

NORTH

DRAWING IS NOT TO SCALE



NORTH

**LEGEND**



APPROXIMATE BORING LOCATION

DRAWING IS NOT TO SCALE

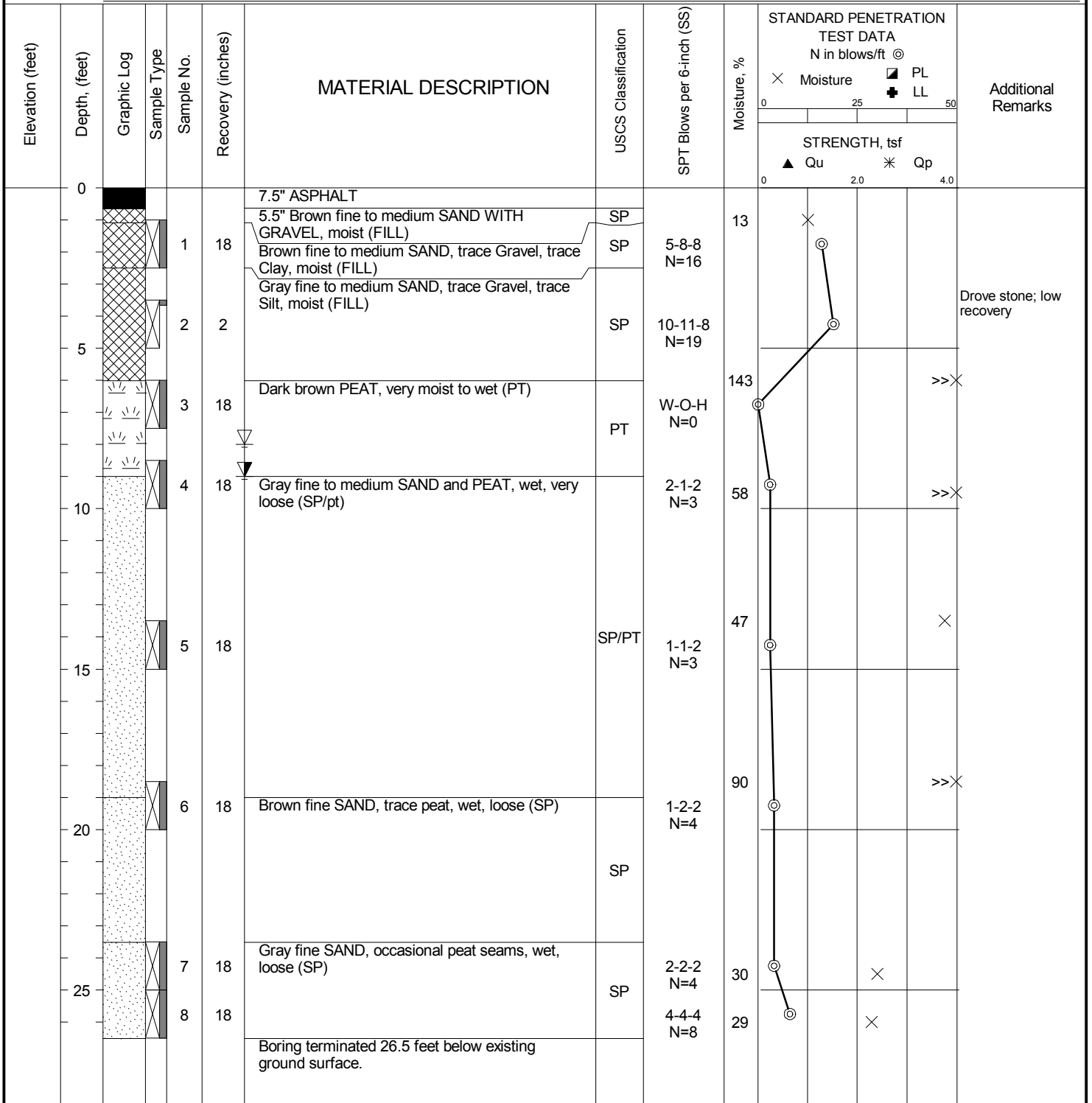


**DATE STARTED:** 8/12/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/12/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 26.5 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 3+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-01

<b>Water</b>	▽	While Drilling	8 feet
	▼	Upon Completion	N/A
	▽	Wet Cave Depth	9 feet

**BORING LOCATION:**  
 See Boring Location Diagram



Professional Service Industries, Inc.  
 3120 Sovereign Drive, Suite C  
 Lansing, MI 48911  
 Telephone: (517) 394-5700

**PROJECT NO.:** 0408731  
**PROJECT:** 2013 Miscellaneous Borings  
**LOCATION:** Five Point Highway  
 Eaton County, Michigan

**DATE STARTED:** 8/12/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/12/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 21.5 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 5+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-02

**Water**  
 ∇ While Drilling 18.5 feet  
 ▼ Upon Completion 2.5 feet  
 ▼ Wet Cave Depth 3 feet

**BORING LOCATION:**  
 See Boring Location Diagram

Elevation (feet)	Depth (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	STANDARD PENETRATION TEST DATA		Additional Remarks
									N in blows/ft @		
									Moisture, % X Moisture    ◻ PL + LL 0                   25                   50		
									STRENGTH, tsf ▲ Qu           * Qp 0                   2.0                   4.0		
0		5" ASPHALT									
		7" Brown fine to medium SAND WITH GRAVEL, moist (FILL)		1	18		SP	3-2-3 N=5			
		Gray fine to medium SAND, trace Gravel, moist (FILL)					SP				
		Dark brown CLAYEY PEAT, very moist (PT)					PT	2-1-1 N=2			Drove stone; low recovery
5				2	1		PT				
		Gray fine to medium SAND, occasional peat seams, wet, very loose (SP)		3	18		SP	1-2-1 N=3			
		Dark gray fine to medium SAND, trace Gravel, occasional peat seams, wet, very loose (SP)		4	18		2-1-1 N=2				
10											
				5	18		SP	2-1-1 N=2			
15											
		Brownish gray fine to medium SAND, trace Gravel, wet, loose (SP)		6	18		SP	1-2-3 N=5			
20		Gray fine to coarse SAND WITH GRAVEL, wet, loose (SP)		7	18		SP	2-3-3 N=6			
		Boring terminated 21.5 feet below existing ground surface.									



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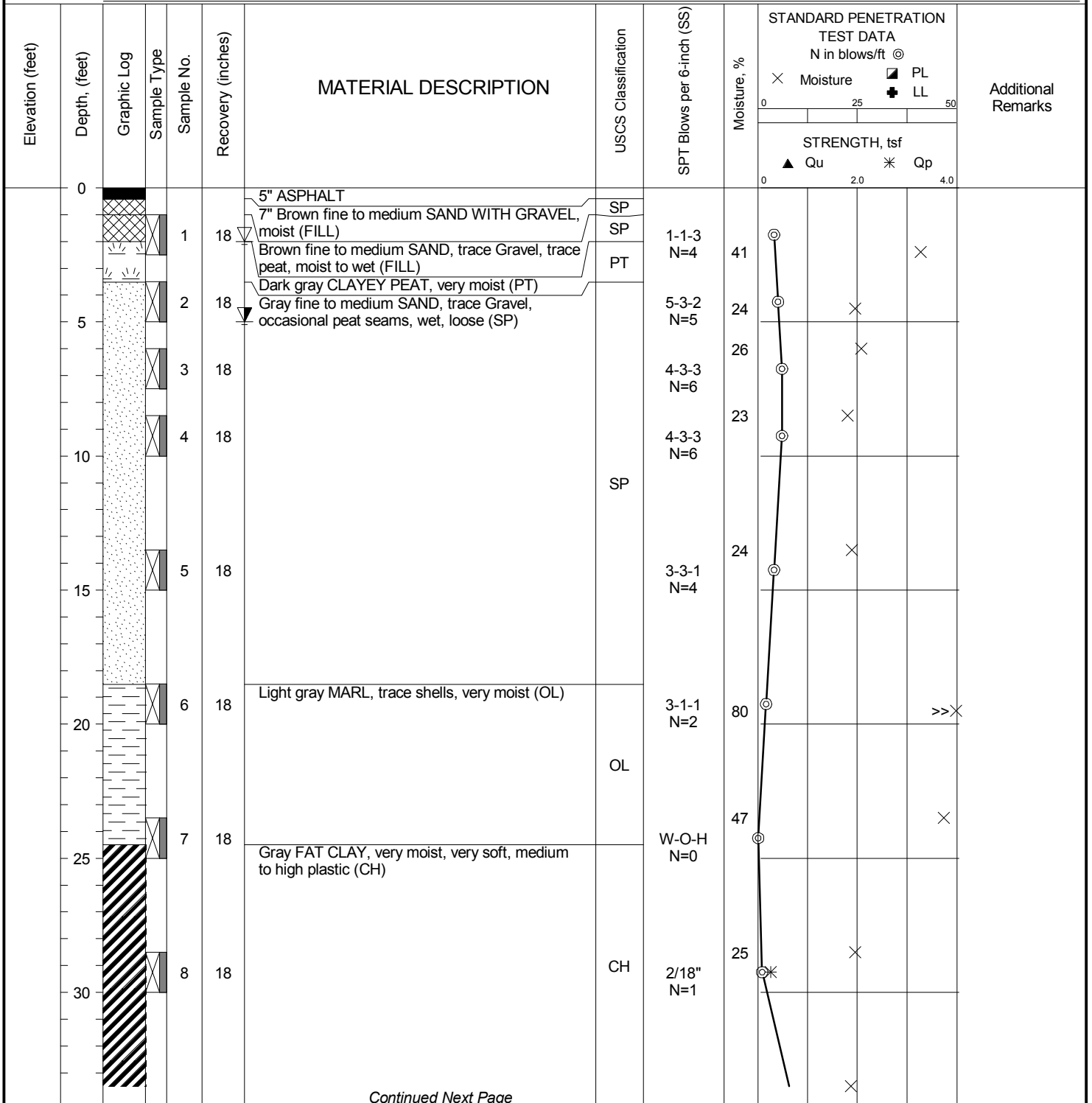
**PROJECT NO.:** 0408731  
**PROJECT:** 2013 Miscellaneous Borings  
**LOCATION:** Five Point Highway  
 Eaton County, Michigan

**DATE STARTED:** 8/12/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/12/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 36.5 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 7+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-03

**Water**  
 ∇ While Drilling 2 feet  
 ▼ Upon Completion N/A  
 ∇ Wet Cave Depth 5 feet

**BORING LOCATION:**  
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 Eaton County, Michigan

**DATE STARTED:** 8/12/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/12/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 36.5 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 7+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-03

<b>Water</b>	▽ While Drilling	2 feet
	▼ Upon Completion	N/A
	▽ Wet Cave Depth	5 feet

**BORING LOCATION:**  
See Boring Location Diagram

Elevation (feet)	Depth (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STRENGTH, tsf	Additional Remarks
	35			9	18	Gray fine SILTY SAND, trace Gravel, wet, loose, non-plastic (SM)	CH SM	1-1-8 N=9	23	Qu	
				10	18	Gray fine to coarse SAND WITH GRAVEL, wet, loose (SP) Boring terminated 36.5 feet below existing ground surface.	SP	5-4-4 N=8	9	Qu	

STANDARD PENETRATION TEST DATA  
N in blows/ft @

× Moisture      ◻ PL  
                           + LL

0                      25                      50

STRENGTH, tsf

▲ Qu                      \* Qp

0                      2.0                      4.0



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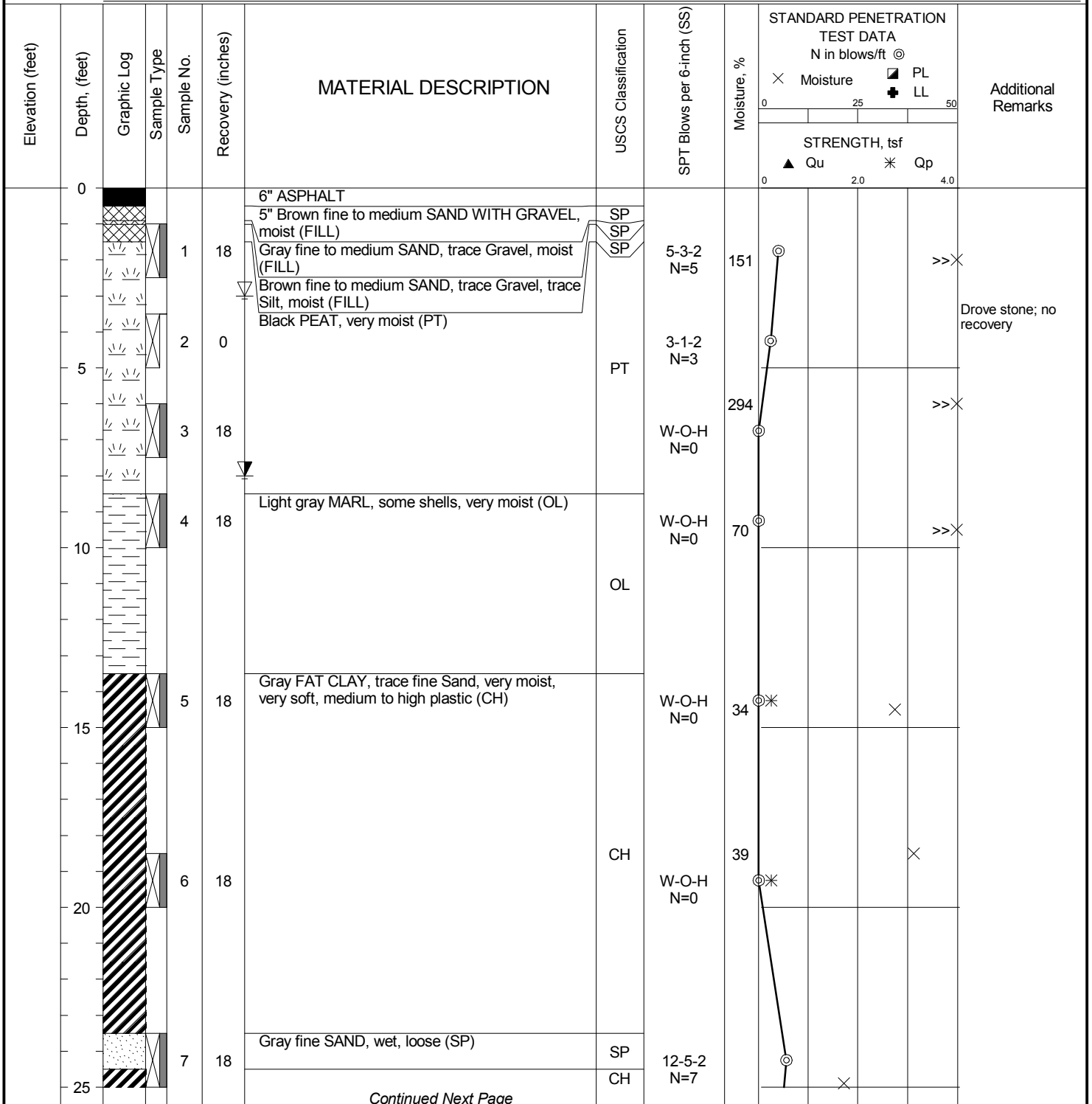
**PROJECT NO.:** 0408731  
**PROJECT:** 2013 Miscellaneous Borings  
**LOCATION:** Five Point Highway  
 Eaton County, Michigan

**DATE STARTED:** 8/12/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/12/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 35.0 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 9+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-04

<b>Water</b>	▽ While Drilling	3 feet
	▼ Upon Completion	N/A
	▽ Wet Cave Depth	8 feet

**BORING LOCATION:**  
See Boring Location Diagram



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**LOCATION:** Five Point Highway  
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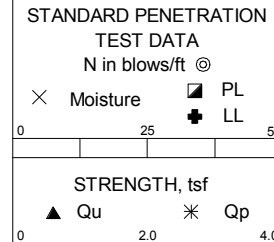
**DATE STARTED:** 8/12/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/12/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 35.0 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 9+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-04

<b>Water</b>	▽ While Drilling	3 feet
	▼ Upon Completion	N/A
	▽ Wet Cave Depth	8 feet

**BORING LOCATION:**  
See Boring Location Diagram

Elevation (feet)	Depth (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STRENGTH, tsf	Additional Remarks
25						Gray FAT CLAY, occasional fine to medium Sand seams, very moist, very soft, medium to high plastic (CH)	CH	3-2-1 N=3	22		
30			8	2					27	×	Drove stone; low recovery
35				9	18	Gray fine to medium SAND, occasional Sandy Clay pockets, wet, medium dense (SP)	SP	5-6-7 N=13	17	⊗	
						Boring terminated 35 feet below existing ground surface.					



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 Eaton County, Michigan

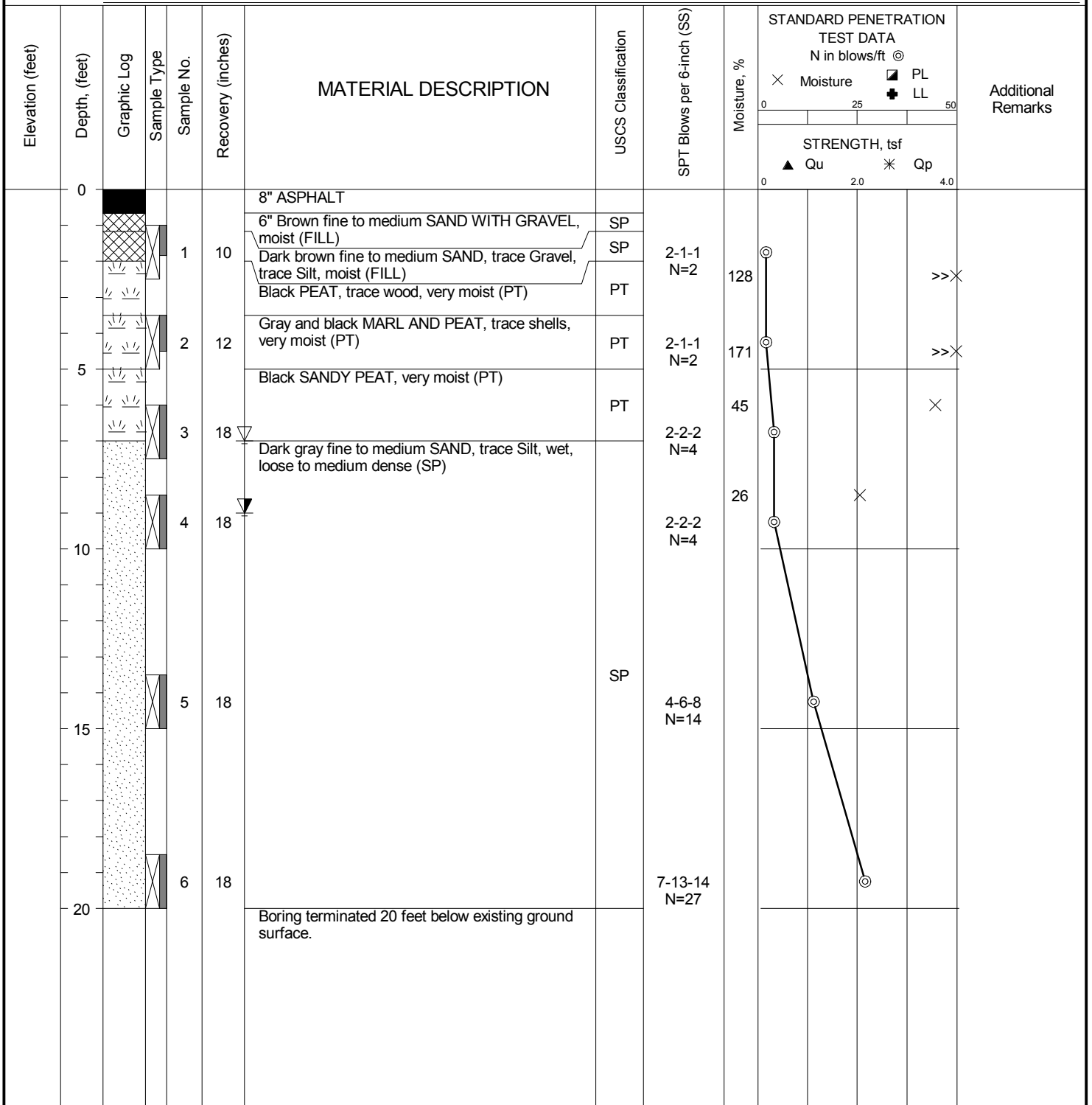


**DATE STARTED:** 8/12/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/12/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 20.0 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 11+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-05

<b>Water</b>	▽ While Drilling	7 feet
	▼ Upon Completion	N/A
	▽ Wet Cave Depth	9 feet

**BORING LOCATION:**  
See Boring Location Diagram



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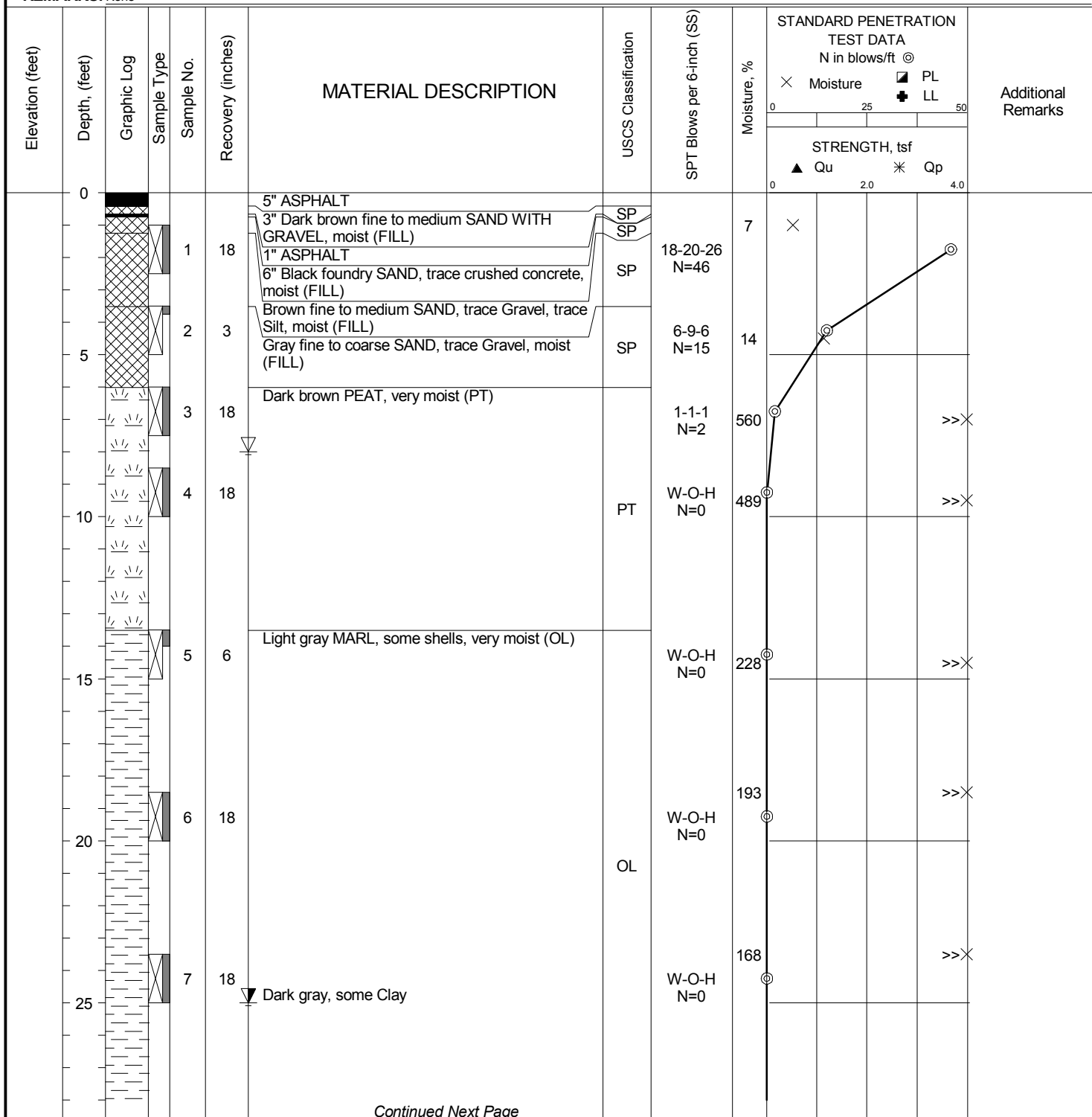
**PROJECT NO.:** 0408731  
**PROJECT:** 2013 Miscellaneous Borings  
**LOCATION:** Five Point Highway  
 Eaton County, Michigan

**DATE STARTED:** 8/13/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/13/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 55.0 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 13+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-06

**Water**  
 ∇ While Drilling 8 feet  
 ▼ Upon Completion N/A  
 ▼ Wet Cave Depth 25 feet

**BORING LOCATION:**  
 See Boring Location Diagram



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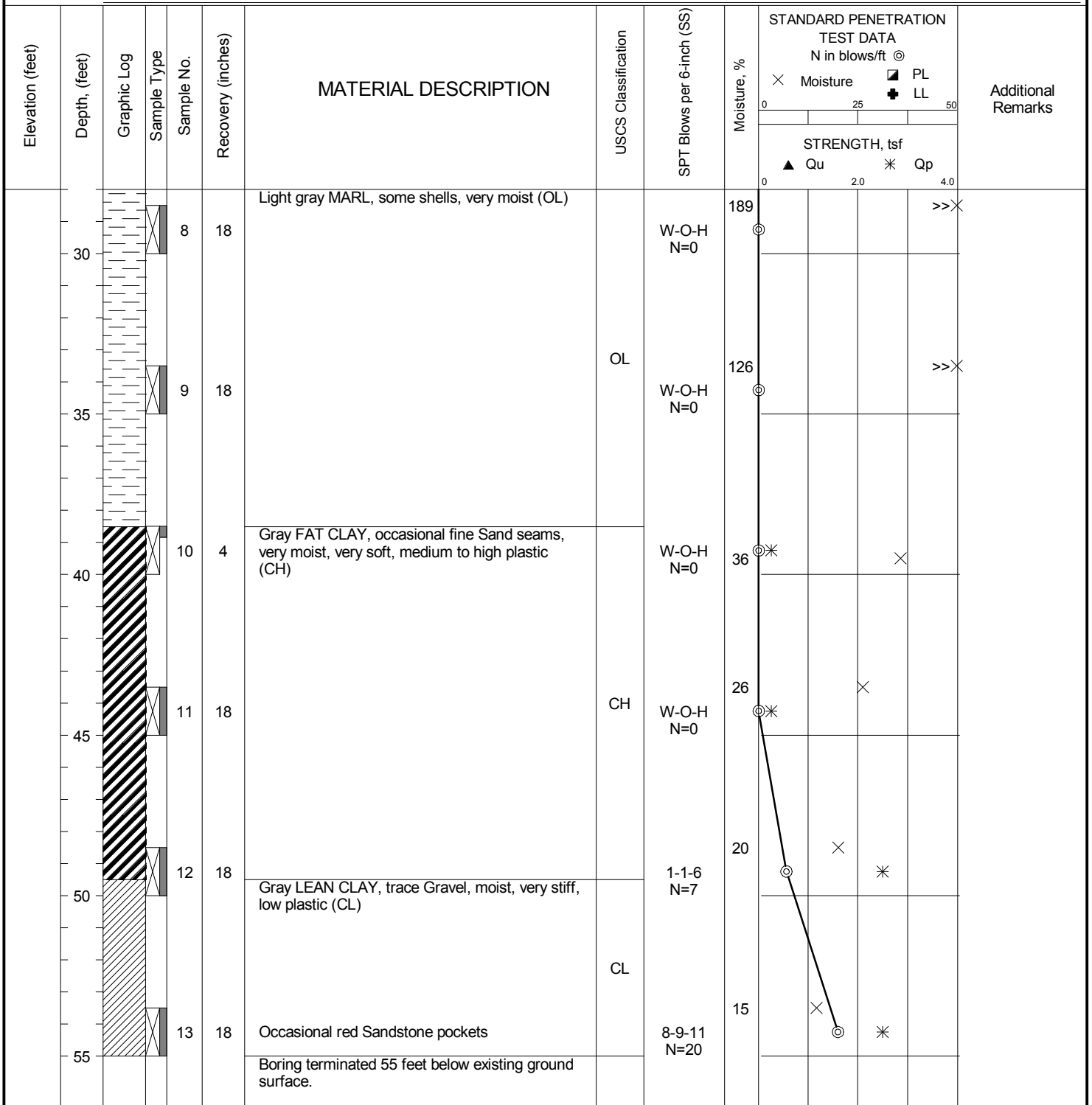
**PROJECT NO.:** 0408731  
**PROJECT:** 2013 Miscellaneous Borings  
**LOCATION:** Five Point Highway  
 Eaton County, Michigan

**DATE STARTED:** 8/13/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/13/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 55.0 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 13+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-06

**Water**  
 ∇ While Drilling 8 feet  
 ▼ Upon Completion N/A  
 ▼ Wet Cave Depth 25 feet

**BORING LOCATION:**  
 See Boring Location Diagram



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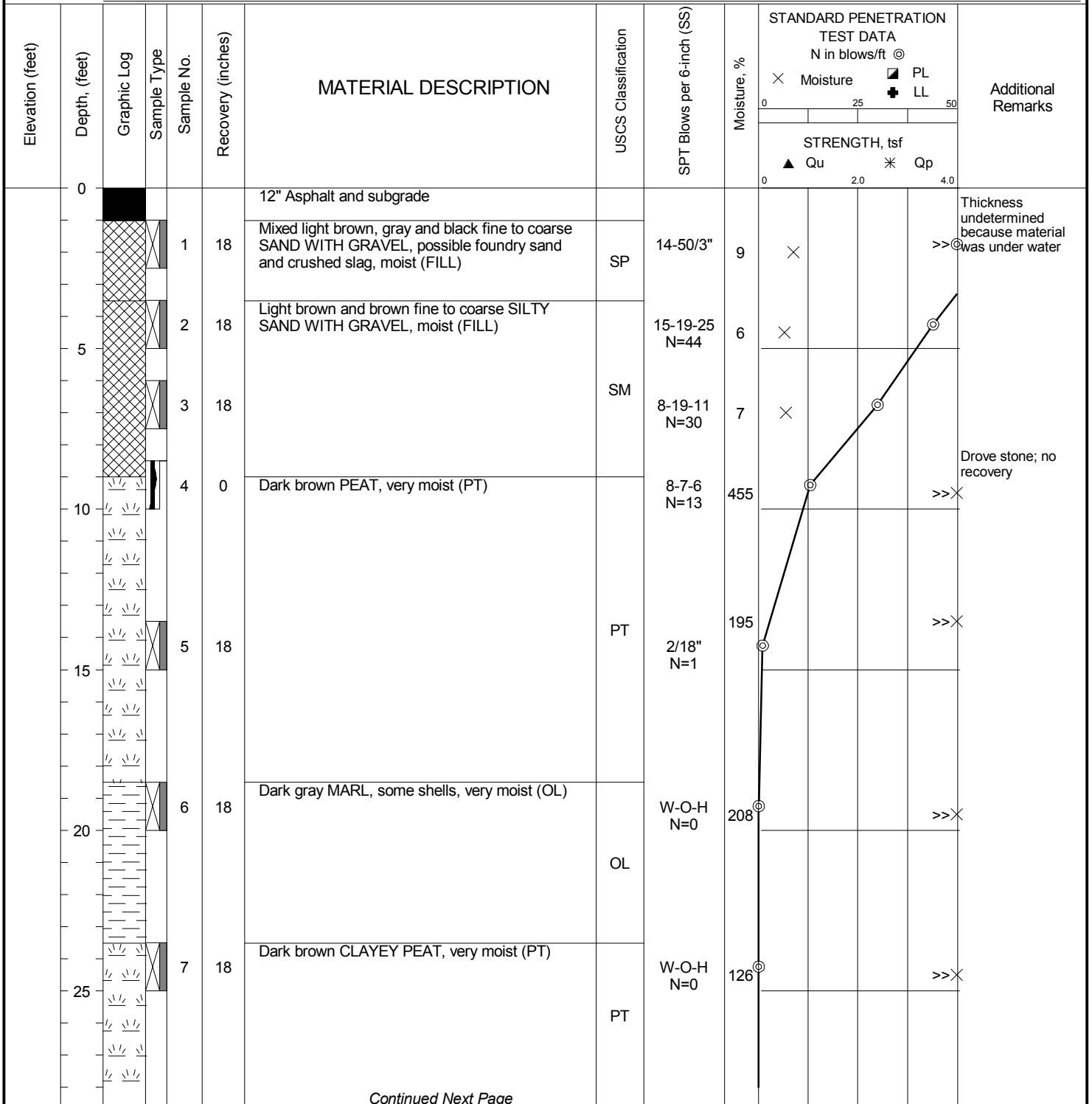
**PROJECT NO.:** 0408731  
**PROJECT:** 2013 Miscellaneous Borings  
**LOCATION:** Five Point Highway  
 Eaton County, Michigan

**DATE STARTED:** 8/13/13      **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/13/13      **DRILLER:** E. Motcheck      **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 55.0 ft      **DRILL RIG:** CME-55  
**BENCHMARK:** N/A      **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A      **SAMPLING METHOD:** SS  
**LATITUDE:**      **HAMMER TYPE:** Automatic  
**LONGITUDE:**      **EFFICIENCY:** N/A  
**STATION:** 14+00      **OFFSET:** 5' R      **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-07

**Water**  
 ∇ While Drilling 47.5 feet  
 ▼ Upon Completion N/A  
 ∇ Cave Depth N/A

**BORING LOCATION:**  
 See Boring Location Diagram



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**DATE STARTED:** 8/13/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/13/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 55.0 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 14+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-07

**Water**  
 ∇ While Drilling 47.5 feet  
 ▼ Upon Completion N/A  
 ▽ Cave Depth N/A

**BORING LOCATION:**  
 See Boring Location Diagram

Elevation (feet)	Depth (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STRENGTH, tsf	Additional Remarks
30	30	[Hatched]	PT	8	18	Dark brown CLAYEY PEAT, very moist (PT)	PT	52	52	>>X	
35	35	[Hatched]	CH	9	18	Gray FAT CLAY, occasional fine Silty Sand seams, very moist, very soft, medium to high plastic (CH)	CH	29	29	X	
40	40	[Hatched]	CH	10	18		CH	20	20	X	
45	45	[Hatched]	CH	11	18		CH	19	19	X	
50	50	[Dotted]	SC-SM	12	14	Brown fine to medium SILTY CLAYEY SAND, some coarse Sand, trace Gravel, wet, loose, low plastic (SC-SM)	SC-SM	17	17	X	
55	55	[Dotted]	SP	13	18	Brown fine SAND, trace Silt, wet, medium dense (SP)	SP	27	27	X	
						Boring terminated 55 feet below existing ground surface.					



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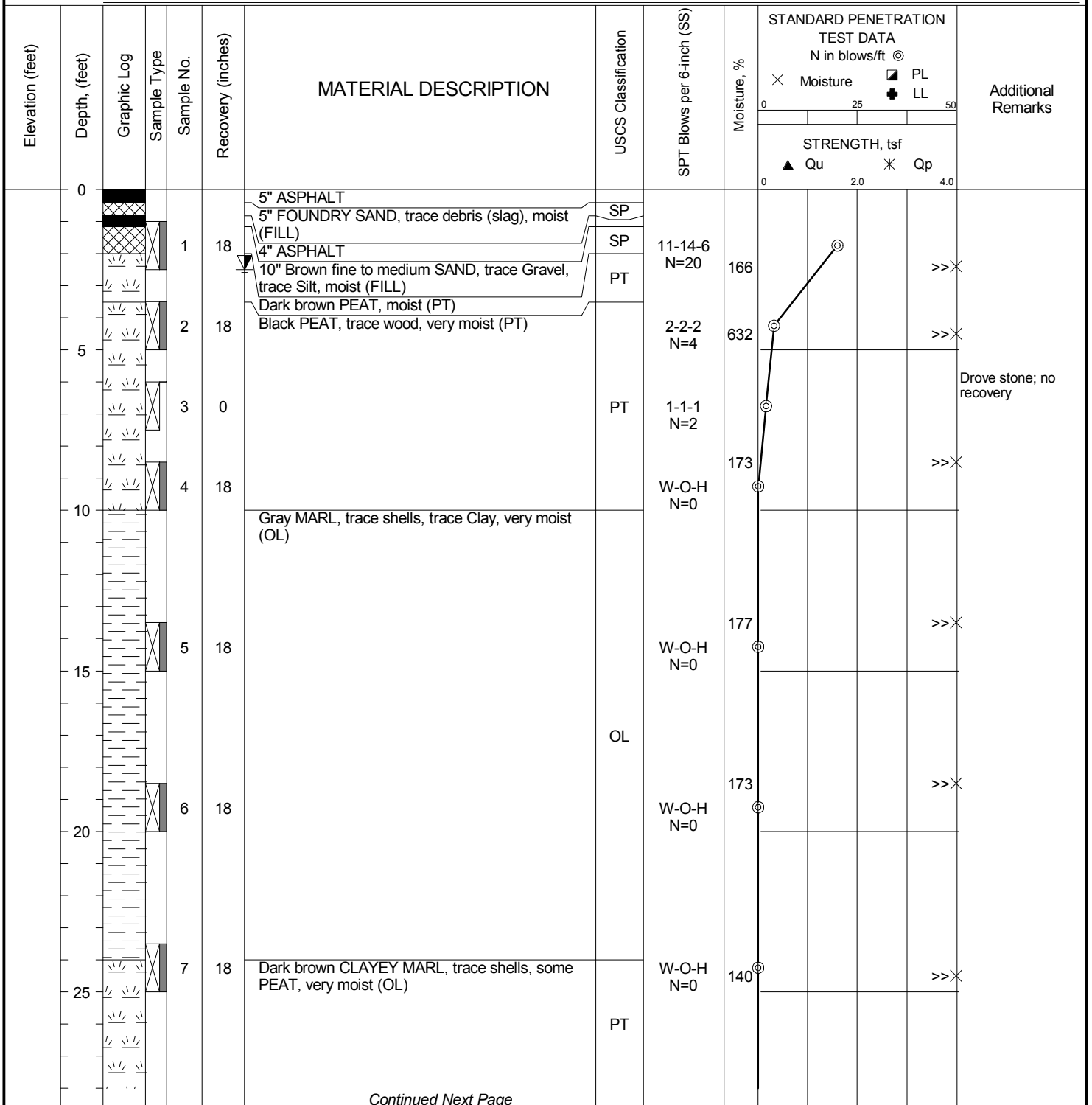
**PROJECT NO.:** 0408731  
**PROJECT:** 2013 Miscellaneous Borings  
**LOCATION:** Five Point Highway  
 Eaton County, Michigan

**DATE STARTED:** 8/13/13      **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/13/13      **DRILLER:** E. Motcheck      **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 50.0 ft      **DRILL RIG:** CME-55  
**BENCHMARK:** N/A      **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A      **SAMPLING METHOD:** SS  
**LATITUDE:**      **HAMMER TYPE:** Automatic  
**LONGITUDE:**      **EFFICIENCY:** N/A  
**STATION:** 15+00      **OFFSET:** 5' R      **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-08

**Water**  
 ∇ While Drilling 43.5 feet  
 ▼ Upon Completion N/A  
 ▽ Dry Cave Depth 2.5 feet

**BORING LOCATION:**  
 See Boring Location Diagram



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**DATE COMPLETED:** 8/13/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 50.0 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 15+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-08

**Water**  
 ∇ While Drilling 43.5 feet  
 ▼ Upon Completion N/A  
 ∇ Dry Cave Depth 2.5 feet

**BORING LOCATION:**  
 See Boring Location Diagram

Elevation (feet)	Depth (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	STANDARD PENETRATION TEST DATA		Additional Remarks
									N in blows/ft ⊙	Moisture, %	
30				8	18	Dark brown CLAYEY MARL, trace shells, some PEAT, very moist (OL)	PT	W-O-H N=0	113	⊙	>>X
35				9	18	Gray FAT CLAY, occasional Silty Sand seams, very moist, very soft, medium to high plastic (CH)	CH	W-O-H N=0	37	⊙*	X
40				10	18	Gray FAT CLAY, moist, very soft, medium to high plastic (CH)	CH	W-O-H N=0	15	⊙*	X
45				11	18	Gray fine to medium SAND WITH SILT, trace Gravel, occasional fine Silty Sand seams, wet, medium dense (SP-SM)	SP-SM	5-6-6 N=12	18	⊙	X
50				12	18	Gray fine to coarse SAND WITH GRAVEL, trace red Sandstone, wet, medium dense (SP)	SP	9-9-5 N=14	13	⊙	X
						Boring terminated 50 feet below existing ground surface.					



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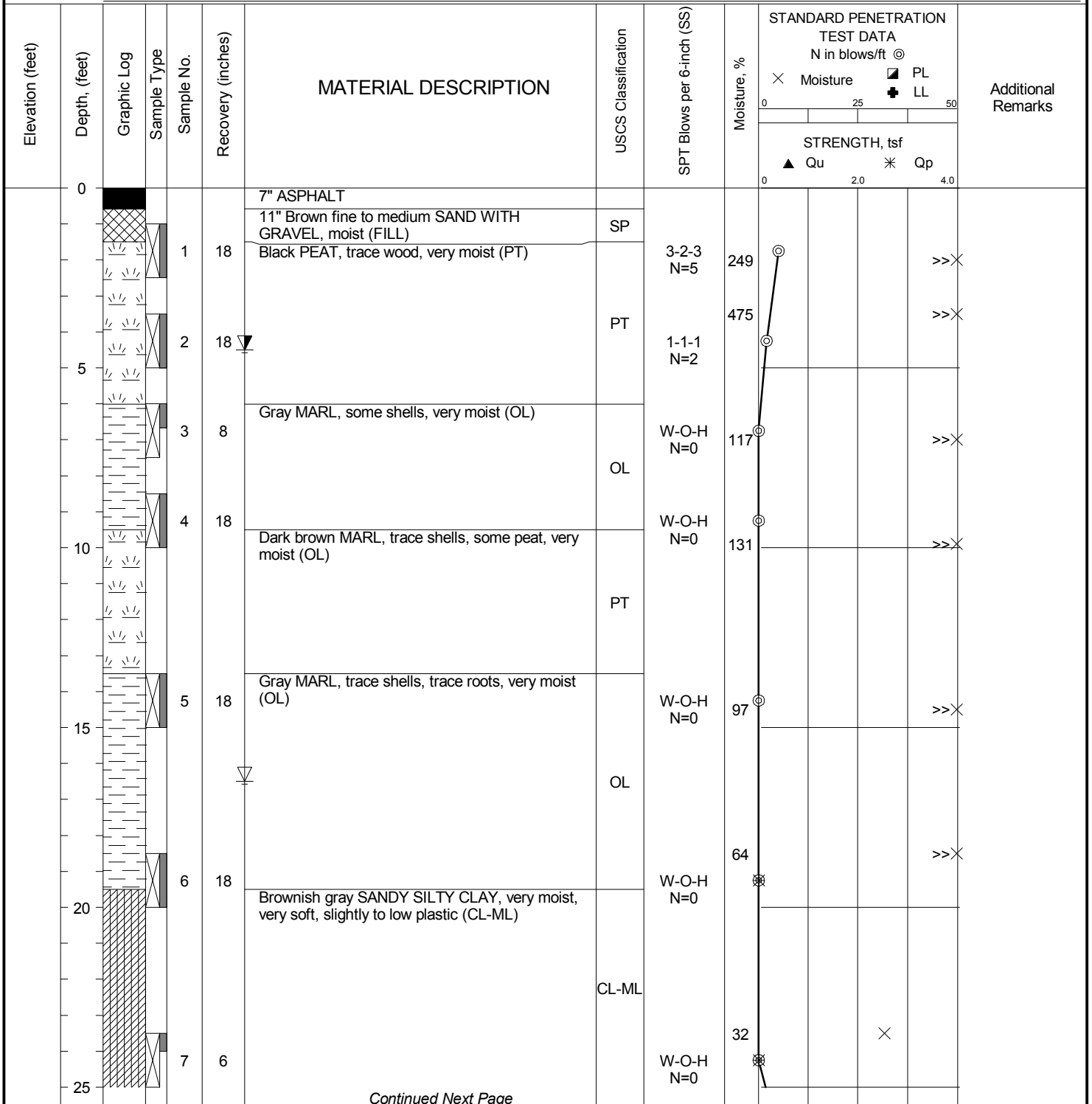
**DATE STARTED:** 8/14/13      **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/14/13      **DRILLER:** E. Motcheck      **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 32.0 ft      **DRILL RIG:** CME-55  
**BENCHMARK:** N/A      **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A      **SAMPLING METHOD:** SS  
**LATITUDE:**      **HAMMER TYPE:** Automatic  
**LONGITUDE:**      **EFFICIENCY:** N/A  
**STATION:** 17+00      **OFFSET:** 5' R      **REVIEWED BY:** S. Rahe

## BORING B-09

<b>Water</b>	▽	While Drilling	16.5 feet
	▼	Upon Completion	N/A
	▽	Wet Cave Depth	4.5 feet

**BORING LOCATION:**  
 See Boring Location Diagram

**REMARKS:** None



*Continued Next Page*



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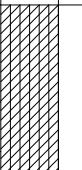
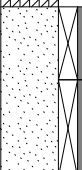
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**DATE COMPLETED:** 8/14/13      **DRILLER:** E. Motcheck      **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 32.0 ft      **DRILL RIG:** CME-55  
**BENCHMARK:** N/A      **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A      **SAMPLING METHOD:** SS  
**LATITUDE:**      **HAMMER TYPE:** Automatic  
**LONGITUDE:**      **EFFICIENCY:** N/A  
**STATION:** 17+00      **OFFSET:** 5' R      **REVIEWED BY:** S. Rahe

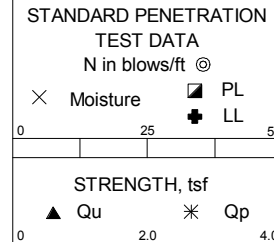
## BORING B-09

**Water**  
 ∇ While Drilling 16.5 feet  
 ▼ Upon Completion N/A  
 ∇ Wet Cave Depth 4.5 feet

**BORING LOCATION:**  
 See Boring Location Diagram

**REMARKS:** None

Elevation (feet)	Depth (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STRENGTH, tsf	Additional Remarks
25						Brownish gray SANDY SILTY CLAY, very moist, very soft, slightly to low plastic (CL-ML)	CL-ML				
	30			8	18	Gray fine to medium SAND, occasional Clay pockets, wet, loose to medium dense (SP)	SP	5-6-6 N=12	24		
				9	24			3-4-5 N=9	19		
						Boring terminated 32 feet below existing ground surface.					



Professional Service Industries, Inc.  
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**PROJECT NO.:** 0408731  
**PROJECT:** 2013 Miscellaneous Borings  
**LOCATION:** Five Point Highway  
 Eaton County, Michigan

**DATE STARTED:** 8/14/13 **DRILL COMPANY:** PSI  
**DATE COMPLETED:** 8/14/13 **DRILLER:** E. Motcheck **LOGGED BY:** E. Motcheck  
**COMPLETION DEPTH:** 10.0 ft **DRILL RIG:** CME-55  
**BENCHMARK:** N/A **DRILLING METHOD:** 3 1/4" HSA  
**ELEVATION:** N/A **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** 19+00 **OFFSET:** 5' R **REVIEWED BY:** S. Rahe  
**REMARKS:** None

## BORING B-10

**Water**  
 ▽ While Drilling 7.5 feet  
 ▼ Upon Completion N/A  
 ▽ Dry Cave Depth 3 feet

**BORING LOCATION:**  
 See Boring Location Diagram

Elevation (feet)	Depth (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	STANDARD PENETRATION TEST DATA		Additional Remarks
									N in blows/ft ⊙		
									Moisture, % × Moisture    ◻ PL + LL		
									STRENGTH, tsf ▲ Qu    * Qp		
0						6" ASPHALT					
				1	18	10" Brown fine to medium SAND WITH GRAVEL, moist (FILL)	SP	4-3-4 N=7			
						6" Gray fine to medium SAND, trace Silt, moist (FILL)	SP				
						Black PEAT, very moist (PT)					>>X
				2	18	Brown	PT	3-2-1 N=3			>>X
5						Occasional fine to medium Sand pockets					
				3	14	Gray fine to medium SAND, wet, medium dense (SP)		W-O-H N=0			>>X
				4	18		SP	5-6-7 N=13			
10						Boring terminated 10 feet below existing ground surface.					



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# GENERAL NOTES

## SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

## DRILLING AND SAMPLING SYMBOLS

- SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
- HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
- M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
- R.C.: Diamond Bit Core Sampler
- H.A.: Hand Auger
- P.A.: Power Auger - Handheld motorized auger
- ☒ SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
- ST: Shelby Tube - 3" O.D., except where noted.
- ▮ RC: Rock Core
- ⬇ TC: Texas Cone
- ☞ BS: Bulk Sample
- ☑ PM: Pressuremeter
- CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

## SOIL PROPERTY SYMBOLS

- N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
- N<sub>60</sub>: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
- Q<sub>u</sub>: Unconfined compressive strength, TSF
- Q<sub>p</sub>: Pocket penetrometer value, unconfined compressive strength, TSF
- w%: Moisture/water content, %
- LL: Liquid Limit, %
- PL: Plastic Limit, %
- PI: Plasticity Index = (LL-PL),%
- DD: Dry unit weight, pcf
- ▼, ▽, ▾ Apparent groundwater level at time noted

## RELATIVE DENSITY OF COARSE-GRAINED SOILS    ANGULARITY OF COARSE-GRAINED PARTICLES

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

## GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

## PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

## RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%





## GENERAL NOTES

(Continued)

### CONSISTENCY OF FINE-GRAINED SOILS

<u>Q<sub>u</sub> - TSF</u>	<u>N - Blows/foot</u>	<u>Consistency</u>
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

### MOISTURE CONDITION DESCRIPTION

<u>Description</u>	<u>Criteria</u>
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

### RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term</u>	<u>% Dry Weight</u>
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

### STRUCTURE DESCRIPTION

<u>Description</u>	<u>Criteria</u>	<u>Description</u>	<u>Criteria</u>
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick	Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick	Lensed:	Inclusion of small pockets of different soils
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing	Layer:	Inclusion greater than 3 inches thick (75 mm)
Slickensided:	Fracture planes appear polished or glossy, sometimes striated	Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
		Parting:	Inclusion less than 1/8-inch (3 mm) thick

### SCALE OF RELATIVE ROCK HARDNESS

<u>Q<sub>u</sub> - TSF</u>	<u>Consistency</u>
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

### ROCK BEDDING THICKNESSES

<u>Description</u>	<u>Criteria</u>
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

### ROCK VOIDS

<u>Voids</u>	<u>Void Diameter</u>
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

### GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

<u>Component</u>	<u>Size Range</u>
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

### ROCK QUALITY DESCRIPTION

<u>Rock Mass Description</u>	<u>RQD Value</u>
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

### DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

# SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS		
			GRAPH	LETTER			
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS  (LITTLE OR NO FINES)		<b>GW</b>	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES		
				<b>GP</b>	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES		
		GRAVELS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>GM</b>	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES		
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE				<b>GC</b>	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	
		SAND AND SANDY SOILS	CLEAN SANDS  (LITTLE OR NO FINES)		<b>SW</b>	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
					<b>SP</b>	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES	
	MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>SM</b>	SILTY SANDS, SAND - SILT MIXTURES	
					<b>SC</b>	CLAYEY SANDS, SAND - CLAY MIXTURES	
		FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		<b>ML</b>	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
						<b>CL</b>	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	<b>OL</b>				ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		<b>MH</b>	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS		
				<b>CH</b>	INORGANIC CLAYS OF HIGH PLASTICITY		
				<b>OH</b>	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS		
HIGHLY ORGANIC SOILS				<b>PT</b>	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS		

