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# Transmittal

TO:

Delaney Peterson

Anchor QEA, LLC

720 Olive Way, Suite 1900

Seattle, WA 98101

| | |
|---|---|
| DATE: 11/26/2019 | GTX NO: 310685 |
| RE: Gasco PDI | |
| | |

| COPIES | DATE | DESCRIPTION |
|---|---|---|
| | 11/26/2019 | **November 2019 Laboratory Test Report** |
| | | |
| | | |
| | | |

REMARKS:

SIGNED:

Barbara Sanchez, Assistant Laboratory Manager

CC:

APPROVED BY :

Jonathan Campbell, Laboratory Manager

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November 26, 2019

Delaney Peterson
Anchor QEA, LLC
720 Olive Way, Suite 1900
Seattle, WA 98101

RE: Gasco PDI (GTX-310685)

Dear Delaney:

Enclosed are the test results you requested for the above referenced project. GeoTesting Express, Inc. (GTX) received eight samples from you on 11/1/2019. These samples were labeled as follows:

Sample Number
PDI-022SC-B-5.5-7.5-191016
PDI-031SC-B-8.9-10.9-191017
PDI-057SC-B-06-08-191023
PDI-059SC-B-06-08-191016
PDI-069SC-B-10-12-191016
PDI-083SC-B-08-10-191022
PDI-097SC-B-02-04-191017
PDI-099SC-B-02-04-191022

GTX performed the following tests on these samples:

8 ASTM D2216 - Moisture Content
8 ASTM D4318 - Atterberg Limits
2 ASTM D6913 - Sieve Analysis
6 ASTM D6913/D7928 - Grain Size Analysis - Sieve and Hydrometer
8 ASTM D854 - Specific Gravity

A copy of your test request is attached.

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,

Barbara Sanchez
Assistant Laboratory Manager

GeoTesting EXPRESS

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**Geotechnical Test Report** **11/26/2019**

# GTX-310685
# Gasco PDI

Prepared for:

Anchor QEA, LLC

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529668 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content,% |
|---|---|---|---|---|
| --- | PDI-2SC-B-5.5-7.5-1910 | --- | Moist, dark gray sand | 10.7 |
| --- | PDI-SC-B-8.9-10.9-1910 | --- | Moist, dark gray sand | 16.0 |
| --- | PDI-57SC-B-06-08-19102 | --- | Wet, dark gray clay | 77.2 |
| --- | PDI-59SC-B-06-08-19101 | --- | Moist, dark grayish brown silty sand | 38.4 |
| --- | PDI-69SC-B-10-12-19101 | --- | Moist, very dark gray silt | 67.2 |
| --- | PDI-83SC-B-08-10-19102 | --- | Moist, dark gray clay | 76.2 |
| --- | PDI-97SC-B-02-04-19101 | --- | Wet, dark gray silt | 86.8 |
| --- | PDI-99SC-B-02-04-19102 | --- | Moist, very dark gray clay | 79.6 |

Notes: Temperature of Drying : 110º Celsius

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529676 | | |

# Specific Gravity of Soils by ASTM D854

| Boring ID | Sample ID | Depth | Visual Description | Specific Gravity | Comment |
|---|---|---|---|---|---|
| --- | PDI-SC-B-5.5-7.5-19 | --- | Moist, dark gray sand | 2.75 | |
| --- | PDI-C-B-8.9-10.9-19 | --- | Moist, dark gray sand | 2.75 | |
| --- | PDI-SC-B-06-08-191 | --- | Wet, dark gray clay | 2.71 | |
| --- | PDI-SC-B-06-08-191 | --- | Moist, dark grayish brown silty sand | 2.80 | |
| --- | PDI-SC-B-10-12-191 | --- | Moist, very dark gray silt | 2.73 | |
| --- | PDI-SC-B-08-10-191 | --- | Moist, dark gray clay | 2.65 | |
| --- | PDI-SC-B-02-04-191 | --- | Wet, dark gray silt | 2.66 | |
| --- | PDI-SC-B-02-04-191 | --- | Moist, very dark gray clay | 2.71 | |

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

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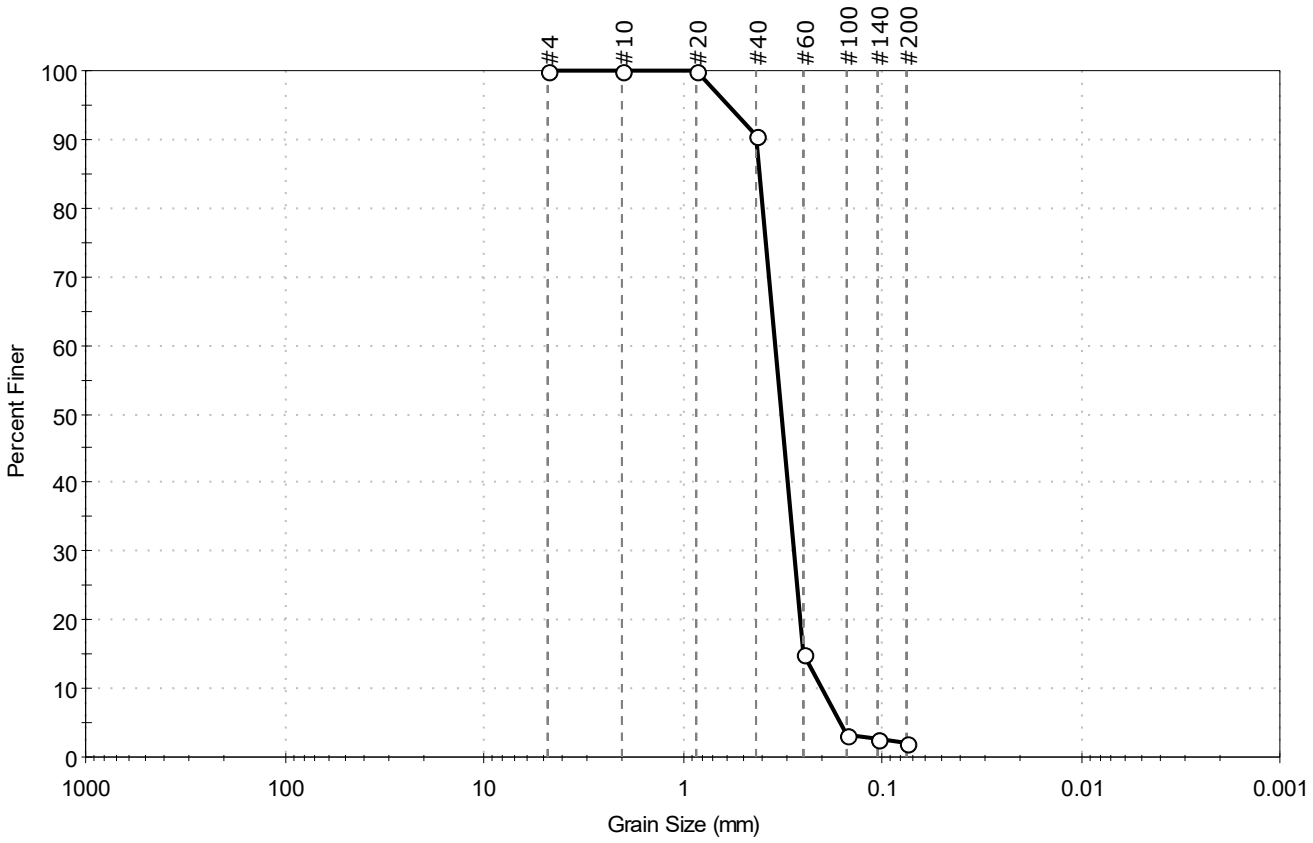
| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | PDI-022SC-B-5.5-7.5-191 | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529663 | | |

Test Comment: ---
Visual Description: Moist, dark gray sand
Sample Comment: ---

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| -- | 0.0 | 97.8 | 2.2 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 90 | | |
| #60 | 0.25 | 15 | | |
| #100 | 0.15 | 3 | | |
| #140 | 0.11 | 3 | | |
| #200 | 0.075 | 2.2 | | |
| | | | | |
| | | | | |

**Coefficients**

$D_{85}$ = 0.4090 mm
$D_{30}$ = 0.2779 mm
$D_{60}$ = 0.3431 mm
$D_{15}$ = 0.2500 mm
$D_{50}$ = 0.3198 mm
$D_{10}$ = 0.2015 mm
$C_u$ = 1.703
$C_c$ = 1.117

**Classification**

ASTM Poorly graded SAND (SP)

AASHTO Fine Sand (A-3 (1))

**Sample/Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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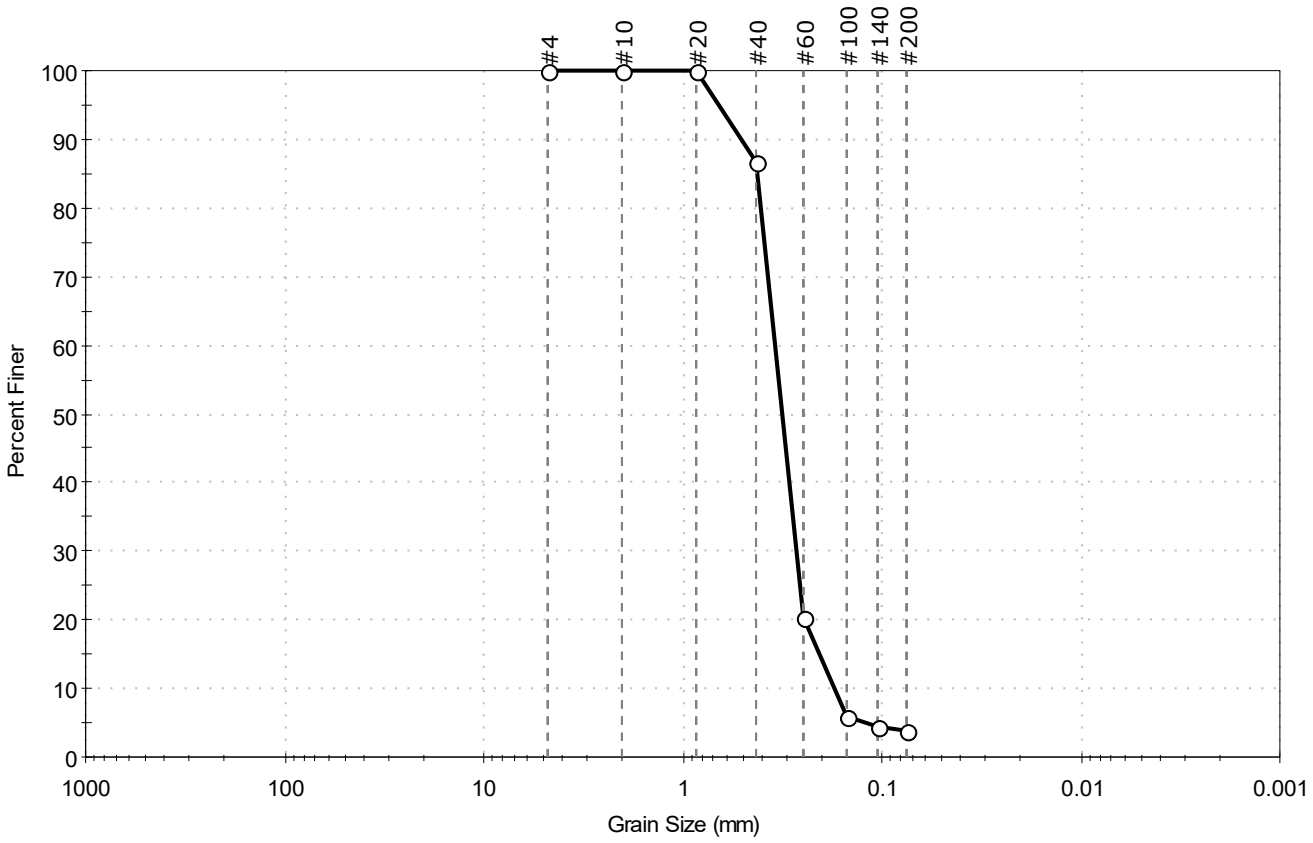
| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | PDI-031SC-B-8.9-10.9-19 | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529661 | | |

Test Comment: ---
Visual Description: Moist, dark gray sand
Sample Comment: ---

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| -- | 0.0 | 96.1 | 3.9 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 87 | | |
| #60 | 0.25 | 20 | | |
| #100 | 0.15 | 6 | | |
| #140 | 0.11 | 4 | | |
| #200 | 0.075 | 3.9 | | |
| | | | | |
| | | | | |

**Coefficients**

$D_{85}$ = 0.4188 mm  $D_{30}$ = 0.2702 mm
$D_{60}$ = 0.3432 mm  $D_{15}$ = 0.2076 mm
$D_{50}$ = 0.3169 mm  $D_{10}$ = 0.1740 mm
$C_u$ = 1.972  $C_c$ = 1.223

**Classification**

ASTM Poorly graded SAND (SP)

AASHTO Fine Sand (A-3 (1))

**Sample/Test Description**

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---

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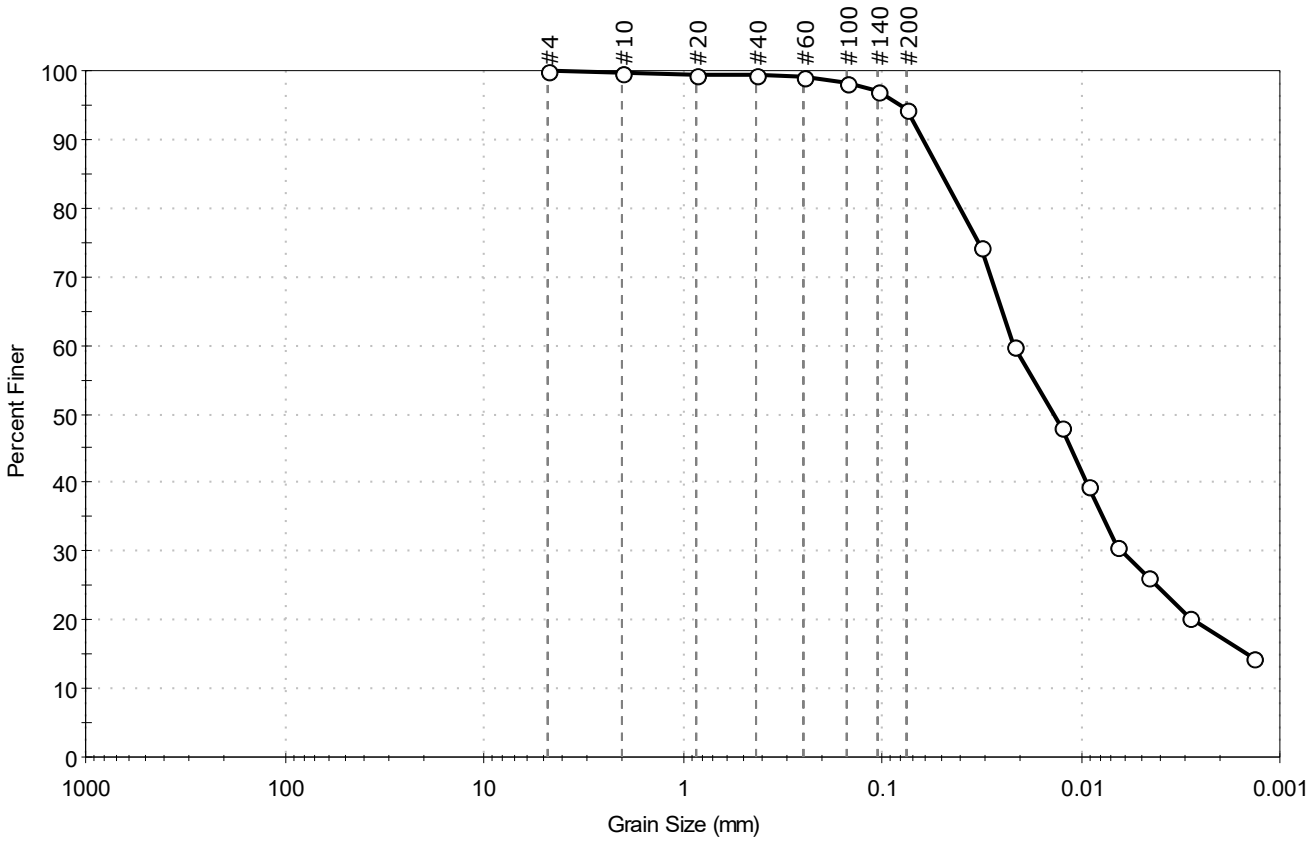
| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | PDI-057SC-B-06-08-1910 | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529658 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Wet, dark gray clay | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| -- | 0.0 | 5.5 | 94.5 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 98 | | |
| #140 | 0.11 | 97 | | |
| #200 | 0.075 | 94 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0320 | 74 | | |
| --- | 0.0215 | 60 | | |
| --- | 0.0126 | 48 | | |
| --- | 0.0091 | 39 | | |
| --- | 0.0065 | 31 | | |
| --- | 0.0047 | 26 | | |
| --- | 0.0029 | 20 | | |
| --- | 0.0014 | 15 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0502 mm | $D_{30}$ = 0.0062 mm |
| $D_{60}$ = 0.0216 mm | $D_{15}$ = 0.0015 mm |
| $D_{50}$ = 0.0137 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Fat CLAY (CH)

AASHTO Clayey Soils (A-7-6 (49))

**Sample/Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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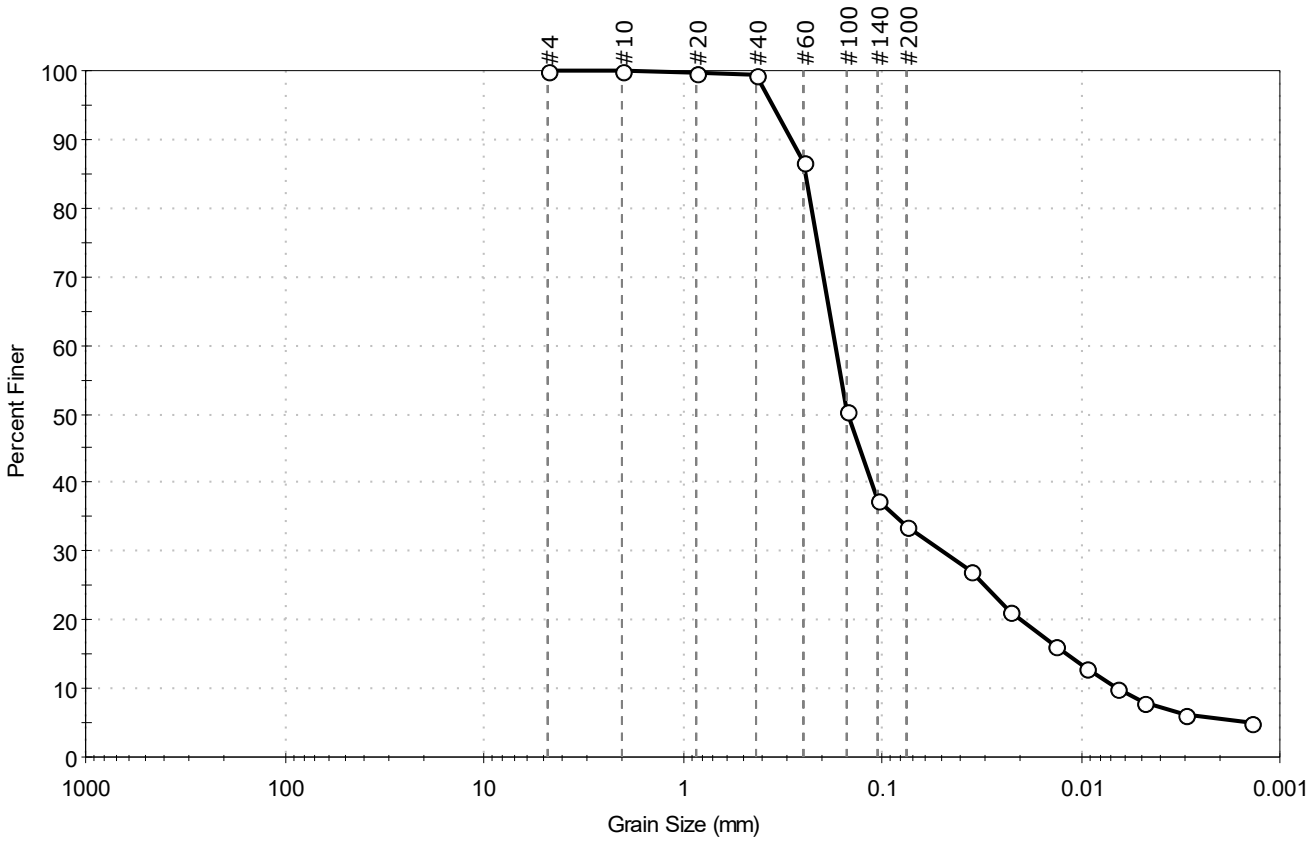
| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | PDI-059SC-B-06-08-1910 | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529664 | | |

Test Comment: ---
Visual Description: Moist, dark grayish brown silty sand
Sample Comment: ---

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| — | 0.0 | 66.4 | 33.6 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 87 | | |
| #100 | 0.15 | 51 | | |
| #140 | 0.11 | 37 | | |
| #200 | 0.075 | 34 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0356 | 27 | | |
| --- | 0.0229 | 21 | | |
| --- | 0.0133 | 16 | | |
| --- | 0.0095 | 13 | | |
| --- | 0.0067 | 10 | | |
| --- | 0.0048 | 8 | | |
| --- | 0.0030 | 6 | | |
| --- | 0.0014 | 5 | | |
| | | | | |

**Coefficients**

$D_{85}$ = 0.2437 mm  $D_{30}$ = 0.0492 mm
$D_{60}$ = 0.1713 mm  $D_{15}$ = 0.0117 mm
$D_{50}$ = 0.1477 mm  $D_{10}$ = 0.0066 mm
$C_u$ = 25.955  $C_c$ = 2.141

**Classification**

ASTM Silty SAND (SM)

AASHTO Silty Gravel and Sand (A-2-4 (0))

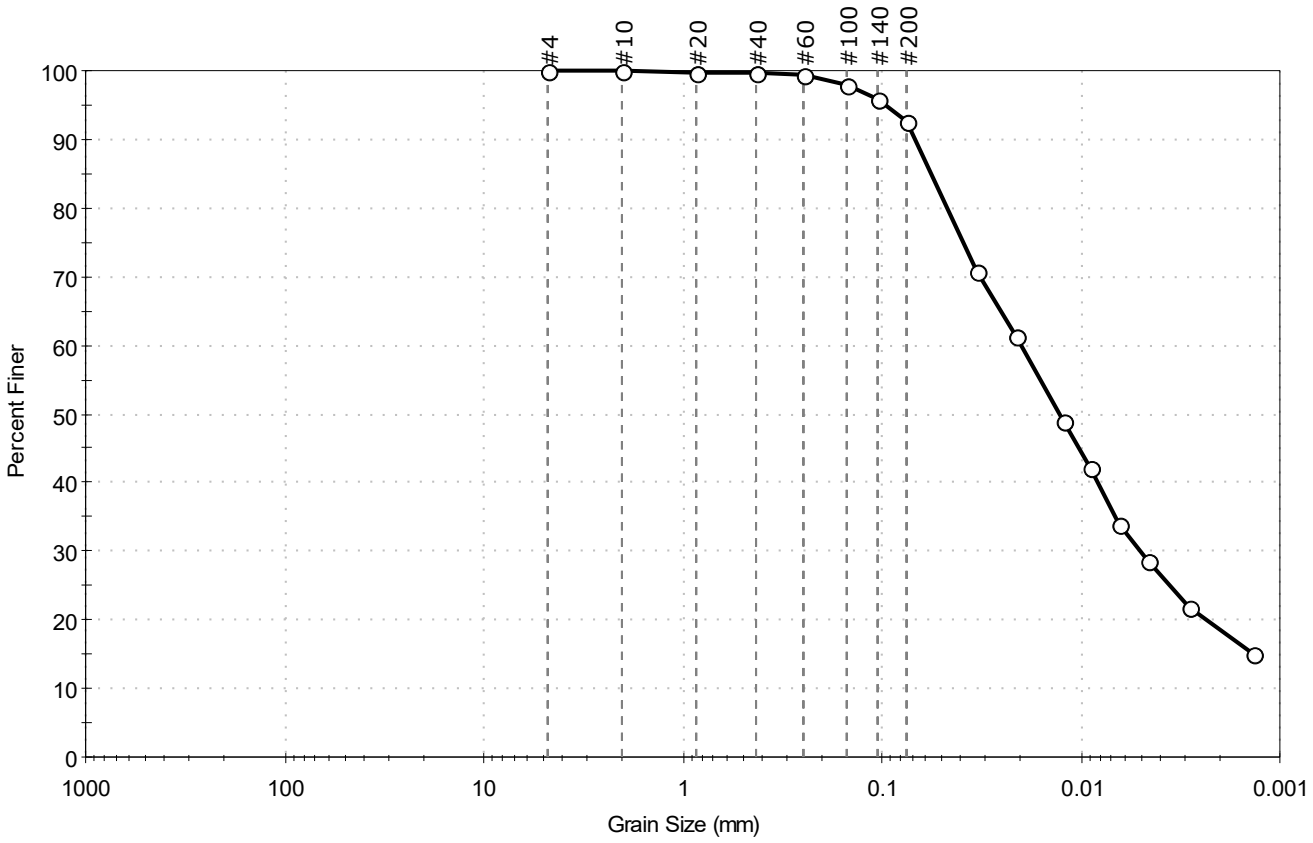
**Sample/Test Description**

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | PDI-069SC-B-10-12-1910 | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529665 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark gray silt | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| -- | 0.0 | 7.4 | 92.6 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 98 | | |
| #140 | 0.11 | 96 | | |
| #200 | 0.075 | 93 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0330 | 71 | | |
| --- | 0.0210 | 61 | | |
| --- | 0.0124 | 49 | | |
| --- | 0.0090 | 42 | | |
| --- | 0.0065 | 34 | | |
| --- | 0.0046 | 29 | | |
| --- | 0.0029 | 22 | | |
| --- | 0.0014 | 15 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0563 mm | $D_{30}$ = 0.0050 mm |
| $D_{60}$ = 0.0199 mm | $D_{15}$ = 0.0014 mm |
| $D_{50}$ = 0.0129 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Elastic SILT (MH)

AASHTO Clayey Soils (A-7-5 (40))

**Sample/Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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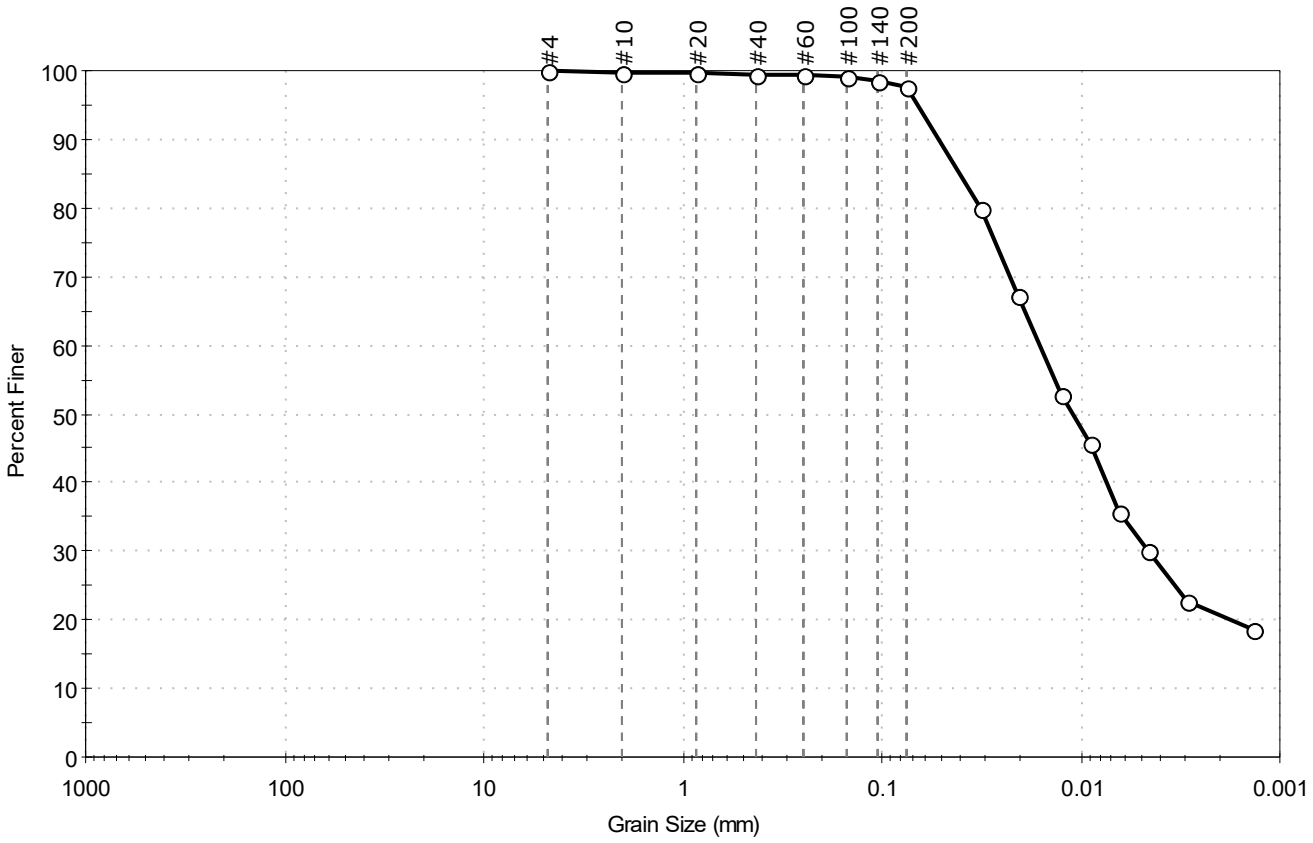
| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | PDI-083SC-B-08-10-1910 | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529659 | | |

Test Comment: ---
Visual Description: Moist, dark gray clay
Sample Comment: Sample contains organics

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| -- | 0.0 | 2.5 | 97.5 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 99 | | |
| #140 | 0.11 | 99 | | |
| #200 | 0.075 | 98 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0320 | 80 | | |
| --- | 0.0208 | 67 | | |
| --- | 0.0125 | 53 | | |
| --- | 0.0089 | 46 | | |
| --- | 0.0065 | 36 | | |
| --- | 0.0046 | 30 | | |
| --- | 0.0029 | 23 | | |
| --- | 0.0014 | 19 | | |
| | | | | |

**Coefficients**

$D_{85}$ = 0.0408 mm  $D_{30}$ = 0.0046 mm
$D_{60}$ = 0.0161 mm  $D_{15}$ = N/A
$D_{50}$ = 0.0109 mm  $D_{10}$ = N/A
$C_u$ = N/A  $C_c$ = N/A

**Classification**

ASTM Fat CLAY (CH)

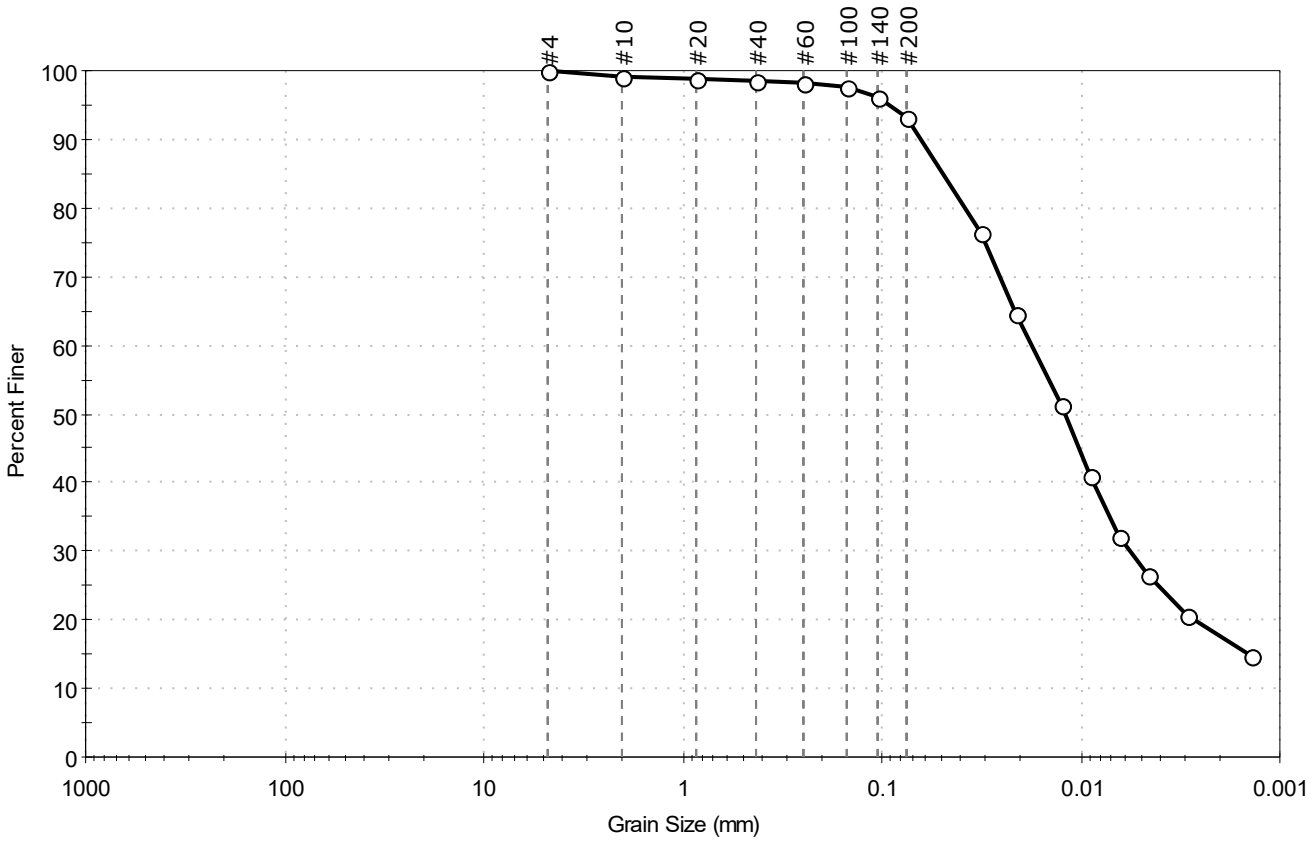
AASHTO Clayey Soils (A-7-5 (55))

**Sample/Test Description**

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | PDI-097SC-B-02-04-1910 | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529662 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Wet, dark gray silt | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| -- | 0.0 | 6.7 | 93.3 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 99 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 98 | | |
| #60 | 0.25 | 98 | | |
| #100 | 0.15 | 98 | | |
| #140 | 0.11 | 96 | | |
| #200 | 0.075 | 93 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0318 | 76 | | |
| --- | 0.0212 | 65 | | |
| --- | 0.0125 | 51 | | |
| --- | 0.0091 | 41 | | |
| --- | 0.0065 | 32 | | |
| --- | 0.0047 | 26 | | |
| --- | 0.0030 | 21 | | |
| --- | 0.0014 | 15 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0493 mm | $D_{30}$ = 0.0057 mm |
| $D_{60}$ = 0.0177 mm | $D_{15}$ = 0.0014 mm |
| $D_{50}$ = 0.0120 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Elastic SILT (MH)

AASHTO Clayey Soils (A-7-5 (39))

**Sample/Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

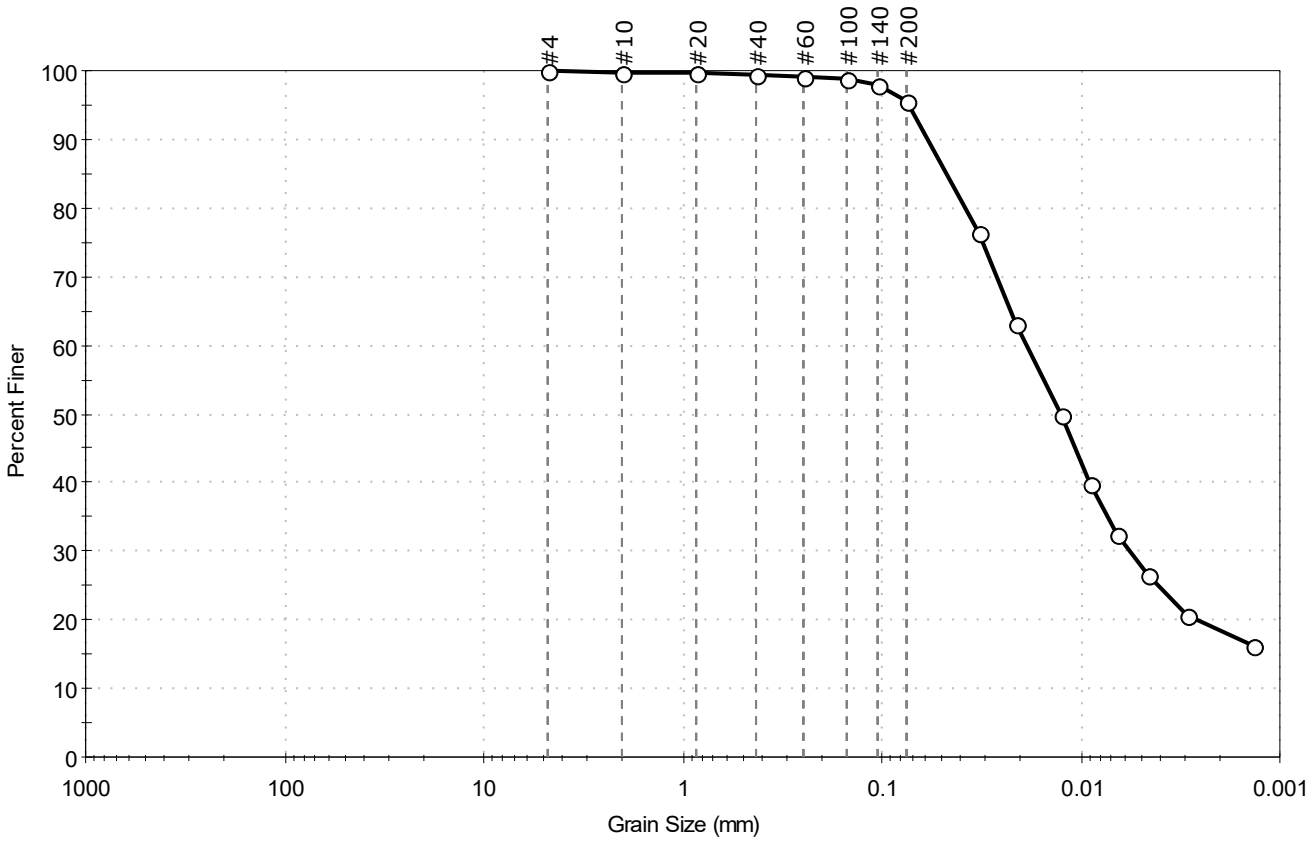
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | PDI-099SC-B-02-04-1910 | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529660 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark gray clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| -- | 0.0 | 4.3 | 95.7 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 99 | | |
| #140 | 0.11 | 98 | | |
| #200 | 0.075 | 96 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0326 | 76 | | |
| --- | 0.0214 | 63 | | |
| --- | 0.0126 | 50 | | |
| --- | 0.0091 | 40 | | |
| --- | 0.0065 | 32 | | |
| --- | 0.0047 | 26 | | |
| --- | 0.0029 | 21 | | |
| --- | 0.0014 | 16 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0472 mm | $D_{30}$ = 0.0057 mm |
| $D_{60}$ = 0.0188 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0126 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Fat CLAY (CH)

AASHTO Clayey Soils (A-7-5 (54))

**Sample/Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | cam |
| Sample ID: | PDI-022SC-B-5.5-7.5-191 | Test Date: | 11/18/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529655 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark gray sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | 22SC-B-5.5-7.5-19 | --- | --- | 11 | n/a | n/a | n/a | n/a | Poorly graded SAND (SP) |

10% Retained on #40 Sieve
Dry Strength: NONE
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | cam |
| Sample ID: | PDI-031SC-B-8.9-10.9-19 | Test Date: | 11/18/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529653 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark gray sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | 31SC-B-8.9-10.9-1 | --- | --- | 16 | n/a | n/a | n/a | n/a | Poorly graded SAND (SP) |

13% Retained on #40 Sieve

Dry Strength: NONE

Dilatancy: RAPID

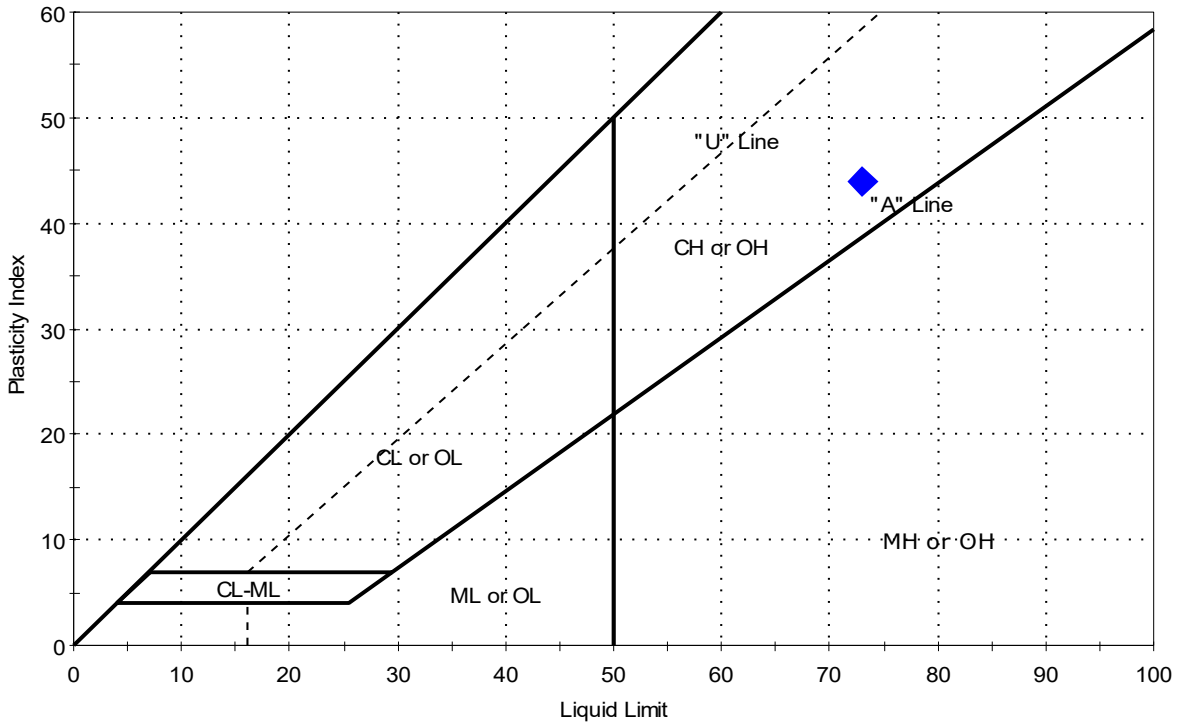
Toughness: n/a

The sample was determined to be Non-Plastic

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | cam |
| Sample ID: | PDI-057SC-B-06-08-1910 | Test Date: | 11/21/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529650 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Wet, dark gray clay | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | 057SC-B-06-08-19 | --- | --- | 77 | 73 | 29 | 44 | 1.1 | Fat CLAY (CH) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | cam |
| Sample ID: | PDI-059SC-B-06-08-1910 | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529656 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown silty sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

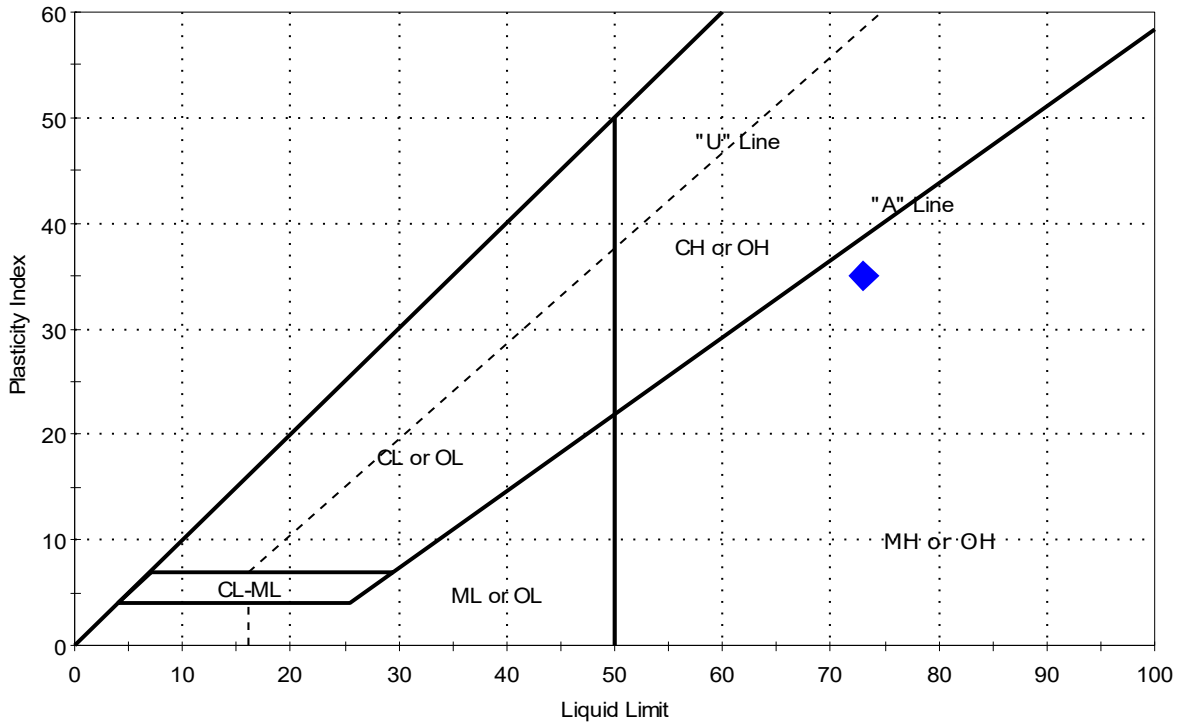
**Sample Determined to be non-plastic**

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | 059SC-B-06-08-19 | --- | --- | 38 | n/a | n/a | n/a | n/a | Silty SAND (SM) |

1% Retained on #40 Sieve
Dry Strength: MEDIUM
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | cam |
| Sample ID: | PDI-069SC-B-10-12-1910 | Test Date: | 11/20/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529657 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark gray silt | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

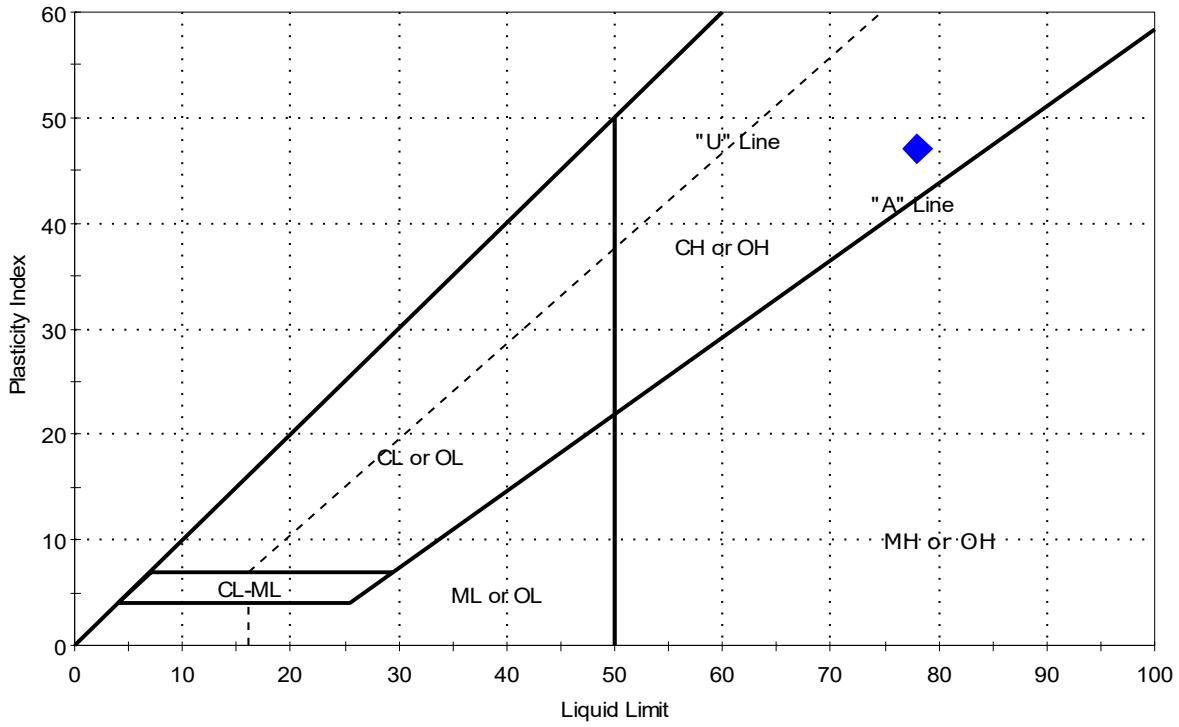



| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | 069SC-B-10-12-19 | --- | --- | 67 | 73 | 38 | 35 | 0.8 | Elastic SILT (MH) |

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | cam |
| Sample ID: | PDI-083SC-B-08-10-1910 | Test Date: | 11/20/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529651 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark gray clay | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Atterberg Limits - ASTM D4318

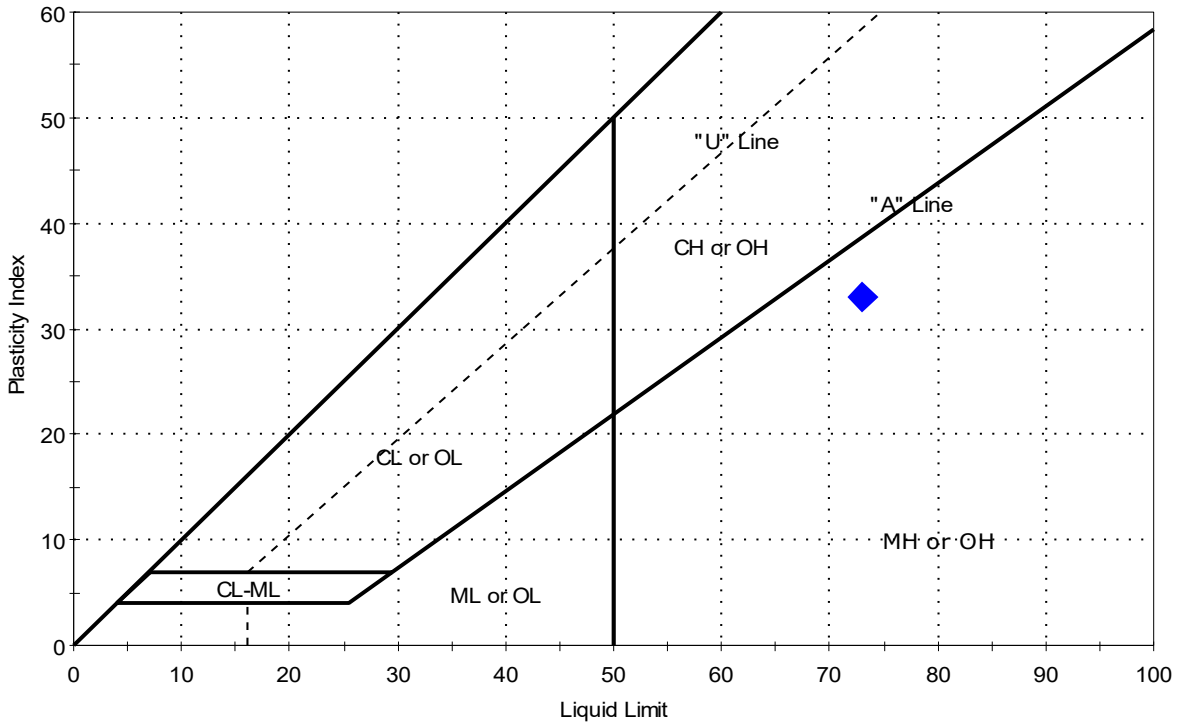



| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | 083SC-B-08-10-19 | --- | --- | 76 | 78 | 31 | 47 | 1 | Fat CLAY (CH) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | cam |
| Sample ID: | PDI-097SC-B-02-04-1910 | Test Date: | 11/19/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529654 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Wet, dark gray silt | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Atterberg Limits - ASTM D4318

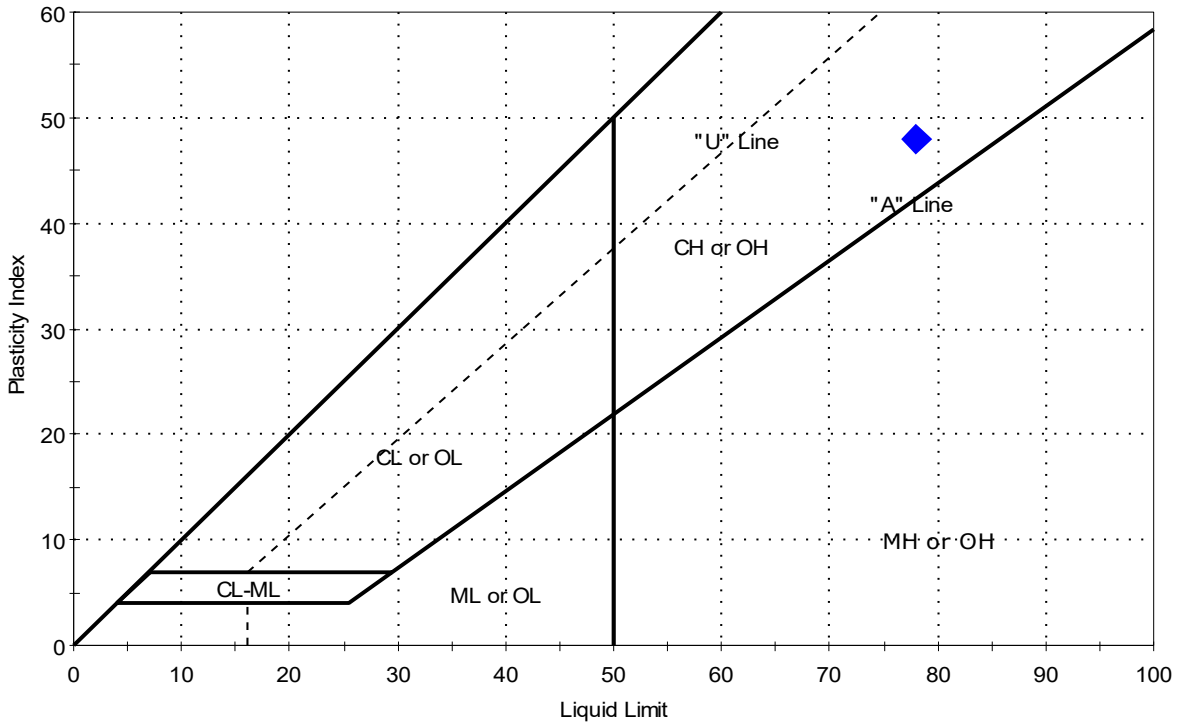



| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | 097SC-B-02-04-19 | --- | --- | 87 | 73 | 40 | 33 | 1.4 | Elastic SILT (MH) |

Sample Prepared using the WET method
2% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | Gasco PDI | | | | |
| Location: | | | | Project No: | GTX-310685 |
| Boring ID: | --- | Sample Type: | bag | Tested By: | cam |
| Sample ID: | PDI-099SC-B-02-04-1910 | Test Date: | 11/20/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 529652 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark 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 |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | 099SC-B-02-04-19 | --- | --- | 80 | 78 | 30 | 48 | 1 | Fat CLAY (CH) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

ANCHOR QEA
1201 3rd Avenue, Suite 2600, Seattle, WA 98101

# ENVIRONMENTAL SAMPLE CHAIN OF CUSTODY

**COC ID:** NWGEO-201910.

**POC:** # Delaney Peterson (360-715-2707)
1605 Cornwall Avenue, Bellingham, WA 98225

**Project:** Gasco PDI
**Client:** NW Natural

**Sample Custodian:** CO, SN, BJ, SS
**Lab:** Geotesting Express

| COC Sample Number | Field Sample ID | Sample Type | Matrix | Collected Date | Collected Time | Containers # | Lab QC* | Test Request | Method | TAT** | Preservative |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | PDI-057SC-B-06-08-191023 | N | SE | 10/23/2019 | 12:46 | 1 | ☐ | | | | |
| | | | | | | | | Atterberg Limits | D4318 | 30 | 4°C |
| | | | | | | | | Grain Size | D6913/D7928 | 30 | 4°C |
| | | | | | | | | Moisture Content | D2216 | 30 | 4°C |
| | | | | | | | | Specific gravity | D854 | 30 | 4°C |

**Comment:**

| Relinquished By: | Received By: | Relinquished By: | Received By: | Relinquished By: | Received By: |
|---|---|---|---|---|---|
| Signature | Signature | Signature | Signature | Signature | Signature |
| Print Name: Ben Johnson | Print Name: Scott Ferguson | Print Name | Print Name | Print Name | Print Name |
| Company: Anchor QEA | Company: GTX | Company | Company | Company | Company |
| Date/Time: 10/29/19 @1215 | Date/Time: 11/6/19 12:00 | Date/Time | Date/Time | Date/Time | Date/Time |

* Lab QC Requested for sample when box is checked ** TAT = Turn Around Time in DAYS # POC = Project Point of Contact

**Date Printed: 10/23/2019**

ANCHOR QEA
1201 3rd Avenue, Suite 2600, Seattle, WA 98101

# ENVIRONMENTAL SAMPLE CHAIN OF CUSTODY

**COC ID:** NWGEO-20191022-162549

**Sample Custodian:** CO, SN, BJ, SS

**Lab:** Geotesting Express

**POC:** # Delaney Peterson (360-715-2707)
1605 Cornwall Avenue, Bellingham, WA 98225

**Project:** Gasco PDI

**Client:** NW Natural

| COC Sample Number | Field Sample ID | Sample Type | Matrix | Collected Date | Collected Time | Containers # | Lab QC* | Test Request | Method | TAT** | Preservative |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | PDI-083SC-B-08-10-191022 | N | SE | 10/22/2019 | 14:05 | 1 | ☐ | | | | |
| | | | | | | | | Atterberg Limits | D4318 | 30 | 4°C |
| | | | | | | | | Grain Size | D6913/D7928 | 30 | 4°C |
| | | | | | | | | Moisture Content | D2216 | 30 | 4°C |
| | | | | | | | | Specific gravity | D854 | 30 | 4°C |
| 002 | PDI-099SC-B-02-04-191022 | N | SE | 10/22/2019 | 10:48 | 1 | ☐ | | | | |
| | | | | | | | | Atterberg Limits | D4318 | 30 | 4°C |
| | | | | | | | | Grain Size | D6913/D7928 | 30 | 4°C |
| | | | | | | | | Moisture Content | D2216 | 30 | 4°C |
| | | | | | | | | Specific gravity | D854 | 30 | 4°C |

**Comment:**

| Relinquished By: | Received By: | Relinquished By: | Received By: | Relinquished By: | Received By: |
|---|---|---|---|---|---|
| Signature | Signature | Signature | Signature | Signature | Signature |
| Print Name Ben Johnson | Print Name Scott Ferguson | Print Name | Print Name | Print Name | Print Name |
| Company AnchorQEA | Company GeoX | Company | Company | Company | Company |
| Date/Time 10/29/19 @1215 | Date/Time 11/6/19 0800 | Date/Time | Date/Time | Date/Time | Date/Time |

* Lab QC Requested for sample when box is checked ** TAT = Turn Around Time in DAYS # POC = Project Point of Contact



**Date Printed:** 10/22/2019

ANCHOR QEA
1201 3rd Avenue, Suite 2600, Seattle, WA 98101

# ENVIRONMENTAL SAMPLE CHAIN OF CUSTODY

**COC ID:** NWGEO-20191017-123936

**POC:** # Delaney Peterson (360-715-2707)
1605 Cornwall Avenue, Bellingham, WA 98225

**Project:** Gasco PDI
**Client:** NW Natural

**Sample Custodian:** SN
**Lab:** Geotesting Express

| COC Sample Number | Field Sample ID | Sample Type | Matrix | Collected Date | Collected Time | Containers # | Lab QC* | Test Request | Method | TAT** | Preservative |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | PDI-031SC-B-8.9-10.9-191017 | N | SE | 10/17/2019 | 9:06 | 1 | ☐ | | | | |
| | | | | | | | | Atterberg Limits | D4318 | 30 | 4°C |
| | | | | | | | | Grain Size | D6913/D7928 | 30 | 4°C |
| | | | | | | | | Moisture Content | D2216 | 30 | 4°C |
| | | | | | | | | Specific gravity | D854 | 30 | 4°C |
| 002 | PDI-097SC-B-02-04-191017 | N | SE | 10/17/2019 | 10:46 | 1 | ☐ | | | | |
| | | | | | | | | Atterberg Limits | D4318 | 30 | 4°C |
| | | | | | | | | Grain Size | D6913/D7928 | 30 | 4°C |
| | | | | | | | | Moisture Content | D2216 | 30 | 4°C |
| | | | | | | | | Specific gravity | D854 | 30 | 4°C |

**Comment:**

| Relinquished By: | Received By: | Relinquished By: | Received By: | Relinquished By: | Received By: |
|---|---|---|---|---|---|
| Signature | Signature | Signature | Signature | Signature | Signature |
| Print Name Ben Johnson | Print Name Scott Ferguson | Print Name | Print Name | Print Name | Print Name |
| Company Anchor QEA | Company GTX | Company | Company | Company | Company |
| Date/Time 10/29/19 1215 | Date/Time 10/6/19 1200 | Date/Time | Date/Time | Date/Time | Date/Time |

* Lab QC Requested for sample when box is checked ** TAT = Turn Around Time in DAYS # POC = Project Point of Contact

**Date Printed: 10/17/2019**

ANCHOR QEA
1201 3rd Avenue, Suite 2600, Seattle, WA 98101

# ENVIRONMENTAL SAMPLE CHAIN OF CUSTODY

**COC ID:** NWGEO-20191016-143858

**POC:** # Delaney Peterson (360-715-2707)
1605 Cornwall Avenue, Bellingham, WA 98225

**Project:** Gasco PDI
**Client:** NW Natural

**Sample Custodian:** CO, SN, BJ, DL
**Lab:** Geotesting Express

| COC Sample Number | Field Sample ID | Sample Type | Matrix | Collected Date | Collected Time | Containers # | Lab QC* | Test Request | Method | TAT** | Preservative |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | PDI-022SC-B-5.5-7.5-191016 | N | SE | 10/16/2019 | 13:41 | 1 | ☐ | | | | |
| | | | | | | | | Atterberg Limits | D4318 | 30 | 4°C |
| | | | | | | | | Grain Size | D6913/D7928 | 30 | 4°C |
| | | | | | | | | Moisture Content | D2216 | 30 | 4°C |
| | | | | | | | | Specific gravity | D854 | 30 | 4°C |
| 002 | PDI-059SC-B-06-08-191016 | N | SE | 10/16/2019 | 7:57 | 1 | ☐ | | | | |
| | | | | | | | | Atterberg Limits | D4318 | 30 | 4°C |
| | | | | | | | | Grain Size | D6913/D7928 | 30 | 4°C |
| | | | | | | | | Moisture Content | D2216 | 30 | 4°C |
| | | | | | | | | Specific gravity | D854 | 30 | 4°C |
| 003 | PDI-069SC-B-10-12-191016 | N | SE | 10/16/2019 | 10:38 | 1 | ☐ | | | | |
| | | | | | | | | Atterberg Limits | D4318 | 30 | 4°C |
| | | | | | | | | Grain Size | D6913/D7928 | 30 | 4°C |
| | | | | | | | | Moisture Content | D2216 | 30 | 4°C |
| | | | | | | | | Specific gravity | D854 | 30 | 4°C |

**Comment:**

| Relinquished By: | Received By: | Relinquished By: | Received By: | Relinquished By: | Received By: |
|---|---|---|---|---|---|
| Signature | Signature | Signature | Signature | Signature | Signature |
| Print Name Ben Johnson | Print Name Scott Ferguson | Print Name | Print Name | Print Name | Print Name |
| Company Anchor QEA | Company GTX | Company | Company | Company | Company |
| Date/Time 10/29/19 1215 | Date/Time 11/6/19 1200 | Date/Time | Date/Time | Date/Time | Date/Time |

* Lab QC Requested for sample when box is checked ** TAT = Turn Around Time in DAYS # POC = Project Point of Contact

**Date Printed: 10/16/2019**

GeoTesting EXPRESS

# 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 $\Delta\sigma_1 - \Delta\sigma_3$ |
| B | pore pressure parameter for $\Delta\sigma_3$ |
| CAI | CERCHAR Abrasiveness Index |
| CIU | isotropically consolidated undrained triaxial shear test |
| CR | compression ratio for one dimensional consolidation |
| CSR | cyclic stress ratio |
| $C_c$ | coefficient of curvature, $(D_{30})^2 / (D_{10} \times D_{60})$ |
| $C_u$ | coefficient of uniformity, $D_{60}/D_{10}$ |
| $C_c$ | compression index for one dimensional consolidation |
| $C_\alpha$ | coefficient of secondary compression |
| $c_v$ | coefficient of consolidation |
| c | cohesion intercept for total stresses |
| c' | cohesion intercept for effective stresses |
| D | diameter of specimen |
| D | damping ratio |
| $D_{10}$ | diameter at which 10% of soil is finer |
| $D_{15}$ | diameter at which 15% of soil is finer |
| $D_{30}$ | diameter at which 30% of soil is finer |
| $D_{50}$ | diameter at which 50% of soil is finer |
| $D_{60}$ | diameter at which 60% of soil is finer |
| $D_{85}$ | diameter at which 85% of soil is finer |
| $d_{50}$ | displacement for 50% consolidation |
| $d_{90}$ | displacement for 90% consolidation |
| $d_{100}$ | displacement for 100% consolidation |
| E | Young's modulus |
| e | void ratio |
| $e_c$ | void ratio after consolidation |
| $e_o$ | initial void ratio |
| G | shear modulus |
| $G_s$ | specific gravity of soil particles |
| H | height of specimen |
| $H_R$ | Rebound Hardness number |
| i | gradient |
| $I_S$ | Uncorrected point load strength |
| $I_{S(50)}$ | Size corrected point load strength index |
| $H_A$ | Modified Taber Abrasion |
| $H_T$ | Total hardness |
| $K_o$ | lateral stress ratio for one dimensional strain |
| k | permeability |
| LI | Liquidity Index |
| $m_v$ | coefficient of volume change |
| n | porosity |
| PI | plasticity index |
| $P_c$ | preconsolidation pressure |
| p | $(\sigma_1 + \sigma_3) / 2$ , $(\sigma_v + \sigma_h) / 2$ |
| p' | $(\sigma'_1 + \sigma'_3) / 2$ , $(\sigma'_v + \sigma'_h) / 2$ |
| $p'_c$ | p' at consolidation |
| Q | quantity of flow |
| q | $(\sigma_1 - \sigma_3) / 2$ |
| $q_f$ | q at failure |
| $q_o$, $q_i$ | initial q |
| $q_c$ | q at consolidation |
| $S_r$ | Post cyclic undrained shear strength |
| T | temperature |
| t | time |
| U, UC | unconfined compression test |
| UU, Q | unconsolidated undrained triaxial test |
| $u_a$ | pore gas pressure |
| $u_e$ | excess pore water pressure |
| u, $u_w$ | pore water pressure |
| V | total volume |
| $V_g$ | volume of gas |
| $V_s$ | volume of solids |
| $V_s$ | shear wave velocity |
| $V_v$ | volume of voids |
| $V_w$ | volume of water |
| $V_o$ | initial volume |
| v | velocity |
| W | total weight |
| $W_s$ | weight of solids |
| $W_w$ | weight of water |
| w | water content |
| $w_c$ | water content at consolidation |
| $w_f$ | final water content |
| $w_l$ | liquid limit |
| $w_n$ | natural water content |
| $w_p$ | plastic limit |
| $w_s$ | shrinkage limit |
| $w_o$, $w_i$ | initial water content |
| $\alpha$ | slope of $q_f$ versus $p_f$ |
| $\alpha'$ | slope of $q_f$ versus $p_f'$ |
| $\gamma_t$ | total unit weight |
| $\gamma_d$ | dry unit weight |
| $\gamma_s$ | unit weight of solids |
| $\gamma_w$ | unit weight of water |
| $\varepsilon$ | strain |
| $\varepsilon_{vol}$ | volume strain |
| $\varepsilon_h$, $\varepsilon_v$ | horizontal strain, vertical strain |
| $\mu$ | Poisson's ratio, also viscosity |
| $\sigma$ | normal stress |
| $\sigma'$ | effective normal stress |
| $\sigma_c$, $\sigma'_c$ | consolidation stress in isotropic stress system |
| $\sigma_h$, $\sigma'_h$ | horizontal normal stress |
| $\sigma_v$, $\sigma'_v$ | vertical normal stress |
| $\sigma'_{vc}$ | Effective vertical consolidation stress |
| $\sigma_1$ | major principal stress |
| $\sigma_2$ | intermediate principal stress |
| $\sigma_3$ | minor principal stress |
| $\tau$ | shear stress |
| $\varphi$ | friction angle based on total stresses |
| $\varphi'$ | friction angle based on effective stresses |
| $\varphi'_r$ | residual friction angle |
| $\varphi_{ult}$ | $\varphi$ for ultimate strength |