M E M O R A N D U M

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Structure Foundations Section
Geotechnical Services Branch

DATE: April 11, 2023

SUBJECT: **Oldham County**
FD52 12F0 093 0393 002-006 D
Mars# 5941401D
Item# 5-234.00
KY 393
2 Span CSX RR Bridge @ CSX RR Sta. 1416+38.98
Geotechnical Engineering Structure Foundation Addendum Report

1.0 LOCATION AND DESCRIPTION

This report addendum is to document end slope global stability analyses and provide lateral load parameters for the abutment foundations applying Hoek-Brown criterion for the bedrock layers per CSX reviewer comments dated March 8, 2021. These recommendations were provided to the structural designer in an email on December 22, 2022. Lateral load parameters and embankment recommendations found in this addendum report supersede lateral load parameters and embankment recommendations found in the initial report, S-077-2004, and previous addendum, SA-001-2022. All other analyses, recommendations, and plan notes from the previous geotechnical reports for this structure are still in effect.

2.0 ENGINEERING ANALYSIS

2.1 Abutment 1 & Abutment 2

Lateral load parameters and lateral earth pressures can be found in the Idealized Soil and Bedrock Profile in the attachments.

2.2 Embankment Analysis

Global stability was analyzed at the end slopes of the bridge embankments. In these analyses, the support from the abutment foundations was ignored and the end slopes were modeled as 2:1 slopes. A surcharge equivalent to the Cooper E90 track surcharge was also included in these analyses. These slopes were modeled with a factor of safety of 1.5 per AREMA Section 1.2.3.2c.

3.0 FOUNDATION RECOMMENDATIONS:

3.1 When analyzing the foundation for lateral loads, use the lateral load parameters and lateral earth pressures found in the Idealized Soil and Bedrock Profile in the attachments.

3.2 To meet global stability requirements as noted in Section 2.2 of this report, granular embankment will be necessary behind the abutment walls. This granular material will need to extend back 35 feet from the end slopes of each embankment.

The designer should feel free to contact the Geotechnical Office at 502-564-2374 for further recommendations or if any questions arise pertaining to this project.

Attachments:

- **Structure Location Map**
- **Idealized Soil and Bedrock Profile**
- **End Slope Stabilities**

SA-005-2023
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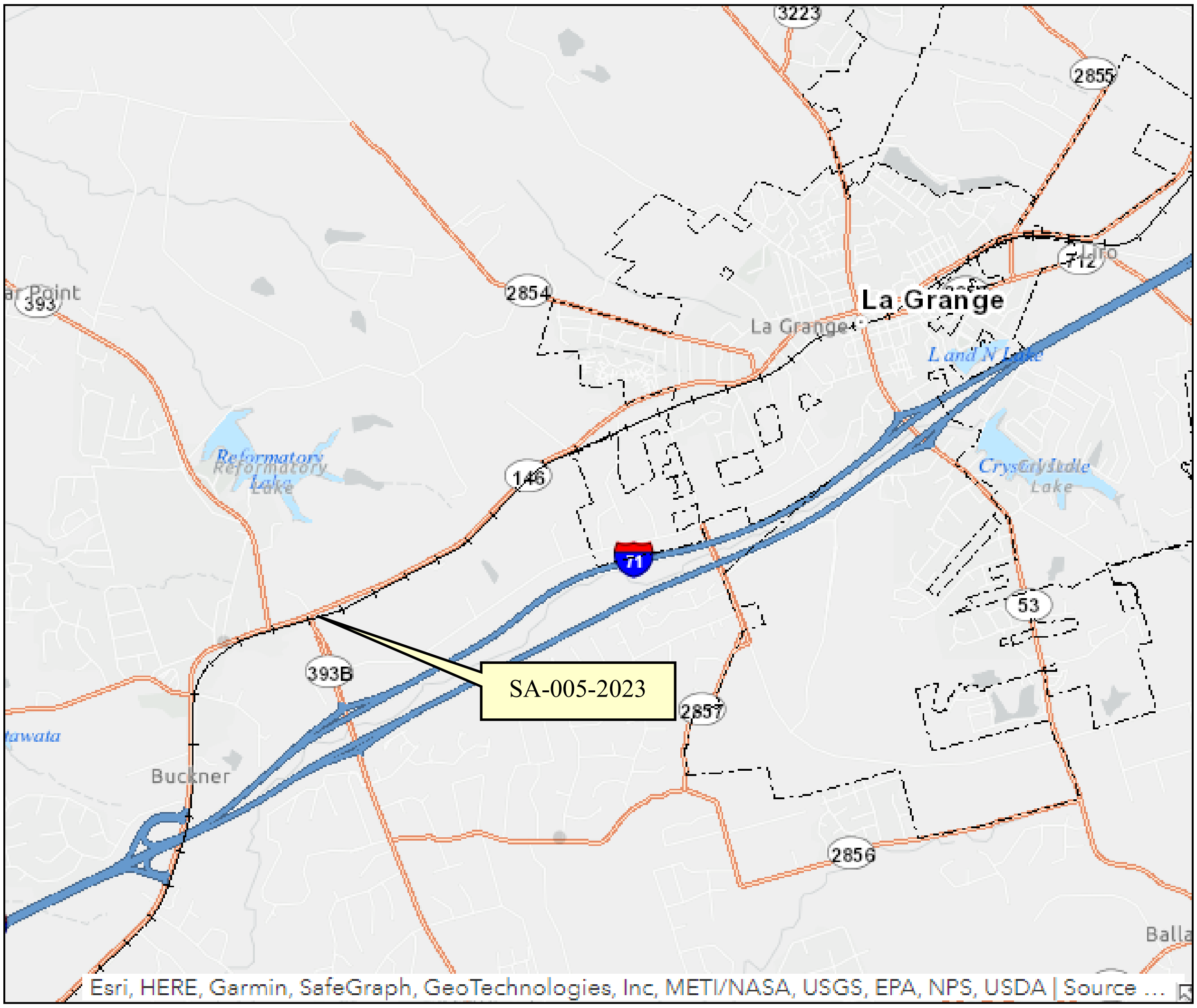
<u>Structure Location Map</u>:
(38.385412, -85.431529)



IDEALIZED SOIL AND BEDROCK PROFILE

Oldham Co., Item# 5-234.00, CSX RR over KY 393
End Bents

TQS 12/22/22

Elev.
(ft.)

Overburden, Neglect for Support
Granular Embankment

Base of weathered rock

* ---

Strata | **Parameters for Lateral Load Analyses**

Massive Rock

Dolomite	**Effective Unit Weight,**	γ_e **(lb/ft^3) =**	**150**
	Uniaxial Compressive Strength,	q_u **(psi) =**	**2500**
	Hoek-Brown Material Index,	**mi=**	**9**
	Poisson's Ratio	**=**	**0.25**
	GSI	**=**	**75**
	Intact Rock Modulus	**(psi)=**	**1062500**

* ---

Massive Rock

Shale	**Effective Unit Weight,**	γ_e **(lb/ft^3) =**	**150**
	Uniaxial Compressive Strength,	q_u **(psi) =**	**1500**
	Hoek-Brown Material Index,	**mi=**	**6**
	Poisson's Ratio	**=**	**0.3**
	GSI	**=**	**35**
	Intact Rock Modulus	**(psi)=**	**300000**

* **Elevations vary and are provided on the Subsurface Data Sheet**

Reference: Practical Rock Engineering (Hoek, 2007 ed.)

Total Active Force on Wall = Ps + Pa

Ps = Total Surcharge Force = Ka*q*H

Ka = active earth pressure coefficient = 0.21

q = surcharge load, P90 = 2117 psf

H = wall height

Pa = Total Earth Pressure Force = $1/2 \cdot Ka \cdot \gamma \cdot H^2$

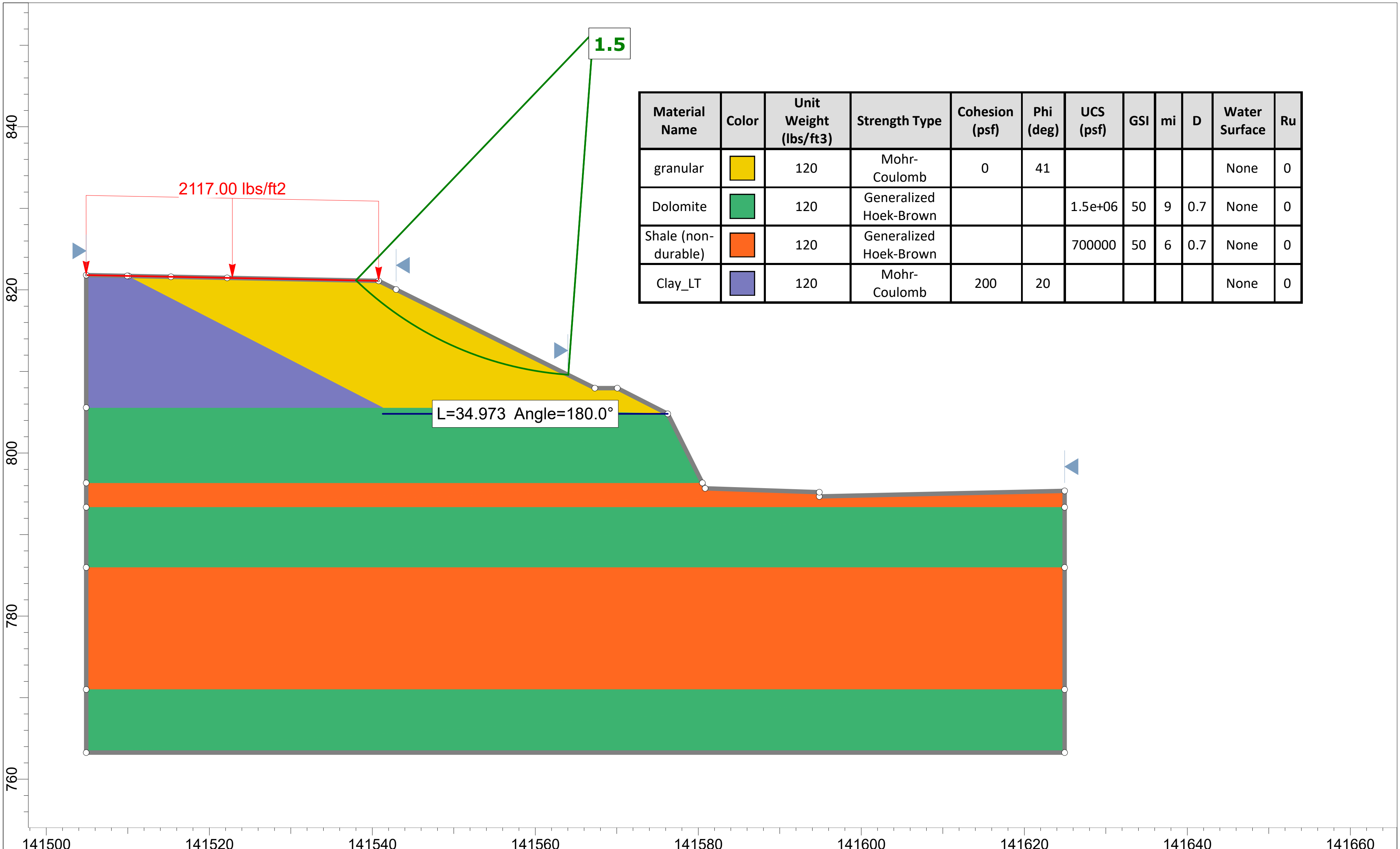
Ka = active earth pressure coefficient = 0.21

γ = unit weight of backfill = 115 pcf

H = wall height

Ps acts at a height H/2 from the bottom of the wall

Pa acts at a height H/3 from the bottom of the wall



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	UCS (psf)	GSI	mi	D	Water Surface	Ru
granular		120	Mohr-Coulomb	0	41					None	0
Dolomite		120	Generalized Hoek-Brown			1.5e+06	50	9	0.7	None	0
Shale (non-durable)		120	Generalized Hoek-Brown			700000	50	6	0.7	None	0
Clay_LT		120	Mohr-Coulomb	200	20					None	0

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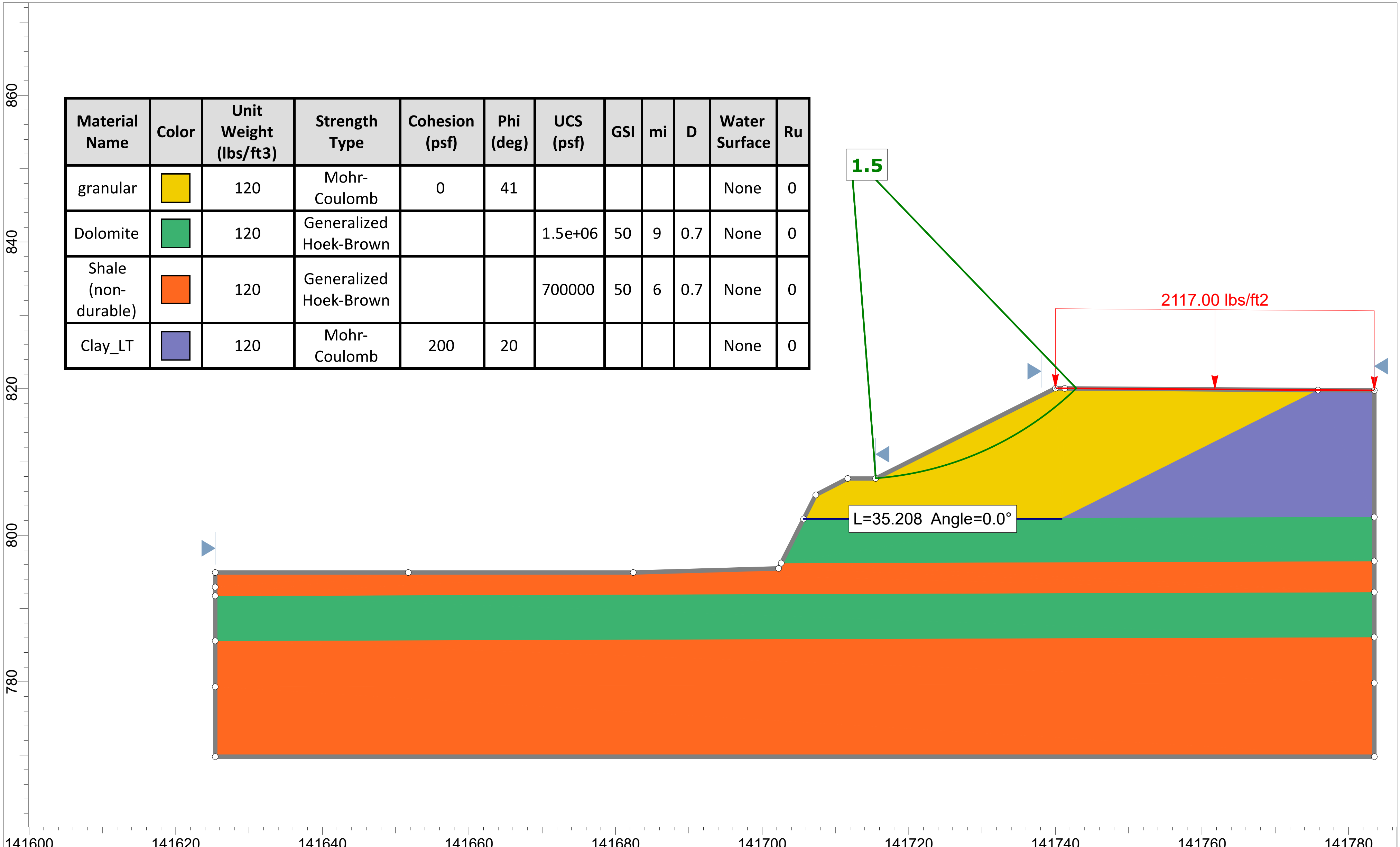
SLIDEINTERPRET 9.026

Project	Slide2 - An Interactive Slope Stability Program		
Group	EB1	*Scenario*	Scenario 2
Drawn By		*Company*	
Date	12/21/2022, 12:37:04 PM	*File Name*	5-234 CSX over KY 393.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	UCS (psf)	GSI	mi	D	Water Surface	Ru
granular		120	Mohr-Coulomb	0	41					None	0
Dolomite		120	Generalized Hoek-Brown			1.5e+06	50	9	0.7	None	0
Shale (non-durable)		120	Generalized Hoek-Brown			700000	50	6	0.7	None	0
Clay_LT		120	Mohr-Coulomb	200	20					None	0



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SLIDEINTERPRET 9.026

Project	Slide2 - An Interactive Slope Stability Program		
Group	EB2	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	12/21/2022, 12:37:04 PM	*File Name*	5-234 CSX over KY 393.slmd