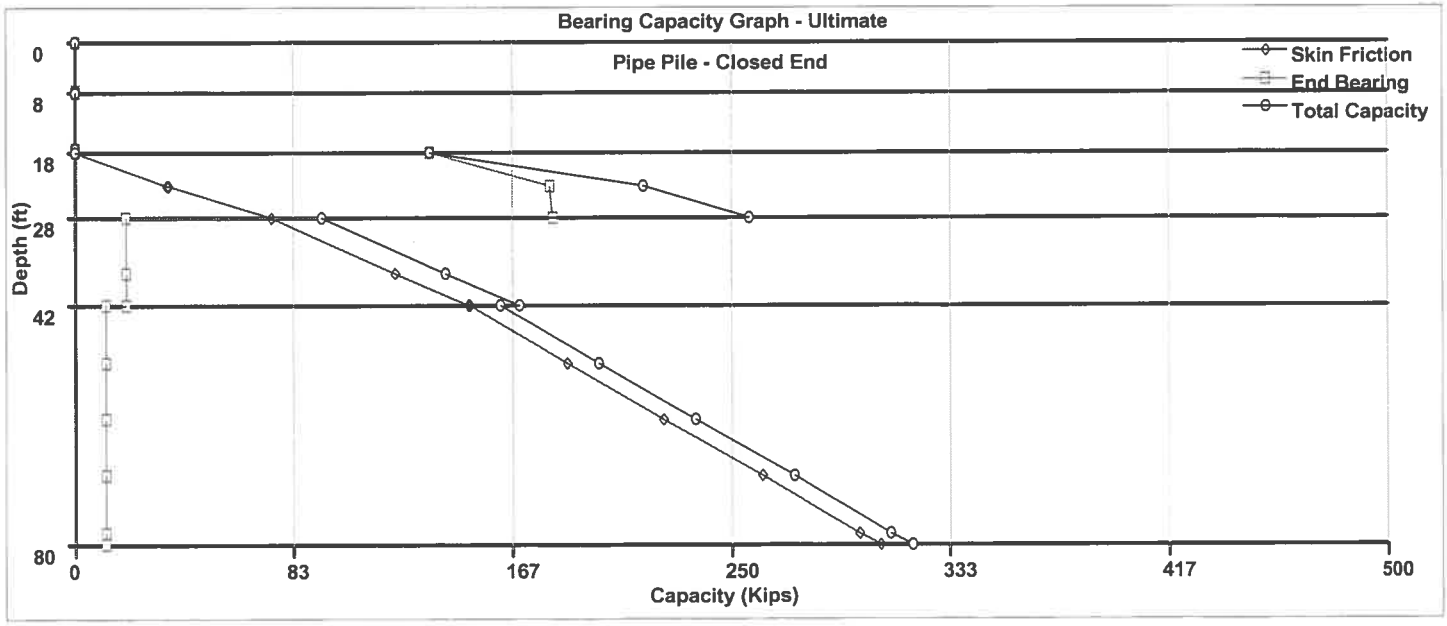
→ Cutoff Elev. − Elev of Capacity

Existing Bridge Structure Abutments - ASD

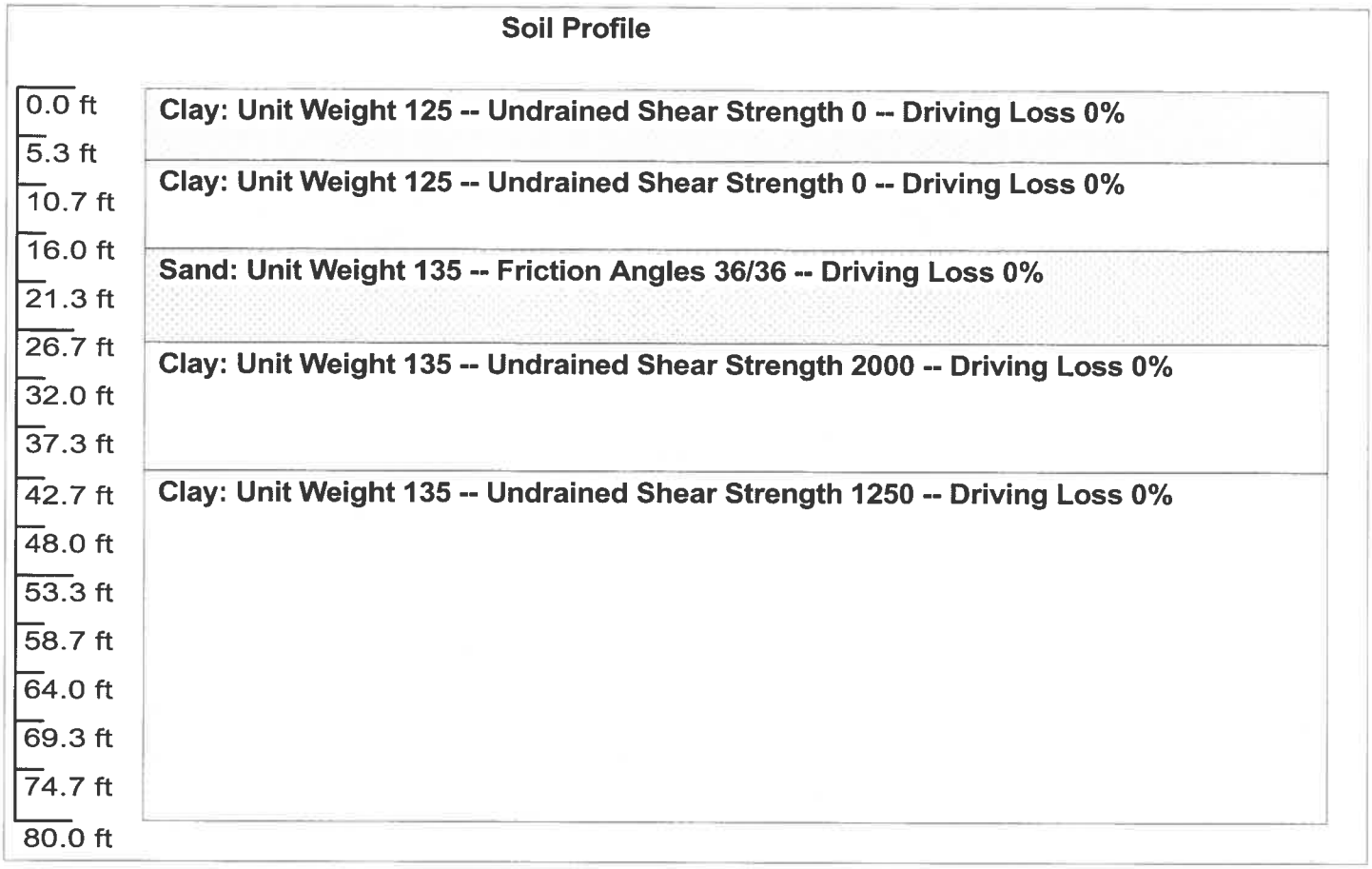
Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	ASD Ultimate Bearing Value (kips) or LFFD R_{ndr}	ASD Unfactored Design Load (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)	LRFD TFL (kips)
West (Rear) Abutment	B-1	805	807	A. 280	140	75	80	196
				B. 250	125	65	70	175
				C. 200	100	55	60	140
				D. 150	75	40	45	105
				E. 100	50	30	35	70
		798	800	A. 280	140	65	70	196
				B. 250	125	60	65	175
				C. 200	100	45	50	140
				D. 150	75	35	40	105
				E 100	50	25	30	70


Bearing Capacity Graph - Restrike
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
83
167
250
333
417
500
Capacity (Kips)


Bearing Capacity Graph - Driving
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
83
167
250
333
417
500
Capacity (Kips)


Bearing Capacity Graph - Ultimate
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
83
167
250
333
417
500
Capacity (Kips)

Filename: T:\GEOTECH\PROJEC~4\B1-14CIP.DVN



DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\PROJEC~4\B1-16CIP.DVN
Project Name: MP 34.5 Bridge Widening
Project Date: 10/31/2017
Project Client: OTIC
Computed By: KCH
Project Manager:

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft Neglect contribution from fill
Diameter of Pile: 16.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.00 ft
	- Driving/Restrike	23.00 ft
	- Ultimate:	23.00 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	8.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
2	Cohesive	9.50 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
3	Cohesionless	10.50 ft	0.00%	135.00 pcf	36.4/36.4	Nordlund
4	Cohesive	14.00 ft	0.00%	135.00 pcf	2000.00 psf	T-79 Steel
5	Cohesive	38.00 ft	0.00%	135.00 pcf	1250.00 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
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	26.64	N/A	0.08 Kips
22.99 ft	Cohesionless	2558.07 psf	26.64	N/A	49.64 Kips
23.01 ft	Cohesionless	2930.36 psf	26.64	N/A	49.84 Kips
27.99 ft	Cohesionless	3111.14 psf	26.64	N/A	104.61 Kips
28.01 ft	Cohesive	N/A	N/A	1293.42 psf	104.78 Kips
37.01 ft	Cohesive	N/A	N/A	1372.17 psf	156.51 Kips
41.99 ft	Cohesive	N/A	N/A	1415.75 psf	187.69 Kips
42.01 ft	Cohesive	N/A	N/A	1068.01 psf	187.80 Kips
51.01 ft	Cohesive	N/A	N/A	1111.32 psf	229.70 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	272.44 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	314.75 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	357.07 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	366.38 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.77	237.55 Kips	176.66 Kips
22.99 ft	Cohesionless	2928.65 psf	82.77	237.55 Kips	236.37 Kips
23.01 ft	Cohesionless	2930.73 psf	82.77	237.55 Kips	236.54 Kips
27.99 ft	Cohesionless	3292.27 psf	82.77	237.55 Kips	237.55 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	15.71 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.08 Kips	176.66 Kips	176.74 Kips
22.99 ft	49.64 Kips	236.37 Kips	286.01 Kips
23.01 ft	49.84 Kips	236.54 Kips	286.39 Kips
27.99 ft	104.61 Kips	237.55 Kips	342.16 Kips
28.01 ft	104.78 Kips	25.13 Kips	129.91 Kips
37.01 ft	156.51 Kips	25.13 Kips	181.65 Kips
41.99 ft	187.69 Kips	25.13 Kips	212.82 Kips
42.01 ft	187.80 Kips	15.71 Kips	203.51 Kips
51.01 ft	229.70 Kips	15.71 Kips	245.41 Kips
60.01 ft	272.44 Kips	15.71 Kips	288.14 Kips
69.01 ft	314.75 Kips	15.71 Kips	330.46 Kips
78.01 ft	357.07 Kips	15.71 Kips	372.78 Kips
79.99 ft	366.38 Kips	15.71 Kips	382.09 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	26.64	N/A	0.08 Kips
22.99 ft	Cohesionless	2558.07 psf	26.64	N/A	49.64 Kips
23.01 ft	Cohesionless	2930.36 psf	26.64	N/A	49.84 Kips
27.99 ft	Cohesionless	3111.14 psf	26.64	N/A	104.61 Kips
28.01 ft	Cohesive	N/A	N/A	1293.42 psf	104.78 Kips
37.01 ft	Cohesive	N/A	N/A	1372.17 psf	156.51 Kips
41.99 ft	Cohesive	N/A	N/A	1415.75 psf	187.69 Kips
42.01 ft	Cohesive	N/A	N/A	1068.01 psf	187.80 Kips
51.01 ft	Cohesive	N/A	N/A	1111.32 psf	229.70 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	272.44 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	314.75 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	357.07 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	366.38 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.77	237.55 Kips	176.66 Kips
22.99 ft	Cohesionless	2928.65 psf	82.77	237.55 Kips	236.37 Kips
23.01 ft	Cohesionless	2930.73 psf	82.77	237.55 Kips	236.54 Kips
27.99 ft	Cohesionless	3292.27 psf	82.77	237.55 Kips	237.55 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	15.71 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.08 Kips	176.66 Kips	176.74 Kips
22.99 ft	49.64 Kips	236.37 Kips	286.01 Kips
23.01 ft	49.84 Kips	236.54 Kips	286.39 Kips
27.99 ft	104.61 Kips	237.55 Kips	342.16 Kips
28.01 ft	104.78 Kips	25.13 Kips	129.91 Kips
37.01 ft	156.51 Kips	25.13 Kips	181.65 Kips
41.99 ft	187.69 Kips	25.13 Kips	212.82 Kips
42.01 ft	187.80 Kips	15.71 Kips	203.51 Kips
51.01 ft	229.70 Kips	15.71 Kips	245.41 Kips
60.01 ft	272.44 Kips	15.71 Kips	288.14 Kips
69.01 ft	314.75 Kips	15.71 Kips	330.46 Kips
78.01 ft	357.07 Kips	15.71 Kips	372.78 Kips
79.99 ft	366.38 Kips	15.71 Kips	382.09 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	26.64	N/A	0.08 Kips
22.99 ft	Cohesionless	2558.07 psf	26.64	N/A	49.64 Kips
23.01 ft	Cohesionless	2930.36 psf	26.64	N/A	49.84 Kips
27.99 ft	Cohesionless	3111.14 psf	26.64	N/A	104.61 Kips
28.01 ft	Cohesive	N/A	N/A	1293.42 psf	104.78 Kips
37.01 ft	Cohesive	N/A	N/A	1372.17 psf	156.51 Kips
41.99 ft	Cohesive	N/A	N/A	1415.75 psf	187.69 Kips
42.01 ft	Cohesive	N/A	N/A	1068.01 psf	187.80 Kips
51.01 ft	Cohesive	N/A	N/A	1111.32 psf	229.70 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	272.44 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	314.75 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	357.07 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	366.38 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.77	237.55 Kips	176.66 Kips
22.99 ft	Cohesionless	2928.65 psf	82.77	237.55 Kips	236.37 Kips
23.01 ft	Cohesionless	2930.73 psf	82.77	237.55 Kips	236.54 Kips
27.99 ft	Cohesionless	3292.27 psf	82.77	237.55 Kips	237.55 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	15.71 Kips

OTIC MP 34.5 Bridge Widening
16" Diameter CIP
Boring B-1

ULTIMATE - SUMMARY OF CAPACITIES

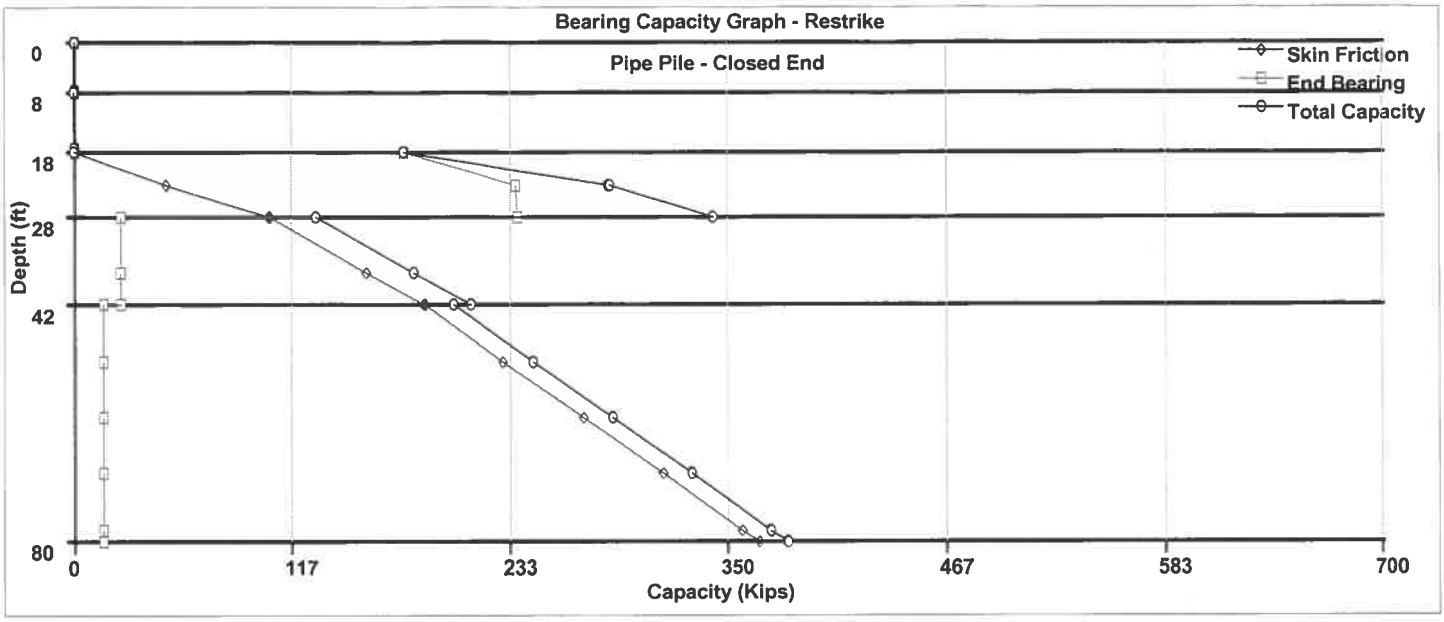
Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft GSE = Elev. 806	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.08 Kips	176.66 Kips	176.74 Kips
22.99 ft	49.64 Kips	236.37 Kips	286.01 Kips
23.01 ft	49.84 Kips	236.54 Kips	286.39 Kips
27.99 ft	104.61 Kips	237.55 Kips	342.16 Kips
28.01 ft	104.78 Kips	25.13 Kips	129.91 Kips ← E @ 31.40 ft (Elev. 775±)
37.01 ft	156.51 Kips	25.13 Kips	181.65 Kips
41.99 ft	187.69 Kips	25.13 Kips	212.82 Kips ← D @ 42 ft (Elev. 764±)
42.01 ft	187.80 Kips	15.71 Kips	203.51 Kips
51.01 ft	229.70 Kips	15.71 Kips	245.41 Kips ← C @ 51.98 ft (Elev. 754±)
60.01 ft	272.44 Kips	15.71 Kips	288.14 Kips ← B @ 62.53 ft (Elev. 743±)
69.01 ft	314.75 Kips	15.71 Kips	330.46 Kips ← A @ 75.29 ft (Elev. 731±)
78.01 ft	357.07 Kips	15.71 Kips	372.78 Kips
79.99 ft	366.38 Kips	15.71 Kips	382.09 Kips

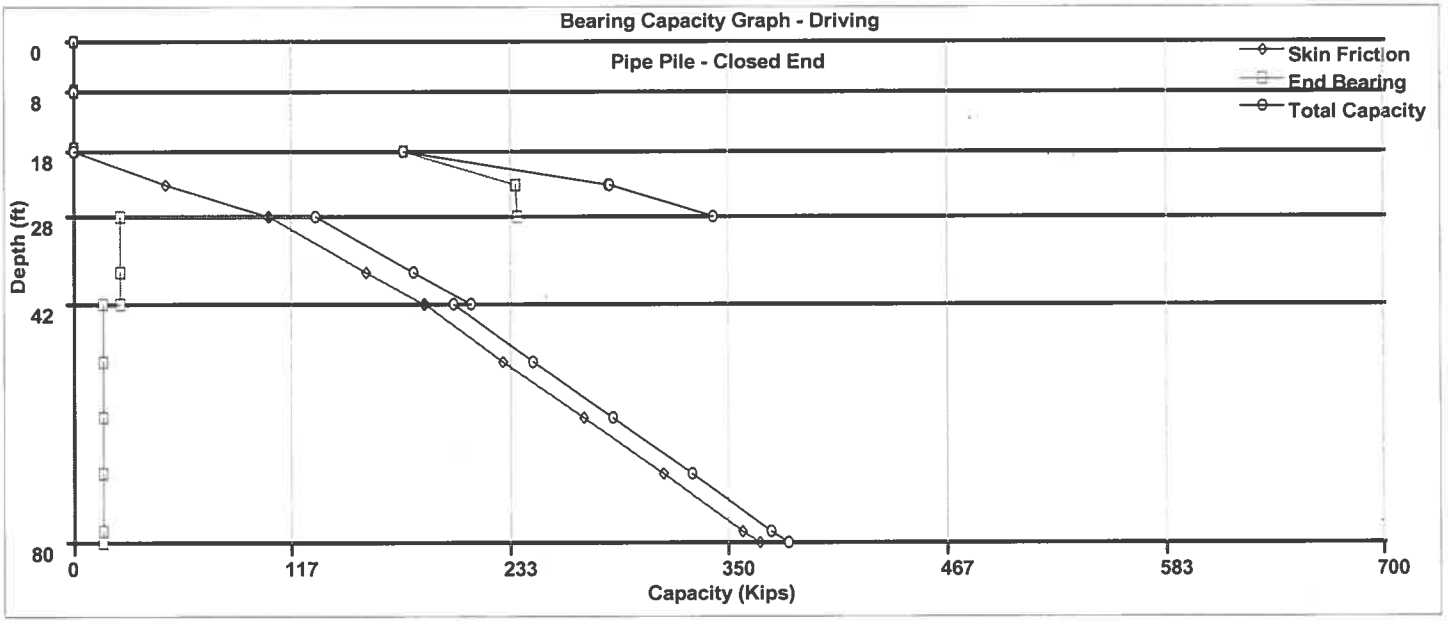
Temporary Bridge Structure Abutments - LRFD

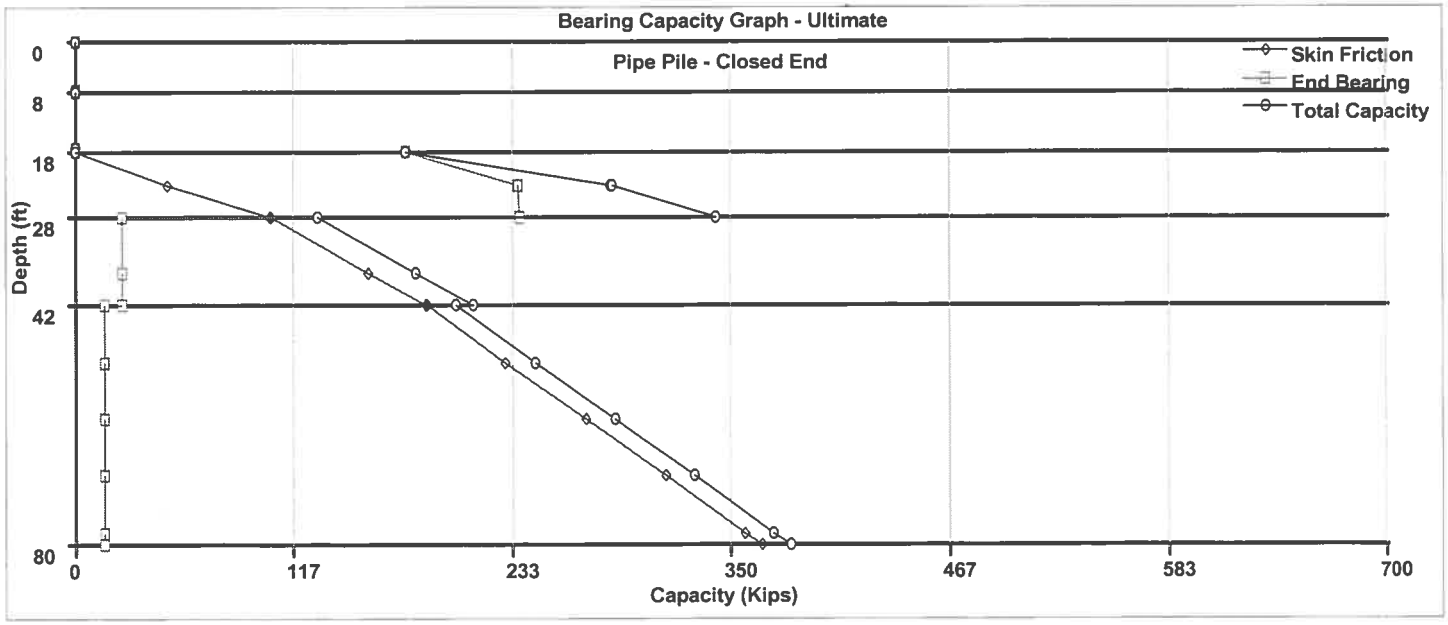
Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	R_{ndr} Max (kips)	Max TFL (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)
West (Rear) Abutment	B-1	805	807	450	315	> Bottom of Boring	

Existing Bridge Structure Abutments - ASD

Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	ASD Ultimate Bearing Value (kips) or R_{ndr} LRFD	ASD Unfactored Design Load (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)	LRFD TFL
West (Rear) Abutment	B-1	805	807	A. 360	180	80	85	252
				B. 300	150	65	70	210
				C. 250	125	55	60	175
				D. 200	100	45	50	140
				E. 150	75	35	40	105
		798	800	A. 360	180	70	75	252
				B. 300	150	60	65	210
				C. 250	125	45	50	175
				D. 200	100	40	45	140
				E. 150	75	25	30	105


Bearing Capacity Graph - Restrike
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
117
233
350
467
583
700
Capacity (Kips)


Bearing Capacity Graph - Driving
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
117
233
350
467
583
700
Capacity (Kips)


Bearing Capacity Graph - Ultimate
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
117
233
350
467
583
700
Capacity (Kips)

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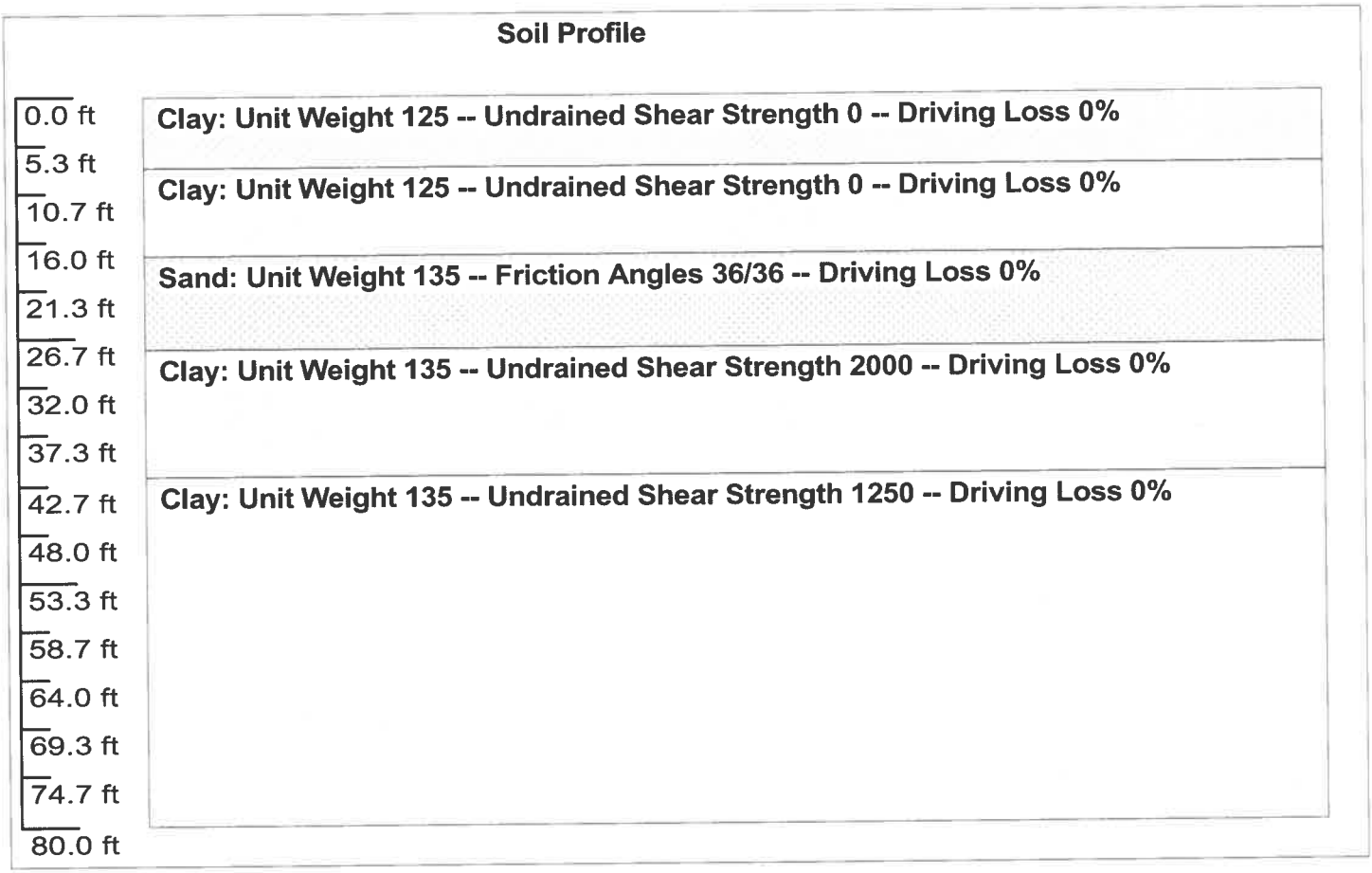


DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\PROJEC~4\B1NOFILL.DVN
Project Name: MP 34.5 Bridge Widening
Project Client: OTIC
Computed By: KCH
Project Manager:

Project Date: 10/31/2017

PILE INFORMATION

Pile Type: H Pile - HP10X42
Top of Pile: 0.00 ft Neglect Contribution From fill
Perimeter Analysis: Box
Tip Analysis: Box Area

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.00 ft
	- Driving/Restrike	23.00 ft
	- Ultimate:	23.00 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	8.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
2	Cohesive	9.50 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
3	Cohesionless	10.50 ft	0.00%	135.00 pcf	36.4/36.4	Nordlund
4	Cohesive	14.00 ft	0.00%	135.00 pcf	2000.00 psf	T-79 Steel
5	Cohesive	38.00 ft	0.00%	135.00 pcf	1250.00 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
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	26.67	N/A	0.04 Kips
22.99 ft	Cohesionless	2558.07 psf	26.67	N/A	23.04 Kips
23.01 ft	Cohesionless	2930.36 psf	26.67	N/A	23.14 Kips
27.99 ft	Cohesionless	3111.14 psf	26.67	N/A	48.56 Kips
28.01 ft	Cohesive	N/A	N/A	1437.55 psf	48.66 Kips
37.01 ft	Cohesive	N/A	N/A	1515.00 psf	93.60 Kips
41.99 ft	Cohesive	N/A	N/A	1515.00 psf	118.47 Kips
42.01 ft	Cohesive	N/A	N/A	1122.50 psf	118.56 Kips
51.01 ft	Cohesive	N/A	N/A	1122.50 psf	151.85 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	185.15 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	218.45 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	251.74 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	259.07 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.77	115.46 Kips	85.86 Kips
22.99 ft	Cohesionless	2928.65 psf	82.77	115.46 Kips	114.80 Kips
23.01 ft	Cohesionless	2930.73 psf	82.77	115.46 Kips	114.88 Kips
27.99 ft	Cohesionless	3292.27 psf	82.77	115.46 Kips	115.46 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	7.64 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.04 Kips	85.86 Kips	85.90 Kips
22.99 ft	23.04 Kips	114.80 Kips	137.84 Kips
23.01 ft	23.14 Kips	114.88 Kips	138.02 Kips
27.99 ft	48.56 Kips	115.46 Kips	164.03 Kips
28.01 ft	48.66 Kips	12.22 Kips	60.88 Kips
37.01 ft	93.60 Kips	12.22 Kips	105.82 Kips
41.99 ft	118.47 Kips	12.22 Kips	130.69 Kips
42.01 ft	118.56 Kips	7.64 Kips	126.19 Kips
51.01 ft	151.85 Kips	7.64 Kips	159.49 Kips
60.01 ft	185.15 Kips	7.64 Kips	192.79 Kips
69.01 ft	218.45 Kips	7.64 Kips	226.08 Kips
78.01 ft	251.74 Kips	7.64 Kips	259.38 Kips
79.99 ft	259.07 Kips	7.64 Kips	266.70 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	26.67	N/A	0.04 Kips
22.99 ft	Cohesionless	2558.07 psf	26.67	N/A	23.04 Kips
23.01 ft	Cohesionless	2930.36 psf	26.67	N/A	23.14 Kips
27.99 ft	Cohesionless	3111.14 psf	26.67	N/A	48.56 Kips
28.01 ft	Cohesive	N/A	N/A	1437.55 psf	48.66 Kips
37.01 ft	Cohesive	N/A	N/A	1515.00 psf	93.60 Kips
41.99 ft	Cohesive	N/A	N/A	1515.00 psf	118.47 Kips
42.01 ft	Cohesive	N/A	N/A	1122.50 psf	118.56 Kips
51.01 ft	Cohesive	N/A	N/A	1122.50 psf	151.85 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	185.15 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	218.45 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	251.74 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	259.07 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.77	115.46 Kips	85.86 Kips
22.99 ft	Cohesionless	2928.65 psf	82.77	115.46 Kips	114.80 Kips
23.01 ft	Cohesionless	2930.73 psf	82.77	115.46 Kips	114.88 Kips
27.99 ft	Cohesionless	3292.27 psf	82.77	115.46 Kips	115.46 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	7.64 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.04 Kips	85.86 Kips	85.90 Kips
22.99 ft	23.04 Kips	114.80 Kips	137.84 Kips
23.01 ft	23.14 Kips	114.88 Kips	138.02 Kips
27.99 ft	48.56 Kips	115.46 Kips	164.03 Kips
28.01 ft	48.66 Kips	12.22 Kips	60.88 Kips
37.01 ft	93.60 Kips	12.22 Kips	105.82 Kips
41.99 ft	118.47 Kips	12.22 Kips	130.69 Kips
42.01 ft	118.56 Kips	7.64 Kips	126.19 Kips
51.01 ft	151.85 Kips	7.64 Kips	159.49 Kips
60.01 ft	185.15 Kips	7.64 Kips	192.79 Kips
69.01 ft	218.45 Kips	7.64 Kips	226.08 Kips
78.01 ft	251.74 Kips	7.64 Kips	259.38 Kips
79.99 ft	259.07 Kips	7.64 Kips	266.70 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
17.51 ft	Cohesionless	2188.18 psf	26.67	N/A	0.04 Kips
22.99 ft	Cohesionless	2558.07 psf	26.67	N/A	23.04 Kips
23.01 ft	Cohesionless	2930.36 psf	26.67	N/A	23.14 Kips
27.99 ft	Cohesionless	3111.14 psf	26.67	N/A	48.56 Kips
28.01 ft	Cohesive	N/A	N/A	1437.55 psf	48.66 Kips
37.01 ft	Cohesive	N/A	N/A	1515.00 psf	93.60 Kips
41.99 ft	Cohesive	N/A	N/A	1515.00 psf	118.47 Kips
42.01 ft	Cohesive	N/A	N/A	1122.50 psf	118.56 Kips
51.01 ft	Cohesive	N/A	N/A	1122.50 psf	151.85 Kips
60.01 ft	Cohesive	N/A	N/A	1122.50 psf	185.15 Kips
69.01 ft	Cohesive	N/A	N/A	1122.50 psf	218.45 Kips
78.01 ft	Cohesive	N/A	N/A	1122.50 psf	251.74 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	259.07 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
7.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
8.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.49 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
17.51 ft	Cohesionless	2188.85 psf	82.77	115.46 Kips	85.86 Kips
22.99 ft	Cohesionless	2928.65 psf	82.77	115.46 Kips	114.80 Kips
23.01 ft	Cohesionless	2930.73 psf	82.77	115.46 Kips	114.88 Kips
27.99 ft	Cohesionless	3292.27 psf	82.77	115.46 Kips	115.46 Kips
28.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
37.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
41.99 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
42.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
51.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
60.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
69.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
78.01 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	7.64 Kips

OTIC MP 34.5 Bridge Widening
HP10x42
Boring B-1

ULTIMATE - SUMMARY OF CAPACITIES

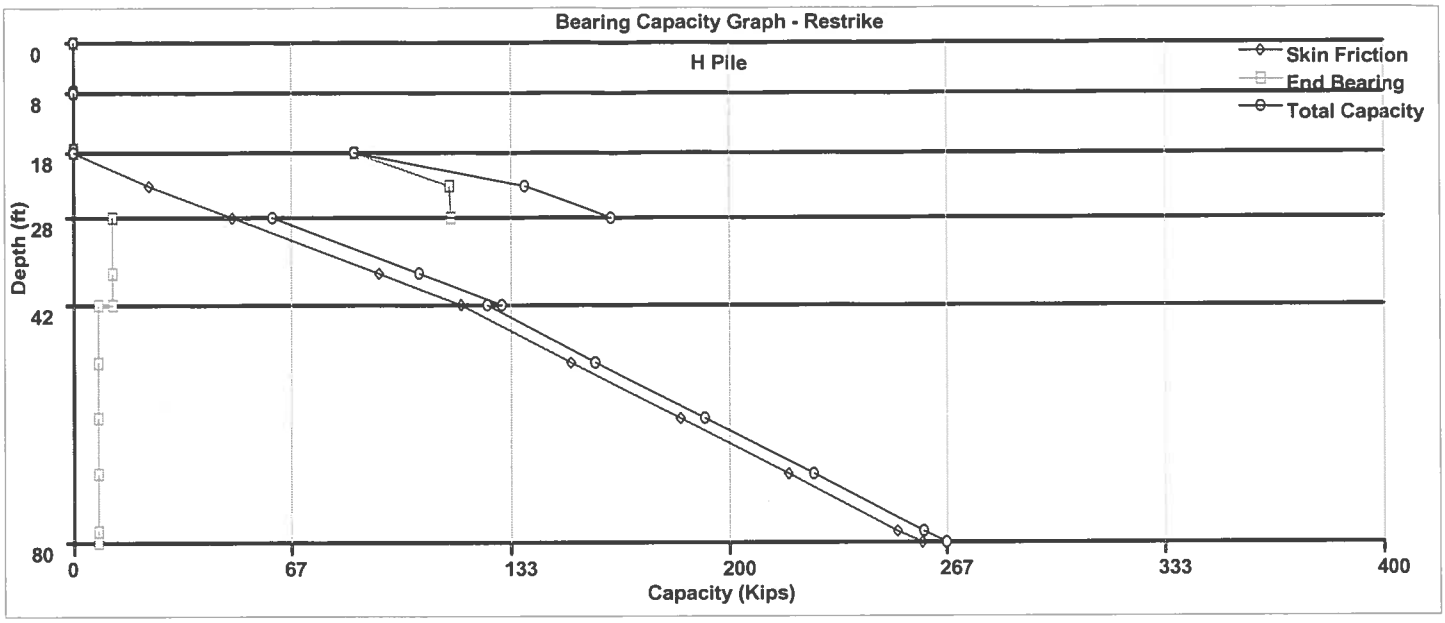
Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft (GSE = Elev. 806)	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
17.51 ft	0.04 Kips	85.86 Kips	85.90 Kips
22.99 ft	23.04 Kips	114.80 Kips	137.84 Kips
23.01 ft	23.14 Kips	114.88 Kips	138.02 Kips
27.99 ft	48.56 Kips	115.46 Kips	164.03 Kips
28.01 ft	48.66 Kips	12.22 Kips	60.88 Kips ← D @ 35.84 ft (Elev. 770±)
37.01 ft	93.60 Kips	12.22 Kips	105.82 Kips
41.99 ft	118.47 Kips	12.22 Kips	130.69 Kips
42.01 ft	118.56 Kips	7.64 Kips	126.19 Kips ← C @ 48.45 ft (Elev. 756±)
51.01 ft	151.85 Kips	7.64 Kips	159.49 Kips
60.01 ft	185.15 Kips	7.64 Kips	192.79 Kips ← B @ 61.95 ft (Elev. 744±)
69.01 ft	218.45 Kips	7.64 Kips	226.08 Kips
78.01 ft	251.74 Kips	7.64 Kips	259.38 Kips ← A @ 75.46 ft (Elev. 730±)
79.99 ft	259.07 Kips	7.64 Kips	266.70 Kips

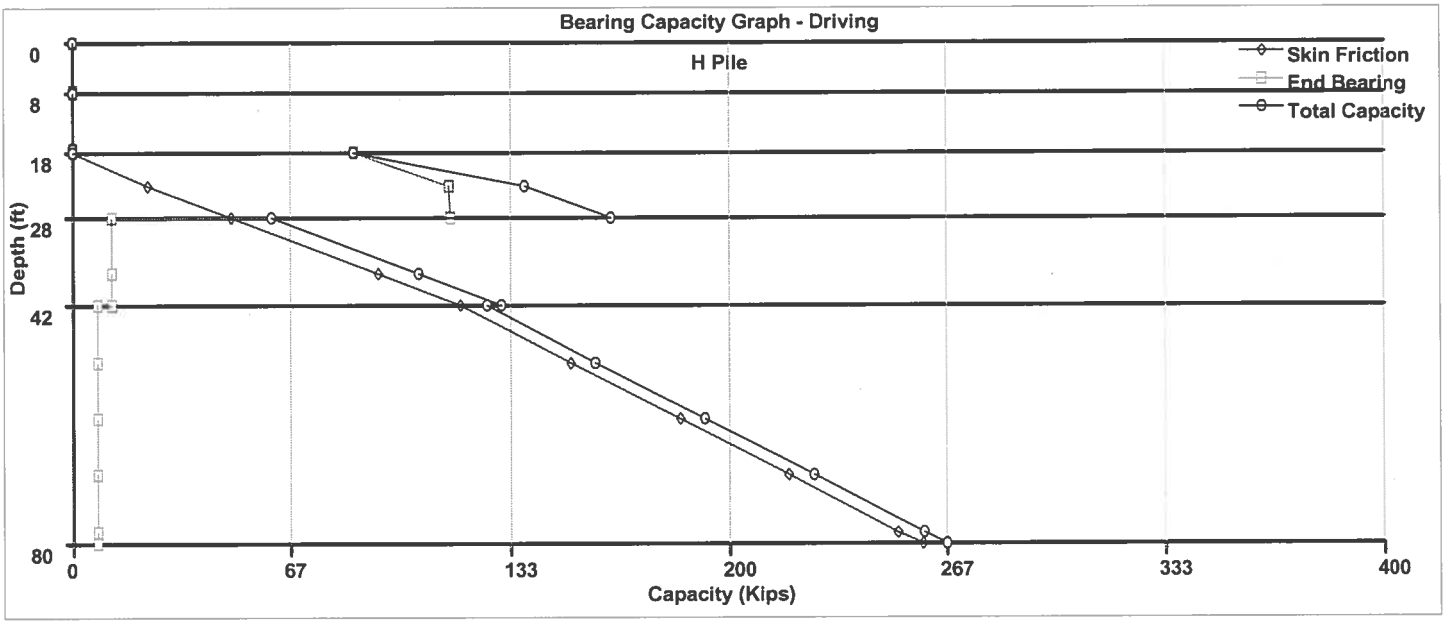
Temporary Bridge Structure Abutments - LRFD

Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	R_{ndr} Max (kips)	Max TFL (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)
West (Rear) Abutment	B-1	805	807	350	245	> Bottom of Boring	

Existing Bridge Structure Abutments - ASD

Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	ASD Ultimate Bearing Value (kips) R_{ndr} LRFD	ASD Unfactored Design Load (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)	LRFD TFL (Kips)
West (Rear) Abutment	B-1	805	807	300	150	> B.O.B.	–	
				A. 250	125	80	85	175
				B. 200	100	65	70	140
				C. 150	75	50	55	105
				D. 100	50	40	45	70
		798	800	300	150	> B.O.B.	–	
				A. 250	125	70	75	175
				B. 200	100	55	60	140
				C. 150	75	45	50	105
				D. 100	50	30	35	70


Bearing Capacity Graph - Restrike
H Pile
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
67
133
200
267
333
400
Capacity (Kips)


Bearing Capacity Graph - Driving
H Pile
Skin Friction
End Bearing
Total Capacity
Depth (ft)
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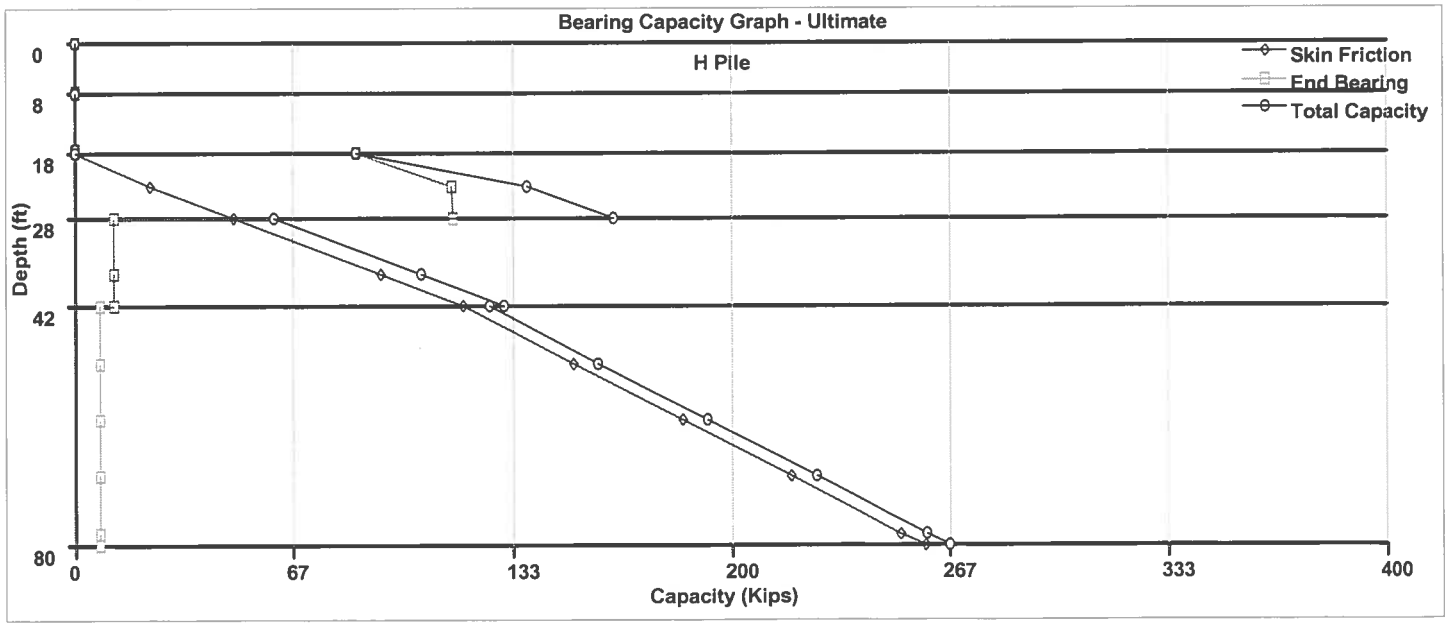
8
18
28
42
80
0
67
133
200
267
333
400
Capacity (Kips)


Bearing Capacity Graph - Ultimate
H Pile
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
8
18
28
42
80
0
67
133
200
267
333
400
Capacity (Kips)

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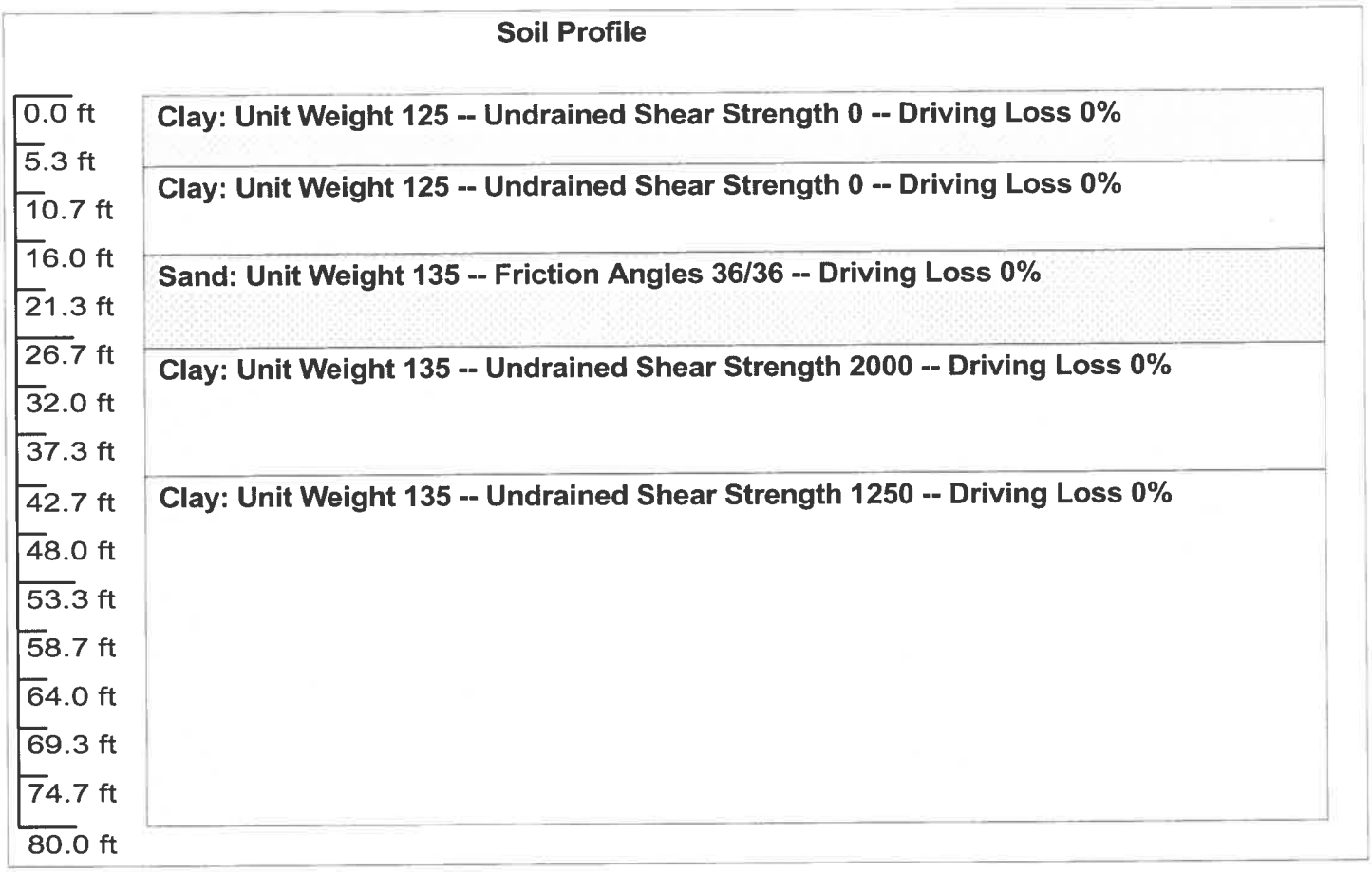


DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\PROJEC~4\B2-12CIP.DVN
Project Name: MP 34.5 Bridge Widening
Project Date: 10/31/2017
Project Client: OTIC
Computed By: KCH
Project Manager:

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft Neglect contribution from fill
Diameter of Pile: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.00 ft
	- Driving/Restrike	23.00 ft
	- Ultimate:	23.00 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	6.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
2	Cohesive	13.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
3	Cohesive	4.00 ft	0.00%	135.00 pcf	1075.00 psf	T-79 Steel
4	Cohesive	10.50 ft	0.00%	135.00 pcf	2000.00 psf	T-79 Steel
5	Cohesive	46.50 ft	0.00%	135.00 pcf	1250.00 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
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	887.88 psf	0.03 Kips
22.99 ft	Cohesive	N/A	N/A	909.47 psf	11.40 Kips
23.01 ft	Cohesive	N/A	N/A	1316.78 psf	11.47 Kips
32.01 ft	Cohesive	N/A	N/A	1421.78 psf	51.67 Kips
33.49 ft	Cohesive	N/A	N/A	1439.05 psf	58.85 Kips
33.51 ft	Cohesive	N/A	N/A	1080.86 psf	58.94 Kips
42.51 ft	Cohesive	N/A	N/A	1122.50 psf	90.68 Kips
51.51 ft	Cohesive	N/A	N/A	1122.50 psf	122.41 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	154.15 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	185.89 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	217.63 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	222.85 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	7.60 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	7.60 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 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
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.03 Kips	7.60 Kips	7.63 Kips
22.99 ft	11.40 Kips	7.60 Kips	19.00 Kips
23.01 ft	11.47 Kips	14.14 Kips	25.61 Kips
32.01 ft	51.67 Kips	14.14 Kips	65.81 Kips
33.49 ft	58.85 Kips	14.14 Kips	72.99 Kips
33.51 ft	58.94 Kips	8.84 Kips	67.77 Kips
42.51 ft	90.68 Kips	8.84 Kips	99.51 Kips
51.51 ft	122.41 Kips	8.84 Kips	131.25 Kips
60.51 ft	154.15 Kips	8.84 Kips	162.99 Kips
69.51 ft	185.89 Kips	8.84 Kips	194.73 Kips
78.51 ft	217.63 Kips	8.84 Kips	226.46 Kips
79.99 ft	222.85 Kips	8.84 Kips	231.68 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	887.88 psf	0.03 Kips
22.99 ft	Cohesive	N/A	N/A	909.47 psf	11.40 Kips
23.01 ft	Cohesive	N/A	N/A	1316.78 psf	11.47 Kips
32.01 ft	Cohesive	N/A	N/A	1421.78 psf	51.67 Kips
33.49 ft	Cohesive	N/A	N/A	1439.05 psf	58.85 Kips
33.51 ft	Cohesive	N/A	N/A	1080.86 psf	58.94 Kips
42.51 ft	Cohesive	N/A	N/A	1122.50 psf	90.68 Kips
51.51 ft	Cohesive	N/A	N/A	1122.50 psf	122.41 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	154.15 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	185.89 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	217.63 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	222.85 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	7.60 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	7.60 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips

DRIVING - SUMMARY OF CAPACITIES

OTIC MP 34.5 Bridge Widening
12" Diameter CIP
Boring B-2

Depth	Skin Friction	End Bearing	Total Capacity
0.01 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
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.03 Kips	7.60 Kips	7.63 Kips
22.99 ft	11.40 Kips	7.60 Kips	19.00 Kips
23.01 ft	11.47 Kips	14.14 Kips	25.61 Kips
32.01 ft	51.67 Kips	14.14 Kips	65.81 Kips
33.49 ft	58.85 Kips	14.14 Kips	72.99 Kips
33.51 ft	58.94 Kips	8.84 Kips	67.77 Kips
42.51 ft	90.68 Kips	8.84 Kips	99.51 Kips
51.51 ft	122.41 Kips	8.84 Kips	131.25 Kips
60.51 ft	154.15 Kips	8.84 Kips	162.99 Kips
69.51 ft	185.89 Kips	8.84 Kips	194.73 Kips
78.51 ft	217.63 Kips	8.84 Kips	226.46 Kips
79.99 ft	222.85 Kips	8.84 Kips	231.68 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	887.88 psf	0.03 Kips
22.99 ft	Cohesive	N/A	N/A	909.47 psf	11.40 Kips
23.01 ft	Cohesive	N/A	N/A	1316.78 psf	11.47 Kips
32.01 ft	Cohesive	N/A	N/A	1421.78 psf	51.67 Kips
33.49 ft	Cohesive	N/A	N/A	1439.05 psf	58.85 Kips
33.51 ft	Cohesive	N/A	N/A	1080.86 psf	58.94 Kips
42.51 ft	Cohesive	N/A	N/A	1122.50 psf	90.68 Kips
51.51 ft	Cohesive	N/A	N/A	1122.50 psf	122.41 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	154.15 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	185.89 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	217.63 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	222.85 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	7.60 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	7.60 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	8.84 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	8.84 Kips

ULTIMATE - SUMMARY OF CAPACITIES

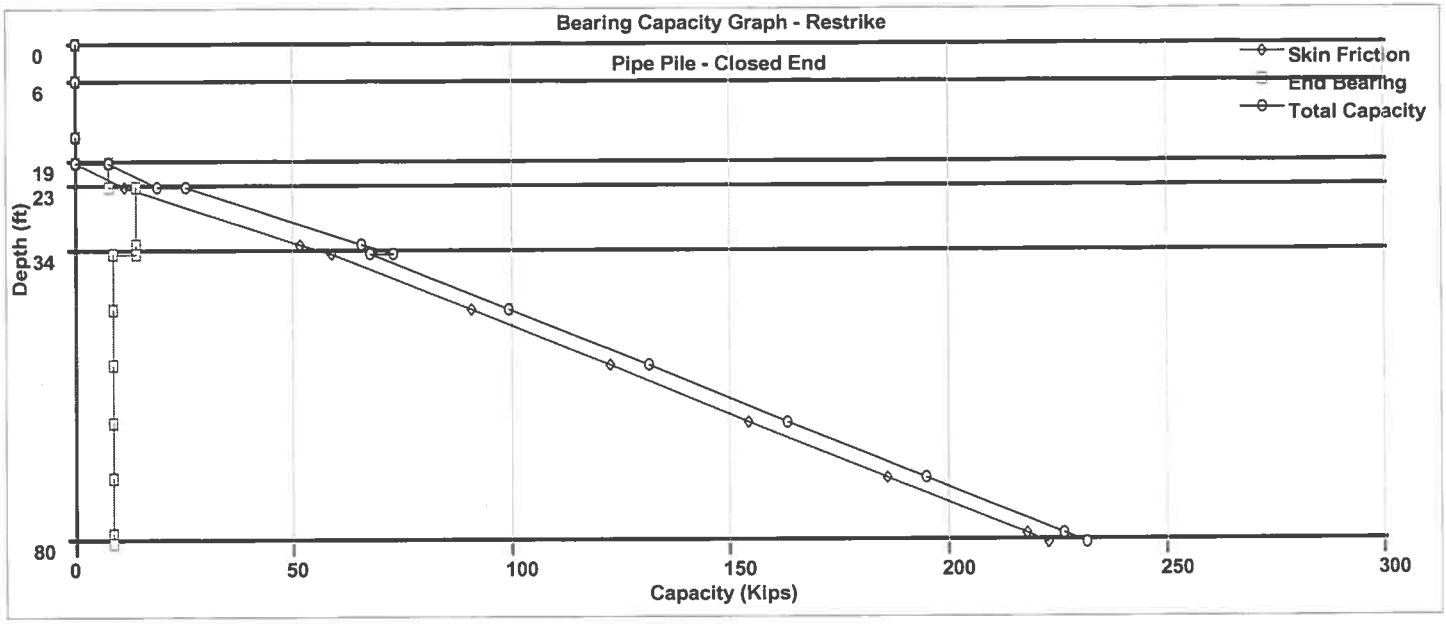
Depth (GSE = Elev. 808)	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
15.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.03 Kips	7.60 Kips	7.63 Kips
22.99 ft	11.40 Kips	7.60 Kips	19.00 Kips
23.01 ft	11.47 Kips	14.14 Kips	25.61 Kips
32.01 ft	51.67 Kips	14.14 Kips	65.81 Kips
33.49 ft	58.85 Kips	14.14 Kips	72.99 Kips
33.51 ft	58.94 Kips	8.84 Kips	67.77 Kips
42.51 ft	90.68 Kips	8.84 Kips	99.51 Kips ← C @ 42.64 ft (Elev. 765±)
51.51 ft	122.41 Kips	8.84 Kips	131.25 Kips
60.51 ft	154.15 Kips	8.84 Kips	162.99 Kips ← B @ 56.83 ft (Elev. 751±)
69.51 ft	185.89 Kips	8.84 Kips	194.73 Kips
78.51 ft	217.63 Kips	8.84 Kips	226.46 Kips ← A @ 71.00 ft (Elev. 737±)
79.99 ft	222.85 Kips	8.84 Kips	231.68 Kips

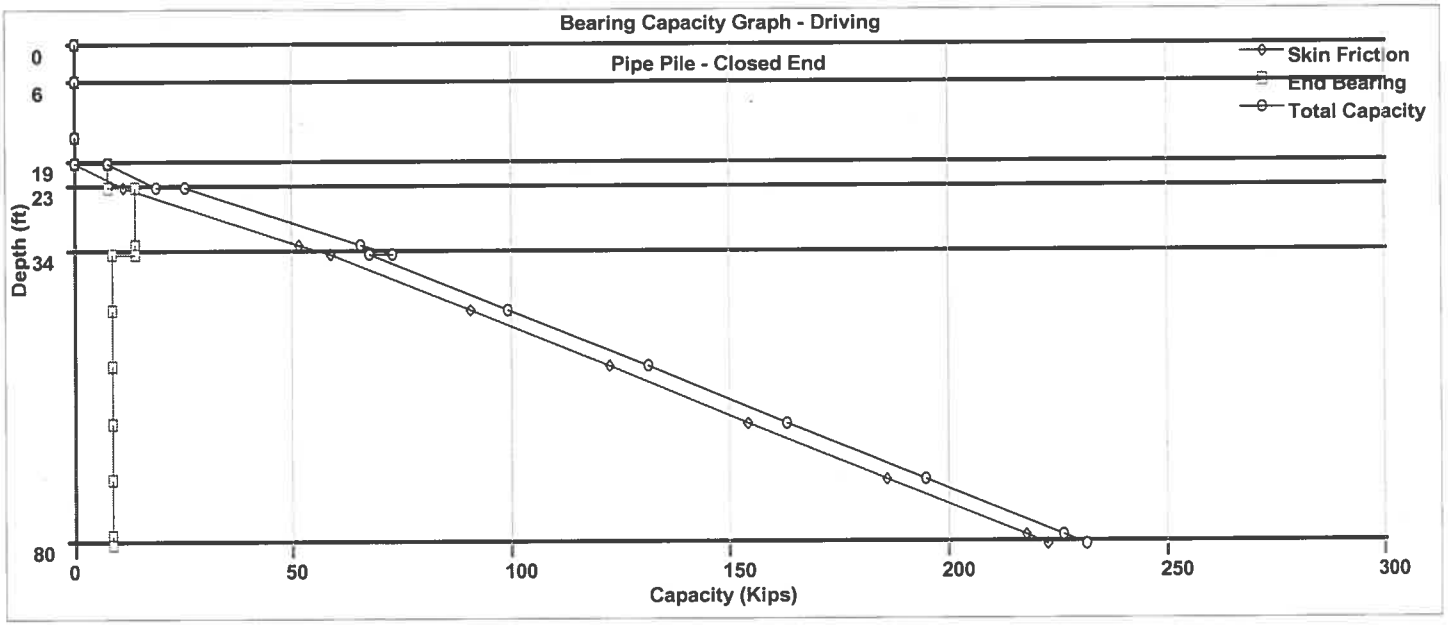
Temporary Bridge Structure Abutments - LRFD

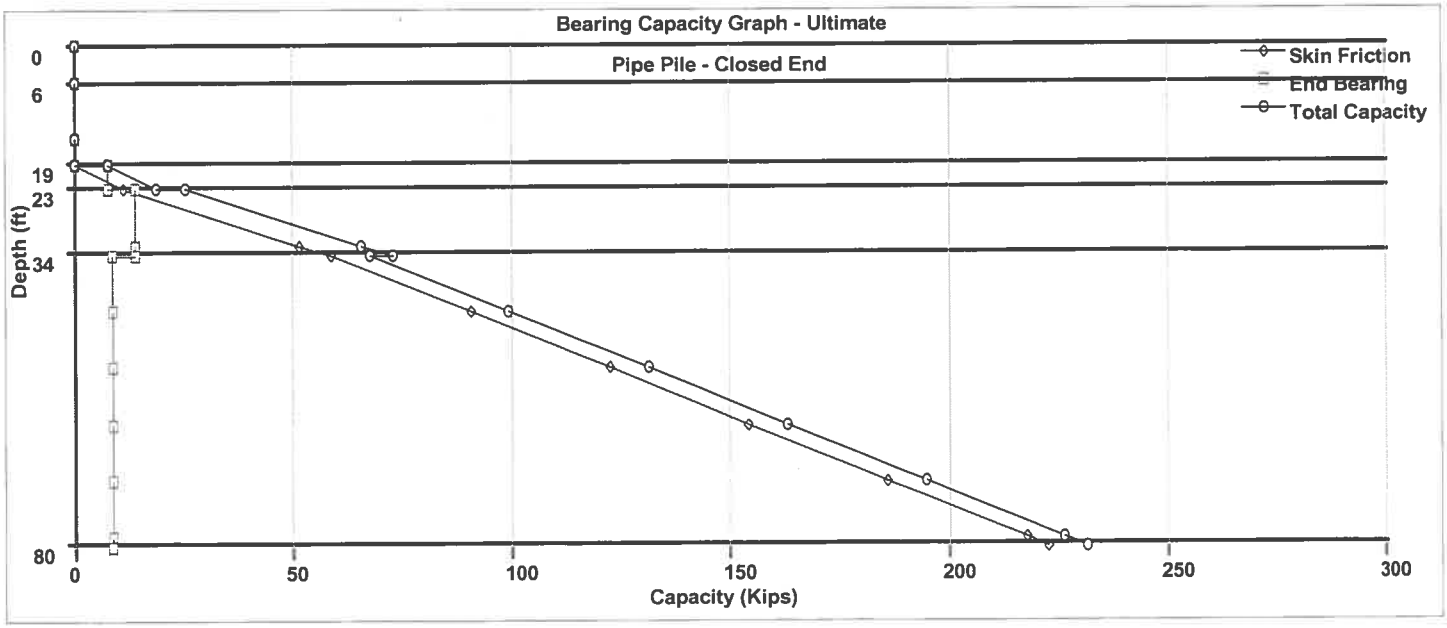
Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	R_{ndr} Max (kips)	Max TFL (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)
East (Forward) Abutment	B-2	803	805	330	231	7 Bottom of Boring	

Existing Bridge Structure Abutments - ASD

Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	ASD Ultimate Bearing Value (kips) R_{ndr} LRFD	ASD Unfactored Design Load (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)	LRFD TFL (kips)
East (Forward) Abutment	B-2	803	805	A. 200	100	70	75	140
				B. 150	75	55	60	105
				C. 100	50	40	45	70
		797	799	A. 200	100	65	70	140
				B. 150	75	50	55	105
				C. 100	50	35	40	70


Bearing Capacity Graph - Restrike
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
6
19
23
34
80
0
50
100
150
200
250
300
Capacity (Kips)


Bearing Capacity Graph - Driving
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
6
19
23
34
80
0
50
100
150
200
250
300
Capacity (Kips)


Bearing Capacity Graph - Ultimate
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
6
19
23
34
80
0
50
100
150
200
250
300
Capacity (Kips)

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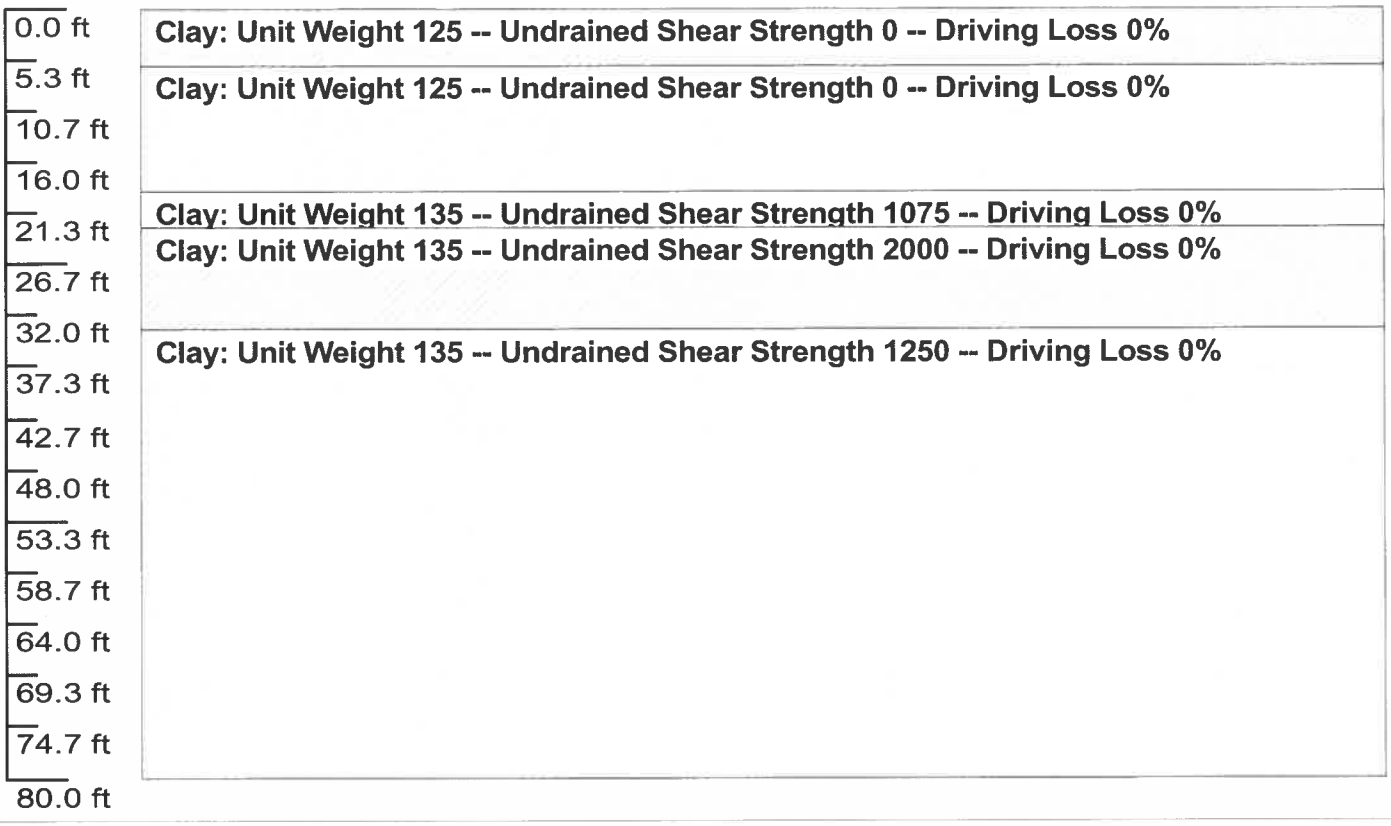
Soil Profile



DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\PROJEC~4\B2-14CIP.DVN
Project Name: MP 34.5 Bridge Widening
Project Date: 10/31/2017
Project Client: OTIC
Computed By: KCH
Project Manager:

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft Neglect Contribution from fill
Diameter of Pile: 14.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.00 ft
	- Driving/Restrike	23.00 ft
	- Ultimate:	23.00 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	6.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
2	Cohesive	13.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
3	Cohesive	4.00 ft	0.00%	135.00 pcf	1075.00 psf	T-79 Steel
4	Cohesive	10.50 ft	0.00%	135.00 pcf	2000.00 psf	T-79 Steel
5	Cohesive	46.50 ft	0.00%	135.00 pcf	1250.00 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
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	873.15 psf	0.03 Kips
22.99 ft	Cohesive	N/A	N/A	891.65 psf	13.04 Kips
23.01 ft	Cohesive	N/A	N/A	1278.43 psf	13.12 Kips
32.01 ft	Cohesive	N/A	N/A	1368.43 psf	58.26 Kips
33.49 ft	Cohesive	N/A	N/A	1383.23 psf	66.26 Kips
33.51 ft	Cohesive	N/A	N/A	1050.14 psf	66.35 Kips
42.51 ft	Cohesive	N/A	N/A	1099.64 psf	102.62 Kips
51.51 ft	Cohesive	N/A	N/A	1122.50 psf	140.41 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	177.43 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	214.46 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	251.49 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	257.58 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	10.34 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	10.34 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 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
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.03 Kips	10.34 Kips	10.37 Kips
22.99 ft	13.04 Kips	10.34 Kips	23.38 Kips
23.01 ft	13.12 Kips	19.24 Kips	32.36 Kips
32.01 ft	58.26 Kips	19.24 Kips	77.51 Kips
33.49 ft	66.26 Kips	19.24 Kips	85.50 Kips
33.51 ft	66.35 Kips	12.03 Kips	78.37 Kips
42.51 ft	102.62 Kips	12.03 Kips	114.65 Kips
51.51 ft	140.41 Kips	12.03 Kips	152.43 Kips
60.51 ft	177.43 Kips	12.03 Kips	189.46 Kips
69.51 ft	214.46 Kips	12.03 Kips	226.49 Kips
78.51 ft	251.49 Kips	12.03 Kips	263.52 Kips
79.99 ft	257.58 Kips	12.03 Kips	269.60 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	873.15 psf	0.03 Kips
22.99 ft	Cohesive	N/A	N/A	891.65 psf	13.04 Kips
23.01 ft	Cohesive	N/A	N/A	1278.43 psf	13.12 Kips
32.01 ft	Cohesive	N/A	N/A	1368.43 psf	58.26 Kips
33.49 ft	Cohesive	N/A	N/A	1383.23 psf	66.26 Kips
33.51 ft	Cohesive	N/A	N/A	1050.14 psf	66.35 Kips
42.51 ft	Cohesive	N/A	N/A	1099.64 psf	102.62 Kips
51.51 ft	Cohesive	N/A	N/A	1122.50 psf	140.41 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	177.43 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	214.46 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	251.49 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	257.58 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	10.34 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	10.34 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 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
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.03 Kips	10.34 Kips	10.37 Kips
22.99 ft	13.04 Kips	10.34 Kips	23.38 Kips
23.01 ft	13.12 Kips	19.24 Kips	32.36 Kips
32.01 ft	58.26 Kips	19.24 Kips	77.51 Kips
33.49 ft	66.26 Kips	19.24 Kips	85.50 Kips
33.51 ft	66.35 Kips	12.03 Kips	78.37 Kips
42.51 ft	102.62 Kips	12.03 Kips	114.65 Kips
51.51 ft	140.41 Kips	12.03 Kips	152.43 Kips
60.51 ft	177.43 Kips	12.03 Kips	189.46 Kips
69.51 ft	214.46 Kips	12.03 Kips	226.49 Kips
78.51 ft	251.49 Kips	12.03 Kips	263.52 Kips
79.99 ft	257.58 Kips	12.03 Kips	269.60 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	873.15 psf	0.03 Kips
22.99 ft	Cohesive	N/A	N/A	891.65 psf	13.04 Kips
23.01 ft	Cohesive	N/A	N/A	1278.43 psf	13.12 Kips
32.01 ft	Cohesive	N/A	N/A	1368.43 psf	58.26 Kips
33.49 ft	Cohesive	N/A	N/A	1383.23 psf	66.26 Kips
33.51 ft	Cohesive	N/A	N/A	1050.14 psf	66.35 Kips
42.51 ft	Cohesive	N/A	N/A	1099.64 psf	102.62 Kips
51.51 ft	Cohesive	N/A	N/A	1122.50 psf	140.41 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	177.43 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	214.46 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	251.49 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	257.58 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	10.34 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	10.34 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	19.24 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	12.03 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	12.03 Kips

ULTIMATE - SUMMARY OF CAPACITIES

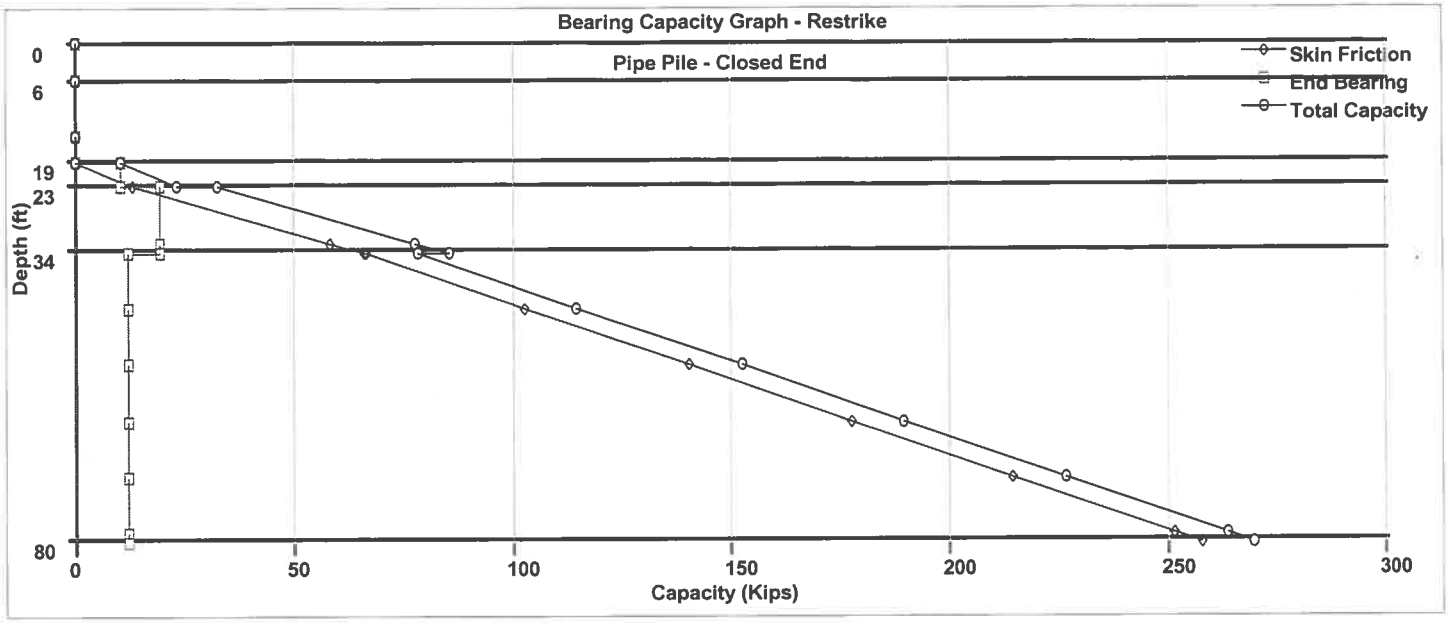
Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft (GSE=Elev. 808)	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
15.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.03 Kips	10.34 Kips	10.37 Kips
22.99 ft	13.04 Kips	10.34 Kips	23.38 Kips
23.01 ft	13.12 Kips	19.24 Kips	32.36 Kips
32.01 ft	58.26 Kips	19.24 Kips	77.51 Kips
33.49 ft	66.26 Kips	19.24 Kips	85.50 Kips
33.51 ft	66.35 Kips	12.03 Kips	78.37 Kips ← D@ 38.77 ft (Elev. 769±)
42.51 ft	102.62 Kips	12.03 Kips	114.65 Kips ← C@ 50.92 ft (Elev. 757±)
51.51 ft	140.41 Kips	12.03 Kips	152.43 Kips
60.51 ft	177.43 Kips	12.03 Kips	189.46 Kips ← B@ 63.07 ft (Elev. 745±)
69.51 ft	214.46 Kips	12.03 Kips	226.49 Kips
78.51 ft	251.49 Kips	12.03 Kips	263.52 Kips ← A@ 75.22 ft (Elev. 733±)
79.99 ft	257.58 Kips	12.03 Kips	269.60 Kips

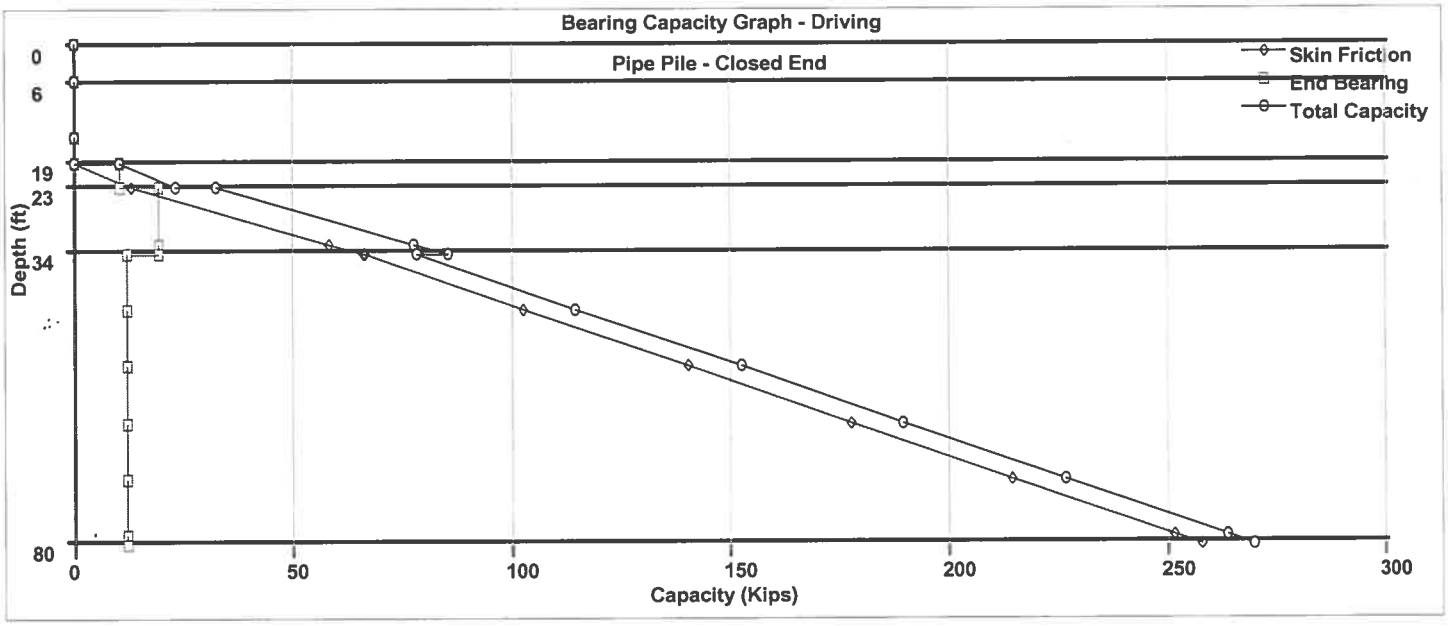
Temporary Bridge Structure Abutments - LRFD

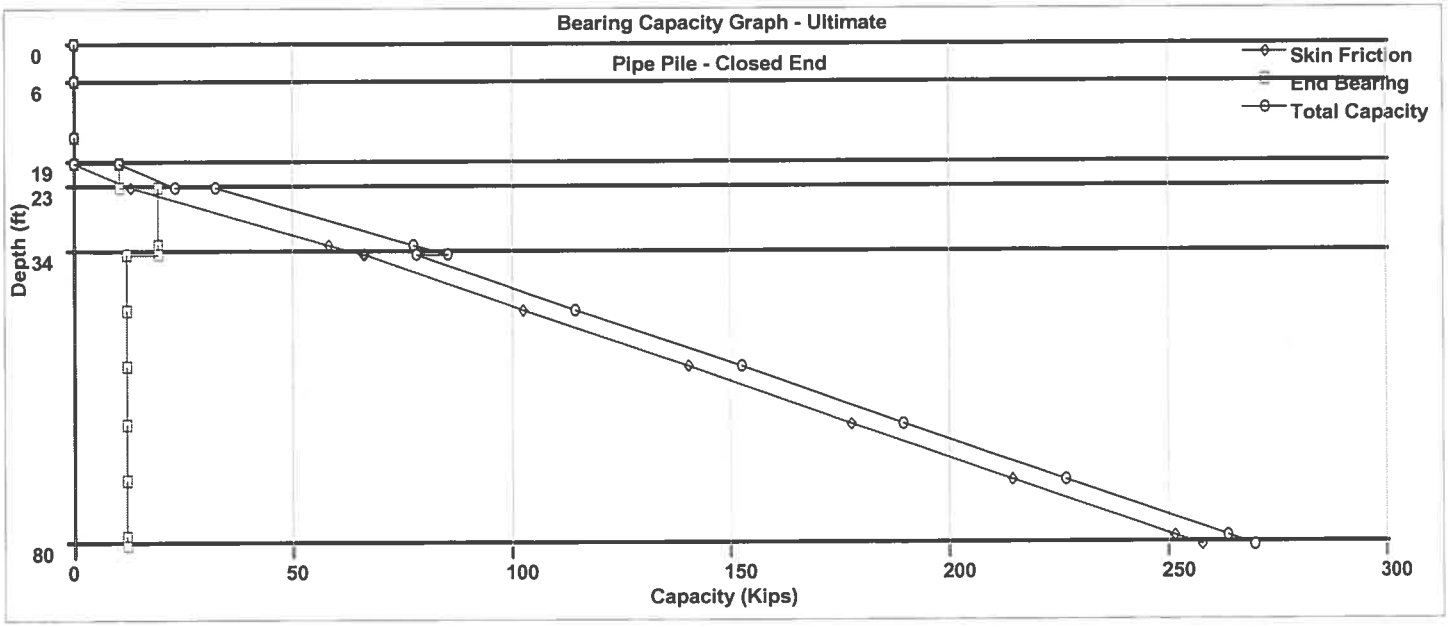
Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	R_{ndr} Max (kips)	Max TFL (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)
East (Forward) Abutment	B-2	803	805	390	273	→ Bottom of Boring	

Existing Bridge Structure Abutments - ASD

Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	ASD Ultimate Bearing Value (kips) (R_{ndr} LRFD)	ASD Unfactored Design Load (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)	LRFD TSL (kips)
East (Forward) Abutment	B-2	803	805	280	140	78.0.B	–	
				A. 250	125	75	80	175
				B. 200	100	60	65	140
				C. 150	75	50	55	105
				D. 100	50	35	40	70
		797	799	280	140	78.0.B.	–	
				A. 250	125	65	70	175
				B. 200	100	55	60	140
				C. 150	75	45	50	105
				D. 100	50	30	35	70


Bearing Capacity Graph - Restrike
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
6
19
23
34
80
0
50
100
150
200
250
300
Capacity (Kips)


Bearing Capacity Graph - Driving
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
6
19
23
34
80
0
50
100
150
200
250
300
Capacity (Kips)


Bearing Capacity Graph - Ultimate
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
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6
19
23
34
80
0
50
100
150
200
250
300
Capacity (Kips)

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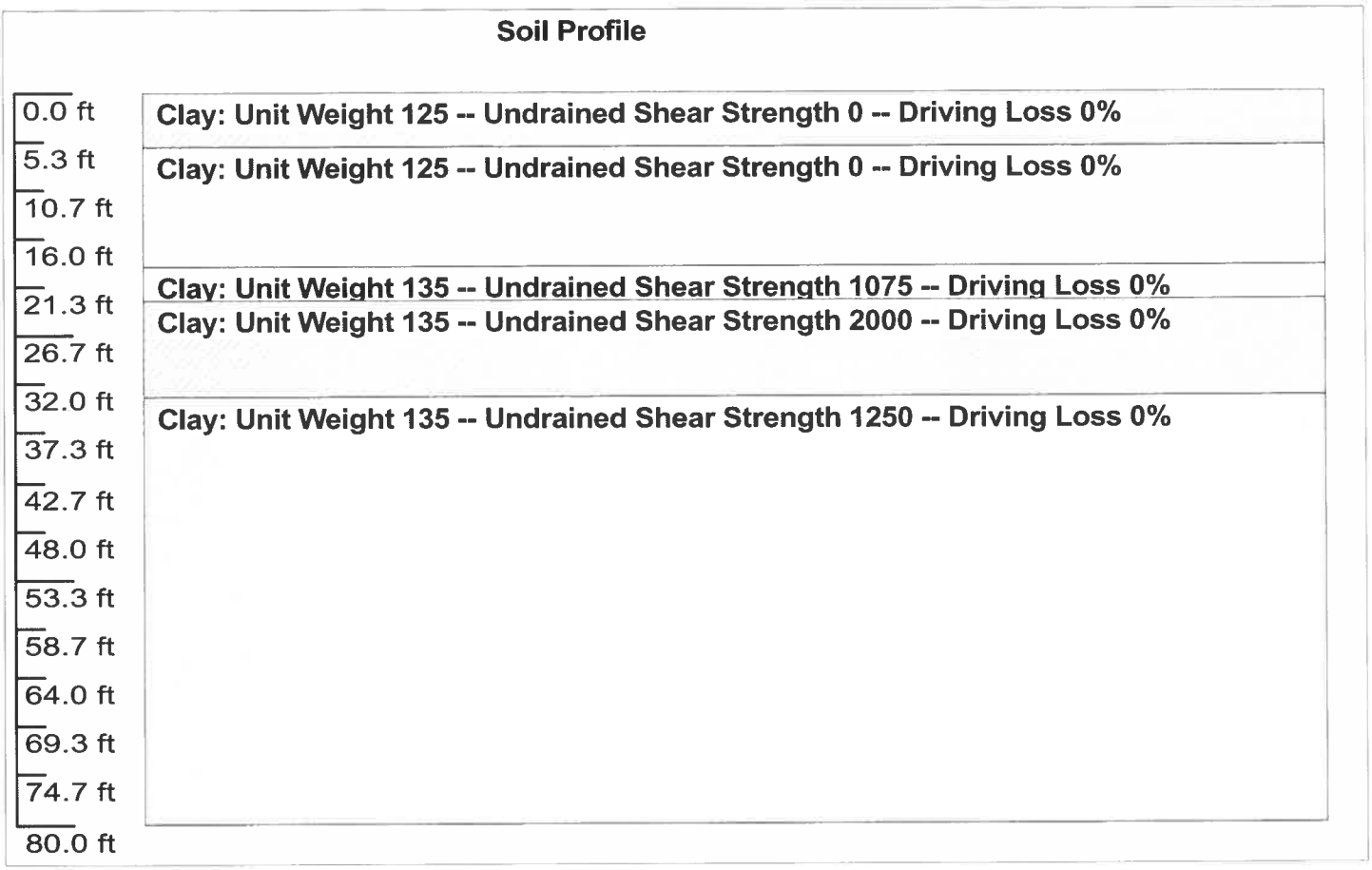


DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\PROJEC~4\B2-16CIP.DVN
Project Name: MP 34.5 Bridge Widening
Project Date: 10/31/2017
Project Client: OTIC
Computed By: KCH
Project Manager:

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft Neglect Contribution from fill
Diameter of Pile: 16.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.00 ft
	- Driving/Restrike	23.00 ft
	- Ultimate:	23.00 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	6.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
2	Cohesive	13.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
3	Cohesive	4.00 ft	0.00%	135.00 pcf	1075.00 psf	T-79 Steel
4	Cohesive	10.50 ft	0.00%	135.00 pcf	2000.00 psf	T-79 Steel
5	Cohesive	46.50 ft	0.00%	135.00 pcf	1250.00 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
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	862.10 psf	0.04 Kips
22.99 ft	Cohesive	N/A	N/A	878.29 psf	14.68 Kips
23.01 ft	Cohesive	N/A	N/A	1249.67 psf	14.77 Kips
32.01 ft	Cohesive	N/A	N/A	1328.42 psf	64.85 Kips
33.49 ft	Cohesive	N/A	N/A	1341.37 psf	73.66 Kips
33.51 ft	Cohesive	N/A	N/A	1027.10 psf	73.76 Kips
42.51 ft	Cohesive	N/A	N/A	1070.41 psf	114.12 Kips
51.51 ft	Cohesive	N/A	N/A	1113.73 psf	157.74 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	200.72 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	243.03 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	285.35 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	292.31 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	13.51 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	13.51 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	15.71 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 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
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.04 Kips	13.51 Kips	13.54 Kips
22.99 ft	14.68 Kips	13.51 Kips	28.19 Kips
23.01 ft	14.77 Kips	25.13 Kips	39.90 Kips
32.01 ft	64.85 Kips	25.13 Kips	89.99 Kips
33.49 ft	73.66 Kips	25.13 Kips	98.79 Kips
33.51 ft	73.76 Kips	15.71 Kips	89.47 Kips
42.51 ft	114.12 Kips	15.71 Kips	129.82 Kips
51.51 ft	157.74 Kips	15.71 Kips	173.44 Kips
60.51 ft	200.72 Kips	15.71 Kips	216.42 Kips
69.51 ft	243.03 Kips	15.71 Kips	258.74 Kips
78.51 ft	285.35 Kips	15.71 Kips	301.06 Kips
79.99 ft	292.31 Kips	15.71 Kips	308.02 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
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	862.10 psf	0.04 Kips
22.99 ft	Cohesive	N/A	N/A	878.29 psf	14.68 Kips
23.01 ft	Cohesive	N/A	N/A	1249.67 psf	14.77 Kips
32.01 ft	Cohesive	N/A	N/A	1328.42 psf	64.85 Kips
33.49 ft	Cohesive	N/A	N/A	1341.37 psf	73.66 Kips
33.51 ft	Cohesive	N/A	N/A	1027.10 psf	73.76 Kips
42.51 ft	Cohesive	N/A	N/A	1070.41 psf	114.12 Kips
51.51 ft	Cohesive	N/A	N/A	1113.73 psf	157.74 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	200.72 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	243.03 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	285.35 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	292.31 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	13.51 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	13.51 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	15.71 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 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
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.04 Kips	13.51 Kips	13.54 Kips
22.99 ft	14.68 Kips	13.51 Kips	28.19 Kips
23.01 ft	14.77 Kips	25.13 Kips	39.90 Kips
32.01 ft	64.85 Kips	25.13 Kips	89.99 Kips
33.49 ft	73.66 Kips	25.13 Kips	98.79 Kips
33.51 ft	73.76 Kips	15.71 Kips	89.47 Kips
42.51 ft	114.12 Kips	15.71 Kips	129.82 Kips
51.51 ft	157.74 Kips	15.71 Kips	173.44 Kips
60.51 ft	200.72 Kips	15.71 Kips	216.42 Kips
69.51 ft	243.03 Kips	15.71 Kips	258.74 Kips
78.51 ft	285.35 Kips	15.71 Kips	301.06 Kips
79.99 ft	292.31 Kips	15.71 Kips	308.02 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
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	862.10 psf	0.04 Kips
22.99 ft	Cohesive	N/A	N/A	878.29 psf	14.68 Kips
23.01 ft	Cohesive	N/A	N/A	1249.67 psf	14.77 Kips
32.01 ft	Cohesive	N/A	N/A	1328.42 psf	64.85 Kips
33.49 ft	Cohesive	N/A	N/A	1341.37 psf	73.66 Kips
33.51 ft	Cohesive	N/A	N/A	1027.10 psf	73.76 Kips
42.51 ft	Cohesive	N/A	N/A	1070.41 psf	114.12 Kips
51.51 ft	Cohesive	N/A	N/A	1113.73 psf	157.74 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	200.72 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	243.03 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	285.35 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	292.31 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	13.51 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	13.51 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	15.71 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	15.71 Kips

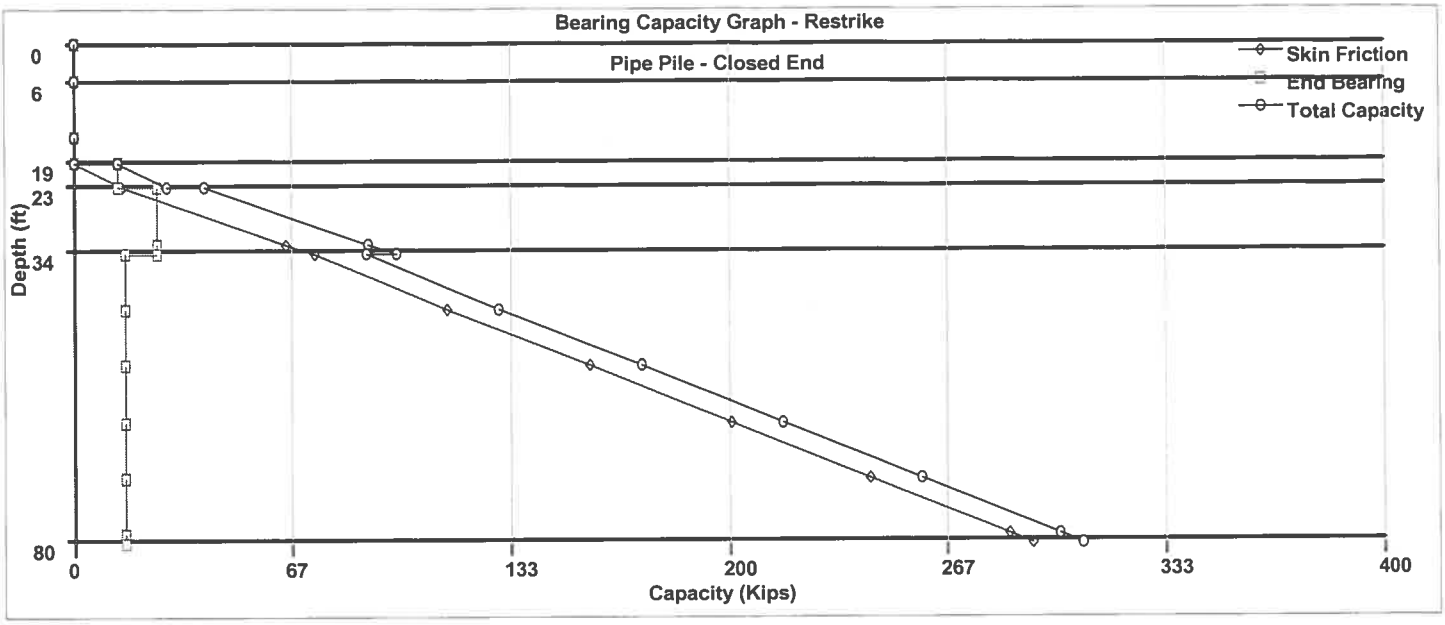
OTIC MP 34.5 Bridge Widening
16" Diameter CIP
Boring B-2

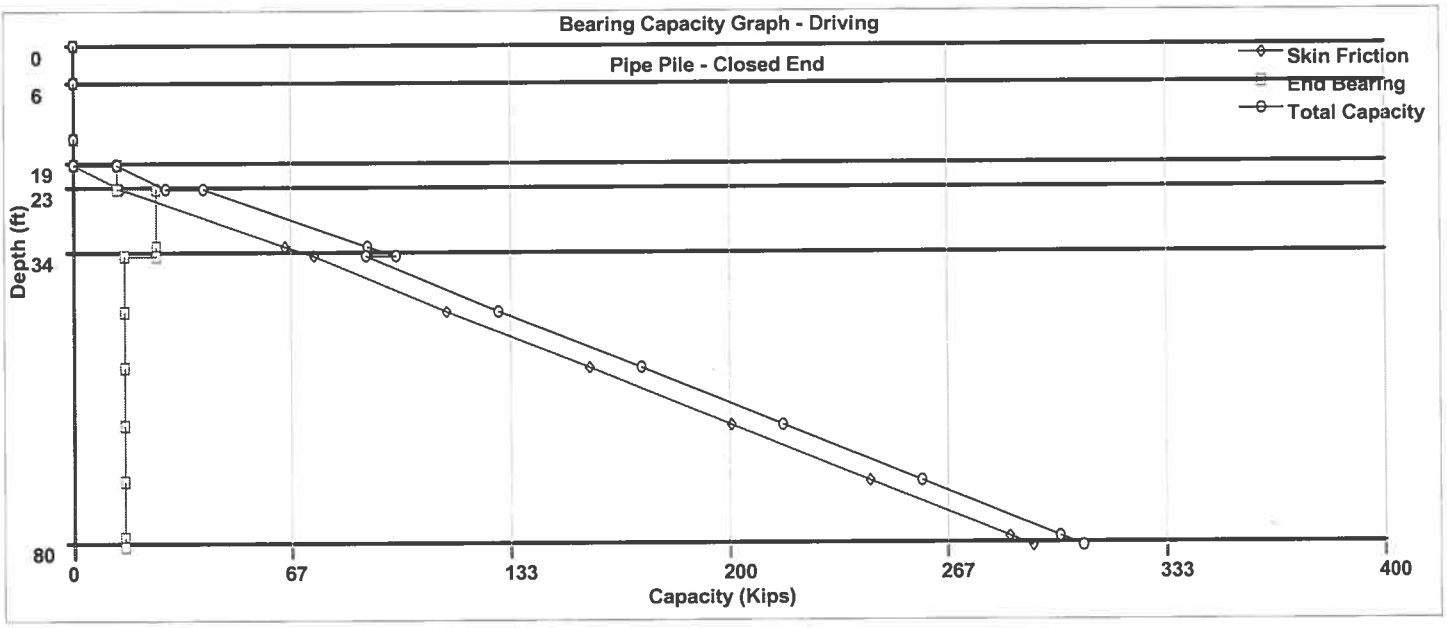
ULTIMATE - SUMMARY OF CAPACITIES

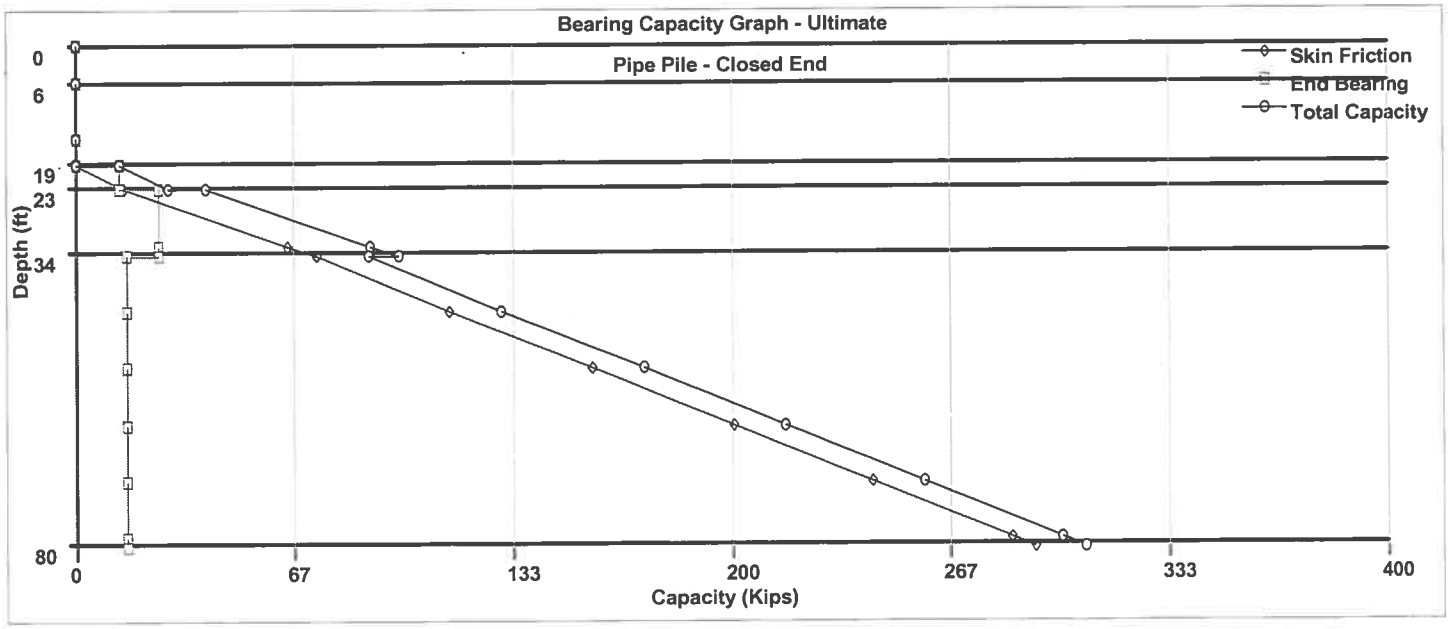
Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft GSE=Elev. 808	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
15.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.04 Kips	13.51 Kips	13.54 Kips
22.99 ft	14.68 Kips	13.51 Kips	28.19 Kips
23.01 ft	14.77 Kips	25.13 Kips	39.90 Kips
32.01 ft	64.85 Kips	25.13 Kips	89.99 Kips
33.49 ft	73.66 Kips	25.13 Kips	98.79 Kips
33.51 ft	73.76 Kips	15.71 Kips	89.47 Kips ← D @ 46.38ft (Elev. 762±)
42.51 ft	114.12 Kips	15.71 Kips	129.82 Kips ← C @ 57.02 ft (Elev. 751±)
51.51 ft	157.74 Kips	15.71 Kips	173.44 Kips
60.51 ft	200.72 Kips	15.71 Kips	216.42 Kips ← B @ 67.65 ft (Elev. 740±)
69.51 ft	243.03 Kips	15.71 Kips	258.74 Kips
78.51 ft	285.35 Kips	15.71 Kips	301.06 Kips ← A @ 78.28ft (Elev. 729±)
79.99 ft	292.31 Kips	15.71 Kips	308.02 Kips

Temporary Bridge Structure Abutments - LRFD							
Location	**Boring Number**	**Assumed Bottom of Pile Cap Elevation (feet)**	**Assumed Cut-Off Pile Elevation (feet)**	**R_{ndr} Max (kips)**	**Max TFL (kips)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**
East (Forward) Abutment	B-2	803	805	450	315	> Bottom of Boring	

Existing Bridge Structure Abutments - ASD								
Location	**Boring Number**	**Assumed Bottom of Pile Cap Elevation (feet)**	**Assumed Cut-Off Pile Elevation (feet)**	**ASD Ultimate Bearing Value (kips)** R_{ndr} LRFD	**ASD Unfactored Design Load (kips)**	**Estimated Pile Length (feet)**	**Order Pile Length (feet)**	LRFD TFL
East (Forward) Abutment	B-2	803	805	360	180	> B.O.B	-	
				A. 300	150	75	80	210
				B. 250	125	65	70	175
				C. 200	100	55	60	140
				D. 150	75	45	50	105
		797	799	360	180	70 B.O.B	-	
				A. 300	150	70	75	210
				B. 250	125	60	65	175
				C. 200	100	50	55	140
				D. 150	75	40	45	105


Bearing Capacity Graph - Restrike
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
6
19
23
34
80
0
67
133
200
267
333
400
Capacity (Kips)


Bearing Capacity Graph - Driving
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
6
19
23
34
80
0
67
133
200
267
333
400
Capacity (Kips)


Bearing Capacity Graph - Ultimate
Pipe Pile - Closed End
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
6
19
23
34
80
0
67
133
200
267
333
400
Capacity (Kips)

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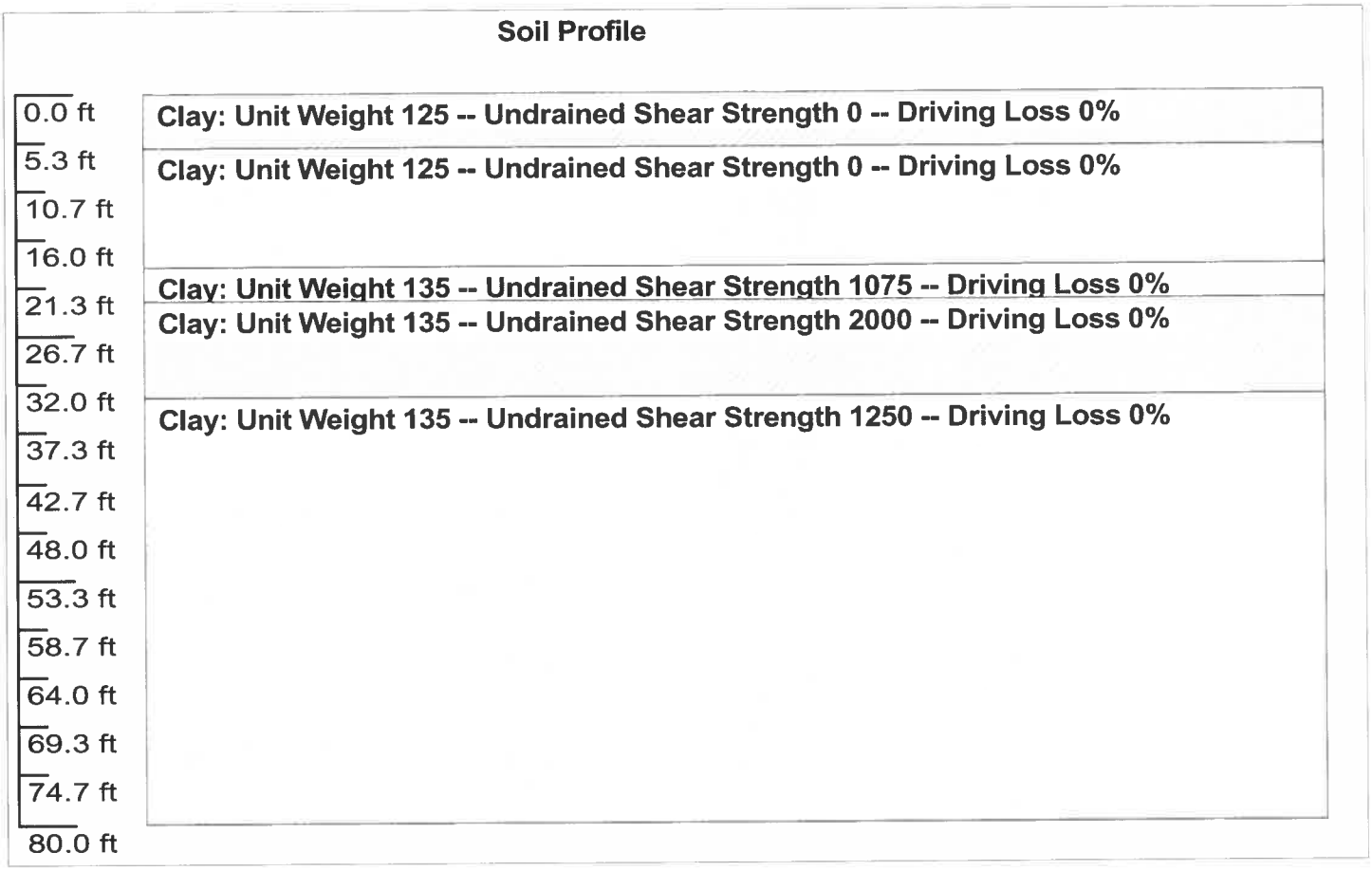


DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: T:\GEOTECH\PROJEC~4\B2NOFILL.DVN
Project Name: MP 34.5 Bridge Widening
Project Date: 10/31/2017
Project Client: OTIC
Computed By: KCH
Project Manager:

PILE INFORMATION

Pile Type: H Pile - HP10X42
Top of Pile: 0.00 ft Neglect contribution from fill
Perimeter Analysis: Box
Tip Analysis: Box Area

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.00 ft
	- Driving/Restrike	23.00 ft
	- Ultimate:	23.00 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	6.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
2	Cohesive	13.00 ft	0.00%	125.00 pcf	0.00 psf	T-79 Steel
3	Cohesive	4.00 ft	0.00%	135.00 pcf	1075.00 psf	T-79 Steel
4	Cohesive	10.50 ft	0.00%	135.00 pcf	2000.00 psf	T-79 Steel
5	Cohesive	46.50 ft	0.00%	135.00 pcf	1250.00 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
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	907.58 psf	0.03 Kips
22.99 ft	Cohesive	N/A	N/A	933.30 psf	12.27 Kips
23.01 ft	Cohesive	N/A	N/A	1368.08 psf	12.35 Kips
32.01 ft	Cohesive	N/A	N/A	1493.14 psf	56.64 Kips
33.49 ft	Cohesive	N/A	N/A	1513.70 psf	64.64 Kips
33.51 ft	Cohesive	N/A	N/A	1121.94 psf	64.73 Kips
42.51 ft	Cohesive	N/A	N/A	1122.50 psf	98.03 Kips
51.51 ft	Cohesive	N/A	N/A	1122.50 psf	131.32 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	164.62 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	197.91 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	231.21 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	236.69 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	6.57 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	6.57 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	7.64 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 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
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.03 Kips	6.57 Kips	6.60 Kips
22.99 ft	12.27 Kips	6.57 Kips	18.84 Kips
23.01 ft	12.35 Kips	12.22 Kips	24.57 Kips
32.01 ft	56.64 Kips	12.22 Kips	68.86 Kips
33.49 ft	64.64 Kips	12.22 Kips	76.85 Kips
33.51 ft	64.73 Kips	7.64 Kips	72.37 Kips
42.51 ft	98.03 Kips	7.64 Kips	105.66 Kips
51.51 ft	131.32 Kips	7.64 Kips	138.96 Kips
60.51 ft	164.62 Kips	7.64 Kips	172.25 Kips
69.51 ft	197.91 Kips	7.64 Kips	205.55 Kips
78.51 ft	231.21 Kips	7.64 Kips	238.85 Kips
79.99 ft	236.69 Kips	7.64 Kips	244.32 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	907.58 psf	0.03 Kips
22.99 ft	Cohesive	N/A	N/A	933.30 psf	12.27 Kips
23.01 ft	Cohesive	N/A	N/A	1368.08 psf	12.35 Kips
32.01 ft	Cohesive	N/A	N/A	1493.14 psf	56.64 Kips
33.49 ft	Cohesive	N/A	N/A	1513.70 psf	64.64 Kips
33.51 ft	Cohesive	N/A	N/A	1121.94 psf	64.73 Kips
42.51 ft	Cohesive	N/A	N/A	1122.50 psf	98.03 Kips
51.51 ft	Cohesive	N/A	N/A	1122.50 psf	131.32 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	164.62 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	197.91 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	231.21 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	236.69 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	6.57 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	6.57 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	7.64 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 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
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.03 Kips	6.57 Kips	6.60 Kips
22.99 ft	12.27 Kips	6.57 Kips	18.84 Kips
23.01 ft	12.35 Kips	12.22 Kips	24.57 Kips
32.01 ft	56.64 Kips	12.22 Kips	68.86 Kips
33.49 ft	64.64 Kips	12.22 Kips	76.85 Kips
33.51 ft	64.73 Kips	7.64 Kips	72.37 Kips
42.51 ft	98.03 Kips	7.64 Kips	105.66 Kips
51.51 ft	131.32 Kips	7.64 Kips	138.96 Kips
60.51 ft	164.62 Kips	7.64 Kips	172.25 Kips
69.51 ft	197.91 Kips	7.64 Kips	205.55 Kips
78.51 ft	231.21 Kips	7.64 Kips	238.85 Kips
79.99 ft	236.69 Kips	7.64 Kips	244.32 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	907.58 psf	0.03 Kips
22.99 ft	Cohesive	N/A	N/A	933.30 psf	12.27 Kips
23.01 ft	Cohesive	N/A	N/A	1368.08 psf	12.35 Kips
32.01 ft	Cohesive	N/A	N/A	1493.14 psf	56.64 Kips
33.49 ft	Cohesive	N/A	N/A	1513.70 psf	64.64 Kips
33.51 ft	Cohesive	N/A	N/A	1121.94 psf	64.73 Kips
42.51 ft	Cohesive	N/A	N/A	1122.50 psf	98.03 Kips
51.51 ft	Cohesive	N/A	N/A	1122.50 psf	131.32 Kips
60.51 ft	Cohesive	N/A	N/A	1122.50 psf	164.62 Kips
69.51 ft	Cohesive	N/A	N/A	1122.50 psf	197.91 Kips
78.51 ft	Cohesive	N/A	N/A	1122.50 psf	231.21 Kips
79.99 ft	Cohesive	N/A	N/A	1122.50 psf	236.69 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
5.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
15.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
18.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	6.57 Kips
22.99 ft	Cohesive	N/A	N/A	N/A	6.57 Kips
23.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
32.01 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
33.49 ft	Cohesive	N/A	N/A	N/A	12.22 Kips
33.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
60.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
69.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
78.51 ft	Cohesive	N/A	N/A	N/A	7.64 Kips
79.99 ft	Cohesive	N/A	N/A	N/A	7.64 Kips

ULTIMATE - SUMMARY OF CAPACITIES

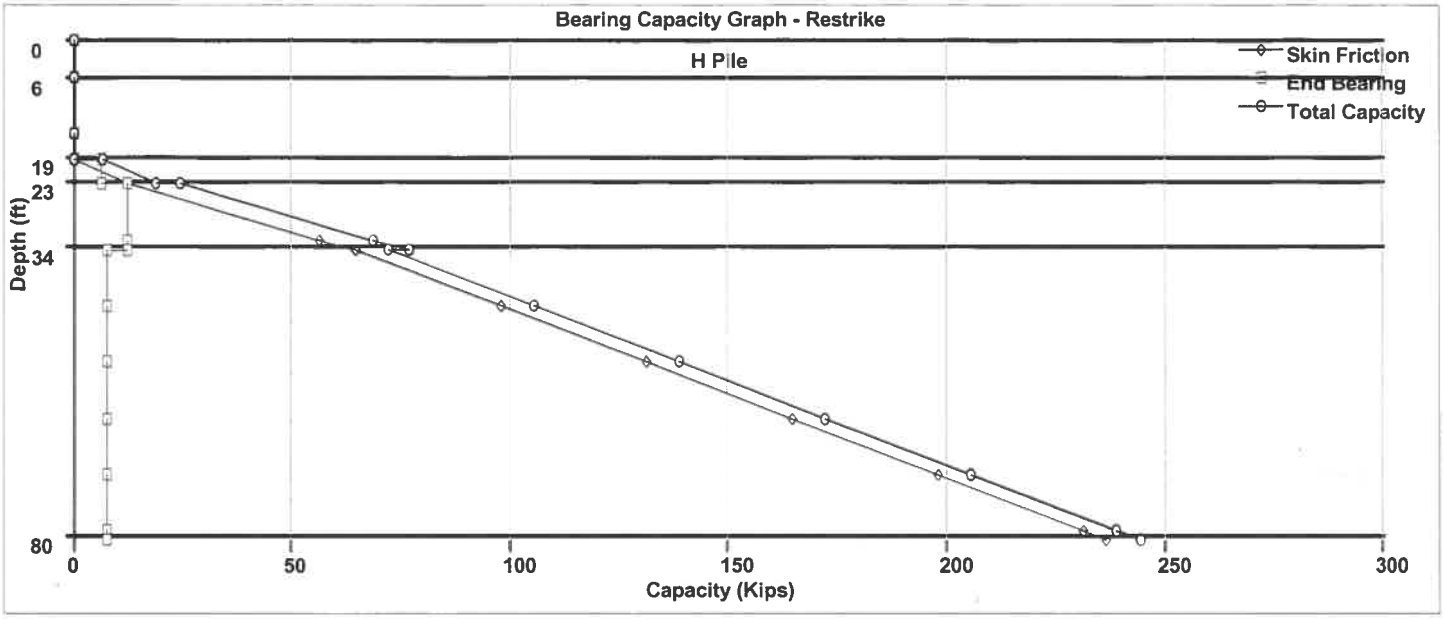
Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft GSE = Elev. 808	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
15.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
18.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
19.01 ft	0.03 Kips	6.57 Kips	6.60 Kips
22.99 ft	12.27 Kips	6.57 Kips	18.84 Kips
23.01 ft	12.35 Kips	12.22 Kips	24.57 Kips
32.01 ft	56.64 Kips	12.22 Kips	68.86 Kips
33.49 ft	64.64 Kips	12.22 Kips	76.85 Kips
33.51 ft	64.73 Kips	7.64 Kips	72.37 Kips ← C @ 40.98 ft (Elev. 767±)
42.51 ft	98.03 Kips	7.64 Kips	105.66 Kips
51.51 ft	131.32 Kips	7.64 Kips	138.96 Kips ← B @ 54.49 ft (Elev. 754±)
60.51 ft	164.62 Kips	7.64 Kips	172.25 Kips ← A @ 60.01 ft (Elev. 740±)
69.51 ft	197.91 Kips	7.64 Kips	205.55 Kips
78.51 ft	231.21 Kips	7.64 Kips	238.85 Kips
79.99 ft	236.69 Kips	7.64 Kips	244.32 Kips

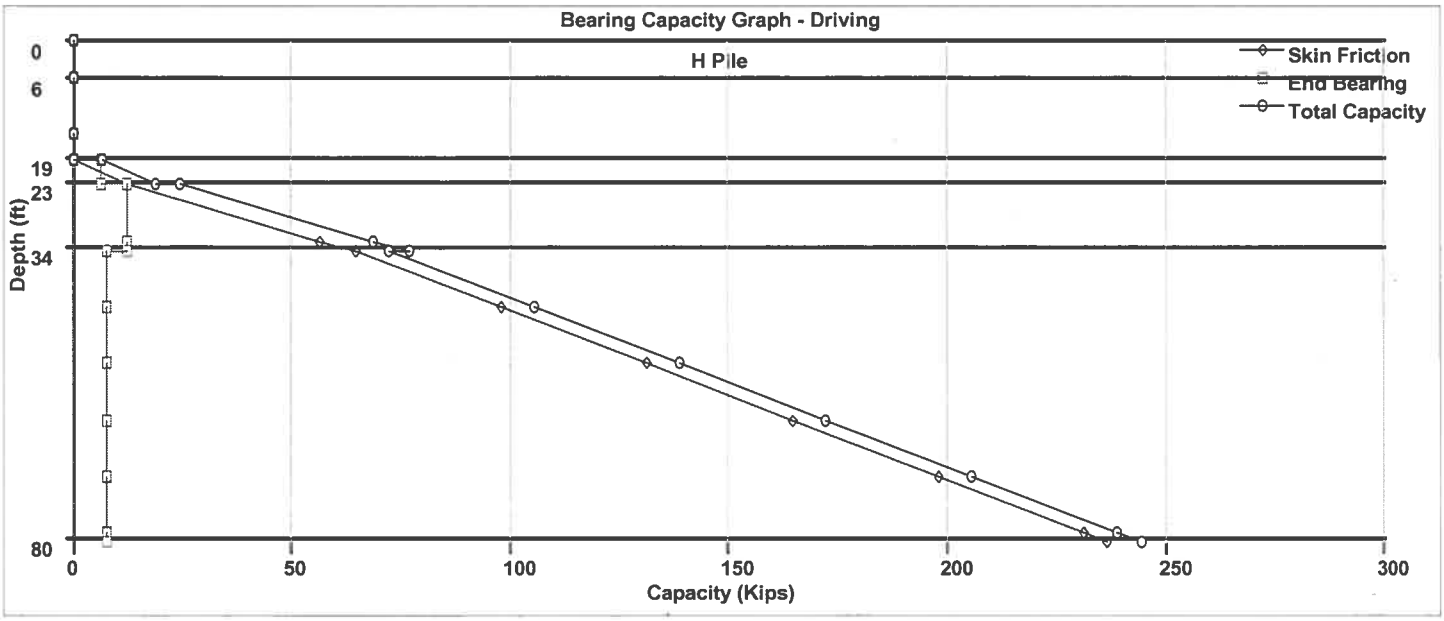
Temporary Bridge Structure Abutments - LRFD

Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	R_{ndr} Max (kips)	Max TFL (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)
East (Forward) Abutment	B-2	803	805	350	245	TBottom of Boring	

Existing Bridge Structure Abutments - ASD

Location	Boring Number	Assumed Bottom of Pile Cap Elevation (feet)	Assumed Cut-Off Pile Elevation (feet)	ASD Ultimate Bearing Value (kips) LRFD R_{ndr}	ASD Unfactored Design Load (kips)	Estimated Pile Length (feet)	Order Pile Length (feet)	LRFD TFL (Kips)
East (Forward) Abutment	B-2	803	805	300	150	TB.O.B.	—	
				A. 200	100	65	70	140
				B. 150	75	50	55	105
				C. 100	50	40	45	70
		797	799	300	150	>B.O.B	—	
				A. 200	100	60	65	140
				B. 150	75	45	50	105
				C. 100	50	35	40	70


Bearing Capacity Graph - Restrike
H Pile
Skin Friction
End Bearing
Total Capacity
Depth (ft)
0
6
19
23
34
80
0
50
100
150
200
250
300
Capacity (Kips)


Bearing Capacity Graph - Driving
H Pile
Skin Friction
End Bearing
Total Capacity
Depth (ft)
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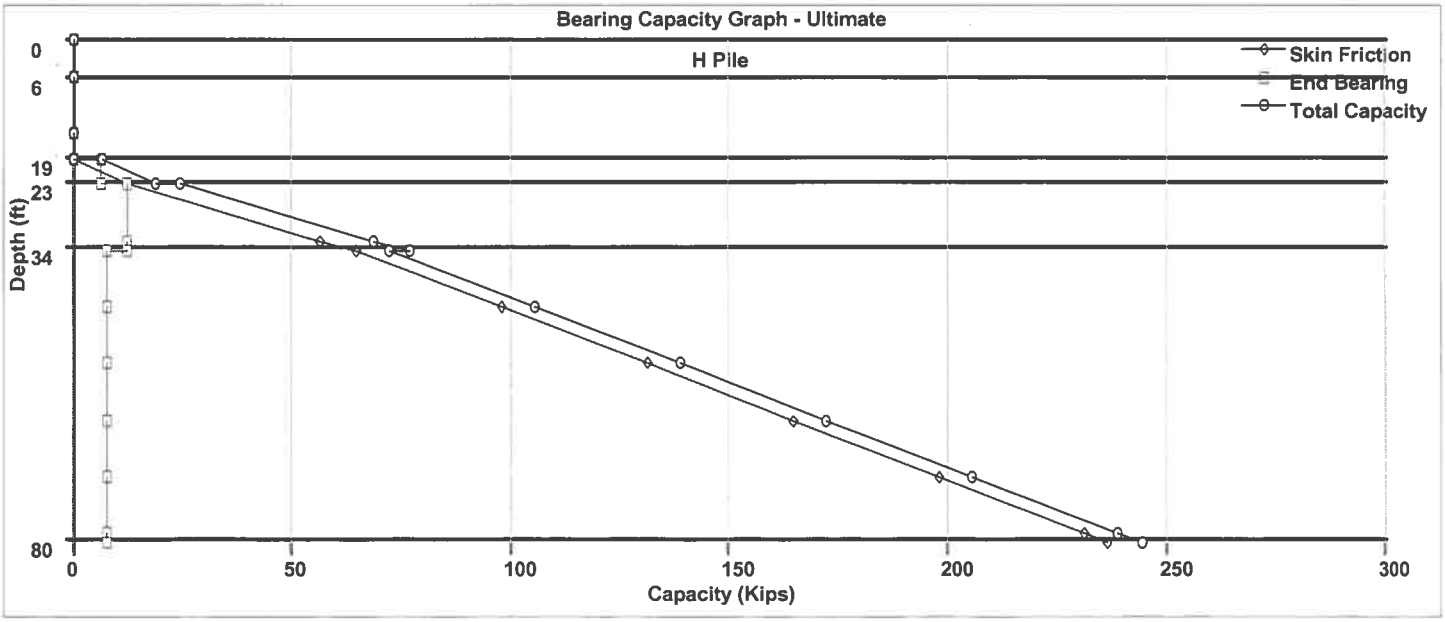
23
34
80
0
50
100
150
200
250
300
Capacity (Kips)


Bearing Capacity Graph - Ultimate
H Pile
Skin Friction
End Bearing
Total Capacity
Depth (ft)
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19
23
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80
0
50
100
150
200
250
300
Capacity (Kips)

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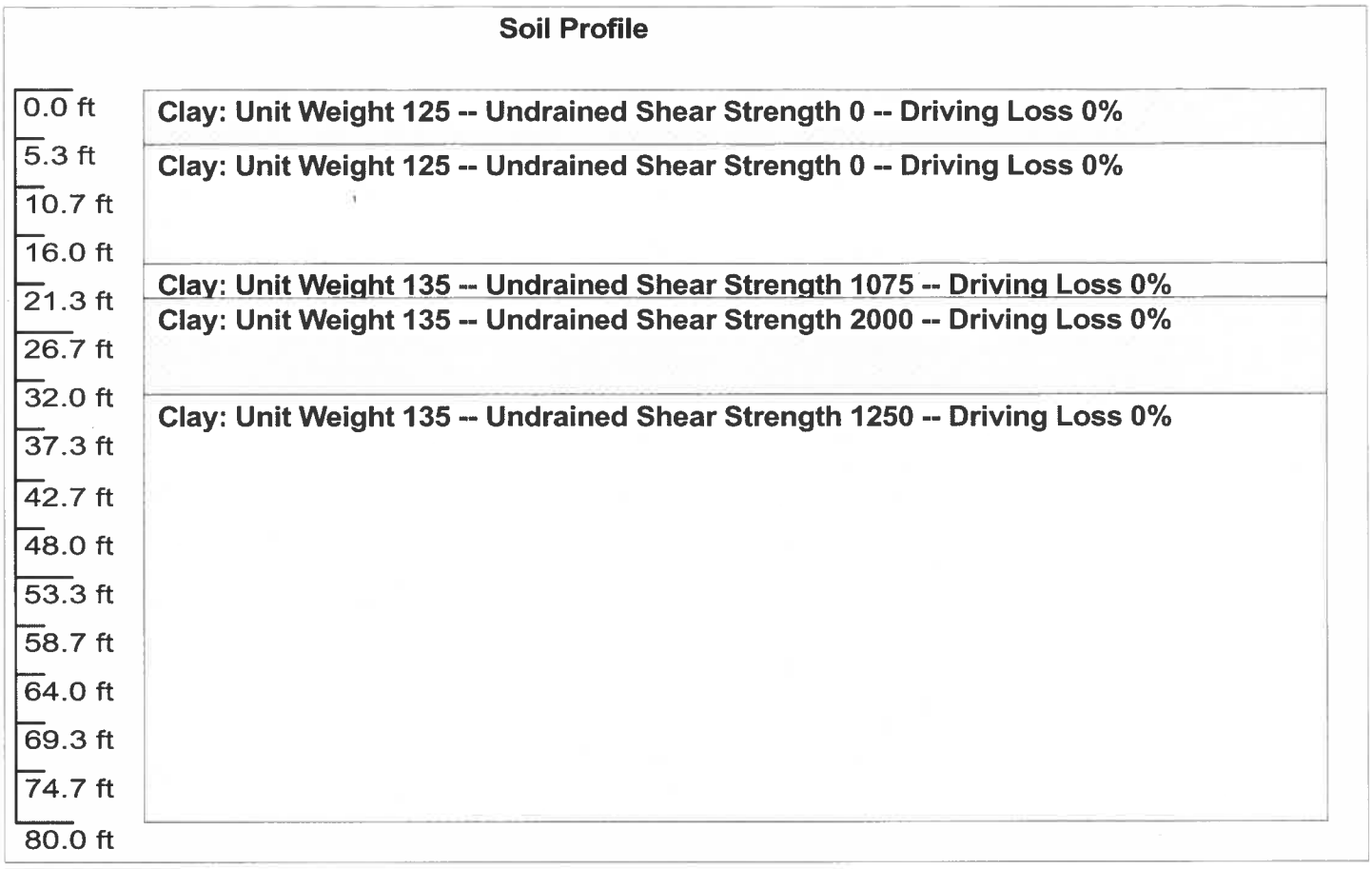

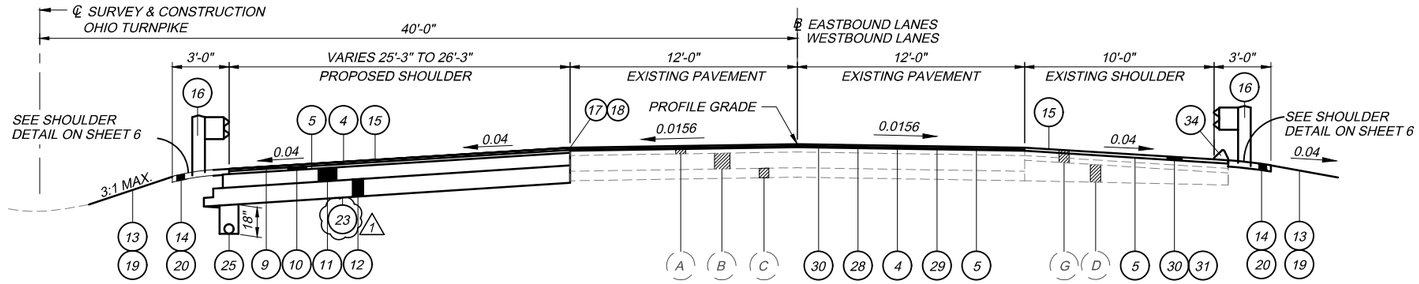

NORMAL SECTION - RESURFACING/WIDENING

EASTBOUND SHOWN. WESTBOUND SYMMETRICAL ABOUT ℄ SURVEY & CONSTRUCTION OHIO TURNPIKE

WESTBOUND		EASTBOUND	
STA. 633+20.00 TO STA. 634+15.00 =	95.00 L.F.	STA. 633+25.00 TO STA. 634+00.00 =	75.00 L.F.

ITEM LEGEND

1	ITEM SP 404	ASPHALT CONCRETE SURFACE COURSE, USING CRUSHED SLAG, PG 76-22 (FR) (T=1-1/2")
2	ITEM SP 402	ASPHALT CONCRETE INTERMEDIATE COURSE OR RECYCLED ASPHALT CONCRETE INTERMEDIATE COURSE, PG 76-22 (FR) (T=1-3/4")
3	ITEM SP 302	ASPHALT CONCRETE BASE, PG 64-22 (T=11-1/2") (2 EQUAL LIFTS) (SEE NOTE 1)
4	ITEM 407	NON-TRACKING TACK COAT FOR INTERMEDIATE COURSE (APPLIED @ 0.06 GAL./S.Y.)
5	ITEM 407	NON-TRACKING TACK COAT (APPLIED @ 0.075 GAL./S.Y.)
6	ITEM SP 304	AGGREGATE BASE (T=6")
7	ITEM SP 304	AGGREGATE BASE (VARIABLE TH.) (WITHOUT GUARDRAIL)
8	ITEM 206	CHEMICALLY STABILIZED SUBGRADE, AS PER PLAN, SEE SHEET X (NOT USED) 1
9	ITEM SP 404	ASPHALT CONCRETE SURFACE COURSE, USING CRUSHED STONE, PG 64-22 (T=1-1/2")
10	ITEM SP 402	ASPHALT CONCRETE INTERMEDIATE COURSE OR RECYCLED ASPHALT CONCRETE INTERMEDIATE COURSE, PG 64-22 (T=1-3/4")
11	ITEM SP 302	ASPHALT CONCRETE BASE, PG 64-22 (SHOULDER) (T=8")
12	ITEM SP 304	AGGREGATE BASE (SHOULDER) (T=9-1/2")
13	ITEM 659	SEEDING AND MULCHING
14	ITEM SP 627	STONE SHOULDER PROTECTION (WITH GUARDRAIL) (T=3")
15	ITEM SPECIAL	SONIC NAP ALERT PATTERN (SNAP)
16	ITEM 606	GUARDRAIL, TYPE MGS WITH LONG STEEL POSTS
17	ITEM SP 404A	JOINT SEALER (APPLIED TO VERTICAL FACE, SP 402, SP 404)
18	ITEM 252	FULL DEPTH PAVEMENT SAWING
19	ITEM 659	TOPSOIL (T=3")
20	ITEM 209	LINEAR GRADING, AS PER PLAN
21	ITEM 526	REINFORCED CONCRETE APPROACH SLAB (T=12"), AS PER PLAN
22	ITEM SP 304	AGGREGATE BASE (T=9")
23	ITEM 204	SUBGRADE COMPACTION
24	ITEM 609	CURB, TYPE 4-A
25	ITEM SP 605	6" BASE PIPE UNDERDRAIN, WITH FABRIC WRAP (18")
26	ITEM SP 605	6" SHALLOW PIPE UNDERDRAIN, WITH FABRIC WRAP (24")
27	ITEM SP 605	6" SHALLOW PIPE UNDERDRAIN, WITH FABRIC WRAP (30")
28	ITEM SP 404	ASPHALT CONCRETE SURFACE COURSE, USING CRUSHED SLAG, PG 76-22 (FR) (T=1-1/4")
29	ITEM SP 403	ASPHALT CONCRETE LEVELING COURSE, USING CRUSHED STONE, PG 76-22 (FR) (VARIABLE DEPTH)
30	ITEM 254	PAVEMENT PLANING, ASPHALT CONCRETE (VARIABLE DEPTH, MIN. DEPTH 1")
31	ITEM SP 404	ASPHALT CONCRETE SURFACE COURSE, USING CRUSHED STONE, PG 64-22 (T=2")
32	ITEM 609	CURB, TYPE 4-C
33	ITEM 622	CONCRETE BARRIER, SINGLE SLOPE, TYPE C-50, AS PER PLAN
34	ITEM 609	ASPHALT CONCRETE CURB, TYPE 1, PG 64-22

EXISTING ITEM LEGEND

A	ASPHALT CONCRETE (T=5"±)
B	CONCRETE PAVEMENT (T=10"±)
C	AGGREGATE BASE (T=6"±)
D	AGGREGATE BASE (T=10 1/2"± AVERAGE)
E	REINFORCED CONCRETE APPROACH SLAB (T=10"±)
F	GUARDRAIL
G	ASPHALT CONCRETE (T=9"±)

COMMON NOTES

NOTE 1: ITEM 407 - NON-TRACKING TACK COAT (APPLIED @ 0.075 GAL./S.Y.) SHALL BE PLACED ON SURFACE OF SP 302 AND ITEM 407 - NON-TRACKING TACK COAT FOR INTERMEDIATE COURSE SHALL BE PLACED BETWEEN THE LIFTS OF SP 302.

NOTE 2: THE TRAVELED LANE PAVEMENT COMPOSITION WILL EXTEND 1 FOOT INTO THE SHOULDER.

NOTE 3: ASPHALT/CONCRETE CURB SHALL BE SEALED PER THE REQUIREMENTS OF SP 400.

NOTE 4: FOR PAVEMENT AND SHOULDER WIDTHS AND CROSS SLOPES, SEE PAVEMENT DETAILS ON SHEETS 63-65 .

* SLOPE VARIES. SEE PAVEMENT DETAILS ON SHEETS 64-66 FOR SLOPES.

DESIGN AGENCY
GPD GROUP
Akron, Ohio 44333
330-572-2100
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NO.	REVISIONS	BY	DATE
1	ADDENDUM #1	CLH	2-5-19
-	-	-	-
-	-	-	-
-	-	-	-

DESIGNED CLH | CHECKED MVJ | IN CHARGE TJW
DRAWN CLH

TYPICAL SECTIONS AND LEGEND
PROPOSED NORMAL RESURFACING

PROJECT 43-19-02
DATE: 11/30/18

4
123

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

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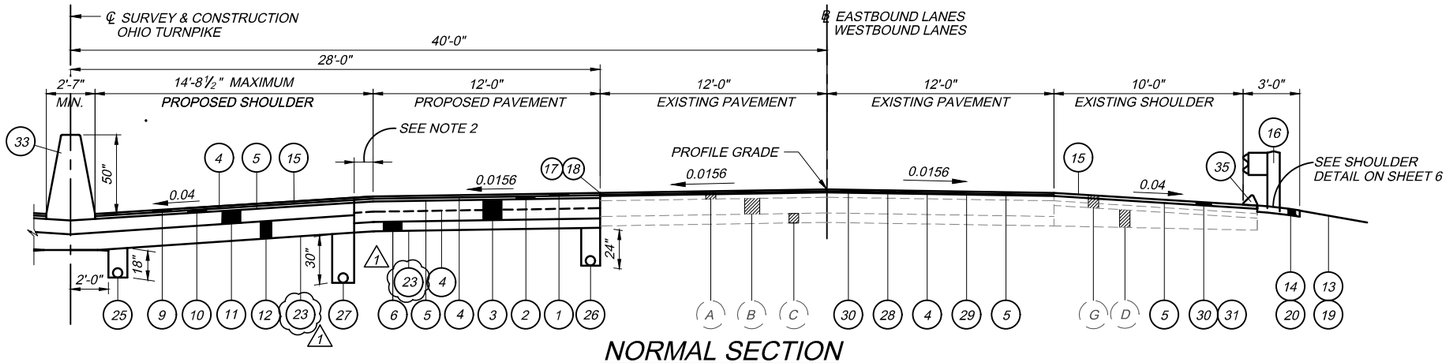
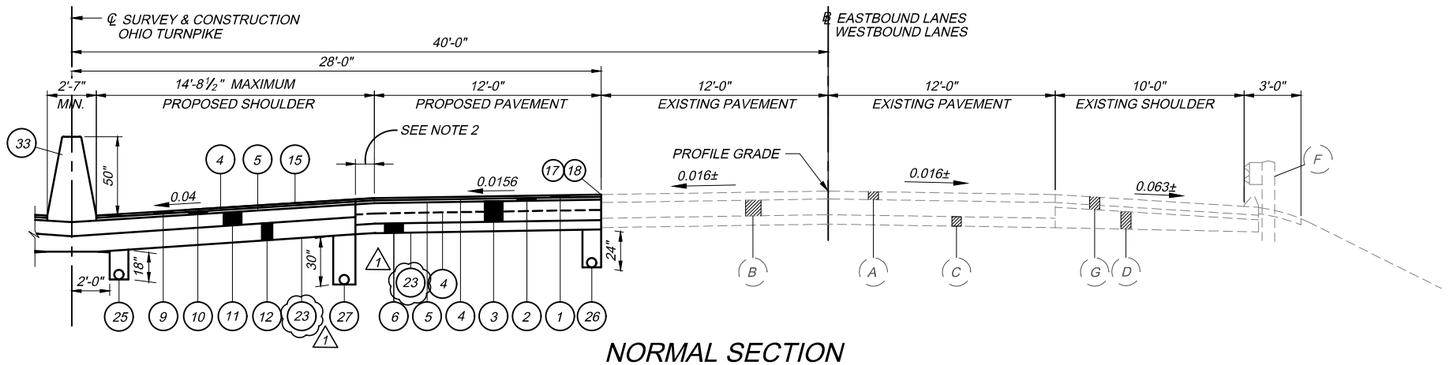


NORMAL SECTION

EASTBOUND SHOWN. WESTBOUND SYMMETRICAL ABOUT ℄ SURVEY & CONSTRUCTION OHIO TURNPIKE

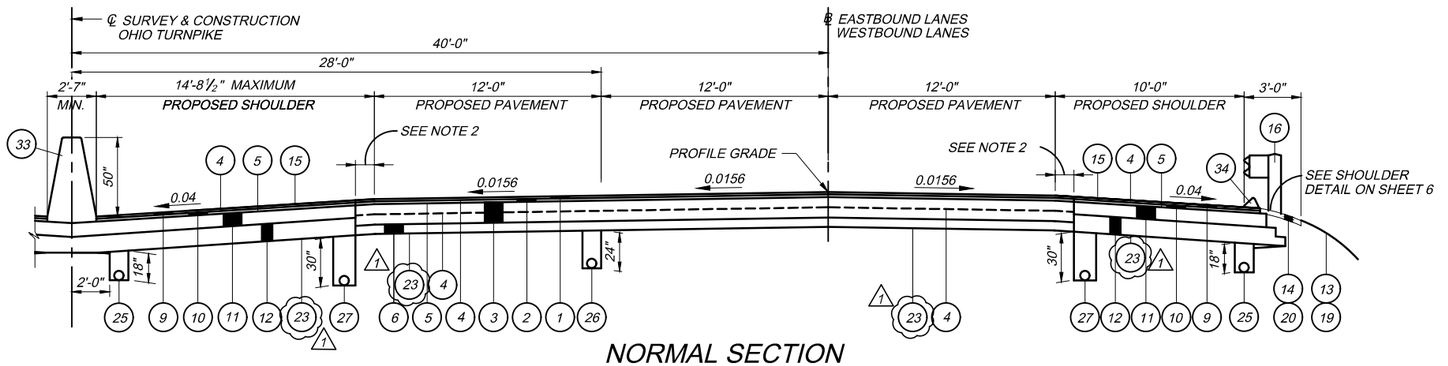
WESTBOUND		EASTBOUND	
STA. 635+90.00 TO STA. 636+70.00 =	80.00 L.F.	STA. 635+75.00 TO STA. 637+00.00 =	125.00 L.F.
STA. 645+25.00 TO STA. 647+43.92 =	218.92 L.F.	STA. 645+25.00 TO STA. 647+43.92 =	218.92 L.F.
STA. 648+99.90 TO STA. 650+25.00 =	125.10 L.F.	STA. 648+99.90 TO STA. 650+25.00 =	125.10 L.F.



NORMAL SECTION

EASTBOUND SHOWN. WESTBOUND SYMMETRICAL ABOUT ℄ SURVEY & CONSTRUCTION OHIO TURNPIKE

WESTBOUND		EASTBOUND	
STA. 636+70.00 TO STA. 645+25.00 =	855.00 L.F.	STA. 637+00.00 TO STA. 645+25.00 =	825.00 L.F.
STA. 650+25.00 TO STA. 652+50.00 =	225.00 L.F.	STA. 650+25.00 TO STA. 652+50.00 =	225.00 L.F.



NORMAL SECTION

EASTBOUND SHOWN. WESTBOUND SYMMETRICAL ABOUT ℄ SURVEY & CONSTRUCTION OHIO TURNPIKE

WESTBOUND		EASTBOUND	
STA. 634+15.00 TO STA. 635+90.00 =	175.00 L.F.	STA. 634+00.00 TO STA. 635+75.00 =	175.00 L.F.

FOR ADDITIONAL NOTES, EXISTING AND PROPOSED LEGEND, SEE SHEET 4.

DESIGN AGENCY

GPD GROUP
Akron, Ohio 44333-2601
330-572-2100
Fax 330-572-2101

NO.	REVISIONS	BY	DATE
1	ADDENDUM 1	CLH	2-5-19
-	-	-	-
-	-	-	-

DESIGNED CLH | CHECKED MVJ | IN CHARGE TJW
DRAWN CLH

TYPICAL SECTIONS
PROPOSED NORMAL AND RESURFACIN /WIDENIN

PROJECT 43-19-02
DATE: 11/30/18

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

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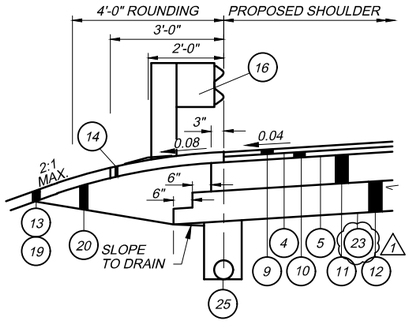
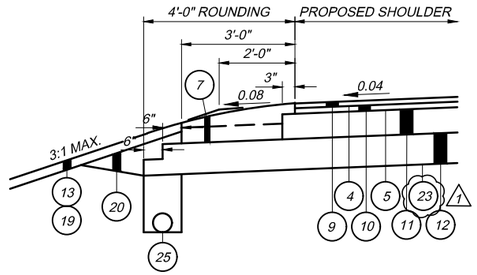


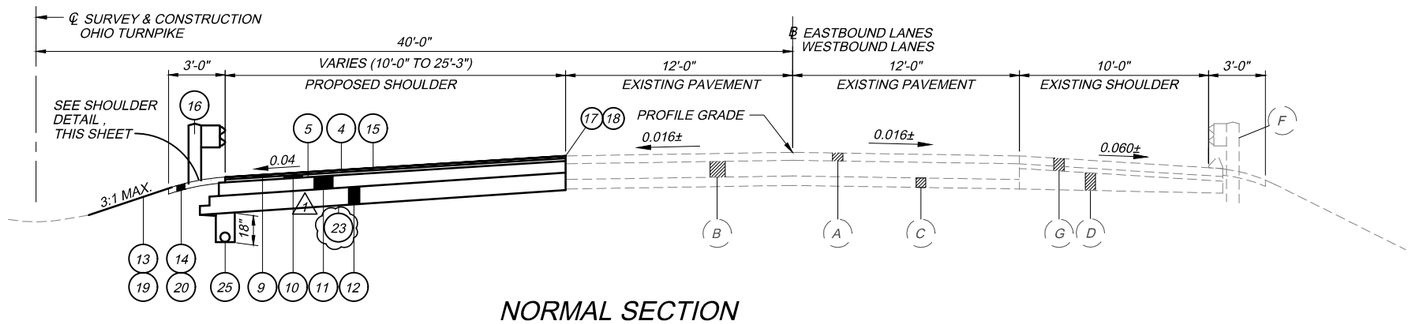
SHOULDER DETAIL

WITH GUARDRAIL, NOT TO SCALE



SHOULDER DETAIL

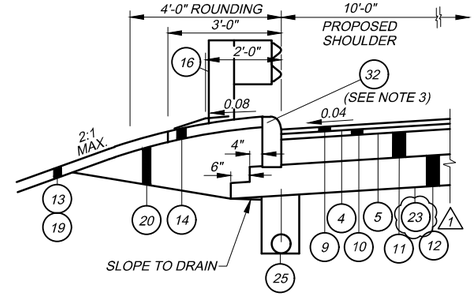
WITH OUT GUARDRAIL, NOT TO SCALE



NORMAL SECTION

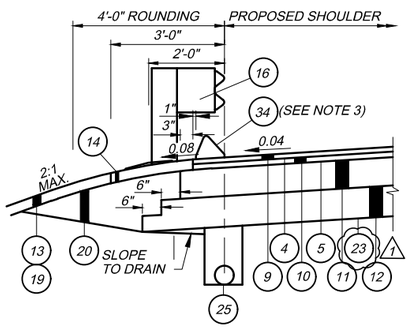
EASTBOUND SHOWN. WESTBOUND SYMMETRICAL ABOUT ℄ SURVEY & CONSTRUCTION OHIO TURNPIKE

WESTBOUND		EASTBOUND	
STA. 629+38.48 TO STA. 633+20.00 =	381.52 L.F.	STA. 632+74.63 TO STA. 633+25.00 =	50.37 L.F.



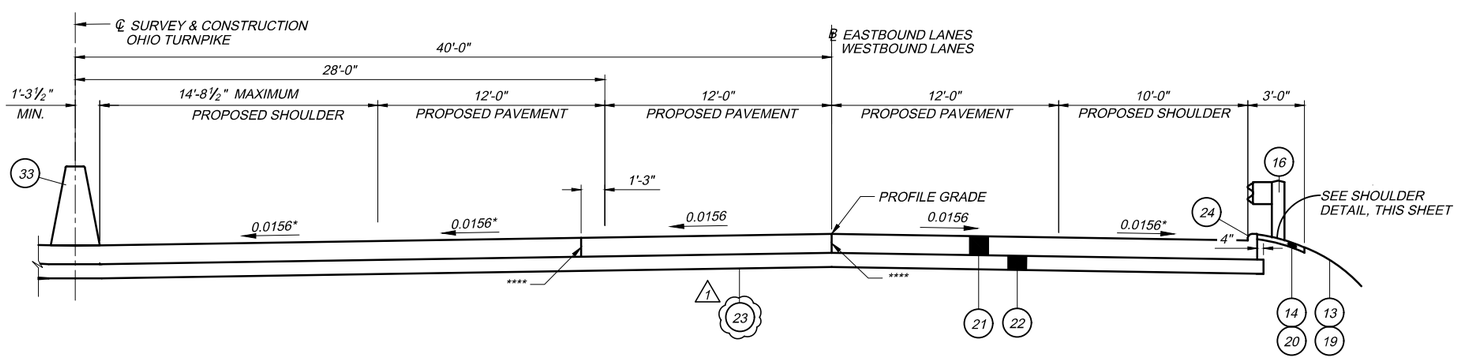
CONCRETE CURB SHOULDER DETAIL

NOT TO SCALE



ASPHALT CURB SHOULDER DETAIL

NOT TO SCALE



APPROACH SLAB SECTION (NORMAL)

EASTBOUND SHOWN. WESTBOUND SYMMETRICAL ABOUT ℄ SURVEY & CONSTRUCTION OHIO TURNPIKE

WESTBOUND		EASTBOUND		
STA. 647+43.92 TO STA. 647+59.08 =	15.16 L.F.	STA. 647+43.92 TO STA. 647+59.08 =	15.16 L.F.	BRIDGE OVER S.R. 108
STA. 648+84.74 TO STA. 648+99.90 =	15.16 L.F.	STA. 648+84.74 TO STA. 648+99.90 =	15.16 L.F.	BRIDGE OVER S.R. 108

NOTES:

* SLOPE VARIES. SEE PAVEMENT DETAILS ON SHEET 64-66 FOR SLOPES.

**** PERMISSIBLE CONSTRUCTION JOINT PER OTIC STANDARD DRAWING AS-2

FOR ADDITIONAL NOTES, EXISTING AND PROPOSED LEGEND, SEE SHEET 4.

DESIGN AGENCY

GPD GROUP
Glaus, Pyle, Schomer, Burns & DeHaven, Inc.
520 South Main Street, Suite 2531, Akron, Ohio 44311
330-572-2100
Fax 330-572-2101

NO.	REVISIONS	BY	DATE
1	ADDENDUM 1	CLH	2-5-19
-	-	-	-
-	-	-	-

DESIGNED CLH | CHECKED MVJ | DRAWN CLH | IN CHARGE TJW

TYPICAL SECTIONS AND DETAILS
APPROACH SLAB SHOULDER WIDENING

PROJECT 43-19-02
DATE: 11/30/18

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

SEQUENCE OF CONSTRUCTION

THE INTENT OF THIS PROJECT IS TO WIDEN THE BRIDGE LOCATED AT MILEPOST (M.P.) 34.5 OVER STATE ROUTE 108 TO A TYPICAL THREE LANE SECTION AND TO REMOVE THE BRIDGE LOCATED AT M.P. 34.2 OVER THE NOW ABANDONED RAILROAD LINE, WHILE MAINTAINING TWO (2) LANES OF TRAFFIC IN BOTH DIRECTIONS. THE CROSSING AT M.P. 34.2 WILL BE FILLED IN AND A TYPICAL 3 LANE SECTION WILL BE CONSTRUCTED TO ACCOMMODATE FUTURE WIDENING. THIS PROJECT ALSO INCLUDES THE RE-DECKING OF THE WAUSEON-OTTOKEE ROAD BRIDGE (COUNTY ROAD 14) OVER THE OHIO TURNPIKE AT M.P. 35.2.

THE FOLLOWING MAINTENANCE OF TRAFFIC PHASING HAS BEEN SUGGESTED TO ACCOMPLISH THE PHASED CONSTRUCTION ACTIVITIES.

PRE-PHASE 1 (NOT SHOWN)

PRIOR TO COMMENCING PHASE 1 CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL PERFORM THE FOLLOWING:

1. PAVEMENT REPAIRS ON BOTH THE EASTBOUND AND WESTBOUND OHIO TURNPIKE WITHIN THE PROJECT LIMITS AND SIGNAGE LIMITS
2. INSTALLATION OF TEMPORARY PAVEMENT AND SHOULDER RECONSTRUCTION THROUGH THE LENGTH OF THE PROJECT, INCLUDING AT THE WESTBOUND ENTRANCE RAMP TO I-80 AND THE EASTBOUND EXIT RAMP TO STATE ROUTE 108 (EXIT 34).
3. INSTALLATION OF STORM SEWER CROSSINGS. PERFORM MAINTENANCE OF TRAFFIC IN ACCORDANCE WITH OTIC STANDARD DRAWING TCR-2.
4. BEGIN EMBANKMENT CONSTRUCTION BELOW THE M.P. 34.2 STRUCTURE.

THE CONTRACTOR SHALL UTILIZE OTIC STANDARD DRAWINGS TO PERFORM ALL PRE-PHASE 1 WORK. THE CONTRACTOR SHALL TAKE CARE TO ENSURE THAT OPPOSING WORK ZONES ARE NOT CREATED.

PHASE 1

THE CONTRACTOR SHALL CLOSE AND DETOUR COUNTY ROAD 14 AND BEGIN RE-DECKING OF THE M.P. 35.2 BRIDGE. THE CONTRACTOR SHALL UTILIZE ODOT SCD MT-101.60 WHEN CLOSING COUNTY ROAD 14 TO PERFORM RE-DECKING. BRIDGE RE-DECKING SHALL BE COMPLETED AT THIS TIME AND COUNTY ROAD 14 SHALL BE RE-OPENED UPON COMPLETION OF THE RE-DECKING. RE-DECKING OF THE M.P. 35.2 BRIDGE MAY BE STARTED WITH PRE-PHASE 1 CONSTRUCTION IF THE CONTRACTOR CHOOSES TO.

THE CONTRACTOR SHALL MAINTAIN TWO LANES OF EASTBOUND AND WESTBOUND TRAFFIC USING THE OUTSIDE LANE AND RECONSTRUCTED SHOULDER AS DETAILED IN THE PHASE 1 MAINTENANCE OF TRAFFIC PLANS.

AT THIS TIME, THE INSIDE PORTION OF THE M.P. 34.2 & 34.5 BRIDGES SHALL BE REMOVED, AND THE PROPOSED MEDIAN WALL, SHOULDER, AND INSIDE LANE CONSTRUCTED AS DETAILED ON THE PLANS THROUGH M.P. 35.4 IN BOTH EASTBOUND AND WESTBOUND DIRECTIONS. THE CONTRACTOR SHALL ALSO COMPLETE A PORTION OF THE MILL & FILL OF THE EXISTING INSIDE LANE BOTH EASTBOUND AND WESTBOUND.

AFTER COMPLETION OF PHASE 1 CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL PROCEED TO PRE-PHASE 2 CONSTRUCTION ACTIVITIES.

PRE-PHASE 2 (NOT SHOWN)

PRIOR TO COMMENCING PHASE 2 CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL PERFORM THE FOLLOWING:

1. INSTALLATION OF TEMPORARY PAVEMENT AND SHOULDER RECONSTRUCTION THROUGH THE LENGTH OF THE PROJECT, INCLUDING AT THE EASTBOUND EXIT RAMP TO STATE ROUTE 108 (EXIT 34).
2. INSTALLATION OF TEMPORARY DRAINAGE AT M.P. 34.1. THIS SHALL INCLUDE THE INSTALLATION OF A TEMPORARY DRAINAGE STRUCTURE, TEMPORARY 12" CONDUIT, AND A TEMPORARY SLOTTED DRAIN. THE EXISTING DRAINAGE STRUCTURE SHALL BE COVERED WITH A STEEL PLATE PRIOR TO THE INSTALLATION OF TEMPORARY PAVEMENT.

PHASE 2

THE CONTRACTOR SHALL MAINTAIN TWO LANES OF EASTBOUND AND WESTBOUND TRAFFIC USING THE NEWLY CONSTRUCTED INSIDE PAVEMENT AND TEMPORARY PAVEMENT AS DETAILED IN THE PHASE 2 MAINTENANCE OF TRAFFIC PLANS.

AT THIS TIME, THE REMAINING PORTION OF THE M.P. 34.2 AND M.P. 34.5 BRIDGE SHALL BE REMOVED. THE EMBANKMENT CONSTRUCTION AT THE M.P. 34.2 STRUCTURE SHALL BE COMPLETED. THE CENTER LANE, OUTSIDE LANE, AND OUTSIDE SHOULDER SHALL BE CONSTRUCTED. THE CONTRACTOR SHALL ALSO COMPLETE THE MILL & FILL AS DESIGNATED ON THE PLANS.

AFTER COMPLETION OF PHASE 2 CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL PROCEED TO PHASE 3 CONSTRUCTION ACTIVITIES.

PHASE 3 (NOT SHOWN)

AT THIS TIME THE CONTRACTOR SHALL INSTALL PROPOSED GUARDRAIL PER OTIC STANDARD DRAWINGS. THE CONTRACTOR SHALL ALSO PLACE THE FINAL SIGNAGE, PAVEMENT MARKINGS, AND BOTH EASTBOUND AND WESTBOUND SNAPS PER OTIC STANDARD DRAWINGS.

INTERIM MAINTENANCE OF TRAFFIC PHASES AND OPERATIONS

THE DETAILED MAINTENANCE OF TRAFFIC PLANS THAT ARE PRESENTED IN THE PLANS FOR THIS PROJECT REFLECT MAJOR PHASES OF CONSTRUCTION THAT ARE REQUIRED TO COMPLETE THE CONSTRUCTION OF THIS PROJECT. THE MAINTENANCE OF TRAFFIC PLANS ALSO INCLUDES QUANTITY CALCULATIONS FOR THESE MAJOR PHASES AS DEPICTED IN THE PLANS.

THERE ARE PERIODS DURING THE CONSTRUCTION OF THIS PROJECT WHERE THE CONTRACTOR SHALL BE REQUIRED TO PERFORM WORK TO ESTABLISH THESE MAJOR CONSTRUCTION PHASES OR TO TRANSITION INTO THE NEXT PHASE OF CONSTRUCTION WHICH SHOULD BE CONSIDERED AS INTERIM MAINTENANCE OF TRAFFIC PHASES.

DURING INTERIM MAINTENANCE OF TRAFFIC PHASES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LABOR, MATERIALS, EQUIPMENT AND TEMPORARY TRAFFIC CONTROL DEVICES, INCLUDING IMPACT ATTENUATORS, REQUIRED TO ESTABLISH THESE MAJOR PHASES OF CONSTRUCTION.

PAYMENT OF THE ABOVE NOTED WORK FOR INTERIM MAINTENANCE OF TRAFFIC PHASES AND OPERATIONS SHALL BE INCLUDED IN THE LUMP SUM BID FOR ITEM SP 614- MAINTAINING TRAFFIC, WHICH SHALL INCLUDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO COMPLETE THE WORK AS SPECIFIED ABOVE.

MAINTAINING TRAFFIC

THIS ITEM SHALL CONSIST OF MAINTENANCE OF TRAFFIC ON EXISTING ROADWAYS IN ACCORDANCE WITH THE OHIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, CURRENT EDITION, LATEST REVISION, THE SPECIFICATIONS AND THE FOLLOWING:

1. ALL TRAFFIC CONTROL DEVICES, DRUMS, TRAFFIC CONTROL SIGNS, FLASHING ARROW PANELS, FLAGGERS, ETC., AS SHOWN AND LOCATED ON THE MAINTENANCE OF TRAFFIC PLANS AND/OR OTIC/ODOT STANDARD DRAWINGS, SHALL BE INCORPORATED FOR THE VARIOUS TYPES OF WORK AREAS UNDER NORMAL TRAFFIC CONDITIONS. IF SPECIAL TRAFFIC CONDITIONS EXIST, THE MAINTENANCE OF TRAFFIC PLANS MAY HAVE TO BE MODIFIED. HOWEVER, NO MODIFICATIONS TO THE MAINTENANCE OF TRAFFIC PLANS SHALL BE MADE UNLESS APPROVED BY THE CHIEF ENGINEER IN WRITING PRIOR TO FIELD IMPLEMENTATION.
2. FLAGGERS SHALL BE REQUIRED TO BE IN PLACE WHERE CONSTRUCTION TRAFFIC CROSSES ACTIVE RAMP LANES AT ANY TIME WHEN CONSTRUCTION IS TAKING PLACE.
3. IN ACCORDANCE WITH OTIC STANDARD DRAWING TCB-1, TRUCKS ENTERING AND EXITING THE CONSTRUCTION ZONE AT ALL ACCESS POINTS MUST BE SIGNED IN. ALL ASSOCIATED SIGNS MUST BE COVERED WHEN THE CONSTRUCTION ACCESS POINT IS NOT IN USE.
4. AT ALL ACTIVE HIGH SPEED CROSSOVERS, THE EXISTING CONFLICTING PAVEMENT MARKINGS AND RPM (RAISED PAVEMENT MARKINGS) SHALL BE REMOVED AND CONSTRUCTION ZONE MARKERS AND EDGE LINE SHALL BE INSTALLED TO THE LIMITS AS INDICATED ON THE MAINTENANCE OF TRAFFIC PLANS PRIOR TO OPENING THE ZONE TO TRAFFIC. REMOVAL OF THE EXISTING PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH SP 614C.
5. CONSTRUCTION ZONE MARKERS AND PORTABLE BARRIERS SHALL BE PLACED IN ACCORDANCE WITH OTIC STANDARD DRAWINGS AND AS SHOWN ON THE MAINTENANCE OF TRAFFIC PLANS.
6. TRUCK MOUNTED ATTENUATORS (TMA) ARE CRASH CUSHIONS THAT ARE ATTACHED TO THE REAR OF PROTECTIVE VEHICLES TO REDUCE THE SEVERITY OF REAR-END COLLISIONS. TMA'S ARE INTENDED TO BE USED ON SHADOW VEHICLES IN MOVING OPERATIONS (THAT PARTIALLY OR TOTALLY ENCROACH ON THE PAVED SHOULDER OR TRAVELED LANE), OPERATIONS IN WHICH THE SHADOW VEHICLE IS BEING OCCUPIED, AND WHEN THERE ARE FEW OR NO ADVANCED WARNING SIGNS OR TRAFFIC CONTROL DEVICES. TMA'S ARE TO BE ATTACHED TO MEDIUM TRUCKS AND ARE TO BE LOCATED IN ADVANCE (AT THE BACK) OF MOVING OPERATIONS.
7. THE CONTRACTOR'S RESPONSIBILITY TO THE SAFETY OF THE MOTORING PUBLIC WHILE PERFORMING THE REQUIREMENTS OF THE CONTRACT SHALL BE IN ACCORDANCE WITH THESE MAINTENANCE OF TRAFFIC PLANS, THE OHIO DEPARTMENT OF TRANSPORTATION, THE OHIO TURNPIKE COMMISSION THE SPECIFICATIONS AND SPECIAL PROVISIONS AND THE "OHIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES" (THE MANUAL).
8. THE CONTRACTOR SHALL COVER ALL PERMANENT SIGNS, OR PORTIONS THEREOF, AS REQUIRED BY THE PLANS, AND/OR AS DIRECTED BY THE CHIEF ENGINEER.
9. TEMPORARY SIGN OVERLAYS FOR OVERHEAD SIGNS SHALL BE OF THE SAME COLOR AS THE BACKGROUND OF THE SIGN AND SHALL BE HIGH INTENSITY GRADE SHEETING (TYPE G) ON 0.080 INCH THICK ALUMINUM. ALL TEMPORARY OVERLAY'S SHALL BE SECURELY FASTENED TO THE EXISTING SIGN IN A MANNER THAT DOES NOT DAMAGE THE ORIGINAL SIGN, AND SHALL BE FURNISHED, INSTALLED AND REMOVED BY THE CONTRACTOR.
10. THE OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION SHALL COORDINATE WITH THE OHIO STATE HIGHWAY PATROL OFFICE TO OBTAIN THE SERVICES OF LAW ENFORCEMENT OFFICERS AS REQUIRED.
11. THE CONTRACTOR SHALL IMMEDIATELY CORRECT ANY DEFICIENCY IN TRAFFIC ZONE ALIGNMENT, EQUIPMENT, NUMBER OF DEVICES OR PROCEDURE OF FLAG PERSONS WHICH IS BROUGHT TO HIS/HER ATTENTION BY THE ENGINEER. THE CONTRACTOR SHALL HAVE THE QUALIFIED ZONE PERSON ON THE SITE, AVAILABLE, AND IN RADIO CONTACT AT ALL TIMES WHENEVER WORK IS BEING PERFORMED AND SUITABLY EQUIPPED TO PROPERLY MAINTAIN, REPLACE OR ADJUST ANY TRAFFIC CONTROL DEVICES.
12. THE LENGTH AND DURATION OF A SINGLE LANE CLOSURE AND RESTRICTION SHALL BE AT THE APPROVAL OF THE CHIEF ENGINEER. IT IS THE INTENT TO MINIMIZE THE IMPACT TO THE TRAVELING PUBLIC. LANE CLOSURES OR RESTRICTIONS OVER SEGMENTS OF THE PROJECT IN WHICH NO WORK IS ANTICIPATED WITHIN A REASONABLE TIME FRAME, AS DETERMINED BY THE CHIEF ENGINEER, SHALL NOT BE PERMITTED. THE LEVEL OF UTILIZATION OF MAINTENANCE OF TRAFFIC DEVICES SHALL BE COMMENSURATE WITH THE WORK IN PROGRESS.
13. THE OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION (OTIC) TEMPORARY TRAFFIC CONTROL PHASE DATES, LANE REDUCTION TIME LIMITATIONS, AND LIQUIDATED DAMAGE CLAUSES ARE CONTAINED IN THE FOLLOWING SPECIAL PROVISIONS:

    SP 103, CONSTRUCTION PHASING AND TIME OF COMPLETION
    SP 104, ACCESS TO TURNPIKE AND RESTRICTIONS
    SP 107, TIME OF ESSENCE - LIQUIDATED DAMAGES

    1 IN ADDITION TO REQUIREMENTS OF THE ABOVE-REFERENCED SPECIAL PROVISIONS,THE FOLLOWING SHALL ALSO APPLY:

    DURING THE PERIOD WHEN COUNTY ROUTE 14 IS CLOSED AND DETOURED, TWO-WAY TRAFFIC SHALL BE MAINTAINED AT ALL TIMES ON STATE ROUTE 108. THE USE OF TEMPORARY SINGLE-LANE CLOSURES SHALL BE MINIMIZED AND NO TEMPORARY CLOSURES OF BOTH LANES ON STATE ROUTE 108 WILL BE PERMITTED DURING THIS PERIOD.

    TO ACCOMMODATE TRAFFIC BEFORE, DURING AND AFTER THE FULTON COUNTY FAIR, TWO LANES OF TRAFFIC WITHOUT RESTRICTION SHALL BE MAINTAINED ON STATE ROUTE 108 DURING THE PERIODS OF 8/23/2019 THRU 9/7/2019 AND 8/28/2020 THRU 9/12/2020.

14. ALL PORTABLE BARRIER SHOWN ON THE PLANS FOR MAINLINE TEMPORARY TRAFFIC CONTROL WILL BE AS PER SP 622. THE SAME BARRIER CAN BE USED FOR THE VARIOUS PHASES. THE COST FOR TRANSPORTING, INSTALLING, SHIFTING, RE-SETTING, MAINTAINING, REMOVAL AND STORING THE PORTABLE BARRIER FOR EACH PHASE SHALL BE INCLUDED IN THE ORIGINAL UNIT COST OF SUPPLYING THE BARRIER FOR ITEM SP 622. GLARE SCREENS SHALL BE INSTALLED ON PORTABLE BARRIER AS SPECIFIED IN THE PLANS AND SPECIFICATIONS. PAYMENT OF THE GLARE SCREENS SHALL BE IN ACCORDANCE WITH THE SPECIAL PROVISION SPECIAL - GLARE SCREENS AND BE CONSIDERED INCIDENTAL TO ITEM SP 622.
15. ALL TEMPORARY TRAFFIC CONTROL SIGNS SHALL BE NEW AT THE START OF THE PROJECT. IF THE SIGNS ARE NEEDED FOR THE SECOND YEAR OF THE PROJECT THEY SHALL BE WASHED PRIOR TO BEING INSTALLED.
16. AFTER THE MAINTENANCE CROSSOVERS ARE OPENED, AN OTIC REPRESENTATIVE SHALL REINSTALL THE SIGNS, "EMERGENCY AND AUTHORIZED VEHICLES ONLY" AND "NO U-TURN".

PAYMENT FOR THE MAINTENANCE OF TRAFFIC ITEMS, UNLESS OTHERWISE SPECIFIED SEPARATELY, SHALL BE PAID FOR UNDER THE LUMP SUM PRICE BID FOR ITEM SP 614 - MAINTAINING TRAFFIC, WHICH SHALL INCLUDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO COMPLETE THE WORK AS DETAILED IN THE PLANS.

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NO.	REVISIONS	BY	DATE
1	ADDENDUM 1	TJW	1/23/19
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-	-	-	-
-	-	-	-

DESIGNED DSM | DRAWN DSM | CHECKED LOB | IN CHARGE TJW

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

MAINTENANCE OF TRAFFIC
GENERAL NOTES

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OHIO TURNPIKE

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STORAGE OF PORTABLE BARRIER

THE OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION WILL ALLOW STORAGE OF PORTABLE BARRIER WALL ON TURNPIKE RIGHT OF WAY AT TOLL PLAZAS 25, 34 AND 39. SPACE IS AVAILABLE AT EACH TOLL PLAZA. THE CONTRACTOR SHALL VERIFY THE AMOUNT OF SPACE THAT IS AVAILABLE AT EACH TOLL PLAZA. THE AVAILABLE SPACE AT THE TOLL PLAZAS MAY REQUIRE MINIMAL GRADING TO PREPARE THE SURFACE FOR LEVEL AND STABLE STORAGE. EITHER ASPHALT MILLINGS OR CRUSHED AGGREGATE MAY BE USED AT THE CONTRACTOR'S OWN EXPENSE TO GRADE AND STABILIZE THE STORAGE AREA. PORTABLE BARRIER SHALL NOT BE STORED HIGHER THAN THREE PIECES HIGH. TYPICAL STORAGE ANTICIPATED WOULD BE IN CUBES OF 5 PORTABLE BARRIER SECTIONS ALTERNATELY STACKED 3 HIGH OR AS RECOMMENDED BY THE MANUFACTURER. RESTORATION OF THE AREA WILL BE REQUIRED TO ORIGINAL OR BETTER CONDITIONS AS APPROVED BY THE CHIEF ENGINEER PRIOR TO FINAL COMPLETION. ALL BROKEN BARRIER AND DEBRIS SHALL BE REMOVED FROM THESE AREAS ONCE COMPLETE AND DISPOSED IN ACCORDANCE WITH SP 105. FLAGGERS WILL BE REQUIRED FOR ANY TURNING MOVEMENTS IN FRONT OF THE TOLL PLAZAS PER THE OTIC'S STANDARDS. THE CONTRACTOR SHALL PROVIDE A UTILIZATION PLAN TO THE CHIEF ENGINEER FOR APPROVAL. THIS PLAN SHALL INCLUDE THE FOLLOWING: AN AERIAL DRAWING OF THE TOLL PLAZA WHICH DEFINES THE STORAGE AREA, SIZE OF AREA REQUIRED, DESCRIPTION OF HOW THE BARRIER IS TO BE STORED, DESCRIPTION OF WORK REQUIRED TO PREPARE THE STORAGE AREA WHICH INCLUDES TYPE OF SURFACE TO BE INSTALLED IF REQUIRED, GRADING THAT PROVIDES POSITIVE DRAINAGE AND ANY EROSION CONTROL MEASURES REQUIRED, AND THE LOGISTICS TO STORE AND RETRIEVE THE STORED PORTABLE BARRIER TO AND FROM THE TOLL PLAZA. ALL COSTS ASSOCIATED WITH THE STORAGE OF PORTABLE BARRIER SHALL BE CONSIDERED INCIDENTAL TO THE LUMP SUM PRICE BID OF ITEM SP 622 - PORTABLE BARRIER.

ITEM 614 PORTABLE CHANGEABLE MESSAGE SIGN, AS PER PLAN

THE CONTRACTOR SHALL FURNISH, INSTALL, MAINTAIN AND REMOVE, WHEN NO LONGER NEEDED, TWO (2) PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS). THE INTENT OF THE PCMS IS TO ALERT MOTORISTS OF TRAFFIC QUEUES OR INCIDENTS DURING MAINTENANCE OF TRAFFIC PHASES 1 AND 2. PCMS SHOULD BE PUT IN PLACE APPROXIMATELY A WEEK BEFORE PHASES 1 AND 2 ARE ESTABLISHED AND REMOVED ONCE PHASES 1 AND 2 DISCONTINUED. THE TWO PCMS SIGNS SHALL BE LOCATED NEAR THE PROJECT SITE, ONE FOR EACH DIRECTION OF TRAVEL, AS DIRECTED BY THE ENGINEER. THE SIGNS SHALL BE OF A TYPE SHOWN ON A LIST OF APPROVED CLASS "A" PCMS UNITS MAINTAINED BY THE ODOT DIRECTOR (OFFICE OF MATERIALS MANAGEMENT). THE APPROVED LIST OF PORTABLE CHANGEABLE MESSAGE SIGNS CAN BE FOUND ON THE ODOT WEBSITE BY CLICKING ON THE SERVICES MENU, THEN CLICKING ON MATERIALS MANAGEMENT.

EACH SIGN SHALL BE TRAILER-MOUNTED AND EQUIPPED WITH A FUNCTIONAL DIMMING MECHANISM, TO DIM THE SIGN DURING DARKNESS, AND A TAMPER AND VANDAL PROOF ENCLOSURE. EACH SIGN SHALL BE PROVIDED WITH APPROPRIATE TRAINING AND OPERATION INSTRUCTIONS TO ENABLE ON-SITE PERSONNEL TO OPERATE AND TROUBLESHOOT THE UNIT. THE SIGN SHALL ALSO BE CAPABLE OF BEING POWERED BY AN ELECTRICAL SERVICE DROP FROM A LOCAL UTILITY COMPANY. PCMS SHALL BE DELINEATED ON A PERMANENT BASIS IN ACCORDANCE WITH ODOT CMS 614.03.

THE PCMS LOCATIONS, LIMITS FOR THOSE LOCATIONS AND ALL ACTIVATION OF PCMS BY THE CONTRACTOR SHALL BE AS DIRECTED BY THE CHIEF ENGINEER. THE PCMS SHALL BE LOCATED IN A HIGHLY VISIBLE POSITION YET PROTECTED FROM TRAFFIC. THE CONTRACTOR SHALL, AT THE DIRECTION OF THE CHIEF ENGINEER, RELOCATE THE PCMS TO IMPROVE VISIBILITY OR ACCOMMODATE CHANGED CONDITIONS. WHEN NOT IN USE, THE PCMS SHALL BE TURNED OFF. ADDITIONALLY, WHEN NOT IN USE FOR EXTENDED PERIODS OF TIME, THE PCMS SHALL BE TURNED, FACING AWAY FROM ALL TRAFFIC, AND SHALL DISPLAY ONE OR MORE TYPE G YELLOW RETROREFLECTIVE SHEETING SURFACES OF 9-INCH BY 15-INCH MINIMUM SIZE FACING TRAFFIC.

THE CHIEF ENGINEER SHALL BE PROVIDED ACCESS TO EACH SIGN UNIT AND SHALL BE PROVIDED WITH APPROPRIATE TRAINING AND OPERATION INSTRUCTIONS TO ENABLE TURNPIKE MAINTENANCE PERSONNEL TO OPERATE AND TROUBLESHOOT THE UNIT, AND TO REVISE SIGN MESSAGES, IF NECESSARY.

ALL MESSAGES TO BE DISPLAYED ON THE SIGN WILL BE PROVIDED BY THE CHIEF ENGINEER. A LIST OF ALL REQUIRED PRE-PROGRAMMED MESSAGES WILL BE GIVEN TO THE CONTRACTOR AT THE PROJECT PRE-CONSTRUCTION CONFERENCE. THE SIGN SHALL HAVE THE CAPABILITY TO STORE UP TO 99 MESSAGES. MESSAGE MEMORY OR PRE-PROGRAMMED DISPLAYS SHALL NOT BE LOST AS A RESULT OF POWER FAILURES TO THE ON-BOARD COMPUTER. THE SIGN LEGEND SHALL BE CAPABLE OF BEING CHANGED IN THE FIELD. THREE-LINE PRESENTATION FORMATS WITH UP TO SIX MESSAGE PHASES SHALL BE SUPPORTED. PCMS FORMAT SHALL PERMIT THE COMPLETE MESSAGE FOR EACH PHASE TO BE READ AT LEAST TWICE.

THE PCMS SHALL CONTAIN AN ACCURATE CLOCK AND PROGRAMMING LOGIC WHICH WILL ALLOW THE SIGN TO BE ACTIVATED, DEACTIVATED OR MESSAGES CHANGED AUTOMATICALLY AT DIFFERENT TIMES OF THE DAY FOR DIFFERENT DAYS OF THE WEEK.

THE PCMS SHALL CONTAIN A CELLULAR TELEPHONE DATA LINK WHICH WILL ALLOW REMOTE ACCESS BY THE OTIC COMMUNICATIONS CENTER THROUGH A WEB BROWSER OR PROVIDED SOFTWARE. REMOTE ACCESS WILL ALLOW PCMS ACTIVATION, MESSAGE CHANGES, MESSAGE ADDITIONS, REVISIONS TO TIME OF DAY PROGRAMS, VERIFICATION OF CURRENT AND PROGRAMMED MESSAGES AND SHOW ITS CURRENT LOCATION ON A MAP. THE OTIC COMMUNICATIONS CENTER SHALL BE FURNISHED A USER NAME AND PASSWORD TO ACCESS THE PCMS THROUGH THE WEBSITE OR PROVIDED SOFTWARE.

ALL PCMS UNITS SHALL BE EQUIPPED WITH RADAR THAT ENABLES THE MESSAGE BOARD TO DISPLAY THE SPEED OF THE APPROACHING VEHICLES.

WHEN A PCMS IS INITIALLY BROUGHT OUT TO THE PROJECT THE CONTRACTOR SHALL CONTACT THE OTIC COMMUNICATIONS CENTER WITH THE PCMS NUMBER AND LOCATION. AT THAT TIME THE OTIC COMMUNICATIONS WILL VERIFY COMMUNICATION WITH THE PCMS.

WHEN A PCMS IS REPLACED OR RELOCATED THE CONTRACTOR SHALL CONTACT THE OTIC COMMUNICATIONS CENTER WITH THE PCMS NUMBER AND LOCATION.

THE PCMS UNIT SHALL BE MAINTAINED IN GOOD WORKING ORDER BY THE CONTRACTOR IN ACCORDANCE WITH THE PROVISIONS OF ODOT CMS 614.07. THE CONTRACTOR SHALL, PRIOR TO ACTIVATING THE UNIT, MAKE ARRANGEMENTS WITH AN AUTHORIZED SERVICE AGENT FOR THE PCMS, TO ASSURE PROMPT SERVICE IN THE EVENT OF FAILURE. ANY FAILURE SHALL NOT RESULT IN THE SIGN BEING OUT OF SERVICE FOR MORE THAN 12 HOURS, INCLUDING WEEKENDS. FAILURE TO COMPLY MAY RESULT IN AN ORDER TO STOP WORK AND OPEN ALL TRAFFIC LANES AND/OR IN THE CHIEF ENGINEER TAKING APPROPRIATE ACTION TO SAFELY CONTROL TRAFFIC. THE ENTIRE COST TO CONTROL TRAFFIC, ACCRUED BY THE OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION DUE TO THE CONTRACTOR'S NONCOMPLIANCE, WILL BE DEDUCTED FROM MONEYS DUE, OR TO BECOME DUE THE CONTRACTOR ON THEIR CONTRACT.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR 24-HOUR-PER-DAY OPERATION AND MAINTENANCE OF THESE SIGNS ON THE PROJECT FOR THE DURATION OF THE PHASES WHEN THE PLAN REQUIRES THEIR USE.

PAYMENT FOR THE ABOVE DESCRIBED ITEM SHALL BE AT THE CONTRACT UNIT PRICE. PAYMENT SHALL INCLUDE ALL LABOR, MATERIALS, EQUIPMENT, FUELS, LUBRICATING OILS, SOFTWARE, HARDWARE AND INCIDENTALS TO PERFORM THE ABOVE DESCRIBED WORK. THE CONTRACTOR SHALL ONLY BE PAID FOR PCMS UNITS WHEN THEY ARE IN OPERATION ON THE PROJECT AS SPECIFIED IN THE PLANS OR BY THE CHIEF ENGINEER.

THE FOLLOWING ESTIMATED QUANTITY HAS BEEN INCLUDED IN THE GENERAL SUMMARY FOR USE AS DIRECTED BY THE CHIEF ENGINEER TO PROVIDE TWO (2) PORTABLE CHANGEABLE MESSAGE SIGNS, EACH SIGN FOR APPROXIMATELY 240 DAYS, FOR AN ESTIMATED TOTAL OF 480 DAYS. 1

ITEM 614, PORTABLE CHANGEABLE MESSAGE SIGN, AS PER PLAN 480 DAY

ITEM 614 - WORK ZONE IMPACT ATTENUATOR FOR 24" WIDE HAZARDS (UNIDIRECTIONAL)

THIS ITEM SHALL CONSIST OF FURNISHING AND INSTALLING A NON-GATING IMPACT ATTENUATOR. FURNISH AN IMPACT ATTENUATOR FROM THE OFFICE OF ROADWAY ENGINEERING'S APPROVED LIST FOR WORK ZONE IMPACT ATTENUATORS, FROM THE ROADWAY STANDARDS APPROVED PRODUCTS WEB PAGE.

INSTALLATION SHALL BE AT THE LOCATIONS SPECIFIED IN THE PLANS IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.

THE CONTRACTOR SHALL REPAIR OR REPLACE A DAMAGED UNIT WITHIN 24 HOURS OF A DAMAGING IMPACT.

WHEN BIDIRECTIONAL DESIGNS ARE SPECIFIED, THE CONTRACTOR SHALL SUPPLY APPROPRIATE TRANSITIONS.

WHEN GATING IMPACT ATTENUATORS ARE DESIRED, THE CONTRACTOR SHALL SUBMIT DOCUMENTATION TO THE ENGINEER FOR ACCEPTANCE.

THE COST FOR THE ADDITIONAL BARRIER REQUIRED FOR A GATING IMPACT ATTENUATOR SHALL BE INCLUDED IN THE COST OF THE GATING IMPACT ATTENUATOR.

ANY IMPACT ATTENUATOR PLACED ON:

- NEW PAVEMENT
- PAVEMENT THAT IS NOT BEING REPLACED AS PART OF THIS PROJECT
- OR PAVEMENT ON AN ACCELERATION/DECELERATION RAMP

SHALL BE AN ANCHORLESS WATER-FILLED IMPACT ATTENUATOR. FURNISH AN ANCHORLESS WATER-FILLED IMPACT ATTENUATOR FROM THE OFFICE OF ROADWAY ENGINEERING'S APPROVED LIST FOR WORK ZONE IMPACT ATTENUATORS, FROM THE ROADWAY STANDARD'S WEB PAGE FOR ROADWAY STANDARDS APPROVED PRODUCTS.

IMPACT ATTENUATORS SHOWN AND QUANTIFIED IN THE PLANS ARE FOR THE PROPOSED MAINTENANCE OF TRAFFIC PHASE LAYOUTS. ADDITIONAL IMPACT ATTENUATORS UTILIZED FOR PHASE SETUP, CONSTRUCTION ACCESS POINTS AND ALTERNATIVE MAINTENANCE OF TRAFFIC METHODS NOT DETAILED IN THESE PLANS SHALL BE INCLUDED IN THE LUMP SUM PRICE BID FOR ITEM SP 614 - MAINTAINING TRAFFIC AND SHALL INCLUDE THE COST OF THE ATTENUATOR, LABOR, MATERIALS AND EQUIPMENT NECESSARY TO SET, RESET AND REMOVE THE IMPACT ATTENUATOR.

PAYMENT FOR THE ABOVE WORK SHALL BE MADE AT THE UNIT PRICE BID AND SHALL INCLUDE ALL LABOR, TOOLS, EQUIPMENT AND MATERIALS NECESSARY TO CONSTRUCT, MAINTAIN AND REMOVE COMPLETE AND FUNCTIONAL IMPACT ATTENUATOR SYSTEM, INCLUDING ALL RELATED BACKUPS, TRANSITIONS, LEVELING PADS, HARDWARE AND GRADING, NOT SEPARATELY SPECIFIED. AS REQUIRED BY THE MANUFACTURER. ANCHOR REMOVAL CAN CAUSE DAMAGE TO THE PAVEMENT SURFACE. PAYMENT SHALL INCLUDE REPAIRING ANY DAMAGE CAUSED DURING REMOVAL.

ITEM 615 - PAVEMENT FOR MAINTAINING TRAFFIC, CLASS A, AS PER PLAN

THIS ITEM SHALL BE AS PER SECTION 615 OF THE CMS. IN ADDITION, PAYMENT FOR THIS ITEM SHALL INCLUDE ALL LABOR, MATERIALS AND ALL OTHER WORK NECESSARY TO THE RESURFACING OF THE EXISTING MEDIAN CROSSOVER AS SHOWN ON SHEETS 22 - 23

PER 254.05 PAVEMENT SURFACE TOLERANCES SHALL BE WITHIN 1/8 INCH PER TEN (10) FEET.

ALL COSTS FOR THE PLACEMENT AND SUBSEQUENT REMOVAL OF THE TEMPORARY PAVEMENT, CROSSOVER GRADING, CROSSOVER DRAINAGE, SLOTTED DRAIN, ANY REQUIRED GUARDRAIL REMOVAL AND/OR RECONSTRUCTION FOR MOT PURPOSES, ALL LABOR AND MATERIALS SHALL BE INCLUDED IN THE PRICE BID FOR

ITEM 615 - PAVEMENT FOR MAINTAINING TRAFFIC, CLASS A, AS PER PLAN 1970 SQ. YD.

ITEM 614 - ASPHALT CONCRETE FOR MAINTAINING TRAFFIC

THIS ITEM SHALL CONSIST OF THE CONTRACTOR PROVIDING ITEM-614 ASPHALT CONCRETE FOR MAINTAINING TRAFFIC. THIS ITEM SHALL BE USED FOR WEDGING PURPOSES TO AID IN TRANSITIONING TRAFFIC FROM NORMAL TO MILLED SURFACE AND BACK AT THE PERTINENT TOLL/SERVICE PLAZAS FOR EACH PART OF THE CONTRACT. SMOOTH TRANSITIONS BETWEEN MILLED SURFACES AND PACED SURFACES SHALL BE MAINTAINED AT ALL TIMES AT TOLL/SERVICE PLAZA ENTRANCE/EXIT. AT NO TIME SHALL TRAFFIC BE SUBJECTED TO SUDDEN DIPS, DROP-OFFS, OR BUMPS. ASPHALT WEDGING OF TRANSITION AREAS SHALL BE IN ACCORDANCE WITH ODOT STANDARD DRAWING MT-101.90. MATERIAL SUPPLIED FOR THIS ITEM SHALL COMPLY WITH THE REQUIREMENTS OF 614.13.

PAYMENT FOR THIS ITEM SHALL INCLUDE ALL LABOR, EQUIPMENT, AND MATERIAL AND INCIDENTALS NECESSARY TO COMPLETE THIS ITEM INCLUDING PLACING AND REMOVING THE ASPHALT CONCRETE. THIS ITEM SHALL BE PAID FOR AT THE UNIT BID PRICE FOR ITEM 614 - ASPHALT CONCRETE FOR MAINTAINING TRAFFIC.

THE FOLLOWING ESTIMATED QUANTITY HAS BEEN INCLUDED IN THE GENERAL SUMMARY FOR USE AS DIRECTED BY THE CHIEF ENGINEER FOR THE MAINTENANCE OF TRAFFIC.

ITEM 614 - ASPHALT CONCRETE FOR MAINTAINING TRAFFIC 150 CU.YD.

ITEM 615 - SHOULDER RECONSTRUCTION FOR MAINTAINING TRAFFIC, CLASS A

THIS ITEM SHALL BE AS PER SECTION 615 OF THE CMS. THIS ITEM SHALL INCLUDE ALL LABOR, MATERIALS AND ALL OTHER WORK NECESSARY TO RECONSTRUCT ROADWAY SHOULDERS FOR THE PURPOSES OF MAINTAINING TRAFFIC.

PER 254.05 PAVEMENT SURFACE TOLERANCES SHALL BE WITHIN 1/8 INCH PER TEN (10) FEET.

ALL COSTS ASSOCIATED WITH SHOULDER RECONSTRUCTION FOR MAINTAINING TRAFFIC SHALL BE INCLUDED IN THE PRICE BID FOR

ITEM 615 - SHOULDER RECONSTRUCTION FOR MAINTAINING TRAFFIC, CLASS A 7451 SQ. YD.

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NO.	REVISIONS	BY	DATE
1	ADDENDUM 1	LOB	2/05/19
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-	-	-	-

DESIGNED	CHECKED
DSM	LOB
DRAWN	IN CHARGE
DSM	TJW

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

MAINTENANCE OF TRAFFIC
GENERAL NOTES

PROJECT 43-19-02
DATE: 11/30/18

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SHEET NUMBER															ITEM	GRAND TOTAL	UNIT	DESCRIPTION	REF. NO.
			12	13	14		17	18	19	20									
																		MAINTENANCE OF TRAFFIC	
									2	3					614	5	EACH	WORK ZONE IMPACT ATTENUATOR FOR 24" WIDE HAZARDS (UNIDIRECTIONAL)	
			20												614	20	EACH	REPLACEMENT SIGN	
			2												614	2	EACH	WORK ZONE CROSSOVER LIGHTING SYSTEM	
				150						1					614	150	CU YD	ASPHALT CONCRETE FOR MAINTAINING TRAFFIC	
									111	136					614	247	EACH	OBJECT MARKER, ONE WAY	
										6					614	6	EACH	OBJECT MARKER, TWO WAY	
					1.32		0.82	0.50							614	2.64	MILE	WORK ZONE LANE LINE, CLASS I, 642 PAINT (4")	
					3.99		2.59	1.40							614	7.98	MILE	WORK ZONE EDGE LINE, CLASS I, 642 PAINT (4")	
					1.33			1.33							614	2.66	MILE	WORK ZONE EDGE LINE, CLASS I, 642 PAINT (6")	
					8,624		2,934	5,690							614	17,248	FT	WORK ZONE CHANNELIZING LINE, CLASS I, 642 PAINT (8")	
					1,632		814	818							614	3,264	FT	WORK ZONE DOTTED LINE, CLASS I, 642 PAINT (4")	
				480											614	480	DAY	PORTABLE CHANGEABLE MESSAGE SIGN, AS PER PLAN	13
			6,000												SP 614	6,000	HOUR	ZONE PERSON	
							0.07	0.07							SP 614B	0.14	MILE	WORK ZONE LANE LINE, 4 INCH	
							0.07	0.07							SP 614B	0.14	MILE	WORK ZONE WHITE EDGE LINE, 4 INCH	
							0.07								SP 614B	0.07	MILE	WORK ZONE YELLOW EDGE LINE, 4 INCH	
								0.07							SP 614B	0.07	MILE	WORK ZONE YELLOW EDGE LINE, 6 INCH	
			17												SP 614C	17	MILE	REMOVAL OF PAVEMENT MARKING	
				1,970											615	1,970	SQ YD	PAVEMENT FOR MAINTAINING TRAFFIC, CLASS A, AS PER PLAN	13
				7,451											615	7,451	SQ YD	SHOULDER RECONSTRUCTION FOR MAINTAINING TRAFFIC, CLASS A	
			500												616	500	MGAL	WATER	
			20												SP 621	20	EACH	RAISED PAVEMENT MARKER - STIMSONITE MODEL 101 LPCR	
			20												SP 621	20	EACH	REPLACEMENT PRISMATIC RETRO-REFLECTOR	
			20												SP 621	20	EACH	REPLACEMENT RAISED PAVEMENT MARKER CASTING - STIMSONITE MODEL 101 LPCR	
															SP 622	LUMP		PORTABLE BARRIER (WITH GLARE SCREEN)	
															SP 622	LUMP		PORTABLE BARRIER (WITHOUT GLARE SCREEN)	
					350				100						SP 626	450	EACH	BARRIER REFLECTOR, TYPE A (WHITE)	
									12	78					SP 626	90	EACH	BARRIER REFLECTOR, TYPE B	
							595	826							SP 626A	1,421	EACH	CONSTRUCTION ZONE MARKER, ONE-WAY MODEL, WHITE	
							298	413							SP 626A	711	EACH	CONSTRUCTION ZONE MARKER, ONE-WAY MODEL, YELLOW	
			500												630	500	SQ FT	SIGNING MISC.: ADDITIONAL SIGNS WITH SUPPORTS, AS DIRECTED BY THE CHIEF ENGINEER	
			15,000												SPECIAL	15,000	FT	"SNAP" MILL AND FILL	

DESIGN AGENCY: GPD GROUP, Glaus, Pyle, Schomer, Burns & Deweese, Inc., Consulting Engineers, Square 1111 Building, Suite 1111, 330-572-2100, Fax 330-572-2101

NO.	REVISIONS	BY	DATE
1	ADDENDUM 1	LOB	2/05/19
-	-	-	-
-	-	-	-

CHECKED: LOB | IN CHARGE: TJW

DESIGNED: DSM | DRAWN: DSM

GENERAL SUMMARY

MAINTENANCE OF TRAFFIC

PROJECT 43-19-02

DATE: 11/30/18

1 / 123

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

OHIO TURNPIKE

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SHEET NO.	REFERENCE NO.	LOCATION	STATION FROM	STATION TO	SIDE		614 WORK ZONE IMPACT ATTENUATOR FOR 24" WIDE HAZARDS (UNIDIRECTIONAL) EACH	614 OBJECT MARKER, ONE WAY EACH	614 OBJECT MARKER, TWO WAY EACH	SP626 BARRIER REFLECTOR, TYPE A EACH	SP626 BARRIER REFLECTOR, TYPE B EACH
		PHASE 2									
29	PCB-6	INTERSTATE ROUTE 80 EB	624+00	627+50	RT		1	8			
29	PCB-7	INTERSTATE ROUTE 80 WB	624+31	627+50	LT			7			
30	PCB-8	INTERSTATE ROUTE 80 WB	627+50	633+73	LT			13	6		
30	PCB-9	INTERSTATE ROUTE 80 EB	627+50	630+57	RT			7			
30	PCB-10	INTERSTATE ROUTE 80 WB	628+76	641+50	LT			26			
30	PCB-11	INTERSTATE ROUTE 80 EB	630+05	641+50	RT		1	24			
30		INTERSTATE ROUTE 80 EB	633+74	641+50	RT						16
30		INTERSTATE ROUTE 80 WB	633+74	641+50	LT						16
31	PCB-12	INTERSTATE ROUTE 80 EB	641+50	650+50	RT			19			
31	PCB-13	INTERSTATE ROUTE 80 WB	641+50	653+45	LT		1	25			
31	PCB-14	INTERSTATE ROUTE 80 EB	652+23	655+02	RT			7			
31		INTERSTATE ROUTE 80 EB	641+50	652+23	RT						23
31		INTERSTATE ROUTE 80 WB	641+50	652+23	LT						23
TOTALS CARRIED TO SHEET 16							3	136	6		78

O:\2017\2017328\admin\reviews\Final Plans\AutoCAD Drawings\431902-MS001.dwg; Sheet 4; 2/05/19 - 1:35pm

DESIGN AGENCY: GPD GROUP, 520 South Main Street, Suite 2531, Akron, Ohio 44311, 330-572-2100, Fax 330-572-2101

NO.	REVISIONS	BY	DATE
1	ADDENDUM 1	LOB	2/05/19
-	-	-	-
-	-	-	-

DESIGNED DSM | CHECKED LOB | DRAWN DSM | IN CHARGE TJW

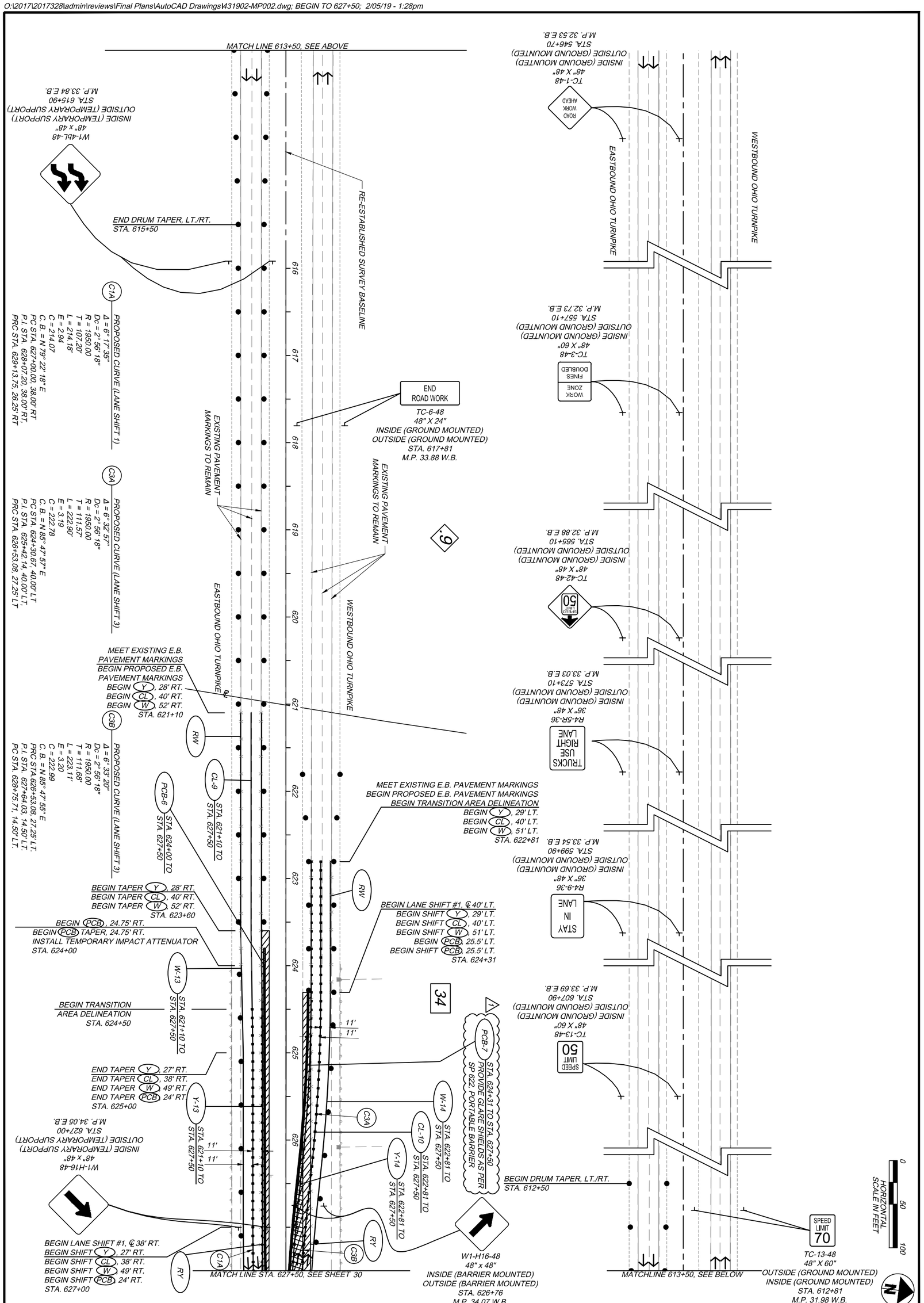
MAINTENANCE OF TRAFFIC - SUBSUMMARY

PROJECT 43-19-02

DATE: 11/30/18

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

O:\2017\2017328\admin\reviews\Final Plans\AutoCAD Drawings\431902-MP002.dwg; BEGIN TO 627+50; 2/05/19 - 1:28pm



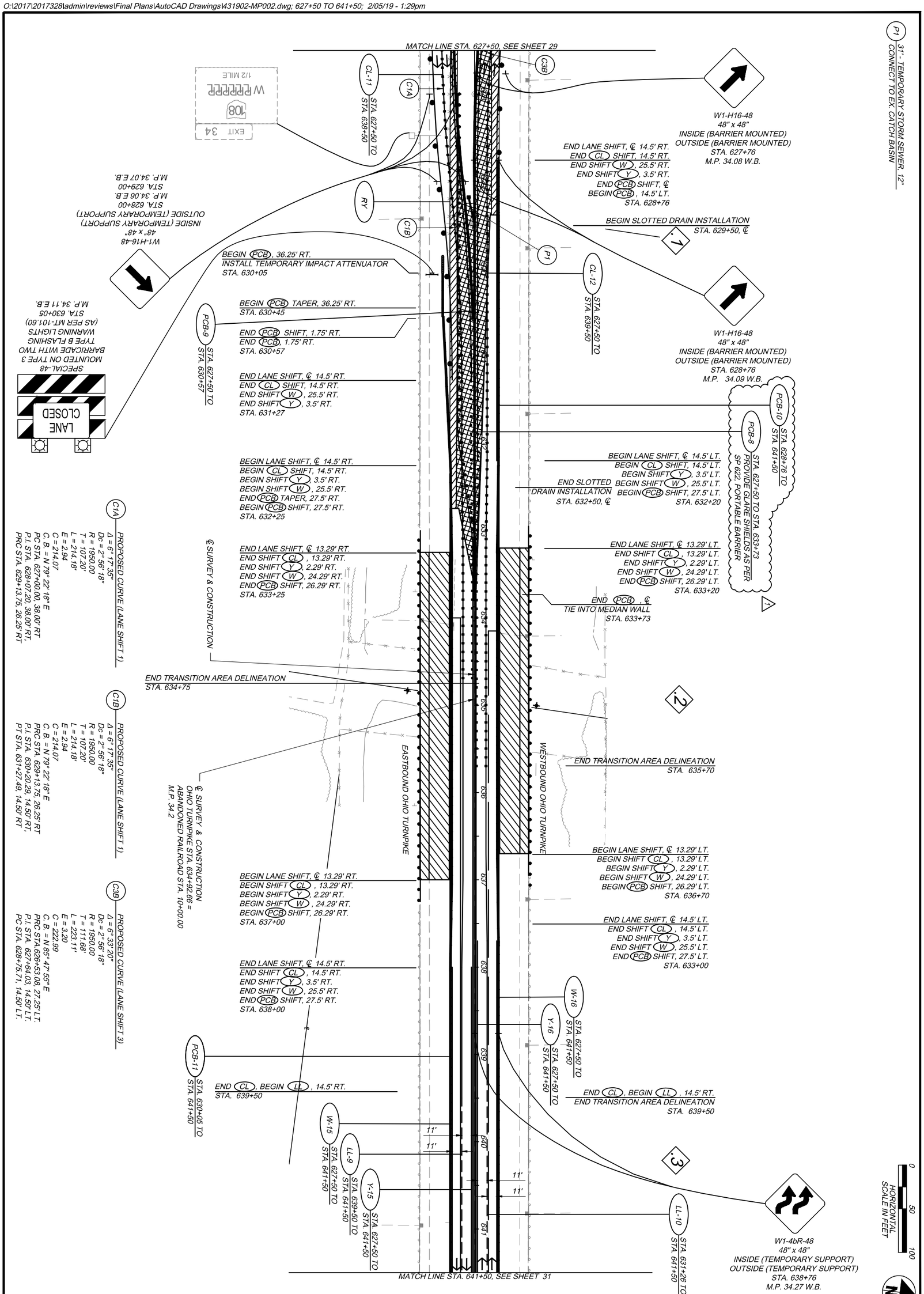
123 / 29	PROJECT 43-19-02	MAINTENANCE OF TRAFFIC - PHASE 2	DESIGNED DSM	CHECKED LOB	NO.	REVISIONS	BY	DATE	DESIGN AGENCY
	DATE: 11/30/18	BE□IN TO STA. □2□□50	DRAWN DSM	IN CHARGE TJW	1	ADDENDUM 1	LOB	2/05/19	GPD GROUP, Gleus, Pyle, Schomer, Burns & DeHaven, Inc. 520 South Main Street, Suite 2531, Akron, Ohio 44311 330-572-2100 Fax 330-572-2101

OHIO TURNPIKE

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

OHIO TURNPIKE

O:\2017\2017328\admin\reviews\Final Plans\AutoCAD Drawings\431902-MP002.dwg; 627+50 TO 641+50; 2/05/19 - 1:29pm



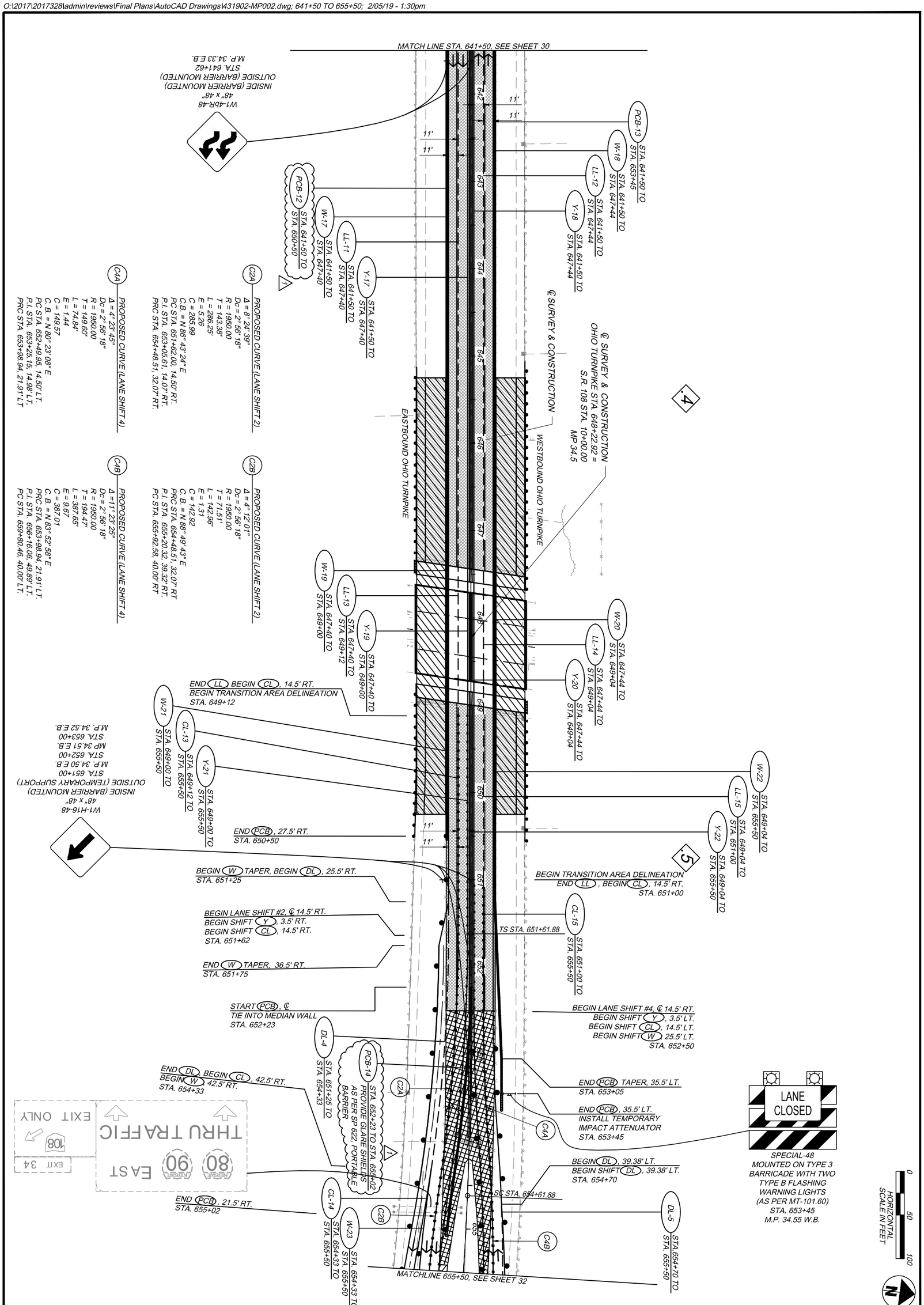
123 / 30	PROJECT 43-19-02	MAINTENANCE OF TRAFFIC - PHASE 2	DESIGNED DSM	CHECKED LOB	NO.	REVISIONS	BY	DATE	DESIGN AGENCY
	DATE: 11/30/18	STA. 2□□50 TO STA. 41□50	DRAWN DSM	IN CHARGE TJW	1	ADDENDUM 1	LOB	2/05/19	GPD GROUP, Gleus, Pyle, Schomer, Burns & DeHaven, Inc. 520 South Main Street, Suite 2531, Akron, Ohio 44311 330-572-2100 Fax 330-572-2101
					-	-	-	-	
					-	-	-	-	

OHIO TURNPIKE

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

OHIO TURNPIKE

O:\2017\2017328\admin\reviews\Final Plans\AutoCAD Drawings\431902-MP002.dwg; 641+50 TO 655+50; 2/05/19 - 1:30pm



31 / 123	PROJECT 43-19-02	MAINTENANCE OF TRAFFIC - PHASE 2	DESIGNED DSM	CHECKED LOB	NO.	REVISIONS	BY	DATE	DESIGN AGENCY
	DATE: 11/30/18	STA. 641+50 TO STA. 655+50	DRAWN DSM	IN CHARGE TJW	1	ADDENDUM 1	LOB	2/05/19	GPD GROUP, Gleus, Pyle, Schomer, Burns & DeHaven, Inc. 520 South Main Street, Suite 2531, Akron, Ohio 44311 330-572-2100 Fax 330-572-2101

OHIO TURNPIKE

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

OHIO TURNPIKE

SHEET NUMBER																		ITEM	GRAND TOTAL	UNIT	DESCRIPTION	REF. NO.
7	8	9	10		42	43	44	45	51	63		69		73		74	77					
																					ROADWAY	
																		201	LUMP	LUMP SUM	CLEARING AND GRUBBING	
2																		201	2	EACH	TREE REMOVED, 18"	
2																		201	6	EACH	TREE REMOVED, 30"	
						10												202	10	EACH	CATCH BASIN OR INLET REMOVED	
									4									202	4	EACH	BRIDGE TERMINAL ASSEMBLY REMOVED	
						703												202	703	FOOT	PIPE REMOVED	
					3,734				100									202	3,834	FOOT	GUARDRAIL REMOVED	
					1,202				120									202	1,322	FOOT	CURB REMOVED	
							4,409											202	4,409	SQ YD	PAVEMENT REMOVED, AS PER PLAN	7
										2,796								203	2,796	CU YD	EXCAVATION	
										14,447								203	14,447	CU YD	EMBANKMENT	
						⚠	12,984											204	⚠ 12,984	SQ YD	SUBGRADE COMPACTION	
							863											209	863	FOOT	LINEAR GRADING, AS PER PLAN	8
					1,875													606	1,875	FOOT	GUARDRAIL, TYPE MGS WITH LONG STEEL POSTS	
					63													606	63	FOOT	GUARDRAIL, BARRIER DESIGN, TYPE MGS WITH LONG STEEL POSTS	
									100									606	100	FOOT	GUARDRAIL, TYPE MGS	
					225													606	225	FOOT	GUARDRAIL, REBUILT, TYPE MGS TO MEET EXISTING	
					2													606	2	EACH	MGS BRIDGE TERMINAL ASSEMBLY, TYPE 1 WITH LONG STEEL POSTS	
									4									606	4	EACH	MGS BRIDGE TERMINAL ASSEMBLY, TYPE 1	
					1													606	1	EACH	MGS BRIDGE TERMINAL ASSEMBLY, TYPE 1, BARRIER DESIGN WITH LONG STEEL POSTS	
					2													606	2	EACH	MGS BRIDGE TERMINAL ASSEMBLY, TYPE 2 WITH LONG STEEL POSTS	
					1													SP 606B	1	EACH	IMPACT ATTENTUATOR, TYPE 2 (QUADGUARD II)	
250																		607	250	FOOT	FENCE, TYPE 47, AS PER PLAN	7
					1,614													622	1,614	FOOT	CONCRETE BARRIER, SINGLE SLOPE, TYPE C-50, AS PER PLAN	8
							2											622	2	EACH	CONCRETE BARRIER, END ANCHORAGE, REINFORCED	
					⚠ ~~1,785~~													⚠ ~~SP 536~~	~~1,785~~	~~SQ YD~~	~~CONCRETE WEATHERPROOFING, MEDIAN WALL~~	
			LS															867	LUMP	LUMP SUM	TEMPORARY WIRED FACED MECHANICALLY STABILIZED EARTH WALL	
			LS															SPECIAL	LUMP	LUMP SUM	ROADWAY, MISC.: EXISTING STRUCTURE MONITORING	10
			7															SPECIAL	7	EACH	ROADWAY, MISC.: SETTLEMENT PLATFORM	10
			3															SPECIAL	3	EACH	ROADWAY, MISC.: VIBRATING WIRE PIEZOMETER	10
																					EROSION CONTROL	
																		SP 113	LUMP	LUMP SUM	SWP3 MANAGEMENT	
						7												601	7	CU YD	ROCK CHANNEL PROTECTION, TYPE C WITHOUT FILTER	
								140										653	140	CU YD	TOPSOIL FURNISHED AND PLACED	
	1																	659	1	EACH	SOIL ANALYSIS TEST	
	321																	659	321	CU YD	TOPSOIL	
	2,886																	659	2,886	SQ YD	SEEDING AND MULCHING	
								1,250										659	1,250	SQ YD	SEEDING AND MULCHING, CLASS 3A	
	145																	659	145	SQ YD	REPAIR SEEDING AND MULCHING	
	145																	659	145	SQ YD	INTER-SEEDING	
	0.39																	659	0.39	TON	COMMERCIAL FERTILIZER	
	0.60																	659	0.60	ACRE	LIME	
	16																	659	16	M GAL	WATER	
	7																	659	7	M.S.F.	MOWING	
								1,250										670	1,250	SQ YD	DITCH EROSION PROTECTION	
	500																	671	500	SQ YD	EROSION CONTROL MAT, TYPE B	
								170										832	170	FOOT	PERIMETER GEOTEXTILE FABRIC FENCE	
								165										832	165	FOOT	GEOTEXTILE FABRIC DITCH CHECK	
								50										832	50	FOOT	INLET PROTECTION	
																		832	LUMP	LUMP SUM	EROSION CONTROL	
																					DRAINAGE	
		200																SP 605	200	FOOT	AGGREGATE DRAIN, TYPE I, WITH FABRIC WRAP, AS PER PLAN	9
		200																SP 605	200	FOOT	AGGREGATE DRAIN, TYPE II, WITH FABRIC WRAP, AS PER PLAN	9
						3,106												SP 605	3,106	FOOT	6" SHALLOW PIPE UNDERDRAIN, WITH FABRIC WRAP (24")	
						3,443												SP 605	3,443	FOOT	6" SHALLOW PIPE UNDERDRAIN, WITH FABRIC WRAP (30")	
						3,915												SP 605	3,915	FOOT	6" BASE PIPE UNDERDRAIN, WITH FABRIC WRAP (18")	
						857												SP 605	857	FOOT	6" UNCLASSIFIED PIPE UNDERDRAIN, WITH FABRIC WRAP	
						262												SP 605	262	FOOT	6" UNDERDRAIN OUTLET PIPE	
						114												SP 611	114	FOOT	12" CONDUIT, TYPE F, 707.33	
						253												SP 611	253	FOOT	15" CONDUIT, TYPE B, 706.02	
						217												SP 611	217	FOOT	15" CONDUIT, TYPE B, 706.02, AS PER PLAN	9
						55												SP 611	55	FOOT	15" CONDUIT, TYPE F, 707.33	
						12												SP 611	12	FOOT	18" CONDUIT, TYPE B, 706.02	
						40												SP 611	40	FOOT	18" CONDUIT, TYPE F, 707.33, AS PER PLAN	9
						24												SP 611	24	FOOT	24" CONDUIT, TYPE F, 707.33, AS PER PLAN	9
		5							4									SP 611	9	EACH	CATCH BASIN ADJUSTED TO GRADE, LESS THAN 4", AS PER PLAN	9
		2																SP 611	2	EACH	CATCH BASIN ADJUSTED TO GRADE, 4" TO 12", AS PER PLAN	9
		1																SP 611	1	EACH	CATCH BASIN ADJUSTED TO GRADE, GREATER THAN 12", AS PER PLAN	9
		8																SP 611	8	EACH	CATCH BASIN GRATE AND CASTING, AS PER PLAN	9

DESIGN AGENCY
GPD GROUP
Glaus, Pyle, Schomer, Burns & DeHaven, Inc.
520 South Main Street, Suite 2531, Akron, Ohio 44311
330-572-2100
Fax 330-572-2101

NO.	REVISIONS	BY	DATE
1	ADDENDUM 1	CLH	2-5-19
-	-	-	-
-	-	-	-

DESIGNED CLH | DRAWN CLH | CHECKED MVJ | IN CHARGE TJW

OHIO TURNPIKE

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

GENERAL SUMMARY
ROADWAY AND EROSION CONTROL

PROJECT 43-19-02
DATE: 11/30/18

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123

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GUARDRAIL/BARRIER SUBSUMMARY

REF NO.	SHEET NO.	STATION TO STATION		SIDE	TOTAL LENGTH	202	606						SP 606B	622		SP 536	SP 626
						GUARDRAIL REMOVED	GUARDRAIL, TYPE MGS WITH LONG STEEL POSTS	GUARDRAIL, BARRIER DESIGN, TYPE MGS WITH LONG STEEL POSTS	GUARDRAIL REBUILT, TYPE MGS TO MEET EXISTING	MGS BRIDGE TERMINAL ASSEMBLY, TYPE 1 WITH LONG STEEL POSTS	MGS BRIDGE TERMINAL ASSEMBLY, TYPE 1, BARRIER DESIGN WITH LONG STEEL POSTS	MGS BRIDGE TERMINAL ASSEMBLY, TYPE 2 WITH LONG STEEL POSTS	IMPACT ATTENTUATOR, TYPE 2 (QUADGUARD II)	CONCRETE BARRIER, SINGLE SLOPE, TYPE C-50, AS PER PLAN	CONCRETE BARRIER, END ANCHORAGE, REINFORCED	CONCRETE WEATHERPROOFING, MEDIAN WALL	BARRIER REFLECTOR, TYPE A
		FROM	TO		FT.	FT.	FT.	FT.	FT.	EACH	EACH	EACH	EACH	FT.	EA	S.Y.	EACH
G-1	49	628+00.06	633+73.29	EB LT	573.23	627.2	462.5	62.5	25.0		1						7
G-2	49, 50	633+73.29	647+44.18	MED	1370.89									1310.9	1	1444.4	
G-3	50	648+99.64	652+50.00	MED	350.36								1	303.4	1	340.7	1
G-4	49	632+95.00	636+95.00	WB RT	400.00	279.2	350.0		50.0								5
G-5	49	633+00.00	637+25.00	EB RT	425.00	298.3	375.0		50.0								6
G-6	50	645+05.66	647+68.16	WB RT	262.50	264.2	237.5		25.0			1					4
G-7	50	645+13.11	647+50.01	EB RT	236.90	238.8	187.5		25.0	1							4
G-8	50	648+93.81	650+55.71	WB RT	161.90	163.8	112.5		25.0	1							3
G-9	50	648+75.66	650+50.63	EB RT	174.97	174.3	150.0		25.0			1					3
R-1	49	633+47.57	634+38.48	WB LT	90.91	91.1											
R-2	49	635+56.89	636+43.53	EB LT	86.64	86.8											
R-3	49	635+59.48	640+14.18	WB LT	454.70	454.8											
R-4	50	643+02.08	647+53.45	EB LT	451.37	455.5											
R-5	50	646+72.96	647+64.63	WB LT	91.67	91.8											
R-6	50	648+79.48	649+70.91	EB LT	91.43	91.6											
R-7	50	648+86.39	653+02.56	WB LT	416.17	416.6											
TOTALS CARRIED TO GENERAL SUMMARY						3734	1875	63	225	2	1	2	1	1614	2	~~1785~~	33

1

CURB SUBSUMMARY

REF NO.	SHEET NO.	STATION TO STATION		SIDE	TOTAL LENGTH	202	609	
						CURB REMOVED	ASPHALT CONCRETE CURB, TYPE 1, PG64-22	CURB, TYPE 4-C
		FROM	TO		FT.	FT.	FT.	FT.
C-1	64	633+20.00	636+70.00	WB RT	350.0	196	350.0	
C-2	64	633+25.00	637+00.00	EB RT	375.0	221	375.0	
C-3	64	633+55.15	633+73.29	WB LT	18.1			18.1
C-4	64	633+55.15	633+73.29	EB LT	18.1			18.1
C-5	65	645+25.00	647+53.00	WB RT	228.0	228	228.0	
C-6	65	645+25.00	647+34.85	EB RT	209.8	210	206.9	3.0
C-7	66	648+90.82	650+25.00	EB RT	134.2	133	134.2	
C-8	66	649+08.97	650+25.00	WB RT	116.0	116	113.0	3.0
R-8	64	634+01.24	634+15.08	EB LT	13.8	14		
R-9	64	634+05.64	634+22.08	WB LT	16.4	16		
R-10	64	635+68.23	635+74.62	EB LT	6.4	6		
R-11	64	635+76.25	635+88.22	WB LT	12.0	12		
R-12	65	647+34.75	647+40.85	EB LT	6.1	6		
R-13	65	647+37.02	647+47.82	WB LT	10.8	11		
R-14	66	648+96.52	649+10.36	EB LT	13.8	14		
R-15	66	649+03.70	649+22.66	WB LT	19.0	19		
TOTALS CARRIED TO GENERAL SUMMARY						1202	1407	42

DESIGN AGENCY

GPD GROUP
Glaus, Pyle, Schomer, Burns & Deweese, Inc.
520 South Main Street, Suite 2531, Akron, Ohio 44311
330.572.2100
Fax 330.572.2101

NO.	REVISIONS	BY	DATE
1	ADDENDUM 1	CLH	2-19
-	-	-	-
-	-	-	-
-	-	-	-

DESIGNED PJF | CHECKED CLH | IN CHARGE MR

DRAWN PJF

ROADWAY SUB-SUMMARIES
REMOVAL OF GUARDRAIL, EARTHWORK AND CURB

PROJECT 43-19-02
DATE: 11/30/18

42
123

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

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STATION TO STATION		SIDE	LENGTH	PAVEMENT WIDTH	SHOULDER WIDTH	SURFACE AREA	APPROACH SLAB AREA	PLANIMETERED AREA	202 PAVEMENT REMOVED, AS PER PLAN	204 SUBGRADE COMPACTION	209 LINEAR GRADING, AS PER PLAN	252 FULL DEPTH PAVEMENT SAWING	254 PAVEMENT PLANING, ASPHALT CONCRETE (VARIABLE DEPTH)	SP 302 8" ASPHALT CONCRETE BASE, PG 64-22 (SHOULDERS)	SP 302 11-1/2" ASPHALT CONCRETE BASE, PG 64-22 (PAVEMENT)	SP 304 9-1/2" AGGREGATE BASE (SHOULDER)	SP 304 AGGREGATE BASE (VARIABLE TH.) (WITHOUT GUARDRAIL)	SP 304 6" AGGREGATE BASE	SP 304 9" AGGREGATE BASE	SP 402 1-3/4" ASPHALT CONCRETE INTERMEDIATE COURSE OR RECYCLED ASPHALT CONCRETE INTERMEDIATE COURSE, PG64-22	SP 402 1-3/4" ASPHALT CONCRETE INTERMEDIATE COURSE OR RECYCLED ASPHALT CONCRETE INTERMEDIATE COURSE, PG76-22 (FR)	SP 403 ASPHALT CONCRETE LEVELING COURSE, USING CRUSHED STONE, PG76-22 (FR) (VARIABLE DEPTH)	SP 404 1-1/2" ASPHALT CONCRETE SURFACE COURSE, USING CRUSHED STONE, PG64-22	SP 404 2" ASPHALT CONCRETE SURFACE COURSE, USING CRUSHED STONE, PG64-22	SP 404 1-1/4" ASPHALT CONCRETE SURFACE COURSE, USING CRUSHED SLAG, PG76-22 (FR)	SP 404 1-1/2" ASPHALT CONCRETE SURFACE COURSE, USING CRUSHED SLAG, PG76-22 (FR)	SP 404A JOINT SEALER	407 NON-TRACKING TACK COAT		SP 627 STONE SHOULDER PROTECTION (WITH GUARDRAIL)	SPECIAL SONIC NAP ALERT PATTERN (SNAP)
			FT.	FT.	FT.	SQ. FT.	SQ. FT.	SQ. FT.	SQ. YD.	SQ. YD.	FT.	FT.	SQ. YD.	CU. YD.	CU. YD.	CU. YD.	CU. YD.	CU. YD.	CU. YD.	CU. YD.	CU. YD.	CU. YD.	CU. YD.	CU. YD.	CU. YD.	CU. YD.	FT.	GAL.		CU. YD.	MILE
TRAVELED LANES AND SHOULDERS - FULL DEPTH																															
634+00.00	635+75.00	EB	175.00	38.00		6650			160	739					236			123			36					31		144			
635+75.00	647+43.92	EB	1168.92	13.00		15196			992	1688		1161			539			281			82					70	2322	329			
647+39.88	647+43.92	EB	4.04	25.00		101			11	11					4			2			1					0.5		2			
647+43.92	647+59.08	EB	15.16			947	947		105	61									26												
648+84.74	648+99.90	EB	15.16			947	947		105	61									26												
648+99.90	649+03.94	EB	4.04	25.00		101			11	11					4			2			1					0.5		2			
648+99.90	652+50.00	EB	350.10	13.00		4551			367	506		350			162			84			25					21	700	99			
632+74.63	633+55.15	EBLT	80.52		18.05	1453			55	161	81	81		36		51	6			8			7				161	22			0.02
633+55.15	633+73.29	EBLT	18.14		26.10	473			10	53		18		12		14				3			2				36	7			0.00
633+73.29	634+00.00	EBLT	26.71		26.71	713			14	79		27		18		22				4			3				53	11			0.01
634+00.00	647+43.92	EBLT	1343.92		13.71	18423				2047				498		591				109			85					291			0.25
648+99.90	652+23.00	EBLT	323.10		13.71	4429			54	492				120		142				26			21					70			0.06
652+23.00	652+50.00	EBLT	27.00		13.00	351			40	39				9		10				2			2					5			0.01
634+00.00	635+75.00	EBRT	175.00		9.83	1720			56	191	175			44		56				9			8					26		3.5	0.03
647+30.80	647+31.86	EBRT	1.06		9.83	10			1	1	1			0.3		0.3				0.1			0.1					0.2		0.1	0.00
647+31.86	647+34.85	EBRT	2.99		9.00	27			3	3	3			0.7		0.9				0.1			0.1					0.4		0.1	0.00
648+90.82	648+93.81	EBRT	2.99		9.00	27			3	3	3			0.7		0.9				0.1			0.1					0.4		0.1	0.00
648+93.81	648+94.86	EBRT	1.05		9.83	10			1	1	1			0.3		0.3				0.1			0.1					0.2		0.1	0.00
634+15.00	635+90.00	WB	175.00	38.00		6650			160	739					236			123			36					31		144			
635+90.00	647+43.92	WB	1153.92	13.00		15001			1057	1667		1154			532			278			81					69	2308	325			
647+39.88	647+43.92	WB	4.04	25.00		101			11	11					4			2			1					0.5		2			
647+43.92	647+59.08	WB	15.16			947	947		105	61									26												
648+84.74	648+99.90	WB	15.16			947	947		105	61									26												
648+99.90	649+03.94	WB	4.04	25.00		101			11	11					4			2			1					0.5		2			
648+99.90	652+50.00	WB	350.10	13.00		4551			347	506		342			162			84			25					21	684	99			
629+38.48	633+55.15	WBLT	416.67		18.33	7639			413	849	417	417		191		270	33			41			35				833	115			0.08
633+55.15	633+73.29	WBLT	18.14		26.67	484			15	54		18		12		15				3			2				36	7			0.00
633+73.29	634+15.00	WBLT	41.71		26.71	1114			27	124		42		29		34				6			5				83	17			0.01
634+15.00	647+43.92	WBLT	1328.92		13.71	18217				2024				492		584				108			84					288			0.25
648+99.90	652+23.00	WBLT	323.10		13.71	4429			62	492				120		142				26			21					70			0.06
652+23.00	652+50.00	WBLT	27.00		13.00	351			43	39				9		10				2			2					5			0.01
634+15.00	635+90.00	WBRT	175.00		9.83	1720			54	191	175			44		56				9			8					26		3.5	0.03
647+48.96	647+50.01	WBRT	1.05		9.83	10			1	1	1			0.3		0.3				0.1			0.1					0.2		0.1	0.00
647+50.01	647+53.00	WBRT	2.99		9.00	27			3	3	3			0.7		0.9				0.1			0.1					0.4		0.1	0.00
649+08.97	649+11.96	WBRT	2.99		9.00	27			3	3	3			0.7		0.9				0.1			0.1					0.4		0.1	0.00
649+11.96	649+13.02	WBRT	1.06		9.83	10			1	1	1			0.3		0.3				0.1			0.1					0.2		0.1	0.00
RESURFACING AREAS - MAINLINE																															
633+25.00	634+00.00	EB	75.00	24.00		1800							200									4			7			27			
633+25.00	634+00.00	EBRT	75.00		10.83	812							90											5				7			0.01
635+75.00	637+00.00	EB	125.00	24.00		3000							333									7			12			45			
635+75.00	637+00.00	EBRT	125.00		10.83	1354							150											8				11			0.02
645+25.00	647+35.78	EB	210.78	24.00		5059							562									12			20			76			
645+25.00	647+30.80	EBRT	205.80		10.83	2229							248											14				19			0.04
648+99.84	649+74.00	EB	74.16	24.00		1780							198									4			7			27			
648+94.86	649+74.00	EBRT	79.14		10.83	857							95											5				7			0.01
649+74.00	650+25.00	EB	51.00	24.80		1265							141									3			5			19			
649+74.00	650+25.00	EBRT	51.00		10.83	552							61											3				5			0.01
633+20.00	634+15.00	WB	95.00	24.00		2280							253									5			9			34			
633+20.00	634+15.00	WBRT	95.00		10.83	1029							114											6				9			0.02
635+90.00	636+70.00	WB	80.00	24.00		1920							213									4			7			29			
635+90.00	636+70.00	WBRT	80.00		10.83	866							96											5				7			0.02
645+25.00	647+43.98	WB	218.98	24.00		5256							584									12			20			79			
645+25.00	647+48.96	WBRT	223.96		10.83	2425							269											15				20			0.04
649+08.04	650+25.00	WB	116.96	24.00		2807							312									6			11			42			
649+13.02	650+25.00	WBRT	111.98		10.83	1213							135											7				10			0.02
TOTALS CARRIED TO GENERAL SUMMARY									4409	12984	863	3609	4056	1636	1881	2003	39	982	106	357	286	58	286	70	97	245	7218	2582		8	1.02
														3517			1127						356		342						

O:\2017\2017328\admin\reviews\Final Plans\AutoCAD Drawings\431902-GC001.dwg; Sheet 1; 2/05/19 - 6:10am

DESIGN AGENCY: GPD GROUP

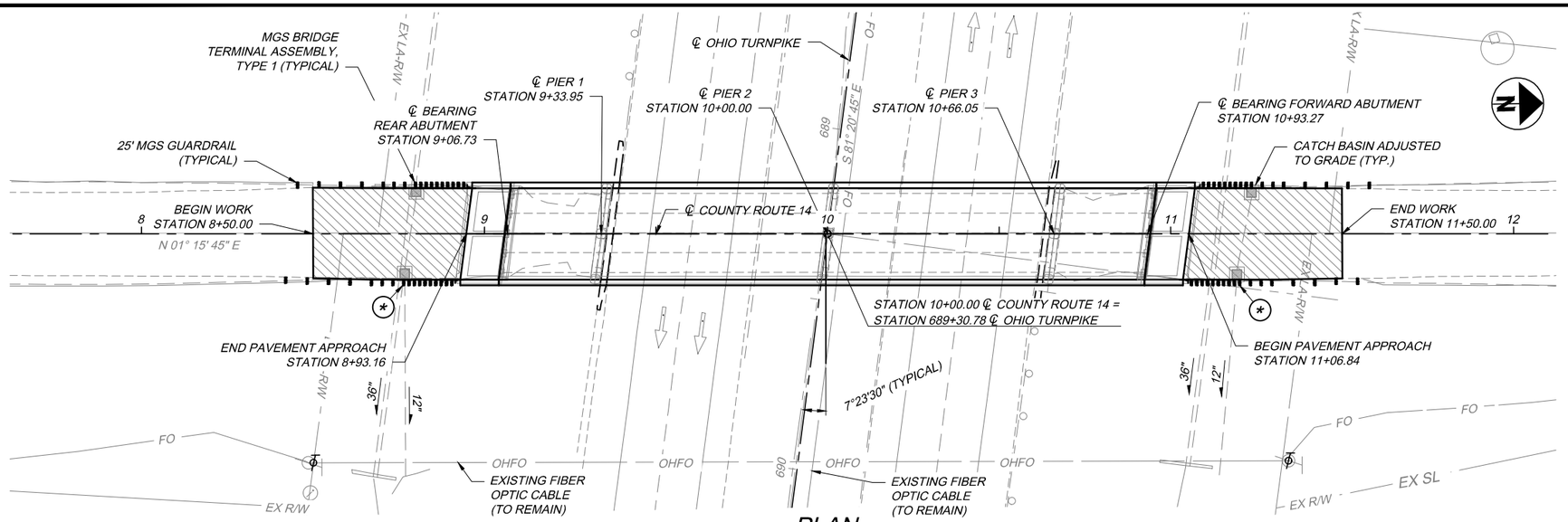
DESIGNED	CHECKED	NO.	REVISIONS	BY	DATE
PJF	CLH	1	ADDENDUM 1	CLH	2-5-19
DRAWN	IN CHARGE				
PJF	MR				

PAVEMENT CALCULATIONS

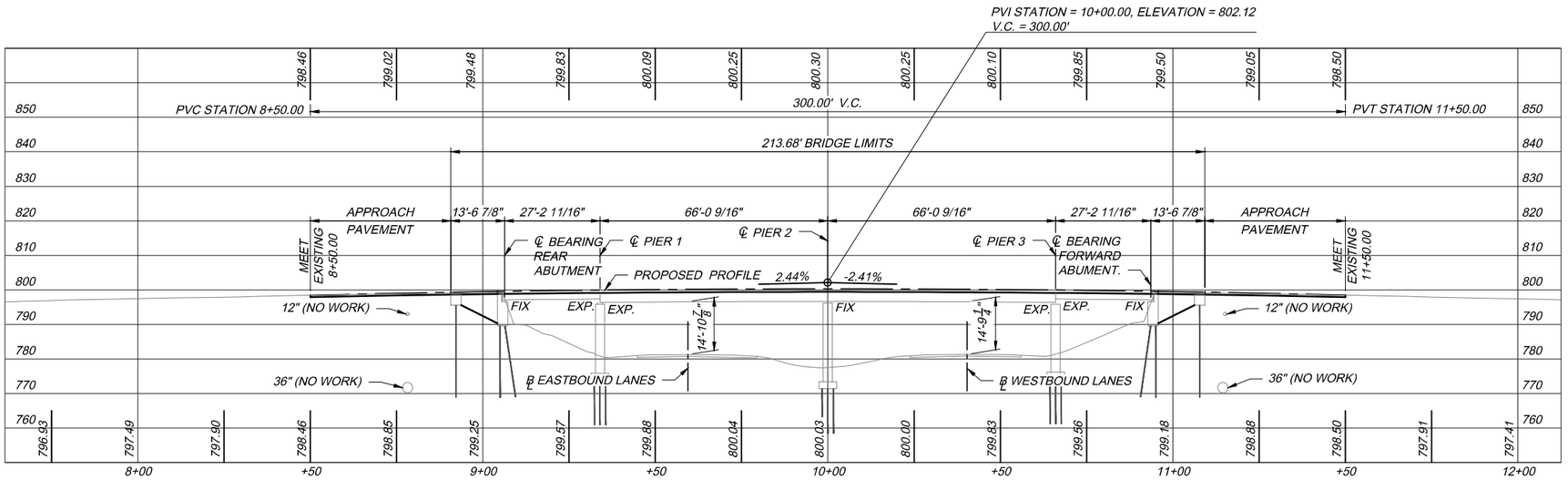
PROJECT 43-19-02

DATE: 11/30/18

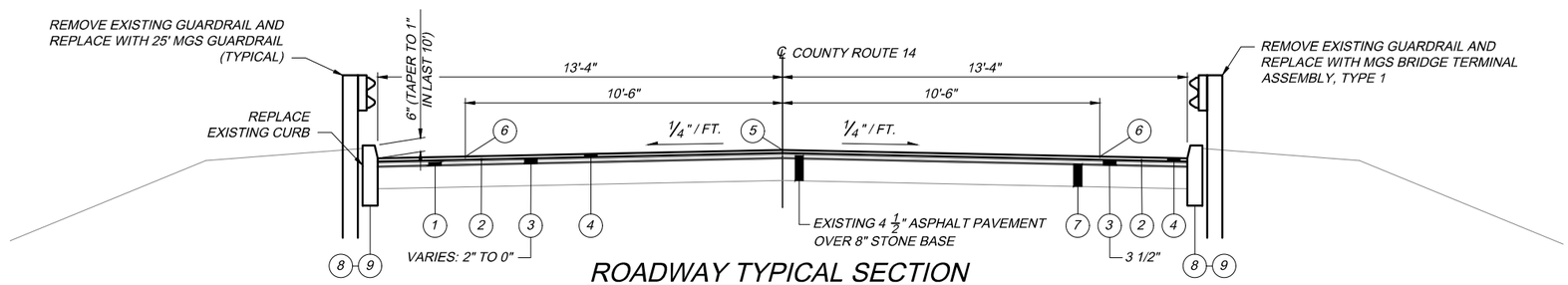
OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION



PLAN



PROFILE



ROADWAY TYPICAL SECTION

LEFT SIDE: STATION 8+50.00 TO STATION 8+88.16
STATION 11+11.84 TO STATION 11+50.00

RIGHT SIDE: STATION 8+88.16 TO STATION 8+93.16
STATION 11+06.84 TO STATION 11+11.84

ITEM	DESCRIPTION	QUANTITY	UNIT
202	BRIDGE TERMINAL ASSEMBLY REMOVED ** 1	4	EACH
202	CURB REMOVED	120	FT
202	GUARDRAIL REMOVED ** 1	100	FT
254	PAVEMENT PLANING; ASPHALT CONCRETE	233	SQ YD
304	AGGREGATE BASE	7	CU YD
407	TACK COAT	23	GAL
441	ASPHALT CONCRETE, SURFACE COURSE, (448), TYPE 1	9	CU YD
441	ASPHALT CONCRETE, INTERMEDIATE COURSE, (448), TYPE 2	12	CU YD
606	GUARDRAIL, TYPE-MGS	100	FT
606	MGS BRIDGE TERMINAL ASSEMBLY, TYPE 1	4	EACH
609	CURB, TYPE 6	120	FT
611	CATCH BASIN ADJUSTED TO GRADE	4	EACH
642	EDGE LINE, 4", TYPE 1	0.1	MILE
642	CENTERLINE, TYPE 1	0.05	MILE

NOTES:

(*) ADJUST GUARDRAIL POST SPACING TO CLEAR PIPE OUTLET

1
** EXISTING STEEL BRIDGE TERMINAL ASSEMBLY AND OTHER EXISTING STEEL GUARDRAIL ELEMENTS ALONG COUNTY ROUTE 14 BEING REMOVED AND REPLACED BY NEW MATERIALS SHALL BE CAREFULLY REMOVED, SALVAGED AND DELIVERED BY THE CONTRACTOR TO THE FULTON COUNTY ENGINEER'S FACILITY LOCATED AT 9120 COUNTY ROUTE 14 NORTH OF THE PROJECT SITE. ALL COSTS SHALL BE INCIDENTAL TO ITEM 202.

LEGEND:

- DENOTES APPROACH PAVEMENT WORK. SEE ROADWAY TYPICAL SECTION, THIS SHEET.

1. ITEM 254 - 1 1/4" PAVEMENT PLANING, ASPHALT CONCRETE
2. ITEM 407 - TACK COAT AT 0.10 GAL/SQ YD
3. ITEM 441 - ASPHALT CONCRETE, INTERMEDIATE COURSE, (448), TYPE 2 MEDIUM DUTY
4. ITEM 441 - 1 1/4" ASPHALT CONCRETE, SURFACE COURSE (448), TYPE 1 MEDIUM DUTY
5. ITEM 642 - CENTERLINE (SOLID DOUBLE), TYPE 1
6. ITEM 642 - EDGE LINE (WHITE) 4 INCH, TYPE 1
7. ITEM 304 - 10" AGGREGATE BASE
8. ITEM 202 - CURB REMOVED
9. ITEM 609 - CURB, TYPE 6

DESIGN AGENCY
PROUDFOOT ASSOCIATES, INC. CONSULTING ENGINEERS

NO.	REVISIONS	BY	DATE
1	ADDENDUM 1	TJW	1/23/19
-	-	-	-
-	-	-	-
-	-	-	-

DESIGNED	CHECKED	NO.
THY	EWH	-
DRAWN	IN CHARGE	-
BPS	THY	-

PLAN & PROFILE - COUNTY ROUTE 14
COUNTY ROUTE 14 OVER OHIO TURNPIKE
FULTON COUNTY
M.P. 35.2

PROJECT 43-19-02
DATE: 11-30-18

51
123

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION

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