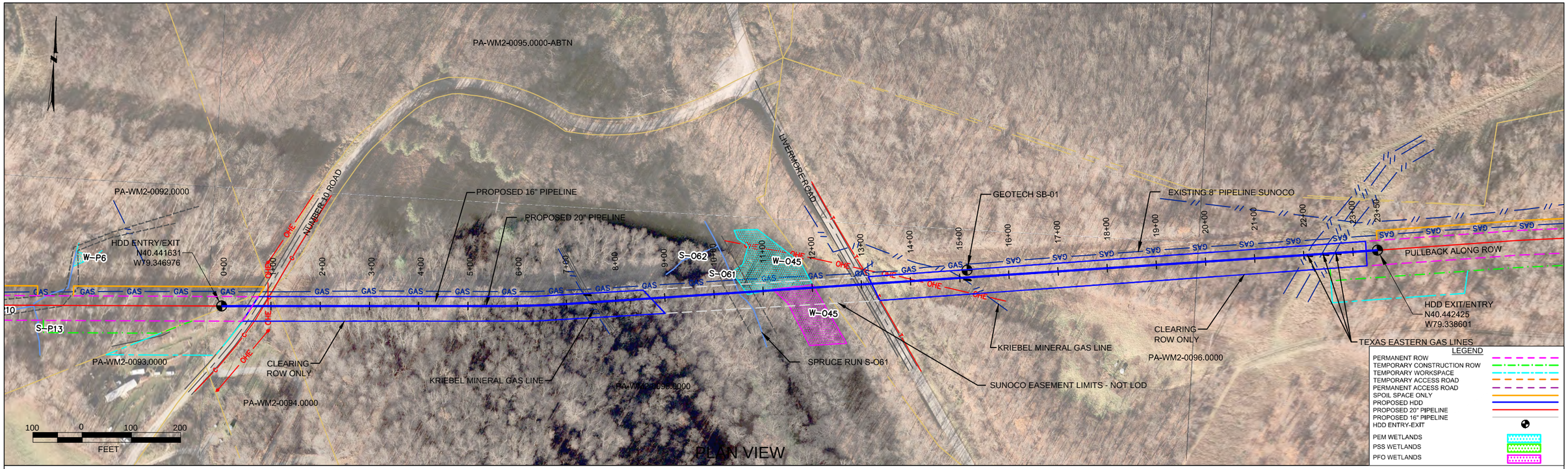
***HDD PA-WM2-0093.0000-RD (S-061)***

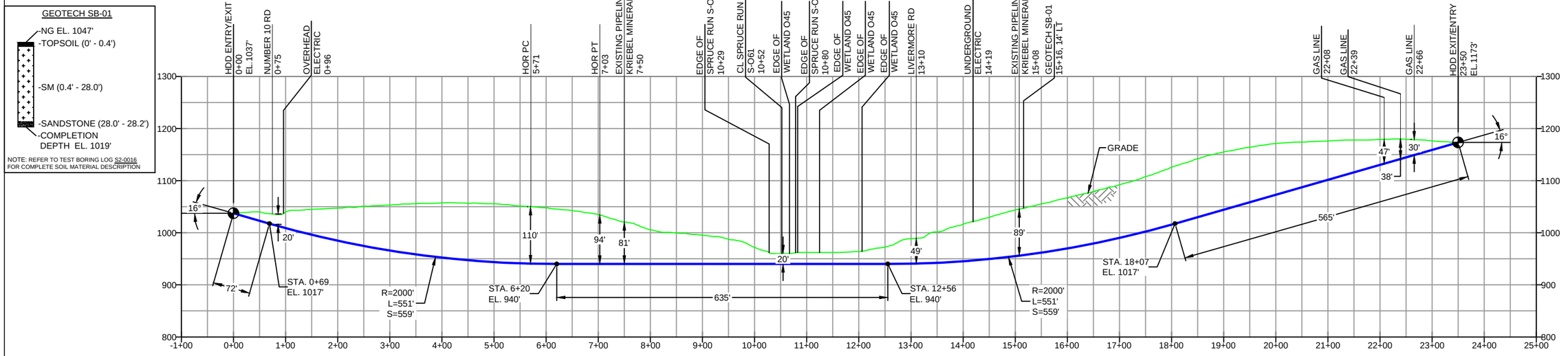
Given the design, the threat of inadvertent return has been reduced to the maximum extent practicable and in this case that threat is considered to be low. Implementing this design, along with adherence to the Pennsylvania Pipeline Project Inadvertent Return Contingency Plan will ensure inadvertent impacts, if they were to occur, are also minimized to the maximum extent.

The drill will enter/exit 1051 feet west of stream 061. The drill will pass 20 feet under this stream. The east entry/exit point is 1299 feet east of this stream. Using the results of the geotechnical investigation, as well as several other data points, the entry/exit, angles, and depths have been configured to pass through the best substrates while maintaining pipe integrity (e.g., no large bends). The majority of the substrate that will be passed through is estimated to be silty sand, and sandstone.




WESTMORELAND COUNTY, PENNSYLVANIA - DERRY TOWNSHIP
S2-0016

## PROFILE VIEW




DESIGN AND CONSTRUCTION:

1. CONTRACTOR SHALL FIELD VERIFY DEPTH OF ALL EXITING UTILITIES SHOWN OR NOT SHOWN ON THIS DRAWING.
2. THE MINIMUM SEPARATION DISTANCE FROM EXISTING SUBSURFACE UTILITIES SHALL NOT BE LESS THAN 10 FEET AS MEASURED FROM THE OUTSIDE EDGE OF THE UTILITY TO OUTSIDE OF PROPOSED PIPELINE.
3. DESIGNED IN ACCORDANCE WITH CFR 49 195 & ASME B31.4
4. CROSSING PIPE SPECIFICATION:
   HDD HORZ. LENGTH (L=):2350'
   HDD PIPE LENGTH (S=):2390'
   20" x 0.456" W.T., X-65, API5L, PSL2, ERW, BFW
   COATING: 14-16 MILS FBE WITH 30-35 MIL ARO (POWERCRETE R95)
5. INTERNAL DESIGN PRESSURE 1480 PSIG (SEAM FACTOR 1.0, DESIGH FACTOR 0.50).
6. INSTALLATION METHOD: HORIZONTAL DIRECTIONAL DRILL (HDD).
7. PIPELINE WARNING MARKERS SHALL BE INSTALLED ON BOTH SIDES OF ALL ROAD, RAILWAY, AND STREAM CROSSINGS.
8. CARRIER PIPE NOT ENCASED.
9. PIPE / AMBIENT TEMPERATURE MUST BE NO LESS THAN 30°F DURING PULLBACK WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER.
10. CONDUCT 4-HOUR PRE-INSTALLATION HYDROTEST OF HDD PIPE STRING TO MINIMUM 1850 PSIG.
11. SEE SUNOCO PENNSYLVANIA PIPELINE PROJECT ESRI WEBMAP FOR ACCESS ROAD ALIGNMENT.
12. SUNOCO PIPELINE, L.P.'S HORIZONTAL DIRECTIONAL DRILL INADVERTENT RETURN CONTINGENCY PLAN WILL BE IMPLEMENTED AT ALL TIMES.
13. SUNOCO PIPELINE, L.P.'S EROSION AND SEDIMENTATION CONTROL PLAN WILL BE IMPLEMENTED AT ALL TIMES.

### NOTES

1. ALL COORDINATES SHOWN ARE IN LATITUDE AND LONGITUDE. ALL MSL ELEVATIONS ARE NAD83
2. STATIONING IS BASED ON HORIZONTAL DISTANCES.
3. ROONEY ENGINEERING, INC. AND SUNOCO PIPELINE, LP ARE NOT RESPONSIBLE FOR LOCATION OF FOREIGN UTILITIES SHOWN IN PLOT PLAN OR PROFILE. THE INFORMATION SHOWN HEREON IS FURNISHED WITHOUT LIABILITY ON THE PART OF ROONEY ENGINEERING, INC. AND SUNOCO PIPELINE, LP, FOR ANY DAMAGES RESULTING FROM ERRORS OR OMISSIONS THEREIN.
4. CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES. CONTACT ONE CALL AT 811 PRIOR TO DIGGING.
5. SUNOCO EMERGENCY HOTLINE NUMBER IS #1-800-786-7440.

### REF. DRAWING

| | | | | |
|---|---|---|---|---|
| ES-2.40 | TO | ES-2.41 | EROSION & SEDIMENT PLAN | |
| SHEET 76 | TO | SHEET 77 | AERIAL SITE PLAN | |
| DWG NO | | DWG NO | DESCRIPTION | |

### REVISIONS

| NO. | DESCRIPTION | BY | DATE | CHK | DATE | APP | DATE |
|---|---|---|---|---|---|---|---|
| EP2 | REVISED PER PADEP COMMENTS RECEIVED 09-06-16 | MRS | 09/30/16 | RMB | 09/30/16 | AAW | 09/30/16 |
| EP1 | REVISED PER PADEP COMMENTS | MRS | 05/18/16 | RMB | 05/18/16 | AAW | 05/18/16 |
| EP | | DLM | 03/23/16 | RMB | 03/23/16 | AAW | 03/23/16 |
| C | ADDED GEOTECH INFO | MRS | 09/07/15 | RMB | 09/07/15 | AAW | 09/07/15 |
| B | ISSUED FOR BID | MRS | 07/31/15 | RMB | 07/31/15 | AAW | 07/31/15 |
| A | ISSUED FOR REVIEW | JAM | 03/24/15 | RMB | 03/24/15 | AAW | 03/24/15 |

Sunoco Logistics Partners L.P.

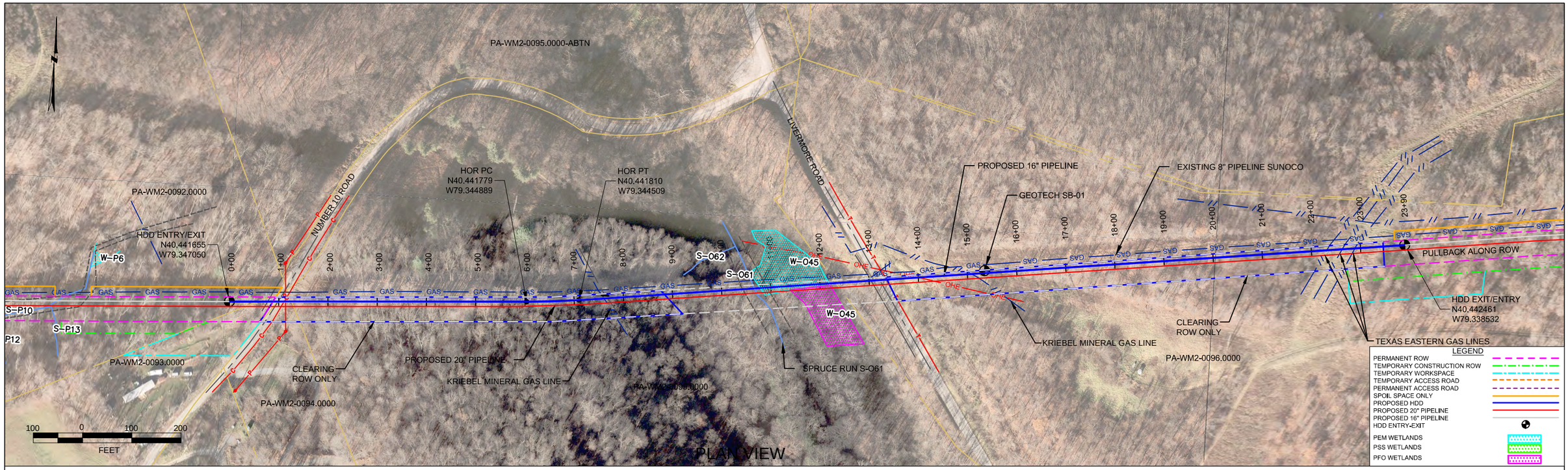
TETRA TECH ROONEY
(303) 792-5911

SUNOCO PIPELINE, L.P.

20-INCH HORIZONTAL DIRECTIONAL DRILL
LIVERMORE ROAD
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=200'

DWG. NO: PA-WM2-0093.0000-RD

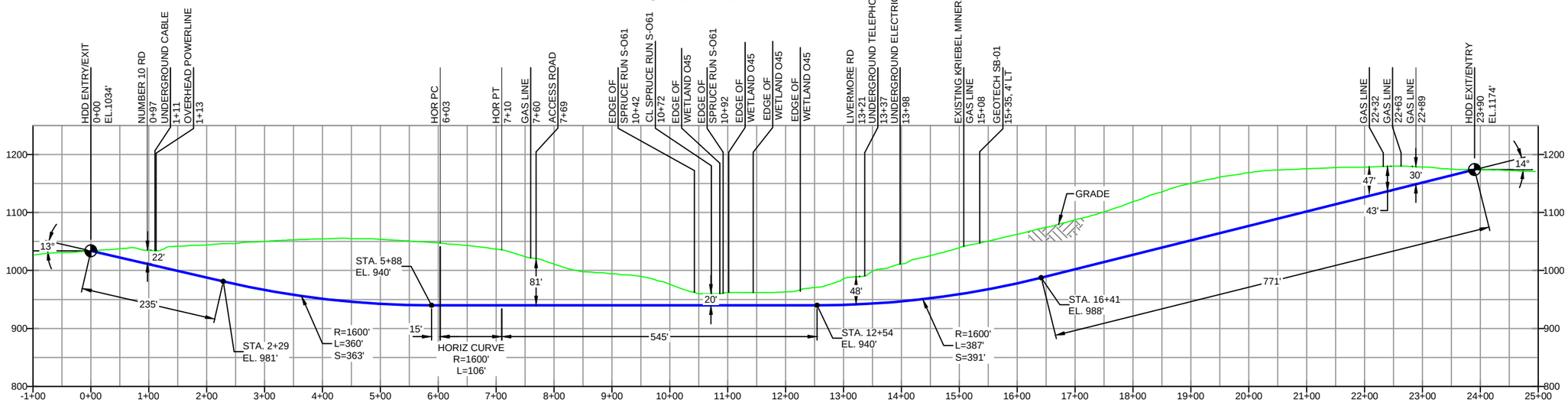



WESTMORELAND COUNTY, PENNSYLVANIA - DERRY TOWNSHIP
S2-0016-16

## PROFILE VIEW

GEOTECH SB-01
-NG EL. 1047'
-TOPSOIL (0' - 0.4')
-SM (0.4' - 28.0')
-SANDSTONE (28.0' - 28.2')
-COMPLETION DEPTH EL. 1019'

NOTE: REFER TO TEST BORING LOG S2-0016 FOR COMPLETE SOIL MATERIAL DESCRIPTION

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3. DESIGNED IN ACCORDANCE WITH CFR 49 195 & ASME B31.4
4. CROSSING PIPE SPECIFICATION:
   HDD HORZ. LENGTH (L=):2390'
   HDD PIPE LENGTH (S=):2426'
   16" x 0.438" W.T., X-70, API5L, PSL2, ERW, BFW
   COATING: 14-16 MILS FBE WITH 30-35 MIL ARO (POWERCRETE OR ENGINEER APPROVED EQUAL)
5. INTERNAL DESIGN PRESSURE 1480 PSIG (SEAM FACTOR 1.0, DESIGH FACTOR 0.50).
6. INSTALLATION METHOD: HORIZONTAL DIRECTIONAL DRILL (HDD).
7. PIPELINE WARNING MARKERS SHALL BE INSTALLED ON BOTH SIDES OF ALL ROAD, RAILWAY, AND STREAM CROSSINGS.
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| EP | | DLM | 03/23/16 | RMB | 03/23/16 | AAW | 03/23/16 |
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| A | ISSUED FOR BID | MRS | 08/31/15 | RMB | 08/31/15 | AAW | 03/24/15 |

Sunoco Logistics Partners L.P.

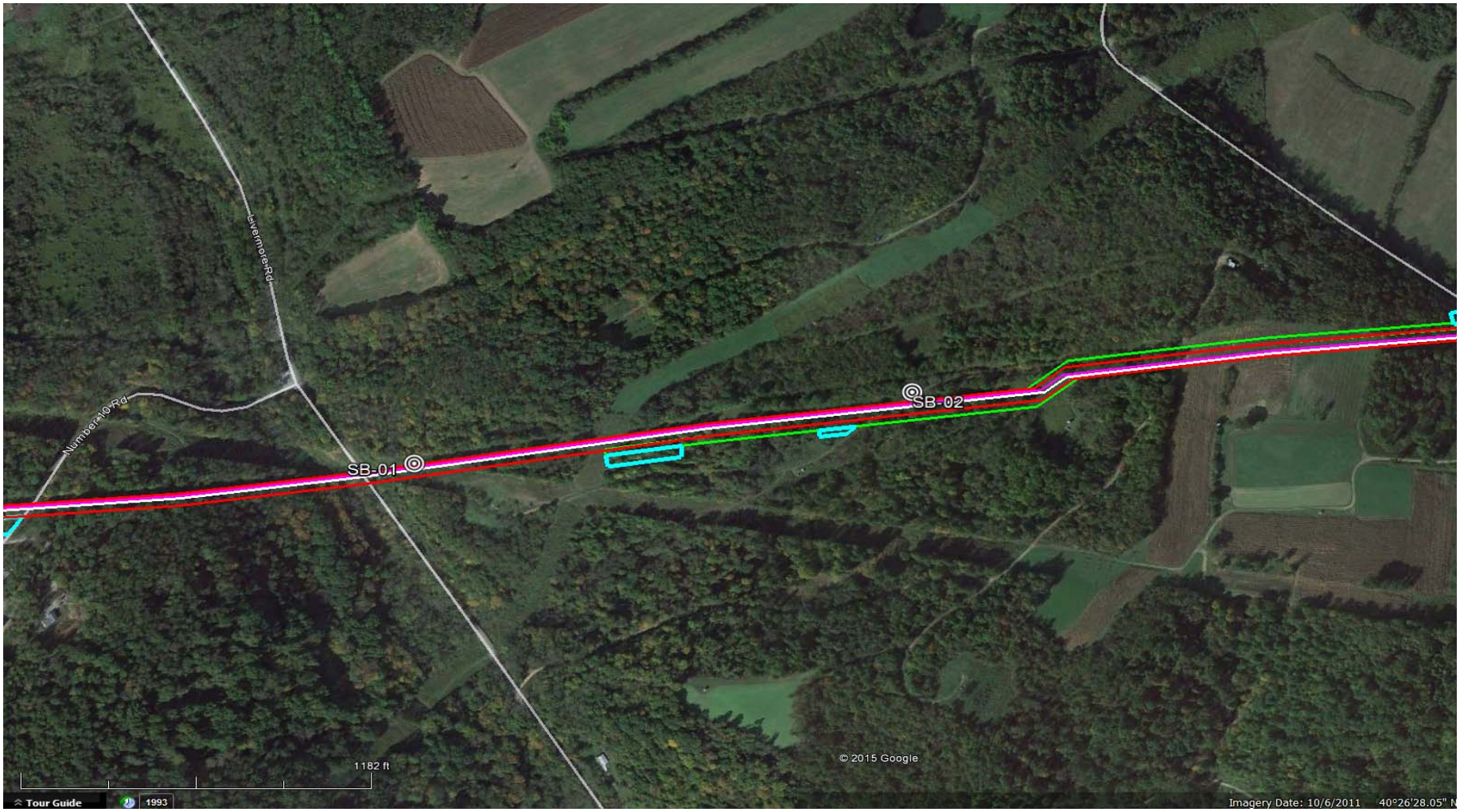
TETRA TECH ROONEY
(303) 792-5911

SUNOCO PIPELINE, L.P.

16-INCH HORIZONTAL DIRECTIONAL DRILL
LIVERMORE ROAD
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=200'

DWG. NO: PA-WM2-0093.0000-RD-16




LEGEND:

◎ Geotechnical Soil Boring (SB) Locations

TETRA TECH

GEOTECHNICAL BORING LOCATIONS
HDD S2-0016
WESTMORELAND COUNTY, DERRY TOWNSHIP, PA
SUNOCO PENNSYLVANIA PIPELINE PROJECT

**TETRA TECH**
*240 Continental Drive, Suite 200*
*Newark, Delaware 19713*
*302.738.7551*
*fax: 302.454.5988*

# TEST BORING LOG

| | | | |
|---|---|---|---|
| Project Name: | SUNOCO PENNSYLVANIA PIPELINE PROJECT | | Project No.: 103IP3406 |
| Project Location: | LIVERMORE ROAD, BLAIRSVILLE, PA | | Page 1 of 1 |
| HDD No.: | S2-0016 | Dates(s) Drilled: 04-13-15 | Inspector: E. WATT |
| Boring No.: | SB-01 | Drilling Method: SPT - ASTM D1586 | Driller: S. HOFFER |
| Drilling Contractor: | HAD DRILLING | Groundwater Depth (ft): NOT ENCOUNTERED | Total Depth (ft): 30.0 |
| Boring Location Coordinates: | | 40° 26' 31.720" N | 79° 20' 29.629" W |

| Sample No. | Sample Depth (ft) From | Sample Depth (ft) To | Strata Depth (ft) From | Strata Depth (ft) To | Recov. (in) | Strata (USCS) | Description of Materials | 6" Increment Blows * | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | 0.4 | | | TOPSOIL (5") | | | | | |
| 1 | 3.0 | 4.9 | 0.4 | | 24 | SM | DARK BROWN AND GRAY MICACEOUS FINE SILTY SAND WITH A | 3 | 21 | 30 | 50/5" | **51** |
| | | | | | | | LITTLE FINE TO COARSE GRAVEL (WEATHERED SANDSTONE). | | | | | |
| 2 | 8.0 | 10.0 | | | 20 | | DARK BROWN AND GRAY MICACEOUS FINE SILTY SAND WITH A | 5 | 16 | 26 | 33 | **42** |
| | | | | | | | LITTLE FINE TO COARSE GRAVEL (WEATHERED SANDSTONE). | | | | | |
| 3 | 13.0 | 14.0 | | | 12 | | DARK BROWN AND GRAY MICACEOUS FINE SILTY SAND WITH A | 9 | 50/6" | | | **>50** |
| | | | | | | | LITTLE FINE TO COARSE GRAVEL (WEATHERED SANDSTONE). | | | | | |
| 4 | 18.0 | 18.9 | | | 11 | | GRAY AND DARK GRAY MICACEOUS FINE SILTY SAND WITH A | 7 | 50/5" | | | **>50** |
| | | | | | | | LITTLE FINE TO COARSE GRAVEL (WEATHERED SANDSTONE). | | | | | |
| 5 | 23.0 | 23.9 | | | 11 | | GRAY AND DARK GRAY MICACEOUS FINE SILTY SAND WITH A | 10 | 50/5" | | | **>50** |
| | | | | 28.0 | | | LITTLE FINE TO COARSE GRAVEL (WEATHERED SANDSTONE). | | | | | |
| 6 | 28.0 | 28.2 | 28.0 | 28.2 | <1 | | PARTIALLY WEATHERED GRAY SANDSTONE. | 50/2" | | | | **>50** |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | AUGERED TO 30'. | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | DRY AND CAVED AT 26'. | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | STARTED GRINDING BETWEEN 20' AND 21'. | | | | | |
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |

Notes/Comments:

Pocket Pentrometer Testing

BORING IS IN SUNOCO ROW, 110' EAST OF PROPOSED LOCATION. NEW LOCATION APPROXIMATEL 15' TO 20' HIGHER IN ELEVATION.

Strata (USCS) Designations are approximated based on visual review, except where indicated in Description of Materials.

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

**TETRA TECH**
*240 Continental Drive, Suite 200*
*Newark, Delaware 19713*
*302.738.7551*
*fax: 302.454.5988*

# TEST BORING LOG

| | | | |
|---|---|---|---|
| Project Name: | SUNOCO PENNSYLVANIA PIPELINE PROJECT | | Project No.: 103IP3406 |
| Project Location: | LIVERMORE ROAD, BLAIRSVILLE, PA | | Page 1 of 1 |
| HDD No.: | S2-0016 | Dates(s) Drilled: 04-11-15 | Inspector: E. WATT |
| Boring No.: | SB-02 | Drilling Method: SPT - ASTM D1586 | Driller: S. HOFFER |
| Drilling Contractor: | HAD DRILLING | Groundwater Depth (ft): NOT ENCOUNTERED | Total Depth (ft): 30.0 |
| Boring Location Coordinates: | | 40° 26' 34.571" N | 79° 20' 5.555" W |

| Sample No. | Sample Depth (ft) From | Sample Depth (ft) To | Strata Depth (ft) From | Strata Depth (ft) To | Recov. (in) | Strata (USCS) | Description of Materials | 6" Increment Blows * | | | | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 | 0.0 | | | NO TOPSOIL | | | | | |
| 1 | 3.0 | 5.0 | 0.0 | | 16 | SM | MOTTLED LIGHT BROWN AND GRAY FINE SAND WITH SOME SILT, WITH | 10 | 18 | 19 | 13 | **37** |
| | | | | | | | A LITTLE F-C GRAVEL. | | | | | |
| 2 | 8.0 | 10.0 | | | 22 | | MOTTLED LIGHT BROWN AND GRAY FINE SAND WITH A LITTLE SILT, | 2 | 6 | 8 | 9 | **14** |
| | | | | | | | AND A LITTLE F-C GRAVEL. | | | | | |
| 3 | 13.0 | 15.0 | | | 24 | | VARIEGATED FINE SAND AND CLAYEY SILT, WITH A LITTLE | 1 | 15 | 19 | 25 | **34** |
| | | | | 16.5 | | | FINE GRAVEL (USCS: SM). | | | | | |
| 4 | 18.0 | 19.3 | 16.5 | | 10 | SM | VARIEGATED FINE SAND WITH SOME CLAYEY SILT, WITH A LITTLE | 4 | 26 | 50/3" | | **>50** |
| | | | | | | | FINE GRAVEL. | | | | | |
| 5 | 23.0 | 24.9 | | | 23 | | ORANGE BROWN TO GRAY FINE SAND WITH SOME CLAYEY SILT, | 8 | 34 | 43 | 50/5" | **77** |
| | | | | 28.5 | | | AND WITH A LITTLE FINE GRAVEL. (USCS: SM). | | | | | |
| 6 | 28.0 | 28.9 | 28.5 | | 10 | SM/ GM | LIGHT GRAY AND LIGHT BROWN FINE SILTY SAND AND FINE TO | 15 | 50/5" | | | **>50** |
| | | | | 30.0 | | | COARSE GRAVEL. | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | AUGERED TO 30'. | | | | | |

Notes/Comments:

Pocket Pentrometer Testing

BORING IS 250' EAST OF PROPOSED LOCATION PER REQUIREMENT OF LANDOWNER. NEW LOCATION IS APPROXIMATELY 15' TO 20' HIGHER IN ELEVATION.

Strata (USCS) Designations are approximated based on visual review, except where indicated in Description of Materials.

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

# GEOTECHNICAL LABORATORY TESTING SUMMARY
# SUNOCO PENNSYLVANIA PIPELINE PROJECT
# HDD S2-0016

| HDD No. | Test Boring No. | Sample No. | Depth of Sample (ft.) From | Depth of Sample (ft.) To | Water Content, % (ASTM D2216) | Percent Silts/Clays, % (ASTM D1140) | Atterburg Limits (ASTM D4318) Liquid Limit, % | Atterburg Limits (ASTM D4318) Plastic Limit, % | Atterburg Limits (ASTM D4318) Plasticity Index, % | USCS Classif. (ASTM D2487) |
|---|---|---|---|---|---|---|---|---|---|---|
| S2-0016 | SB-01 | 1 | 3.0 | 4.9 | 7.0 | 36.4 | - | - | - | - |
| | | 2 | 8.0 | 10.0 | 9.0 | 39.4 | 32 | 25 | 7 | SM |
| | | 3 | 13.0 | 14.0 | 5.3 | 32.5 | - | - | - | - |
| | | 4 | 18.0 | 18.9 | 7.0 | 40.9 | 33 | 25 | 8 | SM |
| | | 5 | 23.0 | 23.9 | 7.4 | 38.2 | - | - | - | - |
| | SB-02 | 1 | 3.0 | 5.0 | 6.1 | 24.2 | - | - | - | - |
| | | 2 | 8.0 | 10.0 | 9.2 | 13.4 | - | - | - | - |
| | | 3 | 13.0 | 15.0 | 15.1 | 46.0 | 34 | 26 | 8 | SM |
| | | 4 | 18.0 | 19.3 | 10.6 | 28.1 | - | - | - | - |
| | | 5 | 23.0 | 24.9 | 11.2 | 44.2 | 36 | 26 | 10 | SM |
| | | 6 | 28.0 | 28.9 | 6.7 | 45.2 | - | - | - | - |

Notes:

1) Sample depths based on feet below grade at time of exploration.

**REGIONAL GEOLOGY SUMMARY**
**SUNOCO PENNSYLVANIA PIPELINE PROJECT**
**HDD S2-0016**

| HDD No. | NAME | BORING NO. | REGIONAL GEOLOGY DESCRIPTION | GENERAL TOPOGRAPHIC SETTING | BEDROCK FORMATION | GENERAL ROCK TYPE | APPROX MAX FM THICKNESS (FT) | DEPTH TO ROCK (Ft bgs) based on nearby well drilling logs | NOTES / COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| S2-0016 | Livermore | SB-01 | **Glenshaw Formation** - Cyclic sequences of shale, sandstone, red beds, and thin limestone and coal; includes four marine limestone or shale horizons; red beds are involved in landslides; base is at top of Upper Freeport coal. | Downward slope | Glenshaw | Shale-sandstone with limestone-clastic-coal | 280-375 | 10-30 | |
| | | SB-02 | **Casselman Formation** - Cyclic sequences of shale, siltstone, sandstone, red beds, thin, impure limestone, and thin, nonpersistent coal; red beds are associated with landslides; base is at top of Ames limestone. | Upland | Casselman | Shale-sandstone with limestone-clastic-coal | 236-525 | 7-14 | Yields range from 5-10 gpm (note: only 3 wells within 1-2 mile radius) |

# FIELD DESCRIPTION AND LOGGING SYSTEM FOR SOIL EXPLORATION

## GRANULAR SOILS

(Sand, Gravel & Combinations)

| ***Density*** | ***N (blows)**** |
|---|---|
| Very Loose | 5 or less |
| Loose | 6 to 10 |
| Medium Dense | 11 to 30 |
| Dense | 31to 50 |
| Very Dense | 51 or more |

***Relative Proportions***

| *Description Term* | *Percent* |
|---|---|
| Trace | 1 - 10 |
| Little | 11 - 20 |
| Some | 21 - 35 |
| And | 36 - 50 |

***Particle Size Identification***

| | | |
|---|---|---|
| Boulders | 8 in. diameter or more | |
| Cobbles | 3 to 8 in. diameter | |
| Gravel | Coarse (C) | 3 in. to ¾ in. sieve |
| | Fine (F) | ¾ in. to No. 4 sieve |
| Sand | Coarse (C) | No. 4 to No. 10 sieve (4.75mm-2.00mm) |
| | Medium (M) | No. 10 to No. 40 sieve (2.00mm – 0.425mm) |
| | Fine (F) | No. 40 to No. 200 sieve (0.425 – 0.074mm) |
| Silt/Clay | Less Than a No. 200 sieve (<0.074mm) | |

## COHESIVE SOILS

(Silt, Clay & Combinations)

| ***Consistency*** | ***N (blows)**** |
|---|---|
| Very Soft | 3 or less |
| Soft | 4 to 5 |
| Medium Stiff | 6 to 10 |
| Stiff | 11 to 15 |
| Very Stiff | 16 to 30 |
| Hard | 31 or more |

***Plasticity***

| *Degree of Plasticity* | *Plasticity Index* |
|---|---|
| None to Slight | 0 - 4 |
| Slight | 5 - 7 |
| Medium | 8- 22 |
| High to Very High | > 22 |

## ROCK

(Rock Cores)

| ***Rock Quality Designation (RQD), %*** | ***Rock Quality Description*** |
|---|---|
| 0-25 | Very Poor |
| 25-50 | Poor |
| 50-75 | Fair |
| 75-90 | Good |
| 90-100 | Excellent |

***N - Standard Penetration Resistance.*** Driving a 2.0" O.D., 1-3/8" I.D. sampler a distance of 18 inches into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. The number of hammer blows to drive the sampler through each 6 inch interval is recorded; the number of blows required to drive the sampler through the final 12 inch interval is termed the Standard Penetration Resistance (SPR) N-value. For example, blow counts of 6/8/9 (through three 6-inch intervals) results in an SPR N-value of 17 (8+9).

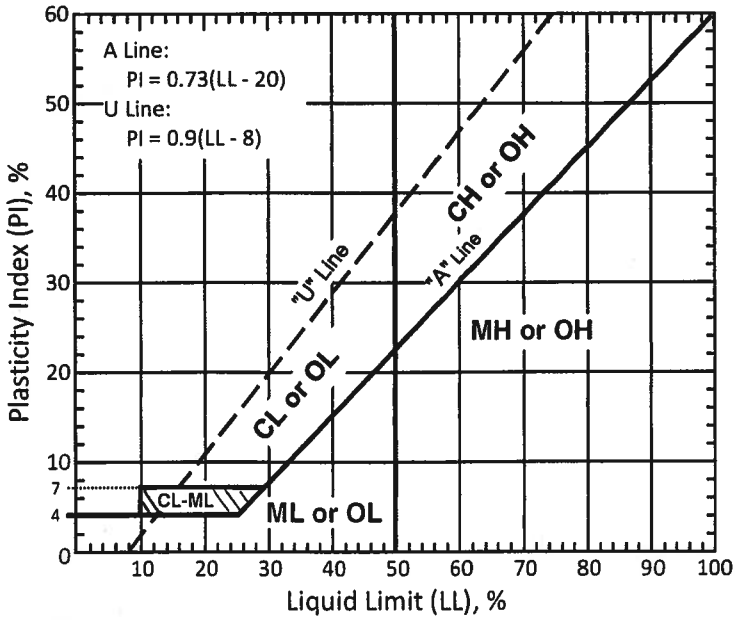
***Groundwater*** observations were made at the times indicated. Groundwater elevations fluctuate throughout a given year, depending on actual field porosity and variations in seasonal and annual precipitation.

## UNIFIED SOIL CLASSIFICATION SYSTEM [Casagrande (1948)]

| Major Divisions | | | Group Symbols | Typical Descriptions | Laboratory Classifications | | |
|---|---|---|---|---|---|---|---|
| Coarse Grained Soils (More than half of material is larger than No. 200 sieve) | Gravels More than half of coarse fraction is larger than No. 4 sieve | Clean gravel (Little or no fines) | GW | Well-graded gravels, gravel-sand mixtures, little or no fines | Determine Percentage of sand and gravel from grain size curve. Depending on Percentage of fines (fraction smaller than No. 200 sieve), coarse-grained soils are classified as follows: Less than 5 percent GW, GP, SW, SP; More than 12 percent GM, GC, SM, SC; 5 to 12 percent Borderline cases requiring dual symbols[1] | $C_u=\frac{D_{60}}{D_{10}}$ greater than 4: $C_c=\frac{(D_{30})2}{D_{10} \times D_{60}}$ between 1 and 3 | |
| | | | GP | Poorly graded gravels, gravel-sand mixtures, little or no fines | | Not meeting $C_u$ or $C_c$ requirements for GW | |
| | | Gravel with fines (Appreciable amount of fines) | GM | Silty gravels, gravel-sand-silt mixtures | | Atterberg limits below A Line or $I_p$ less than 4 | Limits plotting in hatched zone with $I_p$ between 4 and 7 are borderline cases requiring use of dual symbols |
| | | | GC | Clayey gravels, gravel-sand-clay mixtures | | Atterberg limits above A line with $I_p$ greater than 7 | |
| | Sands (More than half of coarse fraction is smaller than No. 4 Sieve) | Clean sands (Little or no fines) | SW | Well graded sands, gravely sands, little or no fines | | $C_u=\frac{D_{60}}{D_{10}}$ greater than 6: $C_c=\frac{(D_{30})2}{D_{10} \times D_{60}}$ between 1 and 3 | |
| | | | SP | Poorly graded sands, gravelly sands, little or no fines | | Not meeting $C_u$ or $C_c$ requirements for SW | |
| | | Sands with fines (Appreciable amount of fines) | SM | Silty sands, sand-silt mixtures | | Atterberg limits below A Line or $I_p$ less than 4 | Limits Plotting in hatched zone with $I_p$ between 4 and 7 are borderline cases requiring use of dual symbols |
| | | | SC | Clayey sands, sand-clay mixtures | | Atterberg limits above A line with $I_p$ greater than 7 | |

| Major Divisions | | Group Symbols | Typical Descriptions |
|---|---|---|---|
| Fine–grained soils (More than half of material is smaller than No. 200 sieve) | Silts and clays (Liquid limit less than 50) | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity |
| | | CL | Inorganic clays of low to medium plasticity, gravelly clays , sandy clays, silty clays, lean clays |
| | | OL | Organic silts and organic silty clays of low plasticity |
| | Silts and Clays (Liquid limit greater than 50) | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts |
| | | CH | Inorganic clays of high plasticity, fat clays |
| | | OH | Organic clays of medium to high plasticity, organic silts |
| | Highly organic soils | Pt | Peat and other highly organic soils |

For soils plotting nearly on A line use dual symbols i.e ., $I_p$ = 29.5, $w_L$=60 gives CH-MH. When $w_L$ is near 50 use CL-CH or ML-MH. Take near as ± 2 percent.




(1) Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC. well-graded gravel-sand mixture with clay binder.