

PROJECT: R-5522 ID: 45547.3.1

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

**STRUCTURE
SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 45547.3.1 F.A. PROJ. ADP-1113(9)
 COUNTY RUTHERFORD
 PROJECT DESCRIPTION BRIDGE OVER CSX RAILROAD
ON RELOCATED SR 1113 (HICKS GROVE ROAD)
 SITE DESCRIPTION RELOCATION OF HICKS GROVE ROAD
TO FACILITATE HORSEHEAD FACILITY

STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	1	7

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

 G. TAYLOR
 M. REVIS
 D. SWOAP

INVESTIGATED BY S&ME, INC.

CHECKED BY M. REVIS

SUBMITTED BY S&ME, INC.

DATE DECEMBER 22, 2011



DRAWN BY: M. REVIS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

DRAWN BY: MGR	CHK'D BY: DAS	SCALE: N/A	<p>S&ME, Inc. ONE MARCUS DRIVE, SUITE 301, GREENVILLE, SC 29615 301 ZIMA PARK DRIVE, SPARTANBURG, SC 29301 NC PE FIRM LICENSE NO. F-0176</p> <p>864.232.8987 Greenville 864.574.2360 Spartanburg 864.576.8730 Fax www.smeinc.com</p>	TITLE SHEET BRIDGE OVER CSX RAILROAD ON RELOCATED SR 1113 RUTHERFORD COUNTY, NORTH CAROLINA	FIGURE NO. 1
PROJECT NO.: 1261-11-222B	DATE: 12-22-11				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO.
38576.1.1 (B-4806)
SHEET NO.
2

SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

Table with multiple columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, MINERALOGICAL COMPOSITION, COMPRESSION, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, ABBREVIATIONS, EQUIPMENT USED ON SUBJECT PROJECT, ROCK HARDNESS, FRACTURE SPACING, BEDDING, INDURATION, PLASTICITY, COLOR.

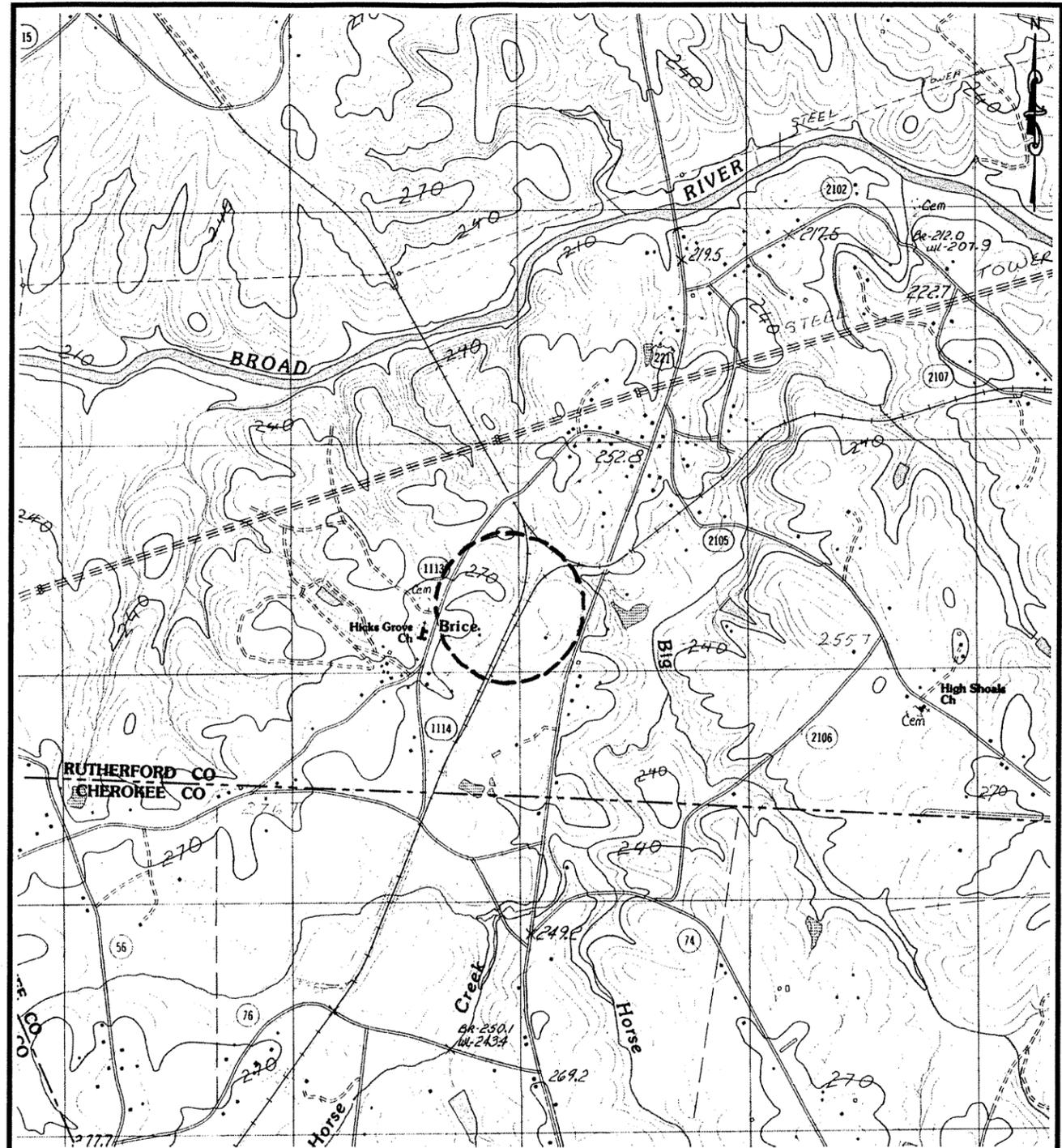
DRAWN BY: MGR
CHK'D BY: DAS
PROJECT NO.: 1261-11-222B
DATE: 12-22-11

SCALE: N/A



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SOIL AND ROCK LEGEND
BRIDGE OVER CSX RAILROAD
ON RELOCATED SR 1113
RUTHERFORD COUNTY, NORTH CAROLINA
FIGURE NO. 2



SOURCE:

TOPOGRAPHIC MAP OF CHESNEE, SOUTH CAROLINA-NORTH CAROLINA QUADRANGLE, 7.5 MINUTE SERIES, USGS, PROVISIONAL EDITION, 1993.

SCALE: 1"=2000'
 CHECKED BY: DAS
 DRAWN BY: MGR
 DATE: 22 DEC 2011



SITE LOCATION PLAN
 BRIDGE OVER CSX RAILROAD
 ON RELOCATED SR 1113
 RUTHERFORD COUNTY, NORTH CAROLINA
 JOB NO: 1261-11-222B

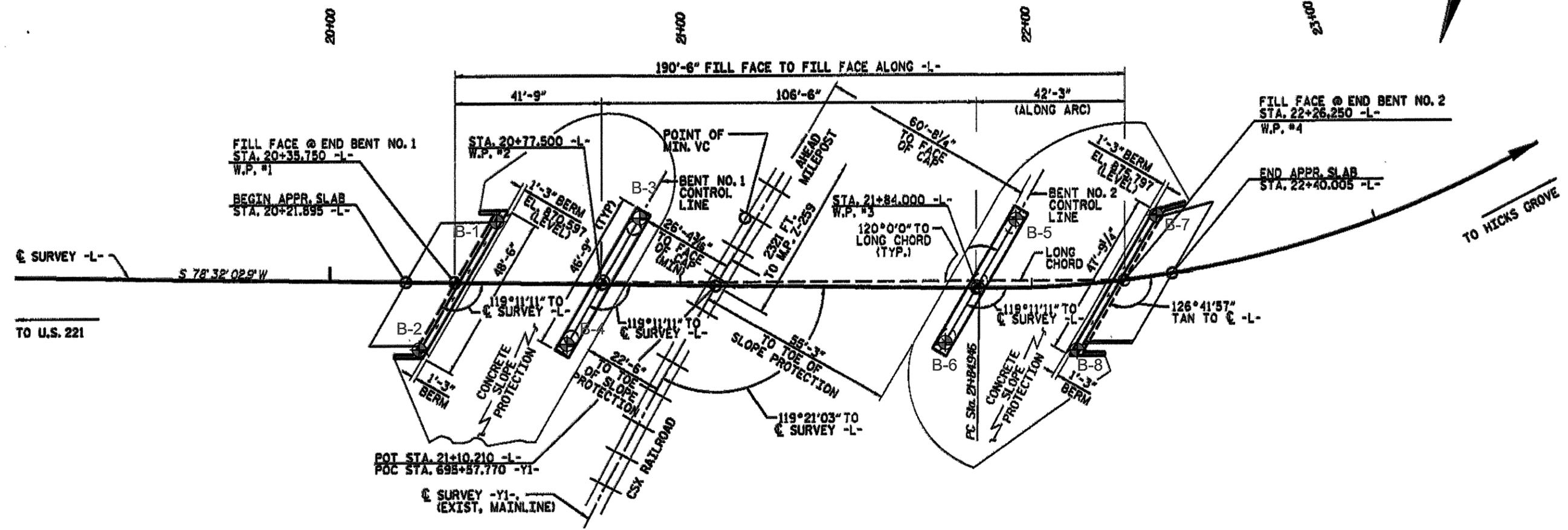
FIGURE NO:
3

EL = 874.17' VC = 393'
 EL = 881.44' VC = 300'

SECTIONS AT BENTS AND END BENTS ARE AT RIGHT ANGLES.

(+1.00000% (+12.1052% (-13.8800%

GRADE DATA -L-



PLAN ALONG C -L-

PILES NOT SHOWN IN PLAN VIEW.
 NOTE: ALL BENTS AND END BENTS ARE PARALLEL.

LEGEND

⊕ APPROXIMATE SOIL TEST BORING LOCATION

SOURCE:

PRELIMINARY GENERAL DRAWING (DRAWING S-1 DATED DECEMBER 2011) PREPARED AND PROVIDED BY VAUGHAN & MELTON.

DRAWN BY: MGR	CHK'D BY: DAS
PROJECT NO.: 1261-11-222B	DATE: 12-22-11

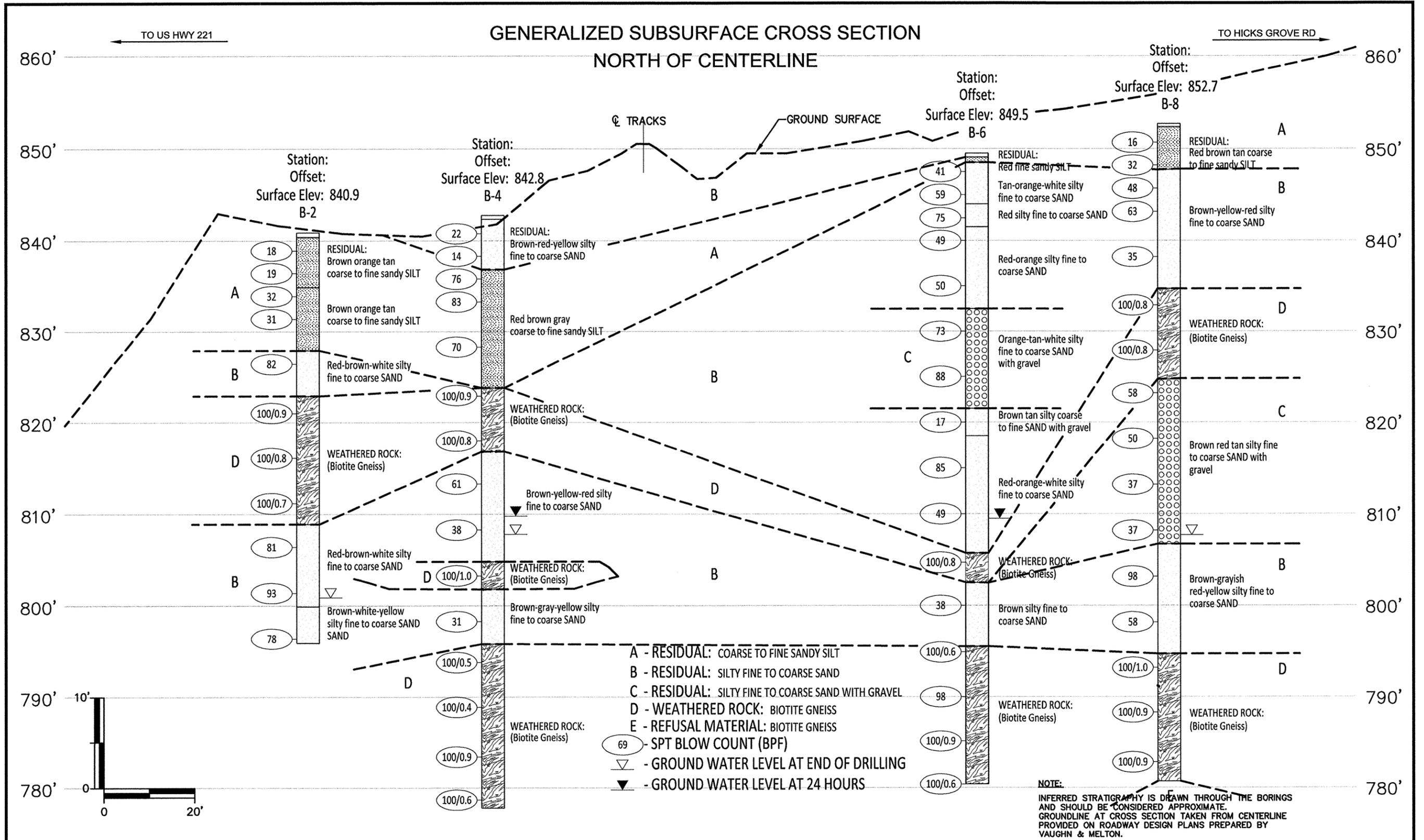
SCALE: 1" = 20'



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BORING LOCATION PLAN	FIGURE NO.
BRIDGE OVER CSX RAILROAD ON RELOCATED SR 1113 RUTHERFORD COUNTY, NORTH CAROLINA	4



DRAWN BY: MGR	CHK'D BY: DAS
PROJECT NO.: 1261-11-222B	DATE: 12-22-11

SCALE:
1" = 20' (VERTICAL)
1" = 100' (HORIZONTAL)



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GENERALIZED SUBSURFACE CROSS SECTION NORTH OF CENTERLINE BRIDGE OVER CSX RAILROAD ON RELOCATED SR 1113 RUTHERFORD COUNTY, NORTH CAROLINA	FIGURE NO. 6
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PHOTO 1: VIEW OF WEST BENT AREAS (BORINGS B-5 TO B-8) TOWARD EXISTING CSX TRACKS



PHOTO 3: VIEW OF EAST BENT AREAS (BORINGS B-1 TO B-4) FROM EXISTING CSX TRACKS



PHOTO 2: VIEW OF WEST BENT AREAS (BORINGS B-5 TO B-8) NEAR BORING B-5



PHOTO 4: VIEW OF ABANDONED RAIL BED EAST OF PROPOSED EAST BRIDGE BENTS

DRAWN BY: MGR	CHK'D BY: DAS	SCALE: N/A
PROJECT NO.: 1261-11-222B	DATE: 12-22-11	



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SITE PHOTOGRAPHS
BRIDGE OVER CSX RAILROAD
ON RELOCATED SR 1113
RUTHERFORD COUNTY, NORTH CAROLINA

FIGURE NO.
7



SUMMARY OF LABORATORY TEST DATA
 Bridge over CSX - Hicks Grove Road Relocation
 Rutherford County, North Carolina
 S&ME Project No. 1261-11-222B

Sample ID	Sample No.	Sample Depth (feet)	AASHTO Class	SPT (N) (bpf)	Percent Finer #200 (%)	Atterberg Limits		pH	Resistivity (ohm-cm)	Sulfate (mg/kg)	Chloride (mg/kg)
						LL (%)	PI (%)				
B-1	SS-1	3.5-5	A2	25	33.1						
B-2	SS-2	6-7.5	A4	19	45.0	32	5				
B-2	SS-3	8.5-10	A4	31	43.5						
B-3	SS-4	6-7.5	A2	60	32.1						
B-3	SS-5	33.5-35	A2	84	31.5						
B-4	SS-6	8.5-10	A4	83	42.9	30	5				
B-4	SS-7	13.5-15	A4	70	41.4						
B-5	SS-8	18.5-20	A-2-4	25	35.0	31	5				
B-5	SS-9	23.5-25	A4	28	55.6						
B-6	SS-10	28.5-30	A2	17	32.5						
B-7	SS-11	3.5-5	A-4	26	49.9	34	6				
B-7	SS-12	6-7.5	A4	23	53.6						
B-8	SS-13	3.5-5	A4	32	38.5						
B-8	SS-14	6-7.5	A-2-4	48	22.6	NP	NP				
B-8	SS-15	43.5-45	A1	37	26.7						
B-1	B-16	5-10	--					5.3	83,100	BRL	BRL
B-3	B-17	10-15	--					6.1	52,400	14	BRL
B-5	B-18	15-20	--					5.3	138,500	BRL	BRL
B-7	B-19	20-25	--					5.1	69,200	12	BRL

Notes:
 SPT = Standard Penetration Test bpf = blows per foot B = Bulk Sample UD = Undisturbed Sample
 LL = Liquid Limit PI = Plasticity Index NP = Non-Plastic
 BRL = Below reporting limits

Form No: TR-126-T88-WH-1
 Revision No. 0
 Revision Date: 11/17/11

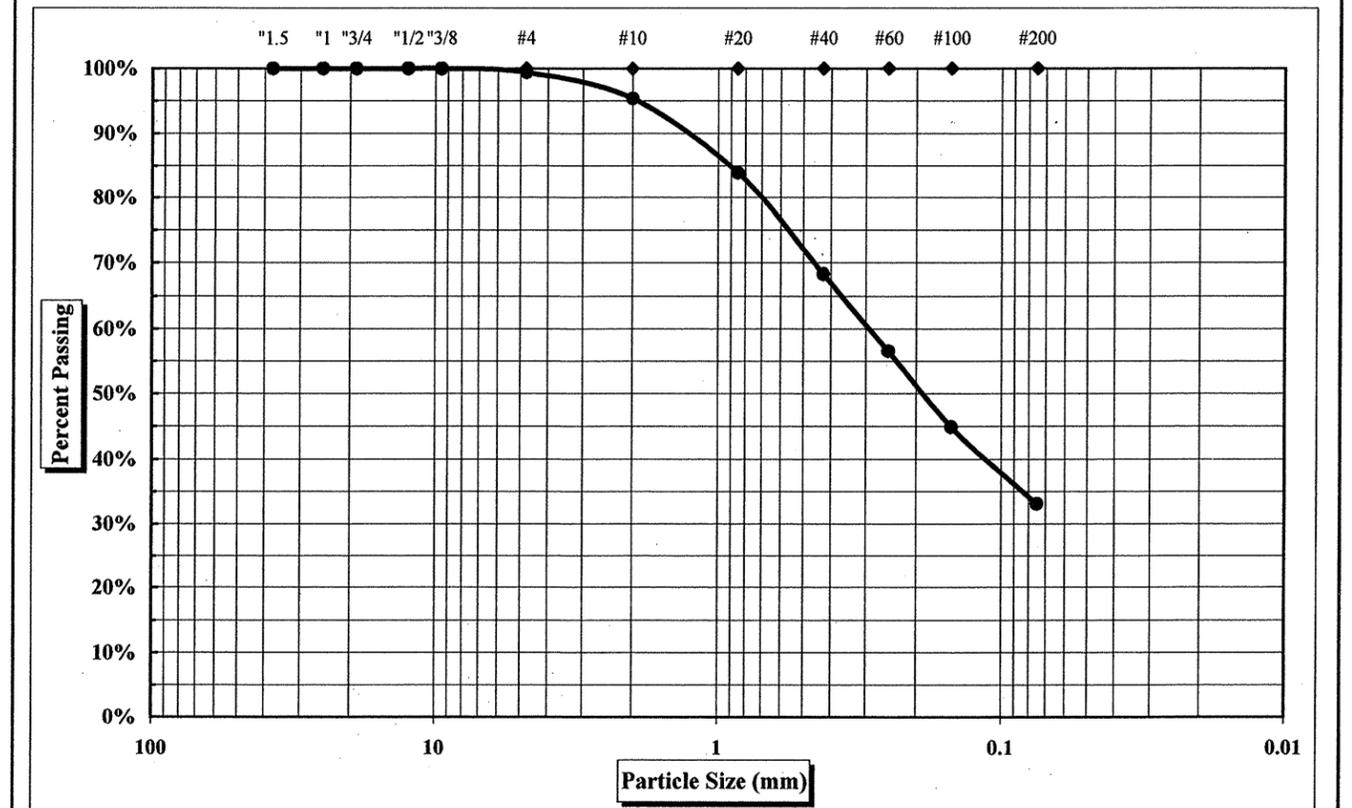
Particle-Size Analysis of Soils
 AASHTO T 88 (without Hydrometer)



S&ME Project #: **1261-11-222B**
 Project Name: **Hicks Grove Road Bridge over CSX Railroad**
 Client Name: **Horsehead Corporation**
 Client Address: **300 Frankfort Road Monaca, Pennsylvania 15061**

Report Date: **12/2/11**
 Test Date(s): **11/14 - 11/17/11**

Boring #:	B-1	Sample #:	360	Sample Date:	11/7/11
Location:	SS-1	Type:	Split-spoon	Elevation:	3.5-5'
Sample Description:	Red brown tan silty coarse to fine SAND				



As Defined by AASHTO		Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.075 and > 0.002 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Clay	< 0.002 mm

Maximum Particle Size 4.75 mm
 Gravel 4.6%
 Coarse Sand 27.0%
 Fine Sand 35.2%
 Silt & Clay 33.1%

References: AASHTO T 88: Particle-Size Analysis of Soils
 AASHTO T 89: Determining the Liquid Limit of Soils
 AASHTO T 2: Practice for Sampling Aggregates
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
 AASHTO T 265: Laboratory Determination of Moisture Content of Soils
 AASHTO T 90: Determining the Plastic Limit & Plastics Index of Soils
 AASHTO T 248: Practice for Reducing Samples of Aggregate to Testing Size

Technical Responsibility: Brian Vaughan, P.E.
 S&ME, INC. 301 Zima Park Drive Spartanburg, SC 29301
 QC Manager
 B-1 (3.5-5') Grain.xls

Liquid Limit, Plastic Limit, and Plastic Index



ASTM D 4318 AASHTO T 89 AASHTO T 90 **Quality Assurance**

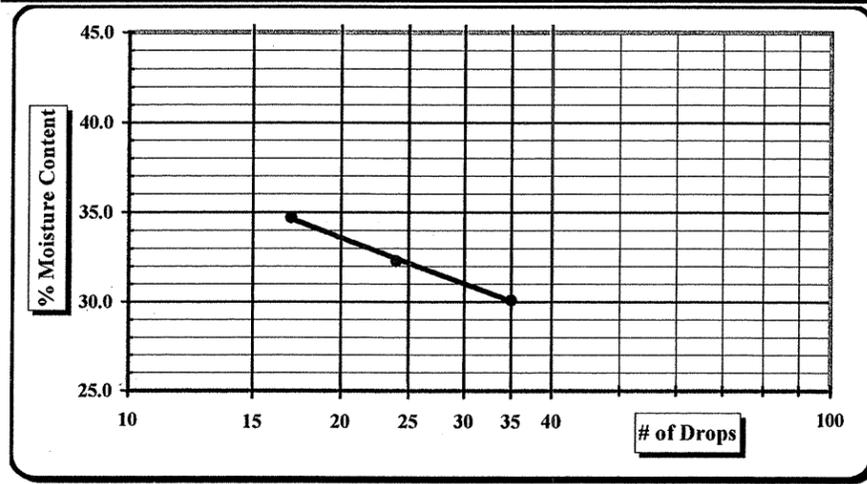
S&ME, Inc. - Spartanburg 301 Zima Park Drive Spartanburg, SC 29301

Project #: 1261-11-222B **Report Date:** 12/2/11
Project Name: Hicks Grove Road Bridge over CSX Railroad **Test Date:** 11/30/11
Client Name: Horsehead Corporation
Client Address: 300 Frankfort Road Monaca, Pennsylvania 15061

Boring #: B-2 **Sample #:** 364 **Sample Date:** 11/8/11
Location: SS-2 **Type:** Split-spoon **Depth:** 6-7.5'

Sample Description: Brown orange tan coarse to fine sandy SILT (A-4)
Type and Specification **S&ME ID #** **Cal Date:** **Type and Specification** **S&ME ID #** **Cal Date:**
 Balance (0.01 g) 7537 1/31/2011 Grooving tool 7797 1/28/2011
 LL Apparatus 13859 1/28/2011
 Oven 7313 7/29/2011

Pan #	Tare #:	Liquid Limit			Plastic Limit	
		P-1	P-2	P-3	1	2
A	Tare Weight	16.46	15.36	16.52	12.11	12.15
B	Wet Soil Weight + A	40.29	38.11	39.37	21.95	21.58
C	Dry Soil Weight + A	34.77	32.55	33.48	19.86	19.56
D	Water Weight (B-C)	5.52	5.56	5.89	2.09	2.02
E	Dry Soil Weight (C-A)	18.31	17.19	16.96	7.75	7.41
F	% Moisture (D/E)*100	30.1%	32.3%	34.7%	27.0%	27.3%
N	# OF DROPS	35	24	17	Moisture Contents determined by AASHTO T 265	
LL	LL = F * FACTOR					
Ave.	Average				27.2%	



N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic
 Liquid Limit **32**
 Plastic Limit **27**
 Plastic Index **5**
 Group Symbol **A-4**
 Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried **% Passing #200 Sieve: 45.0%**

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs 12/2/11 **Brian Vaughan, P.E.** 12/2/11
 Technician Name Date Technical Responsibility Date

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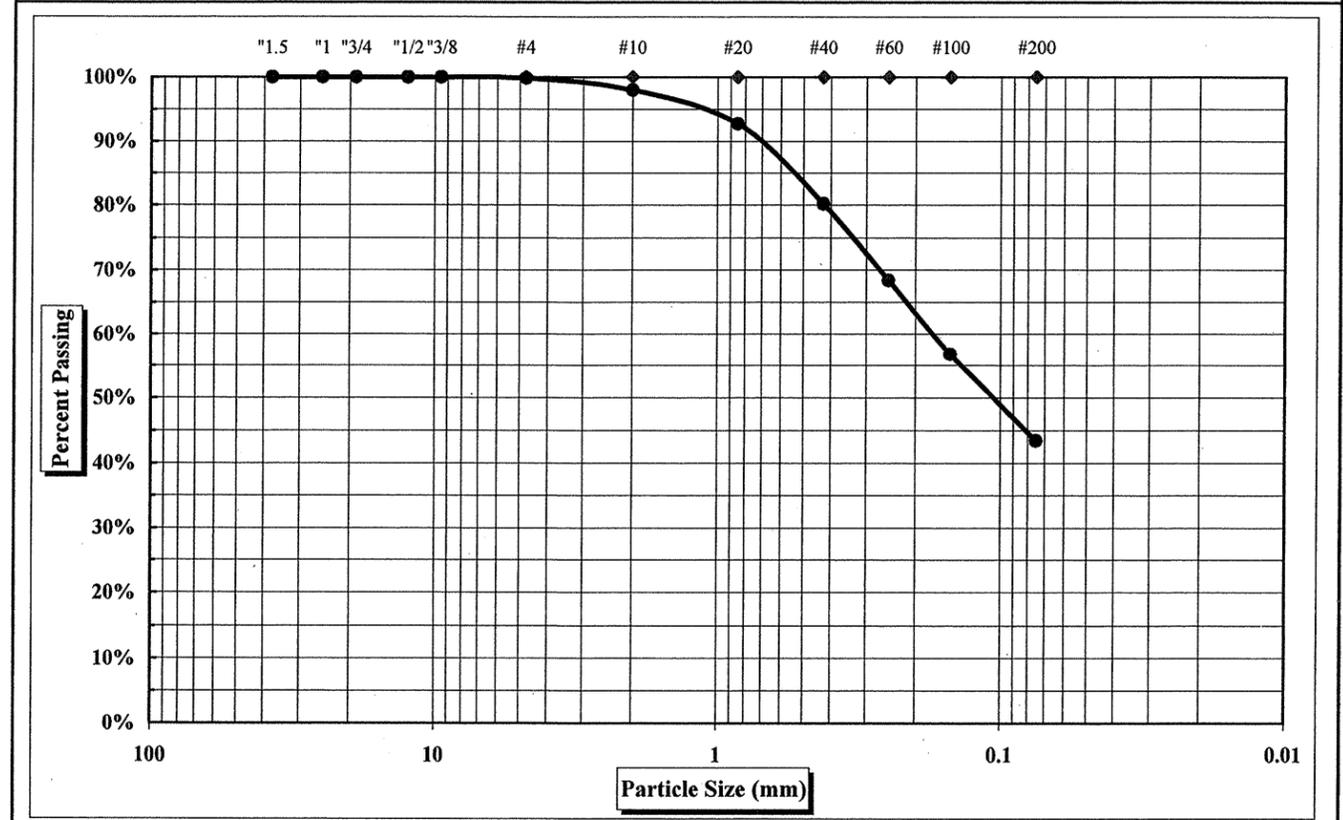
Particle-Size Analysis of Soils



AASHTO T 88 (without Hydrometer)

S&ME Project #: 1261-11-222B **Report Date:** 12/2/11
Project Name: Hicks Grove Road Bridge over CSX Railroad **Test Date(s):** 11/14 - 11/17/11
Client Name: Horsehead Corporation
Client Address: 300 Frankfort Road Monaca, Pennsylvania 15061

Boring #: B-2 **Sample #:** 360 **Sample Date:** 11/8/11
Location: SS-3 **Type:** Split-spoon **Elevation:** 8.5-10'
Sample Description: Brown orange tan coarse to fine sandy SILT



As Defined by AASHTO		Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.075 and > 0.002 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Clay	< 0.002 mm

Maximum Particle Size 4.75 mm Gravel 2.0% Fine Sand 36.7%
 Coarse Sand 17.8% Silt & Clay 43.5%

References: AASHTO T 88: Particle-Size Analysis of Soils AASHTO T 265: Laboratory Determination of Moisture Content of Soils
 AASHTO T 89: Determining the Liquid Limit of Soils AASHTO T 90: Determining the Plastic Limit & Plastics Index of Soils
 AASHTO T 2: Practice for Sampling Aggregates AASHTO T 248: Practice for Reducing Samples of Aggregate to Testing Size
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: **Brian Vaughan, P.E.** **QC Manager**
 S&ME, INC. 301 Zima Park Drive Spartanburg, SC 29301 B-2 (8.5-10') Grain.xls

Liquid Limit, Plastic Limit, and Plastic Index



ASTM D 4318 AASHTO T 89 AASHTO T 90 Quality Assurance

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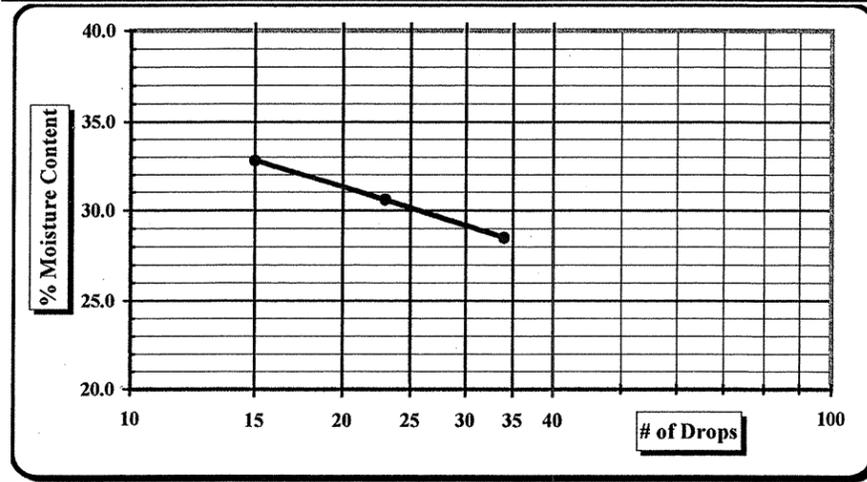
Project #: 1261-11-222B Report Date: 12/2/11
 Project Name: Hicks Grove Road Bridge over CSX Railroad Test Date: 11/30/11
 Client Name: Horsehead Corporation
 Client Address: 300 Frankfort Road Monaca, Pennsylvania 15061

Boring #: B-4 Sample #: 364 Sample Date: 11/4/11
 Location: SS-6 Type: Split-spoon Depth: 8.5-10'

Sample Description: Red brown gray coarse to fine sandy SILT (A-4)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2011	Grooving tool	7797	1/28/2011
LL Apparatus	13859	1/28/2011			
Oven	7313	7/29/2011			

Pan #	Tare #:	Liquid Limit			Plastic Limit	
		Q-1	Q-2	Q-3	3	4
A	Tare Weight	16.75	16.72	15.75	11.58	12.26
B	Wet Soil Weight + A	41.21	42.59	40.66	22.55	21.73
C	Dry Soil Weight + A	35.79	36.53	34.51	20.35	19.85
D	Water Weight (B-C)	5.42	6.06	6.15	2.20	1.88
E	Dry Soil Weight (C-A)	19.04	19.81	18.76	8.77	7.59
F	% Moisture (D/E)*100	28.5%	30.6%	32.8%	25.1%	24.8%
N	# OF DROPS	34	23	15	Moisture Contents determined by AASHTO T 265	
LL	LL = F * FACTOR				25.0%	
Ave.	Average					



N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic
 Liquid Limit 30
 Plastic Limit 25
 Plastic Index 5
 Group Symbol A-4
 Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried % Passing #200 Sieve: 42.9%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs 12/2/11 Brian Vaughan, P.E. 12/2/11
 Technician Name Date Technical Responsibility Date

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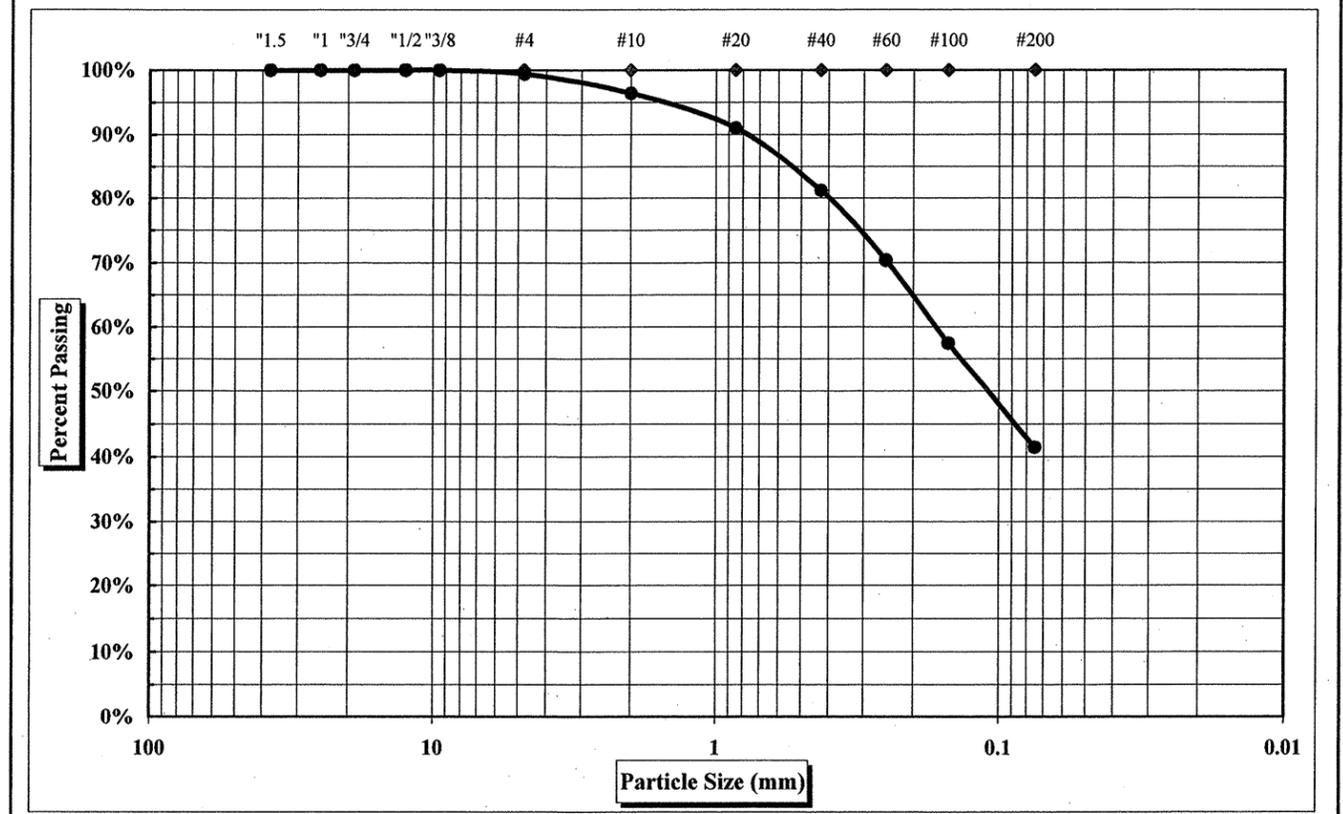
Particle-Size Analysis of Soils



AASHTO T 88 (without Hydrometer)

S&ME Project #: 1261-11-222B Report Date: 12/2/11
 Project Name: Hicks Grove Road Bridge over CSX Railroad Test Date(s): 11/14 - 11/17/11
 Client Name: Horsehead Corporation
 Client Address: 300 Frankfort Road Monaca, Pennsylvania 15061

Boring #: B-4 Sample #: 360 Sample Date: 11/4/11
 Location: SS-7 Type: Split-spoon Elevation: 13.5-15'
 Sample Description: Red brown gray coarse to fine sandy SILT



As Defined by AASHTO		Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.075 and > 0.002 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Clay	< 0.002 mm

Maximum Particle Size 4.75 mm Gravel 3.6% Fine Sand 39.8%
 Coarse Sand 15.2% Silt & Clay 41.4%

References: AASHTO T 88: Particle-Size Analysis of Soils AASHTO T 265: Laboratory Determination of Moisture Content of Soils
 AASHTO T 89: Determining the Liquid Limit of Soils AASHTO T 90: Determining the Plastic Limit & Plastics Index of Soils
 AASHTO T 2: Practice for Sampling Aggregates AASHTO T 248: Practice for Reducing Samples of Aggregate to Testing Size
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Brian Vaughan, P.E. QC Manager
 S&ME, INC. 301 Zima Park Drive Spartanburg, SC 29301 B-4 (13.5-15') Grain.xls

Liquid Limit, Plastic Limit, and Plastic Index



ASTM D 4318 AASHTO T 89 AASHTO T 90 Quality Assurance

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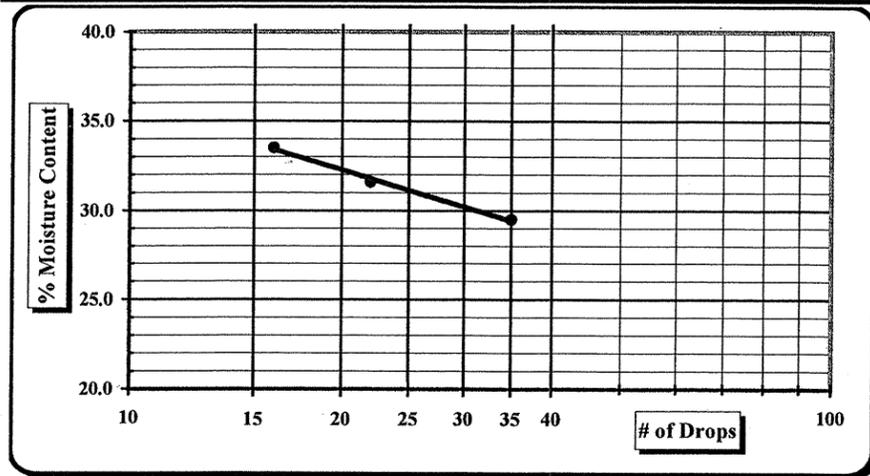
Project #: 1261-11-222B Report Date: 12/2/11
 Project Name: Hicks Grove Road Bridge over CSX Railroad Test Date: 11/30/11
 Client Name: Horsehead Corporation
 Client Address: 300 Frankfort Road Monaca, Pennsylvania 15061

Boring #: B-5 Sample #: 364 Sample Date: 11/1/11
 Location: SS-8 Type: Split-spoon Depth: 18.5-20'

Sample Description: Red orange brown silty coarse to fine SAND (A-2-4)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2011	Grooving tool	7797	1/28/2011
LL Apparatus	13859	1/28/2011			
Oven	7313	7/29/2011			

Pan #	Tare #:	Liquid Limit			Plastic Limit	
		Y-1	Y-2	Y-3	5	6
A	Tare Weight	16.48	16.52	16.99	12.09	12.30
B	Wet Soil Weight + A	40.52	42.69	40.16	23.17	22.42
C	Dry Soil Weight + A	35.05	36.40	34.34	20.86	20.33
D	Water Weight (B-C)	5.47	6.29	5.82	2.31	2.09
E	Dry Soil Weight (C-A)	18.57	19.88	17.35	8.77	8.03
F	% Moisture (D/E)*100	29.5%	31.6%	33.5%	26.3%	26.0%
N	# OF DROPS	35	22	16	Moisture Contents determined by AASHTO T 265	
LL	LL = F * FACTOR					
Ave.	Average				26.2%	



N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic
 Liquid Limit 31
 Plastic Limit 26
 Plastic Index 5
 Group Symbol A-2-4

Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried % Passing #200 Sieve: 35.0%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils

AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs
 Technician Name

12/2/11
 Date

Brian Vaughan, P.E.
 Technical Responsibility

12/2/11
 Date

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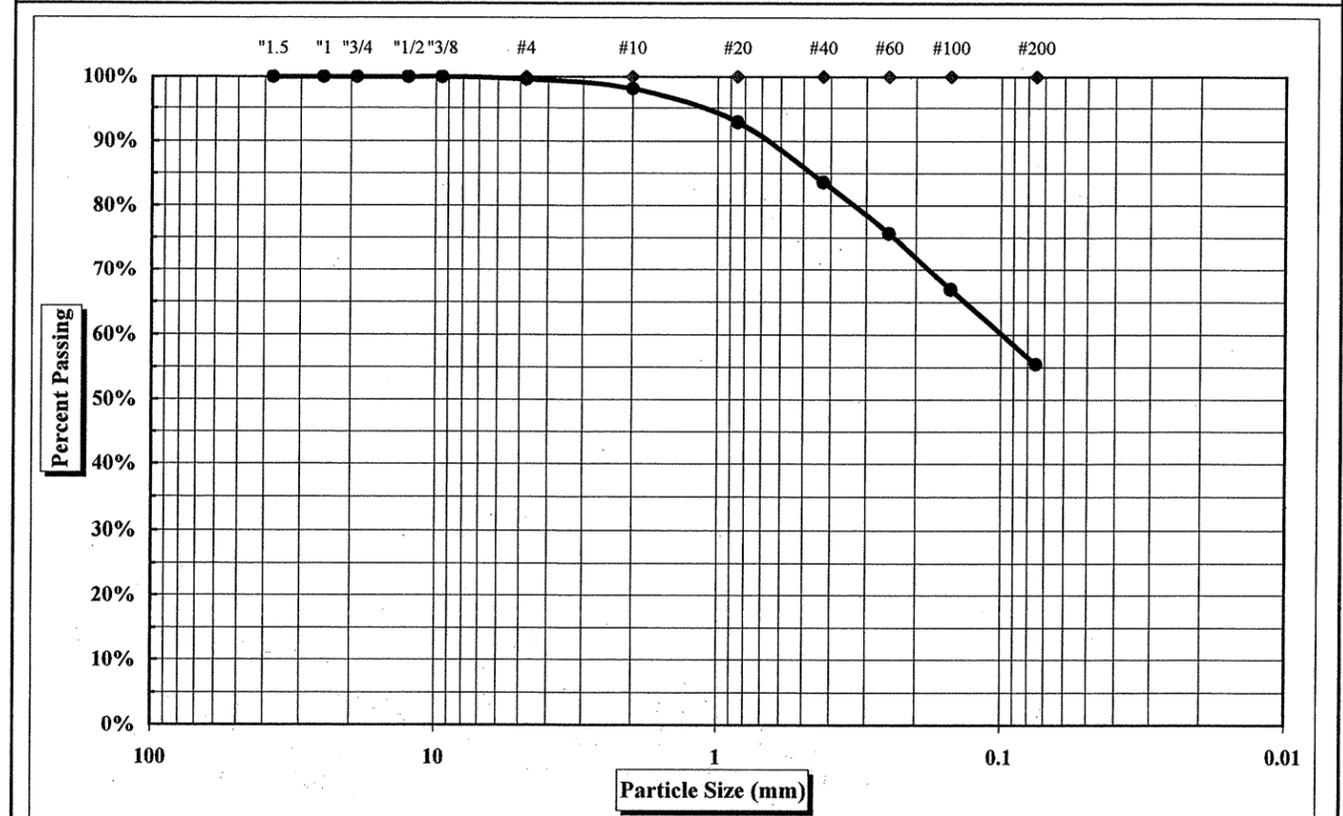
Particle-Size Analysis of Soils



AASHTO T 88 (without Hydrometer)

S&ME Project #: 1261-11-222B Report Date: 12/2/11
 Project Name: Hicks Grove Road Bridge over CSX Railroad Test Date(s): 11/14 - 11/17/11
 Client Name: Horsehead Corporation
 Client Address: 300 Frankfort Road Monaca, Pennsylvania 15061

Boring #: B-5 Sample #: 360 Sample Date: 11/1/11
 Location: SS-9 Type: Split-spoon Elevation: 23.5-25'
 Sample Description: Red brown orange coarse to fine sandy SILT



As Defined by AASHTO		Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.075 and > 0.002 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Clay	< 0.002 mm

Maximum Particle Size 4.75 mm Gravel 1.9% Fine Sand 28.1%
 Coarse Sand 14.5% Silt & Clay 55.6%

References: AASHTO T 88: Particle-Size Analysis of Soils

AASHTO T 265: Laboratory Determination of Moisture Content of Soils

AASHTO T 89: Determining the Liquid Limit of Soils

AASHTO T 90: Determining the Plastic Limit & Plastics Index of Soils

AASHTO T 2: Practice for Sampling Aggregates

AASHTO T 248: Practice for Reducing Samples of Aggregate to Testing Size

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Brian Vaughan, P.E.

QC Manager

Particle-Size Analysis of Soils

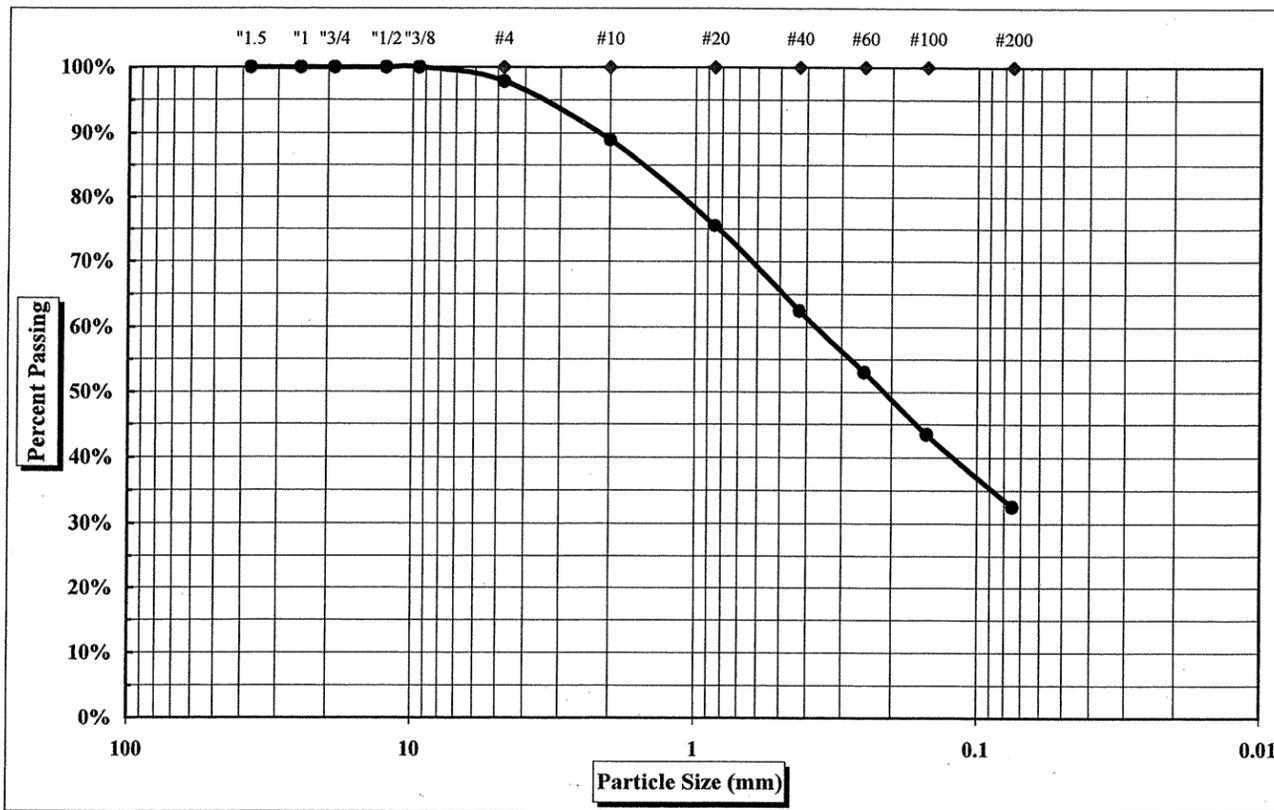
AASHTO T 88 (without Hydrometer)



S&ME Project #: **1261-11-222B**
 Project Name: **Hicks Grove Road Bridge over CSX Railroad**
 Client Name: **Horsehead Corporation**
 Client Address: **300 Frankfort Road Monaca, Pennsylvania 15061**

Report Date: **12/2/11**
 Test Date(s): **11/14 - 11/17/11**

Boring #: **B-6** Sample #: **360** Sample Date: **10/31/11**
 Location: **SS-10** Type: **Split-spoon** Elevation: **28.5-30'**
 Sample Description: **Brown tan silty coarse to fine SAND with gravel**



As Defined by AASHTO		Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.075 and > 0.002 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Clay	< 0.002 mm

Maximum Particle Size **9.50 mm** Gravel **11.1%** Fine Sand **30.0%**
 Coarse Sand **26.4%** Silt & Clay **32.5%**

References: AASHTO T 88: Particle-Size Analysis of Soils AASHTO T 265: Laboratory Determination of Moisture Content of Soils
 AASHTO T 89: Determining the Liquid Limit of Soils AASHTO T 90: Determining the Plastic Limit & Plastics Index of Soils
 AASHTO T 2: Practice for Sampling Aggregates AASHTO T 248: Practice for Reducing Samples of Aggregate to Testing Size
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: **Brian Vaughan, P.E.**
 Signature _____
 S&ME, INC. 301 Zima Park Drive Spartanburg, SC 29301

QC Manager
 Position _____
 B-6 (28.5-30') Grain.xls

Liquid Limit, Plastic Limit, and Plastic Index



ASTM D 4318 AASHTO T 89 AASHTO T 90 Quality Assurance

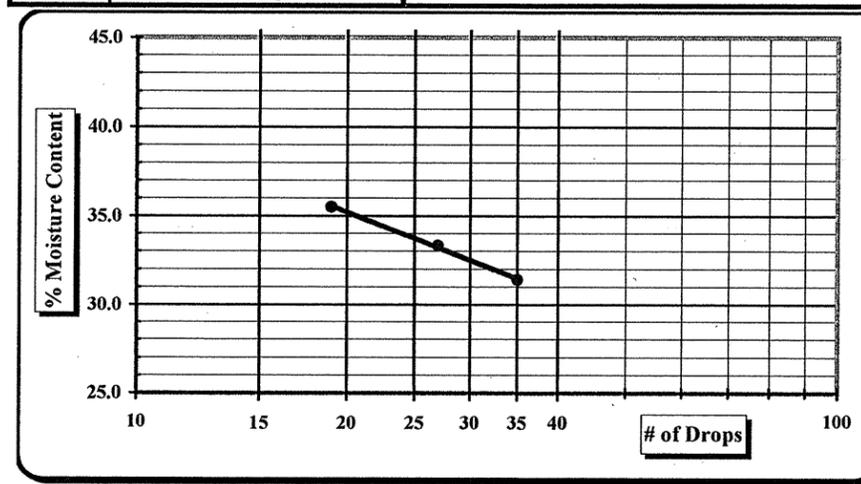
S&ME, Inc. - Spartanburg 301 Zima Park Drive Spartanburg, SC 29301

Project #: **1261-11-222B** Report Date: **12/2/11**
 Project Name: **Hicks Grove Road Bridge over CSX Railroad** Test Date: **12/1/11**
 Client Name: **Horsehead Corporation**
 Client Address: **300 Frankfort Road Monaca, Pennsylvania 15061**

Boring #: **B-7** Sample #: **364** Sample Date: **11/11/11**
 Location: **SS-11** Type: **Split-spoon** Depth: **3.5-5'**
 Sample Description: **Red brown tan coarse to fine sandy SILT (A-4)**

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	7537	1/31/2011	Grooving tool	7797	1/28/2011
LL Apparatus	13859	1/28/2011			
Oven	7313	11/30/2011			

Pan #	Tare #:	Liquid Limit			Plastic Limit	
		Z-1	Z-2	Z-3	7	9
A	Tare Weight	15.97	16.68	16.77	12.00	12.24
B	Wet Soil Weight + A	39.45	39.54	38.89	22.69	22.15
C	Dry Soil Weight + A	33.84	33.83	33.09	20.37	20.01
D	Water Weight (B-C)	5.61	5.71	5.80	2.32	2.14
E	Dry Soil Weight (C-A)	17.87	17.15	16.32	8.37	7.77
F	% Moisture (D/E)*100	31.4%	33.3%	35.5%	27.7%	27.5%
N	# OF DROPS	35	27	19	Moisture Contents determined by AASHTO T 265	
LL	LL = F * FACTOR					
Ave.	Average				27.6%	



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic
 Liquid Limit **34**
 Plastic Limit **28**
 Plastic Index **6**
 Group Symbol **A-4**
 Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried % Passing #200 Sieve: **49.9%**

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs 12/2/11 Brian Vaughan, P.E. 12/2/11
 Technician Name Date Technical Responsibility Date

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Particle-Size Analysis of Soils

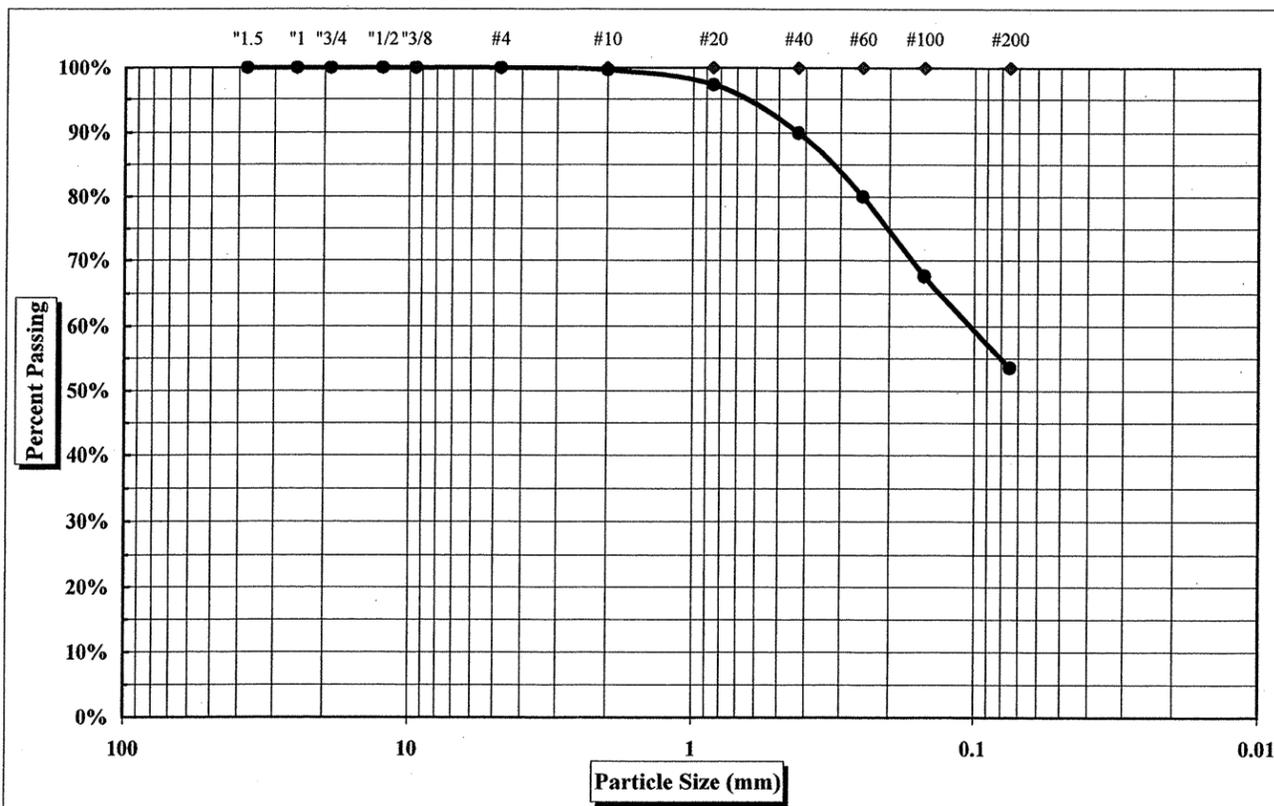
AASHTO T 88 (without Hydrometer)

S&ME Project #: 1261-11-222B
 Project Name: Hicks Grove Road Bridge over CSX Railroad
 Client Name: Horsehead Corporation
 Client Address: 300 Frankfort Road Monaca, Pennsylvania 15061

Report Date: 12/2/11
 Test Date(s): 11/14 - 11/17/11



Boring #: B-7 Sample #: 360 Sample Date: 11/2/11
 Location: SS-12 Type: Split-spoon Elevation: 6-7.5'
 Sample Description: Red brown tan coarse to fine sandy SILT



As Defined by AASHTO		Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.075 and > 0.002 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Clay	< 0.002 mm

Maximum Particle Size 2.00 mm
 Gravel 0.3%
 Coarse Sand 9.7%
 Fine Sand 36.3%
 Silt & Clay 53.6%

References: AASHTO T 88: Particle-Size Analysis of Soils AASHTO T 265: Laboratory Determination of Moisture Content of Soils
 AASHTO T 89: Determining the Liquid Limit of Soils AASHTO T 90: Determining the Plastic Limit & Plastics Index of Soils
 AASHTO T 2: Practice for Sampling Aggregates AASHTO T 248: Practice for Reducing Samples of Aggregate to Testing Size
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Brian Vaughan, P.E. QC Manager
 Signature Position
 S&ME,INC. 301 Zima Park Drive Spartanburg, SC 29301 B-7 (6-7.5') Grain.xls

Particle-Size Analysis of Soils

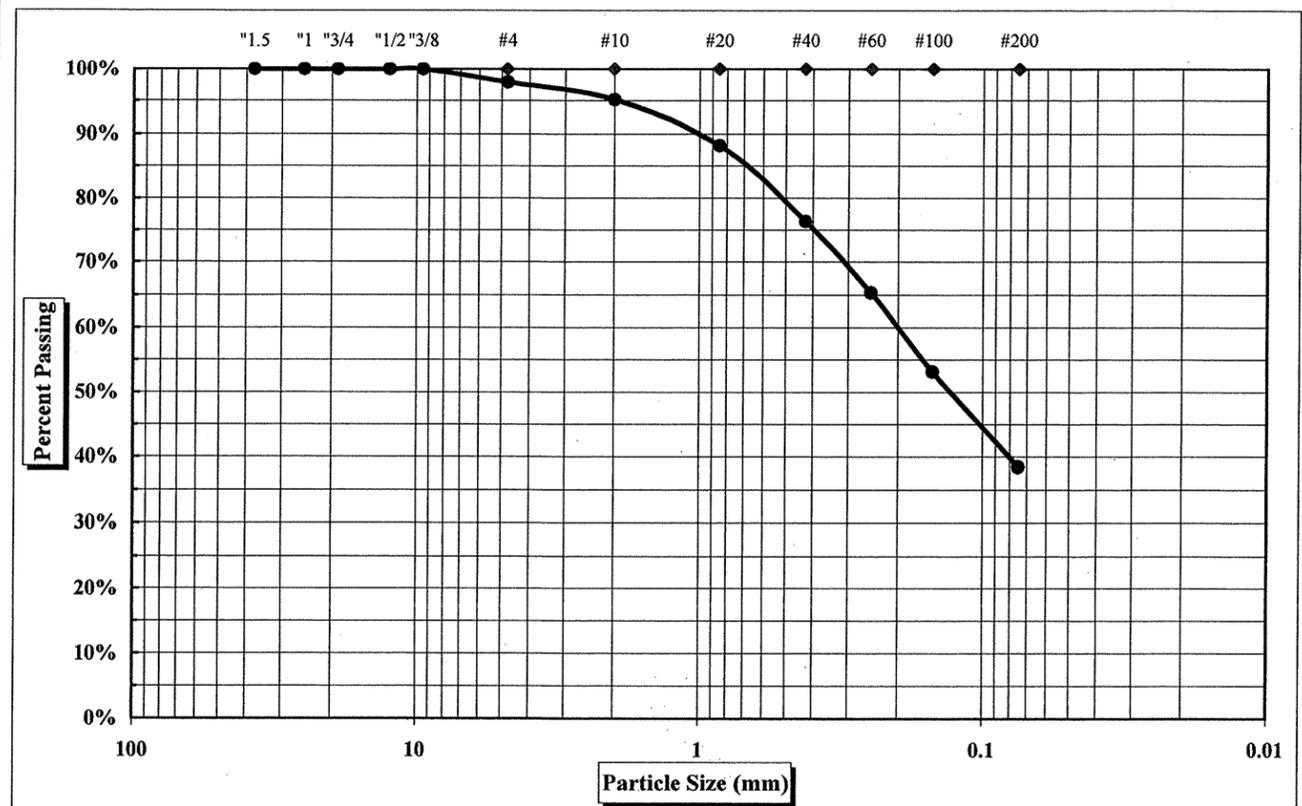
AASHTO T 88 (without Hydrometer)

S&ME Project #: 1261-11-222B
 Project Name: Hicks Grove Road Bridge over CSX Railroad
 Client Name: Horsehead Corporation
 Client Address: 300 Frankfort Road Monaca, Pennsylvania 15061

Report Date: 12/2/11
 Test Date(s): 11/14 - 11/17/11



Boring #: B-8 Sample #: 360 Sample Date: 11/2/11
 Location: SS-13 Type: Split-spoon Elevation: 3.5-5'
 Sample Description: Red brown tan coarse to fine sandy SILT



As Defined by AASHTO		Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.075 and > 0.002 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Clay	< 0.002 mm

Maximum Particle Size 9.50 mm
 Gravel 4.8%
 Coarse Sand 18.8%
 Fine Sand 37.9%
 Silt & Clay 38.5%

References: AASHTO T 88: Particle-Size Analysis of Soils AASHTO T 265: Laboratory Determination of Moisture Content of Soils
 AASHTO T 89: Determining the Liquid Limit of Soils AASHTO T 90: Determining the Plastic Limit & Plastics Index of Soils
 AASHTO T 2: Practice for Sampling Aggregates AASHTO T 248: Practice for Reducing Samples of Aggregate to Testing Size
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Brian Vaughan, P.E. QC Manager
 Signature Position
 S&ME,INC. 301 Zima Park Drive Spartanburg, SC 29301 B-8 (3.5-5') Grain.xls

Liquid Limit, Plastic Limit, and Plastic Index



ASTM D 4318 AASHTO T 89 AASHTO T 90 **Quality Assurance**

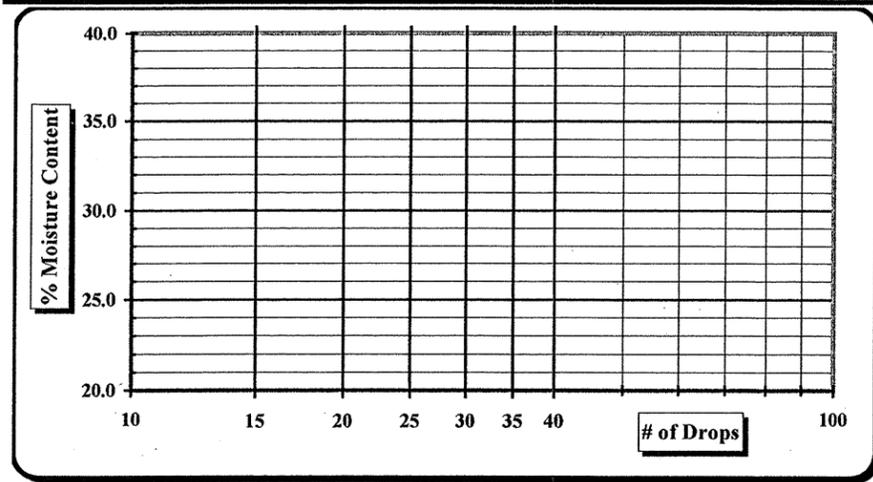
S&ME, Inc. - Spartanburg 301 Zima Park Drive Spartanburg, SC 29301

Project #: 1261-11-222B **Report Date:** 12/2/11
Project Name: Hicks Grove Road Bridge over CSX Railroad **Test Date:** 12/1/11
Client Name: Horsehead Corporation
Client Address: 300 Frankfort Road Monaca, Pennsylvania 15061

Boring #: B-8 **Sample #:** 364 **Sample Date:** 11/2/11
Location: SS-14 **Type:** Split-spoon **Depth:** 6-7.5'

Sample Description: Brown yellow red silty fine to coarse SAND (A-2-4)
Type and Specification **S&ME ID #** **Cal Date:** **Type and Specification** **S&ME ID #** **Cal Date:**
 Balance (0.01 g) 7537 1/31/2011 Grooving tool 7797 1/28/2011
 LL Apparatus 13859 1/28/2011
 Oven 7313 11/30/2011

Pan #	Tare #:	Liquid Limit				Plastic Limit			
A	Tare Weight								
B	Wet Soil Weight + A								
C	Dry Soil Weight + A								
D	Water Weight (B-C)								
E	Dry Soil Weight (C-A)								
F	% Moisture (D/E)*100								
N	# OF DROPS					Moisture Contents determined by AASHTO T 265			
LL	LL = R * FACTOR								
Ave.	Average								



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.00		

NP, Non-Plastic
 Liquid Limit ----
 Plastic Limit NP
 Plastic Index NP
 Group Symbol **A-2-4**
 Multipoint Method
 One-point Method

Wet Preparation Dry Preparation Air Dried **% Passing #200 Sieve: 22.6%**

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils AASHTO T 89: Determining the Liquid Limit of Soils

Matt Jacobs 12/2/11 **Brian Vaughan, P.E.** 12/2/11
 Technician Name Date Technical Responsibility Date

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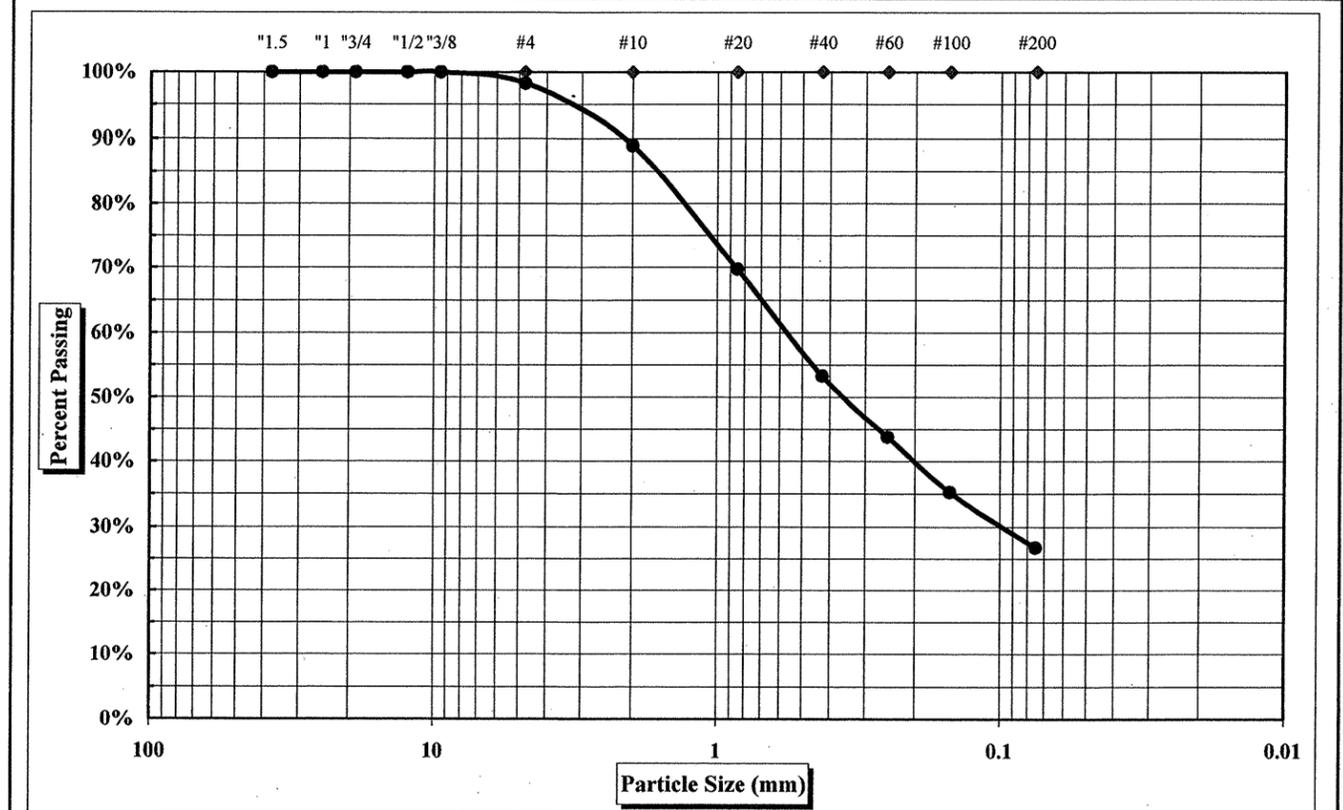
Particle-Size Analysis of Soils



AASHTO T 88 (without Hydrometer)

S&ME Project #: 1261-11-222B **Report Date:** 12/2/11
Project Name: Hicks Grove Road Bridge over CSX Railroad **Test Date(s):** 11/14 - 11/17/11
Client Name: Horsehead Corporation
Client Address: 300 Frankfort Road Monaca, Pennsylvania 15061

Boring #: B-8 **Sample #:** 360 **Sample Date:** 11/2/11
Location: SS-15 **Type:** Split-spoon **Elevation:** 43.5-45'
Sample Description: Brown red tan silty fine to coarse SAND with gravel



As Defined by AASHTO			
Gravel	< 75 mm and > 2.00 mm	Fine Sand	< 0.425 mm and > 0.075 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Silt	< 0.075 and > 0.002 mm
		Clay	< 0.002 mm

Maximum Particle Size 9.50 mm Gravel 11.0% Fine Sand 26.6%
 Coarse Sand 35.7% Silt & Clay 26.7%

References: AASHTO T 88: Particle-Size Analysis of Soils AASHTO T 265: Laboratory Determination of Moisture Content of Soils
 AASHTO T 89: Determining the Liquid Limit of Soils AASHTO T 90: Determining the Plastic Limit & Plastics Index of Soils
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 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: **Brian Vaughan, P.E.** **QC Manager**
 S&ME, INC. 301 Zima Park Drive Spartanburg, SC 29301 B-8 (43.5-45') Grain.xls