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Structure Geotechnical Report

MSE WALL CONSTRUCTION
FAP ROUTE 799 (MLK BRIDGE APPROACH)
ST. CLAIR COUNTY, ILLINOIS
PTB 172-022
CONTRACT NO. 76G39
JOB NO.: P/D-98-038-13
SECTION: 1BR-1-1
STRUCTURE NO. SN 082-W315 (PROPOSED)

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August 2016
Revised May 2017

Prepared for:
MODJESKI AND MASTERS, INC.
4 SUNSET HILLS PROFESSIONAL CENTER
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LICENSED PROFESSIONAL ENGINEER
THOMAS JOSEPH CASEY
062-061853
STATE OF ILLINOIS

SCI No. 2014-3149.51

SCI ENGINEERING, INC.
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CONSTRUCTION SERVICES

May 18, 2017

Ms. Jerilyn Hassard, PE, SE
Modjeski and Masters, Inc.
4 Sunset Hills Professional Center
Edwardsville, Illinois 62025

RE: Structure Geotechnical Report
MLK Bridge Approach MSE Wall
F.A.P. Route 799
St. Clair County, Illinois
PTB 172-022
Contract No. 76G39
Job No.: P/D-98-038-13
Section: 1BR-1-1
Structure No: SN 082-W315 (PROPOSED)
SCI No.: 2014-3149.51

Dear Ms. Hassard:

Enclosed is our *Structure Geotechnical Report (SGR)* dated August 2016, and revised May 2017. This report should be read in its entirety, and our recommendations considered in the design and construction of the proposed MSE wall construction. Please call if you have any questions.

Respectfully,

SCI ENGINEERING, INC.

Bronson L. Bowling, E.I.
Staff Engineer

Thomas J. Casey, P.E.
Senior Engineer

BLB/TJC/tlw

Enclosure

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Structure Geotechnical Report

MSE WALL CONSTRUCTION
FAP ROUTE 799 (MLK BRIDGE APPROACH)
ST. CLAIR COUNTY, ILLINOIS
PTB 172-022
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STRUCTURE NO. SN 082-W315 (PROPOSED)

1.0 PROJECT DESCRIPTION

The geotechnical study summarized in this report was performed for the proposed new retaining wall, proposed SN 082-W315, that is required to support the approach embankment for the proposed bridge ramp replacement, existing SN 082-6003, in East St. Louis, Illinois. Overall, the new bridge will carry traffic over relocated Illinois Route 3, various railroads tracks, Missouri Avenue, and I-55SB/I-64WB. This report will discuss the retaining wall, SN 082-W315 being utilized at the east abutment of the replacement bridge. The new bridge structure, proposed SN 082-0374, is discussed under a separate SGR completed by SCI. The location of the site is shown on the *Vicinity and Topographic Map*, Figure 1.

The new retaining wall, proposed as an MSE wall, will extend from STA 75+18.50 to the abutment at STA 73+59.51. The maximum wall height is estimated to be 24.7 feet tall at the northwest corner. More specific information concerning the layout and dimensions of the proposed MSE wall are presented on the attached TS&L in Appendix D.

2.0 FIELD EXPLORATION AND SUBSURFACE CONDITIONS

2.1 Area Geology

The project is located approximately 0.6 miles east of the Mississippi River in the floodplain known locally as the American Bottoms. Physiographically, the project is located in the Springfield Plain, Till Plains Section, and Central Lowland Province. The soils in the immediate area were formed in alluvial sediment on bottomlands known as the Cahokia Alluvium.

The near-surface soils are of the Darwin Association and Landes-Riley Association comprised mainly of clayey alluvial sediment, loam, and sandy alluvial sediment. Underlying the Cahokia Alluvium is the Henry Formation consisting of glacial deposits of sands and gravels. The bedrock which underlies the Henry Formation was formed in the Mississippi Period, and generally consists of St. Genevieve Limestone underlain by St. Louis Limestone (*Bedrock Geology of Granite City Quadrangle, Madison and St. Clair Counties, Illinois and St. Louis County, Missouri*, Illinois State Geological Survey, 2003).

2.2 Exploration Procedures

Four (4) retaining wall borings, designated as RW-301, RW-302, RW-303, and RW-304 were drilled along the new MSE wall alignment between May 25, 2016 and June 6, 2016. Additionally, this report makes use of referencing two (2) bridge borings, designated BB-305, and BB-306 which were drilled at Pier 4 and the east abutment, respectively, as shown on the *Site Plan*, Figure 2.

The boring locations were selected by SCI and staked in the field using a GPS unit with sub-meter accuracy. The boring locations were collected by submeter GPS Trimble units, while offsets and surface elevations were interpreted by SCI from survey data provided by IDOT for an adjacent project in 2012. The field exploration was performed in general accordance with procedures outlined in the 2015 *IDOT Geotechnical Manual*.

Personnel from SCI were with the drill rigs to supervise drilling, log the borings, and perform field unconfined compressive strength tests of the borings. Two geotechnical drill rigs, one all-terrain mounted CME-550 and one track mounted CME-550, equipped with hollow-stem augers and mud-rotary techniques were used to advance the borings. SPTs were performed with a split-spoon sampler at 2½-foot intervals to 30 feet, and at 5-foot intervals thereafter to the termination depths of the borings. The unconfined compressive strength of the cohesive soils was determined with a Rimac test apparatus. A pocket penetrometer was used to measure the compressive strength if the soils were not conducive to Rimac testing. The borings were drilled to depths ranging from approximately 39.5 feet to 142.3 feet below the existing ground surface, as detailed in Table 2.1, and on the appended boring logs.

Table 2.1 - Summary of Borings Drilled for Structure SN 082-W315

Boring	Location	Ground Surface Elevation (ft)	Termination Depth (ft)	Station	Offset	
BB-305	Pier 4	415.0	130.5	71+43	55	LT
BB-306	East Abutment	427.0	142.3	74+00	31	LT
RW-301	Proposed MSE Wall	404.0	39.5	75+38	107	LT
RW-302	Proposed MSE Wall	400.0	40.0	72+84	67	LT
RW-303	Proposed MSE Wall	428.0	50.0	73+50	59	RT
RW-304	Proposed MSE Wall	422.0	49.5	75+98	39	LT

2.3 Subsurface Conditions

Detailed information regarding the nature and thickness of the soils encountered, and the results of the field sampling and laboratory testing are shown on the Boring Logs in Appendix A. Figure 2, *Site Plan* indicates the boring locations with respect to the proposed structure. The generalized soil profiles are included on the subsurface profile, Figure 3.

The borings encountered fill with varying amounts of debris to depths ranging from approximately 3 to 23 feet beneath the existing ground surface. The deeper fills (16.5 to 23 feet) were encountered in the vicinity of Borings RW-303, RW-304 and BB-306. The fill generally consisted of cinders, coal, slag, glass, wood, brick and concrete fragments, sand, clay and silt and are likely part of the original embankment construction.

Beneath the fill, the natural soils consisted of interbedded layers of silt (A-4 in accordance with the AASHTO soil classification system, based on our visual classification unless lab tests were noted on the logs), clay (A-6), fat clay (A-7), silty loam (A-4), sandy loam, (A-2), and sand (A-3) which extended to a nominal depth of 23 feet. Beneath the interbedded layers, the exploration encountered fine to coarse sand (A-2 and A-3) with varying amounts of gravel to a nominal depth of 108 feet. This sand generally becomes denser with depth as well as an increase in gravel with depth. Below the sand deposit, large gravel with cobbles (A-1) extended to the top of limestone bedrock at a nominal depth of 120 feet (ranging from approximately 116.5 to 126.7 feet).

Bedrock consisting of limestone was encountered between elevation 298.5 and 300.3 in both bridge borings utilized in the evaluation. In general, the Rock Quality Designation (RQD) for the observed limestone ranged from 68.5 to 82.5 percent, indicating moderate to good quality rock. A lower RQD ranging from 54 to 67 percent, indicating fair to poor quality rock, was observed in BB-305, which is attributed to the weathering and thin bedding of the limestone. In general, the limestone observed in the other core runs was medium to thickly bedded. Unconfined compressive strength tests yielded results ranging from 85.7 tons per square foot (tsf) to 820.6 tsf, with an average of 256.6 tsf. The RW- borings 298.5were terminated within the natural soils and did not encounter bedrock. A summary of the depth and elevation that limestone was first encountered in each of the borings is presented in Table 2.2 below.

Table 2.2 – Summary of Bedrock Elevations

Boring	Depth to Rock (ft)	Rock Elevation (ft)
BB-305	126.7	298.5
BB-306	116.5	300.3

2.4 Groundwater Conditions

Groundwater levels observed at the time of drilling are summarized in Table 2.3 below. It should be noted that mud rotary techniques do not allow for accurate detection of groundwater during drilling. Additionally, it should be noted that the groundwater level is subject to seasonal and climatic variations, the water level in the Mississippi River, the proximity to IDOT deep well facility and other factors; and may be present at different depths in the future. In addition, without extended periods of observation, measurement of the true groundwater levels may not be possible.

Table 2.3 – Summary of Approximate Groundwater Levels

Boring No.	Depth to Groundwater During Drilling (ft)	Groundwater Elevation During Drilling (ft)
BB-305	37.5	377.5
BB-306	N/D	N/D
RW-301	N/D	N/D
RW-302	18.0	382.0
RW-303	43.5	384.5
RW-304	N/D	N/D

Note: Not determined (N/D)

3.0 GEOTECHNICAL EVALUATIONS

In order to provide design recommendations for founding the structures, SCI performed the following evaluations based on all available data collected and reviewed at the time of this report. This information includes subsurface explorations performed by SCI, preliminary TS&L plans, and communications with Modjeski and Masters (M&M) personnel familiar with the project.

3.1 Seismic Considerations

3.1.1 Design Earthquake

For the purposes of seismic design the associated bridge (SN 082-0374) has been classified as *Regular* and *Essential*. According to the Illinois Department of Transportation Bridge Manual 2012 edition, the structure should be designed to a design earthquake with a 7 percent Probability of Exceedance (PE) over a 75-year exposure period (i.e. a 1,000-year design earthquake). The design earthquake has a Moment Magnitude (Mw) of 7.70 and a Peak Ground Acceleration (PGA) of 0.09g, as determined from data provided by the United States Geological Survey (USGS) National Seismic Hazard Mapping Project and procedures outlined in the Bridge Manual.

3.1.2 Site Class Determination

The seismic site soil classification for the MSE wall was determined from the design earthquake data, the subsurface data from the associated bridge (SN 082-0374) structure, and the procedures described in AGMU Memo 09.1, *Seismic Site Class Definition*, of the IDOT Bridge Manual Design Guides. The Site Class was evaluated using methods defined as B and C, which include evaluating the SPT N-values separately. The following results were calculated:

- Method B using N: 14 to 20 bpf (Site Class D)
- Method C using N_{ch}: 18 to 28 psf (Site Class D)

Based on the results of the analyses, and the guidelines in the AGMU, SCI recommend that Site Class D be used for the project. Based on Table 6.12.2.1.3-1 of the IDOT Geotechnical Manual, the Seismic Performance Zone is 2. Seismic design parameters for the site are summarized in Table 3.1

Table 3.1 – Seismic Design Parameters

Seismic Design Parameters	
Site Class	D
PGA	0.091
M_W	7.70
Source-to-Site Distance (km)	188.3
F_{pga}	1.60
F_a	1.52
F_v	2.40
A_S	0.145
Design Spectral Acceleration at 0.2 sec. (S_{DS})	0.54g
Design Spectral Acceleration at 1.0 sec.(S_{D1})	0.24g
Seismic Performance Zone	Zone 2

3.1.3 Liquefaction Potential Analysis

The liquefaction potential analysis for the site was conducted using available boring data and the techniques outlined in the National Center for Earthquake Engineering (NCEER) Technical Report NCEER-97-0022. For the seismic hazard evaluation, it is generally not prescribed to assume that earthquakes would coincide with other extreme loading events, (i.e. reoccurring flood events) unless the structure is considered critical, at which time engineering judgment may be used to provide additional conservatism to the analysis, if necessary. The groundwater depth was estimated from the end of boring conditions and was varied from

18 feet to greater than 50 feet to evaluate the sensitivity of the analysis to groundwater elevations. Groundwater elevations were considered in the liquefaction analysis. SCI determined the highest noted groundwater elevation was at approximately EL 384.5. SCI evaluated elevations up to 395 to determine the sensitivity to groundwater and provide a level of conservatism. Sands located above the groundwater table are not susceptible to liquefaction.

Based on our analyses, the soils encountered have sufficient strength and/or a plasticity index that make the threat of liquefaction minimal during the design earthquake. The results of the liquefaction analyses are presented in Appendix B.

While the amount of the seismically-induced settlement is dependent on the magnitude and distance from the seismic event, SCI estimates that the settlement from the design earthquake will be negligible, so liquefaction mitigation techniques are not required.

3.2 Mechanically Stabilized Earth Retaining Walls

Based on the design information available at the time of this report, SCI understands that minimal fills and primarily, large cuts will be made in front of the planned walls. However, the MLK approach roadway elevations are to remain relatively unchanged.

3.2.1 Settlement

Based on conversations with the Bridge Office, and the revised plans provided, SCI understands that either ground improvement or light weight fill options must be considered. Without these options, SCI estimates settlement along the base of the wall to be approximately 1.0 inch. Based on the IDOT "cohesive soil settlement estimate" spreadsheet SCI estimates that maximum settlements for the ground improvement option and lightweight fill options are 0.30 and 0.40 inches, respectively. Additionally, in the Bridge SN 082-0374 SGR, SCI recommends the use of bond breakers be installed on the H-Piles. With the installation of the bond breakers, SCI does not anticipate any down drag loading will be produced on the abutment piles.

3.2.2 Global Slope Stability

The global slope stability of the MSE wall was analyzed for end-of-construction (short-term), long-term, and seismic (pseudo-static) loading conditions, at selected locations along the proposed MSE wall, as detailed in Table 3.2 below. For the short-term condition, SCI evaluated two separate conditions: the first considering an elevated groundwater table that could occur during a flood and the nearby dewatering system were to fail; the second is during what SCI considers to be "normal" groundwater conditions. The long-term and seismic were evaluated considering the "normal" groundwater conditions.

The slope stability analyses were conducted, using the commercially available software program Slope/W (part of the GeoStudio 2012 software package developed by Geo-Slope International), engineering soil properties from the subsurface exploration data, the given retaining wall geometries, the peak ground acceleration (PGA) from the design earthquake, and the procedures for seismic slope stability outlined in Federal Highway Administration (FHWA) publication FHWA-HI-99-012 *Geotechnical Earthquake Engineering*. A Morgenstern-Price analysis with a circular mode of failure was used to search for the critical factor of safety (FS).

The MSE wall global stability was analyzed at three sections as shown on Figure 2. As shown on the preliminary TS&L, the maximum wall height is estimated to be 24.7 feet at STA 73+59.57. While this section is technically the tallest, due to the depth of the girder section, it does not represent that most critical section. The most critical section modeled was determined to be at STA 73+70, where the wall height is approximately 21 feet tall. Per the preliminary TS&L drawing, the reinforced MSE wall backfill was shown as a traditional 70 percent of the proposed wall height with 3.5 feet of embedment. The failure surfaces were limited to exclude the MSE wall reinforced backfill. These analyses assume that the MSE wall is internally stable. To account for traffic loading, a surcharge load of 250 psf was applied to the analyses.

Based on our analysis, the proposed wall configuration does not provide sufficient wall embedment or reinforcement length to satisfy minimum factors of safety for global stability for the sections between STA 73+59.61 LT along the abutment face and 74+00. In order to achieve satisfactory factors of safety, a minimum embedment of approximately 5 feet and either the use of lightweight fill within the new embankment or stone columns to mitigate the soft fine grained soils that underlie the new retaining wall will be required. For the lightweight fill alternative, to account for the subgrade soils beneath the proposed roadway, 3 feet of normal weight soil was also included in the analyses. Additional recommendations related to the light weight fill and stone columns are addressed later in the report. If lightweight fill is used, a minimum reinforcement length of 100 percent of the proposed wall height is required. If stone columns are used, this increased reinforced length is not required. The deeper embedment is required in order to satisfy AASHTO Figure 11.10.2-1 for sloped surfaces in front of the MSE wall. If a 4-foot wide bench can be provided, then the originally proposed 3.5-foot embedment can be used. Beyond STA 74+00 LT the proposed 3.5-foot embedment satisfies AASHTO requirements. Soil parameters used in the analyses and the results of the analyses are shown on the output plots in Appendix B.

End-of-construction (short-term) soil strength parameters were derived from the results of Rimac tests, unconfined compression tests, triaxial tests, and SPT tests. Based on the preliminary TS&L, the remaining fill behind the wall will consist of select fill similar to the material used within the reinforced zone. The required minimum factors of safety were obtained from Section 6.10.4 of the 2015 IDOT Geotechnical Manual for the global slope stability. The results of the global slope stability analyses are presented in Table 3.2 below.

Table 3.2 – Summary of Estimated Global Slope Stability Factors of Safety

MSE Wall Location	Approx. Wall Height (ft)	Reinforced Length Ratio	Model Concept	Embedment depth (ft)	Short-Term Static Condition		Long-Term Static Condition	Seismic Condition
					Extreme High Groundwater Estimated FOS	Estimated FOS	Estimated FOS	Estimated FOS
Required Factor of Safety					**1.3**	**1.3**	**1.3**	**1.0**
73+70 LT	21.0	1.0H	Base	5.0	**1.0**	**1.0**	**1.2**	**<1**
		1.0H	LWF		1.3	1.3	1.5	1.1
73+59.61 (bridge abutment)	19.0	0.7H	LWF	5.0(1)	1.4	1.4	1.6	1.2
74+00, LT	12.0	0.7H	Base	3.5	1.5	1.5	1.5	1.3
			LWF	3.5	1.4	1.4	1.6	1.1

(1) – Embedment may be greater than shown here as required to match bearing grade at adjacent north facing wall (73+70 section)

The native cohesive soils, especially the weak clay overlaying the fluvial sands, are relatively weak and will not support a traditional retaining wall where the wall height is greater than 12 feet (STA 74+00 LT to 73+59 bridge cone). One of two properties can be changed to improve the stability of the proposed retaining wall. The following sub-sections provide additional information on these methods.

3.2.2.1 Stone Column Ground Improvement

As previously mentioned, the native soils do not have the strength to resist the loads associated with a traditional MSE wall. Stone Column Ground Improvement bearing in sand is a viable solution to improve load carrying capacity of the foundation soils. The system involves either drilling the hole, or vibrating a beveled probe down to the top of a suitable bearing layer. When the required depth is reached, crushed rock is either placed from the ground surface or fed through a hollow pipe to the bottom of the pier while slightly pulling the probe up. After an initial lift is placed, the vibrating probe is pushed back down to compact and densify the lift, and the process is repeated. During the process, the vibration from the beveled probe will help densify the surrounding soils, and the ramming of the aggregate will push out the bulb into the surrounding soils and help in densification.

A specialty foundation contractor should be consulted for further evaluation and design of the ground improvement. For a cost comparison, an estimated 542 cubic yards of treatment will be required. The costs of this method are expected to be similar to other alternatives presented in this report. However, for this alternative the minimum length to height ratio of the reinforcement lengths was assumed to be 0.7H. Based on boring BB-306, the stone columns should bear on the underlying medium dense sands estimated at an elevation of 390. The approximate limits of the ground improvement should be defined as an area bounded by a line 2 feet beyond the perimeter of the reinforced soil mass from STA 73+59.61 LT along the abutment and STA 74+00 LT. The contractor should be required to satisfy the following performance requirements in their design of the ground improvement:

- A minimum bearing pressure of 5,600 psf
- Minimum factor of safety against global slope stability failure during short-term conditions of 1.5
- Minimum factor of safety against global slope stability failure during long-term conditions of 1.5
- Minimum factor of safety of 2.0 against equivalent uniform service bearing pressure failure if a load test is performed
- Minimum factor of safety of 2.5 against equivalent uniform service bearing pressure failure if a load test is not performed
- Total settlement measured on the pavement not to exceed 1.0 inches
- Differential settlement measured along the base of the wall not to exceed 1/100

3.2.2.2 Lightweight Fill

The use of lightweight cellular concrete fill, such as Elastizell Class VI engineered fill (EF) (or equivalent), was determined suitable to achieve global stability and reduce settlement. The Class VI should have a minimum unit weight of 50 pcf (+/- 2 pcf) and a minimum 28-day compressive strength of 150 pounds per square inch (psi). For the purposes of achieving the global stability requirements, the analysis considered that the entire area between the MSE walls was constructed from the LWF material. This results in an apparent length of reinforcement to height ratio of greater than one between STA 73+59.61 LT along the abutment face and 74+00 LT. For a cost comparison, an estimated 1,531 cubic yards is required to complete the project. SCI recommends quality control and quality assurance measures include construction monitoring and strength testing of samples.

3.2.3 External Global Stability

External global stability of the MSE walls including sliding, eccentricity, and bearing capacity were also checked using methodologies discussed in FHWA publication FHWA-NHI-10-024 *Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume I.* The appropriate resistance factors for the MSE wall evaluation were obtained from the *2014 AASHTO LRFD Bridge Design Specification* with 2015 and 2016 interims. The results indicate that the MSE walls should have adequate Capacity Demand Ratios (CDR) to resist failure due to these mechanisms.

The highest load factor and the lowest resistance factors were used in the analysis; per the manual, using these values is usually sufficient for simple walls such as the one proposed here so extreme events were not evaluated. Additionally, SCI evaluated the bearing capacity considering both sloping ground in front of the wall and modified bearing capacity factors based on FHWA SA-02-054. The lessor value of each method was used in the evaluation. Table 3.3 presents the results and the minimum requirements for the external global stability analysis. The wall designer should be responsible for the internal stability of the retaining wall.

Table 3.3 – Minimum Design External Global Stability Requirements for MSE Walls

Location	Model Concept	Approx. Wall Height (ft.)	Bearing Capacity Strength Limit State ($q_R \geq q_{V-F}$)		Sliding (CDR > CDR_{min})		Eccentricity ($e < e_{max}$)	
			q_R (ksf)	q_{V-F} (ksf)	Calculated CDR	Min. Required CDR	Calculated Eccentricity (e)	Maximum Allowable, (e_{max})
MSE Wall 73+70, LT	Base	21.0	**2.1**	5.6	1.3	1.0	2.3	4.9
	LWF		2.5	1.7	1.0	1.0	2.9	10.5
MSE Wall 73+59.61 (bridge abutment)	LWF	19.0	2.3	1.6	1.0	1.0	2.6	9.5
MSE Wall 74+00, LT	Base	11.5	3.8	3.1	2.1	1.0	1.3	2.7
	LWF		6.6	1.0	1.6	1.0	1.6	5.8

3.3 Mining Activity

Based on the Illinois Coal Resource Shapefile GIS data provided by the Illinois State Geological Survey, dated July 2012, the site is not undermined. In addition, the subject site is more than 5 miles away from the nearest mapped mine. The listed disclaimer in the Directory states, "Locations of some features on the mine maps may be offset by 500 or more feet due to errors in the original source maps, the compilation process, digitizing, or a combination of these factors." Therefore, a study of the effects of mining activity on the project is not considered necessary.

4.0 CONSTRUCTION CONSIDERATIONS

The construction activities should be performed in accordance with the current *IDOT Standard Specifications for Road and Bridge Construction* and any pertinent Special Provisions or policies. For the construction of the stone column ground improvement specifically, Guide Bridge Special Provision No. 71, *Aggregate Column Ground Improvement* (Revised October 4, 2010) should be included in the construction documents. Due to the specific nature of the design process for MSE walls and ground improvement, the interdependence of the two designs should be considered when developing the plans.

The ground improvement contractor will need to assign strength and consolidation properties to the foundation soils in order to design the aggregate columns. All of the soils laboratory data included in Appendix A of this report should be included in the contract documents.

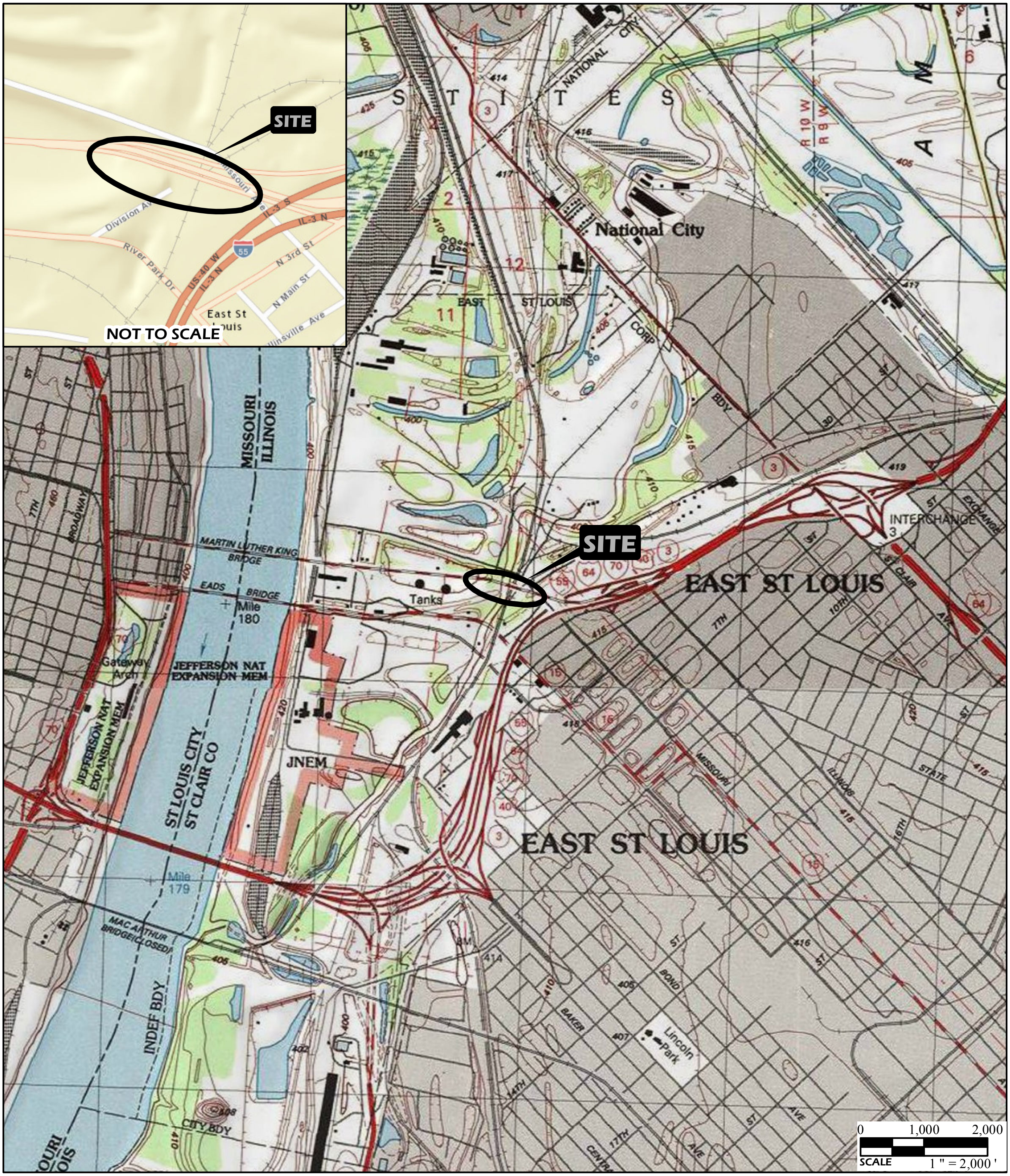
While not anticipated, based on the previous site improvements, obstructions such as old foundations, utilities and debris are possible. Generally, these obstructions should be removed from within the planned ground improvement area. Although it is possible to predrill the aggregate columns or shifting columns around smaller obstructions, this can lead to increased costs and may reduce the effectiveness of the ground improvement. Care should also be taken for the design and layout of the ground improvement to consider the planned pile foundations for the new abutment.

4.1 Temporary Earth Retention

Based on the discussions with personnel from M&M, SCI understands that temporary shoring will not be required to support the excavation and placement of reinforcement and select fill.

5.0 LIMITATIONS

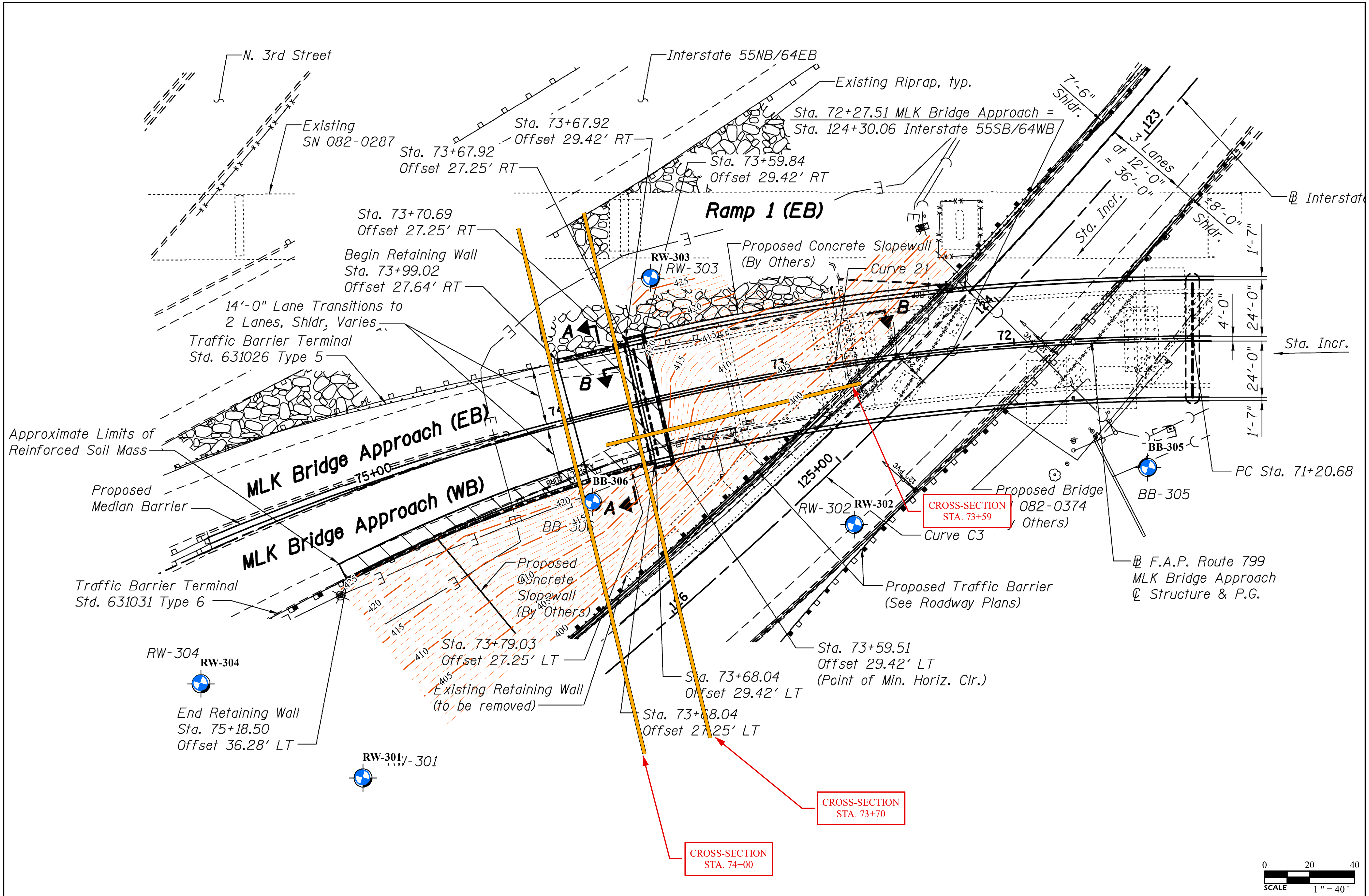
The recommendations provided herein are for the exclusive use of Modjeski and Masters, Inc. and IDOT. They are specific only to the project described, and are based on subsurface information obtained at six boring locations within the MSE Wall area, our understanding of the project as described herein, the TS&L provided by M&M on February 1, 2017, the SGR for the MLK Drive Bridge dated January 2017 and geotechnical engineering practice consistent with the standard of care. No other warranty is expressed or implied. SCI should be contacted if conditions encountered during construction are not consistent with those described.



PROJECT NAME	GENERAL NOTES/LEGEND
PTB 172, ITEM 22 - MLK APPROACH EAST SAINT LOUIS, ILLINOIS	USGS TOPOGRAPHIC MAP GRANITE CITY, ILLINOIS - MISSOURI QUADRANGLE CAHOKIA, ILLINOIS - MISSOURI QUADRANGLE DATED 1998 10' CONTOURS
VICINITY AND TOPOGRAPHIC MAP	STREET MAP http://goto.arcgisonline.com/maps/World_Street_Map

DRAWN BY	RCV	DATE	JOB NUMBER
CHECKED BY	BLB	05/2017	2014-3149.51

FIGURE 1



GENERAL NOTES/LEGEND

INDICATES APPROXIMATE SOIL BORING LOCATION.

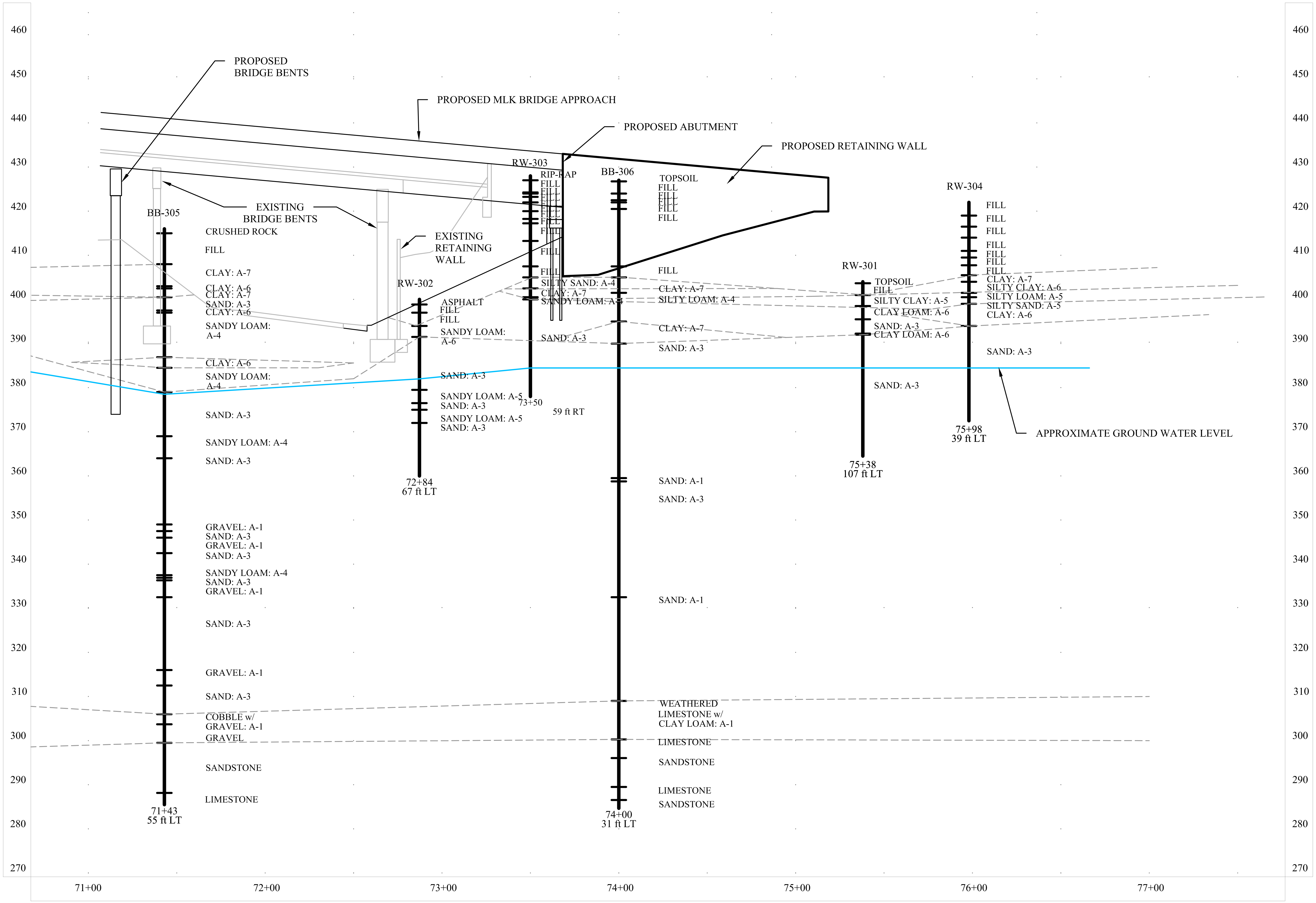
UNDATED PLAN RECEIVED 02/01/2017 FROM MODJESKI AND MASTERS, INC. DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME

MSE WALL CONSTRUCTION
FAP ROUTE 799 (MLK BRIDGE APPROACH) PTB 172-022
ST. CLAIR COUNTY, ILLINOIS

SITE PLAN

JOB NUMBER 2014-3149.51
DATE 05/2017
DRAWN BY RCV
CHECKED BY BLB
FIGURE 2



General Notes/Legend

VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME

MSE WALL CONSTRUCTION
FAP ROUTE 799 (MLK BRIDGE APPROACH) PTB 172-022
ST. CLAIR COUNTY, ILLINOIS

SUBSURFACE PROFILE

SCALE	1" = 20' V 1" = 50' H
JOB NUMBER	2014-3149.51
DATE	05/2017
DRAWN BY	RCV
CHECKED BY	BLB
FIGURE	3

Appendix A

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/25-5/31/2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** TC (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6290280807, -90.1613723778, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. 082-6003(E), 082-0374(P)
Station 73+59 to 75+18.50

BORING NO. BB-305
Station 71+43
Offset 55.0 ft LT
Ground Surface Elev. 415.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 377.5 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CRUSHED LIMESTONE: Gray, 3-inch minus				
414.0				
FILL: Black, clay, with cinders and brick, limestone gravel, A-6		4 9 7	>4.5 P	
Limestone gravel in shoe, no recovery	-5	2 3 3	--	
		1 1 1	0.5 P	
407.0				
CLAY: Gray, A-7	-10	1 1 2	1.5 P 0.9 S/20	
Becomes brownish-gray		1 2 2	1.6 S/20	
	-15	1 1 2	0.8 S/20	
399.5				
SAND: Brown, A-3		3 5 7	N/C	
396.5				
CLAY: Brown, A-6				
396.0				
SANDY LOAM: Brown, A-4	-20	2 2 6	0.2 S/20	

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SANDY LOAM: Brown, A-4 *(continued)*				
		2 4 5	N/C	
	-25	1 4 5	N/C	
		3 5 6	N/C	
385.9				
CLAY: Brown, trace fine sand, A-6	-30	5 5 9	N/C 0.3 P	
383.5				
SANDY LOAM: Brown, A-4				
	-35	6 9 11	N/C	
378.0				
SAND: Brown, A-3	▼			
Becomes gray Began mud rotary at 40.0 ft..	-40	3 5 13	N/C	

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/25-5/31/2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** TC (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6290280807, -90.1613723778, **SEC.** 13, **TWP.** 2N, **RNG.** 10W, (Latitude, Longitude)

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. 082-6003(E), 082-0374(P)
Station 73+59 to 75+18.50

BORING NO. BB-305
Station 71+43
Offset 55.0 ft LT
Ground Surface Elev. 415.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 377.5 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND: Brown, A-3 *(continued)*				
	-45	12, 12, 12	N/C	
SANDY LOAM: Gray, A-4 (top elev. 368.0)				
	-50	10, 18, 18	N/C	
SAND: Gray, A-3 (top elev. 363.0)				
	-55	9, 14, 16	N/C	
	-60	9, 8, 13	N/C	

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND: Gray, A-3 *(continued)*				
	-65	14, 12, 10	N/C	
GRAVEL: Gray, A-1 (top elev. 348.0)				
SAND: Gray, A-3 (top elev. 346.5)				
	-70	11, 16, 17	N/C	
GRAVEL: Gray, A-1 (top elev. 345.0)				
SAND: Gray, A-3 (top elev. 341.5)				
	-75	14, 16, 23	N/C	
SANDY LOAM: Gray, A-4 (top elev. 336.5)				
SAND: Gray, A-3 (top elev. 335.9; bottom elev. 335.3)				
	-80	11, 15, 17	N/C	

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/25-5/31/2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** TC (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6290280807, -90.1613723778, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. 082-6003(E), 082-0374(P)
Station 73+59 to 75+18.50

BORING NO. BB-305
Station 71+43
Offset 55.0 ft LT
Ground Surface Elev. 415.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 377.5 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
GRAVEL: Gray, A-1 *(continued)* Rough drilling from 80.0 ft.-82.0 ft.	331.5				
SAND: Gray, A-3		-85	13 9 12	N/C	
Coarse sand and rock fragments		-90	20 22 21	N/C	
Rough drilling from 92.0 ft.-93.0 ft.		-95	14 15 14	N/C	
	315.0	-100	8 18 23	N/C	

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
GRAVEL: Gray, A-1	311.5				
SAND: Brownish-gray, trace gravel, A-3		-105	14 27 36	N/C	
Rough drilling from 105.0 ft.-107.8 ft.			48 50/4"	--	
Weathered limestone and granite fragments in shoe; set casing at 109.3 ft. STOP: 5/26/2016 START: 5/27/2016	305.0	-110			
COBBLE w/ GRAVEL: Gray and brown, A-1 No recovery	302.7		50/5"	--	
Borehole continued with rock coring.			50/3"	--	
		-115			
		-120			

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

ROCK CORE LOG

Date 5/25-5/31/2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** TC (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6290280807, -90.1613723778, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **CORING METHOD**

STRUCT. NO. 082-6003(E), 082-0374(P)
Station 73+59 to 75+18.50

CORING BARREL TYPE & SIZE NX Wireline
Core Diameter 2 in
Top of Rock Elev. 298.5 ft
Begin Core Elev. 302.7 ft

BORING NO. BB-305
Station 71+43
Offset 55.0 ft LT
Ground Surface Elev. 415.0 ft

Description	Elev.	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
GRAVEL: Limestone and granite cobbles and boulders	302.70		1	12	0		
		-115					
			2	69	56	5	
	298.50						
SANDSTONE: Gray, moderately hard, very fine grained, banded, slightly weathered, calcareous							
Becomes medium bedded							
							94.1
Becomes thickly bedded		-120	3	95	82	2.8	
							85.7
3.2" open vertical fracture, becomes thin to medium bedded							
2.2" open vertical fracture							
Becomes banded to thinly bedded, trace styolites		-125	4	100	74	2.4	
							157.0
	287.15						
LIMESTONE: Light gray, moderately hard, very finely crystalline, medium bedded, slightly weathered			5	86	54	4	
							230.1
		-130					
1.75" open vertical fracture	284.50						
Boring terminated at 130.5 ft.							
Boring grouted to 130.5 ft.							

Color pictures of the cores Yes
Cores will be stored for examination until
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BORING BB-305

DEPTH
112 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	112-115.5	12	0

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PTB 172, Item 22 - FAP 799 (MLK Drive)	
ROCK CORE PHOTOGRAPH	
June 2016	SCI No. 2014-3149.51

BORING BB-305

DEPTH
115.5 ft.

DEPTH
124.5 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	115.5-119.5	69	56
3	119.5-124.5	95	82

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PTB 172, Item 22 - FAP 799 (MLK Drive)

ROCK CORE PHOTOGRAPH

June 2016 SCI No. 2014-3149.51

BORING BB-305

DEPTH
124.5 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	124.5-127.9	100	74

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PTB 172, Item 22 - FAP 799 (MLK Drive)

ROCK CORE PHOTOGRAPH

June 2016 SCI No. 2014-3149.51

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/26-6/2-2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** BDG (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6288584526, -90.1605354324, **SEC.** 13, **TWP.** 2N, **RNG.** 10W, (**Latitude , Longitude**)

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. 082-6003(E), 082-0374(P)
Station 73+59 to 75+18.50

BORING NO. BB-306
Station 74+00
Offset 31.0 ft LT
Ground Surface Elev. 427.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter N/A ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
3" TOPSOIL	426.8				
FILL: Brown and gray, clay, trace sand and cinders, A-6			2 4 4	>4.5 P	24
FILL: Brown, sandy clay, A-6	424.0		2 3 3	0.5 P	38
FILL: Brown, sand, A-3	422.5				
FILL: Brown, clay, with cinders, trace sand, A-6	422.0	-5			
FILL: Brown, sand, A-3	420.5		2 5 5	N/C	
		-10	4 5 6	N/C	
Trace clay lumps			3 4 6	N/C	
		-15	4 6 8	N/C	
			7 9 12	N/C	
			6 7	N/C	
FILL: Black, cinders, A-4	407.5	-20	4	N/C	36

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
FILL: Black, cinders, A-4 *(continued)* Rough drilling at 20.5 ft.			2 2 2	N/C 1.5 P	30 32
CLAY: Gray, with iron stains and nodules, A-7	405.0				
Trace iron stains		-25	1 2 2	0.8 P	28
SILTY LOAM: Gray, A-4	401.5		ST	0.5 S/10.6	33
		-30	2 5 7	0.9 S/15 N/C	28 29
CLAY: Gray, A-7	395.0				
		-35	WOH 1 2	0.9 B/20	49
SAND: Brown, A-3	390.0				
		-40	6 8 10	N/C	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/26-6/2-2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** BDG (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6288584526, -90.1605354324, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. 082-6003(E), 082-0374(P)
Station 73+59 to 75+18.50

BORING NO. BB-306
Station 74+00
Offset 31.0 ft LT
Ground Surface Elev. 427.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter N/A ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND: Brown, A-3 *(continued)* Began mud rotary at 40.0 ft..				
	-45	10 12 15	N/C	
	-50	5 7 12	N/C	
Becomes brownish-gray	-55	10 11 12	N/C	
	-60	4 6 10	N/C	

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND: Brown, A-3 *(continued)*				
	-65	10 19 21	N/C	
359.5 SAND: Brown and gray, A-1 358.8 SAND: Gray, A-3	-70	6 11 12	N/C	
Trace gravel	-75	8 8 7	N/C	
	-80	12 10 7	N/C	

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/26-6/2-2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** BDG (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6288584526, -90.1605354324, **SEC.** 13, **TWP.** 2N, **RNG.** 10W, **Latitude , Longitude**

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. 082-6003(E), 082-0374(P)
Station 73+59 to 75+18.50

BORING NO. BB-306
Station 74+00
Offset 31.0 ft LT
Ground Surface Elev. 427.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter N/A ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND: Gray, A-3 *(continued)*				
	-85	10 14 16	N/C	
Rough drilling from 87.0 ft.-88.5 ft.				
	-90	15 14 12	N/C	
332.5				
SAND: Gray, A-1	-95	12 50/5"	N/C	
	-100	16 22 16	N/C	
SAND: Gray, A-1 *(continued)* Boring advance with casing at 100.0 ft.				
	-105	29 38 50/4"	N/C	
With gravel	-110	23 44 47	N/C	
No gravel	-115	27 33 37	N/C	
309.0				
WEATHERED LIMESTONE w/ CLAY LOAM: Brown and gray, with chert gravel, A-1		50/5"	--	
	-120			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/26-6/2-2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** BDG (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6288584526, -90.1605354324, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. 082-6003(E), 082-0374(P)
Station 73+59 to 75+18.50

BORING NO. BB-306
Station 74+00
Offset 31.0 ft LT
Ground Surface Elev. 427.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter N/A ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
WEATHERED LIMESTONE w/ CLAY LOAM: Brown and gray, with chert gravel, A-1 *(continued)*				
		30	N/C	
		41		
	-125	50/5"		
Borehole continued with rock coring.		50/1"	--	
	-130			
	-135			
	-140			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

ROCK CORE LOG

Date 5/26-6/2-2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** BDG (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6288584526, -90.1605354324, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **CORING METHOD**

STRUCT. NO. 082-6003(E), 082-0374(P)
Station 73+59 to 75+18.50

CORING BARREL TYPE & SIZE NX Wireline

Core Diameter 2 in
Top of Rock Elev. 300.3 ft
Begin Core Elev. 300.3 ft

BORING NO. BB-306
Station 74+00
Offset 31.0 ft LT
Ground Surface Elev. 427.0 ft

Description	Elev.	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
WEATHERED LIMESTONE w/ CLAY LOAM: Brown and gray, with chert gravel, A-1 *(continued)*	300.28		1	100	73	2.22	
LIMESTONE: Light gray, hard, very finely crystalline, thin to medium bedded, moderately weathered, with interbedded clay seams Becomes thinly bedded		-130					820.6
Becomes fractured Becomes thinly bedded	296.05		2	100	89	1.3	
SANDSTONE: Gray, hard, very fine grained, thickly bedded, slightly weathered, calcareous	289.50	-135					228.6 225.4
LIMESTONE: Light gray, moderately hard, very finely crystalline, thickly bedded, slightly weathered Becomes banded, with 0.3" clay seam	286.55	-140					211.5
SANDSTONE: Gray, hard, very fine grained, banded to thinly bedded, slightly weathered 1.3" interbedded limestone 0.65" clay seam, becomes medium bedded	284.68		3	100	67	1	
Boring terminated at 142.3 ft. Boring grouted to 142.3 ft.		-145					

Color pictures of the cores Yes
Cores will be stored for examination until
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BORING BB-306

DEPTH
126.72 ft.

DEPTH
136.72 ft.

Scale in Inches

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	126.72-130.32	100	73
2	130.32-140.32	100	89

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PTB 172, Item 22 - FAP 799 (MLK Drive)

ROCK CORE PHOTOGRAPH

June 2016 SCI No. 2014-3149.51

BORING BB-306

DEPTH
136.72 ft.

DEPTH
142.32 ft.

Scale in Inches

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	130.32-140.32	100	89
3	140.32-142.32	100	67

SCI ENGINEERING, INC.
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PTB 172, Item 22 - FAP 799 (MLK Drive)

ROCK CORE PHOTOGRAPH

June 2016 SCI No. 2014-3149.51

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/25/16

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** BDG (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6290913789, -90.1600632111, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. SN 082-W315
Station 73+59 to 75+18.50

BORING NO. RW-301
Station 75+38
Offset 107.0 ft LT
Ground Surface Elev. 404.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter N/A ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
4" TOPSOIL	403.7				
FILL: Brown and gray, clay, trace iron stains, A-6			1 3 3	1.2 B/20	37
SILTY CLAY: Gray and brown, trace sand, A-5	401.0	-5	2 2 2	0.2 B/20	40
CLAY LOAM: Gray and brown, trace iron stains, A-6	398.5		WOH 1 2	0.9 B/20	34
SAND: Brown, A-3	395.5	-10	ST	--	
Began mud rotary at 11.0 ft..			2 4 3	N/C	33
CLAY LOAM: Gray and brown, A-6	392.3				
SAND: Brown, A-3 Trace silt Becomes brown	392.0	-15	2 3 5	0.5 P N/C	45 30
			5 5 5	N/C	
		-20	3 3 6	N/C	

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND: Brown, A-3 *(continued)*			10 10 10	N/C	
		-25	11 14 16	N/C	
Becomes gray			7 7 9	N/C	
Trace organics		-30	6 8 9	N/C	
Becomes brown		-35	4 4 4	N/C	
Low mud return, wood debris observed					
	364.5	-40	5 5 6	N/C	
Boring terminated at 39.5 ft. Boring grouted to 39.5 ft.					

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 6/1/16

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** TC (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6289833282, -90.1609112849, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. SN 082-W315
Station 73+59 to 75+18.50

BORING NO. RW-302
Station 72+84
Offset 67.0 ft LT
Ground Surface Elev. 400.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 382.0 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
1.2 ft. ASPHALTIC CONCRETE	398.9				
FILL: Brown and gray, sandy clay, A-6			2 8 10	0.9 S/15	14
	397.0				
FILL: Brown, sand and crushed rock, A-1		-5	3 3 3	N/C	3
	394.0				
SANDY LOAM: Brown, A-6			3 6 7	N/C	12
	391.5				
SAND: Brown, A-3		-10	2 4 6	N/C	10
			3 4 6	N/C	7
		-15	3 8 12	N/C	3
			5 9 10	N/C	13
▼					
Some silt		-20	2 7 10	N/C	
SAND: Brown, A-3 *(continued)*	379.5				
SANDY LOAM: Gray, A-5			1 5 9	N/C	
	376.5				
SAND: Gray trace brown, A-3	375.0	-25	1 4 8	N/C	
SANDY LOAM: Gray, A-5 Began mud rotary at 25.0 ft..			8 13 15	N/C	
	372.0				
SAND: Gray trace brown, A-3		-30	7 9 11	N/C	
		-35	13 15 14	--	
	360.0	-40	15 16 12	N/C	

Boring terminated at 40.0 ft.
Boring grouted to 40.0 ft.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 6/3-6/6/2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** BDG (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6286208892, -90.1607292089, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO.	SN 082-W315
Station	73+59 to 75+18.50
BORING NO.	RW-303
Station	73+50
Offset	59.0 ft RT
Ground Surface Elev.	428.0 ft
Surface Water Elev.	N/A ft
Stream Bed Elev.	N/A ft
Groundwater Elev.:	
First Encounter	384.5 ft ▼
Upon Completion	N/A ft
After N/A **Hrs.**	N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
RIP-RAP with SILTY CLAY	427.0				
FILL: Brown, clay loam, A-6			3 5 6	N/C	17
	424.3				
FILL: Brown, silty clay, A-5	424.0				
FILL: Brown, sand, A-3	423.3	-5	1 3 4	0.7 S/15	19
FILL: Brown, clay loam, A-6	422.0				
FILL: Brown, sandy loam, A-4	420.0		2 2 2	N/C	20
FILL: Brown, sand, A-3	418.3	-10	ST	2.3 P	22
FILL: Brown, clay, A-6	417.3				
FILL: Brown, silty clay loam, with brick, A-6			4 5 5	0.6 S/10	21
	413.3	-15	3 4 16	1.9 S/15	19
FILL: Brown, sand, A-3 With gravel and crushed rock			7 8 7	N/C	
With concrete fragments		-20	3 2 3	N/C	37

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Clogging in split spoon due to concrete fragments FILL: Brown, sand, A-3 *(continued)*	407.5				
FILL: Gray, clay, A-7			5 3 3	1.0 S/15	34
	405.0				
SILTY SAND: Gray, trace iron stains, A-4		-25	2 1 2	N/C	33
	402.5				
CLAY: Gray, A-7 Unconfined Compression Strength Test Performed	400.5		ST	0.5 S/2	33
SANDY LOAM: Brown, A-4	400.0				
SAND: Brown, A-3		-30	9 10 8	N/C	
Stop: 6/3/2016 at 3:00 pm Start: 6/6/2016 at 7:40 am					
		-35	7 11 12	N/C	
		-40	8 12 17	N/C	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 6/3-6/6/2016

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** BDG (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6286208892, -90.1607292089, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. SN 082-W315
Station 73+59 to 75+18.50

BORING NO. RW-303
Station 73+50
Offset 59.0 ft RT
Ground Surface Elev. 428.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 384.5 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND: Brown, A-3 *(continued)*					
		▼			
		-45	4 6 7	N/C	
	378.0	-50	4 6 7	N/C	
Boring terminated at 50.0 ft. Boring grouted to 50 ft.					
		-55			
		-60			

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/25/16

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** BDG (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6289209382, -90.1598692515, **SEC.** 13, **TWP.** 2N, **RNG.** 10W,
Latitude , Longitude

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. SN 082-W315
Station 73+59 to 75+18.50

BORING NO. RW-304
Station 75+98
Offset 39.0 ft LT
Ground Surface Elev. 422.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter N/A ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
FILL: Brown, silty clay, trace fine sand, A-6			3 5 7	1.6 S/15	17
	419.0				
FILL: Brown, silty loam, A-4		-5	3 4 5	0.6 S/15	25
	416.5				
FILL: Dark brown, silty clay, trace gravel and brick fragments, A-6			3 3 5	1.6 S/15	22
	414.0				
FILL: Gray, silty loam, A-6 Unconfined Compression Strength Test Performed		-10	ST	1.4 S/4	20
	411.0				
FILL: Brown and red, gravel and sand, with brick fragments, A-2			4 9 50/3"	N/C	11
	409.5				
FILL: Brown, sand, A-3			1 9	N/C	11
	407.8				
FILL: Black and dark brown, crushed asphaltic, A-3		-15	7		28
	405.5				
CLAY: Gray, with sand, A-7 Unconfined Compression Strength Test Performed			ST	1.0 S/1.8	34
	404.0				
SILTY CLAY: Brown, A-6		-20	2 3 4	1.5 P	25

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY: Brown, A-6 *(continued)*	401.5				
SILTY LOAM: Brown, A-5	400.5		1	1.9 B/20	30
SILTY SAND: Brown, A-5			2 3	0.5 P	
	399.0				
CLAY: Gray, trace iron nodules, A-6 Unconfined Compression Strength Test Performed		-25	ST	0.7 S/6	33
With iron stains			1 2 3	0.5 P	32
	394.0				
SAND: Brown, A-3		-30	3 5 7	N/C	
END OF DAY: 5/25 START OF DAY: 5/26 (Delayed due to lightning 2.25 hrs)					
Becomes gray		-35	4 4 5	N/C	
		-40	9 10 12	N/C	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/25/16

ROUTE Interstate 64 **DESCRIPTION** PTB 172, Item 22 - FAP 799 (MLK Drive) **LOGGED BY** BDG (SCI)

SECTION 1BR-1-1 **LOCATION** 38.6289209382, -90.1598692515, **SEC.** 13, **TWP.** 2N, **RNG.** 10W, **Latitude , Longitude**

COUNTY Saint Clair **DRILLING METHOD** CME 550 w/HSA **HAMMER TYPE** Automatic

STRUCT. NO. SN 082-W315
Station 73+59 to 75+18.50

BORING NO. RW-304
Station 75+98
Offset 39.0 ft LT
Ground Surface Elev. 422.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter N/A ft
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND: Brown, A-3 *(continued)*					
			5 8 12	N/C	
		-45			
			10 14 17	N/C	
	372.5				
Boring terminated at 49.5 ft.		-50			
Boring grouted to 49.5 ft.					
		-55			
		-60			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

UNCONFINED COMPRESSION DATA

PROJECT NAME: **PTB 172-022 FAP 799 (MLK Drive)**

PROJECT No.: **2014-3149.51**

Load Cell

BORING NO.	BB-306
SAMPLE NO.	ST-11
SAMPLE DEPTH (ft)	26-28'
VISUAL DESCRIPTION	
SILTY LOAM: Gray, A-4	

Specimen Wt,g	1178.22
Average Diameter (inches)	2.870
Average Height (inches)	6.012
Height to Diametr Ratio	**2.1**
Initial Area $A_o(ft^2)$	**0.0449**
Volume (ft^3)	**0.0225**

Weight- Soil + Tare (wet),g	354.90
Weight- Soil + Tare (dry),g	288.26
Weight- Tare,g	87.62

Wet unit weight (pcf)	**115.4**
Moisture content (%)	**33.2**
Specific Gravity (estimated)	**2.68**
Void Ratio	**0.93**
Dry unit weight (pcf)	**86.7**

Liquid Limit	
Plastic Limit	
Plasticity Index	
CLASSIFICATION	

Unconfined Strength q_u (psf)	**959**
Unconfined Strength q_u (ksf)	**0.96**
Strain at q_u	**0.11**
% Strain at q_u	**10.6%**
Undrained Shear Strength S_u (ksf)	**0.48**

		Date
Tested	**JLB**	7/11/2016
Calculated	**JLB**	7/11/2016
Checked	**KAW**	7/25/2016

Rate of Strain (%/min)

Deformation (inches)	**Load (div)**	**Strain (.%)**	**Corr. Area (ft^2)**	**Stress psf**
0.000	0.0	0.0000	0.0449	0.0
0.005	1.0	0.0008	0.0450	22.2
0.010	1.4	0.0017	0.0450	31.1
0.015	1.9	0.0025	0.0450	42.2
0.020	2.1	0.0033	0.0451	46.6
0.030	2.9	0.0050	0.0451	64.2
0.050	4.3	0.0083	0.0453	94.9
0.070	6.0	0.0116	0.0454	132.0
0.090	7.6	0.0150	0.0456	166.7
0.110	9.1	0.0183	0.0458	198.9
0.130	10.6	0.0216	0.0459	230.9
0.150	12.5	0.0249	0.0461	271.4
0.170	14.4	0.0283	0.0462	311.5
0.200	17.0	0.0333	0.0465	365.9
0.240	21.1	0.0399	0.0468	451.0
0.280	25.6	0.0466	0.0471	543.4
0.320	29.4	0.0532	0.0474	619.7
0.360	33.0	0.0599	0.0478	690.7
0.400	36.3	0.0665	0.0481	754.4
0.440	39.4	0.0732	0.0485	813.0
0.480	42.0	0.0798	0.0488	860.4
0.520	45.0	0.0865	0.0492	915.2
0.560	46.9	0.0931	0.0495	946.9
0.600	47.8	0.0998	0.0499	958.0
0.640	48.2	0.1064	0.0503	958.9
0.680	48.4	0.1131	0.0506	955.7
0.720	47.5	0.1198	0.0510	930.9
0.740	46.7	0.1231	0.0512	911.8

Unconfined Compression Test

SCI Engineering, Inc.

PROJECT NAME: **PTB 172-022 FAP 799 (MLK Drive)**
PROJECT No.: **2014-3149.51**

Boring Number	RW-303
Sample Number	S-11
Sample Depth (ft)	26-28'
Visual Description	
CLAY: Gray, A-7; Becoming SANDY LOAM: Brown, A-4; 22/24"	

Specifications

Unconfined Compression	ASTM D2166
Liquid & Plastic Limits	ASTM D4318
Soil Classification	ASTM D2487
Visual Description	ASTM D2488

Initial Test Data

Average Diameter (inches)	**2.880**
Average Height (inches)	**5.985**
Height to Diameter Ratio	**2.1**
Ave. Rate of Strain (%/min)	**0.04**

Tested	6/15/2016
Calculated	6/16/2016
Checked	7/26/2016

Test Results

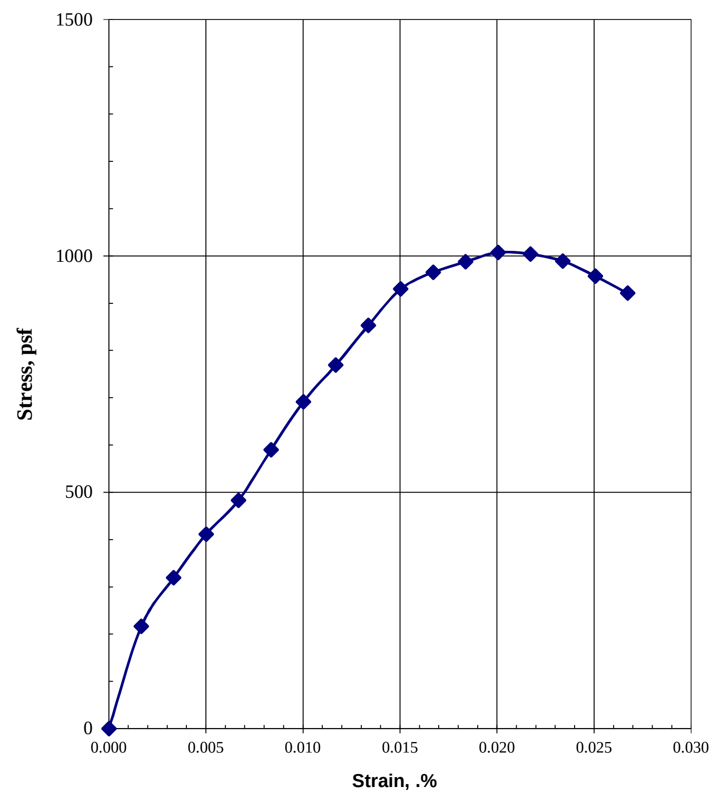
Liquid Limit	
Plastic Limit	
Plasticity Index	
Classification	

Wet unit weight (pcf)	**114.4**
Moisture content (%)	**33.4**
Dry unit weight (pcf)	**85.7**

Unconfined Strength q_u (psf)	**1007**
Unconfined Strength q_u (ksf)	**1.01**
Strain at q_u	**0.02**
% Strain at q_u	**2.0**
Undrained Shear Strength S_u (ksf)	**0.50**

Failure Sketch

Stress vs. Strain



Remarks:

Unconfined Compression Test

SCI Engineering, Inc.

PROJECT NAME: **PTB 172-022 FAP 799 (MLK Drive)**
PROJECT No.: **2014-3149.51**

Boring Number	RW-304
Sample Number	S-4
Sample Depth (ft)	8.5-10.5'
Visual Description	
FILL: Gray, silty loam, A-6	

Specifications

Unconfined Compression	ASTM D2166
Liquid & Plastic Limits	ASTM D4318
Soil Classification	ASTM D2487
Visual Description	ASTM D2488

Initial Test Data

Average Diameter (inches)	**2.876**
Average Height (inches)	**5.987**
Height to Diameter Ratio	**2.1**
Ave. Rate of Strain (%/min)	**0.035**

Tested	6/15/2016
Calculated	6/16/2016
Checked	7/25/2016

Failure Sketch

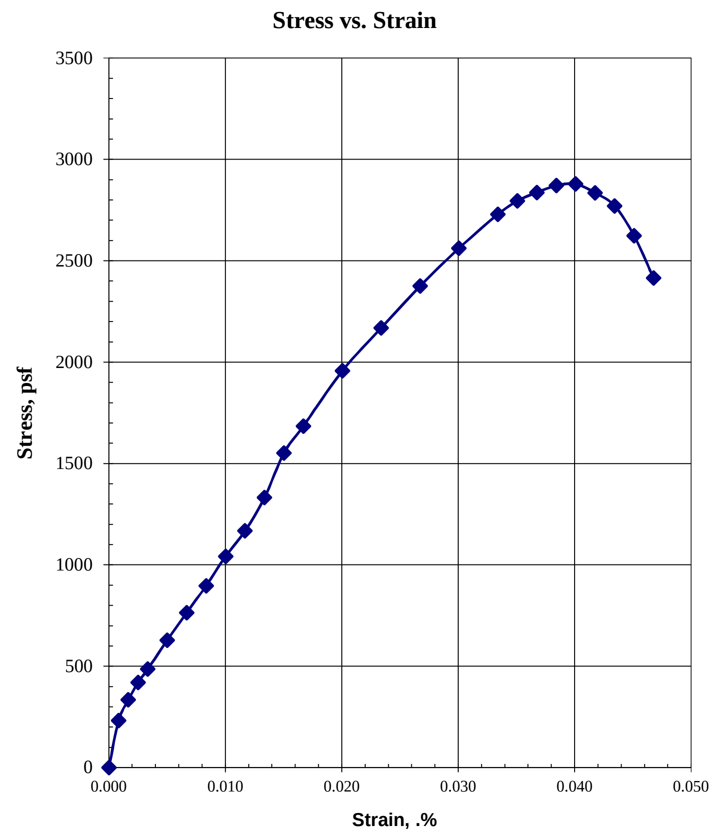
Remarks:

Test Results

Liquid Limit	
Plastic Limit	
Plasticity Index	
Classification	

Wet unit weight (pcf)	**123.3**
Moisture content (%)	**19.9**
Dry unit weight (pcf)	**102.8**

Unconfined Strength q_u (psf)	**2878**
Unconfined Strength q_u (ksf)	**2.88**
Strain at q_u	**0.04**
% Strain at q_u	**4.0**
Undrained Shear Strength S_u (ksf)	**1.44**



Unconfined Compression Test

SCI Engineering, Inc.

PROJECT NAME: **PTB 172-022 FAP 799 (MLK Drive)**
PROJECT No.: **2014-3149.51**

Boring Number	RW-304
Sample Number	S-10
Sample Depth (ft)	23.5-25.5'
Visual Description	
CLAY: Gray, trace iron nodules, A-6	

Test Results

Liquid Limit	
Plastic Limit	
Plasticity Index	
Classification	

Wet unit weight (pcf)	**112.1**
Moisture content (%)	**32.8**
Dry unit weight (pcf)	**84.4**

Unconfined Strength q_u (psf)	**1396**
Unconfined Strength q_u (ksf)	**1.40**
Strain at q_u	**0.06**
% Strain at q_u	**6.0**
Undrained Shear Strength S_u (ksf)	**0.70**

Specifications

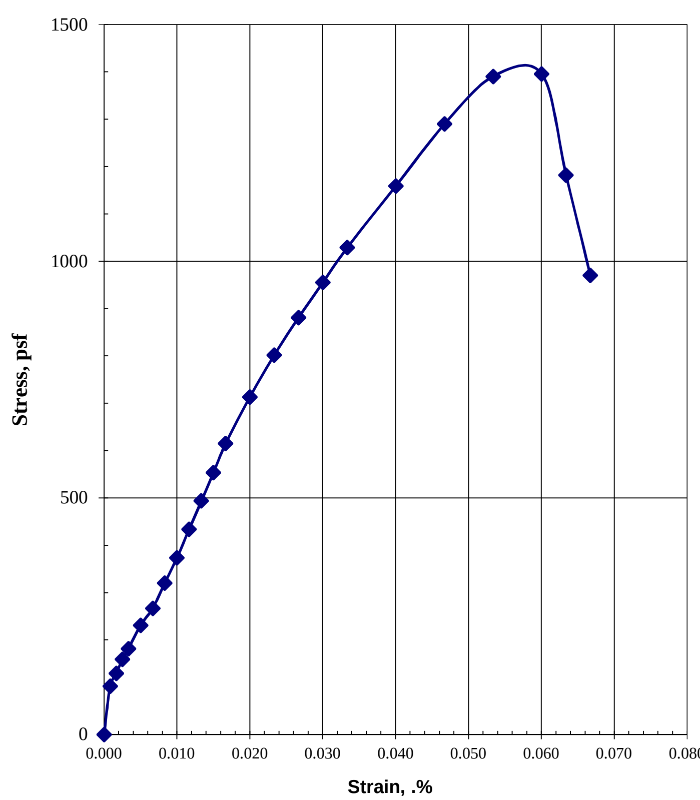
Unconfined Compression	ASTM D2166
Liquid & Plastic Limits	ASTM D4318
Soil Classification	ASTM D2487
Visual Description	ASTM D2488

Initial Test Data

Average Diameter (inches)	**2.840**
Average Height (inches)	**5.994**
Height to Diameter Ratio	**2.1**
Ave. Rate of Strain (%/min)	**0.045**

Tested	6/16/2016
Calculated	6/17/2016
Checked	7/25/2016

Stress vs. Strain



Failure Sketch

Remarks:

Unconfined Compression Test

SCI Engineering, Inc.

PROJECT NAME: **PTB 172-022 FAP 799 (MLK Drive)**
PROJECT No.: **2014-3149.51**

Boring Number	RW-304
Sample Number	S-7
Sample Depth (ft)	16-18'
Visual Description	
CLAY: Gray, with sand, A-7	

Test Results

Liquid Limit	
Plastic Limit	
Plasticity Index	
Classification	

Wet unit weight (pcf)	**113.9**
Moisture content (%)	**34.3**
Dry unit weight (pcf)	**84.8**

Specifications

Unconfined Compression	ASTM D2166
Liquid & Plastic Limits	ASTM D4318
Soil Classification	ASTM D2487
Visual Description	ASTM D2488

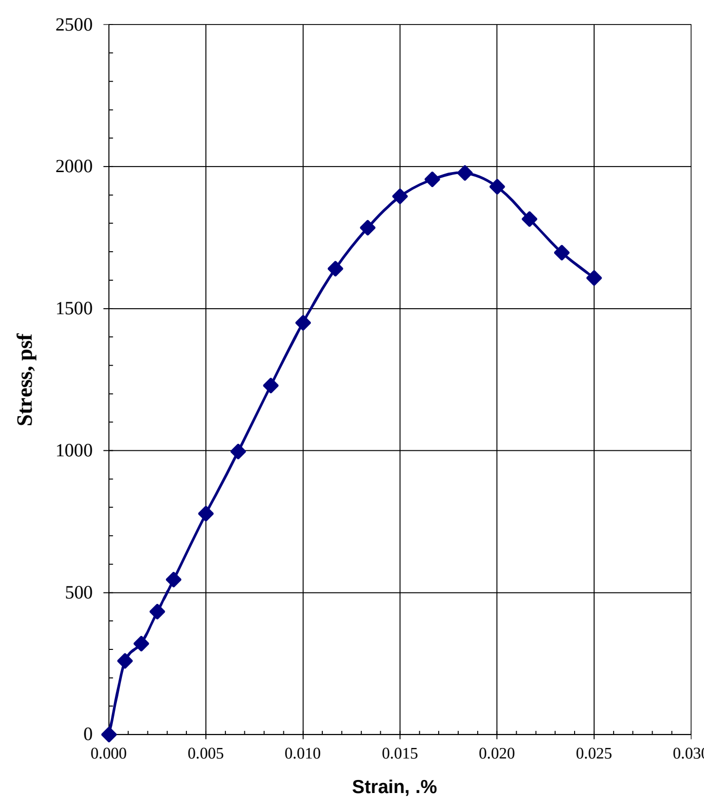
Unconfined Strength q_u (psf)	**1978**
Unconfined Strength q_u (ksf)	**1.98**
Strain at q_u	**0.02**
% Strain at q_u	**1.8**
Undrained Shear Strength S_u (ksf)	**0.99**

Initial Test Data

Average Diameter (inches)	**2.876**
Average Height (inches)	**5.998**
Height to Diameter Ratio	**2.1**
Ave. Rate of Strain (%/min)	**0.09**

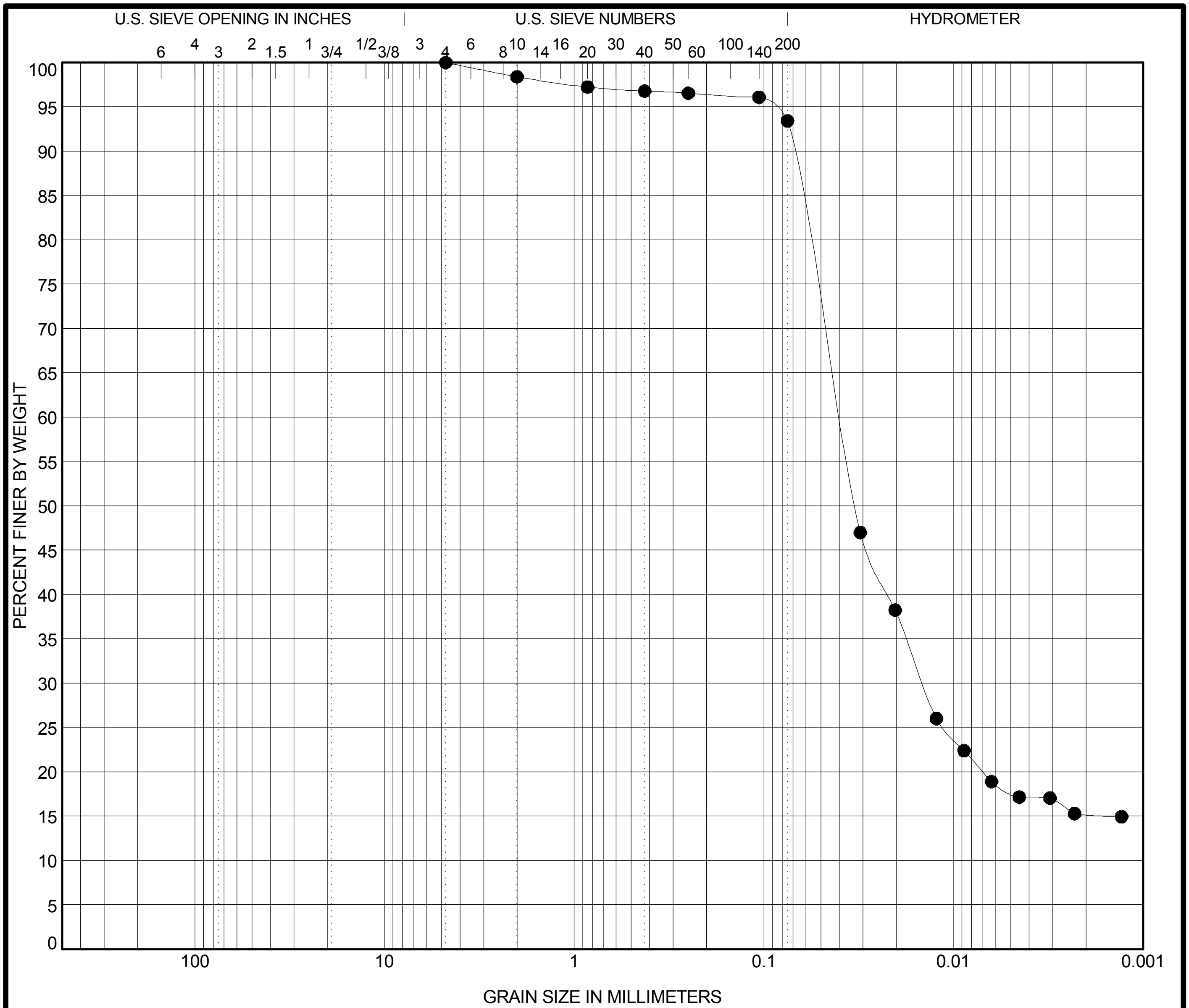
Tested	6/16/2016
Calculated	6/17/2016
Checked	7/25/2016

Stress vs. Strain



Failure Sketch

Remarks:



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **BB-306**	**28.5**	**SILTY CLAY**	**42**	**20**	**22**		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **BB-306**	**28.5**	**4.75**	**0.04**	**0.014**		**0.0**	**6.6**	**75.7**	**17.7**

SCI Engineering, Inc.
650 Pierce Blvd.
O'Fallon, Illinois 62269
Telephone: 618-624-6969

GRAIN SIZE DISTRIBUTION - ASTM

Project Name: PTB 172-022 W06 FAP 799 (MLK Drive)
Location: East St. Louis, Illinois
SCI Project No.: 2014-3149.51

PERCENT FINER THAN NO. 200 SIEVE

PROJECT MLK Drive PTB 172-022 WO6 FAP 799 PAGE 1

JOB NO. 2014-3149.51 Task 300 Tested by/date: EC 6/10/2016

Checked by/date: EC 6/11/2016

	Boring	Sample	Moisture Content				Before WASH			After WASH			Percent Passing
			Wet & Tare	Dry & Tare	Tare	%	Soil & Tare	Tare	Dry Weight	Soil & Tare	Tare	Dry Weight	
1	RW-301	S-11	55.67	53.59	19.32	6.07	305.04	86.98	205.58	287.91	86.98	200.93	2.3
2	RW-301	S-12	43.85	43.73	21.69	0.54	261.00	87.61	172.45	255.60	87.61	167.99	2.6
3	RW-302	S-4	229.76	229.76	210.64	0.00	474.82	210.64	264.18	213.46	210.64	2.82	98.9
4	RW-302	S-10	270.94	270.94	87.32	0.00	270.94	87.32	183.62	266.91	87.32	179.59	2.2
5	RW-302	S-12	48.36	48.21	19.20	0.52	321.91	110.34	210.48	313.73	110.34	203.39	3.4
6	RW-303	S-4	66.01	59.11	30.77	24.35	408.32	217.60	153.38	355.45	217.60	137.85	10.1
7	RW-303	S-11	474.82	474.82	0.00	0.00	474.82	210.64	264.18	213.46	210.64	2.82	98.9
8	RW-303	S-15	51.23	50.05	18.38	3.73	322.58	87.64	226.50	312.55	87.84	224.71	0.8
9	RW-304	S-13	42.34	41.46	17.32	3.65	242.01	88.90	147.72	212.00	88.90	123.10	16.7
10	BB-305	S-7	246.28	246.28	87.97	0.00	246.28	87.97	158.31	239.64	87.97	151.67	4.2
11													
12													
13													
14													
15													

Appendix B

S C I   L I Q U E F A C T I O N   A N A L Y S I S

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 6/14/2013

REFERENCE BORING NUMBER ==================================== RW-302
ELEVATION OF BORING GROUND SURFACE ========================= 400.00 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ====================== 18.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ================== 10.00 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ===== 0.145
EARTHQUAKE MOMENT MAGNITUDE ============================== 7.7
FINISHED GRADE FILL OR CUT FROM BORING SURFACE =============== 0.00 FT.
HAMMER EFFICIENCY== 73 %
BOREHOLE DIAMETER== 6 IN.
SAMPLING METHOD== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **0.948**

AVG. SHEAR WAVE VELOCITY (top 40')
$V_{s,40'}$ = **709** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 7.7
Source-To-Site Distance, R (km) = 188.3
Ground Motion Prediction Equations = NMSZ
PGA = **0.091**

IF(P22="","",IF(B22>=(K$7+K$12-K$9),"N.L. (1)",IF(OR(G22>=12,AND(H22>0,I22>(

BORING DATA								CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
397.5	2.5	18	0.9				14	0.120	0.300	36.632	36.632	-0.113	0.120	0.300	0.300	1.500	**-0.161**	0.999	**0.094**	**N.L. (1)**
395	5	6						0.113	0.583	9.433	9.433	0.108	0.113	0.583	0.583	1.342	**0.138**	0.997	**0.094**	**N.L. (1)**
392.5	7.5	13						0.121	0.885	20.067	20.067	0.216	0.121	0.885	0.885	1.293	**0.265**	0.994	**0.094**	**N.L. (1)**
390	10	10						0.118	1.180	14.672	14.672	0.157	0.118	1.180	1.180	1.165	**0.173**	0.991	**0.094**	**N.L. (1)**
387	13	10						0.118	1.534	14.123	14.123	0.151	0.056	1.348	1.535	1.124	**0.161**	0.987	**0.106**	**1.519 (D)**
385	15	20						0.126	1.786	29.874	29.874	0.459	0.064	1.476	1.788	1.137	**0.495**	0.983	**0.112**	**N.L. (3)**
382.5	17.5	19						0.126	2.101	26.619	26.619	0.328	0.064	1.636	2.104	1.091	**0.339**	0.977	**0.119**	**N.L. (3)**
380	20	17						0.066	2.266	22.925	22.925	0.256	0.066	1.801	2.425	1.052	**0.255**	0.970	**0.123**	**2.073 (D)**
377.5	22.5	14						0.064	2.426	17.983	17.983	0.192	0.064	1.961	2.741	1.022	**0.186**	0.961	**0.127**	**1.465 (D)**
375	25	12						0.063	2.584	14.785	14.785	0.158	0.063	2.119	3.055	1.000	**0.150**	0.950	**0.129**	**1.163 (D)**
372.5	27.5	28						0.070	2.759	37.742	37.742	0.008	0.070	2.294	3.386	0.969	**0.007**	0.938	**0.131**	**N.L. (3)**
370	30	20						0.067	2.926	24.672	24.672	0.286	0.067	2.461	3.709	0.953	**0.258**	0.924	**0.132**	**1.955 (D)**
365	35	29						0.071	3.281	35.639	35.639	-0.351	0.071	2.816	4.376	0.895	**-0.298**	0.892	**0.131**	**N.L. (3)**
360	40	28						0.070	3.631	32.115	32.115	0.764	0.070	3.166	5.038	0.862	**0.624**	0.856	**0.129**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS
N.L. (1) = NOT LIQUEFIABLE, ABOVE EQ GROUND WATER ELEVATION
N.L. (2) = NOT LIQUEFIABLE, PI ≥ 12 OR w_c/LL ≤ 0.85
N.L. (3) = NOT LIQUEFIABLE, $(N_1)_{60}$ > 25
(C) = CONTRACTIVE SOIL TYPES
(D) = DILATIVE SOIL TYPES

S C I   L I Q U E F A C T I O N   A N A L Y S I S

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ====================================RW-303
ELEVATION OF BORING GROUND SURFACE ========================= 428.00 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ====================== 43.50 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ================== 28.00 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ===== 0.145
EARTHQUAKE MOMENT MAGNITUDE =============================== 7.7
FINISHED GRADE FILL OR CUT FROM BORING SURFACE =============== 0.00 FT.
HAMMER EFFICIENCY== 73 %
BOREHOLE DIAMETER== 6 IN.
SAMPLING METHOD==Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **0.948**

AVG. SHEAR WAVE VELOCITY (top 40')
$V^*_{s,40'}$ = **505** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 7.7
Source-To-Site Distance, R (km) = 188.3
Ground Motion Prediction Equations = NMSZ
PGA = **0.091**

IF(P22="","",IF(B22>=(K$7+K$12-K$9),"N.L. (1)",IF(OR(G22>=12,AND(H22>0,I22>(

BORING DATA								CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
425.5	2.5	11						0.119	0.298	20.423	20.423	0.221	0.119	0.298	0.298	1.500	**0.314**	0.988	**0.093**	**N.L. (1)**
423	5	7	0.7				19	0.117	0.590	11.021	11.021	0.122	0.117	0.590	0.590	1.356	**0.157**	0.974	**0.092**	**N.L. (1)**
420.5	7.5	4						0.108	0.860	5.814	5.814	0.078	0.108	0.860	0.860	1.204	**0.089**	0.957	**0.090**	**N.L. (1)**
418	10	4						0.108	1.130	5.815	5.815	0.078	0.108	1.130	1.130	1.138	**0.084**	0.937	**0.088**	**N.L. (1)**
415	13	10						0.118	1.484	14.317	14.317	0.153	0.118	1.484	1.484	1.097	**0.159**	0.908	**0.086**	**N.L. (1)**
413	15	20						0.126	1.736	30.285	30.285	0.489	0.126	1.736	1.736	1.074	**0.498**	0.887	**0.084**	**N.L. (1)**
410.5	17.5	15						0.123	2.044	20.595	20.595	0.223	0.123	2.044	2.044	1.011	**0.214**	0.858	**0.081**	**N.L. (1)**
408	20	5						0.111	2.321	6.295	6.295	0.082	0.111	2.321	2.321	0.981	**0.076**	0.827	**0.078**	**N.L. (1)**
405.5	22.5	6	1				34	0.122	2.626	7.203	7.203	0.089	0.122	2.626	2.626	0.955	**0.081**	0.795	**0.075**	**N.L. (1)**
403	25	3						0.105	2.889	3.460	3.460	0.061	0.105	2.889	2.889	0.940	**0.055**	0.763	**0.072**	**N.L. (1)**
400.5	27.5	3	0.6				33	0.116	3.179	3.307	3.307	0.060	0.116	3.179	3.179	0.922	**0.053**	0.732	**0.069**	**N.L. (1)**
398	30	18						0.125	3.491	19.586	19.586	0.210	0.063	3.336	3.461	0.876	**0.175**	0.704	**0.069**	**2.536 (D)**
393	35	23						0.128	4.131	23.235	23.235	0.261	0.066	3.666	4.103	0.842	**0.208**	0.655	**0.069**	**3.014 (D)**
388	40	29						0.131	4.786	27.397	27.397	0.350	0.069	4.011	4.760	0.805	**0.267**	0.619	**0.069**	**N.L. (3)**
383	45	13						0.063	5.101	10.997	10.997	0.122	0.063	4.326	5.387	0.844	**0.098**	0.594	**0.070**	**1.400 (C)**
378	50	13						0.063	5.416	10.612	10.612	0.119	0.063	4.641	6.014	0.832	**0.093**	0.577	**0.071**	**1.310 (C)**

* FACTOR OF SAFETY DESCRIPTIONS
N.L. (1) = NOT LIQUEFIABLE, ABOVE EQ GROUND WATER ELEVATION
N.L. (2) = NOT LIQUEFIABLE, PI ≥ 12 OR w_c/LL ≤ 0.85
N.L. (3) = NOT LIQUEFIABLE, $(N_1)_{60}$ > 25
(C) = CONTRACTIVE SOIL TYPES
(D) = DILATIVE SOIL TYPES

S C I   L I Q U E F A C T I O N   A N A L Y S I S

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ==================================== BB-305
ELEVATION OF BORING GROUND SURFACE ========================= 415.00 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ====================== 37.50 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ================== 20.00 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ===== 0.145
EARTHQUAKE MOMENT MAGNITUDE =============================== 7.7
FINISHED GRADE FILL OR CUT FROM BORING SURFACE =============== 0.00 FT.
HAMMER EFFICIENCY== 73 %
BOREHOLE DIAMETER== 6 IN.
SAMPLING METHOD== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **0.948**

AVG. SHEAR WAVE VELOCITY (top 40')
$V^{*}_{s,40'}$ = **480** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 7.7
Source-To-Site Distance, R (km) = 188.3
Ground Motion Prediction Equations = NMSZ
PGA = **0.091**

IF(P22="","",IF(B22>=(K$7+K$12-K$9),"N.L. (1)",IF(OR(G22>=12,AND(H22>0,I22>(

ELEV. OF SAMPLE (FT.)	BORING DATA: BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	CONDITIONS DURING DRILLING: EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	CONDITIONS DURING EARTHQUAKE: EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
412.5	2.5	16						0.124	0.310	31.603	31.603	0.647	0.124	0.310	0.310	1.500	**0.920**	0.986	**0.093**	**N.L. (1)**
410	5	6						0.113	0.593	9.403	9.403	0.108	0.113	0.593	0.593	1.337	**0.137**	0.968	**0.091**	**N.L. (1)**
407.5	7.5	2						0.101	0.845	2.920	2.920	0.058	0.101	0.845	0.845	1.202	**0.066**	0.947	**0.090**	**N.L. (1)**
405	10	3						0.105	1.108	4.388	4.388	0.068	0.105	1.108	1.108	1.139	**0.073**	0.923	**0.087**	**N.L. (1)**
402	13	4						0.108	1.432	5.720	5.720	0.078	0.108	1.432	1.432	1.084	**0.080**	0.890	**0.084**	**N.L. (1)**
400	15	3						0.105	1.642	4.196	4.196	0.066	0.105	1.642	1.642	1.052	**0.066**	0.865	**0.082**	**N.L. (1)**
397.5	17.5	12						0.120	1.942	16.445	16.445	0.175	0.120	1.942	1.942	1.024	**0.170**	0.833	**0.079**	**N.L. (1)**
395	20	8						0.116	2.232	10.261	10.261	0.115	0.116	2.232	2.232	0.988	**0.108**	0.799	**0.076**	**N.L. (1)**
392.5	22.5	9						0.117	2.524	11.023	11.023	0.122	0.055	2.369	2.525	0.974	**0.113**	0.765	**0.077**	**1.468 (C)**
390	25	9						0.117	2.817	10.519	10.519	0.118	0.055	2.507	2.819	0.961	**0.107**	0.732	**0.078**	**1.372 (C)**
387.5	27.5	11						0.119	3.114	12.265	12.265	0.134	0.057	2.649	3.117	0.947	**0.120**	0.701	**0.078**	**1.538 (D)**
385	30	14						0.122	3.419	15.017	15.017	0.160	0.060	2.799	3.423	0.930	**0.141**	0.673	**0.078**	**1.808 (D)**
380	35	20						0.126	4.049	20.117	20.117	0.217	0.064	3.119	4.055	0.892	**0.184**	0.626	**0.077**	**2.390 (D)**
375	40	18						0.066	4.379	17.043	17.043	0.181	0.066	3.449	4.697	0.875	**0.150**	0.593	**0.076**	**1.974 (D)**
370	45	24						0.069	4.724	22.403	22.403	0.248	0.069	3.794	5.354	0.835	**0.196**	0.570	**0.076**	**2.579 (D)**
365	50	36						0.073	5.089	33.988	33.988	80.955	0.073	4.159	6.031	0.773	**59.369**	0.555	**0.076**	**N.L. (3)**
360	55	30						0.071	5.444	26.160	26.160	0.317	0.071	4.514	6.698	0.778	**0.234**	0.546	**0.077**	**N.L. (3)**
355	60	21						0.068	5.784	16.736	16.736	0.178	0.068	4.854	7.350	0.797	**0.135**	0.541	**0.077**	**1.753 (D)**
350	65	22						0.068	6.124	16.868	16.868	0.179	0.068	5.194	8.002	0.782	**0.133**	0.532	**0.078**	**1.705 (D)**
345	70	33						0.072	6.484	25.428	25.428	0.301	0.072	5.554	8.674	0.729	**0.208**	0.525	**0.078**	**N.L. (3)**
340	75	39						0.073	6.849	29.472	29.472	0.435	0.073	5.919	9.351	0.696	**0.287**	0.518	**0.077**	**N.L. (3)**
335	80	32						0.071	7.204	22.550	22.550	0.250	0.071	6.274	10.018	0.714	**0.169**	0.511	**0.077**	**2.195 (D)**
330	85	21						0.068	7.544	13.644	13.644	0.147	0.068	6.614	10.670	0.749	**0.104**	0.504	**0.077**	**1.351 (C)**
325	90	43						0.074	7.914	29.197	29.197	0.420	0.074	6.984	11.352	0.658	**0.262**	0.497	**0.076**	**N.L. (3)**
320	95	29						0.071	8.269	17.979	17.979	0.192	0.071	7.339	12.019	0.705	**0.128**	0.490	**0.076**	**1.684 (D)**
315	100	41						0.074	8.639	25.073	25.073	0.293	0.074	7.709	12.701	0.657	**0.183**	0.483	**0.075**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS
N.L. (1) = NOT LIQUEFIABLE, ABOVE EQ GROUND WATER ELEVATION
N.L. (2) = NOT LIQUEFIABLE, PI ≥ 12 OR w_c/LL ≤ 0.85
N.L. (3) = NOT LIQUEFIABLE, $(N_1)_{60}$ > 25
(C) = CONTRACTIVE SOIL TYPES
(D) = DILATIVE SOIL TYPES

S C I   L I Q U E F A C T I O N   A N A L Y S I S

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ==================================== BB-306
ELEVATION OF BORING GROUND SURFACE ========================= 427.00 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ====================== 40.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ================== 30.00 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ===== 0.145
EARTHQUAKE MOMENT MAGNITUDE =============================== 7.7
FINISHED GRADE FILL OR CUT FROM BORING SURFACE =============== 0.00 FT.
HAMMER EFFICIENCY=== 73 %
BOREHOLE DIAMETER== 6 IN.
SAMPLING METHOD=== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **0.948**

AVG. SHEAR WAVE VELOCITY (top 40')
$V^{*}_{s,40'}$ = **472** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 7.7
Source-To-Site Distance, R (km) = 188.3
Ground Motion Prediction Equations = NMSZ
PGA = **0.091**

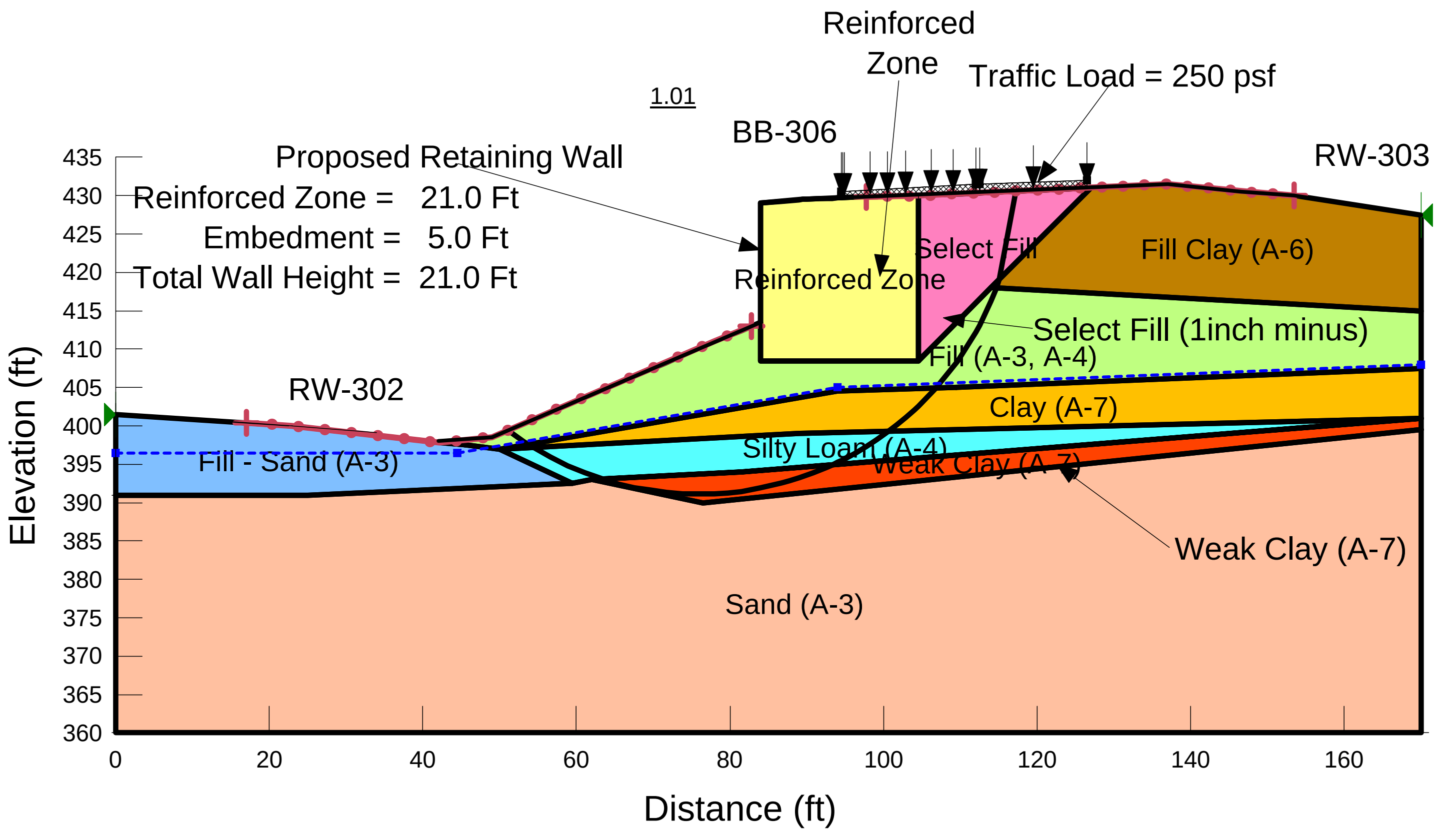
IF(P22="","",IF(B22>=(K$7+K$12-K$9),"N.L. (1)",IF(OR(G22>=12,AND(H22>0,I22>(

BORING DATA								CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
424.5	2.5	8						0.116	0.290	14.275	14.275	0.153	0.116	0.290	0.290	1.500	**0.217**	0.984	**0.093**	**N.L. (1)**
422	5	6						0.113	0.573	9.464	9.464	0.108	0.113	0.573	0.573	1.348	**0.139**	0.966	**0.091**	**N.L. (1)**
419.5	7.5	10						0.118	0.868	14.987	14.987	0.160	0.118	0.868	0.868	1.265	**0.192**	0.944	**0.089**	**N.L. (1)**
417	10	11						0.119	1.165	16.393	16.393	0.174	0.119	1.165	1.165	1.176	**0.195**	0.918	**0.087**	**N.L. (1)**
414	13	10						0.118	1.519	14.181	14.181	0.152	0.118	1.519	1.519	1.090	**0.157**	0.883	**0.083**	**N.L. (1)**
412	15	14						0.122	1.763	19.919	19.919	0.214	0.122	1.763	1.763	1.056	**0.215**	0.857	**0.081**	**N.L. (1)**
409.5	17.5	21						0.127	2.081	30.073	30.073	0.473	0.127	2.081	2.081	1.007	**0.451**	0.824	**0.078**	**N.L. (1)**
407	20	11						0.119	2.378	13.742	13.742	0.148	0.119	2.378	2.378	0.971	**0.136**	0.789	**0.075**	**N.L. (1)**
404.5	22.5	4						0.108	2.648	4.782	4.782	0.070	0.108	2.648	2.648	0.956	**0.064**	0.755	**0.071**	**N.L. (1)**
402	25	4						0.108	2.918	4.588	4.588	0.069	0.108	2.918	2.918	0.938	**0.061**	0.721	**0.068**	**N.L. (1)**
399.5	27.5	4					33	0.108	3.188	4.402	4.402	0.068	0.108	3.188	3.188	0.922	**0.059**	0.690	**0.065**	**N.L. (1)**
397	30	12					28	0.120	3.488	12.615	12.615	0.137	0.120	3.488	3.488	0.884	**0.115**	0.662	**0.063**	**N.L. (1)**
392	35	3	0.9	10	12	40	49	0.120	4.088	2.891	3.823	0.064	0.058	3.778	4.090	0.891	**0.054**	0.616	**0.063**	**N.L. (2)**
387	40	18						0.125	4.713	16.178	16.178	0.172	0.187	4.713	5.337	0.806	**0.132**	0.584	**0.062**	**2.129 (D)**
382	45	27						0.070	5.063	24.321	24.321	0.279	0.070	5.063	5.999	0.756	**0.200**	0.562	**0.063**	**3.175 (D)**
377	50	19						0.067	5.398	15.708	15.708	0.167	0.067	5.398	6.646	0.779	**0.124**	0.548	**0.064**	**1.938 (D)**
372	55	23						0.068	5.738	18.593	18.593	0.199	0.068	5.738	7.298	0.753	**0.142**	0.539	**0.065**	**2.185 (D)**
367	60	16						0.065	6.063	12.144	12.144	0.133	0.065	6.063	7.935	0.773	**0.097**	0.534	**0.066**	**1.470 (C)**
362	65	40						0.074	6.433	31.982	31.982	0.728	0.074	6.433	8.617	0.664	**0.458**	0.526	**0.067**	**N.L. (3)**
357	70	23						0.068	6.773	16.361	16.361	0.174	0.068	6.773	9.269	0.730	**0.120**	0.519	**0.067**	**1.791 (D)**
352	75	15						0.065	7.098	10.176	10.176	0.115	0.065	7.098	9.906	0.755	**0.082**	0.512	**0.068**	**1.206 (C)**
347	80	17						0.066	7.428	11.171	11.171	0.124	0.066	7.428	10.548	0.741	**0.087**	0.505	**0.068**	**1.279 (C)**
342	85	30						0.071	7.783	19.654	19.654	0.211	0.071	7.783	11.215	0.684	**0.137**	0.498	**0.068**	**2.015 (D)**
337	90	26						0.069	8.128	16.165	16.165	0.172	0.069	8.128	11.872	0.696	**0.113**	0.491	**0.068**	**1.662 (D)**
332	95	62						0.078	8.518	42.124	42.124	0.184	0.078	8.518	12.574	0.573	**0.100**	0.484	**0.067**	**N.L. (3)**
327	100	38						0.073	8.883	22.434	22.434	0.248	0.073	8.883	13.251	0.642	**0.151**	0.477	**0.067**	**2.254 (D)**

* FACTOR OF SAFETY DESCRIPTIONS
N.L. (1) = NOT LIQUEFIABLE, ABOVE EQ GROUND WATER ELEVATION
N.L. (2) = NOT LIQUEFIABLE, PI ≥ 12 OR w_c/LL ≤ 0.85
N.L. (3) = NOT LIQUEFIABLE, $(N_1)_{60}$ > 25
(C) = CONTRACTIVE SOIL TYPES
(D) = DILATIVE SOIL TYPES

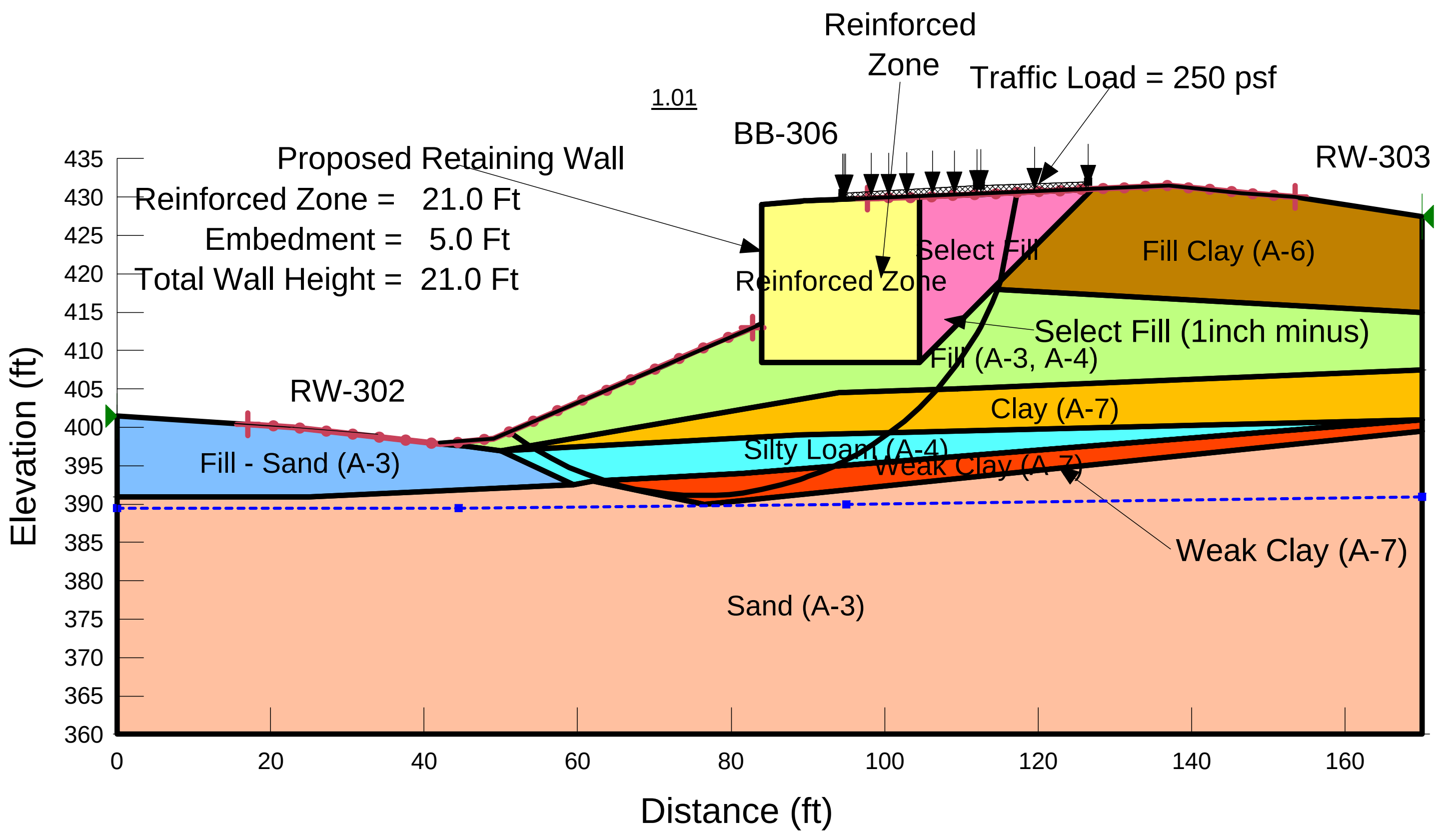
Appendix C

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+70: Short Term
Morgenstern-Price: Circular Failure



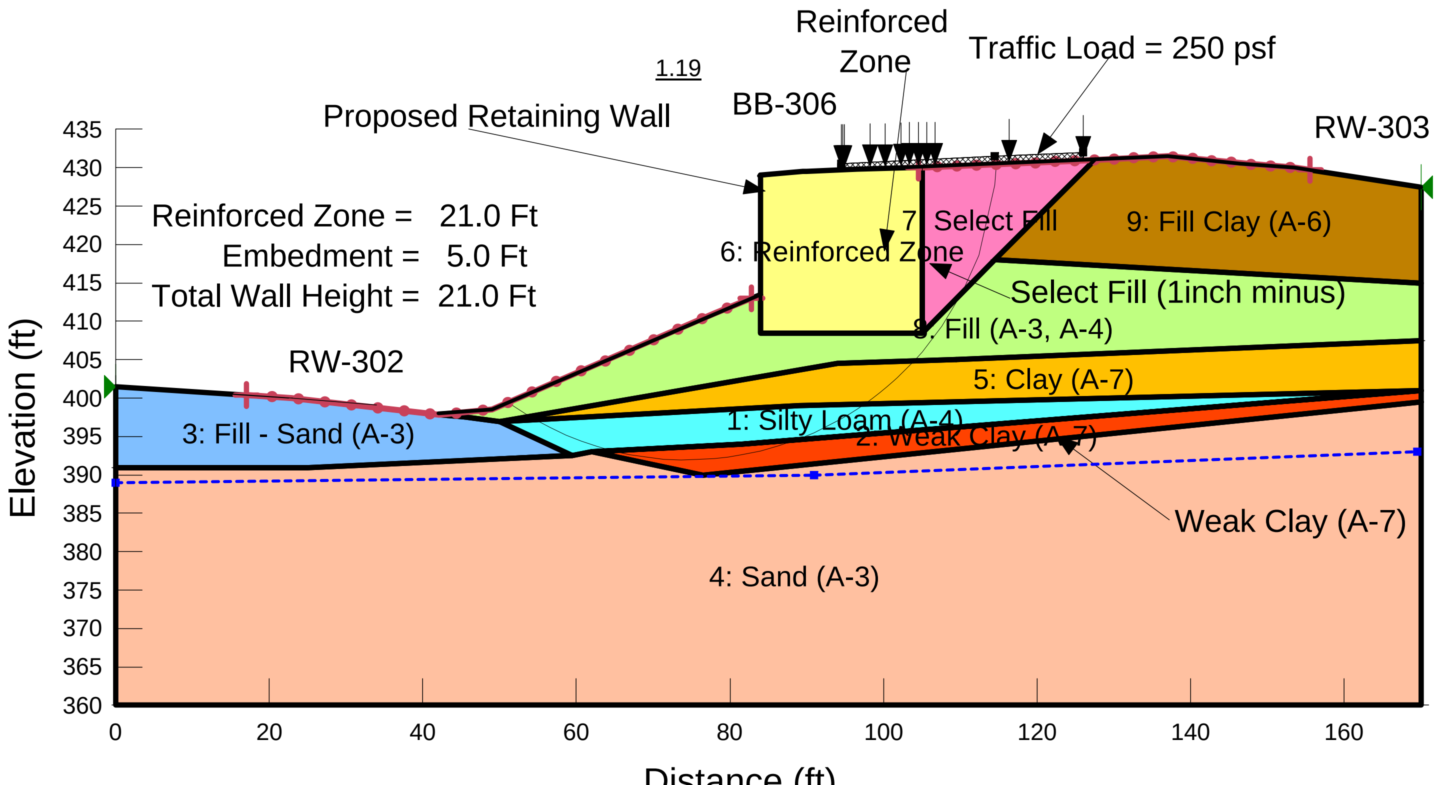
Name: Reinforced Zone Unit Weight: 135 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 10 °
Name: Clay (A-7) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 0 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Select Fill Unit Weight: 135 pcf Cohesion': 0 psf Phi': 34 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: Weak Clay (A-7) Unit Weight: 115 pcf Cohesion': 500 psf Phi': 0 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+70: Short Term
Morgenstern-Price: Circular Failure



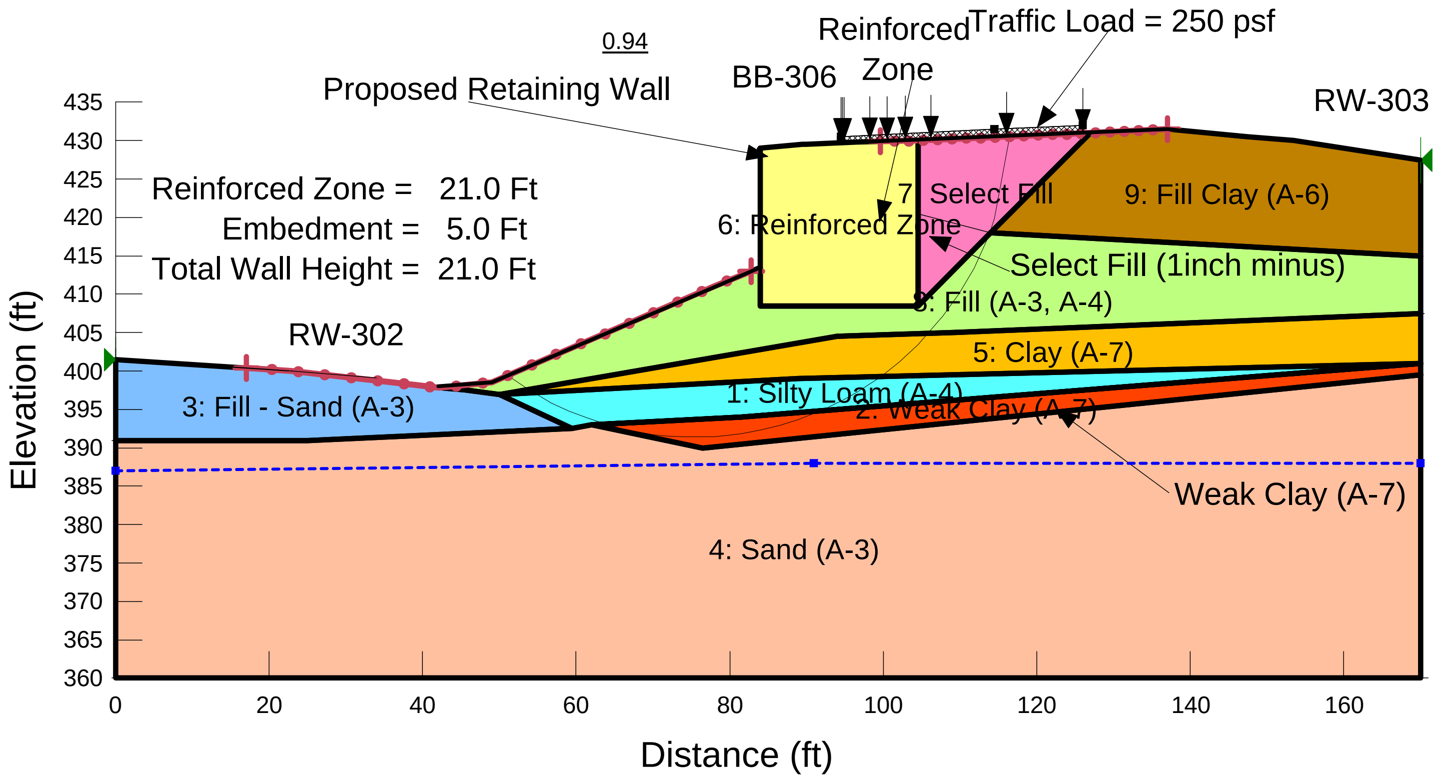
Name: Reinforced Zone Unit Weight: 135 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 10 °
Name: Clay (A-7) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 0 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Select Fill Unit Weight: 135 pcf Cohesion': 0 psf Phi': 34 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: Weak Clay (A-7) Unit Weight: 115 pcf Cohesion': 500 psf Phi': 0 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+70: Long Term
Morgenstern-Price: Circular Failure



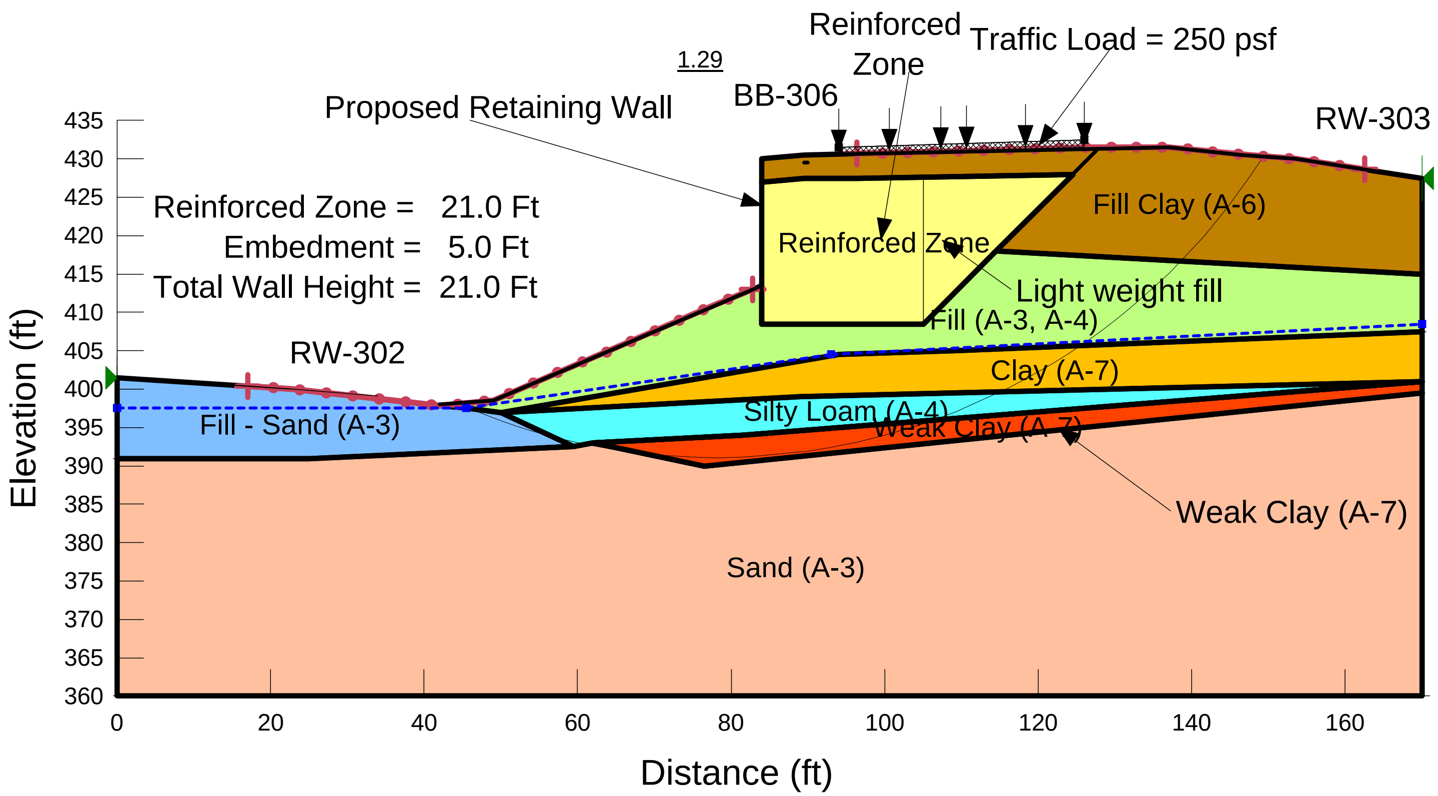
Name: Reinforced Zone Unit Weight: 135 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 50 psf Phi': 28 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 250 psf Phi': 20 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Select Fill Unit Weight: 135 pcf Cohesion': 0 psf Phi': 34 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 250 psf Phi': 26 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 19 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+70: Pseudo-Static
Morgenstern-Price: Circular Failure
Seismic Load = 0.09 g



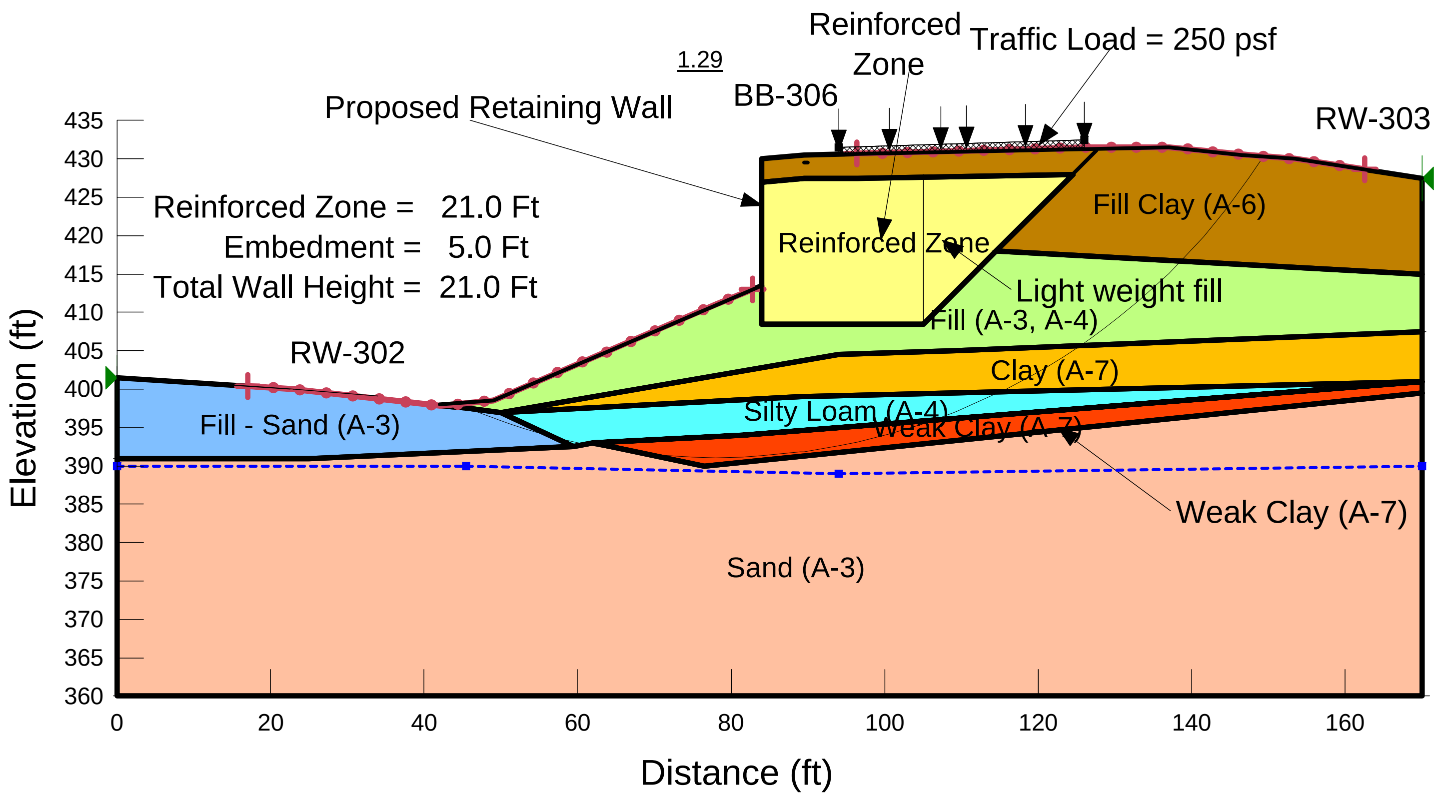
Name: Reinforced Zone Unit Weight: 135 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 700 psf Phi': 9 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 700 psf Phi': 6 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Select Fill Unit Weight: 135 pcf Cohesion': 0 psf Phi': 34 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 8 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 400 psf Phi': 6 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+70: Short Term
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone



Name: Reinforced Zone Unit Weight: 100 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 10 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 0 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 500 psf Phi': 0 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+70: Short Term
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone



Name: Reinforced Zone Unit Weight: 100 pcf

Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °

Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 10 °

Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 0 °

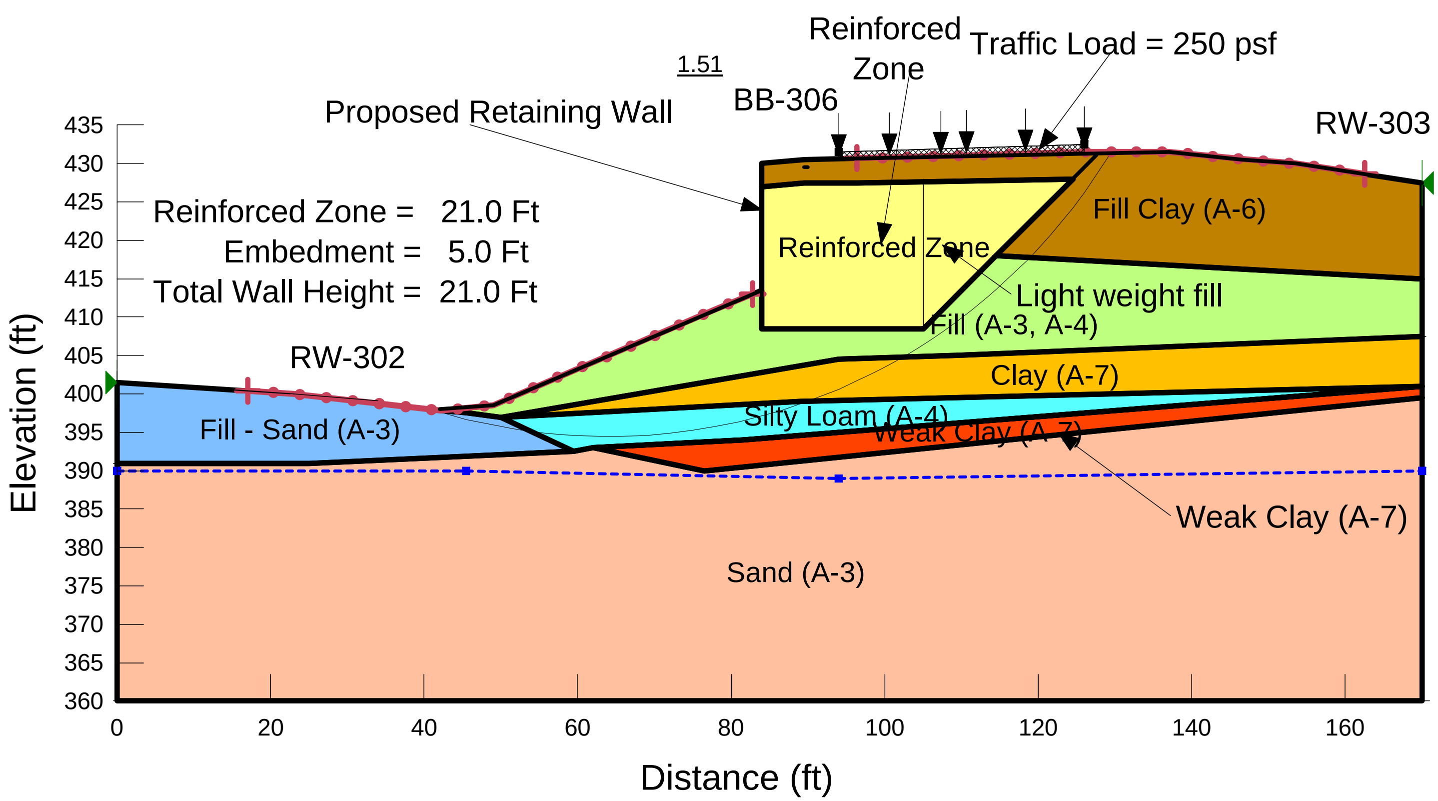
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °

Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °

Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °

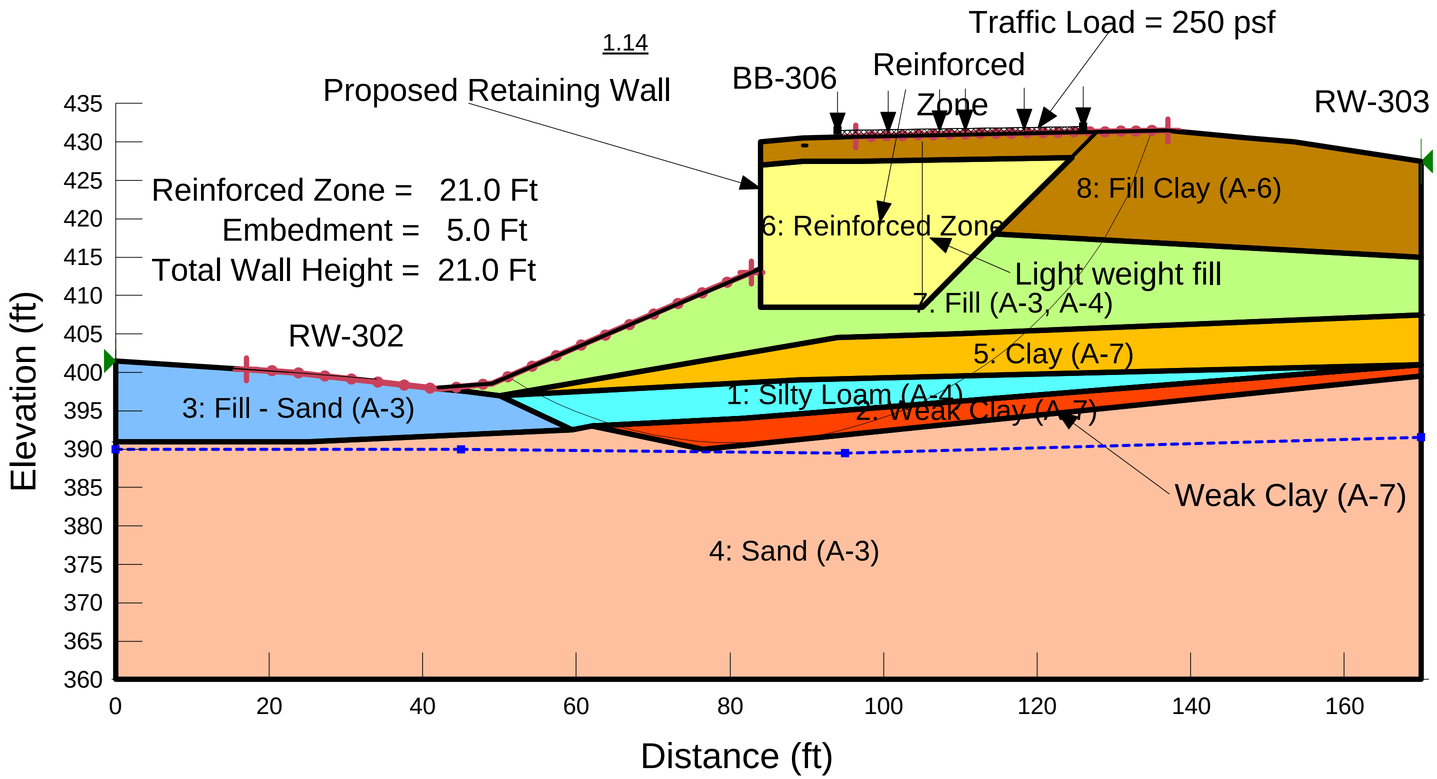
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 500 psf Phi': 0 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+70: Long Term
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone



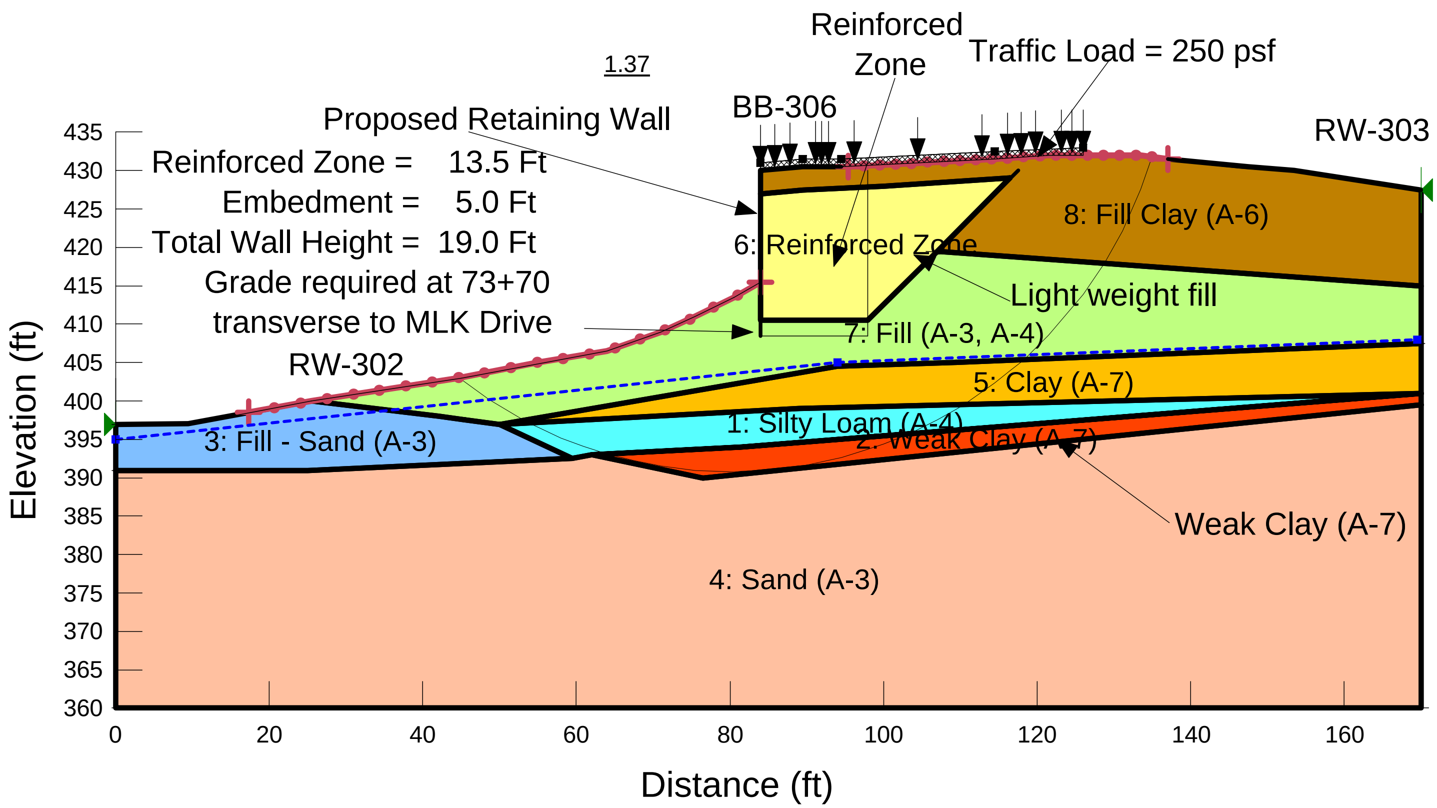
Name: Reinforced Zone Unit Weight: 100 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 50 psf Phi': 28 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 250 psf Phi': 20 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 250 psf Phi': 26 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 19 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+70: Pseudo-Static
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone
Seismic Load = 0.09 g



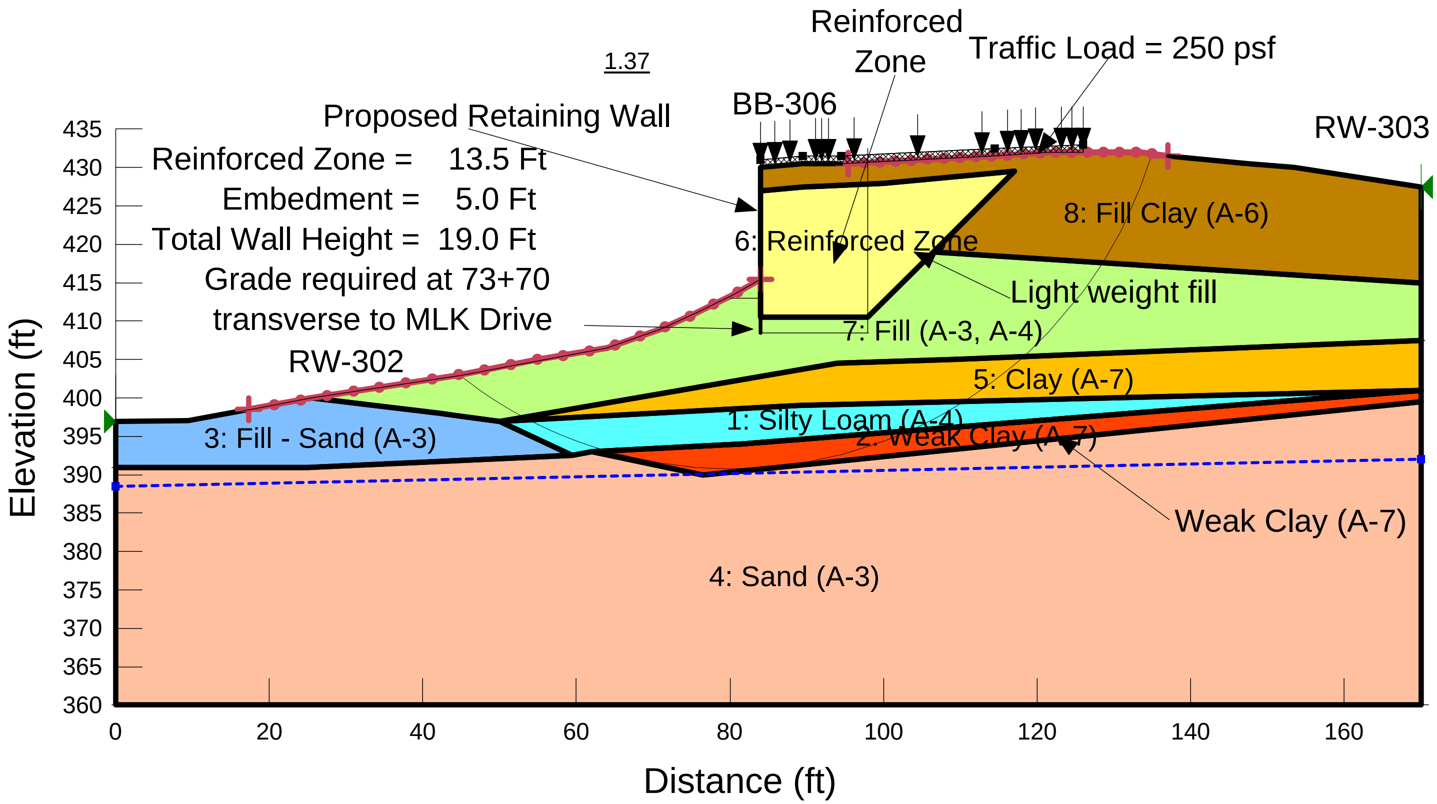
Name: Reinforced Zone Unit Weight: 100 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 700 psf Phi': 9 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 700 psf Phi': 6 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 8 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 400 psf Phi': 6 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+59: Short Term
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone



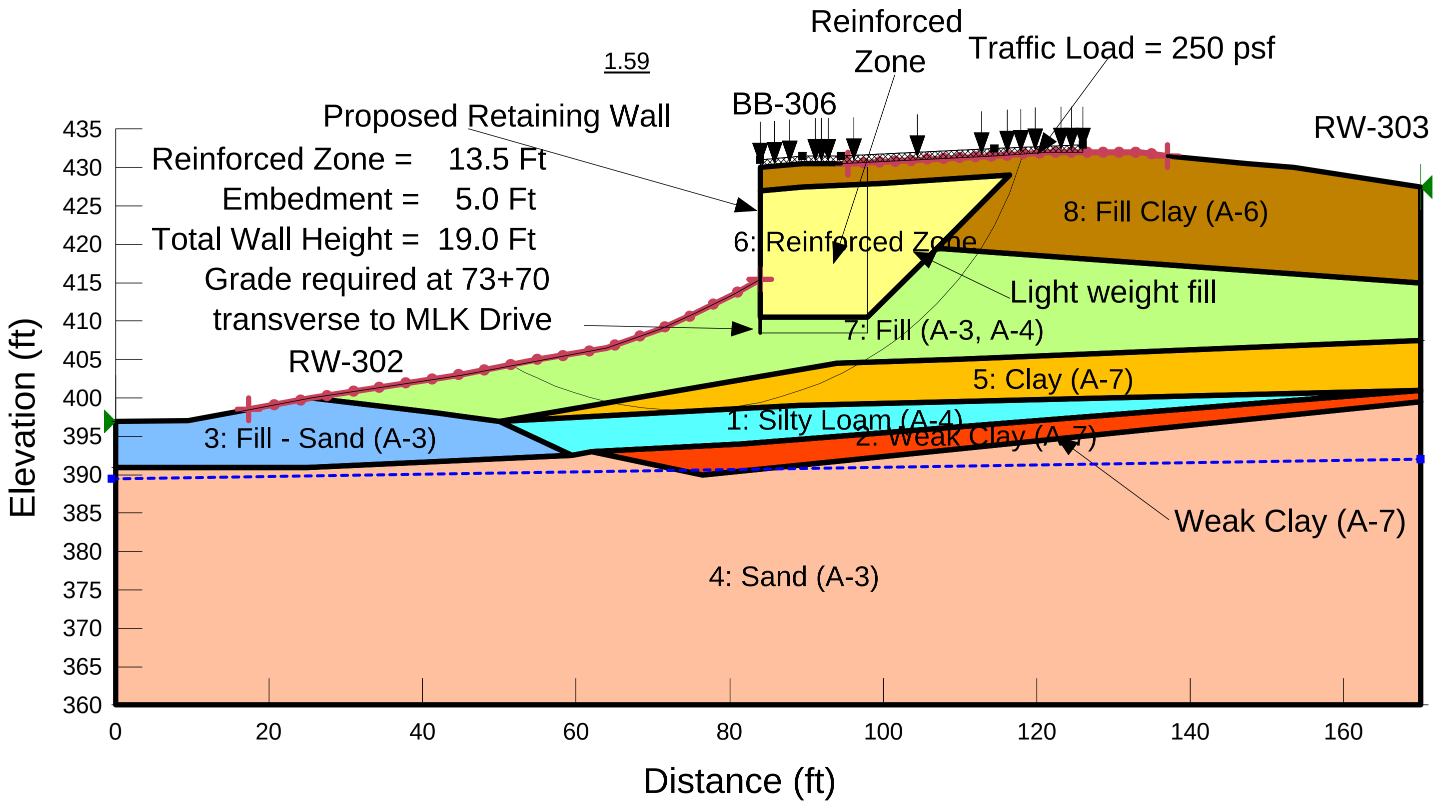
Name: Reinforced Zone Unit Weight: 100 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 10 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 0 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 500 psf Phi': 0 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+59: Short Term
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone



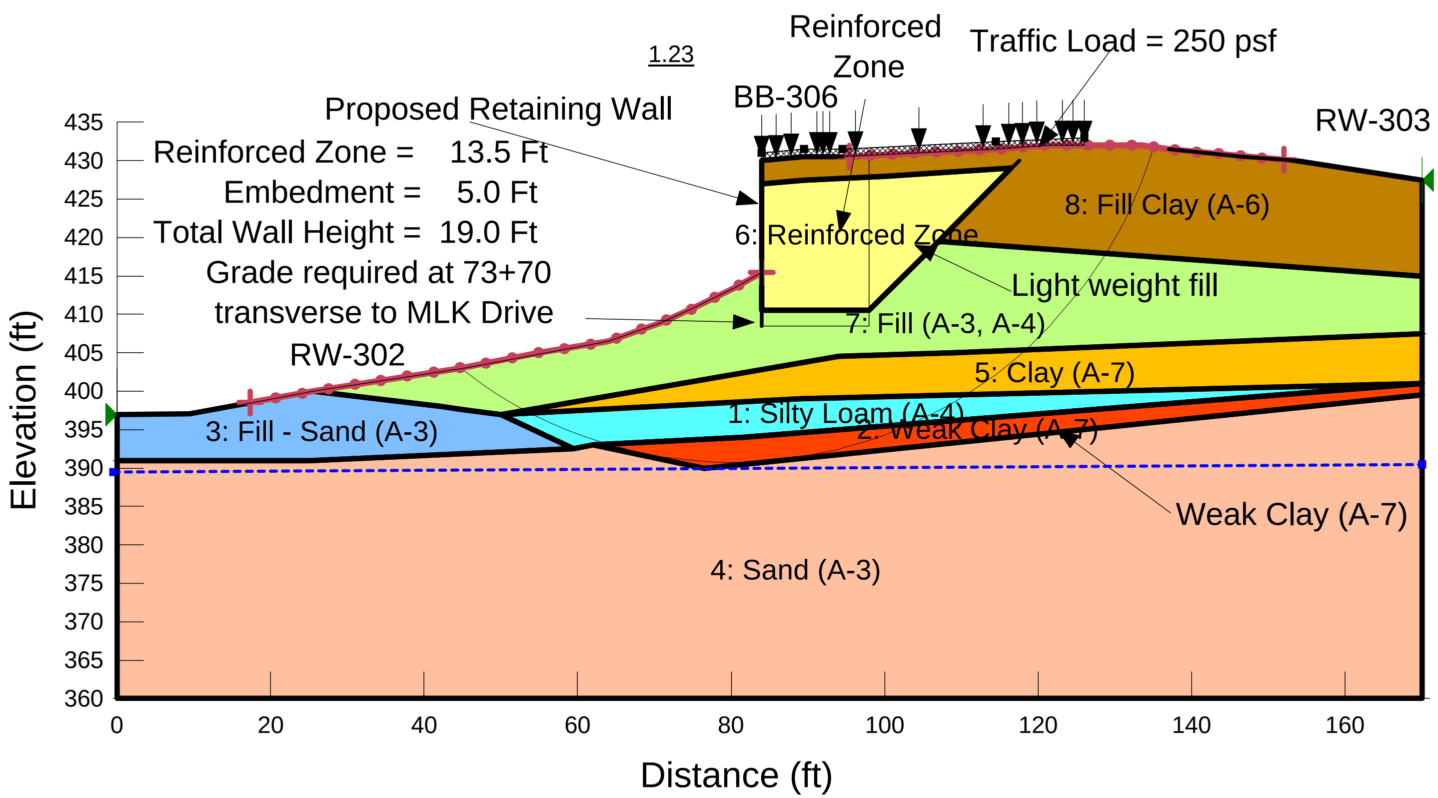
Name: Reinforced Zone Unit Weight: 100 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 10 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 0 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 500 psf Phi': 0 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+59: Long Term
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone



Name: Reinforced Zone Unit Weight: 100 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 50 psf Phi': 28 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 250 psf Phi': 20 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 250 psf Phi': 26 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 19 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 73+59: Pseudo-Static
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone
Seismic Load = 0.09 g



Name: Reinforced Zone Unit Weight: 100 pcf

Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °

Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 700 psf Phi': 9 °

Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 700 psf Phi': 9 °

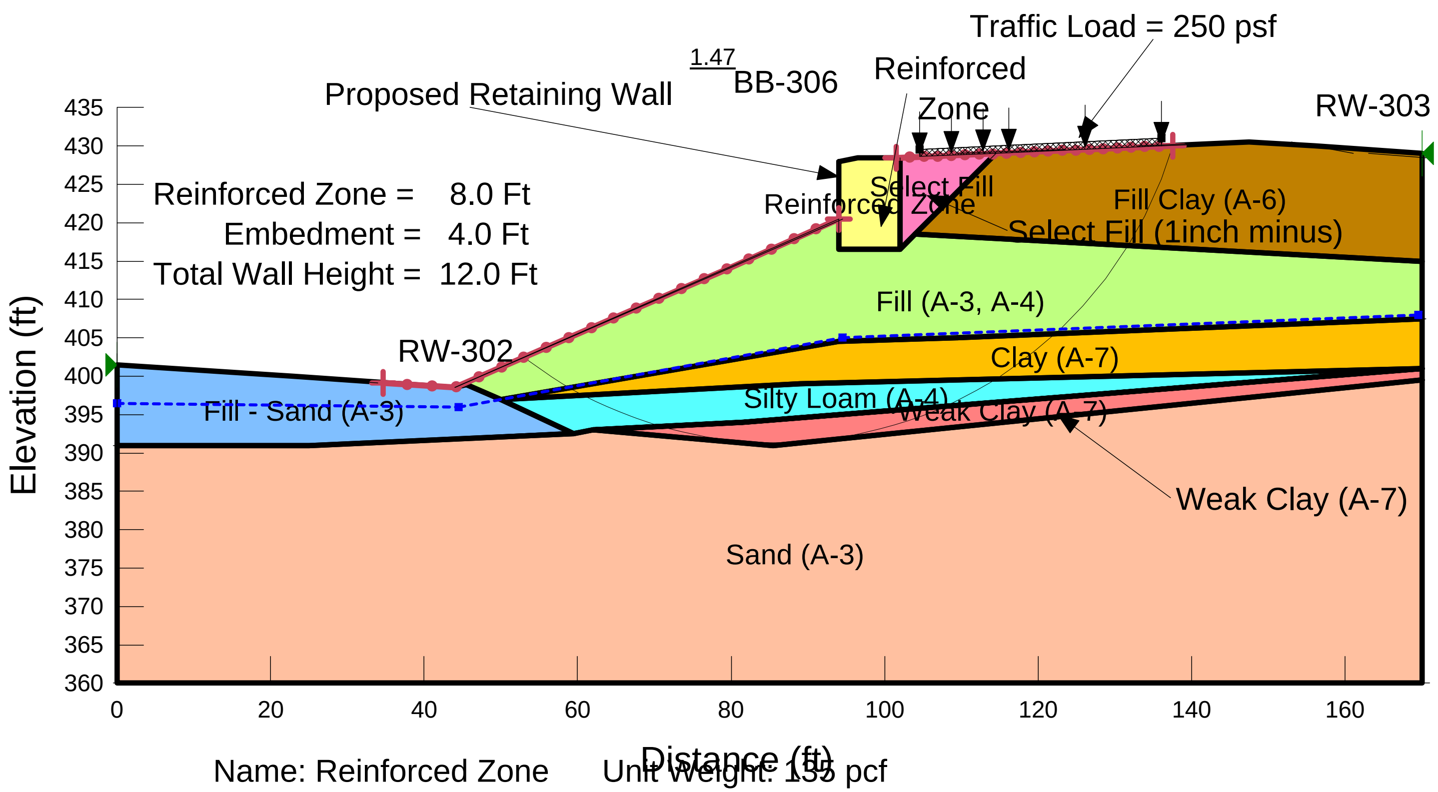
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °

Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °

Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 8 °

Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 400 psf Phi': 6 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 74+00: Short Term
Morgenstern-Price: Circular Failure



Name: Reinforced Zone Unit Weight: 135 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 10 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 0 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
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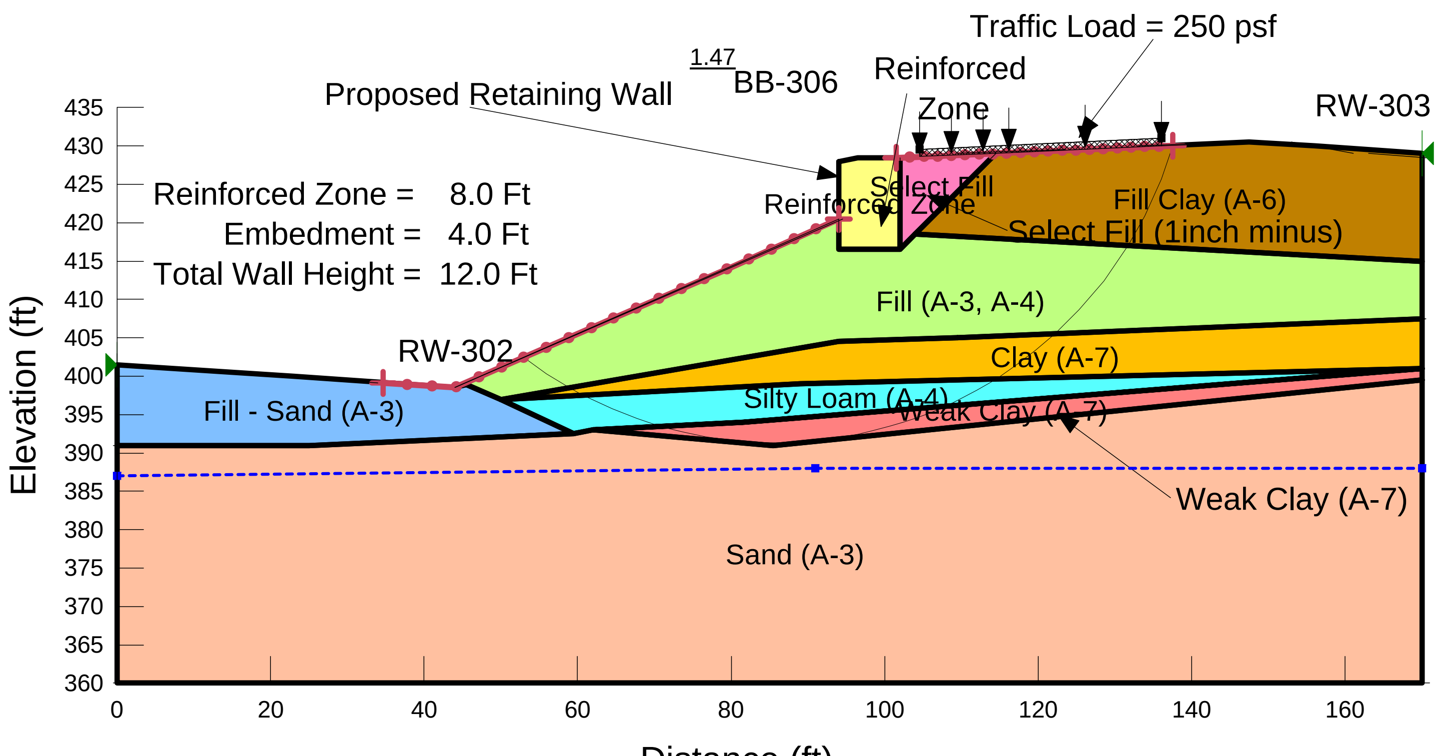
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 500 psf Phi': 0 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 74+00: Short Term
Morgenstern-Price: Circular Failure



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Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
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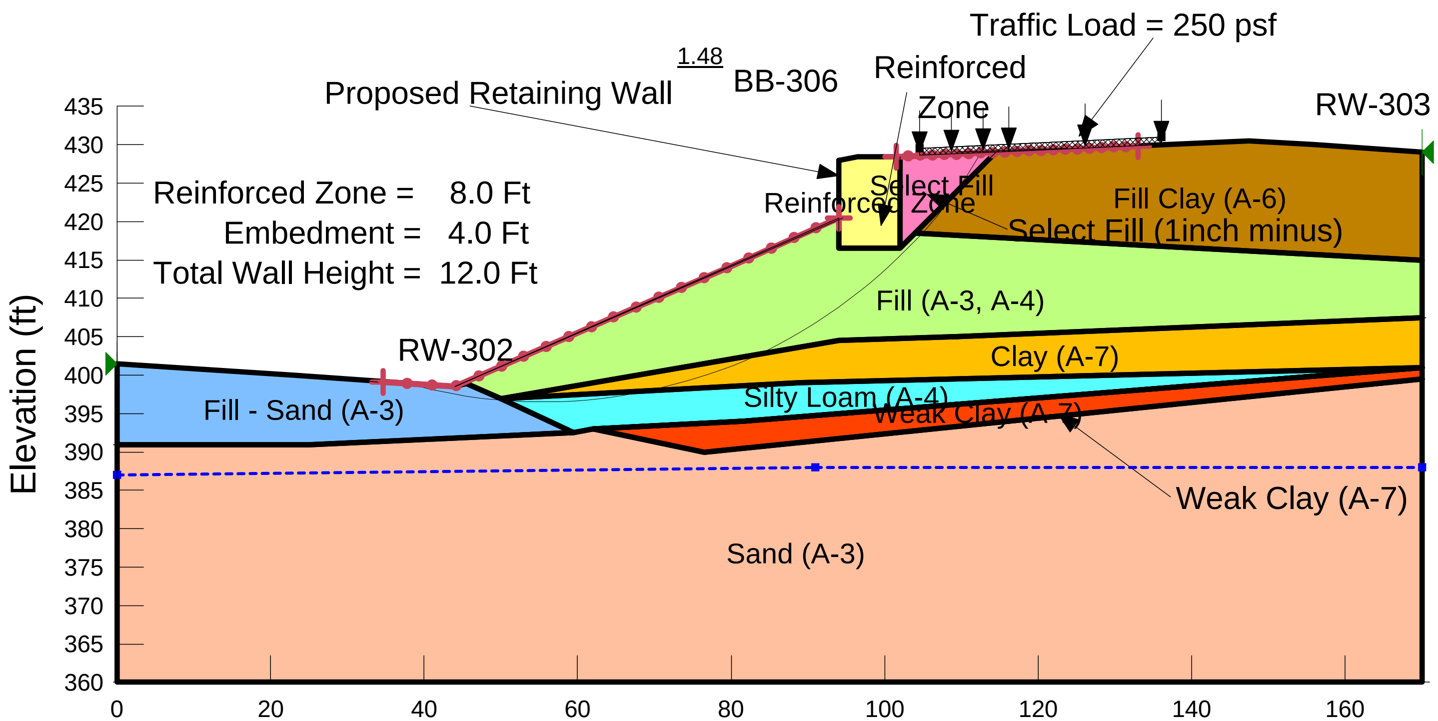
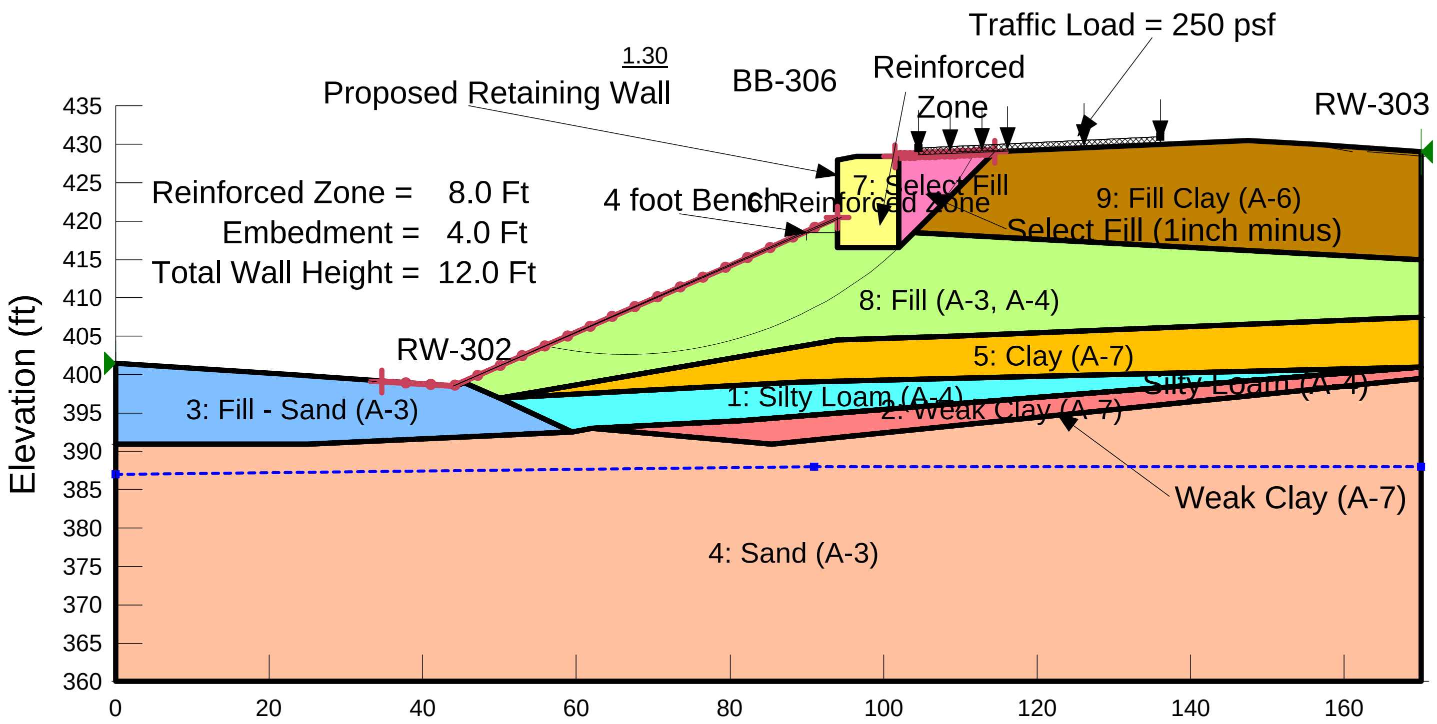
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Select Fill Unit Weight: 135 pcf Cohesion': 0 psf Phi': 34 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 500 psf Phi': 0 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 74+00: Long Term
Morgenstern-Price: Circular Failure



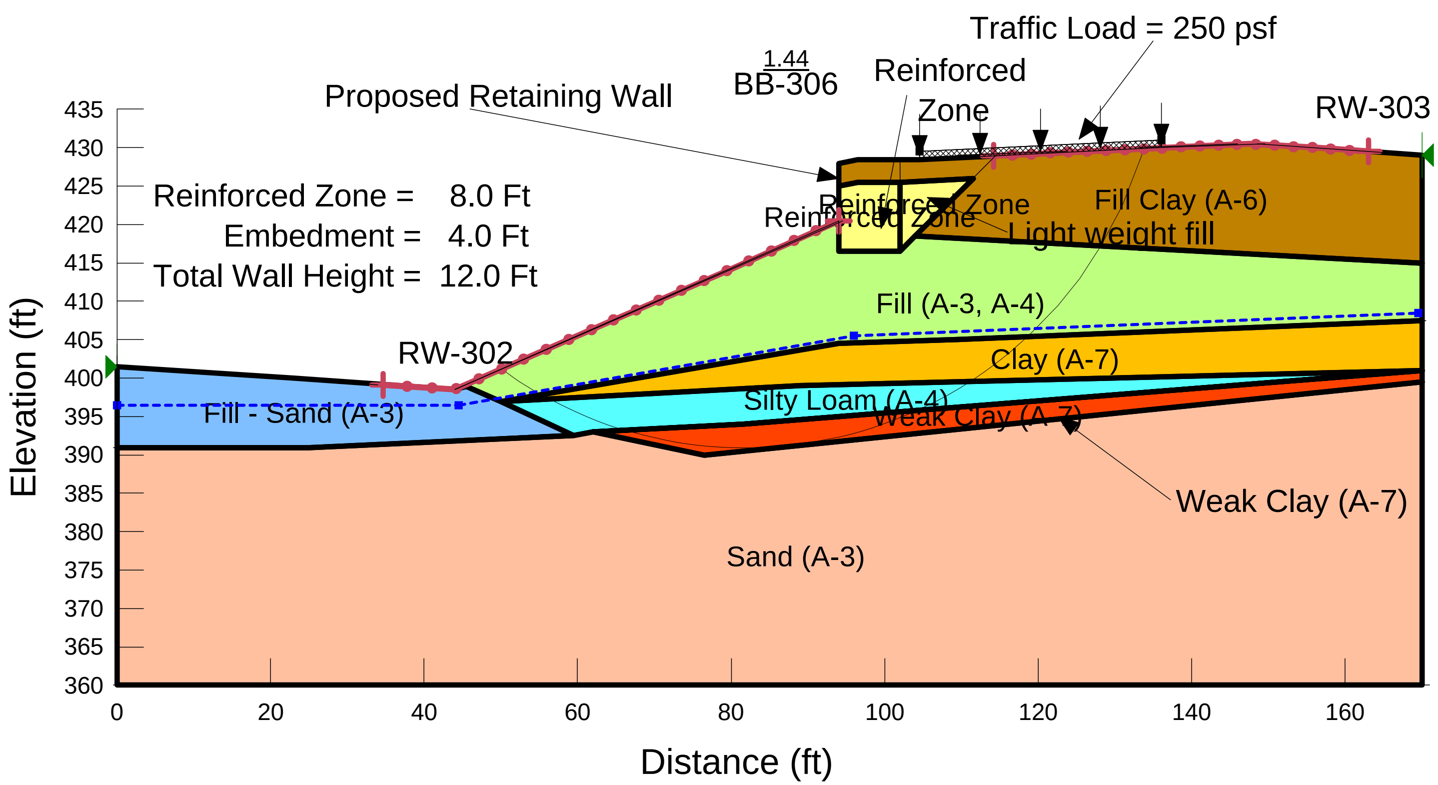
Name: Reinforced Zone Unit Weight: 135 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 50 psf Phi': 28 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 250 psf Phi': 20 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Select Fill Unit Weight: 135 pcf Cohesion': 0 psf Phi': 34 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 250 psf Phi': 26 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 19 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 74+00: Pseudo-Static
Morgenstern-Price: Circular Failure
Seismic Load = 0.09 g



Name: Reinforced Zone Unit Weight: 135 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 30 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 700 psf Phi': 10 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 700 psf Phi': 6 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 28 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
Name: Select Fill Unit Weight: 135 pcf Cohesion': 0 psf Phi': 34 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 8 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 400 psf Phi': 6 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 74+00: Short Term
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone



Name: Reinforced Zone   Unit Weight: 100 pcf

Name: Fill (A-3, A-4)   Unit Weight: 115 pcf   Cohesion': 100 psf   Phi': 32 °

Name: Silty Loam (A-4)   Unit Weight: 115 pcf   Cohesion': 800 psf   Phi': 10 °

Name: Clay (A-7)   Unit Weight: 120 pcf   Cohesion': 800 psf   Phi': 0 °

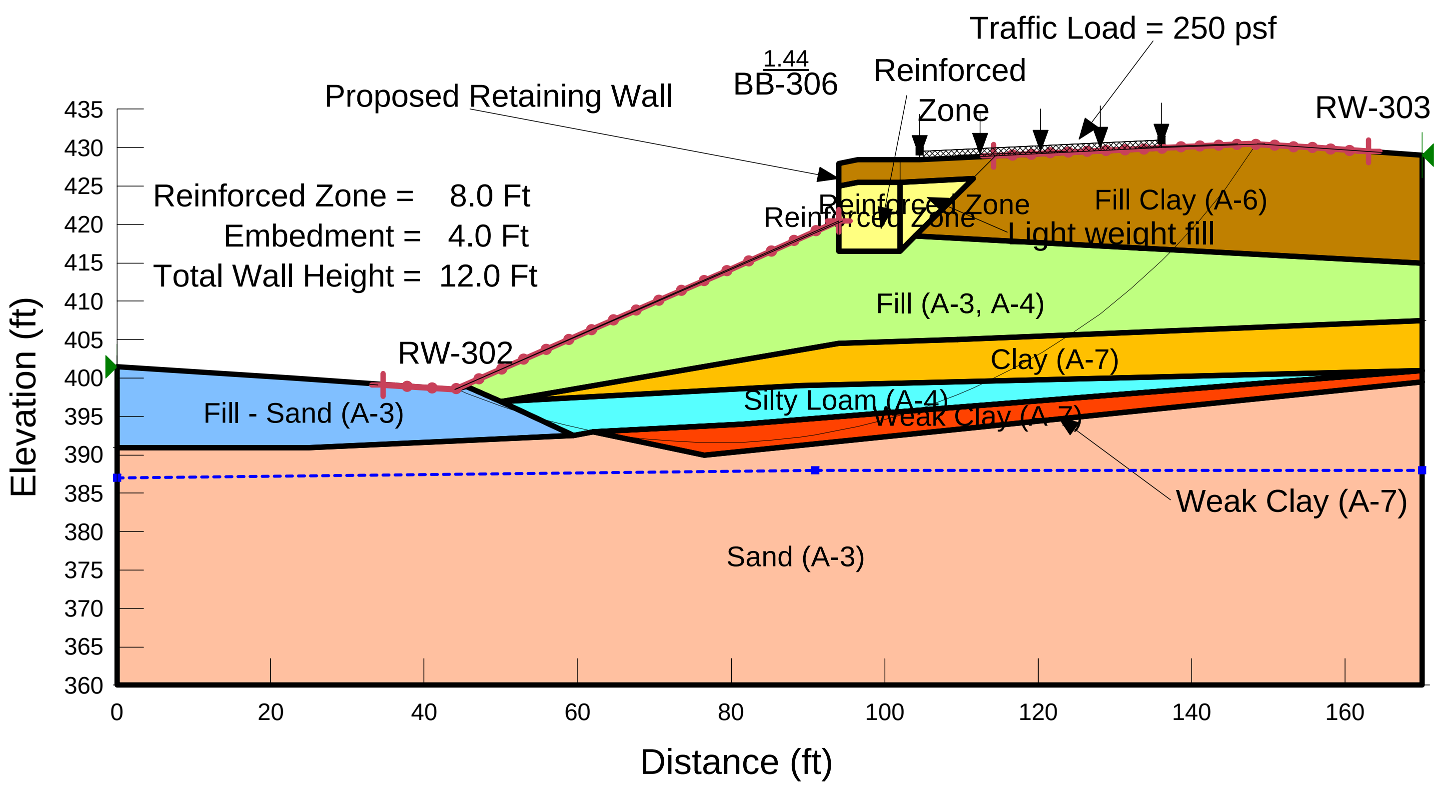
Name: Sand (A-3)   Unit Weight: 125 pcf   Cohesion': 0 psf   Phi': 32 °

Name: Fill - Sand (A-3)   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 30 °

Name: Fill Clay (A-6)   Unit Weight: 120 pcf   Cohesion': 1,000 psf   Phi': 0 °

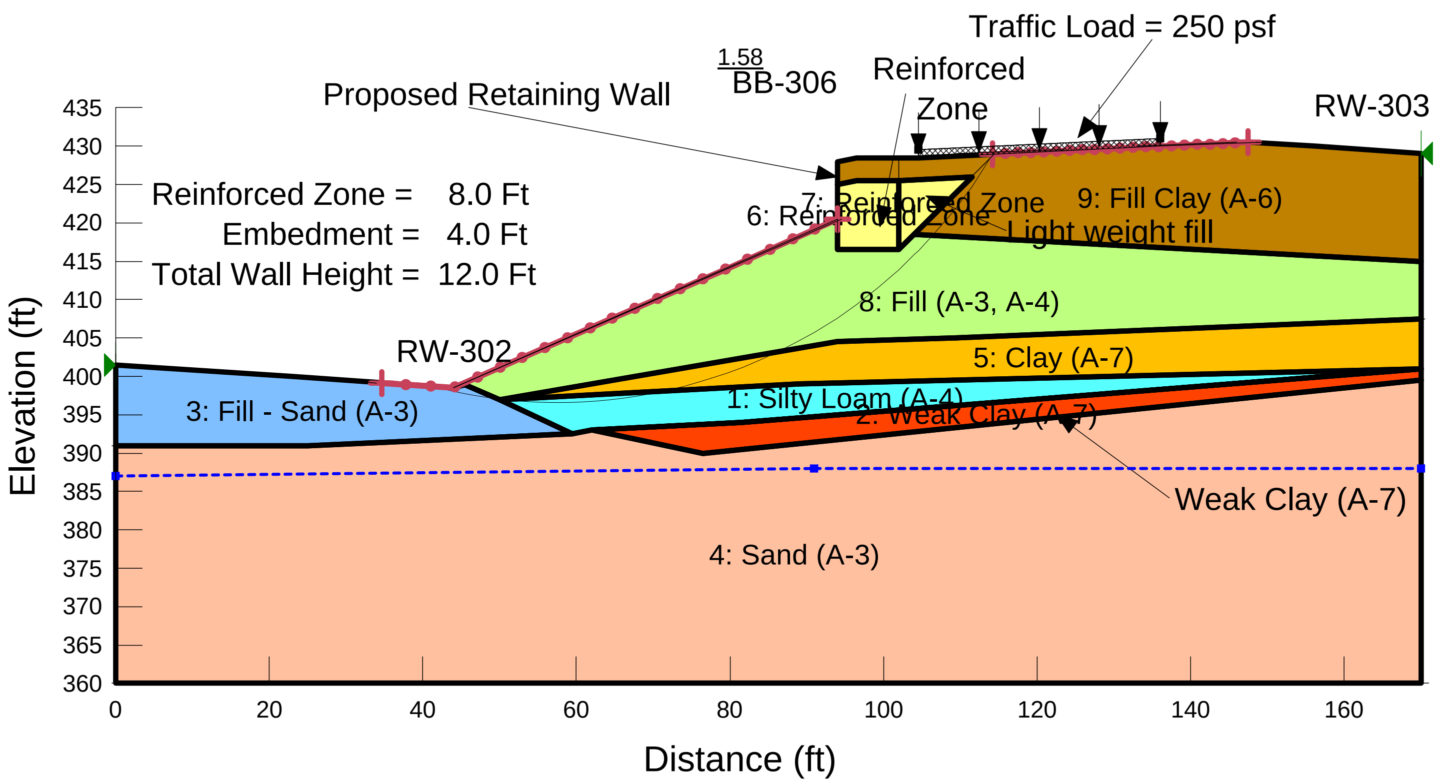
Name: Weak Clay (A-7)   Unit Weight: 120 pcf   Cohesion': 500 psf   Phi': 0 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 74+00: Short Term
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone



Name: Reinforced Zone Unit Weight: 100 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 10 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 0 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 500 psf Phi': 0 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 74+00: Long Term
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone



Name: Reinforced Zone Unit Weight: 100 pcf

Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °

Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 50 psf Phi': 28 °

Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 250 psf Phi': 20 °

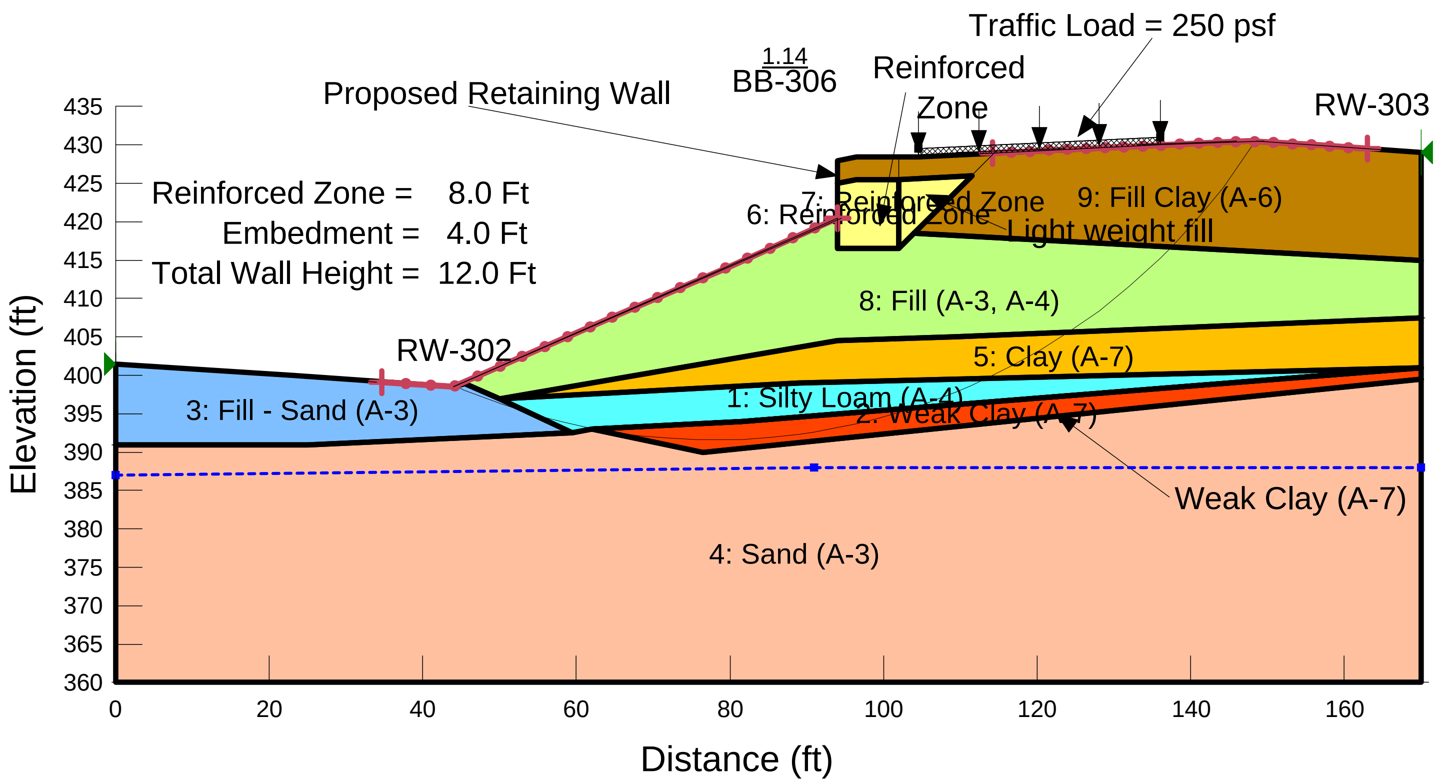
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °

Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °

Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 250 psf Phi': 26 °

Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 19 °

2014-3149.51: PTB 172, Item 22
FAP 799 (MLK Drive): Task 51
Station 74+00: Pseudo-Static
Morgenstern-Price: Circular Failure
Light weight fill used in Reinforced Zone
Seismic Load = 0.09 g



Name: Reinforced Zone Unit Weight: 100 pcf
Name: Fill (A-3, A-4) Unit Weight: 115 pcf Cohesion': 100 psf Phi': 32 °
Name: Silty Loam (A-4) Unit Weight: 115 pcf Cohesion': 800 psf Phi': 10 °
Name: Clay (A-7) Unit Weight: 120 pcf Cohesion': 800 psf Phi': 0 °
Name: Sand (A-3) Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 °
Name: Fill - Sand (A-3) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Fill Clay (A-6) Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: Weak Clay (A-7) Unit Weight: 120 pcf Cohesion': 500 psf Phi': 0 °

Appendix D

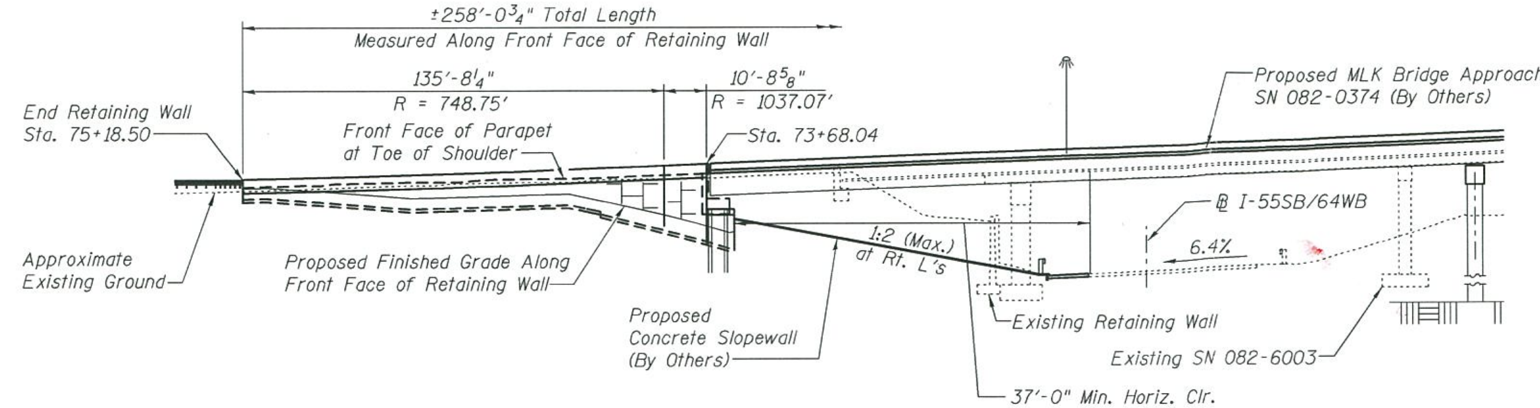
Bench Mark MLK-6: Chiseled square centered on top of the flattop area of a concrete wingwall located at the northwest corner of tunnel SN 082-0013 for connector exit lane to 3rd Street and Eads Bridge, which runs under East MLK Bridge Approach in East St. Louis, Illinois. Elevation NAVD 88 = 428.576

Existing Structure: The existing retaining wall does not have a structure number. It was constructed in 1965 as part of the F.A.I. Route 70 project I-70-1(76)1. It is a cast-in-place concrete wall on a footing with concrete piles.

The existing structure is to be removed and replaced.

MLK Bridge Approach is to be completely closed to traffic during construction. Traffic is to be maintained by detouring onto adjacent structures. Lane closures will be utilized to maintain traffic on I-55SB/64WB.

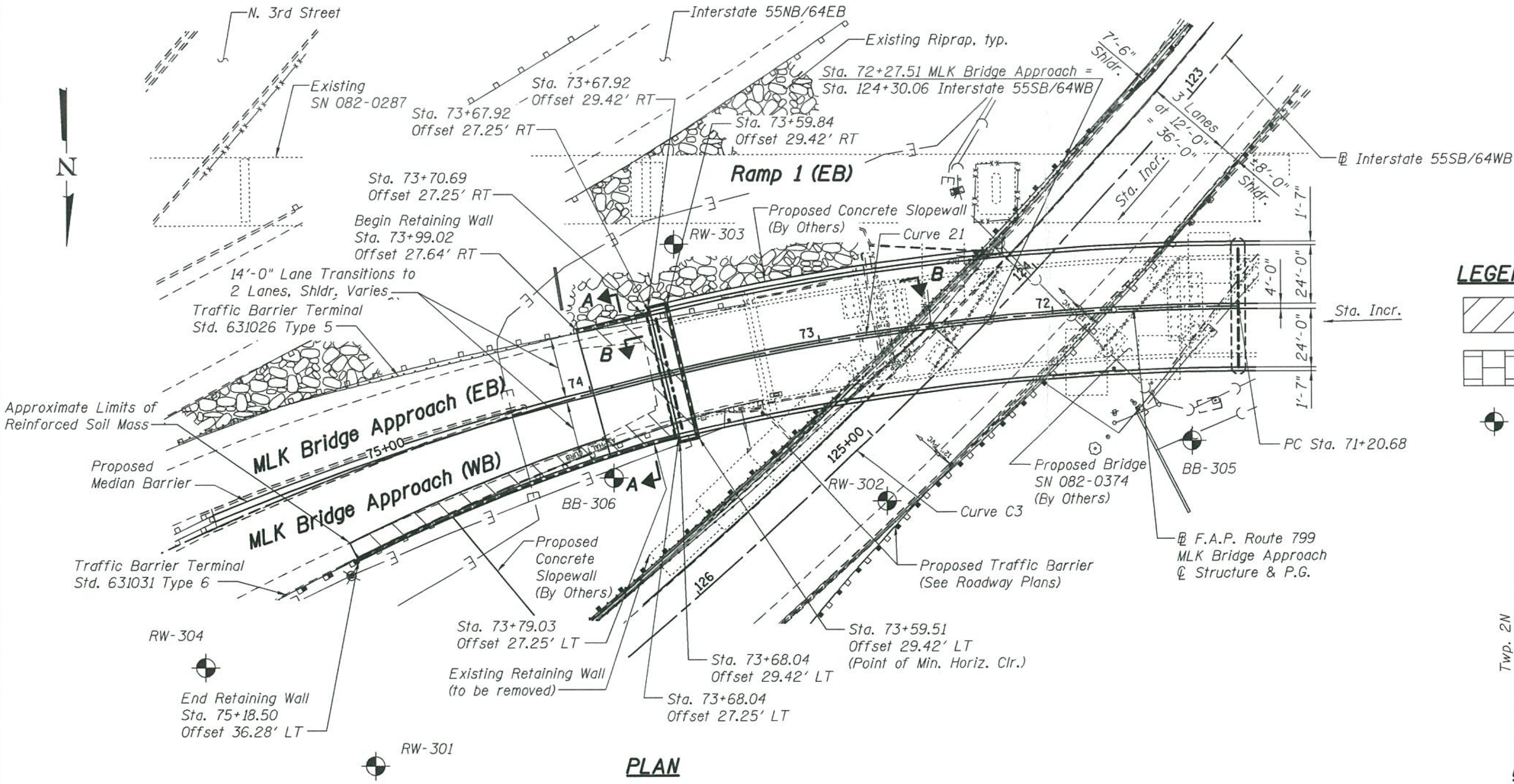
No salvage.



ELEVATION

(Looking South)

See sheet 2 for Unfolded Elevation View.



PLAN

CURVE C3 DATA

P.I. Sta. = 125+66.38
Δ = 21° 41' 42" (RT)
D = 2° 44' 22"
R = 2,091.61'
T = 400.79'
L = 791.99'
E = 38.05'
e = -
T.R. = -
S.E. Run = -
P.C. Sta. = 121+65.59
P.T. Sta. = 129+57.58

CURVE 21 DATA

P.I. Sta. = 74+81.50
Δ = 37° 27' 17" (LT)
D = 5° 23' 00"
R = 1,064.32'
T = 360.82'
L = 695.75'
E = 59.50'
e = 4.7%
T.R. = 31'
S.E. Run = 99'
P.C. Sta. = 71+20.68
P.T. Sta. = 78+16.44

DESIGN SPECIFICATIONS

2014 AASHTO LRFD Bridge Design Specifications, 7th Edition with 2015 and 2016 Interims

DESIGN STRESSES

FIELD UNITS

f'_c = 3,500 psi
f_y = 60,000 psi (reinforcement)

PRECAST UNITS

f'_c = 4,000 psi (precast face panels)

HIGHWAY CLASSIFICATION

F.A.P. Rte. 799 - MLK Bridge Approach
Functional Class: Other Principal Arterial
ADT: 7,600 (2018); 8,700 (2038)
DHV: 957 (2038)
ADTT: SU = 1.9% MU = 1.5%
Design Speed: 50 m.p.h.
Posted Speed: 45 m.p.h.
Two-Way Traffic
Directional Distribution: 57% (WB); 43% (EB)

HIGHWAY CLASSIFICATION

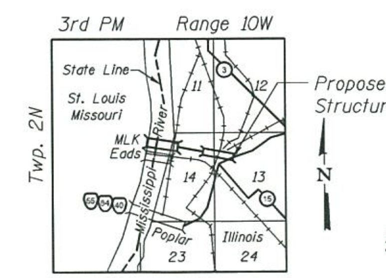
F.A.I. Rte. 55/64
Functional Class: Interstate
ADT: 48,700 (2018); 59,400 (2038)
DHV: 6534 (2038)
ADTT: SU = 2.4% MU = 7.8%
Design Speed: 60 m.p.h.
Posted Speed: 50 m.p.h.
One-Way Traffic

APPROVED
MAR 0 2 2017
AS A BASIS FOR PREPARATION OF DETAILED PLANS

LEGEND

Reinforced Soil Mass
MSE Wall Panels
Soil Borings

Notes:
Wall stations and offsets are given to the front face (FF) of the wall and are measured from the baseline of MLK Bridge Approach.
For Section A-A, see sheet 3.
For Section B-B, see sheet 4.
Existing utilities shown will be relocated to avoid any conflicts during construction.



LOCATION SKETCH

GENERAL PLAN
MLK BRIDGE APPROACH
F.A.P. ROUTE 799 SEC. 1BR-1-1
ST. CLAIR COUNTY
STATION 73+99.02 (EB) TO 75+18.50 (WB)
STRUCTURE NO. 082-W315

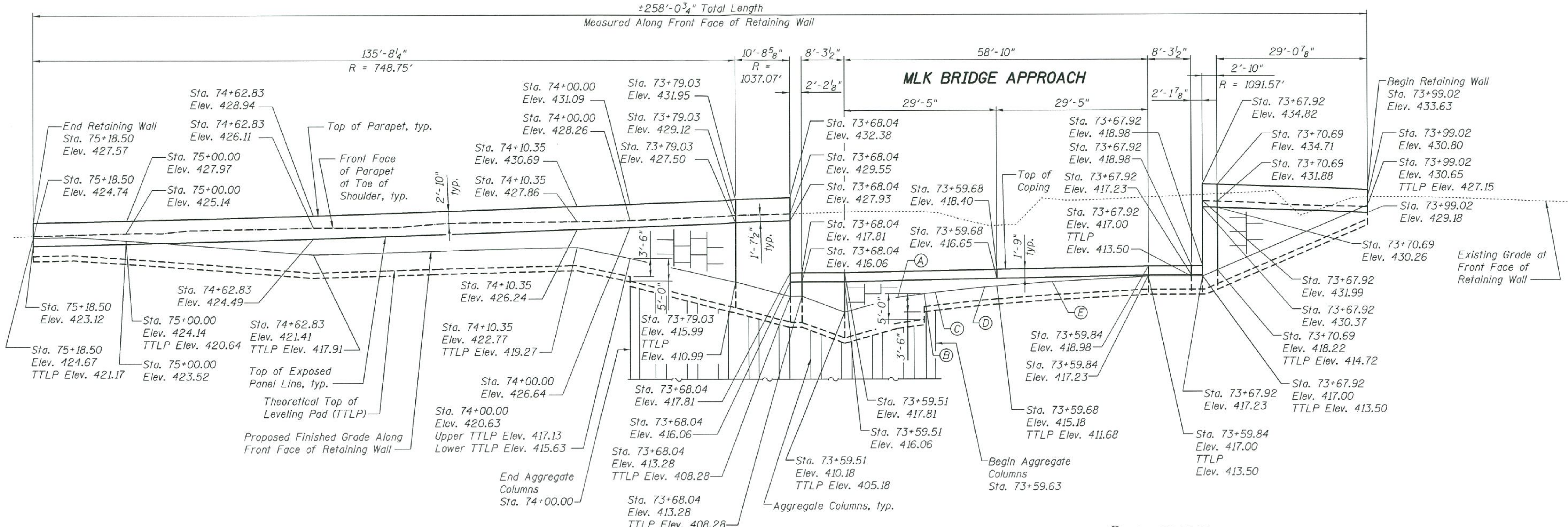
MODJESKI and MASTERS Experience great bridges.	USER NAME =	DESIGNED - ZJB	REVISED
		CHECKED - JMH	REVISED
	PLOT SCALE =	DRAWN - AEC	REVISED
	PLOT DATE = 02/01/2017	CHECKED - JMH	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN

SHEET NO. 1 OF 4 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
799	1BR-1-1	ST. CLAIR		
		CONTRACT NO. 76G39		
		ILLINOIS FED. AID PROJECT		



UNFOLDED ELEVATION VIEW

Ⓐ Sta. 73+59.57
Elev. 413.04
TTLP Elev. 408.04

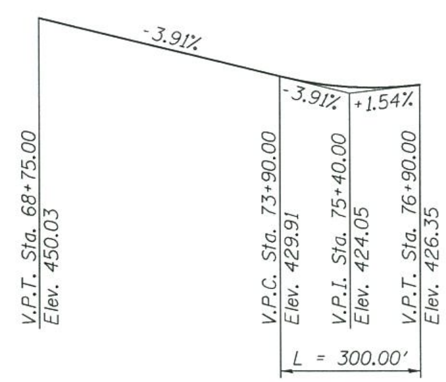
Ⓑ Sta. 73+59.61
Elev. 413.89
Upper TTLP Elev. 410.39
Lower TTLP Elev. 408.89

Ⓒ Sta. 73+59.62
Elev. 414.00
TTLP Elev. 410.50

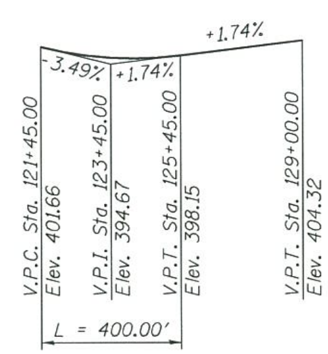
Ⓓ Sta. 73+59.67
Elev. 415.00
TTLP Elev. 411.50

Ⓔ Sta. 73+59.74
Elev. 416.00
TTLP Elev. 412.50

APPROVED
MAR 02 2017
AS A BASIS FOR PREPARATION OF DETAILED PLANS



PROFILE GRADE
(Along MLK Bridge Approach)



PROFILE GRADE
(Along I-55SB/64WB)
(Original Design)

UNFOLDED ELEVATION VIEW
MLK BRIDGE APPROACH
F.A.P. ROUTE 799 SEC. 1BR-1-1
ST. CLAIR COUNTY
STATION 73+99.02 (EB) TO 75+18.50 (WB)
STRUCTURE NO. 082-W315

MODJESKI and MASTERS — Experience great bridges.

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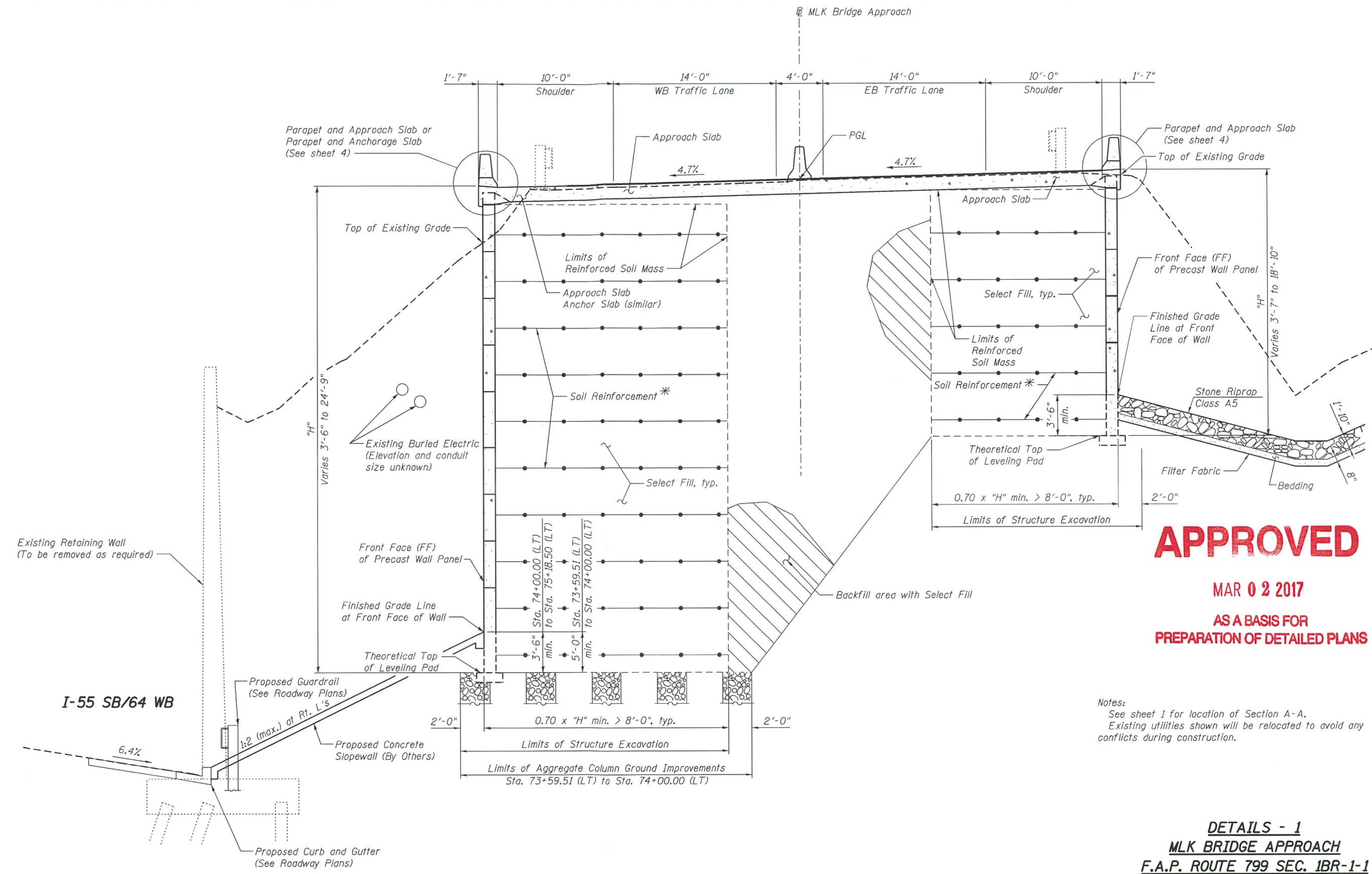
	CHECKED - JMH	REVISED	
PLOT SCALE =	DRAWN - AEC	REVISED	
PLOT DATE = 02/01/2017	CHECKED - JMH	REVISED	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

UNFOLDED ELEVATION
SHEET NO. 2 OF 4 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
799	1BR-1-1	ST. CLAIR		

CONTRACT NO. 76G39
ILLINOIS FED. AID PROJECT



Notes:
See sheet 1 for location of Section A-A.
Existing utilities shown will be relocated to avoid any conflicts during construction.

SECTION A-A
(Typical Wall Section at Approach Pavement)

* The M.S.E. wall supplier's internal stability design shall account for the anchorage slab's bearing pressure surcharge of 1.0 ksf and horizontal sliding force of 0.5 kips/ft. of wall.

DETAILS - 1
MLK BRIDGE APPROACH
F.A.P. ROUTE 799 SEC. 1BR-1-1
ST. CLAIR COUNTY
STATION 73+99.02 (EB) TO 75+18.50 (WB)
STRUCTURE NO. 082-W315

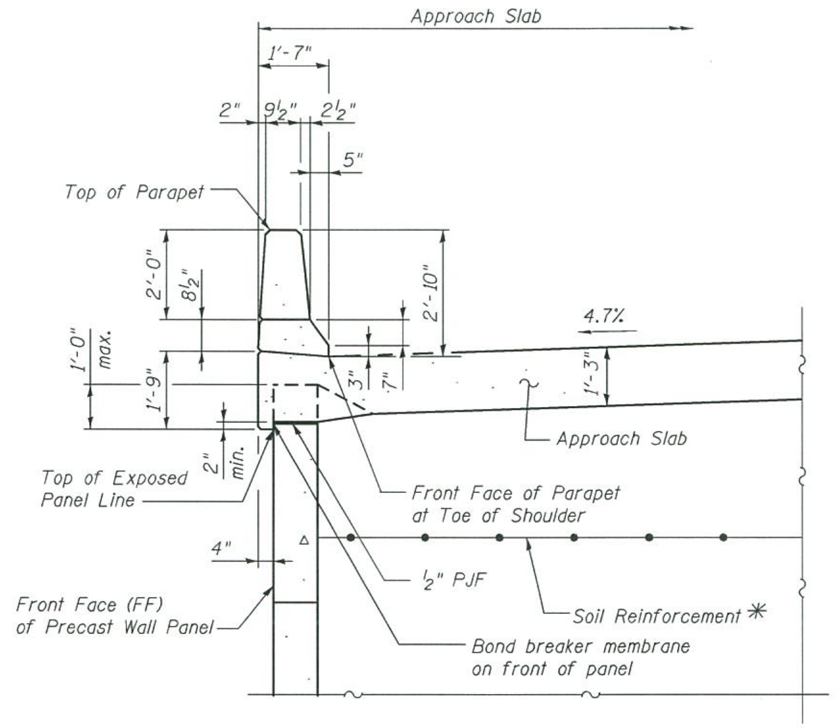
MODJESKI and MASTERS — Experience great bridges.

USER NAME =	DESIGNED - ZJB	REVISED	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
	CHECKED - JMH	REVISED	
PLOT SCALE =	DRAWN - AEC	REVISED	
PLOT DATE = 02/01/2017	CHECKED - JMH	REVISED	

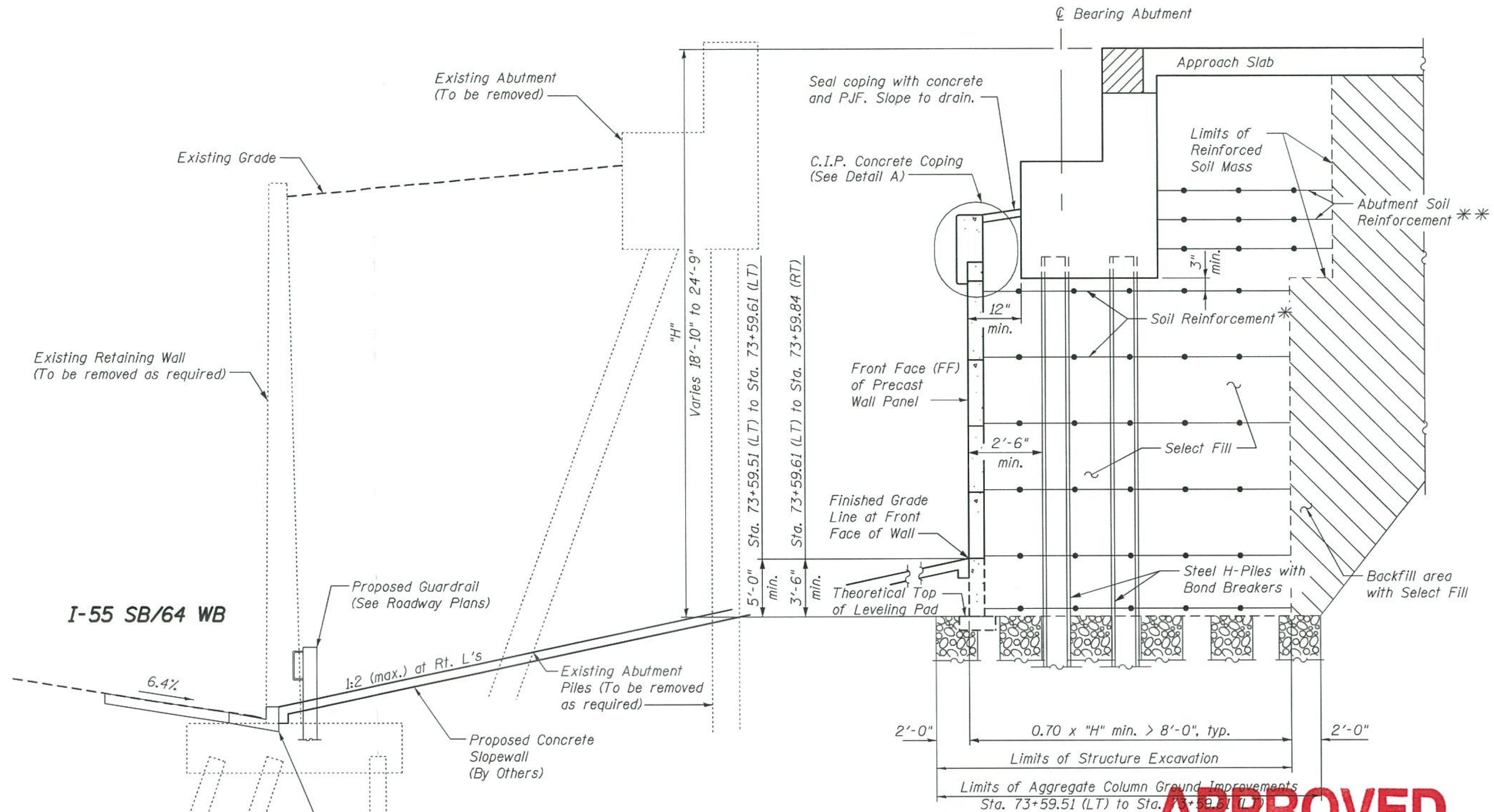
DETAILS - 1
SHEET NO. 3 OF 4 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
799	1BR-1-1	ST. CLAIR		
		CONTRACT NO. 76G39		

ILLINOIS FED. AID PROJECT



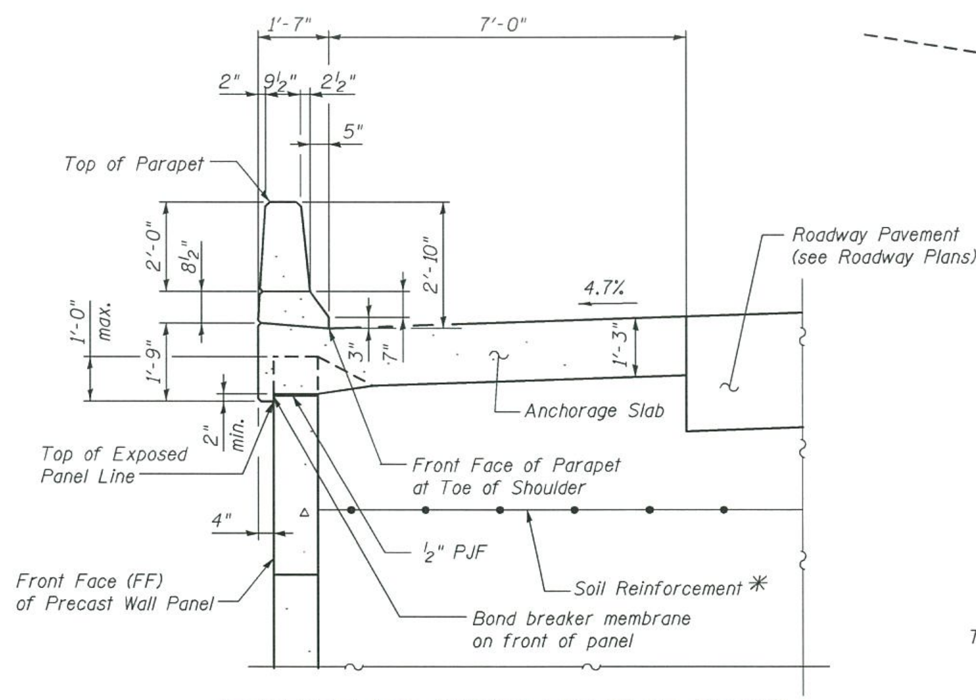
PARAPET AND APPROACH SLAB DETAIL



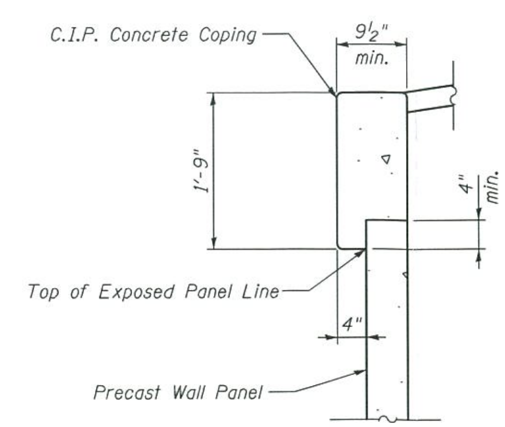
APPROVED
MAR 02 2017
AS A BASIS FOR PREPARATION OF DETAILED PLANS

SECTION B-B

(Typical Wall Section Thru Abutment)



PARAPET AND ANCHORAGE SLAB DETAIL



DETAIL A
C.I.P. CONCRETE COPING

Notes:
See Proposed Structure SN 082-0374 Plans for abutment and slopewall details.
See sheet 1 for location of Section B-B.

✳ The M.S.E. wall supplier's internal stability design shall account for the anchorage slab's bearing pressure surcharge of 1.0 ksf and horizontal sliding force of 0.5 kips/ft. of wall.

✳✳ The M.S.E. wall supplier shall design the abutment soil reinforcement to resist a horizontal force of 3.25 kips/ft. of abutment.

DETAILS - 2
MLK BRIDGE APPROACH
F.A.P. ROUTE 799 SEC. 1BR-1-1
ST. CLAIR COUNTY
STATION 73+99.02 (EB) TO 75+18.50 (WB)
STRUCTURE NO. 082-W315

MODJESKI and MASTERS Experience great bridges.	USER NAME =	DESIGNED - ZJB	REVISED
		CHECKED - JMH	REVISED
	PLOT SCALE =	DRAWN - AEC	REVISED
	PLOT DATE = 02/01/2017	CHECKED - JMH	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

DETAILS - 2
SHEET NO. 4 OF 4 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
799	1BR-1-1	ST. CLAIR		
		CONTRACT NO. 76G39		
		ILLINOIS FED. AID PROJECT		

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

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