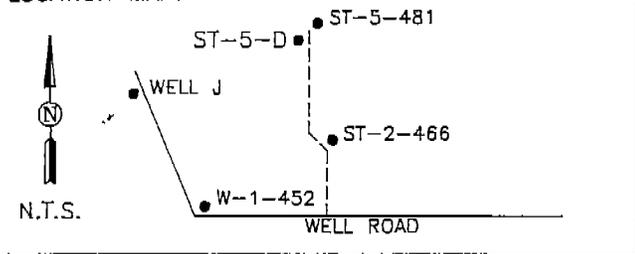


ST-5-D LITHOLOGIC LOG

LOCATION MAP:



SITE ID: NASA-WSTF LOCATION ID: ST-5-D
 SITE COORDINATES (ft.):
 N 230922.96 E 398537.26
 GROUND ELEVATION (ft. MSL): 4458.74(BC)
 STATE: NEW MEXICO COUNTY: DONA ANA
 DRILLING METHOD: MUD/AIR FOAM ROTARY
 DRILLING CONTR.: LARJON DRILLING CO.
 DATE STARTED: 09-30-92 DATE COMPLETED: 06-29-93
 FIELD REP.: M. CANAVAN, D. MENZIE, K. SUMMERS
 COMMENTS: DRILLED MUD ROTARY 0-80' (12 1/4") TRI-CONE MILLTOOTH BIT. REAMED 0-80' TO 16 1/2". INSTALLED 83' OF 14" STEEL SURFACE CASING. DRILL 80-427' WITH 12 1/4" MILLTOOTH BIT. DRILL 427-1210' WITH 12 1/4" BUTTON BIT. TOTAL DEPTH BY DRILLOGRAPH IS 1210'.

SE 1/4 SE 1/4 SW 1/4 NW 1/4 S 32 T 20S R 3E

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
0-585'				CUTTINGS GRAB SAMPLE EVERY 10' 0-380' AND 5' 380-1210'	ALLUVIUM (SANTA FE GROUP): CUTTINGS ARE HIGHLY VARIABLE IN LITHOLOGY, GRAIN SIZE AND GRAIN SHAPE. SAMPLES ARE MULTICOLORED WHEN WASHED BUT CLAY IMPARTS A LIGHT BROWN (5 YR 6/4) COLOR TO UNWASHED SAMPLES. SHAPES RANGE FROM ANGULAR CHIPS AND FLAKES TO ROUNDED ALLUVIAL GRAINS. GRAIN SIZE RANGES FROM CLAY SIZE TO 1.0 INCHES IN DIAMETER. CLAY CONTENT IN SAMPLES RANGES FROM <10% TO >95% WHERE THICK CLAY LENSES ARE PRESENT. CLAY-RICH AND CALICHE-RICH INTERVALS ARE NOTED IN THE LOG. THE UNIT IS AN UNCONSOLIDATED TO CONSOLIDATED, POORLY SORTED, PEBBLE TO BOULDER, POLYGENETIC CONGOLMERATE. LITHOLOGIES REPRESENTED IN SAMPLES ARE PREDOMINANTLY LIMESTONE, CLAY, RHYOLITE AND SILTSTONE. THE LIMESTONE IS MEDIUM GRAY (N5) TO DARK GRAY (N3), MICRITIC, AND CONTAINS A FEW ALLOCHEMS. OTHER SEDIMENTARY ROCKS PRESENT ARE GREENISH GRAY (5 CY 6/1) TO PALE RED (5 R 6/2), LAMINATED TO NON-LAMINATED SILTSTONES; GRAY CHERT; AND MINOR AMOUNTS OF POORLY SORTED, FINE-GRAINED SANDSTONE. VOLCANIC CUTTINGS GENERALLY INCREASE IN ABUNDANCE WITH DEPTH AND INCLUDE RHYOLITES, TUFFS, AND ANDESITE. OTHER IGNEOUS ROCKS INCLUDE MEDIUM-TO FINE-GRAINED GRANITES AND MONZANITES. THE ALLUVIUM IS CONSIDERED VOLCANIC-RICH AT 585 FEET WHERE VOLCANIC CUTTINGS CONSTITUTE >50 PERCENT OF SAMPLES.
36	=====+//OV				
65	=====				
96	=====+				
33	++++++OOVV				
49	VVVVV++++//				
0-5'					CLAY IS MOTTLED TAN TO MEDIUM BROWN. RARE CUTTINGS ARE .25-.50 INCHES IN DIAMETER.
5-10'					CUTTINGS ARE FAIRLY UNIFORM .25-.50 INCHES IN DIAMETER AND ARE ANGULAR TO ROUNDED. CALICHE COATINGS ARE COMMON.
10-15'					CLAY IS MOTTLED TAN TO MEDIUM BROWN. RARE CUTTINGS ARE .25-.50 INCHES IN DIAMETER.
15-20'					99 PERCENT REDDISH BROWN GUMMY CLAY.
20-30'					GRAYISH TAN GUMMY CLAY WITH SOME REDDISH BROWN CLAY BALLS.
30-40'					MULTICOLORED GRAVEL, PREDOMINANTLY BLACK TO GRAY LIMESTONE, SOME CALICHE AND IGNEOUS ROCKS. SUBANGULAR TO SUBROUNDED. SIZE RANGES <0.1 INCHES TO 1.0 INCHES; AVERAGE SIZE 0.4 INCHES.
40-50'					MOSTLY ANGULAR CHIPS TO SUBROUNDED. SIZE RANGES <0.1 INCHES TO 0.4 INCHES. AVERAGE SIZE IS 0.1 INCHES.

ST-5-D LITHOLOGIC LOG

(Continued)

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
60		++++==VV	38	CUTTINGS (CONT'D)	
65					
70		++++==VV	47		70-80' 100 PERCENT SILTY CLAY.
75					80-100' GRADUAL DECREASE IN SILTY CLAY CONTENT TO ~60 PERCENT. WASHED SAMPLES COMPOSED PRIMARILY OF CALICHE CUTTINGS.
80		=====	92		80-150' AVERAGE CUTTING SIZE EQUALS 0.2 INCHES.
85					
90		=====OO++	10		
95					
100		=====OOO+	11		100-150' INCREASE IN SILTY CLAY CONTENT TO 70-80 PERCENT. CALICHE CUTTINGS MOST ABUNDANT.
105					
110		=====OO+	8		
115					115' SLIGHT DECREASE IN PENETRATION RATE.
120		=====OO+	12		

ST-5-D LITHOLOGIC LOG
(Continued)

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)	
130		=====OO	15	CUTTINGS (CONT'D)		
135						
140		=====OO+	14			
145						
150		=====OO+	16			
155						
160		=====OO+	13		160'	DEVIATION SHOT EQUALS ZERO DEGREES (VERTICAL).
165						
170		=====OO++	14		170'	SLIGHT DECREASE IN CLAY CONTENT TO 60 PERCENT.
175					170-190'	SLIGHT INCREASE IN AVERAGE CUTTING SIZE TO 0.3 INCHES.
180		=====OO+V	15			
185						
190		=====OO+V	16		190-220'	SLIGHT INCREASE IN CLAY FRACTION TO 70-80 PERCENT.

**ST-5-D LITHOLOGIC LOG
(Continued)**

DEPTH H	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
200		=====○○+	13	CUTTINGS (CONT'D)	
210		=====++	19		
220		=====○○+	21		220-270' CLAY CONTENT DECREASES TO 60 PERCENT.
230		=====○○++	14		
240		=====++○○	15		
250		=====○○++	18		
260		=====++○○	16		255' DEVIATION SHOT EQUALS ZERO DEGREES (VERTICAL).

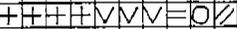
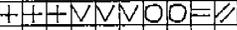
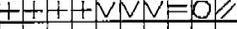
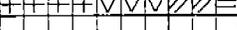
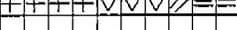
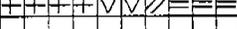
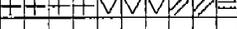
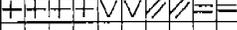
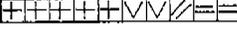
ST-5-D LITHOLOGIC LOG

(Continued)

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
270		=====++O	15	CUTTINGS (CONT'D)	270-290' SHARP DECREASE IN CLAY CONTENT. DOWN TO 10-30 PERCENT.
275					
280		++++VVV//O=	17		
285					
290		+++====VVO//	16		
295					
300		=====++VVO	26		
305					
310		=====++OO	15		
315					
320	+++VVV==O//	20			
325					
330	+++VVV=O//	16			

ST-5-D LITHOLOGIC LOG

(Continued)

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
340			19	CUTTINGS (CONT'D)	
345					
350			36		350' DEVIATION SHOT RESULTS ARE ZERO DEGREES (VERTICAL).
355					
360			17		
365					
370			41		
375					
380			27		
385					
390			29		
395					395-430' SLIGHT CUTTING SIZE REDUCTION. MANY CUTTINGS ARE MEDIUM TO VERY COARSE SAND-SIZE, ALTHOUGH PREDOMINANT SIZE REMAINS VERY COARSE SAND-TO SMALL PEBBLE-SIZE. UNWASHED CUTTINGS ARE VERY SILTY. SOME CLAY PRESENT. (OBSERVING RIG BEHAVIOR; CLAY APPEARS TO BE IN THIN "STRINGERS".)
400			35		
					

ST-5-D LITHOLOGIC LOG
(Continued)

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
				CUTTINGS (CONT'D)	
410			41		410-450' APPEARS THAT "CLAY" IN CUTTINGS IS PARTIALLY BENTONITE GEL. SOME CALICHE COATINGS AT 430 FEET.
415					
420			33		
425					
430			55		430' VERY HARD - SEEMS TO BE PARTIALLY CEMENTED GRAVEL AND COBBLES.
435					
440			99		
445					
450			108		
455					
460			85		460' DEVIATION SHOT <1 DEGREE VERTICAL.
465					
470			83		

ST-5-D LITHOLOGIC LOG

(Continued)

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
480				DRILLOGRAPH NOT WORKING	CUTTINGS (CONT'D)
485					
490					
495					
500					
505					
510					
515				DRILLOGRAPH FIXED	
520					
525					
530			54		
535					
540			53		

ST-5-D LITHOLOGIC LOG

(Continued)

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
550			59	CUTTINGS (CONT'D)	550' DEVIATION SHOT 1/2 DEGREE VERTICAL.
555					
560			42		
565					
570			55		
575					
580			49		
585					587' BIT CHATTER. 585-1210'
590			66		<u>VOLCANIC-RICH ALLUVIUM (SANTA FE GROUP):</u> CUTTINGS ARE SUBROUNDED TO ANGULAR, POORLY SORTED, AND RANGE IN SIZE FROM <0.1 INCHES TO 0.5 INCHES IN DIAMETER. THE UNIT IS A MODERATELY CONSOLIDATED, PEBBLE TO BOULDER, VOLCANIC CONGLOMERATE. LITHOLOGIES PRESENT IN CUTTINGS ARE GRAYISH-RED (5 R 4/2) TO DARK BROWNISH RED (10 R 3/4) ASH FLOW TUFFS AND BROWNISH-BLACK (5 YR 2/1) ANDESITES WITH LESSER AMOUNTS OF RHYOLITES AND CLAYS. OCCASIONAL LIMESTONE AND SILTSTONE OCCUR NEAR THE TOP 25 FEET OF THE UNIT. PREDOMINANTLY VOLCANIC IN ORIGIN.
595					
600			74		600' SLIGHT INCREASE IN CLAY CONTENT. SAMPLE HAS GROUT CHIPS IN IT BROKEN AWAY FROM SOMEWHERE UP-HOLE.
605					605' STILL CLAYEY. DECREASE IN CUTTING SIZE.
610			67		

ST-5-D LITHOLOGIC LOG
(Continued)

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
				CUTTINGS (CONT'D)	615' ANOTHER INCREASE IN CLAY PERCENT.
620		VVVVVVVV===	59		
625		VVVVVVVV===			
630		VVVVVVVV===	68		630-635' FLOW-BANDED RHYOLITE, TUFF AND ANDESITE ARE MAIN FRACTIONS OF VOLCANIC CLASTS.
635		VVVVVVVV===			
640		VVVVVVVV===	64		640' DEVIATION SHOT RESULTS ARE 1 DEGREE (VERTICAL).
645		VVVVVVVV===			
650		VVVVVVVV===	70		
655		VVVVVVVV===			
660		VVVVVVVV===	77		
665		VVVVVVVV===			
670		VVVVVVVV===	54		
675		VVVVVVVV===			
680		VVVVVVVV===	56		
		VVVVVVVV===			

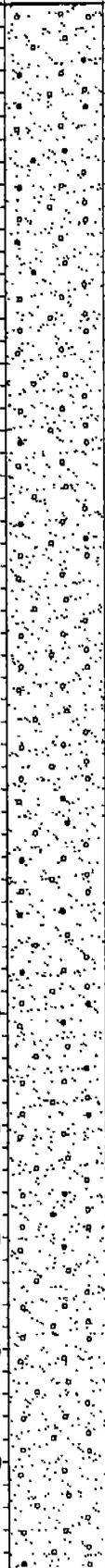
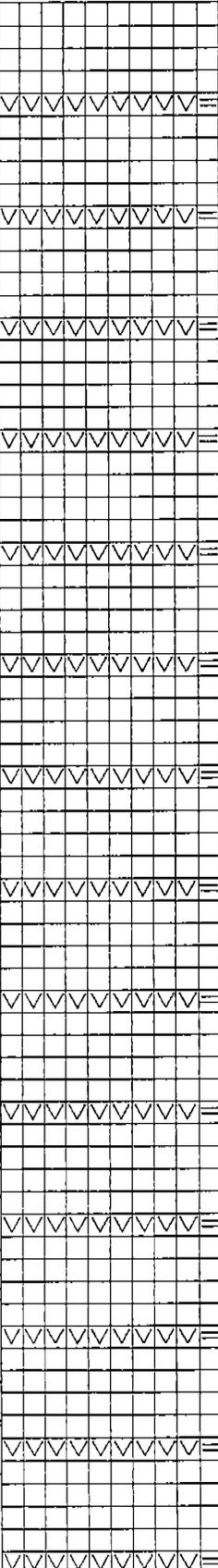
ST-5-D LITHOLOGIC LOG
(Continued)

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)		
690			63	CUTTINGS (CONT'D)			
695							
700			60				
705							
710			49				
715							
720			67				
725							
730			56				
735						735'	DEVIATION SHOT RESULTS ARE 1 DEGREE (VERTICAL).
740			56				
745							
750			66				

ST-5-D LITHOLOGIC LOG
(Continued)

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
760			59	CUTTINGS (CONT'D)	
765					
770			52		
775					
780			83		
785					
790			79		790-805' LOTS OF BIT CHATTER. ANGULAR CHIPS AND FLAKES IN CUTTINGS. FRACTURE-FILL CALCITE PRESENT BUT <1 PERCENT.
795					
800			44		
805					
810			61		
815					
820			64		

**ST-5-D LITHOLOGIC LOG
(Continued)**

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
830			75	CUTTINGS (CONT'D)	825' DEVIATION SHOT IS JUST LESS THAN 1 DEGREE (VERTICAL).
835			62		
840			90		
845			86		
850			57		
855			59		
860			54		
865					
870					
875					
880					
885					
890					

**ST-5-D LITHOLOGIC LOG
(Continued)**

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
900			51	CUTTINGS (CONT'D)	900' CUTTINGS LOOK LIKE THEY ARE BECOMING MORE ANDESITE-RICH.
905					
910			51		
915					
920			72		920' DEVIATION SHOT RESULTS ARE ZERO DEGREES (VERTICAL).
925					
930			73		
935					
940			68		940' POSSIBLY WENT THROUGH A LARGE BOULDER.
945					
950			45		
955					
960			46		

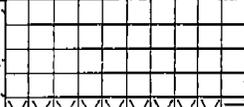
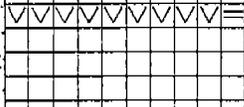
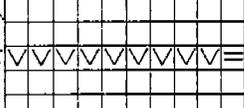
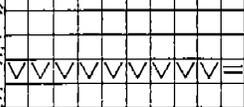
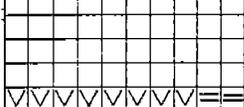
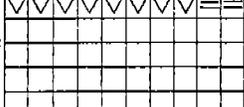
**ST-5-D LITHOLOGIC LOG
(Continued)**

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)		
970			128	CUTTINGS (CONT'D)			
975			73				
980			73				
985			113				
990			82			990'	CUTTINGS AVERAGE 0.3 INCHES, RANGE IN SIZE FROM MUCH LESS THAN 0.1 INCHES (CLAY AND SILT SIZE) TO 0.5 INCHES, CUTTINGS ARE ANGULAR TO SUBROUNDED, LITHOLOGIES ARE MOSTLY RHYOLITE AND ANDESITE WITH LESSER AMOUNT OF TUFF?.
995							
1000							
1005							
1010			115			1010'	DEVIATION SHOT RESULTS ARE <1 DEGREE (VERTICAL).
1015							
1020	99						
1025							
1030	92						

**ST-5-D LITHOLOGIC LOG
(Continued)**

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)	
1040			75	CUTTINGS (CONT'D)		
1045			76			
1050			82			
1055			82			
1060			82			
1065			82		1085'	COLOR CHANGE TO GRAY. CUTTINGS NOW PREDOMINANTLY AVERAGING .2 INCHES TO .25 INCHES IN DIAMETER. FLAT "CHIPS" COMMON. CONSISTS PRIMARILY OF GRAY TUFF(?).
1070			82			
1075			90			
1080			90			
1085			116			
1090			116		1095--1105'	SAMPLES ARE PREDOMINANTLY ANDESITE. TUFF IN ABOVE SAMPLES COULD BE FROM LARGE BOULDERS WITHIN ALLUVIUM.
1095			150			
1100			150		1100'	DEVIATION SHOT RESULTS ARE 1/2 DEGREE (VERTICAL).

**ST-5-D LITHOLOGIC LOG
(Continued)**

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)
1110			150	CUTTINGS (CONT'D)	
1115					
1120			144		
1125					
1130			116		
1135					
1140			133		
1145					
1150			112		
1155					
1160			143		
1165					
1170			97		
					
					
					

**ST-5-D LITHOLOGIC LOG
(Continued)**

DEPTH	LITH.	VISUAL %	DRILLING TIME SCALE: MIN.	SAMPLE TYPE AND INTERVAL	LITHOLOGIC DESCRIPTION (LITH., GRAIN SIZE PROPORTIONS, WET COLOR, RNDG., SRTG., CONSOL., DIST. FEATURES)			
1180			80	CUTTINGS (CONT'D)	1180' DEVIATION SHOT RESULTS ARE <1 DEGREE (VERTICAL).			
1185			80					
1190			90					
1195			80					
1200			80					
1205			80					
1210			101			1210' TOTAL DEPTH BY DRILLOGRAPH. TD BY GEOPHYSICAL LOGGER WAS 1,209 FEET. FINAL DEVIATION BY GEOPHYSICAL LOGGER WAS 3 FEET OF STEP-OUT TOWARDS 352 DEGREES (NORTHERLY).		
1220								
1225								
1230								
1235								
1240								
1245								