S&ME, Inc.
9751 Southern Pine Blvd.
Charlotte, North Carolina
Telephone: 704-523-4726
Fax: 704-525-3953

ENGINEERING • TESTING
ENVIRONMENTAL SERVICES

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**			**Boring No. M-20**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 1 of 2
Boring Depth (ft): **48.0**	Elevation (ft): **706.0**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **12/11/07**
Logged By: **Scott Dacus**	Water Level: **Stabilized Water Level at 38.98 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
705	0		**GRASS and TOPSOIL**		
			SOIL/SAPROLITE (M1): Brownish-Red, Fine Sandy, Silty, **CLAY**		
700	5				
			SOIL/SAPROLITE (M1): Red and Yellow Striated, Medium to Fine Sandy, Clayey, **SILT** With Manganese Staining		
695	10				
			SOIL/SAPROLITE (M1): Red and Yellow Mottled, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining		
690	15				
			SOIL/SAPROLITE (M1): Gray and White, Silty, Fine **SAND** With Manganese Staining		
685	20				
			SOIL/SAPROLITE (M1): Tan and White, Slightly Micaceous, Fine Sandy, **SILT** With Manganese Staining		
680	25				
675	30				

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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Project: **MNS - Groundwater Protection Project**			**Boring No. M-20**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 2 of 2
Boring Depth (ft): **48.0**	Elevation (ft): **706.0**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **12/11/07**
Logged By: **Scott Dacus**	Water Level: **Stabilized Water Level at 38.98 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
670	35				
			SOIL/SAPROLITE (M1): Green and Brown, Clayey, Silty, Medium to Fine **SAND**		
665	40				
			SOIL/SAPROLITE (M1): Red, Tan, and White, Micaceous, Silty, Medium to Fine **SAND**		
660	45				
			Boring Terminated at 48.00 ft bls **Lithologic Descriptions Obtained From M-20R**		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

COMPLETION REPORT OF WELL No. M-20

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **12/11/07**

WATER LEVEL: **Stabilized Water Level at 38.98 ft bls**
LATITUDE: **35 25 37.01**
LONGITUDE: **80 57 09.70**
TOP OF CASING ELEVATION: **709.03**
DATUM: **MSL**
LOGGED BY: **Scott Dacus**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		705.99
GRASS and TOPSOIL		0				
SOIL/SAPROLITE (M1): Brownish-Red, Fine Sandy, Silty, **CLAY**		5				
SOIL/SAPROLITE (M1): Red and Yellow Striated, Medium to Fine Sandy, Clayey, **SILT** With Manganese Staining		10				
SOIL/SAPROLITE (M1): Red and Yellow Mottled, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining		15				
SOIL/SAPROLITE (M1): Gray and White, Silty, Fine **SAND** With Manganese Staining		20				
SOIL/SAPROLITE (M1): Tan and White, Slightly Micaceous, Fine Sandy, **SILT** With Manganese Staining		25				
		30		29.00		676.99
				31.00		674.99

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 33 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 29 ft bls**

SEAL
Type: **Bentonite**
Interval: **29 to 31 ft bls**

FILTERPACK
Type: **#1 Filter Sand**
Interval: **31 to 48 ft bls**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **33 to 48 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **706.0**
LOGGED BY: **Scott Dacus**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
							(See Page 1)
SOIL/SAPROLITE (M1): Tan and White, Slightly Micaceous, Fine Sandy, **SILT** With Manganese Staining *(continued)*		35					
SOIL/SAPROLITE (M1): Green and Brown, Clayey, Silty, Medium to Fine **SAND**		40					
SOIL/SAPROLITE (M1): Red, Tan, and White, Micaceous, Silty, Medium to Fine **SAND**		45		47.50 48.00		658.49 657.99	

LEGEND

	FILTER PACK	TOC	TOP OF CASING
	BENTONITE	GS	GROUND SURFACE
	CEMENT GROUT	BS	BENTONITE SEAL
	CUTTINGS / BACKFILL	FP	FILTER PACK
▼	STATIC WATER LEVEL	TSC	TOP OF SCREEN
		BSC	BOTTOM OF SCREEN
		TD	TOTAL DEPTH
		CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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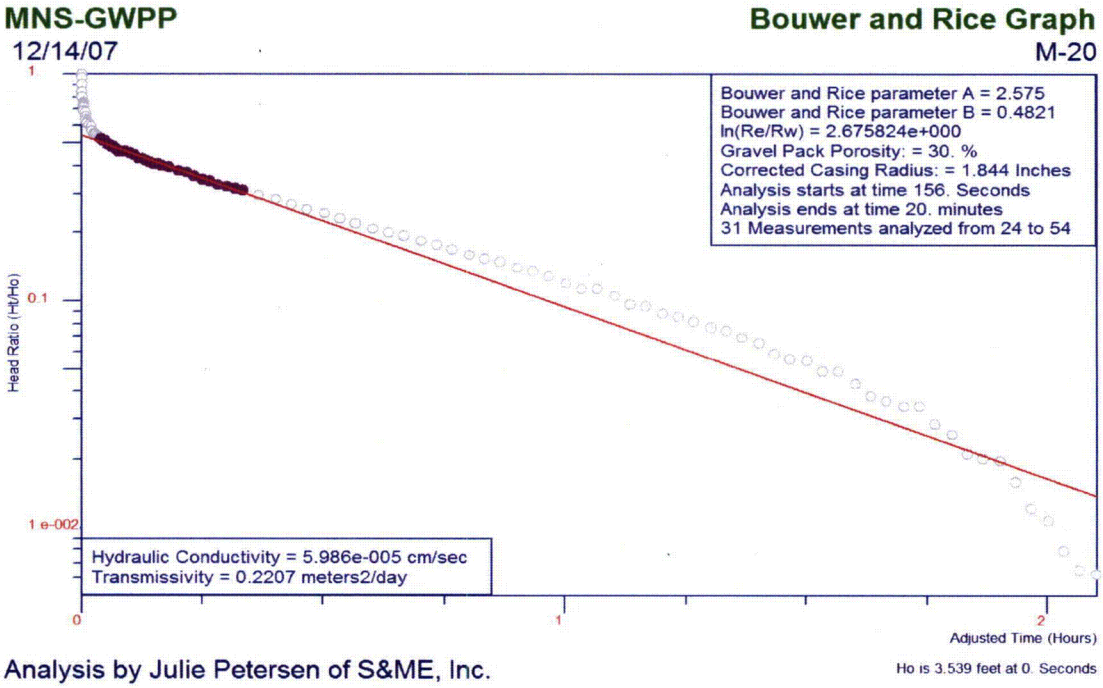
COMPLETION REPORT OF WELL No. M-20

Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	12/14/2007
Well Label:	M-20
Aquifer Thickness:	14. feet
Screen Length:	15. feet
Casing Radius:	1. Inches
Effective Radius:	3. Inches
Gravel Pack Porosity:	30.00%
Corrected Casing Radius:	1.844 Inches
Static Water Level:	38.98 feet
Water Table to Screen Bottom:	9.02 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 107 time and drawdown measurements
Maximum head is 3.539 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



PERMEABILITY

5.99×10^{-05} cm/sec

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Project: **MNS - Groundwater Protection Project**			**Boring No. M-20R**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 1 of 3
Boring Depth (ft): **75.0**	Elevation (ft): **706.2**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **12/5/07**
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 36.32 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
705			**GRASS and TOPSOIL**		
			SOIL/SAPROLITE (M1): Brownish-Red, Fine Sandy, Silty, **CLAY**		26
700	5				
			SOIL/SAPROLITE (M1): Red and Yellow Striated, Medium to Fine Sandy, Clayey, **SILT** With Manganese Staining		13
695	10				
			SOIL/SAPROLITE (M1): Red and Yellow Mottled, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining		7
690	15				
			SOIL/SAPROLITE (M1): Gray and White, Silty, Fine **SAND** With Manganese Staining		12
685	20				
			SOIL/SAPROLITE (M1): Tan and White, Slightly Micaceous, Fine Sandy, **SILT** With Manganese Staining		7
680	25				
					7
675	30				

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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Project: **MNS - Groundwater Protection Project**			**Boring No. M-20R**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 2 of 3
Boring Depth (ft): **75.0**	Elevation (ft): **706.2**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **12/5/07**
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 36.32 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lithology	Material Description
670	35		
			SOIL/SAPROLITE (M1): Green and Brown, Clayey, Silty, Medium to Fine **SAND**
665	40		
			SOIL/SAPROLITE (M1): Red, Tan, and White, Micaceous, Silty, Medium to Fine **SAND**
660	45		
			WEATHERED ROCK (M2): When Sampled Becomes Red, Tan, and White, Clayey, Silty, Coarse to Fine **SAND**
655	50		**Roller Cone Refusal at 52.30 ft bls**
			SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly Fractured Horizontal Joint With No Staining
650	55		SOUND ROCK (D): Fine-Grained **QUARTZ DIORITE**, Moderately Fractured Horizontal, High Angle, and Low Angle Joints With Slight Staining
645	60		SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly Fractured Low Angle Joints With Slight Staining
640	65		SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Unfractured

Well Construction

Penetration Resistance (Blows/Foot)
0 50 100
8
10
27
50/5
>>

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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Project: **MNS - Groundwater Protection Project**			**Boring No. M-20R**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 3 of 3
Boring Depth (ft): **75.0**	Elevation (ft): **706.2**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **12/5/07**
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 36.32 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
635	70				
			SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly Fractured Horizontal Joints With No Staining		
	75		**Boring Terminated at 75.00 ft bls**		

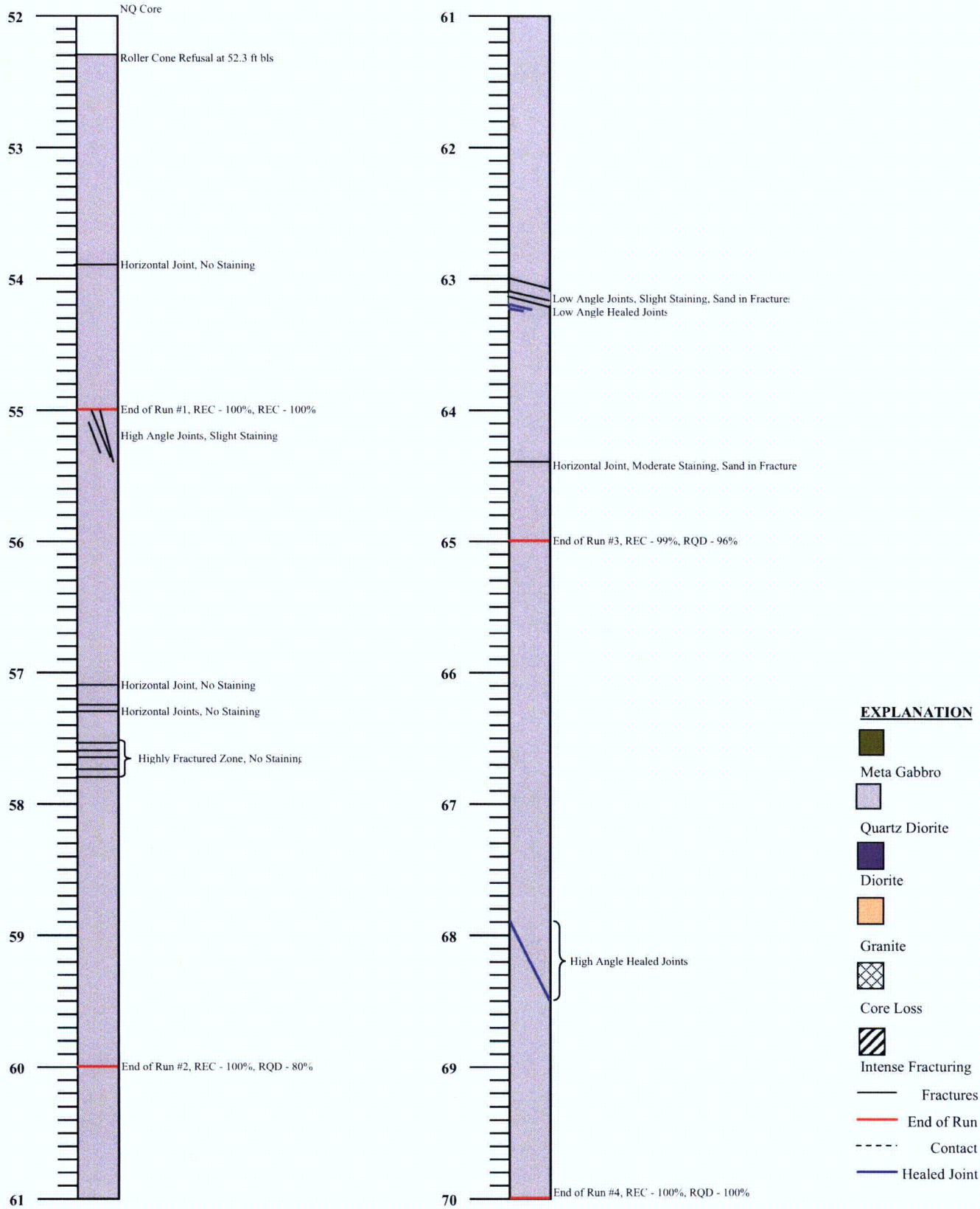
BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-20R

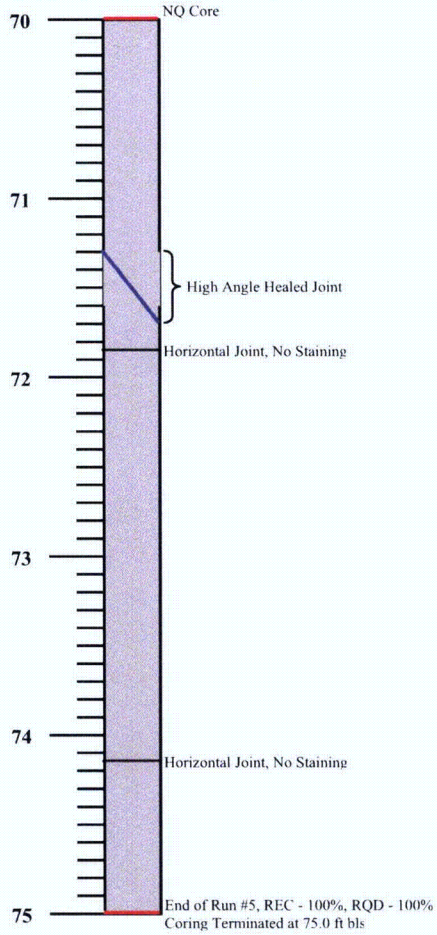


FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-20R



EXPLANATION

- Meta Gabbro
- Quartz Diorite
- Diorite
- Granite
- Core Loss
- Intense Fracturing
- Fractures
- End of Run
- Contact
- Healed Joint

COMPLETION REPORT OF WELL No. M-20R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **12/5/07**

WATER LEVEL: **Stabilized Water Level at 36.32 ft bls**
LATITUDE: **35 25 37.00**
LONGITUDE: **80 57 09.63**
TOP OF CASING ELEVATION: **709.17**
DATUM: **MSL**
LOGGED BY: **Julie Petersen**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		706.17
GRASS and TOPSOIL		0				
SOIL/SAPROLITE (M1): Brownish-Red, Fine Sandy, Silty, **CLAY**		5				
SOIL/SAPROLITE (M1): Red and Yellow Striated, Medium to Fine Sandy, Clayey, **SILT** With Manganese Staining		10				
SOIL/SAPROLITE (M1): Red and Yellow Mottled, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining		15				
SOIL/SAPROLITE (M1): Gray and White, Silty, Fine **SAND** With Manganese Staining		20				
SOIL/SAPROLITE (M1): Tan and White, Slightly Micaceous, Fine Sandy, **SILT** With Manganese Staining		25				
		30				

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 62.49 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 59.92 ft bls**

SEAL
Type: **K-Packer**
Interval: **59.92 to 62.22**

FILTERPACK
Type: **N/A**
Interval: **N/A**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **62.92 to 67.92 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-20R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **706.2**
LOGGED BY: **Julie Petersen**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
							(See Page 1)
SOIL/SAPROLITE (M1): Green and Brown, Clayey, Silty, Medium to Fine **SAND**		35					
		40					
SOIL/SAPROLITE (M1): Red, Tan, and White, Micaceous, Silty, Medium to Fine **SAND**		45					
WEATHERED ROCK (M2): When Sampled Becomes Red, Tan, and White, Clayey, Silty, Coarse to Fine **SAND**		50					
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly Fractured Horizontal Joint With No Staining		55					
SOUND ROCK (D): Fine-Grained **QUARTZ DIORITE**, Moderately Fractured Horizontal, High Angle, and Low Angle Joints With Slight Staining		60		59.92		646.25	
				61.92		644.25	
				62.22		643.95	
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly Fractured Low Angle Joints With Slight Staining		65		62.92		643.25	
				67.42		638.75	
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Unfractured		70		67.92		638.25	
				70.00		636.17	
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly Fractured Horizontal Joints With No Staining		75		75.00		631.17	

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-20R

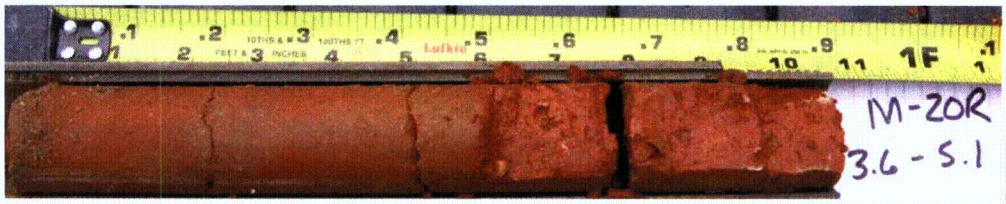
SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

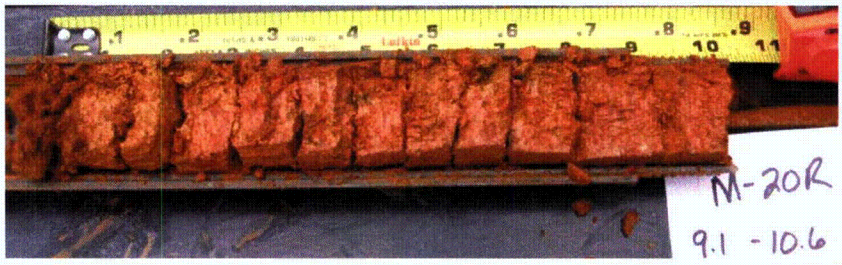
S&ME Project No: 1264-06-724

Boring Number: M-20R

Sample No: 1
Depth (ft-bls): 3.1 - 5.6
Blow Count: 7 * 11 * 15



Sample No: 2
Depth (ft-bls): 9.1 - 10.6
Blow Count: 5 * 6 * 7

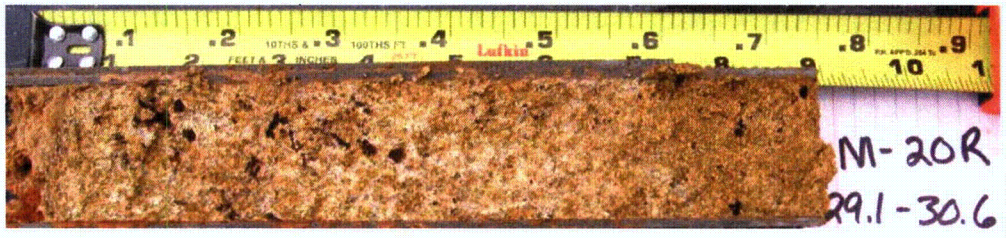


Sample No: 3
Depth (ft-bls): 14.1 - 15.6
Blow Count: 3 * 3 * 4

Sample No: 4
Depth (ft-bls): 19.1 - 20.6
Blow Count: 3 * 5 * 7

Sample No: 5
Depth (ft-bls): 24.1 - 25.6
Blow Count: 3 * 3 * 4

Sample No: 6
Depth (ft-bls): 29.1 - 30.6
Blow Count: 2 * 3 * 4



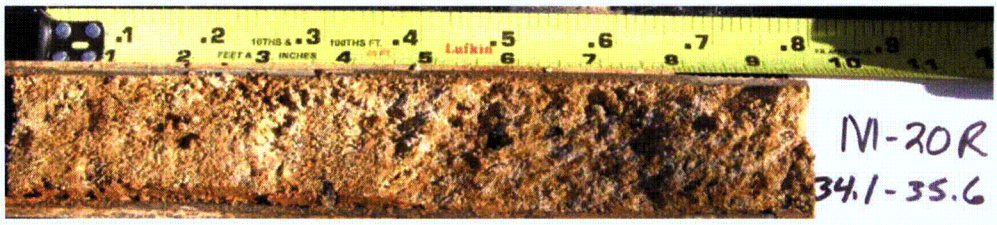
SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

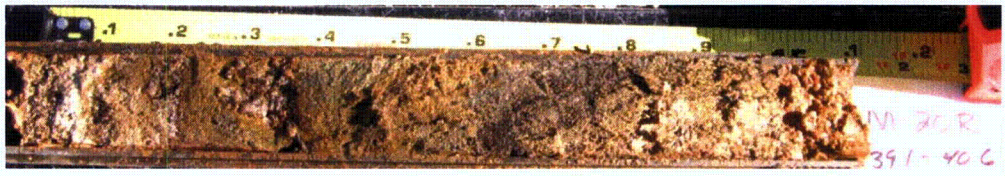
S&ME Project No: 1264-06-724

Boring Number: M-20R

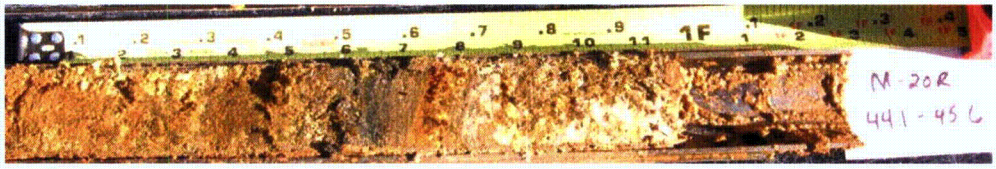
Sample No: 7
Depth (ft-bls): 34.1 - 35.6
Blow Count: 3 * 3 * 5



Sample No: 8
Depth (ft-bls): 39.1 - 40.6
Blow Count: 3 * 4 * 6



Sample No: 9
Depth (ft-bls): 44.1 - 45.6
Blow Count: 12 * 12 * 15



Sample No: 10
Depth (ft-bls): 49.1 - 50.6
Blow Count: 50/5

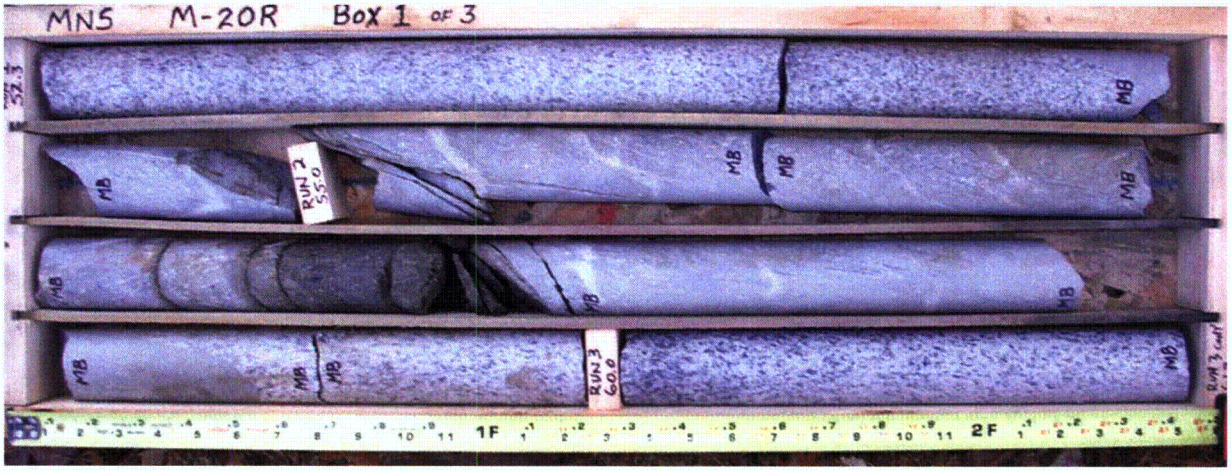
No Recovery

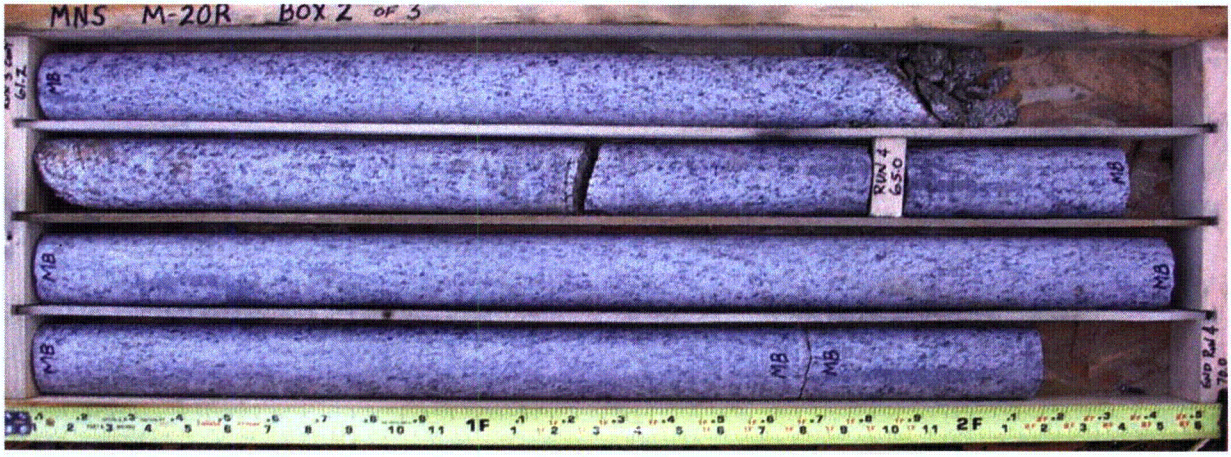
ROCK CORE PICTURES

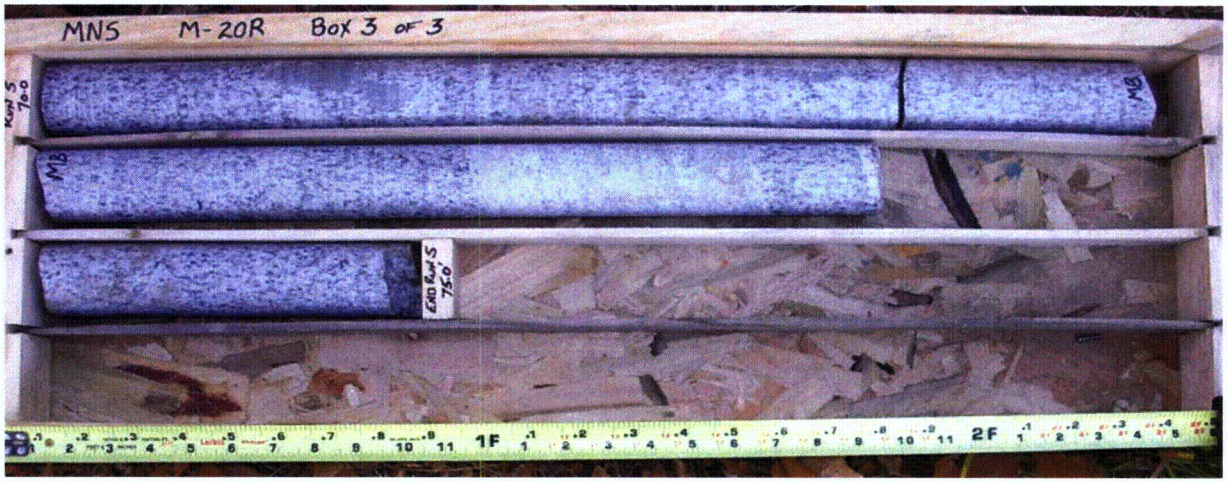
McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-20R







CLASSIFICATION:

52.3' to 54.6': Medium-Grained Quartz Diorite

54.6' to 59': Fine-Grained Quartz Diorite

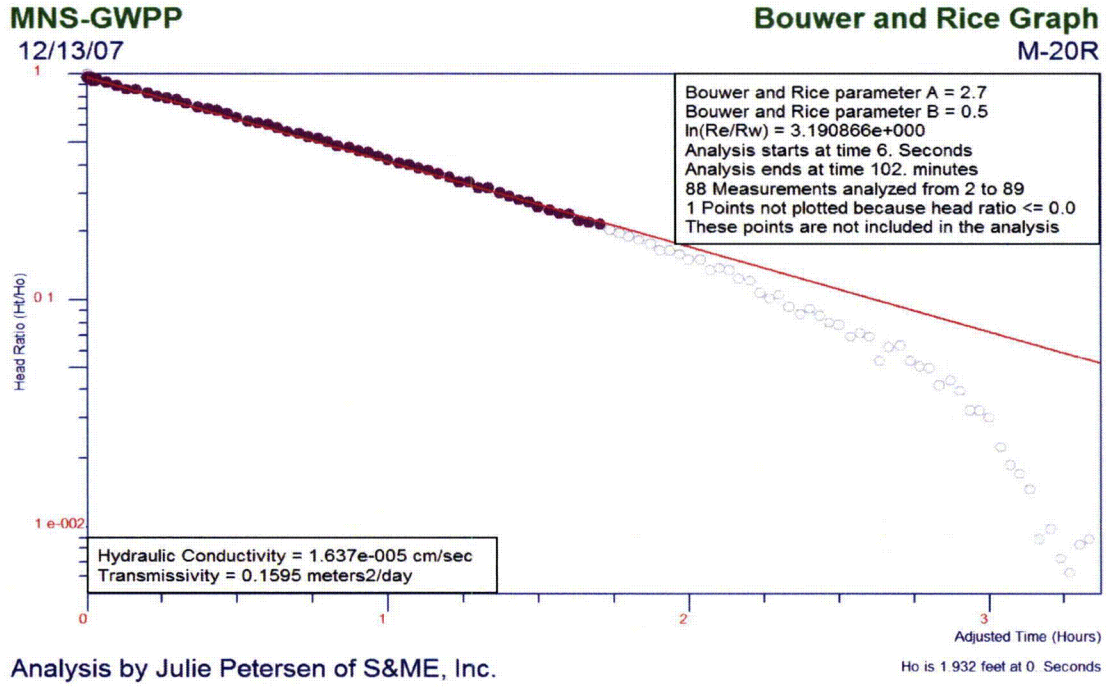
59' to 75': Medium-Grained Quartz Diorite

Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	12/13/2007
Well Label:	M-20R
Aquifer Thickness:	37. feet
Screen Length:	5. feet
Casing Radius:	1. Inches
Effective Radius:	1.5 Inches
Static Water Level:	36.32 feet
Water Table to Screen Bottom:	31.6 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 139 time and drawdown measurements
Maximum head is 1.932 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



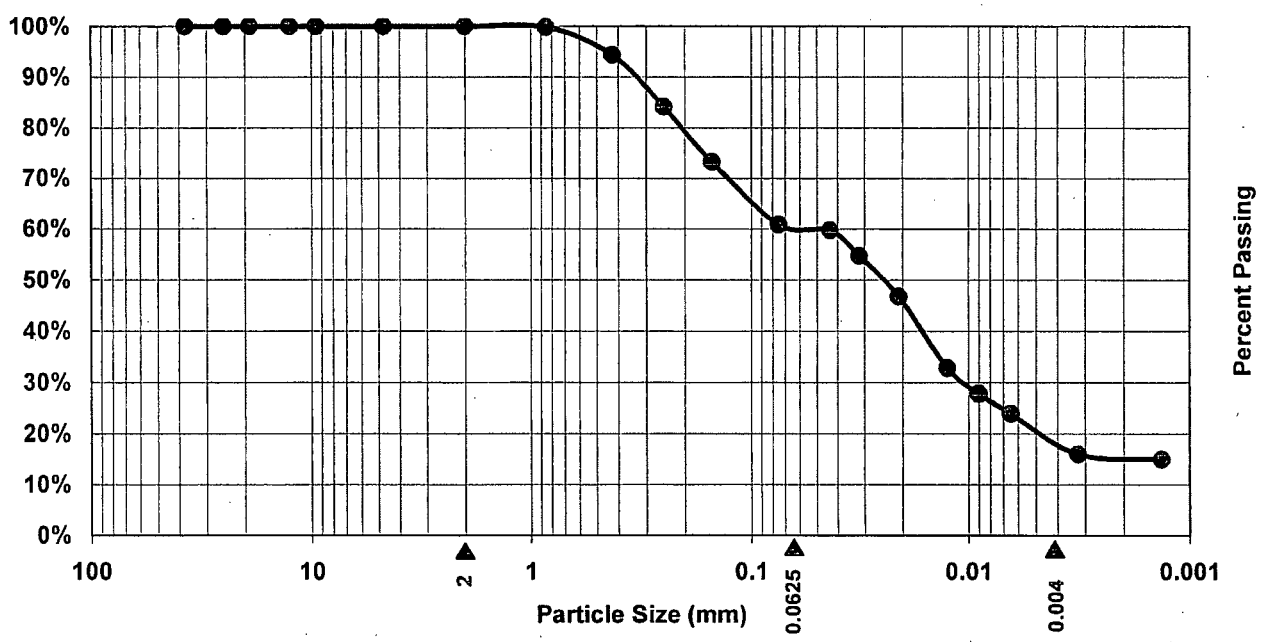
PERMEABILITY

1.64×10^{-05} cm/sec

PARTICLE SIZE ANALYSIS OF SOILS
FOR USE IN FETTER AND BEAR DIAGRAMS

Boring No.:	Sample No.:	Depth:
M-20R	SS-2	9.1 to 10.6 ft bls

Sample Description:
Red and Yellow, Medium to Fine Sandy, Clayey, Silt



	> 2 mm	2 mm - 0.0625 mm	0.0625 mm - 0.004 mm	<0.004 mm
From Graph:	% Gravel 0.0%	% Sand 39.5%	% Silt 42.7%	% Clay 17.8%
Adjusted for Calculations	**0%**	**40%**	**43%**	**18%**

Notes:
Grain size distribution taken from grain size with hydrometer data located in Appendix II.
Gravel, sand, silt and clay sizes based on Wentworth Scale.

S&ME Project:
McGuire Nuclear Station - GWPP

S&ME Project No.:
1264-06-724

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FETTER AND BEAR DIAGRAMS

S&ME PROJECT: McGuire Nuclear Station - GWPP
S&ME PROJECT NO.: 1264-06-724

Boring No. M-20R

Boring Depth: 9.1 to 10.6 ft bls

% Sand: 40%

% Silt: 43%

% Clay: 18%

Estimated Specific Yield: 11%

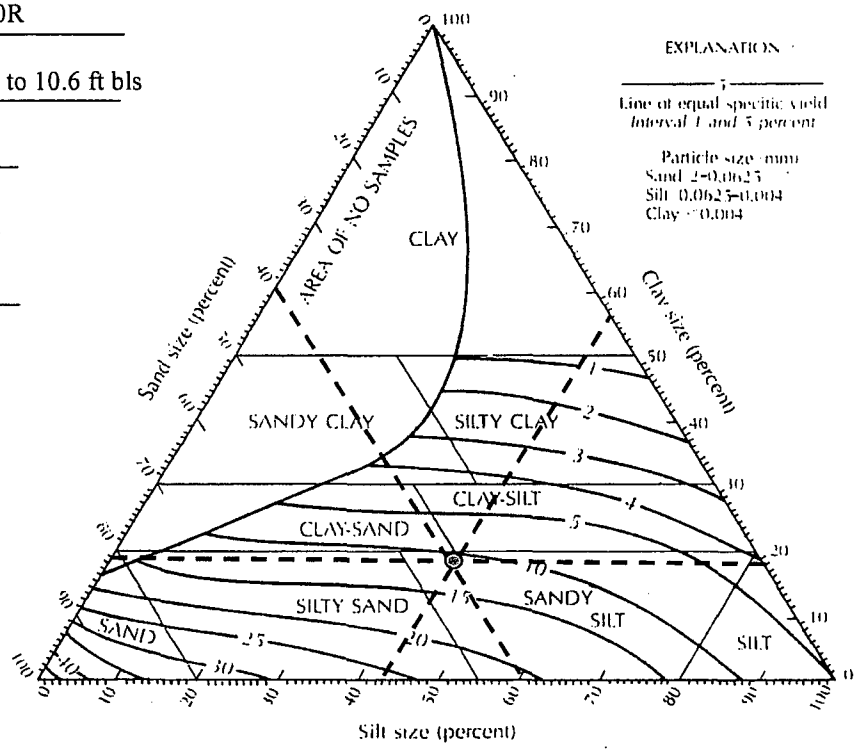
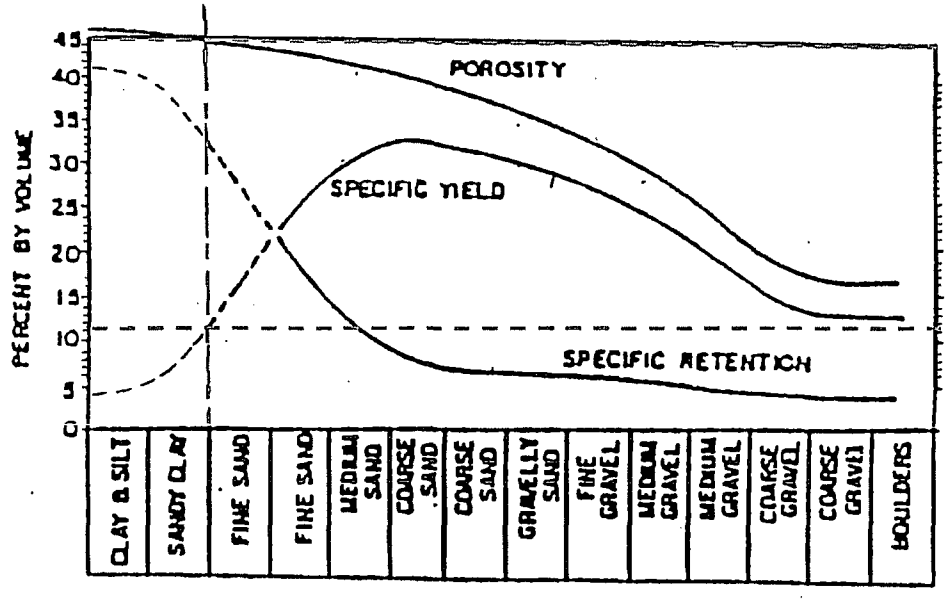


FIGURE 4.11 Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. Source: A. I. Johnson, U.S. Geological Survey Water-Supply Paper 1662-D, 1967.



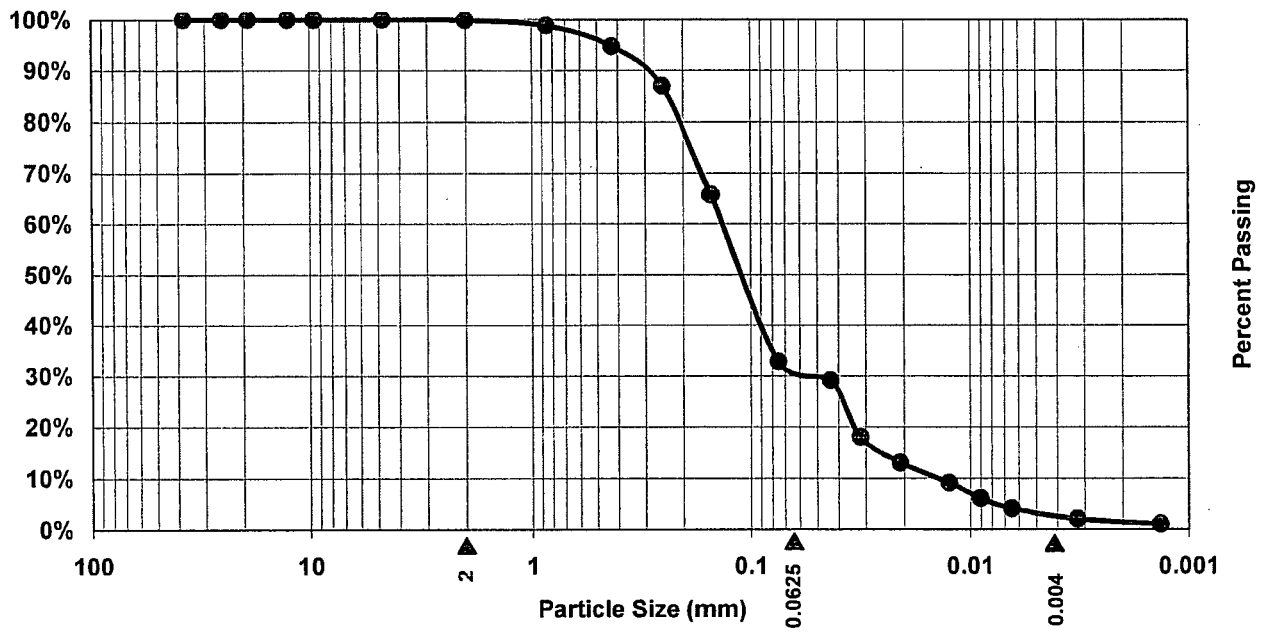
Estimated Porosity: 45%

Variation of Porosity, Specific Yield, and Specific Retention with Grain Size (after Bear, 1972)

PARTICLE SIZE ANALYSIS OF SOILS
FOR USE IN FETTER AND BEAR DIAGRAMS

Boring No.:	Sample No.:	Depth:
M-20R	SS-8	39.1 to 40.6 ft bls

Sample Description:
Green and Brown, Clayey, Silty, Medium to Fine Sand



	> 2 mm	2 mm - 0.0625 mm	0.0625 mm - 0.004 mm	<0.004 mm
From Graph:	% Gravel 0.1%	% Sand 68.3%	% Silt 29.2%	% Clay 2.5%
Adjusted for Calculations	**0%**	**68%**	**29%**	**2%**

Notes:
Grain size distribution taken from grain size with hydrometer data located in Appendix II.
Gravel, sand, silt and clay sizes based on Wentworth Scale.

S&ME Project:
McGuire Nuclear Station - GWPP

S&ME Project No.:
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FETTER AND BEAR DIAGRAMS

S&ME PROJECT: McGuire Nuclear Station - GWPP
S&ME PROJECT NO.: 1264-06-724

Boring No. M-20R

Boring Depth: 39.1 to 40.6 ft bls

% Sand: 68%

% Silt: 29%

% Clay: 2%

Estimated Specific Yield: 27%

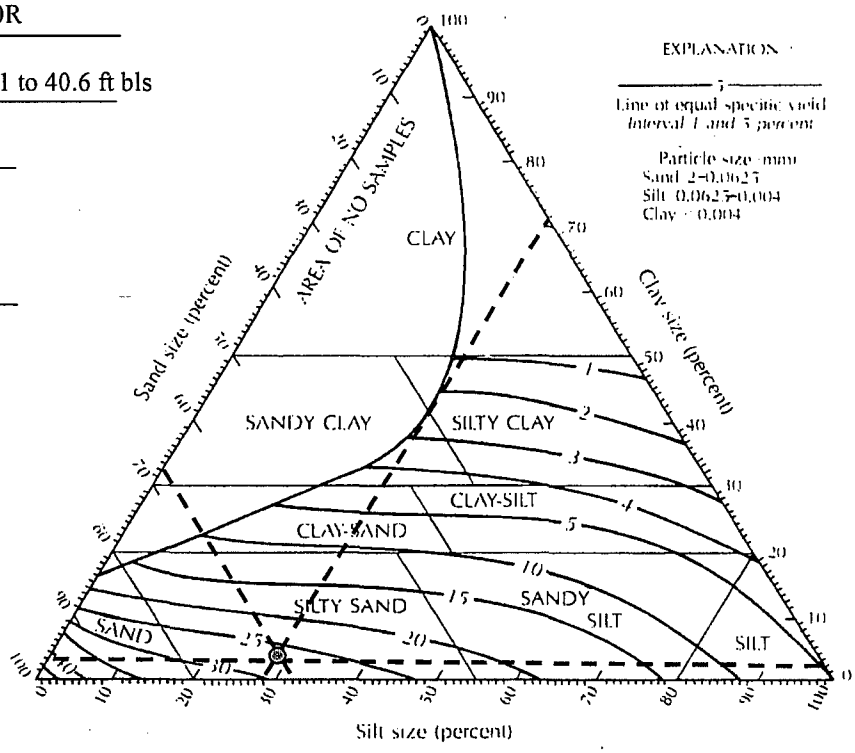
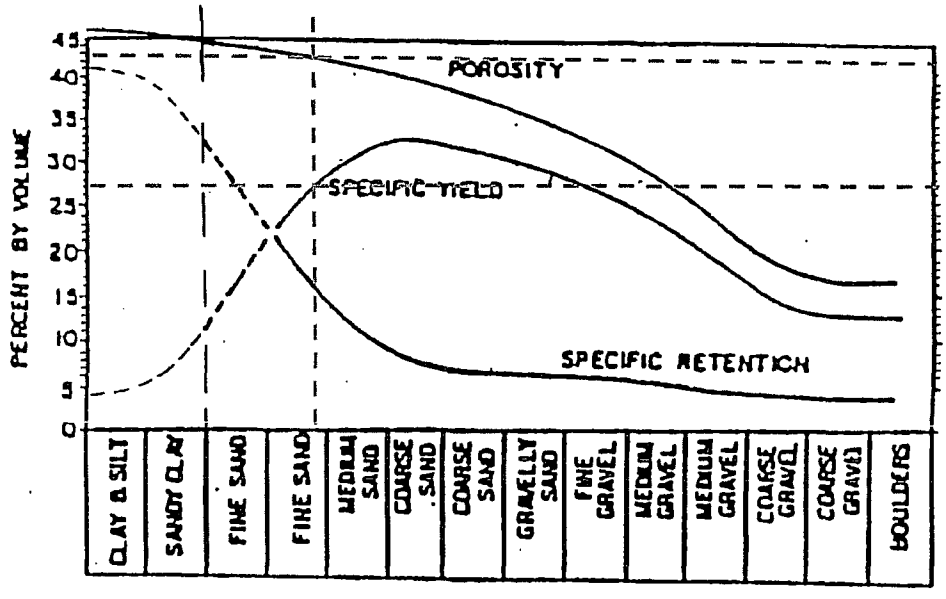


FIGURE 4.11 Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. Source: A. I. Johnson, U.S. Geological Survey Water-Supply Paper 1662-D, 1967.



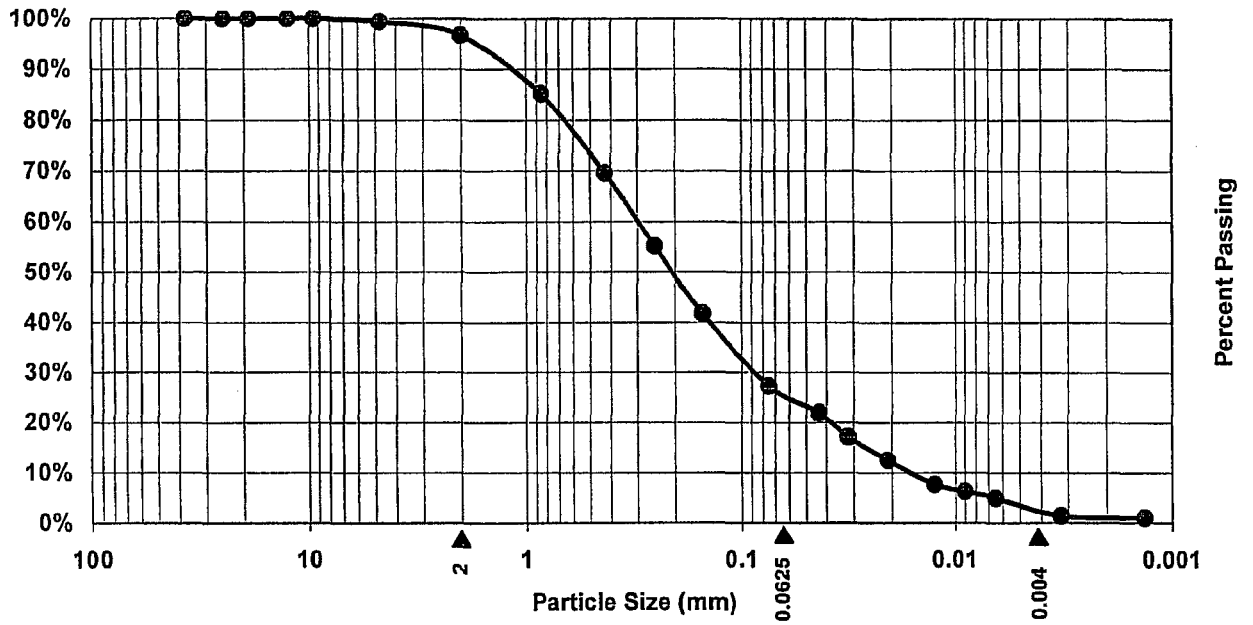
Estimated Porosity: 43%

Variation of Porosity, Specific Yield, and Specific Retention with Grain Size (after Bear, 1972)

PARTICLE SIZE ANALYSIS OF SOILS
FOR USE IN FETTER AND BEAR DIAGRAMS

Boring No.:	Sample No.:	Depth:
M-20R	SS-10	49.1 to 50.6 ft bls

Sample Description:
Red, Tan, and White, Clayey, Silty, Coarse to Fine Sand



	> 2 mm	2 mm - 0.0625 mm	0.0625 mm - 0.004 mm	<0.004 mm
From Graph:	% Gravel 3.3%	% Sand 71.2%	% Silt 23.3%	% Clay 2.2%
Adjusted for Calculations	**0%**	**74%**	**24%**	**2%**

Notes:
Grain size distribution taken from grain size with hydrometer data located in Appendix II.
Gravel, sand, silt and clay sizes based on Wentworth Scale.

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S&ME Project No.:
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FETTER AND BEAR DIAGRAMS

S&ME PROJECT: McGuire Nuclear Station - GWPP
S&ME PROJECT NO.: 1264-06-724

Boring No. M-20R

Boring Depth: 49.1 to 50.6 ft bls

% Sand: 74%

% Silt: 24%

% Clay: 2%

Estimated Specific Yield: 29%

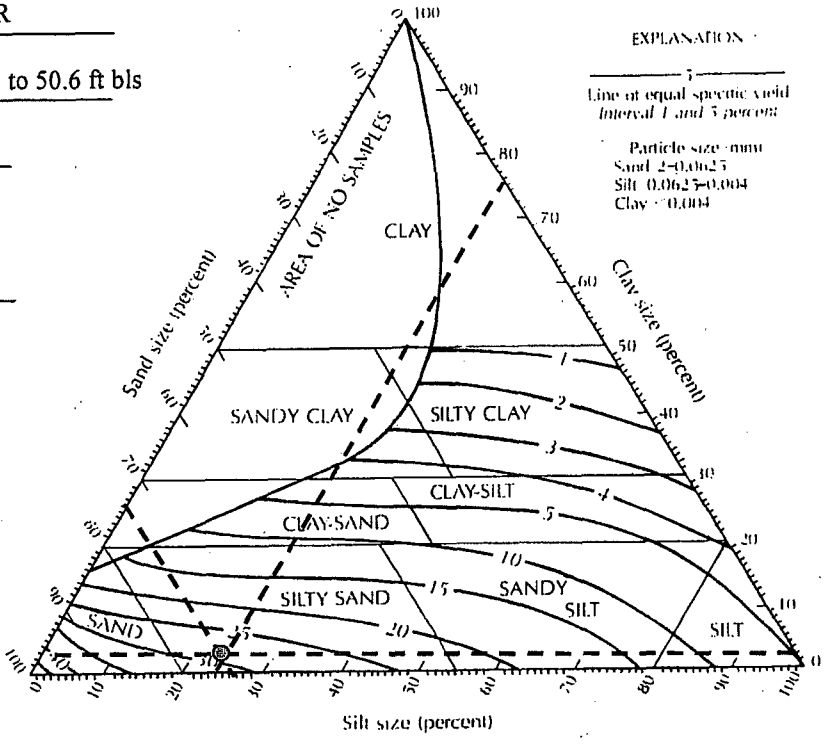
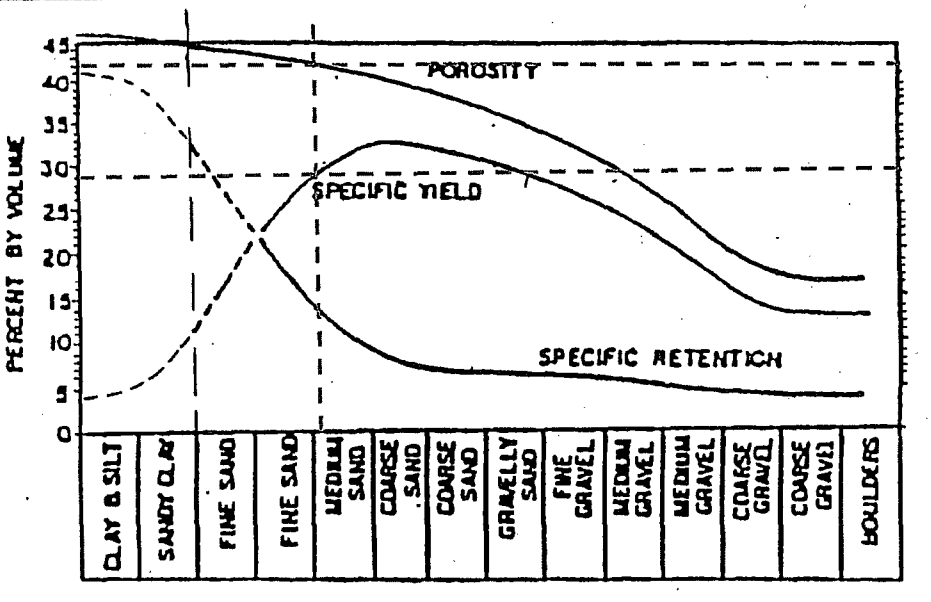


FIGURE 4.11 Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. Source: A. I. Johnson, U.S. Geological Survey Water-Supply Paper 1662-D, 1967.



Estimated Porosity: 42.5%

Variation of Porosity, Specific Yield, and Specific Retention with Grain Size (after Bear, 1972)

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2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**				**Boring No. M-21**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**		Sheet No. 1 of 2
Boring Depth (ft): **50.5**	Elevation (ft): **764.7**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **12/12/07**	
Logged By: **Scott Dacus**	Water Level: **Stabilized Water Level at 35.83 ft bls**		Drilling Method: **Mud Rotary**	

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
760	5		SOIL/SAPROLITE (M1): Orange, Brown, Tan, and Red, Medium to Fine Sandy, Clayey **SILT** With Manganese Staining		12
755	10				10
750	15				8
745	20				8
740	25				14
735	30				9
730					7

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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Project: **MNS - Groundwater Protection Project**			**Boring No. M-21**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 2 of 2
Boring Depth (ft): **50.5**	Elevation (ft): **764.7**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **12/12/07**
Logged By: **Scott Dacus**	Water Level: **Stabilized Water Level at 35.83 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
725	40		SOIL/SAPROLITE (M1): White and Gray, Micaceous, Silty, Medium to Fine **SAND**		4
720	45				5
715	50		SOIL/SAPROLITE (M1): Tan, Micaceous, Silty, Medium to Fine **SAND**		11
			Boring Terminated at 50.50 ft bls		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

COMPLETION REPORT OF WELL No. M-21

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **12/12/07**

WATER LEVEL: **Stabilized Water Level at 35.83 ft bls**
LATITUDE: **35 25 36.18**
LONGITUDE: **80 56 47.86**
TOP OF CASING ELEVATION: **767.65**
DATUM: **MSL**
LOGGED BY: **Scott Dacus**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		764.71
SOIL/SAPROLITE (M1): Orange, Brown, Tan, and Red, Medium to Fine Sandy, Clayey **SILT** With Manganese Staining		0				
		5				
		10				
		15				
		20				
		25		24.00		740.71
		30		27.00		737.71

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 30 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 24 ft bls**

SEAL
Type: **Bentonite**
Interval: **24 to 27 ft bls**

FILTERPACK
Type: **#1 Filter Sand**
Interval: **27 to 50.2 ft bls**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **30 to 50 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **764.7**
LOGGED BY: **Scott Dacus**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
SOIL/SAPROLITE (M1): Orange, Brown, Tan, and Red, Medium to Fine Sandy, Clayey **SILT** With Manganese Staining *(continued)*		35				
SOIL/SAPROLITE (M1): White and Gray, Micaceous, Silty, Medium to Fine **SAND**		40				
		45				
		50		49.50		715.21
SOIL/SAPROLITE (M1): Tan, Micaceous, Silty, Medium to Fine **SAND**				50.00		714.71
				50.20		714.51
				50.50		714.21

WELL CONSTRUCTION DETAILS

(See Page 1)

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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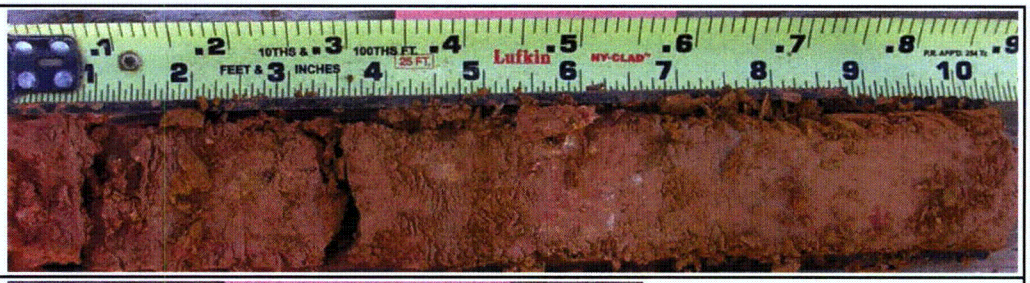
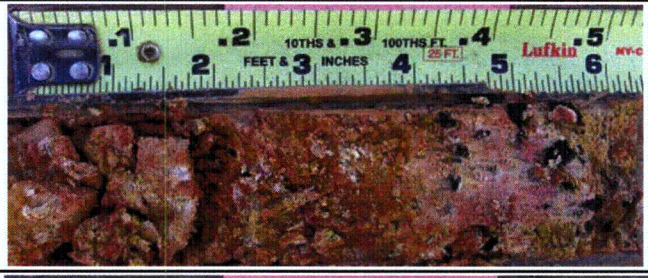
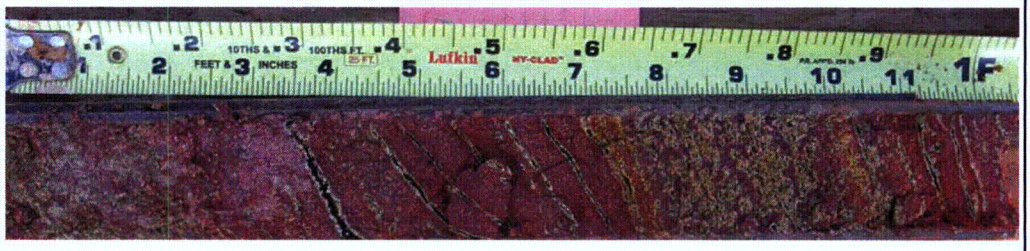
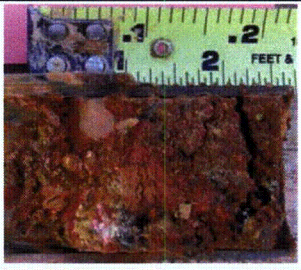
COMPLETION REPORT OF WELL No. M-21

SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Boring Number: M-21

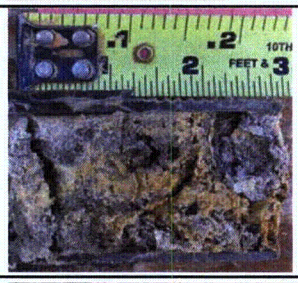
Sample No: 1 **Depth (ft-bls):** 4.6 - 6.1 **Blow Count:** 4 * 6 * 6	
Sample No: 2 **Depth (ft-bls):** 9.6 - 11.1 **Blow Count:** 3 * 4 * 6	
Sample No: 3 **Depth (ft-bls):** 14.6 - 16.1 **Blow Count:** 3 * 3 * 5	
Sample No: 4 **Depth (ft-bls):** 19 - 20.5 **Blow Count:** 3 * 4 * 4	**No Recovery**
Sample No: 5 **Depth (ft-bls):** 24 - 25.5 **Blow Count:** 4 * 6 * 8	
Sample No: 6 **Depth (ft-bls):** 29 - 30.5 **Blow Count:** 3 * 3 * 6	

SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Boring Number: M-21

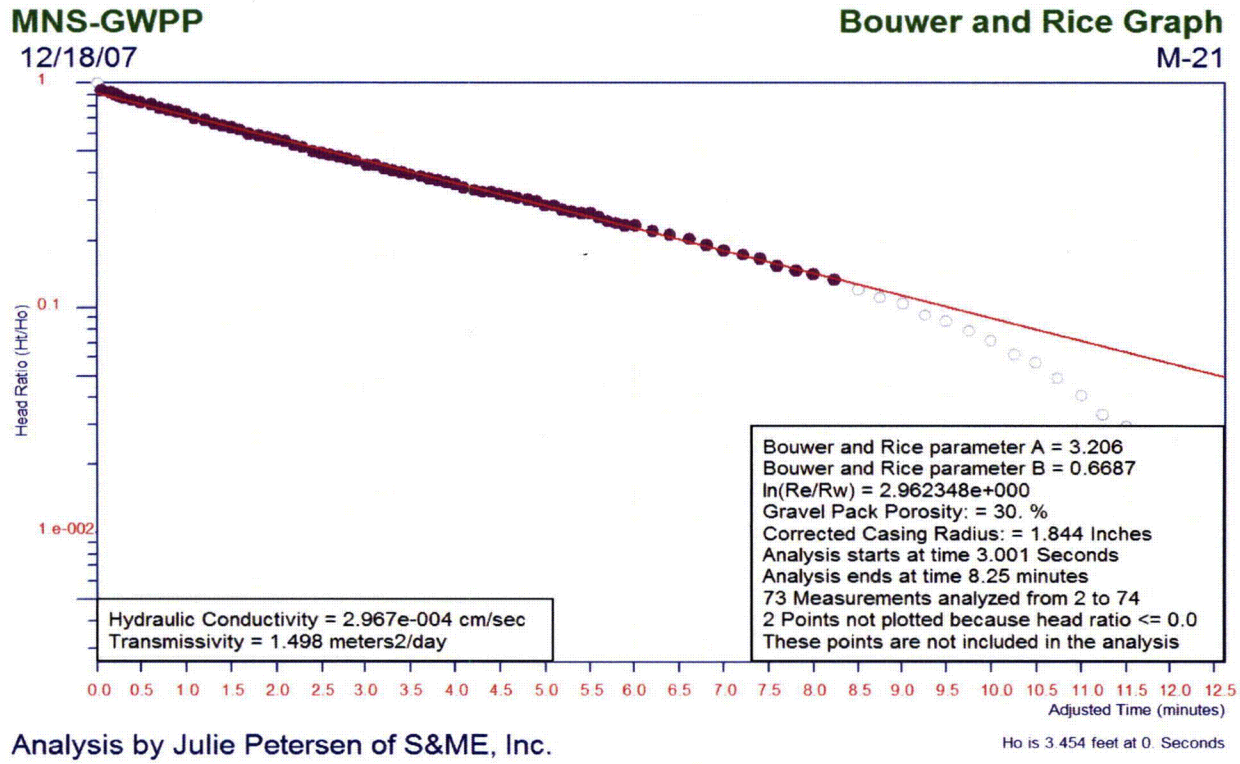
Sample No: 7 **Depth (ft-bls):** 34 - 35.5 **Blow Count:** 2 * 3 * 4	
Sample No: 8 **Depth (ft-bls):** 39 - 40.5 **Blow Count:** 1 * 1 * 3	
Sample No: 9 **Depth (ft-bls):** 44 - 45.58 **Blow Count:** 1 * 2 * 3	
Sample No: 10 **Depth (ft-bls):** 49 - 50.5 **Blow Count:** 3 * 3 * 8	

Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	12/18/2007
Well Label:	M-21
Aquifer Thickness:	19.17 feet
Screen Length:	20. feet
Casing Radius:	1. Inches
Effective Radius:	3. Inches
Gravel Pack Porosity:	30.00%
Corrected Casing Radius:	1.844 Inches
Static Water Level:	35.83 feet
Water Table to Screen Bottom:	14.17 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 92 time and drawdown measurements
Maximum head is 3.454 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



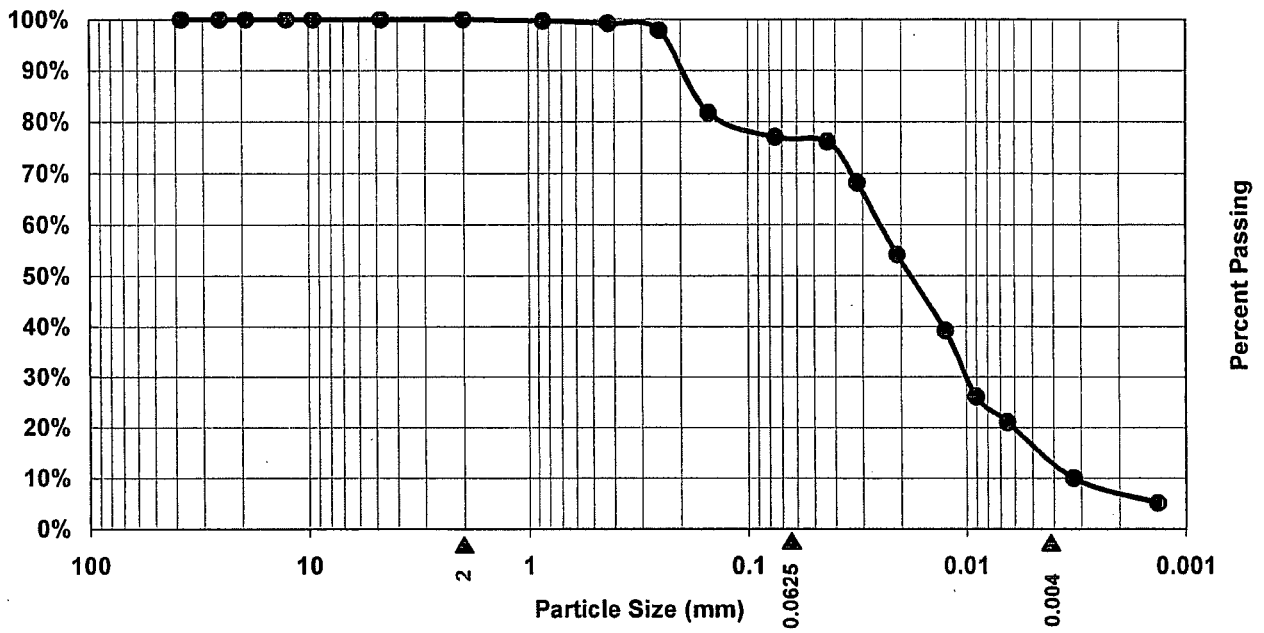
PERMEABILITY

2.97×10^{-04} cm/sec

PARTICLE SIZE ANALYSIS OF SOILS
FOR USE IN FETTER AND BEAR DIAGRAMS

Boring No.:	Sample No.:	Depth:
M-21	SS-3	14.6 to 16.1 ft bls

Sample Description:
Orange, Brown, Tan, and Red, Medium to Fine Sandy, Clayey, Silt



	> 2 mm	2 mm - 0.0625 mm	0.0625 mm - 0.004 mm	<0.004 mm
From Graph:	% Gravel 0.0%	% Sand 23.3%	% Silt 64.1%	% Clay 12.6%
Adjusted for Calculations	**0%**	**23%**	**64%**	**13%**

Notes:
Grain size distribution taken from grain size with hydrometer data located in Appendix II.
Gravel, sand, silt and clay sizes based on Wentworth Scale.

S&ME Project:
McGuire Nuclear Station - GWPP

S&ME Project No.:
1264-06-724

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FETTER AND BEAR DIAGRAMS

S&ME PROJECT: McGuire Nuclear Station - GWPP
S&ME PROJECT NO.: 1264-06-724

Boring No. M-21

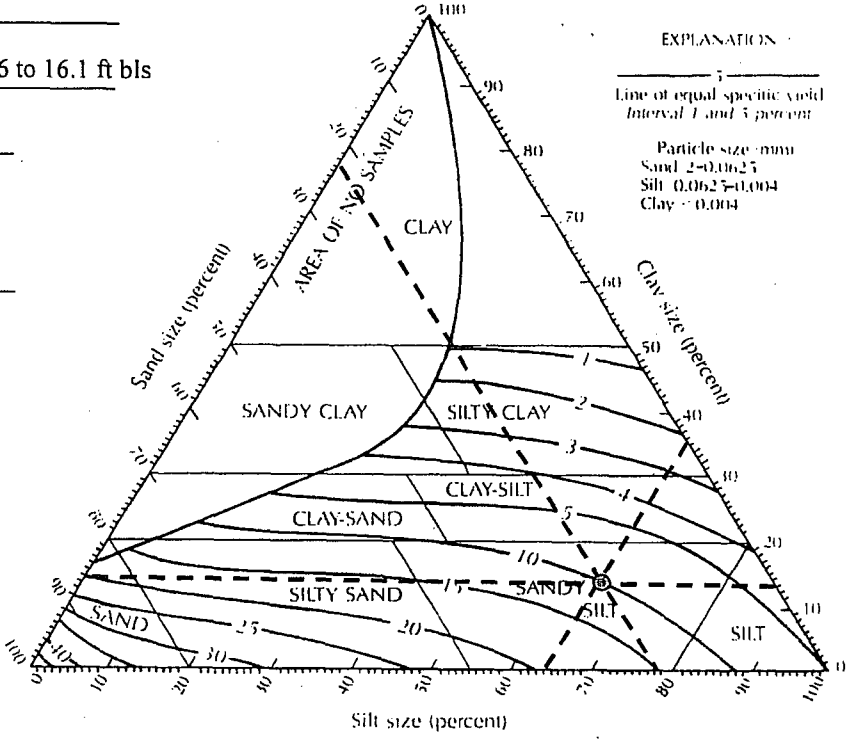
Boring Depth: 14.6 to 16.1 ft bls

% Sand: 23%

% Silt: 64%

% Clay: 13%

Estimated Specific Yield: 10%



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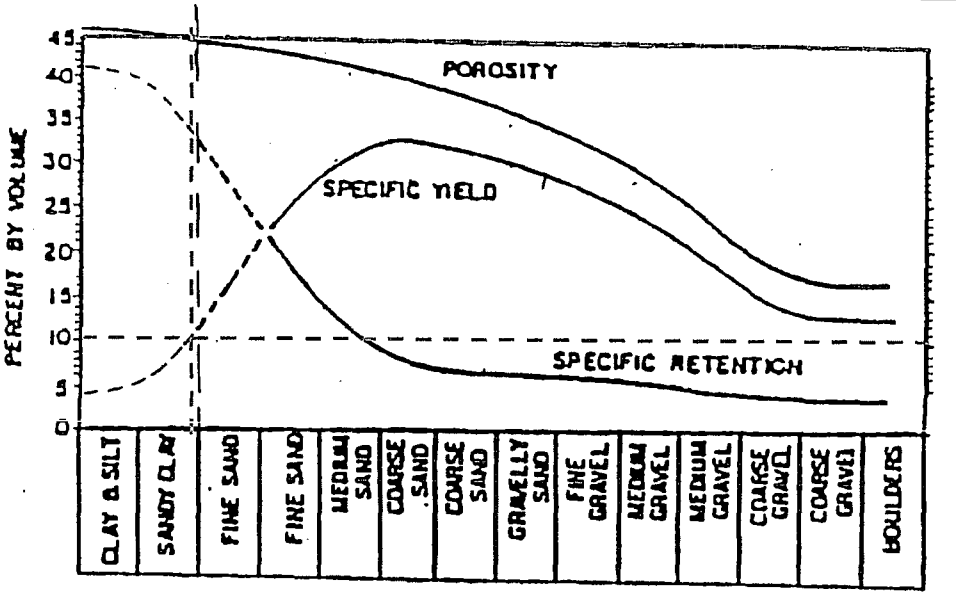

Estimated Porosity: 45%

Variation of Porosity, Specific Yield, and Specific Retention with Grain Size (after Bear, 1972)

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2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**				**Boring No. M-22**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**		Sheet No. 1 of 2
Boring Depth (ft): **60.0**	Elevation (ft): **786.7**	Driller: **Justin Millwood, NC Cert. No. 3439**		Date Drilled: **12/7/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 49.69 ft bls**			Drilling Method: **4¼" H.S.A.**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
785	5		SOIL/SAPROLITE (M1): Red, Very Fine Sandy, Clayey, **SILT**		
780	10		SOIL/SAPROLITE (M1): Orange, Red, White, and Brown, Silty, Fine **SAND** With Manganese Staining		
775	15				
770	20		SOIL/SAPROLITE (M1): Dark Reddish-Brown, Micaceous, Silty, Fine **SAND** With Manganese Nodules		
765	25		SOIL/SAPROLITE (M1): Orange, Red, White, and Brown, Silty, Fine **SAND** With Manganese Staining		
760	30				
755			SOIL/SAPROLITE (M1): Orange and White, Fine Sandy, **SILT** With Manganese Staining; Vertical Quartz Gravel Vein From 39.00 ft to 40.10 ft bls		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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Project: **MNS - Groundwater Protection Project**				**Boring No. M-22**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**		Sheet No. 2 of 2
Boring Depth (ft): **60.0**	Elevation (ft): **786.7**	Driller: **Justin Millwood, NC Cert. No. 3439**		Date Drilled: **12/7/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 49.69 ft bls**			Drilling Method: **4¼" H.S.A.**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
750					
	40				
745					
	45		SOIL/SAPROLITE (M1): Tan, Micaceous, **SILT** With Manganese Staining		
740					
	50		SOIL/SAPROLITE (M1): Tan, Orange, and White, Very Micaceous, Fine Sandy, **SILT** With Manganese Staining; White, Silty, Medium to Fine Sand Lense From 50.30 ft to 50.60 ft bls	▼	
735					
	55				
730					
	60		WEATHERED ROCK (M2): When Sampled Becomes Tan, Orange, and White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		
			Boring Terminated at 60.00 ft bls		
			Lithologic Descriptions Obtained From M-22R		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

COMPLETION REPORT OF WELL No. M-22

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **4¼" H.S.A.**
DATE DRILLED: **12/7/07**

WATER LEVEL: **Stabilized Water Level at 49.69 ft bls**
LATITUDE: **35 25 37.45**
LONGITUDE: **80 56 37.37**
TOP OF CASING ELEVATION: **789.33**
DATUM: **MSL**
LOGGED BY: **Courtney Withers**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		786.71
SOIL/SAPROLITE (M1): Red, Very Fine Sandy, Clayey, **SILT**		0				
		5				
SOIL/SAPROLITE (M1): Orange, Red, White, and Brown, Silty, Fine **SAND** With Manganese Staining		10				
		15				
SOIL/SAPROLITE (M1): Dark Reddish-Brown, Micaceous, Silty, Fine **SAND** With Manganese Nodules		20				
		25				
SOIL/SAPROLITE (M1): Orange, Red, White, and Brown, Silty, Fine **SAND** With Manganese Staining		30				

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 45 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 40 ft bls**

SEAL
Type: **Bentonite**
Interval: **40 to 42.8 ft bls**

FILTERPACK
Type: **#1 Filter Sand**
Interval: **42.8 to 60 ft bls**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **45 to 60 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-22

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **786.7**
LOGGED BY: **Courtney Wither**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
							(See Page 1)
SOIL/SAPROLITE (M1): Orange and White, Fine Sandy, **SILT** With Manganese Staining; Vertical Quartz Gravel Vein From 39.00 ft to 40.10 ft bls ***(continued)***		35					
		40		40.00		746.71	
				42.80		743.91	
SOIL/SAPROLITE (M1): Tan, Micaceous, **SILT** With Manganese Staining		45					
SOIL/SAPROLITE (M1): Tan, Orange, and White, Very Micaceous, Fine Sandy, **SILT** With Manganese Staining; White, Silty, Medium to Fine Sand Lense From 50.30 ft to 50.60 ft bls		50					
		55					
				59.50		727.21	
WEATHERED ROCK (M2): When Sampled Becomes Tan, Orange, and White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		60		60.00		726.71	

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL_MNSLOG.GPJ S&ME.GDT 3/26/08

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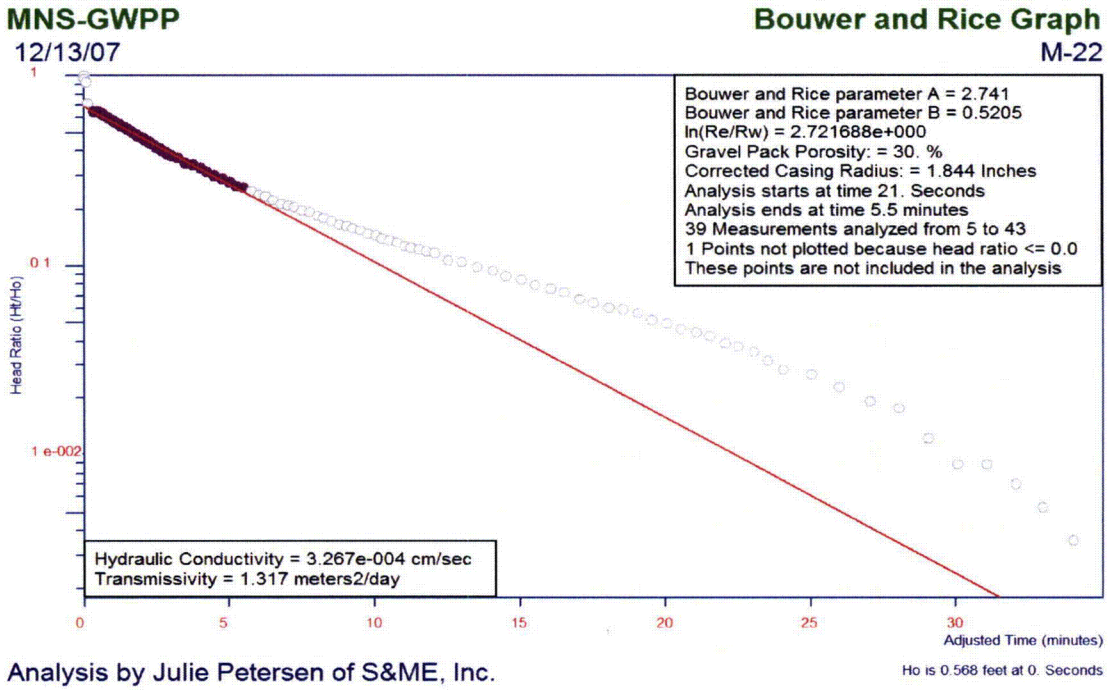
COMPLETION REPORT OF WELL No. M-22

Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	12/13/2007
Well Label:	M-22
Aquifer Thickness:	15.31 feet
Screen Length:	15. feet
Casing Radius:	1. Inches
Effective Radius:	3. Inches
Gravel Pack Porosity:	30.00%
Corrected Casing Radius:	1.844 Inches
Static Water Level:	49.69 feet
Water Table to Screen Bottom:	10.31 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 104 time and drawdown measurements
Maximum head is 0.568 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



PERMEABILITY

3.27×10^{-04} cm/sec

S&ME, Inc.
9751 Southern Pine Blvd.
Charlotte, North Carolina
Telephone: 704-523-4726
Fax: 704-525-3953

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1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**			**Boring No. M-22R**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 1 of 3
Boring Depth (ft): **95.6**	Elevation (ft): **786.8**	Driller: **Justin Millwood, NC Cert. No. 3439**	Date Drilled: **12/3/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 49.42 ft bls**		Drilling Method: **4¼" H.S.A.**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
785	5		SOIL/SAPROLITE (M1): Red, Very Fine Sandy, Clayey, **SILT**		
780	10		SOIL/SAPROLITE (M1): Orange, Red, White, and Brown, Silty, Fine **SAND** With Manganese Staining		5
775	15				11
770	20		SOIL/SAPROLITE (M1): Dark Reddish-Brown, Micaceous, Silty, Fine **SAND** With Manganese Nodules		12
765	25		SOIL/SAPROLITE (M1): Orange, Red, White, and Brown, Silty, Fine **SAND** With Manganese Staining		10
760	30				8
755			SOIL/SAPROLITE (M1): Orange and White, Fine Sandy, **SILT** With Manganese Staining; Vertical Quartz Gravel Vein From 39.00 ft to 40.10 ft bls		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**					**Boring No. M-22R**
Location: **Huntersville, North Carolina**			Number: **1264-06-724**		Sheet No. 2 of 3
Boring Depth (ft): **95.6**	Elevation (ft): **786.8**		Driller: **Justin Millwood, NC Cert. No. 3439**		Date Drilled: **12/3/07**
Logged By: **Courtney Withers**		Water Level: **Stabilized Water Level at 49.42 ft bls**			Drilling Method: **4¼" H.S.A.**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
750	40				7
745					7
	45		SOIL/SAPROLITE (M1): Tan, Micaceous, **SILT** With Manganese Staining		11
740					
	50		SOIL/SAPROLITE (M1): Tan, Orange, and White, Very Micaceous, Fine Sandy, **SILT** With Manganese Staining; White, Silty, Medium to Fine Sand Lense From 50.30 ft to 50.60 ft bls	▼	10
735					
	55				12
730					
	60		WEATHERED ROCK (M2): When Sampled Becomes Tan, Orange, and White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		50/2 >>
725					
	65				50/3 >>
720					50/4 >>

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**			**Boring No. M-22R**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 3 of 3
Boring Depth (ft): **95.6**	Elevation (ft): **786.8**	Driller: **Justin Millwood, NC Cert. No. 3439**	Date Drilled: **12/3/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 49.42 ft bls**		Drilling Method: **4¼" H.S.A.**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
			Auger Refusal at 72.00 ft bls		
715			SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Intensely Fractured Horizontal, High Angle, and Low Angle Joints With Slight to Moderate Staining		
	75				
710			SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly Fractured Low Angle Joints With No Staining		
	80				
			SOUND ROCK (D): Coarse-Grained **QUARTZ DIORITE**, Unfractured		
705			SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly Fractured Low Angle Joints With No Staining		
	85		SOUND ROCK (D): Coarse-Grained **QUARTZ DIORITE**, Moderately Fractured Horizontal, High Angle, and Low Angle Joints With Slight to Heavy Staining		
700					
	90				
695					
	95		**Boring Terminated at 95.60 ft bls**		

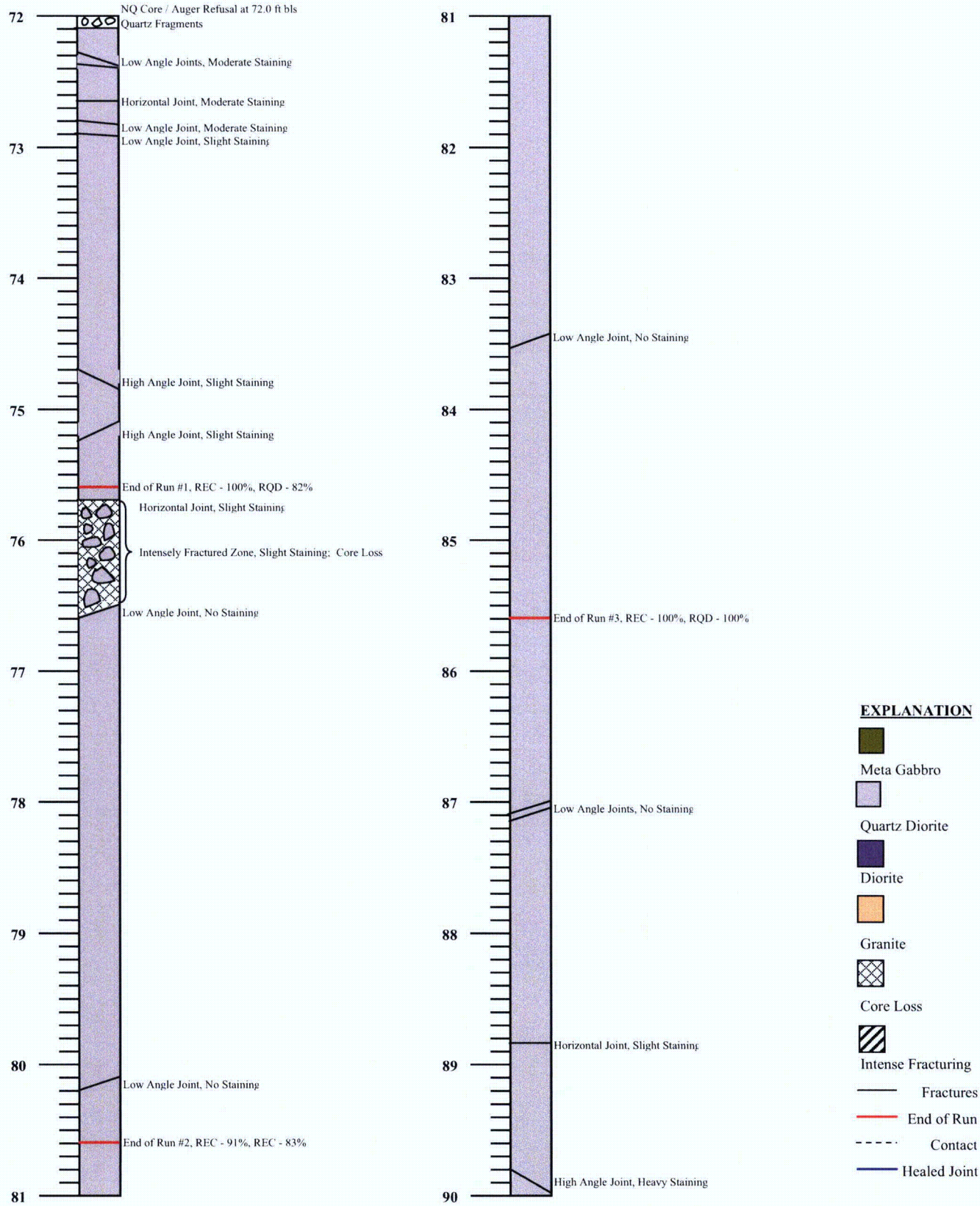
BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-22R

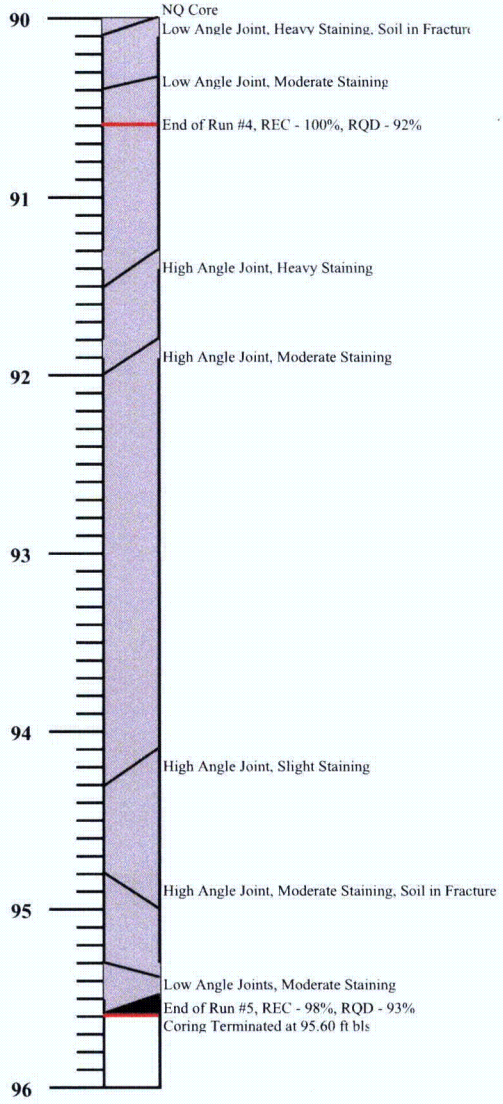


FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-22R



EXPLANATION

- Meta Gabbro
- Quartz Diorite
- Diorite
- Granite
- Core Loss
- Intense Fracturing
- Fractures
- End of Run
- Contact
- Healed Joint

COMPLETION REPORT OF WELL No. M-22R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **4¼" H.S.A.**
DATE DRILLED: **12/3/07**

WATER LEVEL: **Stabilized Water Level at 49.42 ft bls**
LATITUDE: **35 25 37.48**
LONGITUDE: **80 56 37.32**
TOP OF CASING ELEVATION: **789.42**
DATUM: **MSL**
LOGGED BY: **Courtney Withers**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		786.82
SOIL/SAPROLITE (M1): Red, Very Fine Sandy, Clayey, **SILT**		0				
		5				
SOIL/SAPROLITE (M1): Orange, Red, White, and Brown, Silty, Fine **SAND** With Manganese Staining		10				
		15				
SOIL/SAPROLITE (M1): Dark Reddish-Brown, Micaceous, Silty, Fine **SAND** With Manganese Nodules		20				
		25				
SOIL/SAPROLITE (M1): Orange, Red, White, and Brown, Silty, Fine **SAND** With Manganese Staining		30				

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 87 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 37.8 ft bls**

SEAL
Type: **K-Packer + Bentonite**
Interval: **37.8 to 86.3 ft bls**

FILTERPACK
Type: **N/A**
Interval: **N/A**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **87 to 92 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

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COMPLETION REPORT OF WELL No. M-22R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **786.8**
LOGGED BY: **Courtney Wither**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
							(See Page 1)
SOIL/SAPROLITE (M1): Orange and White, Fine Sandy, **SILT** With Manganese Staining; Vertical Quartz Gravel Vein From 39.00 ft to 40.10 ft bls *(continued)*		35		37.80		749.02	
		40					
SOIL/SAPROLITE (M1): Tan, Micaceous, **SILT** With Manganese Staining		45					
SOIL/SAPROLITE (M1): Tan, Orange, and White, Very Micaceous, Fine Sandy, **SILT** With Manganese Staining; White, Silty, Medium to Fine Sand Lense From 50.30 ft to 50.60 ft bls		50					
		55					
WEATHERED ROCK (M2): When Sampled Becomes Tan, Orange, and White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		60					
		65					
		70					
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Intensely Fractured Horizontal, High Angle, and Low Angle Joints With Slight to Moderate Staining		75					

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-22R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **786.8**
LOGGED BY: **Courtney Wither**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
							(See Page 1)
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly Fractured Low Angle Joints With No Staining *(continued)*		80					
SOUND ROCK (D): Coarse-Grained **QUARTZ DIORITE**, Unfractured		85		86.00 86.30 87.00		700.82 700.52 699.82	
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly Fractured Low Angle Joints With No Staining		90		91.50 92.00		695.32 694.82	
SOUND ROCK (D): Coarse-Grained **QUARTZ DIORITE**, Moderately Fractured Horizontal, High Angle, and Low Angle Joints With Slight to Heavy Staining		95		95.60		691.22	

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-22R

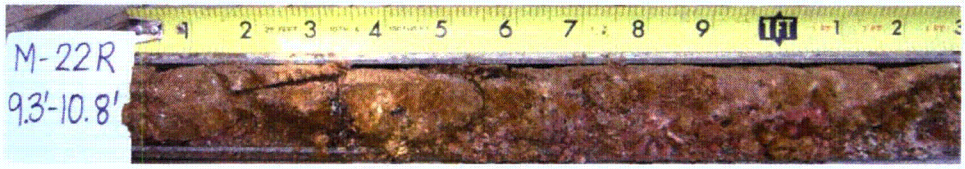
SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

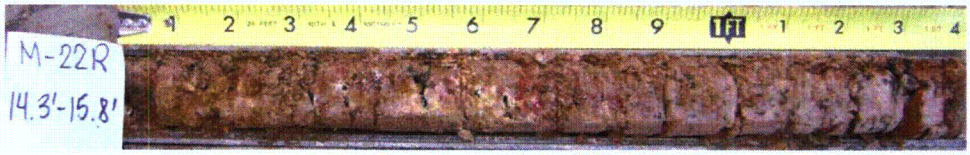
S&ME Project No: 1264-06-724

Boring Number: M-22R

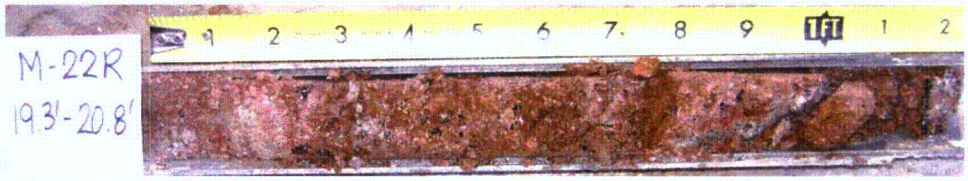
Sample No:	**1**
Depth (ft-bls):	**9.3 - 10.8**
Blow Count:	**2 * 2 * 3**



Sample No:	**2**
Depth (ft-bls):	**14.3 - 15.8**
Blow Count:	**4 * 4 * 7**

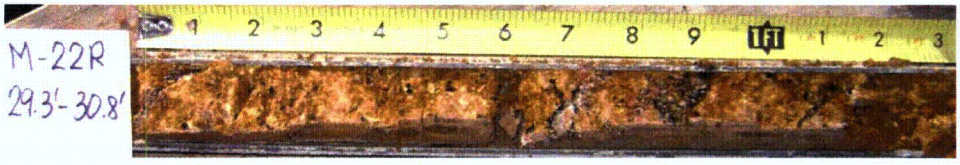


Sample No:	**3**
Depth (ft-bls):	**19.3 - 20.8**
Blow Count:	**5 * 5 *7**



Sample No:	**4**
Depth (ft-bls):	**24.3 - 25.8**
Blow Count:	**3 * 4 * 6**

Sample No:	**5**
Depth (ft-bls):	**29.3 - 30.8**
Blow Count:	**2 * 4 * 4**



Sample No:	**6**
Depth (ft-bls):	**34.3 - 35.8**
Blow Count:	**2 * 3 * 4**

SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

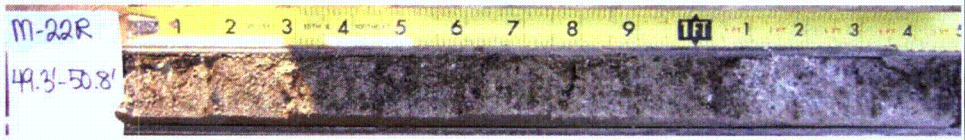
S&ME Project No: 1264-06-724

Boring Number: M-22R

Sample No:	**7**
Depth (ft-bls):	**39.3 - 40.8**
Blow Count:	**3 * 3 * 4**

Sample No:	**8**
Depth (ft-bls):	**44.3 - 45.8**
Blow Count:	**5 * 5 * 6**

Sample No:	**9**
Depth (ft-bls):	**49.3 - 50.8**
Blow Count:	**3 * 4 * 6**



Sample No:	**10**
Depth (ft-bls):	**54.3 - 55.8**
Blow Count:	**4 * 6 * 6**

Sample No:	**11**
Depth (ft-bls):	**59.3 - 60.8**
Blow Count:	**12 * 30 * 50/2**

Sample No:	**12**
Depth (ft-bls):	**64.3 - 65.8**
Blow Count:	**46 * 50/3**

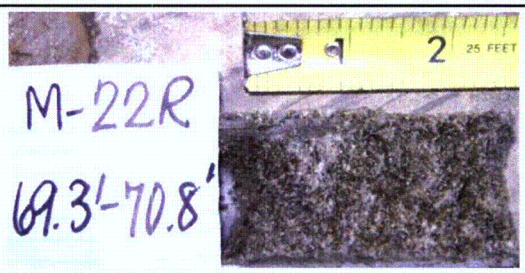
SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Boring Number: **M-22R**

Sample No:	**13**
Depth (ft-bls):	**69.3 - 70.8**
Blow Count:	**50/4**

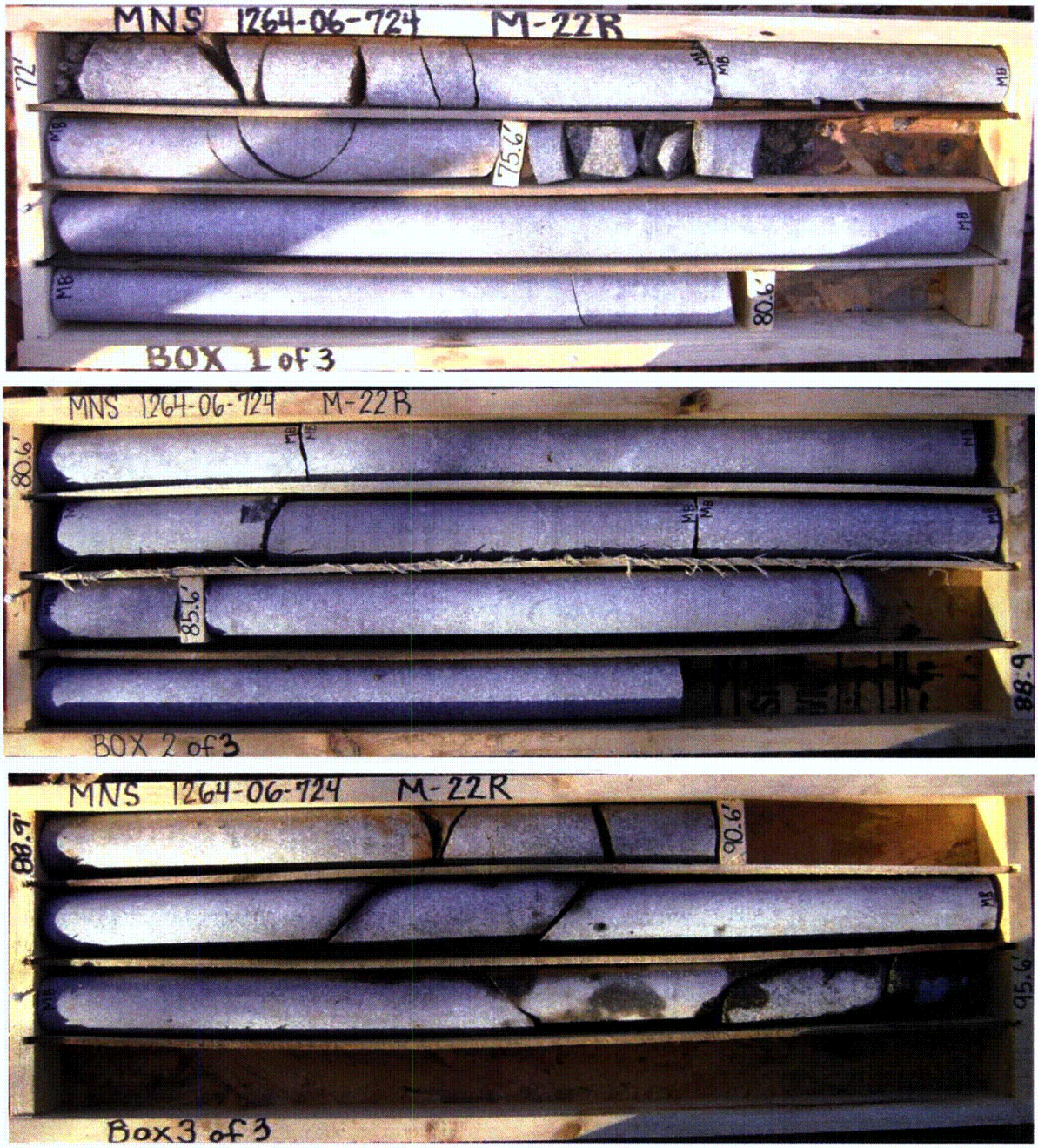


ROCK CORE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-22R



CLASSIFICATION:

72' to 80.55': Medium-Grained Quartz Diorite

80.55' to 81.45': Coarse-Grained Quartz Diorite

81.45' to 84.45': Medium-Grained Quartz Diorite

84.45' to 95.6': Coarse-Grained Quartz Diorite

CALCULATION OF PERMEABILITY BY THE FALLING HEAD METHOD (Open Hole in Uniform Material)

S&ME

Site Name:	MNS - GWPP	
Date:	12/7/2007	
Boring I.D.	M-22R	
Test Interval:	54.5' to 57.5'	(Soil/Saprolite)
Total Depth of Hole:	57.5 ft bls	1753.05 cm
Length of Open Hole:	3 ft	91.46 cm
Transformation Ratio m=	1	
Performed by:	Courtney Withers	

Time (sec)	Head (cm)	Permeability (cm/sec)
0	1751.10	
60	1750.88	5.22E-07
120	1750.27	1.45E-06
180	1749.45	1.98E-06
240	1748.87	1.39E-06
300	1747.53	3.23E-06
360	1747.44	2.18E-07
420	1746.92	1.25E-06
480	1746.07	2.05E-06
540	1745.95	3.01E-07
600	1745.67	6.61E-07
900	1742.16	1.69E-06
1200	1739.42	1.33E-06
1500	1737.04	1.15E-06
1800	1734.21	1.37E-06
2400	1728.32	1.43E-06

Calculations

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\frac{H_1}{H_2}$$

for $\frac{mL}{D} > 4$

Where:

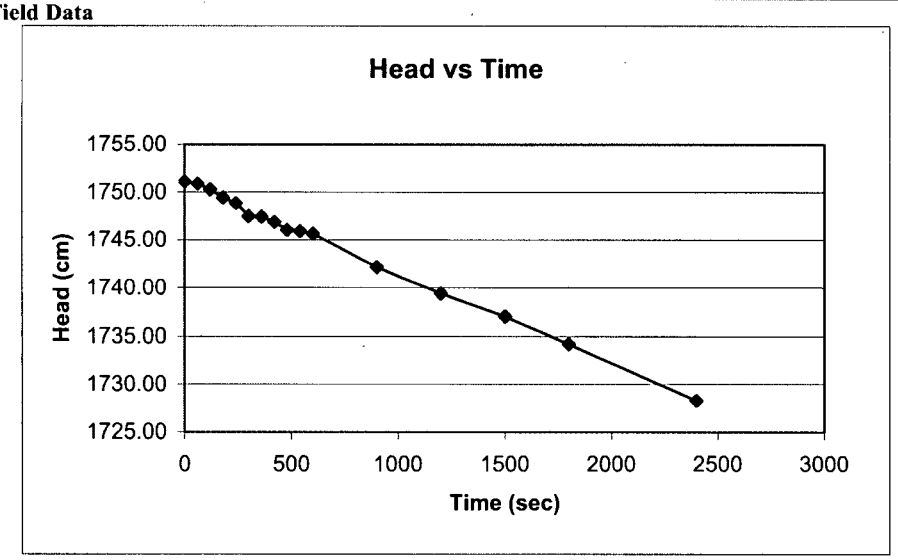
K_h	is the Horizontal Coefficient of Permeability (cm/sec)
H_1	is the Piezometric Head for time; $t = t_1$ (cm)
H_2	is the Piezometric Head for time; $t = t_2$ (cm)
D	is the Diameter of the Standpipe (cm)
d	is the diameter of the Open Length (cm),
m	is the Transformation Ratio, Where
	$m = \sqrt{K_h / K_v}$ K_h is the Horizontal Permeability
	K_v is the Vertical Permeability
L	is the Open Length of Hole (cm)

Spreadsheet assumes 3" ID Pipe; NQ Hole, OD = 3"

MEAN PERMEABILITY (cm/sec)

1.33E-06

Graph of Field Data



CALCULATION OF PERMEABILITY BY THE FALLING HEAD METHOD (Open Hole in Uniform Material)

S&ME

Site Name:	MNS - GWPP	
Date:	12/4/2007	
Boring I.D.	M-22R	
Test Interval:	71.6' to 75.6'	(Sound Rock)
Total Depth of Hole:	75.6 ft bls	2304.87 cm
Length of Open Hole:	4 ft	121.95 cm
Transformation Ratio m=	1	
Performed by:	Courtney Withers	

Time (sec)	Head (cm)	Permeability (cm/sec)
0	2245.03	
60	2037.93	3.33E-04
120	1984.97	9.05E-05
180	1965.52	3.39E-05
240	1949.91	2.74E-05
300	1935.98	2.47E-05
360	1922.26	2.45E-05
420	1909.15	2.35E-05
480	1896.13	2.35E-05
540	1884.94	2.03E-05
600	1873.20	2.15E-05
900	1817.41	2.08E-05
1200	1764.94	2.01E-05
1500	1717.56	1.87E-05
1800	1672.04	1.85E-05
2400	1591.43	1.70E-05
3000	1521.40	1.55E-05
3600	1458.78	1.45E-05

Calculations

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\frac{H_1}{H_2}$$

for $\frac{mL}{D} > 4$

Where:

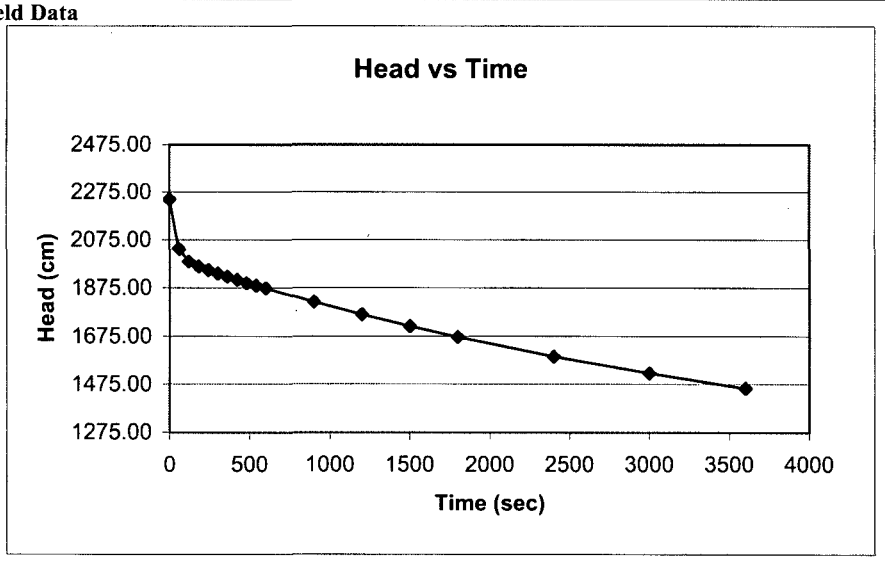
K_h	is the Horizontal Coefficient of Permeability (cm/sec)
H_1	is the Piezometric Head for time; $t = t_1$ (cm)
H_2	is the Piezometric Head for time; $t = t_2$ (cm)
D	is the Diameter of the Standpipe (cm)
d	is the diameter of the Open Length (cm),
m	is the Transformation Ratio, Where
	$m = \sqrt{K_h / K_v}$ K_h is the Horizontal Permeability
	K_v is the Vertical Permeability
L	is the Open Length of Hole (cm)

Spreadsheet assumes 3" ID Pipe; NQ Hole, OD = 3"

MEAN PERMEABILITY (cm/sec)

4.40E-05

Graph of Field Data



CALCULATION OF PERMEABILITY BY THE FALLING HEAD METHOD (Open Hole in Uniform Material)

S&ME

Site Name:	MNS - GWPP	
Date:	12/5/2007	
Boring I.D.	M-22R	
Test Interval:	71.6' to 80.6'	(Sound Rock)
Total Depth of Hole:	80.6 ft bls	2457.32 cm
Length of Open Hole:	9 ft	274.39 cm
Transformation Ratio m=	1	
Performed by:	Courtney Withers	

Time (sec)	Head (cm)	Permeability (cm/sec)
0	2253.17	
60	2187.01	5.62E-05
120	2029.76	1.41E-04
180	1990.55	3.68E-05
240	1970.88	1.87E-05
300	1953.41	1.68E-05
360	1939.02	1.39E-05
420	1924.33	1.43E-05
480	1911.07	1.30E-05
540	1898.81	1.21E-05
600	1886.31	1.25E-05
900	1828.54	1.17E-05
1200	1776.25	1.09E-05
1500	1728.08	1.04E-05
1800	1683.78	9.79E-06
2400	1603.11	9.26E-06
3000	1529.66	8.84E-06
3600	1468.20	7.73E-06

Calculations

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\frac{H_1}{H_2}$$

for $\frac{mL}{D} > 4$

Where:

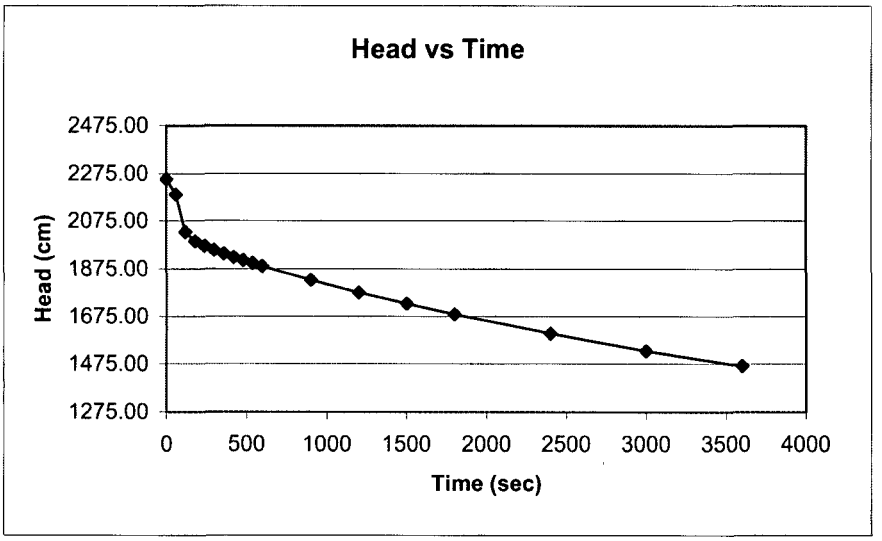
- K_h is the Horizontal Coefficient of Permeability (cm/sec)
- H_1 is the Piezometric Head for time; $t = t_1$ (cm)
- H_2 is the Piezometric Head for time; $t = t_2$ (cm)
- D is the Diameter of the Standpipe (cm)
- d is the diameter of the Open Length (cm),
- m is the Transformation Ratio, Where $m = \sqrt{K_h / K_v}$
  - K_h is the Horizontal Permeability
  - K_v is the Vertical Permeability
- L is the Open Length of Hole (cm)

Spreadsheet assumes 3" ID Pipe; NQ Hole, OD = 3"

MEAN PERMEABILITY (cm/sec)

2.38E-05

Graph of Field Data

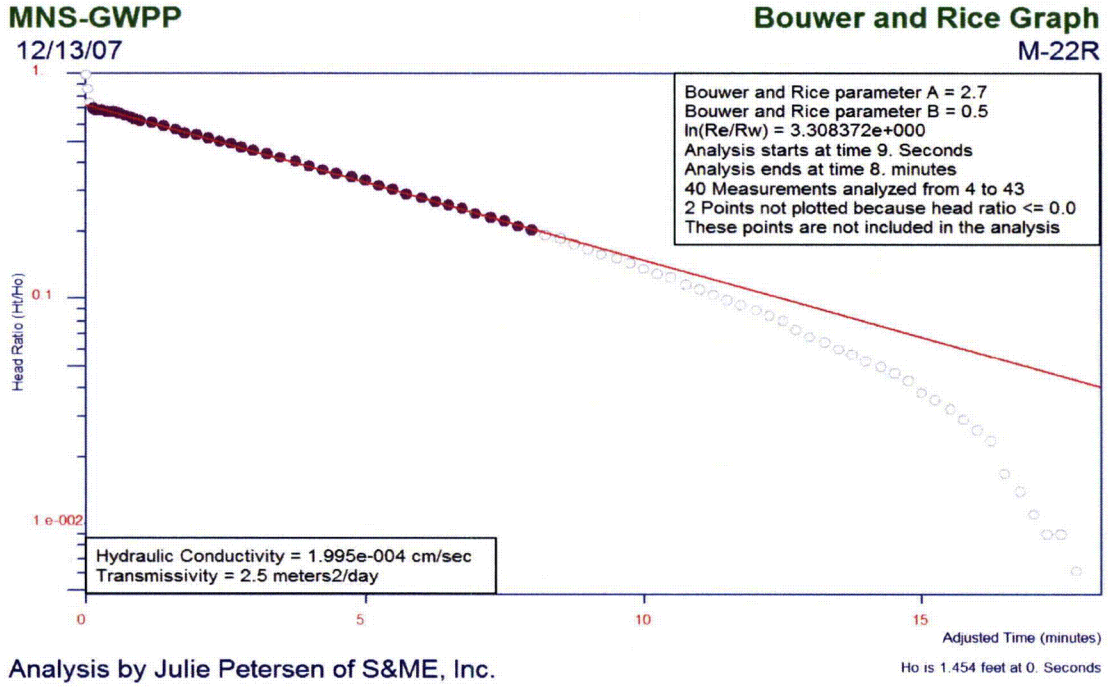


Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	12/13/2007
Well Label:	M-22R
Aquifer Thickness:	47.58 feet
Screen Length:	5. feet
Casing Radius:	1. Inches
Effective Radius:	1.5 Inches
Static Water Level:	49.42 feet
Water Table to Screen Bottom:	42.58 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 84 time and drawdown measurements
Maximum head is 1.454 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



Analysis by Julie Petersen of S&ME, Inc.

PERMEABILITY

2.00×10^{-04} cm/sec

S&ME, Inc.
9751 Southern Pine Blvd.
Charlotte, North Carolina
Telephone: 704-523-4726
Fax: 704-525-3953

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**				**Boring No. M-23**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**		Sheet No. 1 of 2
Boring Depth (ft): **50.9**	Elevation (ft): **775.5**	Driller: **Justin Millwood, NC Cert. No. 3439**		Date Drilled: **11/29/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 37.66 ft bls**			Drilling Method: **4¼" H.S.A.**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
775			**GRASS and TOPSOIL**		
			SOIL/SAPROLITE (M1): Reddish-Brown, Clayey, **SILT**		
	5				
770					
			SOIL/SAPROLITE (M1): Reddish-Yellow, Micaceous, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining		
	10				6
765					
	15		SOIL/SAPROLITE (M1): Yellow-Brown and Red, Slightly Clayey, Very Fine Sandy, **SILT** With Mica and Manganese Staining; Large Manganese Vein at 20.0 ft bls		8
760					
	20				7
755					
	25				7
750					
			SOIL/SAPROLITE (M1): White, Tan, and Orange With Black and Green, Clayey, Coarse to Fine Sandy, **SILT** With Manganese Nodules		
	30				5
745					

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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Charlotte, North Carolina
Telephone: 704-523-4726
Fax: 704-525-3953

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**				**Boring No. M-23**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**		Sheet No. 2 of 2
Boring Depth (ft): **50.9**	Elevation (ft): **775.5**	Driller: **Justin Millwood, NC Cert. No. 3439**		Date Drilled: **11/29/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 37.66 ft bls**			Drilling Method: **4¼" H.S.A.**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
740					7
	40				4
735					
	45				6
730					
	50				12
725			**Boring Terminated at 50.90 ft bls**		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

COMPLETION REPORT OF WELL No. M-23

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **4¼" H.S.A.**
DATE DRILLED: **11/29/07**

WATER LEVEL: **Stabilized Water Level at 37.66 ft bls**
LATITUDE: **35 25 39.69**
LONGITUDE: **80 56 23.01**
TOP OF CASING ELEVATION: **778.23**
DATUM: **MSL**
LOGGED BY: **Courtney Withers**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		775.52
GRASS and TOPSOIL		0				
SOIL/SAPROLITE (M1): Reddish-Brown, Clayey, **SILT**		5				
SOIL/SAPROLITE (M1): Reddish-Yellow, Micaceous, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining		10				
		15				
SOIL/SAPROLITE (M1): Yellow-Brown and Red, Slightly Clayey, Very Fine Sandy, **SILT** With Mica and Manganese Staining; Large Manganese Vein at 20.0 ft bls		20				
		25		26.80		748.72
SOIL/SAPROLITE (M1): White, Tan, and Orange With Black and Green, Clayey, Coarse to Fine Sandy, **SILT** With Manganese Nodules		30		29.40		746.12

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 32 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 26.8 ft bls**

SEAL
Type: **Bentonite**
Interval: **26.8 to 29.4 ft bls**

FILTERPACK
Type: **#1 Filter Sand**
Interval: **29.4 to 48.5 ft bls**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **32 to 47 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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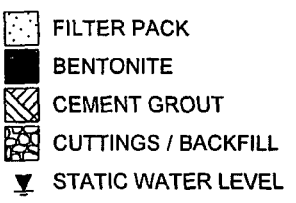
Charlotte, North Carolina

COMPLETION REPORT OF WELL No. M-23

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **775.5**
LOGGED BY: **Courtney Wither**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
							(See Page 1)
SOIL/SAPROLITE (M1): White, Tan, and Orange With Black and Green, Clayey, Coarse to Fine Sandy, **SILT** With Manganese Nodules *(continued)*		35 40 45 50		46.50 47.00 48.50 50.90		729.02 728.52 727.02 724.62	



MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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Charlotte, North Carolina

COMPLETION REPORT OF WELL No. M-23

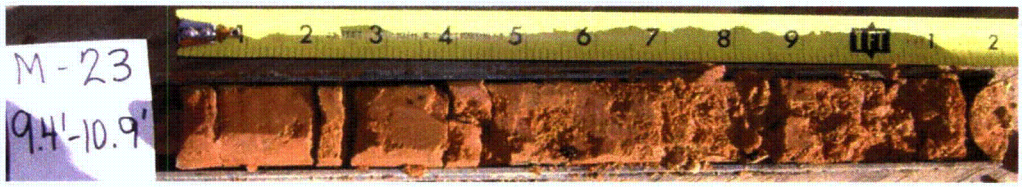
SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

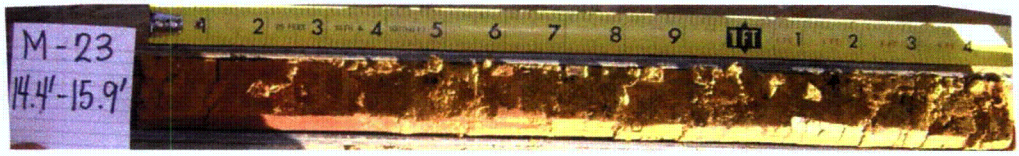
S&ME Project No: 1264-06-724

Boring Number: M-23

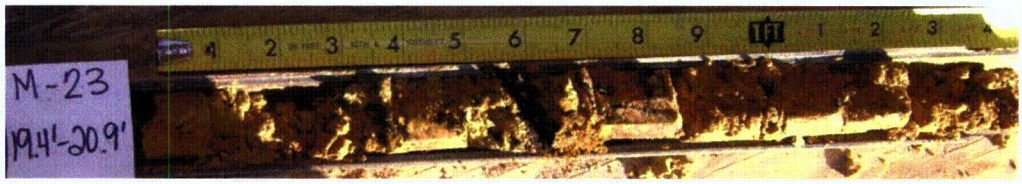
Sample No:	**1**
Depth (ft-bls):	**9.4 - 10.9**
Blow Count:	**3 * 2 * 4**



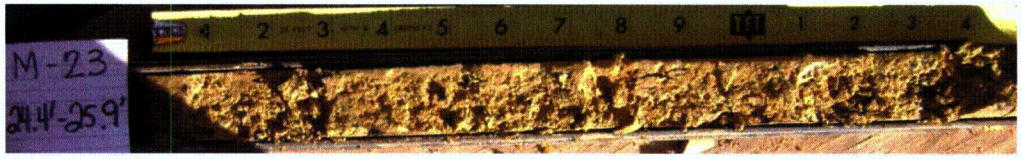
Sample No:	**2**
Depth (ft-bls):	**14.4 - 15.9**
Blow Count:	**4 * 3 * 5**



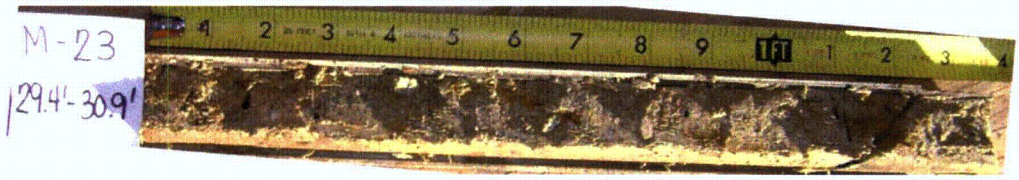
Sample No:	**3**
Depth (ft-bls):	**19.4 - 20.9**
Blow Count:	**3 * 3 * 4**



Sample No:	**4**
Depth (ft-bls):	**24.4 - 25.9**
Blow Count:	**2 * 3 * 4**



Sample No:	**5**
Depth (ft-bls):	**29.4 - 30.9**
Blow Count:	**2 * 2 * 3**



Sample No:	**6**
Depth (ft-bls):	**34.4 - 35.9**
Blow Count:	**2 * 3 * 4**

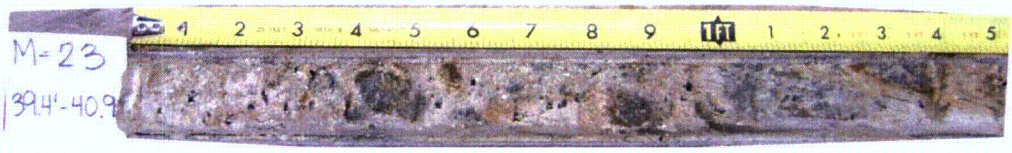
SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

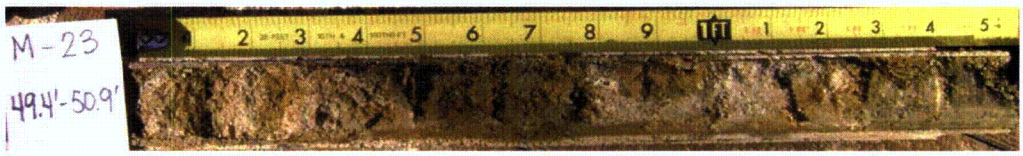
Boring Number: M-23

Sample No: 7
Depth (ft-bls): 39.4 - 40.9
Blow Count: 2 * 2 * 2



Sample No: 8
Depth (ft-bls): 44.4 - 45.9
Blow Count: 2 * 3 * 3

Sample No: 9
Depth (ft-bls): 49.4 - 50.9
Blow Count: 3 * 5 * 7



CALCULATION OF PERMEABILITY BY THE FALLING HEAD METHOD (Open Hole in Uniform Material)

S&ME

Site Name:	MNS - GWPP	
Date:	11/30/2007	
Boring I.D.	M-23	
Test Interval:	39.3' to 42.3'	(Soil/Saprolite)
Total Depth of Hole:	42.3 ft bls	1289.63 cm
Length of Open Hole:	3 ft	91.46 cm
Transformation Ratio m=	1	
Performed by:	Courtney Withers	

Time (sec)	Head (cm)	Permeability (cm/sec)
0	1292.80	
60	1281.74	3.61E-05
120	1271.65	3.32E-05
180	1261.65	3.32E-05
240	1252.53	3.05E-05
300	1243.45	3.06E-05
360	1235.24	2.78E-05
420	1226.40	3.02E-05
480	1219.02	2.54E-05
540	1211.07	2.75E-05
600	1203.38	2.68E-05
900	1168.48	2.47E-05
1200	1136.80	2.31E-05
1500	1110.30	1.98E-05
1800	1083.60	2.05E-05
2400	1027.44	2.24E-05
3000	987.16	1.68E-05
3600	965.27	9.43E-06

Calculations

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\frac{H_1}{H_2}$$

for $\frac{mL}{D} > 4$

Where:

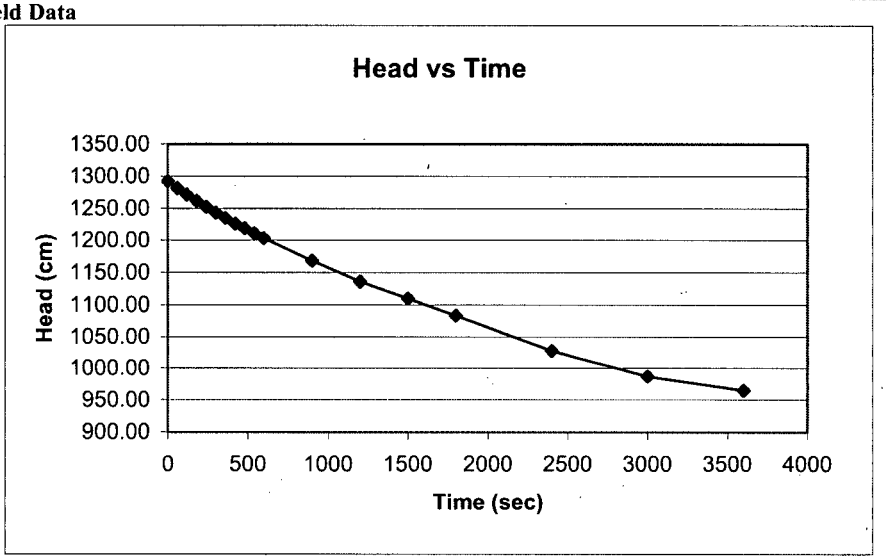
K_h	is the Horizontal Coefficient of Permeability (cm/sec)
H_1	is the Piezometric Head for time; $t = t_1$ (cm)
H_2	is the Piezometric Head for time; $t = t_2$ (cm)
D	is the Diameter of the Standpipe (cm)
d	is the diameter of the Open Length (cm),
m	is the Transformation Ratio, Where
	$m = \sqrt{K_h / K_v}$ K_h is the Horizontal Permeability
	K_v is the Vertical Permeability
L	is the Open Length of Hole (cm)

Spreadsheet assumes 3" ID Pipe; NQ Hole, OD = 3"

MEAN PERMEABILITY (cm/sec)

2.58E-05

Graph of Field Data

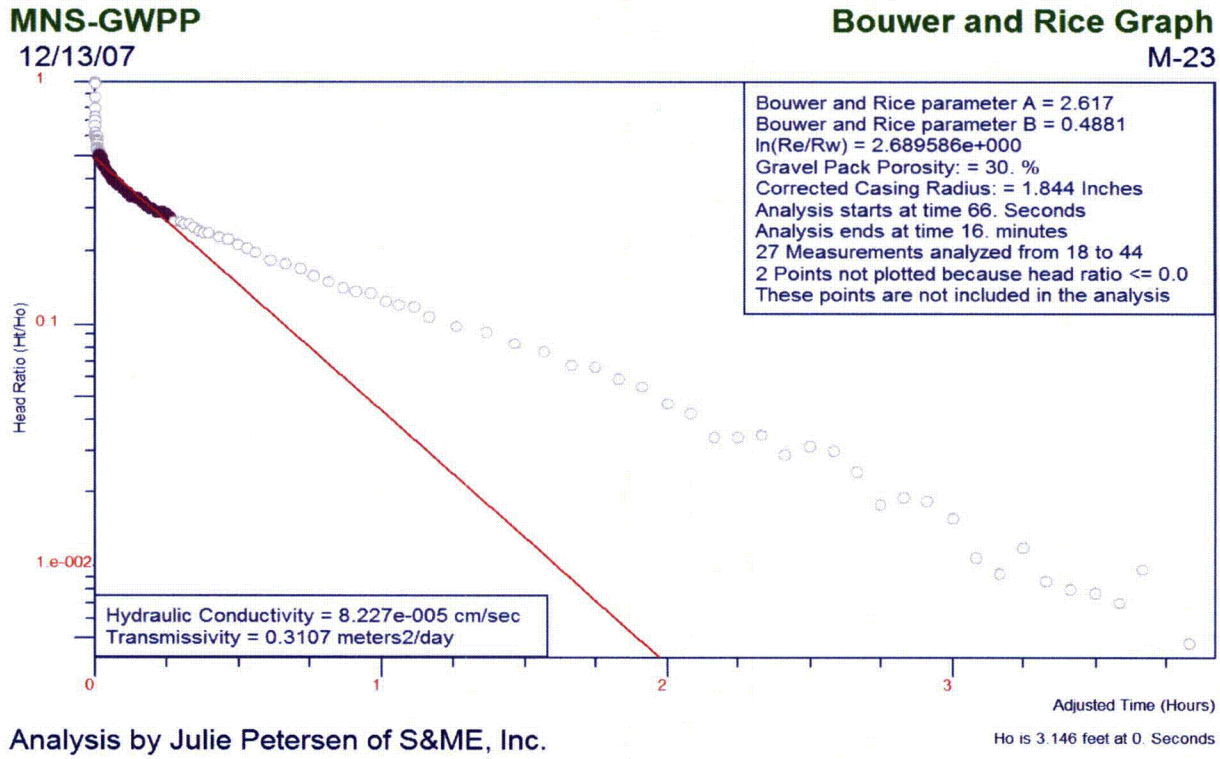


Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	12/13/2007
Well Label:	M-23
Aquifer Thickness:	14.34 feet
Screen Length:	15. feet
Casing Radius:	1. Inches
Effective Radius:	3. Inches
Gravel Pack Porosity:	30.00%
Corrected Casing Radius:	1.844 Inches
Static Water Level:	37.66 feet
Water Table to Screen Bottom:	9.34 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 101 time and drawdown measurements
Maximum head is 3.146 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



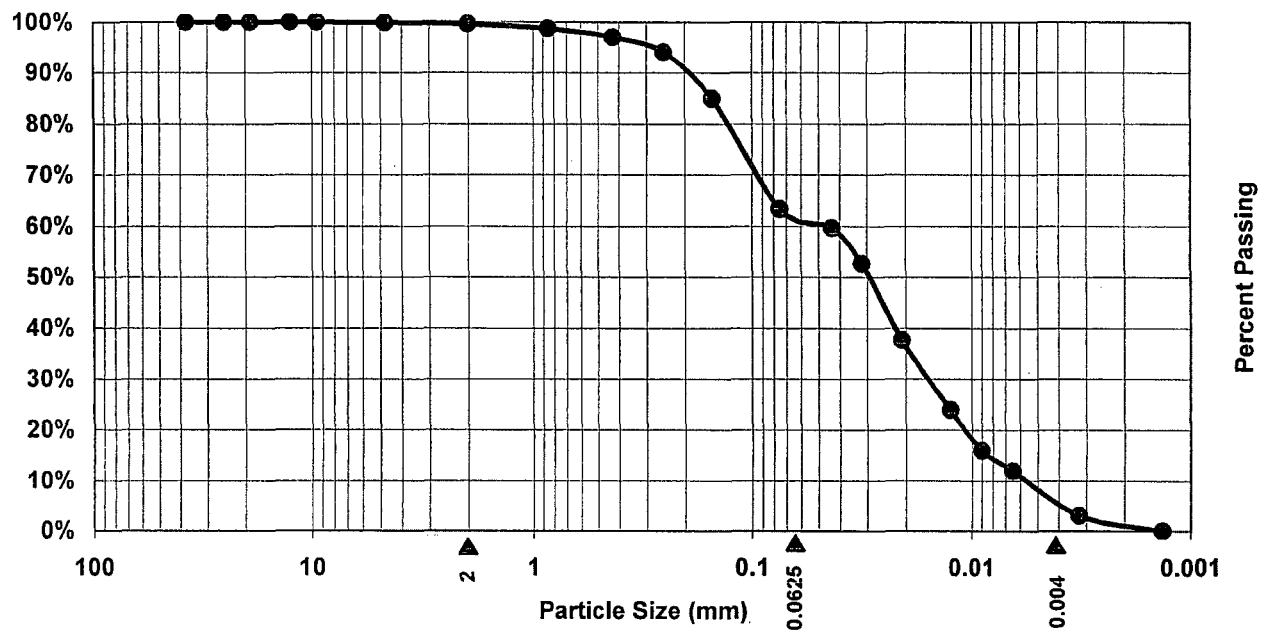
PERMEABILITY

8.23×10^{-05} cm/sec

PARTICLE SIZE ANALYSIS OF SOILS
FOR USE IN FETTER AND BEAR DIAGRAMS

Boring No.:	Sample No.:	Depth:
M-23	SS-5	29.4 to 30.9 ft bls

Sample Description:
White, Tan, Orange With Black and Green, Clayey, Coarse to Fine Sandy, Silt



	> 2 mm	2 mm - 0.0625 mm	0.0625 mm - 0.004 mm	<0.004 mm
From Graph:	% Gravel 0.4%	% Sand 37.5%	% Silt 57.0%	% Clay 5.1%
Adjusted for Calculations	**0%**	**38%**	**57%**	**5%**

Notes:
Grain size distribution taken from grain size with hydrometer data located in Appendix II.
Gravel, sand, silt and clay sizes based on Wentworth Scale.

S&ME Project:
McGuire Nuclear Station - GWPP

S&ME Project No.:
1264-06-724

S&ME

FETTER AND BEAR DIAGRAMS

S&ME PROJECT: McGuire Nuclear Station - GWPP
S&ME PROJECT NO.: 1264-06-724

Boring No. M-23

Boring Depth: 29.4 to 30.9 ft bls

% Sand: 38%

% Silt: 57%

% Clay: 5%

Estimated Specific Yield: 18%

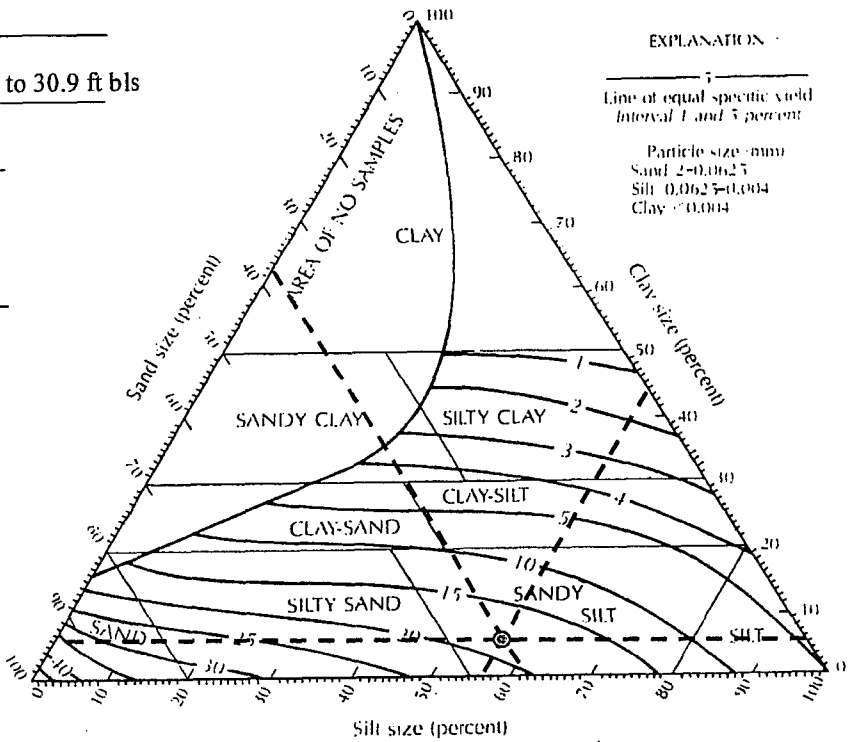
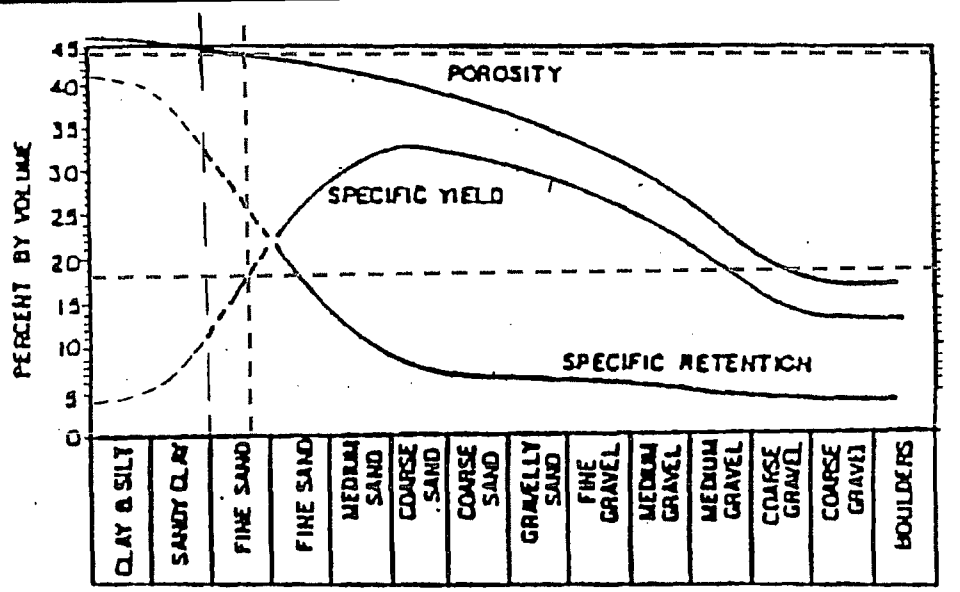


FIGURE 4.11 Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. Source: A. I. Johnson, U.S. Geological Survey Water-Supply Paper 1662-D, 1967.



Estimated Porosity: 44%

Variation of Porosity, Specific Yield, and Specific Retention with Grain Size (after Bear, 1972)

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Fax: 704-525-3953

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**			**Boring No. M-30**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 1 of 2
Boring Depth (ft): **50.7**	Elevation (ft): **733.5**	Driller: **Justin Millwood, NC Cert. No. 3439**	Date Drilled: **5/17/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 42.59 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
730	5		SOIL/SAPROLITE (M1): Red, Micaceous, Slightly Sandy, Clayey, **SILT**		
725	10				
720	15		SOIL/SAPROLITE (M1): Yellow, Red, and Tan, Silty, Fine **SAND** With Manganese Staining; Tan, Medium to Fine Sand Lense From 17.00 to 17.25 ft bls		
715	20				
710	25		SOIL/SAPROLITE (M1): White, Tan, and Black, Silty, Medium to Fine **SAND** With Manganese Staining		
705	30		SOIL/SAPROLITE (M1): White, Tan, and Black, Micaceous, Slightly Sandy, **SILT**		
700			SOIL/SAPROLITE (M1): Greenish-Black, Tan, and White, Micaceous, Clayey, **SILT** With Manganese Staining		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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Project: **MNS - Groundwater Protection Project**				**Boring No. M-30**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**		Sheet No. 2 of 2
Boring Depth (ft): **50.7**	Elevation (ft): **733.5**	Driller: **Justin Millwood, NC Cert. No. 3439**		Date Drilled: **5/17/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 42.59 ft bls**			Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
695	40				
690	45		SOIL/SAPROLITE (M1): Greenish-Black and Tan, Micaceous, Slightly Sandy, **SILT** With Manganese Staining and White, Medium to Fine Sand Lenses	▼	
685	50		WEATHERED ROCK (M2): When Sampled Becomes Greenish-Black and Tan, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		
			Boring Terminated at 50.70 ft bls **Lithologic Descriptions Obtained From M-30R**		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

COMPLETION REPORT OF WELL No. M-30

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **5/17/07**

WATER LEVEL: **Stabilized Water Level at 42.59 ft bls**
LATITUDE: **35 25 38.90**
LONGITUDE: **80 57 02.23**
TOP OF CASING ELEVATION: **736.50**
DATUM: **MSL**
LOGGED BY: **Courtney Withers**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		733.46
SOIL/SAPROLITE (M1): Red, Micaceous, Slightly Sandy, Clayey, **SILT**		0				
		5				
		10				
SOIL/SAPROLITE (M1): Yellow, Red, and Tan, Silty, Fine **SAND** With Manganese Staining; Tan, Medium to Fine Sand Lense From 17.00 to 17.25 ft bls		15				
		20				
SOIL/SAPROLITE (M1): White, Tan, and Black, Silty, Medium to Fine **SAND** With Manganese Staining		25				
SOIL/SAPROLITE (M1): White, Tan, and Black, Micaceous, Slightly Sandy, **SILT**		30		30.70		702.76
				33.00		700.46

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 35.7 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 30.7 ft bls**

SEAL
Type: **Bentonite**
Interval: **30.7 to 33.0 ft bls**

FILTERPACK
Type: **#1 Filter Sand**
Interval: **33.0 to 50.7 ft bls**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **35.7 to 50.7 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **733.5**
LOGGED BY: **Courtney Wither**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
SOIL/SAPROLITE (M1): Greenish-Black, Tan, and White, Micaceous, Clayey, **SILT** With Manganese Staining *(continued)*		35 – 40				
SOIL/SAPROLITE (M1): Greenish-Black and Tan, Micaceous, Slightly Sandy, **SILT** With Manganese Staining and White, Medium to Fine Sand Lenses		45				
WEATHERED ROCK (M2): When Sampled Becomes Greenish-Black and Tan, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		50		50.20 50.70		683.26 682.76

WELL CONSTRUCTION DETAILS

(See Page 1)

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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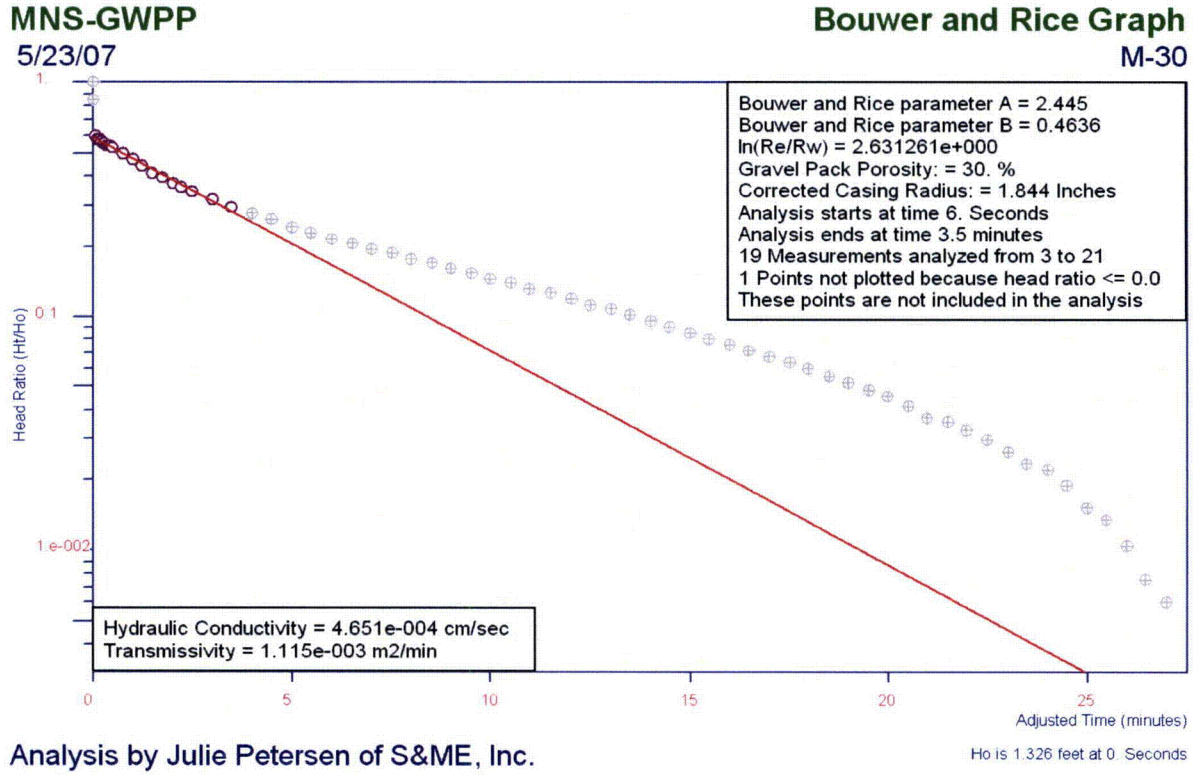
COMPLETION REPORT OF WELL No. M-30

Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	5/23/2007
Well Label:	M-30
Aquifer Thickness:	13.11 feet
Screen Length:	15. feet
Casing Radius:	1. Inches
Effective Radius:	3. Inches
Gravel Pack Porosity:	30.00%
Corrected Casing Radius:	1.844 Inches
Static Water Level:	42.59 feet
Water Table to Screen Bottom:	8.11 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 69 time and drawdown measurements
Maximum head is 1.326 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



PERMEABILITY

4.65E-04 cm/sec

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Project: **MNS - Groundwater Protection Project**			**Boring No. M-30R**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 1 of 3
Boring Depth (ft): **89.6**	Elevation (ft): **733.8**	Driller: **Justin Millwood, NC Cert. No. 3439**	Date Drilled: **5/14/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 42.88 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
730	5		SOIL/SAPROLITE (M1): Red, Micaceous, Slightly Sandy, Clayey, **SILT**		19
725	10				13
720	15		SOIL/SAPROLITE (M1): Yellow, Red, and Tan, Silty, Fine **SAND** With Manganese Staining; Tan, Medium to Fine Sand Lense From 17.00 to 17.25 ft bls.		11
715	20				13
710	25		SOIL/SAPROLITE (M1): White, Tan, and Black, Silty, Medium to Fine **SAND** With Manganese Staining		14
705	30		SOIL/SAPROLITE (M1): White, Tan, and Black, Micaceous, Slightly Sandy, **SILT**		10
700			SOIL/SAPROLITE (M1): Greenish-Black, Tan, and White, Micaceous, Clayey, **SILT** With Manganese Staining		11

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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Project: **MNS - Groundwater Protection Project**			**Boring No. M-30R**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 2 of 3
Boring Depth (ft): **89.6**	Elevation (ft): **733.8**	Driller: **Justin Millwood, NC Cert. No. 3439**	Date Drilled: **5/14/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 42.88 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
695	40				13
690	45		SOIL/SAPROLITE (M1): Greenish-Black and Tan, Micaceous, Slightly Sandy, **SILT** With Manganese Staining and White, Medium to Fine Sand Lenses		41
685	50		WEATHERED ROCK (M2): When Sampled Becomes Greenish-Black and Tan, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		50/4 >>
680	55				50/5 >>
675	60				50/4 >>
670	65				50/4 >>
665			**Roller Cone Refusal at 69.7 ft bls**		50/2 >>

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Project: **MNS - Groundwater Protection Project**				**Boring No. M-30R**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**		Sheet No. 3 of 3
Boring Depth (ft): **89.6**	Elevation (ft): **733.8**	Driller: **Justin Millwood, NC Cert. No. 3439**		Date Drilled: **5/14/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 42.88 ft bls**			Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
660	75		PARTIALLY WEATHERED/FRACTURED ROCK (WF): Medium-Grained **GRANITE**, Intensely Fractured, With Intermittent Soil Seams		
655	80		SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE** With Intermittent Fine-Grained **DIORITE** and Possible Volcanic Intrusion; Moderately to Intensely Fractured		
650	85				
645			**Boring Terminated at 89.55 ft bls**		

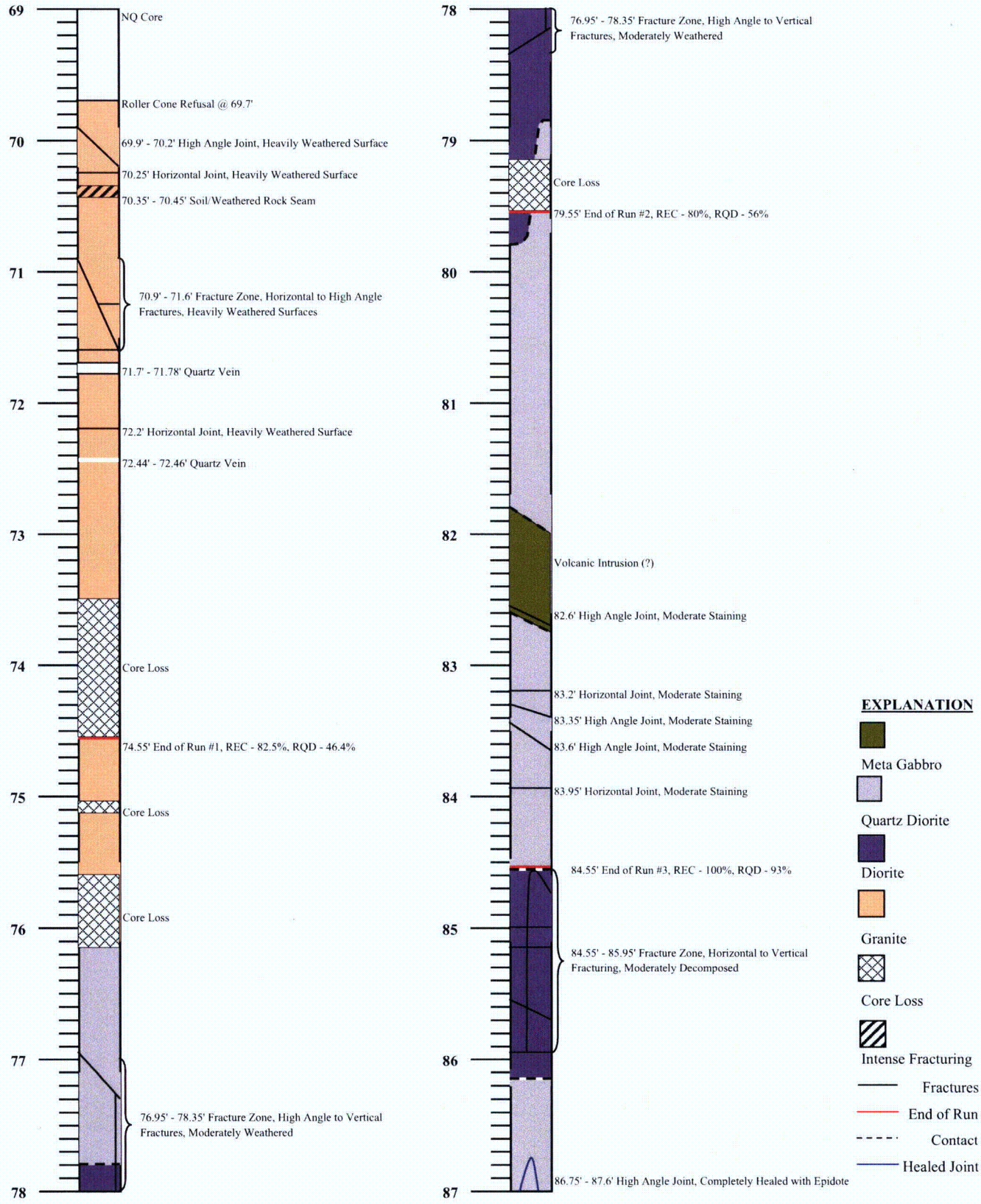
BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-30R

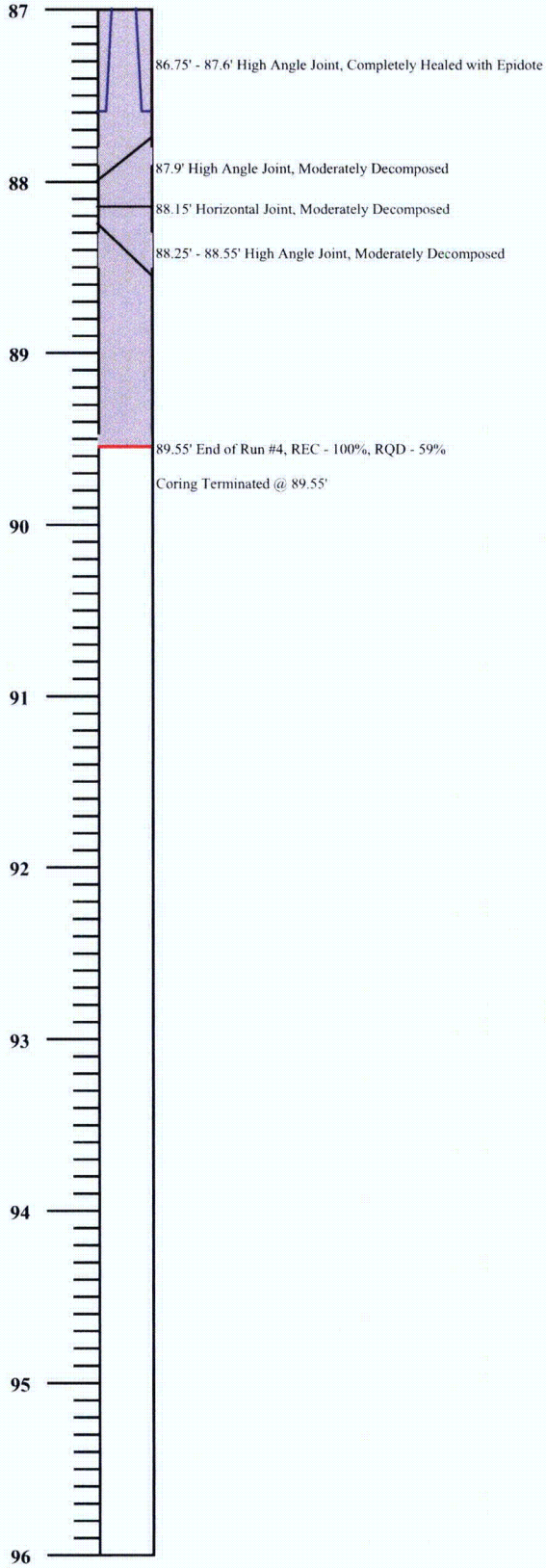


FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-30R



EXPLANATION

- Meta Gabbro
- Quartz Diorite
- Diorite
- Granite
- Core Loss
- Intense Fracturing
- Fractures
- End of Run
- Contact
- Healed Joint

COMPLETION REPORT OF WELL No. M-30R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

WATER LEVEL: **Stabilized Water Level at 42.88 ft bls**
LATITUDE: **35 25 38.92**
LONGITUDE: **80 57 02.19**
TOP OF CASING ELEVATION: **736.99**
DATUM: **MSL**
LOGGED BY: **Courtney Withers**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **5/14/07**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		733.80
SOIL/SAPROLITE (M1): Red, Micaceous, Slightly Sandy, Clayey, **SILT**		0				
		5				
		10				
SOIL/SAPROLITE (M1): Yellow, Red, and Tan, Silty, Fine **SAND** With Manganese Staining; Tan, Medium to Fine Sand Lense From 17.00 to 17.25 ft bls.		15				
		20				
SOIL/SAPROLITE (M1): White, Tan, and Black, Silty, Medium to Fine **SAND** With Manganese Staining		25				
SOIL/SAPROLITE (M1): White, Tan, and Black, Micaceous, Slightly Sandy, **SILT**		30				

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 72.1 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 70 ft bls**

SEAL
Type: **K-Packer + Bentonite**
Interval: **70 to 72.3 ft bls**

FILTERPACK
Type: **N/A**
Interval: **N/A**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **73.5 to 78.5 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-30R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION:
LOGGED BY: **733.8**
CHECKED BY: **Courtney Wither**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
SOIL/SAPROLITE (M1): Greenish-Black, Tan, and White, Micaceous, Clayey, **SILT** With Manganese Staining *(continued)*		35 – 40				
SOIL/SAPROLITE (M1): Greenish-Black and Tan, Micaceous, Slightly Sandy, **SILT** With Manganese Staining and White, Medium to Fine Sand Lenses		45				
WEATHERED ROCK (M2): When Sampled Becomes Greenish-Black and Tan, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		50 – 55 – 60 – 65				
PARTIALLY WEATHERED/FRACTURED ROCK (WF): Medium-Grained **GRANITE**, Intensely Fractured, With Intermittent Soil Seams		70 – 75		70.00 72.10 72.30 73.50 78.00 78.50		663.80 661.70 661.50 660.30 655.80 655.30

WELL CONSTRUCTION DETAILS

(See Page 1)

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-30R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **733.8**
LOGGED BY: **Courtney Wither**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
							(See Page 1)
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE** With Intermittent Fine-Grained **DIORITE** and Possible Volcanic Intrusion; Moderately to Intensely Fractured *(continued)*		80 85		80.30 89.55		653.50 644.25	

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-30R

SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Boring Number: M-30R

Sample No: 1 **Depth (ft-bls):** 2.85 - 4.35 **Blow Count:** 5 * 7 * 12	
Sample No: 2 **Depth (ft-bls):** 7.85 - 9.35 **Blow Count:** 3 * 6 * 7	
Sample No: 3 **Depth (ft-bls):** 12.85 - 14.35 **Blow Count:** 3 * 4 * 7	
Sample No: 4 **Depth (ft-bls):** 17.85 - 19.35 **Blow Count:** 4 * 6 * 7	
Sample No: 5 **Depth (ft-bls):** 22.85 - 24.35 **Blow Count:** 4 * 6 * 8	
Sample No: 6 **Depth (ft-bls):** 27.85 - 29.35 **Blow Count:** 3 * 4 * 6	

SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Boring Number: M-30R

Sample No: 7 **Depth (ft-bls):** 32.85 - 34.35 **Blow Count:** 3 * 5 * 6	
Sample No: 8 **Depth (ft-bls):** 37.85 - 39.35 **Blow Count:** 4 * 4 * 9	
Sample No: 9 **Depth (ft-bls):** 42.85 - 44.35 **Blow Count:** 7 * 15 * 26	
Sample No: 10 **Depth (ft-bls):** 47.85 - 49.35 **Blow Count:** 35 * 50/4	
Sample No: 11 **Depth (ft-bls):** 52.85 - 54.35 **Blow Count:** 32 * 50/5	
Sample No: 12 **Depth (ft-bls):** 57.85 - 59.35 **Blow Count:** 50/4	

SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Boring Number: M-30R

Sample No: 13
Depth (ft-bls): 62.85 - 64.35
Blow Count: 50/4

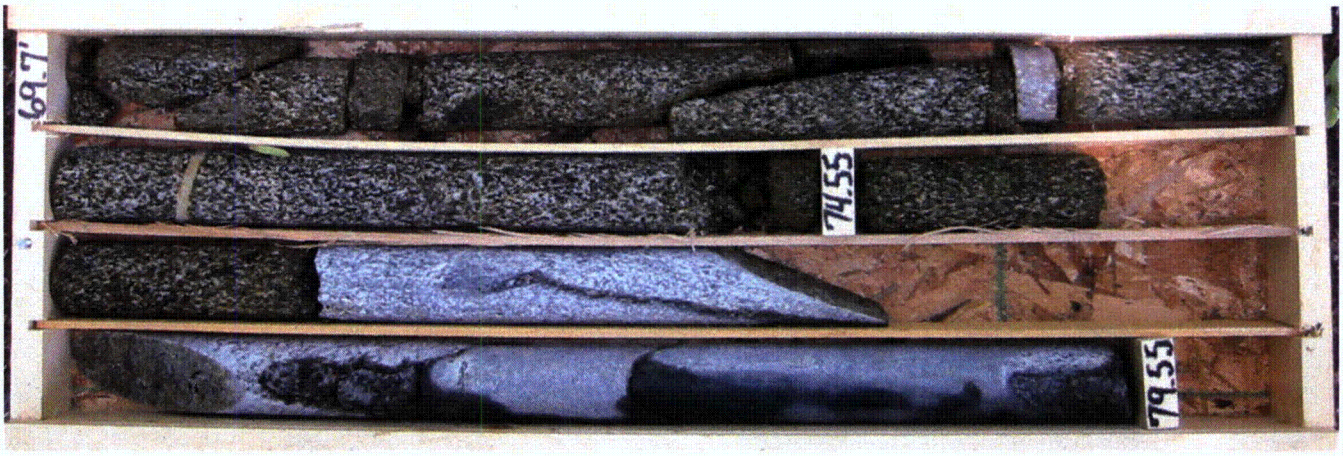
Sample No: 14
Depth (ft-bls): 67.85 - 69.35
Blow Count: 50/2

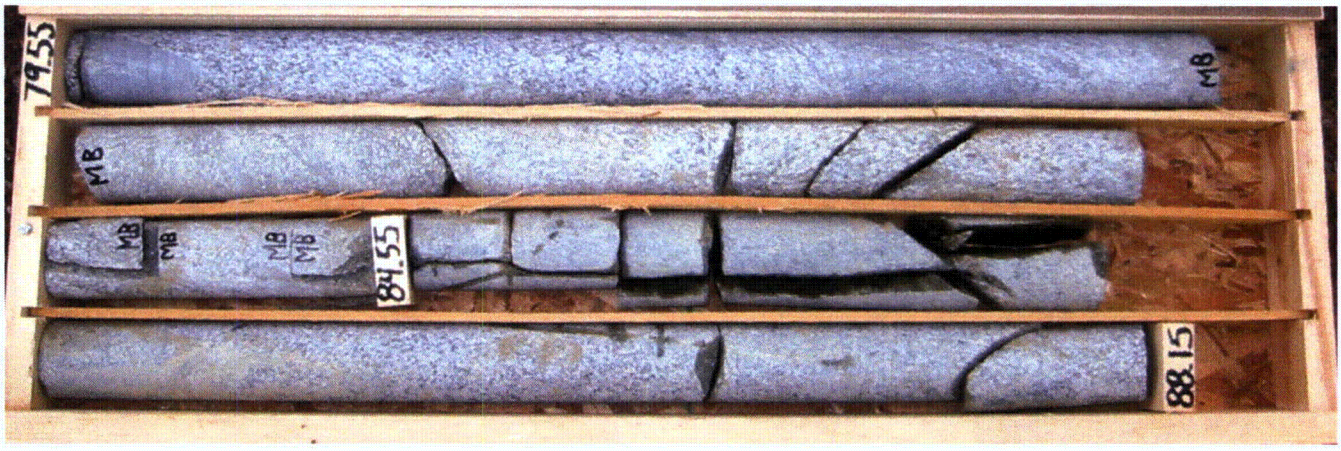
ROCK CORE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-30R





CLASSIFICATION:

69.7' to 76.15' Medium Grained Granite

76.15' to 77.8' Medium Grained Quartz Diorite

77.8' to 79.4' Fine Grained Diorite

79.4' to 81.8' Medium Grained Quartz Diorite

81.8' to 82.65' Volcanic Intrusion (?)

82.65' to 84.55' Medium Grained Quartz Diorite

84.55' - 86.15' Fine Grained Diorite

86.15' to 89.55' Medium Grained Quartz Diorite

CALCULATION OF PERMEABILITY BY THE FALLING HEAD METHOD (Open Hole in Uniform Material)

S&ME

Site Name:	MNS - GWPP	
Date:	5/14/2007	
Boring I.D.	M-30R	
Test Interval:	38.7' to 41.7'	(Soil/Saprolite)
Total Depth of Hole:	41.7 ft bls	1271.34 cm
Length of Open Hole:	3 ft	91.46 cm
Transformation Ratio m=	1	
Performed by:	Julie Petersen	

Time (sec)	Head (cm)	Permeability (cm/sec)
0	1355.46	
60	1349.85	1.74E-05
120	1345.61	1.32E-05
180	1341.04	1.43E-05
240	1336.62	1.39E-05
300	1332.26	1.37E-05
360	1328.08	1.32E-05
420	1323.87	1.33E-05
480	1319.66	1.34E-05
540	1315.27	1.40E-05
600	1311.49	1.21E-05
900	1291.59	1.29E-05
1200	1272.16	1.27E-05
1500	1253.14	1.27E-05
1800	1234.39	1.27E-05
2400	1197.96	1.26E-05
3000	1162.44	1.27E-05
3600	1127.10	1.30E-05

Calculations

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\frac{H_1}{H_2}$$

for $\frac{mL}{D} > 4$

Where:

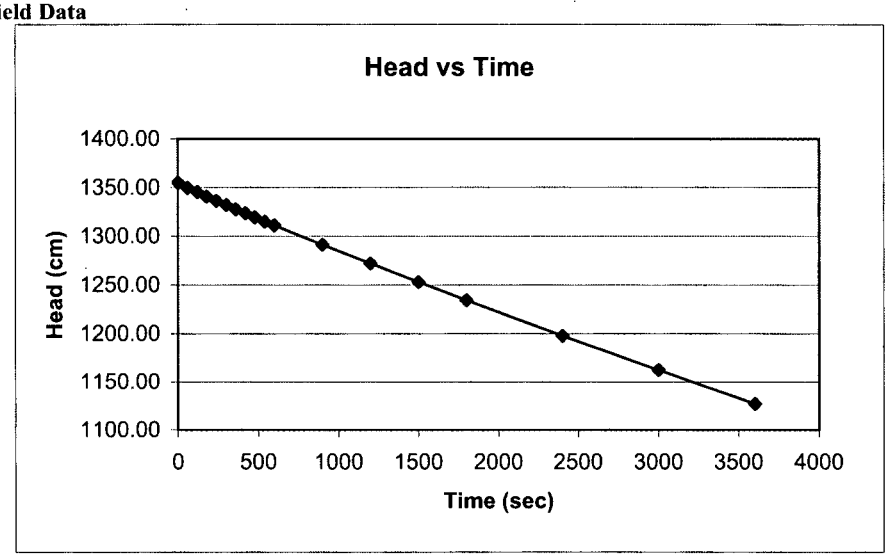
- K_h is the Horizontal Coefficient of Permeability (cm/sec)
- H_1 is the Piezometric Head for time; $t = t_1$ (cm)
- H_2 is the Piezometric Head for time; $t = t_2$ (cm)
- D is the Diameter of the Standpipe (cm)
- d is the diameter of the Open Length (cm),
- m is the Transformation Ratio, Where $m = \sqrt{K_h / K_v}$
  - K_h is the Horizontal Permeability
  - K_v is the Vertical Permeability
- L is the Open Length of Hole (cm)

Spreadsheet assumes 3" ID Pipe; NQ Hole, OD = 3"

MEAN PERMEABILITY (cm/sec)

1.34E-05

Graph of Field Data



CALCULATION OF PERMEABILITY BY THE FALLING HEAD METHOD (Open Hole in Uniform Material)

S&ME

Site Name:	MNS - GWPP	
Date:	5/16/2007	
Boring I.D.	M-30R	
Test Interval:	70.15 to 74.35	(Partially Weathered/Fractured Rock)
Total Depth of Hole:	74.35 ft bls	2266.77 cm
Length of Open Hole:	4.2 ft	128.05 cm
Transformation Ratio m=	1	
Performed by:	Julie Petersen	

Time (sec)	Head (cm)	Permeability (cm/sec)
0	2207.93	
60	2081.52	1.96E-04
120	2035.46	7.43E-05
180	2009.33	4.29E-05
240	1984.70	4.10E-05
300	1961.34	3.93E-05
360	1940.03	3.63E-05
420	1919.66	3.50E-05
480	1899.02	3.59E-05
540	1878.90	3.54E-05
600	1859.27	3.49E-05
900	1767.16	3.37E-05
1200	1685.03	3.16E-05
1500	1611.71	2.95E-05
1800	1545.91	2.77E-05
2400	1432.99	2.52E-05
3000	1362.87	1.67E-05
3600	1286.46	1.92E-05

Calculations

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\frac{H_1}{H_2}$$

$\frac{mL}{D} > 4$

Where:

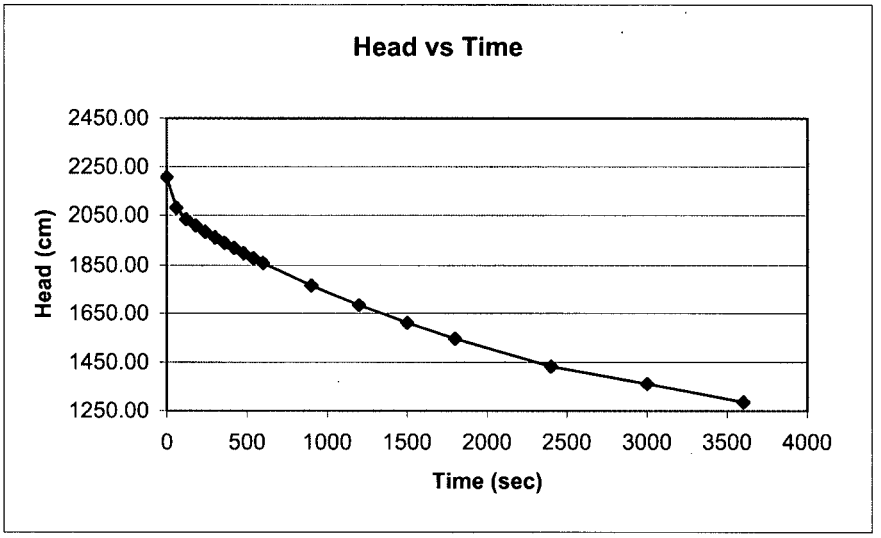
- K_h is the Horizontal Coefficient of Permeability (cm/sec)
- H_1 is the Piezometric Head for time; $t = t_1$ (cm)
- H_2 is the Piezometric Head for time; $t = t_2$ (cm)
- D is the Diameter of the Standpipe (cm)
- d is the diameter of the Open Length (cm),
- m is the Transformation Ratio, Where $m = \sqrt{K_h / K_v}$
  - K_h is the Horizontal Permeability
  - K_v is the Vertical Permeability
- L is the Open Length of Hole (cm)

Spreadsheet assumes 3" ID Pipe; NQ Hole, OD = 3"

MEAN PERMEABILITY (cm/sec)

4.44E-05

Graph of Field Data

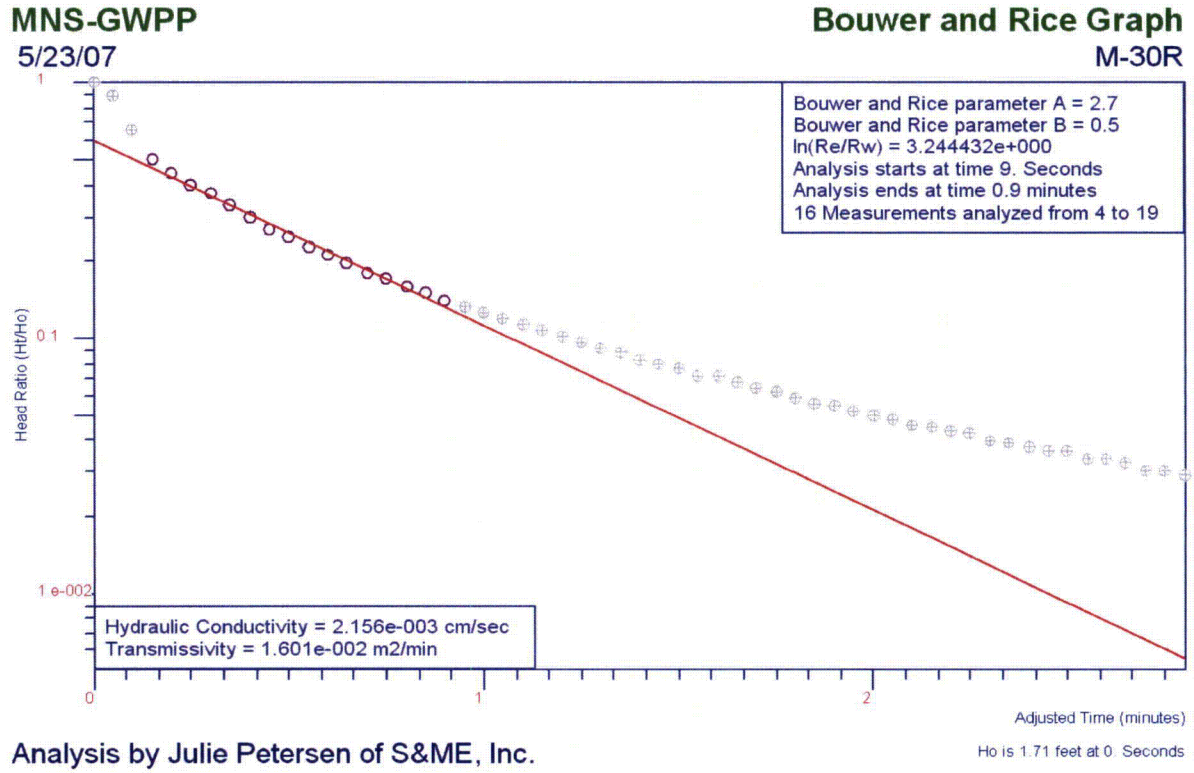


Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	5/23/2007
Well Label:	M-30R
Aquifer Thickness:	40.62 feet
Screen Length:	5. feet
Casing Radius:	1. Inches
Effective Radius:	1.5 Inches
Static Water Level:	42.88 feet
Water Table to Screen Bottom:	35.62 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 57 time and drawdown measurements
Maximum head is 1.71 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



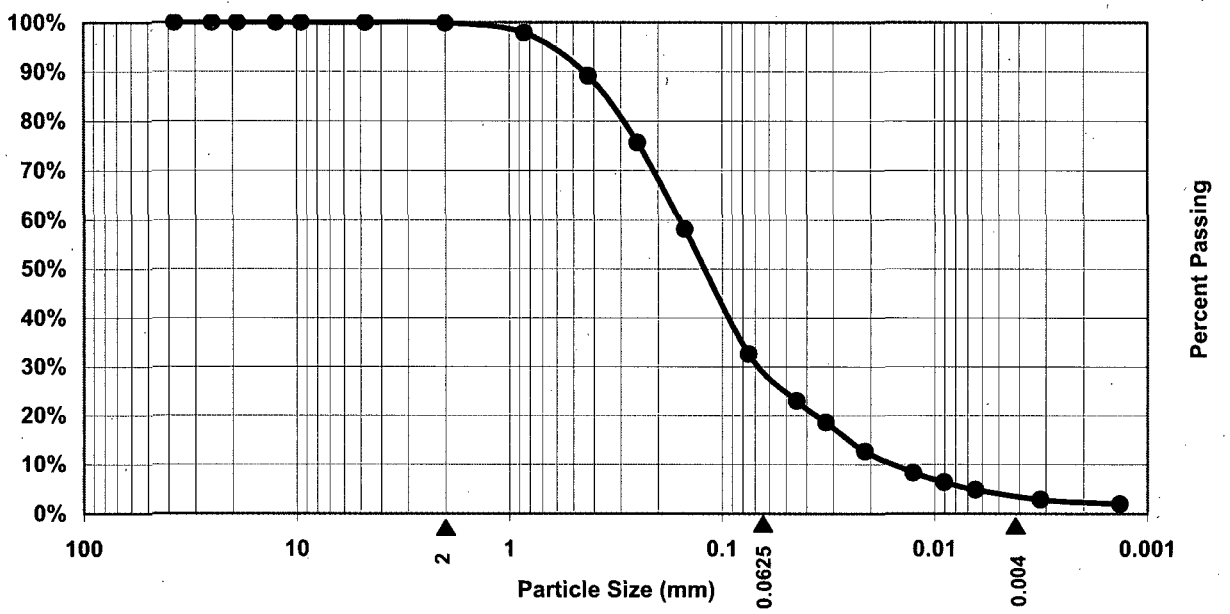
PERMEABILITY

2.16E-03 cm/sec

PARTICLE SIZE ANALYSIS OF SOILS
FOR USE IN FETTER AND BEAR DIAGRAMS

Boring No.:	Sample No.:	Depth:
M-30R	SS-11	52.85 to 54.35 ft bls

Sample Description:
Greenish-Black, and Tan, Silty, Fine to Medium Sand With Mica



	> 2 mm	2 mm - 0.0625 mm	0.0625 mm - 0.004 mm	<0.004 mm
From Graph:	% Gravel 0.1%	% Sand 70.5%	% Silt 26.0%	% Clay 3.4%
Adjusted for Calculations	**0%**	**71%**	**26%**	**3%**

Notes:
Grain size distribution taken from grain size with hydrometer data located in Appendix II.
Gravel, sand, silt and clay sizes based on Wentworth Scale.

S&ME Project:
McGuire Nuclear Station - GWPP

S&ME Project No.:
1264-06-724

S&ME

FETTER AND BEAR DIAGRAMS

S&ME PROJECT: McGuire Nuclear Station - GWPP
S&ME PROJECT NO.: 1264-06-724

Boring No. M-30R

Boring Depth: 52.85 to 54.35 ft bls

% Sand: 71%

% Silt: 26%

% Clay: 3%

Estimated Specific Yield: 27%

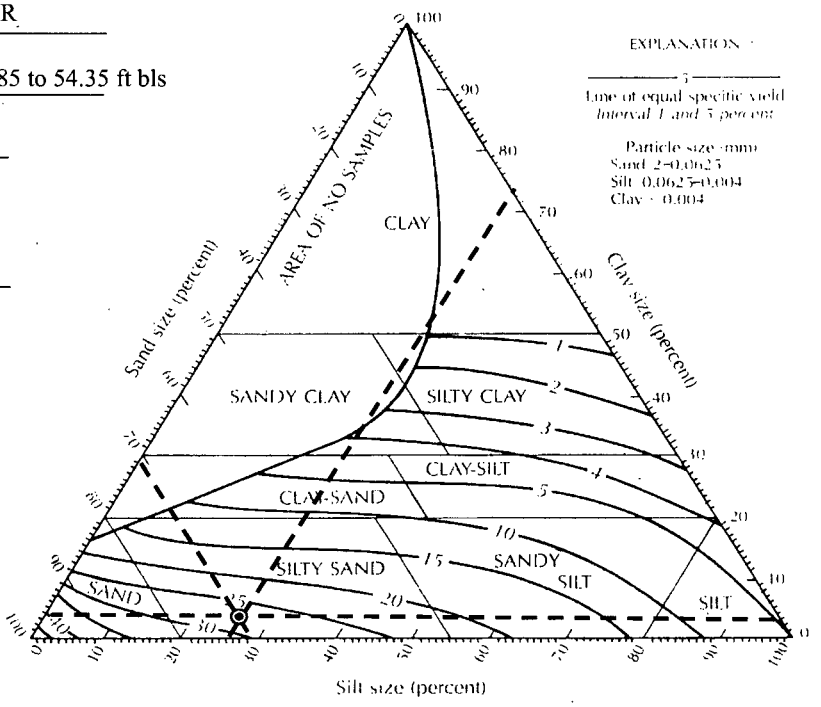
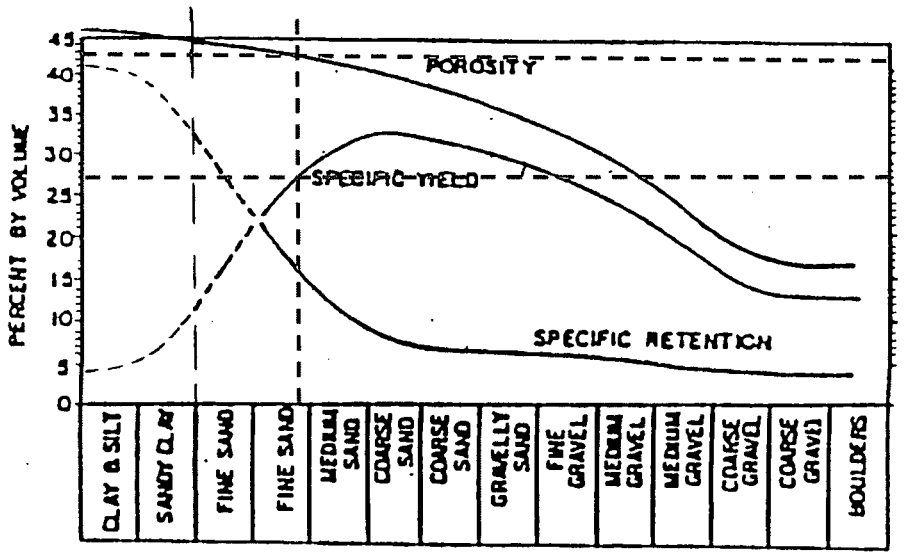


FIGURE 4.11 Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. Source: A. I. Johnson, U.S. Geological Survey Water-Supply Paper 1662-D, 1967.



Estimated Porosity: 42.5%

Variation of Porosity, Specific Yield, and Specific Retention with Grain Size (after Bear, 1972)

S&ME, Inc.
9751 Southern Pine Blvd.
Charlotte, North Carolina
Telephone: 704-523-4726
Fax: 704-525-3953

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**			**Boring No. M-31**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 1 of 2
Boring Depth (ft): **50.8**	Elevation (ft): **771.1**	Driller: **Justin Millwood, NC Cert. No. 3439**	Date Drilled: **11/28/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 31.36 ft bls**		Drilling Method: **4¼" H.S.A.**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
770			SOIL/SAPROLITE (M1): Reddish-Brown, Micaceous, Clayey, **SILT**		
765	5		SOIL/SAPROLITE (M1): Red and Yellow, Very Micaceous, Silty, Fine **SAND**		
760	10				4
755	15		SOIL/SAPROLITE (M1): White, Tan, and Reddish-Orange, Very Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		5
750	20				7
745	25				7
740	30		SOIL/SAPROLITE (M1): Brown and White, Very Micaceous, Coarse to Fine Sandy, **SILT** With Manganese Staining; White Coarse to Fine Sand Lense From 34.75 ft to 34.90 ft bls	▼	5

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**				**Boring No. M-31**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**		Sheet No. 2 of 2
Boring Depth (ft): **50.8**	Elevation (ft): **771.1**	Driller: **Justin Millwood, NC Cert. No. 3439**		Date Drilled: **11/28/07**
Logged By: **Courtney Withers**	Water Level: **Stabilized Water Level at 31.36 ft bls**			Drilling Method: **4¼" H.S.A.**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
735					14
	40				13
730					
	45		SOIL/SAPROLITE (M1): White, Silty, Medium to Fine **SAND**		28
725			SOIL/SAPROLITE (M1): Dark Brown and Light Brown, Very Micaceous, Silty, Fine **SAND** With Manganese Staining		
			SOIL/SAPROLITE (M1): White, Brown, and Orange, Very Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		
	50		SOIL/SAPROLITE (M1): Brown and Orange, Very Micaceous, Silty, Fine **SAND** With Manganese Staining		50
			Boring Terminated at 50.80 ft bls		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

COMPLETION REPORT OF WELL No. M-31

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **4¼" H.S.A.**
DATE DRILLED: **11/28/07**

WATER LEVEL: **Stabilized Water Level at 31.36 ft bls**
LATITUDE: **35 25 49.36**
LONGITUDE: **80 56 27.32**
TOP OF CASING ELEVATION: **773.54**
DATUM: **MSL**
LOGGED BY: **Courtney Withers**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		771.07
SOIL/SAPROLITE (M1): Reddish-Brown, Micaceous, Clayey, **SILT**		0				
SOIL/SAPROLITE (M1): Red and Yellow, Very Micaceous, Silty, Fine **SAND**		5				
		10				
SOIL/SAPROLITE (M1): White, Tan, and Reddish-Orange, Very Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		15				
		20		20.00		751.07
				22.60		748.47
		25				
		30				

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 25 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 20 ft bls**

SEAL
Type: **Bentonite**
Interval: **20 to 22.6 ft bls**

FILTERPACK
Type: **#1 Filter Sand**
Interval: **22.6 to 40 ft bls**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **25 to 40 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **771.1**
LOGGED BY: **Courtney Wither**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
SOIL/SAPROLITE (M1): Brown and White, Very Micaceous, Coarse to Fine Sandy, **SILT** With Manganese Staining; White Coarse to Fine Sand Lense From 34.75 ft to 34.90 ft bls *(continued)*		35		39.50		731.57
		40		40.00		731.07
SOIL/SAPROLITE (M1): White, Silty, Medium to Fine **SAND**		45				
SOIL/SAPROLITE (M1): Dark Brown and Light Brown, Very Micaceous, Silty, Fine **SAND** With Manganese Staining		50		50.80		720.27
SOIL/SAPROLITE (M1): White, Brown, and Orange, Very Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining						
SOIL/SAPROLITE (M1): Brown and Orange, Very Micaceous, Silty, Fine **SAND** With Manganese Staining						

WELL CONSTRUCTION DETAILS

(See Page 1)

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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Charlotte, North Carolina

COMPLETION REPORT OF WELL No. M-31

SPLIT SPOON SAMPLE PICTURES

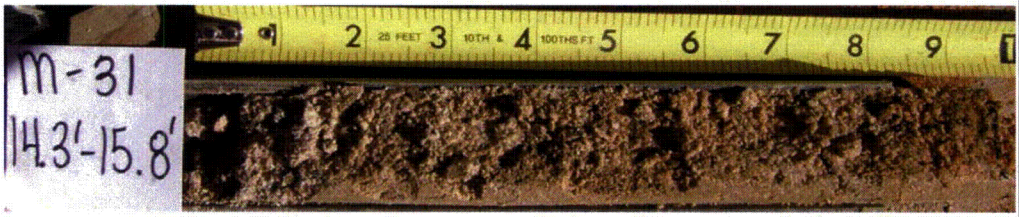
McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

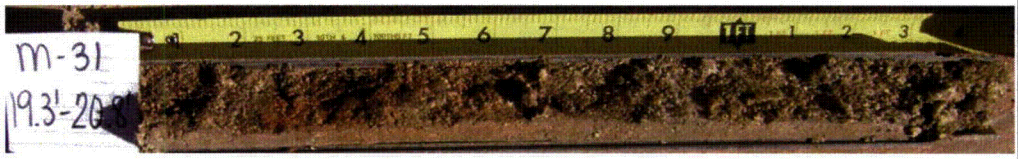
Boring Number: M-31

Sample No:	**1**
Depth (ft-bls):	**9.3 - 10.8**
Blow Count:	**3 * 2 * 2**

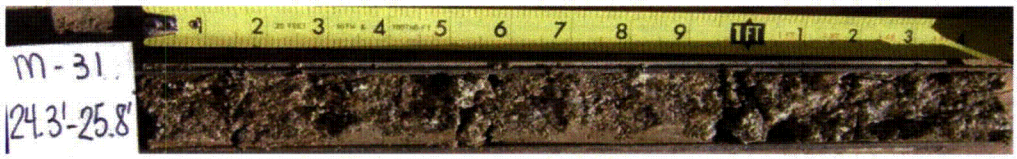
Sample No:	**2**
Depth (ft-bls):	**14.3 - 15.8**
Blow Count:	**4 * 2 * 3**



Sample No:	**3**
Depth (ft-bls):	**19.3 - 20.8**
Blow Count:	**2 * 3 * 4**

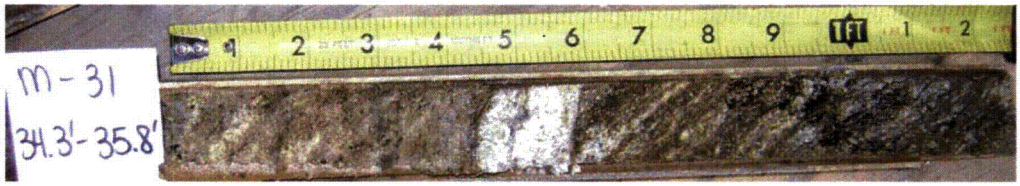


Sample No:	**4**
Depth (ft-bls):	**24.3 - 25.8**
Blow Count:	**2 * 3 * 4**



Sample No:	**5**
Depth (ft-bls):	**29.3 - 30.8**
Blow Count:	**2 * 2 * 3**

Sample No:	**6**
Depth (ft-bls):	**34.3 - 35.8**
Blow Count:	**4 * 6 * 8**



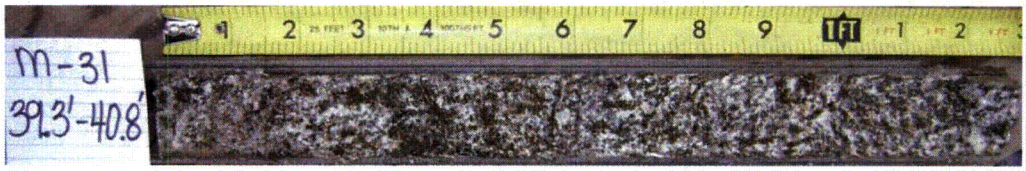
SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

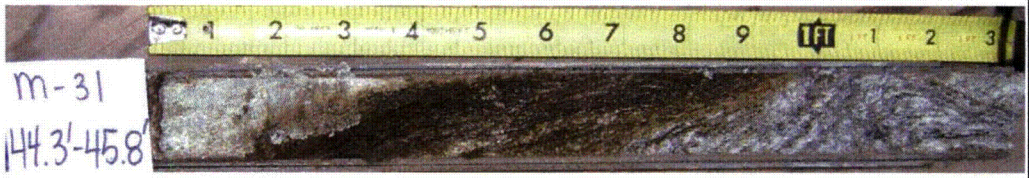
S&ME Project No: 1264-06-724

Boring Number: M-31

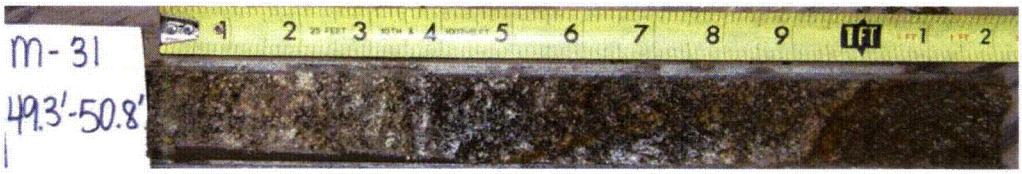
Sample No: 7
Depth (ft-bls): 39.3 - 40.8
Blow Count: 6 * 5 * 8



Sample No: 8
Depth (ft-bls): 44.3 - 45.8
Blow Count: 4 * 9 * 19



Sample No: 9
Depth (ft-bls): 49.3 - 50.8
Blow Count: 16 * 28 * 22



CALCULATION OF PERMEABILITY BY THE FALLING HEAD METHOD (Open Hole in Uniform Material)

S&ME

Site Name:	MNS - GWPP	
Date:	11/28/2007	
Boring I.D.	M-31	
Test Interval:	35' to 38'	(Soil/Saprolite)
Total Depth of Hole:	38 ft bls	1158.54 cm
Length of Open Hole:	3 ft	91.46 cm
Transformation Ratio m=	1	
Performed by:	Courtney Withers	

Time (sec)	Head (cm)	Permeability (cm/sec)
0	1099.33	
60	1097.32	7.70E-06
120	1096.74	2.22E-06
180	1095.09	6.31E-06
240	1093.66	5.50E-06
300	1091.98	6.45E-06
360	1091.16	3.17E-06
420	1089.97	4.58E-06
480	1088.26	6.59E-06
540	1086.07	8.49E-06
600	1084.39	6.50E-06
900	1075.88	6.62E-06
1200	1068.84	5.52E-06
1500	1061.37	5.90E-06
1800	1050.88	8.35E-06

Calculations

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\frac{H_1}{H_2}$$

for $\frac{mL}{D} > 4$

Where:

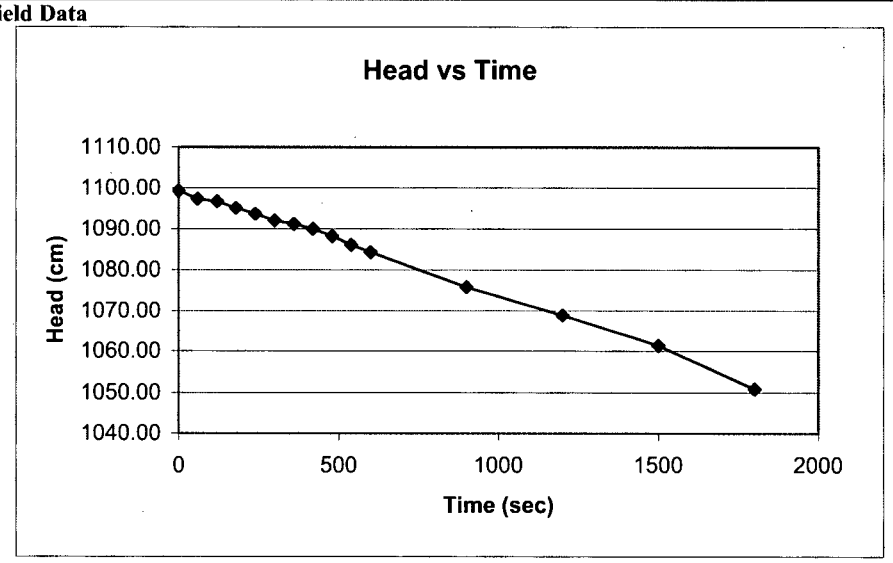
K_h	is the Horizontal Coefficient of Permeability (cm/sec)
H_1	is the Piezometric Head for time; $t = t_1$ (cm)
H_2	is the Piezometric Head for time; $t = t_2$ (cm)
D	is the Diameter of the Standpipe (cm)
d	is the diameter of the Open Length (cm),
m	is the Transformation Ratio, Where
	$m = \sqrt{K_h / K_v}$ K_h is the Horizontal Permeability; K_v is the Vertical Permeability
L	is the Open Length of Hole (cm)

Spreadsheet assumes 3" ID Pipe; NQ Hole, OD = 3"

MEAN PERMEABILITY (cm/sec)

5.99E-06

Graph of Field Data

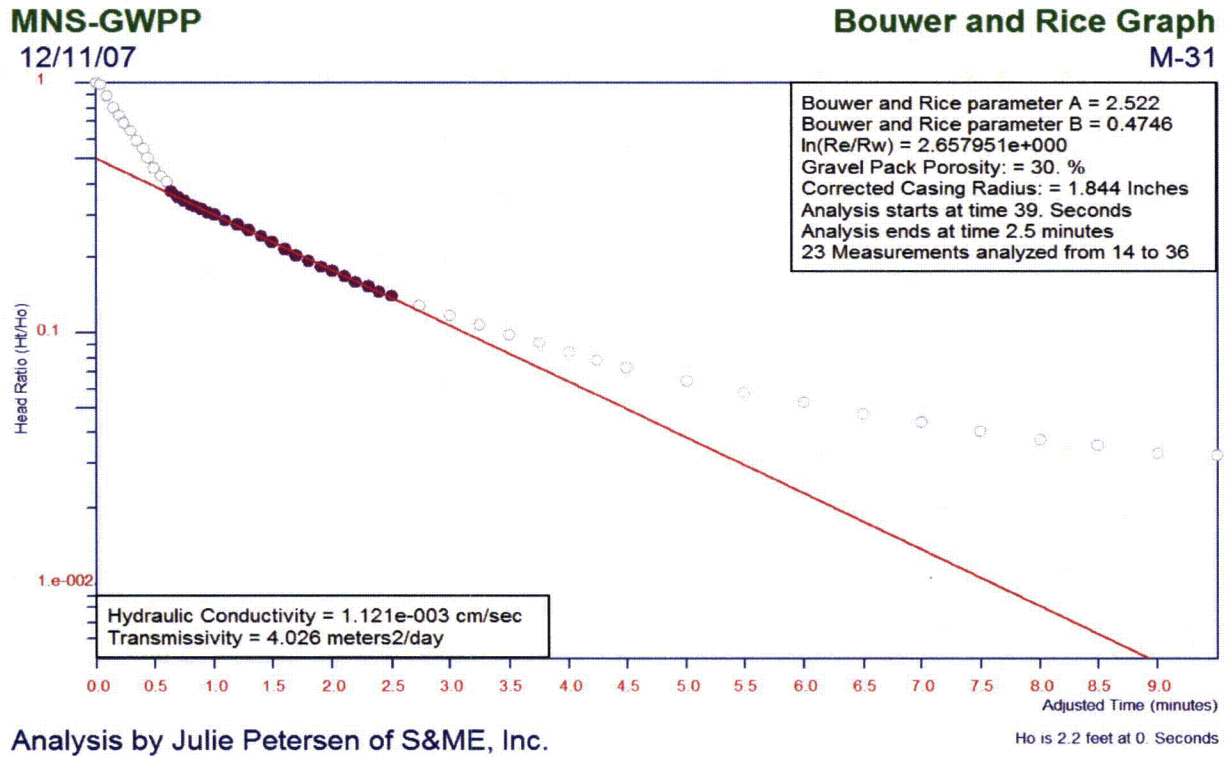


Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	12/11/2007
Well Label:	M-31
Aquifer Thickness:	13.64 feet
Screen Length:	15. feet
Casing Radius:	1. Inches
Effective Radius:	3. Inches
Gravel Pack Porosity:	30.00%
Corrected Casing Radius:	1.844 Inches
Static Water Level:	31.36 feet
Water Table to Screen Bottom:	8.64 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 54 time and drawdown measurements
Maximum head is 2.2 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



PERMEABILITY

1.12×10^{-03} cm/sec

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Fax: 704-525-3953

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**			**Boring No. M-32**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 1 of 2
Boring Depth (ft): **60.4**	Elevation (ft): **790.1**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **5/3/07**
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 51.11 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
785	5		SOIL/SAPROLITE (M1): Red, Slightly Micaceous, Fine Sandy, Clayey, **SILT**		18
780	10		SOIL/SAPROLITE (M1): Tan and Red Mottled, Silty, Fine **SAND** With Manganese Staining		11
775	15		SOIL/SAPROLITE (M1): Reddish-Tan, Clayey, Fine **SAND** With Manganese Staining		10
770	20		SOIL/SAPROLITE (M1): Brown and White, Silty, Medium to Fine **SAND** With Mica and Manganese Staining		9
765	25		SOIL/SAPROLITE (M1): Gray, Silty, Fine **SAND** With Manganese Staining		8
760	30		SOIL/SAPROLITE (M1): Red, Silty, Fine **SAND** With Manganese Staining and Pyrite		10
			SOIL/SAPROLITE (M1): Gray, Silty, Fine **SAND** With Manganese Staining		11

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

S&ME, Inc.
9751 Southern Pine Blvd.
Charlotte, North Carolina
Telephone: 704-523-4726
Fax: 704-525-3953

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**				**Boring No. M-32**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**		Sheet No. 2 of 2
Boring Depth (ft): **60.4**	Elevation (ft): **790.1**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **5/3/07**	
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 51.11 ft bls**		Drilling Method: **Mud Rotary**	

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
			SOIL/SAPROLITE (M1): Grayish-Tan, Silty, Fine SAND		14
750	40		SOIL/SAPROLITE (M1): Gray, Tan, and White, Silty, Medium to Fine **SAND** With Intermittent, Coarse Sand Seams		21
745	45		SOIL/SAPROLITE (M1): Red and Tan, Slightly Clayey, Silty, Fine **SAND** With Manganese Staining		21
740	50		SOIL/SAPROLITE (M1): Brownish-Gray, Slightly Sandy, **SILT** With Manganese Staining		52
735	55		WEATHERED ROCK (M2): When Sampled Becomes Black and White, Silty, Medium to Fine **SAND** With Mica		50/5 >>
730	60		**Roller Cone Refusal at 60.40 ft bls**		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

COMPLETION REPORT OF WELL No. M-32

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **5/3/07**

WATER LEVEL: **Stabilized Water Level at 51.11 ft bls**
LATITUDE: **35 25 39.75**
LONGITUDE: **80 56 36.66**
TOP OF CASING ELEVATION: **793.11**
DATUM: **MSL**
LOGGED BY: **Julie Petersen**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		790.13
SOIL/SAPROLITE (M1): Red, Slightly Micaceous, Fine Sandy, Clayey, **SILT**		0				
		5				
SOIL/SAPROLITE (M1): Tan and Red Mottled, Silty, Fine **SAND** With Manganese Staining		10				
SOIL/SAPROLITE (M1): Reddish-Tan, Clayey, Fine **SAND** With Manganese Staining		15				
SOIL/SAPROLITE (M1): Brown and White, Silty, Medium to Fine **SAND** With Mica and Manganese Staining		20				
SOIL/SAPROLITE (M1): Gray, Silty, Fine **SAND** With Manganese Staining		25				
SOIL/SAPROLITE (M1): Red, Silty, Fine **SAND** With Manganese Staining and Pyrite		30		35.00		755.13

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 40 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 35 ft bls**

SEAL
Type: **Bentonite**
Interval: **35 to 37 ft bls**

FILTERPACK
Type: **#1 Filter Sand**
Interval: **37 to 56 ft bls**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **40 to 55 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-32

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION:
LOGGED BY: **790.1**
CHECKED BY: **Julie Petersen**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
SOIL/SAPROLITE (M1): Gray, Silty, Fine **SAND** With Manganese Staining *(continued)*		35		37.00		753.13
SOIL/SAPROLITE (M1): Grayish-Tan, Silty, Fine **SAND**		40				
SOIL/SAPROLITE (M1): Gray, Tan, and White, Silty, Medium to Fine **SAND** With Intermittent, Coarse Sand Seams		45				
SOIL/SAPROLITE (M1): Red and Tan, Slightly Clayey, Silty, Fine **SAND** With Manganese Staining		50				
SOIL/SAPROLITE (M1): Brownish-Gray, Slightly Sandy, **SILT** With Manganese Staining		55		54.50 55.00 56.00		735.63 735.13 734.13
WEATHERED ROCK (M2): When Sampled Becomes Black and White, Silty, Medium to Fine **SAND** With Mica		60		60.40		729.73

WELL CONSTRUCTION DETAILS

(See Page 1)

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-32

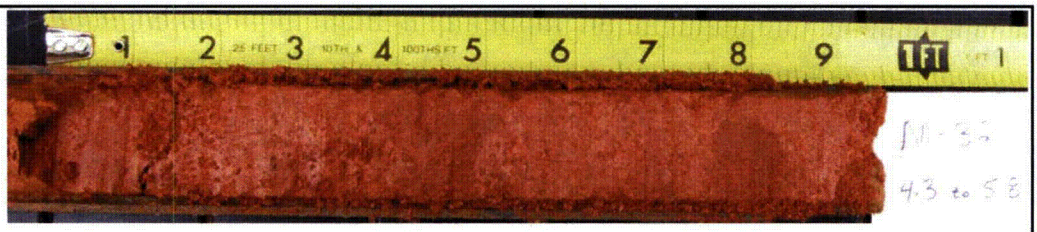
SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

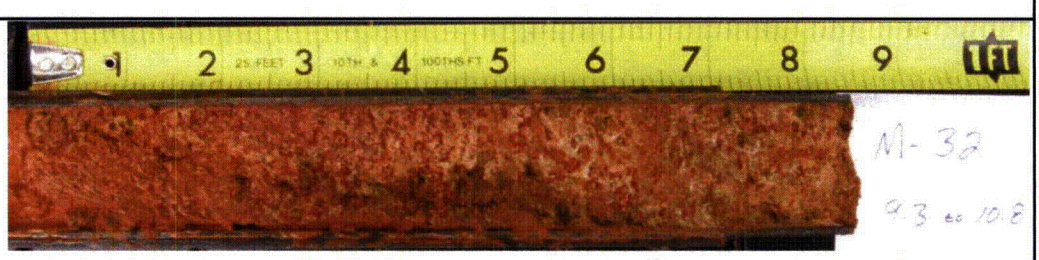
S&ME Project No: 1264-06-724

Boring Number: M-32

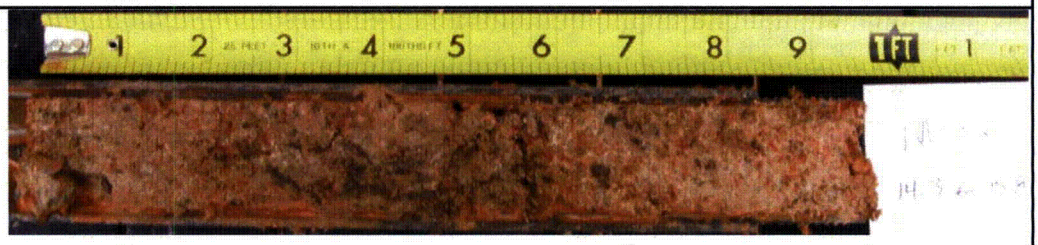
Sample No: 1
Depth (ft-bls): 4.3 - 5.8
Blow Count: 5 * 8 * 10



Sample No: 2
Depth (ft-bls): 9.3 - 10.8
Blow Count: 4 * 5 * 6



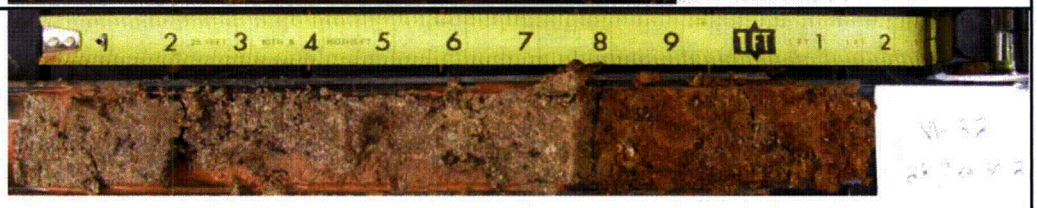
Sample No: 3
Depth (ft-bls): 14.3 - 15.8
Blow Count: 4 * 5 * 5



Sample No: 4
Depth (ft-bls): 19.3 - 20.8
Blow Count: 4 * 4 * 5

Sample No: 5
Depth (ft-bls): 23.7 - 25.2
Blow Count: 3 * 4 * 4

Sample No: 6
Depth (ft-bls): 28.7 - 30.2
Blow Count: 3 * 4 * 6



SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

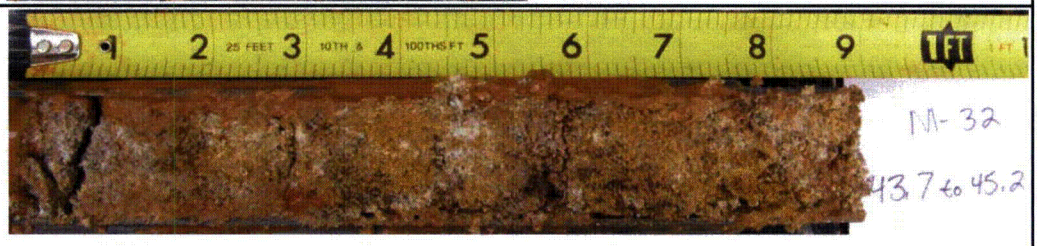
S&ME Project No: 1264-06-724

Boring Number: M-32

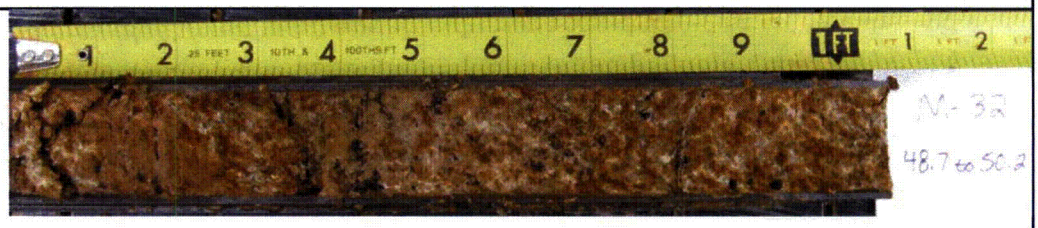
Sample No: 7
Depth (ft-bls): 33.7 - 35.2
Blow Count: 6 * 6 * 5

Sample No: 8
Depth (ft-bls): 38.7 - 40.2
Blow Count: 6 * 6 * 8

Sample No: 9
Depth (ft-bls): 43.7 - 45.2
Blow Count: 11 * 12 * 9



Sample No: 10
Depth (ft-bls): 48.7 - 50.2
Blow Count: 7 * 9 * 12



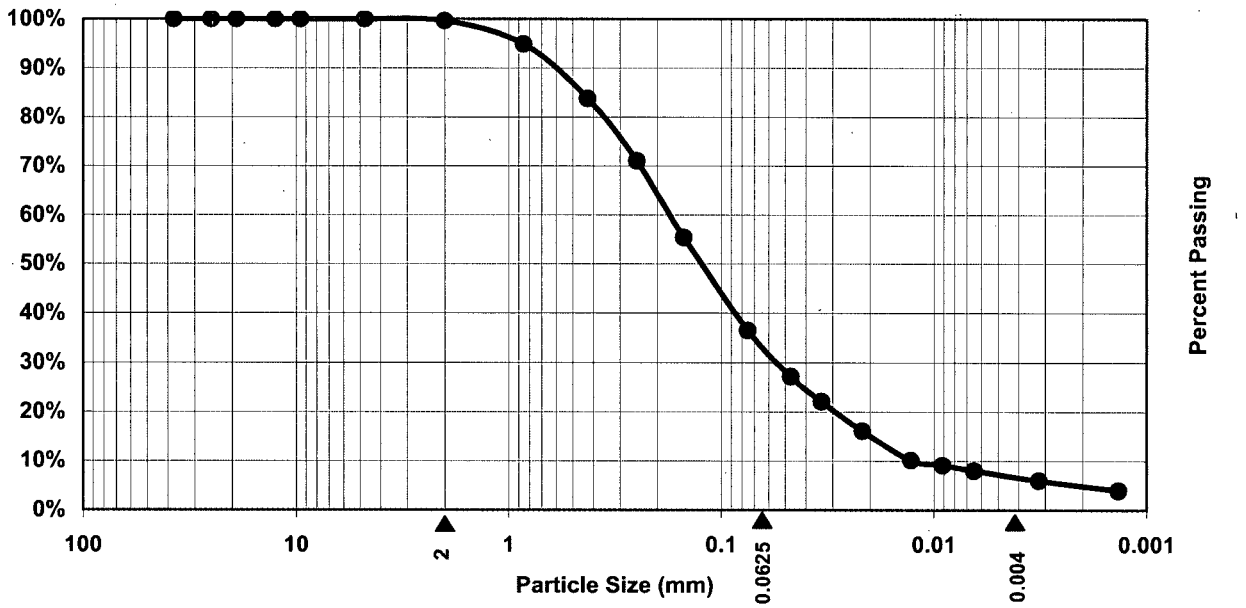
Sample No: 11
Depth (ft-bls): 54.3 - 55.8
Blow Count: 6 * 15 * 37

Sample No: 12
Depth (ft-bls): 58.7 - 60.2
Blow Count: 22 * 16 * 50/5

PARTICLE SIZE ANALYSIS OF SOILS
FOR USE IN FETTER AND BEAR DIAGRAMS

Boring No.:	Sample No.:	Depth:
M-32	SS-12	59.3 to 60.8 ft bls

Sample Description:
Black and White, Silty, Fine to Medium Sand With Mica



	> 2 mm	2 mm - 0.0625 mm	0.0625 mm - 0.004 mm	<0.004 mm
From Graph:	% Gravel 0.4%	% Sand 66.4%	% Silt 26.7%	% Clay 6.5%
Adjusted for Calculations	**0%**	**67%**	**27%**	**7%**

Notes:
Grain size distribution taken from grain size with hydrometer data located in Appendix II.
Gravel, sand, silt and clay sizes based on Wentworth Scale.

S&ME Project:
McGuire Nuclear Station - GWPP

S&ME Project No.:
1264-06-724

S&ME

FETTER AND BEAR DIAGRAMS

S&ME PROJECT: McGuire Nuclear Station - GWPP
S&ME PROJECT NO.: 1264-06-724

Boring No. M-32

Boring Depth: 59.3 to 60.8 ft bls

% Sand: 67%

% Silt: 27%

% Clay: 7%

Estimated Specific Yield: 24%

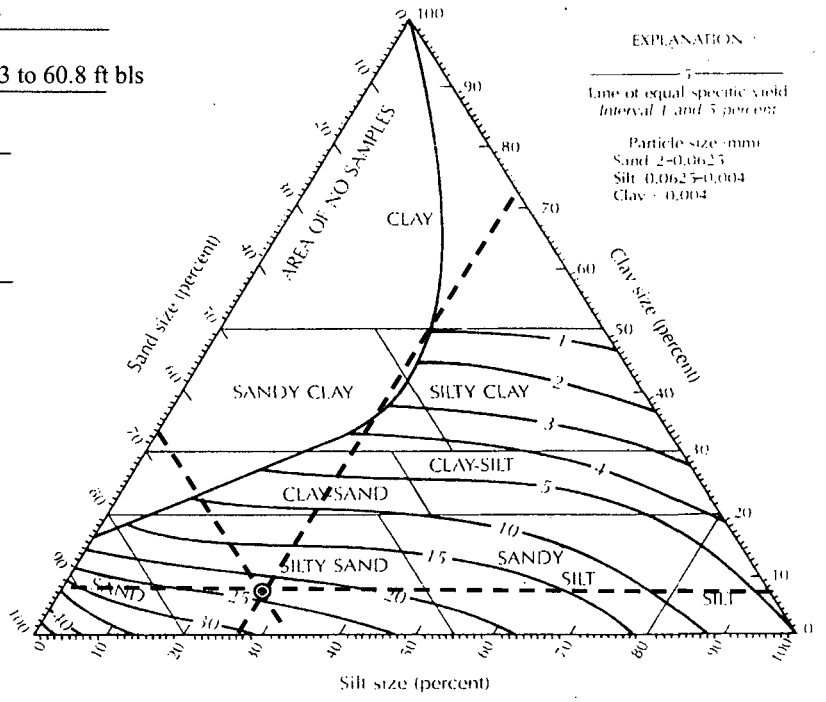
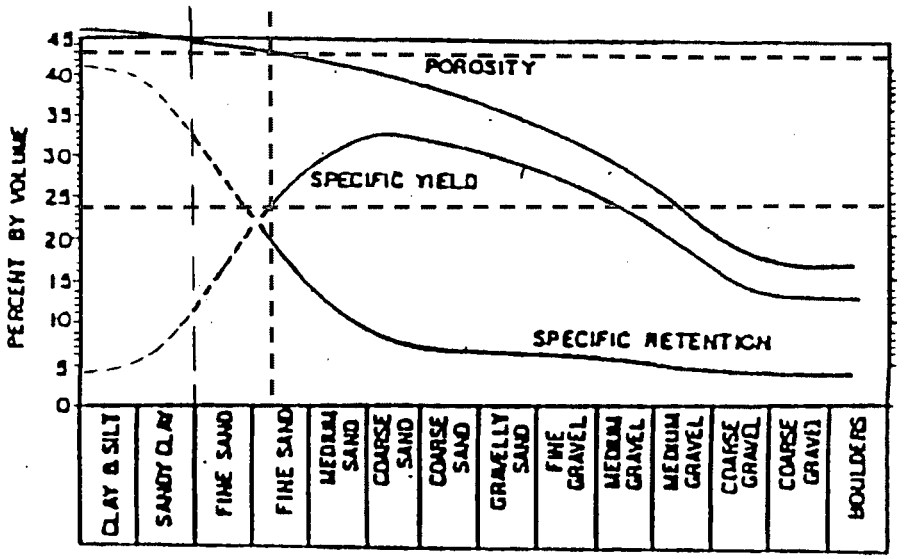


FIGURE 4.11 Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. Source: A. I. Johnson, U.S. Geological Survey Water-Supply Paper 1662-D, 1967.



Estimated Porosity: 43%

Variation of Porosity, Specific Yield, and Specific Retention with Grain Size (after Bear, 1972)

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1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**			**Boring No. M-33**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 1 of 2
Boring Depth (ft): **49.8**	Elevation (ft): **771.8**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **5/11/07**
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 27.52 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
770	0		SOIL/SAPROLITE (M1): Red, Silty, **CLAY**		
	5				17
765			SOIL/SAPROLITE (M1): Reddish-Tan, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining		
			SOIL/SAPROLITE (M1): Red, Silty, **CLAY**		13
	10		SOIL/SAPROLITE (M1): Reddish-Tan, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining		
760			SOIL/SAPROLITE (M1): Reddish-Tan to Yellowish-Tan, Slightly Micaceous, Fine Sandy, **SILT** With Manganese Staining		8
	15				
755			SOIL/SAPROLITE (M1): Tan, Micaceous, Fine Sandy, **SILT** With Iron and Manganese Banding		7
	20				
750			SOIL/SAPROLITE (M1): Reddish-Tan, Clayey, Fine Sandy, **SILT** With Manganese Staining		7
	25				
745			SOIL/SAPROLITE (M1): Gray, Micaceous, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining	▼	4
	30				
740			SOIL/SAPROLITE (M1): Reddish-Tan, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining		11

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**			**Boring No. M-33**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 2 of 2
Boring Depth (ft): **49.8**	Elevation (ft): **771.8**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **5/11/07**
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 27.52 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
	35		SOIL/SAPROLITE (M1): Gray and White, Fine Sandy, **SILT** With Manganese Staining		
735			SOIL/SAPROLITE (M1): Gray, Brown, and White, Silty, Medium to Fine **SAND** With Iron and Manganese Staining (Granitic)		15
	40				
730					41
	45				
725			WEATHERED ROCK (M2): When Sampled Becomes Gray, Brown, and White, Silty, Medium to Fine **SAND** With Iron and Manganese Staining (Granitic)		50/4 >>
			Boring Terminated at 49.80 ft bls		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

COMPLETION REPORT OF WELL No. M-33

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **5/11/07**

WATER LEVEL: **Stabilized Water Level at 27.52 ft bls**
LATITUDE: **35 25 42.39**
LONGITUDE: **80 56 23.61**
TOP OF CASING ELEVATION: **774.83**
DATUM: **MSL**
LOGGED BY: **Julie Petersen**

STRATA DESCRIPTION	DEPTH (ft.)	ELEVATION (ft.)
	0.00	771.78
SOIL/SAPROLITE (M1): Red, Silty, **CLAY**	0	
	5	
SOIL/SAPROLITE (M1): Reddish-Tan, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining	10	
SOIL/SAPROLITE (M1): Red, Silty, **CLAY**		
SOIL/SAPROLITE (M1): Reddish-Tan, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining	15	
SOIL/SAPROLITE (M1): Reddish-Tan to Yellowish-Tan, Slightly Micaceous, Fine Sandy, **SILT** With Manganese Staining	19.00	752.78
	20	
	21.00	750.78
SOIL/SAPROLITE (M1): Tan, Micaceous, Fine Sandy, **SILT** With Iron and Manganese Banding	25	
SOIL/SAPROLITE (M1): Reddish-Tan, Clayey, Fine Sandy, **SILT** With Manganese Staining		
SOIL/SAPROLITE (M1): Gray, Micaceous, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining	30	

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 23 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 19 ft bls**

SEAL
Type: **Bentonite**
Interval: **19 to 21 ft bls**

FILTERPACK
Type: **#1 Filter Sand**
Interval: **21 to 38 ft bls**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **23 to 38 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **771.8**
LOGGED BY: **Julie Petersen**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
							(See Page 1)
SOIL/SAPROLITE (M1): Reddish-Tan, Slightly Clayey, Fine Sandy, **SILT** With Manganese Staining		35		37.50		734.28	
SOIL/SAPROLITE (M1): Gray and White, Fine Sandy, **SILT** With Manganese Staining		40		38.00		733.78	
SOIL/SAPROLITE (M1): Gray, Brown, and White, Silty, Medium to Fine **SAND** With Iron and Manganese Staining (Granitic)		45					
WEATHERED ROCK (M2): When Sampled Becomes Gray, Brown, and White, Silty, Medium to Fine **SAND** With Iron and Manganese Staining (Granitic)				49.80		721.98	

LEGEND

FILTER PACK	TOC	TOP OF CASING
BENTONITE	GS	GROUND SURFACE
CEMENT GROUT	BS	BENTONITE SEAL
CUTTINGS / BACKFILL	FP	FILTER PACK
STATIC WATER LEVEL	TSC	TOP OF SCREEN
	BSC	BOTTOM OF SCREEN
	TD	TOTAL DEPTH
	CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-33

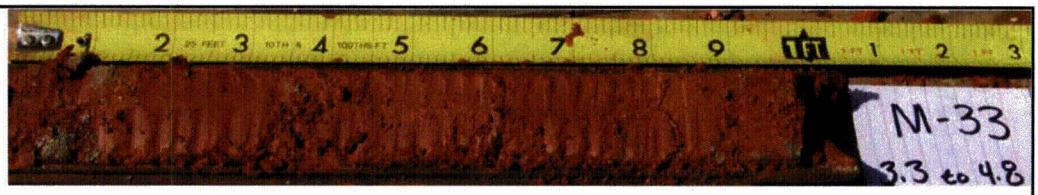
SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

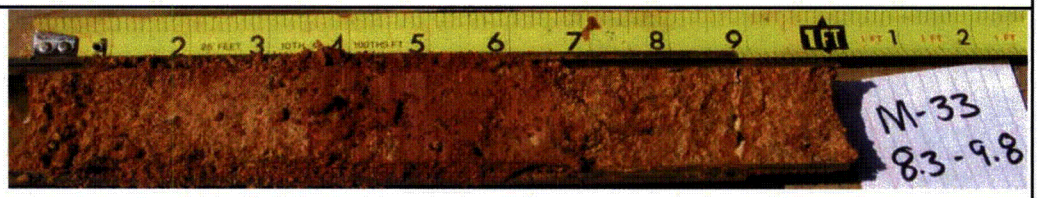
S&ME Project No: 1264-06-724

Boring Number: M-33

Sample No: 1
Depth (ft-bls): 3.3 - 4.8
Blow Count: 5 * 7 * 10

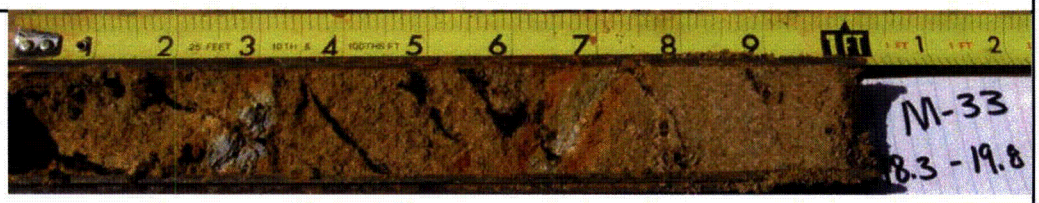


Sample No: 2
Depth (ft-bls): 8.3 - 9.8
Blow Count: 5 * 6 * 7

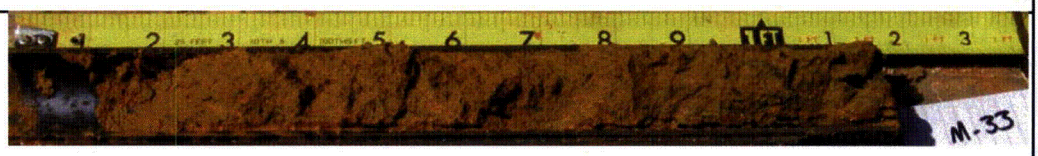


Sample No: 3
Depth (ft-bls): 13.3 - 14.8
Blow Count: 3 * 3 * 5

Sample No: 4
Depth (ft-bls): 18.3 - 19.8
Blow Count: 2 * 3 * 4



Sample No: 5
Depth (ft-bls): 23.3 - 24.8
Blow Count: 3 * 3 * 4



Sample No: 6
Depth (ft-bls): 28.3 - 29.8
Blow Count: 1 * 2 * 2

SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

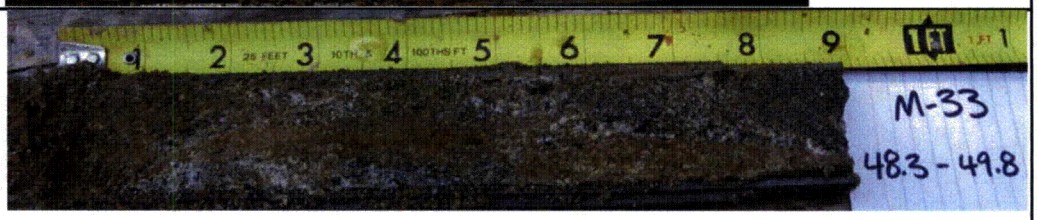
Boring Number: M-33

Sample No: 7
Depth (ft-bls): 33.3 - 34.8
Blow Count: 3 * 4 * 7

Sample No: 8
Depth (ft-bls): 38.3 - 39.8
Blow Count: 4 * 6 * 9

Sample No: 9
Depth (ft-bls): 43.3 - 44.8
Blow Count: 13 * 18 * 23

Sample No: 10
Depth (ft-bls): 48.3 - 49.8
Blow Count: 33 * 45 * 50/4

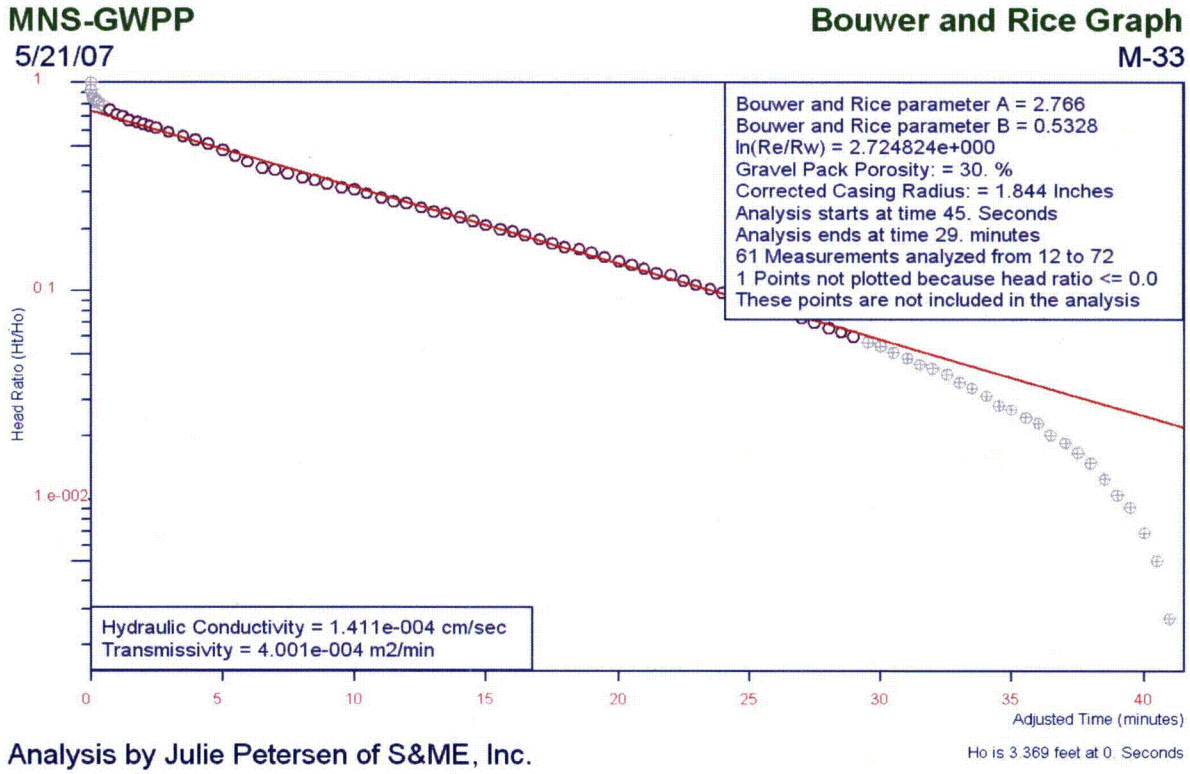


Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	5/21/2007
Well Label:	M-33
Aquifer Thickness:	15.5 feet
Screen Length:	15. feet
Casing Radius:	1. Inches
Effective Radius:	3. Inches
Gravel Pack Porosity:	30.00%
Corrected Casing Radius:	1.844 Inches
Static Water Level:	27.5 feet
Water Table to Screen Bottom:	10.5 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 97 time and drawdown measurements
Maximum head is 3.369 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



PERMEABILITY

1.41E-04 cm/sec

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Charlotte, North Carolina
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Fax: 704-525-3953

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**			**Boring No. M-34R**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 1 of 2
Boring Depth (ft): **65.0**	Elevation (ft): **800.7**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **5/14/07**
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 42.40 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
800			SOIL/SAPROLITE (M1): Reddish-Purple, Micaceous, Silty, Medium to Fine **SAND** With Manganese Banding		
795	5				12
790	10		SOIL/SAPROLITE (M1): White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Banding		15
785	15		SOIL/SAPROLITE (M1): Orange, Fine Sandy, **SILT** With Manganese Banding and Intermittent, Red and White, Coarse Sand Seams		13
780	20				13
775	25				14
770	30		SOIL/SAPROLITE (M1): Gray and White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		14

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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Project: **MNS - Groundwater Protection Project**			**Boring No. M-34R**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 2 of 2
Boring Depth (ft): **65.0**	Elevation (ft): **800.7**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **5/14/07**
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 42.40 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
765					19
	40		WEATHERED ROCK (M2): When Sampled Becomes Gray and White, Silty, Coarse to Fine **SAND**		50/4 >>
760			**Roller Cone Refusal at 42.40 ft bls**		
			PARTIALLY WEATHERED/FRACTURED ROCK (WF): Fine-Grained **GRANITE**, Intensely Fractured		
	45		PARTIALLY WEATHERED/FRACTURED ROCK (WF): Fine-Grained **QUARTZ DIORITE**, Intensely Fractured		
755			PARTIALLY WEATHERED/FRACTURED ROCK (WF): Fine-Grained **GRANITE**, Intensely Fractured		
			PARTIALLY WEATHERED/FRACTURED ROCK (WF): Fine-Grained **QUARTZ DIORITE**, Intensely Fractured		
	50				
750					
			SOUND ROCK (D): Fine-Grained **QUARTZ DIORITE**, Moderately to Intensely Fractured		
	55				
745					
			SOUND ROCK (D): Fine-Grained **GRANITE**, Moderately Fractured		
	60				
740					
			SOUND ROCK (D): Fine-Grained **QUARTZ DIORITE**, Moderately Fractured with Ductile Shear Zone from 62.1' to 63.5'		
	65				
			Boring Terminated at 65.00 ft bls		

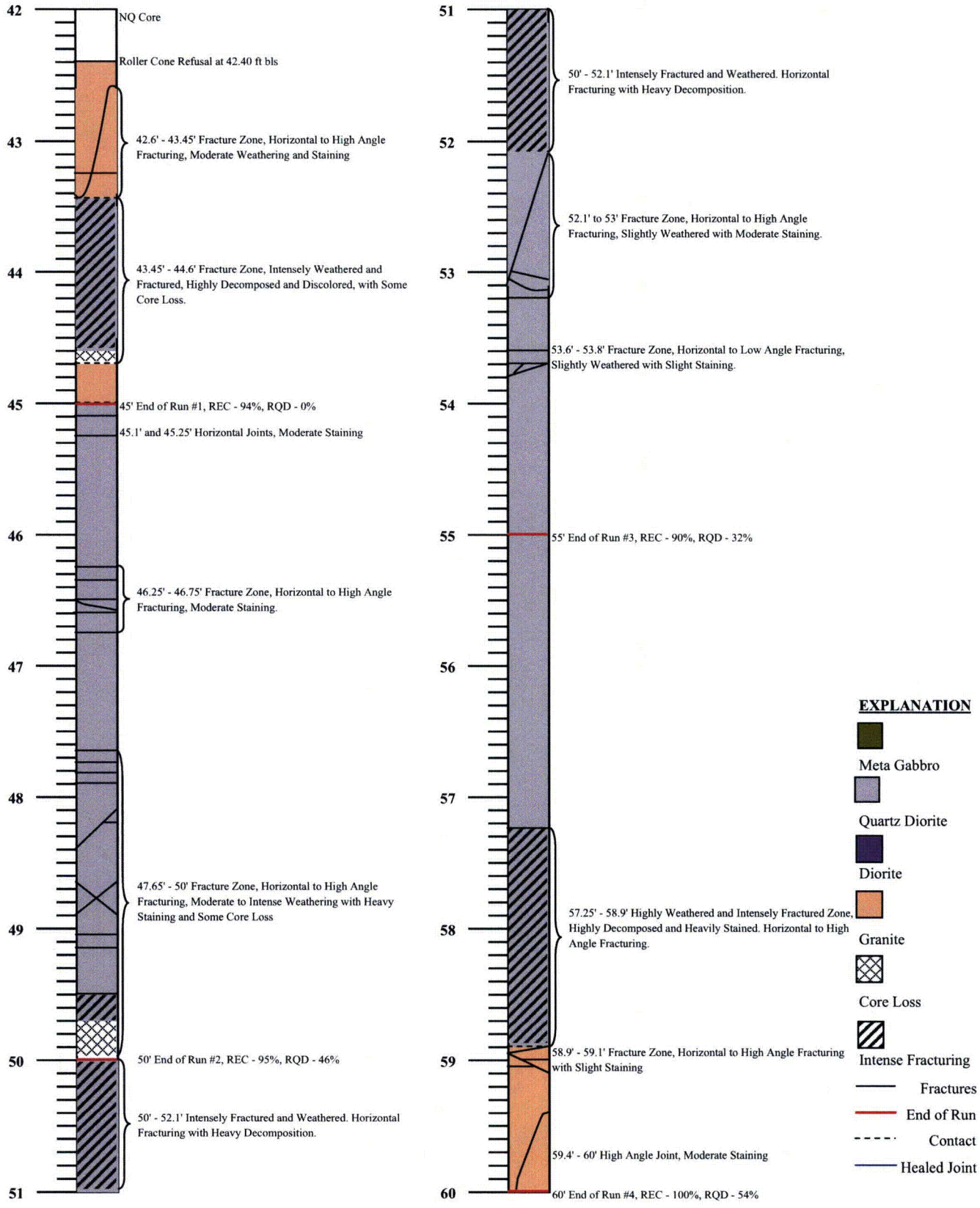
BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-34R

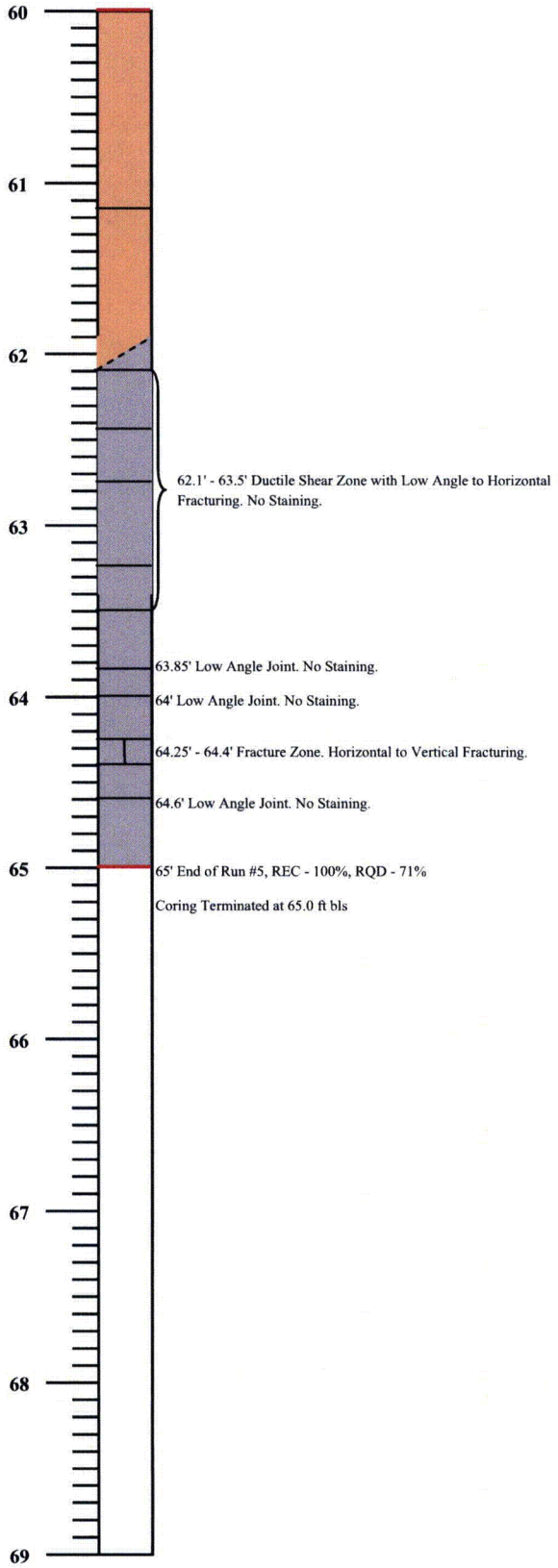


FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-34R



EXPLANATION

- Meta Gabbro
- Quartz Diorite
- Diorite
- Granite
- Core Loss
- Intense Fracturing
- Fractures
- End of Run
- Contact
- Healed Joint

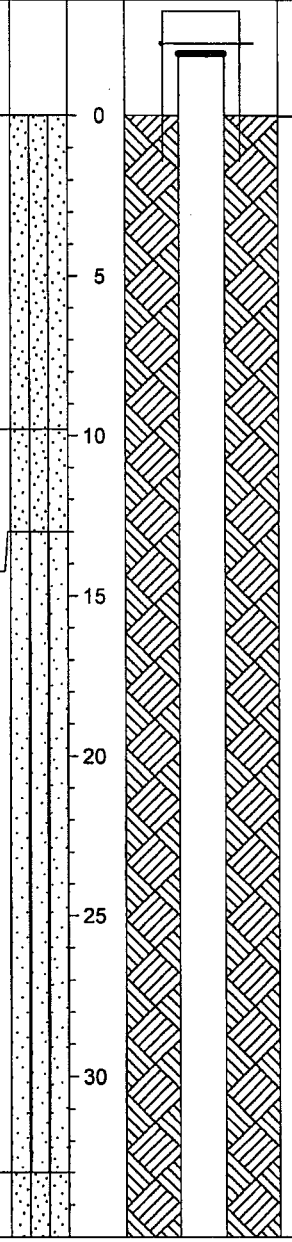
COMPLETION REPORT OF WELL No. M-34R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **5/14/07**

WATER LEVEL: **Stabilized Water Level at 42.40 ft bls**
LATITUDE: **35 25 56.43**
LONGITUDE: **80 56 26.64**
TOP OF CASING ELEVATION: **803.67**
DATUM: **MSL**
LOGGED BY: **Julie Petersen**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		800.74
SOIL/SAPROLITE (M1): Reddish-Purple, Micaceous, Silty, Medium to Fine **SAND** With Manganese Banding		0				
		5				
SOIL/SAPROLITE (M1): White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Banding		10				
SOIL/SAPROLITE (M1): Orange, Fine Sandy, **SILT** With Manganese Banding and Intermittent, Red and White, Coarse Sand Seams		15				
		20				
		25				
		30				



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 56.9 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 40 ft bls**

SEAL
Type: **K-Packer + Bentonite**
Interval: **40 to 56.1 ft bls**

FILTERPACK
Type: **N/A**
Interval: **N/A**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **56.9 to 61.9 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

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COMPLETION REPORT OF WELL No. M-34R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **800.7**
LOGGED BY: **Julie Petersen**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
SOIL/SAPROLITE (M1): Gray and White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining *(continued)*		35				
WEATHERED ROCK (M2): When Sampled Becomes Gray and White, Silty, Coarse to Fine **SAND**		40		40.00		760.74
PARTIALLY WEATHERED/FRACTURED ROCK (WF): Fine-Grained **GRANITE**, Intensely Fractured		45				
PARTIALLY WEATHERED/FRACTURED ROCK (WF): Fine-Grained **QUARTZ DIORITE**, Intensely Fractured		50				
PARTIALLY WEATHERED/FRACTURED ROCK (WF): Fine-Grained **GRANITE**, Intensely Fractured		55		55.90 56.10 56.90		744.84 744.64 743.84
PARTIALLY WEATHERED/FRACTURED ROCK (WF): Fine-Grained **QUARTZ DIORITE**, Intensely Fractured		60		61.40		739.34
SOUND ROCK (D): Fine-Grained **QUARTZ DIORITE**, Moderately to Intensely Fractured		65		61.90 63.00 65.00		738.84 737.74 735.74
SOUND ROCK (D): Fine-Grained **GRANITE**, Moderately Fractured						
SOUND ROCK (D): Fine-Grained **QUARTZ DIORITE**, Moderately Fractured with Ductile Shear Zone from 62.1' to 63.5'						

WELL CONSTRUCTION DETAILS

(See Page 1)

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-34R

SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Boring Number: M-34R

Sample No: 1 **Depth (ft-bls):** 4.3 - 5.8 **Blow Count:** 3 * 5 * 7	
Sample No: 2 **Depth (ft-bls):** 9.3 - 10.8 **Blow Count:** 5 * 7 * 8	
Sample No: 3 **Depth (ft-bls):** 14.3 - 15.8 **Blow Count:** 4 * 5 * 8	
Sample No: 4 **Depth (ft-bls):** 19.3 - 20.8 **Blow Count:** 5 * 6 * 7	
Sample No: 5 **Depth (ft-bls):** 24.3 - 25.8 **Blow Count:** 4 * 5 * 9	
Sample No: 6 **Depth (ft-bls):** 29.3 - 30.8 **Blow Count:** 4 * 6 * 8	

SPLIT SPOON SAMPLE PICTURES

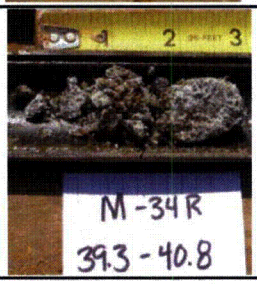
McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Boring Number: M-34R

Sample No: 7
Depth (ft-bls): 34.3 - 35.8
Blow Count: 6 * 8 * 11

Sample No: 8
Depth (ft-bls): 39.3 - 40.8
Blow Count: 50/4

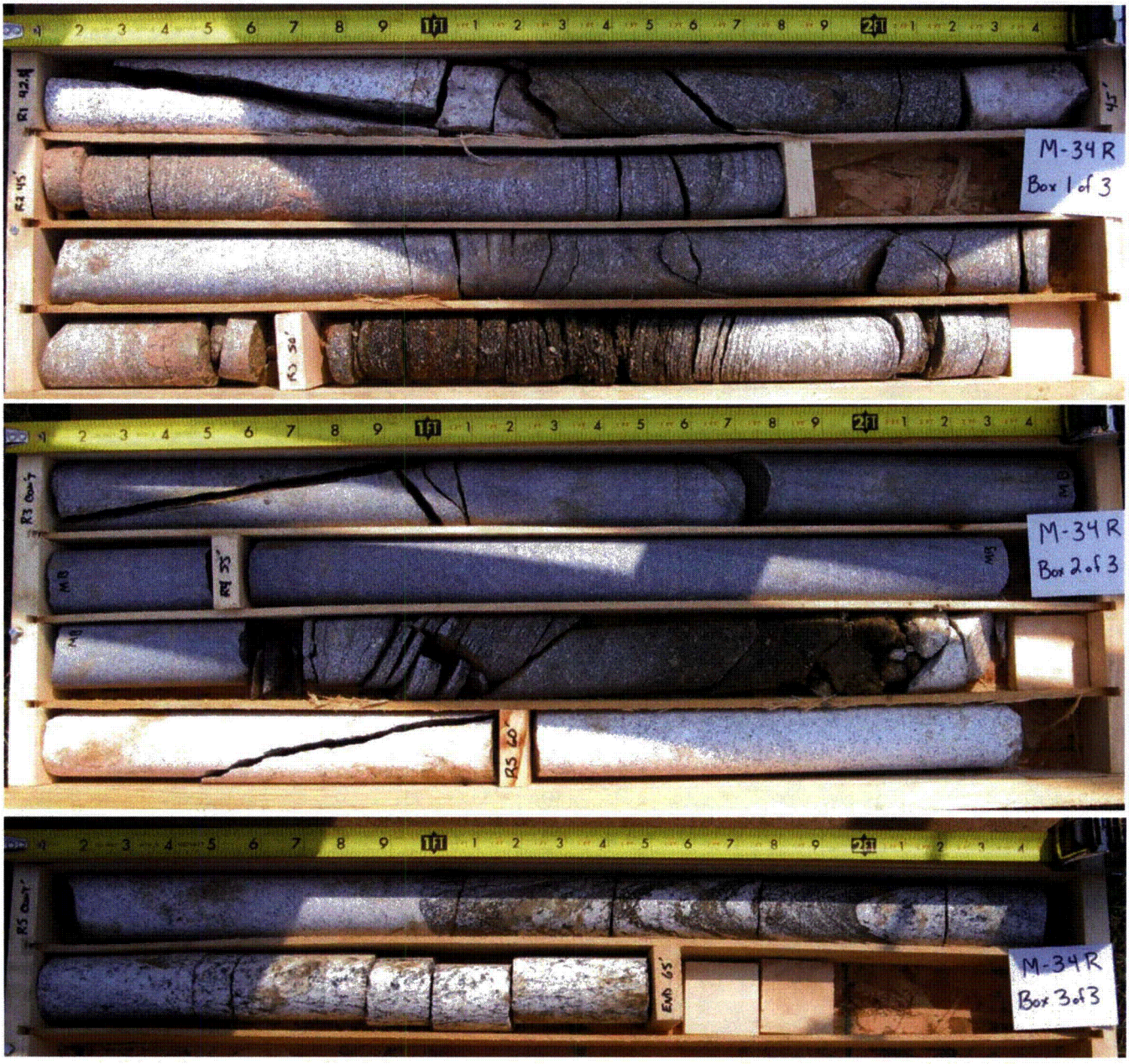


ROCK CORE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-34R



CLASSIFICATION:

42.4' to 43.45' Fine Grained Granite

43.45' to 44.6' Medium Grained Quartz Diorite

44.6' to 45' Fine Grained Granite

45' to 58.9' Medium Grained Quartz Diorite

58.9' to 62' Fine Grained Granite

62' to 65' Medium Granied Quartz Diorite with Ductile Shear Zone from 62.1' to 63.5'

CALCULATION OF PERMEABILITY BY THE FALLING HEAD METHOD (Open Hole in Uniform Material)

S&ME

Site Name:	MNS - GWPP	
Date:	5/15/2007	
Boring I.D.	M-34R	(Weathered/Fractured Rock)
Test Interval:	42.4 to 45	
Total Depth of Hole:	45 ft	1371.95 cm
Length of Open Hole:	2.6 ft	79.27 cm
Transformation Ratio m=	1	
Performed by:	Julie Petersen	

Time (sec)	Head (cm)	Permeability (cm/sec)
0	1329.02	
60	1264.97	2.29E-04
120	1218.32	1.74E-04
180	1176.55	1.62E-04
240	1138.11	1.54E-04
300	1100.18	1.57E-04
360	1064.85	1.51E-04
420	1032.20	1.44E-04
480	1001.13	1.42E-04
540	971.68	1.38E-04
600	944.60	1.31E-04
900	837.35	1.12E-04
1200	750.46	1.01E-04
1500	675.24	9.78E-05
1800	616.16	8.48E-05
2400	527.59	7.19E-05
3000	465.64	5.79E-05
3600	419.21	4.87E-05

Calculations

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\frac{H_1}{H_2}$$

$\frac{mL}{D} > 4$

Where:

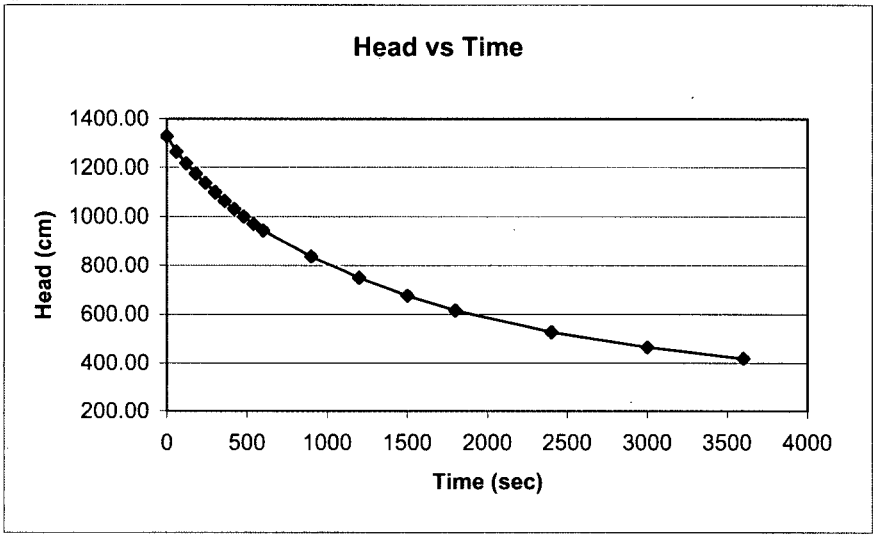
- K_h is the Horizontal Coefficient of Permeability (cm/sec)
- H_1 is the Piezometric Head for time; $t = t_1$ (cm)
- H_2 is the Piezometric Head for time; $t = t_2$ (cm)
- D is the Diameter of the Standpipe (cm)
- d is the diameter of the Open Length (cm),
- m is the Transformation Ratio, Where $m = \sqrt{K_h / K_v}$
  - K_h is the Horizontal Permeability
  - K_v is the Vertical Permeability
- L is the Open Length of Hole (cm)

Spreadsheet assumes 3" ID Pipe; NQ Hole, OD = 3"

MEAN PERMEABILITY (cm/sec)

1.27E-04

Graph of Field Data



CALCULATION OF PERMEABILITY BY THE FALLING HEAD METHOD
(Open Hole in Uniform Material)

S&ME

Site Name:	MNS - GWPP	
Date:	5/15/2007	
Boring I.D.	M-34R	(Weathered/Fractured Rock)
Test Interval:	42.4 to 50	
Total Depth of Hole:	50 ft	1524.39 cm
Length of Open Hole:	7.6 ft	231.71 cm
Transformation Ratio m=	1	
Performed by:	Julie Petersen	

Time (sec)	Head (cm)	Permeability (cm/sec)
0	1417.23	
60	1227.47	3.08E-04
120	1057.13	3.20E-04
180	914.48	3.11E-04
240	791.40	3.10E-04
300	694.54	2.80E-04
360	621.86	2.37E-04
420	565.88	2.02E-04
480	497.80	2.75E-04
540	439.39	2.68E-04
600	397.96	2.12E-04

Calculations

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln\frac{H_1}{H_2}$$

$\frac{mL}{D} > 4$

Where:

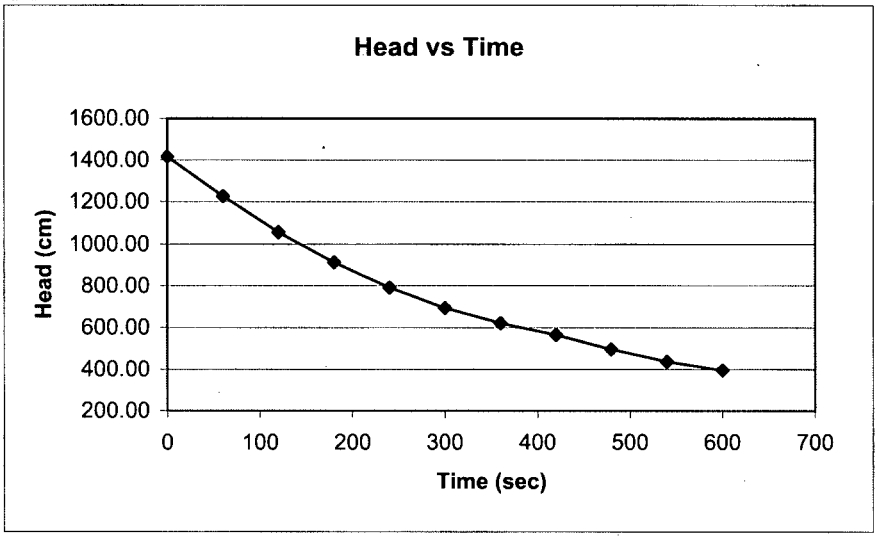
- K_h is the Horizontal Coefficient of Permeability (cm/sec)
- H_1 is the Piezometric Head for time; $t = t_1$ (cm)
- H_2 is the Piezometric Head for time; $t = t_2$ (cm)
- D is the Diameter of the Standpipe (cm)
- d is the diameter of the Open Length (cm),
- m is the Transformation Ratio, Where $m = \sqrt{K_h / K_v}$
  - K_h is the Horizontal Permeability
  - K_v is the Vertical Permeability
- L is the Open Length of Hole (cm)

Spreadsheet assumes 3" ID Pipe; NQ Hole, OD = 3"

MEAN PERMEABILITY (cm/sec)

2.72E-04

Graph of Field Data

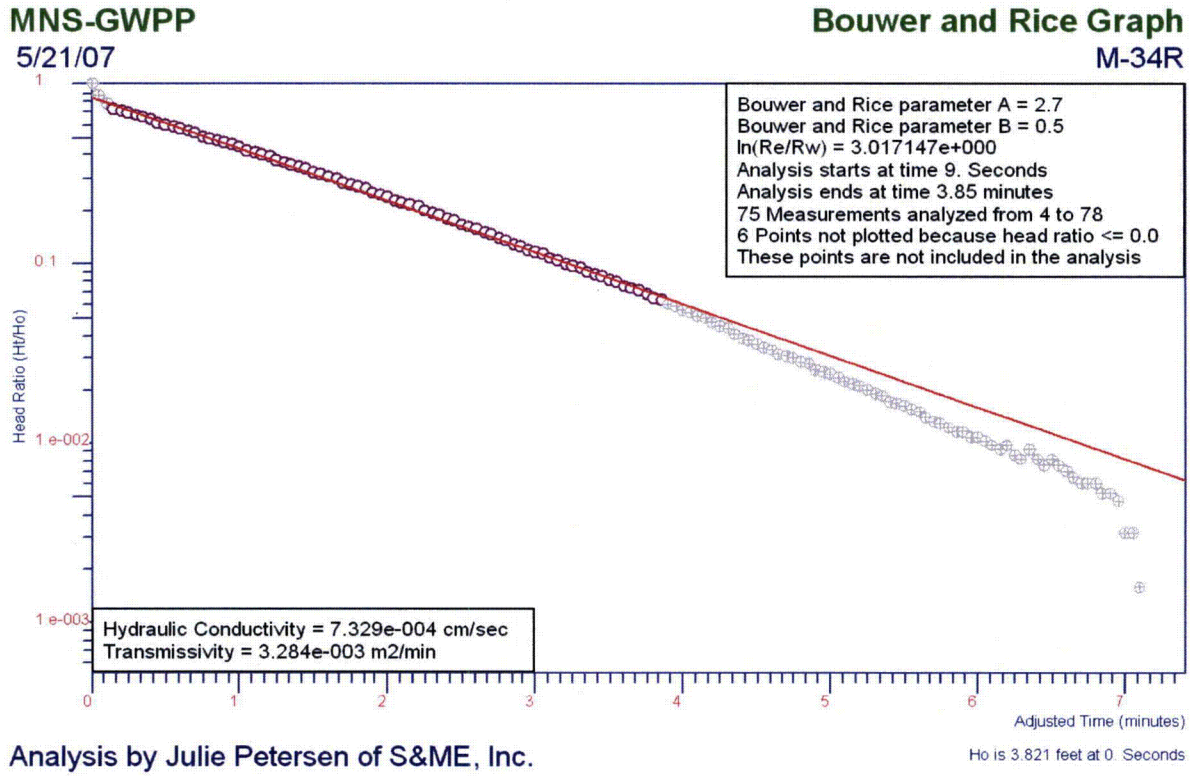


Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	5/21/2007
Well Label:	M-34R
Aquifer Thickness:	24.5 feet
Screen Length:	5. feet
Casing Radius:	1. Inches
Effective Radius:	1.5 Inches
Static Water Level:	42.4 feet
Water Table to Screen Bottom:	19.5 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 149 time and drawdown measurements
Maximum head is 3.821 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



PERMEABILITY

7.33E-04 cm/sec

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Project: **MNS - Groundwater Protection Project**				**Boring No. M-34DR**
Location: ***Huntersville, North Carolina***		Number: **1264-06-724**		Sheet No. 1 of 3
Boring Depth (ft): **90.1**	Elevation (ft): **800.9**	Driller: **Jay Little, NC Cert No. 2717**		Date Drilled: **5/17/07**
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 42.77 ft bls**			Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
800	0		SOIL/SAPROLITE (M1): Reddish-Purple, Micaceous, Silty, Medium to Fine **SAND** With Manganese Banding		
795	5				
790	10		SOIL/SAPROLITE (M1): White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Banding		
785	15		SOIL/SAPROLITE (M1): Orange, Fine Sandy, **SILT** With Manganese Banding and Intermittent, Red and White, Coarse Sand Seams		
780	20				
775	25				
770	30		SOIL/SAPROLITE (M1): Gray and White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**				**Boring No. M-34DR**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**		Sheet No. 2 of 3
Boring Depth (ft): **90.1**	Elevation (ft): **800.9**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **5/17/07**	
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 42.77 ft bls**		Drilling Method: **Mud Rotary**	

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
765					
	40		WEATHERED ROCK (M2): When Sampled Becomes Gray and White, Silty, Coarse to Fine **SAND**		
760			**Roller Cone Refusal at 44.20 ft bls**		
	45		SOUND ROCK (D): Fine-Grained **GRANITE**, Moderately Fractured With Intermittent Zones of Intense Fracturing		
755					
	50				
750					
	55				
745					
	60				
740			SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Intensely Fractured and Sheared		
	65				
735					
			SOUND ROCK (D): Fine-Grained **GRANITE**, Moderately Fractured		
			SOUND ROCK (D): Medium-Grained **QUARTZ**		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

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Project: **MNS - Groundwater Protection Project**			**Boring No. M-34DR**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 3 of 3
Boring Depth (ft): **90.1**	Elevation (ft): **800.9**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **5/17/07**
Logged By: **Julie Petersen**	Water Level: **Stabilized Water Level at 42.77 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
730			**DIORITE**, Intensely Fractured and Sheared		
			SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly to Moderately Fractured and Sheared		
	75				
725					
	80				
720			SOUND ROCK (D): Fine-Grained **GRANITE**, Slightly Fractured		
			PARTIALLY WEATHERED/FRACTURED ROCK (WF): Medium-Grained **QUARTZ DIORITE**, Intensely Fractured		
	85				
715					
			SOUND ROCK (D): Fine-Grained **DIORITE**, Slightly Fractured		
	90				
			Boring Terminated at 90.10 ft bls		
			Lithologic Descriptions Obtained From M-34R		

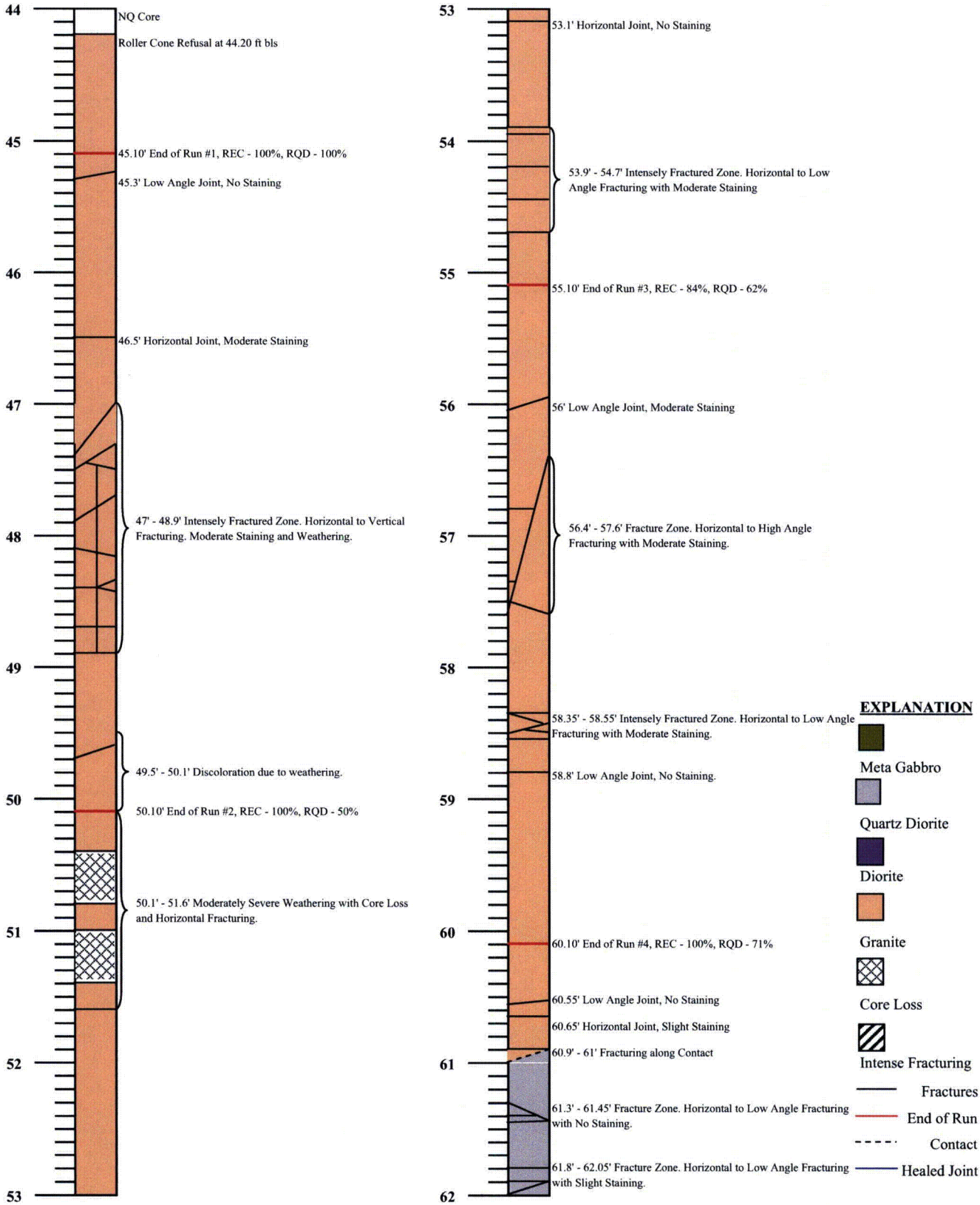
BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-34DR

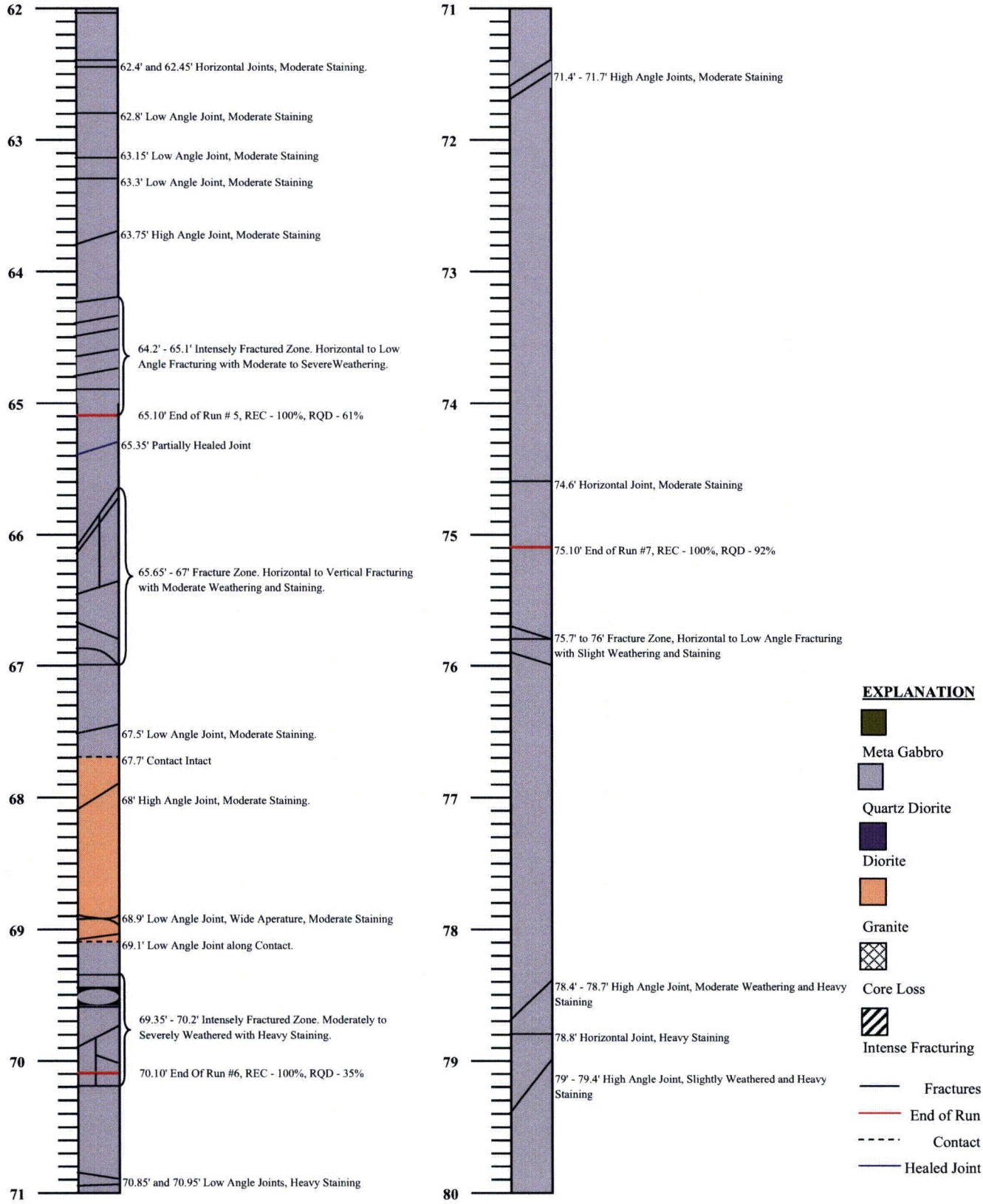


FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-34DR

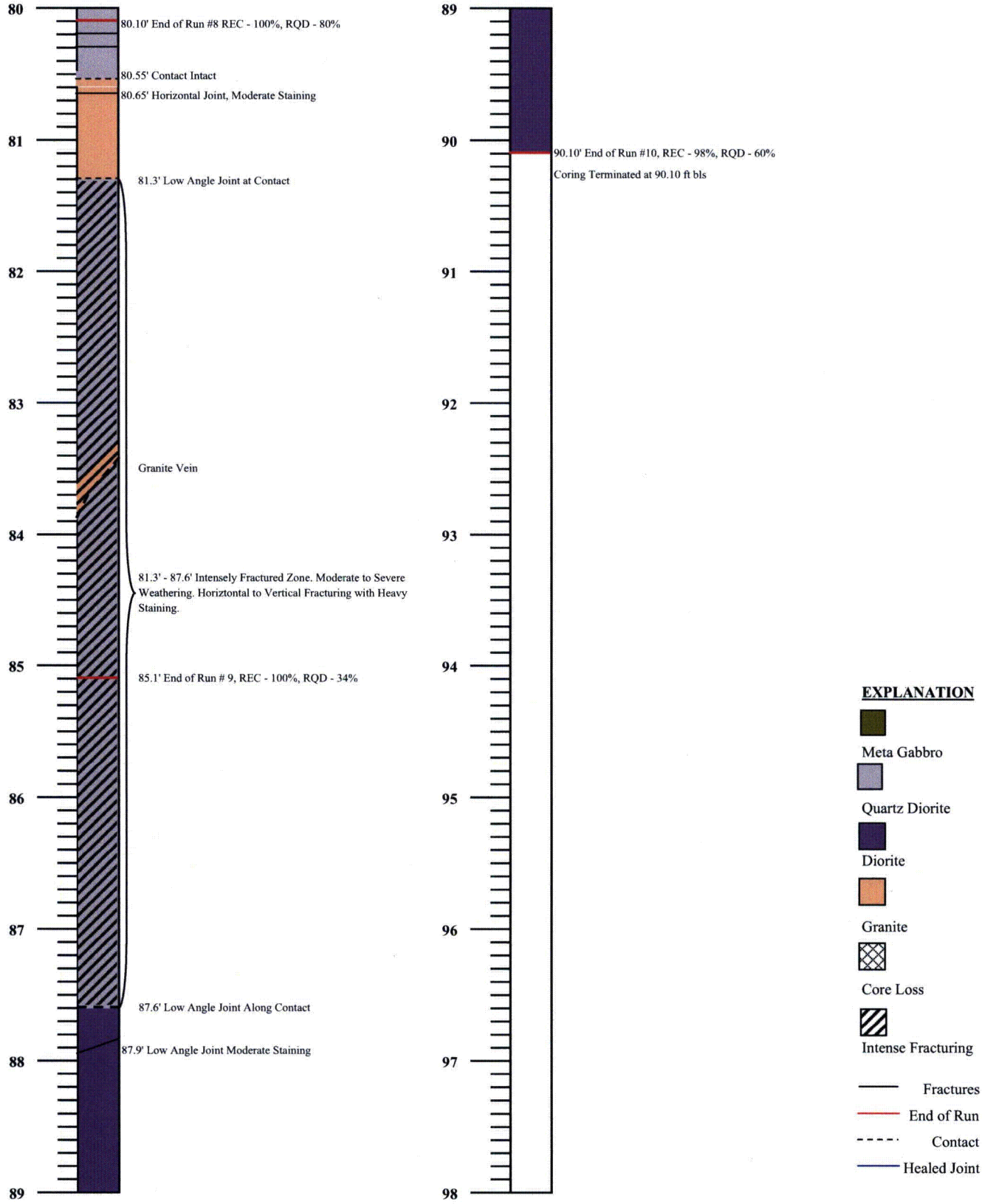


FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-34DR



COMPLETION REPORT OF WELL No. M-34DR

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **5/17/07**

WATER LEVEL: **Stabilized Water Level at 42.77 ft bls**
LATITUDE: **35 25 56.43**
LONGITUDE: **80 56 26.58**
TOP OF CASING ELEVATION: **804.14**
DATUM: **MSL**
LOGGED BY: **Julie Petersen**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		800.94
SOIL/SAPROLITE (M1): Reddish-Purple, Micaceous, Silty, Medium to Fine **SAND** With Manganese Banding		0				
		5				
SOIL/SAPROLITE (M1): White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Banding		10				
SOIL/SAPROLITE (M1): Orange, Fine Sandy, **SILT** With Manganese Banding and Intermittent, Red and White, Coarse Sand Seams		15				
		20				
		25				
		30				

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 79.9 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 38 ft bls**

SEAL
Type: **K-Packer + Bentonite**
Interval: **38 to 79.3 ft bls**

FILTERPACK
Type: **N/A**
Interval: **N/A**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **79.9 to 89.9 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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Charlotte, North Carolina

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **800.9**
LOGGED BY: **Julie Petersen**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
							(See Page 1)
SOIL/SAPROLITE (M1): Gray and White, Micaceous, Silty, Medium to Fine **SAND** With Manganese Staining *(continued)*		35		38.00		762.94	
WEATHERED ROCK (M2): When Sampled Becomes Gray and White, Silty, Coarse to Fine **SAND**		40					
SOUND ROCK (D): Fine-Grained **GRANITE**, Moderately Fractured With Intermittent Zones of Intense Fracturing		45 50 55 60					
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Intensely Fractured and Sheared		65					
SOUND ROCK (D): Fine-Grained **GRANITE**, Moderately Fractured		70					
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Intensely Fractured and Sheared							
SOUND ROCK (D): Medium-Grained **QUARTZ DIORITE**, Slightly to Moderately Fractured and Sheared		75					

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-34DR

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

GROUND SURFACE ELEVATION: **800.9**
LOGGED BY: **Julie Petersen**
CHECKED BY:

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
		80		79.10		721.84
				79.30		721.64
SOUND ROCK (D): Fine-Grained **GRANITE**, Slightly Fractured				79.90		721.04
PARTIALLY WEATHERED/FRACTURED ROCK (WF): Medium-Grained **QUARTZ DIORITE**, Intensely Fractured		85				
SOUND ROCK (D): Fine-Grained **DIORITE**, Slightly Fractured		90		89.40		711.54
				89.90		711.04
				90.10		710.84

WELL CONSTRUCTION DETAILS

(See Page 1)

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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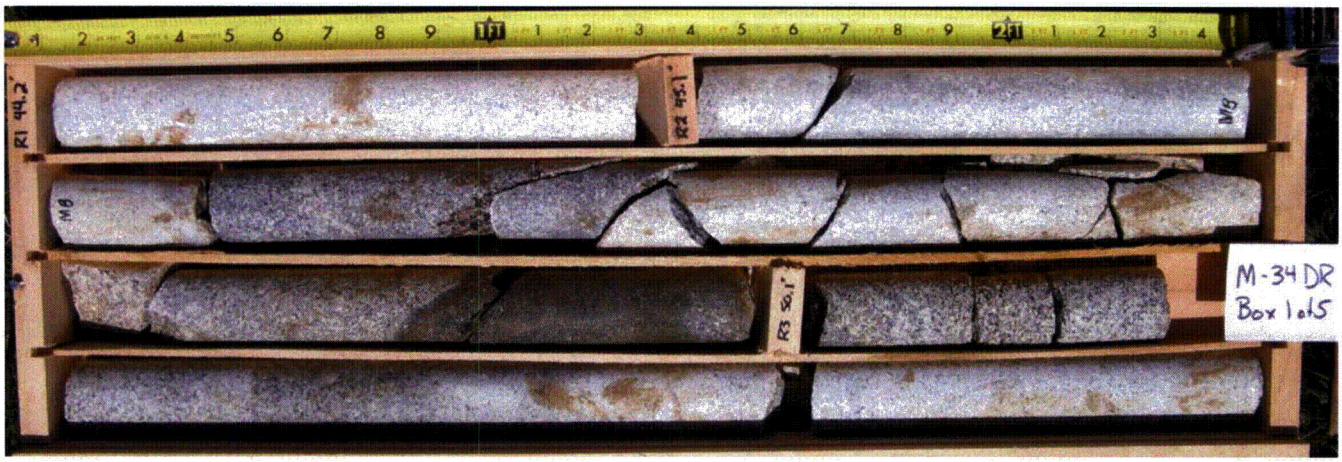
COMPLETION REPORT OF WELL No. M-34DR

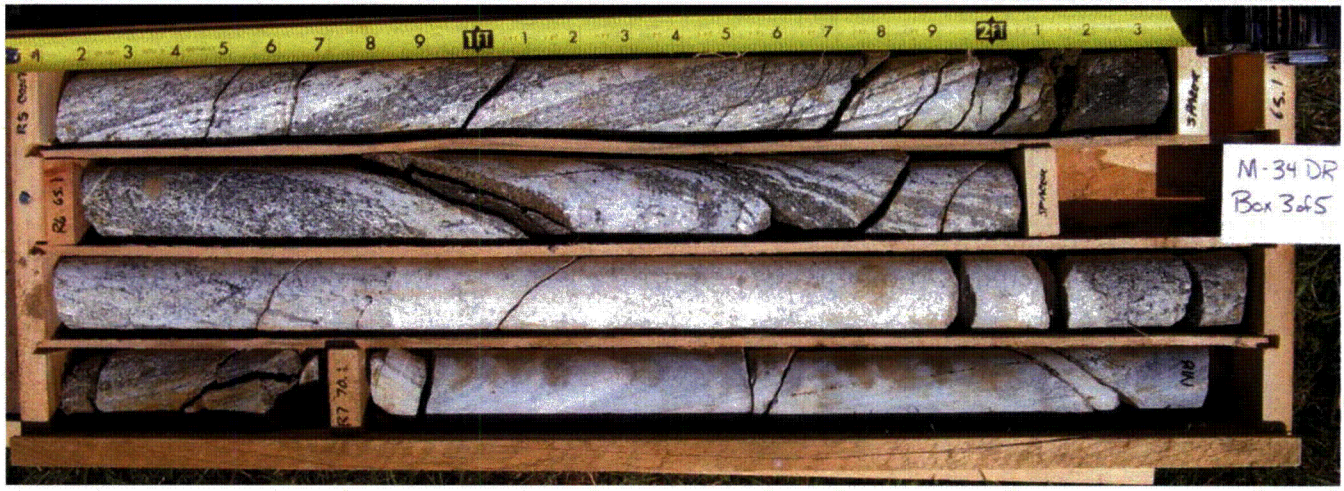
ROCK CORE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-34DR



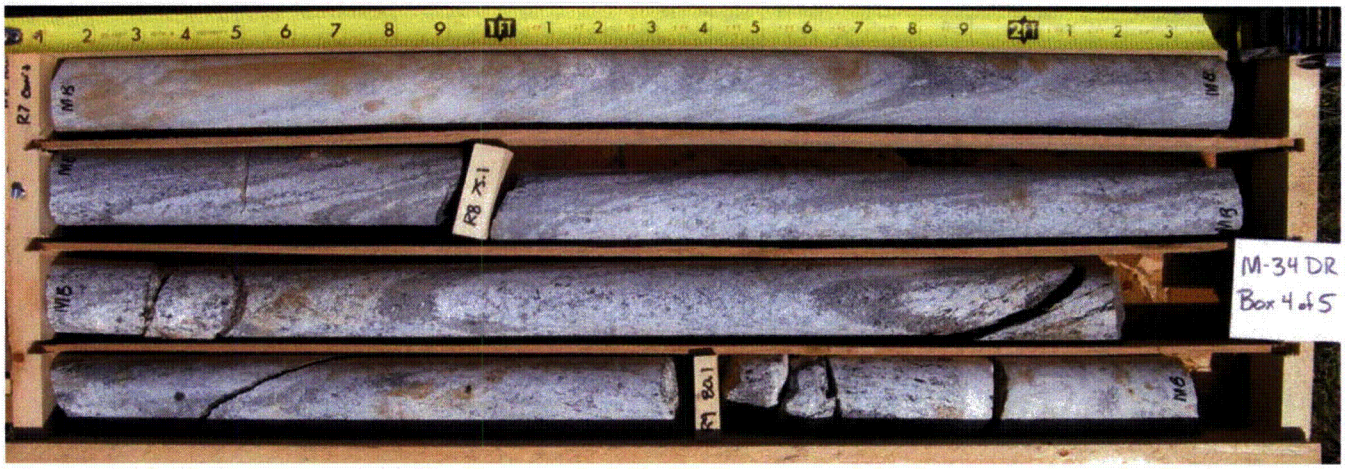


ROCK CORE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-34DR



CLASSIFICATION:

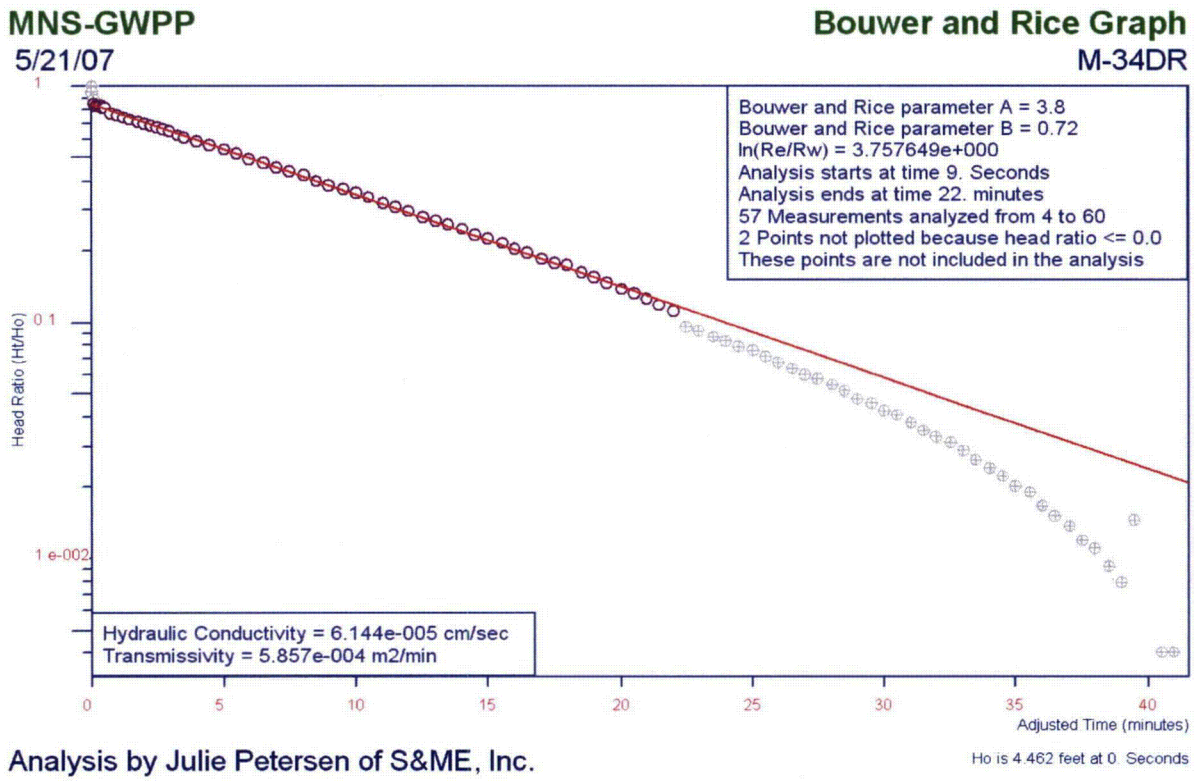
44.2' to 60.9' Fine Grained Granite
60.9' to 67.7' Medium Grained Quartz Diorite (Shear Zone)
67.7' to 69.1' Fine Grained Granite
69.1 to 80.55' Medium Grained Quartz Diorite (Shear Zone)
80.55' 81.3' Fine Grained Granite
81.3' to 87.6' Medium Granied Quartz Diorite
87.6' to 90.1' Fine Grained Diorite

Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	5/21/2007
Well Label:	M-34DR
Aquifer Thickness:	52.13 feet
Screen Length:	10. feet
Casing Radius:	1. Inches
Effective Radius:	1.5 Inches
Static Water Level:	42.77 feet
Water Table to Screen Bottom:	47.13 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 99 time and drawdown measurements
Maximum head is 4.462 feet
Minimum head is -7.e-003 feet

Calculation by Bouwer and Rice Graphical Method



PERMEABILITY

6.14E-05 cm/sec

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Charlotte, North Carolina
Telephone: 704-523-4726
Fax: 704-525-3953

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**				**Boring No. M-35**
Location: **Huntersville, North Carolina**			Number: **1264-06-724**	Sheet No. 1 of 1
Boring Depth (ft): **31.1**	Elevation (ft): **767.3**	Driller: **Justin Millwood, NC Cert. No. 3439**		Date Drilled: **12/11/07**
Logged By: **Scott Dacus**	Water Level: **Stabilized Water Level at 23.74 ft bls**			Drilling Method: **4¼" H.S.A.**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
765	0		**TOPSOIL**		
			SOIL/SAPROLITE (M1): Reddish-Brown, Silty, **CLAY**		15
	5				
760					25
	10				
755					8
	15				
750					4
	20		SOIL/SAPROLITE (M1): Reddish-Brown Mixed With Gray, Fine Sandy, Silty, **CLAY**		
745					4
	25		SOIL/SAPROLITE (M1): Tan and Brown, Clayey, Silty, Coarse to Fine **SAND**		
740					18
	30		SOIL/SAPROLITE (M1): Tan and Brown, Medium to Fine Sandy, **SILT**		
			Auger Refusal at 31.10 ft bls		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

COMPLETION REPORT OF WELL No. M-35

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **4¼" H.S.A.**
DATE DRILLED: **12/11/07**

WATER LEVEL: **Stabilized Water Level at 23.74 ft bls**
LATITUDE: **35 25 44.59**
LONGITUDE: **80 56 21.47**
TOP OF CASING ELEVATION: **769.81**
DATUM: **MSL**
LOGGED BY: **Scott Dacus**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
				0.00		767.34
TOPSOIL		0				
SOIL/SAPROLITE (M1): Reddish-Brown, Silty, **CLAY**		5				
		10		9.00		758.34
				13.00		754.34
		15				
SOIL/SAPROLITE (M1): Reddish-Brown Mixed With Gray, Fine Sandy, Silty, **CLAY**		20				
SOIL/SAPROLITE (M1): Tan and Brown, Clayey, Silty, Coarse to Fine **SAND**		25				
SOIL/SAPROLITE (M1): Tan and Brown, Medium to Fine Sandy, **SILT**		30		30.30 30.80 31.10		737.04 736.54 736.24

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4" X 4"**
Type: **Lockable Steel**
Interval: **Above Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 15.8 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 9 ft bls**

SEAL
Type: **Bentonite**
Interval: **9 to 13 ft bls**

FILTERPACK
Type: **#1 Filter Sand**
Interval: **13 to 30.8 ft bls**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **15.8 to 30.8 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-35

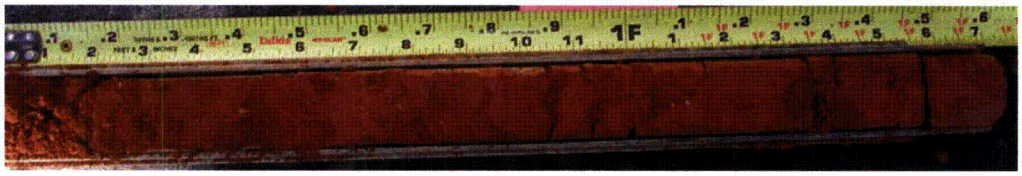
SPLIT SPOON SAMPLE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

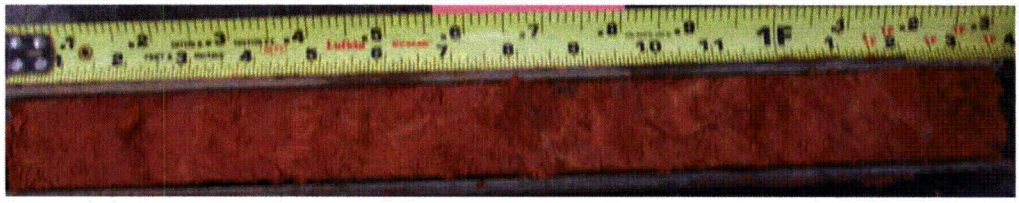
Boring Number: M-35

Sample No: 1
Depth (ft-bls): 3.5 - 5
Blow Count: 7 * 7 * 8



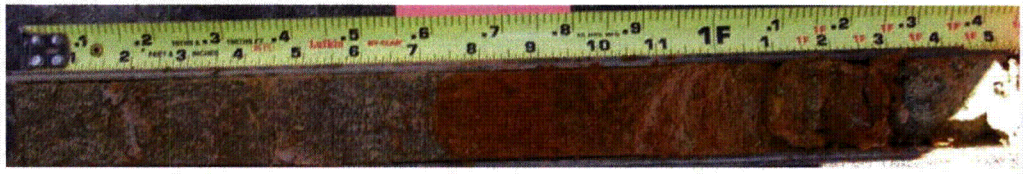
Sample No: 2
Depth (ft-bls): 8.5 - 10
Blow Count: 7 * 11 * 14

Sample No: 3
Depth (ft-bls): 13.5 - 15
Blow Count: 3 * 3 * 5



Sample No: 4
Depth (ft-bls): 18.5 - 20
Blow Count: 3 * 2 * 2

Sample No: 5
Depth (ft-bls): 23.5 - 25
Blow Count: 1 * 2 * 2



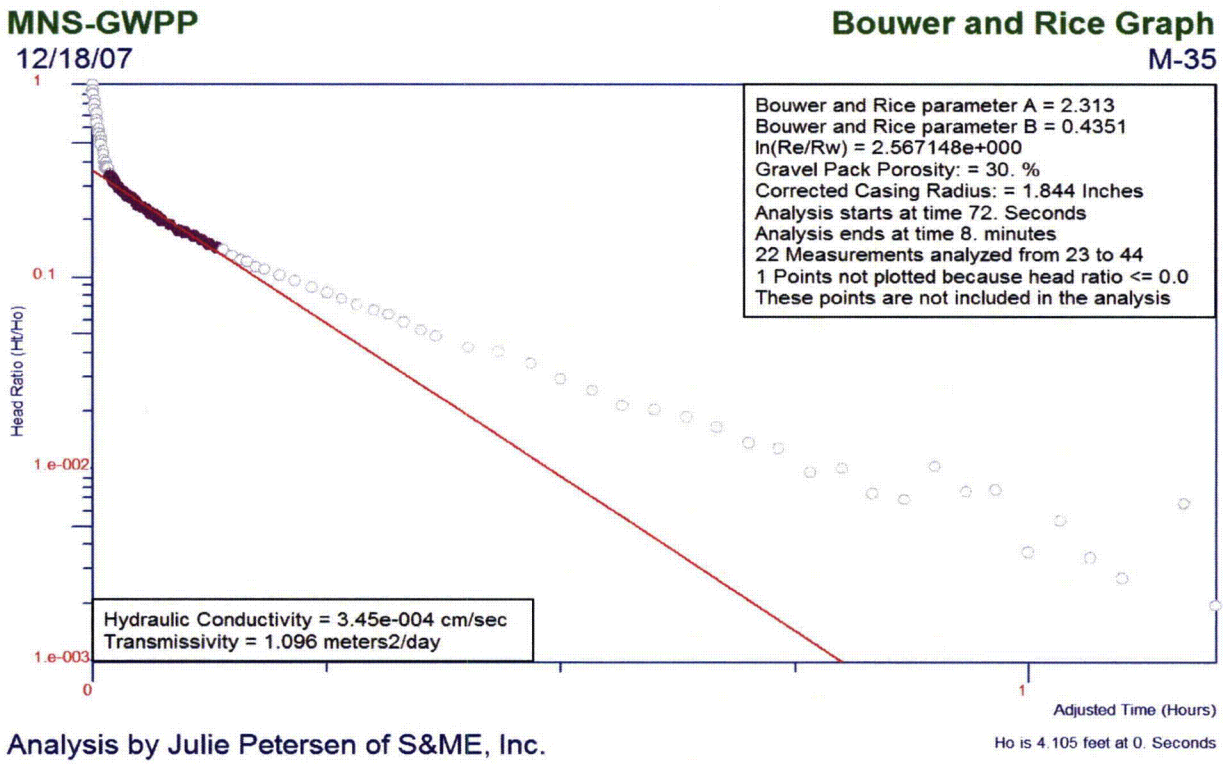
Sample No: 6
Depth (ft-bls): 28.5 - 30
Blow Count: 2 * 4 * 14

Calculation of Permeability By The Rising Head Method (Slug Test)

Site Name:	MNS-GWPP
Test Date:	12/18/2007
Well Label:	M-35
Aquifer Thickness:	12.06 feet
Screen Length:	15. feet
Casing Radius:	1. Inches
Effective Radius:	3. Inches
Gravel Pack Porosity:	30.00%
Corrected Casing Radius:	1.844 Inches
Static Water Level:	23.74 feet
Water Table to Screen Bottom:	7.06 feet
Anisotropy Ratio:	1

Time Adjustment: 0. Seconds
Test starts with trial 0
There are 86 time and drawdown measurements
Maximum head is 4.105 feet
Minimum head is 0. feet

Calculation by Bouwer and Rice Graphical Method



Analysis by Julie Petersen of S&ME, Inc.

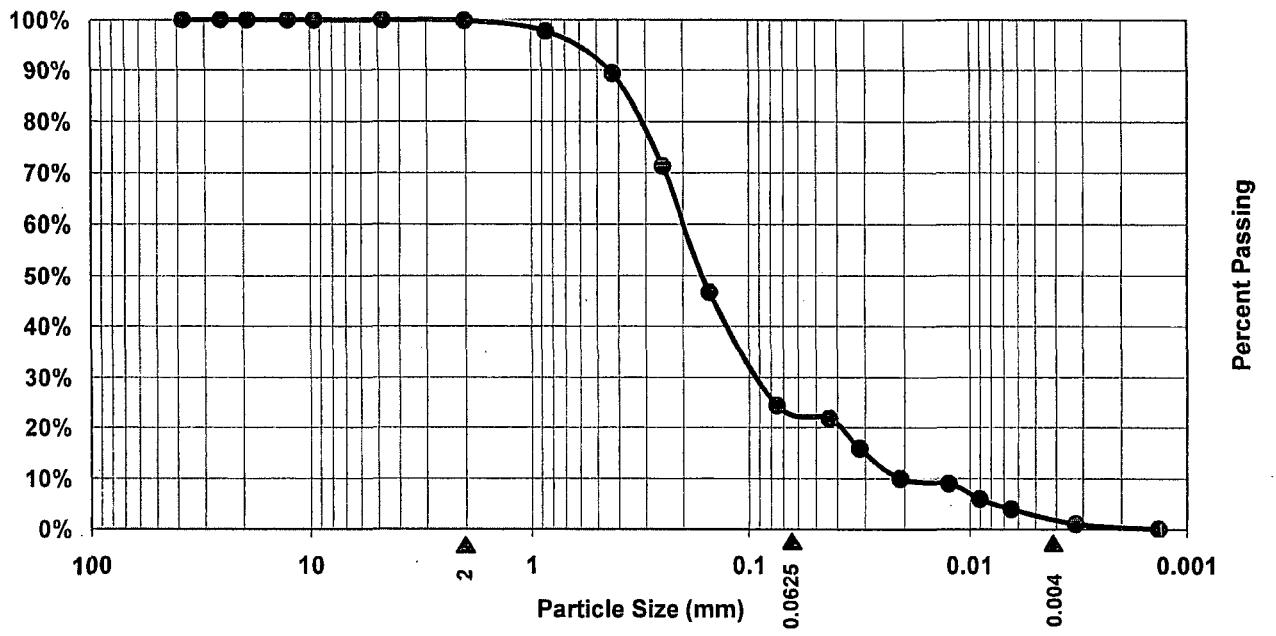
PERMEABILITY

3.45×10^{-04} cm/sec

PARTICLE SIZE ANALYSIS OF SOILS
FOR USE IN FETTER AND BEAR DIAGRAMS

Boring No.:	Sample No.:	Depth:
M-35	SS-6	28.5 to 30 ft bls

Sample Description:
Tan and Brown, Clayey, Silty, Coarse to Fine Sand



	> 2 mm	2 mm - 0.0625 mm	0.0625 mm - 0.004 mm	<0.004 mm
From Graph:	% Gravel 0.2%	% Sand 76.3%	% Silt 21.8%	% Clay 1.7%
Adjusted for Calculations	**0%**	**76%**	**22%**	**2%**

Notes:
Grain size distribution taken from grain size with hydrometer data located in Appendix II.
Gravel, sand, silt and clay sizes based on Wentworth Scale.

S&ME Project:
McGuire Nuclear Station - GWPP

S&ME Project No.:
1264-06-724

S&ME

FETTER AND BEAR DIAGRAMS

S&ME PROJECT: McGuire Nuclear Station - GWPP
S&ME PROJECT NO.: 1264-06-724

Boring No. M-35

Boring Depth: 28.5 to 30 ft bls

% Sand: 76%

% Silt: 22%

% Clay: 2%

Estimated Specific Yield: 29%

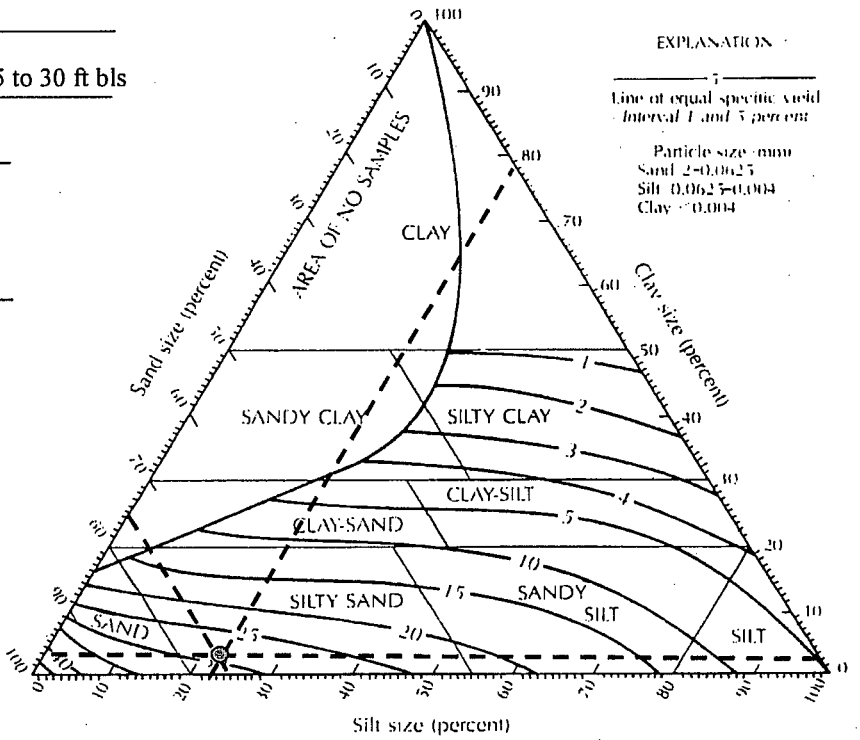
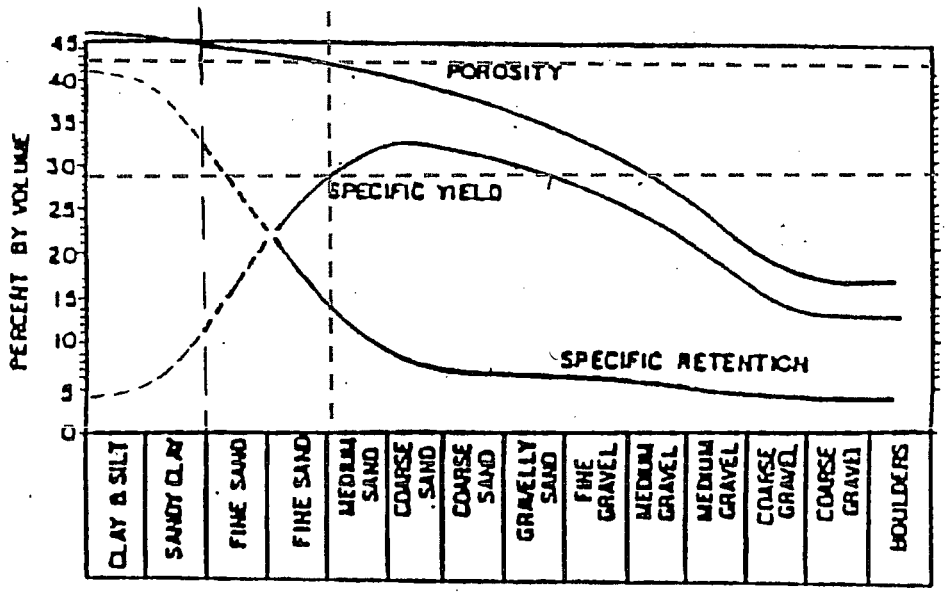


FIGURE 4.11 Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. Source: A. I. Johnson, U.S. Geological Survey Water-Supply Paper 1662-D, 1967.



Estimated Porosity: 42.5%

Variation of Porosity, Specific Yield, and Specific Retention with Grain Size (after Bear, 1972)

S&ME, Inc.
9751 Southern Pine Blvd.
Charlotte, North Carolina
Telephone: 704-523-4726
Fax: 704-525-3953

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**			**Boring No. M-48**
Location: **Huntersville, North Carolina**		Number: **1264-06-724**	Sheet No. 1 of 1
Boring Depth (ft): **20.2**	Elevation (ft): **760.4**	Driller: **Jay Little, NC Cert No. 2717**	Date Drilled: **6/21/07**
Logged By: **Courtney Withers**	Water Level: **Dry**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description	Well Construction	Penetration Resistance (Blows/Foot) 0 50 100
760			**GRAVEL**		
			FILL (F): Red and Yellow, Micaceous, **SILT**		
			GRAVEL		
755	5		FILL (F): Reddish-Brown, Micaceous, Medium to Fine Sandy, Silty, **CLAY**		
750	10				
			FILL (F): Red, Micaceous, Clayey, Medium to Fine **SAND**		
745	15				
	20		**Roller Cone Refusal at 20.20 ft bls**		
			Lithologic Description Obtained From M-48DR		

BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

COMPLETION REPORT OF WELL No. M-48

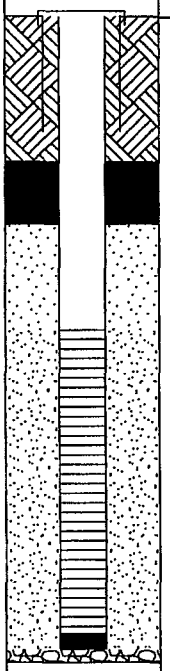
PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

WATER LEVEL: **Dry**

LATITUDE: **35 26 00.82**
LONGITUDE: **80 56 51.63**
TOP OF CASING ELEVATION: **760.17**
DATUM: **MSL**
LOGGED BY: **Courtney Withers**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **6/21/07**

STRATA DESCRIPTION	DEPTH (ft.)	ELEVATION (ft.)
	0.00	760.39
GRAVEL		
FILL (F): Red and Yellow, Micaceous, **SILT**		
GRAVEL	4.50	755.89
FILL (F): Reddish-Brown, Micaceous, Medium to Fine Sandy, Silty, **CLAY**	6.50	753.89
FILL (F): Red, Micaceous, Clayey, Medium to Fine **SAND**	19.30	741.09
	19.80	740.59
	20.20	740.19



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **8"**
Type: **Steel Flush Mount**
Interval: **At Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 9.8 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 4.5 ft bls**

SEAL
Type: **Bentonite**
Interval: **4.5 to 6.5 ft bls**

FILTERPACK
Type: **#1 Filter Sand**
Interval: **6.5 to 19.8 ft bls**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **9.8 to 19.8 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

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9751 Southern Pine Blvd.
Charlotte, North Carolina

COMPLETION REPORT OF WELL No. M-48

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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S&ME, Inc.
9751 Southern Pine Blvd.
Charlotte, North Carolina
Telephone: 704-523-4726
Fax: 704-525-3953

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

Project: **MNS - Groundwater Protection Project**				**Boring No. M-48R**
Location: **Huntersville, North Carolina**			Number: **1264-06-724**	Sheet No. 1 of 1
Boring Depth (ft): **35.2**	Elevation (ft): **760.3**	Driller: **Jay Little, NC Cert No. 2717**		Date Drilled: **6/19/07**
Logged By: **Courtney Withers**		Water Level: **Stabilized Water Level at 19.45 ft bls**		Drilling Method: **Mud Rotary**

Elev. (Feet)	Depth (Feet)	Lith-ology	Material Description
760	0		**GRAVEL**
			FILL (F): Red and Yellow, Micaceous, **SILT**
			GRAVEL
755	5		FILL (F): Reddish-Brown, Micaceous, Medium to Fine Sandy, Silty, **CLAY**
750	10		
745	15		FILL (F): Red, Micaceous, Clayey, Medium to Fine **SAND**
740	20		**Roller Cone Refusal at 20.60 ft bls**
			PARTIALLY WEATHRED/FRACTURED ROCK (WF): Coarse-Grained **QUARTZ DIORITE** With Intermittent Soil Seams, Intensely Fractured
735	25		
			SOUND ROCK (D): Coarse-Grained **QUARTZ DIORITE**, Slightly Fractured
730	30		PARTIALLY WEATHERED/FRACTURED ROCK (WF): Coarse-Grained **QUARTZ DIORITE** With Intermittent Soil Seams, Intensely Fractured
	35		**Boring Terminated at 35.20 ft bls** **Lithologic Descriptions Obtained From M-48DR**

Well Construction

Penetration Resistance (Blows/Foot)
0 50 100

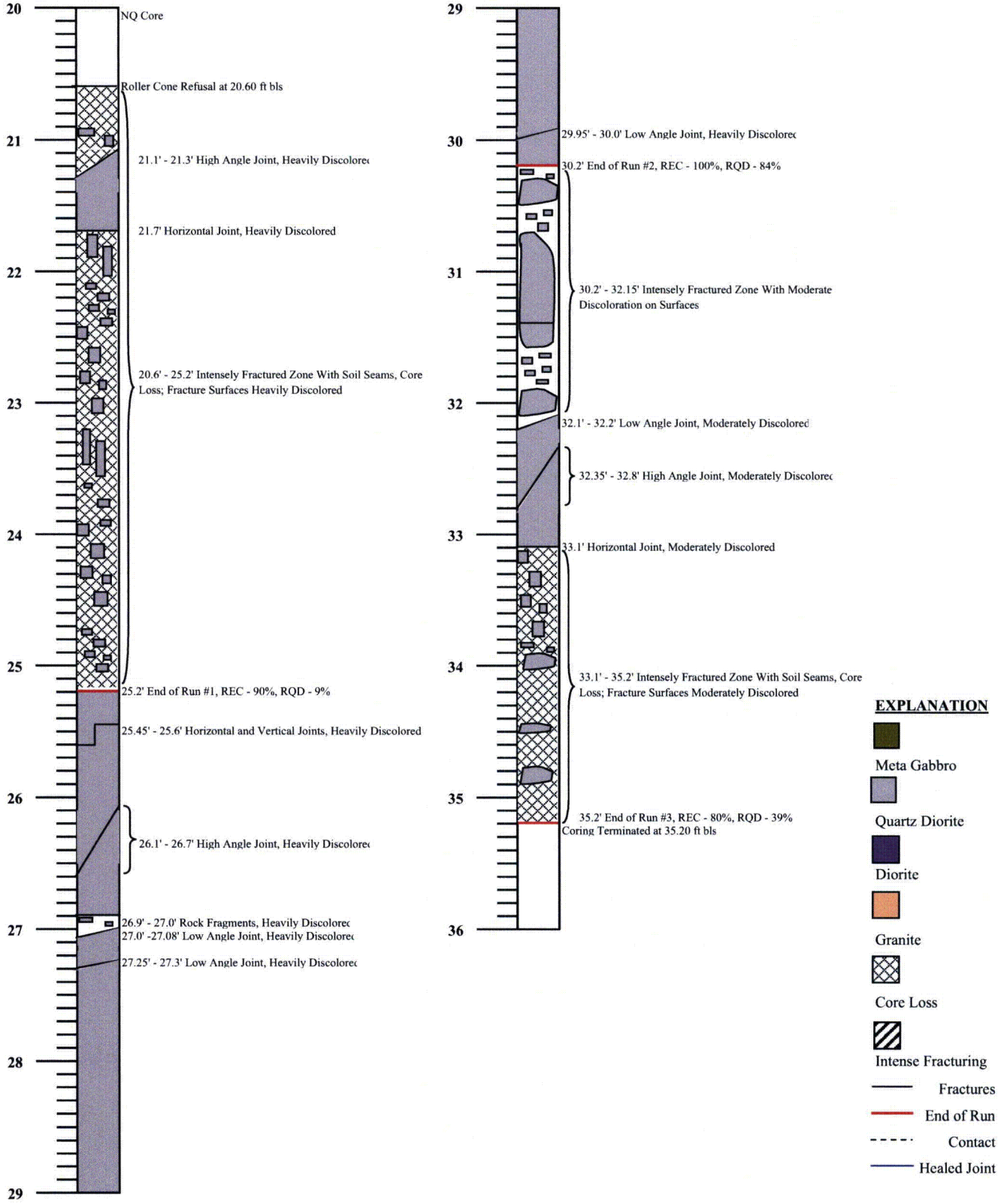
BORING LOG WITH WELL MNSLOG.GPJ LAGWGN01.GDT 3/26/08

FIELD ROCK CORE LOG

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-48R



COMPLETION REPORT OF WELL No. M-48R

PROJECT: **MNS - Groundwater Protection Project**
PROJECT NO: **1264-06-724**
PROJECT LOCATION: **Huntersville, North Carolina**

DRILLING CONTRACTOR: **S&ME, Inc.**
DRILLING METHOD: **Mud Rotary**
DATE DRILLED: **6/19/07**

WATER LEVEL: **Stabilized Water Level at 19.45 ft bls**
LATITUDE: **35 26 00.79**
LONGITUDE: **80 56 51.61**
TOP OF CASING ELEVATION: **760.20**
DATUM: **MSL**
LOGGED BY: **Courtney Withers**

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)	WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)
		0		0.00		760.33
GRAVEL						
FILL (F): Red and Yellow, Micaceous, **SILT**						
GRAVEL		5				
FILL (F): Reddish-Brown, Micaceous, Medium to Fine Sandy, Silty, **CLAY**		10				
FILL (F): Red, Micaceous, Clayey, Medium to Fine **SAND**		15				
		20				
PARTIALLY WEATHRED/FRACTURED ROCK (WF): Coarse-Grained **QUARTZ DIORITE** With Intermittent Soil Seams, Intensely Fractured		25		25.00		735.33
SOUND ROCK (D): Coarse-Grained **QUARTZ DIORITE**, Slightly Fractured		30		28.60 28.80 29.40		731.73 731.53 730.93
PARTIALLY WEATHERED/FRACTURED ROCK (WF): Coarse-Grained **QUARTZ DIORITE** With Intermittent Soil Seams, Intensely Fractured		35		33.90 34.40 35.20		726.43 725.93 725.13

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **8"**
Type: **Steel Flush Mount**
Interval: **At Grade**

RISER CASING
Diameter: **2"**
Type: **Sch. 40 PVC**
Interval: **0 to 29.4 ft bls**

GROUT
Type: **Neat Cement**
Interval: **0 to 25 ft bls**

SEAL
Type: **K-Packer + Bentonite**
Interval: **25 to 28.8 ft bls**

FILTERPACK
Type: **N/A**
Interval: **N/A**

SCREEN
Diameter: **2"**
Type: **0.010 Slotted Sch. 40 PVC**
Interval: **29.4 to 34.4 ft bls**

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

MONITORING WELL MNSLOG.GPJ S&ME.GDT 3/26/08

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COMPLETION REPORT OF WELL No. M-48R

ROCK CORE PICTURES

McGuire Nuclear Station - Groundwater Protection Project

S&ME Project No: 1264-06-724

Core Location: M-48R

CLASSIFICATION:

20.60' to 35.20' Coarse-Grained Quartz Diorite