						I Description	
			TION PROCEDURES and basing fractions on estimated weights)	GROUP SYMBOLS	TYPICAL NAMES	INFORMATION REQUIRED FOR DESCRIBING SOILS	LABORATORY CLASSIFICATION CRITERIA
	odrse	CLEAN GRAVELS Little or	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	$C_{V} = \frac{D_{60}}{D_{10}}$ Greater than 4 (D ₃₀)2
than	S of c th c th	CLEA GRAVE (Little no fine	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	gravel; max. size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and	$C_C = \frac{100}{D_{10}}$ Between one and 3
SOILS	GRAVELS han half n is large sieve size sieve size sieve size	ZELS FINES ciable t t	Non-plastic fines (for identification procedures see ML below).	GM	Silty gravels, poorly graded gravel—sand—silt mixtures	other pertinent descriptive information, and symbol in parentheses.	Not meeting all gradation requirements for GW Attorborg limits below "A" Above "A" line
AINED terial is	More that fraction No. 4 si the "si No. 4 si No. 4 si	GRAVELS WITH FINES (Appreciable amount of fines)	Plastic fines (for identification procedures see CL below).	GC	Clayey gravels, poorly graded gravel—sand—clay mixtures	For undisturbed soils add information on stratification,	line or PI less than 4 and 7 are borderline cases
GR ma 12	rse no she the	SANDS or es)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	SW	Well graded sands, gravely sands; little or no fines	degree of compactness, cementation, moisture conditions and drainage characteristics.	$\frac{1}{2}$ $\frac{1}$
COARSE an half of sieve size	S f of of aller ze ussific	CLEAN S (Little no fine	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,	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
e tha	SAN SAN an h is s eve adu	S WITH IES ciable t of	Non-plastic fines (for indentification procedures see ML below).	SM	Silty sands, poorly graded sand-silt mixtures	angular gravel particles ½ — inch maximum size; rounded and subangular sand grains coarse to fine; about 15%	Not meeting all gradation requirements for SW Not meeting all gradat
Mor	More traction No. 4 (For vised of used of	SANDS FINE (Appreci amount fines)	Plastic fines (for identification procedures see CL below).	SC	Clayey sands, poorly graded sand-clay mixtures	non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM).	Ine or PI less than 4 and 7 are borderline cases
	IDENTIFICATION F	PROCEDURES OF	N FRACTION SMALLER THAN No 40 SIEVE SIZE				Afterberg limits above "A" requiring use of line with PI greater than 7 dual symbols.
ller than	it it	DRY STRENC (Crushing Characteristi	to skaking) (Consistency near				For classification of fine-grained soils and fine-grained fraction of coarse-grained soils.
SOILS is sma		None to sli	ght Quick to slow None	ML	Inorganic silty and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; degree and character of plasticity, amount and maximum size of coarse	Equation of "A"-line Horizontal at PI=4 to LL=25.5, then PI=0.73 (LL - 20)
GRAINED : of material size	Ψ I I / \ ¬ / / ~	Medium to	high None to very slow Medium	CL	Inorganic clays to low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays	grains; color in wet condition, odor in any, local or geologic name, and other pertinent descriptive information; and	$ \cdot - $ Vertical at $ \cdot - $ $ \cdot - $ $ \cdot $ $ \cdot $ $ \cdot $ $ \cdot $
GRA If of m		Slight to me	dium Slow Slight	OL	Organic silts and organic silt—clays of low plasticity	symbol in parentheses.	
FINE han half	e Zs	Slight to med	lium Slow to none Slight to medium	МН	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	For undisturbed soils add information on structure, stratification, consistency in	D S S S S S S S S S S S S S S S S S S S
More the No. 200	CLA CLA iquid eater	High to very	high None High	СН	Inorganic clays of high plasticity, fat clays	undisturbed and remolded states. Moisture and drainage conditions.	E 0 10 16 20 30 40 50 60 70 80 90 100
	g	Medium to h	igh None to very slow Slight to mediun	ОН	Inorganic clays of medium to high plasticity	EXAMPLE: — <u>Clayey Silt</u> , brown; slightly plastic. small percentage of fine sand.	LIQUID LIMIT (LL) FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS
HIGHLY OF	RGANIC SOILS	Readily	dentified by color, odor, spongy feel and frequently by fibrous texture.	PT	Peat and other highly organic soils	numerous vertical root holes, firm and dry in place, loess, (ML).	
					ATION DROCEDURES FOR FINE CRAIL	NED COLLE OD EDVETIONE	

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)

' <u>Boundary classifications:</u> — 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.

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.

ADOPTED BY - CORPS OF ENGINEERS AND BUREAU OF RECLAMATION 1952

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 The tougher the thread near the plastic limit and the stiffer the 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

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles. 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.

103 - D - 347

REV NO 2003- 12 -05 REVISED PLASTICITY CHART. REDRAWN WITH AUTOCAD SOFTWARE. D - G.T.3

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 ferromagnesian 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	Rounded,	mentary subrounded, ngular	Pyroc	lastic		
mm	Particle or fragment	Lithified product	Fragment	Lithified product		
256 _	Boulder	Boulder conglomerate	Block ^(a)	Volcanic ^(a) breccia or		
64 _	Cobble	Cobble conglomerate	or Bomb ^(b)	Volcanic ^(b) agglomerate		
4 _	Pebble	Pebble conglomerate	Lapilli	Lapillistone and Lapilli		
2 _	Granule	Granule conglomerate		tuff		
1 0.5 _	Very coarse sand Coarse sand	Sandstone		Coarse tuff		
0.25	Medium sand	(Very coarse,	Coarse ash			
0.125	Fine sand	coarse, medium, fine, or very fine)				
0.0625	Very fine sand	Tille)				
0.00391_	Silt	Siltstone/ Shale				
0.00391	Clay	Claystone Shale	Fine ash	Fine tuff		

(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 >10 mm [>3/8 in] OR PEGMATITIC COARSE GRAINED MEDIUM GRAINED FINE GRAINED APHANITIC (Cannot be

5-10 mm [3/16 -3/8 in] 1-5 mm [1/32 -3/16 in] 0.1-1 mm [0.004 - 1/32 in] <0.1 mm [<0.004 in] seen with the unaided eye)

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

3

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 VERY THICKLY (bedded, 3 to 10 ft (1 to 3 m) foliated or banded) THICKLY MODERATELY THINLY VERY THINLY

foliated or banded)

Greater than 10 ft (>3 m)

1 to 3 ft (300 mm to 1 m) 0.3 to 1 ft (100 to 300 mm) 0.1 to 0.3 ft (30 to 100 mm) 0.03 [3/8 in] to 0.1 ft (10 to 30 mm) Less than 0.03 ft [3/8 in] (<10 mm) LAMINATED (Intensely

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

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.

> 1 D-P. M. R. 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 DRAWN Marshall Mouse TECH. APPROVAL LETE M. Rollies.
> APPROVED Mars Mylon.

CONVERTED ORIGINAL DRAWING 40-D-6493 TO ACAD, CHANGED

40-D-7022

- 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 <u>fault—disturbed zone</u>. 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



C

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.

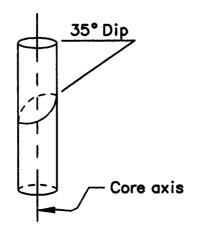


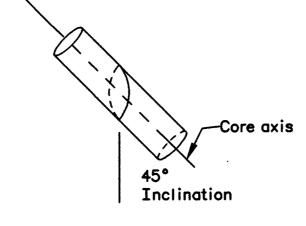
MECHANICAL BREAK (MB) — A break due to drilling, blasting, or handling. Mechanical breaks parallel to bedding or foliation are called <u>Bedding Breaks</u> (BB) or <u>Foliation Breaks</u> (FB), respectively. Recognizing mechanical breaks may be difficult. The absence of oxidation, staining, or mineral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



FRACTURE ZONE (FZ) — Numerous, very closely spaced intersect—ing fractures. Often fragmented core cannot be fitted together.

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





 Vertical hole — true dip is measured and reported.

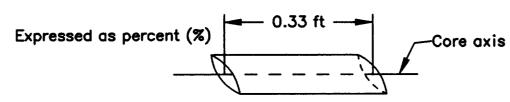
2. Angle hole — true dip usually not known; angle is measured from core axis and is called inclination.

ROCK QUALITY DESIGNATION (RQD)

EXAMPLE SHOWN FOR CORE, BUT APPLICABLE TO ANY LINEAR OBSERVATION

RQD = Sum of length of solid core pieces > 0.33 ft [4 in] (100 mm) long

Length of the run in feet (mm)



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 <u>all natural</u> fractures in an exposure or core recovery lengths in boreholes; <u>excludes mechanical breaks</u>, <u>shears</u>, <u>and shear zones</u>; 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)
VERY WIDELY SPACED (SP2)
WIDELY SPACED (SP3)
MODERATELY SPACED (SP4)
CLOSELY SPACED (SP5)
VERY CLOSELY SPACED (SP6)

Greater then 10 ft (>3 m)
3 to 10 ft (1 to 3 m)
1 to 3 ft (300 mm to 1 m)
0.3 to 1 m (100 to 300 mm)
0.1 to 0.3 ft (30 to 100 mm)
less than 0.1 ft (<30 mm)

FRACTURE CONTINUITY

CONTINUITY DESCRIPTOR

DISCONTINUITY LENGTH

DISCONTINUOUS (C1)
SLIGHTLY CONTINUOUS (C2)
MODERATELY CONTINUOUS (C3)
HIGHLY CONTINUOUS (C4)
VERY CONTINUOUS (C5)

E2

FILLING THICKNESS

Less than 3 ft (<1 m)
3 to 10 ft (1 to 3 m)
10 to 30 ft (3 to 10 m)
30 to 100 ft (10 to 30 m)
Greater than 100 ft (>30 m)

OPENNESS

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).

Neither fracture end terminates in the exposure

FRACTURE OPENNESS OR FILLING THICKNESS

(neither end can be seen).

DESCRIPTOR THICKNESS/OPENNESS DESCRIPTOR CLEAN (TØ) No film or coating. TIGHT (OØ) No visible separation. VERY THIN (T1) Less than 0.003 ft [1/32 in] SLIGHTLY OPEN (01) (<1 mm).MODERATELY THIN 0.003 to 0.01 ft [1/32 to MODERATELY OPEN (02) 1/8 in] (1 to 3 mm). (T2) THIN (T3) 0.01 to 0.03 ft [1/8 to 3/8 OPEN (03) in] (3 to 10 mm). MODERATELY WIDE (04) MODERATELY THICK 0.03 ft [3/8 in] to 0.1 ft (10 to 30 mm). THICK (T5) Greater than 0.1 ft (>30 mm). WIDE (05) Actual thickness or

FRACTURE MOISTURE CONDITIONS

openings recorded.

MOISTURE DESCRIPTOR	DESCRIPTIVE CRITERIA
М1	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.
м3	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.
М5	The fracture shows seepage. It is wet with occasional drops of water.
М6	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 undula—tions 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.

MODERATELY ROUGH (R3): Asperities are clearly visible and fracture surface feels abrasive.

SLIGHTLY ROUGH (R4): Small asperities on the fracture surface are visible

SMOOTH (R5): No asperities, smooth to the touch. POLISHED (R6): Extremely smooth and shiny.

and can be felt.

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

Angular.

Subangular.

Subrounded.

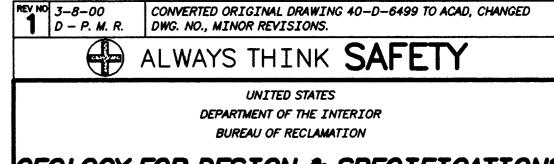
Rounded.

Platy.

Lens-shaped.

Wedge-shaped.

Contorted.



GEOLOGY FOR DESIGN & SPECIFICATIONS

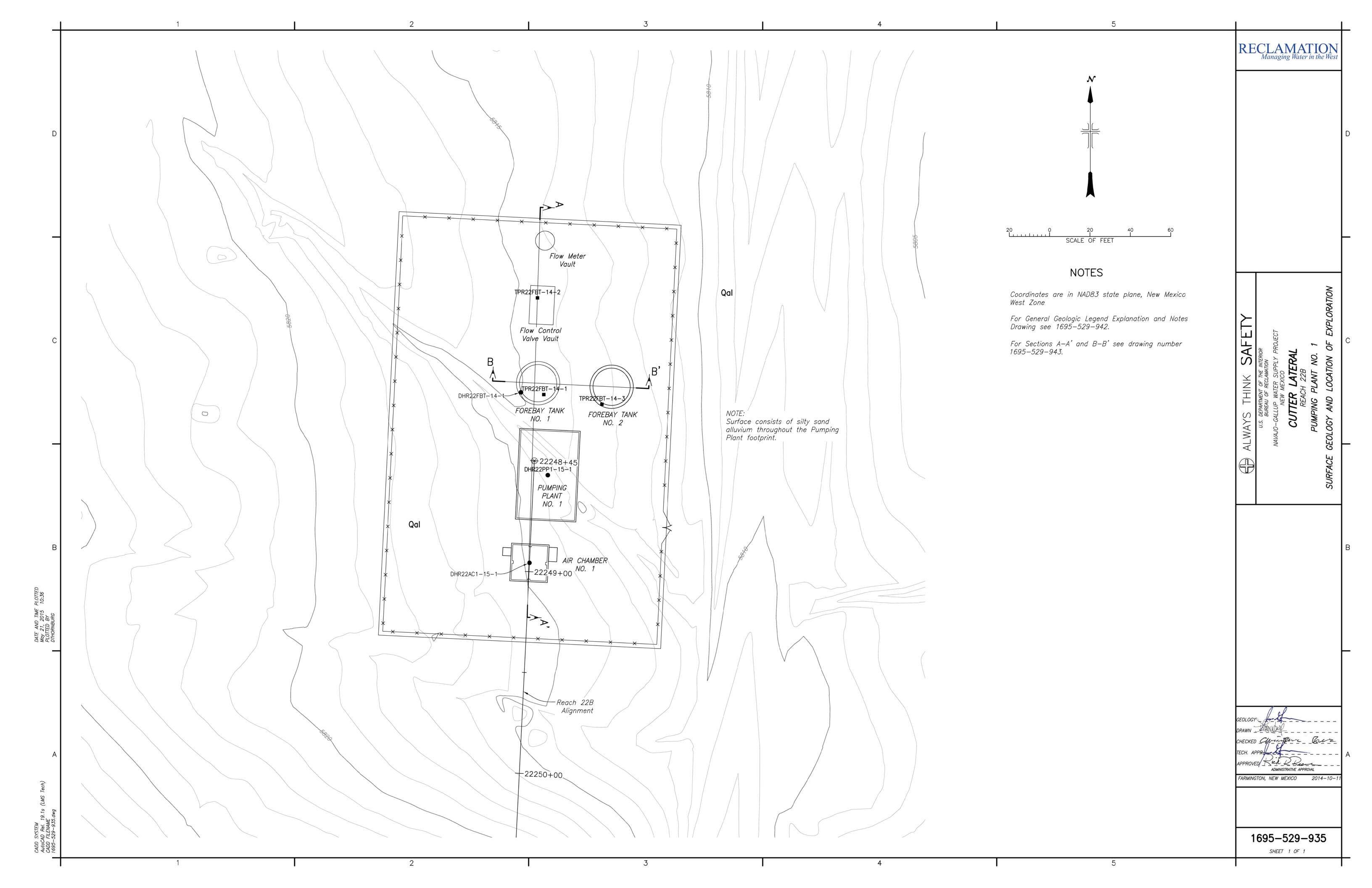
STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES

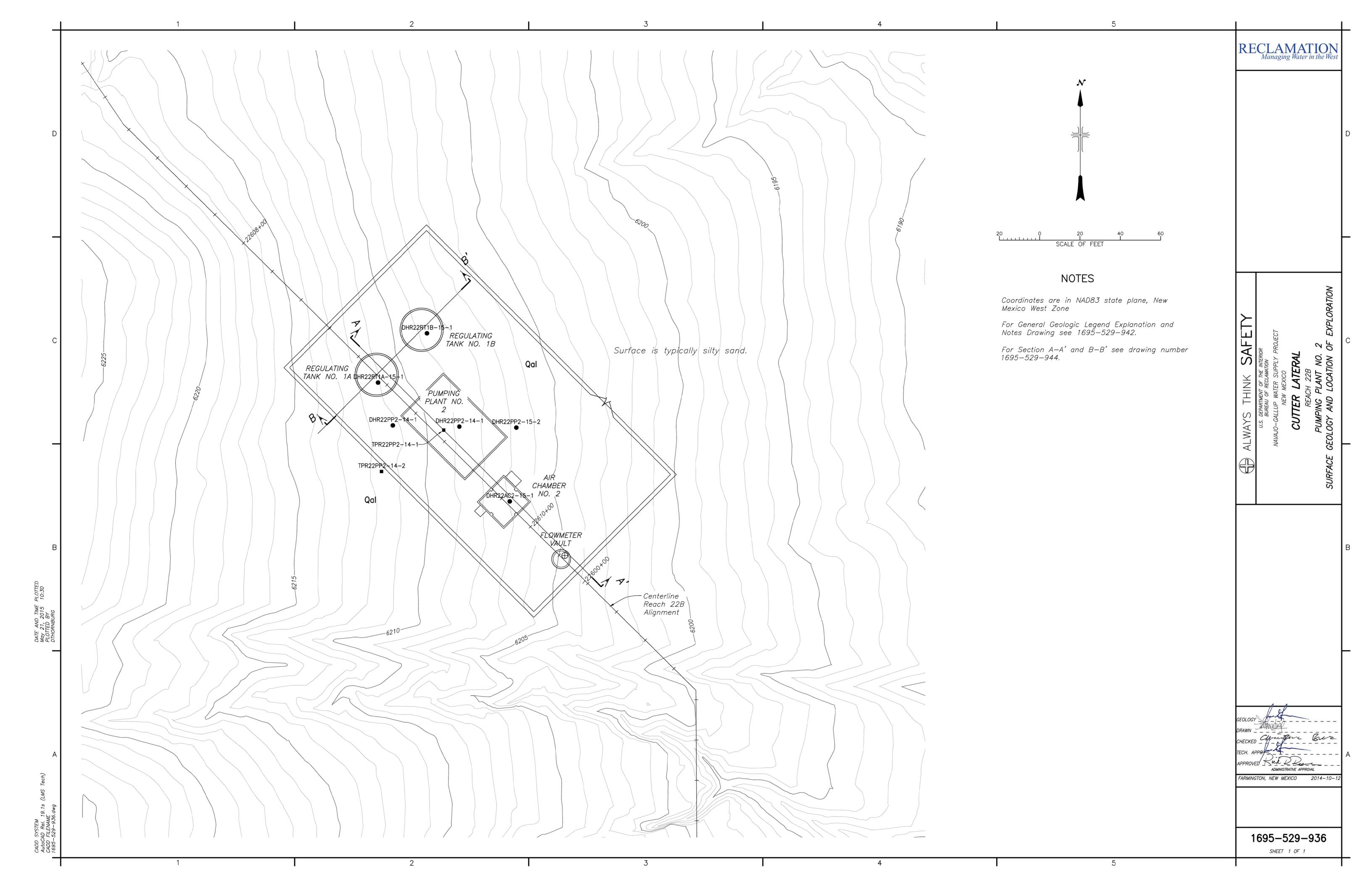
GEOLOGY_NOMENCLATURE COMMITTEE _ CHECKED _ CHECKED _ SUPERIOR SOLLING TECH. APPROVAL LETEN M. LOUISE APPROVED WALL MY UND PEER REVIEWER

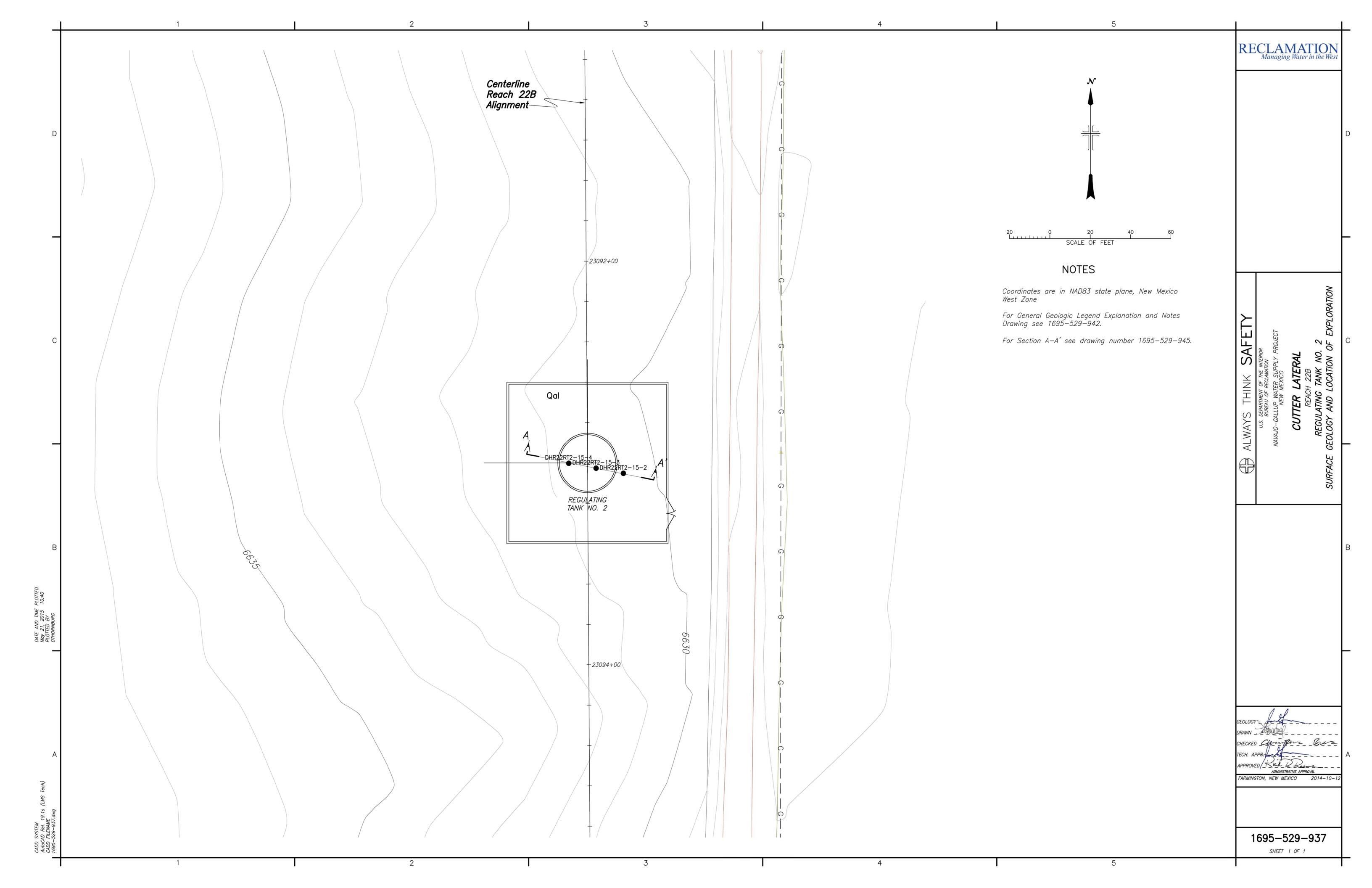
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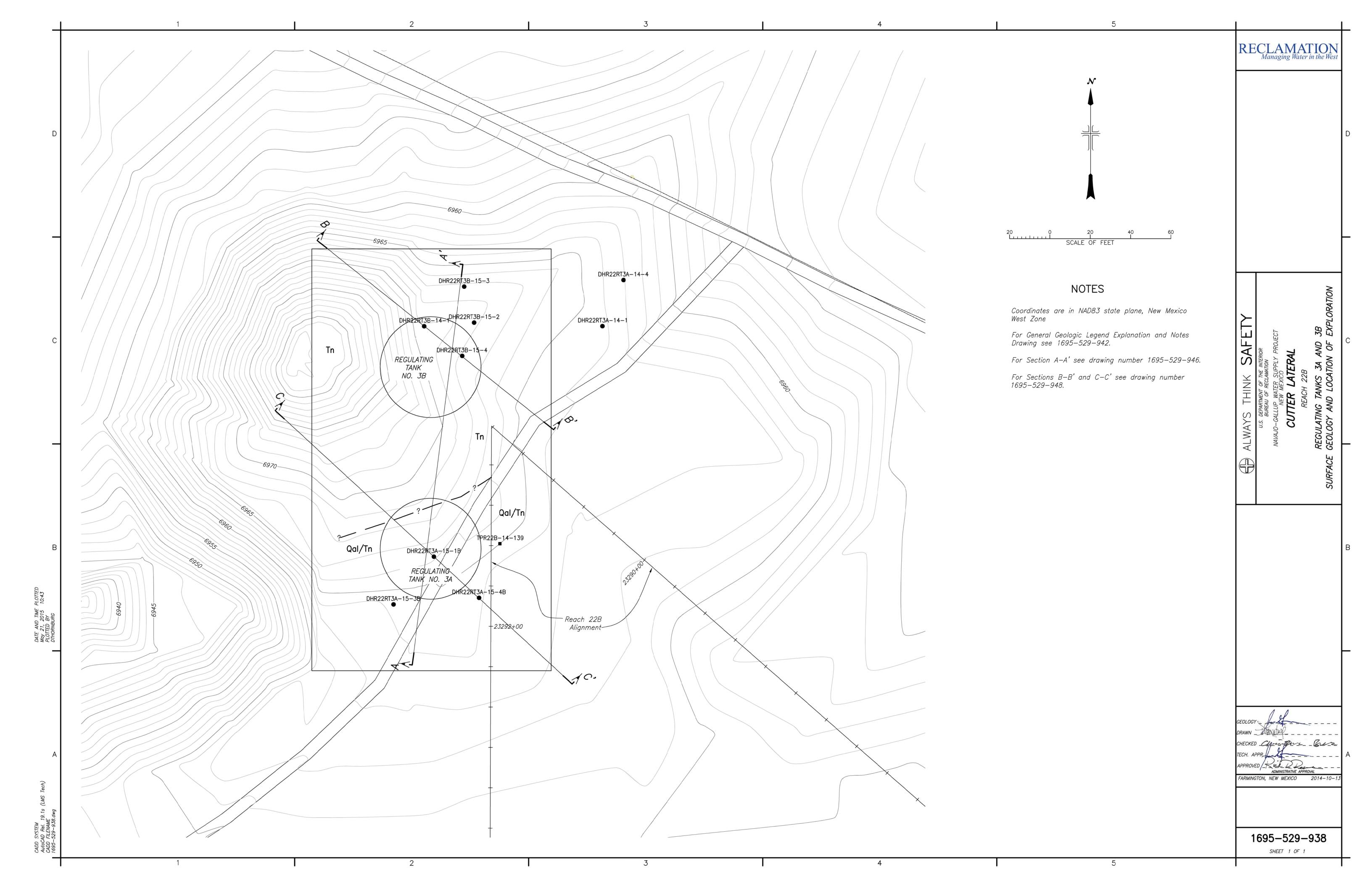
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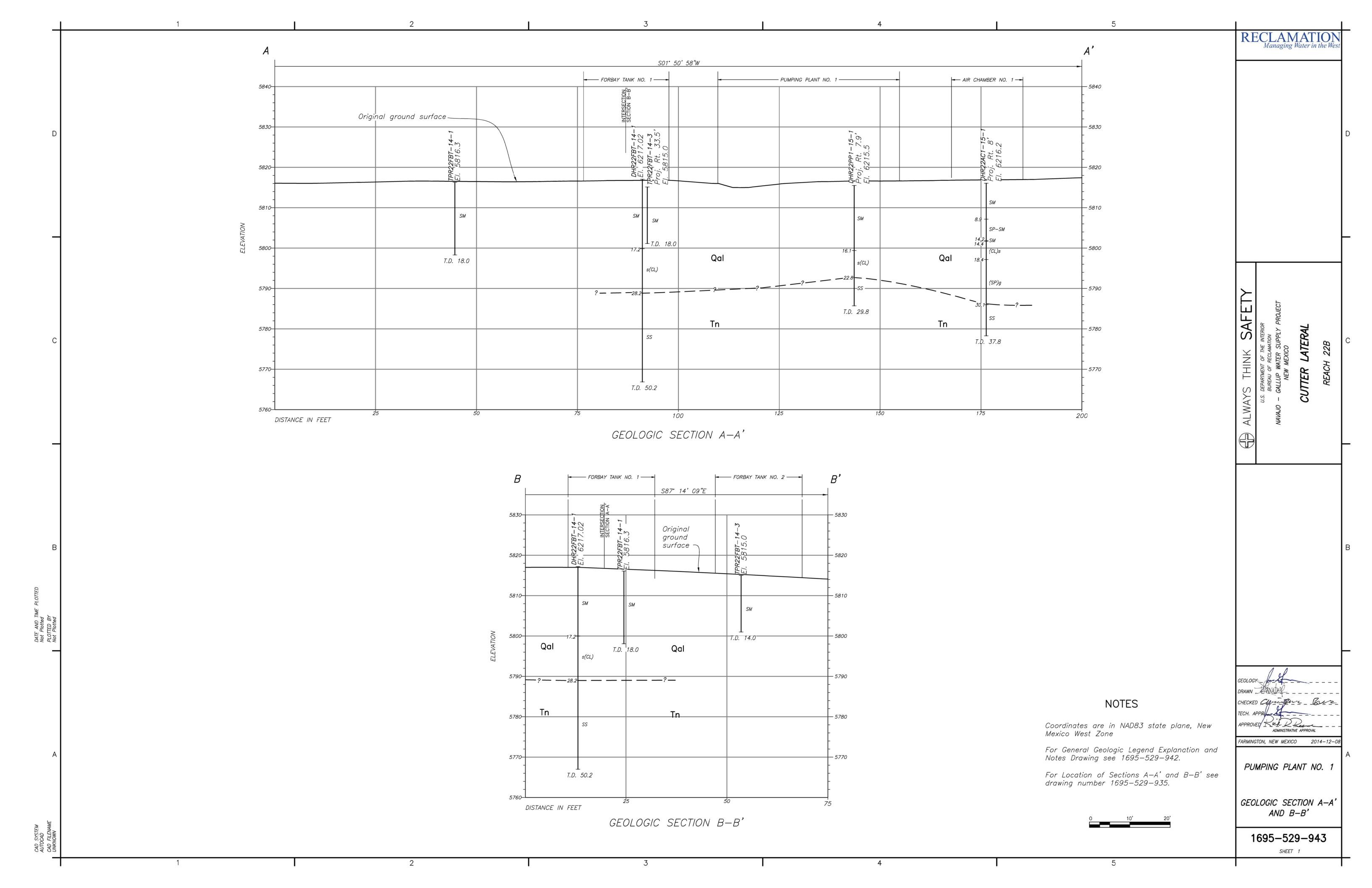


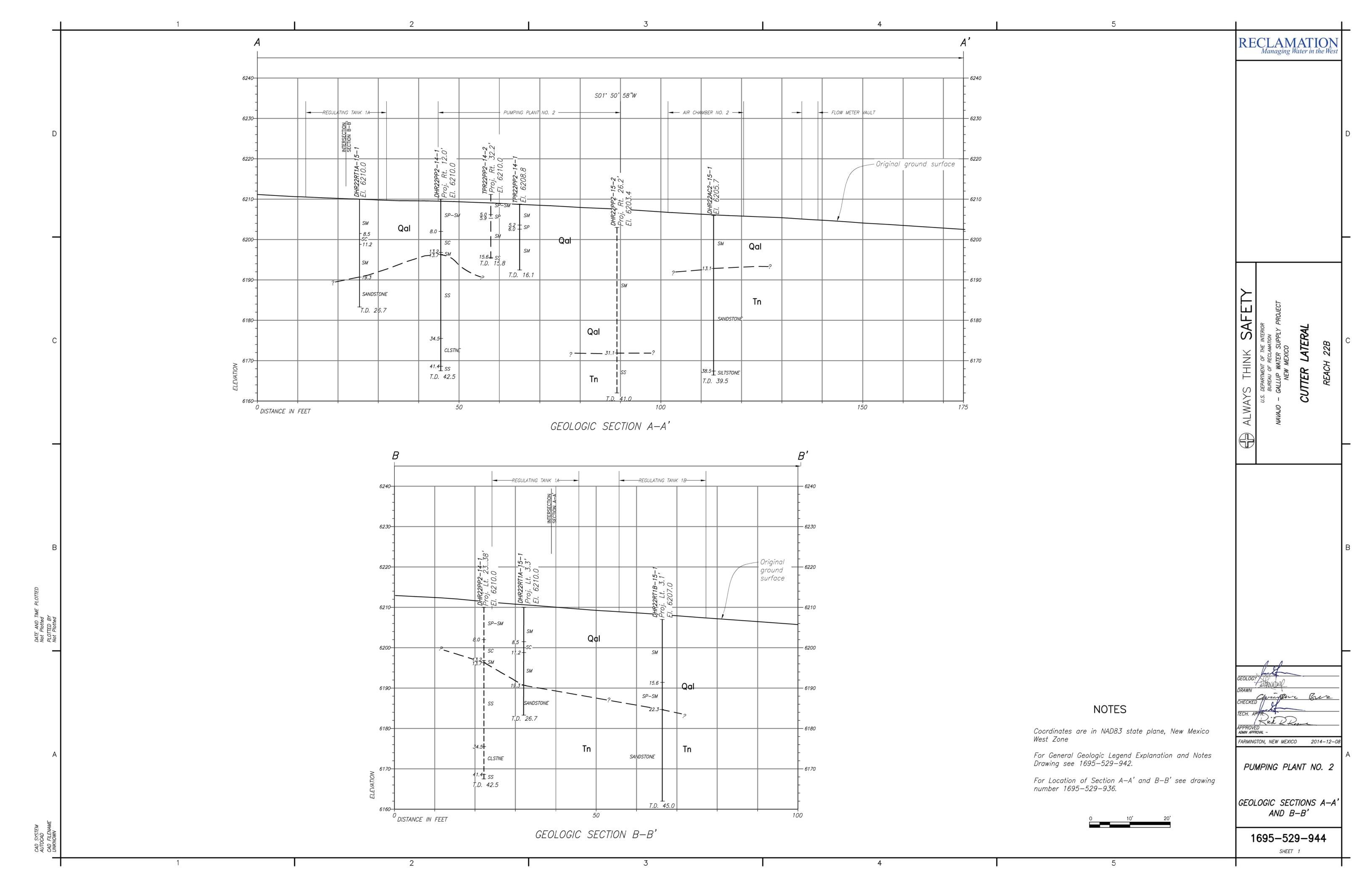


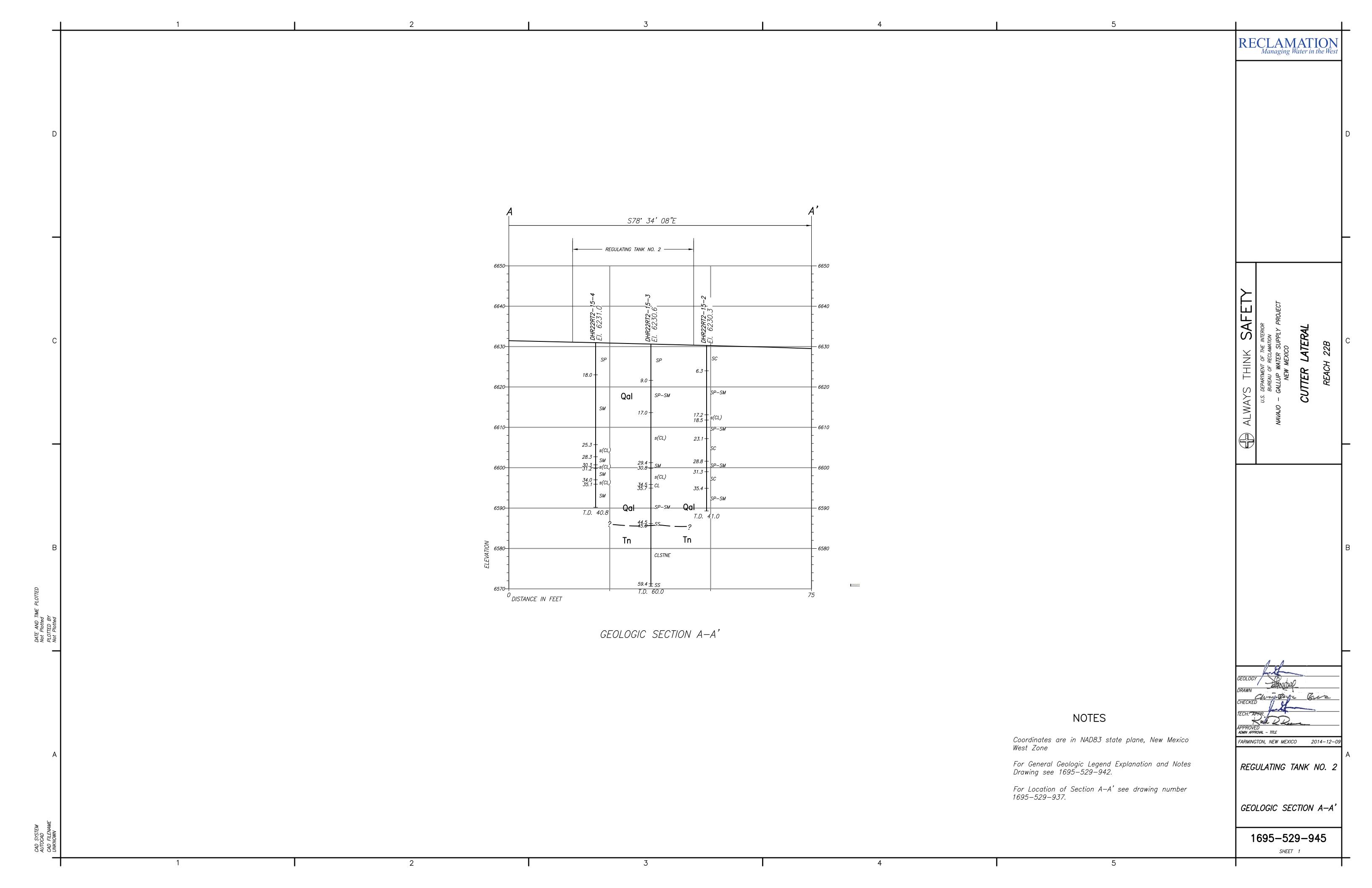


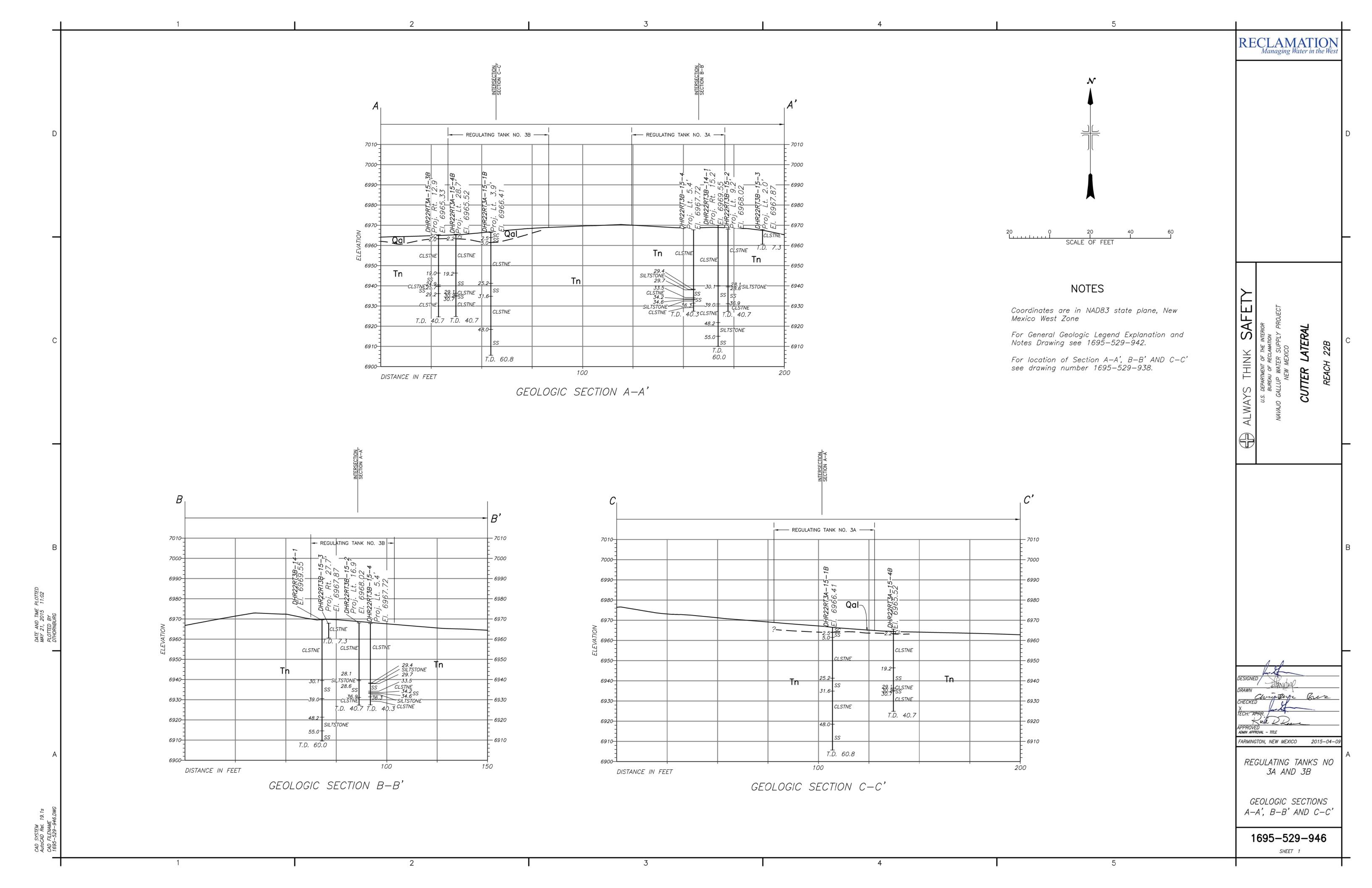


GENERAL GEOLOGIC LEGEND GEOLOGIC EXPLANATION GENERAL GEOLOGIC NOTES STRATIGRAPHY Quaternary Alluvium (Qal) Geologic standards and definitions used for rock quality and rock discontinuities are based on Bureau of Reclamation Engineering Geology Field Manual and drawing numbers 40-D-6493 and DHR22B-14-25 Drill hole location with year and identification number Consists of a variety of materials from clayey sand (SC), silty sand (SM), poorly graded sand with silt (SP-SM), to poorly 40-D-6499. graded sand (SP). TPR22B-14-33 Test Pit location with year and Identification number The Unified Soil Classification System and descriptions are based Tertiary Nacimiento Formation (Tn) on the USCS (Unified Soil Classification System) and Bureau of The Nacimiento Formation is found from the east side of Largo Reclamation procedures and guidelines as described in Geotechnical Branch Training Manuals Nos. 4, 5, 6, and Designations 5000 Canyon to the end of reach 22. Bedrock is often covered by a thin CPT22B-14-38 Cone Penetrometer location with year and Identification number (laboratory classification) and USBR 5005 (visual classification). These procedures are similar to ASTM D2485—87 and D2487—88 layer of Qal/Qsw. respectively. Sandstone (SS), is fine to medium to fine to coarse, color transitions Geologic Unit Contact between brown, orange, grey, and yellow, soft (H6) to moderately hard Interpretations shown on geologic profiles are based on Test Pit, Drill hole, outcrop, and field mapping data. Interpretations suggest (H4), Decomposed (W9), to slightly weathered (W3), thinly to moderately bedded, sporadic zones containing carbon inclusions and general trends between data points and do not depict localized iron/manganese oxide staining, occasional conglomeratic zones irregularities. Dashed where approximate with subrounded to subangular fine gravel and mud ripup clasts. For the entire description of material, drilling or excavation method SAFE and conditions, exact locations of the hole, etc., see complete log. Siltstone (SLTSN), is grey to brown in color, very soft (H7) to moderately hard (H4), slightly weathered (W3) to intensely to Queried where inferred moderately weathered (W6), thinly to moderately bedded, occasional gypsum veins. <u>Claystone</u> (CLSTN), is dark grey, to brown in color, very soft (H7) to soft (H6), decomposed (W9) to intensely weathered (W7), moderately to thinly bedded, occasional carbon inclusions, gypsum and calcite CUTTEF REA ALWAYS veins, iron/manganese oxide staining. Drill hole or Test Pit on profile (dashed where projected) T.D. 14.0 1695-529-942 SHEET 1 OF 1









SHEET 1 OF 1

GEOLOGIC LOG OF DRILL HOLE NO. DHR21-14-G

FEATURE: REACH 22 PIPELINE
LOCATION: WATER TREATMENT PLANT
BEGUN: 9/7/14 FINISHED: 9/7/14

DEPTH AND ELEVATION OF WATER LEVEL: WLNE

AND DATE MEASURED: 9/7/2014

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 1,968,336.0 E 2,735,072.1

TOTAL DEPTH: 53.5
DEPTH TO BEDROCK: 28.3

STATE: NEW MEXICO GROUND ELEVATION: 6631.6 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J. GILBERT

REVIEWED BY:

NOTES Part															
ALL MEASUREMENTS ARE FROM GROUND SIFFACE AND AGE ITE SAME GROUND SIFFACE AND AGE ITE SAME ALL MEASUREMENTS ARE REPORTED IN FEBRUARY WERE MOTION. ALL MEASUREMENTS ARE REPORTED IN FEBRUARY WERE MOTION. BUILD BY LC REGARD RELICEMENTS. 5 0 171.1 0.5 0 0.1 0.1 0.1 0.5 0.5 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1			VERY		LABC	RAT	ORYI	DATA		≿Ö			N O		
GROUND SIEPFACE AND AREE PER SAME AS INFOSE USED BY EXCEPTION OF THE CONTENT OF T	NOTES	ОЕРТН		% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATOR CLASSIFICATI	BLOWS / 0.5	GEOLOGIC UNIT SYMBOL	VISUAL	ELEVATION	
ALL DECISIONENTS ARE REPORTED IN FEET DOCEPT WHEN NOTED. FEET DOCEPT WHEN DOCEPT. FEET DOCEPT	GROUND SURFACE AND ARE THE SAME	-												630.5 630.1	, ,
DRILLE DRY U.C. REGION DRILL CREW OLD FILEY, EFF VALVA SISSALE, FUEL PIESE WILE RESPECT MAY SISSALE, FUEL PIESE WILE RESPECT MAY SISSALE, FUEL PIESE WILE RESPECT MAY SISSALE AND ASSOLE AS A STATE OF THE PIESE WILE RESPECT MAY SISSALE AND ASSOLE AS A STATE OF THE PIESE PREPARATE OF THE PIESE WILE RESPECT MAY SISSALE AND ASSOLE AS A STATE OF THE PIESE PREPARATE OF THE PIESE WILE RESPECT MAY SISSALE AND ASSOLE AS A STATE OF THE PIESE PREPARATE OF THE PIESE WILE RESPECT MAY SISSALE AND ASSOLE AS A STATE OF THE PIESE PREPARATE OF THE PIESE WILE RESPECT MAY SISSALE AND ASSOLE AS A STATE OF THE PIESE PREPARATE OF THE PIESE WILE RESPECT MAY SHOW THE PIESE PREPARATE OF THE PIESE PREPARATE	ALL MEASUREMENTS ARE REPORTED IN	- -		7.117.1	82.9	0	NA NA	NP	3.0%	SM	5/9/11				SAND, MAXIMUM SIZE, FÌNE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH, DRY, TAN
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK POUNDATION NYSSTRATIONS 100 100 100 100 100 100 100 1	DRILLER; JEFF VAN AUSDALE, HELPERS;	5 -	88	.588.5	11.5	0	46.3%	26.3%	12.5%	CL	8/14/18		(CL)s		1.1 - 1.5 FT CLAYEY SAND (SC): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH LOW
DRILL METHOD OFFICE METHOD OFFI OFFI OFFI OFFI OFFI OFFI OFFI OF	PRECONSTRUCTION SOIL AND BEDROCK	-	38	.338.3	61.7	0	24.7	10.9	6.2%	sc	11/21/21		6	622.4	LOW TOUGHNESS AND SLOW DILATANCY; GREY TO ORANGE IN COLOR, DRY, NO
DRILL METHOD:		- 	3.	1.331.3	68.7	0	NA.	NP	3.9%	SM	8/11/12				ABOUT 80% FINES WITH MEDIUM TÒ HÍGH
DRILING MEDIUM: NONE USED. 20 14 9140 801 50 NA NP 256 SM 9/12/14 14 9140 801 50 NA NP 256 SM 9/12/14 21 13/13 82.7 0 NA NP 426 SM 9/12/14 25 90 26 10 10 NA NP 426 SM 9/12/14 27 10 NA NP 426 SM 9/12/14 28 3 - 53.5 FT SANDSTONE: FINE TO MEDIUM GRANDED NO REACTION WITH HOLD COMPRESS OF THE PROMETOR HOLD WITH HOLD COMPRESS OF THE PROMETOR HOLD SANDED HAVE THE PROMETOR HOLD SANDED HAVE THE PROMETOR HOLD WITH HOLD COMPRESS OF THE PROMETOR HOLD SANDED HAVE THE PROMETOR HOLD WITH HOLD COMPRESS OF THE PROMETOR HOLD COMPRESS OF THE WORLD WITH HOLD COMPRESS OF	0-53.5 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs. CASING RECORD:	- - 15-	100	1.714.7	85.3	0	NA	NP	2.0%	SM	6/10/12	Qal			HIGH TOUGHNESS; ABOUT 20% FINE SAND; MAXIUMUM SIZE, FINE SAND; DRY, TAN IN
HOLE COMPLETION: HOLE BACKFILLED WITH CUTTINGS. 20	DRILLING MEDIUM:	- -	32	1.711.7	78.2	10.1	NA	NP	1.9%	SP-SM	6/9/10				SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY
25 - 90		20 		.914.9	80.1	5.0	NA	NP	2.5%	SM	9/12/14		SP-SM		LIGHT BROWN IN COLOR; NO REACTION WITH
13 137.3 82.7 0 NA NP 4.2% SM 5/10/9 90 GRAINED, TANIN COLOR, MODERATELY TO INTENSELY WEATHERED (WS-W7) MODERATELY SOFT (H6), THINLY BEDOED TO LANINATED, NO REACTION WITH HCI. 30 830.8 69.2 0 30.6% 10.8% 12.1% SC 17/34/48 100 ROCK APPEARS TO BE BROKEN DURING DRALING AND IS RECOVERED MOSTLY AS A NOLLAR FRAGMENTS FROM 1/2/INCH TO APPROXIMATELY 4- INCHES IN SIZE MOST SUPFACES OUT HE FRAGMENTS APPEAR FRESHLY BROKEN COCASIONAL PLANAR FRESHLY BROKEN COCASIONAL PLANAR SUPFACE SOME SOME SOME SOME SOME SOME SOME SOM		-													
30 - 100 30,830.8 69.2 0 30.6% 10.8% 12.1% SC 17/34/48 SC		25 		7.317.3	82.7	0	NA	NP	4.2%	SM	5/10/9				GRAINED, TAN IN COLOR, MODERATELY TO INTENSELY WEATHERED (W5-W7) MODERATELY SOFT (H5), THINLY BEDDED TO
30		_											6	603.3	
100		30—		.830.8	69.2	0	30.6%	10.8%	12.1%	sc	17/34/48				APPROXIMATELY 4- INCHES IN SIZE. MOST
32 532.5 67.5 0 28.5% 9.6% 9.3% SC 25/REFUSAL 100 100 100 100 100 100 100 1		_	100												SURFACES ARE STAINED WITH IRON OXIDE INDICATING SOME JOINTS AND FRACTURES
To SS ID. = WATER LEVEL NOT ENCOUNTERED ID. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED IN. = INSIDE DIAMETER BNE = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED IN. = INSIDE DIAMETER BNE = INSIDE		35 -	32	2.532.5	67.5	0	28.5%	9.6%	9.3%	SC 2	5/REFUSAL				DENSITY OF THE JOINTS AND FRACTURES
ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED NE=NOT ENCOUNTERED FT=FEET HSA=HOLLOW STEM AUGER CME=CENTRAL MINING EQUIPMENT SPT=STANDARD PENETRATION TEST.		- -	100												0.0 - 28.3 FT: QUATERNARY ALLUVIUM (Qal) 28.3 - 53.5 FT: TERTIARY NACIMIENTO
SINE - BENCONTERED NE=NDEMOCRATE ENCOUNTERED NE=NDTEMOCRATE ENCOUNTERED NE=		40-	100									Tn	ss		ABBREVIATIÒNŚ: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER
45— - 100 - 50— - 100 - 100 - 100		_													NE=NOT ENCOUNTERED FT=FEET HSA=HOLLOW STEM AUGER
- 100 6578.1		45 	100												
- 100 6578.1		- - -													
		50 -	100												
		_					B	воттог	M OF F	IOLE			6	578.1	

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.

FEATURE: REACH 22B LOCATION: PIPELINE

BEGUN: 6/21/12 FINISHED: 6/21/12

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 2,047,328,8 E 2,750,275,1

TOTAL DEPTH: 23.9
DEPTH TO BEDROCK: 21.4

SHEET 1 OF 1

STATE: NEW MEXICO GROUND ELEVATION: 5863,3 ANGLE FROM HORIZONTAL: 90 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; LENNY WASHBURN, HELPERS; BRENT TERRY, TYSON BEZANSON. PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS. DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY DRILL RIG. DRILL METHOD: 0-23.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. CASING RECORD: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.	LIQUID LIMIT	PLASTICITY	MOISTURE	LABORATORY	BLOWS / 0,5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION 0.0 - 21.4 FT: QUATERNARY ALLUVIUM (Qal): 0.0 - 5.0 FT: CLAYEY SAND (SC): ABOUT 60% FINE SAND, TRACE MEDIUM TO
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; LENNY WASHBURN, HELPERS; BRENT TERRY, TYSON BEZANSON. PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS. DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY DRILL RIG. DRILL METHOD: 0-23.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. CASING RECORD: NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.		PLASTICITY	MOISTURE	LABORATC	BLOWS / 0	SYMBOL SYMBOL	VISIDAL CLASSIFICA ELEVATION	PHYSICAL CONDITION 0.0 - 21.4 FT: QUATERNARY ALLUVIUM (Qal): 0.0 - 5.0 FT: CLAYEY SAND (SC): ABOUT
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; LENNY WASHBURN, HELPERS; BRENT TERRY, TYSON BEZANSON. PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS. DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY DRILL RIG. DRILL METHOD: 0-23.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. CASING RECORD: NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.								(Qal): 0.0 - 5.0 FT: CLAYEY SAND (SC): ABOUT
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED. DRILLED BY: U.C. REGION DRILL CREW; DRILLER; LENNY WASHBURN, HELPERS; BRENT TERRY, TYSON BEZANSON. PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS. DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY DRILL RIG. DRILL METHOD: 0-23.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. CASING RECORD: NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.								
CREW; DRILLER; LENNY WASHBURN, HELPERS; BRENT TERRY, TYSON BEZANSON. PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS. DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY DRILL RIG. DRILL METHOD: 0-23.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. CASING RECORD: NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.							sc	COARSE SAND; ABOUT 40% FINES WITH LOW TO MEDIUM PLASTICITY, NO
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS. DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY DRILL RIG. DRILL METHOD: 0-23.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. CASING RECORD: NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.		1						DILATANCY, LOW DRY STRENGTH, LOW TOUGHNESS; DRY, BROWN TO GREY IN COLOR, MAXIMUM SIZE, COARSE SAND; ROOTS IN TOP 0.5 FT; NO REACTION WITH HCI.
BEDROCK FOUNDATION INVESTIGATIONS. DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY DRILL RIG. DRILL METHOD: 0-23.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. CASING RECORD: NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.					4		5858.3	5.0 - 15.0 FT: SILTY SAND (SM): ABOUT 75% FINE TO MEDIUM SAND; ABOUT 25%
DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY DRILL METHOD: 0-23.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. CASING RECORD: NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.	N/A	NP	1.9%	SM	6			NONPLASTIC FINES, WITH RAPID DILATANCY, NO TOUGHNESS, AND NO
DRILL RIG. DRILL METHOD: 0-23.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs. CASING RECORD: NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.					8			DRY STRENGTH; DRY, TAN IN COLOR; NO REACTION WITH HCL.
0-23.9 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. CASING RECORD: NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.								15.0 - 17.0 FT: CLAYEY SAND (SC): ABOUT
SYSTEM WITH SPTS. CASING RECORD: NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.	N/A	NP	3%	SM	3			50% FINE SAND, WITH LENSES OF COARSE SAND ABOUT 0.2 FT THICK;
NONE USED DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS.	1965	SAME :	570	SIMI	2			ABOUT 50% MEDIUM PLASTIC FINES, WITH NO DILATANCY, LOW TOUGHNESS, LOW DRY STRENGTH; DRY, BROWN TO GREY IN
DRILLING MEDIUM: NONE USED HOLE COMPLETION: BACKFILLED WITH CUTTINGS. 76								COLOR; WEAK REACTION WITH HCI.
HOLE COMPLETION: BACKFILLED WITH CUTTINGS.	-				3		SM	17.0 - 21.4 FT: SILTY SAND (SM): ABOUT 75% FINE TO MEDIUM SAND; ABOUT 25%
BACKFILLED WITH CUTTINGS.	N/A	NP	3.3%	SM	7	Qal		NONPLASTIC FINES, WITH RAPID DILATANCY, NO TOUGHNESS, NO DRY
43.1 58.9 0	-4				3			STRENGTH, DRY, TAN IN COLOR; NO REACTION WITH HCI.
43.1 56.9 0								21.4 - 23.9 FT: TERTIARY NACIMIENTO FORMATION (TN):
	26.1	11.1	4.2%	sc	3			21.4 - 23.9 FT: SANDSTONE: FINE TO
60				259.5	5			MEDIUM GRAINED, MODERATELY TO SLIGHTLY WEATHERED (W4), SOFT (H6),
								TAN IN COLOR, AUGER MET REFUSAL AT 23.9 FT.
15					2		5848.3	STRATIGRAPHY:
	26.2	9.2	3.7%	sc	4		sc	0.0 - 21.4 FT. QUATERNARY ALLUVIUM (Qai) 21.4 - 23.9 FT. TERTIARY NACIMIENTO
64	-	-			4		5846.3	FORMATION (Tn) ABBREVIATIONS:
							3646.3	WLNE = WATER LEVEL NOT ENCOUNTERED
38.4 59.9 1.7	22.9	3.7	3.8%	CM .	3			I.D. = INSIDE DIAMETER.
72		941	3.57	Sivi	4			
							SM	
20	-	\dashv			3			
19.9 80.1 0	N/A	NP	2.8%	SM	4			
	-				5	-	5841.9	
79						TN	SANDSTON	ı.
							5839.4	
	ВО	TTOM	I OF H	OLE			3030.4	

COMMENTS:

SHEET 1 OF 1

GEOLOGIC LOG OF DRILL HOLE NO. DHR22-29

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,042,450.7 E 2,750,045.5

TOTAL DEPTH: 26,3 DEPTH TO BEDROCK: 7.8

STATE: NEW MEXICO GROUND ELEVATION: 5905.9 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: C. BEYER

REVIEWED BY:

FEATURE: REACH 22B LOCATION: PIPELINE BEGUN: 6/22/12 FINISHED: 6/22/12 DEPTH OF WATER LEVEL: DATE MEASURED:

	T		_	101000		-4210	- 7				_		
		ERY		LABO	DRAT	ORY	DATA	1	> Z	E		s /	
NOTES	DEPTH	CORE RECOVERY		52.V	百	TIMIT	È	RE	LABORATORY	BLOWS / 0.5 FT	C UNIT	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND
71.55.254.11.5	8	CORE	% FINES	SAND	GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	ABOR	BLOW	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICA ELEVATION	PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM	Н	32	*	%	%	-	ο.	≥0	-8		Ø	/	0.0 - 7.8 FT: QUATERNARY ALLUVIUM
GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.	-											SM 5904.7	(Qal): 0 - 1.2 FT: SILTY SAND (SM): ABOUT 80%
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	:												FINE SAND; ABOUT 20% NONPLASTIC FINES, WITH RAPID DILATANCY, NO TOUGHNESS, NO DRY STRENGTH; MAX SIZE, FINE SAND: DRY, TAN IN COLOR:
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; LENNY WASHBURN,	_										Qal		ROOTS IN TOP 0.5 FT, STRONG REACTION WITH HCI.
HELPERS; BRENT TERRY, TYSON BEZANSON. PURPOSE:	5											sc	1,2 - 7,8 FT: CLAYEY SAND (SC): ABOUT 60% FINE SAND; ABOUT 40% FINES WITH LOW TO MEDIUM PLASTICITY, NO
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION			63.7	28.6	7.7	32.7%	14.7	7.3	s(CL)	7			DILATANCY, LOW DRY STRENGTH, LOW TOUGHNESS; TRACE COARSE SAND AND
INVESTIGATIONS:	-					-			X 16	8			FINE SUBROUNDED GRAVEL, MAXIMUM SIZE, 15MM; DRY, BROWN TO GREY IN
DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY DRILL RIG.	(+		724.0		7.27		Treater					5898.1	COLOR, INTERMITTENT CALCITE NODULES; STRONG REACTION WITH HCI.
DRILL METHOD: 0 - 9.0 FT 4 1/4" HSA AND DRY CORE	S#5		32.9	67.1	0	N/A	NP	4.5	SM	REFUSAL		SS	7.8 - 26.3 FT: TERTIARY NACIMIENTO FORMATION (TN):
SYSTEM WITH SPTs. 9.0 - 26.3 FT HQ3 WIRELINE CORING	9											5896.6 CLST 5896.2	7.8- 9,3 FT: SANDSTONE: FINE TO MEDIUM GRAINED, AUGER REFUSAL WAS MET AT
SYSTEM WITH A 3' SPILT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT.	10-											SLTS 5895.2	9.0 FT, WEATHERING AND HARDNESS UNKNOWN DUE TO SAMPLE DISINTEGRATION BY AUGER, SWITCHED
CASING RECORD: NONE USED	-	100											TO CORING SYSTEM AND CONTINUED HOLE, FROM 9.0 TO 9.3 SANDSTONE WAS MODERATELY TO SLIGHTLY WEATHERED (W4), MODERATELY SOFT (H5), TAN IN COLOR, NO REACTION WITH HCI.
DRILLING MEDIUM: NONE USED IN TOP 7.8 FT. WATER USED FROM 7.8 TO 26,3 FT.	-												9.3 - 9.7 FT: CLAYSTONE: INTENSELY TO MODERATELY WEATHERED (W6), SOFT (H6) GREY IN COLOR, SAMPLE WASHED
HOLE COMPLETION: BACKFILLED WITH CUTTINGS.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1												BY DRILL, NO REACTION WITH HCI.
	15-												9.7 - 10.7 FT: SILTSTONE: MODERATELY TO SLIGHTLY WEATHERED (W4), MODERATELY SOFT (H5), LIGHT GREY IN COLOR, NO REACTION WITH HCI.
	-	80									TN		10.7 TO 24.3 FT: SANDSTONE: FINE TO MEDIUM GRAINED, MODERATELY TO
	-											ss	SLIGHTLY WEATHERED (W4), MODERATELY SOFT (H5), LIGHT GREY IN COLOR, DARK GREY SILTSTONE INTERBEDS 0.3 FT THICK, MODERATELY BEDDED, NO REACTION WITH HCI.
	20-												24,3 TO 26,3 FT: CLAYSTONE: DARK GREY IN COLOR, MODERATELY TO SLIGHTLY
	36	97											WEATHERED (W4), VERY SOFT (H7), FeOx STAINING ALONG TOP OF CLAYSTONE AT SANDSTONE CONTACT. NO REACTION WITH HCI.
	1												STRATIGRAPHY: 0.0 - 7.8 FT. QUATERNARY ALLUVIUM (QaI) 7.8 - 26.3 FT. TERTIARY NACIMIENTO FORMATION (Tn)
	25-	100											ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED
	25-											CLSTN	I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.
						В	ОТТО	M OF F	HOLE			5879.6	'

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.

SHEET 1 OF 1

GEOLOGIC LOG OF DRILL HOLE NO. DHR22-33

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,037,461 9 E 2,750,453 9

TOTAL DEPTH: 26.8
DEPTH TO BEDROCK: 5.0

STATE: NEW MEXICO
GROUND ELEVATION: 5931 B
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: C_BEYER

REVIEWED BY:

FEATURE: REACH 22B LOCATION: PIPELINE BEGUN: 6/23/12 FINISHED: 6/23/12 DEPTH OF WATER LEVEL:

DATE MEASURED:

	_	_											7	
		ÆRY		LABO	RAT	ORY	DATA	\	≻S.	E		NO	/	
NOTES	DEPTH	CORE RECOVERY			豆	IMIT	YTI,	25	LABORATORY	BLOWS / 0.5 FT	C UNIT	VISUAL	CLASSIFICATION AN	
10.100.000-000	H		FINES	SAND	GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	ASSIF	BLOW	GEOLOGIC UNIT SYMBOL	CLASS	PHYSICAL CONDITION	/IN
ALL MEASUREMENTS ARE FROM		%	%	%	%	3	α.	20	-8		Ø	_/_	0.0 - 5.0 FT: QUATERNARY ALLUVII	JM
GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.													(Qal): 0.0 - 5 0 FT: CLAYEY SAND (SC): ABC 70% FINE SAND: ABOUT 40% FINES	
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	-		46.9	53.1	0	25.6%	5.4%	4.2%	SC-SM		Qal	sc	LOW TO MEDIUM PLASTICITY, NO DILATANCY, LOW DRY STRENGTH, TOUGHNESS; DRY, TAN IN COLOR,	LOW
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; LENNY WASHBURN, HELPERS; BRENT TERRY, TYSON BEZANSON.	F44												INTERMITTENT CALCITE NODULES, IN TOP 0.5 FT, STRONG REACTION V	
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION	5-		39.0	61.0	0	N/A	NP	7.6%	SM	9		- 5	5.0 - 26.8 FT: TERTIARY NACIMIENT FORMATION (Tri):	0
INVESTIGATIONS.	-		33.5	01.0		1000		7.0.0	OW	18 REFUSAL			5 0 - 8 8 FT: SANDSTONE: FINE TO M GRAINED GREY IN COLOR, MODER	ATELY
DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY DRILL RIG	-	44											HARD (W4), SLIGHTLY WEATHERED FRESH (W2), INTERMITTENT TRACI COARSE SAND; GRAVEL-SIZED SUBROUNDED CHERT AND QUART;	ES OF
DRILL METHOD: 0 - 4 6 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs	1												CLASTS UP TO 15 mm IN DIAMETER SUBANGULAR MUDSTONE RUP-UP CLASTS UP TO 15 mm IN DIAMETER	i
4 6 - 26 8 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPILT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT	10-												8 8 - 20 5 FT: SANDSTONE: CHANGE FROM GREY TO BROWN IN COLOR FT; MODERATELY HARD (W4), SLIG WEATHERED TO FRESH (W2),	AT 9.6
CASING RECORD: NONE USED.	92	100											MODERATELY BEDDED, TRACE CO. SAND, SUBANGULAR HEMATITE NO UP TO 70mm IN DIAMETER, IRON O	DULES
DRILLING MEDIUM: NONE USED FROM 0.0 TO 4.6 FT WATER FROM 5.0 TO 26.8 FT.	1											ss	STAINING AROUND MARGINS OF INCLUSIONS SANDSTONE BECOME MODERATERLY SOFT (H5) AND SLIG WEATHERED (W3) AT 13 0 FT, CORE	HTLY
HOLE COMPLETION: BACKFILLED WITH CUTTINGS	12												WASHED BY DRILL 20.5 -24 2 FT: CONGLOMERATE:	
	15-	50									TN		SUBROUNDED DARK GREY CLAYST AND LIGHT GREY SILTSTONE CLAS LIGHT GREY FINE SANDSTONE TO SILTSTONE MATRIX, CLASTS ABOU IN DIAMETER. SLIGHTLY WEATHER	TS IN A T 10mm
		30											FRESH (W2), MODERATELY HARD (I MODERATELY SOFT (H5), MODERA' BEDDED, TRACE FEOX STAINING	H4) TO
	1.5												JOINT MEASUREMENTS: DEPTH INCL R W O T HL INFILLING 21.1 65 3 3 6 FeOx	
	20-											- 5	21 9 65 3 3 6 FeOx 23 0 65 3 3 6 FeOx 23 6 65 3 3 6 FeOx	
	1	100											24.2 - 26.8 FT: SANDSTONE: FINE TO MEDIUM GRAINED BROWN TO GRE	
	-											CONGI	COLOR, MODERATELY SOFT (H5), SLIGHTLY WEATHERED TO FRESH LAMINATED, INTERMITTENT TRACE COARSE SAND, NO REACTION WITH	SOF
	:											5	STRATIGRAPHY: 0.0 - 5.0 FT, QUATERNARY ALLUVIL 5.0 - 26.8 FT, TERTIARY NACIMIENT	
	25	90										SS	FORMATION (Tn) ABBREVIATIONS: WLNE = WATER LEVEL NOT	
	-					R	ОТТО	M OF H	IOLE			5	ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEL NOT ENCOUNTERED.	ROCK
I														

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

FEATURE: REACH 22B PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT LOCATION: PIPELINE COORDINATES: N 2,013,482,2 E 2,750,318,5

TOTAL DEPTH: 25.0 DEPTH TO BEDROCK: 3.0 SHEET 1 OF 1

STATE: NEW MEXICO
GROUND ELEVATION: 6211,9
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: J, GILBERT
REVIEWED BY:

BEGUN: 5/24/13 FINISHED: 5/25/13
DEPTH OF WATER LEVEL:
DATE MEASURED:

NOTES ### Date of the control of th			¥		LABC	RAT	ORY	DATA	\	z	E		z /	
GROUND SURFACE AND ARE THE DRILLER. GAS ARE AS THOSE USED BY THE DRILLER. DRILLER BY LOSE GROWN FREE SAME, A SAME AS THOSE CREATER WHERE NOTED. DRILLE BY LOSE GROWN FREE SKOPT WHERE SKOPT WHERE SKOPT WHEN SHOWN FREE SKOPT WHILE SKO	NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY		GEOLOGIC UNIT	VISUAL CLASSIFICATION ELEVATION	
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTES. IN FEET EXCEPT WHERE NOTES. REFURD BY: U.C. REGION DOILL. CORRECT SHARP WHERE NOTES. REFURD BY: U.C. REGION DOILL. CORRECT SHARP WHERE NOTES. REFURD BY: U.C. REGION DOILL. CORRECT SHARP WHERE NOTES. REFURD BY: U.C. REGION DOILL. COLOR ROOTS AND ORGANIC MATERIAL. REFURD. BELDROCK FOUNDATION. PRECONSTRUCTION SOIL AND BELDROCK FOUNDATION. BELDROCK FOUNDATION. DRILL EQUIPMENT: CMB 80 DRILL METHOD. 100 DRILL METHOD. 101 DRILL SHARP SHARP SHARP WHERE WHEN SHARP W	GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE	-										Oal	SM SM	(Qal):
DRILLE BY: U.C. REGION DRILL CREW: DRILLE, ELNINY WASHBURN, HELPERS, LARRY ZOLEMAN, DAVE NELSEN. PURPOSE: PURPO		:+-										Qai	25000	RAPID DILATANCY, NO DRY STRENGTH; MAXIMUM SIZE, FINE SAND; MOIST, TAN IN
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATIONS BEDROCK FOUNDATIONS DRILL EQUIPMENT: CME 85 DRILL EQUIPMENT: CME 86 DRILL METHOD - 1.33 FT 4 I/4" HAS AND DRY CORE SYSTEM WITH AF SWILL CORNES SYSTEM WITH AF SWILL CORNES SYSTEM WITH AF SWILL CASHING RECORD: NONE USED DRILLING MEDIUM: WATER REFUSAL 10- DRILLING MEDIUM: WATER REFUSAL 10- DRILLING MEDIUM: WATER REFUSAL 11- DRILLING MEDIUM: WATER 11- DRILLING MEDIUM: W	CREW; DRILLER; LENNY WASHBURN, HELPERS; LARRY ZOLEMAN, DAVE	-		29.1	70.9	0	25,1	7.0	5.1	sc	15/17/16		6208.9	IN TOP 0,5 FT, LOOSE; NO REACTION WITH HCI.
BETTMEN GREY TO DARK GREY IN DECOMPOSED (WE) REPUSAL RE	PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION	5		25.4	74.6	0	NA.	NP	4.7	SM :	ZVREFUSAL			FORMATION (Tn) 3,0-25,0 FT: SANDSTONE: SANDSTONE:
DRILLE METHOD: 13.3 TF 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. 13.1 TO 2.5 OF THOS WIRELINE CORING SYSTEM WITH 4.6 SPLIT TUBE SAMPLER AND DIAMOND TUBE SAMPLER AND DIAMOND TUBE SAMPLER AND DIAMOND TO SHARM SHOW THE ST SHOW THE ST SHOW THE ST SHOW THE SAMPLER AND DIAMOND TO SHARM SHOW THE ST SHOW THE ST SHOW THE ST SHOW THE ST SAMPLES AT 2.5 FT. INTERVALS. CLEAN OUT BETWEEN SAMPLERS WITH A CME SPLIT SPOON SAMPLER HOLE COMPLETION: BACKFILLED WITH A UGER CUTTINGS MODERATELY SOFT (HS) AND DRILLEN ON THE SAMPLER SHOW THE ST SHOW THE ST SAMPLES AT 2.5 FT. INTERVALS. CLEAN OUT BETWEEN SAMPLERS WHAT A CME SPLIT SPOON SAMPLER HOLE COMPLETION: BACKFILLED WITH A UGER CUTTINGS 15 84% 98% 98% 98% 98% 98% 98% 98%	DRILL EQUIPMENT:	:=			X-71-E.				2386					BETWEEN GREY TO DARK GREY IN COLOR, SOFT (H6), VERY INTENSELY WEATHERED (W8) TO DECOMPOSED (W9)
SUPFACE SET BIT. CASING RECORD. NONE USED ORILLING MEDIUM: WATER ORILLER NOTES: MOVE RIG AND COLUMENT TO DERIL. SITE. SPOT RIG ON HOLE AND RIG UP. TAKE SPT SAMPLESA T.2 SFT. INTERVALS. CLEAN OUT BETWEEN SAMPLERS HOLE COMPLETION: BACKFILLED WITH AUGER CUTTINGS 16 84% 20 96% 96% 96%	0- 13.3 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS, 13.3 TO 25.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 5' SPILT	- 12 - 13									REFUSAL			MODERATELY SOFT (H5) AND MODERATELY WEATHERED (W5) FROM 13.3 TO 25.0 FT, NO REACTION WITH HCI, INTERMITTENT F6OX STAINING, ENCOUNTERED AUGER REFUSAL AT 13.3
DRILLER NOTES: MOVE RIG AND EQUIPMENT TO DRILL SITE. SPOT RIG ON HOLE AND RIG UP. TAKE SPT SAMPLES AT 25 FT. INTERVALS. CLEAN OUT BETWEEN SAMPLERS WITH A CME SPLIT SPOON SAMPLER. HOLE COMPLETION: BACKFILLED WITH AUGER CUTTINGS 84% 20 96% 96% 96%	SURFACE- SET BIT. CASING RECORD: NONE USED	10-		23.8	76.2	0	NA	NP	2.2	SM				JOINT MEASUREMENTS: DEPTH INCL R W O T HL INFILLING
EQUIPMENT TO DRILL SITE. SPOT RIG ON HOLE AND RIG UP. TAKE SPT SAMPLES AT 2.5 FT. INTERVALS. CLEAN OUT BETWEEN SAMPLERS SWITH A CME SPLIT SPOON SAMPLER. HOLE COMPLETION: BACKFILLED WITH AUGER CUTTINGS 15 84% 20 96% 96%				_										STRATIGRAPHY:
CLEAN OUT BETWEEN SAMPLERS WITH A CME SPUIT SPOON SAMPLER, HOLE COMPLETION: BACKFILLED WITH AUGER CUTTINGS 15 84% 84% 96% 96% 96% 96% 96% 96% 96%	EQUIPMENT TO DRILL SITE, SPOT RIG ON HOLE AND RIG UP. TAKE SPT													0.0 - 3.0 FT. QUATERNARY ALLUVIUM (QaI) 3.0 - 25.0 FT. TERTIARY NACIMIENTO
BACKFILLED WITH AUGER CUTTINGS 84% 20 96% 96%	CLEAN OUT BETWEEN SAMPLERS WITH A CME SPLIT	s	0									Tn	ss	WLNE = WATER LEVEL NOT ENCOUNTERED
96%		15-												NOT ENCOUNTERED.
96%		92	84%											
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6186.9		20-		e:										
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1-515-al 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		-	96%											é.
		-25-					E	вотто	M OF I	HOLE			6186.9	

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

FEATURE: REACH 22B LOCATION: PIPELINE

BEGUN: 4/13/12 FINISHED: 4/13/12

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,008,904,2 E 2,749,313,0

TOTAL DEPTH: 25,3 DEPTH TO BEDROCK: BNE SHEET 1 OF 2 STATE: NEW MEXICO

GROUND ELEVATION: 6192,6 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: C. BEYER

REVIEWED BY:

	_	_	7								_		
		VERY	_	LAB	ORA	TORY	DAT	A	NS	Ę		8 /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY CLASSIFICATION	BLOWS / 0.5	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.													0.0 - 25.0 FT: QUATERNARY ALLUVIUM (Qal): 0.0 - 17.5 FT: SILTY SAND SM: ABOUT 80% PREDOMINATELY FINE TO MEDIUM SAND,
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.		100											TRACE FINE SUBANGULAR GRAVEL; ABOUT 20% NONPLASTIC FINES, WITH RAPID DILATANCY, LOW DRY STRENGTH,
DRILLED BY: P.N. REGION DRILL CREW; C. PETERSON DRILLER; SCRIVENER, CLINE, HELPERS.													AND LOW TOUGHNESS; DRY, BROWN TO GREY IN COLOR, MAXIMUM SIZE, 12 mm; ROOTS ON TOP 1.0 FT, INTERMITTENT CHARCOAL FRAGMENTS; INTERMITTENT CALCITE NODULES BELOW 5.3 FT; NO
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	5-	_											REACTION WITH HCI (STRONG REACTION WITH HCI ON CALCITÉ NODULES). 17.5 -18.2 FT: LEAN CLAY WITH SAND(CL)s:
DRILL EQUIPMENT: CME MODEL 850 TRACK MOUNTED ROTARY DRILL RIG.	3	92	33_1	66,9	0	N/A	NP	3.9	SM	5 5			ABOUT 80% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH TOUGHNESS, ABOUT 20% FINE SAND; DARK GREY IN COLOR,
DRILL METHOD: 0-25.3 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.	100												ORANGE FeOx STAINING; NO REACTION WITH HCI.
CASING RECORD: NONE USED		100	19,9	80.7	0	N/A	NP	2,4	SM H	AMMER SAI	ik.	SM	18,2 -25,3, FT: POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE TO MEDIUM SAND, TRACE COARSE SAND AND
DRILLING MEDIUM: NONE USED	10-												FINE GRAVEI; ABOUT 10% NONPLASTIC FINES, WITH RAPID DILATANCY, NO DRY STRENGTH, AND LOW TOUGHNESS; BROWN TO GREY IN COLOR, F60x
HOLE COMPLETION: BACKFILLED 0.0 TO 10,0 FEET WITH CUTTINGS,	_	100	8,2	91,8	0	N/A	NP	1,6	SP-SM	10			STAINING, MAXIMUM SIZE, 12 mm, NO REACTION WITH HCI.
10.0 TO 25.3 FEET WITH BENTONINTE.		100				\vdash				13			STRATIGRAPHY: 0.0 - 25.3 ft. QUATERNARY ALLUVIUM (QaI)
	-	<u> </u>								4	Qal		ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE
			9.2	80.8	0	N/A	NP	1,3	SP-SM	12			DIAMETER BNE = BEDROCK NOT ENCOUNTERED.
	-	100		-						15			
	15-												
			7.9	02.4		N/A	NE		CD CM	8			
			7.9	92,1	0	N/A	NP	1,5	SP-SM	7			
	-											6175.1	
	-	78	85	15	0	36,3	19.8	16	(CL)s			(CL)s 6174.4	
	-		5.1	91.9	3	N/A	NP	0.7	SP-SM				
	20-		0.1	01.0	Ü	IVA	IMP	0.7	OF-SIVI				
										8			
	Ĩ		6.9	93.1	0	N/A	NP	1.3	SP-SM	17 23		(SP-SM)	
	4											(OF-OIVI)	
		100											
	+												
		8											

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

SHEET 2 OF 2

FEATURE: REACH 22B LOCATION: PIPELINE

BEGUN: 4/13/12 FINISHED: 4/13/12

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT STATE: NEW MEXICO COORDINATES: N 2,008,904.2 E 2,749,313.0 GROUND ELEVATION:

TOTAL DEPTH: 25,3
DEPTH TO BEDROCK: BNE

STATE: NEW MEXICO
GROUND ELEVATION: 6192.6
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: C. BEYER

CLASSIFICATION AND

PHYSICAL CONDITION

REVIEWED BY:

		ERY		LABC	RAT	ORY	DATA	١	Z	-		z /	
NOTES	DEPTH	% CORE RECOVI	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT	LABORATORY CLASSIFICATIO	BLOWS / 0.5 F	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATIO ELEVATION	
												(SP-SM)87.3	

BOTTOM OF HOLE

SHEET 1 OF 1

FEATURE: REACH 22B LOCATION: PIPELINE

BEGUN: 4/14/12 FINISHED: 4/14/12

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,003,871,8 E 2,747,997,6

TOTAL DEPTH: 25.0 DEPTH TO BEDROCK: 21.7 STATE: NEW MEXICO
GROUND ELEVATION: 6187.8
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: C, BEYER

REVIEWED BY:

LABORATORY DATA CORE RECOVERY LABORATORY VISUAL BLOWS / 0.5 DEPTH CLASSIFICATION AND NOTES MOISTURE GEOLOGIC U SYMBOL PLASTICIT GRAVE PHYSICAL CONDITION SAND LIQUID ALL MEASUREMENTS ARE FROM 0.0 - 21.7 FT: QUATERNARY ALLUVIUM GROUND SURFACE AND ARE THE (Qal): SAME AS THOSE USED BY THE DRILLER: 0.0 - 10.0 FT: SILTY SAND SC: ABOUT 60% FINE SAND; ABOUT 40% FINES WITH LOW PLASTICITY, LOW TO MEDIUM DRY ALL MEASUREMENTS ARE REPORTED 92 IN FEET EXCEPT WHERE NOTED. STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; MAXIMUM SIZE, FINE SAND; DRY, BROWN IN COLOR, ROOTS ON TOP DRILLED BY: P.N. REGION DRILL CREW; C. PETERSON DRILLER; 1.0 FT; NO REACTION WITH HCL SCRIVENER, CLINE, HELPERS. PURPOSE: 10,0 -20,0 FT: SILTY SAND SM: ABOUT 80% PRECONSTRUCTION SOIL AND SM FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, LOW DRY STRENGTH, AND 3 BEDROCK FOUNDATION s(CL-ML) 4 INVESTIGATIONS RAPID DILATANCY; DRY, BROWN IN 100 COLOR; NO REACTION WITH HCL 4 DRILL EQUIPMENT: 3 CME MODEL 850 TRACK MOUNTED ROTARY DRILL RIG. 20.0 -21.7 FT: SILTY SAND (SM): ABOUT 75% FINE TO MEDIUM SAND, ABOUT 20% 3 DRILL METHOD: NONPLASTIC FINES, WITH RAPID 0-25.0 FT 4 1/4" HSA AND DRY CORE 21.2 SC-SM 5 DILATANCY, AND NO DRY STRENGTH; ABOUT 5% FINE GRAVEL, MAXIMUM SIZE. SYSTEM WITH SPTs. 40 6 12 mm; NO REACTION WITH HCI. CASING RECORD: NONE USED 21.7 - 25.0 FT: TERTIARY NACIMIENTO 6177.8 FORMATION (Tn): 3 DRILLING MEDIUM: NONE USED N/A SM CLAYSTONE: DECOMPOSED (W9) VERY 1.5 Qal SOFT (H7), LEAN CLAY WITH SAND (CL)s: ABOUT 90% FINES WITH MEDIUM TO HIGH PLASTICITY; 100 9 HOLE COMPLETION: BACKFILLED FROM 0.0 TO 10.0 FEET WITH CUTTINGS ABOUT 10% FINE SAND; DARK GREY WITH FROM 10.0 TO 25.0 FEET WITH PURPLE SPOTS; INTERMITTENT CALCITE VEINS; STRONG REACTION WITH HCI. BENTONINTE. 4 NE SP-SM N/A 0.9 STRATIGRAPHY: 100 10 0.0 - 21.7 ft. QUATERNARY ALLUVIUM (Qal) 21.7 - 25.0 FT: TERTIARY NACIMIENTO FORMATION (Tn) 15 SM 7 ABBREVIATIONS: WLNE = WATER LEVEL NOT N/A NP 2.2 SM 14 ENCOUNTERED 18 I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED. 86 3.2 SM 6167.8 20 11 11 6166. 100 Tn CLST 6162.8

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 DRAWNINGS TITLED FOR DESIGNS AND SPECIFICATIONS AS FOLLOWS-DRAWNING NO. 40-D-6493, STANDARD DESCRIPTIONS AND
DESCRIPTIVE CRITERIA FOR ROCK. DRAWNING NO. 40-D-6499, STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

BOTTOM OF HOLE

SHEET 1 OF 1

FEATURE: REACH 22B LOCATION: 22792+13.21, 9.2'R

BEGUN: 4/15/12 FINISHED: 4/15/12

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 1,999,152,1 E 2,746,905,0

TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: BNE

STATE: NEW MEXICO
GROUND ELEVATION: 6284,8
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: C. HALL

REVIEWED BY: LABORATORY DATA LABORATORY BLOWS / 0.5 FT VISUAL DEPTH **CLASSIFICATION AND** MOISTURE NOTES GEOLOGIC U SYMBOL GRAVE PHYSICAL CONDITION CORE SAND LIQUID 18 2 8 ALL MEASUREMENTS ARE FROM 0.0 - 25.0 FT.: QUATERNARY ALLUVIUM GROUND SURFACE AND ARE THE (Qal): SAME AS THOSE USED BY THE 0.0 - 3.5 FT: SILTY SAND SM: ABOUT 70% PREDOMINATLY FINE SAND; ABOUT 30% DRILLER. SM NONPLASTIC FINES WITH RAPID ALL MEASUREMENTS ARE REPORTED DILATANCY, LOW DRY STRENGTH IN FEET EXCEPT WHERE NOTED. MAXIMUM SIZE, MEDIUM SAND; NO 23.9 76.1 2.6 SM 0 N/A NP REACTION WITH HCI. DRILLED BY: P.N. REGION DRILL 6281.3 DRY, BROWN TO GREY IN COLOR, FINE CREW: C. PETERSON DRILLER; ROOTS ON TOP 1.0 FT. SCRIVENER, CLINE, HELPERS. 3.5 -11.9 FT: POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE TO MEDIUM PURPOSE PRECONSTRUCTION SOIL AND SAND; ABOUT 10% NONPLASTIC FINES, WITH RAPID DILATANCY, NO DRY STRENGTH: MAXIMUM SIZE, MEDIUM BEDROCK FOUNDATION 90.3 0 N/A NP SP-SM 2 INVESTIGATIONS. SAND; NO REACTION WITH HCI. DRY, TAN 100 1 DRILL FOLIPMENT: IN COLOR. CME MODEL 850 TRACK MOUNTED ROTARY DRILL RIG. 11.9 -12.6 FT: SANDY LEAN CLAY s(CL): ABOUT 65% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, SP-SM 4 DRILL METHOD: 0-25.0 FT 4 1/4" HSA AND DRY CORE 10.9 89.1 NP 2.1 SP-SM 9 MEDIUM TO HIGH TOUGHNESS, ABOUT N/A SYSTEM WITH SPTs. 35% PREDOMINATELY FINE SAND; MAXIMUM SIZE, MEDIUM SAND; REDDISH 100 15 BROWN IN COLOR, DRY, NO REACTION CASING RECORD: NONE USED WITH HCL 13 DRILLING MEDIUM: 12,6 - 25,0 FT: SILTY SAND SM: ABOUT 70% FINE TO COARSE, HARD, SUBROUNDED TO ANGULAR SAND: ABOUT 30% NONE USED 12.1 87.9 0 N/A NP 2.1 SM 20 100 23 NONPLASTIC FINES WITH RAPID DRILLER NOTES: SET UP AND BEGAN DRILLING WITH 4 8272.9 DILATANCY, LOW DRY STRENGTH; 1/4 HSA WITH DRY CORE SYSTEM. s(CL) _{6272.2} MAXIMUM SIZE, COARSE SAND; NO R2 1 37.0 0 27.7 11.4 8.3 s(CL) TOOK SPTs, DRILL RAN AT 1500 RPM Qal REACTION WITH HCL. 5 WHEN USING AUTO HAMMER. GEOLOGIST TOOK BLOW COUNTS. DRY, TAN WITH THIN DARK GREY LENSES. 0 N/A SM 16 COMPLETED HOLE, PULLED AUGERS, 100 21 MOVED TO DHR22-69. HOLE COMPLETION: BACKFILLED WITH 4 BAGS SWELL STRATIGRAPHY: 0.0 - 25.0 ft. QUATERNARY ALLUVIUM (Qal) PLUG AND RANDOM FILL, 21.1 78.9 0 N/A 3.3 SM 13 NP ABBREVIATIONS: 5 WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED. 100 SM 20 12

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.

BOTTOM OF HOLE

2.2 SM

N/A NP

12

14

23.3 76.7 0

100

FEATURE: REACH 22B LOCATION: PIPELINE

BEGUN: 4/16/12 FINISHED: 4/16/12

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 1,994,418.9 E 2,745,774.2

TOTAL DEPTH: 25.0 DEPTH TO BEDROCK: BNE STATE: NEW MEXICO
GROUND ELEVATION: 6359,7
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: C, BEYER

SHEET 1 OF 1

REVIEWED BY:

		VERY	_	LABO	PAT	ORY	DATA	\ 	≿Ö	E.	450	<u>v</u> /	
NOTES	ОЕРТН	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY	BLOWS/0.5	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM BROUND SURFACE AND ARE THE BAME AS THOSE USED BY THE BRILLER.	3												0.0 - 25.0 FT: QUATERNARY ALLUVIUM (Qal): 0.0 - 12.5 FT: SILTY SAND SM: ABOUT 70%
ALL MEASUREMENTS ARE REPORTED N FEET EXCEPT WHERE NOTED	8-	100											FINE SAND; ABOUT 30% FINES WITH LOV TO MEDIUM PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH;
DRILLED BY: P.N. REGION DRILL CREW; C. PETERSON DRILLER; SCRIVENER, CLINE, HELPERS.	2_												MAXIMUM SIZE, FINE SAND; LOW TOUGHNESS, DRY, BROWN IN COLOR; N REACTION WITH HCI.
PURPOSE: PRECONSTRUCTION SOIL AND	5												12,5 - 15,0 FT: CLAYEY SAND SC: ABOUT 50% PREDOMINATELY FINE SAND, TRAC
BEDROCK FOUNDATION			16.3	83.7	0	N/A	NP	2.4	SM	8	1		COARSE SAND AND FINE GRAVEL; ABOU
NVESTIGATIONS	-	100	10,5	03.7		1999	144	5.7	OM	14		SM	50% FINES WITH LOW TO MEDIUM PLASTICITY, NO DILATANCY, LOW TO
DRILL EQUIPMENT: CME MODEL 850 TRACK MOUNTED ROTARY DRILL RIG.	-											2001	MEDIUM DRY STRENGTH; LOW TOUGHNESS; MAXIMUM SIZE, 25mm; DR' BROWN IN COLOR; INTERMITTENT
ORILL METHOD:	-				177500		1.70000			8			CALCITE NODULES; STRONG REACTION WITH HCL
D-25.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.		100	25.2	74.8	0	N/A	NP	2,7	SM	9			 15.0 - 25.0 FT: CLAYEY SAND WITH GRAV
CASING RECORD:		100								11			(SC)g: ABOUT 45%PREDOMINATELY FINI SAND, TRACE COARSE SAND; ABOUT 40' FINES WITH LOW TO MEDIUM PLASTICIT
ORILLING MEDIUM:	10									4	1		NO DILATANCY, LOW TO MEDIUM DRY STRENGTH, LOW TOUGHNESS, ABOUT
NONE USED	-		40.1	58.5	1.4	N/A	NP	4.8	SM	8]		15% FINE GRAVEL, MAXIMUM SIZE, 25mm DRY, BROWN IN COLOR; INTERMITTENT
HOLE COMPLETION: BACKFILLED WITH 4 BAGS SWELL PLUG AND RANDOM FILL.	:	100								11		6347.2	CALCITE NODULES; STRONG REACTION WITH HCI.
										10	Qal	6347.2	STRATIGRAPHY:
	-		58	40.6	1.4	31,1	15.7	7	s(CL)	16]		0.0 - 25.0 ft. QUATERNARY ALLUVIUM (Qa
	-	100								15		sc	ABBREVIATIONS:
													WLNE = WATER LEVEL NOT ENCOUNTERED
	15-		_							14		8344.7	I.D. = INSIDE DIAMETER BNE = BEDROCI NOT ENCOUNTERED.
			48.9	46.9	4.3	27.6	12.4	5.8	sc	22	1		
	"	İ								26			
	:=-							_					
		100											
	_		22.4	64.0	316	25.5			1001=				
	_		23.1	61.9	15	25.5	11.1	4,5	(SC)g				
	20-									16		(SC)g	
	2.0		35,7	55,3	9	29.2	14.8	5.6	SC	26			
										30			
	-												
	3	84											
	7.7												
d.	25					P		M OF F	HOLE			6334.7	

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.

SHEET 1 OF 1

FEATURE: REACH 22B LOCATION: PIPELINE

BEGUN: 4/16/12 FINISHED: 4/17/12

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 1,989,099.5 E 2,742,900.5

TOTAL DEPTH: 24.0 DEPTH TO BEDROCK: 10 STATE: NEW MEXICO
GROUND ELEVATION: 6413,0
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: C, BEYER

REVIEWED BY:

LABORATORY DATA BLOWS / 0.5 VISUAL GEOLOGIC UNIT SYMBOL **CLASSIFICATION AND** DEPTH PLASTICITY INDEX LIQUID LIMI MOISTURE NOTES GRAVEL PHYSICAL CONDITION FINES SAND CORE % 2 0.0 - 10.0 FT.: QUATERNARY ALLUVIUM ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE (Qal): SAME AS THOSE USED BY THE 0,0 - 10,0 FT: SILTY SAND SM: ABOUT 70% FINE SAND; ABOUT 30% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY DRILLER. ALL MEASUREMENTS ARE REPORTED STRENGTH, LOW TOUGHNESS; MAXIMUM SIZE, FINE SAND, DRY, BROWN IN COLOR; ROOTS IN TOP 1.0 FT; NO REACTION WITH 96 IN FEET EXCEPT WHERE NOTED. DRILLED BY: P.N. REGION DRILL HCI IN TOP 6.5 FT, STRONG REACTION CREW; C. PETERSON DRILLER; WITH HCI BELOW 6.5 FT. SCRIVENER, CLINE, HELPERS. PURPOSE: 10.0 - 24.0 FT: TERTIARY NACIMIENTO FORMATION (Tn): PRECONSTRUCTION SOIL AND Qal SM 5 BEDROCK FOUNDATION 10.0 - 15.0 FT: SANDSTONE: INTENSELY WEATHERED (W7) TO DECOMPOSED (W9) SOFT (H6) TO VERY SOFT (H7), MATERIAL VERY TIGHTLY PACKED IN SPT SAMPLER, INVESTIGATIONS. N/A NP SM 5 68.9 3.8 31.1 60 5 DRILL EQUIPMENT: CME MODEL 850 TRACK MOUNTED TRACE FINE SUBROUNDED GRAVEL ROTARY DRILL RIG. (ACTUAL ROCK WEATHERING AND HARDNESS APPROXIMATED DUE TO DRILL METHOD: 10 SAMPLE DISINTEGRATION FROM AUGER) 0-24.0 FT 4 1/4" HSA AND DRY CORE SM 16 25.3 NP SYSTEM WITH SPTs. 15.0 - 24.0 FT: CLAYSTONE: INTENSELY 100 23 15,0 - 24.0 FT: CLAYSTONE: INTENSELY
WEATHERED (W7) SOFT (H6) TO VERY
SOFT (H7), GREY IN COLOR, NO REACTION
WITH HCL; MATERIAL VERY TIGHTLY
PACKED IN SPT SAMPLER, (ACTUAL ROCK CASING RECORD: NONE USED 6403.6 DRILLING MEDIUM: 10 WEATHERING AND HARDNES NONE USED APPROXIMATED DUE TO SAMPLE 69.3 28.3 11.4 6.3 SC 30.7 0 DISINTEGRATION FROM AUGER). HOLE COMPLETION: 100 41 BACKFILLED WITH 5 BAGS SWELL STRATIGRAPHY: PLUG AND CUTTINGS. 0.0 - 10.0 FT: QUATERNARY ALLUVIUM (Qal) 10.0 - 24.0 FT: TERTIARY NACIMIENTO SS FORMATION (Tn) 16 ABBREVIATIONS: REFUSAL SC 29.6 67.9 2.5 27.1 10.1 4.7 WLNE = WATER LEVEL NOT ENCOUNTERED 100 I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED. 6398.0 15 26 47.6 52.4 0 34.5 12.8 10.5 SC REFUSAL Tn CLST 20 23 9.4 s(CL) 57.8 42.2 0 35 18.8 REFUSAL 82 6389.0 BOTTOM OF HOLE

COMMENTS:

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DESCRIPTIVE CRITERIA FOR ROCK, DRAWING NO. 40-D-6499, STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

BEGUN: 6/24/12 FINISHED: 6/24/12

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 1,984,821,4 E 2,741,525,2

TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: BNE

STATE: NEW MEXICO
GROUND ELEVATION: 6434,9
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: C, BEYER
REVIEWED BY:

	-												
		RY		LABO	ORAT	ORY	DATA	Α.	-	_		- /	
		CORE RECOVERY	\vdash		Ī	_		Г	A O	F 75	h:	VISUAL CLASSIFICATION ELEVATION	
NOTES	DEPTH	SEC	1000		ᡤ	N N	È	₩ <u></u>	CATO	BLOWS / 0.5	57	ION PICAL	CLASSIFICATION AND
1,0120	9	RE	FINES	SAND	GRAVEL	2	lëë.	SE	SSI	N N	MBC	VISUAL CLASSIFICA ELEVATION	PHYSICAL CONDITION
		8	EIII	% SA	% GF	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY CLASSIFICATION	BLO	GEOLOGIC UNIT SYMBOL	3/ #	
ALL MEASUREMENTS ARE FROM	1		- 0-	6.	100	-	_	20	- 0	-	0	_/	
GROUND SURFACE AND ARE THE													0.0 - 25.0 FT.: QUATERNARY ALLUVIUM
SAME AS THOSE USED BY THE DRILLER.	-	1											(Qal):
ALL MEASUREMENTS ARE REPORTED			1										0.0 - 9.8 FT: SILTY SAND SM: ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO
IN FEET EXCEPT WHERE NOTED.	- "	90		l I		l							PLASTICITY, RAPID DILATANCY, LOW DRY
DRILLED BY: U.C. REGION DRILL	-				1	1							STRENGTH, LOW TOUGHNESS; MAXIMUM SIZE, FINE SAND; DRY, BROWN IN COLOR;
CREW; DRILLER; LENNY WASHBURN, HELPERS; BRENT TERRY.			1			1							ROOTS IN TOP 0.5 FT, CLACITE NODULES AND CEMENT: STRONG REACTION WITH
TYSON BEZANSON.	1 -	i	1										HCI.
PURPOSE: PRECONSTRUCTION SOIL AND	5											SM	9.8 - 10.5 FT: LEAN CLAY WITH SAND (CL)s:
BEDROCK FOUNDATION INVESTIGATIONS.	0-									14		2.00	ABOUT 60% FINES WITH MEDIUM TO HIGH PLASTICITY, HIGH DRY STRENGTH,
· · · · · · · · · · · · · · · · · · ·		200	32.7	67.3	0	21.9%	8.4%	4.6%	sc	21			MEDIUM TOUGHNESS; ABOUT 40% FINE
DRILL EQUIPMENT: GUS PECH MODEL GP3000 ROTARY		88	_	-		-				25			SAND, MAXIMUM SIZE, FINE SAND; DARK GREY IN COLOR; WEAK REACTION WITH
DRILL RIG.	:=	1											HCI.
DRILL METHOD:	. 8	_				1		-		21			10.5 - 11.0 FT: CLAYEY SAND SC: ABOUT 50
0-25.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.	-		51.0	49.0	0	21.4%	3.8%	4.5%	s(ML)	31	1		% FINE SAND; ABOUT 50% MEDIUM PLASTIC FINES, WITH MEDIUM
CASING RECORD:	12	100								29			TOUGHNESS, AND MEDIUM DRY STRENGTH: NO REACTION WITH HCI.
NONE USED												274200	STRENGTH, NO REACTION WITH TICI.
DRILLING MEDIUM:	10-	_	_			222377						6425.1	11.0 - 25.0 FT: SILTY SAND SM: ABOUT 80%
NONE USED			75.4	24.6	0	52.1%	30.3%	17.2%	(CH)s	15		(CL)s 6424.4 SC 6424.9	FINE SAND; ABOUT 20% FINES WITH NO
HOLE COMPLETION:	1.2	96	44.4	55.6	0	25.6%	7.3%	5.6%	SC	26		SC 6423.9	PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH, LOW TOUGHNESS; MAXIMUM
BACKFILLED WITH CUTTINGS,										1			SIZE, FINE SAND; DRY, FeOx STAINING, ORANGE IN COLOR, CLACITE NODULES
	-										Qal		AND CEMENT; STRONG REACTION WITH
										22	Qai		HCI.
			22.8	77.2	0	N/A	NP	2.7%	SM	REFUSAL			
	-	100											STRATIGRAPHY:
													0.0 - 25.0 FT: QUATERNARY ALLUVIUM (Qai)
	15-						-			14			ABBREVIATIONS: WLNE = WATER LEVEL NOT
			68.5	31.5	0	N/A	NP	5.5%	s(ML)	24			ENCOUNTERED
	-	100							91125	24			I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.
			_				_						
	12		40,4	59,6	0	N/A	NP	4.6%	SM	12		SM	
		100	.40.4	98.0		10%	3865	4.072	SWI	29			
	177												
	20-												
	-0		O-CADE			00000	www.	620-100		12			
	-		34.4	65,6	0	N/A	NP	3.9%	SM	21			
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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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

SHEET 1 OF 1

FEATURE: REACH 22B LOCATION: AIR CHAMBER 1 BEGUN: 1/14/15 FINISHED: 1/15/15

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,052,633,1 E 2,752,135,6

TOTAL DEPTH: 37,8
DEPTH TO BEDROCK: 30,1

STATE: NEW MEXICO GROUND ELEVATION: 5816.2 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J. GILBERT

REVIEWED BY:

	T .	T	Т	ar i Carrier		4-3279-174	November 1		T	_	_		
1		VERY		LAB	ORA'	TORY	DAT	A	Z O	ㅂ		ž ,	1
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY	MOISTURE	LABORATORY CLASSIFICATION	BLOWS / 0.5	GEOLOGIC UNIT	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.													0.0 - 30.1 FT QUATERNARY ALLUVIUM (Qal)
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.		_	_										0.0 to 8.9 FT SILTY SAND (SM): ABOUT 80% FINE SAND, MAXIMUM SIZE, FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH.
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILLEBREW, JOE	5-	84	21.7	78.3	0	NA	NP	2.5	SM	3/5/5	-	SM	LOW TOUGHNESS; DRY, TAN IN COLOR; NO REACTION WITH HCI. 8.9 - 14.2 FT POORLY GRADED SAND WITH
PROCTOR. PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	2	88	10.0	90,0	0	NA	NP	1.7	SP-SM	4/4/4			SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY STRENGTH, RAPID DILATANCY; DRY, LIGHT BROWN IN COLOR; NO REACTION WITH HCI,
DRILL EQUIPMENT: CME 850 TRACK MOUNTED DRILL RIG	10-	100	9,6	90.4	0	NA	NP	1.6	SP-SM	2/3/4		5807.3	14.2 - 14.4 FT SILTY SAND (SM): ABOUT 80% FINE SAND, MAXIMUM SIZE, FINE SAND; ABOUT 20% FINES WITH NO
DRILL METHOD: 0.0 - 30.1 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS, 30.1 - 37.8 FT H03 WIRELINE CORING	-	88	37.1	62.9	0	23.4	7.1	5.3	sc	3/5/5		SP-SM	PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH, LOW TOUGHNESS; DRY, TAN IN COLOR; NO REACTION WITH HCI.
SYSTEM WITH A 3' SPLIT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT.	-		27.7	72.3	0	22.4	5.2	4.6	SC-SM	5/6/6		SM 5887.9	14.4 - 18.9 FT LEAN CLAY WITH SAND (CL)s: ABOUT 70% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH TOUGHNESS; ABOUT
CASING RECORD: NONE USED	15	100									Qal		NO REACTION WITH HCI.
DRILLING MEDIUM: 0.0 - 30.1 FT, NONE USED 30.1 - 37.8 FT, WATER		88	36.3	63,7	0	27.2	10.3	5.5	sc	5/8/10		(CL)s	18.9 - 30.1 F POORLY GRADED SAND WITH GRAVEL (SP)g: ABOUT 75% FINE TO COARSE SAND; ABOUT 20% FINE TO COARSE GRAVEL, MAXIMUM SIZE 40mm;
HOLE COMPLETION: BACKFILLED WITH DRILL CUTTINGS AND BENTONITE	20-		37.5	62.5	0	26.9	9.3	5.8	sc	4/8/9		5797.3	ABOUT 5% NONPLASTIC FINES WITH RAPID DILATANCY, AND NO DRY STRENGTH; NO RECTION WITH HCI,
OBSERVATION WELL INSTALLED BGS: NONE USED	-	96											30.1- 37.8 TERTIARY NACIMIENTO FORMATION (Tn)
	-												30.1 - 31.8 FT SANDSTONE: DECOMPOSED (W9) AND DESCRIBED AS A SOIL: POORLY GRADED SAND (SP): ABOUT 90% FINE TO MEDIUM SAND; ABOUT 10% NONPLASTIC
	25-		19.7	79.7	0.6	NA	NP	5,3	SM 12	49/REFUS/	NL.	(SP)g	FINES WITH RAPID DILATANCY, NO DRY STRENGTH; NO REACTION WITH HCI.
		0											31.8 - 37.8 FT SANDSTONE: FINE TO COARSE GRAINED, TAN IN COLOR MODERATELY WEATHERED (W5), MODERATELY HARD (H4); THINLY BEDDED TO LAMINATED; COAL INTERBED FROM 36.1 - 36.6 FT; NO REACTION WITH HCI.
	30-	11										5786.1	STRATIGRAPHY: 0.0 - 30.1 FT: QUATERNARY ALLUVIUM (Qal) 30.1 - 37.8 FT: TERTIARY NACIMIENTO
	-	91											FORMATION (Tn) ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED
	35-	00									Tn	ss	I.D. = INSIDE DIAMETER.
	1	96											
, L						ВО	ТОМ	OF HC	LE			5778.4	

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES...

SHEET 1 OF 1

FEATURE: REACH 22B LOCATION: AIR CHAMBER 2 BEGUN: 1/16/15 FINISHED: 1/17/15

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,017,854.5 E 2,750,606,7

TOTAL DEPTH: 39.5 DEPTH TO BEDROCK: 13.1 STATE: NEW MEXICO
GROUND ELEVATION: 6203,4
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: J, GILBERT
REVIEWED BY:

		RY		LABO	DRAT	ORY	DATA	N.	z	F		z /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	CLASSIFICATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.													0.0 - 13.1 FT QUATERNARY ALLUVIUM (Qal) 0.0 to 13.1 FT SILTY SAND (SM): ABOUT 80%
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED,	<u>-</u>		16.8	83.4	. 0	NA NA	NP	3.7	SM	9/11/12		\$3 S	FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH, LOW TOUGHNESS; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; NO
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILLEBREW, JOE PROCTOR.	5 -	80	70.0	20.0		25.0	20		/OL MILY-	444040	Qal	SM	REACTION WITH HCI. 13.1 - 39.5 FT TERTIARY NACIMIENTO
PURPOSE: PRECONSTRUCTION SOIL AND	-	100	73.2	26.8	0	25.9	6.9	5.4	(CL-ML)s	14/16/18			FORMATION (Tn) 13,1 - 38,5 FT SANDSTONE: FINE TO
BEDROCK FOUNDATION INVESTIGATIONS. DRILL EQUIPMENT:	10-	100	33.5	66.5	0	NA	NP	3.1	SM	11/13/14	İ	to 2 12: 2	MEDIUM GRAINED, INTENSELY TO VERY INTENSELY WEATHERED (W7-W8) , SOFT (H6), WEAK REACTION WITH HCI.
CME 85 DRILL METHOD: 0.0 - 13.1 FT 4 1/4" HSA AND DRY CORE	-	96	30,8	69.2	0	NA	NP	3.7	SM	8/13/13		9	38.5 - 39.5 FT SILTSTONE: FINE GRAINED, GREY IN COLOR, INTENSELY WEATHERED (W7), SOFT (H6); NO REACTION WITH HCI.
SYSTEM WITH SPTS. 13.1 - 39.5 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE	30 T		17.2	82.8	0	NA	NP	2.5	SM	8/6/6	i	6190.3	STRATIGRAPHY: 0.0 - 13.1 FT: QUATERNARY ALLUVIUM (Qal) 13.1 - 39.5 FT: TERTIARY NACIMIENTO
SAMPLER AND DIAMOND SURFACE- SET BIT.	15-	0							()				FORMATION (Tn) ABBREVIATIONS:
CASING RECORD: NONE USED	-		8 S		ii ii	66 R		6 i	85) 85)	ă 3 ă 8	ő ő	23 3 23 3	WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK
DRILLING MEDIUM: 0.0 - 13.1 FT, NONE 13.1 - 39.5 FT, WATER	20-	0											NOT ENCOUNTERED.
HOLE COMPLETION: BACKFILLED WITH DRILL CUTTINGS	2												
OBSERVATION WELL INSTALLED BGS: NONE USED	-	40											
	25—											SANDSTON	=:
	=										Tn		
	-	26											
	30-												
	7	28											
4	35-	20											
	-												
		100										6164.9 SILTSTONE	
						В	оттог	M OF H	IOLE			6163,9	

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

SHEET 1 OF 1

FEATURE: REACH 22B LOCATION: PIPELINE

BEGUN: 8/24/14 FINISHED: 8/24/14

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,047,827.0 E 2,750,962,4

TOTAL DEPTH: 25,5
DEPTH TO BEDROCK: BNE

STATE: NEW MEXICO
GROUND ELEVATION: 5823.8
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: J, GILBERT

REVIEWED BY:

		ERY		LABO	RAT	ORY	DATA	4	Z	Ŀ		z /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.	_	i :		6 % 6 %	70		6 10 6 10	40: 0 40: 0	5		540 S	3	0.0 - 25.5 FT.: QUATERNARY ALLUVIUM (Qal): 0.0 - 20.9 FT SILTY SAND SM: ABOUT 80%
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	2 A	66 E		# 10			5 01	00 0 00 0			1 6 55 7 5 6 50 5	. s	FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH; DRY, MAXIMUM SIZE, FINE SAND; TAN IN COLOR; STRONG REACTION
DRILLED BY: U,C, REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILEBREW, DAVE NIELSEN.	E 77	80 E		30	93 S		8 5 70	4 05 9	Ę		P600 - 0	: 8	WITH HCI. 20.9 - 25.5 FT LEAN CLAY (CL): ABOUT 85 % FINES WITH MEDIUM PLASTICITY, MEDIUM
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	5—	64	45.6	56,4	0	25.9	11.0	4,0	sc	4/4/2	900 8 40 1	8	DRY STRENGTH, MEDIUM TOUGHNESS; ABOUT 15%, PREDOMINATELY FINE TO MEDIUM SAND; MAXIMUM SIZE, MEDIUM SAND; NO REACTION WITH HCI,
DRILL EQUIPMENT: CME 85		d (62										8	STRATIGRAPHY: 0.0 - 25.5 FT QUATERNARY ALLUVIUM (Qal).
DRILL METHOD: 0- 25.5 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.	-	100	39.4	60.8	0	24.3	7.0	6.7	SC-SM	6/5/4			ABBREVIATIONS WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER SS = SANDSTONE SLST = SILTSTONE CLSTNE = CLAYSTONE FeOx
CASING RECORD: NONE USED	2 2	60 0		6 00	0: :		£ 5	9 00 0			0 4 00 - 2	8 8	= IRON OXIDE MnOx = MANGANESE OXIDE
DRILLING MEDIUM: NONE	10-		32	68	0	NA	NP	5.4	SM	3/5/6			,
HOLE COMPLETION: BACKFILLED WITH CUTTINGS	·-	100										SM	
	3	100	36	64	0	25.2	7.0	5.7	SC-SM	5/7/9	Qal	ı	
	15	100	23.3	76.7	0	NA	NP	4,4	SM	8/8/7			
	-												
	-	100	22.3	76.7	0	NA	NP	4.9	SM	6/8/9			
	-												
	20-		22	78	0	NA	NP	5.5	SM	5/8/8			
	-	100										5802.9	
	: -											CL	
	25-		84,1	15,9	0	41,1	21.3	17.6	(CL)s	9/18/21		5798.3	

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.

BEGUN: 8/24/14 FINISHED: 8/24/14

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 2,037,116.7 E 2,750,759.7

TOTAL DEPTH: 25,0 DEPTH TO BEDROCK: BNE STATE: NEW MEXICO GROUND ELEVATION: 5911.1 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J. GILBERT

REVIEWED BY:

	-												
		ERY		LABC	RAT	ORY	DATA	١.	N. N.	E		No /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY	BLOWS / 0.5	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.													0.0 - 25.0 FT.: QUATERNARY ALLUVIUM (Qal): 0.0 - 10.2 FT SILTY SAND SM: ABOUT 80%
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	-												FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; DRY. TAN IN COLOR: STRONG REACTION
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILEBREW, DAVE NIELSEN.	-												MTH HCI. 10.2 - 11.3 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE TO
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	5	100	36.4	63.6	0	22.6	6.4	3.9	SC-SM	2/2/2		SM	MEDIUM SAND, ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY AND NO DRY STRENGTH; TRACE COARSE SAND AND FINE GRAVEL MAXIMUM SIZE, 10MM; GREY, DRY, BECOMES MOIST BELOW 7.0
DRILL EQUIPMENT: CME 85		.65	31.7	68.3	0	NA	NP	3.8	SM	3/4/3			FT; NO REACTION WITH HCI. 11.3 - 25.0 FT CLAYEY SAND (SC): ABOUT 60% FINE SAND; ABOUT 40% FINES WITH
DRILL METHOD: 0- 25,0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.	-	68											MEDIUM PLASTICITY, MEDIUM TOUGHNESS, LOW TO MEDIUM DRY STRENGTH; MAXIMUM SIZE, FINE SAND; DARK GREY IN COLOR: NO REACTION
CASING RECORD: NONE USED	_	60	21.1	78.9	0	NA	NP	2.7	SM	2/3/3			WITH HCI.
DRILLING MEDIUM: NONE HOLE COMPLETION:	10-	60										5900.0 SP-SM	STRATIGRAPHY: 0.0 - 25.0 FT QUATERNARY ALLUVIUM (Qal). ABBREVIATIONS WLNE = WATER LEVEL
BACKFILLED WITH AUGER CUTTINGS		76	42.9	57.1	0	23.6	9.8	6.3	sc	3/4/6	SP- Qal	5899.8	NOT ENCOUNTERED I.D. = INSIDE DIAMETER SS = SANDSTONE SLST = SILTSTONE CLSTNE = CLAYSTONE FEOX = IRON OXIDE MnOx = MANGANESE OXIDE
	15-	92	47.2	52.8	o	27.2	12.1	7.2	sc	4/4/3			
	3	100	59.3	40.7	0	28.4	13.7	9.6	s(CL)	3/4/5		sc	
	20-		43.7	56.3	0	28.4	11.7	8.2	sc	3/4/6		30	
20-	3 - 30	98											
			26.9	73.1	0	NA.	NP	7.1	SM	10/33/18		5886.1	

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES,

SHEET 1 OF 1

FEATURE: REACH 22B LOCATION: PIPELINE

BEGUN: 9/9/14 FINISHED: 9/9/14

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,027,647.0 E 2,750,126.8

TOTAL DEPTH: 24,5
DEPTH TO BEDROCK: 18,5

STATE: NEW MEXICO
GROUND ELEVATION: 5972,8
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: J. GILBERT
REVIEWED BY:

		District on the	_								_		
		ERY		LABC	DRAT	ORY	DATA		>N	ᇤ		z /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY	BLOWS / 0.5	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.		6 8 Fi											0.0 - 18.5 FT QUATERNARY ALLUVIUM (Qal) 0.0 - 18.2 FT: POORLY GRADED SAND (SP):
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	e te	0 :		e 10	9 6 i		6 0.	991 - B	£ ;	S\$ 12	3	s 8	ABOUT 95% PREDOMINATELY FINE SAND, ABOUT 5% NONPLASTIC FINES WITH REPUBLICATION OF THE SAND; STRENGTH; MAXIMUM SIZE, FINE SAND;
DRILLED BY: U,C, REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILEBREW, DAVE NIELSEN.	11 <u>13</u>	20 S		1 75 e 50	72 :		d 83	20 Z		9 5	a) (6)	NO REACTION WITH HCI. 18.2 - 18.5 CLAYEY SAND (SC): ABOUT 80% PREDOMINATELY FINE SAND; ABOUT 20%
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	5—	56	11.4	88.6	0	NA I	NP	0.9%	SP-SM	2/3/4		2	FINES WITH LOW PLASTICITY, LOW DRY STENGTH, LOW TOUGHNESS AND SLOW DILATANCY; TRACE FINE TO COARSE GRAVEL; MAXIMUM SIZE, 50MM; DARK BROWN IN COLOR, MOIST; NO REACTION WITH HCI.
DRILL EQUIPMENT: CME 85	-		83	91.7	0	NA.	NP	0.7%	SP-SM	9/9/9		8	18.5 - 24.5 FT TERTIARY NACIMIENTO FORMATION (TN)
DRILL METHOD: 0- 24.5 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.		48	0.3	917		NA.	NP	0.7%	or-ow	9/9/9		i 3	18.5 - 24.5 FT CLAYSTONE: GREY TO DARK GREY IN COLOR, VERY INTENSLEY WEATHERED TO DECOMPOSED (W8-W9),
CASING RECORD: NONE USED		i,			ì								VERY SOFT TO SOFT (H6-H7); WEAK REACTION WITH HCI
DRILLING MEDIUM: NONE	10-	68	11.8	88,2	0	NA	NP	1.1%	SP-SM	7/12/19	Qal	SP	STRATIGRAPHY: 0.0 - 18.5 FT: QUATERNARY ALLUVIUM (Qal) 18.5 - 24.5 FT: TERTIARY NACIMIENTO
HOLE COMPLETION: BACKFILLED WITH DRILL CUTTINGS	_												FORMATION (Tn) ABBREVIATIONS: WLNE = WATER LEVEL NOT
	-	40	12.6	81,3	6.1	NA	NP	1.3%	SM	13/17/18			I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.
	-												
	15-	80	12.8	87,2	0	NA	NP	1.6%	SM	4/9/12			
	-												
	_	60	17.5	82.5	0	NA	NP	2.4%	SM	8/9/10			
	÷÷											5954.6 SC 5954.3	
	20-		72.1	27.9	0	34.9%	18,0%	10.3%	(CL)s	20/31/49			
	20-	80											
	-										Tn	CLSTNE	
	-		62.6	37.4	0	30.5%	10.4%	9.2%	s(CL)	5/REFUSAL		5948.3	
						В	отто	M OF F	IOLE	*			

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.

BEGUN: 8/25/14 FINISHED: 8/25/14

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 2,016,957,4 E 2,750,693,9

TOTAL DEPTH: 24,0 DEPTH TO BEDROCK: 9,8 STATE: NEW MEXICO GROUND ELEVATION: 6185,5 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J, GILBERT

REVIEWED BY:

		1 2	T							T	<u> </u>	1 2	
		OVER	_	LABO	RAI	ORY	DATA	1	No	F 2	1-	No /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.	_												0.0 - 9.8 FT.: QUATERNARY ALLUVIUM (Qal): 0.0 - 5.1 FT: SILTY SAND (SM): ABOUT 80%
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	-											SM	FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; STRONG REACTION
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILEBREW, DAVE NIELSEN.	-												WITH HCI, 5.1 - 9.8 FT: CLAYEY SAND (SC): ABOUT
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	5-	100	17.4	82.6	0	NA	NP	3.5%	SM	4/11/16	Qal	6180.4	60% FINE SAND; ABOUT 40% FINES WITH LOW TO MEDIUM PLASTICITY, NO DILATANCY, LOW DRY STRENGTH, LOW TOUGHNESS; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR; STRONG REACTION
DRILL EQUIPMENT: CME 85	-		43.8	56.2	0	29.00	12.8%	7.1%	sc	12/17/21			WITH HCI, 9.8 -24.0 FT.: TERTIARY NACIMIENTO FORMATION (Tn):
DRILL METHOD: 0.0 - 10.5 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs. 10.5 - 24.0 FT 4 1/4" HSA AND DRY	9=	100	43.8	56.2	0	36.0%	12.6%	7.179	SC	12/1//21		sc	9.8 - 14.0 FT SANDSTONE: FINE TO MEDIUN GRAINED, INTENSELEY WEATHERED TO
CORE SYSTEM WITH NO SPTS CASING RECORD: NONE USED	10-	and the	53.9	46.1	0	29.3%	12.8%	6.5%	s(CL) 13	50/REFUS	M.	6175.7	DECOMPOSED (W7-W9), MODERATELY SOFT TO SOFT (H5-H6), LIGHT BROWN IN COLOR; NO REACTION WITH HCL
DRILLING MEDIUM: NONE	-	100										SS	14.0 - 15.4 FT CLAYSTONE: FINE GRAINED, INTENSELY WEATHERED TO DECOMPOSED (W7-W9), MODERATELY SOFT TO SOFT (H5-H6), GREY IN COLOR, SANDSTONE INTERBED FROM 20.0 TO 20.4 FEET; NO REACTION WITH HCI.
	-	100										6171.5	15.4 - 24.0 FT SANDSTONE: INTENSELY WEATHERED TO DECOMPOSED (W7-W9), MODERATELY SOFT TO SOFT (H5-H6), LIGHT GREY IN COLOR; NO REACTION
	15-											CLSTN 6170.1	WITH HCI. STRATIGRAPHY: 0.0 - 9.8 FT QUATERNARY ALLUVIUM (Qal). 9.8 - 24.0 FT TERTIARY NACIMIENTO FORMATION (Tn)
	1	100									Tn		ABBREVIATIONS WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER SS = SANDSTONE SLST = SILTSTONE CLSTNE = CLAYSTONE FeOX = IRON OXIDE MnOX = MANGANESE
	-											SS	OXIDE
	20-											7.R	
	2												
						Be	оттог	M OF H	IOLE			6161.5	

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.

BEGUN: 8/21/14 FINISHED: 8/22/14

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 1,975,384.1 E 2,735,818.2

TOTAL DEPTH: 25,0 DEPTH TO BEDROCK: BNE STATE: NEW MEXICO
GROUND ELEVATION: 6623,5
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: J. GILBERT
REVIEWED BY:

		ERY		LABC	RAT	ORY	DATA	١	, z	Ŀ		z /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY	BLOWS / 0.5 I	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.	-												0.0 - 25.0 FT: QUATERNARY ALLUVIUM (Qal): 0.0-10,1 FT SILTY SAND (SM): ABOUT 70%
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	=	č											FINE SAND; ABOUT 30% FINES WITH RAPID DILATANCY, NO DRY STRENGTH; MAXIMUM SIZE, FINE SAND; MOIST, TAN IN COLOR; ROOTS AND ORGANIC MATERIAL
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILEBREW, DAVE NIELSEN.													IN TOP 0.5 FT, LOOSE; NO REACTION WITH HCI. 10.1-20.1 FT CLAYEY SAND (SC): ABOUT
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	5	72	43.2	58.8	0	24.4	11.0	3.9	sc	3/5/7		SM	60% FINE SAND; ABOUT 40% FINES WITH MEDIUM PLASTICITY, LOW TO MEDIUM DRY STRENGTH; MEDIUM TOUGHNESS; MAXIMUM SIZE, FINE SAND; DARK GREY IN COLOR, ORGANIC MATERIAL PRESENT; NO REACTION WITH HCI.
DRILL EQUIPMENT: CME 85	3=	52	18,7	81.3	0	NA	NP	1.7	SM	1/2/2			20,1-25.0 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH
DRILL METHOD: 0- 25.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.	_	52											RAPID DILATANCY, NO DRY STRENGTH; MAXIMUM SIZE, FINE SAND; MOIST, TAN IN COLOR, LOOSE; NO REACTION WITH HCI.
CASING RECORD: NONE USED	=	72	55.7	44,3	0	26.5	12.3	5.4	s(CL)	2/4/5		41017	STRATIGRAPHY: 0.0 - 25.0 FT QUATERNARY ALLUVIUM (Qal).
DRILLING MEDIUM: NONE	10-											6613,4	ABBREVIATIONS WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE
HOLE COMPLETION: BACKFILLED WITH AUGER CUTTINGS		56	47.9	52.1	0	26.7	11.8	5.0	sc	8/9/12	Qal		DIAMETER SS = SANDSTONE FeOx = IRON OXIDE
	15-	60	54.1	45.9	0	29.2	14.8	5.7	s(CL)	8/10/15			
	-	100	59.4	40.6	0	31.2	14.8	2.64	s(CL)	12/14/15			
	20-		53.8	46.2	0	27.9	13.4	5.7	s(CL)	16/21/23		6603.4	*
	-	94											
	٠.											SM	
			47,1	52.9	0	28.2			sc	8/16/22		6598.5	
	20					E	вотто	M OF	HOLE				

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

BEGUN: 8/22/14 FINISHED: 8/22/14

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 1,970,531.8 E 2,735,821.9

TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: BNE

STATE: NEW MEXICO GROUND ELEVATION: 6628,7 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J. GILBERT

REVIEWED BY:

		ERY		LABO	RAT	ORY	DATA	4	z	E		z	/	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY	BLOWS / 0.5 F	GEOLOGIC UNIT SYMBOL	VISUAL	ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.	2													0.0 - 25.0 FT.: QUATERNARY ALLUVIUM (Qal): 0.0 - 6.6 FT SILTY SAND (SM): ABOUT 80%
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	:													FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; DRY, TAN IN COLOR: STRONG REACTION
DRILLED BY: U,C, REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILEBREW, DAVE NIELSEN.		_				_						SM		WITH HCI. 6.6 - 14.2 FT CLAYEY SAND (SC): ABOUT 60% FINE SAND: ABOUT 40% FINES WITH
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	5	100	42.4	57.8	0	34.2	21.8	6.3	sc	7/3/4				LOW TO MEDIUM PLASTICITY, NO DILATANCY, LOW DRY STRENGTH; MAXIMUM SIZE, FINE SAND; LOW TOUGHNESS; DRY, TAN IN COLOR, INTERMITTENT CALCITE NODULES, ROOTS
DRILL EQUIPMENT: CME 85			21.5	78.5	0	NA	NP	3.2	SM	6/12/14			6622.1	IN TOP 0.5 FT, STRONG REACTION WITH HCI.
DRILL METHOD: 0- 25,0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTs.		100												14.2 - 23.2 FT LEAN CLAY (CL): ABOUT 85% MEDIUM PLASTIC FINES, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH TOUGHNESS; ABOUT 15% FINE SAND; MAXIMUM SIZE, FINE SAND; DARK
CASING RECORD: NONE USED	-		43.5	56.5	0	26.3	14.1	6.2	sc	12/18/16				GREY IN COLOR; NO REACTION WITH HCL 23,2 - 24,1 FT SANDY LEAN CLAY s(CL):
DRILLING MEDIUM: NONE	10-	100										sc		ABOUT 80% FINES WITH MEDIUM PLASTICITY, NO DILATANCY, MEDIUM DRY STRENGTH, MEDIUM TO HIGH
HOLE COMPLETION: BACKFILLED WITH AUGER CUTTINGS	-	400	68.5	31.5	0	39.6	27.0	9.6	s(CL)	10/14/16				TOUGHNESS, ABOUT 20% FINE SAND; MAXIMUM SIZE, FINE SAND; DARK GREY IN COLOR; NO REACTION WITH HCI.
	-	100									Qal			24.1 - 25.0 FT FAT CLAY (CH): ABOUT 95% HIGHLY PLASTIC FINES, HIGH TO VERY HIGH DRY STRENGTH, HIGH TOUGHNESS;
	-		76.1	23.9	0	40.4	28.1	10.4	(CL)s	7/12/6			6614.5	ABOUT 5% FINE TO MEDIUM SAND; MAX SIZE, MEDIUM SAND; NO REACTION WITH HCI.
	15-	100	on zage	52.00	0.70	control	2000	72820	(0.0)	4.0868.				STRATIGRAPHY: 0.0 - 25.0 FT QUATERNARY ALLUVIUM (Qal).
	-	100	56.7	43.3	0	34.0	22.0	8.8	s(CL)	10/17/22				ABBREVIATIONS WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER SS = SANDSTONE FeOx = IRON OXIDE
	-											CL		
	-		50.6	49.4	0	28.2	15.9	7.6	s(CL)	13/19/23				
	20-	92												
		92												
	-												6605.5	
	_		96.1	3.9	0	69.0	44.5	25.0	CH	4/8/15		s(CL)		
	25_		30,1	9,9	3			M OF H	CH	aror (5		СН	6603.7	
1						_								

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.

FEATURE: REACH 22B
LOCATION: FOREBAY TANK
BEGUN: 5/7/14 FINISHED: 5/7/14
DEPTH OF WATER LEVEL:
DATE MEASURED: 5/7/2014

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,052,716,0 E 2,752,126,2 TOTAL DEPTH: 50.2

TOTAL DEPTH: 50.2 DEPTH TO BEDROCK: 28.2 STATE: NEW MEXICO
GROUND ELEVATION: 5816,9
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: J. GILBERT
REVIEWED BY:

	_							_	_	-	_		
1		VERY	_	LABO	DRAT	ORY	DATA	\ 	>Z	ե		8 /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY CLASSIFICATION	BLOWS / 0,5	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.) 1.5))-												0.0 - 28.2 FT QUATERNARY ALLUVIUM (Qal)
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	5												0.0 TO 17.2 FT SILTY SAND (SM): ABOUT 80% FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH, LOW TOUGHNESS;
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILLEBREW, ROBBY			34.4	65.6	0.0	NA	NP	3.0	SM	4/4/4			MAXIMUM SIZE, FINE SAND, DRY, BROWN IN COLOR: ROOTS IN TOP 0.5 FT, LENSE OF POORLY GRADED SAND (SP) FROM 10.7 TO 11.0 FT; NO REACTION WITH HCL.
ROBINSON.	10-		20.2	79.8	0.0	NA	NP	3.0	SM	2/3/2		SM	10.7 TO TI,UFT; NO REACTION WITH HCL.
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	-		12.1	85.8	2.1	NA	NP	2.7	SM	2/3/2			17.2 TO 28.2 FT SANDY LEAN CLAY s(CL): ABOUT 70% FINES WITH MEDIUM PLASTICITY, MEDIUM TO HIGH DRY STRENGTH, AND MEDIUM TO HIGH
DRILL EQUIPMENT: CME 85	15-		13.4	86.6	0.0	NA	NP	3.2	SM	4/3/3	Qal		TOUGHNESS; ABOUT 30% FINE SAND, MAXIMUM SIZE; FINE SAND, BROWN IN COLOR; NO REACTION TO HCI.
DRILL METHOD: 0.0 TO 28.2 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPLIT SPOON	1 75		20.5	75.6	3.9	NA	NP	4.3	SM	2/2/2		5799.7	28.2 - 50.2 FT TERTIARY NACIMIENTO FORMATION (TN)
SAMPLER. SPT SAMPLING TO 28.2 FEET. DISCONTINUED SPT SAMPLING DUE TO BEDROCK. 28.2 TO 50.2 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE SAMPLER AND DIAMOND	20-		35.0	65.0	0.0	20.7	2.2	7.7	SM	3/2/2			28.2 TO 50.2 FT SANDSTONE: FINE GRAINED, BROWN IN COLOR, MODERATELY TO INTENSELY WEATHERED (W6) MODERATELY HARD
SURFACE- SET BIT.	-		38.5	61,5	0.0	23.5	9.6	5.0	sc	3/3/2		s(CL)	(H4), THINLY BEDDED TO LAMINATED, TRACE OF SUBANGULAR GRAVEL, MAX SIZE 40 mm, CLAY
CASING RECORD; NONE USED	25												INTERBED FROM 49,9 TO 50,2 FT; POOR CORE RECOVERY, NO REACTION WITH HCI.
DRILLING MEDIUM: 0.0 TO 28.2, NONE USED 28.2 TO 50.2 WATER	30-	0	26,1	73,9	0,0	NA	NP	6.9	SM	REFUSAL		5788,7	STRATIGRAPHY: 0.0 - 28.2 FT QUATERNARY ALLUVIUM (QaI) 28.2 - 50.2 FT TERTIARY NACIMIENTO
HOLE COMPLETION GROUTED TO SURFACE		40											FORMATION (TN). ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.
	35—												
	=	48											
	40-										Tn	SANDSTON	
	-	8											
	45-	~											
	,5												
		40											
	.50-					BO	OTTON	OF H	OLE			5766.7	

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499, STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

SHEET 1 OF 2

FEATURE: REACH 22B LOCATION: PUMPING PLANT 1 BEGUN: 1/15/15 FINISHED: 1/15/15

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,052,663,8 E 2,752,139,7

TOTAL DEPTH: 29.8 DEPTH TO BEDROCK: 22.8 STATE: NEW MEXICO GROUND ELEVATION: 5815,5 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J. GILBERT

REVIEWED BY: LABORATORY DATA BLOWS / 0.5 FT DEPTH VISUAL NOTES MOISTURE CLASSIFICATION AND GRAVEL CORE SAND LIQUID PHYSICAL CONDITION 8 8 ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE 0.0 - 22.8 FT QUATERNARY ALLUVIUM (Qal) DRILLER. 0.0 - 16.1 FT SILTY SAND (SM): ABOUT 85% FINE SAND; ABOUT 15% NONPLASTIC FINES WITH RAPID DILATANCY, AND NO DRY STRENGTH; BROWN IN COLOR, NO ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED. DRILLED BY: U.C. REGION DRILL REACTION WITH HCI. CREW; DRILLER; JEFF VAN AUSDAL, 16.1 -22.8 FT SANDY LEAN CLAY s(CL): HELPERS; KYLE KILLEBREW, JOE 21.1 78.9 NA ABOUT 85% FINES WITH MEDIUM PROCTOR 3/4/4 PLASTICITY, MEDIUM DRY STRENGTH, AND MEDIUM TOUGHNESS; ABOUT 15% FINE SAND; STRONG REACTION WITH HCI, PURPOSE PRECONSTRUCTION SOIL AND INTERMITTENT CALCITE NODULES, GREY BEDROCK FOUNDATION INVESTIGATIONS. 79.0 NA 24 SM 4/5/6 22.8 - 29.8 FT TERTIARY NACIMIENTO DRILL EQUIPMENT FORMATION (TN) CME 850 TRACK MOUNTED DRILL RIG 22,8 TO 29.8 FT SANDSTONE: FINE TO MEDIUM GRAINED, SOFT (H6), DRILL METHOD: SM 0.0 - 22,8 4 1/4 INCH HOLLOW STEM MODERATELY TO INTENSELY WEATHERED (W6), TAN TO GREY IN COLOR, MODERATELY TO THINLY AUGER WIH SPT SAMPLER, REACHED AUGER REFUSAL AT 22.8 FT, 38.3 61.7 0 NA NP 4.3 SC-SM 4/4/5 SWITCHED TO CORING SETUP 22.8 - 29.8 FT HQ3 WIRELINE CORING 10-BEDDED, NO REACTION WITH HCI, OCCASIONAL CARBONACEOUS SYSTEM WITH A 3' SPLIT TUBE INCLUSIONS, FeOx AND MnOx STAINING, SAMPLER AND DIAMOND SURFACE-CORE SEPARATES ALONG BEDDING SET BIT Qal PLANES AND DESTROYED BY AUGER 21.9 74.1 4.0 NF 2.8 SM 3/4/4 CASING RECORD: NONE USED STRATIGRAPHY: 0.0 - 22.8 FT: QUATERNARY ALLUVIUM (Qal) 22.8 - 29.8 FT: TERTIARY NACIMIENTO DRILLING MEDILIM: FORMATION (Tn) 0.0 - 22.8 FT, NONE ABBREVIATIONS: WLNE = WATER LEVEL NOT 22.8 - 29.8 WATER 19.3 80.7 0 NA NP 2.9 SM 2/4/4 ENCOUNTERED HOLE COMPLETION: 15 I.D. = INSIDE DIAMETER BNE = BEDROCK BACKFILLED WITH DRILL CUTTINGS NOT ENCOUNTERED. OBSERVATION WELL INSTALLED BGS: 5799.4 NONE USED 32.4 67.6 SM 3/4/5 31.3 16.5 6.5 SC 3/6/6 s(CL) 20 5792.7 0 25 Tn SS 100

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.

5785.7

FEATURE: REACH 22B
LOCATION: PUMPING PLANT 1
BEGUN: 1/15/15 FINISHED: 1/15/15
DEPTH OF WATER LEVEL:
DATE MEASURED:

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,052,663,8 E 2,752,139,7

TOTAL DEPTH: 29.8
DEPTH TO BEDROCK: 22.8

STATE: NEW MEXICO GROUND ELEVATION: 5815,5 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J. GILBERT

CLASSIFICATION AND

PHYSICAL CONDITION

SHEET 2 OF 2

REVIEWED BY:

SECULOSIFICATION

CENTENT

CLASSIFICATION

BOTTOM OF HOLE

FEATURE: REACH 22B
LOCATION: PUMPING PLANT 2
BEGUN: 9/10/14 FINISHED: 9/10/14
DEPTH OF WATER LEVEL:
DATE MEASURED:

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,017,892,6 E 2,750,548,8

TOTAL DEPTH: 42.5 DEPTH TO BEDROCK: 13.7 STATE: NEW MEXICO
GROUND ELEVATION: 6210,0
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: J, GILBERT
REVIEWED BY:

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		VERY		LABO	ORAT	ORY	DATA	Α	>N	ᇤ		z /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY	BLOWS / 0.5	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.	-												0.0 - 13.7 FT QUATERNARY ALLUVIUM (Qal) 0.0 - 8.0 FT POORLY GRADED SAND WITH
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	:=		9.1	90.9	0	NA.	NP	1.6%	SP-SM	3/6/6		SP-SM	SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% FINES WITH NO PLASTICITY, RAPID DILATANCY, NO DRY STRENGTH; MAXIMUM SIZE, FINE SAND: DRY, LIGHT
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILEBREW, DAVE	5	52											BROWN IN COLOR; NO REACTION WITH HCI.
NIELSEN. PURPOSE: PRECONSTRUCTION SOIL AND	-	52	8.5	91.5	0	NA	NP	1.2%	SP-SM	3/4/13	Qal	6202.0	8.0 - 13.2 FT CLAYEY SAND (SC): ABOUT 70% FINE SAND; ABOUT 30% FINES WITH LOW PLASTICITY, LOW TO MEDIUM DRY STRENGTH, LOW TOUGHNESS AND SLOW
BEDROCK FOUNDATION INVESTIGATIONS. DRILL EQUIPMENT:	10-	100	70.1	29.9	0	23.3%	5.5%	5.0%	(CL-ML)s	18/23/27		4004	DILATANCY, GREY TO ORANGE IN COLOR, DRY, NO REACTION WITH HCI.
CME 85 DRILL METHOD:	-	96	30,1	69.9	0	NA	NP	3,4%	SM	11/15/24		sc	13.2 - 13.7 FT: SILTY SAND (SM): ABOUT 85% FINE SAND; ABOUT 15% FINES WITH NO PLASTICITY, RAPID DILATANCY, LOW DRY STRENGTH: MAXIMUM SIZE, FINE
0- 15.0 FT 4 1/4" HSA AND DRY CORE SYSTEM WITH SPTS. 15.0 - 42.5 FT 4 1/4" HSA AND DRY CORE SYSTEM WITHOUT SPT'S			30.3	69.7	0	NA NA	NP	3.7%	SM 7/	12/REFUSA	L	6196.8 SM 6196.3	SAND; DRY, TAN IN COLOR; STRONG REACTION WITH HCI,
CASING RECORD: NONE USED	15-	96	10.5n-1	n-saturi	~00	INOC	NOV.	3500000					13.7 - 42.5 FT TERTIARY NACIMIENTO FORMATION (TN)
DRILLING MEDIUM: NONE HOLE COMPLETION:													13.7 - 34.5 FT SANDSTONE: FINE TO MEDIUM GRAINED, TAN IN COLOR, MODERATELY TO INTENSELY WEATHERED (W6) MODERATELY HARD (H4), THINLY BEDDED TO LAMINATED; NO REACTION WITH HCI
BACKFILLED WITH AUGER CUTTINGS	20— — —	100											34.5 - 41.4 FT CLAYSTONE: GREY TO DARK GREY IN COLOR, VERY INTENSELY WEATHERED TO DECOMPOSED (W8-W9), SOFT TO VERY SOFT (H6-H7), WEAK REACTION WITH HCI.
	25 - -	100										SS	41.4 - 42.5 FT SANDSTONE: FINE TO MEDIUM GRAINED, TAN IN COLOR, MODERATELY TO INTENSELY WEATHERED (W6) MODERATELY SOFT (H5), THINLY BEDDED TO LAMINATED; NO REACTION WITH HCI
	30-										Tn		STRATIGRAPHY: 0.0 - 13.7 FT: QUATERNARY ALLUVIUM (Qal) 13.7 - 42.5 FT: TERTIARY NACIMIENTO FORMATION (Tn)
		100											ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.
	35-	100										6175.5	
	2 -											CLSTNE	
	40 	100										6168.6	
ļ						80	OTTO	1 OF H	OLE			SS 6167.5	

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499, STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR22PP2-15-2

SHEET 1 OF 1

FEATURE: REACH 22B LOCATION: PUMPING PLANT 2 BEGUN: 1/17/15 FINISHED: 1/18/15 DEPTH OF WATER LEVEL:

DATE MEASURED

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,017,891.0 E 2,750,609.9

TOTAL DEPTH: 41.0 DEPTH TO BEDROCK: 31,1 STATE: NEW MEXICO GROUND ELEVATION: 6203.4 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J. GILBERT

REVIEWED BY: LABORATORY DATA LABORATORY CLASSIFICATION BLOWS / 0.5 FT VISUAL GEOLOGIC UNIT SYMBOL DEPTH **CLASSIFICATION AND** PLASTICITY INDEX ELEVATION MOISTURE NOTES GRAVE SAND PHYSICAL CONDITION LIQUID L CORE 2 28 ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE 0.0 - 31.1 FT QUATERNARY ALLUVIUM (Qal) SAME AS THOSE USED BY THE DRILLER. - 31,1 FT SILTY SAND (SM): ABOUT 80% FINE SAND, MAXIMUM SIZE, FINE SAND; ABOUT 20% FINES WITH NO PLASTICITY. ALL MEASUREMENTS ARE REPORTED RAPID DILATENCY, LOW DRY STRENGTH, LOW TOUGHNESS; DRY, TAN IN COLOR; IN FEET EXCEPT WHERE NOTED. DRILLED BY; U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILLEBREW, JOE NO REACTION WITH HCI. 16.3 83.7 0 NA NP 3.4 SM 2/10/15 100 31.1 - 41.0 FT TERTIARY NACIMIENTO FORMATION (Tn) PROCTOR. PURPOSE: 31.1 - 41.0 SANDSTONE: FINE TO MEDIUM GRAINED, TAN IN COLOR, INTENSELY TO 13.9 88.1 0 NP 2,3 SM 8/16/22 NA PRECONSTRUCTION SOIL AND 100 BEDROCK FOUNDATION VERY INTENSELY WEATHERED (W7-W8), INVESTIGATIONS. VERY SOFT TO SOFT (H6), UNFRACTURED (FD0); NO REACTION WITH HCI. DRILL EQUIPMENT: 46.3 53.7 0 22.2 4.8 5.8 SC-SM 17/22/26 100 CME 850 TRACK MOUNTED DRILL RIG STRATIGRAPHY: 0.0 - 31.1 FT: QUATERNARY ALLUVIUM (Qai) 31.1 - 41.0 FT: TERTIARY NACIMIENTO DRILL METHOD: 0.0 - 31.1 FT 4 1/4" HSA AND DRY CORE FORMATION (Tn) 17.0 83.0 0 NA NP 2.1 SM 8/12/12 SYSTEM WITH SPTs 100 31,1 - 41,0 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE ABBREVIATIONS: WLNE = WATER LEVEL NOT SAMPLER AND DIAMOND SURFACE-ENCOUNTERED SET BIT I.D. = INSIDE DIAMETER BNE = BEDROCK 30.5 69.5 0 NA NP. 3.4 SM 8/13/13 100 NOT ENCOUNTERED. Qal SM CASING RECORD: NONE USED DRILLING MEDIUM: 93,5 0 SP-SM 6.7 NA. NP 1.4 6/12/15 100 0.0 - 31.1 FT, NONE 31.1 - 41.0 FT WATER 8.5 91.5 0 2.2 SP-SM 10/16/19 HOLE COMPLETION: 20-NA NP BACKFILLED WITH DRILL CUTTINGS 100 26.4 73.6 SM 14/16/15 0 3.7 25 NA NP 100 30.7 69.3 0 NA NP 3.5 SM 6/14/19 30 100 6172.3 35 Tn SS 40 61623

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. DHR22RT1A-15-1

SHEET 1 OF 2

FEATURE: REACH 22B

LOCATION: REGULATING TANK 1A

BEGUN: 1/19/15 FINISHED: 1/20/15

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 2,017,913.8 E 2,750,541,4

TOTAL DEPTH: 26.7
DEPTH TO BEDROCK: 19.3

STATE: NEW MEXICO
GROUND ELEVATION: 6208,7
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: J, GILBERT

REVIEWED BY: LABORATORY DATA LABORATORY OWS / 0.5 FT VISUAL DEPTH SEOLOGIC UNIT SYMBOL PLASTICITY INDEX CLASSIFICATION AND NOTES MOISTURE GRAVEL ELEVATION CORE SAND LIQUID PHYSICAL CONDITION 9 8 8 8 ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE 0.0-19.3 FT QUATERNARY ALLUVIUM (Qal) 0.0-8.5 FT SILTY SAND (SM): ABOUT 80% FINE SAND, MAXIMUM SIZE, FINE SAND; ABOUT 20%FINES WITH NO PLASTICITY, DRILLER. ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED. RAPID DILATENCY, LOW DRY STRENGTH, LOW TOUGHNESS; DRY, TAN IN COLOR; DRILLED BY: U.C. REGION DRILL NO REACTION WITH HCI. CREW; DRILLER; JEFF VAN AUSDAL, 8.5 - 11.2 FT CLAYEY SAND (SC): ABOUT 80% PREDOMINATELY FINE SAND; ABOUT HELPERS; KYLE KILLEBREW, JOE 89.3 PROCTOR. NA NP SP-SM 20% FINES WITH LOW PLASTICITY, LOW SM DRY STENGTH, LOW TOUGHNESS AND SLOW DILATANCY; MAXUMUM SIZE, FINE PURPOSE: PRECONSTRUCTION SOIL AND SAND, DARK BROWN IN COLOR, MOIST; BEDROCK FOUNDATION INVESTIGATIONS NO REACTION WITH HCL DRILL EQUIPMENT: 10.8 89.2 0 NA 11.2 - 19.3 FT SILTY SAND (SM): ABOUT SP-SM 2/4/7 85% FINE SAND, MAXIMUM SIZE, FINE SAND; ABOUT 15% FINES WITH NO CME 850 TRACK MOUNTED DRILL RIG DRILL METHOD: PLASTICITY, RAPID DILATENCY, LOW DRY 0.0 - 19.3 FT 4 1/4 INCH HOLLOW STEM AUGER WIH SPT SAMPLER, REACHED STRENGTH, LOW TOUGHNESS; DRY, TAN IN COLOR; NO REACTION WITH HCI. AUGER REFUSAL AT 19.3 FT. SWTCHED TO CORING SETUP. 19.3 - 26.7 FT HQ3 WIRELINE CORING 6200.2 19.3 - 26.7 FT TERTIARY NACIMIENTO 55.7 NP s(CL-ML) 12/19/21 FORMATION (Tn) SYSTEM WITH A 3' SPLIT TUBE 19.3 - 26.7 FT SANDSTONE: FINE TO MEDIUM GRAINED, TAN IN COLOR, VERY INTENSELY WEATHERED TO SAMPLER AND DIAMOND SURFACE-Qal 10 SC DECOMPOSED (W8-W9), VERY SOFT TO CASING RECORD: SOFT (H7); NO REACTION WITH HCI. NONE USED 6197.5 29.1 70.9 0 NA NP 3.5 SM 14/12/12 DRILLING MEDIUM: 0.0 - 19.3 FT, NONE 19.3 - 26.7 FT, WATER HOLE COMPLETION: 12.6 87.4 SM BACKFILLED WITH DRILL CUTTINGS 1.9 7/11/12 OBSERVATION WELL INSTALLED BGS: NONE USED SM NA 28 SP-SM 10/18/17 20.1 12/26/REFUSAL 79.9 0 NA NP SM 6189.4 20 Tn SS 71 25

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

6182.0

GEOLOGIC LOG OF DRILL HOLE NO. DHR22RT1A-15-1

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,017,913,8 E 2,750,541.4

TOTAL DEPTH: 26.7 DEPTH TO BEDROCK: 19.3 STATE: NEW MEXICO GROUND ELEVATION: 6208,7 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J. GILBERT REVIEWED BY:

SHEET 2 OF 2

DEPTH OF WATER LEVEL: DATE MEASURED:

LOCATION: REGULATING TANK 1A

BEGUN: 1/19/15 FINISHED: 1/20/15

FEATURE: REACH 22B

L: DEPTH TO BEI

NOTES

| PLOWS / 0.5 FT | RLOWS / 0.5 FT

BOTTOM OF HOLE

GEOLOGIC LOG OF DRILL HOLE NO. DHR22RT1B-15-1

SHEET 1 OF 1

FEATURE: REACH 22B

LOCATION: REGULATING TANK 1B

BEGUN: 1/18/15 FINISHED: 1/19/15

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 2,017,937.7 E 2,750,565,4

TOTAL DEPTH: 45.0 DEPTH TO BEDROCK: 22.3 STATE: NEW MEXICO GROUND ELEVATION: 6206,0 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J, GILBERT

REVIEWED BY:

SAMPLER AND DIAMOND SURFACE- SET BIT. CASING RECORD: NONE USED DRILLING MEDIUM: 0.0 - 23.1 FT, NONE 23.1 - 45.0 FT, WATER HOLE COMPLETION: BACKFILLED WITH DRILL CUTTINGS OBSERVATION WELL INSTALLED BGS: SP-SM		1 2	_			_					,		·	
ALL MEASUREMENTS ARE FROM SME AS JURY ACR AND ARE THE SAME AS JURY AS JURY THE ARE AND SAME JURY AS JURY THE AREA THE ARE			VERY	_	LABO	ORAT	TORY	DATA	Α	No	ե		8 /	
GROUND SURFACE AND ARE THE DRILLER.	VALUE AND SECURIOR	DEPTH		% FINES		% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATOR	BLOWS / 0.5	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	
DRILLER PRIVE CREEN DRILLER REPORTED IN FEET EXCEPT WHERE RAND, CREEN PRICE SAND, MANIMUM SIZE, FINE SAND, AND RESPONDED IN FEET EXCEPT WHERE ROTED. DRILLER REPORTED IN FEET EXCEPT WHERE ROTED. DRILLER REPORTED IN FEET EXCEPT WHERE ROTED. SAND REPORTED IN FEET EXCEPT WHICH REPORTS AND REPORT ROTED. SAND	GROUND SURFACE AND ARE THE	2.	-											0.0-22.3 QUATERNARY ALLUVIUM (Qal)
DRILLE DRY: LC. REGION DRILL CREW: VRILLER; LEFT VAN AUSDAL, HELPERS; KYLE KILLEBREW, JOE PURPOSE:	DRILLER, ALL MEASUREMENTS ARE REPORTED	3		14,1	85.9	0	NA.	NP	2.4	SM	3/5/5			FINE SAND, MAXIMUM SIZE, FINE SAND; ABOUT 20%FINES WITH NO PLASTICITY, RAPID DILATENCY, LOW DRY STRENGTH.
Purpose	CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILLEBREW, JOE	5-		17.2	82.8	0	NA.	NP	2.4	SM	5/13/23			NO REACTION WITH HCI.
DRILL BUILDMENT: CME 850 TRACK MOUNTED DRILL RIG DRILL METHOD. DRILL MET	PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION	10-		48,7	51.3	0	NA	NP	4.6	SM	10/15/19		SM	WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY STRENGTH, RAPID DILATENCY; DRY, LIGHT BROWN IN
0.0 -19.3 FT. 4 1/4 INCH HOLLOW STEM AUGER WHS PST SAMPLER, REACHED AUGER REFUSAL AT 19.3 FT, SWITCHED TO CORING SETUP, 19.3 -4.6 OFT HOS WIRELINE CORING SYSTEM WITH A S'PLIT TUBE SAMPLER AND DIAMOND SURFACE- SET BIT. CASING RECORD: NONE USED DRILLING MEDIUM: 0.0 -23.1 FT, NONE 23.1 -43.0 FT, WATER HOLE COMPLETION: BACKFILLED WITH DRILL CUTTINGS OBSERVATION WELL INSTALLED BGS: NONE USED The Completion of the Completio	DRILL EQUIPMENT:			46.8	53,2	0	22,4	5.2	5.0	SC-SM	11/21/22	Qal		22.3 - 45.0 TERTIARY NACIMIENTO
SWITCHED TO CORING SETUP. 19.3 - 45.0 FT HOS WIRELING CORING SYSTEM WITH A 9'S PLIT TUBE SWEELING CORING SWEELING SWEELING SYSTEM WITH A 9'S PLIT TUBE SWEELING CORING SWEELING SW	0.0 -19.3 FT 4 1/4 INCH HOLLOW STEM AUGER WIH SPT SAMPLER, REACHED	15-		16.7	83.3	0	NA	NP	2.3	SM	12/12/12		8300.4	WEATHERED (W8), VERY SOFT TO SOFT (H7), TAN IN COLOR; INTERBED OF CLAYSTONE/SILTSTONE FROM 36.1 - 38.3
SET BIT. CASING RECORD: NONE USED 20 DRILLING MEDIUM: 0.0 - 23.1 FT, NONE 23.1 + 45. DFT, WATER - 21 HOLE COMPLETION: BACKFILLED WITH DRILL CUTTINGS OBSERVATION WELL INSTALLED BGS: OBSERVATION WELL INSTALLED BGS: - 28 30 4 The set of the set	SWITCHED TO CORING SETUP. 19.3 - 45.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE	-		4.6	95.4	0	NA	NP	NA	SP	6/11/14		0180.4	BEDDED TO LAMINATED, VERY INTENSELY WEATHERED TO (W8), VERY SOFT TO
0.0 - 2.1 FT, NONE 23.1 - 45.0 FT, WATER 23.1 - 45.0 FT, WATER HOLE COMPLETION: BOCKFILLED WITH DRILL CUTTINGS OBSERVATION WELL INSTALLED BGS: NONE USED The state of the	SET BIT. CASING RECORD:	20-		5.5	94.5	0	NA	NP	1.2	SP-SM	6/13/18		SP-SM	DEPTH INCL R M T HL INFILLING
HOLE COMPLETION: BACKFILLED WITH DRILL CUTTINGS OBSERVATION WELL INSTALLED BGS: NONE USED To so the state of the state o	DRILLING MEDIUM: 0.0 - 23.1 FT, NONE 23.1 - 45.0 FT, WATER	-												0.0 - 22.3 FT: QUATERNARY ALLUVIUM (Qal)
NONE USED 30 4 35 56 100 40 80 80 8161.0	HOLE COMPLETION: BACKFILLED WITH DRILL CUTTINGS	25-	21											FORMATION (Tri) ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED
4 Tn SS 56 100 40 80 6161.0	OBSERVATION WELL INSTALLED BGS: NONE USED	3 -	28											
35		30												
- 56 - 100 40 - 80 - 80 - 6161.0		-	4									Tn	ss	
40————————————————————————————————————		35 -	56											
- 80 - 80 - 6161.0			100											
6161.0		40-										ž.		
		-	80											
,	ı	45					BC	ттом	OF HC	DLE			6161.0	

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 DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

FEATURE: REACH 22B LOCATION: REGULATING TANK 2 BEGUN: 3/17/15 FINISHED: 3/17/15 DEPTH OF WATER LEVEL:

GUN: 3/17/15 FINISHED: 3/17/15 TOTAL DEPTH: 41.0
PTH OF WATER LEVEL: DEPTH TO BEDROCK: BNE
DATE MEASURED:

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT
COORDINATES: N 1,973,663,1 E 2,735,826,9
TOTAL DEPTH: 41,0

STATE: NEW MEXICO
GROUND ELEVATION: 6630,3
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: J, GILBERT
REVIEWED BY:

		R.		LABO	DRAT	ORY	DATA	١	z	Ŀ		z /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY	MOISTURE	LABORATORY	BLOWS / 0.5 F	GEOLOGIC UNIT SYMBOL	CLASSIFICATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.	15												0.0 - 41.0 FT QUATERNARY ALLUVIUM (Qai) 0.0 TO 6.3 FT CLAYEY SAND (SC): ABOUT
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	:=											sc	60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; NO REACTION WITH
DRILLED BY: U.C. REGION DRILL CREW, DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILLEBREW, STEVE COCHRAN.	5	100	32.8	67.2	0	NA	NP	5,4	SM	5/15/17		6624.0	HCI. 6,3 TO 17,2 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90%
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION	-	72	15.8	84.2	0	NA	NP	2.1	SM	6/9/7			PREDOMINATELY FINE SAND; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY STRENGTH, AND RAPID DILATANCY; NO REACTION WITH HCL.
INVESTIGATIONS. DRILL EQUIPMENT: CME 850 TRACK MOUNTED DRILL RIG	10-	68	22.1	77.9	0	NA.	NP	2.6	SM	6/9/13			17.2 TO 18.5 FT SANDY LEAN CLAY s(CL): ABOUT 70% FINES WITH MEDIUM PLASTICITY, MEDIUM TO HIGH DRY
DRILL METHOD: 0.0 - 41.0 4 1/4 INCH HOLLOW STEM AUGER WIH SPTs		100	33.8	68.2	0	NA	NP	4.0	SM	9/12/14		SP-SM	STRENGTH, AND MEDIUM TO HIGH TOUGHNESS; ABOUT 30% FINE SAND; BROWN IN COLOR
CASING RECORD: NONE USED DRILLING MEDIUM:	15-	100	16.6	83.4	0	NA	NP	2.3	SM	5/15/20			18.5 TO 23.1 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% PREDOMINATELY FINE SAND; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY
0.0 - 41.0 FT NONE USED HOLE COMPLETION:	25	100	53.5	46.5	0	31.1	19.4	8.7	s(CL)	12/13/20		6613.1 s(CL) 6611.8	STRENGTH, AND RAPID DILATANCY; NO REACTION WITH HCL.
BACKFILLED WITH DRILL BENTONITE.	20-	100	32.8	67.2	0	20.4	3.8	4.7	SM	13/24/25	Qal	SP-SM	23.1 TO 28.8 FT CLAYEY SAND (SC): ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; NO REACTION WITH
	=	96	35.6	64.4	0	20.4	6.6	4.5	SC-SM	18/28/27		6607.2	HCI, 28.8 TO 31.3 FT POORLY GRADED SAND
	25—	30	39.5	60.5	0	21.3	5.0	4.4	SC-SM	13/21/21			WITH SILT (SP-SM): ABOUT 90% PREDOMINATELY FINE SAND; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY STRENGTH, AND RAPID DILATANCY; NO REACTION WITH HCL.
		100										SC	31.3 TO 35.4 FT CLAYEY SAND (SC); ABOUT 60% PREDOMINATELY FINE SAND; ABOUT 40% FINES WITH LOW PLASTICITY, LOW
	30-		43,3	56.7	0	21.7	5.1	4.7	SC-SM	12/21/27		6601.5 SP-SM	DRY STRENGTH, LOW TOUGHNESS AND SLOW DILATANCY; NO REACTION WITH HCI.
	-	100										6599.0	35.4 TO 41.0 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% PREDOMINATELY FINE SAND; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY
	35-		ace.	200	1	CANA	CAVIERY	(5)60	lesworn		1	SC	STRENGTH, AND RAPID DILATANCY; NO REACTION WITH HCL.
	35-	100	92.1	7.9	0	51.7	30.6	14.4	СН	7/16/23		6594.9	STRATIGRAPHY: 0.0 - 41.0 FT: QUATERNARY ALLUVIUM (QaI) ABBREVIATIONS: WLNE = WATER LEVEL NOT ENCOUNTERED
	40-		37.6	62.4	0	20.1	5,1	4.7	SC-SM	7/16/17		SP-SM	I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.
		ļ	2.00	(2.22)			ОТТО					6589.3	

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 DESCRIPTIVE CRITERIA FOR ROCK, DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR22RT2-15-3

SHEET 1 OF 2

FEATURE: REACH 22B

LOCATION: REGULATING TANK 2

BEGUN: 3/15/15 FINISHED: 3/15/15

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 1,973,665.6 E 2,735,813.4

TOTAL DEPTH: 60.0

DEPTH TO BEDROCK: 44,5

STATE: NEW MEXICO GROUND ELEVATION: 6630.6 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J. GILBERT

REVIEWED BY:

- 7		_	_							,				
			WERY		LABO	DRAT	ORY	DATA	Ÿ.	. ×o	E	5	8 /	
	NOTES	рертн	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY	BLOWS / 0.5	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
	ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER,	7	PILOT											0.0 - 44.5 FT QUATERNARY ALLUVIUM (Qal) 0.0 TO 9.0 FT POORLY GRADED SAND (SP):
	ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	5-	100	20.8	79.2	0	NA	NP	3.4	SM	7/16/23		SP	ABOUT 95% FINE SAND, TRACE MEDIUM SAND; ABOUT 5% NONPLASTIC FINES, WHTH RAPID DILATANCY, NO DRY
	DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILLEBREW, STEVE		80	19.2	80.8	0	NA	NP	2.4	SM	4/6/7		6621.6	STRENGTH AND NO TOUGHNESS; MAXIMUM SIZE, MEDIUM SAND, NO REACTION WITH HCL, OCCASIONAL
	COCHRAN.: PURPOSE:	10-	100	23.6	76.4	0	NA	NP	2.8	SM	5/9/11		. HERLEY	CALCITE CEMENTED AREAS WITH STRONG REACTION WITH HCL.
	PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.		92	23.3	76.7	0	NA	NP	3.2	SM	10/15/15		SP-SM	9.0 TO 17.0 FT POORLY GRADED SAND WHTH SILT (SP-SM): ABOUT 90% FINE SAND, TRACE GRAVEL; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY STRENGTH
	DRILL EQUIPMENT: CME 850 TRACK MOUNTED DRILL RIG	15-	100	18.7	81.3	0	NA	NP	2.5	SM	5/11/12		6613.6	AND NO THOUGHNESS; MAXIMUM SIZE 20MM, NO REACTION WITHG HCL.
	DRILL METHOD: 0.0 - 44.5 FT 4 1/4 INCH HOLLOW STEM		100	57.8	42.2	0	31.5	12.6	9.1	s(CL)	11/18/22		s(CL) 6612.3	17.0 TO 29.4 FT SANDY LEAN CLAY s(CL): ABOUT 60% FINES WITH MEDIUM PLASTICITY, MEDIUM TO HIGH DRY
١	AUGER WIH SPTs 44.5 - 60.0 FT HQ3 WRELINE CORING SYSTEM WITH A 3' SPLIT TUBE	20-	100	24.4	75,6	0	NA	NP	3.5	SM	8/23/25		SP-SM 6610,5	STRENGTH, MEDIUM TO HIGH DRY STRENGTH, AND MEDIUM TOUGHNESS; ABOUT 40% FINE SAND; CALCITE VEINS AND CEMENT, STRONG REACTION WITH
- 1	SAMPLER AND DIAMOND SURFACE- SET BIT	=	96	35.8	64.2	0	18.8	2.6	4.1	SM	13/24/22	Qal		HCL, GREYISH BROWN IN COLOR, FIRM CONSISTANCY.
	CASING RECORD: NONE USED	25-	100	41.6	58.4	0	22.4	7,5	4,9	sc	14/29/28		s(CL)	29.4 TO 30.8 FT SILTY SAND (SM):ABOUT 85% FINE SAND, TRACE MEDIUM SAND; ABOUT 15% NONPLASTIC FINES WITH
- 1	DRILLING MEDIUM: 0.0 - 44.5 FT NONE USED	-	100										6801.2	RAPID DILATANCY, NO DRY STRENGTH AND NO TOUGHNESS; BROWN IN COLOR, MAXIMUM SIZE, MEDIUM SAND, NO
	45.0 - 60.0 WATER	30		39.6	60.4	0	20.6	4.5	4.1	SC-SM	14/17/22		SM _{6599.8}	REACTION WITH HCL.
-1	HOLE COMPLETION: BACKFILLED WITH DRILL BENTONITE AND CUTTINGS.	_	86										s(CL) 8596.1	30.8 TO 34.5 FT SANDY LEAN CLAY s(CL): ABOUT 60% FINES WITH MEDIUM PLASTICITY, MEDIUM TO HIGH DRY STRENGTH, AND MEDIUM TOUGHNESS;
		35-	94	96.3	3.7	0	61.3	40.0	14.9	СН	10/16/33		CL 6594.9	ABOUT 40% FINE SAND; STRONG REACTION WITH HCL.
		-	inte											34.5 TO 35.7 LEAN CLAY (CL): ABOUT 85% FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, MEDIUM TOUGHNESS:
		40-	100	17.3	77.4	5.3	16.9	0.5	2.2	SM	8/18/23			ABOUT 15% FINE TO MEDIUM SAND; MAXIMUM SIZE, MEDIUM SAND; NO REACTION WITH HCL.
		45-											6586.1	35.7 TO 44.5 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE
		-	10							4	2/REFUSAL			SAND; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY STRENGTH, RAPID DILATENCY; NO REACTION WITH HCL
		50	10											44.5 - 60.0 FT TERTIARY NACIMIENTO FORMATION
		=	100									Tn	CLST	44.5 TO 45.0 FT SANDSTONE: FINE TO MEDIUM GRAINED, TAN IN COLOR, VERY INTENSELY WEATHERED TO DECOMPOSED (W8-W9), VERY SOFT TO SOFT (H7); NO REACTION WITH HCI.
			90											45.0 TO 59.4 FT CLAYSTONE: DARK GREY IN COLOR, FINE GRAINED, INTENSELY WEATHERED (W7), SOFT (H6); NO REACTION WITH HCI.
		00					ВС	ОТТОМ	OF H	OLE				59.4 TO 60.0 SANDSTONE: FINE TO MEDIUM GRAINED, TAN IN COLOR, VERY INTENSELY WEATHERED TO DECOMPOSED (W8-W9), VERY SOFT TO SOFT (H7); NO REACTION WITH HCI.

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499, STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR22RT2-15-3

SHEET 2 OF 2

FEATURE: REACH 22B LOCATION: REGULATING TANK 2 BEGUN: 3/15/15 FINISHED: 3/15/15

NOTES

DEPTH

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT COORDINATES: N 1,973,665,6 E 2,735,813,4

TOTAL DEPTH: 60.0

DEPTH TO BEDROCK: 44.5

STATE: NEW MEXICO
GROUND ELEVATION: 6630.6
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: J. GILBERT
REVIEWED BY:

% CORE RECOVERY
% FINES
% SAND
% GRAVEL
LIQUID LIMIT
INDEX
MOISTURE
CONTENT
LABORATORY
CLASSIFICATION
BLOWS / 0.5 FT
GEOLOGIC UNIT
SYMBOL
CLASSIFICATION
ELEVATION
ELEVATION

CLASSIFICATION AND PHYSICAL CONDITION

STRATIGRAPHY:
0.0 - 44.5 FT: QUATERNARY ALLUVIUM (QaI)
44.5 - 60.0 FT: TERTIARY NACIMIENTO
FORMATION (Tn)
ABBREVIATIONS:
WLNE = WATER LEVEL NOT
ENCOUNTERED
I.D. = INSIDE DIAMETER BNE = BEDROCK
NOT ENCOUNTERED.

FEATURE: REACH 22B

LOCATION: REGULATING TANK 2
BEGUN: 3/15/15 FINISHED: 3/15/15

DEPTH OF WATER LEVEL:

DATE MEASURED:

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 1,973,668,1 E 2,735,799.9

TOTAL DEPTH: 40,8 DEPTH TO BEDROCK: BNE STATE: NEW MEXICO
GROUND ELEVATION: 6631,0
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: C, BEYER

(Qal)
ABBREVIATIONS:
WLNE = WATER LEVEL NOT
ENCOUNTERED

REVIEWED BY:

		ERY		LABO	DRAT	ORY	DATA	4	Z	t		z /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER		PILOT											0.0 - 40.8 FT QUATERNARY ALLUVIUM (Qal) 0.0 TO 8.0 FT POORLY GRADED SAND (SP):
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	-											SP	ABOUT 95% FINE SAND, TRACE MEDIUM SAND; ABOUT 5% NONPLASTIC FINES, WHTH RAPID DILATANCY, NO DRY STRENGTH AND NO TOUGHNESS;
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILLEBREW, STEVE COCHRAN.	5	100	13.2	86.8	0	NA	NP	2.6	SM	5/9/11 7/8/8			MAXIMUM SIZE, MEDIUM SAND, NO REACTION WITH HCL. 8.0 TO 25.3 FT SILTY SAND (SM): ABOUT
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION		100	21.4	78.6	0	NA.	NP	3,0	SM			6623.0	85% FINE SAND, TRACE MEDIUM TO COARSE SAND; ABOUT 15% NONPLASTIC FINES WITH RAPID DILATANCY, NO DRY
INVESTIGATIONS. DRILL EQUIPMENT: CME 850 TRACK MOUNTED DRILL RIG	10-	100	21.8	78.2	0	NA	NP	2.8	SM	7/10/9			STRENGTH AND NO TOUGHNESS; BROWN IN COLOR, MAXIMUM SIZE, COARSE SAND, NO REACTION WITH HCL; CALCITE CEMENTED ZONE BETWEEN 18.8 AND 17.5
DRILL METHOD: 0.0 - 40.8 4 1/4 INCH HOLLOW STEM AUGER WIH SPTs.	:= :=	100	36.3	63.7	0	NA	NP	4.4	SM	12/13/15			FEET WITH STRONG REACTION WITH HCL. 25.3 TO 28.3 FT SANDY LEAN CLAY s(CL): ABOUT 60% FONES WITH MEDIUM PLASTICITY, MEDIUM TO HIGH DRY
CASING RECORD: NONE USED	15-	100	18.4	81.6	0	NA	NP	2.4	SM	7/17/21			STRENGTH, AND MEDIUM TO UGHNESS; ABOUT 40% FINE SAND; CALCITE VEINS AND CEMENT, STRONG REACTION WITH HCL. GREYISH BROWN IN COLOR. FIRM
DRILLING MEDIUM: 0.0 - 40.8 FT NONE USED	-	100	47.9	52.1	0	25.7	12.6	6.6	sc	13/24/31		SM	CONSISTANCY, 28.3 TO 30.3 FT SILTY SAND (SM): ABOUT 85% FINE SAND, TRACE MEDIUM SAND;
HOLE COMPLETION: BACKFILLED WITH DRILL BENTONITE AND CUTTINGS.	20-	100	17.8	82.2	0	NA.	NP	2.5	SM	11/19/23	Qal		ABOUT 15% NONPLASTIC FINES WITH RAPID DILATANCY, NO DRY STRENGTH AND NO TOUGHNESS; BROWN IN COLOR, MAXIMUM SIZE, MEDIUM SAND, NO REACTION WITH HCL.
	=	100	27.0	73.0	0	NA	NP	3.7	SM	11/16/21			30.3 TO 31.2 FT SANDY LEAN CLAY s(CL): ABOUT 60% FONES WITH MEDIUM PLASTICITY, MEDIUM TO HIGH DRY
	25— -		37.3	62.7	0	20.2	2.6	4.8	SM	16/20/20		6605,7	STRENGTH, AND MEDIUM TOUGHNESS; ABOUT 40% FINE SAND; CALCITE VEINS AND CEMENT, STRONG REACTION WITH HCL, GREYISH BROWN IN COLOR, FIRM CONSISTANCY
	-	100										s(CL) 6602.7	31.2 TO 34.0 FT SILTY SAND (SM): ABOUT 85% FINE SAND, TRACE MEDIUM SAND; ABOUT 15% NONPLASTIC FINES WITH
	30-		55.0	45.0	0	23.1	5.6	6.3	s(CL-ML)	12/19/22		SM 6600.7 s(CL) 6599.8	RAPID DILATANCY, NO DRY STRENGTH AND NO TOUGHNESS; BROWN IN COLOR, MAXIMUM SIZE, MEDIUM SAND, NO REACTION WITH HCL.
	=	88										SM	34.0 TO 35.1 FT SANDY LEAN CLAY s(CL): ABOUT 60% FONES WITH MEDIUM PLASTICITY, MEDIUM TO HIGH DRY
	35—		95.6	4.4	0	58.8	33.3	14.8	СН	12/17/20		-1011	STRENGTH, AND MEDIUM TOUGHNESS; ABOUT 40% FINE SAND; CALCITE VEINS AND CEMENT, STRONG REACTION WITH HCL, GREYISH BROWN IN COLOR, FIRM
	0.30	100										SM	CONSISTANCY. 35.1 TO 40.8 FT SILTY SAND (SM): ABOUT 85% FINE SAND, TRACE MEDIUM SAND; ABOUT 15% NONPLASTIC FINES WITH
	40-		29.9	70.1	0	NA	NP	3.9	SM	13/17/17		6590.2	RAPID DILATANCY, NO DRY STRENGTH AND NO TOUGHNESS; BROWN IN COLOR, MAXIMUM SIZE, MEDIUM SAND, NO REACTION WITH HCL.
						В	OTTO	VI OF H	IOLE				STRATIGRAPHY: 0.0 - 40.8 FT QUATERNARY ALLUVIUM (Qal)

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499. STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHR22RT2-15-4

SHEET 2 OF 2

FEATURE: REACH 22B

LOCATION: REGULATING TANK 2
BEGUN: 3/15/15 FINISHED: 3/15/15

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 1,973,668.1 E 2,735,799.9

TOTAL DEPTH: 40,8
DEPTH TO BEDROCK: BNE

STATE: NEW MEXICO GROUND ELEVATION: 6631.0

ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: C. BEYER

REVIEWED BY:

		ERY		LABC	RAT	ORY	DATA	١	z	l .		z /	
NOTES	DEPTH	% CORE RECOV	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY CLASSIFICATIO	BLOWS / 0.5 F	GEOLOGIC UNIT SYMBOL	UISUAL CLASSIFICATIO	

CLASSIFICATION AND PHYSICAL CONDITION

I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED.

GEOLOGIC LOG OF DRILL HOLE NO. DHRT2-1 (OLD LOCATION)

SHEET 1 OF 2

FEATURE: REACH 22B

LOCATION: REGULATING TANK 2 (OLD LOCATION)

BEGUN: 8/23/14 FINISHED: 8/23/14

DEPTH OF WATER LEVEL: DATE MEASURED:

COORDINATES: N 1,974,068.0 E 2,735,796.0

TOTAL DEPTH: 60.0 DEPTH TO BEDROCK: 49.2

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT STATE: NEW MEXICO GROUND ELEVATION: 6629,3 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: C. BEYER

REVIEWED BY:

		Τ.	_									T	REVIEWED BY.
		VERY		LAB	ORAT	ORY	DAT	A .	≿ŏ	Ŀ		8 /	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY CLASSIFICATION	BLOWS / 0.5 FT	GEOLOGIC UNIT SYMBOL	VISUAL CLASSIFICATION ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE SAME AS THOSE USED BY THE DRILLER.		-											0.0 - 49.2 FT QUATERNARY ALLUVIUM (Qal) 0.0 TO 9.0 FT POORLY GRADED SAND
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	-												WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY STRENGTH, AND RAPID DILATANCY; NO REACTION WITH
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; RON TODHUNTER AND GREG LOTT.	=		12	88	0	NA.	NP	2.3	SP-SM	3/8/11			HCI, DRY, LIGHT BROWN IN COLOR, ROOTS IN TOP 2.0 FT.
PURPOSE: PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	5-	20										SP-SM	9.0 TO 11.9 FT CLAYEY SAND (SC): ABOUT 85% FINE SAND; ABOUT 15% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, AND LOW TOUGHNESS; STRONG REACTION WITH HCI, BROWN IN COLOR.
DRILL EQUIPMENT: CME 85	-	100	14,8	85.2	0	NA	NP	2.4	SM	7/11/14			11.9 TO 14.8 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% FINE SAND; ABOUT 10% FINES WITH NO
DRILL METHOD: 0.0 TO 60.0 FT 4 1/4" HSA AND DRY	7=			_		_							PLASTICITY, NO DRY STRENGTH, AND RAPID DILATANCY; NO REACTION WITH HCI, DRY, LIGHT BROWN IN COLOR.
CORE SYSTEM WITH SPLIT SPOON SAMPLER, PILOT BIT FROM 0.0 TO 3.5 FEET, SPT SAMPLING AT 2.5 FOOT INTERVALS FROM 3.5 FEET TO 20.0	10-	48	28.2	61,8	0	28.3	14,8	4.8	SC	8/11/11		6620.3	14.8 TO 20.7 FT CLAYEY SAND (SC): ABOU 85% PREDOMINATELY FINE SAND, TRACE
FEET, AND 5 FOOT INTERVALS FROM 20.0 FEET TO TO REFUSAL AT 54.3												sc	MEDIUM TO COARSE SAND GRAVEL AND COBBLES; ABOUT 15% FINES WITH LOW PLASTICITY, LOW DRY STRENGTH, AND
FEET, ADVANCED HOLE TO A TOTAL DEPTH OF 60.0 FEET. CASING RECORD:	-	84	36,3	63.7	0	23.1	8.5	4.8	sc	9/13/12		6617.4	LOW TOUGHNESS; MAXIMUM SIZE, 90 MM STRONG REACTION WITH HCI, ROOT CASTS, BROWN IN COLOR. 90MM SANDSTONE FRAGMENT STUCK IN SPT
NONE USED	-											SP-\$M	SAMPLER BETWEEN 19.4 AND 19.7 FT.
DRILLING MEDIUM: 0,0 TO 60,0 NONE USED HOLE COMPLETION	45	100	35,1	64,9	0	NA	NP	2.8	SM	6/16/21		6614.5	20.7 TO 21.3 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% PREDOMINATELY FINE SAND, TRACE MEDIUM SAND; ABOUT 10% FINES WITH
BACKFILLED HOLE WITH CUTTINGS,	15—										QaL		NO PLASTICITY, NO DRY STRENGTH, AND RAPID DILATANCY; MAXIMUM SIZE.
			57.8	42.4	0	25.7	13.8	8.9	s(CL)				MEDIUM SAND; NO REACTION WITH HCI, DRY, LIGHT BROWN IN COLOR. 21.3 TO 21.6 FT LEAN CLAY WITH SAND
	_	80								10/15/19		sc	(CL)s: ABOUT 85% FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH,
	_		48.7	44.7	6,6	26,9	11.8	7	s(CL)				AND MEDIUM TOUGHNESS; ABOUT 15% FINE SAND; STRONG REACTION WITH HCI INTERMITTENT CALCITE NODULES GREY IN COLOR
	20-	100								14/23/25		6608.6 SP-SM _{608.0} (CL)s 6607.7	21.6 TO 28.2 FT SILTY SAND (SM): ABOUT 85% FINE SAND; ABOUT 15% NONPLASTIC FINES WITH RAPID DILATANCY, AND NO DRY STRENGTH; BROWN IN COLOR, NO REACTION WITH HCI.
													28.2 TO 30.3 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% PREDOMINATELY FINE SAND. TRACE
	25-		53.7	46.3	0	27	13.1	6.3	s(CL)	11/20/20		SM	MEDIUM SAND AND FINE GRAVEL; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY STRENGTH, AND RAPID DILATANCY; MAXIMUM SIZE, 10MM; NO REACTION WITH HCL, DRY, LOOSE, LIGHT BROWN IN COLOR.
	-	100										6601.1	30.3 TO 30.6 FT LEAN CLAY WITH SAND (CL)s: ABOUT 85% FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, AND MEDIUM TOUGHNESS; ABOUT 15% FINE SAND; STRONG REACTION WITH HCI INTERMITTENT CALCITE NODULES GREY IN COLOR.
	_	88	19	80.4	0,6	NA	NP	2.4	SM	8/13/13		SP-SM	30.6 TO 34.4 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90%

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. DHRT2-1 (OLD LOCATION)

SHEET 2 OF 2

FEATURE: REACH 22B

LOCATION: REGULATING TANK 2 (OLD LOCATION)

BEGUN: 8/23/14 FINISHED: 8/23/14

DEPTH OF WATER LEVEL: DATE MEASURED: PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 1,974,068.0 E 2,735,796.0

TOTAL DEPTH: 60.0 DEPTH TO BEDROCK: 49.2 STATE: NEW MEXICO
GROUND ELEVATION: 6629,3
ANGLE FROM HORIZONTAL: 90
HOLE LOGGED BY: C, BEYER
REVIEWED BY:

LABORATORY DATA OWS / 0.5 FT LABORATORY VISUAL DEPTH GEOLOGIC UNIT SYMBOL PLASTICITY INDEX CLASSIFICATION AND MOISTURE NOTES GRAVE CORE % FINES SAND PHYSICAL CONDITION LIQUID I * PREDOMINATELY FINE SAND, TRACE MEDIUM SAND; ABOUT 10% FINES WITH 6599.0 (CL)s 6598.7 NO PLASTICITY, NO DRY STRENGTH, AND RAPID DILATANCY; MAXIMUM SIZE, MEDIUM SAND; NO REACTION WITH HCL, DRY, LOOSE, LIGHT BROWN IN COLOR. SP-SM 34.4 TO 35.1 FT LEAN CLAY WITH SAND (CL)s: ABOUT 85% FINES WITH MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, AND MEDIUM TOUGHNESS; ABOUT 15% 23.9 76.1 NA NP 27 SM 6/11/17 6594.9 FINE SAND; DRY, STRONG REACTION WITH HCI, INTERMITTENT CALCITE NODULES GREY IN COLOR. 79.3 20.7 0 47.4 31.2 12.4 (CL)s 8594.2 (CL)s 35 92 35.1 TO 37.8 FT CLAYEY SAND (SC): ABOUT 85% FINE SAND; ABOUT 15% FINES WITH SC LOW PLASTICITY, LOW DRY STRENGTH, AND LOW TOUGHNESS; DRY, STRONG REACTION WITH HCI, BROWN IN COLOR. 6591.5 37.8 TO 39.5 FT SANDSTONE BOULDER: FINE TO MEDIUM GRAINED, SOFT (H6), BOULDER MODERATELY TO INTENSELY 19.4 80.6 0 NA NP SM 38/19/9 6589.8 WEATHERED (W6), TAN TO BROWN IN COLOR, NO REACTION WITH HCL SAMPLE QaL PULVERIZED BY AUGER AND SPT SAMPLER. 72 39.5 TO 43.5 POORLY GRADED SAND (SP): ABOUT 95% FINE TO MEDIUM SAND, TRACE COARSE SAND; ABOUT 5% FINES WITH NO PLASTICITY, AND NO DRY STRENGTH; NO REACTION WITH HCI SP LOOSELY CONSOLIDATED. 6585.8 43.5 TO 49.2 FT POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM)g: ABOUT 75% FINE TO MEDIUM SAND; ABOUT 15% 17.7 NP 22 (SP-SM)g 5/4/9 45 FINE TO COARSE GRAVEL; ABOUT 10% NONPLASTIC FINES WITH RAPID DILATANCY AND NO DRY STRENGTH; MAXIMUM SIZE, 62MM; LOOSE CONSISTENCY; NO REACTION WITH HCI, 26 (SP-SM)g BECOMES MOIST BELOW 48.5 FT. 49.2 - 60.0 FT TERTIARY NACIMIENTO FORMATION (TN) 6580.1 NA SM 14/10/11 NP 3.3 49.2 TO 60.0 FT SANDSTONE: FINE TO MEDIUM GRAINED, SOFT (H6), MODERATELY TO INTENSELY 50 WEATHERED (W6), TAN TO GREY IN COLOR, MODERATELY TO THINLY BEDDED, NO REACTION WITH HCI, 74 OCCASIONAL CARBONACEOUS INCLUSIONS, FeOx AND MnOx STAINING, CORE SEPARATES ALONG BEDDING PLANES AND DESTROYED BY AUGER. STRATIGRAPHY: 68.9 31.1 0 NA NP 7.9 SM 26 50/REFUS 0.0 - 49.2 FT: QUATERNARY ALLUVIUM (Qal) 49.2 - 60.0 FT: TERTIARY NACIMIENTO FORMATION (Tn) SS 55 ABBREVIATIONS: WLNE = WATER LEVEL NOT **ENCOUNTERED** I.D. = INSIDE DIAMETER BNE = BEDROCK NOT ENCOUNTERED. 100 BOTTOM OF HOLE

GEOLOGIC LOG OF DRILL HOLE NO. DHRT2-2 (OLD LOCATION)

FEATURE: REACH 22B

LOCATION: REGULATING TANK 2 (OLD LOCATION)

BEGUN: 1/21/15 FINISHED: 1/21/15

DEPTH OF WATER LEVEL: DATE MEASURED:

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 1,974,063.3 E 2,735,829.5

TOTAL DEPTH: 50.0 DEPTH TO BEDROCK: 46.2

STATE: NEW MEXICO GROUND ELEVATION: 6628,4 ANGLE FROM HORIZONTAL: 90 HOLE LOGGED BY: J. GILBERT

SHEET 1 OF 2

REVIEWED BY:

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	_	OVER	_	LABO	JKAI	T	DATA	Ì	Ş [™] NO N	5 FT	Ŀ	200	/	
NOTES	DEPTH	% CORE RECOVERY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY CLASSIFICATION	BLOWS/05	GEOLOGIC UNIT SYMBOL	VISUAL	ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE FROM GROUND SURFACE AND ARE THE														0.0-46.2 FT QUATERNARY ALLUVIUM (Qai)
SAME AS THOSE USED BY THE DRILLER,	- 3	1												0.0-8,2 FT SILTY SAND (SM) : ABOUT 80% FINE SAND, MAXIMUM SIZE, FINE SAND;
ALL MEASUREMENTS ARE REPORTED IN FEET EXCEPT WHERE NOTED.	5-		17,0	83,0	0	NA	NP	2.2	SM	4/4/5		SM		ABOUT 20%FINES WITH NO PLASTICITY, RAPID DILATENCY, LOW DRY STRENGTH, LOW TOUGHNESS; DRY, TAN IN COLOR; NO REACTION WITH HCI.
DRILLED BY: U.C. REGION DRILL CREW; DRILLER; JEFF VAN AUSDAL, HELPERS; KYLE KILLEBREW, JOE PROCTOR.	19		12.2	87,8	0	NA	NP	2,9	SM	4/6/8				8.2 - 10.7 FT CLAYEY SAND (SC): ABOUT 80% PREDOMINATELY FINE SAND; ABOUT 20% FINES WITH LOW PLASTICITY, LOW
PURPOSE:	1		29.7	70.3	0		ND.		CM	40/04/40			6620.2	DRY STENGTH, LOW TOUGHNESS AND SLOW DILATANCY; MAXUMUM SIZE, FINE
PRECONSTRUCTION SOIL AND BEDROCK FOUNDATION INVESTIGATIONS.	10-		29.7	70,3	U	NA	NP	5,6	SM	16/21/16		SC	6617.7 5 M 617.1	SAND, DARK BROWN IN COLOR, MOIST; NO REACTION WITH HCI.
DRILL EQUIPMENT: CME 850 TRACK MOUNTED DRILL RIG	3		18,3	81.7	0	NA	NP	2,6	SM	9/13/17		SP	5(WBO17.)	10.7 TO 11.3 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% PREDOMINATELY FINE SAND, TRACE MEDIUM SAND AND FINE GRAVEL: ABOUT
DRILL METHOD: 0,0 - 33.2 FT HOLLOW STEM AUGER	-	1	17.0	83.0	0	ŅA	NP	2.5	SM	13/19/21		_	6614.3	10% FINES WITH NO PLASTICITY, NO DRY STRENGTH, AND RAPID DILATANCY;
33.2 - 50.0 FT HQ3 WIRELINE CORING SYSTEM WITH A 3' SPLIT TUBE	15-	1												MAXIMUM SIZE, 10MM; NO REACTION WITH HCL, DRY, LOOSE, LIGHT BROWN IN
SAMPLER AND DIAMOND SURFACE- SET BIT.	-		45,2	53.9	0.9	22.2	5.2	5,8	SC-SM	15/15/15				COLOR
CASING RECORD: NONE USED	-		63.5	36,5	0	31,4	14.4	7,9	s(CL)	11/18/19		sc		11.3 - 14.1 FT POORLY GRADED SAND (SP): ABOUT 95% FINE TO MEDIUM SAND, TRACE COARSE SAND; ABOUT 5% FINES WITH NO PLASTICITY. AND NO DRY
DRILLING MEDIUM: 0.0 - 33.2 FT, NONE USED 33.2 - 50,0 FT, WATER	20-													STRENGTH; NO REACTION WITH HCI LOOSELY CONSOLIDATED, BECOMES MOIST BELOW 48,5 FT.
HOLE COMPLETION:	-										Qal		6605.2	14.1 - 23.2 FT CLAYEY SAND (SC): ABOUT 80% PREDOMINATELY FINE SAND; ABOUT
BACKFILLED WITH DRILL CUTTINGS	25-		NA	NA	0	55,1	34.2	NA	СН	11/12/15		СН		20% FINES WITH LOW PLASTICITY, LOW DRY STENGTH, LOW TOUGHNESS AND
	20-											011	6602.1	SLOW DILATANCY; MAXUMUM SIZE, FINE SAND, DARK BROWN IN COLOR, MOIST;
	-		21.5	78.5	0	NA	NP	2.9	SM			sc		NO REACTION WITH HCI.
	-									11/11/11			6600.2	23.2 - 26.3 FT FAT CLAY (CH): ABOUT 90% FINES WITH HIGH PLASTICITY, HIGH TO
	30-											SP-S	6598.0	VERY HIGH DRY STRENGTH, HIGH TOUGHNESS; ABOUT 10% MEDIUM TO FINE SAND; MAXIMUM SIZE MEDIUM SAND; NO REACTIO WITH HCI.
	-									REFUSAL				26.3 - 28.2 FT CLAYEY SAND (SC): ABOUT 85% PREDOMINATELY FINE SAND; ABOUT
	35— -									nar oon				15% FINES WITH LOW PLASTICITY, LOW DRY STENGTH, LOW TOUGHNESS AND SLOW DILATANCY; MAXUMUM SIZE, FINE SAND, DARK BROWN IN COLOR, MOIST; NO REACTION WITH HCI,
	- -											SP-S	м	28.2 - 46.2 FT POORLY GRADED SAND WITH SILT (SP-SM): ABOUT 90% PREDOMINATELY FINE SAND, TRACE OF
	40— - -	70												GRAVEL; ABOUT 10% FINES WITH NO PLASTICITY, NO DRY STRENGTH, AND RAPID DILATANCY; MAXIMUM SIZE, 80MM; NO REACTION WITH HCL, DRY, LOOSE, LIGHT BROWN IN COLOR.
	45													46.2 - 50.0 FT TERTIARY NACIMIENTO FORMATION (Tri)
	"-												6582.2	46.2 - 50.0 FT SANDSTONE: INTENSELEY WEATHERED (W8), VERY SOFT TO SOFT
	- -	100									Tn	SS		WEATHERED (WB), VERY SOFT TO SOFT (H7), TAN IN COLOR: , VERY INTENSELY WEATHERED TO DECOMPOSED (W8-W9), VERY SOFT TO SOFT (H7); NO REACTION WITH HCI.
COMMENTS													6578.4	THI TOIS

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 DESCRIPTIVE CRITERIA FOR ROCK. DRAWING NO. 40-D-6499, STANDARD DESCRIPTORS AND DESCRIPTIVE CRITERIA FOR DISCONTINUITIES.

GEOLOGIC LOG OF DRILL HOLE NO. DHRT2-2 (OLD LOCATION)

FEATURE: REACH 22B

LOCATION: REGULATING TANK 2 (OLD LOCATION)

BEGUN: 1/21/15 FINISHED: 1/21/15

DEPTH OF WATER LEVEL:

DATE MEASURED:

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

COORDINATES: N 1,974,063,3 E 2,735,829,5

TOTAL DEPTH: 50.0

DEPTH TO BEDROCK: 46.2

STATE: NEW MEXICO GROUND ELEVATION: 6628,4

ANGLE FROM HORIZONTAL: 90

HOLE LOGGED BY: J, GILBERT

REVIEWED BY:

		ĒRY		LABC	RAT	ORY	DATA	\	Z	l .		z /	
NOTES	DEPTH	% CORE RECOV	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE	LABORATORY CLASSIFICATIO	BLOWS / 0.5 F	GEOLOGIC UNIT SYMBOL	CLASSIFICATIO ELEVATION	

CLASSIFICATION AND PHYSICAL CONDITION

SHEET 2 OF 2

BOTTOM OF HOLE

STRATIGRAPHY: 0.0 - 46.2 FT: QUATERNARY ALLUVIUM (Qal) 46.2 - 50.0 FT: TERTIARY NACIMIENTO FORMATION (Tn)

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

LOG OF TEST PIT NO. TPR22-52

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION:

COORDINATES: N 2,014,701 E 2,750,460 APPROXIMATE DIMENSIONS: 6.0' x 14.5'

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6210.566

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: C. BEYER

DATE EXCAVATED: 5/22/2013

DEPTH TO WATER: NE DATE: DATE EXCAVATED: 5/22/2013			
CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
GROUP SYMBOL (SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SM (visual) 0.0 TO 14.5 FT SILTY SAND: About 75% fine sand; about 25% nonplastic fines with rapid dilatancy, no to low dry strength; maximum size, fine sand; strong reaction with HCl.			
IN-PLACE CONDITION: red/brown, dry in top 1.5 ft, becomes moist below 4.5 ft, intermittent calcite nodules, roots in top 3 ft.			
IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 TO 6.8 ft. Total: 97.8 lbs. / cu ft., 1.8 %. (90.7% compaction) LAB TEST DATA: 89.9% sand, 10.1% fines, LL= NP, PI= NP, SPG= NA Maximum dry density= 107.8 lbs. / cu ft., optimum water content= 13.5% Laboratory classification is: POORLY GRADED SAND WITH SILT			
BAG SAMPLE TAKEN at 10.0 ft for corrosion testing (two 2 quart bags)			
GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6 –			
7			
Density taken at 6.0 ft.			
8 -			
10—			
11-			
12-			
7 -			
13-			
14- 14.5 ft (6196.1)			

LOG OF TEST PIT NO. TPR22-54

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION:

COORDINATES: N 2,012,451 E 2,750,167

APPROXIMATE DIMENSIONS: 6.0' x 14.0'

DEPTH TO WATER: NE DATE:

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6205.273

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: C. BEYER

DATE EXCAVATED: 5/22/2013

"-					
_	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL	% F (BY	PLUS : VOLU	3 in ME)
DEPTH	GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5	5 - 12	PLUS 12
	STIMBUL	(SEE OSBN 3000, 3003)	in	in	in
-	SM	0.0 TO 14.5 FT SILTY SAND: About 75% fine sand; about 25% nonplastic			
1 -		fines with rapid dilatancy, no to low dry strength; maximum size, fine sand; strong reaction with HCl.			
_					
2 -		IN-PLACE CONDITION: Red/brown, dry, roots in top 3 ft.			
1		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 TO 6.8 ft.			
3 -		Total: 99.2 lbs. / cu ft., 2.5%.(90.2% compaction) LAB TEST DATA: 81.4% sand, 18.6% fines, LL= NP, PI= NP, SPG= NA			
12-2		Maximum dry density= 110.0 lbs. / cu ft., optimum water content= 11.4%			
4 -		Laboratory classification is: SILTY SAND			
-					
5 -		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6 -					
-					
7 -	In-Place				
	Density taken at 6.0 ft.				
8 -					
-					
9 -					
10-					
_					
11=					
-					
12 -					
-					
13 — -					
14	14.5 ft (6190.8)				
	AAAAENITO OLI	DEAGE VEGETATED MITH CACE PRINCIPAND CRASS DISCONTINUED DUE T	O I IN	ALT C	\C

LOG OF TEST PIT NO. TPR22-55

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION:

COORDINATES: N 2,011,057 E 2,749,832 APPROXIMATE DIMENSIONS: 6.0' x 14.0'

DEPTH TO WATER: NE DATE:

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6204.497

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: C. BEYER

DATE EXCAVATED: 5/23/2013

DEPTH TO WATER: N	IE DATE: DATE EXCAVATED: 5/23/2013			
I CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLL	
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLU 12 in
SM In-Place Density taken at 6.0 ft.	0.0 TO 7.1 FT SILTY SAND: About 75% fine sand; about 25% nonplastic fines with rapid dilatancy, no to low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Red/brown, dry, moist between 0.3 and 1.2 ft, roots in top 3.0 ft. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 TO 6.8 ft. Total: 96.4 lbs. / cu ft., 2.8 %.(NA% compaction) LAB TEST DATA: 88.1% sand, 11.9% fines, LL=, PI= NP, SPG= Maximum dry density= 110.9 lbs. / cu ft., optimum water content= 11.0% Laboratory classification is: SILTY SAND			
7.1 ft (6197.4) SC 8.3 ft (6196.2) SM 10-11-12-13-14-14.0 ft (6190.5)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 7.1 to 8.3 FT CLAYEY SAND: About 50% fine sand; about 50% fines with medium plasticity, medium dry strength, and medium toughness; strong reaction with HCl. IN-PLACE CONDITION: grey/brown, dry, calcite nodules, roots casts. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 TO 6.8 ft. Total: NA lbs. / cu ft., 2.8 %.(NA% compaction) LAB TEST DATA: 44.4% sand, 55.6% fines, LL= 27.5, Pl= 12.8 NP, SPG= NA Maximum dry density= NA lbs. / cu ft., optimum water content= NA% Laboratory classification is: SANDY LEAN CLAY GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 8.3 to 14.0 FT SILTY SAND: About 75% fine sand; about 25% nonplastic fines with rapid dilatancy, no to low dry strength; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: red/brown, dry. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

LOG OF TEST PIT NO. TPR22-56

SHEET 1 OF 1

FEATURE: Reach 22B

14.0 ft (6191.8)

LOCATION:

COORDINATES: N 2,010,170 E 2,749,620 APPROXIMATE DIMENSIONS: 6.0' x 14.0'

DEPTH TO WATER: NE DATE:

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6205.753

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: C. BEYER
DATE EXCAVATED: 5/23/2013

% PLUS 3 in (BY VOLUME) CLASSIFICATION AND DESCRIPTION OF MATERIAL CLASSIFICATION **GROUP** PLUS 5 -(SEE USBR 5000, 5005) SYMBOL 12 in in in 0.0 TO 14.0 FT SILTY SAND: About 75% fine sand; about 25% nonplastic SM fines with rapid dilatancy, no dry strength; maximum size, fine sand; strong reaction with HCI. IN-PLACE CONDITION: red/brown, dry, calcite nodules and calcite cemented zones, roots in top 3.0 ft. 2 IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 FT. 3 Total: 97.7lbs. / cu ft., 2.7%.(94.1% relative compaction) LAB TEST DATA: 83.8% sand, 16.2% fines, LL= NP, PI=NP, SPG= NA Maximum dry density= 103.8 lbs. / cu ft., optimum water content= 14.4% Laboratory classification is: SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6 In-Place Density taken at 6.0 ft. 8 10 12 -13

LOG OF TEST PIT NO. TPR22-58

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22710+04.61, 4.3' Left COORDINATES: N 2,007,231 E 2,749,018

APPROXIMATE DIMENSIONS: 6.0' x 14.0'
DEPTH TO WATER: NE DATE: 8/1/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6137.9

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 8/1/2012

DE	PIN TO WATER. I	VE BATE. 6/1/2012			
_	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
DEPTH	GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
	(SP-SM)	0.0 to 14.0 ft POORLY GRADED SAND WITH SILT: About 90% fine to medium sand; about 5% non-plastic fines, no dry strength, rapid dilatancy; about 5% fine to coarse, soft to hard, rounded to angular gravel; trace of hard, subangular to subrounded cobbles and boulders; maximum size, 400 mm; no reaction with HCI.	tr	tr	tr
2 -		IN-PLACE CONDITION: Gray to dark brown, surface dry becoming moist at 0.2 ft.			
3		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 102.0 lbs. / cu ft., 5.6 %. (89.8% compaction) LAB TEST DATA: 88.8% sand, 8.3% fines, 2.8% gravel, LL= N/A, Pl= N/P, SPG= 2.67			
5 -		Maximum dry density= 113.5 lbs. / cu ft., optimum water content= 11.8% Laboratory classification is: POORLY GRADED SAND WITH SILT.			
6 -	In-Place Density taken at 4.0 ft. 50 lb sample taken	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
8 -	at 4.0 ft.				
9 -					
11-					
2-					
12-					
13-	440 # (0400 0)				
222	14.0 ft (6123.9)				

COMMENTS: SURFACE FREE OF VEGETATION. TEST PIT PERFORMED IN ARROYO. EXCAVATION DISCONTINUED DUE TO LIMIT OF EQUIPMENT. TEST PIT SLOUGHING OCCURRED AFTER EXCAVATION TO 14.0 ft.

LOG OF TEST PIT NO. TPR22-59

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22721+45.02, 4.2' Left

COORDINATES: N 2,006,175 E 2,748,670 APPROXIMATE DIMENSIONS: 6.0' x 13.0'

DEPTH TO WATER: NE DATE: 8/1/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6155.8

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER DATE EXCAVATED: 8/1/2012

	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS : VOLU	
GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SM	0.0 to 10.5 ft SILTY SAND: About 85% fine sand; about 15% non-plastic fines with no dry strength, rapid dilatancy; maximum size, fine sand; no reaction with HCl.			
	IN-PLACE CONDITION: Dry, tan, roots present up to 8 ft.			
2	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 93.9 lbs. / cu ft., 2.0%. (89.8% compaction) LAB TEST DATA: 81.6% sand, 18.4% fines, LL= N/A, PI= N/P, SPG= 2.62 Maximum dry density= 104.6lbs. / cu ft., optimum water content= 14.3%			
4 —	Laboratory classification is SILTY SAND			
In-Place Density taken at 4.0 ft. 50 lb sample taken at 4.0 ft.	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10- 10.5 ft (6145.3)				
sc	10.5 to 13.0 ft CLAYEY SAND: About 55% fine to medium sand; about 45% medium plastic fines with medium dry strength, no dilatancy, medium toughness; trace of 2-3 inch, fat clay clasts present; maximum size, medium sand; weak reaction with HCl.			
12 -	IN-PLACE CONDITION: Dry, light brown.			
13.0 ft (6142.8)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)		ff O	

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE, GRASSES AND GREASEWOOD. TOP 1 ft OF THE SOUTHEAST CORNER OF TEST PIT CONTAINED DISTURBED, MISCELLANEOUS s(CL) WELL PAD FILL MATERIAL. HOLE TERMINATED DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22-60

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22734+16.50, 27.3' Left

COORDINATES: N 2,004,935 E 2,748,391

APPROXIMATE DIMENSIONS: 6.0' x 13.6' DEPTH TO WATER: NE DATE: 8/1/2012

GROUND ELEVATION: 6175.9

METHOD OF EXPLORATION: CASE 580N BACKHOE

PROJECT: Navajo Gallup Water Supply Project

LOGGED BY: P. GARDNER

DATE EXCAVATED: 8/1/2012

E	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
DEPTH	GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
- - 1 -	SP	0.0 to 3.0 ft POORLY GRADED SAND: About 95% fine to medium sand; about 5% non-plastic fines with no dry strength, rapid dilatancy; maximum size, medium sand; no reaction with HCI.			
2		IN-PLACE CONDITION: Light to dark brown, dry, weak cementation, roots in top 1.5 ft.			
3 -	3.0 ft (6172.9)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4 —	SM	3.0 to 13.6 ft SILTY SAND: About 80% fine to medium sand; about 20% non-plastic fines with no dry strength, rapid dilatancy; maximum size, medium sand; no reaction with HCl.			
5 —		IN-PLACE CONDITION: Light to dark brown, dry, weak cementation, thin lenses of SP pinching laterally throughout.		1	
6 -		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 101.6 lbs. / cu ft., 2.4 %.(88.9% compaction) LAB TEST DATA: 87.7% sand, 12.3% fines, LL= N/A, PI= N/P, SPG= 2.66 Maximum dry density= 114.2 lbs. / cu ft., optimum water content= 11.5%			
7 -		Laboratory classification is SILTY SAND			
9 - 10 - 1	In-Place Density taken at 4.0 ft, 50 lb sample taken at 4.0 ft	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
11-					
12-					
13 –	42.6.4.(0400.0)				
-	13.6 ft (6162.3)	REACE VEGETATION CONSISTS OF SAGE GRASSES AND GREASEWOOD. I	JOLE		

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE, GRASSES AND GREASEWOOD. HOLE TERMINATED DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22-63

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22769+32.06, 3.4' Left

COORDINATES: N 2,001,527 E 2,747,534

APPROXIMATE DIMENSIONS: 6.0' x 13.0'
DEPTH TO WATER: NE DATE: 7/31/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6267.0

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 7/31/2012

DEPIRIO WATER. I	NE DATE: //31/2012 BATE EXCAVATED. 1/31/2012			
CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS : VOLU	
GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SM	0.0 to 13.0 ft SILTY SAND: About 75% fine sand; about 25% non-plastic fines with no dry strength, rapid dilatancy; maximum size, medium sand; no reaction with HCI.			
-	IN-PLACE CONDITION: Brown, dry, calcium carbonate veins and nodules with root casts, roots present in upper 4 ft.			
	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 103.9 lbs. / cu ft., 2.9 %. (90.2% compaction) LAB TEST DATA: 78.9% sand, 21.1% fines, LL= N/A, PI= N/P, SPG= 2.7 Maximum dry density= 115.1lbs. / cu ft., optimum water content= 10.5% Laboratory classification is: SILTY SAND			
5 -	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
In-Place Density taken at 4.0 ft. 50 lb sample taken at 4.0 ft.				
- - - - -				
1				
13.0 ft (6254.0)	DEADS VEGETATION CONSISTS OF SACE AND CRASS. HOLE TERMINATE			

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE AND GRASS. HOLE TERMINATED DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22-64

SHEET 1 OF 1

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: STATION 22783+10.59, 1.5' Right:

GROUND ELEVATION: 6271.7

COORDINATES: N 2,000,196 E 2,747,191

METHOD OF EXPLORATION: CASE 580N BACKHOE

APPROXIMATE DIMENSIONS: 6.0' x 13.8'
DEPTH TO WATER: NE DATE: 7/31/2012

LOGGED BY: P. GARDNER
DATE EXCAVATED: 7/31/2012

	FINIO WATER.	NE DATE. 7/31/2012 DATE EXCAVATED. 7/31/2012			
DEPTH	CLASSIFICATION GROUP	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU 5 -	
ద	SYMBOL	(SEE USBR 5000, 5005)	5 in	12 in	12 in
1 -	SM	0.0 to 4.0 ft SILTY SAND: About 75% fine to medium sand; about 25% non-plastic fines with medium dry strength, rapid dilatancy; maximum size, fine sand; strong reaction with HCl.			
2 —		IN-PLACE CONDITION: Light to dark brown, dry, trace of calcium carbonate nodules(small) and veins, roots in top 2.0 ft, root casts to 4.0 ft, weak cementation.			
3 -		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
4	4.0 ft (6267.7)				
	SC (visual)	4.0 to 5.3 ft CLAYEY SAND: About 65% fine sand; about 35% low to medium plastic fines with high dry strength, no dilatancy, low toughness;			
5	5.3 ft (6266.4)	maximum size, fine sand; strong reaction with HCl.			
6 —	SM	IN-PLACE CONDITION: Light brown, dry, blocky chunks, hard consistency, calcium carbonate veins.			
7 — 8 —		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 97.0 lbs. / cu ft., 5.9 %.(86.3% compaction) LAB TEST DATA: 31.8% sand, 68.2% fines, LL= 27.7, PI= 10.9, SPG= 2.75 Maximum dry density= 112.4 lbs. / cu ft., optimum water content=14.8% Laboratory classification is SANDY LEAN CLAY			
0 - 1 - 1	In-Place Density taken at 5.5 ft 50 lb sample taken at 5.5 ft.	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 5.3 to 13.8 ft SILTY SAND: About 85% fine sand; about 15% non-plastic fines with low dry strength, slow dilatancy; maximum size, fine sand; strong reaction with HCI.			
1=		IN-PLACE CONDITION: Tan to yellowish brown, dry, weak cementation becoming more cemented with depth, calcium carbonate veins.			
2-		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 5.5 TO 6.0 ft. Total: 98.4 lbs. / cu ft., 3.1 %.(92.4% compaction) LAB TEST DATA: 79.5 % sand, 20.5% fines, LL= N/A, PI= N/P, SPG= 2.67 Maximum dry density= 106.4 lbs. / cu ft., optimum water content= 13.4% Laboratory classification is SILTY SAND			
-	13.8 ft (6257.9)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
$\vec{\sim}$	MANAGNITO: CHE	PRACE VECETATION CONSISTS OF SACE AND CRASS. HOLE TERMINATED I	DITE	TO	

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE AND GRASS. HOLE TERMINATED DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22-66

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22806+72.73, 0.8' Right

COORDINATES: N 1,997,932 E 2,746,519

APPROXIMATE DIMENSIONS: 6.0' x 12.8'
DEPTH TO WATER: NE DATE: 7/31/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6291.7

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 7/31/2012

E CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS	3 in
=		101	VOLU	ME)
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLU 12 in
SC	0.0 to 4.0 ft CLAYEY SAND: About 65% fine sand; about 35% medium plastic fines, high dry strength, no dilatancy, medium toughness; maximum size, fine sand; no reaction with HCl.			
2	IN-PLACE CONDITION: Brown, dry, trace of calcium carbonate veins and nodules, roots present in upper 1.5 ft., firm consistency.			
- 1- -	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3 -				
4.0 ft (6287.7)		-		
SM 5 -	4.0 to 9.0 ft SILTY SAND: About 80% predominantly fine sand; about 20% non-plastic fines, medium dry strength, rapid dilatancy; maximum size, medium sand; no reaction with HCI.			
In-Place	IN-PLACE CONDITION: Light brown to tan, dry, calcium carbonate veins and nodules with root casts. Roots present in upper 4 ft.			
Density taken at 4.0 ft. 50 lb sample taken at 4.0 ft.	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 101.8 lbs. / cu ft., 3.2 %.(91.8% compaction) LAB TEST DATA: 68.7% sand, 31.3% fines, LL= N/A, PI= N/P, SPG= 2.67 Maximum dry density= 110.9lbs. / cu ft., optimum water content= 13.0% Laboratory classification is SILTY SAND			
9.0 ft (6282.7)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
SC SC	9.0 to 12.8 ft CLAYEY SAND: About 60% predominantly fine sand; about 40% medium to high plastic fines, low to medium dry strength, no dilatancy, low toughness; maximum size, medium sand; strong reaction with HCl.			
1-	IN-PLACE CONDITION: Tan to brown to gray, dry, calcium carbonate veins and nodules, roots present in upper 1.5 ft., iron oxide staining, clay lenses present.			
2-	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
12.8 ft (6278.9)				
.1	I .			

COMMENTS: SURFACE VEGETATED WITH SAGE AND GRASS. HOLE TERMINATED DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22-67

SHEET 1 OF 2

FEATURE: Reach 22B

LOCATION: STATION 22818+63.90, 16.9' Right

COORDINATES: N 1,996,787 E 2,746,192

APPROXIMATE DIMENSIONS: 6.0' x 13.5'

DEPTH TO WATER: NE DATE: 7/30/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6314.9

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: C. BEYER
DATE EXCAVATED: 7/30/2012

	ME B/(12. 1/00/2012			
CLASSIFICATION GROUP SYMBOL SM O.0 to 12.0 ft SILTY SAND: About 75% fine sand; about 25% nonplastic fines with slow dilatancy, low dry strength, no toughness; maximum size, fine sand; strong reaction with HCI. IN-PLACE CONDITION: Brown to tan, dry, roots in top 1.5 ft, weakly to moderately cemented, recovered as 6 inch diameter clodes. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 104.0 lbs. / cu ft., 3.4 % (92.6% compaction) LAB TEST DATA: 68.1% sand, 31.9 % fines, LL= N/A, PI= N/P, SPG= 2.68 Maximum dry density= 112.3 lbs. / cu ft., optimum water content= 11.8% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 12.0 tf (6302.9) 13.5 ft (6301.9) 12.0 to 13.0 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines, rapid dilatancy, low dry strength, low toughness; maximum size, fine sand; no reaction with HCI IN-PLACE CONDITION: Yellowish-brown, dry moderately cemented. BAG SAMPLE FROM 12.0 TO 12.5 ft.	,	PLUS VOLU		
GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5	5 = 12	PLU 12
01111502	(0 00000)	in	in	in
']				
- III-Flace	LAB TEST DATA: 68.1% sand, 31.9 % fines, LL= N/A, PI= N/P, SPG= 2.68 Maximum dry density= 112.3lbs. / cu ft., optimum water content= 11.8%			
at 4.0 ft. 50 lb				
1 -1100	,			
)				
3				
	12.0 to 12.0 # DOORLY CRADED SAND WITH SILT. About 00% fine cond.			
	about 10% nonplastic fines, rapid dilatancy, low dry strength, low			
10.0 18601.4)				
	LAB TEST DATA: 87.3% sand, 12.7% fines, LL= N/A, PI= N/P, SPG= 2.67 Laboratory classification is: SILTY SAND			
	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.0 to 13.5 ft CLAYEY SAND: About 50% fine sand; about 50% medium			
				1
	plastic fines, no dilatancy, medium dry strength, medium toughness; maximum size, fine sand; strong reaction with HCl.			

7 B	-1336-A (1-86) Bureau of Reclamation	LOG OF TEST PI	T NO. TPR22-67	SH	IEET	2 OF	2
	ATURE: Reach 22B	F	PROJECT: Navajo Gallup Water Supply Project	:t			
LOCATION: STATION 22818+63.90, 16.9' Right GROUND ELEVATION: 6314.9							
			METHOD OF EXPLORATION: CASE 580N B.	4CKHC	DE		
			OGGED BY: C. BEYER				
lin .			DATE EXCAVATED: 7/30/2012				1
					% F	LUS 3	3 in
푸	CLASSIFICATION	CLASSIFICATION AND DES	SCRIPTION OF MATERIAL			VOLU	_
DEPTH	GROUP SYMBOL	(SEE USBR	5000, 5005)		3 - 5	5 - 12	PLUS 12
	0,1,,,202				in	in	in
		GEOLOGIC INTERPRETATION: Qua	aternary Alluvium (Qal)				
					J		Ļ
lco	MMENTS:						

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LOG OF TEST PIT NO. TPR22-68

SHEET 1 OF 2

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: STATION 22828+24.22, 9.4' Right

GROUND ELEVATION: 6325.3

COORDINATES: N 1,995,831 E 2,746,098

METHOD OF EXPLORATION: CASE 580N BACKHOE

APPROXIMATE DIMENSIONS: 6.0' x 13.5'

LOGGED BY: C. BEYER

DEPTH TO WATER: NE DATE: 7/30/2012

DATE EXCAVATED: 7/30/2012

		277721 770072072			
ΞC	LASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	ME)
рертн С	GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
-	s(CL)	0.0 to 2.0 ft SANDY LEAN CLAY: About 55% fines with medium to high plasticity, high toughness, medium to high dry strength; about 45% fine sand; maximum size, fine sand; no reaction with HCl.			
1 -		IN-PLACE CONDITION: Reddish brown, dry, intermittent calcite nodules.			
=		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2	2.0 ft (6323.3)				
-	SM	2.0 to 9.2 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with slow dilatancy, low dry strength; maximum size, fine sand; no reaction with HCl.			
3 —		IN-PLACE CONDITION: Brown, dry, becomes moist below 8.5 ft, weak cementation.			
4 -		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 101.3 lbs. / cu ft., 3.2 %. (93.5% compaction) LAB TEST DATA: 73.8 % sand,26.1 % fines, LL= N/A, PI= N/P, SPG= 2.70 Maximum dry density= 108.3 lbs. / cu ft., optimum water content= 3.2% Laboratory classification is SILTY SAND			
5 -		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	In-Place Density taken at 4.0 ft. 50 lb sample taken at 4.0 ft.				
18					
7 -					
-					
8 —					
(a					
-					
9 - 6	9.2 ft (6316.1)				

COMMENTS: SURFACE VEGETATED WITH SAGE BRUSH AND GRASS, TEST PIT GROUND SURFACE LOCATED IN A SLIGHT DEPRESSION WITH MORE THAN NORMAL LUSH VEGETATION. DISCONTINUED DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86) Bureau of Reclamation	LOG OF TEST P	T NO. TPR22-68	SH	IEET	2 OF	2
FEATURE: Reach 22	3	PROJECT: Navajo Gallup Water Supply Projec	ot .			
LOCATION: STATION	I 22828+24.22, 9.4' Right	GROUND ELEVATION: 6325.3				
COORDINATES: N 1,	995,831 E 2,746,098	METHOD OF EXPLORATION: CASE 580N B	ACKHO	DΕ		
APPROXIMATE DIME	NSIONS: 6.0' x 13.5'	LOGGED BY: C. BEYER				
DEPTH TO WATER:	NE DATE: 7/30/2012	DATE EXCAVATED: 7/30/2012				
Ţ CLASSIFICATION	CLASSIFICATION AND DES	SCRIPTION OF MATERIAL			PLUS : VOLU	
E CLASSIFICATION GROUP SYMBOL	(SEE USBR	5000, 5005)		3 - 5 in	5 - 12 in	PLUS 12 in
9.7 ft (6315.6) SC 11- 12- 13- 13.5 ft (6311.8)	high toughness, high dry strength; Al fine sand, strong reaction with HCL. IN-PLACE CONDITION: Dark grey, and nodules. BAG SAMPLE TAKEN FROM 9.2 TO LAB TEST DATA: 25.1% sand, 74.9% Laboratory classification is LEAN CL GEOLOGIC INTERPRETATION: Qu 9.7 to 13.5 ft CLAYEY SAND: About medium plasticity, no dilatancy, medi maximum size, fine sand; no reaction calcite nodules. IN-PLACE CONDITION: Grey, intern diameter, moist.	moist, firm, intermittent calcite veins 0 9.7 ft % fines, LL= 36.5, PI= 21.7, SPG= 2.7 AY WITH SAND saternary Alluvium (Qal) 60% fine sand; about 40% fines with ium dry strength, medium toughness; in with HCI, except on occasional small nittent calcite nodules 5mm in	3			
COMMENTS:						

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LOG OF TEST PIT NO. TPR22-70

SHEET 1 OF 2

FEATURE: Reach 22B

LOCATION: STATION 22855+49.46, 8.5' Right

COORDINATES: N 1,993,176 E 2,745,526

APPROXIMATE DIMENSIONS: 6.0' x 13.3' x 15'
DEPTH TO WATER: NE DATE: 7/30/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6370.2

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: C. BEYER
DATE EXCAVATED: 7/30/2012

DEPTH TO WATER:	NE DATE: //30/2012 DATE EXCAVATED: //30/2012			
E CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL	(BY	PLUS VOLU	JME)
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SM 0.9 ft (6369.3) SM (visual) SP-SM (lab class) In-Place Density taken at 4.0 ft. 50 lb sample taken at 4.0 ft. 1	0.0 to 0.9 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with slow dilatancy, medium dry strength, no toughness; maximum size, fine sand; no reaction with HCI. IN-PLACE CONDITION: Reddish brown, dry, weak cementation, roots in top 1.0 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 0.9 to 13.0 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with slow dilatancy, medium dry strength, no toughness; maximum size, fine sand; no reaction with HCI, except in thin calcite cemented zone with a strong reaction with HCI. IN-PLACE CONDITION: Reddish brown in color, dry, becomes moist below 11.0 ft, thin zones of calcite cement, weak cementation, roots in top 1.0 ft. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 96.8 lbs. / cu ft, 2.2 % (93.6% compaction) LAB TEST DATA: 88.6% sand,11.4 % fines, LL= N/A, PI= N/P, SPG= 2.72 Maximum dry density= 103.4 lbs. / cu ft, optimum water content= 13.9% Laboratory classification is POORLY GRADED SAND WITH SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3	RFACE VEGETATED WITH SAGE BRUSH AND GRASS. DISCONTINUED DUE TO	O LIM	AIT O	F

7-1336-A (1-86) Bureau of Reclamation	LOG OF TEST	PIT NO. TPR22-70	SH	IEET .	2 OF	2
FEATURE: Reach 22	3	PROJECT: Navajo Gallup Water Supply Proje	ct			
LOCATION: STATION	I 22855+49.46, 8.5' Right	GROUND ELEVATION: 6370.2				
COORDINATES: N 1,	993,176 E 2,745,526	METHOD OF EXPLORATION: CASE 580N B	ACKHO	DE		
APPROXIMATE DIME	NSIONS: 6.0' x 13.3' x 15'	LOGGED BY: C. BEYER				
DEPTH TO WATER:	NE DATE: 7/30/2012	DATE EXCAVATED: 7/30/2012				
E CLASSIFICATION	CLASSIFICATION AND I	DESCRIPTION OF MATERIAL		(BY	VOLU	ME)
SYMBOL	(SEE US	BR 5000, 5005)		3 - 5 in	5 - 12 in	PLUS 12 in
- 13.3 ft (6356.9) SC	medium plasticity, no dilatancy, m trace medium sand; maximum siz HCI.	pout 65% fine sand; about 35% fines with redium dry strength, medium toughness; e, medium sand; strong reaction with moist, root casts, moderately cemented, Quaternary Alluvium (Qal)				
COMMENTS:						

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LOG OF TEST PIT NO. TPR22-71

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22867+48.11, 1.7' Right

COORDINATES: N 1,992,018 E 2,745,226 APPROXIMATE DIMENSIONS: 6.0' x 10.3'

DEPTH TO WATER: NE DATE: 7/30/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6395.2

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: C. BEYER
DATE EXCAVATED: 7/30/2012

-	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
DEPTH	GROUP		3 -		PLU
	SYMBOL	(SEE USBR 5000, 5005)	5 in	12 in	12 in
	s(CL)	0.0 to 2.8 ft SANDY LEAN CLAY: About 60% fines with medium to high			
÷	` ′	plasticity, high toughness, medium to high dry strength, no reaction with			
		HCL; about 40% fine sand; maximum size, fine sand.			
0.5		IN-PLACE CONDITION: Brown, dry, roots in top 1.5 ft.			
		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
; .					
-	2.8 ft (6392.4)				
-	SM	2.8 to 4.5 ft SILTY SAND: About 75% fine sand; about 25% nonplastic			
	In-Place	fines with slow dilatancy, medium dry strength, no toughness; maximum size, fine sand; no reaction with HCl.			
	Density and 50 lb sample	Size, line sand, no reaction with rior.			
-	taken at 4.0 ft.	IN-PLACE CONDITION: Tan, dry, moderate cementation.			
-	4.5 ft (6390.7)	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft.			
3	SANDSTONE	Total: 112.1lbs. / cu ft., 4.1 %.(95.2% compaction)			
-		LAB TEST DATA: 76.6% sand, 23.2% fines, LL= N/A, PI= N/P, SPG= 2.70 Maximum dry density= 117.8 lbs. / cu ft., optimum water content= 11.7%			
9		\Laboratory classification is SILTY SAND			
5		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
_		4.5 to 10.3 ft SANDSTONE: Fine to medium grained, soft (H6) to			
		moderately soft (H5), moderately weathered (W5) to intensely to moderately weathered (W6), yellow to brown in color, FeOx staining,		1	
100		intermittent calcite cemented zones with strong reaction with HCl, No		1	
-		reaction with HCl outside calcite cemented zones. Occasional zones containing angular mud ripup clasts and heavy FeOx staining.			
9					
3		GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)			
-					
3					
9					
-					
3					
) –	10.3 ft (6384.9)				
_3	1	I DEACE VEGETATED WITH SAGE BRUSH AND GRASS DISCONTINUED DUE T			

COMMENTS: SURFACE VEGETATED WITH SAGE BRUSH AND GRASS. DISCONTINUED DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22-72

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22878+45.53, 127.2' Left

COORDINATES: N 1,991,167 E 2,744,521

APPROXIMATE DIMENSIONS: 6.0' x 7.0'
DEPTH TO WATER: NE DATE: 7/20/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6413.8

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: C. BEYER

DATE EXCAVATED: 7/20/2012

DEPTH TO WATER: I	NE DATE: 7/20/2012 DATE EXCAVATED: 7/20/2012			
CLASSIFICATION	CATION CLASSIFICATION AND DESCRIPTION OF MATERIAL		% PLUS 3 (BY VOLUM	
CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLU 12 ir
SC	0.0 to 2.2 ft CLAYEY SAND: About 70% fine sand; about 30% fines with medium plasticity, no dilatancy, medium dry strength, medium toughness; maximum size, fine sand; weak reaction with HCl.			
_	IN-PLACE CONDITION: Tan, dry, roots in top 1.5 ft.			
	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2.2 ft (6411.6)				
SANDSTONE (visual) ML (lab class) In-Place Density taken at 4.0 ft. 50 lb	2.2 to 7.0 ft SANDSTONE: Fine to medium grained argillaceous sandstone, tan to yellow in color, decomposed (W9) to intensely weathered (W7); very soft (H7) to soft (H6); becomes moderately hard (H4) at 7.0 ft contains zones of white, argillaceous calcite cement, strong reaction with HCI. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 93.8 lbs. / cu ft., 5.5%. (82.8 % compaction) LAB TEST DATA: 49.4% sand, 50.6 % fines, LL= N/A, PI= N/P, SPG= 2.7 Maximum dry density= 113.3 lbs. / cu ft., optimum water content= 13.7% Laboratory classification is SILT GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)			
sample taken at 4.0 ft.				
7.0 ft (6406.8)				

COMMENTS: SURFACE VEGETATED WITH SAGE BRUSH AND GRASS. DISCONTINUED DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22-73

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22890+16.05, 43.5' Left

COORDINATES: N 1,990,420 E 2,743,617

APPROXIMATE DIMENSIONS: 6.0' x 11.0' x 13.0'

DEPTH TO WATER: NE DATE: 7/20/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6405.2

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: C. BEYER

DATE EXCAVATED: 7/20/2012

SM O.0 to 4.3 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with rapid dilatancy, low dry strength, low toughness; maximum size, fine sand; strong reaction with HCl. In-Place Density taken at 4.3 ft. 50 lb sample taken at 4.3 ft. 50 lb sample taken at 4.3 ft. In-PLACE UNIT WEIGHT AND MOISTURE FROM 4.3 TO 4.8 ft. Total: 112.8 lbs. / cu ft., 2.4% (99.4% compaction) LAB TEST DATA: 87.0% sand, 13% fines, LL-M/A, PI=N/P, SPG=2.68 Maximum dry density= 113.5 lbs. / cu ft., optimum water content= 12.5% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.3 ft (6400.9) SANDSTONE 4.3 to 11.0 ft SANDSTONE: Fine to medium grained sandstone, becoming predominately fine with depth, tan to yellow in color, decomposed (W9) to intensely weathered (W7), decreased weathering with depth; very soft (H7) to moderately soft (H5), increased hardness with depth; intermittent calcite cemented zones and FeOx staining, no reaction with HCL outside calcareous zones. Logged as a soil: POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, low to no dry strength; maximum size, medium sand; strong reaction with HCl. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)	DEPTH TO WATER.	NE DATE. 1/20/2012 DATE EXCAVATED. 1/20/2012			
GROUP SYMBOL (SEE USBR 5000, 5005) SM 0.0 to 4.3 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with rapid dilatancy, low dry strength, low toughness; maximum size, fine sand; strong reaction with HCl. In-Place Density taken at 4.3 ft. 50 lb sample taken at 4.3 ft. 50 lb sample taken at 4.3 ft. 50 lb sample taken at 4.3 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) SANDSTONE 4.3 ft (6400.9) SANDSTONE 4.3 to 11.0 ft SANDSTONE: Fine to medium grained sandstone, becoming predominately fine with depth, tan to yellow in color, decomposed (W9) to intensely weathered (W7), decreased weathering with depth; very soft (H7) to moderately soft (H5), increased hardness with depth; intermittent calcite cemented zones and FeOx staining, no reaction with HCL outside calcareous zones. Logged as a soil: POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, low to no dry strength; maximum size, medium sand; strong reaction with HCl. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)	± CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL			
with rapid dilatancy, low dry strength, low toughness; maximum size, fine sand; strong reaction with HCI. In-Place Density taken at 4.3 ft. 50 lb sample taken at 4.3 ft. 50 lb sample taken at 4.3 ft. In-Place Density taken a	GROUP		5	12	PLUS 12 in
In-Place Density taken at 4.3 ft. 50 lb sample taken at 4.3 ft. 50 lb sample taken at 4.3 ft. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.3 TO 4.8 ft. Total: 112.8 lbs. / cu ft., 2.4% (99.4% compaction) LAB TEST DATA: 87.0% sand, 13% fines, LL-M/A, PI=N/P, SPG=2.68 Maximum dry density= 113.5 lbs. / cu ft., optimum water content= 12.5% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.3 to 11.0 ft SANDSTONE: Fine to medium grained sandstone, becoming predominately fine with depth, tan to yellow in color, decomposed (W9) to intensely weathered (W7), decreased weathering with depth; very soft (H7) to moderately soft (H5), increased hardness with depth; intermittent calcite cemented zones and FeOx staining, no reaction with HCL outside calcareous zones. Logged as a soil: POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, low to no dry strength; maximum size, medium sand; strong reaction with HCl. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)	SM	with rapid dilatancy, low dry strength, low toughness; maximum size, fine			
Density taken at 4.3 ft. 50 lb sample taken at 4.3 ft. 50 lb sample taken at 4.3 ft. Augment of the taken at 4.3 ft. Bartest DATA: 87.0% sand, 13% fines, LL=N/A, Pl=N/P, SPG=2.68 Maximum dry density= 113.5 lbs. / cu tt., optimum water content= 12.5% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.3 ft (6400.9) SANDSTONE 4.3 to 11.0 ft SANDSTONE: Fine to medium grained sandstone, becoming predominately fine with depth, tan to yellow in color, decomposed (W9) to intensely weathered (W7), decreased weathering with depth; very soft (H7) to moderately soft (H5), increased hardness with depth; intermittent calcite cemented zones and FeOx staining, no reaction with HCL outside calcareous zones. Logged as a soil: POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, low to no dry strength; maximum size, medium sand; strong reaction with HCl. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)		IN-PLACE CONDITION: Brown, dry, roots in top 2.0 ft.			
GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.3 ft (6400.9) SANDSTONE 4.3 to 11.0 ft SANDSTONE: Fine to medium grained sandstone, becoming predominately fine with depth, tan to yellow in color, decomposed (W9) to intensely weathered (W7), decreased weathering with depth; very soft (H7) to moderately soft (H5), increased hardness with depth; intermittent calcite cemented zones and FeOx staining, no reaction with HCL outside calcareous zones. Logged as a soil: POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, low to no dry strength; maximum size, medium sand; strong reaction with HCl. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)	Density taken at 4.3 ft. 50 lb sample taken	Total: 112.8 lbs. / cu ft., 2.4%.(99.4% compaction) LAB TEST DATA: 87.0% sand, 13% fines, LL=N/A, PI=N/P, SPG=2.68 Maximum dry density= 113.5 lbs. / cu ft., optimum water content= 12.5%			
SANDSTONE 4.3 to 11.0 ft SANDSTONE: Fine to medium grained sandstone, becoming predominately fine with depth, tan to yellow in color, decomposed (W9) to intensely weathered (W7), decreased weathering with depth; very soft (H7) to moderately soft (H5), increased hardness with depth; intermittent calcite cemented zones and FeOx staining, no reaction with HCL outside calcareous zones. Logged as a soil: POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, low to no dry strength; maximum size, medium sand; strong reaction with HCl. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
predominately fine with depth, tan to yellow in color, decomposed (W9) to intensely weathered (W7), decreased weathering with depth; very soft (H7) to moderately soft (H5), increased hardness with depth; intermittent calcite cemented zones and FeOx staining, no reaction with HCL outside calcareous zones. Logged as a soil: POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, low to no dry strength; maximum size, medium sand; strong reaction with HCl. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)	4.3 ft (6400.9)				
Logged as a soil: POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy, low to no dry strength; maximum size, medium sand; strong reaction with HCI. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)	SANDSTONE	predominately fine with depth, tan to yellow in color, decomposed (W9) to intensely weathered (W7), decreased weathering with depth; very soft (H7) to moderately soft (H5), increased hardness with depth; intermittent calcite cemented zones and FeOx staining, no reaction with HCL outside			
fines with rapid dilatancy, low to no dry strength; maximum size, medium sand; strong reaction with HCl. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)		Logged as a soil:			
11.0 ft (6394.2)	7 —	fines with rapid dilatancy, low to no dry strength; maximum size, medium			
11.0 ft (6394.2)	3 -	GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)			
11.0 ft (6394.2)	9 -				
	10-				
OMMENTS: SURFACE VEGETATED WITH SAGE BRUSH AND GRASS. REACHED REFUSAL AT 11.0 FT.					
	COMMENTS: SUI	RFACE VEGETATED WITH SAGE BRUSH AND GRASS. REACHED REFUSAL A	AT 11.0) FT.	

LOG OF TEST PIT NO. TPR22-76

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22930+89.09, 31.2' Right

COORDINATES: N 1,986,707 E 2,742,103

APPROXIMATE DIMENSIONS: 6.0' x 13.5' x 11.0'

DEPTH TO WATER: NE DATE: 7/19/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6421.5

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: C. BEYER

DATE EXCAVATED: 7/19/2012

(Visual) SM (lab class) Bag sample taken from 12.0 to 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND						
GROUP SYMBOL (SEE USBR 5000, 5005) 3-5-2 12 5-16 10 10 SC 0.0 to 2.5 ft CLAYEY SAND: About 55% fine sand; about 45% fines with medium plasticity, no dilatancy, medium dry strength, medium toughness; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Reddish brown, dry, roots in top 1.5 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 2.5 ft (6419.0) SM 2.5 to 6.2 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with rapid dilatancy, low dry strength, low toughness; maximum size, fine sand, weak reaction with HCl. IN-PLACE CONDITION: Reddish brown, dry, intermittent calcite nodules. IN-PLACE CONDITION: Reddish brown, dry, intermittent calcite nodules. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 104.8 lbs. /cu ft. 3.9 % (89.9% compaction) LAB TEST DATA: 58.9% sand, 41.1% fines, LL= NIA, PI= N/P, SPG= 2.65 Maximum dry density= 116 files. / cu ft. optimum water content= 11.5% Laboratory classification is SILTY SAND S(CL) GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) SP-SM (visual) SM (idb class) (visual) SM (idb class) Bag sample taken from 12.0 to 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= NIA, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC (INTERPRETATION: Quaternary Alluvium (Qal)	I	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL			
medium plasticity, no dilatancy, medium dry strength, medium toughness; maximum size, fine sand; no reaction with HCI. IN-PLACE CONDITION: Reddish brown, dry, roots in top 1.5 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 2.5 to 6.2 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with rapid dilatancy, low dry strength, low toughness; maximum size, fine sand; weak reaction with HCI. IN-PLACE CONDITION: Reddish brown, dry, intermittent calcite nodules. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 104.8 lbs. / cu ft., 3 9 % (88.9 % compaction) LAB TEST DATA: 58.9% sand, 41.1% fines, LL= N/A, PI= N/P, SPG= 2.65 Maximum dry density= 116.6 lbs. / cu ft., optimum water content= 11.5% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.2 to 9.5 ft SANDY LEAN CLAY: About 60% fines with medium to high plasticity, high toughness, medium to high dry strength, strong reaction with HCL; about 40% fine sand; maximum size, fine sand. IN-PLACE CONDITION: Reddish-brown, dry, intermittent calcite nodules. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.5 ft (6412.0) SP-SM (visual) SM (lab class) IN-PLACE CONDITION: Brown in color, calcite cemented zone in bottom 0.3 ft. Bag sample taken from 12.0 to 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. Laboratory classification is SILTY SAND	DEPT		(SEE USBR 5000, 5005)	5	12	12
2.5 ft (6419.0) GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 2.5 to 6.2 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with rapid dilatancy, low dry strength, low toughness; maximum size, fine sand; weak reaction with HCl. IN-PLACE Density taken at 4.0 ft. 50 lb sample taken at 4.0 ft. 6.2 ft (6415.3) S(CL) GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.2 ft (6415.3) S(CL) GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.2 to 9.5 ft (6412.0) SP-SM (visual) SM (lab class) IN-PLACE CONDITION: Reddish-brown, dry, intermittent calcite nodules. IN-PLACE GONDITION: Reddish-brown, dry, intermittent calcite nodules. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.5 ft (6412.0) 9.5 ft (6412.0) 9.5 ft (6412.0) IN-PLACE CONDITION: Reddish-brown, dry, intermittent calcite nodules. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.5 to 13.5 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines, with rapid dilatancy, low dry strength; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown in color, calcite cemented zone in bottom 0.3 ft. Bag sample taken from 12.0 to 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	1-	SC	medium plasticity, no dilatancy, medium dry strength, medium toughness;			
2.5 ft (6419.0) SM 2.5 to 6.2 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with rapid dilatancy, low dry strength, low toughness; maximum size, fine sand; weak reaction with HCI. In-Place Density taken at 4.0 ft. IN-PLACE CONDITION: Reddish brown, dry, intermittent calcite nodules. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 104.8 lbs. / cu ft., 3.9 % (89.9% compaction) LAB TEST DATA: 58.9% sand, 41.1% fines, LL= N/A, PI= N/P, SPG= 2.65 Maximum dry density= 116.6lbs. / cu ft., optimum water content= 11.5% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.2 to 9.5 ft SANDY LEAN CLAY: About 60% fines with medium to high plasticity, high toughness, medium to high dry strength, strong reaction with HCL; about 40% fine sand; maximum size, fine sand. IN-PLACE CONDITION: Reddish-brown, dry, intermittent calcite nodules. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.5 ft (6412.0) 9.5 ft (6412.0) 9.5 to 13.5 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines, with rapid dilatancy, low dry strength; maximum size, fine sand; no reaction with HCI. IN-PLACE CONDITION: Brown in color, calcite cemented zone in bottom 0.3 ft. IN-PLACE CONDITION: Brown in color, calcite cemented zone in bottom 0.3 ft. Bag sample taken from 12.0 to 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND	-		IN-PLACE CONDITION: Reddish brown, dry, roots in top 1.5 ft.			
with rapid dilatancy, low dry strength, low toughness; maximum size, fine sand; weak reaction with HCl. In-Place Density taken at 4.0 ft. 50 lb sample taken at 4.0 ft. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 104.8 lbs. / cu ft., 3.9 %. (89.9% compaction) LAB TEST DATA: 58.9% sand, 41.1% fines, LL= N/A, Pl= N/P, SPG= 2.65 Maximum dry density= 116.6lbs. / cu ft., optimum water content= 11.5% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.2 ft (6415.3) S(CL) GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.2 to 9.5 ft SANDY LEAN CLAY: About 60% fines with medium to high plasticity, high toughness, medium to high dry strength, strong reaction with HCL; about 40% fine sand; maximum size, fine sand. IN-PLACE CONDITION: Reddish-brown, dry, intermittent calcite nodules. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.5 ft (6412.0) SP-SM (visual) SM (lab class) In-PLACE CONDITION: Brown in color, calcite cemented zone in bottom 0.3 ft. IN-PLACE CONDITION: Brown in color, calcite cemented zone in bottom 0.3 ft. Bag sample taken from 12.0 to 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, Pl= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	2 -	2.5 ft (6419.0)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
Density taken at 4.0 ft. 50 lb sample taken at 4.0 ft. 50 lb sample taken at 4.0 ft. 50 lb sample taken at 4.0 ft. 10 lb sample taken from 12.0 to 13.0 ft. 12 lb sample taken from 13 lb sample taken from 13 lb sample taken from 13 lb sample taken from 13 lb sample taken from 13 lb sample taken from 13 lb sample taken from 13 lb sample taken from 13 lb sample taken from 13 lb sample taken from 14 lb sample taken from 15 lb sample taken from	3 -		with rapid dilatancy, low dry strength, low toughness, maximum size, fine			
sample taken at 4.0 ft. Sample taken at 4.0 ft. Sample taken at 4.0 ft. Sample taken at 4.0 ft. Sample taken at 4.0 ft. Sample taken at 4.0 ft. Sample taken at 4.0 ft. Sample taken from at 4.0 ft. Sample taken from 12.0 to 13.0 ft. Sample taken from 12.0 to 13.0 ft. Sample taken from 13.0 ft. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 104.8 lbs. / cu ft., 3.9 % (89.9% compaction) LAB TEST DATA: 58.9% sand, 41.1% fines, LL= N/A, PI= N/P, SPG= 2.65 Maximum dry density= 116.6lbs. / cu ft., optimum water content= 11.5% LAB TEST DATA: 68.9% sand, 41.1% fines, LL= N/A, PI= N/P, SPG= 2.65 Maximum dry density= 116.6lbs. / cu ft., optimum water content= 11.5% LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND IN-PLACE CONDITION: Brown in color, calcite cemented zone in bottom 0.3 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	4 -	Density taken	IN-PLACE CONDITION: Reddish brown, dry, intermittent calcite nodules.			
Maximum dry density= 116.6lbs. / cu ft., optimum water content= 11.5% Laboratory classification is SILTY SAND S(CL) GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.2 to 9.5 ft SANDY LEAN CLAY: About 60% fines with medium to high plasticity, high toughness, medium to high dry strength, strong reaction with HCL; about 40% fine sand; maximum size, fine sand. IN-PLACE CONDITION: Reddish-brown, dry, intermittent calcite nodules. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.5 ft (6412.0) SP-SM (visual) SM (lab class) (visual) SM (lab class) IN-PLACE CONDITION: GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines, with rapid dilatancy, low dry strength; maximum size, fine sand; no reaction with HCl. IN-PLACE CONDITION: Brown in color, calcite cemented zone in bottom 0.3 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	5 —	sample taken	Total: 104.8 lbs. / cu ft., 3.9 %.(89.9% compaction)			
s(CL) GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.2 to 9.5 ft SANDY LEAN CLAY: About 60% fines with medium to high plasticity, high toughness, medium to high dry strength, strong reaction with HCL; about 40% fine sand; maximum size, fine sand. IN-PLACE CONDITION: Reddish-brown, dry, intermittent calcite nodules. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.5 ft (6412.0) SP-SM (visual) SM (lab class) (lab class) Bag sample taken from 12.0 to 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	6 -	6 2 ft (6415 3)	Maximum dry density= 116.6lbs. / cu ft., optimum water content= 11.5%			
8-	7/2	· · ·				
GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.5 ft (6412.0) SP-SM (visual) SM (lab class) Bag sample taken from 12.0 to 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	7 -	3(02)	plasticity, high toughness, medium to high dry strength, strong reaction with			
9 - 9.5 ft (6412.0) SP-SM (visual) SM (visual) SM (lab class) 10 - 10 - 11 - 12 - 12 - 12 - 13 - 13 - 13 - 13	8 -		IN-PLACE CONDITION: Reddish-brown, dry, intermittent calcite nodules.			
9.5 ft (6412.0) SP-SM (visual) SM (lab class) Bag sample taken from 12.0 to 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Oal)	-		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
(visual) SM (lab class) Bag sample taken from 12.0 to 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Oal)	9	9.5 ft (6412.0)				
Dag sample taken from 12.0 to 13.0 ft. BAG SAMPLE TAKEN FROM 12.0 TO 13.0 ft. LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Oal)	10-	(visual) SM	about 10% nonplastic fines, with rapid dilatancy, low dry strength;			
LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70 Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	11-					
L GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	12=		LAB TEST DATA: 65.3% sand, 34.7% fines, LL= N/A, PI= N/P, SPG= 2.70			
	13-	13.5 ft (6408.0)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

LOG OF TEST PIT NO. TPR22-77

SHEET 1 OF 2

FEATURE: Reach 22B

LOCATION: STATION 22943+19.14, 14.6' Right

COORDINATES: N 1,985,534 E 2,741,732

APPROXIMATE DIMENSIONS: 6.0' x 13.5' x 12.0'
DEPTH TO WATER: NE DATE: 7/19/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6433.6

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: C. BEYER

DATE EXCAVATED: 7/19/2012

DEPTH TO WATER:	NE DATE: 7/19/2012 DATE EXCAVATED: 7/19/2012			
± CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL	% PLUS 3 (BY VOLUM		
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SM	 0.0 to 3.3 ft SILTY SAND: About 65% fine sand; about 35% nonplastic fines with slow dilatancy, low dry strength; maximum size, fine sand; strong reaction with HCI. IN-PLACE CONDITION: Tan, roots in top 1.5 ft, dry. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 			
3.3 ft (6430.3)				
In-Place Density taken at 4.5 ft. 50 lb sample taken at 4.5 ft. Bag sample taken from 6.3 to 7.0 ft.	3.3 to 10.0 ft LEAN CLAY WITH SAND: About 80% fines with medium to high plasticity, no dilatancy, high toughness, medium to high dry strength; about 20% fine sand; maximum size, fine sand; strong reaction with HCI. lens of dark grey CL (LEAN CLAY) from 6.3 to 7.0 f, About 90% fines with high plasticity, high toughness, high dry strength; about 10% fine sand; strong reaction with HCI; bag sample taken. IN-PLACE CONDITION: Brown, dry, intermittent calcite nodules and veins. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 93.3 lbs. / cu ft., 5.5%. (81.3% compaction) LAB TEST DATA: 29.1% sand, 70.9% fines, LL= 27.9, PI= 10.9, SPG= 2.69 Maximum dry density= 114.7lbs. / cu ft., optimum water content=13.4% Laboratory classification is LEAN CLAY WITH SAND BAG SAMPLE TAKEN FROM 6.3 TO 7.0 ft. LAB TEST DATA: 7% sand, 93% fines, LL= 54.4, PI= 35.5, SPG= 2.65 Laboratory classification is FAT CLAY GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10.0 ft (6423.6)				
	RFACE VEGETATED WITH SAGE BRUSH AND GRASS. DISCONTINUED DUE	TO LIN	AIT C)F

7-1336-A	(1-86)
Duroou of	Peclamation

LOG OF TEST PIT NO. TPR22-77

SHEET 2 OF 2

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: STATION 22943+19.14, 14.6' Right

GROUND ELEVATION: 6433.6

COORDINATES: N 1,985,534 E 2,741,732

METHOD OF EXPLORATION: CASE 580N BACKHOE

APPROXIMATE DIMENSIONS: 6.0' x 13.5' x 12.0'
DEPTH TO WATER: NE DATE: 7/19/2012

LOGGED BY: C. BEYER
DATE EXCAVATED: 7/19/2012

DEI III 10 VIVII EIK.	Britz Error Willer			
≠ CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL	% PLUS 3 in (BY VOLUME)		
GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SANDSTONE	10.0 TO 13.5 FT SANDSTONE: Fine to medium grained argillaceous sandstone yellow to brown, becoming yellow to grey in color, decomposed (W9); very soft (H7); zones of white, non plastic calcite cement, strong reaction with HCl.			
Bag sample taken from 10.0 to 11.0 ft.	BAG SAMPLE TAKEN FROM 10.0 TO 11.0 ft. LAB TEST DATA: 86.5% sand, 13.5% fines, LL= N/A, PI= N/P, SPG= 2.68 Laboratory classification is: SILTY SAND			
13—	GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn).			
13.5 ft (6420.1)				
COMMENTS:		_		

LOG OF TEST PIT NO. TPR22-79

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22960+39.43, 228.8' Right

COORDINATES: N 1,984,391 E 2,740,789

APPROXIMATE DIMENSIONS: $6.0' \times 13.0' \times 3.0'$ DEPTH TO WATER: NE DATE: 7/19/2012 PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6448.4

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: C. BEYER

12 DATE EXCAVATED: 7/19/2012

CLASSIFICATION CLASSIFICATION AND DESCRIPTION OF MATERIAL GROUP SYMBOL (SEE USBR 5000, 5005) (SPEUS 3 in (BY VOLUME) 3 - 5 - PLUS 3 in (BY VOLUME)
GROUP 3- 5- PLUS
0000 0000 (0000 0000 0000 0000 0000 00
SYMBOL (SEE USBR 5000, 5005) 5 12 12 12 in in
SC (visual) 0.0 to 13.0 ft CLAYEY SAND: About 75% fine sand; about 25% fines with
CL-ML (lab medium plasticity, no dilatancy, medium dry strength, medium toughness;
class) maximum size, fine sand; no reaction with HCl in top 3.0 ft, weak reaction
with HCl below 3.0 ft.
IN-PLACE CONDITION: Reddish-brown, dry, roots in top 1.5 ft, intermittent calcite veins and nodules; highly calcite cemented zone from 8.7 to 9.5 ft.
IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 97.7 lbs. / cu ft., 5.1%. (85.5% compaction)
LAB TEST DATA: 32.0% sand, 68% fines, LL= 23.6, PI= 6.7, SPG= 2.69
Maximum dry density= 114.3 lbs. / cu ft., optimum water content= 12.7%
Laboratory classification is SANDY SILTY CLAY
GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)
5 –
In-Place
Density taken
at 4.0 ft. 50 lb
7 - sample taken at 4.0 ft.
4
8 -
9 —
10-
11-
12.0 # (6435.4)
13.0 ft (6435.4)

LOG OF TEST PIT NO. TPR22-80

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: STATION 22971+37.02, 153.5' Right

COORDINATES: N 1,983,863 E 2,739,824

APPROXIMATE DIMENSIONS: 6.0' x 13.5' x 10.0'

DEPTH TO WATER: NE DATE: 7/19/2012

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6480.9

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: C. BEYER

DATE EXCAVATED: 7/19/2012

LASSIFICATION CROUP SYMBOL CLASSIFICATION AND DESCRIPTION OF MATERIAL (REY VOCULME) 3. 5. PLUS 5. 12 5. 12 5. 12 5. 12 6.0 (1 (ada) 6.0 (1 (ad74.9)) CLASSIFICATION AND DESCRIPTION OF MATERIAL (REY VOCULME) (SEE USBR 5000, 5005) 3. 5. PLUS 6.0 (1 (ada) 6.0 (1 CLAYEY SAND: About 75% fine sand; about 25% fines with low plasticity, no dilatancy, medium dry strength, low toughness; maximum size, fine sand; strong reaction with HCI. IN-PLACE CONDITION: Reddish-brown, dry, roots in top 1.5 ft; intermittent calcite veins and nodules, well cemented. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 92.7 lbs. / cu ft., 5.9% (82.8% compaction) 1.AB TEST DATA 23.7% sand, 76.3% fines, LL= 27.2, Pl= 9.9, SPG= 2.67 Maximum dry density= 112. 0 lbs. / cu ft., originum water content= 14.5% Laboratory classification is LEAN CLAY WITH SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.0 ft (6474.9) 6.0 ft (6474.9) 6.0 to 13.5 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with slow dilatancy, low dry strength, no toughness; maximum size, fine sand; strong reaction with HCI. IN-PLACE CONDITION: Reddish-brown, calcite veins and nodules below 11.0 ft, dry. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	ᅵᅜᄃ	PIN IO WATER. I	NE DATE. //19/2012 DATE EXCAVATED. //19/2012			
SC (visual) (CL)s (lab class) 1	ОЕРТН	GROUP		3 - 5	5 - 12	JME) PLUS 12
SM 6.0 to 13.5 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with slow dilatancy, low dry strength, no toughness; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Reddish-brown, calcite veins and nodules below 11.0 ft, dry. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9- 10- 11- 12- 13- 13.5 ft (6467.4)	3 - 3 - 4 - 5 5	(CL)s (lab class) In-Place Density taken at 4.0 ft. 50 lb sample taken at 4.0 ft.	low plasticity, no dilatancy, medium dry strength, low toughness; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Reddish-brown, dry, roots in top 1.5 ft; intermittent calcite veins and nodules, well cemented. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 TO 4.5 ft. Total: 92.7 lbs. / cu ft., 5.9%. (82.8% compaction) LAB TEST DATA: 23.7% sand, 76.3% fines, LL= 27.2, PI= 9.9, SPG= 2.67 Maximum dry density= 112.0 lbs. / cu ft., optimum water content= 14.5% Laboratory classification is LEAN CLAY WITH SAND			
	7		fines with slow dilatancy, low dry strength, no toughness; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Reddish-brown, calcite veins and nodules below 11.0 ft, dry.			
			THE LEGISLATION WITH CASE PRINCIPLES CONTROL PROCESSION OF THE PRINCIPLE CONTROL PROCESSION OF THE PRINCIPLE CONTROL PRI		UT A	<u></u>

COMMENTS: SURFACE VEGETATED WITH SAGE BRUSH AND GRASS. DISCONTINUED DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-22

SHEET 1 OF 1

FEATURE: Reach 22B

L. ICGOII ZZL

LOCATION: PIPELINE
COORDINATES: N 2,050,922 E 2,751,289

APPROXIMATE DIMENSIONS: 12'x14'x12.6' DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5847.4

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/22/2014

CLASSIFICATION AND DESCRIPTION OF MATERIAL		1020	IME)
(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLU 12 in
0.0 to 3.3 ft CLAYEY SAND: About 70% fine to coarse sand; about 30% fines with low plasticity, low dry strength, low toughness and no dilatancy; maximum size, coarse sand; no reaction with HCl.			
IN-PLACE CONDITION: Brown and dry, homogeneous and moderate cementation. Roots and root casts down to 2.3 feet.			
GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
			L
3.3 to 6.3 ft POORLY GRADED SAND WITH SILT: About 90% fine to coarse sand, coarse, hard sand; subangular; about 10% fines with no plasticity, medium dry strength and rapid dilatancy; trace of fine to coarse, hard, angular gravel; maximum size, 50mm; strong reaction with HCI.			
IN-PLACE CONDITION: Brown to tan, dry, lensed and strong cementation. Calcium carbonate stringers present. In-place density overlaps stratigraphic units.			
IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 105.5 lbf/ft³ 7.0% (90% compaction) LAB TEST DATA: 49.8% sand, 49.8% fines, 0.4% gravel, LL= 24.1, Pl= 10.8, SPG= 2.57 Maximum dry density= 117.2 lbf/ft³, optimum water content= 14.4% Laboratory classification is CLAYEY SAND			
GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.3 to 12.1 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; strong reaction with HCI.			
IN-PLACE CONDITION: Gray and dry, homogeneous with a hard consistency. Hard to excavate and recovered in blocky 2 x 3 x 4 inch chunks. Calcium carbonate stringers throughout.			
GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
			+
12.1 to 12.6 ft SHALE: Dark gray in color. Fine grained shale. Very soft (H7) and fresh (W1). Fissile and slickensided. No reaction with HCl. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)			
	0.0 to 3.3 ft CLAYEY SAND: About 70% fine to coarse sand; about 30% fines with low plasticity, low dry strength, low toughness and no dilatancy; maximum size, coarse sand; no reaction with HCI. IN-PLACE CONDITION: Brown and dry, homogeneous and moderate cementation. Roots and root casts down to 2.3 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 3.3 to 6.3 ft POORLY GRADED SAND WITH SILT: About 90% fine to coarse sand, coarse, hard sand; subangular; about 10% fines with no plasticity, medium dry strength and rapid dilatancy; trace of fine to coarse, hard, angular gravel; maximum size, 50mm; strong reaction with HCI. IN-PLACE CONDITION: Brown to tan, dry, lensed and strong cementation. Calcium carbonate stringers present. In-place density overlaps stratigraphic units. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 105.5 lbfft ⁸ 7.0% (90% compaction) LAB TEST DATA: 49.8% sand, 49.8% fines, 0.4% gravel, LL= 24.1, Pl= 10.8, SPG= 2.57 Maximum dry density= 117.2 lbf/ft³, optimum water content= 14.4% Laboratory classification is CLAYEY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.3 to 12.1 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; strong reaction with HCI. IN-PLACE CONDITION: Gray and dry, homogeneous with a hard consistency. Hard to excavate and recovered in blocky 2 x 3 x 4 inch chunks. Calcium carbonate stringers throughout. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 12.1 to 12.6 ft SHALE: Dark gray in color. Fine grained shale. Very soft (H7) and fresh (W1). Fissile and slickensided. No reaction with HCI.	in 0.0 to 3.3 ft CLAYEY SAND: About 70% fine to coarse sand; about 30% fines with low plasticity, low dry strength, low toughness and no dilatancy; maximum size, coarse sand; no reaction with HCI. IN-PLACE CONDITION: Brown and dry, homogeneous and moderate cementation. Roots and root casts down to 2.3 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 3.3 to 6.3 ft POORLY GRADED SAND WITH SILT: About 90% fine to coarse sand, coarse, hard sand; subangular, about 10% fines with no plasticity, medium dry strength and rapid dilatancy; trace of fine to coarse, hard, angular gravel; maximum size, 50mm; strong reaction with HCI. IN-PLACE CONDITION: Brown to tan, dry, lensed and strong cementation. Calcium carbonate stringers present. In-place density overlaps stratigraphic units. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 105.5 lbifft ³ 7.0% (90% compaction) LAB TEST DATA: 49.8% sand, 49.8% fines, 0.4% gravel, LL= 24.1, Pl= 10.8, SPG= 2.57 Maximum dry density= 117.2 lbifft ³ , optimum water content= 14.4% Laboratory classification is CLAYEY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.3 to 12.1 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; strong reaction with HCI. IN-PLACE CONDITION: Gray and dry, homogeneous with a hard consistency. Hard to excavate and recovered in blocky 2 x 3 x 4 inch chunks. Calcium carbonate stringers throughout. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 12.1 to 12.6 ft SHALE: Dark gray in color. Fine grained shale. Very soft (H7) and fresh (W1). Fissile and slickensided. No reaction with HCI.	in in in in in in in in in in in in in i

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22B-14-23

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,050,287 E 2,751,105 APPROXIMATE DIMENSIONS: 12'x14'x10'

DEPTH TO WATER: NE DATE: NA

GROUND ELEVATION: 5838.3

METHOD OF EXPLORATION: CASE 680L BACKHOE

PROJECT: Navajo Gallup Water Supply Project

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/22/2014

DEPTH TO WATER.	NE DATE, NA DATE EXCAVATED, 9/22/2014			
CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)		VOLU 5 - 12	
SM In-place density taken at 6.0 ft.	0.0 to 6.8 ft SILTY SAND: About 70% fine to coarse, hard, subangular to subrounded sand; about 30% nonplastic fines with medium dry strength and rapid dilatancy; trace of hard, subangular to subrounded, gravel; maximum size, 75mm; no reaction with HCI. IN-PLACE CONDITION: Brown and dry, homogeneous and moderate cementation. Roots down to 4.0 feet. Easy excavation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 105.2 lbf/ff³ 3.8% (91.5% compaction) LAB TEST DATA: 22.5% fines, 76.6% sand, 0.9% gravel, LL= NA, PI= NP, SPG= 2.54 Maximum dry density= 115.0 lbf/ff³, optimum water content= 13.3% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	o in	in 12	in in
6.8 ft (5831.5) 7 SANDSTONE 8 - 10.0 ft (5828.3)	6.8 to 10.0 ft SANDSTONE: Fine to medium grain sandstone. Light brown to dark brown, orange and white. Very soft (H7) and intensely weathered (W7). Hard to excavate and recovered in 2 x 3 x 6 inch chunks. Because of the soft nature of the sandstone, it may be classified as "POORLY GRADED SAND WITH SILT" that is strongly cemented using the Unified Soil Classification System. Weak reaction with HCI. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)			
	DEACE VEGETATION CONCICTS OF SACE AND CDASSES. DISCONTINUED I			

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE AND GRASSES. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22B-14-24

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,049,059 E 2,751,049

APPROXIMATE DIMENSIONS: 12'x14'x16'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5837.5

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/22/2014

SM 0.0 to 4.2 ft SILTY SAND: About 75% predominantly fine sand; about 25% nonplastic fines with low dry strength and rapid dilatancy; maximum size, medium sand; weak reaction with HCI. IN-PLACE CONDITION: Brown and dry, lensed with POORLY GRADED SAND and strong cementation. Roots down to 4.2 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.2 ft (5833.3) SP (visual) SP-SM (lab class) In-place density taken at 6.0 ft. IN-PLACE CONDITION: Brown to tan, dry and weak cementation. Roots down to 4.2 feet. Easy excavation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 101.8 lbf/ft³ 1.0% (91.2% relative compaction) LAB TEST DATA: 7.6% fines, 91.1% sand, 1.3% gravel, LL= NA, Pl= NP, SPG= 2.39 Maximum dry density= 111.6 lbf/ft³, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND WITH SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.0 to 16.0 ft SILTY SAND: About 85% fine to medium sand; about 15% nonplastic fines with low dry strength and rapid dilatancy; maximum size, medium sand; weak reaction to HCI. IN-PLACE CONDITION: Brown and dry, lensed with POORLY GRADED SAND and strong cementation. Two gallon bag corrosion sample taken at 10.0 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	DEPTH TO WATER: N	E DATE: NA DATE EXCAVATED: 9/22/2014			
SM O.0 to 4.2 ft SILTY SAND: About 75% predominantly fine sand; about 25% nonplastic fines with low dry strength and rapid dilatancy; maximum size, medium sand; weak reaction with HCl. IN-PLACE CONDITION: Brown and dry, lensed with POORLY GRADED SAND and strong cementation. Roots down to 4.2 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) SP-SM (lab class) In-place density taken at 6.0 ft. IN-PLACE CONDITION: Brown to tan, dry and weak cementation. Roots down to 4.2 feet. Easy excavation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 101.8 lbfff* 1.0% (91.2% relative compaction) SPG=2.39 Maximum dry density= 111.6 lbfff*, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND WITH SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.0 to 16.0 ft SILTY SAND: About 85% fine to medium sand; about 15% nonplastic fines with low dry strength and rapid dilatancy; maximum size, medium sand; weak reaction to HCl. IN-PLACE CONDITION: Brown and dry, lensed with POORLY GRADED SAND and strong cementation. Two gallon bag corrosion sample taken at 10.0 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 16.0 ft (5821.5)	GROUP		(BY	VOLU	
SP (visual) SP-SM (lab class) In-place density taken at 6.0 ft. SM SM SM Corrosion sample taken at 10.0 ft. Corrosion Sand Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sand Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft. Corrosion Sample taken at 10.0 ft.	2 - 3	nonplastic fines with low dry strength and rapid dilatancy; maximum size, medium sand; weak reaction with HCl. IN-PLACE CONDITION: Brown and dry, lensed with POORLY GRADED SAND and strong cementation. Roots down to 4.2 feet.	Ю		ın
SPG= 2.39 Maximum dry density= 111.6 lbf/ft³, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND WITH SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.0 to 16.0 ft SILTY SAND: About 85% fine to medium sand; about 15% nonplastic fines with low dry strength and rapid dilatancy; maximum size, medium sand; weak reaction to HCI. IN-PLACE CONDITION: Brown and dry, lensed with POORLY GRADED SAND and strong cementation. Two gallon bag corrosion sample taken at 10.0 ft. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	SP (visual) SP-SM (lab class) In-place density taken at 6.0 ft.	subrounded sand; about 5% nonplastic fines with no dry strength and rapid dilatancy; trace of hard, subrounded gravel; maximum size, 50mm; no reaction to HCI. IN-PLACE CONDITION: Brown to tan, dry and weak cementation. Roots down to 4.2 feet. Easy excavation. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 101.8 lbf/ft³ 1.0% (91.2% relative compaction)			
16.0 ft (5821.5)	SM SM Corrosion sample taken at 10.0 ft.	SPG= 2.39 Maximum dry density= 111.6 lbf/ft³, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND WITH SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.0 to 16.0 ft SILTY SAND: About 85% fine to medium sand; about 15% nonplastic fines with low dry strength and rapid dilatancy; maximum size, medium sand; weak reaction to HCI. IN-PLACE CONDITION: Brown and dry, lensed with POORLY GRADED SAND and strong cementation. Two gallon bag corrosion sample taken at 10.0 ft.			
	16.0 ft (5821.5)				

COMMENTS: SURFACE VEGETATION CONSISTS OF CACTI, GRASSES AND SCRUB BRUSH. DISCONTINUED HOLE DUE TO THE LIMIT OF THE EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-26

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,046,693 E 2,750,871 APPROXIMATE DIMENSIONS: 12'x14'x15'

DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5829.1

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER DATE EXCAVATED: 9/23/2014

DEPTH TO WATER: N	E DATE: NA BATE EXOAVATED: 0/20/2011			
CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS : VOLU	
GROUP		3 -		PLU
SYMBOL	(SEE USBR 5000, 5005)	5 in	12 in	12 in
SM	0.0 to 12.0 ft SILTY SAND: About 75% fine to coarse, subrounded sand; about 25% nonplastic fines with low dry strength and rapid dilatancy; trace			
	of hard, subrounded, fine to coarse gravel; maximum size, 50mm; no reaction with HCl.			
	IN-PLACE CONDITION: Brown to tan, dry, lensed with POORLY GRADED SAND, POORLY GRADED SAND WITH SILT 1 to 8 inches in width. Weak cementation. Roots down to 12.0 feet.			
	Two gallon bag corrosion sample taken at 10.0 ft.			
1	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft.			
In-place	Total: 95.4 lbf/ft³ 1.6% (88.7% relative compaction) LAB TEST DATA: 12.7% fines, 87.3% sand, 0.0% gravel, LL= NA, PI= NP,			
density taken	SPG= 2.62			
at 6.0 ft.	Maximum dry density= 107.5 lbf/ft³. Laboratory classification is SILTY SAND			
sample taken				
at 10.0 ft.	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
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-]				
12.0 ft (5817.1)			<u> </u>	L
SP	12.0 to 15.0 ft POORLY GRADED SAND: About 95% fine to medium sand;			
3=	about 5% nonplastic fines with no dry strength and rapid dilatancy; maximum size, medium sand; no reaction with HCl.			
1 1	IN-PLACE CONDITION: Tan, moist and homogeneous.			
15.0 ft (5814.1)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			L
5-				
	L CONTROL OF A STAND OF AND HANDE	-D		

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, GREASEWOOD AND JUNIPER. DISCONTINUED HOLE DUE TO THE LIMIT OF THE EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-27

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,045,591 E 2,750,776

APPROXIMATE DIMENSIONS: 12'x14'x17'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5850.7

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/23/2014

_ CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLU: 12 in
SM 1 -	0.0 to 15.2 ft SILTY SAND: About 80% predominantly fine sand; about 20% nonplastic fines with low dry strength and rapid dilatancy; trace of coarse sand, hard, subrounded, fine to coarse gravel and cobbles; maximum size, 125mm; weak to strong reaction with HCI. IN-PLACE CONDITION: Brown and dry. Lens of POORLY GRADED SAND at 4.8 feet. Lens is 2 inches to 1 foot thick, is the length of the trench and contains coarse, hard, subrounded sand with a trace of gravel. Roots down to 8.0 ft. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 96.1 lbf/ft³ 3.6% (82.6% compaction) LAB TEST DATA: 27.8% fines, 71.9% sand, 0.3% gravel, LL= NA, PI= NP, SPG= 2.55 Maximum dry density= 116.3 lbf/ft³, optimum water content= 11.9% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	t		
15.2 ft (5835.5)				+
SM 16- 17.0 ft (5833.7)	15.2 to 17.0 ft SILTY SAND: About 65% fine to medium sand; about 35% nonplastic fines with medium dry strength and rapid dilatancy; maximum size, coarse sand; strong reaction with HCI.			
17	IN-PLACE CONDITION: Brown,dry and homogeneous. Calcium carbonate nodules present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qai)	TIN!	LED.	

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND GREASEWOOD. DISCONTINUED HOLE DUE TO THE LIMIT OF THE EQUIPMENT.

7-1336-A (1-86) LOG OF TEST PIT NO. TPR22B-14-28 SHEET 1 OF 1 Bureau of Reclamation PROJECT: Navajo Gallup Water Supply Project FEATURE: Reach 22B LOCATION: PIPELINE **GROUND ELEVATION: 5869.3** METHOD OF EXPLORATION: CASE 680L BACKHOE COORDINATES: N 2,044,324 E 2,750,477 APPROXIMATE DIMENSIONS: 12'x14'x16' LOGGED BY: P. GARDNER DEPTH TO WATER: NE DATE: NA DATE EXCAVATED: 9/23/2014 % PLUS 3 in (BY VOLUME) CLASSIFICATION AND DESCRIPTION OF MATERIAL CLASSIFICATION **GROUP** 5 -PLUS **SYMBOL** (SEE USBR 5000, 5005) 12 12 in in SM 0.0 to 1.8 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with medium dry strength and rapid dilatancy; maximum size, fine sand; no reaction with HCI. 1.8 ft (5867.5) IN-PLACE CONDITION: Light brown and dry. Moderate cementation and 2 SM homogeneous. Roots down to 8.0 feet. 3 GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 1.8 to 4.2 ft SILTY SAND: About 85% fine to coarse sand; about 15% 4.2 ft (5865.1) nonplastic fines with low dry strength and rapid dilatancy; trace of hard, 4 subrounded, fine gravel; maximum size, 30mm; no reaction with HCl. SP 5 -(visual) IN-PLACE CONDITION: Light brown, tan and dry. Moderately cemented. SP-SM (lab Lensed with POORLY GRADED SAND with Fine Gravel . Lenses are 2 to

class) 3 inches thick and up to 2 feet long. 6 GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.2 to 16.0 ft POORLY GRADED SAND: About 95% fine to coarse, hard, angular to rounded sand; about 5% nonplastic fines with no dry strength and rapid dilatancy; trace of hard, angular, fine to coarse gravels; maximum size, 30mm; no reaction with HCI. 9 . IN-PLACE CONDITION: Tan and dry and homogeneous. In-place 10density taken IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. at 6.0 ft. Total: 99.7 lbf/ft3 0.6% (87.4% relative compaction) LAB TEST DATA: 11.2% fines, 88.7% sand, 0.1% gravel, LL= NA, PI= NP, 11 SPG= 2.40 Maximum dry density= 114.1 lbf/ft³, optimum water content= N/A% 12-Laboratory classification is POORLY GRADED SAND WITH SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13-14-15 16.0 ft (5853.3)

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE, GRASSES AND JUNIPER. DISCONTINUED HOLE DUE TO THE LIMIT OF THE EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-30

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,040,702 E 2,750,485

APPROXIMATE DIMENSIONS: 2'x12'x4'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5929.3

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/23/2014

DEPTH TO WATER. T	NE DATE. NA	_		
_ CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL	% F (BY	PLUS VOLU	3 in IME)
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5	5 - 12	PLU: 12
STIMBOL	(SEE GOBIN 5000)	in	in	in
SM	0.0 to 1.7 ft SILTY SAND: About 75% fine sand; about 25% nonplastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; no			
1	reaction with HCl.			
=	IN-PLACE CONDITION: Brown, dry and homogeneous.			
	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
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j				
1.7 ft (5927.6)		-		
SANDSTONE	1.7 to 4.0 ft SANDSTONE: Fine to medium grained sandstone. Orange to brown to yellow in color. Intensely weathered (W7) and moderately soft (H5). No reaction with HCl.			
1	GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)			
3 —				
-				
_				
4.0 ft (5925.3)				
4				
	DANGE OF AND OFFICE			_

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE, GRASSES, CEDAR AND GREASE WOOD. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22B-14-31

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,039,933 E 2,750,598

APPROXIMATE DIMENSIONS: 8'x12'x6.6'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5913.5

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/24/2014

DEFINIO WATER.	NE DATE. WA			
± CLASSIFICATIO	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
王 CLASSIFICATIO GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5	5 - 12	PLU 12
		in	in	in
SP-SM	0.0 to 4.7 ft POORLY GRADED SAND WITH SILT: About 90% fine to medium sand; about 10% nonplastic fines with low dry strength and rapid dilatancy; trace of gravel; maximum size, 40mm; no reaction with HCl.			
1 -	IN-PLACE CONDITION: Brown and dry. Moderate cementation and lensed with LEAN CLAY 5 inch thick and 2 feet in length. Roots down to 4.0 feet.			
	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2 —				
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3 –				
-				
:=				
4 -				
4.7 ft (5908.8)				
SP	4.7 to 5.8 ft POORLY GRADED SAND: About 95% fine to coarse, hard, angular to rounded sand; about 5% nonplastic fines with no dry strength and rapid dilatancy; trace of hard, subangular to rounded, fine to coarse gravels; maximum size, 50mm; no reaction with HCl.			
5.8 ft (5907.7)	IN-PLACE CONDITION: Brown to tan with black. Dry and homogeneous.			
	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
6.6 ft (5906.9)	5.8 to 6.6 ft SANDSTONE: Fine to coarse grained sandstone. Light brown to brown and tan in color. Slightly weathered (W3) and moderately hard (H4). No reaction with HCl.			
1			11	

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND SAGE BRUSH. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22B-14-32

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,038,358 E 2,750,754

APPROXIMATE DIMENSIONS: 6'x12'x6'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5919.9

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/24/2014

_	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL	% PLUS 3 (BY VOLUM				
DEPTH	GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLU 12 in		
1 2	SP-SM 1.2 ft (5918.7) SM	0.0 to 1.2 ft POORLY GRADED SAND WITH SILT: About 90% fine to coarse, hard, subangular to subrounded sand; about 10% nonplastic fines with low dry strength and rapid dilatancy; trace of soft, angular fine gravel; maximum size, 20mm; no reaction with HCl. IN-PLACE CONDITION: Brown and dry. Weak cementation and lensed with 1 inch wide and 12 inches in length SILTY SAND. Roots down to 6.0 feet. GEOLOGICSNITYRAND: ANIONI 79% forestopy with inches with medium dry strength and slow dilatancy; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry and homogeneous. Strong cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)					
3 -	3.3 ft (5916.6)						
4	SANDSTONE	3.3 to 6.0 ft SANDSTONE: Fine grained sandstone. Gray with black specs and mica. Moderately weathered (W5) and soft (H6). No reaction with HCI. Recovered in 1 x 6 x 12 inch flat chunks. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)					
6 -	6.0 ft (5913.9)				L		
<u></u>	MMENTS: SHE	RFACE VEGETATION CONSISTS OF GRASSES AND GREASE WOOD. DISCON	ITINI	JED			

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND GREASE WOOD. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22B-14-34

SHEET 1 OF 1

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: PIPELINE

GROUND ELEVATION: 5928.1

COORDINATES: N 2,035,983 E 2,750,398

METHOD OF EXPLORATION: CASE 680L BACKHOE

APPROXIMATE DIMENSIONS: 2'x10'x3' DEPTH TO WATER: NE DATE: NA

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/24/2014

DEPTH TO WAT	ER: NE	DATE: NA DATE EXCAVATED: 9/24/2014			
± CLASSIFICA	ATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
E CLASSIFICA GROUF SYMBO	>	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SP-SN	Л	0.0 to 1.3 ft POORLY GRADED SAND WITH SILT: About 90% fine to coarse, hard, subangular to subrounded sand; about 10% nonplastic fines with no dry strength and rapid dilatancy; trace of hard, subrounded, fine and coarse gravel; maximum size, 75mm; no reaction with HCI.			
,_		IN-PLACE CONDITION: Brown and dry. Weak cementation and lensed with POORLY GRADED SAND. Roots down to 3.0 feet.			
		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
1 -					
- 1.3 ft (592	6.8)				
SANDSTO	ONE	1.3 to 3.0 ft SANDSTONE: Fine grained, gray with black specs and mica. Intensely weathered (W7) and soft (H6). No reaction with HCl. Recovered in 2 x 2 x 4 inch chunks. Roots recovered in sandstone through 3.0 feet.			
		GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)			
2 —					
3.0 ft (592	5.1)				
CMARTNER	CLIDE	ACE VECETATION CONCISTS OF CDASSES AND SACE BRIGH DISCON	ITIMIJE	$\overline{}$	

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND SAGE BRUSH. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22B-14-36

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,033,668 E 2,749,696

APPROXIMATE DIMENSIONS: 12'x14'x16.5'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5939.0

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/24/2014

DEPTH TO WATER.	NE DATE. NA			
± CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SP (visual) SP-SM (lab class)	0.0 to 6.2 ft POORLY GRADED SAND: About 95% fine to coarse, hard, subrounded sand; about 5% nonplastic fines with low dry strength and rapid dilatancy; trace of hard, subangular to subrounded, fine to coarse gravel; maximum size, 50mm; no reaction with HCI.			
In-place density taken at 6.0 ft.	IN-PLACE CONDITION: Tan and dry. Lensed with POORLY GRADED SAND, 1 inch in width and 3 feet in length, coarse. Weak cementation above 1.7 feet, strongly cemented below. Roots down to to 4.0 feet. Easy excavation. In-place density overlaps stratigraphic unit.			
6.2 ft (5932.8)	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 98.6 lbf/ft³ 1.9% (88.9% relative compaction) LAB TEST DATA: 9.5% fines, 90.3% sand, 0.2% gravel, LL= NA, PI= NP, SPG= 2.41			
SP-SM	Maximum dry density= 110.9 lbf/ft³, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND WITH SILT			
8 - - 9 - - 10 -	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.2 to 14.5 ft POORLY GRADED SAND WITH SILT: About 90% fine to medium sand; about 10% nonplastic fines with low dry strength and rapid dilatancy; trace of hard, subangular and subrounded, fine gravel; maximum size, 20mm; no reaction with HCI.			
11-	IN-PLACE CONDITION: Brown to tan and dry, becoming moist below 10.2 feet. Strong cementation and lensed with POORLY GRADED SAND.			
12 — - - - 13 — -	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14.5 ft (5924.5)		-		-
SP 16-16.5 ft (5922.5)	14.5 to 16.5 ft POORLY GRADED SAND: About 95% fine to coarse, subrounded sand; about 5% nonplastic fines with no dry strength and rapid dilatancy; trace of hard, angular to subrounded gravels; maximum size,			
10.0 it (0922.0)	60mm; no reaction with HCl. IN-PLACE CONDITION: Tan and moist, becoming wet below 15.0 feet. Homogeneous.			
	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
COMMENTS: SU	I REACE VEGETATION CONSISTS OF GRASSES AND GOLDEN ROD. DISCONT	LINU	ED	

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND GOLDEN ROD. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

7-1336-A Bureau d	A (1-86) of Reclamation	LOG OF TEST PI	T NO. TPR22B-14-38	SHE	EET ′	1 OF :	2
LOCATIO COORDII APPROX	IMATE DIME		PROJECT: Navajo Gallup Water Supply Project GROUND ELEVATION: 5950.2 METHOD OF EXPLORATION: CASE 680L ELOGGED BY: P. GARDNER DATE EXCAVATED: 9/24/2014		E		
± CLAS	SIFICATION SROUP SYMBOL	CLASSIFICATION AND [DESCRIPTION OF MATERIAL BR 5000, 5005)		3 - 5	12	ME) PLUS 12
1 - 1.4 f 2 - 2.4 s 3 - den 5 - den 6 - 6.2 f 7 - 12.8 10 - 11 - 12.8 13 - 14 - 15 - 15 - 15 - 15 - 15 - 15 - 15	SC ft (5948.8) R(5948.8) R(5948.8) SM Yislael sity taken at 6.0 ft. ft (5944.0) S(CL) ft (5937.4) SP ft (5934.2)	0.0 to 1.4 ft CLAYEY SAND: Abo fines with low plasticity, high dry s dilatancy; no reaction with HCI. IN-PLACE CONDITION: Brown a cementation. Roots down to 3 feet GEOLOGIC INTERPRETATION: 1.4 to 2.4 ft POORLY GRADED S medium sand; about 10% nonplass strength; trace of coarse sand; may with HCI. IN-PLACE CONDITION: Tan and cementation. Roots down to 3.0 ft GEOLOGIC INTERPRETATION: 2.4 to 6.2 ft SILTY SAND: About nonplastic fines with medium dry subangular to subrounded, fine gr with HCI. IN-PLACE CONDITION: Brown, 6.3.0 feet. In-place density overlaps stratigral IN-PLACE UNIT WEIGHT AND M Total: 98.0 lbf/ft³ 4.5% (83.3% cor LAB TEST DATA: 52.8% fines, 464.9, SPG= 2.44 Maximum dry density= 117.7 lbf/ft Laboratory classification is SILTY GEOLOGIC INTERPRETATION: 6.2 to 12.8 ft SANDY LEAN CLAY toughness, high dry strength and maximum size, fine sand; strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong relationship in the sand strong rel	ut 75% fine to medium sand; about 25% strength, low toughness and slow and dry, homogeneous and strong et. Quaternary Alluvium (Qal) AND WITH SILT: About 90% fine to stic fines with rapid dilatancy and no dry aximum size, coarse sand; no reaction I dry, homogeneous and weak reet. Quaternary Alluvium (Qal) 80% fine to coarse sand; about 20% strength and rapid dilatancy; trace of hard ravel; maximum size, 20mm; no reaction dry and homogeneous. Roots down to aphic unit. IOISTURE FROM 6.0 ft. Inpaction) 6.6% sand, 0.6% gravel, LL= 21.4, PI= 14°, optimum water content= 12.3% SANDY CLAY Quaternary Alluvium (Qal) 7°: About 55% fines with low plasticity, low no dilatancy; about 45% fine sand; reaction with HCl. dry and homogeneous.		5 in	12 in	12 in
СОММЕ		nonplastic fines with rapid dilatand fine sand; no reaction with HCl. RFACE VEGETATION CONSISTS OF	O SAND: About 95% fine sand; about 5% by and no dry strength; maximum size, F GRASSES AND HEAVY SAGE BRUSH				
	DIS	CONTINUED HOLE DUE TO LIMIT (OF EQUIPMENT.				

7 B	'-1336-A (1-86) Bureau of Reclamation	LOG OF TEST PI	Γ NO. TPR22B-14-38	SHI	EET :	2 OF	2
	ATURE: Reach 22B		PROJECT: Navajo Gallup Water Supply Proje	ct			
LO	CATION: PIPELINE		GROUND ELEVATION: 5950.2				
cc	ORDINATES: N 2,0	31,213 E 2,749,670	METHOD OF EXPLORATION: CASE 680L	3ACKHO	E		- 1
AP	PROXIMATE DIMEN	NSIONS: 12'x14'x16'	LOGGED BY: P. GARDNER				
DE	PTH TO WATER: 1	NE DATE: NA	DATE EXCAVATED: 9/24/2014				
DEPTH	(F				LUS VOLU 5 -		
DEF	GROUP SYMBOL	(SEE USE	R 5000, 5005)		5 in	12 in	12 in
		IN-PLACE CONDITION: White, do excavation and sloughing below 13 GEOLOGIC INTERPRETATION:					
cc	I DMMENTS:						-

n = 8 = 8

a 8

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LOG OF TEST PIT NO. TPR22B-14-39

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,030,063 E 2,749,779

APPROXIMATE DIMENSIONS: 12'x14'x16'

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5951.0

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/25/2014

DEPTH TO WATER: 1	NE DATE: NA DATE EXCAVATED: 9/25/2014			
≠ CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
s(CL) 1 - 1.3 ft (5949.7) CL (visual) (CL)s (lab class) In-place density taken at 6.0 ft.	0.0 to 1.3 ft SANDY LEAN CLAY: About 70% fines with low plasticity, low toughness, high dry strength and slow dilatancy; about 30% fine sand; maximum size, medium sand; strong reaction with HCl. IN-PLACE CONDITION: Brown to gray, dry and blocky. Firm consistency and lots of roots. Calcium carbonate stringers and nodules. Roots down to 6.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 1.3 to 9.6 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; strong reaction with HCl. IN-PLACE CONDITION: Brown, moist and homogeneous. Hard consistency. Calcium carbonate stringers and nodules. Roots down to 6.0 feet. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 83.7 lbf/ft³ 14.3% (79.3% compaction) LAB TEST DATA: 84.2% fines, 15.7% sand, 0.1% gravel, LL= 41.0, Pl= 21.5, SPG= 2.37 Maximum dry density= 105.6 lbf/ft³, optimum water content= 19.8%			
9.6 ft (5941.4) SM	Laboratory classification is LEAN CLAY WITH SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 9.6 to 16.0 ft SILTY SAND: About 70% fine to medium sand; about 30% nonplastic fines with no dry strength and rapid dilatancy; maximum size,			
Corrosion sample taken at 10.0 ft.	medium sand; no reaction with HCl. IN-PLACE CONDITION: Reddish brown, moist and homogeneous. Weak cementation. Two gallon bag corrosion sample taken at 10.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
16.0 ft (5935.0)				

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, HEAVY SAGE BRUSH, GREASEWOOD AND TAMARISK. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-40

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,028,911 E 2,749,941

APPROXIMATE DIMENSIONS: 12'x14'x16'

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5969.9

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/25/2014

DEPTH TO WATER: N	NE DATE: NA DATE EXCAVATED: 9/25/2014			
	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
s(CL) 1 - 1.4 ft (5968.5) SM 3	0.0 to 1.4 ft SANDY LEAN CLAY: About 60% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 40% fine to medium sand; maximum size, medium sand; weak reaction with HCl. IN-PLACE CONDITION: Brown, dry and homogeneous. Hard consistency and excavated in blocky chunks. Calcium carbonate stringers and nodules. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 1.4 to 16.0 ft SILTY SAND: About 75% fine to medium sand; about 25% nonplastic fines with low dry strength and rapid dilatancy; trace of hard, subrounded, fine gravel; maximum size, 20mm; weak reaction with HCl. IN-PLACE CONDITION: Light brown to tan, dry, lensed and stratified. Lenses of coarse POORLY GRADED SAND that vary from 2 to 6 inches in width and from 2 feet to the length of the trench. Weak cementation. Calcium carbonate stringers and nodules. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 94.1 lbf/ft³ 2.7% (79.4% compaction) LAB TEST DATA: 26.5% fines, 73.2% sand, 0.3% gravel, LL= NA, Pl= NP, SPG= 2.22 Maximum dry density= 118.5 lbf/ft³, optimum water content= 10.7% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
16.0 ft (5953.9)				

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH AND GREASE WOOD. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-42

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,026,204 E 2,750,278

APPROXIMATE DIMENSIONS: 12'x14'x17'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5997.0

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/25/2014

	1 111 10 10 11211	2,112,111			
	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS (VOLU	
DEPTH	GROUP		3 -		PLUS
۵	SYMBOL	(SEE USBR 5000, 5005)	5 in	12 in	12 in
-	SM	0.0 to 6.3 ft SILTY SAND: About 75% fine to medium sand; about 25%			
1	J	nonplastic fines with medium dry strength and slow dilatancy; trace of			
1 7		hard, flat, fine to coarse gravel; maximum size, 30mm; no reaction with HCl.			
2					
3	In-place	IN-PLACE CONDITION: Brown, dry and lensed. Lenses and pockets of coarse POORLY GRADED SAND that are about 8 inches in width and up			
100	density taken at 6.0 ft.	to 3 feet in length. Strong cementation. Roots down to 8.0 feet.			
4 -	G. 5.5	In-place density overlaps stratigraphic units.			
- 3		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft.			
5		Total: 93.8 lbf/ft³ 3.6% (82.6% compaction) LAB TEST DATA: 30.2% fines, 69.8% sand, 0.0% gravel, LL= NA, PI= NP,			
6 -	6.3 ft (5990.7)	SPG= 2.64			
	SM	Maximum dry density= 113.6 lbf/ft³, optimum water content= 13.6% Laboratory classification is SILTY SAND			
7		GEON OXOCH INTERMEDATAD NUT QOMETIMA IN A MUNICIPAL COMMENTAL COMM			
8		fines with high dry strength and rapid dilatancy; maximum size, medium			
3.2		sand; no reaction with HCl.			
9 -		IN-PLACE CONDITION: Brown, dry and lensed with POORLY GRADED			
10-		SAND. Strong cementation. Roots down to 8.0 feet.			
3	,	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
11-					
12					
127					
13-					
14					
15					
16-					
17-	17.0 ft (5980.0)				
	MARKENTO OUT	PEACE VECETATION CONCICTS OF CRASSES SACE PRIJED AND HANDER			

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH AND JUNIPER. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

7-1336-A (1-86) Bureau of Reclamation SHEET 1 OF 1 LOG OF TEST PIT NO. TPR22B-14-43 PROJECT: Navajo Gallup Water Supply Project FEATURE: Reach 22B **GROUND ELEVATION: 6060.0** LOCATION: PIPELINE METHOD OF EXPLORATION: CASE 680L BACKHOE COORDINATES: N 2,025,296 E 2,750,343 LOGGED BY: J. GILBERT APPROXIMATE DIMENSIONS: 12'x15'x15.8' DEPTH TO WATER: NE DATE: NA DATE EXCAVATED: 10/16/2014 % PLUS 3 in (BY VOLUME) CLASSIFICATION AND DESCRIPTION OF MATERIAL CLASSIFICATION **GROUP** PLUS 5 -(SEE USBR 5000, 5005) SYMBOL 12 12 in in 0.0 to 6.7 ft POORLY GRADED SAND WITH SILT: About 90% fine to SP-SM medium sand; about 10% nonplastic fines with low dry strength and rapid dilatancy; no reaction with HCl. IN-PLACE CONDITION: tan in color, dry. 2 IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. 3 Total: 103.4 lbf/ft3 2.0% (88.5% relative compaction) LAB TEST DATA: 6.9% fines, 86.9% sand, 6.2% gravel, LL= NA, PI= NP, SPG= 2.65 Maximum dry density= 116.9 lbf/ft³, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND WITH SILT 5

GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6 6.7 ft (6053.3) 7 (SP-SM)g 6.7 to 9.9 ft POORLY GRADED SAND WITH SILT AND GRAVEL: About 70% fine to coarse sand; about 20% fine to coarse gravel, maximum size, 70mm; about 10% nonplastic fines with rapid dilatancy, and no dry 8 strength; no reaction with HCI. 9 IN-PLACE CONDITION: Unconsolidated subrounded to subangular gravels, dry. 9.9 ft (6050.1) 10-GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) SP 9.9 to 12.2 ft POORLY GRADED SAND: About 95% fine sand; about 5% nonplastic fines with rapid dilatancy and no dry strength; maximum size, fine sand; no reaction with HCI. ₁₂-12.2 ft (6047.8) IN-PLACE CONDITION: Dry and homogeneous and no cementation, easy (SP)g excavation. 13-GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 12.2 to 15.8 ft POORLY GRADED SAND WITH GRAVEL: About 75% fine 14 to coarse sand; about 20% fine to coarse gravel, maximum size, 80mm; about 5% nonplastic fines with rapid dilatancy, and no dry strength; no reaction with HCI. 15-15.8 ft (6044.2) IN-PLACE CONDITION: Subrounded to subangular gravels, dry. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-44

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE COORDINATES: N 2,023,858 E 2,750,425

APPROXIMATE DIMENSIONS: 12'x15'x12' DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6080.1

METHOD OF EXPLORATION: CASE680L BACKHOE

LOGGED BY: J. GILBERT DATE EXCAVATED: 10/16/2014

SM O.0 to 5.2 ft SILTY SAND: About 85% fine to medium sand; about 15% nonplastic fines with medium dry strength and slow dilatancy; no reaction with HCl. IN-PLACE CONDITION: Brown, dry. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 5.2 ft (8074.9) SP-SM (visual) SP (lab classif) IN-PLACE CONDITION: Brown to tan and dry. becoming slightly moist below 10.2 feet. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 100.2 lbfff* 4.0% (94.2% relative compaction) LAB TEST DATA: 4.7% fines, 95.3% sand, 0.0% gravel, LL= NA, PI= NP, SPG= 2.63 Maximum dry density= 106.4 lbf/ff*, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	DEPTH TO WATER: NI	E DATE: NA DATE EXCAVATED: 10/16/2014			
SM 0.0 to 5.2 ft SILTY SAND: About 85% fine to medium sand; about 15% nonplastic fines with medium dry strength and slow dilatancy; no reaction with HCI. IN-PLACE CONDITION: Brown, dry. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 5.2 tt (6074.9) SP-SM (visual) SP (lab classif) (visual) SP (lab classif) IN-PLACE CONDITION: Brown to tan and dry, becoming slightly moist below 10.2 feet. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 100.2 lb/ft* 4.0% (94.2% relative compaction) LAB TEST DATA: 4.7% fines, 95.3% sand, 0.0% gravel, LL= NA, PI= NP, SPG= 2.63 Maximum dry density= 106.4 lb/ft*, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	GROUP		(BY 3 - 5	VOLU 5 - 12	ME) PLUS 12
SP-SM (visual) SP (lab classif) 5.2 to 12.0 ft POORLY GRADED SAND WITH SILT: About 90% fine to medium sand; about 10% nonplastic fines with low dry strength and rapid dilatancy; no reaction with HCI. IN-PLACE CONDITION: Brown to tan and dry, becoming slightly moist below 10.2 feet. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 100.2 lbf/ft³ 4.0% (94.2% relative compaction) LAB TEST DATA: 4.7% fines, 95.3% sand, 0.0% gravel, LL= NA, PI= NP, SPG= 2.63 Maximum dry density= 106.4 lbf/ft³, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	1	nonplastic fines with medium dry strength and slow dilatancy; no reaction with HCl. IN-PLACE CONDITION: Brown, dry.	In	in	in
	SP-SM (visual) SP (lab classif)	medium sand; about 10% nonplastic fines with low dry strength and rapid dilatancy; no reaction with HCl. IN-PLACE CONDITION: Brown to tan and dry, becoming slightly moist below 10.2 feet. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 100.2 lbf/ft³ 4.0% (94.2% relative compaction) LAB TEST DATA: 4.7% fines, 95.3% sand, 0.0% gravel, LL= NA, PI= NP, SPG= 2.63 Maximum dry density= 106.4 lbf/ft³, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND			
	COMMENTS: SUB	FACE VEGETATION CONSISTS SAGE BRUSH DISCONTINUED HOLF DUE	TO		

COMMENTS: SURFACE VEGETATION CONSISTS SAGE BRUSH. DISCONTINUED HOLE DUE TO SLOUGHING STARTING AT 10.0 FEET.

LOG OF TEST PIT NO. TPR22B-14-46

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,021,692 E 2,750,396 APPROXIMATE DIMENSIONS: 12'x18'x14.7'

DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6092.6

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER DATE EXCAVATED: 8/25/2014

SM O.0 to 4.0 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 to HCI. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Calcium carbonate stringers and nodules below 3.6 feet. Roots in the upper 2.0 feet of excavation. Easy excavation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.0 ft (6088.6) SP In-place density taken at 6.0 ft. IN-PLACE CONDITION: Tan and dry, loose consolidation, trace of peat. Lenses of 2 x 10 inch medium to coarse POORLY GRADED SAND. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 107.0 lbf/ft³ 1.1% (98.7% relative compaction) LAB TEST DATA: 3.9% fines, 94.4% sand, 1.7% gravel, LL= NA, PI= NP, SPG= 2.65 Maximum dry density= 108.4 lbf/ft³, optimum water content= NA% Laboratory classification is POORLY GRADED SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 8.8 to 13.7 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, low dry strength, slow dilatancy; maximum size, fine sand; no reaction to HCI. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Two gallon had corrosion sample taken at 10.0 feet.	DEPTH TO WATER:	NE DATE. NA BATE EXOLUTION OF SECTION			
SM O.0 to 4.0 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 to HCl. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Calcium carbonate stringers and nodules below 3.6 feet. Roots in the upper 2.0 feet of excavation. Easy excavation. SP 4.0 ft (6088.6) SP 4.0 ft (6088.6) SP 4.0 ft (6088.8) In-place density taken at 6.0 ft. IN-PLACE CONDITION: Tan and dry, loose consolidation, trace of gravel; maximum size, 25mm; no reaction to HCl. IN-PLACE CONDITION: Tan and dry, loose consolidation, trace of peat. Lenses of 2 x 10 inch medium to coarse POORLY GRADED SAND. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 107.0 lb/fft³ 1.1% (98.7% relative compaction) LAB TEST DATA: 3.9% fines, 94.4% sand, 1.7% gravel, LL= NA, PI= NP, SPG=2.85 Maximum dry density= 108.4 lb/fft³, optimum water content= NA% Laboratory classification is POORLY GRADED SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 3.8 to 13.7 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, low dry strength, slow dilatancy; maximum size, fine sand, no reaction to HCl. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Two gallon bag corrosion sample taken at 10.0 feet. SEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.7 to 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thinly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica present. None to weak reaction with HCl.	DI ACCIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL			
plasticity, low dry strength and slow dilatancy; maximum size, fine sand; no reaction to HCI. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Calcium carbonate stringers and nodules below 3.6 feet. Roots in the upper 2.0 feet of excavation. Easy excavation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.0 to 8.8 ft POORLY GRADED SAND: About 95% predominantly fine sand; about 5% fines with no plasticity, no dry strength and rapid dilatancy; trace of gravel; maximum size, 25mm; no reaction to HCI. IN-PLACE CONDITION: Tan and dry, loose consolidation, trace of peat. Lenses of 2 x 10 inch medium to coarse POORLY GRADED SAND. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 107.0 lbi/fft³ 1.1% (98.7% relative compaction) LAB TEST DATA: 3.9% fines, 94.4% sand, 1.7% gravel, LL= NA, PI= NP, SPG= 2.65 Maximum dry density= 108.4 lbi/fft³, optimum water content= NA% Laboratory classification is POORLY GRADED SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 8.8 to 13.7 ft SILTY SAND. About 80% fine sand; about 20% fines with no plasticity, low dry strength, slow dilatancy; maximum size, fine sand; no reaction to HCI. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Two gallon bag corrosion sample taken at 10.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.7 to 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thinly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica present. None to weak reaction with HCI.	GROUP		5	12	PLUS 12 in
IN-PLACE CONDITION: Light forwing and dry, loose consolidation. SP 4.0 ft (6088.6) SP 4.0 to 8.8 ft POORLY GRADED SAND: About 95% predominantly fine sand; about 5% fines with no plasticity, no dry strength and rapid dilatancy; trace of gravel; maximum size, 25mm; no reaction to HCl. IN-PLACE CONDITION: Tan and dry, loose consolidation, trace of peat. Lenses of 2 x 10 inch medium to coarse POORLY GRADED SAND. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 107.0 lb/fft* 1.1% (98.7% relative compaction) LAB TEST DATA: 3.9% fines, 94.4% sand, 1.7% gravel, LL= NA, Pl= NP, SPG= 2.65 Maximum dry density= 108.4 lb/fft³, optimum water content= NA% Laboratory classification is POORLY GRADED SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 8.8 to 13.7 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, low dry strength, slow dilatancy; maximum size, fine sand; no reaction to HCl. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Two gallon bag corrosion sample taken at 10.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 8.8 to 13.7 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, low dry strength, slow dilatancy; maximum size, fine sand; no reaction to HCl. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Two gallon bag corrosion sample taken at 10.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.7 to 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thinly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica present. None to weak reaction with HCl.	SM	plasticity, low dry strength and slow dilatancy; maximum size, fine sand; no			
SP In-place density taken at 6.0 ft. IN-PLACE CONDITION: Tan and dry, loose consolidation, trace of peat. Lenses of 2 x 10 inch medium to coarse POORLY GRADED SAND. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 107.0 lbf/ft³ 1.1% (98.7% relative compaction) LAB TEST DATA: 3.9% fines, 94.4% sand, 1.7% gravel, LL= NA, PI= NP, SPG= 2.65 Maximum dry density= 108.4 lbf/ft³, optimum water content= NA% Laboratory classification is POORLY GRADED SAND Corrosion sample taken at 10.0 ft. SANDSTONE AND STONE AND STONE GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.7 ft (6078.9) SANDSTONE AND STONE GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.7 to 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thinly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica	2 - 3 - 3 - 3 - 3	Calcium carbonate stringers and nodules below 3.6 feet. Roots in the			
density taken at 6.0 ft. IN-PLACE CONDITION: Tan and dry, loose consolidation, tack of pear. Lenses of 2 x 10 inch medium to coarse POORLY GRADED SAND. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 107.0 lb//ft³ 1.1% (98.7% relative compaction) LAB TEST DATA: 3.9% fines, 94.4% sand, 1.7% gravel, LL= NA, PI= NP, SPG= 2.65 Maximum dry density= 108.4 lb//ft³, optimum water content= NA% Laboratory classification is POORLY GRADED SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 8.8 to 13.7 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, low dry strength, slow dilatancy; maximum size, fine sand; no reaction to HCl. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Two gallon bag corrosion sample taken at 10.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.7 ft (6078.9) SANDSTONE 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thirly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica present. None to weak reaction with HCl.	4 —	4.0 to 8.8 ft POORLY GRADED SAND: About 95% predominantly fine sand; about 5% fines with no plasticity, no dry strength and rapid dilatancy;			
Total: 107.0 lbf/ft³ 1.1% (98.7% relative compaction) LAB TEST DATA: 3.9% fines, 94.4% sand, 1.7% gravel, LL= NA, PI= NP, SPG= 2.65 Maximum dry density= 108.4 lbf/ft³, optimum water content= NA% Laboratory classification is POORLY GRADED SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 8.8 to 13.7 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, low dry strength, slow dilatancy; maximum size, fine sand; no reaction to HCl. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Two gallon bag corrosion sample taken at 10.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.7 to 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thinly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica present. None to weak reaction with HCl.	density taken	IN-PLACE CONDITION: Tan and dry, loose consolidation, trace of peat. Lenses of 2 x 10 inch medium to coarse POORLY GRADED SAND.			
Maximum dry density= 108.4 lbf/ft³, optimum water content= NA% Laboratory classification is POORLY GRADED SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 8.8 to 13.7 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, low dry strength, slow dilatancy; maximum size, fine sand; no reaction to HCl. IN-PLACE CONDITION: Light brown and dry, loose consolidation. Two gallon bag corrosion sample taken at 10.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.7 to 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thinly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica present. None to weak reaction with HCl.	8.8 ft (6083.8)	Total: 107.0 lbf/ft³ 1.1% (98.7% relative compaction) LAB TEST DATA: 3.9% fines, 94.4% sand, 1.7% gravel, LL= NA, PI= NP,			
sample taken at 10.0 ft. 13.7 ft (6078.9) SANDSTONE 14.7 ft (6077.9) SANDSTONE 14.7 ft (6077.9) SANDSTONE 14.7 ft (6077.9) REDUCTION: Light brown and dry, loose consolidation. Two gallon bag corrosion sample taken at 10.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.7 to 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thinly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica present. None to weak reaction with HCI.	9 - SM 10 -	Maximum dry density= 108.4 lbf/ft³, optimum water content= NA%			
IN-PLACE CONDITION: Light brown and dry, loose consolidation. Two gallon bag corrosion sample taken at 10.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13.7 to 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thinly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica present. None to weak reaction with HCI.	sample taken	8.8 to 13.7 ft SILTY SAND: About 80% fine sand; about 20% fines with no plasticity, low dry strength, slow dilatancy; maximum size, fine sand; no			
13.7 to 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thinly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica present. None to weak reaction with HCI.		Two gallon bag corrosion sample taken at 10.0 feet.			
GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)		13.7 to 14.7 ft SANDSTONE: Fine to medium grained sandstone. Dark brown and brown to tan in color. Moderately to slightly weathered (W4) and very soft (H7), becoming moderately hard (H4) at 14.5 feet. Thinly bedded and recovered from backhoe generally in 2 x 12 x 12 inch pieces. Mica			
		GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)			

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH AND JUNIPER. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22B-14-47

SHEET 1 OF 1

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: PIPELINE

GROUND ELEVATION: 6078.4

COORDINATES: N 2,020,522 E 2,750,401

METHOD OF EXPLORATION: CASE 580N BACKHOE

APPROXIMATE DIMENSIONS: 12'x17'x15.4'

LOGGED BY: P. GARDNER
DATE EXCAVATED: 8/25/2014

DEPTH TO	O WATER: NE	DATE: NA DATE EXCAVATED: 8/25/2014			
₽ CLASS	SIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL	(B)	PLUS Y VOLU	JME)
	ROUP /MBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
1	SM risual) P-SM o class) -place ity taken 6.0 ft.	0.0 to 15.4 ft SILTY SAND: About 85% predominantly fine sand; al 15% fines with no plasticity, low dry strength and rapid dilatancy; tracoarse sand, gravel and cobbles; cobbles are subrounded and hard maximum size, 100mm; no reaction to HCI. IN-PLACE CONDITION: Brown to tan, dry, homogeneous. Roots upper 2.0 feet of excavation. Weak cementation and easy excavated in the interval of the interval	in the ion.		

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND SAGE BRUSH. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-48

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE COORDINATES: N 2,019,384 E 2,750,347

APPROXIMATE DIMENSIONS: 12'x17'x16.3'

DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6121.2

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER DATE EXCAVATED: 8/26/2014

	TITLO WATER.	AL DIVILLIANT			
_]	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
DEPTH	GROUP	(SEE USBR 5000, 5005)	3 - 5	5 - 12	PLUS 12
۵	SYMBOL	(SEE USBR 5000, 5005)	in	in	in
	SM	0.0 to 16.3 ft SILTY SAND: About 85% fine to coarse sand, subangular		tr	
1 -		and hard: about 15% nonplastic fines with no dry strength and rapid			
2 -		dilatancy; trace of hard, angular to subrounded, fine to coarse gravels; trace of hard, angular cobbles; max size, 200mm; no reaction to HCl.			
1		IN-PLACE CONDITION: Brown to tan, moist, homogeneous except for a 2			
3 -		x 3 foot long lens of POORLY GRADED SAND at depth of 3.2 feet. Easy excavation.			
4 -		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft.			
		Total: 100.3 lbf/ft³ 4.0% (87.4% compaction) LAB TEST DATA: 17.3% fines, 82.6% sand, 0.1% gravel, LL= NA, PI= NP,			
5		SPG= 2.61 Maximum dry density= 114.7 lbf/ft³, optimum water content= 10.0%			
6 -		Laboratory classification is SILTY SAND			
7 -		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	In-place				
8	density taken at 6.0 ft.				
9 -	at 0.0 it.				
-					
10-					
11-					
12-					
13-					
4					
14-					
15-					
10					
16-	16.3 ft (6104.9)		-		
		THE ARTHUR CONDICTO OF ARROSES AND SACE BRIGHT DISCONT	INILIE	<u> </u>	

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND SAGE BRUSH. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-50

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,016,957 E 2,750,694

APPROXIMATE DIMENSIONS: 6'x12'x6.8'

DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6185.5

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/25/2014

r CLASSIFICATION		% F	PLUS	2 :		
## CLASSIFICATION CLASSIFICATION AND DESCRIPTION OF MATERIAL ## VOLUME)						
GROUP		3 -	5 -	PLU		
SYMBOL	(SEE USBR 5000, 5005)	5 in	12 in	12 in		
SM	0.0 to 3.0 ft SILTY SAND: About 75% predominantly fine sand; about 25% nonplastic fines with medium dry strength and rapid dilatancy; trace of hard, angular, medium to coarse sand; maximum size, coarse sand; strong reaction with HCI.					
-	IN-PLACE CONDITION: Reddish brown, dry and homogeneous. Strong cementation. Roots down to 6.8 feet.					
	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)					
3.0 ft (6182.5)						
SP-SM	3.0 to 6.0 ft POORLY GRADED SAND WITH SILT: About 90% predominantly fine sand; about 10% nonplastic fines with no dry strength and rapid dilatancy; trace of hard, subangular, medium to coarse sand; maximum size, coarse sand; no reaction with HCI.					
-	IN-PLACE CONDITION: Light brown and tan, dry and lensed with POORLY GRADED SAND. Weak cementation. Roots down to 6.8 feet.					
4	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)					
-						
Y-						
6.0 ft (6179.5)						
SANDSTONE	color. Intensely weathered (W7) and soft (H6). Joints contain calcium carbonate and roots. Excavated in 6 inch blocky chunks; strong reaction					
6.8 ft (6178.7)	with HCl.					
	GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)					

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH. DISCONTINUED HOLI DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22B-14-51

SHEET 1 OF 2

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,015,742 E 2,750,704

APPROXIMATE DIMENSIONS: 12'x17'x14.8'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6203.2

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 8/27/2014

DEPTH TO WATER: NE	DATE: NA DATE EXCAVATED: 0/2/1/2014			
	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
E CLASSIFICATION E GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SM (visual) SP-SM (lab class)	0.0 to 7.5 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with no dry strength and rapid dilatancy; maximum size, fine sand; weak reaction with HCl. IN-PLACE CONDITION: Light brown, dry, homogeneous and moderately cemented.			
In-place density taken at 6.0 ft.	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 98.1 lbf/ft³ 2.0% (95.3% compaction) LAB TEST DATA: 91.1% sand, 8.9% fines, 0.0% gravel, LL= NA, PI= NP, SPG= 2.65 Maximum dry density= 102.9 lbf/ft³, optimum water content= 14.0% Laboratory classification is POORLY GRADED SAND WITH SILT			
7.5 ft (6195.7)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
SM	7.5 to 13.0 ft SILTY SAND: About 75% fine to medium sand; about 25% nonplastic fines with high dry strength and slow dilatancy; maximum size, medium sand; strong reaction to HCI. IN-PLACE CONDITION: Brown, dry, homogeneous and strong cementation. Calcium carbonate stringers and root casts. Hard to excavate. Recovered in blocky chunks.			
0-	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
13.0 ft (6190.2)			-	+
SP-SM One sack sample taken at 14.0 ft.	13.0 to 14.8 ft POORLY GRADED SAND WITH SILT: About 90% fine to coarse sand; about 10% nonplastic fines with no dry strength and rapid dilatancy; maximum size, coarse sand; no reaction with HCI.			
14.8 ft (6188.4)	IN-PLACE CONDITION: Tan, dry and weak cementation.			

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH AND JUNIPER. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

7	7-1336-A (1-86) Bureau of Reclamation LOG OF TEST PIT NO. TPR22B-14-51 SHEET 2 OF				2				
	FEATURE: Reach 22B PROJECT: Navajo Gallup Water Supply Project								
LC	CATION: PIPELINE	Ē	GROUND ELEVATION: 6203.2						
cc	OORDINATES: N 2,0	015,742 E 2,750,704	METHOD OF EXPLORATION: CASE 580N B.	ACKHO	DΕ				
AP	PROXIMATE DIME	NSIONS: 12'x17'x14.8'	LOGGED BY: P. GARDNER						
DE	PTH TO WATER: I	NE DATE: NA	DATE EXCAVATED: 8/27/2014						
DEPTH	CLASSIFICATION GROUP				(BY	PLUS VOLU	IME)		
	SYMBOL		R 5000, 5005)		3 - 5 in	5 - 12 in	PLUS 12 in		
		One gallon sack sample TPR22-51 below 13.0 feet. LAB TEST DATA: 92.4% sand, 7.6 SPG= 2.63 Laboratory classification is POORL GEOLOGIC INTERPRETATION: 0	6% fines, 0.0% gravel, LL= NA, PI= NP, Y GRADED SAND WITH SILT						
CC	COMMENTS:								

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LOG OF TEST PIT NO. TPR22B-14-52B

SHEET 1 OF 1

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: PIPELINE

GROUND ELEVATION: 6202.7

COORDINATES: N 2,014,592 E 2,750,610

METHOD OF EXPLORATION: CASE 580N BACKHOE

APPROXIMATE DIMENSIONS: 12'x14'x16.2'

LOGGED BY: P. GARDNER

DEPTH TO WATER: NE DATE: NA

DATE EXCAVATED: 8/27/2014

DEPTH TO WATER.	NE DATE, NA DATE EXCAVATED, 8/27/2014			
± CLASSIFICATION			PLUS VOLU	
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SM 1	0.0 to 16.2 ft SILTY SAND: About 85% predominantly fine sand; about 15% fines with no plasticity, medium dry strength and rapid dilatancy; maximum size, medium sand; none to strong reaction with HCl. IN-PLACE CONDITION: Brown and dry, moderately cemented. Trace of calcium carbonate nodules. Calcium carbonate stringers below 6.0 feet. Roots in the upper 1.5 feet. Two gallon bag corrosion sample taken at 10.0 feet. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 99.1 lbiffit 3.8% (88.0% compaction) LAB TEST DATA: 67.5% sand, 32.5% fines, 0.0% gravel, L= NA, PI= NP, SPG= 2.66 Maximum dry density= 112.6 lbf/ft³, optimum water content= 12.0% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	I DEACE VECETATION CONCICTS OF SACE BRUSH AND CRASSES DISCONT	TNUUT		

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE BRUSH AND GRASSES. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-54B

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 2,012,009 E 2,750,210

APPROXIMATE DIMENSIONS: 14'x17'x14.9'

DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6181.5

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 8/27/2014

DEFITTO WATER.	NE BATE, IV	r		
± CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		YLUS 3 VOLU	
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SM 1	 0.0 to 5.8 ft SILTY SAND: About 80% fine to medium sand; about 20% fines with no plasticity, low dry strength and rapid dilatancy; trace of hard, subrounded coarse gravel; maximum size, 50mm; no reaction to HCI. IN-PLACE CONDITION: Brown and dry, moderately cemented and homogeneous. Calcium carbonate stringers and nodules. Roots and root casts throughout interval. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 			
5.8 ft (6175.7)				
6 - SM 7	5.8 to 14.9 ft SILTY SAND: About 75% fine to medium sand; about 25% fines with no plasticity, high dry strength and slow dilatancy; maximum size, medium sand; strong reaction to HCI. IN-PLACE CONDITION: Tan to brown, dry, moderately cemented. Calcium carbonate stringers and nodules. Root casts present. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 110.1 lbf/ft³ 3.6% (92.6% compaction) LAB TEST DATA: 70.8% sand, 28.3% fines, 0.9% gravel, LL= NA, PI= NP, SPG= 2.66 Maximum dry density= 118.9 lbf/ft³, optimum water content= 11.4% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
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COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH AND JUNIPER. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-62

SHEET 1 OF 2

FEATURE: Reach 22B

L. INCOUNTED

LOCATION: PIPELINE

COORDINATES: N 2,002,708 E 2,747,827

APPROXIMATE DIMENSIONS: 12'x17'x12.2'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6232.0

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 8/27/2014

DEI III IO VOLIEIX. IX	E BATE EACHTAINES CALLED			
CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
GROUP		3 -		PLU
SYMBOL	(SEE USBR 5000, 5005)	5 in	12 in	12 in
SM	0.0 to 2.4 ft SILTY SAND: About 75% fine to medium sand; about 25%			
-	nonplastic fines with low dry strength and rapid dilatancy; maximum size,			
	medium sand; no reaction to HCI.			
	IN-PLACE CONDITION: Brown and dry, homogeneous and weak			
]	cementation. Roots down to 1.5 feet.			
-	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
2.4 ft (6229.6)				
_	0.44.44.0 (0.01) TV 0.44.0 (0.01)			
SM	2.4 to 11.6 ft SILTY SAND: About 85% fine to medium sand; about 15% nonplastic fines with low dry strength and rapid dilatancy; maximum size,			
1	medium sand; strong reaction to HCl.			
]	IN-PLACE CONDITION: Light gray and white, dry, homogeneous and			
-	moderately cemented. Large veins and nodules of calcium carbonate.			
	Veins can be 12 inches long by 0.5 inches wide.			
	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft.			
	Total: 98.7 lbf/ft³ 3.0% (88.5% compaction) LAB TEST DATA: 19.6% fines, 80.4% sand, 0.0% gravel, LL= NA, PI= NP,			
-	SPG= 2.61			
]	Maximum dry density= 111.5 lbf/ft³, optimum water content= 13.3% Laboratory classification is SILTY SAND			
-	·			
In-place	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
density taken at 6.0 ft.				
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COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE BRUSH AND GRASSES. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

7-1336-A (1-86) Bureau of Reclamation LOG OF TEST PIT NO. TPR22B-14-62		SH	EET	2 OF	2	
FEATURE: Reach 226	3	PROJECT: Navajo Gallup Water Supply Project	ot			
LOCATION: PIPELINE	■	GROUND ELEVATION: 6232.0				
COORDINATES: N 2,	002,708 E 2,747,827	METHOD OF EXPLORATION: CASE 580N BA	4CKHO	E		
	NSIONS: 12'x17'x12.2'	LOGGED BY: P. GARDNER				
DEPTH TO WATER:		DATE EXCAVATED: 8/27/2014				
DEI III IO WATER				% F	PLUS	3 in
E CLASSIFICATION	CLASSIFICATION AND D	ESCRIPTION OF MATERIAL		(BY	VOLU	
± CLASSIFICATION	(SEE LISE)	R 5000, 5005)		3 - 5 - 5 12		PLUS 12
SYMBOL	(SEE USB)	K 5000, 5003)		in	in	in
In-place density taken at 6.0 ft. 11.6 ft (6220.4) 12.6 ft (6220.0) SANDSTONE 12.2 ft (6219.8)	11.6 to 12.0 ft SHALE: Light gray to and soft (H6). Fissile and can have rapidly in field test at natural moist. GEOLOGIC INTERPRETATION: 12.0 to 12.2 ft SANDSTONE: Dark difficult to break with a heavy hammed Calcium carbonate veneer observer.	Tertiary Nacimiento Formation (Tn) c gray and fine grained. Hard (H3), mer blow and slightly weathered (W4).				
John Maria						

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LOG OF TEST PIT NO. TPR22B-14-75

SHEET 1 OF 2

FEATURE: Reach 22B

LOCATION: PIPELINE COORDINATES: N 1,987,945 E 2,742,547

APPROXIMATE DIMENSIONS: 13'x18'x17' DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6408.7

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER

DATE EXCAVATED: 8/28/2014

DEPTH TO WATER:	NE DATE: NA DATE EXCAVATED: 0/20/2014	- 2		
# CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SM	0.0 to 6.2 ft SILTY SAND: About 85% predominantly fine sand; about 15% nonplastic fines with medium dry strength and rapid dilatancy; maximum size, medium sand; no reaction to HCI.			
2 -	IN-PLACE CONDITION: Brown and dry, homogeneous and moderate cementation. Roots down to 2.0 feet.			
3 - 4 - 5 - 5	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 104.5 lbf/ft³ 2.8% (102.2% compaction) LAB TEST DATA: 8.1% fines, 91.9% sand, 0.0% gravel, LL= NA, PI= NP, SPG= 2.63 Maximum dry density= 102.2 lbf/ft³, optimum water content= 9.4% Laboratory classification is POORLY GRADED SAND WITH SILT			
6 - 6.2 ft (6402.5)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
SP-SM	6.2 to 15.0 ft POORLY GRADED SAND WITH SILT: About 90% predominantly fine sand; about 10% nonplastic fines with low dry strength and rapid dilatancy; maximum size, medium sand; no reaction to HCl.			
8 —	IN-PLACE CONDITION: Light brown to brown, dry, homogeneous and weak cementation. In-place density test may overlap soil horizons.			
In-place density taken at 6.0 ft.	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 104.5 lbf/ft³ 2.8% (102.3% compaction) LAB TEST DATA: 91.9% sand, 8.1% fines, 0.0% gravel, LL= NA, PI= NP, SPG= 2.63 Maximum dry density= 102.2 lbf/ft³, optimum water content= 9.4% Laboratory classification is POORLY GRADED SAND WITH SILT			
2	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14- - 15.0 ft (6393.7)				
SANDSTONE 16 - 17.0 ft (6391.7)	to red and white in color. Very soft (H7) and very intensely weathered (W8). Excavated material is very soft and can be described using the Unified Soil Classification System as "POORLY GRADED SAND" with very			

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE BRUSH AND GRASSES. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

7 B	-1336-A (1-86) sureau of Reclamation	LOG OF TEST PI	T NO. TPR22B-14-75	SH	EET :	2 OF	2
FE	ATURE: Reach 22B		PROJECT: Navajo Gallup Water Supply Proje	ct			
LO	CATION: PIPELINE		GROUND ELEVATION: 6408.7				
		87,945 E 2,742,547	METHOD OF EXPLORATION: CASE 580N B.	ACKHO	E		
		ISIONS: 13'x18'x17'	LOGGED BY: P. GARDNER				
DE	PTH TO WATER: 1	NE DATE: NA	DATE EXCAVATED: 8/28/2014		% E	LUS :	3 in
I I	CLASSIFICATION	CLASSIFICATION AND D	DESCRIPTION OF MATERIAL		(BY	VOLU	ME)
DEPTH	GROUP SYMBOL		BR 5000, 5005)		3 - 5	5 - 12	PLUS 12
	STIVIBOL				in	in	in
		consistency. Calcium carbonate s Strong reaction with HCl.	stringer and iron oxide staining observed	- /			
				/			
		GEOLOGIC INTERPRETATION:	Tertiary Nacimiento Formation (Tn)	_/			
0.5	NAME OF THE O						
l _{cc}	MMENTS:						
l							

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LOG OF TEST PIT NO. TPR22B-14-79B

SHEET 1 OF 1

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: PIPELINE

GROUND ELEVATION: 6460,2

COORDINATES: N 1,983,933 E 2,740,342

METHOD OF EXPLORATION: CASE 580N BACKHOE

APPROXIMATE DIMENSIONS: 10'x18'x16.3'

LOGGED BY: P. GARDNER

DEPTH TO WATER: NE DATE: NA

DATE EXCAVATED: 8/28/2014

SYMBOL S(CL) (visual) (CL-ML)s (lab class) In-place density taken at 1.0.0 ft. In-place density taken at 1.0.0 ft. SM 11.2 ft (6449.0) SM 11.2 ft (6449.0) SM 11.2 to 16.3 ft SiLTY SAND: About 80% fine sand; about 20% nonplastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; weak reaction to HCl. IN-PLACE CONDITION: Quaternary Alluvium (Qal) 11.2 ft (6449.0) SM 11.2 to 16.3 ft SiLTY SAND: About 80% fine sand; about 20% nonplastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; weak reaction. Calcium carbonate stringers present. 11.2 ft (6449.0) SM 11.2 to 16.3 ft SiLTY SAND: About 80% fine sand; about 20% nonplastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; weak reaction. Calcium carbonate stringers present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	DEPTH TO WATER:	NE DATE: NA DATE EXCAVATED: 8/28/2014			
S(CL) (visual) (CL-ML)s (lab class) 1	⊥ CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL			
C(visual) (CL-ML)s (lab class) plasticity, medium toughness, no dilatancy and high dry strength; about 45% fine sand; maximum size, fine sand; weak to strong reaction with HCl. IN-PLACE CONDITION: Reddish brown and dry. Homogeneous and very hard consistency. Calcium carbonate stringers present. Hard to excavate. Field dispersion test determined non-dispersive. Roots down to 2.8 feet. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 94.7 lb/ft² 5.9% (84.2% compaction) LAB TEST DATA: 78.3% fines, 21.7% sand, 0.0% gravel, LL= 24.8, Pl= 6.6, SPG= 2.66 Maximum dry density= 112.5 lb/ft², optimum water content= 13.8% Laboratory classification is SILTY CLAY WITH SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) GEOLOGIC INTERPRETATION: Quaternary Alluvium size, fine sand; weak reaction to HCl. IN-PLACE CONDITION: Light brown and dry, homogeneous and weak cementation. Calcium carbonate stringers present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) IN-PLACE CONDITION: Light brown and dry, homogeneous and weak cementation. Calcium carbonate stringers present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) GEOLOGIC INTERPRETATION: Quaternary Allu	GROUP SYMBOL	(SEE USBR 5000, 5005)	5	12	
SM 11.2 to 16.3 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; weak reaction to HCI. IN-PLACE CONDITION: Light brown and dry, homogeneous and weak cementation. Calcium carbonate stringers present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	(visual) (CL-ML)s (lab class) In-place density taken at 6.0 ft. Corrosion sample taken	plasticity, medium toughness, no dilatancy and high dry strength; about 45% fine sand; maximum size, fine sand; weak to strong reaction with HCl. IN-PLACE CONDITION: Reddish brown and dry. Homogeneous and very hard consistency. Calcium carbonate stringers present. Hard to excavate. Field dispersion test determined non-dispersive. Roots down to 2.8 feet. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 94.7 lbf/ft³ 5.9%. (84.2% compaction) LAB TEST DATA: 78.3% fines, 21.7% sand, 0.0% gravel, LL= 24.8, Pl= 6.6, SPG= 2.66 Maximum dry density= 112.5 lbf/ft³, optimum water content= 13.8% Laboratory classification is SILTY CLAY WITH SAND			
16-116.3 ft (6443.9)	SM 12- 13- 14- 15-	fines with low dry strength and rapid dilatancy; maximum size, fine sand; weak reaction to HCl. IN-PLACE CONDITION: Light brown and dry, homogeneous and weak cementation. Calcium carbonate stringers present.			
	16.3 ft (6443.9)				

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE BRUSH AND GRASSES. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-114

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 1,982,697 E 2,739,424

APPROXIMATE DIMENSIONS: 12'x18'x12.9'

DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6490.9

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 8/28/2014

1 25	ETITIO WATER.	DATE. TV			
	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS : VOLU	
DEPTH	GROUP		3 -	5 - 12	PLUS
	SYMBOL	(SEE USBR 5000, 5005)	5 in	in	12 in
1-	SM	0.0 to 2.0 ft SILTY SAND: About 80% fine to medium sand; about 20% nonplastic fines with medium dry strength and slow dilatancy; maximum size, medium sand; no reaction to HCl.			
2 -	2.0 ft (6488.9)	IN-PLACE CONDITION: Brown and dry, homogeneous and moderate cementation. Roots down to 2.8 feet.			
3 -	SC (visual) s(CL) (lab class)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 2.0 to 9.8 ft CLAYEY SAND: About 70% fine sand; about 30% fines with low plasticity, low toughness, no dilatancy and high dry strength; maximum size, fine sand; strong reaction with HCl.			
4 -		IN-PLACE CONDITION: Brown, dry and homogeneous. Hard consistency. Calcium carbonate stringers observed.			
5	In-place density taken at 6.0 ft.	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 89.5 lbf/ft³, 6.0%. (79.2% compaction) LAB TEST DATA: 69.6% fines, 30.4% sand, 0.0% gravel, LL= 26.9, PI= 8.9, SPG= 2.63 Maximum dry density= 113.0 lbf/ft³, optimum water content= 13.8% Laboratory classification is SANDY LEAN CLAY			
8		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
1	9.8 ft (6481.1)				
10-	SANDSTONE Corrosion sample taken at 10.0 ft.	9.8 to 12.9 ft SANDSTONE: Brown, white, red to tan. Fine to medium grained sandstone. Very soft (H7) and may be classified as "POORLY GRADED SAND" using the Unified Soil Classification System. Very intensely weathered (W8) to decomposed (W9). Excavated in powder and 1 x 2 x 5 inch chunks. Iron oxide staining present. Strong reaction to HCI. Two gallon bag corrosion sample taken at 10.0 feet.			
3=	12.9 ft (6478.0)	GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)		<u> </u>	

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE BRUSH AND GRASSES. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22B-14-115

SHEET 1 OF 1

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: PIPELINE

GROUND ELEVATION: 6502.8

COORDINATES: N 1,981,684 E 2,738,789

METHOD OF EXPLORATION: CASE 580N BACKHOE

APPROXIMATE DIMENSIONS: 10'x18'x10'

LOGGED BY: P. GARDNER

DEPTH TO WATER: NE DATE: NA

DATE EXCAVATED: 8/28/2014

וט ן	EPIH TO WATER: 1	NE DATE: NA DATE EXCAVATED: 8/28/2014			
DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	3 - 5	12	JME) PLUS 12
1 - 2 - 3 - 4 - 5 - 6 8 - 9 - 9 -		0.0 to 9.6 ft SILTY SAND: About 70% fine sand; about 30% nonplastic fines with medium dry strength and slow dilatancy; maximum size, fine sand; strong reaction to HCI. IN-PLACE CONDITION: Brown and dry, homogeneous and strong cementation. Roots down to 3.0 feet. Calcium carbonate veins and nodules throughout interval. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 97.7 lbf/ft³ 5.6% (85.4% compaction) LAB TEST DATA: 50.7% fines, 49.3% sand, 0.0% gravel, LL= 24.4, Pl= 7.1, SPG= 2.62 Maximum dry density= 114.4 lbf/ft³, optimum water content= 13.0% Laboratory classification is SANDY LEAN CLAY GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	in	in	in
10-	9.6 ft (6493.2) SANDSTONE 10.0 ft (6492.8)	9.6 to 10.0 ft SANDSTONE: Brown, gray, orange and white in color. Fine to coarse grained sandstone. Very soft (H7) and may be classified as "POORLY GRADED SAND" using the Unified Soil Classification System. Very intensely weathered (W8) to decomposed (W9). Excavated in powder and 1 x 2 x 5 inch chunks. Strong reaction to HCI. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)			

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE BRUSH AND GRASSES. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPR22B-14-116

SHEET 1 OF 2

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: PIPELINE

GROUND ELEVATION: 6528.9

COORDINATES: N 1,980,683 E 2,738,161

METHOD OF EXPLORATION: CASE 580N BACKHOE

APPROXIMATE DIMENSIONS: 12'x18'x14.9'

LOGGED BY: P. GARDNER

DEPTH TO WATER: NE DATE: NA

DATE EXCAVATED: 8/29/2014

I CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
ELASSIFICATION GROUP SYMBOL	CLASSIFICATION (SEE USBR 5000, 5005) SMISC (VISUAI) (SIML) 5 - 12 in	PLUS 12 in		
3 - (lab class) 2 - (lab class) 3 - (lab class) 4 - (lab class) 5 - (lab class) 6 - (lab class) 10 - (lab class) 11 - (lab class) 12 - (lab class) 13 - (lab class) 14 - (lab class) 15 - (lab class) 16 - (lab class) 17 - (lab class) 18 - (lab class) 18 - (lab class) 19 - (lab class) 10 - (lab class) 11 - (lab class) 11 - (lab class) 12 - (lab class) 13 - (lab class) 14 - (lab class) 15 - (lab class) 16 - (lab class) 17 - (lab class) 18 - (lab class) 18 - (lab class) 19 - (lab class) 10 - (lab class) 11 - (lab class) 11 - (lab class) 12 - (lab class) 13 - (lab class) 14 - (lab class) 15 - (lab class) 16 - (lab class) 17 - (lab class) 18 - (lab class) 18 - (lab class) 18 - (lab class) 19 - (lab class) 10 - (lab class) 10 - (lab class) 11 - (lab class) 11 - (lab class) 12 - (lab class) 13 - (lab class) 14 - (lab class) 15 - (lab class) 16 - (lab class) 17 - (lab class) 18 - (lab class) 18 - (lab class) 19 - (lab class) 10 - (lab class) 10 - (lab class) 11 - (lab class) 11 - (lab class) 12 - (lab class) 13 - (lab class) 14 - (lab class) 15 - (lab class) 16 - (lab class) 17 - (lab class) 18 - (lab class)	25% fines with low plasticity, medium dry strength, slow dilatancy and low toughness; maximum size, fine sand; weak reaction to HCl. IN-PLACE CONDITION: Brown and dry, homogeneous and strong cementation. Roots down to 3.0 feet. Calcium carbonate stringers. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 94.8 lbf/ft³ 5.6% (84.7% compaction) LAB TEST DATA: 50.7% fines, 49.3% sand, 0.0% gravel, LL= 22.9, Pl= 3.8, SPG= 2.66 Maximum dry density= 111.9 lbf/ft³, optimum water content= 14.5% Laboratory classification is SANDY SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14-14.2 ft (6514.7)				
SANDSTONE 14.9 ft (6514.0)	to coarse grained sandstone. Very soft (H7) and may be classified as "POORLY GRADED SAND" using the Unified Soil Classification System.			

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE BRUSH AND GRASSES. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

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7-1336-A (1-86) Bureau of Reclamation	LOG OF TE	EST PIT NO. TPR22B-14-116	SH	EET :	2 OF	2
FEATURE: Reach 22E LOCATION: PIPELINE COORDINATES: N 1,9 APPROXIMATE DIMEI	GROUND ELEVATION: 6528.9 ,980,683 E 2,738,161 METHOD OF EXPLORATION: CASE 580N BACKHOE					
DEPTH TO WATER:		DATE EXCAVATED: 8/29/2014				
T CLASSIFICATION GROUP SYMBOL	CLASSIFICAT	TION AND DESCRIPTION OF MATERIAL			PLUS : VOLU 5 -	
SYMBOL		(SEE USBR 5000, 5005)		5 in	12 in	12 in
	and 1 x 5 x 12 inch chur	nks. Strong reaction to HCl.				
	GEOLOGIC INTERPRE	ETATION: Tertiary Nacimiento Formation (Tn)				
COMMENTS:					<u> </u>	

LOG OF TEST PIT NO. TPR22B-14-118

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 1,978,638 E 2,736,870 APPROXIMATE DIMENSIONS: 12'x14'x14.8'

DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6568.4

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER DATE EXCAVATED: 8/29/2014

I	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS : VOLU	
DEPTH	GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5	5 - 12	PLUS 12
			in	in	in
1 -	SM (visual) s(ML)	0.0 to 14.8 ft SILTY SAND: About 75% fine sand; about 25% nonplastic fines with low dry strength and rapid dilatancy; trace of hard, subrounded and elongated gravel; maximum size, 30mm; weak reaction to HCl.			
2 -	(lab class)	IN-PLACE CONDITION: Light brown and dry, homogeneous and strong cementation. Roots down to 3.0 feet. Calcium carbonate stringers and nodules.			
3		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 99.0 lbf/ft³ 5.0% (91.9% compaction) LAB TEST DATA: 50.4% fines, 49.6% sand, 0.0% gravel, LL= NA, PI= NP, SPG= 2.65			
5 -		Maximum dry density= 107.7 lbf/ft³, optimum water content≕ 15.0% Laboratory classification is SANDY SILT			
6 -		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7 -	density taken				
8 -	at 6.0 ft.				
9 -					
10-					
11-					
12 -					
13-					
14-					
-	14.8 ft (6553.6)				

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND SAGE BRUSH. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-119

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE COORDINATES: N 1,977,644 E 2,736,212

APPROXIMATE DIMENSIONS: 12'x14'x13.8'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6592.0

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 8/29/2014

% PLUS 3 in (BY VOLUME) CLASSIFICATION AND DESCRIPTION OF MATERIAL CLASSIFICATION PLUS **GROUP** (SEE USBR 5000, 5005) 12 12 SYMBOL in ำก 0.0 to 6.5 ft SANDY LEAN CLAY: About 70% fines with medium plasticity, s(CL) high dry strength, medium toughness and no dilatancy; about 30% predominantly fine sand, trace of hard, fine gravel; maximum size, 10mm; strong reaction to HCI. 2 IN-PLACE CONDITION: Gray and dry, homogeneous and very hard consistency. Roots down to 1.8 feet. Field crumb test determined non-dispersive. In-place density may overlap soil horizons. In-place 3 density taken IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. at 6.0 ft. Total: 89.5 lbf/ft3 6.6% (77.3% compaction) LAB TEST DATA: 64.4% fines, 35.6% sand, 0.0% gravel, LL= 25.9, PI= 11.8. SPG= 2.65 Maximum dry density= 115.8 lbf/ft³, optimum water content= 13.6% Laboratory classification is SANDY LEAN CLAY 5 GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6 6.5 ft (6585.5) 6.5 to 10.2 ft CLAYEY SAND: About 55% fine sand; about 45% fines with SC medium plasticity, high dry strength, medium toughness and no dilatancy; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Reddish brown and dry, homogeneous and strong cementation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 10.2 ft (6581.8) 10 -SC 10.2 to 13.8 ft CLAYEY SAND: About 55% fine to medium sand; about 45% fines with medium plasticity, medium dry strength, medium toughness 11 and no dilatancy; maximum size, medium sand; strong reaction to HCl. IN-PLACE CONDITION: Gray in color, dry, homogeneous and strong 12 cementation. Calcium carbonate stringers present. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 13 13.8 ft (6578.2)

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES WITH SPARSE SAGE BRUSH.
DISCONTINUED HOLE DUE TO REFUSAL ON STIFF CLAY.

LOG OF TEST PIT NO. TPR22B-14-120

SHEET 1 OF 1

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: PIPELINE

GROUND ELEVATION: 6616.2

COORDINATES: N 1,976,517 E 2,735,822

METHOD OF EXPLORATION: CASE 580N BACKHOE

APPROXIMATE DIMENSIONS: 12'x14'x15.7'

LOGGED BY: P. GARDNER

DEPTH TO WATER: NE DATE: NA DATE EXCAVATED: 8/29/2014

DEI 111 10 10 11 11 - 11				
# CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS : VOLU	
GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
s(CL) (visual) SM (lab class)	0.0 to 12.2 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; strong reaction to HCl.			
2 -	IN-PLACE CONDITION: Gray to light brown, dry, homogeneous and very hard consistency. Roots down to 4.0 feet.			
3 –	Two gallon bag corrosion sample taken at 10.0 feet.			
5 In-place	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 94.4 lbf/ft³ 4.1% (80.3% compaction) LAB TEST DATA: 66.2% sand, 32.0% fines, 1.8% gravel, LL= 19.7, Pl= 2.4, SPG= 2.64 Maximum dry density= 117.6 lbf/ft³, optimum water content= 11.5%			
density taken at 6.0 ft.	Laboratory classification is SILTY SAND			
Corrosion sample taken at 10.0 ft.	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
10-				
11—				
12.2 ft (6604.0)				
13- 13-	12.2 to 15.7 ft CLAYEY SAND: About 55% fine sand; about 45% fines with medium plasticity, high dry strength, medium toughness and no dilatancy; maximum size, fine sand; strong reaction to HCl.			
14	IN-PLACE CONDITION: Dark brown, dry, homogeneous and strong cementation.			
15.7 ft (6600.5)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	DEADER VISCETATION CONCIOTO OF ORACOCO MITH ORAROS CACE RELIGIO	1	Щ_	

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES WITH SPARSE SAGE BRUSH. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-123

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 1,972,957 E 2,735,815 APPROXIMATE DIMENSIONS: 12'x14'x13.6'

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6630.4

METHOD OF EXPLORATION: CASE 680N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/26/2014

DEPTH TO WATER	: NE DATE: NA DATE EXCAVATED: 9/26/2014			
DEPTH TO WATER	NE DATE, NA DATE EXCAVATED. 9/20/2014	% P	LUS :	 3 in
E CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL	(BY \	/OLU	ME)
E CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
CL (visual) s(CL) (lab class) One gallon bag sample taken at 2.0 ft SP-SM (visual) SM (lab class) In-place density taken at 6.0 ft.	0.0 to 4.2 ft LEAN CLAY: About 90% fines with medium plasticity, high toughness, high dry strength and no dilatancy; about 10% fine sand; trace of angular, coarse sand; maximum size, coarse sand; strong reaction with HCI. IN-PLACE CONDITION: Grayish brown, dry and blocky. Very hard consistency and hard to excavate. Calcium carbonate stringers below 2.7 and above 4.2 feet. One gallon bag sample taken at 2.0 ft. LAB TEST DATA: 84.1% fines, 15.9% sand, 0.0% gravel, LL= 45.2, Pl= 27.5, SPG= 2.69 Laboratory classification is LEAN CLAY WITH SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 4.2 to 13.6 ft POORLY GRADED SAND WITH SILT: About 90% fine to medium sand; about 10% nonplastic fines with low dry strength and rapid dilatancy; trace of coarse sand, fine and coarse gravel; maximum size, 30mm; no reaction with HCI. IN-PLACE CONDITION: Reddish brown and tan in color. Dry and homogeneous. Moderately cemented becoming strongly cemented below 12.0 feet and hard to excavate. Nodules containing fines 1 inch in diameter are found throughout the profile. IN-PLACE LINIT WEIGHT AND MOISTURE FROM 6.0 ft			
13- 13.6 ft (6616.	3)			

COMMENTS: SURFACE VEGETATION CONSISTS OF SPARSE SAGE AND GRASSES. DISCONTINUED HOLE DUE TO REFUSAL ON WELL CEMENTED SOIL.

LOG OF TEST PIT NO. TPR22B-14-124

SHEET 1 OF 1

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: PIPELINE

GROUND ELEVATION: 6626.5

COORDINATES: N 1,971,730 E 2,735,804

METHOD OF EXPLORATION: CASE 680N BACKHOE

APPROXIMATE DIMENSIONS: 12'x14'x11.7'

LOGGED BY: J. GILBERT

DEPTH TO WATER: NE DATE: NA

DATE EXCAVATED: 10/15/2014

DEPTH TO WATER: N	IE DATE: NA DATE EXCAVATED: 10/19/2014			
± CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL	(BY	PLUS VOLU	ME)
GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
SC (visual) SC-SM (lab class) In-place density taken at 6.0 ft, corrosion sample at 10.0 ft	0.0 to 7.2 ft CLAYEY SAND: About 60% fine sand; about 40% fines with low plasticity, no dilatancy, medium dry strength, medium toughness; maximum size, fine sand; no reaction with HCI IN-PLACE CONDITION: Dry, dark brown in color, homogeneous, root casts present. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 96.8 lbf/ft³ 5.2% (81.7% compaction) LAB TEST DATA: 33.4% fines, 66.6% sand, 0.0% gravel, LL= 20.1, Pl= 4.8, SPG= 2.64 Maximum dry density= 118.5 lbf/ft³, optimum water content= 11.6% Laboratory classification is SILTY CLAYEY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
7 – 7.2 ft (6619.3)		-		1
- SM 8 9	 7.2 to 11.7 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with rapid dilatancy, no dry strength; maximum size, fine sand; no reaction with HCI. IN-PLACE CONDITION: Tan in color, dry, homogeneous 			
10-				
11.7 ft (6614.8)				
11.7 11 (001-7.0)	DISCONTINU			

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-126

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: PIPELINE

COORDINATES: N 1,969,380 E 2,735,941 APPROXIMATE DIMENSIONS: 12'x14'x14.6'

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6600.9

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: J. GILBERT
DATE EXCAVATED: 10/15/2014

DE	PTH TO WATER: N	NE DATE: NA DATE EXCAVATED: 10/15/2014			
ı	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
DEPTH	GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
1 -	SP-SM	0.0 to 5.5 ft POORLY GRADED SAND WITH SILT: About 90% fine to medium sand; about 10% nonplastic fines with low dry strength and rapid dilatancy; trace of coarse sand, fine and coarse gravel; maximum size, 30mm; no reaction with HCl.			
3 - 4		IN-PLACE CONDITION: Tan in color, homogeneous , dry.			
5 -	5.5 ft (6595.4)		_		
6 — - - 7 —	(SP-SM)g (visual) SP-SM (lab class)	5.5 to 14.6 ft POORLY GRADED SAND WITH SILT AND GRAVEL: About 70% fine to coarse sand; about 20% fine to coarse gravel, maximum size, 60mm; about 10% nonplastic fines with rapid dilatancy, and no dry strength; no reaction with HCI.			
8 - 9 - 10 - 11 - 12 - 13 - 13 - 13 - 13 - 15 - 15 - 15 - 15	In-place density taken at 6.0 ft.	IN-PLACE CONDITION: unconsolidated subrounded to subangular gravel, dry. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 104.2 lbf/ft³ 2.7% (92.1% relative compaction) LAB TEST DATA: 11.7% fines, 82.3% sand, 6.0% gravel, LL= N/A, PI= NP, SPG= 2.43 Maximum dry density= 113.1 lbf/ft³, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND WITH SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
14-	14.6 ft (6586.3)				

COMMENTS: SURFACE VEGETATION CONSISTS OF SAGE BRUSH. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22B-14-127

SHEET 1 OF 1

FEATURE: Reach 22B

PROJECT: Navajo Gallup Water Supply Project

LOCATION: PIPELINE

GROUND ELEVATION: 6618.9

COORDINATES: N 1,968,417 E 2,735,558 APPROXIMATE DIMENSIONS: 6.0' x 10.0' x 14.0' METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: J. GILBERT

DEPTH TO WATER: NE DATE:

DATE EXCAVATED: 7/31/2014

DE	PTH TO WATER: N	IE DATE: DATE EXCAVATED. //31/2014			
DEPTH	CLASSIFICATION GROUP	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU 5 -	
씸	SYMBOL	(SEE USBR 5000, 5005)	5 in	12 in	12 in
1 =	SM	0.0 to 3.1 ft SILTY SAND: About 80% fine sand; about 20% nonplastic fines with rapid dilatancy, no dry strength; no reaction with HCl.			
1-		IN-PLACE CONDITION: Tan in color.			
2 -		GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
3 -	3.1 ft (6615.8)		-		
4 -	SP-SM (visual) SM (lab	3.1 to 14.0 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% nonplastic fines with slow dilatancy, low dry strength; maximum size, fine sand; no reaction with HCI.			
5 -	class)	IN-PLACE CONDITION: tan in color			
6 -		IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 108.3 lbs. / cu ft., 3.4%. (90.9% compaction) LAB TEST DATA: 79.3 % sand, 19.8 % fines, 0.9% gravels, LL= N/A, PI= NP, SPG= 2.68 Maximum dry density = 119.2 lbs. / cu ft., optimum water content = 11.7% Laboratory classification SILTY SAND			
9 - 10 - 11 - 12 - 12 - 12 - 12 - 12 - 12	In-place density taken at 6.0 ft.	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
13					
14-	14.0 ft (6604.9)		\vdash		
\vdash		THE REPORT OF THE PROPERTY OF	TOI	TRAIT	

COMMENTS: SURFACE VEGETATED WITH SAGE BRUSH, DISCONTINUED AT 14.0 FEET DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPR22FBT-14-1

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: FOREBAY TANK

COORDINATES: N 2,052,715 E 2,752,138 APPROXIMATE DIMENSIONS: 12'x14'x16'

DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5816.6

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER DATE EXCAVATED: 5/7/2014

CLASSIFICATION GROUP SYMBOL CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005) SM (visual) O.0 to 16.0 ft SILTY SAND: About 75% fine to medium sand; about 25% fines with no plasticity, no dry strength, rapid dilatancy; trace of fine to coarse, soft, weathered, round sandstone gravel; maximum size, 75mm; no reaction to HCI. IN-PLACE CONDITION: Tan and dry, loose consolidation, lenses of SP-SM 3 to 5 inches thick and 1 to 3 feet in length, iron oxide staining on gravel. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 ft. Total: 94.0 lb/ft ⁹ 2.2% (84.2% compaction) LAB TEST DATA: 77.5% sand, 22.1% fines, 0.4% gravel, LL= NA, PI= NP, SPG= 2.64 Maximum dry density= 111.7 lb/ft³, optimum water content= 13.6% In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 8.0 ft. Which is a specific property of the compaction
SM (visual) O.0 to 16.0 ft SILTY SAND: About 75% fine to medium sand; about 25% fines with no plasticity, no dry strength, rapid dilatancy; trace of fine to coarse, soft, weathered, round sandstone gravel; maximum size, 75mm; no reaction to HCI. IN-PLACE CONDITION: Tan and dry, loose consolidation, lenses of SP-SM 3 to 5 inches thick and 1 to 3 feet in length, iron oxide staining on gravel. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 ft. Total: 94.0 lb/fft² 2.2% (84.2% compaction) LAB TEST DATA: 77.5% sand, 22.1% fines, 0.4% gravel, LL= NA, PI= NP, SPG= 2.64 Maximum dry density= 111.7 lbf/ft³, optimum water content= 13.6% In-place density taken at 4.0 ft. In-place density ta
fines with no plasticity, no dry strength, rapid dilatancy; trace of fine to coarse, soft, weathered, round sandstone gravel; maximum size, 75mm; no reaction to HCl. IN-PLACE CONDITION: Tan and dry, loose consolidation, lenses of SP-SM 3 to 5 inches thick and 1 to 3 feet in length, iron oxide staining on gravel. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 ft. Total: 94.0 lbf/ff³ 2.2% (84.2% compaction) LAB TEST DATA: 77.5% sand, 22.1% fines, 0.4% gravel, LL= NA, PI= NP, SPG= 2.64 Maximum dry density= 111.7 lbf/ff³, optimum water content= 13.6% In-place density taken at 4.0 ft. In-place density taken lat 4.0 ft. In-place density taken lat 4.0 ft. In-place density taken lat 4.0 ft. In-place density taken lateral procession in the state of the state
IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 ft. Total: 94.0 lbf/ft³ 2.2% (84.2% compaction) LAB TEST DATA: 77.5% sand, 22.1% fines, 0.4% gravel, LL= NA, PI= NP, SPG= 2.64 Maximum dry density= 111.7 lbf/ft³, optimum water content= 13.6% In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken In-place In-place density taken In-place density taken In-place density taken In-place density taken In-place In
In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken In-place In-place density taken In-place density taken In-place In
In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken at 4.0 ft. In-place density taken laboratory classification is SILTY SAND IN-PLACE UNIT WEIGHT AND MOISTURE FROM 8.0 ft. Total: 100.2 lbf/ft³ 2.8% (86.6% compaction) LAB TEST DATA: 81.7% sand, 15.9% fines, 2.4% gravel, LL= NA, PI= NP, Maximum dry density= 115.7 lbf/ft³, optimum water content= 10.9%
density taken at 4.0 ft. In-place density taken density taken laboratory classification is SPG= 2.64 Maximum dry density= 115.7 lbf/ft³, optimum water content= 10.9%
density taken Laboratory classification is CULTY 3 AND
GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)
12-
14_
15—
16.0 ft (5800.6)
COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND ELOWERS. DISCONTINUED HOLE

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND FLOWERS. DISCONTINUED HOLE DUE TO THE LIMIT OF THE EQUIPMENT.

7-1336-A (1-86) Bureau of Reclamation	LOG OF TEST PIT NO. TPR22FBT-14-2	SHEET	1.05	4
FEATURE: Reach 22B	PROJECT: Navajo Gallup Water Supply Project		1 OF	1
LOCATION: FOREBAY COORDINATES: N 2,0 APPROXIMATE DIMEN DEPTH TO WATER: N	Y TANK GROUND ELEVATION: 5816.3 D52,763 E 2,752,135 METHOD OF EXPLORATION: CASE 580N BAINSIONS: 12'x14'x18' LOGGED BY: P. GARDNER			
E CLASSIFICATION GROUP	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS 3	
SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - F 12 in	PLUS 12 in
In-place density taken at 4.0 ft.	0.0 to 4.2 ft SILTY SAND: About 80% fine to medium sand; about 20% fines with no plasticity, no dry strength, rapid dilatancy; trace of fine to coarse, soft, weathered, round gravel; max size 75mm; no reaction to HCI. IN-PLACE CONDITION: Tan and dry, loose consolidation, lenses of SP-SM 3 to 5 inches thick and 1 to 3 feet in length, iron oxide staining on gravel.			
4 - 4.2 ft (5812.1)	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 ft.			
5 - SM 5	Total: 98.4 lbf/ft³ 1.6% (88.2% compaction) LAB TEST DATA: 87.0% sand, 12.5% fines, 0.5% gravel, LL= NA, PI= NP, SPG= 2.61 Maximum dry density= 111.6 lbf/ft³, optimum water content= 12.7% Laboratory classification is SILTY SAND			
9 - 1	GEOLOGO FINSIER PRAND: I Also Otuck of fare followed in r(Carl) nd; about 25% fines with no plasticity, low dry strength, rapid dilatancy; trace of fine to coarse, soft, weathered, round to subrounded gravel; max size 75mm; no reaction to HCI.			
In-place density taken at 8.0 ft.	IN-PLACE CONDITION: Tan and dry, loose consolidation, lenses of SP-SM 3 to 5 inches thick and 1 to 3 feet in length, iron oxide staining on gravel.			
13—	IN-PLACE UNIT WEIGHT AND MOISTURE FROM 8.0 ft. Total: 95.1 lbf/ft³ 2.8% (84.5% compaction) LAB TEST DATA: 78.6% sand, 21.0% fines, 0.4% gravel, LL= NA, PI= NP, SPG= 2.63 Maximum dry density= 112.5 lbf/ft³, optimum water content= 11.5% Laboratory classification is SILTY SAND			
16—				
17— 18.0 ft (5798.3)				
COMMENTS: SURFA	ACE VEGETATION CONSISTS OF GRASSES AND FLOWERS. DISCONTINU	JED HOI	LE	-
DOE 10	O THE LIMIT OF THE EQUIPMENT.			

LOG OF TEST PIT NO. TPR22FBT-14-3

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: FOREBAY TANK

COORDINATES: N 2,052,710 E 2,752,167 APPROXIMATE DIMENSIONS: 12'x14'x14'

DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 5815.0

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 5/7/2014

	DATE EXCAVATED: 5/7/2014			
CLASSIFICATION GROUP	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS	
CLASSIFICATION GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLU 12 in
In-place density taken at 4.0 ft. In-place density taken at 8.0 ft. SP-SM (lab classification)	0.0 to 14.0 FT SILTY SAND: About 70% fine to medium sand; about 30% fines with no plasticity, low dry strength, rapid dilatancy; trace of fine to coarse, soft, weathered, round to subrounded gravel; maximum size, 75mm; no reaction to HCI. IN-PLACE CONDITION: Tan and dry, loose consolidation, lenses of SP-SM 3 to 5 inches thick and 1 to 3 feet in length, iron oxide staining on gravel. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 4.0 ft. Total: 93.0 lbf/ft³ 2.9% (80.4% compaction) LAB TEST DATA: 72.5% sand, 26.9% fines, 0.6% gravel, LL= NA, PI= NP, SPG= 2.64 Maximum dry density= 115.7 lbf/ft³, optimum water content= 11.5% Laboratory classification is SILTY SAND IN-PLACE UNIT WEIGHT AND MOISTURE FROM 8.0 ft. Total: 92.2 lbf/ft³ 2.0% (86.6% compaction) LAB TEST DATA: 88.5% sand, 9.1% fines, 2.4% gravel, LL= NA, PI= NP, SPG= 2.63 Maximum dry density= 106.5 lbf/ft³, optimum water content= 5.2% Laboratory classification is POORLY GRADED SAND WITH SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)	1.0		50.0

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND FLOWERS. DISCONTINUED HOLE DUE TO THE LIMIT OF THE EQUIPMENT.

7-1336-A (1- Bureau of R		LOG OF TEST PIT NO. TPR22PP2-14-1	SHE	ET ·	 1 OF	1
APPROXIMA	PUMPINO TES: N 2,0 ATE DIMEN	The search of th		:		70.
∏ GR	FICATION OUP IBOL		3		VOLU 5 - 12 in	
5 - 5.2 ft (6 6 - 6.0 ft & S 7 - 10 - 11 - 15 - 16 - 16.1 ft (6	#202.7) M ace taken 0 ft.	0.0 to 5.2 ft SILTY SAND: About 85% predominantly fine sand; about 15% non plastic fines with low dry strength and rapid dilatancy; maximum size, medium sand; no reaction to HCI. IN-PLACE CONDITION: Dark to light brown, dry, weak cementation and homogeneous. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 5.2 to 6.0 ft POORLY GRADED SAND: About 95% fine sand; about 5% fines with no plasticity, low dry strength and rapid dilatancy; maximum size, fine sand; no reaction to HCI. IN-PLACE CONDITION: Tan, dry, weak cementation and homogeneous. Roots in the upper 4.0 feet of excavation. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 6.0 to 16.1 ft SILTY SAND: About 75% fine sand; about 25% non plastic fines with high dry strength and rapid dilatancy; maximum size, fine sand; strong reaction to HCI. IN-PLACE CONDITION: Dark brown, dry and homogeneous. Moderately cemented. Calcium carbonate stringers and root casts present. Hard to excavate. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 102.4 lbf/ft³ 3.0% (88.4% compaction) LAB TEST DATA: 66.6% sand, 34.4% fines, 0.0% gravel, LL= NA, PI= NP, SPG= 2.64 Maximum dry density= 115.8 lbf/ft³, optimum water content= 12.0% Laboratory classification is SILTY SAND GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)		n	in .	
COMMENTS	S: SURI DISC	FACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH AND JUNIPE ONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.	R.			

LOG OF TEST PIT NO. TPR22PP2-14-2

SHEET 1 OF 1

FEATURE: Reach 22B

NE. Neach 220

LOCATION: PUMPING PLANT
COORDINATES: N 2,017,870 E 2,750,543

APPROXIMATE DIMENSIONS: 12'x17'x15.8'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6211.1

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 8/26/2014

	Er III TO TWATER.	DATE EXOAVATED. 0/20/2014			
F	CLASSIFICATION	CLASSIFICATION AND DESCRIPTION OF MATERIAL		PLUS VOLU	
DEPTH	GROUP SYMBOL	(SEE USBR 5000, 5005)	3 - 5 in	5 - 12 in	PLUS 12 in
1 - 2 - 3 - 4 -	SP-SM	O.0 to 5.0 ft POORLY GRADED SAND WITH SILT: About 90% fine sand; about 10% non plastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; no reaction to HCI. IN-PLACE CONDITION: Tan to brown, dry, weak cementation and homogeneous. Roots through 5.0 feet. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
5 -	5.0 ft (6206.1)				
6 - 7 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 15 - 15 - 15 - 15 - 15 - 15	SM In-place density taken at 6.0 ft.	5.0 to 5.9 ft POORLY GRADED SAND: About 95% fine sand; about 5% non plastic fines with low dry strength and rapid dilatancy; maximum size, fine sand; no reaction to HCl. IN-PLACE CONDITION: Tan, dry, weak cementation and homogeneous. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 5.9 to 15.6 ft SILTY SAND: About 75% fine sand; about 25% non plastic fines with high dry strength and rapid dilatancy; trace of hard, angular gravel; maximum size, 50mm; strong reaction to HCl. IN-PLACE CONDITION: Dark brown, dry, moderate cementation and homogeneous. Calcium carbonate stringers and root casts present. Hard to excavate. In-place density test may overlap stratigraphic units. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 106.6 lbf/ft³ 5.1% (92.8% compaction) LAB TEST DATA: 67.8% sand, 32.2% fines, 0.0% gravel, LL= NA, PI= NP, SPG= 2.66 Maximum dry density= 114.9 lbf/ft³, optimum water content= 13.2% Laboratory classification is SILTY SAND			
	15.6 ft (6195.5)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			
	SANDSTONE 15.8 ft (6195.3)	15.6 to 15.8 ft SANDSTONE: Fine to medium grained sandstone. Yellow to orange in color. Moderately weathered (W5) and soft (H6); No reaction to HCl. GEOLOGIC INTERPRETATION: Tertiary Nacimiento Formation (Tn)			
CC	MMMENTS. SLID	FACE VEGETATION CONSISTS OF CDASSES SACE DOLISH AND HANDED			

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH AND JUNIPER. DISCONTINUED HOLE DUE TO REFUSAL ON BEDROCK.

LOG OF TEST PIT NO. TPRT2-1

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: OLD REGULATING TANK 2

COORDINATES: N 1,974,063 E 2,735,817

APPROXIMATE DIMENSIONS: 12'x14'x15.7'
DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6628.9

METHOD OF EXPLORATION: CASE 680L BACKHOE

LOGGED BY: P. GARDNER
DATE EXCAVATED: 9/26/2014

	PIN TO WATER:	NE DATE: NA DATE EXCAVATED: 9/26/2014			
DEPTH	CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	3 - 5	12	JME) PLUS 12
1 -	A TOTAL PROPERTY.	0.0 to 2.3 ft CLAYEY SAND: About 55% fine to medium sand; about 45% fines with low plasticity, low toughness and high dry strength; maximum size, medium sand; strong reaction with HCl. IN-PLACE CONDITION: Grayish brown, dry, strong cementation and blocky. Roots down to 4.0 feet.	in	in	in
3 -	SM (visual) SP-SM (lab class)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 2.3 to 8.8 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with medium dry strength and rapid dilatancy; maximum size, fine sand; no reaction with HCI.			
5	Density taken at 6.0 ft.	IN-PLACE CONDITION: Reddish brown, dry and homogeneous. Strong cementation. Easy excavation. Roots down to 4.0 feet. IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 95.4 lbf/ft³ 3.2% (90% compaction) LAB TEST DATA: 10.6% fines, 88.4% sand, 0.0% gravel, LL= NA, PI= NP, SPG= 2.64 Maximum dry density= 106.0 lbf/ft³, optimum water content= 11.4% Laboratory classification is POORLY GRADED SAND WITH SILT.			
9 -	8.8 ft (6620.1) s(CL) 10.2 ft (6618.7)	GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 8.8 to 10.2 ft SANDY LEAN CLAY: About 55% fines with medium plasticity, medium toughness, high dry strength and no dilatancy; about 45% fine sand; maximum size, fine sand; strong reaction to HCl.			
11 — 12 — 13 — 14 — 15 — 15 — 15 — 15 — 15 — 15 — 15	SM 15.7 ft (6613.2)	IN-PLACE CONDITION: Dark brown, dry and blocky. Very hard consistency. Calcium carbonate stringers and nodules. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal) 10.2 to 15.7 ft SILTY SAND: About 85% fine sand; about 15% nonplastic fines with medium dry strength and rapid dilatancy; maximum size, fine sand; no reaction to HCI. IN-PLACE CONDITION: Reddish brown, dry and lensed. Lensed with LEAN CLAY and medium to coarse POORLY GRADED SAND. Lenses average 1 inch thick and are of various lengths. Strong cementation. Easy excavation. Calcium carbonate in lenses. GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)			

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES, SAGE BRUSH. DISCONTINUED HOLE DUE TO LIMIT OF EQUIPMENT.

LOG OF TEST PIT NO. TPRT2-2

SHEET 1 OF 1

FEATURE: Reach 22B

LOCATION: OLD REGULATING TANK 2

COORDINATES: N 1,974,063 E 2,735,769

APPROXIMATE DIMENSIONS: 12'x14'x14.8'

DEPTH TO WATER: NE DATE: NA

PROJECT: Navajo Gallup Water Supply Project

GROUND ELEVATION: 6630.5

METHOD OF EXPLORATION: CASE 580N BACKHOE

LOGGED BY: J. GILBERT

DATE EXCAVATED: 10/15/2014

DEFINIO WATER.	NE DATE NA DATE EXCAVATED: 10/15/2014								
H CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL	% PLUS 3 in (BY VOLUME)							
GROUP SYMBOL	(SEE USBR 5000, 5005)								
s(CL) 1 - 2 - 3 - 3.4 ft (6627.1)	0.0 to 3.4 ft SANDY LEAN CLAY: About 60% fines with medium to high plasticity, high toughness, medium to high dry strength, ; about 40% fine sand; maximum size, fine sand; strong reaction with HCl. IN-PLACE CONDITION: Brown in color, homogeneous GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)								
SM (visual) SP-SM (lab class) In-Place Density taken at 6.0 ft, Corrosion sample taken at 10.0 ft.	3.4 to 14.8 ft SILTY SAND: About 80% fine to medium sand; about 20% fines with no plasticity, low dry strength, rapid dilatancy; no reaction to HCI. IN-PLACE CONDITION: Tan and dry IN-PLACE UNIT WEIGHT AND MOISTURE FROM 6.0 ft. Total: 100.6 lbf/ft³ 2.9% (96.1% relative compaction) LAB TEST DATA: 10.6% fines, 89.4% sand, 0.0% gravel, LL= NA, PI= NP, SPG= 2.63 Maximum dry density= 104.7 lbf/ft³, optimum water content= N/A% Laboratory classification is POORLY GRADED SAND WITH SILT GEOLOGIC INTERPRETATION: Quaternary Alluvium (Qal)								
14- 14.8 ft (6615.7)									
COMMENTS: SUR	FACE VEGETATION CONSISTS OF GRASSES AND FLOWERS. DISCONTINUE	:D U							

COMMENTS: SURFACE VEGETATION CONSISTS OF GRASSES AND FLOWERS. DISCONTINUED HOLE DUE TO THE LIMIT OF THE EQUIPMENT.

BUREAU OF RECLAMATION DSA0739 Date/Time Hole # CPT22B-14-6 Cone # 9/9/2014 8:45:44 AM **Project** Location **REACH 22B** L ROBINSON NGWSP Operator Station Offset Elevation **Northing Easting** SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) **Tip Resistance Local Friction** Pore Pressure SPT N* 700 0 14 0 140 12 -2 Qc TSF Fs TSF Pw PSI 60% Hammer 0 1 2 3 4 1 - sensitive fine grained ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand silty clay to clay organic material sand to silty sand ■ 11 - very stiff fine grained (*) **2** clayey silt to silty clay **M** 9 sand ■ 12 - sand to clayey sand (*) ■3clay ■ 6 - sandy silt to clayey silt **Total Depth** 4.8' Qc>600 Fs>11

BUREAU OF RECLAMATION CPT22B-14-7 DSA0739 Hole # Cone # Date/Time 9/9/2014 9:52:54 AM **Project** NGWSP Location **REACH 22B L ROBINSON** Operator Station Offset Elevation Northing **Easting** SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) Local Friction Fs TSF Pore Pressure Pw PSI SPT N* Tip Resistance Qc TSF 300 0 60% Hammer 70 6 -1 3 0 0 5 10 15 20 25 1 - sensitive fine grained silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand organic material ■ 5 - clayey silt to silty clay sand to silty sand ■ 11 - very stiff fine grained (*) **2** -**3** -■ 6 - sandy silt to clayey silt **19** 9 sand ■ 12 - sand to clayey sand (*) clay **Total Depth** 25'

BUREAU OF RECLAMATION 9/9/2014 10:37:12 AM Hole # **CPT22B-14-8** Cone # **DSA0739** Date/Time **REACH 22B** Operator **L ROBINSON Project NGWSP** Location Station Offset Elevation Northing Easting SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) Local Friction Fs TSF **Tip Resistance** Pore Pressure SPT N* 450 0 Pw PSI 10 0 200 12 -2 60% Hammer Qc TSF 0 2 4 6 8 10 12 1 1 - sensitive fine grained silty clay to clay ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand organic material ■ 11 - very stiff fine grained (*) sand to silty sand ■2clayey silt to silty clay **9** sand ■ 12 - sand to clayey sand (*) **3** clay ■ 6 - sandy silt to clayey silt 11.9' Fs>11 **Total Depth**

BUREAU OF RECLAMATION 9/9/2014 11:11:20 AM CPT22B-14-9 Cone # **DSA0739** Date/Time Hole # NGWSP **REACH 22B** Operator **L ROBINSON Project** Location Offset Station Elevation **Northing Easting** SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ff) SPT N* **Local Friction Pore Pressure Tip Resistance** Qc TSF 400 0 Fs TSF 12 -3 Pw PSI 1 0 60% Hammer 160 0 1 2 3 5 6 ■ 10 - gravelly sand to sand ■ 1 - sensitive fine grained silty clay to clay ■7 - silty sand to sandy silt organic material sand to silty sand ■ 11 - very stiff fine grained (*) - clayey silt to silty clay **2** -■ 12 - sand to clayey sand (*) **9** -**3**clay ■ 6 - sandy silt to clayey silt sand 6.2' Qc>600 **Total Depth**

BUREAU OF RECLAMATION Hole # CPT22B-14-10 Cone # DSA0739 Date/Time 9/9/2014 12:03:34 PM L ROBINSON **NGWSP REACH 22B** Operator **Project** Location Offset Elevation Station Easting Northing SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) Tip Resistance Qc TSF **Local Friction** Pore Pressure SPT N* Pw PSI 2 0 180 500 0 10 -1 60% Hammer Fs TSF 0 5 10 15 20 25 ■ 10 - gravelly sand to sand ■ 7 - silty sand to sandy silt 🛭 1 - sensitive fine grained silty clay to clay ■ 11 - very stiff fine grained (*) ■ 5 - clayey silt to silty clay sand to silty sand **2** organic material ■ 12 - sand to clayey sand (*) ■ 6 - sandy silt to clayey silt 9sand **3** clay **Total Depth** 25'

BUREAU OF RECLAMATION DSA0739 Date/Time 10/15/2014 12:30:37 PM CPT22B-14-11 Hole # Cone# Project NGWSP Location **REACH 22B** Operator **L ROBINSON** Offset **Elevation** Station **Easting Northing** SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) SPT N* Pore Pressure **Local Friction** Tip Resistance 35 Qc TSF 140 0 Fs TSF 3 -10 Pw PSI 60 0 60% Hammer 0 5 10 15 20 25 30 ■ 10 - gravelly sand to sand ☑ 1 - sensitive fine grained silty clay to clay ■ 7 × silty sand to sandy silt ■ 11 - very stiff fine grained (*) organic material - clayey silt to silty clay sand to silty sand ■ 12 - sand to clayey sand (*) ■ 6 - sandy silt to clayey silt 9 = ■ 3 clay sand **Total Depth** 30'

BUREAU OF RECLAMATION Date/Time 9/5/2014 12:28:26 PM CPT22B-14-12 **DSA0739** Hole# Cone # **Project NGWSP** Location **REACH 22B** Operator **L ROBINSON** Offset Elevation Station Northing Easting SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) SPT N* **Local Friction** Pore Pressure **Tip Resistance** 90 Qc TSF 500 0 Fs TSF 6 -1 Pw PSI 2 0 60% Hammer 0 2 6 8 10 12 14 16 18 20 ■ 10 - gravelly sand to sand ■ 7 - silty sand to sandy silt 1 - sensitive fine grained silty clay to clay - very stiff fine grained (*) organic material clayey silt to silty clay sand to silty sand **2** -■ 12 - sand to clayey sand (*) ■3-■ 6 - sandy silt to clayey silt 9 sand clay 19.7' Qc>750 **Total Depth**

BUREAU OF RECLAMATION Date/Time 10/15/2014 10:29:41 AM CPT22B-14-13 Cone # DSA0739 Hole # **L ROBINSON** Operator **REACH 22B** Project **NGWSP** Location Offset Elevation Station **Easting** Northing SOIL BEHAVIOR TYPE **CPT DATA** DEPTH **Local Friction** Pore Pressure SPT N* Tip Resistance 250 Pw PSI 70 0 60% Hammer Fs TSF 20 -10 Qc TSF 500 0 0 2 3 6 ■ 10 - gravelly sand to sand ■ 7 - silty sand to sandy silt 1 - sensitive fine grained silty clay to clay 11 - very stiff fine grained (*) sand to silty sand organic material - clayey silt to silty clay ■ 2 × **M** 9 -■ 12 - sand to clayey sand (*) ■ 6 - sandy silt to clayey silt sand ■ 3 = clay 5.9' Fs>13 **Total Depth**

BUREAU OF RECLAMATION Hole # CPT22B-14-14 Cone # DSA0739 Date/Time 10/15/2014 11:12:28 AM L ROBINSON NGWSP REACH 22B Operator Project Location Elevation Offset Station Northing Easting SOIL BEHAVIOR **CPT DATA** DEPTH (ft) **Local Friction** Pore Pressure SPT N* Tip Resistance 160 Pw PSI 1 0 60% Hammer 400 0 12 -1 Qc TSF Fs TSF 0 2 6 8 10 12 14 16 18 20 ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand silty clay to clay 1 - sensitive fine grained sand to silty sand ■ 11 - very stiff fine grained (*) clayey silt to silty clay organic material ■ 12 - sand to clayey sand (*) ■ 6 - sandy silt to clayey silt **9** sand ■3clay **Total Depth** 18.2' Qc>650 Fs>11

BUREAU OF RECLAMATION Date/Time CPT22B-14-15 **DSA0739** 9/9/2014 1:12:28 PM Hole # Cone # Operator L ROBINSON **REACH 22B** NGWSP **Project** Location Station Offset **Elevation** Northing **Easting** SOIL BEHAVIOR **CPT DATA** DEPTH (ft) SPT N* **Tip Resistance Local Friction** Pore Pressure 60 14 0 350 0 Fs TSF 4 -2 Pw PSI 60% Hammer Qc TSF 0 2 6 8 10 12 ■ 10 - gravelly sand to sand 1 - sensitive fine grained silty clay to clay ■ 7 - silty sand to sandy silt sand to silty sand ■ 11 - very stiff fine grained (*) organic material ■ 5 - clayey silt to silty clay **2** -■ 6 - sandy silt to clayey silt sand ■ 12 - sand to clayey sand (*) ■ 3 clay 11' Qc>700 **Total Depth**

BUREAU OF RECLAMATION 10/15/2014 1:28:09 PM Hole # CPT22B-14-16 Cone # D\$A0739 Date/Time L ROBINSON NGWSP **REACH 22B** Operator **Project** Location Offset Elevation Station Northing Easting SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) Tip Resistance **Local Friction** Pore Pressure SPT N* 10 -5 140 700 0 45 0 60% Hammer Qc TSF Fs TSF Pw PSI 0 2 6 8 10 12 14 16 18 20 22 ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand 1 1 - sensitive fine grained silty clay to clay ■ 11 - very stiff fine grained (*) ■ 5 - clayey silt to silty clay sand to silty sand organic material **2** -■ 6 - sandy silt to clayey silt **⋈** 9 sand ■ 12 - sand to clayey sand (*) ■3clay **Total Depth** 20.2' Fs>11

BUREAU OF RECLAMATION 9/5/2014 1:54:10 PM CPT22B-14-17 **DSA0739** Date/Time Hole # Cone # **REACH 22B** Operator L ROBINSON NGWSP Location **Project** Station Offset Elevation Northing **Easting** SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ff) SPT N* **Tip Resistance Local Friction** Pore Pressure 160 Qc TSF 9 -1 8 0 500 0 Fs TSF Pw PSI 60% Hammer 0 5 10 15 20 25 30 35 ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand silty clay to clay □ 1 = sensitive fine grained sand to silty sand ■ 11 - very stiff fine grained (*) organic material ■ 5 - clayey silt to silty clay **2**-■ 12 - sand to clayey sand (*) ■ 6 - sandy silt to clayey silt sand ■ 3 clay **Total Depth** 34.9' Fs>9.5

BUREAU OF RECLAMATION Hole # CPT22B-14-18 Cone # **DSA0739** Date/Time 10/15/2014 2:16:54 PM L ROBINSON NGWSP **REACH 22B** Operator **Project** Location Offset Elevation Station Northing **Easting** SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) **Local Friction Pore Pressure** SPT N* Tip Resistance 2 0 Qc TSF 160 350 0 Fs TSF Pw PSI 60% Hammer 14 -1 0 2 ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand 1 - sensitive fine grained silty clay to clay organic material ■ 5 - clayey silt to silty clay sand to silty sand ■ 11 - very stiff fine grained (*) **8** = **2** -■ 12 - sand to clayey sand (*) **3** -■ 6 - sandy silt to clayey silt **9** sand clay **Total Depth** 2.4' Fs>13

BUREAU OF RECLAMATION Date/Time 9/8/2014 9:33:45 AM **DSA0739** Hole # CPT22B-14-19 Cone# NGWSP Location **REACH 22B** Operator L ROBINSON Project Elevation Station Offset **Easting** Northing SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) Pore Pressure SPT N* Tip Resistance **Local Friction** 100 Pw PSI 3 0 60% Hammer 300 0 Fs TSF 6 -2 Qc TSF 0 5 10 15 20 25 30 ■ 10 - gravelly sand to sand 11 - sensitive fine grained silty clay to clay ■ 7 - silty sand to sandy silt sand to silty sand ■ 11 - very stiff fine grained (*) organic material ■ 5 - clayey silt to silty clay **2** -■ 12 - sand to clayey sand (*) ■ 3 clay ■ 6 - sandy silt to clayey silt **9** sand **Total Depth** 30'

BUREAU OF RECLAMATION 10/15/2014 2:49:57 PM CPT22B-14-20 **DSA0739** Date/Time Hole# Cone # L ROBINSON Project **NGWSP** Location **REACH 22B** Operator Offset Elevation Station Easting **Northing** SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) **Local Friction** Pore Pressure SPT N* **Tip Resistance** Pw PSI 2 0 60% Hammer 200 400 0 Fs TSF 12 -1 Qc TSF 0 1 2 3 5 6 ■ 10 - gravelly sand to sand silty clay to clay ■ 7 - silty sand to sandy silt 1 - sensitive fine grained ■ 11 - very stiff fine grained (*) - clayey silt to silty clay **8** sand to silty sand organic material ■2-**1119** -■ 12 - sand to clayey sand (*) ■ 6 - sandy silt to clayey silt sand **3** clay **Total Depth** 7.1' Qc>400 Fs>11

BUREAU OF RECLAMATION Date/Time 10/15/2014 3:20:40 PM CPT22B-14-21 **DSA0739** Hole # Cone # L ROBINSON **REACH 22B** Operator **NGWSP** Location Project Elevation Offset Station Easting Northing SOIL BEHAVIOR TYPE **CPT DATA** DEPTH SPT N* **Pore Pressure Local Friction Tip Resistance** 60% Hammer 160 7 0 Qc TSF 350 0 Fs TSF 12 -1 Pw PSI 0 2 4 6 8 10 12 14 Derkerb 16 18 ■ 10 - gravelly sand to sand ■ 7 - silty sand to sandy silt silty clay to clay 🛚 1 - sensitive fine grained 11 very stiff fine grained (*) sand to silty sand organic material ■ 5 - clayey silt to silty clay **8** -■2-■ 12 - sand to clayey sand (*) ■ 6 - sandy silt to clayey silt **9** sand ■3clay

Total Depth

16.8' Fs>12

BUREAU OF RECLAMATION Date/Time 9/10/2014 11:24:46 AM CPT22B-14-22 Cone # **DSA0739** Hole # **L ROBINSON REACH 22B** Operator NGWSP Location **Project** Elevation Offset Station Northing **Easting** SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) SPT N* Pore Pressure **Local Friction Tip Resistance** 160 9 0 Qc TSF 350 0 Fs TSF 12 -1 Pw PSI 60% Hammer 0 1 2 3 5 6 ■ 10 - gravelly sand to sand ■ 7 - silty sand to sandy silt 1 - sensitive fine grained silty clay to clay ■ 11 - very stiff fine grained (*) sand to silty sand **2** organic material ■ 5 - clayey silt to silty clay ■ 12 - sand to clayey sand (*) **3** -■ 6 - sandy silt to clayey silt 🇯 9 sand clay 6.6' Fs>12 **Total Depth**

BUREAU OF RECLAMATION 9/5/2014 10:32:51 AM Date/Time DSA0739 CPT22B-14-24 Cone # Hole # L ROBINSON **REACH 22B** Operator Location **NGWSP Project** Elevation Offset Station Easting Northing SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) Pore Pressure SPT N* **Local Friction** Tip Resistance 120 Pw PSI 8 0 60% Hammer 500 0 Fs TSF 8 0 Qc TSF 0 2 6 8 10 12 14 16 ■ 10 - gravelly sand to sand ■ 7 - silty sand to sandy silt silty clay to clay 1 - sensitive fine grained ■ 11 - very stiff fine grained (*) sand to silty sand **8** organic material ■ 5 - clayey silt to silty clay **2** -■ 12 - sand to clayey sand (*) sand ■ 6 - sandy silt to clayey silt **19** 9 clay ■ 3 -

Total Depth

14.3' Qc>400 Fs>8

BUREAU OF RECLAMATION



Hole #

CPT22B-14-25

Cone #

DSA0739

Date/Time

9/10/2014 12:45:13 PM

Project

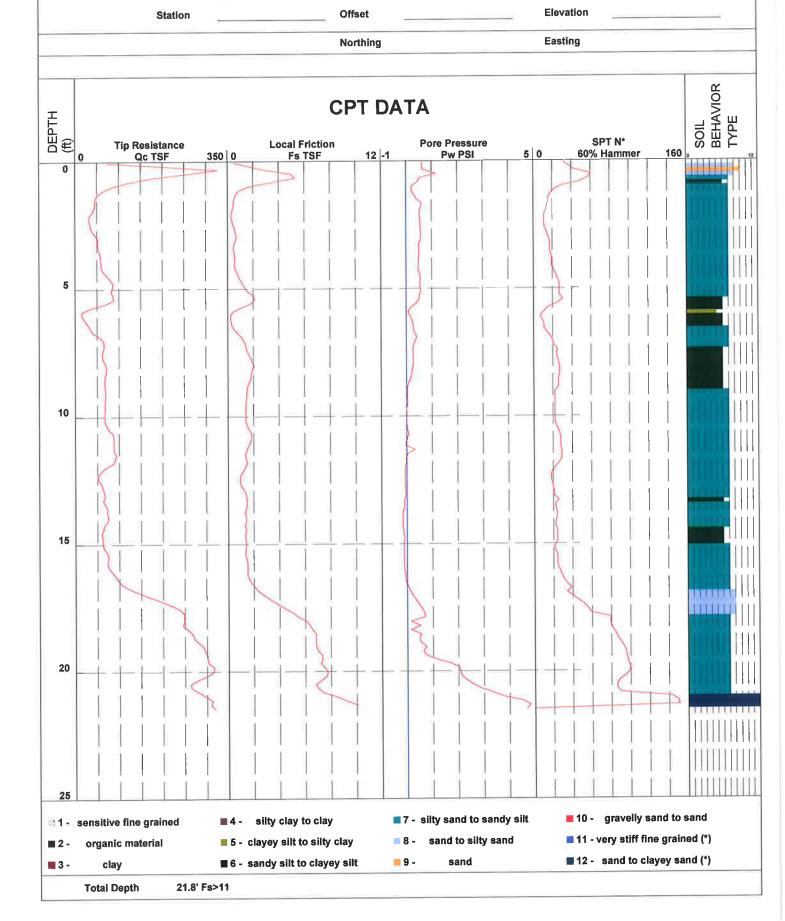
NGWSP

Location

REACH 22B

Operator

L ROBINSON



BUREAU OF RECLAMATION Date/Time 9/8/2014 10:58:08 AM DSA0739 Hole # CPT22B-14-37 Cone # **REACH 22B** Operator **L ROBINSON** NGWSP Location **Project** Elevation Station Offset Easting Northing SOIL BEHAVIOR TYPE **CPT DATA** DEPTH (ft) SPT N* **Local Friction Pore Pressure Tip Resistance** 140 100 0 10 -10 60% Hammer Qc TSF 350 0 Fs TSF Pw PSI 0 5 10 15 20 25 ■ 7 - silty sand to sandy silt ■ 10 - gravelly sand to sand 1 - sensitive fine grained silty clay to clay ■ 11 - very stiff fine grained (*) ■ 5 - clayey silt to silty clay sand to silty sand **2**organic material ■ 12 - sand to clayey sand (*) ■ 6 - sandy silt to clayey silt 🗿 9 sand ■3clay **Total Depth** 35' Fs>12

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS FEATURE: REACH 21 WTP

			SPT [#] 10	SPT [#] 9	SPT [#] 8	SPT [#] 7	SPT [#] 6	SPT [#] 5	SPT [#] 4	SPT [#] 3	SPT [#] 2	SPT [#] 1	TEST PIT NUMBER	D
			33.5 – 34.5	28.5 - 30.0	23.5 - 25.0	18.5 - 20.0	16.0 -17.5	13.5 – 15.0	11.0 - 12.5	8.5 - 10.0	6.0 - 7.5	3.5 - 5.0	DEPTH – feet	IDENTIFICATION
			SC	SC	SM	SM	SP-SM	SM	SM	SC	CL	SM	CLASSIFICATION SYMBOL	Ž
			20.5	19.1	10.5	7.5	5.8	9.0	15.0	27.9	55.7	10.0	SMALLER THAN 0.005 mm	PA
			12.0	11.7	6.8	7.4	5.9	5.7	16.3	10.4	32.8	7.1	0.005 to 0.074 mm	RTICLE IN
			67.5	69.2	82.7	80.1	78.2	85.3	68.7	61.7	11.5	82.9	SAND #200 (.074mm) to #4 (4.76mm)	PARTICLE SIZE FRACTIONS IN PERCENT
			0	0	0	5.0	10.1	0	0	0	0	0	GRAVEL #4 (4.76mm) to 3" (76.2mm)	
			0	0	0	0	0	0	0	0	0	0	COBBLES 3" (76.2mm) to 5" (127mm)	
			0	0	0	0	0	0	0	0	0	0	OVERSIZE Larger than 5" (127mm)	
			28.5	30.6	NA	NA	NA	NA	NA	24.7	46.3	NA	LIQUID LIMIT - %	CON
			9.6	10.8	NP	NP	NP	NP	NP	10.9	26.3	NP	PLASTICITY INDEX - %	CONSISTENCY
			1	-	-	-	1	-	1	ı	9.1	-	SHRINKAGE LIMIT - %	Y
			2.64	2.68	2.68	2.67	2.65	2.64	2.62	2.67	2.75	2.63	SPECIFIC GRAVITY MINUS NO.4	
			1	1	2.27	2.38	2.39	1	1	1	2.43	-	SPECIFIC GRAVITY PLUS NO. 4 BULK	SPEC
			1	-	3.7	6.5	5.2	-	-	-	3.8	-	ABSORPTION - %	SPECIFIC GRAVITY
			9.3	12.1	4.2	2.5	1.9	2.0	3.9	6.2	12.5	3.0	FILL WATER CONTENT % MINUS No. 4	AVITY
			ı	-	0	0	0	1	ı	-	0	-	FILL WATER CONTENT % PLUS No. 4	

Page 1 of 1

Drill Hole Number: DHR21-14-G

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

FEATURE: REACH 22 CUTTER LATERAL

DHR22-33	DHR22-33	DHR22-29	DHR22-29	DHR22-25	DHR22-25	DHR22-25	DHR22-25	DHR22-25	DHR22-25	DHR22-25	TEST PIT NUMBER	IDENJ
5.0-6.2	0.0-4.6	7.5-8.0	5.0-6.5	20.0-21.5	17.5-19.0	15.0-16.5	12.5-14.0	10.0-11.5	7.5-9.0	5.0-6.5	DEPTH – feet	IDENTIFICATION
MS	SC-SM	SM	s(CL)	SM	SM	SC	SC	SM	SM	SM	CLASSIFICATION SYMBOL	2
18.0	16.4	14.0	24.5	10.3	17.6	18.9	18.2	13.9	13.8	10.9	SMALLER THAN 0.005 mm	P
21.0	30.5	18.9	39.2	9.6	20.8	24.2	24.9	12.0	12.1	9.0	0.005 to 0.074 mm	TIC
61.0	53.1	67.1	28.6	80.1	59.9	56.9	56.9	74.1	74.1	80.1	SAND #200 (.074mm) to #4 (4.76mm)	LE SIZE FRA IN PERCENT
0.0	0.0	0.0	7.7	0.0	1.7	0.0	0.0	0.0	0.0	0.0	GRAVEL #4 (4.76mm) to 3" (76.2mm)	FRAC
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	COBBLES 3" (76.2mm) to 5" (127mm)	FIONS
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERSIZE Larger than 5" (127mm)	
N/A	25.6	N/A	32.7	N/A	22.9	26.2	26.1	N/A	N/A	N/A	LIQUID LIMIT - %	CON
NP	5.4	NP	14.7	NP	3.7	9.2	11.1	NP	NP	NP	PLASTICITY INDEX - %	CONSISTENCY LIMITS
ı	1	ı	ı	1	1	ı	ı	1	1	1	SHRINKAGE LIMIT - %	ICY
ı	1	ı	ı	1	1	ı	ı	ı	1	1	DRY DENSITY - PCF	_
7.6	4.2	4.5	7.3	2.8	3.8	3.7	4.2	3.3	3.0	1.9	FILL WATER CONTENT -%	IN-PLACE
I	1	1	1	1	ı	1	1	1	1	1	SPECIFIC GRAVITY PLUS NO. 4	E DENSITY
2.61	2.64	2.68	2.70	2.65	2.61	2.71	N/A	2.64	2.63	2.64	SPECIFIC GRAVITY MINUS NO.4	TY

NOTE: Numbers in parentheses are metric equivalents of numbers directly above. *Denotes in-place density and 5-point curve.

Page 1 of 4

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: **REACH 22**

							DHR22-96			DHR22-53	66	DHR22-13-5	TEST PIT NUMBER	IDENT
25.0 -26.5	17.5 – 19.0	15.0 - 16.5	12.5 – 14.0	10.0 – 11.5	7.5 - 9.0	5.0 - 6.5	2.5 - 4.0	10.0 - 11.5	5.0 - 6.5	2.5 - 4.0	5.0 - 6.5	2.5 - 4.0	DEPTH – feet	IDENTIFICATION
MS	MS	SM	SM	SM	SM	SM	SM	SM	SM	SC	SC	SC	CLASSIFICATION SYMBOL	Ži
15.4	8.0	7.5	8.5	11.0	17.5	7.1	7.5	10.8	14.4	18.0	23.9	11.8	SMALLER THAN 0.005 mm	\mathbf{P}_{ℓ}
13.1	5.7	5.4	4.5	11.0	21.2	5.0	7.2	13.0	11.0	11.1	19.8	12.2	0.005 to 0.074 mm	PARTICLE SIZE FRACTIONS IN PERCENT
71.5	86.3	87.1	87.0	78.0	61.3	82.4	85.3	76.2	74.6	70.9	56.3	74.5	SAND #200 (.074mm) to #4 (4.76mm)	LE SIZE FRA IN PERCENT
0	0	0	0	0	0	5.5	0	0	0	0	0	1.5	<u>GRAVEL</u> #4 (4.76mm) to 3" (76.2mm)	FRACT
0	0	0	0	0	0	0	0	0	0	0	0	0	COBBLES 3" (76.2mm) to 5" (127mm)	FION
0	0	0	0	0	0	0	0	0	0	0	0	0	OVERSIZE Larger than 5" (127mm)	IS
0.61	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	25.1	21.5	23.6	LIQUID LIMIT - %	COI
2.7	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	7.0	7.4	9.4	PLASTICITY INDEX - %	CONSISTENCY LIMITS
1	-	1	1	;	1		}		1	1	1	-	SHRINKAGE LIMIT - %	NCY
-		-	-	1	1		-			-	-	-	DRY DENSITY - PCF	
3.5	1.8	1.7	2.1	2.6	4.0	1.6	1.8	2.2	4.7	5.1	5.3	7.3	FILL WATER CONTENT -%	IN-PLACE DENSITY
-		-	-	1	-	2.36	1		-	-	!	2.53	SPECIFIC GRAVITY PLUS NO. 4	ACE ITY
2.62	2.61	2.64	2.64	2.63	2.64	2.64	2.62	2.64	2.67	2.62	2.68	2.65	SPECIFIC GRAVITY MINUS NO.4	
1	1	1	1	1	1		1			1	-	-	MAXIMUM DRY DENSITY - pcf	
-		1	1	1	1	-	1	-	-	1	-	-	OPTIMUM WATER CONTENT - %	COMP
-		-	-	1	-		-		-	-	:		PENETRATION RESISTANCE psi	COMPACTION TESTS
-		1	1	1	1		1			1		-	D-Value %	TESTS
													Relative Density %	
_														

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

FEATURE: REACH 22 CUTTER LATERAL

DHR22-57

	TEST PIT NUMBER	DHR22-57-1	DHR22-57-2	DHR22-57-3	DHR22-57-4	DHR22-57-5	DHR22-57-7	DHR22-57-8	DHR22-57-9			
IDENTIFICATION	DEPTH – feet	5.3-6.8	7.8-9.3	10.3-11.8	12.8-14.3	15.3-16.8	17.3-18.2	18.2-20.3	20.3-21.8			
	CLASSIFICATION SYMBOL	SM	SM	SP-SM	SP-SM	SP-SM	(CL) _s	SP-SM	SP-SM			
PAR FINES	SMALLER THAN 0.005 mm	12.9	8.0	4.5	4.9	5.5	60.7	3.3	5.2			
ARTICI	0.005 to 0.074 mm	20.2	11.3	3.7	4.3	2.4	24.3	1.8	1.7			
PARTICLE SIZE FRACTIONS IN PERCENT NES	SAND #200 (.074mm) to #4 (4.76mm)	66.9	80.7	91.8	90.8	92.1	15.0	91.9	93.1			
m)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0			
nm) S I	COBBLES 3" (76.2mm to 5" (127mm)	,	ı	ı	1	1	1	0.0	1			
er)	OVERSIZE Larger than 5" (127mm)	1	ı	1	1	1	1	ı	'			
Į Š	LIQUID LIMIT - %	N/A	N/A	N/A	N/A	N/A	36.3	N/A	N/A			
	PLASTICITY INDEX - 9	NP	NP	NP	NP	NP	19.8	NP	NP			
CY	SHRINKAGE LIMIT - %	ı	1	ı	1	1	1	1	ı			
	DRY DENSITY - PCF	1	-	1	1	1	1	-	ı			
IN-PLACE	FILL WATER CONTENT -%	3.9	2.4	1.6	1.3	1.5	16.0	0.7	1.3			
	SPECIFIC GRAVITY PLUS NO. 4	1	ı	1	1	1	1	2.56	ı			
$\mathbf{T}\mathbf{Y}$	SPECIFIC GRAVITY MINUS NO.4	2.68	2.66	2.60	2.70	2.65	2.64	2.66	2.68			

NOTE: Numbers in parentheses are metric equivalents of numbers directly above. *Denotes in-place density and 5-point curve.

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

FEATURE: REACH 22 CUTTER LATERAL

DHR22-61

DHR22-61-6 DHR22-61-5 DHR22-61-3 DHR22-61-4 DHR22-61-2 DHR22-61-1 TEST PIT NUMBER **IDENTIFICATION** 17.5-19.0 15.0-16.5 12.5-14.0 10.0 - 11.57.5-9.0 5.0 - 6.5DEPTH - feet s(CL-ML) SC-SM SP-SM CLASSIFICATION SMSM SM**SYMBOL** 17.5 SMALLER THAN 0.005 mm 7.0 15.5 FINES PARTICLE SIZE FRACTIONS 22.9 33.5 7.8 8.0 0.005 to 0.074 mm IN PERCENT 83.7 85.0 49.0 9 SAND #200 (.074mm) 6 to #4 (4.76mm) 0.0 **GRAVEL** #4 (4.76mm) 0.0 to 3" (76.2mm) **COBBLES** 3" (76.2mm) to 5" (127mm) OVERSIZE Larger than 5" (127mm) 21.2 23.7 N/A N/A N/A N/A LIQUID LIMIT - % CONSISTENCY LIMITS 6.9 Ą ¥ Ę Ŧ PLASTICITY INDEX - % SHRINKAGE LIMIT - % **DRY DENSITY - PCF** IN-PLACE FILL WATER 0.9 4.3 1.5 **CONTENT -%** DENSITY SPECIFIC GRAVITY .50 PLUS NO. 4 SPECIFIC GRAVITY 2.64 .67 .66 .68 .60 .66 MINUS NO.4

NOTE: Numbers in place density and 5 point curve

*Denotes in plac

*Denotes in-place density and 5-point curve.

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

FEATURE: REACH 22 CUTTER LATERAL

DHR22-65

, , , , , , , , , , , , , , , , , , , 		
DHR22-65-4 DHR22-65-5 DHR22-65-6 DHR22-65 DHR22-65	DHR22-65-1 DHR22-65-2	IDEN
12.5-14.0 15.0-16.5 20.0-21.5 2.5-3.5 11.9-12.5	5.0-6.5 DEPTH – feet 7.5-9.0	IDENTIFICATION
SM SM SM SM SM	SP-SM CLASSIFICATION SYMBOL	2
11.5 11.6 10.0 10.4 26.8	5.8 6.7 7.5 SMALLER THAN 0.005 mm FINES	d
14.7 9.5 13.3 13.5 35.3	6.3 4.2 2.0 0.005 to 0.074 mm	ARTICI
73.8 78.9 76.7 76.1 37.9	SAND #200 (.074mm) to #4 (4.76mm) OO OO OO OO OO OO OO OO OO OO OO OO OO	PARTICLE SIZE FRACTIONS
0.0 0.0 0.0 0.0	O O O O O O O O O O O O O O O O O O O	FRAC
	COBBLES 3" (76.2mm) to 5" (127mm)	IONS
	OVERSIZE Larger than 5" (127mm)	
N/A N/A N/A N/A N/A N/A	Z Z Z Z LIQUID LIMIT - %	CONS
NP NP NP	Z Z Z PLASTICITY INDEX - %	SISTENCY
	SHRINKAGE LIMIT - %	CY
	DRY DENSITY - PCF	
3.8 3.3 2.2 2.6 8.3	P. P. FILL WATER CONTENT -%	IN-PLACE
		DENSITY
2.68 2.61 2.68 2.64 2.67	2. 2. 2. SPECIFIC GRAVITY MINUS NO.4	ΥT

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

*Parents in place density and 5 point arms.

*Denotes in-place density and 5-point curve.

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FI

FEATURE: REACH 22 CUTTER LATERAL

DHR22-69

IDEN	1	TEST PIT NUMBER	DHR22-69-1	DHR22-69-2	DHR22-69-3	DHR22-69-4	DHR22-69-5	DHR22-69-6	DHR22-69-7				
IDENTIFICATION		DEPTH – feet	5.0-6.5	7.5-9.0	10.0-11.5	12.5-14.0	15.0-16.5	17.0-20.0	20.0-21.5				
Z		CLASSIFICATION SYMBOL	SM	SM	SM	s(CL)	SC	$(SC)_g$	SC				
	FIN	SMALLER THAN 0.005 mm	7.8	8.5	13.8	21.2	20.3	12.7	18.8				
PARTICLE SIZE FRACTIONS IN PERCENT	<u>FINES</u>	0.005 to 0.074 mm	8.5	16.7	26.3	36.8	28.6	10.4	16.9				
LE SIZE FRA IN PERCENT		SAND #200 (.074mm) to #4 (4.76mm)	83.7	74.8	58.5	40.6	46.8	61.9	55.3				
FRAC		GRAVEL #4 (4.76mm) to 3" (76.2mm)	0.0	0.0	1.4	1.4	4.3	15.0	9.0				
TIONS	1)	COBBLES 3" (76.2mm)	1	ı	0.0	0.0	0.0	0.0	0.0				
		OVERSIZE Larger than 5" (127mm)	1	ı	ı	1	1	ı	ı				
CONSI		LIQUID LIMIT - %	N/A	N/A	N/A	31.1	27.6	25.5	29.2				
NSISTENCY LIMITS	%	PLASTICITY INDEX - %	NP	NP	NP	15.7	12.4	11.1	14.8				
NCY	%	SHRINKAGE LIMIT - %	1	-	-	-	-	-	-				
11		DRY DENSITY - PCF	1	-	-	-	-	-	-				
IN-PLACE		FILL WATER CONTENT -%	2.4	2.7	4.8	7.0	5.8	4.5	5.6				
E DENSITY		SPECIFIC GRAVITY PLUS NO. 4	ı	1	2.62	2.45	2.40	2.57	2.43				
TY		SPECIFIC GRAVITY MINUS NO.4	2.70	2.71	2.65	2.60	2.70	2.69	2.70				

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

*Denotes in place dansity and 5-point curve.

*Denotes in-place density and 5-point curve.

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

FEATURE: REACH 22 CUTTER LATERAL

DHR22-74

IDEN'	t	TEST PIT NUMBER	DHR22-74-1	DHR22-74-2	DHR22-74-3	DHR22-74-4	DHR22-74-5	DHR22-74-6				
IDENTIFICATION		DEPTH – feet	5.0-6.5	7.5-9.0	10.0-11.5	12.5-14.0	15.0-15.7	20.0-20.6				
		CLASSIFICATION SYMBOL	SM	SM	SC	SC	SC	s(CL)				
F	FINES	SMALLER THAN 0.005 mm	11.9	17.0	18.0	17.5	16.7	28.6				
PARTICLE SIZE FRACTIONS IN PERCENT	IES	0.005 to 0.074 mm	19.2	12.1	12.7	12.1	30.9	29.2				
LE SIZE FRA IN PERCENT		SAND #200 (.074mm) to #4 (4.76mm)	68.9	70.9	69.3	67.9	52.4	42.2				
FRAC		GRAVEL #4 (4.76mm) to 3" (76.2mm)	0.0	0.0	0.0	2.5	0.0	0.0				
TIONS	1)	COBBLES 3" (76.2mm to 5" (127mm)	1	-	-	0.0	-	-				
		OVERSIZE Larger than 5" (127mm)	1	ı	ı	1	1	1				
CON		LIQUID LIMIT - %	N/A	25.3	28.3	27.1	34.5	35.0				
CONSISTENCY LIMITS	%	PLASTICITY INDEX - 9	NP	NP	11.4	10.1	12.8	18.8				
ICY	%	SHRINKAGE LIMIT - %	1	ı	ı	ı	ı	1				
1 5		DRY DENSITY - PCF	1	ı	ı	ı	ı	1				
IN-PLACE		FILL WATER CONTENT -%	3.8	6.4	6.3	4.7	10.5	9.4				
DENSITY		SPECIFIC GRAVITY PLUS NO. 4	1	ı	1	2.54	1	1				
TY		SPECIFIC GRAVITY MINUS NO.4	2.65	2.67	2.73	2.74	2.65	2.74				

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

*Denotes in-place density and 5-point curve.

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT

FEATURE: REACH 22 CUTTER LATERAL

	IDENTIFICATION	,	PAR FINES	TIC	LE SIZE FRA	FRACI	m) ITONS	r	Õ	~ 70	MITS IMITS	STENCY MITS	STENCY MITS ** F	STENCY MITS	STENCY IN-PLACE
EST PIT NUMBER	DEPTH – feet	CLASSIFICATION SYMBOL	MALLER THAN 0.005 mm	0.005 to 0.074 mm	5AND #200 (.074mm) to #4 (4.76mm)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	OBBLES 3" (76.2mm to 5" (127mm)	OVERSIZE Larger than 5" (127mm)	LIQUID LIMIT - %	ASTICITY INDEX - (IRINKAGE LIMIT - 9		DRY DENSITY - PCF	DRY DENSITY - PCF FILL WATER CONTENT -%	FILL WATER
T		C	SI	0.	<u>S.</u>	<u>G</u>	CC	9	I	PL.	SH		D	D	
DHR22-78	5.0-6.5	SC	25.0	7.7	67.3	0.0	0.0	0.0	21.9	8.4	1		1	- 4.6	
DHR22-78	7.5-9.0	$(TW)^{s}$	19.3	31.7	49.0	0.0	0.0	0.0	21.4	3.8	ı		ı	- 4.5	
DHR22-78	10.0-10.5	(CH) _s	58.2	17.2	24.6	0.0	0.0	0.0	52.1	30.3	8.1		ı	- 17.2	
DHR22-78	10.5-11.5	SC	21.4	23.0	55.6	0.0	0.0	0.0	25.6	7.3	1		ı	- 5.6	
DHR22-78	12.5-14.0	MS	12.8	10.0	77.2	0.0	0.0	0.0	N/A	NP	1		ı	- 2.7	
DHR22-78	15.0-16.5	(ML)	17.0	51.5	31.5	0.0	0.0	0.0	N/A	NP	ı		1	- 5.5	
DHR22-78	17.5-19.0	MS	16.3	24.1	59.6	0.0	0.0	0.0	N/A	NP	ı		1	- 4.6	
DHR22-78	20.0-21.5	MS	14.0	20.4	65.6	0.0	0.0	0.0	N/A	NP	ı		ı	- 3.9	
												_			

NOTE: Numbers in parentheses are metric equivalents of numbers directly above. *Denotes in-place density and 5-point curve.

Page 2 of 4

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE:

CT FEATURE: REACH 22B
Drill Hole Number: DHR22AC1-15-1

IBE	TEST PIT NUN	SPT #1	SPT #2	SPT #3	SPT #4	SPT #5	SPT #6	SPT #7	SPT #8				
et	DEPTH – fo	3.5 - 5.0	6.0 - 7.5	8.5 - 10.0	11.0 – 12.5	13.5 – 15.0	16.0 – 17.5	18.5 - 20.0	23.5 – 25.0				
'IOI	CLASSIFICA' SYMBOL	MS	SP-SM	SP-SM	SC	SC-SM	SC	SC	SM				
N	SMALLER THA 0.005 mm	8.5	4.9	4.4	17.0	14.6	16.6	16.3	9.6				
1	0.005 to 0.074 mi	13.2	5.1	5.2	20.1	13.1	19.7	21.2	10.1				
	SAND #200 (.07 to #4 (4.76m)	78.3	90.0	90.4	62.9	72.3	63.7	62.5	79.7				
6mm n)	GRAVEL #4 (4.7 to 3" (76.2m)	0	0	0	0	0	0	0	0.6				
5.2m 1)	COBBLES 3" (7 to 5" (127mm	1	ı	1	-	-	1	-	ı				
rger nm)	OVERSIZE L than 5" (127)	-	-	1	-	-	-	ı	-				
Γ - %	LIQUID LIMI	AN	NA	NA	23.4	22.4	27.2	26.9	NA				
EX -	PLASTICITY INI	NP	NP	NP	7.1	5.2	10.3	9.3	NP				
IIT -	SHRINKAGE LIN	-	ı	ı	-	1	-	ı	-				
	SPECIFIC GRA MINUS NO	2.70	2.62	2.51	2.61	2.62	2.72	2.66	2.67				
	SPECIFIC GRA PLUS NO. 4 B	-	1	ı	1	1	-	1	2.48				
	APPAREN	-	-	-	_	1	-	1	-				
- %	ABSORPTION	-	ı	ı	1	1	ı	ı	1.3				
	FILL WATER COM MINUS No.	2.5	1.7	1.6	5.3	4.6	5.5	5.8	5.3				
	FILL WATER CON PLUS No. 4	-	ı	ı	1	1	1	ı	1.2				

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: REACH 22B

Drill Hole Number: DHR22AC2-15-1

					SPT #5	SPT #4	SPT #3	SPT #2	SPT #1	TEST PIT NUMBER	
					13.5 – 15.0	11.0 – 12.5	8.5 - 10.0	6.0 – 7.5	3.5 - 5.0	DEPTH – feet	IDENTIFICATION
					SM	SM	SM	(CL-ML)s	SM	CLASSIFICATION SYMBOL	Ž
					8.9	12.2	11.0	16.8	9.4	SMALLER THAN 0.005 mm	FID
					8.3	18.6	22.5	56.4	7.2	0.005 to 0.074 mm	FINES
					82.8	69.2	66.5	26.8	83.4	SAND #200 (.074mm) to #4 (4.76mm)	IN PERCENT VES The size fractions The size fr
					0	0	0	0	0	GRAVEL #4 (4.76mm) to 3" (76.2mm)	ENT
					-	-	-	-	-	COBBLES 3" (76.2mm) to 5" (127mm)	CNO
					ı	1	1	ı	-	OVERSIZE Larger than 5" (127mm)	
					NA	NA	NA	25.9	NA	LIQUID LIMIT - %	I
					NP	NP	NP	6.9	NP	PLASTICITY INDEX - %	LIMITS
					1	-	1	1	-	SHRINKAGE LIMIT - %	
					2.62	2.64	2.64	2.64	2.66	SPECIFIC GRAVITY MINUS NO.4	SPEC
					1	1	1	1	ı	SPECIFIC GRAVITY PLUS NO. 4 BULK	SPECIFIC GRAVITY
					ı	1	ı	1	1	APPARENT	RAVI
					ı	ı	1	1	1	ABSORPTION - %	LX
					2.5	3.7	3.1	5.4	3.7	FILL WATER CONTENT % MINUS No. 4	<u></u>
					1	1	1	•	1	FILL WATER CONTENT % PLUS No. 4	DENSITY

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: REACH 22B

Drill
Hole
Num
ber: l
DHR2
2B-1
4-25

IDI	R	TEST PIT NUMBER (DHR22B-14-25)	SPT# 1	SPT#2	SPT#3	SPT# 4	SPT# 5	SPT#6	SPT# 7	SPT# 8				
IDENTIFICATION		DEPTH – feet	4.0 - 5.5	6.5 - 8.0	9.0 - 10.5	11.5 - 13.0	14.0 – 15.5	16.5 - 18.0	19.0 - 20.5	24.0 – 25.5				
Ż		CLASSIFICATION SYMBOL	SC	SC-SM	SM	SC-SM	SM	SM	SM	(CL) _S				
P.	FIL	SMALLER THAN 0.005 mm	20.9	21.0	16.9	20.3	14.3	13.3	16.5	35.9				
ARTICI I	FINES	0.005 to 0.074 mm	22.7	18.4	15.1	15.7	9.0	9.0	5.5	48.2				
PARTICLE SIZE FRACTIONS IN PERCENT)	SAND #200 (.074mm) to #4 (4.76mm)	56.4	60.6	68.0	64.0	76.7	77.7	78.0	15.9				
FRACT ENT)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	0	0	0	0	0	0	0	0				
SNOI	n)	COBBLES 3" (76.2mm)	0	0	0	0	0	0	0	0				
		OVERSIZE Larger than 5" (127mm)	0	0	0	0	0	0	0	0				
CON		LIQUID LIMIT - %	25.9	24.3	NA	25.2	AN	21.6	NA	41.1				
CONSISTENCY LIMITS	%	PLASTICITY INDEX - %	11.0	7.0	NP	7.0	NP	3.0	NP	21.3				
ICY	0%	SHRINKAGE LIMIT - %	1	1	1	ı	1	1	ı	12.0				
SPE		SPECIFIC GRAVITY MINUS NO.4	2.69	2.66	2.69	2.69	2.68	2.64	2.70	2.73				
SPECIFIC GRAVITY		SPECIFIC GRAVITY PLUS NO. 4 BULK	-	1	1	1	-	-	1	-				
RAVI		APPARENT	1	ı	ı	ı	1	1	ı	ı				
TY		ABSORPTION - %	,	,	,	1	1	1	ı	1				
	Γ%	FILL WATER CONTENT MINUS No. 4	4.0	6.7	5.4	5.7	4.4	4.9	5.5	17.6				
IN-PLA	Γ%	FILL WATER CONTENT PLUS No. 4	1	1	1	ı	-	-	ı	-				
IN-PLACE DENSITY														
KLISI														

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE:

Drill	FEA'
Hole	TURE:
Number:	REACH
DHR22B	22B
B-14-33	

				SPT#8	SPT#7	SPT#6	SPT# 5	SPT#4	SPT# 3	SPT# 2	SPT# 1	TEST PIT NUMBER (DHR22B-14-33)	IDE
				23.5 – 25.0	18.5 - 20.0	16.0 - 17.5	13.5 – 15.0	11.0 – 12.5	8.5 - 10.0	6.0 - 7.5	3.5 - 5.0	DEPTH – feet	IDENTIFICATION
				SM	SC	s(CL)	SC	SC	SM	SM	SC-SM	CLASSIFICATION SYMBOL	N
				4.5	21.9	26.0	22.4	19.1	10.5	14.9	16.6	SMALLER THAN 0.005 mm	P.
				22.4	21.8	33.3	24.8	23.8	10.6	16.8	19.8	0.005 to 0.074 mm	ARTICL
				73.1	56.3	40.7	52.8	57.1	78.9	68.3	63.6	SAND #200 (.074mm) to #4 (4.76mm)	PARTICLE SIZE FRACTIONS IN PERCENT
				0	0	0	0	0	0	0	0	GRAVEL #4 (4.76mm) to 3" (76.2mm)	RACT
				0	0	0	0	0	0	0	0	COBBLES 3" (76.2mm) to 5" (127mm)	IONS
				0	0	0	0	0	0	0	0	OVERSIZE Larger than 5" (127mm)	
				NA	26.4	28.4	27.2	23.6	NA	NA	22.6	LIQUID LIMIT - %	CON
				NP	11.7	13.7	12.1	9.8	NP	NP	6.4	PLASTICITY INDEX - %	CONSISTENCY LIMITS
				ı	ı	1	1	1	1	ı	1	SHRINKAGE LIMIT - %	CY
				2.71	2.72	2.73	2.68	2.67	2.65	2.64	2.66	SPECIFIC GRAVITY MINUS NO.4	SPEC
				ı	ı	ı	1	1	-	ı	-	SPECIFIC GRAVITY PLUS NO. 4 BULK	SPECIFIC GRAVITY
				ı	ı	1	ı	ı	1	ı	ı	APPARENT	RAVI
						,	,	,	1	ı		ABSORPTION - %	ГҮ
				7.1	8.2	9.6	7.2	6.3	2.7	3.8	3.9	FILL WATER CONTENT % MINUS No. 4	
				ı	ı	ı	1	1	1	ı	1	FILL WATER CONTENT % PLUS No. 4	IN-PLA
													IN-PLACE DENSITY
													SITY

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: **REACH 22B**

Drill Hole N	FEATURE:
lumber: D H	REACH 22B
Drill Hole Number: DHR-22B-14-41	~
	Page 1 of 1

				SPT [#] 8	SPT [#] 7	SPT [#] 6	SPT [#] 5	SPT [#] 4	SPT [#] 3	SPT [#] 2	SPT [#] 1	TEST PIT NUMBER	Ð
				23.5 – 25.0	18.5 - 20.0	16.0 -17.5	13.5 – 15.0	11.0 – 12.5	8.5 - 10.0	6.0 - 7.5	3.5 - 5.0	DEPTH – feet	IDENTIFICATION
				s(CL)	(CL)s	SM	MS	MS	SP-SM	SP-SM	SP-SM	CLASSIFICATION SYMBOL	N
				23.9	29.8	8.5	6.0	6.1	6.0	4.0	5.0	SMALLER THAN 0.005 mm	PA
				38.7	42.3	9.0	6.8	6.5	5.8	4.3	6.4	0.005 to 0.074 mm	PARTICLE SIZE FRACTIONS IN PERCENT
				37.4	27.9	82.5	87.2	81.3	88.2	91.7	88.6	SAND #200 (.074mm) to #4 (4.76mm)	LE SIZE FRA IN PERCENT
				0	0	0	0	6.1	0	0	0	GRAVEL #4 (4.76mm) to 3" (76.2mm)	RACTION
				0	0	0	0	0	0	0	0	COBBLES 3" (76.2mm) to 5" (127mm)	SNO
				0	0	0	0	0	0	0	0	OVERSIZE Larger than 5" (127mm)	
				30.5	34.9	NA	NA	AN	NA	NA	AN	LIQUID LIMIT - %	CONSIST LIMI
				10.4	18.0	NP	NP	NP	NP	NP	NP	PLASTICITY INDEX - %	NSISTENCY LIMITS
				-	ı	-	-	-	1	ı	1	SHRINKAGE LIMIT - %	Y
				2.66	2.67	2.67	2.65	2.63	2.66	2.64	2.63	SPECIFIC GRAVITY MINUS NO.4	
				1	1	1	ı	2.47	1	1	1	SPECIFIC GRAVITY PLUS NO. 4 BULK	SPEC
				-	-	-	-	3.7	-	-	-	ABSORPTION - %	SPECIFIC GRAVITY
				9.2	10.3	2.4	1.6	1.3	1.1	0.7	0.9	FILL WATER CONTENT % MINUS No. 4	LAVITY
				ı	-	1	1	0	ı	ı	-	FILL WATER CONTENT % PLUS No. 4	

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE:

Drill Hole Number: DHR22B-14-50 **REACH 22B**

ID]	2	TEST PIT NUMBER (DHR22B-14-50)	SPT# 1	SPT# 2	SPT#3							
IDENTIFICATION		DEPTH – feet	4.0 - 5.5	6.5 - 8.0	9.0 – 10.5							
Ž		CLASSIFICATION SYMBOL	SM	SC	s(CL)							
P,	FIN	SMALLER THAN 0.005 mm	9.4	22.9	21.0							
ARTICL	<u>FINES</u>	0.005 to 0.074 mm	8.0	20.9	32.9							
PARTICLE SIZE FRACTIONS IN PERCENT		<u>SAND</u> #200 (.074mm) to #4 (4.76mm)	82.6	56.2	46.1							
RACTI		GRAVEL #4 (4.76mm) to 3" (76.2mm)	0	0	0							
SNO]	1)	COBBLES 3" (76.2mm to 5" (127mm)	0	0	0							
		OVERSIZE Larger than 5" (127mm)	0	0	0							
CON		LIQUID LIMIT - %	NA	38.0	29.3							
CONSISTENCY LIMITS	%	PLASTICITY INDEX - 9	NP	21.6	12.8							
CY	%	SHRINKAGE LIMIT - %	1	1	ı							
SPEC		SPECIFIC GRAVITY MINUS NO.4	2.63	2.67	2.65							
SPECIFIC GRAVITY		SPECIFIC GRAVITY PLUS NO. 4 BULK	1	1	1							
RAVI		APPARENT	ı	ı	1							
TY		ABSORPTION - %	1	ı	'							
	· %	FILL WATER CONTENT MINUS No. 4	3.5	7.1	6.7							
IN-PLA	· %	FILL WATER CONTENT PLUS No. 4	ı	ı	ı							
IN-PLACE DENSITY												
SITY												

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE:

REACH 22B

Drill Hole Number: DHR22B-14-121

IDENTIF	TEST PIT NUM	SPT#	SF	S	S	S	S	70	7.0				
H – feet CA		# 1	SPT# 2	SPT#3	SPT# 4	SPT#5	SPT#6	SPT# 7	SPT# 8				
Tio	DEPTH – fe	3.5 – 5.0	6.0 – 7.5	8.5 – 10.0	11.0 - 12.5	13.5 – 15.0	16.0 - 17.5	18.5 - 20.0	23.5 – 25.0				
FICATION	CLASSIFICAT SYMBOL	SC	SM	s(CL)	SC	s(CL)	s(CL)	s(CL)	SC				
	SMALLER THAN 0.005 mm	19.8	8.5	21.8	20.9	28.0	31.8	27.8	29.0				
PARTICI PARTICI PINES	0.005 to 0.074 mm	23.4	10.2	33.9	27.0	26.1	27.6	26.0	18.1				
PARTICLE SIZE FRACTIONS 100 (.074mm) 4.76mm) #4 (4.76mm) 76.2mm) 127mm)	SAND #200 (.07- to #4 (4.76mn	56.8	81.3	44.3	52.1	45.9	40.6	46.2	52.9				
#4 (4.76mm) ENT ACT	GRAVEL #4 (4.70 to 3" (76.2mn	1	1	1	1	1	1	1	1				
3" (76,2mm)	COBBLES 3" (76 to 5" (127mm	1	1	ı	ı	1	ı	ı	ı				
ZE Larger ' (127mm)	OVERSIZE La than 5" (127m	1	1	1	ı	1	ı	ı	ı				
LIMIT - %	LIQUID LIMIT	24.4	NA	26.5	26.7	29.2	31.2	27.9	28.2				
CONSISTENCE TY INDEX - %	PLASTICITY IND	11.0	NP	12.3	11.8	14.8	16.6	13.4	14.8				
	SHRINKAGE LIM	ı	ı	ı	14.2	ı	ı	ı	ı				
C GRAVITY US NO.4	SPECIFIC GRAV	2.65	2.62	2.63	2.67	2.65	2.64	2.64	2.65				
	SPECIFIC GRAV PLUS NO. 4 BU	-	-	1	-	-	-	ı	-				
ARENT A Y	APPARENT	1	ı	ı	ı	ı	ı	ı	ı				
PTION - %	ABSORPTION	1	ı	ı	ı	ı	ı	ı	ı				
JS No. 4	FILL WATER CON MINUS No. 4	3.9	1.7	5.4	5.0	5.7	7.0	5.7	4.7				
	FILL WATER CON PLUS No. 4	1	ı	ı	ı	ı	ı	ı	ı				
CE DEN													
ALISN													

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE:

FEATURE: REACH 22B

Drill Hole Number: DHR22B-14-125

IDF	2	TEST PIT NUMBER (DHR22B-14-125)	SPT# 1	SPT#2	SPT#3	SPT#4	SPT#5	SPT#6	SPT#7	SPT#8				
IDENTIFICATION		DEPTH – feet	3.5 – 5.0	6.0 – 7.5	8.5 - 10.0	11.0 - 12.5	13.5 –15.0	16.0 - 17.5	18.5 - 20.0	23.5 – 25.0				
Z 		CLASSIFICATION SYMBOL	SC	SM	SC	s(CL)	$(CL)_S$	s(CL)	s(CL)	СН				
P	FIN	SMALLER THAN 0.005 mm	31.0	12.5	26.1	39.2	45.0	38.3	29.4	74.6				
ARTICL	FINES	0.005 to 0.074 mm	11.4	9.0	17.4	29.3	31.1	18.4	21.2	21.5				
PARTICLE SIZE FRACTIONS IN PERCENT		SAND #200 (.074mm) to #4 (4.76mm)	57.6	78.5	56.5	31.5	23.9	43.3	49.4	3.9				
RACT	ı	GRAVEL #4 (4.76mm) to 3" (76.2mm)	0	0	0	0	0	0	0	0				
SNOI	1)	COBBLES 3" (76.2mm)	0	0	0	0	0	0	0	0				
		OVERSIZE Larger than 5" (127mm)	0	0	0	0	0	0	0	0				
CON		LIQUID LIMIT - %	34.2	ı	26.3	39.6	40.4	34.0	28.2	69.0				
CONSISTENCY LIMITS	%	PLASTICITY INDEX - %	21.6	NP	14.1	27.0	28.1	22.0	15.9	44.5				
ICY	%	SHRINKAGE LIMIT - %	1	ı	ı	ı	8.8	1	ı	8.3				
SPEC		SPECIFIC GRAVITY MINUS NO.4	2.61	2.66	2.61	2.58	2.60	2.63	2.59	2.56				
SPECIFIC GRAVITY		SPECIFIC GRAVITY PLUS NO. 4 BULK	1	1	1	ı	1	1	ı	ı				
RAVI		APPARENT	1	1	ı	1	1	1	ı	ı				
ГҮ		ABSORPTION - %	1	ı	ı	1	1	-	ı	ı				
	Γ %	FILL WATER CONTENT MINUS No. 4	6.3	3.2	6.2	9.9	10.4	8.8	7.6	25.0				
IN-PLACE DENSITY	۲%	FILL WATER CONTENT PLUS No. 4	-	1	1	1	1	-	ı	ı				
CE DEN														
ALIS														

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: REACH 22B

Drill Hole Number: DHR22PP1-15-1

				SPT #7	SPT #6	SPT #5	SPT #4	SPT #3	SPT #2	SPT #1	TEST PIT NUMBER	IDI
				18.5 - 20.0	16.0 - 17.5	13.5 - 15.0	11.0 – 12.5	8.5 - 10.0	6.0 - 7.5	3.5 - 5.0	DEPTH – feet	IDENTIFICATION
				SC	SM	SM	SM	SC-SM	SM	SM	CLASSIFICATION SYMBOL	N
				19.1	16.2	9.0	8.6	15.0	9.3	8.9	SMALLER THAN 0.005 mm	P,
				19.5	16.2	10.3	13.3	23.3	11.7	12.2	0.005 to 0.074 mm	ARTICL
				61.4	67.6	80.7	74.1	61.7	79.0	78.9	SAND #200 (.074mm) to #4 (4.76mm)	PARTICLE SIZE FRACTIONS IN PERCENT
				0	0	0	4.0	0	0	0	GRAVEL #4 (4.76mm) to 3" (76.2mm)	FRACT ENT
				ı	ı	ı	ı	ı	ı	ı	COBBLES 3" (76.2mm) to 5" (127mm)	SNOL
				ı	-	1	ı	1	-	ı	OVERSIZE Larger than 5" (127mm)	
				31.3	NA	NA	NA	22.8	NA	NA	LIQUID LIMIT - %	CON
				16.5	NP	NP	NP	4.2	NP	NP	PLASTICITY INDEX - %	CONSISTENCY LIMITS
				ı	ı	ı	1	1	1	1	SHRINKAGE LIMIT - %	ICY
				2.67	2.62	2.63	2.69	2.61	2.63	2.66	SPECIFIC GRAVITY MINUS NO.4	SPEC
				ı	1	1	2.34	-	-	1	SPECIFIC GRAVITY PLUS NO. 4 BULK	SPECIFIC GRAVITY
				ı	1	ı	ı	ı	ı	ı	APPARENT	RAVI
				ı	-	-	6.5	1	-	1	ABSORPTION - %	TY
				6.5	4.8	2.9	2.8	4.3	2.4	3.1	FILL WATER CONTENT % MINUS No. 4	
				ı	-	ı	2.8	1	1	1	FILL WATER CONTENT % PLUS No. 4	IN-PLA
												IN-PLACE DENSITY
												SITY

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: **REACH 22**

Ħ	ł	TEST PIT NUMBER	SPT#1	SPT#2	SPT#3	SPT#4	SPT#5						
IDENTIFICATION		DEPTH – feet	3.5 – 5.0	6.0 – 7.5	8.5 - 10.0	11.0 – 12.5	13.5 – 15.0						
ON		CLASSIFICATION SYMBOL	SP-SM	SP-SM	(CL-ML)s	SM	SM						
PA	FINES	SMALLER THAN 0.005 mm	5.0	4.0	23.6	15.0	16.5						
PARTICLE SIZE FRACTIONS IN PERCENT	ES	0.005 to 0.074 mm	4.1	4.5	46.5	15.1	13.8						
LE SIZE FRA IN PERCENT		SAND #200 (.074mm) to #4 (4.76mm)	90.9	91.5	29.9	69.9	69.7						
RACTI		GRAVEL #4 (4.76mm) to 3" (76.2mm)	0	0	0	0	0						
SNO	1)	COBBLES 3" (76.2mm)	0	0	0	0	0						
		OVERSIZE Larger than 5" (127mm)	0	0	0	0	0						
CON		LIQUID LIMIT - %	NA	NA	23.3	NA	NA						
CONSISTENCY LIMITS	%	PLASTICITY INDEX - %	NP	NP	5.5	NP	NP						
	%	SHRINKAGE LIMIT - %	-	1	1		1						
SPEC		SPECIFIC GRAVITY MINUS NO.4	2.64	2.63	2.68	2.68	2.65						
SPEC		SPECIFIC GRAVITY PLUS NO. 4 BULK	1	ı	ı	ı	-						
SPECIFIC GRAVITY		ABSORPTION - %	1	1	1	1	1						
LAVITY	· %	FILL WATER CONTENT MINUS No. 4	1.6	1.2	5.0	3.4	3.7						
	· %	FILL WATER CONTENT PLUS No. 4	1	ı	ı	ı	ı						
		Total Moisture%	1.6	1.2	5.0	3.4	3.7						

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: REACH 22B

Drill Hole Number: DHR22PP2-15-2

IDI	2	TEST PIT NUMBER	SPT # 1	SPT #2	SPT #3	SPT #4	SPT #5	SPT #6	SPT #7	SPT #8	SPT #9				
IDENTIFICATION		DEPTH – feet	4.2 – 5.7	6.7 – 8.2	9.2 – 10.7	11.7 – 13.2	14.2 – 15.7	16.7 – 18.2	19.2 – 20.7	24.2 – 25.7	29.2 – 30.7				
Ż		CLASSIFICATION SYMBOL	SM	SM	SC-SM	SM	SM	SP-SM	SP-SM	SM	SM				
P,	FINES	SMALLER THAN 0.005 mm	8.4	6.4	18.4	6.9	9.5	3.4	5.4	10.9	11.0				
ARTICL	<u>IES</u>	0.005 to 0.074 mm	7.9	7.5	27.9	10.1	21.0	3.1	3.1	15.5	19.7				
PARTICLE SIZE FRACTIONS IN PERCENT)	SAND #200 (.074mm) to #4 (4.76mm)	83.7	86.1	53.7	83.0	69.5	93.5	91.5	73.6	69.3				
FRACT ENT)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	0	0	0	0	0	0	0	0	0				
SNOL	n)	COBBLES 3" (76.2mm to 5" (127mm)	ı	ı	ı	ı	ı	ı	ı	ı	1				
		OVERSIZE Larger than 5" (127mm)	1	ı	1	1	1	-	ı	ı	1				
CON		LIQUID LIMIT - %	AN	NA	22.2	NA	NA	NA	NA	NA	NA				
CONSISTENCY LIMITS	%	PLASTICITY INDEX - %	NP	NP	4.8	NP	NP	NP	NP	NP	NP				
ICY	0/0	SHRINKAGE LIMIT - %	1	1	ı	ı	ı	ı	ı	ı	ı				
SPE		SPECIFIC GRAVITY MINUS NO.4	2.64	2.61	2.61	2.65	2.64	2.65	2.66	2.62	2.63				
SPECIFIC GRAVITY		SPECIFIC GRAVITY PLUS NO. 4 BULK	1	1	1	1	1	1	ı	ı	ı				
RAVI		APPARENT	ı	ı	ı	ı	ı	ı	ı	ı	ı				
ГҮ		ABSORPTION - %	1	1	,	ı	ı	ı	I	I	i				
	Γ%	FILL WATER CONTENT MINUS No. 4	3.4	2.3	5.8	2.1	3.4	1.4	2.2	3.7	3.5				
IN-PLACE DENSITY	Г%	FILL WATER CONTENT PLUS No. 4	-	1	1	1	1	-	ı	ı	ı				
CE DE															
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											1				

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE:

Drill Hole Number: DHR22RT1A-15-1

REACH 22B

				SPT #7	SPT #6	SPT #5	SPT #4	SPT #3	SPT #2	SPT #1	TEST PIT NUMBER (DHR22B-14-50)	ID
				18.0 - 19.5	15.5 - 17.0	13.0 - 14.5	10.5 - 12.0	8.0 - 9.5	5.5 - 7.0	3.0 - 4.5	DEPTH – feet	IDENTIFICATION
				SM	SP-SM	SM	SM	s(CL-ML)	SP-SM	SP-SM	CLASSIFICATION SYMBOL	ON
				13.0	6.3	6.5	11.0	20.4	3.5	4.4	SMALLER THAN 0.005 mm	\mathbf{P}_{ℓ}
				7.1	5.6	6.1	18.1	35.3	7.3	6.3	0.005 to 0.074 mm	ARTICL II
				79.9	88.1	87.4	70.9	44.3	89.2	89.3	<u>SAND</u> #200 (.074mm) to #4 (4.76mm)	PARTICLE SIZE FRACTIONS IN PERCENT
				0	0	0	0	0	0	0	GRAVEL #4 (4.76mm) to 3" (76.2mm)	RACT
				1	1	1	1	1	1	1	COBBLES 3" (76.2mm) to 5" (127mm)	IONS
				1	ı	1	ı	1	1	-	OVERSIZE Larger than 5" (127mm)	,
				NA	NA	NA	NA	26.0	NA	AN	LIQUID LIMIT - %	CON
				NP	NP	NP	NP	6.9	NP	NP	PLASTICITY INDEX - %	CONSISTENCY LIMITS
				ı	ı	ı	ı	1	1	1	SHRINKAGE LIMIT - %	ICY
				2.65	2.65	2.65	2.64	2.65	2.65	2.66	SPECIFIC GRAVITY MINUS NO.4	SPEC
				1	1	ı	1	-	-	-	SPECIFIC GRAVITY PLUS NO. 4 BULK	SPECIFIC GRAVITY
				1	ı	ı	ı	1	1	-	APPARENT	RAVI
				ı	ı	-	ı	-	-	1	ABSORPTION - %	TY
				4.8	2.8	1.9	3.5	6.7	1.6	1.5	FILL WATER CONTENT % MINUS No. 4	
				ı	ı	ı	ı	1	ı	-	FILL WATER CONTENT % PLUS No. 4	IN-PLA
												IN-PLACE DENSITY
												SITY

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: **REACH 22B**

Drill Hole Number: DHR22RT1B-15-1

IDE	R	TEST PIT NUMBER	SPT #1	SPT #2	SPT #3	SPT #4	SPT #5	SPT #6	SPT #7					
IDENTIFICATION		DEPTH – feet	3.1 – 4.6	5.6 – 7.1	8.1 – 9.6	10.6 - 12.1	13.1 - 14.6	15.6 – 17.1	18.1 – 19.6					
Z	ſ	CLASSIFICATION SYMBOL	SM	SM	SM	SC-SM	SM	SP	SP-SM					
P	FIN	SMALLER THAN 0.005 mm	4.4	7.5	15.4	17.5	7.4	2.4	3.4					
ARTICL	<u>FINES</u>	0.005 to 0.074 mm	9.7	9.7	33.3	29.3	9.3	2.2	2.1					
PARTICLE SIZE FRACTIONS IN PERCENT)	<u>SAND</u> #200 (.074mm) to #4 (4.76mm)	85.9	82.8	51.3	53.2	83.3	95.4	94.5					
RACT)	GRAVEL #4 (4.76mm) to 3" (76.2mm)	0	0	0	0	0	0	0					
ONS	n)	COBBLES 3" (76.2mm to 5" (127mm)	1	ı	ı	ı	ı	ı	ı					
		OVERSIZE Larger than 5" (127mm)	1	1	1	1	-	ı	ı					
CON		LIQUID LIMIT - %	NA	NA	NA	22.4	NA	NA	NA					
CONSISTENCY LIMITS	%	PLASTICITY INDEX - 9	NP	NP	NP	5.2	NP	NP	NP					
NCY	%	SHRINKAGE LIMIT - %	1	ı	ı	-	ı	ı	ı					
SPEC	7	SPECIFIC GRAVITY MINUS NO.4	2.63	2.67	2.62	2.64	2.64	2.64	2.63					
SPECIFIC GRAVITY	7	SPECIFIC GRAVITY PLUS NO. 4 BULK	ı	ı	ı	ı	ı	ı	ı					
RAVI		APPARENT	1	ı	ı	1	ı	ı	ı					
IY		ABSORPTION - %	1	,	,	ı	1	ı	ı					
	Γ%	FILL WATER CONTENT MINUS No. 4	2.4	2.4	4.6	5.0	2.3	ı	1.2					
IN-PLA	Γ%	FILL WATER CONTENT PLUS No. 4	ı	ı	ı	-	ı	ı	ı					
IN-PLACE DENSITY														
SITY														

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE:

ECT FEATURE: REACH 22B
Drill Hole Number: DHR22RT2-15-2

SPT SPT SPT SPT SPT SPT SPT SPT **SPT** #2 TEST PIT NUMBER)#6 #4 * #3 #9 #8 #7 #5 #1 IDENTIFICATION 25.7 23.2 13.2 15.7 10.7 18.2 8.2 5.7 \dot{c} \perp DEPTH - feet -9.7 27.2 24.7 4.7 19.7 17.2 14.7 12.2 SC-SM s(CL) CLASSIFICATION SM SM SM SMSMSMCH**SYMBOL** 25.8 9.0 SMALLER THAN 0.005 mm 10.9 10.3 18.8 8.5 4 FINES PARTICLE SIZE FRACTIONS 28. 10.6 19.4 10.9 8.0 8.0 3.7 9 0.005 to 0.074 mm 6 9 PERCENT 36.5 53.9 83.0 83.0 70.3 **SAND** #200 (.074mm) 78 to #4 (4.76mm) **GRAVEL** #4 (4.76mm) 0.9 0 0 0 0 0 0 0 to 3" (76.2mm) **COBBLES** 3" (76.2mm) to 5" (127mm) **OVERSIZE** Larger than 5" (127mm) 55. 22.2 NA X X NA NA LIQUID LIMIT - % CONSISTENCY 14.4 NP Z PLASTICITY INDEX - % \dot{c} SHRINKAGE LIMIT - % ī ī 5 SPECIFIC GRAVITY SPECIFIC GRAVITY 2 2 2 67 2 62 MINUS NO.4 1 SPECIFIC GRAVITY ı ı PLUS NO. 4 BULK APPARENT **ABSORPTION - %** ω FILL WATER CONTENT % 2.9 7.9 2.9 ò 6 6 \dot{c} MINUS No. 4 IN-PLACE DENSITY FILL WATER CONTENT % PLUS No. 4

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PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: REACH 22B

	Drill
	Hole
	Number:
	DF
	IR22RT2-15-3

		SPT # 12	SPT # 11	SPT # 10	SPT # 9	SPT #8	SPT #7	SPT # 6	SPT # 5	SPT # 4	SPT # 3	SPT # 2	SPT # 1	TEST PIT NUMBER		ID
		39.5 – 41.0	34.5 - 36.0	29.5 – 31.0	24.5 - 26.0	22.0 - 23.5	19.0 - 21.5	17.0 - 18.5	14.5 - 16.0	12.0 - 13.5	9.5 - 11.0	7.0 - 8.5	4.5 - 6.0	DEPTH – feet		IDENTIFICATION
		SM	СН	SC-SM	SC	SM	SM	s(CL)	SM	SM	SM	SM	SM	CLASSIFICATION SYMBOL)N
		8.5	70.1	17.4	18.4	21.8	11.9	38.5	8.5	13.9	11.9	10.9	12.9	SMALLER THAN 0.005 mm	FINES	PA
		8.8	26.2	22.2	23.2	14.0	12.5	19.3	10.2	9.4	11.7	8.3	7.9	0.005 to 0.074 mm	ES	PARTICLE SIZE FRACTIONS IN PERCENT
		77.4	3.7	60.4	58.4	64.2	75.6	42.2	81.3	76.7	76.4	80.8	79.2	<u>SAND</u> #200 (.074mm) to #4 (4.76mm)		LE SIZE FRA IN PERCENT
		5.3	0	0	0	0	0	0	0	0	0	0	0	GRAVEL #4 (4.76mm) to 3" (76.2mm)		RACTION NT
		-	ı	1	1	-	1	1	1	1	1	1	1	COBBLES 3" (76.2mm) to 5" (127mm))	SNC
		-	ı	1	1	1	1	1	1	1	ı	1	1	OVERSIZE Larger than 5" (127mm)		
		16.9	61.3	20.6	22.4	18.8	NA	31.5	NA	NA	NA	NA	NA	LIQUID LIMIT - %		CONSIS
		0.5	40.0	4.5	7.5	2.6	NP	12.6	NP	NP	NP	NP	NP	PLASTICITY INDEX - %	, 0	NSISTENCY LIMITS
		-	9.2	1	1	1	1	1	1	1	1	1	-	SHRINKAGE LIMIT - %)	Y
		2.61	2.68	2.65	2.67	2.64	2.65	2.60	2.64	2.65	2.64	2.64	2.64	SPECIFIC GRAVITY MINUS NO.4		
		2.38	1	1	1	-	1	1	ı	1	1	1	1	SPECIFIC GRAVITY PLUS NO. 4 BULK		SPEC
		5.5	1	1	1	1	1	1	-	1	1	1	-	ABSORPTION - %		SPECIFIC GRAVITY
		2.2	14.9	4.1	4.9	4.1	3.5	9.1	2.5	3.2	2.8	2.4	3.4	FILL WATER CONTENT MINUS No. 4	%	AVITY
		2.0	1	1	1	-	1	1	-	-	-	1	1	FILL WATER CONTENT PLUS No. 4	%	

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE:

Drill
Hole
Number:
DHR22RT2-15-4

REACH 22B

		SPT # 12	SPT # 11	SPT # 10	SPT # 9	8 # TAS	SPT # 7	SPT # 6	SPT # 5	SPT # 4	SPT # 3	SPT # 2	SPT # 1	TEST PIT NUMBER		I
		39.3 – 40.8	34.8 – 36.3	29.3 – 30.8	24.3 – 25.8	21.8 – 23.3	19.3 – 20.8	16.8 – 18.3	14.3 – 15.8	11.8 – 13.3	9.3 – 10.8	6.8 – 8.3	4.3 - 5.8	DEPTH – feet		IDENTIFICATION
		SM	СН	s(CL-ML)	SM	SM	SM	SC	SM	SM	SM	SM	SM	CLASSIFICATION SYMBOL		ON
		17.5	69.9	30.9	20.0	13.8	8.0	29.3	8.5	17.8	11.3	11.5	8.9	SMALLER THAN 0.005 mm	FINES	PA
		12.4	25.7	24.1	17.3	13.2	9.8	18.6	9.9	18.5	10.5	9.9	4.3	0.005 to 0.074 mm	ES	PARTICLE SIZE FRACTIONS IN PERCENT
		70.1	4.4	45.0	62.7	73.0	82.2	52.1	81.6	63.7	78.2	78.6	86.8	<u>SAND</u> #200 (.074mm) to #4 (4.76mm)		LE SIZE FRA IN PERCENT
		0	0	0	0	0	0	0	0	0	0	0	0	GRAVEL #4 (4.76mm) to 3" (76.2mm)		RACTI
		1	1	1	1	1	-	1	1	-	1	1	-	COBBLES 3" (76.2mm) to 5" (127mm))	ONS
		1	1	-	1	-	-	-	-	1	1	-	1	OVERSIZE Larger than 5" (127mm)		
		AN	8.85	23.1	20.2	AN	AN	25.7	AN	\overline{AN}	AN	AN	AN	LIQUID LIMIT - %		CON
		NP	33.3	5.6	2.6	NP	NP	12.6	NP	NP	NP	NP	NP	PLASTICITY INDEX - %	ó	CONSISTENCY LIMITS
		1	9.8	1	1	-	-	1	-	-	1	1	_	SHRINKAGE LIMIT - %	, D	Y
		2.63	2.70	2.63	2.65	2.63	2.65	2.60	2.63	2.65	2.65	2.60	2.62	SPECIFIC GRAVITY MINUS NO.4		
		-	-	-	-	-	-	-	-	-	-	-	-	SPECIFIC GRAVITY PLUS NO. 4 BULK		SPEC
		1	1	1	1	1	-	1	1	1	1	1	ı	ABSORPTION - %		SPECIFIC GRAVITY
		3.9	14.8	6.3	4.8	3.7	2.5	6.6	2.4	4.4	2.8	3.0	2.6	FILL WATER CONTENT MINUS No. 4	%	AVITY
		ı	1	1	1	1	-	1	1	-	1	1	ı	FILL WATER CONTENT PLUS No. 4	%	

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE:

CONSISTENCY Drill Hole Number: DHRT2-14-1 **REACH 22B**

SPT# 14	SPT# 13	SPT# 12	SPT# 11	SPT# 10B	SPT# 10A	SPT# 9	SPT# 8	SPT# 7	SPT#6	SPT# 5	SPT# 4	SPT# 3	SPT# 2	SPT# 1	TEST PIT NUMBER	IDE
53.5 - 54.3	48.5 - 50.0	43.5 - 45.0	38.5 - 40.0	34.4 - 35.0	33.5 - 34.4	28.5 - 30.0	23.5 - 25.0	18.5 - 20.0	16.0 - 17.5	13.5 –15.0	11.0 - 12.5	8.5 - 10.0	6.0 - 7.5	3.5 - 5.0	DEPTH – feet	IDENTIFICATION
SM	MS	$(SP-SM)_G$	SM	(CL)s	SM	SM	s(CL)	s(CL)	s(CL)	SM	SC	SC	SM	SP-SM	CLASSIFICATION SYMBOL	Z
14.5	7.1	5.7	8.0	53.9	13.5	11.4	33.0	28.9	31.8	14.0	20.0	16.0	7.5	8.7	SMALLER THAN 0.005 mm	Ą
16.6	7.8	4.6	11.4	25.4	10.4	7.6	20.7	19.8	25.8	21.1	16.3	22.2	7.3	3.3	0.005 to 0.074 mm	ARTICL II
6.86	69.1	72.0	80.6	20.7	76.1	80.4	46.3	44.7	42.4	64.9	63.7	61.8	85.2	0.88	<u>SAND</u> #200 (.074mm) to #4 (4.76mm)	PARTICLE SIZE FRACTIONS IN PERCENT
0	16.0	17.7	0	0	0	0.6	0	6.6	0	0	0	0	0	0	GRAVEL #4 (4.76mm) to 3" (76.2mm)	FRACT ENT
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	COBBLES 3" (76.2mm) to 5" (127mm)	IONS
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OVERSIZE Larger than 5" (127mm)	
NA	AN	NA	NA	47.4	NA	NA	27.0	26.9	25.7	NA	23.1	28.3	NA	NA	LIQUID LIMIT - %	CON
NP	ΝP	NP	NP	31.2	NP	NP	13.1	11.8	13.8	NP	8.5	14.8	NP	NP	PLASTICITY INDEX - %	CONSISTENCY LIMITS
1	1	ı	ı	8.6	ı	1	ı	ı	1	ı	1	1	1	1	SHRINKAGE LIMIT - %	ICY
2.64	2.61	2.65	2.61	2.68	2.68	2.65	2.69	2.58	2.56	2.65	2.65	2.64	2.63	2.63	SPECIFIC GRAVITY MINUS NO.4	SPEC
1	2.35	2.39	ı	1	1	2.62	1	2.47	1	1	1	1	1	1	SPECIFIC GRAVITY PLUS NO. 4 BULK	SPECIFIC GRAVITY
															APPARENT	RAVIT
1	6.2	6.2	ı	1	1	2.5	1	3.4	1	1	1	1	1		ABSORPTION - %	ГҮ
7.9	3.3	2.2	2.0	12.4	2.7	2.4	6.3	7.0	8.9	2.8	4.8	4.8	2.4	2.3	FILL WATER CONTENT % MINUS No. 4	
-	0	0	ı	ı	ı	0	1	0	ı	ı	ı	ı	1	1	FILL WATER CONTENT % PLUS No. 4	IN-PLA
																IN-PLACE DENSITY
																SITY

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: **REACH 22**

			TPR22-89	TPR22-88	TPR22-87	TPR22-87	TPR22-87	TPR22-56	TPR22-55	TPR22-55	TPR22-54	TPR22-52	TEST PIT NUMBER	IDENI
			6.0	6.0	6.0	4.0-5.0	0.0-1.0	6.0	7.1-8.3	6.0	6.0	6.0	DEPTH – feet	IDENTIFICATION
			SM	SM	SM	SM	s(CL)	SM	s(CL)	SP-SM	SM	SP-SM	CLASSIFICATION SYMBOL	Ī
			18.1	14.0	14.4	12.8	26.6	7.5	21.3	7.0	7.5	4.0	SMALLER THAN 0.005 mm	Ρ/
			23.3	15.2	15.3	9.9	35.6	8.7	34.3	4.9	11.1	6.1	0.005 to 0.074 mm	PARTICLE SIZE FRACTIONS IN PERCENT
			58.6	70.8	69.6	75.6	37.8	83.8	44.4	88.1	81.4	89.9	SAND #200 (.074mm) to #4 (4.76mm)	E SIZE FRA N PERCENT
			0	0	0.7	1.7	0	0	0	0	0	0	<u>GRAVEL</u> #4 (4.76mm) to 3" (76.2mm)	FRACT ENT
			0	0	0	0	0	0	0	0	0	0	COBBLES 3" (76.2mm) to 5" (127mm)	LION
			0	0	0	0	0	0	0	0	0	0	OVERSIZE Larger than 5" (127mm)	9 2
			NP	NP	NP	NP	29.3	NP	27.5	NP	NP	NP	LIQUID LIMIT - %	CON
			NP	NP	NP	NP	14.0	NP	12.8	NP	NP	NP	PLASTICITY INDEX - %	CONSISTENCY LIMITS
			NA	AN	SHRINKAGE LIMIT - %	ICY								
			92.6	94.9	92.0	:	1	97.7	-	96.4	99.2	97.8	DRY DENSITY - PCF	
			5.3	3.5	3.5	3.0	5.7	2.7	6.4	2.8	2.5	1.8	FILL WATER CONTENT -%	IN-PLACE DENSITY
			1	-	2.25	2.56	-	-	-	1	1	-	SPECIFIC GRAVITY PLUS NO. 4	ACE ITY
			2.61	2.62	2.61	2.62	2.64	2.61	2.68	2.64	2.65	2.63	SPECIFIC GRAVITY MINUS NO.4	
			115.2	116.3	115.8	-	-	103.8	-	110.9	110.0	107.8	MAXIMUM DRY DENSITY - pcf	
			12.8	12.8	12.0	1	1	14.4	1	11.0	11.4	13.5	OPTIMUM WATER CONTENT - %	COMP
			1059	700	910	:	:	260	:	510	420	590	PENETRATION RESISTANCE psi	COMPACTION TESTS
			80.4	81.6	79.4	1	1	94.1	1	86.9	90.2	90.7	D-Value %	FESTS
													Relative Density %	

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS (Maximum Density by Proctor)

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: REACH 22

>			_	_	_			_	_	_		_	_		
NOTE: Number	*TPR22-71	*TPR22-70	TPR22-68	*TPR22-68	TPR22-67	*TPR22-67	*TPR22-66	*TPR22-64	*TPR22-64	*TPR22-63	*TPR22-60	*TPR22-59	*TPR22-58	Test Pit Number	IDENT
	4.0	4.0	9.2-9.7	4.0	12.0 - 12.5	4.0	4.0	5.5	4.0	4.0	4.0	4.0	4.0	DEPTH – feet	IDENTIFICATION
	SM	SP-SM	(CL)s	SM	SM	SM	SM	SM	s(CL)	SM	SM	SM	SP-SM	CLASSIFICATION SYMBOL	ON
	14.5	6.5	43.4	10.0	6.9	14.0	11.9	9.5	24.0	9.3	6.0	7.0	6.0	SMALLER THAN 0.005 mm	PAI
	8.7	4.9	31.5	16.2	5.8	17.9	19.4	11.0	44.2	11.8	6.3	11.4	2.3	0.005 to 0.074 mm	\square
Toute of	76.6	88.6	25.1	73.8	87.3	68.1	68.7	79.5	31.8	78.9	87.7	81.6	88.8	SAND #200 (.074mm) to #4 (4.76mm)	LE SIZE FRA IN PERCENT
îb	0.2	0	0	0	0	0	0	0	0	0	0	0	2.9	GRAVEL #4 (4.76mm) to 3" (76.2mm)	FRAC
1:	0	0	0	0	0	0	0	0	0	0	0	0	0	COBBLES 3" (76.2mm) to 5" (127mm)	
	0	0	0	0	0	0	0	0	0	0	0	0	0	OVERSIZE Larger than 5" (127mm)	S
hana	N/A	N/A	36.5	N/A	N/A	N/A	N/A	N/A	27.7	N/A	N/A	N/A	N/A	LIQUID LIMIT - %	CON
	N/P	N/P	21.7	N/P	N/P	N/P	N/P	N/P	10.9	N/P	N/P	N/P	N/P	PLASTICITY INDEX - %	CONSISTENCY LIMITS
	-	_	8.8	I	_	_	_	-	I	_	_	I	1	SHRINKAGE LIMIT - %	NCY
	112.1	96.8	-	101.3	_	104.0	101.8	98.4	97.0	103.9	101.6	93.9	102.0	DRY DENSITY - PCF	IN-PLA
	4.1	2.2	15.9	3.2	2.6	3.4	3.2	3.1	5.9	2.9	2.4	2.0	5.6	TOTAL FILL WATER CONTENT -%	LACE
	2.47	_	-	_	_	_	_	_	-	_	_	_	2.41	SPECIFIC GRAVITY PLUS NO. 4	DENSITY
	2.70	2.72	2.73	2.70	2.67	2.68	2.67	2.67	2.75	2.70	2.66	2.62	2.67	SPECIFIC GRAVITY MINUS NO.4	TY
	117.8	103.4	_	108.3	-	112.3	110.9	106.4	112.4	115.1	114.2	104.6	113.5	MAXIMUM DRY DENSITY - pcf	CON
	11.7	13.9	I	12.9	_	11.8	13.0	13.4	14.8	10.5	11.5	14.3	11.8	OPTIMUM WATER CONTENT - %	MPACT
	900	230	ı	400	1	501	520	275	890	400	310	215	I	PENETRATION RESISTANCE psi	COMPACTION TESTS
	95.2	93.6	I	93.5	_	92.6	91.8	92.5	86.3	90.3	89.0	89.8	I	D-Value - %	ESTS
	112.1	96.8	1	101.3	1	104.0	101.8	98.4	97.0	103.9	101.6	93.9	102.0	DRY IN-PLACE MINUS #4 pcf	=[
	4.1	2.2	15.9	3.2	2.6	3.4	3.2	3.1	5.9	2.9	2.4	2.0	5.7	MINUS #4 MOISTURE	
	I	I	I	I	I	I	I	I	I	I	I	I	77.2	RELATIVE DENSITY	

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)

FEATURE: Reach 22

PROJECT:

Navajo Gallup Water Supply Project

	IDENTIFICATION feet	TION	AN PAI	I E E	PER SIZ	76mm) NT RACTI		76.2mm)	Larger	Zarger /mm) IT - %	Zarger /mm) IT - %	IT - % CONSISTENCY DEX - %	DEX - % MIT - % CONSISTENCY MIT - %	CONSISTENCY LIMITS DEX - % MIT - % Y - PCF VATER	CONSISTENCY LIMITS DEX - % MIT - % Y - PCF VATER -%	CONSISTENCY LIMITS LIMITS CONSISTENCY LIMITS IT - % LIMITS IN-PLACE DENSITY AVITY AVITY	CONSISTENCY LIMITS DEX - % MIT - % V-PCF VATER -% AVITY .4 AVITY .4 DRY nef	CONSISTENCY LIMITS T - % DEX - % MIT - % V- PCF VATER -% AVITY .4 AVITY .4 DRY nef	CONSISTENCY LIMITS T - % DEX - % MIT - % V- PCF VATER -% AVITY .4 AVITY .4 DRY nef	CONSISTENCY LIMITS IT - % DEX - % MIT - % V - PCF VATER - % AVITY AVITY DAY DRY pcf ION E psi ION E psi	CONSISTENCY LIMITS IT - % DEX - % MIT - % V - PCF VATER - % AVITY AVITY D.4 DRY pcf VATER - % ION E psi % E
Test Pit Number	DEPTH – feet	CLASSIFICATIO SYMBOL	SMALLER THAN 0.005 mm	0.005 to 0.074 mm	SAND #200 (.074mm to #4 (4.76mm)	GRAVEL #4 (4.76mm to 3" (76.2mm)	COBBLES 3" (76.2n to 5" (127mm)	OVERSIZE Large than 5" (127mm)	LIQUID LIMIT - 9	PLASTICITY INDEX	SHRINKAGE LIMIT	DRY DENSITY - PO	TOTAL FILL WATI CONTENT -%	SPECIFIC GRAVIT PLUS NO. 4	SPECIFIC GRAVIT MINUS NO.4		MAXIMUM DRY DENSITY - pcf		DENSITY - pcf OPTIMUM WATE	DENSITY - pcf OPTIMUM WATE CONTENT - % PENETRATION	DENSITY - pcf OPTIMUM WATE CONTENT - % PENETRATION RESISTANCE ps
*TPR22-72	4.0	ML	15.8	34.8	49.4	0.0	0	0	N/A	NP	1	93.8	5.5	1		2.70	2.70 113.3		113.3	113.3 13.7	113.3 13.7 900
*TPR22-73	4.0	MS	7.9	5.1	87.0	0.0	0	0	N/A	NP	ı	112.8	2.4	ı		2.68	2.68 113.5		113.5	113.5 12.5	113.5 12.5 740
*TPR22-76	4.0	MS	16.0	25.1	58.9	0.0	0	0	A/N	NP	ı	104.8	3.9	1		2.65	2.65 116.6	.65	.65 116.6	.65 116.6 11.5	.65 116.6 11.5 1180
TPR22-76	12.0-13.0	MS	12.9	21.8	65.3	0.0	0	0	A/N	NP	ı	ı	3.9	1		2.70	2.70 -	70	70 -	70	70
*TPR22-77	4.0	$(CL)_s$	20.8	50.1	29.1	0.0	0	0	27.9	10.9	-	93.3	5.5	1		2.69	2.69 114.7	.69	.69 114.7	.69 114.7 13.4	.69 114.7 13.4 930
TPR22-77	6.3-7.0	СН	58.7	34.3	7.0	0.0	0	0	54.4	35.5	10.4	1	15.5	1		2.65	2.65 -		-		
TPR22-77	10.0-10.7	SM	10.0	3.5	86.5	0.0	0	0	N/A	NP	1	ı	3.6	1		2.68	2.68 -	.68	.68 -	.68	.68
*TPR22-79	4.0	CL-ML	21.3	46.7	32.0	0.0	0	0	23.6	6.7	1	97.7	5.1	1		2.69	2.69 114.3	.69	.69 114.3	.69 114.3 12.7	.69 114.3 12.7 1180 85
*TPR22-80	4.0	(CL) _s	21.3	55.0	23.7	0.0	0	0	27.2	9.9	1	92.7	5.9	1		2.67	2.67 112.0		112.0	112.0 14.5	112.0 14.5 1050 82
TPR22-81	0.0-3.0	SC-SM	15.2	15.1	68.3	1.4	0	0	21.3	4.1	1	ı	4.0	2.42	()	2.68		2.68	2.68 -	2.68	2.68
TPR22-81	3.0-4.0	(SC-SM) _g	7.4	5.3	58.5	28.8	0	0	21.2	5.2	-	ı	3.4	2.41	1	1 2.63	2	2.63	2.63 -	2.63	2.63
TPR22-81	4.0-4.5	SM	13.8	13.8	71.7	0.7	0	0	18.7	NP	-	ı	4.0	1		2.65	2.65	.65	.65 -	.65	.65
*TPR22-81	4.5	SM	12.7	16.5	69.0	1.8	0	0	23.8	NP	-	106.5	5.5	2.33	3	3 2.66	2	2.66	2.66 109.2	2.66 109.2 14.4	2.66 109.2 14.4 600
*TPR22-83	4.0	SC-SM	20.9	28.5	50.6	0	0	0	22.1	5.1	1	98.7	5.2	1		2.60	2	2.60 115	2.60 115.3	2.60 115.3 12.3	2.60 115.3 12.3 950 85
E: Number.	NOTE: Numbers in parentheses are metric equivalents of numbers directly above	eses are metr	ic equiv	alents of	numbers	s directl	y ab	оче.													

*Denotes in-place density and 5-point curve.

FEATURE:

REACH 22B

Page 1 of 1

PROJECT:

NAVAJO GALLUP WATER SUPPLY PROJECT

*TPR22B-14-126	*TPR22B-14-124	*TPR22B-14-123	TPR22B-14-123	*TPR22B-14-44	*TPR22B-14-43	*TPR22B-14-42	*TPR22B-14-40	*TPR22B-14-39	*TPR22B-14-38	*TPR22B-14-36	*TPR22B-14-28	*TPR22B-14-27	*TPR22B-14-26	*TPR22B-14-24	*TPR22B-14-23	*TPR22B-14-22	TEST PIT NUMBER	
6.0	6.0	6.0	2.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	DEPTH – feet	DENTIFICATION
SP-SM	SC-SM	SM	(CL) _s	SP	SP-SM	SM	SM	$(CL)_s$	s(CL-ML)	SP-SM	SP-SM	SM	SM	SP-SM	SM	SC	CLASSIFICATION SYMBOL	
6.1	18.9	12.6	68.9	3.0	5.6	14.0	8.6	39.9	16.7	0.0	6.0	12.9	5.0	4.4	13.3	17.9	SMALLER THAN 0.005 mm	FIN
5.6	14.5	13.3	15.2	1.7	1.3	16.2	17.9	44.3	36.1	9.5	5.2	14.9	7.7	3.2	9.2	31.9	0.005 to0.074 mm	PARTIC FINES
82.3	66.6	74.1	15.9	95.3	86.9	69.8	73.2	15.7	46.6	90.3	88.7	71.9	87.3	91.1	76.6	49.8	SAND #200 (.074mm) to #4 (4.76mm)	PARTICLE SIZE FRACTIONS IN PERCENT NES
6.0	0.0	0.0	0.0	0.0	6.2	0.0	0.3	0.1	0.6	0.2	0.1	0.3	0.0	1.3	0.9	0.4	GRAVEL #4 (4.76mm) to 3" (76.2mm)	LE SIZE FRA IN PERCENT
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	COBBLES 3" (76.2mm)	CTION
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERSIZE Larger than 5" (127mm)	S
NA	20.1	NA	45.2	NA	NA	NA	NA	41.0	21.4	NA	NA	NA	NA	NA	NA	24.1	LIQUID LIMIT - %	CON
NP	4.8	NP	27.5	NP	NP	NP	NP	21.5	4.9	NP	NP	NP	NP	NP	NP	10.8	PLASTICITY INDEX - 9	CONSISTENC LIMITS
1	ı	1	8.8	ı	ı	1	1	11.5	ı	1	1	1	ı	1	1	ı	SHRINKAGE LIMIT - 9	NCY
104.2	96.8	97.3	1	100.2	103.4	93.8	94.1	83.7	98.0	98.6	99.7	96.1	95.4	101.8	105.2	105.5	DRY DENSITY - pcf	Ī
2.7	5.2	3.6	10.9	4.0	2.0	3.6	2.7	14.3	4.5	1.9	0.6	3.6	1.6	1.0	3.8	7.0	FILL WATER CONTENT - %	IN-PLACE
2.43	-	1		-	2.45	-	2.22	2.37	2.44	2.41	2.40	2.55		2.39	2.50	2.57	SPECIFIC GRAVITY PLUS No. 4	DENSITY
2.65	2.64	2.68	2.69	2.63	2.65	2.64	2.64	2.73	2.69	2.61	2.66	2.65	2.62	2.65	2.67	2.67	SPECIFIC GRAVITY MINUS No. 4	TY
113.1	118.5	116.2	1	106.4	116.9	113.6	118.5	105.6	117.7	110.9	114.1	116.3	107.5	111.6	115.0	117.2	MAXIMUM DRY DENSITY - pcf	
-	11.6	11.5	-	-	-	13.6	10.7	19.8	12.3	-	-	11.9	1	1	13.3	14.4	OPTIMUM WATER CONTENT - %	COMP
-	810	480	1	-	-	430	1050	300	800	1	-	1281	-	,	850	280	PENETRATION RESISTANCE - psi	COMPACTION TESTS
-	81.7	83.7	1	-	-	82.6	79.4	79.3	83.3	1	1	82.6		1	91.5	90.0	D-VALUE - %	N TEST
92.1	-		1	94.2	88.5	1	1	1	1	88.9	87.4	1	88.7	91.2	ı	ı	RELATIVE COMPACTION - %	— ×

^{*} Denotes In-place density and 5-point curve

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT FEATURE: **REACH 22**

IDENTIFICATION		TEST PIT NUMBER	TPR22-46	TPR22-47	TPR22-48	TPR22-51	TPR22-51	TPR22-52B	TPR22-54B	TPR22-62	TPR22-75	TPR22-79B	TPR22-114	TPR22-115	TPR22-116	TPR22-118P	TPR22-119P	TPR22-120P
ICATION		DEPTH – feet	6.0	6.0	6.0	6.0	14.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Z ,		CLASSIFICATION SYMBOL	SP	SP-SM	SM	SP-SM	SP-SM	SM	SM	SM	SP-SM	CL-ML	s(CL)	s(CL)	ML	ML	s(CL)	SM
PA	FINES	SMALLER THAN 0.005 mm	2.0	4.9	8.0	4.4	2.4	10.6	11.4	8.9	6.4	18.9	19.2	20.1	18.1	15.4	24.6	16.1
RTICL	<u>IES</u>	0.005 to 0.074 mm	1.9	7.1	9.3	4.5	5.2	21.9	16.9	10.7	1.7	59.4	50.4	30.6	32.6	35.0	39.8	15.9
PARTICLE SIZE FRACTIONS IN PERCENT		SAND #200 (.074mm) to #4 (4.76mm)	94.4	87.8	82.6	91.1	92.4	67.5	70.8	80.4	91.9	21.7	30.4	49.3	49.3	49.6	35.6	66.2
FRACT ENT		<u>GRAVEL</u> #4 (4.76mm) to 3" (76.2mm)	1.7	0.2	0.1	0	0	0	0.9	0	0	0	0	0	0	0	0	1.8
SNOL	1)	COBBLES 3" (76,2mm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		OVERSIZE Larger than 5" (127mm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CON		LIQUID LIMIT - %	ı	ı	ı	ı	ı	1	1	ı	-	24.8	26.9	24.4	22.9	1	25.9	19.7
CONSISTENCY LIMITS	%	PLASTICITY INDEX - %	NP	NP	NP	NP	NP	NP	NP	NP	NP	6.6	8.9	7.1	3.8	NP	11.8	2.4
CY	6	SHRINKAGE LIMIT - %	ı	ı	ı	ı	ı	ı	ı	ı	1	ı	ı	1	ı	1	ı	1
		DRY DENSITY - PCF	107.0	102.9	100.3	98.1	1	99.1	110.1	98.7	104.5	94.7	89.5	97.7	94.8	99.0	89.5	94.4
IN-PLACE DENSITY		FILL WATER CONTENT -%	1.1	1.9	4.0	2.0	1.2	3.8	3.6	3.0	2.8	5.9	6.0	5.6	5.6	5.0	6.6	4.1
ACE		SPECIFIC GRAVITY PLUS NO. 4	2.47	2.39	2.44	ı	1	,	2.56	ı	1	ı	ı	1	1	1		2.28
		SPECIFIC GRAVITY MINUS NO.4	2.65	2.63	2.61	2.65	2.63	2.66	2.66	2.61	2.63	2.66	2.63	2.62	2.66	2.65	2.65	2.64
		MAXIMUM DRY DENSITY - pcf	108.4	111.9	114.7	102.9	NA	112.6	118.9	111.5	102.2	112.5	113.0	114.4	111.9	107.7	115.8	117.6
COMP		OPTIMUM WATER CONTENT - %	ı	11.3	10.0	14.0	NA	12.0	11.4	13.3	9.4	13.8	13.8	13.0	14.5	15.0	13.6	11.5
COMPACTION TESTS		PENETRATION RESISTANCE psi	-	225	430	61	NA	440	800	440	150	1195	1150	1100	600	530	420	1300
TESTS		D-Value %	ī	92.0	87.4	95.3	ı	88.0	92.6	88.5	102.3	84.2	79.2	85.4	84.7	91.9	77.3	80.3
		% Relative Compaction	98.7	ı	1	1	ı	1	1	1	ı	1	1	ı	ı	1	ı	1

PROJECT: NAVAJO GALLUP WATER SUPPLY PROJECT SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS FEATURE:

REACH 22B

Page 1 of 1

IDENTIFICATION	ł	T PIT NUMBER	TES	TPR22B-14-127	TPR22B-14-128	TPR22B-14-130	TPR22B-14-131	TPR22B-14-132	TPR22B-14-134	TPR22B-14-135	TPR22B-14-136	TPR22B-14-138			
FICATIO		DEPTH – feet]	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0			
) N		ASSIFICATION SYMBOL	CL	SM	SP-SM	SP-SM	SM	SM	SC	SM	SM	SP-SM			
PA	<u>FINES</u>	LLER THAN 0.005 mm	SMA	13.8	9.0	3.0	11.0	8.0	26.7	17.4	8.0	6.5			
RTICL	ES	5 to 0.074 mm	0.00	6.0	2.6	2.2	6.2	11.2	12.3	21.7	6.5	2.6			
LE SIZE FRA IN PERCENT		<u>ID</u> #200 (.074mm) to #4 (4.76mm)		79.3	88.4	94.8	82.8	80.8	61.0	60.8	85.5	90.9			
PARTICLE SIZE FRACTIONS IN PERCENT	١	AVEL #4 (4.76mm) to 3" (76.2mm)		0.9	0	0	0	0	0	0.1	0	0			
TIONS	1)	BLES 3" (76.2mm to 5" (127mm)	COB	0	0	0	0	0	0	0	0	0			
		ERSIZE Larger an 5" (127mm)	OV th	0	0	0	0	0	0	0	0	0			
COZ		QUID LIMIT - %	LIC	NA	NA	NA	NA	NA	25.0	NA	NA	NA			
CONSISTENCY LIMITS	%	TICITY INDEX - '	PLAS	NP	NP	NP	NP	NP	9.7	NP	NP	NP			
CY	%	NKAGE LIMIT - 9	SHRI	ı	ı	ı	ı	ı	1	ı	ı	ı			
		Y DENSITY - PCF	DR'	108.3	97.9	99.5	100.7	96.2	108.1	93.0	97.7	100.7			
IN-PLACE DENSITY		FILL WATER CONTENT -%		3.4	2.4	1.6	3.0	3.0	6.5	4.1	2.4	2.4			
ACE (TY		CCIFIC GRAVITY PLUS NO. 4		2.33	1	ı	1	1	1	2.55	ı	1			
		CCIFIC GRAVITY MINUS NO.4	SPI	2.68	2.64	2.62	2.67	2.64	2.66	2.63	2.64	2.65			
CC		AXIMUM DRY DENSITY - pcf		119.2	107.5	101.1	110.3	113.8	115.7	118.5	107.1	107.2			
OMPAC	R	IMUM WATEI CONTENT - %		11.7	14.0	16.0	13.4	11.8	12.8	11.5	13.1	12.0			
COMPACTION TESTS		ENETRATION SISTANCE psi		1400	353	ı	ı	600	520	ı	433	ı			
TS		D-Value %		90.9	91.1	98.4	91.3	84.5	93.4	78.5	91.2	93.9			

NOTE: Numbers in parentheses are metric equivalents of numbers directly above.

*Denotes In-place density and 5-point curve.