



Aptim Environmental & Infrastructure, LLC

6401 Congress Avenue, Suite 140

Boca Raton, Florida 33487

Phone # 1-561-391-8102

Legend for Geotechnical Data

Grain Size Scale for Sediments

Unified Soil Classification System (USCS) (ASTM D2487/2488)		APTIM Standard Sieve Stack		
		Sieve Number	Size (phi)	Size (mm)
Gravel	Coarse Gravel	3/4	-4.25	19.03
	Fine Gravel	5/8	-4.00	16.00
		7/16	-3.50	11.20
		5/16	-3.00	8.00
		3 1/2	-2.50	5.60
		4	-2.25	4.75
Sand	Coarse Sand	5	-2.00	4.00
		7	-1.50	2.80
		10	-1.00	2.00
	Medium Sand	14	-0.50	1.40
		18	0.00	1.00
		25	0.50	0.71
		35	1.00	0.50
	Fine Sand	45	1.50	0.36
		60	2.00	0.25
		80	2.50	0.18
		120	3.00	0.13
		170	3.50	0.09
		200	3.75	0.08
Fines	Silt/Clay	230	4.00	0.06

Proportional Definition of Descriptive Terms

<u>Descriptive Term</u>	<u>Range of Proportions</u>
Sandy, gravelly, etc.	35 % to 50 %
Some	20 % to 35 %
Little	10 % to 20 %
Trace	1 % to 10 %

Consistency of Cohesive Soils

Description	Consistency Index	Approximate Undrained Shear Strength (kPa)	Field Identification
Hard		Over 300	Indented with difficulty by thumbnail, brittle.
Very Stiff	>1	150-300	Readily indented by thumbnail, still very tough.
Stiff	0.75-1	75-150	Readily indented by thumb but penetrated only with difficulty. Cannot be moulded in the fingers.
Firm	0.5-0.75	40-75	Can be penetrated several centimeters by thumb with moderate effort and moulded in fingers by strong pressure.
Soft	< 0.5	20-40	Easily penetrated several centimeters by thumb, easily moulded.
Very Soft		Less than 20	Easily penetrated several centimeters by fist, exudes between fingers when squeezed in fist.

Source: *Engineering Properties of Soils and Rocks, Fourth Edition by Fred G. Bell*

USCS Classifications

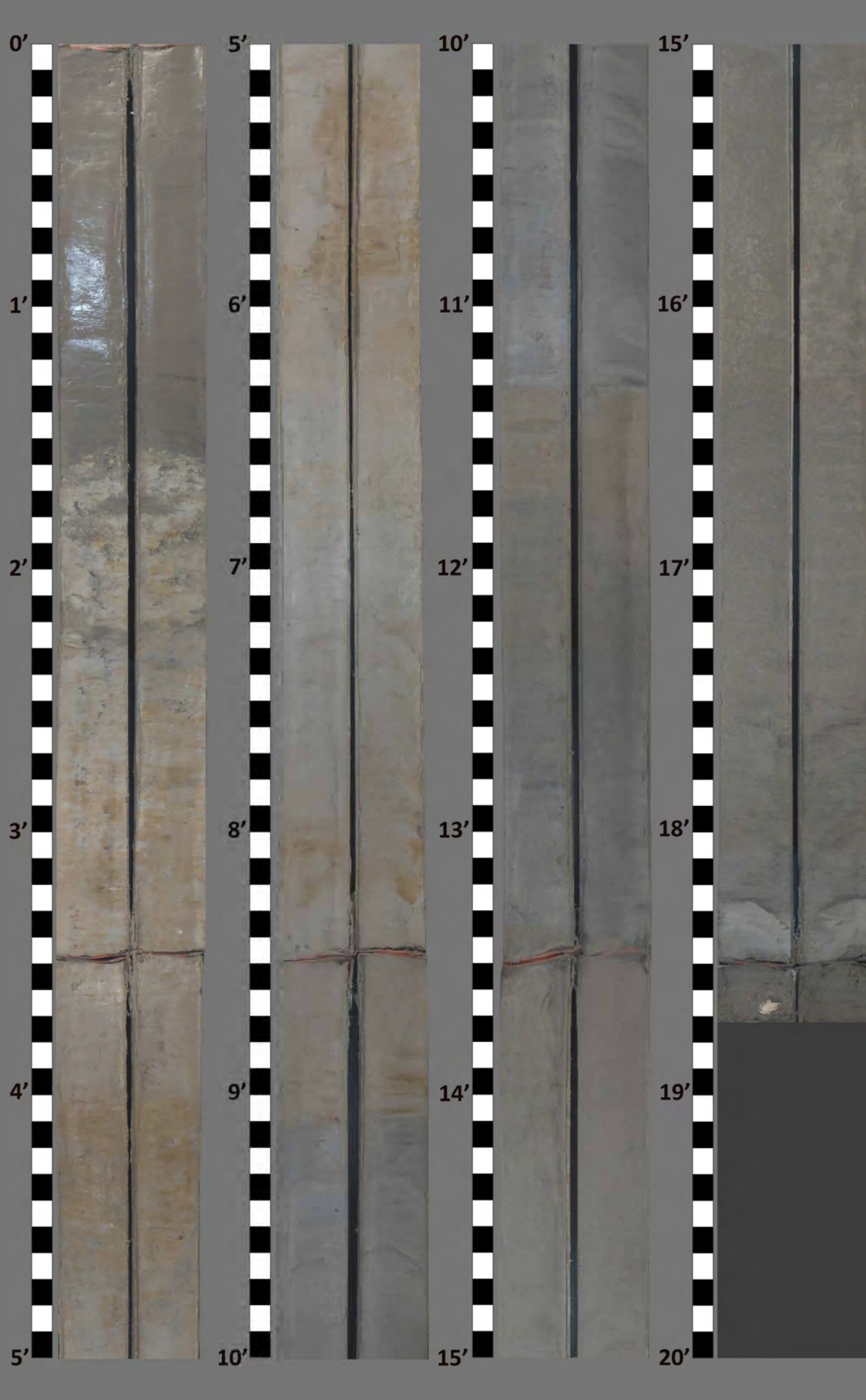
Refers to the Army Corps of Engineers Unified Soils Classification System. Class types are defined primarily by grain size, sorting and percent of material passing the #200 sieve. Classification of materials on the core logs based on visual field examinations are identified on the core logs under the Classification of Materials Description. Classifications based on laboratory sieve analyses are identified on the core logs in the Legend and under Remarks.

GW		Well graded gravels or gravel-sand mixtures, little or no fines	ML		Inorganic silts and very fine sands, rock flour, sandy silts or clayey silts with slight plasticity
GP		Poorly graded gravels or gravel-sand mixtures, w/ little or no fines	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soil, elastic silts
GM		Silty gravels, gravel-sand-silt mixtures	OL		Organic silts and organic silt-clays of low plasticity
GC		Clayey gravels, gravel-sand-clay mixtures	OH		Organic clays of medium to high plasticity, organic silts
SW		Well graded sands or gravelly sands, little or no fines	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SP		Poorly graded sands or gravelly sands, little or no fines	CH		Inorganic clays of high plasticity, fat clays
SM		Silty sands, sand-silt mixtures	PT		Peat and other highly organic soils
SC		Clayey sands, sand-clay mixtures	SP-SM		Poorly-graded silty sand
SW-SM		Well-graded silty sand	SM-SC		Silty clayey sand
GW-GM		Well-graded silty gravel	ML-CL		Inorganic silty lean clay
GM-GC		Clayey silty gravel			

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

DRILLING LOG		DIVISION		INSTALLATION		SHEET 1 OF 1 SHEETS	
1. PROJECT TX GLO Region 1 Recon Geotechnical Sand Search Jefferson, Chambers, Galveston and Brazoria Co. 				9. SIZE AND TYPE OF BIT 3.0 In.			
2. BORING DESIGNATION TXGLO1-VC-23-014				10. COORDINATE SYSTEM/DATUM Texas State Plane South		HORIZONTAL NAD 1983	
3. DRILLING AGENCY APTIM				11. MANUFACTURER'S DESIGNATION OF DRILL APTIM SEAS VC-700 Vibracore		VERTICAL NAVD88	
4. NAME OF DRILLER APTIM				12. TOTAL SAMPLES 3			
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED				13. TOTAL NUMBER CORE BOXES			
6. THICKNESS OF OVERBURDEN 0.0 Ft.				14. ELEVATION GROUND WATER			
7. DEPTH DRILLED INTO ROCK 0.0 Ft.				15. DATE BORING 10-06-23			
8. TOTAL DEPTH OF BORING 19.2 Ft.				16. ELEVATION TOP OF BORING -28.4 Ft.			
				17. TOTAL RECOVERY FOR BORING 18.7 Ft.			
				18. SIGNATURE AND TITLE OF INSPECTOR SM			
ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS The USCS classification system defines silt as the percent passing the No.200 (0.075 mm) sieve	
-28.4	0.0						
-29.9	1.5		LEAN CLAY, very soft, trace shell hash, trace silt, silt distributed in laminae, shell hash distributed in silt laminae between 1.2' & 1.5', very dark grayish brown (2.5Y-3/2), (CL).		T1	Sample #T1, Depth = 0.8' Ave. Field Vane (tsf): 0.00	
-30.8	2.4		FAT CLAY, very stiff, trace silt, oxidation throughout layer, greenish gray (10GY-5/1), (CH).		T2	Sample #T2, Depth = 1.9' Ave. Field Vane (tsf): 0.20	
-34.7	6.3		FAT CLAY, very stiff, little silt, trace rock fragments, oxidation throughout layer, rock fragments are fragments of partially lithified clay between 3.2' & 4.5', color is mottled brown (10YR-5/3) and light brownish gray (2.5Y-6/2), (CH).		T3	Sample #T3, Depth = 5.0' Ave. Field Vane (tsf): 0.26	
-36.8	8.4		Clayey SILT, trace sand, fine grained, quartz, 1.5" clay pocket @ 7.0', 0.25" clay pocket @ 7.5', light brownish gray (2.5Y-6/2), (ML).				
-37.5	9.1		Sandy SILT, little clay, sand component is fine grained quartz, 2.0" clay pocket @ 8.9', light olive brown (2.5Y-5/3), (ML).				
-39.7	11.3		FAT CLAY, very stiff, trace sand, fine grained, quartz, trace silt, silt distributed in laminae, lenticular bedding between 10.5' & 11.0', gray (2.5Y-5/1), (CH).		T4	Sample #T4, Depth = 10.0' Ave. Field Vane (tsf): 0.28	
-40.1	11.7		Silty SAND, fine grained, quartz, trace clay, 0.25" clay pocket @ 11.3', grayish brown (2.5Y-5/2), (SM).				
-43.5	15.1		Silty SAND, fine grained, quartz, trace clay, 0.25" clay pocket @ 14.0', 1.5" clay pocket @ 14.9', gray (2.5Y-5/1), (SM).		1	Sample #1, Depth = 12.5' Mean (mm): 0.09, Phi Sorting: 0.28 Fines (230): 35.38% Fines (200): 48.13% (SM)	
-45.9	17.5		SAND, fine grained, quartz, trace clay, trace silt, clay distributed in pockets up to 0.25", clay increases with depth in layer, possible bioturbation between 15.1' & 16.3', gray (2.5Y-5/1), (SM).		2	Sample #2, Depth = 14.4' Mean (mm): 0.10, Phi Sorting: 0.29 Fines (230): 30.64% Fines (200): 40.79% (SM)	
-47.1	18.7		FAT CLAY, very stiff, trace sand, fine grained, quartz, trace shell fragments, trace silt, silt distributed in laminae, sand distributed in pockets up to 0.5" between 18.2' & 18.7', (0.75" x 1.25") bivalve fragment in bit sample, Bit sample from 18.5' to 18.7', color is mottled gray (5Y-6/1) and gray (2.5Y-5/1), (CH).		3	Sample #3, Depth = 16.4' Mean (mm): 0.11, Phi Sorting: 0.31 Fines (230): 17.28% Fines (200): 20.83% (SM)	
-47.6	19.2		No recovery.		T5	Sample #T5, Depth = 18.0' Ave. Field Vane (tsf): 0.31	
			End of Boring				

REGION 1 RECON GEOTECH GP-1 3/25/24



Texas General
Land Office

Texas GLO
Region 1
Geotechnical
Reconnaissance
Survey

TXGLO1-VC-23-014

Date Collected: 10/6/23
Top Elev. (ft NAVD88): -28.4
Bottom Elev. (ft NAVD88): -47.1
Core Length (ft): 18.7



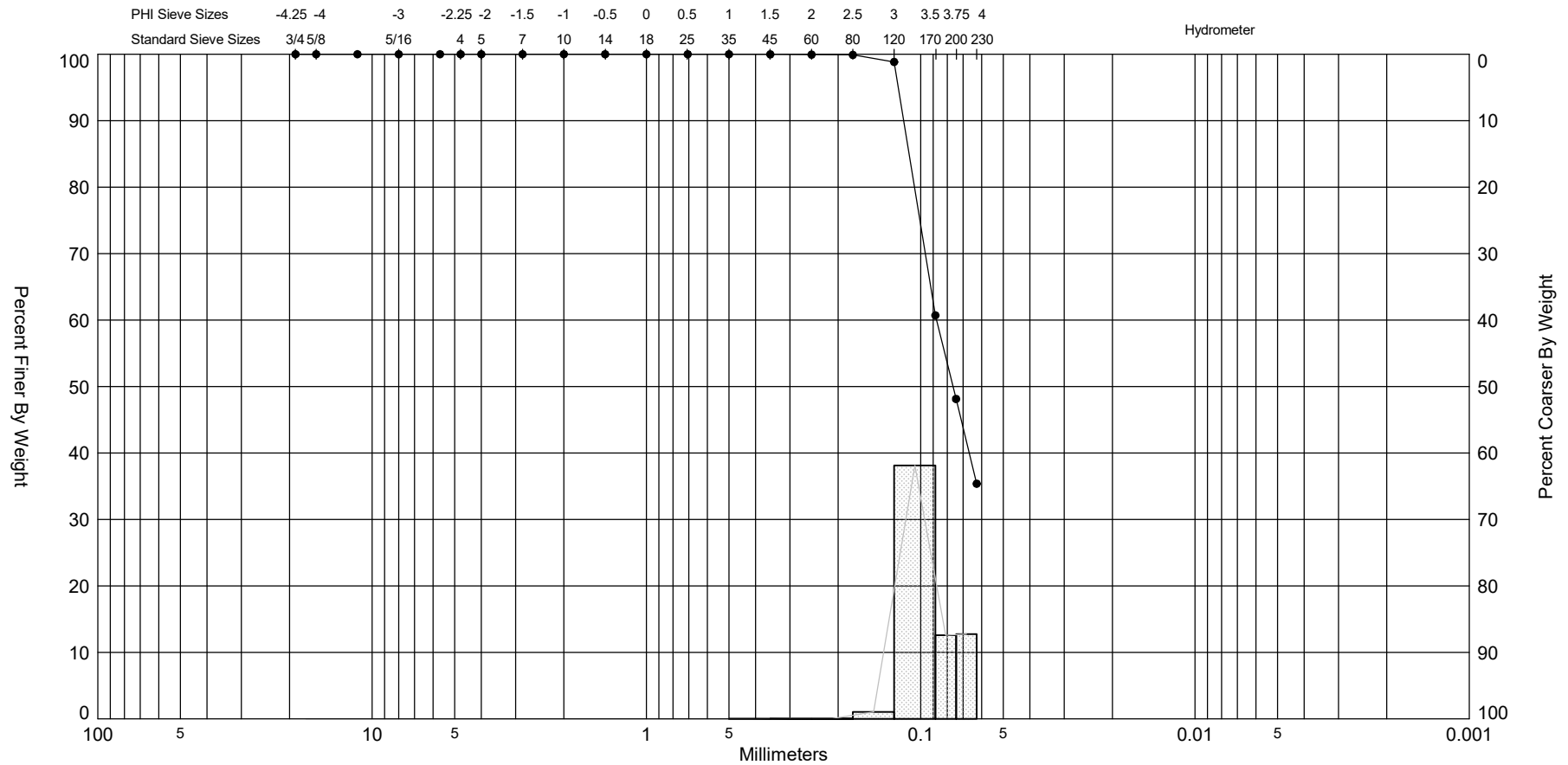
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Granularmetric Report				 APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102			
Depths and elevations based on measured values							
Project Name: TX GLO Region 1 Recon Geotechnical Sand Search							
Sample Name: TXGLO1-VC-23-014 #1							
Analysis Date: 01-19-24							
Analyzed By: WMM							
Easting (ft):		Northing (ft):		Coordinate System:		Elevation (ft):	
3,531,539		13,794,886		Texas State Plane South		-40.9 NAVD88	
USCS:		Munsell:		Comments:			
SM		Wet - 2.5Y-5/1 Dry - 2.5Y-7/1 Washed - 2.5Y-7/1					
Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
93.11	66.83	6.66	0.00	#200 - 48.13 #230 - 35.38			
Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained	
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00	
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00	
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00	
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00	
3.5	-2.50	5.66	0.00	0.00	0.00	0.00	
4	-2.25	4.76	0.00	0.00	0.00	0.00	
5	-2.00	4.00	0.00	0.00	0.00	0.00	
7	-1.50	2.83	0.00	0.00	0.00	0.00	
10	-1.00	2.00	0.00	0.00	0.00	0.00	
14	-0.50	1.41	0.00	0.00	0.00	0.00	
18	0.00	1.00	0.00	0.00	0.00	0.00	
25	0.50	0.71	0.00	0.00	0.00	0.00	
35	1.00	0.50	0.00	0.00	0.00	0.00	
45	1.50	0.35	0.02	0.02	0.02	0.02	
60	2.00	0.25	0.04	0.04	0.06	0.06	
80	2.50	0.18	0.04	0.04	0.10	0.10	
120	3.00	0.13	0.99	1.06	1.09	1.16	
170	3.50	0.09	35.50	38.13	36.59	39.29	
200	3.75	0.07	11.71	12.58	48.30	51.87	
230	4.00	0.06	11.87	12.75	60.17	64.62	
Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95	
			3.71	3.31	3.19	3.05	
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis		
Statistics	3.44	0.09	0.28	0.06	4.36		

Granularmetric Report				 APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102			
Depths and elevations based on measured values							
Project Name: TX GLO Region 1 Recon Geotechnical Sand Search							
Sample Name: TXGLO1-VC-23-014 #2							
Analysis Date: 01-19-24							
Analyzed By: WMM							
Easting (ft):		Northing (ft):		Coordinate System:		Elevation (ft):	
3,531,539		13,794,886		Texas State Plane South		-42.8 NAVD88	
USCS:		Munsell:		Comments:			
SM		Wet - 2.5Y-5/1 Dry - 2.5Y-6/2 Washed - 2.5Y-7/2					
Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
97.68	72.48	4.74	0.00	#200 - 40.79 #230 - 30.64			
Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained	
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00	
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00	
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00	
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00	
3.5	-2.50	5.66	0.00	0.00	0.00	0.00	
4	-2.25	4.76	0.00	0.00	0.00	0.00	
5	-2.00	4.00	0.00	0.00	0.00	0.00	
7	-1.50	2.83	0.00	0.00	0.00	0.00	
10	-1.00	2.00	0.00	0.00	0.00	0.00	
14	-0.50	1.41	0.00	0.00	0.00	0.00	
18	0.00	1.00	0.00	0.00	0.00	0.00	
25	0.50	0.71	0.00	0.00	0.00	0.00	
35	1.00	0.50	0.00	0.00	0.00	0.00	
45	1.50	0.35	0.02	0.02	0.02	0.02	
60	2.00	0.25	0.04	0.04	0.06	0.06	
80	2.50	0.18	0.12	0.12	0.18	0.18	
120	3.00	0.13	3.66	3.75	3.84	3.93	
170	3.50	0.09	39.04	39.97	42.88	43.90	
200	3.75	0.07	14.95	15.31	57.83	59.21	
230	4.00	0.06	9.91	10.15	67.74	69.36	
Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95	
			3.60	3.26	3.15	3.01	
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis		
Statistics	3.39	0.10	0.29	-0.21	4.35		

Granularmetric Report				 APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102			
Depths and elevations based on measured values							
Project Name: TX GLO Region 1 Recon Geotechnical Sand Search							
Sample Name: TXGLO1-VC-23-014 #3							
Analysis Date: 01-19-24							
Analyzed By: WMM							
Easting (ft):		Northing (ft):		Coordinate System:		Elevation (ft):	
3,531,539		13,794,886		Texas State Plane South		-44.8 NAVD88	
USCS:		Munsell:		Comments:			
SM		Wet - 2.5Y-5/1 Dry - 2.5Y-6/1 Washed - 2.5Y-7/1					
Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
94.58	79.65	1.40	0.00	#200 - 20.83 #230 - 17.28			
Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained	
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00	
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00	
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00	
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00	
3.5	-2.50	5.66	0.00	0.00	0.00	0.00	
4	-2.25	4.76	0.00	0.00	0.00	0.00	
5	-2.00	4.00	0.00	0.00	0.00	0.00	
7	-1.50	2.83	0.00	0.00	0.00	0.00	
10	-1.00	2.00	0.00	0.00	0.00	0.00	
14	-0.50	1.41	0.00	0.00	0.00	0.00	
18	0.00	1.00	0.01	0.01	0.01	0.01	
25	0.50	0.71	0.00	0.00	0.01	0.01	
35	1.00	0.50	0.00	0.00	0.01	0.01	
45	1.50	0.35	0.04	0.04	0.05	0.05	
60	2.00	0.25	0.07	0.07	0.12	0.12	
80	2.50	0.18	0.33	0.35	0.45	0.47	
120	3.00	0.13	20.10	21.25	20.55	21.72	
170	3.50	0.09	47.87	50.61	68.42	72.33	
200	3.75	0.07	6.47	6.84	74.89	79.17	
230	4.00	0.06	3.36	3.55	78.25	82.72	
Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95	
		3.60	3.28	3.03	2.87	2.61	
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis		
Statistics	3.17	0.11	0.31	-0.37	5.74		

REGION1_RECON_GEOTECH.GPJ 3/6/24



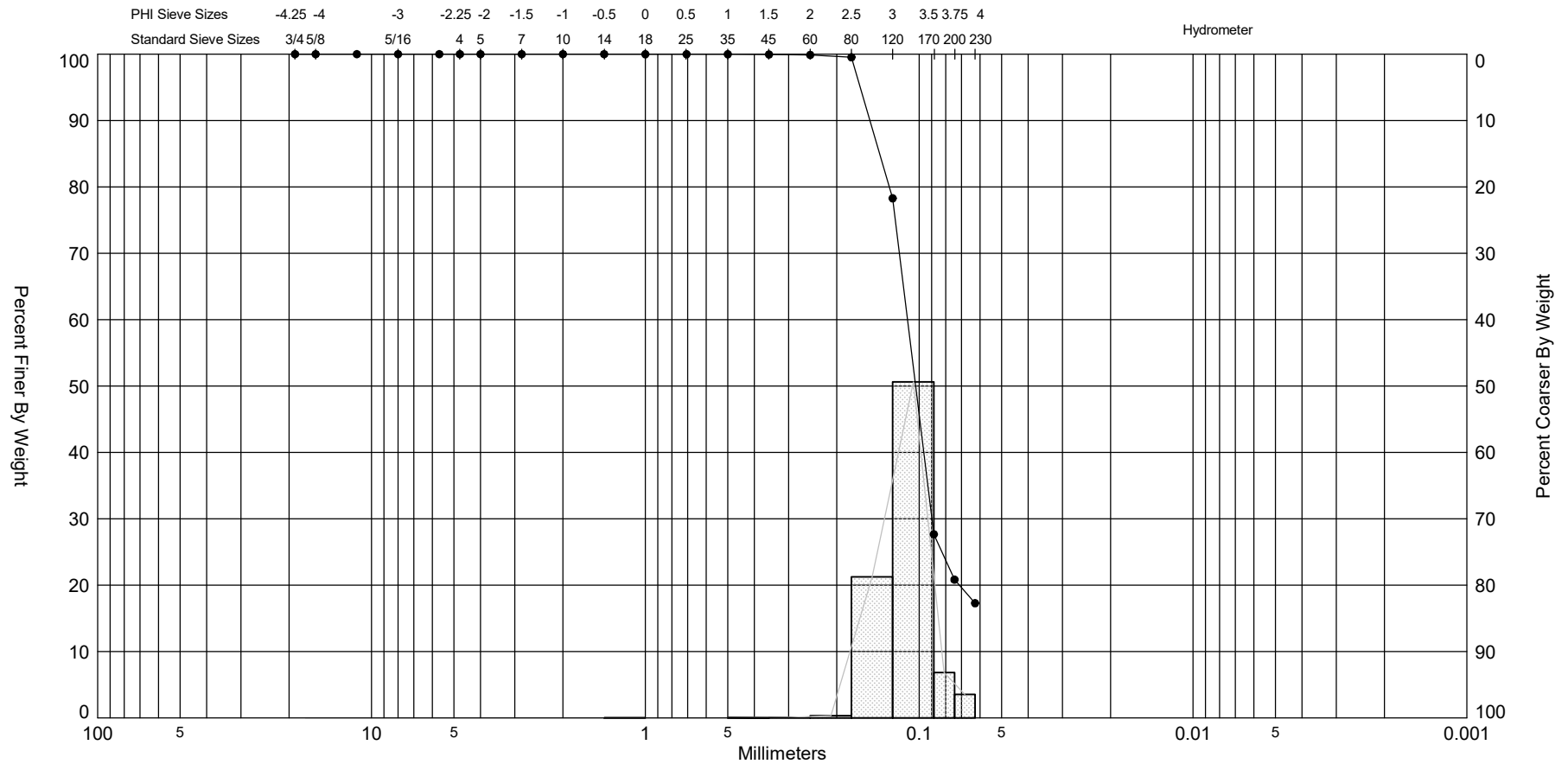
Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
TXGLO1-VC-23-014 #1	—●—	-40.9	SM	#200 - 48.13 #230 - 35.38			3.71	3.44	0.06	4.36	0.28	Project Name:	TX GLO Region 1 Recon Geotechnical Sand Search
Comments:												Analysis Date:	01-19-24
Depths and elevations based on measured values												Analyzed By:	WMM
							APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102					Easting (X, ft):	3,531,539
												Northing (Y, ft):	13,794,886
												Horizontal Datum:	NAD 1983
												Vertical Datum:	NAVD88



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
TXGLO1-VC-23-014 #2		-42.8	SM	#200 - 40.79 #230 - 30.64			3.6	3.39	-0.21	4.35	0.29	Project Name:	TX GLO Region 1 Recon Geotechnical Sand Search
Comments:												Analysis Date:	01-19-24
Depths and elevations based on measured values												Analyzed By:	WMM
						APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102						Easting (X, ft):	3,531,539
												Northing (Y, ft):	13,794,886
												Horizontal Datum:	NAD 1983
												Vertical Datum:	NAVD88

REGION1_RECON_GEOTECH.GPJ 3/6/24



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
TXGLO1-VC-23-014 #3	—●—	-44.8	SM	#200 - 20.83 #230 - 17.28			3.28	3.17	-0.37	5.74	0.31	Project Name:	TX GLO Region 1 Recon Geotechnical Sand Search
Comments:												Analysis Date:	01-19-24
Depths and elevations based on measured values												Analyzed By:	WMM
							APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102					Easting (X, ft):	3,531,539
												Northing (Y, ft):	13,794,886
												Horizontal Datum:	NAD 1983
												Vertical Datum:	NAVD88



Mini Vane Shear Test Results

CORE ID	SAMPLE DEPTH (ft)	TORVANE (kg/cm ²)	TORVANE (tsf)	TORVANE (kpa)	DESCRIPTION ¹
TXGLO1-VC-23-001	No Torvane Conducted				
TXGLO1-VC-23-002	3.0	1.5	0.15	147.10	Stiff
	6.0	1.0	0.10	98.07	Stiff
TXGLO1-VC-23-003	10.3	4.5	0.46	441.30	Hard
	13.4	5.5	0.56	539.37	Hard
	16.3	2.5	0.26	245.17	Very Stiff
TXGLO1-VC-23-004	9.1	3.0	0.31	294.20	Very Stiff
	11.9	5.0	0.51	490.33	Hard
	14.1	6.0	0.61	588.40	Hard
TXGLO1-VC-23-005	4.8	6.0	0.61	588.40	Hard
	7.5	5.0	0.51	490.33	Hard
	13.5	5.5	0.56	539.37	Hard
	16.5	3.5	0.36	343.23	Hard
TXGLO1-VC-23-006	No Torvane Conducted				
TXGLO1-VC-23-007	9.0	5.5	0.56	539.37	Hard
	15.1	1.5	0.15	147.10	Stiff
TXGLO1-VC-23-008	7.1	5.5	0.56	539.37	Hard
	8.1	9.0	0.92	882.60	Hard
	10.2	8.0	0.82	784.53	Hard
	16.0	8.0	0.82	784.53	Hard
TXGLO1-VC-23-009	No Torvane Conducted				
TXGLO1-VC-23-010	8.0	7.0	0.72	686.47	Hard
	10.0	8.5	0.87	833.57	Hard
	12.5	9.5	0.97	931.63	Hard
TXGLO1-VC-23-011	4.4	5.5	0.56	539.37	Hard
	16.0	6.5	0.67	637.43	Hard
TXGLO1-VC-23-012	0.8	0.0	0.00	0.00	Very Soft
	2.6	1.0	0.10	98.07	Stiff
TXGLO1-VC-23-013	3.0	2.5	0.26	245.17	Very Stiff
	6.4	3.0	0.31	294.20	Very Stiff
	13.7	8.0	0.82	784.53	Hard
TXGLO1-VC-23-014	0.8	0.0	0.00	0.00	Very Soft
	1.9	2.0	0.20	196.13	Very Stiff
	5.0	2.5	0.26	245.17	Very Stiff
	10.0	2.8	0.28	269.68	Very Stiff
	18.0	3.0	0.31	294.20	Very Stiff
TXGLO1-VC-23-015	No Torvane Conducted				
TXGLO1-VC-23-016	2.4	7.0	0.72	686.47	Hard
	5.5	7.5	0.77	735.50	Hard