

LEGEND:

PZ-# (X')	PIEZOMETER NUMBER AND (DEPTH)
B-# (X')	BORING NUMBER AND (DEPTH)
B-# (X')	EXISTING BORING AND (DEPTH)
	BY AVILES & OTHERS

AVILES ENGINEERING CORPORATION

BORING LOCATION PLAN

66-INCH WATER LINE INTERCONNECTION ALONG
W. HARDY ROAD FROM BELTWAY 8 TO GREENS ROAD
COH WBS No: S-000900-0166-4
HOUSTON, TEXAS

AEC REPORT NO: G167-17	DATE: 08-22-19	SOURCE DRAWING PROVIDED BY: GOOGLE
APPROX. SCALE: 1" = 400'	DRAFTED BY: WLW	PLATE NO.: PLATE A-2



PROJECT: **66-inch Water Line along West Hardy**

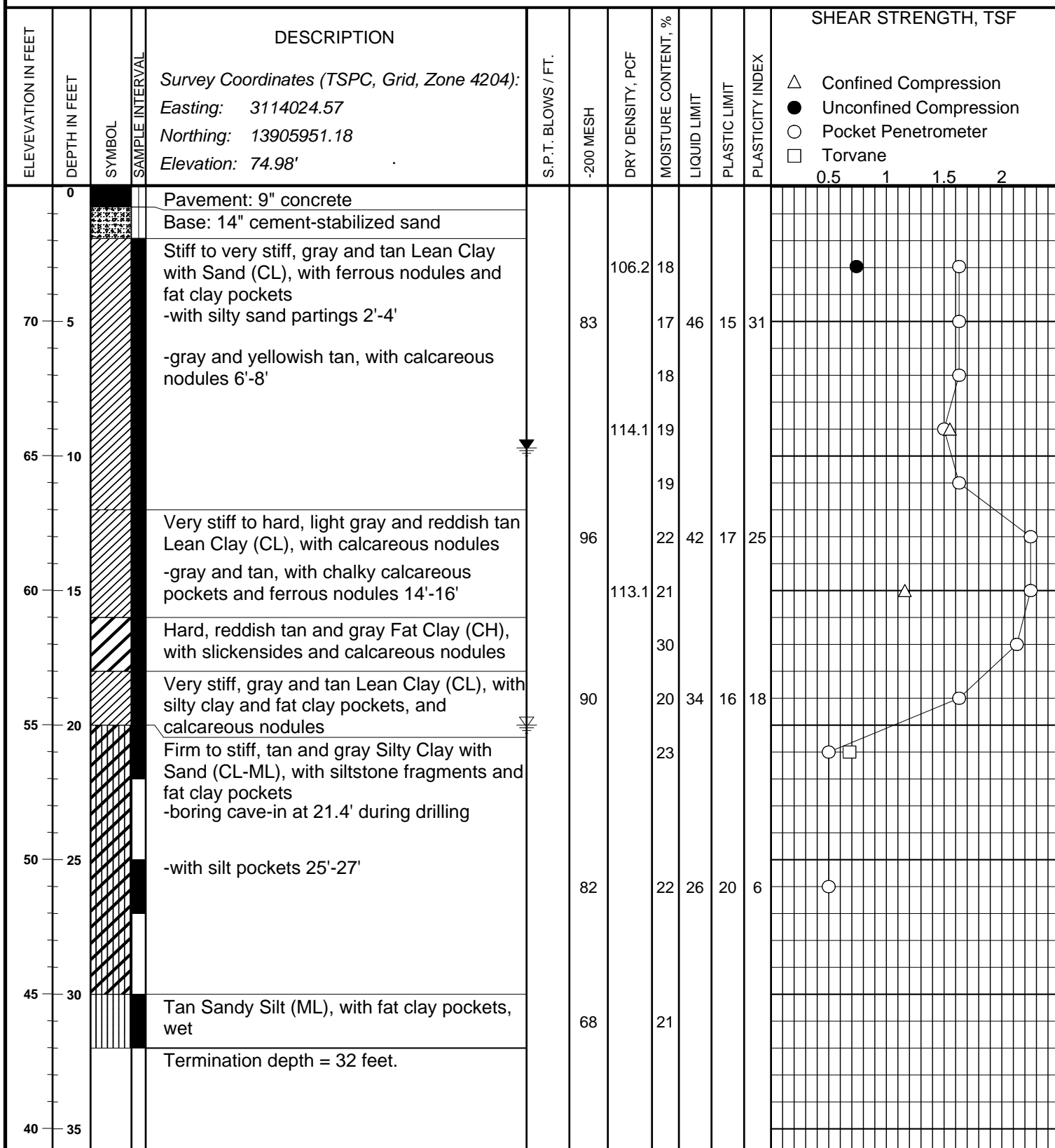
ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-1**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/16/2017**



BORING DRILLED TO 22 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 20 FEET WHILE DRILLING
 WATER LEVEL AT 9.7 FEET AFTER 15 MINS.
 DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY KH



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-2**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/22/2017**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF	
												△ Confined Compression	● Unconfined Compression
				Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3113905.94 Northing: 13906351.64 Elevation: 74.99'									
0	0			Pavement: 9" concrete									
				Base: 2" cement-stabilized sand			109.0	20					
				Stiff to hard, dark gray Lean Clay with Sand (CL)									
				-with calcareous nodules 0'-4'									
				-gray and olive 2'-4', with silty sand partings									
70	5			2'-6' and ferrous nodules 2'-12'		79	17	46	15	31			
				-gray and tan 4'-10'									
				-with fat clay pockets 6'-8'									
				-with sandy lean clay pockets 8'-10'									
65	10			-yellowish tan and gray 10'-12'									
				-groundwater at 11.7' approx. 15 min. after initial encounter									
				Very stiff to hard, red and gray Fat Clay (CH), with slickensides and abundant calcareous nodules		81	18	45	16	29			
				-with ferrous nodules 12'-14'									
60	15			Stiff to hard, light gray and tan Lean Clay (CL), with abundant sandy silt pockets and seams									
				-with silty clay pockets 16'-18'									
				-reddish tan and light gray 18'-20'									
				-boring cave-in at 19.4' during drilling									
55	20			Reddish tan Silt with Sand (ML), with calcareous nodules, wet		75	23	23	22	1			
				Very dense, reddish tan Sandy Silt (ML), with calcareous nodules, wet									
				-with silt and fat clay pockets 22'-24'		59	58	20					
				-tan, with gravel and fat clay pockets 24'-26'	50/5"								
50	25			Firm to hard, red Fat Clay (CH)									
				-with ferrous and calcareous nodules 26'-28'		39	98	23	52	20	32		
				-reddish tan 28'-30', with silty clay pockets									
				28'-30' and silt pockets 28'-32'		47		22					
45	30			Very stiff to hard, red Lean Clay (CL)									
				-with silty clay pockets 32'-34'		40		27					
				-red and light gray 34'-36'		28	93	22	28	14	14		
40	35						100.3	23					

BORING DRILLED TO 22 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 20 FEET WHILE DRILLING
 WATER LEVEL AT 11.6 FEET AFTER 11/27/2017
 DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY MRB



ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

PROJECT: 66-inch Water Line along West Hardy

BORING B-2

COH WBS No. S-000900-0166-4

TYPE 4" Dry Auger/Wet Rotary

DATE 11/22/2017

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF					
												0.5	1	1.5	2		
												△ Confined Compression ● Unconfined Compression ○ Pocket Penetrometer □ Torvane					
				Dense to very dense, red Sandy Silt (ML), wet -with 5" fat clay layer 36'-38' -reddish tan, with fat clay pockets 38'-45'	31			21									
35	40				53	66		20									
30	45				50/4"			22									
25	50			Very stiff, reddish tan Fat Clay (CH), with slickensides and silt laminations			95.4	30						△	○		
				Termination depth = 50 feet.													
20	55																
15	60																
10	65																
5	70																

BORING DRILLED TO 22 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 20 FEET WHILE DRILLING ∇
 WATER LEVEL AT 11.6 FEET AFTER 11/27/2017 ∇
 DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY MRB



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-3**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/16/2017**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												△	●	○	□				
75	0			Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3113866.60 Northing: 13906959.33 Elevation: 75.28'															
				Pavement: 7.3" concrete															
				Fill: very stiff, tan, gray, and dark gray Lean Clay (CL), with gravel and abundant sandy lean clay pockets				25											
				Stiff to very stiff, gray Lean Clay with Sand (CL), with ferrous nodules			116.2	15											
	5			-with calcareous nodules 2'-8'															
				-gray and tan 4'-10'	77		16	41	14	27									
								17											
	10			Very stiff to hard, tan and gray Fat Clay with Sand (CH)			109.8	21											
				-with lean clay pockets 10'-12'															
				-reddish tan and gray 12'-16', with abundant large calcareous nodules 12'-14' and claystone pockets 12'-16'	84		22	55	17	38									
	15							19											
				Hard, reddish tan and gray Lean Clay with Sand (CL)			99.9	22											
	20			Firm to very stiff, gray and tan Silty Clay with Sand (CL-ML)			74	17	31	15	16								
				-with abundant silty clayey sand pockets 18'-20'															
				-with siltstone gravel 20'-22'															
				-boring cave-in at 20.7' during drilling	76		110.5	18	26	19	7								
				Tan and gray Silt with Sand (ML), with lean clay pockets and calcareous nodules, wet															
				Hard, reddish tan and gray Fat Clay (CH), with claystone and calcareous nodules	78			25	NP	NP	NP								
	25																		
				Dense to very dense, tan and gray Silty Sand (SM), wet															
					94			21											
				-reddish tan 28'-30', with calcareous nodules 28'-30' and fat clay pockets 28'-32'	82		35												
	30																		
				-tan 30'-38'	79			22											
				-with calcareous nodules 32'-34'	48			27											
	35			-with lean clay pockets 34'-36'	50/			23											

BORING DRILLED TO **22** FEET WITHOUT DRILLING FLUID

WATER ENCOUNTERED AT **20** FEET WHILE DRILLING

WATER LEVEL AT **13.9** FEET AFTER **17 MINS.**

DRILLED BY **Van and Sons** DRAFTED BY **MRB** LOGGED BY **KH**



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-3**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/16/2017**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												0.5	1	1.5	2				
				Silty Sand (cont...) -with silty clay pockets 36'-38'	5.5"			19											
	40			Hard, tan and light gray Sandy Fat Clay (CH), with calcareous nodules	81			23											
	45			-with lean clay pockets 43'-45'	50/ 4.5"	60		27											
	50			Very stiff to hard, red Fat Clay (CH), with slickensides			92.7	30											
	50			Termination depth = 50 feet.															
	55																		
	60																		
	65																		
	70																		

BORING DRILLED TO **22** FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT **20** FEET WHILE DRILLING
 WATER LEVEL AT **13.9** FEET AFTER **17 MINS.**
 DRILLED BY **Van and Sons** DRAFTED BY **MRB** LOGGED BY **KH**



PROJECT: **66-inch Water Line along West Hardy**

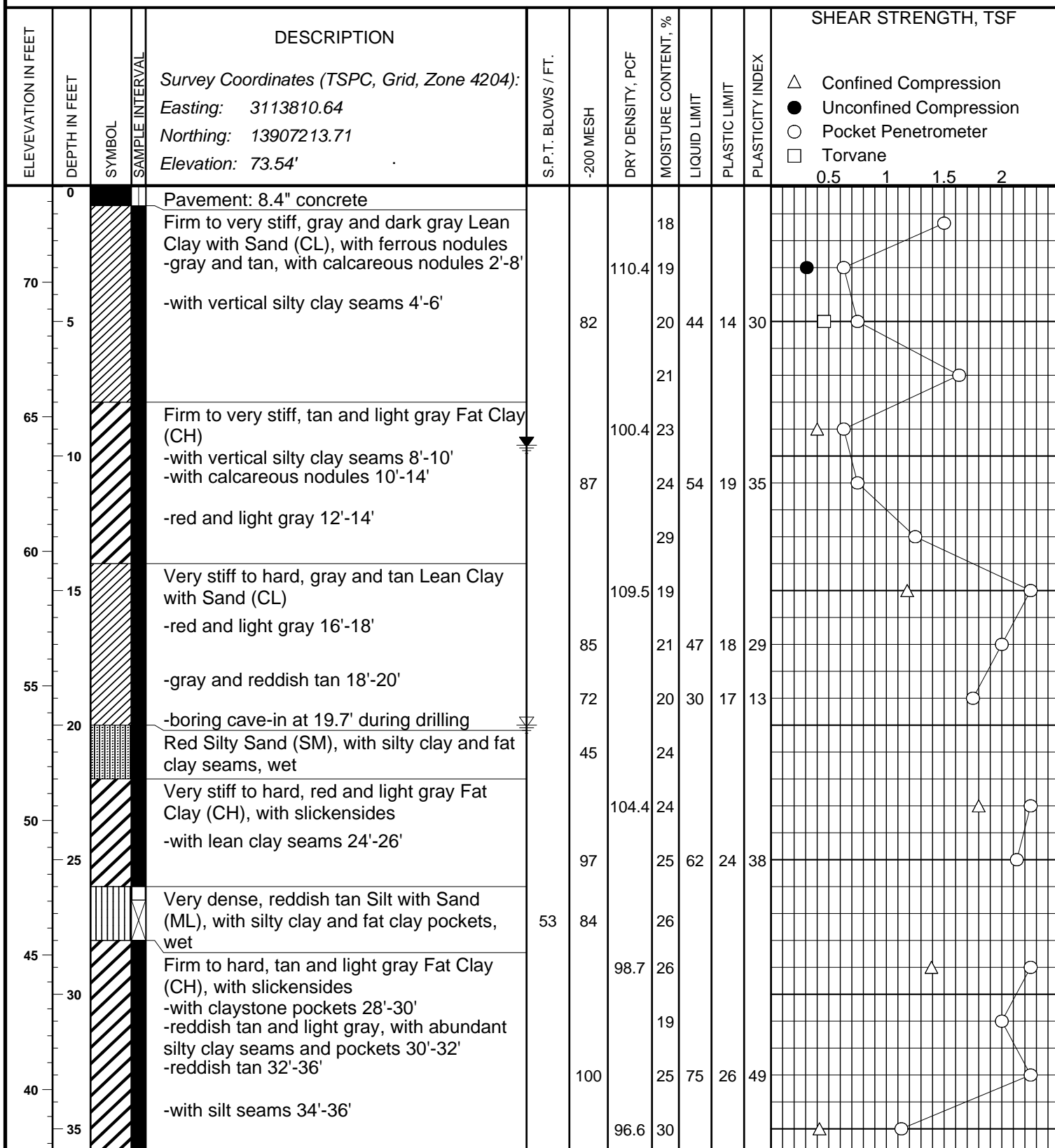
ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-4**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/20/2017**



BORING DRILLED TO **22** FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT **20** FEET WHILE DRILLING
 WATER LEVEL AT **9.6** FEET AFTER **15 MINS.**
 DRILLED BY **Van and Sons** DRAFTED BY **MRB** LOGGED BY **KH**



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-4**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/20/2017**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												0.5	1	1.5	2				
35				Very dense, tan Silty Sand (SM), wet -with lean clay pockets 36'-38'	50/ 5.5"			23											
40				-with fat clay pockets 38'-40'	50/4"	30		25											
30				Very stiff to hard, reddish tan and gray Fat Clay (CH), with silt laminations -with silt pockets 43'-45'			107.9	20											
45																			
25				-reddish tan 48'-50'				27											
50				Termination depth = 50 feet.															

BORING DRILLED TO 22 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 20 FEET WHILE DRILLING
 WATER LEVEL AT 9.6 FEET AFTER 15 MINS.
 DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY KH



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-5**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger**

DATE **11/21/2017**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF						
												△	●	○	□			
				Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3113572.40 Northing: 13907775.63 Elevation: 74.90'														
0				Pavement: 8" concrete														
70	5			Stiff to very stiff, dark gray Sandy Lean Clay (CL) -with ferrous nodules 0'-2' -gray and dark gray, with abundant calcareous nodules 2'-6' -with ferrous nodules 4'-6'	63		117.8	17										
65	10			Soft to very stiff, tan and gray Fat Clay (CH) -with ferrous nodules 6'-12', and calcareous nodules and lean clay pockets 6'-10'				15										
60	15			-reddish tan and light gray, with calcareous nodules 12'-14' -with silty clay pockets 14'-16'	93		110.8	17										
55	20			Stiff to hard, reddish tan and light gray Lean Clay with Sand (CL) -with fat clay pockets and calcareous nodules 16'-18' -tan and light gray, with silt seams and pockets 18'-20'	80		109.0	16	25	62	22	40						
50	25			Firm, tan and light gray Lean Clay (CL), with silt partings/pockets and fat clay pockets -boring cave-in at 22' during drilling Termination depth = 25 feet.	95			22										
45	30							18										
40	35							19										

BORING DRILLED TO N/A FEET WITHOUT DRILLING FLUID

WATER ENCOUNTERED AT 23 FEET WHILE DRILLING

WATER LEVEL AT 20.8 FEET AFTER 15 MINS.

DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY KH



PROJECT: **66-inch Water Line along West Hardy**

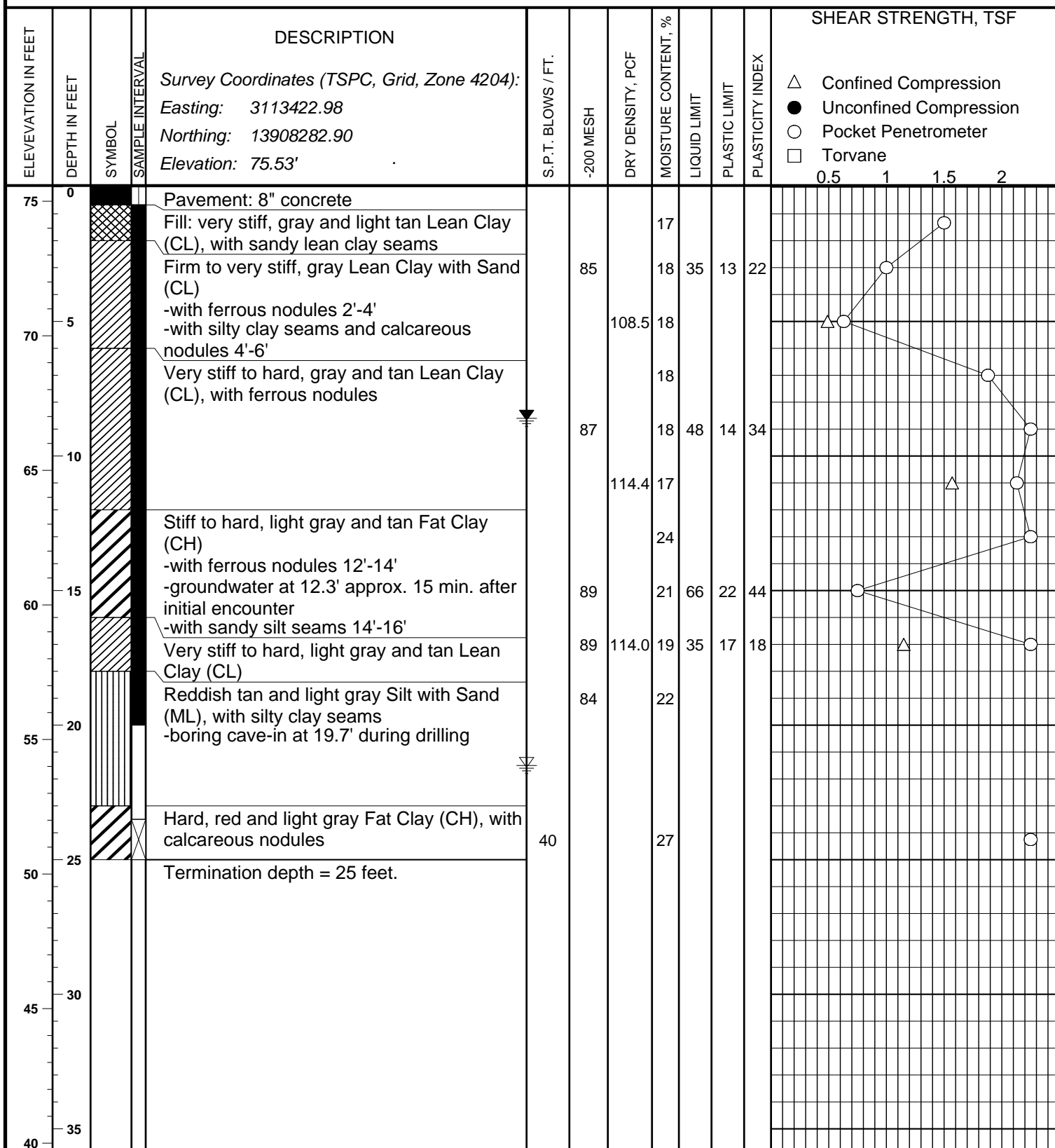
ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-6**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger**

DATE **11/20/2017**



BORING DRILLED TO 25 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 21.5 FEET WHILE DRILLING
 WATER LEVEL AT 8.6 FEET AFTER 11/27/2017
 DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY KH



PROJECT: **66-inch Water Line along West Hardy**

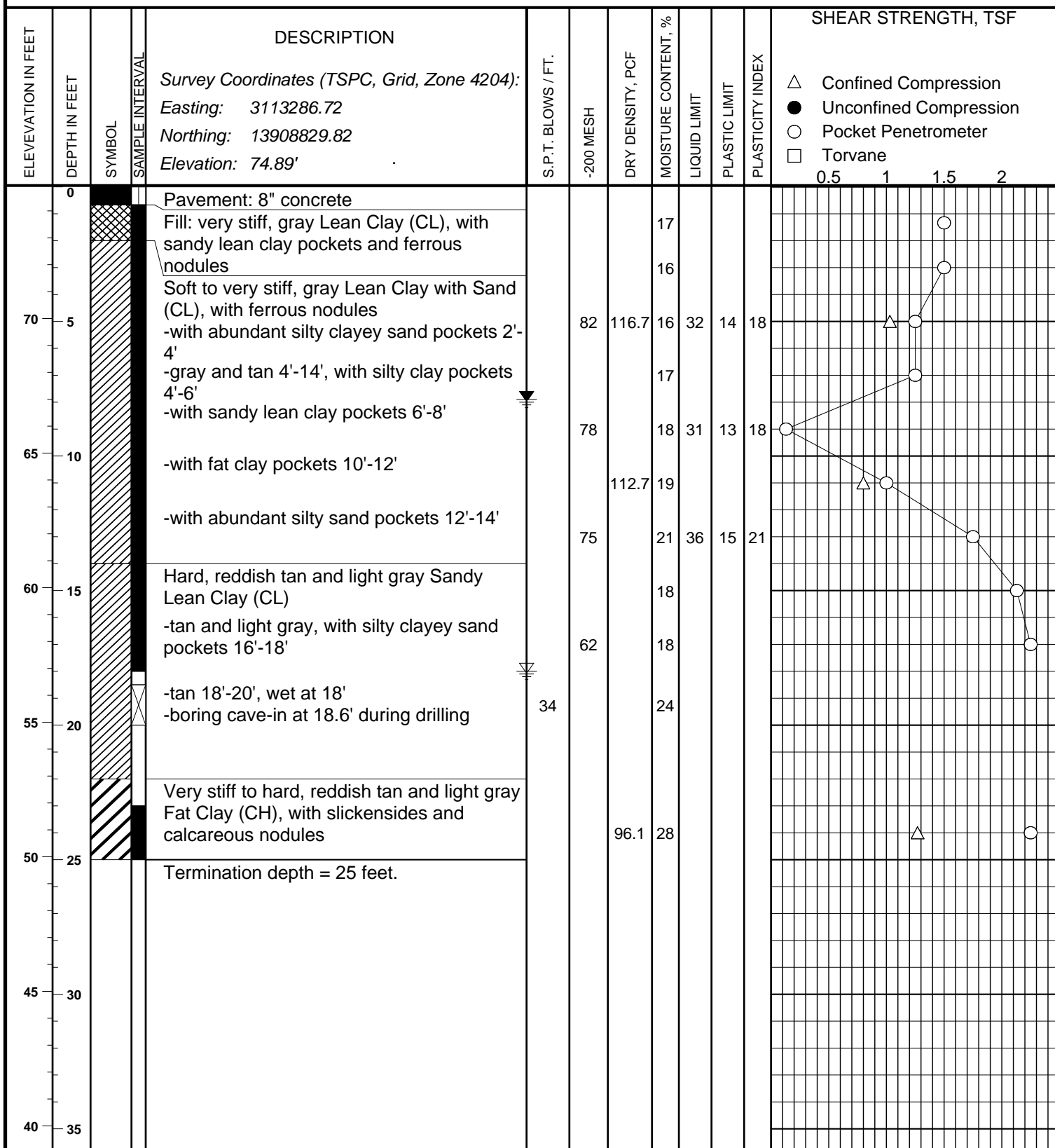
ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-7**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/21/2017**



BORING DRILLED TO 20 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 18 FEET WHILE DRILLING
 WATER LEVEL AT 7.9 FEET AFTER 15 MINS.
 DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY KH



PROJECT: **66-inch Water Line along West Hardy**

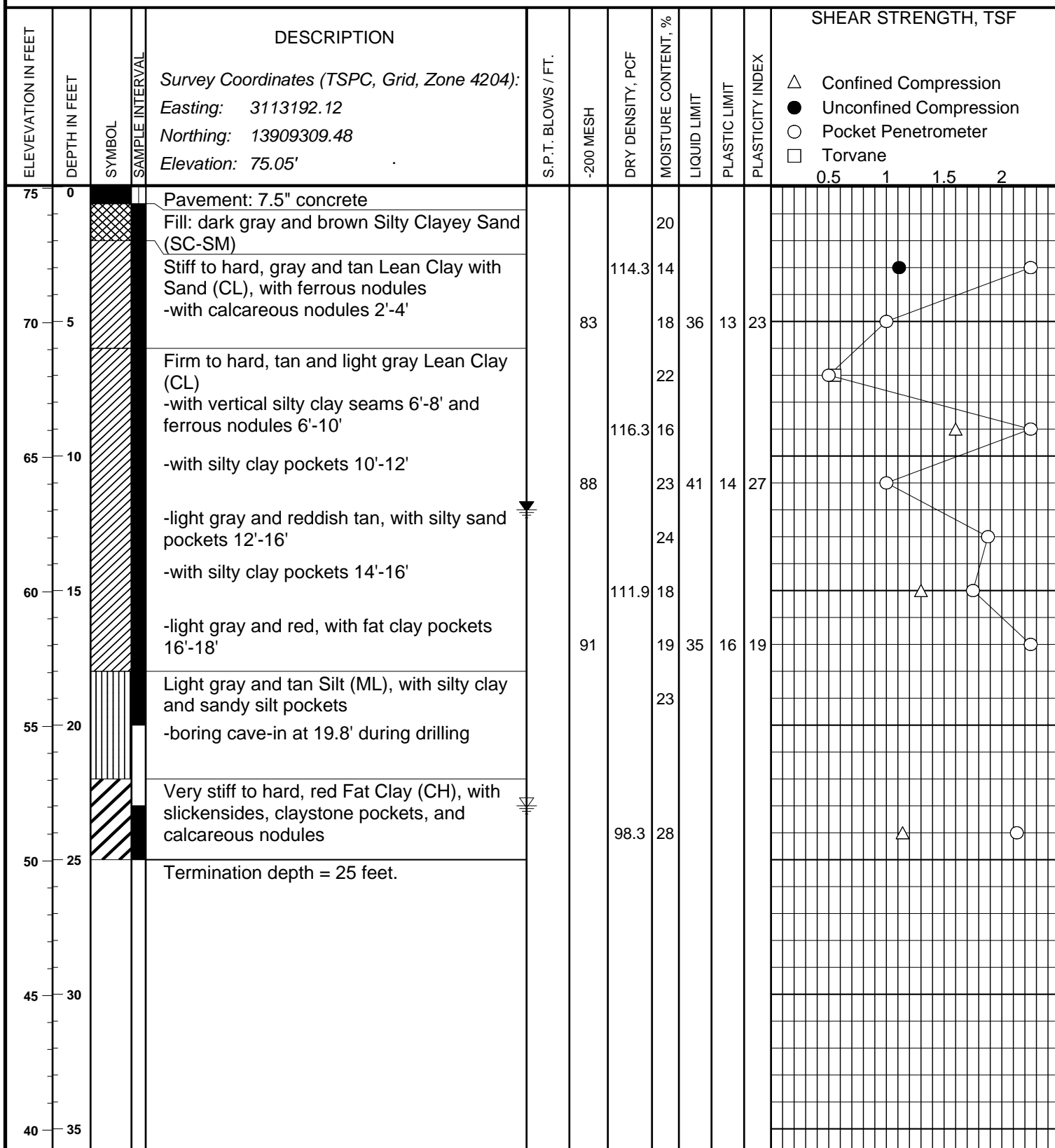
ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-8**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger**

DATE **11/21/2017**



BORING DRILLED TO N/A FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 23 FEET WHILE DRILLING
 WATER LEVEL AT 12 FEET AFTER 15 MINS.
 DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY KH



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-9**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger**

DATE **11/21/2017**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF						
												△	●	○	□			
				Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3113066.14 Northing: 13909755.33 Elevation: 75.68'														
75	0			Pavement: 6.9" concrete														
				Hard, dark gray Silty Clay with Sand (CL-ML), with sandy silt pockets and ferrous nodules		84		16	23	16	7							
				Very stiff, gray and tan Lean Clay with Sand (CL), with ferrous nodules				17										
	5			-with sandy lean clay pockets 2'-6'			118.5	15										
				-light gray, with silty sand partings 4'-6'				16										
				-light gray and tan 6'-10', with silty clay pockets 6'-8'				16										
				-with sandy silt pockets 8'-10'				16										
	10			Stiff to hard, light gray and tan Fat Clay (CH), with slickensides		79		35	13	22								
				-with silty sand partings and ferrous nodules 10'-12'				106.7	23									
				-reddish tan and light gray 12'-14', with silty sand pockets 12'-14' and calcareous nodules 12'-16'				25										
				-with silty clay seams 14'-16'				25										
	15			Firm to very stiff, reddish tan and light gray Lean Clay (CL), with fat clay pockets		97		23	39	18	21							
				-with silty clay pockets and calcareous nodules 16'-18'				101.2	27									
	20			Very stiff, red and light gray Fat Clay (CH), with slickensides				31										
	25			Termination depth = 25 feet.														

BORING DRILLED TO N/A FEET WITHOUT DRILLING FLUID

WATER ENCOUNTERED AT N/A FEET WHILE DRILLING

WATER LEVEL AT N/A FEET AFTER COMPLETE

DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY KH



PROJECT: **66-inch Water Line along West Hardy**

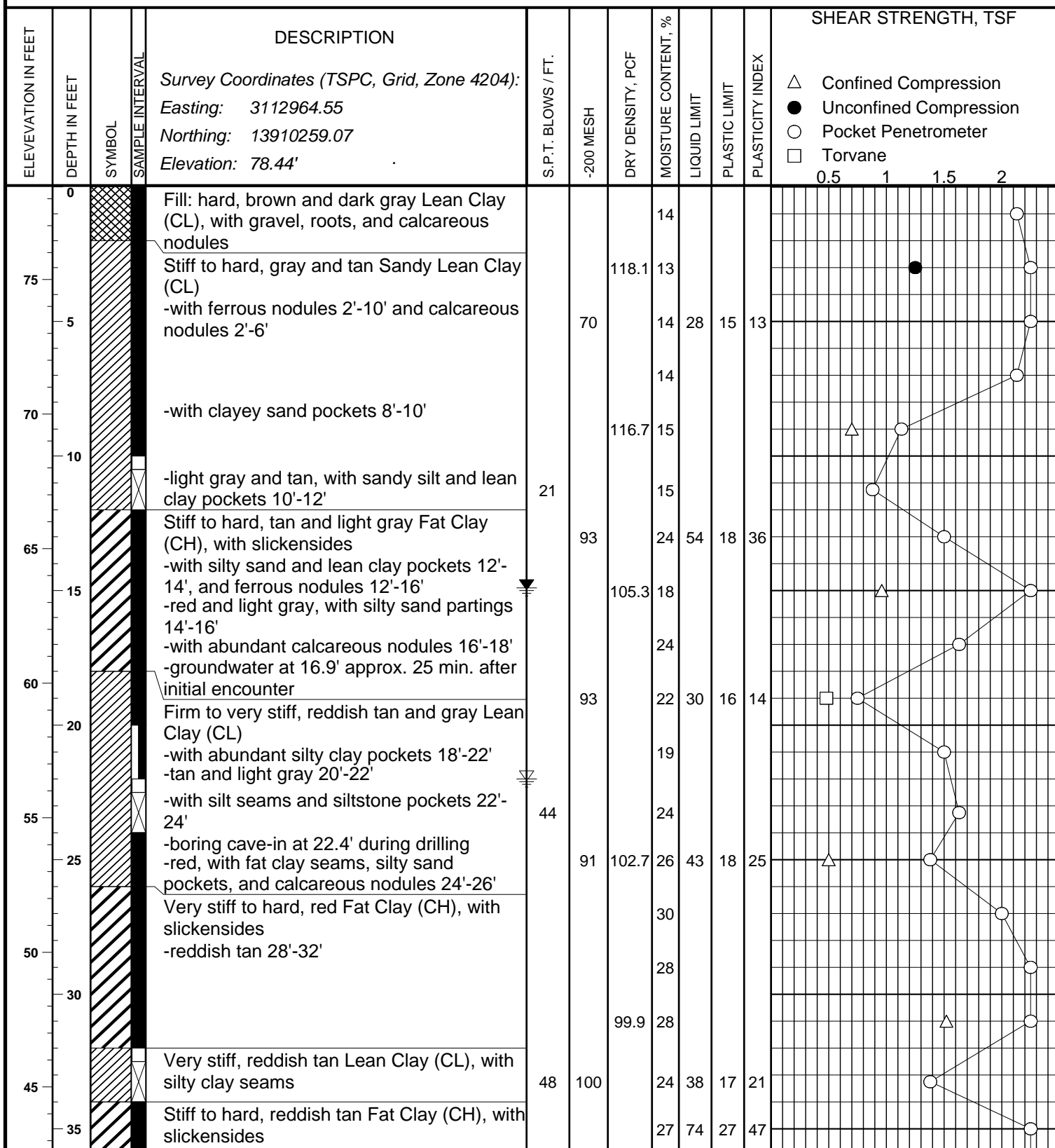
ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-10**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **12/15/2017**



BORING DRILLED TO **23** FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT **22** FEET WHILE DRILLING
 WATER LEVEL AT **14.9** FEET AFTER **12/20/2017**
 DRILLED BY **Van and Sons** DRAFTED BY **MRB** LOGGED BY **RJM**



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-10**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **12/15/2017**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												0.5	1	1.5	2				
40	40			Fat Clay (cont...) -with silt seams 36'-40' -red 38'-40'				24											
40	40			Hard, reddish tan Sandy Lean Clay (CL), with sandstone fragments, wet -with sand and silty clay pockets, and calcareous nodules 40'-42' -with fat clay pockets 42'-44'	50/5"	66	30	30	14	16									
35	35			Very stiff to hard, red Fat Clay (CH), with slickensides -with calcareous nodules 44'-48' -with claystone pockets 46'-48'	50/4"		31												
45	45			-grayish tan and gray 48'-50'	37		27												
30	30			-tan and gray, with ferrous nodules 53'-55'	97		28	78	23	55									
50	50			-reddish tan and gray, with silt pockets 58'-60'			17												
55	55			Termination depth = 60 feet.															
60	60																		
65	65																		
70	70																		

- △ Confined Compression
- Unconfined Compression
- Pocket Penetrometer
- Torvane

BORING DRILLED TO 23 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 22 FEET WHILE DRILLING
 WATER LEVEL AT 14.9 FEET AFTER 12/20/2017
 DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY RJM



PROJECT: **66-inch Water Line along West Hardy**

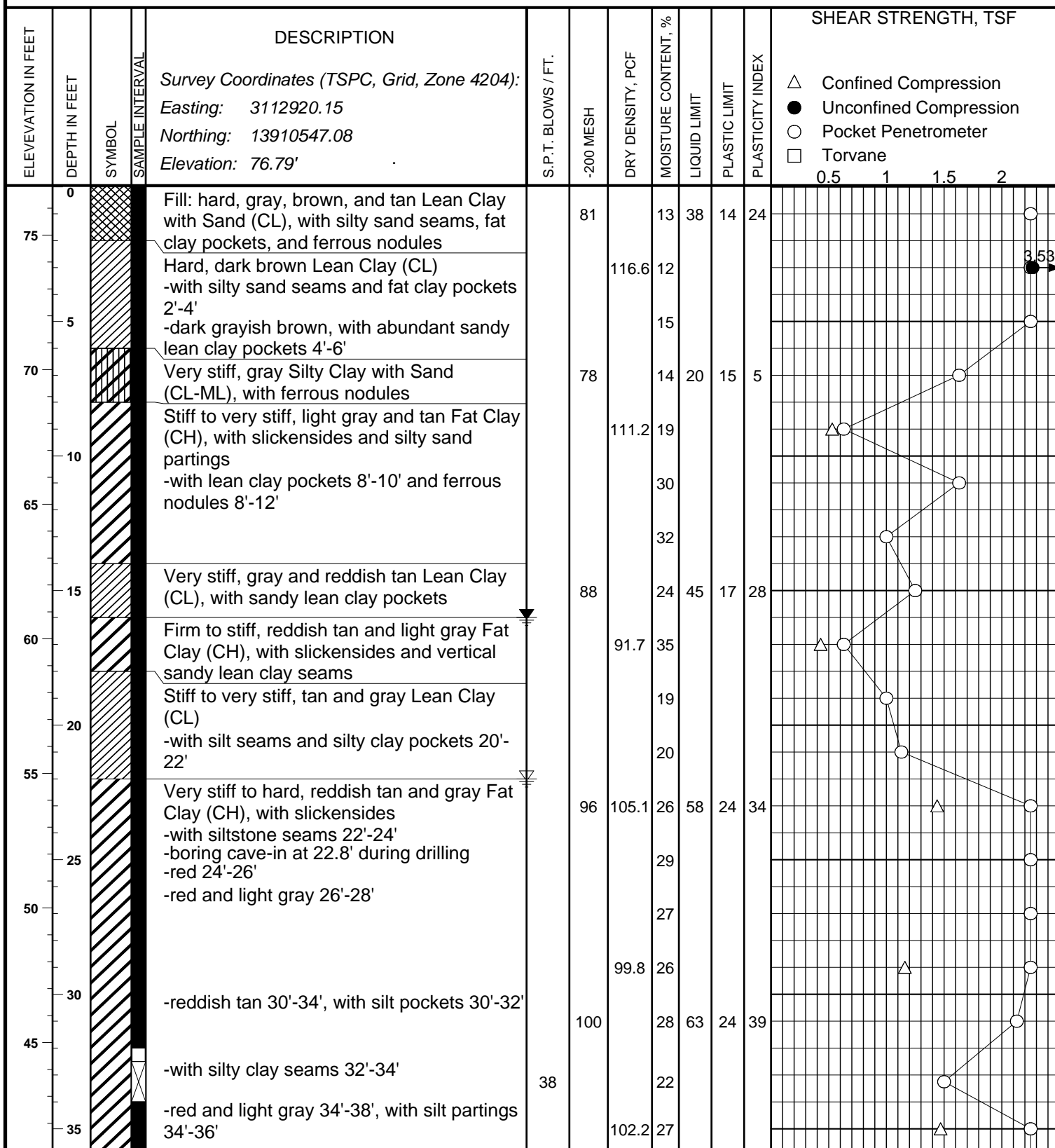
ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-11**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/15/2017**



BORING DRILLED TO 24 FEET WITHOUT DRILLING FLUID

WATER ENCOUNTERED AT 22 FEET WHILE DRILLING

WATER LEVEL AT 16 FEET AFTER 15 MINS.

DRILLED BY Van and Sons

DRAFTED BY MRB

LOGGED BY

KH



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-11**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/15/2017**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												0.5	1	1.5	2				
40				Fat Clay (cont...)				25											
				-reddish tan 38'-40'				100.8											
40				Hard, tan Lean Clay with Sand (CL), with silty clay pockets, wet -with fat clay pockets 40'-42'	80	71	23	26	14	12									
35					42			26											
45				Firm to hard, reddish tan Fat Clay (CH), with slickensides				96.7											
30				-gray and reddish tan 53'-55'															
50					100			31	80	29	51								
55								87.5											
20				Hard, gray and tan Lean Clay (CL), with abundant sandy lean clay pockets															
60				Termination depth = 60 feet.				16											
65																			
70																			

- △ Confined Compression
- Unconfined Compression
- Pocket Penetrometer
- Torvane

BORING DRILLED TO 24 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 22 FEET WHILE DRILLING
 WATER LEVEL AT 16 FEET AFTER 15 MINS.
 DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY KH



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-12**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/14/2017**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF					
												0.5	1	1.5	2		
				Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3112812.02 Northing: 13910927.22 Elevation: 75.66'								△ Confined Compression ● Unconfined Compression ○ Pocket Penetrometer □ Torvane					
75	0			Stiff to hard, gray and dark gray Lean Clay with Sand (CL) -with ferrous nodules 0'-2' -gray and tan 2'-10', with silty sand seams 2'-4' and calcareous nodules 2'-6' -with ferrous nodules 4'-8'				12									
70	5			-with fat clay seams 8'-10'	82		115.2	17	39	14	25						
65	10			Stiff to hard, light gray and tan Fat Clay (CH), with slickensides -with silty clay seams and ferrous nodules 10'-12' -with calcareous nodules 12'-14' -reddish tan and light gray, with silt partings 14'-16'	84		108.0	21	36	14	22						
60	15			-reddish tan and light gray 20'-24'	98		103.6	24	57	24	33						
55	20			-reddish tan 24'-28'			101.7	26									
50	25				100			26	68	27	41						
45	30			Very dense, tan Silt (ML), with abundant siltstone fragments, wet -with silty sand seams 28'-30'	53		93	22	NP	NP	NP						
40	35			Stiff to hard, reddish tan Fat Clay (CH), with slickensides -with siltstone fragments 32'-34'	98		103.0	24	57	22	35						

BORING DRILLED TO **30** FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT **28** FEET WHILE DRILLING
 WATER LEVEL AT **23.3** FEET AFTER **15 MINS.**
 DRILLED BY **Van and Sons** DRAFTED BY **MRB** LOGGED BY **JG**



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-12**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/14/2017**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF										
												0.5	1	1.5	2							
40	36'-38'			Fat Clay (cont...) -with silt pockets 36'-38'			103.3	26														
40	38'-40'			-with silty clay seams 38'-40'																		
45	43'-45'			-with silt pockets 43'-45'	41	97		23	59	24	35											
50	48'-50'			-with silt laminations 48'-50'				28														
50	Termination depth = 50 feet.																					

- △ Confined Compression
- Unconfined Compression
- Pocket Penetrometer
- Torvane

BORING DRILLED TO **30** FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT **28** FEET WHILE DRILLING
 WATER LEVEL AT **23.3** FEET AFTER **15 MINS.**
 DRILLED BY **Van and Sons** DRAFTED BY **MRB** LOGGED BY **JG**



PROJECT: **66-inch Water Line along West Hardy**

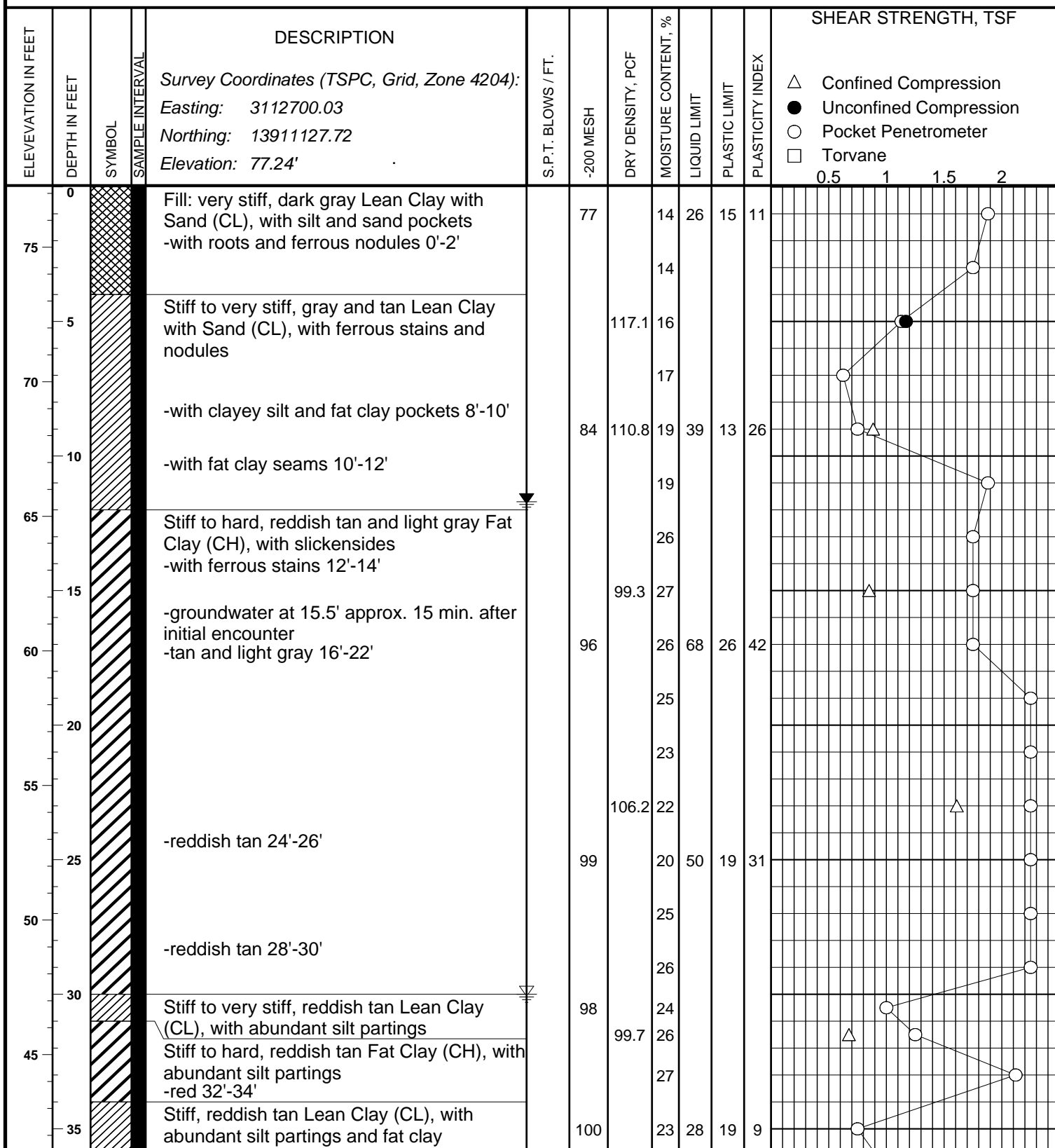
ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-13**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **02/08/2018**



BORING DRILLED TO **32** FEET WITHOUT DRILLING FLUID

WATER ENCOUNTERED AT **30** FEET WHILE DRILLING

WATER LEVEL AT **11.7** FEET AFTER **02/12/2018**

DRILLED BY **Van and Sons** DRAFTED BY **WLW** LOGGED BY **BPJ**



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-13**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **02/08/2018**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF	
												△ Confined Compression	● Unconfined Compression
40				laminations	16								
				Very stiff, reddish tan Fat Clay (CH), with abundant silt partings									
40				Very stiff, tan Lean Clay (CL), with abundant silt partings and fat clay laminations	100		99.9	27					
35				Very stiff to hard, reddish tan Fat Clay (CH), with silt partings									
45					23			27					
50				Termination depth = 50 feet.				29					

BORING DRILLED TO **32** FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT **30** FEET WHILE DRILLING
 WATER LEVEL AT **11.7** FEET AFTER **02/12/2018**
 DRILLED BY **Van and Sons** DRAFTED BY **WLW** LOGGED BY **BPJ**



ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

PROJECT: **66-inch Water Line along West Hardy**

BORING **B-13A**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger**

DATE **01/15/19**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF						
												0.5	1	1.5	2			
0	0			Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3112700.03 Northing: 13911127.72 Elevation: 77														
75	0-20			No sampling performed from 0'-20' *Boring coordinates and elevation taken from Boring B-13 Gray Sandy Lean Clay (CL)														
5	20-55			-moist at 5' during drilling														
70	55-65			Hard, light gray and tan Fat Clay (CH), with slickensides														
15	65-20			-with calcareous nodules 22'-24'				23	52	22	30							
60	20-26			Termination depth = 26 feet.														
25	26-35																	
50	35-45																	
30	45-50																	
45	50-55																	
35	55-60																	

BORING DRILLED TO 26 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT N/A FEET WHILE DRILLING
 WATER LEVEL AT N/A FEET AFTER **COMPLETE**
 DRILLED BY JH Drilling DRAFTED BY WLW LOGGED BY BTC



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-14**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **05/07/2018**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF						
												0.5	1	1.5	2			
				Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3113929.93 Northing: 13906674.58 Elevation: 74.24								△ Confined Compression ● Unconfined Compression ○ Pocket Penetrometer □ Torvane						
0				Pavement: 3.2" concrete														
	70			Fill: stiff to hard, gray and dark gray Lean Clay with Sand (CL) -with gravel 0'-2' -gray, with silty sand and fat clay pockets, and calcareous nodules 2'-4' TCP: 6(6") 4(6") -gray and tan, with silty sand partings 6'-8'		73		14	34	14	20							
	65			Stiff to very stiff, light gray and tan Fat Clay with Sand (CH), with slickensides TCP: 4(6") 7(6") -with silty sand pockets and ferrous nodules 10'-12' -light gray and reddish tan 12'-14'		85		110.8	19									
	60			TCP: 6(6") 9(6")														
	55			Soft to very stiff, light gray Lean Clay (CL), with fat clay pockets TCP: 16(6") 17(6") -light gray and reddish tan 20'-24', with calcareous nodules 20'-22' -with silty clay pockets 22'-24'		19		91.2	35	61	17	44						
	50			TCP: 14(6") 18(6") -reddish tan 26'-30', with fat clay and silty sand seams 26'-28'		14	98		25	37	19	18						
	45			TCP: 32(6") 34(6")														
	40			Medium dense to dense, tan Sandy Silt (ML), wet -with fat clay pockets 32'-34' TCP: 50(2") 50(2")		16		94	22	29	17	12						
						19		26										
						19	67		23									

BORING DRILLED TO 20 FEET WITHOUT DRILLING FLUID

WATER ENCOUNTERED AT 20 FEET WHILE DRILLING

WATER LEVEL AT 11.5 FEET AFTER 18 MINS.

DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY RJM



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-14**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **05/07/2018**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												0.5	1	1.5	2				
				Sandy Silt (cont...) -with silty clay pockets and fat clay partings 36'-38'	31			19											
	40			Dense, tan Silty Sand (SM), with fat clay pockets, wet TCP: 50(4") 42(6")	36	34		23											
				Stiff to hard, reddish tan Fat Clay (CH), with slickensides TCP: 11(6") 16(6")	14			33											
	45			-with silt partings 47'-49'															
				Reddish tan Clayey Sand (SC), with silty clayey sand pockets TCP: 14(6") 14(6")															
	50			-with sandy lean clay seams 52'-54'															
				TCP: 14(6") 17(6")			114.0	17											
	55			-dark tan, with silty clay pockets 57'-59'															
				TCP: 20(6") 21(6")				22											
	60			Termination depth = 61 feet.															
	65																		
	70																		

BORING DRILLED TO 20 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 20 FEET WHILE DRILLING
 WATER LEVEL AT 11.5 FEET AFTER 18 MINS.
 DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY RJM



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-15**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **05/07/2018**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF						
												△	●	○	□			
				Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3113943.90 Northing: 13906523.39 Elevation: 74.04														
0				Pavement: 4.75" concrete														
	0-70			Fill: stiff to very stiff, dark gray and tan Lean Clay with Sand (CL), with silty sand pockets -with gravel 0'-2' -with fat clay pockets and calcareous nodules 2'-4' TCP: 4(6") 6(6")	82			15										
	70-65			Stiff to very stiff, gray and tan Fat Clay (CH), with ferrous nodules -with calcareous nodules 6'-8' TCP: 4(6") 4(6")			114.0	18										
	65-60			-reddish tan and light gray 10'-14' -with lean clay pockets 12'-14'	90			19										
	60-55			Stiff, light gray and tan Sandy Lean Clay (CL) TCP: 11(6") 15(6") -boring cave-in at 16.7' during drilling	68		109.9	18	30	18	12							
	55-50			TCP: 8(6") 13(6") Firm to very stiff, tan and light gray Fat Clay (CH), with slickensides -with calcareous nodules 20'-22' -reddish tan 22'-24'	16			27										
	50-45			TCP: 15(6") 15(6") Dense to very dense, tan Silty Sand (SM), wet	40			22										
	45-40			TCP: 50(3") 50(3") Very stiff to hard, reddish tan Fat Clay (CH), with slickensides	91/10"	34		18										
	40-35			TCP: 50(2") 50(2")				27										

△ Confined Compression
● Unconfined Compression
○ Pocket Penetrometer
□ Torvane

0.5 1 1.5 2

BORING DRILLED TO 20 FEET WITHOUT DRILLING FLUID

WATER ENCOUNTERED AT 20 FEET WHILE DRILLING

WATER LEVEL AT 16.7 FEET AFTER 15 MINS.

DRILLED BY Van and Sons

DRAFTED BY MRB

LOGGED BY

RJM



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-15**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **05/07/2018**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												0.5	1	1.5	2				
35	40			Dense to very dense, tan Silty Sand (SM), wet TCP: 23(6") 19(6") -with silty clayey sand pockets 40'-42' -with clayey sand pockets 42'-44'	41	39		20											
30	45			Hard, reddish tan Fat Clay (CH), with silt laminations TCP: 11(6") 14(6")	50/4"	28		23											
25	50			TCP: 14(6") 17(6")		97		25	72	25	47								
20	55			Dense, light gray and tan Clayey Sand (SC), wet -with silty sand and sandy lean clay pockets 52'-54' TCP: 50(3") 50(2")			115.9	17											
15	60			-tan and gray, with silty clayey sand pockets 57'-59' TCP: 50(3") 50(4")	49			22											
10	65			Termination depth = 61 feet.															
5	70																		

BORING DRILLED TO 20 FEET WITHOUT DRILLING FLUID

WATER ENCOUNTERED AT 20 FEET WHILE DRILLING

WATER LEVEL AT 16.7 FEET AFTER 15 MINS.

DRILLED BY Van and Sons DRAFTED BY MRB LOGGED BY RJM



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-16**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger**

DATE **11/8/18**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												0.5	1	1.5	2				
				<p>Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3113380.68 Northing: 13905859.05 Elevation: 76.36</p>															
75	0			Hard, dark gray Lean Clay with Sand (CL), with ferrous nodules	77			14											
				Stiff to very stiff, gray Sandy Lean Clay (CL), with calcareous nodules and ferrous stains -gray and tan 4'-6'			119.5	16											
70	5			Stiff to hard, gray and tan Lean Clay with Sand (CL) -with fat clay pockets 6'-14' and calcareous nodules 6'-8' -with ferrous stains 8'-12'	69		15	34	15	19									
				-reddish tan and gray 12'-14', with calcareous nodules 12'-18'				19											
65	10				84		17	45	18	27									
								23											
60	15				76		18	30	19	11									
				-with silty clay pockets 23'-25'				19											
55	20							21											
50	25			Termination Depth = 25 feet.															

- △ Confined Compression
- Unconfined Compression
- Pocket Penetrometer
- Torvane

BORING DRILLED TO **25** FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT **N/A** FEET WHILE DRILLING
 WATER LEVEL AT **N/A** FEET AFTER **COMPLETE**
 DRILLED BY **Van and Sons** DRAFTED BY **JG** LOGGED BY **BTC**



ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

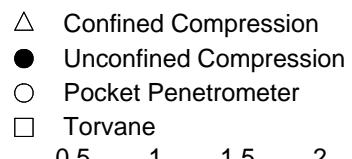
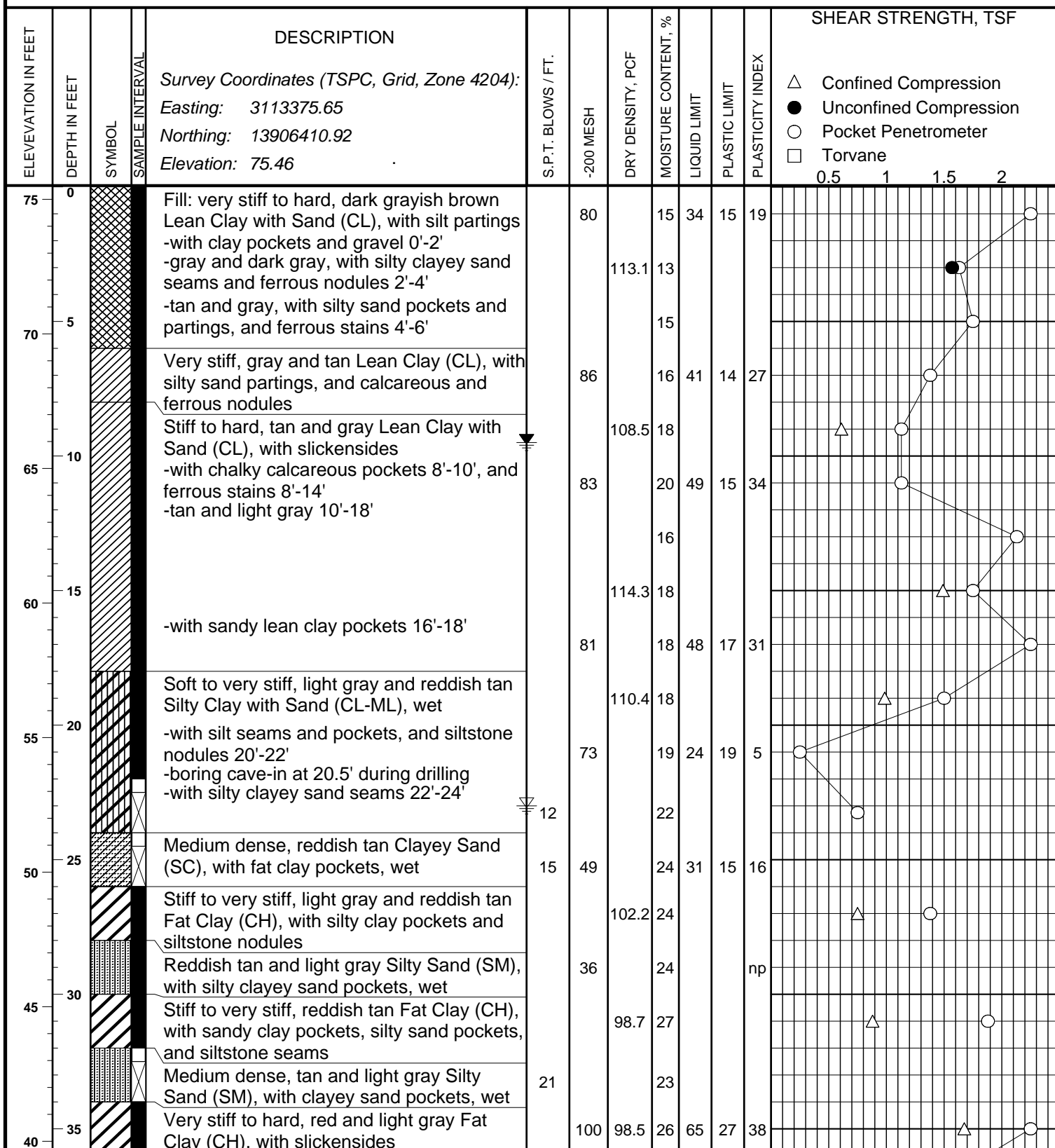
BORING **B-17**

PROJECT: **66-inch Water Line along West Hardy**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **08/17/2018**



BORING DRILLED TO **23** FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT **23** FEET WHILE DRILLING
 WATER LEVEL AT **9.5** FEET AFTER **15** MINS.
 DRILLED BY **Van and Sons** DRAFTED BY **BTC** LOGGED BY **CK**



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-17**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **08/17/2018**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												0.5	1	1.5	2				
				Fat Clay (cont.) -reddish tan, with silty sand seams 36'-38'	8			24											
	40			Stiff to very stiff, reddish tan Lean Clay (CL) -with fat clay pockets 38'-40'	10	100		24	31	17	14								
35				-red, with silt partings and pockets 40'-42'		100	100.0	23	40	19	21								
				-with fat clay and abundant silty clay pockets 42'-44', wet at 42'	11			30											
30	45																		
				Very stiff to hard, red and gray Fat Clay (CH), with slickensides			91.6	31											
25	50																		
				Very stiff to hard, tan and gray Lean Clay (CL) -with calcareous nodules 53'-55'		91		16	45	16	29								
20	55																		
				-reddish tan and gray 58'-60'	21			24											
15	60			Termination depth = 60 feet.															
10	65																		
5	70																		

- △ Confined Compression
- Unconfined Compression
- Pocket Penetrometer
- Torvane

BORING DRILLED TO **23** FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT **23** FEET WHILE DRILLING
 WATER LEVEL AT **9.5** FEET AFTER **15 MINS.**
 DRILLED BY **Van and Sons** DRAFTED BY **BTC** LOGGED BY **CK**



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-18**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **08/20/2018**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF						
												0.5	1	1.5	2			
				Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3113358.32 Northing: 13906700.36 Elevation: 76.05														
75	0			Pavement: 8.5" concrete over 1" asphalt Base: 14" cement-stabilized sand/gravel/shell														
70	5			Very stiff, gray and dark gray Lean Clay with Sand (CL), with calcareous nodules -with ferrous nodules 2'-3' TCP: 5(6") 7(6")	79		113.8	18	37	14	23							
65	10			Stiff to very stiff, grayish tan and gray Fat Clay (CH), with calcareous nodules, ferrous nodules, and lean clay pockets -gray and tan 8'-13', with abundant chalky calcareous pockets 8'-10' TCP: 4(6") 4(6")				18										
60	15			Hard, light gray and tan Lean Clay (CL), with fat clay pockets and ferrous stains TCP: 8(6") 13(6")				21	52	15	37							
55	20			Hard, light gray and tan Fat Clay (CH), with lean clay pockets and ferrous stains TCP: 23(6") 32(6")				19	52	18	34							
50	25			Very stiff, light gray and tan Lean Clay (CL), with sandy lean clay pockets -boring cave-in at 19.1' during drilling TCP: 23(6") 32(6")				113.2	17									
45	30			Medium dense, tan and light gray Silty Clayey Sand (SC-SM), with silt and sandy lean clay pockets TCP: 9(6") 10(6")	12	42		22	22	17	5							
40	35			Very stiff to hard, tan and light gray Fat Clay (CH), with slickensides and calcareous nodules -with silty clay seams 23'-25' TCP: 9(6") 10(6") -reddish tan and light gray 26'-28'	16	95		102.9	26									
35	40			Medium dense to very dense, tan and reddish tan Silty Sand (SM), wet TCP: 50(5") 50(3")	29			24										
30	45			-tan 31'-35'	31	18		22										
25	50			TCP: 31(6") 18(6")	35			23										

- △ Confined Compression
- Unconfined Compression
- Pocket Penetrometer
- Torvane

BORING DRILLED TO 20 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 21 FEET WHILE DRILLING
 WATER LEVEL AT 12.1 FEET AFTER 15 MINS.
 DRILLED BY Van and Sons DRAFTED BY BTC LOGGED BY BTC



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-18**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **08/20/2018**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												0.5	1	1.5	2				
40				Silty Sand (cont.) -reddish tan, with clayey sand and fat clay layers 36'-38' -with sandy lean clay and fat clay pockets 38'-40'	16			23											
	40			TCP: 24(6") 24(6") -with sandstone fragments 41'-43'	56	24		21											
35																			
	45			Very stiff, reddish tan and gray Fat Clay (CH), with slickensides TCP: 38(6") 24(6")	24	99		29											
30																			
	50			-tan and gray 48'-50' TCP: 11(6") 15 (6")			91.0	35											
25																			
	55			Very stiff, reddish tan Sandy Lean Clay (CL), with fat clay seams and calcareous nodules TCP: 26(6") 25(6")	70			20	28	15	13								
20																			
	60			Hard, reddish brown Fat Clay (CH), with calcareous nodules TCP: 18(6") 20(6")				25											
15				Termination depth = 61 feet.															
	65																		
10																			
	70																		
5																			

BORING DRILLED TO 20 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 21 FEET WHILE DRILLING
 WATER LEVEL AT 12.1 FEET AFTER 15 MINS.
 DRILLED BY Van and Sons DRAFTED BY BTC LOGGED BY BTC



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-19**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger/Wet Rotary**

DATE **11/29/18**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF							
												0.5	1	1.5	2				
40				Silty Sand (cont...)	50/5"			23											
35	40				95/11"			23											
					50/2"	22		23											
					50/5"			22											
30	45			Very stiff to hard, dark tan Fat Clay (CH), with slickensides															
25	50				100	92.7	32	63	27	36									
20	55			-reddish tan, with sandy lean clay seams, silty sand seams, and calcareous nodules 53'- 55'	85			20											
15	60			Very dense, tan Silty Sand (SM), with fat clay pockets, wet	50/5"			28											
				Termination Depth = 60 feet.															
10	65																		
5	70																		

- △ Confined Compression
- Unconfined Compression
- Pocket Penetrometer
- Torvane

BORING DRILLED TO 24 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT 24 FEET WHILE DRILLING
 WATER LEVEL AT 15.2 FEET AFTER 15 MINS.
 DRILLED BY Van and Sons DRAFTED BY JG LOGGED BY BTC



PROJECT: **66-inch Water Line along West Hardy**

ENGINEERING CORP.
GEOTECHNICAL ENGINEERS

BORING **B-20**

COH WBS No. **S-000900-0166-4**

TYPE **4" Dry Auger**

DATE **11/27/18**

ELEVATION IN FEET	DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	-200 MESH	DRY DENSITY, PCF	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SHEAR STRENGTH, TSF						
												△	●					
				Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3113554.55 Northing: 13907111.43 Elevation: 76.81								△ Confined Compression ● Unconfined Compression ○ Pocket Penetrometer □ Torvane	0.5	1	1.5	2		
75	0			Fill: firm to very stiff, gray and tannish gray Sandy Lean Clay (CL), with calcareous nodules -with ferrous nodules 0'-2'	70		16	37	14	23								
65	5			Stiff to hard, gray and tan Lean Clay with Sand (CL), with fat clay pockets -with ferrous nodules 6'-12' -with calcareous nodules 12'-14' -gray and reddish tan, with slickensides 14'- 16' -gray and reddish tan 18'-20'	81		19	38	14	24								
55	10						14											
50	15						14											
45	20						14											
40	25			Stiff to very stiff, gray Silty Clay with Sand (CL-ML), with silty sand seams	84		21	48	15	33								
35	25			Termination Depth = 25 feet.	72		112.0	19	25	19	6							

BORING DRILLED TO 25 FEET WITHOUT DRILLING FLUID
 WATER ENCOUNTERED AT N/A FEET WHILE DRILLING
 WATER LEVEL AT N/A FEET AFTER COMPLETE
 DRILLED BY Van and Sons DRAFTED BY JG LOGGED BY BTC

KEY TO SYMBOLS

Symbol Description

Strata symbols



Paving



Description not given for:
"D"



Low plasticity
clay



High plasticity
clay



Silty low plasticity
clay



Silt



Fill



Silty sand



Clayey sand



Silty clayey sand

Misc. Symbols



Water table depth
during drilling



Subsequent water
table depth



Torvane



Pocket Penetrometer



Unconfined Compression

Symbol Description



Confined Compression

Soil Samplers



Rock core



Undisturbed thin wall
Shelby tube



Standard penetration test



Auger



TXDOT Cone Penetrometer

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL NAMES	
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (Less than 50% of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)		
		GW	Well-graded gravel, well-graded gravel with sand	
		GP	Poorly-graded gravel, poorly-graded gravel with sand	
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart	GM
	Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravel, clayey gravel with sand
	SANDS (50% or more of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)		
		SW	Well-graded sand, well-graded sand with gravel	
		SP	Poorly-graded sand, poorly-graded sand with gravel	
SANDS WITH FINES (More than 12% passes No. 200 sieve)		Limits plot below "A" line & hatched zone on plasticity chart	SM	Silty sand, silty sand with gravel
	Limits plot above "A" line & hatched zone on plasticity chart	SC	Clayey sand, clayey sand with gravel	
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS AND CLAYS (Liquid Limit Less Than 50%)		ML	Silt, silt with sand, silt with gravel, sandy silt, gravelly silt
			CL	Lean clay, lean clay with sand, lean clay with gravel, sandy lean clay, gravelly lean clay
			OL	Organic clay, organic clay with sand, sandy organic clay, organic silt, sandy organic silt
	SILTS AND CLAYS (Liquid Limit 50% or More)		MH	Elastic silt, elastic silt with sand, sandy elastic silt, gravelly elastic silt
			CH	Fat clay, fat clay with sand, fat clay with gravel, sandy fat clay, gravelly fat clay
			OH	Organic clay, organic clay with sand, sandy organic clay, organic silt, sandy organic silt

NOTE: Coarse soils between 5% and 12% passing the No. 200 sieve and fine-grained soils with limits plotting in the hatched zone of the plasticity chart are to have dual symbols.

PLASTICITY CHART

LIQUID LIMIT (LL)

Equation of A-Line: Horizontal at PI=4 to LL=25.5, then $PI=0.73(LL-20)$
Equation of U-Line: Vertical at LL=16 to PI=7, then $PI=0.9(LL-8)$

DEGREE OF PLASTICITY OF COHESIVE SOILS

Degree of Plasticity	Plasticity Index
None	0 - 4
Slight	5 - 10
Medium	11 - 20
High	21 - 40
Very High.....	>40

SOIL SYMBOLS

Fill	Sand
Clay (CH)	Silt
Clay (CL)	

TERMS USED ON BORING LOGS

SOIL GRAIN SIZE

U.S. STANDARD SIEVE

	6"	3"	3/4"	#4	#10	#40	#200		
BOULDERS	COBBLES	GRAVEL		SAND			SILT	CLAY	
		COARSE	FINE	COARSE	MEDIUM	FINE			
	152	76.2	19.1	4.76	2.00	0.420	0.074	0.002	

SOIL GRAIN SIZE IN MILLIMETERS

STRENGTH OF COHESIVE SOILS

<u>Consistency</u>	Undrained Shear Strength, Kips per Sq. ft.	<u>SPT Blowcount</u>
Very Soft	less than 0.25	< 2 bpf
Soft	0.25 to 0.50	2-4 bpf
Firm	0.50 to 1.00	4-8 bpf
Stiff	1.00 to 2.00	8-16 bpf
Very Stiff	2.00 to 4.00	16-32 bpf
Hard	greater than 4.00	>32 bpf

RELATIVE DENSITY OF COHESIONLESS SOILS FROM STANDARD PENETRATION TEST

Very Loose	<4 bpf
Loose	5-10 bpf
Medium Dense	11-30 bpf
Dense	31-50 bpf
Very Dense	>50 bpf

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows per Foot	Description
25	25 blows driving sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows driving sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows driving sampler 3 inches, during initial 6-inches seating interval.

NOTE: To avoid change to sampling tools, driving is limited to 50 blows during or after seating interval.

DRY STRENGTH ASTM D2488

MOISTURE CONDITION ASTM D2488

None	Dry specimen crumbles into powder with mere pressure of handling	Dry	Absence of moisture, dusty, dry to the touch
Low	Dry specimen crumbles into powder with some finger pressure	Moist	Damp but no visible water
Medium	Dry specimen breaks into pieces or crumbles with considerable pressure	Wet	Visible free water
High	Dry specimen cannot be broken with finger pressure, it can be broken between thumb and hard surface		
Very High	Dry specimen cannot be broken between thumb and hard surface		

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy. The degree of slickensidedness depends upon the spacing of slickensides and the easiness of breaking along these planes.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Friable	Crumbly, can be easily crushed with light pressure.
Blocky	Clays that have a block-like or polyhedral structure.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil types.
Interlayered	Soil sample composed of alternating layers of different soil types.
Intermixed	Soil sample composed of pockets of different soil types and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of calcium material.