FINAL REPORT
STRUCTURE FOUNDATION EXPLORATION
PROPOSED RAMP B6 STRUCTURES:
RETAINING WALL Y & Z
BRIDGE NO. CUY-90-1652S
CUY-90-16.28 (CCG3A)
CUYAHOGA COUNTY, OHIO
PID#: 82382

Prepared For:

Michael Baker International
1111 Superior Avenue, Suite 2300
Cleveland, OH 44114

Prepared by:

NATIONAL ENGINEERING AND ARCHITECTURAL SERVICES INC.
2800 Corporate Exchange Drive, Suite 240
Columbus, Ohio 43231

NEAS PROJECT 21-0011

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National Engineering & Architectural Services Inc.

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1. INTRODUCTION

1.1. General

National Engineering & Architectural Services, Inc. (NEAS) presents our Structure Foundation Exploration Report for the proposed Bridge CUY-90-1652S (Bridge 12) structure and associated retaining walls, Retaining Walls Y and Z (RW-Y and RW-Z), as part of the proposed Ohio Department of Transportation (ODOT) project CCG3A (CUY-90-16.28, PID 82382) in the City of Cleveland, Cuyahoga County, Ohio. The overall project objective is to reconstruct and improve the IR-77/IR-90 interchange, IR-90 and associated surface streets within the project limits. As part of the planned improvements, a new ramp, designated as Ramp B6, is proposed to carry traffic from IR-90 eastbound (EB) to East 22nd St and the newly proposed Midtown Connector to Cedar Ave and Carnegie Ave. To facilitate the addition of this ramp, specifically the portion carrying traffic over East 14th St and Ramp H5, the construction of one (1) bridge structure (CUY-90-1652S) and two associated retaining walls (RW-Y and RW-Z) are required. This report presents a summary of the encountered surficial and subsurface conditions and our recommendations for bridge and retaining wall foundation design and construction in accordance with Load and Resistance Factor Design (LRFD) method as set forth in AASHTO's Publication *LRFD Bridge Design Specifications, 9th Edition* (BDS) (AASHTO, 2020) and the 2021 revision of *ODOT's Bridge Design Manual 2020 Edition* (BDM) (ODOT [1], 2021).

The exploration was conducted in general accordance with Barr Engineering, Inc. DBA National Engineering & Architectural Services, Inc.'s (formerly Barr & Prevost) proposal to Michael Baker International (Baker) dated June 11, 2014, subsequent Modification 7 (MOD 7) proposal to Baker dated October 12, 2020 and with the provisions of the July 2014 (ODOT, 2014) and January 2021 (ODOT, 2021) revisions of ODOT's *Specifications for Geotechnical Explorations* (SGE) for the initial project exploration and the MOD 7 exploration, respectively.

The scope of work performed by NEAS as part of the CCG3A project included: 1) a review of published geotechnical information; 2) performing 182 total test soil borings (8 utilized within this report as a part of the indicated structure foundation exploration); 3) performing 30 total cone penetration test (CPT) sounding (1 utilized within this report); 4) laboratory testing of soil samples in accordance with the SGE; 5) performing geotechnical engineering analysis to assess foundation design and construction considerations; and, 6) development of this summary report.

1.2. Proposed Construction

It is our understanding that ODOT plans to both horizontally and vertically realign the ramp carrying traffic from IR-90 EB to East 22nd St and to the newly proposed Midtown Connector as part of the referenced interstate improvement project. To facilitate the proposed East 14th St and Ramp H5 overpasses of the planned Ramp B6 alignment, the construction of one bridge structure and two retaining walls are required. The bridge structure (CUY-90-1652S) is proposed to carry Ramp B6 over East 14th St and the proposed Ramp H5 while the retaining walls (RW-Y & RW-Z) will provide grade separation between the proposed Ramp B6 embankment and the adjacent parking lot of Abrams Eye Center/St. Vincent Medical Center (RW-Y) and the proposed IR-90 roadway grades (RW-Z). RW-Y will also act as a wing wall for the bridge CUY-90-1652S forward abutment.

The proposed RW-Y and RW-Z will consist of mechanically stabilized earth (MSE) type retaining walls. RW-Y is anticipated to be about 395.5 ft in length with maximum wall height of about 28.5 ft while RW-Z is anticipated to be about 460.5 ft in length with a maximum wall height of about 29.6 ft. RW-Y and RW-Z will utilize a shallow foundation system likely bearing on the existing fill encountered at the site.

The newly proposed bridge structure carrying Ramp B6 over East 14th St and Ramp H5 will consist of a three-span continuous steel beam bridge (designated as CUY-90-1652S) supported on a semi-integral abutments and cap and column type piers with an MSE wall type abutment at the forward abutment location. The new structure (roadway surface) will be approximately 30-ft wide (parapet to parapet) and approximately 518 ft in length. Substructures of the new bridge will likely be supported by a driven pile foundation consisting of closed-ended cast-in-place reinforced concrete pipe piles (CIP piles).

2. GEOLOGY AND OBSERVATIONS OF THE PROJECT

2.1. Geology and Physiography

The project site is located within the Erie Lake Plain, part of the Huron-Erie Lake Plains. This area is characterized as the edge of the very low-relief (10 ft), Ice-Age lake basin separated from the modern Lake Erie by shoreline cliffs with major streams in deep gorges being characteristic. The geology in this region is described as Pleistocene-age lacustrine sand, silt, clay and wave-planed glacial till over Devonian- and Mississippi-age shales and sandstones (ODGS, 1998).

The geology underlying the western portion of the site of the proposed Ramp B6 structures is mapped as an average of 10 ft or less of Wisconsinan-age sand atop an average of 90 ft of Wisconsinan-age lacustrine silt and clay followed by an average of 80 ft of Wisconsinan-age till underlain by an average of 10 ft or less of Wisconsinan-age sand all over Devonian-age Ohio Shale (ODGS, 2002). The geology underlying the eastern portion of the site is mapped as an average of 20 ft of Wisconsinan-age sand atop a maximum of 290 ft of Wisconsinan-age lacustrine silt and clay thinning to an average of 90 ft in the proximity of the reference bridge site all over Devonian-age Ohio Shale. The Wisconsinan-age sand mapped at the site is characterized as well to moderately sorted, moderately to well rounded, finely stratified to massive and contains minor amounts of disseminated gravel or thin lenses of silt or clay. The lacustrine silt and clay at the site is described as laminated silts and clays that may contain fine sand or gravel layers. The till is described as an unsorted mix of clay, silt, sand, gravel and boulders which may contain silt, sand and gravel lenses. Till in buried valleys and thicker areas are noted as potentially being older than Wisconsinan.

Bedrock beneath the proposed Ramp B6 has been mapped as sedimentary Devonian-age Ohio shale with carbonate and/or siderite concretions in the lowermost 50 ft. This brownish black to greenish gray shale is carbonaceous to clayey, laminated to thin bedded, and can have a petroliferous odor (USGS & ODGS, 2005). Based on the ODNR bedrock topography map of Ohio, bedrock elevations near the proposed Ramp B6 site can be expected to be between elevations of 450 and 400 ft above mean sea level (amsl), putting bedrock at a depth ranging from about 210 to 295 ft below ground surface (bgs).

The soils at the Ramp B6 site have been mapped (Web Soil Survey) by the Natural Resources Conservation Service as Udorthents, loamy (Ua) and Urban Land (Ub). These are soils that have been disturbed by cutting or filling and are not rated for local roads (USDA, 2019).

2.2. Hydrology/Hydrogeology

The local hydro-geologic system is dominated by the valley of the Cuyahoga River, located approximately 0.4 to 0.7 miles to the southwest of the proposed Ramp B6 structures and flows northwest discharging into Lake Erie. The elevation of the Cuyahoga River and Lake Erie is about 570 to 575 ft amsl in this region and is likely to be representative of the regional groundwater table. As mentioned previously, the surficial geology consists of primarily granular soils underlain by a relatively impermeable lacustrine or glacial silt and clay layer. It is possible for groundwater to become trapped in granular soils above the regional groundwater level by an underlying impermeable layer forming a perched water table. The project site follows a similar geological model and therefore, could result in a groundwater elevation within the project limits that is likely above the regional groundwater table elevation.

The proposed Ramp B6 site is not located within a special flood hazard area based on available mapping by the Federal Emergency Management Agency's (FEMA) National Flood Hazard mapping program (FEMA, 2016).

2.3. Mining and Oil/Gas Production

No abandoned mines are noted on ODNR's Abandoned Underground Mine Locator within the immediate vicinity of the proposed Ramp B6 location (ODNR [1], 2016).

No oil or gas wells are noted on ODNR's Ohio Oil & Gas Locator within the immediate vicinity of the proposed Ramp B6 location (ODNR [2], 2016).

2.4. Historical Records and Previous Phases of Project Exploration

A historic record search was performed through ODOT's Geotechnical Data Management System (GeoMS). Three historical soil borings (B-111-0-57, B-069-1-10 and B-069-2-10) were reviewed and were considered in our evaluation of the proposed structures subsurface conditions. A summary of the historic boring information (location, elevation, etc.) is provided in Table 1, and their locations are depicted on the Soil Profile Sheets provided in Appendix A. The historic boring logs of the borings utilized within this report are provided in Appendix B.

Table 1: Historic Boring Summary

Boring Number	Latitude	Longitude	Elevation (NAVD 88) (ft)	Depth (ft)	Proposed Substructure
B-111-0-57	41.496039	-81.677802	673.0	81.0	Pier 1
B-069-1-10	41.496122	-81.677050	662.0	100.0	Pier 2
B-069-2-10	41.496169	-81.676870	663.5	100.0	Pier 2

Notes:
1. *Based on locations as mapped in ODOT's Transportation Information Mapping System (TIMS).*

2.5. Site Reconnaissance

Field reconnaissance visits for the proposed Ramp B6 structures were conducted between July 9, 2015 and July 10, 2015, along the existing IR-90, the proposed Ramp B6 alignment and the Saint Vincent Medical Building parking lot at this location. Site conditions were noted and photographed during the visit. A summary of our observations at the Bridge CUY-90-1652S, RW-Y and RW-Z locations is provided below.

2.5.1. Retaining Walls Y and Z

The location of the proposed MSE walls (RW-Y & RW-Z) encompasses the area located along the northwest side of the Saint Vincent Medical Building parking lot and the immediately adjacent IR-77 NB exit ramp to IR-90 EB, with RW-Z extending along IR-90 EB to the proposed East 22nd St and IR-90 EB overpass. At the time of our site visit, the area located just north of the Saint Vincent Medical Building parking lot and within the limits of the proposed walls was observed to be a grassy area with the terrain gradually sloping downward from north to south with a maximum slope of about 3 Horizontal to 1 Vertical (3H:1V). The remainder of the proposed RW-Y & RW-Z site was observed to consist of asphalt pavement at the surface and gradually sloped downward from west to east. Each area generally appeared to be in good condition with no visible sign of instability. In the pavement areas, no significant sign of pavement distress within the length of the proposed walls was observed. In general, the site appeared to be well-drained with no apparent signs of ponding observed at the time of our visit on or near the referenced roadways.

2.5.2. Bridge No. CUY-90-1652S

The proposed bridge site spans an area along the southeast edge of the existing Bridge No. CUY-90-1652. The proposed Ramp B6 bridge begins at the existing spill-through slopes at the rear abutment of Bridge No. CUY-90-1652 (Photograph 1), crosses over East 14th St. and associated ramps, including the grassy medians, and continues past the forward abutment spill-through (Photograph 2) slope for about 220 ft to terminate along the southern side of IR-90 EB encompassing the supporting IR-90 embankment slope (Photograph 3).

The existing abutment spill-through slopes in this area both appeared to be generally stable and can be described as either grassy, heavily vegetated or concrete-protected with slopes from about 2.5H:1V to about 2H:1V at the steepest. The existing embankment slopes supporting the segment of IR 90 EB at this location also appeared to be generally stable. These embankments are sloping at approximately 3H:1V and can be described as grassy or heavily vegetated. The majority of the proposed bridge site is generally well drained with the exception of one small area at the toe of the existing rear abutment spill-through slope where standing water was observed during our visit (Photograph 4).

The existing structure immediately adjacent to this area appeared to be performing well with no apparent sign of geotechnical related instability observed at the time of our visit.

Photograph 1: Existing rear abutment spill-through slope

Photograph 2: East 14th Street to existing forward abutment spill-through slope

Photograph 3: IR-90 eastbound and supporting embankment slope

Photograph 4: Small ponding area at toe of existing rear abutment spill-through slope

3. GEOTECHNICAL EXPLORATION

3.1. Field Exploration Program

The exploration for the proposed Bridge CUY-90-1652S and associated retaining wall (RW-Y & RW-Z) structures was conducted by NEAS between November 7, 2014 and March 17, 2021. The exploration for the referenced structures included 8 borings drilled to depths ranging from of 51.5 to 112 ft bgs and 1 CPT sounding that was extended to a depth of 116.8 ft bgs. The exploration locations were selected by NEAS in general accordance with the guidelines contained in the SGE with the intent to evaluate subsurface soil and groundwater conditions. Borings were typically located at/near proposed substructure locations and along wall alignments that were not restricted by maintenance of traffic, underground utilities or dictated by terrain (i.e. steep embankment slopes). Project exploration locations were located and surveyed in the field by NEAS after the completion of drilling/sounding. Each individual project boring/CPT log (included within Appendix B) includes the recorded boring latitude and longitude location (based on the surveyed Ohio State Plane North, NAD83, location) and the corresponding ground surface elevation. A summary of the exploration locations including stationing, offsets, location information and elevations of the indicated Ramp B6 structure foundation exploration are shown in Table 2 below, while the locations are depicted on the Soil Profile Sheets provided within Appendix A.

Table 2: Project Boring Summary

Boring Number	Location (Sta/Offset)	Latitude	Longitude	Elevation (NAVD 88) (ft)	Depth (ft)	Structure
C-082-0-14	1610+67, 23' RT.	41.496150	-81.677194	661.0	116.8	CUY-90-1652S Pier 2
B-085-3-20	1620+83, 108' RT.	41.497630	-81.674080	669.8	51.5	RW-Z
B-122-0-14	1611+21, 36' RT.	41.496213	-81.677011	676.0	112.0	CUY-90-1652S Pier 2
B-157-0-14	1607+41, 37' RT.	41.495554	-81.678084	694.4	111.5	CUY-90-1652S Rear Abutment
B-158-0-14	1608+74, 89' RT.	41.495673	-81.677588	678.6	112.0	CUY-90-1652S Pier 1
B-159-0-14	1613+12, 66' RT.	41.496483	-81.676402	672.0	86.5	RW-Y & CUY-90-1652S Forward Abutment
B-160-0-14	1616+72, 100' RT.	41.497034	-81.675305	666.3	61.5	RW-Y
B-161-0-14	1616+99, 53' RT.	41.497179	-81.675336	666.5	61.5	RW-Z
B-162-0-14	1619+59, 98' RT.	41.497483	-81.674507	669.4	61.5	RW-Z

Notes:
1. *As-drilled boring location and corresponding ground surface elevation was surveyed in the field by NEAS Inc.*

The borings were drilled using either a CME 55, CME 55X or CME 45B truck mounted drilling rig utilizing 3.25-inch diameter hollow stem augers. Soil samples were generally recovered at 2.5-ft intervals to a depth of 30 ft bgs and at 5.0-ft intervals thereafter using a split spoon sampler (AASHTO T-206 "Standard Method for Penetration Test and Split Barrel Sampling of Soils"). The soil samples obtained from the exploration program were visually observed in the field by the NEAS field representative and preserved for review by a Geologist and possible laboratory testing. Standard penetration tests (SPT) were conducted using CME auto hammers that had been calibrated to be between 68.4% and 81.2% efficient as indicated on the boring log. Field boring logs were prepared by drilling personnel, and included lithological description, SPT results recorded as blows per 6-inch increment of penetration and estimated unconfined shear strength values on specimens exhibiting cohesion (using a hand penetrometer). Groundwater level observations were recorded both during and after the completion of drilling. These groundwater level observations are included on the individual boring log. After completing the boring, the borehole was backfilled with auger cuttings to the ground surface.

The CPT sounding was performed by ODOT utilizing a A.P. van den Berg twin-cylinder H-form HYSON 200-kN (45-kip) track mounted penetrometer with a model ELCI-CFXYP20-15 seismic piezocone. During testing, data was collected continuously by a GOnsite! Data acquisition system. The CPT sounding was conducted in accordance with ASTM D5778 "Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils". In general, the 15-cm^2 (2.3-in^2) seismic piezocone was advanced at a rate of 20 mm/sec (0.8 in/sec) utilizing 1-m (3.3-ft) long connector rods extending to the target termination depth. After the completion of the CPT sounding, the CPT log was generated by ODOT utilizing the software entitled CPeT-IT by GeoLogismiki. It should be noted that in instances where the angle of inclination of the cone deviated from vertical and/or cone tip pressures increased to tolerances that may result in damaging of the equipment, the CPT soundings was stopped prior to target termination depth. The continuously recorded sounding data can be found on the individual log included within Appendix B.

3.2. Laboratory Testing Program

The laboratory testing program consisted of classification testing and moisture content determinations. Data from the laboratory testing program was incorporated onto the final boring logs included within Appendix B. Soil samples are retained at the laboratory for 60 days following report submittal, after which time they will be discarded.

3.2.1. Classification Testing

Representative soil samples were selected for index properties (Atterberg Limits) and gradation testing for classification purposes on approximately 33% of the samples. At the boring location, samples were selected for testing with the intent of identification and classification of all significant soil units. Soils not selected for testing were compared to laboratory tested samples/strata and classified visually. Moisture content testing was conducted on all samples. The laboratory testing was performed in general accordance with applicable AASHTO specifications.

A final classification of the soil strata was made in accordance with AASHTO M-145 "Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes," as modified by ODOT "Classification of Soils" once laboratory test results became available. The results of the soil classification are presented on the boring log in Appendix B.

3.2.2. Standard Penetration Test Results

Standard Penetration Tests (SPT) and split-barrel (commonly known as split-spoon) sampling of soils were performed at varying intervals (i.e., continuous, 2.5-ft and 5.0-ft) in the project borings performed. To account for the high efficiency (automatic) hammers used during SPT sampling, field SPT N-values were converted based on the calibrated efficiency (energy ratio) of the specific drill rig's hammer. Field N-values were converted to an equivalent rod energy of 60% (N_{60}) for use in analysis or for correlation purposes. The resulting N_{60} values are presented on the boring logs provided in Appendix B.

4. GEOTECHNICAL FINDINGS

The subsurface conditions encountered during NEAS's explorations are described in the following subsections and on each boring/CPT log presented in Appendix B. The boring/CPT logs represent NEAS's interpretation of the subsurface conditions encountered at each exploration location based on our site observations, field logs, visual review of the soil samples by NEAS's geologist, laboratory test results as well as comparison of boring and CPT data. The lines designating the interfaces between various soil strata on the logs represent the approximate interface location; the actual transition between strata may be gradual and indistinct. The subsurface and groundwater characterizations included herein, including summary test data, are based on the subsurface findings from the geotechnical explorations performed by NEAS as part of the referenced project, results of historical explorations, and consideration of the geological history of the site.

It should be noted, as soil borings and CPT soundings generate geotechnical data in different forms and because there are no direct design methods recommended by ODOT utilizing CPT data, the CPT data obtained during our exploration has been converted to equivalent soil boring data (i.e., SPT N_{60} and soil type). The CPT data was converted using correlations provided in published engineering manuals and guidance documents. The conversion process starts with determining the Soil Behavior Index (I_c) with depth to approximate soil type (i.e., cohesive or granular) followed by calculating an equivalent SPT N_{60} value with depth using the determined Soil Behavior Indices and the measured CPT cone tip resistances. These converted values are then compared to nearby soil boring(s) to estimate the stratification and assign appropriate ODOT modified AASHTO classification to each distinct stratum. For the purposes of our analyses and this report, descriptions of the subsurface profile, soil characteristics and engineering soil properties are based on both the direct soil borings information as well as the indirect soil-boring-equated CPT data. See Sections 5.1.2. of this report for our sited correlation/reference material for CPT data conversion.

4.1. Subsurface Conditions

The general subsurface profile is relatively uniform and consistent with the geological model for the project. The subsurface profile at the site of proposed Bridge CUY-90-1652S and associated retaining walls generally consists of surficial materials (i.e., topsoil or pavement) underlain by existing embankment or historical fill soils followed by natural sands and gravels underlain by natural lacustrine and/or till soils. Where encountered, the embankment fill at the site can generally be described as loose to very dense non-cohesive, granular soils. The natural sands and gravels encountered at the site were generally comprised of very loose to very dense non-cohesive, granular material. The lacustrine/till soils at the site were highly variable though can generally be described as medium dense to very dense coarse- and fined-grained, non-cohesive material in the upper portion of the stratum and soft to hard fine-grained, cohesive and non-cohesive material in the lower portion of the stratum. Bedrock was not encountered within the depths of the explorations performed.

4.1.1. Overburden Soil

At the site of proposed structures, three different materials were encountered below the surficial material. In general, the three different overburden materials consisted of historical or embankment “man-made” fill soils, natural sands and gravels, and natural lacustrine and/or till soils. These materials and the general profile underlying the site is further described below.

Fill soils were encountered in each boring performed for the proposed structures. These fill soils were encountered immediately below the topsoil, pavement section or at the ground surface and extended to depths ranging from 2.0 to 22.5 ft bgs (approximate elevations 659.0 to 671.9 ft amsl). Based on laboratory testing results, a visual review of the soil samples obtained as well as the calculated Soil Behavior Index, the fill at the site is comprised of granular material and is classified on the boring logs as Gravel with Sand

(A-1-b), Gravel with Sand and Silt (A-2-4), Fine Sand (A-3), Coarse and Fine Sand (A-3a) and non-cohesive Sandy Silt (A-4a). The exception being an approximately 3-ft thick layer of fine-grained cohesive fill encountered at a depth of 1.5 ft bgs (elevation 677.1 ft amsl) in boring B-158-0-14. With respect to the soil strength, the granular fill soils can be described having a relative compactness of loose to very dense correlating to converted SPT-N values (N_{60}) between 5 blows per foot (bpf) and SPT-N refusal (i.e., less than 6 inches of penetration over 50 blows). Natural moisture contents of the granular fill ranged from 5 to 17 percent. With respect to the soil strength of the fine-grained cohesive fill, these soils can be described as having a consistency of stiff to hard correlating to N_{60} values of 12 and 17 bpf and unconfined compressive strengths (estimated by means of hand penetrometer) between approximately 1.0 and 4.5 tons per square foot (tsf). Natural moisture contents of the cohesive fill ranged from 14 to 16 percent. Based on a Atterberg Limits test performed on a representative sample of the cohesive fill material, the liquid and plastic limits were 29 and 15 percent, respectively.

The stratum encountered immediately beneath the fill consisted of a natural sand layer extending to depths between 22.0 and 63.3 ft bgs (approximate elevations 621.5 and 650.0 ft amsl). Based on laboratory testing results, a visual review of the soil samples obtained as well as the calculated Soil Behavior Index within this stratum, these soils are comprised of granular material and are classified on the boring logs as Gravel and/or Stone Fragments with Sand (A-1-b), Fine Sand (A-3), Coarse and Fine Sand (A-3a) and non-cohesive Sandy Silt (A-4a). The exception being various seams of fine-grained cohesive material that were encountered within three of the structure borings performed (B-122-0-14, B-159-0-14 and B-162-0-14) and classified on the boring logs as Silt and Clay (A-6a) and Clay (A-7-6). These seams of cohesive soil were encountered in the indicated borings at depths ranging from 9.5 to 27.0 ft bgs (elevations 647.4 to 662.5 ft amsl) with thicknesses ranging from 1.3-ft to 5.3-ft. With respect to the soil strength, the natural sand can be described having a relative compactness of very loose to very dense correlating to converted N_{60} values between 4 and 57 bpf. Natural moisture contents of the natural sand ranged from 3 to 29 percent. With respect to the soil strength of the fine-grained seams encountered within this stratum, these soils can be described as having a consistency of soft to very stiff correlating to N_{60} values between 4 and 14 bpf and unconfined compressive strengths (estimated by means of hand penetrometer) between 0.0 and 2.5 tsf. Natural moisture contents of the cohesive soils ranged from 22 to 35 percent. Based on Atterberg Limits tests performed on representative samples of the cohesive material, the liquid and plastic limits ranged from 30 to 43 percent and from 18 to 21 percent, respectively.

The soils encountered directly underlying the natural sand layer encountered at the site consisted of highly variable lacustrine soils which consisted of an upper stratum comprised predominantly of non-cohesive, coarse- and fine-grained soils and a lower stratum comprised of predominantly cohesive, fine-grained soils. The upper stratum of the lacustrine soils extended to depths between 42.0 and 83.3 ft bgs (approximate elevations 610.3 and 625.9 ft amsl) and are classified on the boring logs as Coarse and Fine Sand (A-3a), non-cohesive Sandy Silt (A-4a), and non-cohesive Silt (A-4b). With respect to the soil strength, the upper lacustrine soils can be described having a relative compactness of medium dense to very dense correlating to converted N_{60} values between 14 and 81 bpf. Natural moisture contents of the upper lacustrine soils ranged from 16 to 29 percent. The lower cohesive portion of the lacustrine stratum extended to termination depths ranging from 61.5 to 112.0 ft bgs (approximate elevations 544.2 and 607.9 ft amsl) and are classified on the boring logs as cohesive Silt (A-4b), Silt and Clay (A-6a) and Silty Clay (A-6b). The exception being boring B-085-3-20 in which the lower cohesive lacustrine stratum was not encountered. With respect to the soil strength, the lower lacustrine soils can be described having a consistency of very soft to hard correlating to N_{60} values between 0 and 58 bpf and unconfined compressive strengths (estimated by means of hand penetrometer and laboratory test results) between 0.3 and in excess of 4.5 tsf. Natural moisture contents of the lower cohesive lacustrine soils ranged from 16 to 33 percent. Based on Atterberg Limits tests performed on representative samples of the lower lacustrine material, the liquid and plastic limits ranged from 25 to 39 percent and from 16 to 22 percent, respectively.

4.1.2. Groundwater

Groundwater measurements were taken during the boring drilling procedures and immediately following the completion of the boring performed. Groundwater was observed during drilling in 7 of the 8 borings performed at the bridge and retaining wall site at depths ranging from 17.5 to 27.5 ft bgs (elevations 644.5 to 651.1 ft amsl). Groundwater was not encountered within boring B-157-0-14 performed as part of the structure foundation exploration. Pore pressure readings collected from CPT sounding data can also indicate groundwater levels at the site. However, it should be noted that pore pressure readings may suggest a groundwater level that is higher or lower than the static groundwater table when performed on specific soil types (i.e. contractive or dilative soils). Therefore, during a CPT sounding, a more accurate interpretation of the groundwater level can be made by performing a dissipation test in which the pushing of the cone is paused temporarily, and pore pressure readings are allowed to stabilize to the hydrostatic pressure at that depth. Two (2) dissipation tests were performed within sounding C-082-0-14 at depths of 29.5 ft and 98.4 ft bgs. However, the dissipation test performed at a depth of 98.4 ft bgs was not performed long enough to stabilize and therefore does not provide an accurate static groundwater level reading. Based on the dissipation test performed at a depth of 29.5 ft bgs, approximately 16.7 ft of water pressure was measured at the referenced depth once the dissipation test had stabilized putting water at a depth of about 12.8 ft bgs (approximate elevation 648.2 ft amsl). It should be noted that groundwater is affected by many hydrologic characteristics in the area and may vary from those measured at the time of the exploration. The specific groundwater and pore pressure readings are included on the logs located within Appendix B.

5. ANALYSES AND RECOMMENDATIONS

5.1. Retaining Walls Y and Z Analysis and Recommendations

5.1.1. Retaining Wall Design Assumptions

As the proposed Ramp B6 retaining walls (RW-Y & RW-Z) are planned as MSE type, ODOT's BDM and AASHTO's LRFD BDS dictate analysis parameters and design minimums/constraints to be used in the analysis and design process. The referenced parameters and design minimums/constraints that were significant to our analyses consist of the following:

- Minimum reinforcement strap lengths of proposed MSE walls are to be 70% of the total wall height (as measured from proposed profile grade at the face of the wall to the top of the leveling pad) or 8 ft, whichever is greater, at the section of wall being analyzed, per ODOT’s BDM section 307.4-A;
- Minimum MSE wall embedment depths (as measured from top of the leveling pad to the lowest point on the ground surface within 4-ft of the face of the wall) are to conform to Figure 201-5 presented in ODOT's BDM and be the larger of 3 ft or the local frost depth;
- Soils below the bottom of leveling pad will be undercut a minimum of 1 ft and replaced Granular Material Type C according to the requirements of ODOT Construction & Materials Specifications Section 204.07 (CMS 204.07);
- Maximum allowable differential settlement in the longitudinal direction is 1%. (BDM Section 307.1.6); and,
- Reinforced Zone and Retained Fill soils will meet the minimum design soil parameters per Table 840.04-1 of the ODOT Supplemental Specification 840 (SS-840) as shown in Table 3 below.

Table 3: Design Soil Parameters for Fill Materials

Fill Zone	Type of Soil	Soil Unit Weight (pcf)	Friction Angle (°)	Cohesion (psf)
Reinforced Zone	Select Granular Backfill	120	34	0
Retained Soil	On-site soil varying from sandy lean clay to silty sand	120	30	0

Notes:
1. *Table reproduced from Section 840.04 - A-1 of ODOT's SS 840.*

With respect to design constraints and assumptions specific to the RW-Y & RW-Z MSE walls, the geometry of the proposed walls (i.e., exposed wall heights, existing ground elevations, proposed final grade behind/at the toe of the wall, etc.) is assumed to be consistent with that shown in the proposed structure basemaps developed by Baker and obtained via ProjectWise on July 12, 2021.

5.1.2. Soil Profile for Analysis

For external stability, settlement and global stability analyses purposes, each boring drilled for RW-Y & RW-Z was reviewed, and a generalized material profile was developed. Utilizing the generalized soil profile, engineering properties for each soil strata was estimated based on their field (i.e., SPT N_{60} Values, hand penetrometer values, etc.) and laboratory test (i.e., Atterberg Limits, grain size, etc.) results using correlations provided in published engineering manuals, research reports and guidance documents. Engineering soil properties were estimated for each individual classified layer per boring location. Soil layers from each of the borings with similar behavior (i.e., cohesive or non-cohesive/granular) and characteristics (i.e., relative compactness/consistency, moisture content, etc.) were grouped into generalized soil units (i.e., Soil Types) and weighted average values of the estimated engineering soil properties were assigned to each Soil Type to develop a generalized soil profile for analysis. The summary of the generalized soil profile including designated Soil Types, elevations, average engineering soil properties per boring location are presented in Tables 4 through 8 below. Settlement parameters (with sited correlation/reference material) developed for each Soil Type are presented in Table 9.

Table 4: Soil Profile and Estimated Engineering Properties - At Boring B-159-0-14

Retaining Walls Y & Z: Analysis, B-159-0-14					
Soil Description	**Moist Unit Weight[(1)] (pcf)**	**Total Cohesion[(2)] (psf)**	**Total Friction Angle (degrees)**	**Effective Cohesion[(3)] (psf)**	**Effective Friction Angle[(3)] (degrees)**
Soil Type 1 - Granular Depth (672 ft - 662.5 ft)	122	-	33	-	33
Soil Type 3 - Cohesive Depth (662.5 ft - 658.8 ft)	105	600	0	75	20
Soil Type 4 - Granular Depth (658.8 ft - 650 ft)	128	-	34	-	34
Soil Type 3 - Cohesive Depth (650 ft - 644.5 ft)	105	600	0	75	20
Soil Type 4 - Granular Depth (644.5 ft - 623.7 ft)	128	-	34	-	34
Soil Type 5 - Cohesive Depth (623.7 ft - 585.5 ft)	130	3350	0	250	26

Values interpreted from Geotechnical Bulletin 7 Table 1.
Values calculated from Terzaghi and Peck (1967) if $N1_{60}$ <52, else Stroud and Butler (1975) was used.
Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.

Table 5: Soil Profile and Estimated Engineering Properties - At Boring B-160-0-14

Retaining Wall Y: Analysis, B-160-0-14

Soil Description	Moist Unit Weight(1) (pcf)	Total Cohesion(2) (psf)	Total Friction Angle (degrees)	Effective Cohesion(3) (psf)	Effective Friction Angle(3) (degrees)
Soil Type 1 - Granular Depth (666.3 ft - 664.3 ft)	122	-	33	-	33
Soil Type 2 - Granular Depth (664.3 ft - 651.8 ft)	110	-	29	-	29
Soil Type 4 - Granular Depth (651.8 ft - 619 ft)	128	-	34	-	34
Soil Type 5 - Cohesive Depth (619 ft - 604.8 ft)	130	3350	0	250	26

Notes:

1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 6: Soil Profile and Estimated Engineering Properties - At Boring B-161-0-14

Retaining Walls Y & Z: Analysis, B-161-0-14

Soil Description	Moist Unit Weight(1) (pcf)	Total Cohesion(2) (psf)	Total Friction Angle (degrees)	Effective Cohesion(3) (psf)	Effective Friction Angle(3) (degrees)
Soil Type 1 - Granular Depth (666.5 ft - 664.5 ft)	122	-	33	-	33
Soil Type 2 - Granular Depth (664.5 ft - 654.5 ft)	110	-	29	-	29
Soil Type 4 - Granular Depth (654.5 ft - 613.2 ft)	128	-	34	-	34
Soil Type 5 - Cohesive Depth (613.2 ft - 605 ft)	130	3350	0	250	26

Notes:

1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 7: Soil Profile and Estimated Engineering Properties - At Boring B-162-0-14

Retaining Wall Z: Analysis, B-162-0-14

Soil Description	Moist Unit Weight(1) (pcf)	Total Cohesion(2) (psf)	Total Friction Angle (degrees)	Effective Cohesion(3) (psf)	Effective Friction Angle(3) (degrees)
Soil Type 1 - Granular Depth (669.4 ft - 659.9 ft)	122	-	33	-	33
Soil Type 2 - Granular Depth (659.9 ft - 644.9 ft)	110	-	29	-	29
Soil Type 4 - Granular Depth (644.9 ft - 625.9 ft)	128	-	34	-	34
Soil Type 5 - Cohesive Depth (625.9 ft - 607.9 ft)	130	3350	0	250	26

Notes:

1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 8: Soil Profile and Estimated Engineering Properties - At Boring B-085-3-20

Retaining Wall Z: Profile for Analysis, B-085-3-20

Soil Description	Moist Unit Weight(1) (pcf)	Total Cohesion(2) (psf)	Total Friction Angle (degrees)	Effective Cohesion(3) (psf)	Effective Friction Angle(3) (degrees)
Soil Type 1 - Granular Depth (669.8 ft - 661.5 ft)	122	-	33	-	33
Soil Type 2 - Granular Depth (661.5 ft - 651.5 ft)	110	-	29	-	29
Soil Type 4 - Granular Depth (651.5 ft - 618.3 ft)	128	-	34	-	34

Notes:

1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 9: Settlement Parameters for Analysis - Retaining Walls Y & Z

Retaining Wall Z: Settlement Analysis, B-085-3-20 & B-159-0-14 to B-162-0-14								
Soil Description	**Unit Weight (pcf)**	**Elastic Modulus(1) (psf)**	**Poissons Ratio(1), v**	**Void Ratio e_o**	**Compression Index(2), C_c**	**Recompression Index(3), C_r**	**OCR(4)**	**Coeff. of Consol.(5), C_v**
Soil Type 1 - Granular	122	505000	0.20	-	-	-	-	-
Soil Type 2 - Granular	110	183000	0.25	-	-	-	-	-
Soil Type 3 - Cohesive	105	363000	0.40	1.023	0.20	0.041	1.0	0.30
Soil Type 4 - Granular	128	957000	0.30	-	-	-	-	-
Soil Type 5a - Cohesive(6)	130	2000000	0.30	0.585	0.10	0.020	1.3	0.54
Soil Type 5b - Cohesive(6)	125	2000000	0.45	0.784	0.10	0.020	1.2	0.23
Soil Type 5c - Cohesive	130	2000000	0.50	0.534	0.12	0.024	1.1	0.21

Notes:

1. *Values interpreted from 2017 AASHTO LRFD BDS Table C10.4.6.3-1*
2. *Values calculated from Kulhawy and Mayne, 1990, Equation 6-6.*
3. *Values calculated from Kulhawy and Mayne, 1990, Equation 6-9.*
4. *Values interpreted from Mayne and Kemper, 1988, Figure 7.*
5. *Values interpreted from FHWA GEC No. 5, Boeckmann, et al., 2016, Figure 6-37.*
6. *Based on laboratory test results from B-144-0-14.*

In addition to the Soil Type parameters presented above, a graphical depiction of the generalized subsurface profile is located within Appendix C. The generalized subsurface profile includes: a color coded general interpretation of the Soil Types between borings, a graphical interpretation of the soil strata identified by the project soil borings along the referenced wall profiles, representative boring data (N_{60}-values, moisture contents, and groundwater levels), current ground surface elevation, proposed fill, and proposed wall location (i.e., top of leveling pad and top of coping).

5.1.3. External Stability Analysis

Based on our estimated engineering soil properties, the developed generalized profile and the retaining wall design assumptions provided in Section 5.1.1. of this report, an external stability analyses of the proposed RW-Y & RW-Z were performed. External stability was evaluated at three (3) cross-sections along the proposed RW-Y alignment and one (1) cross-sections along the proposed RW-Z alignment. Each cross-section was evaluated for resistance to bearing pressure, sliding forces and overturning at the Strength Limit State in accordance with Section 11.10.5 of the AASHTO's LRFD BDS. The capacity to demand ratios (CDRs) calculated for the referenced cross-sections with respect to bearing, sliding and overturning, as well as the calculated factored bearing resistances are presented in Table 10 below. (External Stability and Bearing Resistance Calculation Results can be found in Appendix D)

Table 10: External Stability Analysis Summary

Dimensions				
	Wall Y			Wall Z
Design Wall Height (feet)	28.5	18.6	13.3	29.6
Exposed Wall Height (feet)	25.5	15.6	10.3	26.6
Length of Reinforecement (feet)	20	13	9.3	20.7
Length of Reinf. To Height Ratio	0.7	0.7	0.7	0.7
Approximate Station(1)	1300+00	1300+69.4	1302+51.5	02+50
Broken back slope above wall (°)	N/A	26.565	26.565	N/A
Capactiy Demand Ratio (CDR)				
Bearing Capacity	2.31	1.86	2.13	2.28
Overturning / Eccentricity	1.56	1.27	1.26	1.57
Sliding	1.55	1.16	1.06	1.56
Factored Bearing Resistance (ksf)(2)	16.4	12.5	11.2	16.8

Notes:

1. *Stationing in reference to respective retaining wall alignment.*
2. *Bearing Resistance calculated in accordance to Section 11.10.5.4 of 2014 LRFD BDS and factored using Resistance Factor provided in Table 11.5.7-1 of 2014 LRFD BDS.*

5.1.4. *Settlement Analysis*

In order to estimate the maximum total and differential settlement that could result within the subsurface soils supporting the proposed MSE retaining walls (RW-Y & RW-Z), NEAS reviewed: 1) the RW Y & RW-Z Stage 1 design information obtained via ProjectWise on July 12, 2021; 2) Service Limit State loading conditions; and, 3) the generalized subsurface profile and Settlement Parameters for Analysis provided in Section 5.1.2. of this report. Utilizing this information and the software entitled *FoSSA 2.0* by ADAMA Engineering, Inc., a settlement model was developed and analyzed for both elastic (immediate) and consolidation (long term) settlement. For analysis purposes and in order to determine the location of maximum settlement as well as differential settlement along the proposed RW-Y & RW-Z alignments, the developed model for settlement analysis was first evaluated along the length (proposed profile) of each wall alignment. Based on the results of the initial settlement analysis (along the length of the proposed wall alignments), various cross-sections were then selected to be re-evaluated for settlement across the width of the wall (i.e., strap length). The cross-sections selected were at the location of maximum settlement and at locations of significant differential settlement based on our initial settlement evaluation performed along the length of the proposed walls.

Based on our analysis, the estimated maximum total settlement that could occur along the length of proposed RW-Y & RW-Z as a result of the induced MSE retaining wall loads is estimated to be about 5 inches. The maximum differential settlement along the length of the proposed retaining walls is estimated to be on the order of 0.10% along RW-Y alignment and 0.04% along the RW-Z alignment. This settlement magnitude is not anticipated to be a concern as about 2 inches of the total settlement is expected to be elastic (immediate) and take place during construction. The majority (approximately 90 percent) of the total long-term settlement (consolidation) is expected to be complete within the first 60 days. A summary of the results of our summary analysis including the estimated elastic, consolidation and differential settlement for the different sections evaluated along the RW-Y & RW-Z alignments is given in Table 11 below. Outputs of the settlement analysis program are presented within Appendix E.

Table 11: Summary of Settlement Analysis

Cross-Section Along Wall Alignment (STA)	Location	Immediate Settlement (in)	Consolidation Settlement (in)	Total Settlement (in)
Retaining Wall Y				
1+00 (Forward Abutment)	Face of Wall	1.0	2.5	3.5
	0.7H from Face of Wall	1.6	3.7	5.3
1+91	Face of Wall	1.1	2.8	3.8
	0.7H from Face of Wall	1.7	3.5	5.2
2+91	Face of Wall	1.0	1.7	2.6
	0.7H from Face of Wall	1.6	2.2	3.7
Retaining Wall Z				
0+00	Face of Wall	0.7	1.2	1.9
	0.7H from Face of Wall	1.2	1.8	3.0
1+80	Face of Wall	1.2	1.3	2.5
	0.7H from Face of Wall	2.0	2.3	4.3
6+50	Face of Wall	1.3	1.7	3.0
	0.7H from Face of Wall	2.2	2.3	4.4
7+50	Face of Wall	1.3	2.2	3.5
	0.7H from Face of Wall	1.9	3.0	4.9

5.1.5. Global Stability Analysis

For purposes of evaluating the stability of RW-Y & RW-Z at the proposed Ramp B6 location, NEAS reviewed cross-sections along the length of the proposed retaining walls to determine the subsurface conditions that posed the greatest potential for slope instability. In general, cross-sections along the proposed wall alignments were reviewed to determine the sections that would represent a combination of existing subsurface conditions and planned site grading that would be most critical to slope stability (i.e., maximum total wall height, maximum embankment height measured from toe of slope to top of wall, proposed/existing grades behind and in front of the wall, weak and/or thick soil layer, etc.). Based on our review of the available information at the referenced location and the associated soil properties, two (2) cross-sections were estimated to be most "critical" and were analyzed for global stability. The cross-sections analyzed for global stability consisted of the maximum wall height section of RW-Y at the proposed forward abutment location and the maximum wall height section of RW-Z at approximate STA. 1404+85.6.

For the indicated cross-sections, NEAS developed a representative cross-sectional model to use as the basis for global stability analysis. The models were developed from NEAS's interpretation of the available information which included: 1) the RW-Y & RW-Z Stage 2 design information accessed via ProjectWise on January 15, 2024; 2) a live load surcharge of 250 pounds per square foot (psf) accounting for traffic induced loads; and, 3) test borings and laboratory data developed as part of this project. With respect to the soil's engineering properties, the provided generalized soil profile and estimated engineering properties presented in Section 5.1.2. of this report were used in our analysis.

The above referenced global stability models were analyzed for long-term (Effective Stress) and short-term (Total Stress) slope stability utilizing the software entitled *Slide 7.0* by Rocscience, Inc. Specifically, the Modified Bishop and Spencer analysis methods were used to calculate a factor of safety (FOS) for circular and block type slope failures, respectively. The FOS is the ratio of the resisting forces and the driving forces, with the desired safety factor being more than about 1.3 which equates to an AASHTO resistance factor less than 0.75 (per AASHTO's LRFD BDS, the specified resistance factors are essentially the inverse of the FOS that should be targeted in slope stability programs). For this analysis, a resistance factor of 0.75 or lower is targeted as the MSE walls do not contain or support a structural element at the sections evaluated. Based on our slope stability analyses for the referenced MSE wall sections, the minimum slope stability factor was estimated to be about 1.3 (0.75 resistance factor). Graphical outputs of the slope stability program (cross-sectional model, calculated safety factor, and critical failure plane) are presented within Appendix F. It should be noted, an additional global stability analysis for RW-Y was performed at the forward abutment location where RW-Y acts as an MSE wall type abutment. For the analysis at the forward abutment, a resistance factor of 0.65 or lower is targeted as the MSE wall does contain or support a structural element at this location. Global stability analyses for the rear and forward abutments are presented within Section 5.2.7. of this report.

5.2. Bridge No. CUY-90-1652S Analysis and Recommendations

5.2.1. Soil Profile for Analysis

For friction pile, settlement and global stability analyses purposes, each boring drilled for Bridge CUY-90-1652S was reviewed, and a generalized material profile was developed. Utilizing the generalized soil profile, engineering properties for each soil stratum were estimated based on their field (i.e., SPT N_{60} Values, hand penetrometer values, etc.) and laboratory test (i.e., Atterberg Limits, grain size, etc.) results using correlations provided in published engineering manuals, research reports and guidance documents. Engineering soil properties were estimated for each individual classified layer per boring location. The developed soil profiles and estimated engineering soil properties for use in analysis of Bridge CUY-90-1652S (with cited correlation/reference material) are summarized within Tables 12 through 15 below. Settlement parameters (with sited correlation/reference material) developed for analysis at the rear abutment location is presented in Table 16, while parameters developed for RW-Y & RW-Z presented within Table 9 of this report will be utilized for the settlement analysis at the forward abutment location.

Table 12: Soil Profile and Estimated Engineering Properties - At Boring B-157-0-14

Bridge CUY-90-1652 S Over E. 14th St: Rear Abutment, B-157-0-14 & B-158-0-14

Soil Description	Moist Unit Weight[(1)] (pcf)	Total Cohesion[(2)] (psf)	Total Friction Angle (degrees)	Effective Cohesion[(3)] (psf)	Effective Friction Angle[(3)] (degrees)	Setup Factor (f_{su})
Coarse and Fine Sand Depth (694.4 ft - 671.9 ft)	130	-	38	-	38	1.0
Coarse and Fine Sand Depth (671.9 ft - 656.1 ft)	122	-	30	-	30	1.0
Coarse and Fine Sand Depth (656.1 ft - 631.1 ft)	128	-	33	-	33	1.0
Silt Depth (631.1 ft - 616.1 ft)	135	-	35	-	35	1.5
Coarse and Fine Sand Depth (616.1 ft - 611.1 ft)	135	-	39	-	39	1.0
Silt Depth (611.1 ft - 596.1 ft)	125	3500	0	300	27	1.5
Silt and Clay Depth (596.1 ft - 570.3 ft)	125	3200	0	250	26	1.5
Silty Clay Depth (570.3 ft - 566.6 ft)	118	1000	0	100	22	1.75

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 13: Soil Profile and Estimated Engineering Properties - At Boring B-158-0-14

Bridge CUY-90-1652 S Over E. 14th St: Pier 1, B-158-0-14

Soil Description	Moist Unit Weight$^{(1)}$ (pcf)	Total Cohesion$^{(2)}$ (psf)	Total Friction Angle (degrees)	Effective Cohesion$^{(3)}$ (psf)	Effective Friction Angle$^{(3)}$ (degrees)	Setup Factor (f_{su})
Coarse and Fine Sand Depth (678.6 ft - 677.1 ft)	112	-	33	-	33	1.0
Silt and Clay Depth (677.1 ft - 674.1 ft)	122	1800	0	200	24	1.5
Coarse and Fine Sand Depth (674.1 ft - 671.8 ft)	125	-	36	-	36	1.0
Gravel with Sand Depth (671.8 ft - 669.1 ft)	125	-	35	-	35	1.0
Coarse and Fine Sand Depth (669.1 ft - 666.6 ft)	112	-	32	-	32	1.0
Sandy Silt Depth (666.6 ft - 664.1 ft)	110	-	30	-	30	1.2
Coarse and Fine Sand Depth (664.1 ft - 654.1 ft)	112	-	31	-	31	1.0
Coarse and Fine Sand Depth (654.1 ft - 635.3 ft)	128	-	34	-	34	1.0
Silt Elevation (635.3 ft - 615.3 ft)	135	-	34	-	34	1.5
Silt Elevation (615.3 ft - 570.3 ft)	130	3550	0	300	27	1.5
Silty Clay Elevation (570.3 ft - 566.6 ft)	120	1000	0	100	22	1.75

Notes:

1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if* $N1_{60}$*<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 14: Soil Profile and Estimated Engineering Properties - At Boring B-122-0-14

Bridge CUY-90-1652 S Over E. 14th St: Pier 2, B-122-0-14 & C-082-0-14

Soil Description	Moist Unit Weight$^{(1)}$ (pcf)	Total Cohesion$^{(2)}$ (psf)	Total Friction Angle (degrees)	Effective Cohesion$^{(3)}$ (psf)	Effective Friction Angle$^{(3)}$ (degrees)	Setup Factor (f_{su})
Coarse and Fine Sand Depth (676 ft - 671.5 ft)	125	-	38	-	38	1.0
Gravel with Sand Depth (671.5 ft - 669 ft)	125	-	35	-	35	1.0
Sandy Silt Depth (669 ft - 667.5 ft)	110	-	30	-	30	1.2
Fine Sand Depth (667.5 ft - 654 ft)	112	-	30	-	30	1.2
Sandy Silt Depth (654 ft - 649 ft)	122	-	30	-	30	1.2
Silt and Clay Depth (649 ft - 646.5 ft)	122	1750	0	200	24	1.5
Sandy Silt Depth (646.5 ft - 642.7 ft)	128	-	34	-	34	1.2
Coarse and Fine Sand Depth (642.7 ft - 627.7 ft)	130	-	36	-	36	1.0
Sandy Silt Elevation (627.7 ft - 622.7 ft)	125	-	32	-	32	1.2
Silt Elevation (622.7 ft - 572.7 ft)	125	2800	0	250	26	1.5
Silt and Clay Elevation (572.7 ft - 544.2 ft)	130	1400	0	150	23	1.5

Notes:

1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if* $N1_{60}$*<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 15: Soil Profile and Estimated Engineering Properties - At Boring B-159-0-14

Bridge CUY-90-1652 S Over E. 14th St: Forward Abutment, B-159-0-14 & C-082-0-14

Soil Description	Moist Unit Weight$^{(1)}$ (pcf)	Total Cohesion$^{(2)}$ (psf)	Total Friction Angle (degrees)	Effective Cohesion$^{(3)}$ (psf)	Effective Friction Angle$^{(3)}$ (degrees)	Setup Factor (f_{su})
Gravel with Sand and Silt Depth (672 ft - 667.5 ft)	122	-	34	-	34	1.2
Fine Sand Depth (667.5 ft - 665 ft)	122	-	32	-	32	1.2
Sandy Silt Depth (665 ft - 662.5 ft)	122	-	33	-	33	1.2
Silt and Clay Depth (662.5 ft - 658.8 ft)	105	600	0	75	21	1.5
Coarse and Fine Sand Depth (658.8 ft - 655 ft)	128	-	36	-	36	1.0
Gravel with Sand Depth (655 ft - 652.1 ft)	128	-	37	-	37	1.0
Gravel with Sand Depth (652.1 ft - 650 ft)	110	-	30	-	30	1.0
Clay Depth (650 ft - 647.5 ft)	105	600	0	75	20	2.0
Silt and Clay Elevation (647.5 ft - 644.5 ft)	125	2000	0	200	24	1.5
Sandy Silt Elevation (644.5 ft - 642.5 ft)	125	-	31	-	31	1.2
Coarse and Fine Sand Elevation (642.5 ft - 633.7 ft)	128	-	33	-	33	1.0
Sandy Silt Elevation (633.7 ft - 628.7 ft)	128	-	34	-	34	1.2
Silt Elevation (628.7 ft - 598.5 ft)	130	4800	0	350	28	1.5
Silt and Clay Elevation (598.5 ft - 572.7 ft)	125	4250	0	300	26	1.5
Silt and Clay Elevation (572.7 ft - 544.2 ft)	130	1600	0	150	23	1.5

Notes:

1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 16: Settlement Parameters for Analysis - Rear Abutment

Bridge 12 - Rear Abutment: Settlement Analysis, B-157-0-14

Soil Description	Unit Weight (pcf)	Elastic Modulus$^{(1)}$ (psf)	Poissons Ratio$^{(1)}$, v	Void Ratio e_o	Compression Index$^{(2)}$, C_c	Recompression Index$^{(3)}$, C_r	OCR$^{(4)}$	Coeff. of Consol.$^{(5)}$, C_v
Coarse and Fine Sand Elevation (694.4 ft - 671.9 ft)	130	797000	0.30	-	-	-	-	-
Coarse and Fine Sand Elevation (671.9 ft - 656.1 ft)	122	180000	0.20	-	-	-	-	-
Coarse and Fine Sand Elevation (656.1 ft - 631.1 ft)	128	406000	0.30	-	-	-	-	-
Silt Elevation (631.1 ft - 611.1 ft)	135	285000	0.35	-	-	-	-	-
Silt$^{(6)}$ Elevation (611.1 ft - 598.5 ft)	130	2000000	0.30	0.585	0.10	0.020	1.3	0.54
Silt and Clay$^{(6)}$ Elevation (598.5 ft - 572.7 ft)	125	2000000	0.45	0.635	0.10	0.020	1.2	0.23
Silt and Clay Elevation (572.7 ft - 450 ft)	130	2000000	0.50	0.534	0.12	0.024	1.1	0.21

Notes:

1. *Values interpreted from 2017 AASHTO LRFD BDS Table C10.4.6.3-1*
2. *Values calculated from Kulhawy and Mayne, 1990, Equation 6-6.*
3. *Values calculated from Kulhawy and Mayne, 1990, Equation 6-9.*
4. *Values interpreted from Mayne and Kemper, 1988, Figure 7.*
5. *Values interpreted from FHWA GEC No. 5, Boeckmann, et al., 2016, Figure 6-37.*
6. *Based on laboratory test results from B-144-0-14.*

5.2.2. Pile Foundation Analysis

Based on the determined soil profile and our estimated engineering soil properties, a pile analysis was performed using the computer program Driven to determine the estimated geotechnical pile length needed to achieve the UBV required to support the design load for a single pile at each substructure (Driven results included within Appendix G). For the purposes of this report and our analysis, the term 'geotechnical pile length' has been assumed to represent the length of pile from bottom of pile cap (assumed pile cap bearing elevation) to the depth at which the required UBV is obtained. Based on the soil profile encountered at the site, it is our opinion that pile resistances obtained during dynamic testing (driving) may be reduced due to the potential for soil disturbance (development of high pore water pressure) near the pile perimeter. This disturbance could cause piles to potentially drive easily or “run” for extended depths and initial driving resistances may not reach the indicated target UBV utilizing the estimated pile lengths. This reduced resistance value obtained at the end of driving the estimated pile length is designated as the End of Initial Driving resistance or EOID. If the EOID is significantly different than the required UBV, it may be necessary to let the piles “set up” (reduction of pore water pressure in the soils adjacent to the pile) for an established time period. To estimate the potential effects of this disturbance during driving, the setup factors are presented in Tables 12 through 15 of the Section 5.2.1. of this report are used to estimate driving strength losses as well as the side resistance expected to gain following the setup period.

The UBV and EOID values are determined in accordance with Sections 305.3.2.4 and 305.3.5.9 of the ODOT BDM. The UBV is determined by dividing the total factored load for the highest loaded pile at each substructure by the appropriate driven pile resistance factor, while the EOID is determined by subtracting the amount of side resistance expected to gain from soil setup from the UBV value. The amount of side resistance expected to gain from soil setup is taken as the difference between the side resistance obtained in ultimate (post setup) conditions and the side resistance obtained during driving (dynamic) conditions at the determined geotechnical pile length. It is recommended that the piles for the referenced project be installed according to ODOT's Construction and Material Specifications (CMS) 507 and CMS 523, and therefore, a driven pile resistance factor of 0.7 should be used.

The results for our analysis including the estimated skin friction (Rs) and pile tip bearing (Rp) for ultimate and during driving conditions are summarized in Table 17 below (*Driven* results included within Appendix G). The referenced table also includes 1) the required geotechnical pile length in ultimate conditions for 12-inch or 16-inch diameter CIP piles driven to the respective UBV per substructure location; 2) the length of driven pile required in driving conditions for 12-inch or 16-inch diameter CIP piles driven to the respective UBV per substructure location; and, 3) the estimated difference in pile length between a pile in ultimate and driving conditions.

Table 17: Deep Foundation Analysis Summary

Pile Type	Ultimate Conditions				Driving Conditions				Pile Length Difference Ultimate vs. Driving Conditions (ft)	End of Initial Driving Value(3) (kips)	Setup Factor (f_{su})
	Geotechnical Pile Length(1) (ft)	Ultimate Side Resistance(2) (kips)	Ultimate Point Resistance(2) (kips)	Ultimate Bearing Value(2) (kips)	Driven Pile Length(1) (ft)	Side Resistance During Driving(2) (kips)	Point Resistance During Driving(2) (kips)	Bearing Value During Driving(2)(4) (kips)			
CUY-90-1652S Rear Abutment, B-157-0-14											
12-inch CIP pile	47.7	142.5	84.5	227	49.8	142.5	84.5	227	2	218	1.0
CUY-90-1652S Pier 1, B-158-0-14											
16-inch CIP pile	79.2	379.5	44.6	424	93.9	337.9	12.6	350	> 14.7	324	1.3
CUY-90-1652S Pier 2, B-122-0-14											
16-inch CIP pile	71.6	378.8	35.2	414	84.8	378.8	35.2	414	13	239	1.7
CUY-90-1652S Forward Abutment, B-159-0-14 & C-082-0-14											
12-inch CIP pile	79.1	214.1	33.9	248	99.9	218.0	30.0	248	21	200	1.2

Notes:

1. *The length of pile from bottom of pile cap (pile cap bearing elevation) to the depth at which the required UBV is obtained.*
2. *Resistance factor for driven piles, dynamic analysis and static load test methods (BDM Table 305-1) for piles installed according to C&MS 507 using dynamic test methods according to C&MS 523 has not been applied to values calculated.*
3. *EOID is based on driving resistance obtained at the indicated geotechnical pile length.*
4. *At Pier 1 the required UBV could not be obtained during driving conditions within the length of the boring performed.*

5.2.3. Pile Drivability

NEAS's pile drivability evaluation estimated a Delmag D19-42 diesel hammer to determine if the pile type or size being considered would be overstressed (i.e., compressive stresses experienced by pile during driving are greater than 90% of the yield strength of the steel) at any time during pile installation. The results of the evaluation indicated that the referenced CIP pile sizes would not be overstressed during the pile installation process based on: 1) a minimum wall thickness calculated in accordance with Section 507.03 "Cast-in-Place Reinforced Concrete Piles" of ODOT's CMS; 2) the use of ASTM A 252 Grade 2 steel piles; 3) a pile hammer with a minimum rated energy of 42,000 ft-lbs; and, 4) our developed model used in the computer program *GRLWEAP* by GRL Engineers, Inc. Using the assumed UBVs (Table 17), the minimum wall thicknesses were calculated to be 0.33 inches at the rear abutment, 0.48 inches at Pier 1, 0.46 at Pier 2 and 0.32 inches at the forward abutment. *GRLWEAP* results for each substructure location are included within Appendix H.

It should be noted that the driving resistance of CIP piles through soils encountered at the bridge site is expected to be high. Drivability is difficult to assess quantitatively as the field test results (i.e., SPT N_{60} values, pocket penetrometer values, etc.) tend to be very high. Furthermore, pile drivability is highly reliant upon the specific equipment used in construction; therefore, it is recommended that the contractor provide an analysis to demonstrate that the equipment and pile combination planned for use is capable of obtaining the UBV without over-stressing the piles.

5.2.4. Pile Foundation Recommendations

Based on our evaluation of the subsurface conditions and our geotechnical engineering analysis for the proposed Bridge CUY-90-1652S, it is our opinion that the bridge foundations can be supported on driven friction CIP piles seated within the hard/dense to very dense natural subsurface material encountered at the site.

We recommend that a driven pile foundation be used for support for the proposed bridge abutment and pier foundations. New CIP piles are recommended to be installed in accordance with Sections 507 and 523 of ODOT's CMS with 12-inch diameter piles installed at the abutment and 16-inch piles installed at the piers. During driving conditions and if driven to the UBVs indicated in Table 17 of this report, it is anticipated that the newly driven CIP piles would "run" for extended depths at each substructure location extending the indicated geotechnical pile lengths by greater than 13 to 31 ft. Therefore, it is recommended that the proposed piles be driven to the full estimated length and pile/soil setup be utilized to achieve the required UBV. It is recommended that plan note 606.7-4 of ODOT's 2020 BDM "Piles Driven To Full Estimated Length With Pile/Soil Setup" be included on the plans. The first two piles at each substructure should be driven to the full Estimated Length indicated in Table 18 below. After driving and testing the first two piles, drive the remaining piles in the substructure to the same depth as the first two piles. After driving all piles to the estimated length, cease all driving operations at the substructure for a period of 14 days. After the specified waiting period, it is recommended that the pile driving contractor perform a restrike on both of the first two piles at each substructure. If the restrike test results indicate that both piles achieved the required UBV, all piles in the substructure may be accepted by the Engineer. If the restrike test results indicate that either of the two piles did not achieve the required UBV, immediately notify the Engineer so that the Engineer can notify the District Geotechnical Engineer, the Office of Construction Administration, and the Office of Geotechnical Engineering.

When new piles are installed in accordance with referenced construction specifications utilizing the referenced method as specified in the ODOT BDM, 12-inch diameter CIP piles driven to the indicated UBVs may be used to support a total factored load (single pile) of 208.5 kips at the proposed Rear Abutment location and 199.5 kips at the proposed Forward Abutment location while 16-inch diameter CIP piles driven to the indicated UBVs may be used to support a total factored load (single pile) of 428.4 kips at the proposed Pier 1 location and 414.0 kips at the proposed Pier 2 location It should be noted that if preferred, methods B and C specified in Section 305.3.5.9 of ODOT's 2020 BDM can also be used to establish driving criteria accounting for the anticipated pile/soil setup.

Newly driven pile lengths and estimated geotechnical pile tip elevations based on: 1) our Deep Foundation Analysis (presented in Section 5.2.2); and, 2) the "Estimated Length" and "Order Length" definitions and formulas presented in Section 305.3.5.2 "Pile Foundations" of the ODOT BDM, are presented in Table 18 below.

Table 18: Estimated Pile Lengths

Pile Type	Bottom of Pile Cap Elevation (ft amsl)	Geotechnical Pile Length (ft)	Geotechnical Pile Tip Elevation (ft amsl)	Estimated Pile Length(1) (ft)	Order Length(1) (ft)
CUY-90-1652S Rear Abutment, B-157-0-14					
12-inch CIP	674.5	47.7	626.8	55	60
CUY-90-1652S Pier 1, B-158-0-14					
16-inch CIP	660.5	79.2	581.3	85	90
CUY-90-1652S Pier 2, B-122-0-14					
16-inch CIP	662.5	71.6	590.9	75	80
CUY-90-1652S Forward Abutment, B-159-0-14 & C-082-0-14					
12-inch CIP	682.5	79.1	603.4	85	90

Notes:
1. *Based on definitions and formulas presented in Section 305.3.5.2 of the 2020 BDM.*

5.2.5. Settlement Analysis

In order to estimate the maximum total and differential settlement that could result within the subsurface soils supporting the proposed Ramp B6 embankment soils at the proposed Bridge CUY-90-1652S rear abutment location, NEAS reviewed: 1) Bridge CUY-90-1652S site plan profile views accessed via ProjectWise on August 19, 2021; 2) Service Limit State loading conditions; and, 3) the generalized subsurface profile and Settlement Parameters for Analysis provided in Sections 5.2.1. of this report. Utilizing this information and the software entitled *FoSSA 2.0* by ADAMA Engineering, Inc., a settlement model was developed and analyzed for both elastic (immediate) and consolidation (long term) settlement. Settlement at the forward abutment location was also evaluated, however the results of this analysis are presented as part of the RW-Y settlement analysis presented in Section 5.1.3 of this report. Outputs of our *FoSSA 2.0* settlement analysis for the rear abutment is included within Appendix I while settlement analysis for the forward abutment is included with that of RW-Y within Appendix E.

Based on our analyses, the estimated maximum total settlement associated with the loads induced by the proposed new embankment at the rear abutment location is about 2.5 inches. This settlement will begin as the embankment load is applied and will dissipate with time. However, the amount of settlement and the time required for the settlement to occur is mostly dependent on the thickness of the underlying compressible soil, the uniformity and properties of these layers (i.e., compaction, material type, compressibility, etc.), and the proposed embankment fill height/surcharge load. Due to: 1) the presence of granular material within the upper portion of the soil profile at the site; and, 2) the consolidation properties of the natural cohesive soils, this settlement magnitude is not anticipated to be a concern as about 2.3 inches of the total settlement is expected to be elastic (immediate) and take place during construction.

5.2.6. Downdrag Analysis

Based on our settlement analysis it was determined that the identified settlement magnitudes at the forward abutment location (approximately 4.2 inches of consolidation settlement) may induce downdrag loading on the proposed forward abutment CIP pile foundation. Per Section 305.3.2.2 "Downdrag and Drag Load" of the ODOT BDM, as greater than 0.4 inches of consolidation (long-term) settlement is anticipated to occur, a check should be performed to determine if the factored structural axial resistance of the pile at the Strength Limit State is equal to or greater than the combined effect of the factored downdrag load and the sum of factored loads (highest loaded pile at each substructure).

In order to perform this check, NEAS reviewed: 1) Bridge CUY-90-1652S site plan profile views accessed via ProjectWise on August 19, 2021; 2) the forward abutment loading information provided by HDR on July 13, 2021; and, 3) the proposed 12-inch CIP pile properties (0.312 inch wall thickness, 35 ksi yield stress). Utilizing this information and geotechnical resistance information presented in Section 5.2.1 of this report, the location of the neutral plane per the Goudreault and Fellenius (1994) method was calculated to be about 26.7 ft at the forward abutment. At the depth of the neutral plane it was subsequently determined that the combination of permanent, transient and downdrag loads was on the order of 219.9 kips with a factored load on the order of 271.2 kips. The combined effect of the factored downdrag load and the sum of factored loads was determined to be well below the factored structural axial resistance of the subject pile (i.e., calculated to be 447.9 kips). Therefore, downdrag loads are not anticipated to be a concern for the project proposed pile foundations. Under the referenced factored downdrag load and the sum of factored loads, the elastic compression of the pile was calculated to be 0.01 inches. Neutral plane and downdrag loading pile check results are included within Appendix I.

5.2.7. Global Stability Analysis

For purposes of evaluating the stability of the CUY-90-1652S bridge abutments, NEAS developed representative profile models to use as the basis for global stability analyses. The models were developed from NEAS's interpretation of the available information which included: 1) Bridge CUY-90-1652S site plan profile views accessed via ProjectWise on August 19, 2021; 2) a live load surcharge of 250 psf accounting for traffic induced loads; and, 3) test borings and laboratory data developed as part of this project. With respect to the soil's engineering properties, the provided generalized soil profiles and estimated engineering properties presented in Section 5.2.1. of this report were used in our analysis as indicated.

The above referenced global stability models were analyzed for long-term (Effective Stress) and short-term (Total Stress) slope stability utilizing the software entitled *Slide 7.0* by Rocscience, Inc. Specifically, the Spencer analysis method was used to calculate a factor of safety (FOS) for circular and block type slope failures. The FOS is the ratio of the resisting forces and the driving forces, with the desired safety factor being more than about 1.5 which equates to an AASHTO resistance factor less than 0.65 (per AASHTO's LRFD BDS, the specified resistance factors are essentially the inverse of the FOS that should be targeted in slope stability programs). For this analysis, a resistance factor of 0.65 or lower is targeted. Based on our slope stability analyses for the referenced abutments, the slope stability factors were estimated to be about 1.56 (0.64 resistance factor). Graphical outputs of the slope stability program (cross-sectional models, calculated safety factors, and critical failure planes) are presented within Appendix J.

5.2.8. Seismic Site Class

It is NEAS's opinion that the subsurface conditions encountered at the proposed Bridge CUY-90-1652S site are characterized as a Seismic Site Class of D in accordance with Section 3.10.3.1, Method B, of the

LRFD BDS. For the overall bridge site, seismic site class parameters were determined at each substructure and subsequently averaged to obtain an overall global Site Class Definition. Seismic Site Classification Calculation results are included within Appendix K.

6. QUALIFICATIONS

This investigation was performed in accordance with accepted geotechnical engineering practice for the purpose of characterizing the subsurface conditions at the site of the proposed Ramp B6 structures, specifically Bridge CUY-90-1652S as well as both Retaining Walls Y and Z. This report has been prepared for Michael Baker International, ODOT and their design consultants to be used solely in evaluating the soils underlying the referenced proposed structures and presenting geotechnical engineering recommendations specific to this project. The assessment of general site environmental conditions or the presence of pollutants in the soil, rock and groundwater of the site was beyond the scope of this geotechnical exploration. Our recommendations are based on the results of our field explorations, laboratory test results from representative soil samples, and geotechnical engineering analyses. The results of the field explorations and laboratory tests, which form the basis of our recommendations, are presented in the appendices as noted. This report does not reflect any variations that may occur between the borings or elsewhere on the site, or variations whose nature and extent may not become evident until a later stage of construction. In the event that any changes in the nature, design or location of the referenced proposed Ramp B6 structures is made, the conclusions and recommendations contained in this report should not be considered valid until they are reviewed and have been modified or verified in writing by a geotechnical engineer.

It has been a pleasure to be of service to Michael Baker International in performing this geotechnical exploration for the CUY-90-16.28 (CCG3A) project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

Brendan P. Andrews, P.E.
Geotechnical Engineer

Kevin C. Arens, P.E.
Geotechnical Engineer

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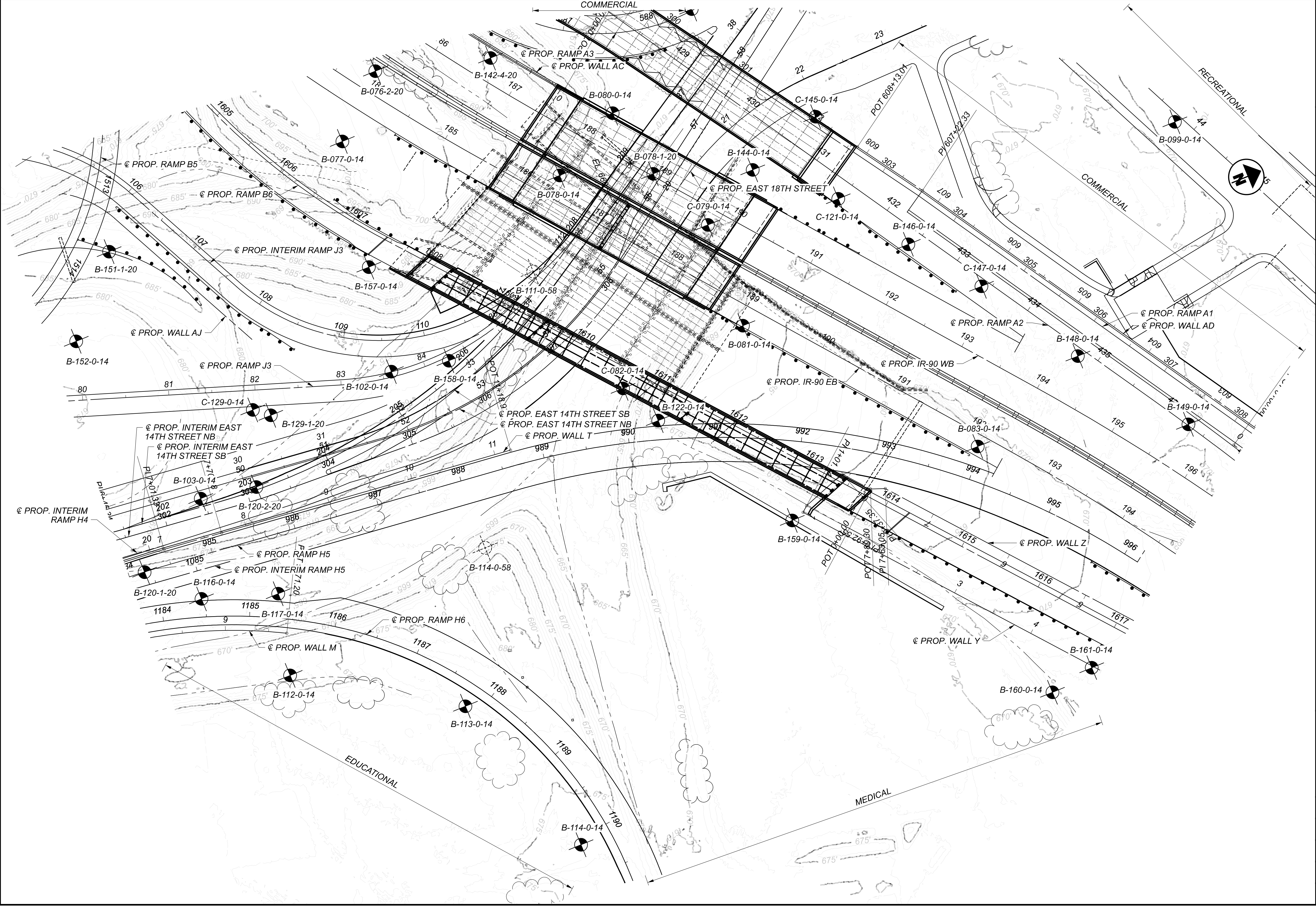
APPENDIX A

SOIL PROFILE SHEETS

CUY-90-16.28 (CCG3A)

MODEL: 82382_IP0702 PAPERSIZE: 17x11 (in.) DATE: 6/23/2022 TIME: 1:19:19 PM USER: mjasiewicz
pw:\\mb-us-pw.bentley.com:mb-us-pw-03\Documents\Cleveland_OH\01_Projects\ODOT\District12\82382\400-Engineering\Geotechnical\Sheets\82382_IP702.dgn



HORIZONTAL SCALE IN FEET
0 25 50 100

SOIL PROFILE - ROADWAY
STA. 984+00 TO END RAMP H5

DESIGN AGENCY
NEAS
National Engineering & Architectural Services Inc.
2800 CORPORATE EXCHANGE DR,
SUITE 240
COLUMBUS, OH,
43231
TEL:614.714.0299
WWW.NEASINC.COM

DESIGNER	MWJ
REVIEWER	BPA 06/23/22
PROJECT ID	82382
SUBSET 53	TOTAL 302
SHEET P.0	TOTAL 0

APPENDIX B

BORING/CPT LOGS AND LABORATORY TESTING RESULTS

PROJECT: CUY-CCG3
TYPE: BRIDGE
PID: 82380 BR ID: CUY-90-1651R
START: 11/7/2014 END: 11/7/2014

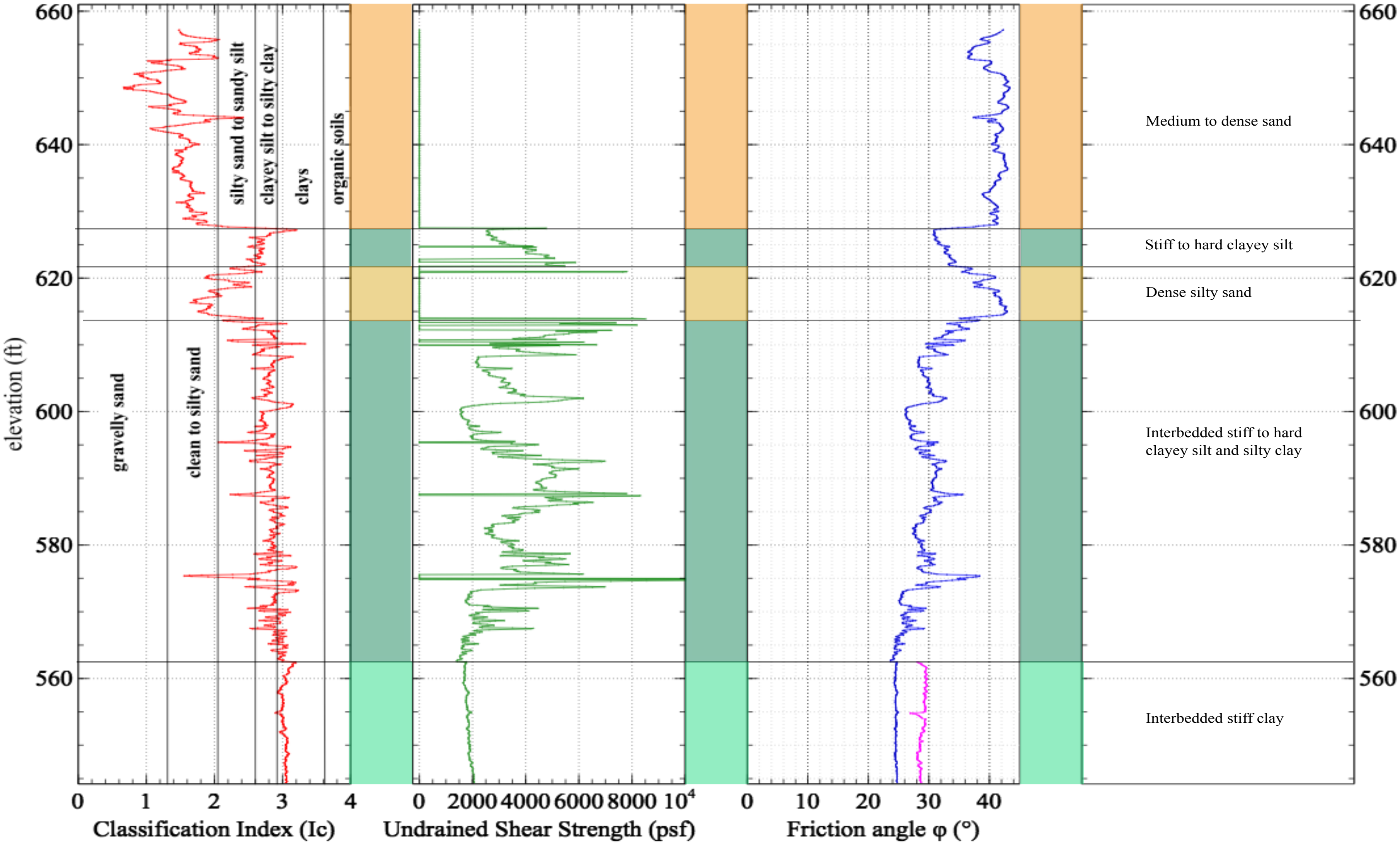
CONE FIRM/OPERATOR: ODOT/BINKLEY

RIG: 20-TON TRUCK RIG
VELOCITY: V=20mm/s
CONE: I-CFXYP20-15
SERIES: 091002

STATION/OFFSET: 1610+76, 30LT
ALIGNMENT: RAMP B6
ELEVATION: 661
LAT/LONG: 41.496150, -81.677194

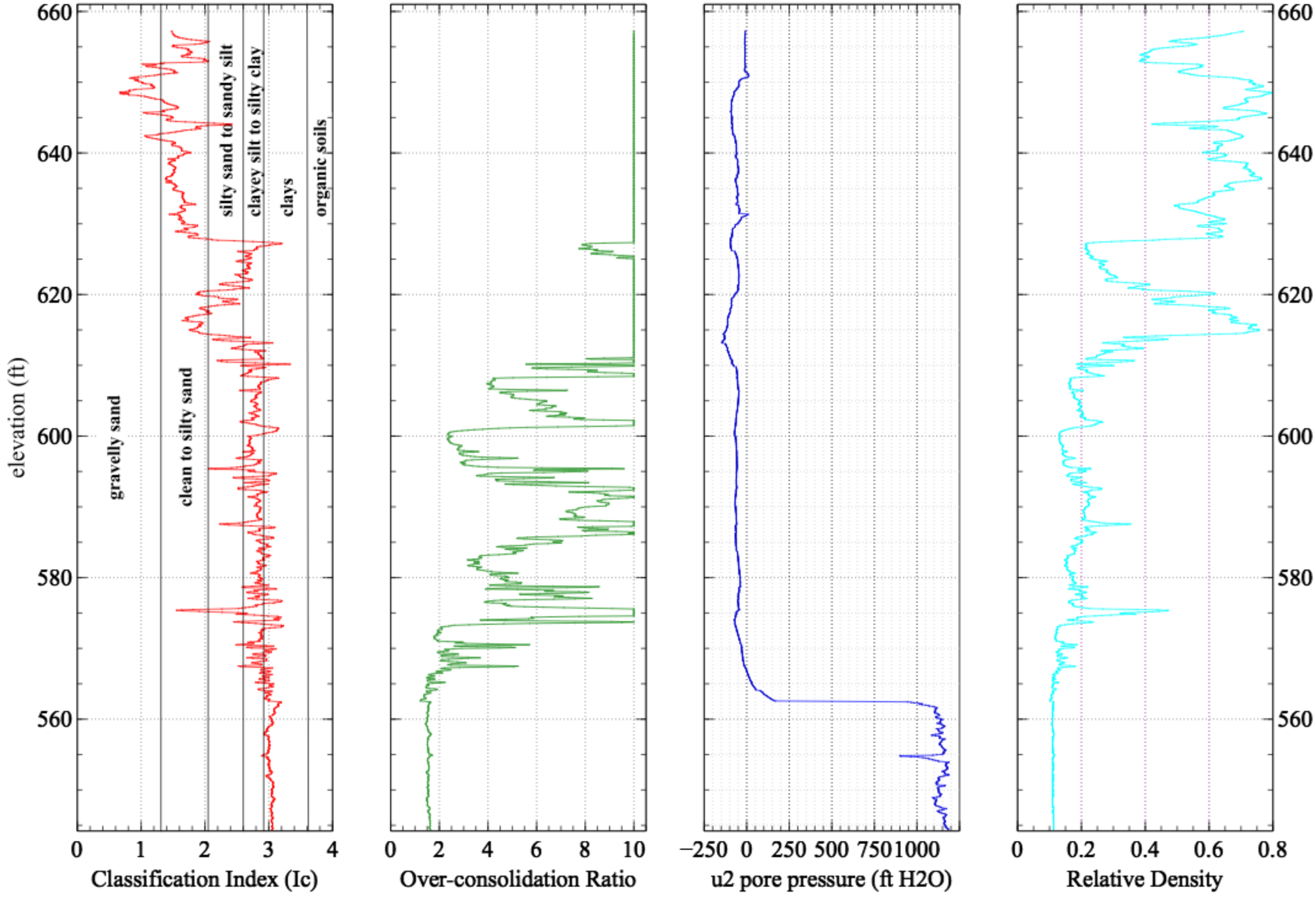
EXPLORATION ID C-082-0-14
PAGE 1 OF 2

🟩 Silty Clay and Clayey Silt 🟨 Silty Sand and Sandy Silt 🟩 Clay 🟧 Sand



C-082-0-14 v = 20 mm/s

PROJECT:	CUY-CCG3			CONE FIRM/OPERATOR:	ODOT/BINKLEY	RIG:	20-TON TRUCK RIG	STATION/OFFSET:	1610+76, 30LT	EXPLORATION ID C-082-0-14
TYPE:	BRIDGE					VELOCITY:	V=20mm/s	ALIGNMENT:	RAMP B6	
PID:	82380	BR ID:	CUY-90-1651R			CONE:	I-CFXYP20-15	ELEVATION:	661	PAGE
START:	11/7/2014	END:	11/7/2014			SERIES:	091002	LAT/LONG:	41.496150, -81.677194	2 OF 2



C-082-0-14 v = 20 mm/s

PROJECT: CUY-90-16.28 (CCG3A)
TYPE: PIEZO
PID: 82382 SFN:
START: 3/17/21 END: 3/17/21

DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH
SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 55T
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 68.4

STATION / OFFSET: 1620+93, 108' RT.
ALIGNMENT: RAMP B6
ELEVATION: 669.8 (MSL) EOB: 51.5 ft.
LAT / LONG: 41.497630, -81.674080

EXPLORATION ID
B-085-3-20

PAGE
1 OF 2

MATERIAL DESCRIPTION AND NOTES	ELEV. 669.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	PIEZ.
5.0" TOPSOIL (DRILLERS DESCRIPTION)	669.4																	
LOOSE TO MEDIUM DENSE, BROWN BECOMING BROWNISH GRAY, **FINE SAND**, SOME COARSE SAND, TRACE SILT, TRACE GRAVEL, TRACE CLAY, SS-1 CONTAINS IRON STAINING, DAMP TO MOIST		1 – 4																
		5 – 6	4 5 7	14	67	SS-1	-	-	-	-	-	-	-	-	-	8	A-3 (V)	
		10 – 11	3 4 5	10	67	SS-2	-	-	-	-	-	-	-	-	-	13	A-3 (V)	
F.S		15 – 16	4 3 4	8	78	SS-3	-	6	30	55	6	3	NP	NP	NP	12	A-3 (0)	
		20 – 21	4 5 9	16	72	SS-4	-	-	-	-	-	-	-	-	-	10	A-3 (V)	
	W 646.0	22 – 24																
@25.0'; BECOMES WET		25 – 26	4 4 8	14	89	SS-5	-	-	-	-	-	-	-	-	-	22	A-3 (V)	
		27 – 29																

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/22/22 13:24 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\CUY-90-16.28 (CCG3A - MOD#7)\GINT FILES\CUY-90-16.28 (CCG3

PID: 82382 | SFN: | PROJECT: CUY-90-16.28 (CCG3A) | STATION / OFFSET: 1620+93, 108' RT. | START: 3/17/21 | END: 3/17/21 | PG 2 OF 2 | B-085-3-20

MATERIAL DESCRIPTION AND NOTES		ELEV. 639.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	PIEZ.
									GR	CS	FS	SI	CL	LL	PL	PI			
LOOSE TO MEDIUM DENSE, BROWN BECOMING BROWNISH GRAY, **FINE SAND**, SOME COARSE SAND, TRACE SILT, TRACE GRAVEL, TRACE CLAY, SS-1 CONTAINS IRON STAINING, DAMP TO MOIST *(continued)*			31	4 5 11	18	78	SS-6	-	-	-	-	-	-	-	-	-	23	A-3 (V)	
			32																
			33																
			34																
			35																
			36	6 6 7	15	100	SS-7	-	-	-	-	-	-	-	-	-	20	A-3 (V)	
			37																
			38																
	FS		39																
			40																
			41	6 7 8	17	100	SS-8	-	-	-	-	-	-	-	-	-	25	A-3 (V)	
			42																
			43																
			44																
			45																
			46	5 8 8	18	89	SS-9	-	-	-	-	-	-	-	-	-	24	A-3 (V)	
			47																
		621.5	48																
MEDIUM DENSE, GRAY, **SILT**, SOME SAND, LITTLE CLAY, TRACE GRAVEL, WET			49																
			50																
		618.3	51 EOB	8 9 13	25	89	SS-10	-	0	0	21	59	20	NP	NP	NP	19	A-4b (8)	

NOTES: GROUNDWATER ENCOUNTERED AT 23.8' DURING DRILLING, 21.7' AFTER PIEZOMETER INSTALLATION. HOLE DID NOT CAVE. BORING OFFSET 22.0' SOUTH.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 30 GAL. BENTONITE GROUT; POURED 2 BAGS CEMENT; POURED 7 BAGS SAND

PROJECT: CUY-CCG3
TYPE: BRIDGE
PID: 82380 SFN:
START: 4/9/15 END: 4/10/15

DRILLING FIRM / OPERATOR: BARR / J.GILBERT
SAMPLING FIRM / LOGGER: BARR / S.PENCE
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT / ST

DRILL RIG: CME 55X
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 1/26/14
ENERGY RATIO (%): 81.2

STATION / OFFSET: 990+36, 22' LT.
ALIGNMENT: RAMP H5
ELEVATION: 676.0 (MSL) EOB: 112.0 ft.
LAT / LONG: 41.496213, -81.677011

EXPLORATION ID
B-122-0-14

PAGE
1 OF 4

MATERIAL DESCRIPTION AND NOTES	ELEV. 676.0	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
MEDIUM DENSE TO DENSE, DARK BROWN, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE GRAVEL, TRACE CLAY, DAMP **(FILL)**		1 2	1 5 8	18	100	SS-1	-	-	-	-	-	-	-	-	-	11	A-3a (V)	
	671.5	3 4	9 13 10	31	100	SS-2	-	14	15	43	20	8	NP	NP	NP	10	A-3a (0)	
MEDIUM DENSE, BROWN AND REDDISH BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, CONTAINS BRICK FRAGMENTS, DAMP **(FILL)**	669.0	5 6 7	8 7 5	16	100	SS-3	-	27	23	31	13	6	NP	NP	NP	10	A-1-b (0)	
LOOSE, GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, WET	667.5	8	3 2 3	7	100	SS-4A	-	-	-	-	-	-	-	-	-	19	A-4a (V)	
LOOSE, BROWN, **COARSE AND FINE SAND**, TRACE SILT, TRACE CLAY, TRACE GRAVEL, WET	666.5	9				SS-4B	-	-	-	-	-	-	-	-	-	14	A-3a (V)	
LOOSE TO MEDIUM DENSE, BROWN, **FINE SAND**, LITTLE COARSE SAND, TRACE SILT, TRACE GRAVEL, TRACE CLAY, DAMP		10 11 12	3 4 6	14	100	SS-5	-	-	-	-	-	-	-	-	-	9	A-3 (V)	
		13 14	4 3 6	12	100	SS-6	-	4	19	68	6	3	NP	NP	NP	7	A-3 (0)	
		15 16 17	3 4 2	8	100	SS-7	-	-	-	-	-	-	-	-	-	11	A-3 (V)	
		18 19	2 2 4	8	100	SS-8	-	-	-	-	-	-	-	-	-	6	A-3 (V)	
	654.0	20 21 22	4 5 7	16	100	SS-9	-	-	-	-	-	-	-	-	-	6	A-3 (V)	
SOFT TO MEDIUM STIFF, BROWN, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, MOIST TO WET		23 24	2 3 4	9	83	SS-10	0.50	3	18	39	14	26	19	12	7	16	A-4a (1)	
	649.0	25 26	2 4 7	15	100	SS-11	0.90	-	-	-	-	-	-	-	-	23	A-4a (V)	
STIFF, BROWN, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, MOIST	646.5	W 648.5 27 28 29	5 4 6	14	100	SS-12	1.50	19	22	9	22	28	32	18	14	22	A-6a (4)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/22/22 14:16 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\1ARCHIVE\ARCHIVE BY YEAR\2017 ARCHIVE\CUY-CCG3 82380\GINT FILES

PID: 82380	SFN:	PROJECT: CUY-CCG3	STATION / OFFSET: 990+36, 22' LT.	START: 4/9/15	END: 4/10/15	PG 2 OF 4	B-122-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 646.0	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, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, WET *(continued)*	642.7	31 32 33	5 9 12	28	100	SS-13	1.30	-	-	-	-	-	-	-	-	21	A-4a (V)	
DENSE, GRAY, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, MOIST TO WET		34 35 36 37 38 39	7 11 14	34	100	SS-14	-	0	1	73	23	3	NP	NP	NP	23	A-3a (0)	
		40 41 42 43 44	8 13 20	45	100	SS-15	-	-	-	-	-	-	-	-	-	18	A-3a (V)	
	627.7	45 46 47 48	7 15 22	50	100	SS-16	-	-	-	-	-	-	-	-	-	27	A-3a (V)	
MEDIUM DENSE, GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, WET	622.7	49 50 51 52 53	8 7 14	28	100	SS-17	-	-	-	-	-	-	-	-	-	29	A-4a (V)	
MEDIUM STIFF TO HARD, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, (INTERBEDDED SILT AND CLAY), MOIST TO WET		54 55 56 57 58 59	4 7 10	23	100	SS-18	3.25	-	-	-	-	-	-	-	-	20	A-4b (V)	
		60 61	5 11 20	42	100	SS-19	4.25	-	-	-	-	-	-	-	-	20	A-4b (V)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/22/22 14:16 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\1ARCHIVE\ARCHIVE BY YEAR\2017 ARCHIVE\CUY-CCG3 82380\GINT FILES

PID: 82380	SFN:	PROJECT: CUY-CCG3	STATION / OFFSET: 990+36, 22' LT.	START: 4/9/15	END: 4/10/15	PG 3 OF 4	B-122-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 613.9	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
MEDIUM STIFF TO HARD, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, (INTERBEDDED SILT AND CLAY), MOIST TO WET *(continued)*		63 64																
		65 66	4 6 10	22	100	SS-20	1.80	0	0	1	66	33	28	20	8	23	A-4b (8)	
		67 68 69																
		70 71	3 5 7	16	100	SS-21	2.20	-	-	-	-	-	-	-	-	21	A-4b (V)	
		72 73 74																
		75 76	3 5 6	15	100	SS-22	0.75	-	-	-	-	-	-	-	-	27	A-4b (V)	
		77 78 79																
		80 81	WOH WOH WOH	0	100	SS-23	1.25	-	-	-	-	-	-	-	-	27	A-4b (V)	
		82 83 84																
		85 86	4 8 12	27	100	SS-24	4.00	-	-	-	-	-	-	-	-	21	A-4b (V)	
		87																
GRAY, **SILT**, LITTLE SAND, TRACE CLAY, TRACE GRAVEL, MOIST	587.7	88 89																
		90 91			81	SS-25	-	0	0	15	78	7	NP	NP	NP	17	A-4b (8)	
@91.5'; UNIT WEIGHT: 123.2 PCF @ 17.9% MC		92 93																
	582.2	94																

PID: 82380	SFN:	PROJECT: CUY-CCG3	STATION / OFFSET: 990+36, 22' LT.	START: 4/9/15	END: 4/10/15	PG 4 OF 4	B-122-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 581.8	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 TO VERY STIFF, GRAY, **SILT**, "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST *(continued)*		95 – 96.5	6 7 10	23	100	SS-26	3.25	-	-	-	-	-	-	-	-	20	A-4b (V)	
		100 – 101.5	2 5 7	16	100	SS-27	1.50	0	0	0	59	41	27	19	8	23	A-4b (8)	
	572.7	103																
MEDIUM STIFF TO STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST TO WET		105 – 106.5	WOH WOH 2	3	100	SS-28	2.00	-	-	-	-	-	-	-	-	29	A-6a (V)	
		110 – 112			94	SS-29	0.60	1	1	5	45	48	28	16	12	25	A-6a (9)	
@111.5'; UNIT WEIGHT: 129.7 PCF @ 26.6% MC	564.0	EOB 112																

NOTES: GROUNDWATER ENCOUNTERED AT 27.5' DURING DRILLING. CAVE DEPTH 27.5'.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 1/3/24 15:19 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\1ARCHIVE BY YEAR\2017 ARCHIVE\CUY-CCG3 82380\GINT FILES\CU

PROJECT: CUY-CCG3
TYPE: BRIDGE
PID: 82380 SFN:
START: 11/20/14 END: 11/21/14

DRILLING FIRM / OPERATOR: BARR / T.GILBERT
SAMPLING FIRM / LOGGER: BARR / Z.JEWELL
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 55X
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 1/26/14
ENERGY RATIO (%): 81.2

STATION / OFFSET: 1607+41, 37' RT.
ALIGNMENT: RAMP B6
ELEVATION: 694.5 (MSL) EOB: 111.5 ft.
LAT / LONG: 41.495554, -81.678084

EXPLORATION ID
B-157-0-14

PAGE
1 OF 4

MATERIAL DESCRIPTION AND NOTES	ELEV. 694.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
MEDIUM DENSE TO VERY DENSE, DARK GRAYISH BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, CONTAINS ASPHALT, SLAG, AND BRICK FRAGMENTS, DAMP **(FILL)**		1 2	3 5 7	16	100	SS-1	-	-	-	-	-	-	-	-	-	11	A-1-b (V)	
		3	15 16 15	42	100	SS-2	-	34	27	20	13	6	NP	NP	NP	8	A-1-b (0)	
		4																
@5.0'; SS-3 BECOMES BROWN AND DARD GRAYISH BROWN		5 6	9 13 14	37	100	SS-3	-	-	-	-	-	-	-	-	-	10	A-1-b (V)	
		7																
@7.5'; SS-4 BECOMES DARK GRAYISH BROWN		8	8 24 28	70	100	SS-4	-	-	-	-	-	-	-	-	-	9	A-1-b (V)	
	685.0	9																
MEDIUM DENSE TO DENSE, ORANGISH BROWN, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE TO LITTLE GRAVEL, TRACE CLAY, SS-5 CONTAINS IRON STAINS, DAMP TO MOIST **(FILL)**		10 11	5 9 11	27	100	SS-5	-	10	18	55	10	7	NP	NP	NP	10	A-3a (0)	
		12																
@12.5'; SS-6 TO SS-7 BECOME BROWN AND GRAYISH BROWN, CONTAINS ASPHALT FRAGMENTS		13	10 7 4	15	100	SS-6	-	-	-	-	-	-	-	-	-	9	A-3a (V)	
		14																
@15.0'; SS-7 CONTAINS BRICK FRAGMENTS		15 16	5 10 16	35	100	SS-7	-	-	-	-	-	-	-	-	-	12	A-3a (V)	
		17																
@17.5'; SS-8 TO SS-9 BECOME BROWN AND DARK GRAYISH BROWN, CONTAINS ROOT, BRICK AND SLAG FRAGMENTS		18	18 14 20	46	100	SS-8	-	12	33	32	15	8	NP	NP	NP	13	A-3a (0)	
		19																
@20.0'; SS-9 BECOMES VERY DENSE		20	50/3"	-	67	SS-9	-	-	-	-	-	-	-	-	-	13	A-3a (V)	
	672.0	21 22																
LOOSE, ORANGISH BROWN, **COARSE AND FINE SAND**, TRACE SILT, TRACE GRAVEL, CONTAINS IRON STAINS, DAMP		23	2 3 4	9	100	SS-10	-	-	-	-	-	-	-	-	-	8	A-3a (V)	
	670.0	24																
MEDIUM DENSE, BROWN, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, DAMP		25 26	3 4 4	11	100	SS-11	-	25	47	22	4	2	NP	NP	NP	7	A-1-b (0)	
	667.5	27																
MEDIUM DENSE TO DENSE, LIGHT BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, DAMP TO MOIST		28	3 3 6	12	100	SS-12	-	-	-	-	-	-	-	-	-	7	A-3a (V)	
		29																

PID: 82380	SFN:	PROJECT: CUY-CCG3	STATION / OFFSET: 1607+41, 37' RT.	START: 11/20/14	END: 11/21/14	PG 2 OF 4	B-157-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 664.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
MEDIUM DENSE TO DENSE, LIGHT BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, DAMP TO MOIST *(continued)*		31	4 4 5	12	100	SS-13	-	-	-	-	-	-	-	-	-	18	A-3a (V)	
		32 33 34																
@35.0'; SS-14 BECOMES BROWN		35 36	3 5 5	14	83	SS-14	-	-	-	-	-	-	-	-	-	14	A-3a (V)	
		37 38 39																
@40.0'; SS-15 BECOMES LIGHT BROWN, (FINE SAND INTERBEDDED WITH SILT)		40 41	8 11 12	31	100	SS-15	-	-	-	-	-	-	-	-	-	10	A-3a (V)	
		42 43 44																
@45.0'; SS-16 TO SS-19 BECOME BROWN, WET		45 46	3 7 8	20	100	SS-16	-	-	-	-	-	-	-	-	-	27	A-3a (V)	
		47 48 49																
		50 51	7 12 18	41	100	SS-17	-	0	1	86	11	2	NP	NP	NP	22	A-3a (0)	
		52 53 54																
		55 56	8 14 15	39	100	SS-18	-	-	-	-	-	-	-	-	-	26	A-3a (V)	
		57 58 59																
		60 61	6 6 13	26	100	SS-19	-	-	-	-	-	-	-	-	-	24	A-3a (V)	

PID: 82380	SFN:	PROJECT: CUY-CCG3	STATION / OFFSET: 1607+41, 37' RT.	START: 11/20/14	END: 11/21/14	PG 3 OF 4	B-157-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 632.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
	631.2	63																
DENSE TO VERY DENSE, GRAY, **SILT**, "AND" SAND, TRACE CLAY, TRACE GRAVEL, MOIST TO WET		64																
		65 66	10 22 37	80	100	SS-20	-	0	1	40	51	8	NP	NP	NP	20	A-4b (5)	
		67 68 69																
@70.0'; SS-21 TO SS-22 BECOME LITTLE CLAY, TRACE SAND		70 71	11 17 19	49	72	SS-21	-	-	-	-	-	-	-	-	-	19	A-4b (V)	
		72 73 74																
		75 76	9 12 19	42	100	SS-22	-	-	-	-	-	-	-	-	-	16	A-4b (V)	
	616.2	77 78																
VERY DENSE, GRAY, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, WET		79																
		80 81	17 28 32	81	100	SS-23	-	0	0	65	30	5	NP	NP	NP	22	A-3a (0)	
	611.2	82 83																
STIFF TO HARD, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP		84																
		85 86	4 7 9	22	100	SS-24	2.00	0	0	3	66	31	28	18	10	20	A-4b (8)	
		87 88 89																
		90 91	6 8 13	28	100	SS-25	4.25	-	-	-	-	-	-	-	-	18	A-4b (V)	
		92 93 94																

PID: 82380 | SFN: | PROJECT: CUY-CCG3 | STATION / OFFSET: 1607+41, 37' RT. | START: 11/20/14 | END: 11/21/14 | PG 4 OF 4 | B-157-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 600.2	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 TO HARD, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP *(continued)*		95 96	7 10 15	34	100	SS-26	4.50	-	-	-	-	-	-	-	-	17	A-4b (V)	
	596.2	97 98																
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, INTERBEDDED, MOIST		99																
		100 101	6 8 14	30	100	SS-27	2.00	0	0	1	55	44	30	18	12	20	A-6a (9)	
		102 103 104																
		105 106	4 7 9	22	100	SS-28	2.90	-	-	-	-	-	-	-	-	24	A-6a (V)	
		107 108 109																
	583.0	110 111 EOB	4 6 10	22	100	SS-29	2.00	-	-	-	-	-	-	-	-	21	A-6a (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. CAVE DEPTH 53.0'.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: CUY-CCG3
TYPE: BRIDGE
PID: 82380 SFN:
START: 3/10/15 END: 3/10/15

DRILLING FIRM / OPERATOR: BARR / J.GILBERT
SAMPLING FIRM / LOGGER: BARR / D.KLIMKOWICZ
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT / ST

DRILL RIG: CME 55
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 1/26/14
ENERGY RATIO (%): 78.8

STATION / OFFSET: 32+82, 30' LT.
ALIGNMENT: SB E 14TH ST
ELEVATION: 678.6 (MSL) EOB: 112.0 ft.
LAT / LONG: 41.495673, -81.677588

EXPLORATION ID
B-158-0-14

PAGE
1 OF 4

MATERIAL DESCRIPTION AND NOTES	ELEV. 678.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
LOOSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, DAMP **(FILL)**	677.1		3 3 4	9	100	SS-1	-	-	-	-	-	-	-	-	-	10	A-3a (V)	
STIFF TO VERY STIFF, BROWN AND GRAY, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, MOIST TO DAMP **(FILL)**			5 6 7	17	100	SS-2	4.00	2	6	21	40	31	29	15	14	16	A-6a (9)	
	674.1		1 4 5	12	100	SS-3	1.25	-	-	-	-	-	-	-	-	14	A-6a (V)	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, TRACE SILT, TRACE CLAY, TRACE GRAVEL, DAMP **(FILL)**	671.8		8 9 8	22	100	SS-4	-	-	-	-	-	-	-	-	-	10	A-3a (V)	
MEDIUM DENSE, BROWN, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, DAMP **(FILL)**	669.1		5 7 7	18	100	SS-5	-	22	41	28	6	3	NP	NP	NP	7	A-1-b (0)	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, TRACE SILT, TRACE CLAY, TRACE GRAVEL, DAMP **(FILL)**	666.6		4 5 6	14	100	SS-6	-	-	-	-	-	-	-	-	-	8	A-3a (V)	
LOOSE, BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, MOIST **(FILL)**	664.1		3 3 3	8	100	SS-7	-	5	4	35	42	14	NP	NP	NP	17	A-4a (4)	
LOOSE TO DENSE, BROWN, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE CLAY, TRACE GRAVEL, DAMP TO WET			3 3 3	8	100	SS-8	-	-	-	-	-	-	-	-	-	11	A-3a (V)	
@17.5'; SS-9 TO SS-11 BECOMES LIGHT BROWN			3 6 8	18	100	SS-9	-	-	-	-	-	-	-	-	-	9	A-3a (V)	
			4 5 7	16	100	SS-10	-	6	12	66	8	8	NP	NP	NP	8	A-3a (0)	
			3 5 7	16	100	SS-11	-	-	-	-	-	-	-	-	-	8	A-3a (V)	
@25.0'; SS-12 TO SS-16 BECOMES DARK BROWN			3 8 11	25	100	SS-12	-	-	-	-	-	-	-	-	-	11	A-3a (V)	
		W 651.1	4 5 9	18	100	SS-13	-	-	-	-	-	-	-	-	-	27	A-3a (V)	

PID: 82380	SFN:	PROJECT: CUY-CCG3	STATION / OFFSET: 32+82, 30' LT.	START: 3/10/15	END: 3/10/15	PG 2 OF 4	B-158-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 648.6	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
LOOSE TO DENSE, BROWN, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE CLAY, TRACE GRAVEL, DAMP TO WET *(continued)*		31	4 6 9	20	100	SS-14	-	0	5	71	19	5	NP	NP	NP	24	A-3a (0)	
		32 33 34 35																
		36	7 13 25	50	100	SS-15	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
		37 38 39 40																
		41	7 10 11	28	100	SS-16	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
	635.3	42 43																
MEDIUM DENSE TO DENSE, GRAY, **SILT**, LITTLE CLAY, LITTLE SAND, TRACE GRAVEL, MOIST TO WET		44 45																
		46	10 15 20	46	100	SS-17	-	-	-	-	-	-	-	-	-	20	A-4b (V)	
		47 48 49 50																
		51	7 9 13	29	100	SS-18	-	0	0	18	64	18	NP	NP	NP	22	A-4b (8)	
		52 53 54 55																
		56	10 13 13	34	100	SS-19	-	-	-	-	-	-	-	-	-	21	A-4b (V)	
		57 58 59 60																
@60.0'; ST-20 BECOMES SOME CLAY, TRACE SAND @61.6'; UNIT WEIGHT: 135.8 PCF @ 20.4% MC		61			100	SS-20	-	0	0	6	73	21	NP	NP	NP	20	A-4b (8)	

PID: 82380	SFN:	PROJECT: CUY-CCG3	STATION / OFFSET: 32+82, 30' LT.	START: 3/10/15	END: 3/10/15	PG 3 OF 4	B-158-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 616.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
MEDIUM STIFF TO HARD, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, DAMP TO MOIST	615.3	63 64																
		65 66	8 12 15	35	100	SS-21	4.00	-	-	-	-	-	-	-	-	20	A-4b (V)	
		67 68 69																
		70 71	6 6 9	20	100	SS-22	1.60	-	-	-	-	-	-	-	-	22	A-4b (V)	
		72 73 74																
@75.0'; UNIT WEIGHT: 131.4 PCF @ 19.6% MC		75 76 77			100	SS-23	3.50	0	0	0	66	34	27	20	7	20	A-4b (8)	
		78 79																
		80 81	8 9 13	29	100	SS-24	4.00	-	-	-	-	-	-	-	-	18	A-4b (V)	
		82 83 84																
		85 86	8 10 13	30	100	SS-25	4.25	-	-	-	-	-	-	-	-	20	A-4b (V)	
		87 88 89																
		90 91	7 9 14	30	100	SS-26	4.25	-	-	-	-	-	-	-	-	19	A-4b (V)	
		92 93 94																

PID: 82380	SFN:	PROJECT: CUY-CCG3	STATION / OFFSET: 32+82, 30' LT.	START: 3/10/15	END: 3/10/15	PG 4 OF 4	B-158-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 584.4	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
MEDIUM STIFF TO HARD, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, DAMP TO MOIST *(continued)*		95																
@96.5'; UNIT WEIGHT: 134.1 PCF @ 19.1% MC		95 - 97			100	SS-27	3.00	0	0	0	67	33	26	19	7	19	A-4b (8)	
		100 - 101.5	8 12 16	37	100	SS-28	4.50	-	-	-	-	-	-	-	-	17	A-4b (V)	
		105 - 106.5	4 6 8	18	100	SS-29	0.60	-	-	-	-	-	-	-	-	24	A-4b (V)	
	570.3	108																
MEDIUM STIFF TO STIFF, GRAY, **SILTY CLAY**, TRACE SAND, TRACE GRAVEL, MOIST																		
@111.6'; UNIT WEIGHT: 120.9 PCF @ 31.8% MC		110 - 112			100	SS-30	1.00	1	1	2	26	70	38	21	17	32	A-6b (11)	
	566.6	EOB 112																

NOTES: GROUNDWATER ENCOUNTERED AT 27.5' DURING DRILLING. CAVE DEPTH 26.0'.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: CUY-CCG3
TYPE: BRIDGE
PID: 82380 SFN:
START: 12/2/14 END: 12/3/14

DRILLING FIRM / OPERATOR: BARR / D.SHOPE
SAMPLING FIRM / LOGGER: BARR / D.KLIMKOWICZ
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT / ST

DRILL RIG: CME 55
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 1/26/14
ENERGY RATIO (%): 78.8

STATION / OFFSET: 1613+12, 66' RT.
ALIGNMENT: RAMP B6
ELEVATION: 672.0 (MSL) EOB: 86.5 ft.
LAT / LONG: 41.496483, -81.676402

EXPLORATION ID
B-159-0-14

PAGE
1 OF 3

MATERIAL DESCRIPTION AND NOTES	ELEV. 672.0	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
4.5", **ASPHALT**	671.6																	
7.5", **GRANULAR BASE**	671.0	1																
MEDIUM DENSE, DARK GRAY AND BROWN, **GRAVEL WITH SAND AND SILT**, TRACE CLAY, CONTAINS BRICK FRAGMENTS AND CINDERS, MOIST **(FILL)**	667.5	2 3 4	4 5 4	12	100	SS-1	-	-	-	-	-	-	-	-	-	15	A-2-4 (V)	
MEDIUM DENSE, BROWN, **FINE SAND**, TRACE COARSE SAND, TRACE SILT, TRACE GRAVEL, TRACE CLAY, CONTAINS BRICK FRAGMENTS, DAMP **(FILL)**	665.0	5 6 7	3 3 5	11	100	SS-2	-	-	-	-	-	-	-	-	-	7	A-3 (V)	
MEDIUM DENSE, BROWN AND LIGHT BROWN AND LIGHT GRAY, **SANDY SILT**, TRACE CLAY, TRACE GRAVEL, CONTAINS SILT SEAMS, MOIST **(FILL)**	662.5	8 9	5 6 7	17	100	SS-3	-	2	4	54	31	9	NP	NP	NP	16	A-4a (1)	
STIFF, BROWN MOTTLED WITH GRAYISH BROWN, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		10 11 12	2 2 2	5	100	SS-4	1.50	1	0	4	56	39	34	19	15	24	A-6a (10)	
	658.8	13	5 8 13	28	100	SS-5A	1.90	1	1	5	56	37	32	20	12	24	A-6a (9)	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE GRAVEL, TRACE CLAY, DAMP		14				SS-5B	-	-	-	-	-	-	-	-	-	8	A-3a (V)	
	655.0	15 16 17	7 10 11	28	100	SS-6	-	-	-	-	-	-	-	-	-	5	A-3a (V)	
MEDIUM DENSE, BROWN, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, DRY TO DAMP		18 19	7 11 12	30	100	SS-7	-	23	54	12	8	3	NP	NP	NP	3	A-1-b (0)	
@20.0'; SS-8 BECOMES LOOSE @21.1'; UNIT WEIGHT: 125.1 PCF @ 28.1% MC	650.0	20 21	6 4 2	8	100	SS-8	-	-	-	-	-	-	-	-	-	9	A-1-b (V)	
VERY SOFT, BROWN, **CLAY**, "AND" SILT, TRACE SAND, TRACE GRAVEL, MOIST	647.5	22 23 24	0 2 2	5	100	SS-9	0.15	1	0	1	36	62	43	21	22	34	A-7-6 (13)	
VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, WET	644.7	25 26 27 ▼ W 644.5			100	ST-10	2.10	0	1	5	57	37	30	19	11	28	A-6a (8)	
MEDIUM DENSE, GRAY, **SANDY SILT**, TRACE CLAY, TRACE GRAVEL, CONTAINS SILT SEAMS, WET	642.5	28 29	2 5 8	17	100	SS-11	-	-	-	-	-	-	-	-	-	24	A-4a (V)	

PID: 82380	SFN:	PROJECT: CUY-CCG3	STATION / OFFSET: 1613+12, 66' RT.	START: 12/2/14	END: 12/3/14	PG 2 OF 3	B-159-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 642.0	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
MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, WET *(continued)*		31	4 8 12	26	100	SS-12	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
		36	4 7 11	24	100	SS-13	-	-	-	-	-	-	-	-	-	20	A-3a (V)	
	633.7																	
MEDIUM DENSE, GRAY, **SANDY SILT**, TRACE CLAY, TRACE GRAVEL, MOIST		41	7 8 13	28	100	SS-14	-	-	-	-	-	-	-	-	-	20	A-4a (V)	
	628.7																	
VERY STIFF TO HARD, GRAY, **SILT**, TRACE TO SOME SAND, LITTLE TO SOME CLAY, TRACE GRAVEL, MOIST		46	8 10 16	34	100	SS-15	3.70	0	3	22	59	16	22	16	6	18	A-4b (8)	
		51	6 8 12	26	100	SS-16	4.00	-	-	-	-	-	-	-	-	19	A-4b (V)	
		56	9 22 22	58	100	SS-17	3.00	-	-	-	-	-	-	-	-	16	A-4b (V)	
@60.0'; UNIT WEIGHT: 131.3 PCF @ 20.8% MC		61			100	ST-18	2.20	0	1	0	73	26	27	18	9	21	A-4b (8)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 1/3/24 15:20 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\1ARCHIVE BY YEAR\2017 ARCHIVE\CUY-CCG3 82380\GINT FILES\CU

PID: 82380 | SFN: | PROJECT: CUY-CCG3 | STATION / OFFSET: 1613+12, 66' RT. | START: 12/2/14 | END: 12/3/14 | PG 3 OF 3 | B-159-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 609.9	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**, TRACE TO SOME SAND, LITTLE TO SOME CLAY, TRACE GRAVEL, MOIST *(continued)*		63 64 65 66	7 10 15	33	100	SS-19	2.25	-	-	-	-	-	-	-	-	20	A-4b (V)	
		67 68 69 70 71	10 13 18	41	100	SS-20	4.25	-	-	-	-	-	-	-	-	18	A-4b (V)	
	598.5	72 73																
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		74 75 76	8 11 15	34	100	SS-21	3.00	0	0	1	53	46	31	19	12	22	A-6a (9)	
		77 78 79 80 81	8 11 15	34	100	SS-22	2.10	-	-	-	-	-	-	-	-	23	A-6a (V)	
	585.5	82 83 84 85 86 EOB	9 11 15	34	100	SS-23	1.50	-	-	-	-	-	-	-	-	26	A-6a (V)	

NOTES: GROUNDWATER ENCOUNTERED AT 27.5' DURING DRILLING, 26.8' UPON COMPLETION. CAVE DEPTH 29.0'.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED .5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: CUY-CCG3
TYPE: RETAINING WALL
PID: 82380 SFN:
START: 12/4/14 END: 12/5/14

DRILLING FIRM / OPERATOR: BARR / T.GILBERT
SAMPLING FIRM / LOGGER: BARR / D.LYON
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT / ST

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 1/26/14
ENERGY RATIO (%): 77.4

STATION / OFFSET: 1616+72, 100' RT.
ALIGNMENT: RAMP B6
ELEVATION: 666.3 (MSL) EOB: 61.5 ft.
LAT / LONG: 41.497034, -81.675305

EXPLORATION ID
B-160-0-14

PAGE
1 OF 2

MATERIAL DESCRIPTION AND NOTES	ELEV. 666.3	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
4.0", **TOPSOIL**	665.9																	
MEDIUM DENSE, BROWN, BLACK AND LIGHT BROWN, **COARSE AND FINE SAND**, SOME GRAVEL, TRACE SILT, TRACE CLAY, CONTAINS SLAG AND BRICK FRAGMENTS **(FILL)**	664.3	1 2	2 5 5	13	100	SS-1	-	-	-	-	-	-	-	-	-	9	A-3a (V)	
LOOSE TO MEDIUM DENSE, BROWN AND LIGHT BROWN, **FINE SAND**, TRACE SILT, TRACE COARSE SAND, TRACE GRAVEL, TRACE CLAY, DAMP		3 4	6 6 7	17	78	SS-2	-	4	5	83	7	1	NP	NP	NP	6	A-3 (0)	
	659.3	5 6 7	3 3 3	8	78	SS-3	-	-	-	-	-	-	-	-	-	6	A-3 (V)	
VERY LOOSE TO LOOSE, BROWN, **COARSE AND FINE SAND**, TRACE GRAVEL, TRACE SILT, TRACE CLAY, DAMP TO MOIST		8 9	2 2 2	5	89	SS-4	-	-	-	-	-	-	-	-	-	10	A-3a (V)	
	653.3	10 11 12	2 1 2	4	100	SS-5	-	-	-	-	-	-	-	-	-	8	A-3a (V)	
LOOSE TO MEDIUM DENSE, BROWN, **FINE SAND**, TRACE TO LITTLE COARSE SAND, TRACE SILT, TRACE CLAY, DAMP		13 14	6 2 3	6	94	SS-6A SS-6B	- -	- 0	- 1	- 90	- 7	- 2	- NP	- NP	- NP	6 5	A-3a (V) A-3 (0)	
		15 16 17	4 5 7	15	78	SS-7	-	-	-	-	-	-	-	-	-	6	A-3 (V)	
@17.5'; SS-8 BECOMES WET	646.8	W 648.8 18 19	4 4 5	12	72	SS-8	-	-	-	-	-	-	-	-	-	24	A-3 (V)	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, WET	644.3	20 21 22	4 6 7	17	100	SS-9	-	-	-	-	-	-	-	-	-	24	A-3a (V)	
MEDIUM DENSE TO DENSE, BROWN, **FINE SAND**, LITTLE COARSE SAND, TRACE SILT, TRACE CLAY, TRACE GRAVEL, WET		23 24	2 9 14	30	100	SS-10	-	0	11	83	5	1	NP	NP	NP	22	A-3 (0)	
		25 26 27	8 16 21	48	100	SS-11	-	-	-	-	-	-	-	-	-	21	A-3 (V)	
	636.8	28 29	7 14 20	44	100	SS-12	-	-	-	-	-	-	-	-	-	24	A-3 (V)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/22/22 14:20 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\1ARCHIVE\ARCHIVE BY YEAR\2017 ARCHIVE\CUY-CCG3 82380\GINT FILES

PID: 82380 | SFN: | PROJECT: CUY-CCG3 | STATION / OFFSET: 1616+72, 100' RT. | START: 12/4/14 | END: 12/5/14 | PG 2 OF 2 | **B-160-0-14**

MATERIAL DESCRIPTION AND NOTES	ELEV. 636.3	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
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, WET *(continued)*		31	5 8 12	26	100	SS-13	-	0	0	65	32	3	NP	NP	NP	24	A-3a (0)	
		32																
	633.0	33																
VERY DENSE, GRAYISH BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, MOIST		34																
		35																
		36	13 18 23	53	100	SS-14	-	-	-	-	-	-	-	-	-	19	A-4a (V)	
		37																
	628.0	38																
MEDIUM DENSE, GRAYISH BROWN, **SILT**, SOME SAND, SOME CLAY, TRACE GRAVEL, WET		39																
		40																
		41	6 6 9	19	100	SS-15	-	0	0	28	51	21	21	16	5	29	A-4b (7)	
		42																
		43																
		44																
		45																
		46	4 6 7	17	100	SS-16	-	-	-	-	-	-	-	-	-	20	A-4b (V)	
	619.0	47																
VERY STIFF, GRAY TO GRAYISH BROWN, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST @48.0'; UNIT WEIGHT: 128.5 PCF @ 23.2% MC		48																
		49			96	ST-17	2.50	0	0	4	61	35	29	17	12	23	A-6a (9)	
		50																
		51	3 5 7	15	100	SS-18	3.25	-	-	-	-	-	-	-	-	23	A-6a (V)	
		52																
	612.8	53																
MEDIUM DENSE, GRAYISH BROWN, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, MOIST		54																
		55																
		56	3 6 7	17	100	SS-19	-	-	-	-	-	-	-	-	-	21	A-4b (V)	
		57																
		58																
		59																
		60																
	604.8	EOB 61	6 8 8	21	100	SS-20	-	0	0	1	70	29	25	19	6	20	A-4b (8)	

NOTES: GROUNDWATER ENCOUNTERED AT 17.5' DURING DRILLING. CAVE DEPTH 16.2'.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT:	CUY-CCG3	DRILLING FIRM / OPERATOR:	BARR / T.GILBERT	DRILL RIG:	CME 45B	STATION / OFFSET:	1616+99, 53' RT.	EXPLORATION ID B-161-0-14
TYPE:	RETAINING WALL	SAMPLING FIRM / LOGGER:	BARR / D.LYON	HAMMER:	CME AUTOMATIC	ALIGNMENT:	RAMP B6	
PID: 82380	SFN:	DRILLING METHOD:	3.25" HSA	CALIBRATION DATE:	1/26/14	ELEVATION: 666.5 (MSL)	EOB: 61.5 ft.	PAGE 1 OF 2
START: 12/3/14	END: 12/3/14	SAMPLING METHOD:	SPT / ST	ENERGY RATIO (%):	77.4	LAT / LONG:	41.497179, -81.675336	

MATERIAL DESCRIPTION AND NOTES	ELEV. 666.5	DEPTHS		SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
									GR	CS	FS	SI	CL	LL	PL	PI			
3.0", **TOPSOIL**	666.3																		
MEDIUM DENSE, BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, CONTAINS FEW ROOTS, DAMP **(FILL)**	664.5		1	3 4 5	12	44	SS-1	-	35	16	35	11	3	NP	NP	NP	8	A-1-b (0)	
VERY LOOSE TO MEDIUM DENSE, BROWN AND GRAYISH BROWN, **FINE SAND**, SOME COARSE SAND, LITTLE GRAVEL, TRACE SILT, TRACE CLAY, DAMP			2 3 4	7 6 7	17	89	SS-2	-	-	-	-	-	-	-	-	-	9	A-3 (V)	
@5.0'; SS-3 BECOMES DARK BROWN			5 6 7	2 1 2	4	94	SS-3	-	19	21	53	5	2	NP	NP	NP	10	A-3 (0)	
			8 9	2 2 2	5	100	SS-4	-	-	-	-	-	-	-	-	-	9	A-3 (V)	
			10 11 12	3 2 4	8	50	SS-5	-	-	-	-	-	-	-	-	-	9	A-3 (V)	
@12.5'; SS-6 BECOMES GRAYISH BROWN, TRACE GRAVEL			13 14	3 4 7	14	100	SS-6	-	5	26	62	6	1	NP	NP	NP	5	A-3 (0)	
@15.0'; SS-7 BECOMES MOIST	649.5		15 16	5 5 7	15	100	SS-7	-	-	-	-	-	-	-	-	-	16	A-3 (V)	
MEDIUM DENSE TO VERY DENSE, GRAY, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE CLAY, TRACE GRAVEL, MOIST TO WET		W 649.0	17 18 19	4 5 7	15	61	SS-8	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
			20 21 22	10 15 21	46	100	SS-9	-	-	-	-	-	-	-	-	-	15	A-3a (V)	
			23 24	4 8 14	28	100	SS-10	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
@25.0'; SS-11 TO SS-15 BECOME GRAYISH BROWN			25 26 27	8 18 26	57	100	SS-11	-	-	-	-	-	-	-	-	-	20	A-3a (V)	
			28 29	6 10 18	36	100	SS-12	-	0	7	81	10	2	NP	NP	NP	19	A-3a (0)	

PID: 82380 | SFN: | PROJECT: CUY-CCG3 | STATION / OFFSET: 1616+99, 53' RT. | START: 12/3/14 | END: 12/3/14 | PG 2 OF 2 | B-161-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 636.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
MEDIUM DENSE TO VERY DENSE, GRAY, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE CLAY, TRACE GRAVEL, MOIST TO WET *(continued)*		31	5 12 20	41	100	SS-13	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
		36	4 10 13	30	100	SS-14	-	-	-	-	-	-	-	-	-	24	A-3a (V)	
		41	9 13 13	34	100	SS-15	-	-	-	-	-	-	-	-	-	24	A-3a (V)	
	623.2	43																
MEDIUM DENSE, GRAY, **SILT**, LITTLE TO SOME CLAY, TRACE SAND, TRACE GRAVEL, DAMP TO WET		46	3 4 7	14	100	SS-16	-	-	-	-	-	-	-	-	-	25	A-4b (V)	
@48.0'; UNIT WEIGHT: 130.1 PCF @ 21.2% MC		49			117	ST-17	-	0	0	2	78	20	26	21	5	21	A-4b (8)	
		51	5 7 10	22	100	SS-18	-	-	-	-	-	-	-	-	-	20	A-4b (V)	
	613.2	53																
STIFF TO VERY STIFF, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, WET		56	5 6 10	21	100	SS-19	1.40	0	0	1	74	25	28	20	8	26	A-4b (8)	
	605.0	EOB 61	6 8 10	23	100	SS-20	2.75	-	-	-	-	-	-	-	-	26	A-4b (V)	

NOTES: GROUNDWATER ENCOUNTERED AT 17.5' DURING DRILLING. CAVE DEPTH 15.0'.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: CUY-CCG3
TYPE: RETAINING WALL
PID: 82380 SFN:
START: 12/3/14 END: 12/4/14

DRILLING FIRM / OPERATOR: BARR / T.GILBERT
SAMPLING FIRM / LOGGER: BARR / D.LYON
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT / ST

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 1/26/14
ENERGY RATIO (%): 77.4

STATION / OFFSET: 197+39, 180' RT.
ALIGNMENT: IR-90 EB
ELEVATION: 669.4 (MSL) EOB: 61.5 ft.
LAT / LONG: 41.497483, -81.674507

EXPLORATION ID
B-162-0-14

PAGE
1 OF 2

MATERIAL DESCRIPTION AND NOTES	ELEV. 669.4	DEPTHS		SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
									GR	CS	FS	SI	CL	LL	PL	PI			
4.0", **TOPSOIL** LOOSE, DARK GRAY AND GRAY, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, CONTAINS CONCRETE FRAGMENTS, WET **(FILL)**	669.1 667.4		1 2	4 3 3	8	28	SS-1	-	-	-	-	-	-	-	-	-	17	A-1-b (V)	
LOOSE, DARK BROWN TO BROWN, **COARSE AND FINE SAND**, LITTLE TO SOME GRAVEL, LITTLE SILT, TRACE CLAY, SS-2 CONTAINS CONCRETE AND BRICK FRAGMENTS, WET **(FILL)**			3 4	4 2 2	5	94	SS-2	-	-	-	-	-	-	-	-	-	15	A-3a (V)	
			5 6 7	3 3 2	6	72	SS-3	-	17	18	45	13	7	NP	NP	NP	16	A-3a (0)	
@7.5'; SS-4 CHANGES TO DAMP	659.9		8 9	4 3 4	9	89	SS-4	-	-	-	-	-	-	-	-	-	7	A-3a (V)	
LOOSE, BROWN, **FINE SAND**, TRACE COARSE SAND, TRACE CLAY, TRACE SILT, TRACE GRAVEL, DAMP	657.4		10 11 12	4 4 4	10	100	SS-5	-	1	3	89	3	4	NP	NP	NP	7	A-3 (0)	
VERY LOOSE TO LOOSE, BROWN, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, DAMP			13 14	2 2 2	5	83	SS-6	-	-	-	-	-	-	-	-	-	9	A-1-b (V)	
			15 16 17	2 1 2	4	89	SS-7	-	-	-	-	-	-	-	-	-	9	A-1-b (V)	
	649.9		18 19	3 2 3	6	83	SS-8	-	33	40	23	3	1	NP	NP	NP	8	A-1-b (0)	
LOOSE, BROWN, **FINE SAND**, TRACE COARSE SAND, TRACE SILT, TRACE CLAY, TRACE GRAVEL, WET	647.4	W 649.4	20 21 22	5 4 4	10	72	SS-9	-	-	-	-	-	-	-	-	-	26	A-3 (V)	
VERY SOFT, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, CONTAINS NO INTACT SOIL FOR HP READINGS, WET	646.1		23	0 0 3	4	100	SS-10A	-	-	-	-	-	-	-	-	-	35	A-6a (V)	
VERY LOOSE, GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, WET	644.9		24				SS-10B	-	-	-	-	-	-	-	-	-	28	A-4a (V)	
MEDIUM DENSE TO VERY DENSE, DARK GRAY AND BROWN TO BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, WET @25.8'; UNIT WEIGHT: 126.6 PCF @ 28.8% MC			25 26 27			100	SS-11	-	0	1	75	20	4	NP	NP	NP	29	A-3a (0)	
			28 29	8 13 16	37	100	SS-12	-	-	-	-	-	-	-	-	-	18	A-3a (V)	

PID: 82380 | SFN: | PROJECT: CUY-CCG3 | STATION / OFFSET: 197+39, 180' RT. | START: 12/3/14 | END: 12/4/14 | PG 2 OF 2 | B-162-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV. 639.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
MEDIUM DENSE TO VERY DENSE, DARK GRAY AND BROWN TO BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, WET *(continued)*		31	16 20 12	41	100	SS-13	-	-	-	-	-	-	-	-	-	14	A-3a (V)	
		32																
		33																
		34																
@35.0'; SS-14 BECOMES GRAY		35																
		36	9 9 11	26	56	SS-14	-	-	-	-	-	-	-	-	-	24	A-3a (V)	
		37																
		38																
		39																
		40																
		41	10 20 23	55	100	SS-15	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
		42																
	625.9	43																
STIFF TO HARD, GRAYISH BROWN, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, DAMP TO MOIST		44																
		45																
		46	6 7 7	18	72	SS-16	1.90	0	1	3	70	26	26	19	7	23	A-4b (8)	
		47																
		48																
		49																
		50																
		51	2 6 8	18	100	SS-17	3.50	-	-	-	-	-	-	-	-	19	A-4b (V)	
		52																
		53																
		54																
		55																
		56	6 9 12	27	100	SS-18	4.25	1	0	5	69	25	27	19	8	19	A-4b (8)	
		57																
	611.2	58																
STIFF, GRAYISH BROWN, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, DAMP		59																
		60																
	607.9	61 EOB	4 5 7	15	100	SS-19	1.70	-	-	-	-	-	-	-	-	22	A-6a (V)	

NOTES: GROUNDWATER ENCOUNTERED AT 20.0' DURING DRILLING. CAVE DEPTH 20.0'.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

BARR & PREVOST
ENGINEERING | TESTING | SURVEYING

5710 Westbourne Avenue
Columbus, OH 43213
614-892-0162

Consolidation Test

Project Name: CUY-77-13.80
Source: B-144-0-14, ST-21, 71.2' - 71.4'
Description: Very stiff, SILT, some clay, trace sand.

Prepared by: CH
Checked by:
Date: 12/9/2014

Test Specification: ASTM D 2435-04
Initial Void Ratio: 0.585
In-situ Vertical Effective Stress: 5900 psf

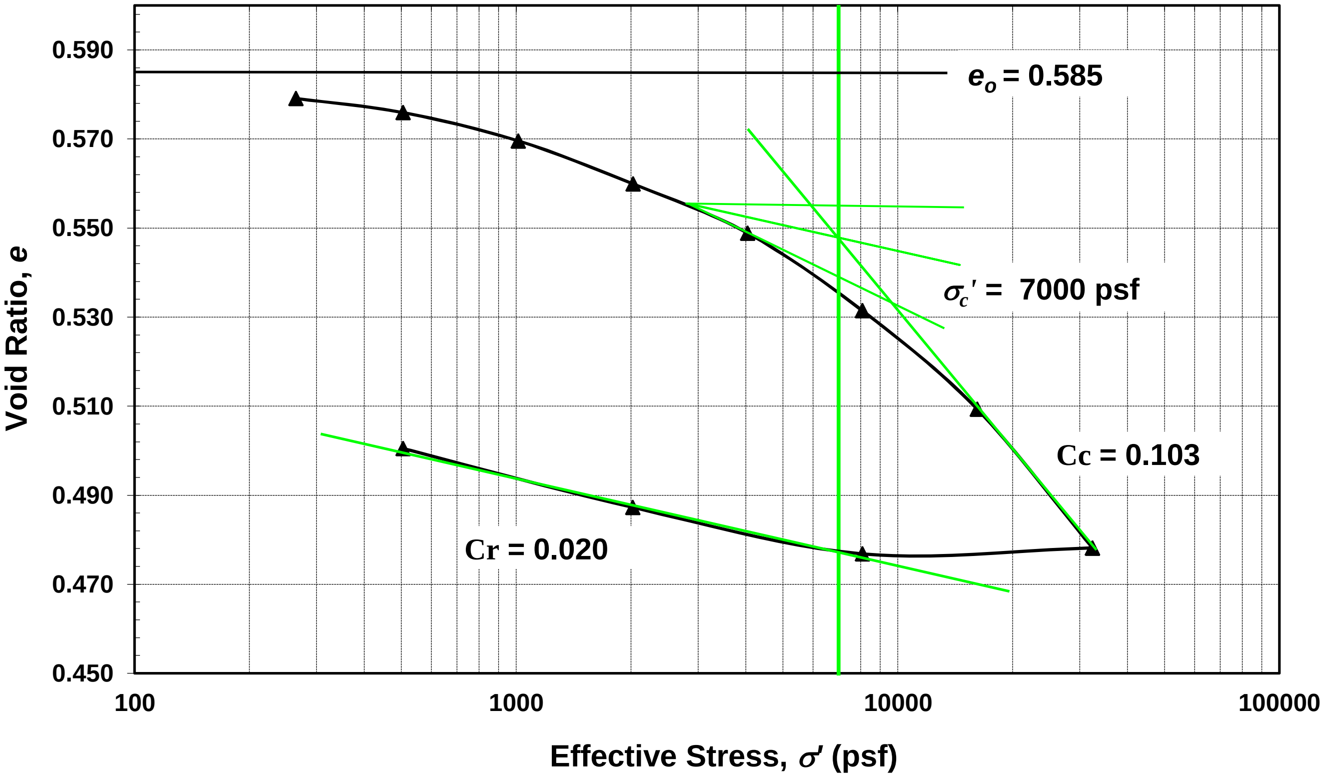
Initial Bulk Unit Weight (lb/ft^3): 128
Dry Unit Weight (lb/ft^3): 106

Compression and Swelling Index

Compression Index (*Cc*): 0.103
Recompression Index (*Cr*): 0.020

Preconsolidation Pressure (σ_c'): **7000 psf**
Over-Consolidation Ratio (*OCR*): **1.2**

Consolidation Curve



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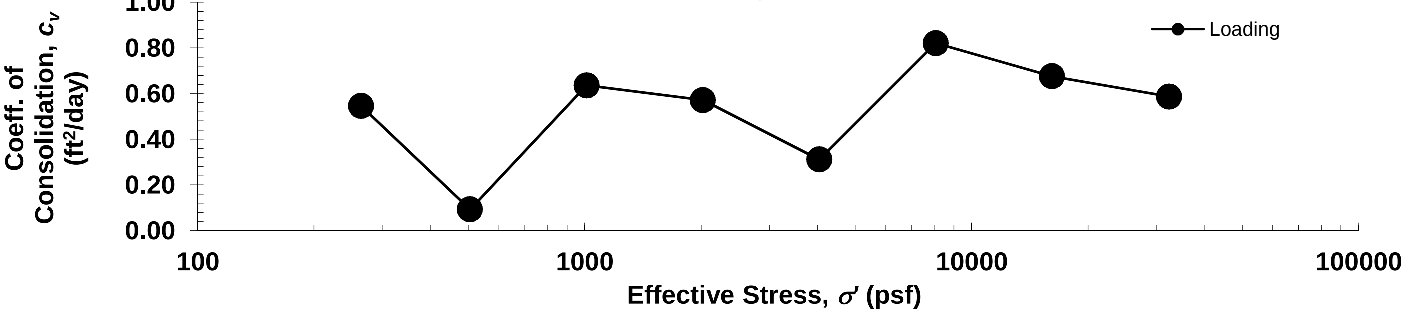


PROJECT: CUY-90-14.90	DRILLING FIRM / OPERATOR: OTB / D. HEPNER	DRILL RIG: SIMCO 2800 HSHT	STATION / OFFSET: 524+47, 115.0 RT	EXPLORATION ID B-069-1-10
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: B&P / WESTERVILLER	HAMMER: SIMCO AUTO	ALIGNMENT: TEMPORARY I-90 WB	
PID: 77332 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 10/22/09	ELEVATION: 662.0 (MSL) EOB: 100.0 ft.	PAGE 1 OF 4
START: 4/23/10 END: 4/27/10	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 83.4	COORD: 667587.535 N, 2193939.024 E	

MATERIAL DESCRIPTION AND NOTES	ELEV. 662.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL, 2.4"	661.8																	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, TRACE FINE GRAVEL, SOME SILT, DRY **(FILL)**	659.0	1 2 3	4 4 4	11	78	SS-1	n/a	-	-	-	-	-	-	-	-	5	A-3a (V)	
VERY LOOSE TO LOOSE, BROWN, **COARSE AND FINE SAND**, TRACE SILT, TRACE GRAVEL, TRACE CLAY, MOIST		4 5	3 3 2	7	100	SS-2	n/a	7	19	58	9	7	NP	NP	NP	11	A-3a (0)	
		6 7 8	1 2 1	4	72	SS-3	n/a	-	-	-	-	-	-	-	-	8	A-3a (V)	
	652.0	9 10	1 2 3	7	72	SS-4	n/a	-	-	-	-	-	-	-	-	11	A-3a (V)	
MEDIUM DENSE TO DENSE, BROWN TO GRAY-BROWN, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE GRAVEL, TRACE CLAY, MOIST TO WET		11 12 W	3 4 6	14	78	SS-5	n/a	9	17	60	9	5	NP	NP	NP	12	A-3a (0)	
13.5' changes to wet		13 14 15	6 8 9	24	100	SS-6	n/a	-	-	-	-	-	-	-	-	24	A-3a (V)	
		16 17 18	5 9 10	26	89	SS-7	n/a	-	-	-	-	-	-	-	-	22	A-3a (V)	
		19 20	2 4 6	14	78	SS-8	n/a	-	-	-	-	-	-	-	-	25	A-3a (V)	
		21 22 23																
		24 25	7 13 15	39	72	SS-9	n/a	0	2	83	12	3	NP	NP	NP	23	A-3a (0)	
		26 27 28																
		29	3 5 9	19	78	SS-10	n/a	-	-	-	-	-	-	-	-	21	A-3a (V)	

PID: 77332	BR ID:	PROJECT: CUY-90-14.90	STATION / OFFSET: 524+47, 115.0 RT	START: 4/23/10	END: 4/27/10	PG 2 OF 4	B-069-1-10

MATERIAL DESCRIPTION AND NOTES	ELEV. 632.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI			
MEDIUM DENSE TO DENSE, BROWN TO GRAY-BROWN, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE GRAVEL, TRACE CLAY, MOIST TO WET *(continued)*	629.0	31 32																
DENSE TO MEDIUM DENSE, GRAY-BROWN, **SILT**, "AND" TO LITTLE SAND, TRACE TO LITTLE CLAY, TRACE GRAVEL, WET TO DAMP		33																
		34 35	8 10 12	31	94	SS-11	n/a	1	0	40	51	8	NP	NP	NP	25	A-4b (5)	
		36 37 38																
		39 40	8 5 8	18	89	SS-12	n/a	0	0	15	72	13	21	20	1	20	A-4b (8)	
	620.0	41																
STIFF TO VERY STIFF, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, MOIST		42 43																
		44 45	2 2 3	7	100	SS-13	1.0 - 1.3	-	-	-	-	-	-	-	-	21	A-4b (V)	
		46 47																
UC = 2044 psf @ 4.4% strain		48 49 50			100	ST-14	1.0 - 1.8	1	1	1	66	31	26	18	8	23	A-4b (8)	
		51 52 53																
		54 55	3 4 6	14	89	SS-15	2.1 - 2.8	0	0	1	72	27	26	20	6	21	A-4b (8)	
		56 57 58																
		59 60	3 5 7	17	94	SS-16	2.2 - 2.5	-	-	-	-	-	-	-	-	20	A-4b (V)	
	600.0	61																

PID: 77332	BR ID:	PROJECT: CUY-90-14.90	STATION / OFFSET: 524+47, 115.0 RT	START: 4/23/10	END: 4/27/10	PG 3 OF 4	B-069-1-10

MATERIAL DESCRIPTION AND NOTES	ELEV. 599.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
MEDIUM STIFF TO HARD, GRAY, **SILT AND CLAY**, MOIST *(continued)*		63																
		64 65	1 3 3	8	100	SS-17	0.8 - 1.0	-	-	-	-	-	-	-	-	24	A-6a (V)	
		66 67 68																
UC = 4258 psf @ 6.0% strain		69 70			75	ST-18	2.25 - 4.5+	0	0	0	52	48	31	20	11	23	A-6a (8)	
	590.0	71 72																
STIFF TO HARD, GRAY, **SILT**, "AND" CLAY, MOIST		73																
		74 75	4 6 8	19	83	SS-19	2.9 - 4.5+	-	-	-	-	-	-	-	-	21	A-4b (V)	
		76 77 78																
		79 80	4 8 11	26	72	SS-20	2.8 - 4.0	0	0	0	64	36	26	19	7	21	A-4b (8)	
		81 82 83																
		84 85	2 4 5	13	100	SS-21	1.8 - 2.5	-	-	-	-	-	-	-	-	25	A-4b (V)	
	576.0																	
MEDIUM STIFF TO VERY STIFF, GRAY, **SANDY SILT**, "AND" CLAY, TRACE GRAVEL, MOIST		86 87 88																
		89 90	1 2 2	6	100	SS-22	0.5 - 0.6	-	-	-	-	-	-	-	-	29	A-4a (V)	
		91 92 93																
UC = 2876 psf @ 15.0% strain		94																

PID: 77332	BR ID:	PROJECT: CUY-90-14.90	STATION / OFFSET: 524+47, 115.0 RT	START: 4/23/10	END: 4/27/10	PG 4 OF 4	B-069-1-10

MATERIAL DESCRIPTION AND NOTES	ELEV. 567.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI			
MEDIUM STIFF TO VERY STIFF, GRAY, **SANDY SILT**, "AND" CLAY, TRACE GRAVEL, MOIST *(continued)*		95			88	ST-23	0.8 - 1.3	1	2	3	45	49	28	18	10	23	A-4a (8)	
		96 97 98																
	562.0	99 EOB 100	5 8 9	24	100	SS-24	1.8 - 3.3	-	-	-	-	-	-	-	-	22	A-4a (V)	

NOTES: GROUNDWATER ENCOUNTERED DURING DRILLING AT 12.5'. WATER USED AS CIRCULATING FLUID FROM 50.0' TP 98.5'. CAVE DEPTH 12.0'.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 1 BAG CEMENT; PLACED SOIL CUTTINGS

PROJECT: CUY-90-14.90
TYPE: STRUCTURE
PID: 77332 BR ID:
START: 4/22/10 END: 4/23/10

DRILLING FIRM / OPERATOR: OTB / D. HEPNER
SAMPLING FIRM / LOGGER: B&P / WESTERVILLER
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: SIMCO 2800 HSHT
HAMMER: SIMCO AUTO
CALIBRATION DATE: 10/22/09
ENERGY RATIO (%): 83.4

STATION / OFFSET: 524+97.48, 128.83 RT
ALIGNMENT: TEMPORARY I-90 WB
ELEVATION: 663.5 (MSL) EOB: 100.0 ft.
COORD: 667604.962 N, 2193988.378 E

EXPLORATION ID
B-069-2-10

PAGE
1 OF 4

MATERIAL DESCRIPTION AND NOTES	ELEV. 663.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI			
TOPSOIL, 2.4"	663.3																	
DENSE, BROWN, **COARSE AND FINE SAND**, DAMP contains brick fragments **(FILL)**	660.5		6 13 14	38	89	SS-1	n/a	-	-	-	-	-	-	-	-	6	A-3a (V)	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, TRACE SILT, TRACE CLAY, MOIST	658.0		4 5 4	13	67	SS-2	n/a	-	-	-	-	-	-	-	-	11	A-3a (V)	
LOOSE TO MEDIUM DENSE, BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND**, TRACE SILT, TRACE CLAY, DAMP TO MOIST			2 2 2	6	78	SS-3	n/a	2	54	36	5	3	NP	NP	NP	7	A-1-b (0)	
			4 5 6	15	67	SS-4	n/a	-	-	-	-	-	-	-	-	6	A-1-b (V)	
		W	3 4 3	10	89	SS-5	n/a	-	-	-	-	-	-	-	-	21	A-1-b (V)	
			5 8 9	24	67	SS-6	n/a	-	-	-	-	-	-	-	-	20	A-1-b (V)	
few silt seams below 15.0'			2 6 10	22	89	SS-7	n/a	-	-	-	-	-	-	-	-	22	A-1-b (V)	
			5 10 10	28	67	SS-8	n/a	-	-	-	-	-	-	-	-	21	A-1-b (V)	
	641.5																	
MEDIUM DENSE TO DENSE, GRAY-BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, WET			3 5 9	19	56	SS-9	n/a	1	2	78	16	3	NP	NP	NP	23	A-3a (0)	
			7 10 12	31	61	SS-10	n/a	-	-	-	-	-	-	-	-	24	A-3a (V)	

PID: 77332	BR ID:	PROJECT: CUY-90-14.90	STATION / OFFSET: 524+97.48, 128.83 RT	START: 4/22/10	END: 4/23/10	PG 2 OF 4	B-069-2-10

MATERIAL DESCRIPTION AND NOTES	ELEV. 633.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
MEDIUM DENSE TO DENSE, GRAY-BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, WET *(continued)*	630.5	31 32 33																
DENSE TO MEDIUM DENSE, GRAY, **SILT**, SOME CLAY, LITTLE FINE SAND, WET TO MOIST		34 35 36 37 38	6 10 15	35	28	SS-11	n/a	0	0	14	68	18	NP	NP	NP	26	A-4b (8)	
	621.5	39 40 41	3 6 14	28	83	SS-12	n/a	-	-	-	-	-	-	-	-	17	A-4b (V)	
VERY DENSE, GRAY-BROWN, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, WET	616.5	42 43 44 45 46	6 17 22	54	100	SS-13	n/a	0	0	68	28	4	NP	NP	NP	23	A-3a (0)	
HARD, GRAY, **SILT**, LITTLE CLAY, TRACE FINE SAND, DAMP	611.5	47 48 49 50 51	6 12 20	44	100	SS-14	n/a	0	0	3	80	17	25	22	3	19	A-4b (8)	
MEDIUM STIFF TO HARD, GRAY, **SILT**, SOME TO "AND" CLAY, TRACE FINE SAND, MOIST		52 53 54 55 56 57 58	3 4 6	14	100	SS-15	1.3 - 1.9	0	0	1	67	32	27	20	7	22	A-4b (8)	
		59 60 61	3 5 8	18	100	SS-16	2.3 - 2.8	-	-	-	-	-	-	-	-	19	A-4b (V)	

PID: 77332	BR ID:	PROJECT: CUY-90-14.90	STATION / OFFSET: 524+97.48, 128.83 RT	START: 4/22/10	END: 4/23/10	PG 3 OF 4	B-069-2-10

MATERIAL DESCRIPTION AND NOTES	ELEV. 601.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI			
MEDIUM STIFF TO HARD, GRAY, **SILT**, SOME TO "AND" CLAY, TRACE FINE SAND, MOIST *(continued)*		63																
		64 65	WOH 2 3	7	100	SS-17	0.9 - 1.2	-	-	-	-	-	-	-	-	24	A-4b (V)	
		66 67 68																
		69 70	2 3 5	11	100	SS-18	1.0 - 1.5	-	-	-	-	-	-	-	-	23	A-4b (V)	
		71 72																
At 73.0' changes to very stiff to hard.		73																
		74 75	5 8 11	26	72	SS-19	4.5+	0	0	0	64	36	28	19	9	20	A-4b (8)	
		76 77 78																
		79 80	6 9 16	35	89	SS-20	4.5+	-	-	-	-	-	-	-	-	19	A-4b (V)	
		81 82 83																
		84 85	5 7 9	22	89	SS-21	3.1 - 4.5+	0	0	0	64	36	27	20	7	21	A-4b (8)	
	577.0	86																
MEDIUM STIFF TO STIFF, GRAY, **SANDY SILT**, "AND" CLAY, TRACE GRAVEL, WET TO MOIST		87 88																
		89 90	1 2 2	6	100	SS-22	0.8 - 0.9	1	0	0	47	52	30	20	10	28	A-4a (8)	
		91 92 93																
		94	3				0.8 -											

PID: 77332	BR ID:	PROJECT: CUY-90-14.90	STATION / OFFSET: 524+97.48, 128.83 RT	START: 4/22/10	END: 4/23/10	PG 4 OF 4	B-069-2-10

MATERIAL DESCRIPTION AND NOTES	ELEV. 569.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI	WC		
MEDIUM STIFF TO STIFF, GRAY, **SANDY SILT**, "AND" CLAY, TRACE GRAVEL, WET TO MOIST *(continued)*	567.5	95	5 5	14	94	SS-23	1.3	-	-	-	-	-	-	-	-	21	A-4a (V)	
SOFT, GRAY, **SILT AND CLAY**, TRACE SAND, MOIST	563.5	96 97 98 99 EOB 100	WOH WOH 2	3	100	SS-24	0.3 - 0.5	0	1	2	24	73	39	22	17	33	A-6b (11)	

NOTES: GROUNDWATER ENCOUNTERED DURING DRILLING AT 12.5'. WATER USED AS CIRCULATING FLUID FROM 40.0' TO 100.0'. CAVE DEPTH 6.6'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 1 BAG CEMENT; PLACED SOIL CUTTINGS

SHEET 14

STATE OF OHIO
DEPARTMENT OF HIGHWAYS
TESTING LABORATORY

LOG OF BORING

CO., RT. NO., SEC. CUYAHOGA-CLEVELAND BRIDGE NO. ____________
WILLOW INNERBELT INTERCHANGE

LOCATION: T.H.B-111 STA. ________ OFFSET ________ FED. NO. ________

ELEV.	DEPTH	NO. BLOWS	SAMPLE NO.	DESCRIPTION
673.0	0			Brick & Cinders
	2			
	4			
688.0	6	9/10	84989	Brown Silty Sand
	8			
663.0	10	7/17	84990	Brown Silty Gravelly Sand
	12			
	14			
658.0	16	8/33	84991	Brown Silty Sand
	18			
653.0	20	6/12	84992	Brown Silty Sand
	22			
	24			
648.0	26	9/17	84993	Brown Silty Sand
	28			
643.0	30	15/25	84994	Brown Silty Sand
	32			
	34			
638.0	36	38/55	84995	Brown Silty Sand

4-17-58

RC

SHEET 15

LOG OF BORING (CONTINUED)

BRIDGE NO. ____________ T.H. B-111

ELEV.	DEPTH	NO. BLOWS	SAMPLE NO.	DESCRIPTION
	38			
633.0	40	10/26	84996	Gray Sandy Silt
	42			
	44			
628.0	46	17/17	84997	Gray Silt
	48			
623.0	50	9/12	84998	Gray Silt
	52			
	54			
618.0	56	12/27	84999	Gray Silt
	58			
613.0	60	7/13	85000	Gray Silt
	62			
	64			
608.0	66	9/17	85001	Gray Silt
	68			
603.0	70	15/19	85002	Gray Silt
	72			
	74			
598.0	76	12/15	85003	Gray Silt
	78			
593.0	80			
592.0		15/30	85004	Gray Silt
	82			BOTTOM OF BORING

4-17-58
RC

APPENDIX C

GENERALIZED SUBSURFACE PROFILE - RETAINING WALLS Y AND Z

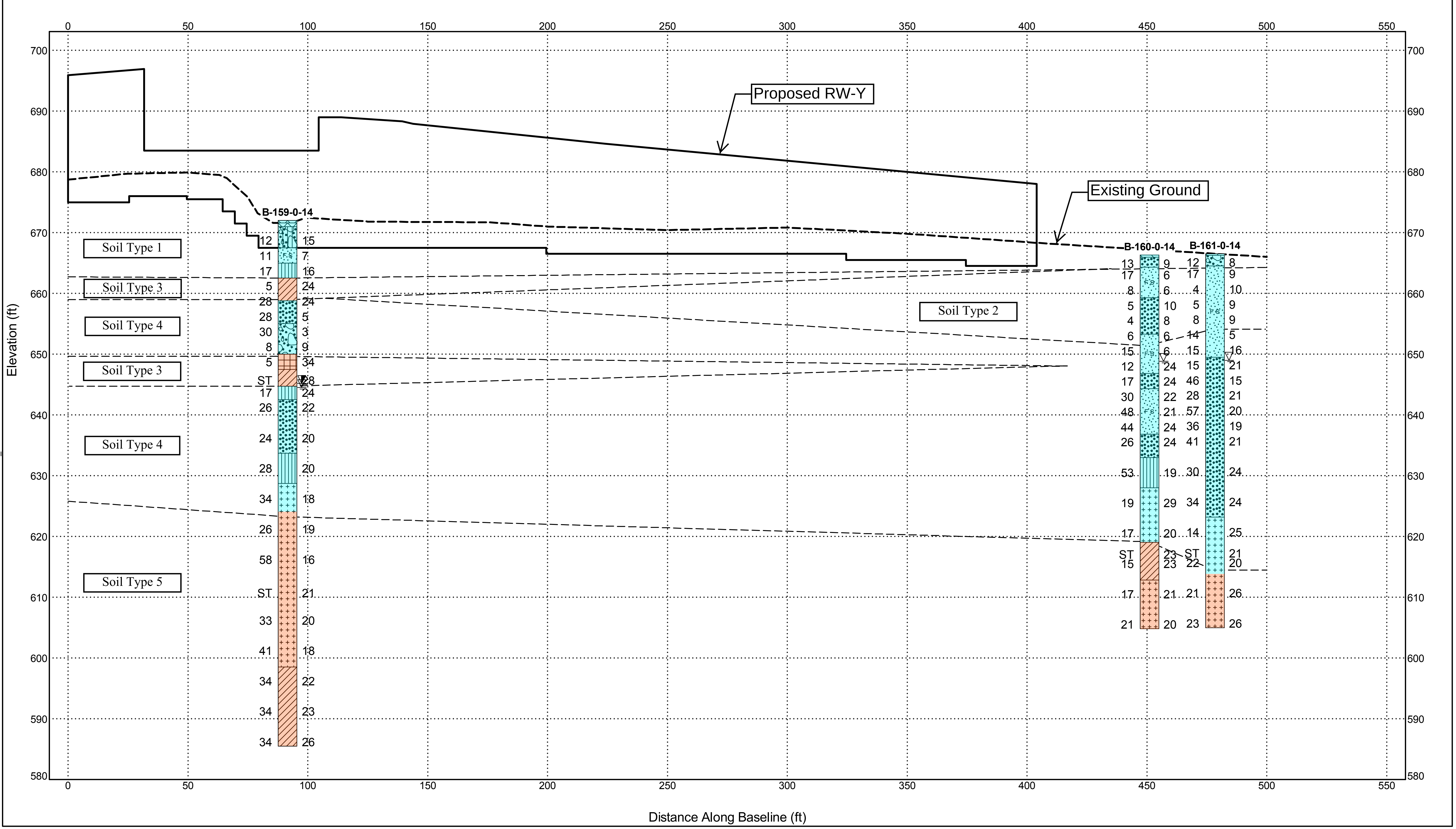
OHIO DEPARTMENT OF TRANSPORTATION
OFFICE OF GEOTECHNICAL ENGINEERING

🟦 Non-cohesive
🟧 Cohesive

SUBSURFACE DIAGRAM
RETAINING WALL Y

⊠	Ohio DOT: Pavement or Aggregate base
▥	Ohio DOT: A-4a, sandy silt
⁘	Ohio DOT: A-1-b, gravel and/or stone fragments with sand
▧	Ohio DOT: Sod and Topsoil
⁘	Ohio DOT: A-2-4, gravel and/or stone fragments with sand and silt
▨	Ohio DOT: A-6a, silt and clay
▦	Ohio DOT: A-7-6, clay
F.S.	Ohio DOT: A-3, fine sand
⁙	Ohio DOT: A-3a, coarse and fine sand
+	Ohio DOT: A-4b, silt

CLIENT Michael Baker International
PROJECT NUMBER 82382
PROJECT NAME CCG3A
PROJECT LOCATION Cuyahoga County, Ohio



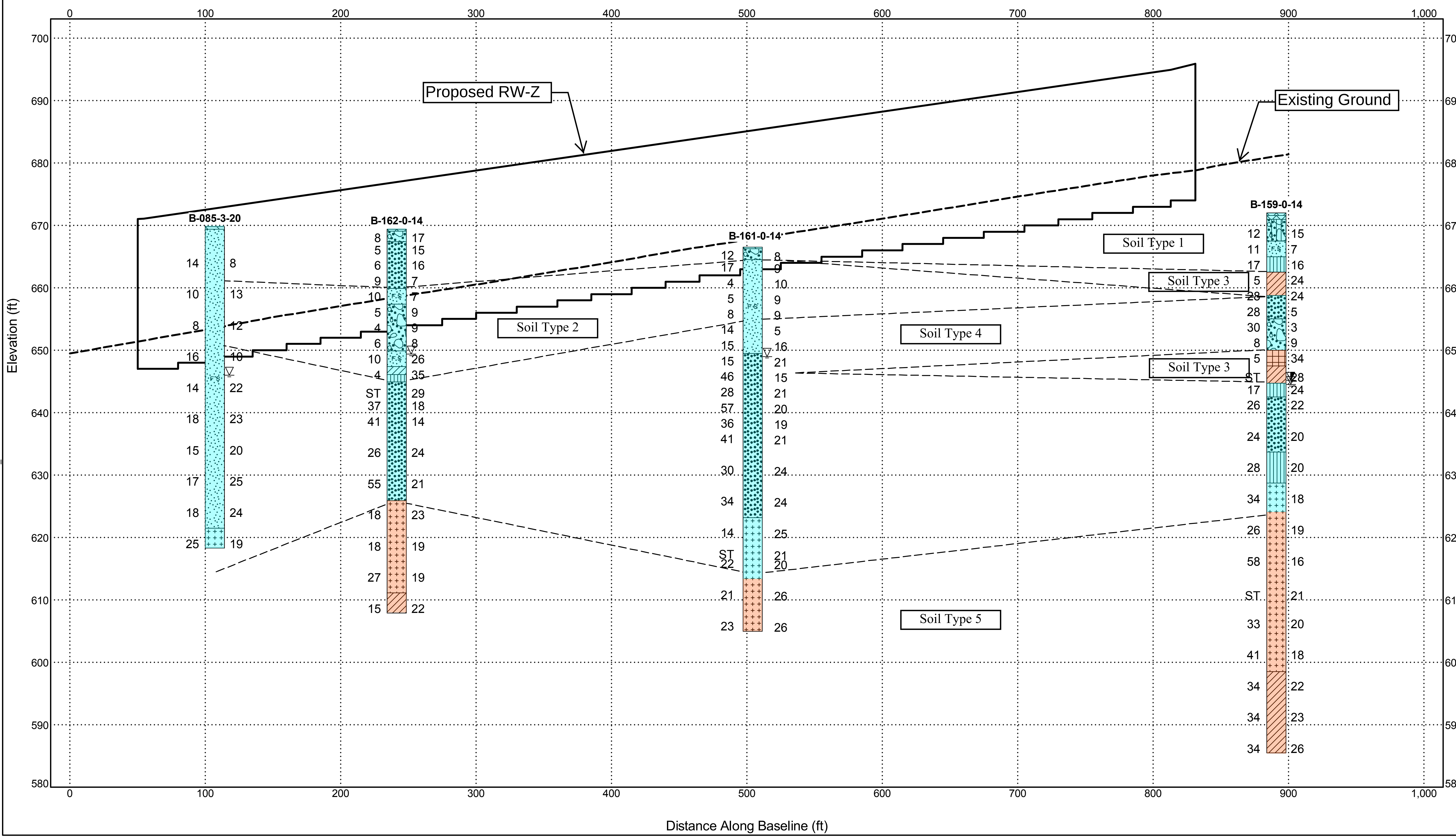
OHIO DEPARTMENT OF TRANSPORTATION
OFFICE OF GEOTECHNICAL ENGINEERING

🟦 Non-cohesive
🟧 Cohesive

SUBSURFACE DIAGRAM
RETAINING WALL Z

CLIENT Michael Baker International
PROJECT NUMBER 82382
PROJECT NAME CCG3A
PROJECT LOCATION Cuyahoga County, Ohio

- Ohio DOT: Pavement or Aggregate base
- Concrete
- Ohio DOT: A-3, fine sand
- Ohio DOT: A-4a, sandy silt
- Ohio DOT: A-1-a, gravel and/or stone fragments
- Ohio DOT: A-1-b, gravel and/or stone fragments with sand
- Ohio DOT: A-4b, silt
- Ohio DOT: A-6a, silt and clay
- Ohio DOT: A-3a, coarse and fine sand
- Ohio DOT: Sod and Topsoil
- Ohio DOT: A-2-4, gravel and/or stone fragments with sand and silt
- Ohio DOT: A-7-6, clay



STRATIGRAPHY & GW - B SIZE - OH DOT.GDT - 7/7/21 07:09 - C:\USERS\KARENS\DESKTOP\RWZ_GINT-PROFILE070621.GPJ

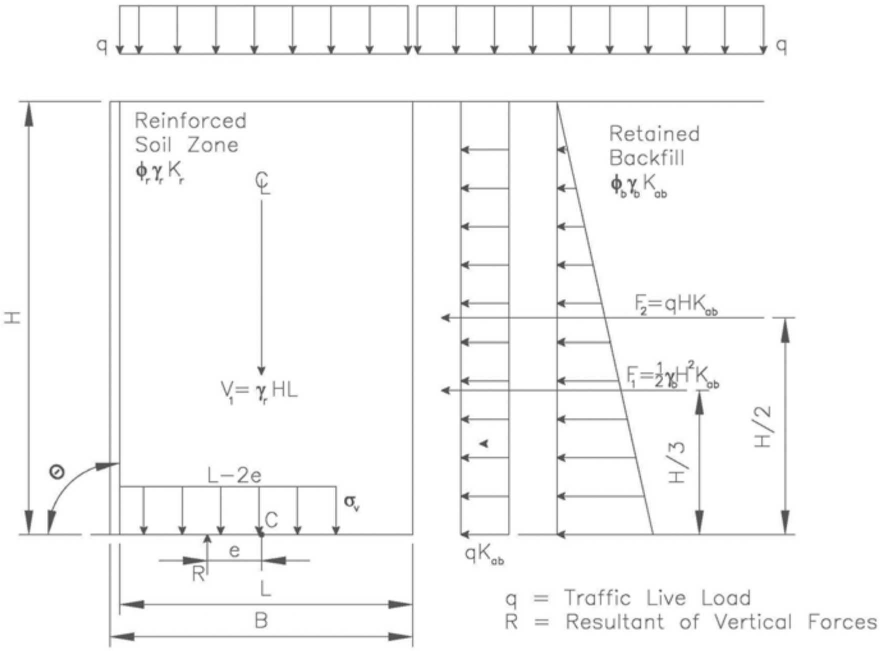
APPENDIX D

EXTERNAL STABILITY ANALYSIS - RETAINING WALLS Y AND Z

RETAINING WALL Y – STA. 1300+00

Objective: To evaluate the external stability of MSE wall design with vertical wall face and horizontal backfill.
Method: In accordance with ODOT Bridge Design Manual, 2013 [Sect. 307] LRFD Bridge Design Specifications, 8th Ed., 2018, [Sect. 11.10.5].
Assumptions:

- **Horizontal backfill behind MSE wall on granular (drained) soils.**
- **For battered or vertical walls with a back face of wall angle of θ to horizontal.**
- **Not for sheet type reinforcement. If so, use different assessment for Sliding parameter ϕ_{μ}.**
- **MSE wall not acting as abutment, if so must meet minimum embedment depth of H/10 if no slope in front of wall**
- **Load combinations and wall configuration are as shown below:**



Givens:

Wall Geometry:

$H_e := 25.5 \cdot ft$ Exposed wall height

$\theta := 90 \cdot deg$ Angle of back face of wall to horizontal: 90 deg for vertical or near vertical walls (per Berg et al., 2009; near vertical = 80 deg < θ < 100 deg)

Reinforced Backfill Soil Design Parameters:

$\phi'_r := 34 \cdot deg$ Effective angle of internal friction (Per BDM [Table 307-1])

$\gamma_r := 120 \cdot \frac{lbf}{ft^3}$ Unit weight (Per BDM [Table 307-1])

$c'_r := 0 \cdot \frac{lbf}{ft^2}$ Effective Cohesion

Retained Backfill Soil Design Parameters:

$\phi'_b := 30 \cdot deg$ Effective angle of internal friction (Per BDM [Table 307-1])

$\gamma_b := 120 \cdot \frac{lbf}{ft^3}$ Unit weight (Per BDM [Table 307-1])

$c'_b := 0 \cdot \frac{lbf}{ft^2}$ Effective Cohesion

Foundation Soil Design Parameters:

Drained Conditions (Effective Stress):

$\phi'_f := 33 \cdot deg$	Effective angle of internal friction
$\gamma_f := 122 \cdot \frac{lbf}{ft^3}$	Unit weight
$c'_f := 0 \cdot \frac{lbf}{ft^2}$	Cohesion

Undrained Conditions (Total Stress):

$\phi_f := 33 \cdot deg$	Angle of internal friction (Same as Drained Conditions if Sand)
$\gamma_f = 122 \ \frac{lbf}{ft^3}$	Unit weight
$c_f := 0 \cdot \frac{lbf}{ft^2}$	Cohesion (Use Su if Angle of internal friction = 0 deg)

Foundation Surcharge Soil Parameters:

$\gamma_q := 120 \cdot \frac{lbf}{ft^3}$	Unit weight of Soil above bearing depth (Used in Bearing Resistance of Soil Calculation LRFD 10.6.3.1.2a-1)

Depth of Embedment Check:

$d_{frost} := 3\ ft$ $\quad d_{user} := 0\ ft$ Local Frost Depth

$Slope_{fw} := 0\ deg$

Inclination of ground slope in front of wall :

- Horizontal: **0**
- 3H:1V: **18.435**
- 2H:1V: **26.565**
- 1.5H:1V: **33.690**

$d_{est} := \max\left(d_{frost}, 3\ ft, d_{user}\right)$ $\quad d_{est} = 3\ ft$

$H_{est} := d_{est} + \left(4\ ft \cdot \tan\left(Slope_{fw}\right)\right) + H_e$ $\quad H_{est} = 28.5\ ft$

$$d_{eSlope} := \text{if}\left(Slope_{fw} < 1\ deg, \frac{H_{est}}{20}, \text{if}\left(Slope_{fw} < 26.565\ deg, \frac{H_{est}}{10}, \text{if}\left(Slope_{fw} < 33.69\ deg, \frac{H_{est}}{7}, \frac{H_{est}}{5}\right)\right)\right)$$

$d_{eSlope} = 1.4\ ft$ Minimum Embedment Depth per Table C11.10.2.2-1 of LRFD BDS

$d_e := \max\left(d_{est}, d_{eSlope}\right)$ $\quad d_e = 3\ ft$ Minimum Required Embedment Depth used in analysis.

$H := d_e + \left(4\ ft \cdot \tan\left(Slope_{fw}\right)\right) + H_e$ $\quad H = 28.5\ ft$ Design Wall Height

Estimate Length of Reinforcement:

$L_{user} := 0 \cdot ft$ User inputted value (if changes need to be made to satisfy other requirements)

$L := \max\left(8 \cdot ft, 0.7 \cdot H, L_{user}\right)$ $\quad L = 20\ ft$ Length of Reinforcement

Live Load Surcharge Parameters:

$SUR := 250 \cdot \frac{lbf}{ft^2}$

Live load surcharge (per **LRFD BDS [3.11.6.4]** & **BDM [307.1.1]**)
Note: If vehicular loading is within 1 ft of the backface of the wall and with a design height, H, less than 20 ft, see **LRFD BDS Section 3.11.6.4 and Table 3.11.6.4-2** for adjusted surcharge load calculation.
Note: When traffic vehicular live loads are not present within 0.5*H from the back of the reinforced zone let SUR equal 100 psf to account for construction loads.

Calculations:

Active Earth Pressure:

$\beta := 0 \qquad \delta := \beta$

Inclination of ground slope behind face of wall and angle of friction between retained backfill and reinforced soil

$$\Gamma := \left(1 + \sqrt{\frac{\left(\sin\left(\phi'_b + \delta\right) \cdot \sin\left(\phi'_b - \beta\right)\right)}{\left(\sin\left(\theta - \delta\right) \cdot \sin\left(\theta + \beta\right)\right)}}\right)^2$$

$$k_{af} := \left(\frac{\left(\sin\left(\theta + \phi'_b\right)\right)^2}{\left(\Gamma \cdot \left(\sin\left(\theta\right)\right)^2 \cdot \sin\left(\theta - \delta\right)\right)}\right) \qquad k_{af} = 0.3333$$

Active Earth Pressure Coefficient

$F_T := \frac{1}{2} \cdot \gamma_b \cdot H^2 \cdot k_{af} \qquad F_T = 16245 \ \frac{lbf}{ft}$ Active Earth Force Resultant (EH)

$F_{SUR} := SUR \cdot H \cdot k_{af} \qquad F_{SUR} = 2375 \ \frac{lbf}{ft}$ Live Load Surcharge (LS)

Vertical Loads:

$V_1 := \gamma_r \cdot H \cdot L \qquad V_1 = 68229 \ \frac{lbf}{ft}$ Soil backfill - reinforced soil (EV)

$V_2 := SUR \cdot L \qquad V_2 = 4987.5 \ \frac{lbf}{ft}$ Live Load Surcharge - (LS)

Moment Arm: Moment:

$d_{v1} := 0 \cdot ft \qquad d_{v1} = 0 \ ft \qquad MV_1 := V_1 \cdot d_{v1} \qquad MV_1 = 0 \ \frac{lbf \cdot ft}{ft}$

$d_{v2} := 0 \ ft \qquad d_{v2} = 0 \ ft \qquad MV_2 := V_2 \cdot d_{v2} \qquad MV_2 = 0 \ \frac{lbf \cdot ft}{ft}$

Horizontal Loads:

$H_1 := F_T = 16245 \ \frac{lbf}{ft}$ Active Earth Force Resultant (horizontal comp. - EH)

$H_2 := F_{SUR} = 2375 \ \frac{lbf}{ft}$ Live Load Surcharge Resultant (horizontal comp. - LS)

Moment Arm: Moment:

$d_{h1} := \frac{H}{3} \qquad d_{h1} = 9.5 \ ft \qquad MH_1 := H_1 \cdot d_{h1} \qquad MH_1 = 154327.5 \ \frac{lbf \cdot ft}{ft}$

$d_{h2} := \frac{H}{2} \qquad d_{h2} = 14.3 \ ft \qquad MH_2 := H_2 \cdot d_{h2} \qquad MH_2 = 33843.8 \ \frac{lbf \cdot ft}{ft}$

Unfactored Loads by Load Type

$V_{EV} := V_1$ $\quad V_{EV} = 68229 \, \frac{lbf}{ft}$

$V_{LS} := V_2$ $\quad V_{LS} = 4987.5 \, \frac{lbf}{ft}$

$H_{EH} := H_1$ $\quad H_{EH} = 16245 \, \frac{lbf}{ft}$

$H_{LS} := H_2$ $\quad H_{LS} = 2375 \, \frac{lbf}{ft}$

Unfactored Moments by Load Type

$M_{EV} := MV_1$ $\quad M_{EV} = 0 \, \frac{lbf \cdot ft}{ft}$

$M_{LS} := MV_2$ $\quad M_{LS} = 0 \, \frac{lbf \cdot ft}{ft}$

$M_{EH2} := MH_1$ $\quad M_{EH2} = 154327.5 \, \frac{lbf \cdot ft}{ft}$

$M_{LS2} := MH_2$ $\quad M_{LS2} = 33843.8 \, \frac{lbf \cdot ft}{ft}$

Load Combination Limit States:

$\eta := 1$ LRFD Load Modifier

Strength Limit State I: EV(min) = 1.00 EV(max) = 1.35
EH(min) = 0.90 EH(max) = 1.50
LS = 1.75

Strength Limit State Ia: (Sliding and Eccentricity)	$Ia_{EV} := 1$	$Ia_{EH} := 1.5$	$Ia_{LS} := 1.75$
Strength Limit State Ib: (Bearing Capacity)	$Ib_{EV} := 1.35$	$Ib_{EH} := 1.5$	$Ib_{LS} := 1.75$

Factored Vertical Loads by Limit State:

$V_{Ia} := \eta \cdot \left(Ia_{EV} \cdot V_{EV}\right)$ $\quad V_{Ia} = 68229 \, \frac{lbf}{ft}$

$V_{Ib} := \eta \cdot \left(\left(Ib_{EV} \cdot V_{EV}\right) + \left(Ib_{LS} \cdot V_{LS}\right)\right)$ $\quad V_{Ib} = 100837.3 \, \frac{lbf}{ft}$

Factored Horizontal Loads by Limit State:

$H_{Ia} := \eta \cdot \left(\left(Ia_{LS} \cdot H_{LS}\right) + \left(Ia_{EH} \cdot H_{EH}\right)\right)$ $\quad H_{Ia} = 28523.8 \, \frac{lbf}{ft}$

$H_{Ib} := \eta \cdot \left(\left(Ib_{LS} \cdot H_{LS}\right) + \left(Ib_{EH} \cdot H_{EH}\right)\right)$ $\quad H_{Ib} = 28523.8 \, \frac{lbf}{ft}$

Factored Moments Produced by Vertical Loads by Limit State:

$MV_{Ia} := \eta \cdot \left(Ia_{EV} \cdot M_{EV}\right)$ $\quad MV_{Ia} = 0 \, \frac{lbf \cdot ft}{ft}$

$MV_{Ib} := \eta \cdot \left(\left(Ib_{EV} \cdot M_{EV}\right) + \left(Ib_{LS} \cdot M_{LS}\right)\right)$ $\quad MV_{Ib} = 0 \, \frac{lbf \cdot ft}{ft}$

Factored Moments Produced by Horizontal Loads by Limit State:

$MH_{Ia} := \eta \cdot \left(\left(Ia_{LS} \cdot M_{LS2}\right) + \left(Ia_{EH} \cdot M_{EH2}\right)\right)$ $\quad MH_{Ia} = 290717.8 \, \frac{lbf \cdot ft}{ft}$

$MH_{Ib} := \eta \cdot \left(\left(Ib_{LS} \cdot M_{LS2}\right) + \left(Ib_{EH} \cdot M_{EH2}\right)\right)$ $\quad MH_{Ib} = 290717.8 \, \frac{lbf \cdot ft}{ft}$

Compute Bearing Resistance:

Compute the Effective Bearing Length (Strength Ib):

$\Sigma M_R := MV_{Ib}$ $\quad \Sigma M_R = 0\ \frac{lbf \cdot ft}{ft}$ Sum of Resisting Moments (Strength Ib)

$\Sigma M_O := MH_{Ib}$ $\quad \Sigma M_O = 290717.8\ \frac{lbf \cdot ft}{ft}$ Sum of Overturning Moments (Strength Ib)

$\Sigma V := V_{Ib}$ $\quad \Sigma V = 100837.3\ \frac{lbf}{ft}$ Sum of Vertical Loads (Strength Ib)

$e_{wall} := \frac{(\Sigma M_O - \Sigma M_R)}{\Sigma V}$ $\quad e_{wall} = 2.9\ ft$ Wall Eccentricity

$B' := \text{if}\left(e_{wall} > 0, L - 2 \cdot e_{wall}, L\right)$ $\quad B' = 14.2\ ft$ Effective Bearing Width

Foundation Layout:

$L_{Wall} := 40 \cdot ft$ Assumed Footing Length (Wall Section Length)

$H' := H_{Ib}$ $\quad H' = 28523.8\ \frac{lbf}{ft}$ Summation of Horizontal Loads (Strength Ib)

$V' := V_{Ib}$ $\quad V' = 100837.3\ \frac{lbf}{ft}$ Summation of Vertical Loads (Strength Ib)

$D_f := d_e$ $\quad D_f = 3\ ft$ Footing embedment

$d_w := 0 \cdot ft$ Depth of Groundwater below Bearing Grade

$\theta' := 90 \cdot deg$ Direction of H' and V' resultant measured from wall back face **LRFD [Figure C10.6.3.1.2a-1]**

Drained Conditions (Effective Stress):

$N_q := \text{if}\left(\phi'_f > 0, e^{\pi \cdot \tan(\phi'_f)} \cdot \tan\left(45\ deg + \frac{\phi'_f}{2}\right)^2, 1.0\right)$ $\quad N_q = 26.09$

$N_c := \text{if}\left(\phi'_f > 0, \frac{N_q - 1}{\tan(\phi'_f)}, 5.14\right)$ $\quad N_c = 38.64$

$N_\gamma := 2 \cdot (N_q + 1) \cdot \tan(\phi'_f)$ $\quad N_\gamma = 35.2$

Compute shape correction factors per **LRFD [Table 10.6.3.1.2a-3]**:

$s_c := \text{if}\left(\phi'_f > 0, 1 + \left(\frac{B'}{L_{Wall}}\right) \cdot \left(\frac{N_q}{N_c}\right), 1 + \left(\frac{B'}{5 \cdot L_{Wall}}\right)\right)$ $\quad s_c = 1.239$

$s_q := \text{if}\left(\phi'_f > 0, 1 + \left(\frac{B'}{L_{Wall}} \cdot \tan(\phi'_f)\right), 1\right)$ $\quad s_q = 1.23$

$s_\gamma := \text{if}\left(\phi'_f > 0, 1 - 0.4 \cdot \left(\frac{B'}{L_{Wall}}\right), 1\right)$ $\quad s_\gamma = 0.858$

Load inclination factors using **LRFD [10.6.3.1.2a-5] thru [10.6.3.1.2a-9]:**

$i_q := 1$ $\qquad i_q = 1$

$i_\gamma := 1$ $\qquad i_\gamma = 1$

$i_c := 1$ $\qquad i_c = 1$

Compute groundwater depth correction factors per **LRFD [Table 10.6.3.1.2a-2]**:

$C_{wq} := \text{if}\left(d_w \ge 0, 1, 0.5\right)$ $\qquad C_{wq} = 1$

$C_{w\gamma} := \text{if}\left(d_w > 1.5 \cdot B', 1, 0.5\right)$ $\qquad C_{w\gamma} = 0.5$

Depth Correction Factor per **Hanson (1970):**

$$d_q := \text{if}\left(\frac{D_f}{B'} \le 1, 1 + 2 \cdot \tan\left(\phi'_f\right) \cdot \left(1 - \sin\left(\phi'_f\right)\right)^2 \cdot \frac{D_f}{B'}, 1 + 2 \cdot \tan\left(\phi'_f\right) \cdot \left(1 - \sin\left(\phi'_f\right)\right)^2 \cdot \text{atan}\left(\frac{D_f}{B'}\right)\right)$$

$d_q = 1.1$

Compute modified bearing capacity factors **LRFD [Equation 10.6.3.1.2a-2 to 10.6.3.1.2a-4]:**

$N_{cm} := N_c \cdot s_c \cdot i_c$ $\qquad N_{cm} = 47.89$

$N_{qm} := N_q \cdot s_q \cdot i_q$ $\qquad N_{qm} = 32.1$

$N_{\gamma m} := N_\gamma \cdot s_\gamma \cdot i_\gamma$ $\qquad N_{\gamma m} = 30.197$

Compute nominal bearing resistance, **LRFD [Eq 10.6.3.1.2a-1]:**

$q_{nd} := c'_f \cdot N_{cm} + \gamma_q \cdot D_f \cdot N_{qm} \cdot d_q \cdot C_{wq} + 0.5 \cdot \gamma_f \cdot B' \cdot N_{\gamma m} \cdot C_{w\gamma}$ $\qquad q_{nd} = 25277.7\ \frac{lbf}{ft^2}$

Compute factored bearing resistance, **LRFD [Eq 10.6.3.1.1]:**

$\phi_b := 0.65$ $\qquad$ Bearing resistance factor **LRFD Table 11.5.7-1.**

$q_{Rd} := \phi_b \cdot q_{nd}$ $\qquad q_{Rd} = 16.4\ ksf$ $\qquad$ Factored bearing resistance Drained Conditions

Undrained Conditions (Effective Stress):

$N_q := \text{if}\left(\phi_f > 0, e^{\pi \cdot \tan\left(\phi_f\right)} \cdot \tan\left(45\ deg + \frac{\phi_f}{2}\right)^2, 1.0\right)$ $\qquad N_q = 26.09$

$N_c := \text{if}\left(\phi_f > 0, \frac{N_q - 1}{\tan\left(\phi_f\right)}, 5.14\right)$ $\qquad N_c = 38.64$

$N_\gamma := 2 \cdot \left(N_q + 1\right) \cdot \tan\left(\phi_f\right)$ $\qquad N_\gamma = 35.2$

Compute shape correction factors per **LRFD [Table 10.6.3.1.2a-3]**:

$s_c := \text{if}\left(\phi_f > 0, 1 + \left(\frac{B'}{L_{Wall}}\right) \cdot \left(\frac{N_q}{N_c}\right), 1 + \left(\frac{B'}{5 \cdot L_{Wall}}\right)\right)$ $s_c = 1.239$

$s_q := \text{if}\left(\phi_f > 0, 1 + \left(\frac{B'}{L_{Wall}} \cdot \tan\left(\phi_f\right)\right), 1\right)$ $s_q = 1.23$

$s_\gamma := \text{if}\left(\phi_f > 0, 1 - 0.4 \cdot \left(\frac{B'}{L_{Wall}}\right), 1\right)$ $s_\gamma = 0.858$

Load inclination factors using **LRFD [10.6.3.1.2a-5] thru [10.6.3.1.2a-9]:**

$i_q := 1$ $i_q = 1$

$i_\gamma := 1$ $i_\gamma = 1$

$i_c := 1$ $i_c = 1$

Compute modified bearing capacity factors **LRFD [Equation 10.6.3.1.2a-2 to 10.6.3.1.2a-4]:**

$N_{cm} := N_c \cdot s_c \cdot i_c$ $N_{cm} = 47.89$

$N_{qm} := N_q \cdot s_q \cdot i_q$ $N_{qm} = 32.1$

$N_{\gamma m} := N_\gamma \cdot s_\gamma \cdot i_\gamma$ $N_{\gamma m} = 30.197$

Compute nominal bearing resistance, **LRFD [Eq 10.6.3.1.2a-1:**

$q_{nu} := c_f \cdot N_{cm} + \gamma_q \cdot D_f \cdot N_{qm} \cdot d_q \cdot C_{wq} + 0.5 \cdot \gamma_f \cdot B' \cdot N_{\gamma m} \cdot C_{w\gamma}$ $q_{nu} = 25277.7 \, \frac{lbf}{ft^2}$

Compute factored bearing resistance, **LRFD [Eq 10.6.3.1.1]:**

$\phi_b := 0.65$ Bearing resistance factor **LRFD Table 11.5.7-1.**

$q_{Ru} := \phi_b \cdot q_{nu}$ $q_{Ru} = 16.4 \, ksf$ Factored bearing resistance Undrained Conditions

Factored Bearing Resistance Drained vs. Undrained Conditions:

Drained Conditions: $q_{Rd} = 16.4 \, ksf$

Undrained Conditions: $q_{Ru} = 16.4 \, ksf$

Factored Bearing Resistance to be used in CDR Calculations:

$q_R := q_{Rd}$

$q_R = 16.4 \, ksf$

Evaluate External Stability of Wall:

Bearing Resistance at Base of the Wall:

Compute the resultant location (distance from Point 'O'):

$\Sigma M_R := MV_{Ib}$ $\Sigma M_R = 0 \ \frac{lbf \cdot ft}{ft}$ Sum of Resisting Moments (Strength Ib)

$\Sigma M_O := MH_{Ib}$ $\Sigma M_O = 290717.8 \ \frac{lbf \cdot ft}{ft}$ Sum of Overturning Moments (Strength Ib)

$\Sigma V := V_{Ib}$ $\Sigma V = 100837.3 \ \frac{lbf}{ft}$ Sum of Vertical Loads (Strength Ib)

$e_{wall} := \frac{\left(\Sigma M_O - \Sigma M_R\right)}{\Sigma V}$ $e_{wall} = 2.9 \ ft$ Wall Eccentricity

$B' := \text{if}\left(e_{wall} > 0, L - 2 \cdot e_{wall}, L\right)$ $B' = 14.2 \ ft$ Effective Bearing Width

Compute the ultimate bearing stress:

$\sigma_v := \frac{\Sigma V}{B'}$ $\sigma_v = 7109.3 \ \frac{lbf}{ft^2}$ Ultimate Bearing Stress

Bearing Capacity:Demand Ratio (CDR)

$CDR_{Bearing} := \frac{q_R}{\sigma_v}$ Is the CDR > or = to 1.0? $CDR_{Bearing} = 2.31$

Limiting Eccentricity at Base of MSE Wall (Strength Ia):

$e_{max} := \frac{L}{3}$ $e_{max} = 6.7 \ ft$ Maximum Eccentricity **LRFD [C11.6.3.3.]**

$\Sigma M_R := MV_{Ia}$ $\Sigma M_R = 0 \ \frac{lbf \cdot ft}{ft}$ Sum of Resisting Moments (Strength Ia)

$\Sigma M_O := MH_{Ia}$ $\Sigma M_O = 290717.8 \ \frac{lbf \cdot ft}{ft}$ Sum of Overturning Moments (Strength Ia)

$\Sigma V := V_{Ia}$ $\Sigma V = 68229 \ \frac{lbf}{ft}$ Sum of Vertical Loads (Strength Ia)

$e_{wall} := \frac{\left(\Sigma M_O - \Sigma M_R\right)}{\Sigma V}$ $e_{wall} = 4.3 \ ft$

Eccentricity Capacity:Demand Ratio (CDR)

$CDR_{Eccentricity} := \frac{e_{max}}{e_{wall}}$ Is the CDR > or = to 1.0? $CDR_{Eccentricity} = 1.56$

Sliding Resistance at Base of Wall LRFD [10.6.3.4]:

Factored Sliding Force (Strength Ia):

$F_\tau := H_{Ia}$ $F_\tau = 28523.8 \ \frac{lbf}{ft}$

Compute sliding resistance between soil and foundation:

Drained Conditions:

$\Sigma V := V_{Ia}$ $\Sigma V = 68229 \ \frac{lbf}{ft}$ Sum of Vertical Loads (Strength Ia)

$R_{\tau d} := \Sigma V \cdot \tan\left(\phi'_f\right)$ $R_{\tau d} = 44308.4 \ \frac{lbf}{ft}$ Nominal sliding resistance Drained Conditions

Nominal Sliding Resistance Drained Conditions:

Drained Conditions: $R_{\tau d} = 44.308 \ \frac{kip}{ft}$

Nominal Sliding Resistance to be used in CDR Calculations: $R_\tau := R_{\tau d}$

Compute factored resistance against failure by sliding **LRFD [10.6.3.4]**:

$\phi_\tau := 1.0$ Resistance factor for sliding resistance specified in **LRFD Table 11.5.7-1.**

$\phi R_n := \phi_\tau \cdot R_\tau$ $R_R := \phi R_n$

$R_R = 44.3 \ \frac{kip}{ft}$

Sliding Capacity:Demand Ratio (CDR)

$CDR_{Sliding} := \frac{R_R}{F_\tau}$ Is the CDR > or = to 1.0? $CDR_{Sliding} = 1.55$

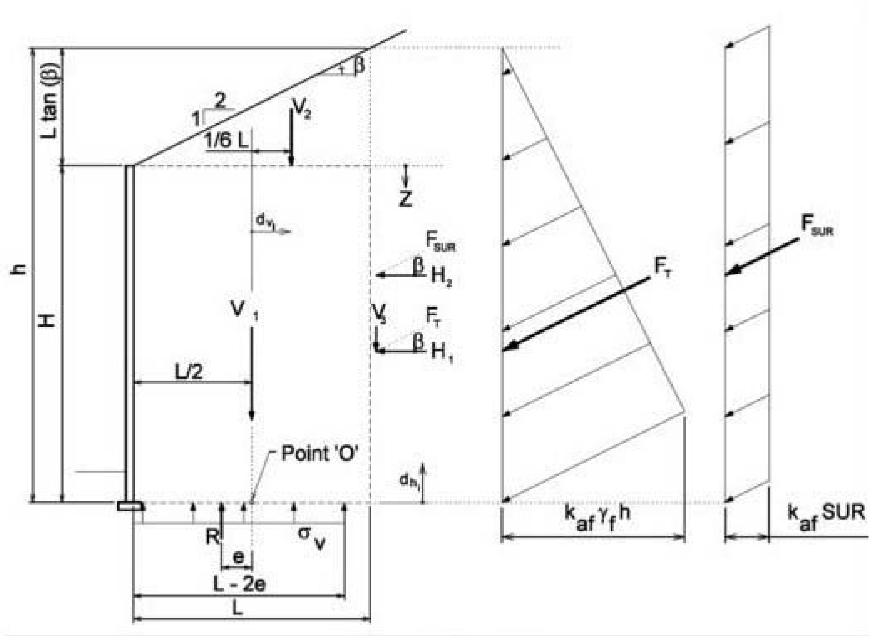
RETAINING WALL Y – STA. 1300+69.4

Objective: To evaluate the external stability of MSE wall design with broken backsloping backfill.

Method: In accordance with ODOT Bridge Design Manual, 2020 [Sect. 201.4.1] and LRFD Bridge Design Specifications, 8th Ed., 2017, [Sect. 11.10.5].

Assumptions:

- **Broken backsloping backfill behind wall with a backfill slope inclination of β and an equivalent backfill slope inclination of β'.**
- **For battered or vertical walls with a front face of wall angle of θ to horizontal.**
- **Not for sheet type reinforcement. If so, use different assessment for Sliding parameter ϕ_μ.**
- **Must enter *"effective"* cohesion (c') (undrained shear strength) and *"effective"* friction angle (ϕ') for cohesive foundation soils**
- **Variables follow convention shown below:**



Givens:

Wall Geometry:

$H_e := 15.6 \cdot ft$ Exposed wall height

$\theta := 90 \cdot deg$ Angle of front face of wall to horizontal

$\beta := 26.565 \cdot deg$ Inclination of ground slope behind face of wall

Reinforced Backfill Soil Design Parameters:

$\phi'_r := 34 \cdot deg$ Effective angle of internal friction

$\gamma_r := 120 \cdot \frac{lbf}{ft^3}$ Unit weight

$c'_r := 0 \cdot \frac{lbf}{ft^2}$ Effective Cohesion

Retained Backfill Soil Design Parameters:

$\phi'_b := 30 \cdot deg$ Effective angle of internal friction

$\gamma_b := 120 \cdot \frac{lbf}{ft^3}$ Unit weight

$c'_b := 0 \cdot \frac{lbf}{ft^2}$ Effective Cohesion

Foundation Soil Design Parameters:

Drained Soil Conditions (Effective Stress):

$\phi'_f := 33 \cdot deg$ Effective angle of internal friction

$\gamma_f := 122 \cdot \frac{lbf}{ft^3}$ Unit weight

$c'_f := 0 \cdot \frac{lbf}{ft^2}$ Effective Cohesion

Undrained Conditions (Total Stress):

$\phi_{fu} := 33 \cdot deg$ Effective angle of internal friction

$\gamma_f = 122\ \frac{lbf}{ft^3}$ Unit weight

$Su_{fu} := 0 \cdot \frac{lbf}{ft^2}$ Effective Cohesion

Foundation Surcharge Soil Parameters:

$\gamma_q := 120 \cdot \frac{lbf}{ft^3}$ Unit weight

Depth of Embedment Check:

$d_{frost} := 3\ ft$ $d_{user} := 3\ ft$ Local Frost Depth

$Slope_{fw} := 0\ deg$

Inclination of ground slope in front of wall :

- Horizontal: **0**
- 3H:1V: **18.435**
- 2H:1V: **26.565**
- 1.5H:1V: **33.690**

$d_{est} := \max\left(d_{frost}, 3\ ft, d_{user}\right)$ $d_{est} = 3\ ft$

$H_{est} := d_{est} + \left(4\ ft \cdot \tan\left(Slope_{fw}\right)\right) + H_e$ $H_{est} = 18.6\ ft$

$$d_{eSlope} := \text{if}\left(Slope_{fw} < 1\ deg, \frac{H_{est}}{20}, \text{if}\left(Slope_{fw} < 26.565\ deg, \frac{H_{est}}{10}, \text{if}\left(Slope_{fw} < 33.69\ deg, \frac{H_{est}}{7}, \frac{H_{est}}{5}\right)\right)\right)$$

$d_{eSlope} = 0.9\ ft$

$d_e := \max\left(d_{est}, d_{eSlope}\right)$ $d_e = 3\ ft$ Minimum Required Embedment Depth

$H := d_e + \left(4\ ft \cdot \tan\left(Slope_{fw}\right)\right) + H_e$ $H = 18.6\ ft$ Design Wall Height

Estimate Length of Reinforcement:

$L_{user} := 0 \cdot ft$ User inputted value (if changes need to be made to satisfy other requirements)

$L := \max\left(8 \cdot ft, 0.7 \cdot H, L_{user}\right)$ $L = 13\ ft$ Length of Reinforcement

$B := L$ L = MSE Bearing Width

$h := H + L \cdot \tan(\beta)$ Height of retained fill at the back of the reinforced soil

$h = 25.1\ ft$

Site Grading and Slope Dimensions:

$\beta = 26.6\ \mathbf{deg}$ Inclination of ground slope behind face of wall.

$\lambda := 25.9\ \mathbf{ft}$ Horizontal distance from the back of wall to point of slope crest and assumed traffic surcharge load.

$2 \cdot H = 37.2\ \mathbf{ft}$ **IF λ IS GREATER THAN 2*H - USE INFINITE SLOPE CALCULATION SHEET**

$h_{slope} := \lambda \cdot \tan(\beta)$ $h_{slope} = 12.9\ \mathbf{ft}$ Height of broken slope behind wall

$\beta' := \operatorname{atan}\left(\dfrac{h_{slope}}{2 \cdot H}\right) = 19.2\ \mathbf{deg}$ Equivalent backslope angle

$h := \operatorname{if}\left(\lambda \le L, H + h_{slope}, H + L \cdot \tan(\beta)\right) = 25.1\ \mathbf{ft}$ Height of retained fill at back of heel

Live Load Surcharge Parameters:

$SUR := 100\ \dfrac{\mathbf{lbf}}{\mathbf{ft}^2}$

Live load surcharge (per **LRFD BDS [3.11.6.4]**)
Note: If vehicular loading is within 1 ft of the backface of the wall and with a design height, H, less than 20 ft, see **LRFD BDS Section 3.11.6.4** and **Table 3.11.6.4-2** for adjusted surcharge load calculation.
Note: when $\lambda <$ H/2 include a SUR of 250 psf, otherwise make SUR equal to 100 psf to account for construction loads.

Calculations:

Active Earth Pressure:

$\beta := \beta'$ $\delta := \beta'$ Angle of friction between retained backfill and reinforced soil

$\theta := \operatorname{if}(\theta < 100\ \mathbf{deg}, 90\ \mathbf{deg}, \theta)$ $\theta = 90\ \mathbf{deg}$ Angle of front face of wall to horizontal

$$\Gamma := \left(1 + \sqrt{\frac{\left(\sin\left(\phi'_b + \delta\right) \cdot \sin\left(\phi'_b - \beta\right)\right)}{\left(\sin(\theta - \delta) \cdot \sin(\theta + \beta)\right)}}\right)^2$$

$$k_{af} := \left(\frac{\left(\sin\left(\theta + \phi'_b\right)\right)^2}{\left(\Gamma \cdot \left(\sin(\theta)\right)^2 \cdot \sin(\theta - \delta)\right)}\right)$$

$k_{af} = 0.4058$ Active Earth Pressure Coefficient

$F_T := \dfrac{1}{2} \cdot \gamma_b \cdot h^2 \cdot k_{af}$ $F_T = 15352.5\ \dfrac{\mathbf{lbf}}{\mathbf{ft}}$ Active Earth Force Resultant (EH)

$F_{SUR} := SUR \cdot h \cdot k_{af}$ $F_{SUR} = 1019\ \dfrac{\mathbf{lbf}}{\mathbf{ft}}$ Live Load Surcharge (LS)

Vertical Loads:

$V_1 := \gamma_r \cdot H \cdot L$ $V_1 = 29060.6\ \dfrac{\mathbf{lbf}}{\mathbf{ft}}$ Soil backfill - reinforced soil (EV)

$V_2 := \operatorname{if}\left(\lambda < L, \gamma_b \cdot \dfrac{1}{2} \cdot \lambda \cdot h_{slope}, \gamma_b\ \dfrac{1}{2} \cdot L \cdot (h - H)\right)$ $V_2 = 5085.6\ \dfrac{\mathbf{lbf}}{\mathbf{ft}}$ Soil backfill - Backslope Triangular Portion

$V_3 := \operatorname{if}\left(\lambda < L, \gamma_b \cdot (L - \lambda) \cdot h_{slope}, 0\ \dfrac{\mathbf{lbf}}{\mathbf{ft}}\right)$ $V_3 = 0\ \dfrac{\mathbf{lbf}}{\mathbf{ft}}$ Soil backfill - Backslope Rectangular Portion

$V_4 := \operatorname{if}\left(\lambda < L, (L - \lambda) \cdot SUR, 0\ \dfrac{\mathbf{lbf}}{\mathbf{ft}}\right)$ $V_4 = 0\ \dfrac{\mathbf{lbf}}{\mathbf{ft}}$ Live Load Surcharge Above Heel - (LS)

$V_5 := F_{SUR} \cdot \sin(\beta)$ $V_5 = 335\ \dfrac{\mathbf{lbf}}{\mathbf{ft}}$ Live Load Surcharge Resultant (vertical component - LS)

$V_6 := F_T \cdot \sin(\beta)$ $V_6 = 5047.4\ \dfrac{\mathbf{lbf}}{\mathbf{ft}}$ Active Earth Force Resultant (vertical component - EH)

Moment Arm:		Moment:	
Moments produced from vertical loads about Point 'O'			
$d_{v1} := 0 \cdot ft$	$d_{v1} = 0\ ft$	$MV_1 := V_1 \cdot d_{v1}$	$MV_1 = 0\ \frac{lbf \cdot ft}{ft}$
$d_{v2} := \text{if}\left(\lambda \ge L, \frac{L}{6}, \frac{2}{3} \cdot \lambda - \frac{L}{2}\right)$	$d_{v2} = 2.2\ ft$	$MV_2 := V_2 \cdot d_{v2}$	$MV_2 = 11035.8\ \frac{lbf \cdot ft}{ft}$
$d_{v3} := \frac{\lambda}{2}$	$d_{v3} = 13\ ft$	$MV_3 := V_3 \cdot d_{v3}$	$MV_3 = 0\ \frac{lbf \cdot ft}{ft}$
$d_{v4} := \frac{\lambda}{2}$	$d_{v4} = 13\ ft$	$MV_4 := V_4 \cdot d_{v4}$	$MV_4 = 0\ \frac{lbf \cdot ft}{ft}$
$d_{v5} := \frac{L}{2}$	$d_{v5} = 6.5\ ft$	$MV_5 := V_5 \cdot d_{v5}$	$MV_5 = 2181\ \frac{lbf \cdot ft}{ft}$
$d_{v6} := \frac{L}{2}$	$d_{v6} = 6.5\ ft$	$MV_6 := V_6 \cdot d_{v6}$	$MV_6 = 32858.5\ \frac{lbf \cdot ft}{ft}$

Horizontal Loads:

$H_1 := F_{SUR} \cdot \cos(\beta)$ $\quad H_1 = 962.4\ \frac{lbf}{ft}$ $\quad$ Live Load Surcharge Resultant (horizontal comp. - LS)

$H_2 := F_T \cdot \cos(\beta)$ $\quad H_2 = 14499.1\ \frac{lbf}{ft}$ $\quad$ Active Earth Force Resultant (horizontal comp. - EH)

Moment Arm:		Moment:	
$d_{h1} := \frac{h}{2}$	$d_{h1} = 12.6\ ft$	$MH_1 := H_1 \cdot d_{h1}$	$MH_1 = 12082.6\ \frac{lbf \cdot ft}{ft}$
$d_{h2} := \frac{h}{3}$	$d_{h2} = 8.4\ ft$	$MH_2 := H_2 \cdot d_{h2}$	$MH_2 = 121357.2\ \frac{lbf \cdot ft}{ft}$

Unfactored Loads by Load Type

$V_{EV} := V_1 + V_2 + V_3$ $\quad V_{EV} = 34146.2\ \frac{lbf}{ft}$

$V_{LS} := V_4 + V_5$ $\quad V_{LS} = 335\ \frac{lbf}{ft}$ $\quad H_{LS} := H_1$ $\quad H_{LS} = 962.4\ \frac{lbf}{ft}$

$V_{EH} := V_6$ $\quad V_{EH} = 5047.4\ \frac{lbf}{ft}$ $\quad H_{EH} := H_2$ $\quad H_{EH} = 14499.1\ \frac{lbf}{ft}$

Unfactored Moments by Load Type

$M_{EV} := MV_1 + MV_2 + MV_3$ $\quad M_{EV} = 11035.8\ \frac{lbf \cdot ft}{ft}$

$M_{LSV} := MV_4 + MV_5$ $\quad M_{LSV} = 2181\ \frac{lbf \cdot ft}{ft}$ $\quad M_{LSH} := MH_1$ $\quad M_{LSH} = 12082.6\ \frac{lbf \cdot ft}{ft}$

$M_{EH1} := MV_6$ $\quad M_{EH1} = 32858.5\ \frac{lbf \cdot ft}{ft}$ $\quad M_{EH2} := MH_2$ $\quad M_{EH2} = 121357.2\ \frac{lbf \cdot ft}{ft}$

Load Combination Limit States:

$n := 1$ $\quad$ LRFD Load Modifier

Strength Limit State I: EV(min) = 1.00 EV(max) = 1.35
EH(min) = 0.90 EH(max) = 1.50
LS = 1.75

Strength Limit State Ia:
(Sliding and Eccentricity) $\quad Ia_{EV} := 1$ $\quad Ia_{EH} := 1.5$ $\quad Ia_{LS} := 1.75$

Strength Limit State Ib:
(Bearing Capacity) $\quad Ib_{EV} := 1.35$ $\quad Ib_{EH} := 1.5$ $\quad Ib_{LS} := 1.75$

Factored Vertical Loads by Limit State:

$V_{Ia} := n \cdot \left(\left(Ia_{EV} \cdot V_{EV} \right) + \left(Ia_{EH} \cdot V_{EH} \right) \right)$ $\qquad V_{Ia} = 41717.3 \ \dfrac{lbf}{ft}$

$V_{Ib} := n \cdot \left(\left(Ib_{EV} \cdot V_{EV} \right) + \left(Ib_{EH} \cdot V_{EH} \right) + \left(Ib_{LS} \cdot V_{LS} \right) \right)$ $\qquad V_{Ib} = 54254.8 \ \dfrac{lbf}{ft}$

Factored Horizontal Loads by Limit State:

$H_{Ia} := n \cdot \left(\left(Ia_{LS} \cdot H_{LS} \right) + \left(Ia_{EH} \cdot H_{EH} \right) \right)$ $\qquad H_{Ia} = 23432.8 \ \dfrac{lbf}{ft}$

$H_{Ib} := n \cdot \left(\left(Ib_{LS} \cdot H_{LS} \right) + \left(Ib_{EH} \cdot H_{EH} \right) \right)$ $\qquad H_{Ib} = 23432.8 \ \dfrac{lbf}{ft}$

Factored Moments Produced by Vertical Loads by Limit State:

$MV_{Ia} := n \cdot \left(\left(Ia_{EV} \cdot M_{EV} \right) + \left(Ia_{EH} \cdot M_{EH1} \right) \right)$ $\qquad MV_{Ia} = 60323.4 \ \dfrac{lbf \cdot ft}{ft}$

$MV_{Ib} := n \cdot \left(\left(Ib_{EV} \cdot M_{EV} \right) + \left(Ib_{EH} \cdot M_{EH1} \right) + \left(Ib_{LS} \cdot M_{LSV} \right) \right)$ $\qquad MV_{Ib} = 68002.6 \ \dfrac{lbf \cdot ft}{ft}$

Factored Moments Produced by Horizontal Loads by Limit State:

$MH_{Ia} := n \cdot \left(\left(Ia_{LS} \cdot M_{LSH} \right) + \left(Ia_{EH} \cdot M_{EH2} \right) \right)$ $\qquad MH_{Ia} = 203180.3 \ \dfrac{lbf \cdot ft}{ft}$

$MH_{Ib} := n \cdot \left(\left(Ib_{LS} \cdot M_{LSH} \right) + \left(Ib_{EH} \cdot M_{EH2} \right) \right)$ $\qquad MH_{Ib} = 203180.3 \ \dfrac{lbf \cdot ft}{ft}$

Compute Bearing Resistance:

Compute the resultant location about the toe of the base length (distance from "O") Strength Ib:

$\Sigma M_R := MV_{Ib}$ $\qquad \Sigma M_R = 68002.6 \ \dfrac{lbf \cdot ft}{ft}$ $\qquad$ Sum of Resisting Moments (Strength Ib)

$\Sigma M_O := MH_{Ib}$ $\qquad \Sigma M_O = 203180.3 \ \dfrac{lbf \cdot ft}{ft}$ $\qquad$ Sum of Overturning Moments (Strength Ib)

$\Sigma V := V_{Ib}$ $\qquad \Sigma V = 54254.8 \ \dfrac{lbf}{ft}$ $\qquad$ Sum of Vertical Loads (Strength Ib)

$e := \dfrac{\left(\Sigma M_O - \Sigma M_R \right)}{\Sigma V}$ $\qquad e = 2.49 \ ft$ $\qquad$ Distance from Point "O" the resultant intersects the base

Wall eccentricity, **Note:** The vertical stress is assumed to be uniformly distributed over the effective bearing width, B', since the wall is supported by a soil foundation **LRFD [11.6.3.2]**. The effective bearing width is equal to B-2e. When the foundation eccentricity is negative the absolute value is used.

Foundation Layout:

$B' := \text{if} \left(e > 0 , L - 2 \cdot e , L \right)$ $\qquad B' = 8.04 \ ft$ $\qquad$ Effective Footing Width

$L' := 182 \ ft$ $\qquad$ Effective Footing Length (Assumed)

$H' := H_{Ib}$ $\qquad H' = 23432.8 \ \dfrac{lbf}{ft}$ $\qquad$ Summation of Horizontal Loads (Strength Ib)

$V' := V_{Ib}$ $\qquad V' = 54254.8 \ \dfrac{lbf}{ft}$ $\qquad$ Summation of Vertical Loads (Strength Ib)

$D_f := d_e$ $\qquad D_f = 3 \ ft$ $\qquad$ Footing embedment

$d_w := d_e$ $\qquad d_w = 3 \ ft$ $\qquad$ Depth of Groundwater below ground surface in front of wall.

Drained Conditions (Effective Stress):

$$N_q := \text{if}\left(\phi'_f > 0, e^{\pi \cdot \tan(\phi'_f)} \cdot \tan\left(45\ \textbf{deg} + \frac{\phi'_f}{2}\right)^2, 1.0\right)$$

$$N_q = 26.09$$

$$N_c := \text{if}\left(\phi'_f > 0, \frac{N_q - 1}{\tan(\phi'_f)}, 5.14\right)$$

$$N_c = 38.64$$

$$N_\gamma := 2 \cdot (N_q + 1) \cdot \tan(\phi'_f)$$

$$N_\gamma = 35.2$$

Compute shape correction factors per **LRFD [Table 10.6.3.1.2a-3]**:

$$s_c := \text{if}\left(\phi'_f > 0, 1 + \left(\frac{B'}{L'}\right) \cdot \left(\frac{N_q}{N_c}\right), 1 + \left(\frac{B'}{5 \cdot L'}\right)\right)$$

$$s_c = 1.03$$

$$s_q := \text{if}\left(\phi'_f > 0, 1 + \left(\frac{B'}{L'} \cdot \tan(\phi'_f)\right), 1\right)$$

$$s_q = 1.029$$

$$s_\gamma := \text{if}\left(\phi'_f > 0, 1 - 0.4 \cdot \left(\frac{B'}{L'}\right), 1\right)$$

$$s_\gamma = 0.982$$

Load inclination factors:

$$i_q := 1$$

$$i_\gamma := 1$$

$$i_c := 1$$

Assumed to be 1.0, see **LRFD BDS C10.6.3.1.2a**. "Most geotechnical engineers do not used the load inclination factors". If desired, use LRFD Equations [10.6.3.1.2a-5] thru [10.6.3.1.2a-9].

Compute groundwater depth correction factors per **LRFD [Table 10.6.3.1.2a-2]**:

$$C_{wq} := \text{if}(d_w \geq 0, 1, 0.5)$$

$$C_{wq} = 1$$

$$C_{w\gamma} := \text{if}(d_w > 1.5 \cdot B', 1, 0.5)$$

$$C_{w\gamma} = 0.5$$

Depth Correction Factor per Hanson (1970):

$$d_q := \text{if}\left(\frac{D_f}{B'} \leq 1, 1 + 2 \cdot \tan(\phi'_f) \cdot (1 - \sin(\phi'_f))^2 \cdot \frac{D_f}{B'}, 1 + 2 \cdot \tan(\phi'_f) \cdot (1 - \sin(\phi'_f))^2 \cdot \text{atan}\left(\frac{D_f}{B'}\right)\right)$$

$$d_q = 1.1$$

Compute modified bearing capacity factors **LRFD [Equation 10.6.3.1.2a-2 to 10.6.3.1.2a-4]:**

$$N_{cm} := N_c \cdot s_c \cdot i_c$$

$$N_{cm} = 39.791$$

$$N_{qm} := N_q \cdot s_q \cdot i_q$$

$$N_{qm} = 26.84$$

$$N_{\gamma m} := N_\gamma \cdot s_\gamma \cdot i_\gamma$$

$$N_{\gamma m} = 34.566$$

Compute nominal bearing resistance, **LRFD [Eq 10.6.3.1.2a-1]:**

$$q_{nd} := c'_f \cdot N_{cm} + \gamma_f \cdot D_f \cdot N_{qm} \cdot d_q \cdot C_{wq} + 0.5 \cdot \gamma_f \cdot B' \cdot N_{\gamma m} \cdot C_{w\gamma}$$

$$q_{nd} = 19284.1\ \frac{\textbf{lbf}}{\textbf{ft}^2}$$

Compute factored bearing resistance, **LRFD [Eq 10.6.3.1.1]:**

$$\phi_b := 0.65$$

Bearing resistance factor **LRFD Table 11.5.7-1.**

$$q_{Rd} := \phi_b \cdot q_{nd} \qquad q_{Rd} = 12.5\ \textbf{ksf}$$

Factored bearing resistance Drained Conditions

Undrained Conditions (Effective Stress):

$N_q := \text{if}\left(\phi_{fu} > 0, e^{\pi \cdot \tan\left(\phi_{fu}\right)} \cdot \tan\left(45\ \mathbf{deg} + \frac{\phi_{fu}}{2}\right)^2, 1.0\right)$ $N_q = 26.09$

$N_c := \text{if}\left(\phi_{fu} > 0, \frac{N_q - 1}{\tan\left(\phi_{fu}\right)}, 5.14\right)$ $N_c = 38.64$

$N_\gamma := 2 \cdot \left(N_q + 1\right) \cdot \tan\left(\phi_{fu}\right)$ $N_\gamma = 35.2$

Compute shape correction factors per **LRFD [Table 10.6.3.1.2a-3]**:

$s_c := \text{if}\left(\phi_{fu} > 0, 1 + \left(\frac{B'}{L'}\right) \cdot \left(\frac{N_q}{N_c}\right), 1 + \left(\frac{B'}{5 \cdot L'}\right)\right)$ $s_c = 1.03$

$s_q := \text{if}\left(\phi_{fu} > 0, 1 + \left(\frac{B'}{L'} \cdot \tan\left(\phi_{fu}\right)\right), 1\right)$ $s_q = 1.029$

$s_\gamma := \text{if}\left(\phi_{fu} > 0, 1 - 0.4 \cdot \left(\frac{B'}{L'}\right), 1\right)$ $s_\gamma = 0.982$

Load inclination factors:

$i_q := 1$

$i_\gamma := 1$

$i_c := 1$

Assumed to be 1.0, see **LRFD BDS C10.6.3.1.2a**. "Most geotechnical engineers do not used the load inclination factors". If desired, use LRFD Equations [10.6.3.1.2a-5] thru [10.6.3.1.2a-9].

$i_c = 1$

Compute modified bearing capacity factors **LRFD [Equation 10.6.3.1.2a-2 to 10.6.3.1.2a-4]:**

$N_{cm} := N_c \cdot s_c \cdot i_c$ $N_{cm} = 39.791$

$N_{qm} := N_q \cdot s_q \cdot i_q$ $N_{qm} = 26.84$

$N_{\gamma m} := N_\gamma \cdot s_\gamma \cdot i_\gamma$ $N_{\gamma m} = 34.566$

Depth Correction Factor per Hanson (1970):

$$d_q := \text{if}\left(\frac{D_f}{B'} \le 1, 1 + 2 \cdot \tan\left(\phi_{fu}\right) \cdot \left(1 - \sin\left(\phi_{fu}\right)\right)^2 \cdot \frac{D_f}{B'}, 1 + 2 \cdot \tan\left(\phi_{fu}\right) \cdot \left(1 - \sin\left(\phi_{fu}\right)\right)^2 \cdot \text{atan}\left(\frac{D_f}{B'}\right)\right)$$

$d_q = 1.1$

Compute nominal bearing resistance, **LRFD [Eq 10.6.3.1.2a-1:**

$q_{nu} := Su_{fu} \cdot N_{cm} + \gamma_f \cdot D_f \cdot N_{qm} \cdot d_q \cdot C_{wq} + 0.5 \cdot \gamma_f \cdot B' \cdot N_{\gamma m} \cdot C_{w\gamma}$ $q_{nu} = 19284.1\ \frac{\mathbf{lbf}}{\mathbf{ft}^2}$

Compute factored bearing resistance, **LRFD [Eq 10.6.3.1.1]:**

$\phi_b := 0.65$

Bearing resistance factor **LRFD Table 11.5.7-1.**

$q_{Ru} := \phi_b \cdot q_{nu}$ $q_{Ru} = 12.5\ \mathbf{ksf}$

Factored bearing resistance Undrained Conditions

Factored Bearing Resistance Drained vs. Undrained Conditions:

Drained Conditions: $q_{Rd} = 12.5\ \mathbf{ksf}$

Undrained Conditions: $q_{Ru} = 12.5\ \mathbf{ksf}$

Factored Bearing Resistance to be used in CDR Calculations: $q_R := q_{Rd}$

Evaluate External Stability of Wall:

Compute the ultimate bearing stress:

$e = 2.49\ ft$

$\sigma_v := \dfrac{\Sigma V}{B - 2 \cdot e}$ $\sigma_v = 6.8\ ksf$

Bearing Capacity:Demand Ratio (CDR)

Drained Conditions: $CDR_{Bearing\_D} := \dfrac{q_{Rd}}{\sigma_v}$ Is the CDR > or = to 1.0?: $CDR_{Bearing\_D} = 1.86$

Undrained Conditions: $CDR_{Bearing\_U} := \dfrac{q_{Ru}}{\sigma_v}$ Is the CDR > or = to 1.0?: $CDR_{Bearing\_D} = 1.86$

Limiting Eccentricity at Base of MSE Wall (Strength Ia):

Compute the resultant location about the center "O" of the base length:

$e_{max} := \dfrac{L}{3}$	$e_{max} = 4.3\ ft$	Maximum Eccentricity (LRFD C11.6.3.3.)
$\Sigma M_R := MV_{Ia}$	$\Sigma M_R = 60323.4\ \dfrac{lbf \cdot ft}{ft}$	Sum of Resisting Moments (Strength Ia)
$\Sigma M_O := MH_{Ia}$	$\Sigma M_O = 203180.3\ \dfrac{lbf \cdot ft}{ft}$	Sum of Overturning Moments (Strength Ia)
$\Sigma V := V_{Ia}$	$\Sigma V = 41717.3\ \dfrac{lbf}{ft}$	Sum of Vertical Loads (Strength Ia)
$e_{wall} := \dfrac{(\Sigma M_O - \Sigma M_R)}{\Sigma V}$	$e_{wall} = 3.42\ ft$	Wall eccentricity (Strength Ia)

Eccentricity Capacity:Demand Ratio (CDR)

$CDR_{Eccentricity} := \dfrac{e_{max}}{e_{wall}}$ Is the CDR > or = to 1.0? $CDR_{Eccentricity} = 1.27$

Sliding Resistance at Base of MSE Wall (Strength Ia):

$\phi_s := 1.0$ Sliding Resistance Factor

$R_u := \phi_s \cdot H_{Ia}$ $R_u = 23432.8\ \dfrac{lbf}{ft}$ Factored Sliding Force

Drained Conditions (Effective Stress):

$\phi_\mu := min\left(\phi'_f, \phi'_r\right)$ $\phi_\mu = 33\ deg$ Minimum Resisting Friction Angle

$\mu := \tan\left(\phi_\mu\right)$ $\mu = 0.6$

$V_{Nm} := \mu \cdot V_{Ia}$ $V_{Nm} = 27091.5\ \dfrac{lbf}{ft}$

$R_R := \phi_s \cdot V_{Nm}$ $R_R = 27091.5\ \dfrac{lbf}{ft}$ Factored Sliding Resistance (From Friction)

Sliding Capacity:Demand Ratio (CDR) - Drained Conditions

$CDR_{Sliding\_D} := \dfrac{R_R}{R_u}$ Is the CDR > or = to 1.0? $CDR_{Sliding\_D} = 1.16$

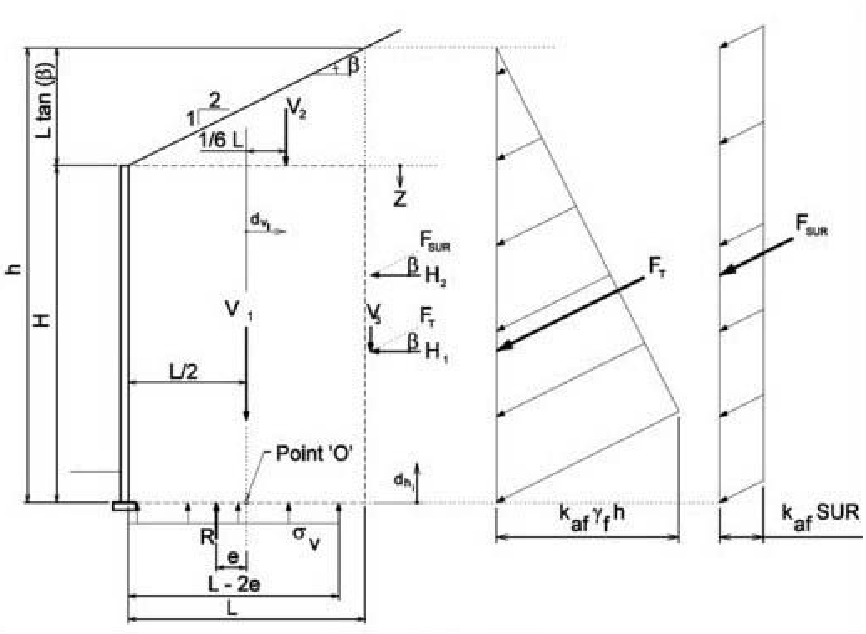
RETAINING WALL Y – STA. 1302+51.5

Objective: **To evaluate the external stability of MSE wall design with broken backsloping backfill.**

Method: **In accordance with ODOT Bridge Design Manual, 2020 [Sect. 201.4.1] and LRFD Bridge Design Specifications, 8th Ed., 2017, [Sect. 11.10.5].**

Assumptions:

- **Broken backsloping backfill behind wall with a backfill slope inclination of β and an equivalent backfill slope inclination of β'.**
- **For battered or vertical walls with a front face of wall angle of θ to horizontal.**
- **Not for sheet type reinforcement. If so, use different assessment for Sliding parameter ϕ_μ.**
- **Must enter *"effective"* cohesion (c') (undrained shear strength) and *"effective"* friction angle (ϕ') for cohesive foundation soils**
- **Variables follow convention shown below:**



Givens:

Wall Geometry:

$H_e := 10.3 \cdot ft$	Exposed wall height
$\theta := 90 \cdot deg$	Angle of front face of wall to horizontal
$\beta := 26.565 \cdot deg$	Inclination of ground slope behind face of wall

Reinforced Backfill Soil Design Parameters:

$\phi'_r := 34 \cdot deg$	Effective angle of internal friction
$\gamma_r := 120 \cdot \frac{lbf}{ft^3}$	Unit weight
$c'_r := 0 \cdot \frac{lbf}{ft^2}$	Effective Cohesion

Retained Backfill Soil Design Parameters:

$\phi'_b := 30 \cdot deg$	Effective angle of internal friction
$\gamma_b := 120 \cdot \frac{lbf}{ft^3}$	Unit weight
$c'_b := 0 \cdot \frac{lbf}{ft^2}$	Effective Cohesion

Foundation Soil Design Parameters:

Drained Soil Conditions (Effective Stress):

$\phi'_f := 33 \cdot deg$ Effective angle of internal friction

$\gamma_f := 122 \cdot \frac{lbf}{ft^3}$ Unit weight

$c'_f := 0 \cdot \frac{lbf}{ft^2}$ Effective Cohesion

Undrained Conditions (Total Stress):

$\phi_{fu} := 33 \cdot deg$ Effective angle of internal friction

$\gamma_f = 122 \ \frac{lbf}{ft^3}$ Unit weight

$Su_{fu} := 0 \cdot \frac{lbf}{ft^2}$ Effective Cohesion

Foundation Surcharge Soil Parameters:

$\gamma_q := 120 \cdot \frac{lbf}{ft^3}$ Unit weight

Depth of Embedment Check:

$d_{frost} := 3\ ft$ $d_{user} := 3\ ft$ Local Frost Depth

$Slope_{fw} := 0\ deg$

Inclination of ground slope in front of wall :

- Horizontal: **0**
- 3H:1V: **18.435**
- 2H:1V: **26.565**
- 1.5H:1V: **33.690**

$d_{est} := \max\left(d_{frost}, 3\ ft, d_{user}\right)$ $d_{est} = 3\ ft$

$H_{est} := d_{est} + \left(4\ ft \cdot \tan\left(Slope_{fw}\right)\right) + H_e$ $H_{est} = 13.3\ ft$

$$d_{eSlope} := \text{if}\left(Slope_{fw} < 1\ deg, \frac{H_{est}}{20}, \text{if}\left(Slope_{fw} < 26.565\ deg, \frac{H_{est}}{10}, \text{if}\left(Slope_{fw} < 33.69\ deg, \frac{H_{est}}{7}, \frac{H_{est}}{5}\right)\right)\right)$$

$d_{eSlope} = 0.7\ ft$

$d_e := \max\left(d_{est}, d_{eSlope}\right)$ $d_e = 3\ ft$ Minimum Required Embedment Depth

$H := d_e + \left(4\ ft \cdot \tan\left(Slope_{fw}\right)\right) + H_e$ $H = 13.3\ ft$ Design Wall Height

Estimate Length of Reinforcement:

$L_{user} := 0 \cdot ft$ User inputted value (if changes need to be made to satisfy other requirements)

$L := \max\left(8 \cdot ft, 0.7 \cdot H, L_{user}\right)$ $L = 9.3\ ft$ Length of Reinforcement

$B := L$ L = MSE Bearing Width

$h := H + L \cdot \tan(\beta)$ Height of retained fill at the back of the reinforced soil

$h = 18\ ft$

Site Grading and Slope Dimensions:

$\beta = 26.6\ deg$ — Inclination of ground slope behind face of wall.

$\lambda := 25\ ft$ — Horizontal distance from the back of wall to point of slope crest and assumed traffic surcharge load.

$2 \cdot H = 26.6\ ft$ — **IF λ IS GREATER THAN 2*H - USE INFINITE SLOPE CALCULATION SHEET**

$h_{slope} := \lambda \cdot \tan(\beta)$ — $h_{slope} = 12.5\ ft$ — Height of broken slope behind wall

$\beta' := \operatorname{atan}\left(\dfrac{h_{slope}}{2 \cdot H}\right) = 25.2\ deg$ — Equivalent backslope angle

$h := \text{if}\left(\lambda \le L, H + h_{slope}, H + L \cdot \tan(\beta)\right) = 18\ ft$ — Height of retained fill at back of heel

Live Load Surcharge Parameters:

$SUR := 100\ \dfrac{lbf}{ft^2}$

Live load surcharge (per **LRFD BDS [3.11.6.4]**)
Note: If vehicular loading is within 1 ft of the backface of the wall and with a design height, H, less than 20 ft, see **LRFD BDS Section 3.11.6.4** and **Table 3.11.6.4-2** for adjusted surcharge load calculation.
Note: when λ < H/2 include a SUR of 250 psf, otherwise make SUR equal to 100 psf to account for construction loads.

Calculations:

Active Earth Pressure:

$\beta := \beta' \qquad \delta := \beta'$ — Angle of friction between retained backfill and reinforced soil

$\theta := \text{if}(\theta < 100\ deg, 90\ deg, \theta)$ — $\theta = 90\ deg$ — Angle of front face of wall to horizontal

$$\Gamma := \left(1 + \sqrt{\frac{\left(\sin\left(\phi'_b + \delta\right) \cdot \sin\left(\phi'_b - \beta\right)\right)}{\left(\sin(\theta - \delta) \cdot \sin(\theta + \beta)\right)}}\right)^2$$

$$k_{af} := \left(\frac{\left(\sin\left(\theta + \phi'_b\right)\right)^2}{\left(\Gamma \cdot (\sin(\theta))^2 \cdot \sin(\theta - \delta)\right)}\right)$$

$k_{af} = 0.4976$ — Active Earth Pressure Coefficient

$F_T := \dfrac{1}{2} \cdot \gamma_b \cdot h^2 \cdot k_{af}$ — $F_T = 9625.1\ \dfrac{lbf}{ft}$ — Active Earth Force Resultant (EH)

$F_{SUR} := SUR \cdot h \cdot k_{af}$ — $F_{SUR} = 893.5\ \dfrac{lbf}{ft}$ — Live Load Surcharge (LS)

Vertical Loads:

$V_1 := \gamma_r \cdot H \cdot L$ — $V_1 = 14858.8\ \dfrac{lbf}{ft}$ — Soil backfill - reinforced soil (EV)

$V_2 := \text{if}\left(\lambda < L, \gamma_b \cdot \dfrac{1}{2} \cdot \lambda \cdot h_{slope}, \gamma_b\ \dfrac{1}{2} \cdot L \cdot (h - H)\right)$ — $V_2 = 2600.3\ \dfrac{lbf}{ft}$ — Soil backfill - Backslope Triangular Portion

$V_3 := \text{if}\left(\lambda < L, \gamma_b \cdot (L - \lambda) \cdot h_{slope}, 0\ \dfrac{lbf}{ft}\right)$ — $V_3 = 0\ \dfrac{lbf}{ft}$ — Soil backfill - Backslope Rectangular Portion

$V_4 := \text{if}\left(\lambda < L, (L - \lambda) \cdot SUR, 0\ \dfrac{lbf}{ft}\right)$ — $V_4 = 0\ \dfrac{lbf}{ft}$ — Live Load Surcharge Above Heel - (LS)

$V_5 := F_{SUR} \cdot \sin(\beta)$ — $V_5 = 380\ \dfrac{lbf}{ft}$ — Live Load Surcharge Resultant (vertical component - LS)

$V_6 := F_T \cdot \sin(\beta)$ — $V_6 = 4093.6\ \dfrac{lbf}{ft}$ — Active Earth Force Resultant (vertical component - EH)

Moment Arm: Moment:

Moments produced from vertical loads about Point 'O'

$d_{v1} := 0 \cdot ft$ $d_{v1} = 0\ ft$ $MV_1 := V_1 \cdot d_{v1}$ $MV_1 = 0\ \frac{lbf \cdot ft}{ft}$

$d_{v2} := \text{if}\left(\lambda \geq L, \frac{L}{6}, \frac{2}{3} \cdot \lambda - \frac{L}{2}\right)$ $d_{v2} = 1.6\ ft$ $MV_2 := V_2 \cdot d_{v2}$ $MV_2 = 4034.8\ \frac{lbf \cdot ft}{ft}$

$d_{v3} := \frac{\lambda}{2}$ $d_{v3} = 12.5\ ft$ $MV_3 := V_3 \cdot d_{v3}$ $MV_3 = 0\ \frac{lbf \cdot ft}{ft}$

$d_{v4} := \frac{\lambda}{2}$ $d_{v4} = 12.5\ ft$ $MV_4 := V_4 \cdot d_{v4}$ $MV_4 = 0\ \frac{lbf \cdot ft}{ft}$

$d_{v5} := \frac{L}{2}$ $d_{v5} = 4.7\ ft$ $MV_5 := V_5 \cdot d_{v5}$ $MV_5 = 1768.8\ \frac{lbf \cdot ft}{ft}$

$d_{v6} := \frac{L}{2}$ $d_{v6} = 4.7\ ft$ $MV_6 := V_6 \cdot d_{v6}$ $MV_6 = 19055.8\ \frac{lbf \cdot ft}{ft}$

Horizontal Loads:

$H_1 := F_{SUR} \cdot \cos(\beta)$ $H_1 = 808.6\ \frac{lbf}{ft}$ Live Load Surcharge Resultant (horizontal comp. - LS)

$H_2 := F_T \cdot \cos(\beta)$ $H_2 = 8711.2\ \frac{lbf}{ft}$ Active Earth Force Resultant (horizontal comp. - EH)

Moment Arm: Moment:

$d_{h1} := \frac{h}{2}$ $d_{h1} = 9\ ft$ $MH_1 := H_1 \cdot d_{h1}$ $MH_1 = 7259.4\ \frac{lbf \cdot ft}{ft}$

$d_{h2} := \frac{h}{3}$ $d_{h2} = 6\ ft$ $MH_2 := H_2 \cdot d_{h2}$ $MH_2 = 52136.8\ \frac{lbf \cdot ft}{ft}$

Unfactored Loads by Load Type

$V_{EV} := V_1 + V_2 + V_3$ $V_{EV} = 17459\ \frac{lbf}{ft}$

$V_{LS} := V_4 + V_5$ $V_{LS} = 380\ \frac{lbf}{ft}$ $H_{LS} := H_1$ $H_{LS} = 808.6\ \frac{lbf}{ft}$

$V_{EH} := V_6$ $V_{EH} = 4093.6\ \frac{lbf}{ft}$ $H_{EH} := H_2$ $H_{EH} = 8711.2\ \frac{lbf}{ft}$

Unfactored Moments by Load Type

$M_{EV} := MV_1 + MV_2 + MV_3$ $M_{EV} = 4034.8\ \frac{lbf \cdot ft}{ft}$

$M_{LSV} := MV_4 + MV_5$ $M_{LSV} = 1768.8\ \frac{lbf \cdot ft}{ft}$ $M_{LSH} := MH_1$ $M_{LSH} = 7259.4\ \frac{lbf \cdot ft}{ft}$

$M_{EH1} := MV_6$ $M_{EH1} = 19055.8\ \frac{lbf \cdot ft}{ft}$ $M_{EH2} := MH_2$ $M_{EH2} = 52136.8\ \frac{lbf \cdot ft}{ft}$

Load Combination Limit States:

$n := 1$ LRFD Load Modifier

Strength Limit State I: EV(min) = 1.00 EV(max) = 1.35
EH(min) = 0.90 EH(max) = 1.50
LS = 1.75

Strength Limit State Ia:
(Sliding and Eccentricity)
$Ia_{EV} := 1$ $Ia_{EH} := 1.5$ $Ia_{LS} := 1.75$

Strength Limit State Ib:
(Bearing Capacity)
$Ib_{EV} := 1.35$ $Ib_{EH} := 1.5$ $Ib_{LS} := 1.75$

Factored Vertical Loads by Limit State:

$V_{Ia} := n \cdot \left(\left(Ia_{EV} \cdot V_{EV} \right) + \left(Ia_{EH} \cdot V_{EH} \right) \right)$ $V_{Ia} = 23599.5\ \frac{lbf}{ft}$

$V_{Ib} := n \cdot \left(\left(Ib_{EV} \cdot V_{EV} \right) + \left(Ib_{EH} \cdot V_{EH} \right) + \left(Ib_{LS} \cdot V_{LS} \right) \right)$ $V_{Ib} = 30375.1\ \frac{lbf}{ft}$

Factored Horizontal Loads by Limit State:

$H_{Ia} := n \cdot \left(\left(Ia_{LS} \cdot H_{LS} \right) + \left(Ia_{EH} \cdot H_{EH} \right) \right)$ $H_{Ia} = 14481.9\ \frac{lbf}{ft}$

$H_{Ib} := n \cdot \left(\left(Ib_{LS} \cdot H_{LS} \right) + \left(Ib_{EH} \cdot H_{EH} \right) \right)$ $H_{Ib} = 14481.9\ \frac{lbf}{ft}$

Factored Moments Produced by Vertical Loads by Limit State:

$MV_{Ia} := n \cdot \left(\left(Ia_{EV} \cdot M_{EV} \right) + \left(Ia_{EH} \cdot M_{EH1} \right) \right)$ $MV_{Ia} = 32618.5\ \frac{lbf \cdot ft}{ft}$

$MV_{Ib} := n \cdot \left(\left(Ib_{EV} \cdot M_{EV} \right) + \left(Ib_{EH} \cdot M_{EH1} \right) + \left(Ib_{LS} \cdot M_{LSV} \right) \right)$ $MV_{Ib} = 37126.1\ \frac{lbf \cdot ft}{ft}$

Factored Moments Produced by Horizontal Loads by Limit State:

$MH_{Ia} := n \cdot \left(\left(Ia_{LS} \cdot M_{LSH} \right) + \left(Ia_{EH} \cdot M_{EH2} \right) \right)$ $MH_{Ia} = 90909\ \frac{lbf \cdot ft}{ft}$

$MH_{Ib} := n \cdot \left(\left(Ib_{LS} \cdot M_{LSH} \right) + \left(Ib_{EH} \cdot M_{EH2} \right) \right)$ $MH_{Ib} = 90909\ \frac{lbf \cdot ft}{ft}$

Compute Bearing Resistance:

Compute the resultant location about the toe of the base length (distance from "O") Strength Ib:

$\Sigma M_R := MV_{Ib}$ $\Sigma M_R = 37126.1\ \frac{lbf \cdot ft}{ft}$ Sum of Resisting Moments (Strength Ib)

$\Sigma M_O := MH_{Ib}$ $\Sigma M_O = 90909\ \frac{lbf \cdot ft}{ft}$ Sum of Overturning Moments (Strength Ib)

$\Sigma V := V_{Ib}$ $\Sigma V = 30375.1\ \frac{lbf}{ft}$ Sum of Vertical Loads (Strength Ib)

$e := \frac{\left(\Sigma M_O - \Sigma M_R \right)}{\Sigma V}$ $e = 1.77\ ft$ Distance from Point "O" the resultant intersects the base

Wall eccentricity, **Note:** The vertical stress is assumed to be uniformly distributed over the effective bearing width, B', since the wall is supported by a soil foundation **LRFD [11.6.3.2]**. The effective bearing width is equal to B-2e. When the foundation eccentricity is negative the absolute value is used.

Foundation Layout:

$B' := \text{if}\left(e > 0, L - 2 \cdot e, L \right)$ $B' = 5.77\ ft$ Effective Footing Width

$L' := 144\ ft$ Effective Footing Length (Assumed)

$H' := H_{Ib}$ $H' = 14481.9\ \frac{lbf}{ft}$ Summation of Horizontal Loads (Strength Ib)

$V' := V_{Ib}$ $V' = 30375.1\ \frac{lbf}{ft}$ Summation of Vertical Loads (Strength Ib)

$D_f := d_e$ $D_f = 3\ ft$ Footing embedment

$d_w := d_e$ $d_w = 3\ ft$ Depth of Groundwater below ground surface in front of wall.

Drained Conditions (Effective Stress):

$$N_q := \text{if}\left(\phi'_f > 0, e^{\pi \cdot \tan(\phi'_f)} \cdot \tan\left(45\ deg + \frac{\phi'_f}{2}\right)^2, 1.0\right)$$

$N_q = 26.09$

$$N_c := \text{if}\left(\phi'_f > 0, \frac{N_q - 1}{\tan(\phi'_f)}, 5.14\right)$$

$N_c = 38.64$

$$N_\gamma := 2 \cdot (N_q + 1) \cdot \tan(\phi'_f)$$

$N_\gamma = 35.2$

Compute shape correction factors per **LRFD [Table 10.6.3.1.2a-3]**:

$$s_c := \text{if}\left(\phi'_f > 0, 1 + \left(\frac{B'}{L'}\right) \cdot \left(\frac{N_q}{N_c}\right), 1 + \left(\frac{B'}{5 \cdot L'}\right)\right)$$

$s_c = 1.027$

$$s_q := \text{if}\left(\phi'_f > 0, 1 + \left(\frac{B'}{L'} \cdot \tan(\phi'_f)\right), 1\right)$$

$s_q = 1.026$

$$s_\gamma := \text{if}\left(\phi'_f > 0, 1 - 0.4 \cdot \left(\frac{B'}{L'}\right), 1\right)$$

$s_\gamma = 0.984$

Load inclination factors:

$i_q := 1$

$i_\gamma := 1$

$i_c := 1$

Assumed to be 1.0, see **LRFD BDS C10.6.3.1.2a**. "Most geotechnical engineers do not used the load inclination factors". If desired, use LRFD Equations [10.6.3.1.2a-5] thru [10.6.3.1.2a-9].

Compute groundwater depth correction factors per **LRFD [Table 10.6.3.1.2a-2]**:

$C_{wq} := \text{if}(d_w \geq 0, 1, 0.5)$ $\qquad C_{wq} = 1$

$C_{w\gamma} := \text{if}(d_w > 1.5 \cdot B', 1, 0.5)$ $\qquad C_{w\gamma} = 0.5$

Depth Correction Factor per Hanson (1970):

$$d_q := \text{if}\left(\frac{D_f}{B'} \leq 1, 1 + 2 \cdot \tan(\phi'_f) \cdot \left(1 - \sin(\phi'_f)\right)^2 \cdot \frac{D_f}{B'}, 1 + 2 \cdot \tan(\phi'_f) \cdot \left(1 - \sin(\phi'_f)\right)^2 \cdot \text{atan}\left(\frac{D_f}{B'}\right)\right)$$

$d_q = 1.14$

Compute modified bearing capacity factors **LRFD [Equation 10.6.3.1.2a-2 to 10.6.3.1.2a-4]**:

$N_{cm} := N_c \cdot s_c \cdot i_c$ $\qquad N_{cm} = 39.684$

$N_{qm} := N_q \cdot s_q \cdot i_q$ $\qquad N_{qm} = 26.771$

$N_{\gamma m} := N_\gamma \cdot s_\gamma \cdot i_\gamma$ $\qquad N_{\gamma m} = 34.624$

Compute nominal bearing resistance, **LRFD [Eq 10.6.3.1.2a-1]:**

$$q_{nd} := c'_f \cdot N_{cm} + \gamma_f \cdot D_f \cdot N_{qm} \cdot d_q \cdot C_{wq} + 0.5 \cdot \gamma_f \cdot B' \cdot N_{\gamma m} \cdot C_{w\gamma}$$

$q_{nd} = 17262.3\ \frac{lbf}{ft^2}$

Compute factored bearing resistance, **LRFD [Eq 10.6.3.1.1]:**

$\phi_b := 0.65$

Bearing resistance factor **LRFD Table 11.5.7-1.**

$q_{Rd} := \phi_b \cdot q_{nd}$ $\qquad q_{Rd} = 11.2\ ksf$

Factored bearing resistance Drained Conditions

Undrained Conditions (Effective Stress):

$$N_q := \text{if}\left(\phi_{fu} > 0, e^{\pi \cdot \tan\left(\phi_{fu}\right)} \cdot \tan\left(45\ deg + \frac{\phi_{fu}}{2}\right)^2, 1.0\right)$$ $N_q = 26.09$

$$N_c := \text{if}\left(\phi_{fu} > 0, \frac{N_q - 1}{\tan\left(\phi_{fu}\right)}, 5.14\right)$$ $N_c = 38.64$

$$N_\gamma := 2 \cdot \left(N_q + 1\right) \cdot \tan\left(\phi_{fu}\right)$$ $N_\gamma = 35.2$

Compute shape correction factors per **LRFD [Table 10.6.3.1.2a-3]**:

$$s_c := \text{if}\left(\phi_{fu} > 0, 1 + \left(\frac{B'}{L'}\right) \cdot \left(\frac{N_q}{N_c}\right), 1 + \left(\frac{B'}{5 \cdot L'}\right)\right)$$ $s_c = 1.027$

$$s_q := \text{if}\left(\phi_{fu} > 0, 1 + \left(\frac{B'}{L'} \cdot \tan\left(\phi_{fu}\right)\right), 1\right)$$ $s_q = 1.026$

$$s_\gamma := \text{if}\left(\phi_{fu} > 0, 1 - 0.4 \cdot \left(\frac{B'}{L'}\right), 1\right)$$ $s_\gamma = 0.984$

Load inclination factors:

$i_q := 1$

$i_\gamma := 1$

$i_c := 1$

Assumed to be 1.0, see **LRFD BDS C10.6.3.1.2a**. "Most geotechnical engineers do not used the load inclination factors". If desired, use LRFD Equations [10.6.3.1.2a-5] thru [10.6.3.1.2a-9].

$i_c = 1$

Compute modified bearing capacity factors **LRFD [Equation 10.6.3.1.2a-2 to 10.6.3.1.2a-4]:**

$N_{cm} := N_c \cdot s_c \cdot i_c$ $N_{cm} = 39.684$

$N_{qm} := N_q \cdot s_q \cdot i_q$ $N_{qm} = 26.771$

$N_{\gamma m} := N_\gamma \cdot s_\gamma \cdot i_\gamma$ $N_{\gamma m} = 34.624$

Depth Correction Factor per Hanson (1970):

$$d_q := \text{if}\left(\frac{D_f}{B'} \le 1, 1 + 2 \cdot \tan\left(\phi_{fu}\right) \cdot \left(1 - \sin\left(\phi_{fu}\right)\right)^2 \cdot \frac{D_f}{B'}, 1 + 2 \cdot \tan\left(\phi_{fu}\right) \cdot \left(1 - \sin\left(\phi_{fu}\right)\right)^2 \cdot \text{atan}\left(\frac{D_f}{B'}\right)\right)$$

$d_q = 1.14$

Compute nominal bearing resistance, **LRFD [Eq 10.6.3.1.2a-1:**

$$q_{nu} := Su_{fu} \cdot N_{cm} + \gamma_f \cdot D_f \cdot N_{qm} \cdot d_q \cdot C_{wq} + 0.5 \cdot \gamma_f \cdot B' \cdot N_{\gamma m} \cdot C_{w\gamma}$$ $q_{nu} = 17262.3\ \frac{lbf}{ft^2}$

Compute factored bearing resistance, **LRFD [Eq 10.6.3.1.1]:**

$\phi_b := 0.65$

Bearing resistance factor **LRFD Table 11.5.7-1.**

$q_{Ru} := \phi_b \cdot q_{nu}$ $q_{Ru} = 11.2\ ksf$

Factored bearing resistance Undrained Conditions

Factored Bearing Resistance Drained vs. Undrained Conditions:

Drained Conditions: $q_{Rd} = 11.2\ ksf$

Undrained Conditions: $q_{Ru} = 11.2\ ksf$

Factored Bearing Resistance to be used in CDR Calculations: $q_R := q_{Rd}$

Evaluate External Stability of Wall:

Compute the ultimate bearing stress:

$e = 1.77\ ft$

$\sigma_v := \dfrac{\Sigma V}{B - 2 \cdot e}$ $\sigma_v = 5.3\ ksf$

Bearing Capacity:Demand Ratio (CDR)

Drained Conditions: $CDR_{Bearing\_D} := \dfrac{q_{Rd}}{\sigma_v}$ Is the CDR > or = to 1.0?: $CDR_{Bearing\_D} = 2.13$

Undrained Conditions: $CDR_{Bearing\_U} := \dfrac{q_{Ru}}{\sigma_v}$ Is the CDR > or = to 1.0?: $CDR_{Bearing\_D} = 2.13$

Limiting Eccentricity at Base of MSE Wall (Strength Ia):

Compute the resultant location about the center "O" of the base length:

$e_{max} := \dfrac{L}{3}$ $e_{max} = 3.1\ ft$ Maximum Eccentricity (LRFD C11.6.3.3.)

$\Sigma M_R := MV_{Ia}$ $\Sigma M_R = 32618.5\ \dfrac{lbf \cdot ft}{ft}$ Sum of Resisting Moments (Strength Ia)

$\Sigma M_O := MH_{Ia}$ $\Sigma M_O = 90909\ \dfrac{lbf \cdot ft}{ft}$ Sum of Overturning Moments (Strength Ia)

$\Sigma V := V_{Ia}$ $\Sigma V = 23599.5\ \dfrac{lbf}{ft}$ Sum of Vertical Loads (Strength Ia)

$e_{wall} := \dfrac{\left(\Sigma M_O - \Sigma M_R\right)}{\Sigma V}$ $e_{wall} = 2.47\ ft$ Wall eccentricity (Strength Ia)

Eccentricity Capacity:Demand Ratio (CDR)

$CDR_{Eccentricity} := \dfrac{e_{max}}{e_{wall}}$ Is the CDR > or = to 1.0? $CDR_{Eccentricity} = 1.26$

Sliding Resistance at Base of MSE Wall (Strength Ia):

$\phi_s := 1.0$ Sliding Resistance Factor

$R_u := \phi_s \cdot H_{Ia}$ $R_u = 14481.9\ \dfrac{lbf}{ft}$ Factored Sliding Force

Drained Conditions (Effective Stress):

$\phi_\mu := min\left(\phi'_f, \phi'_r\right)$ $\phi_\mu = 33\ deg$ Minimum Resisting Friction Angle

$\mu := \tan\left(\phi_\mu\right)$ $\mu = 0.6$

$V_{Nm} := \mu \cdot V_{Ia}$ $V_{Nm} = 15325.7\ \dfrac{lbf}{ft}$

$R_R := \phi_s \cdot V_{Nm}$ $R_R = 15325.7\ \dfrac{lbf}{ft}$ Factored Sliding Resistance (From Friction)

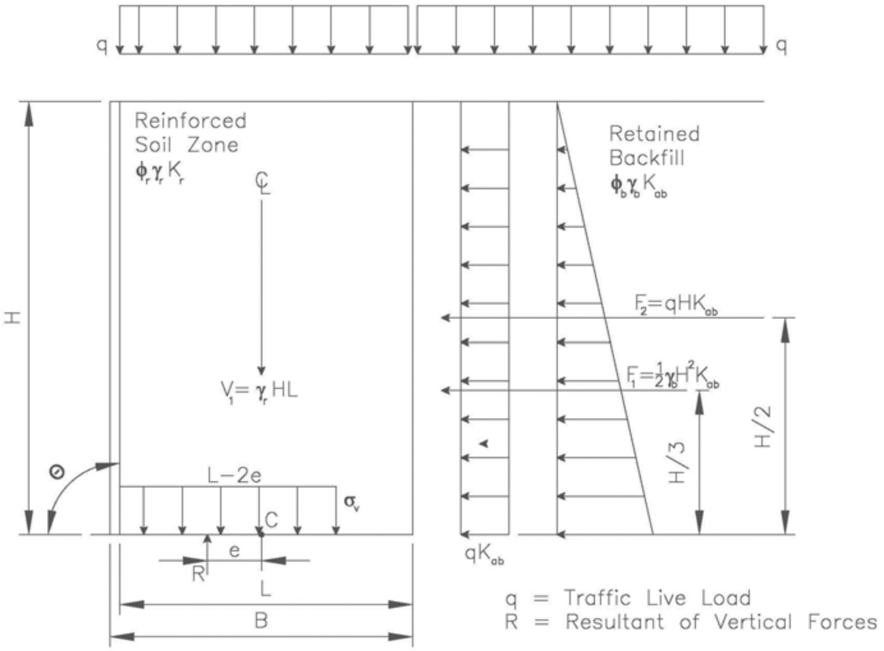
Sliding Capacity:Demand Ratio (CDR) - Drained Conditions

$CDR_{Sliding\_D} := \dfrac{R_R}{R_u}$ Is the CDR > or = to 1.0? $CDR_{Sliding\_D} = 1.06$

RETAINING WALL Z – STA. 1404+85.6

Objective: To evaluate the external stability of MSE wall design with vertical wall face and horizontal backfill.
Method: In accordance with ODOT Bridge Design Manual, 2013 [Sect. 307] LRFD Bridge Design Specifications, 8th Ed., 2018, [Sect. 11.10.5].
Assumptions:

- **Horizontal backfill behind MSE wall on granular (drained) soils.**
- **For battered or vertical walls with a back face of wall angle of θ to horizontal.**
- **Not for sheet type reinforcement. If so, use different assessment for Sliding parameter ϕ_{μ}.**
- **MSE wall not acting as abutment, if so must meet minimum embedment depth of H/10 if no slope in front of wall**
- **Load combinations and wall configuration are as shown below:**



Givens:

Wall Geometry:

$H_e := 26.6 \cdot ft$ Exposed wall height

$\theta := 90 \cdot deg$ Angle of back face of wall to horizontal: 90 deg for vertical or near vertical walls (per Berg et al., 2009; near vertical = 80 deg < θ < 100 deg)

Reinforced Backfill Soil Design Parameters:

$\phi'_r := 34 \cdot deg$ Effective angle of internal friction (Per BDM [Table 307-1])

$\gamma_r := 120 \cdot \frac{lbf}{ft^3}$ Unit weight (Per BDM [Table 307-1])

$c'_r := 0 \cdot \frac{lbf}{ft^2}$ Effective Cohesion

Retained Backfill Soil Design Parameters:

$\phi'_b := 30 \cdot deg$ Effective angle of internal friction (Per BDM [Table 307-1])

$\gamma_b := 120 \cdot \frac{lbf}{ft^3}$ Unit weight (Per BDM [Table 307-1])

$c'_b := 0 \cdot \frac{lbf}{ft^2}$ Effective Cohesion

Foundation Soil Design Parameters:

Drained Conditions (Effective Stress):

$\phi'_f := 33 \cdot \mathbf{deg}$ Effective angle of internal friction

$\gamma_f := 122 \cdot \dfrac{\mathbf{lbf}}{\mathbf{ft}^3}$ Unit weight

$c'_f := 0 \cdot \dfrac{\mathbf{lbf}}{\mathbf{ft}^2}$ Cohesion

Undrained Conditions (Total Stress):

$\phi_f := 33 \cdot \mathbf{deg}$ Angle of internal friction (Same as Drained Conditions if Sand)

$\gamma_f = 122 \ \dfrac{\mathbf{lbf}}{\mathbf{ft}^3}$ Unit weight

$c_f := 0 \cdot \dfrac{\mathbf{lbf}}{\mathbf{ft}^2}$ Cohesion (Use Su if Angle of internal friction = 0 deg)

Foundation Surcharge Soil Parameters:

$\gamma_q := 120 \cdot \dfrac{\mathbf{lbf}}{\mathbf{ft}^3}$ Unit weight of Soil above bearing depth (Used in Bearing Resistance of Soil Calculation LRFD 10.6.3.1.2a-1)

Depth of Embedment Check:

$d_{frost} := 3 \ \mathbf{ft}$ $d_{user} := 0 \ \mathbf{ft}$ Local Frost Depth

$Slope_{fw} := 0 \ \mathbf{deg}$

Inclination of ground slope in front of wall :

- Horizontal: **0**
- 3H:1V: **18.435**
- 2H:1V: **26.565**
- 1.5H:1V: **33.690**

$d_{est} := \max\left(d_{frost}, 3 \ \mathbf{ft}, d_{user}\right)$ $d_{est} = 3 \ \mathbf{ft}$

$H_{est} := d_{est} + \left(4 \ \mathbf{ft} \cdot \tan\left(Slope_{fw}\right)\right) + H_e$ $H_{est} = 29.6 \ \mathbf{ft}$

$$d_{eSlope} := \text{if}\left(Slope_{fw} < 1 \ \mathbf{deg}, \frac{H_{est}}{20}, \text{if}\left(Slope_{fw} < 26.565 \ \mathbf{deg}, \frac{H_{est}}{10}, \text{if}\left(Slope_{fw} < 33.69 \ \mathbf{deg}, \frac{H_{est}}{7}, \frac{H_{est}}{5}\right)\right)\right)$$

$d_{eSlope} = 1.5 \ \mathbf{ft}$ Minimum Embedment Depth per Table C11.10.2.2-1 of LRFD BDS

$d_e := \max\left(d_{est}, d_{eSlope}\right)$ $d_e = 3 \ \mathbf{ft}$ Minimum Required Embedment Depth used in analysis.

$H := d_e + \left(4 \ \mathbf{ft} \cdot \tan\left(Slope_{fw}\right)\right) + H_e$ $H = 29.6 \ \mathbf{ft}$ Design Wall Height

Estimate Length of Reinforcement:

$L_{user} := 0 \cdot \mathbf{ft}$ User inputted value (if changes need to be made to satisfy other requirements)

$L := \max\left(8 \cdot \mathbf{ft}, 0.7 \cdot H, L_{user}\right)$ $L = 20.7 \ \mathbf{ft}$ Length of Reinforcement

Live Load Surcharge Parameters:

$SUR := 250 \cdot \frac{lbf}{ft^2}$

Live load surcharge (per **LRFD BDS [3.11.6.4]** & **BDM [307.1.1]**)
Note: If vehicular loading is within 1 ft of the backface of the wall and with a design height, H, less than 20 ft, see **LRFD BDS Section 3.11.6.4 and Table 3.11.6.4-2** for adjusted surcharge load calculation.
Note: When traffic vehicular live loads are not present within 0.5*H from the back of the reinforced zone let SUR equal 100 psf to account for construction loads.

Calculations:

Active Earth Pressure:

$\beta := 0 \qquad \delta := \beta$

Inclination of ground slope behind face of wall and angle of friction between retained backfill and reinforced soil

$$\Gamma := \left(1 + \sqrt{\frac{\left(\sin\left(\phi'_b + \delta\right) \cdot \sin\left(\phi'_b - \beta\right)\right)}{\left(\sin\left(\theta - \delta\right) \cdot \sin\left(\theta + \beta\right)\right)}}\right)^2$$

$$k_{af} := \left(\frac{\left(\sin\left(\theta + \phi'_b\right)\right)^2}{\left(\Gamma \cdot \left(\sin\left(\theta\right)\right)^2 \cdot \sin\left(\theta - \delta\right)\right)}\right) \qquad k_{af} = 0.3333$$

Active Earth Pressure Coefficient

$F_T := \frac{1}{2} \cdot \gamma_b \cdot H^2 \cdot k_{af} \qquad F_T = 17523.2 \ \frac{lbf}{ft}$ Active Earth Force Resultant (EH)

$F_{SUR} := SUR \cdot H \cdot k_{af} \qquad F_{SUR} = 2466.7 \ \frac{lbf}{ft}$ Live Load Surcharge (LS)

Vertical Loads:

$V_1 := \gamma_r \cdot H \cdot L \qquad V_1 = 73597.4 \ \frac{lbf}{ft}$ Soil backfill - reinforced soil (EV)

$V_2 := SUR \cdot L \qquad V_2 = 5180 \ \frac{lbf}{ft}$ Live Load Surcharge - (LS)

Moment Arm: Moment:

$d_{v1} := 0 \cdot ft \qquad d_{v1} = 0 \ ft \qquad MV_1 := V_1 \cdot d_{v1} \qquad MV_1 = 0 \ \frac{lbf \cdot ft}{ft}$

$d_{v2} := 0 \ ft \qquad d_{v2} = 0 \ ft \qquad MV_2 := V_2 \cdot d_{v2} \qquad MV_2 = 0 \ \frac{lbf \cdot ft}{ft}$

Horizontal Loads:

$H_1 := F_T = 17523.2 \ \frac{lbf}{ft}$ Active Earth Force Resultant (horizontal comp. - EH)

$H_2 := F_{SUR} = 2466.7 \ \frac{lbf}{ft}$ Live Load Surcharge Resultant (horizontal comp. - LS)

Moment Arm: Moment:

$d_{h1} := \frac{H}{3} \qquad d_{h1} = 9.9 \ ft \qquad MH_1 := H_1 \cdot d_{h1} \qquad MH_1 = 172895.6 \ \frac{lbf \cdot ft}{ft}$

$d_{h2} := \frac{H}{2} \qquad d_{h2} = 14.8 \ ft \qquad MH_2 := H_2 \cdot d_{h2} \qquad MH_2 = 36506.7 \ \frac{lbf \cdot ft}{ft}$

Unfactored Loads by Load Type

$V_{EV} := V_1$ $\qquad$ $V_{EV} = 73597.4 \ \frac{lbf}{ft}$

$V_{LS} := V_2$ $\qquad$ $V_{LS} = 5180 \ \frac{lbf}{ft}$

$H_{EH} := H_1$ $\qquad$ $H_{EH} = 17523.2 \ \frac{lbf}{ft}$

$H_{LS} := H_2$ $\qquad$ $H_{LS} = 2466.7 \ \frac{lbf}{ft}$

Unfactored Moments by Load Type

$M_{EV} := MV_1$ $\qquad$ $M_{EV} = 0 \ \frac{lbf \cdot ft}{ft}$

$M_{LS} := MV_2$ $\qquad$ $M_{LS} = 0 \ \frac{lbf \cdot ft}{ft}$

$M_{EH2} := MH_1$ $\qquad$ $M_{EH2} = 172895.6 \ \frac{lbf \cdot ft}{ft}$

$M_{LS2} := MH_2$ $\qquad$ $M_{LS2} = 36506.7 \ \frac{lbf \cdot ft}{ft}$

Load Combination Limit States:

$\eta := 1$ LRFD Load Modifier

Strength Limit State I: EV(min) = 1.00 EV(max) = 1.35
EH(min) = 0.90 EH(max) = 1.50
LS = 1.75

Strength Limit State Ia: (Sliding and Eccentricity) $\qquad$ $Ia_{EV} := 1$ $\qquad$ $Ia_{EH} := 1.5$ $\qquad$ $Ia_{LS} := 1.75$

Strength Limit State Ib: (Bearing Capacity) $\qquad$ $Ib_{EV} := 1.35$ $\qquad$ $Ib_{EH} := 1.5$ $\qquad$ $Ib_{LS} := 1.75$

Factored Vertical Loads by Limit State:

$V_{Ia} := \eta \cdot \left(Ia_{EV} \cdot V_{EV}\right)$ $\qquad$ $V_{Ia} = 73597.4 \ \frac{lbf}{ft}$

$V_{Ib} := \eta \cdot \left(\left(Ib_{EV} \cdot V_{EV}\right) + \left(Ib_{LS} \cdot V_{LS}\right)\right)$ $\qquad$ $V_{Ib} = 108421.5 \ \frac{lbf}{ft}$

Factored Horizontal Loads by Limit State:

$H_{Ia} := \eta \cdot \left(\left(Ia_{LS} \cdot H_{LS}\right) + \left(Ia_{EH} \cdot H_{EH}\right)\right)$ $\qquad$ $H_{Ia} = 30601.5 \ \frac{lbf}{ft}$

$H_{Ib} := \eta \cdot \left(\left(Ib_{LS} \cdot H_{LS}\right) + \left(Ib_{EH} \cdot H_{EH}\right)\right)$ $\qquad$ $H_{Ib} = 30601.5 \ \frac{lbf}{ft}$

Factored Moments Produced by Vertical Loads by Limit State:

$MV_{Ia} := \eta \cdot \left(Ia_{EV} \cdot M_{EV}\right)$ $\qquad$ $MV_{Ia} = 0 \ \frac{lbf \cdot ft}{ft}$

$MV_{Ib} := \eta \cdot \left(\left(Ib_{EV} \cdot M_{EV}\right) + \left(Ib_{LS} \cdot M_{LS}\right)\right)$ $\qquad$ $MV_{Ib} = 0 \ \frac{lbf \cdot ft}{ft}$

Factored Moments Produced by Horizontal Loads by Limit State:

$MH_{Ia} := \eta \cdot \left(\left(Ia_{LS} \cdot M_{LS2}\right) + \left(Ia_{EH} \cdot M_{EH2}\right)\right)$ $\qquad$ $MH_{Ia} = 323230 \ \frac{lbf \cdot ft}{ft}$

$MH_{Ib} := \eta \cdot \left(\left(Ib_{LS} \cdot M_{LS2}\right) + \left(Ib_{EH} \cdot M_{EH2}\right)\right)$ $\qquad$ $MH_{Ib} = 323230 \ \frac{lbf \cdot ft}{ft}$

Compute Bearing Resistance:

Compute the Effective Bearing Length (Strength Ib):

$\Sigma M_R := MV_{Ib}$ $\qquad \Sigma M_R = 0\ \frac{lbf \cdot ft}{ft}$ Sum of Resisting Moments (Strength Ib)

$\Sigma M_O := MH_{Ib}$ $\qquad \Sigma M_O = 323230\ \frac{lbf \cdot ft}{ft}$ Sum of Overturning Moments (Strength Ib)

$\Sigma V := V_{Ib}$ $\qquad \Sigma V = 108421.5\ \frac{lbf}{ft}$ Sum of Vertical Loads (Strength Ib)

$e_{wall} := \frac{(\Sigma M_O - \Sigma M_R)}{\Sigma V}$ $\qquad e_{wall} = 3\ ft$ Wall Eccentricity

$B' := \text{if}\left(e_{wall} > 0, L - 2 \cdot e_{wall}, L\right)$ $\qquad B' = 14.8\ ft$ Effective Bearing Width

Foundation Layout:

$L_{Wall} := 44.5 \cdot ft$ Assumed Footing Length (Wall Section Length)

$H' := H_{Ib}$ $\qquad H' = 30601.5\ \frac{lbf}{ft}$ Summation of Horizontal Loads (Strength Ib)

$V' := V_{Ib}$ $\qquad V' = 108421.5\ \frac{lbf}{ft}$ Summation of Vertical Loads (Strength Ib)

$D_f := d_e$ $\qquad D_f = 3\ ft$ Footing embedment

$d_w := 0 \cdot ft$ Depth of Groundwater below Bearing Grade

$\theta' := 90 \cdot deg$ Direction of H' and V' resultant measured from wall back face **LRFD [Figure C10.6.3.1.2a-1]**

Drained Conditions (Effective Stress):

$$N_q := \text{if}\left(\phi'_f > 0, e^{\pi \cdot \tan(\phi'_f)} \cdot \tan\left(45\ deg + \frac{\phi'_f}{2}\right)^2, 1.0\right) \qquad N_q = 26.09$$

$$N_c := \text{if}\left(\phi'_f > 0, \frac{N_q - 1}{\tan(\phi'_f)}, 5.14\right) \qquad N_c = 38.64$$

$$N_\gamma := 2 \cdot (N_q + 1) \cdot \tan(\phi'_f) \qquad N_\gamma = 35.2$$

Compute shape correction factors per **LRFD [Table 10.6.3.1.2a-3]**:

$$s_c := \text{if}\left(\phi'_f > 0, 1 + \left(\frac{B'}{L_{Wall}}\right) \cdot \left(\frac{N_q}{N_c}\right), 1 + \left(\frac{B'}{5 \cdot L_{Wall}}\right)\right) \qquad s_c = 1.224$$

$$s_q := \text{if}\left(\phi'_f > 0, 1 + \left(\frac{B'}{L_{Wall}} \cdot \tan(\phi'_f)\right), 1\right) \qquad s_q = 1.215$$

$$s_\gamma := \text{if}\left(\phi'_f > 0, 1 - 0.4 \cdot \left(\frac{B'}{L_{Wall}}\right), 1\right) \qquad s_\gamma = 0.867$$

Load inclination factors using **LRFD [10.6.3.1.2a-5] thru [10.6.3.1.2a-9]:**

$i_q := 1$ $\quad i_q = 1$

$i_\gamma := 1$ $\quad i_\gamma = 1$

$i_c := 1$ $\quad i_c = 1$

Compute groundwater depth correction factors per **LRFD [Table 10.6.3.1.2a-2]**:

$C_{wq} := \text{if}\left(d_w \geq 0, 1, 0.5\right)$ $\quad C_{wq} = 1$

$C_{w\gamma} := \text{if}\left(d_w > 1.5 \cdot B', 1, 0.5\right)$ $\quad C_{w\gamma} = 0.5$

Depth Correction Factor per **Hanson (1970):**

$$d_q := \text{if}\left(\frac{D_f}{B'} \leq 1, 1 + 2 \cdot \tan\left(\phi'_f\right) \cdot \left(1 - \sin\left(\phi'_f\right)\right)^2 \cdot \frac{D_f}{B'}, 1 + 2 \cdot \tan\left(\phi'_f\right) \cdot \left(1 - \sin\left(\phi'_f\right)\right)^2 \cdot \text{atan}\left(\frac{D_f}{B'}\right)\right)$$

$d_q = 1.1$

Compute modified bearing capacity factors **LRFD [Equation 10.6.3.1.2a-2 to 10.6.3.1.2a-4]:**

$N_{cm} := N_c \cdot s_c \cdot i_c$ $\quad N_{cm} = 47.291$

$N_{qm} := N_q \cdot s_q \cdot i_q$ $\quad N_{qm} = 31.711$

$N_{\gamma m} := N_\gamma \cdot s_\gamma \cdot i_\gamma$ $\quad N_{\gamma m} = 30.52$

Compute nominal bearing resistance, **LRFD [Eq 10.6.3.1.2a-1]:**

$q_{nd} := c'_f \cdot N_{cm} + \gamma_q \cdot D_f \cdot N_{qm} \cdot d_q \cdot C_{wq} + 0.5 \cdot \gamma_f \cdot B' \cdot N_{\gamma m} \cdot C_{w\gamma}$ $\quad q_{nd} = 25778.2 \ \frac{lbf}{ft^2}$

Compute factored bearing resistance, **LRFD [Eq 10.6.3.1.1]:**

$\phi_b := 0.65$ Bearing resistance factor **LRFD Table 11.5.7-1.**

$q_{Rd} := \phi_b \cdot q_{nd}$ $\quad q_{Rd} = 16.8 \ ksf$ Factored bearing resistance Drained Conditions

Undrained Conditions (Effective Stress):

$N_q := \text{if}\left(\phi_f > 0, e^{\pi \cdot \tan\left(\phi_f\right)} \cdot \tan\left(45 \ deg + \frac{\phi_f}{2}\right)^2, 1.0\right)$ $\quad N_q = 26.09$

$N_c := \text{if}\left(\phi_f > 0, \frac{N_q - 1}{\tan\left(\phi_f\right)}, 5.14\right)$ $\quad N_c = 38.64$

$N_\gamma := 2 \cdot \left(N_q + 1\right) \cdot \tan\left(\phi_f\right)$ $\quad N_\gamma = 35.2$

Compute shape correction factors per **LRFD [Table 10.6.3.1.2a-3]**:

$s_c := \text{if}\left(\phi_f > 0, 1 + \left(\frac{B'}{L_{Wall}}\right) \cdot \left(\frac{N_q}{N_c}\right), 1 + \left(\frac{B'}{5 \cdot L_{Wall}}\right)\right)$ $s_c = 1.224$

$s_q := \text{if}\left(\phi_f > 0, 1 + \left(\frac{B'}{L_{Wall}} \cdot \tan\left(\phi_f\right)\right), 1\right)$ $s_q = 1.215$

$s_\gamma := \text{if}\left(\phi_f > 0, 1 - 0.4 \cdot \left(\frac{B'}{L_{Wall}}\right), 1\right)$ $s_\gamma = 0.867$

Load inclination factors using **LRFD [10.6.3.1.2a-5] thru [10.6.3.1.2a-9]:**

$i_q := 1$ $i_q = 1$

$i_\gamma := 1$ $i_\gamma = 1$

$i_c := 1$ $i_c = 1$

Compute modified bearing capacity factors **LRFD [Equation 10.6.3.1.2a-2 to 10.6.3.1.2a-4]:**

$N_{cm} := N_c \cdot s_c \cdot i_c$ $N_{cm} = 47.291$

$N_{qm} := N_q \cdot s_q \cdot i_q$ $N_{qm} = 31.711$

$N_{\gamma m} := N_\gamma \cdot s_\gamma \cdot i_\gamma$ $N_{\gamma m} = 30.52$

Compute nominal bearing resistance, **LRFD [Eq 10.6.3.1.2a-1:**

$q_{nu} := c_f \cdot N_{cm} + \gamma_q \cdot D_f \cdot N_{qm} \cdot d_q \cdot C_{wq} + 0.5 \cdot \gamma_f \cdot B' \cdot N_{\gamma m} \cdot C_{w\gamma}$ $q_{nu} = 25778.2 \ \frac{lbf}{ft^2}$

Compute factored bearing resistance, **LRFD [Eq 10.6.3.1.1]:**

$\phi_b := 0.65$ Bearing resistance factor **LRFD Table 11.5.7-1.**

$q_{Ru} := \phi_b \cdot q_{nu}$ $q_{Ru} = 16.8 \ ksf$ Factored bearing resistance Undrained Conditions

Factored Bearing Resistance Drained vs. Undrained Conditions:

Drained Conditions: $q_{Rd} = 16.8 \ ksf$

Undrained Conditions: $q_{Ru} = 16.8 \ ksf$

Factored Bearing Resistance to be used in CDR Calculations:

$q_R := q_{Rd}$

$q_R = 16.8 \ ksf$

Evaluate External Stability of Wall:

Bearing Resistance at Base of the Wall:

Compute the resultant location (distance from Point 'O'):

$\Sigma M_R := MV_{Ib}$	$\Sigma M_R = 0\ \frac{lbf \cdot ft}{ft}$	Sum of Resisting Moments (Strength Ib)
$\Sigma M_O := MH_{Ib}$	$\Sigma M_O = 323230\ \frac{lbf \cdot ft}{ft}$	Sum of Overturning Moments (Strength Ib)
$\Sigma V := V_{Ib}$	$\Sigma V = 108421.5\ \frac{lbf}{ft}$	Sum of Vertical Loads (Strength Ib)
$e_{wall} := \frac{(\Sigma M_O - \Sigma M_R)}{\Sigma V}$	$e_{wall} = 3\ ft$	Wall Eccentricity
$B' := \text{if}(e_{wall} > 0, L - 2 \cdot e_{wall}, L)$	$B' = 14.8\ ft$	Effective Bearing Width

Compute the ultimate bearing stress:

$\sigma_v := \frac{\Sigma V}{B'}$	$\sigma_v = 7346.9\ \frac{lbf}{ft^2}$	Ultimate Bearing Stress

Bearing Capacity:Demand Ratio (CDR)

$CDR_{Bearing} := \frac{q_R}{\sigma_v}$ Is the CDR > or = to 1.0? $CDR_{Bearing} = 2.28$

Limiting Eccentricity at Base of MSE Wall (Strength Ia):

$e_{max} := \frac{L}{3}$	$e_{max} = 6.9\ ft$	Maximum Eccentricity **LRFD [C11.6.3.3.]**
$\Sigma M_R := MV_{Ia}$	$\Sigma M_R = 0\ \frac{lbf \cdot ft}{ft}$	Sum of Resisting Moments (Strength Ia)
$\Sigma M_O := MH_{Ia}$	$\Sigma M_O = 323230\ \frac{lbf \cdot ft}{ft}$	Sum of Overturning Moments (Strength Ia)
$\Sigma V := V_{Ia}$	$\Sigma V = 73597.4\ \frac{lbf}{ft}$	Sum of Vertical Loads (Strength Ia)
$e_{wall} := \frac{(\Sigma M_O - \Sigma M_R)}{\Sigma V}$	$e_{wall} = 4.4\ ft$	

Eccentricity Capacity:Demand Ratio (CDR)

$CDR_{Eccentricity} := \frac{e_{max}}{e_{wall}}$ Is the CDR > or = to 1.0? $CDR_{Eccentricity} = 1.57$

Sliding Resistance at Base of Wall LRFD [10.6.3.4]:

Factored Sliding Force (Strength Ia):

$F_\tau := H_{Ia}$ $\quad$ $F_\tau = 30601.5 \ \frac{lbf}{ft}$

Compute sliding resistance between soil and foundation:

Drained Conditions:

$\Sigma V := V_{Ia}$ $\quad$ $\Sigma V = 73597.4 \ \frac{lbf}{ft}$ $\quad$ Sum of Vertical Loads (Strength Ia)

$R_{\tau d} := \Sigma V \cdot \tan\left(\phi'_f\right)$ $\quad$ $R_{\tau d} = 47794.7 \ \frac{lbf}{ft}$ $\quad$ Nominal sliding resistance Drained Conditions

Nominal Sliding Resistance Drained Conditions:

Drained Conditions: $R_{\tau d} = 47.795 \ \frac{kip}{ft}$

Nominal Sliding Resistance to be used in CDR Calculations: $R_\tau := R_{\tau d}$

Compute factored resistance against failure by sliding **LRFD [10.6.3.4]**:

$\phi_\tau := 1.0$ $\quad$ Resistance factor for sliding resistance specified in **LRFD Table 11.5.7-1.**

$\phi R_n := \phi_\tau \cdot R_\tau$ $\quad$ $R_R := \phi R_n$

$R_R = 47.8 \ \frac{kip}{ft}$

Sliding Capacity:Demand Ratio (CDR)

$CDR_{Sliding} := \frac{R_R}{F_\tau}$ $\quad$ Is the CDR > or = to 1.0? $\quad$ $CDR_{Sliding} = 1.56$

APPENDIX E

SETTLEMENT ANALYSIS - RETAINING WALLS Y AND Z

RETAINING WALL Y ALIGNMENT

CUY-90-16.28 (CCG3A)

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PROJECT IDENTIFICATION

Title:	CUY-90-16.28 (CCG3A)
Project Number:	PID 82382 -
Client:	Michael Baker International
Designer:	KCA
Station Number:	

Description:

Company's information:

Name:	NEAS Inc.
Street:	2800 Coroporate Exchange Drive, Suite 240 Columbus, OH 43231
Telephone #:	614-714-0299
Fax #:	614-714-0251
E-Mail:	brendan.andrews@neasinc.com

Original file path and name: P:\21-0011 ..... ysis\Wall Y\Settlement\FOSSA\WallY_FOSSA081921.2ST
Original date and time of creating this file: Tue Jun 29 16:28:11 2021

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 10 layers

	Wet Unit Weight, γ [lb/ft³]	**Poisson's Ratio μ**	**Description of Soil**
1	122.00	0.20	ST1 - Granular
2	105.00	0.40	ST3 - Cohesive
3	110.00	0.25	ST2 - Granular
4	128.00	0.30	ST4 - Granular
5	105.00	0.40	ST3 - Cohesive
6	128.00	0.30	ST4 - Granular
7	130.00	0.30	ST5a - Granular
8	125.00	0.45	ST5b - Cohesive
9	130.00	0.50	ST5c - Cohesive
10	150.00	0.20	Termination Layer

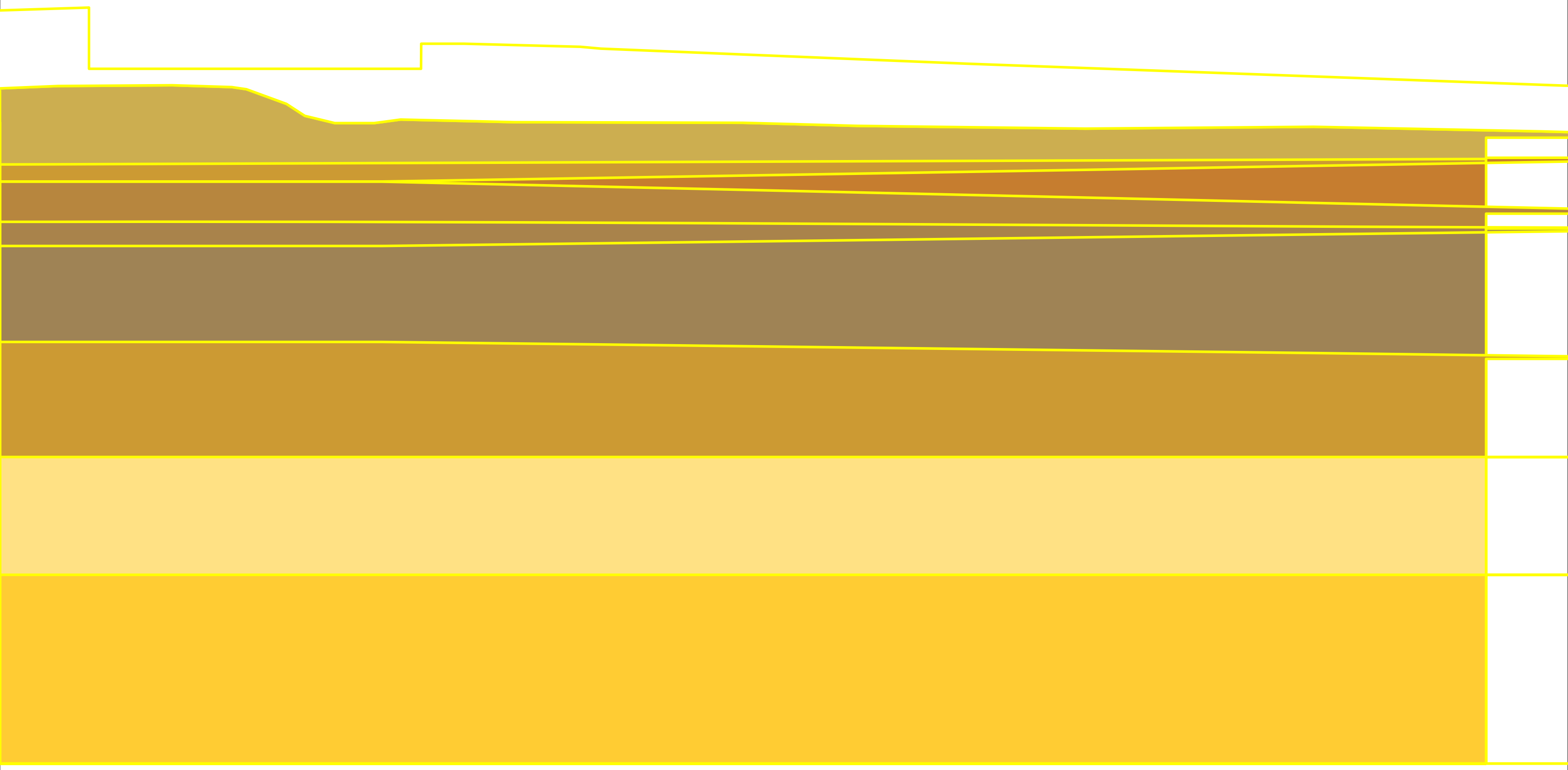
INPUT DATA – EMBANKMENT LAYERS -- 1 layers

	Wet Unit Weight, γ [lb/ft³]	**Description of Soil**
1	120.00	Proposed Embankment

INPUT DATA OF WATER

Point #	**Coordinates (X, Z) :** (X) [ft.]	(Z) [ft.]
1	0.00	648.80
2	404.00	649.00

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION -- $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	No	N/A	N/A	N/A	N/A	N/A	N/A
5	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
6	No	N/A	N/A	N/A	N/A	N/A	N/A
7	Yes	1.30	0.100	0.020	0.585	0.5400	Top
8	Yes	1.20	0.100	0.020	0.784	0.2300	Top
9	Yes	1.10	0.120	0.024	0.534	0.2100	Top
10	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	0.00	0.00	1	505000	0.2000	0.0249	678.70	678.63	0.07
			2	363000	0.4000	0.0051			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0056			
			5	363000	0.4000	0.0065			
			6	957000	0.3000	0.0112			
			7	2000000	0.3000	0.0055			
			8	2000000	0.4500	0.0026			
			9	2000000	0.5000	0.0126			
			10	1000000000(	0.2000	0.0000			
2	10.00	0.00	1	505000	0.2000	0.0511	679.10	678.98	0.12
			2	363000	0.4000	0.0103			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0091			
			5	363000	0.4000	0.0104			
			6	957000	0.3000	0.0149			
			7	2000000	0.3000	0.0066			
			8	2000000	0.4500	0.0034			
			9	2000000	0.5000	0.0152			
			10	1000000000(	0.2000	0.0000			
3	20.00	0.00	1	505000	0.2000	0.0530	679.50	679.37	0.13
			2	363000	0.4000	0.0109			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0098			
			5	363000	0.4000	0.0112			
			6	957000	0.3000	0.0163			
			7	2000000	0.3000	0.0074			
			8	2000000	0.4500	0.0041			
			9	2000000	0.5000	0.0179			
			10	1000000000(	0.2000	0.0000			
4	30.00	0.00	1	505000	0.2000	0.0424	679.74	679.63	0.11
			2	363000	0.4000	0.0072			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0076			
			5	363000	0.4000	0.0089			
			6	957000	0.3000	0.0154			
			7	2000000	0.3000	0.0078			
			8	2000000	0.4500	0.0046			
			9	2000000	0.5000	0.0206			
			10	1000000000(	0.2000	0.0000			
5	40.00	0.00	1	505000	0.2000	0.0133	679.82	679.74	0.08
			2	363000	0.4000	0.0022			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0045			
			5	363000	0.4000	0.0054			
			6	957000	0.3000	0.0134			
			7	2000000	0.3000	0.0080			
			8	2000000	0.4500	0.0051			
			9	2000000	0.5000	0.0232			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
6	50.00	0.00	1	505000	0.2000	0.0104	679.90	679.83	0.07
			2	363000	0.4000	0.0001			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0028			
			5	363000	0.4000	0.0030			
			6	957000	0.3000	0.0119			
			7	2000000	0.3000	0.0082			
			8	2000000	0.4500	0.0056			
			9	2000000	0.5000	0.0258			
			10	1000000000(	0.2000	0.0000			
7	60.00	0.00	1	505000	0.2000	0.0112	679.59	679.52	0.07
			2	363000	0.4000	0.0002			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0028			
			5	363000	0.4000	0.0026			
			6	957000	0.3000	0.0119			
			7	2000000	0.3000	0.0086			
			8	2000000	0.4500	0.0061			
			9	2000000	0.5000	0.0284			
			10	1000000000(	0.2000	0.0000			
8	70.00	0.00	1	505000	0.2000	0.0157	677.62	677.53	0.09
			2	363000	0.4000	0.0019			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0040			
			5	363000	0.4000	0.0040			
			6	957000	0.3000	0.0135			
			7	2000000	0.3000	0.0093			
			8	2000000	0.4500	0.0067			
			9	2000000	0.5000	0.0309			
			10	1000000000(	0.2000	0.0000			
9	80.00	0.00	1	505000	0.2000	0.0175	672.96	672.86	0.10
			2	363000	0.4000	0.0045			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0058			
			5	363000	0.4000	0.0063			
			6	957000	0.3000	0.0160			
			7	2000000	0.3000	0.0103			
			8	2000000	0.4500	0.0075			
			9	2000000	0.5000	0.0334			
			10	1000000000(	0.2000	0.0000			
10	90.00	0.00	1	505000	0.2000	0.0184	671.60	671.48	0.12
			2	363000	0.4000	0.0063			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0075			
			5	363000	0.4000	0.0087			
			6	957000	0.3000	0.0191			
			7	2000000	0.3000	0.0115			
			8	2000000	0.4500	0.0082			
			9	2000000	0.5000	0.0358			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft^2]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
11	100.00	0.00	1	505000	0.2000	0.0226	672.40	672.27	0.13
			2	363000	0.4000	0.0077			
			3	183000	0.2500	0.0000			
			4	957000	0.3000	0.0090			
			5	363000	0.4000	0.0103			
			6	957000	0.3000	0.0220			
			7	2000000	0.3000	0.0126			
			8	2000000	0.4500	0.0090			
			9	2000000	0.5000	0.0381			
			10	1000000000(	0.2000	0.0000			
12	110.00	0.00	1	505000	0.2000	0.0275	672.16	672.01	0.15
			2	363000	0.4000	0.0090			
			3	183000	0.2500	0.0044			
			4	957000	0.3000	0.0105			
			5	363000	0.4000	0.0120			
			6	957000	0.3000	0.0250			
			7	2000000	0.3000	0.0137			
			8	2000000	0.4500	0.0097			
			9	2000000	0.5000	0.0402			
			10	1000000000(	0.2000	0.0000			
13	120.00	0.00	1	505000	0.2000	0.0283	671.92	671.76	0.16
			2	363000	0.4000	0.0099			
			3	183000	0.2500	0.0073			
			4	957000	0.3000	0.0110			
			5	363000	0.4000	0.0125			
			6	957000	0.3000	0.0270			
			7	2000000	0.3000	0.0144			
			8	2000000	0.4500	0.0103			
			9	2000000	0.5000	0.0422			
			10	1000000000(	0.2000	0.0000			
14	130.00	0.00	1	505000	0.2000	0.0272	671.79	671.62	0.17
			2	363000	0.4000	0.0098			
			3	183000	0.2500	0.0124			
			4	957000	0.3000	0.0108			
			5	363000	0.4000	0.0128			
			6	957000	0.3000	0.0285			
			7	2000000	0.3000	0.0150			
			8	2000000	0.4500	0.0108			
			9	2000000	0.5000	0.0438			
			10	1000000000(	0.2000	0.0000			
15	140.00	0.00	1	505000	0.2000	0.0265	671.77	671.60	0.17
			2	363000	0.4000	0.0086			
			3	183000	0.2500	0.0147			
			4	957000	0.3000	0.0107			
			5	363000	0.4000	0.0119			
			6	957000	0.3000	0.0293			
			7	2000000	0.3000	0.0154			
			8	2000000	0.4500	0.0112			
			9	2000000	0.5000	0.0452			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
16	150.00	0.00	1	505000	0.2000	0.0257	671.75	671.58	0.17
			2	363000	0.4000	0.0082			
			3	183000	0.2500	0.0167			
			4	957000	0.3000	0.0100			
			5	363000	0.4000	0.0114			
			6	957000	0.3000	0.0295			
			7	2000000	0.3000	0.0153			
			8	2000000	0.4500	0.0114			
			9	2000000	0.5000	0.0464			
			10	1000000000(	0.2000	0.0000			
17	160.00	0.00	1	505000	0.2000	0.0249	671.73	671.56	0.17
			2	363000	0.4000	0.0071			
			3	183000	0.2500	0.0185			
			4	957000	0.3000	0.0096			
			5	363000	0.4000	0.0102			
			6	957000	0.3000	0.0291			
			7	2000000	0.3000	0.0154			
			8	2000000	0.4500	0.0115			
			9	2000000	0.5000	0.0472			
			10	1000000000(	0.2000	0.0000			
18	170.00	0.00	1	505000	0.2000	0.0242	671.71	671.54	0.17
			2	363000	0.4000	0.0067			
			3	183000	0.2500	0.0203			
			4	957000	0.3000	0.0090			
			5	363000	0.4000	0.0099			
			6	957000	0.3000	0.0290			
			7	2000000	0.3000	0.0153			
			8	2000000	0.4500	0.0115			
			9	2000000	0.5000	0.0477			
			10	1000000000(	0.2000	0.0000			
19	180.00	0.00	1	505000	0.2000	0.0229	671.56	671.39	0.17
			2	363000	0.4000	0.0065			
			3	183000	0.2500	0.0243			
			4	957000	0.3000	0.0088			
			5	363000	0.4000	0.0088			
			6	957000	0.3000	0.0288			
			7	2000000	0.3000	0.0149			
			8	2000000	0.4500	0.0114			
			9	2000000	0.5000	0.0480			
			10	1000000000(	0.2000	0.0000			
20	190.00	0.00	1	505000	0.2000	0.0218	671.28	671.11	0.17
			2	363000	0.4000	0.0058			
			3	183000	0.2500	0.0261			
			4	957000	0.3000	0.0082			
			5	363000	0.4000	0.0086			
			6	957000	0.3000	0.0282			
			7	2000000	0.3000	0.0147			
			8	2000000	0.4500	0.0113			
			9	2000000	0.5000	0.0481			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
21	200.00	0.00	1	505000	0.2000	0.0207	671.00	670.83	0.17
			2	363000	0.4000	0.0057			
			3	183000	0.2500	0.0278			
			4	957000	0.3000	0.0081			
			5	363000	0.4000	0.0077			
			6	957000	0.3000	0.0280			
			7	2000000	0.3000	0.0144			
			8	2000000	0.4500	0.0111			
			9	2000000	0.5000	0.0479			
			10	1000000000(	0.2000	0.0000			
22	210.00	0.00	1	505000	0.2000	0.0203	670.88	670.71	0.17
			2	363000	0.4000	0.0050			
			3	183000	0.2500	0.0294			
			4	957000	0.3000	0.0076			
			5	363000	0.4000	0.0075			
			6	957000	0.3000	0.0278			
			7	2000000	0.3000	0.0140			
			8	2000000	0.4500	0.0109			
			9	2000000	0.5000	0.0474			
			10	1000000000(	0.2000	0.0000			
23	220.00	0.00	1	505000	0.2000	0.0190	670.76	670.59	0.17
			2	363000	0.4000	0.0049			
			3	183000	0.2500	0.0309			
			4	957000	0.3000	0.0074			
			5	363000	0.4000	0.0066			
			6	957000	0.3000	0.0277			
			7	2000000	0.3000	0.0137			
			8	2000000	0.4500	0.0107			
			9	2000000	0.5000	0.0468			
			10	1000000000(	0.2000	0.0000			
24	230.00	0.00	1	505000	0.2000	0.0187	670.64	670.47	0.17
			2	363000	0.4000	0.0048			
			3	183000	0.2500	0.0343			
			4	957000	0.3000	0.0069			
			5	363000	0.4000	0.0065			
			6	957000	0.3000	0.0270			
			7	2000000	0.3000	0.0132			
			8	2000000	0.4500	0.0104			
			9	2000000	0.5000	0.0459			
			10	1000000000(	0.2000	0.0000			
25	240.00	0.00	1	505000	0.2000	0.0175	670.52	670.36	0.16
			2	363000	0.4000	0.0041			
			3	183000	0.2500	0.0356			
			4	957000	0.3000	0.0064			
			5	363000	0.4000	0.0057			
			6	957000	0.3000	0.0267			
			7	2000000	0.3000	0.0129			
			8	2000000	0.4500	0.0101			
			9	2000000	0.5000	0.0449			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
26	250.00	0.00	1	505000	0.2000	0.0171	670.40	670.24	0.16
			2	363000	0.4000	0.0040			
			3	183000	0.2500	0.0366			
			4	957000	0.3000	0.0063			
			5	363000	0.4000	0.0055			
			6	957000	0.3000	0.0263			
			7	2000000	0.3000	0.0126			
			8	2000000	0.4500	0.0098			
			9	2000000	0.5000	0.0438			
			10	1000000000(	0.2000	0.0000			
27	260.00	0.00	1	505000	0.2000	0.0166	670.48	670.32	0.16
			2	363000	0.4000	0.0033			
			3	183000	0.2500	0.0374			
			4	957000	0.3000	0.0057			
			5	363000	0.4000	0.0047			
			6	957000	0.3000	0.0258			
			7	2000000	0.3000	0.0120			
			8	2000000	0.4500	0.0095			
			9	2000000	0.5000	0.0425			
			10	1000000000(	0.2000	0.0000			
28	270.00	0.00	1	505000	0.2000	0.0160	670.56	670.40	0.16
			2	363000	0.4000	0.0032			
			3	183000	0.2500	0.0397			
			4	957000	0.3000	0.0055			
			5	363000	0.4000	0.0045			
			6	957000	0.3000	0.0250			
			7	2000000	0.3000	0.0117			
			8	2000000	0.4500	0.0091			
			9	2000000	0.5000	0.0412			
			10	1000000000(	0.2000	0.0000			
29	280.00	0.00	1	505000	0.2000	0.0154	670.64	670.49	0.15
			2	363000	0.4000	0.0026			
			3	183000	0.2500	0.0400			
			4	957000	0.3000	0.0050			
			5	363000	0.4000	0.0038			
			6	957000	0.3000	0.0245			
			7	2000000	0.3000	0.0113			
			8	2000000	0.4500	0.0088			
			9	2000000	0.5000	0.0397			
			10	1000000000(	0.2000	0.0000			
30	290.00	0.00	1	505000	0.2000	0.0148	670.72	670.57	0.15
			2	363000	0.4000	0.0025			
			3	183000	0.2500	0.0402			
			4	957000	0.3000	0.0049			
			5	363000	0.4000	0.0032			
			6	957000	0.3000	0.0240			
			7	2000000	0.3000	0.0108			
			8	2000000	0.4500	0.0085			
			9	2000000	0.5000	0.0382			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ^{2}]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
31	300.00	0.00	1	505000	0.2000	0.0143	670.80	670.66	0.14
			2	363000	0.4000	0.0024			
			3	183000	0.2500	0.0406			
			4	957000	0.3000	0.0045			
			5	363000	0.4000	0.0031			
			6	957000	0.3000	0.0236			
			7	2000000	0.3000	0.0105			
			8	2000000	0.4500	0.0081			
			9	2000000	0.5000	0.0366			
			10	1000000000(	0.2000	0.0000			
32	310.00	0.00	1	505000	0.2000	0.0140	670.60	670.46	0.14
			2	363000	0.4000	0.0019			
			3	183000	0.2500	0.0414			
			4	957000	0.3000	0.0044			
			5	363000	0.4000	0.0025			
			6	957000	0.3000	0.0230			
			7	2000000	0.3000	0.0100			
			8	2000000	0.4500	0.0079			
			9	2000000	0.5000	0.0348			
			10	1000000000(	0.2000	0.0000			
33	320.00	0.00	1	505000	0.2000	0.0132	670.40	670.26	0.14
			2	363000	0.4000	0.0019			
			3	183000	0.2500	0.0440			
			4	957000	0.3000	0.0040			
			5	363000	0.4000	0.0025			
			6	957000	0.3000	0.0228			
			7	2000000	0.3000	0.0097			
			8	2000000	0.4500	0.0076			
			9	2000000	0.5000	0.0328			
			10	1000000000(	0.2000	0.0000			
34	330.00	0.00	1	505000	0.2000	0.0124	670.20	670.06	0.14
			2	363000	0.4000	0.0015			
			3	183000	0.2500	0.0451			
			4	957000	0.3000	0.0040			
			5	363000	0.4000	0.0020			
			6	957000	0.3000	0.0227			
			7	2000000	0.3000	0.0094			
			8	2000000	0.4500	0.0072			
			9	2000000	0.5000	0.0307			
			10	1000000000(	0.2000	0.0000			
35	340.00	0.00	1	505000	0.2000	0.0117	670.00	669.87	0.13
			2	363000	0.4000	0.0015			
			3	183000	0.2500	0.0462			
			4	957000	0.3000	0.0037			
			5	363000	0.4000	0.0020			
			6	957000	0.3000	0.0225			
			7	2000000	0.3000	0.0089			
			8	2000000	0.4500	0.0067			
			9	2000000	0.5000	0.0285			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
36	350.00	0.00	1	505000	0.2000	0.0116	669.80	669.67	0.13
			2	363000	0.4000	0.0015			
			3	183000	0.2500	0.0474			
			4	957000	0.3000	0.0034			
			5	363000	0.4000	0.0016			
			6	957000	0.3000	0.0219			
			7	2000000	0.3000	0.0084			
			8	2000000	0.4500	0.0062			
			9	2000000	0.5000	0.0261			
			10	1000000000(	0.2000	0.0000			
37	360.00	0.00	1	505000	0.2000	0.0109	669.54	669.42	0.12
			2	363000	0.4000	0.0011			
			3	183000	0.2500	0.0486			
			4	957000	0.3000	0.0034			
			5	363000	0.4000	0.0016			
			6	957000	0.3000	0.0214			
			7	2000000	0.3000	0.0079			
			8	2000000	0.4500	0.0057			
			9	2000000	0.5000	0.0236			
			10	1000000000(	0.2000	0.0000			
38	370.00	0.00	1	505000	0.2000	0.0103	669.28	669.16	0.12
			2	363000	0.4000	0.0011			
			3	183000	0.2500	0.0511			
			4	957000	0.3000	0.0031			
			5	363000	0.4000	0.0010			
			6	957000	0.3000	0.0204			
			7	2000000	0.3000	0.0071			
			8	2000000	0.4500	0.0050			
			9	2000000	0.5000	0.0210			
			10	1000000000(	0.2000	0.0000			
39	380.00	0.00	1	505000	0.2000	0.0096	669.02	668.91	0.11
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0508			
			4	957000	0.3000	0.0029			
			5	363000	0.4000	0.0010			
			6	957000	0.3000	0.0186			
			7	2000000	0.3000	0.0063			
			8	2000000	0.4500	0.0042			
			9	2000000	0.5000	0.0183			
			10	1000000000(	0.2000	0.0000			
40	390.00	0.00	1	505000	0.2000	0.0085	668.76	668.67	0.10
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0466			
			4	957000	0.3000	0.0022			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0154			
			7	2000000	0.3000	0.0053			
			8	2000000	0.4500	0.0033			
			9	2000000	0.5000	0.0156			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
41	400.00	0.00	1	505000	0.2000	0.0057	668.50	668.43	0.07
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0330			
			4	957000	0.3000	0.0015			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0113			
			7	2000000	0.3000	0.0041			
			8	2000000	0.4500	0.0024			
			9	2000000	0.5000	0.0129			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	0.00	0.00	678.70	0.18	678.52
2	10.00	0.00	679.10	0.22	678.88
3	20.00	0.00	679.50	0.23	679.27
4	30.00	0.00	679.74	0.22	679.52
5	40.00	0.00	679.82	0.20	679.62
6	50.00	0.00	679.90	0.19	679.71
7	60.00	0.00	679.59	0.20	679.39
8	70.00	0.00	677.62	0.24	677.38
9	80.00	0.00	672.96	0.33	672.63
10	90.00	0.00	671.60	0.39	671.21
11	100.00	0.00	672.40	0.41	671.99
12	110.00	0.00	672.16	0.45	671.71
13	120.00	0.00	671.92	0.48	671.44
14	130.00	0.00	671.79	0.49	671.30
15	140.00	0.00	671.77	0.50	671.27
16	150.00	0.00	671.75	0.49	671.26
17	160.00	0.00	671.73	0.49	671.24
18	170.00	0.00	671.71	0.48	671.23
19	180.00	0.00	671.56	0.47	671.09
20	190.00	0.00	671.28	0.47	670.81
21	200.00	0.00	671.00	0.46	670.54
22	210.00	0.00	670.88	0.45	670.43
23	220.00	0.00	670.76	0.43	670.33
24	230.00	0.00	670.64	0.41	670.23
25	240.00	0.00	670.52	0.40	670.12

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
26	250.00	0.00	670.40	0.38	670.02
27	260.00	0.00	670.48	0.35	670.13
28	270.00	0.00	670.56	0.33	670.23
29	280.00	0.00	670.64	0.31	670.33
30	290.00	0.00	670.72	0.28	670.44
31	300.00	0.00	670.80	0.26	670.54
32	310.00	0.00	670.60	0.24	670.36
33	320.00	0.00	670.40	0.22	670.18
34	330.00	0.00	670.20	0.21	669.99
35	340.00	0.00	670.00	0.19	669.81
36	350.00	0.00	669.80	0.17	669.63
37	360.00	0.00	669.54	0.15	669.39
38	370.00	0.00	669.28	0.13	669.15
39	380.00	0.00	669.02	0.11	668.91
40	390.00	0.00	668.76	0.10	668.67
41	400.00	0.00	668.50	0.08	668.42

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	678.70	ST1 - Granular
	2	25.00	679.70	
	3	50.00	679.90	
	4	63.00	679.50	
	5	66.20	679.00	
	6	75.00	675.80	
	7	79.00	673.20	
	8	85.60	671.60	
	9	94.20	671.60	
	10	100.00	672.40	
	11	125.00	671.80	
	12	175.00	671.70	
	13	200.00	671.00	
	14	250.00	670.40	
	15	300.00	670.80	
	16	350.00	669.80	
	17	404.00	668.40	
2	1	0.00	662.50	ST3 - Cohesive
	2	404.00	664.01	
3	1	0.00	658.80	ST2 - Granular
	2	96.00	658.80	
	3	404.00	664.00	
4	1	0.00	658.79	ST4 - Granular
	2	96.00	658.79	
	3	404.00	651.80	
5	1	0.00	650.00	ST3 - Cohesive
	2	96.00	650.00	
	3	404.00	648.51	
6	1	0.00	644.70	ST4 - Granular
	2	96.00	644.70	
	3	404.00	648.50	
7	1	0.00	623.70	ST5a - Granular
	2	96.00	623.70	
	3	404.00	620.00	
8	1	0.00	598.50	ST5b - Cohesive
	2	404.00	598.50	
9	1	0.00	572.70	ST5c - Cohesive
	2	404.00	572.70	
10	1	0.00	450.00	Termination Layer
	2	404.00	450.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	D E S C R I P T I O N
1	X1 = 0.00 [ft]	1	0.00	678.70	Proposed Embankment
	X2 = 404.00 [ft]	2	0.01	695.90	
		3	31.75	696.90	
		4	31.76	683.50	
		5	104.50	683.50	
		6	104.51	689.00	
		7	113.90	689.00	
		8	139.40	688.30	
		9	143.90	687.90	
		10	195.60	685.80	
		11	224.20	684.60	
		12	403.99	678.00	
		13	404.00	678.00	
		14	404.00	668.30	

RETAINING WALL Y – STA. 01+00 (FORWARD ABUTMENT)

CUY-90-16.28 (CCG3A)

PROJECT IDENTIFICATION

Title:	CUY-90-16.28 (CCG3A)
Project Number:	PID 82382 -
Client:	Michael Baker International
Designer:	KCA
Station Number:	

Description:

Company's information:

Name:	NEAS Inc.
Street:	2800 Coroporate Exchange Drive, Suite 240 Columbus, OH 43231
Telephone #:	614-714-0299
Fax #:	614-714-0251
E-Mail:	brendan.andrews@neasinc.com

Original file path and name: C:\Users\karens\Desktop\B12\Bridge12 FA-FOSSA081921.2ST
Original date and time of creating this file: Tue Jun 29 16:28:11 2021

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 8 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	122.00	0.20	ST1 - Granular
2	105.00	0.40	ST3 - Cohesive
3	128.00	0.30	ST4 - Granular
4	105.00	0.40	ST3 - Cohesive
5	128.00	0.30	ST4 - Granular
6	130.00	0.30	ST5a - Cohesive
7	125.00	0.45	ST5b - Cohesive
8	150.00	0.20	Termination Layer

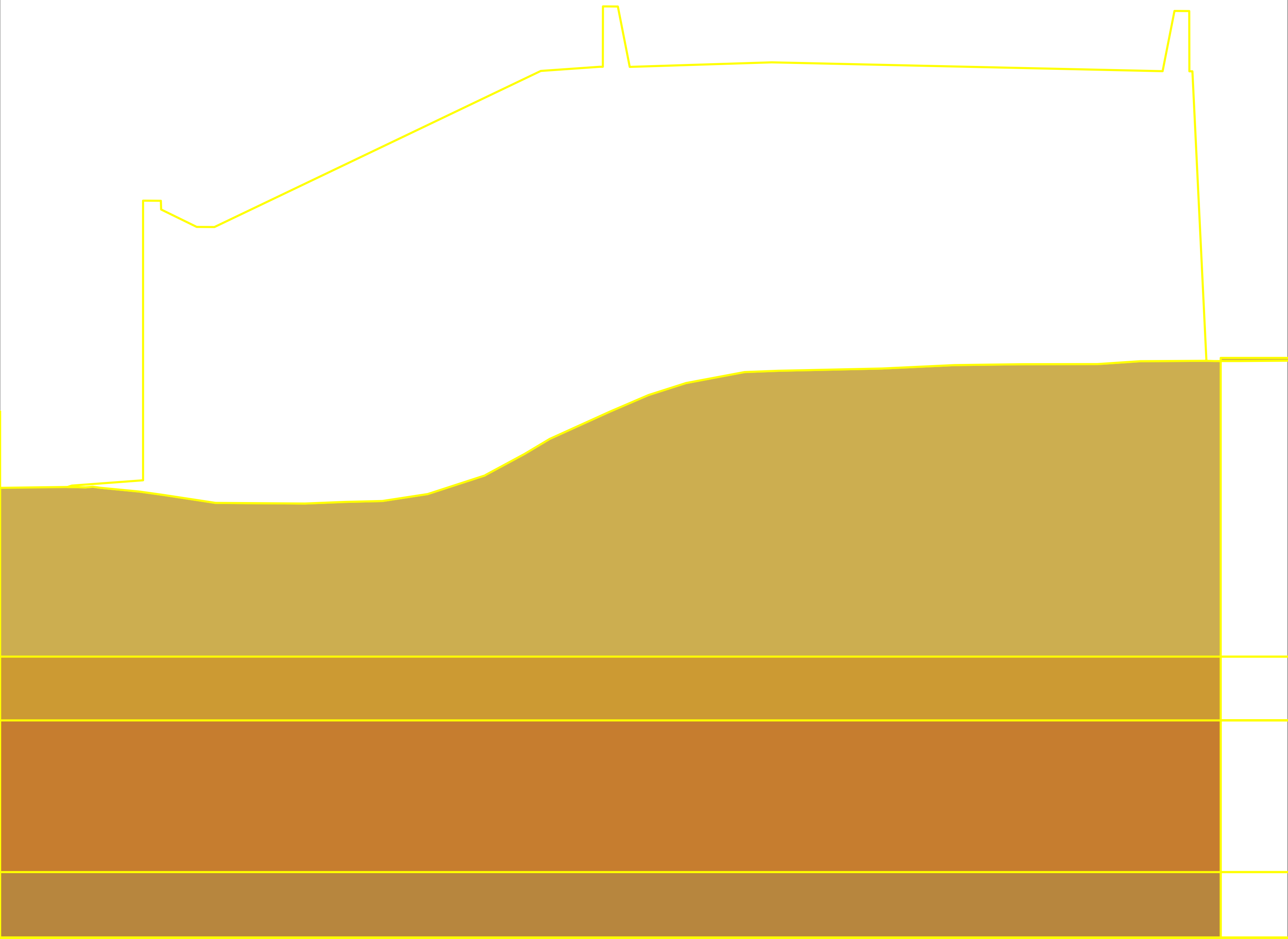
INPUT DATA – EMBANKMENT LAYERS -- 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	120.00	Proposed Embankment

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	645.20
2	120.00	645.20

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION -- $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
5	No	N/A	N/A	N/A	N/A	N/A	N/A
6	Yes	1.30	0.100	0.020	0.585	0.5400	Top
7	Yes	1.20	0.100	0.020	0.784	0.2300	Top
8	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	50.00	0.00	1	505000	0.2000	0.0562	676.65	676.49	0.16
			2	363000	0.4000	0.0143			
			3	957000	0.3000	0.0155			
			4	363000	0.4000	0.0216			
			5	957000	0.3000	0.0319			
			6	2000000	0.3000	0.0137			
			7	2000000	0.4500	0.0093			
			8	99999999999	0.2000	0.0000			
2	51.00	0.00	1	505000	0.2000	0.0557	677.09	676.92	0.16
			2	363000	0.4000	0.0141			
			3	957000	0.3000	0.0154			
			4	363000	0.4000	0.0215			
			5	957000	0.3000	0.0319			
			6	2000000	0.3000	0.0137			
			7	2000000	0.4500	0.0093			
			8	99999999999	0.2000	0.0000			
3	52.00	0.00	1	505000	0.2000	0.0545	677.51	677.35	0.16
			2	363000	0.4000	0.0139			
			3	957000	0.3000	0.0153			
			4	363000	0.4000	0.0215			
			5	957000	0.3000	0.0319			
			6	2000000	0.3000	0.0137			
			7	2000000	0.4500	0.0093			
			8	99999999999	0.2000	0.0000			
4	53.00	0.00	1	505000	0.2000	0.0543	677.88	677.72	0.16
			2	363000	0.4000	0.0137			
			3	957000	0.3000	0.0152			
			4	363000	0.4000	0.0214			
			5	957000	0.3000	0.0319			
			6	2000000	0.3000	0.0137			
			7	2000000	0.4500	0.0093			
			8	99999999999	0.2000	0.0000			
5	54.00	0.00	1	505000	0.2000	0.0544	678.19	678.04	0.16
			2	363000	0.4000	0.0134			
			3	957000	0.3000	0.0151			
			4	363000	0.4000	0.0213			
			5	957000	0.3000	0.0318			
			6	2000000	0.3000	0.0137			
			7	2000000	0.4500	0.0093			
			8	99999999999	0.2000	0.0000			
6	55.00	0.00	1	505000	0.2000	0.0547	678.46	678.30	0.16
			2	363000	0.4000	0.0132			
			3	957000	0.3000	0.0150			
			4	363000	0.4000	0.0212			
			5	957000	0.3000	0.0317			
			6	2000000	0.3000	0.0137			
			7	2000000	0.4500	0.0093			
			8	99999999999	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
7	56.00	0.00	1	505000	0.2000	0.0551	678.65	678.49	0.16
			2	363000	0.4000	0.0131			
			3	957000	0.3000	0.0149			
			4	363000	0.4000	0.0210			
			5	957000	0.3000	0.0316			
			6	2000000	0.3000	0.0136			
			7	2000000	0.4500	0.0093			
			8	99999999999	0.2000	0.0000			
8	57.00	0.00	1	505000	0.2000	0.0546	678.83	678.68	0.16
			2	363000	0.4000	0.0129			
			3	957000	0.3000	0.0147			
			4	363000	0.4000	0.0208			
			5	957000	0.3000	0.0314			
			6	2000000	0.3000	0.0136			
			7	2000000	0.4500	0.0093			
			8	99999999999	0.2000	0.0000			
9	58.00	0.00	1	505000	0.2000	0.0553	679.02	678.86	0.16
			2	363000	0.4000	0.0127			
			3	957000	0.3000	0.0146			
			4	363000	0.4000	0.0206			
			5	957000	0.3000	0.0312			
			6	2000000	0.3000	0.0135			
			7	2000000	0.4500	0.0093			
			8	99999999999	0.2000	0.0000			
10	59.00	0.00	1	505000	0.2000	0.0550	679.06	678.90	0.16
			2	363000	0.4000	0.0126			
			3	957000	0.3000	0.0145			
			4	363000	0.4000	0.0205			
			5	957000	0.3000	0.0309			
			6	2000000	0.3000	0.0135			
			7	2000000	0.4500	0.0092			
			8	99999999999	0.2000	0.0000			
11	60.00	0.00	1	505000	0.2000	0.0548	679.09	678.94	0.16
			2	363000	0.4000	0.0125			
			3	957000	0.3000	0.0143			
			4	363000	0.4000	0.0202			
			5	957000	0.3000	0.0307			
			6	2000000	0.3000	0.0134			
			7	2000000	0.4500	0.0092			
			8	99999999999	0.2000	0.0000			
12	61.00	0.00	1	505000	0.2000	0.0546	679.12	678.96	0.15
			2	363000	0.4000	0.0124			
			3	957000	0.3000	0.0142			
			4	363000	0.4000	0.0200			
			5	957000	0.3000	0.0304			
			6	2000000	0.3000	0.0133			
			7	2000000	0.4500	0.0092			
			8	99999999999	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
13	62.00	0.00	1	505000	0.2000	0.0544	679.14	678.99	0.15
			2	363000	0.4000	0.0123			
			3	957000	0.3000	0.0140			
			4	363000	0.4000	0.0198			
			5	957000	0.3000	0.0301			
			6	2000000	0.3000	0.0132			
			7	2000000	0.4500	0.0091			
			8	99999999999	0.2000	0.0000			
14	63.00	0.00	1	505000	0.2000	0.0543	679.16	679.01	0.15
			2	363000	0.4000	0.0122			
			3	957000	0.3000	0.0139			
			4	363000	0.4000	0.0195			
			5	957000	0.3000	0.0297			
			6	2000000	0.3000	0.0131			
			7	2000000	0.4500	0.0091			
			8	99999999999	0.2000	0.0000			
15	64.00	0.00	1	505000	0.2000	0.0541	679.18	679.03	0.15
			2	363000	0.4000	0.0121			
			3	957000	0.3000	0.0138			
			4	363000	0.4000	0.0192			
			5	957000	0.3000	0.0293			
			6	2000000	0.3000	0.0130			
			7	2000000	0.4500	0.0090			
			8	99999999999	0.2000	0.0000			
16	65.00	0.00	1	505000	0.2000	0.0540	679.20	679.06	0.15
			2	363000	0.4000	0.0121			
			3	957000	0.3000	0.0136			
			4	363000	0.4000	0.0189			
			5	957000	0.3000	0.0289			
			6	2000000	0.3000	0.0129			
			7	2000000	0.4500	0.0090			
			8	99999999999	0.2000	0.0000			
17	66.00	0.00	1	505000	0.2000	0.0538	679.23	679.08	0.15
			2	363000	0.4000	0.0121			
			3	957000	0.3000	0.0135			
			4	363000	0.4000	0.0186			
			5	957000	0.3000	0.0285			
			6	2000000	0.3000	0.0127			
			7	2000000	0.4500	0.0089			
			8	99999999999	0.2000	0.0000			
18	67.00	0.00	1	505000	0.2000	0.0548	679.27	679.13	0.15
			2	363000	0.4000	0.0120			
			3	957000	0.3000	0.0133			
			4	363000	0.4000	0.0183			
			5	957000	0.3000	0.0281			
			6	2000000	0.3000	0.0126			
			7	2000000	0.4500	0.0088			
			8	99999999999	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
19	68.00	0.00	1	505000	0.2000	0.0546	679.32	679.17	0.15
			2	363000	0.4000	0.0120			
			3	957000	0.3000	0.0131			
			4	363000	0.4000	0.0180			
			5	957000	0.3000	0.0276			
			6	2000000	0.3000	0.0125			
			7	2000000	0.4500	0.0087			
			8	99999999999	0.2000	0.0000			
20	69.00	0.00	1	505000	0.2000	0.0545	679.37	679.22	0.14
			2	363000	0.4000	0.0119			
			3	957000	0.3000	0.0129			
			4	363000	0.4000	0.0176			
			5	957000	0.3000	0.0271			
			6	2000000	0.3000	0.0123			
			7	2000000	0.4500	0.0087			
			8	99999999999	0.2000	0.0000			
21	70.00	0.00	1	505000	0.2000	0.0543	679.41	679.27	0.14
			2	363000	0.4000	0.0119			
			3	957000	0.3000	0.0127			
			4	363000	0.4000	0.0172			
			5	957000	0.3000	0.0265			
			6	2000000	0.3000	0.0121			
			7	2000000	0.4500	0.0086			
			8	99999999999	0.2000	0.0000			
22	71.00	0.00	1	505000	0.2000	0.0542	679.43	679.29	0.14
			2	363000	0.4000	0.0118			
			3	957000	0.3000	0.0125			
			4	363000	0.4000	0.0168			
			5	957000	0.3000	0.0259			
			6	2000000	0.3000	0.0120			
			7	2000000	0.4500	0.0085			
			8	99999999999	0.2000	0.0000			
23	72.00	0.00	1	505000	0.2000	0.0541	679.44	679.30	0.14
			2	363000	0.4000	0.0117			
			3	957000	0.3000	0.0122			
			4	363000	0.4000	0.0163			
			5	957000	0.3000	0.0254			
			6	2000000	0.3000	0.0118			
			7	2000000	0.4500	0.0084			
			8	99999999999	0.2000	0.0000			
24	73.00	0.00	1	505000	0.2000	0.0540	679.45	679.32	0.14
			2	363000	0.4000	0.0116			
			3	957000	0.3000	0.0119			
			4	363000	0.4000	0.0158			
			5	957000	0.3000	0.0248			
			6	2000000	0.3000	0.0116			
			7	2000000	0.4500	0.0083			
			8	99999999999	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
25	74.00	0.00	1	505000	0.2000	0.0539	679.47	679.33	0.14
			2	363000	0.4000	0.0114			
			3	957000	0.3000	0.0116			
			4	363000	0.4000	0.0153			
			5	957000	0.3000	0.0241			
			6	2000000	0.3000	0.0114			
			7	2000000	0.4500	0.0082			
			8	99999999999	0.2000	0.0000			
26	75.00	0.00	1	505000	0.2000	0.0537	679.47	679.34	0.13
			2	363000	0.4000	0.0112			
			3	957000	0.3000	0.0113			
			4	363000	0.4000	0.0147			
			5	957000	0.3000	0.0235			
			6	2000000	0.3000	0.0112			
			7	2000000	0.4500	0.0081			
			8	99999999999	0.2000	0.0000			
27	76.00	0.00	1	505000	0.2000	0.0535	679.47	679.34	0.13
			2	363000	0.4000	0.0109			
			3	957000	0.3000	0.0109			
			4	363000	0.4000	0.0142			
			5	957000	0.3000	0.0228			
			6	2000000	0.3000	0.0110			
			7	2000000	0.4500	0.0080			
			8	99999999999	0.2000	0.0000			
28	77.00	0.00	1	505000	0.2000	0.0531	679.48	679.35	0.13
			2	363000	0.4000	0.0105			
			3	957000	0.3000	0.0105			
			4	363000	0.4000	0.0135			
			5	957000	0.3000	0.0221			
			6	2000000	0.3000	0.0108			
			7	2000000	0.4500	0.0078			
			8	99999999999	0.2000	0.0000			
29	78.00	0.00	1	505000	0.2000	0.0526	679.48	679.35	0.13
			2	363000	0.4000	0.0101			
			3	957000	0.3000	0.0100			
			4	363000	0.4000	0.0129			
			5	957000	0.3000	0.0214			
			6	2000000	0.3000	0.0106			
			7	2000000	0.4500	0.0077			
			8	99999999999	0.2000	0.0000			
30	79.00	0.00	1	505000	0.2000	0.0519	679.52	679.40	0.12
			2	363000	0.4000	0.0095			
			3	957000	0.3000	0.0095			
			4	363000	0.4000	0.0122			
			5	957000	0.3000	0.0207			
			6	2000000	0.3000	0.0104			
			7	2000000	0.4500	0.0076			
			8	99999999999	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
31	80.00	0.00	1	505000	0.2000	0.0516	679.58	679.47	0.12
			2	363000	0.4000	0.0089			
			3	957000	0.3000	0.0089			
			4	363000	0.4000	0.0115			
			5	957000	0.3000	0.0199			
			6	2000000	0.3000	0.0102			
			7	2000000	0.4500	0.0075			
			8	99999999999	0.2000	0.0000			
32	81.00	0.00	1	505000	0.2000	0.0500	679.65	679.54	0.11
			2	363000	0.4000	0.0081			
			3	957000	0.3000	0.0083			
			4	363000	0.4000	0.0108			
			5	957000	0.3000	0.0192			
			6	2000000	0.3000	0.0100			
			7	2000000	0.4500	0.0073			
			8	99999999999	0.2000	0.0000			
33	82.00	0.00	1	505000	0.2000	0.0477	679.65	679.55	0.11
			2	363000	0.4000	0.0072			
			3	957000	0.3000	0.0077			
			4	363000	0.4000	0.0101			
			5	957000	0.3000	0.0184			
			6	2000000	0.3000	0.0098			
			7	2000000	0.4500	0.0072			
			8	99999999999	0.2000	0.0000			
34	83.00	0.00	1	505000	0.2000	0.0446	679.66	679.56	0.10
			2	363000	0.4000	0.0062			
			3	957000	0.3000	0.0071			
			4	363000	0.4000	0.0094			
			5	957000	0.3000	0.0177			
			6	2000000	0.3000	0.0095			
			7	2000000	0.4500	0.0071			
			8	99999999999	0.2000	0.0000			
35	84.00	0.00	1	505000	0.2000	0.0344	679.67	679.58	0.09
			2	363000	0.4000	0.0052			
			3	957000	0.3000	0.0064			
			4	363000	0.4000	0.0086			
			5	957000	0.3000	0.0169			
			6	2000000	0.3000	0.0093			
			7	2000000	0.4500	0.0070			
			8	99999999999	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	50.00	0.00	676.65	0.27	676.38

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	672.00	ST1 - Granular
	2	9.48	671.85	
	3	10.99	671.99	
	4	14.03	672.29	
	5	18.68	672.35	
	6	19.73	672.32	
	7	20.15	672.36	
	8	20.63	672.30	
	9	22.84	672.09	
	10	24.25	671.88	
	11	27.28	671.42	
	12	32.46	671.39	
	13	34.81	671.48	
	14	36.95	671.53	
	15	39.58	671.94	
	16	42.91	673.03	
	17	42.92	673.03	
	18	42.93	673.03	
	19	42.94	673.04	
	20	45.20	674.26	
	21	46.67	675.14	
	22	50.18	676.74	
	23	52.40	677.68	
	24	54.58	678.38	
	25	57.98	679.02	
	26	59.91	679.09	
	27	65.95	679.23	
	28	70.16	679.42	
	29	74.08	679.47	
	30	78.46	679.48	
	31	80.95	679.65	
	32	84.78	679.67	
	33	85.25	679.65	
	34	86.67	679.65	
	35	112.98	679.85	
	36	120.00	679.84	
2	1	0.00	662.50	ST3 - Cohesive
	2	120.00	662.50	
3	1	0.00	658.80	ST4 - Granular
	2	120.00	658.80	
4	1	0.00	650.00	ST3 - Cohesive
	2	120.00	650.00	
5	1	0.00	644.70	ST4 - Granular
	2	120.00	644.70	
6	1	0.00	623.70	ST5a - Cohesive
	2	120.00	623.70	
7	1	0.00	598.50	ST5b - Cohesive
	2	120.00	598.50	

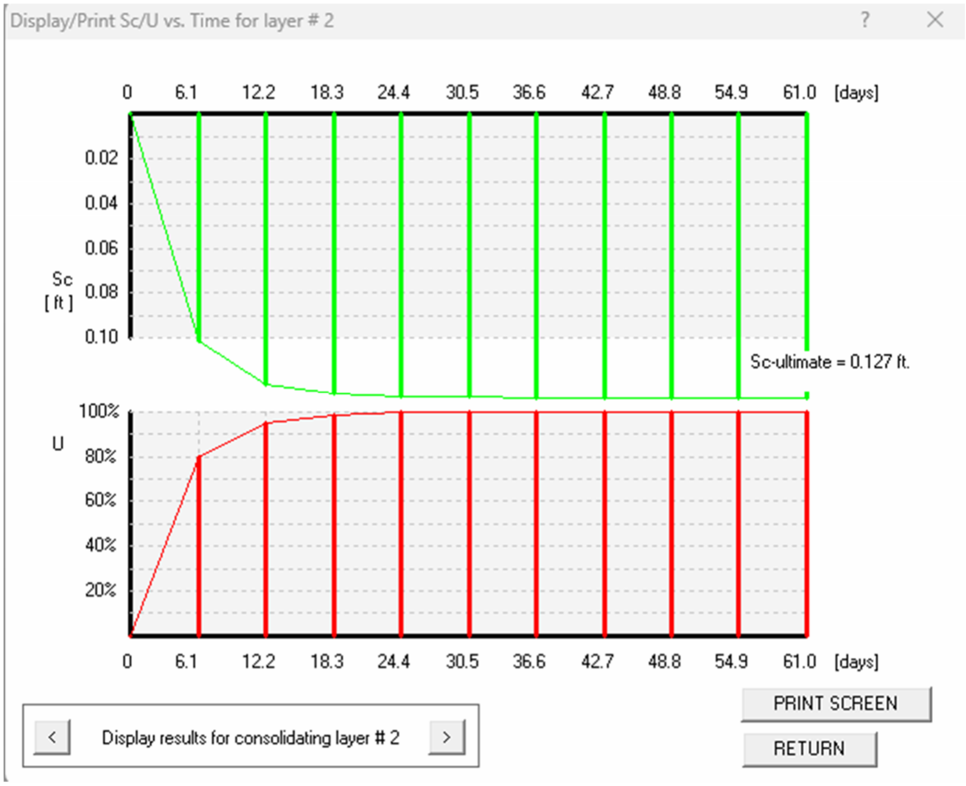
TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
8	1	0.00	573.00	Termination Layer
	2	120.00	573.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	D E S C R I P T I O N
1	X1 = 18.68 [ft]	1	18.68	672.35	Proposed Embankment
	X2 = 84.78 [ft]	2	18.94	672.43	
		3	23.06	672.74	
		4	23.06	676.96	
		5	23.07	688.96	
		6	24.10	688.95	
		7	24.11	688.45	
		8	26.17	687.44	
		9	27.20	687.43	
		10	46.15	696.49	
		11	49.58	696.74	
		12	49.75	696.73	
		13	49.76	700.23	
		14	50.62	700.23	
		15	51.31	696.72	
		16	59.55	696.99	
		17	82.24	696.48	
		18	82.93	699.97	
		19	83.78	699.97	
		20	83.80	696.47	
		21	83.97	696.46	
		22	84.78	679.67	

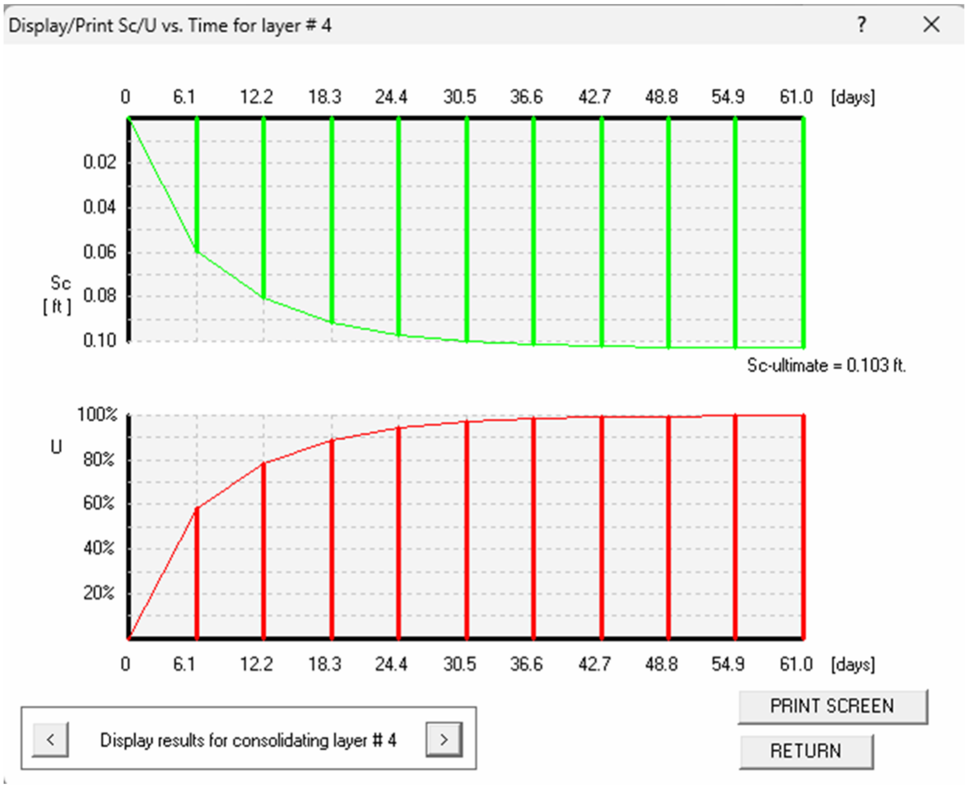
FoSSA Time Rate Calculations



Display/Print Sc/U vs. Time for layer # 2

Sc-ultimate = 0.127 ft.

Display results for consolidating layer # 2

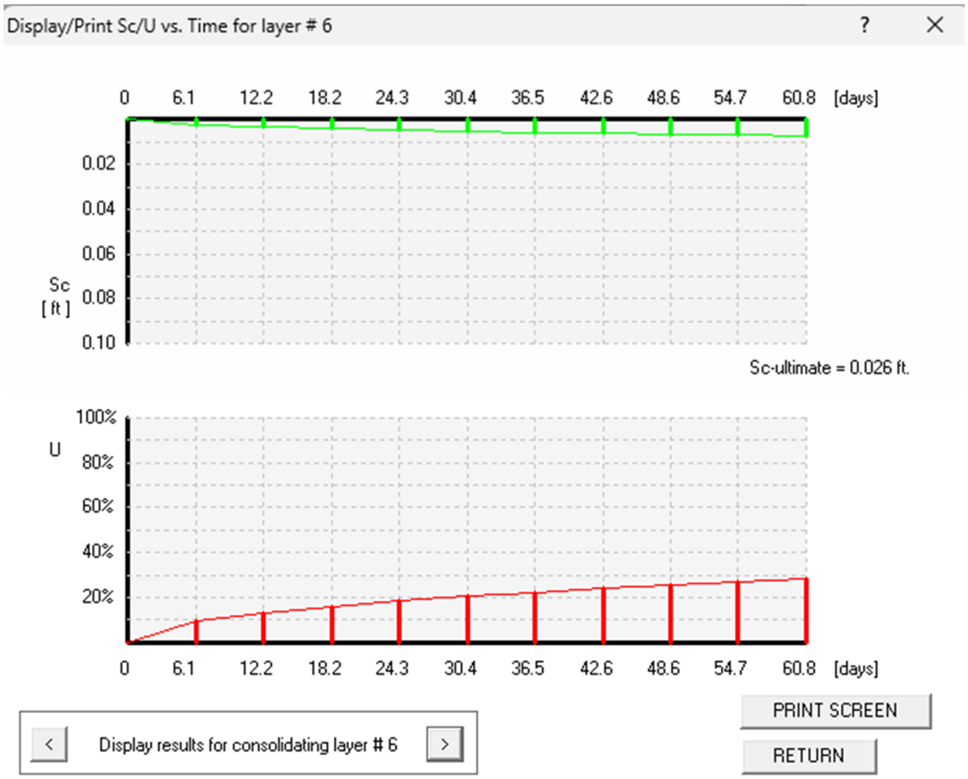


Display/Print Sc/U vs. Time for layer # 4

Sc-ultimate = 0.103 ft.

Display results for consolidating layer # 4

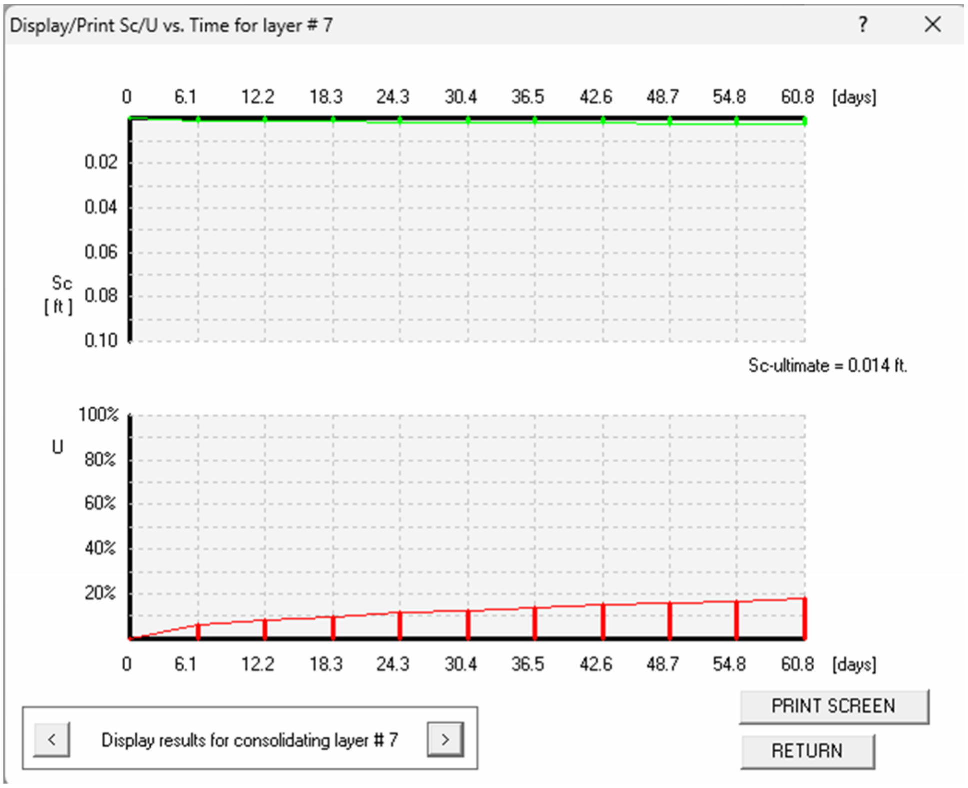
FoSSA Time Rate Calculations



Display/Print Sc/U vs. Time for layer # 6

Sc-ultimate = 0.026 ft.

Display results for consolidating layer # 6



Display/Print Sc/U vs. Time for layer # 7

Sc-ultimate = 0.014 ft.

Display results for consolidating layer # 7

RETAINING WALL Y – STA. 01+91

CUY-90-16.28 (CCG3A)

PROJECT IDENTIFICATION

Title:	CUY-90-16.28 (CCG3A)
Project Number:	PID 82382 -
Client:	Michael Baker International
Designer:	KCA
Station Number:	

Description:

Company's information:

Name:	NEAS Inc.
Street:	2800 Coroporate Exchange Drive, Suite 240 Columbus, OH 43231
Telephone #:	614-714-0299
Fax #:	614-714-0251
E-Mail:	brendan.andrews@neasinc.com

Original file path and name: P:\21-0011 ..... Wall Z\Settlement\FOSSA\WallZ 7+50_FOSSA071121.2ST
Original date and time of creating this file: Tue Jun 29 16:28:11 2021

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 9 layers

	Wet Unit Weight, γ [lb/ft³]	**Poisson's Ratio μ**	**Description of Soil**
1	122.00	0.20	ST1 - Granular
2	105.00	0.40	ST3 - Cohesive
3	128.00	0.30	ST4 - Granular
4	105.00	0.40	ST3 - Cohesive
5	128.00	0.30	ST4 - Granular
6	130.00	0.30	ST5a - Cohesive
7	125.00	0.45	ST5b - Cohesive
8	130.00	0.50	ST5c - Cohesive
9	150.00	0.20	Termination Layer

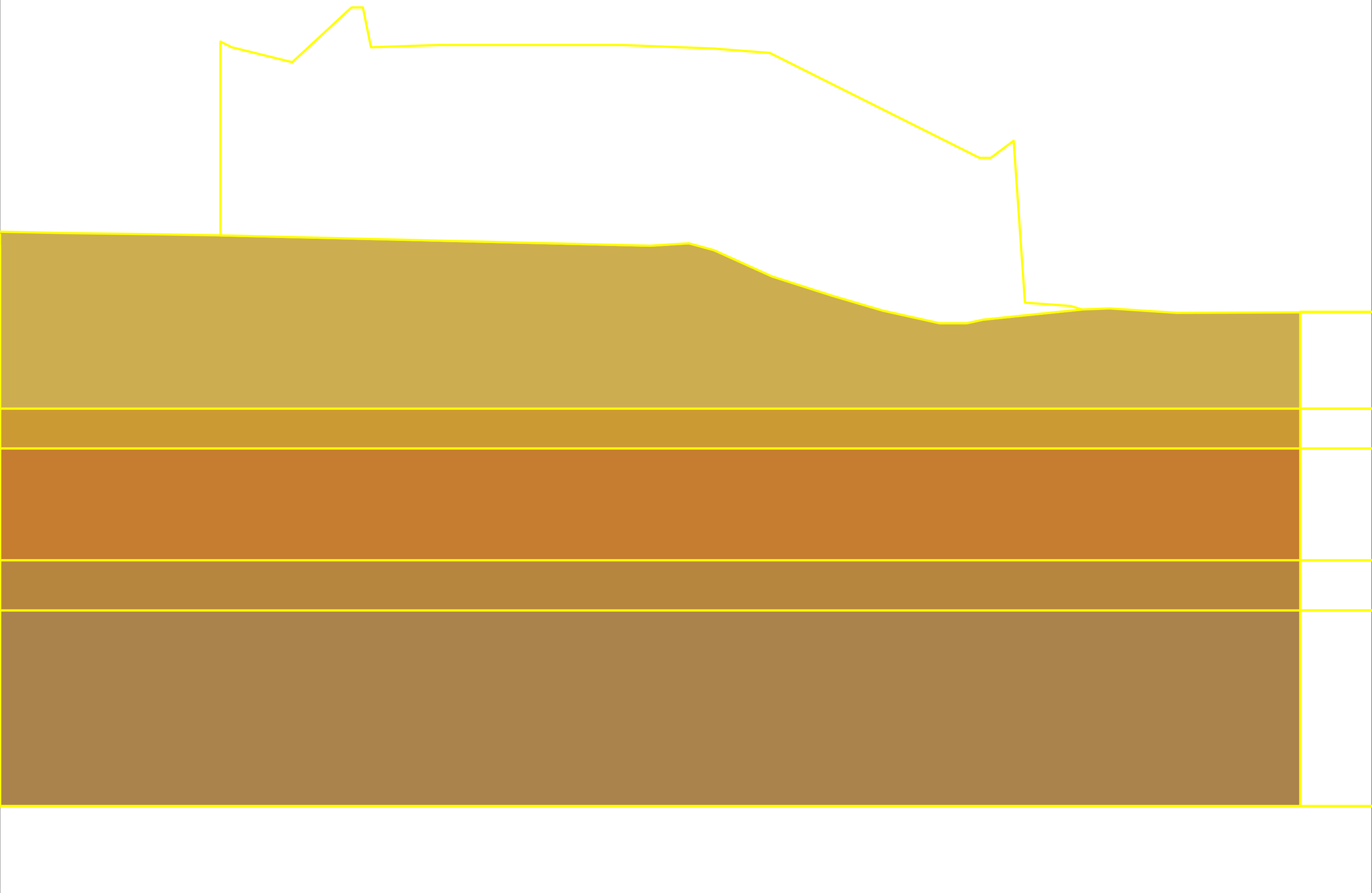
INPUT DATA – EMBANKMENT LAYERS -- 1 layers

	Wet Unit Weight, γ [lb/ft³]	**Description of Soil**
1	120.00	Proposed Embankment

INPUT DATA OF WATER

Point #	**Coordinates (X, Z) : (X) [ft.]**	**(Z) [ft.]**
1	0.00	648.80
2	160.00	648.80

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION –– $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
5	No	N/A	N/A	N/A	N/A	N/A	N/A
6	Yes	1.30	0.100	0.020	0.585	0.5400	Top
7	Yes	1.20	0.100	0.020	0.784	0.2300	Top
8	Yes	1.10	0.120	0.024	0.534	0.2100	Top
9	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	108.00	0.00	1	505000	0.2000	0.0302	671.88	671.75	0.14
			2	363000	0.4000	0.0111			
			3	957000	0.3000	0.0132			
			4	363000	0.4000	0.0130			
			5	957000	0.3000	0.0261			
			6	2000000	0.3000	0.0109			
			7	2000000	0.4500	0.0083			
			8	2000000	0.5000	0.0245			
			9	1000000000(	0.2000	0.0000			
2	121.00	0.00	1	505000	0.2000	0.0124	671.00	670.91	0.09
			2	363000	0.4000	0.0045			
			3	957000	0.3000	0.0070			
			4	363000	0.4000	0.0071			
			5	957000	0.3000	0.0178			
			6	2000000	0.3000	0.0086			
			7	2000000	0.4500	0.0069			
			8	2000000	0.5000	0.0225			
			9	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	108.00	0.00	671.88	0.29	671.59
2	121.00	0.00	671.00	0.23	670.77

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	678.20	ST1 - Granular
	2	23.30	678.60	
	3	37.70	678.30	
	4	45.60	678.20	
	5	51.20	678.10	
	6	88.90	677.20	
	7	92.30	677.40	
	8	94.50	676.80	
	9	99.60	674.50	
	10	104.90	672.80	
	11	109.30	671.50	
	12	114.30	670.40	
	13	116.70	670.40	
	14	118.10	670.70	
	15	123.90	671.30	
	16	126.80	671.60	
	17	129.20	671.70	
	18	135.10	671.30	
	19	159.50	671.40	
	20	160.00	671.40	
2	1	0.00	662.90	ST3 - Cohesive
	2	160.00	662.90	
3	1	0.00	659.40	ST4 - Granular
	2	160.00	659.40	
4	1	0.00	649.60	ST3 - Cohesive
	2	160.00	649.60	
5	1	0.00	645.20	ST4 - Granular
	2	160.00	645.20	
6	1	0.00	622.30	ST5a - Cohesive
	2	160.00	622.30	
7	1	0.00	598.50	ST5b - Cohesive
	2	160.00	598.50	
8	1	0.00	572.70	ST5c - Cohesive
	2	160.00	572.70	
9	1	0.00	450.00	Termination Layer
	2	160.00	450.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	 (Z) [ft.]	DESCRIPTION
1	X1 = 51.20 [ft]	1	51.20	695.10	Proposed Embankment
	X2 = 126.80 [ft]	2	51.20	678.10	
		3	52.20	694.60	
		4	52.20	695.10	
		5	57.50	693.30	
		6	62.70	698.10	
		7	62.70	694.60	
		8	63.70	698.10	
		9	64.40	694.60	
		10	70.40	694.80	
		11	86.40	694.80	
		12	94.40	694.50	
		13	99.40	694.10	
		14	117.80	684.90	
		15	118.80	684.90	
		16	120.80	686.40	
		17	120.80	685.90	
		18	121.80	672.20	
		19	121.80	686.40	
		20	125.80	671.90	
		21	126.80	671.60	

RETAINING WALL Y – STA. 02+91

CUY-90-16.28 (CCG3A)

PROJECT IDENTIFICATION

Title: CUY-90-16.28 (CCG3A)
Project Number: PID 82382 -
Client: Michael Baker International
Designer: KCA
Station Number:

Description:

Company's information:

Name: NEAS Inc.
Street: 2800 Coroporate Exchange Drive, Suite 240
Columbus, OH 43231
Telephone #: 614-714-0299
Fax #: 614-714-0251
E-Mail: brendan.andrews@neasinc.com

Original file path and name: P:\21-0011 ..... Wall Z\Settlement\FOSSA\WallZ 6+50_FOSSA071121.2ST
Original date and time of creating this file: Tue Jun 29 16:28:11 2021

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 10 layers

	Wet Unit Weight, γ [lb/ft³]	**Poisson's Ratio μ**	**Description of Soil**
1	122.00	0.20	ST1 - Granular
2	105.00	0.40	ST3 - Cohesive
3	110.00	0.25	ST2 - Granular
4	128.00	0.30	ST4 - Granular
5	105.00	0.40	ST3 - Cohesive
6	128.00	0.30	ST4 - Granular
7	130.00	0.30	ST5a - Cohesive
8	125.00	0.45	ST5b - Cohesive
9	130.00	0.50	ST5c - Cohesive
10	150.00	0.20	Termination Layer

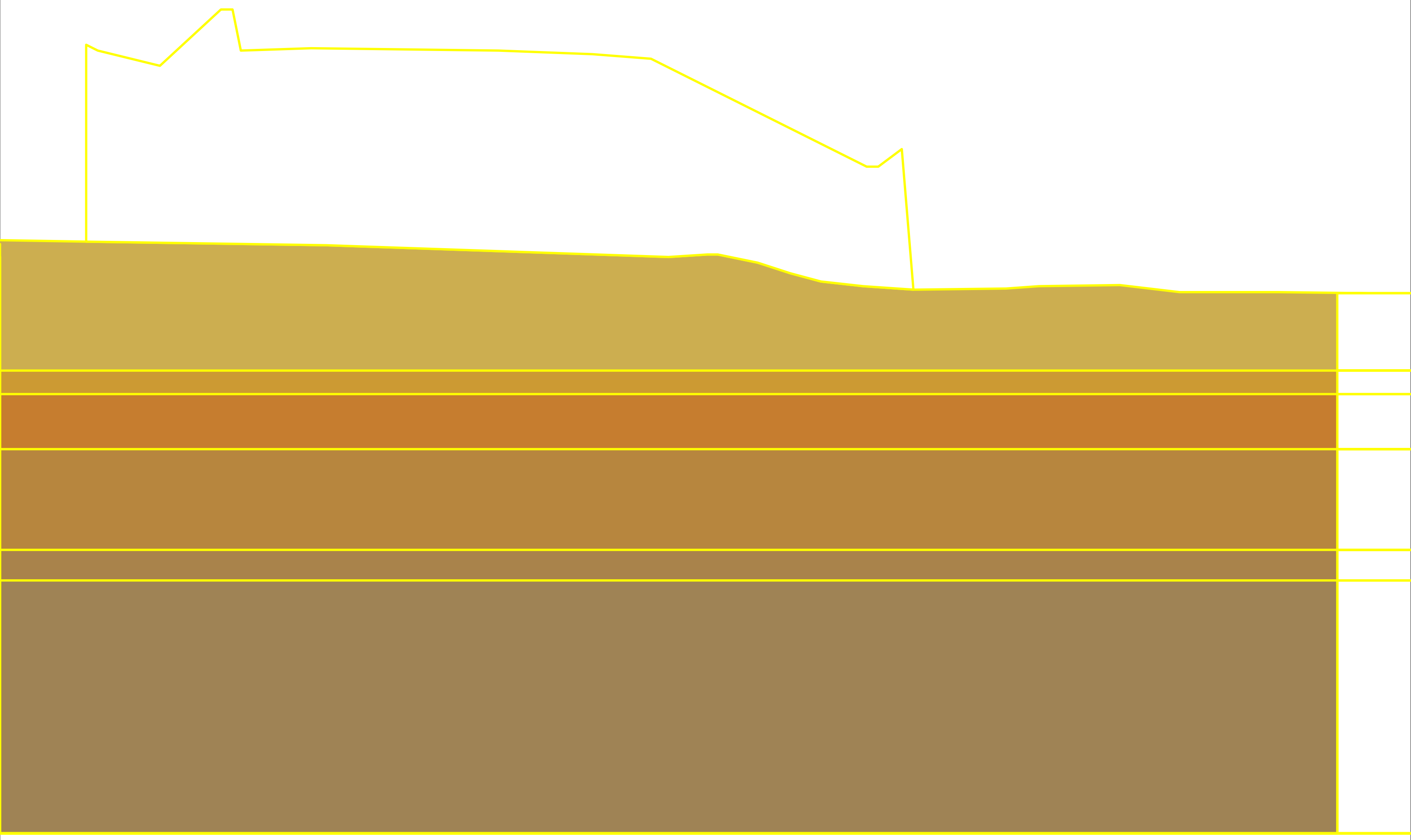
INPUT DATA – EMBANKMENT LAYERS -- 1 layers

	Wet Unit Weight, γ [lb/ft³]	**Description of Soil**
1	120.00	Proposed Embankment

INPUT DATA OF WATER

Point #	**Coordinates (X, Z) : (X) [ft.]**	**(Z) [ft.]**
1	0.00	649.00
2	160.00	649.00

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION -- $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	No	N/A	N/A	N/A	N/A	N/A	N/A
5	Yes	1.00	0.200	0.041	1.023	0.3000	Top
6	No	N/A	N/A	N/A	N/A	N/A	N/A
7	Yes	1.30	0.100	0.020	0.585	0.5400	Top
8	Yes	1.20	0.100	0.020	0.784	0.2300	Top
9	Yes	1.10	0.120	0.024	0.534	0.2100	Top
10	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	115.00	0.00	1	505000	0.2000	0.0207	672.38	672.25	0.13
			2	363000	0.4000	0.0048			
			3	183000	0.2500	0.0288			
			4	957000	0.3000	0.0089			
			5	363000	0.4000	0.0057			
			6	957000	0.3000	0.0249			
			7	2000000	0.3000	0.0080			
			8	2000000	0.4500	0.0073			
			9	2000000	0.5000	0.0221			
			10	1000000000(	0.2000	0.0000			
2	127.00	0.00	1	505000	0.2000	0.0063	670.50	670.42	0.08
			2	363000	0.4000	0.0013			
			3	183000	0.2500	0.0122			
			4	957000	0.3000	0.0042			
			5	363000	0.4000	0.0026			
			6	957000	0.3000	0.0161			
			7	2000000	0.3000	0.0062			
			8	2000000	0.4500	0.0060			
			9	2000000	0.5000	0.0201			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	115.00	0.00	672.38	0.18	672.21
2	127.00	0.00	670.50	0.14	670.36

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	674.40	ST1 - Granular
	2	36.70	675.00	
	3	38.80	674.90	
	4	56.40	674.60	
	5	76.90	674.30	
	6	106.10	673.30	
	7	109.40	673.50	
	8	110.30	673.50	
	9	113.70	672.80	
	10	116.50	671.90	
	11	119.10	671.20	
	12	122.70	670.80	
	13	127.00	670.50	
	14	127.30	670.50	
	15	134.90	670.60	
	16	137.70	670.80	
	17	144.60	670.90	
	18	149.70	670.30	
	19	158.10	670.30	
	20	165.80	670.20	
	21	170.00	670.20	
2	1	0.00	663.60	ST3 - Cohesive
	2	170.00	663.60	
3	1	0.00	661.60	ST2 - Granular
	2	170.00	661.60	
4	1	0.00	656.90	ST4 - Granular
	2	170.00	656.90	
5	1	0.00	648.30	ST3 - Cohesive
	2	170.00	648.30	
6	1	0.00	645.70	ST4 - Granular
	2	170.00	645.70	
7	1	0.00	619.00	ST5a - Cohesive
	2	170.00	619.00	
8	1	0.00	598.50	ST5b - Cohesive
	2	170.00	598.50	
9	1	0.00	572.70	ST5c - Cohesive
	2	170.00	572.70	
10	1	0.00	450.00	Termination Layer
	2	170.00	450.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 56.40 [ft]	1	56.40	691.40	Proposed Embankment
	X2 = 127.00 [ft]	2	56.40	673.50	
		3	57.40	690.90	
		4	57.40	691.40	
		5	62.70	689.60	
		6	67.90	694.40	
		7	67.90	690.90	
		8	68.90	694.40	
		9	69.60	690.90	
		10	75.60	691.10	
		11	91.60	690.90	
		12	99.60	690.60	
		13	104.60	690.20	
		14	123.00	681.00	
		15	124.00	681.00	
		16	126.00	682.50	
		17	126.00	682.00	
		18	127.00	670.50	
		19	127.00	682.50	

RETAINING WALL Z ALIGNMENT

CUY-90-16.28 (CCG3A)

PROJECT IDENTIFICATION

Title:	CUY-90-16.28 (CCG3A)
Project Number:	PID 82382 -
Client:	Michael Baker International
Designer:	KCA
Station Number:	

Description:

Company's information:

Name:	NEAS Inc.
Street:	2800 Coroporate Exchange Drive, Suite 240 Columbus, OH 43231
Telephone #:	614-714-0299
Fax #:	614-714-0251
E-Mail:	brendan.andrews@neasinc.com

Original file path and name: P:\21-0011 ..... ysis\Wall Z\Settlement\FOSSA\WallZ_FOSSA081921.2ST
Original date and time of creating this file: Tue Jun 29 16:28:11 2021

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 10 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	122.00	0.20	ST1 - Granular
2	105.00	0.40	ST3 - Cohesive
3	110.00	0.25	ST2 - Granular
4	128.00	0.30	ST4 - Granular
5	105.00	0.40	ST3 - Cohesive
6	128.00	0.30	ST4 - Granular
7	130.00	0.30	ST5a - Cohesive
8	125.00	0.45	ST5b - Cohesive
9	130.00	0.50	ST5c - Cohesive
10	150.00	0.20	Termination Layer

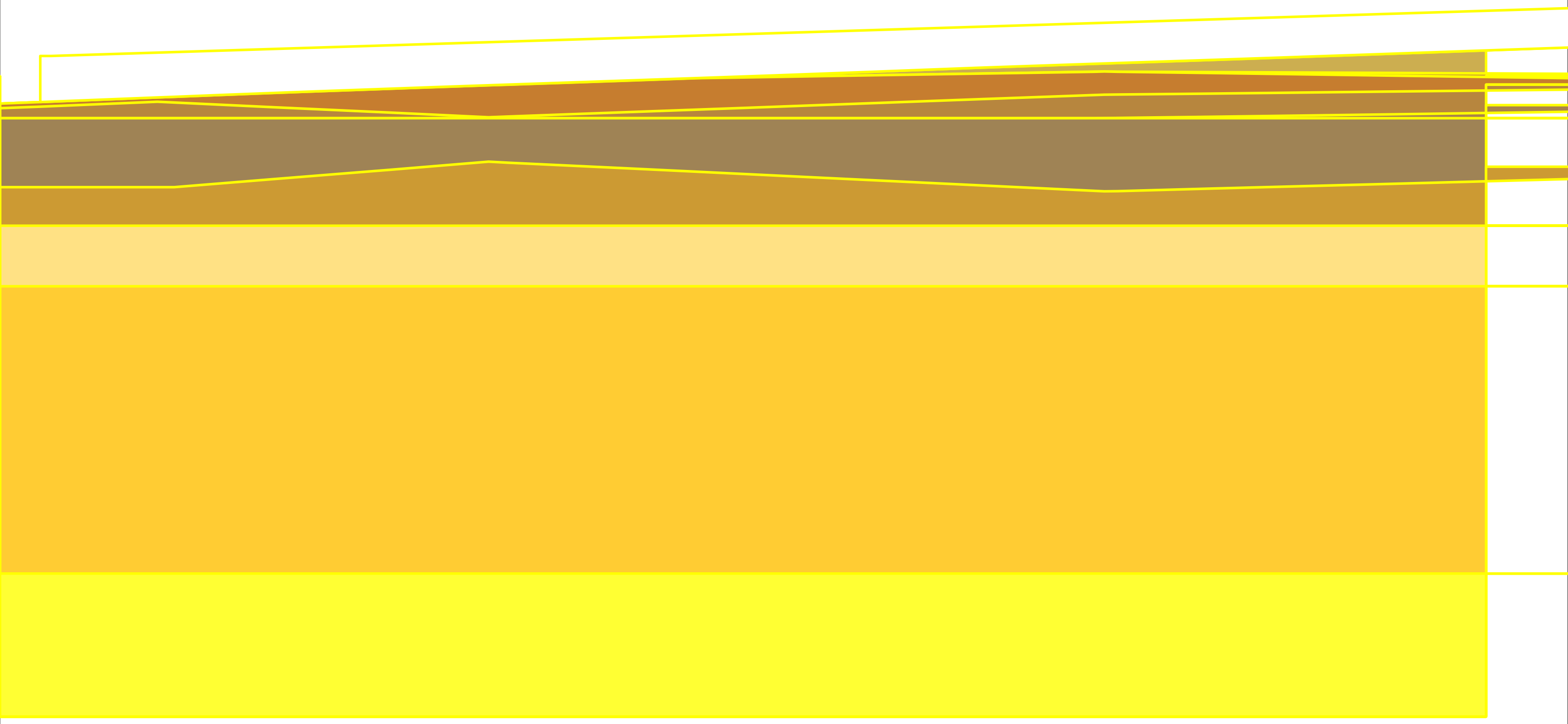
INPUT DATA – EMBANKMENT LAYERS -- 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	120.00	Proposed Embankment

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	-50.00	648.10
2	57.20	648.10
3	191.40	649.40
4	454.30	649.00
5	850.00	645.20

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION –– $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	No	N/A	N/A	N/A	N/A	N/A	N/A
5	No	N/A	N/A	N/A	N/A	N/A	N/A
6	No	N/A	N/A	N/A	N/A	N/A	N/A
7	Yes	1.20	0.100	0.020	0.585	0.5400	Top
8	Yes	1.30	0.100	0.020	0.784	0.2300	Top
9	Yes	1.10	0.120	0.024	0.534	0.2100	Top
10	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	0.00	0.00	1	505000	0.2000	0.0000	651.40	651.35	0.05
			2	363000	0.4000	0.0005			
			3	183000	0.2500	0.0092			
			4	957000	0.3000	0.0033			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0196			
			7	2000000	0.3000	0.0054			
			8	2000000	0.4500	0.0036			
			9	2000000	0.5000	0.0131			
			10	1000000000(	0.2000	0.0000			
2	20.00	0.00	1	505000	0.2000	0.0000	652.16	652.05	0.11
			2	363000	0.4000	0.0011			
			3	183000	0.2500	0.0165			
			4	957000	0.3000	0.0088			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0429			
			7	2000000	0.3000	0.0097			
			8	2000000	0.4500	0.0079			
			9	2000000	0.5000	0.0233			
			10	1000000000(	0.2000	0.0000			
3	40.00	0.00	1	505000	0.2000	0.0000	652.92	652.79	0.13
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.0162			
			4	957000	0.3000	0.0097			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0450			
			7	2000000	0.3000	0.0117			
			8	2000000	0.4500	0.0106			
			9	2000000	0.5000	0.0322			
			10	1000000000(	0.2000	0.0000			
4	60.00	0.00	1	505000	0.2000	0.0000	653.70	653.56	0.14
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.0243			
			4	957000	0.3000	0.0091			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0441			
			7	2000000	0.3000	0.0123			
			8	2000000	0.4500	0.0117			
			9	2000000	0.5000	0.0388			
			10	1000000000(	0.2000	0.0000			
5	80.00	0.00	1	505000	0.2000	0.0000	654.50	654.34	0.16
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.0376			
			4	957000	0.3000	0.0080			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0404			
			7	2000000	0.3000	0.0134			
			8	2000000	0.4500	0.0119			
			9	2000000	0.5000	0.0434			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
6	100.00	0.00	1	505000	0.2000	0.0000	655.30	655.13	0.17
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.0506			
			4	957000	0.3000	0.0066			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0370			
			7	2000000	0.3000	0.0143			
			8	2000000	0.4500	0.0116			
			9	2000000	0.5000	0.0461			
			10	1000000000(	0.2000	0.0000			
7	120.00	0.00	1	505000	0.2000	0.0000	656.02	655.84	0.18
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.0637			
			4	957000	0.3000	0.0053			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0340			
			7	2000000	0.3000	0.0152			
			8	2000000	0.4500	0.0112			
			9	2000000	0.5000	0.0475			
			10	1000000000(	0.2000	0.0000			
8	140.00	0.00	1	505000	0.2000	0.0000	656.74	656.55	0.19
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.0766			
			4	957000	0.3000	0.0039			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0313			
			7	2000000	0.3000	0.0161			
			8	2000000	0.4500	0.0108			
			9	2000000	0.5000	0.0481			
			10	1000000000(	0.2000	0.0000			
9	160.00	0.00	1	505000	0.2000	0.0000	657.44	657.24	0.20
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.0896			
			4	957000	0.3000	0.0026			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0287			
			7	2000000	0.3000	0.0169			
			8	2000000	0.4500	0.0104			
			9	2000000	0.5000	0.0480			
			10	1000000000(	0.2000	0.0000			
10	180.00	0.00	1	505000	0.2000	0.0000	658.12	657.91	0.21
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.1025			
			4	957000	0.3000	0.0013			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0263			
			7	2000000	0.3000	0.0178			
			8	2000000	0.4500	0.0100			
			9	2000000	0.5000	0.0476			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
11	200.00	0.00	1	505000	0.2000	0.0000	658.80	658.59	0.21
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.1101			
			4	957000	0.3000	0.0013			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0252			
			7	2000000	0.3000	0.0181			
			8	2000000	0.4500	0.0098			
			9	2000000	0.5000	0.0470			
			10	1000000000(	0.2000	0.0000			
12	220.00	0.00	1	505000	0.2000	0.0000	659.48	659.27	0.21
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.1098			
			4	957000	0.3000	0.0022			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0264			
			7	2000000	0.3000	0.0173			
			8	2000000	0.4500	0.0095			
			9	2000000	0.5000	0.0463			
			10	1000000000(	0.2000	0.0000			
13	240.00	0.00	1	505000	0.2000	0.0000	660.16	659.95	0.21
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.1095			
			4	957000	0.3000	0.0030			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0276			
			7	2000000	0.3000	0.0165			
			8	2000000	0.4500	0.0093			
			9	2000000	0.5000	0.0455			
			10	1000000000(	0.2000	0.0000			
14	260.00	0.00	1	505000	0.2000	0.0000	660.87	660.65	0.22
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.1139			
			4	957000	0.3000	0.0039			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0287			
			7	2000000	0.3000	0.0158			
			8	2000000	0.4500	0.0091			
			9	2000000	0.5000	0.0447			
			10	1000000000(	0.2000	0.0000			
15	280.00	0.00	1	505000	0.2000	0.0000	661.60	661.39	0.21
			2	363000	0.4000	0.0010			
			3	183000	0.2500	0.1058			
			4	957000	0.3000	0.0051			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0298			
			7	2000000	0.3000	0.0150			
			8	2000000	0.4500	0.0089			
			9	2000000	0.5000	0.0440			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
16	300.00	0.00	1	505000	0.2000	0.0021	662.30	662.09	0.21
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.1029			
			4	957000	0.3000	0.0059			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0310			
			7	2000000	0.3000	0.0143			
			8	2000000	0.4500	0.0088			
			9	2000000	0.5000	0.0432			
			10	1000000000(	0.2000	0.0000			
17	320.00	0.00	1	505000	0.2000	0.0032	663.02	662.81	0.21
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0998			
			4	957000	0.3000	0.0067			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0321			
			7	2000000	0.3000	0.0136			
			8	2000000	0.4500	0.0086			
			9	2000000	0.5000	0.0425			
			10	1000000000(	0.2000	0.0000			
18	340.00	0.00	1	505000	0.2000	0.0042	663.74	663.54	0.20
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0967			
			4	957000	0.3000	0.0075			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0332			
			7	2000000	0.3000	0.0129			
			8	2000000	0.4500	0.0085			
			9	2000000	0.5000	0.0419			
			10	1000000000(	0.2000	0.0000			
19	360.00	0.00	1	505000	0.2000	0.0052	664.48	664.28	0.20
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0936			
			4	957000	0.3000	0.0083			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0342			
			7	2000000	0.3000	0.0122			
			8	2000000	0.4500	0.0084			
			9	2000000	0.5000	0.0414			
			10	1000000000(	0.2000	0.0000			
20	380.00	0.00	1	505000	0.2000	0.0072	665.24	665.04	0.20
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0879			
			4	957000	0.3000	0.0095			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0352			
			7	2000000	0.3000	0.0115			
			8	2000000	0.4500	0.0083			
			9	2000000	0.5000	0.0409			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
21	400.00	0.00	1	505000	0.2000	0.0082	666.00	665.80	0.20
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0847			
			4	957000	0.3000	0.0103			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0362			
			7	2000000	0.3000	0.0108			
			8	2000000	0.4500	0.0082			
			9	2000000	0.5000	0.0406			
			10	1000000000(	0.2000	0.0000			
22	420.00	0.00	1	505000	0.2000	0.0092	666.68	666.48	0.20
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0820			
			4	957000	0.3000	0.0110			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0373			
			7	2000000	0.3000	0.0101			
			8	2000000	0.4500	0.0082			
			9	2000000	0.5000	0.0404			
			10	1000000000(	0.2000	0.0000			
23	440.00	0.00	1	505000	0.2000	0.0102	667.36	667.16	0.20
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0793			
			4	957000	0.3000	0.0118			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0385			
			7	2000000	0.3000	0.0095			
			8	2000000	0.4500	0.0082			
			9	2000000	0.5000	0.0402			
			10	1000000000(	0.2000	0.0000			
24	460.00	0.00	1	505000	0.2000	0.0122	668.04	667.84	0.20
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0741			
			4	957000	0.3000	0.0126			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0388			
			7	2000000	0.3000	0.0093			
			8	2000000	0.4500	0.0082			
			9	2000000	0.5000	0.0402			
			10	1000000000(	0.2000	0.0000			
25	480.00	0.00	1	505000	0.2000	0.0142	668.72	668.53	0.19
			2	363000	0.4000	0.0000			
			3	183000	0.2500	0.0714			
			4	957000	0.3000	0.0126			
			5	363000	0.4000	0.0000			
			6	957000	0.3000	0.0383			
			7	2000000	0.3000	0.0095			
			8	2000000	0.4500	0.0082			
			9	2000000	0.5000	0.0403			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
26	500.00	0.00	1	505000	0.2000	0.0161	669.40	669.21	0.19
			2	363000	0.4000	0.0016			
			3	183000	0.2500	0.0663			
			4	957000	0.3000	0.0125			
			5	363000	0.4000	0.0015			
			6	957000	0.3000	0.0374			
			7	2000000	0.3000	0.0099			
			8	2000000	0.4500	0.0083			
			9	2000000	0.5000	0.0405			
			10	1000000000(	0.2000	0.0000			
27	520.00	0.00	1	505000	0.2000	0.0191	670.08	669.88	0.20
			2	363000	0.4000	0.0016			
			3	183000	0.2500	0.0636			
			4	957000	0.3000	0.0125			
			5	363000	0.4000	0.0021			
			6	957000	0.3000	0.0370			
			7	2000000	0.3000	0.0103			
			8	2000000	0.4500	0.0084			
			9	2000000	0.5000	0.0407			
			10	1000000000(	0.2000	0.0000			
28	540.00	0.00	1	505000	0.2000	0.0211	670.76	670.57	0.19
			2	363000	0.4000	0.0022			
			3	183000	0.2500	0.0585			
			4	957000	0.3000	0.0121			
			5	363000	0.4000	0.0027			
			6	957000	0.3000	0.0361			
			7	2000000	0.3000	0.0105			
			8	2000000	0.4500	0.0085			
			9	2000000	0.5000	0.0410			
			10	1000000000(	0.2000	0.0000			
29	560.00	0.00	1	505000	0.2000	0.0230	671.44	671.25	0.19
			2	363000	0.4000	0.0029			
			3	183000	0.2500	0.0559			
			4	957000	0.3000	0.0120			
			5	363000	0.4000	0.0034			
			6	957000	0.3000	0.0352			
			7	2000000	0.3000	0.0109			
			8	2000000	0.4500	0.0086			
			9	2000000	0.5000	0.0413			
			10	1000000000(	0.2000	0.0000			
30	580.00	0.00	1	505000	0.2000	0.0260	672.12	671.93	0.19
			2	363000	0.4000	0.0029			
			3	183000	0.2500	0.0509			
			4	957000	0.3000	0.0120			
			5	363000	0.4000	0.0040			
			6	957000	0.3000	0.0348			
			7	2000000	0.3000	0.0111			
			8	2000000	0.4500	0.0087			
			9	2000000	0.5000	0.0415			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
31	600.00	0.00	1	505000	0.2000	0.0279	672.80	672.61	0.19
			2	363000	0.4000	0.0035			
			3	183000	0.2500	0.0483			
			4	957000	0.3000	0.0120			
			5	363000	0.4000	0.0047			
			6	957000	0.3000	0.0340			
			7	2000000	0.3000	0.0115			
			8	2000000	0.4500	0.0089			
			9	2000000	0.5000	0.0417			
			10	1000000000(	0.2000	0.0000			
32	620.00	0.00	1	505000	0.2000	0.0308	673.52	673.33	0.19
			2	363000	0.4000	0.0035			
			3	183000	0.2500	0.0432			
			4	957000	0.3000	0.0119			
			5	363000	0.4000	0.0046			
			6	957000	0.3000	0.0332			
			7	2000000	0.3000	0.0120			
			8	2000000	0.4500	0.0091			
			9	2000000	0.5000	0.0417			
			10	1000000000(	0.2000	0.0000			
33	640.00	0.00	1	505000	0.2000	0.0326	674.24	674.05	0.19
			2	363000	0.4000	0.0041			
			3	183000	0.2500	0.0406			
			4	957000	0.3000	0.0114			
			5	363000	0.4000	0.0053			
			6	957000	0.3000	0.0328			
			7	2000000	0.3000	0.0122			
			8	2000000	0.4500	0.0094			
			9	2000000	0.5000	0.0413			
			10	1000000000(	0.2000	0.0000			
34	660.00	0.00	1	505000	0.2000	0.0356	674.94	674.75	0.19
			2	363000	0.4000	0.0041			
			3	183000	0.2500	0.0356			
			4	957000	0.3000	0.0114			
			5	363000	0.4000	0.0059			
			6	957000	0.3000	0.0320			
			7	2000000	0.3000	0.0127			
			8	2000000	0.4500	0.0096			
			9	2000000	0.5000	0.0405			
			10	1000000000(	0.2000	0.0000			
35	680.00	0.00	1	505000	0.2000	0.0376	675.62	675.44	0.18
			2	363000	0.4000	0.0048			
			3	183000	0.2500	0.0308			
			4	957000	0.3000	0.0113			
			5	363000	0.4000	0.0065			
			6	957000	0.3000	0.0319			
			7	2000000	0.3000	0.0132			
			8	2000000	0.4500	0.0099			
			9	2000000	0.5000	0.0390			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, µ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
36	700.00	0.00	1	505000	0.2000	0.0397	676.30	676.12	0.18
			2	363000	0.4000	0.0055			
			3	183000	0.2500	0.0283			
			4	957000	0.3000	0.0113			
			5	363000	0.4000	0.0072			
			6	957000	0.3000	0.0314			
			7	2000000	0.3000	0.0135			
			8	2000000	0.4500	0.0100			
			9	2000000	0.5000	0.0365			
			10	1000000000(	0.2000	0.0000			
37	720.00	0.00	1	505000	0.2000	0.0429	676.98	676.80	0.18
			2	363000	0.4000	0.0056			
			3	183000	0.2500	0.0236			
			4	957000	0.3000	0.0113			
			5	363000	0.4000	0.0080			
			6	957000	0.3000	0.0310			
			7	2000000	0.3000	0.0139			
			8	2000000	0.4500	0.0098			
			9	2000000	0.5000	0.0325			
			10	1000000000(	0.2000	0.0000			
38	740.00	0.00	1	505000	0.2000	0.0452	677.66	677.49	0.17
			2	363000	0.4000	0.0065			
			3	183000	0.2500	0.0214			
			4	957000	0.3000	0.0109			
			5	363000	0.4000	0.0090			
			6	957000	0.3000	0.0311			
			7	2000000	0.3000	0.0136			
			8	2000000	0.4500	0.0089			
			9	2000000	0.5000	0.0267			
			10	1000000000(	0.2000	0.0000			
39	760.00	0.00	1	505000	0.2000	0.0463	678.26	678.10	0.16
			2	363000	0.4000	0.0073			
			3	183000	0.2500	0.0171			
			4	957000	0.3000	0.0111			
			5	363000	0.4000	0.0099			
			6	957000	0.3000	0.0299			
			7	2000000	0.3000	0.0119			
			8	2000000	0.4500	0.0067			
			9	2000000	0.5000	0.0191			
			10	1000000000(	0.2000	0.0000			
40	780.00	0.00	1	505000	0.2000	0.0269	678.77	678.67	0.10
			2	363000	0.4000	0.0049			
			3	183000	0.2500	0.0100			
			4	957000	0.3000	0.0107			
			5	363000	0.4000	0.0073			
			6	957000	0.3000	0.0156			
			7	2000000	0.3000	0.0070			
			8	2000000	0.4500	0.0031			
			9	2000000	0.5000	0.0103			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	0.00	0.00	651.40	0.29	651.11
2	20.00	0.00	652.16	0.44	651.72
3	40.00	0.00	652.92	0.56	652.36
4	60.00	0.00	653.70	0.64	653.06
5	80.00	0.00	654.50	0.71	653.79
6	100.00	0.00	655.30	0.76	654.54
7	120.00	0.00	656.02	0.80	655.22
8	140.00	0.00	656.74	0.83	655.91
9	160.00	0.00	657.44	0.85	656.59
10	180.00	0.00	658.12	0.87	657.25
11	200.00	0.00	658.80	0.87	657.93
12	220.00	0.00	659.48	0.84	658.64
13	240.00	0.00	660.16	0.81	659.35
14	260.00	0.00	660.87	0.78	660.08
15	280.00	0.00	661.60	0.75	660.85
16	300.00	0.00	662.30	0.72	661.58
17	320.00	0.00	663.02	0.70	662.32
18	340.00	0.00	663.74	0.67	663.07
19	360.00	0.00	664.48	0.64	663.84
20	380.00	0.00	665.24	0.62	664.62
21	400.00	0.00	666.00	0.59	665.41
22	420.00	0.00	666.68	0.57	666.11
23	440.00	0.00	667.36	0.55	666.81
24	460.00	0.00	668.04	0.53	667.51
25	480.00	0.00	668.72	0.53	668.19

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
26	500.00	0.00	669.40	0.53	668.87
27	520.00	0.00	670.08	0.53	669.55
28	540.00	0.00	670.76	0.52	670.24
29	560.00	0.00	671.44	0.52	670.92
30	580.00	0.00	672.12	0.51	671.61
31	600.00	0.00	672.80	0.50	672.30
32	620.00	0.00	673.52	0.49	673.03
33	640.00	0.00	674.24	0.47	673.77
34	660.00	0.00	674.94	0.45	674.49
35	680.00	0.00	675.62	0.43	675.19
36	700.00	0.00	676.30	0.40	675.90
37	720.00	0.00	676.98	0.36	676.62
38	740.00	0.00	677.66	0.32	677.34
39	760.00	0.00	678.26	0.26	678.00
40	780.00	0.00	678.77	0.16	678.60

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	-50.00	649.50	ST1 - Granular
	2	0.00	651.40	
	3	50.00	653.30	
	4	100.00	655.30	
	5	150.00	657.10	
	6	200.00	658.80	
	7	250.00	660.50	
	8	280.00	661.60	
	9	300.00	662.30	
	10	350.00	664.10	
	11	400.00	666.00	
	12	450.00	667.70	
	13	500.00	669.40	
	14	550.00	671.10	
	15	600.00	672.80	
	16	650.00	674.60	
	17	700.00	676.30	
	18	750.00	678.00	
	19	781.30	678.80	
	20	800.00	679.70	
	21	850.00	681.40	
2	1	-50.00	649.49	ST3 - Cohesive
	2	0.00	651.39	
	3	50.00	653.29	
	4	100.00	655.29	
	5	150.00	657.09	
	6	200.00	658.79	
	7	250.00	660.49	
	8	280.00	661.59	
	9	454.30	664.40	
	10	850.00	662.50	
3	1	-50.00	649.48	ST2 - Granular
	2	0.00	651.38	
	3	50.00	653.28	
	4	100.00	655.28	
	5	150.00	657.08	
	6	200.00	658.78	
	7	250.00	660.48	
	8	280.00	661.58	
	9	454.30	664.39	
	10	850.00	658.80	
4	1	-50.00	647.50	ST4 - Granular
	2	0.00	649.40	
	3	50.00	651.50	
	4	191.40	644.90	
	5	454.30	654.50	
	6	850.00	658.79	
5	1	-50.00	644.50	ST3 - Cohesive
	2	460.00	644.50	
	3	850.00	650.00	

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
6	1	-50.00	644.49	ST4 - Granular
	2	460.00	644.49	
	3	850.00	644.50	
7	1	-50.00	615.00	ST5a - Cohesive
	2	57.20	615.00	
	3	191.40	625.90	
	4	454.30	613.20	
	5	850.00	623.70	
8	1	-50.00	598.50	ST5b - Cohesive
	2	850.00	598.50	
9	1	-50.00	572.70	ST5c - Cohesive
	2	850.00	572.70	
10	1	-50.00	450.00	Termination Layer
	2	850.00	450.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 0.00 [ft]	1	0.00	651.40	Proposed Embankment
	X2 = 781.31 [ft]	2	0.01	671.03	
		3	4.64	671.07	
		4	763.05	694.91	
		5	781.30	695.90	
		6	781.31	678.80	

RETAINING WALL Z – STA. 00+00

CUY-90-16.28 (CCG3A)

PROJECT IDENTIFICATION

Title:	CUY-90-16.28 (CCG3A)
Project Number:	PID 82382 -
Client:	Michael Baker International
Designer:	KCA
Station Number:	

Description:

Company's information:

Name:	NEAS Inc.
Street:	2800 Coroporate Exchange Drive, Suite 240 Columbus, OH 43231
Telephone #:	614-714-0299
Fax #:	614-714-0251
E-Mail:	brendan.andrews@neasinc.com

Original file path and name: P:\21-0011 ..... Wall Z\Settlement\FOSSA\WallZ 0+00_FOSSA071121.2ST
Original date and time of creating this file: Tue Jun 29 16:28:11 2021

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 6 layers

	Wet Unit Weight, γ [lb/ft³]	**Poisson's Ratio μ**	**Description of Soil**
1	122.00	0.20	ST1 - Granular
2	128.00	0.30	ST4 - Granular
3	130.00	0.30	ST5a - Cohesive
4	125.00	0.45	ST5b - Cohesive
5	130.00	0.50	ST5c - Cohesive
6	150.00	0.20	Termination Layer

INPUT DATA – EMBANKMENT LAYERS -- 1 layers

	Wet Unit Weight, γ [lb/ft³]	**Description of Soil**
1	120.00	Proposed Embankment

INPUT DATA OF WATER

Point #	**Coordinates (X, Z) : (X) [ft.]**	**(Z) [ft.]**
1	0.00	648.10
2	160.00	648.10

DRAWING OF SPECIFIED GEOMETRY

INPUT DATA FOR CONSOLIDATION -- $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A
3	Yes	1.30	0.100	0.020	0.585	0.5400	Top
4	Yes	1.20	0.100	0.020	0.784	0.2300	Top
5	Yes	1.10	0.120	0.024	0.534	0.2100	Top
6	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	54.00	0.00	1	505000	0.2000	0.0000	651.40	651.34	0.06
			2	957000	0.3000	0.0310			
			3	2000000	0.3000	0.0058			
			4	2000000	0.4500	0.0072			
			5	2000000	0.5000	0.0205			
			6	1000000000(	0.2000	0.0000			
2	71.00	0.00	1	505000	0.2000	0.0000	651.46	651.36	0.10
			2	957000	0.3000	0.0584			
			3	2000000	0.3000	0.0084			
			4	2000000	0.4500	0.0096			
			5	2000000	0.5000	0.0230			
			6	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node # 	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	54.00	0.00	651.40	0.10	651.30
2	71.00	0.00	651.46	0.15	651.31

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	650.20	ST1 - Granular
	2	42.30	651.50	
	3	53.80	651.40	
	4	65.10	651.50	
	5	78.60	651.40	
	6	92.70	651.60	
	7	99.20	651.60	
	8	106.80	670.30	
	9	111.00	670.90	
	10	115.00	671.10	
	11	120.00	670.90	
	12	148.10	670.30	
	13	156.40	670.40	
	14	160.00	670.40	
2	1	0.00	650.19	ST4 - Granular
	2	42.30	651.49	
	3	53.80	651.39	
	4	65.10	651.49	
	5	78.60	651.39	
	6	92.70	651.59	
	7	99.20	651.59	
	8	160.00	651.50	
3	1	0.00	613.50	ST5a - Cohesive
	2	160.00	613.50	
4	1	0.00	598.50	ST5b - Cohesive
	2	160.00	598.50	
5	1	0.00	572.70	ST5c - Cohesive
	2	160.00	572.70	
6	1	0.00	450.00	Termination Layer
	2	160.00	450.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 53.80 [ft]	1	53.80	651.40	Proposed Embankment
	X2 = 106.80 [ft]	2	53.81	671.00	
		3	106.80	670.30	

RETAINING WALL Z – STA. 01+80

CUY-90-16.28 (CCG3A)

PROJECT IDENTIFICATION

Title:	CUY-90-16.28 (CCG3A)
Project Number:	PID 82382 -
Client:	Michael Baker International
Designer:	KCA
Station Number:	

Description:

Company's information:

Name:	NEAS Inc.
Street:	2800 Coroporate Exchange Drive, Suite 240 Columbus, OH 43231
Telephone #:	614-714-0299
Fax #:	614-714-0251
E-Mail:	brendan.andrews@neasinc.com

Original file path and name: P:\21-0011 ..... Wall Z\Settlement\FOSSA\WallZ 1+80_FOSSA071121.2ST
Original date and time of creating this file: Tue Jun 29 16:28:11 2021

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 6 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	110.00	0.25	ST2 - Granular
2	128.00	0.30	ST4 - Granular
3	130.00	0.30	ST5a - Cohesive
4	125.00	0.45	ST5b - Cohesive
5	130.00	0.50	ST5c - Cohesive
6	150.00	0.20	Termination Layer

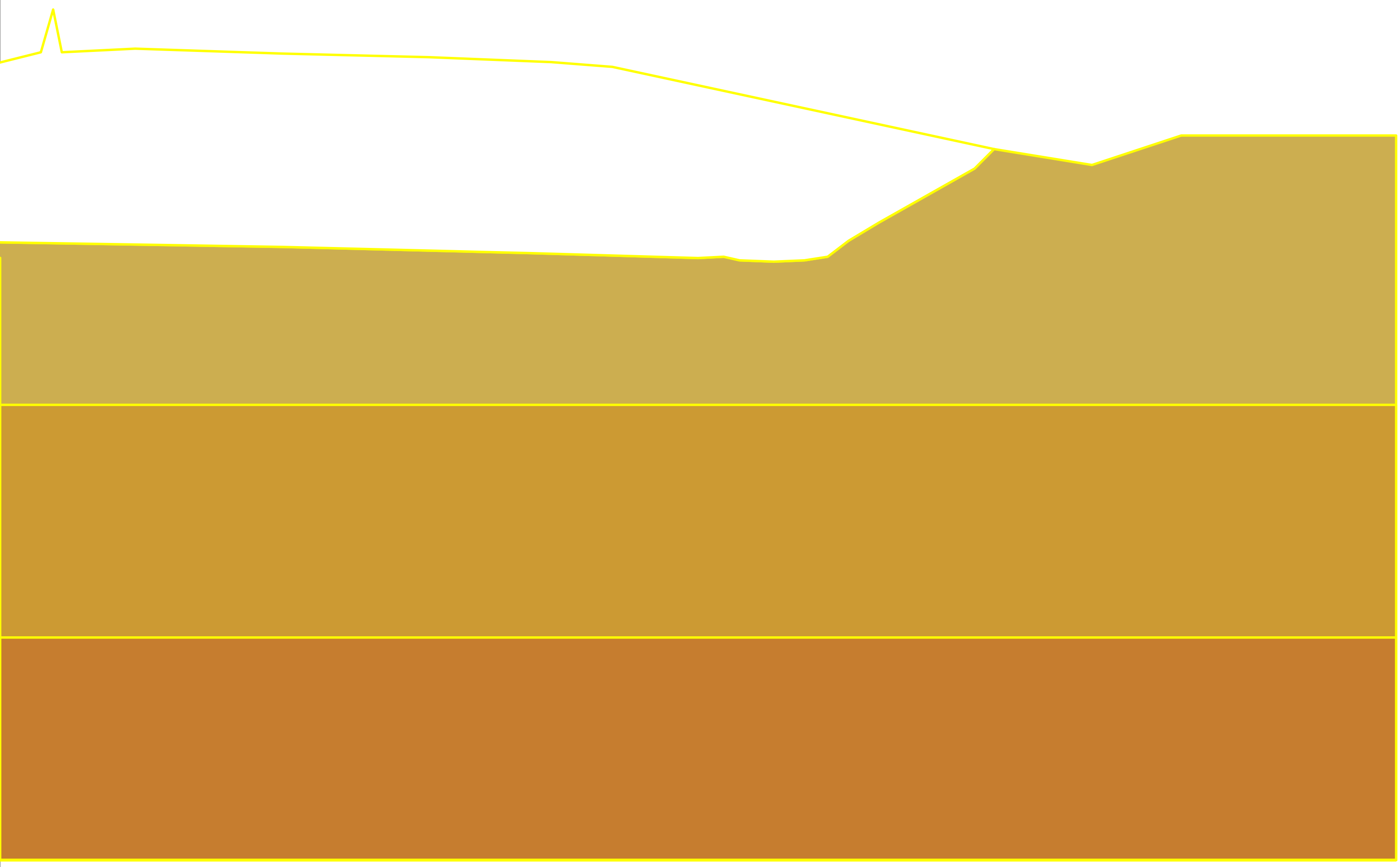
INPUT DATA – EMBANKMENT LAYERS -- 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	120.00	Proposed Embankment

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	649.40
2	160.00	649.40

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION -- $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A
3	Yes	1.30	0.100	0.020	0.585	0.5400	Top
4	Yes	1.20	0.100	0.020	0.784	0.2300	Top
5	Yes	1.10	0.120	0.024	0.534	0.2100	Top
6	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	54.00	0.00	1	183000	0.2500	0.0527	658.11	658.01	0.10
			2	957000	0.3000	0.0122			
			3	2000000	0.3000	0.0090			
			4	2000000	0.4500	0.0064			
			5	2000000	0.5000	0.0219			
			6	1000000000(	0.2000	0.0000			
2	73.00	0.00	1	183000	0.2500	0.0969	657.98	657.81	0.17
			2	957000	0.3000	0.0247			
			3	2000000	0.3000	0.0145			
			4	2000000	0.4500	0.0092			
			5	2000000	0.5000	0.0259			
			6	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	54.00	0.00	658.11	0.11	658.00
2	73.00	0.00	657.98	0.19	657.80

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	656.80	ST2 - Granular
	2	50.60	658.00	
	3	53.20	658.10	
	4	59.60	658.20	
	5	84.40	657.80	
	6	104.70	657.30	
	7	118.40	656.90	
	8	120.50	657.00	
	9	121.80	656.70	
	10	124.60	656.60	
	11	127.10	656.70	
	12	129.00	657.00	
	13	130.70	658.30	
	14	133.20	659.80	
	15	141.00	664.20	
	16	142.60	665.80	
	17	150.60	664.50	
	18	157.90	666.90	
	19	157.90	666.90	
	20	160.00	666.90	
2	1	0.00	644.90	ST4 - Granular
	2	160.00	644.90	
3	1	0.00	625.90	ST5a - Cohesive
	2	160.00	625.90	
4	1	0.00	598.50	ST5b - Cohesive
	2	160.00	598.50	
5	1	0.00	572.70	ST5c - Cohesive
	2	160.00	572.70	
6	1	0.00	450.00	Termination Layer
	2	160.00	450.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 53.20 [ft]	1	53.20	658.10	Proposed Embankment
	X2 = 142.60 [ft]	2	53.20	674.20	
		3	54.20	674.20	
		4	54.20	673.70	
		5	59.50	672.40	
		6	64.70	673.70	
		7	64.70	677.20	
		8	65.70	677.20	
		9	66.40	673.70	
		10	72.40	674.00	
		11	84.40	673.60	
		12	96.40	673.30	
		13	106.40	672.90	
		14	111.40	672.50	
		15	142.60	665.80	

RETAINING WALL Z – STA. 06+50

CUY-90-16.28 (CCG3A)

PROJECT IDENTIFICATION

Title: CUY-90-16.28 (CCG3A)
Project Number: PID 82382 -
Client: Michael Baker International
Designer: KCA
Station Number:

Description:

Company's information:

Name: NEAS Inc.
Street: 2800 Coroporate Exchange Drive, Suite 240
Columbus, OH 43231
Telephone #: 614-714-0299
Fax #: 614-714-0251
E-Mail: brendan.andrews@neasinc.com

Original file path and name: P:\21-0011 ..... Wall Z\Settlement\FOSSA\WallZ 6+50_FOSSA071121.2ST
Original date and time of creating this file: Tue Jun 29 16:28:11 2021

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 10 layers

	Wet Unit Weight, γ [lb/ft³]	**Poisson's Ratio μ**	**Description of Soil**
1	122.00	0.20	ST1 - Granular
2	105.00	0.40	ST3 - Cohesive
3	110.00	0.25	ST2 - Granular
4	128.00	0.30	ST4 - Granular
5	105.00	0.40	ST3 - Cohesive
6	128.00	0.30	ST4 - Granular
7	130.00	0.30	ST5a - Cohesive
8	125.00	0.45	ST5b - Cohesive
9	130.00	0.50	ST5c - Cohesive
10	150.00	0.20	Termination Layer

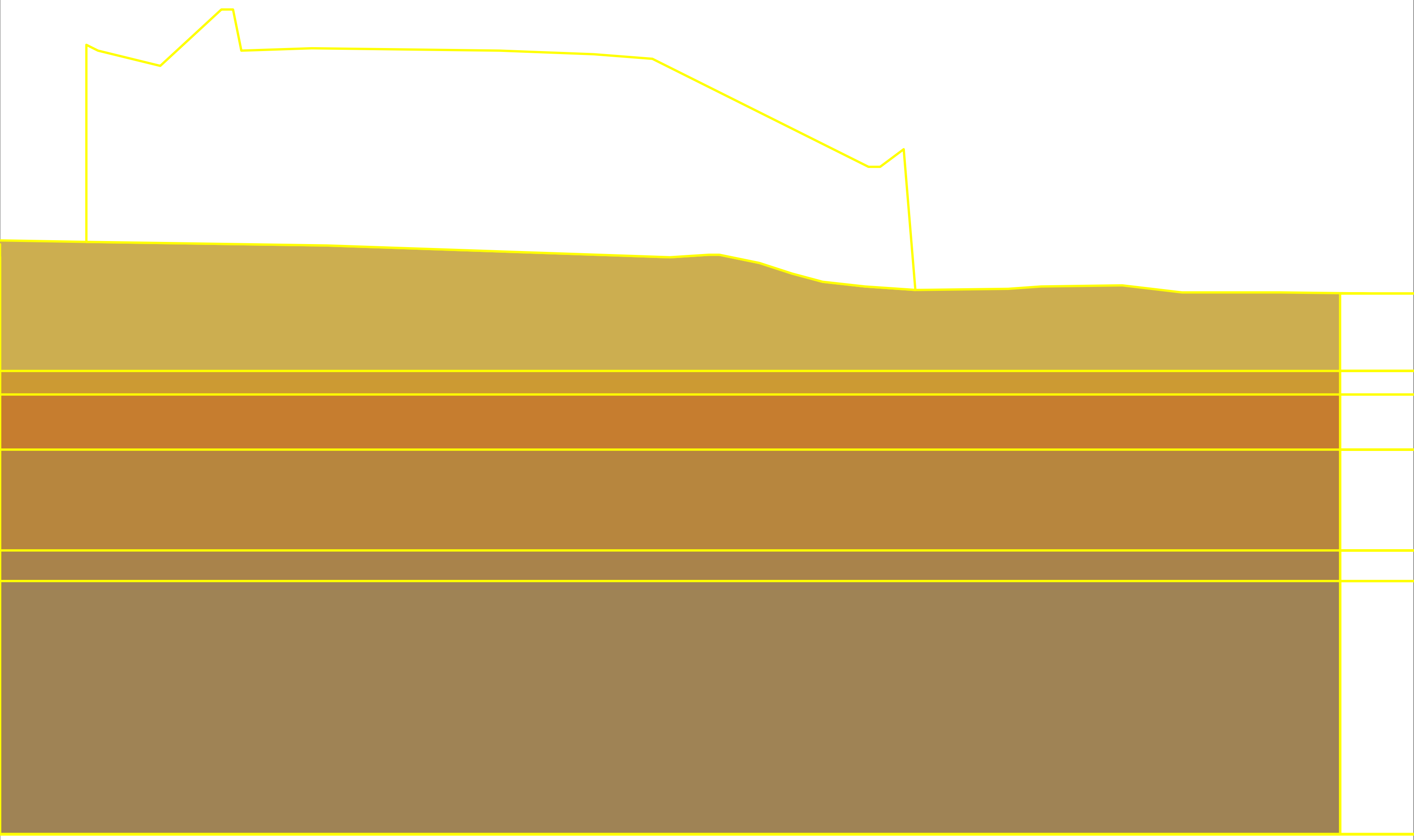
INPUT DATA – EMBANKMENT LAYERS -- 1 layers

	Wet Unit Weight, γ [lb/ft³]	**Description of Soil**
1	120.00	Proposed Embankment

INPUT DATA OF WATER

Point #	**Coordinates (X, Z) :** **(X) [ft.]**	**(Z) [ft.]**
1	0.00	649.00
2	160.00	649.00

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION -- $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	No	N/A	N/A	N/A	N/A	N/A	N/A
5	Yes	1.00	0.200	0.041	1.023	0.3000	Top
6	No	N/A	N/A	N/A	N/A	N/A	N/A
7	Yes	1.30	0.100	0.020	0.585	0.5400	Top
8	Yes	1.20	0.100	0.020	0.784	0.2300	Top
9	Yes	1.10	0.120	0.024	0.534	0.2100	Top
10	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	57.00	0.00	1	505000	0.2000	0.0216	674.59	674.48	0.11
			2	363000	0.4000	0.0030			
			3	183000	0.2500	0.0202			
			4	957000	0.3000	0.0065			
			5	363000	0.4000	0.0041			
			6	957000	0.3000	0.0204			
			7	2000000	0.3000	0.0071			
			8	2000000	0.4500	0.0066			
			9	2000000	0.5000	0.0210			
			10	1000000000(	0.2000	0.0000			
2	77.00	0.00	1	505000	0.2000	0.0336	674.30	674.12	0.18
			2	363000	0.4000	0.0069			
			3	183000	0.2500	0.0408			
			4	957000	0.3000	0.0129			
			5	363000	0.4000	0.0084			
			6	957000	0.3000	0.0330			
			7	2000000	0.3000	0.0096			
			8	2000000	0.4500	0.0084			
			9	2000000	0.5000	0.0235			
			10	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	57.00	0.00	674.59	0.14	674.45
2	77.00	0.00	674.30	0.19	674.10

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) :		
		(X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	674.40	ST1 - Granular
	2	36.70	675.00	
	3	38.80	674.90	
	4	56.40	674.60	
	5	76.90	674.30	
	6	106.10	673.30	
	7	109.40	673.50	
	8	110.30	673.50	
	9	113.70	672.80	
	10	116.50	671.90	
	11	119.10	671.20	
	12	122.70	670.80	
	13	127.00	670.50	
	14	127.30	670.50	
	15	134.90	670.60	
	16	137.70	670.80	
	17	144.60	670.90	
	18	149.70	670.30	
	19	158.10	670.30	
	20	165.80	670.20	
	21	170.00	670.20	
2	1	0.00	663.60	ST3 - Cohesive
	2	170.00	663.60	
3	1	0.00	661.60	ST2 - Granular
	2	170.00	661.60	
4	1	0.00	656.90	ST4 - Granular
	2	170.00	656.90	
5	1	0.00	648.30	ST3 - Cohesive
	2	170.00	648.30	
6	1	0.00	645.70	ST4 - Granular
	2	170.00	645.70	
7	1	0.00	619.00	ST5a - Cohesive
	2	170.00	619.00	
8	1	0.00	598.50	ST5b - Cohesive
	2	170.00	598.50	
9	1	0.00	572.70	ST5c - Cohesive
	2	170.00	572.70	
10	1	0.00	450.00	Termination Layer
	2	170.00	450.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 56.40 [ft]	1	56.40	691.40	Proposed Embankment
	X2 = 127.00 [ft]	2	56.40	673.50	
		3	57.40	690.90	
		4	57.40	691.40	
		5	62.70	689.60	
		6	67.90	694.40	
		7	67.90	690.90	
		8	68.90	694.40	
		9	69.60	690.90	
		10	75.60	691.10	
		11	91.60	690.90	
		12	99.60	690.60	
		13	104.60	690.20	
		14	123.00	681.00	
		15	124.00	681.00	
		16	126.00	682.50	
		17	126.00	682.00	
		18	127.00	670.50	
		19	127.00	682.50	

RETAINING WALL Z – STA. 07+50

CUY-90-16.28 (CCG3A)

PROJECT IDENTIFICATION

Title:	CUY-90-16.28 (CCG3A)
Project Number:	PID 82382 -
Client:	Michael Baker International
Designer:	KCA
Station Number:	

Description:

Company's information:

Name:	NEAS Inc.
Street:	2800 Coroporate Exchange Drive, Suite 240 Columbus, OH 43231
Telephone #:	614-714-0299
Fax #:	614-714-0251
E-Mail:	brendan.andrews@neasinc.com

Original file path and name: P:\21-0011 ..... Wall Z\Settlement\FOSSA\WallZ 7+50_FOSSA071121.2ST
Original date and time of creating this file: Tue Jun 29 16:28:11 2021

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 9 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	122.00	0.20	ST1 - Granular
2	105.00	0.40	ST3 - Cohesive
3	128.00	0.30	ST4 - Granular
4	105.00	0.40	ST3 - Cohesive
5	128.00	0.30	ST4 - Granular
6	130.00	0.30	ST5a - Cohesive
7	125.00	0.45	ST5b - Cohesive
8	130.00	0.50	ST5c - Cohesive
9	150.00	0.20	Termination Layer

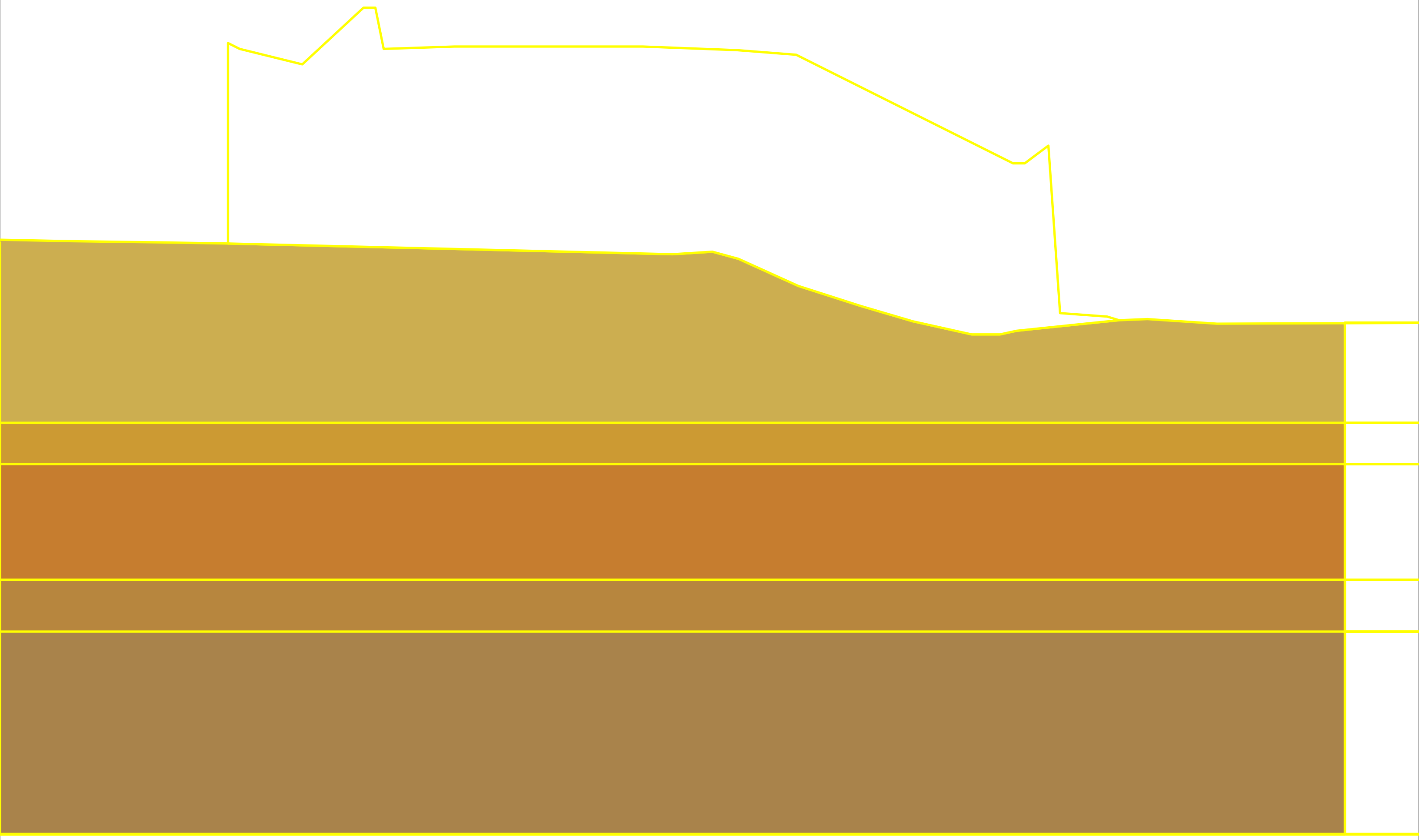
INPUT DATA – EMBANKMENT LAYERS -- 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	120.00	Proposed Embankment

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	648.80
2	160.00	648.80

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION –– $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	Yes	1.00	0.200	0.041	1.023	0.3000	Top & Bot.
5	No	N/A	N/A	N/A	N/A	N/A	N/A
6	Yes	1.30	0.100	0.020	0.585	0.5400	Top
7	Yes	1.20	0.100	0.020	0.784	0.2300	Top
8	Yes	1.10	0.120	0.024	0.534	0.2100	Top
9	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	52.00	0.00	1	505000	0.2000	0.0308	678.08	677.97	0.11
			2	363000	0.4000	0.0050			
			3	957000	0.3000	0.0074			
			4	363000	0.4000	0.0074			
			5	957000	0.3000	0.0181			
			6	2000000	0.3000	0.0087			
			7	2000000	0.4500	0.0070			
			8	2000000	0.5000	0.0225			
			9	1000000000(	0.2000	0.0000			
2	72.00	0.00	1	505000	0.2000	0.0472	677.60	677.44	0.16
			2	363000	0.4000	0.0115			
			3	957000	0.3000	0.0145			
			4	363000	0.4000	0.0148			
			5	957000	0.3000	0.0292			
			6	2000000	0.3000	0.0118			
			7	2000000	0.4500	0.0089			
			8	2000000	0.5000	0.0252			
			9	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	52.00	0.00	678.08	0.18	677.90
2	72.00	0.00	677.60	0.25	677.35

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	678.20	ST1 - Granular
	2	23.30	678.60	
	3	37.70	678.30	
	4	45.60	678.20	
	5	51.20	678.10	
	6	88.90	677.20	
	7	92.30	677.40	
	8	94.50	676.80	
	9	99.60	674.50	
	10	104.90	672.80	
	11	109.30	671.50	
	12	114.30	670.40	
	13	116.70	670.40	
	14	118.10	670.70	
	15	123.90	671.30	
	16	126.80	671.60	
	17	129.20	671.70	
	18	135.10	671.30	
	19	159.50	671.40	
	20	160.00	671.40	
2	1	0.00	662.90	ST3 - Cohesive
	2	160.00	662.90	
3	1	0.00	659.40	ST4 - Granular
	2	160.00	659.40	
4	1	0.00	649.60	ST3 - Cohesive
	2	160.00	649.60	
5	1	0.00	645.20	ST4 - Granular
	2	160.00	645.20	
6	1	0.00	622.30	ST5a - Cohesive
	2	160.00	622.30	
7	1	0.00	598.50	ST5b - Cohesive
	2	160.00	598.50	
8	1	0.00	572.70	ST5c - Cohesive
	2	160.00	572.70	
9	1	0.00	450.00	Termination Layer
	2	160.00	450.00	

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 51.20 [ft]	1	51.20	695.10	Proposed Embankment
	X2 = 126.80 [ft]	2	51.20	678.10	
		3	52.20	694.60	
		4	52.20	695.10	
		5	57.50	693.30	
		6	62.70	698.10	
		7	62.70	694.60	
		8	63.70	698.10	
		9	64.40	694.60	
		10	70.40	694.80	
		11	86.40	694.80	
		12	94.40	694.50	
		13	99.40	694.10	
		14	117.80	684.90	
		15	118.80	684.90	
		16	120.80	686.40	
		17	120.80	685.90	
		18	121.80	672.20	
		19	121.80	686.40	
		20	125.80	671.90	
		21	126.80	671.60	

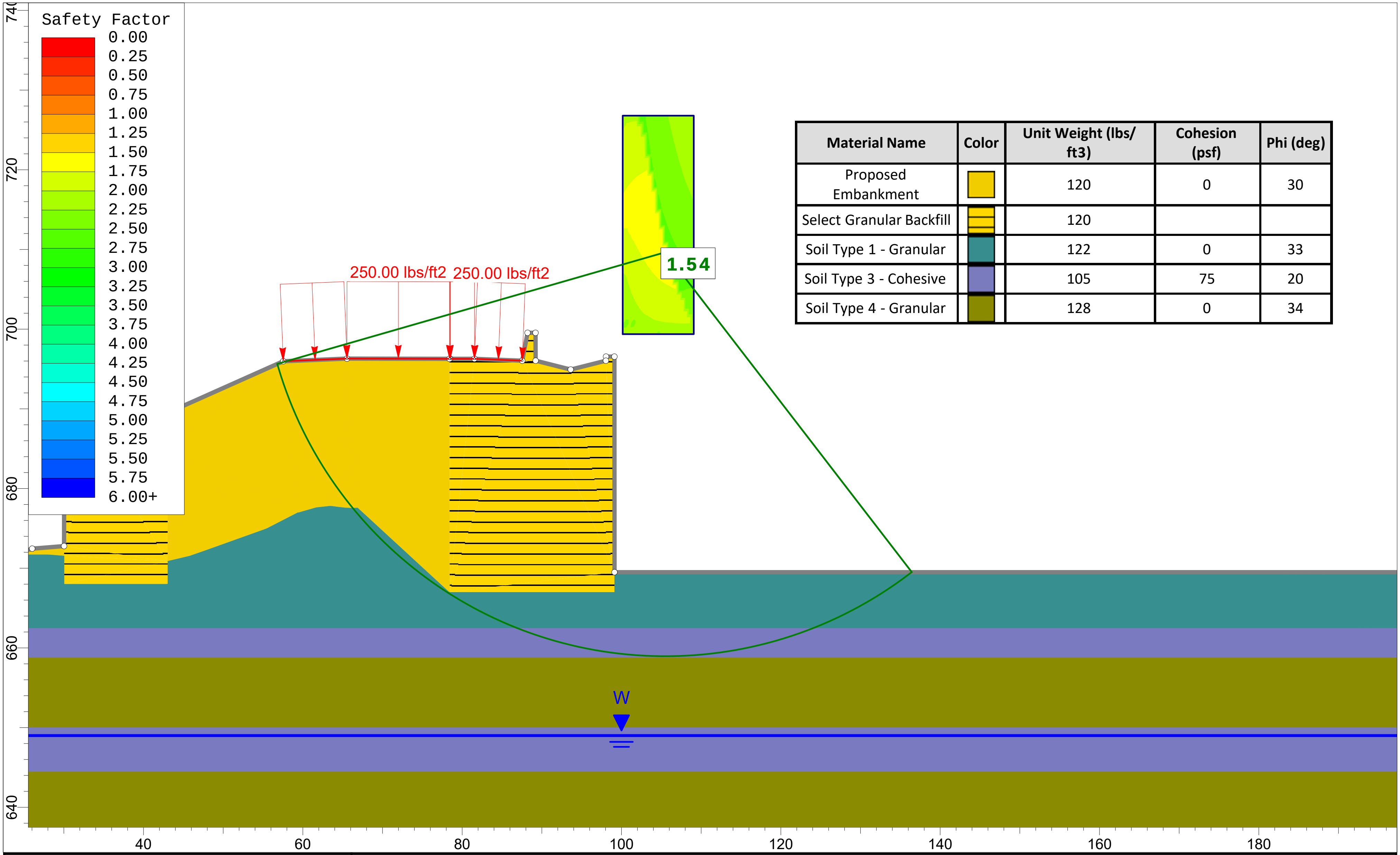
APPENDIX F

GLOBAL STABILITY ANALYSIS - RETAINING WALLS Y & Z

RETAINING WALL Y – STA. 1300+50

SEE FORWARD ABUTMENT GLOBAL STABILITY ANALYSIS (APPENDIX F)

RETAINING WALL Z – STA. 1404+85.6

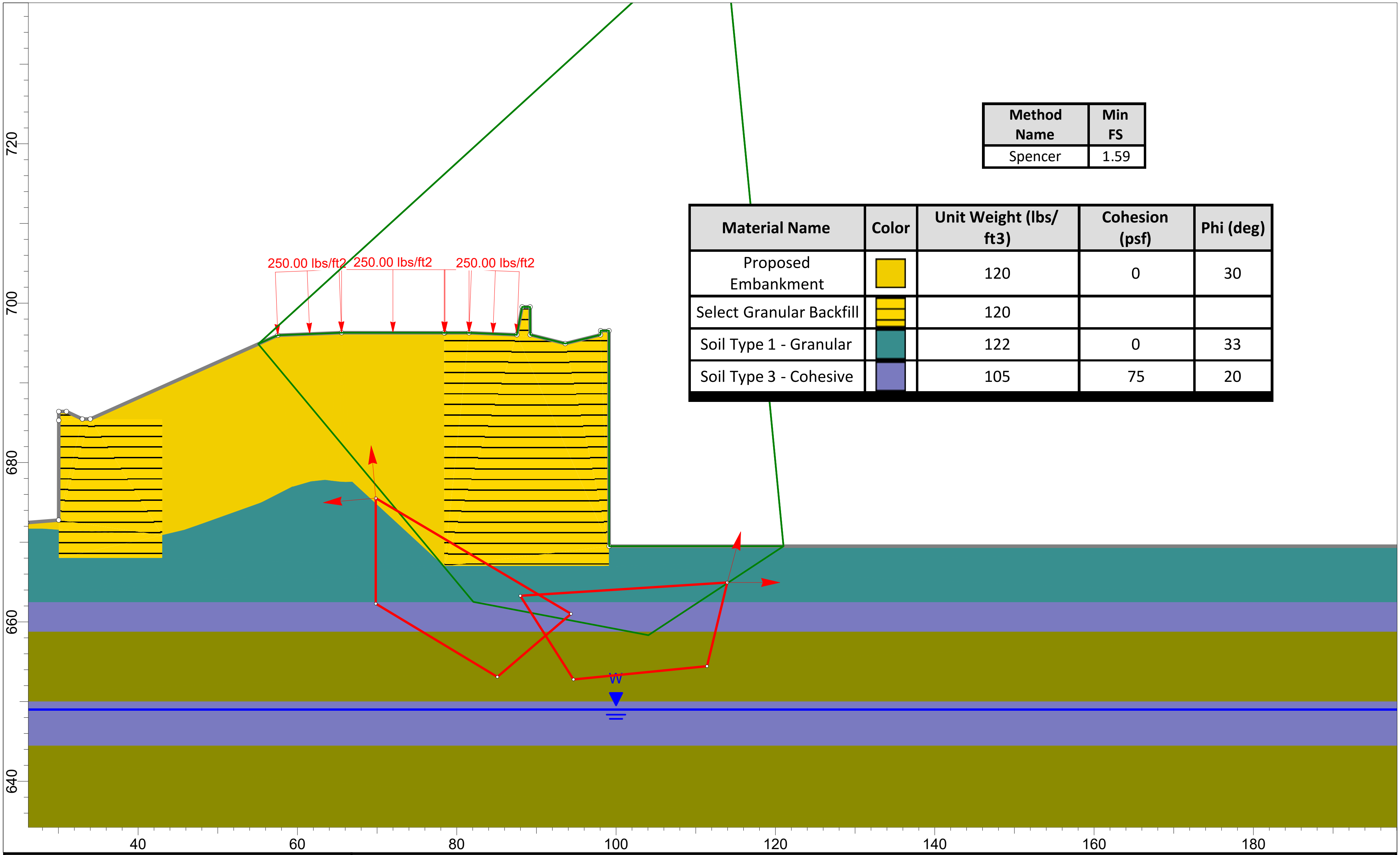


Material Name	Color	Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)
Proposed Embankment	🟨	120	0	30
Select Granular Backfill	▤	120		
Soil Type 1 - Granular	🟦	122	0	33
Soil Type 3 - Cohesive	🟪	105	75	20
Soil Type 4 - Granular	🟫	128	0	34

rocscience

SLIDEINTERPRET 9.025

Project	CUY-90-16.28 (CCG3A), PID 82382		
Analysis Description	Wall Z @ STA. 1404+85.6, Global Stability - Effective Stress, Circular Failure		
Drawn By	KCA	*Company*	NEAS Inc.
Date	1/16/2024, 2:28:05 PM	*File Name*	WallZ_STA1404+85.6_EffCircular011624.slim



Method Name	Min FS
Spencer	1.59

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Proposed Embankment	🟨	120	0	30
Select Granular Backfill	▤	120		
Soil Type 1 - Granular	🟦	122	0	33
Soil Type 3 - Cohesive	🟪	105	75	20

rocscience

SLIDEINTERPRET 9.025

Project CUY-90-16.28 (CCG3A), PID 82382

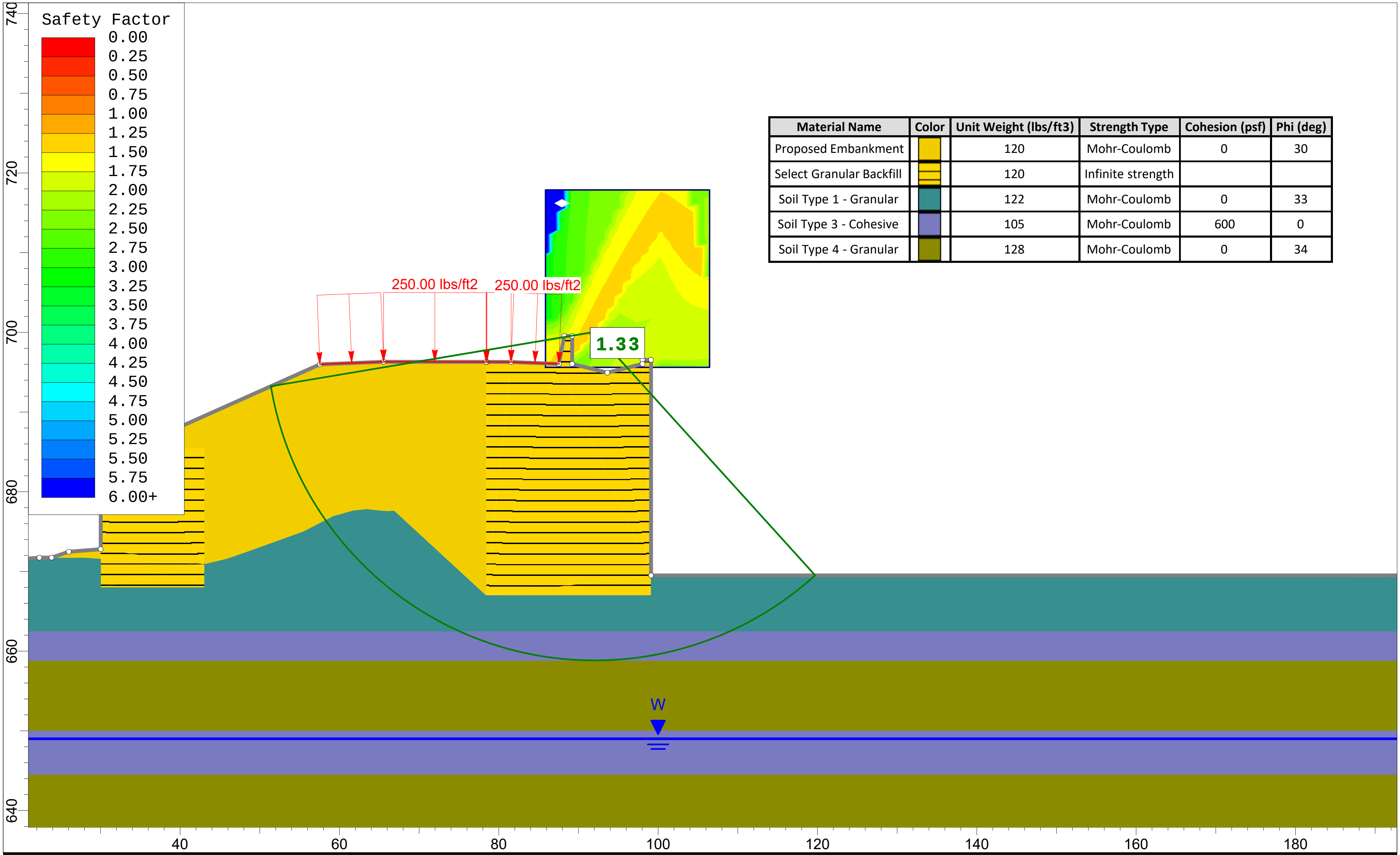
Analysis Description Wall Z @ STA. 1404+85.6, Global Stability - Effective Stress, Block Failure

Drawn By KCA

Company NEAS Inc.

Date 1/16/2024, 2:28:05 PM

File Name WallZ_STA1404+85.6_EffBlock011624.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Proposed Embankment	🟨	120	Mohr-Coulomb	0	30
Select Granular Backfill	▤	120	Infinite strength		
Soil Type 1 - Granular	🟦	122	Mohr-Coulomb	0	33
Soil Type 3 - Cohesive	🟪	105	Mohr-Coulomb	600	0
Soil Type 4 - Granular	🟫	128	Mohr-Coulomb	0	34

SLIDEINTERPRET 9.025

Project
CUY-90-16.28 (CCG3A), PID 82382

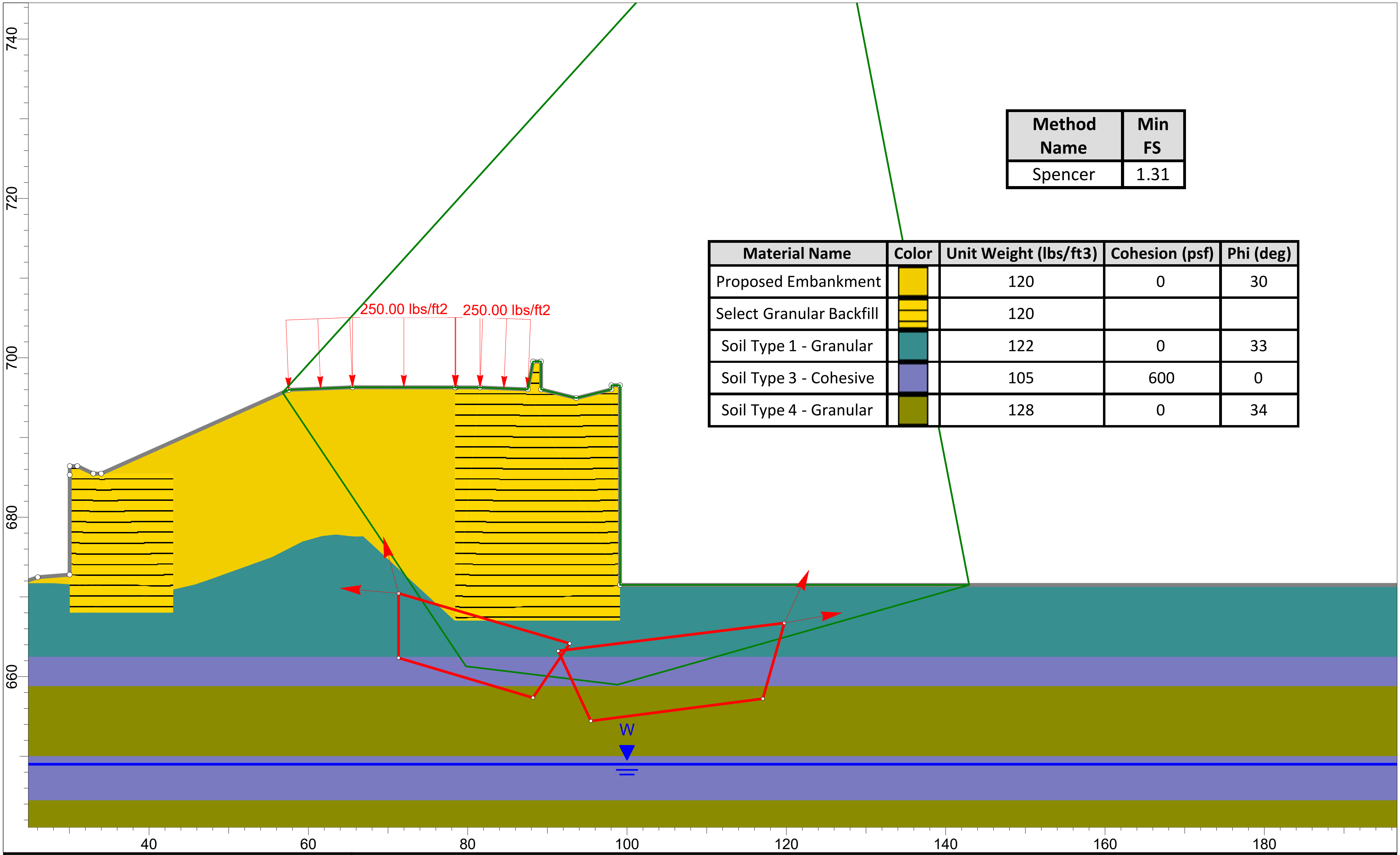
Analysis Description
Wall Z @ STA. 1404+85.6, Global Stability - Total Stress, Circular Failure

Drawn By
KCA

Company
NEAS Inc.

Date
1/16/2024, 2:28:05 PM

File Name
WallZ_STA1404+85.6_TotalCircular011624.slim



Method Name	Min FS
Spencer	1.31

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Proposed Embankment	🟨	120	0	30
Select Granular Backfill	▤	120		
Soil Type 1 - Granular	🟦	122	0	33
Soil Type 3 - Cohesive	🟪	105	600	0
Soil Type 4 - Granular	🟫	128	0	34

rocscience

SLIDEINTERPRET 9.025

Project CUY-90-16.28 (CCG3A), PID 82382

Analysis Description Wall Z @ STA. 1404+85.6, Global Stability - Total Stress, Block Failure

Drawn By KCA

Company NEAS Inc.

Date 1/16/2024, 2:28:05 PM

File Name WallZ_STA1404+85.6_TotalBlock011624.slim

APPENDIX G

DRIVEN ANALYSIS

REAR ABUTMENT

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\XPMUSER\DESKTOP\CCG3\BRIDGE12\RA.DVN
Project Name: CCG3A Project Date: 06/30/2021
Project Client: Michael Baker International
Computed By: KCA
Project Manager: BPA

PILE INFORMATION

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

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	22.00 ft
	- Driving/Restrike	22.00 ft
	- Ultimate:	22.00 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	Cohesionless	2.60 ft	0.00%	130.00 pcf	38.0/38.0	Nordlund
2	Cohesionless	15.80 ft	0.00%	122.00 pcf	30.0/30.0	Nordlund
3	Cohesionless	25.00 ft	0.00%	128.00 pcf	33.0/33.0	Nordlund
4	Cohesionless	15.00 ft	33.00%	135.00 pcf	35.0/35.0	Nordlund
5	Cohesionless	5.00 ft	0.00%	135.00 pcf	39.0/39.0	Nordlund
6	Cohesive	15.00 ft	33.00%	125.00 pcf	3500.00 psf	T-80 Same
7	Cohesive	25.80 ft	33.00%	125.00 pcf	3200.00 psf	T-80 Same
8	Cohesive	3.70 ft	43.00%	118.00 pcf	1000.00 psf	T-80 Same

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.65 psf	22.35	N/A	0.00 Kips
2.59 ft	Cohesionless	168.35 psf	22.35	N/A	0.89 Kips
2.61 ft	Cohesionless	338.61 psf	17.64	N/A	0.90 Kips
11.61 ft	Cohesionless	887.61 psf	17.64	N/A	7.81 Kips
18.39 ft	Cohesionless	1301.19 psf	17.64	N/A	18.66 Kips
18.41 ft	Cohesionless	2266.24 psf	19.41	N/A	18.71 Kips
21.99 ft	Cohesionless	2495.36 psf	19.41	N/A	29.25 Kips
22.01 ft	Cohesionless	2726.73 psf	19.41	N/A	29.31 Kips
31.01 ft	Cohesionless	3021.93 psf	19.41	N/A	61.40 Kips
40.01 ft	Cohesionless	3317.13 psf	19.41	N/A	99.76 Kips
43.39 ft	Cohesionless	3427.99 psf	19.41	N/A	115.78 Kips
43.41 ft	Cohesionless	4130.60 psf	20.58	N/A	115.85 Kips
52.41 ft	Cohesionless	4457.30 psf	20.58	N/A	153.35 Kips
58.39 ft	Cohesionless	4674.38 psf	20.58	N/A	181.31 Kips
58.41 ft	Cohesionless	5219.60 psf	22.93	N/A	181.50 Kips
63.39 ft	Cohesionless	5400.38 psf	22.93	N/A	241.67 Kips
63.41 ft	Cohesive	N/A	N/A	856.41 psf	241.77 Kips
72.41 ft	Cohesive	N/A	N/A	856.41 psf	257.99 Kips
78.39 ft	Cohesive	N/A	N/A	940.03 psf	271.41 Kips
78.41 ft	Cohesive	N/A	N/A	867.15 psf	271.45 Kips
87.41 ft	Cohesive	N/A	N/A	867.15 psf	287.88 Kips
96.41 ft	Cohesive	N/A	N/A	1018.86 psf	310.06 Kips
104.19 ft	Cohesive	N/A	N/A	1166.22 psf	334.74 Kips
104.21 ft	Cohesive	N/A	N/A	923.00 psf	334.79 Kips
107.89 ft	Cohesive	N/A	N/A	923.00 psf	340.87 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.30 psf	110.40	210.96 Kips	0.08 Kips
2.59 ft	Cohesionless	336.70 psf	110.40	210.96 Kips	21.08 Kips
2.61 ft	Cohesionless	339.22 psf	30.00	10.46 Kips	4.64 Kips
11.61 ft	Cohesionless	1437.22 psf	30.00	10.46 Kips	10.46 Kips
18.39 ft	Cohesionless	2264.38 psf	30.00	10.46 Kips	10.46 Kips
18.41 ft	Cohesionless	2266.88 psf	47.20	39.27 Kips	39.27 Kips
21.99 ft	Cohesionless	2725.12 psf	47.20	39.27 Kips	39.27 Kips
22.01 ft	Cohesionless	2727.06 psf	47.20	39.27 Kips	39.27 Kips
31.01 ft	Cohesionless	3317.46 psf	47.20	39.27 Kips	39.27 Kips
40.01 ft	Cohesionless	3907.86 psf	47.20	39.27 Kips	39.27 Kips
43.39 ft	Cohesionless	4129.58 psf	47.20	39.27 Kips	39.27 Kips
43.41 ft	Cohesionless	4130.97 psf	64.00	84.51 Kips	84.51 Kips
52.41 ft	Cohesionless	4784.37 psf	64.00	84.51 Kips	84.51 Kips
58.39 ft	Cohesionless	5218.51 psf	64.00	84.51 Kips	84.51 Kips
58.41 ft	Cohesionless	5219.97 psf	135.20	266.03 Kips	266.03 Kips
63.39 ft	Cohesionless	5581.51 psf	135.20	266.03 Kips	266.03 Kips
63.41 ft	Cohesive	N/A	N/A	N/A	24.74 Kips
72.41 ft	Cohesive	N/A	N/A	N/A	24.74 Kips
78.39 ft	Cohesive	N/A	N/A	N/A	24.74 Kips
78.41 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
87.41 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
96.41 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
104.19 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
104.21 ft	Cohesive	N/A	N/A	N/A	7.07 Kips
107.89 ft	Cohesive	N/A	N/A	N/A	7.07 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.08 Kips	0.08 Kips
2.59 ft	0.89 Kips	21.08 Kips	21.96 Kips
2.61 ft	0.90 Kips	4.64 Kips	5.53 Kips
11.61 ft	7.81 Kips	10.46 Kips	18.27 Kips
18.39 ft	18.66 Kips	10.46 Kips	29.12 Kips
18.41 ft	18.71 Kips	39.27 Kips	57.98 Kips
21.99 ft	29.25 Kips	39.27 Kips	68.52 Kips
22.01 ft	29.31 Kips	39.27 Kips	68.58 Kips
31.01 ft	61.40 Kips	39.27 Kips	100.67 Kips
40.01 ft	99.76 Kips	39.27 Kips	139.03 Kips
43.39 ft	115.78 Kips	39.27 Kips	155.05 Kips
43.41 ft	115.85 Kips	84.51 Kips	200.36 Kips
52.41 ft	153.35 Kips	84.51 Kips	237.86 Kips
58.39 ft	181.31 Kips	84.51 Kips	265.82 Kips
58.41 ft	181.50 Kips	266.03 Kips	447.53 Kips
63.39 ft	241.67 Kips	266.03 Kips	507.70 Kips
63.41 ft	241.77 Kips	24.74 Kips	266.51 Kips
72.41 ft	257.99 Kips	24.74 Kips	282.73 Kips
78.39 ft	271.41 Kips	24.74 Kips	296.15 Kips
78.41 ft	271.45 Kips	22.62 Kips	294.07 Kips
87.41 ft	287.88 Kips	22.62 Kips	310.50 Kips
96.41 ft	310.06 Kips	22.62 Kips	332.68 Kips
104.19 ft	334.74 Kips	22.62 Kips	357.36 Kips
104.21 ft	334.79 Kips	7.07 Kips	341.86 Kips
107.89 ft	340.87 Kips	7.07 Kips	347.94 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.65 psf	22.35	N/A	0.00 Kips
2.59 ft	Cohesionless	168.35 psf	22.35	N/A	0.89 Kips
2.61 ft	Cohesionless	338.61 psf	17.64	N/A	0.90 Kips
11.61 ft	Cohesionless	887.61 psf	17.64	N/A	7.81 Kips
18.39 ft	Cohesionless	1301.19 psf	17.64	N/A	18.66 Kips
18.41 ft	Cohesionless	2266.24 psf	19.41	N/A	18.71 Kips
21.99 ft	Cohesionless	2495.36 psf	19.41	N/A	29.25 Kips
22.01 ft	Cohesionless	2726.73 psf	19.41	N/A	29.31 Kips
31.01 ft	Cohesionless	3021.93 psf	19.41	N/A	61.40 Kips
40.01 ft	Cohesionless	3317.13 psf	19.41	N/A	99.76 Kips
43.39 ft	Cohesionless	3427.99 psf	19.41	N/A	115.78 Kips
43.41 ft	Cohesionless	4130.60 psf	20.58	N/A	115.89 Kips
52.41 ft	Cohesionless	4457.30 psf	20.58	N/A	171.86 Kips
58.39 ft	Cohesionless	4674.38 psf	20.58	N/A	213.59 Kips
58.41 ft	Cohesionless	5219.60 psf	22.93	N/A	213.78 Kips
63.39 ft	Cohesionless	5400.38 psf	22.93	N/A	273.94 Kips
63.41 ft	Cohesive	N/A	N/A	856.41 psf	274.09 Kips
72.41 ft	Cohesive	N/A	N/A	856.41 psf	298.31 Kips
78.39 ft	Cohesive	N/A	N/A	940.03 psf	318.34 Kips
78.41 ft	Cohesive	N/A	N/A	867.15 psf	318.40 Kips
87.41 ft	Cohesive	N/A	N/A	867.15 psf	342.92 Kips
96.41 ft	Cohesive	N/A	N/A	1018.86 psf	376.02 Kips
104.19 ft	Cohesive	N/A	N/A	1166.22 psf	412.86 Kips
104.21 ft	Cohesive	N/A	N/A	923.00 psf	412.94 Kips
107.89 ft	Cohesive	N/A	N/A	923.00 psf	423.61 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.30 psf	110.40	210.96 Kips	0.08 Kips
2.59 ft	Cohesionless	336.70 psf	110.40	210.96 Kips	21.08 Kips
2.61 ft	Cohesionless	339.22 psf	30.00	10.46 Kips	4.64 Kips
11.61 ft	Cohesionless	1437.22 psf	30.00	10.46 Kips	10.46 Kips
18.39 ft	Cohesionless	2264.38 psf	30.00	10.46 Kips	10.46 Kips
18.41 ft	Cohesionless	2266.88 psf	47.20	39.27 Kips	39.27 Kips
21.99 ft	Cohesionless	2725.12 psf	47.20	39.27 Kips	39.27 Kips
22.01 ft	Cohesionless	2727.06 psf	47.20	39.27 Kips	39.27 Kips
31.01 ft	Cohesionless	3317.46 psf	47.20	39.27 Kips	39.27 Kips
40.01 ft	Cohesionless	3907.86 psf	47.20	39.27 Kips	39.27 Kips
43.39 ft	Cohesionless	4129.58 psf	47.20	39.27 Kips	39.27 Kips
43.41 ft	Cohesionless	4130.97 psf	64.00	84.51 Kips	84.51 Kips
52.41 ft	Cohesionless	4784.37 psf	64.00	84.51 Kips	84.51 Kips
58.39 ft	Cohesionless	5218.51 psf	64.00	84.51 Kips	84.51 Kips
58.41 ft	Cohesionless	5219.97 psf	135.20	266.03 Kips	266.03 Kips
63.39 ft	Cohesionless	5581.51 psf	135.20	266.03 Kips	266.03 Kips
63.41 ft	Cohesive	N/A	N/A	N/A	24.74 Kips
72.41 ft	Cohesive	N/A	N/A	N/A	24.74 Kips
78.39 ft	Cohesive	N/A	N/A	N/A	24.74 Kips
78.41 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
87.41 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
96.41 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
104.19 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
104.21 ft	Cohesive	N/A	N/A	N/A	7.07 Kips
107.89 ft	Cohesive	N/A	N/A	N/A	7.07 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.08 Kips	0.08 Kips
2.59 ft	0.89 Kips	21.08 Kips	21.96 Kips
2.61 ft	0.90 Kips	4.64 Kips	5.53 Kips
11.61 ft	7.81 Kips	10.46 Kips	18.27 Kips
18.39 ft	18.66 Kips	10.46 Kips	29.12 Kips
18.41 ft	18.71 Kips	39.27 Kips	57.98 Kips
21.99 ft	29.25 Kips	39.27 Kips	68.52 Kips
22.01 ft	29.31 Kips	39.27 Kips	68.58 Kips
31.01 ft	61.40 Kips	39.27 Kips	100.67 Kips
40.01 ft	99.76 Kips	39.27 Kips	139.03 Kips
43.39 ft	115.78 Kips	39.27 Kips	155.05 Kips
43.41 ft	115.89 Kips	84.51 Kips	200.39 Kips
52.41 ft	171.86 Kips	84.51 Kips	256.37 Kips
58.39 ft	213.59 Kips	84.51 Kips	298.10 Kips
58.41 ft	213.78 Kips	266.03 Kips	479.81 Kips
63.39 ft	273.94 Kips	266.03 Kips	539.97 Kips
63.41 ft	274.09 Kips	24.74 Kips	298.83 Kips
72.41 ft	298.31 Kips	24.74 Kips	323.05 Kips
78.39 ft	318.34 Kips	24.74 Kips	343.08 Kips
78.41 ft	318.40 Kips	22.62 Kips	341.02 Kips
87.41 ft	342.92 Kips	22.62 Kips	365.54 Kips
96.41 ft	376.02 Kips	22.62 Kips	398.64 Kips
104.19 ft	412.86 Kips	22.62 Kips	435.48 Kips
104.21 ft	412.94 Kips	7.07 Kips	420.01 Kips
107.89 ft	423.61 Kips	7.07 Kips	430.68 Kips

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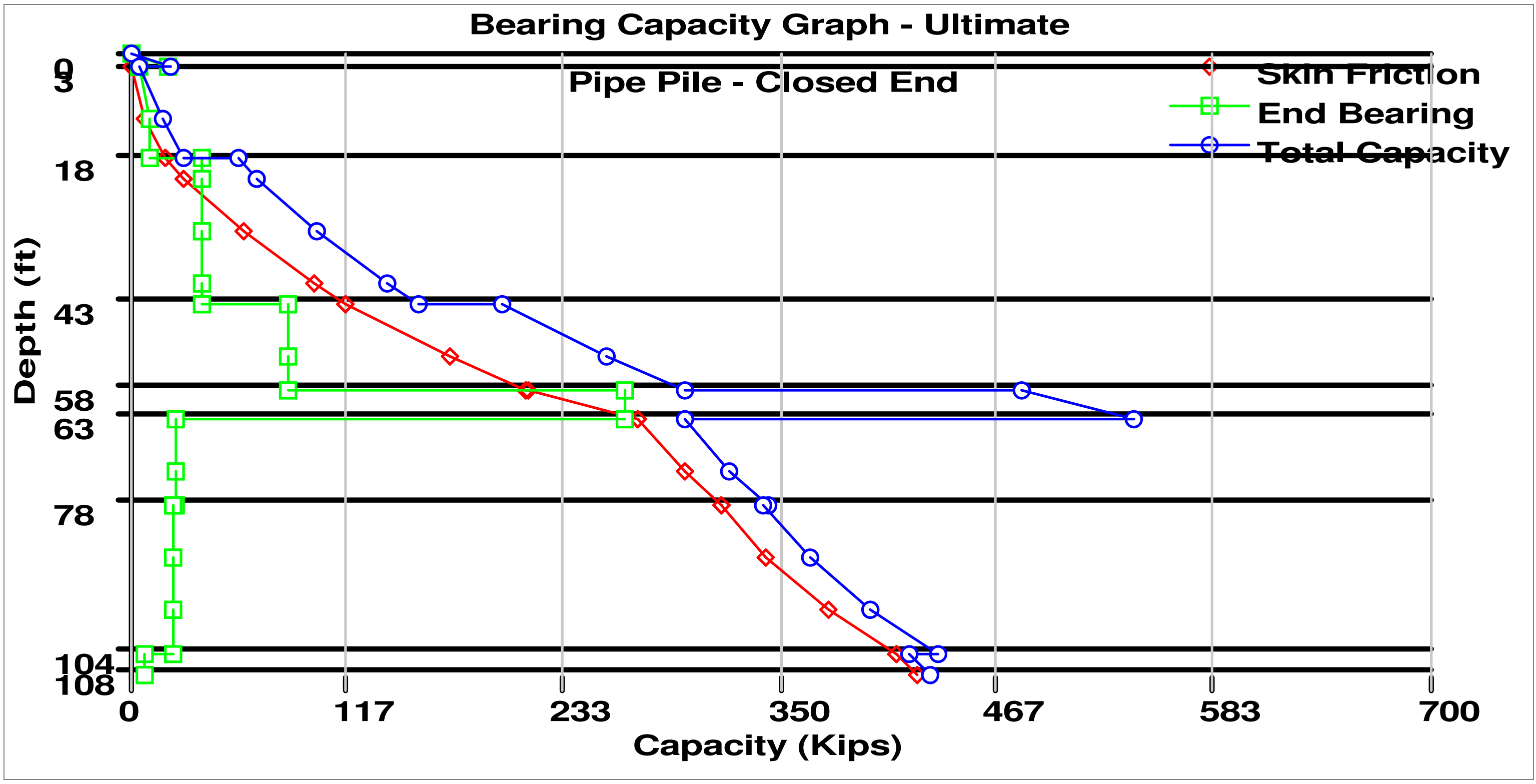

PIER 1

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\XPMUSER\DESKTOP\CCG3\BRIDGE12\P1.DVN
Project Name: CCG3A Project Date: 06/21/2022
Project Client: Michael Baker International
Computed By: KCA
Project Manager: BPA

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 16.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	8.00 ft
	- Driving/Restrike	8.00 ft
	- Ultimate:	8.00 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	Cohesionless	6.40 ft	0.00%	112.00 pcf	31.0/31.0	Nordlund
2	Cohesionless	18.80 ft	0.00%	128.00 pcf	34.0/34.0	Nordlund
3	Cohesionless	20.00 ft	33.00%	135.00 pcf	34.0/34.0	Nordlund
4	Cohesive	45.00 ft	33.00%	130.00 pcf	3550.00 psf	T-80 Same
5	Cohesive	3.70 ft	43.00%	120.00 pcf	1000.00 psf	T-80 Same

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.56 psf	22.70	N/A	0.00 Kips
6.39 ft	Cohesionless	357.84 psf	22.70	N/A	4.36 Kips
6.41 ft	Cohesionless	717.44 psf	24.90	N/A	4.39 Kips
7.99 ft	Cohesionless	818.56 psf	24.90	N/A	7.78 Kips
8.01 ft	Cohesionless	921.93 psf	24.90	N/A	7.83 Kips
17.01 ft	Cohesionless	1217.13 psf	24.90	N/A	36.53 Kips
25.19 ft	Cohesionless	1485.43 psf	24.90	N/A	74.69 Kips
25.21 ft	Cohesionless	2050.28 psf	24.90	N/A	74.76 Kips
34.21 ft	Cohesionless	2376.98 psf	24.90	N/A	112.30 Kips
43.21 ft	Cohesionless	2703.68 psf	24.90	N/A	160.17 Kips
45.19 ft	Cohesionless	2775.56 psf	24.90	N/A	172.09 Kips
45.21 ft	Cohesive	N/A	N/A	861.85 psf	172.17 Kips
54.21 ft	Cohesive	N/A	N/A	861.85 psf	193.94 Kips
63.21 ft	Cohesive	N/A	N/A	918.86 psf	218.59 Kips
72.21 ft	Cohesive	N/A	N/A	1028.58 psf	250.12 Kips
81.21 ft	Cohesive	N/A	N/A	1138.30 psf	287.19 Kips
90.19 ft	Cohesive	N/A	N/A	1247.78 psf	329.70 Kips
90.21 ft	Cohesive	N/A	N/A	923.00 psf	329.76 Kips
93.89 ft	Cohesive	N/A	N/A	923.00 psf	337.87 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.12 psf	35.20	28.85 Kips	0.03 Kips
6.39 ft	Cohesionless	715.68 psf	35.20	28.85 Kips	21.20 Kips
6.41 ft	Cohesionless	718.08 psf	55.60	102.65 Kips	36.95 Kips
7.99 ft	Cohesionless	920.32 psf	55.60	102.65 Kips	47.35 Kips
8.01 ft	Cohesionless	922.26 psf	55.60	102.65 Kips	47.45 Kips
17.01 ft	Cohesionless	1512.66 psf	55.60	102.65 Kips	77.83 Kips
25.19 ft	Cohesionless	2049.26 psf	55.60	102.65 Kips	102.65 Kips
25.21 ft	Cohesionless	2050.65 psf	55.60	102.65 Kips	102.65 Kips
34.21 ft	Cohesionless	2704.05 psf	55.60	102.65 Kips	102.65 Kips
43.21 ft	Cohesionless	3357.45 psf	55.60	102.65 Kips	102.65 Kips
45.19 ft	Cohesionless	3501.19 psf	55.60	102.65 Kips	102.65 Kips
45.21 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
54.21 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
63.21 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
72.21 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
81.21 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
90.19 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
90.21 ft	Cohesive	N/A	N/A	N/A	12.57 Kips
93.89 ft	Cohesive	N/A	N/A	N/A	12.57 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.03 Kips	0.03 Kips
6.39 ft	4.36 Kips	21.20 Kips	25.56 Kips
6.41 ft	4.39 Kips	36.95 Kips	41.34 Kips
7.99 ft	7.78 Kips	47.35 Kips	55.14 Kips
8.01 ft	7.83 Kips	47.45 Kips	55.28 Kips
17.01 ft	36.53 Kips	77.83 Kips	114.36 Kips
25.19 ft	74.69 Kips	102.65 Kips	177.34 Kips
25.21 ft	74.76 Kips	102.65 Kips	177.41 Kips
34.21 ft	112.30 Kips	102.65 Kips	214.96 Kips
43.21 ft	160.17 Kips	102.65 Kips	262.82 Kips
45.19 ft	172.09 Kips	102.65 Kips	274.74 Kips
45.21 ft	172.17 Kips	44.61 Kips	216.78 Kips
54.21 ft	193.94 Kips	44.61 Kips	238.55 Kips
63.21 ft	218.59 Kips	44.61 Kips	263.20 Kips
72.21 ft	250.12 Kips	44.61 Kips	294.73 Kips
81.21 ft	287.19 Kips	44.61 Kips	331.80 Kips
90.19 ft	329.70 Kips	44.61 Kips	374.31 Kips
90.21 ft	329.76 Kips	12.57 Kips	342.33 Kips
93.89 ft	337.87 Kips	12.57 Kips	350.44 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.56 psf	22.70	N/A	0.00 Kips
6.39 ft	Cohesionless	357.84 psf	22.70	N/A	4.36 Kips
6.41 ft	Cohesionless	717.44 psf	24.90	N/A	4.39 Kips
7.99 ft	Cohesionless	818.56 psf	24.90	N/A	7.78 Kips
8.01 ft	Cohesionless	921.93 psf	24.90	N/A	7.83 Kips
17.01 ft	Cohesionless	1217.13 psf	24.90	N/A	36.53 Kips
25.19 ft	Cohesionless	1485.43 psf	24.90	N/A	74.69 Kips
25.21 ft	Cohesionless	2050.28 psf	24.90	N/A	74.79 Kips
34.21 ft	Cohesionless	2376.98 psf	24.90	N/A	130.83 Kips
43.21 ft	Cohesionless	2703.68 psf	24.90	N/A	202.28 Kips
45.19 ft	Cohesionless	2775.56 psf	24.90	N/A	220.06 Kips
45.21 ft	Cohesive	N/A	N/A	861.85 psf	220.19 Kips
54.21 ft	Cohesive	N/A	N/A	861.85 psf	252.68 Kips
63.21 ft	Cohesive	N/A	N/A	918.86 psf	289.47 Kips
72.21 ft	Cohesive	N/A	N/A	1028.58 psf	336.52 Kips
81.21 ft	Cohesive	N/A	N/A	1138.30 psf	391.85 Kips
90.19 ft	Cohesive	N/A	N/A	1247.78 psf	455.30 Kips
90.21 ft	Cohesive	N/A	N/A	923.00 psf	455.41 Kips
93.89 ft	Cohesive	N/A	N/A	923.00 psf	469.64 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.12 psf	35.20	28.85 Kips	0.03 Kips
6.39 ft	Cohesionless	715.68 psf	35.20	28.85 Kips	21.20 Kips
6.41 ft	Cohesionless	718.08 psf	55.60	102.65 Kips	36.95 Kips
7.99 ft	Cohesionless	920.32 psf	55.60	102.65 Kips	47.35 Kips
8.01 ft	Cohesionless	922.26 psf	55.60	102.65 Kips	47.45 Kips
17.01 ft	Cohesionless	1512.66 psf	55.60	102.65 Kips	77.83 Kips
25.19 ft	Cohesionless	2049.26 psf	55.60	102.65 Kips	102.65 Kips
25.21 ft	Cohesionless	2050.65 psf	55.60	102.65 Kips	102.65 Kips
34.21 ft	Cohesionless	2704.05 psf	55.60	102.65 Kips	102.65 Kips
43.21 ft	Cohesionless	3357.45 psf	55.60	102.65 Kips	102.65 Kips
45.19 ft	Cohesionless	3501.19 psf	55.60	102.65 Kips	102.65 Kips
45.21 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
54.21 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
63.21 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
72.21 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
81.21 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
90.19 ft	Cohesive	N/A	N/A	N/A	44.61 Kips
90.21 ft	Cohesive	N/A	N/A	N/A	12.57 Kips
93.89 ft	Cohesive	N/A	N/A	N/A	12.57 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.03 Kips	0.03 Kips
6.39 ft	4.36 Kips	21.20 Kips	25.56 Kips
6.41 ft	4.39 Kips	36.95 Kips	41.34 Kips
7.99 ft	7.78 Kips	47.35 Kips	55.14 Kips
8.01 ft	7.83 Kips	47.45 Kips	55.28 Kips
17.01 ft	36.53 Kips	77.83 Kips	114.36 Kips
25.19 ft	74.69 Kips	102.65 Kips	177.34 Kips
25.21 ft	74.79 Kips	102.65 Kips	177.45 Kips
34.21 ft	130.83 Kips	102.65 Kips	233.49 Kips
43.21 ft	202.28 Kips	102.65 Kips	304.93 Kips
45.19 ft	220.06 Kips	102.65 Kips	322.71 Kips
45.21 ft	220.19 Kips	44.61 Kips	264.80 Kips
54.21 ft	252.68 Kips	44.61 Kips	297.29 Kips
63.21 ft	289.47 Kips	44.61 Kips	334.08 Kips
72.21 ft	336.52 Kips	44.61 Kips	381.13 Kips
81.21 ft	391.85 Kips	44.61 Kips	436.46 Kips
90.19 ft	455.30 Kips	44.61 Kips	499.91 Kips
90.21 ft	455.41 Kips	12.57 Kips	467.98 Kips
93.89 ft	469.64 Kips	12.57 Kips	482.21 Kips

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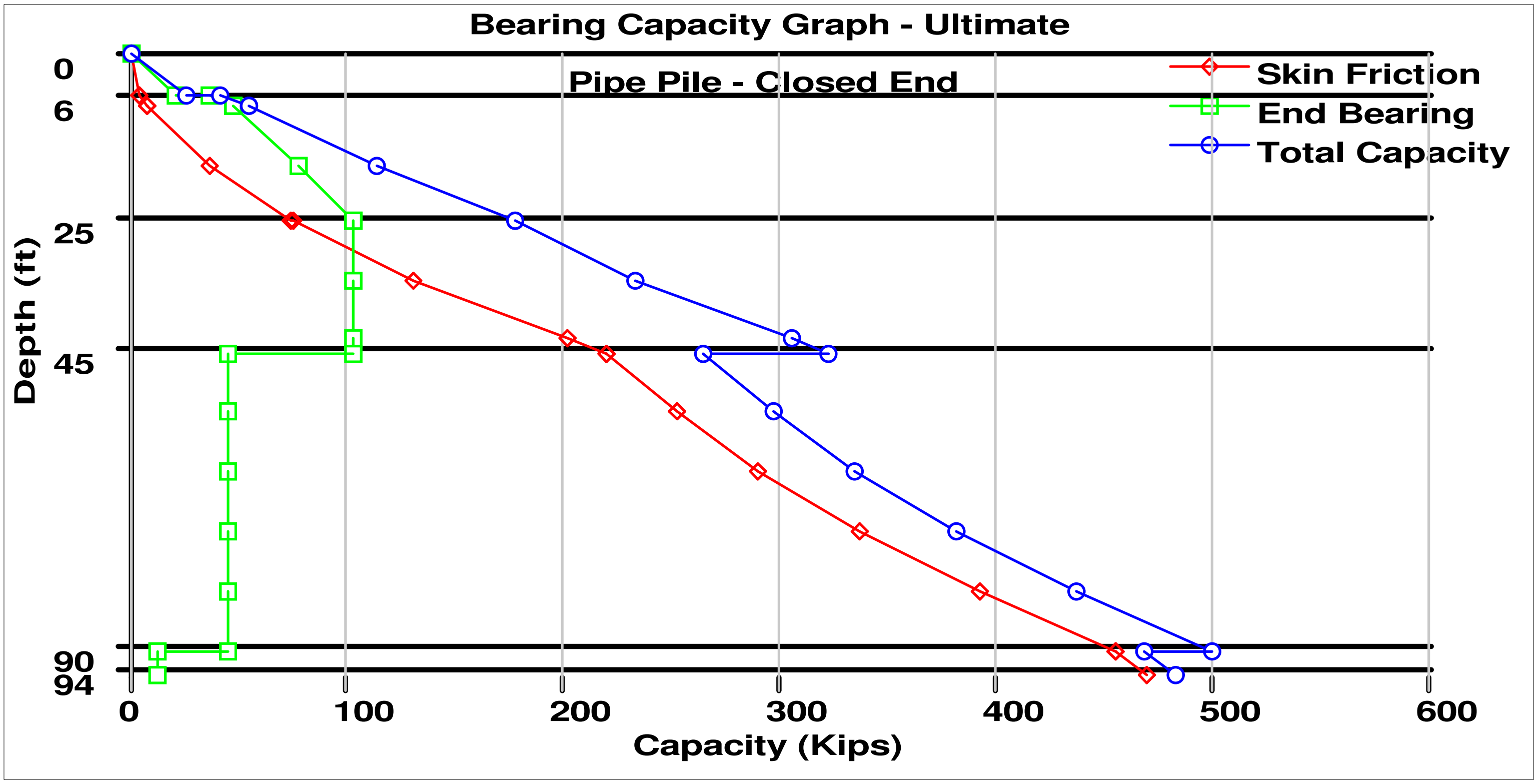

PIER 2

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\XPMUSER\DESKTOP\CCG3\BRIDGE12\P2.DVN
Project Name: CCG3A Project Date: 06/21/2022
Project Client: Michael Baker International
Computed By: KCA
Project Manager: BPA

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 16.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	14.00 ft
	- Driving/Restrike	14.00 ft
	- Ultimate:	14.00 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	Cohesionless	8.50 ft	17.00%	112.00 pcf	30.0/30.0	Nordlund
2	Cohesionless	5.00 ft	17.00%	122.00 pcf	30.0/30.0	Nordlund
3	Cohesive	2.50 ft	33.00%	122.00 pcf	1750.00 psf	T-80 Same
4	Cohesionless	3.80 ft	17.00%	128.00 pcf	34.0/34.0	Nordlund
5	Cohesionless	15.00 ft	0.00%	130.00 pcf	36.0/36.0	Nordlund
6	Cohesionless	5.00 ft	17.00%	125.00 pcf	32.0/32.0	Nordlund
7	Cohesive	50.00 ft	33.00%	125.00 pcf	2800.00 psf	T-80 Same
8	Cohesive	28.50 ft	33.00%	130.00 pcf	1400.00 psf	T-80 Same

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.56 psf	21.97	N/A	0.00 Kips
8.49 ft	Cohesionless	475.44 psf	21.97	N/A	5.64 Kips
8.51 ft	Cohesionless	952.61 psf	21.97	N/A	5.66 Kips
13.49 ft	Cohesionless	1256.39 psf	21.97	N/A	14.40 Kips
13.51 ft	Cohesive	N/A	N/A	1345.58 psf	14.46 Kips
15.99 ft	Cohesive	N/A	N/A	1345.58 psf	23.83 Kips
16.01 ft	Cohesionless	1742.53 psf	24.90	N/A	23.91 Kips
19.79 ft	Cohesionless	1866.51 psf	24.90	N/A	39.25 Kips
19.81 ft	Cohesionless	1991.82 psf	26.37	N/A	39.37 Kips
28.81 ft	Cohesionless	2296.02 psf	26.37	N/A	108.58 Kips
34.79 ft	Cohesionless	2498.14 psf	26.37	N/A	164.70 Kips
34.81 ft	Cohesionless	3005.79 psf	23.44	N/A	164.84 Kips
39.79 ft	Cohesionless	3161.67 psf	23.44	N/A	192.78 Kips
39.81 ft	Cohesive	N/A	N/A	973.73 psf	192.85 Kips
48.81 ft	Cohesive	N/A	N/A	973.73 psf	217.45 Kips
57.81 ft	Cohesive	N/A	N/A	1047.26 psf	245.76 Kips
66.81 ft	Cohesive	N/A	N/A	1188.76 psf	282.94 Kips
75.81 ft	Cohesive	N/A	N/A	1330.25 psf	327.26 Kips
84.81 ft	Cohesive	N/A	N/A	1471.75 psf	378.74 Kips
89.79 ft	Cohesive	N/A	N/A	1550.05 psf	410.29 Kips
89.81 ft	Cohesive	N/A	N/A	1193.00 psf	410.39 Kips
98.81 ft	Cohesive	N/A	N/A	1193.00 psf	440.52 Kips
107.81 ft	Cohesive	N/A	N/A	1217.20 psf	471.88 Kips
116.81 ft	Cohesive	N/A	N/A	1263.78 psf	506.16 Kips
118.29 ft	Cohesive	N/A	N/A	1271.44 psf	512.02 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.12 psf	30.00	18.60 Kips	0.03 Kips
8.49 ft	Cohesionless	950.88 psf	30.00	18.60 Kips	18.60 Kips
8.51 ft	Cohesionless	953.22 psf	30.00	18.60 Kips	18.60 Kips
13.49 ft	Cohesionless	1560.78 psf	30.00	18.60 Kips	18.60 Kips
13.51 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
15.99 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
16.01 ft	Cohesionless	1742.86 psf	55.60	102.65 Kips	89.68 Kips
19.79 ft	Cohesionless	1990.82 psf	55.60	102.65 Kips	102.44 Kips
19.81 ft	Cohesionless	1992.16 psf	77.60	211.67 Kips	149.66 Kips
28.81 ft	Cohesionless	2600.56 psf	77.60	211.67 Kips	195.21 Kips
34.79 ft	Cohesionless	3004.80 psf	77.60	211.67 Kips	211.67 Kips
34.81 ft	Cohesionless	3006.11 psf	40.40	46.08 Kips	46.08 Kips
39.79 ft	Cohesionless	3317.85 psf	40.40	46.08 Kips	46.08 Kips
39.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
48.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
57.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
66.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
75.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
84.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
89.79 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
89.81 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
98.81 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
107.81 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
116.81 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
118.29 ft	Cohesive	N/A	N/A	N/A	17.59 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.03 Kips	0.03 Kips
8.49 ft	5.64 Kips	18.60 Kips	24.23 Kips
8.51 ft	5.66 Kips	18.60 Kips	24.26 Kips
13.49 ft	14.40 Kips	18.60 Kips	33.00 Kips
13.51 ft	14.46 Kips	21.99 Kips	36.45 Kips
15.99 ft	23.83 Kips	21.99 Kips	45.82 Kips
16.01 ft	23.91 Kips	89.68 Kips	113.59 Kips
19.79 ft	39.25 Kips	102.44 Kips	141.69 Kips
19.81 ft	39.37 Kips	149.66 Kips	189.03 Kips
28.81 ft	108.58 Kips	195.21 Kips	303.79 Kips
34.79 ft	164.70 Kips	211.67 Kips	376.38 Kips
34.81 ft	164.84 Kips	46.08 Kips	210.92 Kips
39.79 ft	192.78 Kips	46.08 Kips	238.85 Kips
39.81 ft	192.85 Kips	35.19 Kips	228.04 Kips
48.81 ft	217.45 Kips	35.19 Kips	252.63 Kips
57.81 ft	245.76 Kips	35.19 Kips	280.95 Kips
66.81 ft	282.94 Kips	35.19 Kips	318.12 Kips
75.81 ft	327.26 Kips	35.19 Kips	362.45 Kips
84.81 ft	378.74 Kips	35.19 Kips	413.92 Kips
89.79 ft	410.29 Kips	35.19 Kips	445.48 Kips
89.81 ft	410.39 Kips	17.59 Kips	427.98 Kips
98.81 ft	440.52 Kips	17.59 Kips	458.12 Kips
107.81 ft	471.88 Kips	17.59 Kips	489.47 Kips
116.81 ft	506.16 Kips	17.59 Kips	523.75 Kips
118.29 ft	512.02 Kips	17.59 Kips	529.61 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.56 psf	21.97	N/A	0.00 Kips
8.49 ft	Cohesionless	475.44 psf	21.97	N/A	6.79 Kips
8.51 ft	Cohesionless	952.61 psf	21.97	N/A	6.82 Kips
13.49 ft	Cohesionless	1256.39 psf	21.97	N/A	17.35 Kips
13.51 ft	Cohesive	N/A	N/A	1345.58 psf	17.44 Kips
15.99 ft	Cohesive	N/A	N/A	1345.58 psf	31.42 Kips
16.01 ft	Cohesionless	1742.53 psf	24.90	N/A	31.52 Kips
19.79 ft	Cohesionless	1866.51 psf	24.90	N/A	50.00 Kips
19.81 ft	Cohesionless	1991.82 psf	26.37	N/A	50.12 Kips
28.81 ft	Cohesionless	2296.02 psf	26.37	N/A	119.33 Kips
34.79 ft	Cohesionless	2498.14 psf	26.37	N/A	175.45 Kips
34.81 ft	Cohesionless	3005.79 psf	23.44	N/A	175.62 Kips
39.79 ft	Cohesionless	3161.67 psf	23.44	N/A	209.28 Kips
39.81 ft	Cohesive	N/A	N/A	973.73 psf	209.39 Kips
48.81 ft	Cohesive	N/A	N/A	973.73 psf	246.10 Kips
57.81 ft	Cohesive	N/A	N/A	1047.26 psf	288.35 Kips
66.81 ft	Cohesive	N/A	N/A	1188.76 psf	343.84 Kips
75.81 ft	Cohesive	N/A	N/A	1330.25 psf	410.00 Kips
84.81 ft	Cohesive	N/A	N/A	1471.75 psf	486.83 Kips
89.79 ft	Cohesive	N/A	N/A	1550.05 psf	533.93 Kips
89.81 ft	Cohesive	N/A	N/A	1193.00 psf	534.07 Kips
98.81 ft	Cohesive	N/A	N/A	1193.00 psf	579.05 Kips
107.81 ft	Cohesive	N/A	N/A	1217.20 psf	625.85 Kips
116.81 ft	Cohesive	N/A	N/A	1263.78 psf	677.01 Kips
118.29 ft	Cohesive	N/A	N/A	1271.44 psf	685.75 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.12 psf	30.00	18.60 Kips	0.03 Kips
8.49 ft	Cohesionless	950.88 psf	30.00	18.60 Kips	18.60 Kips
8.51 ft	Cohesionless	953.22 psf	30.00	18.60 Kips	18.60 Kips
13.49 ft	Cohesionless	1560.78 psf	30.00	18.60 Kips	18.60 Kips
13.51 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
15.99 ft	Cohesive	N/A	N/A	N/A	21.99 Kips
16.01 ft	Cohesionless	1742.86 psf	55.60	102.65 Kips	89.68 Kips
19.79 ft	Cohesionless	1990.82 psf	55.60	102.65 Kips	102.44 Kips
19.81 ft	Cohesionless	1992.16 psf	77.60	211.67 Kips	149.66 Kips
28.81 ft	Cohesionless	2600.56 psf	77.60	211.67 Kips	195.21 Kips
34.79 ft	Cohesionless	3004.80 psf	77.60	211.67 Kips	211.67 Kips
34.81 ft	Cohesionless	3006.11 psf	40.40	46.08 Kips	46.08 Kips
39.79 ft	Cohesionless	3317.85 psf	40.40	46.08 Kips	46.08 Kips
39.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
48.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
57.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
66.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
75.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
84.81 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
89.79 ft	Cohesive	N/A	N/A	N/A	35.19 Kips
89.81 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
98.81 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
107.81 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
116.81 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
118.29 ft	Cohesive	N/A	N/A	N/A	17.59 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.03 Kips	0.03 Kips
8.49 ft	6.79 Kips	18.60 Kips	25.39 Kips
8.51 ft	6.82 Kips	18.60 Kips	25.42 Kips
13.49 ft	17.35 Kips	18.60 Kips	35.95 Kips
13.51 ft	17.44 Kips	21.99 Kips	39.43 Kips
15.99 ft	31.42 Kips	21.99 Kips	53.41 Kips
16.01 ft	31.52 Kips	89.68 Kips	121.20 Kips
19.79 ft	50.00 Kips	102.44 Kips	152.44 Kips
19.81 ft	50.12 Kips	149.66 Kips	199.77 Kips
28.81 ft	119.33 Kips	195.21 Kips	314.54 Kips
34.79 ft	175.45 Kips	211.67 Kips	387.12 Kips
34.81 ft	175.62 Kips	46.08 Kips	221.69 Kips
39.79 ft	209.28 Kips	46.08 Kips	255.36 Kips
39.81 ft	209.39 Kips	35.19 Kips	244.58 Kips
48.81 ft	246.10 Kips	35.19 Kips	281.28 Kips
57.81 ft	288.35 Kips	35.19 Kips	323.54 Kips
66.81 ft	343.84 Kips	35.19 Kips	379.03 Kips
75.81 ft	410.00 Kips	35.19 Kips	445.19 Kips
84.81 ft	486.83 Kips	35.19 Kips	522.02 Kips
89.79 ft	533.93 Kips	35.19 Kips	569.11 Kips
89.81 ft	534.07 Kips	17.59 Kips	551.67 Kips
98.81 ft	579.05 Kips	17.59 Kips	596.64 Kips
107.81 ft	625.85 Kips	17.59 Kips	643.44 Kips
116.81 ft	677.01 Kips	17.59 Kips	694.60 Kips
118.29 ft	685.75 Kips	17.59 Kips	703.35 Kips

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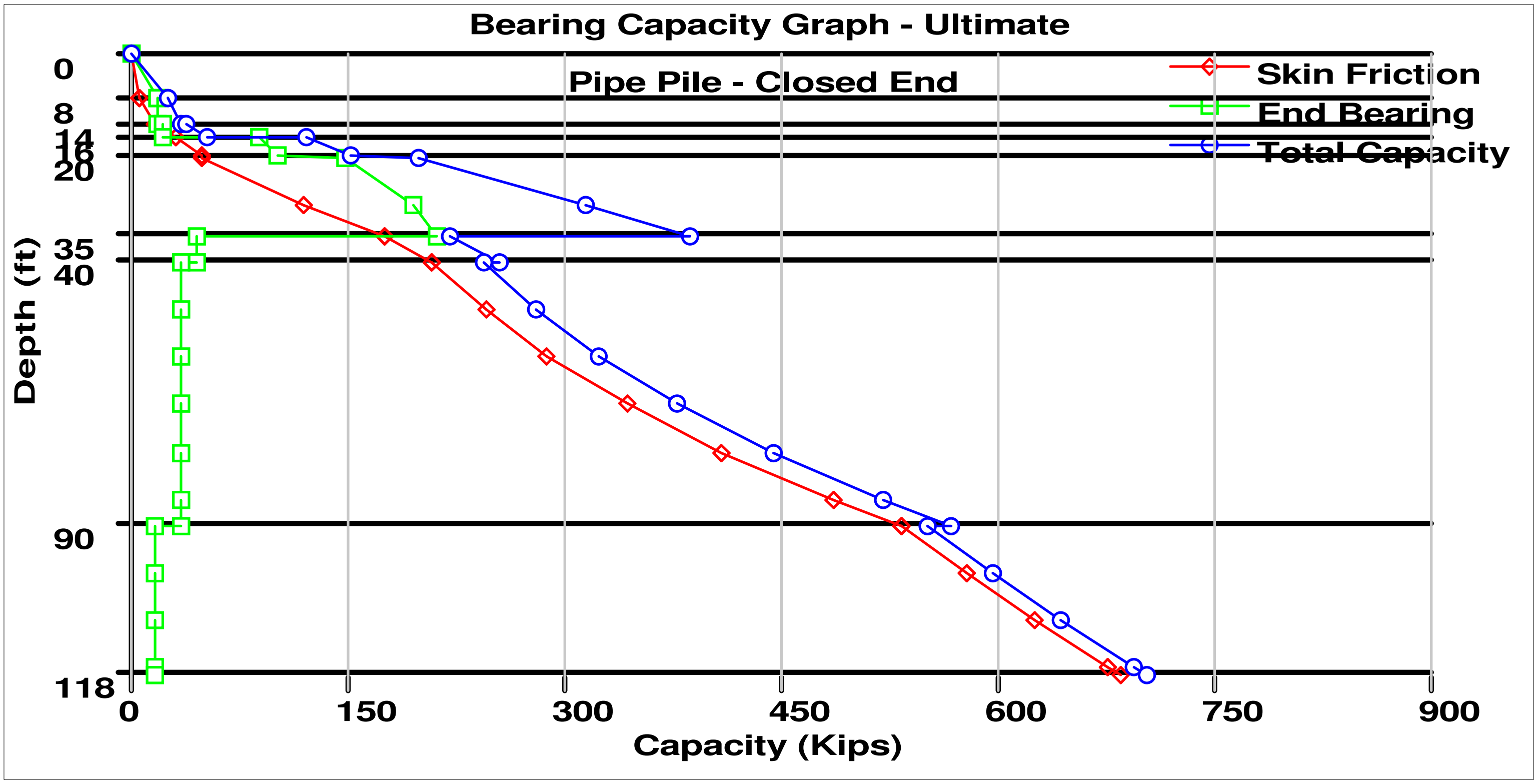

FORWARD ABUTMENT

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\XPMUSER\DESKTOP\CCG3\BRIDGE12\FA.DVN
Project Name: CCG3A Project Date: 06/21/2022
Project Client: Michael Baker International
Computed By: KCA
Project Manager: BPA

PILE INFORMATION

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

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.30 ft
	- Driving/Restrike	23.30 ft
	- Ultimate:	23.30 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	1.00 ft	17.00%	122.00 pcf	34.0/34.0	Nordlund
2	Cohesionless	2.50 ft	17.00%	122.00 pcf	32.0/32.0	Nordlund
3	Cohesionless	2.50 ft	17.00%	122.00 pcf	33.0/33.0	Nordlund
4	Cohesive	3.70 ft	33.00%	105.00 pcf	600.00 psf	T-80 Same
5	Cohesionless	3.80 ft	0.00%	128.00 pcf	36.0/36.0	Nordlund
6	Cohesionless	2.90 ft	0.00%	128.00 pcf	37.0/37.0	Nordlund
7	Cohesionless	2.10 ft	0.00%	110.00 pcf	30.0/30.0	Nordlund
8	Cohesive	2.50 ft	50.00%	105.00 pcf	600.00 psf	T-80 Sand
9	Cohesive	3.00 ft	33.00%	125.00 pcf	2000.00 psf	T-80 Same
10	Cohesionless	2.00 ft	17.00%	125.00 pcf	31.0/31.0	Nordlund
11	Cohesionless	8.80 ft	0.00%	128.00 pcf	33.0/33.0	Nordlund
12	Cohesionless	5.00 ft	17.00%	128.00 pcf	34.0/34.0	Nordlund
13	Cohesive	30.20 ft	33.00%	130.00 pcf	4800.00 psf	T-80 Same
14	Cohesive	25.80 ft	33.00%	125.00 pcf	4250.00 psf	T-80 Same
15	Cohesive	28.50 ft	33.00%	130.00 pcf	1600.00 psf	T-80 Same

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.61 psf	19.99	N/A	0.00 Kips
0.99 ft	Cohesionless	60.39 psf	19.99	N/A	0.06 Kips
1.01 ft	Cohesionless	122.61 psf	18.82	N/A	0.07 Kips
3.49 ft	Cohesionless	273.89 psf	18.82	N/A	0.67 Kips
3.51 ft	Cohesionless	427.61 psf	19.41	N/A	0.68 Kips
5.99 ft	Cohesionless	578.89 psf	19.41	N/A	2.09 Kips
6.01 ft	Cohesive	N/A	N/A	582.11 psf	2.11 Kips
9.69 ft	Cohesive	N/A	N/A	582.11 psf	6.61 Kips
9.71 ft	Cohesionless	1121.14 psf	21.17	N/A	6.65 Kips
13.49 ft	Cohesionless	1363.06 psf	21.17	N/A	14.93 Kips
13.51 ft	Cohesionless	1607.54 psf	21.76	N/A	14.98 Kips
16.39 ft	Cohesionless	1791.86 psf	21.76	N/A	24.36 Kips
16.41 ft	Cohesionless	1978.65 psf	17.64	N/A	24.41 Kips
18.49 ft	Cohesionless	2093.05 psf	17.64	N/A	28.18 Kips
18.51 ft	Cohesive	N/A	N/A	600.00 psf	28.20 Kips
20.99 ft	Cohesive	N/A	N/A	600.00 psf	30.54 Kips
21.01 ft	Cohesive	N/A	N/A	1375.16 psf	30.58 Kips
23.99 ft	Cohesive	N/A	N/A	1375.16 psf	39.21 Kips
24.01 ft	Cohesionless	2803.23 psf	18.23	N/A	39.26 Kips
25.99 ft	Cohesionless	2865.21 psf	18.23	N/A	43.82 Kips
26.01 ft	Cohesionless	2928.45 psf	19.41	N/A	43.89 Kips
34.79 ft	Cohesionless	3216.43 psf	19.41	N/A	77.20 Kips
34.81 ft	Cohesionless	3505.73 psf	19.99	N/A	77.27 Kips
39.79 ft	Cohesionless	3669.07 psf	19.99	N/A	96.80 Kips
39.81 ft	Cohesive	N/A	N/A	1142.40 psf	96.85 Kips
48.81 ft	Cohesive	N/A	N/A	1142.40 psf	118.50 Kips
57.81 ft	Cohesive	N/A	N/A	1220.58 psf	143.10 Kips
66.81 ft	Cohesive	N/A	N/A	1308.42 psf	171.22 Kips
69.99 ft	Cohesive	N/A	N/A	1339.45 psf	181.95 Kips
70.01 ft	Cohesive	N/A	N/A	1011.50 psf	182.00 Kips
79.01 ft	Cohesive	N/A	N/A	1011.50 psf	201.16 Kips
88.01 ft	Cohesive	N/A	N/A	1082.09 psf	223.00 Kips
95.79 ft	Cohesive	N/A	N/A	1150.65 psf	244.44 Kips
95.81 ft	Cohesive	N/A	N/A	1287.72 psf	244.50 Kips
104.81 ft	Cohesive	N/A	N/A	1287.72 psf	268.89 Kips
113.81 ft	Cohesive	N/A	N/A	1367.37 psf	296.31 Kips
122.81 ft	Cohesive	N/A	N/A	1456.86 psf	327.30 Kips
124.29 ft	Cohesive	N/A	N/A	1471.58 psf	332.72 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.22 psf	55.60	57.74 Kips	0.04 Kips
0.99 ft	Cohesionless	120.78 psf	55.60	57.74 Kips	3.50 Kips
1.01 ft	Cohesionless	123.22 psf	40.40	25.92 Kips	2.45 Kips
3.49 ft	Cohesionless	425.78 psf	40.40	25.92 Kips	8.45 Kips
3.51 ft	Cohesionless	428.22 psf	47.20	39.27 Kips	10.25 Kips
5.99 ft	Cohesionless	730.78 psf	47.20	39.27 Kips	17.49 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
9.69 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
9.71 ft	Cohesionless	1121.78 psf	77.60	119.07 Kips	47.40 Kips
13.49 ft	Cohesionless	1605.62 psf	77.60	119.07 Kips	67.85 Kips
13.51 ft	Cohesionless	1608.18 psf	91.20	161.82 Kips	81.50 Kips
16.39 ft	Cohesionless	1976.82 psf	91.20	161.82 Kips	100.18 Kips
16.41 ft	Cohesionless	1979.20 psf	30.00	10.46 Kips	10.46 Kips
18.49 ft	Cohesionless	2208.00 psf	30.00	10.46 Kips	10.46 Kips
18.51 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
20.99 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
21.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
23.99 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
24.01 ft	Cohesionless	2803.55 psf	35.20	16.23 Kips	16.23 Kips
25.99 ft	Cohesionless	2927.49 psf	35.20	16.23 Kips	16.23 Kips
26.01 ft	Cohesionless	2928.78 psf	47.20	39.27 Kips	39.27 Kips
34.79 ft	Cohesionless	3504.74 psf	47.20	39.27 Kips	39.27 Kips
34.81 ft	Cohesionless	3506.06 psf	55.60	57.74 Kips	57.74 Kips
39.79 ft	Cohesionless	3832.74 psf	55.60	57.74 Kips	57.74 Kips
39.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
48.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
57.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
66.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
69.99 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
70.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
79.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
88.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
95.79 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
95.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
104.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
113.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
122.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
124.29 ft	Cohesive	N/A	N/A	N/A	11.31 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.04 Kips	0.04 Kips
0.99 ft	0.06 Kips	3.50 Kips	3.56 Kips
1.01 ft	0.07 Kips	2.45 Kips	2.51 Kips
3.49 ft	0.67 Kips	8.45 Kips	9.12 Kips
3.51 ft	0.68 Kips	10.25 Kips	10.93 Kips
5.99 ft	2.09 Kips	17.49 Kips	19.58 Kips
6.01 ft	2.11 Kips	4.24 Kips	6.35 Kips
9.69 ft	6.61 Kips	4.24 Kips	10.86 Kips
9.71 ft	6.65 Kips	47.40 Kips	54.05 Kips
13.49 ft	14.93 Kips	67.85 Kips	82.77 Kips
13.51 ft	14.98 Kips	81.50 Kips	96.48 Kips
16.39 ft	24.36 Kips	100.18 Kips	124.54 Kips
16.41 ft	24.41 Kips	10.46 Kips	34.88 Kips
18.49 ft	28.18 Kips	10.46 Kips	38.64 Kips
18.51 ft	28.20 Kips	4.24 Kips	32.44 Kips
20.99 ft	30.54 Kips	4.24 Kips	34.78 Kips
21.01 ft	30.58 Kips	14.14 Kips	44.72 Kips
23.99 ft	39.21 Kips	14.14 Kips	53.34 Kips
24.01 ft	39.26 Kips	16.23 Kips	55.49 Kips
25.99 ft	43.82 Kips	16.23 Kips	60.05 Kips
26.01 ft	43.89 Kips	39.27 Kips	83.16 Kips
34.79 ft	77.20 Kips	39.27 Kips	116.47 Kips
34.81 ft	77.27 Kips	57.74 Kips	135.02 Kips
39.79 ft	96.80 Kips	57.74 Kips	154.54 Kips
39.81 ft	96.85 Kips	33.93 Kips	130.78 Kips
48.81 ft	118.50 Kips	33.93 Kips	152.42 Kips
57.81 ft	143.10 Kips	33.93 Kips	177.03 Kips
66.81 ft	171.22 Kips	33.93 Kips	205.15 Kips
69.99 ft	181.95 Kips	33.93 Kips	215.88 Kips
70.01 ft	182.00 Kips	30.04 Kips	212.04 Kips
79.01 ft	201.16 Kips	30.04 Kips	231.21 Kips
88.01 ft	223.00 Kips	30.04 Kips	253.04 Kips
95.79 ft	244.44 Kips	30.04 Kips	274.48 Kips
95.81 ft	244.50 Kips	11.31 Kips	255.81 Kips
104.81 ft	268.89 Kips	11.31 Kips	280.20 Kips
113.81 ft	296.31 Kips	11.31 Kips	307.62 Kips
122.81 ft	327.30 Kips	11.31 Kips	338.61 Kips
124.29 ft	332.72 Kips	11.31 Kips	344.03 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.61 psf	19.99	N/A	0.00 Kips
0.99 ft	Cohesionless	60.39 psf	19.99	N/A	0.08 Kips
1.01 ft	Cohesionless	122.61 psf	18.82	N/A	0.08 Kips
3.49 ft	Cohesionless	273.89 psf	18.82	N/A	0.81 Kips
3.51 ft	Cohesionless	427.61 psf	19.41	N/A	0.82 Kips
5.99 ft	Cohesionless	578.89 psf	19.41	N/A	2.52 Kips
6.01 ft	Cohesive	N/A	N/A	582.11 psf	2.54 Kips
9.69 ft	Cohesive	N/A	N/A	582.11 psf	9.27 Kips
9.71 ft	Cohesionless	1121.14 psf	21.17	N/A	9.31 Kips
13.49 ft	Cohesionless	1363.06 psf	21.17	N/A	17.58 Kips
13.51 ft	Cohesionless	1607.54 psf	21.76	N/A	17.64 Kips
16.39 ft	Cohesionless	1791.86 psf	21.76	N/A	27.02 Kips
16.41 ft	Cohesionless	1978.65 psf	17.64	N/A	27.07 Kips
18.49 ft	Cohesionless	2093.05 psf	17.64	N/A	30.84 Kips
18.51 ft	Cohesive	N/A	N/A	600.00 psf	30.88 Kips
20.99 ft	Cohesive	N/A	N/A	600.00 psf	35.55 Kips
21.01 ft	Cohesive	N/A	N/A	1375.16 psf	35.61 Kips
23.99 ft	Cohesive	N/A	N/A	1375.16 psf	48.49 Kips
24.01 ft	Cohesionless	2803.23 psf	18.23	N/A	48.56 Kips
25.99 ft	Cohesionless	2865.21 psf	18.23	N/A	54.05 Kips
26.01 ft	Cohesionless	2928.45 psf	19.41	N/A	54.11 Kips
34.79 ft	Cohesionless	3216.43 psf	19.41	N/A	87.43 Kips
34.81 ft	Cohesionless	3505.73 psf	19.99	N/A	87.52 Kips
39.79 ft	Cohesionless	3669.07 psf	19.99	N/A	111.04 Kips
39.81 ft	Cohesive	N/A	N/A	1142.40 psf	111.12 Kips
48.81 ft	Cohesive	N/A	N/A	1142.40 psf	143.42 Kips
57.81 ft	Cohesive	N/A	N/A	1220.58 psf	180.15 Kips
66.81 ft	Cohesive	N/A	N/A	1308.42 psf	222.11 Kips
69.99 ft	Cohesive	N/A	N/A	1339.45 psf	238.13 Kips
70.01 ft	Cohesive	N/A	N/A	1011.50 psf	238.21 Kips
79.01 ft	Cohesive	N/A	N/A	1011.50 psf	266.81 Kips
88.01 ft	Cohesive	N/A	N/A	1082.09 psf	299.40 Kips
95.79 ft	Cohesive	N/A	N/A	1150.65 psf	331.41 Kips
95.81 ft	Cohesive	N/A	N/A	1287.72 psf	331.49 Kips
104.81 ft	Cohesive	N/A	N/A	1287.72 psf	367.90 Kips
113.81 ft	Cohesive	N/A	N/A	1367.37 psf	408.82 Kips
122.81 ft	Cohesive	N/A	N/A	1456.86 psf	455.07 Kips
124.29 ft	Cohesive	N/A	N/A	1471.58 psf	463.16 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.22 psf	55.60	57.74 Kips	0.04 Kips
0.99 ft	Cohesionless	120.78 psf	55.60	57.74 Kips	3.50 Kips
1.01 ft	Cohesionless	123.22 psf	40.40	25.92 Kips	2.45 Kips
3.49 ft	Cohesionless	425.78 psf	40.40	25.92 Kips	8.45 Kips
3.51 ft	Cohesionless	428.22 psf	47.20	39.27 Kips	10.25 Kips
5.99 ft	Cohesionless	730.78 psf	47.20	39.27 Kips	17.49 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
9.69 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
9.71 ft	Cohesionless	1121.78 psf	77.60	119.07 Kips	47.40 Kips
13.49 ft	Cohesionless	1605.62 psf	77.60	119.07 Kips	67.85 Kips
13.51 ft	Cohesionless	1608.18 psf	91.20	161.82 Kips	81.50 Kips
16.39 ft	Cohesionless	1976.82 psf	91.20	161.82 Kips	100.18 Kips
16.41 ft	Cohesionless	1979.20 psf	30.00	10.46 Kips	10.46 Kips
18.49 ft	Cohesionless	2208.00 psf	30.00	10.46 Kips	10.46 Kips
18.51 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
20.99 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
21.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
23.99 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
24.01 ft	Cohesionless	2803.55 psf	35.20	16.23 Kips	16.23 Kips
25.99 ft	Cohesionless	2927.49 psf	35.20	16.23 Kips	16.23 Kips
26.01 ft	Cohesionless	2928.78 psf	47.20	39.27 Kips	39.27 Kips
34.79 ft	Cohesionless	3504.74 psf	47.20	39.27 Kips	39.27 Kips
34.81 ft	Cohesionless	3506.06 psf	55.60	57.74 Kips	57.74 Kips
39.79 ft	Cohesionless	3832.74 psf	55.60	57.74 Kips	57.74 Kips
39.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
48.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
57.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
66.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
69.99 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
70.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
79.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
88.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
95.79 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
95.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
104.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
113.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
122.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
124.29 ft	Cohesive	N/A	N/A	N/A	11.31 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.04 Kips	0.04 Kips
0.99 ft	0.08 Kips	3.50 Kips	3.57 Kips
1.01 ft	0.08 Kips	2.45 Kips	2.53 Kips
3.49 ft	0.81 Kips	8.45 Kips	9.26 Kips
3.51 ft	0.82 Kips	10.25 Kips	11.07 Kips
5.99 ft	2.52 Kips	17.49 Kips	20.01 Kips
6.01 ft	2.54 Kips	4.24 Kips	6.78 Kips
9.69 ft	9.27 Kips	4.24 Kips	13.51 Kips
9.71 ft	9.31 Kips	47.40 Kips	56.71 Kips
13.49 ft	17.58 Kips	67.85 Kips	85.43 Kips
13.51 ft	17.64 Kips	81.50 Kips	99.14 Kips
16.39 ft	27.02 Kips	100.18 Kips	127.20 Kips
16.41 ft	27.07 Kips	10.46 Kips	37.53 Kips
18.49 ft	30.84 Kips	10.46 Kips	41.30 Kips
18.51 ft	30.88 Kips	4.24 Kips	35.12 Kips
20.99 ft	35.55 Kips	4.24 Kips	39.79 Kips
21.01 ft	35.61 Kips	14.14 Kips	49.75 Kips
23.99 ft	48.49 Kips	14.14 Kips	62.62 Kips
24.01 ft	48.56 Kips	16.23 Kips	64.79 Kips
25.99 ft	54.05 Kips	16.23 Kips	70.28 Kips
26.01 ft	54.11 Kips	39.27 Kips	93.38 Kips
34.79 ft	87.43 Kips	39.27 Kips	126.70 Kips
34.81 ft	87.52 Kips	57.74 Kips	145.26 Kips
39.79 ft	111.04 Kips	57.74 Kips	168.78 Kips
39.81 ft	111.12 Kips	33.93 Kips	145.05 Kips
48.81 ft	143.42 Kips	33.93 Kips	177.35 Kips
57.81 ft	180.15 Kips	33.93 Kips	214.08 Kips
66.81 ft	222.11 Kips	33.93 Kips	256.04 Kips
69.99 ft	238.13 Kips	33.93 Kips	272.06 Kips
70.01 ft	238.21 Kips	30.04 Kips	268.25 Kips
79.01 ft	266.81 Kips	30.04 Kips	296.85 Kips
88.01 ft	299.40 Kips	30.04 Kips	329.45 Kips
95.79 ft	331.41 Kips	30.04 Kips	361.45 Kips
95.81 ft	331.49 Kips	11.31 Kips	342.80 Kips
104.81 ft	367.90 Kips	11.31 Kips	379.21 Kips
113.81 ft	408.82 Kips	11.31 Kips	420.13 Kips
122.81 ft	455.07 Kips	11.31 Kips	466.38 Kips
124.29 ft	463.16 Kips	11.31 Kips	474.47 Kips

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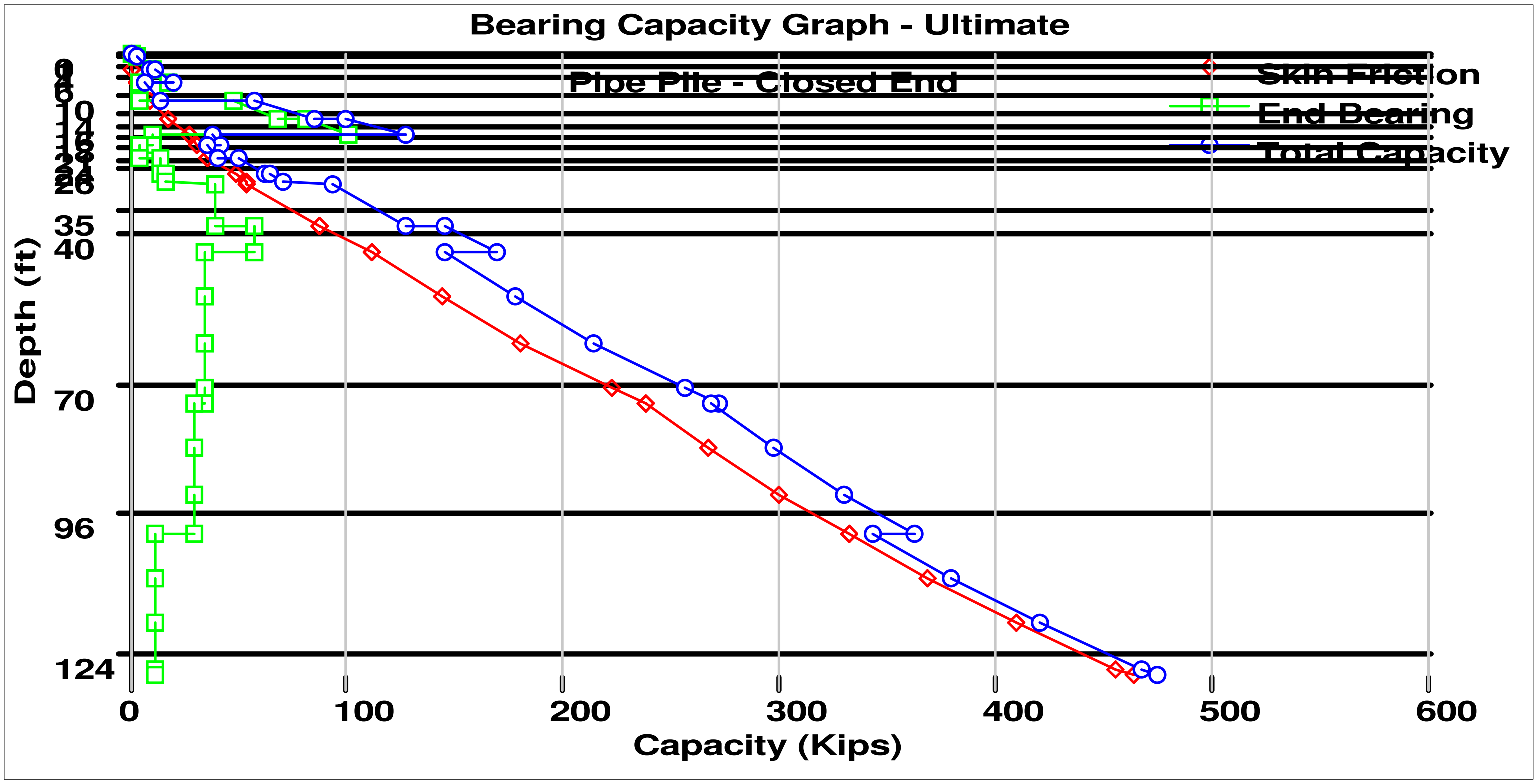

FORWARD ABUTMENT (FOR DOWNDRAG ANALYSIS)

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\XPMUSER\DESKTOP\CCG3\BRIDGE12\FA.DVN
Project Name: CCG3A Project Date: 06/21/2022
Project Client: Michael Baker International
Computed By: KCA
Project Manager: BPA

PILE INFORMATION

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

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	37.30 ft
	- Driving/Restrike	37.30 ft
	- Ultimate:	37.30 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	14.00 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
2	Cohesionless	1.00 ft	17.00%	122.00 pcf	34.0/34.0	Nordlund
3	Cohesionless	2.50 ft	17.00%	122.00 pcf	32.0/32.0	Nordlund
4	Cohesionless	2.50 ft	17.00%	122.00 pcf	33.0/33.0	Nordlund
5	Cohesive	3.70 ft	33.00%	105.00 pcf	600.00 psf	T-80 Same
6	Cohesionless	3.80 ft	0.00%	128.00 pcf	36.0/36.0	Nordlund
7	Cohesionless	2.90 ft	0.00%	128.00 pcf	37.0/37.0	Nordlund
8	Cohesionless	2.10 ft	0.00%	110.00 pcf	30.0/30.0	Nordlund
9	Cohesive	2.50 ft	50.00%	105.00 pcf	600.00 psf	T-80 Sand
10	Cohesive	3.00 ft	33.00%	125.00 pcf	2000.00 psf	T-80 Same
11	Cohesionless	2.50 ft	17.00%	125.00 pcf	31.0/31.0	Nordlund
12	Cohesionless	8.30 ft	0.00%	128.00 pcf	33.0/33.0	Nordlund
13	Cohesionless	5.00 ft	17.00%	128.00 pcf	34.0/34.0	Nordlund
14	Cohesive	30.20 ft	33.00%	130.00 pcf	4800.00 psf	T-80 Same
15	Cohesive	25.80 ft	33.00%	125.00 pcf	4250.00 psf	T-80 Same
16	Cohesive	28.50 ft	33.00%	130.00 pcf	1600.00 psf	T-80 Same

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.60 psf	16.46	N/A	0.00 Kips
9.01 ft	Cohesionless	540.60 psf	16.46	N/A	3.61 Kips
13.99 ft	Cohesionless	839.40 psf	16.46	N/A	8.70 Kips
14.01 ft	Cohesionless	1680.61 psf	19.99	N/A	8.73 Kips
14.99 ft	Cohesionless	1740.39 psf	19.99	N/A	10.93 Kips
15.01 ft	Cohesionless	1802.61 psf	18.82	N/A	10.97 Kips
17.49 ft	Cohesionless	1953.89 psf	18.82	N/A	16.17 Kips
17.51 ft	Cohesionless	2107.61 psf	19.41	N/A	16.22 Kips
19.99 ft	Cohesionless	2258.89 psf	19.41	N/A	22.83 Kips
20.01 ft	Cohesive	N/A	N/A	582.11 psf	22.88 Kips
23.69 ft	Cohesive	N/A	N/A	582.11 psf	29.61 Kips
23.71 ft	Cohesionless	2801.14 psf	21.17	N/A	29.67 Kips
27.49 ft	Cohesionless	3043.06 psf	21.17	N/A	48.14 Kips
27.51 ft	Cohesionless	3287.54 psf	21.76	N/A	48.25 Kips
30.39 ft	Cohesionless	3471.86 psf	21.76	N/A	66.42 Kips
30.41 ft	Cohesionless	3658.65 psf	17.64	N/A	66.52 Kips
32.49 ft	Cohesionless	3773.05 psf	17.64	N/A	73.31 Kips
32.51 ft	Cohesive	N/A	N/A	600.00 psf	73.36 Kips
34.99 ft	Cohesive	N/A	N/A	600.00 psf	78.04 Kips
35.01 ft	Cohesive	N/A	N/A	1375.16 psf	78.10 Kips
37.99 ft	Cohesive	N/A	N/A	1375.16 psf	90.98 Kips
38.01 ft	Cohesionless	4483.23 psf	18.23	N/A	91.06 Kips
40.49 ft	Cohesionless	4560.86 psf	18.23	N/A	102.01 Kips
40.51 ft	Cohesionless	4639.75 psf	19.41	N/A	102.11 Kips
48.79 ft	Cohesionless	4911.33 psf	19.41	N/A	150.09 Kips
48.81 ft	Cohesionless	5184.23 psf	19.99	N/A	150.22 Kips
53.79 ft	Cohesionless	5347.57 psf	19.99	N/A	184.50 Kips
53.81 ft	Cohesive	N/A	N/A	1142.40 psf	184.60 Kips
62.81 ft	Cohesive	N/A	N/A	1142.40 psf	216.90 Kips
71.81 ft	Cohesive	N/A	N/A	1220.58 psf	253.63 Kips
80.81 ft	Cohesive	N/A	N/A	1308.42 psf	295.59 Kips
83.99 ft	Cohesive	N/A	N/A	1339.45 psf	311.61 Kips
84.01 ft	Cohesive	N/A	N/A	1011.50 psf	311.69 Kips
93.01 ft	Cohesive	N/A	N/A	1011.50 psf	340.29 Kips
102.01 ft	Cohesive	N/A	N/A	1082.09 psf	372.88 Kips
109.79 ft	Cohesive	N/A	N/A	1150.65 psf	404.89 Kips
109.81 ft	Cohesive	N/A	N/A	1287.72 psf	404.97 Kips
118.81 ft	Cohesive	N/A	N/A	1287.72 psf	441.38 Kips
127.81 ft	Cohesive	N/A	N/A	1367.37 psf	482.29 Kips
136.81 ft	Cohesive	N/A	N/A	1456.86 psf	528.55 Kips
138.29 ft	Cohesive	N/A	N/A	1471.58 psf	536.64 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.20 psf	22.80	10.46 Kips	0.01 Kips
9.01 ft	Cohesionless	1081.20 psf	22.80	10.46 Kips	10.38 Kips
13.99 ft	Cohesionless	1678.80 psf	22.80	10.46 Kips	10.46 Kips
14.01 ft	Cohesionless	1681.22 psf	55.60	57.74 Kips	48.66 Kips
14.99 ft	Cohesionless	1800.78 psf	55.60	57.74 Kips	52.12 Kips
15.01 ft	Cohesionless	1803.22 psf	40.40	25.92 Kips	25.92 Kips
17.49 ft	Cohesionless	2105.78 psf	40.40	25.92 Kips	25.92 Kips
17.51 ft	Cohesionless	2108.22 psf	47.20	39.27 Kips	39.27 Kips
19.99 ft	Cohesionless	2410.78 psf	47.20	39.27 Kips	39.27 Kips
20.01 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
23.69 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
23.71 ft	Cohesionless	2801.78 psf	77.60	119.07 Kips	118.18 Kips
27.49 ft	Cohesionless	3285.62 psf	77.60	119.07 Kips	119.07 Kips
27.51 ft	Cohesionless	3288.18 psf	91.20	161.82 Kips	161.82 Kips
30.39 ft	Cohesionless	3656.82 psf	91.20	161.82 Kips	161.82 Kips
30.41 ft	Cohesionless	3659.20 psf	30.00	10.46 Kips	10.46 Kips
32.49 ft	Cohesionless	3888.00 psf	30.00	10.46 Kips	10.46 Kips
32.51 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
34.99 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
35.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
37.99 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
38.01 ft	Cohesionless	4483.55 psf	35.20	16.23 Kips	16.23 Kips
40.49 ft	Cohesionless	4638.79 psf	35.20	16.23 Kips	16.23 Kips
40.51 ft	Cohesionless	4640.08 psf	47.20	39.27 Kips	39.27 Kips
48.79 ft	Cohesionless	5183.24 psf	47.20	39.27 Kips	39.27 Kips
48.81 ft	Cohesionless	5184.56 psf	55.60	57.74 Kips	57.74 Kips
53.79 ft	Cohesionless	5511.24 psf	55.60	57.74 Kips	57.74 Kips
53.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
62.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
71.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
80.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
83.99 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
84.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
93.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
102.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
109.79 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
109.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
118.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
127.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
136.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
138.29 ft	Cohesive	N/A	N/A	N/A	11.31 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.01 Kips	0.01 Kips
9.01 ft	3.61 Kips	10.38 Kips	13.99 Kips
13.99 ft	8.70 Kips	10.46 Kips	19.16 Kips
14.01 ft	8.73 Kips	48.66 Kips	57.39 Kips
14.99 ft	10.93 Kips	52.12 Kips	63.05 Kips
15.01 ft	10.97 Kips	25.92 Kips	36.89 Kips
17.49 ft	16.17 Kips	25.92 Kips	42.09 Kips
17.51 ft	16.22 Kips	39.27 Kips	55.49 Kips
19.99 ft	22.83 Kips	39.27 Kips	62.10 Kips
20.01 ft	22.88 Kips	4.24 Kips	27.12 Kips
23.69 ft	29.61 Kips	4.24 Kips	33.85 Kips
23.71 ft	29.67 Kips	118.18 Kips	147.85 Kips
27.49 ft	48.14 Kips	119.07 Kips	167.20 Kips
27.51 ft	48.25 Kips	161.82 Kips	210.07 Kips
30.39 ft	66.42 Kips	161.82 Kips	228.25 Kips
30.41 ft	66.52 Kips	10.46 Kips	76.98 Kips
32.49 ft	73.31 Kips	10.46 Kips	83.77 Kips
32.51 ft	73.36 Kips	4.24 Kips	77.61 Kips
34.99 ft	78.04 Kips	4.24 Kips	82.28 Kips
35.01 ft	78.10 Kips	14.14 Kips	92.24 Kips
37.99 ft	90.98 Kips	14.14 Kips	105.11 Kips
38.01 ft	91.06 Kips	16.23 Kips	107.29 Kips
40.49 ft	102.01 Kips	16.23 Kips	118.24 Kips
40.51 ft	102.11 Kips	39.27 Kips	141.38 Kips
48.79 ft	150.09 Kips	39.27 Kips	189.36 Kips
48.81 ft	150.22 Kips	57.74 Kips	207.96 Kips
53.79 ft	184.50 Kips	57.74 Kips	242.24 Kips
53.81 ft	184.60 Kips	33.93 Kips	218.53 Kips
62.81 ft	216.90 Kips	33.93 Kips	250.83 Kips
71.81 ft	253.63 Kips	33.93 Kips	287.56 Kips
80.81 ft	295.59 Kips	33.93 Kips	329.52 Kips
83.99 ft	311.61 Kips	33.93 Kips	345.54 Kips
84.01 ft	311.69 Kips	30.04 Kips	341.73 Kips
93.01 ft	340.29 Kips	30.04 Kips	370.33 Kips
102.01 ft	372.88 Kips	30.04 Kips	402.92 Kips
109.79 ft	404.89 Kips	30.04 Kips	434.93 Kips
109.81 ft	404.97 Kips	11.31 Kips	416.28 Kips
118.81 ft	441.38 Kips	11.31 Kips	452.69 Kips
127.81 ft	482.29 Kips	11.31 Kips	493.60 Kips
136.81 ft	528.55 Kips	11.31 Kips	539.86 Kips
138.29 ft	536.64 Kips	11.31 Kips	547.95 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.60 psf	16.46	N/A	0.00 Kips
9.01 ft	Cohesionless	540.60 psf	16.46	N/A	3.61 Kips
13.99 ft	Cohesionless	839.40 psf	16.46	N/A	8.70 Kips
14.01 ft	Cohesionless	1680.61 psf	19.99	N/A	8.73 Kips
14.99 ft	Cohesionless	1740.39 psf	19.99	N/A	10.55 Kips
15.01 ft	Cohesionless	1802.61 psf	18.82	N/A	10.58 Kips
17.49 ft	Cohesionless	1953.89 psf	18.82	N/A	14.90 Kips
17.51 ft	Cohesionless	2107.61 psf	19.41	N/A	14.94 Kips
19.99 ft	Cohesionless	2258.89 psf	19.41	N/A	20.43 Kips
20.01 ft	Cohesive	N/A	N/A	582.11 psf	20.46 Kips
23.69 ft	Cohesive	N/A	N/A	582.11 psf	24.97 Kips
23.71 ft	Cohesionless	2801.14 psf	21.17	N/A	25.03 Kips
27.49 ft	Cohesionless	3043.06 psf	21.17	N/A	43.50 Kips
27.51 ft	Cohesionless	3287.54 psf	21.76	N/A	43.61 Kips
30.39 ft	Cohesionless	3471.86 psf	21.76	N/A	61.79 Kips
30.41 ft	Cohesionless	3658.65 psf	17.64	N/A	61.88 Kips
32.49 ft	Cohesionless	3773.05 psf	17.64	N/A	68.67 Kips
32.51 ft	Cohesive	N/A	N/A	600.00 psf	68.70 Kips
34.99 ft	Cohesive	N/A	N/A	600.00 psf	71.04 Kips
35.01 ft	Cohesive	N/A	N/A	1375.16 psf	71.08 Kips
37.99 ft	Cohesive	N/A	N/A	1375.16 psf	79.70 Kips
38.01 ft	Cohesionless	4483.23 psf	18.23	N/A	79.78 Kips
40.49 ft	Cohesionless	4560.86 psf	18.23	N/A	88.87 Kips
40.51 ft	Cohesionless	4639.75 psf	19.41	N/A	88.97 Kips
48.79 ft	Cohesionless	4911.33 psf	19.41	N/A	136.94 Kips
48.81 ft	Cohesionless	5184.23 psf	19.99	N/A	137.05 Kips
53.79 ft	Cohesionless	5347.57 psf	19.99	N/A	165.50 Kips
53.81 ft	Cohesive	N/A	N/A	1142.40 psf	165.57 Kips
62.81 ft	Cohesive	N/A	N/A	1142.40 psf	187.21 Kips
71.81 ft	Cohesive	N/A	N/A	1220.58 psf	211.82 Kips
80.81 ft	Cohesive	N/A	N/A	1308.42 psf	239.93 Kips
83.99 ft	Cohesive	N/A	N/A	1339.45 psf	250.66 Kips
84.01 ft	Cohesive	N/A	N/A	1011.50 psf	250.72 Kips
93.01 ft	Cohesive	N/A	N/A	1011.50 psf	269.88 Kips
102.01 ft	Cohesive	N/A	N/A	1082.09 psf	291.72 Kips
109.79 ft	Cohesive	N/A	N/A	1150.65 psf	313.16 Kips
109.81 ft	Cohesive	N/A	N/A	1287.72 psf	313.22 Kips
118.81 ft	Cohesive	N/A	N/A	1287.72 psf	337.61 Kips
127.81 ft	Cohesive	N/A	N/A	1367.37 psf	365.02 Kips
136.81 ft	Cohesive	N/A	N/A	1456.86 psf	396.01 Kips
138.29 ft	Cohesive	N/A	N/A	1471.58 psf	401.44 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.20 psf	22.80	10.46 Kips	0.01 Kips
9.01 ft	Cohesionless	1081.20 psf	22.80	10.46 Kips	10.38 Kips
13.99 ft	Cohesionless	1678.80 psf	22.80	10.46 Kips	10.46 Kips
14.01 ft	Cohesionless	1681.22 psf	55.60	57.74 Kips	48.66 Kips
14.99 ft	Cohesionless	1800.78 psf	55.60	57.74 Kips	52.12 Kips
15.01 ft	Cohesionless	1803.22 psf	40.40	25.92 Kips	25.92 Kips
17.49 ft	Cohesionless	2105.78 psf	40.40	25.92 Kips	25.92 Kips
17.51 ft	Cohesionless	2108.22 psf	47.20	39.27 Kips	39.27 Kips
19.99 ft	Cohesionless	2410.78 psf	47.20	39.27 Kips	39.27 Kips
20.01 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
23.69 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
23.71 ft	Cohesionless	2801.78 psf	77.60	119.07 Kips	118.18 Kips
27.49 ft	Cohesionless	3285.62 psf	77.60	119.07 Kips	119.07 Kips
27.51 ft	Cohesionless	3288.18 psf	91.20	161.82 Kips	161.82 Kips
30.39 ft	Cohesionless	3656.82 psf	91.20	161.82 Kips	161.82 Kips
30.41 ft	Cohesionless	3659.20 psf	30.00	10.46 Kips	10.46 Kips
32.49 ft	Cohesionless	3888.00 psf	30.00	10.46 Kips	10.46 Kips
32.51 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
34.99 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
35.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
37.99 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
38.01 ft	Cohesionless	4483.55 psf	35.20	16.23 Kips	16.23 Kips
40.49 ft	Cohesionless	4638.79 psf	35.20	16.23 Kips	16.23 Kips
40.51 ft	Cohesionless	4640.08 psf	47.20	39.27 Kips	39.27 Kips
48.79 ft	Cohesionless	5183.24 psf	47.20	39.27 Kips	39.27 Kips
48.81 ft	Cohesionless	5184.56 psf	55.60	57.74 Kips	57.74 Kips
53.79 ft	Cohesionless	5511.24 psf	55.60	57.74 Kips	57.74 Kips
53.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
62.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
71.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
80.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
83.99 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
84.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
93.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
102.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
109.79 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
109.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
118.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
127.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
136.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
138.29 ft	Cohesive	N/A	N/A	N/A	11.31 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.01 Kips	0.01 Kips
9.01 ft	3.61 Kips	10.38 Kips	13.99 Kips
13.99 ft	8.70 Kips	10.46 Kips	19.16 Kips
14.01 ft	8.73 Kips	48.66 Kips	57.39 Kips
14.99 ft	10.55 Kips	52.12 Kips	62.67 Kips
15.01 ft	10.58 Kips	25.92 Kips	36.50 Kips
17.49 ft	14.90 Kips	25.92 Kips	40.82 Kips
17.51 ft	14.94 Kips	39.27 Kips	54.21 Kips
19.99 ft	20.43 Kips	39.27 Kips	59.70 Kips
20.01 ft	20.46 Kips	4.24 Kips	24.70 Kips
23.69 ft	24.97 Kips	4.24 Kips	29.21 Kips
23.71 ft	25.03 Kips	118.18 Kips	143.21 Kips
27.49 ft	43.50 Kips	119.07 Kips	162.57 Kips
27.51 ft	43.61 Kips	161.82 Kips	205.44 Kips
30.39 ft	61.79 Kips	161.82 Kips	223.61 Kips
30.41 ft	61.88 Kips	10.46 Kips	72.35 Kips
32.49 ft	68.67 Kips	10.46 Kips	79.13 Kips
32.51 ft	68.70 Kips	4.24 Kips	72.94 Kips
34.99 ft	71.04 Kips	4.24 Kips	75.28 Kips
35.01 ft	71.08 Kips	14.14 Kips	85.22 Kips
37.99 ft	79.70 Kips	14.14 Kips	93.84 Kips
38.01 ft	79.78 Kips	16.23 Kips	96.01 Kips
40.49 ft	88.87 Kips	16.23 Kips	105.10 Kips
40.51 ft	88.97 Kips	39.27 Kips	128.24 Kips
48.79 ft	136.94 Kips	39.27 Kips	176.21 Kips
48.81 ft	137.05 Kips	57.74 Kips	194.79 Kips
53.79 ft	165.50 Kips	57.74 Kips	223.24 Kips
53.81 ft	165.57 Kips	33.93 Kips	199.50 Kips
62.81 ft	187.21 Kips	33.93 Kips	221.14 Kips
71.81 ft	211.82 Kips	33.93 Kips	245.75 Kips
80.81 ft	239.93 Kips	33.93 Kips	273.86 Kips
83.99 ft	250.66 Kips	33.93 Kips	284.59 Kips
84.01 ft	250.72 Kips	30.04 Kips	280.76 Kips
93.01 ft	269.88 Kips	30.04 Kips	299.92 Kips
102.01 ft	291.72 Kips	30.04 Kips	321.76 Kips
109.79 ft	313.16 Kips	30.04 Kips	343.20 Kips
109.81 ft	313.22 Kips	11.31 Kips	324.53 Kips
118.81 ft	337.61 Kips	11.31 Kips	348.92 Kips
127.81 ft	365.02 Kips	11.31 Kips	376.33 Kips
136.81 ft	396.01 Kips	11.31 Kips	407.32 Kips
138.29 ft	401.44 Kips	11.31 Kips	412.75 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.60 psf	16.46	N/A	0.00 Kips
9.01 ft	Cohesionless	540.60 psf	16.46	N/A	3.61 Kips
13.99 ft	Cohesionless	839.40 psf	16.46	N/A	8.70 Kips
14.01 ft	Cohesionless	1680.61 psf	19.99	N/A	8.73 Kips
14.99 ft	Cohesionless	1740.39 psf	19.99	N/A	10.93 Kips
15.01 ft	Cohesionless	1802.61 psf	18.82	N/A	10.97 Kips
17.49 ft	Cohesionless	1953.89 psf	18.82	N/A	16.17 Kips
17.51 ft	Cohesionless	2107.61 psf	19.41	N/A	16.22 Kips
19.99 ft	Cohesionless	2258.89 psf	19.41	N/A	22.83 Kips
20.01 ft	Cohesive	N/A	N/A	582.11 psf	22.88 Kips
23.69 ft	Cohesive	N/A	N/A	582.11 psf	29.61 Kips
23.71 ft	Cohesionless	2801.14 psf	21.17	N/A	29.67 Kips
27.49 ft	Cohesionless	3043.06 psf	21.17	N/A	48.14 Kips
27.51 ft	Cohesionless	3287.54 psf	21.76	N/A	48.25 Kips
30.39 ft	Cohesionless	3471.86 psf	21.76	N/A	66.42 Kips
30.41 ft	Cohesionless	3658.65 psf	17.64	N/A	66.52 Kips
32.49 ft	Cohesionless	3773.05 psf	17.64	N/A	73.31 Kips
32.51 ft	Cohesive	N/A	N/A	600.00 psf	73.36 Kips
34.99 ft	Cohesive	N/A	N/A	600.00 psf	78.04 Kips
35.01 ft	Cohesive	N/A	N/A	1375.16 psf	78.10 Kips
37.99 ft	Cohesive	N/A	N/A	1375.16 psf	90.98 Kips
38.01 ft	Cohesionless	4483.23 psf	18.23	N/A	91.06 Kips
40.49 ft	Cohesionless	4560.86 psf	18.23	N/A	102.01 Kips
40.51 ft	Cohesionless	4639.75 psf	19.41	N/A	102.11 Kips
48.79 ft	Cohesionless	4911.33 psf	19.41	N/A	150.09 Kips
48.81 ft	Cohesionless	5184.23 psf	19.99	N/A	150.22 Kips
53.79 ft	Cohesionless	5347.57 psf	19.99	N/A	184.50 Kips
53.81 ft	Cohesive	N/A	N/A	1142.40 psf	184.60 Kips
62.81 ft	Cohesive	N/A	N/A	1142.40 psf	216.90 Kips
71.81 ft	Cohesive	N/A	N/A	1220.58 psf	253.63 Kips
80.81 ft	Cohesive	N/A	N/A	1308.42 psf	295.59 Kips
83.99 ft	Cohesive	N/A	N/A	1339.45 psf	311.61 Kips
84.01 ft	Cohesive	N/A	N/A	1011.50 psf	311.69 Kips
93.01 ft	Cohesive	N/A	N/A	1011.50 psf	340.29 Kips
102.01 ft	Cohesive	N/A	N/A	1082.09 psf	372.88 Kips
109.79 ft	Cohesive	N/A	N/A	1150.65 psf	404.89 Kips
109.81 ft	Cohesive	N/A	N/A	1287.72 psf	404.97 Kips
118.81 ft	Cohesive	N/A	N/A	1287.72 psf	441.38 Kips
127.81 ft	Cohesive	N/A	N/A	1367.37 psf	482.29 Kips
136.81 ft	Cohesive	N/A	N/A	1456.86 psf	528.55 Kips
138.29 ft	Cohesive	N/A	N/A	1471.58 psf	536.64 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	1.20 psf	22.80	10.46 Kips	0.01 Kips
9.01 ft	Cohesionless	1081.20 psf	22.80	10.46 Kips	10.38 Kips
13.99 ft	Cohesionless	1678.80 psf	22.80	10.46 Kips	10.46 Kips
14.01 ft	Cohesionless	1681.22 psf	55.60	57.74 Kips	48.66 Kips
14.99 ft	Cohesionless	1800.78 psf	55.60	57.74 Kips	52.12 Kips
15.01 ft	Cohesionless	1803.22 psf	40.40	25.92 Kips	25.92 Kips
17.49 ft	Cohesionless	2105.78 psf	40.40	25.92 Kips	25.92 Kips
17.51 ft	Cohesionless	2108.22 psf	47.20	39.27 Kips	39.27 Kips
19.99 ft	Cohesionless	2410.78 psf	47.20	39.27 Kips	39.27 Kips
20.01 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
23.69 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
23.71 ft	Cohesionless	2801.78 psf	77.60	119.07 Kips	118.18 Kips
27.49 ft	Cohesionless	3285.62 psf	77.60	119.07 Kips	119.07 Kips
27.51 ft	Cohesionless	3288.18 psf	91.20	161.82 Kips	161.82 Kips
30.39 ft	Cohesionless	3656.82 psf	91.20	161.82 Kips	161.82 Kips
30.41 ft	Cohesionless	3659.20 psf	30.00	10.46 Kips	10.46 Kips
32.49 ft	Cohesionless	3888.00 psf	30.00	10.46 Kips	10.46 Kips
32.51 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
34.99 ft	Cohesive	N/A	N/A	N/A	4.24 Kips
35.01 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
37.99 ft	Cohesive	N/A	N/A	N/A	14.14 Kips
38.01 ft	Cohesionless	4483.55 psf	35.20	16.23 Kips	16.23 Kips
40.49 ft	Cohesionless	4638.79 psf	35.20	16.23 Kips	16.23 Kips
40.51 ft	Cohesionless	4640.08 psf	47.20	39.27 Kips	39.27 Kips
48.79 ft	Cohesionless	5183.24 psf	47.20	39.27 Kips	39.27 Kips
48.81 ft	Cohesionless	5184.56 psf	55.60	57.74 Kips	57.74 Kips
53.79 ft	Cohesionless	5511.24 psf	55.60	57.74 Kips	57.74 Kips
53.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
62.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
71.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
80.81 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
83.99 ft	Cohesive	N/A	N/A	N/A	33.93 Kips
84.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
93.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
102.01 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
109.79 ft	Cohesive	N/A	N/A	N/A	30.04 Kips
109.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
118.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
127.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
136.81 ft	Cohesive	N/A	N/A	N/A	11.31 Kips
138.29 ft	Cohesive	N/A	N/A	N/A	11.31 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.01 Kips	0.01 Kips
9.01 ft	3.61 Kips	10.38 Kips	13.99 Kips
13.99 ft	8.70 Kips	10.46 Kips	19.16 Kips
14.01 ft	8.73 Kips	48.66 Kips	57.39 Kips
14.99 ft	10.93 Kips	52.12 Kips	63.05 Kips
15.01 ft	10.97 Kips	25.92 Kips	36.89 Kips
17.49 ft	16.17 Kips	25.92 Kips	42.09 Kips
17.51 ft	16.22 Kips	39.27 Kips	55.49 Kips
19.99 ft	22.83 Kips	39.27 Kips	62.10 Kips
20.01 ft	22.88 Kips	4.24 Kips	27.12 Kips
23.69 ft	29.61 Kips	4.24 Kips	33.85 Kips
23.71 ft	29.67 Kips	118.18 Kips	147.85 Kips
27.49 ft	48.14 Kips	119.07 Kips	167.20 Kips
27.51 ft	48.25 Kips	161.82 Kips	210.07 Kips
30.39 ft	66.42 Kips	161.82 Kips	228.25 Kips
30.41 ft	66.52 Kips	10.46 Kips	76.98 Kips
32.49 ft	73.31 Kips	10.46 Kips	83.77 Kips
32.51 ft	73.36 Kips	4.24 Kips	77.61 Kips
34.99 ft	78.04 Kips	4.24 Kips	82.28 Kips
35.01 ft	78.10 Kips	14.14 Kips	92.24 Kips
37.99 ft	90.98 Kips	14.14 Kips	105.11 Kips
38.01 ft	91.06 Kips	16.23 Kips	107.29 Kips
40.49 ft	102.01 Kips	16.23 Kips	118.24 Kips
40.51 ft	102.11 Kips	39.27 Kips	141.38 Kips
48.79 ft	150.09 Kips	39.27 Kips	189.36 Kips
48.81 ft	150.22 Kips	57.74 Kips	207.96 Kips
53.79 ft	184.50 Kips	57.74 Kips	242.24 Kips
53.81 ft	184.60 Kips	33.93 Kips	218.53 Kips
62.81 ft	216.90 Kips	33.93 Kips	250.83 Kips
71.81 ft	253.63 Kips	33.93 Kips	287.56 Kips
80.81 ft	295.59 Kips	33.93 Kips	329.52 Kips
83.99 ft	311.61 Kips	33.93 Kips	345.54 Kips
84.01 ft	311.69 Kips	30.04 Kips	341.73 Kips
93.01 ft	340.29 Kips	30.04 Kips	370.33 Kips
102.01 ft	372.88 Kips	30.04 Kips	402.92 Kips
109.79 ft	404.89 Kips	30.04 Kips	434.93 Kips
109.81 ft	404.97 Kips	11.31 Kips	416.28 Kips
118.81 ft	441.38 Kips	11.31 Kips	452.69 Kips
127.81 ft	482.29 Kips	11.31 Kips	493.60 Kips
136.81 ft	528.55 Kips	11.31 Kips	539.86 Kips
138.29 ft	536.64 Kips	11.31 Kips	547.95 Kips

APPENDIX H

DRIVABILITY ANALYSIS

REAR ABUTMENT

Gain/Loss 3 at Shaft and Toe 0.570 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
2.6	30.7	1.4	29.3	2.4	15.140	-0.694	4.85	24.0
2.6	7.9	1.4	6.5	1.2	9.918	-1.267	3.76	20.3
10.5	23.2	9.6	13.6	1.8	13.807	-1.301	4.51	24.0
18.4	41.9	27.3	14.6	2.8	16.031	-0.998	4.98	23.4
18.4	82.3	27.4	54.8	7.3	18.833	0.000	5.71	20.4
30.9	146.0	91.2	54.8	13.2	22.371	-3.621	6.45	19.7
43.4	228.7	173.9	54.8	22.7	25.663	-5.520	7.42	20.7
43.4	292.1	174.2	118.0	42.5	30.153	-9.328	8.45	22.8
50.9	339.6	221.6	118.0	71.2	32.127	-10.136	9.11	23.9
58.4	392.9	274.9	118.0	176.1	32.726	-10.223	9.41	24.1
58.4	646.8	275.4	371.4	9999.0	35.544	-11.306	9.86	25.1
60.9	694.7	323.3	371.4	9999.0	35.207	-10.891	9.79	24.8
63.4	744.2	372.8	371.4	9999.0	35.083	-10.650	9.73	24.5
63.4	407.7	373.2	34.5	192.6	31.693	-8.909	9.33	23.6
70.9	421.2	386.6	34.5	289.8	31.688	-7.574	9.27	22.7
78.4	434.8	400.2	34.5	369.7	33.161	-6.680	9.44	22.4
78.4	431.9	400.3	31.6	344.5	33.144	-6.643	9.43	22.4
91.3	455.5	423.9	31.6	835.5	34.211	-4.741	9.28	20.7
104.2	481.5	449.9	31.6	9999.0	34.831	-2.558	9.40	19.7
104.2	459.9	450.0	9.9	702.2	34.775	-2.609	9.36	19.6
106.0	462.9	453.0	9.9	828.2	34.728	-2.371	9.33	19.3
107.9	465.9	456.0	9.9	925.4	34.702	-2.040	9.31	19.0

Refusal occurred; no driving time output possible

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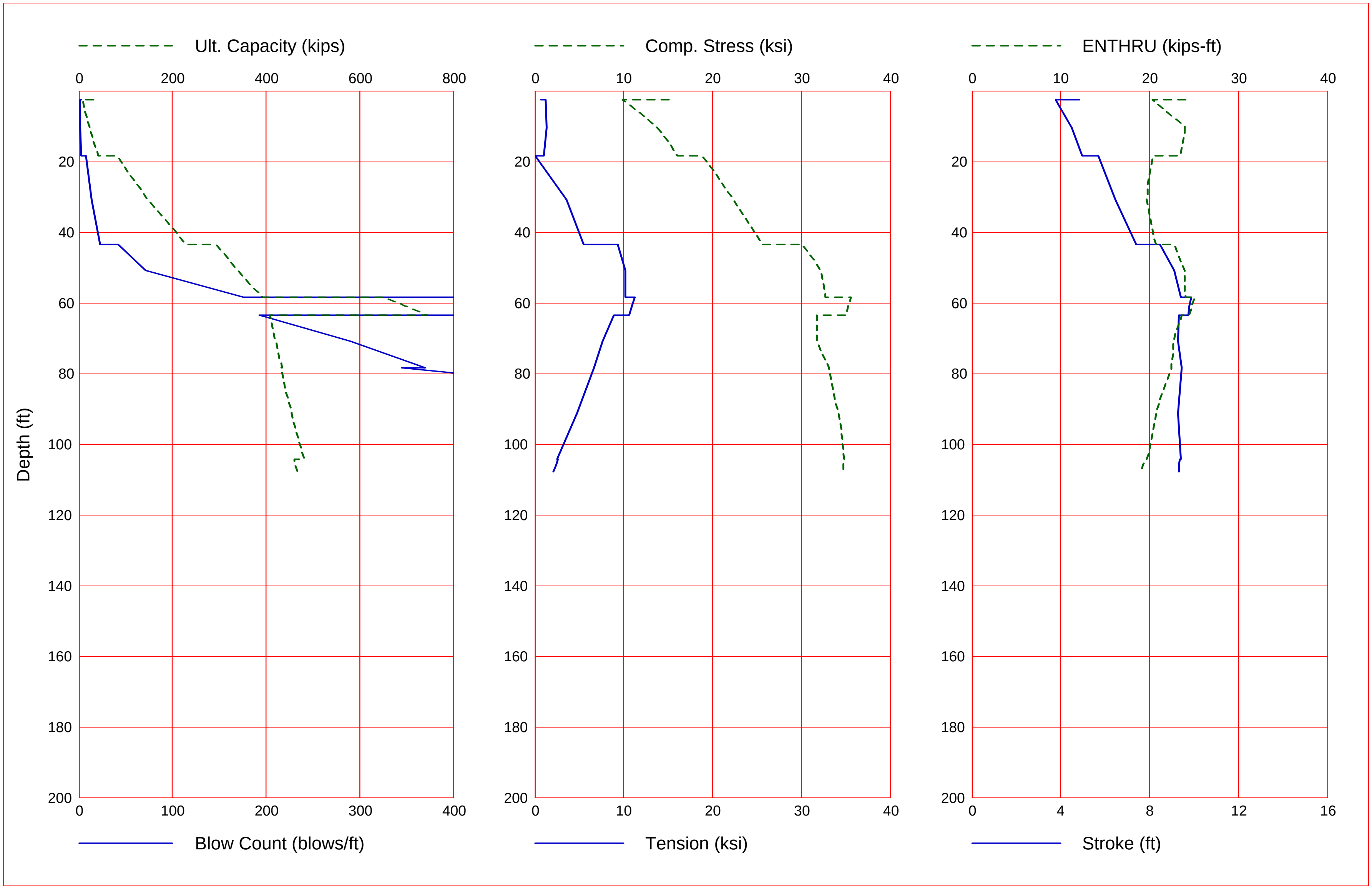
Jun 21 2022
GRLWEAP Version 2010

Gain/Loss 3 at Shaft and Toe 0.570 / 1.000



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                           GRLWEAP - Version 2010
                  WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS

          written by GRL Engineers, Inc. (formerly Goble Rausche Likins
         and Associates, Inc.) with cooperation from Pile Dynamics, Inc.
                 Copyright (c) 1998-2010, Pile Dynamics, Inc.


                   ABOUT THE WAVE EQUATION ANALYSIS RESULTS


The GRLWEAP program simulates the behavior of a preformed pile driven by
either an impact hammer or a vibratory hammer.  The program is based on
mathematical models, which describe motion and forces of hammer, driving
system, pile and soil under the hammer action.  Under certain conditions,
the models only crudely approximate, often complex, dynamic situations.

A wave equation analysis generally relies on input data, which represents
normal situations.  In particular, the hammer data file supplied with the
program assumes that the hammer is in good working order.  All of the input
data selected by the user may be the best available information at the time
when the analysis is performed.  However, input data and therefore results
may significantly differ from actual field conditions.

Therefore, the program authors recommend prudent use of the GRLWEAP results.
Soil response and hammer performance should be verified by static and/or
dynamic testing and measurements.  Estimates of bending or other local
stresses (e.g., helmet or clamp contact, uneven rock surfaces etc.),
prestress effects and others must also be accounted for by the user.

The calculated capacity - blow count relationship, i.e. the bearing graph,
should be used in conjunction with observed blow counts for the capacity
assessment of a driven pile.  Soil setup occurring after pile installation
may produce bearing capacity values that differ substantially from those
expected from a wave equation analysis due to soil setup or relaxation.  This
is particularly true for pile driven with vibratory hammers.  The GRLWEAP user
must estimate such effects and should also use proper care when applying blow
counts from restrike because of the variability of hammer energy, soil
resistance and blow count during early restriking.

Finally, the GRLWEAP capacities are ultimate values.  They MUST be reduced by
means of an appropriate factor of safety to yield a design or working load.
The selection of a factor of safety should consider the quality of the
construction control, the variability of the site conditions, uncertainties
in the loads, the importance of building and other factors.
 ♀
 Input  File: C:\USERS\KARENS\DESKTOP\GRL FILES\RA12IN.GWW
 Hammer File: C:\ProgramData\PDI\GRLWEAP\2010\Resource\HAMMER2010.GW
 Hammer File Version:  2003 (10/17/2016)

                        Input File Contents
     CCG3A : 06/30/2021 : KCA
 OUT OSG HAM STR FUL PEL  N SPL N-U P-D %SK ISM  0 PHI RSA ITR H-D MXT     DEx
-100   0  41   0   0   0  0   0   0   1   0   0  0   0   0   0   0   0   0.000
    Pile g  Hammer g  Toe Area Pile Size           Pile Type
    32.170    32.170   113.090    12.000                Pipe
      W Cp      A Cp      E Cp      T Cp       CoR      ROut      StCp
     2.500    12.130     530.0     2.000     0.800     0.010       0.0
      A Cu      E Cu      T Cu       CoR      ROut      StCu
     0.000       0.0     0.000     0.000     0.000       0.0
      LPle      APle      EPle      WPle      Peri        CI       CoR      ROut
   107.880     12.13   30000.0   492.000     3.141         0     0.850     0.010
```

```
 FFatigue        F0  0-Bottom
        0     0.000     0.000
Manufac  Hmr Name  HmrType No Seg-s
DELMAG   D 19-42         1        5
   Ram Wt     Ram L   Ram Dia   MaxStrk   RtdStrk    Efficy
     4.00    129.10     12.60     11.86     10.81      0.80
   IB. Wt     IB. L    IB.Dia    IB CoR     IB RO
     0.75     25.30     12.60     0.900     0.010
 CompStrk A Chamber V Chamber   C Delay  C Duratn Exp Coeff VolCStart  Vol CEnd
    16.65    124.70    157.70    0.0020    0.0020     1.250      0.00      0.00
    P atm        P1        P2        P3        P4        P5
    14.70   1600.00   1440.00   1295.00   1165.00      0.00
   Stroke    Effic.  Pressure  R-Weight   T-Delay Exp-Coeff   Eps-Str  Total-AW
  10.8100    0.8000 1600.0000    0.0000    0.0000    0.0000    0.0100    0.0000
       Qs        Qt        Js        Jt        Qx        Jx      Rati      Dept
    0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
 Research Soil Model: Atoe, Plug,  Gap, Q-fac
    0.000     0.000     0.000     0.000
 Research Soil Model: RD-skn: m, d, toe: m, d
    0.000     0.000     0.000     0.000
 Res. Distribution
   Dpth    Rskn      Rtoe      Qs      Qt      Js      Jt   SU F   LimL    TSf0
   0.01    0.00      0.11    0.10    0.20    0.05    0.15   1.00   6.00   1.000
   2.59    0.35     29.43    0.10    0.20    0.05    0.15   1.00   6.00   1.000
   2.61    0.14      6.47    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  11.61    0.58     14.61    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  18.39    0.91     14.61    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  18.41    1.29     54.83    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  21.99    1.54     54.83    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  22.01    1.55     54.83    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  31.01    1.88     54.83    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  40.01    2.22     54.83    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  43.39    2.34     54.83    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  43.41    2.83    117.99    0.10    0.10    0.10    0.15   1.49   6.00  24.000
  52.41    3.28    117.99    0.10    0.10    0.10    0.15   1.49   6.00  24.000
  58.39    3.57    117.99    0.10    0.10    0.10    0.15   1.49   6.00  24.000
  58.41    6.04    371.42    0.10    0.10    0.05    0.15   1.00   6.00   1.000
  63.39    6.46    371.42    0.10    0.10    0.05    0.15   1.00   6.00  24.000
  63.41    0.86     34.54    0.10    0.20    0.15    0.15   1.49   6.00  24.000
  72.41    0.86     34.54    0.10    0.20    0.15    0.15   1.49   6.00  24.000
  78.39    0.88     34.54    0.10    0.20    0.15    0.15   1.49   6.00  24.000
  78.41    0.87     31.58    0.10    0.20    0.15    0.15   1.49   6.00 168.000
  87.41    0.87     31.58    0.10    0.20    0.15    0.15   1.49   6.00 168.000
  96.41    0.93     31.58    0.10    0.20    0.15    0.15   1.49   6.00 168.000
 104.19    1.04     31.58    0.10    0.20    0.15    0.15   1.49   6.00 168.000
 104.21    0.92      9.87    0.10    0.20    0.20    0.15   1.75   6.00 168.000
 107.88    0.92      9.87    0.10    0.20    0.20    0.15   1.75   6.00 168.000
 Gain/Loss factors: shaft and toe
  0.48400   0.52700   0.57000   0.61300   0.65600
  1.00000   1.00000   1.00000   1.00000   1.00000
     Dpth         L      Wait      Strk      Pmx%      Eff.      Stff       CoR
     2.58      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     2.62      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    10.50      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    18.38      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    18.42      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    30.90      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    43.38      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    43.42      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    50.90      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    58.38      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    58.42      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    60.90      0.00      0.00     0.000       0.0     0.000     0.000     0.000
```

```
     63.38      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     63.42      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     70.90      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     78.38      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     78.42      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     91.30      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    104.18      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    104.22      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    106.03      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    107.88      0.00      0.00     0.000       0.0     0.000     0.000     0.000
      0.00      0.00      0.00     0.000       0.0     0.000     0.000     0.000
 ♀           GRLWEAP: WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS
                                  Version 2010
                                 English Units

                   CCG3A : 06/30/2021 : KCA
                   ________________________________________

            Hammer Model:   D 19-42              Made by:      DELMAG

            No.    Weight    Stiffn       CoR     C-Slk     Dampg
                     kips    k/inch                  ft    k/ft/s
              1     0.800
              2     0.800  140046.6     1.000    0.0000
              3     0.800  140046.6     1.000    0.0000
              4     0.800  140046.6     1.000    0.0000
              5     0.800  140046.6     1.000    0.0000
      Imp Block     0.753   70735.6     0.900    0.0100
      Helmet        2.500    3214.4     0.800    0.0100       5.8
      Combined Pile Top      8995.2

HAMMER OPTIONS:
  Hammer File ID No.                41  Hammer Type                OE Diesel
  Stroke Option              FxdP-VarS  Stroke Convergence Crit.       0.010
  Fuel Pump Setting            Maximum

HAMMER DATA:
  Ram Weight          (kips)      4.00  Ram Length          (inch)    129.10
  Maximum Stroke        (ft)     11.86
  Rated Stroke          (ft)     10.81  Efficiency                     0.800

  Maximum Pressure     (psi)   1600.00  Actual Pressure      (psi)   1600.00
  Compression Exponent           1.350  Expansion Exponent             1.250
  Ram Diameter        (inch)     12.60
  Combustion Delay       (s)   0.00200  Ignition Duration      (s)   0.00200

          The Hammer Data Includes Estimated (NON-MEASURED) Quantities
          ____________________________________________________________



  HAMMER CUSHION                        PILE CUSHION
  Cross Sect. Area     (in2)     12.13  Cross Sect. Area     (in2)      0.00
  Elastic-Modulus      (ksi)     530.0  Elastic-Modulus      (ksi)       0.0
  Thickness           (inch)      2.00  Thickness           (inch)      0.00
  Coeff of Restitution             0.8  Coeff of Restitution             1.0
  RoundOut              (ft)       0.0  RoundOut              (ft)       0.0
  Stiffness        (kips/in)    3214.4  Stiffness        (kips/in)       0.0
```

```
 Depth                  (ft)       2.6  Standard Soil Setup
 Shaft Gain/Loss Factor          0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area              (in2)   113.090  Pile Type                       Pipe
 Pile Size            (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)     12.838

        Pile and Soil Model            Total Capacity Rut  (kips)      30.7
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.140      8995 0.010 0.000 0.85      0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140      8995 0.000 0.000 1.00      0.0   0.000 0.100   6.74   3.1    12.1
 32  0.140      8995 0.000 0.000 1.00      1.4   0.050 0.100 107.88   3.1    12.1
Toe                                       29.3   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)

 PILE, SOIL, ANALYSIS OPTIONS:
 Uniform pile                           Pile Segments: Automatic
 No. of Slacks/Splices               0  Pile Damping            (%)        1
                                        Pile Damping Fact.(k/ft/s)     0.433
 Driveability Analysis
 Soil Damping Option             Smith
 Max No Analysis Iterations          0  Time Increment/Critical          160
 Output Time Interval                1  Analysis Time-Input   (ms)         0
 Output Level: Normal
 Gravity Mass, Pile, Hammer:   32.170    32.170    32.170
 Output Segment Generation: Automatic

    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
     2.58     10.81      1.00     0.800
♀
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    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
   30.7     2.4   4.85   4.83   -0.69   5  17    15.14  12   7   24.0    53.8
   30.7     2.4   4.85   4.83   -0.69   5  17    15.14  12   7   24.0    53.8
   30.7     2.4   4.85   4.83   -0.69   5  17    15.14  12   7   24.0    53.8
   30.7     2.4   4.85   4.83   -0.69   5  17    15.14  12   7   24.0    53.8
   30.7     2.4   4.85   4.83   -0.69   5  17    15.14  12   7   24.0    53.8
♀
CCG3A : 06/30/2021 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)       2.6  Standard Soil Setup
 Shaft Gain/Loss Factor          0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area              (in2)   113.090  Pile Type                       Pipe
 Pile Size            (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
```

```
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1         0    16807.      21.7
    107.9    12.13   30000.    492.0      3.1         0    16807.      21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)       7.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00     1.4   0.050 0.100 107.88   3.1    12.1
Toe                                      6.5   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
     2.62     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                            06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
    7.9     1.2   3.76   3.76   -1.27   6  19     9.92   1   7   20.3    60.9
    7.9     1.2   3.76   3.76   -1.27   6  19     9.92   1   7   20.3    60.9
    7.9     1.2   3.76   3.76   -1.27   6  19     9.92   1   7   20.3    60.9
    7.9     1.2   3.76   3.76   -1.27   6  19     9.92   1   7   20.3    60.9
    7.9     1.2   3.76   3.76   -1.27   6  19     9.92   1   7   20.3    60.9
♀
CCG3A : 06/30/2021 : KCA                                            06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      10.5  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                        Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1         0    16807.      21.7
    107.9    12.13   30000.    492.0      3.1         0    16807.      21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)      23.2
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00     0.0   0.050 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00     2.0   0.050 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00     2.9   0.050 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00     4.7   0.050 0.100 107.88   3.1    12.1
Toe                                     13.6   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)
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    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    10.50     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi          kip-ft   b/min
   23.2     1.8   4.51   4.54   -1.30   8  17    13.81   1   6   24.0    55.7
   23.2     1.8   4.51   4.54   -1.30   8  17    13.81   1   6   24.0    55.7
   23.2     1.8   4.51   4.54   -1.30   8  17    13.81   1   6   24.0    55.7
   23.2     1.8   4.51   4.54   -1.30   8  17    13.81   1   6   24.0    55.7
   23.2     1.8   4.51   4.54   -1.30   8  17    13.81   1   6   24.0    55.7
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      18.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0   16807.      21.7
    107.9    12.13   30000.    492.0      3.1        0   16807.      21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)      41.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85      0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00      0.0   0.000 0.100   6.74   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00      0.5   0.050 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00      2.3   0.050 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00      3.5   0.050 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00      5.2   0.050 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00      7.0   0.050 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00      8.7   0.050 0.100 107.88   3.1    12.1
Toe                                      14.6   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    18.38     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi          kip-ft   b/min
   41.9     2.8   4.98   4.95   -1.00   5  17    16.03   9   6   23.4    53.2
   41.9     2.8   4.98   4.95   -1.00   5  17    16.03   9   6   23.4    53.2
   41.9     2.8   4.98   4.95   -1.00   5  17    16.03   9   6   23.4    53.2
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   41.9     2.8   4.98   4.95   -1.00   5  17    16.03   9   6   23.4    53.2
   41.9     2.8   4.98   4.95   -1.00   5  17    16.03   9   6   23.4    53.2
♀
CCG3A : 06/30/2021 : KCA                                              06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                  (ft)      18.4  Standard Soil Setup
 Shaft Gain/Loss Factor          0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area              (in2)   113.090  Pile Type                       Pipe
 Pile Size            (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)      82.3
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00     0.5   0.050 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00     2.3   0.050 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00     3.5   0.050 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00     5.3   0.050 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00     7.0   0.050 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00     8.8   0.050 0.100 107.88   3.1    12.1
Toe                                     54.8   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    18.42     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                              06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
   82.3     7.3   5.71   5.77    0.00   1   0    18.83  23   9   20.4    49.1
   82.3     7.3   5.71   5.77    0.00   1   0    18.83  23   9   20.4    49.1
   82.3     7.3   5.71   5.77    0.00   1   0    18.83  23   9   20.4    49.1
   82.3     7.3   5.71   5.77    0.00   1   0    18.83  23   9   20.4    49.1
   82.3     7.3   5.71   5.77    0.00   1   0    18.83  23   9   20.4    49.1
♀
CCG3A : 06/30/2021 : KCA                                              06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                  (ft)      30.9  Standard Soil Setup
 Shaft Gain/Loss Factor          0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area              (in2)   113.090  Pile Type                       Pipe
 Pile Size            (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
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       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     146.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00     0.1   0.050 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00     2.1   0.050 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00     3.0   0.050 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00     4.7   0.050 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00     6.5   0.050 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00     8.2   0.050 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00    13.0   0.050 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00    16.5   0.050 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00    17.9   0.050 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00    19.2   0.050 0.100 107.88   3.1    12.1
Toe                                     54.8   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    30.90     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                   06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up      ksi             ksi         kip-ft   b/min
  146.0    13.2   6.45   6.47   -3.62  24  45    22.37  24   9   19.7    46.2
  146.0    13.2   6.45   6.47   -3.62  24  45    22.37  24   9   19.7    46.2
  146.0    13.2   6.45   6.47   -3.62  24  45    22.37  24   9   19.7    46.2
  146.0    13.2   6.45   6.47   -3.62  24  45    22.37  24   9   19.7    46.2
  146.0    13.2   6.45   6.47   -3.62  24  45    22.37  24   9   19.7    46.2
♀
CCG3A : 06/30/2021 : KCA                                   06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      43.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     228.7
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
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  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00     1.6   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00     2.5   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00     4.2   0.050 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00     6.0   0.050 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00     7.7   0.050 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00    11.2   0.050 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00    15.9   0.050 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00    17.5   0.050 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00    18.8   0.050 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00    20.1   0.050 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00    21.5   0.050 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00    22.8   0.050 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00    24.1   0.050 0.100 107.88   3.1    12.1
Toe                                     54.8   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    43.38     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi             ksi          kip-ft   b/min
  228.7    22.7   7.42   7.37   -5.52  22  36    25.66  23   9   20.7    43.2
  228.7    22.7   7.42   7.37   -5.52  22  36    25.66  23   9   20.7    43.2
  228.7    22.7   7.42   7.37   -5.52  22  36    25.66  23   9   20.7    43.2
  228.7    22.7   7.42   7.37   -5.52  22  36    25.66  23   9   20.7    43.2
  228.7    22.7   7.42   7.37   -5.52  22  36    25.66  23   9   20.7    43.2
♀
CCG3A : 06/30/2021 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      43.4  Standard Soil Setup
 Shaft Gain/Loss Factor          0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

       Pile and Soil Model            Total Capacity Rut  (kips)     292.1
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00     1.6   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00     2.5   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00     4.2   0.050 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00     6.0   0.050 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00     7.7   0.050 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00    11.2   0.050 0.100  84.28   3.1    12.1
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 26  0.140     8995 0.000 0.000 1.00    15.9   0.050 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00    17.5   0.050 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00    18.8   0.050 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00    20.2   0.050 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00    21.5   0.050 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00    22.8   0.050 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00    24.1   0.050 0.100 107.88   3.1    12.1
Toe                                    118.0   0.150 0.100

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    43.42     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft    down      up     ksi              ksi          kip-ft   b/min
  292.1    42.5   8.45    8.50   -9.33  22  34    30.16  20  12   22.8    40.4
  292.1    42.5   8.45    8.50   -9.33  22  34    30.15  20  12   22.8    40.4
  292.1    42.5   8.45    8.50   -9.33  22  34    30.15  20  12   22.8    40.4
  292.1    42.5   8.45    8.50   -9.33  22  34    30.16  20  12   22.8    40.4
  292.2    42.5   8.45    8.50   -9.33  22  34    30.16  20  12   22.8    40.4
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      50.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3      ft              ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1         0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1         0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     334.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft      in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00     0.0   0.050 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00     2.0   0.050 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00     2.9   0.050 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00     4.6   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00     6.4   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00     8.1   0.050 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00    12.6   0.050 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00    16.3   0.050 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00    17.8   0.050 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00    19.1   0.050 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00    20.4   0.050 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00    21.8   0.050 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00    23.1   0.050 0.100  97.77   3.1    12.1
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 30  0.140     8995 0.000 0.000 1.00    22.9   0.063 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00    18.9   0.100 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00    19.9   0.100 0.100 107.88   3.1    12.1
Toe                                    118.0   0.150 0.100

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    50.90     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi        kip-ft   b/min
  334.9    67.7   9.05   9.00   -9.99  20  32    31.90  20  12   23.8    39.2
  337.2    69.8   9.08   9.03  -10.05  19  32    32.02  20  12   23.9    39.1
  339.6    71.2   9.11   9.05  -10.14  20  32    32.13  20  12   23.9    39.1
  341.9    73.3   9.14   9.08  -10.20  20  32    32.24  20  12   24.0    39.0
  344.3    74.8   9.17   9.09  -10.29  20  32    32.36  20  12   24.1    39.0
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      58.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi  lb/ft3       ft              ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     382.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00     0.2   0.050 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00     2.2   0.050 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00     3.3   0.050 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00     5.0   0.050 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00     6.8   0.050 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00     8.5   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00    14.0   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00    16.7   0.050 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00    18.1   0.050 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00    19.4   0.050 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00    20.7   0.050 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00    22.1   0.050 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00    23.4   0.050 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00    21.7   0.075 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00    19.1   0.100 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00    20.2   0.100 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00    21.2   0.100 0.100 104.51   3.1    12.1
```

```
 32  0.140     8995 0.000 0.000 1.00    22.3   0.100 0.100 107.88   3.1    12.1
Toe                                    118.0   0.150 0.100

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    58.38     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi           kip-ft   b/min
  382.9   143.6   9.34   9.33  -10.04  18  30    32.39  19  12   24.0    38.6
  387.9   159.4   9.37   9.36  -10.13  18  30    32.55  19  12   24.1    38.5
  392.9   176.1   9.41   9.40  -10.22  18  30    32.73  19  12   24.1    38.4
  397.9   199.1   9.44   9.44  -10.30  18  30    32.89  19  12   24.2    38.3
  402.8   221.9   9.47   9.46  -10.42  18  30    33.05  19  12   24.3    38.3
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      58.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod   Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     636.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00     0.3   0.050 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00     2.2   0.050 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00     3.3   0.050 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00     5.0   0.050 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00     6.8   0.050 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00     8.5   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00    14.1   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00    16.7   0.050 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00    18.1   0.050 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00    19.4   0.050 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00    20.8   0.050 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00    22.1   0.050 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00    23.4   0.050 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00    21.7   0.075 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00    19.1   0.100 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00    20.2   0.100 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00    21.2   0.100 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00    22.5   0.100 0.100 107.88   3.1    12.1
Toe                                    371.4   0.150 0.100
```

```
     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    58.42     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                        06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
  636.9  9999.0   9.84   9.81  -11.25  18  30    35.45  20  12   25.1    37.6
  641.9  9999.0   9.85   9.82  -11.28  18  30    35.50  20  12   25.1    37.6
  646.8  9999.0   9.86   9.83  -11.31  18  30    35.54  20  12   25.1    37.6
  651.8  9999.0   9.87   9.84  -11.35  18  30    35.61  20  12   25.2    37.5
  656.8  9999.0   9.88   9.85  -11.38  18  30    35.66  20  12   25.2    37.5
♀
CCG3A : 06/30/2021 : KCA                                        06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      60.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model           Total Capacity Rut  (kips)     684.7
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00     0.0   0.050 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00     1.9   0.050 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00     2.8   0.050 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00     4.6   0.050 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00     6.3   0.050 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00     8.1   0.050 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00    12.4   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00    16.3   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00    17.7   0.050 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00    19.1   0.050 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00    20.4   0.050 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00    21.7   0.050 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00    23.1   0.050 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00    23.1   0.061 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00    18.8   0.100 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00    19.9   0.100 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00    21.0   0.100 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00    22.0   0.100 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00    54.1   0.058 0.100 107.88   3.1    12.1
Toe                                    371.4   0.150 0.100
```

```
     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    60.90     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                       06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
  684.7  9999.0   9.78   9.75  -10.84  17  30    35.07  19  12   24.8    37.7
  689.7  9999.0   9.78   9.76  -10.87  17  30    35.14  19  12   24.8    37.7
  694.7  9999.0   9.79   9.77  -10.89  17  30    35.21  19  12   24.8    37.7
  699.7  9999.0   9.80   9.78  -10.95  17  30    35.28  19  12   24.8    37.7
  704.7  9999.0   9.81   9.79  -10.95  17  30    35.36  19  12   24.8    37.7
♀
CCG3A : 06/30/2021 : KCA                                       06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      63.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     734.2
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00     1.5   0.050 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00     2.4   0.050 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00     4.1   0.050 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00     5.9   0.050 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00     7.6   0.050 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00    10.8   0.050 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00    15.7   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00    17.4   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00    18.7   0.050 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00    20.1   0.050 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00    21.4   0.050 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00    22.7   0.050 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00    24.0   0.050 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00    19.0   0.097 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00    19.6   0.100 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00    20.7   0.100 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00    21.8   0.100 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00    42.6   0.069 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00    66.9   0.050 0.100 107.88   3.1    12.1
Toe                                    371.4   0.150 0.100

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
```

```
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    63.38     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                          06/21/2022
National Engineering & Architectural Ser                  GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi          kip-ft   b/min
  734.2  9999.0   9.70   9.68  -10.59  16  29    34.88  18  12   24.4    37.9
  739.2  9999.0   9.72   9.69  -10.61  16  29    34.98  18  12   24.4    37.8
  744.2  9999.0   9.73   9.70  -10.65  16  29    35.08  18  12   24.5    37.8
  749.2  9999.0   9.74   9.72  -10.65  16  29    35.16  18  12   24.5    37.8
  754.1  9999.0   9.75   9.73  -10.67  16  29    35.25  18  12   24.5    37.8
♀
CCG3A : 06/30/2021 : KCA                                          06/21/2022
National Engineering & Architectural Ser                  GRLWEAP Version 2010

 Depth                 (ft)      63.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     397.7
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00     1.5   0.050 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00     2.4   0.050 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00     4.1   0.050 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00     5.9   0.050 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00     7.6   0.050 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00    10.8   0.050 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00    15.8   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00    17.4   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00    18.7   0.050 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00    20.1   0.050 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00    21.4   0.050 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00    22.7   0.050 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00    24.1   0.050 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00    19.0   0.097 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00    19.6   0.100 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00    20.7   0.100 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00    21.8   0.100 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00    43.1   0.069 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00    66.5   0.050 0.100 107.88   3.1    12.1
Toe                                     34.5   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)
```

```
    Depth    Stroke  Pressure    Efficy
      ft        ft     Ratio
    63.42     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi         kip-ft   b/min
  397.7   156.9   9.25   9.17   -8.68  16  29    31.23  19  12   23.4    38.8
  402.7   173.3   9.29   9.21   -8.79  16  29    31.47  19  12   23.5    38.7
  407.7   192.6   9.33   9.24   -8.91  17  29    31.69  19  12   23.6    38.7
  412.7   224.7   9.28   9.27   -9.04  17  29    31.82  19  12   23.5    38.7
  417.7   253.8   9.32   9.31   -9.17  17  29    32.04  19  12   23.6    38.6
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      70.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                      Pipe
 Pile Size           (inch)    12.000

  L b Top     Area     E-Mod  Spec Wt     Perim  C Index  Wave Sp      EA/c
       ft      in2       ksi   lb/ft3        ft              ft/s    k/ft/s
      0.0    12.13   30000.     492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.     492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

       Pile and Soil Model                Total Capacity Rut  (kips)     409.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim     Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85      0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00      0.0   0.000 0.100   6.74   3.1    12.1
 11  0.140     8995 0.000 0.000 1.00      0.0   0.050 0.100  37.08   3.1    12.1
 12  0.140     8995 0.000 0.000 1.00      1.9   0.050 0.100  40.45   3.1    12.1
 13  0.140     8995 0.000 0.000 1.00      2.8   0.050 0.100  43.83   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00      4.5   0.050 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00      6.3   0.050 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00      8.0   0.050 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00     12.2   0.050 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00     16.2   0.050 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00     17.7   0.050 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00     19.0   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00     20.4   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00     21.7   0.050 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00     23.0   0.050 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00     23.3   0.059 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00     18.8   0.100 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00     19.9   0.100 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00     20.9   0.100 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00     22.0   0.100 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00     52.6   0.060 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00     53.3   0.054 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00      5.5   0.150 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00      5.5   0.150 0.100 107.88   3.1    12.1
Toe                                      34.5   0.150 0.200
```

```
     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    70.90     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi          kip-ft   b/min
  409.9   211.9   9.18   9.18   -7.35  13  27    31.29  14  11   22.6    38.9
  415.5   246.4   9.23   9.23   -7.44  14  27    31.50  14  11   22.7    38.8
  421.2   289.8   9.27   9.27   -7.57  14  27    31.69  14  11   22.7    38.7
  426.8   338.1   9.31   9.30   -7.71  14  27    31.90  14  11   22.9    38.6
  432.5   394.8   9.35   9.34   -7.84  14  27    32.09  15  11   23.0    38.6
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      78.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top      Area    E-Mod  Spec Wt     Perim  C Index  Wave Sp       EA/c
       ft       in2      ksi   lb/ft3        ft             ft/s     k/ft/s
      0.0     12.13   30000.    492.0       3.1        0    16807.       21.7
    107.9     12.13   30000.    492.0       3.1        0    16807.       21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     422.1
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft          kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85      0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00      0.0   0.000 0.100   6.74   3.1    12.1
  9  0.140     8995 0.000 0.000 1.00      0.1   0.050 0.100  30.34   3.1    12.1
 10  0.140     8995 0.000 0.000 1.00      2.2   0.050 0.100  33.71   3.1    12.1
 11  0.140     8995 0.000 0.000 1.00      3.1   0.050 0.100  37.08   3.1    12.1
 12  0.140     8995 0.000 0.000 1.00      4.9   0.050 0.100  40.45   3.1    12.1
 13  0.140     8995 0.000 0.000 1.00      6.6   0.050 0.100  43.83   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00      8.4   0.050 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00     13.6   0.050 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00     16.6   0.050 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00     18.0   0.050 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00     19.3   0.050 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00     20.7   0.050 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00     22.0   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00     23.3   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00     22.1   0.071 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00     19.0   0.100 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00     20.1   0.100 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00     21.2   0.100 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00     22.2   0.100 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00     62.2   0.052 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00     40.0   0.060 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00      5.5   0.150 0.100  97.77   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00      5.5   0.150 0.100 104.51   3.1    12.1
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 32  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100 107.88   3.1    12.1
Toe                                     34.5   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    78.38     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
  422.1   267.8   9.32   9.26   -6.44  14  26    32.70  13  11   22.2    38.7
  428.5   321.9   9.38   9.30   -6.56  14  26    32.93  13  11   22.3    38.6
  434.8   369.7   9.44   9.35   -6.68  14  26    33.16  13  11   22.4    38.5
  441.1   478.6   9.39   9.39   -6.79  14  26    33.23  13  11   22.3    38.5
  447.4   576.9   9.45   9.44   -6.91  14  26    33.45  13  11   22.4    38.4
♀
CCG3A : 06/30/2021 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      78.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                        Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     419.2
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
  9  0.140     8995 0.000 0.000 1.00     0.2   0.050 0.100  30.34   3.1    12.1
 10  0.140     8995 0.000 0.000 1.00     2.2   0.050 0.100  33.71   3.1    12.1
 11  0.140     8995 0.000 0.000 1.00     3.2   0.050 0.100  37.08   3.1    12.1
 12  0.140     8995 0.000 0.000 1.00     4.9   0.050 0.100  40.45   3.1    12.1
 13  0.140     8995 0.000 0.000 1.00     6.7   0.050 0.100  43.83   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00     8.4   0.050 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00    13.6   0.050 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00    16.6   0.050 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00    18.0   0.050 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00    19.3   0.050 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00    20.7   0.050 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00    22.0   0.050 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00    23.3   0.050 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00    22.0   0.072 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00    19.0   0.100 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00    20.1   0.100 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00    21.2   0.100 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00    22.2   0.100 0.100  87.65   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00    62.7   0.052 0.100  91.02   3.1    12.1
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 28  0.140     8995 0.000 0.000 1.00    39.3   0.060 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  97.77   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100 107.88   3.1    12.1
Toe                                     31.6   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    78.42     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up      ksi                ksi      kip-ft   b/min
  419.2   241.4   9.31   9.24   -6.43  14  26    32.70  13  11   22.2    38.7
  425.6   296.8   9.37   9.30   -6.53  14  26    32.91  13  11   22.3    38.6
  431.9   344.5   9.43   9.35   -6.64  14  26    33.14  13  11   22.4    38.5
  438.2   418.5   9.39   9.38   -6.78  14  26    33.26  13  11   22.3    38.5
  444.5   508.9   9.44   9.43   -6.89  14  26    33.45  13  11   22.4    38.4
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      91.3  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pipe Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3      ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     440.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft       kips    s/ft  inch     ft    ft      in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     0.0   0.000 0.100   6.74   3.1    12.1
  5  0.140     8995 0.000 0.000 1.00     0.0   0.050 0.100  16.86   3.1    12.1
  6  0.140     8995 0.000 0.000 1.00     1.9   0.050 0.100  20.23   3.1    12.1
  7  0.140     8995 0.000 0.000 1.00     2.9   0.050 0.100  23.60   3.1    12.1
  8  0.140     8995 0.000 0.000 1.00     4.6   0.050 0.100  26.97   3.1    12.1
  9  0.140     8995 0.000 0.000 1.00     6.4   0.050 0.100  30.34   3.1    12.1
 10  0.140     8995 0.000 0.000 1.00     8.1   0.050 0.100  33.71   3.1    12.1
 11  0.140     8995 0.000 0.000 1.00    12.5   0.050 0.100  37.08   3.1    12.1
 12  0.140     8995 0.000 0.000 1.00    16.3   0.050 0.100  40.45   3.1    12.1
 13  0.140     8995 0.000 0.000 1.00    17.8   0.050 0.100  43.83   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00    19.1   0.050 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00    20.4   0.050 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00    21.8   0.050 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00    23.1   0.050 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00    23.0   0.062 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00    18.8   0.100 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00    19.9   0.100 0.100  67.42   3.1    12.1
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 21  0.140     8995 0.000 0.000 1.00    21.0   0.100 0.100  70.80   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00    22.1   0.100 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00    54.9   0.058 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00    50.2   0.055 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  84.28   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100 107.88   3.1    12.1
Toe                                     31.6   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    91.30     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down       up      ksi              ksi         kip-ft   b/min
  440.5   445.4   9.26   9.17   -4.66   9  23     33.88  10  10   20.7    38.9
  448.0   559.3   9.32   9.23   -4.71   9  23     34.12  10  10   20.8    38.8
  455.5   835.5   9.28   9.27   -4.74   9  23     34.21  10  10   20.7    38.8
  463.0  1245.5   9.32   9.32   -4.79   9  23     34.43  10  10   20.9    38.7
  470.5  2466.4   9.37   9.36   -4.82   9  22     34.64  10  10   20.9    38.6
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)     104.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                      Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     464.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     1.6   0.050 0.100   6.74   3.1    12.1
  3  0.140     8995 0.000 0.000 1.00     2.5   0.050 0.100  10.11   3.1    12.1
  4  0.140     8995 0.000 0.000 1.00     4.3   0.050 0.100  13.48   3.1    12.1
  5  0.140     8995 0.000 0.000 1.00     6.0   0.050 0.100  16.86   3.1    12.1
  6  0.140     8995 0.000 0.000 1.00     7.8   0.050 0.100  20.23   3.1    12.1
  7  0.140     8995 0.000 0.000 1.00    11.4   0.050 0.100  23.60   3.1    12.1
  8  0.140     8995 0.000 0.000 1.00    16.0   0.050 0.100  26.97   3.1    12.1
  9  0.140     8995 0.000 0.000 1.00    17.5   0.050 0.100  30.34   3.1    12.1
 10  0.140     8995 0.000 0.000 1.00    18.9   0.050 0.100  33.71   3.1    12.1
 11  0.140     8995 0.000 0.000 1.00    20.2   0.050 0.100  37.08   3.1    12.1
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 12  0.140     8995 0.000 0.000 1.00    21.5   0.050 0.100  40.45   3.1    12.1
 13  0.140     8995 0.000 0.000 1.00    22.8   0.050 0.100  43.83   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00    24.0   0.052 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00    18.6   0.100 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00    19.7   0.100 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00    20.8   0.100 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00    21.9   0.100 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00    47.1   0.065 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00    61.1   0.052 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  70.80   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  87.65   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00     5.8   0.150 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00     5.9   0.150 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00     6.2   0.150 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00     6.5   0.150 0.100 107.88   3.1    12.1
Toe                                     31.6   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   104.18     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi         kip-ft   b/min
  464.0  1200.0   9.29    9.23   -2.44   5  20    34.32   6   9   19.4    38.8
  472.7  2883.6   9.34    9.27   -2.51   5  20    34.57   6   9   19.6    38.7
  481.5  9999.0   9.40    9.31   -2.56   5  20    34.83   6   9   19.7    38.6
  490.3  9999.0   9.44    9.37   -2.59   5  20    35.06   6   9   19.7    38.5
  499.1  9999.0   9.50    9.41   -2.63   5  20    35.31   6   9   19.9    38.4
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)     104.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     442.3
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     1.6   0.050 0.100   6.74   3.1    12.1
  3  0.140     8995 0.000 0.000 1.00     2.6   0.050 0.100  10.11   3.1    12.1
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  4  0.140     8995 0.000 0.000 1.00     4.3   0.050 0.100  13.48   3.1    12.1
  5  0.140     8995 0.000 0.000 1.00     6.1   0.050 0.100  16.86   3.1    12.1
  6  0.140     8995 0.000 0.000 1.00     7.8   0.050 0.100  20.23   3.1    12.1
  7  0.140     8995 0.000 0.000 1.00    11.5   0.050 0.100  23.60   3.1    12.1
  8  0.140     8995 0.000 0.000 1.00    16.0   0.050 0.100  26.97   3.1    12.1
  9  0.140     8995 0.000 0.000 1.00    17.5   0.050 0.100  30.34   3.1    12.1
 10  0.140     8995 0.000 0.000 1.00    18.9   0.050 0.100  33.71   3.1    12.1
 11  0.140     8995 0.000 0.000 1.00    20.2   0.050 0.100  37.08   3.1    12.1
 12  0.140     8995 0.000 0.000 1.00    21.5   0.050 0.100  40.45   3.1    12.1
 13  0.140     8995 0.000 0.000 1.00    22.9   0.050 0.100  43.83   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00    23.9   0.052 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00    18.7   0.100 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00    19.7   0.100 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00    20.8   0.100 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00    21.9   0.100 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00    47.6   0.064 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00    60.3   0.052 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  70.80   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100  84.28   3.1    12.1
 26  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  87.65   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00     5.8   0.150 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00     5.9   0.150 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00     6.2   0.150 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00     6.5   0.150 0.100 107.88   3.1    12.1
Toe                                      9.9   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   104.22     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi        kip-ft   b/min
  442.3   381.4   9.24   9.20   -2.48   5  20    34.25   6   9   19.3    38.9
  451.1   503.4   9.30   9.25   -2.55   5  20    34.51   6   9   19.5    38.8
  459.9   702.2   9.36   9.29   -2.61   5  20    34.78   6   9   19.6    38.7
  468.6  1085.9   9.42   9.34   -2.65   5  20    35.03   6   9   19.7    38.6
  477.4  2204.0   9.47   9.39   -2.68   5  20    35.26   6   9   19.8    38.5
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)     106.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1        0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1        0    16807.     21.7
```

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 Wave Travel Time 2L/c (ms)    12.838

       Pile and Soil Model            Total Capacity Rut  (kips)     444.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     0.5   0.050 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     2.3   0.050 0.100   6.74   3.1    12.1
  3  0.140     8995 0.000 0.000 1.00     3.5   0.050 0.100  10.11   3.1    12.1
  4  0.140     8995 0.000 0.000 1.00     5.2   0.050 0.100  13.48   3.1    12.1
  5  0.140     8995 0.000 0.000 1.00     7.0   0.050 0.100  16.86   3.1    12.1
  6  0.140     8995 0.000 0.000 1.00     8.7   0.050 0.100  20.23   3.1    12.1
  7  0.140     8995 0.000 0.000 1.00    14.9   0.050 0.100  23.60   3.1    12.1
  8  0.140     8995 0.000 0.000 1.00    16.9   0.050 0.100  26.97   3.1    12.1
  9  0.140     8995 0.000 0.000 1.00    18.3   0.050 0.100  30.34   3.1    12.1
 10  0.140     8995 0.000 0.000 1.00    19.6   0.050 0.100  33.71   3.1    12.1
 11  0.140     8995 0.000 0.000 1.00    20.9   0.050 0.100  37.08   3.1    12.1
 12  0.140     8995 0.000 0.000 1.00    22.2   0.050 0.100  40.45   3.1    12.1
 13  0.140     8995 0.000 0.000 1.00    23.6   0.050 0.100  43.83   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00    21.0   0.081 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00    19.2   0.100 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00    20.3   0.100 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00    21.4   0.100 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00    27.7   0.090 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00    65.8   0.050 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00    27.6   0.070 0.100  67.42   3.1    12.1
 21  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  70.80   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  84.28   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00     5.7   0.150 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00     5.9   0.150 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00     6.1   0.150 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00     6.4   0.150 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00     5.6   0.176 0.100 107.88   3.1    12.1
Toe                                      9.9   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   106.03     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
  444.9   415.2   9.21   9.17   -2.24   5  20    34.19   6   9   19.1    39.0
  453.9   565.5   9.28   9.22   -2.31   5  20    34.46   6   9   19.2    38.8
  462.9   828.2   9.33   9.27   -2.37   5  20    34.73   6   9   19.3    38.7
  471.9  1402.6   9.39   9.32   -2.42   5  20    34.99   6   9   19.4    38.6
  480.9  3927.1   9.44   9.36   -2.46   5  20    35.23   6   9   19.5    38.5
♀
CCG3A : 06/30/2021 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)     107.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
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```
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    12.13   30000.    492.0      3.1         0    16807.     21.7
    107.9    12.13   30000.    492.0      3.1         0    16807.     21.7

 Wave Travel Time 2L/c (ms)    12.838

        Pile and Soil Model            Total Capacity Rut  (kips)     447.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft   inch     ft    ft     in2
  1  0.140     8995 0.010 0.000 0.85     1.8   0.050 0.100   3.37   3.1    12.1
  2  0.140     8995 0.000 0.000 1.00     2.7   0.050 0.100   6.74   3.1    12.1
  3  0.140     8995 0.000 0.000 1.00     4.5   0.050 0.100  10.11   3.1    12.1
  4  0.140     8995 0.000 0.000 1.00     6.2   0.050 0.100  13.48   3.1    12.1
  5  0.140     8995 0.000 0.000 1.00     8.0   0.050 0.100  16.86   3.1    12.1
  6  0.140     8995 0.000 0.000 1.00    12.0   0.050 0.100  20.23   3.1    12.1
  7  0.140     8995 0.000 0.000 1.00    16.2   0.050 0.100  23.60   3.1    12.1
  8  0.140     8995 0.000 0.000 1.00    17.7   0.050 0.100  26.97   3.1    12.1
  9  0.140     8995 0.000 0.000 1.00    19.0   0.050 0.100  30.34   3.1    12.1
 10  0.140     8995 0.000 0.000 1.00    20.3   0.050 0.100  33.71   3.1    12.1
 11  0.140     8995 0.000 0.000 1.00    21.6   0.050 0.100  37.08   3.1    12.1
 12  0.140     8995 0.000 0.000 1.00    23.0   0.050 0.100  40.45   3.1    12.1
 13  0.140     8995 0.000 0.000 1.00    23.5   0.058 0.100  43.83   3.1    12.1
 14  0.140     8995 0.000 0.000 1.00    18.8   0.100 0.100  47.20   3.1    12.1
 15  0.140     8995 0.000 0.000 1.00    19.8   0.100 0.100  50.57   3.1    12.1
 16  0.140     8995 0.000 0.000 1.00    20.9   0.100 0.100  53.94   3.1    12.1
 17  0.140     8995 0.000 0.000 1.00    22.0   0.100 0.100  57.31   3.1    12.1
 18  0.140     8995 0.000 0.000 1.00    51.3   0.061 0.100  60.68   3.1    12.1
 19  0.140     8995 0.000 0.000 1.00    55.2   0.053 0.100  64.05   3.1    12.1
 20  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  67.42   3.1    12.1
 22  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  74.17   3.1    12.1
 23  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  77.54   3.1    12.1
 24  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100  80.91   3.1    12.1
 25  0.140     8995 0.000 0.000 1.00     5.5   0.150 0.100  84.28   3.1    12.1
 27  0.140     8995 0.000 0.000 1.00     5.6   0.150 0.100  91.02   3.1    12.1
 28  0.140     8995 0.000 0.000 1.00     5.8   0.150 0.100  94.39   3.1    12.1
 29  0.140     8995 0.000 0.000 1.00     6.0   0.150 0.100  97.77   3.1    12.1
 30  0.140     8995 0.000 0.000 1.00     6.2   0.150 0.100 101.14   3.1    12.1
 31  0.140     8995 0.000 0.000 1.00     6.4   0.154 0.100 104.51   3.1    12.1
 32  0.140     8995 0.000 0.000 1.00     4.7   0.200 0.100 107.88   3.1    12.1
Toe                                      9.9   0.150 0.200

     4.471 kips total unreduced pile weight (g= 32.17 ft/s2)
     4.471 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   107.88     10.81      1.00     0.800
♀
CCG3A : 06/30/2021 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi                ksi         kip-ft   b/min
  447.4   431.5   9.19    9.14   -1.96   5  20    34.13   5   9   18.7    39.0
  456.7   603.0   9.25    9.20   -2.00   5  20    34.42   5   9   18.8    38.9
  465.9   925.4   9.31    9.25   -2.04   5  20    34.70   5   9   19.0    38.8
  475.2  1812.1   9.36    9.30   -2.08   5  19    34.96   5   9   19.0    38.7
  484.4  8154.6   9.42    9.34   -2.12   5  19    35.23   5   9   19.1    38.6
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♀
 CCG3A : 06/30/2021 : KCA                                     06/21/2022
 National Engineering & Architectural Ser              GRLWEAP Version 2010

                                SUMMARY OVER DEPTHS

                        G/L at Shaft and Toe:  0.484  1.000
    Depth      Rut   Frictn   End Bg    Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips    bl/ft     ksi     ksi      ft   kip-ft
      2.6     30.7      1.4     29.3      2.4  15.140  -0.694    4.85     24.0
      2.6      7.9      1.4      6.5      1.2   9.918  -1.267    3.76     20.3
     10.5     23.2      9.6     13.6      1.8  13.807  -1.301    4.51     24.0
     18.4     41.9     27.3     14.6      2.8  16.031  -0.998    4.98     23.4
     18.4     82.3     27.4     54.8      7.3  18.833   0.000    5.71     20.4
     30.9    146.0     91.2     54.8     13.2  22.371  -3.621    6.45     19.7
     43.4    228.7    173.9     54.8     22.7  25.663  -5.520    7.42     20.7
     43.4    292.1    174.1    118.0     42.5  30.155  -9.329    8.45     22.8
     50.9    334.9    216.9    118.0     67.7  31.900  -9.985    9.05     23.8
     58.4    382.9    265.0    118.0    143.6  32.392 -10.043    9.34     24.0
     58.4    636.9    265.5    371.4   9999.0  35.445 -11.251    9.84     25.1
     60.9    684.7    313.3    371.4   9999.0  35.074 -10.839    9.78     24.8
     63.4    734.2    362.8    371.4   9999.0  34.882 -10.587    9.70     24.4
     63.4    397.7    363.2     34.5    156.9  31.231  -8.677    9.25     23.4
     70.9    409.9    375.3     34.5    211.9  31.292  -7.348    9.18     22.6
     78.4    422.1    387.6     34.5    267.8  32.702  -6.442    9.32     22.2
     78.4    419.2    387.7     31.6    241.4  32.700  -6.426    9.31     22.2
     91.3    440.5    408.9     31.6    445.4  33.878  -4.660    9.26     20.7
    104.2    464.0    432.4     31.6   1200.0  34.316  -2.440    9.29     19.4
    104.2    442.3    432.4      9.9    381.4  34.248  -2.482    9.24     19.3
    106.0    444.9    435.0      9.9    415.2  34.189  -2.243    9.21     19.1
    107.9    447.4    437.6      9.9    431.5  34.132  -1.960    9.19     18.7

Refusal occurred; no driving time output possible

                        G/L at Shaft and Toe:  0.527  1.000
    Depth      Rut   Frictn   End Bg    Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips    bl/ft     ksi     ksi      ft   kip-ft
      2.6     30.7      1.4     29.3      2.4  15.140  -0.694    4.85     24.0
      2.6      7.9      1.4      6.5      1.2   9.918  -1.267    3.76     20.3
     10.5     23.2      9.6     13.6      1.8  13.807  -1.301    4.51     24.0
     18.4     41.9     27.3     14.6      2.8  16.031  -0.998    4.98     23.4
     18.4     82.3     27.4     54.8      7.3  18.833   0.000    5.71     20.4
     30.9    146.0     91.2     54.8     13.2  22.371  -3.621    6.45     19.7
     43.4    228.7    173.9     54.8     22.7  25.663  -5.520    7.42     20.7
     43.4    292.1    174.1    118.0     42.5  30.154  -9.328    8.45     22.8
     50.9    337.2    219.3    118.0     69.8  32.018 -10.047    9.08     23.9
     58.4    387.9    269.9    118.0    159.4  32.547 -10.131    9.37     24.1
     58.4    641.9    270.4    371.4   9999.0  35.496 -11.278    9.85     25.1
     60.9    689.7    318.3    371.4   9999.0  35.139 -10.875    9.78     24.8
     63.4    739.2    367.8    371.4   9999.0  34.976 -10.606    9.72     24.4
     63.4    402.7    368.2     34.5    173.3  31.466  -8.789    9.29     23.5
     70.9    415.5    381.0     34.5    246.4  31.500  -7.444    9.23     22.7
     78.4    428.5    393.9     34.5    321.9  32.927  -6.563    9.38     22.3
     78.4    425.6    394.0     31.6    296.8  32.912  -6.531    9.37     22.3
     91.3    448.0    416.4     31.6    559.3  34.115  -4.714    9.32     20.8
    104.2    472.7    441.1     31.6   2883.6  34.573  -2.510    9.34     19.6
    104.2    451.1    441.2      9.9    503.4  34.511  -2.548    9.30     19.5
    106.0    453.9    444.0      9.9    565.5  34.461  -2.308    9.28     19.2
    107.9    456.7    446.8      9.9    603.0  34.419  -1.996    9.25     18.8

Refusal occurred; no driving time output possible
♀
 CCG3A : 06/30/2021 : KCA                                     06/21/2022
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                                SUMMARY OVER DEPTHS

                        G/L at Shaft and Toe:  0.570  1.000
    Depth        Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft       kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      2.6       30.7      1.4     29.3     2.4  15.140  -0.694    4.85     24.0
      2.6        7.9      1.4      6.5     1.2   9.918  -1.267    3.76     20.3
     10.5       23.2      9.6     13.6     1.8  13.807  -1.301    4.51     24.0
     18.4       41.9     27.3     14.6     2.8  16.031  -0.998    4.98     23.4
     18.4       82.3     27.4     54.8     7.3  18.833   0.000    5.71     20.4
     30.9      146.0     91.2     54.8    13.2  22.371  -3.621    6.45     19.7
     43.4      228.7    173.9     54.8    22.7  25.663  -5.520    7.42     20.7
     43.4      292.1    174.2    118.0    42.5  30.153  -9.328    8.45     22.8
     50.9      339.6    221.6    118.0    71.2  32.127 -10.136    9.11     23.9
     58.4      392.9    274.9    118.0   176.1  32.726 -10.223    9.41     24.1
     58.4      646.8    275.4    371.4  9999.0  35.544 -11.306    9.86     25.1
     60.9      694.7    323.3    371.4  9999.0  35.207 -10.891    9.79     24.8
     63.4      744.2    372.8    371.4  9999.0  35.083 -10.650    9.73     24.5
     63.4      407.7    373.2     34.5   192.6  31.693  -8.909    9.33     23.6
     70.9      421.2    386.6     34.5   289.8  31.688  -7.574    9.27     22.7
     78.4      434.8    400.2     34.5   369.7  33.161  -6.680    9.44     22.4
     78.4      431.9    400.3     31.6   344.5  33.144  -6.643    9.43     22.4
     91.3      455.5    423.9     31.6   835.5  34.211  -4.741    9.28     20.7
    104.2      481.5    449.9     31.6  9999.0  34.831  -2.558    9.40     19.7
    104.2      459.9    450.0      9.9   702.2  34.775  -2.609    9.36     19.6
    106.0      462.9    453.0      9.9   828.2  34.728  -2.371    9.33     19.3
    107.9      465.9    456.0      9.9   925.4  34.702  -2.040    9.31     19.0

Refusal occurred; no driving time output possible

                        G/L at Shaft and Toe:  0.613  1.000
    Depth        Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft       kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      2.6       30.7      1.4     29.3     2.4  15.140  -0.694    4.85     24.0
      2.6        7.9      1.4      6.5     1.2   9.918  -1.267    3.76     20.3
     10.5       23.2      9.6     13.6     1.8  13.807  -1.301    4.51     24.0
     18.4       41.9     27.3     14.6     2.8  16.031  -0.998    4.98     23.4
     18.4       82.3     27.4     54.8     7.3  18.833   0.000    5.71     20.4
     30.9      146.0     91.2     54.8    13.2  22.371  -3.621    6.45     19.7
     43.4      228.7    173.9     54.8    22.7  25.663  -5.520    7.42     20.7
     43.4      292.1    174.2    118.0    42.5  30.156  -9.330    8.45     22.8
     50.9      341.9    223.9    118.0    73.3  32.240 -10.202    9.14     24.0
     58.4      397.9    279.9    118.0   199.1  32.886 -10.304    9.44     24.2
     58.4      651.8    280.4    371.4  9999.0  35.609 -11.353    9.87     25.2
     60.9      699.7    328.3    371.4  9999.0  35.284 -10.945    9.80     24.8
     63.4      749.2    377.7    371.4  9999.0  35.160 -10.652    9.74     24.5
     63.4      412.7    378.2     34.5   224.7  31.820  -9.042    9.28     23.5
     70.9      426.8    392.3     34.5   338.1  31.895  -7.715    9.31     22.9
     78.4      441.1    406.6     34.5   478.6  33.233  -6.785    9.39     22.3
     78.4      438.2    406.6     31.6   418.5  33.255  -6.778    9.39     22.3
     91.3      463.0    431.4     31.6  1245.5  34.433  -4.790    9.32     20.9
    104.2      490.3    458.7     31.6  9999.0  35.057  -2.591    9.44     19.7
    104.2      468.6    458.8      9.9  1085.9  35.032  -2.654    9.42     19.7
    106.0      471.9    462.0      9.9  1402.6  34.993  -2.423    9.39     19.4
    107.9      475.2    465.3      9.9  1812.1  34.956  -2.077    9.36     19.0

Refusal occurred; no driving time output possible
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                              SUMMARY OVER DEPTHS

                      G/L at Shaft and Toe:  0.656  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      2.6     30.7      1.4     29.3     2.4  15.140  -0.694    4.85     24.0
      2.6      7.9      1.4      6.5     1.2   9.918  -1.267    3.76     20.3
     10.5     23.2      9.6     13.6     1.8  13.807  -1.301    4.51     24.0
     18.4     41.9     27.3     14.6     2.8  16.031  -0.998    4.98     23.4
     18.4     82.3     27.4     54.8     7.3  18.833   0.000    5.71     20.4
     30.9    146.0     91.2     54.8    13.2  22.371  -3.621    6.45     19.7
     43.4    228.7    173.9     54.8    22.7  25.663  -5.520    7.42     20.7
     43.4    292.2    174.2    118.0    42.5  30.156  -9.329    8.45     22.8
     50.9    344.3    226.3    118.0    74.8  32.357 -10.291    9.17     24.1
     58.4    402.8    284.9    118.0   221.9  33.053 -10.419    9.47     24.3
     58.4    656.8    285.4    371.4  9999.0  35.664 -11.380    9.88     25.2
     60.9    704.7    333.2    371.4  9999.0  35.356 -10.952    9.81     24.8
     63.4    754.1    382.7    371.4  9999.0  35.249 -10.674    9.75     24.5
     63.4    417.7    383.2     34.5   253.8  32.039  -9.172    9.32     23.6
     70.9    432.5    397.9     34.5   394.8  32.089  -7.835    9.35     23.0
     78.4    447.4    412.9     34.5   576.9  33.453  -6.907    9.45     22.4
     78.4    444.5    413.0     31.6   508.9  33.453  -6.887    9.44     22.4
     91.3    470.5    438.9     31.6  2466.4  34.636  -4.822    9.37     20.9
    104.2    499.1    467.5     31.6  9999.0  35.315  -2.630    9.50     19.9
    104.2    477.4    467.6      9.9  2204.0  35.263  -2.679    9.47     19.8
    106.0    480.9    471.0      9.9  3927.1  35.232  -2.462    9.44     19.5
    107.9    484.4    474.5      9.9  8154.6  35.227  -2.122    9.42     19.1

Refusal occurred; no driving time output possible
 ♀
 CCG3A : 06/30/2021 : KCA                                           06/21/2022
 National Engineering & Architectural Ser                 GRLWEAP Version 2010


               Table of Depths Analyzed with Driving System Modifiers

               Temp.      Wait Equivalent  Pressure              Stiffn.   Cushion
     Depth    Length      Time    Stroke     Ratio   Efficy.    Factor       CoR
        ft        ft        hr        ft
      2.58    107.88      0.00     10.81      1.00      0.80      1.00      1.00
      2.62    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     10.50    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     18.38    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     18.42    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     30.90    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     43.38    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     43.42    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     50.90    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     58.38    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     58.42    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     60.90    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     63.38    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     63.42    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     70.90    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     78.38    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     78.42    107.88      0.00     10.81      1.00      0.80      1.00      1.00
     91.30    107.88      0.00     10.81      1.00      0.80      1.00      1.00
    104.18    107.88      0.00     10.81      1.00      0.80      1.00      1.00
    104.22    107.88      0.00     10.81      1.00      0.80      1.00      1.00
    106.03    107.88      0.00     10.81      1.00      0.80      1.00      1.00
    107.88    107.88      0.00     10.81      1.00      0.80      1.00      1.00
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                              Soil Layer Resistance Values
          Shaft      End    Shaft      Toe    Shaft      Toe     Soil    Limit    Setup
  Depth    Res.  Bearing    Quake    Quake  Damping  Damping    Setup Distance     Time
     ft  k/ft2     kips     inch     inch     s/ft     s/ft  Normlzd       ft      hrs
   0.01   0.00     0.11    0.100    0.200    0.050    0.150    0.000    6.000    1.000
   2.59   0.35    29.43    0.100    0.200    0.050    0.150    0.000    6.000    1.000
   2.61   0.14     6.47    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  11.61   0.58    14.61    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  18.39   0.91    14.61    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  18.41   1.29    54.83    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  21.99   1.54    54.83    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  22.01   1.55    54.83    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  31.01   1.88    54.83    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  40.01   2.22    54.83    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  43.39   2.34    54.83    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  43.41   2.83   117.99    0.100    0.100    0.100    0.150    0.768    6.000   24.000
  52.41   3.28   117.99    0.100    0.100    0.100    0.150    0.768    6.000   24.000
  58.39   3.57   117.99    0.100    0.100    0.100    0.150    0.768    6.000   24.000
  58.41   6.04   371.42    0.100    0.100    0.050    0.150    0.000    6.000    1.000
  63.39   6.46   371.42    0.100    0.100    0.050    0.150    0.000    6.000   24.000
  63.41   0.86    34.54    0.100    0.200    0.150    0.150    0.768    6.000   24.000
  72.41   0.86    34.54    0.100    0.200    0.150    0.150    0.768    6.000   24.000
  78.39   0.88    34.54    0.100    0.200    0.150    0.150    0.768    6.000   24.000
  78.41   0.87    31.58    0.100    0.200    0.150    0.150    0.768    6.000  168.000
  87.41   0.87    31.58    0.100    0.200    0.150    0.150    0.768    6.000  168.000
  96.41   0.93    31.58    0.100    0.200    0.150    0.150    0.768    6.000  168.000
 104.19   1.04    31.58    0.100    0.200    0.150    0.150    0.768    6.000  168.000
 104.21   0.92     9.87    0.100    0.200    0.200    0.150    1.000    6.000  168.000
 107.88   0.92     9.87    0.100    0.200    0.200    0.150    1.000    6.000  168.000
```

PIER 1

Gain/Loss 3 at Shaft and Toe 0.570 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.4	26.0	1.4	24.6	2.2	12.852	-4.257	5.32	22.3
10.8	51.0	10.7	40.3	4.1	14.317	-3.192	5.76	21.0
10.8	97.9	10.8	87.1	10.1	16.152	-0.212	6.44	19.0
20.0	184.5	48.8	135.6	22.3	18.450	-2.269	7.25	18.4
29.2	244.8	101.5	143.3	32.2	19.626	-3.400	7.62	18.2
29.2	245.0	101.7	143.3	32.3	19.629	-3.408	7.62	18.2
39.2	295.0	151.7	143.3	43.7	20.615	-4.439	7.91	18.3
49.2	357.6	214.3	143.3	63.0	21.243	-4.512	8.21	18.4
49.2	276.8	214.5	62.3	34.3	20.477	-3.164	7.76	17.5
71.7	332.9	270.6	62.3	49.1	21.222	-3.580	8.15	16.9
94.2	402.9	340.6	62.3	77.0	22.057	-0.781	8.54	16.4
94.2	358.3	340.8	17.5	51.2	21.907	-1.478	8.46	16.2
96.0	362.3	344.7	17.5	52.6	21.992	-1.448	8.49	16.2
97.9	366.4	348.8	17.5	53.8	22.175	-1.488	8.53	16.2

Total Continuous Driving Time 93.00 minutes; Total Number of Blows 3879 (starting at penetration 5.4 ft)

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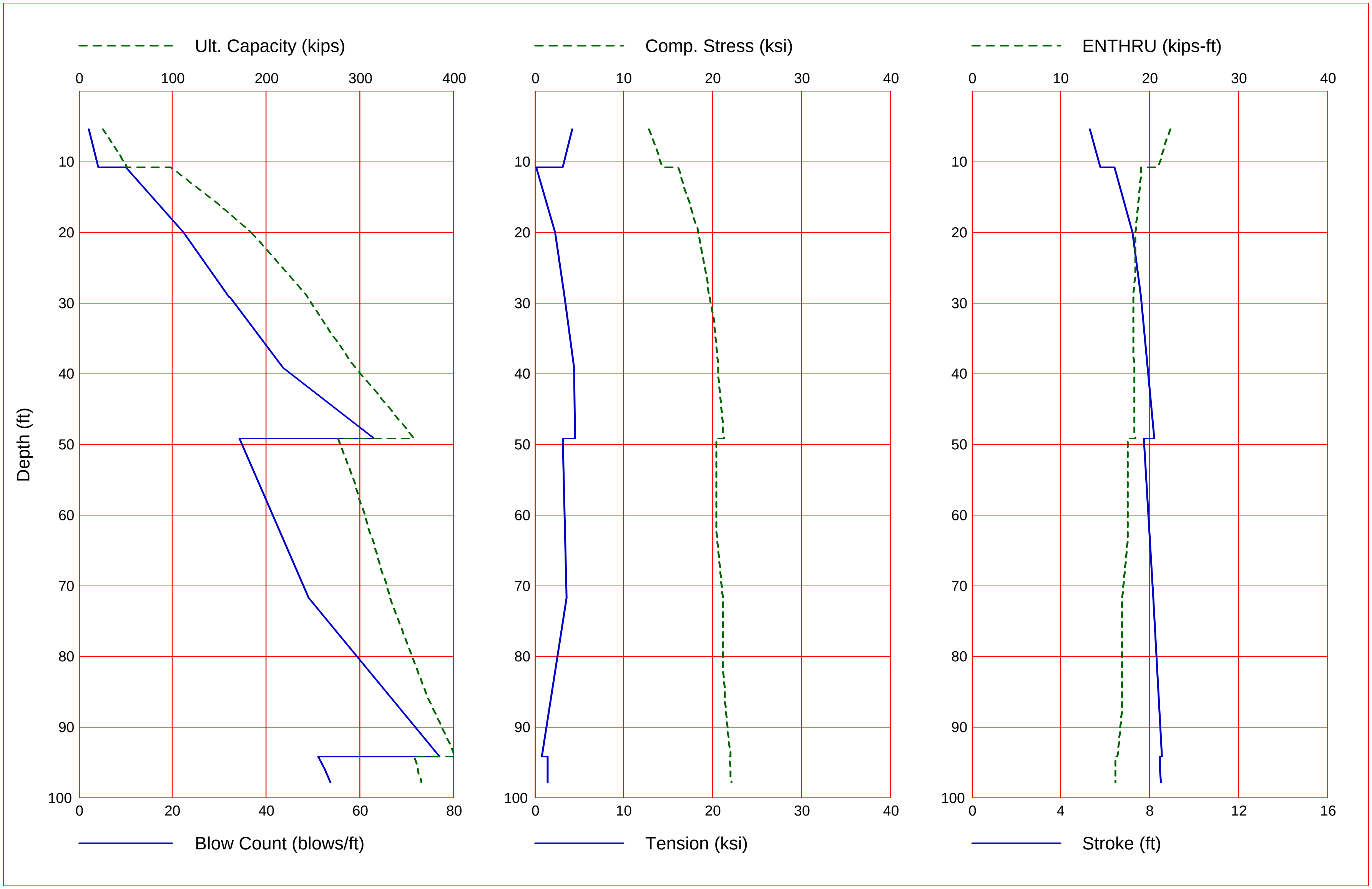
Jun 21 2022
GRLWEAP Version 2010

Gain/Loss 3 at Shaft and Toe 0.570 / 1.000



```
                           GRLWEAP - Version 2010
                  WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS

          written by GRL Engineers, Inc. (formerly Goble Rausche Likins
         and Associates, Inc.) with cooperation from Pile Dynamics, Inc.
                 Copyright (c) 1998-2010, Pile Dynamics, Inc.


                   ABOUT THE WAVE EQUATION ANALYSIS RESULTS


The GRLWEAP program simulates the behavior of a preformed pile driven by
either an impact hammer or a vibratory hammer.  The program is based on
mathematical models, which describe motion and forces of hammer, driving
system, pile and soil under the hammer action.  Under certain conditions,
the models only crudely approximate, often complex, dynamic situations.

A wave equation analysis generally relies on input data, which represents
normal situations.  In particular, the hammer data file supplied with the
program assumes that the hammer is in good working order.  All of the input
data selected by the user may be the best available information at the time
when the analysis is performed.  However, input data and therefore results
may significantly differ from actual field conditions.

Therefore, the program authors recommend prudent use of the GRLWEAP results.
Soil response and hammer performance should be verified by static and/or
dynamic testing and measurements.  Estimates of bending or other local
stresses (e.g., helmet or clamp contact, uneven rock surfaces etc.),
prestress effects and others must also be accounted for by the user.

The calculated capacity - blow count relationship, i.e. the bearing graph,
should be used in conjunction with observed blow counts for the capacity
assessment of a driven pile.  Soil setup occurring after pile installation
may produce bearing capacity values that differ substantially from those
expected from a wave equation analysis due to soil setup or relaxation.  This
is particularly true for pile driven with vibratory hammers.  The GRLWEAP user
must estimate such effects and should also use proper care when applying blow
counts from restrike because of the variability of hammer energy, soil
resistance and blow count during early restriking.

Finally, the GRLWEAP capacities are ultimate values.  They MUST be reduced by
means of an appropriate factor of safety to yield a design or working load.
The selection of a factor of safety should consider the quality of the
construction control, the variability of the site conditions, uncertainties
in the loads, the importance of building and other factors.
 ♀
 Input  File: C:\USERS\KARENS\DESKTOP\GRL FILES\P116IN.GWW
 Hammer File: C:\ProgramData\PDI\GRLWEAP\2010\Resource\HAMMER2010.GW
 Hammer File Version:  2003 (10/17/2016)

                        Input File Contents
     CCG3A : 06/21/2022 : KCA
 OUT OSG HAM STR FUL PEL  N SPL N-U P-D %SK ISM  0 PHI RSA ITR H-D MXT      DEx
-100   0  41   0   0   0  0   0   0   1   0   0  0   0   0   0   0   0   0.000
    Pile g  Hammer g  Toe Area Pile Size           Pile Type
    32.170    32.170   201.060    16.000                Pipe
      W Cp      A Cp      E Cp      T Cp       CoR      ROut      StCp
     2.500    23.210     530.0     2.000     0.800     0.010       0.0
      A Cu      E Cu      T Cu       CoR      ROut      StCu
     0.000       0.0     0.000     0.000     0.000       0.0
      LPle      APle      EPle      WPle      Peri        CI       CoR      ROut
    97.880     23.21   30000.0   492.000     4.188         0     0.850     0.010
```

```
 FFatigue        F0  0-Bottom
        0     0.000     0.000
Manufac  Hmr Name  HmrType No Seg-s
DELMAG   D 19-42        1       5
   Ram Wt     Ram L   Ram Dia   MaxStrk   RtdStrk    Efficy
     4.00    129.10     12.60     11.86     10.81      0.80
   IB. Wt     IB. L    IB.Dia    IB CoR     IB RO
     0.75     25.30     12.60     0.900     0.010
 CompStrk A Chamber V Chamber   C Delay  C Duratn Exp Coeff VolCStart  Vol CEnd
    16.65    124.70    157.70    0.0020    0.0020     1.250      0.00      0.00
    P atm        P1        P2        P3        P4        P5
    14.70   1600.00   1440.00   1295.00   1165.00      0.00
   Stroke    Effic.  Pressure  R-Weight   T-Delay Exp-Coeff   Eps-Str  Total-AW
  10.8100    0.8000 1600.0000    0.0000    0.0000    0.0000    0.0100    0.0000
       Qs        Qt        Js        Jt        Qx        Jx      Rati      Dept
    0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
 Research Soil Model: Atoe, Plug,  Gap, Q-fac
    0.000     0.000     0.000     0.000
 Research Soil Model: RD-skn: m, d, toe: m, d
    0.000     0.000     0.000     0.000
 Res. Distribution
   Dpth    Rskn      Rtoe      Qs      Qt      Js      Jt   SU F    LimL    TSf0
   0.01    0.00      0.00    0.10    0.27    0.05    0.15   1.00    6.00   1.000
   3.99    0.00      0.00    0.10    0.27    0.05    0.15   1.00    6.00   1.000
   4.00    0.20     18.53    0.10    0.27    0.05    0.15   1.00    6.00   1.000
   9.01    0.46     40.28    0.10    0.27    0.05    0.15   1.00    6.00   1.000
  10.79    0.55     40.28    0.10    0.27    0.05    0.15   1.00    6.00   1.000
  10.81    0.76     87.00    0.10    0.27    0.05    0.15   1.00    6.00   1.000
  11.99    0.85     97.85    0.10    0.27    0.05    0.15   1.00    6.00   1.000
  12.01    0.85     97.99    0.10    0.27    0.05    0.15   1.00    6.00   1.000
  21.01    1.22    140.41    0.10    0.27    0.05    0.15   1.00    6.00   1.000
  29.19    1.56    143.33    0.10    0.27    0.05    0.15   1.00    6.00   1.000
  29.21    1.56    143.33    0.10    0.27    0.10    0.15   1.49    6.00  24.000
  38.21    1.97    143.33    0.10    0.27    0.10    0.15   1.49    6.00  24.000
  47.21    2.38    143.33    0.10    0.27    0.10    0.15   1.49    6.00  24.000
  49.19    2.46    143.33    0.10    0.27    0.10    0.15   1.49    6.00  24.000
  49.21    0.86     62.29    0.10    0.27    0.15    0.15   1.49    6.00  24.000
  58.21    0.86     62.29    0.10    0.27    0.15    0.15   1.49    6.00  24.000
  67.21    0.92     62.29    0.10    0.27    0.15    0.15   1.49    6.00  24.000
  76.21    1.03     62.29    0.10    0.27    0.15    0.15   1.49    6.00  24.000
  85.21    1.14     62.29    0.10    0.27    0.15    0.15   1.49    6.00  24.000
  94.19    1.25     62.29    0.10    0.27    0.15    0.15   1.49    6.00  24.000
  94.21    0.92     17.55    0.10    0.27    0.20    0.15   1.75    6.00 168.000
  97.88    0.92     17.55    0.10    0.27    0.20    0.15   1.75    6.00 168.000
 Gain/Loss factors: shaft and toe
  0.48400   0.52700   0.57000   0.61300   0.65600
  1.00000   1.00000   1.00000   1.00000   1.00000
     Dpth         L      Wait      Strk      Pmx%      Eff.      Stff       CoR
     5.40      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    10.78      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    10.82      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    20.00      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    29.18      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    29.22      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    39.20      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    49.18      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    49.22      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    71.70      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    94.18      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    94.22      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    96.03      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    97.88      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     0.00      0.00      0.00     0.000       0.0     0.000     0.000     0.000
```

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 ♀           GRLWEAP: WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS
                                  Version 2010
                                 English Units

                   CCG3A : 06/21/2022 : KCA
                   ________________________________________

            Hammer Model:   D 19-42             Made by:      DELMAG

            No.    Weight    Stiffn       CoR     C-Slk     Dampg
                     kips    k/inch                  ft    k/ft/s
              1     0.800
              2     0.800  140046.6     1.000    0.0000
              3     0.800  140046.6     1.000    0.0000
              4     0.800  140046.6     1.000    0.0000
              5     0.800  140046.6     1.000    0.0000
      Imp Block     0.753   70735.6     0.900    0.0100
      Helmet        2.500    6150.6     0.800    0.0100       5.8
      Combined Pile Top     17191.7

HAMMER OPTIONS:
  Hammer File ID No.                  41  Hammer Type                OE Diesel
  Stroke Option                FxdP-VarS  Stroke Convergence Crit.       0.010
  Fuel Pump Setting              Maximum

HAMMER DATA:
  Ram Weight          (kips)       4.00  Ram Length          (inch)    129.10
  Maximum Stroke        (ft)      11.86
  Rated Stroke          (ft)      10.81  Efficiency                     0.800

  Maximum Pressure     (psi)    1600.00  Actual Pressure      (psi)   1600.00
  Compression Exponent            1.350  Expansion Exponent             1.250
  Ram Diameter        (inch)      12.60
  Combustion Delay       (s)    0.00200  Ignition Duration      (s)   0.00200

           The Hammer Data Includes Estimated (NON-MEASURED) Quantities
           ____________________________________________________________



  HAMMER CUSHION                         PILE CUSHION
  Cross Sect. Area     (in2)      23.21  Cross Sect. Area     (in2)      0.00
  Elastic-Modulus      (ksi)      530.0  Elastic-Modulus      (ksi)       0.0
  Thickness           (inch)       2.00  Thickness           (inch)      0.00
  Coeff of Restitution              0.8  Coeff of Restitution             1.0
  RoundOut              (ft)        0.0  RoundOut              (ft)       0.0
  Stiffness        (kips/in)     6150.6  Stiffness        (kips/in)       0.0

 ♀
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 National Engineering & Architectural Ser                GRLWEAP Version 2010

  Depth                 (ft)        5.4  Standard Soil Setup
  Shaft Gain/Loss Factor          0.484  Toe Gain/Loss Factor           1.000

  PILE PROFILE:
  Toe Area             (in2)    201.060  Pile Type                       Pipe
  Pile Size           (inch)     16.000

   L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
        ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
       0.0    23.21   30000.    492.0      4.2        0   16807.      41.4
      97.9    23.21   30000.    492.0      4.2        0   16807.      41.4
```

```
 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)      26.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.000 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00     0.0   0.000 0.100   6.75   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00     1.4   0.050 0.100  97.88   4.2    23.2
Toe                                     24.6   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)

 PILE, SOIL, ANALYSIS OPTIONS:
 Uniform pile                          Pile Segments: Automatic
 No. of Slacks/Splices             0  Pile Damping           (%)         1
                                       Pile Damping Fact.(k/ft/s)     0.829
 Driveability Analysis
 Soil Damping Option           Smith
 Max No Analysis Iterations        0  Time Increment/Critical         160
 Output Time Interval              1  Analysis Time-Input   (ms)         0
 Output Level: Normal
 Gravity Mass, Pile, Hammer:   32.170    32.170    32.170
 Output Segment Generation: Automatic

    Depth    Stroke  Pressure    Effcy
       ft        ft     Ratio
     5.40     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                   06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips     b/ft   down      up     ksi              ksi         kip-ft   b/min
   26.0     2.2   5.32   5.34   -4.26   5  14    12.85   1   3   22.3    51.4
   26.0     2.2   5.32   5.34   -4.26   5  14    12.85   1   3   22.3    51.4
   26.0     2.2   5.32   5.34   -4.26   5  14    12.85   1   3   22.3    51.4
   26.0     2.2   5.32   5.34   -4.26   5  14    12.85   1   3   22.3    51.4
   26.0     2.2   5.32   5.34   -4.26   5  14    12.85   1   3   22.3    51.4
♀
CCG3A : 06/21/2022 : KCA                                   06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      10.8  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)      51.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.000 0.100   3.38   4.2    23.2
```

```
  2  0.268    17192 0.000 0.000 1.00     0.0   0.000 0.100   6.75   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00     4.1   0.050 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00     6.5   0.050 0.100  97.88   4.2    23.2
Toe                                     40.3   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    10.78     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi                ksi       kip-ft   b/min
   51.0     4.1   5.76   5.78   -3.19   5  14    14.32   1   3   21.0    49.4
   51.0     4.1   5.76   5.78   -3.19   5  14    14.32   1   3   21.0    49.4
   51.0     4.1   5.76   5.78   -3.19   5  14    14.32   1   3   21.0    49.4
   51.0     4.1   5.76   5.78   -3.19   5  14    14.32   1   3   21.0    49.4
   51.0     4.1   5.76   5.78   -3.19   5  14    14.32   1   3   21.0    49.4
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      10.8  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model           Total Capacity Rut  (kips)      97.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.000 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00     0.0   0.000 0.100   6.75   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00     0.1   0.050 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00     4.1   0.050 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00     6.6   0.050 0.100  97.88   4.2    23.2
Toe                                     87.1   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    10.82     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
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National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi                ksi         kip-ft   b/min
   97.9    10.1   6.44   6.45   -0.21   3  14    16.15  21   7   19.0    46.5
   97.9    10.1   6.44   6.45   -0.21   3  14    16.15  21   7   19.0    46.5
   97.9    10.1   6.44   6.45   -0.21   3  14    16.15  21   7   19.0    46.5
   97.9    10.1   6.44   6.45   -0.21   3  14    16.15  21   7   19.0    46.5
   97.9    10.1   6.44   6.45   -0.21   3  14    16.15  21   7   19.0    46.5
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      20.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor          1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                      Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2         0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2         0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

       Pile and Soil Model           Total Capacity Rut  (kips)     184.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.268     17192 0.010 0.000 0.85       0.0   0.000 0.100   3.38   4.2    23.2
  2  0.268     17192 0.000 0.000 1.00       0.0   0.000 0.100   6.75   4.2    23.2
 24  0.268     17192 0.000 0.000 1.00       0.0   0.050 0.100  81.00   4.2    23.2
 25  0.268     17192 0.000 0.000 1.00       2.8   0.050 0.100  84.38   4.2    23.2
 26  0.268     17192 0.000 0.000 1.00       5.9   0.050 0.100  87.75   4.2    23.2
 27  0.268     17192 0.000 0.000 1.00      10.7   0.050 0.100  91.13   4.2    23.2
 28  0.268     17192 0.000 0.000 1.00      13.8   0.050 0.100  94.50   4.2    23.2
 29  0.268     17192 0.000 0.000 1.00      15.7   0.050 0.100  97.88   4.2    23.2
Toe                                    135.6   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    20.00     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi                ksi         kip-ft   b/min
  184.5    22.3   7.25   7.22   -2.27  25  42    18.45  24   7   18.4    43.8
  184.5    22.3   7.25   7.22   -2.27  25  42    18.45  24   7   18.4    43.8
  184.5    22.3   7.25   7.22   -2.27  25  42    18.45  24   7   18.4    43.8
  184.5    22.3   7.25   7.22   -2.27  25  42    18.45  24   7   18.4    43.8
  184.5    22.3   7.25   7.22   -2.27  25  42    18.45  24   7   18.4    43.8
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      29.2  Standard Soil Setup
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```
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                      Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)     244.8
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.000 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00     0.0   0.000 0.100   6.75   4.2    23.2
 21  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100  70.88   4.2    23.2
 22  0.268    17192 0.000 0.000 1.00     1.6   0.050 0.100  74.25   4.2    23.2
 23  0.268    17192 0.000 0.000 1.00     5.2   0.050 0.100  77.63   4.2    23.2
 24  0.268    17192 0.000 0.000 1.00     9.1   0.050 0.100  81.00   4.2    23.2
 25  0.268    17192 0.000 0.000 1.00    13.2   0.050 0.100  84.38   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00    15.2   0.050 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00    17.1   0.050 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00    19.1   0.050 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00    21.0   0.050 0.100  97.88   4.2    23.2
Toe                                    143.3   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    29.18     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi          kip-ft   b/min
   244.8    32.2   7.62   7.60   -3.40  22  35    19.63  23   7   18.2    42.8
   244.8    32.2   7.62   7.60   -3.40  22  35    19.63  23   7   18.2    42.8
   244.8    32.2   7.62   7.60   -3.40  22  35    19.63  23   7   18.2    42.8
   244.8    32.2   7.62   7.60   -3.40  22  35    19.63  23   7   18.2    42.8
   244.8    32.2   7.62   7.60   -3.40  22  35    19.63  23   7   18.2    42.8
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      29.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                      Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4
```

```
 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)     245.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.000 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00     0.0   0.000 0.100   6.75   4.2    23.2
 21  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100  70.88   4.2    23.2
 22  0.268    17192 0.000 0.000 1.00     1.6   0.050 0.100  74.25   4.2    23.2
 23  0.268    17192 0.000 0.000 1.00     5.2   0.050 0.100  77.63   4.2    23.2
 24  0.268    17192 0.000 0.000 1.00     9.1   0.050 0.100  81.00   4.2    23.2
 25  0.268    17192 0.000 0.000 1.00    13.2   0.050 0.100  84.38   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00    15.2   0.050 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00    17.1   0.050 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00    19.1   0.050 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00    21.0   0.050 0.100  97.88   4.2    23.2
Toe                                    143.3   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    29.22     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                              06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi         kip-ft   b/min
  245.0    32.3   7.62   7.60   -3.41  22  35    19.63  23   7   18.2    42.8
  245.0    32.3   7.62   7.60   -3.41  22  35    19.62  23   7   18.2    42.8
  245.0    32.3   7.62   7.60   -3.41  22  35    19.63  23   7   18.2    42.8
  245.0    32.3   7.62   7.60   -3.41  22  35    19.63  23   7   18.2    42.8
  245.0    32.3   7.62   7.60   -3.41  22  35    19.63  23   7   18.2    42.8
♀
CCG3A : 06/21/2022 : KCA                                              06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                   (ft)      39.2  Standard Soil Setup
 Shaft Gain/Loss Factor           0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area              (in2)   201.060  Pile Type                       Pipe
 Pile Size            (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)     290.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.000 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00     0.0   0.000 0.100   6.75   4.2    23.2
 18  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100  60.75   4.2    23.2
 19  0.268    17192 0.000 0.000 1.00     1.5   0.050 0.100  64.13   4.2    23.2
 20  0.268    17192 0.000 0.000 1.00     5.1   0.050 0.100  67.50   4.2    23.2
 21  0.268    17192 0.000 0.000 1.00     8.9   0.050 0.100  70.88   4.2    23.2
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 22  0.268    17192 0.000 0.000 1.00    13.1   0.050 0.100  74.25   4.2    23.2
 23  0.268    17192 0.000 0.000 1.00    15.1   0.050 0.100  77.63   4.2    23.2
 24  0.268    17192 0.000 0.000 1.00    17.1   0.050 0.100  81.00   4.2    23.2
 25  0.268    17192 0.000 0.000 1.00    19.0   0.050 0.100  84.38   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00    21.0   0.050 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00    14.2   0.098 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00    15.2   0.100 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00    16.5   0.100 0.100  97.88   4.2    23.2
Toe                                    143.3   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    39.20     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi          kip-ft   b/min
  290.0    42.4   7.88   7.88   -4.32  20  32    20.54  21   8   18.3    42.0
  292.5    43.1   7.90   7.89   -4.38  20  32    20.58  21   8   18.3    42.0
  295.0    43.7   7.91   7.91   -4.44  20  32    20.61  21   8   18.3    41.9
  297.5    44.5   7.92   7.93   -4.50  20  32    20.62  21   7   18.3    41.9
  299.9    45.0   7.94   7.94   -4.54  20  32    20.69  21   8   18.4    41.9
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      49.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

       Pile and Soil Model             Total Capacity Rut  (kips)     346.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.000 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00     0.0   0.000 0.100   6.75   4.2    23.2
 15  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100  50.63   4.2    23.2
 16  0.268    17192 0.000 0.000 1.00     1.3   0.050 0.100  54.00   4.2    23.2
 17  0.268    17192 0.000 0.000 1.00     5.0   0.050 0.100  57.38   4.2    23.2
 18  0.268    17192 0.000 0.000 1.00     8.6   0.050 0.100  60.75   4.2    23.2
 19  0.268    17192 0.000 0.000 1.00    13.1   0.050 0.100  64.13   4.2    23.2
 20  0.268    17192 0.000 0.000 1.00    15.0   0.050 0.100  67.50   4.2    23.2
 21  0.268    17192 0.000 0.000 1.00    17.0   0.050 0.100  70.88   4.2    23.2
 22  0.268    17192 0.000 0.000 1.00    18.9   0.050 0.100  74.25   4.2    23.2
 23  0.268    17192 0.000 0.000 1.00    20.9   0.050 0.100  77.63   4.2    23.2
 24  0.268    17192 0.000 0.000 1.00    14.5   0.096 0.100  81.00   4.2    23.2
 25  0.268    17192 0.000 0.000 1.00    15.1   0.100 0.100  84.38   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00    16.5   0.100 0.100  87.75   4.2    23.2
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 27  0.268    17192 0.000 0.000 1.00    17.8   0.100 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00    19.1   0.100 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00    20.4   0.100 0.100  97.88   4.2    23.2
Toe                                    143.3   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    49.18     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi                 ksi          kip-ft   b/min
  346.5    59.2   8.16    8.16   -4.33  18  29    21.14  18   7   18.3    41.3
  352.1    60.8   8.18    8.18   -4.43  18  29    21.21  18   7   18.4    41.3
  357.6    63.0   8.21    8.20   -4.51  18  29    21.24  18   7   18.4    41.2
  363.2    64.7   8.23    8.23   -4.59  18  29    21.31  18   7   18.5    41.1
  368.7    66.7   8.27    8.25   -4.67  18  29    21.37  18   7   18.5    41.1
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      49.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size            (inch)    16.000

  L b Top     Area    E-Mod   Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3        ft                ft/s    k/ft/s
      0.0    23.21   30000.     492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.     492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)     265.6
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim     Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft      in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.000 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00     0.0   0.000 0.100   6.75   4.2    23.2
 15  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100  50.63   4.2    23.2
 16  0.268    17192 0.000 0.000 1.00     1.3   0.050 0.100  54.00   4.2    23.2
 17  0.268    17192 0.000 0.000 1.00     5.1   0.050 0.100  57.38   4.2    23.2
 18  0.268    17192 0.000 0.000 1.00     8.7   0.050 0.100  60.75   4.2    23.2
 19  0.268    17192 0.000 0.000 1.00    13.1   0.050 0.100  64.13   4.2    23.2
 20  0.268    17192 0.000 0.000 1.00    15.0   0.050 0.100  67.50   4.2    23.2
 21  0.268    17192 0.000 0.000 1.00    17.0   0.050 0.100  70.88   4.2    23.2
 22  0.268    17192 0.000 0.000 1.00    18.9   0.050 0.100  74.25   4.2    23.2
 23  0.268    17192 0.000 0.000 1.00    20.9   0.050 0.100  77.63   4.2    23.2
 24  0.268    17192 0.000 0.000 1.00    14.5   0.097 0.100  81.00   4.2    23.2
 25  0.268    17192 0.000 0.000 1.00    15.2   0.100 0.100  84.38   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00    16.5   0.100 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00    17.8   0.100 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00    19.1   0.100 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00    20.3   0.100 0.100  97.88   4.2    23.2
Toe                                     62.3   0.150 0.267
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     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    49.22     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi          kip-ft   b/min
  265.6    32.2   7.69   7.66   -3.35  16  34    20.32  18   7   17.4    42.6
  271.2    33.1   7.73   7.70   -3.24  16  34    20.42  18   7   17.5    42.5
  276.8    34.3   7.76   7.74   -3.16  15  34    20.48  18   7   17.5    42.4
  282.3    35.5   7.80   7.77   -3.09  15  33    20.53  18   7   17.5    42.3
  287.9    36.8   7.83   7.81   -3.00  15  33    20.59  18   7   17.6    42.2
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      71.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)     316.2
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.268    17192 0.010 0.000 0.85      0.0   0.000 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00      0.0   0.000 0.100   6.75   4.2    23.2
  8  0.268    17192 0.000 0.000 1.00      0.0   0.050 0.100  27.00   4.2    23.2
  9  0.268    17192 0.000 0.000 1.00      0.2   0.050 0.100  30.38   4.2    23.2
 10  0.268    17192 0.000 0.000 1.00      4.2   0.050 0.100  33.75   4.2    23.2
 11  0.268    17192 0.000 0.000 1.00      6.8   0.050 0.100  37.13   4.2    23.2
 12  0.268    17192 0.000 0.000 1.00     12.3   0.050 0.100  40.50   4.2    23.2
 13  0.268    17192 0.000 0.000 1.00     14.4   0.050 0.100  43.88   4.2    23.2
 14  0.268    17192 0.000 0.000 1.00     16.3   0.050 0.100  47.25   4.2    23.2
 15  0.268    17192 0.000 0.000 1.00     18.3   0.050 0.100  50.63   4.2    23.2
 16  0.268    17192 0.000 0.000 1.00     20.2   0.050 0.100  54.00   4.2    23.2
 17  0.268    17192 0.000 0.000 1.00     16.9   0.080 0.100  57.38   4.2    23.2
 18  0.268    17192 0.000 0.000 1.00     14.7   0.100 0.100  60.75   4.2    23.2
 19  0.268    17192 0.000 0.000 1.00     16.0   0.100 0.100  64.13   4.2    23.2
 20  0.268    17192 0.000 0.000 1.00     17.3   0.100 0.100  67.50   4.2    23.2
 21  0.268    17192 0.000 0.000 1.00     18.6   0.100 0.100  70.88   4.2    23.2
 22  0.268    17192 0.000 0.000 1.00     19.9   0.100 0.100  74.25   4.2    23.2
 23  0.268    17192 0.000 0.000 1.00     11.8   0.121 0.100  77.63   4.2    23.2
 24  0.268    17192 0.000 0.000 1.00      7.4   0.150 0.100  81.00   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00      7.4   0.150 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00      7.6   0.150 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00      7.8   0.150 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00      8.1   0.150 0.100  97.88   4.2    23.2
Toe                                      62.3   0.150 0.267
```

```
     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    71.70     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                        06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi             ksi         kip-ft   b/min
  316.2    44.6   8.07    8.06   -3.28  11  26    21.06  12   6   16.8    41.6
  324.6    46.6   8.11    8.10   -3.48  10  26    21.15  12   6   16.9    41.5
  332.9    49.1   8.15    8.14   -3.58  10  26    21.22  12   6   16.9    41.4
  341.2    51.2   8.20    8.19   -3.50  10  26    21.34  12   6   17.1    41.3
  349.6    53.7   8.25    8.24   -3.40  10  26    21.43  12   6   17.2    41.1
♀
CCG3A : 06/21/2022 : KCA                                        06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      94.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)     379.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim     Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft      in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.000 0.100   3.38   4.2     23.2
  2  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100   6.75   4.2     23.2
  3  0.268    17192 0.000 0.000 1.00     2.7   0.050 0.100  10.13   4.2     23.2
  4  0.268    17192 0.000 0.000 1.00     5.8   0.050 0.100  13.50   4.2     23.2
  5  0.268    17192 0.000 0.000 1.00    10.6   0.050 0.100  16.88   4.2     23.2
  6  0.268    17192 0.000 0.000 1.00    13.7   0.050 0.100  20.25   4.2     23.2
  7  0.268    17192 0.000 0.000 1.00    15.7   0.050 0.100  23.63   4.2     23.2
  8  0.268    17192 0.000 0.000 1.00    17.6   0.050 0.100  27.00   4.2     23.2
  9  0.268    17192 0.000 0.000 1.00    19.6   0.050 0.100  30.38   4.2     23.2
 10  0.268    17192 0.000 0.000 1.00    19.3   0.063 0.100  33.75   4.2     23.2
 11  0.268    17192 0.000 0.000 1.00    14.3   0.100 0.100  37.13   4.2     23.2
 12  0.268    17192 0.000 0.000 1.00    15.6   0.100 0.100  40.50   4.2     23.2
 13  0.268    17192 0.000 0.000 1.00    16.9   0.100 0.100  43.88   4.2     23.2
 14  0.268    17192 0.000 0.000 1.00    18.2   0.100 0.100  47.25   4.2     23.2
 15  0.268    17192 0.000 0.000 1.00    19.5   0.100 0.100  50.63   4.2     23.2
 16  0.268    17192 0.000 0.000 1.00    16.3   0.107 0.100  54.00   4.2     23.2
 17  0.268    17192 0.000 0.000 1.00     7.4   0.150 0.100  57.38   4.2     23.2
 19  0.268    17192 0.000 0.000 1.00     7.4   0.150 0.100  64.13   4.2     23.2
 20  0.268    17192 0.000 0.000 1.00     7.6   0.150 0.100  67.50   4.2     23.2
 21  0.268    17192 0.000 0.000 1.00     7.7   0.150 0.100  70.88   4.2     23.2
 22  0.268    17192 0.000 0.000 1.00     8.0   0.150 0.100  74.25   4.2     23.2
 23  0.268    17192 0.000 0.000 1.00     8.4   0.150 0.100  77.63   4.2     23.2
 24  0.268    17192 0.000 0.000 1.00     8.7   0.150 0.100  81.00   4.2     23.2
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 25  0.268    17192 0.000 0.000 1.00     9.1   0.150 0.100  84.38   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00     9.4   0.150 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00     9.8   0.150 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00    10.1   0.150 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00    10.5   0.150 0.100  97.88   4.2    23.2
Toe                                     62.3   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    94.18     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft    down      up     ksi              ksi        kip-ft   b/min
  379.4    65.7    8.44    8.48   -0.89   4  40    21.86   5   4   16.3    40.7
  391.1    71.0    8.49    8.53   -0.83   4  40    21.96   5   4   16.4    40.6
  402.9    77.0    8.54    8.57   -0.78   4  40    22.06   5   4   16.4    40.4
  414.7    83.6    8.60    8.61   -0.73   4  40    22.16   5   4   16.5    40.3
  426.5    90.1    8.64    8.65   -0.68   4  40    22.25   5   4   16.6    40.2
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      94.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                      Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft                ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)     334.7
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.000 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00     0.0   0.050 0.100   6.75   4.2    23.2
  3  0.268    17192 0.000 0.000 1.00     2.8   0.050 0.100  10.13   4.2    23.2
  4  0.268    17192 0.000 0.000 1.00     5.9   0.050 0.100  13.50   4.2    23.2
  5  0.268    17192 0.000 0.000 1.00    10.6   0.050 0.100  16.88   4.2    23.2
  6  0.268    17192 0.000 0.000 1.00    13.7   0.050 0.100  20.25   4.2    23.2
  7  0.268    17192 0.000 0.000 1.00    15.7   0.050 0.100  23.63   4.2    23.2
  8  0.268    17192 0.000 0.000 1.00    17.6   0.050 0.100  27.00   4.2    23.2
  9  0.268    17192 0.000 0.000 1.00    19.6   0.050 0.100  30.38   4.2    23.2
 10  0.268    17192 0.000 0.000 1.00    19.2   0.064 0.100  33.75   4.2    23.2
 11  0.268    17192 0.000 0.000 1.00    14.3   0.100 0.100  37.13   4.2    23.2
 12  0.268    17192 0.000 0.000 1.00    15.6   0.100 0.100  40.50   4.2    23.2
 13  0.268    17192 0.000 0.000 1.00    16.9   0.100 0.100  43.88   4.2    23.2
 14  0.268    17192 0.000 0.000 1.00    18.2   0.100 0.100  47.25   4.2    23.2
 15  0.268    17192 0.000 0.000 1.00    19.5   0.100 0.100  50.63   4.2    23.2
 16  0.268    17192 0.000 0.000 1.00    16.1   0.108 0.100  54.00   4.2    23.2
 17  0.268    17192 0.000 0.000 1.00     7.4   0.150 0.100  57.38   4.2    23.2
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 19  0.268    17192 0.000 0.000 1.00     7.4   0.150 0.100  64.13   4.2    23.2
 20  0.268    17192 0.000 0.000 1.00     7.6   0.150 0.100  67.50   4.2    23.2
 21  0.268    17192 0.000 0.000 1.00     7.8   0.150 0.100  70.88   4.2    23.2
 22  0.268    17192 0.000 0.000 1.00     8.0   0.150 0.100  74.25   4.2    23.2
 23  0.268    17192 0.000 0.000 1.00     8.4   0.150 0.100  77.63   4.2    23.2
 24  0.268    17192 0.000 0.000 1.00     8.7   0.150 0.100  81.00   4.2    23.2
 25  0.268    17192 0.000 0.000 1.00     9.1   0.150 0.100  84.38   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00     9.4   0.150 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00     9.8   0.150 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00    10.1   0.150 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00    10.4   0.150 0.100  97.88   4.2    23.2
Toe                                     17.5   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    94.22     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
  334.7    44.6   8.35   8.40   -2.24  17  26    21.72   5   4   16.1    40.9
  346.5    47.7   8.40   8.45   -1.87  17  26    21.81   5   4   16.2    40.8
  358.3    51.2   8.46   8.50   -1.48  17  26    21.91   5   4   16.2    40.6
  370.1    55.1   8.51   8.55   -1.08  23  24    22.01   5   4   16.3    40.5
  381.9    59.3   8.57   8.60   -0.84  23  24    22.10   5   4   16.4    40.4
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      96.0  Standard Soil Setup
 Shaft Gain/Loss Factor          0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)    201.060  Pile Type                        Pipe
 Pile Size           (inch)     16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)     338.1
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.050 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00     0.9   0.050 0.100   6.75   4.2    23.2
  3  0.268    17192 0.000 0.000 1.00     4.7   0.050 0.100  10.13   4.2    23.2
  4  0.268    17192 0.000 0.000 1.00     8.0   0.050 0.100  13.50   4.2    23.2
  5  0.268    17192 0.000 0.000 1.00    12.8   0.050 0.100  16.88   4.2    23.2
  6  0.268    17192 0.000 0.000 1.00    14.8   0.050 0.100  20.25   4.2    23.2
  7  0.268    17192 0.000 0.000 1.00    16.7   0.050 0.100  23.63   4.2    23.2
  8  0.268    17192 0.000 0.000 1.00    18.7   0.050 0.100  27.00   4.2    23.2
  9  0.268    17192 0.000 0.000 1.00    20.6   0.050 0.100  30.38   4.2    23.2
 10  0.268    17192 0.000 0.000 1.00    15.4   0.090 0.100  33.75   4.2    23.2
 11  0.268    17192 0.000 0.000 1.00    15.0   0.100 0.100  37.13   4.2    23.2
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 12  0.268    17192 0.000 0.000 1.00    16.3   0.100 0.100  40.50   4.2    23.2
 13  0.268    17192 0.000 0.000 1.00    17.6   0.100 0.100  43.88   4.2    23.2
 14  0.268    17192 0.000 0.000 1.00    18.9   0.100 0.100  47.25   4.2    23.2
 15  0.268    17192 0.000 0.000 1.00    20.2   0.100 0.100  50.63   4.2    23.2
 16  0.268    17192 0.000 0.000 1.00     9.1   0.136 0.100  54.00   4.2    23.2
 17  0.268    17192 0.000 0.000 1.00     7.4   0.150 0.100  57.38   4.2    23.2
 18  0.268    17192 0.000 0.000 1.00     7.4   0.150 0.100  60.75   4.2    23.2
 19  0.268    17192 0.000 0.000 1.00     7.5   0.150 0.100  64.13   4.2    23.2
 20  0.268    17192 0.000 0.000 1.00     7.7   0.150 0.100  67.50   4.2    23.2
 21  0.268    17192 0.000 0.000 1.00     7.9   0.150 0.100  70.88   4.2    23.2
 22  0.268    17192 0.000 0.000 1.00     8.2   0.150 0.100  74.25   4.2    23.2
 23  0.268    17192 0.000 0.000 1.00     8.6   0.150 0.100  77.63   4.2    23.2
 24  0.268    17192 0.000 0.000 1.00     8.9   0.150 0.100  81.00   4.2    23.2
 25  0.268    17192 0.000 0.000 1.00     9.3   0.150 0.100  84.38   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00     9.6   0.150 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00    10.0   0.150 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00    10.3   0.150 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00     8.3   0.173 0.100  97.88   4.2    23.2
Toe                                     17.5   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    96.03     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
  338.1    45.4   8.39    8.43   -2.30  16  26    21.84   4   4   16.1    40.8
  350.2    49.0   8.44    8.49   -1.87  16  26    21.90   4   4   16.1    40.7
  362.3    52.6   8.49    8.53   -1.45  16  26    21.99   4   4   16.2    40.5
  374.4    56.7   8.55    8.58   -1.05  23  24    22.09   4   4   16.3    40.4
  386.5    61.3   8.60    8.63   -0.79  23  24    22.19   4   4   16.3    40.3
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                  (ft)      97.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                      Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft                ft/s    k/ft/s
      0.0    23.21   30000.    492.0      4.2        0    16807.     41.4
     97.9    23.21   30000.    492.0      4.2        0    16807.     41.4

 Wave Travel Time 2L/c (ms)    11.648

        Pile and Soil Model            Total Capacity Rut  (kips)     341.6
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft         kips    s/ft  inch     ft    ft      in2
  1  0.268    17192 0.010 0.000 0.85     0.0   0.050 0.100   3.38   4.2    23.2
  2  0.268    17192 0.000 0.000 1.00     3.2   0.050 0.100   6.75   4.2    23.2
  3  0.268    17192 0.000 0.000 1.00     6.1   0.050 0.100  10.13   4.2    23.2
  4  0.268    17192 0.000 0.000 1.00    11.1   0.050 0.100  13.50   4.2    23.2
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  5  0.268    17192 0.000 0.000 1.00    13.9   0.050 0.100  16.88   4.2    23.2
  6  0.268    17192 0.000 0.000 1.00    15.9   0.050 0.100  20.25   4.2    23.2
  7  0.268    17192 0.000 0.000 1.00    17.8   0.050 0.100  23.63   4.2    23.2
  8  0.268    17192 0.000 0.000 1.00    19.8   0.050 0.100  27.00   4.2    23.2
  9  0.268    17192 0.000 0.000 1.00    18.6   0.068 0.100  30.38   4.2    23.2
 10  0.268    17192 0.000 0.000 1.00    14.4   0.100 0.100  33.75   4.2    23.2
 11  0.268    17192 0.000 0.000 1.00    15.7   0.100 0.100  37.13   4.2    23.2
 12  0.268    17192 0.000 0.000 1.00    17.0   0.100 0.100  40.50   4.2    23.2
 13  0.268    17192 0.000 0.000 1.00    18.3   0.100 0.100  43.88   4.2    23.2
 14  0.268    17192 0.000 0.000 1.00    19.6   0.100 0.100  47.25   4.2    23.2
 15  0.268    17192 0.000 0.000 1.00    15.0   0.110 0.100  50.63   4.2    23.2
 16  0.268    17192 0.000 0.000 1.00     7.4   0.150 0.100  54.00   4.2    23.2
 18  0.268    17192 0.000 0.000 1.00     7.4   0.150 0.100  60.75   4.2    23.2
 19  0.268    17192 0.000 0.000 1.00     7.6   0.150 0.100  64.13   4.2    23.2
 20  0.268    17192 0.000 0.000 1.00     7.8   0.150 0.100  67.50   4.2    23.2
 21  0.268    17192 0.000 0.000 1.00     8.0   0.150 0.100  70.88   4.2    23.2
 22  0.268    17192 0.000 0.000 1.00     8.4   0.150 0.100  74.25   4.2    23.2
 23  0.268    17192 0.000 0.000 1.00     8.8   0.150 0.100  77.63   4.2    23.2
 24  0.268    17192 0.000 0.000 1.00     9.1   0.150 0.100  81.00   4.2    23.2
 25  0.268    17192 0.000 0.000 1.00     9.4   0.150 0.100  84.38   4.2    23.2
 26  0.268    17192 0.000 0.000 1.00     9.8   0.150 0.100  87.75   4.2    23.2
 27  0.268    17192 0.000 0.000 1.00    10.2   0.150 0.100  91.13   4.2    23.2
 28  0.268    17192 0.000 0.000 1.00    10.1   0.153 0.100  94.50   4.2    23.2
 29  0.268    17192 0.000 0.000 1.00     6.3   0.200 0.100  97.88   4.2    23.2
Toe                                     17.5   0.150 0.267

     7.762 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.762 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    97.88     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi         kip-ft   b/min
   341.6    46.7   8.43   8.47   -2.36  16  26    21.95   4   4   15.9    40.7
   354.0    49.9   8.48   8.51   -1.94  16  26    22.08   4   4   16.1    40.6
   366.4    53.8   8.53   8.56   -1.49  16  26    22.17   4   4   16.2    40.5
   378.8    58.5   8.58   8.61   -1.03  23  24    22.24   4   4   16.2    40.4
   391.2    63.4   8.63   8.65   -0.91  26  10    22.34   4   4   16.3    40.2
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

                                SUMMARY OVER DEPTHS

                        G/L at Shaft and Toe:  0.484  1.000
   Depth       Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
      ft      kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
     5.4      26.0      1.4     24.6     2.2  12.852  -4.257    5.32     22.3
    10.8      51.0     10.7     40.3     4.1  14.317  -3.192    5.76     21.0
    10.8      97.9     10.8     87.1    10.1  16.152  -0.212    6.44     19.0
    20.0     184.5     48.8    135.6    22.3  18.450  -2.269    7.25     18.4
    29.2     244.8    101.5    143.3    32.2  19.626  -3.400    7.62     18.2
    29.2     245.0    101.7    143.3    32.3  19.629  -3.408    7.62     18.2
    39.2     290.0    146.7    143.3    42.4  20.545  -4.323    7.88     18.3
    49.2     346.5    203.2    143.3    59.2  21.142  -4.330    8.16     18.3
    49.2     265.6    203.3     62.3    32.2  20.317  -3.347    7.69     17.4
    71.7     316.2    253.9     62.3    44.6  21.060  -3.280    8.07     16.8
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```
     94.2    379.4    317.1     62.3    65.7  21.863  -0.891    8.44     16.3
     94.2    334.7    317.2     17.5    44.6  21.717  -2.236    8.35     16.1
     96.0    338.1    320.6     17.5    45.4  21.838  -2.295    8.39     16.1
     97.9    341.6    324.0     17.5    46.7  21.949  -2.356    8.43     15.9

Total Driving Time      85 minutes;            Total No. of Blows    3569
Starting at penetration     5.4 ft

                      G/L at Shaft and Toe:  0.527  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      5.4     26.0      1.4     24.6     2.2  12.852  -4.257    5.32     22.3
     10.8     51.0     10.7     40.3     4.1  14.317  -3.192    5.76     21.0
     10.8     97.9     10.8     87.1    10.1  16.152  -0.212    6.44     19.0
     20.0    184.5     48.8    135.6    22.3  18.450  -2.269    7.25     18.4
     29.2    244.8    101.5    143.3    32.2  19.626  -3.400    7.62     18.2
     29.2    245.0    101.7    143.3    32.3  19.622  -3.409    7.62     18.2
     39.2    292.5    149.2    143.3    43.1  20.577  -4.383    7.90     18.3
     49.2    352.1    208.7    143.3    60.8  21.208  -4.425    8.18     18.4
     49.2    271.2    208.9     62.3    33.1  20.415  -3.245    7.73     17.5
     71.7    324.6    262.3     62.3    46.6  21.155  -3.477    8.11     16.9
     94.2    391.1    328.9     62.3    71.0  21.958  -0.829    8.49     16.4
     94.2    346.5    329.0     17.5    47.7  21.812  -1.869    8.40     16.2
     96.0    350.2    332.6     17.5    49.0  21.902  -1.874    8.44     16.1
     97.9    354.0    336.4     17.5    49.9  22.077  -1.941    8.48     16.1

Total Driving Time      89 minutes;            Total No. of Blows    3712
Starting at penetration     5.4 ft
 ♀
 CCG3A : 06/21/2022 : KCA                                          06/21/2022
 National Engineering & Architectural Ser                GRLWEAP Version 2010

                                SUMMARY OVER DEPTHS

                      G/L at Shaft and Toe:  0.570  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      5.4     26.0      1.4     24.6     2.2  12.852  -4.257    5.32     22.3
     10.8     51.0     10.7     40.3     4.1  14.317  -3.192    5.76     21.0
     10.8     97.9     10.8     87.1    10.1  16.152  -0.212    6.44     19.0
     20.0    184.5     48.8    135.6    22.3  18.450  -2.269    7.25     18.4
     29.2    244.8    101.5    143.3    32.2  19.626  -3.400    7.62     18.2
     29.2    245.0    101.7    143.3    32.3  19.629  -3.408    7.62     18.2
     39.2    295.0    151.7    143.3    43.7  20.615  -4.439    7.91     18.3
     49.2    357.6    214.3    143.3    63.0  21.243  -4.512    8.21     18.4
     49.2    276.8    214.5     62.3    34.3  20.477  -3.164    7.76     17.5
     71.7    332.9    270.6     62.3    49.1  21.222  -3.580    8.15     16.9
     94.2    402.9    340.6     62.3    77.0  22.057  -0.781    8.54     16.4
     94.2    358.3    340.8     17.5    51.2  21.907  -1.478    8.46     16.2
     96.0    362.3    344.7     17.5    52.6  21.992  -1.448    8.49     16.2
     97.9    366.4    348.8     17.5    53.8  22.175  -1.488    8.53     16.2

Total Driving Time      93 minutes;            Total No. of Blows    3879
Starting at penetration     5.4 ft

                      G/L at Shaft and Toe:  0.613  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      5.4     26.0      1.4     24.6     2.2  12.852  -4.257    5.32     22.3
     10.8     51.0     10.7     40.3     4.1  14.317  -3.192    5.76     21.0
     10.8     97.9     10.8     87.1    10.1  16.152  -0.212    6.44     19.0
     20.0    184.5     48.8    135.6    22.3  18.450  -2.269    7.25     18.4
     29.2    244.8    101.5    143.3    32.2  19.626  -3.400    7.62     18.2
```

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     29.2    245.0    101.7    143.3    32.3  19.628  -3.408    7.62     18.2
     39.2    297.5    154.1    143.3    44.5  20.619  -4.496    7.92     18.3
     49.2    363.2    219.9    143.3    64.7  21.307  -4.591    8.23     18.5
     49.2    282.3    220.1     62.3    35.5  20.533  -3.090    7.80     17.5
     71.7    341.2    279.0     62.3    51.2  21.342  -3.504    8.20     17.1
     94.2    414.7    352.4     62.3    83.6  22.157  -0.726    8.60     16.5
     94.2    370.1    352.6     17.5    55.1  22.009  -1.083    8.51     16.3
     96.0    374.4    356.8     17.5    56.7  22.093  -1.049    8.55     16.3
     97.9    378.8    361.2     17.5    58.5  22.242  -1.030    8.58     16.2

Total Driving Time      98 minutes;            Total No. of Blows    4048
Starting at penetration     5.4 ft
 ♀
 CCG3A : 06/21/2022 : KCA                                        06/21/2022
 National Engineering & Architectural Ser                GRLWEAP Version 2010

                                SUMMARY OVER DEPTHS

                        G/L at Shaft and Toe:  0.656  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      5.4     26.0      1.4     24.6     2.2  12.852  -4.257    5.32     22.3
     10.8     51.0     10.7     40.3     4.1  14.317  -3.192    5.76     21.0
     10.8     97.9     10.8     87.1    10.1  16.152  -0.212    6.44     19.0
     20.0    184.5     48.8    135.6    22.3  18.450  -2.269    7.25     18.4
     29.2    244.8    101.5    143.3    32.2  19.626  -3.400    7.62     18.2
     29.2    245.0    101.7    143.3    32.3  19.630  -3.409    7.62     18.2
     39.2    299.9    156.6    143.3    45.0  20.685  -4.543    7.94     18.4
     49.2    368.7    225.4    143.3    66.7  21.375  -4.667    8.27     18.5
     49.2    287.9    225.6     62.3    36.8  20.594  -3.002    7.83     17.6
     71.7    349.6    287.3     62.3    53.7  21.435  -3.400    8.25     17.2
     94.2    426.5    364.2     62.3    90.1  22.249  -0.676    8.64     16.6
     94.2    381.9    364.4     17.5    59.3  22.104  -0.838    8.57     16.4
     96.0    386.5    368.9     17.5    61.3  22.187  -0.794    8.60     16.3
     97.9    391.2    373.6     17.5    63.4  22.336  -0.915    8.63     16.3

Total Driving Time     102 minutes;            Total No. of Blows    4224
Starting at penetration     5.4 ft
 ♀
 CCG3A : 06/21/2022 : KCA                                        06/21/2022
 National Engineering & Architectural Ser                GRLWEAP Version 2010


                 Table of Depths Analyzed with Driving System Modifiers

                 Temp.      Wait Equivalent Pressure             Stiffn.   Cushion
     Depth     Length       Time     Stroke     Ratio   Efficy.    Factor       CoR
        ft         ft         hr         ft
      5.40      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     10.78      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     10.82      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     20.00      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     29.18      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     29.22      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     39.20      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     49.18      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     49.22      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     71.70      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     94.18      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     94.22      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     96.03      97.88       0.00      10.81      1.00      0.80      1.00      1.00
     97.88      97.88       0.00      10.81      1.00      0.80      1.00      1.00
```

```
                           Soil Layer Resistance Values
         Shaft       End   Shaft     Toe   Shaft     Toe    Soil   Limit   Setup
Depth     Res. Bearing   Quake   Quake Damping Damping   Setup Distance    Time
   ft    k/ft2    kips    inch    inch    s/ft    s/ft Normlzd      ft     hrs
 0.01     0.00    0.00   0.100   0.267   0.050   0.150   0.000   6.000   1.000
 3.99     0.00    0.00   0.100   0.267   0.050   0.150   0.000   6.000   1.000
 4.00     0.20   18.53   0.100   0.267   0.050   0.150   0.000   6.000   1.000
 9.01     0.46   40.28   0.100   0.267   0.050   0.150   0.000   6.000   1.000
10.79     0.55   40.28   0.100   0.267   0.050   0.150   0.000   6.000   1.000
10.81     0.76   87.00   0.100   0.267   0.050   0.150   0.000   6.000   1.000
11.99     0.85   97.85   0.100   0.267   0.050   0.150   0.000   6.000   1.000
12.01     0.85   97.99   0.100   0.267   0.050   0.150   0.000   6.000   1.000
21.01     1.22  140.41   0.100   0.267   0.050   0.150   0.000   6.000   1.000
29.19     1.56  143.33   0.100   0.267   0.050   0.150   0.000   6.000   1.000
29.21     1.56  143.33   0.100   0.267   0.100   0.150   0.768   6.000  24.000
38.21     1.97  143.33   0.100   0.267   0.100   0.150   0.768   6.000  24.000
47.21     2.38  143.33   0.100   0.267   0.100   0.150   0.768   6.000  24.000
49.19     2.46  143.33   0.100   0.267   0.100   0.150   0.768   6.000  24.000
49.21     0.86   62.29   0.100   0.267   0.150   0.150   0.768   6.000  24.000
58.21     0.86   62.29   0.100   0.267   0.150   0.150   0.768   6.000  24.000
67.21     0.92   62.29   0.100   0.267   0.150   0.150   0.768   6.000  24.000
76.21     1.03   62.29   0.100   0.267   0.150   0.150   0.768   6.000  24.000
85.21     1.14   62.29   0.100   0.267   0.150   0.150   0.768   6.000  24.000
94.19     1.25   62.29   0.100   0.267   0.150   0.150   0.768   6.000  24.000
94.21     0.92   17.55   0.100   0.267   0.200   0.150   1.000   6.000 168.000
97.88     0.92   17.55   0.100   0.267   0.200   0.150   1.000   6.000 168.000
```

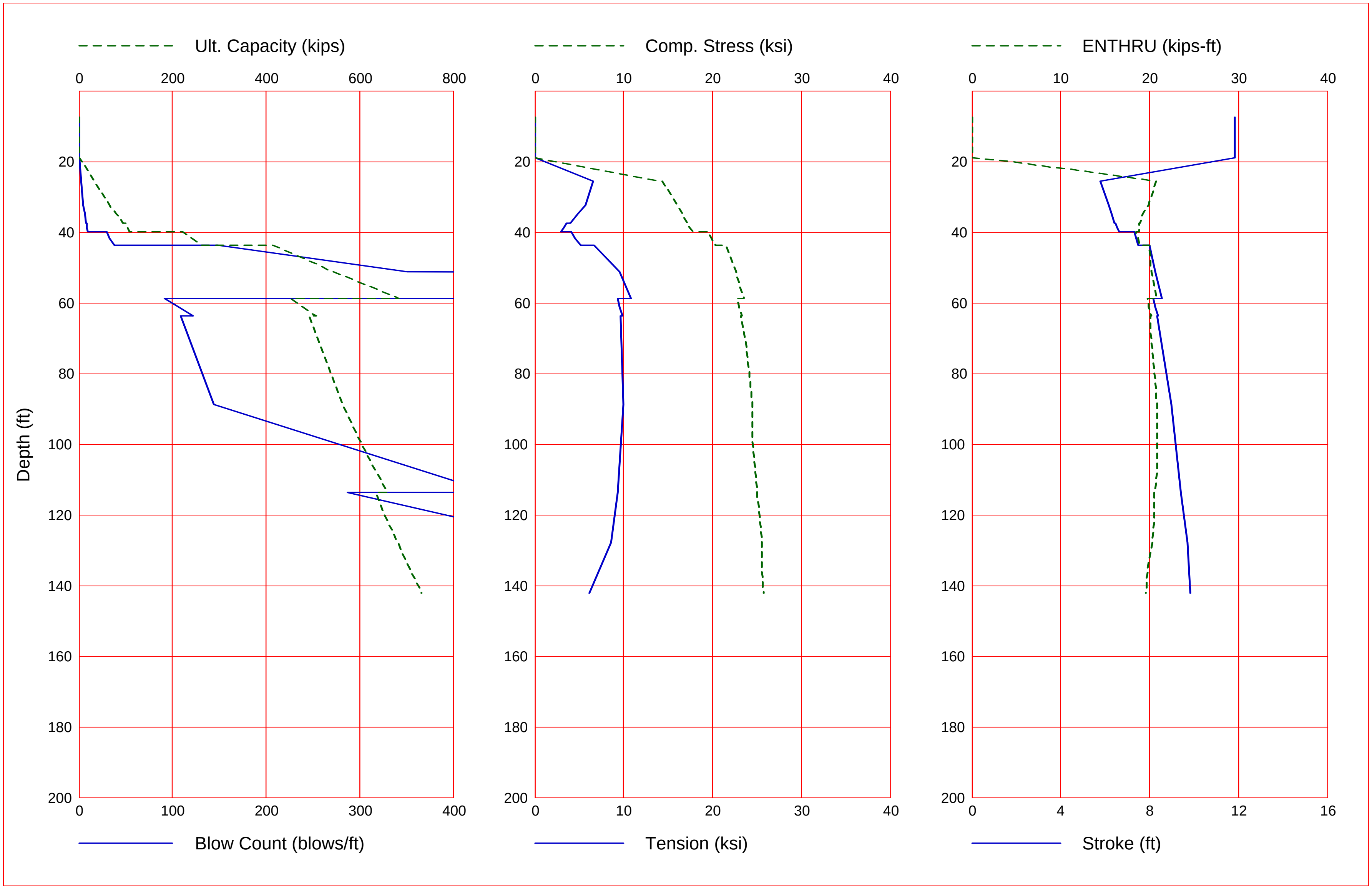
PIER 2

Gain/Loss 3 at Shaft and Toe 0.670 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
7.4	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.9	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.9	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
16.1	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
17.4	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
17.4	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
18.1	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
18.9	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
18.9	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
25.6	33.3	7.3	26.0	2.6	14.325	-6.530	5.78	20.7
32.4	65.9	40.0	26.0	4.9	16.005	-5.708	6.16	19.9
32.4	66.2	40.2	26.0	4.9	16.007	-5.693	6.16	19.9
34.9	80.0	54.1	26.0	6.3	16.599	-4.834	6.31	19.3
37.4	95.0	69.0	26.0	7.9	17.128	-4.007	6.44	18.9
37.4	99.9	69.2	30.7	8.5	17.233	-3.594	6.48	18.8
38.7	104.5	73.8	30.7	9.1	17.456	-3.251	6.53	18.7
39.9	109.2	78.5	30.7	9.6	17.815	-2.984	6.64	18.8
39.9	222.1	78.7	143.3	29.7	19.444	-4.115	7.31	18.5
41.8	241.3	98.0	143.3	33.4	19.903	-4.567	7.40	18.7
43.7	261.0	117.7	143.3	37.8	20.336	-5.154	7.47	18.8
43.7	413.8	118.2	295.5	148.6	21.513	-6.625	8.02	20.0
51.2	542.6	247.1	295.5	350.6	22.642	-9.586	8.27	20.2
58.7	684.2	388.6	295.5	9999.0	23.513	-10.802	8.56	20.8
58.7	453.6	389.2	64.3	91.4	22.787	-9.300	8.18	19.8
61.2	479.9	415.5	64.3	106.4	22.994	-9.568	8.24	19.9
63.7	506.9	442.6	64.3	122.4	23.299	-9.834	8.40	20.2
63.7	492.0	442.8	49.1	109.2	23.222	-9.686	8.34	20.1
88.7	563.7	514.5	49.1	144.6	24.430	-10.018	8.98	20.8
113.7	658.5	609.4	49.1	439.5	25.046	-9.368	9.42	20.6
113.7	634.1	609.6	24.6	287.3	25.021	-9.368	9.40	20.5
127.9	681.8	657.2	24.6	520.0	25.551	-8.630	9.69	20.3
142.2	731.2	706.6	24.6	2345.1	25.755	-6.151	9.82	19.6

Refusal occurred; no driving time output possible

Gain/Loss 3 at Shaft and Toe 0.670 / 1.000



GRLWEAP - Version 2010
WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS

written by GRL Engineers, Inc. (formerly Goble Rausche Likins
and Associates, Inc.) with cooperation from Pile Dynamics, Inc.

ABOUT THE WAVE EQUATION ANALYSIS RESULTS

The GRLWEAP program simulates the behavior of a preformed pile driven by either an impact hammer or a vibratory hammer. The program is based on mathematical models, which describe motion and forces of hammer, driving system, pile and soil under the hammer action. Under certain conditions, the models only crudely approximate, often complex, dynamic situations.

A wave equation analysis generally relies on input data, which represents normal situations. In particular, the hammer data file supplied with the program assumes that the hammer is in good working order. All of the input data selected by the user may be the best available information at the time when the analysis is performed. However, input data and therefore results may significantly differ from actual field conditions.

Therefore, the program authors recommend prudent use of the GRLWEAP results. Soil response and hammer performance should be verified by static and/or dynamic testing and measurements. Estimates of bending or other local stresses (e.g., helmet or clamp contact, uneven rock surfaces etc.), prestress effects and others must also be accounted for by the user.

The calculated capacity - blow count relationship, i.e. the bearing graph, should be used in conjunction with observed blow counts for the capacity assessment of a driven pile. Soil setup occurring after pile installation may produce bearing capacity values that differ substantially from those expected from a wave equation analysis due to soil setup or relaxation. This is particularly true for pile driven with vibratory hammers. The GRLWEAP user must estimate such effects and should also use proper care when applying blow counts from restrike because of the variability of hammer energy, soil resistance and blow count during early restriking.

Finally, the GRLWEAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of building and other factors.

```
 ♀
 Input  File: C:\USERS\KARENS\DESKTOP\GRL FILES\P216IN.GWW
 Hammer File: C:\ProgramData\PDI\GRLWEAP\2010\Resource\HAMMER2010.GW
 Hammer File Version:  2003 (10/17/2016)

                        Input File Contents
     CCG3A : 06/21/2022 : KCA
 OUT OSG HAM STR FUL PEL  N SPL N-U P-D %SK ISM  0 PHI RSA ITR H-D MXT     DEx
-100   0  41   0   0   0  0   0   0   1   0   0  0   0   0   0   0   0   0.000
    Pile g  Hammer g  Toe Area Pile Size           Pile Type
    32.170    32.170   201.060    16.000                Pipe
      W Cp      A Cp      E Cp      T Cp       CoR      ROut      StCp
     2.500    22.450     530.0     2.000     0.800     0.010       0.0
      A Cu      E Cu      T Cu       CoR      ROut      StCu
     0.000       0.0     0.000     0.000     0.000       0.0
      LPle      APle      EPle      WPle      Peri        CI       CoR      ROut
   142.180     22.45   30000.0   492.000     4.188         0     0.850     0.010
```

```
 FFatigue        F0  0-Bottom
        0     0.000     0.000
Manufac  Hmr Name  HmrType No Seg-s
DELMAG   D 19-42         1        5
   Ram Wt     Ram L   Ram Dia   MaxStrk   RtdStrk    Efficy
     4.00    129.10     12.60     11.86     10.81      0.80
   IB. Wt     IB. L    IB.Dia    IB CoR     IB RO
     0.75     25.30     12.60     0.900     0.010
 CompStrk A Chamber V Chamber   C Delay  C Duratn Exp Coeff VolCStart  Vol CEnd
    16.65    124.70    157.70    0.0020    0.0020     1.250      0.00      0.00
    P atm        P1        P2        P3        P4        P5
    14.70   1600.00   1440.00   1295.00   1165.00      0.00
   Stroke    Effic.  Pressure  R-Weight   T-Delay Exp-Coeff   Eps-Str  Total-AW
  10.8100    0.8000 1600.0000    0.0000    0.0000    0.0000    0.0100    0.0000
       Qs        Qt        Js        Jt        Qx        Jx      Rati      Dept
    0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
 Research Soil Model: Atoe, Plug,  Gap, Q-fac
    0.000     0.000     0.000     0.000
 Research Soil Model: RD-skn: m, d, toe: m, d
    0.000     0.000     0.000     0.000
 Res. Distribution
   Dpth    Rskn      Rtoe      Qs      Qt      Js      Jt   SU F   LimL    TSf0
   0.01    0.00      0.00    0.10    0.27    0.05    0.15   1.00   6.00   1.000
   9.01    0.00      0.00    0.10    0.27    0.05    0.15   1.00   6.00   1.000
  14.89    0.00      0.00    0.10    0.27    0.05    0.15   1.00   6.00   1.000
  14.91    0.00      0.00    0.10    0.27    0.05    0.15   1.00   6.00   1.000
  17.39    0.00      0.00    0.10    0.27    0.05    0.15   1.00   6.00   1.000
  17.41    0.00      0.00    0.10    0.27    0.10    0.15   1.21   6.00  24.000
  18.89    0.00      0.00    0.10    0.27    0.10    0.15   1.21   6.00  24.000
  18.91    0.00      0.00    0.10    0.27    0.05    0.15   1.21   6.00  24.000
  23.89    0.00      0.00    0.10    0.27    0.05    0.15   1.21   6.00  24.000
  23.90    1.16     25.97    0.10    0.27    0.05    0.15   1.21   6.00  24.000
  27.91    1.35     25.97    0.10    0.27    0.05    0.15   1.21   6.00  24.000
  32.39    1.55     25.97    0.10    0.27    0.05    0.15   1.21   6.00  24.000
  32.41    1.55     25.97    0.10    0.27    0.10    0.15   1.21   6.00  24.000
  37.39    1.79     25.97    0.10    0.27    0.10    0.15   1.21   6.00  24.000
  37.41    1.35     30.70    0.10    0.27    0.15    0.15   1.49   6.00 168.000
  39.89    1.35     30.70    0.10    0.27    0.15    0.15   1.49   6.00 168.000
  39.91    2.90    143.33    0.10    0.27    0.10    0.15   1.21   6.00  24.000
  43.69    3.06    143.33    0.10    0.27    0.10    0.15   1.21   6.00  24.000
  43.71    3.91    295.54    0.10    0.27    0.05    0.15   1.00   6.00   1.000
  52.71    4.40    295.54    0.10    0.27    0.05    0.15   1.00   6.00   1.000
  58.69    4.72    295.54    0.10    0.27    0.05    0.15   1.00   6.00   1.000
  58.71    3.01     64.34    0.10    0.27    0.10    0.15   1.21   6.00  24.000
  63.69    3.17     64.34    0.10    0.27    0.10    0.15   1.21   6.00  24.000
  63.71    0.97     49.13    0.10    0.27    0.15    0.15   1.49   6.00  24.000
  72.71    0.97     49.13    0.10    0.27    0.15    0.15   1.49   6.00  24.000
  81.71    1.05     49.13    0.10    0.27    0.15    0.15   1.49   6.00  24.000
  90.71    1.19     49.13    0.10    0.27    0.15    0.15   1.49   6.00  24.000
  99.71    1.33     49.13    0.10    0.27    0.15    0.15   1.49   6.00  24.000
 108.71    1.47     49.13    0.10    0.27    0.15    0.15   1.49   6.00  24.000
 113.69    1.55     49.13    0.10    0.27    0.15    0.15   1.49   6.00  24.000
 113.71    1.19     24.56    0.10    0.27    0.15    0.15   1.49   6.00 168.000
 122.71    1.19     24.56    0.10    0.27    0.15    0.15   1.49   6.00 168.000
 131.71    1.22     24.56    0.10    0.27    0.15    0.15   1.49   6.00 168.000
 140.71    1.26     24.56    0.10    0.27    0.15    0.15   1.49   6.00 168.000
 142.18    1.27     24.56    0.10    0.27    0.15    0.15   1.49   6.00 168.000
 Gain/Loss factors: shaft and toe
  0.60400   0.63700   0.67000   0.70300   0.73600
  1.00000   1.00000   1.00000   1.00000   1.00000
     Dpth         L      Wait      Strk      Pmx%      Eff.      Stff       CoR
     7.45      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    14.88      0.00      0.00     0.000       0.0     0.000     0.000     0.000
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     14.92      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     16.15      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     17.38      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     17.42      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     18.15      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     18.88      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     18.92      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     25.65      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     32.38      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     32.42      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     34.90      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     37.38      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     37.42      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     38.65      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     39.88      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     39.92      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     41.80      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     43.68      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     43.72      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     51.20      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     58.68      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     58.72      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     61.20      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     63.68      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     63.72      0.00      0.00     0.000       0.0     0.000     0.000     0.000
     88.70      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    113.68      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    113.72      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    127.93      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    142.18      0.00      0.00     0.000       0.0     0.000     0.000     0.000
      0.00      0.00      0.00     0.000       0.0     0.000     0.000     0.000
 ♀           GRLWEAP: WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS
                                  Version 2010
                                 English Units

                   CCG3A : 06/21/2022 : KCA
                   ________________________________________

            Hammer Model:   D 19-42              Made by:      DELMAG

            No.    Weight    Stiffn       CoR     C-Slk     Dampg
                     kips    k/inch                  ft    k/ft/s
              1     0.800
              2     0.800  140046.6     1.000    0.0000
              3     0.800  140046.6     1.000    0.0000
              4     0.800  140046.6     1.000    0.0000
              5     0.800  140046.6     1.000    0.0000
      Imp Block     0.753   70735.6     0.900    0.0100
      Helmet        2.500    5949.2     0.800    0.0100       5.8
      Combined Pile Top     16974.1

HAMMER OPTIONS:
  Hammer File ID No.                41  Hammer Type                OE Diesel
  Stroke Option              FxdP-VarS  Stroke Convergence Crit.       0.010
  Fuel Pump Setting            Maximum

HAMMER DATA:
  Ram Weight          (kips)      4.00  Ram Length          (inch)    129.10
  Maximum Stroke        (ft)     11.86
  Rated Stroke          (ft)     10.81  Efficiency                     0.800

  Maximum Pressure     (psi)   1600.00  Actual Pressure      (psi)   1600.00
  Compression Exponent           1.350  Expansion Exponent             1.250
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 Ram Diameter        (inch)     12.60
 Combustion Delay       (s)   0.00200  Ignition Duration      (s)   0.00200

         The Hammer Data Includes Estimated (NON-MEASURED) Quantities



 HAMMER CUSHION                        PILE CUSHION
 Cross Sect. Area     (in2)     22.45  Cross Sect. Area     (in2)      0.00
 Elastic-Modulus      (ksi)     530.0  Elastic-Modulus      (ksi)       0.0
 Thickness           (inch)      2.00  Thickness           (inch)      0.00
 Coeff of Restitution             0.8  Coeff of Restitution             1.0
 RoundOut              (ft)       0.0  RoundOut              (ft)       0.0
 Stiffness        (kips/in)    5949.2  Stiffness        (kips/in)       0.0

♀
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National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                (ft)       7.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 135.57   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 142.18   4.2    22.4
Toe                                      0.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)

 PILE, SOIL, ANALYSIS OPTIONS:
 Uniform pile                          Pile Segments: Automatic
 No. of Slacks/Splices              0  Pile Damping           (%)        1
                                       Pile Damping Fact.(k/ft/s)     0.801
 Driveability Analysis
 Soil Damping Option            Smith
 Max No Analysis Iterations         0  Time Increment/Critical         160
 Output Time Interval               1  Analysis Time-Input   (ms)        0
 Output Level: Normal
 Gravity Mass, Pile, Hammer:   32.170    32.170    32.170
 Output Segment Generation: Automatic

    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
     7.45     10.81      1.00     0.800
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INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
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    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      14.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod   Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    22.45   30000.     492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.     492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model           Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 39  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 128.95   4.2    22.4
 43  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 142.18   4.2    22.4
Toe                                      0.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    14.88     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
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INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
♀
CCG3A : 06/21/2022 : KCA                                        06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
♀
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National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      14.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

       Pile and Soil Model            Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 39  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 128.95   4.2    22.4
 43  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 142.18   4.2    22.4
Toe                                      0.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    14.92     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
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INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
♀
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    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
♀
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National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      16.1  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

       Pile and Soil Model            Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 39  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 128.95   4.2    22.4
 43  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 142.18   4.2    22.4
Toe                                      0.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    16.15     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
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 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      17.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85      0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00      0.0   0.000 0.100   6.61   4.2    22.5
 38  0.254    16974 0.000 0.000 1.00      0.0   0.050 0.100 125.65   4.2    22.4
 43  0.254    16974 0.000 0.000 1.00      0.0   0.050 0.100 142.18   4.2    22.4
Toe                                       0.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    17.38     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
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INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      17.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 38  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 125.65   4.2    22.4
 43  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100 142.18   4.2    22.4
Toe                                      0.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    17.42     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
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INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      18.1  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft                ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model           Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft          kips    s/ft  inch      ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85      0.0   0.000 0.100   3.31   4.2     22.5
  2  0.254    16974 0.000 0.000 1.00      0.0   0.000 0.100   6.61   4.2     22.5
 38  0.254    16974 0.000 0.000 1.00      0.0   0.050 0.100 125.65   4.2     22.4
 43  0.254    16974 0.000 0.000 1.00      0.0   0.100 0.100 142.18   4.2     22.4
Toe                                       0.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    18.15     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
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CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
♀
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National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      18.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 38  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 125.65   4.2    22.4
 43  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100 142.18   4.2    22.4
Toe                                      0.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    18.88     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010
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    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      18.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 38  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 125.65   4.2    22.4
 43  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 142.18   4.2    22.4
Toe                                      0.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    18.92     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    14.2     0.0
 Hammer+Pile Weight > Rult: Pile Runs
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
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CCG3A : 06/21/2022 : KCA                                        06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      25.6  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)      33.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 36  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 119.03   4.2    22.4
 43  0.254    16974 0.000 0.000 1.00     7.0   0.050 0.100 142.18   4.2    22.4
Toe                                     26.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    25.65     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                        06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
   33.0     2.6   5.77   5.78   -6.54   7  19    14.30   1   3   20.7    49.4
   33.2     2.6   5.77   5.78   -6.53   7  19    14.32   1   4   20.7    49.3
   33.3     2.6   5.78   5.78   -6.53   7  19    14.32   1   3   20.7    49.3
   33.5     2.6   5.78   5.79   -6.52   7  19    14.33   1   3   20.6    49.3
   33.6     2.6   5.78   5.79   -6.52   7  19    14.35   1   4   20.7    49.3
♀
CCG3A : 06/21/2022 : KCA                                        06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      32.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919
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        Pile and Soil Model            Total Capacity Rut  (kips)      64.3
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 34  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 112.42   4.2    22.4
 41  0.254    16974 0.000 0.000 1.00     7.5   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    14.6   0.050 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    16.2   0.050 0.100 142.18   4.2    22.4
Toe                                     26.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    32.38     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
   64.3     4.7   6.14   6.15   -5.77   7  19    15.94  32   9   19.9    47.8
   65.1     4.8   6.15   6.16   -5.74   7  19    15.97  32   9   19.9    47.8
   65.9     4.9   6.16   6.17   -5.71   7  19    16.01  32   9   19.9    47.7
   66.8     4.9   6.17   6.18   -5.68   7  19    16.05  33   9   19.9    47.7
   67.6     5.0   6.17   6.19   -5.63   7  19    16.07  34   9   19.8    47.7
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      32.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)      64.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 34  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 112.42   4.2    22.4
 41  0.254    16974 0.000 0.000 1.00     7.7   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    14.6   0.050 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    16.2   0.050 0.100 142.18   4.2    22.4
Toe                                     26.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
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       ft        ft     Ratio
    32.42     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i    t Comp Str   i    t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi         kip-ft   b/min
   64.5     4.7   6.15   6.16   -5.75   7  19    15.94  32   9   19.9    47.8
   65.3     4.8   6.15   6.17   -5.73   7  19    15.98  32   9   19.9    47.8
   66.2     4.9   6.16   6.17   -5.69   7  19    16.01  33   9   19.9    47.7
   67.0     4.9   6.17   6.18   -5.65   7  19    16.04  33   9   19.8    47.7
   67.8     5.0   6.18   6.19   -5.62   7  19    16.08  33   9   19.8    47.7
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      34.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2         0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2         0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)      77.8
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft     ft         kips    s/ft  inch      ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 33  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 109.11   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00     4.3   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    14.2   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    15.8   0.050 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    17.5   0.088 0.100 142.18   4.2    22.4
Toe                                     26.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    34.90     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i    t Comp Str   i    t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi         kip-ft   b/min
   77.8     6.1   6.29   6.30   -4.93   6  19    16.52  36  10   19.4    47.2
   78.9     6.2   6.30   6.31   -4.88   6  19    16.56  37  10   19.3    47.2
   80.0     6.3   6.31   6.32   -4.83   6  19    16.60  37  10   19.3    47.1
   81.1     6.4   6.32   6.33   -4.79   6  19    16.65  37  10   19.3    47.1
   82.2     6.5   6.33   6.34   -4.74   6  19    16.68  37  10   19.2    47.0
```

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♀
CCG3A : 06/21/2022 : KCA                                       06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      37.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)      92.1
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 32  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 105.81   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00     1.0   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    13.8   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    15.4   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    17.1   0.076 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    18.9   0.100 0.100 142.18   4.2    22.4
Toe                                     26.0   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    37.38     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                       06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
   92.1     7.7   6.41   6.42   -4.13   6  19    17.05  37  10   18.9    46.7
   93.5     7.8   6.43   6.44   -4.05   6  19    17.08  37  10   18.9    46.6
   95.0     7.9   6.44   6.45   -4.01   6  19    17.13  38  10   18.9    46.6
   96.4     8.0   6.45   6.46   -3.94   6  19    17.17  38  10   18.9    46.5
   97.8     8.2   6.46   6.47   -3.88   6  19    17.21  38  10   18.9    46.5
♀
CCG3A : 06/21/2022 : KCA                                       06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      37.4  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
```

```
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

       Pile and Soil Model            Total Capacity Rut  (kips)      97.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 32  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 105.81   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00     1.2   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    13.8   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    15.4   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    17.1   0.077 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    18.8   0.100 0.100 142.18   4.2    22.4
Toe                                     30.7   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    37.42     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
   97.0     8.2   6.46   6.47   -3.74   6  19    17.16  37  10   18.9    46.5
   98.5     8.3   6.47   6.48   -3.67   6  19    17.20  38  10   18.9    46.5
   99.9     8.5   6.48   6.49   -3.59   6  19    17.23  38  10   18.8    46.4
  101.3     8.6   6.49   6.50   -3.55   6  19    17.29  38  10   18.8    46.4
  102.7     8.8   6.50   6.51   -3.47   6  19    17.32  38  10   18.8    46.3
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      38.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

       Pile and Soil Model            Total Capacity Rut  (kips)     101.2
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 32  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 105.81   4.2    22.4
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 37  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00     6.1   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    14.4   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    16.1   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    17.8   0.095 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    16.2   0.116 0.100 142.18   4.2    22.4
Toe                                     30.7   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    38.65     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                              06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
  101.2     8.7   6.50   6.51   -3.40   6  19    17.35  38  10   18.8    46.3
  102.9     8.9   6.51   6.52   -3.34   6  19    17.41  38  10   18.8    46.3
  104.5     9.1   6.53   6.54   -3.25   6  19    17.46  38  10   18.7    46.2
  106.2     9.2   6.54   6.55   -3.17   6  19    17.50  38  10   18.7    46.2
  107.8     9.4   6.55   6.56   -3.09   6  19    17.56  38  10   18.7    46.1
♀
CCG3A : 06/21/2022 : KCA                                              06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      39.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     105.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 31  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 102.50   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    11.3   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    15.0   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    16.7   0.064 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    18.4   0.100 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    13.3   0.135 0.100 142.18   4.2    22.4
Toe                                     30.7   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
```

```
       ft        ft     Ratio
    39.88     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi            kip-ft   b/min
  105.4     9.2   6.61   6.54   -3.18   6  19    17.69  38  10   18.9    46.1
  107.3     9.5   6.56   6.57   -3.01   6  19    17.62  38  10   18.6    46.1
  109.2     9.6   6.64   6.57   -2.98   6  19    17.81  38  10   18.8    46.0
  111.1     9.8   6.65   6.58   -2.88   6  19    17.86  38  10   18.8    45.9
  112.9    10.0   6.66   6.60   -2.78   6  19    17.91  38  10   18.8    45.9
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      39.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft                ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     218.3
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 31  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 102.50   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    11.5   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    15.0   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    16.7   0.064 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    18.4   0.100 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    13.3   0.135 0.100 142.18   4.2    22.4
Toe                                    143.3   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    39.92     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi            kip-ft   b/min
  218.3    29.0   7.30   7.28   -3.98  39  47    19.37  38  10   18.5    43.6
  220.2    29.4   7.30   7.29   -4.05  39  47    19.41  38  10   18.5    43.6
  222.1    29.7   7.31   7.30   -4.12  39  47    19.44  38  10   18.5    43.6
  224.0    30.0   7.33   7.31   -4.18  39  47    19.49  38  10   18.5    43.5
  225.8    30.3   7.33   7.32   -4.25  39  47    19.53  39  10   18.6    43.5
♀
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CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      41.8  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     236.7
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 31  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 102.50   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00     5.5   0.050 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    14.3   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    16.0   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    17.7   0.092 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    16.5   0.114 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    23.4   0.113 0.100 142.18   4.2    22.4
Toe                                    143.3   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    41.80     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi       kip-ft   b/min
  236.7    32.6   7.38    7.37   -4.45  38  48    19.80  38  10   18.6    43.4
  239.0    32.9   7.39    7.37   -4.51  38  48    19.85  38  10   18.7    43.4
  241.3    33.4   7.40    7.38   -4.57  38  47    19.90  38  10   18.7    43.3
  243.6    33.9   7.41    7.39   -4.63  38  47    19.92  38  10   18.7    43.3
  245.9    34.3   7.42    7.40   -4.69  38  47    19.97  38  10   18.7    43.3
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      43.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
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```
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.     492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.     492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

       Pile and Soil Model            Total Capacity Rut  (kips)     255.7
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft          kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 30  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  99.20   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00    13.4   0.050 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    15.3   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    16.9   0.071 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    18.7   0.100 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    15.1   0.132 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    33.0   0.100 0.100 142.18   4.2    22.4
Toe                                    143.3   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    43.68     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
  255.7    36.5   7.46   7.44   -4.97  38  44    20.25  38  10   18.8    43.2
  258.3    37.2   7.46   7.45   -5.06  38  44    20.28  38  10   18.8    43.2
  261.0    37.8   7.47   7.47   -5.15  38  44    20.34  38  10   18.8    43.1
  263.7    38.4   7.49   7.48   -5.24  38  44    20.40  38  10   18.8    43.1
  266.4    38.9   7.50   7.49   -5.33  38  44    20.45  38  10   18.8    43.1
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      43.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.     492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.     492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

       Pile and Soil Model            Total Capacity Rut  (kips)     408.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft          kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 30  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  99.20   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00    13.6   0.050 0.100 125.65   4.2    22.4
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 39  0.254    16974 0.000 0.000 1.00    15.3   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    16.9   0.072 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    18.7   0.100 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    15.2   0.131 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    33.1   0.100 0.100 142.18   4.2    22.4
Toe                                    295.5   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    43.72     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                              06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi        kip-ft   b/min
  408.4   143.4   8.01   8.07   -6.39  38  37    21.57  43  12   19.9    41.6
  411.1   145.4   8.02   8.07   -6.51  38  37    21.55  42  12   20.0    41.6
  413.8   148.6   8.02   8.07   -6.63  38  37    21.51  42  12   20.0    41.6
  416.5   152.5   8.02   8.08   -6.74  38  37    21.53  38  10   19.9    41.5
  419.2   156.9   8.03   8.09   -6.85  38  37    21.57  38  10   19.9    41.5
♀
CCG3A : 06/21/2022 : KCA                                              06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      51.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2         0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2         0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     537.3
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft       kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 28  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  92.58   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00     3.4   0.050 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00    14.1   0.050 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00    15.7   0.050 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00    17.4   0.085 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    17.7   0.107 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    20.0   0.120 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    38.9   0.084 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    56.1   0.050 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    58.5   0.050 0.100 142.18   4.2    22.4
Toe                                    295.5   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
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    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    51.20     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi                ksi          kip-ft   b/min
  537.3   330.0   8.26    8.25   -9.48  36  36    22.55  36  10   20.2    41.0
  539.9   340.2   8.26    8.26   -9.53  36  36    22.60  36  10   20.2    41.0
  542.6   350.6   8.27    8.27   -9.59  36  36    22.64  36  10   20.2    41.0
  545.3   362.1   8.27    8.27   -9.64  36  36    22.69  36  10   20.2    41.0
  548.0   366.4   8.28    8.27   -9.68  36  36    22.77  36  10   20.3    41.0
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      58.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     678.8
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85       0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00       0.0   0.000 0.100   6.61   4.2    22.5
 26  0.254    16974 0.000 0.000 1.00       0.0   0.050 0.100  85.97   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00       6.9   0.050 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00      14.5   0.050 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00      16.1   0.050 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00      17.9   0.098 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00      15.8   0.119 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00      25.7   0.109 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00      44.7   0.070 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00      56.7   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00      59.2   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00      61.6   0.050 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00      64.1   0.050 0.100 142.18   4.2    22.4
Toe                                    295.5   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    58.68     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
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National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi          kip-ft   b/min
  678.8  9999.0   8.54   8.54  -10.77  33  35    23.36  35  10    20.7    40.4
  681.5  9999.0   8.55   8.54  -10.78  33  36    23.44  35  10    20.7    40.3
  684.2  9999.0   8.56   8.56  -10.80  33  36    23.51  35  10    20.8    40.3
  686.9  9999.0   8.57   8.57  -10.82  33  36    23.55  35  10    20.8    40.3
  689.5  9999.0   8.58   8.57  -10.84  33  36    23.58  35  10    20.7    40.3
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      58.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     448.2
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85      0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00      0.0   0.000 0.100   6.61   4.2    22.5
 26  0.254    16974 0.000 0.000 1.00      0.0   0.050 0.100  85.97   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00      7.1   0.050 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00     14.5   0.050 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00     16.2   0.050 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00     17.9   0.098 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00     15.7   0.119 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00     26.0   0.108 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00     45.0   0.070 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00     56.7   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00     59.2   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00     61.7   0.050 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00     64.0   0.050 0.100 142.18   4.2    22.4
Toe                                      64.3   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    58.72     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi          kip-ft   b/min
  448.2    87.9   8.16   8.16   -9.22  33  37    22.67  35  10    19.8    41.3
  450.9    90.1   8.17   8.17   -9.27  33  37    22.70  34  10    19.8    41.2
  453.6    91.4   8.18   8.18   -9.30  33  37    22.79  34  10    19.8    41.2
  456.3    92.7   8.19   8.19   -9.34  33  37    22.87  34  10    19.9    41.2
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  459.0    93.9   8.21   8.21   -9.38  33  37    22.95  34  10   19.9    41.2
♀
CCG3A : 06/21/2022 : KCA                                             06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                  (ft)      61.2  Standard Soil Setup
 Shaft Gain/Loss Factor          0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area              (in2)   201.060  Pile Type                        Pipe
 Pile Size            (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model           Total Capacity Rut  (kips)     473.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 25  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  82.66   4.2    22.4
 30  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100  99.20   4.2    22.4
 31  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100 102.50   4.2    22.4
 32  0.254    16974 0.000 0.000 1.00     3.7   0.050 0.100 105.81   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00    14.1   0.050 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00    15.8   0.050 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00    17.4   0.086 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00    17.5   0.108 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00    20.6   0.118 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00    39.4   0.082 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    56.1   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    58.6   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    61.1   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    63.5   0.050 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    41.3   0.083 0.100 142.18   4.2    22.4
Toe                                     64.3   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    61.20     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                             06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi             ksi         kip-ft   b/min
  473.4   102.9   8.21   8.28   -9.47  33  36    22.88  35  10   19.9    41.1
  476.7   104.7   8.23   8.29   -9.51  33  36    22.93  35  10   19.9    41.0
  479.9   106.4   8.24   8.30   -9.57  33  36    22.99  35  10   19.9    41.0
  483.1   108.2   8.26   8.31   -9.61  33  36    23.05  35  10   20.0    41.0
  486.4   110.3   8.29   8.33   -9.67  33  36    23.10  34  10   20.0    40.9
♀
CCG3A : 06/21/2022 : KCA                                             06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010
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 Depth                 (ft)      63.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     499.3
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 24  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  79.36   4.2    22.4
 31  0.254    16974 0.000 0.000 1.00     0.4   0.050 0.100 102.50   4.2    22.4
 32  0.254    16974 0.000 0.000 1.00    13.7   0.050 0.100 105.81   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00    15.3   0.050 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00    17.0   0.074 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00    18.8   0.100 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00    15.7   0.131 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00    33.9   0.097 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00    55.5   0.050 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    58.0   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    60.4   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    62.9   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    48.9   0.070 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    34.4   0.100 0.100 142.18   4.2    22.4
Toe                                     64.3   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    63.68     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi         kip-ft   b/min
  499.3   117.3   8.37   8.40   -9.75  32  36    23.17  34  10   20.1    40.7
  503.1   119.7   8.39   8.42   -9.79  32  36    23.23  34  10   20.2    40.7
  506.9   122.4   8.40   8.43   -9.83  32  36    23.30  34  10   20.2    40.7
  510.7   125.1   8.42   8.44   -9.87  32  36    23.36  34  10   20.2    40.6
  514.5   127.9   8.43   8.45   -9.91  32  36    23.44  34  10   20.3    40.6
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      63.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000
```

```
  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     484.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 24  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  79.36   4.2    22.4
 29  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100  95.89   4.2    22.4
 30  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  99.20   4.2    22.4
 31  0.254    16974 0.000 0.000 1.00     0.6   0.050 0.100 102.50   4.2    22.4
 32  0.254    16974 0.000 0.000 1.00    13.7   0.050 0.100 105.81   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00    15.4   0.050 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00    17.0   0.074 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00    18.8   0.100 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00    15.8   0.130 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00    34.2   0.097 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00    55.5   0.050 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    58.0   0.050 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    60.5   0.050 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    62.9   0.050 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    48.6   0.071 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    34.2   0.100 0.100 142.18   4.2    22.4
Toe                                     49.1   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    63.72     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi         kip-ft   b/min
  484.4   104.7   8.31    8.36   -9.59  32  37    23.09  34  10   20.0    40.8
  488.2   106.9   8.32    8.37   -9.63  32  37    23.16  34  10   20.1    40.8
  492.0   109.2   8.34    8.40   -9.69  32  36    23.22  34  10   20.1    40.8
  495.7   112.0   8.37    8.42   -9.75  32  36    23.27  34  10   20.1    40.7
  499.5   114.4   8.39    8.43   -9.79  32  36    23.34  34  10   20.1    40.7
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      88.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
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    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

       Pile and Soil Model            Total Capacity Rut  (kips)     549.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
     kips      k/in    ft    ft         kips     s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
 17  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  56.21   4.2    22.4
 24  0.254    16974 0.000 0.000 1.00     8.0   0.050 0.100  79.36   4.2    22.4
 25  0.254    16974 0.000 0.000 1.00    14.6   0.050 0.100  82.66   4.2    22.4
 26  0.254    16974 0.000 0.000 1.00    16.3   0.051 0.100  85.97   4.2    22.4
 27  0.254    16974 0.000 0.000 1.00    18.0   0.100 0.100  89.28   4.2    22.4
 28  0.254    16974 0.000 0.000 1.00    15.2   0.122 0.100  92.58   4.2    22.4
 29  0.254    16974 0.000 0.000 1.00    27.4   0.106 0.100  95.89   4.2    22.4
 30  0.254    16974 0.000 0.000 1.00    46.5   0.066 0.100  99.20   4.2    22.4
 31  0.254    16974 0.000 0.000 1.00    56.9   0.050 0.100 102.50   4.2    22.4
 32  0.254    16974 0.000 0.000 1.00    59.4   0.050 0.100 105.81   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00    61.8   0.050 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00    62.0   0.052 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00    33.9   0.100 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00    19.8   0.114 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00     8.1   0.150 0.100 122.34   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00     8.2   0.150 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00     8.4   0.150 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00     8.7   0.150 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00     9.0   0.150 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00     9.5   0.150 0.100 142.18   4.2    22.4
Toe                                    49.1   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    88.70     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi          kip-ft   b/min
  549.0   129.0   8.94    8.90   -9.71  24  30    24.31  27   9   20.7    39.5
  556.3   136.4   8.96    8.92   -9.87  24  30    24.37  27   9   20.7    39.5
  563.7   144.6   8.98    8.95  -10.02  24  30    24.43  27   9   20.8    39.4
  571.0   153.5   9.00    8.96  -10.16  24  30    24.49  27   9   20.8    39.4
  578.3   164.7   9.02    8.99  -10.29  24  30    24.50  27   9   20.8    39.4
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)     113.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
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    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

       Pile and Soil Model            Total Capacity Rut  (kips)     634.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85    0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00    0.0   0.000 0.100   6.61   4.2    22.5
  9  0.254    16974 0.000 0.000 1.00    0.0   0.050 0.100  29.76   4.2    22.4
 14  0.254    16974 0.000 0.000 1.00    0.0   0.100 0.100  46.29   4.2    22.4
 15  0.254    16974 0.000 0.000 1.00    0.0   0.050 0.100  49.60   4.2    22.4
 16  0.254    16974 0.000 0.000 1.00    2.0   0.050 0.100  52.90   4.2    22.4
 17  0.254    16974 0.000 0.000 1.00   13.9   0.050 0.100  56.21   4.2    22.4
 18  0.254    16974 0.000 0.000 1.00   15.5   0.050 0.100  59.52   4.2    22.4
 19  0.254    16974 0.000 0.000 1.00   17.2   0.080 0.100  62.82   4.2    22.4
 20  0.254    16974 0.000 0.000 1.00   18.4   0.103 0.100  66.13   4.2    22.5
 21  0.254    16974 0.000 0.000 1.00   17.8   0.125 0.100  69.44   4.2    22.4
 22  0.254    16974 0.000 0.000 1.00   36.6   0.090 0.100  72.74   4.2    22.4
 23  0.254    16974 0.000 0.000 1.00   55.8   0.050 0.100  76.05   4.2    22.4
 24  0.254    16974 0.000 0.000 1.00   58.3   0.050 0.100  79.36   4.2    22.4
 25  0.254    16974 0.000 0.000 1.00   60.7   0.050 0.100  82.66   4.2    22.4
 26  0.254    16974 0.000 0.000 1.00   63.2   0.050 0.100  85.97   4.2    22.4
 27  0.254    16974 0.000 0.000 1.00   45.2   0.076 0.100  89.28   4.2    22.4
 28  0.254    16974 0.000 0.000 1.00   31.4   0.102 0.100  92.58   4.2    22.4
 29  0.254    16974 0.000 0.000 1.00    8.1   0.150 0.100  95.89   4.2    22.4
 31  0.254    16974 0.000 0.000 1.00    8.2   0.150 0.100 102.50   4.2    22.4
 32  0.254    16974 0.000 0.000 1.00    8.3   0.150 0.100 105.81   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00    8.6   0.150 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00    8.8   0.150 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00    9.3   0.150 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00    9.7   0.150 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00   10.1   0.150 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00   10.6   0.150 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00   11.0   0.150 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00   11.4   0.150 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00   11.9   0.150 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00   12.3   0.150 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00   12.7   0.150 0.100 142.18   4.2    22.4
Toe                                    49.1   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   113.68     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
   634.5   297.8   9.38   9.30   -9.28  17  25    24.94  20   7   20.5    38.7
   646.5   356.5   9.40   9.32   -9.33  17  25    24.99  20   7   20.5    38.7
   658.5   439.5   9.42   9.33   -9.37  17  25    25.05  19   7   20.6    38.6
   670.5   614.4   9.35   9.35   -9.31  17  24    24.95  19   7   20.4    38.7
   682.5   851.0   9.36   9.36   -9.34  16  24    25.03  19   7   20.4    38.7
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010
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 Depth                 (ft)     113.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     610.1
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
  9  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  29.76   4.2    22.4
 14  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100  46.29   4.2    22.4
 15  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  49.60   4.2    22.4
 16  0.254    16974 0.000 0.000 1.00     2.2   0.050 0.100  52.90   4.2    22.4
 17  0.254    16974 0.000 0.000 1.00    13.9   0.050 0.100  56.21   4.2    22.4
 18  0.254    16974 0.000 0.000 1.00    15.6   0.050 0.100  59.52   4.2    22.4
 19  0.254    16974 0.000 0.000 1.00    17.2   0.080 0.100  62.82   4.2    22.4
 20  0.254    16974 0.000 0.000 1.00    18.3   0.103 0.100  66.13   4.2    22.5
 21  0.254    16974 0.000 0.000 1.00    18.1   0.124 0.100  69.44   4.2    22.4
 22  0.254    16974 0.000 0.000 1.00    36.8   0.089 0.100  72.74   4.2    22.4
 23  0.254    16974 0.000 0.000 1.00    55.8   0.050 0.100  76.05   4.2    22.4
 24  0.254    16974 0.000 0.000 1.00    58.3   0.050 0.100  79.36   4.2    22.4
 25  0.254    16974 0.000 0.000 1.00    60.8   0.050 0.100  82.66   4.2    22.4
 26  0.254    16974 0.000 0.000 1.00    63.2   0.050 0.100  85.97   4.2    22.4
 27  0.254    16974 0.000 0.000 1.00    44.9   0.077 0.100  89.28   4.2    22.4
 28  0.254    16974 0.000 0.000 1.00    31.1   0.102 0.100  92.58   4.2    22.4
 29  0.254    16974 0.000 0.000 1.00     8.1   0.150 0.100  95.89   4.2    22.4
 31  0.254    16974 0.000 0.000 1.00     8.2   0.150 0.100 102.50   4.2    22.4
 32  0.254    16974 0.000 0.000 1.00     8.3   0.150 0.100 105.81   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00     8.6   0.150 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00     8.8   0.150 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00     9.3   0.150 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00     9.7   0.150 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00    10.1   0.150 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00    10.6   0.150 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    11.0   0.150 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    11.4   0.150 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    11.9   0.150 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    12.3   0.150 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    12.7   0.150 0.100 142.18   4.2    22.4
Toe                                     24.6   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   113.72     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                            06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
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```
   kips    b/ft    down     up     ksi              ksi         kip-ft   b/min
  610.1   213.4   9.37   9.29   -9.28  17  25    24.90  20    7   20.4    38.7
  622.1   245.9   9.39   9.31   -9.33  17  25    24.95  19    7   20.5    38.7
  634.1   287.3   9.40   9.32   -9.37  17  25    25.02  19    7   20.5    38.6
  646.1   342.5   9.43   9.34   -9.37  17  24    25.08  19    7   20.5    38.6
  658.1   417.0   9.45   9.37   -9.39  17  24    25.16  19    7   20.6    38.6
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)     127.9  Standard Soil Setup
 Shaft Gain/Loss Factor          0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                      Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft                ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2         0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2         0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     653.1
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.000 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.000 0.100   6.61   4.2    22.5
  5  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  16.53   4.2    22.4
 10  0.254    16974 0.000 0.000 1.00     0.0   0.100 0.100  33.07   4.2    22.5
 11  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100  36.37   4.2    22.4
 12  0.254    16974 0.000 0.000 1.00     6.1   0.050 0.100  39.68   4.2    22.4
 13  0.254    16974 0.000 0.000 1.00    14.4   0.050 0.100  42.98   4.2    22.4
 14  0.254    16974 0.000 0.000 1.00    16.1   0.050 0.100  46.29   4.2    22.4
 15  0.254    16974 0.000 0.000 1.00    17.8   0.095 0.100  49.60   4.2    22.4
 16  0.254    16974 0.000 0.000 1.00    16.2   0.116 0.100  52.90   4.2    22.4
 17  0.254    16974 0.000 0.000 1.00    24.5   0.111 0.100  56.21   4.2    22.4
 18  0.254    16974 0.000 0.000 1.00    43.5   0.073 0.100  59.52   4.2    22.4
 19  0.254    16974 0.000 0.000 1.00    56.6   0.050 0.100  62.82   4.2    22.4
 20  0.254    16974 0.000 0.000 1.00    59.0   0.050 0.100  66.13   4.2    22.5
 21  0.254    16974 0.000 0.000 1.00    61.5   0.050 0.100  69.44   4.2    22.4
 22  0.254    16974 0.000 0.000 1.00    64.0   0.050 0.100  72.74   4.2    22.4
 23  0.254    16974 0.000 0.000 1.00    35.7   0.095 0.100  76.05   4.2    22.4
 24  0.254    16974 0.000 0.000 1.00    23.4   0.109 0.100  79.36   4.2    22.4
 25  0.254    16974 0.000 0.000 1.00     8.1   0.150 0.100  82.66   4.2    22.4
 27  0.254    16974 0.000 0.000 1.00     8.2   0.150 0.100  89.28   4.2    22.4
 28  0.254    16974 0.000 0.000 1.00     8.4   0.150 0.100  92.58   4.2    22.4
 29  0.254    16974 0.000 0.000 1.00     8.6   0.150 0.100  95.89   4.2    22.4
 30  0.254    16974 0.000 0.000 1.00     9.0   0.150 0.100  99.20   4.2    22.4
 31  0.254    16974 0.000 0.000 1.00     9.4   0.150 0.100 102.50   4.2    22.4
 32  0.254    16974 0.000 0.000 1.00     9.8   0.150 0.100 105.81   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00    10.3   0.150 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00    10.7   0.150 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00    11.1   0.150 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00    11.6   0.150 0.100 119.03   4.2    22.4
 37  0.254    16974 0.000 0.000 1.00    12.0   0.150 0.100 122.34   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00    12.4   0.150 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    12.0   0.150 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    10.0   0.150 0.100 132.26   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    10.0   0.150 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    10.1   0.150 0.100 142.18   4.2    22.4
Toe                                     24.6   0.150 0.267
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    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   127.93     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi          kip-ft   b/min
  653.1   323.4   9.65    9.56   -8.37  12  22    25.42  15   6   20.2    38.2
  667.4   402.8   9.67    9.59   -8.51  12  22    25.49  15   6   20.2    38.1
  681.8   520.0   9.69    9.60   -8.63  12  22    25.55  15   6   20.3    38.1
  696.1   710.9   9.71    9.62   -8.75  12  22    25.61  15   6   20.3    38.1
  710.5  1064.7   9.73    9.64   -8.85  12  22    25.68  15   6   20.4    38.0
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)     142.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.604  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    22.45   30000.    492.0      4.2        0    16807.     40.1
    142.2    22.45   30000.    492.0      4.2        0    16807.     40.1

 Wave Travel Time 2L/c (ms)    16.919

        Pile and Soil Model            Total Capacity Rut  (kips)     697.6
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.254    16974 0.010 0.000 0.85     0.0   0.050 0.100   3.31   4.2    22.5
  2  0.254    16974 0.000 0.000 1.00     0.0   0.050 0.100   6.61   4.2    22.5
  8  0.254    16974 0.000 0.000 1.00    10.4   0.050 0.100  26.45   4.2    22.4
  9  0.254    16974 0.000 0.000 1.00    14.9   0.050 0.100  29.76   4.2    22.4
 10  0.254    16974 0.000 0.000 1.00    16.6   0.060 0.100  33.07   4.2    22.5
 11  0.254    16974 0.000 0.000 1.00    18.3   0.100 0.100  36.37   4.2    22.4
 12  0.254    16974 0.000 0.000 1.00    13.8   0.131 0.100  39.68   4.2    22.4
 13  0.254    16974 0.000 0.000 1.00    31.2   0.102 0.100  42.98   4.2    22.4
 14  0.254    16974 0.000 0.000 1.00    50.4   0.059 0.100  46.29   4.2    22.4
 15  0.254    16974 0.000 0.000 1.00    57.3   0.050 0.100  49.60   4.2    22.4
 16  0.254    16974 0.000 0.000 1.00    59.8   0.050 0.100  52.90   4.2    22.4
 17  0.254    16974 0.000 0.000 1.00    62.3   0.050 0.100  56.21   4.2    22.4
 18  0.254    16974 0.000 0.000 1.00    56.8   0.059 0.100  59.52   4.2    22.4
 19  0.254    16974 0.000 0.000 1.00    34.1   0.100 0.100  62.82   4.2    22.4
 20  0.254    16974 0.000 0.000 1.00    15.2   0.123 0.100  66.13   4.2    22.5
 21  0.254    16974 0.000 0.000 1.00     8.1   0.150 0.100  69.44   4.2    22.4
 23  0.254    16974 0.000 0.000 1.00     8.3   0.150 0.100  76.05   4.2    22.4
 24  0.254    16974 0.000 0.000 1.00     8.5   0.150 0.100  79.36   4.2    22.4
 25  0.254    16974 0.000 0.000 1.00     8.7   0.150 0.100  82.66   4.2    22.4
 26  0.254    16974 0.000 0.000 1.00     9.1   0.150 0.100  85.97   4.2    22.4
 27  0.254    16974 0.000 0.000 1.00     9.5   0.150 0.100  89.28   4.2    22.4
 28  0.254    16974 0.000 0.000 1.00    10.0   0.150 0.100  92.58   4.2    22.4
 29  0.254    16974 0.000 0.000 1.00    10.4   0.150 0.100  95.89   4.2    22.4
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 30  0.254    16974 0.000 0.000 1.00    10.8   0.150 0.100  99.20   4.2    22.4
 31  0.254    16974 0.000 0.000 1.00    11.3   0.150 0.100 102.50   4.2    22.4
 32  0.254    16974 0.000 0.000 1.00    11.7   0.150 0.100 105.81   4.2    22.4
 33  0.254    16974 0.000 0.000 1.00    12.1   0.150 0.100 109.11   4.2    22.4
 34  0.254    16974 0.000 0.000 1.00    12.6   0.150 0.100 112.42   4.2    22.4
 35  0.254    16974 0.000 0.000 1.00    11.1   0.150 0.100 115.73   4.2    22.4
 36  0.254    16974 0.000 0.000 1.00    10.0   0.150 0.100 119.03   4.2    22.4
 38  0.254    16974 0.000 0.000 1.00    10.0   0.150 0.100 125.65   4.2    22.4
 39  0.254    16974 0.000 0.000 1.00    10.1   0.150 0.100 128.95   4.2    22.4
 40  0.254    16974 0.000 0.000 1.00    10.2   0.150 0.100 132.26   4.2    22.5
 41  0.254    16974 0.000 0.000 1.00    10.3   0.150 0.100 135.57   4.2    22.5
 42  0.254    16974 0.000 0.000 1.00    10.4   0.150 0.100 138.87   4.2    22.5
 43  0.254    16974 0.000 0.000 1.00    10.6   0.150 0.100 142.18   4.2    22.4
Toe                                     24.6   0.150 0.267

    10.906 kips total unreduced pile weight (g= 32.17 ft/s2)
    10.906 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   142.18     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
  697.6   555.3   9.78   9.70   -6.12   8  17    25.64  13   6   19.6    37.9
  714.4  1072.5   9.80   9.72   -6.12   8  17    25.69  11   5   19.6    37.9
  731.2  2345.1   9.82   9.75   -6.15   8  17    25.75  11   5   19.6    37.8
  748.0  9999.0   9.85   9.78   -6.18   8  17    25.82  11   5   19.7    37.8
  764.8  9999.0   9.87   9.79   -6.22   8  17    25.88  11   5   19.7    37.8
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

                                SUMMARY OVER DEPTHS

                        G/L at Shaft and Toe:  0.604  1.000
   Depth       Rut   Frictn    End Bg    Bl Ct Com Str Ten Str  Stroke   ENTHRU
      ft      kips     kips      kips    bl/ft     ksi     ksi      ft   kip-ft
     7.4       0.0      0.0       0.0      0.0   0.000   0.000   10.81      0.0
    14.9       0.0      0.0       0.0      0.0   0.000   0.000   10.81      0.0
    14.9       0.0      0.0       0.0      0.0   0.000   0.000   10.81      0.0
    16.1       0.0      0.0       0.0      0.0   0.000   0.000   10.81      0.0
    17.4       0.0      0.0       0.0      0.0   0.000   0.000   10.81      0.0
    17.4       0.0      0.0       0.0      0.0   0.000   0.000   10.81      0.0
    18.1       0.0      0.0       0.0      0.0   0.000   0.000   10.81      0.0
    18.9       0.0      0.0       0.0      0.0   0.000   0.000   10.81      0.0
    18.9       0.0      0.0       0.0      0.0   0.000   0.000   10.81      0.0
    25.6      33.0      7.0      26.0      2.6  14.301  -6.535    5.77     20.7
    32.4      64.3     38.3      26.0      4.7  15.936  -5.766    6.14     19.9
    32.4      64.5     38.5      26.0      4.7  15.941  -5.754    6.15     19.9
    34.9      77.8     51.8      26.0      6.1  16.518  -4.933    6.29     19.4
    37.4      92.1     66.2      26.0      7.7  17.051  -4.134    6.41     18.9
    37.4      97.0     66.3      30.7      8.2  17.157  -3.735    6.46     18.9
    38.7     101.2     70.5      30.7      8.7  17.352  -3.405    6.50     18.8
    39.9     105.4     74.7      30.7      9.2  17.694  -3.179    6.61     18.9
    39.9     218.3     75.0     143.3     29.0  19.374  -3.982    7.30     18.5
    41.8     236.7     93.4     143.3     32.6  19.797  -4.455    7.38     18.6
    43.7     255.7    112.3     143.3     36.5  20.251  -4.971    7.46     18.8
    43.7     408.4    112.9     295.5    143.4  21.572  -6.393    8.01     19.9
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    51.2    537.3    241.7    295.5   330.0  22.551  -9.478    8.26     20.2
    58.7    678.8    383.2    295.5  9999.0  23.356 -10.769    8.54     20.7
    58.7    448.2    383.8     64.3    87.9  22.669  -9.221    8.16     19.8
    61.2    473.4    409.1     64.3   102.9  22.880  -9.468    8.21     19.9
    63.7    499.3    435.0     64.3   117.3  23.166  -9.752    8.37     20.1
    63.7    484.4    435.2     49.1   104.7  23.092  -9.590    8.31     20.0
    88.7    549.0    499.9     49.1   129.0  24.315  -9.712    8.94     20.7
   113.7    634.5    585.4     49.1   297.8  24.937  -9.282    9.38     20.5
   113.7    610.1    585.5     24.6   213.4  24.900  -9.276    9.37     20.4
   127.9    653.1    628.5     24.6   323.4  25.418  -8.374    9.65     20.2
   142.2    697.6    673.1     24.6   555.3  25.645  -6.120    9.78     19.6

Refusal occurred; no driving time output possible
 ♀
 CCG3A : 06/21/2022 : KCA                                        06/21/2022
 National Engineering & Architectural Ser               GRLWEAP Version 2010

                                SUMMARY OVER DEPTHS

                        G/L at Shaft and Toe:  0.637  1.000
   Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
      ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
     7.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
    14.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
    14.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
    16.1      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
    17.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
    17.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
    18.1      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
    18.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
    18.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
    25.6     33.2      7.2     26.0     2.6  14.324  -6.531    5.77     20.7
    32.4     65.1     39.2     26.0     4.8  15.973  -5.742    6.15     19.9
    32.4     65.3     39.4     26.0     4.8  15.977  -5.726    6.15     19.9
    34.9     78.9     53.0     26.0     6.2  16.561  -4.884    6.30     19.3
    37.4     93.5     67.6     26.0     7.8  17.076  -4.053    6.43     18.9
    37.4     98.5     67.8     30.7     8.3  17.197  -3.670    6.47     18.9
    38.7    102.9     72.2     30.7     8.9  17.413  -3.338    6.51     18.8
    39.9    107.3     76.6     30.7     9.5  17.619  -3.011    6.56     18.6
    39.9    220.2     76.9    143.3    29.4  19.412  -4.050    7.30     18.5
    41.8    239.0     95.7    143.3    32.9  19.853  -4.510    7.39     18.7
    43.7    258.3    115.0    143.3    37.2  20.280  -5.064    7.46     18.8
    43.7    411.1    115.5    295.5   145.4  21.554  -6.510    8.02     20.0
    51.2    539.9    244.4    295.5   340.2  22.597  -9.534    8.26     20.2
    58.7    681.5    385.9    295.5  9999.0  23.437 -10.783    8.55     20.7
    58.7    450.9    386.5     64.3    90.1  22.700  -9.270    8.17     19.8
    61.2    476.7    412.3     64.3   104.7  22.933  -9.514    8.23     19.9
    63.7    503.1    438.8     64.3   119.7  23.233  -9.787    8.39     20.2
    63.7    488.2    439.0     49.1   106.9  23.160  -9.634    8.32     20.1
    88.7    556.3    507.2     49.1   136.4  24.372  -9.868    8.96     20.7
   113.7    646.5    597.4     49.1   356.5  24.993  -9.334    9.40     20.5
   113.7    622.1    597.6     24.6   245.9  24.946  -9.327    9.39     20.5
   127.9    667.4    642.9     24.6   402.8  25.486  -8.508    9.67     20.2
   142.2    714.4    689.9     24.6  1072.5  25.694  -6.120    9.80     19.6

Refusal occurred; no driving time output possible
 ♀
 CCG3A : 06/21/2022 : KCA                                        06/21/2022
 National Engineering & Architectural Ser               GRLWEAP Version 2010

                                SUMMARY OVER DEPTHS

                        G/L at Shaft and Toe:  0.670  1.000
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```
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      7.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     14.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     14.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     16.1      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     17.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     17.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     18.1      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     18.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     18.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     25.6     33.3      7.3     26.0     2.6  14.325  -6.530    5.78     20.7
     32.4     65.9     40.0     26.0     4.9  16.005  -5.708    6.16     19.9
     32.4     66.2     40.2     26.0     4.9  16.007  -5.693    6.16     19.9
     34.9     80.0     54.1     26.0     6.3  16.599  -4.834    6.31     19.3
     37.4     95.0     69.0     26.0     7.9  17.128  -4.007    6.44     18.9
     37.4     99.9     69.2     30.7     8.5  17.233  -3.594    6.48     18.8
     38.7    104.5     73.8     30.7     9.1  17.456  -3.251    6.53     18.7
     39.9    109.2     78.5     30.7     9.6  17.815  -2.984    6.64     18.8
     39.9    222.1     78.7    143.3    29.7  19.444  -4.115    7.31     18.5
     41.8    241.3     98.0    143.3    33.4  19.903  -4.567    7.40     18.7
     43.7    261.0    117.7    143.3    37.8  20.336  -5.154    7.47     18.8
     43.7    413.8    118.2    295.5   148.6  21.513  -6.625    8.02     20.0
     51.2    542.6    247.1    295.5   350.6  22.642  -9.586    8.27     20.2
     58.7    684.2    388.6    295.5  9999.0  23.513 -10.802    8.56     20.8
     58.7    453.6    389.2     64.3    91.4  22.787  -9.300    8.18     19.8
     61.2    479.9    415.5     64.3   106.4  22.994  -9.568    8.24     19.9
     63.7    506.9    442.6     64.3   122.4  23.299  -9.834    8.40     20.2
     63.7    492.0    442.8     49.1   109.2  23.222  -9.686    8.34     20.1
     88.7    563.7    514.5     49.1   144.6  24.430 -10.018    8.98     20.8
    113.7    658.5    609.4     49.1   439.5  25.046  -9.368    9.42     20.6
    113.7    634.1    609.6     24.6   287.3  25.021  -9.368    9.40     20.5
    127.9    681.8    657.2     24.6   520.0  25.551  -8.630    9.69     20.3
    142.2    731.2    706.6     24.6  2345.1  25.755  -6.151    9.82     19.6

Refusal occurred; no driving time output possible
 ♀
 CCG3A : 06/21/2022 : KCA                                           06/21/2022
 National Engineering & Architectural Ser                 GRLWEAP Version 2010

                              SUMMARY OVER DEPTHS

                        G/L at Shaft and Toe:  0.703  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      7.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     14.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     14.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     16.1      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     17.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     17.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     18.1      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     18.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     18.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     25.6     33.5      7.5     26.0     2.6  14.329  -6.523    5.78     20.6
     32.4     66.8     40.8     26.0     4.9  16.048  -5.680    6.17     19.9
     32.4     67.0     41.0     26.0     4.9  16.041  -5.647    6.17     19.8
     34.9     81.1     55.2     26.0     6.4  16.646  -4.791    6.32     19.3
     37.4     96.4     70.4     26.0     8.0  17.172  -3.939    6.45     18.9
     37.4    101.3     70.6     30.7     8.6  17.290  -3.548    6.49     18.8
     38.7    106.2     75.5     30.7     9.2  17.503  -3.169    6.54     18.7
     39.9    111.1     80.4     30.7     9.8  17.859  -2.877    6.65     18.8
     39.9    224.0     80.6    143.3    30.0  19.492  -4.181    7.33     18.5
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     41.8    243.6    100.3    143.3    33.9  19.921  -4.628    7.41     18.7
     43.7    263.7    120.4    143.3    38.4  20.395  -5.243    7.49     18.8
     43.7    416.5    120.9    295.5   152.5  21.531  -6.739    8.02     19.9
     51.2    545.3    249.8    295.5   362.1  22.687  -9.640    8.27     20.2
     58.7    686.9    391.3    295.5  9999.0  23.549 -10.824    8.57     20.8
     58.7    456.3    391.9     64.3    92.7  22.870  -9.336    8.19     19.9
     61.2    483.1    418.8     64.3   108.2  23.052  -9.614    8.26     20.0
     63.7    510.7    446.3     64.3   125.1  23.365  -9.873    8.42     20.2
     63.7    495.7    446.6     49.1   112.0  23.274  -9.749    8.37     20.1
     88.7    571.0    521.9     49.1   153.5  24.488 -10.158    9.00     20.8
    113.7    670.5    621.4     49.1   614.4  24.946  -9.314    9.35     20.4
    113.7    646.1    621.6     24.6   342.5  25.079  -9.370    9.43     20.5
    127.9    696.1    671.6     24.6   710.9  25.609  -8.746    9.71     20.3
    142.2    748.0    723.4     24.6  9999.0  25.818  -6.176    9.85     19.7

Refusal occurred; no driving time output possible
 ♀
 CCG3A : 06/21/2022 : KCA                                            06/21/2022
 National Engineering & Architectural Ser                GRLWEAP Version 2010

                              SUMMARY OVER DEPTHS

                      G/L at Shaft and Toe:  0.736  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      7.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     14.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     14.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     16.1      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     17.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     17.4      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     18.1      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     18.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     18.9      0.0      0.0      0.0     0.0   0.000   0.000   11.86      0.0
     25.6     33.6      7.6     26.0     2.6  14.355  -6.525    5.78     20.7
     32.4     67.6     41.6     26.0     5.0  16.065  -5.635    6.17     19.8
     32.4     67.8     41.8     26.0     5.0  16.075  -5.616    6.18     19.8
     34.9     82.2     56.3     26.0     6.5  16.682  -4.744    6.33     19.2
     37.4     97.8     71.8     26.0     8.2  17.212  -3.878    6.46     18.9
     37.4    102.7     72.0     30.7     8.8  17.320  -3.469    6.50     18.8
     38.7    107.8     77.1     30.7     9.4  17.564  -3.089    6.55     18.7
     39.9    112.9     82.2     30.7    10.0  17.915  -2.778    6.66     18.8
     39.9    225.8     82.5    143.3    30.3  19.534  -4.246    7.33     18.6
     41.8    245.9    102.5    143.3    34.3  19.974  -4.688    7.42     18.7
     43.7    266.4    123.1    143.3    38.9  20.448  -5.328    7.50     18.8
     43.7    419.2    123.6    295.5   156.9  21.571  -6.852    8.03     19.9
     51.2    548.0    252.5    295.5   366.4  22.774  -9.676    8.28     20.3
     58.7    689.5    394.0    295.5  9999.0  23.583 -10.845    8.58     20.7
     58.7    459.0    394.6     64.3    93.9  22.947  -9.379    8.21     19.9
     61.2    486.4    422.0     64.3   110.3  23.103  -9.665    8.29     20.0
     63.7    514.5    450.1     64.3   127.9  23.435  -9.913    8.43     20.3
     63.7    499.5    450.4     49.1   114.4  23.340  -9.794    8.39     20.1
     88.7    578.3    529.2     49.1   164.7  24.502 -10.286    9.02     20.8
    113.7    682.5    633.4     49.1   851.0  25.031  -9.339    9.36     20.4
    113.7    658.1    633.6     24.6   417.0  25.158  -9.391    9.45     20.6
    127.9    710.5    685.9     24.6  1064.7  25.676  -8.852    9.73     20.4
    142.2    764.8    740.2     24.6  9999.0  25.878  -6.225    9.87     19.7

Refusal occurred; no driving time output possible
 ♀
 CCG3A : 06/21/2022 : KCA                                            06/21/2022
 National Engineering & Architectural Ser                GRLWEAP Version 2010
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          Table of Depths Analyzed with Driving System Modifiers

           Temp.       Wait Equivalent Pressure            Stiffn.   Cushion
  Depth   Length       Time     Stroke    Ratio   Efficy.   Factor       CoR
     ft       ft         hr         ft
   7.45   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  14.88   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  14.92   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  16.15   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  17.38   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  17.42   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  18.15   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  18.88   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  18.92   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  25.65   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  32.38   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  32.42   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  34.90   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  37.38   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  37.42   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  38.65   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  39.88   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  39.92   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  41.80   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  43.68   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  43.72   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  51.20   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  58.68   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  58.72   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  61.20   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  63.68   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  63.72   142.18       0.00      10.81     1.00      0.80     1.00      1.00
  88.70   142.18       0.00      10.81     1.00      0.80     1.00      1.00
 113.68   142.18       0.00      10.81     1.00      0.80     1.00      1.00
 113.72   142.18       0.00      10.81     1.00      0.80     1.00      1.00
 127.93   142.18       0.00      10.81     1.00      0.80     1.00      1.00
 142.18   142.18       0.00      10.81     1.00      0.80     1.00      1.00


                        Soil Layer Resistance Values
         Shaft      End   Shaft     Toe   Shaft     Toe    Soil   Limit   Setup
Depth     Res. Bearing   Quake   Quake Damping Damping   Setup Distance   Time
   ft    k/ft2    kips    inch    inch    s/ft    s/ft Normlzd      ft     hrs
 0.01     0.00    0.00   0.100   0.267   0.050   0.150   0.000   6.000   1.000
 9.01     0.00    0.00   0.100   0.267   0.050   0.150   0.000   6.000   1.000
14.89     0.00    0.00   0.100   0.267   0.050   0.150   0.000   6.000   1.000
14.91     0.00    0.00   0.100   0.267   0.050   0.150   0.000   6.000   1.000
17.39     0.00    0.00   0.100   0.267   0.050   0.150   0.000   6.000   1.000
17.41     0.00    0.00   0.100   0.267   0.100   0.150   0.515   6.000  24.000
18.89     0.00    0.00   0.100   0.267   0.100   0.150   0.515   6.000  24.000
18.91     0.00    0.00   0.100   0.267   0.050   0.150   0.515   6.000  24.000
23.89     0.00    0.00   0.100   0.267   0.050   0.150   0.515   6.000  24.000
23.90     1.16   25.97   0.100   0.267   0.050   0.150   0.515   6.000  24.000
27.91     1.35   25.97   0.100   0.267   0.050   0.150   0.515   6.000  24.000
32.39     1.55   25.97   0.100   0.267   0.050   0.150   0.515   6.000  24.000
32.41     1.55   25.97   0.100   0.267   0.100   0.150   0.515   6.000  24.000
37.39     1.79   25.97   0.100   0.267   0.100   0.150   0.515   6.000  24.000
37.41     1.35   30.70   0.100   0.267   0.150   0.150   1.000   6.000 168.000
39.89     1.35   30.70   0.100   0.267   0.150   0.150   1.000   6.000 168.000
39.91     2.90  143.33   0.100   0.267   0.100   0.150   0.515   6.000  24.000
43.69     3.06  143.33   0.100   0.267   0.100   0.150   0.515   6.000  24.000
43.71     3.91  295.54   0.100   0.267   0.050   0.150   0.000   6.000   1.000
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   52.71    4.40  295.54   0.100   0.267   0.050   0.150   0.000   6.000   1.000
   58.69    4.72  295.54   0.100   0.267   0.050   0.150   0.000   6.000   1.000
   58.71    3.01   64.34   0.100   0.267   0.100   0.150   0.515   6.000  24.000
   63.69    3.17   64.34   0.100   0.267   0.100   0.150   0.515   6.000  24.000
   63.71    0.97   49.13   0.100   0.267   0.150   0.150   1.000   6.000  24.000
   72.71    0.97   49.13   0.100   0.267   0.150   0.150   1.000   6.000  24.000
   81.71    1.05   49.13   0.100   0.267   0.150   0.150   1.000   6.000  24.000
   90.71    1.19   49.13   0.100   0.267   0.150   0.150   1.000   6.000  24.000
   99.71    1.33   49.13   0.100   0.267   0.150   0.150   1.000   6.000  24.000
  108.71    1.47   49.13   0.100   0.267   0.150   0.150   1.000   6.000  24.000
  113.69    1.55   49.13   0.100   0.267   0.150   0.150   1.000   6.000  24.000
  113.71    1.19   24.56   0.100   0.267   0.150   0.150   1.000   6.000 168.000
  122.71    1.19   24.56   0.100   0.267   0.150   0.150   1.000   6.000 168.000
  131.71    1.22   24.56   0.100   0.267   0.150   0.150   1.000   6.000 168.000
  140.71    1.26   24.56   0.100   0.267   0.150   0.150   1.000   6.000 168.000
  142.18    1.27   24.56   0.100   0.267   0.150   0.150   1.000   6.000 168.000
```

FORWARD ABUTMENT

Gain/Loss 3 at Shaft and Toe 0.500 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
7.0	8.5	2.2	6.3	0.0	0.000	0.000	11.86	0.0
14.0	16.9	8.7	8.2	1.5	13.760	-2.850	4.47	22.5
14.0	47.0	8.7	38.2	3.9	16.969	-0.512	5.24	22.3
14.5	49.2	9.6	39.6	4.2	17.093	-0.367	5.28	22.1
15.0	51.4	10.5	40.9	4.4	17.216	-0.219	5.32	21.9
15.0	31.0	10.6	20.4	2.2	15.368	-1.666	4.91	24.0
16.2	33.0	12.7	20.4	2.3	15.632	-1.647	4.95	23.8
17.5	35.2	14.9	20.4	2.5	15.842	-1.551	4.98	23.6
17.5	45.8	15.0	30.8	3.6	16.718	-0.726	5.20	22.5
18.8	48.4	17.6	30.8	3.9	16.954	-0.631	5.25	22.3
20.0	51.2	20.4	30.8	4.1	17.160	-0.502	5.29	22.1
20.0	23.8	20.5	3.3	1.7	14.719	-2.864	4.67	22.6
21.9	26.0	22.7	3.3	1.9	15.090	-2.651	4.73	22.5
23.7	28.3	25.0	3.3	2.0	15.538	-2.683	4.83	23.2
23.7	117.9	25.1	92.8	11.8	21.534	-2.250	6.15	20.2
25.6	127.0	33.9	93.2	12.7	21.950	-3.185	6.24	20.3
27.5	136.9	43.4	93.5	13.6	22.292	-4.012	6.34	20.4
27.5	170.7	43.7	127.1	18.8	25.678	-5.464	6.78	21.2
29.0	179.5	52.4	127.1	20.2	25.729	-6.153	6.86	21.3
30.4	188.8	61.7	127.1	21.8	25.856	-6.857	6.97	21.5
30.4	70.1	61.9	8.2	4.9	19.093	-0.786	5.47	21.3
31.5	73.4	65.2	8.2	5.2	19.344	-0.675	5.52	21.2
32.5	76.8	68.6	8.2	5.5	19.637	-0.600	5.56	21.1
32.5	72.0	68.7	3.3	4.9	19.384	-0.873	5.49	21.3
33.8	73.2	69.9	3.3	5.1	19.530	-0.769	5.52	21.2
35.0	74.3	71.0	3.3	5.3	19.764	-0.701	5.54	21.1
35.0	82.2	71.1	11.1	6.2	20.150	-0.085	5.66	20.8
36.5	86.5	75.4	11.1	6.8	20.520	0.000	5.72	20.7
38.0	90.8	79.7	11.1	7.5	20.749	0.000	5.74	20.4
38.0	92.5	79.8	12.8	7.8	20.818	0.000	5.77	20.3
39.2	97.0	84.3	12.8	8.3	21.117	0.000	5.83	20.3
40.5	101.6	88.8	12.8	8.8	21.394	0.000	5.89	20.2
40.5	119.8	89.0	30.8	10.7	22.046	-1.885	6.10	19.9
44.7	143.1	112.2	30.8	12.6	22.964	-3.427	6.32	19.9
48.8	167.7	136.8	30.8	15.0	23.807	-3.796	6.56	20.2
48.8	182.4	137.1	45.3	17.3	24.403	-5.217	6.80	20.8
51.3	196.4	151.0	45.3	19.7	24.766	-5.989	6.95	21.0
53.8	210.7	165.4	45.3	22.6	25.245	-6.715	7.12	21.3
53.8	192.2	165.5	26.6	18.1	24.878	-5.300	6.93	20.8
68.9	228.8	202.1	26.6	26.3	26.673	-6.681	7.51	21.4
84.0	268.9	242.3	26.6	41.3	28.011	-7.615	8.08	22.0
84.0	266.0	242.4	23.6	39.6	27.963	-7.538	8.04	21.9
96.9	293.5	269.9	23.6	58.9	28.374	-6.448	8.25	21.6
109.8	323.2	299.6	23.6	109.1	29.248	-4.749	8.42	21.0
109.8	308.6	299.7	8.9	74.7	29.095	-4.724	8.31	20.8
124.0	347.3	338.5	8.9	200.3	30.232	-2.836	8.44	19.8
138.3	389.3	380.5	8.9	9999.0	30.677	-1.559	8.54	18.4

Refusal occurred; no driving time output possible

Gain/Loss 3 at Shaft and Toe 0.500 / 1.000 (Continued)

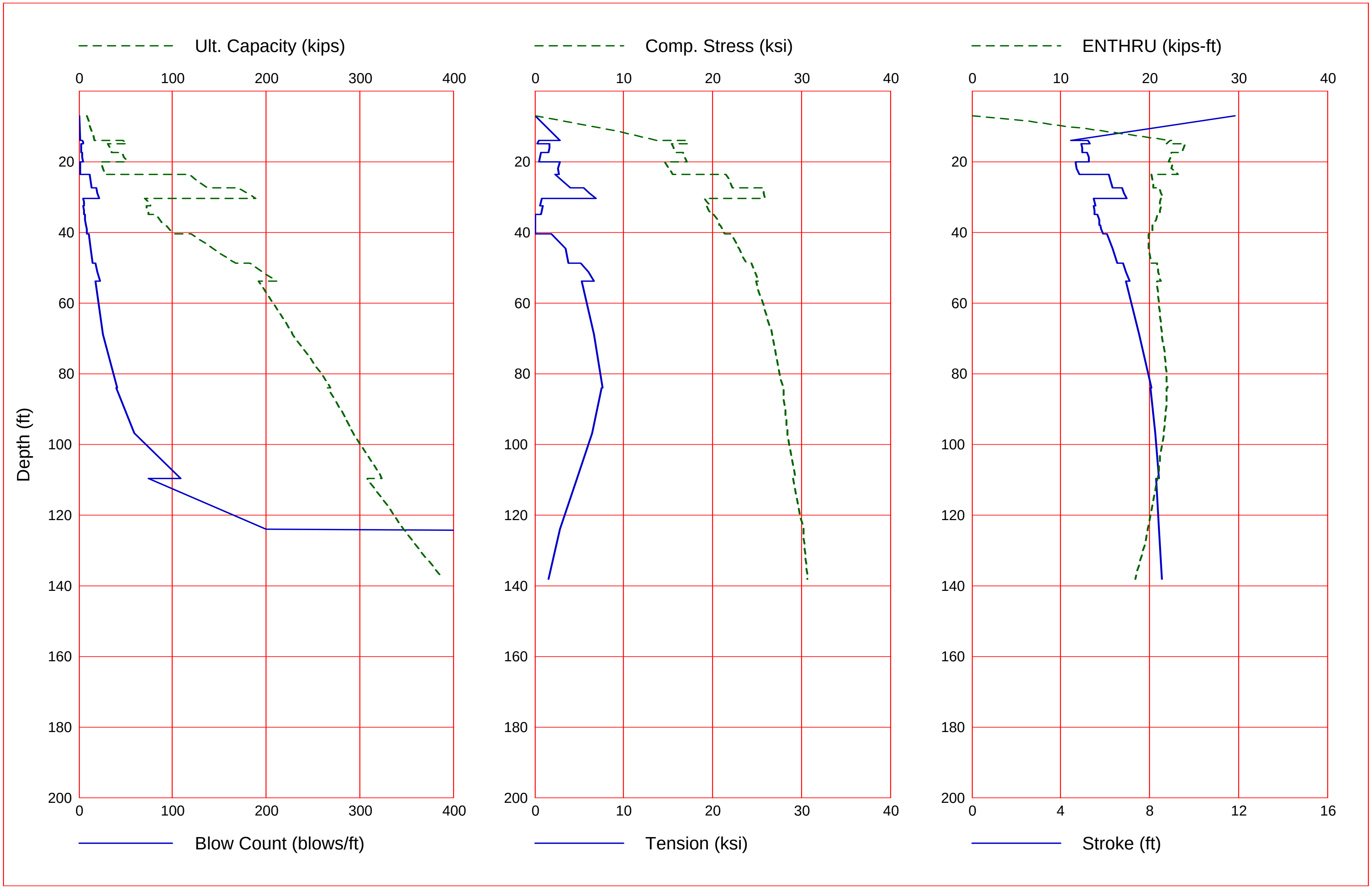
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
96.9	293.5	269.9	23.6	58.9	28.374	-6.448	8.25	21.6
109.8	323.2	299.6	23.6	109.1	29.248	-4.749	8.42	21.0
109.8	308.6	299.7	8.9	74.7	29.095	-4.724	8.31	20.8
124.0	347.3	338.5	8.9	200.3	30.232	-2.836	8.44	19.8
138.3	389.3	380.5	8.9	9999.0	30.677	-1.559	8.54	18.4

Refusal occurred; no driving time output possible

National Engineering & Architectural Ser
CCG3A : 06/21/2022 : KCA

Jun 21 2022
GRLWEAP Version 2010

Gain/Loss 3 at Shaft and Toe 0.500 / 1.000



GRLWEAP - Version 2010
WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS

written by GRL Engineers, Inc. (formerly Goble Rausche Likins
and Associates, Inc.) with cooperation from Pile Dynamics, Inc.

ABOUT THE WAVE EQUATION ANALYSIS RESULTS

The GRLWEAP program simulates the behavior of a preformed pile driven by either an impact hammer or a vibratory hammer. The program is based on mathematical models, which describe motion and forces of hammer, driving system, pile and soil under the hammer action. Under certain conditions, the models only crudely approximate, often complex, dynamic situations.

A wave equation analysis generally relies on input data, which represents normal situations. In particular, the hammer data file supplied with the program assumes that the hammer is in good working order. All of the input data selected by the user may be the best available information at the time when the analysis is performed. However, input data and therefore results may significantly differ from actual field conditions.

Therefore, the program authors recommend prudent use of the GRLWEAP results. Soil response and hammer performance should be verified by static and/or dynamic testing and measurements. Estimates of bending or other local stresses (e.g., helmet or clamp contact, uneven rock surfaces etc.), prestress effects and others must also be accounted for by the user.

The calculated capacity - blow count relationship, i.e. the bearing graph, should be used in conjunction with observed blow counts for the capacity assessment of a driven pile. Soil setup occurring after pile installation may produce bearing capacity values that differ substantially from those expected from a wave equation analysis due to soil setup or relaxation. This is particularly true for pile driven with vibratory hammers. The GRLWEAP user must estimate such effects and should also use proper care when applying blow counts from restrike because of the variability of hammer energy, soil resistance and blow count during early restriking.

Finally, the GRLWEAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of building and other factors.

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 ♀
 Input  File: C:\USERS\KARENS\DESKTOP\GRL FILES\FA12IN.GWW
 Hammer File: C:\ProgramData\PDI\GRLWEAP\2010\Resource\HAMMER2010.GW
 Hammer File Version:  2003 (10/17/2016)

                        Input File Contents
     CCG3A : 06/21/2022 : KCA
 OUT OSG HAM STR FUL PEL  N SPL N-U P-D %SK ISM  0 PHI RSA ITR H-D MXT     DEx
-100   0  41   0   0   0  0   0   0   1   0   0  0   0   0   0   0   0   0.000
    Pile g  Hammer g  Toe Area Pile Size           Pile Type
    32.170    32.170   113.090    12.000                Pipe
      W Cp      A Cp      E Cp      T Cp       CoR      ROut      StCp
     2.500    11.630     530.0     2.000     0.800     0.010       0.0
      A Cu      E Cu      T Cu       CoR      ROut      StCu
     0.000       0.0     0.000     0.000     0.000       0.0
      LPle      APle      EPle      WPle      Peri        CI       CoR      ROut
   138.280     11.63   30000.0   492.000     3.141         0     0.850     0.010
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 FFatigue        F0  0-Bottom
        0     0.000     0.000
Manufac  Hmr Name  HmrType No Seg-s
DELMAG   D 19-42        1         5
   Ram Wt     Ram L   Ram Dia   MaxStrk   RtdStrk    Efficy
     4.00    129.10     12.60     11.86     10.81      0.80
   IB. Wt     IB. L    IB.Dia    IB CoR     IB RO
     0.75     25.30     12.60     0.900     0.010
 CompStrk A Chamber V Chamber   C Delay  C Duratn Exp Coeff VolCStart  Vol CEnd
    16.65    124.70    157.70    0.0020    0.0020     1.250      0.00      0.00
    P atm        P1        P2        P3        P4        P5
    14.70   1600.00   1440.00   1295.00   1165.00      0.00
   Stroke    Effic.  Pressure  R-Weight   T-Delay Exp-Coeff   Eps-Str  Total-AW
  10.8100    0.8000 1600.0000    0.0000    0.0000    0.0000    0.0100    0.0000
       Qs        Qt        Js        Jt        Qx        Jx      Rati      Dept
    0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
 Research Soil Model: Atoe, Plug,  Gap, Q-fac
    0.000     0.000     0.000     0.000
 Research Soil Model: RD-skn: m, d, toe: m, d
    0.000     0.000     0.000     0.000
 Res. Distribution
   Dpth    Rskn      Rtoe      Qs      Qt      Js      Jt   SU F   LimL    TSf0
   0.01    0.00      0.01    0.10    0.20    0.05    0.15   1.00   6.00   1.000
   9.01    0.25      8.15    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  13.99    0.40      8.21    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  14.01    0.69     38.21    0.10    0.20    0.10    0.15   1.21   6.00  24.000
  14.99    0.74     40.93    0.10    0.20    0.10    0.15   1.21   6.00  24.000
  15.01    0.62     20.36    0.10    0.20    0.05    0.15   1.21   6.00  24.000
  17.49    0.72     20.36    0.10    0.20    0.05    0.15   1.21   6.00  24.000
  17.51    0.79     30.84    0.10    0.20    0.10    0.15   1.21   6.00  24.000
  19.99    0.90     30.84    0.10    0.20    0.10    0.15   1.21   6.00  24.000
  20.01    0.58      3.33    0.10    0.20    0.15    0.15   1.49   6.00 168.000
  23.69    0.58      3.33    0.10    0.20    0.15    0.15   1.49   6.00 168.000
  23.71    1.43     92.81    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  27.49    1.68     93.51    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  27.51    1.90    127.08    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  30.39    2.12    127.08    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  30.41    1.01      8.21    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  32.49    1.07      8.21    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  32.51    0.60      3.33    0.10    0.20    0.20    0.15   2.00   6.00 168.000
  34.99    0.60      3.33    0.10    0.20    0.20    0.15   2.00   6.00 168.000
  35.01    1.38     11.10    0.10    0.20    0.15    0.15   1.49   6.00 168.000
  37.99    1.38     11.10    0.10    0.20    0.15    0.15   1.49   6.00 168.000
  38.01    1.38     12.75    0.10    0.20    0.10    0.15   1.21   6.00  24.000
  40.49    1.43     12.75    0.10    0.20    0.10    0.15   1.21   6.00  24.000
  40.51    1.74     30.84    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  48.79    1.95     30.84    0.10    0.20    0.05    0.15   1.00   6.00   1.000
  48.81    2.12     45.35    0.10    0.20    0.10    0.15   1.21   6.00  24.000
  53.79    2.26     45.35    0.10    0.20    0.10    0.15   1.21   6.00  24.000
  53.81    1.14     26.65    0.10    0.10    0.15    0.15   1.49   6.00  24.000
  62.81    1.14     26.65    0.10    0.10    0.15    0.15   1.49   6.00  24.000
  71.81    1.22     26.65    0.10    0.10    0.15    0.15   1.49   6.00  24.000
  80.81    1.31     26.65    0.10    0.10    0.15    0.15   1.49   6.00  24.000
  83.99    1.34     26.65    0.10    0.10    0.15    0.15   1.49   6.00  24.000
  84.01    1.01     23.59    0.10    0.10    0.15    0.15   1.49   6.00 168.000
  93.01    1.01     23.59    0.10    0.10    0.15    0.15   1.49   6.00 168.000
 102.01    1.08     23.59    0.10    0.10    0.15    0.15   1.49   6.00 168.000
 109.79    1.15     23.59    0.10    0.10    0.15    0.15   1.49   6.00 168.000
 109.81    1.29      8.88    0.10    0.20    0.15    0.15   1.49   6.00 168.000
 118.81    1.29      8.88    0.10    0.20    0.15    0.15   1.49   6.00 168.000
 127.81    1.37      8.88    0.10    0.20    0.15    0.15   1.49   6.00 168.000
 136.81    1.46      8.88    0.10    0.20    0.15    0.15   1.49   6.00 168.000
 138.28    1.47      8.88    0.10    0.20    0.15    0.15   1.49   6.00 168.000
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Gain/Loss factors: shaft and toe
 0.40000   0.45000   0.50000   0.55000   0.60000
 1.00000   1.00000   1.00000   1.00000   1.00000
    Dpth         L      Wait      Strk      Pmx%      Eff.      Stff       CoR
    7.00      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   13.98      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   14.02      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   14.50      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   14.98      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   15.02      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   16.25      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   17.48      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   17.52      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   18.75      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   19.98      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   20.02      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   21.85      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   23.68      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   23.72      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   25.60      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   27.48      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   27.52      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   28.95      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   30.38      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   30.42      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   31.45      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   32.48      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   32.52      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   33.75      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   34.98      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   35.02      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   36.50      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   37.98      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   38.02      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   39.25      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   40.48      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   40.52      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   44.65      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   48.78      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   48.82      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   51.30      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   53.78      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   53.82      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   68.90      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   83.98      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   84.02      0.00      0.00     0.000       0.0     0.000     0.000     0.000
   96.90      0.00      0.00     0.000       0.0     0.000     0.000     0.000
  109.78      0.00      0.00     0.000       0.0     0.000     0.000     0.000
  109.82      0.00      0.00     0.000       0.0     0.000     0.000     0.000
  124.03      0.00      0.00     0.000       0.0     0.000     0.000     0.000
  138.28      0.00      0.00     0.000       0.0     0.000     0.000     0.000
    0.00      0.00      0.00     0.000       0.0     0.000     0.000     0.000
♀          GRLWEAP: WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS
                                Version 2010
                               English Units

                 CCG3A : 06/21/2022 : KCA
                 ________________________________________

          Hammer Model:   D 19-42             Made by:      DELMAG

          No.    Weight    Stiffn       CoR     C-Slk     Dampg
                   kips    k/inch                  ft    k/ft/s
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              1     0.800
              2     0.800  140046.6     1.000    0.0000
              3     0.800  140046.6     1.000    0.0000
              4     0.800  140046.6     1.000    0.0000
              5     0.800  140046.6     1.000    0.0000
      Imp Block     0.753   70735.6     0.900    0.0100
      Helmet        2.500    3081.9     0.800    0.0100       5.8
      Combined Pile Top      8620.7

HAMMER OPTIONS:
  Hammer File ID No.                41  Hammer Type                OE Diesel
  Stroke Option              FxdP-VarS  Stroke Convergence Crit.       0.010
  Fuel Pump Setting            Maximum

HAMMER DATA:
  Ram Weight          (kips)      4.00  Ram Length          (inch)    129.10
  Maximum Stroke        (ft)     11.86
  Rated Stroke          (ft)     10.81  Efficiency                     0.800

  Maximum Pressure     (psi)   1600.00  Actual Pressure      (psi)   1600.00
  Compression Exponent           1.350  Expansion Exponent             1.250
  Ram Diameter        (inch)     12.60
  Combustion Delay       (s)   0.00200  Ignition Duration      (s)   0.00200

            The Hammer Data Includes Estimated (NON-MEASURED) Quantities
            ____________________________________________________________



  HAMMER CUSHION                        PILE CUSHION
  Cross Sect. Area     (in2)     11.63  Cross Sect. Area     (in2)      0.00
  Elastic-Modulus      (ksi)     530.0  Elastic-Modulus      (ksi)       0.0
  Thickness           (inch)      2.00  Thickness           (inch)      0.00
  Coeff of Restitution             0.8  Coeff of Restitution             1.0
  RoundOut              (ft)       0.0  RoundOut              (ft)       0.0
  Stiffness        (kips/in)    3081.9  Stiffness        (kips/in)       0.0

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 National Engineering & Architectural Ser                GRLWEAP Version 2010

  Depth                 (ft)       7.0  Standard Soil Setup
  Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

  PILE PROFILE:
  Toe Area             (in2)   113.090  Pile Type                       Pipe
  Pile Size           (inch)    12.000

   L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
        ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
       0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
     138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

  Wave Travel Time 2L/c (ms)    16.455

         Pile and Soil Model            Total Capacity Rut  (kips)       8.5
 No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
       kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
   1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
   2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
  39  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 131.53   3.1    11.6
  40  0.134     8621 0.000 0.000 1.00     0.6   0.050 0.100 134.91   3.1    11.6
  41  0.134     8621 0.000 0.000 1.00     1.6   0.050 0.100 138.28   3.1    11.6
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Toe                                      6.3   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)

 PILE, SOIL, ANALYSIS OPTIONS:
 Uniform pile                          Pile Segments: Automatic
 No. of Slacks/Splices              0  Pile Damping           (%)         1
                                       Pile Damping Fact.(k/ft/s)     0.415
 Driveability Analysis
 Soil Damping Option            Smith
 Max No Analysis Iterations         0  Time Increment/Critical          160
 Output Time Interval               1  Analysis Time-Input   (ms)         0
 Output Level: Normal
 Gravity Mass, Pile, Hammer:   32.170    32.170    32.170
 Output Segment Generation: Automatic

    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
     7.00     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)     8.7     8.5
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)     8.7     8.5
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)     8.7     8.5
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)     8.7     8.5
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)     8.7     8.5
 Hammer+Pile Weight > Rult: Pile Runs
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    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi                ksi        kip-ft   b/min
    8.5     0.0  10.81   0.00    0.00   1   0     0.00   1   0    0.0    78.4
    8.5     0.0  11.86   0.00    0.00   1   0     0.00   1   0    0.0    74.4
    8.5     0.0  11.86   0.00    0.00   1   0     0.00   1   0    0.0    74.4
    8.5     0.0  11.86   0.00    0.00   1   0     0.00   1   0    0.0    74.4
    8.5     0.0  11.86   0.00    0.00   1   0     0.00   1   0    0.0    74.4
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      14.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
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       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      16.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     0.7   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     1.7   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     2.7   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     3.7   0.050 0.100 138.28   3.1    11.6
Toe                                      8.2   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    13.98     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
   16.9     1.5   4.47   4.48   -2.85  11  21    13.76   1   6   22.5    56.0
   16.9     1.5   4.47   4.48   -2.85  11  21    13.76   1   6   22.5    56.0
   16.9     1.5   4.47   4.48   -2.85  11  21    13.76   1   6   22.5    56.0
   16.9     1.5   4.47   4.48   -2.85  11  21    13.76   1   6   22.5    56.0
   16.9     1.5   4.47   4.48   -2.85  11  21    13.76   1   6   22.5    56.0
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      14.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                        Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      47.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     0.7   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     1.7   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     2.7   0.050 0.100 134.91   3.1    11.6
```

```
 41  0.134     8621 0.000 0.000 1.00     3.7   0.051 0.100 138.28   3.1    11.6
Toe                                     38.2   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    14.02     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
   47.0     3.9   5.24   5.23   -0.50   4  21    16.93  31  11   22.3    51.7
   47.0     3.9   5.24   5.23   -0.51   4  21    16.96  31  11   22.3    51.7
   47.0     3.9   5.24   5.23   -0.51   4  21    16.97  31  11   22.3    51.7
   47.0     3.9   5.24   5.23   -0.51   4  21    16.97  31  11   22.3    51.7
   47.0     3.9   5.25   5.22   -0.50   4  21    16.95  31  11   22.3    51.7
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      14.5  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                        Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp       EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.      20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.      20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      49.2
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     0.8   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     1.8   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     2.8   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     4.1   0.063 0.100 138.28   3.1    11.6
Toe                                     39.6   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    14.50     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
```

```
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
   49.2     4.2   5.28   5.26   -0.37   3  21    17.10  31  11   22.1    51.5
   49.2     4.2   5.28   5.26   -0.37   3  21    17.10  31  11   22.1    51.5
   49.2     4.2   5.28   5.26   -0.37   3  21    17.09  31  11   22.1    51.5
   49.2     4.2   5.28   5.27   -0.37   3  21    17.09  31  11   22.1    51.5
   49.2     4.2   5.28   5.27   -0.37   3  21    17.09  31  11   22.1    51.5
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      15.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      51.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     0.1   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     1.0   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     2.0   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     3.0   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     4.5   0.072 0.100 138.28   3.1    11.6
Toe                                     40.9   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    14.98     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
   51.4     4.4   5.32   5.30   -0.24   3  21    17.27  31  11   22.0    51.3
   51.4     4.4   5.32   5.30   -0.23   3  21    17.23  31  10   22.0    51.3
   51.4     4.4   5.32   5.31   -0.22   3  21    17.22  31  10   21.9    51.3
   51.5     4.4   5.32   5.30   -0.23   3  21    17.27  31  11   22.0    51.3
   51.5     4.4   5.32   5.31   -0.24   3  21    17.27  31  11   22.0    51.3
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      15.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
```

```
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp     EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model           Total Capacity Rut  (kips)      30.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     0.1   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     1.0   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     2.0   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     3.0   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     4.5   0.073 0.100 138.28   3.1    11.6
Toe                                     20.4   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    15.02     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi             ksi         kip-ft   b/min
   30.9     2.2   4.91   4.89   -1.67   7  20    15.37  10   7   24.0    53.6
   30.9     2.2   4.91   4.89   -1.67   7  20    15.36  10   7   24.0    53.5
   31.0     2.2   4.91   4.89   -1.67   7  20    15.37  10   7   24.0    53.5
   31.0     2.3   4.91   4.90   -1.69   7  20    15.39   9   6   24.0    53.5
   31.0     2.3   4.91   4.90   -1.71   7  20    15.43  10   7   24.0    53.5
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      16.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor          1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp     EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model           Total Capacity Rut  (kips)      32.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     0.3   0.050 0.100 124.79   3.1    11.6
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 38  0.134     8621 0.000 0.000 1.00     1.3   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     2.3   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     3.4   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     5.1   0.068 0.100 138.28   3.1    11.6
Toe                                     20.4   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    16.25     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                             06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi         kip-ft   b/min
   32.9     2.3   4.94   4.93   -1.62   7  20    15.57   6   6   23.8    53.3
   32.9     2.3   4.94   4.93   -1.61   7  20    15.57   6   6   23.8    53.3
   33.0     2.3   4.95   4.93   -1.65   7  20    15.63   7   6   23.8    53.3
   33.1     2.4   4.95   4.93   -1.63   7  20    15.62   7   6   23.8    53.3
   33.2     2.4   4.95   4.93   -1.62   7  20    15.62   7   6   23.8    53.3
♀
CCG3A : 06/21/2022 : KCA                                             06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      17.5  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                        Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      35.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     0.7   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     1.7   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     2.7   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     3.8   0.053 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     5.7   0.064 0.100 138.28   3.1    11.6
Toe                                     20.4   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    17.48     10.81      1.00     0.800
♀
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CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i    t Comp Str   i    t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi                 ksi         kip-ft   b/min
   35.0     2.5   4.98   4.96   -1.56   7  20    15.80   5   6   23.6    53.1
   35.1     2.5   4.98   4.97   -1.58   7  20    15.86   6   6   23.6    53.1
   35.2     2.5   4.98   4.97   -1.55   7  20    15.84   6   6   23.6    53.1
   35.4     2.5   4.99   4.97   -1.53   7  20    15.83   6   6   23.6    53.1
   35.5     2.5   4.99   4.97   -1.54   7  20    15.88   6   6   23.6    53.1
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      17.5  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                         Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft               ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      45.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     0.7   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     1.7   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     2.7   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     3.8   0.054 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     5.7   0.064 0.100 138.28   3.1    11.6
Toe                                     30.8   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    17.52     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i    t Comp Str   i    t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi                 ksi         kip-ft   b/min
   45.5     3.6   5.20   5.18   -0.71   5  20    16.66  30  10   22.5    52.0
   45.7     3.6   5.20   5.18   -0.71   5  20    16.66  30  10   22.5    51.9
   45.8     3.6   5.20   5.18   -0.73   5  20    16.72  15   7   22.5    51.9
   45.9     3.6   5.20   5.18   -0.70   5  20    16.70  15   7   22.5    51.9
   46.1     3.6   5.21   5.18   -0.71   5  20    16.74  15   7   22.5    51.9
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010
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 Depth                 (ft)      18.8  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      48.1
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     0.2   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     1.1   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     2.1   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     3.1   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     4.7   0.071 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     6.1   0.071 0.100 138.28   3.1    11.6
Toe                                     30.8   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    18.75     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi         kip-ft   b/min
   48.1     3.8   5.24   5.22   -0.63   4  20    16.91  17   8   22.3    51.7
   48.2     3.8   5.24   5.22   -0.62   4  20    16.91  17   8   22.3    51.7
   48.4     3.9   5.25   5.23   -0.63   4  20    16.95  17   8   22.3    51.7
   48.6     3.9   5.25   5.23   -0.61   4  20    16.94  18   8   22.3    51.7
   48.8     3.9   5.25   5.23   -0.61   4  20    16.95  18   8   22.3    51.7
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      20.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455
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        Pile and Soil Model            Total Capacity Rut  (kips)      50.8
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     0.4   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     1.4   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     2.5   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     3.5   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     5.3   0.067 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     6.8   0.089 0.100 138.28   3.1    11.6
Toe                                     30.8   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    19.98     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi           kip-ft   b/min
   50.8     4.1   5.29   5.27   -0.51   4  20    17.11  20   8   22.1    51.5
   51.0     4.1   5.29   5.27   -0.53   4  21    17.17  20   8   22.1    51.5
   51.2     4.1   5.29   5.28   -0.50   4  21    17.16  20   8   22.1    51.5
   51.5     4.2   5.30   5.28   -0.51   4  21    17.22  20   8   22.1    51.4
   51.7     4.2   5.30   5.28   -0.51   4  21    17.25  20   8   22.1    51.4
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      20.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                      Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      23.3
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     0.4   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     1.5   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     2.5   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     3.5   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     5.3   0.067 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     6.8   0.089 0.100 138.28   3.1    11.6
Toe                                      3.3   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
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```
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    20.02     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                        06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut    Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi         kip-ft   b/min
   23.3     1.7   4.65    4.69   -2.88   9  20    14.63   1   5   22.6    54.8
   23.6     1.7   4.66    4.70   -2.91   9  20    14.71   1   5   22.6    54.7
   23.8     1.7   4.67    4.70   -2.86   9  20    14.72   1   5   22.6    54.7
   24.0     1.7   4.68    4.71   -2.87   9  20    14.78   1   5   22.6    54.6
   24.3     1.7   4.68    4.71   -2.88   9  20    14.84   1   5   22.6    54.6
♀
CCG3A : 06/21/2022 : KCA                                        06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      21.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                        Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      25.3
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     0.1   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     1.0   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     2.0   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     3.0   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     4.5   0.072 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     6.0   0.067 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     5.4   0.122 0.100 138.28   3.1    11.6
Toe                                      3.3   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    21.85     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                        06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut    Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi         kip-ft   b/min
   25.3     1.8   4.71    4.75   -2.70   8  20    15.02   1   5   22.5    54.4
```

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   25.7     1.8   4.72   4.76   -2.68   8  20    15.06   1   5   22.5    54.3
   26.0     1.9   4.73   4.77   -2.65   8  20    15.09   1   5   22.5    54.3
   26.4     1.9   4.78   4.77   -2.75   8  20    15.29   2   5   22.7    54.1
   26.7     1.9   4.79   4.78   -2.70   8  20    15.30   3   5   22.7    54.1
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      23.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1         0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1         0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      27.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft          kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     0.5   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     1.5   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     2.5   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     3.6   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     5.5   0.067 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     6.6   0.096 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     3.7   0.150 0.100 138.28   3.1    11.6
Toe                                      3.3   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    23.68     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi             ksi          kip-ft   b/min
   27.4     1.9   4.81   4.79   -2.63   8  20    15.41   4   6   22.7    54.0
   27.8     2.0   4.82   4.81   -2.66   4  52    15.45   5   6   23.0    53.9
   28.3     2.0   4.83   4.82   -2.68   4  52    15.54   6   6   23.2    53.9
   28.7     2.0   4.85   4.83   -2.70   5  52    15.61   7   6   23.4    53.8
   29.2     2.0   4.86   4.85   -2.70   5  52    15.67   7   6   23.6    53.8
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      23.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
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```
 Toe Area             (in2)   113.090  Pile Type                      Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft                ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     116.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft          kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     0.5   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     1.5   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     2.6   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     3.6   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     5.5   0.066 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     6.6   0.097 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     3.8   0.149 0.100 138.28   3.1    11.6
Toe                                     92.8   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    23.72     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up      ksi                ksi        kip-ft   b/min
  116.9    11.8   6.14   6.16   -2.14  28  50    21.38  38  12   20.2    47.3
  117.4    11.8   6.15   6.16   -2.20  29  50    21.45  38  12   20.2    47.3
  117.9    11.8   6.15   6.17   -2.25  29  50    21.53  38  12   20.2    47.3
  118.3    11.9   6.16   6.18   -2.32  29  50    21.52  38  12   20.2    47.3
  118.8    11.9   6.16   6.18   -2.37  29  50    21.61  38  12   20.2    47.3
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      25.6  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                      Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft                ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     126.1
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
```

```
      kips      k/in    ft    ft         kips    s/ft  inch     ft    ft      in2
  1  0.134     8621 0.010 0.000 0.85      0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00      0.0   0.000 0.100   6.75   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00      0.2   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00      1.1   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00      2.1   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00      3.1   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00      4.7   0.071 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00      6.2   0.072 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00      5.0   0.128 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     10.5   0.073 0.100 138.28   3.1    11.6
Toe                                      93.2   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    25.60     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                               06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
  126.1    12.6   6.23   6.25   -3.09  30  50    21.88  38  12   20.3    47.0
  126.6    12.6   6.24   6.25   -3.13  30  50    21.93  38  12   20.3    47.0
  127.0    12.7   6.24   6.26   -3.18  30  50    21.95  38  12   20.3    46.9
  127.5    12.7   6.25   6.26   -3.24  31  50    21.94  38  12   20.3    46.9
  128.0    12.8   6.25   6.27   -3.28  31  50    22.01  38  12   20.3    46.9
♀
CCG3A : 06/21/2022 : KCA                                               06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      27.5  Standard Soil Setup
 Shaft Gain/Loss Factor          0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area              (in2)   113.090  Pile Type                        Pipe
 Pile Size            (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

         Pile and Soil Model            Total Capacity Rut  (kips)     136.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft         kips    s/ft  inch     ft    ft      in2
  1  0.134     8621 0.010 0.000 0.85      0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00      0.0   0.000 0.100   6.75   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00      0.0   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00      0.7   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00      1.7   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00      2.7   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00      3.7   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00      5.7   0.066 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00      6.4   0.106 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00      5.1   0.125 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     16.6   0.050 0.100 138.28   3.1    11.6
```

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Toe                                    93.5   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    27.48     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi             ksi         kip-ft   b/min
  136.0    13.5   6.33    6.34   -3.93  34  50    22.29  38  12   20.4    46.6
  136.5    13.5   6.33    6.34   -3.97  34  50    22.32  38  12   20.4    46.6
  136.9    13.6   6.34    6.35   -4.01  34  50    22.29  38  12   20.4    46.6
  137.4    13.6   6.34    6.36   -4.05  34  50    22.37  38  12   20.4    46.6
  137.9    13.7   6.35    6.36   -4.09  34  50    22.37  38  12   20.4    46.5
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      27.5  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.     492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.     492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     169.8
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     0.7   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     1.7   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     2.7   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     3.7   0.051 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     5.7   0.065 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     6.3   0.107 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     5.3   0.123 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00    16.7   0.050 0.100 138.28   3.1    11.6
Toe                                   127.1   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    27.52     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
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National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi          kip-ft   b/min
  169.8    18.6   6.77   6.73   -5.39  24  45    25.64  39  12   21.2    45.1
  170.3    18.7   6.78   6.73   -5.43  24  45    25.67  39  12   21.2    45.1
  170.7    18.8   6.78   6.74   -5.46  24  45    25.68  39  12   21.2    45.1
  171.2    18.9   6.78   6.75   -5.50  24  45    25.67  39  12   21.2    45.0
  171.7    18.9   6.79   6.75   -5.54  24  45    25.72  39  12   21.2    45.0
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                (ft)      29.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area            (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

       Pile and Soil Model           Total Capacity Rut  (kips)     178.6
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
         kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85      0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00      0.0   0.000 0.100   6.75   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00      0.2   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00      1.1   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00      2.1   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00      3.1   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00      4.7   0.071 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00      6.2   0.072 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00      5.0   0.128 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     10.4   0.074 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     18.7   0.050 0.100 138.28   3.1    11.6
Toe                                     127.1   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    28.95     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi          kip-ft   b/min
  178.6    20.0   6.86   6.83   -6.08  25  45    25.76  39  12   21.4    44.8
  179.1    20.1   6.86   6.83   -6.12  25  45    25.77  39  12   21.4    44.8
  179.5    20.2   6.86   6.84   -6.15  25  45    25.73  39  12   21.3    44.8
  180.0    20.3   6.87   6.84   -6.19  25  45    25.79  39  12   21.4    44.7
  180.5    20.4   6.88   6.85   -6.23  25  45    25.75  39  12   21.4    44.7
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
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National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      30.4  Standard Soil Setup
 Shaft Gain/Loss Factor          0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)    113.090  Pile Type                       Pipe
 Pile Size           (inch)     12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)     16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     187.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     0.5   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     1.5   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     2.5   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     3.5   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     5.5   0.067 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     6.7   0.095 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     3.7   0.150 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    16.1   0.051 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00    20.7   0.050 0.100 138.28   3.1    11.6
Toe                                    127.1   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    30.38     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                              06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
  187.9    21.6   6.95   6.92   -6.79  26  45    25.87  39  12   21.5    44.5
  188.3    21.7   6.96   6.92   -6.82  26  45    25.89  39  12   21.6    44.5
  188.8    21.8   6.97   6.93   -6.86  26  45    25.86  39  12   21.5    44.4
  189.2    21.9   6.97   6.94   -6.89  26  45    25.84  39  12   21.5    44.4
  189.7    22.0   6.97   6.95   -6.93  27  45    25.82  39  12   21.5    44.4
♀
CCG3A : 06/21/2022 : KCA                                              06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      30.4  Standard Soil Setup
 Shaft Gain/Loss Factor          0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)    113.090  Pile Type                       Pipe
 Pile Size           (inch)     12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
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       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      69.2
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134      8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134      8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 32  0.134      8621 0.000 0.000 1.00     0.0   0.050 0.100 107.93   3.1    11.6
 33  0.134      8621 0.000 0.000 1.00     0.5   0.050 0.100 111.30   3.1    11.6
 34  0.134      8621 0.000 0.000 1.00     1.5   0.050 0.100 114.67   3.1    11.6
 35  0.134      8621 0.000 0.000 1.00     2.5   0.050 0.100 118.04   3.1    11.6
 36  0.134      8621 0.000 0.000 1.00     3.6   0.050 0.100 121.42   3.1    11.6
 37  0.134      8621 0.000 0.000 1.00     5.5   0.067 0.100 124.79   3.1    11.6
 38  0.134      8621 0.000 0.000 1.00     6.6   0.096 0.100 128.16   3.1    11.6
 39  0.134      8621 0.000 0.000 1.00     3.7   0.150 0.100 131.53   3.1    11.6
 40  0.134      8621 0.000 0.000 1.00    16.2   0.050 0.100 134.91   3.1    11.6
 41  0.134      8621 0.000 0.000 1.00    20.7   0.050 0.100 138.28   3.1    11.6
Toe                                      8.2   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    30.42     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi                ksi         kip-ft   b/min
   69.2     4.8   5.46    5.44   -0.79   4  20    18.95  32  11   21.3    50.6
   69.6     4.9   5.47    5.44   -0.77   4  20    19.00  32  11   21.3    50.6
   70.1     4.9   5.47    5.45   -0.79   4  20    19.09  32  11   21.3    50.5
   70.6     5.0   5.48    5.46   -0.74   4  20    19.09  32  11   21.3    50.5
   71.0     5.0   5.49    5.46   -0.75   4  20    19.17  32  11   21.3    50.4
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      31.5  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      72.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134      8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
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  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     0.1   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     0.8   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     1.8   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     2.9   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     4.2   0.065 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     5.8   0.064 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     5.9   0.115 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     7.2   0.099 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    17.4   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00    18.2   0.050 0.100 138.28   3.1    11.6
Toe                                      8.2   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    31.45     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi          kip-ft   b/min
   72.5     5.1   5.51   5.49   -0.70   4  20    19.24  32  11   21.2    50.3
   73.0     5.2   5.51   5.49   -0.68   4  20    19.29  32  11   21.2    50.3
   73.4     5.2   5.52   5.50   -0.68   4  20    19.34  32  11   21.2    50.3
   73.9     5.2   5.53   5.50   -0.64   4  20    19.36  32  11   21.2    50.2
   74.3     5.3   5.53   5.51   -0.64   4  20    19.43  32  11   21.2    50.2
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      32.5  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

       Pile and Soil Model           Total Capacity Rut  (kips)      75.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft          kips    s/ft  inch     ft    ft      in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     0.2   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     1.1   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     2.2   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     3.2   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     4.8   0.070 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     6.3   0.074 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     4.8   0.130 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    11.0   0.070 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    18.9   0.050 0.100 134.91   3.1    11.6
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 41  0.134     8621 0.000 0.000 1.00    15.2   0.050 0.100 138.28   3.1    11.6
Toe                                      8.2   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    32.48     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi           kip-ft   b/min
   75.9     5.4   5.54   5.53   -0.61   4  20    19.49  32  11    21.1    50.1
   76.4     5.4   5.55   5.53   -0.61   4  20    19.59  32  11    21.1    50.1
   76.8     5.5   5.56   5.54   -0.60   4  20    19.64  32  11    21.1    50.1
   77.3     5.5   5.56   5.54   -0.55   4  20    19.63  32  11    21.1    50.0
   77.8     5.5   5.57   5.55   -0.52   4  20    19.66  32  11    21.1    50.0
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      32.5  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1         0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1         0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      71.1
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft          kips    s/ft  inch     ft    ft      in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     0.2   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     1.2   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     2.2   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     3.2   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     4.8   0.070 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     6.3   0.075 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     4.8   0.131 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    11.2   0.070 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    18.9   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00    15.0   0.050 0.100 138.28   3.1    11.6
Toe                                      3.3   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    32.52     10.81      1.00     0.800
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♀
CCG3A : 06/21/2022 : KCA                                       06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
   71.1     4.8   5.48   5.45   -0.91   5  20    19.28  32  11   21.3    50.5
   71.6     4.9   5.48   5.46   -0.90   5  20    19.34  32  11   21.3    50.5
   72.0     4.9   5.49   5.47   -0.87   5  20    19.38  32  11   21.3    50.5
   72.5     5.0   5.50   5.47   -0.84   4  20    19.42  32  11   21.3    50.4
   73.0     5.0   5.50   5.48   -0.83   4  20    19.47  32  11   21.3    50.4
♀
CCG3A : 06/21/2022 : KCA                                       06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                  (ft)      33.8  Standard Soil Setup
 Shaft Gain/Loss Factor          0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area              (in2)   113.090  Pile Type                       Pipe
 Pile Size            (inch)    12.000

  L b Top      Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp       EA/c
       ft       in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0     11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3     11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)     16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      72.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     0.5   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     1.5   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     2.5   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     3.5   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     5.5   0.067 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     6.7   0.095 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     3.7   0.150 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    16.0   0.051 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    20.7   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     7.9   0.088 0.100 138.28   3.1    11.6
Toe                                      3.3   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    33.75     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                       06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
   72.0     5.0   5.50   5.48   -0.81   4  20    19.45  32  11   21.3    50.4
   72.6     5.0   5.51   5.49   -0.80   4  20    19.49  32  11   21.2    50.3
   73.2     5.1   5.52   5.50   -0.77   4  20    19.53  32  11   21.2    50.3
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   73.8     5.1   5.52   5.50   -0.75   4  20    19.58  32  11   21.2    50.3
   74.4     5.2   5.53   5.51   -0.73   4  20    19.64  32  11   21.2    50.2
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      35.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft               ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      73.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     0.1   0.050 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     0.9   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     1.9   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     2.9   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     4.3   0.068 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     5.9   0.065 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     5.7   0.117 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     7.8   0.093 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    17.7   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    17.7   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     4.8   0.142 0.100 138.28   3.1    11.6
Toe                                      3.3   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    34.98     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi             ksi         kip-ft   b/min
   73.0     5.1   5.53   5.51   -0.74   4  20    19.61  32  11   21.2    50.2
   73.6     5.2   5.54   5.52   -0.73   4  20    19.71  32  11   21.2    50.2
   74.3     5.3   5.54   5.52   -0.70   4  20    19.76  32  11   21.1    50.2
   75.0     5.3   5.56   5.53   -0.68   4  20    19.85  32  11   21.1    50.1
   75.7     5.4   5.57   5.55   -0.62   4  20    19.83  32  11   21.1    50.0
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      35.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000
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 PILE PROFILE:
 Toe Area            (in2)   113.090  Pile Type                       Pipe
 Pile Size          (inch)    12.000

   L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
        ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
       0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
     138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

         Pile and Soil Model           Total Capacity Rut  (kips)      80.8
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     0.1   0.050 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     0.9   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     1.9   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     2.9   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     4.3   0.069 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     5.9   0.065 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     5.7   0.118 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     7.9   0.092 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    17.7   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    17.6   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     4.8   0.144 0.100 138.28   3.1    11.6
Toe                                     11.1   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    35.02     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi          kip-ft   b/min
   80.8     6.1   5.64   5.62   -0.18   3  20    20.01  32  11   20.9    49.7
   81.5     6.1   5.65   5.63   -0.15   3  21    20.11  32  11   20.9    49.6
   82.2     6.2   5.66   5.64   -0.08   3  21    20.15  32  11   20.8    49.6
   82.9     6.3   5.67   5.65   -0.03   3  21    20.20  32  11   20.8    49.5
   83.6     6.4   5.68   5.66    0.00   1   0    20.22  32  11   20.8    49.5
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                   (ft)      36.5  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area            (in2)   113.090  Pile Type                       Pipe
 Pile Size          (inch)    12.000

   L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
        ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
       0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
     138.3    11.63   30000.    492.0      3.1        0    16807.     20.8
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 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      84.6
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     0.3   0.050 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     1.3   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     2.3   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     3.4   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     5.1   0.068 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     6.6   0.084 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     4.1   0.142 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00    13.6   0.059 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    19.8   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    11.6   0.065 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     5.3   0.168 0.100 138.28   3.1    11.6
Toe                                     11.1   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    36.50     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                              06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
   84.6     6.5   5.70   5.68    0.00   1   0    20.34  32  11   20.7    49.4
   85.6     6.6   5.71   5.69    0.00   1   0    20.47  32  11   20.8    49.3
   86.5     6.8   5.72   5.71    0.00   1   0    20.52  32  11   20.7    49.3
   87.4     6.9   5.74   5.72    0.00   1   0    20.55  32  11   20.7    49.2
   88.3     7.1   5.69   5.75    0.00   1   0    20.49  32  11   20.4    49.2
♀
CCG3A : 06/21/2022 : KCA                                              06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                  (ft)      38.0  Standard Soil Setup
 Shaft Gain/Loss Factor          0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      88.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     0.8   0.050 0.100 104.55   3.1    11.6
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 32  0.134     8621 0.000 0.000 1.00     1.8   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     2.8   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     4.0   0.060 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     5.8   0.064 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     6.0   0.113 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     6.5   0.107 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00    17.1   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    18.8   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     5.8   0.123 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     8.1   0.153 0.100 138.28   3.1    11.6
Toe                                     11.1   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    37.98     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi                ksi         kip-ft   b/min
   88.5     7.1   5.77   5.75    0.00   1   0    20.73  32  11   20.6    49.1
   89.6     7.4   5.73   5.78    0.00   1   0    20.65  32  11   20.4    49.1
   90.8     7.5   5.74   5.80    0.00   1   0    20.75  32  11   20.4    49.0
   91.9     7.6   5.76   5.81    0.00   1   0    20.80  32  11   20.3    48.9
   93.0     7.8   5.77   5.83    0.00   1   0    20.84  32  11   20.3    48.8
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      38.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                        Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model             Total Capacity Rut  (kips)      90.3
No. Weight   Stiffn C-Slk T-Slk  CoR   Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     0.8   0.050 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     1.8   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     2.8   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     4.0   0.061 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     5.8   0.064 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     6.0   0.113 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     6.6   0.105 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00    17.2   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    18.7   0.050 0.100 131.53   3.1    11.6
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 40  0.134     8621 0.000 0.000 1.00     5.7   0.125 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     8.2   0.152 0.100 138.28   3.1    11.6
Toe                                     12.8   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    38.02     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
   90.3     7.5   5.73   5.79    0.00   1   0    20.67  32  11   20.4    49.0
   91.4     7.6   5.75   5.80    0.00   1   0    20.71  32  11   20.3    48.9
   92.5     7.8   5.77   5.82    0.00   1   0    20.82  32  11   20.3    48.9
   93.7     7.9   5.79   5.83    0.00   1   0    20.89  32  11   20.3    48.8
   94.8     8.1   5.80   5.85    0.00   1   0    20.97  32  11   20.3    48.7
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      39.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft                ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

       Pile and Soil Model           Total Capacity Rut  (kips)      94.6
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft       kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     0.2   0.050 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     1.1   0.050 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     2.2   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     3.2   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     4.8   0.070 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     6.3   0.075 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     4.8   0.131 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00    11.1   0.070 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00    18.9   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    15.1   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     4.2   0.178 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     9.9   0.131 0.100 138.28   3.1    11.6
Toe                                     12.8   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)
```

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    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    39.25     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi                ksi          kip-ft   b/min
   94.6     7.9   5.79   5.84    0.00   1   0    20.91  32  11   20.3    48.8
   95.8     8.1   5.81   5.86    0.00   1   0    21.05  32  11   20.3    48.7
   97.0     8.3   5.83   5.87    0.00   1   0    21.12  32  11   20.3    48.7
   98.2     8.4   5.84   5.89    0.00   1   0    21.15  32  11   20.2    48.5
   99.4     8.6   5.86   5.90    0.00   1   0    21.26  32  11   20.2    48.5
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      40.5  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                        Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)      98.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     0.5   0.050 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     1.5   0.050 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     2.5   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     3.5   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     5.5   0.067 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     6.7   0.094 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     3.7   0.150 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00    16.0   0.051 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00    20.7   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     8.0   0.087 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     6.4   0.160 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00    11.0   0.113 0.100 138.28   3.1    11.6
Toe                                     12.8   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    40.48     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010
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    Rut    Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips     b/ft   down     up     ksi              ksi          kip-ft   b/min
   98.9      8.5   5.85   5.90    0.00   1   0    21.23  32  11   20.2    48.5
  100.2      8.7   5.87   5.92    0.00   1   0    21.27  32  11   20.1    48.4
  101.6      8.8   5.89   5.93    0.00   1   0    21.39  32  11   20.2    48.4
  102.9      9.0   5.91   5.95    0.00   1   0    21.49  32  11   20.1    48.3
  104.2      9.1   5.92   5.96    0.00   1   0    21.57  32  11   20.1    48.2
♀
CCG3A : 06/21/2022 : KCA                                               06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                    (ft)      40.5  Standard Soil Setup
 Shaft Gain/Loss Factor          0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area              (in2)   113.090  Pile Type                        Pipe
 Pile Size            (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     117.2
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     0.5   0.050 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     1.5   0.050 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     2.5   0.050 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     3.6   0.050 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     5.5   0.067 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     6.7   0.095 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     3.7   0.150 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00    16.1   0.051 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00    20.8   0.050 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     7.8   0.089 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     6.5   0.160 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00    11.1   0.112 0.100 138.28   3.1    11.6
Toe                                     30.8   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    40.52     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                               06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut    Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips     b/ft   down     up     ksi              ksi          kip-ft   b/min
  117.2     10.5   6.07   6.10   -1.54  30  50    21.89  32  11   19.9    47.6
  118.5     10.6   6.09   6.11   -1.73  30  50    21.93  32  11   19.8    47.6
  119.8     10.7   6.10   6.12   -1.89  30  50    22.05  32  11   19.9    47.5
  121.1     10.8   6.12   6.14   -2.07  30  50    22.07  32  11   19.8    47.5
  122.5     11.0   6.13   6.15   -2.22  30  50    22.17  32  11   19.8    47.4
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♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      44.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     140.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00     0.7   0.050 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     1.8   0.050 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     2.8   0.050 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     3.9   0.058 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     5.8   0.064 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     6.1   0.112 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     6.2   0.110 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00    17.0   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00    19.0   0.050 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     5.9   0.120 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     7.9   0.153 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    13.3   0.088 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00    19.1   0.050 0.100 138.28   3.1    11.6
Toe                                     30.8   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    44.65     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
  140.5    12.3   6.28   6.31   -3.28  30  50    22.77  32  11   19.8    46.8
  141.8    12.4   6.30   6.32   -3.31  29  47    22.86  32  11   19.8    46.7
  143.1    12.6   6.32   6.33   -3.43  29  47    22.96  32  11   19.9    46.7
  144.4    12.7   6.33   6.35   -3.53  29  47    23.01  32  11   19.9    46.6
  145.7    12.8   6.35   6.36   -3.62  29  47    23.12  32  11   19.9    46.6
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      48.8  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000
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 PILE PROFILE:
 Toe Area            (in2)   113.090  Pile Type                      Pipe
 Pile Size          (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     165.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134      8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134      8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 27  0.134      8621 0.000 0.000 1.00     0.1   0.050 0.100  91.06   3.1    11.6
 28  0.134      8621 0.000 0.000 1.00     1.0   0.050 0.100  94.44   3.1    11.6
 29  0.134      8621 0.000 0.000 1.00     2.0   0.050 0.100  97.81   3.1    11.6
 30  0.134      8621 0.000 0.000 1.00     3.0   0.050 0.100 101.18   3.1    11.6
 31  0.134      8621 0.000 0.000 1.00     4.5   0.072 0.100 104.55   3.1    11.6
 32  0.134      8621 0.000 0.000 1.00     6.0   0.066 0.100 107.93   3.1    11.6
 33  0.134      8621 0.000 0.000 1.00     5.4   0.122 0.100 111.30   3.1    11.6
 34  0.134      8621 0.000 0.000 1.00     8.9   0.084 0.100 114.67   3.1    11.6
 35  0.134      8621 0.000 0.000 1.00    18.1   0.050 0.100 118.04   3.1    11.6
 36  0.134      8621 0.000 0.000 1.00    16.8   0.050 0.100 121.42   3.1    11.6
 37  0.134      8621 0.000 0.000 1.00     4.6   0.155 0.100 124.79   3.1    11.6
 38  0.134      8621 0.000 0.000 1.00     9.4   0.140 0.100 128.16   3.1    11.6
 39  0.134      8621 0.000 0.000 1.00    15.0   0.075 0.100 131.53   3.1    11.6
 40  0.134      8621 0.000 0.000 1.00    19.3   0.050 0.100 134.91   3.1    11.6
 41  0.134      8621 0.000 0.000 1.00    20.2   0.050 0.100 138.28   3.1    11.6
Toe                                      30.8   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    48.78     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi          kip-ft   b/min
  165.0    14.6   6.53   6.54   -3.74  29  47    23.63  31  10   20.1    45.9
  166.3    14.8   6.54   6.56   -3.74  29  47    23.69  31  10   20.1    45.9
  167.7    15.0   6.56   6.57   -3.80  29  44    23.81  31  10   20.2    45.8
  169.0    15.1   6.57   6.58   -3.91  28  44    23.91  31  10   20.2    45.8
  170.3    15.3   6.59   6.60   -4.02  29  44    23.95  31  10   20.2    45.7
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                   (ft)      48.8  Standard Soil Setup
 Shaft Gain/Loss Factor           0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area            (in2)   113.090  Pile Type                      Pipe
 Pile Size          (inch)    12.000
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  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     179.8
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 27  0.134     8621 0.000 0.000 1.00     0.1   0.050 0.100  91.06   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00     1.0   0.050 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00     2.0   0.050 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     3.0   0.050 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     4.5   0.072 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     6.0   0.066 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     5.4   0.122 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     9.1   0.083 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00    18.1   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00    16.7   0.050 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     4.5   0.157 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     9.4   0.140 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    15.1   0.074 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    19.3   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00    20.2   0.050 0.100 138.28   3.1    11.6
Toe                                     45.3   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    48.82     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi                ksi          kip-ft   b/min
  179.8    16.9   6.77    6.70   -5.01  29  44    24.24  31  10   20.7    45.2
  181.1    17.1   6.78    6.72   -5.12  29  44    24.28  31  10   20.7    45.2
  182.4    17.3   6.80    6.73   -5.22  29  44    24.40  31  10   20.8    45.1
  183.7    17.5   6.81    6.75   -5.31  29  44    24.46  31  10   20.8    45.1
  185.0    17.8   6.83    6.77   -5.41  29  44    24.53  31  10   20.8    45.0
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      51.3  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8
```

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 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     193.1
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft          kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 26  0.134     8621 0.000 0.000 1.00     0.0   0.050 0.100  87.69   3.1    11.6
 27  0.134     8621 0.000 0.000 1.00     0.7   0.050 0.100  91.06   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00     1.7   0.050 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00     2.7   0.050 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     3.8   0.055 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     5.8   0.064 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     6.2   0.111 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     5.9   0.114 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00    16.9   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00    19.3   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     6.2   0.115 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     7.7   0.154 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00    13.0   0.091 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    19.1   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    19.9   0.050 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00    18.8   0.088 0.100 138.28   3.1    11.6
Toe                                     45.3   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    51.30     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi         kip-ft   b/min
  193.1    19.1   6.92   6.86   -5.78  28  43    24.60  31  10   20.9    44.7
  194.8    19.4   6.94   6.88   -5.88  28  43    24.72  31  10   21.0    44.7
  196.4    19.7   6.95   6.91   -5.99  28  43    24.77  31  10   21.0    44.6
  198.0    20.0   6.97   6.92   -6.09  28  42    24.89  31  10   21.0    44.5
  199.6    20.4   6.99   6.95   -6.20  28  42    24.94  31  10   21.0    44.5
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      53.8  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     206.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
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      kips      k/in    ft    ft          kips    s/ft  inch      ft    ft      in2
  1  0.134      8621 0.010 0.000 0.85      0.0   0.000 0.100    3.37   3.1     11.6
  2  0.134      8621 0.000 0.000 1.00      0.0   0.000 0.100    6.75   3.1     11.6
 26  0.134      8621 0.000 0.000 1.00      0.4   0.050 0.100   87.69   3.1     11.6
 27  0.134      8621 0.000 0.000 1.00      1.5   0.050 0.100   91.06   3.1     11.6
 28  0.134      8621 0.000 0.000 1.00      2.5   0.050 0.100   94.44   3.1     11.6
 29  0.134      8621 0.000 0.000 1.00      3.5   0.050 0.100   97.81   3.1     11.6
 30  0.134      8621 0.000 0.000 1.00      5.4   0.067 0.100 101.18   3.1     11.6
 31  0.134      8621 0.000 0.000 1.00      6.8   0.090 0.100 104.55   3.1     11.6
 32  0.134      8621 0.000 0.000 1.00      3.7   0.150 0.100 107.93   3.1     11.6
 33  0.134      8621 0.000 0.000 1.00     15.2   0.053 0.100 111.30   3.1     11.6
 34  0.134      8621 0.000 0.000 1.00     20.4   0.050 0.100 114.67   3.1     11.6
 35  0.134      8621 0.000 0.000 1.00      9.1   0.079 0.100 118.04   3.1     11.6
 36  0.134      8621 0.000 0.000 1.00      6.1   0.163 0.100 121.42   3.1     11.6
 37  0.134      8621 0.000 0.000 1.00     10.9   0.116 0.100 124.79   3.1     11.6
 38  0.134      8621 0.000 0.000 1.00     18.4   0.053 0.100 128.16   3.1     11.6
 39  0.134      8621 0.000 0.000 1.00     19.7   0.050 0.100 131.53   3.1     11.6
 40  0.134      8621 0.000 0.000 1.00     19.3   0.075 0.100 134.91   3.1     11.6
 41  0.134      8621 0.000 0.000 1.00     18.7   0.100 0.100 138.28   3.1     11.6
Toe                                       45.3   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    53.78     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                            06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi               ksi         kip-ft   b/min
  206.9    21.7   7.07   7.03   -6.45  28  42    25.05  30  10   21.2    44.2
  208.8    22.2   7.09   7.05   -6.58  28  42    25.15  30  10   21.2    44.1
  210.7    22.6   7.12   7.08   -6.72  28  42    25.24  30  10   21.3    44.1
  212.6    23.1   7.14   7.11   -6.85  28  41    25.28  30  10   21.3    44.0
  214.5    23.5   7.16   7.13   -6.99  28  41    25.40  30  10   21.3    43.9
♀
CCG3A : 06/21/2022 : KCA                                            06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      53.8  Standard Soil Setup
 Shaft Gain/Loss Factor          0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)    113.090  Pile Type                       Pipe
 Pile Size           (inch)     12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     188.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim     Area
      kips      k/in    ft    ft          kips    s/ft  inch      ft    ft      in2
  1  0.134      8621 0.010 0.000 0.85      0.0   0.000 0.100    3.37   3.1     11.6
  2  0.134      8621 0.000 0.000 1.00      0.0   0.000 0.100    6.75   3.1     11.6
 26  0.134      8621 0.000 0.000 1.00      0.5   0.050 0.100   87.69   3.1     11.6
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 27  0.134     8621 0.000 0.000 1.00     1.5   0.050 0.100  91.06   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00     2.5   0.050 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00     3.5   0.050 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     5.4   0.067 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     6.8   0.091 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     3.7   0.150 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00    15.4   0.053 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00    20.5   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     8.9   0.080 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     6.2   0.162 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00    10.9   0.115 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00    18.5   0.052 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00    19.7   0.050 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00    19.3   0.076 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00    18.6   0.100 0.100 138.28   3.1    11.6
Toe                                     26.6   0.150 0.100

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    53.82     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi                ksi         kip-ft   b/min
  188.4    17.5   6.89   6.82   -5.04  28  42    24.66  30  10   20.7    44.8
  190.3    17.8   6.91   6.84   -5.17  28  42    24.78  30  10   20.7    44.8
  192.2    18.1   6.93   6.87   -5.30  28  42    24.88  30  10   20.8    44.7
  194.1    18.5   6.95   6.89   -5.43  28  42    24.98  30  10   20.8    44.6
  196.0    18.8   6.98   6.92   -5.56  28  42    25.08  30  10   20.9    44.5
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)      68.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     221.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 21  0.134     8621 0.000 0.000 1.00     0.1   0.050 0.100  70.83   3.1    11.6
 22  0.134     8621 0.000 0.000 1.00     0.9   0.050 0.100  74.20   3.1    11.6
 23  0.134     8621 0.000 0.000 1.00     1.9   0.050 0.100  77.57   3.1    11.6
 24  0.134     8621 0.000 0.000 1.00     3.0   0.050 0.100  80.94   3.1    11.6
 25  0.134     8621 0.000 0.000 1.00     4.4   0.071 0.100  84.32   3.1    11.6
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 26  0.134     8621 0.000 0.000 1.00     5.9   0.065 0.100  87.69   3.1    11.6
 27  0.134     8621 0.000 0.000 1.00     5.5   0.120 0.100  91.06   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00     8.5   0.087 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00    17.9   0.050 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00    17.2   0.050 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     4.7   0.151 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     9.3   0.142 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00    14.7   0.076 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00    19.3   0.050 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00    20.1   0.050 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00    18.4   0.098 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00    13.3   0.116 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100 128.16   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     7.4   0.150 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     7.6   0.150 0.100 138.28   3.1    11.6
Toe                                     26.6   0.150 0.100

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    68.90     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi             ksi         kip-ft   b/min
  221.4    24.3   7.40   7.37   -6.22  18  36    26.33  23  13   21.2    43.2
  225.1    25.3   7.46   7.44   -6.45  18  36    26.51  23  13   21.3    43.0
  228.8    26.3   7.51   7.49   -6.68  18  36    26.67  23  13   21.4    42.9
  232.5    27.3   7.57   7.55   -6.90  19  36    26.84  23  13   21.5    42.7
  236.2    28.5   7.62   7.60   -7.10  19  36    27.00  23  13   21.6    42.6
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      84.0  Standard Soil Setup
 Shaft Gain/Loss Factor          0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                         Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     257.6
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
 17  0.134     8621 0.000 0.000 1.00     0.4   0.050 0.100  57.34   3.1    11.6
 18  0.134     8621 0.000 0.000 1.00     1.4   0.050 0.100  60.71   3.1    11.6
 19  0.134     8621 0.000 0.000 1.00     2.4   0.050 0.100  64.08   3.1    11.6
 20  0.134     8621 0.000 0.000 1.00     3.4   0.050 0.100  67.45   3.1    11.6
 21  0.134     8621 0.000 0.000 1.00     5.3   0.068 0.100  70.83   3.1    11.6
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 22  0.134     8621 0.000 0.000 1.00     6.8   0.087 0.100  74.20   3.1    11.6
 23  0.134     8621 0.000 0.000 1.00     3.8   0.148 0.100  77.57   3.1    11.6
 24  0.134     8621 0.000 0.000 1.00    14.6   0.055 0.100  80.94   3.1    11.6
 25  0.134     8621 0.000 0.000 1.00    20.2   0.050 0.100  84.32   3.1    11.6
 26  0.134     8621 0.000 0.000 1.00    10.0   0.073 0.100  87.69   3.1    11.6
 27  0.134     8621 0.000 0.000 1.00     5.8   0.164 0.100  91.06   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00    10.7   0.118 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00    18.1   0.054 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00    19.7   0.050 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00    19.4   0.073 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00    18.6   0.100 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     7.9   0.145 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     7.5   0.150 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     7.6   0.150 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     7.8   0.150 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     8.0   0.150 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     8.2   0.150 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     8.5   0.150 0.100 138.28   3.1    11.6
Toe                                     26.6   0.150 0.100

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    83.98     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
   257.6    35.9   7.93   7.92   -7.19  18  33    27.58  20  12   21.7    41.7
   263.3    38.5   8.00   7.99   -7.40  19  33    27.79  20  12   21.8    41.6
   268.9    41.3   8.08   8.08   -7.62  19  33    28.01  20  12   22.0    41.4
   274.6    45.1   8.08   8.15   -7.81  19  33    28.13  20  12   22.0    41.3
   280.3    48.4   8.16   8.23   -7.99  19  33    28.36  20  12   22.2    41.1
♀
CCG3A : 06/21/2022 : KCA                                         06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                  (ft)      84.0  Standard Soil Setup
 Shaft Gain/Loss Factor          0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)    113.090  Pile Type                       Pipe
 Pile Size            (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model             Total Capacity Rut  (kips)     254.6
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
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 17  0.134     8621 0.000 0.000 1.00     0.4   0.050 0.100  57.34   3.1    11.6
 18  0.134     8621 0.000 0.000 1.00     1.4   0.050 0.100  60.71   3.1    11.6
 19  0.134     8621 0.000 0.000 1.00     2.4   0.050 0.100  64.08   3.1    11.6
 20  0.134     8621 0.000 0.000 1.00     3.5   0.050 0.100  67.45   3.1    11.6
 21  0.134     8621 0.000 0.000 1.00     5.3   0.067 0.100  70.83   3.1    11.6
 22  0.134     8621 0.000 0.000 1.00     6.8   0.088 0.100  74.20   3.1    11.6
 23  0.134     8621 0.000 0.000 1.00     3.8   0.149 0.100  77.57   3.1    11.6
 24  0.134     8621 0.000 0.000 1.00    14.8   0.055 0.100  80.94   3.1    11.6
 25  0.134     8621 0.000 0.000 1.00    20.3   0.050 0.100  84.32   3.1    11.6
 26  0.134     8621 0.000 0.000 1.00     9.8   0.074 0.100  87.69   3.1    11.6
 27  0.134     8621 0.000 0.000 1.00     5.9   0.164 0.100  91.06   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00    10.8   0.118 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00    18.2   0.054 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00    19.7   0.050 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00    19.4   0.073 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00    18.6   0.100 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     7.8   0.146 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     7.5   0.150 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     7.6   0.150 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     7.8   0.150 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     8.0   0.150 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     8.3   0.150 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     8.4   0.150 0.100 138.28   3.1    11.6
Toe                                     23.6   0.150 0.100

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    84.02     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi         kip-ft   b/min
  254.6    34.6   7.88    7.87   -7.12  21  34    27.52  20  12   21.6    41.9
  260.3    37.0   7.97    7.96   -7.32  19  33    27.75  20  12   21.7    41.6
  266.0    39.6   8.04    8.03   -7.54  19  33    27.96  20  12   21.9    41.5
  271.7    42.7   8.12    8.12   -7.73  19  33    28.17  20  12   22.0    41.3
  277.4    46.4   8.12    8.19   -7.93  19  33    28.30  20  12   22.1    41.2
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                   (ft)      96.9  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                        Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455
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        Pile and Soil Model                Total Capacity Rut  (kips)     279.4
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85      0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00      0.0   0.000 0.100   6.75   3.1    11.6
 13  0.134     8621 0.000 0.000 1.00      0.3   0.050 0.100  43.84   3.1    11.6
 14  0.134     8621 0.000 0.000 1.00      1.2   0.050 0.100  47.22   3.1    11.6
 15  0.134     8621 0.000 0.000 1.00      2.3   0.050 0.100  50.59   3.1    11.6
 16  0.134     8621 0.000 0.000 1.00      3.3   0.050 0.100  53.96   3.1    11.6
 17  0.134     8621 0.000 0.000 1.00      5.0   0.069 0.100  57.34   3.1    11.6
 18  0.134     8621 0.000 0.000 1.00      6.5   0.079 0.100  60.71   3.1    11.6
 19  0.134     8621 0.000 0.000 1.00      4.5   0.136 0.100  64.08   3.1    11.6
 20  0.134     8621 0.000 0.000 1.00     12.3   0.064 0.100  67.45   3.1    11.6
 21  0.134     8621 0.000 0.000 1.00     19.4   0.050 0.100  70.83   3.1    11.6
 22  0.134     8621 0.000 0.000 1.00     13.3   0.057 0.100  74.20   3.1    11.6
 23  0.134     8621 0.000 0.000 1.00      4.7   0.172 0.100  77.57   3.1    11.6
 24  0.134     8621 0.000 0.000 1.00     10.2   0.127 0.100  80.94   3.1    11.6
 25  0.134     8621 0.000 0.000 1.00     16.9   0.062 0.100  84.32   3.1    11.6
 26  0.134     8621 0.000 0.000 1.00     19.5   0.050 0.100  87.69   3.1    11.6
 27  0.134     8621 0.000 0.000 1.00     19.7   0.064 0.100  91.06   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00     18.5   0.100 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00      9.9   0.132 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00      7.3   0.150 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00      7.3   0.150 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00      7.4   0.150 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00      7.6   0.150 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00      7.8   0.150 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00      8.0   0.150 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00      8.2   0.150 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00      8.4   0.150 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00      6.8   0.150 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00      6.5   0.150 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00      6.5   0.150 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00      6.6   0.150 0.100 138.28   3.1    11.6
Toe                                      23.6   0.150 0.100

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    96.90     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi         kip-ft   b/min
  279.4    47.2   8.15    8.15   -6.07  16  31    27.99  16  11   21.4    41.2
  286.5    51.8   8.24    8.24   -6.28  16  31    28.23  17  11   21.6    41.0
  293.5    58.9   8.25    8.32   -6.45  16  30    28.37  17  11   21.6    40.9
  300.6    65.7   8.36    8.41   -6.61  16  30    28.63  17  11   21.8    40.6
  307.6    73.0   8.46    8.48   -6.80  16  30    28.90  17  11   22.1    40.4
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)     109.8  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
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 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model            Total Capacity Rut  (kips)     306.2
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
  9  0.134     8621 0.000 0.000 1.00     0.2   0.050 0.100  30.35   3.1    11.6
 10  0.134     8621 0.000 0.000 1.00     1.1   0.050 0.100  33.73   3.1    11.6
 11  0.134     8621 0.000 0.000 1.00     2.1   0.050 0.100  37.10   3.1    11.6
 12  0.134     8621 0.000 0.000 1.00     3.1   0.050 0.100  40.47   3.1    11.6
 13  0.134     8621 0.000 0.000 1.00     4.7   0.071 0.100  43.84   3.1    11.6
 14  0.134     8621 0.000 0.000 1.00     6.1   0.070 0.100  47.22   3.1    11.6
 15  0.134     8621 0.000 0.000 1.00     5.1   0.126 0.100  50.59   3.1    11.6
 16  0.134     8621 0.000 0.000 1.00    10.0   0.076 0.100  53.96   3.1    11.6
 17  0.134     8621 0.000 0.000 1.00    18.5   0.050 0.100  57.34   3.1    11.6
 18  0.134     8621 0.000 0.000 1.00    16.0   0.050 0.100  60.71   3.1    11.6
 19  0.134     8621 0.000 0.000 1.00     4.4   0.167 0.100  64.08   3.1    11.6
 20  0.134     8621 0.000 0.000 1.00     9.6   0.136 0.100  67.45   3.1    11.6
 21  0.134     8621 0.000 0.000 1.00    15.6   0.070 0.100  70.83   3.1    11.6
 22  0.134     8621 0.000 0.000 1.00    19.4   0.050 0.100  74.20   3.1    11.6
 23  0.134     8621 0.000 0.000 1.00    20.0   0.054 0.100  77.57   3.1    11.6
 24  0.134     8621 0.000 0.000 1.00    18.3   0.100 0.100  80.94   3.1    11.6
 25  0.134     8621 0.000 0.000 1.00    12.0   0.122 0.100  84.32   3.1    11.6
 26  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100  87.69   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00     7.4   0.150 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00     7.6   0.150 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     7.8   0.150 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     8.0   0.150 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     8.2   0.150 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     8.4   0.150 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     7.2   0.150 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     6.5   0.150 0.100 118.04   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     6.6   0.150 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     6.7   0.150 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     6.9   0.150 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     7.1   0.150 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100 138.28   3.1    11.6
Toe                                     23.6   0.150 0.100

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   109.78     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                        06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
  306.2    76.7   8.24   8.27   -4.51  13  28    28.71  13  11   20.7    41.0
  314.7    90.1   8.33   8.35   -4.64  13  28    28.99  13  11   20.9    40.8
  323.2   109.1   8.42   8.43   -4.75  13  28    29.25  13  11   21.0    40.6
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  331.7   138.0   8.51   8.52   -4.85  13  27    29.48  13  11   21.1    40.4
  340.2   174.0   8.60   8.58   -4.97  13  27    29.76  13  11   21.4    40.2
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                  (ft)     109.8  Standard Soil Setup
 Shaft Gain/Loss Factor          0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area              (in2)   113.090  Pile Type                       Pipe
 Pile Size            (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model             Total Capacity Rut  (kips)     291.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
  9  0.134     8621 0.000 0.000 1.00     0.2   0.050 0.100  30.35   3.1    11.6
 10  0.134     8621 0.000 0.000 1.00     1.1   0.050 0.100  33.73   3.1    11.6
 11  0.134     8621 0.000 0.000 1.00     2.1   0.050 0.100  37.10   3.1    11.6
 12  0.134     8621 0.000 0.000 1.00     3.1   0.050 0.100  40.47   3.1    11.6
 13  0.134     8621 0.000 0.000 1.00     4.7   0.071 0.100  43.84   3.1    11.6
 14  0.134     8621 0.000 0.000 1.00     6.1   0.071 0.100  47.22   3.1    11.6
 15  0.134     8621 0.000 0.000 1.00     5.1   0.127 0.100  50.59   3.1    11.6
 16  0.134     8621 0.000 0.000 1.00    10.2   0.075 0.100  53.96   3.1    11.6
 17  0.134     8621 0.000 0.000 1.00    18.6   0.050 0.100  57.34   3.1    11.6
 18  0.134     8621 0.000 0.000 1.00    15.9   0.050 0.100  60.71   3.1    11.6
 19  0.134     8621 0.000 0.000 1.00     4.3   0.169 0.100  64.08   3.1    11.6
 20  0.134     8621 0.000 0.000 1.00     9.7   0.135 0.100  67.45   3.1    11.6
 21  0.134     8621 0.000 0.000 1.00    15.7   0.070 0.100  70.83   3.1    11.6
 22  0.134     8621 0.000 0.000 1.00    19.4   0.050 0.100  74.20   3.1    11.6
 23  0.134     8621 0.000 0.000 1.00    20.0   0.055 0.100  77.57   3.1    11.6
 24  0.134     8621 0.000 0.000 1.00    18.4   0.100 0.100  80.94   3.1    11.6
 25  0.134     8621 0.000 0.000 1.00    11.8   0.122 0.100  84.32   3.1    11.6
 26  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100  87.69   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00     7.4   0.150 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00     7.6   0.150 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     7.8   0.150 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     8.0   0.150 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     8.2   0.150 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     8.4   0.150 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     7.2   0.150 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     6.5   0.150 0.100 118.04   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     6.6   0.150 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     6.7   0.150 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     6.9   0.150 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     7.1   0.150 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100 138.28   3.1    11.6
Toe                                      8.9   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
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       ft        ft     Ratio
   109.82     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi                ksi        kip-ft   b/min
  291.5    56.6   8.11   8.15   -4.48  12  28    28.53  13  11   20.4    41.3
  300.1    64.7   8.21   8.24   -4.62  12  28    28.81  13  11   20.6    41.1
  308.6    74.7   8.31   8.32   -4.72  12  27    29.09  13  11   20.8    40.8
  317.1    88.1   8.40   8.41   -4.82  12  27    29.35  13  11   20.9    40.6
  325.6   105.3   8.48   8.49   -4.95  13  27    29.60  13  11   21.1    40.4
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)     124.0  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   113.090  Pile Type                       Pipe
 Pile Size           (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

           Pile and Soil Model            Total Capacity Rut  (kips)     326.5
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips      k/in    ft    ft        kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.0   0.000 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     0.0   0.000 0.100   6.75   3.1    11.6
  5  0.134     8621 0.000 0.000 1.00     0.3   0.050 0.100  16.86   3.1    11.6
  6  0.134     8621 0.000 0.000 1.00     1.3   0.050 0.100  20.24   3.1    11.6
  7  0.134     8621 0.000 0.000 1.00     2.3   0.050 0.100  23.61   3.1    11.6
  8  0.134     8621 0.000 0.000 1.00     3.3   0.050 0.100  26.98   3.1    11.6
  9  0.134     8621 0.000 0.000 1.00     5.1   0.069 0.100  30.35   3.1    11.6
 10  0.134     8621 0.000 0.000 1.00     6.5   0.082 0.100  33.73   3.1    11.6
 11  0.134     8621 0.000 0.000 1.00     4.3   0.139 0.100  37.10   3.1    11.6
 12  0.134     8621 0.000 0.000 1.00    12.9   0.062 0.100  40.47   3.1    11.6
 13  0.134     8621 0.000 0.000 1.00    19.6   0.050 0.100  43.84   3.1    11.6
 14  0.134     8621 0.000 0.000 1.00    12.5   0.060 0.100  47.22   3.1    11.6
 15  0.134     8621 0.000 0.000 1.00     5.0   0.170 0.100  50.59   3.1    11.6
 16  0.134     8621 0.000 0.000 1.00    10.3   0.124 0.100  53.96   3.1    11.6
 17  0.134     8621 0.000 0.000 1.00    17.2   0.060 0.100  57.34   3.1    11.6
 18  0.134     8621 0.000 0.000 1.00    19.6   0.050 0.100  60.71   3.1    11.6
 19  0.134     8621 0.000 0.000 1.00    19.6   0.066 0.100  64.08   3.1    11.6
 20  0.134     8621 0.000 0.000 1.00    18.5   0.100 0.100  67.45   3.1    11.6
 21  0.134     8621 0.000 0.000 1.00     9.4   0.135 0.100  70.83   3.1    11.6
 22  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100  74.20   3.1    11.6
 23  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100  77.57   3.1    11.6
 24  0.134     8621 0.000 0.000 1.00     7.4   0.150 0.100  80.94   3.1    11.6
 25  0.134     8621 0.000 0.000 1.00     7.6   0.150 0.100  84.32   3.1    11.6
 26  0.134     8621 0.000 0.000 1.00     7.8   0.150 0.100  87.69   3.1    11.6
 27  0.134     8621 0.000 0.000 1.00     8.0   0.150 0.100  91.06   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00     8.2   0.150 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00     8.4   0.150 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     6.7   0.150 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     6.5   0.150 0.100 104.55   3.1    11.6
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 32  0.134     8621 0.000 0.000 1.00     6.5   0.150 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     6.6   0.150 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     6.8   0.150 0.100 114.67   3.1    11.6
 35  0.134     8621 0.000 0.000 1.00     6.9   0.150 0.100 118.04   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     7.1   0.150 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     7.5   0.150 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     8.2   0.150 0.100 128.16   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     8.3   0.150 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     8.4   0.150 0.100 138.28   3.1    11.6
Toe                                      8.9   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   124.03     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
  326.5   113.0   8.30   8.26   -2.64   9  25    29.70   9  10   19.5    41.0
  336.9   147.6   8.37   8.33   -2.71   8  25    29.96   9  10   19.6    40.8
  347.3   200.3   8.44   8.38   -2.84   8  25    30.23   9  10   19.8    40.6
  357.8   319.8   8.51   8.46   -2.91   8  24    30.47   9  10   19.8    40.5
  368.2   644.8   8.57   8.51   -3.00   8  24    30.73   9  10   20.0    40.3
♀
CCG3A : 06/21/2022 : KCA                                          06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

 Depth                 (ft)     138.3  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor          1.000

 PILE PROFILE:
 Toe Area            (in2)   113.090  Pile Type                        Pipe
 Pile Size          (inch)    12.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft             ft/s    k/ft/s
      0.0    11.63   30000.    492.0      3.1        0    16807.     20.8
    138.3    11.63   30000.    492.0      3.1        0    16807.     20.8

 Wave Travel Time 2L/c (ms)    16.455

        Pile and Soil Model           Total Capacity Rut  (kips)     364.3
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.134     8621 0.010 0.000 0.85     0.5   0.050 0.100   3.37   3.1    11.6
  2  0.134     8621 0.000 0.000 1.00     1.5   0.050 0.100   6.75   3.1    11.6
  3  0.134     8621 0.000 0.000 1.00     2.5   0.050 0.100  10.12   3.1    11.6
  4  0.134     8621 0.000 0.000 1.00     3.5   0.050 0.100  13.49   3.1    11.6
  5  0.134     8621 0.000 0.000 1.00     5.5   0.067 0.100  16.86   3.1    11.6
  6  0.134     8621 0.000 0.000 1.00     6.7   0.094 0.100  20.24   3.1    11.6
  7  0.134     8621 0.000 0.000 1.00     3.7   0.150 0.100  23.61   3.1    11.6
  8  0.134     8621 0.000 0.000 1.00    16.0   0.051 0.100  26.98   3.1    11.6
  9  0.134     8621 0.000 0.000 1.00    20.7   0.050 0.100  30.35   3.1    11.6
 10  0.134     8621 0.000 0.000 1.00     8.1   0.087 0.100  33.73   3.1    11.6
 11  0.134     8621 0.000 0.000 1.00     6.4   0.161 0.100  37.10   3.1    11.6
 12  0.134     8621 0.000 0.000 1.00    11.0   0.113 0.100  40.47   3.1    11.6
 13  0.134     8621 0.000 0.000 1.00    18.8   0.050 0.100  43.84   3.1    11.6
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 14  0.134     8621 0.000 0.000 1.00    19.8   0.050 0.100  47.22   3.1    11.6
 15  0.134     8621 0.000 0.000 1.00    19.2   0.078 0.100  50.59   3.1    11.6
 16  0.134     8621 0.000 0.000 1.00    18.1   0.101 0.100  53.96   3.1    11.6
 17  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100  57.34   3.1    11.6
 19  0.134     8621 0.000 0.000 1.00     7.3   0.150 0.100  64.08   3.1    11.6
 20  0.134     8621 0.000 0.000 1.00     7.5   0.150 0.100  67.45   3.1    11.6
 21  0.134     8621 0.000 0.000 1.00     7.7   0.150 0.100  70.83   3.1    11.6
 22  0.134     8621 0.000 0.000 1.00     7.9   0.150 0.100  74.20   3.1    11.6
 23  0.134     8621 0.000 0.000 1.00     8.1   0.150 0.100  77.57   3.1    11.6
 24  0.134     8621 0.000 0.000 1.00     8.3   0.150 0.100  80.94   3.1    11.6
 25  0.134     8621 0.000 0.000 1.00     8.3   0.150 0.100  84.32   3.1    11.6
 26  0.134     8621 0.000 0.000 1.00     6.5   0.150 0.100  87.69   3.1    11.6
 28  0.134     8621 0.000 0.000 1.00     6.5   0.150 0.100  94.44   3.1    11.6
 29  0.134     8621 0.000 0.000 1.00     6.6   0.150 0.100  97.81   3.1    11.6
 30  0.134     8621 0.000 0.000 1.00     6.8   0.150 0.100 101.18   3.1    11.6
 31  0.134     8621 0.000 0.000 1.00     7.0   0.150 0.100 104.55   3.1    11.6
 32  0.134     8621 0.000 0.000 1.00     7.2   0.150 0.100 107.93   3.1    11.6
 33  0.134     8621 0.000 0.000 1.00     7.7   0.150 0.100 111.30   3.1    11.6
 34  0.134     8621 0.000 0.000 1.00     8.2   0.150 0.100 114.67   3.1    11.6
 36  0.134     8621 0.000 0.000 1.00     8.3   0.150 0.100 121.42   3.1    11.6
 37  0.134     8621 0.000 0.000 1.00     8.5   0.150 0.100 124.79   3.1    11.6
 38  0.134     8621 0.000 0.000 1.00     8.7   0.150 0.100 128.16   3.1    11.6
 39  0.134     8621 0.000 0.000 1.00     8.9   0.150 0.100 131.53   3.1    11.6
 40  0.134     8621 0.000 0.000 1.00     9.1   0.150 0.100 134.91   3.1    11.6
 41  0.134     8621 0.000 0.000 1.00     9.3   0.150 0.100 138.28   3.1    11.6
Toe                                      8.9   0.150 0.200

     5.495 kips total unreduced pile weight (g= 32.17 ft/s2)
     5.495 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
   138.28     10.81      1.00     0.800
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down      up     ksi              ksi         kip-ft   b/min
  364.3    473.9  8.42   8.38   -1.42   5  23    30.20   4   9   18.3    40.7
  376.8  3691.3   8.48   8.44   -1.47   5  23    30.44   5   9   18.4    40.5
  389.3  9999.0   8.54   8.50   -1.56   5  23    30.68   5   9   18.4    40.4
  401.8  9999.0   8.59   8.54   -1.62   5  23    30.91   5   9   18.5    40.3
  414.3  9999.0   8.63   8.59   -1.65   5  23    31.15   5   9   18.6    40.2
♀
CCG3A : 06/21/2022 : KCA                                           06/21/2022
National Engineering & Architectural Ser                 GRLWEAP Version 2010

                             SUMMARY OVER DEPTHS

                     G/L at Shaft and Toe:  0.400  1.000
   Depth       Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
      ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
     7.0       8.5       2.2       6.3     0.0   0.000   0.000   10.81       0.0
    14.0      16.9       8.7       8.2     1.5  13.760  -2.850    4.47      22.5
    14.0      47.0       8.7      38.2     3.9  16.926  -0.496    5.24      22.3
    14.5      49.2       9.6      39.6     4.2  17.098  -0.370    5.28      22.1
    15.0      51.4      10.5      40.9     4.4  17.268  -0.242    5.32      22.0
    15.0      30.9      10.5      20.4     2.2  15.366  -1.672    4.91      24.0
    16.2      32.9      12.5      20.4     2.3  15.570  -1.621    4.94      23.8
    17.5      35.0      14.6      20.4     2.5  15.801  -1.555    4.98      23.6
    17.5      45.5      14.7      30.8     3.6  16.660  -0.714    5.20      22.5
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     18.8     48.1     17.2     30.8     3.8  16.909  -0.626    5.24     22.3
     20.0     50.8     19.9     30.8     4.1  17.108  -0.513    5.29     22.1
     20.0     23.3     20.0      3.3     1.7  14.629  -2.877    4.65     22.6
     21.9     25.3     22.0      3.3     1.8  15.017  -2.705    4.71     22.5
     23.7     27.4     24.0      3.3     1.9  15.414  -2.628    4.81     22.7
     23.7    116.9     24.1     92.8    11.8  21.382  -2.145    6.14     20.2
     25.6    126.1     33.0     93.2    12.6  21.877  -3.089    6.23     20.3
     27.5    136.0     42.5     93.5    13.5  22.292  -3.926    6.33     20.4
     27.5    169.8     42.7    127.1    18.6  25.636  -5.387    6.77     21.2
     29.0    178.6     51.5    127.1    20.0  25.761  -6.081    6.86     21.4
     30.4    187.9     60.8    127.1    21.6  25.868  -6.787    6.95     21.5
     30.4     69.2     61.0      8.2     4.8  18.951  -0.789    5.46     21.3
     31.5     72.5     64.3      8.2     5.1  19.238  -0.698    5.51     21.2
     32.5     75.9     67.7      8.2     5.4  19.494  -0.609    5.54     21.1
     32.5     71.1     67.8      3.3     4.8  19.283  -0.910    5.48     21.3
     33.8     72.0     68.7      3.3     5.0  19.445  -0.812    5.50     21.3
     35.0     73.0     69.6      3.3     5.1  19.613  -0.739    5.53     21.2
     35.0     80.8     69.7     11.1     6.1  20.013  -0.179    5.64     20.9
     36.5     84.6     73.5     11.1     6.5  20.342   0.000    5.70     20.7
     38.0     88.5     77.4     11.1     7.1  20.726   0.000    5.77     20.6
     38.0     90.3     77.5     12.8     7.5  20.668   0.000    5.73     20.4
     39.2     94.6     81.8     12.8     7.9  20.909   0.000    5.79     20.3
     40.5     98.9     86.2     12.8     8.5  21.229   0.000    5.85     20.2
     40.5    117.2     86.4     30.8    10.5  21.895  -1.544    6.07     19.9
     44.7    140.5    109.6     30.8    12.3  22.772  -3.283    6.28     19.8
     48.8    165.0    134.2     30.8    14.6  23.628  -3.736    6.53     20.1
     48.8    179.8    134.4     45.3    16.9  24.236  -5.015    6.77     20.7
     51.3    193.1    147.8     45.3    19.1  24.598  -5.780    6.92     20.9
     53.8    206.9    161.6     45.3    21.7  25.048  -6.446    7.07     21.2
     53.8    188.4    161.7     26.6    17.5  24.664  -5.037    6.89     20.7
     68.9    221.4    194.7     26.6    24.3  26.334  -6.218    7.40     21.2
     84.0    257.6    230.9     26.6    35.9  27.584  -7.195    7.93     21.7
     84.0    254.6    231.0     23.6    34.6  27.525  -7.118    7.88     21.6
     96.9    279.4    255.8     23.6    47.2  27.990  -6.070    8.15     21.4
    109.8    306.2    282.6     23.6    76.7  28.708  -4.514    8.24     20.7
    109.8    291.5    282.7      8.9    56.6  28.534  -4.484    8.11     20.4
    124.0    326.5    317.6      8.9   113.0  29.699  -2.638    8.30     19.5
    138.3    364.3    355.5      8.9   473.9  30.205  -1.419    8.42     18.3

Total Driving Time     191 minutes;           Total No. of Blows    7884
Starting at penetration     7.0 ft
 ♀
 CCG3A : 06/21/2022 : KCA                                           06/21/2022
 National Engineering & Architectural Ser                 GRLWEAP Version 2010

                              SUMMARY OVER DEPTHS

                      G/L at Shaft and Toe:  0.450  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      7.0      8.5      2.2      6.3     0.0   0.000   0.000   11.86      0.0
     14.0     16.9      8.7      8.2     1.5  13.760  -2.850    4.47     22.5
     14.0     47.0      8.7     38.2     3.9  16.963  -0.511    5.24     22.3
     14.5     49.2      9.6     39.6     4.2  17.103  -0.370    5.28     22.1
     15.0     51.4     10.5     40.9     4.4  17.231  -0.228    5.32     22.0
     15.0     30.9     10.6     20.4     2.2  15.364  -1.667    4.91     24.0
     16.2     32.9     12.6     20.4     2.3  15.573  -1.615    4.94     23.8
     17.5     35.1     14.8     20.4     2.5  15.858  -1.577    4.98     23.6
     17.5     45.7     14.8     30.8     3.6  16.659  -0.706    5.20     22.5
     18.8     48.2     17.4     30.8     3.8  16.913  -0.618    5.24     22.3
     20.0     51.0     20.2     30.8     4.1  17.172  -0.528    5.29     22.1
     20.0     23.6     20.2      3.3     1.7  14.714  -2.906    4.66     22.6
     21.9     25.7     22.4      3.3     1.8  15.061  -2.683    4.72     22.5
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     23.7     27.8     24.5      3.3     2.0  15.450  -2.661    4.82     23.0
     23.7    117.4     24.6     92.8    11.8  21.453  -2.200    6.15     20.2
     25.6    126.6     33.4     93.2    12.6  21.932  -3.135    6.24     20.3
     27.5    136.5     43.0     93.5    13.5  22.323  -3.968    6.33     20.4
     27.5    170.3     43.2    127.1    18.7  25.672  -5.425    6.78     21.2
     29.0    179.1     52.0    127.1    20.1  25.768  -6.118    6.86     21.4
     30.4    188.3     61.2    127.1    21.7  25.890  -6.823    6.96     21.6
     30.4     69.6     61.4      8.2     4.9  18.996  -0.775    5.47     21.3
     31.5     73.0     64.7      8.2     5.2  19.286  -0.682    5.51     21.2
     32.5     76.4     68.2      8.2     5.4  19.586  -0.611    5.55     21.1
     32.5     71.6     68.2      3.3     4.9  19.341  -0.896    5.48     21.3
     33.8     72.6     69.3      3.3     5.0  19.491  -0.795    5.51     21.2
     35.0     73.6     70.3      3.3     5.2  19.709  -0.729    5.54     21.2
     35.0     81.5     70.4     11.1     6.1  20.115  -0.151    5.65     20.9
     36.5     85.6     74.5     11.1     6.6  20.466   0.000    5.71     20.8
     38.0     89.6     78.5     11.1     7.4  20.654   0.000    5.73     20.4
     38.0     91.4     78.7     12.8     7.6  20.715   0.000    5.75     20.3
     39.2     95.8     83.0     12.8     8.1  21.047   0.000    5.81     20.3
     40.5    100.2     87.5     12.8     8.7  21.274   0.000    5.87     20.1
     40.5    118.5     87.7     30.8    10.6  21.930  -1.734    6.09     19.8
     44.7    141.8    110.9     30.8    12.4  22.858  -3.307    6.30     19.8
     48.8    166.3    135.5     30.8    14.8  23.689  -3.738    6.54     20.1
     48.8    181.1    135.7     45.3    17.1  24.283  -5.115    6.78     20.7
     51.3    194.8    149.4     45.3    19.4  24.724  -5.884    6.94     21.0
     53.8    208.8    163.5     45.3    22.2  25.148  -6.581    7.09     21.2
     53.8    190.3    163.6     26.6    17.8  24.781  -5.172    6.91     20.7
     68.9    225.1    198.4     26.6    25.3  26.508  -6.452    7.46     21.3
     84.0    263.3    236.6     26.6    38.5  27.790  -7.403    8.00     21.8
     84.0    260.3    236.7     23.6    37.0  27.746  -7.316    7.97     21.7
     96.9    286.5    262.9     23.6    51.8  28.234  -6.275    8.24     21.6
    109.8    314.7    291.1     23.6    90.1  28.986  -4.636    8.33     20.9
    109.8    300.1    291.2      8.9    64.7  28.812  -4.615    8.21     20.6
    124.0    336.9    328.0      8.9   147.6  29.957  -2.714    8.37     19.6
    138.3    376.8    368.0      8.9  3691.3  30.435  -1.470    8.48     18.4

Total Driving Time     775 minutes;            Total No. of Blows   31561
Starting at penetration     7.0 ft
 ♀
 CCG3A : 06/21/2022 : KCA                                            06/21/2022
 National Engineering & Architectural Ser                  GRLWEAP Version 2010

                              SUMMARY OVER DEPTHS

                      G/L at Shaft and Toe:  0.500  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      7.0      8.5      2.2      6.3     0.0   0.000   0.000   11.86      0.0
     14.0     16.9      8.7      8.2     1.5  13.760  -2.850    4.47     22.5
     14.0     47.0      8.7     38.2     3.9  16.969  -0.512    5.24     22.3
     14.5     49.2      9.6     39.6     4.2  17.093  -0.367    5.28     22.1
     15.0     51.4     10.5     40.9     4.4  17.216  -0.219    5.32     21.9
     15.0     31.0     10.6     20.4     2.2  15.368  -1.666    4.91     24.0
     16.2     33.0     12.7     20.4     2.3  15.632  -1.647    4.95     23.8
     17.5     35.2     14.9     20.4     2.5  15.842  -1.551    4.98     23.6
     17.5     45.8     15.0     30.8     3.6  16.718  -0.726    5.20     22.5
     18.8     48.4     17.6     30.8     3.9  16.954  -0.631    5.25     22.3
     20.0     51.2     20.4     30.8     4.1  17.160  -0.502    5.29     22.1
     20.0     23.8     20.5      3.3     1.7  14.719  -2.864    4.67     22.6
     21.9     26.0     22.7      3.3     1.9  15.090  -2.651    4.73     22.5
     23.7     28.3     25.0      3.3     2.0  15.538  -2.683    4.83     23.2
     23.7    117.9     25.1     92.8    11.8  21.534  -2.250    6.15     20.2
     25.6    127.0     33.9     93.2    12.7  21.950  -3.185    6.24     20.3
     27.5    136.9     43.4     93.5    13.6  22.292  -4.012    6.34     20.4
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     27.5    170.7     43.7    127.1    18.8  25.678  -5.464    6.78     21.2
     29.0    179.5     52.4    127.1    20.2  25.729  -6.153    6.86     21.3
     30.4    188.8     61.7    127.1    21.8  25.856  -6.857    6.97     21.5
     30.4     70.1     61.9      8.2     4.9  19.093  -0.786    5.47     21.3
     31.5     73.4     65.2      8.2     5.2  19.344  -0.675    5.52     21.2
     32.5     76.8     68.6      8.2     5.5  19.637  -0.600    5.56     21.1
     32.5     72.0     68.7      3.3     4.9  19.384  -0.873    5.49     21.3
     33.8     73.2     69.9      3.3     5.1  19.530  -0.769    5.52     21.2
     35.0     74.3     71.0      3.3     5.3  19.764  -0.701    5.54     21.1
     35.0     82.2     71.1     11.1     6.2  20.150  -0.085    5.66     20.8
     36.5     86.5     75.4     11.1     6.8  20.520   0.000    5.72     20.7
     38.0     90.8     79.7     11.1     7.5  20.749   0.000    5.74     20.4
     38.0     92.5     79.8     12.8     7.8  20.818   0.000    5.77     20.3
     39.2     97.0     84.3     12.8     8.3  21.117   0.000    5.83     20.3
     40.5    101.6     88.8     12.8     8.8  21.394   0.000    5.89     20.2
     40.5    119.8     89.0     30.8    10.7  22.046  -1.885    6.10     19.9
     44.7    143.1    112.2     30.8    12.6  22.964  -3.427    6.32     19.9
     48.8    167.7    136.8     30.8    15.0  23.807  -3.796    6.56     20.2
     48.8    182.4    137.1     45.3    17.3  24.403  -5.217    6.80     20.8
     51.3    196.4    151.0     45.3    19.7  24.766  -5.989    6.95     21.0
     53.8    210.7    165.4     45.3    22.6  25.245  -6.715    7.12     21.3
     53.8    192.2    165.5     26.6    18.1  24.878  -5.300    6.93     20.8
     68.9    228.8    202.1     26.6    26.3  26.673  -6.681    7.51     21.4
     84.0    268.9    242.3     26.6    41.3  28.011  -7.615    8.08     22.0
     84.0    266.0    242.4     23.6    39.6  27.963  -7.538    8.04     21.9
     96.9    293.5    269.9     23.6    58.9  28.374  -6.448    8.25     21.6
    109.8    323.2    299.6     23.6   109.1  29.248  -4.749    8.42     21.0
    109.8    308.6    299.7      8.9    74.7  29.095  -4.724    8.31     20.8
    124.0    347.3    338.5      8.9   200.3  30.232  -2.836    8.44     19.8
    138.3    389.3    380.5      8.9  9999.0  30.677  -1.559    8.54     18.4

Refusal occurred; no driving time output possible
 ♀
 CCG3A : 06/21/2022 : KCA                                           06/21/2022
 National Engineering & Architectural Ser                 GRLWEAP Version 2010

                              SUMMARY OVER DEPTHS

                      G/L at Shaft and Toe:  0.550  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      7.0      8.5      2.2      6.3     0.0   0.000   0.000   11.86      0.0
     14.0     16.9      8.7      8.2     1.5  13.760  -2.850    4.47     22.5
     14.0     47.0      8.7     38.2     3.9  16.971  -0.513    5.24     22.3
     14.5     49.2      9.6     39.6     4.2  17.093  -0.365    5.28     22.1
     15.0     51.5     10.6     40.9     4.4  17.266  -0.234    5.32     22.0
     15.0     31.0     10.6     20.4     2.3  15.393  -1.685    4.91     24.0
     16.2     33.1     12.7     20.4     2.4  15.625  -1.634    4.95     23.8
     17.5     35.4     15.0     20.4     2.5  15.831  -1.528    4.99     23.6
     17.5     45.9     15.1     30.8     3.6  16.696  -0.703    5.20     22.5
     18.8     48.6     17.8     30.8     3.9  16.940  -0.612    5.25     22.3
     20.0     51.5     20.6     30.8     4.2  17.221  -0.513    5.30     22.1
     20.0     24.0     20.7      3.3     1.7  14.783  -2.874    4.68     22.6
     21.9     26.4     23.1      3.3     1.9  15.293  -2.747    4.78     22.7
     23.7     28.7     25.4      3.3     2.0  15.609  -2.700    4.85     23.4
     23.7    118.3     25.5     92.8    11.9  21.522  -2.324    6.16     20.2
     25.6    127.5     34.4     93.2    12.7  21.936  -3.236    6.25     20.3
     27.5    137.4     43.9     93.5    13.6  22.370  -4.049    6.34     20.4
     27.5    171.2     44.1    127.1    18.9  25.670  -5.501    6.78     21.2
     29.0    180.0     52.9    127.1    20.3  25.790  -6.191    6.87     21.4
     30.4    189.2     62.2    127.1    21.9  25.842  -6.892    6.97     21.5
     30.4     70.6     62.4      8.2     5.0  19.086  -0.742    5.48     21.3
     31.5     73.9     65.7      8.2     5.2  19.362  -0.644    5.53     21.2
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     32.5     77.3     69.1      8.2     5.5  19.626  -0.547    5.56     21.1
     32.5     72.5     69.2      3.3     5.0  19.424  -0.845    5.50     21.3
     33.8     73.8     70.4      3.3     5.1  19.585  -0.747    5.52     21.2
     35.0     75.0     71.7      3.3     5.3  19.846  -0.684    5.56     21.1
     35.0     82.9     71.8     11.1     6.3  20.201  -0.028    5.67     20.8
     36.5     87.4     76.3     11.1     6.9  20.546   0.000    5.74     20.7
     38.0     91.9     80.8     11.1     7.6  20.801   0.000    5.76     20.3
     38.0     93.7     80.9     12.8     7.9  20.887   0.000    5.79     20.3
     39.2     98.2     85.5     12.8     8.4  21.154   0.000    5.84     20.2
     40.5    102.9     90.1     12.8     9.0  21.488   0.000    5.91     20.1
     40.5    121.1     90.3     30.8    10.8  22.072  -2.068    6.12     19.8
     44.7    144.4    113.6     30.8    12.7  23.015  -3.528    6.33     19.9
     48.8    169.0    138.1     30.8    15.1  23.906  -3.906    6.57     20.2
     48.8    183.7    138.4     45.3    17.5  24.462  -5.314    6.81     20.8
     51.3    198.0    152.6     45.3    20.0  24.890  -6.093    6.97     21.0
     53.8    212.6    167.3     45.3    23.1  25.284  -6.849    7.14     21.3
     53.8    194.1    167.5     26.6    18.5  24.977  -5.427    6.95     20.8
     68.9    232.5    205.8     26.6    27.3  26.844  -6.896    7.57     21.5
     84.0    274.6    248.0     26.6    45.1  28.130  -7.814    8.08     22.0
     84.0    271.7    248.1     23.6    42.7  28.167  -7.732    8.12     22.0
     96.9    300.6    277.0     23.6    65.7  28.630  -6.612    8.36     21.8
    109.8    331.7    308.1     23.6   138.0  29.483  -4.850    8.51     21.1
    109.8    317.1    308.2      8.9    88.1  29.347  -4.822    8.40     20.9
    124.0    357.8    348.9      8.9   319.8  30.468  -2.910    8.51     19.8
    138.3    401.8    393.0      8.9  9999.0  30.912  -1.615    8.59     18.5

Refusal occurred; no driving time output possible
 ♀
 CCG3A : 06/21/2022 : KCA                                           06/21/2022
 National Engineering & Architectural Ser                 GRLWEAP Version 2010

                              SUMMARY OVER DEPTHS

                      G/L at Shaft and Toe:  0.600  1.000
    Depth      Rut   Frictn   End Bg   Bl Ct Com Str Ten Str  Stroke   ENTHRU
       ft     kips     kips     kips   bl/ft     ksi     ksi      ft   kip-ft
      7.0      8.5      2.2      6.3     0.0   0.000   0.000   11.86      0.0
     14.0     16.9      8.7      8.2     1.5  13.760  -2.850    4.47     22.5
     14.0     47.0      8.7     38.2     3.9  16.951  -0.500    5.25     22.3
     14.5     49.2      9.7     39.6     4.2  17.094  -0.366    5.28     22.1
     15.0     51.5     10.6     40.9     4.4  17.271  -0.235    5.32     22.0
     15.0     31.0     10.7     20.4     2.3  15.434  -1.707    4.91     24.0
     16.2     33.2     12.8     20.4     2.4  15.620  -1.622    4.95     23.8
     17.5     35.5     15.1     20.4     2.5  15.876  -1.543    4.99     23.6
     17.5     46.1     15.2     30.8     3.6  16.737  -0.710    5.21     22.5
     18.8     48.8     18.0     30.8     3.9  16.946  -0.605    5.25     22.3
     20.0     51.7     20.9     30.8     4.2  17.253  -0.505    5.30     22.1
     20.0     24.3     21.0      3.3     1.7  14.835  -2.877    4.68     22.6
     21.9     26.7     23.4      3.3     1.9  15.298  -2.699    4.79     22.7
     23.7     29.2     25.9      3.3     2.0  15.669  -2.702    4.86     23.6
     23.7    118.8     26.0     92.8    11.9  21.612  -2.369    6.16     20.2
     25.6    128.0     34.8     93.2    12.8  22.012  -3.280    6.25     20.3
     27.5    137.9     44.4     93.5    13.7  22.367  -4.089    6.35     20.4
     27.5    171.7     44.6    127.1    18.9  25.719  -5.539    6.79     21.2
     29.0    180.5     53.4    127.1    20.4  25.751  -6.226    6.88     21.4
     30.4    189.7     62.6    127.1    22.0  25.820  -6.929    6.97     21.5
     30.4     71.0     62.8      8.2     5.0  19.175  -0.749    5.49     21.3
     31.5     74.3     66.1      8.2     5.3  19.431  -0.645    5.53     21.2
     32.5     77.8     69.5      8.2     5.5  19.663  -0.520    5.57     21.1
     32.5     73.0     69.6      3.3     5.0  19.469  -0.832    5.50     21.3
     33.8     74.4     71.0      3.3     5.2  19.636  -0.730    5.53     21.2
     35.0     75.7     72.4      3.3     5.4  19.834  -0.618    5.57     21.1
     35.0     83.6     72.5     11.1     6.4  20.221   0.000    5.68     20.8
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     36.5     88.3     77.2     11.1      7.1  20.485   0.000    5.69     20.4
     38.0     93.0     81.9     11.1      7.8  20.845   0.000    5.77     20.3
     38.0     94.8     82.0     12.8      8.1  20.967   0.000    5.80     20.3
     39.2     99.4     86.7     12.8      8.6  21.259   0.000    5.86     20.2
     40.5    104.2     91.4     12.8      9.1  21.569   0.000    5.92     20.1
     40.5    122.5     91.6     30.8     11.0  22.173  -2.217    6.13     19.8
     44.7    145.7    114.9     30.8     12.8  23.117  -3.619    6.35     19.9
     48.8    170.3    139.5     30.8     15.3  23.954  -4.016    6.59     20.2
     48.8    185.0    139.7     45.3     17.8  24.526  -5.412    6.83     20.8
     51.3    199.6    154.2     45.3     20.4  24.939  -6.200    6.99     21.0
     53.8    214.5    169.2     45.3     23.5  25.399  -6.986    7.16     21.3
     53.8    196.0    169.4     26.6     18.8  25.076  -5.556    6.98     20.9
     68.9    236.2    209.5     26.6     28.5  27.003  -7.100    7.62     21.6
     84.0    280.3    253.7     26.6     48.4  28.362  -7.995    8.16     22.2
     84.0    277.4    253.8     23.6     46.4  28.303  -7.931    8.12     22.1
     96.9    307.6    284.0     23.6     73.0  28.902  -6.796    8.46     22.1
    109.8    340.2    316.6     23.6    174.0  29.763  -4.973    8.60     21.4
    109.8    325.6    316.7      8.9    105.3  29.604  -4.948    8.48     21.1
    124.0    368.2    359.3      8.9    644.8  30.725  -3.003    8.57     20.0
    138.3    414.3    405.5      8.9   9999.0  31.149  -1.651    8.63     18.6

Refusal occurred; no driving time output possible
 ♀
 CCG3A : 06/21/2022 : KCA                                          06/21/2022
 National Engineering & Architectural Ser                GRLWEAP Version 2010


              Table of Depths Analyzed with Driving System Modifiers

              Temp.       Wait Equivalent Pressure             Stiffn.   Cushion
     Depth    Length      Time    Stroke     Ratio   Efficy.    Factor       CoR
        ft        ft        hr        ft
      7.00    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     13.98    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     14.02    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     14.50    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     14.98    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     15.02    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     16.25    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     17.48    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     17.52    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     18.75    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     19.98    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     20.02    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     21.85    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     23.68    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     23.72    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     25.60    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     27.48    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     27.52    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     28.95    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     30.38    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     30.42    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     31.45    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     32.48    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     32.52    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     33.75    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     34.98    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     35.02    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     36.50    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     37.98    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     38.02    138.28      0.00     10.81      1.00      0.80      1.00      1.00
     39.25    138.28      0.00     10.81      1.00      0.80      1.00      1.00
```

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    40.48    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    40.52    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    44.65    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    48.78    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    48.82    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    51.30    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    53.78    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    53.82    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    68.90    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    83.98    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    84.02    138.28      0.00     10.81      1.00      0.80      1.00      1.00
    96.90    138.28      0.00     10.81      1.00      0.80      1.00      1.00
   109.78    138.28      0.00     10.81      1.00      0.80      1.00      1.00
   109.82    138.28      0.00     10.81      1.00      0.80      1.00      1.00
   124.03    138.28      0.00     10.81      1.00      0.80      1.00      1.00
   138.28    138.28      0.00     10.81      1.00      0.80      1.00      1.00


                      Soil Layer Resistance Values
           Shaft      End    Shaft      Toe    Shaft      Toe     Soil    Limit    Setup
  Depth     Res.  Bearing    Quake    Quake  Damping  Damping    Setup Distance     Time
     ft    k/ft2     kips     inch     inch     s/ft     s/ft  Normlzd       ft      hrs
   0.01     0.00     0.01    0.100    0.200    0.050    0.150    0.000    6.000    1.000
   9.01     0.25     8.15    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  13.99     0.40     8.21    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  14.01     0.69    38.21    0.100    0.200    0.100    0.150    0.340    6.000   24.000
  14.99     0.74    40.93    0.100    0.200    0.100    0.150    0.340    6.000   24.000
  15.01     0.62    20.36    0.100    0.200    0.050    0.150    0.340    6.000   24.000
  17.49     0.72    20.36    0.100    0.200    0.050    0.150    0.340    6.000   24.000
  17.51     0.79    30.84    0.100    0.200    0.100    0.150    0.340    6.000   24.000
  19.99     0.90    30.84    0.100    0.200    0.100    0.150    0.340    6.000   24.000
  20.01     0.58     3.33    0.100    0.200    0.150    0.150    0.660    6.000  168.000
  23.69     0.58     3.33    0.100    0.200    0.150    0.150    0.660    6.000  168.000
  23.71     1.43    92.81    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  27.49     1.68    93.51    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  27.51     1.90   127.08    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  30.39     2.12   127.08    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  30.41     1.01     8.21    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  32.49     1.07     8.21    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  32.51     0.60     3.33    0.100    0.200    0.200    0.150    1.000    6.000  168.000
  34.99     0.60     3.33    0.100    0.200    0.200    0.150    1.000    6.000  168.000
  35.01     1.38    11.10    0.100    0.200    0.150    0.150    0.660    6.000  168.000
  37.99     1.38    11.10    0.100    0.200    0.150    0.150    0.660    6.000  168.000
  38.01     1.38    12.75    0.100    0.200    0.100    0.150    0.340    6.000   24.000
  40.49     1.43    12.75    0.100    0.200    0.100    0.150    0.340    6.000   24.000
  40.51     1.74    30.84    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  48.79     1.95    30.84    0.100    0.200    0.050    0.150    0.000    6.000    1.000
  48.81     2.12    45.35    0.100    0.200    0.100    0.150    0.340    6.000   24.000
  53.79     2.26    45.35    0.100    0.200    0.100    0.150    0.340    6.000   24.000
  53.81     1.14    26.65    0.100    0.100    0.150    0.150    0.660    6.000   24.000
  62.81     1.14    26.65    0.100    0.100    0.150    0.150    0.660    6.000   24.000
  71.81     1.22    26.65    0.100    0.100    0.150    0.150    0.660    6.000   24.000
  80.81     1.31    26.65    0.100    0.100    0.150    0.150    0.660    6.000   24.000
  83.99     1.34    26.65    0.100    0.100    0.150    0.150    0.660    6.000   24.000
  84.01     1.01    23.59    0.100    0.100    0.150    0.150    0.660    6.000  168.000
  93.01     1.01    23.59    0.100    0.100    0.150    0.150    0.660    6.000  168.000
 102.01     1.08    23.59    0.100    0.100    0.150    0.150    0.660    6.000  168.000
 109.79     1.15    23.59    0.100    0.100    0.150    0.150    0.660    6.000  168.000
 109.81     1.29     8.88    0.100    0.200    0.150    0.150    0.660    6.000  168.000
 118.81     1.29     8.88    0.100    0.200    0.150    0.150    0.660    6.000  168.000
 127.81     1.37     8.88    0.100    0.200    0.150    0.150    0.660    6.000  168.000
 136.81     1.46     8.88    0.100    0.200    0.150    0.150    0.660    6.000  168.000
 138.28     1.47     8.88    0.100    0.200    0.150    0.150    0.660    6.000  168.000
```

APPENDIX I

SETTLEMENT ANALYSIS – REAR ABUTMENT

CUY-90-16.28 (CCG3A)

Report created by FoSSA(2.0): Copyright (c) 2003-2012, ADAMA Engineering, Inc.

PROJECT IDENTIFICATION

Title:	CUY-90-16.28 (CCG3A)
Project Number:	PID 82382 -
Client:	Michael Baker International
Designer:	KCA
Station Number:	

Description:
Bridge 12 - Rear Abutment

Company's information:

Name:	NEAS Inc.
Street:	2800 Coroporate Exchange Drive, Suite 240 Columbus, OH 43231
Telephone #:	614-714-0299
Fax #:	614-714-0251
E-Mail:	brendan.andrews@neasinc.com

Original file path and name: P:\21-0011 ..... ettlement\RearAbutment\Bridge12_RA-FOSSA062921.2ST
Original date and time of creating this file: Tue Jun 29 16:28:11 2021

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 8 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	130.00	0.30	1 - Non-cohesive
2	122.00	0.20	2 - Non-cohesive
3	128.00	0.30	3 - Non-cohesive
4	135.00	0.35	4 - Non-cohesive
5	130.00	0.30	5 - Cohesive
6	125.00	0.45	6 - Cohesive
7	130.00	0.50	7 - Cohesive
8	150.00	0.20	Termination Layer

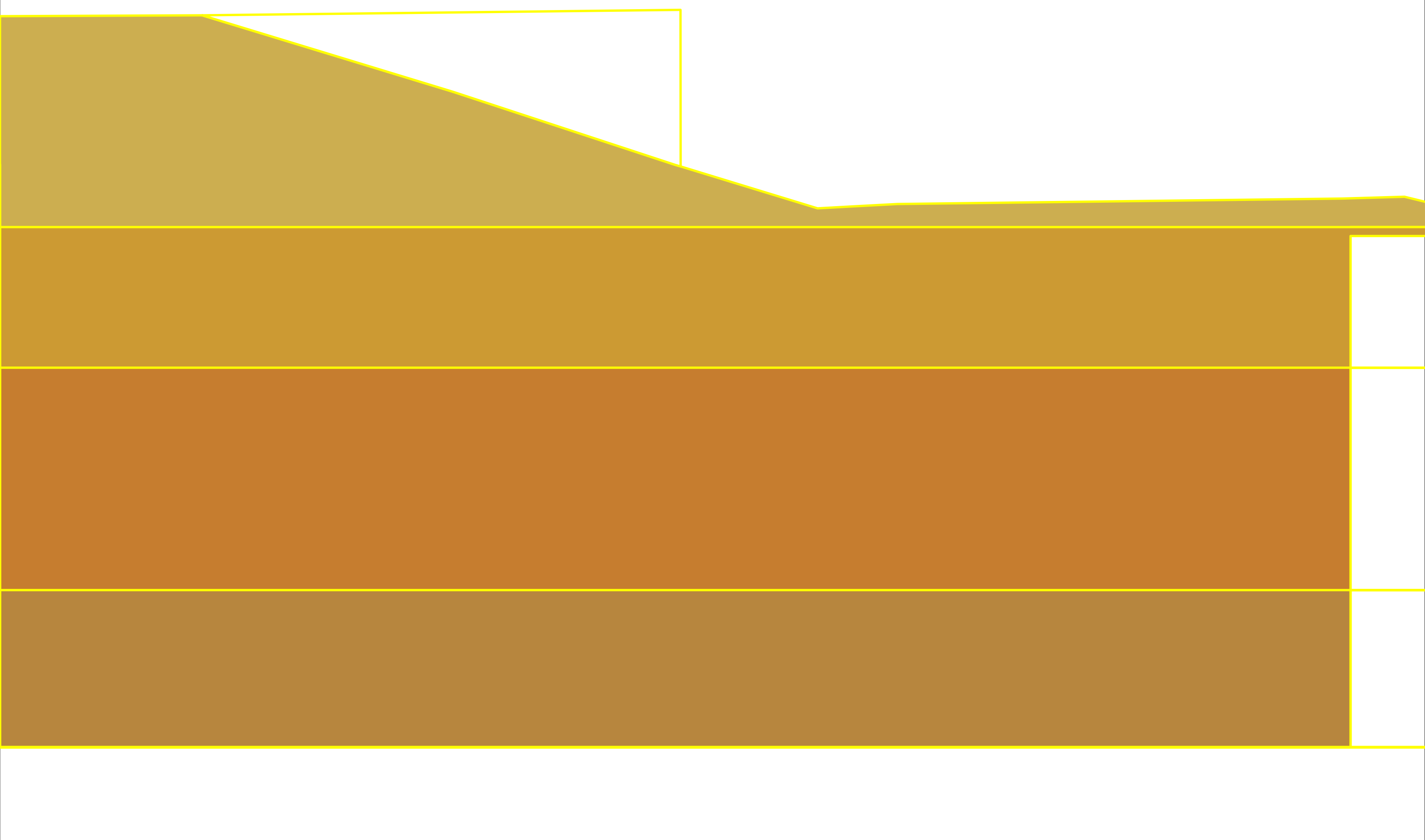
INPUT DATA – EMBANKMENT LAYERS -- 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	120.00	Proposed Embankment

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	652.50
2	200.00	652.50

DRAWING OF SPECIFIED GEOMETRY



INPUT DATA FOR CONSOLIDATION -- $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	No	N/A	N/A	N/A	N/A	N/A	N/A
5	Yes	1.30	0.100	0.020	0.585	0.5400	Top
6	Yes	1.20	0.100	0.020	0.635	0.2300	Top
7	Yes	1.10	0.120	0.024	0.534	0.2100	Top
8	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	40.00	0.00	1	797000	0.3000	-0.0009	695.67	695.63	0.04
			2	180000	0.2000	0.0066			
			3	406000	0.3000	0.0092			
			4	285000	0.3500	0.0132			
			5	2000000	0.3000	0.0013			
			6	2000000	0.4500	0.0022			
			7	2000000	0.5000	0.0072			
			8	1000000000(	0.2000	0.0000			
2	45.00	0.00	1	797000	0.3000	-0.0007	695.69	695.64	0.05
			2	180000	0.2000	0.0117			
			3	406000	0.3000	0.0123			
			4	285000	0.3500	0.0156			
			5	2000000	0.3000	0.0015			
			6	2000000	0.4500	0.0024			
			7	2000000	0.5000	0.0075			
			8	1000000000(	0.2000	0.0000			
3	50.00	0.00	1	797000	0.3000	0.0014	694.72	694.66	0.07
			2	180000	0.2000	0.0190			
			3	406000	0.3000	0.0161			
			4	285000	0.3500	0.0182			
			5	2000000	0.3000	0.0017			
			6	2000000	0.4500	0.0026			
			7	2000000	0.5000	0.0078			
			8	1000000000(	0.2000	0.0000			
4	55.00	0.00	1	797000	0.3000	0.0045	693.20	693.11	0.09
			2	180000	0.2000	0.0284			
			3	406000	0.3000	0.0202			
			4	285000	0.3500	0.0208			
			5	2000000	0.3000	0.0018			
			6	2000000	0.4500	0.0028			
			7	2000000	0.5000	0.0081			
			8	1000000000(	0.2000	0.0000			
5	60.00	0.00	1	797000	0.3000	0.0074	691.67	691.57	0.11
			2	180000	0.2000	0.0393			
			3	406000	0.3000	0.0246			
			4	285000	0.3500	0.0234			
			5	2000000	0.3000	0.0020			
			6	2000000	0.4500	0.0029			
			7	2000000	0.5000	0.0083			
			8	1000000000(	0.2000	0.0000			
6	65.00	0.00	1	797000	0.3000	0.0098	690.15	690.02	0.13
			2	180000	0.2000	0.0509			
			3	406000	0.3000	0.0290			
			4	285000	0.3500	0.0257			
			5	2000000	0.3000	0.0021			
			6	2000000	0.4500	0.0031			
			7	2000000	0.5000	0.0085			
			8	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
7	70.00	0.00	1	797000	0.3000	0.0117	688.62	688.48	0.15
			2	180000	0.2000	0.0625			
			3	406000	0.3000	0.0330			
			4	285000	0.3500	0.0275			
			5	2000000	0.3000	0.0022			
			6	2000000	0.4500	0.0032			
			7	2000000	0.5000	0.0087			
			8	1000000000(	0.2000	0.0000			
8	75.00	0.00	1	797000	0.3000	0.0135	687.10	686.93	0.17
			2	180000	0.2000	0.0732			
			3	406000	0.3000	0.0362			
			4	285000	0.3500	0.0290			
			5	2000000	0.3000	0.0023			
			6	2000000	0.4500	0.0033			
			7	2000000	0.5000	0.0088			
			8	1000000000(	0.2000	0.0000			
9	80.00	0.00	1	797000	0.3000	0.0147	685.46	685.28	0.18
			2	180000	0.2000	0.0820			
			3	406000	0.3000	0.0383			
			4	285000	0.3500	0.0298			
			5	2000000	0.3000	0.0023			
			6	2000000	0.4500	0.0033			
			7	2000000	0.5000	0.0088			
			8	1000000000(	0.2000	0.0000			
10	85.00	0.00	1	797000	0.3000	0.0153	683.82	683.63	0.19
			2	180000	0.2000	0.0872			
			3	406000	0.3000	0.0389			
			4	285000	0.3500	0.0298			
			5	2000000	0.3000	0.0023			
			6	2000000	0.4500	0.0033			
			7	2000000	0.5000	0.0088			
			8	1000000000(	0.2000	0.0000			
11	90.00	0.00	1	797000	0.3000	0.0148	682.18	682.00	0.18
			2	180000	0.2000	0.0866			
			3	406000	0.3000	0.0378			
			4	285000	0.3500	0.0292			
			5	2000000	0.3000	0.0023			
			6	2000000	0.4500	0.0033			
			7	2000000	0.5000	0.0087			
			8	1000000000(	0.2000	0.0000			
12	95.00	0.00	1	797000	0.3000	0.0119	680.54	680.37	0.17
			2	180000	0.2000	0.0782			
			3	406000	0.3000	0.0351			
			4	285000	0.3500	0.0279			
			5	2000000	0.3000	0.0022			
			6	2000000	0.4500	0.0032			
			7	2000000	0.5000	0.0086			
			8	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
13	100.00	0.00	1	797000	0.3000	0.0063	678.90	678.76	0.14
			2	180000	0.2000	0.0625			
			3	406000	0.3000	0.0311			
			4	285000	0.3500	0.0260			
			5	2000000	0.3000	0.0021			
			6	2000000	0.4500	0.0031			
			7	2000000	0.5000	0.0085			
			8	1000000000(	0.2000	0.0000			
14	105.00	0.00	1	797000	0.3000	0.0020	677.37	677.26	0.11
			2	180000	0.2000	0.0435			
			3	406000	0.3000	0.0261			
			4	285000	0.3500	0.0238			
			5	2000000	0.3000	0.0020			
			6	2000000	0.4500	0.0030			
			7	2000000	0.5000	0.0083			
			8	1000000000(	0.2000	0.0000			
15	110.00	0.00	1	797000	0.3000	0.0003	675.84	675.76	0.08
			2	180000	0.2000	0.0272			
			3	406000	0.3000	0.0210			
			4	285000	0.3500	0.0210			
			5	2000000	0.3000	0.0018			
			6	2000000	0.4500	0.0028			
			7	2000000	0.5000	0.0080			
			8	1000000000(	0.2000	0.0000			
16	115.00	0.00	1	797000	0.3000	-0.0000	674.31	674.24	0.06
			2	180000	0.2000	0.0159			
			3	406000	0.3000	0.0163			
			4	285000	0.3500	0.0184			
			5	2000000	0.3000	0.0017			
			6	2000000	0.4500	0.0026			
			7	2000000	0.5000	0.0078			
			8	1000000000(	0.2000	0.0000			
17	120.00	0.00	1	797000	0.3000	-0.0002	674.22	674.17	0.05
			2	180000	0.2000	0.0087			
			3	406000	0.3000	0.0121			
			4	285000	0.3500	0.0157			
			5	2000000	0.3000	0.0015			
			6	2000000	0.4500	0.0023			
			7	2000000	0.5000	0.0074			
			8	1000000000(	0.2000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	40.00	0.00	695.67	0.02	695.66
2	45.00	0.00	695.69	0.02	695.68
3	50.00	0.00	694.72	0.02	694.71
4	55.00	0.00	693.20	0.02	693.18
5	60.00	0.00	691.67	0.02	691.66
6	65.00	0.00	690.15	0.02	690.13
7	70.00	0.00	688.62	0.02	688.60
8	75.00	0.00	687.10	0.02	687.08
9	80.00	0.00	685.46	0.02	685.44
10	85.00	0.00	683.82	0.02	683.80
11	90.00	0.00	682.18	0.02	682.16
12	95.00	0.00	680.54	0.02	680.52
13	100.00	0.00	678.90	0.02	678.88
14	105.00	0.00	677.37	0.02	677.35
15	110.00	0.00	675.84	0.02	675.82
16	115.00	0.00	674.31	0.02	674.28
17	120.00	0.00	674.22	0.02	674.20

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	0.00	695.50	1 - Non-cohesive
	2	46.80	695.70	
	3	75.00	687.10	
	4	100.00	678.90	
	5	100.60	678.72	
	6	106.30	676.97	
	7	116.00	674.00	
	8	125.00	674.50	
	9	175.00	675.10	
	10	182.00	675.30	
	11	195.91	671.91	
2	1	0.00	671.90	2 - Non-cohesive
	2	195.91	671.90	
	3	200.00	670.90	
3	1	0.00	656.10	3 - Non-cohesive
	2	200.00	656.10	
4	1	0.00	631.10	4 - Non-cohesive
	2	200.00	631.10	
5	1	0.00	611.10	5 - Cohesive
	2	200.00	611.10	
6	1	0.00	598.50	6 - Cohesive
	2	200.00	598.50	
7	1	0.00	572.70	7 - Cohesive
	2	200.00	572.70	
8	1	0.00	450.00	Termination Layer
	2	120.00	450.00	

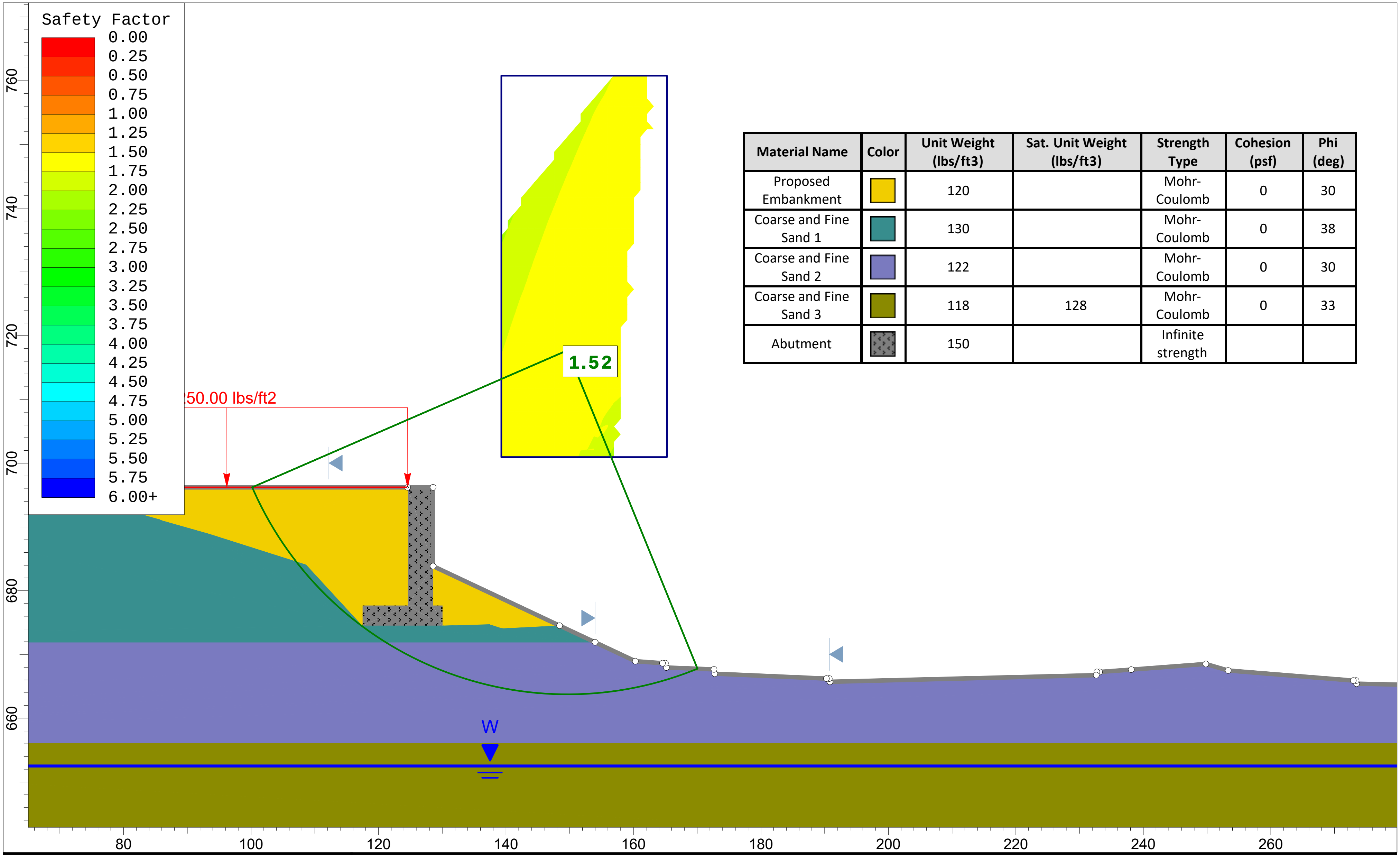
TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 46.80 [ft]	1	46.80	695.70	Proposed Embankment
	X2 = 100.61 [ft]	2	100.60	696.30	
		3	100.61	678.72	

APPENDIX J

GLOBAL STABILITY ANALYSIS - REAR AND FORWARD ABUTMENT

REAR ABUTMENT



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Proposed Embankment	🟨	120		Mohr-Coulomb	0	30
Coarse and Fine Sand 1	🟦	130		Mohr-Coulomb	0	38
Coarse and Fine Sand 2	🟪	122		Mohr-Coulomb	0	30
Coarse and Fine Sand 3	🟫	118	128	Mohr-Coulomb	0	33
Abutment	▨	150		Infinite strength		

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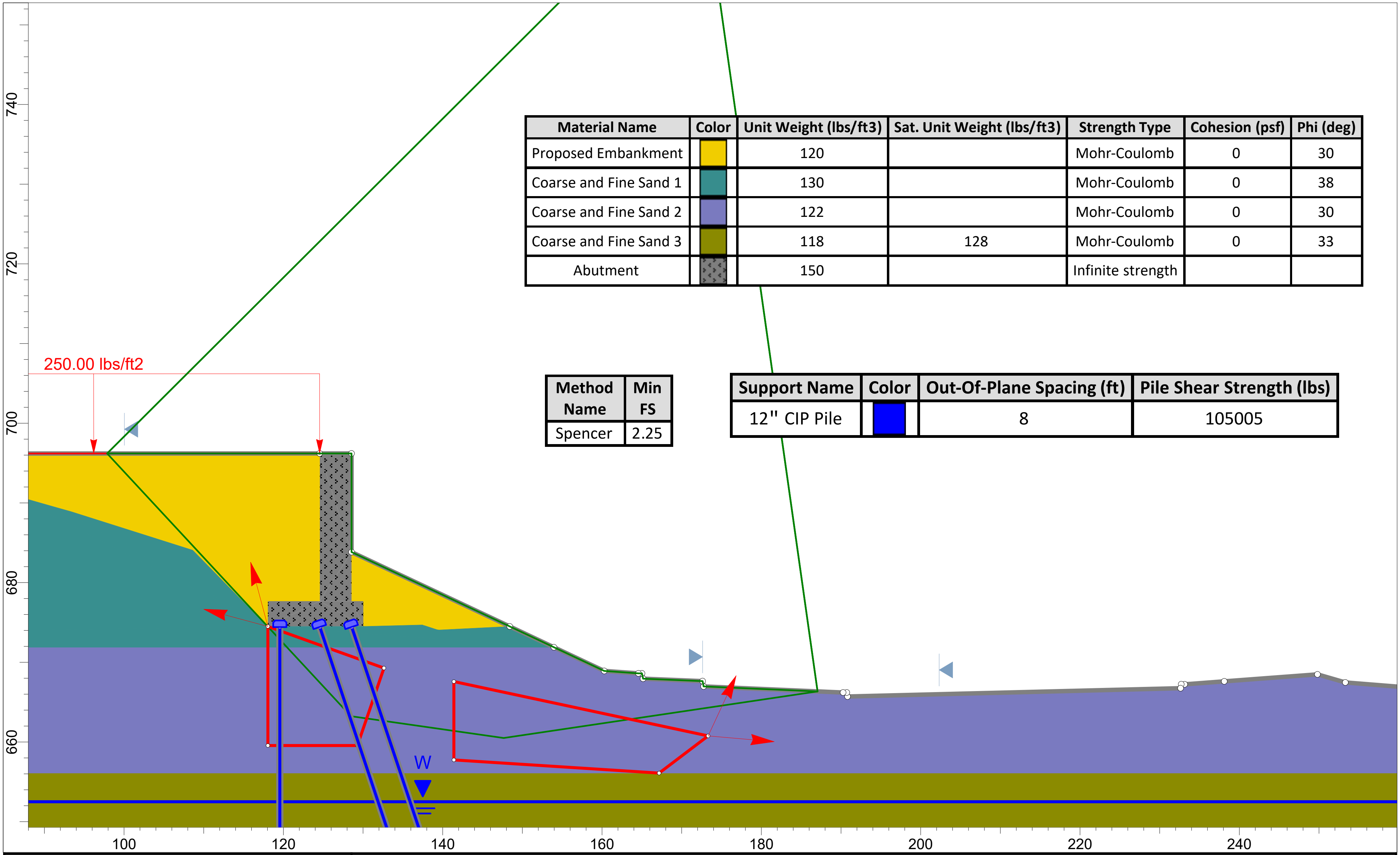
SLIDEINTERPRET 9.025

Project	CUY-90-16.28 (CCG3A), PID 82382		
Analysis Description	Rear Abutment, Global Stability - Effective Stress, Circular Failure		
Drawn By	KCA	*Company*	NEAS Inc.
Date	8/24/2021, 4:22:02 PM	*File Name*	RA_EffCircular082421.slim



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Proposed Embankment	🟨	120		Mohr-Coulomb	0	30
Coarse and Fine Sand 1	🟩	130		Mohr-Coulomb	0	38
Coarse and Fine Sand 2	🟪	122		Mohr-Coulomb	0	30
Coarse and Fine Sand 3	🟫	118	128	Mohr-Coulomb	0	33
Abutment	▨	150		Infinite strength		

Method Name	Min FS
Spencer	2.25

Support Name	Color	Out-Of-Plane Spacing (ft)	Pile Shear Strength (lbs)
12" CIP Pile	🟦	8	105005

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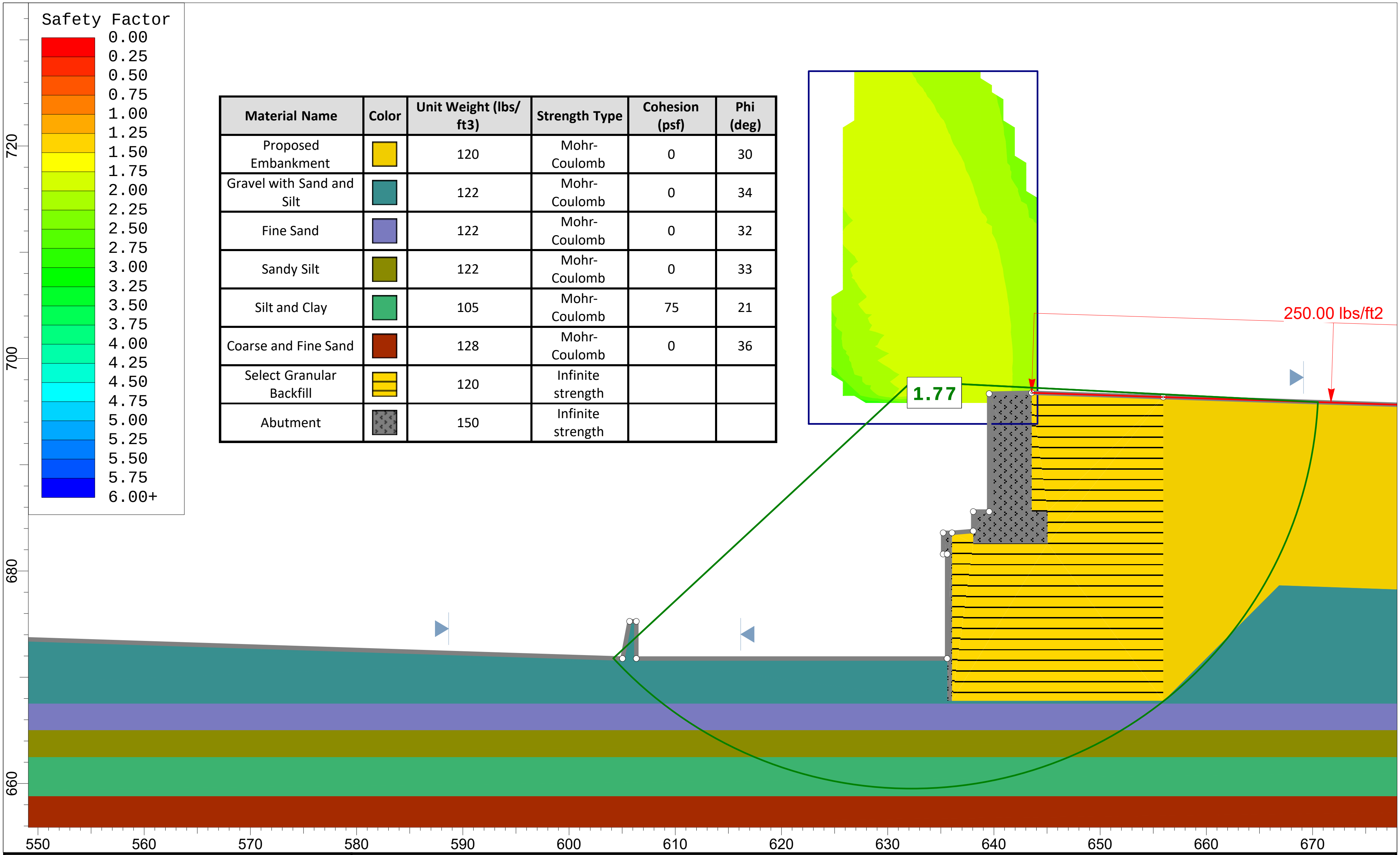
SLIDEINTERPRET 9.025

Project	CUY-90-16.28 (CCG3A), PID 82382		
Analysis Description	Rear Abutment, Global Stability - Effective Stress, Block Failure		
Drawn By	KCA	*Company*	NEAS Inc.
Date	8/24/2021, 4:22:02 PM	*File Name*	RA_EffBlock082421.slim

FORWARD ABUTMENT



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Proposed Embankment	🟨	120	Mohr-Coulomb	0	30
Gravel with Sand and Silt	🟦	122	Mohr-Coulomb	0	34
Fine Sand	🟪	122	Mohr-Coulomb	0	32
Sandy Silt	🟫	122	Mohr-Coulomb	0	33
Silt and Clay	🟩	105	Mohr-Coulomb	75	21
Coarse and Fine Sand	🟥	128	Mohr-Coulomb	0	36
Select Granular Backfill	▤	120	Infinite strength		
Abutment	▩	150	Infinite strength		

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SLIDEINTERPRET 9.025

Project CUY-90-16.28 (CCG3A), PID 82382

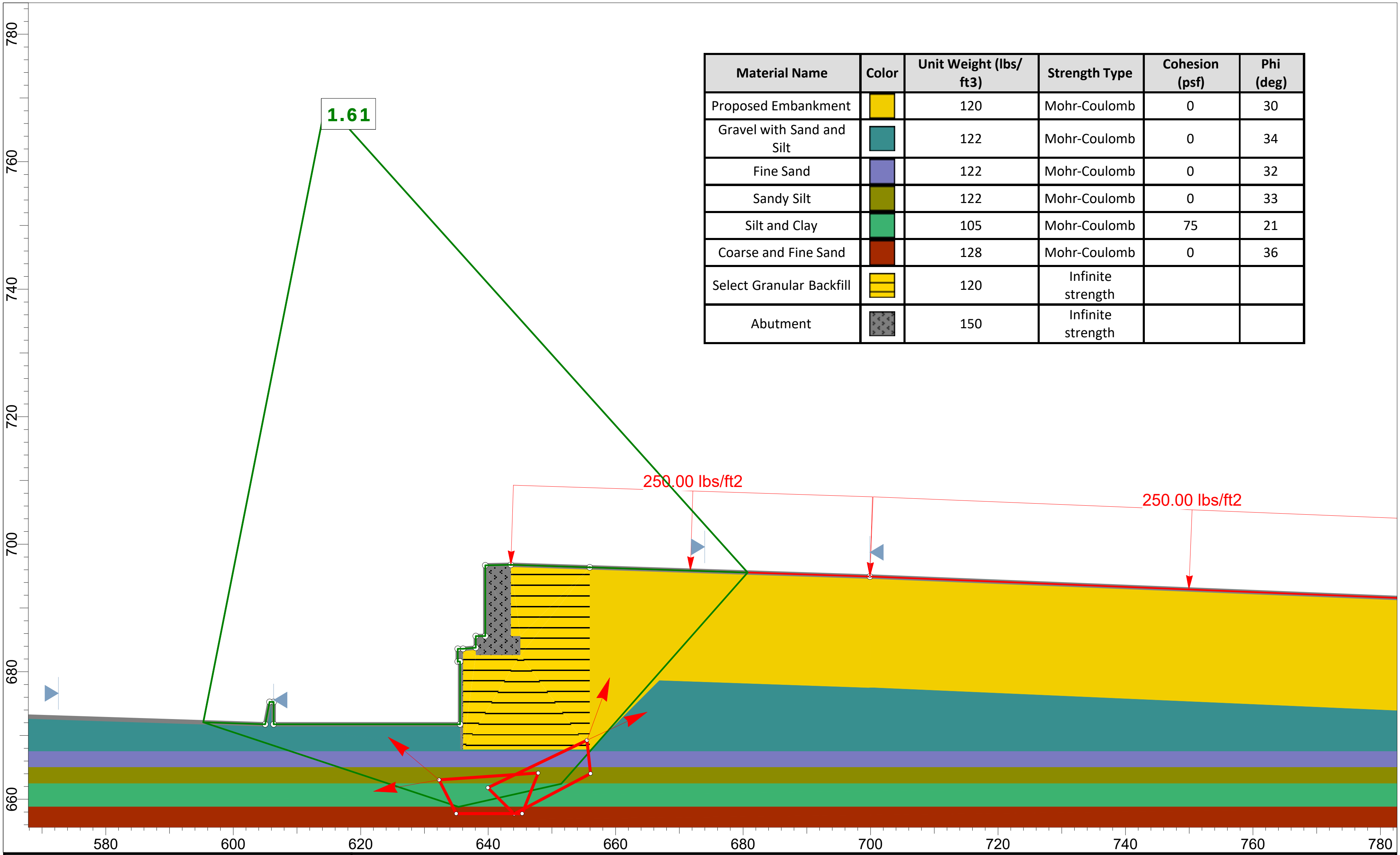
Analysis Description Forward Abutment, Global Stability - Effective Stress, Circular Failure

Drawn By KCA

Company NEAS Inc.

Date 8/24/2021, 4:22:02 PM

File Name FA_EffCircular082421.slim



Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Proposed Embankment	🟨	120	Mohr-Coulomb	0	30
Gravel with Sand and Silt	🟦	122	Mohr-Coulomb	0	34
Fine Sand	🟪	122	Mohr-Coulomb	0	32
Sandy Silt	🟫	122	Mohr-Coulomb	0	33
Silt and Clay	🟩	105	Mohr-Coulomb	75	21
Coarse and Fine Sand	🟥	128	Mohr-Coulomb	0	36
Select Granular Backfill	▤	120	Infinite strength		
Abutment	▨	150	Infinite strength		

rocscience

SLIDEINTERPRET 9.025

Project CUY-90-16.28 (CCG3A), PID 82382

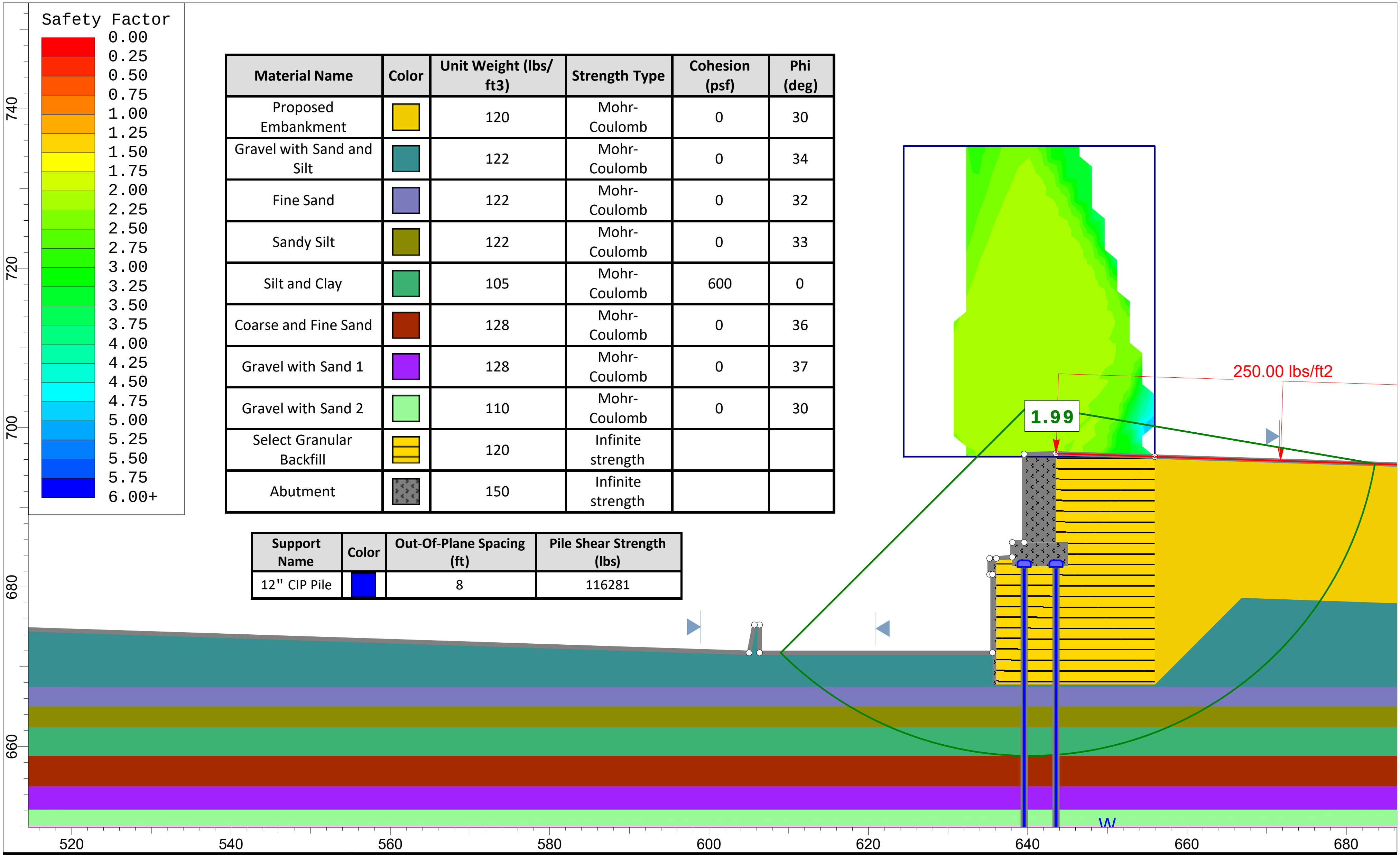
Analysis Description Forward Abutment, Global Stability - Effective Stress, Block Failure

Drawn By KCA

Company NEAS Inc.

Date 8/24/2021, 4:22:02 PM

File Name FA_EffBlock082421.slim



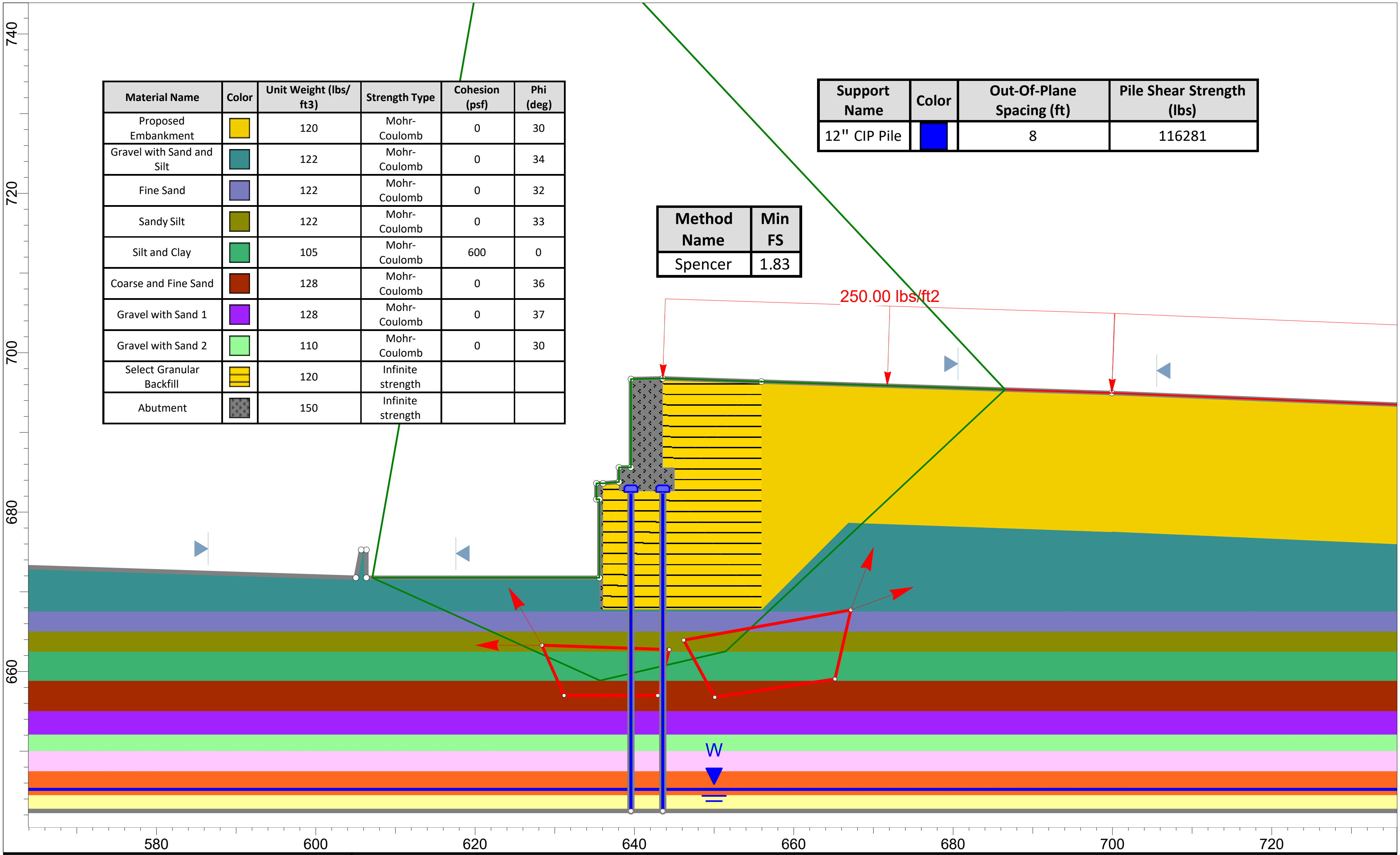
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Proposed Embankment	🟨	120	Mohr-Coulomb	0	30
Gravel with Sand and Silt	🟦	122	Mohr-Coulomb	0	34
Fine Sand	🟪	122	Mohr-Coulomb	0	32
Sandy Silt	🟫	122	Mohr-Coulomb	0	33
Silt and Clay	🟩	105	Mohr-Coulomb	600	0
Coarse and Fine Sand	🟥	128	Mohr-Coulomb	0	36
Gravel with Sand 1	🟪	128	Mohr-Coulomb	0	37
Gravel with Sand 2	🟩	110	Mohr-Coulomb	0	30
Select Granular Backfill	▤	120	Infinite strength		
Abutment	▨	150	Infinite strength		

Support Name	Color	Out-Of-Plane Spacing (ft)	Pile Shear Strength (lbs)
12" CIP Pile	🟦	8	116281

rocscience

SLIDEINTERPRET 9.025

Project	CUY-90-16.28 (CCG3A), PID 82382		
Analysis Description	Forward Abutment, Global Stability - Total Stress, Circular Failure		
Drawn By	KCA	*Company*	NEAS Inc.
Date	8/24/2021, 4:22:02 PM	*File Name*	FA_TotCircular082421.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Proposed Embankment	🟨	120	Mohr-Coulomb	0	30
Gravel with Sand and Silt	🟦	122	Mohr-Coulomb	0	34
Fine Sand	🟪	122	Mohr-Coulomb	0	32
Sandy Silt	🟫	122	Mohr-Coulomb	0	33
Silt and Clay	🟩	105	Mohr-Coulomb	600	0
Coarse and Fine Sand	🟥	128	Mohr-Coulomb	0	36
Gravel with Sand 1	🟪	128	Mohr-Coulomb	0	37
Gravel with Sand 2	🟩	110	Mohr-Coulomb	0	30
Select Granular Backfill	▤	120	Infinite strength		
Abutment	▨	150	Infinite strength		

Support Name	Color	Out-Of-Plane Spacing (ft)	Pile Shear Strength (lbs)
12" CIP Pile	🟦	8	116281

Method Name	Min FS
Spencer	1.83

rocscience

SLIDEINTERPRET 9.025

Project	CUY-90-16.28 (CCG3A), PID 82382
Analysis Description	Forward Abutment, Global Stability - Total Stress, Block Failure
Drawn By	KCA
Company	NEAS Inc.
Date	8/24/2021, 4:22:02 PM
File Name	FA_TotBlock082421.slim

APPENDIX K

DOWNDRAG ANALYSIS

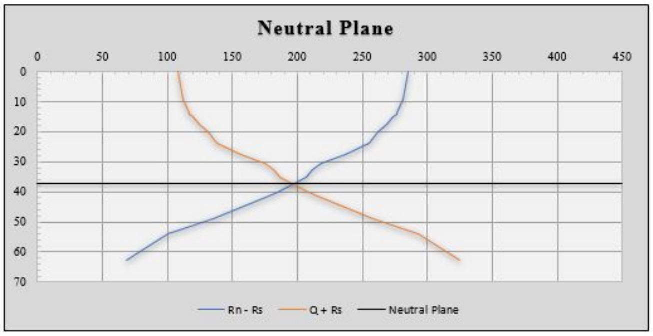
Objective: **To evaluate structural capacity of cast-in-place (CIP) closed-ended pipe piles at the Structural Strength Limit State considering downdrag loading, as well as to determine the elastic compression of the pile above the neutral plane for evaluation at the Service Limit State.**

Method: **In accordance with ODOT Bridge Design Manual, 2020 [Sect. 305.3.2.2], FHWA-NHI-16-009/010, Geotechnical Engineering Circular 12 (GEC 12), [Sect. 7.3.5, Sect. 7.3.6.1, and Sect. 11.6.3], and LRFD Bridge Design Specifications, 8th Ed., 2018, [Sect. 6.15.3.1]**

Givens:

DD Load Factor	UBV (kips)	Factored Permanent Load (kips)	Unfactored Permanent Load (kips)
1.4	285.0	138.9	108.4

Depth (ft)	Side Resistance, Rs (kips)	Nominal Resistance - Side Resistance (Rn - Rs) (kips)	Unfactored Permanent Load + Side Resistance (Q + Rs) (kips)
0.01	0	285.00	108.40
9.01	3.61	281.4	112.01
13.99	8.7	276.3	117.10
14.01	8.73	276.27	117.13
14.99	10.93	274.07	119.33
15.01	10.97	274.03	119.37
17.49	16.17	268.83	124.57
17.51	16.22	268.78	124.62
19.99	22.83	262.17	131.23
20.01	22.88	262.12	131.28
23.69	29.61	255.39	138.01
23.71	29.67	255.33	138.07
27.49	48.14	236.86	156.54
27.51	48.25	236.75	156.65
30.39	66.42	218.58	174.82
30.41	66.52	218.48	174.92
32.49	73.31	211.69	181.71
32.51	73.36	211.64	181.76
34.99	78.04	206.96	186.44
35.01	78.1	206.9	186.50
37.99	90.98	194.02	199.38
38.01	91.06	193.94	199.46
40.49	102.01	182.99	210.41
40.51	102.11	182.89	210.51
48.79	150.09	134.91	258.49
48.81	150.22	134.78	258.62
53.79	184.5	100.5	292.90
53.81	184.6	100.4	293.00
62.81	216.90	68.1	325.30



	Depth	Rs	Rn-Rs	Q+Rs
Lower Bound	35.01	78.1	206.9	186.5
Upper Bound	37.99	90.98	194.02	199.38

Depth of Neutral Plane (ft)	37.4
Q+DD @ Neutral Plane (kips)	196.7
DD @ Neutral Plane (kips)	88.3
Qp @ Neutral Plane (kips)	262.52

Rs = Nominal Side Resistance
Rn = Nominal Geotechnical Resistance (Side & End Bearing)
Q = Permanent Unfactored Load (Exclude Transient)
Qp = Total Factored Load (Permanent & Downdrag)
DD = Nominal Drag Load Per Pile

Pile Loading and Parameters:

Total Unfactored Axial Load (for the highest loaded pile at the substructure):

$Q_1 = \Sigma Q_i$ $\qquad Q_1 := 149.6\ kip$ $\qquad$ Permanent and transient loads

$Q_2 = \Sigma Q_i + DD$ $\qquad Q_2 := 196.7\ kip$ $\qquad$ Permanent and downdrag (DD) loads

$Q := \max\left(Q_1, Q_2\right)$ $\qquad Q = 196.7\ kip$ $\qquad$ Factored Axial Load to use in Structural Strength Limit State per **ODOT BDM [Sect. 305.3.2.2]**

Total Factored Axial Load (for the highest loaded pile at the substructure):

$Q_{P1} = \Sigma \eta_i \gamma_i Q_i$ $\qquad Q_{P1} := 199.5\ kip$ $\qquad$ Permanent and transient loads **ODOT BDM [Eq. C305.3.2-5]**

$Q_{P2} = \Sigma \eta_i \gamma_i Q_i + \eta_i \gamma_p DD$ $\qquad Q_{P2} := 262.5\ kip$ $\qquad$ Permanent and downdrag (DD) loads **ODOT BDM [Eq. C305.3.2.2-1]**

$Q_P := \max\left(Q_{P1}, Q_{P2}\right)$ $\qquad Q_P = 262.5\ kip$ $\qquad$ Factored Axial Load to use in Structural Strength Limit State per **ODOT BDM [Sect. 305.3.2.2]**

Pile Parameters:

$D_o := 12\ in$ $\qquad$ Pile Outside Diameter (ODOT Preferred: 12-in, 14-in & 16-in)

$t_w := 0.25\ in$ $\qquad$ Pile Wall Thickness (minimum = UBV/900 kips)

$D_i := D_o - 2 \cdot t_w$ $\qquad D_i = 11.5\ in$ $\qquad$ Pile Inside Diameter

$f'_c := 4\ ksi$ $\qquad$ 28-day compressive strength of concrete assumed to be 4 ksi per **ODOT BDM [Sect. C305.3.3]**

$F_y := 35\ ksi$ $\qquad$ Yield strength of structural steel assumed to be 35 ksi per **ODOT BDM [Sect. C305.3.3]**

Calculations

Assumptions:

The factored axial structural resistance of the pile calculated below are calculated in accordance with **LRFD BDS [Sect. 6.9.5.1]** assuming an axially loaded pile with negligible moment; no appreciable loss of section due to deterioration throughout the life of the structure; a steel yield strength of 35-ksi; a 28-day compressive strength of concrete. 4-ksi, a structural resistance factor for pipe piles subject to damage due to severe driving conditions (φ_c = 0.60); and a pile fully braced along its length (*l* = 0-in). If a pile is not anticipated to be fully braced along its length (i.e., capped column type piers) see **LRFD BDS [Sect. 6.9.5.1].**

Piles under combined axial compression and flexure, should check structural Strength Limit State by determining factored structural resistance in accordance with LRFD BDS [Sect. 6.9.2.2]

Cross-sectional area of concrete

$$A_c := \frac{\pi}{4} \cdot D_i^2 \qquad A_c = 103.9\ in^2$$

Cross-sectional area of steel

$$A_s := \frac{\pi}{4} \cdot \left(D_o^2 - D_i^2\right) \qquad A_s = 9.2\ in^2$$

Nominal Compressive Resistance of Composite Members:

$$F_e := F_y + 0.85 \cdot f'_c \cdot \left(\frac{A_c}{A_s}\right) \qquad F_e = 73.3\ ksi$$

LRFD BDS [Eq. 6.9.5.1-4]

Factored Structural Resistance of Pile:

$\varphi_c := 0.6$ Structural Resistance Factor per **LRFD BDS [Sect. 6.5.4.2]** for severe driving conditions

$$P_r := \varphi_c \cdot F_e \cdot A_s \qquad P_r = 405.7\ kip$$

Structural Strength Limit State Check:

$$\text{Check} := \text{if}\left(P_r \geq Q_P, \text{"GOOD"}, \text{"FAIL"}\right)$$

$$\text{Check} = \text{"GOOD"}$$

If Check = "FAIL", consideration should be given to increased pile wall thickness or decreased load on pile (i.e., more piles, reduce downdrag effect, etc.)

Axial Compression of Pile Above the Neutral Plane:

$C_3 := 0.4$ Composite Column Constant per **LRFD BDS [Table 6.9.5.1-1]**

$E := 29000\ ksi$ Elastic Modulus of Steel

$L := 37.4\ ft$ Length of pile (above neutral plane if downdrag controls)

$A := \frac{\pi}{4} \cdot D_o^2 = 113.1\ in^2$ Total Area of the Pile

$E_c := \left(2500\ f'_c{}^{0.33}\right)\ ksi = 3950.2\ ksi$ Elastic Modulus of Concrete per **LRFD BDS [Eq. C5.4.2.4-1]**

$n := \frac{E}{E_c} = 7.3$ Modular Ratio on the Concrete per **LRFD BDS [Eq. C5.4.2.4-1]**

$E_e := E \cdot \left(1 + \left(\frac{C_3}{n}\right) \cdot \left(\frac{A_c}{A_s}\right)\right) = 46784.3\ ksi$ Elastic Modulus of Composite Column per **LRFD BDS [Eq. 6.9.5.1-5]**

$\Delta := \frac{Q \cdot L}{A \cdot E_e} = 0.02\ in$ Elastic Compression of the Pile per **GEC 12 [Eq. 7-48]**

APPENDIX L

SEISMIC SITE CLASSIFICATION CALCULATION

Seismic Site Classification - Bridge CUY-90-1652S

B-157-0-14

Depth (ft)	Layer Thickness, d (ft)	Avg. SPT Value, N (bpf)	d/N
9.5	9.5	41.3	0.23
22.5	13.0	30.8	0.42
38.3	15.8	11.6	1.36
63.3	25.0	31.4	0.80
78.3	15.0	57.0	0.26
83.3	5.0	81.0	0.06
88.3	5.0	34.0	0.15
100.0	11.7	28.0	0.42
Sum	100		3.701
N-avg	27.0		

B-158-0-14

Depth (ft)	Layer Thickness, d (ft)	Avg. SPT Value, N (bpf)	d/N
1.5	1.5	9.0	0.17
4.5	3.0	14.5	0.21
12.0	7.5	18.0	0.42
17.0	5.0	8.0	0.63
43.3	26.3	23.9	1.10
100.0	56.7	31.1	1.82
Sum	100		4.339
N-avg	23.0		

B-122-0-14

Depth (ft)	Layer Thickness, d (ft)	Avg. SPT Value, N (bpf)	d/N	
9	9.0	10.3	0.88	
14.0	5.0	14.5	0.34	
42.8	28.8	34.7	0.83	
87.8	45.0	20.1	2.24	
100.0	12.2	9.9	1.24	**From C-137, B-069-1, B-069-2**
Sum	100		5.527	
N-avg	18.1			

B-158-0-14

Depth (ft)	Layer Thickness, d (ft)	Avg. SPT Value, N (bpf)	d/N	
9.5	9.5	13.3	0.71	
12.0	2.5	5.0	0.50	
19.5	7.5	28.7	0.26	
22.0	2.5	8.0	0.31	
27.3	5.3	5.0	1.06	
43.3	16.0	23.8	0.67	
86.5	43.2	36.8	1.18	
100.0	13.5	9.9	1.37	**From C-137, B-069-1, B-069-2**
Sum	100		6.065	
N-avg	16.5			

Site Average	21.2