



INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

January 30, 2026

Mr. James G. Silliman III, P.E.
County Engineer
Oldham County Fiscal Court
100 West Jefferson Street
La Grange, Kentucky 40031

RE: Addendum
Subsurface Investigation (Roadway & Bridge) for
Underpass of CSX Railroad Connecting Commerce Parkway and KY 146
Oldham County, Kentucky
Item #5-434.00
DLZ Project No. 0631-0006.02

Mr. Silliman:

The above-referenced project consists of lowering the existing Allen Lane at the CSX railroad crossing, and relocating the existing Allen Lane to provide a grade separation at the Allen Lane/CSX railroad intersection. A new CSX bridge will also be constructed over the lowered Allen Lane, and a temporary railroad diversion track (railroad runaround) will be installed north of the existing track to maintain railroad traffic during the Allen Lane/CSX railroad construction. The findings of the subsurface exploration performed in 2014 and associated recommendations were presented in the Report of Subsurface Investigation (Roadway) for Underpass of CSX Railroad Connecting Commerce Parkway and KY 146, Oldham County, Kentucky, dated September 4, 2015 and the Report of Subsurface Investigation (Bridge) for Underpass of CSX Railroad Connecting Commerce Parkway and KY 146, Oldham County, Kentucky, dated September 4, 2015. To finalize the design of the project, an additional geotechnical exploration was performed in 2024 at the proposed CSX railroad runaround to evaluate the stability of the proposed railroad embankment as well as to address the review comments on both September 2015 reports. This letter report includes the findings of the additional geotechnical exploration along with associated engineering analyses recommended in the review comments. The geotechnical exploration has been performed essentially in accordance with DLZ's proposal dated May 23, 2024. A summary of the general scope of work as indicated in the proposal is as follows:

- Perform a total of ten borings, B-03 through B-12, along the proposed runaround alignment.
- Perform dynamic cone penetration tests at boring locations B-01, B-02, B-13, and B-14.
- Perform a boring B-32C with rock coring at Station 1528+55 of the proposed railroad bridge (near Pier 1) to an elevation of approximately 805 to confirm the bedrock type and quality for the drilled shaft support of the proposed railroad bridge.
- Install an observation well at each of boring B-5 and B-12 locations.

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- Perform slope stability, settlement, and bearing capacity analyses for railroad runaround Stations 1518+00, 1528+00, and 1538+00.
- Perform a stability analysis at CSXT Mainline Station 1526+00 where the existing railroad embankment is widening and will have a proposed embankment height of 28 feet. The subsurface conditions at a previous boring B-22 drilled in 2014 is used for the analysis.

FIELD EXPLORATION

DLZ prepared the scope of field exploration based on the proposed work of the additional exploration. The field exploration plan was reviewed and subsequently approved by the Kentucky Transportation Cabinet (KYTC) Geotechnical Branch.

The field exploration originally consisted of drilling elevation borings (B-03 through B-12 and B-32C), performing five dynamic cone penetration (DCP) tests at borings B-01, B-02, B-04, B-13, and B-14), and installing two observation wells at borings B-5 and B-12. Originally, DCP tests were planned at four boring locations (B-01, B-02, B-13, and B-14). Because of the site constraints, boring B-04 could not be drilled at the originally planned location at the toe of the existing railroad embankment. A DCP test was performed instead at the originally planned location of B-04 and boring B-04 was drilled offset approximately 35 feet north of its original location. During the field exploration, some of the borings were also drilled offset from the originally planned boring locations to accommodate the site conditions. The field exploration were performed between November 11 and 15, 2024. The borings were drilled using an all-terrain-vehicle (ATV) mounted rotary-type drill rig, which had hammer calibrated on June 13, 2023 (hammer efficiency of 74.7 percent). A drawing showing the as-drilled boring locations with respect to the existing features is presented in Appendix I. The stations and offsets and latitude and longitudes of the as-drilled boring locations are on the boring logs in Appendix I. The as-drilled locations and elevations of the borings were determined in the field by representatives of DLZ, except that the boring stake for B-11 could not be located at the time of survey, and the ground surface elevation at boring B-11 was estimated based on Google Earth imagery.

Standard Penetration Tests were performed generally in 1.5-foot increments at intervals not exceeding 5 feet through the overburden to the top of bedrock. A Shelby tube sample was collected from each of borings B-03, B-05, and B-7. Five feet of rock cores were obtained from borings B-05, B-8, and B-12 and 32 feet of rock cores from boring B-32C. NQ size diamond coring tools were used with water as the circulating fluid. All drilling and sampling were performed in general accordance with the current KYTC Geotechnical Manual, Section GT-300. Information concerning the general drilling procedures is presented in Appendix I.

The present field investigation was undertaken to develop engineering information to meet the purposes as described above. The intent of these services was not to uncover or identify any contaminated subsurface material that may contain hazardous or flammable substances. Identification of such substances requires specialized exploration techniques and analyses that were not employed in this investigation.

A field log was prepared for each boring. These logs contain visual classifications of the materials encountered during drilling as well as an interpolation of the subsurface conditions between samples. Final logs, included in Appendix I, represent our interpretation of the field logs and may include modifications based on laboratory observations and tests of the field samples. The final logs describe the materials encountered, their thicknesses, and the locations where samples were obtained. Ground surface elevations at the borings are presented on the final logs.

GENERALIZED SURFACE CONDITIONS

The following sections present the generalized subsurface conditions encountered by borings B-03 through B-12 drilling along the proposed railroad runaround location. For more detailed information, please refer to the boring logs presented in the Appendix I. Please note that the strata contact lines shown on the boring logs represent approximate boundaries between soil and rock layers. In the field, the actual transitions between soil and bedrock layers might be different both vertically and laterally.

Generally, the subsurface conditions encountered in the borings drilled in this additional field exploration are similar to those encountered in the borings previously drilled for the project.

Surface Material

The surface materials encountered in borings B-03 through B-11 generally consisted of 3 to 9 inches of topsoil. No topsoil was reported in boring B-12.

Fill

Fill soils consisting of silty sand and low plasticity lean clay with cinders/slag were encountered at depths of between 0.5 and 13.5 feet in boring B-03.

Lean Clays and Fat Clays

Beneath the ground surface, fill soils or topsoil, the overburden soils consisted mostly of low to high plasticity clays with isolated layers of silty sands. The top of bedrock was encountered at depths varying from 0.3 to 18.5 feet below the existing ground surface. The upper portion of the clay soils occasionally contained trace organics. Fat clays (AASHTO A-7-6) were encountered in five (B-03, B-05, B-07, B-08, and B-09) of the ten borings drilled. Hand penetrometer strength test values in the clay soils generally varied from 1.0 to 4.5+ tons per square foot (tsf), indicating medium stiff to hard consistency.

Auger Refusal

Auger refusal, indicative of top of bedded material, was encountered in all of the borings at depths ranging from 0.0 (ground surface) to 18.5 feet below the existing ground surface (i.e., elevations ranging from 868.7 to

831.8 feet). While the depths to the auger refusal conditions varied across the site, the top of rock elevations generally increased from the west to the east along the railway runaround alignment.

Bedrock

Rock coring was performed in borings B-05, B-08, B-10, and B-12. The rock core samples generally consisted of a Rock Disintegration Zone (RDZ) and very fine to fine grained, brown and gray dolomite. Rock recovery ranged between 90 and 96 percent and the Rock Quality Designation (RQD) values were mostly greater than 50 percent, ranging between 54 and 78 percent, which corresponds to a Rock Quality Description of fair to good according to Table 39 of FHWA-IF-02-034 *Geotechnical Engineering Circular No. 5 Evaluation of Soil and Rock Properties*. The RQD value of the rock core obtained from boring B-08 was 14, which corresponds to a Rock Quality Description of very poor according to Table 39 of FHWA-IF-02-034.

Observation Wells and Groundwater Levels

During the field exploration, immediate groundwater levels were reported in some of the borings. Observation wells were installed in borings B-05 and B-12. The following table, Table 1, presents the elevations where groundwater was encountered during drilling (immediate water level) and where the groundwater level was encountered after the completion of drilling. Boring locations without reported groundwater levels are not included in the table below except for B-12 where an observation well was installed at the boring location.

Table 1 – Groundwater Observations Summary

Boring Location	Depth (Elevation) to Immediate Water Level, ft ¹	Static Water Depth (Elevation), ft	In Observation Well, Depth/Elevation, ft (Date Measured) ³	Depth (Elevation) to Bedrock, ft
B-03 (850.5)	3.5 (847.0)	NR ¹	N/A ²	18.5 (832.0)
B-05 (848.8)	NR ¹	NR ¹	14.0/834.8 (01-22-2025)	17.0 (831.8)
B-07 (851.4)	13.5 (837.9)	NR ¹	N/A ⁴	18.5 (832.9)
B-08 (856.4)	13.5 (842.9)	NR ¹	N/A ⁴	13.5 (842.9)
B-09 (860.8)	13.7 (847.1)	NR ¹	N/A ⁴	13.5 (847.3)
B-10 (864.7)	8.0 (856.7)	NR ¹	N/A ⁴	8.5 (856.2)
B-12 (868.5)	NR ²	NR ¹	NR ¹	0.0 (868.5)

¹NR: Measured, but none reported.

²N/A: No observation well was installed.

³Measured from the ground surface.

It should be noted that groundwater levels may fluctuate with seasonal variations and following periods of heavy or prolonged precipitation and, therefore, the readings indicated on the boring logs may not be representative of the long-term groundwater level. Long-term monitoring would be needed to obtain a more accurate estimate of the groundwater table elevation. Consequently, during construction or at other times during the project life, water levels may be higher or lower than observed at the time of this investigation.

LABORATORY TESTING AND RESULTS

Laboratory tests were performed in accordance with applicable AASHTO or Kentucky Methods of soil and rock testing specifications (KM) as specified in the KYTC Geotechnical Guidance Manual, dated June 2005. Where both AASHTO and KM standards are designated in the guidance manual, the KM procedure was used. The results of the laboratory tests are shown on a laboratory test summary tables in Appendix II and on the appropriate soil profile sheets in Appendix IV.

The laboratory testing program consisted of visual classifications of all collected soil and decomposed rock samples, and soil classification tests on selected Standard Penetration Test samples. The types of soils resulting from laboratory classification testing were primarily either lean clay (CL or A-6, A-7-6) or fat clay (CH or A-7-6), which is in general agreement with the results of visual classification of all collected soil. The in-place moisture contents of tested samples varied approximately from 3 to 59 percent with an average of approximately 21 percent.

RESULTS OF DYNAMIC CONE PENETRATION TESTS

Dynamic cone penetration (DCP) tests were performed between the existing railroad tracks at boring locations B-01, B-02, B-13, and B-14 to determine the materials of the existing embankment. High blows per 6 inches of penetration (ranging from 15 to over 50 blows) and refusal were generally encountered at depths of less than four feet below the top of the existing railroad embankment, indicating hard or very dense materials immediately below the embankment crest. Based on the conversations between field personnel from DLZ and CSX, the upper 6 feet of the existing railroad embankment generally consisted of granular material (stone), which is consistent with the results of the DCP tests at the boring locations B-01, B-02, B-13, and B-14.

ENGINEERING ANALYSES

For this additional geotechnical exploration, the following engineering analyses were performed:

- Slope stability, settlement, and bearing capacity analyses for railroad runaround Stations 1518+00, 1528+00, and 1538+00.
- Stability analysis at CSXT Mainline Station 1526+00 where the existing railroad embankment is widening and will have a proposed embankment height of 28 feet. The subsurface conditions at a previous boring B-22 is used for the analysis.

The cross-sections of each station analyzed along with the results of the analyses are included in the Appendix III.

Soil and Rock Parameter Selections

The subsurface profile for the analyses used the stratigraphy disclosed by the borings and material properties were estimated from normalized Standard Penetration Test blow counts (N_{60} -values), visual classification, index properties, unconfined compressive strengths, and engineering judgment. The federal government's Naval Facilities Design Manual (NAVFAC DM-7.2) and the FHWA's Soils and Foundations Workshop Manual were used as guide in estimating the soil and rock parameters used for the analyses. Additional published engineering literatures were also used, wherever applicable, to provide additional references for the soil and rock parameters. Generally, the subsurface conditions encountered in the borings drilled in this additional field exploration are similar to those encountered in the borings previously drilled for the project. Consequently, the soil and rock parameters used in the above-mentioned 2015 report were used for the present engineering

analyses. The soil and rock properties used for the stability analyses are included with the analysis output appended to this letter report.

It should be noted that the material used for the new embankment fill is not known during the time of this reporting and that the embankment stability analyses performed for this addendum were based on the estimated soil strength parameter of commonly available lean clay or granular soils. Consequently, the shear strength of all potential embankment fill materials should meet or exceed the shear strength values used in the slope stability analyses for this additional subsurface exploration and should be approved by the geotechnical engineer prior to placement. Approval requires that moisture-density relationship test and gradation analysis as well as applicable strength tests, if deemed necessary, be determined for each fill material prior to their placement.

The soil and rock profiles used for the engineering analyses are the subsurface conditions encountered in the boring(s) near the section/station analyzed; hence, boring B-03 for Station 1518+00, boring B-07 for Station 1528+00, boring B-12 for Station 1538+00, and previous boring B-22 drilled in 2014 for Station 1526+00. In the analyses, the groundwater level was assumed to be 2 feet above the soil-rock interface where groundwater was not encountered in the boring used for the analysis. A vertical live load surcharge of 1,880 psf (distributed over a standard length of a railroad tie, 8'-6") was used based on the recommendation indicated in the appendix of the *"CSXT Public Project Information"*, last revised on August 10, 2012. This vertical railroad surcharge was applied in the stability analysis for both short-term (undrained) and long-term (drained) conditions.

Given the results of the DCP tests and the conversations between field personnel from DLZ and CSX, the upper 6 feet of the existing railroad embankment was assumed to be granular material. Beneath the granular embankment fill, cohesive embankment fill was assumed in the stability analyses. As recommended by American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering, Chapter 1, Part 1.3.7.5.6, granular new fill was also assumed to be used in the upper 6 feet of the new embankment area to minimize slope stability concerns associated with drainage issue immediately beneath the railroad tracks. In the analyses, a friction angle of 34° was used for the granular embankment fill in reference to Tables 8-20-0 and 8-20-3 of the AREMA manual (medium clean sand) and Table 10.4.6.2.4-1 of the AASHTO 9th Edition.

Based on the recent conversations with KYTC and CSX, free-draining crushed rock embankment fill with a friction angle of 38 degrees was used for the new embankment fill at Station 1526+00.

Slope Stability Analyses

The global stability analyses were performed for the above-mentioned stations, considering the short term and long-term conditions. The short term analyses considered undrained shear strength parameters; whereas long-term analyses considered drained shear strength parameters. The global slope stability analyses were performed utilizing limit equilibrium methodology (Spencer method of slices) with the computer program

SLIDE 2D v9, by Rocscience, assuming potential circular failure surfaces. Furthermore, it was assumed that potential failure surfaces did not extend below the bottom of the rock disintegration zone, if applicable, or top of bedrock. The following table, Table 2, summarizes the results of the stability analyses.

Table 2 - Summary of Summary of Embankment Stability Analyses (Railroad Runaround)

Station	F.S./Target F.S. Short-term (Undrained)	Long-term (Drained)
1518+00	1.4 (new granular fill)/ 1.1-1.3	1.4 (new granular fill)/1.4-1.6
1526+00	1.4 (new granular fill)/ 1.1-1.3	1.4 (new crush rock granular fill)/1.4-1.6 1.5 (new crushed rock granular fill with NO RR surcharge)/1.4-1.6
1528+00	2.3 (new granular fill)/ 1.1-1.3 2.6 (new cohesive fill)/ 1.1-1.3	1.5 (new granular fill)/1.4-1.6 1.5 (new cohesive fill)/1.4-1.6
1538+00	2.1 (new cohesive fill)/ 1.1-1.3 2.1 (new granular fill)/ 1.1-1.3	1.8 (new cohesive fill)/ 1.4-1.6 1.8 (new granular fill)/ 1.4-1.6

For placement of new fill on existing embankment slopes, benching requiring horizontal cuts into existing slopes to provide interlock with existing soils for shear resistance should be used in accordance with the applicable KYTC requirements.

Based on the recent conversations with KYTC and CSX, it is acceptable to use the top of the decomposed bedrock elevation at 525 feet across the embankment footprint at Station 1526+00 for the slope stability analysis. This top of decomposed bedrock elevation was derived based on the top of decomposed bedrock or bedrock profile from the borings along Allen Lane drilled in the 2014 field exploration across from Station 1526+00. It should be noted that for the new embankment at Station 1526+00 to meet the required factors of safety, a portion of the existing embankment fill is required to be excavated and replaced with the free-draining crushed rock embankment fill as shown on the design plans.

Settlement Analyses

Based on the anticipated amounts of new embankment fill shown in the cross-section of each station analyzed, the settlement analyses were performed in general accordance with the FHWA's Soils and Foundation Workshop Manual (NHI-00-045, July 2000). The following table, Tables 3, summarizes the results of the

settlement analyses with and without considering a 5-foot undercut and replacement of the existing foundation soils with compacted granular fill.

Table 3 - Summary of Results of Settlement Analyses

Station	Settlement, inch
1518+00	1.1 (no undercut) 0.3 (5' undercut)
1528+00	1.3 (no undercut) 1.0 (5' undercut)
1538+00	-- ¹

¹New embankment height is less than 5 feet and the embankment is founded on RDZ.

Based on conversations with KYTC, it is anticipated that the proposed railroad embankment will be constructed as early as possible in construction before the railroad tracks are constructed and that settlement platforms will be installed to monitor the settlement progress of the embankment foundation soil prior to the construction of the railroad tracks to avoid the undercut of the existing foundation.

Bearing Capacity of the Runaround Railroad Embankment

FHWA guidelines suggest that if the pressure exerted by the weight of the embankment exceeds three times the undrained shear strength of the foundation soils, the potential for lateral squeeze exists. Based on the cross-section of the proposed embankment fill at Station 1528+00, the new embankment will be approximately 8.6 feet high with side slopes of 2H:1V. Boring B-07 is located near the new embankment and encountered very stiff to hard fat clay in the upper portion of the foundations soils. In the analysis, an undrained shear strength of 1,000 psf was used for the existing very stiff to hard clay and a unit weight of 130 pcf for the new embankment fill. Using the FHWA guidelines, the pressure increases applied by the new fill are less than three times the undrained shear strength of the foundation soils, indicative of unlikeliness of lateral squeeze.

Evaluations of bearing capacity for the railroad track foundations were performed in general accordance with AASHTO LRFD Bridge Design Specifications 9th Edition, Section 10.6.3.1.2c "Considerations for Footings on Slopes". The following table, Table 4, summarizes the results of the bearing capacity evaluations.

Table 4 - Summary of Results of Bearing Capacity Evaluations

Station	Estimated Factored Bearing Resistance, psf	Railroad Surcharge, psf
1518+00	11,790 (new granular fill)	3,760 (two tracks)
1528+00	3,550 (new cohesive fill) 5,700 (new granular fill)	1,880
1538+00	3,780 (new cohesive fill) 7,640 (new granular fill)	1,880

ADDITIONAL BORING AT THE PROPOSED BRIDGE LOCATION

Boring B-32C was drilled approximately at Station 1528+55 of the proposed railroad bridge (near Pier 1). The boring encountered dolomite rock fragments at a depth of approximately 18.5 feet (elevation 838.4). Rock coring began at the depth of 20 feet (elevation 836.9) and was terminated at the depth of 52 feet (elevation 804.9). The rock cores consisted primarily of dolomite. Shale (claystone) was embedded with the dolomite at depths of between 47 feet (elevation 809.9) and 49.3 (elevation 49.3). A log of the boring is included with this report in Appendix I.

CLOSING

This addendum should be attached to DLZ's September 4, 2015 subsurface investigation reports for the project and made a part thereof.

We appreciate having the opportunity to be of service to you on this project. Please do not hesitate to call if you have any questions concerning this report.

Respectfully submitted,

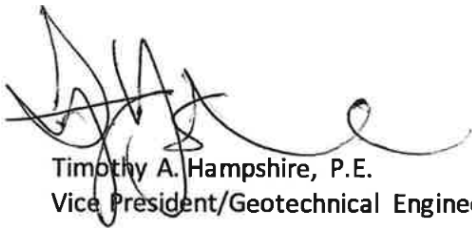
DLZ



Eric W. Tse, P.E.
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Timothy A. Hampshire, P.E.
Vice President/Geotechnical Engineering

Attachments: As noted.

Appendix I

General Information

Boring Plan

Boring Logs

DCP Logs

Well Installation Forms

GENERAL INFORMATION DRILLING PROCEDURES AND LOGS OF BORINGS

Drilling and sampling were conducted in accordance with procedures generally recognized and accepted as standardized methods of investigation of subsurface conditions concerning geotechnical engineering considerations. Borings were drilled with either a truck-mounted or ATV-mounted drill rig.

Drive split-barrel sampling was performed in 1.5 foot increments at intervals not exceeding 5 feet. In the event the sampler encountered resistance to penetration of 6 inches or less after 50 blows of the drop hammer, the sampling increment was discontinued. Standard penetration data were recorded and one or more representative samples were preserved from each sampling increment.

In borings where rock was cored, NXM or NQ size diamond coring tools were used.

In the laboratory all samples were visually classified by a geotechnical engineer. Moisture contents of representative fine-grained soil samples were determined. A limited number of samples, considered representative of foundation materials present, were selected for performance of grain-size analyses and plasticity characteristics tests. The results of these tests are shown on the boring logs.

The boring logs included in the Appendix have been prepared on the basis of the field record of drilling and sampling, and the results of the laboratory examination and testing of samples. Stratification lines on the boring logs indicating changes in soil stratigraphy represent depths of changes approximated by the driller, by sampling effort and recovery, and by laboratory test results. Actual depths to changes may differ somewhat from the estimated depths, or transitions may occur gradually and not be sharply defined. The boring logs presented in this report therefore contain both factual and interpretative information and are not an exact copy of the field log.

Although it is considered that the borings have disclosed information generally representative of site conditions, it should be expected that between borings conditions may occur which are not precisely represented by any one of the borings. Soil deposition processes and natural geologic forces are such that soil and rock types and conditions may change in short vertical intervals and horizontal distances.

Soil/rock samples will be stored at our laboratory for a period of six months. After this period of time, they will be discarded, unless notified to the contrary by the client.

BORING COORDINATES				
POINT NO.	STATION	OFFSET	EAST	NORTH
B-1	1515+00	0.00	1310233.77	329618.57
B-2	1516+50	0.00	1310370.84	329679.48
B-3	1518+02.6	15.8 Rt	1310500.05	329762.10
B-4	1520+00.2	38.9 Lt	1310665.63	329872.83
B-5	1522+27.9	25.4 Lt	1310874.23	329964.49
B-6	1524+10.3	20.7 Lt	1311038.73	330043.43
B-7	1525+94.5	24.8 Lt	1311200.81	330131.06



BORING COORDINATES				
POINT NO.	STATION	OFFSET	EAST	NORTH
AB-32	1528+59.1	55.0 Rt	1311471.91	330178.46
B-8	1530+02.6	13.4 Rt	1311585.07	330272.37
B-9	1531+94.4	2.8 Rt	1311762.53	330343.60
B-10	1534+00.3	2.3 Lt	1311960.91	330398.92
B-11	1536+00	0.00	1312155.54	330443.08
B-12	1537+99.3	2.9 Rt	1312350.15	330486.65
B-13	1540+00	0.00	1312544.55	330536.16
B-14	1542+00	0.00	1312736.92	330590.73

NOTE: B-1, B-2, B-13, AND B-14 ARE DCP HOLES AND WERE NOT SURVEYED. B-11 COULD NOT BE LOCATED IN THE FIELD AND WAS NOT SURVEYED. THE BORING INFORMATION WAS ESTIMATED BASED ON GOOGLE EARTH IMAGERY

BORING LOCATION PLAN

SCALE: 1"=100'

Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u>				Project Type: <u>Railroad Runaround</u>			
Item Number: <u>5-434.00</u>		<u>CSX Runaround</u>				Project Manager: <u>Erik Scott</u>			
Hole Number <u>B-03</u>		Immediate Water Depth <u>3.5 (11/15/25)</u>		Start Date <u>11/15/2024</u>		Hole Type <u>sample</u>			
Surface Elevation <u>850.5'</u>		Static Water Depth <u>NA</u>		End Date <u>11/15/2024</u>		Rig Number <u>CME-55 (NEW)</u>			
Total Depth <u>18.7'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.399870</u>					
Location <u>1518+02.60 15.8' Lt.</u>				Longitude(83) <u>-85.401240</u>					
Lithology		Overburden		Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth	Description		Rock Core	Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	
850.0	0.5	Topsoil (6").							Offset 15' South @ 0
		Very loose, black, wet, silty sand with cinders or slag (FILL, A-4/SM).		S-1	3.5-5.0	0.6	1-0-1	SPT	
844.5	6.0								
		Very stiff, reddish brown and black, moist, lean clay with cinders (FILL, A-6/CL).		ST-1	6.0-8.0	1.6		ST	HP = 2.75 tsf @ 8.5-10
				S-2	8.5-10.0	1.5	5-5-6	SPT	
837.0	13.5								
		Stiff to very stiff, reddish brown, moist, fat clay (A-7-6/CH).		S-3	13.5-15.0	1.5	5-5-6	SPT	HP = 2.0 tsf @ 13.5-15
832.0	18.5								
831.8	18.7	Very dense, brown, rock fragments (Decomposed dolomite).		S-4	18.5-18.7	0.2	50/0.20'	SPT	
		(Bottom of Hole 18.7') (Refusal @ 18.5)							

Drilling Firm: DLZ Ohio
For: Division of Structural Design
Geotechnical Branch

DRILLER'S SUBSURFACE LOG

Printed: 3/2/25

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Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u>			Project Type: <u>Railroad Runaround</u>				
Item Number: <u>5-434.00</u>		<u>CSX Runaround</u>			Project Manager: <u>Erik Scott</u>				
Hole Number <u>B-04</u>		Immediate Water Depth <u>NA</u>		Start Date <u>11/14/2024</u>		Hole Type <u>sample</u>			
Surface Elevation <u>848.8'</u>		Static Water Depth <u>NA</u>		End Date <u>11/14/2024</u>		Rig_Number <u>CME-55 (NEW)</u>			
Total Depth <u>13.6'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.400180</u>					
Location <u>1520+00.20 38.9' Lt.</u>				Longitude(83) <u>-85.400670</u>					
Lithology		Overburden	Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks	
Elevation	Depth	Description	Rock Core	Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)		SDI (JS)
848.2	0.6	Topsoil (7").							Offset 35' North @ 0 HP = 4.5+ tsf @ 3.5 HP = 4.5+ tsf @ 8.5
		Hard, brown, damp, lean clay (A-6/CL).		S-1	3.5-5.0	0.3	3-6-9	SPT	
				S-2	8.5-10.0	1.3	4-8-9	SPT	
835.3	13.5	Very dense, light gray, rock fragments (Decomposed dolomite).		S-3	13.5-13.6	0.1	50/0.10'	SPT	
835.2	13.6	(Bottom of Hole 13.6') (Refusal @ 13.5)							

Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u> <u>CSX Runaround</u>			Project Type: <u>Railroad Runaround</u> Project Manager: <u>Erik Scott</u>			
Hole Number <u>B-05</u>		Immediate Water Depth <u>NA</u>		Start Date <u>11/14/2024</u>		Hole Type <u>core and sample</u>		
Surface Elevation <u>848.8'</u>		Static Water Depth <u>14.0 (01/22/25)</u>		End Date <u>11/14/2024</u>		Rig Number <u>CME-55 (NEW)</u>		
Total Depth <u>22.0'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.400440</u>		<u>GQ-1075</u> <u>Laurel</u>		
Location <u>1522+27.90 25.4' Lt.</u>		Geologist <u>Jonah Conley</u>		Longitude(83) <u>-85.399950</u>				
Lithology		Overburden	Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth	Description Rock Core	Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	SDI (JS)	
848.1	0.7	<u>Overburden: Topsoil - 8"</u>						Offset 29' North @ 0 HP = 4.5+ tsf @ 3.5-5 HP = 4.5+ tsf @ 8.5-10
		<u>Overburden: Hard reddish brown LEAN CLAY (A-6/CL), contains trace organics, damp.</u>	S-1	3.5-5.0	1.5	6-9-10	SPT	
			ST-1	6.0-8.0	1.5		ST	
840.3	8.5							
		<u>Overburden: Hard reddish brown FAT CLAY (A-7-6/CH), moist.</u>	S-2	8.5-10.0	1.5	5-8-10	SPT	
835.3	13.5							
		<u>Overburden: Light brown medium dense silty SAND (A-2-4/SM) with gravel and dolomite fragments, damp, [@ 17', auger refusal (Begin Core)</u>	S-3	13.5-15.0	1.0	5-2-15	SPT	
831.8	17.0							
828.8	20.0	<u>Dolomite: Gray and brown, moderately strong, fine grained, highly weathered, fossiliferous, vuggy and pitted, thinly bedded, highly fractured to broken.</u>	54 / 54	5.0	4.6	92		Occasional low angle fractures with dissolution on surfaces @ 17.4-21.9 Zone of core loss (suspected void) @ 18.5-19.2
826.8	22.0	<u>Dolomite: Bluish gray, strong, fine grained, slightly weathered, pitted, pyritic, medium bedded, moderately fractured.</u>						
		(Bottom of Hole 22.0')						
Top of Rock = 17.0' Base Weathered Rock = 20.0RDZ = 20.0' Elevation = 831.8' Elevation = 828.8' Elevation = 828.8'								
Laurel Dolomite Laurel Dolomite								

Drilling Firm: DLZ Ohio
For: Division of Structural Design
Geotechnical Branch

DRILLER'S SUBSURFACE LOG

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Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u>			Project Type: <u>Railroad Runaround</u>				
Item Number: <u>5-434.00</u>		<u>CSX Runaround</u>			Project Manager: <u>Erik Scott</u>				
Hole Number <u>B-06</u>		Immediate Water Depth <u>NA</u>		Start Date <u>11/12/2024</u>		Hole Type <u>sample</u>			
Surface Elevation <u>849.1'</u>		Static Water Depth <u>NA</u>		End Date <u>11/12/2024</u>		Rig_Number <u>CME-55 (NEW)</u>			
Total Depth <u>13.7'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.400670</u>					
Location <u>1524+10.30 20.7' Lt.</u>				Longitude(83) <u>-85.399380</u>					
Lithology		Overburden		Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth	Description Rock Core		Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	SDI (JS)	
848.5	0.6	Topsoil (7").							Offset 20' Northwest @ 0 HP = 4.5+ tsf @ 3.5-5 HP = 4.5+ tsf @ 8.5-10
		Hard, brown, damp to moist, lean clay with trace organics (A-6/CL).		S-1	3.5-5.0	1.3	4-8-8	SPT	
				S-2	8.5-10.0	1.5	3-5-6	SPT	
835.6	13.5								
835.4	13.7	Very dense, light brown, rock fragments (dolomite fragments).		S-3	13.5-13.7	0.2	50/0.20'	SPT	
		(Bottom of Hole 13.7') (Refusal @ 13.5)							

Drilling Firm: DLZ Ohio
For: Division of Structural Design
Geotechnical Branch

DRILLER'S SUBSURFACE LOG

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Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u>		Project Type: <u>Railroad Runaround</u>					
Item Number: <u>5-434.00</u>		<u>CSX Runaround</u>		Project Manager: <u>Erik Scott</u>					
Hole Number <u>B-07</u>		Immediate Water Depth <u>13.5 (11/12/24)</u>		Start Date <u>11/12/2024</u>					
Surface Elevation <u>851.4'</u>		Static Water Depth <u>NA</u>		End Date <u>11/12/2024</u>					
Total Depth <u>22.6'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.400910</u>					
Location <u>1525+94.50 24.8' Lt.</u>				Longitude(83) <u>-85.398820</u>					
Lithology		Overburden		Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth	Description Rock Core		Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	SDI (JS)	
850.6	0.8	Topsoil (9").							Offset 15' Northwest @ 0 HP = 4.5+ tsf @ 3.5-5 HP = 3.5 tsf @ 8.5-10
		Very stiff to hard, reddish brown, damp to moist, fat clay with gravel (A-7-6/CH).		S-1	3.5-5.0	1.5	3-7-8	SPT	
				ST-1	6.0-8.0	2.0		ST	
				S-2	8.5-10.0	1.5	4-5-5	SPT	
837.9	13.5	Loose, brown, wet, silty sand (A-2-4/SM).		S-3	13.5-15.0	0.5	6-3-6	SPT	
832.9	18.5	Very dense, brown and light gray, rock fragments (dolomite fragments).		S-4	18.5-20.0	1.5	20-34-39	SPT	
828.8	22.6	(Bottom of Hole 22.6') (Refusal @ 18.5)		S-5	22.5-22.6	0.1	50/0.10'	SPT	

Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u>			Project Type: <u>Railroad Runaround</u>			
Item Number: <u>5-434.00</u>		<u>CSX Runaround</u>			Project Manager: <u>Erik Scott</u>			
Hole Number <u>B-08</u>		Immediate Water Depth <u>13.5 (11/12/24)</u>		Start Date <u>11/12/2024</u>		Hole Type <u>core and sample</u>		
Surface Elevation <u>856.4'</u>		Static Water Depth <u>NA</u>		End Date <u>11/12/2024</u>		Rig Number <u>CME-55 (NEW)</u>		
Total Depth <u>20.0'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.401310</u>		<u>GQ-1075</u>		
Location <u>1530+02.60 13.4' Rt.</u>		Geologist <u>Jonah Conley</u>		Longitude(83) <u>-85.397480</u>		<u>Laurel</u>		
Lithology		Overburden	Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth	Description	Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	SDI (JS)	
855.8	0.6	<u>Overburden: Topsoil - 7".</u>						HP = 2.0 tsf @ 3.5-5
		<u>Overburden: Stiff to very stiff reddish brown sandy LEAN CLAY (A-7-6/CL), contains trace organics, moist.</u>	S-1	3.5-5.0	1.5	4-4-6	SPT	
847.9	8.5							
		<u>Overburden: Stiff reddish brown FAT CLAY (A-7-6/CH), moist.</u>	S-2	8.5-10.0	1.5	3-4-5	SPT	HP = 1.5 tsf @ 8.5-10
842.9	13.5	(Begin Core)						
841.4	15.0	<u>Dolomite: Light gray rock (dolomite) fragments, [@ 13.5', auger refusal].</u>	- / -	1.5				Auger Chatter @ 12-13.5 Zone of suspected loss @ 15-15.5 Vertical fracture @ 16.4-16.9 Occasional high angle fractures @ 18.6-19.8
836.4	20.0	<u>Dolomite: Brown and gray, moderately strong, fine to medium grained, moderately to highly weathered, fossiliferous, vuggy, thinly bedded, highly fractured to broken, contain zones of dissolution and openings.</u>	14 / 14	5.0	4.8	96		
		(Bottom of Hole 20.0')						
Top of Rock = 13.5' Base Weathered Rock = 16.0RDZ = 16.0' Elevation = 842.9' Elevation = 840.4' Elevation = 840.4'								

Laurel Dolomite
Laurel Dolomite

Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u> <u>CSX Runaround</u>			Project Type: <u>Railroad Runaround</u> Project Manager: <u>Erik Scott</u>				
Hole Number <u>B-09</u>		Immediate Water Depth <u>13.7 (11/11/24)</u>		Start Date <u>11/11/2024</u>		Hole Type <u>sample</u>			
Surface Elevation <u>860.8'</u>		Static Water Depth <u>NA</u>		End Date <u>11/11/2024</u>		Rig Number <u>CME-55 (NEW)</u>			
Total Depth <u>14.2'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.401510</u>					
Location <u>1531+94.40 2.8' Rt.</u>				Longitude(83) <u>-85.396870</u>					
Lithology		Overburden	Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks	
Elevation	Depth	Description	Rock Core	Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)		SDI (JS)
860.5	0.3	Topsoil (3").							HP = 1.0 tsf @ 3.5-5
		Medium stiff to stiff, dark brown to reddish brown, moist, lean clay with sand (A-6/CL).		S-1	3.5-5.0	0.4	2-4-4	SPT	
852.3	8.5								
		Stiff, dark brown to reddish brown, moist, fat clay (A-7-6/CH).		S-2	8.5-10.0	1.5	2-3-5	SPT	HP = 1.5 tsf @ 8.5-10
847.3	13.5								
846.6	14.2	Very dense, light brown, rock fragments (Decomposed dolomite).		S-3	13.5-14.2	0.7	30-50/0.20'	SPT	
		(Bottom of Hole 14.2') (Refusal @ 13.5)							

Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u> <u>CSX Runaround</u>			Project Type: <u>Railroad Runaround</u> Project Manager: <u>Erik Scott</u>				
Hole Number <u>B-10</u>		Immediate Water Depth <u>8.0 (11/11/24)</u>		Start Date <u>11/11/2024</u>		Hole Type <u>core and sample</u>			
Surface Elevation <u>864.7'</u>		Static Water Depth <u>NA</u>		End Date <u>11/11/2024</u>		Rig Number <u>CME-55 (NEW)</u>			
Total Depth <u>18.5'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.401670</u>		<u>GQ-1075</u> <u>Laurel</u>			
Location <u>1534+00.30 2.3' Lt.</u>		Geologist <u>Jonah Conley</u>		Longitude(83) <u>-85.396180</u>					
Lithology		Overburden		Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth	Description		Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	SDI (JS)	
863.9	0.8	<u>Overburden: Topsoil - 9"</u>							Chatter @ 1.5-9.3 HP = 2.0 tsf @ 3.5-5
5		<u>Overburden: Stiff to very stiff reddish brown LEAN CLAY (A-6/CL), moist.</u>		S-1	3.5-5.0	0.7	2-2-4	SPT	
856.2	8.5	(Begin Core)							
10	854.7	10.0	<u>Dolomite: Light gray rock (dolomite) fragments, [@ 8.5', auger refusal].</u>	- / -	1.5				No recovery (void), suspected calcite deposits in void opening @ 10.1-12.9 Occasional disintegrated bedding @ 14.5-15.9 vertical fracture @ 17.5-18.5
851.2	13.5	<u>Dolomite: Brown, strong, very fine grained, moderately weathered, slightly vuggy, thinly bedded, highly fractured.</u>		23 / 23	3.5	1.2	34		
15		<u>Dolomite: Gray, strong, fine to very fine grained, moderately weathered, very vuggy and pitted, thinly bedded, highly fractured, contains karstic openings and calcite deposits, dissolutioned beds.</u>		62 / 62	5.0	4.5	90		
846.2	18.5								
20		(Bottom of Hole 18.5')							
25									
30									
35									
40									
45									
50									
Top of Rock = 8.5' Base Weathered Rock = 12.9RDZ = 12.9' Laurel Dolomite Elevation = 856.2' Elevation = 851.8' Elevation = 851.8' Laurel Dolomite									

Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u> <u>CSX Runaround</u>			Project Type: <u>Railroad Runaround</u> Project Manager: <u>Erik Scott</u>				
Hole Number <u>B-11</u>		Immediate Water Depth <u>NA</u>		Start Date <u>11/14/2024</u>		Hole Type <u>sample</u>			
Surface Elevation <u>869.0'</u>		Static Water Depth <u>NA</u>		End Date <u>11/14/2024</u>		Rig Number <u>CME-55 (NEW)</u>			
Total Depth <u>3.6'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.401802</u>		Longitude(83) <u>-85.395498</u>			
Location <u>1536+00.00 CL</u>									
Lithology		Overburden		Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth	Description		Rock Core	Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	
868.7	0.3	Topsoil (4").							Auger Chatter @ 0.3-3.6
865.4	3.6	Very dense, light gray, rock fragments (dolomite fragments).							
5				S-1	3.5-3.6	0.1	50/0.10'	SPT	5
10		(Bottom of Hole 3.6') (Refusal @ 0.3)							10
15									15
20									20
25									25
30									30
35									35
40									40
45									45
50									50

Drilling Firm: DLZ Ohio
For: Division of Structural Design
Geotechnical Branch

GEOLOGIST'S SUBSURFACE LOG

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GEOLOGIST'S SUBSURFACE LOG

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Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u>			Project Type: <u>Railroad Runaround</u>				
Item Number: <u>5-434.00</u>		<u>CSX Runaround</u>			Project Manager: <u>Erik Scott</u>				
Hole Number <u>B-32C</u>		Immediate Water Depth <u>NA</u>		Start Date <u>11/13/2024</u>		Hole Type <u>core and sample</u>			
Surface Elevation <u>856.9'</u>		Static Water Depth <u>NA</u>		End Date <u>11/13/2024</u>		Rig Number <u>CME-55 (NEW)</u>			
Total Depth <u>52.0'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.401050</u>		<u>GQ-1075</u>			
Location <u>1528+59.10 55.0' Rt.</u>		Geologist <u>Jonah Conley</u>		Longitude(83) <u>-85.397870</u>		<u>Laurel</u>			
Lithology		Overburden		Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth	Description		Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	SDI (JS)	
856.4	0.5	<u>Overburden: Topsoil - 6".</u>							HP = 2.0 tsf @ 3.5-5
		<u>Overburden: Stiff to very stiff reddish brown LEAN CLAY (A-6/CL), trace organics, damp to moist.</u>		S-1	3.5-5.0	1.5	2-3-6	SPT	
848.4	8.5								
		<u>Overburden: Very stiff reddish brown FAT CLAY (A-7-6/CH), moist.</u>		S-2	8.5-10.0	1.5	3-8-10	SPT	HP = 3.5 tsf @ 8.5-10
843.4	13.5								HP = 1.5 tsf @ 13.5-15
		<u>Overburden: Stiff reddish brown ELASTIC SILT (A-7-5/MH), moist.</u>		S-3	13.5-15.0	1.5	1-2-3	SPT	
838.4	18.5	(Begin Core)							
836.9	20.0	<u>Dolomite: Light gray (dolomite), rock fragments, [@20', auger refusal].</u>		- / -	1.5				20.0 Zone of suspected loss @ 20-20.9
833.6	23.3	<u>Limestone: Light brown, strong, fine to coarse grained, highly weathered, fossiliferous, thin bedded, highly fractured to broken.</u>		30 / 30	4.0	3.4	85		
830.6	26.3	<u>Dolomite: Gray, strong, fine grained, moderately weathered, pitted, medium bedded, highly fractured.</u>		68 / 68	5.0	5.0	100		24.0 Occasional low angle fractures @ 25.6-46
828.7	28.2	<u>Dolomite: Gray, moderately strong, (60%) interbedded with SILTSTONE (40%); fine grained, slightly weathered, thinly bedded, highly fractured to broken.</u>		46 / 46	5.0	5.0	100		
				70 / 70	5.0	5.0	100		34.0
		<u>Dolomite: Gray to greenish gray, strong, fine grained, slightly weathered, argillaceous, medium bedded, moderately fractured.</u>		80 / 80	5.0	5.0	100		
				13 / 13	3.0	2.8	93		39.0
809.9	47.0			56 / 56	5.0	5.0	100		
807.6	49.3	<u>Shale (claystone): Gray, moderately strong, fine grained, highly weathered, thickly bedded, highly fractured to broken.</u>							47.0 Zone of suspected loss, clay filled seams
Top of Rock = 18.5' Base Weathered Rock = 21.6RDZ = 21.6' Laurel Dolomite									
Elevation = 838.4' Elevation = 835.3' Elevation = 835.3' Laurel Dolomite									

Project ID: <u>0631-000602</u>		<u>Oldham - CSX Runaround</u> <u>CSX Runaround</u>			Project Type: <u>Railroad Runaround</u> Project Manager: <u>Erik Scott</u>				
Hole Number <u>B-32C</u>		Immediate Water Depth <u>NA</u>		Start Date <u>11/13/2024</u>		Hole Type <u>core and sample</u>			
Surface Elevation <u>856.9'</u>		Static Water Depth <u>NA</u>		End Date <u>11/13/2024</u>		Rig_Number <u>CME-55 (NEW)</u>			
Total Depth <u>52.0'</u>		Driller <u>Keith Conrad</u>		Latitude(83) <u>38.401050</u>		<u>GQ-1075</u> <u>Laurel</u>			
Location <u>1528+59.10 55.0' Rt.</u>		Geologist <u>Jonah Conley</u>		Longitude(83) <u>-85.397870</u>					
Lithology		Overburden		Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth	Description		Rock Core	Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	
804.9	52.0	<u>Dolomite</u> : Gray to greenish gray, strong, fine grained, slightly weathered, medium bedded, highly fractured.		56 / 56	5.0	5.0	100		@ 46.7-47 Occasional low angle fractures @ 50.4-51.4
55		(Bottom of Hole 52.0')							55
60									60
65									65
70									70
75									75
80									80
85									85
90									90
95									95
100									100
Top of Rock = 18.5' Base Weathered Rock = 21.6RDZ = 21.6' Elevation = 838.4' Elevation = 835.3' Elevation = 835.3' Laurel Dolomite Laurel Dolomite									

DRILLER'S SUBSURFACE LOG

Project ID: 0631-000602		Oldham - Allen Lane			Project Type: Roadway Railroad Bridge				
Item Number: 5-434.00		Allen Lane			Project Manager: Eric Scott				
Hole Number B-22		Immediate Water Depth NA		Start Date 12/29/2014		Hole Type sample			
Surface Elevation 856.2'		Static Water Depth NA		End Date 12/29/2014		Rig Number CME-45C			
Total Depth 13.3'		Driller Keith Conrad		Latitude(83) 38.401131					
Location 170+99.59 262.4' Lt.				Longitude(83) -85.398705					
Lithology		Description	Overburden	Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth		Rock Core	Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	SDI (JS)	
		Very stiff, red, moist, fat clay ((A-7)/(CH); @1.0'-2.5', HP=2.5 tsf, @3.5'-5.0', HP=3.75 tsf, @6.0'-7.5', HP=3.0 tsf).		1	1.0-2.5	1.1	2-2-3	SPT	
				2	3.5-5.0	1.0	4-4-5	SPT	
				3	6.0-7.5	1.5	3-4-6	SPT	
				4	8.5-10.0	0.8	8-8-9	SPT	
847.7	8.5								
843.2	13.0	Very stiff, red, moist, fat clay with rock fragments ((A-7)/(CH); @8.5'-10', HP=2.5 tsf).							
842.9	13.3								
		Very dense, brown, rock fragments (decomposed dolomite).	5	13.0-13.3	0.2	50/0.30'	SPT		
		(Bottom of Hole 13.3') (Refusal @ 13)							

B-01 Dynamic Cone Penetrometer Log

B-01 Number of Blows (Cumulative)	Penetration between Readings (in)	Penetration between Readings (mm)	Cumulative Penetration (in)	Cumulative Penetration (mm)
1	1	25.4	1	25.4
2	0.5	12.7	1.5	38.1
3	0.5	12.7	2	50.8
3-10	0.5	12.7	2.5	63.5
11-15	0.5	12.7	3	76.2
16-20	0.5	12.7	3.5	88.9
21-25	1.25	31.75	4.75	120.65
26-30	0.5	12.7	5.25	133.35
31-35	0.5	12.7	5.75	146.05
36-40	0.5	12.7	6.25	158.75
41-45	0	0	6.25	158.75
46-50	0.25	6.35	6.5	165.1
51-55	0.25	6.35	6.75	171.45
56-60	0	0	6.75	171.45
61-65	0.5	12.7	7.25	184.15
66-70	0	0	7.25	184.15
71-75	0.25	6.35	7.5	190.5
76-80	0.25	6.35	7.75	196.85
81-85	0	0	7.75	196.85
86-90	0.25	6.35	8	203.2
91-100	0	0	8	203.2

B-02 Dynamic Cone Penetrometer

B-02 Number of Blows (Cumulative)	Penetration between Readings (in)	Penetration between Readings (mm)	Cumulative Penetration (in)	Cumulative Penetration (mm)
1-5	2	50.8	2	50.8
6-10	0	0	2	50.8
11-15	2.5	63.5	4.5	114.3
16-20	1	25.4	5.5	139.7
21-25	1	25.4	6.5	165.1
26-30	1	25.4	7.5	190.5
31-35	0.5	12.7	8	203.2
36-40	0.5	12.7	8.5	215.9
41-45	0.5	12.7	9	228.6
46-65	0	0	9	228.6

B-04 Dynamic Cone Penetration Log

B-04 Number of Blows (Cumulative)	Penetration between Readings (in)	Penetration between Readings (mm)	Cumulative Penetration (in)	Cumulative Penetration (mm)
1-5	2	50.8	2	2
6	1	25.4	3	3
7	2	50.8	5	5
8	1.5	38.1	6.5	6.5
9	2	50.8	8.5	8.5
10	2	50.8	10.5	10.5
11	2	50.8	12.5	12.5
12	2	50.8	14.5	14.5
13	1.5	38.1	16	16
14	2	50.8	18	18
15	1.75	44.45	19.75	19.75
16	1	25.4	20.75	20.75
17	1	25.4	21.75	21.75
18	1	25.4	22.75	22.75
19	1	25.4	23.75	23.75
20	1	25.4	24.75	24.75
21	0.5	12.7	25.25	25.25
22	0.75	19.05	26	26
23	0.5	12.7	26.5	26.5
24	0.5	12.7	27	27
25	0.75	19.05	27.75	27.75
26	0.5	12.7	28.25	28.25
27	0.5	12.7	28.75	28.75
28	0.5	12.7	29.25	29.25
29	0.75	19.05	30	30
30	0.75	19.05	30.75	30.75
31	0.5	12.7	31.25	31.25
32	0.25	6.35	31.5	31.5
33	0.25	6.35	31.75	31.75
34	0.25	6.35	32	32
35	0.5	12.7	32.5	32.5
36	0.75	19.05	33.25	33.25
37	0.75	19.05	34	34
38	0.5	12.7	34.5	34.5
39	0.5	12.7	35	35
40	0.5	12.7	35.5	35.5
41	0.25	6.35	35.75	35.75
42	0.25	6.35	36	36
43	0.25	6.35	36.25	36.25

44	0.5	12.7	36.75	36.75
45	0.5	12.7	37.25	37.25
46	0.5	12.7	37.75	37.75
47	0.5	12.7	38.25	38.25
48	0.75	19.05	39	39
49	0.5	12.7	39.5	39.5
50	0.75	19.05	40.25	40.25
51	0.75	19.05	41	41
52	0.5	12.7	41.5	41.5
53	0.5	12.7	42	42
54	0.5	12.7	42.5	42.5
55	0.5	12.7	43	43
56	0.25	6.35	43.25	43.25
57	0.5	12.7	43.75	43.75
58	0.25	6.35	44	44
59	0.5	12.7	44.5	44.5
60	0.5	12.7	45	45
61-65	1	25.4	46	46
65-70	1	25.4	47	47
71-75	1	25.4	48	48
76-80	2	50.8	50	50
81-85	1	25.4	51	51
86-90	2	50.8	53	53
91-95	1	25.4	54	54
96-100	1	25.4	55	55
101-105	1	25.4	56	56
106-110	1	25.4	57	57
111-115	2	50.8	59	59
116-120	1	25.4	60	60

B-13 Dynamic Cone Penetrometer Log

B-13 Number of Blows (Cumulative)	Penetration between Readings (in)	Penetration between Readings (mm)	Cumulative Penetration (in)	Cumulative Penetration (mm)
1	0.3	7.62	0.3	7.62
2	0.5	12.7	0.8	20.32
3	0.5	12.7	1.3	33.02
4	0.4	10.16	1.7	43.18
5-8	0.4	10.16	2.1	53.34
9	0.2	5.08	2.3	58.42
10	0.2	5.08	2.5	63.5
11-17	0.4	10.16	2.9	73.66
18	0.25	6.35	3.15	80.01
19	0.25	6.35	3.4	86.36
20	0.5	12.7	3.9	99.06
21	0.5	12.7	4.4	111.76
22	0.5	12.7	4.9	124.46
23	0.5	12.7	5.4	137.16
24	0.25	6.35	5.65	143.51
25-30	0.5	12.7	6.15	156.21
31	0.25	6.35	6.4	162.56
32	0.25	6.35	6.65	168.91
33	0.5	12.7	7.15	181.61
34	0.1	2.54	7.25	184.15
35	0.25	6.35	7.5	190.5
36	0.25	6.35	7.75	196.85
37	0.25	6.35	8	203.2
38-40	1	25.4	9	228.6
41-45	0.5	12.7	9.5	241.3
46-50	0.5	12.7	10	254
51-55	0.5	12.7	10.5	266.7
56-60	1	25.4	11.5	292.1
61-65	1	25.4	12.5	317.5
66-70	0.5	12.7	13	330.2
71-75	0.5	12.7	13.5	342.9
76-80	0	0	13.5	342.9
81-85	0.5	12.7	14	355.6
86-90	0.5	12.7	14.5	368.3
91-95	0	0	14.5	368.3
96-100	0.5	12.7	15	381
101-105	1	25.4	16	406.4
106-110	0.5	12.7	16.5	419.1
111-115	0.5	12.7	17	431.8

116-120	1	25.4	18	457.2
121-125	1	25.4	19	482.6
126-130	1	25.4	20	508
131-135	0	0	20	508
136-140	0.5	12.7	20.5	520.7
141-145	0.5	12.7	21	533.4
146-150	0.5	12.7	21.5	546.1
151-155	0.5	12.7	22	558.8
156-165	0	0	22	558.8

B-14 Dynamic Cone Penetrometer Log

B-14 Number of Blows (Cumulative)	Penetration between Readings (in)	Penetration between Readings (mm)	Cumulative Penetration (in)	Cumulative Penetration (mm)
1	0.5	12.7	0.5	12.7
2	0.5	12.7	1	25.4
3	0.25	6.35	1.25	31.75
4	0.25	6.35	1.5	38.1
5	0.25	6.35	1.75	44.45
6	0.25	6.35	2	50.8
7	0.25	6.35	2.25	57.15
8	0.25	6.35	2.5	63.5
9	1	25.4	3.5	88.9
10	1	25.4	4.5	114.3
11	0.25	6.35	4.75	120.65
12	0.25	6.35	5	127
13	0.25	6.35	5.25	133.35
14	0.25	6.35	5.5	139.7
15	0.25	6.35	5.75	146.05
16	0.25	6.35	6	152.4
17-24	0.6	15.24	6.6	167.64
25	0.5	12.7	7.1	180.34
26	0.5	12.7	7.6	193.04
27-29	1	25.4	8.6	218.44
30	1	25.4	9.6	243.84
31	2	50.8	11.6	294.64
32	4	101.6	15.6	396.24
33	4	101.6	19.6	497.84
34	5	127	24.6	624.84
35	4	101.6	28.6	726.44
36	6	152.4	34.6	878.84
37	7	177.8	41.6	1056.64
38	2	50.8	43.6	1107.44
39	1	25.4	44.6	1132.84
40-50	0	0	44.6	1132.84

MONITORING WELL INSTALLATION REPORT

PROJECT: Oldham CO. KY CSX

BORING NO.: B-05

PROJECT NO: 0631-0006.02

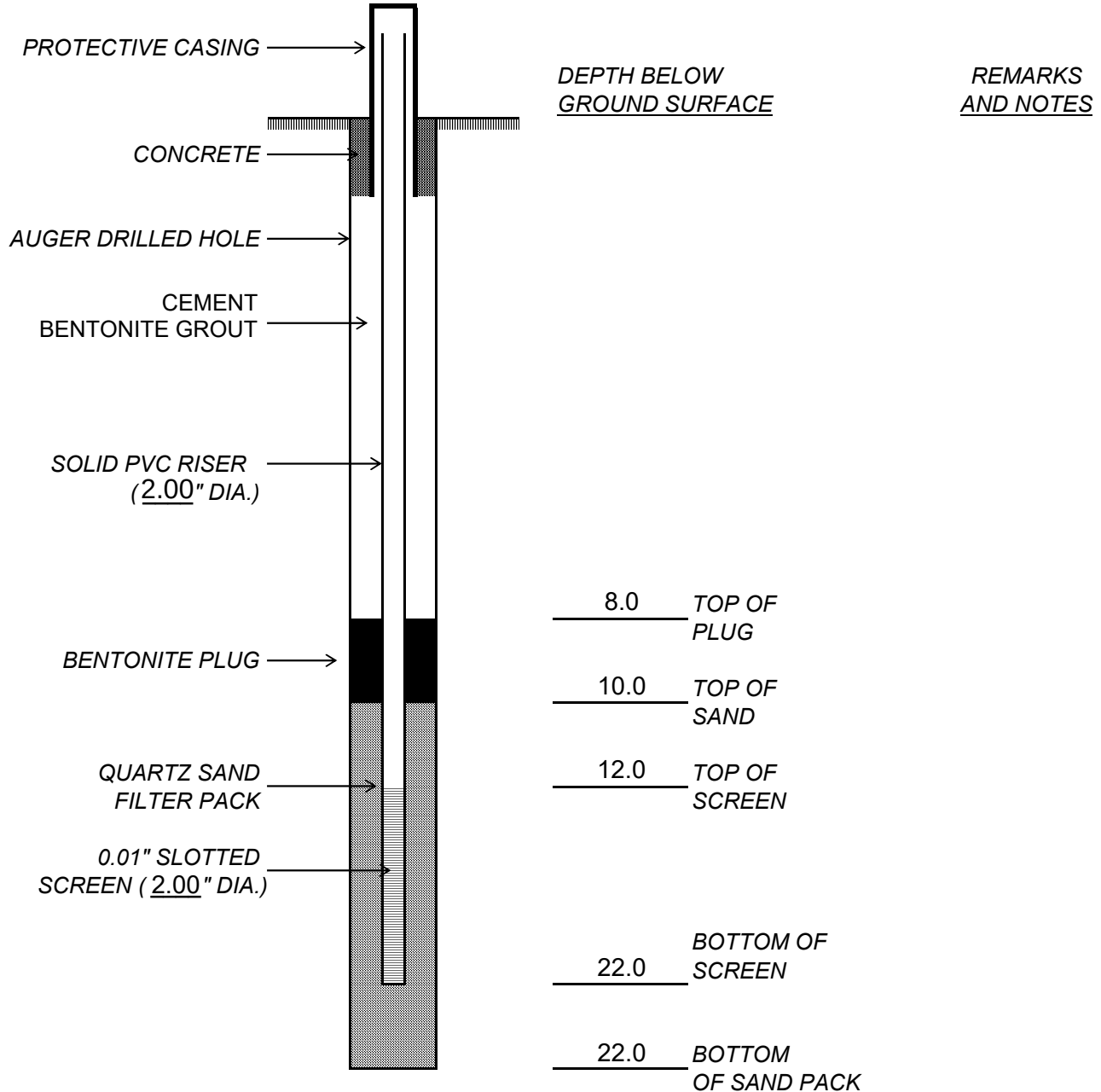
DATE INSTALLED: 11/13/24

GROUND SURFACE
ELEVATION: -

LOGGED BY: Jonah Conley

TOP OF RISER
ELEVATION: 3.2'

GROUND WATER LEVEL
AT COMPLETION: 13.0



MONITORING WELL INSTALLATION REPORT

PROJECT: Oldham CO. KY CSX

BORING NO.: B-12

PROJECT NO: 0631-0006.02

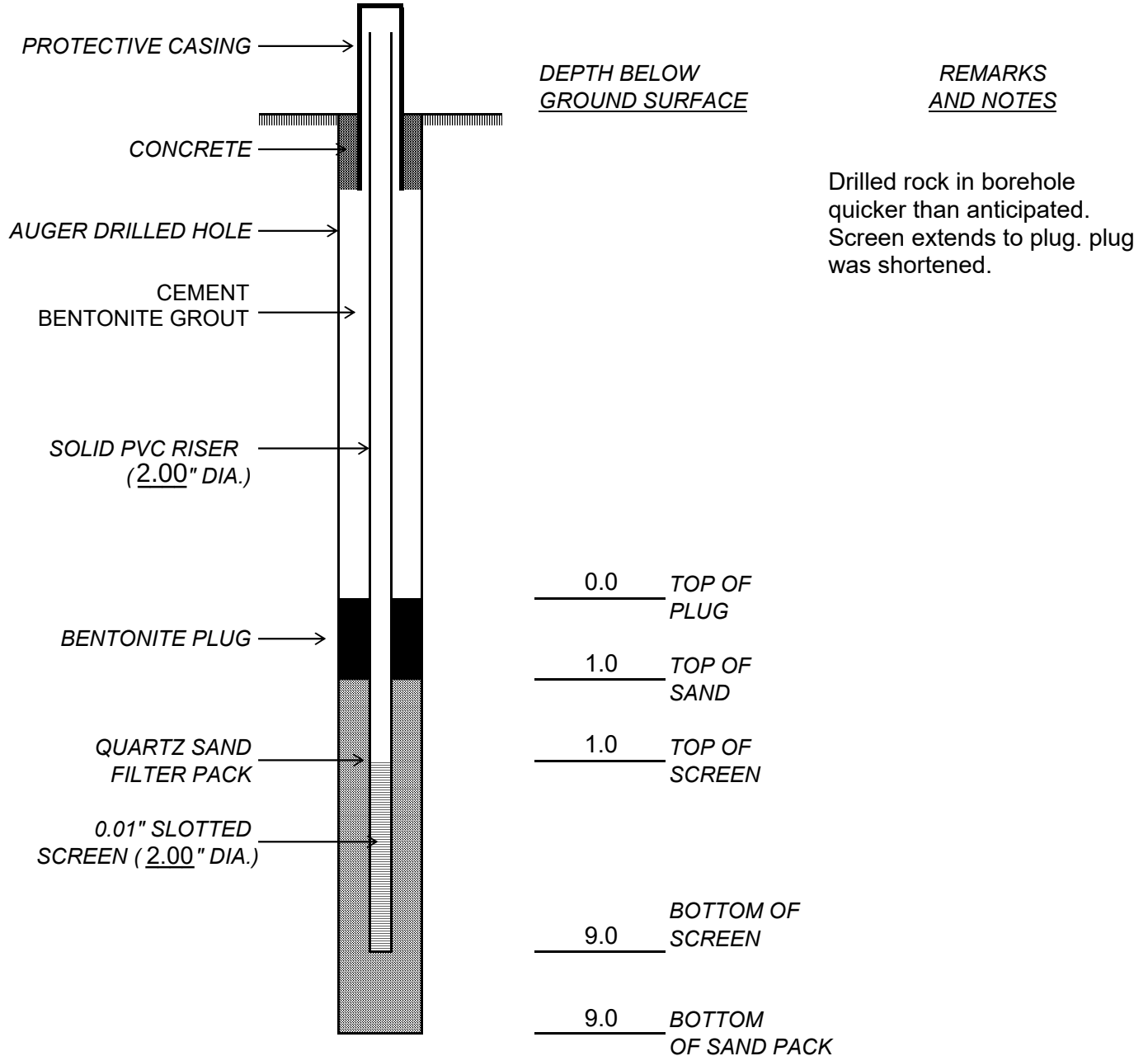
DATE INSTALLED: 11/14/24

GROUND SURFACE
ELEVATION: -

LOGGED BY: Jonah Conley

TOP OF RISER
ELEVATION: 3.1'

GROUND WATER LEVEL
AT COMPLETION: 4.8



Appendix II

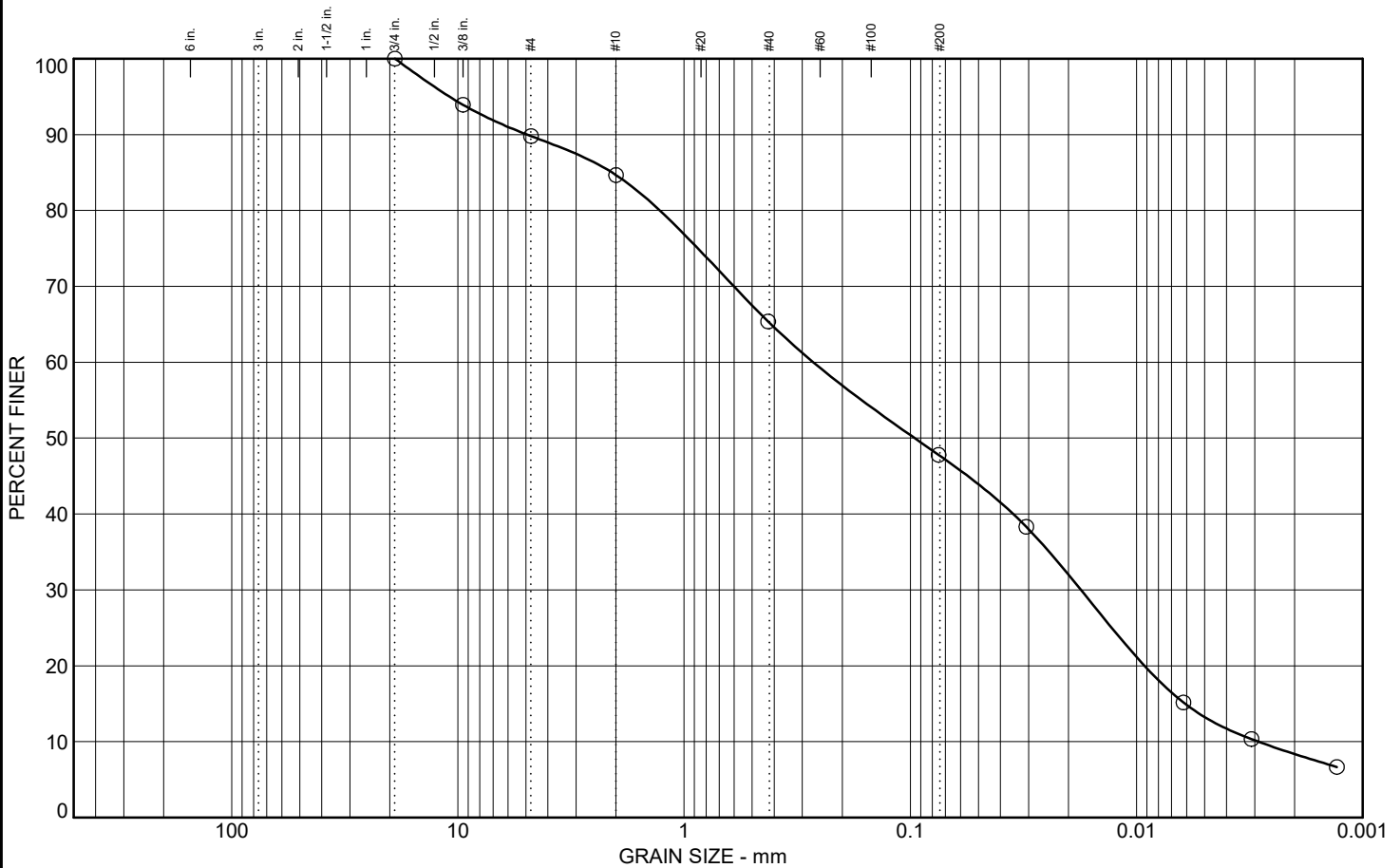
Grain Size Curves

Summary of Laboratory Testing Results

Summary of Laboratory Test Results - Index Properties

Boring Number	Sample Number	Depth (feet)	USCS Class.	AASHTO Class.	N Value	N60 Value	% AGG	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	LL	PL	PI	Moisture Content %	Liquidity Index	Soil Activity
B-03	S-1	3.5	SM	A-4 (0)	1	1	10.2	5.1	19.3	17.6	39.3	8.5	25	24	1	32.2	8.18	0.12
B-03	ST-1	6	--	--	--	--	--	--	--	--	--	--	--	--	--	27.6	--	--
B-03	S-2	8.5	CL	A-6 (18)	11	14	0.1	0.4	4.3	3.9	58.8	32.5	37	17	20	22.8	0.29	0.62
B-03	S-3	13.5	CH	A-7-6 (55)	11	14	0.4	0.0	0.1	1.2	34.7	63.6	71	22	49	29.1	0.15	0.77
B-03	S-4	18.5	--	--	50+	50+	--	--	--	--	--	--	--	--	--	27.2	--	--
B-04	S-1	3.5	CL	A-6 (12)	15	19	0.5	0.0	3.0	2.7	72.1	21.8	33	20	13	12.6	-0.57	0.60
B-04	S-2	8.5	--	--	17	21	--	--	--	--	--	--	--	--	--	19.0	--	--
B-04	S-3	13.5	--	--	50+	50+	--	--	--	--	--	--	--	--	--	7.0	--	--
B-05	S-1	3.5	CL	A-6 (17)	19	24	0.7	0.6	3.9	5.7	60.3	28.8	37	18	19	14.9	-0.16	0.66
B-05	ST-1	6	--	--	--	--	--	--	--	--	--	--	--	--	--	17.0	--	--
B-05	S-2	8.5	CH	A-7-6 (36)	18	22	2.8	0.1	1.1	1.9	44.4	49.7	54	19	35	22.1	0.09	0.70
B-05	S-3	13.5	SM	A-2-4 (0)	17	21	19.4	4.5	10.6	44.9	18.7	1.9	0	0	0	13.6	--	--
B-06	S-1	3.5	CL	A-6 (10)	16	20	0.0	0.2	8.9	4.8	66.1	19.9	31	18	13	14.6	-0.26	0.65
B-06	S-2	8.5	CL	A-6 (15)	11	14	0.0	0.0	2.7	2.8	65.5	28.9	36	21	15	22.0	0.06	0.52
B-06	S-3	13.5	--	--	50+	50+	--	--	--	--	--	--	--	--	--	11.5	--	--
B-07	S-1	3.5	--	--	15	19	--	--	--	--	--	--	--	--	--	14.4	--	--
B-07	ST-1	6	--	--	--	--	--	--	--	--	--	--	--	--	--	22.2	--	--
B-07	S-2	8.5	CH	A-7-6 (42)	10	12	22.7	2.0	3.4	1.8	22.7	47.5	84	24	60	25.1	0.02	1.26
B-07	S-3	13.5	SM	A-2-4 (0)	9	11	0.0	0.0	9.4	71.8	15.9	2.9	0	0	0	20.2	--	--
B-07	S-4	18.5	--	--	73	91	--	--	--	--	--	--	--	--	--	15.2	--	--
B-07	S-5	22.5	--	--	50+	50+	--	--	--	--	--	--	--	--	--	--	--	--
B-08	S-1	3.5	CL	A-7-6 (13)	10	12	10.9	4.3	12.0	5.7	43.5	23.7	41	19	22	20.7	0.08	0.93
B-08	S-2	8.5	CH	A-7-6 (50)	9	11	0.0	0.0	1.6	2.6	32.1	63.7	69	23	46	42.8	0.43	0.72
B-08	S-3	13.5	--	--	50+	50+	--	--	--	--	--	--	--	--	--	10.9	--	--
B-09	S-1	3.5	CL	A-6 (8)	8	10	8.2	2.6	3.5	7.2	64.7	13.8	34	23	11	32.1	0.83	0.80
B-09	S-2	8.5	CH	A-7-6 (41)	8	10	0.4	0.2	1.5	1.3	43.2	53.5	59	21	38	27.2	0.16	0.71
B-09	S-3	13.5	--	--	50+	50+	--	--	--	--	--	--	--	--	--	--	--	--
B-10	S-1	3.5	CL	A-7-6 (18)	6	7	1.4	0.8	2.6	25.2	36.7	33.4	45	16	29	27.0	0.38	0.87
B-10	S-2	8.5	--	--	50+	50+	--	--	--	--	--	--	--	--	--	--	--	--
B-11	S-1	3.5	--	--	50+	50+	--	--	--	--	--	--	--	--	--	5.1	--	--
B-12	S-1	3.5	--	--	50+	50+	--	--	--	--	--	--	--	--	--	22.7	--	--
B-32C	S-1	3.5	CL	A-6 (13)	9	11	2.0	0.7	6.3	3.2	61.4	26.4	35	20	15	19.3	-0.05	0.57
B-32C	S-2	8.5	CH	A-7-6 (36)	18	22	0.4	1.1	5.4	3.5	47.1	42.6	56	19	37	21.4	0.07	0.87
B-32C	S-3	13.5	MH	A-7-5 (36)	5	6	0.0	0.0	0.6	1.7	19.5	78.2	74	49	25	58.9	0.39	0.32
B-32C	S-4	18.5	--	--	50+	50+	--	--	--	--	--	--	--	--	--	3.4	--	--
Minimum moisture content,%=			3.4				Maximum moisture content,%=			58.9	Average moisture content,%=			20.73				

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	10.2	5.1	19.3	17.6		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	93.9		
4.75	89.8		
2	84.7		
0.425	65.4		
0.075	47.8		

* SPECIFICATION :

Soil Description

fine to medium sand, low plasticity silt

General Characteristics

Moisture Content = 32.2%

Atterberg Limits

LL= 25

PL= 24

PI= 1

Coefficients

$D_{85} = 2.118$

$D_{60} = 0.25$

$D_{50} = 0.093$

$D_{30} = 0.017$

$D_{15} = 0.006$

$D_{10} = 0.003$

$C_u = 87.53$

$C_c = 0.42$

Classification

USCS = SM

AASHTO = A-4

Remarks

Group Index = 0

Sample No.:

Location: -

Source of Sample: B-03

Date:

Depth / Elev: 3.5' / 846.96'



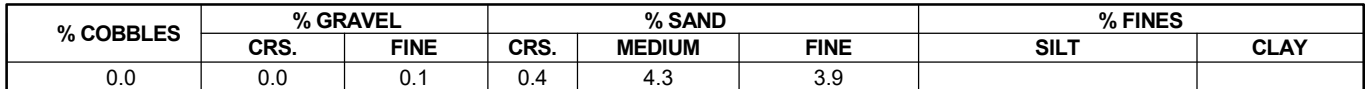
Client:

Project:

Project No:

Figure

DLZ TEMPLATE VER 2-2.GDT - 1/31/25 11:38 - X:\SHARED\DISCIPLINE\GEOTECH\GINT_COLUMBUS\PROJECTS\0631-0006.02 CSX OLDHAM CO. RUNAROUND.GPJ

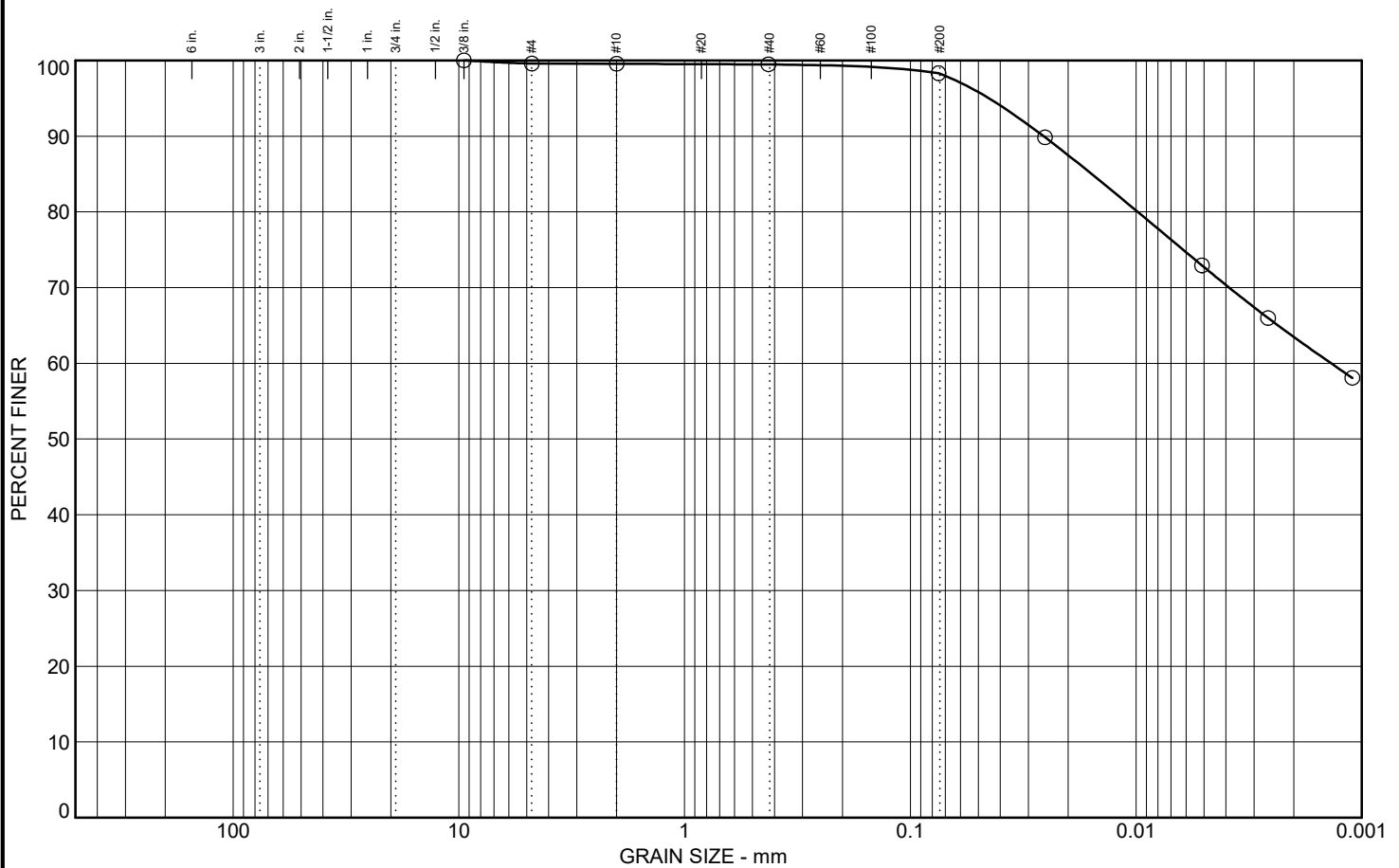


<u>Soil Description</u>		
moderate plasticity clay		
<u>General Characteristics</u>		
Moisture Content = 22.8%		
<u>Atterberg Limits</u>		
LL= 37	PL= 17	PI= 20
<u>Coefficients</u>		
D ₈₅ = 0.048	D ₆₀ = 0.011	D ₅₀ = 0.007
D ₃₀ = 0.002	D ₁₅ =	D ₁₀ =
C _u =	C _c =	
<u>Classification</u>		
USCS = CL	AASHTO = A-6	
<u>Remarks</u>		
Group Index = 18		



Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	0.0	0.1	1.2		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.6		
2	99.6		
0.425	99.5		
0.075	98.3		

* SPECIFICATION :

Soil Description

high plasticity clay

General Characteristics

Moisture Content = 29.1%

Atterberg Limits

LL= 71

PL= 22

PI= 49

Coefficients

$D_{85} = 0.016$

$D_{60} = 0.001$

$D_{50} =$

$D_{30} =$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CH

AASHTO = A-7-6

Remarks

Group Index = 55

Sample No.:

Location: -

Source of Sample: B-03

Date:

Depth / Elev: 13.5' / 836.96'



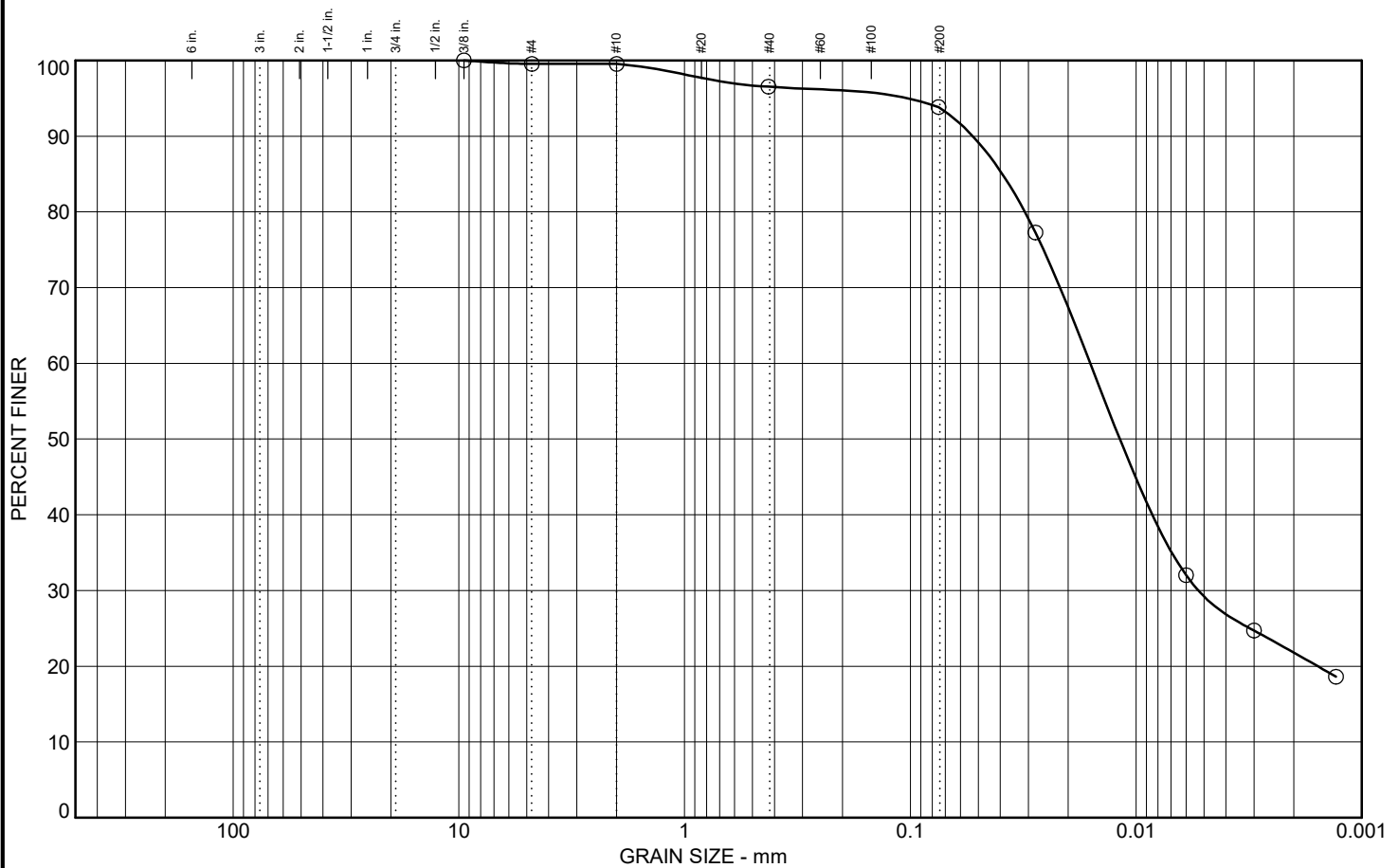
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.5	0.0	3.0	2.7		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.5		
2	99.5		
0.425	96.5		
0.075	93.8		

* SPECIFICATION :

Soil Description

low plasticity clay

General Characteristics

Moisture Content = 12.6%

Atterberg Limits

LL= 33

PL= 20

PI= 13

Coefficients

$D_{85} = 0.044$

$D_{60} = 0.016$

$D_{50} = 0.011$

$D_{30} = 0.005$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CL

AASHTO = A-6

Remarks

Group Index = 12

Sample No.:

Location: -

Source of Sample: B-04

Date:

Depth / Elev: 3.5' / 845.25'



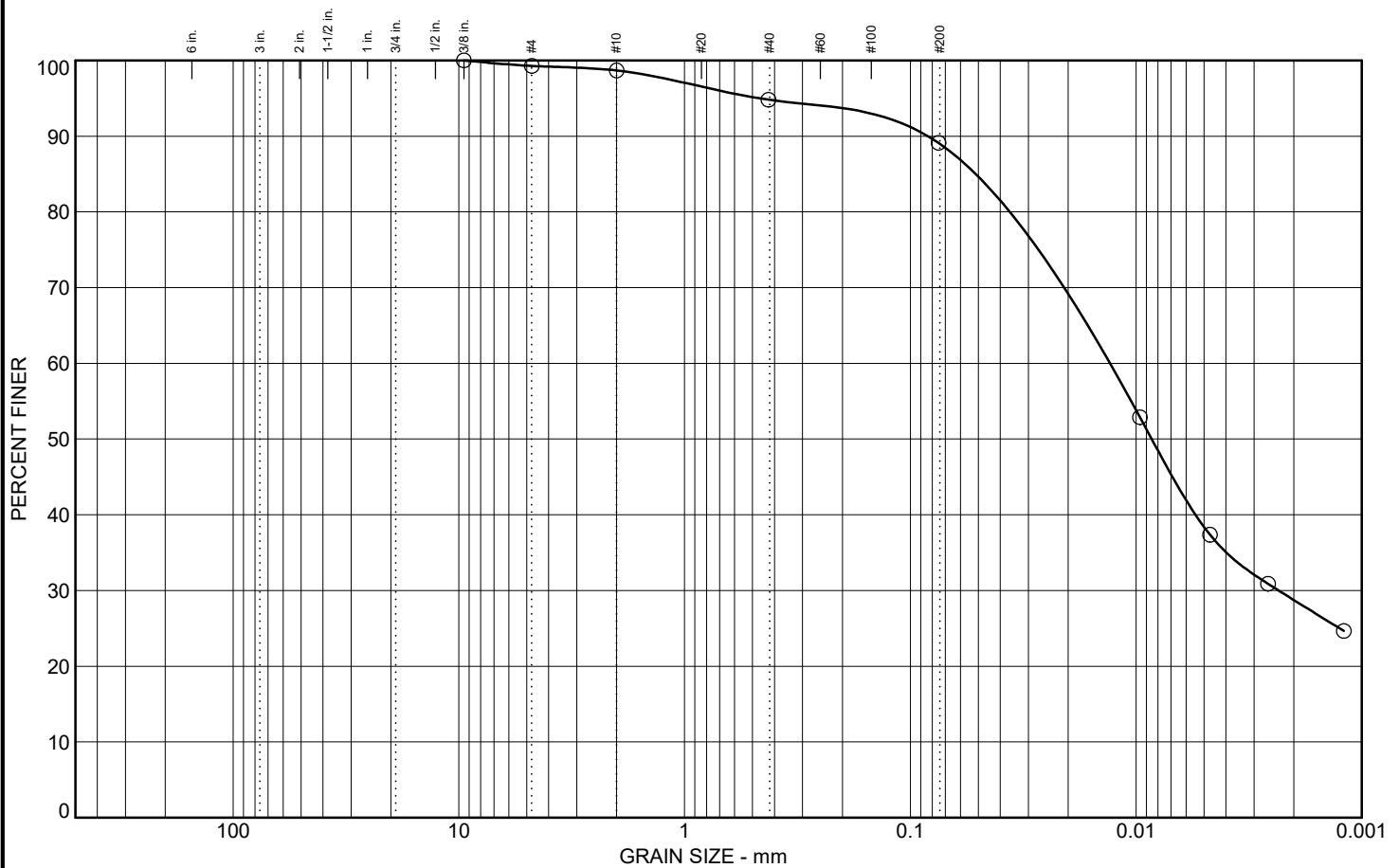
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.7	0.6	3.9	5.7		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.3		
2	98.7		
0.425	94.8		
0.075	89.1		

* SPECIFICATION :

Soil Description

moderate plasticity clay

General Characteristics

Moisture Content = 14.9%

Atterberg Limits

LL= 37

PL= 18

PI= 19

Coefficients

$D_{85} = 0.059$

$D_{60} = 0.014$

$D_{50} = 0.008$

$D_{30} = 0.002$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CL

AASHTO = A-6

Remarks

Group Index = 17

Sample No.:

Location: -

Source of Sample: B-05

Date:

Depth / Elev: 3.5' / 845.32'



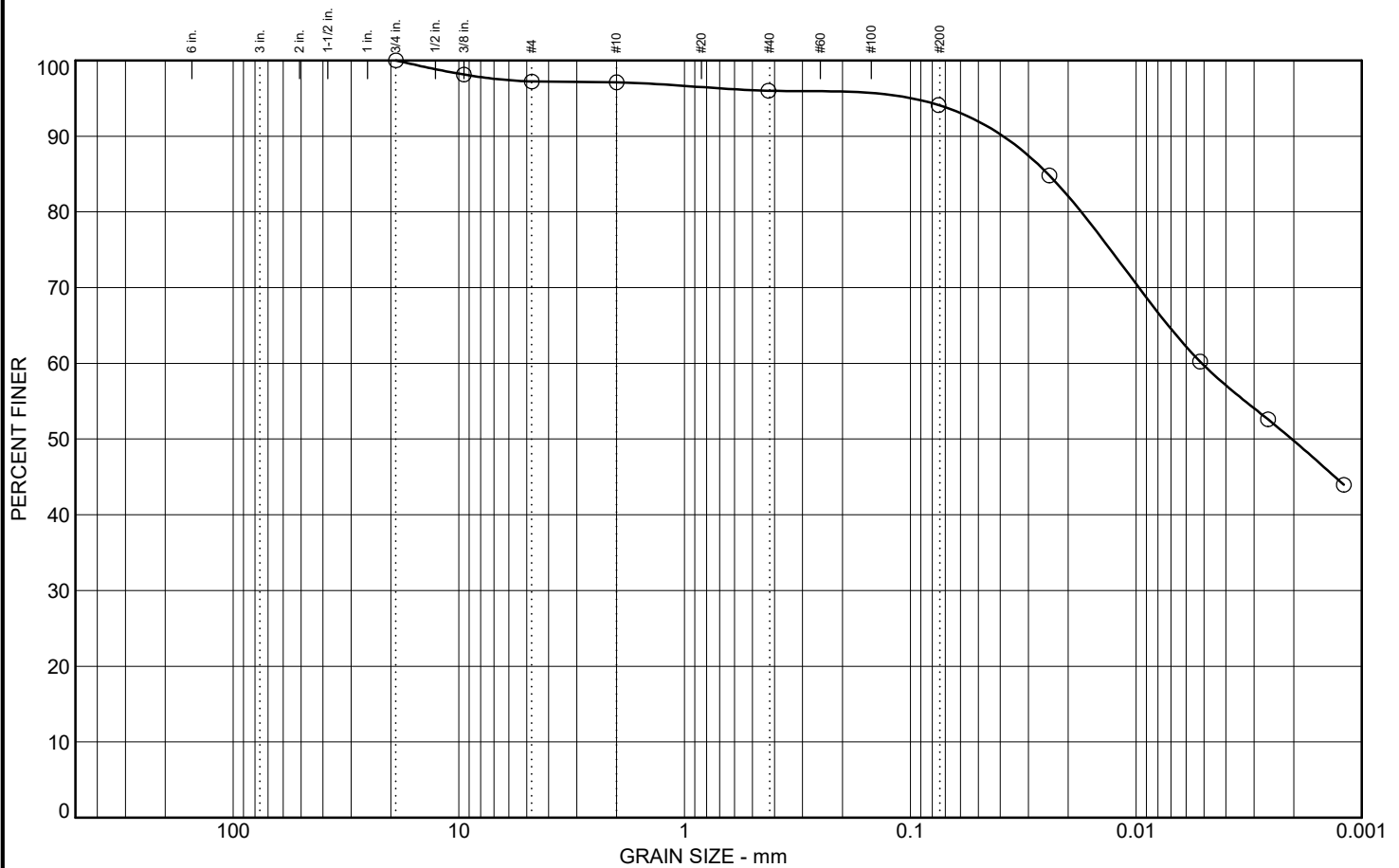
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.8	0.1	1.1	1.9		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	98.1		
4.75	97.2		
2	97.1		
0.425	96.0		
0.075	94.1		

* SPECIFICATION :

Soil Description

high plasticity clay

General Characteristics

Moisture Content = 22.1%

Atterberg Limits

LL= 54

PL= 19

PI= 35

Coefficients

$D_{85} = 0.025$

$D_{60} = 0.005$

$D_{50} = 0.002$

$D_{30} =$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CH

AASHTO = A-7-6

Remarks

Group Index = 36

Sample No.:

Location: -

Source of Sample: B-05

Date:

Depth / Elev: 8.5' / 840.32'



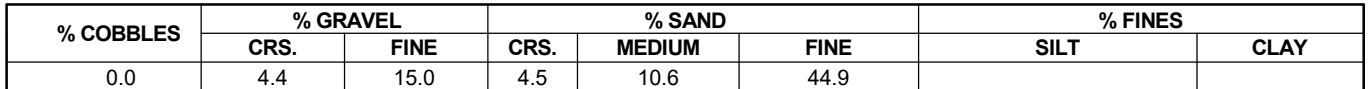
Client:

Project:

Project No:

Figure

DLZ TEMPLATE VER 2-2.GDT - 1/31/25 11:39 - X:\SHARED\DISCIPLINE\GEOTECH\GINT_COLUMBUS\PROJECTS\0631-0006.02 CSX OLDHAM CO. RUNAROUND.GPJ

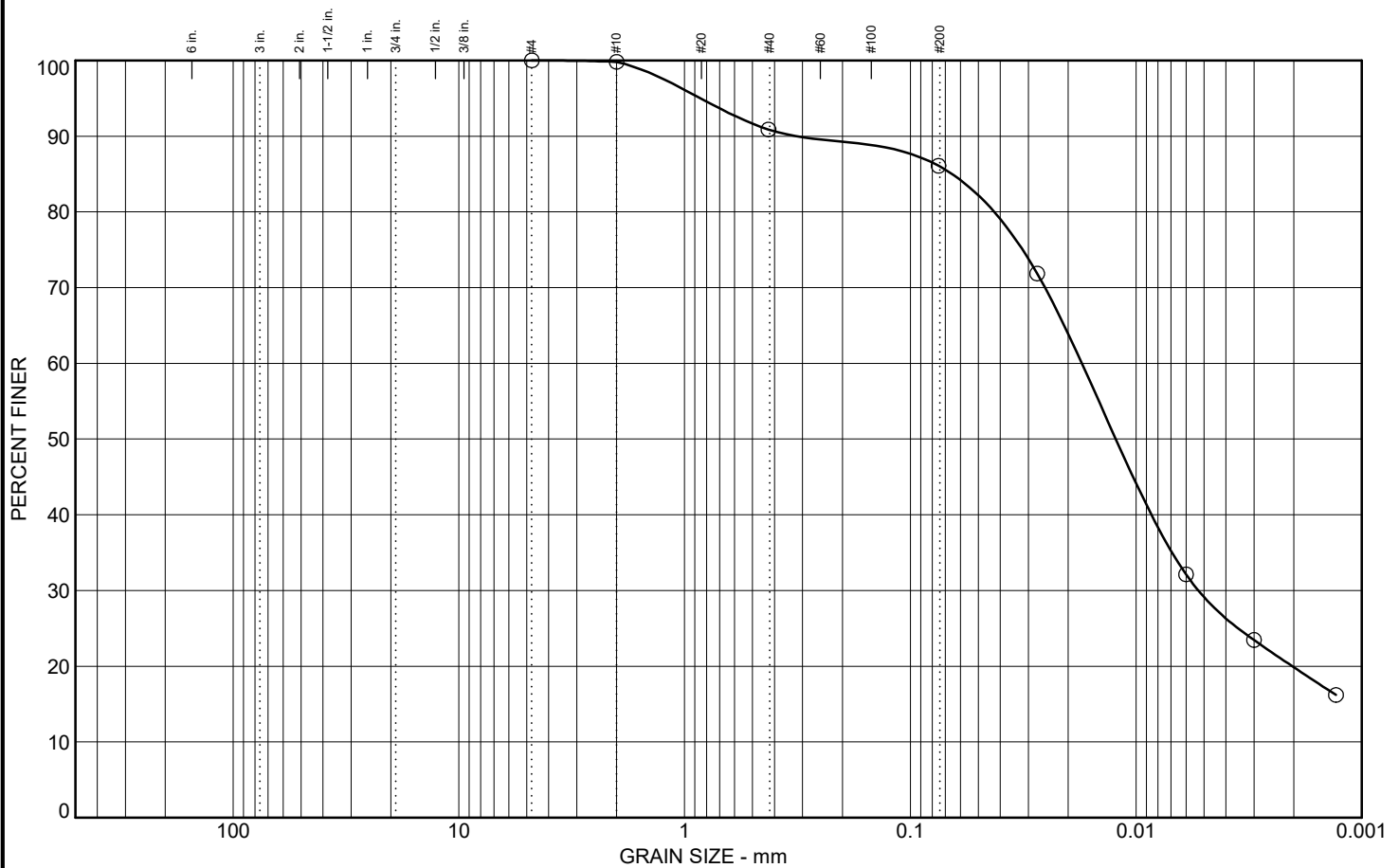


<u>Soil Description</u>		
fine sand, non-plastic silt, fine gravel		
<u>General Characteristics</u>		
Moisture Content = 13.6%		
<u>Atterberg Limits</u>		
LL= 0	PL= 0	PI= 0
<u>Coefficients</u>		
D ₈₅ = 9.113	D ₆₀ = 0.344	D ₅₀ = 0.234
D ₃₀ = 0.108	D ₁₅ = 0.051	D ₁₀ = 0.035
C _u = 9.69	C _c = 0.95	
<u>Classification</u>		
USCS = SM	AASHTO = A-2-4	
<u>Remarks</u>		
Group Index = 0		



Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.2	8.9	4.8		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.75	100.0		
2	99.8		
0.425	90.9		
0.075	86.1		

* SPECIFICATION :

Soil Description

low plasticity clay

General Characteristics

Moisture Content = 14.6%

Atterberg Limits

LL= 31

PL= 18

PI= 13

Coefficients

$D_{85} = 0.069$

$D_{60} = 0.017$

$D_{50} = 0.012$

$D_{30} = 0.005$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CL

AASHTO = A-6

Remarks

Group Index = 10

Sample No.:

Location: -

Source of Sample: B-06

Date:

Depth / Elev: 3.5' / 845.64'



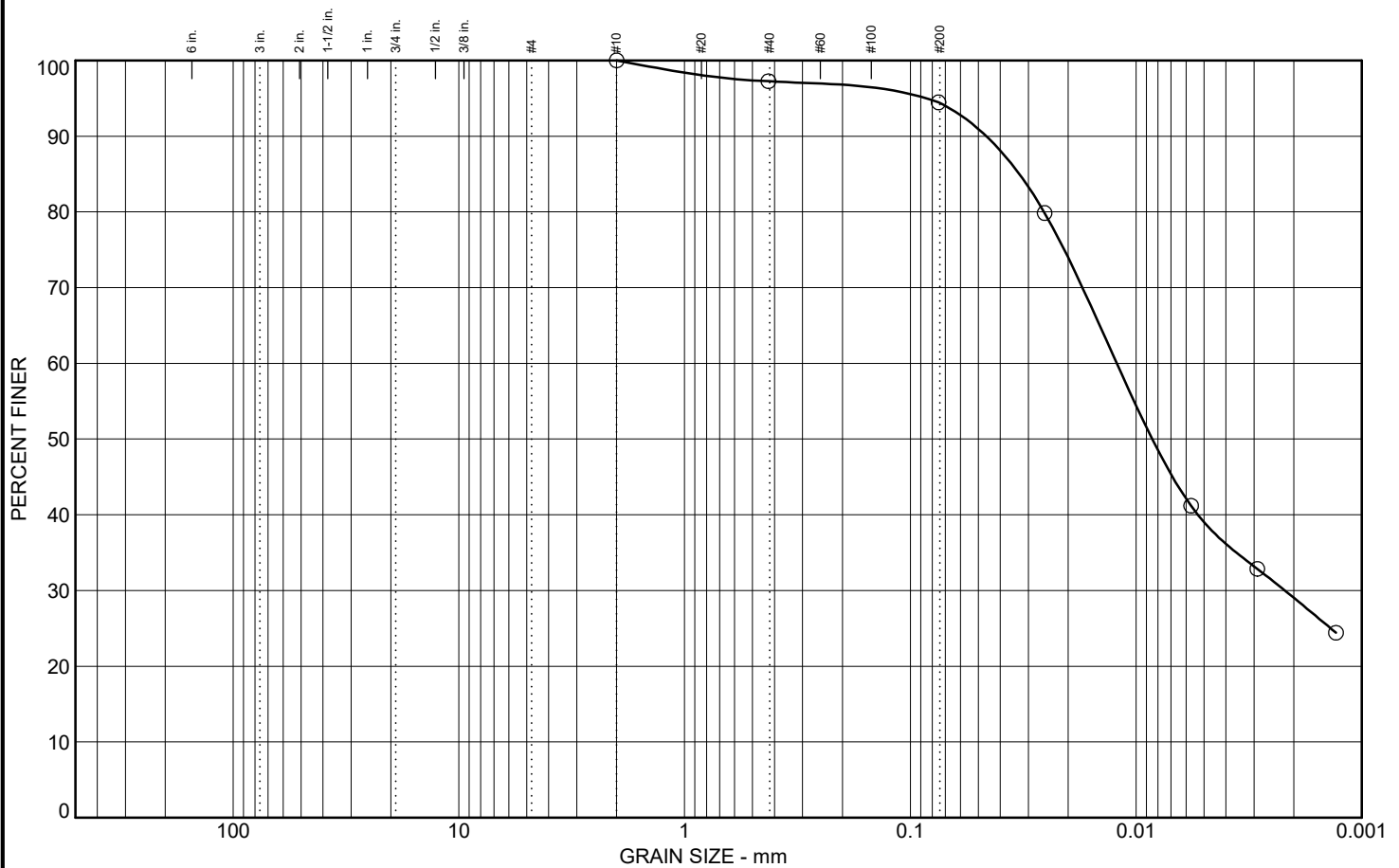
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	2.7	2.8		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
0.425	97.3		
0.075	94.5		

* SPECIFICATION :

Soil Description

moderate plasticity clay

General Characteristics

Moisture Content = 22.0%

Atterberg Limits

LL= 36

PL= 21

PI= 15

Coefficients

$D_{85} = 0.037$

$D_{60} = 0.012$

$D_{50} = 0.008$

$D_{30} = 0.002$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CL

AASHTO = A-6

Remarks

Group Index = 15

Sample No.:

Location: -

Source of Sample: B-06

Date:

Depth / Elev: 8.5' / 840.64'



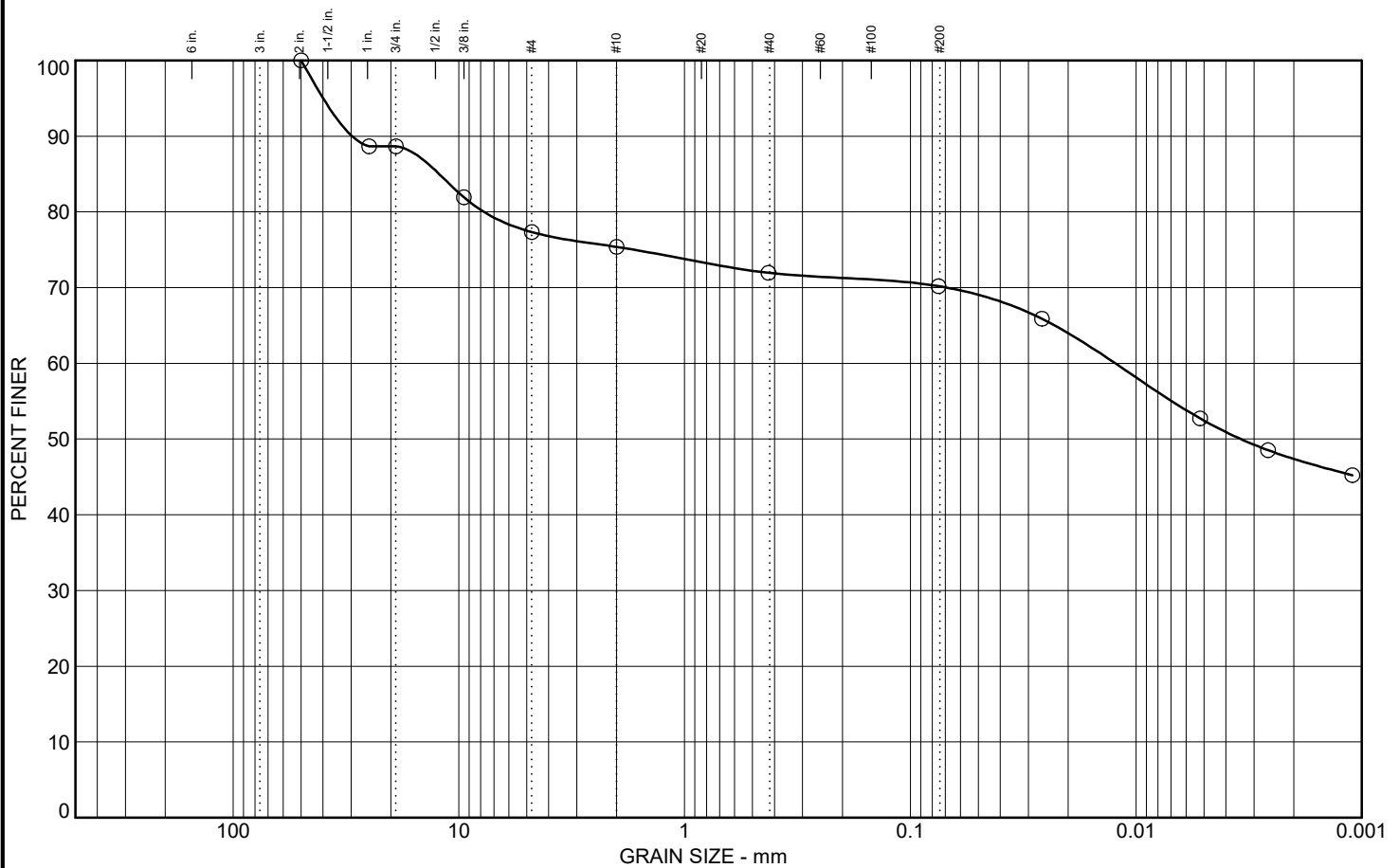
Client:

Project:

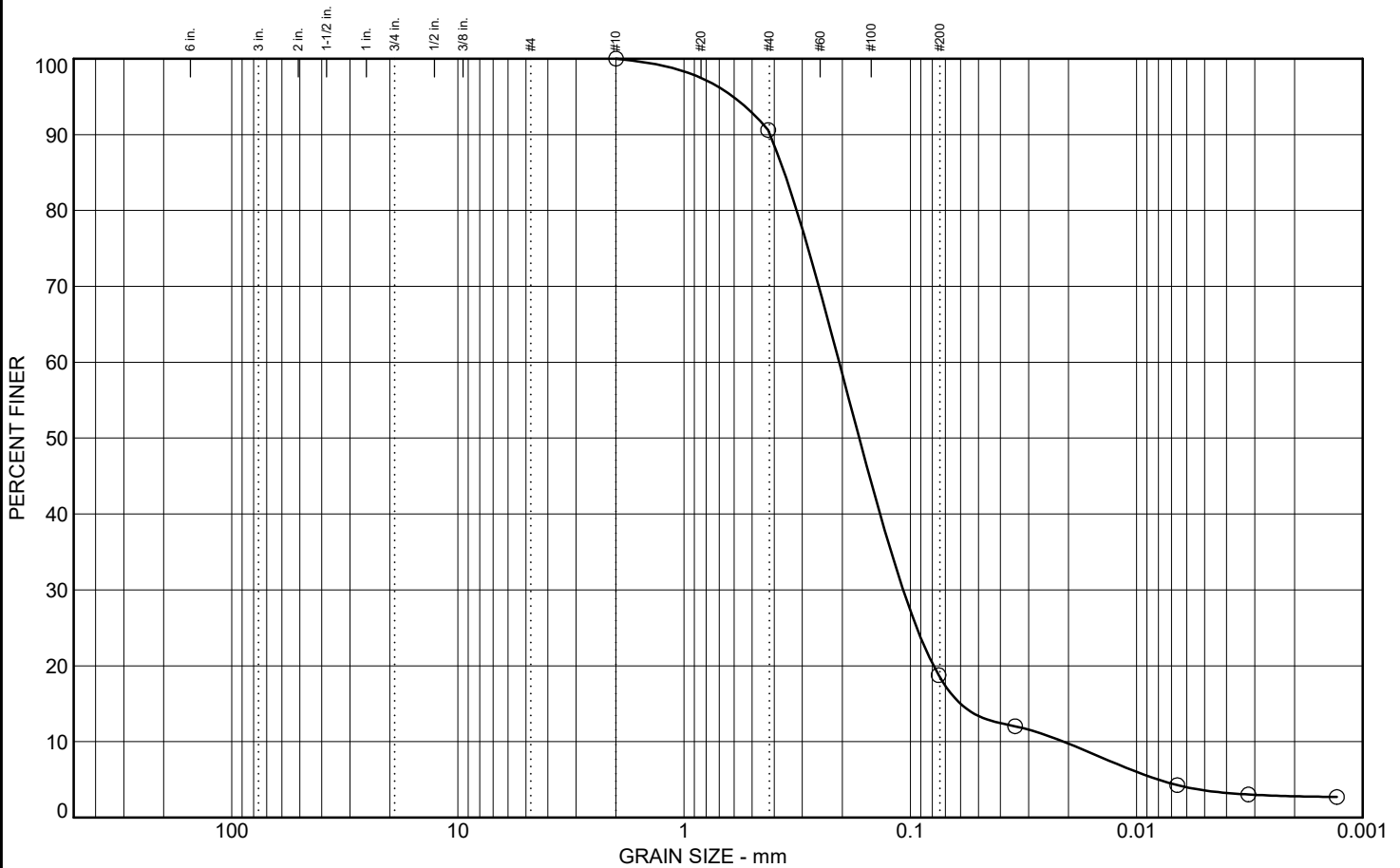
Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	9.4	71.8		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
0.425	90.6		
0.075	18.8		

* SPECIFICATION :

Soil Description

fine sand, non-plastic silt

General Characteristics

Moisture Content = 20.2%

Atterberg Limits

LL= 0

PL= 0

PI= 0

Coefficients

$D_{85} = 0.371$

$D_{60} = 0.203$

$D_{50} = 0.159$

$D_{30} = 0.098$

$D_{15} = 0.048$

$D_{10} = 0.022$

$C_u = 9.09$

$C_c = 2.13$

Classification

USCS = SM

AASHTO = A-2-4

Remarks

Group Index = 0

Sample No.:

Location: -

Source of Sample: B-07

Date:

Depth / Elev: 13.5' / 837.85'



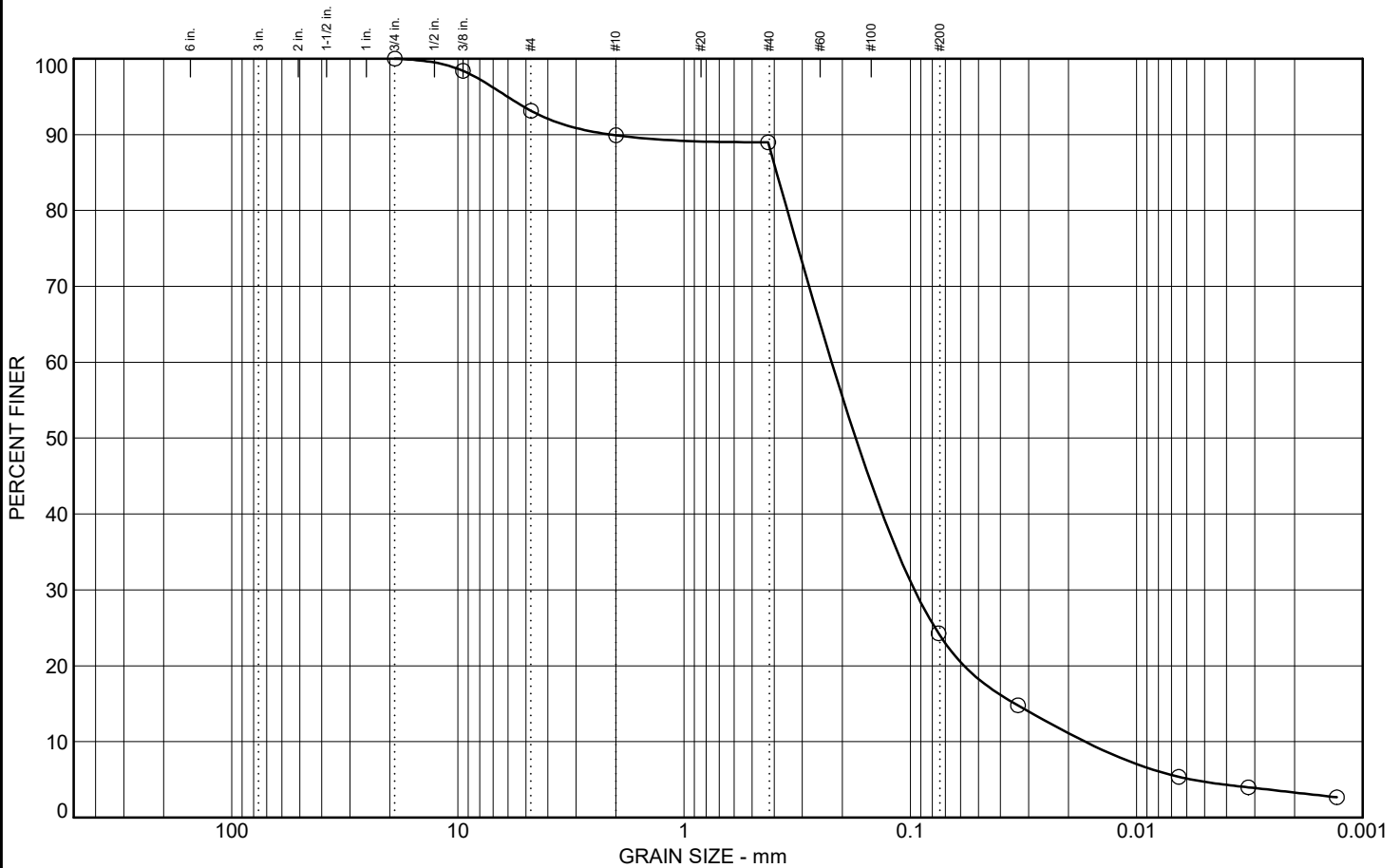
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.9	3.2	0.9	64.7		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	98.4		
4.75	93.1		
2	89.9		
0.425	89.0		
0.075	24.3		

* SPECIFICATION :

Soil Description

fine sand, non-plastic silt

General Characteristics

Moisture Content = 15.2%

Atterberg Limits

LL= 0

PL= 0

PI= 0

Coefficients

$D_{85} = 0.382$

$D_{60} = 0.195$

$D_{50} = 0.149$

$D_{30} = 0.087$

$D_{15} = 0.034$

$D_{10} = 0.015$

$C_u = 13.43$

$C_c = 2.69$

Classification

USCS = SM

AASHTO = A-2-4

Remarks

Group Index = 0

Sample No.:

Location: -

Source of Sample: B-07

Date:

Depth / Elev: 18.5' / 832.85'



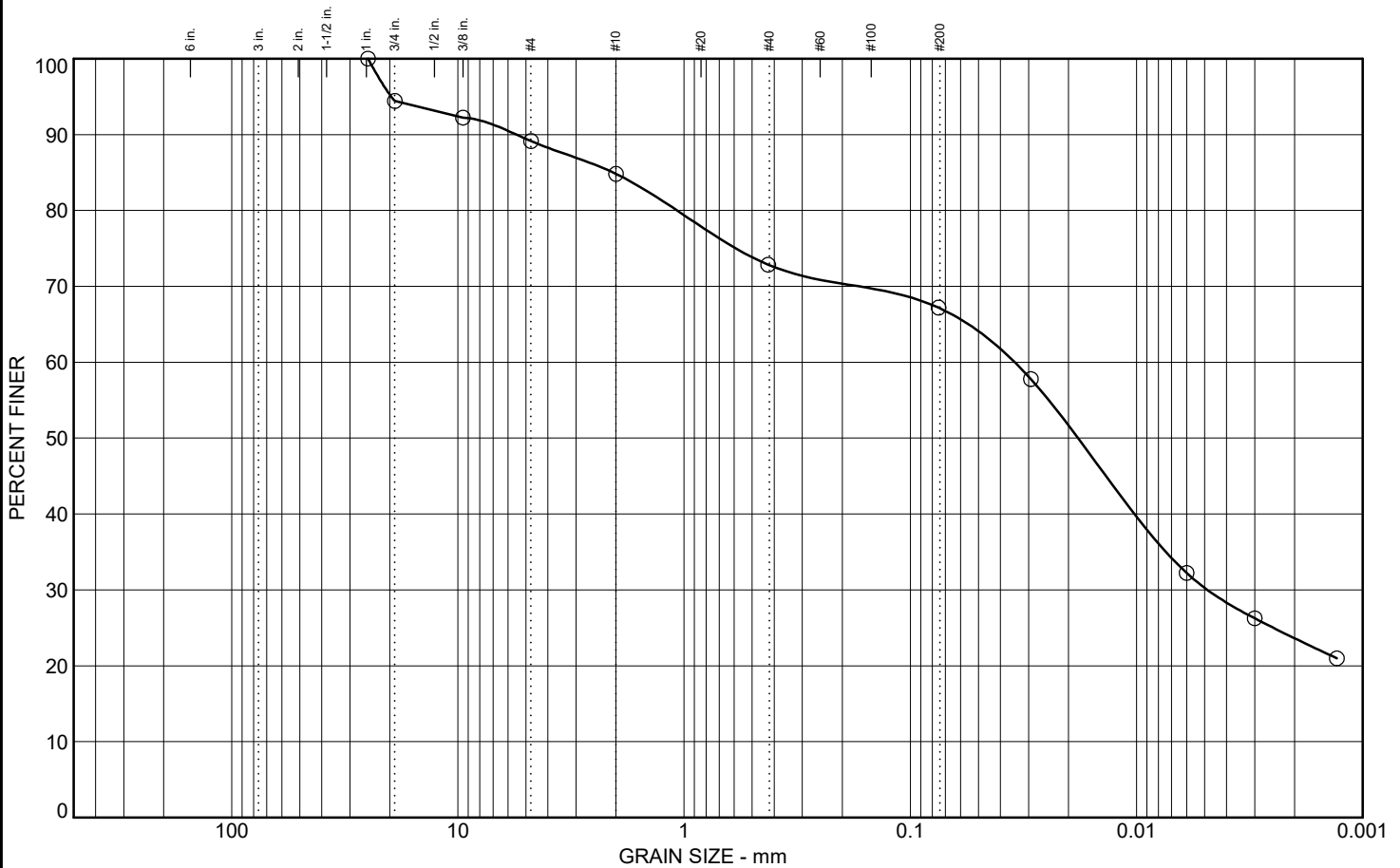
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	5.6	5.3	4.3	12.0	5.7		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
25	100.0		
19	94.4		
9.5	92.2		
4.75	89.1		
2	84.8		
0.425	72.8		
0.075	67.2		

* SPECIFICATION :

Soil Description

moderate plasticity clay, fine to medium sand

General Characteristics

Moisture Content = 20.7%

Atterberg Limits

LL= 41

PL= 19

PI= 22

Coefficients

$D_{85} = 2.075$

$D_{60} = 0.037$

$D_{50} = 0.018$

$D_{30} = 0.005$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CL

AASHTO = A-7-6

Remarks

Group Index = 13

Sample No.:

Location: -

Source of Sample: B-08

Date:

Depth / Elev: 3.5' / 852.88'



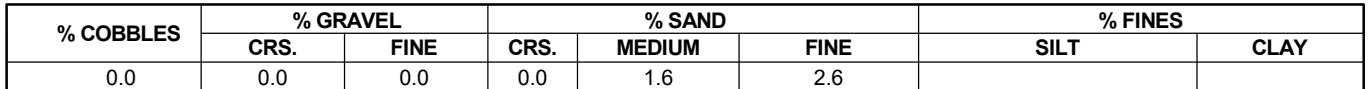
Client:

Project:

Project No:

Figure

DLZ TEMPLATE VER 2-2.GDT - 1/31/25 11:39 - X:\SHARED\DISCIPLINE\GEOTECH\GINT_COLUMBUS\PROJECTS\0631-0006.02 CSX OLDHAM CO. RUNAROUND.GPJ

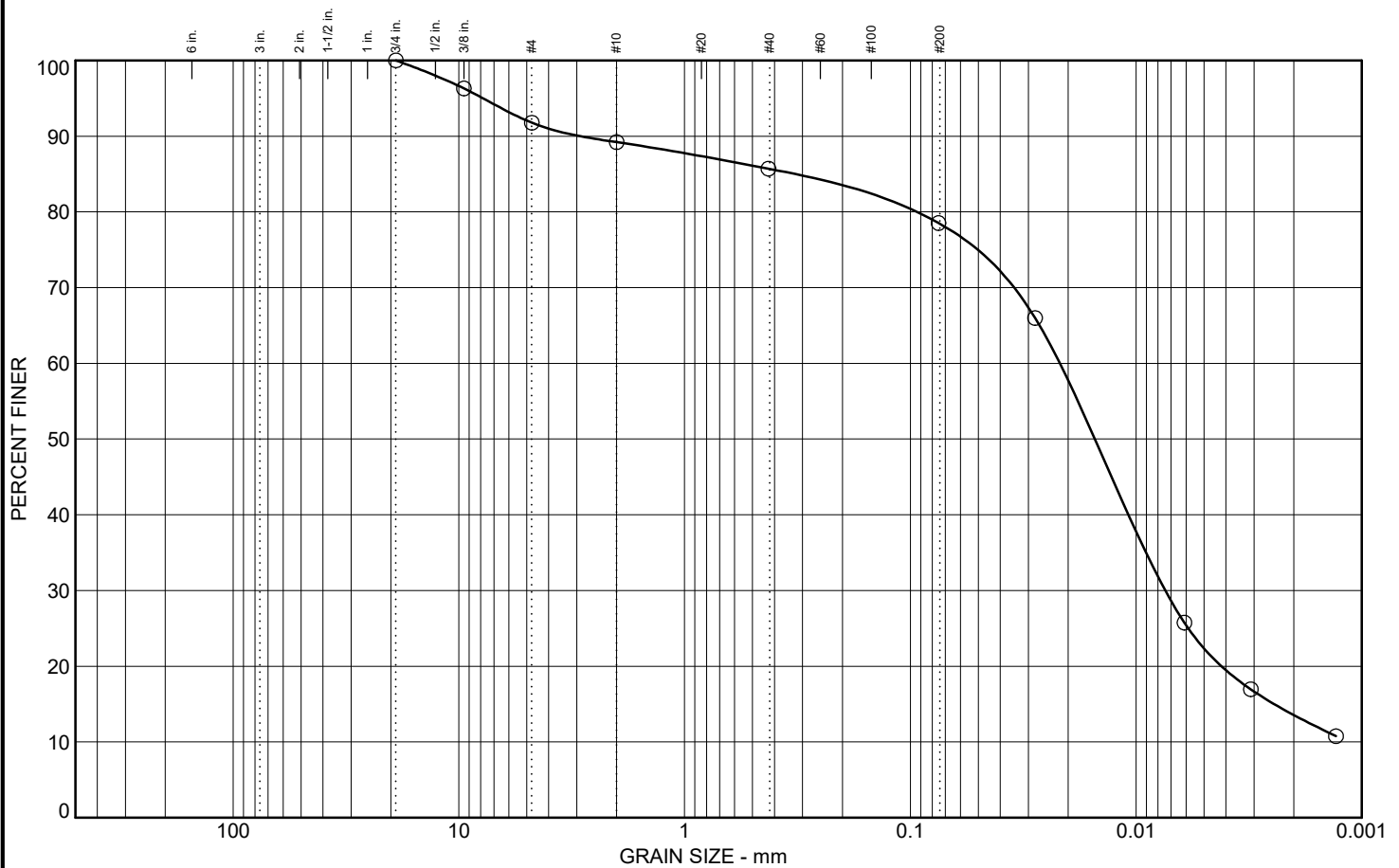


<u>Soil Description</u>		
high plasticity clay		
<u>General Characteristics</u>		
Moisture Content = 42.8%		
<u>Atterberg Limits</u>		
LL= 69	PL= 23	PI= 46
<u>Coefficients</u>		
D ₈₅ = 0.018	D ₆₀ = 0.001	D ₅₀ =
D ₃₀ =	D ₁₅ =	D ₁₀ =
C _u =	C _c =	
<u>Classification</u>		
USCS = CH	AASHTO = A-7-6	
<u>Remarks</u>		
Group Index = 50		



Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	8.2	2.6	3.5	7.2		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	96.3		
4.75	91.8		
2	89.2		
0.425	85.7		
0.075	78.5		

* SPECIFICATION :

Soil Description

low plasticity clay, fine to medium sand

General Characteristics

Moisture Content = 27.2%

Atterberg Limits

LL= 34

PL= 23

PI= 11

Coefficients

$D_{85} = 0.359$

$D_{60} = 0.022$

$D_{50} = 0.015$

$D_{30} = 0.007$

$D_{15} = 0.002$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CL

AASHTO = A-6

Remarks

Group Index = 8

Sample No.:

Location: -

Source of Sample: B-09

Date:

Depth / Elev: 3.5' / 857.28'



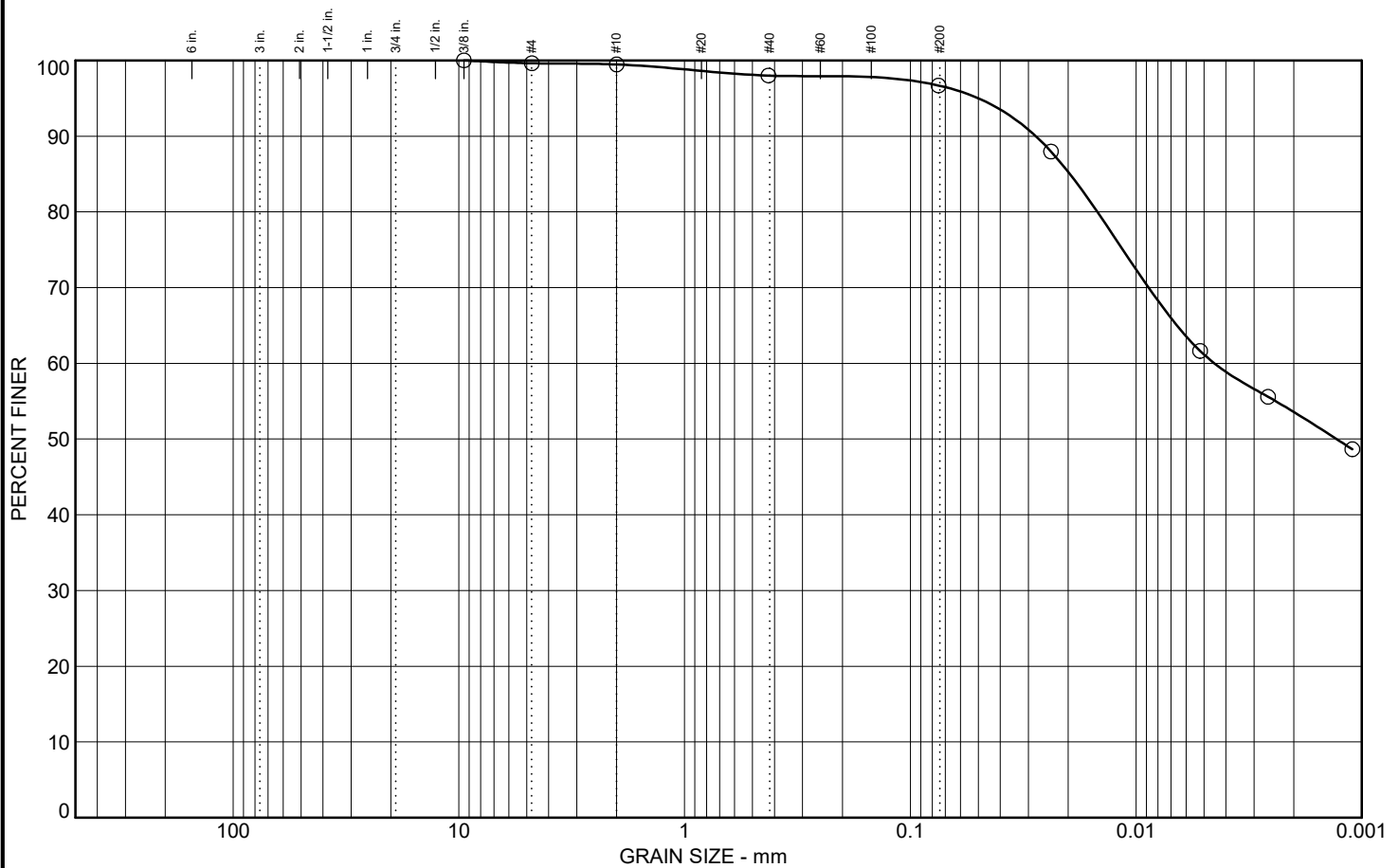
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	0.2	1.5	1.3		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.6		
2	99.5		
0.425	98.0		
0.075	96.7		

* SPECIFICATION :

Soil Description

high plasticity clay

General Characteristics

Moisture Content = 32.1%

Atterberg Limits

LL= 59

PL= 21

PI= 38

Coefficients

$D_{85} = 0.02$

$D_{60} = 0.004$

$D_{50} = 0.001$

$D_{30} =$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CH

AASHTO = A-7-6

Remarks

Group Index = 41

Sample No.:

Location: -

Source of Sample: B-09

Date:

Depth / Elev: 8.5' / 852.28'



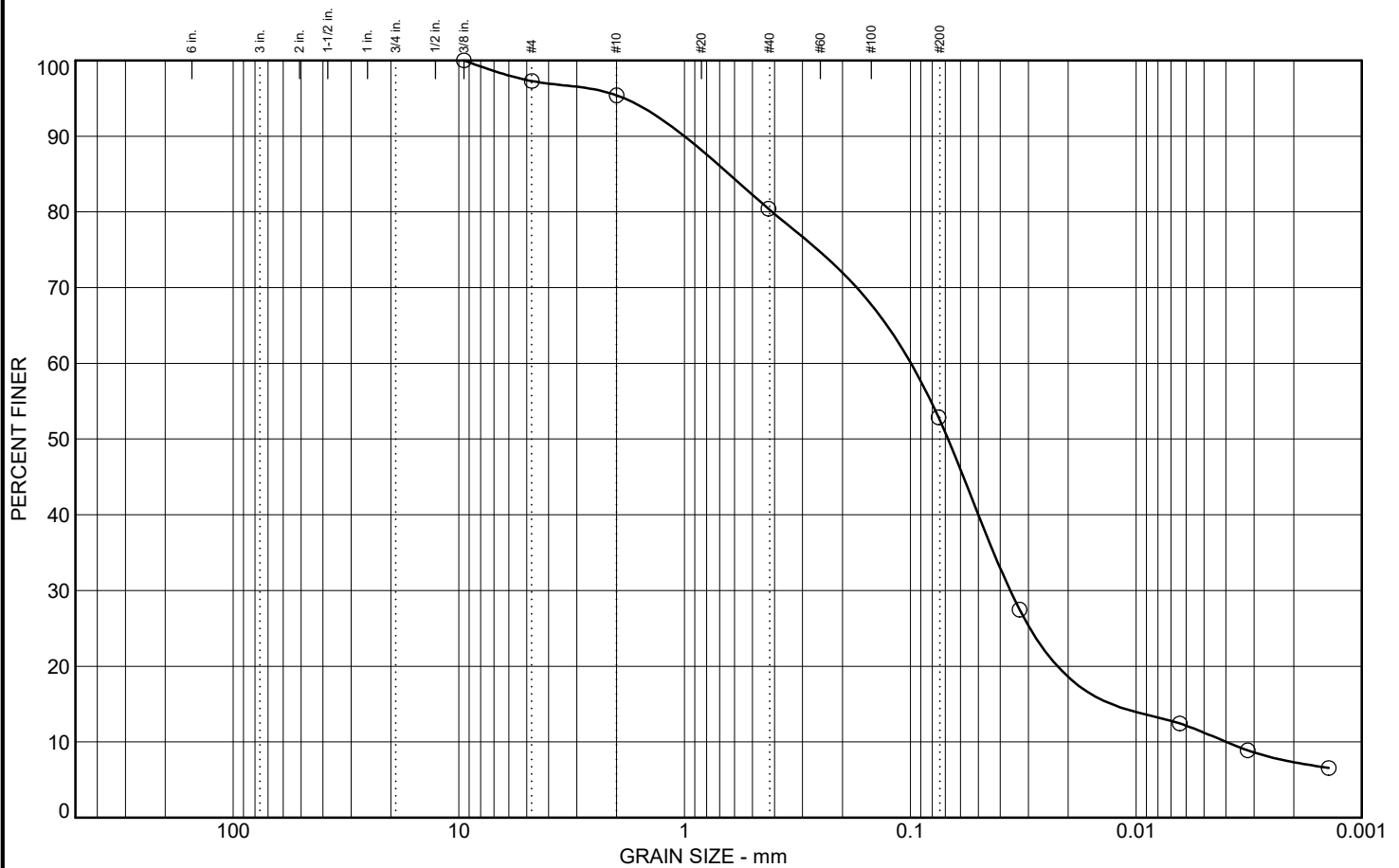
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.7	1.9	15.0	27.5		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	97.3		
2	95.4		
0.425	80.4		
0.075	52.9		

* SPECIFICATION :

Soil Description

non-plastic silt, fine to medium sand

General Characteristics

Moisture Content = %

Atterberg Limits

LL= 0

PL= 0

PI= 0

Coefficients

$D_{85} = 0.683$

$D_{60} = 0.118$

$D_{50} = 0.068$

$D_{30} = 0.036$

$D_{15} = 0.008$

$D_{10} = 0.004$

$C_u = 29.58$

$C_c = 2.72$

Classification

USCS = ML

AASHTO = A-4

Remarks

Group Index = 0

Sample No.:

Location: -

Source of Sample: B-09

Date:

Depth / Elev: 13.5' / 847.28'



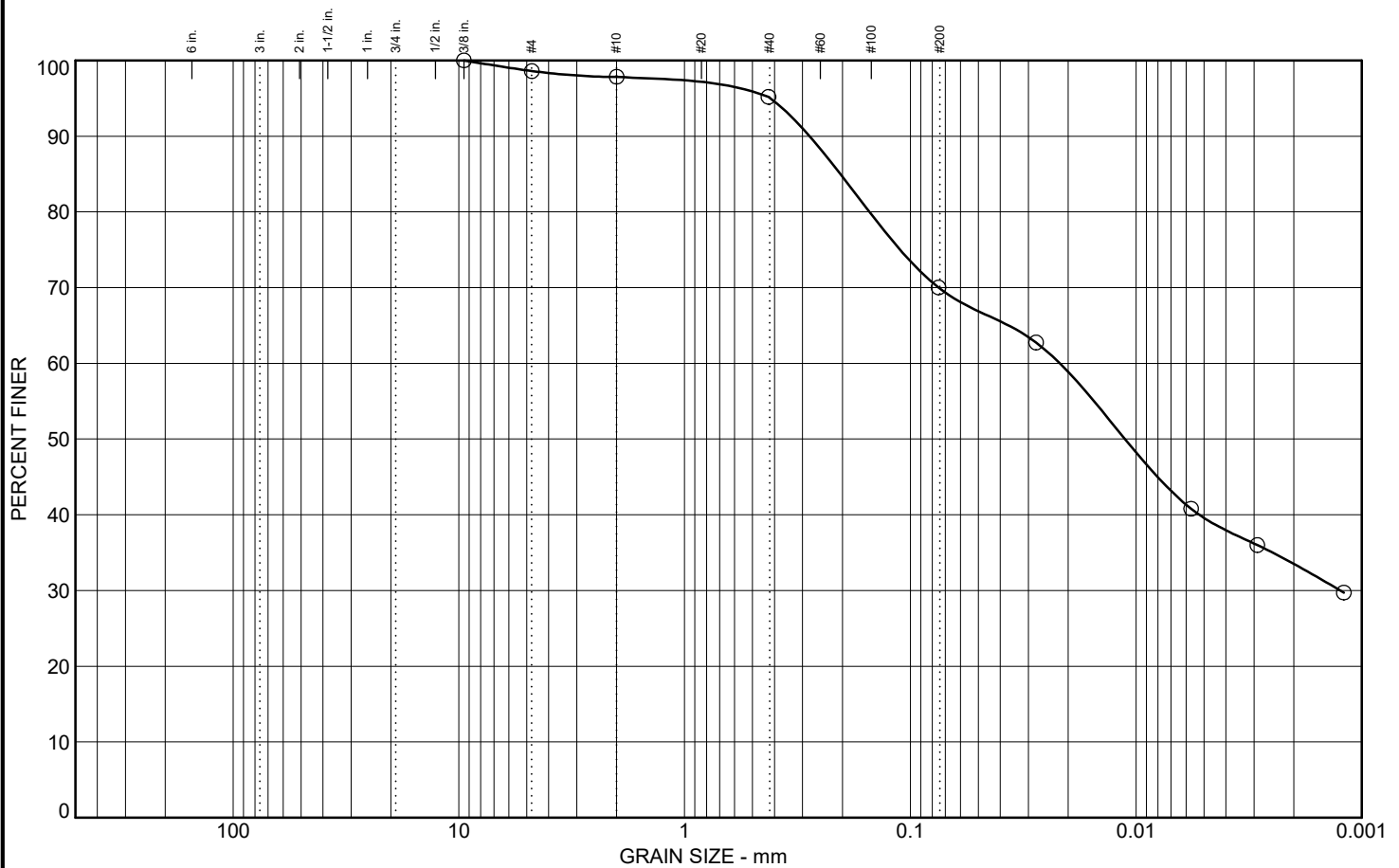
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.4	0.8	2.6	25.2		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	98.6		
2	97.8		
0.425	95.2		
0.075	70.0		

* SPECIFICATION :

Soil Description

moderate plasticity clay, fine sand

General Characteristics

Moisture Content = 27.0%

Atterberg Limits

LL= 45

PL= 16

PI= 29

Coefficients

$D_{85} = 0.211$

$D_{60} = 0.023$

$D_{50} = 0.011$

$D_{30} = 0.001$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CL

AASHTO = A-7-6

Remarks

Group Index = 18

Sample No.:

Location: -

Source of Sample: B-10

Date:

Depth / Elev: 3.5' / 861.2'



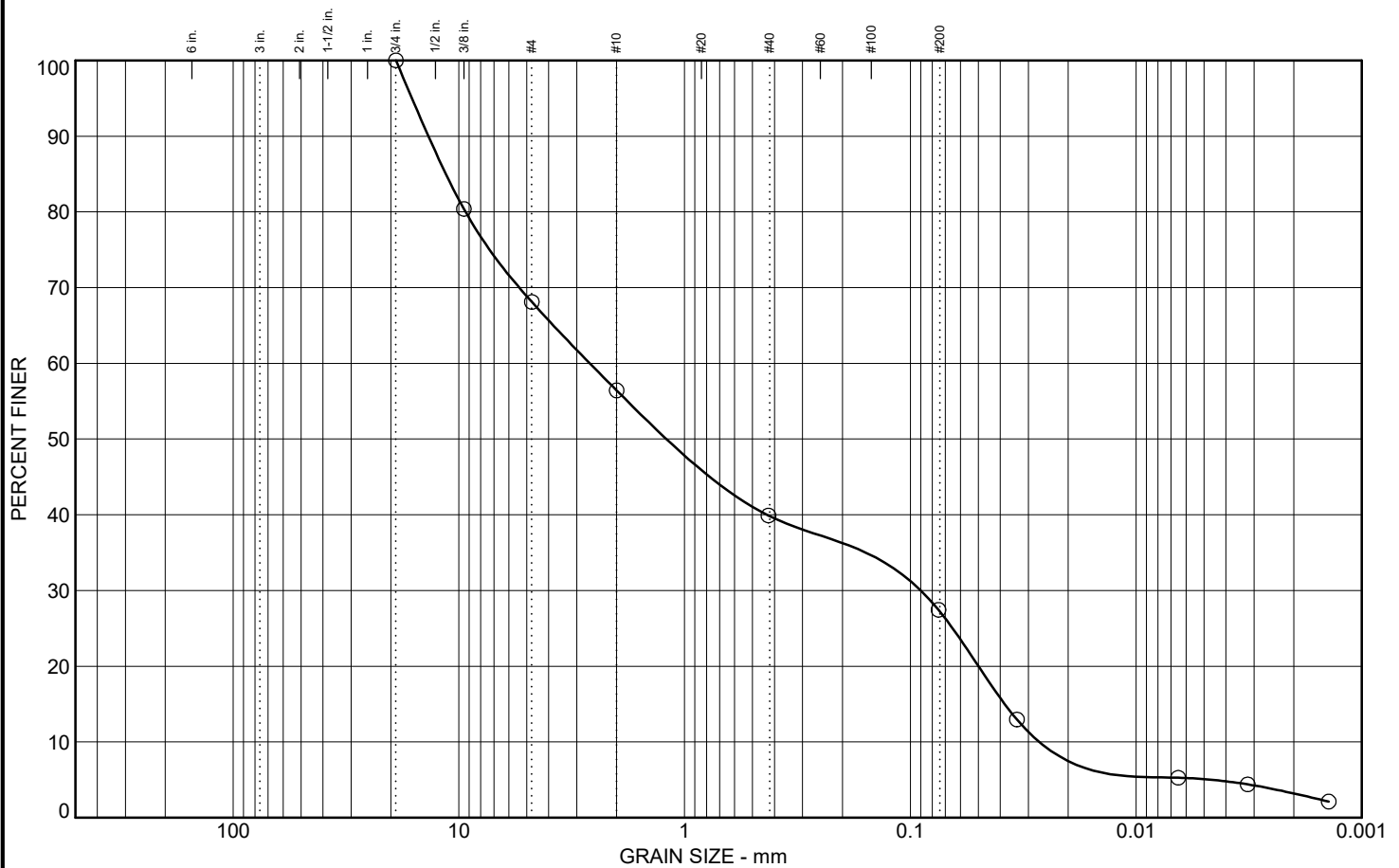
Client:

Project:

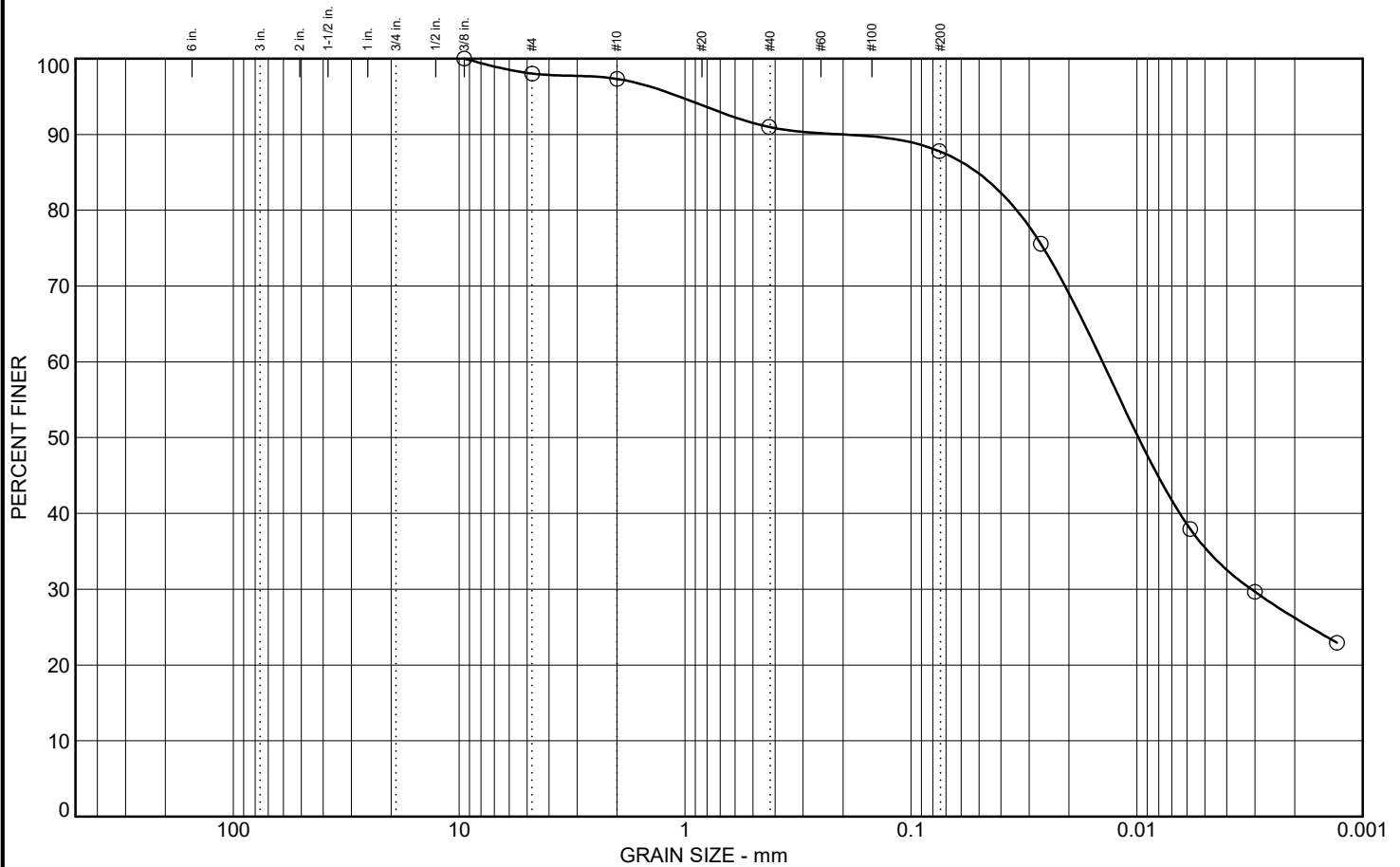
Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.0	0.7	6.3	3.2		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	98.0		
2	97.3		
0.425	91.0		
0.075	87.8		

* SPECIFICATION :

Soil Description

moderate plasticity clay

General Characteristics

Moisture Content = 19.3%

Atterberg Limits

LL= 35

PL= 20

PI= 15

Coefficients

$D_{85} = 0.059$

$D_{60} = 0.014$

$D_{50} = 0.009$

$D_{30} = 0.003$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CL

AASHTO = A-6

Remarks

Group Index = 13

Sample No.:

Location: -

Source of Sample: B-32C

Date:

Depth / Elev: 3.5' / 853.37'



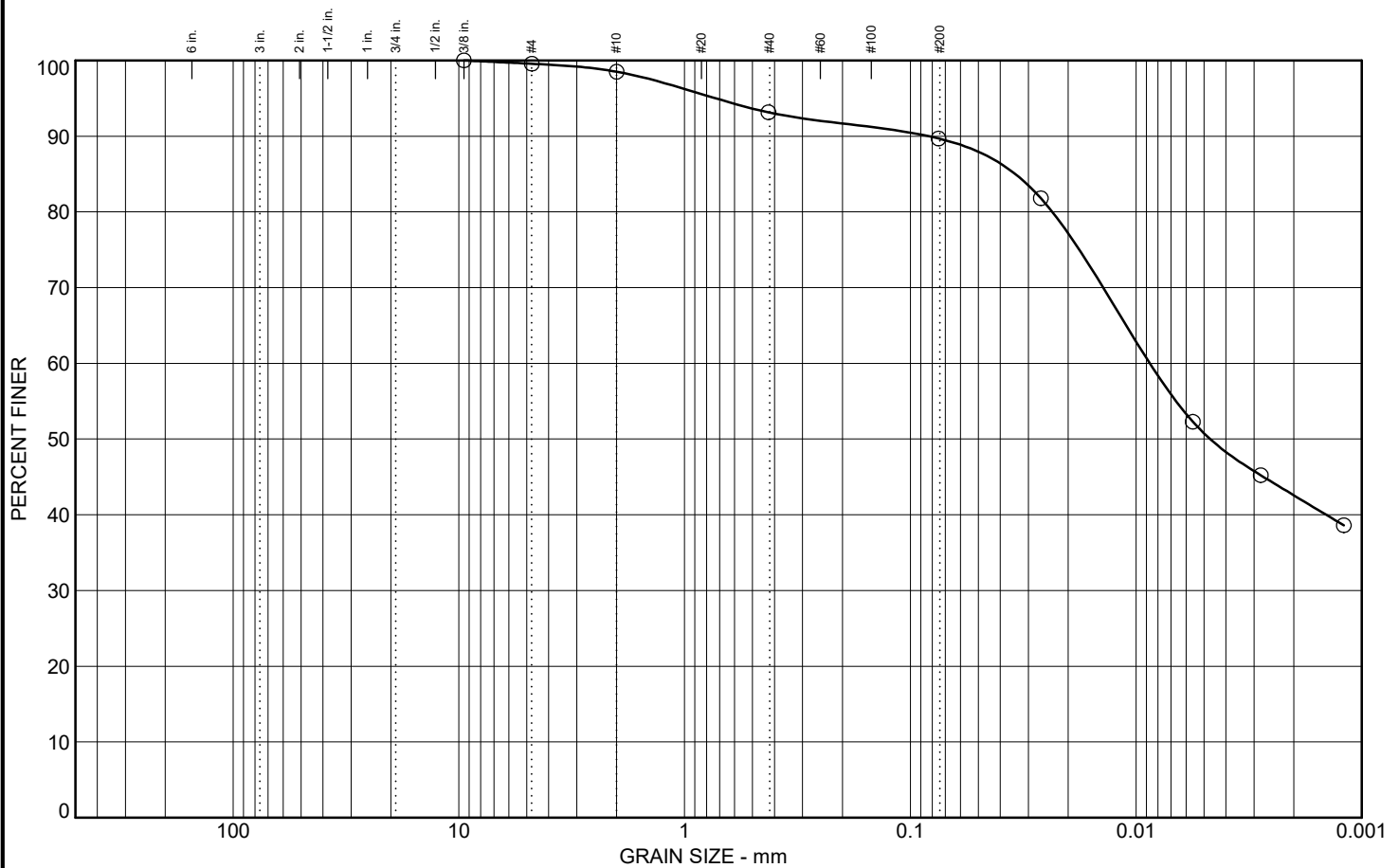
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	1.1	5.4	3.5		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.6		
2	98.5		
0.425	93.1		
0.075	89.7		

* SPECIFICATION :

Soil Description

high plasticity clay

General Characteristics

Moisture Content = 21.4%

Atterberg Limits

LL= 56

PL= 19

PI= 37

Coefficients

$D_{85} = 0.04$

$D_{60} = 0.008$

$D_{50} = 0.004$

$D_{30} =$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = CH

AASHTO = A-7-6

Remarks

Group Index = 36

Sample No.:

Location: -

Source of Sample: B-32C

Date:

Depth / Elev: 8.5' / 848.37'



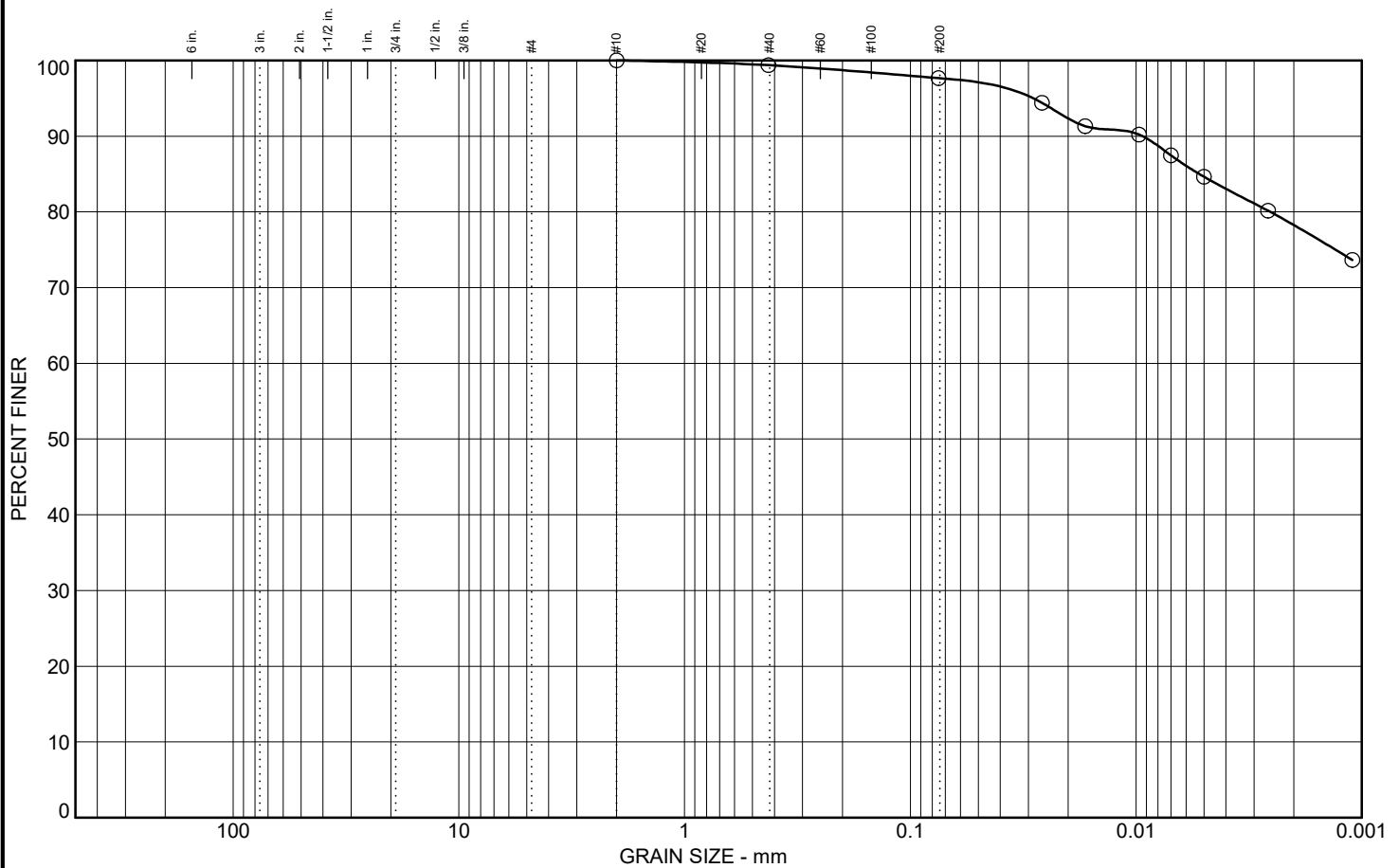
Client:

Project:

Project No:

Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.6	1.7		

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
0.425	99.4		
0.075	97.7		

Soil Description

high plasticity silt

General Characteristics

Moisture Content = 58.9%

Atterberg Limits

LL= 74

PL= 49

PI= 25

Coefficients

$D_{85} = 0.005$

$D_{60} =$

$D_{50} =$

$D_{30} =$

$D_{15} =$

$D_{10} =$

$C_u =$

$C_c =$

Classification

USCS = MH

AASHTO = A-7-5

Remarks

Group Index = 36

* SPECIFICATION :

Sample No.:

Location: -

Source of Sample: B-32C

Date:

Depth / Elev: 13.5' / 843.37'



Client:

Project:

Project No:

Figure

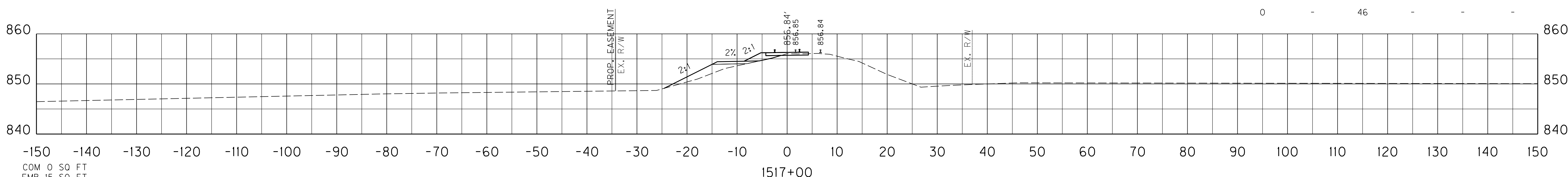
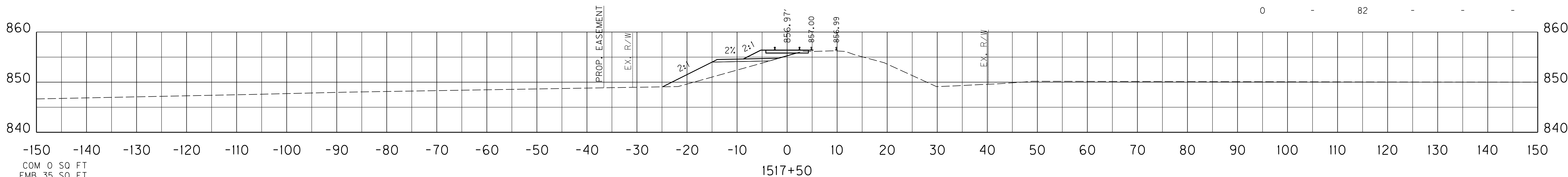
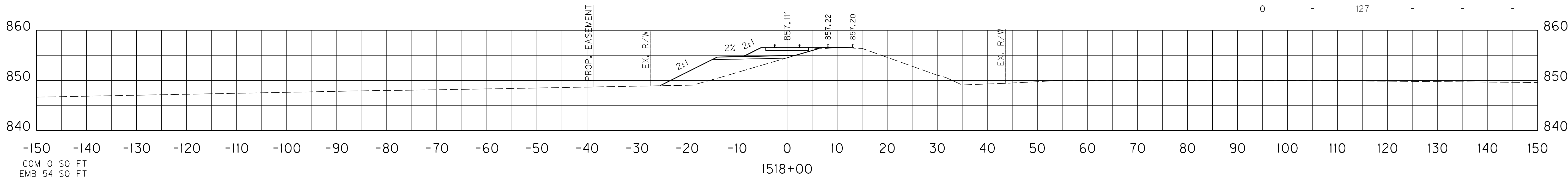
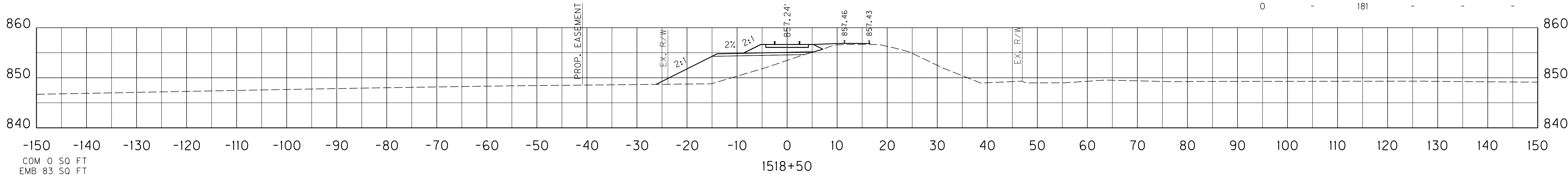
Appendix III

Cross-sections
Calculations

FILE NAME: X:\PROJECTS\LEX\PROJ\0631\0006 OLDHAM COUNTY OVERPASS-UNDERPASS\02 UNDERPASS\CONTRACT PLANS AND PROPOSAL\CONTRACT PLAN SET.RVT
USER: lstriggs
DATE PLOTTED: November 13, 2019
E-SHEET NAME: X04700XS
MicroStation v8.11.9.832

COUNTY OF	ITEM NO.	SHEET NO.
OLDHAM	5-434.00	X47

COM ROCK EMB BENCH DT. LT. DT. RT.



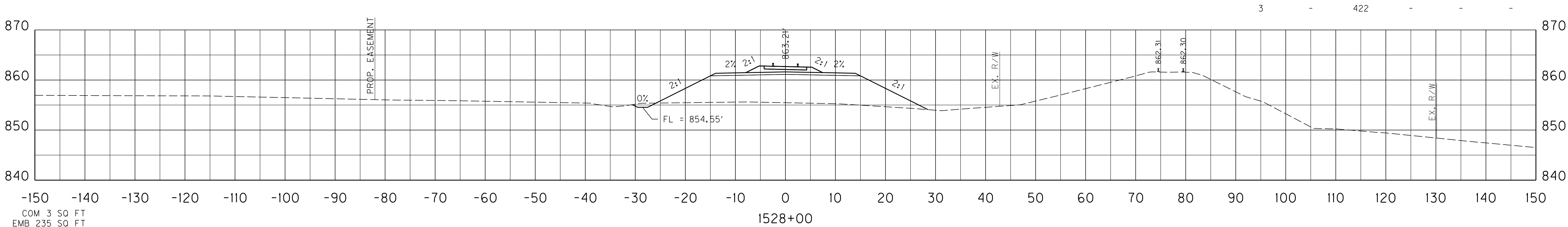
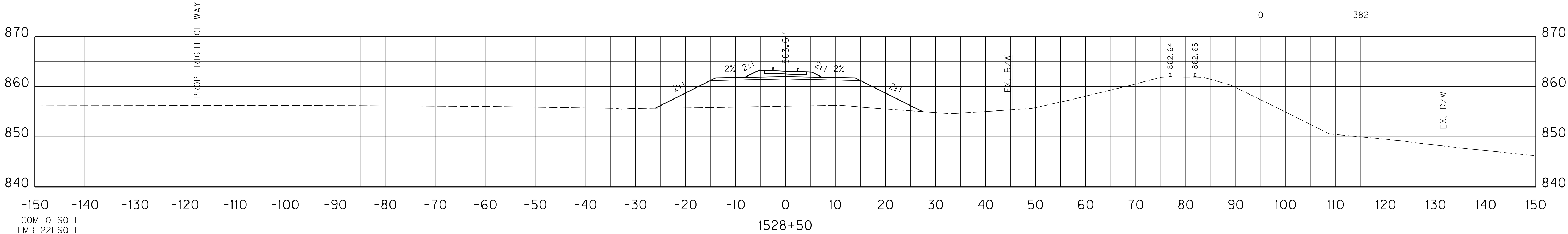
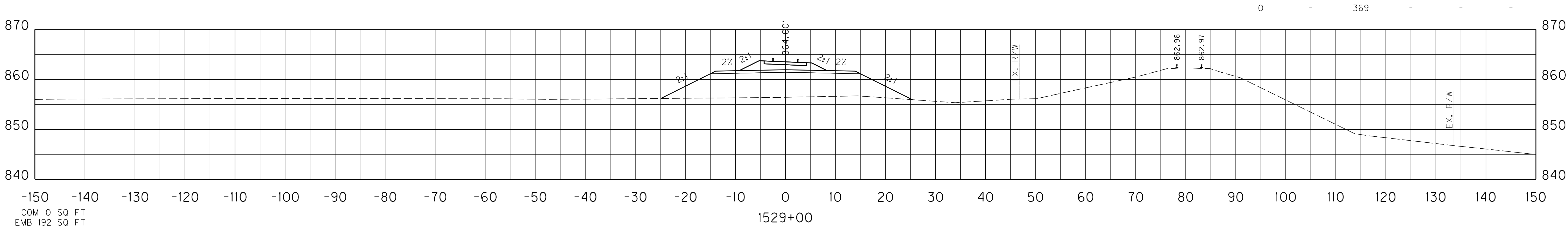
SCALE: 1" = 10' HORIZONTAL
1" = 10' VERTICAL

CSX RUNAROUND
STA.1517+00 TO STA.1518+50

FILE NAME: X:\PROJECTS\LEX\PROJ\0631\0006 OLDHAM COUNTY OVERPASS-UNDERPASS\02 UNDERPASS\CONTRACT PLANS AND PROPOSAL\CONTRACT PLAN SET
USER: lstraggs
DATE PLOTTED: November 13, 2019
E-SHEET NAME: X05400XS
MicroStation v8.11.9.832

COUNTY OF	ITEM NO.	SHEET NO.
OLDHAM	5-434.00	X54

COM ROCK EMB BENCH DT. LT. DT. RT.

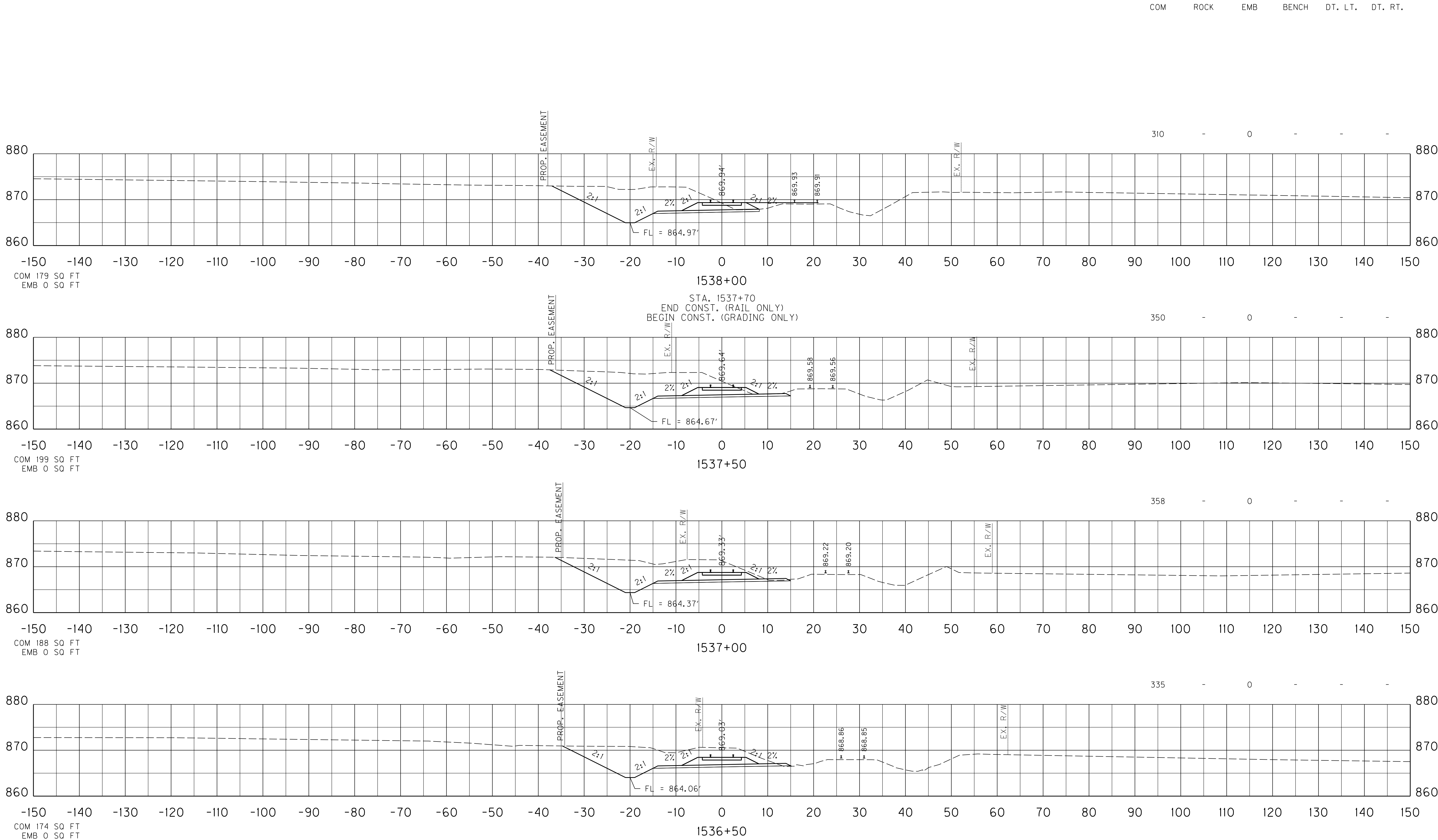


SCALE: 1" = 10' HORIZONTAL
1" = 10' VERTICAL

CSX RUNAROUND
STA.1528+00 TO STA.1529+00

FILE NAME: X:\PROJECTS\LEX\PROJ\0631\0006 OLDHAM COUNTY OVERPASS-UNDERPASS\02 UNDERPASS\CONTRACT PLANS AND PROPOSAL\CONTRACT PLAN SET.RVT
USER: lstgogs
DATE PLOTTED: November 13, 2019
E-SHEET NAME: X05800XS
MicroStation v8.11.9.832

COUNTY OF	ITEM NO.	SHEET NO.
OLDHAM	5-434.00	X58

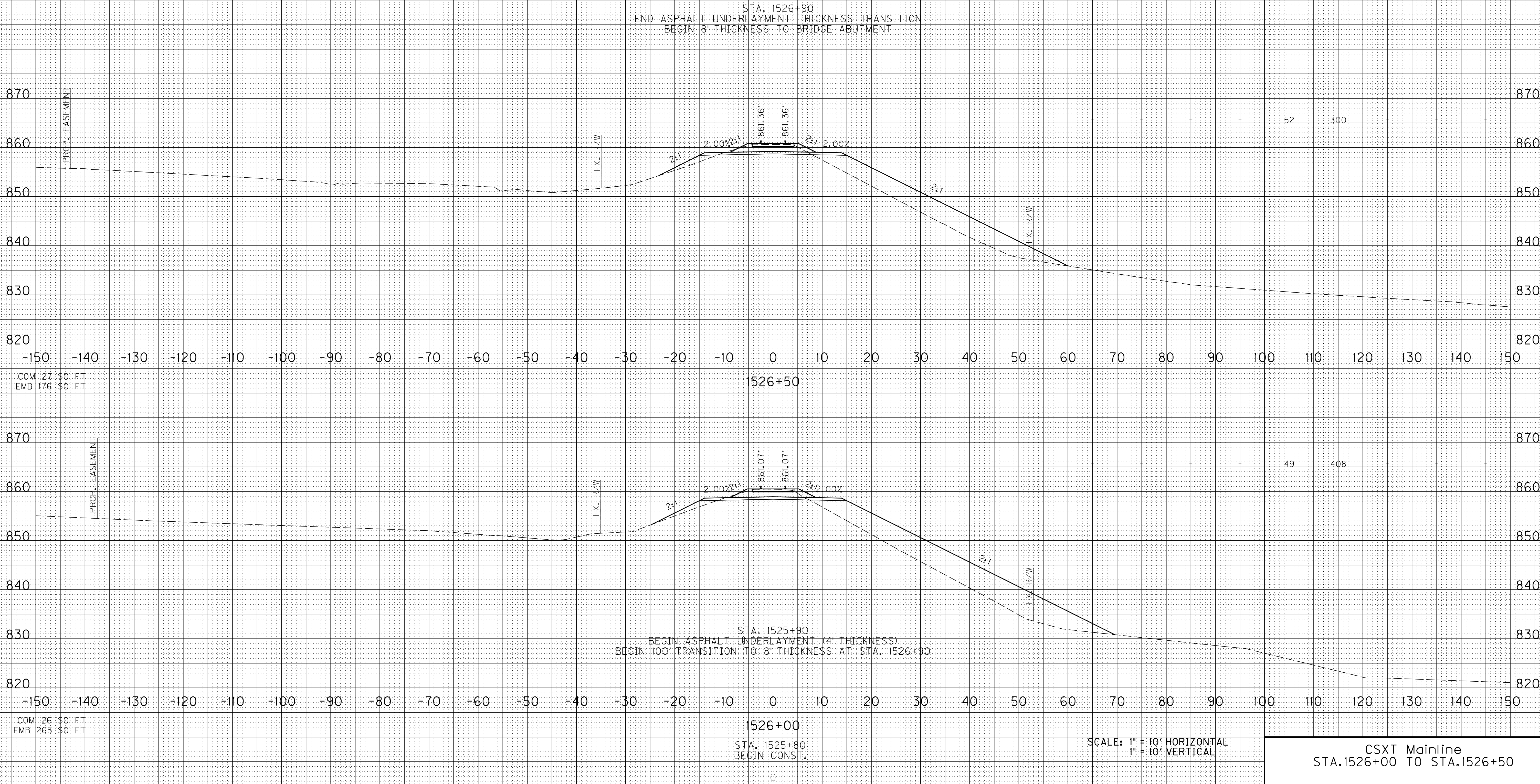


SCALE: 1" = 10' HORIZONTAL
1" = 10' VERTICAL

CSX RUNAROUND
STA.1536+50 TO STA.1538+00

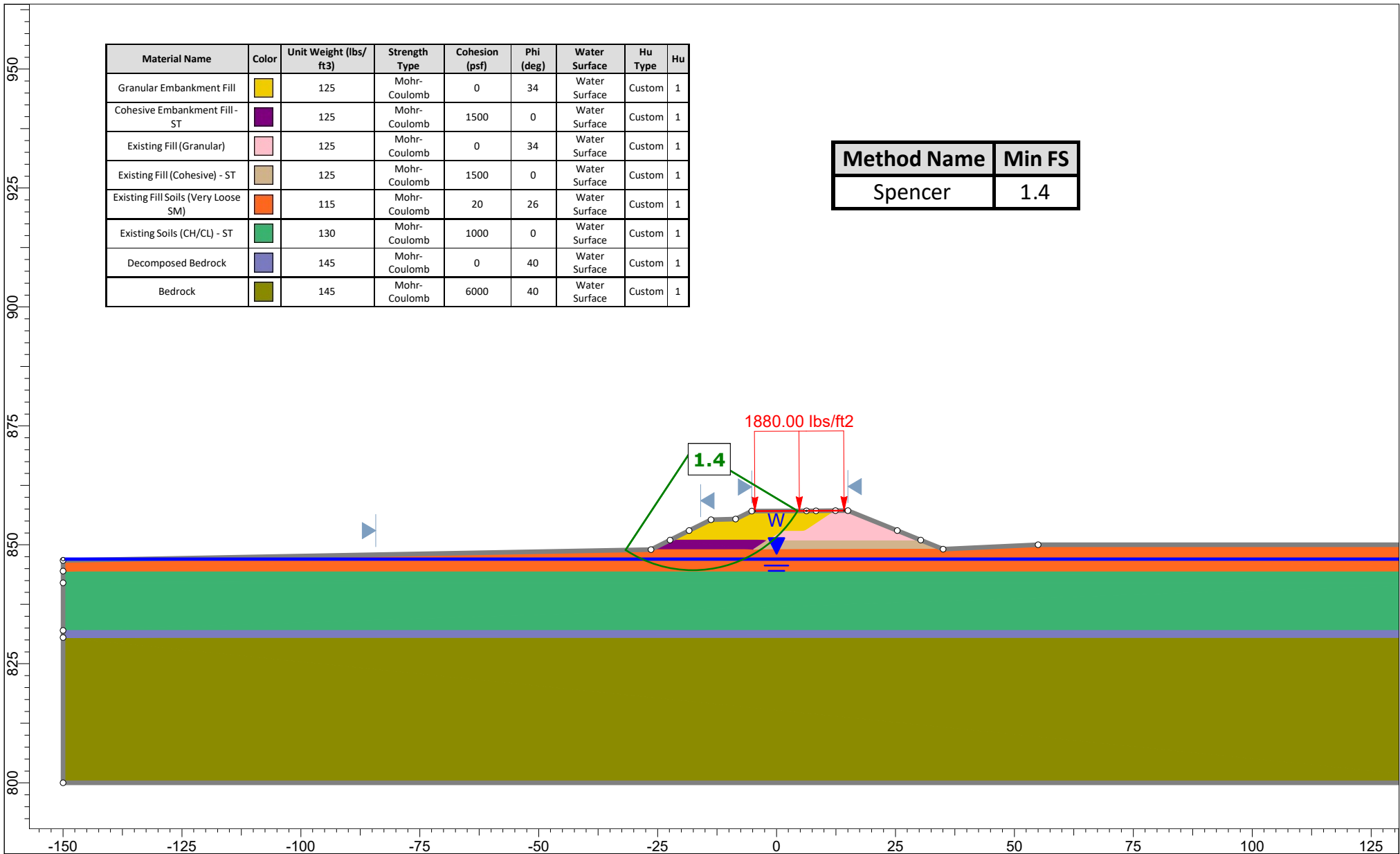
COUNTY OF	ITEM NO.	SHEET NO.
OLDHAM	5-434.00	X63

ROCK ROAD BED	REFILL	EMB. BENCH	GRAN. EMB.	COM	EMB	ROCK EXC	DT LT	DT RT
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SCALE: 1" = 10' HORIZONTAL
1" = 10' VERTICAL

CSXT Mainline
STA.1526+00 TO STA.1526+50



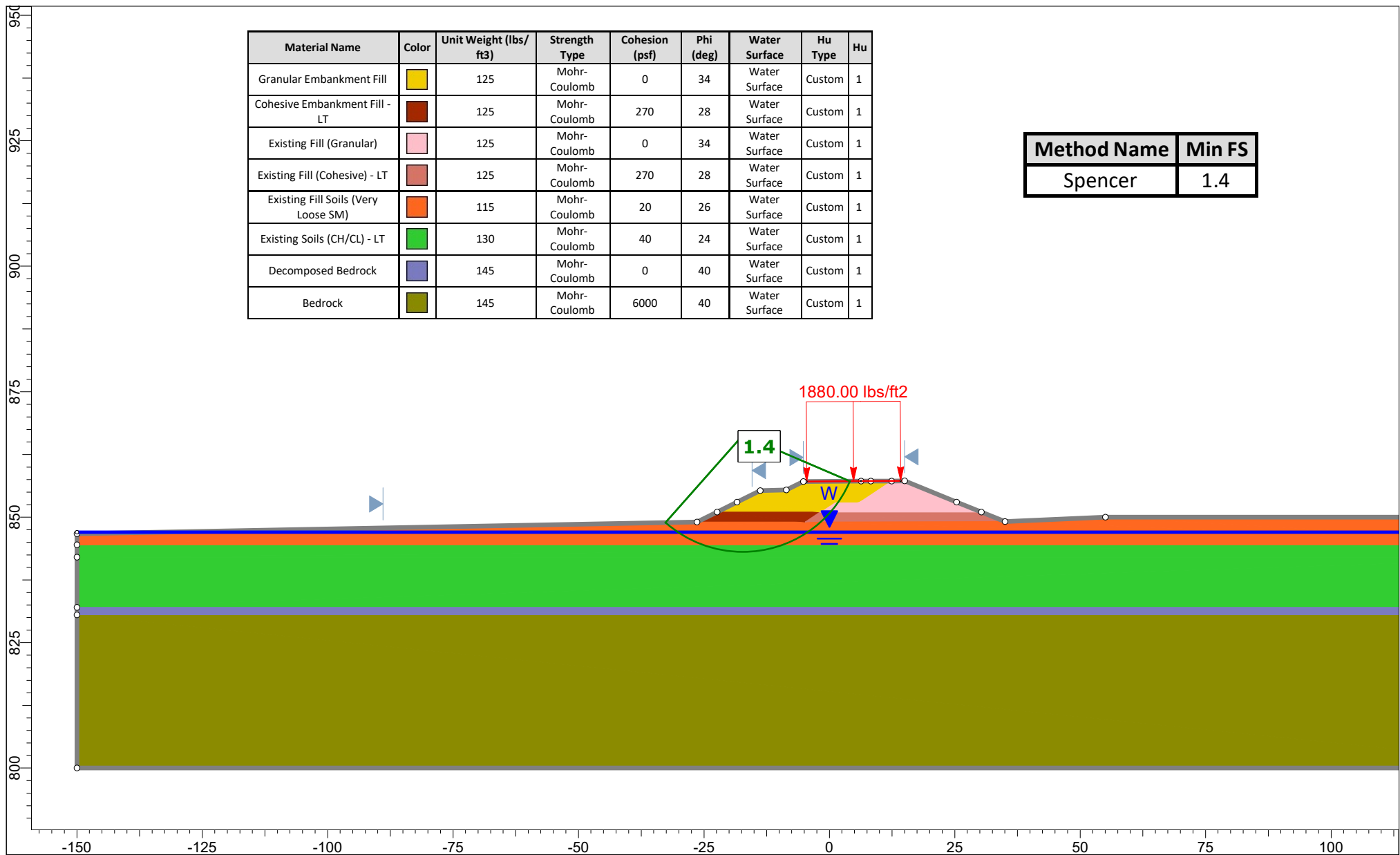
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Granular Embankment Fill		125	Mohr-Coulomb	0	34	Water Surface	Custom	1
Cohesive Embankment Fill - ST		125	Mohr-Coulomb	1500	0	Water Surface	Custom	1
Existing Fill (Granular)		125	Mohr-Coulomb	0	34	Water Surface	Custom	1
Existing Fill (Cohesive) - ST		125	Mohr-Coulomb	1500	0	Water Surface	Custom	1
Existing Fill Soils (Very Loose SM)		115	Mohr-Coulomb	20	26	Water Surface	Custom	1
Existing Soils (CH/CL) - ST		130	Mohr-Coulomb	1000	0	Water Surface	Custom	1
Decomposed Bedrock		145	Mohr-Coulomb	0	40	Water Surface	Custom	1
Bedrock		145	Mohr-Coulomb	6000	40	Water Surface	Custom	1

Method Name	Min FS
Spencer	1.4

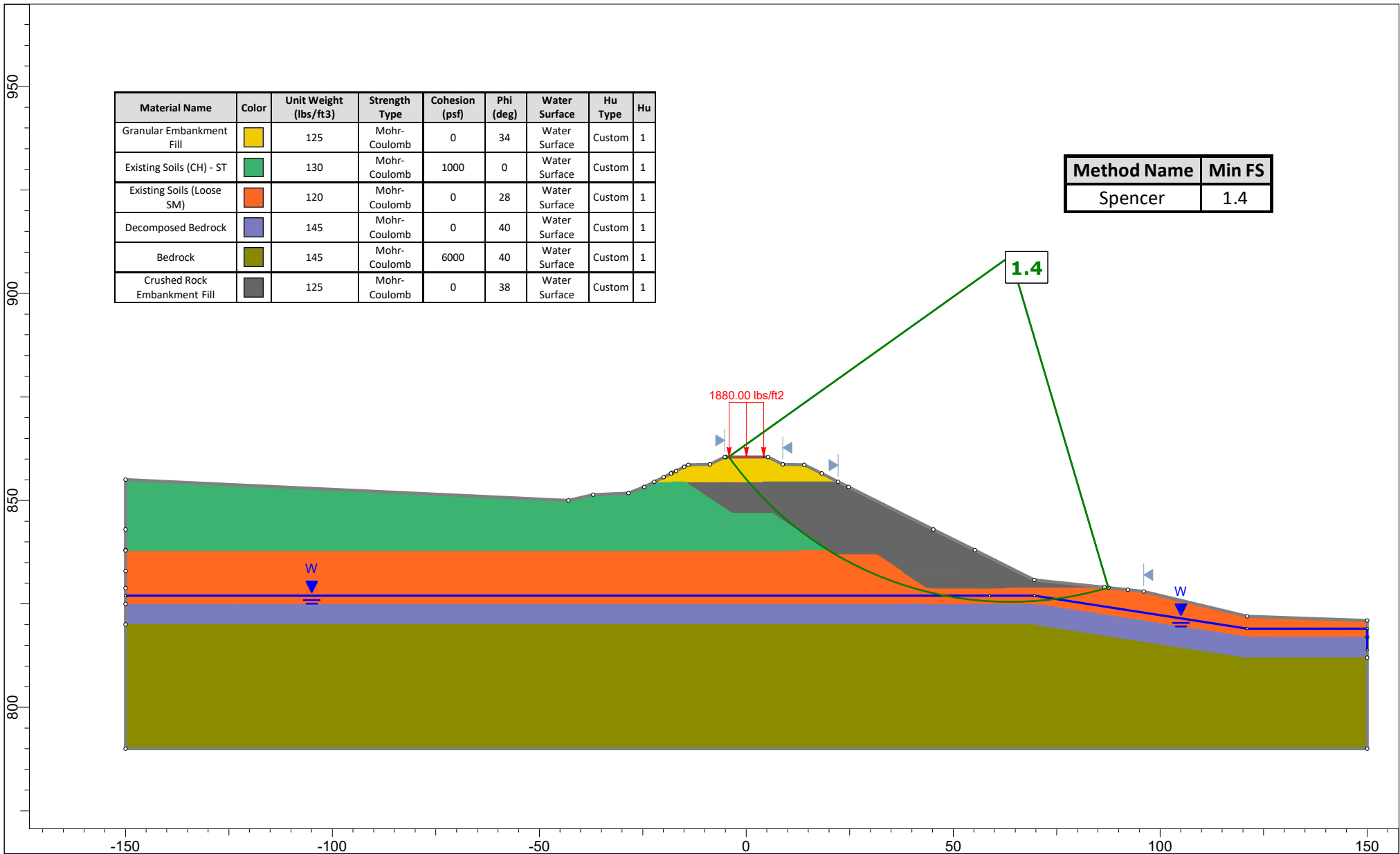
	Project		CSX Railroad Runaround (Item #5-434.00)	
	Group		Short Term (Undrained)	Scenario
	Drawn By		SEB	Company
	Date		1/27/2025, 1:53:17 PM	File Name
				Sta. 1518+00 CSX Runaround ET.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Granular Embankment Fill		125	Mohr-Coulomb	0	34	Water Surface	Custom	1
Cohesive Embankment Fill - LT		125	Mohr-Coulomb	270	28	Water Surface	Custom	1
Existing Fill (Granular)		125	Mohr-Coulomb	0	34	Water Surface	Custom	1
Existing Fill (Cohesive) - LT		125	Mohr-Coulomb	270	28	Water Surface	Custom	1
Existing Fill Soils (Very Loose SM)		115	Mohr-Coulomb	20	26	Water Surface	Custom	1
Existing Soils (CH/CL) - LT		130	Mohr-Coulomb	40	24	Water Surface	Custom	1
Decomposed Bedrock		145	Mohr-Coulomb	0	40	Water Surface	Custom	1
Bedrock		145	Mohr-Coulomb	6000	40	Water Surface	Custom	1

Method Name	Min FS
Spencer	1.4



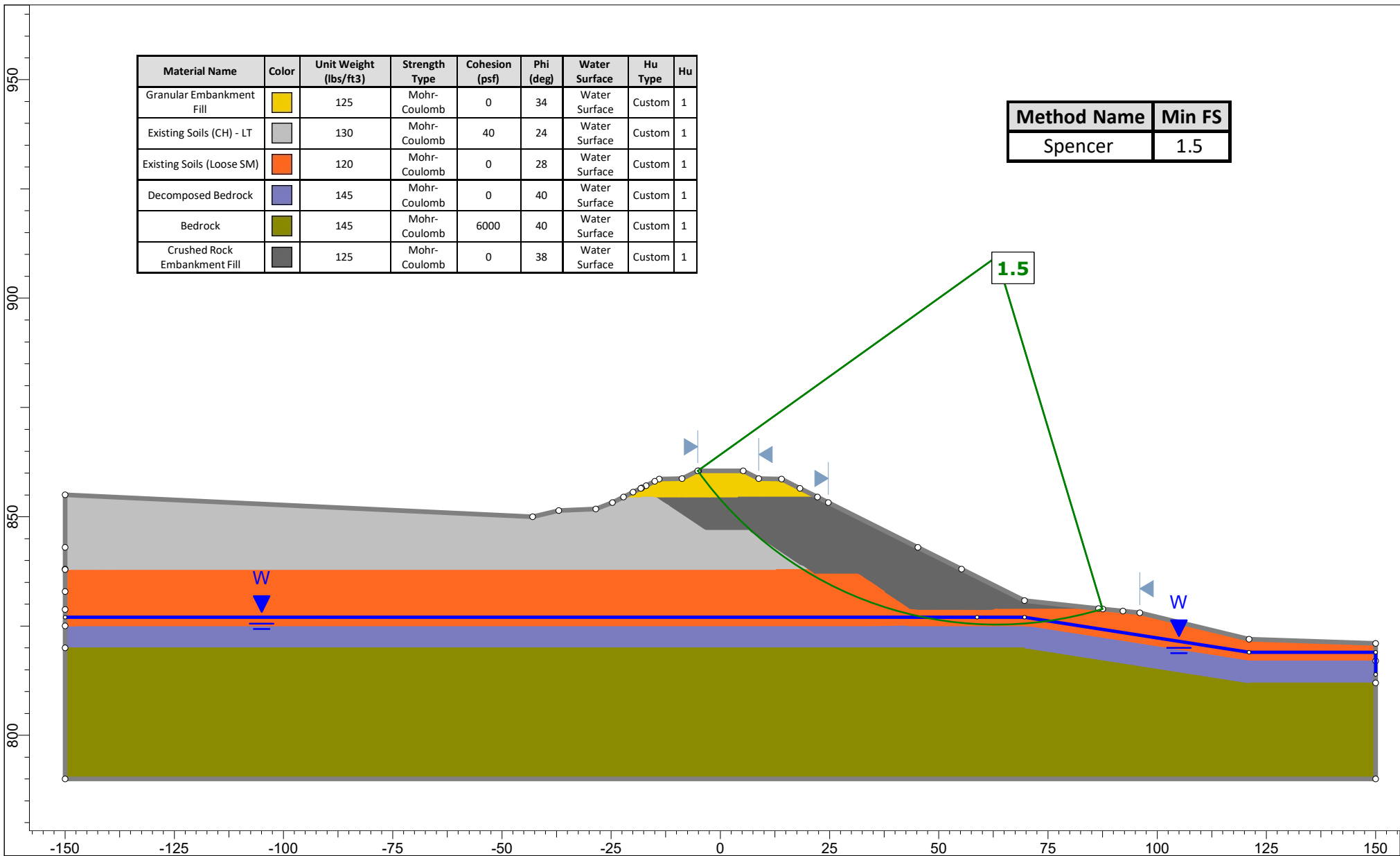
Project	CSX Railroad Runaround (Item #5-434.00)		
Group	Long Term (Drained)	Scenario	Granular Embankment Fill
Drawn By	SEB	Company	DLZ
Date	1/27/2025, 1:53:17 PM	File Name	Sta. 1518+00 CSX Runaround ET.slmd



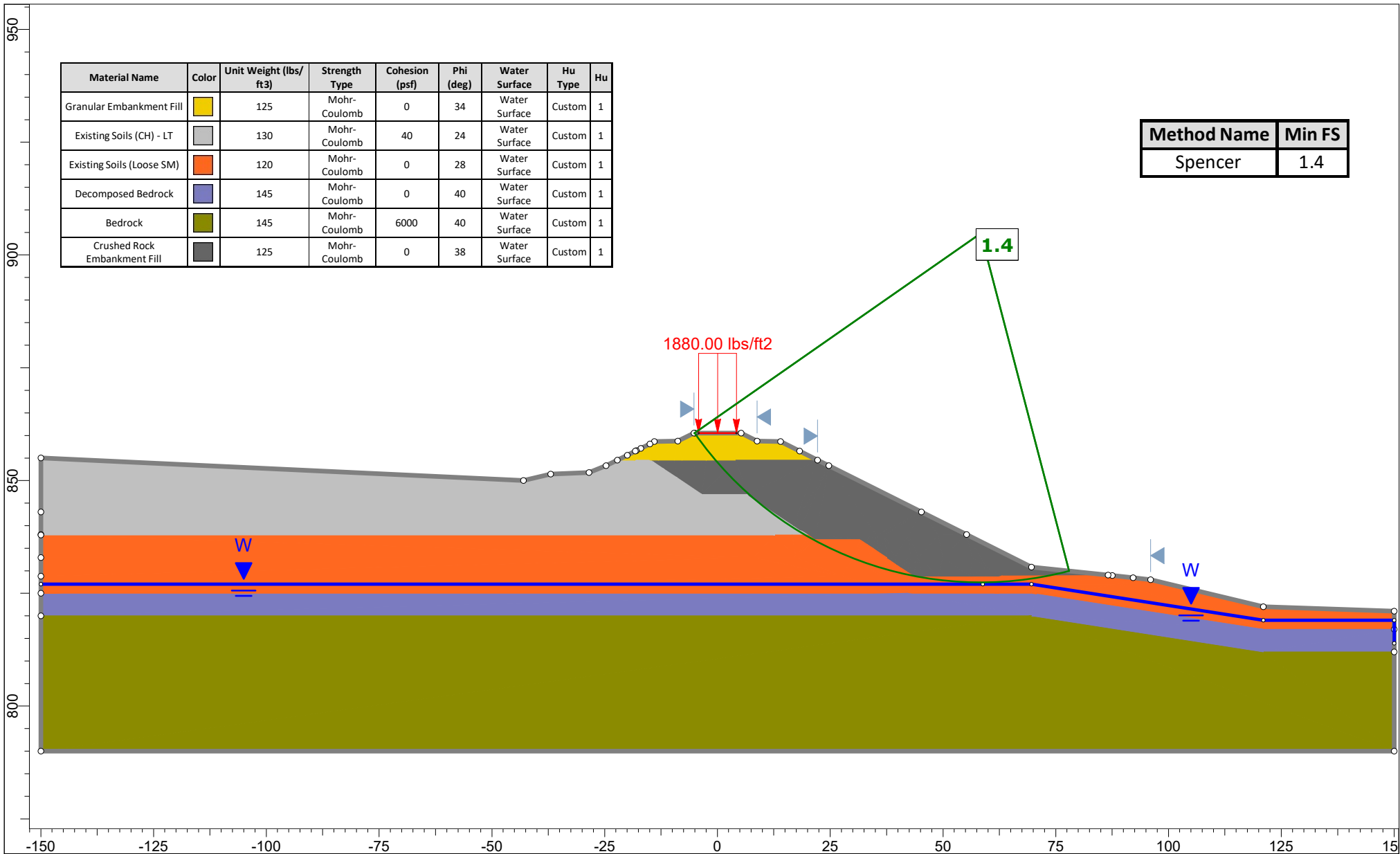
	Project		CSX Railroad Runaround (Item #5-434.00)	
	Group	Short Term (Crushed Rock Embankment Fill)	Scenario	Granular Embankment Fill
	Drawn By	SEB	Company	DLZ
	Date	1/27/2025, 1:53:17 PM	File Name	Sta. 1526+00 CSX Runaround ET.slmd
	SLIDEINTERPRET 9.010			

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Granular Embankment Fill		125	Mohr-Coulomb	0	34	Water Surface	Custom	1
Existing Soils (CH) - LT		130	Mohr-Coulomb	40	24	Water Surface	Custom	1
Existing Soils (Loose SM)		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Decomposed Bedrock		145	Mohr-Coulomb	0	40	Water Surface	Custom	1
Bedrock		145	Mohr-Coulomb	6000	40	Water Surface	Custom	1
Crushed Rock Embankment Fill		125	Mohr-Coulomb	0	38	Water Surface	Custom	1

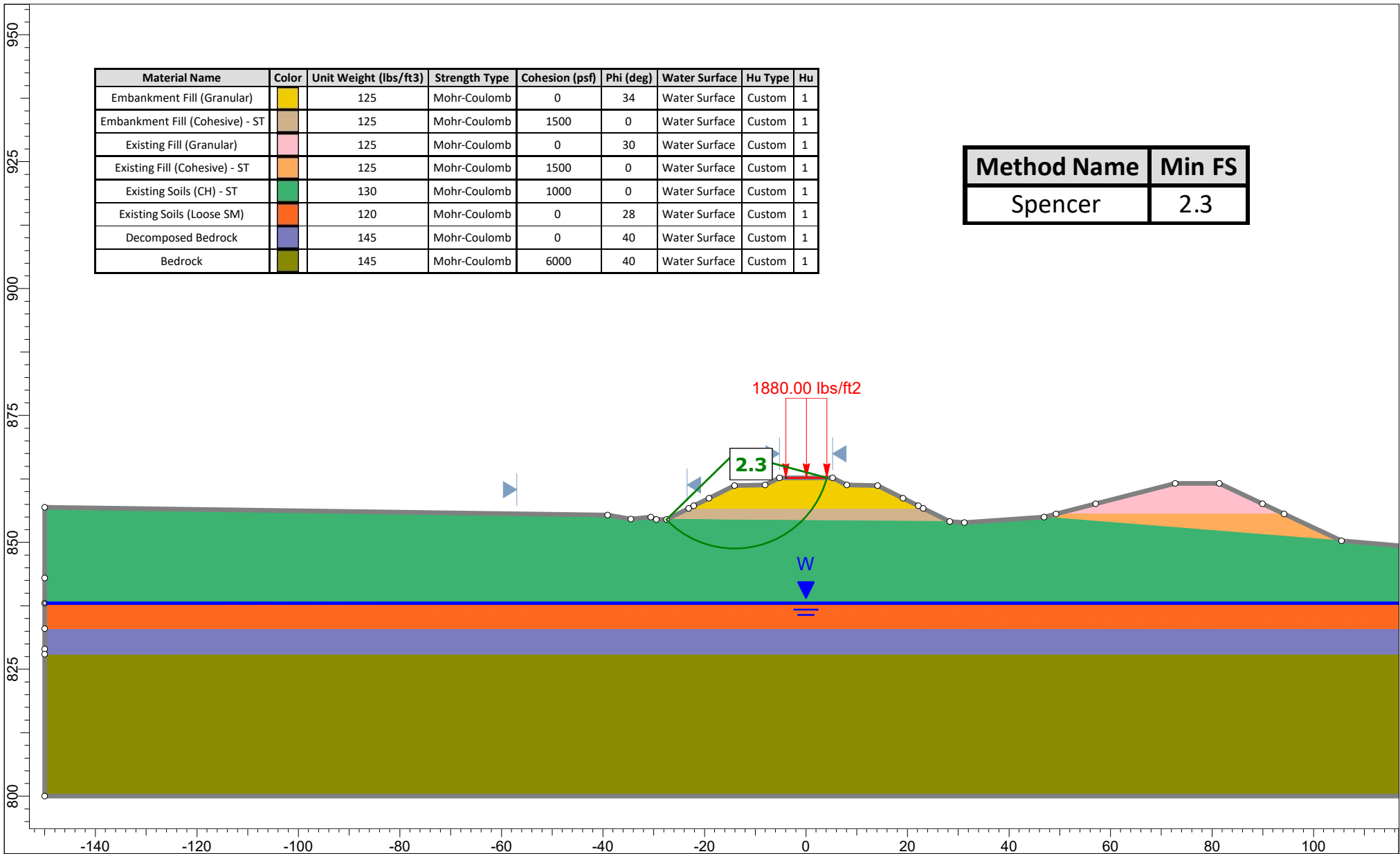
Method Name	Min FS
Spencer	1.5



Project			CSX Railroad Runaround (Item #5-434.00)		
Group		Long Term (Crushed Rock Embankment Fill, Lower Bedrock)		Scenario	
				Granular Fill (no surcharge)	
Drawn By		SEB		Company	
				DLZ	
Date		1/27/2025, 1:53:17 PM		File Name	
				Sta. 1526+00 CSX Runaround ET.slmd	



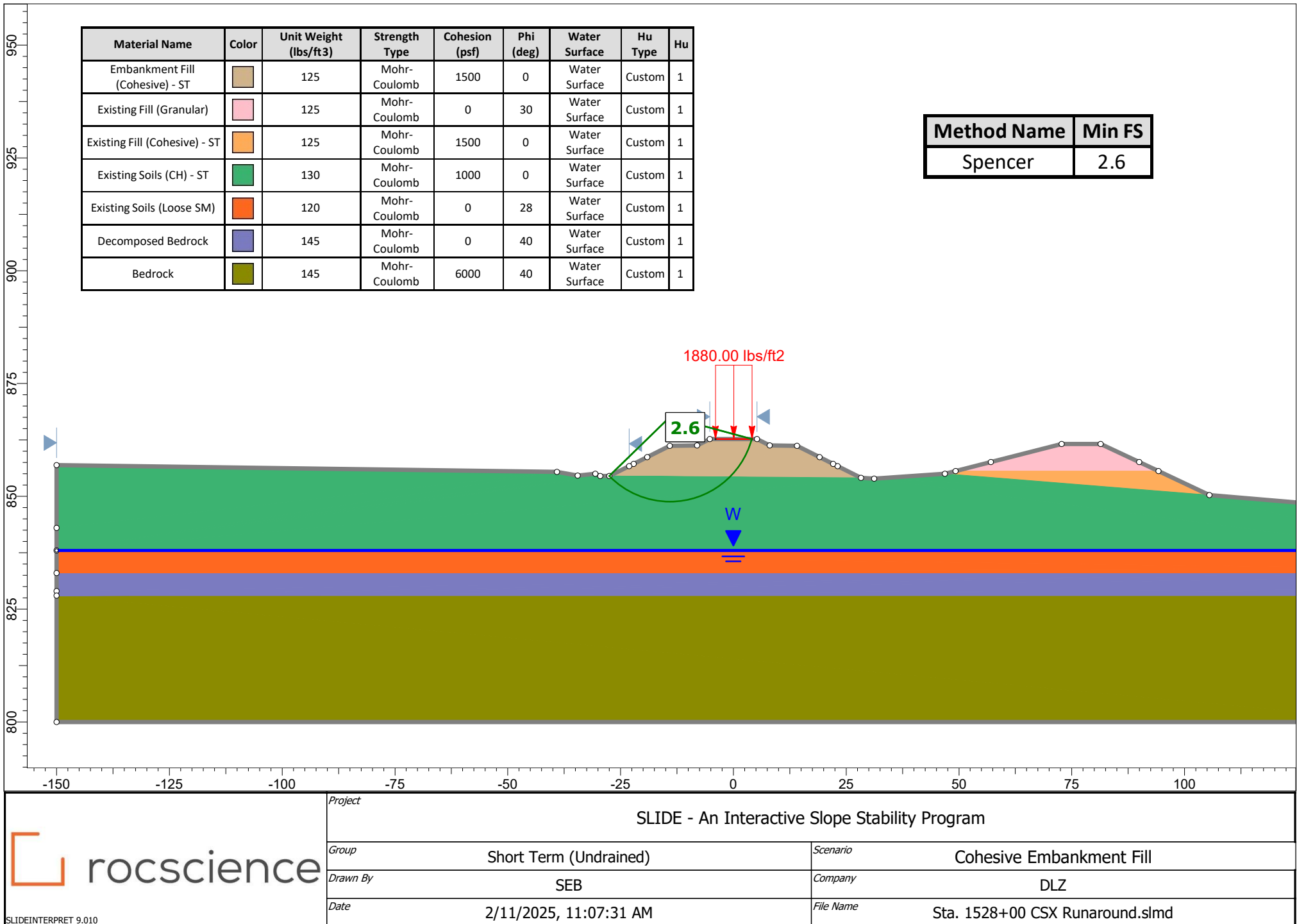
Project			CSX Railroad Runaround (Item #5-434.00)		
Group		Long Term (Crushed Rock Embankment Fill, Lower Bedrock)		Scenario	
				Granular Embankment Fill	
Drawn By		SEB		Company	
				DLZ	
Date		1/27/2025, 1:53:17 PM		File Name	
				Sta. 1526+00 CSX Runaround ET.slmd	



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Embankment Fill (Granular)		125	Mohr-Coulomb	0	34	Water Surface	Custom	1
Embankment Fill (Cohesive) - ST		125	Mohr-Coulomb	1500	0	Water Surface	Custom	1
Existing Fill (Granular)		125	Mohr-Coulomb	0	30	Water Surface	Custom	1
Existing Fill (Cohesive) - ST		125	Mohr-Coulomb	1500	0	Water Surface	Custom	1
Existing Soils (CH) - ST		130	Mohr-Coulomb	1000	0	Water Surface	Custom	1
Existing Soils (Loose SM)		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Decomposed Bedrock		145	Mohr-Coulomb	0	40	Water Surface	Custom	1
Bedrock		145	Mohr-Coulomb	6000	40	Water Surface	Custom	1

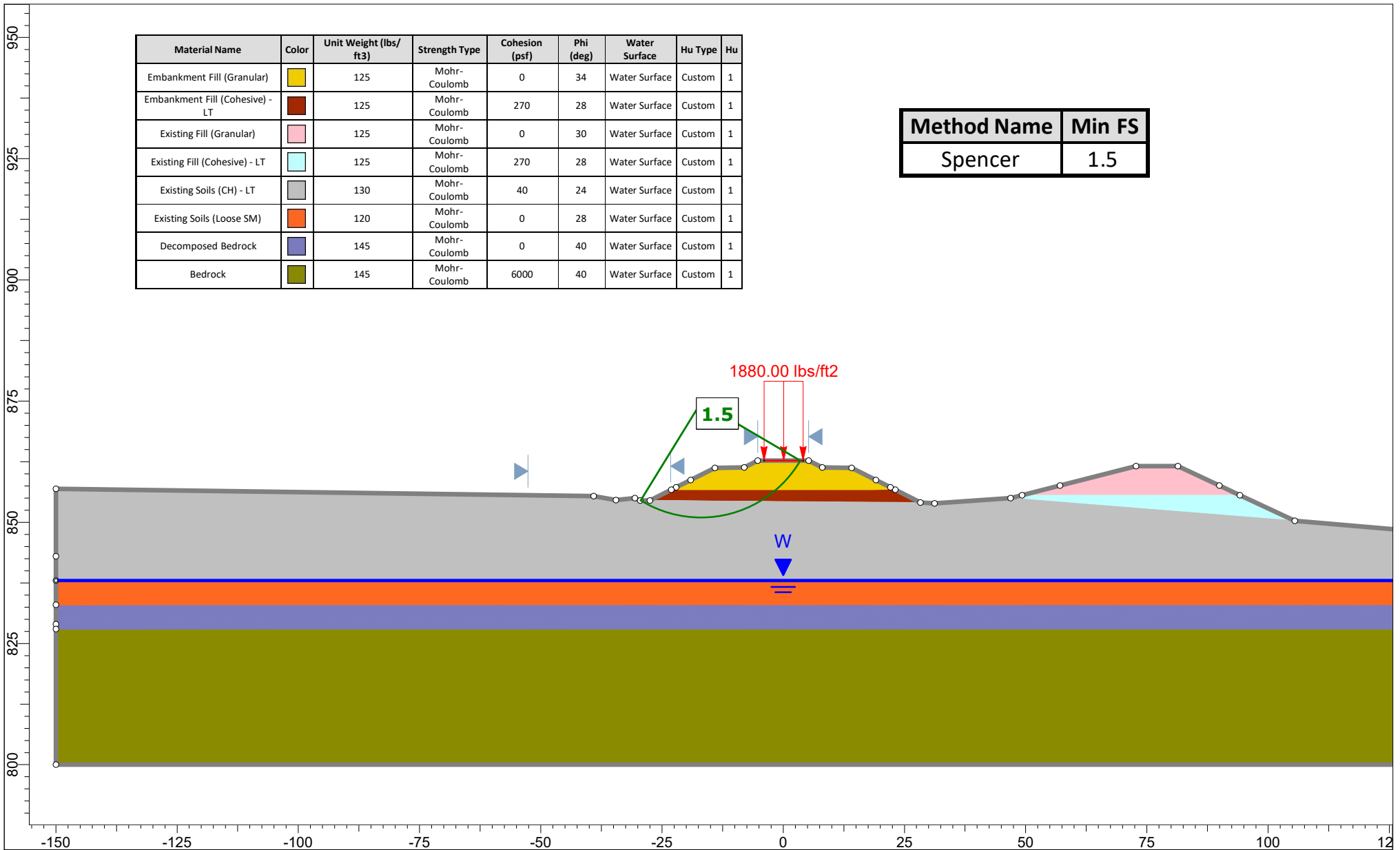
Method Name	Min FS
Spencer	2.3

	Project		SLIDE - An Interactive Slope Stability Program	
	Group	Short Term (Undrained)	Scenario	Granular Embankment Fill
	Drawn By	SEB	Company	DLZ
	Date	2/11/2025, 11:07:31 AM	File Name	Sta. 1528+00 CSX Runaround.slmd
	SLIDEINTERPRET 9.010			

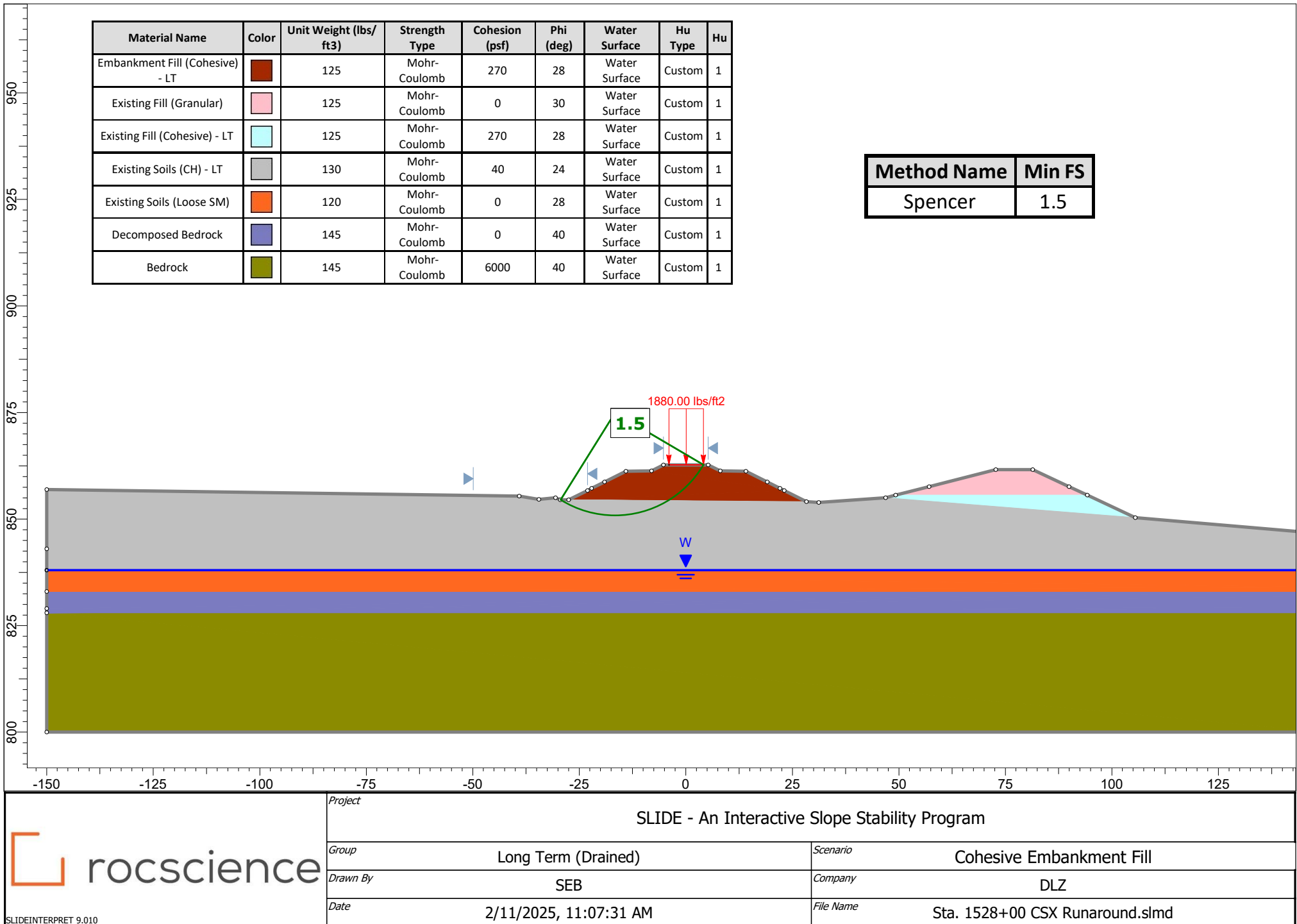


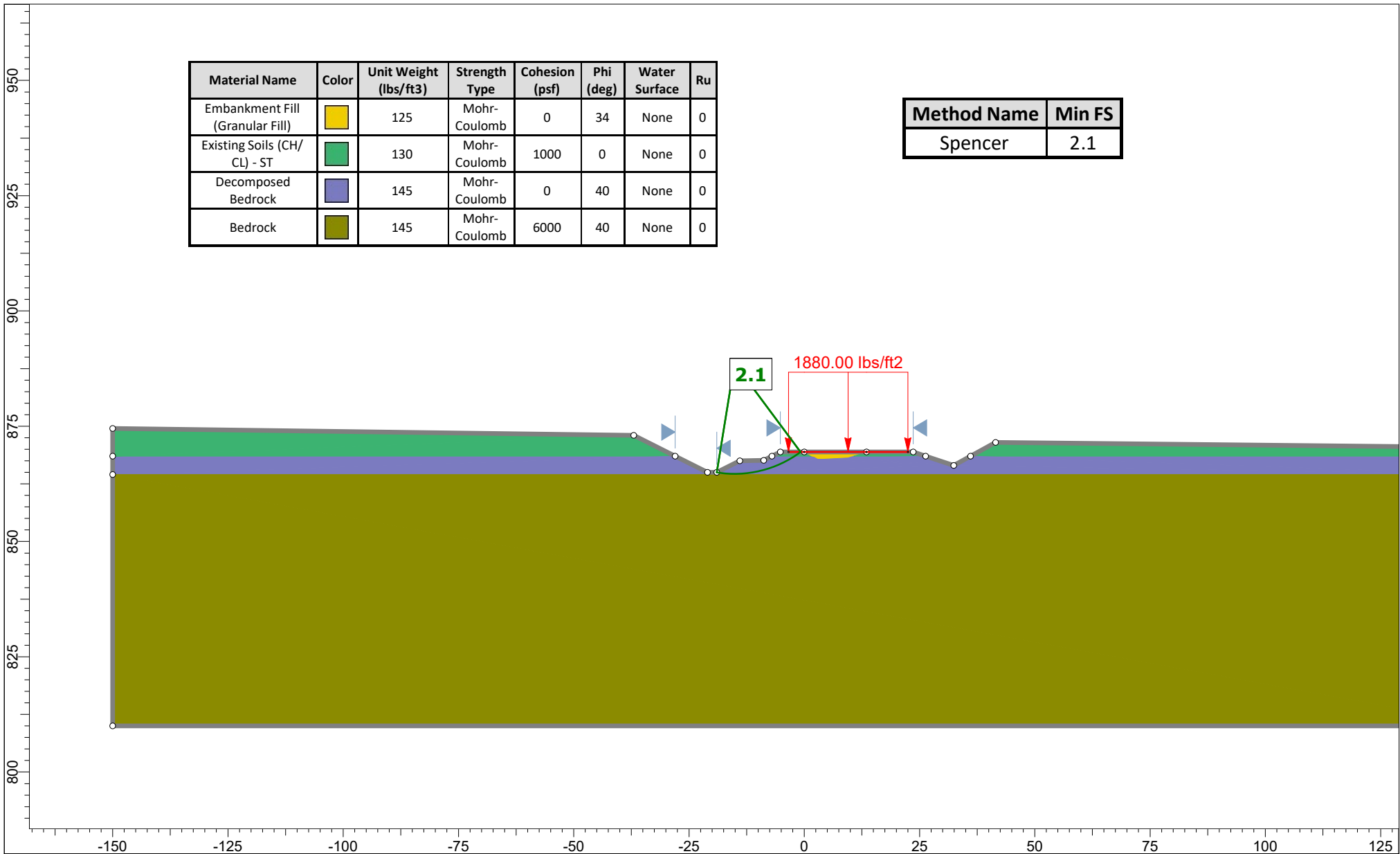
Material Name	Color	Unit Weight (lbs/ft ³)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Embankment Fill (Granular)		125	Mohr-Coulomb	0	34	Water Surface	Custom	1
Embankment Fill (Cohesive) - LT		125	Mohr-Coulomb	270	28	Water Surface	Custom	1
Existing Fill (Granular)		125	Mohr-Coulomb	0	30	Water Surface	Custom	1
Existing Fill (Cohesive) - LT		125	Mohr-Coulomb	270	28	Water Surface	Custom	1
Existing Soils (CH) - LT		130	Mohr-Coulomb	40	24	Water Surface	Custom	1
Existing Soils (Loose SM)		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Decomposed Bedrock		145	Mohr-Coulomb	0	40	Water Surface	Custom	1
Bedrock		145	Mohr-Coulomb	6000	40	Water Surface	Custom	1

Method Name	Min FS
Spencer	1.5



Project				SLIDE - An Interactive Slope Stability Program	
Group		Long Term (Drained)		Scenario	Granular Embankment Fill
Drawn By		SEB		Company	DLZ
Date		2/11/2025, 11:07:31 AM		File Name	Sta. 1528+00 CSX Runaround.slmd

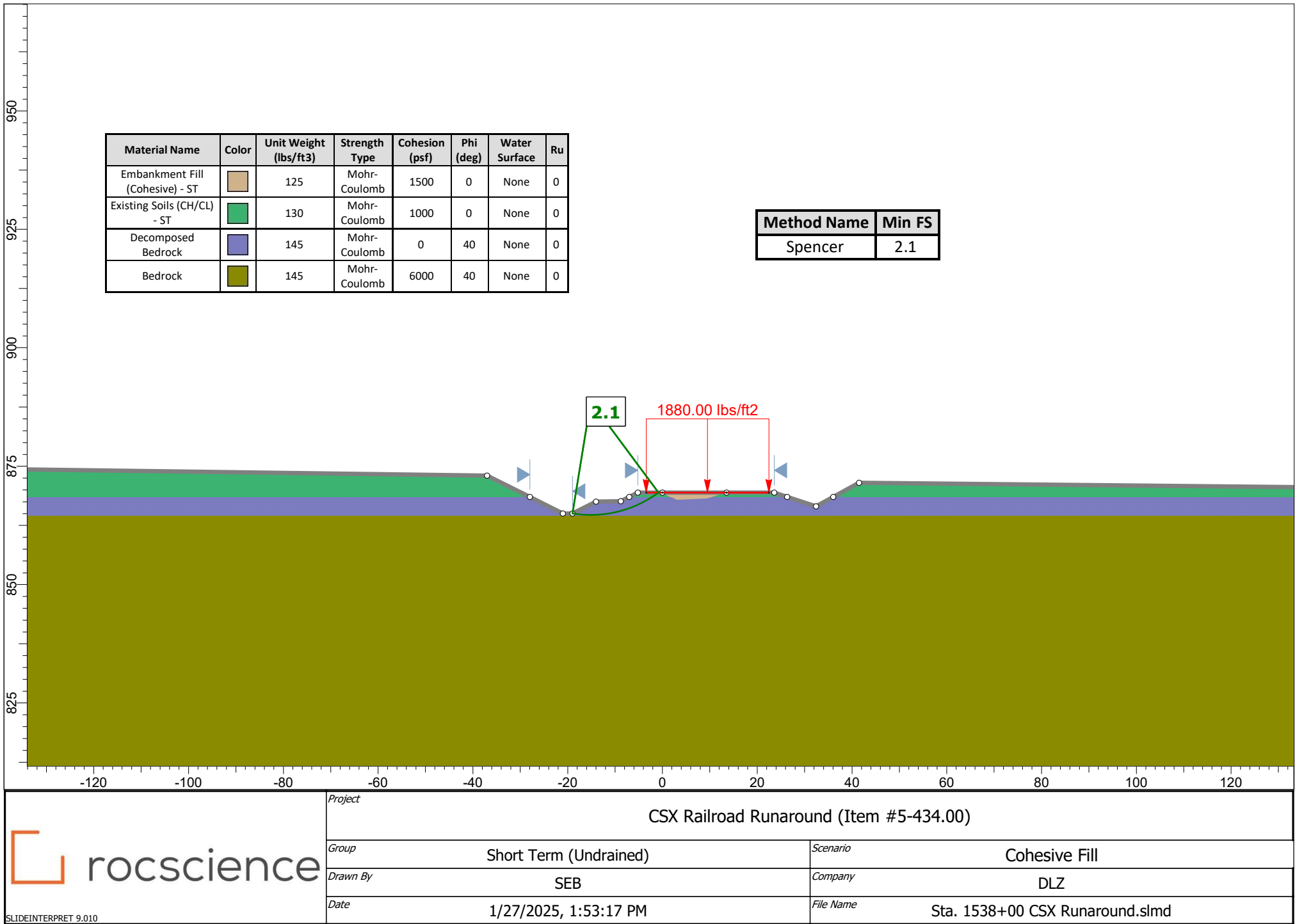


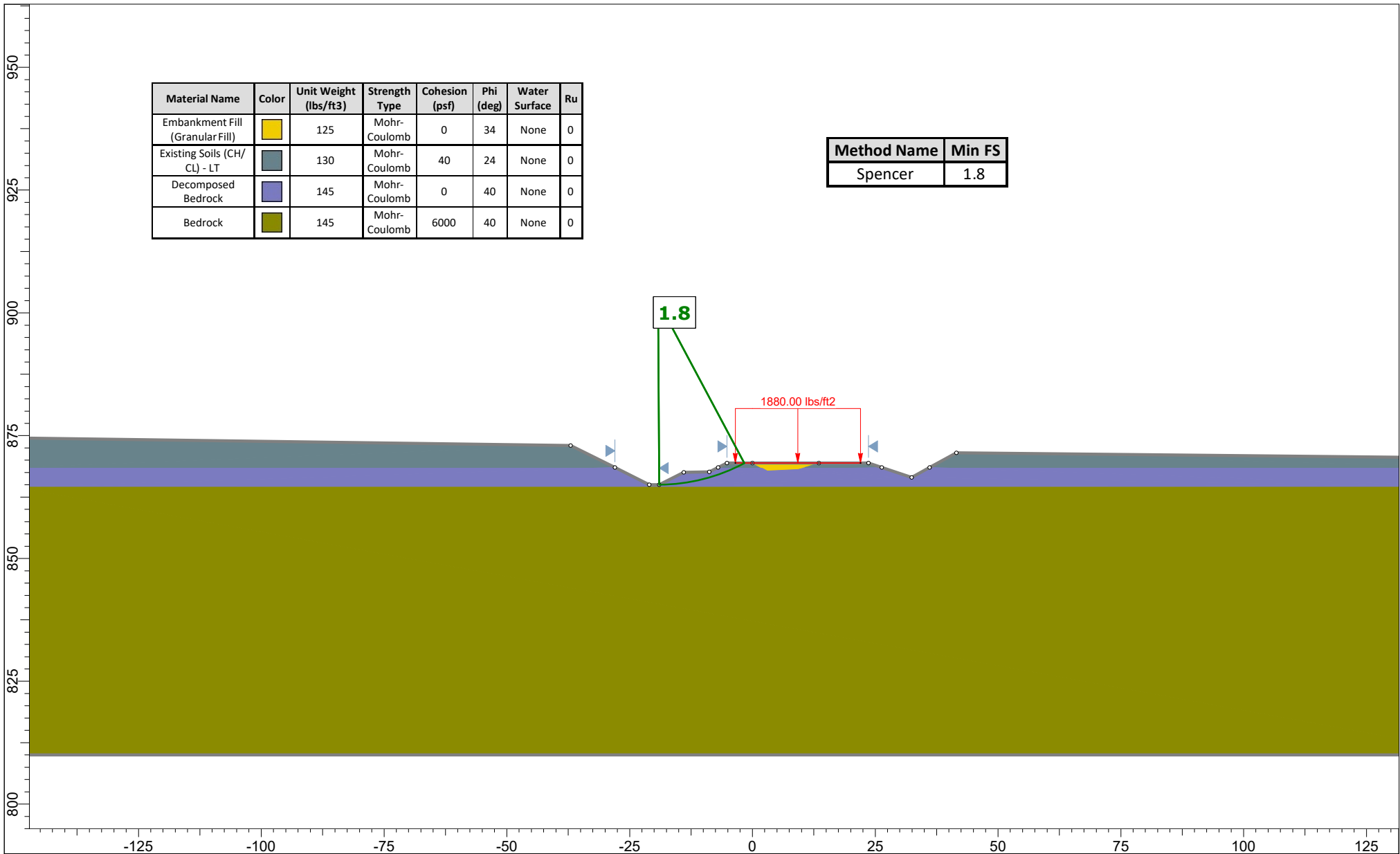


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Embankment Fill (Granular Fill)		125	Mohr-Coulomb	0	34	None	0
Existing Soils (CH/CL) - ST		130	Mohr-Coulomb	1000	0	None	0
Decomposed Bedrock		145	Mohr-Coulomb	0	40	None	0
Bedrock		145	Mohr-Coulomb	6000	40	None	0

Method Name	Min FS
Spencer	2.1

	Project		CSX Railroad Runaround (Item #5-434.00)	
	Group		Short Term (Undrained)	Scenario Granular Fill
	Drawn By		SEB	Company DLZ
	Date		1/27/2025, 1:53:17 PM	File Name Sta. 1538+00 CSX Runaround.slmd
	SLIDEINTERPRET 9.010			





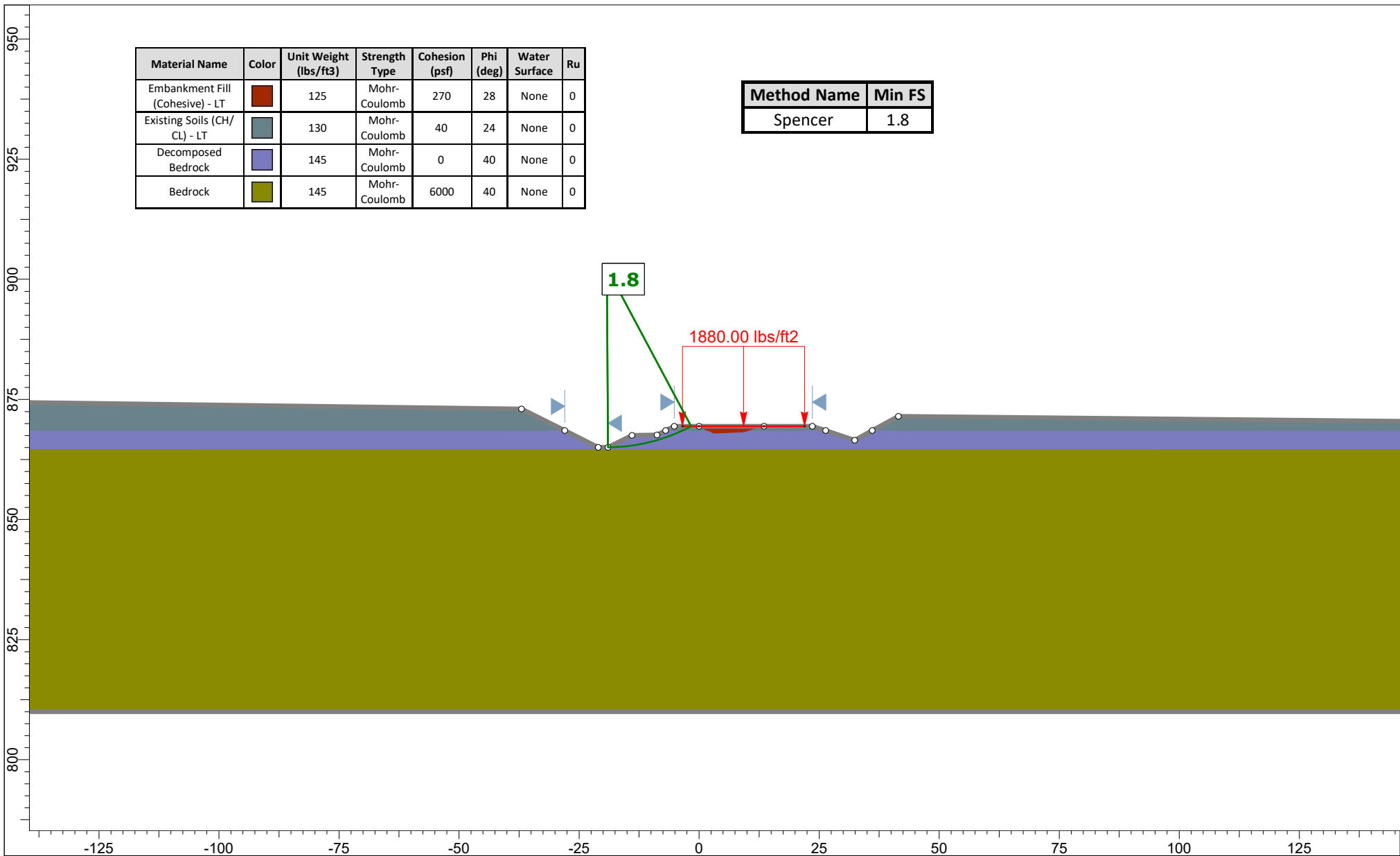
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Embankment Fill (Granular Fill)		125	Mohr-Coulomb	0	34	None	0
Existing Soils (CH/CL) - LT		130	Mohr-Coulomb	40	24	None	0
Decomposed Bedrock		145	Mohr-Coulomb	0	40	None	0
Bedrock		145	Mohr-Coulomb	6000	40	None	0

Method Name	Min FS
Spencer	1.8

	Project		CSX Railroad Runaround (Item #5-434.00)	
	Group		Long Term (Drained)	Scenario
	Drawn By		SEB	Company
	Date		1/27/2025, 1:53:17 PM	File Name
				Sta. 1538+00 CSX Runaround.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Embankment Fill (Cohesive) - LT		125	Mohr-Coulomb	270	28	None	0
Existing Soils (CH/CL) - LT		130	Mohr-Coulomb	40	24	None	0
Decomposed Bedrock		145	Mohr-Coulomb	0	40	None	0
Bedrock		145	Mohr-Coulomb	6000	40	None	0

Method Name	Min FS
Spencer	1.8



Project		CSX Railroad Runaround (Item #5-434.00)	
Group	Long Term (Drained)	Scenario	Cohesive Fill
Drawn By	SEB	Company	DLZ
Date	1/27/2025, 1:53:17 PM	File Name	Sta. 1538+00 CSX Runaround.slmd



SUBJECT

Client KYTC

JOB NUMBER

0631-0006.02

Project CSX Runaround (Item #5-434.00)

SHEET NO.

1

OF

2

Item Settlement (STA. 1518+00)

COMP. BY

SEB

DATE

1/29/2025

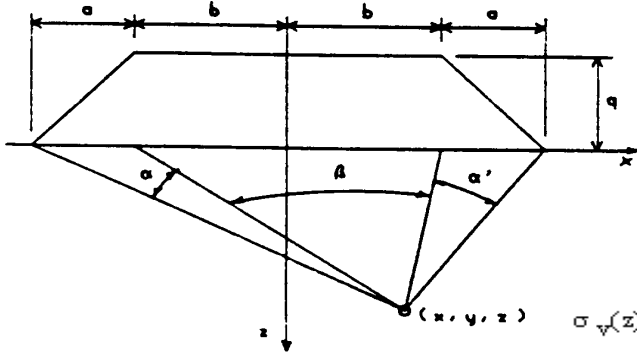
Based on Boring B-03

CHECKED BY

EWT

DATE

2/17/2025

Settlement 1 (Existing Embankment with Sidehill Fill)**SETTLEMENT ANALYSIS - EMBANKMENT****Embankment Informaiton:**

Groundwater Table: D= 18.0 ft

Embankment Height: H = 8 ft

Fill Unit Weight: $\gamma_{emb} = 125$ pcf

q = 1,000 psf

Width of Slope: a = 16.4

Top half-width of Emb: b = 12.5

Distance from CL: x = 21.4

Output Range: z = 0 to 30 ft

*See Data output Attached

$$\sigma_v(z) := \left(\frac{q}{\pi a} \right) \left(a \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + b \cdot (\alpha(z) + \alpha'(z)) + x \cdot (\alpha(z) - \alpha'(z)) \right)$$
$$\beta(z) := \text{atan} \left[\frac{(b-x)}{z} \right] + \text{atan} \left[\frac{(b+x)}{z} \right]$$
$$\alpha'(z) := \text{atan} \left[\frac{(a+b-x)}{z} \right] - \text{atan} \left[\frac{(b-x)}{z} \right]$$
$$\alpha(z) := \text{atan} \left[\frac{(a+b+x)}{z} \right] - \text{atan} \left[\frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

Cohesionless

Soil Properites:

Settlement is calculated at mid-point of layer

Soil Properites:			Settlement is calculated at mid-point of layer						Soils		Cohesive Soils	
No.	Bot. of Laye		Soil Type	γ_{soil} (pcf)	σ'_{c} (psf)	σ'_{o} (psf)	$\Delta\sigma_z$ (psf)	σ'_{f} (psf)	C'	C _r	C _c	e _o
1	5.0	ft	Granular Fill	115	2,000	288	458	745	25.0			
2	13.0	ft	CH/CL	130	2,000	1,095	464	1,559		0.023	0.23	0.63
3	18.0	ft	CH/CL	130	3,000	1,940	466	2,406		0.029	0.29	0.80
4	20.0	ft	Decomposed Rx	145	5,000	2,348	463	2,810	300.0			
5	30.0	ft	Bedrock	145	10,000	2,843	451	3,295	10000.0			
6				0	0							
7				0	0							
8				0	0							
9				0	0							
10				0	0							

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999

Overconsolidated Soils - Case I ($\sigma'_0 < \sigma'_c$) Eqn:11.24

$$(\delta_c)_{ult} = \sum \frac{C_r}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

Overconsolidated Soils - Case II ($\sigma'_0 < \sigma'_c < \sigma'_f$) Eqn:11.25

$$(\delta_c)_{ult} = \sum \left[\frac{C_r}{1+e_0} H \log \left(\frac{\sigma'_c}{\sigma'_0} \right) + \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_c} \right) \right]$$

Normally Consolidated Soils ($\sigma'_0 = \sigma'_c$) Eqn: 11.23

$$(\delta_c)_{ult} = \sum \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ($\sigma'_0 = \sigma'_c$)

$$(\delta_c)_{ult} = \sum \frac{1}{C'} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

No. Settlement: Total Se aqw

1	0.083	ft	0.99	in
2	0.017	ft	0.21	in
3	0.008	ft	0.09	in
4	0.001	ft	0.01	in
5	0.000	ft	0.00	in

0.108 ft**1.30 in**



SUBJECT

Client KYTC

JOB NUMBER

0631-0006.02

Project CSX Runaround (Item #5-434.00)

SHEET NO.

1

OF

2

Item Settlement (STA. 1518+00)

COMP. BY

SEB

DATE

1/29/2025

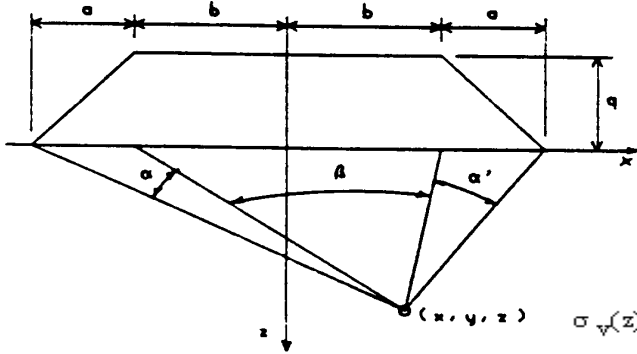
Based on Boring B-03

CHECKED BY

EWT

DATE

2/17/2025

Settlement 2 (Existing Embankment Only)**SETTLEMENT ANALYSIS - EMBANKMENT****Embankment Informaiton:**

Groundwater Table: D= 18.0 ft

Embankment Height: H= 8 ft

Fill Unit Weight: $\gamma_{emb} = 125$ pcf

q = 1,000 psf

Width of Slope: a = 25.2

Top half-width of Emb: b = 4.4

Distance from CL: x = 29.6

Output Range: z = 0 to 30 ft

*See Data output Attached

$$\sigma_v(z) := \left(\frac{q}{\pi a} \right) \left(a \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + b \cdot (\alpha(z) + \alpha'(z)) + x \cdot (\alpha(z) - \alpha'(z)) \right)$$

$$\beta(z) := \text{atan} \left[\frac{(b-x)}{z} \right] + \text{atan} \left[\frac{(b+x)}{z} \right]$$

$$\alpha'(z) := \text{atan} \left[\frac{(a+b-x)}{z} \right] - \text{atan} \left[\frac{(b-x)}{z} \right]$$

$$\alpha(z) := \text{atan} \left[\frac{(a+b+x)}{z} \right] - \text{atan} \left[\frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

Cohesionless

Soil Properites:

Settlement is calculated at mid-point of layer

Soil Properites:			Settlement is calculated at mid-point of layer						Soils		Cohesive Soils	
No.	Bot. of Laye		Soil Type	γ_{soil} (pcf)	σ'_{c} (psf)	σ'_{o} (psf)	$\Delta\sigma_z$ (psf)	σ'_{f} (psf)	C'	C _r	C _c	e _o
1	5.0	ft	Granular Fill	115	2,000	288	30	318	25.0			
2	13.0	ft	CH/CL	130	2,000	1,095	108	1,203		0.023	0.23	0.63
3	18.0	ft	CH/CL	130	3,000	1,940	166	2,106		0.029	0.29	0.80
4	20.0	ft	Decomposed Rx	145	5,000	2,348	192	2,539	300.0			
5	30.0	ft	Bedrock	145	10,000	2,843	222	3,065	10000.0			
6				0	0							
7				0	0							
8				0	0							
9				0	0							
10				0	0							

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999

Overconsolidated Soils - Case I ($\sigma'_0 < \sigma'_c$) Eqn:11.24

$$(\delta_c)_{ult} = \sum \frac{C_r}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

Overconsolidated Soils - Case II ($\sigma'_0 < \sigma'_c < \sigma'_f$) Eqn:11.25

$$(\delta_c)_{ult} = \sum \left[\frac{C_r}{1+e_0} H \log \left(\frac{\sigma'_c}{\sigma'_0} \right) + \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_c} \right) \right]$$

Normally Consolidated Soils ($\sigma'_0 = \sigma'_c$) Eqn: 11.23

$$(\delta_c)_{ult} = \sum \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ($\sigma'_0 = \sigma'_c$)

$$(\delta_c)_{ult} = \sum \frac{1}{C'} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

No. Settlement: Total Se aqw

1	0.009	ft	0.10	in
2	0.005	ft	0.06	in
3	0.003	ft	0.03	in
4	0.000	ft	0.00	in
5	0.000	ft	0.00	in

0.016 ft**0.20 in**



SUBJECT

Client KYTC

JOB NUMBER

0631-0006.02

Project CSX Runaround (Item #5-434.00)

SHEET NO.

1

OF

2

Item Settlement (STA. 1518+00)

COMP. BY

SEB

DATE

1/29/2025

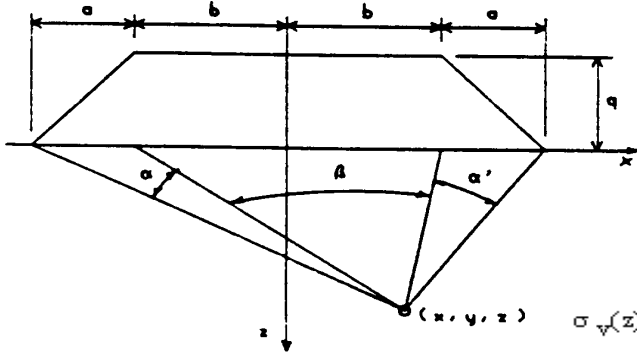
Based on Boring B-03 (5-FT UNDERCUT)

CHECKED BY

EWT

DATE

2/17/2025

Settlement 1 (Existing Embankment with Sidehill Fill)**SETTLEMENT ANALYSIS - EMBANKMENT****Embankment Informaiton:**

Groundwater Table: D= 18.0 ft

Embankment Height: H = 8 ft

Fill Unit Weight: $\gamma_{emb} = 125$ pcf $q = 1,000$ psf

Width of Slope: a = 16.4

Top half-width of Emb: b = 12.5

Distance from CL: x = 21.4

Output Range: z = 0 to 30 ft

*See Data output Attached

$$\sigma_v(z) := \left(\frac{q}{\pi a} \right) \left(a \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + b \cdot (\alpha(z) + \alpha'(z)) + x \cdot (\alpha(z) - \alpha'(z)) \right)$$
$$\beta(z) := \arctan \left[\frac{(b-x)}{z} \right] + \arctan \left[\frac{(b+x)}{z} \right]$$
$$\alpha'(z) := \arctan \left[\frac{(a+b-x)}{z} \right] - \arctan \left[\frac{(b-x)}{z} \right]$$
$$\alpha(z) := \arctan \left[\frac{(a+b+x)}{z} \right] - \arctan \left[\frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

Cohesionless

Soil Properites:

Settlement is calculated at mid-point of layer

Soil Properites:			Settlement is calculated at mid-point of layer						Soils		Cohesive Soils	
No.	Bot. of Laye		Soil Type	γ_{soil} (pcf)	σ'_{c} (psf)	σ'_{o} (psf)	$\Delta\sigma_z$ (psf)	σ'_{f} (psf)	C'	C _r	C _c	e _o
1	5.0	ft	Granular Fill	125	2,000	313	458	770	250.0			
2	13.0	ft	CH/CL	130	2,000	1,145	464	1,609		0.023	0.23	0.63
3	18.0	ft	CH/CL	130	3,000	1,990	466	2,456		0.029	0.29	0.80
4	20.0	ft	Decomposed Rx	145	5,000	2,398	463	2,860	300.0			
5	30.0	ft	Bedrock	145	10,000	2,893	451	3,345	10000.0			
6				0	0							
7				0	0							
8				0	0							
9				0	0							
10				0	0							

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999

Overconsolidated Soils - Case I ($\sigma'_0 < \sigma'_c$) Eqn:11.24

$$(\delta_c)_{ult} = \sum \frac{C_r}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

Overconsolidated Soils - Case II ($\sigma'_0 < \sigma'_c < \sigma'_f$) Eqn:11.25

$$(\delta_c)_{ult} = \sum \left[\frac{C_r}{1+e_0} H \log \left(\frac{\sigma'_c}{\sigma'_0} \right) + \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_c} \right) \right]$$

Normally Consolidated Soils ($\sigma'_0 = \sigma'_c$) Eqn: 11.23

$$(\delta_c)_{ult} = \sum \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ($\sigma'_0 = \sigma'_c$)

$$(\delta_c)_{ult} = \sum \frac{1}{C'} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

No. Settlement: Total Se aqw

1	0.008	ft	0.09	in
2	0.017	ft	0.20	in
3	0.007	ft	0.09	in
4	0.001	ft	0.01	in
5	0.000	ft	0.00	in

0.032 ft**0.39 in**



SUBJECT

Client KYTC

JOB NUMBER

0631-0006.02

Project CSX Runaround (Item #5-434.00)

SHEET NO.

1

OF

2

Item Settlement (STA. 1518+00)

COMP. BY

SEB

DATE

1/29/2025

Based on Boring B-03 (5-FT UNDERCUT)

CHECKED BY

EWT

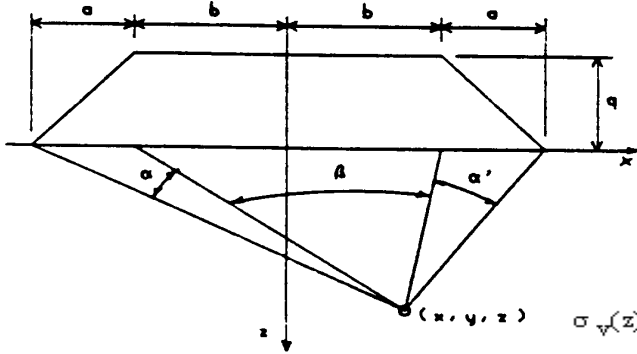
DATE

2/17/2025

Settlement 2 (Existing Embankment Only)

SETTLEMENT ANALYSIS - EMBANKMENT

Embankment Informaiton:



Groundwater Table: D= 18.0 ft

Embankment Height: H= 8 ft

Fill Unit Weight: $\gamma_{emb} = 125$ pcf $q = 1,000$ psf

Width of Slope: a= 25.2

Top half-width of Emb: b= 4.4

Distance from CL: x= 29.6

Output Range: z= 0 to 30 ft

*See Data output Attached

$$\sigma_v(z) := \left(\frac{q}{\pi a} \right) \left(a \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + b \cdot (\alpha(z) + \alpha'(z)) + x \cdot (\alpha(z) - \alpha'(z)) \right)$$

$$\beta(z) := \arctan \left[\frac{(b-x)}{z} \right] + \arctan \left[\frac{(b+x)}{z} \right]$$

$$\alpha'(z) := \arctan \left[\frac{(a+b-x)}{z} \right] - \arctan \left[\frac{(b-x)}{z} \right]$$

$$\alpha(z) := \arctan \left[\frac{(a+b+x)}{z} \right] - \arctan \left[\frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

Cohesionless

Soil Properites:

Settlement is calculated at mid-point of layer

Soil Properites:			Settlement is calculated at mid-point of layer						Soils		Cohesive Soils	
No.	Bot. of Laye		Soil Type	γ_{soil} (pcf)	σ'_{c} (psf)	σ'_{o} (psf)	$\Delta\sigma_z$ (psf)	σ'_{f} (psf)	C'	C _r	C _c	e _o
1	5.0	ft	Granular Fill	125	2,000	313	30	343	250.0			
2	13.0	ft	CH/CL	130	2,000	1,145	108	1,253		0.023	0.23	0.63
3	18.0	ft	CH/CL	130	3,000	1,990	166	2,156		0.029	0.29	0.80
4	20.0	ft	Decomposed Rx	145	5,000	2,398	192	2,589	300.0			
5	30.0	ft	Bedrock	145	10,000	2,893	222	3,115	10000.0			
6				0	0							
7				0	0							
8				0	0							
9				0	0							
10				0	0							

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999

Overconsolidated Soils - Case I ($\sigma'_0 < \sigma'_c$) Eqn:11.24

$$(\delta_c)_{ult} = \sum \frac{C_r}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

Overconsolidated Soils - Case II ($\sigma'_0 < \sigma'_c < \sigma'_f$) Eqn:11.25

$$(\delta_c)_{ult} = \sum \left[\frac{C_r}{1+e_0} H \log \left(\frac{\sigma'_c}{\sigma'_0} \right) + \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_c} \right) \right]$$

Normally Consolidated Soils ($\sigma'_0 = \sigma'_c$) Eqn: 11.23

$$(\delta_c)_{ult} = \sum \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ($\sigma'_0 = \sigma'_c$)

$$(\delta_c)_{ult} = \sum \frac{1}{C'} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

No. Settlement: Total Se aqw

1 0.001 ft 0.01 in

2 0.004 ft 0.05 in

3 0.003 ft 0.03 in

4 0.000 ft 0.00 in

5 0.000 ft 0.00 in

6

7

8

9

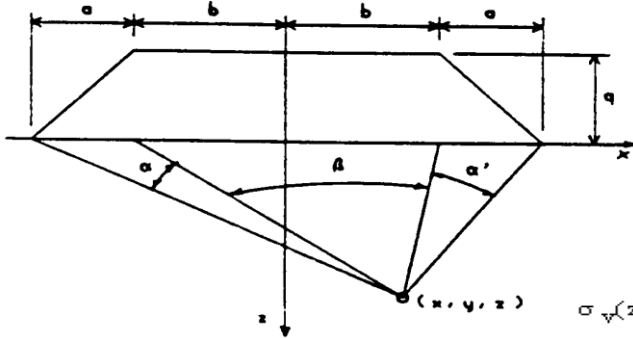
10

0.008 ft

0.10 in

SETTLEMENT ANALYSIS - EMBANKMENT

Embankment Informaiton:



Groundwater Table: D= 11.0 ft

Embankment Height: H= 8.6 ft

Fill Unit Weight: $\gamma_{emb} = 125$ pcf $q = 1,075$ psf

Width of Slope: a= 18

Top half-width of Emb: b= 10

Distance from CL: x= 0

Output Range: z= 0 to 50 ft

*See Data output Attached

$$\sigma_v(z) := \left(\frac{q}{\pi a} \right) (a \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + b \cdot (\alpha(z) + \alpha'(z)) + x \cdot (\alpha(z) - \alpha'(z)))$$

$$\beta(z) := \text{atan} \left[\frac{(b-x)}{z} \right] + \text{atan} \left[\frac{(b+x)}{z} \right]$$

$$\alpha'(z) := \text{atan} \left[\frac{(a+b-x)}{z} \right] - \text{atan} \left[\frac{(b-x)}{z} \right]$$

$$\alpha(z) := \text{atan} \left[\frac{(a+b+x)}{z} \right] - \text{atan} \left[\frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

Cohesionless

Soil Properites:

Settlement is calculated at mid-point of layer

No.	Bot. of Laye	Soil Type	γ_{soil} (pcf)	σ'_c (psf)	σ'_o (psf)	$\Delta\sigma_z$ (psf)	σ'_f (psf)	Cohesive Soils			
								Soils	C _r	C _c	e _o
1	5.0	ft	Fat Clay (CH)	130	2,000	325	1,073	1,398	0.022	0.22	0.611
2	13.5	ft	Fat Clay (CH)	130	3,000	1,203	1,215	2,418	0.025	0.25	0.690
3	18.5	ft	Granular Soils	120	2,000	1,743	1,126	2,869	40.0		
4	22.6	ft	Decomposed Rx	145	5,000	2,056	1,054	3,110	300.0		
5	30.0	ft	Bedrock	145	10,000	2,531	963	3,494	10000.0		
6	40.0	ft	Bedrock	145	10,000	3,250	834	4,084	10000.0		
7	50.0	ft	Bedrock	145	10,000	4,076	710	4,786	10000.0		
8											
9											
10											

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999

Overconsolidated Soils - Case I ($\sigma'_0 < \sigma'_c$) Eqn:11.24

$$(\delta_c)_{ult} = \sum \frac{C_r}{1 + e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

Overconsolidated Soils - Case II ($\sigma'_0 < \sigma'_c < \sigma'_f$) Eqn:11.25

$$(\delta_c)_{ult} = \sum \left[\frac{C_r}{1 + e_0} H \log \left(\frac{\sigma'_c}{\sigma'_0} \right) + \frac{C_c}{1 + e_0} H \log \left(\frac{\sigma'_f}{\sigma'_c} \right) \right]$$

Normally Consolidated Soils ($\sigma'_0 = \sigma'_c$) Eqn: 11.23

$$(\delta_c)_{ult} = \sum \frac{C_c}{1 + e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ($\sigma'_0 = \sigma'_c$)

$$(\delta_c)_{ult} = \sum \frac{1}{C'} H \log \left(\frac{\sigma'_f}{\sigma'_0} \right)$$

No. Settlement: Total Se aqw

1	0.044	ft	0.52	in
2	0.038	ft	0.46	in
3	0.027	ft	0.32	in
4	0.002	ft	0.03	in
5	0.000	ft		
6	0.000	ft		
7	0.000	ft		
8				
9				
10				

0.112 ft

1.34 in



SUBJECT

Client KYTC

JOB NUMBER

0631-0006.02

Project CSX Runaround (Item #5-434.00)

SHEET NO.

1

OF

2

Item Settlement (STA. 1528+00)

COMP. BY

SEB

DATE

1/30/2025

Based on Boring B-07

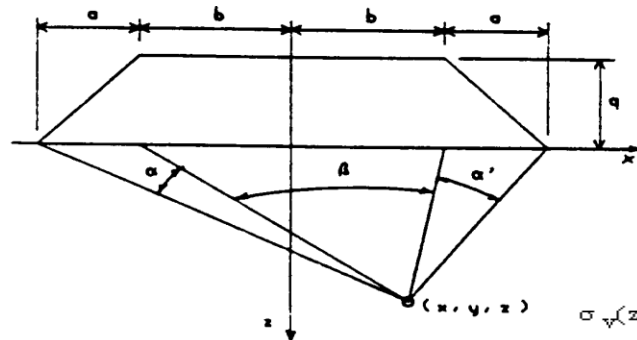
CHECKED BY

DATE

5 Foot Undercut and Replace

SETTLEMENT ANALYSIS - EMBANKMENT

Embankment Informaiton:



Groundwater Table: D= 11.0 ft

Embankment Height: H = 8.6 ft

Fill Unit Weight: $\gamma_{emb} = 125$ pcf $q = 1,075$ psf

Width of Slope: a = 18

Top half-width of Emb: b = 10

Distance from CL: x = 0

Output Range: z = 0 to 50 ft

*See Data output Attached

$$\sigma_v(z) := \left\{ \frac{q}{\pi a} \right\} (a \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + b \cdot (\alpha(z) + \alpha'(z)) + x \cdot (\alpha(z) - \alpha'(z)))$$

$$\beta(z) := \text{atan} \left[\frac{(b-x)}{z} \right] + \text{atan} \left[\frac{(b+x)}{z} \right]$$

$$\alpha'(z) := \text{atan} \left[\frac{(a+b-x)}{z} \right] - \text{atan} \left[\frac{(b-x)}{z} \right]$$

$$\alpha(z) := \text{atan} \left[\frac{(a+b+x)}{z} \right] - \text{atan} \left[\frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

Soil Properites:

Settlement is calculated at mid-point of layer

Cohesionless

Soil Properites:			Settlement is calculated at mid-point of layer						Soils		Cohesive Soils	
No.	Bot. of Laye	Soil Type	γ_{soil} (pcf)	σ'_c (psf)	σ'_o (psf)	$\Delta\sigma_z$ (psf)	σ'_f (psf)	C'	C _r	C _c	e _o	
1	5.0	ft	Fat Clay (CH)	130	2,000	325	1,073	1,398	250.0			
2	13.5	ft	Fat Clay (CH)	130	3,000	1,203	1,215	2,418		0.025	0.25 0.690	
3	18.5	ft	Granular Soils	120	2,000	1,743	1,126	2,869	40.0			
4	22.6	ft	Decomposed Rx	145	5,000	2,056	1,054	3,110	300.0			
5	30.0	ft	Bedrock	145	10,000	2,531	963	3,494	10000.0			
6	40.0	ft	Bedrock	145	10,000	3,250	834	4,084	10000.0			
7	50.0	ft	Bedrock	145	10,000	4,076	710	4,786	10000.0			
8												
9												
10												

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999

Overconsolidated Soils - Case I ($\sigma'_o < \sigma'_c$) Eqn:11.24

$$(\delta_c)_{ult} = \sum \frac{C_r}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_o} \right)$$

Overconsolidated Soils - Case II ($\sigma'_o < \sigma'_c < \sigma'_f$) Eqn:11.25

$$(\delta_c)_{ult} = \sum \left[\frac{C_r}{1+e_0} H \log \left(\frac{\sigma'_c}{\sigma'_o} \right) + \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_c} \right) \right]$$

Normally Consolidated Soils ($\sigma'_o = \sigma'_c$) Eqn: 11.23

$$(\delta_c)_{ult} = \sum \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_o} \right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ($\sigma'_o = \sigma'_c$)

$$(\delta_c)_{ult} = \sum \frac{1}{C'} H \log \left(\frac{\sigma'_f}{\sigma'_o} \right)$$

No. Settlement: Total Se aqw

1 0.013 ft 0.15 in

2 0.038 ft 0.46 in

0.081 ft

3 0.027 ft 0.32 in

0.97 in

4 0.002 ft 0.03 in

5 0.000 ft

6 0.000 ft

7 0.000 ft

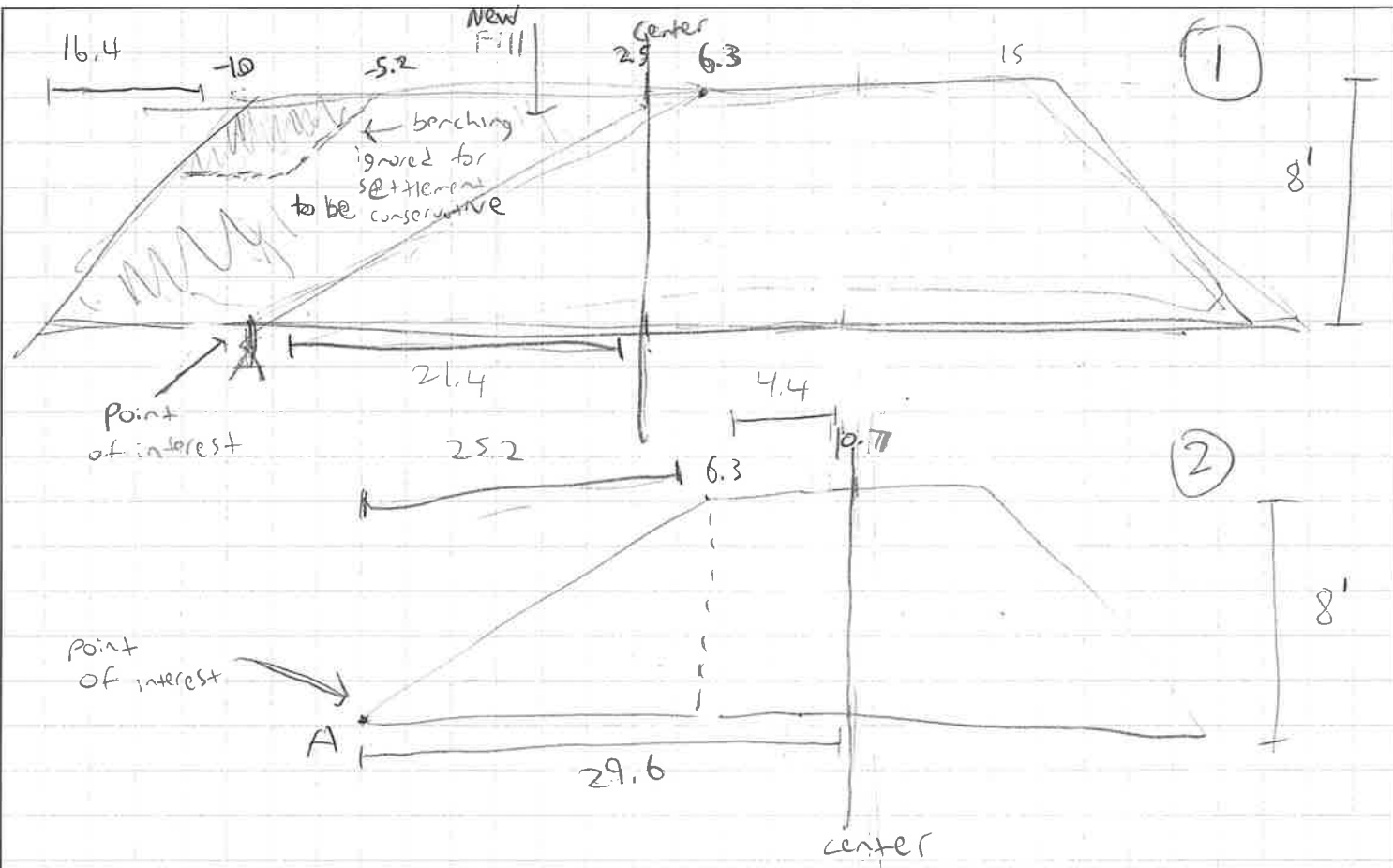
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9

10

CLIENT KYTC
PROJECT Oldham County CSX Remarving
SUBJECT Settlement
Sidchill Fill at STA. 1518+00

PROJECT NO. 0631-0006.02
SHEET NO. 1 OF 1
COMP. BY SEB DATE 2/5/25
CHECKED BY EWT DATE 2/17/25



Settlement ① - settlement ② = Total settlement from Proposed Sidchill Fill

Assuming In-Situ Soil Conditions:

Total Settlement
= Settlement ① - Settlement ② = 1.30 in - 0.20 in = 1.1 inches

Assuming 5-ft Undercut into Existing Foundation Soils and Replace with Granular Structural Fill:

Total Settlement = Settlement ① - Settlement ② = 0.34 in - 0.10 in = 0.24 inches
≈ 0.3 inches



CLIENT	KYTC
PROJECT	CSX Railroad Runaround
SUBJECT	Lateral Squeeze, STA. 1528+00
	Embankment - No Ground Improvement

JOB NUMBER	0631-0006.02		
SHEET NO.	1	OF	1
COMP. BY	SEB	DATE	1/30/2025
CHECKED BY		DATE	

Embankment - No Improvement

Lateral Squeeze

$$FS_{\text{Squeeze}} = \frac{2}{\gamma_{\text{slope}}} \frac{s_u}{D_s \tan \theta_{\text{slope}}} + \frac{4.14}{H_{\text{slope}}} \frac{s_u}{\gamma_{\text{slope}}}$$

FHWA-NHI-06-088 VOL. I
Eq. 7-12

$$FS_{\text{Squeeze}} = \frac{2}{130 \text{ pcf}} \frac{1000 \text{ psf}}{12.0 \text{ ft} \tan (26.6^\circ)} + \frac{4.14}{8.6 \text{ ft}} \frac{1000 \text{ psf}}{130 \text{ pcf}}$$

D_s considers average slope
from toe to approach slab

$$FS_{\text{Squeeze}} = \frac{2000.0}{781.2} + \frac{4140.0}{1118.0}$$

$$FS_{\text{Squeeze}} = 6.3 \qquad FS_{\text{Squeeze}} \geq 2.0$$

FHWA-NHI-06-088 VOL. I
Pg. 7-42

$$H_{\text{slope}} \gamma_{\text{slope}} < 3.0 s_u$$

FHWA-NHI-06-088 VOL. I
Eq. 7-11

$$8.6 \text{ ft} \cdot 130 \text{ pcf} < 3.0 \cdot 1000 \text{ psf}$$

$$1118 \text{ psf} < 3000 \text{ psf}$$



CLIENT KYTC
PROJECT Oldham County CSX Runaround
SUBJECT Bearing Resistance Calculation - STA. 1518+00
Granular Embankment - Railroad Footing Adjacent to Slope

JOB NUMBER 0631-0006.02
SHEET NO. 1 OF 1
COMP. BY SEB DATE 02/25/25
CHECKED BY DATE

Bearing Depth = 857.1 ft Foot. Width (B') = 20.0 ft
Foot. Width (B) = 20.0 ft Embankment Height = 8.0 ft
Embankment Soil Type = Granular
Distance from footing to edge of slope (b) = 5.0 ft

Calculate factored bearing resistance (q_R)

Reference: AASHTO LRFD Bridge Design Specifications

$$q_{ns} = q_n * R_{BC}$$

$$q_n = cN_c + 0.5\gamma B N_\gamma$$

$$q_R = \phi_b q_{ns}$$

Total Stress

$$c = 0 \text{ psf}$$

$$\phi_f = 34^\circ$$

$$N_c = 42.2$$

$$N_q = 29.4$$

$$N_\gamma = 41.1$$

Effective Stress

$$c' = 0 \text{ psf}$$

$$\phi'_f = 34^\circ$$

$$N'_c = 42.2$$

$$N'_q = 29.4$$

$$N'_\gamma = 41.1$$

N_c, N_q, N_γ values from Tables 10.6.3.1.2a-1

Groundwater 834.0 ft $\rightarrow$ (857.1' - 834') = 23.1' Water is within 1.5B of bearing depth

Total and Effective Stress

$$q_n = 0 + (0.5) (125.0 \text{ pcf}) (20.0 \text{ ft}) (41.1)$$

$$q_n = 51375 \text{ psf}$$

$$q_n = 51375 \text{ psf}$$

$$R_{BC} = 0.51$$

Table 10.6.3.1.2c-2

For R_{BC} , Emb Slope = 27°

$$c' = 0$$

$$B/H = 2.5$$

$$b/B = 0.25$$

$$\text{Resistance Factor } (\phi_b) = 0.45 \text{ strength limit state}$$

$$N_s = \gamma * H_s / c \quad 10.6.3.1.2c-2$$

$$q_R = q_n * \phi_b * R_{BC} = (11790.6 \text{ psf}) = 11.79 \text{ ksf} > 3.76 \text{ ksf (Railroad Surcharge Load)}$$



CLIENT KYTC
PROJECT Oldham County CSX Runaround
SUBJECT Bearing Resistance Calculation - STA. 1528+00
Cohesive Embankment - Railroad Footing Adjacent to Slope

JOB NUMBER 0631-0006.02
SHEET NO. 1 OF 1
COMP. BY SEB DATE 02/25/25
CHECKED BY DATE

Bearing Depth = 862.7 ft Foot. Width (B') = 8.5 ft
Foot. Width (B) = 8.5 ft Embankment Height = 8.6 ft
Embankment Soil Type = Cohesive
Distance from footing to edge of slope (b) = 10.0 ft

Calculate factored bearing resistance (q_R)

Reference: AASHTO LRFD Bridge Design Specifications

$$q_n = q_n \cdot R_{BC}$$

$$q_n = cN_c + 0.5\gamma B N_\gamma$$

$$q_R = \phi_b q_n$$

Total Stress	Effective Stress
$c = 1500 \text{ psf}$	$c' = 0 \text{ psf}$
$\phi_f = 0^\circ$	$\phi'_f = 28^\circ$
$N_c = 5.14$	$N_c = 25.8$
$N_q = 1$	$N_q = 14.7$
$N_\gamma = 0$	$N_\gamma = 16.7$
N_c, N_q, N_γ values from Tables 10.6.3.1.2a-1	

Groundwater 838.0 ft $\rightarrow$ (862.7' - 838') = 24.7' Water is below 1.5B from the bearing depth

Total Stress

$$q_n = (1500 \text{ psf}) (5.14) = 7710 \text{ psf}$$

Effective Stress

$$q_n = 0 + (0.5) (125.0 \text{ pcf}) (8.5 \text{ ft}) (16.7)$$

$$q_n = 8872 \text{ psf}$$

$$q_n = 7710 \text{ psf} \quad \text{Total Stress} < \text{Effective Stress}$$

$RC_{BC} = 0.92$ Table 10.6.3.1.2c-2 For RC_{BC} , Emb Slope = 27° $N_s = 0.72$ $B/H = 1$ $b/B = 1.18$

Resistance Factor (ϕ_b) = 0.50 strength limit state

$N_s = \gamma \cdot H_s / c$ 10.6.3.1.2c-2

$$q_R = \phi_b \cdot q_n \cdot RC_{BC} = (3546.6 \text{ psf}) = 3.55 \text{ ksf} > 1.88 \text{ ksf} \quad (\text{Railroad Surcharge Load})$$



CLIENT KYTC
PROJECT Oldham County CSX Runaround
SUBJECT Bearing Resistance Calculation - STA. 1528+00
Granular Embankment - Railroad Footing Adjacent to Slope

JOB NUMBER 0631-0006.02
SHEET NO. 1 OF 1
COMP. BY SEB DATE 02/25/25
CHECKED BY DATE

Bearing Depth = 862.7 ft Foot. Width (B') = 8.5 ft
Foot. Width (B) = 8.5 ft Embankment Height = 8.6 ft
Embankment Soil Type = Granular
Distance from footing to edge of slope (b) = 10.0 ft

Calculate factored bearing resistance (q_R)

Reference: AASHTO LRFD Bridge Design Specifications

$$q_{ns} = q_n * RB_{BC}$$

$$q_n = cN_c + 0.5\gamma BN_\gamma$$

$$q_R = \phi_b q_{ns}$$

Total Stress	Effective Stress
$c = 0$ psf	$c' = 0$ psf
$\phi_f = 34^\circ$	$\phi'_f = 34^\circ$
$N_c = 42.2$	$N_c = 42.2$
$N_q = 29.4$	$N_q = 29.4$
$N_\gamma = 41.1$	$N_\gamma = 41.1$
N_c, N_q, N_γ values from Tables 10.6.3.1.2a-1	

Groundwater 838.0 ft $\rightarrow$ (862.7' - 838') = 24.7' Water is below 1.5B from the bearing depth

Total and Effective Stress

$$q_n = 0 + (0.5) (125.0 \text{ pcf}) (8.5 \text{ ft}) (41.1)$$

$$q_n = 21834 \text{ psf}$$

$$q_n = 21834 \text{ psf}$$

$RC_{BC} = 0.58$ Table 10.6.3.1.2c-2 For RC_{BC} , Emb Slope = 27° $c' = 0$ $B/H = 1$ $b/B = 1.18$

Resistance Factor (ϕ_b) = 0.45 strength limit state $N_s = \gamma * H_s / c$ 10.6.3.1.2c-2

$$q_R = q_n * \phi_b * RC_{BC} = (5698.8 \text{ psf}) = 5.70 \text{ ksf} > 1.88 \text{ ksf (Railroad Surcharge Load)}$$



CLIENT KYTC
PROJECT Oldham County CSX Runaround
SUBJECT Bearing Resistance Calculation - STA. 1538+00
Cohesive Embankment - Railroad Footing Adjacent to Slope

JOB NUMBER 0631-0006.02
SHEET NO. 1 OF 1
COMP. BY SEB DATE 02/25/25
CHECKED BY DATE

Bearing Depth = 869.4 ft Foot. Width (B') = 8.5 ft
Foot. Width (B) = 8.5 ft Embankment Height = 4.3 ft
Embankment Soil Type = Cohesive
Distance from footing to edge of slope (b) = 10.0 ft

Calculate factored bearing resistance (q_R)

Reference: AASHTO LRFD Bridge Design Specifications

$$q_n = q_n \cdot R_{BC}$$

$$q_n = cN_c + 0.5\gamma B N_\gamma$$

$$q_R = \phi_b q_n$$

Total Stress	Effective Stress
$c = 1500 \text{ psf}$	$c' = 0 \text{ psf}$
$\phi_f = 0^\circ$	$\phi'_f = 28^\circ$
$N_c = 5.14$	$N_c = 25.8$
$N_q = 1$	$N_q = 14.7$
$N_\gamma = 0$	$N_\gamma = 16.7$
N_c, N_q, N_γ values from Tables 10.6.3.1.2a-1	

Groundwater none → No water - -

Total Stress

$$q_n = (1500 \text{ psf}) (5.14) = 7710 \text{ psf}$$

Effective Stress

$$q_n = 0 + (0.5) (125.0 \text{ pcf}) (8.5 \text{ ft}) (16.7)$$

$$q_n = 8872 \text{ psf}$$

$$q_n = 7710 \text{ psf} \quad \text{Total Stress} < \text{Effective Stress}$$

$RC_{BC} = 0.98$ Table 10.6.3.1.2c-2 For RC_{BC} , Emb Slope = 27° $N_s = 0.36$ $B/H = 2$ $b/B = 1.18$

Resistance Factor (ϕ_b) = 0.50 strength limit state $N_s = \gamma \cdot H_s / c$ 10.6.3.1.2c-2

$$q_R = \phi_b \cdot q_n \quad *RC_{BC} = (3777.9 \text{ psf}) = 3.78 \text{ ksf} > 1.88 \text{ ksf} \quad (\text{Railroad Surcharge Load})$$



CLIENT KYTC
PROJECT Oldham County CSX Runaround
SUBJECT Bearing Resistance Calculation - STA. 1538+00
Granular Embankment - Railroad Footing Adjacent to Slope

JOB NUMBER 0631-0006.02
SHEET NO. 1 OF 1
COMP. BY SEB DATE 02/25/25
CHECKED BY DATE

Bearing Depth = 869.4 ft Foot. Width (B') = 8.5 ft
Foot. Width (B) = 8.5 ft Embankment Height = 4.3 ft
Embankment Soil Type = Cohesive
Distance from footing to edge of slope (b) = 10.0 ft

Calculate factored bearing resistance (q_R)

Reference: AASHTO LRFD Bridge Design Specifications

$$q_{ns} = q_n * R_{BC}$$

$$q_n = cN_c + 0.5\gamma B N_\gamma$$

$$q_R = \phi_b q_{ns}$$

Total Stress	Effective Stress
$c = 0$ psf	$c' = 0$ psf
$\phi_f = 34^\circ$	$\phi'_f = 34^\circ$
$N_c = 42.2$	$N_c = 42.2$
$N_q = 29.4$	$N_q = 29.4$
$N_\gamma = 41.1$	$N_\gamma = 41.1$
N_c, N_q, N_γ values from Tables 10.6.3.1.2a-1	

Groundwater 838.0 ft $\rightarrow$ (869.4' - 838') = 31.4' Water is below 1.5B from the bearing depth

Effective Stress

$$q_n = 0 + (0.5) (125.0 \text{ pcf}) (8.5 \text{ ft}) (41.1)$$

$$q_n = 21834 \text{ psf}$$

$RC_{BC} = 0.70$ Table 10.6.3.1.2c-2 For RC_{BC} , Emb Slope = 27° $c'=0$ $B/H = 2$ $b/B = 1.18$

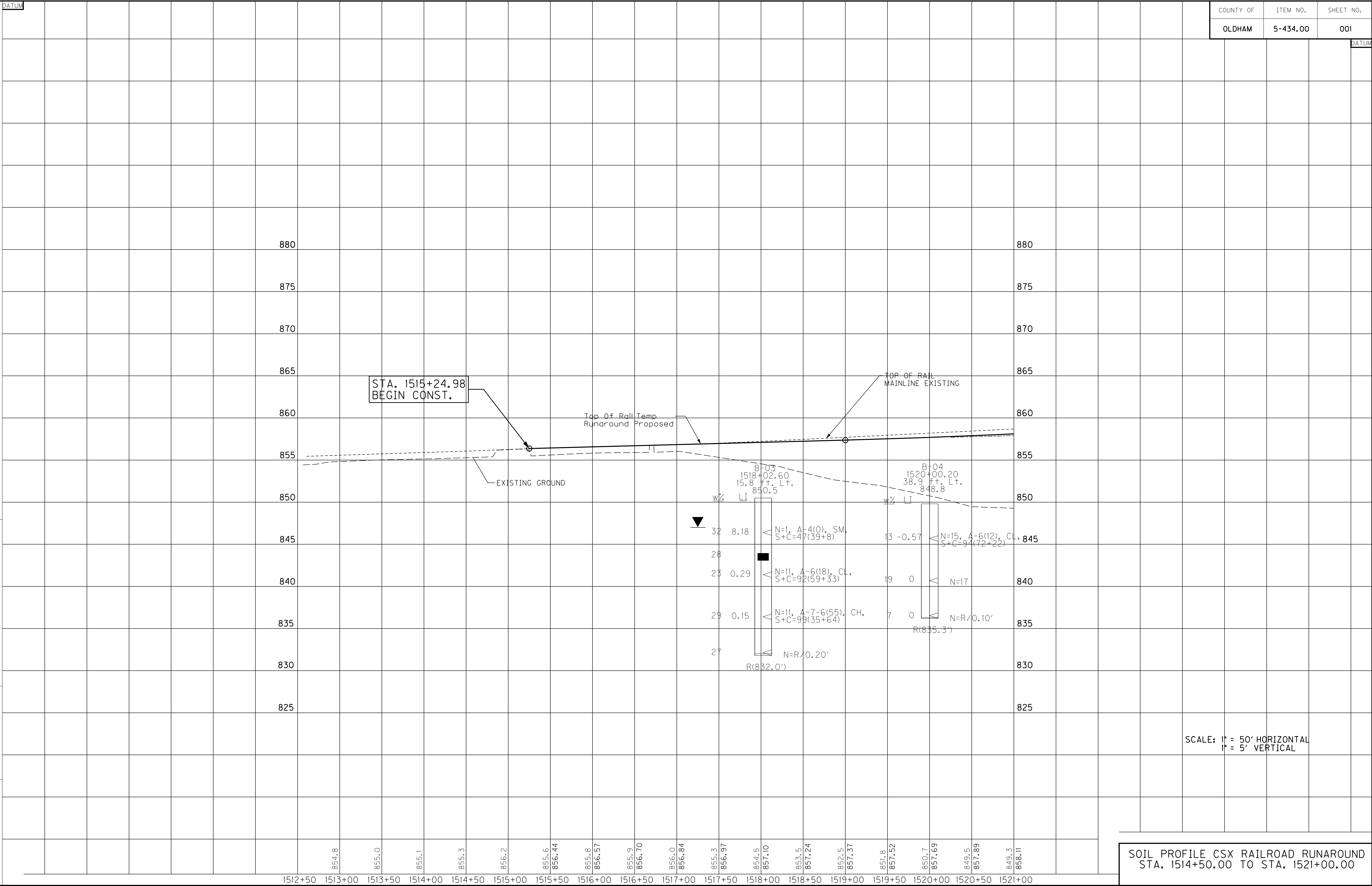
Resistance Factor (ϕ_b) = 0.50 strength limit state $N_s = \gamma * H_s / c$ 10.6.3.1.2c-2

$$q_R = \phi_b * q_n * RC_{BC} = (7642.0 \text{ psf}) = \underline{\underline{7.64 \text{ ksf}}} > 1.88 \text{ ksf} \text{ (Railroad Surcharge Load)}$$

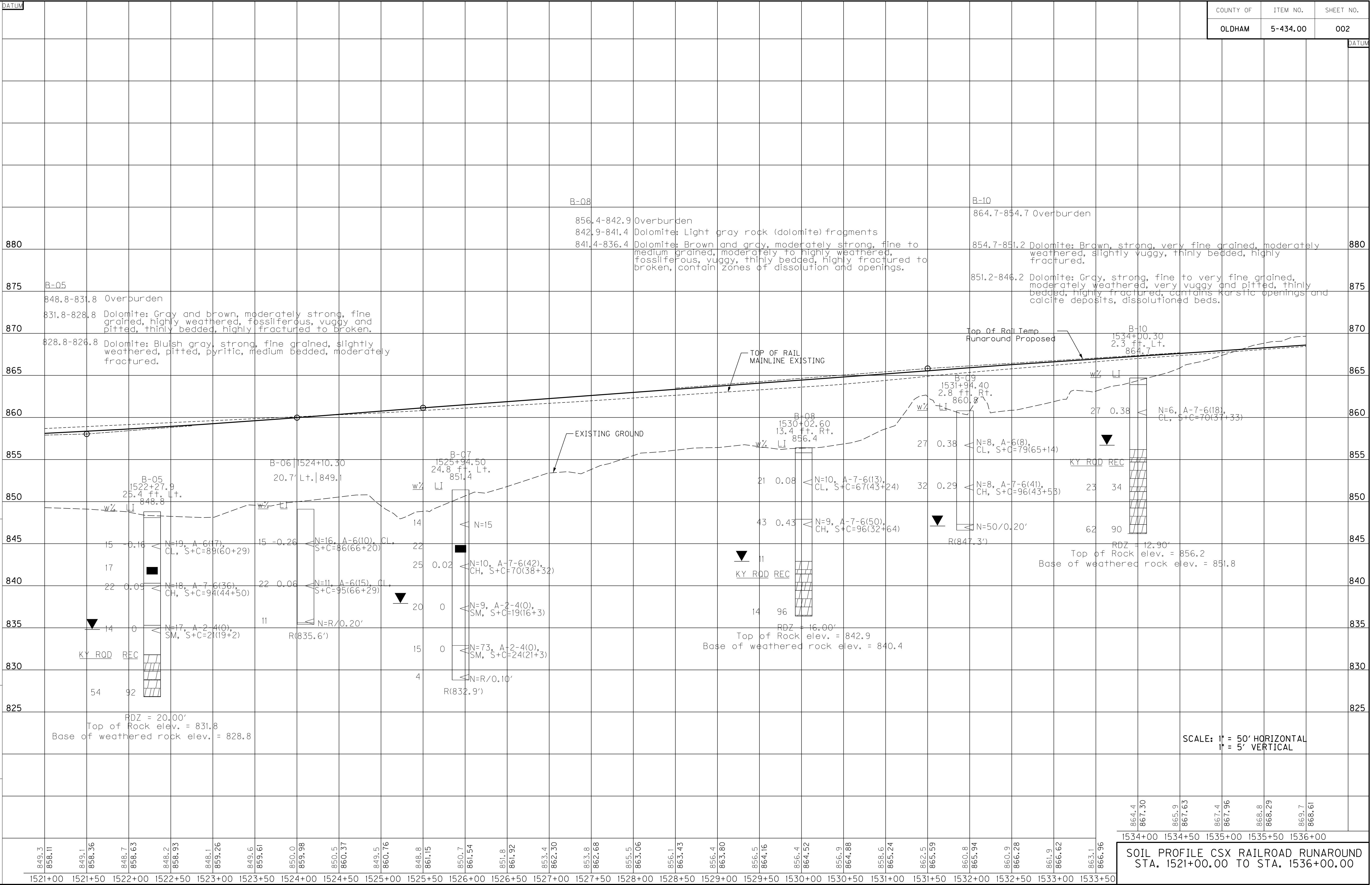
Appendix IV

Soil Profile Sheets

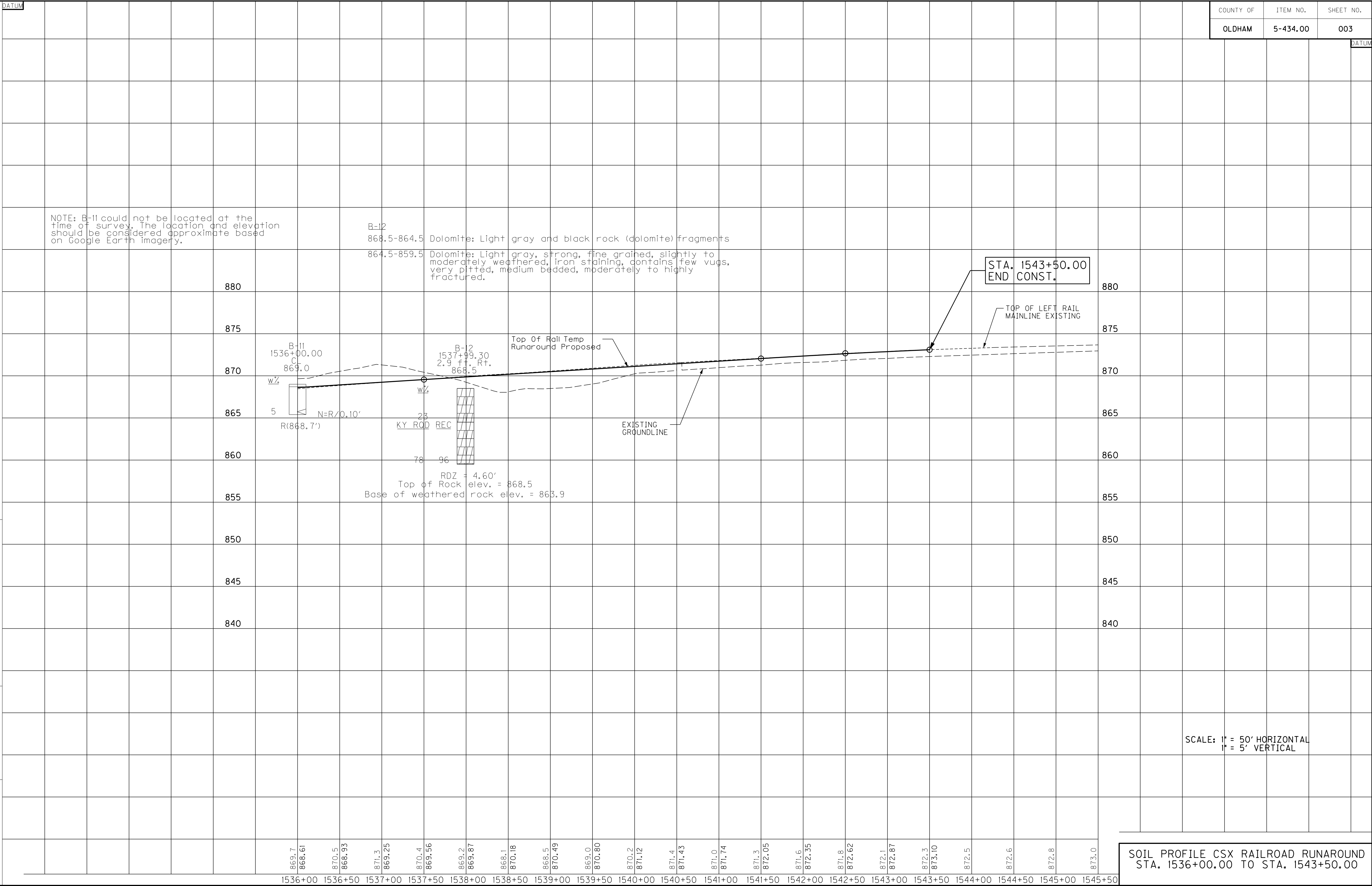
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FILE NAME: \\DLZCORP.COM\SPAN-FILES\PROJECTS\2006\0631\000602 OLDHAM COUNTY KY 02 UNDERPASS\CONTRACT PLANS AND PROPOSAL\MSCLANE E-SHEET NAME: R02700PF E-SHEET NAME: R02700PF DATE PLOTTED: June 14, 2024 USER: sbollinger MicroStation v10.17.02.61



MicroStation v10.17.02.61 E-SHEET NAME: R02708PF USER: sbollinger DATE PLOTTED: June 14, 2024 FILE NAME: \\DLZCORP.COM\PAN-FILES\FILES\PROJECTS\2006\0631\000602 OLDHAM COUNTY KY\02 UNDERPASS\CONTRACT PLANS AND PROPOSAL\MSCELLANEOUS



MicroStation v10.17.02.61

E-SHEET NAME: X00100XS

USER: sbollinger
DATE PLOTTED: June 14, 2024

FILE NAME: \\DLZCORP.COM\PAN-FILES\FILES\PROJECTS\2006\0631\000602 OLDHAM COUNTY KY 02 UNDERPASS\CONTRACT PLANS AND PROPOSAL\MSCELLANE

COUNTY OF	ITEM NO.	SHEET NO.
OLDHAM	5-434.00	004

B-32C	
856.9-838.4	Overburden
838.4-836.9	Dolomite: Light gray (dolomite) rock fragments.
836.9-833.6	Limestone: Light brown, strong, fine to coarse grained, highly weathered, fossiliferous, thin bedded, highly fractured to broken.
833.6-830.6	Dolomite: Gray, strong, fine grained, moderately weathered, pitted, medium bedded, highly fractured.
830.6-828.7	Dolomite: Gray, moderately strong, (60%) interbedded with SILTSTONE (40%); fine grained, slightly weathered, thinly bedded, highly fractured to broken.
828.7-809.9	Dolomite: Gray to greenish gray, strong, fine grained, slightly weathered, argillaceous, medium bedded, moderately fractured.
809.9-807.6	Shale (claystone): Gray, moderately strong, fine grained, highly weathered, thickly bedded, highly fractured to broken.
807.6-804.9	Dolomite: Gray to greenish gray, strong, fine grained, slightly weathered, medium bedded, highly fractured.

890

880

870

860

850

840

830

820

810

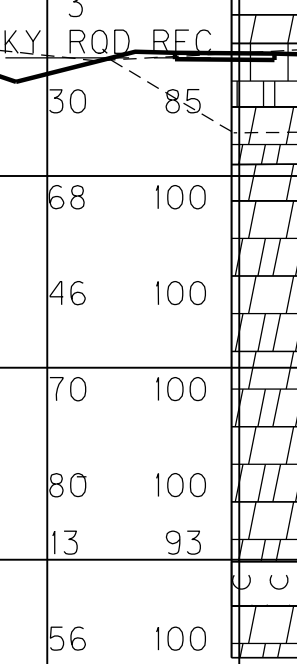
800

790

B-32C
1528+61.60
24.6' ft. L.T.
856.9
(CSX MAINLINE STA. OFFSET)

w% LI

19	-0.05	<	N=9, A-6(13), CL, S+C=87(61+26)
21	0.07	<	N=18, A-7-6(36), CH, S+C=90(47+43)
59	0.39	<	N=5, A-7-5(36), MH, S+C=97(19+78)



RDZ = 21.60'
Top of Rock elev. = 838.4
Base of weathered rock elev. = 835.3

1527+50

1528+00

1528+50

1529+00

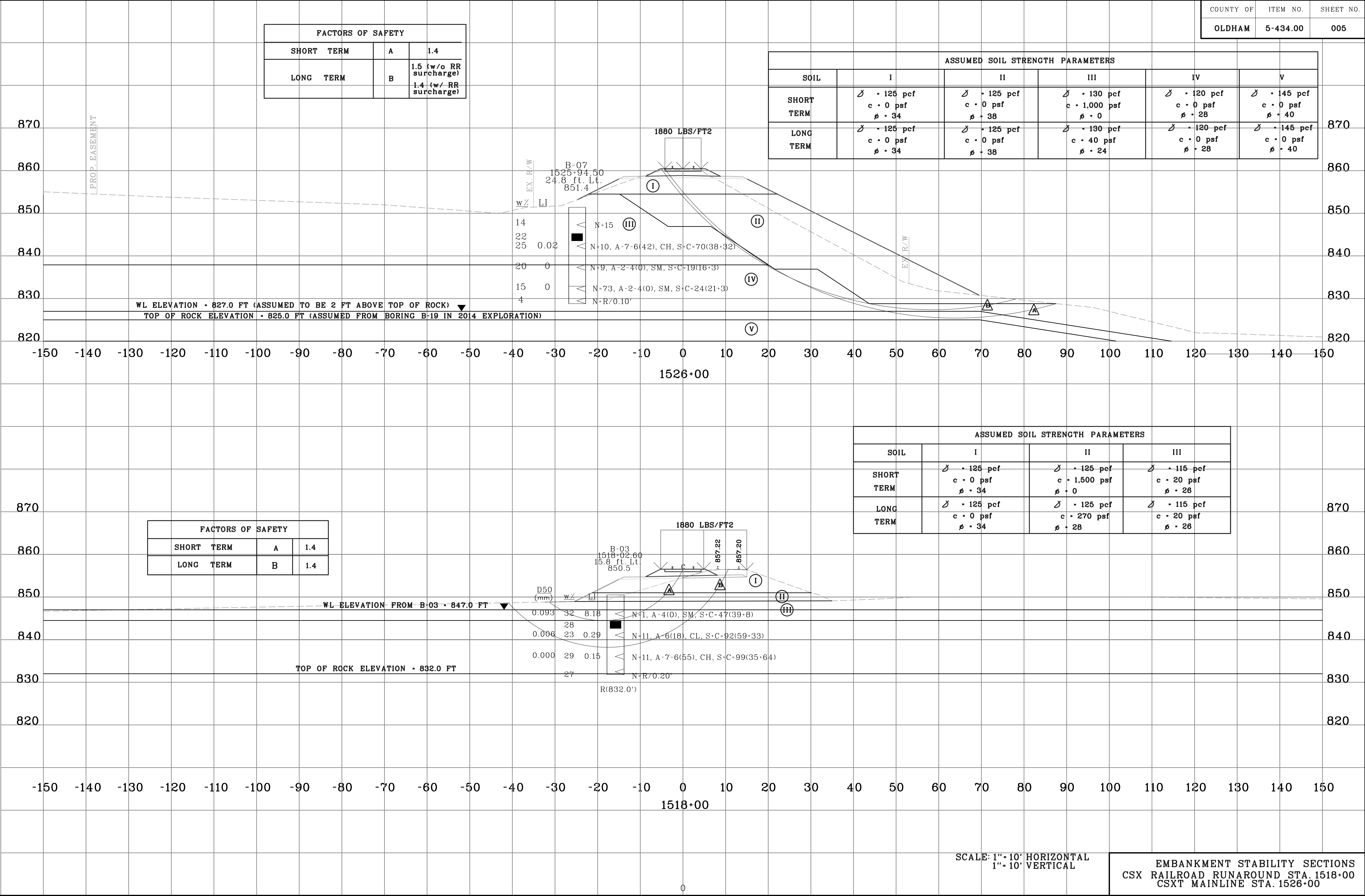
1529+50

1530+00

1530+50

SCALE: 1" = 10' HORIZONTAL
1" = 10' VERTICAL

SOIL PROFILE - CSXT MAINLINE
STA. 1528+61.60



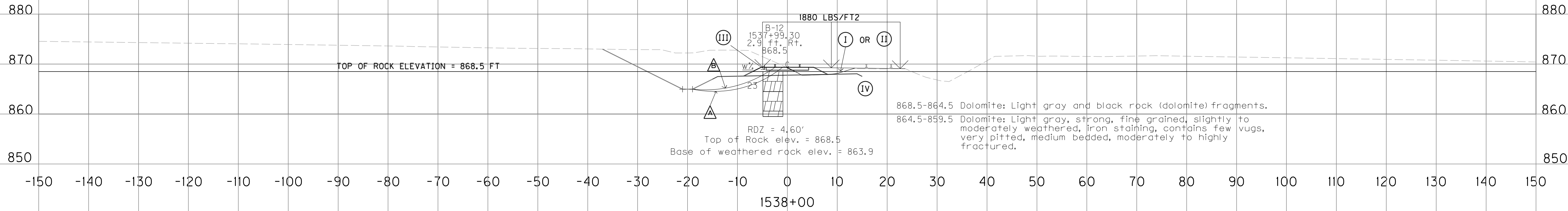
COUNTY OF	ITEM NO.	SHEET NO.
OLDHAM	5-434.00	006

	FACTORS	OF SAFETY	
SHORT TERM		A	2.1
LONG TERM		B	1.8

(New cohesive or granular fill)

(New cohesive or granular fill)

						ASSUMED SOIL STRENGTH PARAMETERS					
SOIL		I		II		III				IV	
SHORT TERM		$\gamma = 125 \text{ pcf}$ $c = 0 \text{ psf}$ $\phi = 34$		$\gamma = 125 \text{ pcf}$ $c = 1500 \text{ psf}$ $\phi = 0$		$\gamma = 130 \text{ pcf}$ $c = 1,000 \text{ psf}$ $\phi = 0$				$\gamma = 145 \text{ pcf}$ $c = 0 \text{ psf}$ $\phi = 40$	
LONG TERM		$\gamma = 125 \text{ pcf}$ $c = 0 \text{ psf}$ $\phi = 34$		$\gamma = 125 \text{ pcf}$ $c = 270 \text{ psf}$ $\phi = 28$		$\gamma = 130 \text{ pcf}$ $c = 40 \text{ psf}$ $\phi = 24$				$\gamma = 145 \text{ pcf}$ $c = 0 \text{ psf}$ $\phi = 40$	

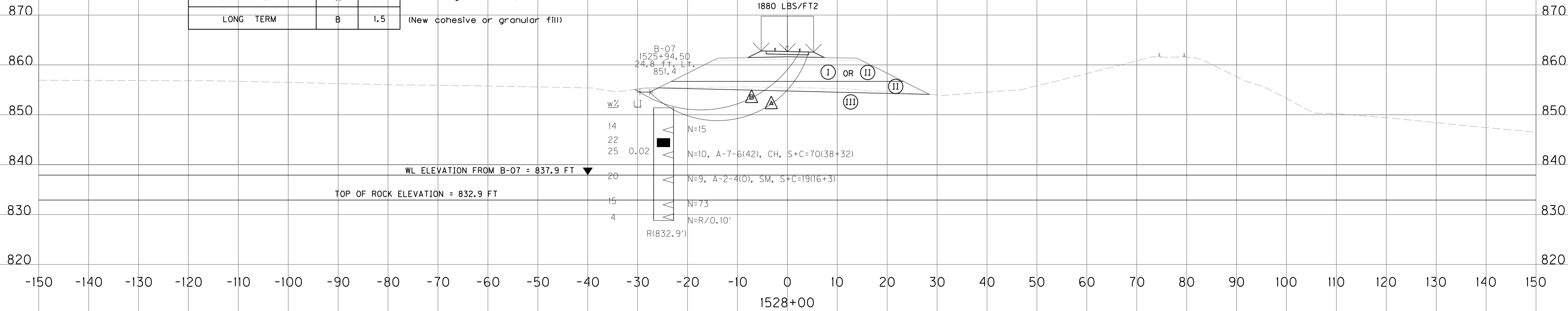


	FACTORS	OF SAFETY	
SHORT TERM		A	2.3
LONG TERM		B	1.5

(2.3 for granular fill, 2.6 for cohesive fill)

(New cohesive or granular fill)

		ASSUMED SOIL STRENGTH PARAMETERS					
SOIL		I		II		III	
SHORT TERM		$\gamma = 125 \text{ pcf}$		$\gamma = 125 \text{ pcf}$		$\gamma = 130 \text{ pcf}$	
		$c = 0 \text{ psf}$ $\phi = 34$		$c = 1,500 \text{ psf}$ $\phi = 0$		$c = 1,000 \text{ psf}$ $\phi = 0$	
LONG TERM		$\gamma = 125 \text{ pcf}$		$\gamma = 125 \text{ pcf}$		$\gamma = 130 \text{ pcf}$	
		$c = 0 \text{ psf}$ $\phi = 34$		$c = 270 \text{ psf}$ $\phi = 28$		$c = 40 \text{ psf}$ $\phi = 24$	



SCALE: 1" = 10' HORIZONTAL
1" = 10' VERTICAL

EMBAKMENT STABILITY SECTIONS
CSX RAILROAD RUNAROUND STA. 1528+00
CSX RAILROAD RUNAROUND STA. 1538+00