UNIFIED SOIL CLASSIFICATION
INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3 inches and basing fractions on estimated weights)				GROUP SYMBOLS	TYPICAL NAMES	INFORMATION REQUIRED FOR DESCRIBING SOILS
COARSE GRAINED SOILS — More than half of material is larger than No. 200 sieve size 12	GRAVELS — More than half of coarse fraction is larger than No. 4 sieve size (For visual classifications, the " size may be used as equivalent to the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	Well graded gravel's, gravel–sand mixtures; little or no fines	Give typical name; indicate approximate percentages of sand and gravel; max. size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information, and symbol in parentheses.
			Predominantly one size or a range of sizes with some intermediate sizes missing.	GP	Poorly graded gravel's, gravel–sand mixtures; little or no fines	
		GRAVELS WITH FINES (Appreciable amount of fines)	Non–plastic fines (for identification procedures see ML below).	GM	Silty gravels, poorly graded gravel–sand–silt mixtures	
			Plastic fines (for identification procedures see CL below).	GC	Clayey gravels, poorly graded gravel–sand–clay mixtures	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics.
	SANDS — More than half of coarse fraction is smaller than No. 4 sieve size	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	SW	Well graded sands, gravely sands; little or no fines	
			Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	Poorly graded sands, gravely sands; little or no fines	EXAMPLE:– Silty Sand, gravely; about 20% hard, angular gravel particles ½ – inch maximum size; rounded and subangular sand grains coarse to fine; about 15% non–plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM).
		SANDS WITH FINES (Appreciable amount of fines)	Non–plastic fines (for indentification procedures see ML below).	SM	Silty sands, poorly graded sand–silt mixtures	
			Plastic fines (for identification procedures see CL below).	SC	Clayey sands, poorly graded sand–clay mixtures	
FINE GRAINED SOILS — More than half of material is smaller than No. 200 sieve size is about the smallest particle visible to the naked eye) (The No. 200 sieve size 12	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No 40 SIEVE SIZE					
	SILTS AND CLAYS — Liquid limit less than 50	DRY STRENGTH (Crushing Characteristics)	DILATANCY (Reaction to skaking)	TOUGHNESS (Consistency near Plastic Limit)		
		None to slight	Quick to slow	None	ML	Inorganic silty and very fine sands, rock flour, silty or clayey fine sands with slight plasticity
		Medium to high	None to very slow	Medium	CL	Inorganic clays to low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays
		Slight to medium	Slow	Slight	OL	Organic silts and organic silt–clays of low plasticity
	SILTS AND CLAYS — Liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays
		Medium to high	None to very slow	Slight to medium	OH	Inorganic clays of medium to high plasticity
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.			PT	Peat and other highly organic soils

Give typical name; degree and character of plasticity, amount and maximum size of coarse grains; color in wet condition, odor in any, local or geologic name, and other pertinent descriptive information; and symbol in parentheses.

For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states. Moisture and drainage conditions.

EXAMPLE:– Clayey Silt, brown; slightly plastic. small percentage of fine sand. numerous vertical root holes, firm and dry in place, loess, (ML).

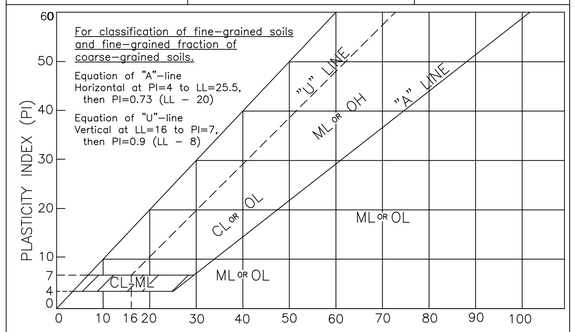
LABORATORY CLASSIFICATION CRITERIA

Use grain size curve identifying the fractions as given under field identification

Determine percentages of gravel and sand from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows:

Less than 5% — GW, GP, SW, SP
More than 12% — GM, GC, SM, SC
5% to 12% requiring use of dual symbols. — Bordering cases

$C_V = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})2}{D_{10}\ Dep}$ Between one and 3	
Not meeting all gradation requirements for GW	
Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
Atterberg limits above "A" line with PI greater than 7	
Cv = $\frac{D\ 60}{D\ 10}$ Greater than 6 Cc = $\frac{(D\ 30)2}{D\ 10\ Dep}$ Between one and 3	
Not meeting all gradation requirements for SW	
Afterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
Afterberg limits above "A" line with PI greater than 7	



FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS

* Boundary classifications: – Soils processing characteristics of two groups are designated by combinations of group symbols for Example GW–GC, well graded gravel mixture with clay binder
* All sieve sizes on this chart are US standard.

ADOPTED BY – CORPS OF ENGINEERS AND BUREAU OF RECLAMATION 1952

FIELD IDENTIFICATION PROCEDURES FOR FINE GRAINED SOILS OR FRACTIONS

These procedures are to be performed on the minus No. 40 sieve size particles, in for field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

DILATANCY (Reaction to shaking)

After removing particles larger than No 40 sieve sieve, prepare a pat striking vigorously against the other of moist soil with a volume of about one–half cubic inch. Add enough water if necessary to make the soil soft but not sticky.
Place the pot in the open palm of one hand and shake horizontally, hand several times. A positive reaction consists of the appearance of water on the surface of the pot which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pot stiffens, and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the times in a soil.
Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction inorganic silts, such as a typical rock flour, show a moderately quick reaction.

DRY STRENGTH (Crushing Characteristics)

After removing particles larger than No. 40 sieve size, mold a pot of soil to the consistency of putty, adding water if necessary. Allow the pot to dry completely by oven, sun, or air drying and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.
High dry strength is characteristic for clays of the CH group A typical inorganic silt possesses only very slight dry strength Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Letter symbols in the logs, are group symbols of the Unified soil classification system based on field indent. Copies of Drawing No. 103–D–347, Unified Soil Classification, may be obtained on request office of Director of Design and Construction. Bureau of Reclamation, Denver, Colorado R0225.

TOUGHNESS (Consistency near plastic limit)

After removing particles larger than No. 40 sieve size, a specimen of soil about one–half inch cube in size is molded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one–eighth inch in diameter. The thread is then folded and rerolled repeatedly. During this manipulation, the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.
After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.
The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin – type clays and organic clays which occur below the A–line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

REV NO		
2	2016-03-31 D C.F.S.	FIXED OFFICIAL RENDITION, FONT SPACING AND OTHER VISUAL ONLY ASPECTS.
1	2003– 12 –05 D – G.T.	REVISED PLASTICITY CHART. REDRAWN WITH AUTOCAD SOFTWARE.

DATE AND TIME PLOTTED 12–05–2003
PLOTTED BY Roy Dunbar

103–D–347

WEATHERING

FRESH (W1): Body of rock is not oxidized or discolored; fracture surfaces are not oxidized or discolored*; no separation of grain boundaries; no change of texture and no solutioning. Hammer rings when crystalline rocks are struck.

SLIGHTLY WEATHERED TO FRESH (W2):**

SLIGHTLY WEATHERED (W3): Discoloration or oxidation is limited to surface of, or short distance from fractures; some feldspar crystals are dull; fracture surfaces have minor to complete discoloration or oxidation; no visible separation of grain boundaries; texture preserved and minor leaching of soluble minerals may be present. Hammer rings when crystalline rocks are struck, body of rock is not weakened by weathering.

MODERATELY TO SLIGHTLY WEATHERED (W4):**

MODERATELY WEATHERED (W5): Discoloration or oxidation extends from fractures, usually throughout body of rock; ferromagnesian minerals are "rusty", feldspar crystals are "cloudy"; all fracture surfaces are discolored or oxidized; partial opening of grain boundaries visible; texture generally preserved, but soluble minerals may be mostly leached. Hammer does not ring when rock is struck, body of rock is slightly weakened.

INTENSELY TO MODERATELY WEATHERED (W6):**

INTENSELY WEATHERED (W7): Body of rock is discolored or oxidized throughout; all feldspars and ferromagnesian minerals are altered to clay to some extent. All fracture surfaces are discolored or oxidized, and friable; partial separation of grain boundaries, rock is friable; in situ disaggregation of granitics common in semi-arid regions; texture altered and leaching of soluble minerals may be complete. Rock has dull sound when struck with hammer; rock is weakened, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness.

VERY INTENSELY WEATHERED (W8):**

DECOMPOSED (W9): Body of rock is discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and ferro-magnesian minerals are completely altered to clay; complete separation of grain boundaries (disaggregated), partial or complete remnant rock structure may be preserved, but resembles a soil.

NOTE: Weathering categories are established primarily for crystalline rocks and those with ferromagnesian minerals, weathering in various sedimentary rocks will not always fit the categories established – weathering categories may be modified for particular site conditions or alteration such as hydrothermal alteration. Where modified criteria are established, they should be identified and described.

* Characteristics of fracture surfaces do not include directional weathering along shears or faults and their associated fracture zones; for example a shear that carries weathering to great depths in a fresh rock mass would not require the whole rock mass to be classified as weathered.

** Combination descriptors are used when equal distribution of both weathering characteristics are present over significant intervals or where characteristics noted are "in between" the diagnostic characteristics.

DURABILITY INDEX

DURABILITY DESCRIPTOR	DESCRIPTIVE CRITERIA
DIØ	Rock specimen or exposure remains intact with no deleterious cracking after exposure longer than 1 year.
DI1	Rock specimen or exposure develops hairline cracking on surfaces within 1 month, but no disaggregation within 1 year of exposure.
DI2	Rock specimen or exposure develops hairline cracking on surfaces within 1 week, and/or disaggregation within 1 month of exposure.
DI3	Specimen or exposure may develop hairline cracks in 1 day and displays pronounced separation of bedding and/or disaggregation within 1 week of exposure.
DI4	Specimen or exposure displays pronounced cracking and disaggregation within 1 day (24 hours) of exposure. Generally ravels and degrades to small fragments.

COLOR

The Munsell color system (Geologic Society of America Rock Color Chart) should be used. This system defines wet color by its hue, value, and chroma. Color symbols used (i.e., 5 YR 5/6 may be included).

SEDIMENTARY AND PYROCLASTIC ROCK PARTICLE SIZES

Size in mm	Sedimentary Rounded, subrounded, subangular		Pyroclastic	
	Particle or fragment	Lithified product	Fragment	Lithified product
256	Boulder	Boulder conglomerate	Block[a] or Bomb[b]	Volcanic[a] breccia or Volcanic[b] agglomerate
64	Cobble	Cobble conglomerate		
4	Pebble	Pebble conglomerate	Lapilli	Lapillistone and Lapilli tuff
2	Granule	Granule conglomerate		
1	Very coarse sand	Sandstone (Very coarse, coarse, medium, fine, or very fine)	Coarse ash	Coarse tuff
0.5	Coarse sand			
0.25	Medium sand			
0.125	Fine sand			
0.0625	Very fine sand			
0.00391	Silt	Siltstone/ Shale	Fine ash	Fine tuff
	Clay	Claystone Shale		

[a] Broken from previous igneous rock, block shaped (angular to subangular).
[b] Solidified from plastic material while in flight, rounded clasts.

IGNEOUS AND METAMORPHIC ROCK TEXTURE

TEXTURE DESCRIPTOR	AVERAGE GRAIN DIAMETER
VERY COARSE GRAINED OR PEGMATITIC	>10 mm [>3/8 in]
COARSE GRAINED	5-10 mm [3/16 -3/8 in]
MEDIUM GRAINED	1-5 mm [1/32 -3/16 in]
FINE GRAINED	0.1-1 mm [0.004 - 1/32 in]
APHANITIC (Cannot be seen with the unaided eye)	<0.1 mm [<0.004 in]

ADDITIONAL TEXTURAL ADJECTIVES

PIT (pitted) – pinhole to 0.03 ft [3/8 in] (<1 to 10 mm) openings.

VUG (vuggy) – Small openings (usually lined with crystals) ranging in diameter from 0.03 ft [3/8 in] to 0.33 ft [4 in] (10 to 100 mm).

CAVITY – An opening larger than 0.33 ft [4 in] (100 mm), size descriptions are required, and adjectives such as small, large, etc., may be used.

HONEYCOMBED – If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form.

VESICLE (vesicular) – Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification.

BEDDING FOLIATION OR FLOW TEXTURE

DESCRIPTORS	THICKNESS/SPACING
MASSIVE	Greater than 10 ft (>3 m)
VERY THICKLY (bedded, foliated or banded)	3 to 10 ft (1 to 3 m)
THICKLY	1 to 3 ft (300 mm to 1 m)
MODERATELY	0.3 to 1 ft (100 to 300 mm)
THINLY	0.1 to 0.3 ft (30 to 100 mm)
VERY THINLY	0.03 [3/8 in] to 0.1 ft (10 to 30 mm)
LAMINATED (Intensely foliated or banded)	Less than 0.03 ft [3/8 in] (<10 mm)

BEDROCK HARDNESS/STRENGTH

EXTREMELY HARD (H1): Core, fragment or exposure cannot be scratched with knife or sharp pick; can only be chipped with repeated heavy hammer blows.

VERY HARD (H2): Cannot be scratched with knife or sharp pick. Core or fragment breaks with repeated heavy hammer blows.

HARD (H3): Can be scratched with knife or sharp pick with difficulty (heavy pressure). Heavy hammer blow required to break specimen.

MODERATELY HARD (H4): Can be scratched with knife or sharp pick with light or moderate pressure. Core or fragment breaks with moderate hammer blow.

MODERATELY SOFT (H5): Can be grooved 1/16 inch (2 mm) deep by knife or sharp pick with moderate or heavy pressure. Core or fragment breaks with light hammer blow or heavy manual pressure.

SOFT (H6): Can be grooved or gouged easily by knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.

VERY SOFT (H7): Can be readily indented, grooved or gouged with fingernail, or carved with a knife. Breaks with light manual pressure.

Any bedrock unit softer than H7, Very Soft, is to be described using USBR 5005-86 (visual classification of soils) consistency characteristics.

REV NO		
1	3-8-00 D - P. M. R.	CONVERTED ORIGINAL DRAWING 40-D-6493 TO ACAD, CHANGED DWG. NO., MINOR REVISIONS.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

GEOLOGY FOR DESIGN & SPECIFICATIONS

STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR ROCK

GEOLOGY NOMENCLATURE COMMITTEE CHECKED CHUCK SULLIVAN
DRAWN MARSHALL MONSON TECH. APPROVAL PETER M. ROHRER
APPROVED MARK McKEOWN PEER REVIEWER

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AutoCAD Rel. 15.0 DENVER, COLORADO	40-D-7022.DWG MARCH 8, 2000	JUNE 28, 2002 11:28

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DISCONTINUITY TERMINOLOGY

DISCONTINUITY – A collective term used for all structural breaks in geologic materials which usually are unhealed and have zero or low tensile strength. Discontinuities also may be healed and exhibit high tensile strength. Discontinuities comprise fractures (including jointa), planes of weakness, shears/faults, and shear/fault zones. Contacts between various units also may be considered discontinuities.

FRACTURE – A term used to describe any natural break in geologic material excluding shears and shear zones. Additional fracture terminology is provided below.

SHEAR – A structural break where differential movement has taken place along a surface or zone of failure by shear; characterized by striations, slickensides, gouge, breccia, mylonite, or any combination of these. Often direction, amount of displacement, and continuity may not be known because of limited exposures or observations.

FAULT – A shear with significant continuity which can be correlated between observations; occurs over a significant portion of a given site, foundation area, or region; or is a segment of a fault or fault zone defined in the literature. The designation of a shear as a fault or fault zone is a site-specific determination.

SHEAR/FAULT ZONE – A shear that is expressed in relative terms of width. The zone may consist of gouge, breccia, or many related faults or shears together with fractured and crushed rock between the shears and faults, or any combination of these. In the literature many fault zones simply are referred to as faults.

SHEAR-/FAULT-DISTURBED ZONE – An associated zone of fractures and/or folds adjacent to a shear or shear zone where the country rock has been subjected to only minor cataclastic action and may be mineralized. If adjacent to a fault or fault zone, the term is fault-disturbed zone. Occurrence, orientation, and areal extent of these phenomena depend upon depth of burial (pressure and temperature) during shearing, brittleness of materials, and the stress envelope.

FRACTURE TERMINOLOGY

EXAMPLES SHOWN FOR CORE, BUT APPLICABLE TO ANY OBSERVATION

JOINT (JT) – A relatively planar fracture along which there has been little or no shearing displacement.

FOLIATION JOINT (FJ) OR BEDDING JOINT (BJ) – a relatively planar fracture which is parallel to foliation or bedding along which there has been little or no shearing displacement.

BEDDING PLANE SEPARATION – A separation along bedding after extraction or exposure due to stress relief or slaking.

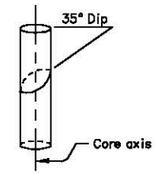
INCIPIENT JOINT (IJ) OR INCIPIENT FRACTURE (IF) – A joint or fracture which does not continue through the specimen or at least is not seen with the naked eye. However, when the specmen is wetted, and then allowed to dry, the joint or fracture trace is evident. When core is broken, it breaks along an existing plane.

RANDOM FRACTURE (RF) – A natural break which does not belong to a joint set, and which exhibits a generally rough, very irregular, nonplanar surface.

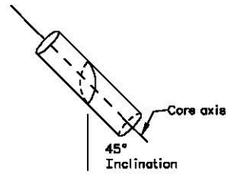
MECHANICAL BREAK (MB) – A break due to drilling, blasting, or handling. Mechanical breaks parallel to bedding or foliation are called Bedding Breaks (BB) or Foliation Breaks (FB), respectively. Recognizing mechanical breaks may be difficult. The absence of oxidation, staining, or mineral fillings, and often a hackly or irregular surface are clues for recognition.

FRACTURE ZONE (FZ) – Numerous, very closely spaced intersecting fractures. Often fragmented core cannot be fitted together.

METHOD OF MEASURING DIP OF PLANAR DISCONTINUITIES, FOLIATION, AND BEDDING IN CORE



1. Vertical hole – true dip is measured and reported.

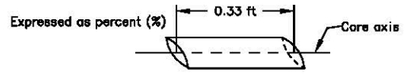


2. Angle hole – true dip usually not known; angle is measured from core axis and is called inclination.

ROCK QUALITY DESIGNATION (RQD)

EXAMPLE SHOWN FOR CORE, BUT APPLICABLE TO ANY LINEAR OBSERVATION

$$RQD = \frac{\text{Sum of length of solid core pieces} > 0.33 \text{ ft [4 in] (100 mm) long}}{\text{Length of the run in feet (mm)}} \times 100$$



FRACTURE FREQUENCY

FRACTURE FREQUENCY – The number of natural fractures occurring within a base length or core run. The number of fractures is divided by the length and is reported as fractures per foot or fractures per meter. Expressed as 3/m or 6/ft.

FRACTURE DENSITY

FRACTURE DENSITY – Based on the spacing of all natural fractures in an exposure or core recovery lengths in boreholes; excludes mechanical breaks, shears, and shear zones; however, shear-disturbed zones (fracturing outside the shear) are included. Descriptors for fracture density apply to all rock exposures such as tunnel walls, dozer trenches, outcrops, or foundation cut slopes and inverts, as well as boreholes. Descriptive criteria presented below are based on borehole cores where lengths are measured along the core axis. For other exposures the criterium is distance measured between fractures (size of blocks).

UNFRACTURED (FD0): No fractures.

VERY SLIGHTLY FRACTURED (FD1): Core recovered mostly in lengths greater than 3 feet (1 m).

SLIGHTLY TO VERY SLIGHTLY FRACTURED (FD2) *

SLIGHTLY FRACTURED (FD3): Core recovered mostly in lengths from 1 to 3 feet (300 to 1000 mm) with few scattered lengths less than 1 foot (300 mm) or greater than 3 feet (1000 mm).

MODERATELY TO SLIGHTLY FRACTURED (FD4) *

MODERATELY FRACTURED (FD5): Core recovered mostly in 0.3- to 1.0-foot (100- to 300-mm) lengths with most lengths about 0.6 foot (200 mm).

INTENSELY TO MODERATELY FRACTURED (FD6) *

INTENSELY FRACTURED (FD7): Lengths average from 0.1 to 0.3 foot (30 to 100 mm) with scattered fragmented intervals. Core recovered mostly in lengths less than 0.3 foot (100 mm).

VERY INTENSELY TO INTENSELY FRACTURED (FD8) *

VERY INTENSELY FRACTURED (FD9): Core recovered mostly as chips and fragments with a few scattered short core lengths.

* Combinations of fracture densities (e.g., Very Intensely to Intensely Fractured or Moderately to Slightly Fractured) are used where equal distribution of both fracture density characteristics are present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions.

FRACTURE SPACING

JOINT SET, OR FRACTURE SPACING DESCRIPTOR	TRUE SPACING
EXTREMELY WIDELY SPACED (SP1)	Greater than 10 ft (>3 m)
VERY WIDELY SPACED (SP2)	3 to 10 ft (1 to 3 m)
WIDELY SPACED (SP3)	1 to 3 ft (300 mm to 1 m)
MODERATELY SPACED (SP4)	0.3 to 1 m (100 to 300 mm)
CLOSELY SPACED (SP5)	0.1 to 0.3 ft (30 to 100 mm)
VERY CLOSELY SPACED (SP6)	less than 0.1 ft (<30 mm)

FRACTURE CONTINUITY

CONTINUITY DESCRIPTOR	DISCONTINUITY LENGTH
DISCONTINUOUS (C1)	Less than 3 ft (<1 m)
SLIGHTLY CONTINUOUS (C2)	3 to 10 ft (1 to 3 m)
MODERATELY CONTINUOUS (C3)	10 to 30 ft (3 to 10 m)
HIGHLY CONTINUOUS (C4)	30 to 100 ft (10 to 30 m)
VERY CONTINUOUS (C5)	Greater than 100 ft (>30 m)

FRACTURE ENDS (JOINT SURVEYS)

FRACTURE ENDS DESCRIPTOR	DESCRIPTIVE CRITERIA
EØ	Zero ends leave the exposure (both ends can be seen).
E1	One end of the fracture terminates in the exposure (one end can be seen).
E2	Neither fracture end terminates in the exposure (neither end can be seen).

FRACTURE OPENNESS OR FILLING THICKNESS

FILLING THICKNESS DESCRIPTOR	THICKNESS/OPENNESS	OPENNESS DESCRIPTOR
CLEAN (TØ)	No film or coating.	
	No visible separation.	TIGHT (OØ)
VERY THIN (T1)	Less than 0.003 ft [1/32 in] (<1 mm).	SLIGHTLY OPEN (O1)
MODERATELY THIN (T2)	0.003 to 0.01 ft [1/32 to 1/8 in] (1 to 3 mm).	MODERATELY OPEN (O2)
THIN (T3)	0.01 to 0.03 ft [1/8 to 3/8 in] (3 to 10 mm).	OPEN (O3)
MODERATELY THICK (T4)	0.03 ft [3/8 in] to 0.1 ft (10 to 30 mm).	MODERATELY WIDE (O4)
THICK (T5)	Greater than 0.1 ft (>30 mm). Actual thickness or openings recorded.	WIDE (O5)

FRACTURE MOISTURE CONDITIONS

MOISTURE DESCRIPTOR	DESCRIPTIVE CRITERIA
M1	The fracture is dry. It is tight or filling (where present) is of sufficient density or composition to impede waterflow. Waterflow along the fracture does not appear possible.
M2	The fracture is dry with no evidence of previous waterflow. Waterflow appears possible.
M3	The fracture is dry, but shows evidence of waterflow such as staining, leaching and/or vegetation.
M4	The fracture or filling (where present) is damp, but no free water is present.
M5	The fracture shows seepage. It is wet with occasional drops of water.
M6	The fracture emits a continuous flow (estimate flow rate) under low pressure. Filling materials (where present) may show signs of leaching or piping.
M7	The fracture emits a continuous flow (estimate flow rate) under moderate to high pressure. Water is squirting and/or filling material (where present) may be substantially washed out.

FRACTURE ROUGHNESS

Refers to small-scale asperities of surfaces, not large-scale undulations or waviness.

STEPPED (R1): Near-normal steps and ridges occur on the fracture surface.
ROUGH (R2): Large, angular asperities can be seen.
MODERATELY ROUGH (R3): Asperities are clearly visible and fracture surface feels abrasive.
SLIGHTLY ROUGH (R4): Small asperities on the fracture surface are visible and can be felt.
SMOOTH (R5): No asperities, smooth to the touch.
POLISHED (R6): Extremely smooth and shiny.

FRACTURE SURFACE AND/OR FILLING ALTERATION AND HARDNESS

Descriptors for weathering or alteration of fracture surfaces and fracture fillings (excluding soil materials) are the same as those used for weathering and alteration of rock.

Descriptors for hardness/strength of fillings and/or fracture surfaces are the same as those presented for hardness of rock and consistency of soils.

DISCONTINUITY HEALING

TOTALLY HEALED (HL1) – All fragments bonded, discontinuity is completely healed or recemented to a degree at least as hard as surrounding rock.

MODERATELY HEALED (HL3) – Greater than 50 percent of fractured or sheared material, discontinuity surfaces or filling is healed or recemented; and/or strength of healing agent is less hard than surrounding rock.

PARTLY HEALED (HL5) – Less than 50 percent of fractured or sheared material, discontinuity surface or filling is healed or recemented.

NOT HEALED (HL6) – Discontinuity surface, fractured zone, sheared material or filling is not healed or recemented, rock fragments or filling (if present) held in place by their own angularity and/or cohesiveness.

SHEAR/FAULT DESCRIPTORS

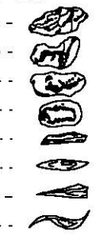
SHEAR/FAULT GOUGE CONSISTENCY

DESCRIPTOR	DESCRIPTIVE CRITERIA (Similar to consistency of soils)
VERY HARD	Gouge cannot be broken with finger pressure; cannot be indented with fingernail.
HARD	Gouge can be broken with firm finger pressure; can be indented with fingernail; cannot be indented with thumb.
FIRM	Gouge can be easily crumbled; can be indented with thumb 1 to 5 mm.
SOFT	Gouge can be easily molded; can be penetrated with thumb 5 to 25 mm.
VERY SOFT	Gouge can be penetrated with thumb more than 25 mm.

SHEAR/FAULT MOISTURE DESCRIPTORS

The apparent moisture content of gouge is described as WET (visible free water); MOIST (damp, but no visible water); and DRY (absence of moisture, dusty, dry to the touch). Moisture descriptors M1 through M7 may be used to describe the shear or shear zone.

BRECCIA SHAPES



REV NO		
1	3-8-00 D-P. W. R.	CONVERTED ORIGINAL DRAWING 40-D-6499 TO ACAD, CHANGED DWG. NO., MINOR REVISIONS.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

GEOLOGY FOR DESIGN & SPECIFICATIONS

STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES

GEOLOGY NOMENCLATURE COMMITTEE — CHECKED: CHUCK SULLIVAN
DRAWN: MARSHALL MONSON — TECH. APPROVAL: PETER M. ROHRER
APPROVED: MARK McKEOWN (PEER REVIEWER)

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AutoCAD Rel. 15.0 DENVER, COLORADO	40-D-7023.DWG MARCH 8, 2000	JUNE 28, 2002 11:10

40-D-7023

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-1

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/10/15 FINISHED: 10/10/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
AND DATE MEASURED: 10/10/2015

PROJECT: NGWSP
COORDINATES: N 1,841,766.9 E 2,473,292.3
TOTAL DEPTH: 28.7
DEPTH TO BEDROCK: 7.7

STATE: NM
GROUND ELEVATION: 5845.5
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J .GILBERT
REVIEWED BY: P. GARDNER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JOE PROCTOR, HELPERS; BRANDON LANE; RENATO MATHESON

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 8.7 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
8.7 - 28.7 FT HQ3 WIRELINE CORING SYSTEM WITH A 5' SPLIT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 8.7 FT NONE USED.
8.7 - 28.7 FT WATER.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
5	36	28.2	71.8	0	NP	NP	3.9	SM	12/22/41	Qal	SM
											5837.8
									50/REFUSAL		SANDSTONE
10	88										5835.2
15	90									Kmf	
20	100										CLAYSTONE
25	100										5816.8

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 7.7 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 7.7 FT SILTY SAND (SM) : ABOUT 80% FINE SAND, ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH, LOW TOUGHNESS; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; NO REACTION WITH HCl.

7.7 - 28.7 FT CRETACEOUS MENEFEE FORMATION (Kmf)

7.7 - 10.3 FT SANDSTONE WITH CLAYSTONE INTERBEDS: SLIGHTLY WEATHERED (W3), SOFT (H6), TAN IN COLOR; NO REACTION WITH HCl.

10.3 - 28.7 FT CLAYSTONE: DARK GREY IN COLOR, MODERATELY TO SLIGHTLY WEATHERED (W4), VERY SOFT (H7); NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 7.7 FT: QUATERNARY ALLUVIUM (Qal)
7.7 - 28.7 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS:
WLNE = WATER LEVEL NOT ENCOUNTERED
I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-2

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 11/18/15 FINISHED: 11/18/15
DEPTH AND ELEVATION OF WATER LEVEL: 11.0 ft. (5820.9)
AND DATE MEASURED: 11.0 (5820.9) 11/18/2015

PROJECT: NGWSP
COORDINATES: N 1,835,943.4 E 2,474,721.4
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: 10.8

STATE: NM
GROUND ELEVATION: 5831.9
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: P. GARDNER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; KYLE KILLEBREW
HELPERS; JOE PROCTOR, BRANDON LANE

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0.0 - 25.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 25.0 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
5	100	51.4	48.6	0	NA	NA	17.6	NA	1/2/3	Qal	SC
	60	26.5	73.5	0	NA	NA	19.6	NA	19/32/39		
10	100	26.7	73.3	0	NA	NA	19.9	NA	35/24/13		5821.1
	100	79.4	20.6	0	NA	NA	3.0	NA	8/29/38	Kmf	
15	100	82.3	17.7	0	NA	NA	17.7	NA	12/23/26		
	100	70.8	29.2	0	NA	NA	17.2	NA	13/29/31		CLSTNE
20		59.0	41.0	0	NA	NA	18.7	NA	16/50		
	100										5809.5 SS
25											5806.9

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 10.8 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 10.8 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND, TRACE OF COARSE SAND; ABOUT 40% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; MAXIMUM SIZE, COARSE SAND; LIGHT BROWN IN COLOR; NO REACTION WITH HCl.

10.8 - 25.0 FT CRETACEOUS MENEFEE FORMATION (Kmf)

10.8 - 22.4 FT CLAYSTONE: GREY IN COLOR, VERY SOFT (H7), MODERATELY TO INTENESELY WEATHERED (W6), INTERMITTENT IRON OXIDE STAINING, THINLY TO MODERATELY BEDDED, VISIBLE ORGANIC MATERIAL.

22.4 - 25.0 FT SANDSTONE: MODERATELY TO SLIGHTLY WEATHERED (W4), SOFT (H6), TAN IN COLOR; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 10.8 FT: QUATERNARY ALLUVIUM (Qal)
10.8 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-3

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 11/18/15 FINISHED: 11/18/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
AND DATE MEASURED: 11/18/2015

PROJECT: NGWSP
COORDINATES: N 1,831,286.9 E 2,476,219.7
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: 19.2

STATE: NM
GROUND ELEVATION: 5875.1
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: P. GARDNER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW; DRILLER; KYLE KILLEBREW; HELPERS, JOE PROCTOR, BRANDON LANE

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0.0 - 25.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 25.0 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
0	0									Qal	SM
	52	51.0	49.0	0	29.3	15.9	6.3	s(CL)	7/12/12		
5											5869.0
	60	38.8	59.4	1.8	26.9	12.4	4.4	SC	15/21/15		SC
											5866.5
	100	90	10	0	56.7	36.0	15.0	CH	14/23/27		CH
10											5864.2
	68	84.5	15.5	0	42.5	27.0	13.6	(CL)s	11/21/31		SC
	88	59.1	40.9	0	31.9	16.6	16.5	s(CL)	16/36/REFUSAL		
15											5859.1
	100										SC
		86.8	13.2	0	44.6	26.5	15.9	CL			5855.9
20										Kmf	CLSTNE
	100										
25											5850.1

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 19.2 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 6.1 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY; MAXIMUM SIZE, FINE SAND; LOW DRY STRENGTH, DRY, TAN IN COLOR; NO REACTION WITH HCl.

6.1 - 8.6 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH LOW TOUGHNESS AND SLOW DILATANCY; TRACE OF COARSE SAND MAXIMUM SIZE, COARSE SAND, LIGHT BROWN IN COLOR; NO REACTION WITH HCl.

8.6 - 10.9 FT FAT CLAY (CH): ABOUT 90% PLASTIC FINES WITH HIGH TOUGHNESS, HIGH DRY STRENGTH; ABOUT 10% FINE SAND WITH NO DILATANCY; MAXIMUM SIZE, FINE SAND; NO REACTION WITH HCl.

10.9 - 16.0 FT CLAYEY SAND (SC): ABOUT 60% FINE SAND; ABOUT 40% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH TOUGHNESS; MAXIMUM SIZE, FINE SAND; TAN IN COLOR; NO REACTION WITH HCl.

16.0 - 19.2 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH LOW TOUGHNESS AND SLOW DILATANCY; TRACE OF COARSE SAND MAXIMUM SIZE,COARSE SAND, LIGHT BROWN IN COLOR; NO REACTION WITH HCl.

19.2 - 25.0 FT CRETACEOUS MENEFEE FORMATION (Kmf)

19.2 - 25.0 FT CLAYSTONE: DECOMPOSED (W9) AND DESCRIBED AS SOIL; FAT CLAY (CH): ABOUT 90% PLASTIC FINES WITH HIGH TOUGHNESS, HIGH DRY STRENGTH; ABOUT 10% FINE SAND WITH NO DILATANCY; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 19.2 FT: QUATERNARY ALLUVIUM (Qal)
19.2 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-4

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/11/15 FINISHED: 10/11/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,827,713.2 E 2,477,541.8
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: 2.5

STATE: NM
GROUND ELEVATION: 5963.7 ft.
ANGLE FROM HORIZONTAL: AZIMUTH:
HOLE LOGGED BY: CBEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JOE PROCTOR, HELPERS; BRANDON LANE; RENATO MATHESON

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 5.0 FT 4 1/4" HSA PILOT BIT
5.0 - 25.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE SAMPLER AND DIAMOND SURFACE-SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 5.0 FT NONE USED.
5.0 - 25.0 FT WATER

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	GEOLOGIC SYMBOL	% CORE RECOVERY	RQD	HARDNESS	WEATHERING	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	VISUAL CLASSIFICATION
	Qal			7	8									(SM)g
5		66	12	6	6									
10		98	66	3	2									
	Kmf													SS
15		82	0	6	6									
20		32	0											
25				6	6									CLST

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 2.5 FT: QUATERNARY ALLUVIUM (Qal):

0.0- 2.5 FT SILTY SAND WITH GRAVEL (SM)g: ABOUT 60% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, NO DRY STRENGTH AND RAPID DILATANCY; ABOUT 20% FINE TO COARSE GRAVEL; BROWN IN COLOR, MOIST; MAXIMUM SIZE, 75MM.

2.5 - 25.0 FT CRETACEOUS MENEFEE FORMATION

2.5 - 11.9 FT SANDSTONE: TAN IN COLOR, VERY INTENSELY WEATHERED (W8) VERY SOFT (H7) IN TOP 1.O FT. SANDSTONE BECOMES MODERATELY TO INTENSELY WEATHERED (W6) AND SOFT (H6) BELOW THE TOP 1.O FT. IT IS FINE GRAINED, AND THINLY BEDDED. THE SANDSTONE HAS NO REACTION WITH HCI AND CONTAINS INTERMITTENT ANGULAR 1"MUDSTONE RIPUP CLASTS.
11.9 - 13.2 FT SANDSTONE: GREY IN COLOR, SLIGHTLY WEATHERED TO FRESH (W2) AND HARD (H3). IT IS MODERATELY BEDDED AND CALCAREOUS, STRONG REACTION WITH HCI. ROCK HAMMER RINGS WHEN CORE IS STRUCK.

13.2 - 24.5 FT SANDSTONE: TAN IN COLOR, MODERATELY TO INTENSELY WEATHERED (W6) AND SOFT (H6); FINE GRAINED, AND THINLY BEDDED, NO REACTION WITH HCI AND CONTAINS INTERMITTENT ANGULAR 1"MUDSTONE RIPUP CLASTS.

24.5 - 25.0 CLAYSTONE: GREY IN COLOR, MODERATELY TO INTENSELY WEATHERED (W6), SOFT (H6). SAMPLE WASHED BY DRILL AND STUCK TO CORE BARREL.

STRATIGRAPHY: 0.0 - 2.5 FT. QUATERNARY ALLUVIUM (Qal)
2.5 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-5

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 8/14/15 FINISHED: 8/14/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
AND DATE MEASURED: 8/14/2015

PROJECT: NGWSP
COORDINATES: N 1,824,358.0 E 2,478,371.0
TOTAL DEPTH: 21.1
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 5960.8
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: C. BEYER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; JOE PROCTOR; BRIAN HART.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0- 21.1 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 21.1 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
5	92	17.4	82.6	0	NA	NP	3.0	SM	2/5/5		
	48	14.2	85.8	0	NA	NP	2.3	SM	3/2/1		
											SM
10	100	33.1	66.9	0	20.1	3.5	4.7	SM	1/5/12		
										Qal	
	80	20.3	79.6	0.1	NA	NP	2.9	SM	5/9/11		
15	100	44.8	55.2	0	21.0	7.4	4.7	SC	6/9/12		
											5944.5
	96	13.4	65.6	21.0	NA	NP	1.1	(SM)g	20/50/50		
											(SP)g
20	0	9.9	79.1	11.0	NA	NP	0.6	SM	REFUSAL		
	0										5939.7

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 21.1 FT: QUATERNARY ALLUVIUM (Qal):

0.0 - 16.3 FT SILTY SAND (SM): ABOUT 80% PREDOMINATELY FINE TO MEDIUM SAND; ABOUT 20% NONPLASTIC FINES, WITH RAPID DILATANCY, LOW DRY STRENGTH, DRY, BROWN TO GREY IN COLOR; MAXIMUM SIZE, MEDIUM SAND; ROOTS ON TOP 1.0 FT; NO REACTION WITH HCl.

16.3 - 21.1 FT POORLY GRADED SAND WITH GRAVELS (SP)g: ABOUT 75% FINE TO COARSE, HARD TO VERY HARD SUBROUNDED SAND; ABOUT 20% FINE TO COARSE, HARD TO VERY HARD, SUBANGULAR TO SUBROUNDED GRAVEL; ABOUT 5% NONPLASTIC FINES; MAXIMUM SIZE, 50 mm; NO REACTION WITH HCl.

STRATIGRAPHY: 0.0 - 21.1 FT. QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-6

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/11/15 FINISHED: 10/11/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,819,682.3 E 2,479,568.4
TOTAL DEPTH: 26.5
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 5930.7
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: C. BEYER
REVIEWED BY:

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JOE PROCTOR, HELPERS; BRANDON LANE; RENATO MATHESON

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.
DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 5.0 4 1/4" HSA WITH PILOT BIT
5.0 - 26.5 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
	NR									Qal	(SP-SC)
5	32	27.7	72.3	0	23.6	5	4.9	SC-SM	4/8/7		
											5923.2
	48	33.1	66.9	0	26.6	7.1	6.2	SC	5/7/7		SC
10	48	32.2	67.8	0	24.4	6.5	5.9	SC-SM	5/6/7		
											5918.7
	56	22.8	37.5	39.7	NA	NP	2.7	(GM)s	32/25/19		(SM)g
15	88	19.2	56.5	24.3	NA	NP	3.2	(SM)g	16/18/17		
											5913.7
											(SP-SM) 5913.2
	72	13.8	68.2	18	NA	NP	2.9	(SM)g	14/23/20		
20	58	16.1	49.3	34.6	NA	NP	3.2	(SM)g	2734/15		(SP-SM)g
											5908.0
25		20.4	77.8	1.8	NA	NP	8.3	SM	6/9/8		SM
											5904.2

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 26.5 FT: QUATERNARY ALLUVIUM (Qal):

0.0 - 7.5 FT POORLY GRADED SAND WITH CLAY (SP-SC): ABOUT 90% FINE SAND; ABOUT 10% FINES WITH LOW PLASTICITY, LOW TOUGHNES, LOW DRY STRENGTH AND SLOW DILATANCY; LOOSE CONSOLIDATOIN; MAXIMUM SIZE, FINE SAND; WEAK REACTION WITH HCL.

7.5 - 12.0 FT CLAYEY SAND (SC): ABOUT 85% PREDOMINATELY FINE SAND; ABOUT 15% FINES WITH LOW PLASTICITY, LOW TOUGHNES, LOW DRY STRENGTH AND SLOW DILATANCY; TRACE MEDIUM SAND AND COARSE SUBROUNDED GRAVEL; LOOSE CONSOLIDATOIN; MAXIMUM SIZE, 3 INCHES; WEAK REACTION WITH HCL.

12.0 - 17.0 FT SILTY SAND WITH GRAVEL (SM)g: ABOUT 60% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, NO DRY STRENGTH AND RAPID DILATANCY; ABOUT 20% FINE TO COARSE GRAVEL; BROWN IN COLOR, DRY, LOOSE CONSOLIDATION; MAXIMUM SIZE, 3 INCHES; GRAVEL PULVERIZED BY AUGER AND SPT SAMPLER.

17.0 - 17.5 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ANOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY, AND LOW DRY STRENGTH; NO REACTION WITH HCL.

17.5 - 22.7 FT POORLY GRADED SAND WITH GRAVEL (SP-SM)g: ABOUT 75% PRODOMINATELY FINE SAND, TRACE MEDIUM TO COARSE SAND; ABOUT 15% FINE TO COARSE GRAVEL; ABOUT 10% FINES WITH NO PLASTICITY, RAPID DILATANCY, AND LOW DRY STRENGTH; MAXIMUM SIZE 3 INICHES; NO REACTION WITH HCL.

22.7 - 26.5 FT SILTY SAND (SM): ABOUT 85% PREDOMINATELY FINE SAND, TRACE MEDIUM TO COARSE SAND; ABOUT 15% FINES WITH NO PLASTICITY, RAPID DILATANCY, AND LOW DRY STRENGTH; INTERMITTENT CALCITE NODULES, CALCITE CEMENTED FROM 22.7 TO 23.5 FT; DRY, BECOMES MOIST BELOW 23.0 FT; STRONG REACTION WITH HCL.

STRATIGRAPHY: 0.0 - 26.5 FT: QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-7

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/27/15 FINISHED: 10/27/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,813,384.1 E 2,481,040.8
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 5938.4
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: C. BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JOE PROCTOR, HELPERS; BRANDON LANE; RENATO MATHESON

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 5.0 FT 4 1/4" HSA WITH PILOT BIT
5.0 - 25.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
	NR									Qal	SP 5937.4
5											
	100	94.3	5.7	0	114.3	94.0	15.7	CH	7/11/13		CH
											5931.1
		71.1	28.9	0	40.5	26.3	6.6	(CL)s	45/REFUSAL		
	92										
10											
	94										
15										Kmf	SS
	100										
20											
	100										
25											5913.4

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 7.3 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 1.0 FT: POORLY GRADED SAND (SP): ABOUT 95% PREDOMINATELY FINE SAND, TRACE MEDIUM, AND COARSE SAND, TRACE GRAVEL; ABOUT 5% FINES WITH NO PLASTICITY, NO DRY STRENGTH AND RAPID DILATANCY; WEAK CEMENTATION; MAXIMUM SIZE, 25MM; NO REACTION WITH HCL.

1.0 - 7.3 FT: FAT CLAY (CH): ABOUT 90% FINES WITH HIGH PLASTICITY, HIGH DRY STRENGTH, AND HIGH TOUGHNESS; ABOUT 10% FINE SAND. GREY IN COLOR; NO REACTION WITH HCl.

7.3 - 25.0 FT CRETACEOUS MENEFEE FORMATION

7.3 - 7.8 FT SANDSTONE: DECOMPOSED (W9) VERY SOFT (H7) CLASSIFIED AS A SOIL. ABOUT 80% PREDOMINATELY FINE SAND, TRACE MEDIUM TO COARSE SAND; ABOUT 20% FINES WITH MEDIUM PLASTICITY, MEDIUM TOUGHNESS AND MEDIUM DRY STRENGTH; BROWNISH ORANGE IN COLOR, WEAK REACTION WITH HCl.

7.8 - 25.0 FT SANDSTONE: MODERATELY TO INTENSELY WEATHERED (W6) SOFT (H6), AND MODERATELY BEDDED FROM 7.8 TO 15.0 FT; BECOMES MODERATELY WEATHERED (W5), MODERATELY SOFT (H5) AND THICKLY BEDDED BELOW 15 FT; GRAYISH BROWN IN COLOR, NO REACTION WITH HCl; SUBANGULAR CLAYSTONE RIPUP CLASTS, 12MM IN DIAMETER FROM 24.5 TO 25.0 FT.

STRATIGRAPHY:
0.0 - 7.3 FT: QUATERNARY ALLUVIUM (Qal)
7.3 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-8

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/12/15 FINISHED: 10/12/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,809,042.7 E 2,481,215.1
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: 10.0

STATE: NM
GROUND ELEVATION: 5967.6
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: C. BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JOE PROCTOR
HELPERS; BRANDON LANE, RENATO MATHESON.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 15.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
15.0 - 25.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 15.0 FT NONE USED.
15.0 - 25.0 FT WATER

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
											SP-SM
											5964.9
5		27.7	67.8	4.5	19.2	0.7	2.6	SM	4/REFUSAL	Qal	(SP-SM)g
		33.9	34.3	31.8	29.4	15.1	4.0	(SC)g	33/19/16		
10	92	94.8	5.2	0	62.4	40.4	14.4	CH	11/17/19		5957.6
	80										
15	100									Kmf	CLST
20	100										
25											5942.6

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 10.0 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 2.7 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY, AND LOW DRY STRENGTH; GRAYISH BROWN IN COLOR; WEAK CEMENTATION; STRONG REACTION WITH HCl.

2.7 - 10.0 FT POORLY GRADED SAND WITH GRAVEL (SP-SM)g: ABOUT 65% PREDOMINATELY FINE SAND, TRACE MEDIUM TO COARSE SAND; ABOUT 15% FINE TO COARSE GRAVEL; ABOUT 10% FINES WITH NO PLASTICITY, RAPID DILATANCY, AND LOW DRY STRENGTH; MAXIMUM SIZE, 3 INCHES; STRONG REACTION WITH HCl.

10.0 - 25.0 FT CRETACEOUS MENEFEE FORMATION

10.0 - 25.0 FT CLAYSTONE: DARK GREY IN COLOR, VERY INTENSELY WEATHERED (W8) AND VERY SOFT (H7) FROM 10.0 TO 12.0 FT. MODERATELY TO INTENSELY WEATHERED (W6), SOFT (H6) BELOW 12.0 FT. LAMINATED TO THINLY BEDDED; INTERMITTENT IRON OXIDE STAINING CARBONACEOUS FRAGMENTS AND CALCITE NODULES. SAMPLES STUCK TO CORE BARREL, MAKING THEM DIFFICULT TO REMOVE INTACT.

STRATIGRAPHY:
0.0 - 10.0 FT: QUATERNARY ALLUVIUM (Qal)
10.0 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-9

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 11/22/15 FINISHED: 11/23/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED: 11/23/2015

PROJECT: NGWSP
COORDINATES: N 1,805,195.0 E 2,480,983.7
TOTAL DEPTH: 25.9
DEPTH TO BEDROCK: 11.1

STATE: NM
GROUND ELEVATION: 5938.6
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: P. GARDNER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW; DRILLER; KYLE KILLEBREW HELPERS; JOE PROCTOR, BRANDON LANE

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0.0 - 25.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

DRILLING MEDIUM:
0.0 - 25.9 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
0	0										
	72	42.3	57.7	0	22.3	4.4	3.9	SC-SM	4/4/7		SM
5										Qal	
	36	41.9	58.1	0	24.6	9.1	5.0	SC	6/16/21		5931.7
	48	52.7	47.3	0	27.3	14.8	5.8	s(CL)	11/10/16		SC
10											5927.5
	80	29.3	70.7	0	N/A	N/P	1.3	SM	48/REFUSAL		
	100	27.8	72.2	0	N/A	N/P	2.3	SM			
15											
	100									Kmf	SS
20											
	100										
25	100										5912.7

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 11.1 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 6.9 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; NO REACTION WITH HCl.

6.9 - 11.1 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, LOW DRY STRENGTH LOW TOUGHNESS AND SLOW DILATANCY; TRACE OF COARSE SAND AND FINE GRAVEL; MAXIMUM SIZE, FINE GRAVEL; BROWN IN COLOR; NO REACTION WITH HCl.

11.1 - 25.9 FT CRETACEOUS MENEFEE FORMATION (Kmf)

11.1 - 25.9 FT SANDSTONE: VERY INTENSELY WEATHERED TO DECOMPOSED (W8-W9), VERY SOFT TO SOFT (H6-H7), TAN IN COLOR, BREAKS WITH MODERATE HAMMER BLOW; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 11.1 FT: QUATERNARY ALLUVIUM (Qal)
11.1 - 25.9 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-10

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/15/15 FINISHED: 10/15/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,799,310.8 E 2,480,923.2
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: 16

STATE: NM
GROUND ELEVATION: 6048.2
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: C.BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JOE PROCTOR
HELPERS; BRANDON LANE, RENATO MATHESON.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 2.5 FT 4 1/4" HSA WITH PILOT BIT
2.5 - 25.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT.
REACHED AUGER REFUSAL IN HARD COBBLES AND BOULDERS AT 2.5 FT. SWICHED TO CORING SYSTEM, RESULTING IN POOR RECOVERY.
NOTE:
MULTIPLE TEST PITS EXCAVATED AND ABANDONED BY UNKNOWN PARTY NEAR DHR9-15-10.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 2.5 FT NONE
2.5 - 25.0 FT WATER

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
0											SP 6046.7
											(SP)g 6045.7
5		15.4	35.4	49.2	NP	NP	4.8	(GM)s			
										Qal	
10											(GW-GM)scb
15	NR										6032.2
20	72									Kmf	CLST
25											6023.2

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 16.0 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 1.5 FT POORLY GRADED SAND (SP): ABOUT 95% PREDOMINATELY FINE SAND, TRACE MEDIUM TO COARSE SAND; ABOUT 5% FINES WITH NO PLASTICITY, RAPID DILATANCY, AND LOW DRY STRENGTH MAXIMUM SIZE, COARSE SAND; NO REACTION WITH HCl.

1.5 - 2.5 FT POORLY GRADED SAND WITH GRAVEL (SP)g: ABOUT 75% PREDOMINATELY FINE SAND, TRACE MEDIUM TO COARSE SAND; ABOUT 20% FINE TO COARSE GRAVEL; ABOUT 5% FINES WITH NO PLASTICITY, RAPID DILATANCY AND LOW DRY STRENGTH; MAXIMUM SIZE, 3 INCHES; WEAK REACTION WITH HCl.

2.5 -16.0 FT WELL GRADED GRAVEL WITH SILT, SAND, COBBLES AND BOULDERS (GW-GM)scb:
ABOUT 40% HARD FINE GRAINED, SUBROUNDED SANDSTONE COBBLES; ABOUT 25% FINE TO COARSE SUBROUNDED HARD FINE GRAINED SANDSTONE GRAVEL; ABOUT 15% FINE TO COARSE SAND; ABOUT 10% NONPLASTIC FINES; ABOUT 10% HARD FINE GRAINED, SUBROUNDED SANDSTONE BOULDERS; MAXIMUM SIZE 1.6 FT.

16.0 - 25.0 FT CRETACEOUS MENEFEE FORMATION

16.0 - 25.0 FT CLAYSTONE: DARK GREY IN COLOR, VERY INTENSELY WEATHERED (W8) AND VERY SOFT (H7) IN TOP 2.0 FT. MODERATELY TO INTENSELY WEATHERED (W6), AND SOFT (H6) BELOW TOP 2.0 FT. LAMINATED TO THINLY BEDDED; INTERMITTENT IRON OXIDE STAINING, SAMPLES STUCK TO CORE BARREL, MAKING THEM DIFFICULT TO REMOVE INTACT.

STRATIGRAPHY:
0.0 - 16.0 FT: QUATERNARY ALLUVIUM (Qal)
16.0 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-11

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 8/13/15 FINISHED: 8/13/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,795,726.5 E 2,480,507.3
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 6030.3
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: C. BEYER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JEFF VAN AUSDALE
HELPERS; JOE PROCTOR, BRIAN HART.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0- 25.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 25.0 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
										Qal	
5	92	33.8	66.2	0	NA	NP	3.3	SM	3/5/6		SM
	100	49.5	50.5	0	24.8	5.8	5.3	SC-SM	5/5/7		
10	80	17.3	81.8	0.9	21.1	NP	1.5	SM	5/6/7		6020.6
	100	42.7	57.3	0	22.5	7.2	4.1	SC	4/5/6		SP-SM 6018.1
15	100	19.7	79.5	0.8	NA	NP	1.7	SM	5/6/5		SM
	100	61.3	38.7	0	42.3	23.8	9.7	s(CL)	6/11/15		6014.0
20	100	74.1	25.9	0	46.7	32.0	5.7	(CL)s	15/22/21		SC
											6006.8
25		17.5	69.7	12.8	NA	NP	2.4	SM	17/18/28		CL 6006.1 (SP-SM)g 6005.3

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 25.0 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 9.7 FT SILTY SAND (SM): ABOUT 80% PREDOMINATELY FINE TO MEDIUM SAND; ABOUT 20% NONPLASTIC FINES, WITH RAPID DILATANCY, LOW DRY STRENGTH, DRY, BROWN TO GREY IN COLOR; MAXIMUM SIZE, MEDIUM SAND; ROOTS ON TOP 1.0 FT; NO REACTION WITH HCl.

9.7 - 12.2 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% PREDOMINATELY FINE SAND; ABOUT 10% NON PLASTIC FINES, NO DRY STRENGTH, RAPID DILATANCY; MAXIMUM SIZE, MEDIUM SAND; DRY, LIGHT BROWN IN COLOR; NO REACTION TO HCl.

12.2- 16.3 FT SILTY SAND (SM): ABOUT 80% FINE TO MEDIUM SAND; ABOUT 20% NONPLASTIC FINES WITH RAPID DILATANCY, NO DRY STRENGTH; MAXIMUM SIZE, MEDIUM SAND; NO REACTION WITH HCl.

16.3 - 23.5 FT SANDY LEAN CLAY s(CL): ABOUT 60% FINES WITH MEDIUM TO HIGH PLASTICITY, NO DILATANCY, MEDIUM TO HIGH DRY STRENGTH; ABOUT 40% FINE SAND, BROWN IN COLOR; NO REACTION WITH HCl.

23.5 - 24.2 FT LEAN CLAY (CL): ABOUT 90 % FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, MEDIUM TOUGHNESS; ABOUT 10%, PREDOMINATELY FINE TO MEDIUM SAND; MAXIMUM SIZE, MEDIUM SAND; NO REACTION WITH HCL.

24.2 - 25.0 FT POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM)g: ABOUT 45% COARSE TO FINE, HARD, SUBANGULAR TO SUBROUNDED GRAVEL; ABOUT 30% FINE TO MEDIUM SAND WITH RAPID DILATANCY; ABOUT 25% NONPLASTIC FINES, NO DRY STRENGTH, NO TOUGHNESS; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 25.0 ft. QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-12

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/27/15 FINISHED: 10/27/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,790,652.6 E 2,480,515.5
TOTAL DEPTH: 26.5
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 6018.4
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: C. BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JOE PROCTOR
HELPER; RENATO MATHESON.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 26.5 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 26.5 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
											SC
											6015.4
5	40	35.0	65.0	0	21.7	3.7	4.4	SM	3/5/4		
	50	49.8	50.2	0	23.2	4.5	7.6	SC-SM	3/4/4		
10	72	40.6	59.4	0	NA	NP	7.2	SM	2/2/3		SP-SM
	100	59.7	40.3	0	25.1	5.3	8.3	s(CL-ML)	3/3/3	Qal	
15	52	39.0	61.0	0	NA	NP	5	SM	2/2/3		
											6000.9
	64	35.8	64.2	0	NA	NP	3.8	SM	4/5/5		
20		33.7	66.3	0	NA	NP	3.7	SM	3/5/6		SP
	32										5995.9
											SP-SM
25		35.3	62.4	2.3	NA	NP	3.8	SM	5/7/20		5992.4

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 26.5 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 3.0 FT CLAYEY SAND (SC): ABOUT 80% FINE SAND: ABOUT 20% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, SLOW DILATANCY AND LOW TOUGHNESS; BROWNISH RED IN COLOR; MAXIMUM SIZE, FINE SAND.

3.0 - 17.5 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY, AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWNISH GREY IN COLOR.

17.5 - 22.5 FT POORLY GRADED SAND (SP): ABOUT 95% FINE SAND; ABOUT 5% NONPLASTIC FINES WITH RAPID DILATANCY, AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWNISH GREY IN COLOR.

22.5 - 26.5 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND, TRACE COARSE GRAVEL; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY, AND LOW DRY STRENGTH; MAXIMUM SIZE, COARSE GRAVEL; BROWNISH GREY IN COLOR.

STRATIGRAPHY:
0.0 - 26.5 FT: QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-13

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 11/19/15 FINISHED: 11/19/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,786,197.8 E 2,480,789.8
TOTAL DEPTH: 25.1
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 6003.9
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: P. GARDNER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW DRILLER; KYLE KILLEBREW HELPERS; JOE PROCTOR, BRANDON LANE

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0.0 - 25.1 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 25.1 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
	0									Qal	SM
	0	16.5	69.1	14.4	NP	NP	2.5	SM	3/5/5		
5											
	36	61.7	23.7	14.6	32.1	14.5	4.2	s(CL)	3/4/6		
	100	31.6	66.5	1.9	20.6	7.0	3.9	SC-SM	4/4/4		
10											
	60	35.5	64.5	0	NP	NP	4.3	SM	4/4/5		
	40	44.6	55.4	0	23.2	8.0	4.1	SC	3/6/7		
15											
	76	33.4	63.7	1.9	NP	NP	3.7	SM	5/9/5		
		44.6	55.4	0	NP	NP	4.5	SM	5/8/10		
20	71										
											5979.7
25		62.5	37.5	0	34.0	22.0	9.7	s(CL)	10/14/14		SC 5978.8

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 25.1 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 24.2 FT SILTY SAND (SM): ABOUT 80% FINE SAND, ABOUT 20%FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; NO REACTION WITH HCl.

24.2 - 25.1 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND, TRACE OF COARSE SAND; ABOUT 40% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH LOW TOUGHNESS AND SLOW DILATANCY; MAXIMUM SIZE, COARSE SAND; LIGHT BROWN IN COLOR, NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 25.1 FT: QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-15

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/23/15 FINISHED: 10/23/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
DATE MEASURED: 10/23/2015

PROJECT: NGWSP
COORDINATES: N 1,779,049.5 E 2,480,659.5
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: 8.8

STATE: NM
GROUND ELEVATION: 6030.4 ft.
ANGLE FROM HORIZONTAL: -90
HOLE LOGGED BY: C. BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JOE PROCTOR
HELPER; RENATO MATHESON.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 8.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
8.9- 25.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE SAMPLER AND DIAMOND SURFACE-SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 8.9 FT NONE USED.
8.9 - 25.0 FT WATER.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	GEOLOGIC SYMBOL	% CORE RECOVERY	% RQD	HARDNESS	WEATHERING	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	VISUAL CLASSIFICATION
5	Qal					21.3	68.4	10.3	NA	NP	2.6	SM	10/34/50	SP / 6032.9 / (GW)s
10		90	17	7	8									6039.2 / CLST / 6041.2
				6	6									SS
15	Kmf	98	26	7	8									6045.5 / CLST / 6049.9
20				6	6									SS
		92	32											
25														6055.4

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 8.8 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 2.5 FT FT POORLY GRADED SAND (SP): ABOUT 95% FINE SAND; ABOUT 5% NONPLASTIC FINES WITH RAPID DILATANCY, AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWNISH GREY IN COLOR.

2.5 - 8.8 FT WELL GRADED GRAVEL WITH SAND (GW)S: ABOUT 60% FINE TO COARSE SUB ROUNDED TO SUBANGULAR GRAVEL; ABOUT 35% FINE TO COARSE SAND; ABOUT 5% NONPLASTIC FINES WITH RAPID DILATANCY AND NO DRY STRENGTH; MAXIMUM SIZE, 75MM.

8.8 - 25.0 FT CRETACEOUS MENEFEE FORMATION

8.8 - 10.8 FT CLAYSTONE: VERY INTENSELY WEATHERED (W8), VERY SOFT (H7), GREY IN COLOR, IRON OXIDE STAINING; SAMPLE FELL APART IN CORE BARREL, NO VISIBLE STRUCTURE.

10.8 - 13.8 FT SANDSTONE: INTENSELY TO MODERATELY WEATHERED (W6), SOFT (H6), FINE GRAINED, MODERATELY BEDDED, LIGHT BROWN IN COLOR. THIN CLAYSTONE INTERBED 15.4 TO 15.5 FT.

13.8 - 14.2 FT CLAYSTONE: VERY INTENSELY WEATHERED (W8), VERY SOFT (H7), GREY IN COLOR, IRON OXIDE STAINING, THINLY BEDDED.

14.2 - 15.1 FT SANDSTONE: INTENSELY TO MODERATELY WEATHERED (W6), SOFT (H6), FINE GRAINED, MODERATELY BEDDED, LIGHT BROWN IN COLOR.

15.1 - 15.5 FT CLAYSTONE: VERY INTENSELY WEATHERED (W8), VERY SOFT (H7), GREY IN COLOR, IRON OXIDE STAINING, THINLY BEDDED.

15.5 - 25.0 SANDSTONE: MODERATELY WEATHERED (W5), MODERATELY SOFT (H5), FINE GRAINED, MODERATELY BEDDED, LIGHT BROWN IN COLOR, BECOMES BROWNISH ORANGE WITH IRON OXIDE STAINING BELOW 17.6 FT. CORE SEPARATES ALONG BEDDING PLANES.

STRATIGRAPHY:
0.0 - 8.8 FT: QUATERNARY ALLUVIUM (Qal)
8.8 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-16

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/23/15 FINISHED: 10/24/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,774,202.0 E 2,479,440.2
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: 2.5

STATE: NM
GROUND ELEVATION: 6062.9 ft.
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: C. BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JOE PROCTOR
HELPER; RENATO MATHESON.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 2.5 FT 4 1/4" HSA WITH PILOT BIT
2.5 - 25.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE SAMPLER AND DIAMOND SURFACE-SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 25.0 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	GEOLOGIC SYMBOL	% CORE RECOVERY	% RQD	HARDNESS	WEATHERING	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	VISUAL CLASSIFICATION
0	Qal													(SP-SM)
														6060.4
		68	0	3	3									
				7	8									
5		80	0	6	6									
				7	7									
10	Kmf	100	68											
15		98	48	6	6									
20		42	0											
25														

BOTTOM OF HOLE

0.0 - 2.5 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 2.5 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND, TRACE COARSE GRAVEL; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY, AND LOW DRY STRENGTH; MAXIMUM SIZE, COARSE GRAVEL; BROWN IN COLOR; MOIST.

2.5 - 25.0 FT CRETACEOUS MENEFEE FORMATION

2.5 - 4.6 FT SANDSTONE: FINE GRAINED, GREY IN COLOR, SLIGHTLY WEATHERED (W3), HARD (H3), INTENSELY FRACTURED (FD7), CONJUGATE FRACTURES, IRON OXIDE STAINING ALONG FRACTURES SURFACES, THINLY TO MODERATELY BEDDED.

4.6 - 5.0 FT CLAYSTONE: VERY INTENSELY WEATHERED (W8), VERY SOFT (H7), GREY IN COLOR, IRON OXIDE STAINING, THINLY BEDDED.

5.0 - 8.3 FT SANDSTONE: FINE GRAINED, INTENSELY TO MODERATELY WEATHERED (W6), SOFT (H6), FINE GRAINED, MODERATELY BEDDED, LIGHT BROWN IN COLOR, NO REACTION WITH HCl.

8.3 - 9.3 FT CLAYSTONE: VERY INTENSELY WEATHERED (W8), VERY SOFT (H7), GREY IN COLOR, IRON OXIDE STAINING, SANDY, VISIBLE ORGANIC MATERIAL, MODERATELY BEDDED.

JOINT:

DEPTH	INCL	R	M	T	HL	INFILLING
8.3	10	5	4	3		ORGANIC MATTER.

9.3 - 25.0 FT SANDSTONE: FINE GRAINED, INTENSELY TO MODERATELY WEATHERED (W6), SOFT (H6), MODERATELY BEDDED, LIGHT BROWN IN COLOR, NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 2.5 FT: QUATERNARY ALLUVIUM (Qal)
2.5 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

CLASSIFICATION AND PHYSICAL CONDITION

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-17

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/26/15 FINISHED: 10/26/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,769,729.9 E 2,477,629.6
TOTAL DEPTH: 26.5
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 6044.6
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: C. BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JOE PROCTOR
HELPER; RENATO MATHESON.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 26.5 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 26.5 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
											SC 6040.1
5	32	34.3	66.7	0	NA	NP	3.3	SM	3/4/3		(SP-SM) 6037.2
	60	54.4	45.6	0	31.8	19.5	7.4	s(CL)	6/7/7		SC 6035.9
10	44	35.1	64.9	0	NA	NP	3	SM	3/5/6		(SP-SM)
	50	49.5	50.5	0	22.0	1.2	4.3	SM	5/4/5	Qal	6029.9
15	40	83	17	0	40.4	24.6	6.4	(CL)s	3/4/3		SC 6027.6
											(SP-SM) 6027.1
	100	35.4	64.6	0	NA	NP	3.5	SM	5/6/6		SP 6025.6
20		60.3	39.7	0	24.1	2.4	4.9	s(ML)	5/6/6		
	64										(SP-SM)
25		50.9	49.1	0	22.9	2.3	4.6	s(ML)	3/3/5		6018.1

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 26.5 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 4.5 FT CLAYEY SAND (SC): ABOUT 80% FINE SAND: ABOUT 20% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, SLOW DILATANCY AND LOW TOUGHNESS; BROWNISH RED IN COLOR; MAXIMUM SIZE, FINE SAND.

4.5 - 7.4 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; MOIST.

7.4 - 8.7 CLAYEY SAND (SC): ABOUT 80% FINE SAND: ABOUT 20% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, SLOW DILATANCY AND LOW TOUGHNESS; BROWNISH RED IN COLOR; MAXIMUM SIZE, FINE SAND.

8.7 - 14.7 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; DRY, CALCAREOUS ZONE FROM 11.8 TO 12.0 FT.

14.7 - 17.0 FT CLAYEY SAND (SC): ABOUT 80% FINE SAND: ABOUT 20% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, SLOW DILATANCY AND LOW TOUGHNESS; BROWNISH RED IN COLOR; MAXIMUM SIZE, FINE SAND.

17.0 - 17.5 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; DRY.

17.5 - 19.0 FT POORLY GRADED SAND (SP): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; DRY.

19.0 - 26.5 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; MOIST.

STRATIGRAPHY:
0.0 - 25.6 FT: QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER
BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-18

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/23/15 FINISHED: 10/23/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,765,078.6 E 2,475,667.7
TOTAL DEPTH: 26.5
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 6047.6
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: C. BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JOE PROCTOR
HELPER; RENATO MATHESON.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 26.5 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 26.5 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
	NR										
5	44	79.1	20.9	0	41.5	26.2	7	(CL)s	2/3/4		SC
	48	53.7	46.3	0	46.1	30.6	9.6	s(CL)	4/6/7		
10	60	72	28	0	28.8	11.0	7	(CL)s	4/6/8		6035.1
	96	33.2	66.8	0	23.2	5.4	5.3	SC-SM	7/10/11	Qal	(SP-SM) 6033.4
15	100	80.6	19.4	0	47.8	34	7.3	(CL)s	9/11/12		SC 6031.6
	100	80.2	19.8	0	88	72.1	6.2	(CH)s	6/7/9		(SP-SM) 6029.6
20	26	47.1	52.9	0	22.2	2.0	4.5	SM	6/7/9		SC
25		52.7	47.3	0	21.5	2.3	6.3	s(ML)	5/8/9		6021.1

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 26.5 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 12.5 FT CLAYEY SAND (SC): ABOUT 85 % FINE SAND; ABOUT 15% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; GREY IN COLOR; WEAK CEMENTATION.

12.5 - 14.2 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY, AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; DRY.

14.2 - 16.0 FT CLAYEY SAND (SC): ABOUT 85 % FINE SAND; ABOUT 15% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; GREY IN COLOR; LOOSE CONSISTENCY.

16.0 - 18.0 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY, AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; DRY.

18.0 - 26.5 FT CLAYEY SAND (SC): ABOUT 85 % FINE SAND; ABOUT 15% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; GREY IN COLOR; WEAK CEMENTATION.

STRATIGRAPHY:
0.0 - 26.5 FT: QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-19

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 10/25/15 FINISHED: 10/25/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED: 10/25/2015

PROJECT: NGWSP
COORDINATES: N 1,761,055.6 E 2,473,622.9
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 6067.4
ANGLE FROM HORIZONTAL: -90
HOLE LOGGED BY: C. BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JOE PROCTOR
HELPER; RENATO MATHESON.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 25.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 25.0 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
5	NR									Qal	SP-SM 6072.4
	26	69.8	30.2	0	49	25.2	10.7	s(CL)	4/3/4		SC 6074.4
											(CL)s 6075.4
	44	93.2	6.8	0	66	35.8	10.6	CH	7/8/8		
10	84	78	22	0	39.6	19.2	11.3	(CL)s	7/7/5		SC
	28	82.5	17.5	0	30.8	12.4	5.2	(CL)s	5/7/9		6082.4
15	48	17.7	82.3	0	NA	NP	2.2	SM	3/5/5		SP 6083.8
											SC 6084.9
	60	25.7	74.3	0	NA	NP	3.6	SM	7/7/8		SP 6086.9
20	84	80.1	19.9	0	56.8	30.1	10.5	(CH)s	7/7/8		SC 6088.8
		45	55	0	29.3	14.7	5.0	SC			(CL)s 6092.0
25											SP-SM 6092.4

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 25.0 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 5.0 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY, AND NO DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; DRY.

5.0 - 7.0 FT CLAYEY SAND (SC): ABOUT 60 % FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, MEDIUM TOUGHNESS AND NO DILATANCY; MAXIMUM SIZE, FINE SAND; GRAY IN COLOR.

7.0 - 8.0 FT LEAN CLAY WITH SAND (CL)s: ABOUT 75% FINES WITH MEDIUM TO HIGH PLASTICITY, MEDIUM TO HIGH TOUGHNESS AND MEDIUM TO HIGH DRY STRENGTH; ABOUT 25% FINE SAND; GREY IN COLOR.

8.0 - 15.0 FT CLAYEY SAND (SC): ABOUT 60 % FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, MEDIUM TOUGHNESS AND NO DILATANCY; GREY IN COLOR.

15.0 - 16.4 FT POORLY GRADED SAND (SP): ABOUT 95% FINE SAND; ABOUT 5% NONPLASTIC FINES WITH RAPID DILATANCY AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; WEAK CMENTATION; DRY.

16.4 - 17.5 FT CLAYEY SAND (SC): ABOUT 60 % FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, MEDIUM TOUGHNESS AND NO DILATANCY; GREY IN COLOR.

17.5 - 19.5 FT POORLY GRADED SAND (SP): ABOUT 95% FINE SAND; ABOUT 5% NONPLASTIC FINES WITH RAPID DILATANCY AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; WEAK CMENTATION; DRY.

19.5 - 21.4 FT CLAYEY SAND (SC): ABOUT 60 % FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, MEDIUM TOUGHNESS AND NO DILATANCY; GREY IN COLOR.

21.4 - 24.6 FT LEAN CLAY WITH SAND (CL)s: ABOUT 75% FINES WITH MEDIUM TO HIGH PLASTICITY, MEDIUM TO HIGH TOUGHNESS AND MEDIUM TO HIGH DRY STRENGTH; ABOUT 25% FINE SAND; GREY IN COLOR.

24.6 - 25.0 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY AND LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; WEAK CEMENTATION; DRY.

STRATIGRAPHY: 0.0 - 25.0 FT. QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-20

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 11/20/15 FINISHED: 11/20/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED: 11/20/2015

PROJECT: NGWSP
COORDINATES: N 1,753,655.6 E 2,469,860.6
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: 13.3

STATE: NM
GROUND ELEVATION: 6075.8
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: C. BEYER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; KYLE KILLEBREW
HELPERS, JOE PROCTOR, BRANDON LANE

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0.0 - 25.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 25.0 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
0	0									Qal	
	100	40.3	57.6	2.1	25.2	10.8	7.4	SC	5/9/12		
5											SC
	64	50.4	49.6	0	31.0	18.0	6.3	s(CL)	11/15/15		
	100	39.9	60.1	0	31.8	15.9	6.3	SC	16/30/48		
10											6065.3
	48	27.9	72.1	0	N/A	N/P	6.7	SM	27/48/35		SM
											6062.5
	100	95.0	5.0	0	82.5	61.3	7.7	CH	8/18/24		
15											CLSTN
	100	96.2	3.8	0	84.1	63.3	15.4	CH	13/32/41		
											6057.7
		85.1	14.9	0	54.5	38.6	7.4	CH	30/22/41	Kmf	SS
20											6055.4
	88										CLSTN
25											6050.8

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 13.3 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 10.5 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY, TRACE OF COARSE SAND; MAXIMUM SIZE, COARSE SAND; LIGHT BROWN IN COLOR; NO REACTION WITH HCl.

10.5 - 13.3 FT SILTY SAND (SM): ABOUT 80% FINE SAND, MAXIMUM SIZE, FINE SAND; ABOUT 20%FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH; DRY, TAN IN COLOR; NO REACTION WITH HCl.

13.3 - 25.0 FT CRETACEOUS MENEFEE FORMATION (Kmf)

13.3 - 18.1 FT CLAYSTONE: GREY IN COLOR, VERY SOFT (H7), MODERATELY TO INTENESELY WEATHERED (W6), INTERMITTENT IRON OXIDE STAINING, THINLY TO MODERATELY BEDDED, VISIBLE ORGANIC MATERIAL.

18.1 - 20.4 FT SANDSTONE: MODERATELY TO SLIGHTLY WEATHERED (W4), SOFT (H6), TAN IN COLOR; NO REACTION WITH HCl.

20.4 - 25.0 FT CLAYSTONE: GREY IN COLOR, VERY SOFT (H7), MODERATELY TO INTENESELY WEATHERED (W6), INTERMITTENT IRON OXIDE STAINING, THINLY TO MODERATELY BEDDED, VISIBLE ORGANIC MATERIAL.

STRATIGRAPHY:
0.0 - 13.3 FT: QUATERNARY ALLUVIUM (Qal)
13.3 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-21

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 11/20/15 FINISHED: 11/20/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED: 11/20/2015

PROJECT: NGWSP
COORDINATES: N 1,745,756.3 E 2,465,051.6
TOTAL DEPTH: 25.7
DEPTH TO BEDROCK: 10.7

STATE: NM
GROUND ELEVATION: 6102.6
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: P. GARDNER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; KYLE KILLEBREW
HELPERS; JOE PROCTOR, BRANDON LANE

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0.0 - 25.7 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 25.7 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
	56	53.0	47.0	0	31.3	19.1	7.6	s(CL)	5/7/8		SC
5										Qal	
	64	20.8	79.2	0	NP	NP	4.1	SM	9/22/48		6095.8
	96	25.5	74.5	0	24.6	5.5	5.7	SC-SM	19/29/47		SP-SM
10											6091.9
	100	19.3	80.7	0	NA	NA	3.0	NA	REFUSAL		
15	100										
	100									Kmf	SS
20	100										
25	100										6076.9

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 10.7 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 6.8 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; TRACE COARSE SAND AND FINE GRAVEL; MAXIMUM SIZE, FINE GRAVEL; BROWN IN COLOR; NO REACTION WITH HCl.

6.8 - 10.7 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY AND LOW DRY STRENGTH; GREYISH BROWN IN COLOR; LOOSE CONSISTANCY; STRONG REACTION WITH HCl ON CALICHE.

10.7 - 25.7 FT CRETACEOUS MENEFEE FORMATION (Kmf)

10.7 - 25.7 FT SANDSTONE: VERY INTENSELY WEATHERED TO DECOMPOSED (W8-W9), VERY SOFT TO SOFT (H6-H7), TAN IN COLOR, BREAKS WITH MODERATE HAMMER BLOW; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 10.7 FT: QUATERNARY ALLUVIUM (Qal)
10.7- 25.7 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-22

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 11/21/15 FINISHED: 11/21/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
AND DATE MEASURED: 11/21/2015

PROJECT: NGWSP
COORDINATES: N 1,742,939.9 E 2,463,046.9
TOTAL DEPTH: 26.0
DEPTH TO BEDROCK: 0.2

STATE: NM
GROUND ELEVATION: 6140.5
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: P. GARDNER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; KYLE KILLEBREW
HELPERS; JOE PROCTOR, BRANDON LANE

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0.0 - 16.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
16.0 - 26.0 HQ WIRELINE CORING SYSTEM WITH SPLIT SPOON SAMPLER

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 16.0 FT NONE USED.
16.0 - 26.0 FT WATER.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
										Qal	SM 6140.3
	36	30.4	69.6	0	21.3	7.9	3.9	SC	6/7/7		
5											
	32	98.7	1.3	0	67.7	39.5	16.3	CH	10/12/18		
	68	98.3	1.7	0	60.9	36.3	15.5	CH	10/23/24		
10											
	96	93.7	6.3	0	53.4	30.7	11.9	CH	12/26/29		CLSTNE
										Kmf	
		94.3	5.7	0	50.6	25.4	13.7	CH	30/REFUSAL		
15											
	100										
20											
											6118.6
	94										SLSTNE
25											6114.5

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 0.2 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 0.2 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY; MAXIMUM SIZE, FINE SAND; LOW DRY STRENGTH, DRY, TAN IN COLOR; NO REACTION WITH HCl.

0.2 - 26.0 FT CRETACEOUS MENEFEE FORMATION (Kmf)

0.2 - 21.9 FT CLAYSTONE: GREY IN COLOR, VERY SOFT (H7), MODERATELY TO INTENESELY WEATHERED (W6), INTERMITTENT IRON OXIDE STAINING, THINLY TO MODERATELY BEDDED, VISIBLE ORGANIC MATERIAL.

JOINT MEASUREMENTS:

DEPTH	INCL	R	W	O	T	HL	INFILLING
19.8	45	4		2	5		FeOX

21.9 - 26.0 FT SILTSTONE: LIGHT GREY IN COLOR, MODERATELY HARD (H4) MODERATELY TO SLIGHTLY WEATHERED (W4), NON FISSILE, NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 0.2 FT: QUATERNARY ALLUVIUM (Qal)
0.2 - 26.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-23

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 11/21/15 FINISHED: 11/21/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED: 11/21/2015

PROJECT: NGWSP
COORDINATES: N 1,739,271.1 E 2,460,822.8
TOTAL DEPTH: 28.2
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 6151.5
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: P. GARDNER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; KYLE KILLEBREW
HELPERS; JOE PROCTOR, BRANDON LANE

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0.0 - 28.2 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

DRILLING MEDIUM:
0.0 - 28.2 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
	44	56.3	43.7	0	27.4	12.9	7.0	s(CL)	3/4/6		
5											
	28	23.5	76.5	0	N/A	N/P	3.2	SM	3/5/5		
	60	34.1	65.9	0	N/A	N/P	3.7	SM	2/3/5		SM
10											
	36	33.2	66.8	0	21.2	6.0	3.3	SC-SM	6/7/6		
	36	63.5	36.5	0	30.7	12.5	6.5	s(CL)	4/7/7	Qal	
15											
	78	83.8	16.2	0	44.0	25.6	6.9	(CL)s	4/7/6		6132.3
20											SC
											6128.3
	96										SM
											6126.8
25											SC
											6123.3

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 28.2 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 19.2 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; NO REACTION WITH HCl.

19.2 - 23.2 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; MAXIMUM SIZE, FINE SAND; BROWN IN COLOR; NO REACTION WITH HCl.

23.2 - 24.7 FT SILTY SAND SM: ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY; MAXIMUM SIZE, FINE SAND; LOW DRY STRENGTH, DRY, TAN IN COLOR; NO REACTION WITH HCl.

24.7 -28.2 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; TRACE COARSE SAND AND FINE GRAVEL; MAXIMUM SIZE, FINE GRAVEL; BROWN IN COLOR; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 28.2 FT: QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR9-15-24

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 9 PIPELINE
BEGUN: 11/22/15 FINISHED: 11/22/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED: 11/22/2015

PROJECT: NGWSP
COORDINATES: N 1,737,168.1 E 2,459,296.5
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 6164.1
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: P. GARDNER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; KYLE KILLEBREW
HELPERS; JOE PROCTOR, BRANDON LANE

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0.0 - 25.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

DRILLING MEDIUM:
0.0 - 25.0 FT NONE USED.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
5	72	73.6	26.4	0	37.5	21.1	9.0	(CL)s	4/8/6	Qal	SC
											6158.1
	24	38.4	61.6	0	N/A	N/P	3.4	SM	4/5/6		
10	32	48.3	51.7	0	23.9	2.8	4.9	SM	4/5/4		SM
	40	81.9	18.1	0	33.8	16.6	5.8	(CL)s	4/5/6		
											6150.7
15	28	78.8	21.2	0	43.1	26.1	8.2	(CL)s	4/6/6		
20	32	79.0	21.0	0	37.1	20.6	6.4	(CL)s	5/6/7		SC
25		31.7	68.3	0	20.4	2.0	4.2	SM	10/10/10		6139.1

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 25.0 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 6.0 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; TRACE OF COARSE SAND AND FINE GRAVEL; MAXIMUM SIZE, FINE GRAVEL; BROWN IN COLOR; NO REACTION WITH HCl.

6.0 - 13.4 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY; MAXIMUM SIZE, FINE SAND; LOW DRY STRENGTH, DRY, TAN IN COLOR; NO REACTION WITH HCl.

13.4 - 25.0 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; TRACE OF COARSE SAND AND FINE GRAVEL; MAXIMUM SIZE, FINE GRAVEL; BROWN IN COLOR; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 25.0 FT: QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR10-15-1

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 10 PIPELINE
BEGUN: 8/12/15 FINISHED: 8/12/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
AND DATE MEASURED: 8/12/2015

PROJECT: NGWSP
COORDINATES: N 1,731,412.4 E 2,455,713.3
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: 19.5

STATE: NM
GROUND ELEVATION: 6190.3
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: C. BEYER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JEFF VAN AUSDAL
HELPERS; JOE PROCTOR; BRIAN HART.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0- 17.1 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
17.1 - 25.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 5' SPLIT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 17.1 FT NONE.
17.1 - 25.0 FT WATER.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
											SM
	100	37.7	62.3	0	22.3	5.7	4.4	SC-SM	11/13/11		6186.0
5											
	80	49.7	50.3	0	26.9	13.7	5.8	SC	16/34/47		
	100	43.9	56.1	0	26.8	13.6	6.5	SC	16/22/24		
10										Qal	
	100	43.6	56.4	0	26.9	13.8	6.6	SC	19/25/21		SC
	100	82.5	17.5	0	55.9	40.1	7.5	(CH)s	11/21/29		
15											
	100	83.9	16.1	0	41.0	23.0	6.2	(CL)s	20/REFUSAL		6170.8
20											
	100									Kmf	CLAYSTONE
	100										6165.3
25											

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 19.5 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 4.3 FT SILTY SAND (SM): ABOUT 80% PREDOMINATELY FINE TO MEDIUM SAND; ABOUT 20% NONPLASTIC FINES, LOW DRY STRENGTH AND RAPID DILATANCY; MAXIMUM SIZE, MEDIUM SAND; DRY, BROWN TO GREY IN COLOR; NO REACTION WITH HCl.

4.3 - 19.5 FT CLAYEY SAND (SC): ABOUT 60% FINE SAND; ABOUT 40% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH TOUGHNESS; MAXIMUM SIZE, FINE SAND; TAN IN COLOR; NO REACTION WITH HCl.

19.5 - 25.0 FT CRETACEOUS MENEFEE FORMATION (Kmf)

19.5 - 25.0 FT CLAYSTONE: DARK GREY IN COLOR, MODERATELY TO SLIGHTLY WEATHERED (W4), VERY SOFT (H7), FeOx STAINING ALONG FRACTURES; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 19.5 FT: QUATERNARY ALLUVIUM (Qal)
19.5 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR10-15-2

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 10 PIPELINE
BEGUN: 10/22/15 FINISHED: 10/22/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,729,236.2 E 2,454,147.6
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: 5.2

STATE: NM
GROUND ELEVATION: 6214.8 ft.
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: C. BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JOE PROCTOR
HELPER; RENATO MATHESON.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 5.0 FT 4 1/4" HSA WITH PILOT BIT.
5.0 - 8.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
8.9- 25.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE SAMPLER AND DIAMOND SURFACE-SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 8.9 FT NONE USED.
8.9 - 25.0 FT WATER.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	GEOLOGIC SYMBOL	% CORE RECOVERY	% RQD	HARDNESS	WEATHERING	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	VISUAL CLASSIFICATION
0	Qal													SC
5				6	7	19.6	80.4	0.0	NA	NP	2.1	SM	12/32/19	6209.6
		90	40											
10		100	14											
15	Kmf	88	52	5	7									SS
20		100	56											
25														6189.8

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 5.2 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 5.2 FT CLAYEY SAND (SC): ABOUT 85% PREDOMINATELY FINE SAND, TRACE FINE TO COARSE SAND; ABOUT 15% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH LOW TOUGHNESS AND SLOW DILATANCY; MAXIMUM SIZE, COARSE SAND; BROWNISH RED IN COLOR; NO REACTION WITH HCl.

5.2 - 25.0 FT CRETACEOUS MENEFEE FORMATION

5.2 - 25.0 FT SANDSTONE: FINE GRAINED, BROWNISH TAN IN COLOR, MODERATELY BEDDED, SOFT (H6) AND INTENSELY WEATHERED (W7) FROM 5.2 TO 8.2 FT, NO REACTION WITH HCl. BECOMES MODERATELY SOFT (H5) AND MODERATELY WEATHERED (W5) BELOW 8.2 FT. CORE SEPARATES ALONG BEDDING PLANES. GRAYISH BROWN IN COLOR, CARBONACEOUS, MICACEOUS AND STAINED WITH IRON OXIDE BELOW 15.0 FT.
CLAYSTONE INTERBED FROM 16.9 TO 17.0 FT. CLAYSTONE IS SOFT (H6) AND MODERATELY WEATHERED (W5). SANDSTONE CONTAINS SUBROUNDED CLAYSTONE RIPUP CLASTS 3mm IN DIAMETER FROM 23.0 TO 23.5 FT.

STRATIGRAPHY:
0.0 - 5.2 FT: QUATERNARY ALLUVIUM (Qal)
5.2 - 25.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR10-15-3

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 10 PIPELINE
BEGUN: 10/21/15 FINISHED: 10/22/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
DATE MEASURED:

PROJECT: NGWSP
COORDINATES: N 1,728,537.9 E 2,453,677.7
TOTAL DEPTH: 40.0
DEPTH TO BEDROCK: 11.1

STATE: NM
GROUND ELEVATION: 6232.6 ft.
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: C. BEYER
REVIEWED BY: J. GILBERT

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JOE PROCTOR
HELPER; RENATO MATHESON.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 5.0 FT 4 1/4" HSA WITH PILOT BIT.
5.0 - 15.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
15.0 - 40.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE SAMPLER AND DIAMOND SURFACE-SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 15.0 FT NONE USED.
15.0 - 40.0 FT WATER.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	GEOLOGIC SYMBOL	% CORE RECOVERY	% RQD	HARDNESS	WEATHERING	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	VISUAL CLASSIFICATION
5	Qal					34.7	65.3	0	21.0	2.0	4.6	SM	6/7/8	SC
														6226.2
						34.8	65.2	0	NA	NP	3.8	SM	6/12/16	SM
10						42.5	57.5	0	NA	NP	3.4	SM	30/REFUSAL	6221.5
		96	41	6	6									SS
15		76	15	5	5									6214.6
				7	6									CLST
20		100	48	6	6									6212.6
														SS
25	Kmf	96	75	7	6									6210.1
														CLST
30		100	100											
35		96	91	5	5									6197.1
														SS
40														6192.6

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0-11.1 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 6.4 FT CLAYEY SAND (SC): ABOUT 80% PREDOMINATELY FINE SAND, TRACE FINE TO COARSE SAND AND FINE GRAVEL; ABOUT 20% FINES WITH MEDIUM PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; MAXIMUM SIZE, 20mm; BROWNISH RED IN COLOR; NO REACTION WITH HCl.

6.4 - 11.1 FT SILTY SAND (SM): ABOUT 85% FINE SAND; ABOUT 15% NONPLASTIC FINES, WITH RAPID DILATANCY AND LOW DRY STRENGTH; DRY, BROWN TO GREY IN COLOR, MAXIMUM SIZE, FINE SAND; CALCAREOUS ZONES WITH STRONG REACTION WITH HCl, NO REACTION WITH HCl OUTSIDE CALCAREOUS ZONES.

11.1 - 40.0 FT CRETACEOUS MENEFEE FORMATION

11.1 - 18.0 FT SANDSTONE: FINE GRAINED, GRAYISH BROWN IN COLOR AND MODERATELY BEDDED. SOFT (H6), AND MODERATELY TO INTENSELY WEATHERED (W6) FROM 11.1 TO 15.0 FT. MODERATELY SOFT (H5) AND MODERATELY WEATHERED (W5) WITH CARBONACEOUS PARTICLES AND IRON OXIDE STAINING FROM 15.0 TO 18.0 FT.

18.0 - 20.0 FT CLAYSTONE: GREY IN COLOR, VERY SOFT (H7), MODERATELY TO INTENSELY WEATHERED (W6), INTERMITTENT IRON OXIDE STAINING, THINLY BEDDED; CORE STICKS TO SAMPLER, WASHED BY DRILL.

20.0 - 22.5 FT SANDSTONE: FINE GRAINED, GRAYISH BROWN IN COLOR, MODERATELY BEDDED, MODERATELY SOFT (H5), MODERATELY WEATHERED (W5), SOME CARBONACEOUS PARTICLES AND IRON OXIDE STAINING. CONJUGATE FRACTURES THROUGHOUT.

22.5 - 35.5 FT CLAYSTONE: GREY IN COLOR, VERY SOFT (H7), MODERATELY TO INTENSELY WEATHERED (W6), INTERMITTENT IRON OXIDE STAINING, THINLY TO MODERATELY BEDDED, VISIBLE ORGANIC MATERIAL, AND IRON OXIDE STAINING. CARBONACEOUS INTERBEDS FROM 32.0 TO 33.0 FT; CORE STICKS TO SAMPLER, WASHED BY DRILL.

35.5 - 40.0 FT SANDSTONE: FINE GRAINED, GRAYISH BROWN IN COLOR, MODERATELY BEDDED, MODERATELY SOFT (H5) AND MODERATELY WEATHERED (W5), SOME CARBONACEOUS PARTICLES AND IRON OXIDE STAINING. CORE SEPARATES ALONG BEDDING PLANES.

STRATIGRAPHY:
0.0 - 11.1 FT: QUATERNARY ALLUVIUM (Qal)
11.1 - 40.0 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR11-15-1

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 11 ROAD BORE
BEGUN: 8/4/15 FINISHED: 8/4/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
DATE MEASURED: 8/4/2015

PROJECT: NGWSP
COORDINATES: N 1,728,271.8 E 2,452,819.3
TOTAL DEPTH: 40.5
DEPTH TO BEDROCK: 18.0

STATE: NM
GROUND ELEVATION: 6236.8 ft.
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: C .BEYER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JEFF VAN AUSDAL
HELPERS; JOE PROCTOR; BRIAN HART.

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0- 18.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
18.0 - 40.5 FT HQ3 WIRELINE CORING SYSTEM WITH A 5' SPLIT TUBE SAMPLER AND DIAMOND SURFACE-SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 18.0 FT NONE.
18.0 - 40.5 FT WATER.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	GEOLOGIC SYMBOL	% CORE RECOVERY	% RQD	HARDNESS	WEATHERING	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	VISUAL CLASSIFICATION
						67.3	32.7	0	28.4	11.8	5.4	s(CL)	7/11/14	SM
5														
						45.7	54.3	0	NA	NP	3.4	SM	15/24/21	
														6229.9
	Qal					60.2	39.8	0	34.5	17.8	8.4	s(CL)	14/27/34	
10														
						65.1	34.9	0	36.2	17.2	5.1	s(CL)	14/17/18	
														CL
						96.9	3.1	0	81.9	62.7	9.6	CH	10/13/14	
15														
														6218.8
		44	0										REFUSAL	
20														
		86	80											SANDSTONE
25														
		100	36											
	Kmf				4									6207.6
30														
		96	56											CLAYSTONE
35														6201.9
		100	54											SANDSTONE
40														6196.3

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0-18.0 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 6.9 FT SILTY SAND (SM) : ABOUT 80% FINE SAND, ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH, LOW TOUGHNESS; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; NO REACTION WITH HCl.

6.9 - 18.0 FT LEAN CLAY (CL): ABOUT 90 % FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, MEDIUM TOUGHNESS; ABOUT 10%, PREDOMINATELY FINE TO MEDIUM SAND; MAXIMUM SIZE, MEDIUM SAND; NO REACTION WITH HCl.

18.0 - 40.5 FT CRETACEOUS MENEFEE FORMATION (Kmf)

18.0 - 29.2 FT SANDSTONE: MODERATELY TO SLIGHTLY WEATHERED (W4), SOFT (H6), TAN IN COLOR; NO REACTION WITH HCl.

JOINT MEASUREMENTS:

DEPTH	INCL	R	M	T	HL	INFILLING
27.3	90	5	4	3		FeOx
28.1	90	4	4	2		FeOx

29.2 - 34.9 FT CLAYSTONE: DARK GREY IN COLOR, MODERATELY TO SLIGHTLY WEATHERED (W4), VERY SOFT (H7), FeOx STAINING ALONG FRACTURES; NO REACTION WITH HCl.

DEPTH	INCL	R	M	T	HL	INFILLING
31.4	75	5	4	3		FeOx
31.8	80	4	4	2		FeOx
32.6	65	4	4	2		FeOx
33.2	75	4	4	2		FeOx

34.9 - 40.5 FT SANDSTONE: MODERATELY TO SLIGHTLY WEATHERED (W4), SOFT (H6), TAN IN COLOR; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 18.0 FT: QUATERNARY ALLUVIUM (Qal)
18.0 - 40.5 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS:
WLNE = WATER LEVEL NOT ENCOUNTERED
I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR11-15-2

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 11 PIPELINE
BEGUN: 8/3/15 FINISHED: 8/3/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
DATE MEASURED: 8/3/2015

PROJECT: NGWSP
COORDINATES: N 1,717,020.5 E 2,446,962.8
TOTAL DEPTH: 25.7
DEPTH TO BEDROCK: BNE

STATE: NM
GROUND ELEVATION: 6303.2 ft.
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: C. BEYER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JEFF VAN AUSDAL
HELPERS; JOE PROCTOR; BRIAN HART

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0.0 - 25.7 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
00 - 25.7 FT NONE.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	GEOLOGIC SYMBOL	% CORE RECOVERY	% RQD	HARDNESS	WEATHERING	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	VISUAL CLASSIFICATION
		52				39.8	60.2	0	NA	NP	4.3	SM	4/7/6	SM
5														
		76				53.9	46.1	0	31.0	17.0	4.5	s(CL)	4/5/6	
		48				97.3	2.7	0	45.6	25.8	8.5	CL	4/5/5	6294.1
10														SC
														6292.7
		72				97.6	2.4	0	72.6	42.7	12.7	CH	8/14/15	
	Qal													
		88				41.9	58.1	0	25.7	6.5	4.3	SC-SM	5/5/6	CL
15														
		100				49.4	50.6	0	25.1	7.2	4.4	SC	6/6/7	6286.4
		96				97.5	2.5	0	66.6	39.7	10.7	CH	9/13/9	SM
20														
		96				40.7	59.3	0	NA	NP	4.2	SM	6/6/8	6282.0
														SC
		80												
25														
														6277.5

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 25.7 FT: QUATERNARY ALLUVIUM (Qal):

0.0 - 9.1 FT SILTY SAND (SM): ABOUT 80% PREDOMINATELY FINE TO MEDIUM SAND; ABOUT 20% NONPLASTIC FINES WITH RAPID DILATANCY, LOW DRY STRENGTH; MAXIMUM SIZE, MEDIUM SAND; DRY, BROWN TO GREY IN COLOR, ROOTS ON TOP 1.0 FT; NO REACTION WITH HCl.

9.1 - 10.5 FT CLAYEY SAND (SC): ABOUT 60% FINE SAND; ABOUT 40% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH TOUGHNESS; MAXIMUM SIZE, FINE SAND; TAN IN COLOR; NO REACTION WITH HCl.

10.5 - 16.8 FT LEAN CLAY (CL): ABOUT 90 % FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, MEDIUM TOUGHNESS; MAXIMUM SIZE, MEDIUM SAND; ABOUT 10%, PREDOMINATELY FINE TO MEDIUM SAND; NO REACTION WITH HCL.

16.8 - 21.2 FT SILTY SAND (SM): ABOUT 80% PREDOMINATELY FINE SAND; ABOUT 20% NONPLASTIC FINES, WITH RAPID DILATANCY, LOW DRY STRENGTH; DRY, BROWN TO GREY IN COLOR; MAXIMUM SIZE, FINE SAND; STRONG REACTION WITH HCl.

21.2 - 25.7 FT CLAYEY SAND (SC): ABOUT 60% FINE TO MEDIUM SAND; ABOUT 40% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH TOUGHNESS; MAXIMUM SIZE, MEDIUM SAND; TAN IN COLOR; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 25.7 FT: QUATERNARY ALLUVIUM (Qal)

ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR11-15-3

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 11 PIPELINE
BEGUN: 10/9/15 FINISHED: 10/9/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE
AND DATE MEASURED: 10/9/2015

PROJECT: NGWSP
COORDINATES: N 1,717,447.3 E 2,446,870.1
TOTAL DEPTH: 29.1
DEPTH TO BEDROCK: 14.1

STATE: NM
GROUND ELEVATION: 6303.1
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: P. GARDENR

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JOE PROCTOR
HELPERS; BRANDON LANE, RANATO MATHESON

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 14.1 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
14.1 - 29.1 FT HQ3 WIRELINE CORING SYSTEM WITH A 5' SPLIT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 18.7 FT NONE.
14.1 - 29.1 FT WATER.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
5	64	44.0	54.5	1.5	24.3	6.2	4.7	SC-SM	9/8/10	Qal	SM
	52	48.3	51.7	0	24.2	6.1	4.9	SC-SM	7/8/9		6293.6 SC 6293.0
10	96	83.8	16.2	0	39.9	20.9	11.9	(CL)s	16/21/33		CH
	93	78.9	21.1	0	42.0	20.6	8.0	(CL)s	36/REFUSAL		6290.5 s(CL) 6289.0
15	92										
20	96									Kmf	SANDSTONE
25	52										6274.7 CLAYSTONE 6274.0

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 14.1 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 9.5 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, LOW DRY STRENGTH, RAPID DILATANCY; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; NO REACTION WITH HCl.

9.5 - 10.1 FT CLAYEY SAND (SC): ABOUT 60% FINE SAND; ABOUT 40% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH TOUGHNESS; MAXIMUM SIZE, FINE SAND; TAN IN COLOR; NO REACTION WITH HCl.

10.1 - 12.6 FT FAT CLAY (CH): ABOUT 90% PLASTIC FINES WITH HIGH TOUGHNESS, HIGH DRY STRENGTH; ABOUT 10% NONPLASTIC FINES WITH NO DILATANCY; NO REACTION WITH HCl.

12.6 - 14.1 FT SANDY LEAN CLAY s(CL): ABOUT 60% FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, MEDIUM TOUGHNESS; ABOUT 40%, PREDOMINATELY FINE SAND; MAXIMUM SIZE, FINE SAND; NO REACTION WITH HCl.

14.1 - 29.1 FT CRETACEOUS MENEFEE FORMATION (Kmf)

14.1 - 28.4 FT SANDSTONE: MODERATELY TO SLIGHTLY WEATHERED (W4), SOFT (H6), TAN IN COLOR; NO REACTION WITH HCl.

28.4 - 29.1 FT CLAYSTONE: DARK GREY IN COLOR, MODERATELY TO SLIGHTLY WEATHERED (W4), VERY SOFT (H7), FeOx STAINING THROUGHT SAMPLE, MOTTLED; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 14.1 FT: QUATERNARY ALLUVIUM (Qal)
14.1 - 29.1 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS:
WLNE = WATER LEVEL NOT ENCOUNTERED
I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR11-15-4

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 11 PIPELINE
BEGUN: 8/12/15 FINISHED: 8/12/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED: 8/12/2015

PROJECT: NGWSP
COORDINATES: N 1,714,174.9 E 2,444,745.3
TOTAL DEPTH: 25.7
DEPTH TO BEDROCK: 5.1

STATE: NM
GROUND ELEVATION: 6349.5
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: C. BEYER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JEFF VAN AUSDAL
HELPERS; JOE PROCTOR; BRIAN HART

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRUCK MOUNTED CME 85.

DRILL METHOD:
0- 8.7 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
8.7 - 25.7 FT HQ3 WIRELINE CORING SYSTEM WITH A 5' SPLIT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 8.7 FT NONE USED.
8.7 - 25.7 FT WATER.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
5	100	32.9	67.1	0	NA	NP	7.4	SM	24/REFUSAL	Qal	SM
											6344.4
	100	31.4	68.6	0	NA	NP	3.4	SM			SANDSTONE
10	65										6339.0
	92									Kmf	CLAYSTONE
15											
	100										
20											6329.2
	100										SANDSTONE
25											6323.8

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 5.1 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 5.1 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, LOW DRY STRENGTH, RAPID DILATANCY; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; NO REACTION WITH HCl.

5.1 - 25.7 FT CRETACEOUS MENEFEE FORMATION (Kmf)

5.1 - 10.5 FT SANDSTONE: SLIGHTLY WEATHERED (W3), SOFT (H6), TAN IN COLOR, THINLY BEDDED, FINE TO MEDIUM GRAINED; NO REACTION WITH HCl.

10.5 - 20.3 FT CLAYSTONE: DARK GREY IN COLOR, MODERATELY TO SLIGHTLY WEATHERED (W4), VERY SOFT (H7), FeOx STAINING ALONG FRACTURES; NO REACTION WITH HCl.

20.3 - 25.7 FT SANDSTONE: SLIGHTLY WEATHERED (W3), SOFT (H6), TAN IN COLOR MODERATELY BEDDED, FINE TO MEDIUM GRAINED; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 5.1 FT: QUATERNARY ALLUVIUM (Qal)
5.1 - 25.7 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS:
WLNE = WATER LEVEL NOT ENCOUNTERED
I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR11-15-5

SHEET 1 OF 1

FEATURE: REACH 9, 10 AND 11
LOCATION: REACH 11 PIPELINE
BEGUN: 10/7/15 FINISHED: 10/7/15
DEPTH AND ELEVATION OF WATER LEVEL: WLNE AND DATE MEASURED: 10/7/2015

PROJECT: NGWSP
COORDINATES: N 1,712,754.4 E 2,443,810.1
TOTAL DEPTH: 28.7
DEPTH TO BEDROCK: 18.7

STATE: NM
GROUND ELEVATION: 6374.0
ANGLE FROM HORIZONTAL:
HOLE LOGGED BY: J. GILBERT
REVIEWED BY: P. GARDNER

NOTES

ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.

ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.

DRILLED BY: U.C. REGION DRILL CREW
DRILLER; JOE PROCTOR
HELPERS; BRANDON LANE

PURPOSE:
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.

DRILL EQUIPMENT:
TRACK MOUNTED CME 850.

DRILL METHOD:
0.0 - 18.7 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.
18.7 - 28.7 FT HQ3 WIRELINE CORING SYSTEM WITH A 5' SPLIT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT.

CASING RECORD:
NONE USED.

DRILLING MEDIUM:
0.0 - 18.7 FT NONE.
18.7 - 28.7 FT WATER.

HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS AND BENTONITE.

DEPTH	% CORE RECOVERY	LABORATORY DATA: % FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION / ELEVATION
											SM
		44.8	55.2	0	23.2	5.1	6.7	SC-SM	8/7/8		
											6369.1
5		48.9	51.1	0	25.5	11.8	7.1	SC	7/7/9		SC
											6365.3
		40.0	60.0	0	22.9	5.7	5.4	SC-SM	11/12/16		
										Qal	
10		41.9	58.1	0	NP	NP	4.3	SM	14/19/26		SM
		62.2	37.8	0	25.0	NP	4.9	s(ML)	22/24/35		
											6359.1
15		77.3	22.7	0	40.5	25.1	11.2	(CL)s	12/13/19		SC
											6356.8
		84.4	15.6	0	44.5	23.9	12.6	(CL)s	20/25/48		CL
											6355.3
20	74										
										Kmf	CLAYSTONE
25	94										
											6345.3

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 - 18.7 FT QUATERNARY ALLUVIUM (Qal)

0.0 - 4.9 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, LOW DRY STRENGTH, RAPID DILATANCY; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; NO REACTION WITH HCl.

4.9 - 8.7 FT CLAYEY SAND (SC): ABOUT 60% FINE SAND; ABOUT 40% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH TOUGHNESS; MAXIMUM SIZE, FINE SAND; TAN IN COLOR; NO REACTION WITH HCl.

8.7 - 14.9 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20%FINES WITH NO PLASTICITY, RAPID DILATANCY; MAXIMUM SIZE, FINE SAND; LOW DRY STRENGTH, DRY, TAN IN COLOR; NO REACTION WITH HCl.

14.9 - 17.2 FT CLAYEY SAND (SC): ABOUT 60% FINE SAND; ABOUT 40% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH TOUGHNESS; MAXIMUM SIZE, FINE SAND; TAN IN COLOR; NO REACTION WITH HCl.

17. 2 - 18.7 FT LEAN CLAY (CL): ABOUT 90 % FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, MEDIUM TOUGHNESS; ABOUT 10%, PREDOMINATELY FINE SAND; MAXIMUM SIZE, FINE SAND; NO REACTION WITH HCl.

18.7 - 28.7 FT CRETACEOUS MENEFEE FORMATION (Kmf)

18.7 - 28.7 FT CLAYSTONE: DARK GREY IN COLOR, MODERATELY TO SLIGHTLY WEATHERED (W4), VERY SOFT (H7), FeOx STAINING THROUGHOUT SAMPLE, MOTTLED; NO REACTION WITH HCl.

STRATIGRAPHY:
0.0 - 18.7 FT: QUATERNARY ALLUVIUM (Qal)
18.7 - 28.7 FT: CRETACEOUS MENEFEE FORMATION (Kmf)

ABBREVIATIONS:
WLNE = WATER LEVEL NOT ENCOUNTERED
I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

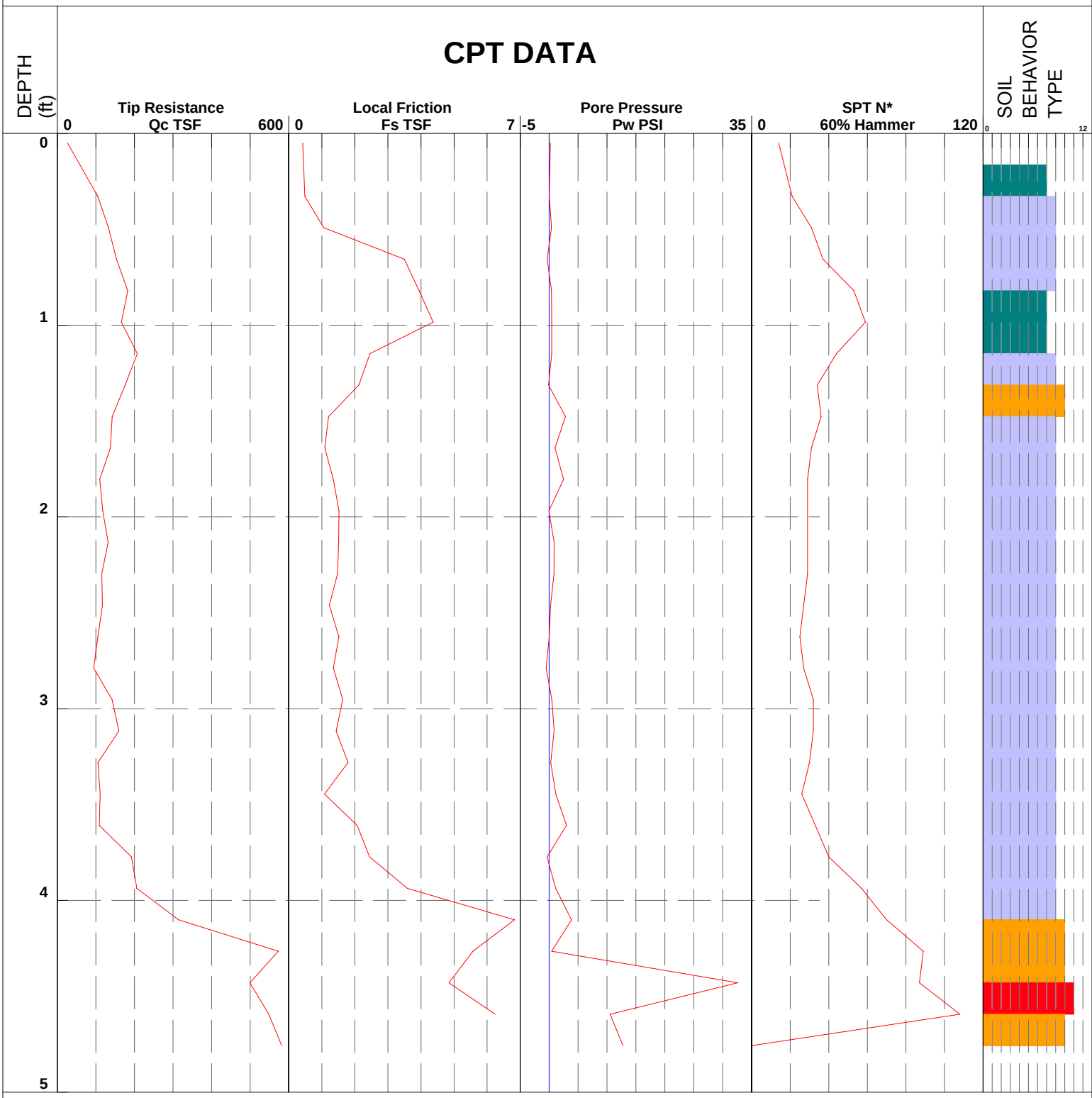
COMMENTS:

ALL ANGLES MEASURED FROM CORE AXIS AT ZERO DEGREES, UNLESS OTHERWISE NOTED.
THE DATA FOR THE CENTER COLUMN AND"CLASSIFICATION AND PHYSICAL CONDITIONS" COLUMN ARE BASED ON BUREAU OF RECLAMATION GEOLOGY FIELD MANUAL AND DRAWINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS- DRAWING NO. 40-D-6493. STANDARD DESCRIPTIONS AND DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

BUREAU OF RECLAMATION

Hole #	CPT9-14-1	Cone #	DSA0739	Date/Time	6/17/2014 2:36:42 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



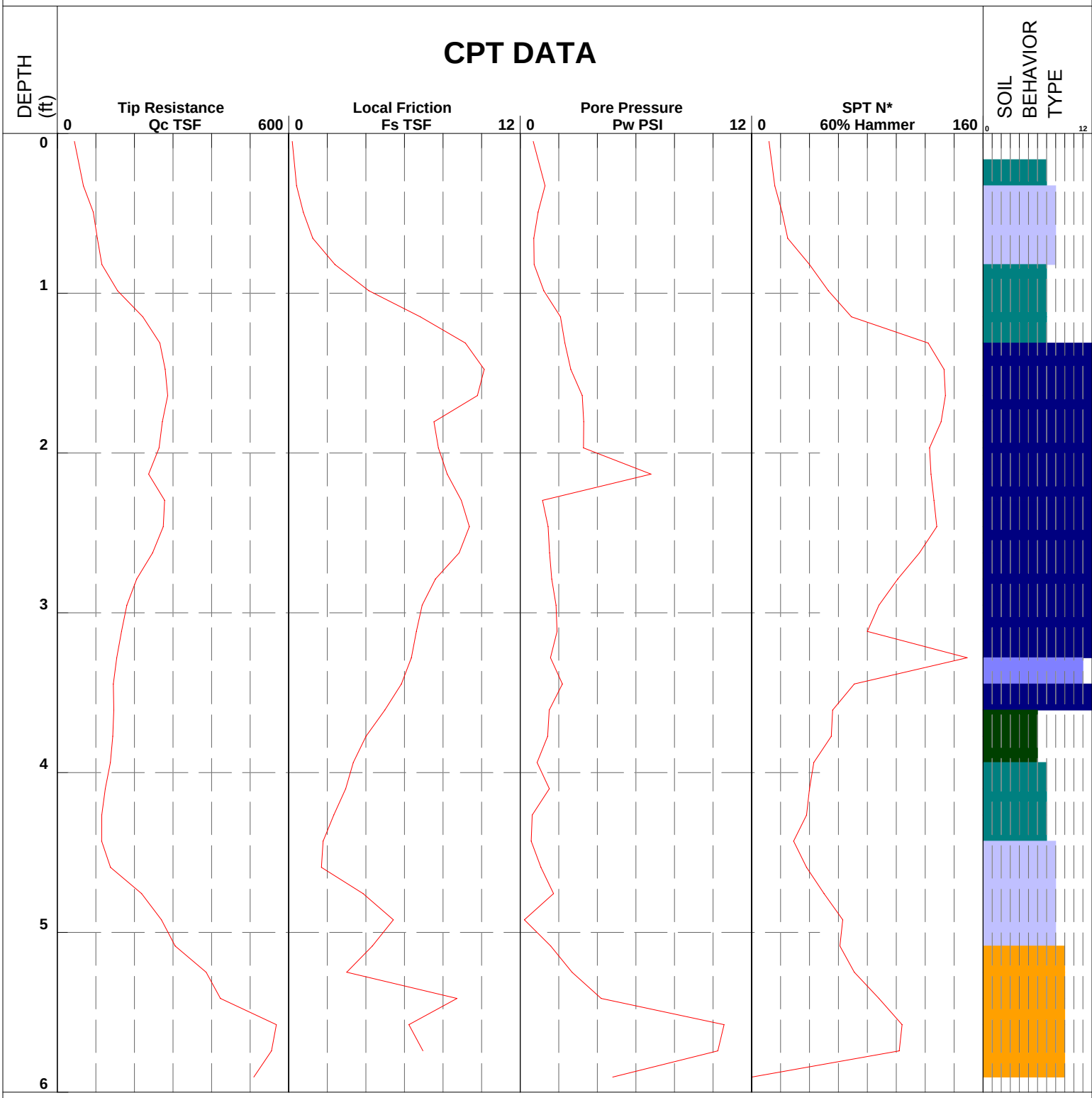
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 5.0' Qc>700

BUREAU OF RECLAMATION

Hole #	CPT9-14-2	Cone #	DSA0739	Date/Time	6/17/2014 1:54:46 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



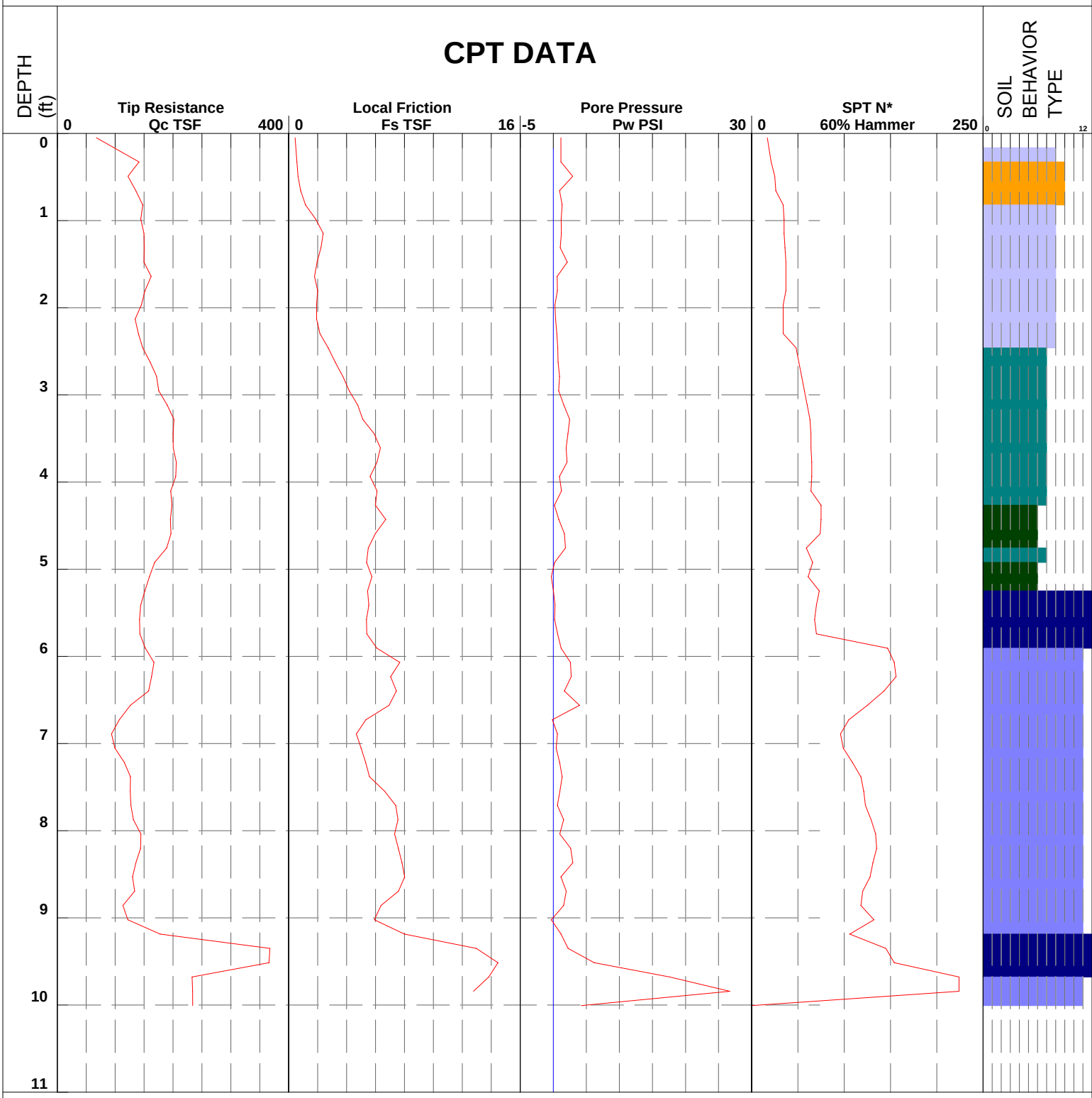
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 6.2' Qc>600 Fs>10

BUREAU OF RECLAMATION

Hole #	CPT9-14-3	Cone #	DSA0739	Date/Time	6/17/2014 12:57:17 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



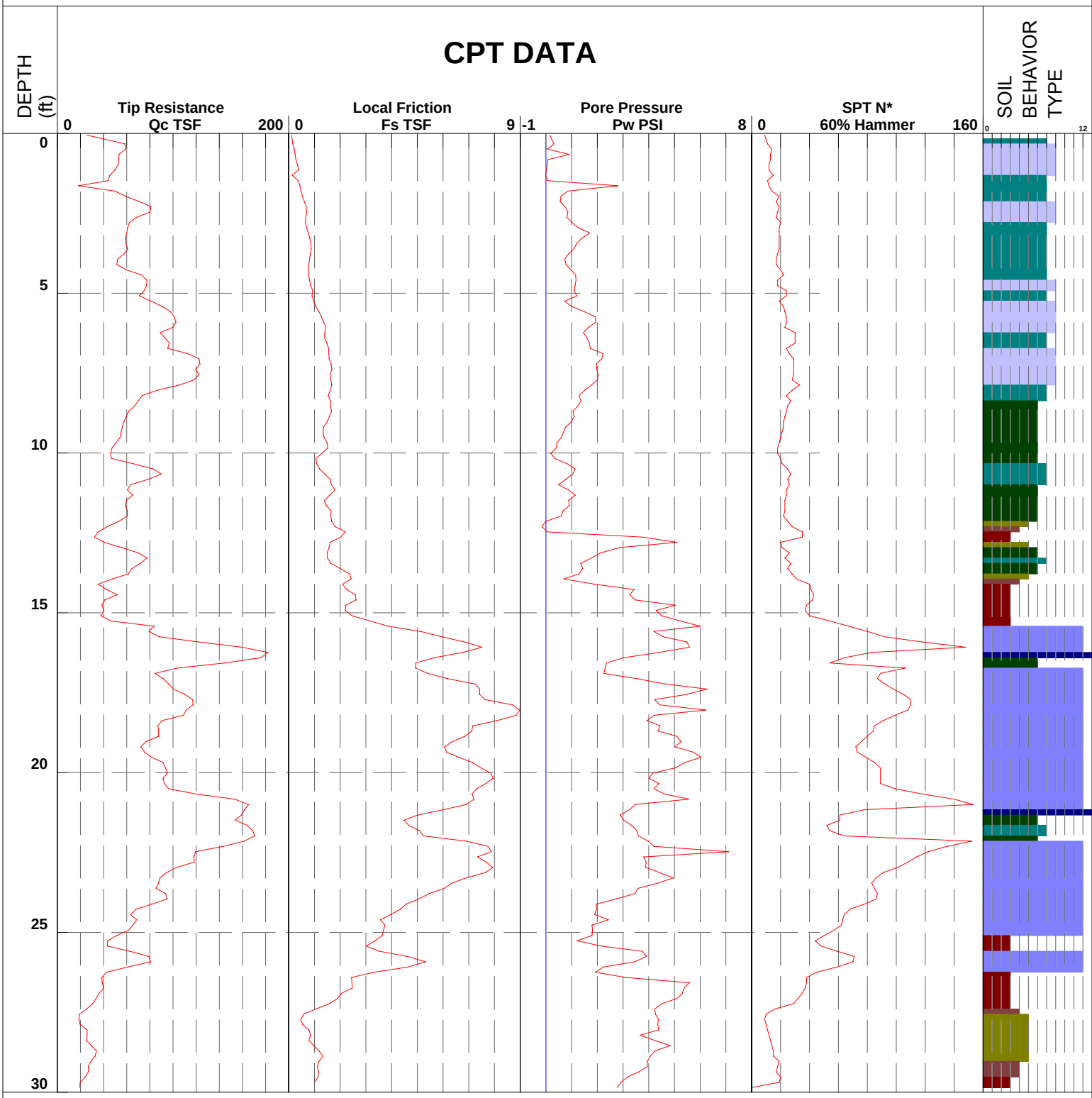
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 10.2' Fs>13

BUREAU OF RECLAMATION

Hole #	CPT9-14-4	Cone #	DSA0739	Date/Time	6/17/2014 12:11:51 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



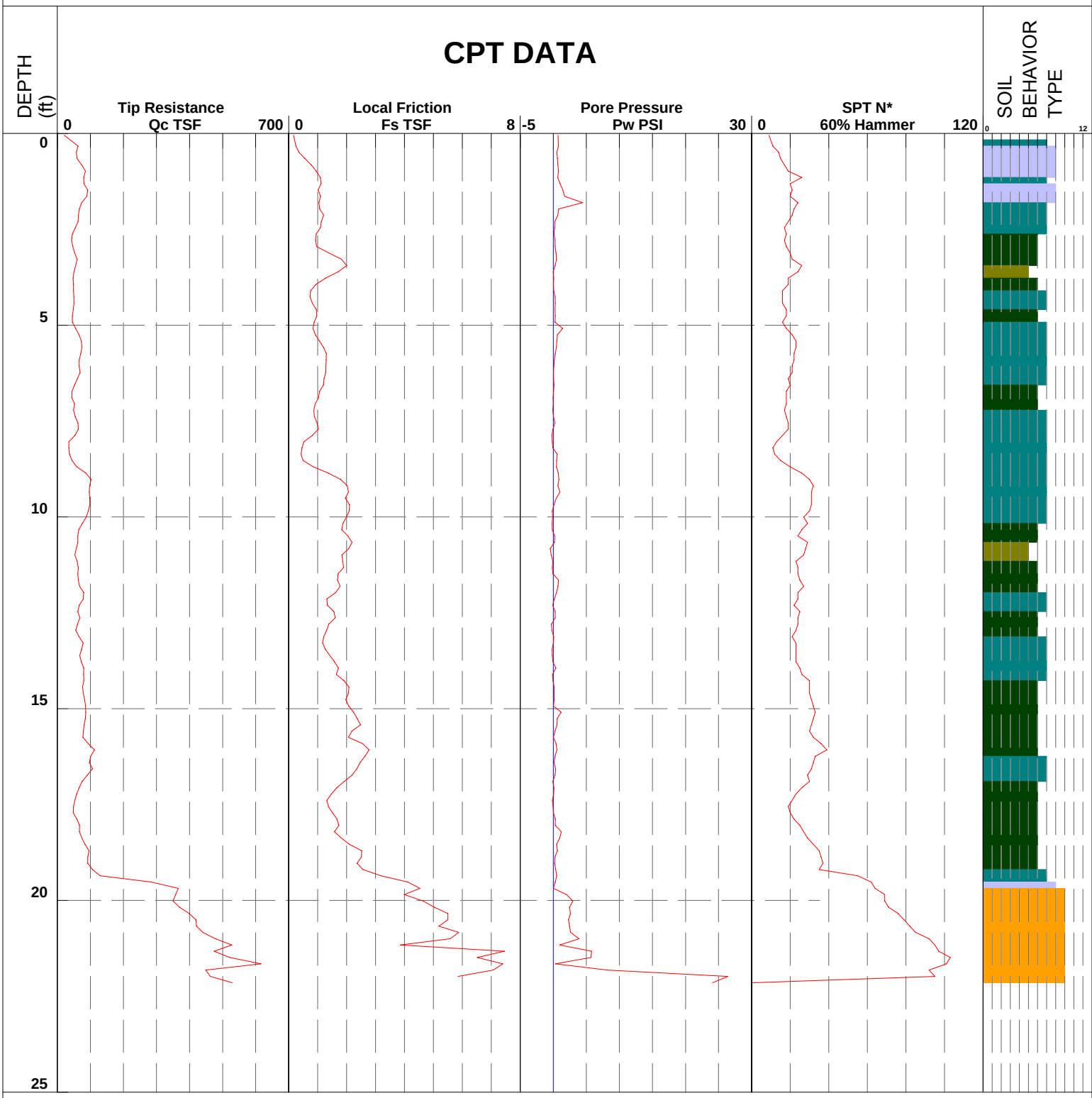
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 30'

BUREAU OF RECLAMATION

Hole #	CPT9-14-5	Cone #	DSA0739	Date/Time	6/17/2014 11:30:34 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



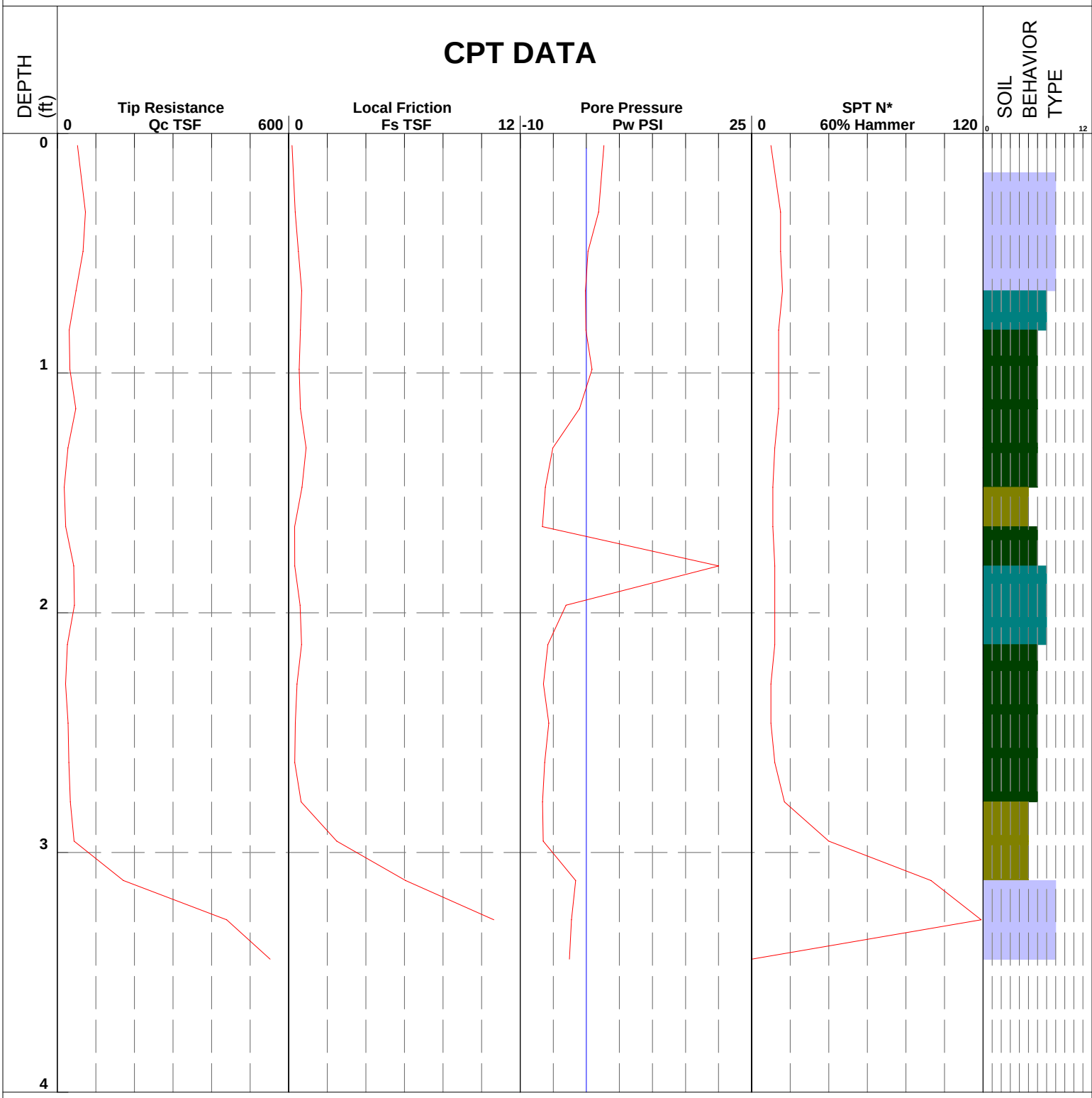
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 22.4' Qc>700 Fs>8

BUREAU OF RECLAMATION

Hole #	CPT9-14-7	Cone #	DSA0739	Date/Time	6/17/2014 10:36:24 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



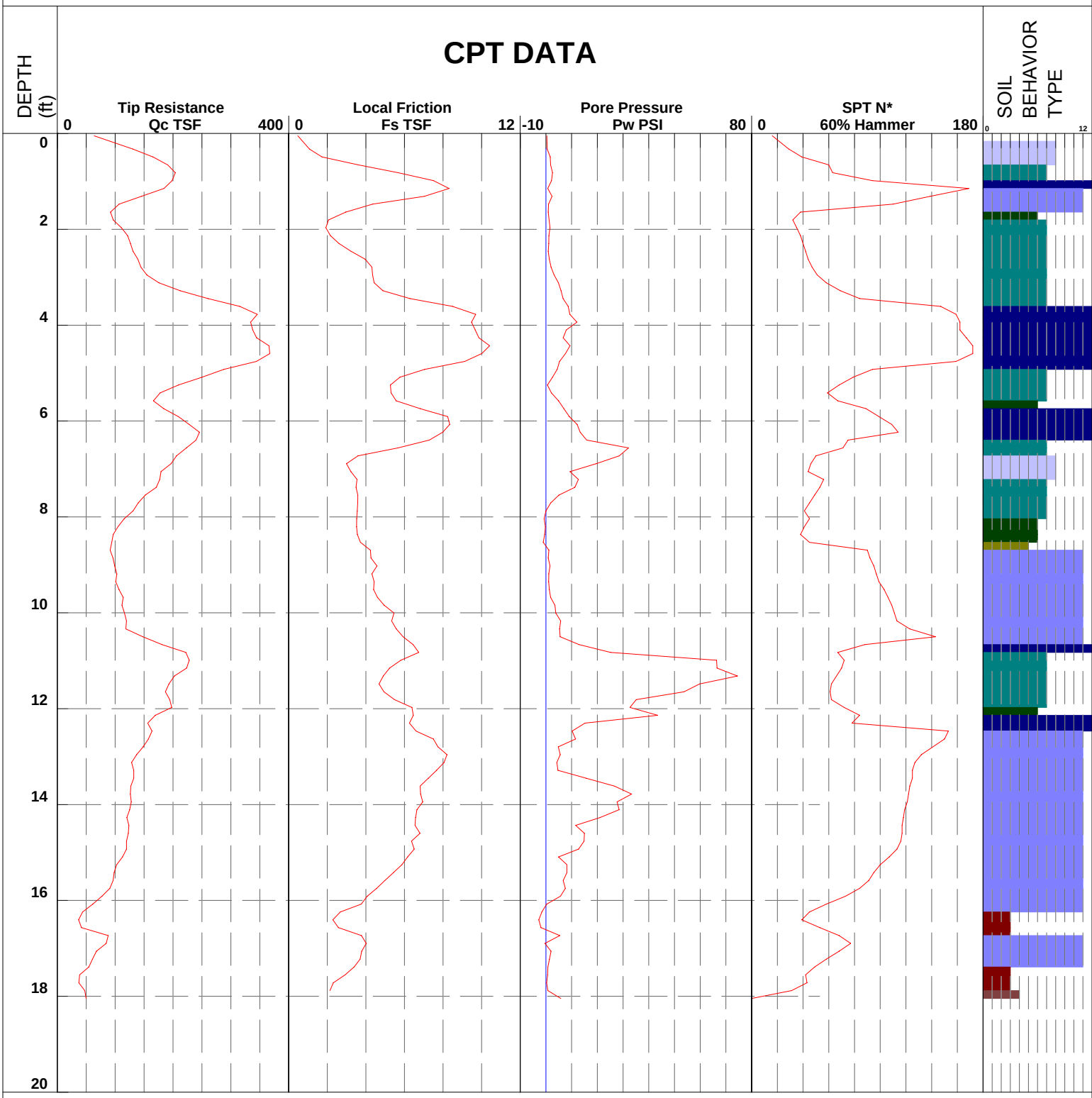
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 3.7' HIGHQc>600 Fs>13

BUREAU OF RECLAMATION

Hole #	CPT9-14-8	Cone #	DSA0739	Date/Time	6/17/2014 9:46:22 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



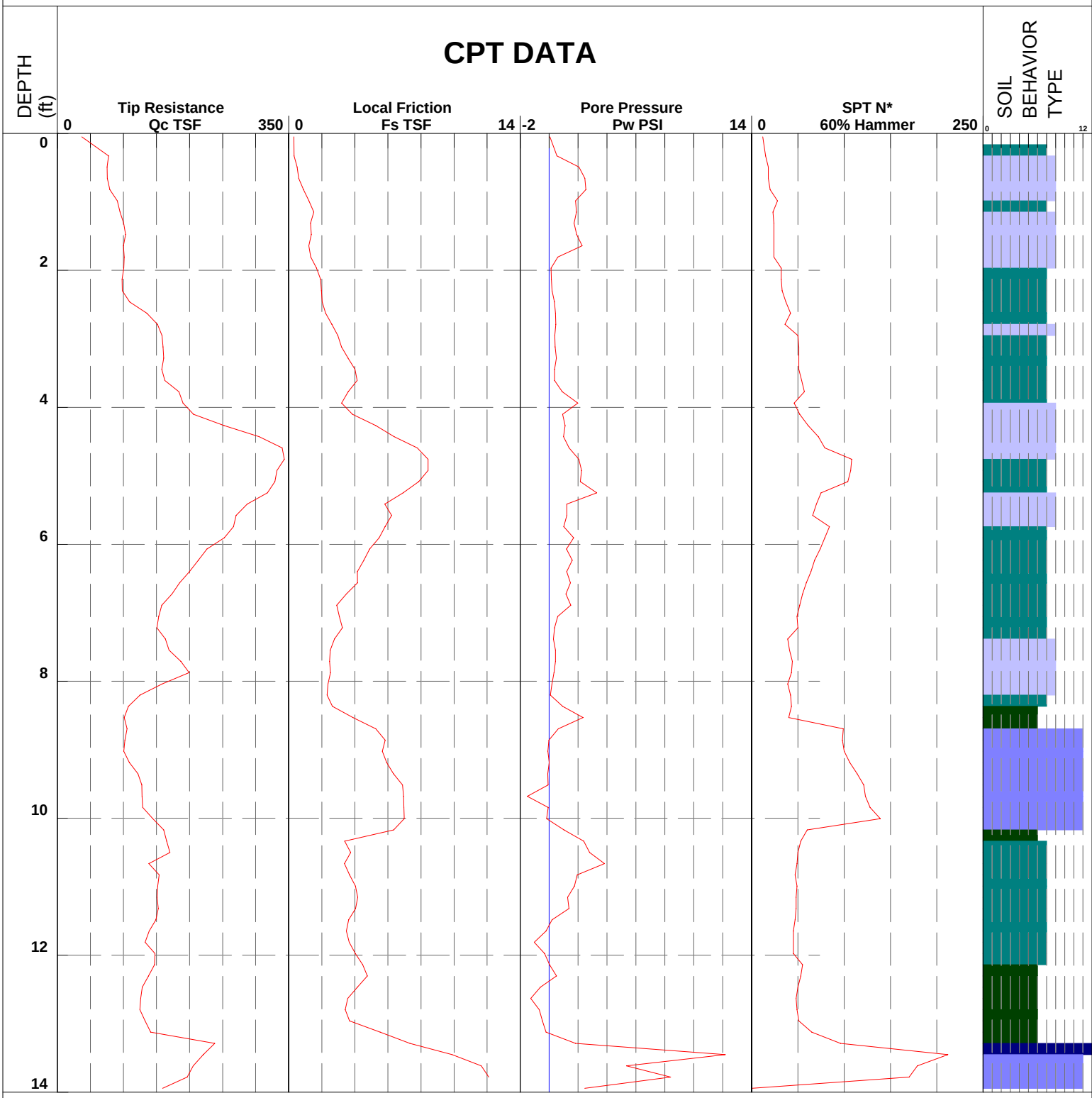
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 18.3' ,Qc>600 Inc>9

BUREAU OF RECLAMATION

Hole #	CPT9-14-9	Cone #	DSA0739	Date/Time	6/16/2014 1:53:14 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



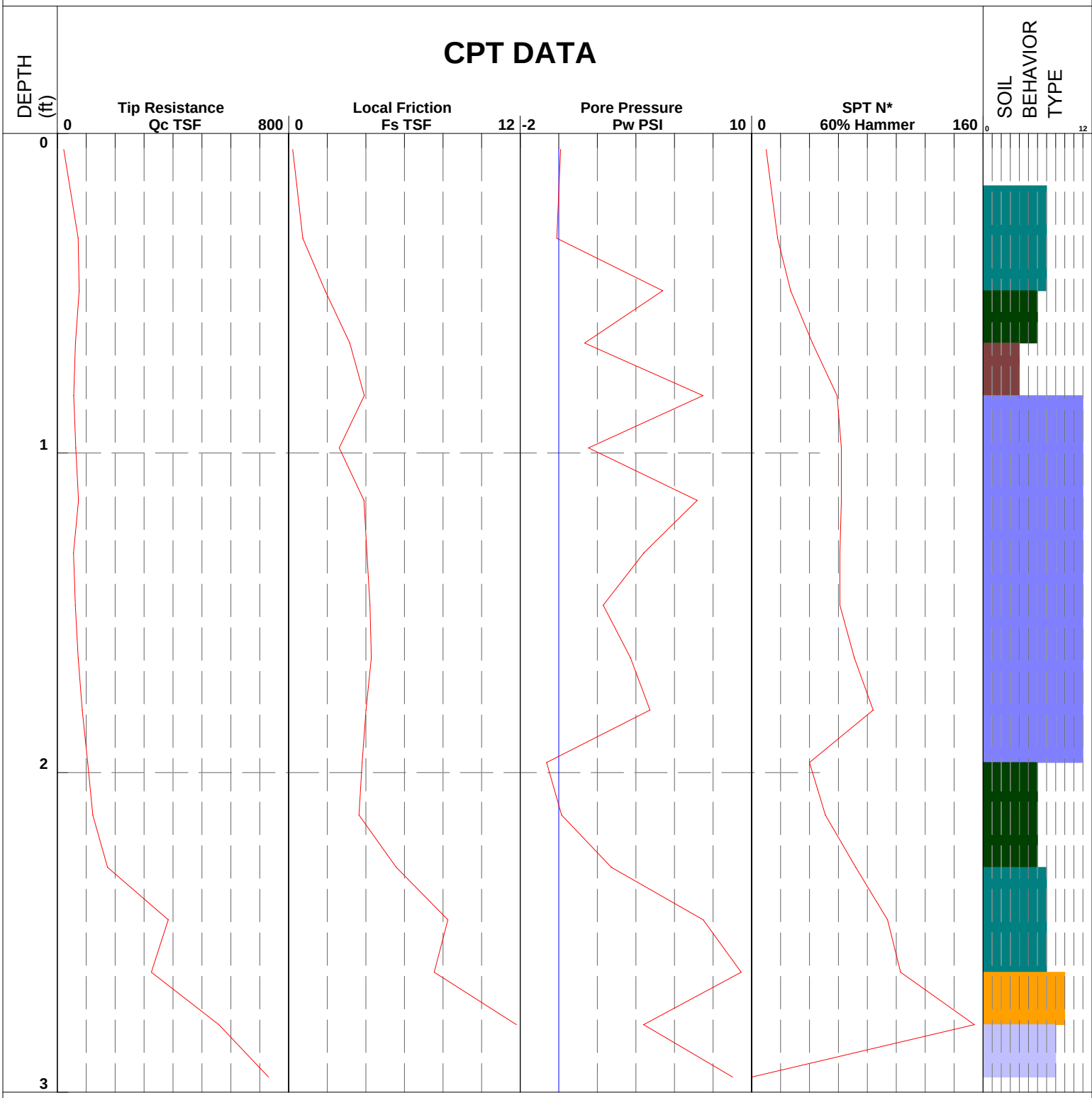
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 14.1

BUREAU OF RECLAMATION

Hole #	CPT9-14-10	Cone #	DSA0739	Date/Time	6/16/2014 1:18:49 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



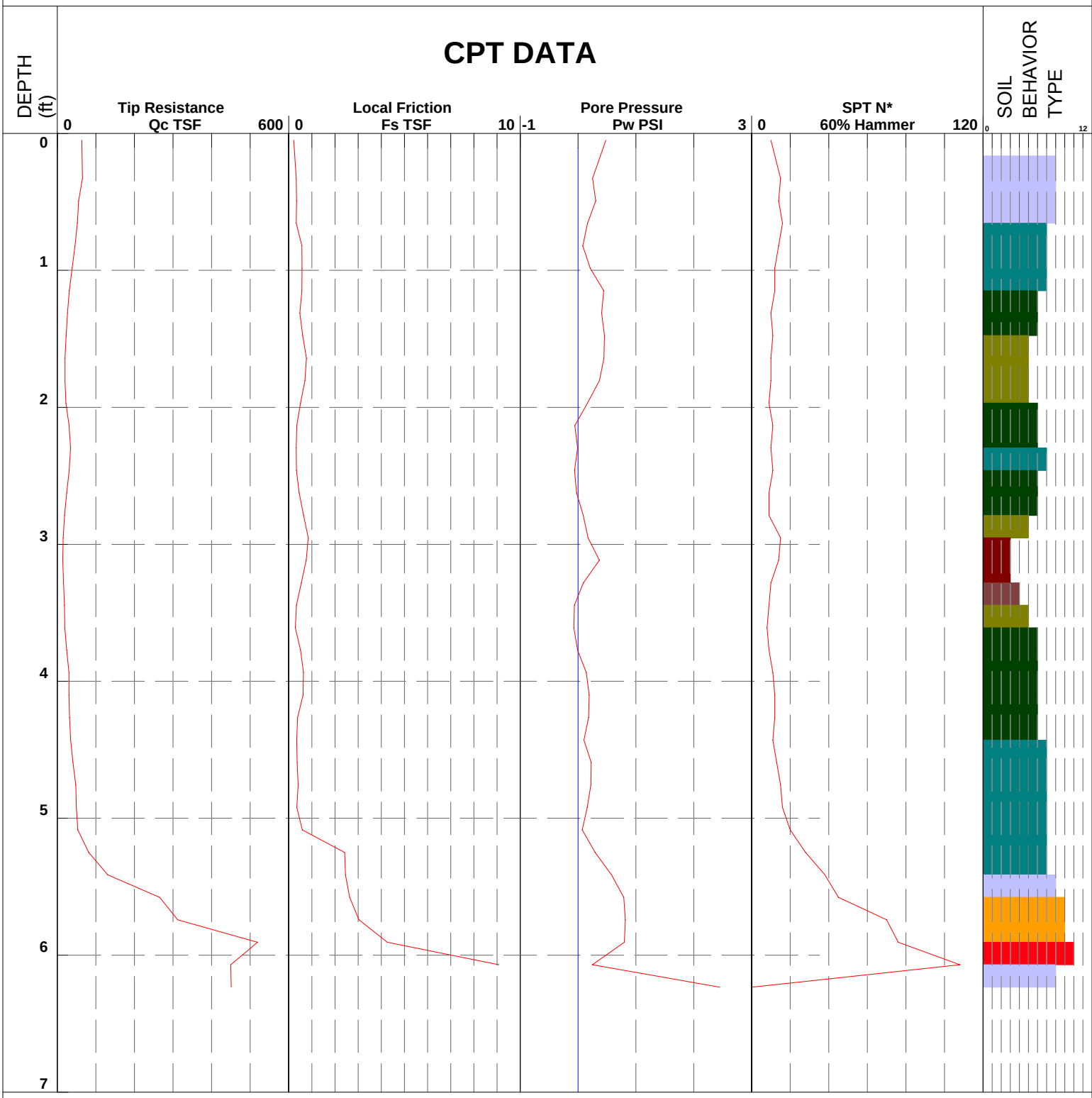
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 3.2'Qc>700,Fs>13

BUREAU OF RECLAMATION

Hole #	CPT9-14-11	Cone #	DSA0739	Date/Time	6/16/2014 12:42:06 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



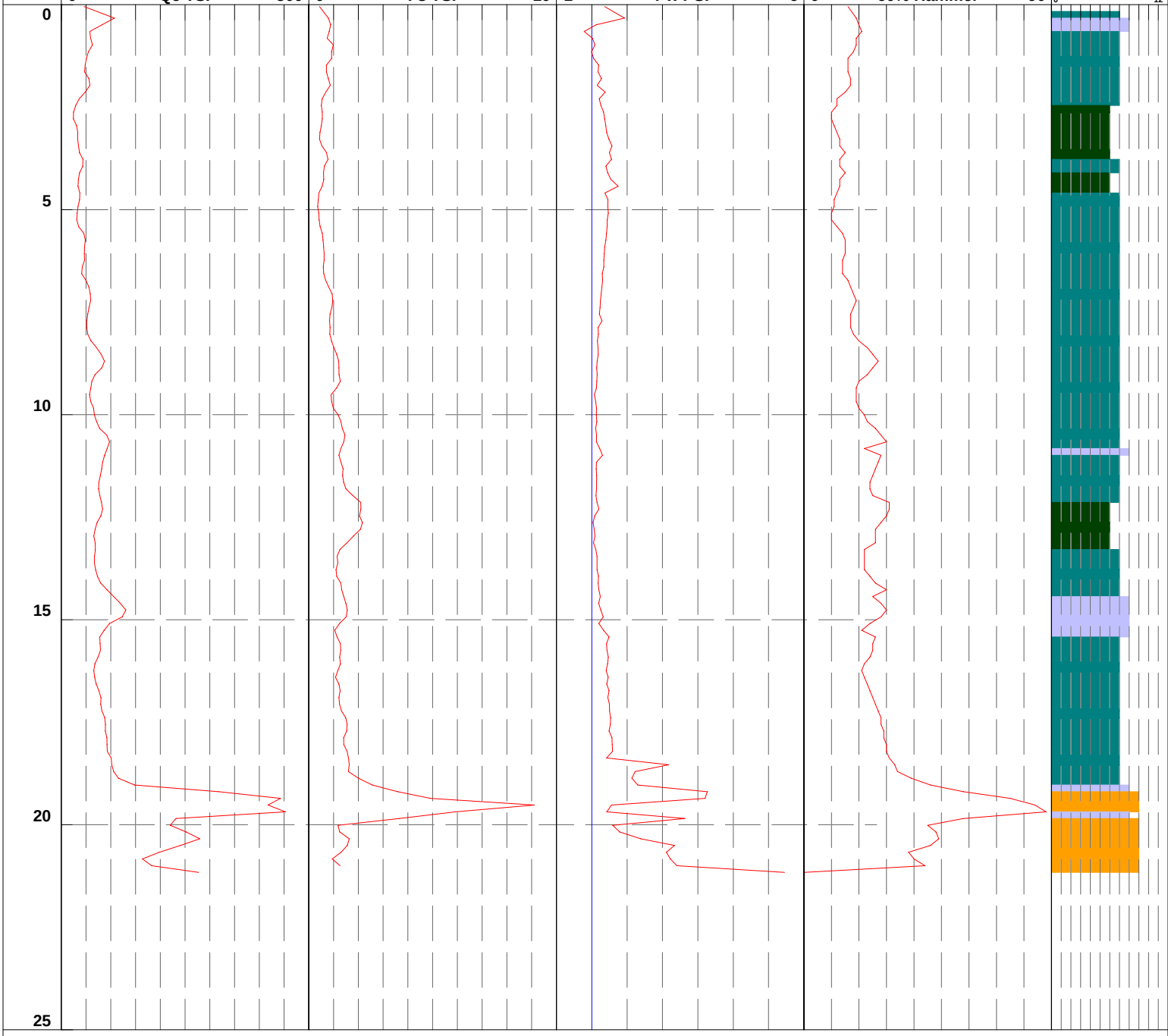
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 6.4' Qc>600

BUREAU OF RECLAMATION

Hole #	CPT9-14-12	Cone #	DSG1028	Date/Time	7/24/2014 7:49:09 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



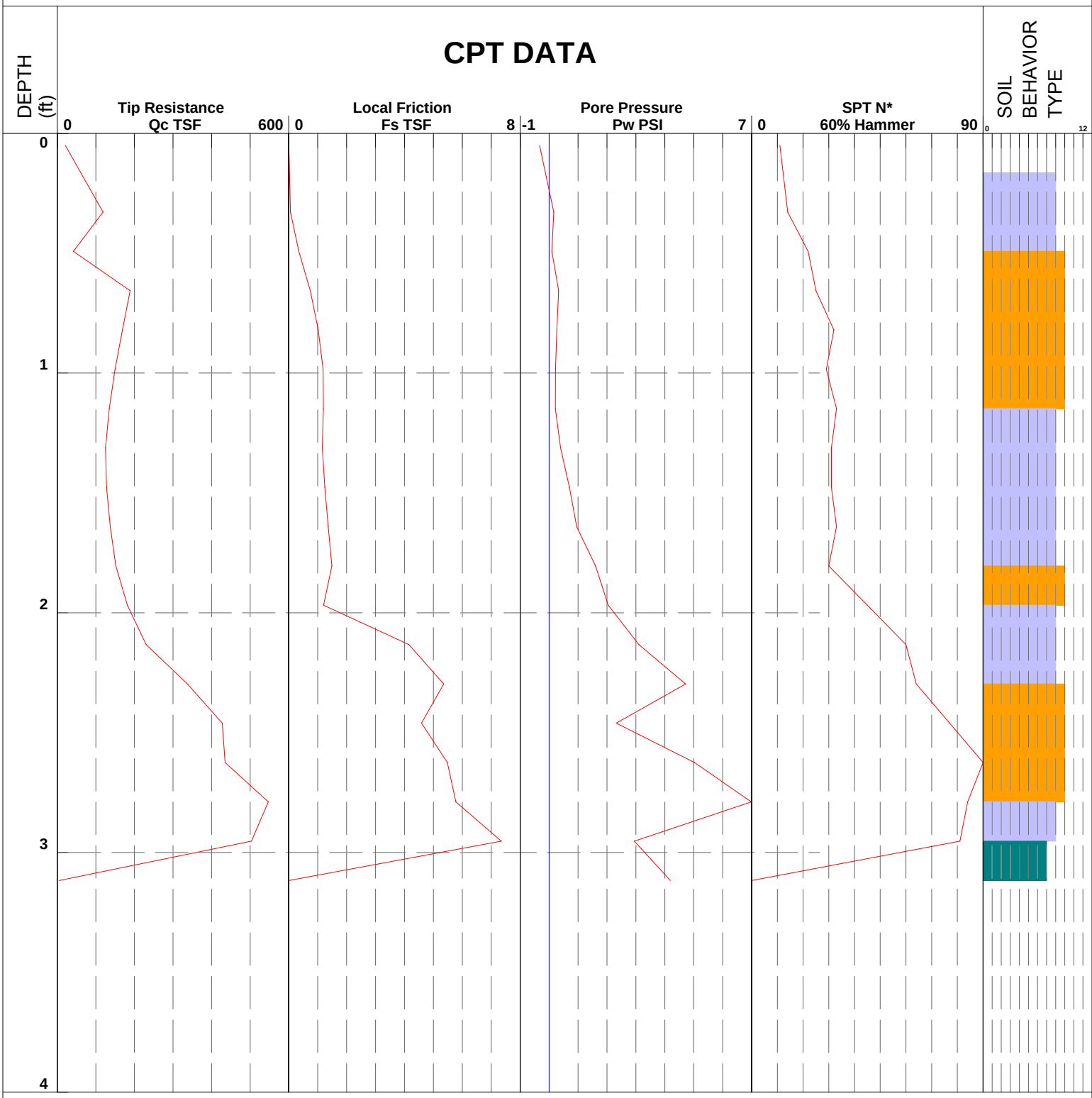
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 21.4' Qc>700

BUREAU OF RECLAMATION

Hole #	CPT9-14-13	Cone #	DSG1028	Date/Time	7/24/2014 8:47:00 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



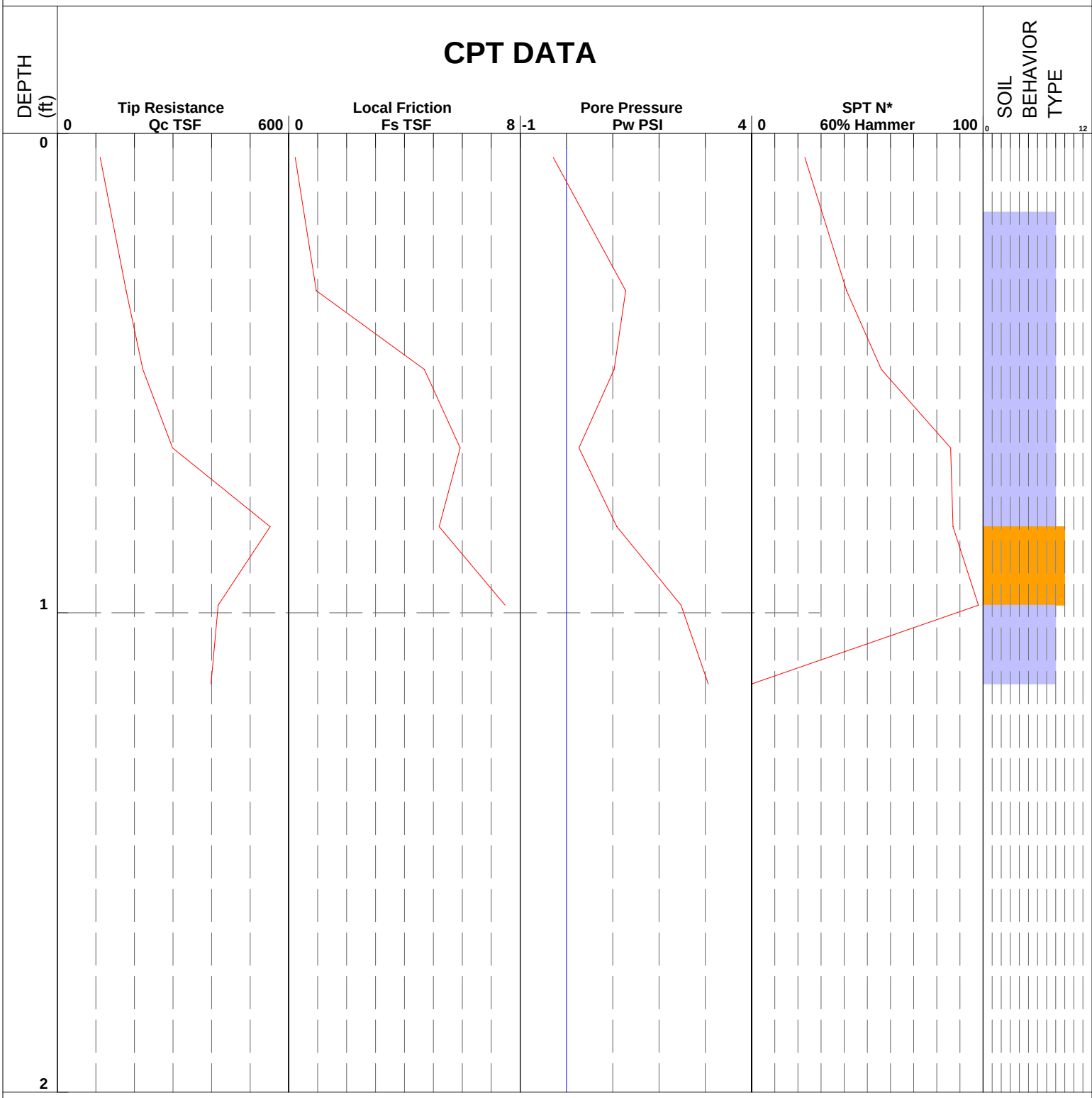
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 3.4' Qc>650 Fs>6

BUREAU OF RECLAMATION

Hole #	CPT9-14-15	Cone #	DSG1028	Date/Time	7/24/2014 9:34:02 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



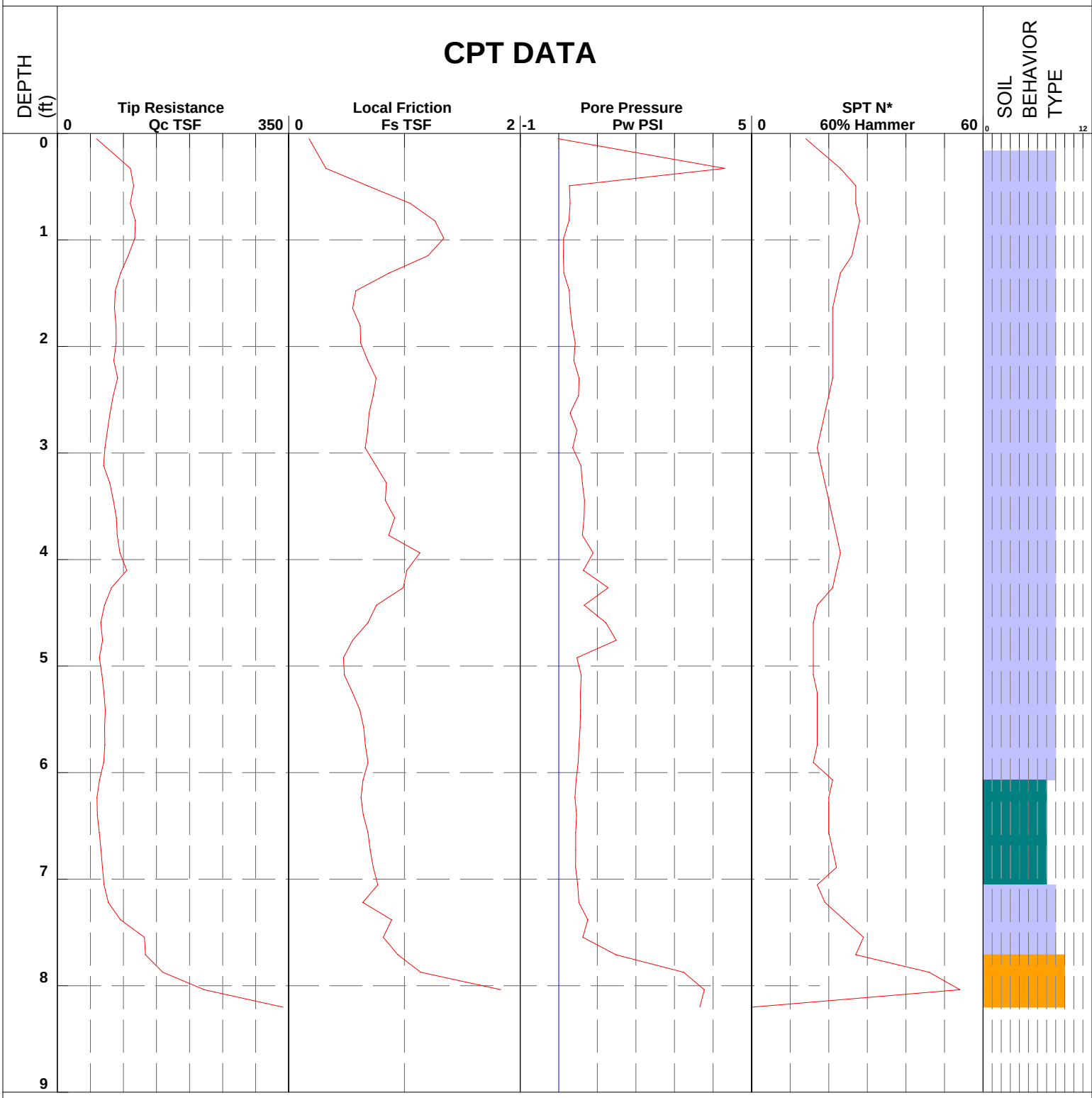
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 1.3' Qc>600 Fs>6

BUREAU OF RECLAMATION

Hole #	CPT9-14-17	Cone #	DSG1028	Date/Time	7/24/2014 10:16:58 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



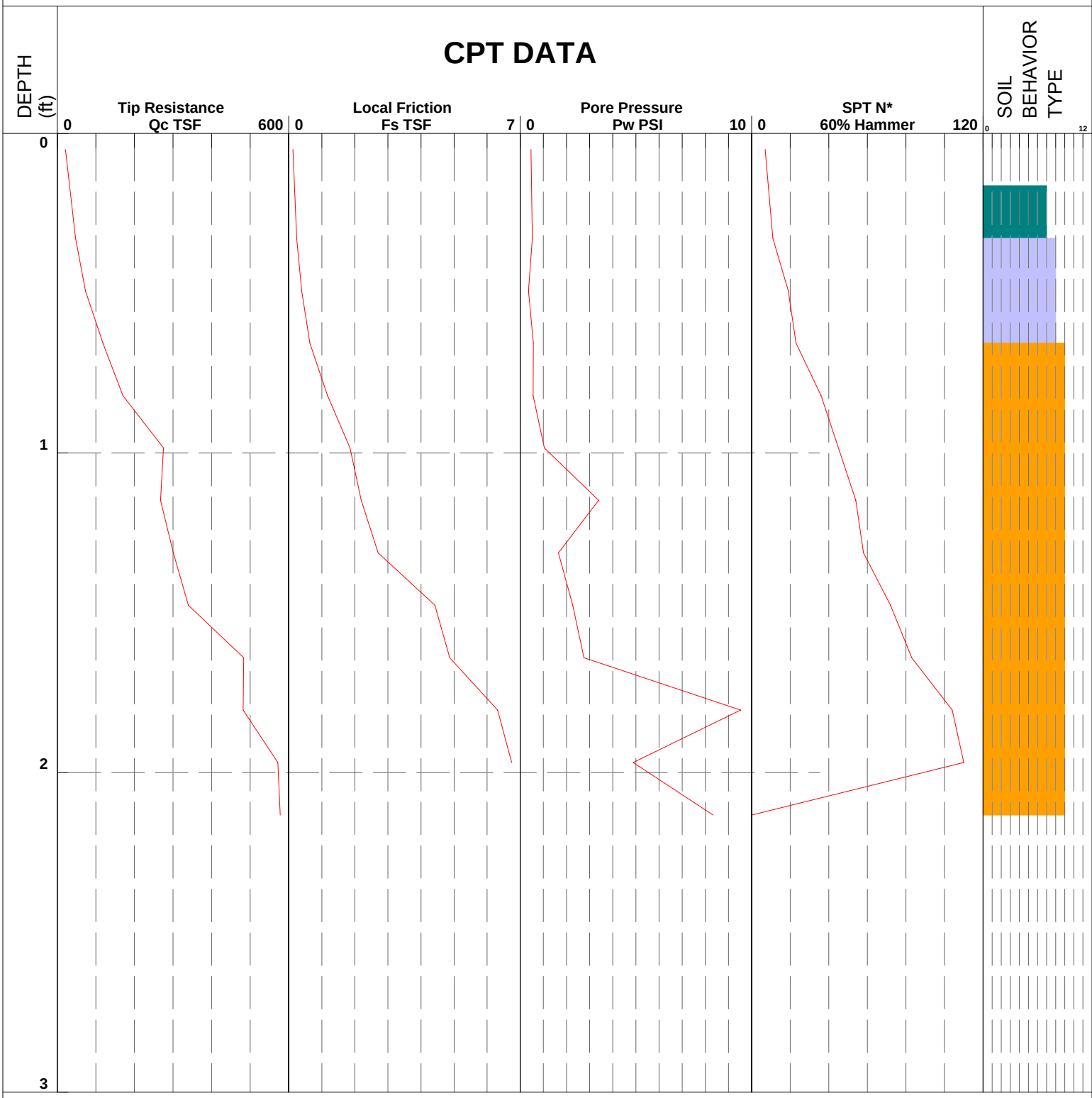
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 8.4' Qc>1000

BUREAU OF RECLAMATION

Hole #	CPT9-14-18	Cone #	DSG1028	Date/Time	7/24/2014 11:03:55 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



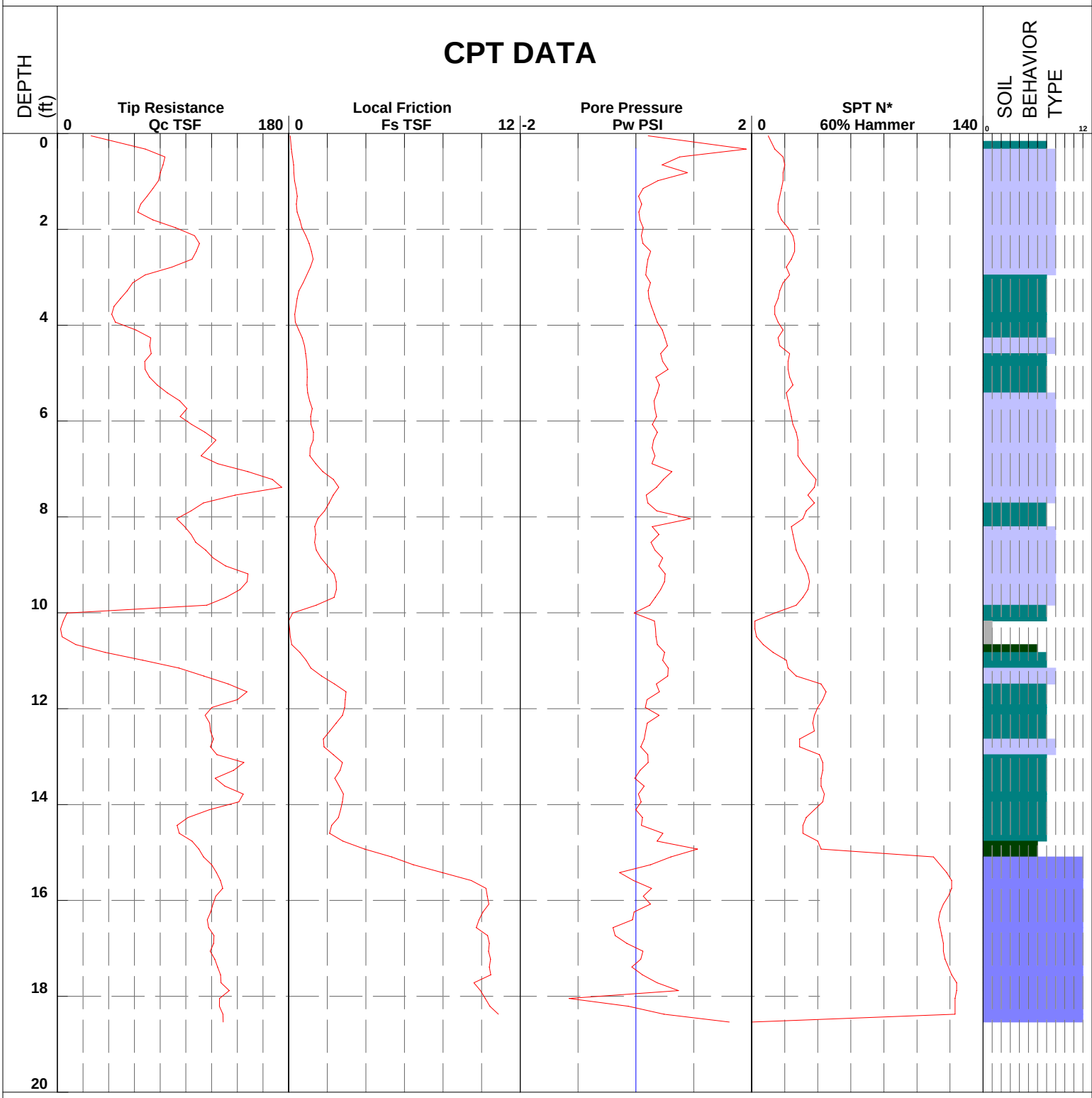
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 2.3' Qc>700

BUREAU OF RECLAMATION

Hole #	CPT9-14-19	Cone #	DSG1028	Date/Time	7/24/2014 11:48:44 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



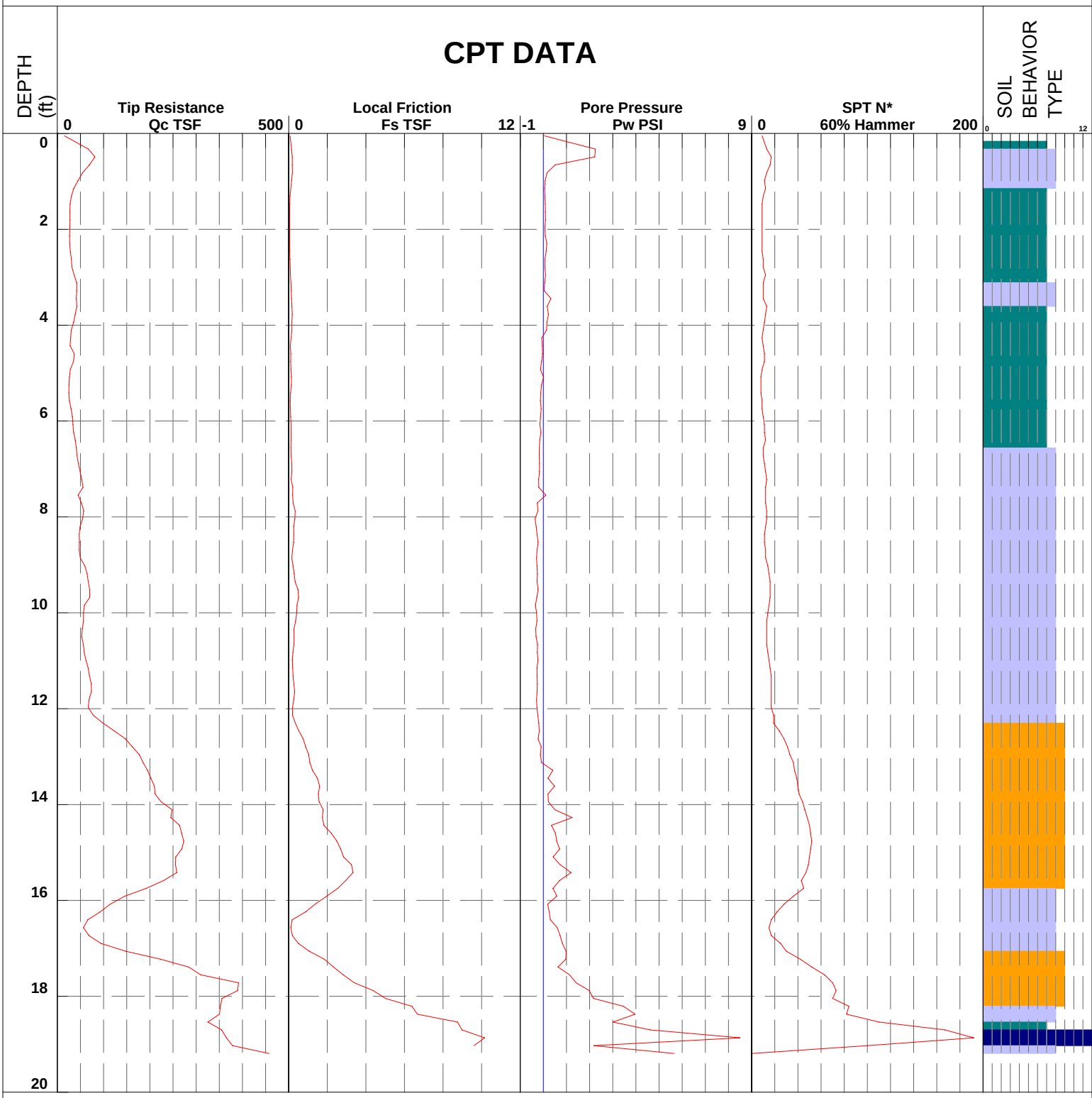
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 18.8' Fs>11

BUREAU OF RECLAMATION

Hole #	CPT9-14-20	Cone #	DSG1028	Date/Time	7/24/2014 12:38:24 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



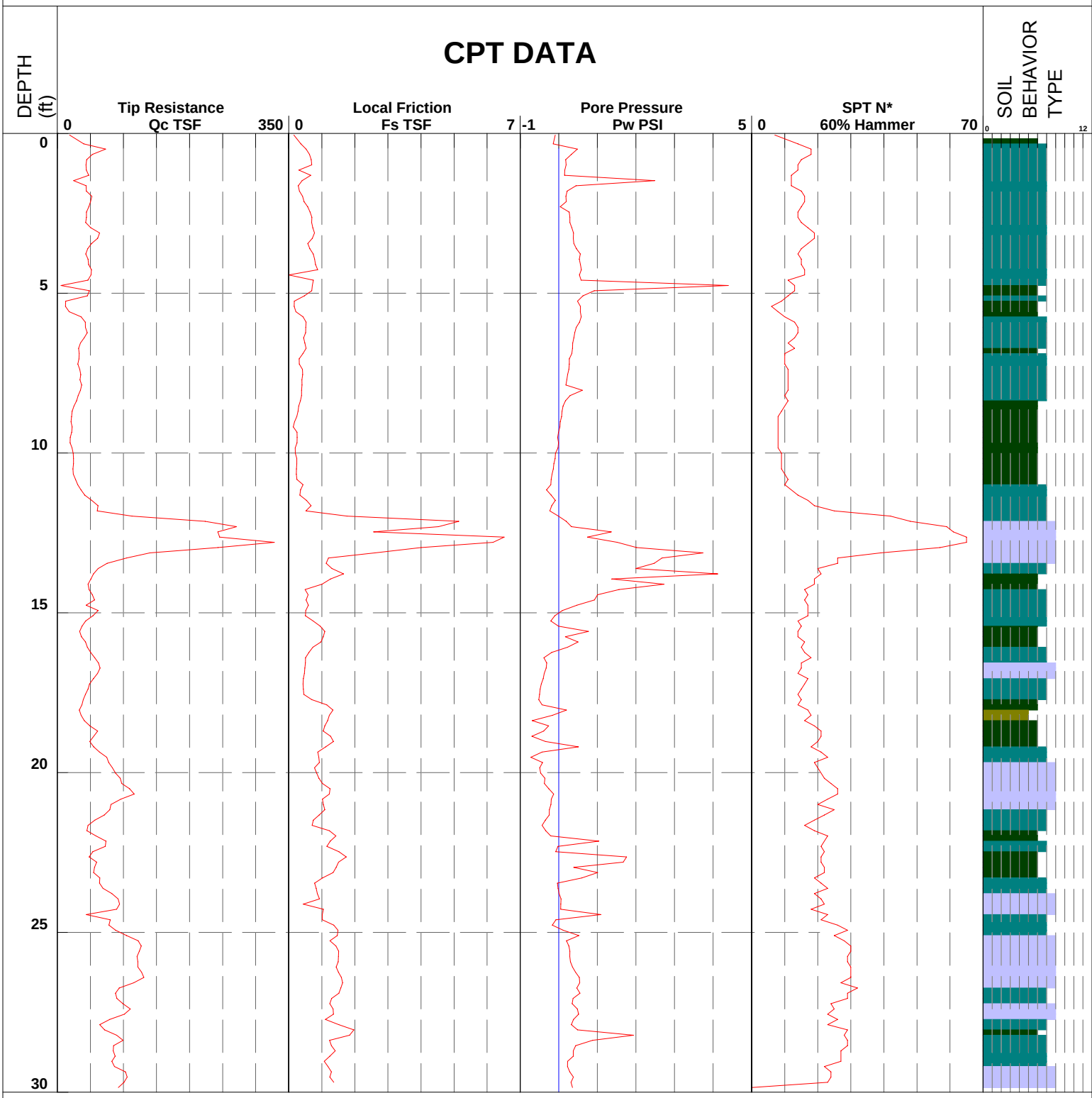
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 19.4' Qc>400 Fs>12

BUREAU OF RECLAMATION

Hole #	CPT9-14-21	Cone #	DSG1028	Date/Time	7/16/2014 1:41:05 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



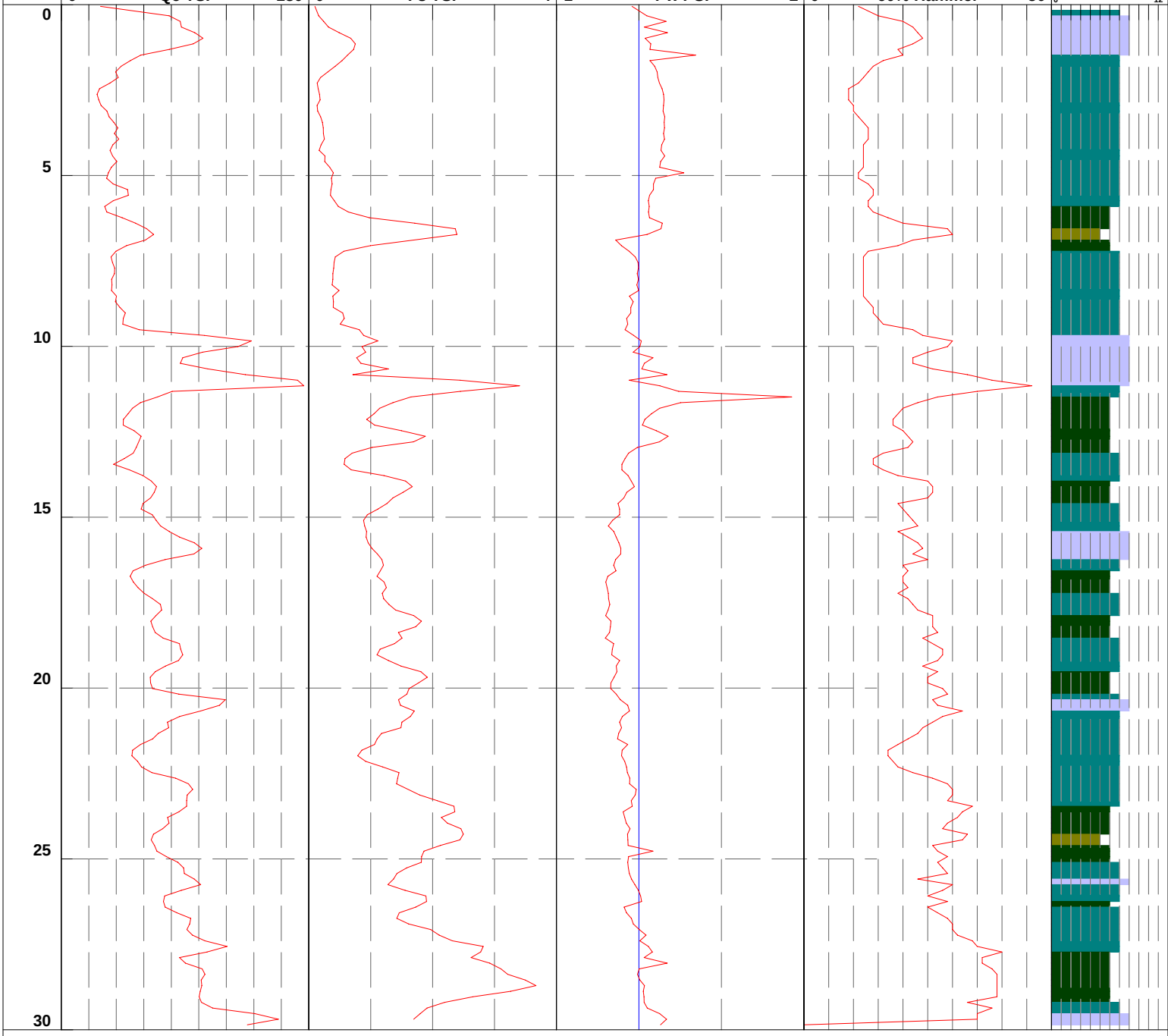
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 30'

BUREAU OF RECLAMATION

Hole #	CPT9-14-22	Cone #	DSG1028	Date/Time	7/16/2014 12:29:47 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



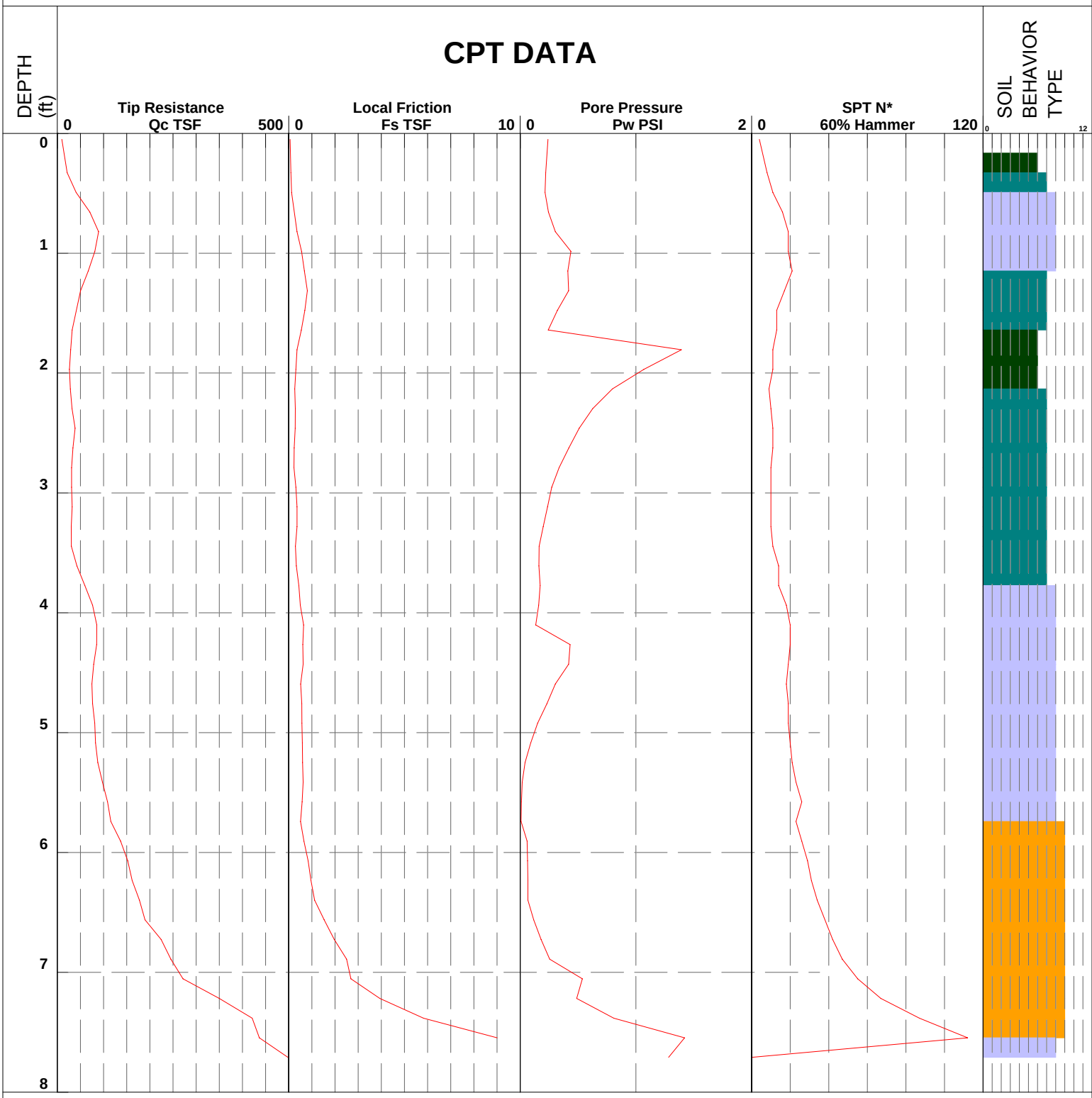
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 30'

BUREAU OF RECLAMATION

Hole #	CPT9-14-23	Cone #	DSG1028	Date/Time	7/23/2014 8:38:05 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



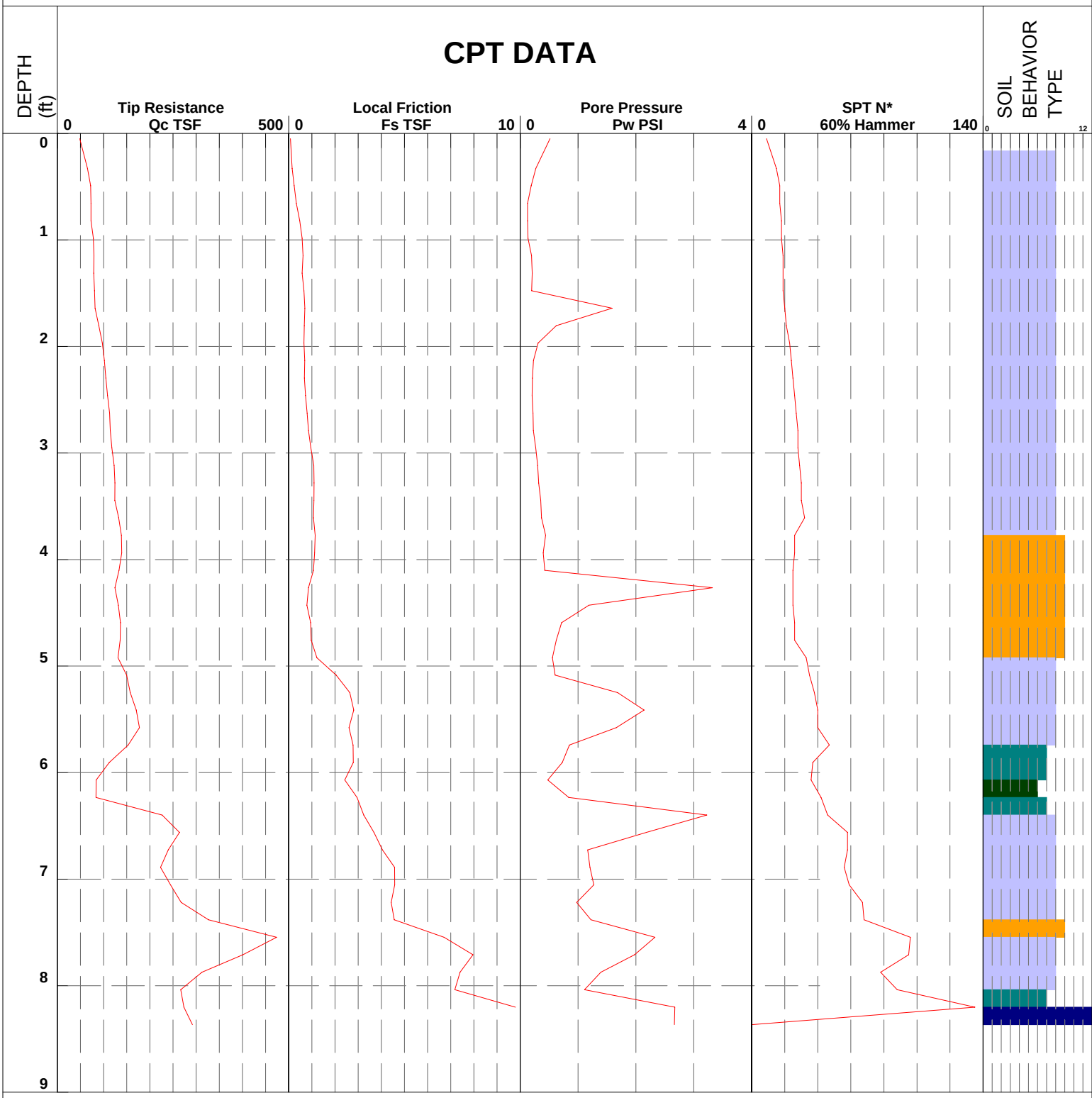
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 8' Qc>500 Fs>10

BUREAU OF RECLAMATION

Hole #	CPT9-14-24	Cone #	DSG1028	Date/Time	7/23/2014 9:33:40 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



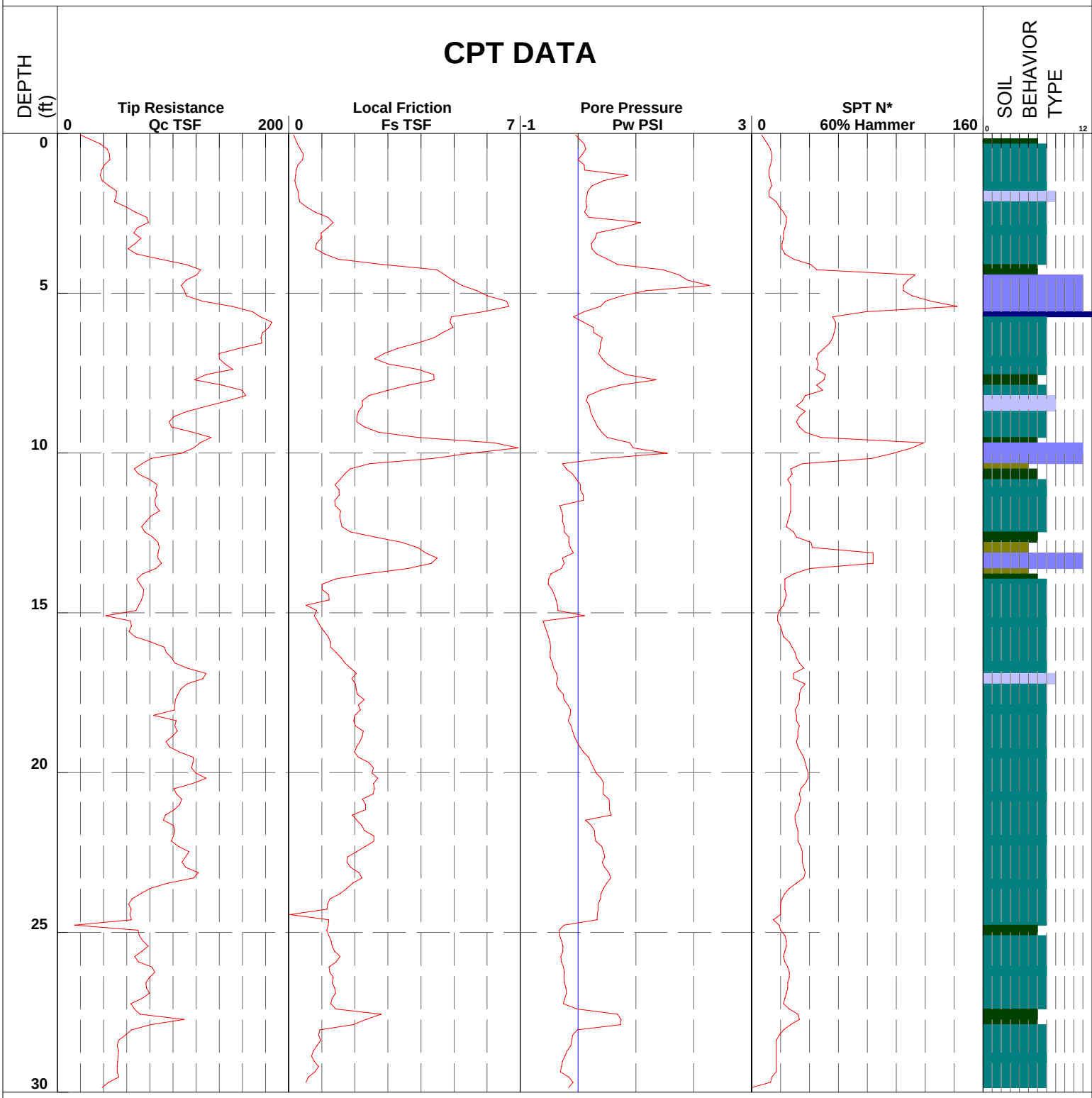
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 8.6' Qc>600 Fs>11

BUREAU OF RECLAMATION

Hole #	CPT9-14-25	Cone #	DSG1028	Date/Time	7/23/2014 10:40:19 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



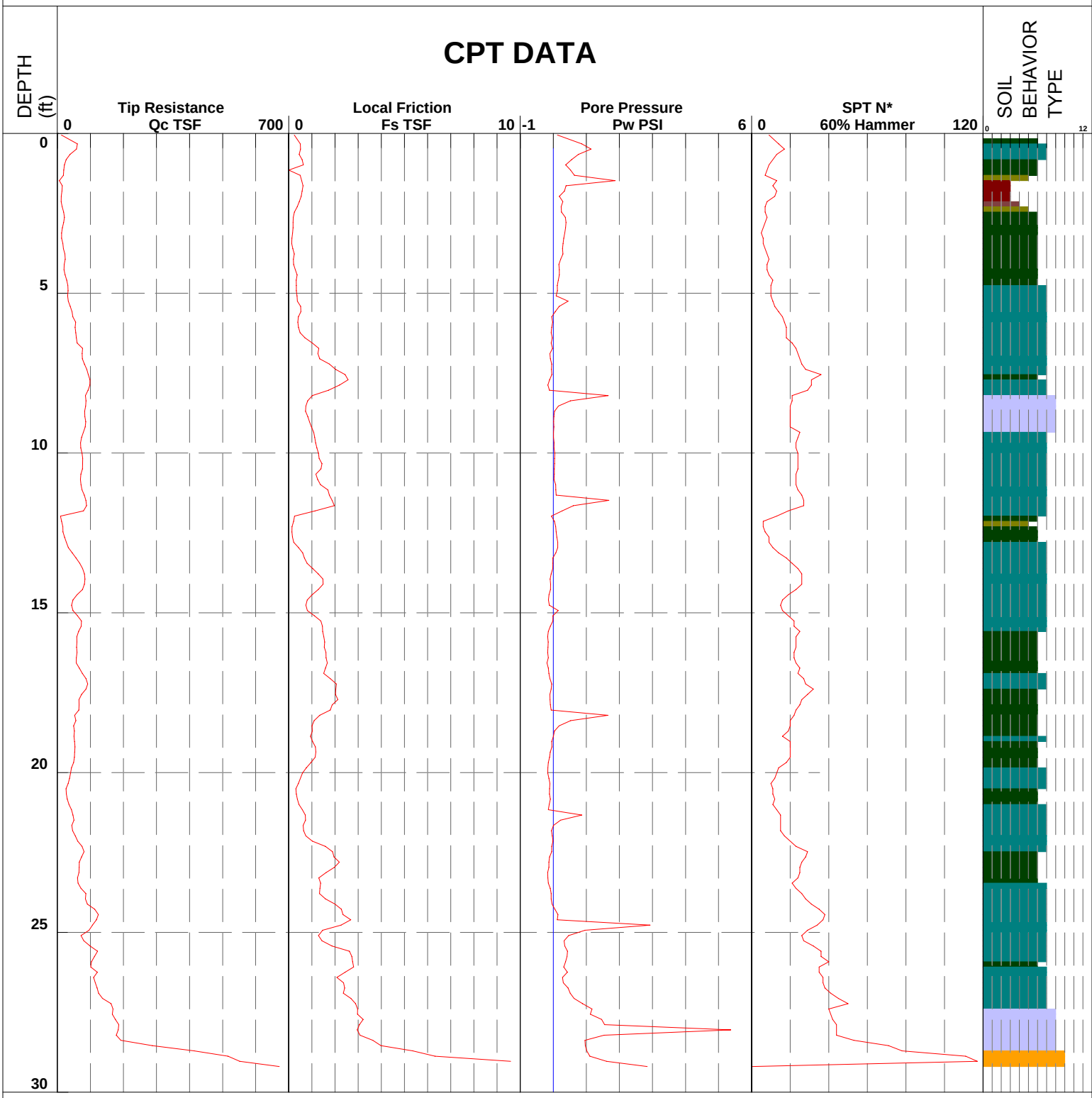
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 30'

BUREAU OF RECLAMATION

Hole #	CPT9-14-26	Cone #	DSG1028	Date/Time	7/23/2014 12:31:33 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



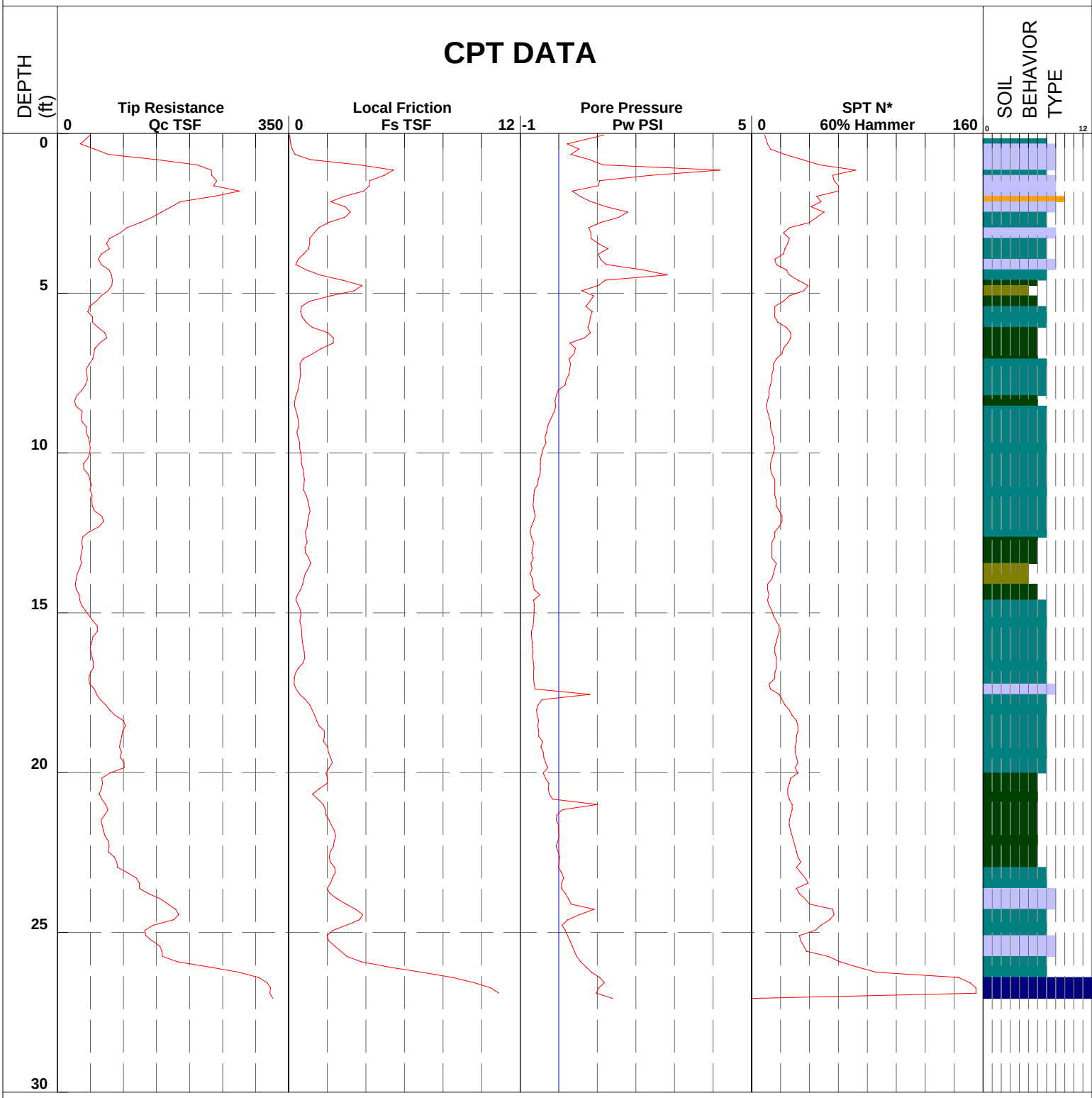
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 29.3' Qc>800 Fs>11

BUREAU OF RECLAMATION

Hole #	CPT9-14-27	Cone #	DSG1028	Date/Time	7/23/2014 1:17:38 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



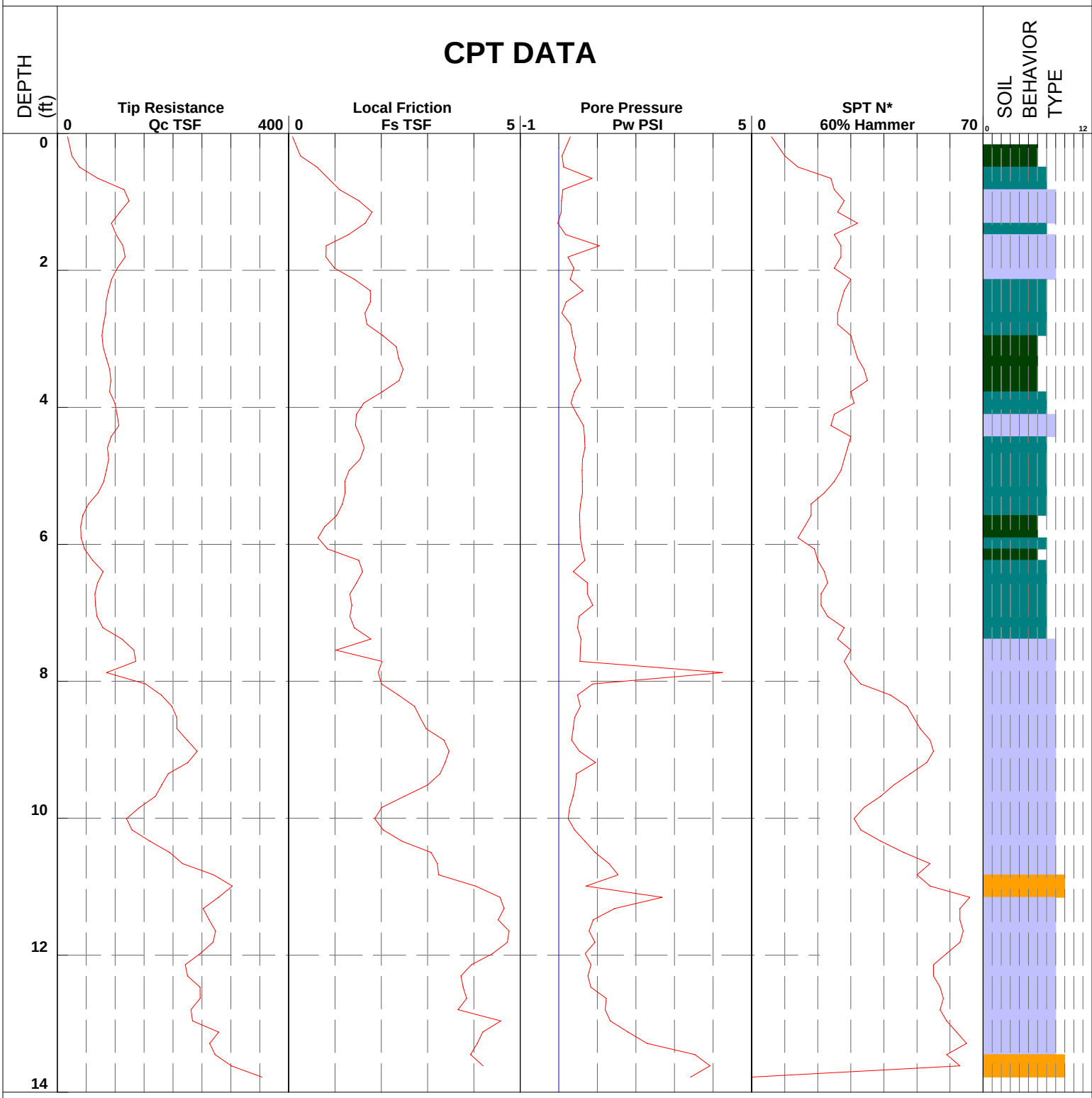
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 27.3' Qc>300 Fs>11

BUREAU OF RECLAMATION

Hole #	CPT9-14-28	Cone #	DSG1028	Date/Time	7/26/2014 12:24:26 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



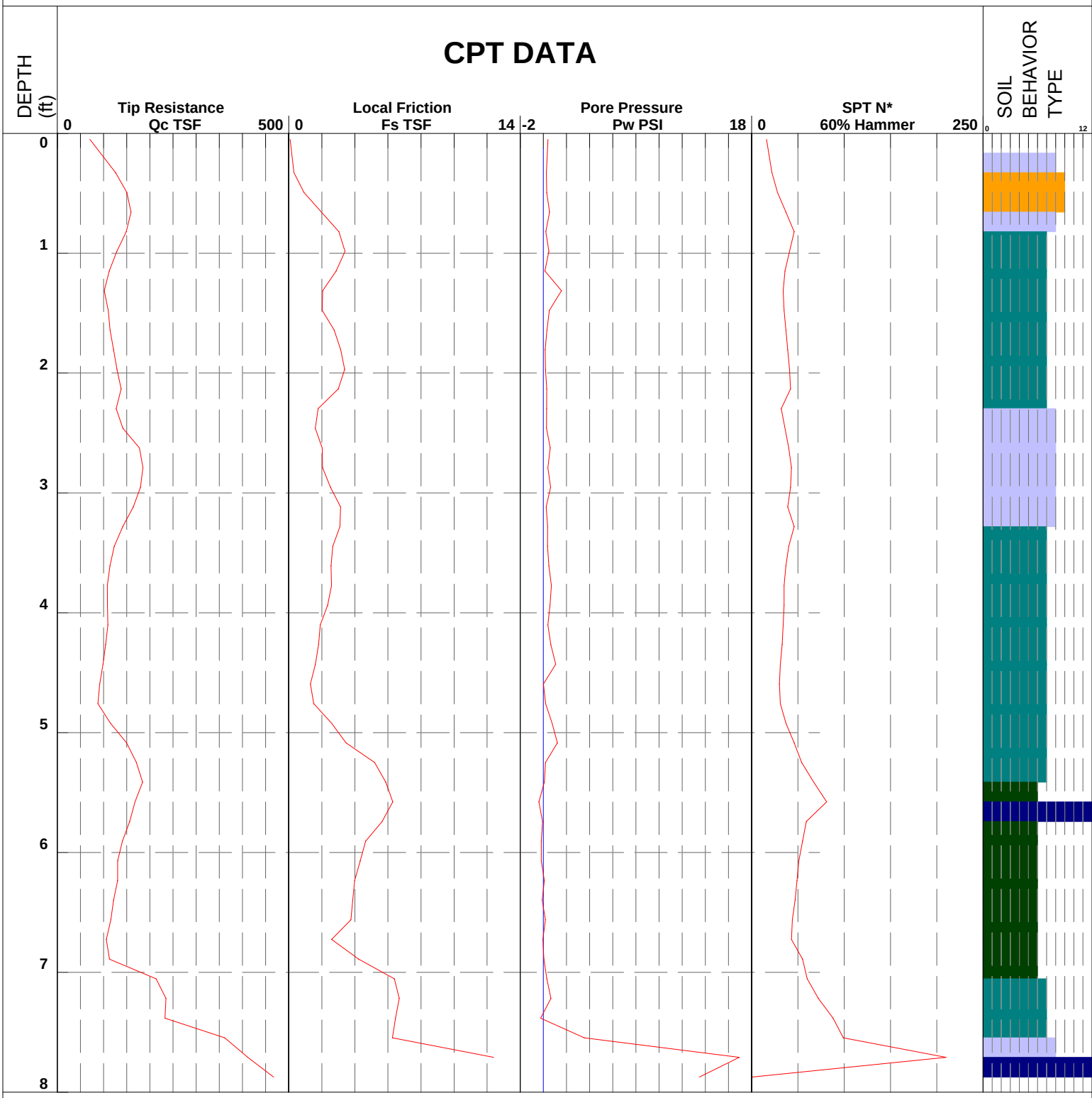
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 14.1' Qc>650

BUREAU OF RECLAMATION

Hole #	CPT9-14-29	Cone #	DSG1028	Date/Time	7/26/2014 12:51:15 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



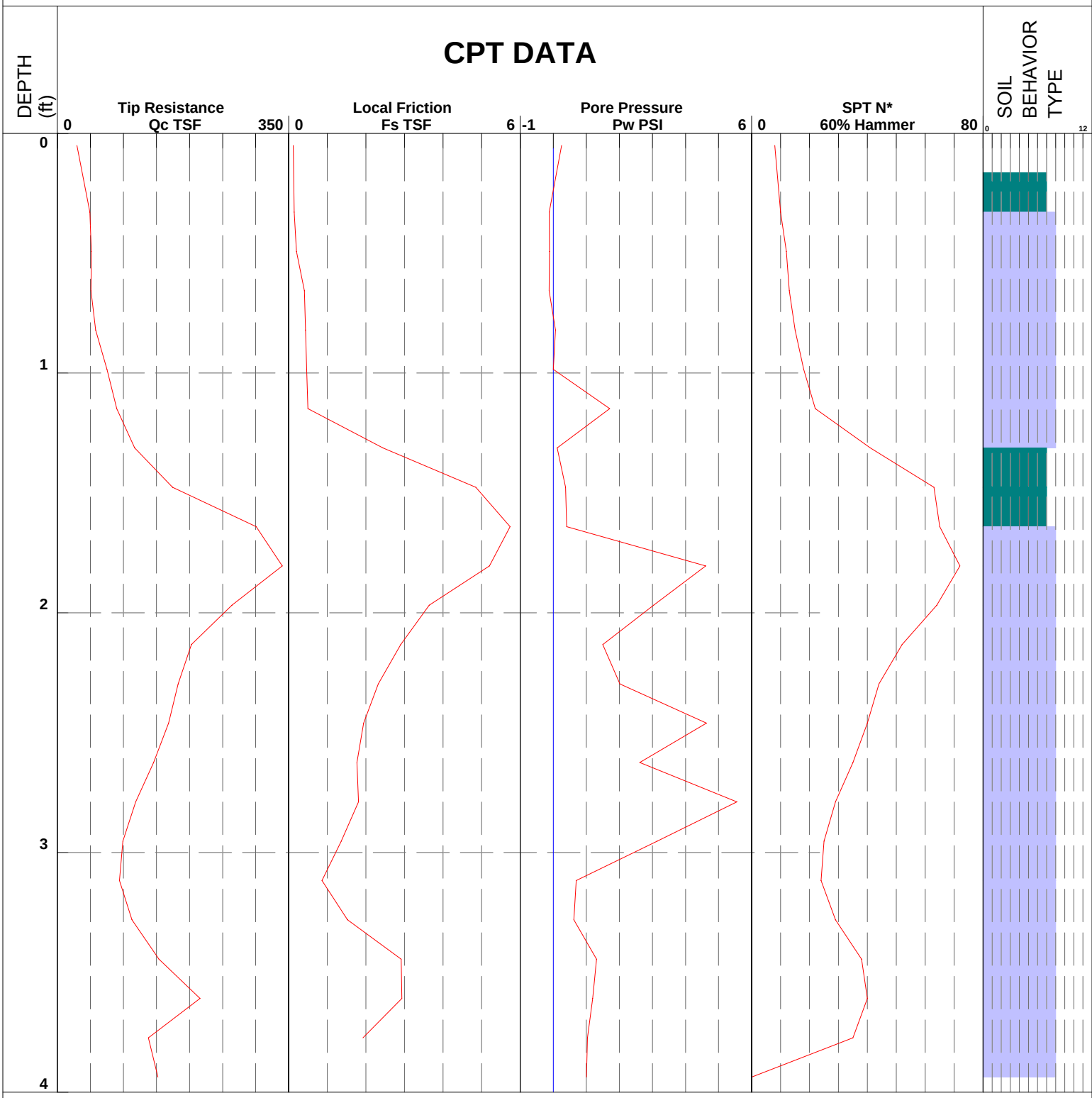
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 8' Qc>500 Fs>12

BUREAU OF RECLAMATION

Hole #	CPT9-14-30	Cone #	DSG1028	Date/Time	7/26/2014 1:24:23 PM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



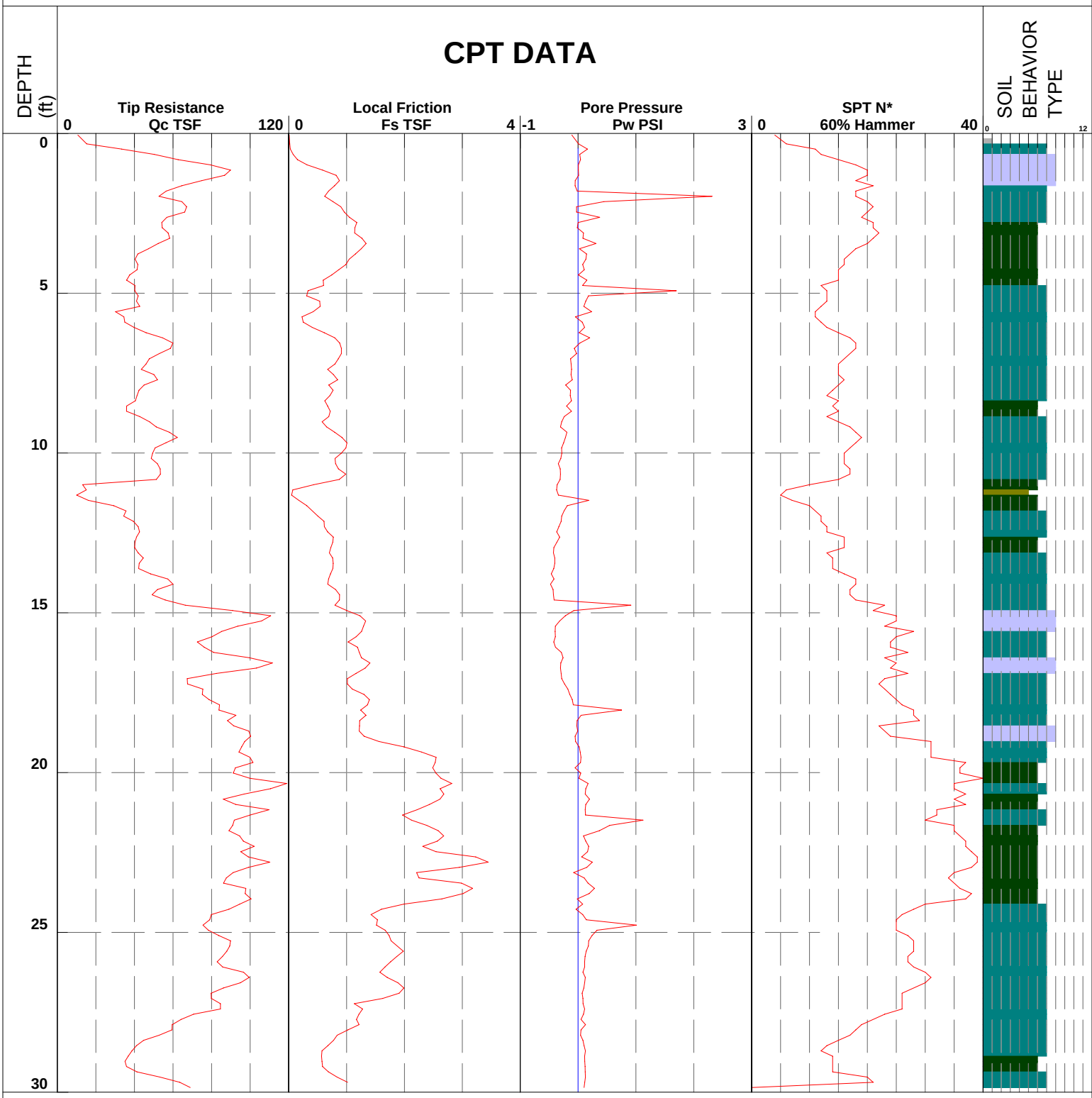
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 4.2' Qc>500 Inc>7

BUREAU OF RECLAMATION

Hole #	CPT9-14-31	Cone #	DSG1028	Date/Time	7/26/2014 10:53:38 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



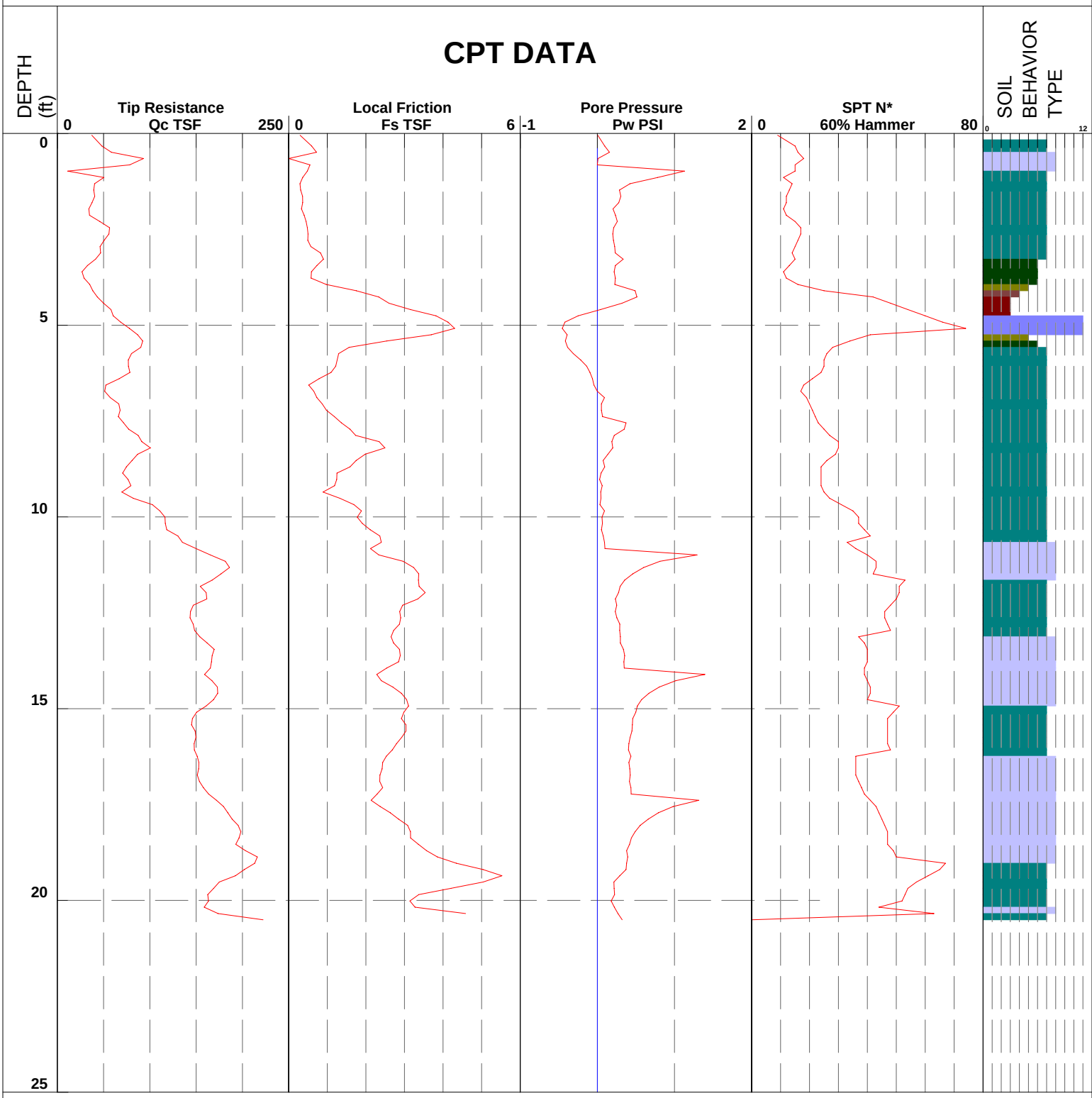
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 30'

BUREAU OF RECLAMATION

Hole #	CPT9-14-32	Cone #	DSG1028	Date/Time	7/26/2014 10:06:52 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



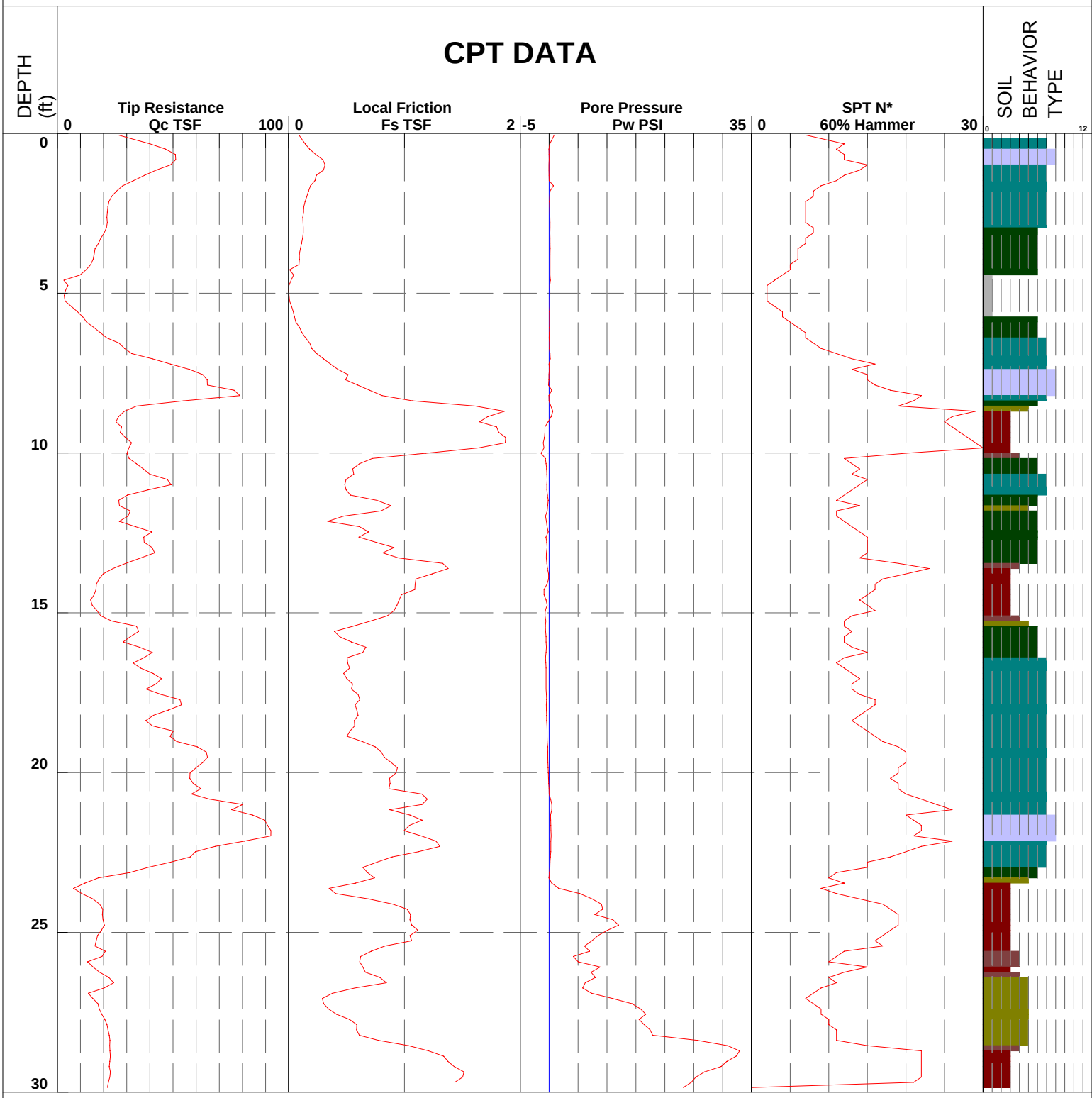
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 20.7' Qc>800

BUREAU OF RECLAMATION

Hole #	CPT9-14-33	Cone #	DSG1028	Date/Time	7/26/2014 9:16:39 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



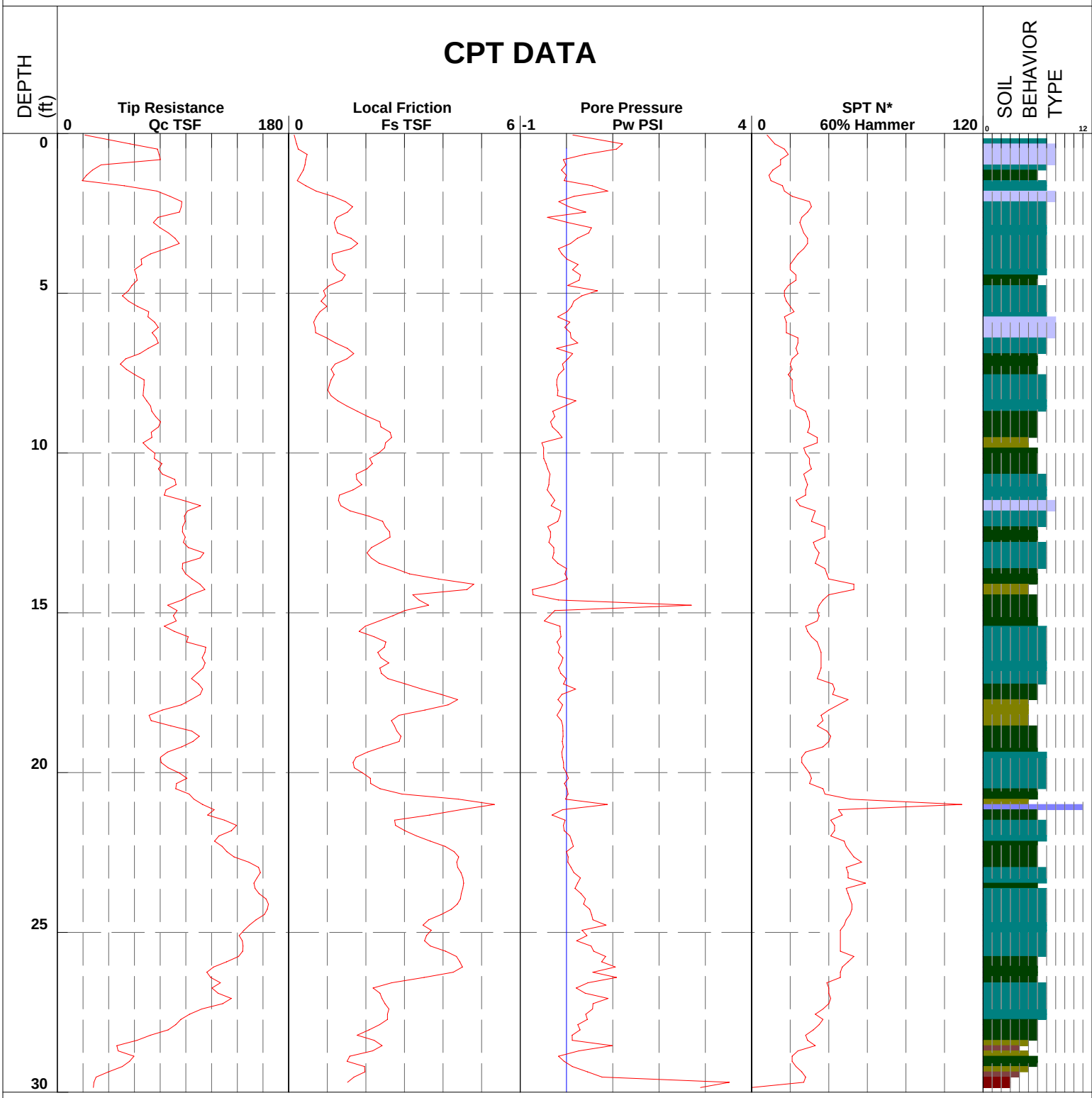
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 30'

BUREAU OF RECLAMATION

Hole #	CPT9-14-35	Cone #	DSG1028	Date/Time	7/26/2014 8:02:24 AM
Project	NGWSP	Location	REACH 9	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



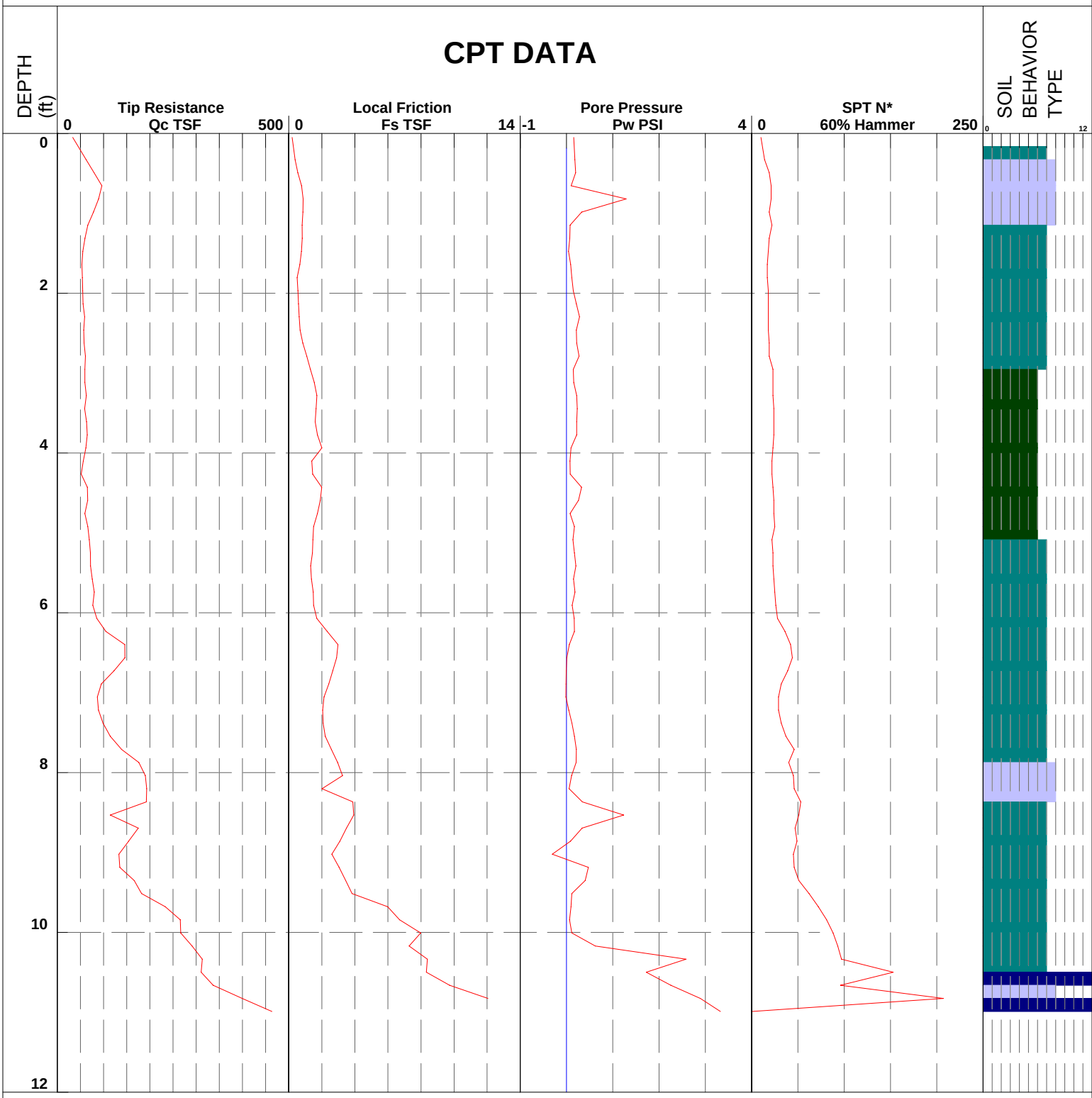
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 30'

BUREAU OF RECLAMATION

Hole #	CPT10-14-2	Cone #	DSA0739	Date/Time	6/17/2014 8:06:36 AM
Project	NGWSP	Location	REACH 10	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



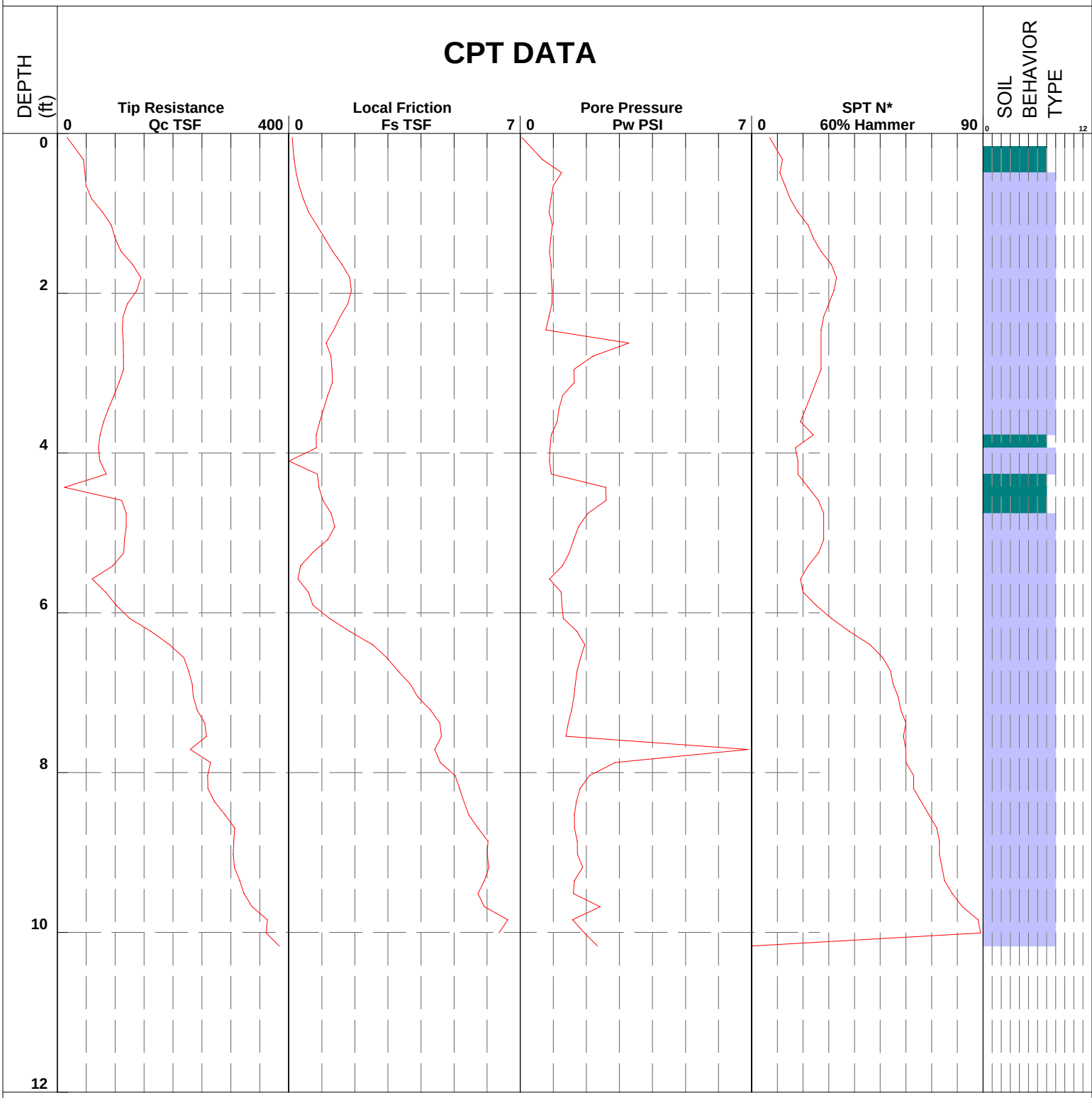
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 11.2', Qc>500 Fs>13

BUREAU OF RECLAMATION

Hole #	CPT10-14-6	Cone #	DSA0739	Date/Time	6/16/2014 10:30:31 AM
Project	NGWSP	Location	REACH 10	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



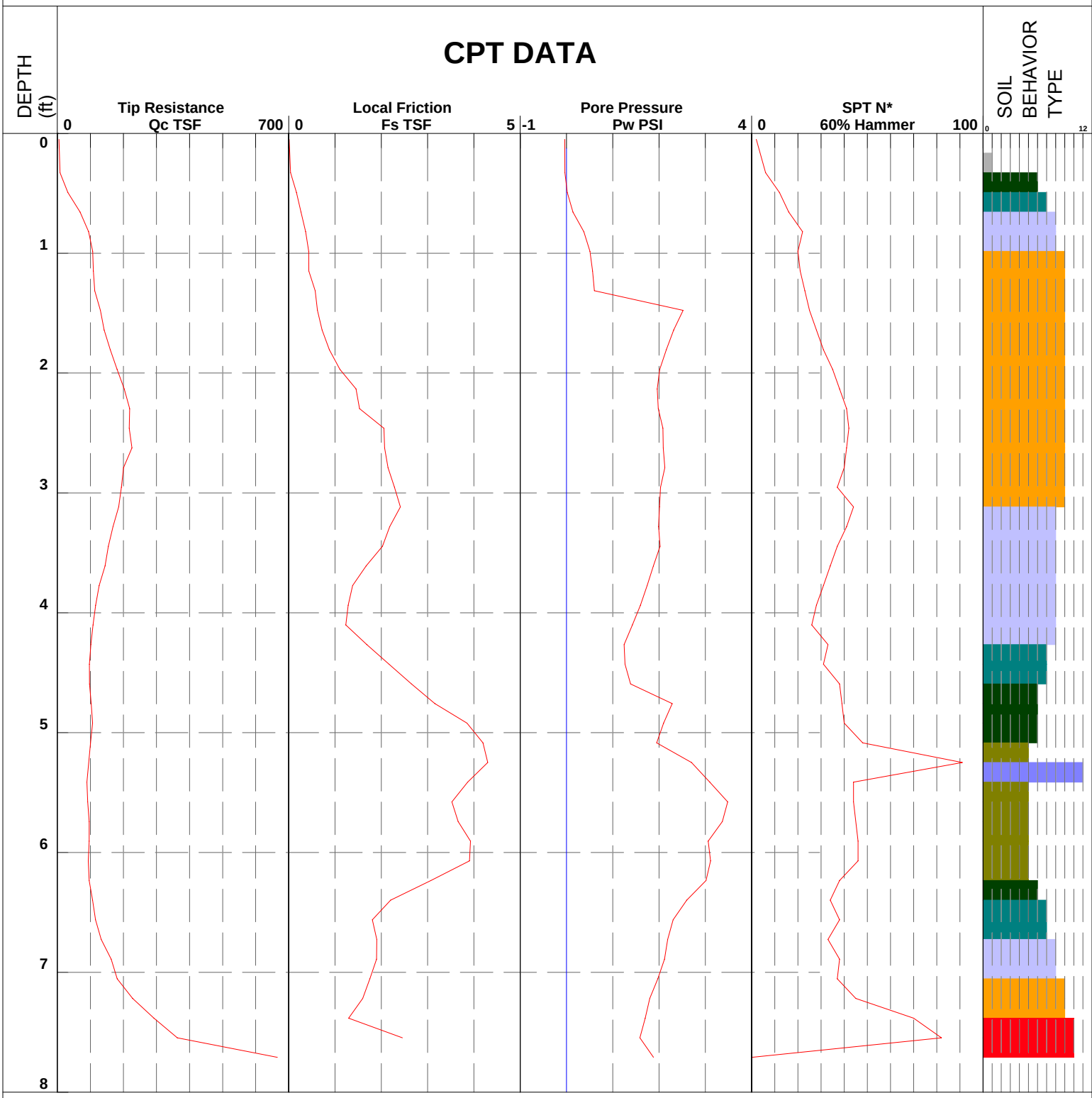
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 10.4' REF Qc>500

BUREAU OF RECLAMATION

Hole #	CPT10-14-7	Cone #	DSA0739	Date/Time	6/16/2014 9:28:35 AM
Project	NGWSP	Location	REACH 10	Operator	L ROBINSON
Station		Offset		Elevation	
		Northing		Easting	

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Total Depth 8' REF Qc>900

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-1

SHEET 1 OF 2

FEATURE: Reaches 9, 10 and 11
PROJECT: Navajo Gallup Water Supply Project
LOCATION: PIPELINE
GROUND ELEVATION: 5879.4
COORDINATES: N 1,844,394 E 2,472,375
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X12.0'X11.7'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/21/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	(SP)gc	0.0 to 9.5 ft POORLY GRADED SAND WITH GRAVEL AND COBBLE: About 50% fine sand; about 45% subangular gravel; about 5% non plastic fines with rapid dilatancy and no dry strength and no toughness. TOTAL SAMPLE (BY VOLUME): About 25% 5 to 12 inch cobbles; about 20% 3- to 5-inch, hard subangular to subrounded cobbles; remainder minus 3-inch; maximum size, 500 mm; strong reaction with HCl to caliche coated gravel and cobbles. IN-PLACE CONDITION: Dry, loose GEOLOGIC INTERPRETATION: Quaternary Pediment Deposit (Qpd)	20	25	tr
9.5 ft (5869.9)					
10	(SP)cb	9.5 to 10.6 ft POORLY GRADED SAND WITH COBBLES AND BOULDERS: About 50% fine sand; about 45% subangular gravel; about 5% non plastic fines with rapid dilatancy and no dry strength and no toughness.	20	25	
10.6 ft (5868.8)					
11	s(CL)	TOTAL SAMPLE (BY VOLUME): About 25% 5 to 12 inch cobbles; about 20% 3- to 5-inch, hard subangular to subrounded cobbles; remainder minus 3-inch; maximum size, 500 mm; strong reaction with HCl to caliche coated gravel and cobbles. IN-PLACE CONDITION: Dry, loose			
11.7 ft (5867.7)					

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE AND TUMBLE WEEDS. DISCONTINUED DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-1

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5879.4
COORDINATES: N 1,844,394 E 2,472,375
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X12.0'X11.7'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/21/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
		GEOLOGIC INTERPRETATION: Quaternary Pediment Deposit (Qpd)			
		10.6 to 11.7 ft SANDY LEAN CLAY: About 50% medium plastic fines with medium dry strength, medium toughness; about 50% fine sand; maximum size, fine sand; no reaction with HCl.			
		IN-PLACE CONDITION: Brown in color			
		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-2

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5844.6
COORDINATES: N 1,842,946 E 2,473,035
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X12.0'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/21/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
0	SM	0.0 to 12.0 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with low toughness, low to no dry strength; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Tan in color, dry. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 96.2 lbs. / cu ft., 2.6 %.(93.3 % compaction) LAB TEST DATA: 83.5% sand, 16.4 % fines, LL= NA, PI = NP SPG = 2.63 Maximum dry density= 103.1 lbs. / cu ft., optimum water content = 14.3% Laboratory classification is: SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6	IN-PLACE DENSITY TAKEN AT 7.5 ft				
12	12.0 ft (5832.6)				

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, DISCONTINUED DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-3

SHEET 1 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5830.5
COORDINATES: N 1,840,673 E 2,473,294
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X8.5'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/22/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 2.5 ft CLAYEY SAND: About 80% fine sand; about 20% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Tan color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2					
	2.5 ft (5828.0)				
3	s(CL)	2.5 to 5.0 ft SANDY LEAN CLAY: About 50% medium plastic fines with medium dry strength, medium toughness; about 50% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown in color GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4					
5	5.0 ft (5825.5)				
	CLAYSTONE	5.0 to 8.0 ft CLAYSTONE: Grey in color, mottled, soft (H6) moderately weathered (W5), moist, intermittent iron oxide staining and calcite nodules; strong reaction with HCl. Recovered as 2 to 4 inch subangular fragments. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
6					
7					
8	8.0 ft (5822.5)				
	SANDSTONE	8.0 to 8.5 ft SANDSTONE: Fine grained, tan in color, very soft (H7) and very intensely weathered (W8) in top 0.5 ft; becomes soft (H6) and moderately to intensely weathered (W6) below top 0.5 ft; thinly to moderately bedded; intermittent iron oxide staining and calcareous zones; no reaction with HCl outside calcareous zones. Recovered as 3 to 10 inch subangular fragments.			
	8.5 ft (5822.0)				

COMMENTS: SURFACE SPARSLEY VEGETATED WITH RUSSIAN THISTLE, REFUSAL MET AT 8.5 FT

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-3

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5830.5
COORDINATES: N 1,840,673 E 2,473,294
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X8.5'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/22/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
		GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-4

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5836.1
COORDINATES: N 1,839,252 E 2,473,697
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X13.0'X14.5'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/22/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 4.2 ft CLAYEY SAND: About 60% fine sand; about 40% fines with low plasticity, low toughness, low dry strength and slow dilatancy, maximum size; fine sand; weak reaction with HCl. IN-PLACE CONDITION: Tan color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
4	4.2 ft (5831.9)				
5	SM (VISUAL) (SM)g (LAB CLASS)	4.2 to 14.5 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown in color. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 104.7 lbs. / cu ft., 2.8 %.(93.3 % compaction) LAB TEST DATA: 67.9% sand, 14.4 % fines, 17.7% gravel, LL= NA, PI = NP SPG = 2.64 Maximum dry density= 116.3 lbs. / cu ft., optimum water content = 11.6% Laboratory classification is: SILTY SAND WITH GRAVEL			
9	IN-PLACE DENSITY TAKEN AT 7.0 ft	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
14	14.5 ft (5821.6)				

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, DISCONTINUED DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-5

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5836.4
COORDINATES: N 1,838,473 E 2,474,173
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X13.0'X13.2'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/22/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP-SM	0.0 to 6.9 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% non plastic fines with no toughness, no dry strength; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Tan in color, dry. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7	6.9 ft (5829.5)				
8	SM (VISUAL) (CL)s (LAB CLASS)	6.9 to 13.2 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with rapid dilatancy and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown in color. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 103.4 lbs. / cu ft., 6.2 %.(97.2 % compaction) LAB TEST DATA: 82.7 % fines, 17.3% sand, LL= 29.4, PI = 8.1 SPG = NA Maximum dry density= 106.4 lbs. / cu ft., optimum water content = 17.2% Laboratory classification is: LEAN CLAY WITH SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
10	IN-PLACE DENSITY TAKEN AT 7.0 ft				
13	13.2 ft (5823.2)				

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, DISCONTINUED DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-8

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5865.6
COORDINATES: N 1,833,412 E 2,475,530
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X14.0'X11.0'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/22/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM	0.0 to 2.1 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown in color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
2	2.1 ft (5863.5)				
3	SC	2.1 to 6.9 ft CLAYEY SAND: About 60% fine sand; about 40% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Tan color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
7	6.9 ft (5858.7)				
8	s(CL)	6.9 to 11.0 ft SANDY LEAN CLAY: About 50% medium plastic fines with medium dry strength, medium toughness; about 50% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown in color IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 78.1 lbs. / cu ft., 2.6 %.(71.4 % compaction) LAB TEST DATA: 39.6% sand, 60.3 % fines, 0.1% gravel LL= 33.1, PI = 19.9 SPG =2.62 Maximum dry density= 109.0 lbs. / cu ft., optimum water content = 17.0% Laboratory classification is: SANDY LEAN CLAY GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
9	IN-PLACE DENSITY TAKEN AT 7.0 FT				
11	11.0 ft (5854.6)				

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE. DISCONTINUED DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-9

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5880.7
COORDINATES: N 1,832,446 E 2,475,823
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X13.0'X11.6'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/22/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
0	(SM)gc	0.0 to 6.7 SILTY SAND WITH GRAVELS AND COBBLES: About 40% fine sand; about 30% subrounded to subangular gravel; about 25% subrounded to subangular cobbles; about 5% nonplastic fines; no reaction with HCl. IN-PLACE CONDITION: Loose, dry. GEOLOGIC INTERPRETATION: Quaternary Pediment Deposit (Qpd)		25%	
6.7 ft (5874.0)	CLAYSTONE	6.7 to 11.6 FT CLAYSTONE: Grey in color, mottled, soft (H6) moderately weathered (W5), moist, intermittent iron oxide staining and calcite nodules; strong reaction with HCl on calcite. Recovered as 2 to 4 inch blocky fragments. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
11.6 ft (5869.1)					

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-10

SHEET 1 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPIELINE
GROUND ELEVATION: 5880.8
COORDINATES: N 1,830,005 E 2,476,729
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X13.0'X12.3'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/23/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1–10	SP-SM	0.0 to 10.2 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, low dry strength; strong reaction with HCl. IN-PLACE CONDITION: Grayish brown in color, calcite cement. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 91.1 lbs. / cu ft., 3.9%.(82.4 % compaction) LAB TEST DATA: 74.0% sand, 26.0 % fines, LL = NA, PI = NP SPG = 2.65 Maximum dry density= 110.6 lbs. / cu ft., optimum water content = 14.5% Laboratory classification is: SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
	IN-PLACE DENSITY TAKEN AT 7.0 ft				
10	~~10.2 ft (5870.6)~~				
10–11	SANDSTONE	10.2 to 11.0 ft SANDSTONE: Fine grained, tan in color, slightly weathered to fresh (W2); moderately hard (H4), thinly to moderately bedded; intermittent calcareous zones; no reaction with HCl outside calcareous zones. Recovered as 2 to 4 inch blocky fragments.			
11	~~11.0 ft (5869.8)~~				
11–12	CLAYSTONE	GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf) 11.0 to 12.3 ft CLAYSTONE: Grey in color, mottled, soft (H6) moderately weathered (W5), moist, intermittent iron oxide staining, recovered as 2 to 4 inch blocky fragments; no reaction with HCl.			
12	~~12.3 ft (5868.5)~~				

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, MET BACKHOE REFUSAL ON BEDROCK AT 12.3 FT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-10

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPIELINE
GROUND ELEVATION: 5880.8
COORDINATES: N 1,830,005 E 2,476,729
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X13.0'X12.3'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/23/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
		GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-11

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5910.4
COORDINATES: N 1,828,831 E 2,476,970
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 12.0'X10.0'X8.0'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/23/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 3.3 ft CLAYEY SAND: About 60% fine sand; about 40% fines with medium plasticity, medium toughness, medium dry strength and slow dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown in color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
2					
3					
3.3 ft (5907.1)	SM	3.3 to 7.2 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown in color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
4					
5					
6					
7					
7.2 ft (5903.2)	SANDSTONE	7.2 to 8.0 ft SANDSTONE: Fine grained, tan in color, very soft (H7) and very intensely weathered to decomposed (W8-W9) in top 1.5 ft; becomes moderately soft (H5) and moderately to intensely weathered (W6); thinly to moderately bedded; recovered as 3 to 5 inch fragments; no reaction with HCl. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
8.0 ft (5902.4)					

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE. REFUSAL MET ON SANDSTONE.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-12

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5963.5
COORDINATES: N 1,826,548 E 2,477,808
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 13.0'X10.0'X12.2'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/23/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
0	SC	0.0 - 2.5 FT CLAYEY SAND: About 60% fine sand; about 40% fines with medium plasticity, medium toughness, medium dry strength and slow dilatancy; no reaction with HCl. IN-PLACE CONDITION: Reddish brown in color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
2.5 ft (5961.0)	(SM)gc	2.5 - 12.2 FT SILTY SAND WITH GRAVELS AND COBBLES: About 40% fine sand with rapid dilatency; about 30% subrounded to subangular gravel; about 25% subrounded to subangular cobbles; about 5% nonplastic fines; no reaction with HCl. IN-PLACE CONDITION: Loose, dry. GEOLOGIC INTERPRETATION: Quaternary Pediment Deposit (Qpd)	30%	25%	
12.2 ft (5951.3)					

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR9-15-13

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 5960.1
COORDINATES: N 1,825,418 E 2,478,093
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X11.7'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE:
DATE EXCAVATED: 10/23/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP-SM	0.0 to 3.8 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Tan color, loose. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
2					
3					
3.8 ft (5956.3)					
4	s(CL)	3.8 to 6.4 ft LEAN CLAY: About 50% medium plastic fines with medium dry strength, medium toughness; about 50% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown in color GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
5					
6					
6.4 ft (5953.7)					
7	(SM)gc	6.4 to 11.7 ft SILTY SAND WITH GRAVELS AND COBBLES: About 40% fine sand; about 30% subrounded to subangular gravel; about 30% nonplastic fines with rapid dilatency; no reaction with HCl. TOTAL SAMPLE (BY VOLUME): About 25% 5 to 12 inch cobbles; about 20% 3- to 5-inch, hard subangular to subrounded cobbles; remainder minus 3-inch; maximum size, 500 mm; strong reaction to caliche coated gravel and cobbles. IN-PLACE CONDITION: Loose, dry. GEOLOGIC INTERPRETATION: Quaternary Pediment Deposit (Qpd)	20%	25%	
8					
9					
10					
11					
11.7 ft (5948.4)					

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, DISCONTINUED DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-14

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5949.5
COORDINATES: N 1,823,263 E 2,478,913
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X10.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/17/2015
DATE EXCAVATED: 11/17/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM	0.0 to 2.0 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Light brown in color, loose consolidation.			
2	2.0 ft (5947.5)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3	SC	2.0 to 5.6 ft CLAYEY SAND: About 80% fine sand; about 20% fines with low to medium plasticity, medium toughness, medium dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown in color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
5	5.6 ft (5943.9)				
6	s(CL) (VISUAL) SC-SM (LAB CLASSIF)	5.6 to 9.5 ft SANDY LEAN CLAY: About 60% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Grey in color, calcareous, firm consistency.			
7	In-place density and 50 Lb sample taken from 7.0 to 8.0 ft.	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 TO 8.0 ft. Total: 101.6 lbs. / cu ft., 6.3%. (89.7% compaction) LAB TEST DATA: 62.8% sand, 36.8% fines, 0.4% gravel, LL = 21.9, PI = 5.7 SPG = 2.61 Maximum dry density = 113.3 lbs. / cu ft., optimum water content = 14.5% Laboratory classification is CLAYEY SAND WITH SILT			
9	9.5 ft (5940.0)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
10	SANDSTONE 10.0 ft (5939.5)	9.5 to 10.0 ft SANDSTONE: Fine grained, moderately to intenesely weathered (W6), soft (H6), brownish red in color, moderately bedded; recovered from bucket as 5 inch subangular fragments. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH. DISCONTINUED EXCAVATION DUE TO REFUSAL ON SANDSTONE BEDROCK.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-15

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5945.5
COORDINATES: N 1,822,080 E 2,479,154
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/17/2015
DATE EXCAVATED: 11/17/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP (VISUAL) SM (LAB CLASSIF)	0.0 to 12.0 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brownish grey in color; moist in top 2.0 ft; weak cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 TO 8.0 ft. Total: 89.4 lbs. / cu ft., 3.3%. (84.8 % compaction) LAB TEST DATA: 67.4% sand, 32.6% fines, LL = N/P, PI = N/P SPG = 2.63 Maximum dry density = 105.4 lbs. / cu ft., optimum water content = 14.0% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2					
3					
4					
5	In-place density and 50 Lb sample taken from 7.0 to 8.0 ft.				
6					
7					
8					
9					
10					
11					
12	12.0 ft (5933.5)				
13	(SP)gc	12.0 to 14.0 ft POORLY GRADED SAND WITH GRAVEL AND COBBLES: About 75% predominately fine sand, trace medium to coarse sand; about 20% fine to coarse, subrounded gravel; about 5% nonplastic fines, with rappid dilatancy, and no dry strength; maximum size, coarse gravel.	10	5	trace
14	14.0 ft (5931.5)	TOTAL SAMPLE (BY VOLUME) About 15% subrounded, hard, sandstone cobbles; trace subrounded to subangular sandstone boulders; remainder minus 3-inch; maximum size, 12 inches. IN-PLACE CONDITION: Grey in color; dry; weak cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. COBBLES AND GRAVEL SCATTERED ON SURFACE. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-16

SHEET 1 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5941.7
COORDINATES: N 1,820,886 E 2,479,400
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/17/2015
DATE EXCAVATED: 11/17/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP	0.0 to 7.0 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brownish grey in color; moist in top 2.0 ft; weak cementation, stratified. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
7	7.0 ft (5934.7)				
7	7.3 ft (5934.4) (CL)s	7.0 to 7.3 ft LEAN CLAY WITH SAND: About 75% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 25 % fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Dark gray in color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).	tr		
8	SP (VISUAL) SM (LAB CLASSIF) In-place density and 50 Lb sample taken from 7.5 to 8.5 ft.	7.3 to 12.5 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; trace fine to coarse gravel and cobbles; maximum size, 100mm; strong reaction with HCl. IN-PLACE CONDITION: Brownish grey in color; weak cementation.			

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-16

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5941.7
COORDINATES: N 1,820,886 E 2,479,400
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/17/2015
DATE EXCAVATED: 11/17/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
11	In-place density and 50 Lb sample taken from 7.5 to 8.5 ft.	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal). IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.5 TO 8.5 ft. Total: 88.4 lbs. / cu ft., 4.1%. (80.1% compaction) LAB TEST DATA: 63.5% sand, 31.6% fines, LL= NP, PI= NP SPG= 2 .63 Maximum dry density: 110.4 lbs. / cu ft., optimum water content= 13.6% Laboratory classification is SILTY SAND.			
12	12.5 ft (5929.2)				
13	(SP)gc			15	tr
14	14.0 ft (5927.7)	12.5 to 14.0 ft POORLY GRADED SAND WITH GRAVEL AND COBBLES: About 75% predominately fine sand, trace medium to coarse sand; about 20% fine to coarse, subrounded gravel; about 5% nonplastic fines, with rapid dilatancy, and no dry strength. Total sample (BY VOLUME): About 15% subrounded, hard, sandstone cobbles; trace subrounded to subangular sandstone boulders; remainder minus 3-inch; maximum size, 300mm. IN-PLACE CONDITION: Grey in color; dry; weak cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-17

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5933.6
COORDINATES: N 1,818,541 E 2,479,688
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/18/2015
DATE EXCAVATED: 11/18/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP-SM	0.0 to 1.9 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl.			
1.9 ft (5931.7)		IN-PLACE CONDITION: Brownish grey in color dry, weak cementation.			
2	SP	GEOLOGIC INTERPRETATION: Quaternary alluvium (Qal).			
3		1.9 to 4.3 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl.			
4.3 ft (5929.3)		IN-PLACE CONDITION: Light brown in color; dry, weak cementation, homogenous.			
5	SC (VISUAL) s(CL) (LAB CLASSIF)	GEOLOGIC INTERPRETATION: Quaternary alluvium (Qal).			
6		4.3 to 14.0 ft CLAYEY SAND: About 70% fine sand; about 30% fines with medium plasticity, medium toughness, and medium dry strength; maximum size, fine sand; weak reaction with HCl.			
7		IN-PLACE CONDITION: Brown in color; dry; becomes moist below 9.0 ft.			
8		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 TO 8.0 ft. Total: 92.1 lbs. / cu ft., 7.2 %. (83.3% compaction) LAB TEST DATA: 50.8% fines, 49.2% sand, LL = 26.8 , PI = 14.0 SPG = 2.65 Maximum dry density = 110.5 lbs. / cu ft., optimum water content = 15.5 % Laboratory classification is SANDY LEAN CLAY.			
9	In-place density and 50 Lb sample taken from 7.0 to 8.0 ft.				
10		GEOLOGIC INTERPRETATION: Quaternary alluvium (Qal).			
11					
12					
13					
14.0 ft (5919.6)					
14					

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-18

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5940.6
COORDINATES: N 5,934 E 2,480,020
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X8.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/18/2015
DATE EXCAVATED: 11/18/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP-SM	0.0 to 4.0 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brownish grey in color dry, weak cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4	4.0 ft (5936.6)				
5	COBBLES AND BOULDERS	4.0 to 8.0 ft COBBLES AND BOULDERS WITH GRAVEL SAND AND SILT: About 50% fine to coarse gravel; about 40% fine to coarse sand; about 10% nonplastic fines with rapid dilatancy, no dry strength and rapid dilatancy; maximum size, coarse gravel; grey in color, no reaction with HCl. TOTAL SAMPLE (BY VOLUME): About 30% 3 to 5 inch, hard, fine grained, subrounded sandstone cobbles; about 15% 5 to 12 inch hard, fine grained, subrounded sandstone cobbles; about 10% hard fine grained, subrounded sandstone boulders; remainder minus 3-inch; maximum size, 1.6 ft.	30	15	10
6	50 pound bag sample collected from 4 to 8 ft.				
7		IN-PLACE CONDITION: Brownish grey in color dry, weak cementation, sloughing test pit walls. LAB TEST DATA: 43.1% sand, 47.3% gravel, 9.6% fines, LL= NP , PI = NP (Minus 3 inch fraction, by mass) Laboratory classification is: POORLY GRADED GRAVEL WITH SILT AND SAND.			
8	8.0 ft (5932.6)	GEOLOGIC INTERPRETATION: Quaternary alluvium (Qal).			

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT. NO IN-PLACE DENSITY TEST CONDUCTED IN COBBLES AND BOULDERS.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-19

SHEET 1 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5943.9
COORDINATES: N 816,203 E 2,480,335
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X15.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/18/2015
DATE EXCAVATED: 11/18/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP-SM	0.0 to 2.1 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl.			
2	2.1 ft (5941.8)	IN-PLACE CONDITION: Brownish red in color dry, weak cementation, roots throughout.			
3	SC	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
4	4.0 ft (5939.9)	2.1 to 4.0 ft CLAYEY SAND: About 70% fine sand; about 30% fines with medium plasticity, medium toughness, medium dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl.			
5	SP-SM	IN-PLACE CONDITION: Brownish red in color, moderate calcite cementation, roots throughout.	Trace		
6	6.0 ft (5937.9)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal			
7	(SP-SM)gc	4.6 to 6.0 ft POORLY GRADED SAND WITH SILT: About 90% predominately fine fine sand, about 10% nonplastic fines with rapid dilatancy, and low dry strength; trace medium to coarse sand and subrounded sandstone gravel and cobbles; maximum size, 100 mm; strong reaction with HCl.	15		
8	7.5 ft (5936.4)	IN-PLACE CONDITION: Brownish red in color dry, weak cementation, roots throughout.	Trace		
9	SP-SM (VISUAL) SM (LAB CLASSIF)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
10		7.5 to 15.0 ft POORLY GRADED SAND WITH SILT GRAVEL AND COBBLES:			
11	In-place density and 50 Lb sample taken from 8.0 to 9.0 ft.	MINUS 3 INCH FRACTION (BY MASS): About 70% predominately fine fine sand; about 20% fine to coarse, subrounded sandstone gravel; 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, coarse gravel; strong reaction with HCl.			
12		TOTAL SAMPLE (BY VOLUME): About 15% subrounded sandstone cobbles; remainder minus 3-inch; maximum size, 100 mm;			
13		IN-PLACE CONDITION: Brownish red in color dry, weak cementation, roots throughout.			
14		GEOLOGIC INTERPRETATION: Quaternary Pediment (Qpd).			
15	15.0 ft (5928.9)	7.5 to 15.0 ft POORLY GRADED SAND WITH SILT: About 90% predominately fine fine sand, trace medium to coarse sand and subrounded sandstone gravel and cobbles; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, 100 mm; strong reaction with HCl.			

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-19

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5943.9
COORDINATES: N 816,203 E 2,480,335
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X15.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/18/2015
DATE EXCAVATED: 11/18/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
		IN-PLACE CONDITION: Brownish red in color dry, weak cementation, roots throughout. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 8.0TO 9.0 ft. Total: 104.8 lbs. / cu ft., 2.7 %.(95.9 % compaction) LAB TEST DATA: 79.1% sand, 13.7 % fines, 7.2 % gravel, LL= N/P, PI = N/P SPG = 2.64 Maximum dry density= 109.3 lbs. / cu ft., optimum water content = 13.7 % Laboratory classification is: SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Pediment (Qpd).			

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-20

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5915.4
COORDINATES: N 1,814,971 E 2,480,694
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X10.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/18/2015
DATE EXCAVATED: 11/18/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
0	0.3 ft (5915.1) SC	0.0 to 0.3 ft CLAYEY SAND: About 70% fine sand; about 30% fines with medium plasticity, medium toughness, medium dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl.			
1	SP-SM 1.3 ft (5914.1)	IN-PLACE CONDITION: Grayish brown in color, moderate cementation, roots throughout.			
2	SC	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 0.3 to 1.3 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl.			
3		IN-PLACE CONDITION: Grayish brown in color, calcite cement.			
4	4.3 ft (5911.1)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 1.3 to 4.3 ft CLAYEY SAND: About 75% fine sand; about 25% fines with medium plasticity, medium toughness, medium dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl.			
5	s(CL) (VISUAL) (CL)s (LAB CLASSIF)	IN-PLACE CONDITION: Grayish brown in color, moderate cementation, roots throughout.			
6		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.3 to 10.0 ft SANDY LEAN CLAY: About 60% fines with medium plasticity, medium to high dry strength, and medium to high toughness; about 40% fine sand; maximum size, fine sand; strong reaction with HCl.			
7	In-place density and 50 Lb sample taken from 8.0 to 9.0 ft. 1 Gal bag sample collected at 10.0 ft.	IN-PLACE CONDITION: Grey in color, moderate cementation, calcite nodules and roots throughout.			
8		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 8.0 TO 9.0 ft. Total: 96.8 lbs. / cu ft., 9.9 %. (96.2% compaction) LAB TEST DATA: 36.2% sand, 63.8 % fines, LL= 36.9, PI = 24.6 SPG = 2.65 Maximum dry density = 100.6 lbs. / cu ft., optimum water content = 21.1 % Laboratory classification is: SANDY LEAN CLAY.			
9		BAG SAMPLE LAB TEST DATA: 23.4% sand, 76.6% fines, LL= 49.0 , PI = 35.1 SPG = 2.61 Laboratory classification is LEAN CLAY WITH SAND			
10	10.0 ft (5905.4)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-21

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5981.9
COORDINATES: N 1,812,647 E 2,481,160
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X13.5'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/19/2015
DATE EXCAVATED: 11/19/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP	0.0 to 2.0 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown in color, weak cementation.			
2 ft (5979.9)					
2	(GP)scb	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 2.0 to 11.0 ft POORLY GRADED GRAVEL WITH SAND, COBBLES AND BOULDERS: About 50% fine to coarse gravel; about 40% fine to coarse sand; about 10% nonplastic fines with rapid dilatancy, no dry strength and rapid dilatancy; grey in color, no reaction with HCl. Total sample (BY VOLUME): About 20% 3 to 5 inch, hard fine grained, hard, subrounded sandstone cobbles; about 15% 5-12 inch hard fine grained, hard, subrounded sandstone cobbles; about 10% hard fine grained, subrounded sandstone boulders; remainder minus 3-inch; maximum size, 600mm. IN-PLACE CONDITION: Brownish grey in color dry, weak cementation, cobbles and boulders coated with calcite cement, sloughing test pit walls. GEOLOGIC INTERPRETATION: Quaternary Pediment (Qpd).	20	15	10
11.0 ft (5970.9)					
11	(SP)g	11.0 to 13.5 ft POORLY GRADED SAND WITH GRAVEL: About 80% predominately fine sand, about 15% fine to coarse gravel; about 5% nonplastic fines with rapid dilatancy, and no dry strength; trace medium to coarse sand; maximum size, coarse gravel; weak reaction with HCl. IN-PLACE CONDITION: Brownish grey in color, dry, weak cementation.			
13.5 ft (5968.4)		GEOLOGIC INTERPRETATION: Quaternary alluvium (Qal)			

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT. NO IN-PLACE DENSITY TEST CONDUCTED IN COBBLES AND BOULDERS.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-22

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5957.4
COORDINATES: N 1,811,501 E 2,481,373
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X4.0'X5.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/19/2015
DATE EXCAVATED: 11/19/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	(CL)s (VISUAL) 1 gal bag sample collected from 0.0 to 1.2 ft.	0.0 to 1.2 ft LEAN CLAY WITH SAND: About 75% fines with medium to high plasticity, medium to high dry strength, and medium to high toughness; about 25% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brownish grey in color, firm consistency, gypsum veins, roots throughout. BAG SAMPLE LAB TEST DATA: 22.9 % sand, 75.8 % fines, LL= 52.2 , PI = 38.0, SPG = 2.72. Laboratory classification is: FAT CLAY WITH SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
1.2 ft (5956.2)	CLAYSTONE	1.2 to 5.0 ft CLAYSTONE: Dark grey to brown in color, iron oxide staining, occasional gypsum nodules, sandy, very intensely weathered (W8) and soft (H6) from 1.2 to 2.5 ft. Becomes moderately weathered (W5), and moderately hard (H4) below 2.5 ft. No reaction with HCl, recovered in bucket as 2 to 6 inch blocky fragments. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
2					
3					
4					
5.0 ft (5952.4)					
5					

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO REFUSAL ON CLAYSTONE BEDROCK.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-23

SHEET 1 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5942.1
COORDINATES: N 1,810,266 E 2,481,277
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.5'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/19/2015
DATE EXCAVATED: 11/19/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 1.5 ft CLAYEY SAND: About 85% fine sand; about 15% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl.			
1.5 ft (5940.6)					
2	SP	IN-PLACE CONDITION: Brownish Grey in color, roots throughout. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 1.5 to 7.0 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; trace fine gravel; maximum size, 25 mm; no reaction with HCl. IN-PLACE CONDITION: Brown in color weak cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7.0 ft (5935.1)					
8	SM	7.0 to 14.0 ft SILTY SAND: About 85 % fine sand: about 15% fines with no plasticity, no dry strength and rapid dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown in color, moist, weak cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 TO 8.0 ft. Total: 92.2 lbs. / cu ft., 7.2 %. (83.7 % compaction) LAB TEST DATA: 57.9 % sand, 42.1 % fines, LL= 22.8, PI = 2.5 SPG = 2.67 Maximum dry density = 110.2 lbs. / cu ft., optimum water content = 14.6 % Laboratory classification is SILTY SAND			
9	In-place density and 50 Lb sample taken from 7.0 to 8.0 ft. 1 gallon corrosion sample collected at 10.0 ft.				
14.0 ft (5928.1)					
14.5 ft (5927.6)	SC	14.0 to 14.5 ft CLAYEY SAND: About 80% predominately fine sand, trace medium sand; about 20% fines with medium plasticity, medium toughness, medium dry strength and slow dilatancy; maximum size, medium sand; strong reaction with HCl.			

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-23

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5942.1
COORDINATES: N 1,810,266 E 2,481,277
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.5'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/19/2015
DATE EXCAVATED: 11/19/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
		IN-PLACE CONDITION: Brown in color, moist, moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-24

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5938.8
COORDINATES: N 1,807,639 E 2,481,099
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X7.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/19/2015
DATE EXCAVATED: 11/19/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP-SM	0.0 to 6.5 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Grayish brown in color, moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2					
3	3.0 ft (5935.8)				
	(SP-SM)g	3.0 to 4.0 ft POORLY GRADED SAND WITH SILT AND GRAVEL: About 75% predominately fine sand, trace medium sand; about 15% subrounded gravel;about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, 60 mm; weak reaction with HCl.			
4	4.0 ft (5934.8)	IN-PLACE CONDITION: Grayish brown in color, calcite cement.			
	SP-SM	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
5		4.0 to 6.5 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Grayish brown in color, calcite cement. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6	6.5 ft (5932.3)				
	CLAYSTONE	6.5 to 7.0 ft CLAYSTONE: Brown to orange in color, iron oxide staining, carbonaceous, gypsum veins, thinly bedded, slightly to moderately weathered (W4), moderately hard (H4), no reaction with HCl. Recovered in bucket as 2 to 6 inch blocky fragments.			
7	7.0 ft (5931.8)	GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO REFUSAL ON CLAYSTONE BEDROCK.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-25

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5937.9
COORDINATES: N 1,806,653 E 2,481,133
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x17.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/8/2015
DATE EXCAVATED: 12/8/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1–16	SM (visual) SC (lab classification)	0.0 to 17.0 ft SILTY SAND: About 80% predominantly fine to medium sand; about 20% fines with low plasticity, low dry strength, low toughness and no dilatancy; trace of fine to coarse, hard, subrounded gravel; maximum size, 75mm; weak to strong reaction with HCl. IN-PLACE CONDITION: Dry, brown, moderate cementation and lensed with POORLY GRADED SAND from 1 inch in width to 5 inches in length. Calcium carbonate stringers and nodules present. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 86.6 lbf/ft³, 6.0% (76.9% compaction) LAB TEST DATA: 53.5% sand, 46.5% fines, LL= 26.8 PI= 13.4 SPG= 2.66 Maximum dry density: 112.6 lbf/ft³, optimum water content= 13.6% Laboratory classification is CLAYEY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
8–9	In-place density taken at 7.0 ft				
17	17.0 ft (5920.9)				

COMMENTS: Surface vegetation consists of grasses and tumbleweed. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-26

SHEET 1 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5936.3
COORDINATES: N 1,803,923 E 2,481,131
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/19/2015
DATE EXCAVATED: 11/19/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 3.7 ft CLAYEY SAND: About 85% fine sand; about 15% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl.			
2		IN-PLACE CONDITION: Brown in color, roots throughout.			
3		GEOLOGIC INTERPRETATION: Quaternary alluvium (Qal)			
	3.7 ft (5932.6)				
4	SP	3.7 to 5.7 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; trace fine gravel; maximum size, 25 mm; no reaction with HCl.			
5		IN-PLACE CONDITION: Brown in color weak cementation.			
	5.7 ft (5930.6)				
6	SC (VISUAL) In-place density and 50 Lb sample taken from 7.0 to 8.0 ft.	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7		5.7 to 8.5 ft CLAYEY SAND: About 85% fine sand; about 15% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl.			
8		IN-PLACE CONDITION: Brown in color, firm consistency.			
	8.5 ft (5927.8)				
9	SP	N-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 TO 8.0 ft.			
10		Total: 91.6 lbs. / cu ft., 6.5 %.(81.1 % compaction)			
11		LAB TEST DATA: 54.8% sand, 45.2 % fines, LL= 22.7 , PI = 6.6 SPG = 2.67 Maximum dry density = 112.9 lbs. / cu ft., optimum water content = 14.5 % Laboratory classification is: CLAYEY SAND WITH SILT			
	12.0 ft (5924.3)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
12	SC	8.5 to 12.0 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; trace fine gravel; maximum size, 25 mm; no reaction with HCl.			
13		IN-PLACE CONDITION: Brown in color weak cementation.			
	14.0 ft (5922.3)	I			
14					

COMMENTS: SURFACE VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-26

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5936.3
COORDINATES: N 1,803,923 E 2,481,131
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 11/19/2015
DATE EXCAVATED: 11/19/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 12.0 to 14.0 ft CLAYEY SAND: About 85% fine sand; about 15% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown in color, firm consistency. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-27

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5948.7
COORDINATES: N 1,802,970 E 2,481,086
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x15.2'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/8/2015
DATE EXCAVATED: 12/8/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM	0.0 to 1.8 ft SILTY SAND: About 85% predominantly fine sand; about 15% fines with no plasticity, slow dilatancy and low dry strength; maximum size, medium sand; weak reaction with HCl.			
	1.8 ft (5946.9)	IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation.			
2	(CL)s	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3		1.8 to 4.6 ft LEAN CLAY WITH SAND: About 65% fines with low plasticity, low dry strength, low toughness and no dilatancy; about 35% fine sand; maximum size, fine sand; strong reaction with HCl.			
4	4.6 ft (5944.1)	IN-PLACE CONDITION: Dark brown, dry, homogeneous and hard, thumb will not indent soil. Roots present.			
5	SM (visual) SC (lab classification)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	tr		
6		4.6 to 15.2 SILTY SAND WITH COBBLES: About 85% fine sand; about 15% fines with no plasticity, medium dry strength and slow dilatancy; trace of coarse, hard, subangular to subrounded gravel; trace of cobbles, hard and subrounded; maximum size, 100mm; weak reaction with HCl.			
7		IN-PLACE CONDITION: Brown, dry, moderate cementation and lenses of gravel approximately 5 x 24 inches in width and length.			
8		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 89.1 lbf/ft³, 7.2% (80.1% compaction) LAB TEST DATA: 58.5% sand, 41.4% fines, 0.1% gravel, LL= 23.4 PI= 7.6 SPG= 2.62 Maximum dry density: 111.3 lbf/ft³, optimum water content= 15.3% Laboratory classification is CLAYEY SAND			
9					
10	In-place density taken at 7.0 ft				
11		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
12					
13					
14					
15	15.2 ft (5933.5)				

COMMENTS: Surface vegetation consists of grasses, weeds and Goldenrod. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-28

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5956.3
COORDINATES: N 1,801,969 E 2,481,041
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x15.6'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/8/2015
DATE EXCAVATED: 12/8/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM (visual) s(CL) (lab classification)	0.0 to 15.6 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, slow dilatancy and low dry strength; trace of fine, hard, subangular gravel; maximum size, 10mm; strong reaction with HCl.			
2		IN-PLACE CONDITION: Light to dark brown, moderate cementation, homogeneous and dry. Calcium carbonate stringers and roots present.			
3		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 83.1 lbf/ft³, 8.0% (75.3% compaction) LAB TEST DATA: 53.9% fines, 46.0% sand, 0.1% gravel, LL= 26.1 PI= 11.7 SPG= 2.59 Maximum dry density: 110.3 lbf/ft³, optimum water content= 14.3% Laboratory classification is SANDY LEAN CLAY			
4					
5		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6					
7					
8	In-place density taken at 7.0 ft				
9					
10					
11					
12					
13					
14					
15	15.6 ft (5940.7)				

COMMENTS: Surface vegetation consists of grasses and weeds. Trace of coarse gravels on the surface. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-29

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5969.4
COORDINATES: N 1,800,781 E 2,480,954
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x15.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/8/2015
DATE EXCAVATED: 12/8/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1 2 3 4	SM	0.0 to 4.8 ft SILTY SAND: About 65% fine to medium sand; about 35% fines with no plasticity, no dry strength and slow dilatancy; trace of coarse, hard, subrounded gravel; maximum size, 20mm; strong reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation. Calcium carbonate stringers and roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4.8 ft (5964.6)					
5 6 7 8 9 10 11 12 13 14 15	SM (lab classification) In-place density taken at 7.0 ft Corrosion sample taken at 10.0 ft	4.8 to 15.0 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, no dry strength and slow dilatancy; trace of coarse, hard, subrounded gravel; maximum size, 30mm; no to weak reaction with HCl. IN-PLACE CONDITION: Light brown, dry, homogeneous and weak cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 83.8 lbf/ft³, 4.0% (78.8% compaction) LAB TEST DATA: 63.8% sand, 36.2% fines, LL= NA PI= NP SPG= 2.60 Maximum dry density: 106.3 lbf/ft³, optimum water content= 16.5% Laboratory classification is SILTY SAND Two quart corrosion sample taken at 10.0 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
15.0 ft (5954.4)					

COMMENTS: Surface vegetation consists of weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-30

SHEET 1 OF 3

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6015.5
COORDINATES: N 1,798,117 E 2,480,867
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x15.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/9/2015
DATE EXCAVATED: 12/9/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1 2	SM	0.0 to 3.0 ft SILTY SAND: About 80% fine to coarse, hard, subangular sand; about 20% fines with no plasticity, low dry strength and slow dilatancy; trace of coarse, hard subangular gravel; maximum size, 30mm; no reaction with HCl. IN-PLACE CONDITION: Brown, moist, homogeneous and moderate cementation. Roots and root casts present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3	3.0 ft (6012.5)				
4	s(CL)	3.0 to 5.0 ft SANDY LEAN CLAY: About 70% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 30% fine to medium sand; maximum size, medium sand; strong reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, heterogeneous and hard, thumb will not indent soil. Heavy calcium carbonate stringers and nodules and manganese oxide staining present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
5	5.0 ft (6010.5)				
	(CL)s	5.0 to 7.0 ft LEAN CLAY WITH SAND: About 80% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 20% fine sand; maximum size, fine sand; strong reaction with HCl.			

COMMENTS: Surface vegetation consists of grasses and weeds. Trace of boulders on the surface. Discontinued hole due to refusal on bedrock.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-30

SHEET 2 OF 3

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6015.5
COORDINATES: N 1,798,117 E 2,480,867
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x15.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/9/2015
DATE EXCAVATED: 12/9/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
6		IN-PLACE CONDITION: Light brown, dry, homogeneous and hard, thumb will not indent soil. Calcium carbonate stringers and nodules and manganese oxide staining present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7	7.0 ft (6008.5) SM (lab classification) In-place density taken at 7.0 ft	7.0 to 8.0 ft SILTY SAND: About 80% fine to coarse, hard, subangular sand; about 20% fines with no plasticity, low dry strength and slow dilatancy; trace of coarse, hard subangular gravel; maximum size, 30mm; no reaction with HCl. IN-PLACE CONDITION: Brown, moist, homogeneous and moderate cementation. Roots and root casts present.			
8	8.0 ft (6007.5) (CL)s	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 95.7 lbf/ft³, 5.3% (83.7% compaction) LAB TEST DATA: 67.9% sand, 32.1% fines, LL= NA PI= NP SPG= 2.61 Maximum dry density: 114.4 lbf/ft³, optimum water content= 14.6% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
9		8.0 to 13.0 ft LEAN CLAY WITH SAND: About 80% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 20% fine sand; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Light brown, dry, homogeneous, very hard and difficult to excavate below 11.5 ft. Calcium carbonate stringers and nodules and manganese oxide staining present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10					

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-30

SHEET 3 OF 3

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6015.5
COORDINATES: N 1,798,117 E 2,480,867
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x15.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/9/2015
DATE EXCAVATED: 12/9/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
11					
12					
13	13.0 ft (6002.5)				
	s(CL)	13.0 to 14.5 ft SANDY LEAN CLAY WITH COBBLES: About 55% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 45% fine to coarse, hard, subangular to subrounded sand; trace of hard, flat and elongated, subrounded cobbles; maximum size, 125mm; weak to strong reaction with HCl. IN-PLACE CONDITION: Light brown, dry, homogeneous and hard. Calcium carbonate stringers and nodules. Iron and manganese oxide staining present. Roots and root casts present.	tr		
14	14.5 ft (6001.0)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	SANDSTONE	14.5 to 15.0 ft SANDSTONE: Light gray, orange and red in color. Fine grained with trace of coarse sand. Very soft (H7) and moderately weathered (W5). Joints are filled with clay and gypsum. Excavated in flat pieces up to 12 inches in length and typically 1 or 2 inches thick. Iron and manganese oxide staining present. Calcium carbonate coating on exposed surfaces.			
15	15.0 ft (6000.5)	GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-31

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6025.2
COORDINATES: N 1,796,915 E 2,480,664
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x14.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/9/2015
DATE EXCAVATED: 12/9/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1–7	SM	0.0 to 7.0 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, low dry strength and slow dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, moderate cementation. Roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7.0 ft (6018.2)					
7–13	SC (visual) SM (lab classification) In-place density taken at 7.0 ft	7.0 to 13.0 ft CLAYEY SAND: About 55% fine to medium sand; about 45% fines with medium plasticity, high toughness, high dry strength and no dilatancy; maximum size, medium sand; weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, homogeneous and hard. Calcium carbonate stringers present. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 95.0 lbf/ft³, 3.2% (87.6% compaction) LAB TEST DATA: 76.0% sand, 24.0% fines, LL= NA PI= NP SPG= 2.64 Maximum dry density: 108.5 lbf/ft³, optimum water content= 14.3% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
13.0 ft (6012.2)					
13–14	(SC)gcb	13.0 to 14.0 ft CLAYEY SAND WITH GRAVEL, COBBLES AND BOULDERS: About 40% fine to medium sand; about 40% fines with medium plasticity, high toughness, high dry strength and no dilatancy; about 20% hard, subrounded to subangular gravel; maximum size, 400mm; weak reaction with HCl. TOTAL SAMPLE (BY VOLUME): About 30% 3- to 5-inch,hard, subrounded to angular cobbles; about 10% hard, subrounded to angular 5- to 12-inch cobbles; about 5% hard, subangular boulders; remainder minus 3-inch. IN-PLACE CONDITION: Brown, dry and homogeneous. GEOLOGIC INTERPRETATION: Quaternary Pediment Deposit (Qpd)	30	10	5
14.0 ft (6011.2)					

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to refusal on cobbles and boulders.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-32

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6025.5
COORDINATES: N 1,794,515 E 2,480,445
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x16.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/9/2015
DATE EXCAVATED: 12/9/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	s(CL)	0.0 to 3.6 ft SANDY LEAN CLAY: About 60% fines with medium plasticity, medium toughness no dilatancy and medium dry strength; about 40% fine to coarse, hard, subangular sand; maximum size, coarse sand; strong reaction with HCl. IN-PLACE CONDITION: Dark brown, very hard, homogeneous and dry. Calcium carbonate stringers and nodules present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3.6 ft (6021.9)					
4	SM (lab classification)	3.6 to 16.0 ft SILTY SAND: About 60% fine to coarse, hard, angular sand; about 40% nonplastic fines with low dry strength and no dilatancy; trace of hard, subangular, coarse gravel; maximum size, 80mm; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry and strong cementation. Pockets and lenses of POORLY GRADED SAND WITH GRAVEL approximately 1 inch by 12 inches in length. Weak reaction with HCl. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 101.7 lbf/ft³, 3.3% (90.1% compaction) LAB TEST DATA: 70.7% sand, 20.9% fines, 8.4% gravel, LL= NA PI= NP SPG= 2.62 Maximum dry density: 112.9 lbf/ft³, optimum water content= 11.6% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10	In-place density taken at 7.0 ft				
16					
16.0 ft (6009.5)					

COMMENTS: Surface vegetation consists of weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-33

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6026.7
COORDINATES: N 1,793,324 E 2,480,388
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x15.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/9/2015
DATE EXCAVATED: 12/9/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM (visual) SC (lab classification)	0.0 to 13.5 ft SILTY SAND: About 60% fine to medium sand; about 40% nonplastic fines with low dry strength and slow dilatancy; trace of hard, angular to subangular, fine to coarse gravels; maximum size, 50mm; weak reaction with HCl. IN-PLACE CONDITION: Brown and dry. Lenses of hard, subrounded, fine and coarse gravels, 2 by 12 inches in length. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 86.3 lbf/ft³, 5.7% (74.5% compaction) LAB TEST DATA: 56.7% sand, 43.1% fines, 0.2% gravel, LL= 22.5 PI= 8.5 SPG= 2.62 Maximum dry density: 115.9 lbf/ft³, optimum water content= 14.0% Laboratory classification is CLAYEY SAND Two quart corrosion sample taken at 10 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6	In-place density taken at 7.0 ft Corrosion sample taken at 10.0 ft				
13	13.5 ft (6013.2)				
14	(CL)s	13.5 to 15.0 ft LEAN CLAY WITH SAND: About 75% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 25% fine to coarse, hard, subangular sand; Maximum size, coarse sand; no reaction with HCl. IN-PLACE CONDITION: Dry, dark brown, homogeneous and very hard. Calcium carbonate stringers present. Hard to excavate. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
15	15.0 ft (6011.7)				

COMMENTS: Surface vegetation consists of grasses and weeds. Trace of cobbles and gravels on surface. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-34

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6025.8
COORDINATES: N 1,792,125 E 2,480,358
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x15.2'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/10/2015
DATE EXCAVATED: 12/10/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM (visual) s(CL) (lab classification)	0.0 to 9.0 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with slow dilatancy and high dry strength; trace of gravel; maximum size, 30mm; no reaction with HCl. IN-PLACE CONDITION: Light brown, dry and homogeneous. Moderate cementation. Calcium carbonate nodules and roots present. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 76.9 lbf/ft³, 11.9% (72.7% compaction) LAB TEST DATA: 68.8% fines, 31.2% sand, LL= 40.1 PI= 22.9 SPG= 2.68 Maximum dry density: 105.8 lbf/ft³, optimum water content= 18.2% Laboratory classification is SANDY LEAN CLAY GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2					
3					
4	In-place density taken at 7.0 ft				
5					
6					
7					
8					
9	9.0 ft (6016.8)				
10	CL	9.0 to 12.0 ft LEAN CLAY: About 90% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 10% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, homogeneous and hard, thumb will not easily indent soil. Calcium carbonate nodules present.			
11					
12	12.0 ft (6013.8)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
13	CLAYSTONE 13.0 ft (6012.8)	12.0 to 13.0 ft CLAYSTONE: Dark gray and fissile. Soft (H6), can be scratched with fingernail, breaks with moderate manual pressure and slightly weathered (W3). No reaction with HCl. Recovered as flat gravel sized chunks. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
14	SANDSTONE				
15	15.2 ft (6010.6)	13.0 to 15.2 ft SANDSTONE: Tan and fine grained. Moderately soft (H5) and slightly weathered (W3). Calcium carbonate in joints and on surfaces. No reaction with HCl. Excavated in blocks, as gravels and flat 12 by 12 inch chunks. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to refusal on sandstone.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-35

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6023.1
COORDINATES: N 1,789,709 E 2,480,354
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x15.7'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/10/2015
DATE EXCAVATED: 12/10/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM	0.0 to 1.4 ft SILTY SAND: About 75% fine to coarse, hard, subrounded sand; about 25% nonplastic fines with slow dilatancy and low dry strength; trace of hard, subrounded, fine gravel; maximum size, 30mm; no reaction with HCl.			
	1.4 ft (6021.7)				
2	s(CL)	IN-PLACE CONDITION: Tan, dry, homogeneous and moderate cementation. Roots present.			
3		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4		1.4 to 5.6 ft SANDY LEAN CLAY: About 65% fines with low plasticity, low toughness, medium dry strength and no dilatancy; about 35% fine to coarse, hard, subrounded sand; maximum size, coarse sand; strong reaction with HCl.			
5		IN-PLACE CONDITION: Dry, brown, hard and homogeneous. Roots present.			
	5.6 ft (6017.5)				
6	SM (lab classification)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7		5.6 to 15.7 ft SILTY SAND: About 75% fine to medium, subrounded sand; about 25% nonplastic fines with slow dilatancy and no dry strength; maximum size, medium sand; strong reaction with HCl.			
8		IN-PLACE CONDITION: Tan, dry, homogeneous and weak cementation.			
9		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 88.1 lbf/ft³, 4.2% (78.9% compaction) LAB TEST DATA: 69.6% sand, 30.4% fines, LL= 20.8 PI= 2.2 SPG= 2.62 Maximum dry density: 111.7 lbf/ft³, optimum water content= 14.5% Laboratory classification is SILTY SAND			
10					
11	In-place density taken at 7.0 ft	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
12					
13					
14					
15					
	15.7 ft (6007.4)				

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-36

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6015.1
COORDINATES: N 1,788,530 E 2,480,178
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x17.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/10/2015
DATE EXCAVATED: 12/10/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	s(CL)	0.0 to 6.3 ft SANDY LEAN CLAY WITH COBBLES: About 70% fines with medium plasticity, medium to high dry strength, medium toughness and no dilatancy; about 30% fine to coarse, hard, subrounded to subangular sand; trace of hard, subangular to subrounded gravels and cobbles; maximum size, 125mm; strong reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, predominantly homogeneous and hard, thumb will not indent soil. Roots present. Small channel of POORLY GRADED SAND AND SILT WITH GRAVEL measuring 2 ft in depth and 3 ft in length at the surface. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	tr		
6	6.3 ft (6008.8)				
7	SM (lab classification)	6.3 to 17.0 ft SILTY SAND WITH COBBLES: About 85% fine to coarse, soft to hard, subangular to subrounded sand; about 15% nonplastic fines with rapid dilatancy and low dry strength; trace of hard, subrounded to subangular gravels; trace of hard, subangular to subrounded cobbles; maximum size, 150mm; weak reaction with HCl. IN-PLACE CONDITION: Tan to light brown in color, dry, homogeneous and moderate cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 94.3 lbf/ft³, 3.4% (84.8% compaction) LAB TEST DATA: 73.0% sand, 24.9% fines, 2.1% gravel, LL= NA PI= NP SPG= 2.61 Maximum dry density: 111.2 lbf/ft³, optimum water content= 12.3% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	tr	tr	
12	In-place density taken at 7.0 ft				
17	17.0 ft (5998.1)				

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-37

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6019.6
COORDINATES: N 1,787,327 E 2,480,127
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x16.7'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/10/2015
DATE EXCAVATED: 12/10/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM	0.0 to 3.2 ft SILTY SAND: About 80% fine to medium sand; About 20% nonplastic fines with low dry strength and slow dilatancy; trace of fine to coarse, hard, subangular to subrounded gravel; maximum size, 50mm; weak reaction with HCl.			
2		IN-PLACE CONDITION: Tan to light brown, dry, stratified 10 inch layer of coarse sand and gravel.			
3	3.2 ft (6016.4)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4	s(CL) (visual) SC-SM (lab classification) In-place density taken at 7.0 ft	3.2 to 7.2 ft SANDY LEAN CLAY: About 65% fines with low plasticity, low dry strength, low toughness and no dilatancy; about 35% fine sand; maximum size, fine sand; strong reaction with HCl.			
5		IN-PLACE CONDITION: Brown, dry, homogeneous and hard. Calcium carbonate nodules present.			
6		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 81.1 lbf/ft³, 6.0% (77.2% compaction) LAB TEST DATA: 57.3% sand, 42.0% fines, 0.7% gravel, LL= 22.4 PI= 6.1 SPG= 2.64 Maximum dry density: 105.0 lbf/ft³, optimum water content= 18.2% Laboratory classification is SILTY CLAYEY SAND NOTE: TEST EXTENDED INTO UNDERLYING INTERVAL.			
7	7.2 ft (6012.4)				
8	SM	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 7.2 to 16.7 ft SILTY SAND: About 85% fine to medium sand; About 15% nonplastic fines with low dry strength and slow dilatancy; trace of fine to coarse, hard, subangular to subrounded gravel; maximum size, 50mm; weak reaction with HCl.			
9					
10					
11		IN-PLACE CONDITION: Tan to light brown, dry, homogeneous.			
12	Corrosion sample taken at 10.0 ft	Two quart corrosion sample taken at 10.0 ft.			
13		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14					
15					
16					
	16.7 ft (6002.9)				

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-38

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6000.4
COORDINATES: N 1,786,045 E 2,481,177
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x15.8'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/11/2015
DATE EXCAVATED: 12/11/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM	0.0 to 2.5 ft SILTY SAND: About 70% predominantly fine sand; about 30% nonplastic fines with medium dry strength and slow dilatancy; trace of fine and coarse, hard, subrounded gravel; maximum size, 50mm; weak reaction with HCl.			
2	2.5 ft (5997.9)	IN-PLACE CONDITION: Brown to tan, stratified and lensed with sand and gravel. Moderate cementation.			
3	CL	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 2.5 to 6.6 ft LEAN CLAY: About 90% fines with medium plasticity, medium dry strength, medium toughness and no dilatancy; about 10% fine sand; trace of fine and coarse, hard, subrounded gravels; Maximum size, 70mm; strong reaction with HCl.			
4					
5		IN-PLACE CONDITION: Dark brown, dry, homogeneous and hard, thumb will not indent soil. Roots present.			
6	6.6 ft (5993.8)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7	SM (lab classification)	6.6 to 15.8 ft SILTY SAND WITH COBBLES: About 80% fine to coarse, soft to hard, subrounded sand; about 20% nonplastic fines with medium dry strength and slow dilatancy; trace of cobbles; maximum size, 300mm; weak reaction with HCl.	tr	tr	
8		IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation.			
9					
10		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 87.8 lbf/ft³, 4.8% (78.5% compaction) LAB TEST DATA: 67.2% sand, 32.5% fines, 0.3% gravel, LL= NA PI= NP SPG= 2.62 Maximum dry density: 111.8 lbf/ft³, optimum water content= 15.2% Laboratory classification is SILTY SAND			
11	In-place density taken at 7.0 ft				
12		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
13					
14					
15	15.8 ft (5984.6)				

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-39

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5991.5
COORDINATES: N 1,785,378 E 2,481,411
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x17.1'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/11/2015
DATE EXCAVATED: 12/11/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1–15	SM (visual) SC (lab classification)	0.0 to 15.5 ft SILTY SAND WITH COBBLES: About 80% fine to coarse, hard, subrounded sand; About 20% nonplastic fines with medium dry strength and slow dilatancy; trace of fine to coarse, hard, subrounded gravel; trace of very hard, subrounded cobbles; maximum size, 300mm; weak to strong reaction with HCl. IN-PLACE CONDITION: Light brown, dry, homogeneous and moderate cementation. Cobble encountered at 9 ft. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 87.5 lbf/ft³, 5.7% (76.6% compaction) LAB TEST DATA: 55.4% sand, 42.5% fines, 2.1% gravel, LL= 22.3 PI= 7.3 SPG= 2.56 Maximum dry density: 114.3 lbf/ft³, optimum water content= 13.7% Laboratory classification is CLAYEY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)		tr	
	In-place density taken at 7.0 ft				
15	15.5 ft (5976.0)				
16–17	CL	15.5 to 17.1 ft LEAN CLAY: About 90% fines with medium plasticity, medium dry strength, medium toughness and no dilatancy; about 10% fine sand; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and hard. Calcium carbonate stringers and nodules present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
17	17.1 ft (5974.4)				

COMMENTS: Surface vegetation consists of grasses and weeds. Coarse and fine gravels on surface. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-40

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 5988.8
COORDINATES: N 1,784,655 E 2,481,193
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x16.5'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/11/2015
DATE EXCAVATED: 12/11/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1–11	SC (visual) SM (lab classification)	0.0 to 11.5 ft CLAYEY SAND: About 65% fine to coarse, angular to subrounded, soft to hard sand; About 35% fines with low plasticity, medium dry strength, low toughness and no dilatancy; trace of hard to soft, angular to subrounded gravel; maximum size, 40mm; strong reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and hard, thumb will not indent soil. Calcium carbonate nodules and roots present. Hard to excavate. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 102.7 lbf/ft³, 4.5% (92.3% compaction) LAB TEST DATA: 64.3% sand, 35.7% fines, LL= NA PI= NP SPG= 2.66 Maximum dry density: 111.3 lbf/ft³, optimum water content= 14.2% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6	In-place density taken at 7.0 ft				
11	11.5 ft (5977.3)				
12–16	SC	11.5 to 16.5 ft CLAYEY SAND: About 55% fine sand, about 45% fines with low plasticity, low dry strength, low toughness and no dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Yellowish to tan, dry and hard. Calcium carbonate stringers present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
16	16.5 ft (5972.3)				

COMMENTS: Surface vegetation consists of grasses. Fine gravels on surface. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-15-42

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6008.9
COORDINATES: N 1,780,730 E 2,480,945
METHOD OF EXPLORATION: CASE 580N BACKHOE
APPROXIMATE DIMENSIONS: 17'x13'x16.7'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 12/11/2015
DATE EXCAVATED: 12/11/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 2.4 ft CLAYEY SAND: About 70% fine sand; about 30% fines with medium plasticity, medium dry strength, medium toughness and no dilatancy; maximum size, fine sand; weak reaction with HCl.			
2		IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation. Roots present.			
	2.4 ft (6006.5)				
3	s(CL)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4		2.4 to 5.2 ft SANDY LEAN CLAY: About 55% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; maximum size, fine sand; weak reaction with HCl.			
5		IN-PLACE CONDITION: Brown, dry, homogeneous and hard, thumb will not indent soil. Calcium carbonate nodules present.			
	5.2 ft (6003.7)				
6	SM (lab classification)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7		5.2 to 16.7 ft SILTY SAND: About 75% fine sand; about 25% nonplastic fines with low toughness and slow dilatancy; maximum size, fine sand; weak reaction with HCl.			
8		IN-PLACE CONDITION: Tan, dry, homogeneous and moderate cementation.			
9		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft.			
10	In-place density taken at 7.0 ft Corrosion sample taken at 10.0 ft	Total: 90.8 lbf/ft³, 2.4% (85.1% compaction) LAB TEST DATA: 82.4% sand, 17.6% fines, LL= NA PI= NP SPG= 2.61 Maximum dry density: 106.7 lbf/ft³, optimum water content= 14.5% Laboratory classification is SILTY SAND			
11		Two quart corrosion sample taken at 10.0 ft			
12		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
13					
14					
15					
16					
	16.7 ft (5992.2)				

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-43

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6050.7
COORDINATES: N 1,777,691 E 2,480,256
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x12.7'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/25/2016
DATE EXCAVATED: 1/25/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 2.3 ft CLAYEY SAND: About 55% fine to medium sand, about 45% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; maximum size, medium sand; strong reaction with HCl. IN-PLACE CONDITION: Dark brown, moist, homogeneous and firm. Roots and calcium carbonate nodules present.			
2	2.3 ft (6048.4)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3	(SP-SM)gcb	2.3 to 12.7 ft POORLY GRADED SAND WITH SILT, GRAVEL, COBBLES AND BOULDERS: About 65% fine to coarse, subangular to subrounded, hard to soft sand; about 25% fine to coarse, hard to soft, subangular to subrounded gravel; about 10% nonplastic fines with low dry strength and rapid dilatancy; strong reaction with HCl. TOTAL SAMPLE (BY VOLUME): About 20% 3-5 inch hard, subangular to subrounded cobbles; about 10% 5-12 inch hard, subrounded cobbles; about 5% hard subangular boulders; remainder minus 3 inch; maximum size, 500mm. IN-PLACE CONDITION: Dark to light brown, tan to white, dry and hard. Stratified and lensed with rock pockets and alternating layers of fines. Calcium carbonate present. GEOLOGIC INTERPRETATION: Quaternary Pediment Deposit (Qpd)	20	10	5
12	12.7 ft (6038.0)				

COMMENTS: Surface vegetation consists of grasses. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-44

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6043.1
COORDINATES: N 1,776,549 E 2,479,973
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x13.2'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/25/2016
DATE EXCAVATED: 1/25/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 3.4 ft CLAYEY SAND: About 65% fine sand; about 35% fines with low plasticity, low toughness, low dry strength and no dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, moderate cementation and homogeneous. Roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3	3.4 ft (6039.7)				
4	CH (visual) s(CL) (lab classification)	3.4 to 11.5 ft FAT CLAY: About 95% fines with high plasticity, high dry strength, high toughness and no dilatancy; about 5% fine sand, maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, homogeneous and hard. Calcium carbonate nodules present. Not easy to excavate. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 91.9 lbf/ft³, 7.4% (84.9% compaction) LAB TEST DATA: 64.4% fines, 35.6% sand, LL= 30.9 PI= 14.6 SPG= 2.61 Maximum dry density: 108.3 lbf/ft³, optimum water content= 16.0% Laboratory classification is SANDY LEAN CLAY GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7	In-place density taken at 7.0 ft				
11	11.5 ft (6031.6)				
12	CLAYSTONE	11.5 to 13.2 ft CLAYSTONE: Tan to dark brown, laminated to thickly bedded and fissile. Fine grained with fine sand lamination. Moderately weathered (W5) and moderately soft (H5). Excavated in angular, gravel size to flat 4x6x12 inch chunks. No reaction with HCl. MnOx spotting and stains present.			
13	13.2 ft (6029.9)				
		GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to refusal on claystone.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-45

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6045.7
COORDINATES: N 1,775,373 E 2,479,698
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x11.2'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/25/2016
DATE EXCAVATED: 1/25/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1–10	SM (lab classification)	0.0 to 9.8 ft SILTY SAND: About 75% fine to coarse, hard sand; about 25% nonplastic fines with low dry strength and slow dilatancy; trace of hard, flat, coarse gravel; maximum size, 75mm; no reaction with HCl. IN-PLACE CONDITION: Tan to brown, dry, homogeneous and moderate cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 95.0 lbf/ft³, 5.0% (86.4% compaction) LAB TEST DATA: 68.1% sand, 31.2% fines, 0.7% gravel, LL= NA PI= NP SPG= 2.57 Maximum dry density: 110.0 lbf/ft³, optimum water content= 13.5% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
5	In-place density taken at 7.0 ft				
9	9.8 ft (6035.9)				
10	SANDSTONE	9.8 to 11.2 ft SANDSTONE: Tan to orange to brown. Fine grained. Intensely weathered (W7) and soft (H6), easily broken with hand pressure. Calcium carbonate present in joints. Sandstone has no reaction with HCl. FeOx staining present. Excavated in gravel size and flat 1x5x5 inch pieces.			
11	11.2 ft (6034.5)	GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to refusal on sandstone.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-46

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6050.1
COORDINATES: N 1,773,078 E 2,479,055
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.5'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/25/2016
DATE EXCAVATED: 1/25/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM (lab classification)	0.0 to 14.5 ft SILTY SAND: About 55% fine sand; about 45% nonplastic fines with low dry strength and slow dilatancy; maximum size, medium sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and predominantly homogeneous. Stratified and lenses at 3.2 to 4.2 ft. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 87.7 lbf/ft³, 5.7% (80.5% compaction) LAB TEST DATA: 64.7% sand, 35.3% fines, LL= NA PI= NP SPG= 2.65 Maximum dry density: 108.9 lbf/ft³, optimum water content= 14.5% Laboratory classification is SILTY SAND Two quart corrosion sample taken at 10 ft GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2					
3					
4					
5					
6					
7	In-place density taken at 7.0 ft Corrosion sample taken at 10.0 ft				
8					
9					
10					
11					
12					
13					
14	14.5 ft (6035.6)				

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-47

SHEET 1 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6048.6
COORDINATES: N 1,771,983 E 2,478,566
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/26/2016
DATE EXCAVATED: 1/26/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	CL	0.0 to 2.2 ft LEAN CLAY: About 95% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 5% fine sand; maximum size, fine sand; no reaction HCl. IN-PLACE CONDITION: Dark brown, moist, homogeneous and hard. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2	2.2 ft (6046.4)				
	SP-SM 2.6 ft (6046.0)	2.2 to 2.6 ft POORLY GRADED SAND WITH SILT: About 80% fine to coarse, hard, subrounded sand; about 10% fine to coarse, subrounded, hard gravel; about 10% fines with no plasticity, low dry strength and slow dilatancy; maximum size, 70mm; no reaction with HCl.			
3	(CL)s (visual) s(CL) (lab classification)	IN-PLACE CONDITION: Brown, dry, lensed with gravel pockets, moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4		2.6 to 11.2 ft LEAN CLAY WITH SAND: About 75% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 25% fine sand; maximum size, fine sand; no reaction HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and hard.			
5	In-place density taken at 7.0 ft	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 85.6 lbf/ft³, 8.7% (78.6% compaction) LAB TEST DATA: 66.3% fines, 33.7% sand, LL= 33.3 PI= 19.3 SL= 14.4 SPG= 2.67 Maximum dry density: 108.9 lbf/ft³, optimum water content= 16.2% Laboratory classification is SANDY LEAN CLAY GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6					
7					

COMMENTS: Surface vegetation consists of grasses. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-47

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6048.6
COORDINATES: N 1,771,983 E 2,478,566
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/26/2016
DATE EXCAVATED: 1/26/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
8					
9	In-place density taken at 7.0 ft				
10					
11	11.2 ft (6037.4)				
	SC	11.2 to 14.0 ft CLAYEY SAND: About 55% fine sand; about 45% fines with low plasticity, low dry strength, low toughness and no dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
12					
13					
14	14.0 ft (6034.6)				

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-48

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6046.1
COORDINATES: N 1,770,789 E 2,478,049
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.4'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/26/2016
DATE EXCAVATED: 1/26/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 1.8 ft CLAYEY SAND: About 60% fine to coarse, hard, subrounded sand; about 40% fines with medium plasticity, low toughness, medium dry strength and no dilatancy; maximum size, coarse sand; weak reaction with HCl.			
1.8 ft (6044.3)		IN-PLACE CONDITION: Brown, dry, homogeneous, moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2	s(CL) (lab classification)	1.8 to 7.6 ft SANDY LEAN CLAY: About 70% fines with medium plasticity, medium dry strength, low toughness and no dilatancy; about 30% fine sand; maximum size, fine sand; weak reaction with HCl.			
3		IN-PLACE CONDITION: Brown, dry, homogeneous and hard.			
4	In-place density taken at 7.0 ft	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 85.7 lbf/ft³, 7.8% (78.0% compaction) LAB TEST DATA: 67.4% fines, 32.6% sand, LL= 28.6 PI= 14.5 SPG= 2.64 Maximum dry density: 109.9 lbf/ft³, optimum water content= 16.0% Laboratory classification is SANDY LEAN CLAY			
5		NOTE: TEST EXTENDS INTO UNDERLYING INTERVAL.			
6					
7					
7.6 ft (6038.5)		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
8	SC	7.6 to 14.4 ft CLAYEY SAND: About 55% fine sand, about 45% fines with low plasticity, low dry strength, low toughness and no dilatancy; maximum size, fine sand; weak reaction with HCl.			
9		IN-PLACE CONDITION: Light brown, dry, homogeneous, moderate cementation.			
10		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
11					
12					
13					
14					
14.4 ft (6031.7)					

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-49

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6041.7
COORDINATES: N 1,768,634 E 2,477,243
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/26/2016
DATE EXCAVATED: 1/26/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 2.2 ft CLAYEY SAND: About 55% fine sand; about 45% fines with low plasticity, medium dry strength, low toughness and no dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous, moderate cementation.			
2	2.2 ft (6039.5)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3	CL (visual) (CL)s (lab classification)	2.2 to 11.3 ft LEAN CLAY: About 90% fines with medium plasticity, high dry strength, high toughness and no dilatancy; about 10% fine sand; maximum size, fine sand; no to weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, homogeneous, very hard and not easily scratched with thumbnail. Difficult to excavate. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 96.8 lbf/ft³, 13.2% (98.3% compaction) LAB TEST DATA: 83.0% fines, 17.0% sand, LL= 49.1 PI= 33.8 SL= 11.2 SPG= 2.61 Maximum dry density: 98.5 lbf/ft³, optimum water content= 23.0% Laboratory classification is LEAN CLAY WITH SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4					
5					
6					
7	In-place density taken at 7.0 ft				
8					
9					
10					
11	11.3 ft (6030.4)				
12	SM	11.3 to 14.0 ft SILTY SAND: About 65% fine sand; about 35% fines with low plasticity, medium dry strength, low toughness and no dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous, moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
13					
14	14.0 ft (6027.7)				

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-50

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6044.1
COORDINATES: N 1,767,531 E 2,476,755
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x12.9'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/26/2016
DATE EXCAVATED: 1/26/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
0	CL 0.6 ft (6043.5)	0.0 to 0.6 ft LEAN CLAY: About 95% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 5% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Gray, moist, homogeneous and hard. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
1	SC 1.6 ft (6042.5)	0.6 to 1.6 ft CLAYEY SAND: About 65% fine sand; about 35% fines with low plasticity, low dry strength, low toughness and no dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and hard. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2	s(CL) (visual) (CL)s (lab classification)				
3					
4					
5	In-place density taken at 7.0 ft	1.6 to 8.8 ft SANDY LEAN CLAY: About 65% fines with low plasticity, low dry strength, low toughness and slow dilatancy; about 35% fine to medium sand; trace of fine, hard, subrounded gravel; maximum size, 20mm; weak reaction with HCl. IN-PLACE CONDITION: Tan to dark brown, dry and hard. Lensed and stratified with SILT and POORLY GRADED SAND WITH SILT. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 80.6 lbf/ft³, 8.0% (77.8% compaction) LAB TEST DATA: 72.9% fines, 27.1% sand, LL= 29.7 PI= 14.1 SPG= 2.65 Maximum dry density: 103.6 lbf/ft³, optimum water content= 19.4% Laboratory classification is LEAN CLAY WITH SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6					
7					
8	8.8 ft (6035.3)				
9	CL	8.8 to 12.9 ft LEAN CLAY: About 85% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 15% fine to medium sand; maximum size,e medium sand; weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry. Calcium carbonate present. Hard to excavate. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10					
11					
12	12.9 ft (6031.2)				

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to refusal on stiff clay.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-51

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6046.8
COORDINATES: N 1,766,438 E 2,476,288
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x13.9'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/26/2016
DATE EXCAVATED: 1/26/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1–2	SM	0.0 to 2.6 ft SILTY SAND: About 80% fine to medium sand; about 20% nonplastic fines with low dry strength and slow dilatancy; maximum size, medium sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, stratified and moderate cementation. Roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2.6 ft (6044.2)					
3–8	(CL)s (lab classification) In-place density taken at 7.0 ft	2.6 to 8.2 ft LEAN CLAY WITH SAND: About 85% fines with medium toughness, medium plasticity, medium dry strength and no dilatancy; about 15% fine sand; maximum size, fine sand; no to weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, homogeneous, very hard and difficult to scratch with thumbnail. Calcium carbonate stringers present. Hard to excavate. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 92.1 lbf/ft³, 13.2% (90.7% compaction) LAB TEST DATA: 70.6% fines, 29.4% sand, LL= 40.7 PI= 25.9 SL= 10.9 SPG= 2.64 Maximum dry density: 101.5 lbf/ft³, optimum water content= 20.9% Laboratory classification is LEAN CLAY WITH SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
8.2 ft (6038.6)					
9–13	CL	8.2 to 13.9 ft LEAN CLAY: About 95% fines with low plasticity, low toughness, low dry strength and no dilatancy; about 5% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Gray, dry, homogeneous and hard. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
13.9 ft (6032.9)					

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-52

SHEET 1 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6050.4
COORDINATES: N 1,764,358 E 2,475,334
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.7'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/27/2016
DATE EXCAVATED: 1/27/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP-SM	0.0 to 2.1 ft POORLY GRADED SAND WITH SILT: About 90% fine to medium sand; about 10% nonplastic fines with low dry strength and slow dilatancy; maximum size, medium sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, stratified and moderate cementation. Roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2	2.1 ft (6048.3)				
3	CL	2.1 to 4.0 ft LEAN CLAY: About 90% fines with medium plasticity, high dry strength, low toughness and no dilatancy; about 10% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, homogeneous and very hard. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4	4.0 ft (6046.4)				
	SM 4.6 ft (6045.8)	4.0 to 4.6 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with low dry strength and slow dilatancy; maximum size. fine sand; no to weak reaction with HCl.			
5	(CL)s (visual) CL (lab classification)	IN-PLACE CONDITION: Brown, dry, stratified and moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.6 to 9.2 ft LEAN CLAY WITH SAND: About 75% fines with medium plasticity, high dry strength, low toughness and no dilatancy; about 25% fine sand; maximum size, fine sand; weak reaction with HCl.			
6		IN-PLACE CONDITION: Dark brown, dry, homogeneous and very hard. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 83.9 lbf/ft³, 12.1% (81.5% compaction) LAB TEST DATA: 87.0% fines, 13.0% sand, LL= 37.7 PI= 21.7 SPG= 2.66 Maximum dry density: 103.0 lbf/ft³, optimum water content= 19.5% Laboratory classification is LEAN CLAY			
7		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-52

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6050.4
COORDINATES: N 1,764,358 E 2,475,334
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.7'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/27/2016
DATE EXCAVATED: 1/27/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
8					
9	9.2 ft (6041.2)				
	SM	9.2 to 14.7 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with low dry strength and slow dilatancy; maximum size. fine sand; no to weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, stratified and moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10					
11					
12					
13					
14					
	14.7 ft (6035.7)				

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-53

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6056.7
COORDINATES: N 1,763,180 E 2,474,750
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.9'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/27/2016
DATE EXCAVATED: 1/27/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1 2 3	s(CL) 3.0 ft (6053.7)	0.0 to 3.0 ft SANDY LEAN CLAY: About 55% fines with medium plasticity, high dry strength, medium toughness and no dilatancy; About 45% fine sand; maximum size, fine sand; weak reaction with HCL. IN-PLACE CONDITION: Brown, dry and hard. Stratified and lensed. Interval from 2.3 ft to 3.0 ft contains a stratified sequence of SILT, POORLY GRADED SAND AND SILT to LEAN CLAY. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4 5 6 7 8 9	SC (visual) SM (lab classification) In-place density taken at 7.0 ft 8.9 ft (6047.8)	3.0 to 8.9 ft CLAYEY SAND: About 55% fine sand; about 45% fines with low plasticity, low dry strength, low toughness and no dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and moderately cemented. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 92.0 lbf/ft³, 4.2% (80.8% compaction) LAB TEST DATA: 71.1% sand, 28.9% fines, LL= NA PI= NP SPG= 2.67 Maximum dry density: 113.8 lbf/ft³, optimum water content= 14.3% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10 11 12 13 14	SM 14.9 ft (6041.8)	8.9 to 14.9 ft SILTY SAND: About 55% fine sand; about 45% nonplastic fines with low dry strength and no dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS: Surface vegetation consists of sage, grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-54

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6060.0
COORDINATES: N 1,762,111 E 2,474,206
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.4'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/27/2016
DATE EXCAVATED: 1/27/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	s(CL) 1.0 ft (6059.0)	0.0 to 1.0 ft SANDY LEAN CLAY: About 55% fines with medium plasticity, medium dry strength, medium toughness and no dilatancy; about 45% fine sand; maximum size, fine sand; weak reaction with HCl.			
2	(CL)s 2.4 ft (6057.6)	IN-PLACE CONDITION: Brown, dry, moderate cementation and stratified. Lenses of SILT 1 inch wide to 3 feet in length. Roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3	s(CL) (visual) SC (lab classification)	1.0 to 2.4 ft LEAN CLAY WITH SAND: About 80% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 20% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, very hard and homogeneous. Roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6	In-place density taken at 7.0 ft Corrosion sample taken at 10.0 ft	2.4 to 10.4 ft SANDY LEAN CLAY: About 60% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 40% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and hard. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 88.1 lbf/ft³, 7.3% (79.4% compaction) LAB TEST DATA: 57.7% sand, 42.3% fines, LL= 24.3 PI= 10.0 SPG= 2.65 Maximum dry density: 111.0 lbf/ft³, optimum water content= 16.0% Laboratory classification is CLAYEY SAND Two quart corrosion sample taken at 10 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10	10.4 ft (6049.6)				
11	(CL)s	10.4 to 14.4 ft LEAN CLAY WITH SAND: About 80% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 20% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, very hard and homogeneous. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14	14.4 ft (6045.6)				

COMMENTS: Surface vegetation consists of sage, grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-55

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6070.0
COORDINATES: N 1,759,987 E 2,473,056
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/27/2016
DATE EXCAVATED: 1/27/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	s(CL)	0.0 to 1.2 ft SANDY LEAN CLAY: About 70% fines with low plasticity, low toughness, low dry strength and no dilatancy; about 30% fine sand; maximum size, fine sand; no reaction with HCl.			
	1.2 ft (6068.8)				
2	SC	IN-PLACE CONDITION: Brown, moist, homogeneous and firm. Can be indented with thumb. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3		1.2 to 4.3 ft CLAYEY SAND: About 60% fine sand; about 40% fines with medium plasticity, low toughness, low dry strength and no dilatancy; maximum size, fine sand; weak reaction with HCl.			
4	4.3 ft (6065.7)	IN-PLACE CONDITION: Brown, dry and moderately cemented. Lensed with SILT 2 inches wide and up to 3 feet in length.			
5	SM (lab classification)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6		4.3 to 11.0 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl.			
7		IN-PLACE CONDITION: Light brown, dry, homogeneous and moderately cemented.			
8	In-place density taken at 7.0 ft	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 96.5 lbf/ft³, 4.0% (86.6% compaction) LAB TEST DATA: 70.7% sand, 29.3% fines, LL= NA PI= NP SPG= 2.66 Maximum dry density: 111.4 lbf/ft³, optimum water content= 14.6% Laboratory classification is SILTY SAND			
9		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10					
	11.0 ft (6059.0)				
11	SC	11.0 to 14. ft CLAYEY SAND: About 55% fine sand; about 45% fines with low plasticity, low toughness, low dry strength and no dilatancy; maximum size, fine sand; weak reaction with HCl.			
12		IN-PLACE CONDITION: Light brown, dry, homogeneous and moderate cementation.			
13		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	14.0 ft (6056.0)				
14					

COMMENTS: Surface vegetation consists of sage, grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-56

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6072.8
COORDINATES: N 1,758,901 E 2,472,576
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/27/2016
DATE EXCAVATED: 1/27/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1 2 3 4	SC	0.0 to 4.8 ft CLAYEY SAND: About 60% fine sand; about 40% fines with low plasticity, low dry strength, low toughness and no dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Light brown, dry, hard and homogeneous. Roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4.8 ft (6068.0)					
5 6 7 8 9 10 11 12	SM (lab classification) In-place density taken at 7.0 ft	4.8 to 12.1 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Light brown, dry, moderate cementation and stratified. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 94.8 lbf/ft³, 5.9% (85.0% compaction) LAB TEST DATA: 65.5% sand, 34.5% fines, LL= NA PI= NP SPG= 2.61 Maximum dry density: 111.5 lbf/ft³, optimum water content= 16.3% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
12.1 ft (6060.7)					
13 14	(CL)s	12.1 to 14.0 ft LEAN CLAY WITH SAND: About 70% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 30% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, very hard and homogeneous. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14.0 ft (6058.8)					

COMMENTS: Surface vegetation consists of sage, grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-57

SHEET 1 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6079.8
COORDINATES: N 1,757,815 E 2,472,073
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.5'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/28/2016
DATE EXCAVATED: 1/28/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1 2	(CL)s	0.0 to 2.7 ft LEAN CLAY WITH SAND: About 75% fines with medium plasticity, low toughness, low dry strength and no dilatancy; about 25% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, blocky and hard. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	2.7 ft (6077.1)				
3 4	SM	2.7 to 4.1 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with low dry strength and slow dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Light brown, dry, stratified layers roughly 5mm thick, moderate cementation.			
	4.1 ft (6075.7)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
5 6 7	(CL)s (visual) s(CL) (lab classification) In-place density taken at 7.0 ft	4.1 to 7.3 ft LEAN CLAY WITH SAND: About 75% fines with medium plasticity, low toughness, low dry strength and no dilatancy; about 25% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and hard. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 86.8 lbf/ft³, 10.8% (80.7% compaction) LAB TEST DATA: 55.4% fines, 44.6% sand, LL= 32.5 PI= 18.4 SL= 15.0 SPG= 2.67 Maximum dry density: 107.6 lbf/ft³, optimum water content= 17.6% Laboratory classification is SANDY LEAN CLAY NOTE: TEST EXTENDED INTO UNDERLYING INTERVAL. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	7.3 ft (6072.5)				

COMMENTS: Surface vegetation consists of sage and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-57

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6079.8
COORDINATES: N 1,757,815 E 2,472,073
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.5'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/28/2016
DATE EXCAVATED: 1/28/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
8	SM	7.3 to 8.6 ft SILTY SAND: About 65% fine sand; about 35% nonplastic fines with low dry strength and slow dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Light brown, dry, homogeneous with moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
8.6 ft (6071.2)					
9	SC	8.6 to 14.5 ft CLAYEY SAND: About 55% fine sand; about 45% fines with medium plasticity, low dry strength, low toughness and no dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10					
11					
12					
13					
14					
14.5 ft (6065.3)					

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-58

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6080.0
COORDINATES: N 1,757,110 E 2,471,760
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.0'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/28/2016
DATE EXCAVATED: 1/28/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	(CL)s	0.0 to 1.4 ft LEAN CLAY WITH SAND: About 80% fines with low plasticity, medium dry strength, low toughness and no dilatancy;about 20% fine sand; maximum size, fine sand; no reaction with HCl.			
	1.4 ft (6078.6)				
2	s(CL) (lab classification)	IN-PLACE CONDITION: Brown, dry , homogeneous and hard. Roots present.			
		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3		1.4 to 14.0 ft SANDY LEAN CLAY: About 55% fines with low plasticity, medium dry strength, low toughness and no dilatancy; about 45% fine sand; maximum size, fine sand; no reaction with HCl.			
4		IN-PLACE CONDITION: Brown, dry, homogeneous and very hard. Trace of calcium carbonate.			
5		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft.			
6		Total: 88.3 lbf/ft³, 7.9% (81.2% compaction)			
		LAB TEST DATA: 63.9% fines, 36.1% sand, LL= 30.8 PI= 13.6 SPG= 2.66			
		Maximum dry density: 108.7 lbf/ft³, optimum water content= 16.8%			
		Laboratory classification is SANDY LEAN CLAY			
7		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
8	In-place density taken at 7.0 ft				
9					
10					
11					
12					
13					
14	14.0 ft (6066.0)				

COMMENTS: Surface vegetation consists of sage, grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-59

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6088.5
COORDINATES: N 1,755,422 E 2,470,761
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x13.2'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/28/2016
DATE EXCAVATED: 1/28/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	s(CL)	0.0 to 1.6 ft SANDY LEAN CLAY: About 60% fines with medium plasticity, medium dry strength, medium toughness and no dilatancy; about 40% fine sand; maximum size, fine sand; weak reaction with HCl.			
	1.6 ft (6086.9)	IN-PLACE CONDITION: Brown, dry, homogeneous and hard. Roots present.			
2	CL (lab classification)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3		1.6 to 13.2 ft LEAN CLAY: About 90% fines with medium plasticity, high dry strength, medium toughness and no dilatancy; about 10% fine sand; maximum size, fine sand; no to weak reaction with HCl.			
4		IN-PLACE CONDITION: Dark brown, dry, homogeneous and very hard. Calcium carbonate stringers and nodules present.			
5		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 92.3 lbf/ft³, 15.7% (95.4% compaction) LAB TEST DATA: 98.2% fines, 1.8% sand, LL= 49.2 PI= 31.0 SL= 12.8 SPG= 2.64 Maximum dry density: 96.8 lbf/ft³, optimum water content= 22.8% Laboratory classification is LEAN CLAY			
6					
7	In-place density taken at 7.0 ft Corrosion sample taken at 10.0 ft	Two quart corrosion sample taken at 10 ft.			
8		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
9					
10					
11					
12					
13	13.2 ft (6075.3)				

COMMENTS: Surface vegetation consists of sage, grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-60

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6080.1
COORDINATES: N 1,752,588 E 2,469,315
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x13.4'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 1/28/2016
DATE EXCAVATED: 1/28/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	s(CL)	0.0 to 1.6 ft SANDY LEAN CLAY: About 60% fines with medium plasticity, medium dry strength, medium toughness and no dilatancy; about 40% fine sand; maximum size, fine sand; weak reaction with HCl.			
1.6 ft (6078.5)		IN-PLACE CONDITION: Brown, dry, homogeneous and hard. Roots present.			
2	CH	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3		1.6 to 4.4 ft FAT CLAY: About 90% fines with high plasticity, high dry strength, high toughness and no dilatancy; about 10% fine sand; maximum size, fine sand; no reaction with HCl.			
4		IN-PLACE CONDITION: Dark brown, dry, homogeneous and very hard.			
4.4 ft (6075.7)		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
5	SC	4.4 to 6.3 ft CLAYEY SAND: About 65% fine sand; about 35% fines with low plasticity, medium toughness, medium dry strength and no dilatancy; maximum size, fine sand; no reaction with HCl.			
6		IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation.			
6.3 ft (6073.8)		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7	(CL)s (visual) s(CL) (lab classification)	6.3 to 13.4 ft LEAN CLAY WITH SAND: About 80% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 20% fine sand, maximum size, fine sand; weak reaction with HCl.			
8		IN-PLACE CONDITION: Dark brown, dry, homogeneous and very hard. Calcium carbonate stringers and nodules present.			
9		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft.			
10	In-place density taken at 7.0 ft	Total: 93.8 lbf/ft³, 9.1% (86.8% compaction) LAB TEST DATA: 61.6% fines, 38.4% sand, LL= 30.5 PI= 16.5 SL= 14.6 SPG= 2.62 Maximum dry density: 108.1 lbf/ft³, optimum water content= 17.0% Laboratory classification is SANDY LEAN CLAY			
11		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
12					
13					
13.4 ft (6066.7)					

COMMENTS: Surface vegetation consists of sage and grasses. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-61

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6082.3
COORDINATES: N 1,750,711 E 2,468,148
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.8'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/8/2016
DATE EXCAVATED: 2/8/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	CL (visual) SM (lab classification)	0.0 to 7.2 ft LEAN CLAY: About 90% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 10% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, blocky and hard. Roots present. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 90.9 lbf/ft³, 3.5% (86.6% compaction) LAB TEST DATA: 76.8% sand, 23.2% fines, LL= NA PI= NP SPG= 2.64 Maximum dry density: 105.0 lbf/ft³, optimum water content= 14.6% Laboratory classification is SILTY SAND NOTE: TEST EXTENDED INTO UNDERLYING INTERVAL. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2					
3	In-place density taken at 7.0 ft				
4					
5					
6					
7	7.2 ft (6075.1)				
8	SM	7.2 to 14.8 ft SILTY SAND: About 65% fine sand; about 35% nonplastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and weak cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
9					
10					
11					
12					
13					
14					
	14.8 ft (6067.5)				

COMMENTS: Surface vegetation consists of sage and grasses. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-62

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6084.3
COORDINATES: N 1,749,724 E 2,467,494
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.4'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/8/2016
DATE EXCAVATED: 2/8/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	CL	0.0 to 4.2 ft LEAN CLAY: About 90% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 10% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, blocky and very hard. Roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4	4.2 ft (6080.1)				
5	SM (lab classification)	4.2 to 10.7 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and medium cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 91.5 lbf/ft³, 5.3% (83.7% compaction) LAB TEST DATA: 55.8% sand, 44.2% fines, LL= NA PI= NP SPG= 2.60 Maximum dry density: 109.3 lbf/ft³, optimum water content= 15.6% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluviuim (Qal)			
7	In-place density taken 7.0 ft.				
10	10.7 ft (6073.6)				
11	SC	10.7 to 14.4 ft CLAYEY SAND: About 55% fine sand; about 45% fines with low plasticity, low toughness, low dry strength and no dilatancy; maximum size, fine sand; no to weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and medium cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14	14.4 ft (6069.9)				

COMMENTS: Surface vegetation consists of weeds, sage and grasses. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-63

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6088.9
COORDINATES: N 1,748,645 E 2,466,949
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.5'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/8/2016
DATE EXCAVATED: 2/8/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1 2 3	CL 3.2 ft (6085.7)	0.0 to 3.2 ft LEAN CLAY: About 90% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 10% fine sand; maximum size, fine sand; no to weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, blocky and very hard. Roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4 5 6 7 8 9 10	(CL)s (visual) CH (lab classification) In-place density taken at 7.0 ft. 10.2 ft (6078.7)	3.2 to 10.2 ft LEAN CLAY WITH SAND: About 80% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 20% fine sand; maximum size, fine sand; no to weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, blocky and very hard. Calcium carbonate stringers and roots present. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 90.5 lbf/ft³, 16.3% (97.0% compaction) LAB TEST DATA: 93.7% fines, 6.3% sand, LL= 56.8 PI= 37.6 SL= 8.8 SPG= 2.67 Maximum dry density: 93.3 lbf/ft³, optimum water content= 25.8% Laboratory classification is FAT CLAY GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
11 12 13 14	SC 14.5 ft (6074.4)	10.2 to 14.5 ft CLAYEY SAND: About 60% fine sand; about 40% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown , dry, homogeneous and moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS: Surface vegetation consists of sage and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-64

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6090.7
COORDINATES: N 1,747,646 E 2,466,289
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.5'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/8/2016
DATE EXCAVATED: 2/8/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1 2 3	(CL)s	0.0 to 3.7 ft LEAN CLAY WITH SAND: About 85% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 15% fine sand; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, blocky and very hard. Calcium carbonate stringers and roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3.7 ft (6087.0)					
4 5 6	SM	3.7 to 6.9 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with low dry strength and slow dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry, stratified in 3mm intervals and lenses from 2 x 12 inches in length and width. GEOLOGIC INTERPRETATION: Qauternary Alluvium (Qal)			
6.9 ft (6083.8)					
7 8 9 10 11 12 13	CL (visual) CH (lab classification) In-place density taken at 7.0 ft	6.9 to 14.5 ft LEAN CLAY: About 90% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 10% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and hard. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 85.1 lbf/ft³, 15.7% (91.3% compaction) LAB TEST DATA: 98.3% fines, 1.7% sand, LL= 57.9 PI= 37.0 SL= 12.6 SPG= 2.69 Maximum dry density: 93.2 lbf/ft³, optimum water content= 26.7% Laboratory classification is FAT CLAY GEOLOGI C INTERPRETATION: Quaternary Alluvium (Qal)			
14	14.5 ft (6076.2)				

COMMENTS: Surface vegetation consists of sage and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-65

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6095.7
COORDINATES: N 1,746,640 E 2,465,635
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.4'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/9/2016
DATE EXCAVATED: 2/9/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1–8	(CL)s (visual) CL (lab classification) In-place density taken at 7.0 ft 8.2 ft (6087.5)	0.0 to 8.2 ft LEAN CLAY WITH SAND: About 85% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 15% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, blocky and stratified with 2 inch intervals of CLAYEY SAND from 1.2 ft to 2.7 ft. Very hard. Calcium carbonate stringers and iron oxide staining. Roots present. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 77.6 lbf/ft³, 11.5% (76.3% compaction) LAB TEST DATA: 90.1% fines, 9.9% sand, LL= 38.7 PI= 19.0 SL= 16.5 SPG= 2.63 Maximum dry density: 101.7 lbf/ft³, optimum water content= 20.5% Laboratory classification is LEAN CLAY GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
9–14	SC Corrosion sample taken at 10.0 ft 14.4 ft (6081.3)	8.2 to 14.4 ft CLAYEY SAND: About 60% fine sand; about 40% fines with low plasticity, low toughness, low dry strength and slow dilatancy; trace of very hard, angular cobbles; maximum size, 120mm; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation. Two quart corrosion sample taken at 10.0 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	tr		

COMMENTS: Surface vegetation consists of sage, grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-66

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6124.4
COORDINATES: N 1,744,661 E 2,464,214
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x11.2'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/9/2016
DATE EXCAVATED: 2/9/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM (lab classification)	0.0 to 8.2 ft SILTY SAND: About 75% fine to medium sand; about 25% nonplastic fines with low dry strength and rapid dilatancy; trace of soft, angular gravel; maximum size, 30mm; strong reaction with HCl. IN-PLACE CONDITION: Reddish brown, moist in top 1.5 feet and dry below, moderate to strong cementation with depth. Calcium carbonate stringers present. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 96.0 lbf/ft³, 4.0% (85.6% compaction) LAB TEST DATA: 66.2% sand, 33.8% fines, LL= NA PI= NP SPG= 2.63 Maximum dry density: 112.2 lbf/ft³, optimum water content= 13.6% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2					
3					
4	In-place density taken at 7.0 ft				
5					
6					
7					
8	8.2 ft (6116.2)				
9	SANDSTONE 9.5 ft (6114.9)	8.2 to 9.5 ft SANDSTONE: Brown to gray to orange. Fine to medium grain. Moderately soft (H5), breaks with light hammer blow or moderate hand pressure. Sligthly weatherd (W3), discoloration and oxidation present with texture preserved. Can be scratched with fingernail. Excavated in gravel to 12x12x3 inch cobbles. Calcium carbonate in some joints. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
10	CLAYSTONE	9.5 to 11.2 CLAYSTONE: Dark brown, fine grained and friable. Soft (H6), breaks with light to moderate manual pressure and can be scratched with fingernail. Slightly weathered (W3) with calcium carbonate and manganese staining in joints. Excavated as coarse gravel. Difficult to excavate. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
11	11.2 ft (6113.2)				

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to refusal on claystone.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-67

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6129.9
COORDINATES: N 1,744,177 E 2,463,879
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x11.8'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/9/2016
DATE EXCAVATED: 2/9/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1 2 3 4 5	SM	0.0 to 5.5 ft SILTY SAND: About 80% fine to coarse, hard, subangular sand; about 20% nonplastic fines with low dry strength and rapid dilatancy; trace of fine to coarse, soft, angular to subrounded gravel; maximum size, 70mm; strong reaction with HCl. IN-PLACE CONDITON: Reddish brown, dry, lensed and moderate cementation. Calcium carbonate nodules and stringers present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
5.5 ft (6124.4)					
6 7 8 9 10 11	CLAYSTONE	5.5 to 11.8 ft CLAYSTONE: Dark brown, fine grained and friable. Soft (H6), breaks with light to moderate manual pressure and can be scratched with fingernail. Slightly weathered (W3) with calcium carbonate and manganese staining in joints. Excavated as coarse gravel, cobbles and boulders. Some sandstone intervals up to 5 inches thick encountered. Difficult to excavate. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
11.8 ft (6118.1)					

COMMENTS: Surface vegetation consists of weeds. Discontinued hole due to refusal on claystone.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-68

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6147.1
COORDINATES: N 1,741,371 E 2,461,946
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x8.5'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/9/2016
DATE EXCAVATED: 2/9/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1 2 3 4 5 6	SM	0.0 to 6.2 ft SILTY SAND: About 80% fine to medium sand; about 20% nonplastic fines with low dry strength and rapid dilatancy; trace of fine, hard, subangular gravel; trace of very hard, angular cobbles; maximum size, 200mm; strong reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	tr	tr	
6.2 ft (6140.9)					
7 8	SANDSTONE	6.2 to 8.5 ft SANDSTONE: Brown to gray to orange. Fine to medium grain. Moderately soft (H5), breaks with light hammer blow or moderate hand pressure. Slightly weathered to fresh (W2), no oxidization or discolor present with texture preserved. Can be scratched with fingernail. Excavated as gravel to 12x12x3 inch cobbles. Calcium carbonate in some joints. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
8.5 ft (6138.6)					

COMMENTS: Surface vegetation consists of weeds. Trace of cobbles and boulders on surface. Discontinued hole due to refusal on sandstone.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-69

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6147.3
COORDINATES: N 1,740,621 E 2,461,693
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.5'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/10/2016
DATE EXCAVATED: 2/10/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SM (lab classification)	0.0 to 14.5 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation. Calcium carbonate blebs present. Clayclasts the size of coarse gravel present below 9 feet. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 85.9 lbf/ft³, 6.5% (81.1% compaction) LAB TEST DATA: 55.4% sand, 44.6% fines, LL= NA PI= NP SPG= 2.61 Maximum dry density: 105.9 lbf/ft³, optimum water content= 17.4% Laboratory classification is SILTY SAND Two quart corrosion sample taken at 10.0 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2					
3					
4					
5					
6					
7	In-place density taken at 7.0 ft Corrosion sample taken at 10.0 ft				
8					
9					
10					
11					
12					
13					
14	14.5 ft (6132.8)				

COMMENTS: Surface vegetation consists of sage and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-70

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6159.4
COORDINATES: N 1,738,096 E 2,460,028
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.8'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/10/2016
DATE EXCAVATED: 2/10/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	CL	0.0 to 3.8 ft LEAN CLAY: About 90% fines with medium plasticity, high toughness, high dry strength and no dilatancy; about 10% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Dark brown, dry, homogeneous and very hard. Roots present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3	3.8 ft (6155.6)				
4	s(CL)	3.8 to 6.2 ft SANDY LEAN CLAY: About 65% fines with low plasticity, low toughness, low dry strength and no dilatancy; about 35% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Light brown to brown, dry, stratified and hard. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6	6.2 ft (6153.2)				
7	SM (lab classification)	6.2 to 13.8 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 87.3 lbf/ft³, 4.3% (81.8% compaction) LAB TEST DATA: 63.1% sand, 36.9% fines, LL= NA PI= NP SPG= 2.59 Maximum dry density: 106.7 lbf/ft³, optimum water content= 15.7% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10	In-place density taken at 7.0 ft				
13	13.8 ft (6145.6)				
14	SM 14.8 ft (6144.6)	13.8 to 14.8 ft SILTY SAND: About 75% fine sand; about 25% nonplastic fines with medium dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Reddish brown, dry and homogeneous. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS: Surface vegetation consists of sage, grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-71

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6168.4
COORDINATES: N 1,735,951 E 2,458,604
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.8'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/10/2016
DATE EXCAVATED: 2/10/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1–7	SM (visual) CL (lab classification)	0.0 to 7.2 ft SILTY SAND: About 75% fine sand; about 25% nonplastic fines with low dry strength and rapid dilatancy; maximium size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown, dry and medium cementation. Stratified with 2 inch LEAN CLAY intervals at 3.8 and 6.2 feet. Roots present. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 78.5 lbf/ft³, 13.2% (80.3% compaction) LAB TEST DATA: 90.8% fines, 9.2% sand, LL= 44.2 PI= 26.3 SL= 12.5 SPG= 2.66 Maximum dry density: 97.7 lbf/ft³, optimum water content= 22.5% Laboratory classification is LEAN CLAY NOTE: TEST EXTENDED INTO UNDERLYING INTERVAL. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	In-place density taken at 7.0 ft				
7	7.2 ft (6161.2)				
8	CL	7.2 to 8.6 ft LEAN CLAY WITH SAND: About 90% fines with medium plasticity, medium dry strength, medium toughness and no dilatancy; about 10% fine sand; maximum size, fine sand; weak to strong reaction with HCl.			
	8.6 ft (6159.8)				
9–14	s(CL)	IN-PLACE CONDITION: Brown, dry, blocky and very hard. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 8.6 to 14.8 ft SANDY LEAN CLAY: About 55% fines with medium plasticty, medium toughness, medium dry strength and no dilatancy; about 45% fine sand: maximum size, fine sand; weak to strong reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and hard. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	14.8 ft (6153.6)				

COMMENTS: Surface vegetation consists of weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-72

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6171.7
COORDINATES: N 1,734,915 E 2,458,008
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.6'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/10/2016
DATE EXCAVATED: 2/10/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	s(CL)	0.0 to 1.8 SANDY LEAN CLAY: About 65% fines with low plasticty, low toughness, medium dry strength and no dilatancy; about 35% fine sand; maximum size, fine sand; weak reaction with HCl.			
	1.8 ft (6169.9)	IN-PLACE CONDITION: Brown, dry, hard and stratified. Iron oxide staining present.			
2	SM (visual) CL (lab classification)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3		1.8 to 7.6 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines, low dry strength and rapid dilatancy; maximum size, fine sand; no reaction with HCl.			
4		IN-PLACE CONDITION: Tan, dry, stratified and weak cementation.			
5	In-place density taken at 7.0 ft	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 76.5 lbf/ft³, 13.1% (77.3% compaction) LAB TEST DATA: 94.0% fines, 6.0% sand, LL= 38.1 PI= 16.5 SL= 16.1 SPG= 2.60 Maximum dry density: 99.0 lbf/ft³, optimum water content= 21.1% Laboratory classification is LEAN CLAY			
6					
7		NOTE: TEST EXTENDED INTO UNDERLYING INTERVAL.			
	7.6 ft (6164.1)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
8	CL	7.6 to 9.2 ft LEAN CLAY: About 90% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 10% fine sand; maximum size, fine sand; weak reaction with HCl.			
9	9.2 ft (6162.5)	IN-PLACE CONDITION: Dark brown, dry, blocky to stratified.			
	s(CL)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10		9.2 to 14.6 ft SANDY LEAN CLAY: About 55% fines with low plasticity, low toughness, medium dry strength and no dilatancy; about 45% fine sand, maximum size, fine sand; weak reaction with HCl.			
11		IN-PLACE CONDITION: Brown, dry, homogeneous and hard.			
12	Corrosion sample taken at 10.0 ft	Two quart corrosion sample taken at 10.0 ft.			
13		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14					
	14.6 ft (6157.1)				

COMMENTS: Surface vegetation consists of weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR9-16-73

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 9 PIPELINE
GROUND ELEVATION: 6175.3
COORDINATES: N 1,733,938 E 2,457,331
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.5'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/11/2016
DATE EXCAVATED: 2/11/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1 2 3	SM	0.0 to 3.8 ft SILTY SAND: About 60% fine sand; about 40% nonplastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; no to weak reaction with HCl. IN-PLACE CONDITION: Light brown to brown to tan. Dry, stratified and lensed with clean sand and clay about 1 to 2 inches in width. Low to moderate cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3.8 ft (6171.5)					
4 5 6 7 8 9 10 11 12 13 14	(CL)s (lab classification) In-place density taken at 7.0 ft	3.8 to 14.5 ft LEAN CLAY WITH SAND: About 80% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 20% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and hard. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 82.2 lbf/ft³, 8.3% (78.2% compaction) LAB TEST DATA: 73.9% fines, 26.1% sand, LL= 28.4 PI= 13.3 SPG= 2.60 Maximum dry density: 105.1 lbf/ft³, optimum water content= 17.5% Laboratory classification is LEAN CLAY WITH SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14.5 ft (6160.8)					

COMMENTS: Surface vegetation consists of tumbleweeds. Surface is humocky. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR10-16-1

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 10 PIPELINE
GROUND ELEVATION: 6174.8
COORDINATES: N 1,732,948 E 2,456,647
METHOD OF EXPLORATION: DEERE 310J BACKHOE
APPROXIMATE DIMENSIONS: 12'x18'x14.8'
LOGGED BY: P. Gardner
DEPTH TO WATER: NE DATE: 2/11/2016
DATE EXCAVATED: 2/11/2016

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	s(CL)	0.0 to 4.7 ft SANDY LEAN CLAY: About 60% fines with edium plasticity, medium toughness, medium dry strength and slow dilatancy; about 40% fine sand; maximum size, fine sand; weak reaction wiith HCl. IN-PLACE CONDITION: Dark brown, moist, stratified and firm. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4.7 ft (6170.1)					
5	SM (lab classification)	4.7 to 9.5 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and moderate cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 83.0 lbf/ft³, 4.9% (78.3% compaction) LAB TEST DATA: 56.7% sand, 43.3% fines, LL= NA PI= NP SPG= 2.61 Maximum dry density: 106.0 lbf/ft³, optimum water content= 16.3% Laboratory classification is SILTY SAND			
7	In-place density taken at 7.0 ft				
9					
9.5 ft (6165.3)		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10	(CL)s	9.5 to 14.8 ft LEAN CLAY WITH SAND: About 75% fines with medium plasticity, medium toughness, medium dry strength and no dilatancy; about 25% fine sand; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry, homogeneous and hard. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14					
14.8 ft (6160.0)					

COMMENTS: Surface vegetation consists of grasses and weeds. Discontinued hole due to limit of equipment.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR10-15-2

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 10 PIPELINE
GROUND ELEVATION: 6180.7
COORDINATES: N 1,731,735 E 2,455,950
METHOD OF EXPLORATION: CASE 580 SUPER M BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X10.5'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 9/16/2015
DATE EXCAVATED: 9/16/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 4.2 ft CLAYEY SAND: About 80% fine sand; about 20% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak to strong reaction with HCl. IN-PLACE CONDITION: Reddish brown in color; becomes grayish brown from 2.2 to 4.2 ft, moderate cementation; roots throughout. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4	4.2 ft (6176.5)				
5	SP-SC	4.2 to 6.0 ft POORLY GRADED SAND WITH CLAY: About 90% fine sand; about 10% fines with low plasticity, low toughness, low dry strength slow dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Reddish brown in color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
6	6.0 ft (6174.7)				
7	SP-SM (VISUAL) In-place density and 50 Lb sample taken from 7.0 to 8.0 ft.	6.0 to 9.5 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Grayish brown in color, moderate cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 93.9 lbs. / cu ft., 3.7 %. (86.1% compaction) LAB TEST DATA: 50.7% sand, 49.3% fines, LL= NA, PI = NP SPG =2.64 Maximum dry density= 109.1 lbs. / cu ft., optimum water content = 14.8% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
9	9.5 ft (6171.2)				
10	SANDSTONE	9.5 to 10.5 ft SANDSTONE: Fine grained, tan in color, very soft (H7) and very intensely weathered (W8) in top 0.5 ft; becomes soft (H6) and moderately to intensely weathered (W6) below top 0.5 ft; thinly to moderately bedded; intermittent iron oxide staining and calcareous zones; no reaction with HCl outside calcareous zones. Recovered as 3 to 10 inch subangular fragments. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
	10.5 ft (6170.2)				

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH. DISCONTINUED EXCAVATION DUE TO REFUSAL ON SANDSTONE BEDROCK.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR10-15-3

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 10 PIPELINE
GROUND ELEVATION: 6205.8
COORDINATES: N 1,730,877 E 2,455,338
METHOD OF EXPLORATION: CASE 580 SUPER M BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X11.5'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 9/16/2015
DATE EXCAVATED: 9/16/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP	0.0 to 2.6 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Reddish brown in color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
2	2.6 ft (6203.2)				
3	SC	2.6 to 5.3 ft CLAYEY SAND: About 75% fine sand; about 25% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Reddish brown in color; moderate cementation, roots throughout. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
4					
5	5.3 ft (6200.5)				
6	SP-SM (VISUAL)	5.3 to 10.0 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Light brown in color, loosely consolidated. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 TO 8.0 ft. Total: 93.5 lbs. / cu ft., 3.3%.(85% compaction) LAB TEST DATA: 65.4% sand, 34.6 % fines, LL= NA, PI = NP SPG =2.63 Maximum dry density= 110.0 lbs. / cu ft., optimum water content = 14.4 % Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7	In-place density, 50 Lb sample, and 1 gal corrosion sample taken from 7.0 to 8.0 ft.				
8					
9					
10	10.0 ft (6195.8)				
11	SANDSTONE	10.0 to 11.5 ft SANDSTONE: Fine grained, tan in color, moderately soft (H5) and moderately to intensely weathered (W6); thinly to moderately bedded; intermittent calcareous zones; no reaction with HCl outside calcareous zones. Thin lenses of hard (H3), slightly weathered (W3), grey sandstone present near the top. Recovered as 3 to 10 inch subangular fragments. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
	11.5 ft (6194.3)				

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH. DISCONTINUED EXCAVATION DUE TO REFUSAL ON SANDSTONE BEDROCK.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR10-15-4

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 10 PIPELINE
GROUND ELEVATION: 6212.8
COORDINATES: N 1,729,646 E 2,454,403
METHOD OF EXPLORATION: CASE 580 SUPER M BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X11.5'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 9/16/2015
DATE EXCAVATED: 9/16/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP	0.0 to 1.9 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Brown in color, roots throughout.			
1.9 ft (6210.9)		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2	SC	1.9 to 6.5 ft CLAYEY SAND: About 75% fine sand; about 25% fines with medium plasticity, medium toughness, medium dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Reddish brown in color; moderate cementation, roots throughout. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6.5 ft (6206.3)					
7	SM (LAB CLASSIF)	6.5 to 10.5 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl.			
8	In-place density and 50 Lb sample taken from7.0 to 8.0 ft.	IN-PLACE CONDITION: Tan in color, moderate cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 TO 8.0 ft. Total: 97.9 lbs. / cu ft., 6.0%. (88.2 % compaction) LAB TEST DATA: 77.6% sand, 22.4 % fines, LL= 27.2, PI = 1.0 SPG = 2.67 Maximum dry density= 111.0 lbs. / cu ft., optimum water content = 15.6 % Laboratory classification is SILTY SAND			
9					
10					
10.5 ft (6202.3)		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
11	SANDSTONE	10.5 to 11.5 ft SANDSTONE: Fine grained, tan in color, moderately soft (H5) and moderately to intensely weathered (W6); thinly to moderately bedded; intermittent calcareous zones; no reaction with HCl outside calcareous zones. Recovered as 3 to 10 inch subangular fragments.			
11.5 ft (6201.3)		GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH. DISCONTINUED EXCAVATION DUE TO REFUSAL ON SANDSTONE BEDROCK.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR11-15-1

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 11 PIPELINE
GROUND ELEVATION: 6260.5
COORDINATES: N 1,727,486 E 2,453,041
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X4.0'X11.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 9/14/2015
DATE EXCAVATED: 9/14/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP-SM	0.0 to 2.0 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; trace cobbles, maximum size, 100mm; strong reaction with HCl. IN-PLACE CONDITION: Brown in color, roots throughout.	tr		
2	2.0 ft (6258.5)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3	SANDSTONE	2.0 to 11.0 ft SANDSTONE: Intermittent lenses of grey, hard (H3), moderately to slightly weathered (W4) sandstone caprock in top 1.0 ft. The caprock is moderately bedded, recovered as flat subangular fragments up to 1.4 ft X 0.5 ft. with Iron oxide staining. The main body of sandstone is predominately fine grained, tan in color, soft (H6) to moderately soft (H5) and moderately to intensely weathered (W6). The sandstone is thinly to moderately bedded, with intermittent iron oxide staining and calcareous zones. No reaction with HCl outside calcareous zones. Recovered as 3 to 10 inch subangular fragments. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
11	11.0 ft (6249.5)				

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH. DISCONTINUED EXCAVATION DUE TO REFUSAL ON SANDSTONE BEDROCK.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR11-15-2

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 11 PIPELINE
GROUND ELEVATION: 6247.4
COORDINATES: N 1,725,883 E 2,452,005
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 9/14/2015
DATE EXCAVATED: 9/14/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC 1.0 ft (6246.4)	0.0 to 1.0 ft CLAYEY SAND: About 80% fine sand; about 20% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl.			
	1.3 ft (6246.1) CL (VISUAL) CH (LAB CLASSIF)	IN-PLACE CONDITION: Grey in color, dry, roots throughout.			
2	SP	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3	3.4 ft (6244.0)	1.0 to 1.3 ft LEAN CLAY: About 95% fines with medium to high plasticity, medium to high dry strength, and medium to high toughness; about 5% fine sand; maximum size, fine sand; strong reaction with HCl.			
4	CL	IN-PLACE CONDITION: Dark grey in color, dry, roots throughout.			
5		BAG SAMPLE FROM 1.0 TO 1.3 ft. LAB TEST DATA: 8.7% sand, 91.3 % fines, LL= 54.7, PI =36.9 SL= 9.4, SPG = 2.55 Laboratory classification is FAT CLAY			
6		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7	In-place density, 50 Lb sample, and 1 gal corrosion sample taken from 6.0 to 7.0 ft.	1.3 to 3.4 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Grey in color, dry, roots throughout. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
8					
9		3.4 to 11.5 ft LEAN CLAY: About 95% fines with medium to high plasticity, medium dry strength, and medium toughness; about 5% fine sand; maximum size, fine sand; strong reaction with HCl.			
10		IN-PLACE CONDITION: Dark grey in color, dry, becomes moist below 6.0 ft, roots throughout. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 TO 7.0 ft. Total: 86.7 lbs. / cu ft., 16.3%. (92.3% compaction)			
11	11.5 ft (6235.9)	LAB TEST DATA: 11.4% sand, 88.6 % fines, LL=46.7 , PI = 29.4, SPG= 2.54 Maximum dry density= 93.9 lbs. / cu ft., optimum water content = 24.4 % Laboratory classification is LEAN CLAY			
12	SC	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
13		11.5 to 14.0 ft CLAYEY SAND: About 80% fine sand; about 20% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Reddish brown in color, moist; calcite nodules below 12.0 ft.			
14	14.0 ft (6233.4)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH. DIFFICULT EXCAVATION IN STIFF CLAY. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR11-15-3

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 11 PIPELINE
GROUND ELEVATION: 6251.6
COORDINATES: N 1,724,381 E 2,451,026
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 9/14/2015
DATE EXCAVATED: 9/14/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC (VISUAL) s(CL-ML) (LAB CLASSIF)	0.0 to 14.0 ft CLAYEY SAND: About 80% fine sand; about 20% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl.			
2		IN-PLACE CONDITION: Tan color, roots in top 5 feet.			
3		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 TO 7.0 ft. Total: 84.0 lbs. / cu ft., 6.2%. (78.4% compaction) LAB TEST DATA: 60.4% fines, 39.6% sand, LL = 26.2 , PI = 6.7 SPG =2.6 Maximum dry density= 107.2 lbs. / cu ft., optimum water content = 15.0% Laboratory classification is SANDY LEAN CLAY WITH SILT.			
4		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
5					
6					
7	In-place density and 50 Lb sample taken from 6.0 to 7.0 ft.				
8					
9					
10					
11					
12					
13					
14	14.0 ft (6237.6)				

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR11-15-4

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 11 PIPELINE
GROUND ELEVATION: 6271.3
COORDINATES: N 1,722,031 E 2,449,505
METHOD OF EXPLORATION: CASE 580 SUPER M BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X15.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 9/15/2015
DATE EXCAVATED: 9/15/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1–15	SC (VISUAL) SM (LAB CLASSIF)	0.0 to 15.0 ft CLAYEY SAND: About 85% fine sand; about 15% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Grayish tan in color; loosely consolidated, dry, becomes moist below 11.0 ft, roots in top 1.0 foot. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 TO 7.0 ft. Total: 84.0 lbs. / cu ft., 4.9% (77.2% compaction) LAB TEST DATA: 62.3% sand, 37.7% fines, LL= 22.1, PI =0.7 SPG =2.58 Maximum dry density = 108.8 lbs. / cu ft., optimum water content = 15.3% Laboratory classification is SILTY SAND. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7–8	In-place density and 50 Lb sample taken from 6.0 to 7.0 ft.				
15	15.0 ft (6256.3)				

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH AND GRASS. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR11-15-5

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 11 PIPELINE
GROUND ELEVATION: 6279.6
COORDINATES: N 1,721,123 E 2,448,904
METHOD OF EXPLORATION: CASE 580 SUPER M BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X16.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 9/15/2015
DATE EXCAVATED: 9/15/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
0	SC	0.0 to 1.3 ft CLAYEY SAND: About 80% fine sand; about 20% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl.			
1.3 ft (6278.3)					
1.6 ft (6278.0)	(CL)s	IN-PLACE CONDITION: Tan color; roots in top 5 feet.			
	SP	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
		1.3 to 1.6 ft LEAN CLAY WITH SAND: About 80% fines with medium plasticity, medium dry strength, and medium toughness; about 20% fine sand; maximum size, fine sand; strong reaction with HCl.			
		IN-PLACE CONDITION: Dark gray in color, dry, horizon concentrated near the bottom of roots.			
6.0 ft (6273.6)		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	SC (VISUAL)	1.6 to 6.0 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; no reaction with HCl.			
	In-place density and 50 Lb sample taken from 6.0 to 7.0 ft.	IN-PLACE CONDITION: Grayish tan in color, dry.			
		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
		6.0 to 10.0 ft CLAYEY SAND: About 80% fine sand; about 20% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl.			
10.0 ft (6269.6)					
	SP	IN-PLACE CONDITION: Grayish tan color, dry.			
		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 TO 7.0 ft. Total: 81.0 lbs. / cu ft., 5.7%. (75.2% compaction) LAB TEST DATA: 63.1% sand, 36.9% fines, LL=25.6, PI = 6.6 SPG = 2.59 Maximum dry density= 107.7 lbs. / cu ft., optimum water content = 16.3% Laboratory classification is CLAYEY SAND WITH SILT.			
		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
		10.0 to 16.0 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; no reaction with HCl.			
16.0 ft (6263.6)		IN-PLACE CONDITION: Grayish tan in color, dry.			
		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR11-15-6

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 11 PIPELINE
GROUND ELEVATION: 6286.9
COORDINATES: N 1,720,451 E 2,448,460
METHOD OF EXPLORATION: CASE 580 SUPER M BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X15.5'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 9/15/2015
DATE EXCAVATED: 9/15/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP-SM	0.0 to 3.0 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Grayish brown in color, stratifiied dunes, moderate cementation.			
2					
3	3.0 ft (6283.9)	GEOLOGIC INTERPRETATION: Quaternary Eolian (Qeo)			
	3.4 ft (6283.5) SC	3.0 to 3.4 ft CLAYEY SAND: About 80% fine sand; about 20% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; weak reaction with HCl.			
4	4.0 ft (6282.9)				
5	SC (VISUAL) s(CL) (LAB CLASSIF)	IN-PLACE CONDITION: Tan color, intermittent iron oxide staining, dry, roots throughout.			
6		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7		3.4 to 4.0 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Grayish brown in color, stratifiied, moderate cementation.			
8					
9	In-place density, 50 Lb sample and 1 gal corrosion sample taken from 6.0 to 7.0 ft.	GEOLOGIC INTERPRETATION: Quaternary Eolian (Qeo) 4.0 to 15.5 ft CLAYEY SAND: About 70% fine sand; about 30% fines with low to medium plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Grayish tan in color, moderate cementation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 TO 7.0 ft. Total: 85.9 lbs. / cu ft., 8.3%.(78.8% compaction) LAB TEST DATA: 64.5% fines, 35.5% sand, LL = 33.0, PI =18.6 SPG = 2.59 Maximum dry density = 109.0 lbs. / cu ft., optimum water content = 16.2 % Laboratory classification is SANDY LEAN CLAY GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10					
11					
12					
13					
14					
15	15.5 ft (6271.4)				

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH. AREA COVERED BY SAND DUNES UP TO 3 FEET TALL. DISCONTINUED EXCAVATION TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR11-15-8

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 6297.1
COORDINATES: N 1,716,515 E 2,447,324
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X14.6'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE: 10/21/2015
DATE EXCAVATED: 10/21/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SP-SM	0.0 to 1.2 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% non plastic fines with no toughness, no dry strength; maximum size, fine sand; no reaction with HCl.			
1	1.2 ft (6295.9)				
2	SM	IN-PLACE CONDITION: Tan in color, dry GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3		1.2 to 14.6 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with low toughness, low to no dry strength; maximum size, fine sand; no reaction with HCl.			
4		IN-PLACE CONDITION: Tan in color, dry			
5		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 95.8 lbs. / cu ft., 3.7 %.(88.6 % compaction) LAB TEST DATA: 72.7% sand, 21.4 % fines, 5.9% gravel LL= NA, PI = NP SPG =2.64 Maximum dry density= 108.1 lbs. / cu ft., optimum water content = 14.2% Laboratory classification is SILTY SAND			
7	IN-PLACE DENSITY TAKEN AT 7.0 FEET				
8		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14	14.6 ft (6282.5)				

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH, DISCONTINUED DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR11-15-9

SHEET 1 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 6315.5
COORDINATES: N 1,714,685 E 2,447,172
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X13.0'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE: 10/20/2015
DATE EXCAVATED: 10/20/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC (VISUAL) SM (LAB CLASS)	0.0 to 11.4 FT CLAYEY SAND: About 75% fine sand; about 25% fines with medium plasticity, medium toughness, medium dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Reddish brown in color; calcite cement, roots throughout. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 102.9 lbs. / cu ft., 4.8 %.(93.3 % compaction) LAB TEST DATA: 70.6% sand, 29.4 % fines, LL= NA, PI= NP SPG= 2.65 Maximum dry density= 110.3 lbs. / cu ft., optimum water content = 14.2% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
2					
3					
4					
5	IN-PLACE DENSITY TAKEN AT 7.0 FEET				
6					
7					
8					
9					
10					
11					
11.4 ft (6304.1)					
12	s(CL)	11.4 to 12.8 FT SANDY LEAN CLAY: About 50% medium plastic fines with medium dry strength, medium toughness; about 50% fine sand; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown in color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
12.8 ft (6302.7)					
13	SANDSTONE	12.8 to 13.0 FT SANDSTONE: Fine grained, tan in color, moderately soft (H5),			

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASOINAL SAGE BRUSH. DISCONTINUED DUE TO REFUSAL ON BEDROCK.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR11-15-9

SHEET 2 OF 2

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 6315.5
COORDINATES: N 1,714,685 E 2,447,172
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X10.0'X13.0'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE: 10/20/2015
DATE EXCAVATED: 10/20/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
		moderately weathered (W5). GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS:

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST-PIT/HAND-AUGER NO. TPR11-15-10

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NGWSP
LOCATION: PIPELINE
GROUND ELEVATION: 6384.4
COORDINATES: N 1,713,352 E 2,444,252
METHOD OF EXPLORATION: CASE 680 L BACKHOE
APPROXIMATE DIMENSIONS: 15.0' X 10.0' X14.5'
LOGGED BY: J. GILBERT
DEPTH TO WATER: WLNE DATE: 10/20/2015
DATE EXCAVATED: 10/20/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 5.9 ft CLAYEY SAND: About 75% fine sand; about 25% fines with medium plasticity, medium toughness, medium dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Reddish brown in color; calcite cement, roots throughout. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
6	5.9 ft (6378.5) 6.2 ft (6378.2) SM SC (VISUAL) s(ML)(LAB CLASS)	5.9 to 6.2 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with rapid dilatancy, and low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown in color. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
9		6.2 to 14.5 ft CLAYEY SAND: About 75% fine sand; about 25% fines with medium plasticity, medium toughness, medium dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl.			
10	IN-PLACE DENSITY TAKEN AT 7.0 FEET	IN-PLACE CONDITION: Brown in color. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 7.0 ft. Total: 93.8 lbs. / cu ft., 6.7 %.(82.5 % compaction) LAB TEST DATA: 52.8% fines, 47.2% sand, LL= 22.2, PI = 3.4 SPG =2.64 Maximum dry density= 113.7 lbs. / cu ft., optimum water content = 14.3% Laboratory classification is SANDY SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal).			
14	14.5 ft (6369.9)				

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASOINAL SAGE BRUSH. DISCONTINUED EXCAVATION DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT NO. TPR11-15-12

SHEET 1 OF 1

FEATURE: REACHES 9, 10 AND 11
PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
LOCATION: REACH 11 PIPELINE
GROUND ELEVATION: 6376.9
COORDINATES: N 1,712,142 E 2,443,791
METHOD OF EXPLORATION: CASE 580 SUPER M BACKHOE
APPROXIMATE DIMENSIONS: 15.0'X8.0'X14.0'
LOGGED BY: C. BEYER
DEPTH TO WATER: WLNE DATE: 9/16/2015
DATE EXCAVATED: 9/16/2015

DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
1	SC	0.0 to 6.0 ft CLAYEY SAND: About 80% fine sand; about 20% fines with low plasticity, low toughness, low dry strength and slow dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown in color; becomes grayish brown from 2.2 to 4.3 ft, moderate cementation; roots in top 4 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6	6.0 ft (6370.9)				
7	SANDSTONE	6.0 to 13.5 ft SANDSTONE: Fine grained, tan in color, soft (H6), intensely to moderately weathered (W6), thinly to moderately bedded; intermittent iron oxide staining and calcareous zones. Recovered predominately as 3 to 10 inch flat subangular fragments with some as large as 1.6 ft in diameter. No reaction with HCl outside calcareous zones. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			
13	13.5 ft (6363.4)				
14	14.0 ft (6362.9)	13.5 to 14.0 ft CLAYSTONE: Grey in color, mottled, soft (H6) moderately weathered (W5), moist, intermittent iron oxide staining and calcite nodules; strong reaction with HCl. Recovered as 2 to 4 inch subangular fragments. GEOLOGIC INTERPRETATION: Cretaceous Menefee Formation (Kmf)			

COMMENTS: SURFACE HEAVILY VEGETATED WITH RUSSIAN THISTLE, AND OCCASIONAL SAGE BRUSH. DISCONTINUED EXCAVATION DUE TO REFUSAL ON CLAYSTONE BEDROCK.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-1

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	5.0-6.5	SM	13.9	14.3	71.8	0.0	0.0	0.0	NP	NP	-	-	3.9	-	2.63	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-2

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.5 – 5.0	***	20.4	31.0	48.6	0.0	0.0	0.0	***	***	-	-	17.6	-	2.61	-	-	-	-
SPT #2	6.0 – 7.5	***	14.0	12.5	73.5	0.0	0.0	0.0	***	***	-	-	19.6	-	2.64	-	-	-	-
SPT #3	8.5 – 10.0	***	13.9	12.8	73.3	0.0	0.0	0.0	***	***	-	-	19.9	-	2.62	-	-	-	-
SPT #4	11.0 – 12.5	***	42.4	37.0	20.6	0.0	0.0	0.0	***	***	-	-	3.0	-	2.63	-	-	-	-
SPT #5	13.5 – 15.0	***	42.1	40.2	17.7	0.0	0.0	0.0	***	***	-	-	17.7	-	2.65	-	-	-	-
SPT #6	16.0 – 17.5	***	36.9	33.9	29.2	0.0	0.0	0.0	***	***	-	-	17.2	-	2.67	-	-	-	-
SPT #7	18.5 – 20.0	***	32.8	26.2	41.0	0.0	0.0	0.0	***	***	-	-	18.7	-	2.62	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**** Atterberg Limits Lab samples not-labeled.*

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-3

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.5 – 5.0	$_S$(CL)	28.4	22.6	49.0	0.0	0.0	0.0	29.3	15.9	-	-	6.3	-	2.55	-	-	-	-
SPT #2	6.0 – 7.5	SC	21.9	16.9	59.4	1.8	0.0	0.0	26.9	12.4	-	-	4.4	2.67	2.56	-	-	-	-
SPT #3	8.5 – 10.0	CH	55.1	34.9	10.0	0.0	0.0	0.0	56.7	36.0	10.3	-	15.0	-	2.64	-	-	-	-
SPT #4	11.0 – 12.5	(CL)$_S$	42.3	42.2	15.5	0.0	0.0	0.0	42.5	27.0	13.3	-	13.6	-	2.72	-	-	-	-
SPT #5	13.5 – 15.0	$_S$(CL)	25.0	34.1	40.9	0.0	0.0	0.0	31.9	16.6	-	-	16.5	-	2.69	-	-	-	-
SPT #6	18.5 – 20.0	CL	50.8	36.0	13.2	0.0	0.0	0.0	44.6	26.5	13.1	-	15.9	-	2.70	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

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SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-5

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.8-5.3	SM	8.5	8.9	82.6	0.0	0.0	0.0	NA	NP	-	-	3.0	-	2.61	-	-	-	-
SPT #2	6.3-7.8	SM	8.4	5.8	85.8	0.0	0.0	0.0	NA	NP	-	-	2.3	-	2.63	-	-	-	-
SPT #3	8.8-10.3	SM	17.3	15.8	66.9	0.0	0.0	0.0	20.1	3.5	-	-	4.7	-	2.61	-	-	-	-
SPT #4	11.3-12.8	SM	9.0	11.3	79.6	0.1	0.0	0.0	NA	NP	-	-	2.9	NA	2.62	-	-	-	-
SPT #5	13.8-15.3	SC	14.0	30.8	55.2	0.0	0.0	0.0	21.0	7.4	-	-	4.7	-	2.60	-	-	-	-
SPT #6	16.3-17.8	$(SM)_g$	4.3	9.1	65.6	21.0	0.0	0.0	NA	NP	-	-	1.1	2.42	2.60	-	-	-	-
SPT #7	18.8-20.3	SM	3.4	6.5	79.1	11.0	0.0	0.0	NA	NP	-	-	0.6	2.42	2.63	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-6

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	5.0-6.5	SC-SM	20.0	7.7	72.3	0.0	0.0	0.0	23.6	5.0	-	-	4.9	-	2.54	-	-	-	-
SPT #2	7.5-9.0	SC	24.0	9.1	66.9	0.0	0.0	0.0	26.6	7.1	-	-	6.2	-	2.62	-	-	-	-
SPT #3	10.0-11.5	SC-SM	22.0	10.2	67.8	0.0	0.0	0.0	24.4	6.5	-	-	5.9	-	2.62	-	-	-	-
SPT #4	12.5-14.0	$(GM)_S$	7.5	15.3	37.5	39.7	0.0	0.0	NP	NP	-	-	2.7	2.34	2.52	-	-	-	-
SPT #5	15.0-16.5	$(SM)_G$	7.6	11.6	56.5	24.3	0.0	0.0	NA	NP	-	-	3.2	2.34	2.54	-	-	-	-
SPT #6	17.5-19.0	$(SM)_G$	4.9	8.9	68.2	18.0	0.0	0.0	NP	NP	-	-	2.9	2.39	2.64	-	-	-	-
SPT #7	20.0-21.5	$(SM)_G$	5.9	10.2	49.3	34.6	0.0	0.0	NP	NP	-	-	3.2	2.36	2.53	-	-	-	-
SPT #8	25.0-26.5	SM	8.8	11.6	77.8	1.8	0.0	0.0	NP	NP	-	-	8.3	2.33	2.59	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE:** Reach 9

DHR9-15-7

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	5.0-6.5	CH	69.2	25.1	5.7	0.0	0.0	0.0	114.3	94.0	14.9	-	15.7	-	2.65	-	-	-	-
SPT #2	7.5-8.0	(CL)s	24.1	47.0	28.9	0.0	0.0	0.0	40.5	26.3	21.2		6.6	-	2.72	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-8

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	5.0-5.7	SM	11.0	16.7	67.8	4.5	0.0	0.0	19.2	0.7	-	-	2.6	2.40	-	-	-	-	-
SPT #2	7.5-9.0	$(SC)_G$	15.2	18.7	34.3	31.8	0.0	0.0	29.4	15.1	-	-	4.0	2.51	2.50	-	-	-	-
SPT #3	10.0-11.5	CH	68.0	26.8	5.2	0.0	0.0	0.0	62.4	40.4	4.9	-	14.4	-	2.61	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

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SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-9

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES		SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
			SMALLER THAN 0.005mm	0.005 to 0.074mm															
SPT #1	3.4 -4.9	SC-SM	18.8	23.5	57.7	0.0	0.0	0.0	22.3	4.4	-	-	3.9	-	2.62	-	-	-	-
SPT #2	5.9 – 7.4	SC	24.5	17.4	58.1	0.0	0.0	0.0	24.6	9.1	-	-	5.0	-	2.60	-	-	-	-
SPT #3	8.4 – 9.9	$_S$(CL)	30.8	21.9	47.3	0.0	0.0	0.0	27.3	14.8	-	-	5.8	-	2.64	-	-	-	-
SPT #4	10.9 – 12.4	SM	13.9	15.4	70.7	0.0	0.0	0.0	N/A	N/P	-	-	1.3	-	-	-	-	-	-
SPT #5	13.4 – 14.9	SM	10.9	16.9	72.2	0.0	0.0	0.0	N/A	N/P	-	-	2.3	-	2.68	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-10

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
BAG #1	0.0-2.5	$(GM)_S$	8.1	7.3	35.4	49.2	0.0	0.0	NP	NP	-	-	4.8	2.38	2.54	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-11

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.5-5.0	SM	13.2	20.6	66.2	0.0	0.0	0.0	NA	NP	-	-	3.3	-	2.60	-	-	-	-
SPT #2	6.0-7.5	SC-SM	18.6	30.9	50.5	0.0	0.0	0.0	24.8	5.8	-	-	5.3	-	2.61	-	-	-	-
SPT #3	8.5-10.0	SM	8.4	8.9	81.8	0.9	0.0	0.0	21.1	NP	-	-	1.5	NA	2.58	-	-	-	-
SPT #4	11.0-12.5	SC	14.4	28.3	57.3	0.0	0.0	0.0	22.5	7.2	-	-	4.1	-	2.61	-	-	-	-
SPT #5	13.5-15.0	SM	7.8	11.9	79.5	0.8	0.0	0.0	NA	NP	-	-	1.7	NA	2.65	-	-	-	-
SPT #6	16.0-17.5	$_s$(CL)	36.8	24.5	38.7	0.0	0.0	0.0	42.3	23.8	12.2	-	9.7	-	2.54	-	-	-	-
SPT #7	18.5-20.0	(CL)$_s$	41.8	32.3	25.9	0.0	0.0	0.0	46.7	32.0	10.5	-	5.7	-	NA	-	-	-	-
SPT #8	23.5-25.0	SM	10.6	6.9	69.7	12.8	0.0	0.0	NA	NP	-	-	2.4	2.42	2.57	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE:** Reach 9

DHR9-15-12

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	5.0-6.5	SM	12.3	22.7	65.0	0.0	0.0	0.0	21.7	3.7	-	-	4.4	-	2.55	-	-	-	-
SPT #2	7.5-9.0	SC-SM	17.2	32.6	50.2	0.0	0.0	0.0	23.2	4.5	-	-	7.6	-	2.61	-	-	-	-
SPT #3	10.0-11.5	SM	13.0	27.6	59.4	0.0	0.0	0.0	NA	NP	-	-	7.2	-	2.63	-	-	-	-
SPT #4	12.5-14.0	s(CL-ML)	16.0	43.7	40.3	0.0	0.0	0.0	25.1	5.3	-	-	8.3	-	2.57	-	-	-	-
SPT #5	15.0-16.5	SM	12.6	26.4	61.0	0.0	0.0	0.0	NA	NP	-	-	5.0	-	2.64	-	-	-	-
SPT #6	17.5-19.0	SM	11.2	24.6	64.2	0.0	0.0	0.0	NA	NP	-	-	3.8	-	2.56	-	-	-	-
SPT #7	20.0-21.5	SM	10.3	23.4	66.3	0.0	0.0	0.0	NA	NP	-	-	3.7	-	2.63	-	-	-	-
SPT #8	25.0-26.5	SM	12.4	22.9	62.4	2.3	0.0	0.0	NA	NP	-	-	3.8	2.23	2.64	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-13

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.1 – 4.6	SM	9.9	6.6	69.1	14.4	0.0	0.0	NP	NP	-	-	2.5	2.36	2.61	-	-	-	-
SPT #2	5.6 – 7.1	$_S$(CL)	22.7	39.0	23.7	14.6	0.0	0.0	32.1	14.5	-	-	4.2	2.43	2.56	-	-	-	-
SPT #3	8.1 – 9.6	SC-SM	14.9	16.7	66.5	1.9	0.0	0.0	20.6	7.0	-	-	3.9	2.44	2.63	-	-	-	-
SPT #4	10.6 – 12.1	SM	15.1	20.4	64.5	0.0	0.0	0.0	NP	NP	-	-	4.3	-	2.65	-	-	-	-
SPT #5	13.1 – 14.6	SC	17.2	27.4	55.4	0.0	0.0	0.0	23.2	8.0	-	-	4.1	-	2.60	-	-	-	-
SPT #6	15.6 – 17.1	SM	11.6	22.8	63.7	1.9	0.0	0.0	NP	NP	-	-	3.7	2.26	2.62	-	-	-	-
SPT #7	18.1 – 19.6	SM	14.9	29.7	55.4	0.0	0.0	0.0	NP	NP	-	-	4.5	-	2.52	-	-	-	-
SPT #8	23.6 – 25.1	$_S$(CL)	31.6	30.9	37.5	0.0	0.0	0.0	34.0	22.0	-	-	9.7	-	2.67	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE:** Reach 9

DHR9-15-15

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT# 1	5.0-6.1	SM	9.6	11.7	68.4	10.3	0.0	0.0	NA	NP	-	-	2.6	2.46	2.60				

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE:** Reach 9

DHR9-15-17

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	5.0-6.5	SM	11.0	22.3	66.7	0.0	0.0	0.0	NA	NP	-	-	3.3	-	2.59	-	-	-	-
SPT #2	7.5-8.7	s(CL)	31.1	23.3	45.6	0.0	0.0	0.0	31.8	19.5	-	-	7.4	-	2.58	-	-	-	-
SPT #3	10.0-11.5	SM	10.3	24.8	64.9	0.0	0.0	0.0	NA	NP	-	-	3.0	-	2.59	-	-	-	-
SPT #4	12.5-14.0	SM	16.7	32.8	50.5	0.0	0.0	0.0	22.0	1.2	-	-	4.3	-	2.65	-	-	-	-
SPT #5	15.0-16.5	(CL)s	40.4	42.6	17.0	0.0	0.0	0.0	40.4	24.6	-	-	6.4	-	2.55	-	-	-	-
SPT #6	17.5-19.0	SM	13.1	22.3	64.6	0.0	0.0	0.0	NA	NP	-	-	3.5	-	2.62	-	-	-	-
SPT #7	20.0-21.5	s(ML)	16.6	43.7	39.7	0.0	0.0	0.0	24.1	2.4	-	-	4.9	-	2.62	-	-	-	-
SPT #8	25.0-26.5	s(ML)	16.9	34.0	49.1	0.0	0.0	0.0	22.9	2.3	-	-	4.6	-	2.64	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE:** Reach 9

DHR9-15-18

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	5.0-6.5	(CL)s	43.6	35.5	20.9	0.0	0.0	0.0	41.5	26.2	15.6	-	7.0	-	2.55	-	-	-	-
SPT #2	7.5-9.0	s(CL)	38.6	15.1	46.3	0.0	0.0	0.0	46.1	30.6	11.7	-	9.6	-	2.62	-	-	-	-
SPT #3	10.0-11.5	(CL)s	26.9	45.1	28.0	0.0	0.0	0.0	28.8	11.0	-	-	7.0	-	2.64	-	-	-	-
SPT #4	12.5-14.0	SC-SM	18.3	14.9	66.8	0.0	0.0	0.0	23.2	5.4	-	-	5.3	-	2.60	-	-	-	-
SPT #5	15.0-16.5	(CL)s	46.1	34.5	19.4	0.0	0.0	0.0	47.8	34.0	10.6	-	7.3	-	2.52	-	-	-	-
SPT #6	17.5-19.0	(CH)s	35.7	44.5	19.8	0.0	0.0	0.0	88.0	72.1	14.0	-	6.2	-	2.63	-	-	-	-
SPT #7	20.0-21.5	SM	15.3	31.8	52.9	0.0	0.0	0.0	22.2	2.0	-	-	4.5	-	2.59	-	-	-	-
SPT #8	25.0-26.5	s(ML)	18.4	34.3	47.3	0.0	0.0	0.0	21.5	2.3	-	-	6.3	-	2.61	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE:** Reach 9

DHR9-15-19

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	5.0-6.5	s(CL)	51.2	18.6	30.2	0.0	0.0	0.0	49.0	25.2	11.9	-	10.7	-	2.64	-	-	-	-
SPT #2	7.5-9.0	CH	68.0	25.2	6.8	0.0	0.0	0.0	66.0	35.8	13.4	-	10.6	-	2.54	-	-	-	-
SPT #3	10.0-11.5	(CL)s	48.4	29.6	22.0	0.0	0.0	0.0	39.6	19.2	-	-	11.3	-	2.64	-	-	-	-
SPT #4	12.5-14.0	(CL)s	33.8	48.7	17.5	0.0	0.0	0.0	30.8	12.4	-	-	5.2	-	2.52	-	-	-	-
SPT #5	15.0-16.5	SM	8.5	9.2	82.3	0.0	0.0	0.0	NA	NP	-	-	2.2	-	2.62	-	-	-	-
SPT #6	17.5-19.0	SM	15.5	10.2	74.3	0.0	0.0	0.0	NA	NP	-	-	3.6	-	2.62	-	-	-	-
SPT #7A	20.0-20.9	(CH)s	59.4	20.7	19.9	0.0	0.0	0.0	56.8	30.1	10.4	-	10.5	-	2.56	-	-	-	-
SPT #7B	20.9-21.5	SC	29.0	16.0	55.0	0.0	0.0	0.0	29.3	14.7	-	-	5.0	-	2.58	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-20

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.5 – 5.0	SC	23.6	16.7	57.6	2.1	0.0	0.0	25.2	10.8	-	-	7.4	2.53	2.62	-	-	-	-
SPT #2	6.0 – 7.5	$_S$(CL)	30.4	20.0	49.6	0.0	0.0	0.0	31.0	18.0	-	-	6.3	-	2.65	-	-	-	-
SPT #3	8.5 – 10.0	SC	24.7	15.2	60.1	0.0	0.0	0.0	31.8	15.9	-	-	6.3	-	2.55	-	-	-	-
SPT #4	11.0 – 12.5	SM	16.6	11.3	72.1	0.0	0.0	0.0	N/A	N/P	-	-	6.7	-	2.65	-	-	-	-
SPT #5	13.5 – 15.0	CH	71.8	23.2	5.0	0.0	0.0	0.0	82.5	61.3	12.1	-	7.7	-	2.63	-	-	-	-
SPT #6	16.0 – 17.5	CH	74.0	22.2	3.8	0.0	0.0	0.0	84.1	63.3	12.0	-	15.4	-	2.62	-	-	-	-
SPT #7	18.5 – 20.0	CH	41.7	43.4	14.9	0.0	0.0	0.0	54.5	38.6	16.3	-	7.4	-	2.69	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-21

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.2 - 4.7	$_S$(CL)	31.2	21.8	47.0	0.0	0.0	0.0	31.3	19.1	-	-	7.6	-	2.61	-	-	-	-
SPT #2	5.7 - 7.2	SM	13.5	7.3	79.2	0.0	0.0	0.0	N/P	N/P	-	-	4.1	-	2.62	-	-	-	-
SPT #3	8.2 - 9.7	SC-SM	15.3	10.2	74.5	0.0	0.0	0.0	24.6	5.5	-	-	5.7	-	2.67	-	-	-	-
SPT #4	10.7 – 12.2	***	11.2	8.1	80.7	0.0	0.0	0.0	***	***	-	-	3.0	-	2.63	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**** Not enough material to run Atterberg Limits/PI*

G183

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-22

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.5 – 5.0	SC	18.9	11.5	69.6	0.0	0.0	0.0	21.3	7.9	-	-	3.9	-	2.65	-	-	-	-
SPT #2	6.0 – 7.5	CH	87.1	11.6	1.3	0.0	0.0	0.0	67.7	39.5	12.8	-	16.3	-	2.74	-	-	-	-
SPT #3	8.5 – 10.0	CH	82.0	16.3	1.7	0.0	0.0	0.0	60.9	36.3	12.8	-	15.5	-	2.72	-	-	-	-
SPT #4	11.0 – 12.5	CH	63.6	30.1	6.3	0.0	0.0	0.0	53.4	30.7	11.7	-	11.9	-	2.70	-	-	-	-
SPT #5	13.5 – 15.0	CH	47.5	46.8	5.7	0.0	0.0	0.0	50.6	25.4	-	-	13.7	-	2.73	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-23

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.2 – 4.7	$_S$(CL)	26.2	30.1	43.7	0.0	0.0	0.0	27.4	12.9	-	-	7.0	-	2.66	-	-	-	-
SPT #2	5.7 – 7.2	SM	13.9	9.6	76.5	0.0	0.0	0.0	N/A	N/P	-	-	3.2	-	2.64	-	-	-	-
SPT #3	8.2 – 9.7	SM	17.4	16.7	65.9	0.0	0.0	0.0	N/A	N/P	-	-	3.7	-	2.64	-	-	-	-
SPT #4	10.7 – 12.2	SC-SM	15.0	18.2	66.8	0.0	0.0	0.0	21.2	6.0	-	-	3.3	-	2.64	-	-	-	-
SPT #5	13.2 – 14.7	$_S$(CL)	28.6	34.9	36.5	0.0	0.0	0.0	30.7	12.5	-	-	6.5	-	2.55	-	-	-	-
SPT #6	18.2 – 19.7	(CL)$_S$	48.0	35.8	16.2	0.0	0.0	0.0	44.0	25.6	12.7	-	6.9	-	2.51	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

DHR9-15-24

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.5 – 5.0	$(CL)_S$	42.9	30.7	26.4	0.0	0.0	0.0	37.5	21.1	14.7	-	9.0	-	2.65	-	-	-	-
SPT #2	6.0 – 7.5	SM	22.7	15.7	61.6	0.0	0.0	0.0	N/A	N/P	-	-	3.4	-	-	-	-	-	-
SPT #3	8.5 – 10.0	SM	21.7	26.6	51.7	0.0	0.0	0.0	23.9	2.8	-	-	4.9	-	2.66	-	-	-	-
SPT #4	11.0 – 12.5	$(CL)_S$	33.0	48.9	18.1	0.0	0.0	0.0	33.8	16.6	15.0	-	5.8	-	2.64	-	-	-	-
SPT #5	13.5 – 15.0	$(CL)_S$	49.2	29.6	21.2	0.0	0.0	0.0	43.1	26.1	11.3	-	8.2	-	-	-	-	-	-
SPT #6	18.5 – 20.0	$(CL)_S$	45.0	34.0	21.0	0.0	0.0	0.0	37.1	20.6	12.1	-	6.4	-	-	-	-	-	-
SPT #7	23.5 – 25.0	SM	15.4	16.3	68.3	0.0	0.0	0.0	20.4	2.0	-	-	4.2	-	2.61	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

G186

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 10**

DHR10-15-1

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.3-4.8	SC-SM	19.2	18.5	62.3	0.0	0.0	0.0	22.3	5.7	-	-	4.4	-	2.60	-	-	-	-
SPT #2	5.8-7.3	SC	25.8	23.9	50.3	0.0	0.0	0.0	26.9	13.7	-	-	5.8	-	2.61	-	-	-	-
SPT #3	8.3-9.8	SC	24.6	19.3	56.1	0.0	0.0	0.0	26.8	13.6	-	-	6.5	-	2.60	-	-	-	-
SPT #4	10.8-12.3	SC	26.8	16.8	56.4	0.0	0.0	0.0	26.9	13.8	-	-	6.6	-	2.56	-	-	-	-
SPT #5	13.3-14.8	$(CH)_s$	50.8	31.7	17.5	0.0	0.0	0.0	55.9	40.1	9.5	-	7.5	-	2.52	-	-	-	-
SPT #6	15.8-17.3	$(CL)_s$	36.0	47.9	16.1	0.0	0.0	0.0	41.0	23.0	NA	-	6.2	-	2.55	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

G187

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE:** Reach 10

DHR10-15-2

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	5.0-6.5	SM	10.5	9.1	80.4	0.0	0.0	0.0	NA	NP	-	-	2.1	-	2.57	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE:** Reach 10

DHR10-15-3

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES		SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
			SMALLER THAN 0.005mm	0.005 to 0.074mm															
SPT #1	5.0-6.5	SM	15.3	19.4	65.3	0.0	0.0	0.0	21.0	2.0	-	-	4.6	-	2.65	-	-	-	-
SPT #2	7.5-9.0	SM	12.3	22.5	65.2	0.0	0.0	0.0	NA	NP	-	-	3.8	-	2.64	-	-	-	-
SPT #3	10.0-11.5	SM	16.3	26.2	57.5	0.0	0.0	0.0	NA	NP	-	-	3.4	-	2.62	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 11**

DHR11-15-1

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.0-4.5	s(CL)	35.0	32.3	32.7	0.0	0.0	0.0	28.4	11.8	-	-	5.4	-	2.54	-	-	-	-
SPT #2	5.5-7.0	SM	23.7	22.0	54.3	0.0	0.0	0.0	NA	NP	-	-	3.4	-	2.64	-	-	-	-
SPT #3	8.0-9.5	s(CL)	39.7	20.5	39.8	0.0	0.0	0.0	34.5	17.8	-	-	8.4	-	2.68	-	-	-	-
SPT #4	10.5-12.0	s(CL)	32.6	32.5	34.9	0.0	0.0	0.0	36.2	17.2	-	-	5.1	-	-	-	-	-	-
SPT #5	13.0-14.5	CH	68.0	28.9	3.1	0.0	0.0	0.0	81.9	62.7	10.4	-	9.6	-	-	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 11**

DHR11-15-2

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.2-4.7	SM	18.3	21.5	60.2	0.0	0.0	0.0	NA	NP	-	-	4.3	-	-	-	-	-	-
SPT #2	5.7-7.2	S(CL)	27.5	26.4	46.1	0.0	0.0	0.0	31.0	17.0	-	-	4.5	-	2.59	-	-	-	-
SPT #3	8.2-9.7	CL	55.4	41.9	2.7	0.0	0.0	0.0	45.6	25.8	13.0	-	8.5	-	-	-	-	-	-
SPT #4	10.7-12.2	CH	80.9	16.7	2.4	0.0	0.0	0.0	72.6	42.7	8.0	-	12.7	-	2.47	-	-	-	-
SPT #5	13.2-14.7	SC-SM	30.0	11.9	58.1	0.0	0.0	0.0	25.7	6.5	-	-	4.3	-	-	-	-	-	-
SPT #6	15.7-17.2	SC	27.8	21.6	50.6	0.0	0.0	0.0	25.1	7.2	-	-	4.4	-	2.59	-	-	-	-
SPT #7	18.2-19.7	CH	72.7	24.8	2.5	0.0	0.0	0.0	66.6	39.7	9.2	-	10.7	-	-	-	-	-	-
SPT #8	20.7-22.2	SM	19.8	20.9	59.3	0.0	0.0	0.0	NA	NP	-	-	4.2	-	2.56	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 11**

DHR11-15-3

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005mm	0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	5.0-6.5	SC-SM	18.7	25.3	54.5	1.5	0.0	0.0	24.3	6.2	-	-	4.7	2.66	2.67	-	-	-	-
SPT #2	7.5-9.0	SC-SM	19.9	28.4	51.7	0.0	0.0	0.0	24.2	6.1	-	-	4.9	-	2.68	-	-	-	-
SPT #3	10.0-11.5	(CL)s	52.9	30.9	16.2	0.0	0.0	0.0	39.9	20.9	15.1	-	11.9	-	2.73	-	-	-	-
SPT #4	12.5-14.0	(CL)s	32.9	46.0	21.1	0.0	0.0	0.0	42.0	20.6	22.2	-	8.0	-	2.53	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 11**

DHR11-15-4

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	3.8-5.3	SM	16.3	16.6	67.1	0.0	0.0	0.0	NA	NP	-	-	7.4	-	2.60	-	-	-	-
SPT #2	6.3-7.1	SM	16.4	15.0	68.6	0.0	0.0	0.0	NA	NP	-	-	3.4	-	NA	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 11**

DHR11-15-5

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
SPT #1	2.5-4.0	SC-SM	26.8	18.0	55.2	0.0	0.0	0.0	23.2	5.1	-	-	6.7	-	2.62	-	-	-	-
SPT #2	5.0-6.5	SC	26.9	22.0	51.1	0.0	0.0	0.0	25.5	11.8	-	-	7.1	-	2.62	-	-	-	-
SPT #3	7.5-9.0	SC-SM	19.9	20.1	60.0	0.0	0.0	0.0	22.9	5.7	-	-	5.4	-	2.68	-	-	-	-
SPT #4	10.0-11.5	SM	17.0	24.9	58.1	0.0	0.0	0.0	NP	NP	-	-	4.3	-	2.66	-	-	-	-
SPT #5	12.5-14.0	$_S$(ML)	17.9	44.3	37.8	0.0	0.0	0.0	25.0	NP	-	-	4.9	-	2.64	-	-	-	-
SPT #6	15.0-16.5	$(CL)_S$	46.9	30.4	22.7	0.0	0.0	0.0	40.5	25.1	12.0	-	11.2	-	2.69	-	-	-	-
SPT #7	17.5-19.0	$(CL)_S$	45.6	38.8	15.6	0.0	0.0	0.0	44.5	23.9	16.0	-	12.6	-	2.67	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 9**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
*TPR9-15-2	7.0	SM	7.5	8.9	83.5	0.1	0.0	0.0	N/P	N/P	-	96.2	2.6	-	2.63	103.1	14.3	-	93.3
*TPR9-15-4	7.0	$(SM)_G$	6.2	8.2	67.9	17.7	0.0	0.0	N/P	N/P	-	104.7	2.8	2.4	2.64	116.3	11.6	600	90.0
*TPR9-15-5	7.0	$(CL)_S$	20.7	62.0	17.3	0.0	0.0	0.0	29.4	8.8	-	103.4	6.2	-	2.59	106.4	17.2	1250	97.2
*TPR9-15-8	7.0	$_S(CL)$	35.0	25.3	39.6	0.1	0.0	0.0	33.1	19.9	-	78.1	9.0	-	2.62	109.0	17.0	300	71.7
*TPR9-15-10	7.0	SM	15.3	10.7	74.0	0.0	0.0	0.0	N/P	N/P	-	91.1	3.9	-	2.65	110.6	14.5	500	82.4

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**Denotes in-place density and 5-point curve.*

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 9**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
*TPR9-15-14	7.0	SC-SM	23.0	13.8	62.8	0.4	0.0	0.0	21.9	5.7	-	101.6	6.3	2.47	2.61	113.3	14.5	700	89.7
*TPR9-15-15	7.0	SM	9.5	23.1	67.4	0.0	0.0	0.0	N/P	N/P	-	89.4	3.3	-	2.63	105.4	14.0	910	84.8
*TPR9-15-16	7.5	SM	9.5	22.1	63.5	4.9	0.0	0.0	N/P	N/P	-	88.4	4.1	2.38	2.63	110.4	13.6	450	80.1
*TPR9-15-17	7.0	$_S$(CL)	30.9	19.9	49.2	0.0	0.0	0.0	26.8	14.0	-	92.1	7.2	-	2.65	110.5	15.5	590	83.3
*TPR9-15-19	8.0	SM	6.9	6.8	79.1	7.2	0.0	0.0	N/P	N/P	-	104.8	2.7	2.33	2.64	109.3	13.7	525	95.9
*TPR9-15-20	8.0	$_S$(CL)	44.7	19.1	36.2	0.0	0.0	0.0	36.9	24.6	-	96.8	9.9	-	2.65	100.6	21.1	210	96.2
*TPR9-15-23	7.0	SM	20.7	21.4	57.9	0.0	0.0	0.0	22.8	2.5	-	92.2	7.2	-	2.67	110.2	14.6	700	83.7
*TPR9-15-26	7.0	SC-SM	26.3	18.9	54.8	0.0	0.0	0.0	22.7	6.6	-	91.6	6.5	-	2.67	112.9	14.5	800	81.1

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**Denotes in-place density and 5-point curve.*

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

TPR9-15-18

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES: SMALLER THAN 0.005mm	FINES: 0.005 to 0.074mm	SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
BAG #1	4.0 – 8.0	$(GP\text{-}GM)_S$	5.5	4.1	43.1	47.3	0.0	0.0	NP	NP	-	-	-	-	-	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

TPR9-15-20

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES		SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
			SMALLER THAN 0.005mm	0.005 to 0.074mm															
BAG #1	10.0	$(CL)_S$	54.0	22.6	23.4	0.0	0.0	0.0	49.0	35.1	6.2	-	11.3	-	2.61	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Navajo Gallup Water Supply Project **FEATURE: Reach 9**

TPR9-15-22

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
SAMPLE NUMBER	DEPTH - feet	CLASSIFICATION SYMBOL	FINES		SAND #200 (0.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	COBBLES 3" (76.2mm) to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY- pcf	FILL MOISTURE CONTENT- %	SPECIFIC GRAVITY PLUS No. 4	SPECIFIC GRAVITY MINUS No. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM MOISTURE CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
			SMALLER THAN 0.005mm	0.005 to 0.074mm															
BAG #1	0.0 – 1.2	$(CH)_S$	59.0	16.8	22.9	1.3	0.0	0.0	52.2	38.0	11.3	-	14.6	2.54	2.72	-	-	-	-

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 9**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
*TPR9-15-25	7.0	SC	23.6	22.9	53.5	0.0	0.0	0.0	26.8	13.4	-	86.6	6.0	-	2.66	112.6	13.6	1010	76.9
*TPR9-15-27	7.0	SC	25.2	16.2	58.5	0.1	0.0	0.0	23.4	7.6	-	89.1	7.2	2.35	2.62	111.3	15.3	600	80.1
*TPR9-15-28	7.0	$_S$(CL)	28.9	25.0	46.0	0.1	0.0	0.0	26.1	11.7	-	83.1	8.0	2.35	2.59	110.3	14.3	930	75.3
*TPR9-15-29	7.0	SM	12.0	24.2	63.8	0.0	0.0	0.0	N/P	N/P	-	83.8	4.0	-	2.60	106.3	16.5	480	78.8
*TPR9-15-30	7.0	SM	17.0	15.1	67.9	0.0	0.0	0.0	N/P	N/P	-	95.7	5.3	-	2.61	114.4	14.6	600	83.7
*TPR9-15-31	7.0	SM	9.4	14.6	76.0	0.0	0.0	0.0	N/P	N/P	-	95.0	3.2	-	2.64	108.5	14.3	580	87.6
*TPR9-15-32	7.0	SM	8.8	12.1	70.7	8.4	0.0	0.0	N/P	N/P	-	101.7	3.3	2.40	2.62	112.9	11.6	700	90.1
*TPR9-15-33	7.0	SC	18.0	25.1	56.7	0.2	0.0	0.0	22.5	8.5	-	86.3	5.7	2.28	2.62	115.9	14.0	1000	74.5

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**Denotes in-place density and 5-point curve.*

G200

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 9**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
*TPR9-15-34	7.0	$_S$(CL)	41.6	27.2	31.2	0.0	0.0	0.0	40.1	22.9	-	76.9	11.9	-	2.68	105.8	18.2	387	72.7
*TPR9-15-35	7.0	SM	13.9	16.5	69.6	0.0	0.0	0.0	20.8	2.2	-	88.1	4.2	-	2.62	111.7	14.5	600	78.9
*TPR9-15-36	7.0	SM	11.1	13.8	73.0	2.1	0.0	0.0	N/P	N/P	-	94.3	3.4	2.33	2.61	111.2	12.3	550	84.8
*TPR9-15-37	7.0	SC-SM	20.7	21.3	57.3	0.7	0.0	0.0	22.4	6.1	-	81.1	6.0	2.35	2.64	105.0	18.2	550	77.2
*TPR9-15-38	7.0	SM	15.3	17.2	67.2	0.3	0.0	0.0	N/P	N/P	-	87.8	4.8	2.36	2.62	111.8	15.2	750	78.5
*TPR9-15-39	7.0	SC	16.7	25.8	55.4	2.1	0.0	0.0	22.3	7.3	-	87.5	5.7	2.35	2.56	114.3	13.7	1150	76.6
*TPR9-15-40	7.0	SM	13.5	22.2	64.3	0.0	0.0	0.0	N/P	N/P	-	102.7	4.5	-	2.66	111.3	14.2	946	92.3
*TPR9-15-42	7.0	SM	6.5	11.1	82.4	0.0	0.0	0.0	N/P	N/P	-	90.8	2.4	-	2.61	106.7	14.5	700	85.1

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**Denotes in-place density and 5-point curve.*

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 9**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
*TPR9-16-44	7.0	$_S$(CL)	31.2	33.2	35.6	0.0	0.0	0.0	30.9	14.6	-	91.9	7.4	-	2.61	108.3	16.0	500	84.9
*TPR9-16-45	7.0	SM	15.9	15.3	68.1	0.7	0.0	0.0	N/A	N/P	-	95.0	5.0	2.37	2.57	110.0	13.5	1150	86.4
*TPR9-16-46	7.0	SM	20.0	15.3	64.7	0.0	0.0	0.0	N/A	N/P	-	87.7	5.7	-	2.65	108.9	14.5	650	80.5
*TPR9-16-47	7.0	$_S$(CL)	33.7	32.6	33.7	0.0	0.0	0.0	33.3	19.3	14.4	85.6	8.7	-	2.67	108.9	16.2	575	78.6
*TPR9-16-48	7.0	$_S$(CL)	35.5	31.9	32.6	0.0	0.0	0.0	28.6	14.5	-	85.7	7.8	-	2.64	109.9	16.0	507	78.0
*TPR9-16-49	7.0	$(CL)_S$	59.3	23.7	17.0	0.0	0.0	0.0	49.1	33.8	11.2	96.8	13.2	-	2.61	98.5	23.0	200	98.3
*TPR9-16-50	7.0	$(CL)_S$	30.4	42.5	27.1	0.0	0.0	0.0	29.7	14.1	-	80.6	8.0	-	2.65	103.6	19.4	375	77.8
*TPR9-16-51	7.0	$(CL)_S$	53.5	17.1	29.4	0.0	0.0	0.0	40.7	25.9	10.9	92.1	13.2	-	2.64	101.5	20.9	350	90.7
*TPR9-16-52	7.0	CL	47.8	39.2	13.0	0.0	0.0	0.0	37.7	21.7	-	83.9	12.1	-	2.66	103.0	19.5	450	81.5

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**Denotes in-place density and 5-point curve.*

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 9**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
*TPR9-16-53	7.0	SM	15.9	13.0	71.1	0.0	0.0	0.0	N/A	N/P	-	92.0	4.2	-	2.67	113.8	14.3	700	80.8
*TPR9-16-54	7.0	SC	31.7	10.6	57.7	0.0	0.0	0.0	24.3	10.0	-	88.1	7.3	-	2.65	111.0	16.0	250	79.4
*TPR9-16-55	7.0	SM	14.0	15.3	70.7	0.0	0.0	0.0	N/A	N/P	-	96.5	4.0	-	2.66	111.4	14.6	950	86.6
*TPR9-16-56	7.0	SM	21.7	12.8	65.5	0.0	0.0	0.0	N/A	N/P	-	94.8	5.9	-	2.61	111.5	16.3	450	85.0
*TPR9-16-57	7.0	$_S$(CL)	42.3	13.1	44.6	0.0	0.0	0.0	32.5	18.4	15.0	86.8	10.8	-	2.67	107.6	17.6	363	80.7
*TPR9-16-58	7.0	$_S$(CL)	31.3	32.6	36.1	0.0	0.0	0.0	30.8	13.6	-	88.3	7.9	-	2.66	108.7	16.8	650	81.2
*TPR9-16-59	7.0	CL	67.7	30.5	1.8	0.0	0.0	0.0	49.2	31.0	12.8	92.3	15.7	-	2.64	96.8	22.8	300	95.4
*TPR9-16-60	7.0	$_S$(CL)	38.3	23.3	38.4	0.0	0.0	0.0	30.5	16.5	14.6	93.8	9.1	-	2.62	108.1	17.0	450	86.8

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**Denotes in-place density and 5-point curve.*

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 9**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
*TPR9-16-61	7.0	SM	13.3	9.9	76.8	0.0	0.0	0.0	N/A	N/P	-	90.9	3.5	-	2.64	105.0	14.6	520	86.6
*TPR9-16-62	7.0	SM	22.2	22.0	55.8	0.0	0.0	0.0	N/A	N/P	-	91.5	5.3	-	2.60	109.3	15.6	680	83.7
*TPR9-16-63	7.0	CH	74.2	19.5	6.3	0.0	0.0	0.0	56.8	37.6	8.8	90.5	16.3	-	2.67	93.3	25.8	350	97.0
*TPR9-16-64	7.0	CH	70.0	28.3	1.7	0.0	0.0	0.0	57.9	37.0	12.6	85.1	15.7	-	2.69	93.2	26.7	330	91.3
*TPR9-16-65	7.0	CL	51.4	38.7	9.9	0.0	0.0	0.0	38.7	19.0	16.5	77.6	11.5	-	2.63	101.7	20.5	500	76.3
*TPR9-16-66	7.0	SM	16.9	16.9	66.2	0.0	0.0	0.0	N/A	N/P	-	96.0	4.0	-	2.63	112.2	13.6	620	85.6
*TPR9-16-69	7.0	SM	25.6	19.0	55.4	0.0	0.0	0.0	N/A	N/P	-	85.9	6.5	-	2.61	105.9	17.4	500	81.1
*TPR9-16-70	7.0	SM	16.2	20.7	63.1	0.0	0.0	0.0	N/A	N/P	-	87.3	4.3	-	2.59	106.7	15.7	630	81.8
*TPR9-16-71	7.0	CL	69.4	21.4	9.2	0.0	0.0	0.0	44.2	26.3	12.5	78.5	13.2	-	2.66	97.7	22.5	497	80.3
*TPR9-16-72	7.0	CL	56.9	37.1	6.0	0.0	0.0	0.0	38.1	16.5	16.1	76.5	13.1	-	2.60	99.0	21.1	523	77.3
*TPR9-16-73	7.0	$(CL)_S$	33.8	40.1	26.1	0.0	0.0	0.0	28.4	13.3	-	82.2	8.3	-	2.60	105.1	17.5	700	78.2

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**Denotes in-place density and 5-point curve.*

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 10**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
*TPR10-15-2	7.0	SM	14.1	35.2	50.7	0.0	0.0	0.0	NA	NP	-	93.9	3.7	-	2.64	109.1	14.8	1413	86.1
*TPR10-15-3	7.0	SM	11.9	22.7	65.4	0.0	0.0	0.0	NA	NP	-	93.5	3.3	-	2.63	110.0	14.4	1080	85.0
*TPR10-15-4	7.0	SM	16.8	5.6	77.6	0.0	0.0	0.0	27.2	1.0	-	97.9	6.0	-	2.67	111.0	15.6	900	88.2

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

**Denotes in-place density and 5-point curve.*

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 10**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
*TPR10-16-1	7.0	SM	18.4	24.9	56.7	0.0	0.0	0.0	NA	NP	-	83.0	4.9	-	2.61	106.0	16.3	727	78.3

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

**Denotes in-place density and 5-point curve.*

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 11**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
TPR11-15-2	1.0-1.3	CH	73.1	18.2	8.7	0.0	0.0	0.0	54.7	36.9	9.4	-	15.4	-	2.55	-	-	-	-
*TPR11-15-2	6.0	CL	66.4	22.2	11.4	0.0	0.0	0.0	46.7	29.4	8.4	86.7	16.3	-	2.54	93.9	24.4	483	92.3
*TPR11-15-3	6.0	s(CL-ML)	22.4	38.0	39.6	0.0	0.0	0.0	26.2	6.7	-	84.0	6.2	-	2.60	107.2	15.0	900	78.4
*TPR11-15-4	6.0	SM	17.1	20.6	62.3	0.0	0.0	0.0	22.1	0.7	-	84.0	4.9	-	2.58	108.8	15.3	1000	77.2
*TPR11-15-5	6.0	SC-SM	19.8	17.1	63.1	0.0	0.0	0.0	25.6	6.6	-	81.0	5.7	-	2.59	107.7	16.3	770	75.2
*TPR11-15-6	6.0	s(CL)	31.6	32.9	35.5	0.0	0.0	0.0	33.0	18.6	-	85.9	8.3	-	2.59	109.0	16.2	550	78.8

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**Denotes in-place density and 5-point curve.*

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT **FEATURE: REACH 11**

IDENTIFICATION			PARTICLE SIZE FRACTIONS IN PERCENT						CONSISTENCY LIMITS			IN-PLACE DENSITY				COMPACTION TESTS			
			FINES																
TEST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (0.074 mm) to #4 (4.76 mm)	GRAVEL #4 (4.76 mm) to 3" (76.2 mm)	COBBLES 3" (76.2 mm) to 5" (127 mm)	OVERSIZE Larger than 5" (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	DRY DENSITY - pcf	FILL WATER CONTENT - %	SPECIFIC GRAVITY PLUS NO. 4	SPECIFIC GRAVITY MINUS NO. 4	MAXIMUM DRY DENSITY - pcf	OPTIMUM WATER CONTENT - %	PENETRATION RESISTANCE - psi	D-VALUE - %
*TPR11-15-8	7.0	SM	10.4	11.0	72.7	5.9	0.0	0.0	N/P	N/P	-	95.8	3.7	2.51	2.64	108.1	14.2	640	88.6
*TPR11-15-9	7.0	SM	15.4	14.0	70.6	0.0	0.0	0.0	N/P	N/P	-	102.9	4.8	-	2.65	110.3	14.2	1000	93.3
*TPR11-15-10	7.0	s(ML)	21.9	30.9	47.2	0.0	0.0	0.0	22.2	3.4	-	93.8	6.7	-	2.64	113.7	14.3	900	82.5

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.
**Denotes in-place density and 5-point curve.*