



## 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)<br>(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*

|                                                                                                                        |  |                 |                                                                               |                                      |
|------------------------------------------------------------------------------------------------------------------------|--|-----------------|-------------------------------------------------------------------------------|--------------------------------------|
| <b>DRILLING LOG</b>                                                                                                    |  | <b>DIVISION</b> | <b>INSTALLATION</b>                                                           | <b>SHEET 1</b><br><b>OF 1 SHEETS</b> |
| <b>1. PROJECT</b><br>TX GLO Region 1 Recon Geotechnical Sand Search<br>Jefferson, Chambers, Galveston and Brazoria Co. |  |                 | <b>9. SIZE AND TYPE OF BIT</b> 3.0 In.                                        |                                      |
| <b>2. BORING DESIGNATION</b><br>TXGLO1-VC-23-010                                                                       |  |                 | <b>10. COORDINATE SYSTEM/DATUM</b><br>Texas State Plane South                 |                                      |
| <b>3. DRILLING AGENCY</b><br>APTIM                                                                                     |  |                 | <b>11. MANUFACTURER'S DESIGNATION OF DRILL</b><br>APTIM SEAS VC-700 Vibracore |                                      |
| <b>4. NAME OF DRILLER</b><br>APTIM                                                                                     |  |                 | <b>12. TOTAL SAMPLES</b><br>1                                                 |                                      |
| <b>5. DIRECTION OF BORING</b><br><input checked="" type="checkbox"/> VERTICAL<br><input type="checkbox"/> INCLINED     |  |                 | <b>13. TOTAL NUMBER CORE BOXES</b><br>3                                       |                                      |
| <b>6. THICKNESS OF OVERBURDEN</b> 0.0 Ft.                                                                              |  |                 | <b>14. ELEVATION GROUND WATER</b>                                             |                                      |
| <b>7. DEPTH DRILLED INTO ROCK</b> 0.0 Ft.                                                                              |  |                 | <b>15. DATE BORING</b> 10-06-23                                               |                                      |
| <b>8. TOTAL DEPTH OF BORING</b> 14.3 Ft.                                                                               |  |                 | <b>16. ELEVATION TOP OF BORING</b> -24.4 Ft.                                  |                                      |
|                                                                                                                        |  |                 | <b>17. TOTAL RECOVERY FOR BORING</b> 14.3 Ft.                                 |                                      |
|                                                                                                                        |  |                 | <b>18. SIGNATURE AND TITLE OF INSPECTOR</b><br>SM                             |                                      |

| ELEV.<br>(ft) | DEPTH<br>(ft) | LEGEND | CLASSIFICATION OF MATERIALS<br>Depths and elevations based on measured values                                                                                                                                                                               | %<br>REC. | BOX OR<br>SAMPLE | REMARKS<br>The USCS classification system defines silt as the<br>percent passing the No.200 (0.075 mm) sieve     |
|---------------|---------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------|------------------------------------------------------------------------------------------------------------------|
| -24.4         | 0.0           |        |                                                                                                                                                                                                                                                             |           |                  |                                                                                                                  |
| -29.7         | 5.3           |        | LEAN CLAY, very soft, trace shell hash, trace silt, trace whole shell, shell hash and silt distributed in laminae that increase with depth in layer, whole shells up to 0.25" between 4.1' & 4.6', dark gray (2.5Y-4/1), (CL).                              |           |                  |                                                                                                                  |
| -31.0         | 6.6           |        | SAND, fine grained, quartz, trace clay, trace shell hash, trace silt, flaser bedding between 5.3' & 5.9', 2.0" shell hash pocket @ 5.4', color is mottled greenish gray (5GY-6/1) and yellowish brown (10YR-5/6), (SM).                                     |           | 1                | Sample #1, Depth = 6.0'<br>Mean (mm): 0.14, Phi Sorting: 0.41<br>Fines (230): 20.83%<br>Fines (200): 22.35% (SM) |
| -35.5         | 11.1          |        | FAT CLAY, hard, trace silt, oxidation throughout layer, color is mottled yellowish brown (10YR-5/4) and light olive gray (5Y-6/2), (CH).                                                                                                                    |           | T1               | Sample #T1, Depth = 8.0'<br>Ave. Field Vane (tsf): 0.72                                                          |
| -38.7         | 14.3          |        | FAT CLAY, hard, trace sand, fine grained, quartz, trace silt, oxidation throughout layer, sand distributed in possible bioturbation @ 13.7'. Bit sample from 13.8' to 14.3', color is mottled yellowish brown (10YR-5/4) and greenish gray (10Y-5/1), (CH). |           | T2               | Sample #T2, Depth = 10.0'<br>Ave. Field Vane (tsf): 0.87                                                         |
|               |               |        | End of Boring                                                                                                                                                                                                                                               |           | T3               | Sample #T3, Depth = 12.5'<br>Ave. Field Vane (tsf): 0.97                                                         |



Texas General  
Land Office

Texas GLO  
Region 1  
Geotechnical  
Reconnaissance  
Survey

**TXGLO1-VC-23-010**

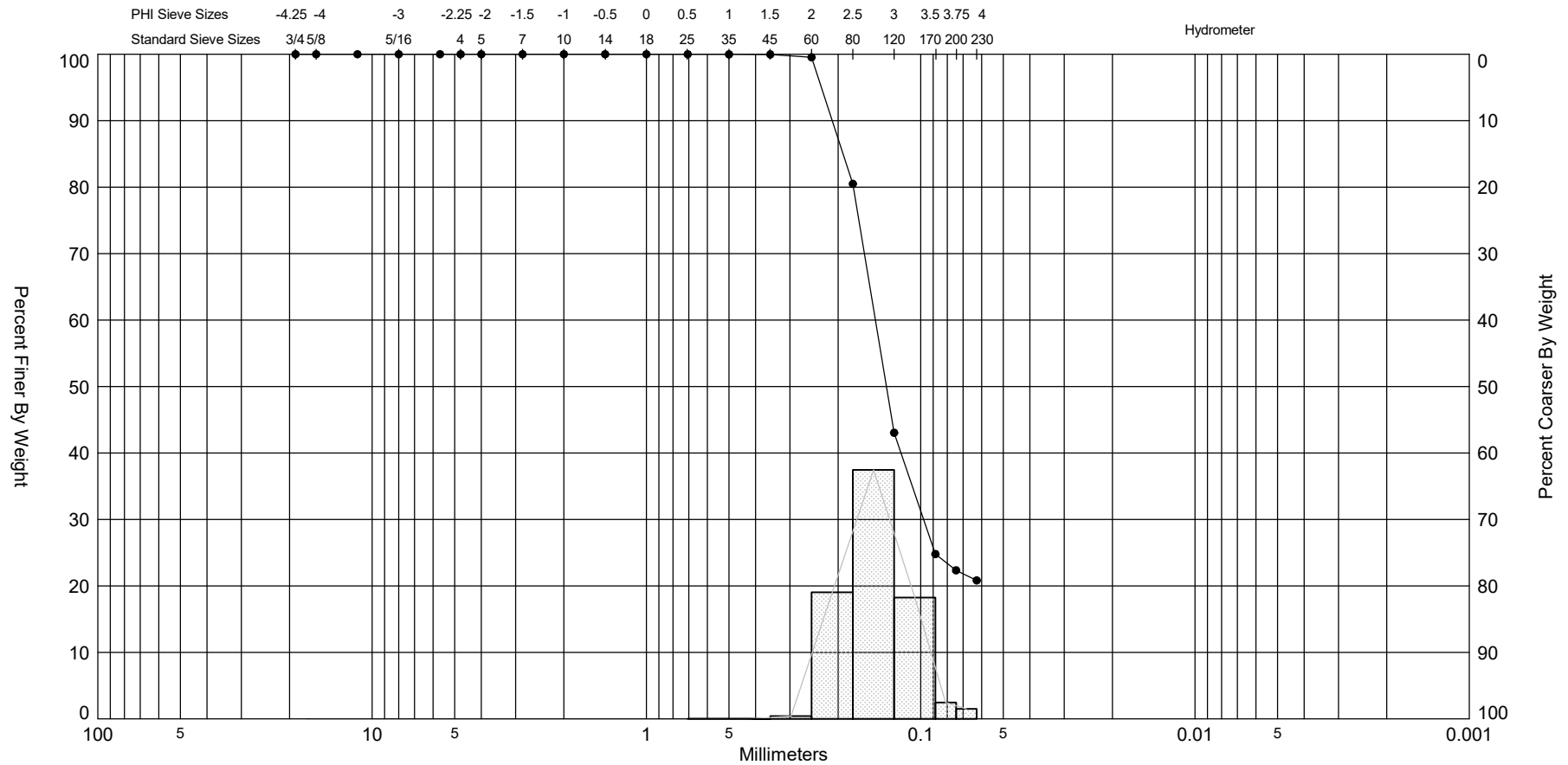
Date Collected: 10/6/23  
Top Elev. (ft NAVD88): -24.4  
Bottom Elev. (ft NAVD88): -38.7  
Core Length (ft): 14.3



6401 Congress Avenue, Suite 140  
Boca Raton, FL 33487  
[www.aptim.com](http://www.aptim.com)  
(561)391-8102

| Granularmetric Report                                        |                  |                                                                |                 | <br><b>APTIM</b><br>6401 Congress Avenue, Suite 140<br>Boca Raton, FL 33487<br>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-23-010 #1                             |                  |                                                                |                 |                                                                                                                                                                                     |                     |                      |                 |
| Analysis Date: 01-18-24                                      |                  |                                                                |                 |                                                                                                                                                                                     |                     |                      |                 |
| Analyzed By: SM                                              |                  |                                                                |                 |                                                                                                                                                                                     |                     |                      |                 |
| Easting (ft):                                                |                  | Northing (ft):                                                 |                 | Coordinate System:                                                                                                                                                                  |                     | Elevation (ft):      |                 |
| 3,537,996                                                    |                  | 13,804,017                                                     |                 | Texas State Plane South                                                                                                                                                             |                     | -30.4 NAVD88         |                 |
| USCS:                                                        |                  | Munsell: Wet - 10YR-5/6<br>Dry - 10YR-6/6<br>Washed - 10YR-8/3 |                 | Comments:                                                                                                                                                                           |                     |                      |                 |
| SM                                                           |                  |                                                                |                 |                                                                                                                                                                                     |                     |                      |                 |
| Dry Weight (g):                                              | Wash Weight (g): | Pan Retained (g):                                              | Sieve Loss (%): | Fines (%):                                                                                                                                                                          | Organics (%):       | Carbonates (%):      | Shell Hash (%): |
| 105.22                                                       | 83.77            | 0.48                                                           | 0.00            | #200 - 22.35<br>#230 - 20.83                                                                                                                                                        |                     |                      |                 |
| 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                                                           | 0.02            | 0.02                                                                                                                                                                                | 0.02                | 0.02                 |                 |
| 45                                                           | 1.50             | 0.35                                                           | 0.01            | 0.01                                                                                                                                                                                | 0.03                | 0.03                 |                 |
| 60                                                           | 2.00             | 0.25                                                           | 0.44            | 0.42                                                                                                                                                                                | 0.47                | 0.45                 |                 |
| 80                                                           | 2.50             | 0.18                                                           | 20.05           | 19.06                                                                                                                                                                               | 20.52               | 19.51                |                 |
| 120                                                          | 3.00             | 0.13                                                           | 39.39           | 37.44                                                                                                                                                                               | 59.91               | 56.95                |                 |
| 170                                                          | 3.50             | 0.09                                                           | 19.20           | 18.25                                                                                                                                                                               | 79.11               | 75.20                |                 |
| 200                                                          | 3.75             | 0.07                                                           | 2.58            | 2.45                                                                                                                                                                                | 81.69               | 77.65                |                 |
| 230                                                          | 4.00             | 0.06                                                           | 1.60            | 1.52                                                                                                                                                                                | 83.29               | 79.17                |                 |
|                                                              |                  |                                                                |                 |                                                                                                                                                                                     |                     |                      |                 |
| Phi 5                                                        | Phi 16           | Phi 25                                                         | Phi 50          | Phi 75                                                                                                                                                                              | Phi 84              | Phi 95               |                 |
|                                                              |                  | 3.49                                                           | 2.91            | 2.57                                                                                                                                                                                | 2.41                | 2.12                 |                 |
| Moment                                                       | Mean Phi         | Mean mm                                                        | Sorting         | Skewness                                                                                                                                                                            | Kurtosis            |                      |                 |
| Statistics                                                   | 2.79             | 0.14                                                           | 0.41            | 0.28                                                                                                                                                                                | 2.86                |                      |                 |

REGION1\_RECON\_GEOTECH.GPJ 3/6/24



| Sample                                                                              | Symbol                                                                              | Elev. (ft) | USCS | % Fines                      | % Organics | % Carbonates                                                                          | Median | Mean | Skew | Kurt | Sort | Sample Information |                                                |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------|------|------------------------------|------------|---------------------------------------------------------------------------------------|--------|------|------|------|------|--------------------|------------------------------------------------|
| TXGLO1-VC-23-010 #1                                                                 |  | -30.4      | SM   | #200 - 22.35<br>#230 - 20.83 |            |                                                                                       | 2.91   | 2.79 | 0.28 | 2.86 | 0.41 | Project Name:      | TX GLO Region 1 Recon Geotechnical Sand Search |
| Comments:                                                                           |                                                                                     |            |      |                              |            |                                                                                       |        |      |      |      |      | Analysis Date:     | 01-18-24                                       |
| Depths and elevations based on measured values                                      |                                                                                     |            |      |                              |            |                                                                                       |        |      |      |      |      | Analyzed By:       | SM                                             |
|  |                                                                                     |            |      |                              |            | APTIM<br>6401 Congress Avenue, Suite 140<br>Boca Raton, FL 33487<br>ph (561) 391-8102 |        |      |      |      |      | Easting (X, ft):   | 3,537,996                                      |
|                                                                                     |                                                                                     |            |      |                              |            |                                                                                       |        |      |      |      |      | Northing (Y, ft):  | 13,804,017                                     |
|                                                                                     |                                                                                     |            |      |                              |            |                                                                                       |        |      |      |      |      | Horizontal Datum:  | NAD 1983                                       |
|                                                                                     |                                                                                     |            |      |                              |            |                                                                                       |        |      |      |      |      | Vertical Datum:    | NAVD88                                         |



## Mini Vane Shear Test Results

| CORE ID          | SAMPLE DEPTH<br>(ft) | TORVANE<br>(kg/cm <sup>2</sup> ) | TORVANE<br>(tsf) | TORVANE<br>(kpa) | DESCRIPTION <sup>1</sup> |
|------------------|----------------------|----------------------------------|------------------|------------------|--------------------------|
| 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                     |