

2017 Test Boring Logs



TEST BORING REPORT

Boring No. HA17-1

Project Proposed Pier Improvements, International Marine Terminal, Portland, Maine
 Client HNTB Corporation
 Contractor Northern Test Borings, Inc.

File No. 129950-002
 Sheet No. 1 of 4
 Start 19 June 2017
 Finish 20 June 2017
 Driller M. Nadeau
 H&A Rep. M. Snow

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	--	Rig Make & Model: Diedrich D-50
Inside Diameter (in.)	4.0	1.375	--	Bit Type: Roller Bit
Hammer Weight (lb)	140	140	-	Drill Mud: Polymer
Hammer Fall (in.)	30	30	-	Casing: HW to 85.0 ft
				Hoist/Hammer: Winch / Automatic Hammer
				PID Make & Model: MiniRAE 2000 10.6 eV

Elevation 15.3
 Datum NGVD 29
 Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel			Sand			Field Test			
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0	1 3 3 4	S1 8	0.0 2.0		SM	Note: 20.7 ft from top of deck to mudline from deck. Sample depths reference mudline. Soft black silty SAND with gravel (SM), mps 1.5 in., organic odor, wet, contains few brick fragments -HARBOR BOTTOM DEPOSIT-	20	10	5	25	25	15				
				11.3 4.0		Note: Drill cuttings indicate granular soil to approximately 4 ft.										
5	6 1 WOR WOR	S2 12	5.0 7.0		OL	Very soft olive-brown organic SILT (OL), mps 0.43 mm, strong organic odor, wet, contains shells -HARBOR BOTTOM DEPOSIT-							100			
	1 1 1 6	S3 NR	7.0 9.0	8.8 8.5		No Recovery										
10	3 4 7 6	S4 18	10.0 12.0		SP	Medium dense gray poorly-graded SAND (SP), mps 0.25 in., no odor, wet -MARINE DEPOSIT- (Sand)			5	55	35	5				
15	4 6 7 8	S5 14	15.0 17.0		SP	Medium dense gray poorly-graded SAND (SP), mps 0.25 in., no odor, wet			5	60	30	5				

Water Level Data				Sample ID		Well Diagram		Summary	
Date	Time	Elapsed Time (hr.)	Depth (ft) to:		O - Open End Rod	T - Thin Wall Tube	U - Undisturbed Sample	S - Split Spoon Sample	Overburden (ft) 101.2
			Bottom of Casing	Bottom of Hole					
									Samples 20S, 1U
								Boring No. HA17-1	

Field Tests: Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
 Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**
Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 129950-002_HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\129950 - IMT PIER INFILL PHASE \FIELD\GINT LOGS\129950-002_TB_HA17-1_HA17-2.GPJ 4 Aug 17



TEST BORING REPORT

Boring No. HA17-1

File No. 129950-002
Sheet No. 2 of 4

H&A-TEST BORING-07-1 129950-002 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\129950 - IMT PIER INFILL PHASE \FIELD\GINT LOGS\129950-002_TB_HA17-1_HA17-2.GPJ 4 Aug 17

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test				
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
20	2 3 2 3	S6 18	20.0 22.0		SM	Loose dark gray-brown silty SAND (SM), organic silt layer with shells, trace fine gravel, no odor, wet, contains wood -MARINE DEPOSIT- (Sand)		5	10	40	25	20				
				-8.7 24.0												
25	Hydr. Push	S7 24	25.0 27.0		CL	Note: Attempt tube sample from 25 to 27 ft; 3 in. recovery - gray lean CLAY with sand on bottom; probable sand layer. Collected split spoon sample through tube sample depth from 25 to 27 ft. Medium stiff gray lean CLAY (CL) with frequent fine sand seams (0.0625 in.), mps 0.42 mm, no odor, wet -MARINE DEPOSIT- (Clay)				10	90					
30		U1 24	29.0 31.0			Note: Gray lean CLAY (CL) in top and bottom of tube.										
				-17.3 32.6		Note: 55x110 mm vane raw torque readings: V1 (31.5-32.0 ft); 200/150 in. lbs; Su=775/580 psf V2 (32.5-33.0 ft); Advanced field vane to refusal at 32.6 ft on probable sand layer										
35	6 7 11 10	S8 18	35.0 37.0		SP	Medium dense brown poorly-graded SAND (SP), mps 0.43 mm, no odor, wet -MARINE DEPOSIT- (Sand)				95	5					
40	7 8 11 11	S9 15	40.0 42.0		SP	Medium dense brown poorly-graded SAND (SP), mps 2 mm, no odor, wet				60	35	5				
45	9 13 15 9	S10 13	45.0 47.0		SP	Medium dense brown poorly-graded SAND (SP), mps 2 mm, no odor, wet, occasional rust-brown seams (0.25 to 0.5 in.)				10	90					

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA17-1



TEST BORING REPORT

Boring No. HA17-1

File No. 129950-002
Sheet No. 3 of 4

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test				
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
50	13 19 21 20	S11 10	50.0 52.0	-34.7 50.0	SP	Dense gray poorly-graded SAND (SP), mps 0.42 mm, no odor, wet Note: Washed ahead of casing in 5-ft increments beginning at 50 ft to bottom of exploration. -MARINE DEPOSIT- (Sand)					95	5				
55	12 18 29 30	S12 13	55.0 57.0	-40.7 56.0	SP	Dense brown poorly-graded SAND with gravel (SP), mps 1 in, no odor, wet, grading to gray at bottom of sample Note: Drill action indicates gravel from 56 to 60 ft, and 62 to 65 ft.	10	10	10	40	25	5				
60	18 22 29 32	S13 1	60.0 62.0		GP	Very dense gray poorly-graded GRAVEL with sand (GP), mps 1 in., no odor, wet Note: Low recovery (wash sample). -ICE CONTACT DEPOSIT-	10	75	5	5	5					
65	19 29 31 27	S14 20	65.0 67.0	-49.7 65.0	SP-SM	Very dense gray poorly-graded SAND with silt (SP-SM), mps 0.42 mm, no odor, wet -ICE CONTACT DEPOSIT-					90	10				
70	20 26 32 32	S15 20	70.0 72.0		SP-SM	Very dense gray poorly-graded SAND with silt and gravel (SP-SM), mps 2 in., stratified (gravel layer), no odor, wet	10	5	5	5	65	10				
75	78 205	S16 12	75.0 76.0	-58.2 73.5	SP	Very dense brown-gray poorly-graded SAND with gravel (SP), mps 2 in., no odor, wet, well bonded -GLACIAL TILL-	15	10	10	10	50	5				

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

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TEST BORING REPORT

Boring No. HA17-1

File No. 129950-002
Sheet No. 4 of 4

H&A-TEST BORING-07-1 129950-002_HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\129950 - IMT PIER INFILL PHASE \IFIELD\GINT LOGS\129950-002_TB_HA17-1_HA17-2.GPJ 4 Aug 17

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test				
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
80	22 93 50/2"	S17 15	80.0 81.2		SP	Very dense brown-gray poorly-graded SAND with gravel (SP), mps 2 in., no odor, wet, moderately bonded	15	10	5	5	60	5				
						-GLACIAL TILL-										
85	53 126	S18 10	85.0 86.0		SW	Very dense brown-gray well graded SAND with gravel (SW), mps 1.5 in., no odor, wet, moderately to well bonded	15	5	10	30	35	5				
90	32 70	S19 12	90.0 91.0		SW-SM	Very dense gray well graded SAND with silt and gravel (SW-SM), mps 1.5 in., no odor, wet, slightly to moderately bonded	10	25	20	20	15	10				
95						Note: Probable boulders from 92 to 99 ft; rock chips observed in wash water return.										
100	44 70 75/3"	S20 12	100.0 101.2	-85.9 101.2	SW	Very dense gray well graded SAND with gravel (SW), mps 1.5 in., no odor, wet	10	30	25	15	15	5				
						BOTTOM OF EXPLORATION 101.2 FT (NO REFUSAL)										
						Note: All soil samples within the fill unit were screened with a photoionization detector. No elevated readings were encountered during screening.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA17-1



TEST BORING REPORT

Boring No. HA17-2

Project Proposed Pier Improvements, International Marine Terminal, Portland, Maine
 Client HNTB Corporation
 Contractor Northern Test Borings, Inc.

File No. 129950-002
 Sheet No. 1 of 5
 Start 21 June 2017
 Finish 22 June 2017
 Driller M. Nadeau

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	--	Rig Make & Model: Diedrich D-50
Inside Diameter (in.)	4.0	1.375	--	Bit Type: Roller Bit
Hammer Weight (lb)	140	140	-	Drill Mud: Polymer
Hammer Fall (in.)	30	30	-	Casing: HW to 85.0 ft
				Hoist/Hammer: Winch / Automatic Hammer
				PID Make & Model: MiniRAE 2000 10.6 eV

H&A Rep. M. Snow
 Elevation 14.7
 Datum NGVD 29
 Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel			Sand			Field Test					
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength		
0						-BITUMINOUS CONCRETE-												
14	29	S1	1.0	13.9 0.8	SM	Very dense brown silty SAND with gravel (SM), mps 2 in., no odor, dry	23	11	28	23	15							
30	32	18	3.0			-FILL-												
15	14	S2	3.0	13.9 0.8	SM	Dense brown to black silty SAND with gravel (SM), mps 1.5 in., no odor, dry, contains coal, ash and few brick fragments	12	18	8	22	25	15						
22	26	15	5.0															
10	16	S3	5.0	13.9 0.8	SM	Medium dense brown to black silty SAND with gravel (SM), mps 1 in., no odor, dry, contains coal, ash and brick fragments	7	21	11	26	20	15						
14	15	14	7.0			No Recovery												
8	7	S4	7.0	13.9 0.8	SW-SM	Loose brown well graded SAND with silt and gravel (SW-SM), mps 1 in., no odor, dry to moist	5	10	10	40	25	10						
3	3	S5	8.0			Note: Encountered concrete at 10 ft. Augered to refusal on concrete. Moved location 2.5 ft west and drilled to 10 ft and continued sampling.												
10	1	S6	10.0	13.9 0.8	SW-SM	Loose brown well graded SAND with silt (SW-SM), trace fine gravel, mps 0.5 in., no odor, moist	10	15	35	30	10							
2	3	14	12.0			-FILL-												
1	1	S7	12.0	13.9 0.8	SW-SM	Very loose brown well graded SAND with silt (SW-SM), trace fine gravel, mps 0.5 in., no odor, wet	5	15	40	30	10							
2	3	15	14.0			Note: Encountered obstruction with casing at 11.7 ft. Advanced rollerbit 11.7 to 15 ft.												
5	3	S8	14.0	13.9 0.8	SW-SM	Loose brown well graded SAND with silt and gravel (SW-SM), mps 0.5 in., no odor, wet	20	10	35	25	10							
2	2	3	16.0			Note: S8 sampler blows likely impacted by rollerbit advancement from 11.7 to 15 ft prior to sampling.												
2	3	S9	16.0	-2.3 17.0	SW-SM	Loose brown well graded SAND with silt and gravel (SW-SM), mps 1 in., no odor, wet	5	10	10	40	25	10						
3	2	12	18.0			SM/ML Medium stiff gray-brown silty SAND grading to sandy SILT with organics, shells (SM/ML), mps 0.42 mm, strong organic odor, wet						20	80					
						-HARBOR BOTTOM DEPOSIT-												

Water Level Data						Sample ID		Well Diagram		Summary												
Date	Time	Elapsed Time (hr.)	Depth (ft) to:			O - Open End Rod	T - Thin Wall Tube	U - Undisturbed Sample	S - Split Spoon Sample	Riser Pipe	Screen	Filter Sand	Cuttings	Grout	Concrete	Bentonite Seal	Overburden (ft)	111.2	Rock Cored (ft)	--	Samples	285
			Bottom of Casing	Bottom of Hole	Water																	
6/22/17	07:30	24.0	85.0	85.0	~2.0																	
6/22/17	11:30	28.5	--	48.2	12.3 Tidal																	

Field Tests: Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
 Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High V - Very High

*Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.
 Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 129950-002_HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\129950 - IMT PIER INFILL PHASE \FIELD\GINT LOGS\129950-002_TB_HA17-1_HA17-2.GPJ 4 Aug 17



TEST BORING REPORT

Boring No. HA17-2

File No. 129950-002
Sheet No. 2 of 5

H&A-TEST BORING-07-1 129950-002 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\129950 - IMT PIER INFILL PHASE \IFIELD\GINT LOGS\129950-002_TB_HA17-1_HA17-2.GPJ 4 Aug 17

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test			
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity
20	5 2 3 4	S10 12	20.0 22.0		OL/SM	Medium stiff dark gray to gray-brown interlayered SILT with organics and silty SAND (OL/SM), mps 2 mm, strong organic odor, wet, contains shells			15	35	50				
-HARBOR BOTTOM DEPOSIT-															
25	WOH 2 1 3	S11 24	25.0 27.0		OL/SM	Soft dark gray-brown interlayered SILT with organics and silty SAND (OL/SM), mps 2 mm, strong organic odor, wet, contains shells			15	35	50				
30	WOH 2 2	S12 24	30.0 32.0		OL	Very soft gray-brown ORGANIC SILT with sand (OL), mps 0.42 mm, organic odor, wet, contains shells				25	75				
35	WOH 2 2 2	S13 24	35.0 37.0	-20.3 35.0	CL	Note: Attempt vane shear test at 35 ft, no penetration, vane refusal at 35 ft. Soft dark gray lean CLAY (CL), mps 0.075 mm, no odor, wet						100			
-MARINE DEPOSIT- (Clay)															
40		S14 24	40.0 42.0		CL	Very stiff gray lean CLAY (CL), mps 0.075 mm, no odor, wet, occasional gray silty fine sand seams (0.25 in.) 55x110 mm vane raw torque readings: V1 (40.5-41.0 ft); >300 in. lbs; Su>1,165 psf			5		95				
45	1 2 3 6	S15 18	45.0 47.0		CL	Medium stiff dark gray lean CLAY (CL) with frequent brown and gray silty fine sandy layers (0.5 to 1-in. thick), mps 0.42 mm, no odor, wet				15	85				
				-34.3 49.0											

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA17-2



TEST BORING REPORT

Boring No. HA17-2

File No. 129950-002
Sheet No. 3 of 5

H&A-TEST BORING-07-1 129950-002_HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\129950 - IMT PIER INFILL PHASE \IFIELD\GINT LOGS\129950-002_TB_HA17-1_HA17-2.GPJ 4 Aug 17

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test				
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
50	7 7 11 12	S16 18	50.0 52.0		SP-SM	Medium dense brown to rust-brown to gray (layered) poorly-graded SAND with silt (SP-SM), mps 2 mm, no odor, wet			15	75	10					
						-MARINE DEPOSIT- (Sand)										
55	10 11 10 11	S17 14	55.0 57.0		SP	Medium dense brown to rust-brown poorly-graded SAND (SP), mps 0.25 in., no odor, wet			5	15	75	5				
60	7 10 15 11	S18 13	60.0 62.0		SP	Medium dense brown to rust-brown poorly-graded SAND (SP), mps 0.42 mm, no odor, wet					95	5				
65	6 8 11 11	S19 14	65.0 67.0		SP	Medium dense brown to rust-brown poorly-graded SAND (SP), mps 0.42 mm, no odor, wet					95	5				
70	8 8 6 9	S20 14	70.0 72.0		SP-SM	Medium dense gray poorly-graded SAND with silt (SP-SM), mps 2 mm, no odor, wet, one 1-in. silt layer				15	75	10				
						-MARINE DEPOSIT- (Sand)										
				-59.3 74.0		Note: Gravel in wash water at 74 ft.										
75	16 18 23 19	S21 10	75.0 77.0		SP-SM	Dense gray poorly-graded SAND with silt and gravel (SP-SM), mps 1 in., no odor, wet, well bonded	5	15	15	10	40	15				
						-GLACIAL TILL-										

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Boring No. HA17-2



TEST BORING REPORT

Boring No. HA17-2

File No. 129950-002
Sheet No. 4 of 5

H&A-TEST BORING-07-1 129950-002_HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\129950 - IMT PIER INFILL PHASE \IFIELD\GINT LOGS\129950-002_TB_HA17-1_HA17-2.GPJ 4 Aug 17

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							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
80	7 6 9 9	S22 12	80.0 82.0		SP-SM	Medium dense gray poorly-graded SAND with silt (SP-SM), trace gravel, mps 1 in., no odor, wet, moderately bonded	5	5	10	25	40	15				
						-GLACIAL TILL-										
85	9 5 8 10	S23 10	85.0 87.0		SW	Medium dense gray well graded SAND with gravel (SW), mps 1 in., no odor, wet, slightly to moderately bonded	10	15	15	30	25	5				
90	11 7 10 14	S24 12	90.0 92.0		SM	Medium dense gray silty SAND with gravel (SM), mps 2 in., no odor, wet Note: Drill action indicates gravel/cobbles from 92 to 95 ft.	15	10	5	10	45	15				
95	72 88 82 79	S25 20	95.0 97.0	-80.3 95.0	SM	Very dense dark gray silty SAND with gravel (SM), mps 2 in., no odor, wet -GLACIAL TILL-	20	10	10	10	35	15				
100	35 163 70/1"	S26 13	100.0 102.0		SM	Very dense dark gray silty SAND with gravel (SM), mps 2 in., no odor, wet, color changes to brown at approximately 100.5 ft. Note: Drill action indicates gravel/cobbles from 102 to 105 ft.	20	10	10	10	35	15				
105	50 115 75/2"	S27 12	105.0 107.0		SM	Very dense gray-brown silty SAND with gravel (SM), mps 1.5 in., no odor, wet Note: Drill action indicates gravel/cobbles from 107 to 110 ft.	20	10	10	10	35	15				

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Boring No. HA17-2



TEST BORING REPORT

Boring No. HA17-2

File No. 129950-002
Sheet No. 5 of 5

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test				
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
110	39 95 80/3"	S28 10	110.0 111.2	-96.5 111.2	SM	Very dense gray silty SAND with gravel (SM), mps 1 in., no odor, wet -GLACIAL TILL-	5	10	10	30	30	15				
BOTTOM OF EXPLORATION 111.2 FT (NO REFUSAL)																
Note: All soil samples within the fill unit were screened with a photoionization detector. No elevated readings were encountered during screening.																

H&A-TEST BORING-07-1 129950-002_HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\129950 - IMT PIER INFILL PHASE \FIELD\GINT LOGS\129950-002_TB_HA17-1_HA17-2.GPJ 4 Aug 17

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA17-2

1992 Test Boring Log



HALEY & ALDRICH, INC.
SCARBOROUGH,
MAINE

TEST BORING REPORT

BORING NO. B102

PROJECT PROPOSED RENOVATIONS INTERNATIONAL FERRY TERMINAL, PORTLAND, MAINE
CLIENT TEC ASSOCIATES
CONTRACTOR MAINE TEST BORINGS, INC.

FILE NO. 80349-00
SHEET NO. 1 OF 3
LOCATION SEE PLAN

ITEM	CASING	DRIVE SAMPLER	CORE BARREL	DRILLING EQUIPMENT & PROCEDURES	
TYPE	NW	SS	-	RIG TYPE MOBILE B53 TRUCK RIG	ELEVATION -0.8
INSIDE DIAMETER (IN)	3.0	1 3/8	-	BIT TYPE ROLLER BIT	DATUM MLW
HAMMER WEIGHT (LB)	300	140	-	DRILL MUD NONE	START 22 July 1992
HAMMER FALL (IN)	24	30	-	OTHER FV = 2 IN. X 7 IN. FIELD VANE SHEAR	FINISH 23 July 1992
					DRILLER D. MCKEEN H & A REP C. KARAM

DEPTH (FT)	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE NUMBER & RECOVERY	SAMPLE DEPTH (FT)	ELEV./DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS
0	2	2	S1 12"	0.0	-1.3	Very loose brown gravelly coarse to fine SAND -FILL-
	1	1		1.5	0.5	
	1					Very loose black to dark gray fine sandy SILT, with organics
	WOH					
	1					No Recovery
	WOH	W	S2	4.0		
5		O	NR	5.5		-HARBOR BOTTOM DEPOSIT-
	WOH	H				
	4					-7.8
	15				7.0	
	17					Loose gray silty medium to fine SAND -HARBOR BOTTOM DEPOSIT-
10	6	1	S3	9.0		
		3	12"	10.5		
	9	3				
	14					
	15					
	8					Medium dense gray coarse to fine SAND, with trace shell fragments
15	7	3	S4	14.0		
		4	18"	15.5		
	11	6				
	17					
	21					
	25					Very loose gray silty fine SAND, with organics
20	12	1	S5	19.0		
		1	10"	20.5		
	13	1				
	17					
	18					
	22					-23.8
	25				23.0	
25	W		S6	24.0		Soft to medium stiff gray silty CLAY with shell fragments
	O		18"	25.5		

WATER LEVEL DATA					SAMPLE IDENTIFICATION		SUMMARY					
DATE	TIME	ELAPSED TIME (HR)	DEPTH (FT.) TO:			O	T	U	S	OVERBURDEN (LIN FT)	ROCK CORED (LIN FT)	SAMPLES
			BOTTOM OF CASING	BOTTOM OF HOLE	WATER							
										79.8	0.0	17S
										BORING NO.	B102	



HALEY & ALDRICH, INC.
SCARBOROUGH,
MAINE

TEST BORING REPORT

BORING NO. **B102**
FILE NO. 80349-00
SHEET NO. 2 OF 3

DEPTH (FT)	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE NUMBER & RECOVERY	SAMPLE DEPTH (FT)	ELEV./DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS
25	19	H				-MARINE CLAY-
	21					
	22					
	22					
	40	W	S7	29.0		Stiff gray silty CLAY
30		O	18"	30.5		
	34	H				
	37					
	43					
	54					
	40	7	S8	34.0		Medium dense brown silty fine SAND
35		5	12"	35.5		
	34	8				
	37					
	43					
	51					
	41	7	S9	39.0		Dense brown silty medium to fine SAND
40		15	10"	40.5		
	48	15				-MARINE SAND-
	57					
	110					
	51					
	28	10	S10	44.0		Medium dense rusty brown silty medium to fine SAND
45		8	12"	45.5		
	30	10				
	34					
	32					
	39					
	24	6	S11	49.0		Loose brown silty fine SAND
50		5	8"	50.5		
	22	3				
	27					
	33					
	30					
	29	6	S12	54.0		Medium dense gray silty fine SAND
55		5	10"	55.5		
	26	6				-MARINE SAND-
	25					
	34					
	30					
	29	4	S13	59.0		Medium dense gray silty medium to fine SAND
60		5	12"	60.5		

-32.8
32.0

-52.8
52.0



HALEY & ALDRICH, INC.
SCARBOROUGH,
MAINE

TEST BORING REPORT

BORING NO. **B102**
FILE NO. 80349-00
SHEET NO. 3 OF 3

DEPTH (FT)	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE NUMBER & RECOVERY	SAMPLE DEPTH (FT)	ELEV./DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS
60	31	5				
	32					
	37					
	32					
65	29	1	S14	64.0	-65.8	Very loose gray silty fine SAND, with clayey silt seams
		1	12"	65.5		
		39	1			
		45				
	42					-ICE CONTACT DEPOSIT-
	40					
70	53	20	S15	69.0		Very dense gray gravelly medium to fine SAND, little silt (bonded and gravel is rough and angular)
		50	6"	70.5		
		70	40			
		79				
	61					
	71					
75	40	15	S16	74.0	-74.8	Very dense gray gravelly medium to fine SAND, little silt (well bonded)
		30	8"	75.5		
		91	100			
		131				
	234					-GLACIAL TILL-
						NOTE: Washed ahead of casing with roller bit from 78.0 to 79.0 ft.
		92	S17	79.0	-80.6	Very dense brown gravelly medium to fine SAND, little silt, trace coarse sand (well bonded)
		100/.3		79.8		
		50/0				Split spoon refusal at 79.8 ft. Bottom of Exploration at 79.8 ft.

1987 Test Boring Log

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT

Haley & Aldrich, Inc.

SHEET 1 OF 3
HOLE NO. B-6

DRILLER
Darrel McKeen
M.T.B. JOB NUMBER

PROJECT NAME
Proposed Cargo Pier

LINE & STATION

87-213

LOCATION
Portland, Maine

OFFSET

GROUND WATER OBSERVATIONS

AT _____ FT. AFTER _____ HOURS
AT _____ FT. AFTER _____ HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	NW	SS	
SIZE I.D.	3"	1 3/8"	
HAMMER WT.	300	140	
HAMMER FALL	16"	30"	

DATE START 9/22/87 DATE FIN. 9/23/87
SURFACE ELEV. _____
GROUND WATER ELEV. _____

CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER			DEPTH	STRATUM DESCRIPTION
	NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	0-6	6-12	12-18		
Auger	1D	2"	18"		1.9	7	5	3	0.4	Concrete
10										
17										Brown gravelly sand w/cobbles
17										
34									5.0	
36	2D	2"	18"		6.5	38	21	12		Black silty sand ,ash,brick
42										
47										
23										
18									10.0	
1	D	2"	18"	0	11.5	5	7	8		
5										
15	3D	2"	18"		13.0	7	5	5		Brown coarse sand w/trace of gravel
18										
15									15.5	
8	4D	2"	18"		16.5	5	16	22		
36										
28										
31										
55										
23	D	2"	18"	0	21.5	9	7	3	21.0	Brown silty sand w/weathered rock
13										
10										
15	5D	2"	30"		24.0	1	1	1 2 3		
16										
16	6D	2"	18"		26.5	2	1	1		Gray organic silty clayey sand
14										
14										
15										
16									30.0	
26	7D	2"	18"		31.5	WOR	1	1		
22										
22										
22										
20									35.0	
38	8D	2"	18"		36.5	WOR	3	4		
60									37.0	Gray fine sandy SILT, trace coarse gravel and clay *
60										
70										
72										Brown medium sand w/trace of silt

SAMPLES
D = Split Spoon
C = 2" Shelby Tube
U = 3 1/2" Shelby Tube

SOIL CLASSIFIED BY:
 Driller - Visually
 Soil Technician - Visually
 Laboratory Tests

REMARKS

* Changes made by Haley & Aldrich

HOLE NO. B-6

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT

Haley & Aldrich, Inc.

SHEET 2 OF 3

HOLE NO. B-6

DRILLER
Darrel McKeen

PROJECT NAME
Proposed Cargo Pier

LINE & STATION

M.T.B. JOB NUMBER
87-213

LOCATION
Portland, Maine

OFFSET

GROUND WATER OBSERVATIONS

AT _____ FT. AFTER _____ HOURS
AT _____ FT. AFTER _____ HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	NW	SS	
SIZE I.D.	3"	1 3/8"	
HAMMER WT.	300	140	
HAMMER FALL	16"	30"	

DATE START 9/22/87 DATE FIN 9/23/87
SURFACE ELEV. _____
GROUND WATER ELEV. _____

CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER			DEPTH	DEPTH	STRATUM DESCRIPTION
	NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	0-6	6-12	12-18			
67	9D	2"	18"		41.5	8	17	16	18-24*	47.0	Brown medium sand w/trace of silt
75											
77											
80											
81											
32	10D	2"	18"		46.5	3	7	11	53.0	Brown silty fine sand	
82											
67											
65									63.0	Brown silty fine coarse sand w/trace of gravel	
48											
55	11D	2"	18"		51.5	4	5	15			
57											
85											
158									67.0	Gray gravelly sand w/trace of silt	
79											
43	12D	2"	18"		56.9	5	6	10			
41											
60											
70									71.5	Gray silty fine to coarse sand w/trace of gravel	
85											
45	13D	2"	18"		61.5	7	14	14			
57											
65											
80									77.5	Gray silty fine to coarse sand w/trace of gravel	
75											
45											
52	14D	2"	24"		67.0	4	4	6			9
58											
60									76.5	Gray silty fine to coarse sand w/trace of gravel	
69											
65	15D	2"	18"		71.5	10	11	17			
85											
62											
90									76.5	Gray silty fine to coarse sand w/trace of gravel	
67											
65	D	2"	18"	0	76.5	8	16	20			
105	16D	2"	12"		77.5	17	18				
167											
130									77.5	Gray silty fine to coarse sand w/trace of gravel	
105											

SAMPLES

D = Split Spoon
C = 2" Shelby Tube
U = 3 1/2" Shelby Tube

SOIL CLASSIFIED BY:

Driller - Visually
 Soil Technician - Visually
 Laboratory Tests

REMARKS

* Changes made by Haley & Aldrich

HOLE NO. B-6

Laboratory Test

Results



Technologies to manage risk for infrastructure

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Transmittal

TO:

Bryan Steinert
Haley & Aldrich, Inc.
75 Washington Avenue, Suite 20
Portland, ME 04101-2617

DATE: 8/4/2017	GTX NO: 306769
RE: Proposed Pier Infill Int. Marine Terminal	

COPIES	DATE	DESCRIPTION
	8/4/2017	July 2017 Laboratory Test Report

REMARKS:

CC:

SIGNED:

Ethan Marro, Assistant Laboratory Manager

APPROVED BY:

Joe Tomei, Laboratory Manager

August 4, 2017

Bryan Steinert
Haley & Aldrich, Inc.
75 Washington Avenue, Suite 20
Portland, ME 04101-2617

RE: Proposed Pier Infill Int. Marine Terminal, Portland, ME (GTX-306769)

Dear Bryan:

Enclosed are the test results you requested for the above referenced project. GeoTesting Express, Inc. (GTX) received nine samples from you on 7/21/2017. These samples were labeled as follows:

Boring	Sample	Depth
HA-17-1	S2	5.0-7.0 ft
HA-17-1	S7	25.0-27.0 ft
HA-17-2	S1	1.0-3.0 ft
HA-17-2	S2	3.0-5.0 ft
HA-17-2	S3	5.0-7.0 ft
HA-17-2	S11	25.0-27.0 ft
HA-17-2	S12	30.0-32.0 ft
HA-17-2	S13	35.0-37.0 ft
HA-17-2	S14	40.0-42.0 ft

GTX performed the following tests on these samples:

6 ASTM D2216 - Moisture Contents
3 ASTM D422 - Grain Size Analyses - Sieve Only
6 ASTM D4318 - Atterberg Limits

The results presented in this report apply only to the items tested. This report shall not be reproduced except in full, without written approval from GeoTesting Express. The remainder of these samples will be retained for a period of sixty (60) days and will then be discarded unless otherwise notified by you. Please call me if you have any questions or require additional information. Thank you for allowing GeoTesting Express the opportunity of providing you with testing services. We look forward to working with you again in the future.

Respectfully yours,



Ethan Marro
Assistant Laboratory Manager



*Technologies to manage risk
for infrastructure*

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New York

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Geotechnical Test Report

8/4/2017

GTX-306769

Proposed Pier Infill Int.

Marine Terminal

Portland, ME

Client Project No.: 129950-002

Prepared for:

Haley & Aldrich, Inc.



Client:	Haley & Aldrich, Inc.		
Project:	Proposed Pier Infill Int. Marine Terminal		
Location:	Portland, ME	Project No:	GTX-306769
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	08/01/17
Depth :	---	Test Id:	418620
		Tested By:	GA
		Checked By:	emm

Moisture Content of Soil and Rock - ASTM D2216

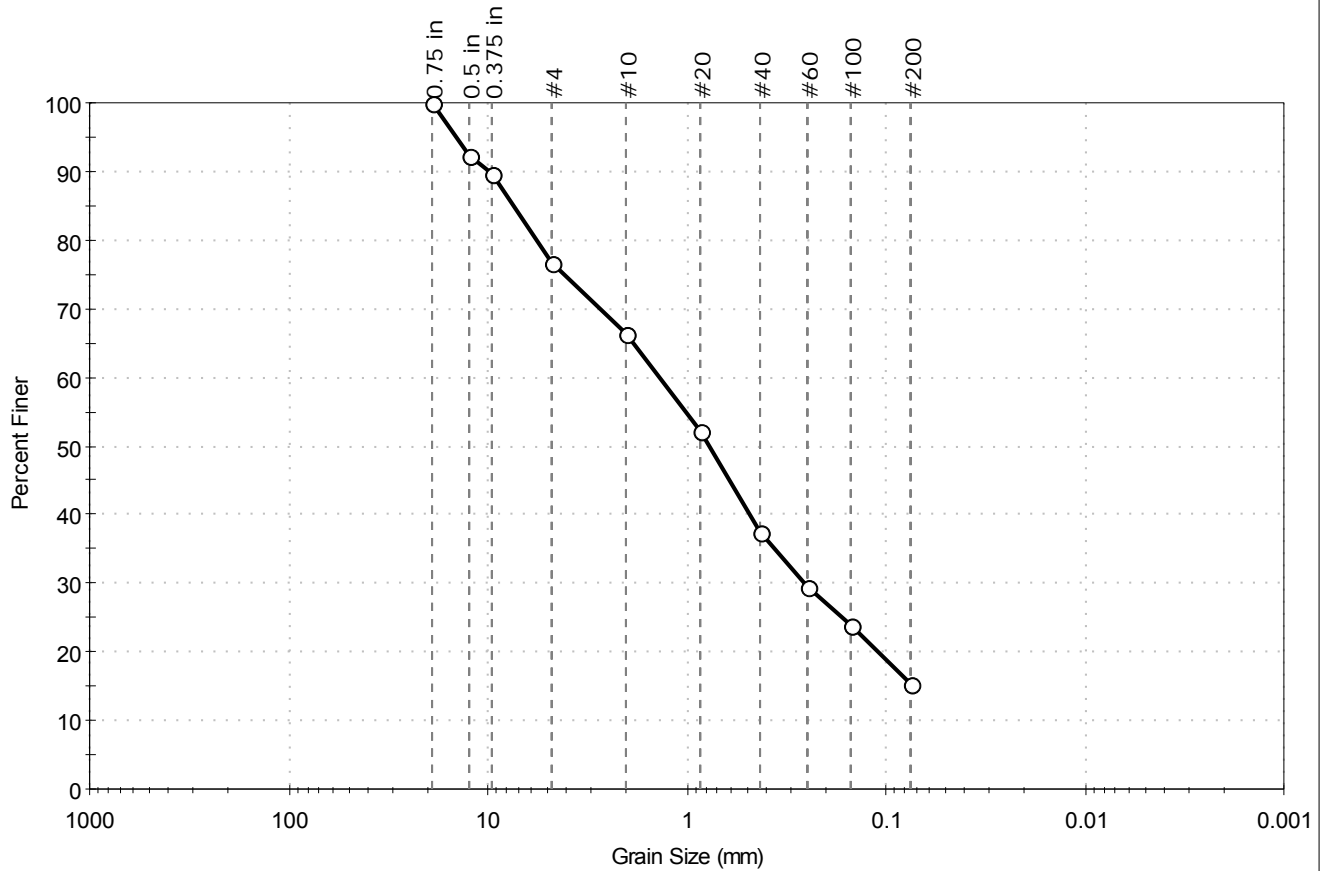
Boring ID	Sample ID	Depth	Description	Moisture Content, %
HA-17-1	S2	5.0-7.0 ft	Moist, olive gray clay	79.1
HA-17-1	S7	25.0-27.0 ft	Moist, gray clay	29.8
HA-17-2	S11	25.0-27.0 ft	Moist, olive gray clay	38.2
HA-17-2	S12	30.0-32.0 ft	Moist, gray clay	43.0
HA-17-2	S13	35.0-37.0 ft	Moist, olive gray clay	39.3
HA-17-2	S14	40.0-42.0 ft	Moist, olive gray clay	31.1

Notes: Temperature of Drying : 110° Celsius



Client:	Haley & Aldrich, Inc.		
Project:	Proposed Pier Infill Int. Marine Terminal		
Location:	Portland, ME	Project No:	GTX-306769
Boring ID:	HA-17-2	Sample Type:	jar
Sample ID:	S1	Test Date:	07/31/17
Depth:	1.0-3.0 ft	Test Id:	418623
Test Comment:	---		
Visual Description:	Moist, brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	23.4	61.2	15.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	92		
0.375 in	9.50	90		
#4	4.75	77		
#10	2.00	66		
#20	0.85	52		
#40	0.42	38		
#60	0.25	29		
#100	0.15	24		
#200	0.075	15		

<u>Coefficients</u>	
D ₈₅ = 7.4338 mm	D ₃₀ = 0.2595 mm
D ₆₀ = 1.3601 mm	D ₁₅ = N/A
D ₅₀ = 0.7692 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

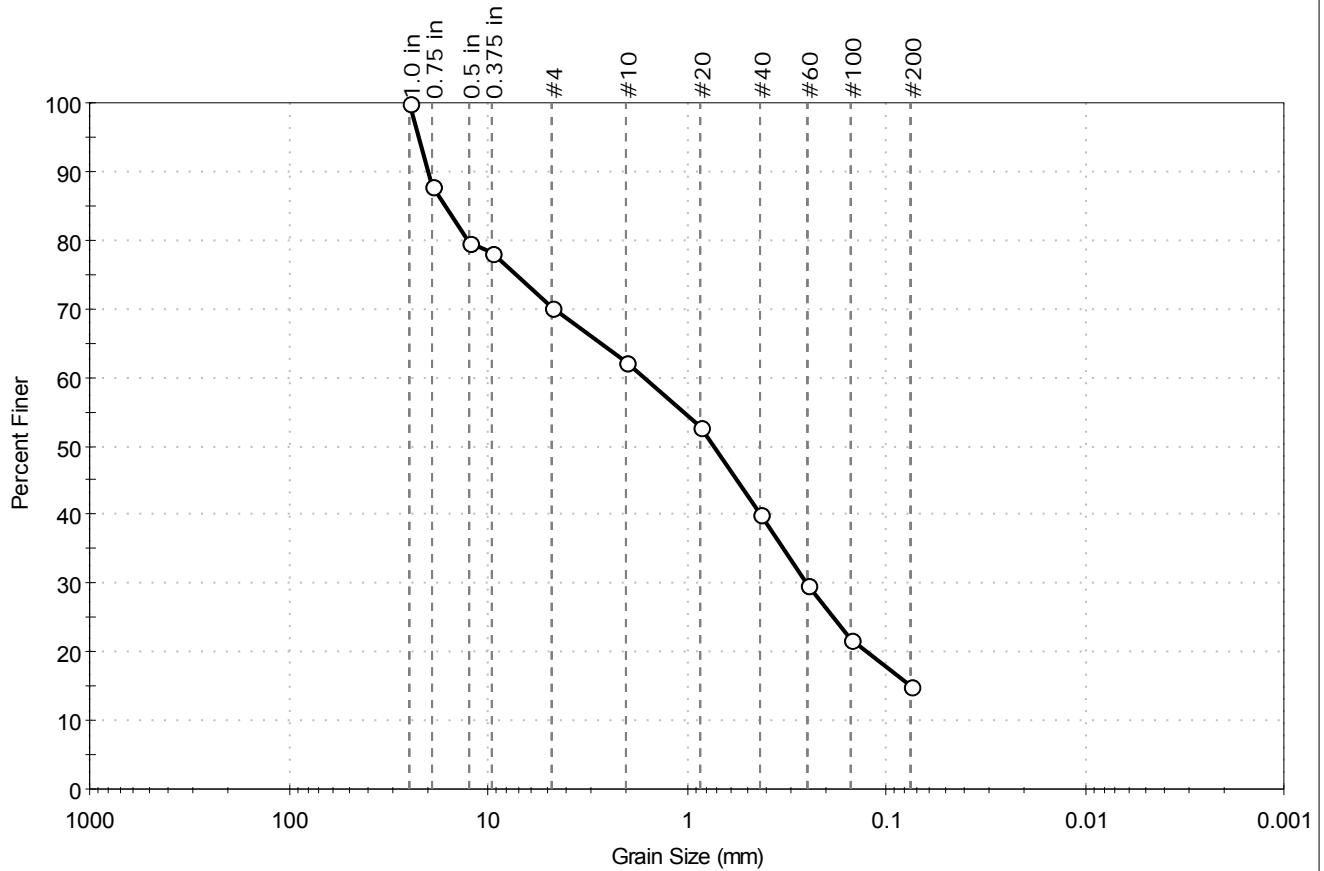
<u>Classification</u>	
ASTM	N/A
AASHTO	Stone Fragments, Gravel and Sand (A-1-b (0))

<u>Sample/Test Description</u>
Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD



Client:	Haley & Aldrich, Inc.		
Project:	Proposed Pier Infill Int. Marine Terminal		
Location:	Portland, ME	Project No:	GTX-306769
Boring ID:	HA-17-2	Sample Type:	jar
Sample ID:	S2	Test Date:	07/31/17
Depth :	3.0-5.0 ft	Checked By:	emm
		Test Id:	418624
Test Comment:	---		
Visual Description:	Moist, very dark grayish brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	29.9	55.2	14.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.0 in	25.00	100		
0.75 in	19.00	88		
0.5 in	12.50	80		
0.375 in	9.50	78		
# 4	4.75	70		
# 10	2.00	62		
# 20	0.85	53		
# 40	0.42	40		
# 60	0.25	30		
# 100	0.15	22		
# 200	0.075	15		

<u>Coefficients</u>	
D ₈₅ = 16.4967 mm	D ₃₀ = 0.2510 mm
D ₆₀ = 1.6277 mm	D ₁₅ = 0.0756 mm
D ₅₀ = 0.7309 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

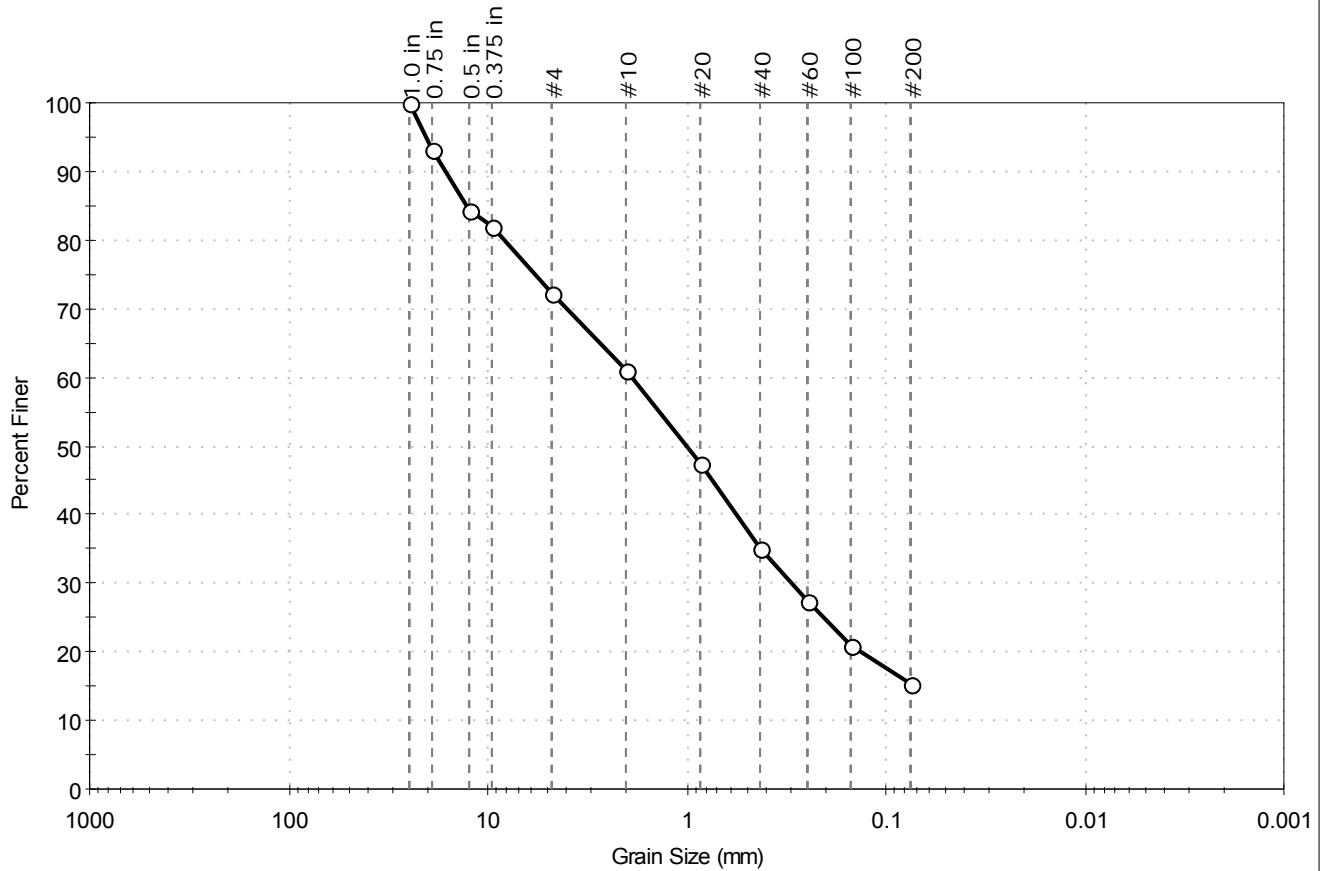
<u>Classification</u>	
ASTM	N/A
AASHTO	Stone Fragments, Gravel and Sand (A-1-b (0))

<u>Sample/Test Description</u>
Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD



Client:	Haley & Aldrich, Inc.		
Project:	Proposed Pier Infill Int. Marine Terminal		
Location:	Portland, ME	Project No:	GTX-306769
Boring ID:	HA-17-2	Sample Type:	jar
Sample ID:	S3	Test Date:	07/31/17
Depth:	5.0-7.0 ft	Test Id:	418625
Test Comment:	---		
Visual Description:	Moist, dark yellowish brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	27.8	56.9	15.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.0 in	25.00	100		
0.75 in	19.00	93		
0.5 in	12.50	84		
0.375 in	9.50	82		
#4	4.75	72		
#10	2.00	61		
#20	0.85	48		
#40	0.42	35		
#60	0.25	27		
#100	0.15	21		
#200	0.075	15		

<u>Coefficients</u>	
D ₈₅ = 12.8419 mm	D ₃₀ = 0.2980 mm
D ₆₀ = 1.8742 mm	D ₁₅ = N/A
D ₅₀ = 0.9895 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

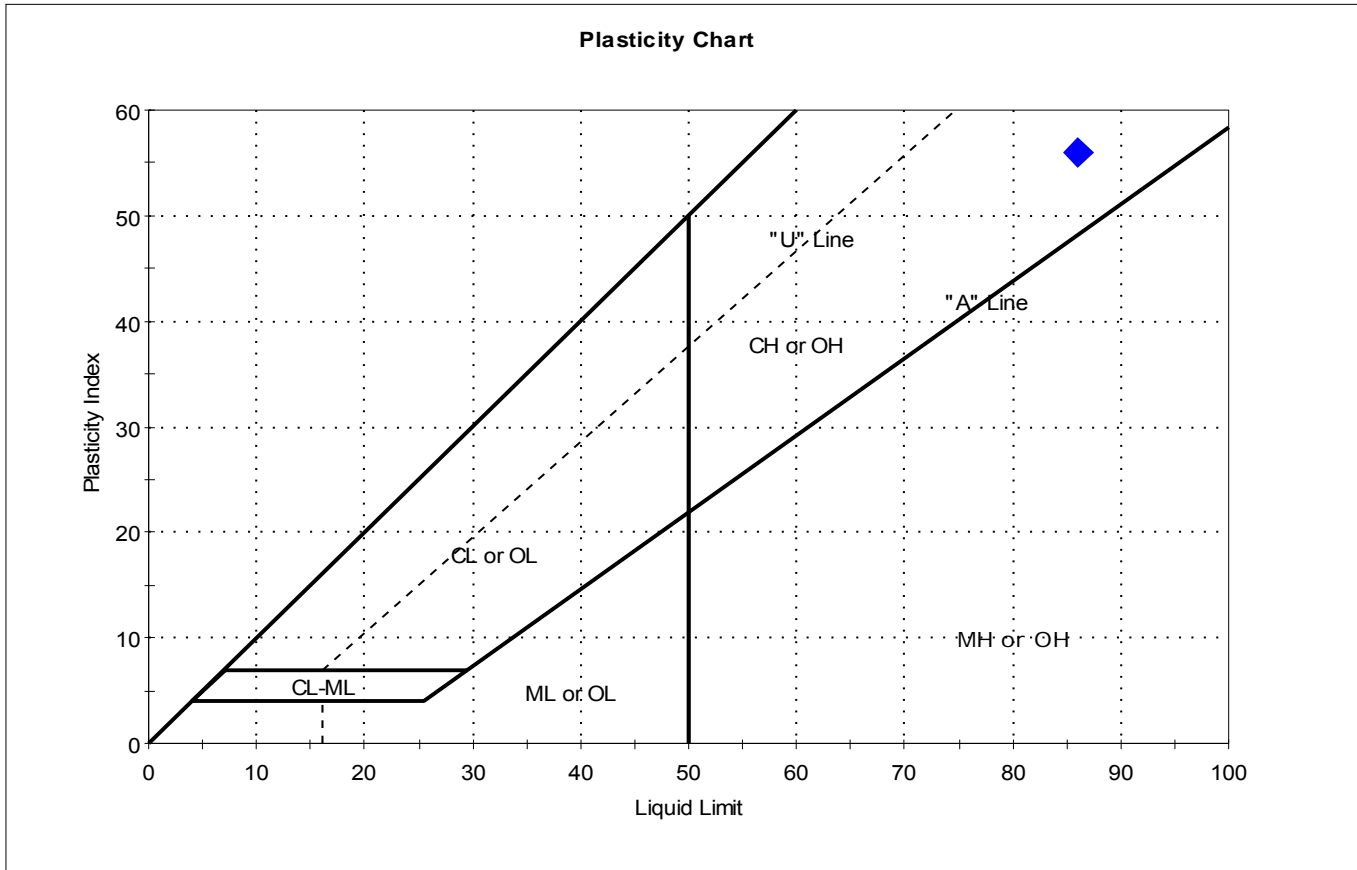
<u>Classification</u>	
ASTM	N/A
AASHTO	Stone Fragments, Gravel and Sand (A-1-b (0))

<u>Sample/Test Description</u>
Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD



Client:	Haley & Aldrich, Inc.		
Project:	Proposed Pier Infill Int. Marine Terminal		
Location:	Portland, ME	Project No:	GTX-306769
Boring ID:	HA-17-1	Sample Type:	jar
Sample ID:	S2	Test Date:	08/01/17
Depth :	5.0-7.0 ft	Checked By:	emm
		Test Id:	418611
Test Comment:	---		
Visual Description:	Moist, olive gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S2	HA-17-1	5.0-7.0 ft	79	86	30	56	0.9	

Sample Prepared using the WET method

Dry Strength: HIGH

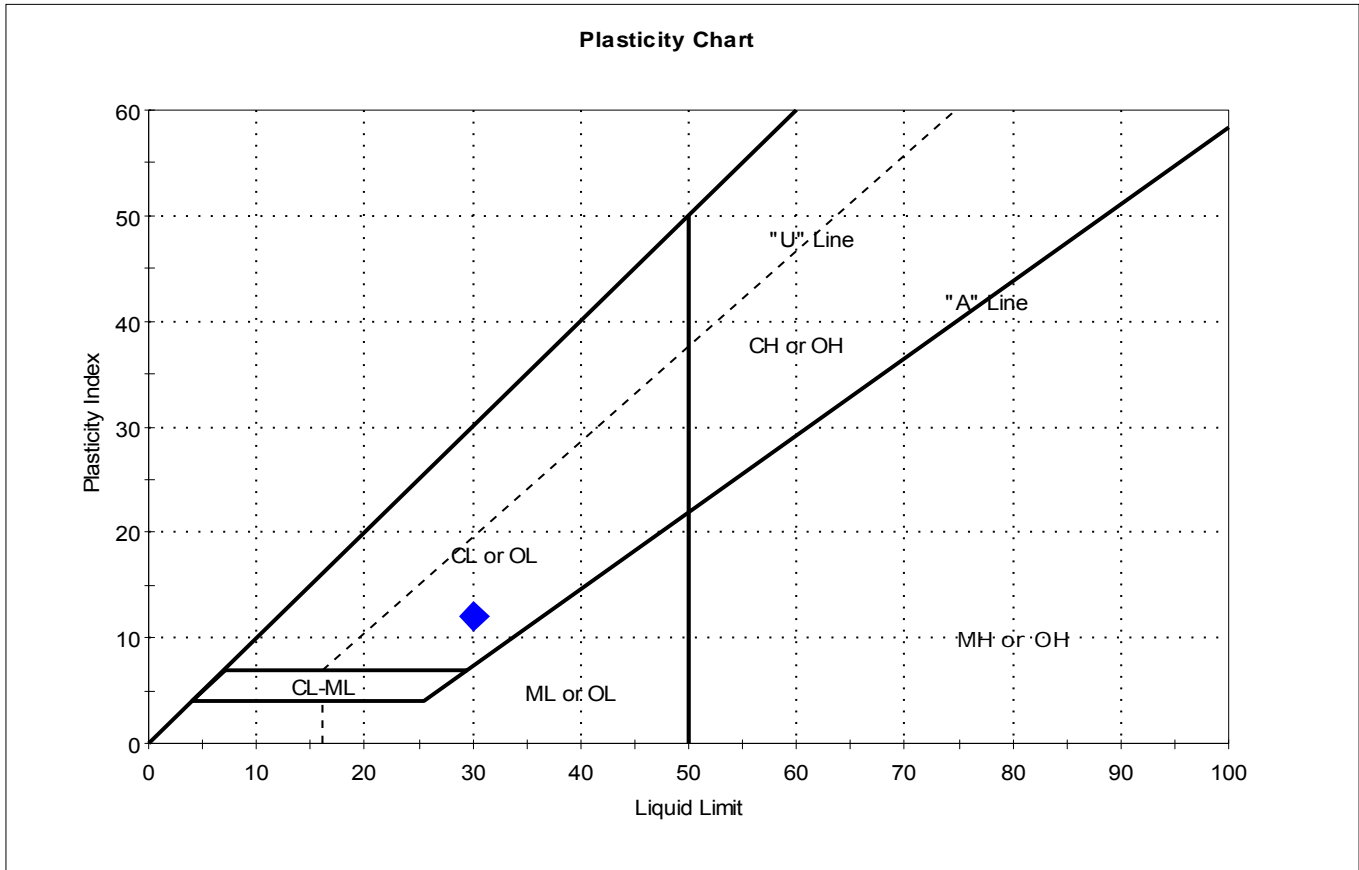
Dilatancy: SLOW

Toughness: LOW



Client:	Haley & Aldrich, Inc.		
Project:	Proposed Pier Infill Int. Marine Terminal		
Location:	Portland, ME	Project No:	GTX-306769
Boring ID:	HA-17-1	Sample Type:	jar
Sample ID:	S7	Test Date:	08/01/17
Depth :	25.0-27.0 ft	Test Id:	418612
Test Comment:	---		
Visual Description:	Moist, gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S7	HA-17-1	25.0-27.0 ft	30	30	18	12	1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

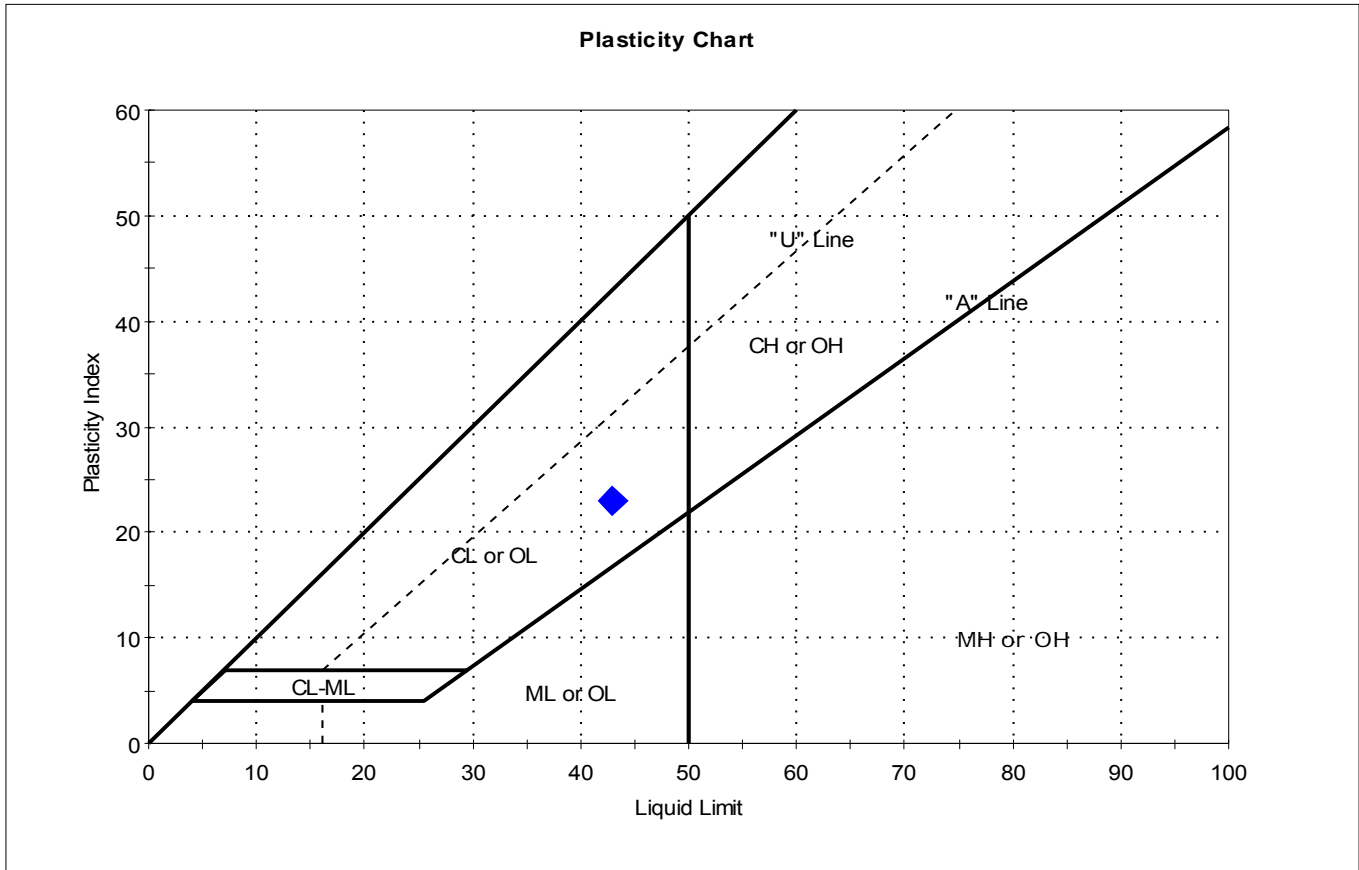
Dilatancy: NONE

Toughness: LOW



Client:	Haley & Aldrich, Inc.		
Project:	Proposed Pier Infill Int. Marine Terminal		
Location:	Portland, ME	Project No:	GTX-306769
Boring ID:	HA-17-2	Sample Type:	jar
Sample ID:	S11	Test Date:	08/01/17
Depth :	25.0-27.0 ft	Test Id:	418615
Test Comment:	---		
Visual Description:	Moist, olive gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S11	HA-17-2	25.0-27.0 ft	38	43	20	23	0.8	

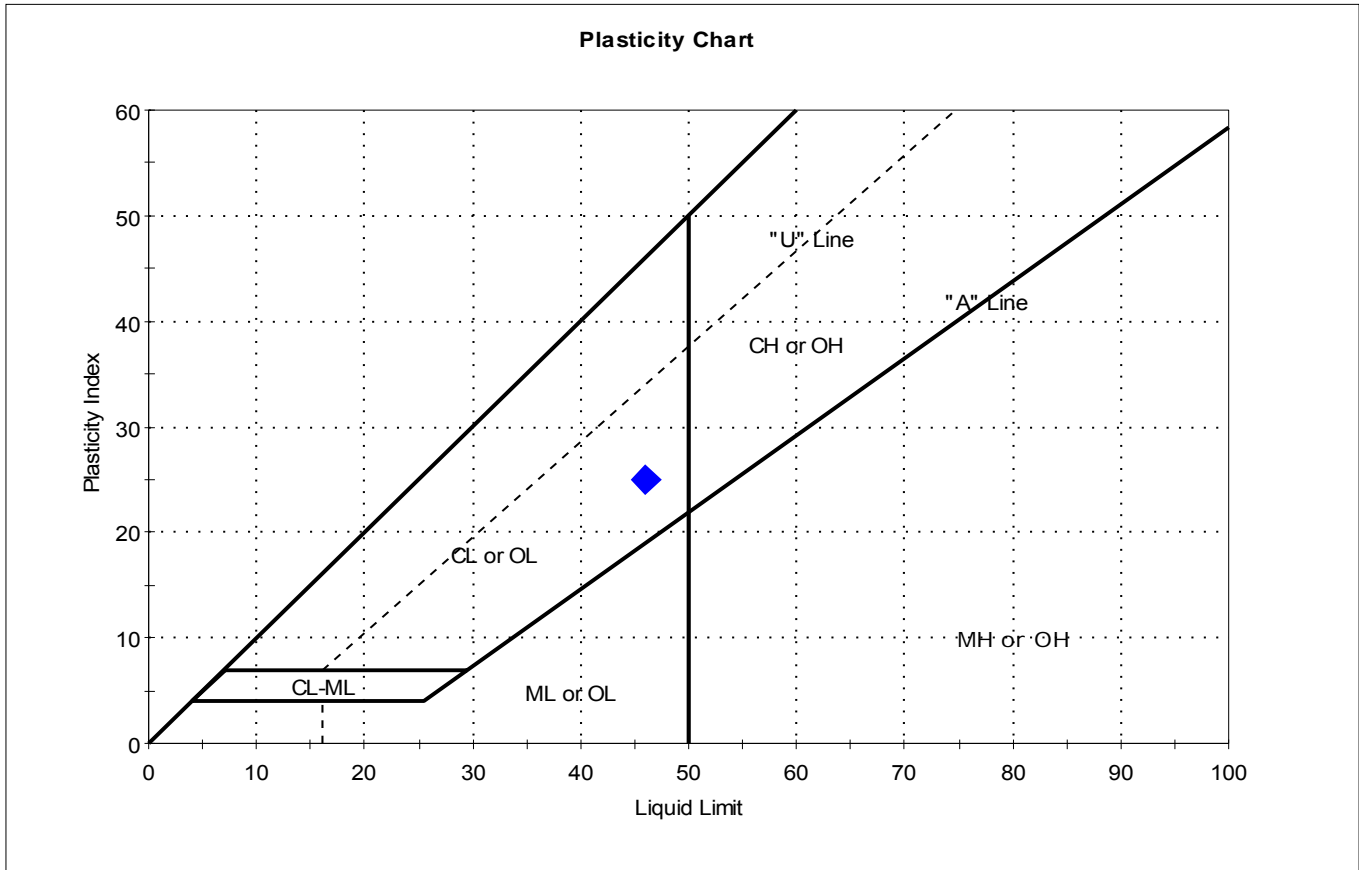
Sample Prepared using the WET method

Dry Strength: HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Haley & Aldrich, Inc.		
Project:	Proposed Pier Infill Int. Marine Terminal		
Location:	Portland, ME	Project No:	GTX-306769
Boring ID:	HA-17-2	Sample Type:	jar
Sample ID:	S12	Test Date:	08/01/17
Depth :	30.0-32.0 ft	Test Id:	418613
Test Comment:	---		
Visual Description:	Moist, gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S12	HA-17-2	30.0-32.0 ft	43	46	21	25	0.9	

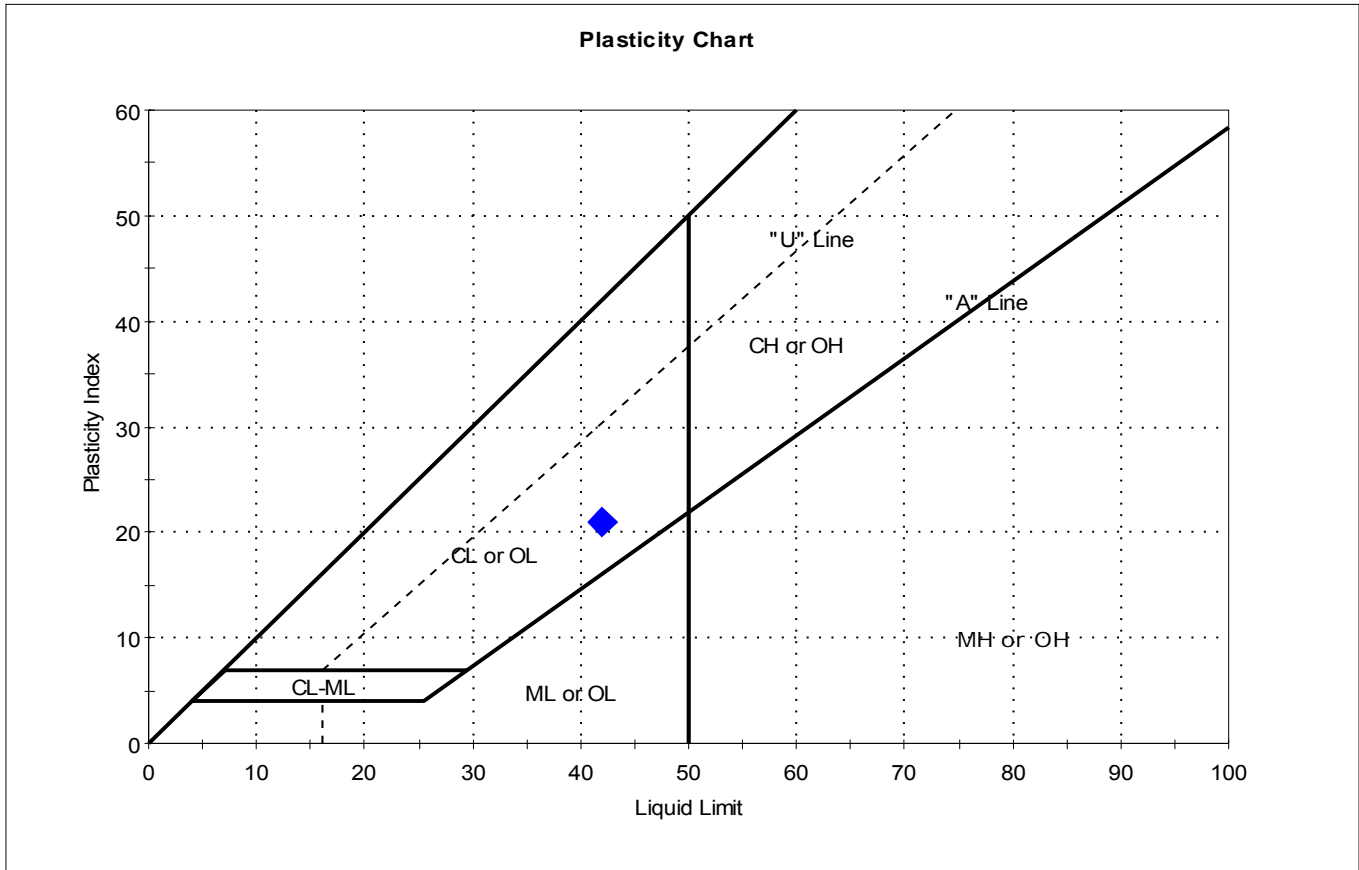
Sample Prepared using the WET method

Dry Strength: HIGH
 Dilatancy: NONE
 Toughness: MEDIUM



Client:	Haley & Aldrich, Inc.		
Project:	Proposed Pier Infill Int. Marine Terminal		
Location:	Portland, ME	Project No:	GTX-306769
Boring ID:	HA-17-2	Sample Type:	jar
Sample ID:	S13	Test Date:	08/01/17
Depth :	35.0-37.0 ft	Test Id:	418616
Test Comment:	---		
Visual Description:	Moist, olive gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S13	HA-17-2	35.0-37.0 ft	39	42	21	21	0.9	

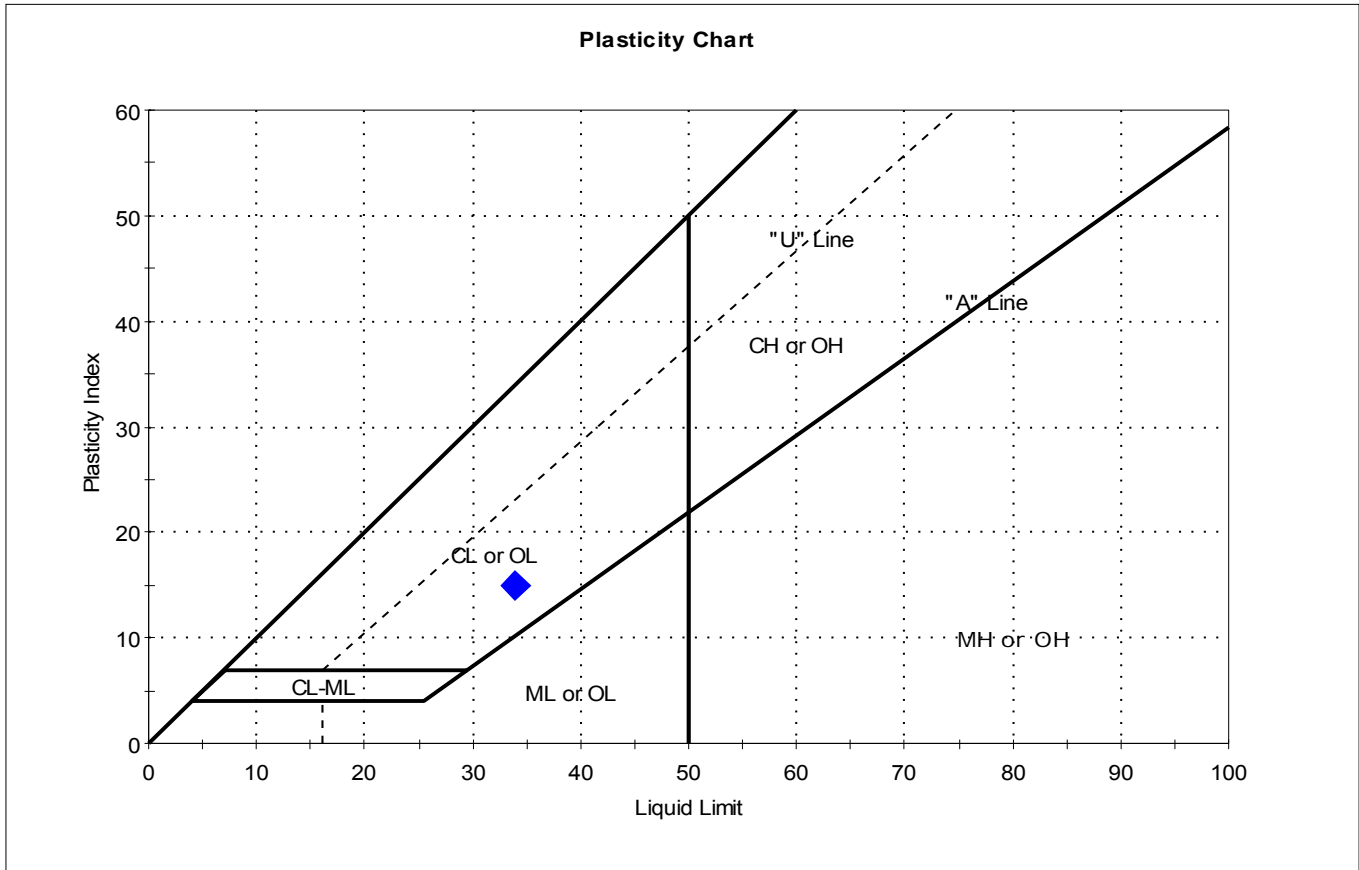
Sample Prepared using the WET method

Dry Strength: HIGH
 Dilatancy: SLOW
 Toughness: MEDIUM



Client:	Haley & Aldrich, Inc.		
Project:	Proposed Pier Infill Int. Marine Terminal		
Location:	Portland, ME	Project No:	GTX-306769
Boring ID:	HA-17-2	Sample Type:	jar
Sample ID:	S14	Test Date:	08/01/17
Depth:	40.0-42.0 ft	Test Id:	418614
Test Comment:	---		
Visual Description:	Moist, olive gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S14	HA-17-2	40.0-42.0 ft	31	34	19	15	0.8	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: NONE

Toughness: MEDIUM

WARRANTY and LIABILITY

GeoTesting Express (GTX) warrants that all tests it performs are run in general accordance with the specified test procedures and accepted industry practice. GTX will correct or repeat any test that does not comply with this warranty. GTX has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

GTX may report engineering parameters that require us to interpret the test data. Such parameters are determined using accepted engineering procedures. However, GTX does not warrant that these parameters accurately reflect the true engineering properties of the *in situ* material. Responsibility for interpretation and use of the test data and these parameters for engineering and/or construction purposes rests solely with the user and not with GTX or any of its employees.

GTX's liability will be limited to correcting or repeating a test which fails our warranty. GTX's liability for damages to the Purchaser of testing services for any cause whatsoever shall be limited to the amount GTX received for the testing services. GTX will not be liable for any damages, or for any lost benefits or other consequential damages resulting from the use of these test results, even if GTX has been advised of the possibility of such damages. GTX will not be responsible for any liability of the Purchaser to any third party.

Commonly Used Symbols

A	pore pressure parameter for $\Delta\sigma_1 - \Delta\sigma_3$	S_r	Post cyclic undrained shear strength
B	pore pressure parameter for $\Delta\sigma_3$	T	temperature
CAI	CERCHAR Abrasiveness Index	t	time
CIU	isotropically consolidated undrained triaxial shear test	U, UC	unconfined compression test
CR	compression ratio for one dimensional consolidation	UU, Q	unconsolidated undrained triaxial test
CSR	cyclic stress ratio	u_a	pore gas pressure
C_c	coefficient of curvature, $(D_{30})^2 / (D_{10} \times D_{60})$	u_e	excess pore water pressure
C_u	coefficient of uniformity, D_{60}/D_{10}	u, u_w	pore water pressure
C_c	compression index for one dimensional consolidation	V	total volume
C_α	coefficient of secondary compression	V_g	volume of gas
c_v	coefficient of consolidation	V_s	volume of solids
c	cohesion intercept for total stresses	V_s	shear wave velocity
c'	cohesion intercept for effective stresses	V_v	volume of voids
D	diameter of specimen	V_w	volume of water
D	damping ratio	V_o	initial volume
D_{10}	diameter at which 10% of soil is finer	v	velocity
D_{15}	diameter at which 15% of soil is finer	W	total weight
D_{30}	diameter at which 30% of soil is finer	W_s	weight of solids
D_{50}	diameter at which 50% of soil is finer	W_w	weight of water
D_{60}	diameter at which 60% of soil is finer	w	water content
D_{85}	diameter at which 85% of soil is finer	w_c	water content at consolidation
d_{50}	displacement for 50% consolidation	w_f	final water content
d_{90}	displacement for 90% consolidation	w_l	liquid limit
d_{100}	displacement for 100% consolidation	w_n	natural water content
E	Young's modulus	w_p	plastic limit
e	void ratio	w_s	shrinkage limit
e_c	void ratio after consolidation	w_o, w_i	initial water content
e_o	initial void ratio	α	slope of q_f versus p_f
G	shear modulus	α'	slope of q_f versus p_f'
G_s	specific gravity of soil particles	γ_t	total unit weight
H	height of specimen	γ_d	dry unit weight
H_R	Rebound Hardness number	γ_s	unit weight of solids
i	gradient	γ_w	unit weight of water
I_S	Uncorrected point load strength	ϵ	strain
$I_{S(50)}$	Size corrected point load strength index	ϵ_{vol}	volume strain
H_A	Modified Taber Abrasion	ϵ_h, ϵ_v	horizontal strain, vertical strain
H_T	Total hardness	μ	Poisson's ratio, also viscosity
K_o	lateral stress ratio for one dimensional strain	σ	normal stress
k	permeability	σ'	effective normal stress
LI	Liquidity Index	σ_c, σ'_c	consolidation stress in isotropic stress system
m_v	coefficient of volume change	σ_h, σ'_h	horizontal normal stress
n	porosity	σ_v, σ'_v	vertical normal stress
PI	plasticity index	σ'_{vc}	Effective vertical consolidation stress
P_c	preconsolidation pressure	σ_1	major principal stress
p	$(\sigma_1 + \sigma_3) / 2, (\sigma_v + \sigma_h) / 2$	σ_2	intermediate principal stress
p'	$(\sigma'_1 + \sigma'_3) / 2, (\sigma'_v + \sigma'_h) / 2$	σ_3	minor principal stress
p'_c	p' at consolidation	τ	shear stress
Q	quantity of flow	ϕ	friction angle based on total stresses
q	$(\sigma_1 - \sigma_3) / 2$	ϕ'	friction angle based on effective stresses
q_f	q at failure	ϕ'_r	residual friction angle
q_o, q_i	initial q	ϕ_{ult}	ϕ for ultimate strength
q_c	q at consolidation		