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Source Document Compilation: Los Alamos Investigations Related to the Environment, Engineering, Geology, and Hydrology

1961–1990

Compiled by
William D. Purtymun

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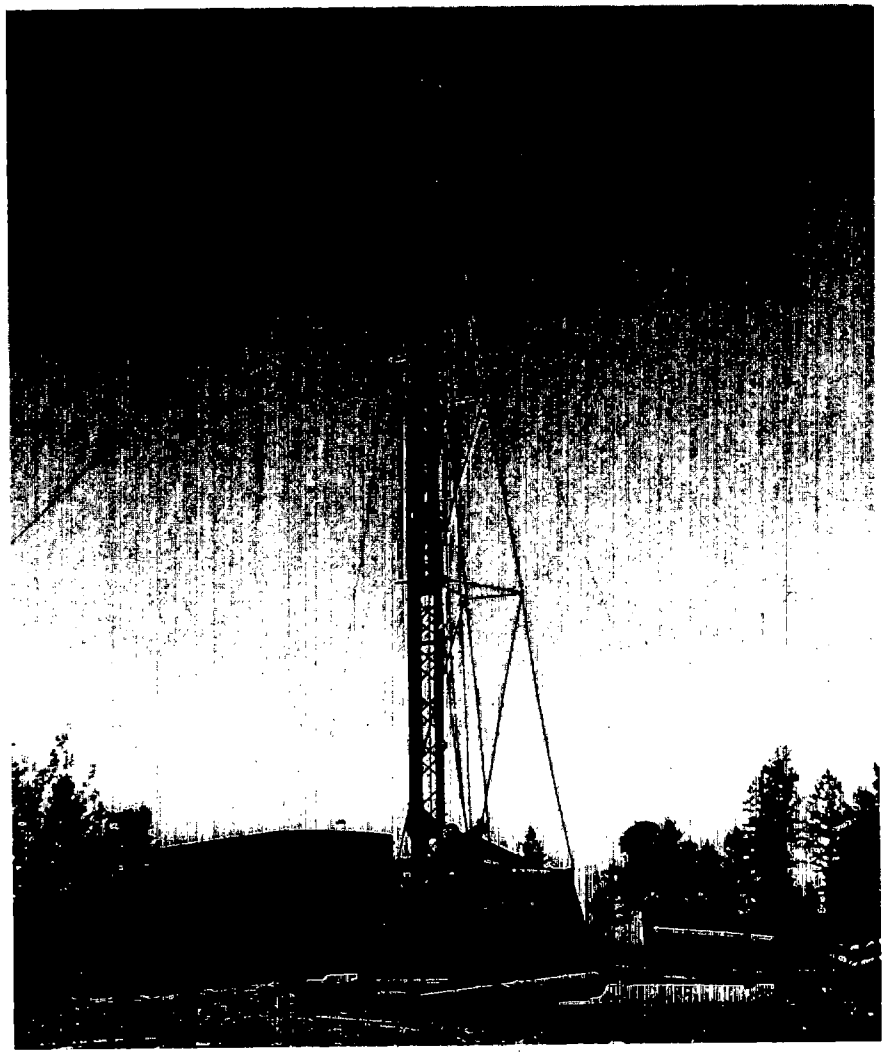

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Cover Photo: *Drilling Supply Well FH-1, Fenton Hill, August 1977 (see Chapter 36). Photo taken by W. Purtymun.*

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SOURCE DOCUMENT COMPILATION: LOS ALAMOS INVESTIGATIONS RELATED TO THE ENVIRONMENT, ENGINEERING, GEOLOGY, AND HYDROLOGY 1961–1990

Compiled by

William D. Purtymun

ABSTRACT

This document is a compilation of informal reports, letters, and memorandums regarding geologic and hydrologic studies and investigations such as foundation investigations for structures, drilling or coring for environmental studies, development of water supply, or construction of test or observation wells for monitoring. Also included are replies requested for specific environmental, engineering, geologic, and hydrologic problems.

The purpose of this document is to preserve and make the original data available to the environmental studies that are now in progress at Los Alamos and provide a reference for and supplement the LAMS report "Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs, and Surface water stations at Los Alamos: with Reference to the Geology and Hydrology," which is in preparation. The informal reports and memorandums are listed chronologically from December 1961 to January 1990.

Item 208 is a descriptive history of the U.S. Geological Survey's activities at Los Alamos from 1946 through 1972. The history includes a list of published and unpublished reports that cover geology, hydrology, water supply, waste disposal, and environmental monitoring in the Los Alamos area.

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LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545

OFFICE MEMORANDUM

TO : David Kirby, Eng-9, MS-702 DATE: February 1, 1978

FROM : W. D. Purtymun, H-8 WDP

SUBJECT : LOG OF TEST HOLE NEAR TA-22

SYMBOL : H8-78-59

MAIL STOP: 702

The log of the test hole drilled January 30, 1978 is as follows:

	Depth (ft) From	To
Soil, light to dark brown, clay, with a few rock <1 in. dia. of latite and rhyolite	0	8
Tuff, light pinkish gray, moderately welded, quartz and sanidine fragment, with a few small rock fragments of latite and rhyolite; Unit 3a	8	38
Tuff, dark gray, welded, quartz and sanidine crystals, and crystal fragments, in a densely welded ash matrix; Unit 2b	38	40

The soil appears dense and consists mainly of plastic clay which has a very low permeability. This section of the hole should not be considered in design criteria for the seepage shaft. The tuff, Unit 3a from 8 to 38 ft, is moderately welded and can be augered for construction of the shaft by ZIA Co. The 30 ft. section of unit 3a has a permeability high enough to be considered for a seepage shaft to receive about 500 gal/day. The design of the shaft, diameter need, is being determined by Issac Suazo, ZIA U/E. The lower unit 2b, is a densely welded tuff and can not be angered.

If we can be of further assistance please call.

WDP:pdb

xc: Issac Suazo, ZIA U/E

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext: 5862

OFFICE MEMORANDUM

TO : Dave Kirby, ENG-9, MS 702

DATE: May 15, 1978

FROM : W. D. Purtymun, H-8

SUBJECT : LOGS OF TEST HOLES

SYMBOL : H8-78-249

MAIL STOP 490

Attached are the logs of test holes drilled on Two-Mile Mesa. Issac Suazo, ZIA U/E, and I will run perculation tests on holes 3 and 4 as soon as connections to the water line are completed. Moisture content of cuttings from holes 2 and 3 were as expected. Hole 2 is collared in unweathered tuff. The upper section of hole 3 has about 7 ft of soil and weathered tuff so the moisture content in that interval is slightly higher.

WDP:mar
Attach: a/s
xc: Issac Suazo, ZIA U/E

GENERALIZED LOG

Hole 1

Tuff, light red, moderately welded	0 - 19
Tuff, light gray, mdoerately welded	19 - 42
Tuff, dark gray, welded	42 - 43

Hole 2

Tuff, light red, moderately welded	0 - 24
Tuff, light gray, moderately welded	24 - 52
Tuff, dark gray, welded	52 - 57

Hole 3

Soil, brown, sandy	0 - 3
Soil and tuff, brown, weathered with silts and clays	3 - 6
Tuff, light gray, moderately welded	6 - 20
Tuff, light red, moderately welded	20 - 44
Tuff, gray, moderately welded	44 - 52

Hole 4

Soil, brown, sandy	0 - 3
Soil and tuff, brown, weathered with silt and clay	3 - 6
Tuff, light, gray, moderately welded	6 - 21
Tuff, light red, moderately welded	21 - 22

MOISTURE CONTENTS

Depth (ft)	(Percent by weight) Hole 2	Hole 3
0 - 2	2.8	6.8
2 - 7	2.7	7.2
7 - 12	2.5	3.9
12 - 17	2.2	2.7
17 - 22	2.6	1.7
22 - 27	2.4	1.4
27 - 32	2.5	1.9
32 - 37	2.9	1.5
37 - 42	3.2	1.2
42 - 47	1.9	1.0
47 - 52	2.9	0.8
52 - 57	4.9	--

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545

OFFICE MEMORANDUM

TO : Phil Hunt, ENG-2, MS-984

DATE: June 2, 1978

FROM : W. D. Purtymun, H-8

SUBJECT : GEOLOGIC LOGS OF TEST HOLES AT TA-53

SYMBOL : H8-78-276

MAIL STOP: 490

Attached are the logs from the test holes drilled May 31 at TA-53. The soil is light brown, ranging in thickness from 1 to 2 ft. The soil is underlain by a moderately welded tuff. The tan tuff is slightly weathered, underlain by a unweathered gray tuff. Both belong to the same unit. Field estimates indicated the moisture content of the tuff to be less than 5% by volume. As the tuff is a moderately welded unit, your design for bearing capacity of 4000 lbs/sq ft is good. If we can be of further assistance pleast advise.

WDP:tj
Attachments: a/s

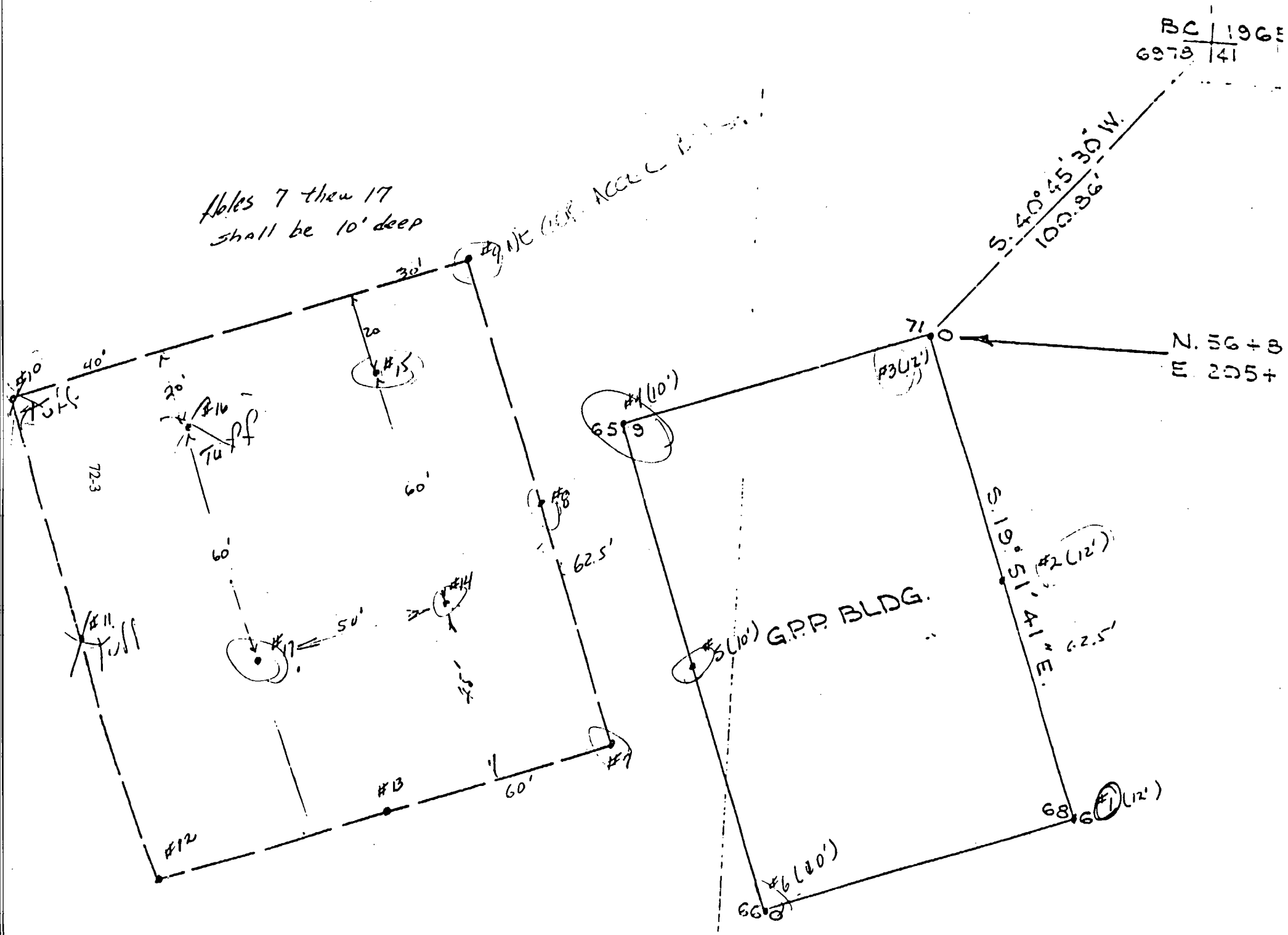
Log of Test Holes

(Depth in feet)

Hole #	Soil	Tuff (tan)[a]	Tuff (gray)
Hole 1	0 - 1.5	1.5 - 2.5	2.5 - 12
Hole 2	0 - 1	1 - 4	4 - 12
Hole 3	0 - 1.5	1.5 - 5	5 - 12
Hole 4	0 - 2	2 - 5	5 - 12
Hole 5	0 - 1.5	1.5 - 4	4 - 12
Hole 6	0 - 1	1 - 4	4 - 12
Hole 7	0 - 2	2 - 4	4 - 12
Hole 8	0 - 2	2 - 4	4 - 12
Hole 9	0 - 1.5	1.5 - 5	5 - 12
Hole 10	Not drilled		
Hole 11	Not drilled		
Hole 12	0 - 1.5	1.5 - 4	4 - 12
Hole 13	0 - 1	1 - 3	3 - 12
Hole 14	0 - 1.5	1.5 - 4	4 - 12
Hole 15	0 - 1	1 - 3.5	3.5 - 12
Hole 16	Not drilled		
Hole 17	0 - 2	2 - 4	4 - 12

[a]Tuff, slightly weathered, some pumice fragments weathered to clay.

For Location see attached ENG-2 sketch.


Holes 7 thru 17
shall be 10' deep
BC 1965
6978 41
S. 40° 45' 30" W.
100.36'
N. 56 + 8
E. 205 +
G.P.P. BLDG.
S. 19° 51' 41" E.
62.5'
30'
40'
20'
60'
50'
72-3
#1 (12')
#2 (12')
#3 (12')
#4 (10')
#5 (10')
#6 (10')
#7
#8
#9
#10
#11
#12
#13
#14
#15
#16
Tuff
Tuff
Tuff
68
66
65
71

UNIVERSITY OF CALIFORNIA
LOS ALAMOS SCIENTIFIC LABORATORY
(CONTRACT W-7405-ENG-36)
P.O. BOX 1663
LOS ALAMOS, NEW MEXICO 87545

IN REPLY
REFER TO: H8-78-388
MAIL STOP: 490

June 23, 1978

Mr. Charley Shields
US Forest Service
Jemez Springs, NM 87025

Dear Charley:

Attached is a map showing the location of a temperature gradient hole located near El Cajete. It was drilled in December 1971. If additional information is needed, please contact me.

Sincerely,

Bill

William D. Purtymun
Group H-8
Environmental Surveillance

WDP:tj

Enc: a/s

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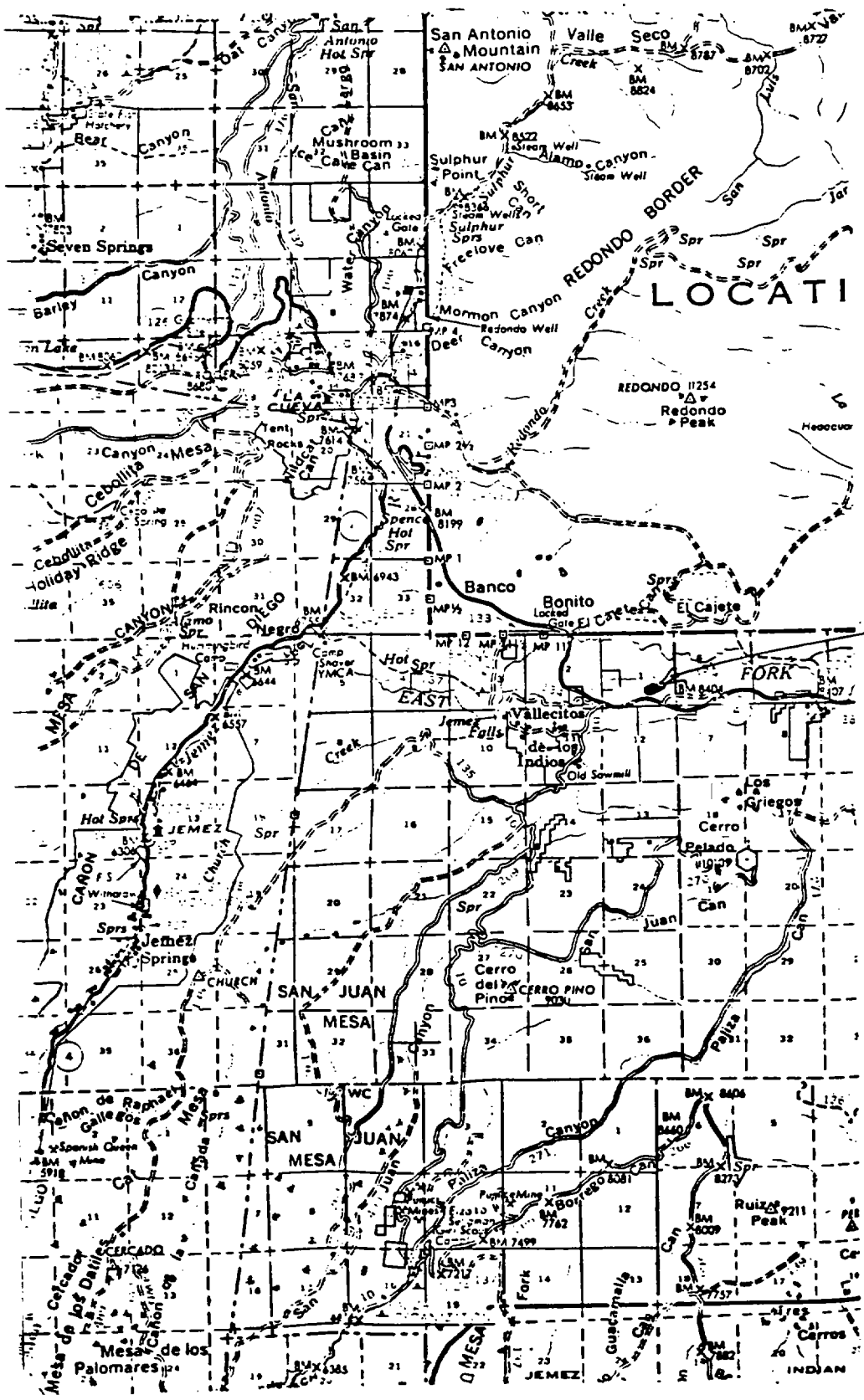

Charley Shields
USFS
Jemez Springs

Location of Temp Gradient hole drilled in 1971.

Approx Location on This scale
Purtymun

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P.O. BOX 1663
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IN REPLY
REFER TO: H8-78-369
MAIL STOP: 490

June 6, 1978

Mr. John D. Hunter
Bandelier National Monument
Los Alamos, New Mexico 87544

Dear John:

Attached are the results from the chemical and radiochemical analyses of water collected in the Monument in 1977. Sample locations are shown on the attached sketch.

A comparision of the chemical quality of prefire and post-fire analyses from the station near Park Headquarters indicates major changes occurred with increases of Ca, HCO_3, Cl, F, and TDS. Mg, Na, and CO_3 did not change

	mg/ℓ	
	Prefire[a]	Post-fire
Ca	9	32
HCO_3	48	120
Cl	4	7
F	0.3	1.2
TDS	137	222

significantly. The pH also remained about the same at 7.5. The pH (alkalinity) should have increased due to the presents of ash; however, the sediments in the runoff had a buffering effect on the ash reducing the alkalinity to near normal. The chemical quality of the water will return to normal as the ash is flushed from the burn area and vegetation of these areas increases.

There was no significant changes in radionuclides or radioactivity of post-fire analyses in surface water at the Park Headquarters. Other radiochemical analyses were normal with no significant concentrations of nuclides. This completes the data we collected in 1977.

Sincerely,

Bill

William D. Purtymun
Group H-8
Environmental Surveillance

WDP:tj (W571)
Enc: Results
Sketch

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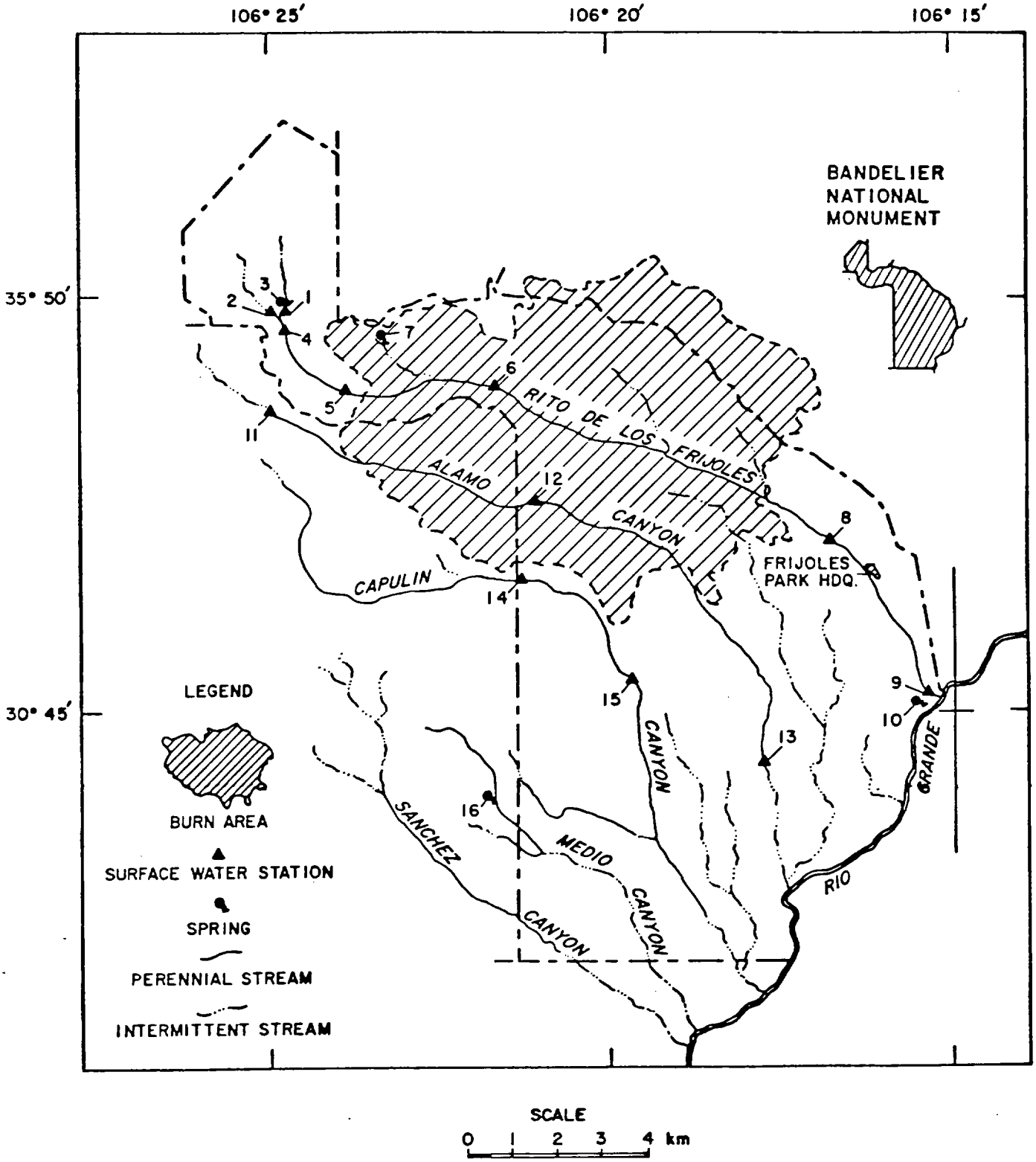

106° 25′
106° 20′
106° 15′
35° 50′
30° 45′
BANDELIER NATIONAL MONUMENT
RITO DE LOS FRIJOLES
ALAMO CANYON
CAPULIN
FRIJOLES PARK HDQ.
SANCHEZ CANYON
MEDIO CANYON
CANYON
RIO GRANDE
LEGEND
BURN AREA
SURFACE WATER STATION
SPRING
PERENNIAL STREAM
INTERMITTENT STREAM
SCALE
0 1 2 3 4 km

TABLE I

CHEMICAL AND RADIOCHEMICAL ANALYSES OF SURFACE AND GROUND WATER IN AND ADJACENT TO BANDELIER NATIONAL MONUMENT

(Samples collected after Burn in June 1977)

CHEMICAL

Station	Location	Date	SiO_2	Ca	Mg	K	Na	CO_3	HCO_3	Cl	F	NO_3	TDS	Total Hard	Cond. (μmho/cm)	pH	Total U (μg/ℓ)	T(°C)
			Concentrations in mg/ℓ															
1	Frijoles, N. Fork	7-8-77		13	3	3.2	5	0	48	12	0.1	0.4	154	44	130	7.3	1.9(±0.6)	10
2	Frijoles, W. Fork	7-8-77		10	2	0.7	9	0	48	5	0.2	0.4	164	34	130	7.8	2.5(±0.6)	16
3	Spring, N. Fork	7-8-77		12	3	2.3	8	0	66	2	0.1	0.4	150	44	130	7.8	2.5(±0.6	10
5	Frijoles	7-8-77		10	<1	0.2	9	0	62	5	0.1	0.3	140	26	100	7.7	2.8(±0.6)	15
10	Spring 10	9-14-77		13	2	-	11	0	62	4	0.5	0.9	138	41	140	7.8		18
11	Alamo Canyon	7-10-77		13	3	4.1	3	0	50	2	0.2	0.8	148	44	140	7.2	2.5(±0.6)	11
16	Turkey Spring	7-10-77		24	5	2.5	11	0	104	3	0.2	<0.4	166	80	250	7.8	2.0(±0.6)	19
6	Frijoles, UC	7-8-77		17	3	1.1	9	0	84	6	0.1	0.8	166	56	170	7.6	3.4(±0.8)	17
7	Apache Spring	7-8-77		13	5	3.5	14	0	60	22	0.1	<0.4	222	54	200	7.5	2.0(±0.6)	7
8	Frijoles Park Hdq.	3-8-77		8	2	-	10	0	48	2	0.2	<0.4	110	30	120	7.9		1
	" " "	7-10-77		32	4	1.9	10	0	120	7	1.2	1.3	214	96	220	7.6	5.5(±0.8)	13
	" " "	11-1-77		13	<1	-	22	0	78	7	0.3	1.6	190	32	180	7.9		
9	Frijoles at Rio Grande	7-10-77		34	4	4.5	13	0	124	2	<0.1	2.2	246	102	260	7.5	6.8(±1.0)	17
	Frijoles at Rio Grande	9-14-77		22	4	-	17	0	102	6	0.2	0.4	182	72	210	8.5		17
12	Alamo Canyon	7-10-77		29	4	6.3	8	0	98	1	0.1	0.4	176	90	260	7.6	2.4(±0.6)	15
13	Alamo Canyon	7-10-77		33	5	4.0	11	0	122	3	0.1	1.3	232	104	240	7.7	3.7(±0.8)	22
14	Capulin Canyon	7-10-77		15	3	2.3	10	0	72	3	0.1	0.4	148	51	170	7.7	1.9(±0.6)	17
15	Capulin Canyon	7-9-77		21	4	4.5	8	0	92	2	0.2	<0.4	178	70	220	7.8	2.4(±0.6)	18

RADIOCHEMICAL

Station	Location	Date	^{137}Cs 10^{-9} μCi/mℓ	^{238}Pu 10^{-9} μCi/mℓ	^{239}Pu 10^{-9} μCi/mℓ	Gross-α 10^{-9} μCi/mℓ	Gross-β 10^{-9} μCi/mℓ	Total U μg/ℓ
4	Frijoles	8-11-77	30(±140)	0.004(±0.036)	-0.019(±0.018)	0.7(±1.2)	4.1(±1.8)	0.7 ± 0.2
10	Spr. 10	9-14-77	-10(±140)	-0.033(±0.030)	-0.010(±0.024)	-1.1(±1.2)	0.5(±1.6)	0.4 ± 0.2
16	Turkey Spr.	8-21-77	150(±140)	0.000(±0.40)	0.003(±0.036)	-	-	2.6 ± 0.6
6	Frijoles UC	8-10-77	-20(±140)	0.010(±0.040)	0.004(±0.032)	0.6(±1.0)	16.0(±3.6)	0.8(±0.2)
7	Apache Spr.	8-19-77	70(±140)	-0.020(±0.100)	0.030(±0.100)	0.5(±1.2)	6.0(±1.8)	0.7(±0.2)
8	Frijoles, Park Hdq.	3-9-77	-50(±80)	-0.002(±0.024)	0.009(±0.018)	-0.5(±1.2)	1.7(±1.4)	0.0(±0.2)
	" " "	8-2-77	30(±140)	0.000(±0.040)	-0.029(±0.032)	0.6(±1.8)	18.0(±4.0)	0.6(±0.4)
	" " "	10-25-77	-20(±40)	0.000(±0.036)	0.020(±0.160)	0.2(±1.2)	7.6(±2.2)	2.9(±0.6)
9	Frijoles at Rio Grande	8-7-77	-	-0.014(±0.028)	0.002(±0.024)	1.7(±1.8)	3.0(±1.6)	0.9(±0.2)
	"	9-14-77	30(±18)	-0.022(±0.020)	-0.007(±0.022)	-0.5(±1.6)	10.6(±2.8)	0.5(±0.2)
12	Alamo Canyon	8-19-77	140(±140)	-0.011(±0.032)	0.003(±0.030)	1.1(±1.2)	7.1(±1.8)	2.3(±0.4)
13	Alamo Canyon	8-7-77	-	0.007(±0.038)	-0.006(±0.078)	0.1(±1.2)	13.5(±3.2)	1.6(±0.6)
14	Capulin Canyon	8-17-77	-40(±140)	-0.033(±0.030)	-0.009(±0.032)	0.0(±0.8)	-0.1(±1.0)	0.6(±0.7)
15	Capulin Canyon	8-17-77	-60(±140)	-0.035(±0.026)	-0.015(±0.024)	0.2(±1.0)	3.2(±1.4)	1.0(±0.2)

Note: Parenthetical values represent twice the analytical error term for that analyses.

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext. 5862

OFFICE MEMORANDUM

TO : Mike Terry, ENG-9, MS 702

DATE: July 20, 1978

FROM : W. D. Purtymun, H-8 WDP

SUBJECT : WATER TEMPERATURES IN DISTRIBUTION SYSTEM

SYMBOL : H8-78-325

MAIL STOP: 490

If further data is needed, please call. We also have records of water temperatures at individual well head.

	Temperature at Tap °C				
Date	FS-1	FS-2	FS-3	FS-4	FS-5
3-76	17	17	--	21	17
7-76	26	25	26	26	25
10-76	23	24	24	24	23
3-77	12	8	10	10	9
8-77	23	29	26	23	27
10-77	20	20	20	20	21
3-78	18	16	15	16	15

Temperatures are at Fire Stations; FS-1 = TA-3, FS-2 = TA-21 (DP), FS-3 = White Rock, FS-4 = M. Golf Course, and FS-5 = S-Site.

WDP:mar

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext:

OFFICE MEMORANDUM

TO Nick Matwiyoff, CNC-4, MS-346 DATE: October 18, 1978

FROM W. D. Purtymun, H-8

SUBJECT TEST HOLES AT TA-46

SYMBOL H8-78-453

MAIL STOP 490

The cutting from the first test hole at TA-46 were logged as follows: Other holes encounted the same formations.

	Feet From	Feet To
Bandelier Tuff		
Tshirege Member	0	360
Otowi Member	360	695
Guaje Member	695	727
Puye Formation	727	747

The Tshirege Member is a series of welded to nonwelded ashflows; Otowi Member, a massive nonwelded ashflow; and Guaje, a pumice fall. All tuff were rhyolitic in composition. The Puye Formation is a conglomerate composed of volcanic debris.

The hole was reamed to a 16-inch diameter and cased with 13 3/8-inch steel casing. The casing was cemented in with from the bottom, i.e., cement pumped in through a plug at bottom of the casing filling the annular spare between casing and hole wall. (From notes).

The hole was completed at a depth of about 747 feet, or about 400 feet above the main aquifier which lies at a depth of about 1160 feet at the site. Test drilling on the mesas adjacent the area have not encountered perched water above the main aquifier.

The series of holes drilled at TA-46 (casing cemented in from the bottom) should pose no problems if failures occur in the distillation system in holes. Fluids would be contained in casing.

Attached is memo of anticipated sections prior to drilling at TA-46. Detailed data can be found in LASL Engineer Drawing related

to construction of the holes and casing. Unfortunately, I did not retain my copies. R. L. Henning, ENG-2, was the project engineer. If I can be of further assistance, please call.

WDP:vh

Attachment: (a/s)

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544

OFFICE MEMORANDUM

TO : Dick Olwin, J-6, MS 680

DATE: May 4, 1979

FROM : W. D. Purtymun, H-8

SUBJECT : INFORMATION FOR MAY 14, 1979 CONFERENCE AT DEEP TEST HOLE ON THE PAJARITO PLATEAU

SYMBOL : H8-79-152

The test hole will penetrate the top of the main aquifer (water-bearing unit capable of municipal and industrial water supply) at about 1200 ft. At a depth of about 5500 to 5600 ft, the water will become slightly saline (1 to 3 gram per liter). The drilling of the test hole and drilling fluids used are the same as would be used in completion of a water supply well, thus, no contamination of the fresh water aquifer with undesirable chemicals. Some artesian pressures will not cause the well to flow, but will probably cause water level in the hole to rise 50 to 80 ft if the drilling mud were removed from the hole.

Water bearing zones will be cased off to assure no mixing of fresh and saline waters. Geothermal waters use in production of space heat or electric energy will be through the cased hole assuring no mixing of fresh and thermal water.

Production of space heat or electric energy could result in waste waters containing highly undesirable chemical constituents. These undesirable chemicals will have to be removed before the waters can be released to the environment.

WDP:vh

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544

OFFICE MEMORANDUM

TO : G. J. Nunz, GDO, MS 570

DATE: May 4, 1979

FROM : W. D. Purtymun, H-8 WDP

SUBJECT : INFORMATION FOR MAY 14, 1979 CONFERENCE AT FENTON HILL SITE

SYMBOL : H8-79-153

"The deep experimental holes penetrate a fresh water aquifer at a depth of 365 to about 450 ft, and a saline (1 to 3 grams/liter) aquifer at a depth of 1750 ft to 2395 ft (top of the granite). The holes are cased and cemented through these water-bearing zones to prevent mixing of fresh and saline aquifers.

The experimental holes are cased to near zone of fracture in the granite with circulation of water during experiments through the casing or tubing in the casing. Circulating water is not released or lost into the fresh or saline aquifers.

The circulating waters are held in ponds at the site and reused. When excess water in the pond necessitates release, the water is analyzed prior to release. If it contains undesirable chemicals, they are removed by treatment (such as fluorides). After treatment, the water is released into an adjacent dry canyon. Studies made during periods of release indicate water from the ponds infiltrate into the alluvium of the canyon with 1000 ft of the ponds. The water does not enter the live streams in the area.

The laboratory has maintained since 1974, a monitoring net to determine the chemical quality of surface and ground water in the area. The results have indicated no effects of the operations at the geothermal site.

WDP:vh

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544

OFFICE MEMORANDUM

TO : Ed Kaufman, G-DO, MS 575

DATE: May 14, 1979

FROM : W. D. Purtymun, H-8 WDP

SUBJECT : LOCATION FOR EXPLORATORY HOLES AT FENTON HILL

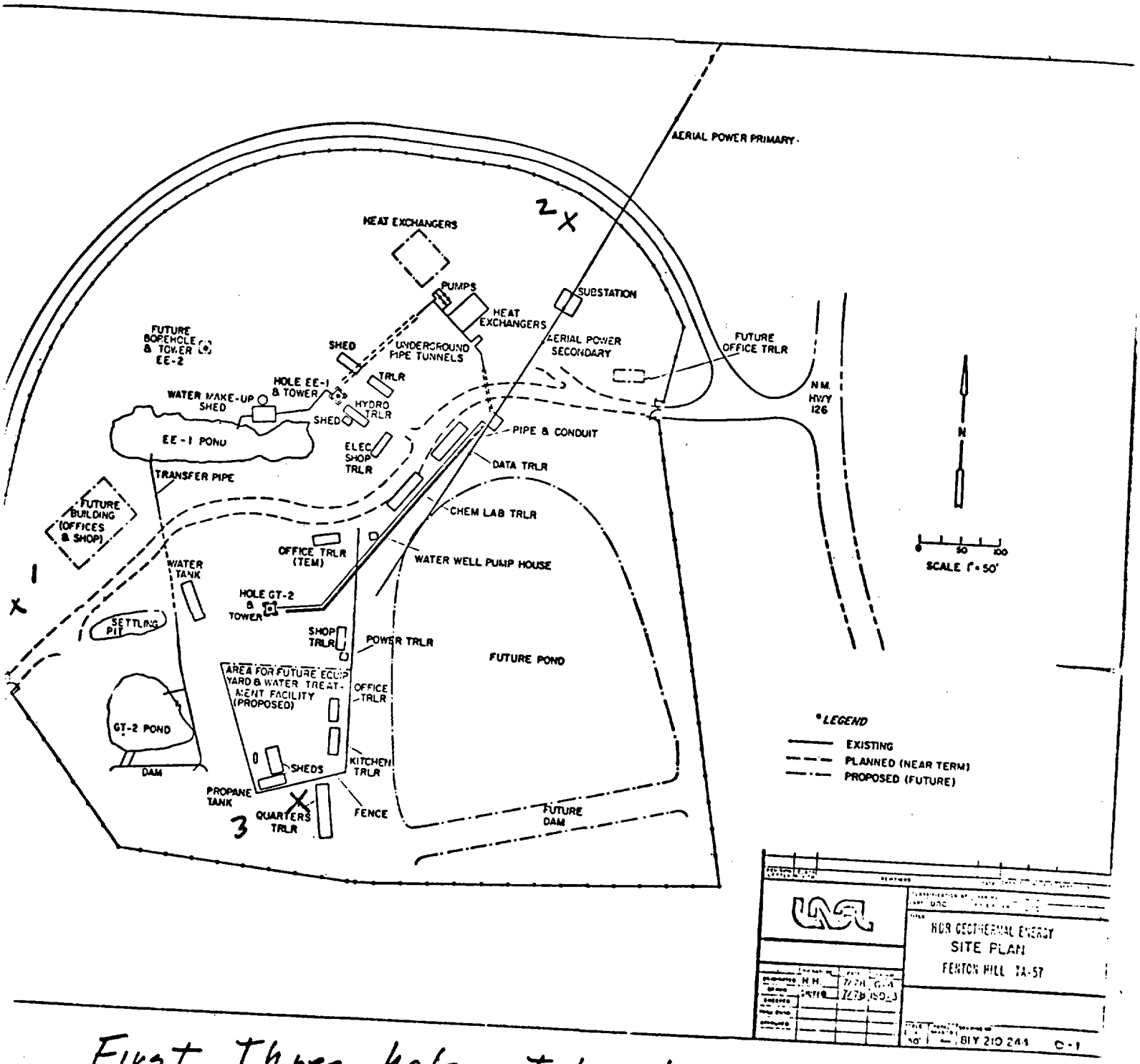
SYMBOL : H8-79-166

Enclosed are two maps showing proposed locations for test holes to evaluate the hydrologic characteristics of the volcanics as possible source of water supply for the site. Locations can be changed slightly to accomodate siting of the rig. After data from the first test hole, other locations are subject to change. Proposed drilling sequence at this time 1, 2, 3---ie.

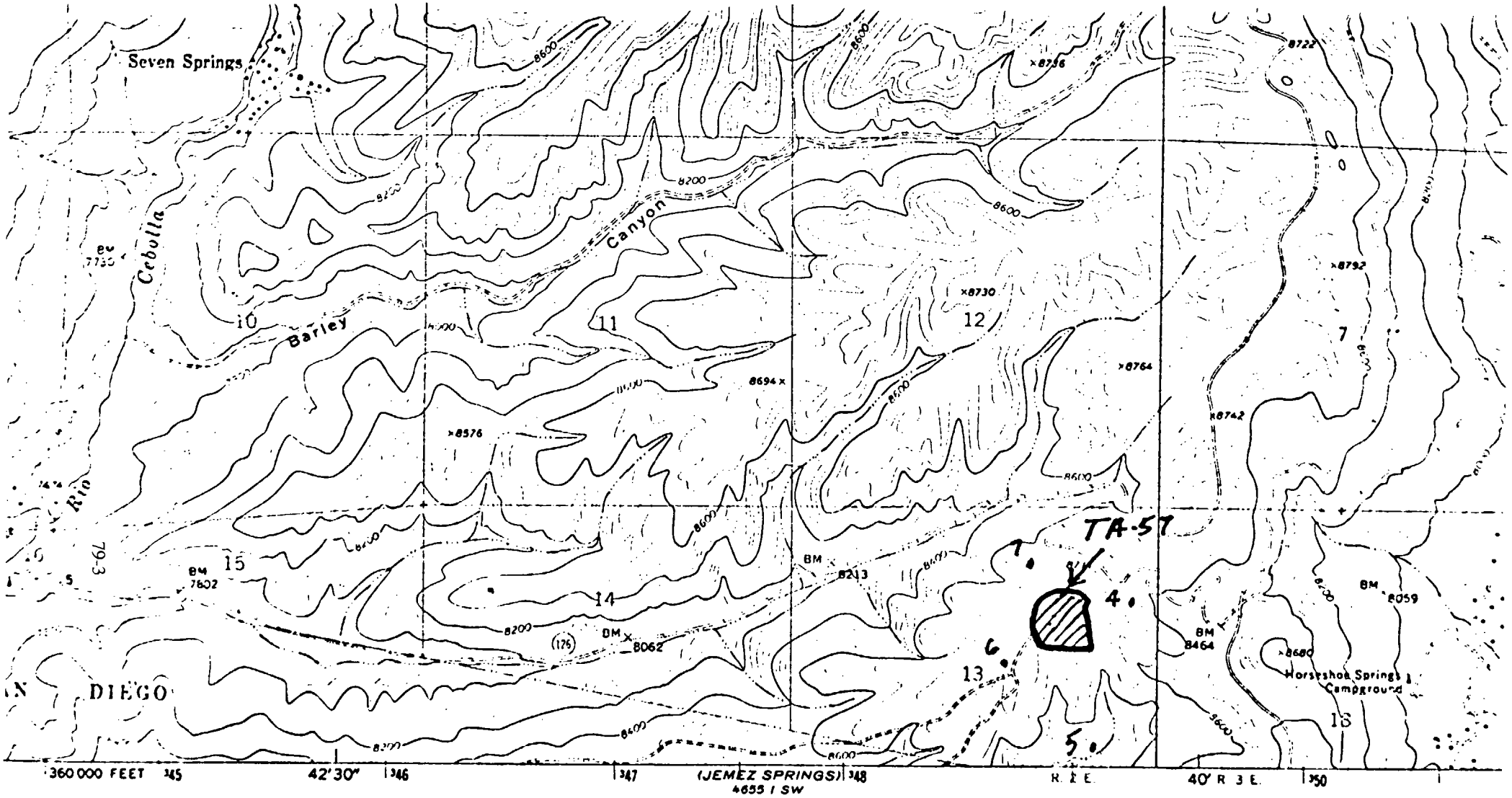
The holes should be drilled about 20 ft into the top of the Abo Formation, penetrating the entire saturated thickness of the volcanics. Casing should be slotted through the entire saturated section. The estimated depth of holes range from 340 (Hole 5) to 500 feet (Holes 4 and 7).

WDP:vh

xc: Francis West, G-9, MS 983



First Three holes Tobe drilled within The Site



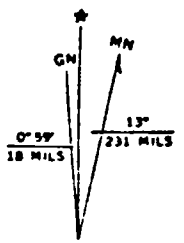
SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL



UTM GRID AND 1970 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D.C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

Proposed location of 4 Test Hole outside The Site

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544

OFFICE MEMORANDUM

TO : Price Fernon, Eng. - 2, MS 984 DATE: July 17, 1979

FROM : W. D. Purtymun, H-8 WDP

SUBJECT : FOUNDATION HOLES AT FENTON HILL

SYMBOL : H8-79-251

Two Hole Near GT-2

1. 3.5 ft from Northeast Corner of Pad GT-2

Fill, dry	0 to 4 ft
fill, wet, muck	4 to 8 ft
Tuff(?), water, muck	8 to 12 ft

2. 3 ft from Northwest corner of Pad GT-2

Fill, dry	0 to 4 ft
fill, wet, muck	4 to 7 ft
Tuff(?), water, muck	7 to 12 ft

The water level in both holes was at about 5 ft. The cuttings were at so impregnated with muck (oil drilling mud, and residual chemical from circulating loop), that we couldn't determine exactly where the tuff contact occurred, but it appeared at about 8 and 7 ft according to the down pressure increase on the rotary table. The accumulation of water and muck is due to leakage from the well head and the fact that the holes were drilled in the excavation or cellar, which is now filled with gravel that was used for setting the "blow out" preventor when the GT-2 was drilled. I suggest excavating the area with a backhoe to find out where the formulation can be set.

Two Hole Near EE-1

3. 3 ft from Southwest corner of Pad EE-1

Fill, dry	0 to 3.5 ft
Tuff, dry	3.5 to 12 ft

4. 2 ft out from center of pad, eastside EE-1

Fill, dry	0 to 4 ft
Tuff, dry	4 to 12 ft

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LOS ALAMOS, NEW MEXICO 87544

One Hole near EE-2

5. 10 ft Southeast of Rig Platform

Fill	0 to 3 ft
Tuff, dry	3 to 7 ft

Buried pipes and electrical conducts are adjacent to the existing pad at GT-2 and EE-1 so that caution should be used in excavation in these areas. A cellar, now filled with gravel, may extend beyond the pad at EE-1, but was not encountered by the by the two test holes.

WDP:vh

L' ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext:

OFFICE MEMORANDUM

TO Jim Gose, ENG-2, MS 984
Jim Hill, G-4, MS 980

DATE: September 7, 1979

FROM ~~W. D. Purtymun and Charlene Wardlow, H-8~~

SUBJECT TEST HOLES AT THE FENTON HILL PROPOSED STORAGE POND SITE

SYMBOL H8-79-333

MAIL STOP 490

Seven holes ranging in depth from 17 to 42 feet were drilled in the vicinity of the proposed site of the storage pond (Fig. 1). The driller's logs of the holes are shown in Figure 2. The holes were logged with a neutron probe to determine moisture content by volume and the data is shown in Figure 3.

The bottom elevation of the proposed pond is 8685 feet. Holes 1, 2, 5, 6, and 7, encountered a wet silty clay zone at approximately 8700 elevation ranging in thickness from 6 to 20 feet. The silty clay zone is a badly weathered tuff that receives water from precipitation. The zone would underlie the pond in the vicinity of holes 1, 2, and 6. The moisture content by volume in the silty clay zone ranged from 25 to 45%. Oven dried cuttings of the zone had a moisture content of 40%.

The wet silty clay zone is plastic as most of the holes had bridged so that the entire depth could not be logged.

The plastic silty clay zone may cause problems during excavation for the proposed pond and stability of the pond itself.

WDP:CW:vh

Enclosures: Figure 1, 2, and 3

Plot Plan of Proposed Storage Area at TA-57

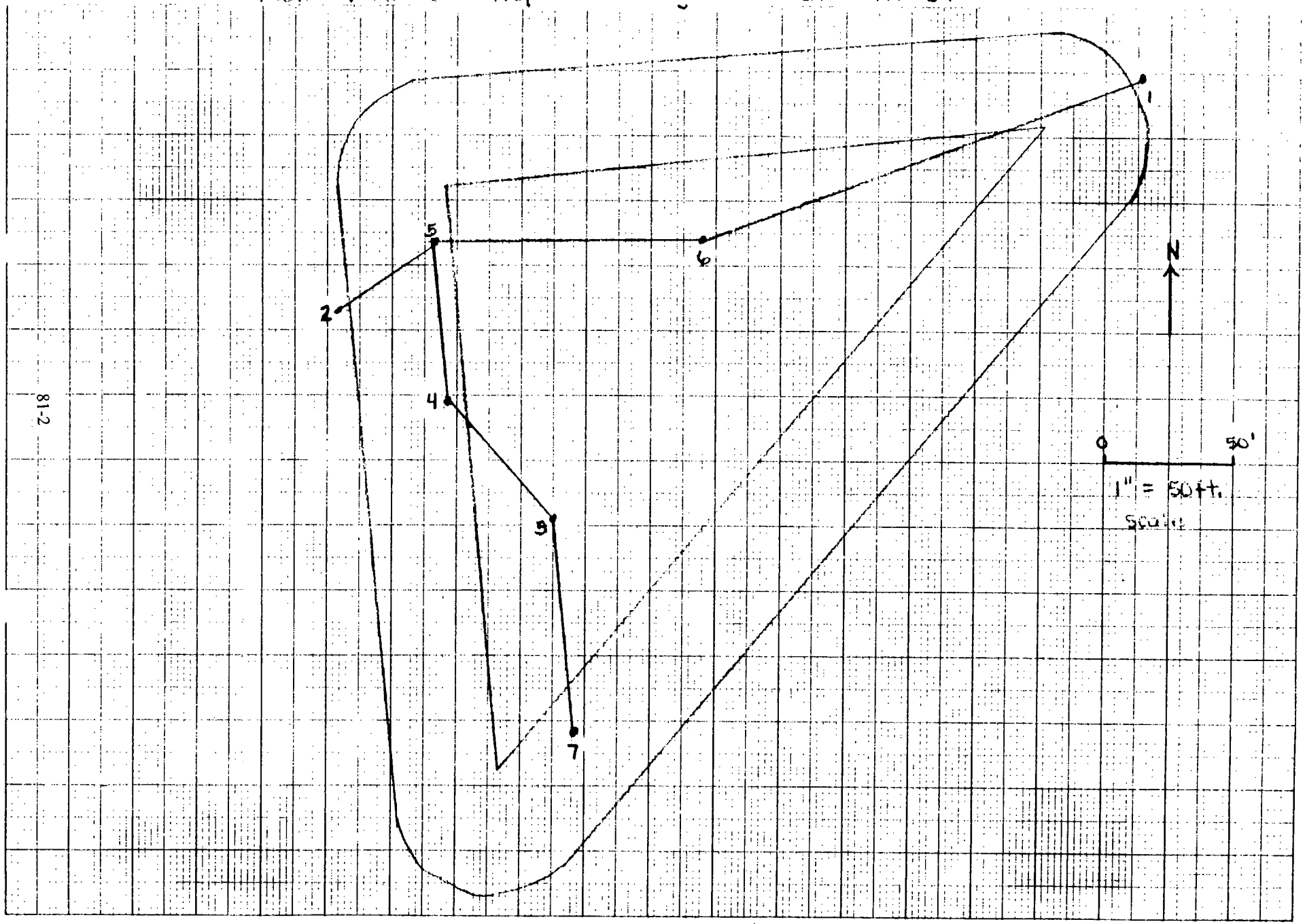


Figure 1

GRAPH PAPER GRAPHIC CONTROLS CORPORATION Buffalo New York Printed in U.S.A. SQUARE 10 X 10 TO THE HALF INCH AS 8013-E1

Driller's Logs and Correlations

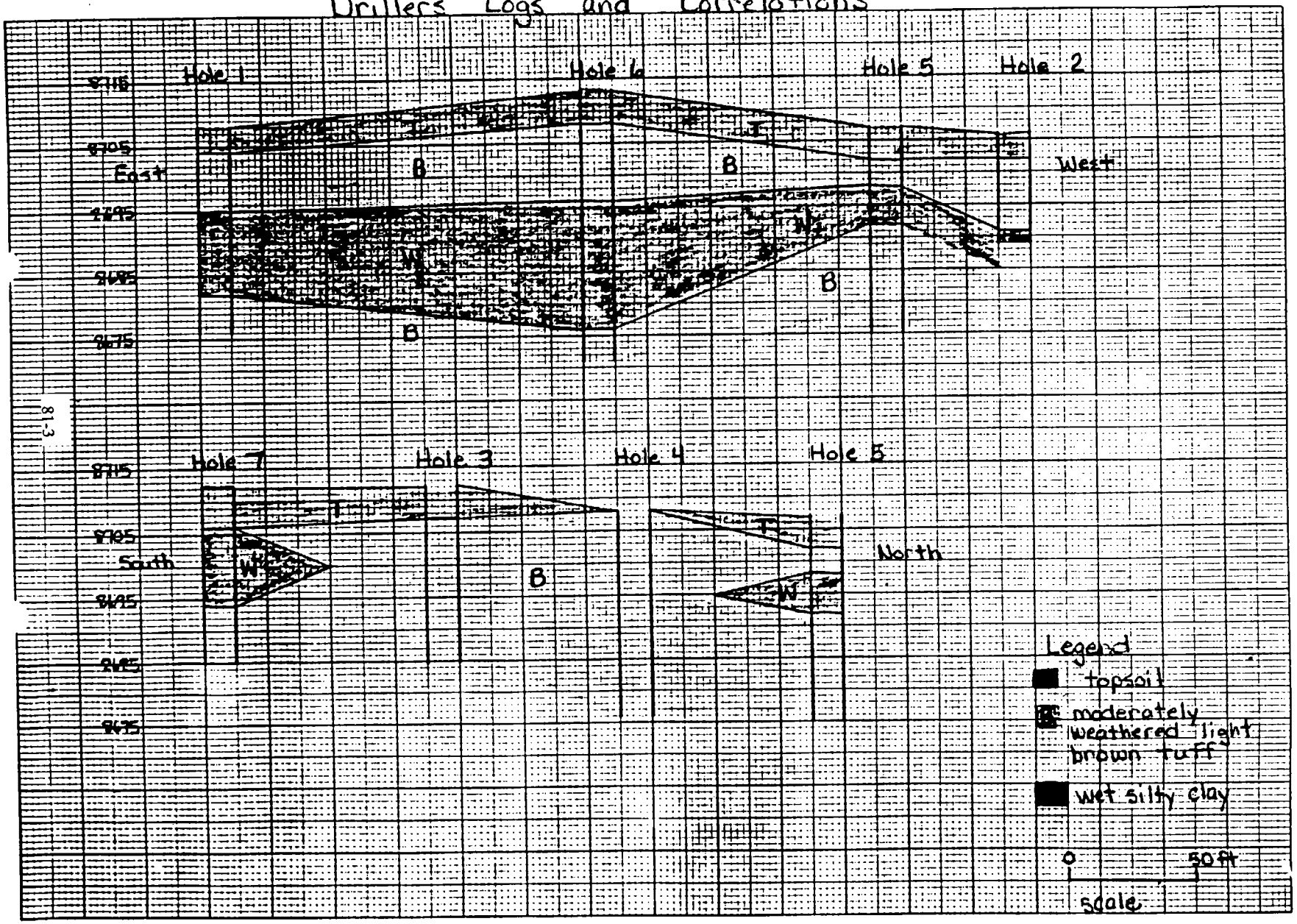


Figure. 2

vertical axis - elevation in feet

horizontal axis - water content by volume in percentage, [illegible]

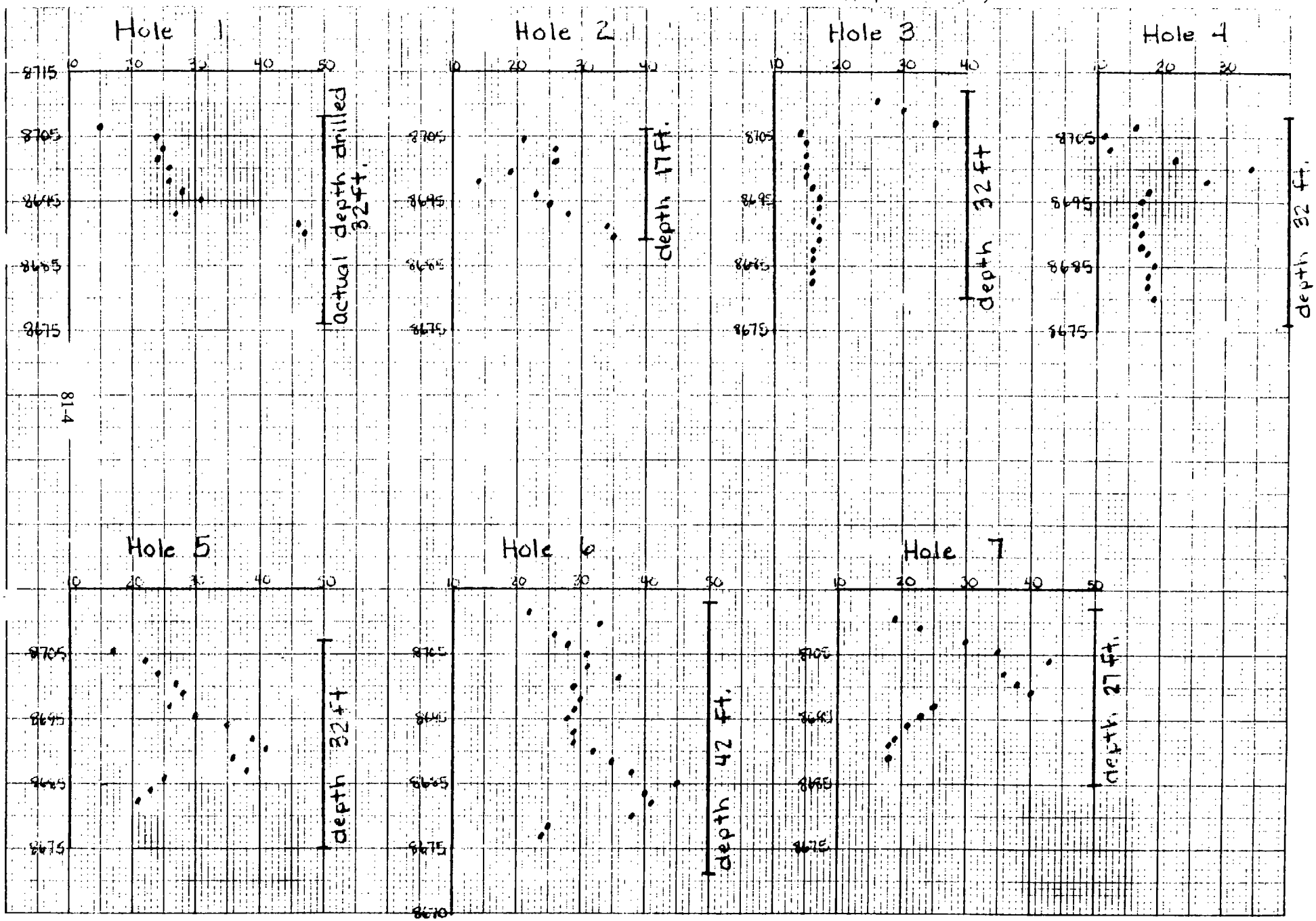


Figure 3

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext:

OFFICE MEMORANDUM

TO : Price Ferron, ENG-2, MS 984

DATE: October 29, 1979

FROM : William D. Purtymun, H-8 WDP
Charlene Wardlow, H-8 CW

SUBJECT : PROPOSED TOWER SITE AT TA-57 TEST HOLE

SYMBOL : H8-79-416

MAIL STOP: 490

Attached are the logs of the two holes drilled 100 feet west of EE-2. The two holes were approximately 15 feet apart. Lithology of of both holes was the same.

0-12 feet - light pinkish grey moderately welded tuff

The moisture content of cuttings from the western most hole at a depth of 5 ft was 12% by weight. The moisture content of the tuff from this hole reflects infiltration of water from the drainage ditch along the west side of the access road. The foundation should be at least 2 ft into the undisturbed tuff.

WDP:CW:vh

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext.

OFFICE MEMORANDUM

TO : Jim Gose, ENG-2, MS 984
Jim Hill, G-4, MS 980

DATE October 29, 1979

FROM : W. D. Purtymun, H-8 WP
Charlene Wardlow, H-8 CW

SUBJECT : PROPOSED STORAGE POND SITE AT TA-57 TEST HOLES

SYMBOL : H8-79-415

MAIL STOP: 490

Attached are the logs from five holes drilled at the proposed storage pond site at TA-57.

NE corner 0-22 ft - light brownish grey moderately welded tuff

NW corner 0-22 ft - light brownish grey moderately welded tuff

SE corner 0-22 ft - light brownish grey moderately welded tuff

SE corner 0-5 ft - light brown weathered tuff
5-27 ft - light brownish grey moderately welded tuff

Center 0-5 ft - badly weathered brown tuff
5-24 ft - light pink moderately welded tuff
24-27 ft - brown weathered tuff
27-42 ft - badly weathered tuff, wet

The moisture content of cuttings from the center hole from a depth of 28-32 ft was 21% by weight. The location appears to be alright with respect to the underlying tuff. The base on floor of the reservoir should have about 10 ft of moderately welded tuff above the weathered zone at 24 to 42 ft.

WDP:CW:vh

UNIVERSITY OF CALIFORNIA
LOS ALAMOS SCIENTIFIC LABORATORY
(CONTRACT W-7405-ENG-36)
P.O. BOX 1663
LOS ALAMOS, NEW MEXICO 87545

IN REPLY
REFER TO: H8-79-525
MAIL STOP: 490

December 14, 1979

Mr. Jose H. Lucero
P.O. Box 580
Espanola, NM 87532

Dear Jose:

After looking through the files, I could come up with only one chemical analysis in the area. The sample was taken of surface water from Santa Clara Creek midway between Ponds 2 and 3. It was collected on April 16, 1969. The results were:

Chemical (mg/ℓ)

Ca	6	Cl	1
Mg	0.5	F	<0.1
Na	10	NO_3	0.1
CO_3	0	TDS	82
HCO_3	22	T. Hard	16

Conductance 54 μmho
pH 7.3

Low concentrations of chemical constituents are typical of water in high mountain streams. Quality is exceptionally good.

If I can be of further service, please contact me.

Yours truly,

Bill

W. D. Purtymun
Group H-8 MS 490
Environmental Surveillance

An Affirmative Action/Equal Opportunity Employer

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext:

OFFICE MEMORANDUM

TO : Merle Bunker, Group Leader P-2, MS 776 DATE: December 14, 1979

THRU : Wayne R. Hansen, H-8 Group Leader

FROM : W. D. Purtymun, H-8

SUBJECT : STABILITY OF ROCKS ON WALL AND SLOPES OF LOS ALAMOS CANYON ABOVE TA-2

SYMBOL : H8-79-526

MAIL STOP: 490

A reconnaissance was made of the canyon on December 12, 1979, at the request of A. Lyle, P-2 (memo P-2-140). There appears to have been little movement of rocks on the slopes of the canyon walls above the site since the study by the U.S. Geologic Survey in September, 1970. Only one large boulder (600 to 800 lbs) was lodged against the east end of the "rock catcher" on the north side of the canyon. Another boulder (400 to 600 lbs) was lodged against the chain link fence on the south side of the canyon. The fence was bulged slightly.

Scars on trees caused by rock falls indicate that movement of the rocks is close to the slope, within 3 to 4 feet. Thus, it appears that on the north canyon slope above the buildings, the "rock catcher" and chain link fence below the catcher will arrest any loose boulders moving down from above.

Inspection of the slope failed to detect any rocks that were unstable or any other evidence of recent movement besides that noted above.

It may be advisable to break up the boulder in the rock catcher and repair the wire spacing the cables. We will plan to take a more complete look at the slope in the spring after freezing and thawing occur. It may be advisable to consider contracting for a Geologic Consultant to look at the area in reference to rock falls as an independent review of past work.

WDP/mlk

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext:

OFFICE MEMORANDUM

TO : Distribution

DATE March 12, 1980

FROM : W. D. Purtymun, H-8 WDP
Naomi Becker, G-5, Dan Miles, G-4 DM

SUBJECT : WATER SUPPLY AT FENTON HILL

SYMBOL : H8-80-184

MAIL STOP: 490

The purpose of this memo is to document activities since 1978 related to the development of a water supply for domestic and geothermal usage at Fenton Hill Site (TA-57). The memo also proposes hydrologic studies to be made of the new well FH-3.

I. WATER RIGHTS

Effective May 15, 1978, the water rights for Fenton Hill under State Engineer's Office (SEO) Permit-34834 was increased to 18 ac-ft for the year 1978 and to 15 ac-ft per year for the years 1979 through 1986. Eighty (80) percent of diversion is to be returned to the ground water reservoir or surface water in the area. (See attached correspondence and Application for Permit, Attachment I).

A requirement which LASL has not complied with is under "Action of the State Engineer," items 1 and 3, in reporting water returned to the ground water reservoir and/or surface water system in the vicinity of the well RG-24834 (FH-1). It should be noted that during 1979, discharge from the ponds at TA-57 into the small canyon tributary to Lake Fork Canyon was not reported to DOE, thus, it was not reported with amount of water produced to the SEO in Albuquerque. However, discharges were reported to the EPA under the NPDES permit requirements, and these reports are automatically available to the New Mexico Environmental Improvement Division, and thus accessible to the SEO.

Three meetings were held with the LASL, DOE, and SEO to discuss additional use of water above the 18 ac-ft 1978, and 15 ac-ft from 1979 through 1986. The meetings resulted in the drilling of five slim holes and a second supply well during December 1979 and February 1980 (see Section III of this memo).

The first meeting, January 16, 1979, was held in Santa Fe to probe the possibility of LASL obtaining water rights for 60 ac-ft in FY 1981 and 15 ac-ft in each FY-1982 through 1985, in addition to the 18 ac-ft (1978) and 15 ac-ft (1979-1986). There were two possible areas to obtain the water, aquifers in the volcanics, and the Madera Limestone. LASL would make a literature search and come up with some hydrologic characteristics.

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544

The second meeting, March 23, 1979, was held in Santa Fe (see Attachment II for attendees). The hydrologic characteristics of the volcanic aquifer and Madera Limestone as well as the effects of pumpage at the Fenton Hill Site on streams and springs were discussed. The SEO would use estimated aquifer characteristics (Transmissivity "T" and coefficient of storage "S") of the volcanics ($T = 100{,}000$ gpd/ft^2, $S = 0.0005$, discharge area Lake Fork Canyon 15,000 ft) and of the Madera Limestones ($T = 115{,}000$ gpd/ft^2, $S = 0.0005$, discharge area Jemez River 24,000 ft) to calculate the estimated amount of water rights at the Fenton Hill Site to offset the effect of increased pumpage on the local surface water.

The third meeting, April 23, 1979, was held at Los Alamos. The SEO had computed the following effects of pumpage on local surface water.

LASL Hot Dry Rock Experiment

Calculations based on consumptive use of 60 af/an in FY 1981 and 15 af/an in each of FY's 1982 through 1985 inclusive.

Fiscal Year	Assumed entire appropriation from Volcanics Calculated effects on Rio Cebolla & Lake Fork Seven Springs at end of Fiscal year indicated (af/an)	Assumed entire appropriation from Madera Calculated effects on Jemez River at end of FY indicated (af/an)
1981	16.0	56.7
1982	17.5	17.1
1983	16.3	15.1
1984	15.5	14.6
1985	15.1	14.6
1986	10.7	.40
1987		
1988		
1989		
1990		
1991		
1992	1.6	

It was decided by LASL to explore the possibilities of taking the additional water (60 ac-ft FY 1981 and 15 ac-ft in FY 1982 through FY 1985) out of the volcanic aquifer. LASL was to do additional studies to determine the aquifer characteristics and feasibility of the aquifer to produce the additional pumpage. This study will be explained in Section III of this memo.

II. GENERAL STATEMENT OF GEOHYDROLOGY OF THE VOLCANIC

The volcanic aquifer is perched on clay, shales, and siltstones of the underlying Abo Formation. The upper surface of the Abo has been fluted and dissected by erosion prior to deposition of the volcanics. These erosional channels in the Abo, which were subsequently filled with volcanic debris, comprise the aquifer that supplies the water from well FH-1 of the Fenton Hill Site (Attachment III). The amount of storage in this aquifer is determined by width, length, and spatial extent of the channel. Topographic highs of the Abo surface limit the aquifers thickness and lateral extent, and will "disconnect" portions of the aquifer where the Abo surface is above the water table.

Generalized contours on top of the Abo in the area of Fenton Hill indicate the formation dips to the southwest at about 80 ft/mi. Thus, the general movement of water in the aquifer was believed to be to the southwest where a series of springs and seeps discharge from the volcanics into the middle and lower reaches of Lake Fork Canyon.

The supply well FH-1 (1976) was completed at a depth of 450 ft with the water level at about 365 ft below land surface after completion of the drilling. The aquifer may have been artesian since the water rose in the well about 10 ft after the aquifer was penetrated. The well did not penetrate the Abo Formation. Aquifer tests in January 1978 indicated the well had a specific capacity of 137 gpm per ft of drawdown at a pumping rate of 44 gpm after pumping 122 hrs. A second test indicated a specific capacity of 191 gpm per ft of drawdown at a pumping rate of 38 gpm after 25 min of pumping. Based on the specific capacity the transmissivity (T) of the aquifer was estimated at 100,000 gpd/ft^2, which was used by SEO calculations reported in April 1979.

The total production from the well November 1976 through July 1979, has been about 9,8 x 10^6 gal. The water level has declined from 366.7 ft below land surface in January 1978 to 368.5 ft in July 1979. The decline in water level indicates that pumpage is exceeding recharge to the aquifer.

III. HYDROLOGIC STUDIES DECEMBER 1979 - FEBRUARY 1980

As suggested at the meeting of LASL, SEO and DOE on April 23, 1979, the following proposed study was to be made by LASL to evaluate the volcanic aquifer's characteristics.

A. Proposed Study

1. Drill 4 to 6 slim holes (6-in dia) through the volcanics into the top of the Abo Formation to determine the top and lateral configuration of the base of the aquifer in the volcanic aquifer.

2. Based on geologic and hydrologic data derived from the slim holes, locate and drill a test hole (supply well FH-2), and perform an aquifer test. The purpose of the test would be to determine aquifer characteristics needed to evaluate the aquifer for potential to produce the additional required production (60 ac-ft FY 1981, and 15 ac-ft FY 1982 through FY 1986).

3. Using these aquifer characteristics, in cooperation with the SEO, determine the effects of pumpage on surface water flow in the area, thus determining the amount of water rights needed for the additional production.

B. Actual Study

The proposed program was not carried out in the prescribed sequence. Moreover, the data that were to be collected were not gathered, improperly gathered, or lost. This is due in part to no one person being in charge, a lack of understanding with the drilling contractor, or improper specifications in the contract, and a lack of recognition of the program goals.

Sequence of Events

1. The test hole (Supply Well FH-2) was located in December 1979, and drilling began prior to completion of the slim holes. Hence, this test hole was sited without the information the slim holes could supply. The test hole was evidently located near the edge of the aquifer as the Abo Formation was encountered at a depth of 433 ft or more than 20 ft higher than occurred in Supply Well FH-1. The hole (FH-2) was completed at a depth of 450 ft with the water level at 371 ft below land surface. A test on February 4, 1980, indicated a specific capacity of 0.8 gpm per ft of drawdown at a pumping rate of 20 gpm after 2.25 h of pumping. At that time the pumping rate was increased to 40 gpm and the water level dropped to the top of the pump setting (49 ft) after 40 min with a specific capacity of about 1 gpm per ft of drawdown. Using the aquifer test results, a value of "T", calculated from the drawdown at a pumping rate of 20 gpm, was about 600 gpd/ft^2, while from the water level recovery data, T was about 300 gpd/ft^2. Erratic water levels in the slim hole 75 ft north precluded any independent determination of T or S.

2. Five slim holes were drilled to a depth of 450 ft in December 1979 and January 1980. Some of the holes may have not been deep enough to penetrate the Abo Formation. The holes are cased with 1 1/2 in. galvanized pump. During drilling of these holes, no geologic or hydrologic logs were kept. The driller did not keep any notes. Drill cuttings have been found from one hole; thus, the data necessary to determine the configuration of the base of the aquifer has been lost.

3. A lack of supervision of the driller during slim hole development led us to believe that these holes were not completed properly with respect to aquifer connection. The annulus between the bore hole wall and slotted pipe may be filled with drilling mud and cuttings. If this is the case, water level measurements in the slim holes could misrepresent the aquifers response to tests of FH-3 when completed.

4. Elevations of the five slim holes and well FH-2 were surveyed and water levels measured during the week of February 4, 1980. ENG-4 prepared a location map of slim holes, supply wells, and Granite Test Holes. (Attachments IV and V).

In short, the results of field activities during December 1979 through February 1980 were discouraging. The slim holes did not yield the information necessary to determine the configuration of the base of the aquifer. Well FH-2 was poorly located. The tests indicated a very reduced yield when compared with well FH-1. This might have all been avoided had the proposed study been properly followed.

IV. THIRD TEST HOLE (WATER SUPPLY FH-3)

In early February, we were requested by G-Division (Nunz, Hill, and Hendron) to recommend a location for a third test hole or supply well due to the poor performance of FH-2. The data needed (i.e., configuration of the base of the aquifer) to make an intelligent recommendation was not available, nor is it now available. The ideal location for this new well would be in the thickest saturated section of the volcanics in a channel cut into the Abo (Attachment VI).

Under pressure to secure a continuation of the contract of the drill rig present, the location was chosen near FH-1, about 75 ft to the south. The location was chosen based on (1) FH-1 penetrated 85 ft of saturated volcanics and did not reach the top of the Abo, (2) yield from the well indicated by the present production is large, and (3) the proximity of FH-1 to the new well will be ideal to determine the aquifer characteristics during testing. The disadvantage is the proximity of two wells. If both are used, it will accelerate the water-level decline when compared to wells properly spaced. Construction of the well began on February 20, 1980.

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544

V. HYDROLOGIC STUDIES OF FH-3

We were informed in the Fall of 1979 that a consultant was to be hired to determine hydrologic characteristics and secure the needed additional water rights. It is not clear that a consultant will actually begin work by the time the new well FH-3 is completed.

In an attempt to insure that future field activities will not repeat past performance, it is proposed that the following program be carried out by Dan Miles, G-4, Naomi Becker, G-5, and W. D. Purtymun, H-8, to insure data collection necessary to evaluate the hydrologic characteristics of the aquifer. This will answer both the question of whether the volcanic aquifer can supply the quantity of water necessary to TA-57 operations and satisfy LASL's obligation to furnish aquifer characteristics to SEO.

1. A bore-hole TV log will be run in FH-2 to determine if slots in casing are sufficient and, if possible, the amount of bridging of sand particles in slots, thus checking this well's connection with aquifer. This is scheduled udring the week of March 17-21, 1980.

2. The well FH-2 will be equipped with a water-stage recorder after the well is logged with the TV. The records will be used to determine if water-level trends can be related to pumping well FH-1 and to determine the barometric pressure effect on the aquifer.

3. Dan Miles will coordinate with the drilling contractor for FH-3 in collection of samples and drilling information assisted by Becker and Purtymun.

4. Upon completion of FH-3, we will conduct an aquifer test as specified in the driller's contract. In order to use FH-1 as an observation well during the test, the pump will be pulled and the well equipped with a water stage recorder. Water-level data will be collected from the slim holes and FH-2 for use in determining the transmissivity and storage coefficient. Reduction of data will be completed by Miles, Becker, and Purtymun. Some additional staffing from G-Division will be required during this test.

5. Geophysical logging of slim holes should be done by the U.S. Geological Survey, or other capable company, using a gamma-ray density probe to determine, if possible, the contact between the volcanics and Abo Formation. This data is necessary to delineate the extent of the aquifer (i.e., saturate volume of volcanics).

We have the water storage recorders. Needed are the geophysical logs and having the pump pulled from FH-1 two or three days prior to the test.

Approaching the testing of FH-3 in this manner should result in maximum return of data required by the SEO. Prior to the aquifer test, the SEO should be contacted to see if they wish to send an observer to the test. In addition, the data will be useful in the future if additional water rights are to be obtained.

WDP:NB:vh
Attach. (I thru VI)

TO: Distribution DATE: March 12, 1980

Distribution:

G. J. Nunz	G-DOF, MS 575
M. C. Smith	G-DOF, MS 575
Paul Frank	G-1, MS 575
E. L. Koufman	G-1, MS 575
C. L. Edwards	G-2, MS 978
Hendron/Hill	G-2, MS 978
B. R. Dennis	G-3, MS 586
W. A. Morris	G-4, MS 980
J. W. Tester	G-5, MS 981
Aamodt/Brown	G-5, MS 981
H. F. Althaus	DOE-ENG MS 316
Felix Miera	LS-6, MS 495
W. R. Hansen	H-8, MS 490

ATTACHMENT I

STATE OF NEW MEXICO

STATE ENGINEER OFFICE

DISTRICT 1

S.E. REYNOLDS
STATE ENGINEER

May 23, 1978

ADDRESS CORRESPONDENCE TO:
2340 MENAUL, N.E.
SUITE 206
ALBUQUERQUE, NEW MEXICO 87107
PHONE: 842-3126

FILE: RG-24834

Mr. Kenneth R. Braziel, Area Manager
U. S. Department of Energy
Los Alamos Area Office
Los Alamos, New Mexico 87544

Dear Mr. Braziel:

Enclosed is your copy of the above-numbered application for permit for water to be used in geothermal research which has been approved subject to the conditions set forth on the reverse side of the permit.

Please note Condition #3 which sets out the requirement for metering the amount of water used under this permit and the reporting of said usage to this office.

This permit will automatically expire on January 1, 1987.

Very truly yours,

J. L. Williams
Supervisor, District 1

mlh
Encl: Permit (1)

cc: Santa Fe

Department of Energy
Los Alamos, New Mexico 87544

MAY 3 1 1978

R. H. Hendron, G-4, LASL (MS-980)

WATER RIGHTS - FENTON HILL

In response to your previous correspondence G-4-78-102, dated December 7, 1977 please be advised effective May 15, 1978 the water rights for Fenton Hill under Permit RG-34834 have been increased to 18 acre feet for the year 1978 and to 15 acre feet for the years following through 1986. The permit is to be automatically cancelled effective January 1, 1987.

Your attention is directed to Items 1, 2 and 3 on the reverse side of the permit. Please advise this office of the methods planned by your office for assuring that these items are complied with and that a report acceptable to the State Engineer is made available to that office on or before the 10th day of each month following the period of useage. A copy of the report should also be made available to this office.

Original signed by
Harry F. Althaus

Harry F. Althaus, Chief
Facilities Engineering Branch

LFE:HFA

Enclosure:
Permit RG-34834 dtd 5/15/78 (3 copies)

cc: Dean Miller, The Zia Company, w/encl
W. Purtyman, LASL (MS-490), w/encl
B. Crismon, LAAO, w/encl
H. Althaus, Fac.Engrg. Br., w/encl

Revised August 1967

ATTACHMENT I

IMPORTANT—READ INSTRUCTIONS ON BACK BEFORE FILLING OUT THIS FORM

APPLICATION FOR PERMIT

To Appropriate the Underground Waters of the State of New Mexico

Date Received _____ File No. _____

1. Name of applicant U. S. Department of Energy
   Mailing address Los Alamos Area Office
   City and State Los Alamos, New Mexico 87544
2. Source of water supply shallow water aquifer, located in Rio Grande
   (artesian or shallow water aquifer) (name of underground basin)
3. The well is to be located in the NE ¼ SW ¼ NE ¼, Section 13 Township T 19 N
   Range R 2 E N.M.P.M., or Tract No. ____ of Map No. ____ of the _____ District,
   on land owned by U. S. Department of Agriculture, Forest Service
4. Description of well: name of driller Existing well drilled under RG-24834 and RG-24834-2
   Outside Diameter of casing 7 inches; Approximate depth to be drilled 450 feet.
5. Quantity of water to be appropriated and beneficially used 18 acre feet in 1978 and 15 acre feet, thereafter through 1986.
   (consumptive use/diversion) *
   for scientific research for geothermal hot dry rock energy purposes.
6. Acreage to be irrigated or place of use same as well location, para. 3 above acres.

Subdivision	Section	Township	Range	Acres	Owner

Additional statements or explanations The production of steam at Fenton Hill has been demonstrated by circulating water between two deep hot dry rock geothermal holes connected by hydraulic fracturing. Additional experimentation is now necessary to conduct heat flow studies and other research to test the concept of hot dry rock geothermal energy extraction.

Although the geothermal holes are located in hot dry rock and not in an aquifer, make-up water, to offset down hole and other losses, is necessary to conduct further experimentation. It is the opinion of the Department of Energy that appropriation of the quantity of water designated under paragraph 5 above, from the existing water well drilled under permits numbers RG-24834 and RG-24834-2, will not affect the Guadalupe River flow. However, a study will be performed to determine if there is an affect. If there is an affect, DOE will acquire the appropriate rights to offset the affect or will provide make-up water by means which will not affect the Guadalupe River.

*Consumptive use is estimated to be 20 percent of the diversion.

I, Kenneth R. Braziel, affirm that the foregoing statements are true to the best of my knowledge and belief and that development shall not commence until approval of the permit has been obtained.

U. S. Department of Energy, Permittee,

By: Kenneth R. Braziel
Kenneth R. Braziel, Area Manager

Subscribed and sworn to before me this 5th day of January, A.D., 19 78.

My commission expires 3-10-78 Emma E. Hahn
Notary Public

'78 JAN 5 PM 1 15

'78 JAN 5 PM 2 06

'78 JAN 6 AM 10 28

ALBUQUERQUE, N. MEX.

STATE ENGINEER OFFICE
ALBUQUERQUE, N. MEX.

Number of this permit RG-24334

ACTION OF STATE ENGINEER

After notice pursuant to statute and by authority vested in me, this application is approved provided it is not exercised to the detriment of any owners having existing rights; further provided that all rules and regulations of the State Engineer pertaining to the drilling of _____ wells be complied with; and further subject to the following conditions:

1. Diversion of water under this permit shall not exceed 18 acre feet per annum for the year 1978 and 15 acre feet per annum for each subsequent year through 1986. Eighty percent of the amount diverted shall be returned to the ground water reservoir and/or surface water system in the vicinity of well RG-24334.

2. All diversion of water from RG-24334 shall be measured by a totalizing meter, or meters, of a type and at a location (s) approved by and installed in a manner acceptable to the State Engineer.

3. Consumptive use and/or return flow shall be measured and/or computed by the permittee by a method acceptable to the State Engineer. Records of diversion and consumptive use and/or return flow shall be submitted to the State Engineer on or before the 10th day of the following month for each calendar month.

4. This permit shall automatically expire on January 1, 1987.

Proof of completion of well shall be filed on or before _____, 19____

Proof of application of water to beneficial use shall be filed on or before _____, 19____

Witness my hand and seal this 15th day of May, A.D., 19 78

S. E. Reynolds, State Engineer

By: M. B. Compton, Engineer, Water Rights Bureau

INSTRUCTIONS

This form shall be executed, preferably typewritten, in triplicate and shall be accompanied by a filing fee of $5.00. Each of triplicate copies must be properly signed and attested.

A separate application for permit must be filed for each well used.

Secs. 1—4—Fill out all blanks fully and accurately.

Sec. 5—Irrigation use shall be stated in acre feet of water per acre per annum to be applied on the land. If for municipal or other purposes, state total quantity in acre feet to be used annually.

Sec. 6—Describe only the lands to be irrigated or where water will be used. If on unsurveyed lands describe by legal subdivision "as projected" from the nearest government survey corners, or describe by metes and bounds and tie survey to some permanent, easily located natural object.

Sec. 7—If lands are irrigated from any other source, explain in this section. Give any other data necessary to fully describe water right sought.

ATTENDANCE MEETINGS LASL, SEO AND DOE

January 16, 1979

M. B. Compton	SEO
D. R. Cooper	SEO
P. D. Akin	SEO
M. P. Spinks	SEO
D. N. Stone	SEO
C. E. Bingham	DOE
H. F. Althaus	DOE
E. M. Nunez	LASL
R. H. Hendron	LASL
W. D. Purtymun	LASL
E. L. Kaufman	LASL

March 23, 1979

M. B. Compton	SEO
H. F. Althaus	DOE
R. H. Hendron	LASL
E. L. Kaufman	LASL
W. D. Purtymun	LASL
C. E. Bingham	DOE
D. R. Cooper	SEO
P. D. Akins	SEO
M. P. Spinks	SEO
D. N. Stone	SEO

ATTACHMENT III

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544
TELEPHONE:

OFFICE MEMORANDUM

TO : M. C. Smith, Group Leader, Q-22 DATE: April 2, 1974

FROM : Wm. D. Purtymun, H-8 and Francis West, Q-22

SUBJECT: EXPLORATORY TEST HOLE IN VOLCANICS WITH POSSIBLE COMPLETION AS A SMALL YIELD WATER SUPPLY.

SYMBOL : H8-74-140

The following data was compiled at the request of Don Brown in regards to data obtained during the initial phase of drilling GT-2.

The geophysical and lithologic logs of test hole GT-2, Fenton Hill Site indicated water is perched in the volcanics overlying the Abo Formation. An exploratory hole would be necessary to determine if an adequate water supply could be developed for the site.

The volcanics at the site are about 450 feet thick. The Bandelier Tuff extends from land surface to a depth of about 360 ft. The Paliza Formation from 360 to 410 ft. and the Abiquiu Tuff from 410 to 450 ft. The Bandelier Tuff is composed of a series of moderately welded to welded ash flow tuff that are ryholitic in composition. The Paliza Formation is an andesite basaltic breccia and is underlain by the Abiquiu Tuff that is a tuffaceous sand and conglomerate.

The geophysical logs of GT-2 indicated about 40 feet of saturated thickness in the volcanics (Paliza Canyon and Abiquiu Tuff). The presence of water in this section was noted by drilling condition of GT-2. Water bearing characteristics could not be determined as the hole was drilled using fluids as a cutting carrier.

The velocity log of GT-2 indicated a saturated section from a depth of 410 to 450 feet in the volcanics that is perched on the Abo Formation. The Abo is composed of shales, siltstones, and fine grained sandstones. The Paliza Canyon is a fairly stable formation while the Abiquiu Tuff is loosely consolidated and friable. The caliper log on GT-2 through the Abiquiu section indicated washout while the Paliza Canyon remained stable. The electric log indicated porosity and fresh water in the interval from 410 to 450 feet.

Generalized contours on top of the Abo Formation (using test holes GT-1, GT-2, A and D for control) indicate the surface of the Abo Formation dip to the west south west at about 80 feet per mile (Fig. 1). The water in the volcanic would move down dip perched on

the Abo Formation.

The contours on top of the Abo are generalized as the upper surface is very irregular, forming high and low areas, cut by erosion, that were later filled with volcanics. The water in the volcanics will move down dip filling these low areas while in some of the high areas the Abo may be above the water table.

The springs and seeps in Lake Fork (elevation 7890 ft) and Virgin Canyon (elevation 7750 ft) discharge from the volcanics overlying the Abo. The discharge forms perennial stream that flows in the Rio Guadalupe. The spring at elevation 8120 is perched in the volcanics.

The ground water divide in the volcanics between the Fenton Hill Site and the valley cut by San Antonio Creek occurs along the north-south trending fault that was mapped by Smith and other (1970). The spring at elevation 7950 ft. (Horse Shoe Spring) discharges from the base of the volcanics on the down thrown side of the fault. Along the Jemez River the base of the volcanics are 300 to 500 feet below the base of the volcanics to the south and south east of the Fenton Hill Site. The difference in elevation probably occurs along Virgin Canyon and due in part to erosion and in part to a probable fault that is down thrown to the east. The spring at elevations of 7300 and 7460 ft discharge from the base of the volcanics while the spring at 7560 ft discharges from a perched zone in the volcanics. The springs at elevations 7300 and 7460 ft are used for water supply at Jemez Springs. The ground water divide probably occurs along Virgin Canyon.

Test Hole A (elevation 8329 ft) was reported to have little or no water in the volcanics GT-1 (elevation 8315) was drilled using fluid as a carrier so that no hydrologic observation could be made prior to casing the hole through the volcanic. Test Hole D (elevation 7830) contains water in the volcanic that rose to a depth of ~30 ft below land surface.

The springs in Lake Fork and Virgin Canyon as well as the geophysical logs of GT-2 indicated water in the volcanics. A hole drilled by cable-tool method would be necessary to determine if a supply for this site could be constructed. There is a limited area for recharge to the aquifer in the volcanics east of the site and there is always the possibility of drilling into a high area of the Abo where the volcanics would be dry. Limited ground water storage could occur in the low areas between the highs. Thus due to the geologic and hydrologic conditions in the area a hole drilled into the volcanics at the Fenton Hill Site for a water supply should be considered an exploratory hole

until tested to determine if an adequate ground water supply could be developed.

The specifications for an exploratory hole and possible completion as a water supply well are attached.

SPECIFICATIONS FOR AN EXPLORATORY HOLE AND POSSIBLE COMPLETION AS A WATER WELL

Scope of Work

The contractor shall furnish all labor, material, equipment, and maintenance of equipment to perform all work required to drill, case, test, and develop one exploratory hole to a depth of about 450 ft using cable-tool equipment. The anticipated log of the exploratory hole to be located at TA-57, Fenton Hill Site in Sandoval County is as follows:

	Depth (feet)	
	From	To
Tuff moderately welded and weld ash flows	0	360
Basaltic breccia	360	410
Tuffaceous sand and conglomerate	410	450

Anticipated water level ~360 ft.

The thickness of the saturated thickness of the volcanic rocks penetrated above the Abo Formation (red beds) will determine if the hole will be completed as a well.

Specifications:

1. The drilling contractor must be licensed by the New Mexico State Engineer to drill in the Rio Grande Basin. The contractor shall secure the necessary permit to drill and test the exploratory hole from the State Engineer.

2. The proposed exploratory hole is to be drilled as follows:
   a. Drill a 12 or 14 inch diameter hole to a depth of about 20 ft and set 10 3/4 inch casing (the 10 3/4 inch casing will be furnished by LASL). The 10 3/4 inch casing will be cemented with a slurry grout from top to bottom by the contractor.
   b. Drill an 8 inch diameter hole to a depth of about 450 ft through the volcanics into the top of the Abo Formation (red beds).

c. The saturated thickness of volcanics encountered and hydrologic characteristics of the section will determine further completion of the exploratory hole. This decision will be made by the contractor in agreement with a LASL representative.

2. Casing construction of the exploratory hole is as follows:

a. The length of the screen or perforated (slotted casing) will be determined by the contractor in agreement with a representative of LASL. The type and size of the openings in screen or perforated casing will be determined by the contractor in agreement with a LASL representative to allow minimum entrance of sand to the cased well.

b. The screen or perforated pipe will be run with 6 inch ID standard pipe (welded or threaded) to the required depth of about 450 ft. The screen and/or perforated pipe will be furnished by the contractor. The casing and screen and/or perforated pipe will be set by the contractor.

c. The casing shall be secured at the surface in an approved manner (i. e. welded to I beams) and hung in tension in the hole.

3. Development and test of the exploratory hole is outlined as follows:

a. The contractor will provide bailing tests not to exceed 2 hours in each perched water zone above a depth of 350 feet as requested by a LASL representative chargeable to LASL as an hourly rate.

b. The contractor will provide testing by pumping for a period of at least 24 hours to determine the type and size of the pump and adequacy of the well for water supply.

4. General specifications are as follows:

a. The contractor will provide LASL with cuttings from each 5 foot interval in depth during drilling of the 8 inch diameter hole.

b. during the 24 hour test a representative of LASL will be present. Water levels will be determined prior to, during and after the test. Pumping rates will be determined at hourly intervals during the test.

WDP:et

cc: Don Brown, Q-22
Bob Hendron, Q-22
Francis West, Q-22

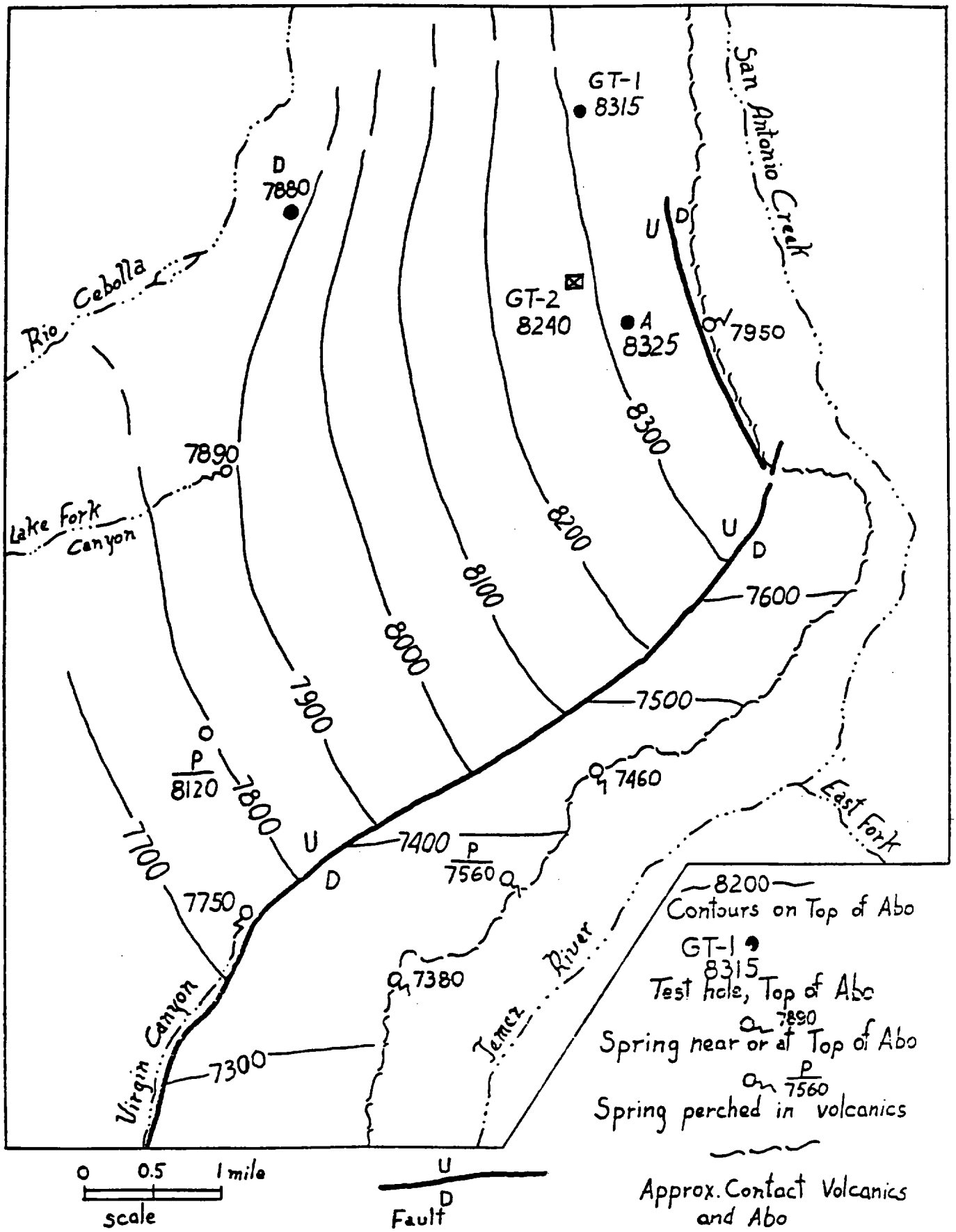


Fig. 1. Structure contours on the top of Abo Formation.

Approximate Cost of the Exploratory Hole

1.	a. Drilling 12 or 14 inch to a depth of about 20 ft and cementing in 10 3/4 inch casing	$300
	b. Drilling 8 inch hole to about 450 ft at $8 a ft.[1]	3600
2.	a. Casing 6 inch ID standard pipe about 430 ft at $5 a ft.	2150
	b. Stainless steel screen 20 ft at $60 a ft = $1200 OR perforated standard 6 inch ID pipes 20 ft at $12 a ft $240[2]	1200
3.	a. Hourly rate for testing and development 12 hrs at $25 an hr.	750
	b. Testing by pumping for 24 hours at $30 an hour	720
	Estimated total	$8720

[1] Contract terminates at 1. b if no water encountered
[2] Type of casing depends on sand size in aquifer.

Elevations (in feet)

	Land Surface	Top of Casing
Slim Hole 1	8684.6	8686.7
Slim Hole 2	8699.2	8701.3
Slim Hole 3	8706.4	8606.6
Slim Hole 4	8695.6	8696.9
Slim Hole 5	8689.0	8692.2
FH-2	8688.6	a/

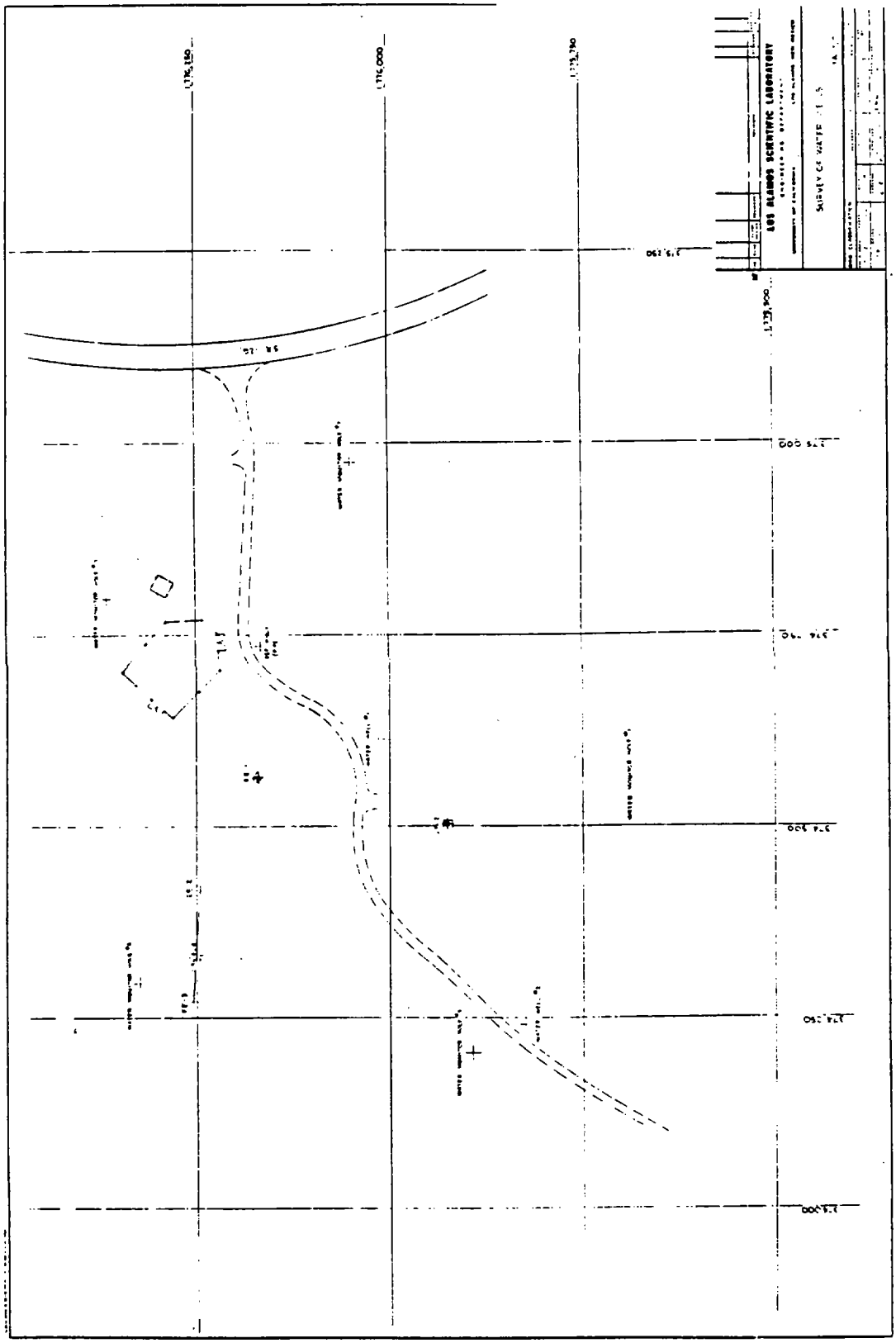
a/ Top of 20" Surface Casing 8689.1 ft.
Top of 16" Casing 8691.2 ft.

Water Levels (in feet)

	2/4/80	2/6/80
Slim Hole 1	366	365.68
Slim Hole 2	379.8 b/	-
Slim Hole 3	412.7	411.05
Slim Hole 4	377.3	377.37
Slim Hole 5	371	370.03
FH-2 6	371 c/	370.26
FH-1	-	370.66

b/ MP Land surface

c/ MP Top of 16" casing (Elevation 8691.2')


LOS ALAMOS SCIENTIFIC LABORATORY
SURVEY OF WATER LINES

ATTACHMENT VI

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext

OFFICE MEMORANDUM

TO : Distribution

DATE: February 13, 1980

FROM : ~~Jim Hill, G-2~~

SUBJECT : Water Well #3

SYMBOL : G-2

MAIL STOP: 980

Water well #2 was completed near the west side of the site in January. The well proved to be inadequate in production for its intended purpose. A committee consisting of Bill Purtyman, Dan Miles and Naomi Becker with Bob Hendron and Jim Hill assisting, was formed to pick a location for water well #3. With the information available, it was decided to place the well as near as feasible to water well #1. The final location agreed to is ∿ 75' south of water well #1. Some sentiment was expressed for drilling the well near the test hole #1 at the south end of the site. This was dismissed as the available information was too sketchy to attach any credence to such a location.

Distribution
G. Nunz, G-DOF MS 575
C.L. Edwards, G-2 MS 978
Bill Purtyman, H-8 MS 490
Dan Miles G-4 MS 980
Naomi Becker G-5 MS 980
G-2 File
Ed. Kaufman, G-DOF MS 575

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext:

OFFICE MEMORANDUM

TO: Price Feron, ENG-2, MS 984

DATE: March 18, 1980

FROM: W. D. Purtymun, H-8 *WDP*

SUBJECT: LOGS OF TEST BORING, MARCH 17, 1980

SYMBOL: H8-80-195

MAIL STOP: 490

The following data was collected as you requested in memos ENG-2-80-195 and ENG-2-80-209.

Micro-Machining Facility, SM-66, TA-3

Test Hole BH-20	Depth(ft) From	To
Soil & Fill	0	6
Tuff, light brown (Tuff moderately welded)	6	18
Test Hole BH-21		
Soil & Fill	0	10
Tuff, light brown	10	15
Tuff, dark brown (Tuff moderately welded)	15	18

Road Improvement, TA-54

Station 9 + 00	Soil	0-2 ft (Adjacent to Road)
Station 18 + 09	Fill	0-2 ft (On Road)
Station 24 + 50	Soil (clayey)	0-6 ft (Ditch)
Station 24 + 50	Soil (clayey)	0-7 ft (Adjacent to Ditch)
Station 35 + 00	Fill	0-2 ft (Edge of Road)
Station 47 + 00	Fill	0-3 ft (Edge of Road)
Station 60 + 00	Soil	0-0.5 ft (Adjacent to Road)
Station 70 + 00	Fill	0-2 ft (On Road)
Station 80 + 00	Fill	0-2 ft (On Road)

Note: Soil or Fill underlain by Tuff

WDP:vh

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544

OFFICE MEMORANDUM

TO : Naomi Becker, G-5, MS 981
Dan Miles, G-4, MS 980

DATE: April 4, 1980

FROM : W. D. Purtymun, H-8 WDP

SUBJECT : HYDROLOGIC CHARACTERISTICS OF SUPPLY WELL FH-2

SYMBOL : H8-80-247

The transmissivity of the aquifer at FH-2 was determined from drawdown and recovery water level measurements during an aquifer test on February 4, 1980 (Fig. 1). Method used is described by Wenzel (1942) and Todd (1959). The storage coefficient could not be determined because of erratic water level fluctuations in the observation hole.

A water stage recorder was installed on well FH-1 on March 20, 1980, along with a microbaragraph. The water level in the well responded inversely to the atmospheric pressure changes, i.e., when pressure increased, water levels declined. The barometric efficiency of the well was computed from the average water level and barometric change from March 20 through 28 (Fig. 2).

The storage coefficient (S) of the aquifer was estimated by a method described by Todd (1959) using the barometric efficiency of the well as described in the following equation:

$$S = \frac{\alpha b}{Ew\ B}$$

Where α = Porosity (estimated at 0.44 from 3-D elastic properties log of GT-2)
b = Thickness of aquifer (63 ft)
Ew = bulk modules of compression of water (Todd 3×10^5 psi $\approx 6.9 \times 10^5$ ft of water)
B = Barometric efficiency (0.49)

or $$S = \frac{(0.44)(63)}{(6.9 \times 10^5)(0.49)} = 8.2 \times 10^{-5}$$

Water level declines in the vicinity of the well can be estimated (assuming no water available for recharge and a homogeneous and unbounded aquifer) by using the transmissivity and storage coefficient. The following equations are found in Wenzel and Todd:

$$u = \frac{1.87r^2S}{Tt}$$

and $$s = \frac{114.6\ Q}{T}\ W(u)$$

where r = distance from FH2(ft)
S = 8.2×10^{-5}
T = 1×10^3gpd/ft.
t = time after pumping began (days).
Q = ~9.3 gpm continuous pumping, which is equal to about 15 ac.ft/year.
W(u) = derived from u in tables for values of W(u) (Wenzel 1942).
s = decline in water level (ft) at distance from FH-2.

Water level declines at distances of 10, 250 and 500 ft from FH-2 were estimated using the two equations and parameters described above.

At the end of	Cumulative Pumpage 10^6 gal	Cumulative Pumpage ac-ft	Distance from FH-2: 10 ft	250 ft	500 ft
			Water level declines (ft)		
1st year	4.9	15	18	10	9
2nd year	9.8	30	18	11	10
5th year	24.4	75	19	12	11
10th year	48.9	150	23	16	14

The data shown is subject to the assumptions made of the aquifer. The actual aquifer is, however, neither homogeneous or of indefinite areal extent. As a result, water level declines would be much greater than tabulated. The data is presented to indicate the minimum magnitude of water level decline under ideal aquifer condition if production from FH-2 was at 15 ac-ft/year.

References

L. K. Wenzel, "Methods for Determining Permeability of Water Bearing Materials," U.S. Geol. Survey Water Supply Paper 887 (1942).
K. D. Todd, "Ground Water Hydrology," John Wiley and Sons, Inc., Publishers, New York, New York (1959).

WDP/mlk
Enc. (Figs. 1 & 2)
xc: W. R. Hansen/A. K. Stoker, H-8
F. R. Miera, LS-6

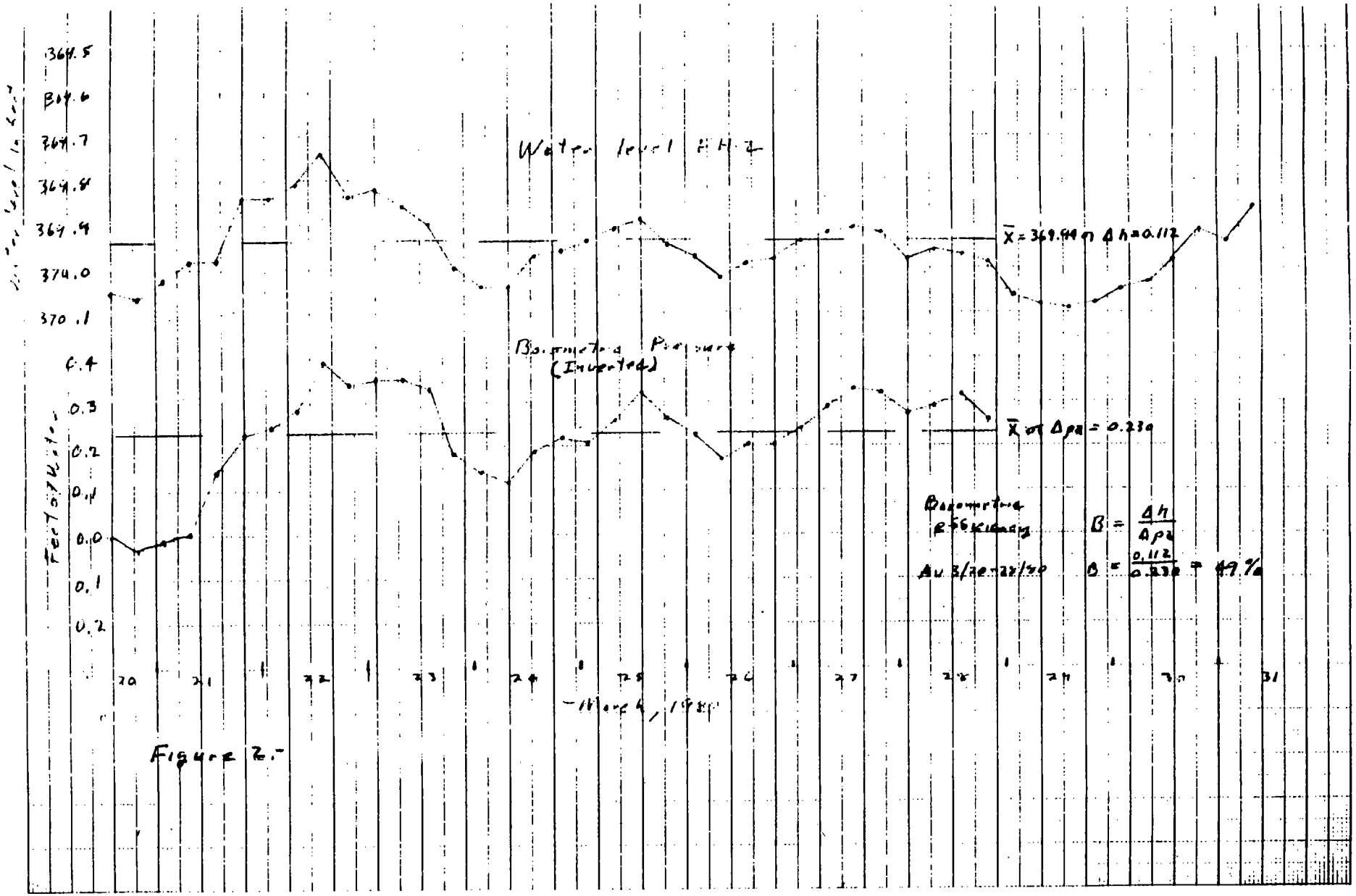
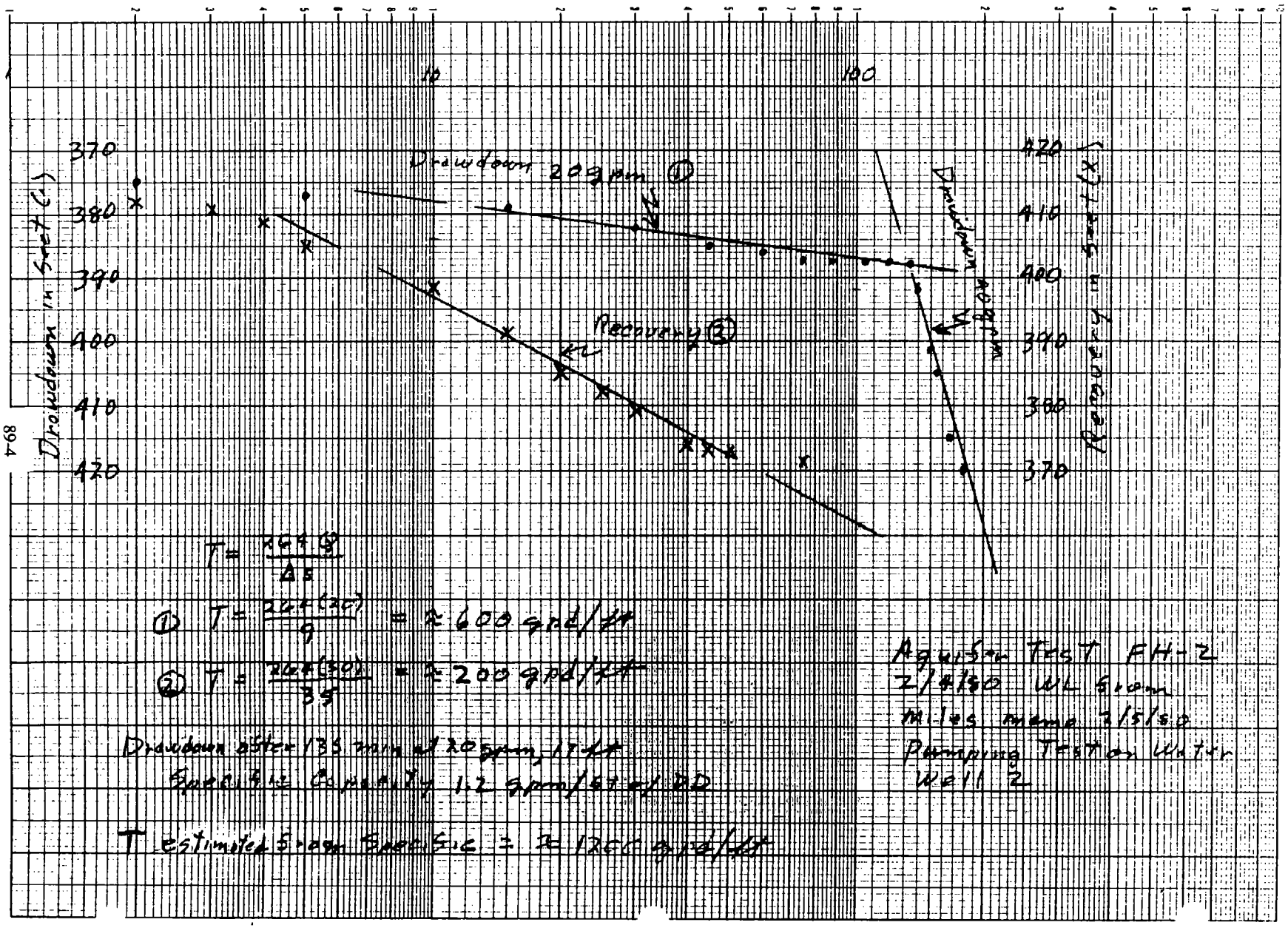

Water level HH-4
Barometric Pressure (Inverted)
X̄ = 369.99 m Δh = 0.112
X̄ of Δpa = 0.230
Barometric efficiency
Au 3/20-22/90
B = Δh / Δpa
B = 0.112 / 0.230 = 49%
Feet of Water
369.5
369.6
369.7
369.8
369.9
370.0
370.1
0.4
0.3
0.2
0.1
0.0
0.1
0.2
20
21
22
23
24
25
26
27
28
29
30
31
March, 1990

Figure 2.

GRAPH-LAPH GRAPHIC CONTROLS CORPORATION Buffalo, New York Made in U.S.A. SEMI-LOGARITHMIC 3 CYCLES X 140 DIVISIONS AD 0040 -60



$T = \frac{264\,Q}{\Delta s}$

① $T = \frac{264(200)}{9} = \approx 600$ gpd/ft

② $T = \frac{264(200)}{35} = \approx 200$ gpd/ft

Drawdown after 135 min at 200 gpm, 17 ft

Specific Capacity 1.2 gpm/ft of DD

T estimated from Specific = ≈ 1200 gpd/ft

Agustin Test FH-2
2/4/80 WL 6.0 m
Miles memo 3/5/80
Pumping Test on Water
Well 2

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext.

OFFICE MEMORANDUM

TO Jim Gose, ZIA Tech Division

DATE May 12, 1980

FROM W. D. Purtymun, H-8 WDP

SUBJECT TEST HOLES AT PROPOSED PUMP STATION AT TA-57

SYMBOL H8-80-349

MAIL STOP 490

Four test holes, 12 to 23 ft in depth, were drilled at the proposed structure on May 9, 1980. The holes penetrated a moderately welded to welded tuff to a depth of 10 to 12 ft. Below 10 to 12 ft the tuff was a nonwelded to moderately welded tuff. Free water was encountered in the welded tuff in the eastern-most hole. Water was present in an open joint or fracture and was the result of snowmelt ponded on the recently exposed surface of the tuff.

Both the units of the tuff should have a good bearing capacity (~5000 lbs/ft^2); however, the presence of free water in the upper tuff unit may indicate some problem. Final decision on bearing capacity of the tuff can be made after the sump for the pumps is excavated, which will expose both units. At that time bearing capacities can be adjusted if necessary.

WDP/mlk

UNIVERSITY OF CALIFORNIA
LOS ALAMOS SCIENTIFIC LABORATORY
(CONTRACT W-7405-ENG-36)
P.O. BOX 1663
LOS ALAMOS, NEW MEXICO 87545

IN REPLY REFER TO: H8-80-376
MAIL STOP: 490

May 27, 1980

Mr. Glenn Hammock
G. Herkenhoff & Associates
302 8th Street NW
Albuquerque, NM 87102

Dear Glenn:

Enclosed is the data you requested in reguards to well locations in Pueblo Canyon. Table I presents the anticipated log and probable hydrologic characteristics of the aquifer. Figure 1 shows access roads and proposed well locations, while Figure 2 shows the topography in the vicinity of the proposed locations.

Water for drilling operations would be available from Los Alamos well field booster #3 (Fig. 1). Well spacing is about one mile, as well location two is slightly north and upgradient to the ground water movement at location one.

The presence of water from the Bayo St Plant and possible perched water in basalts at a depth of about 235 ft will require a string of surface casing to the top of the main aquifer. This would be similar to the construction of supply well PM-1.

Access to both locations is on an unpaved road off State Road 4 that services the Bayo STP.

Both areas will require some site work to level the area for the rig. This will be about as much as required when we drilled PM-1. Also, enclosed is a copy of report on a well site in Pueblo Canyon written in 1965.

If I can be of further assistance, please call me at 667-7952.

Sincerely,

Bill

W. D. Purtymun
Group H-8, MS 490
Environmental Surveillance

WDP:vh

Enc.: Report

91-1

An Affirmative Action/Equal Opportunity Employer

xc: Harry Althaus, DOE ENG, LAAO, MS 316

TABLE 1

ANTICIPATED LOG OF ADDITIONAL SUPPLY WELLS IN PUEBLO CANYON AREA

Elevation: 6450 to 6500 ft.

Total Depth of Pilot Hole: 2800 ft.

Hydrologic Data:

Probable depth to water: 625 to 650 ft.

Probable yield: 600 to 1400 gpm

Probably drawdown: 50 to 120 ft.

Aquifers: Puye Conglomerate & Tesuque Fm.

Probable Geologic Station:

Stratigraphic Unit	Thickness (feet)	Depth (feet)
Alluvium:		
Gravel and boulders	10	10
Puye Conglomerate:		
Conglomerate, gravels and boulders	70	80
Basaltic rock of Chino Mesa:		
Basalts and interflow breccias, may contain perched water at a depth of 235 feet	200	280
Puye Conglomerate:		
Conglomeratie, gravels & boulders	170	450
Basaltic Rocks of Chino Mesa:		
Basalt and interflow breccias	100	550
Puye Conglomerate:		
Conglomerate, gravels and boulders	150	700
Tesuque Formation:		
Siltstone, sandstone & conglomerate interbedded with occasional basalt flow in the upper 1,000 ft of formation	2100	2800

~~CONFIDENTIAL~~

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext:

OFFICE MEMORANDUM

TO : File

DATE : July 17, 1980

THRU : Wayne R. Hansen, H-8 Group Leader

FROM : W. D. Purtymun and A. John Ahlquist, H-8

SUBJECT : UPDATE ON ACTIVITIES AT TA-49

SYMBOL : H-8

MAIL STOP : 490

UNCLASSIFIED
Classification changed to
by authority of the U.S.D.O.E.,
Per E. M. Sandoval, SM, 05-6 JAN 25 1994
(Sig. of person authorizing change, title, org., date)
Nellie Lang, TSM, 05-6 JAN 25 1994
(Sig. of second reviewer, title, organization, date)
File

Note: Every portion of this document is Confidential NSI.

I. INTRODUCTION

This memo presents data collected from January through July 3, 1980, at TA-49 in reference to accumulation of water in Core Hole 2 (CH-2) near the center of Area 2. [CH-2 is a 4-1/2" hole drilled November 30, 1959, to a depth of 500.5 ft from a surface elevation of 7137 ft. It was cased with a 2" diam. pipe. The bottom 20 ft of casing is slotted. In January 1961, a 6-ft-clay pad (capped with asphalt) was placed over Area 2 with a 2-1/2" diam extension to the casing bringing the casing above the pad surface.] Five test holes were drilled adjacent to Areas 2, 2A, and 2B and three holes were drilled into sand-filled shafts in Areas 2A and 2B. Cuttings from the holes were monitored on the site by H-1 and no contamination was detected. Data related to moisture neutron logging in the eight holes is discussed with reference to water in CH-2. Results of bailing water from CH-2 are included.

Continued activities are outlined and additional support requested.

II. TEST HOLES

Five test holes were drilled to a depth of 123 ft adjacent to Areas 2, 2A, and 2B (Fig. 1). The holes are located to provide hydrologic monitoring of the tuff below the bottom of the shafts in Areas 2, 2A, and 2B, and to determine if water found in CH-2 is being recharged beyond the area or if water is being discharged from the area. Cuttings from the holes were logged and moisture content determined over 5 ft drilling intervals. The holes were logged with a neutron sonde at ~1.6 ft intervals to provide a baseline for additional moisture monitoring and aid in determination of geologic units (Figs. 2 through 4). The neutron logs were run to a depth of about 103 ft, the length of the logging cable. Data from the neutron log is used to describe moisture content of materials penetrated by the holes. The average and standard deviation of a number of observed moisture values are used to describe the moisture distribution in the various units.

~~DERIVATIVE CLASSIFIER~~
~~Sharon J. Anderson~~
~~Classification Analyst~~

~~Classified by LA-4000~~

~~Declassify~~
OI 92-1 ~~July 17, 2049~~
(Date or event)
~~Review~~

~~CONFIDENTIAL~~

~~NATIONAL SECURITY INFORMATION~~
~~Unauthorized Disclosure Subject to Criminal Sanctions.~~

University of California
LOS ALAMOS SCIENTIFIC LABORATORY
Los Alamos, New Mexico 87545

Starting at the surface, the holes penetrated a soil and pumice zone and Units 4, 5, and 6 of the Tshirege member of the Bandelier tuff. The lower part of Test Hole 2 (TH-2) is completed into Unit 3 of the Tshirege as the ground surface at TH-2 is at a lower elevation than the other four holes.

The soil and pumice zone ranged from 5.3 to 9.7 ft thick with the thickest sections occurring near the axis of the mesa. The average moisture content, as determined from the neutron logs, in the soil and pumice ranged from about 15 to near 20% by volume (Fig. 5). The large standard deviation (SD) associated with the average reflects variation in moisture distribution through the soil and pumice zone. Moisture in this zone is from infiltration from precipitation. It should be noted that no free water was encountered in the soil and pumice, thus, the specific retention of the soil and pumice is greater than 20% by volume.

Unit 6 ranged from 54 to about 70 ft thick. Unit 6 is a moderately welded tuff with an average porosity of about 48% by volume and a specific retention of about 20% by volume. The maximum moisture content from the neutron logs were about 13% by volume while the average moisture content ranged from 5.5 to 8.5% by volume. No free water was encountered in Unit 6. The maximum moisture content was well below the specific retention of the tuff.

Unit 5 (sand unit) ranges from a knife edge to about 3 to 4 ft thick. As it is thin in the area, the thickness penetrated by the test holes could not be determined. The slight increase in moisture content in Unit 6 above the contact is normal due to the downward moisture flux in the unit perching above a boundary as formed by the ash flows at the contact of Unit 6 and Unit 5. The low moisture content of the tuff above and below Unit 5 indicates no free water is being transmitted through the relatively flat lying thin sand layer comprising Unit 5.

The section logged in Unit 4 with the neutron sonde was about 30 ft in TH-1, TH-3, TH-4, and TH-5, and about 46 ft in TH-2. The total thickness of Unit 4 in TH-2 is about 55 ft (Fig. 2). Unit 4 is a moderately welded tuff with a porosity of about 46% by volume and a specific retention of about 16% by volume. The maximum moisture content logged with the neutron sonde in the unit was about 12% by volume, which is below the value for specific retention. Average moisture content in the five holes ranged from 7.2 to 7.8% by volume. No free water was encountered during drilling in Unit 4.

Unit 3 in TH-2 is a nonwelded to a moderately welded tuff. The moisture content of the cuttings is low (estimated from % weight measurements to be less than 5% by volume). There was no free water encountered in Unit 3.

III. TEST HOLES IN SHAFTS 2A-O, 2A-Y, AND 2 B-Y

Test holes were drilled in three sand-filled shafts (unused) and into the underlying tuff. The holes were drilled to determine if the shafts were a possible recharge area for the water that has accumulated in CH-2. The holes were logged and moisture content determined of sand and tuff. The holes were cased as deep as possible to facilitate neutron moisture logging. Casing depths vary as the holes collapsed when the drilling auger was pulled. Several neutron logs were run in each hole to determine the distribution of moisture in the sand with time.

Test Hole 2A-O penetrated 59 ft of sand and 15 ft of underlying tuff. The moisture content of the cuttings from the sand decreased with depth with an apparent slight increase in moisture in the underlying tuff (Fig. 6). As the data on cuttings are reported in moisture % by weight, the increase of moisture in the tuff is a density difference and does not necessarily indicate excessive moisture at the bottom of the shaft.

Test Hole 2A-O was cased in the sand to about 56 ft or just above the bottom of the shaft. Neutron logs of the hole indicate moisture from precipitation has infiltrated to about a depth of 8 ft in the sand. The average moisture content in the upper 8 ft of sand from April 18 through June 19 ranged from 10.6 to 11.1% by volume with a maximum moisture of 12.1% by volume (Fig. 7). In the lower 50 ft of sand the average moisture content ranged from 7.4 to 7.8% with a maximum of 8.7% by volume. The specific retention of the sand as determined from laboratory experiments ranged from 23.8 to 25.2% with an average of 24% by volume. Thus, maximum moisture content of the sand was well below the specific retention. However, there is an apparent downward flux of moisture in the sand in a low moisture range. The estimated moisture content of the tuff (converted from % weight to % volume) beneath the sand is less than 6% by volume. No free water was encountered in drilling the hole.

Test Hole 2A-Y penetrated 58 ft of sand and 22 ft of underlying tuff. Moisture content of the cuttings in the sand decreased with depth with an apparent increase in the underlying tuff as in Test Hole 2A-O (Fig. 8). Test Hole 2A-Y was cased to ~29 ft. Neutron logs of the hole indicated moisture from precipitation has infiltrated to a depth of 6.2 ft in the sand. The average moisture content in the upper 6.2 ft of sand on May 16, and June 19 was 10.3 and 11.3% by volume with a maximum of 12.7% by volume (Fig. 7). The average moisture content of the underlying 22 ft of sand was 6.6 and 6.7% by volume with a maximum of 7.4% by volume. The estimated moisture content of the tuff (converted from % weight to % volume) underlying the sand is less than 6% by volume. No free water was encountered in drilling the hole.

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Test Hole 2B-Y penetrated 58 ft of sand and 22 ft of underlying tuff. As in Test Holes 2A-O and 2A-Y, the moisture contents decrease with depth with an apparent increase in moisture in the tuff (Fig. 9). The hole was cased to ~30 ft. Neutron logs of the hole indicated moisture from precipitation has infiltrated to 6.2 ft into the sand. The average moisture content in the upper 6.2 ft of sand from May 21 through June 19 has ranged from 9.3 to 10.7% by volume with a maximum moisture of 11.3% by volume. The average moisture content of the underlying 19 ft of sand ranged from 6.6 to 6.8% by volume with a maximum content of 8.2% by volume. The estimated moisture content of the tuff (converted % weight to % volume) underlying the sand was less than 6% by volume. No free water was encountered in drilling the hole.

In comparing the moisture data in the sand of the three shafts, shaft 2A-O contains the largest concentrations (Fig. 7). From the limited data, it appears that in this shaft there is a downward flux of moisture in the sand at a low moisture range. The low moisture range is less than the specific retention of the sand.

IV. CORE HOLE FLUID LEVEL MEASUREMENTS AND ACTIONS

With the discovery of water infiltration into CH-2 and measured contamination in that water, a history of water level measurements was compiled and is reproduced below along with pertinent activities.

Date & Time	Fluid Level (ft)	Comments
June 1960	Hole dry	USGS Geophysical Log
Summer of '73 or '74	Hole dry	Recalled from bottom sampling
Prior to 9/25/74	--	Subsidence hole appears in pad above shaft 2M (noted from aerial photograph taken 9/25/74)
2/27/75	450 ft(?)[a] (~15 m)	
12/4/75	450 ft(?)[a] (~15 m)	
9/76	--	Hole filled over shaft 2M and pad repaved with ashphalt

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TO: File -5- DATE: July 17, 1980

Date & Time	Fluid Level (ft)	Comments
10/77	460 ft(?)[a] (~14 m)	Recalled depth from sample taking
8/14/78	--	Water sample collected
Winter '78-'79		

		Barometric Pressure (in. of Hg)
4/16/79 14:00	348.59[a]	22.90
4/19/79 10:00	348.61	22.83
4/27/79 09:00	348.66	22.88
5/4/79 16:00	348.68	22.99
5/15/79 11:15	348.72	23.04
5/31/79 15:00	348.80	--
4/8/80 11:30	349.92	--
5/12/80 15:15	350.07	22.75
6/10/80 09:20	350.21	22.99

[a]Measured from the top of casing

To better detect water movement into or out of the casing, it was decided to bail as much fluid as possible from the hole. This was done in June 1980. Bailing results and data are shown below.

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Date	Time	Water Level (ft)[a]	Barometric Pressure
6/10/80	09:20	350.21	22.99
	Bail ~5.0 gal		
6/10/80	14:00	380.75	22.96
6/11/80	08:55	380.68	
	Bail ~6.4 gal		
6/11/80	11:45	418.72	
6/17/80	09:00	418.41	23.02
	Bail ~6.4 gal		
6/17/80	11:20	456.15	23.02
6/18/80	09:20	455.60	23.04
	Bail ~5.1 gal		
6/18/80	11:20	486.38	23.02
6/19/80	09:30	486.37	23.05
	Bail ~1.3 gal (all we could get)[b]		
6/19/80	10:40	494.00	23.05
7/3/80	09:30	~493.80	

[a]Measured from the top of the core hole; drilled depth was 500.5 ft; extension of pad added ~6-6.5 ft for a total present depth of ~506.5 ft-507 ft.

[b]An estimated 1.65 ft of fluid remains in the hole above the mud bottom; depth to mud is 495.65 ft.

The volume of fluid removed equals the volume that would occupy a 2.0 in. diam. cylinder, i.e., no fluid in the annulus between the casing and formation flowed into the annulus during these operations. We suspect the bottom of the annulus is also filled with drilling mud which acts as a barrier to flow of fluids between the casing and annulus. There is some hydrological connection as the fluid level dropped 1.62 ft from 4/16/79 to 6/10/80.

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V. SUMMARY AND CONCLUSION

Five 123-ft-deep test holes (TH-1 through TH-5) drilled around Areas 2, 2A, and 2B do not penetrate the entire section of Bandelier Tuff underlying TA-49. However, in the upper 123 ft, it appears from data collected that there is no recharge from outside Area 2 into Core Hole 2 (CH-2) or discharge from the area. The presence of water in CH-2 indicates recharge is within the areas--infiltrating through sand-filled shafts in Areas 2A or 2B or through the asphalt pad (solar collection, partially sealed cracks in the asphalt, or the subsidence hole above hole 2M that appeared in 1974 and was sealed in September 1976).

The presence of contaminants in the fluid from CH-2 in 1978 indicates recharge to CH-2 must move through the upper unit (Unit 6) of the Bandelier Tuff as all shafts are completed in this unit. Unit 5, the sand layer is thin [2 ft thick (78'-80')] in CH-2, and 20 ft below the bottom of shafts in the area.

Moisture data collected from holes drilled in unused sand-filled shafts indicates water from precipitation infiltrates into the upper 6 to 8 ft of the sand. The moisture content in that zone depends on weather. Moisture content in the lower section of sand is lower and varies only slightly. The moisture content of the sand is well below the specific retention values though there appears to be a downward flux of moisture in the low moisture range. The tuff beneath the sand does not contain excessive moisture as if water was ponding in the bottom of the shaft. In all respects, the moisture content of the sand and tuff in the holes drilled in the three shafts cannot account for the accumulation of water in CH-2. Other sand-filled shafts (unused and used) in Areas 2A and 2B could be a source of recharge to CH-2 if they are located in a low area such as south of the asphalt pad. The long-term effect of the exposed sand in the top of the shafts will alter the moisture content of the tuff in Unit 6, increasing the possibility of movement through the tuff mainly by capillary movement with some possibility of movement of free water.

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TO: File -8- DATE: July 17, 1980

VI. CONTINUED STUDIES

Additional moisture neutron logging is planned for the test hole and the holes in the shafts to evaluate seasonal moisture changes.

Cuttings from two test holes are being analyzed for radionuclides to provide background data. Cuttings (sand and tuff) from the shafts are also being analyzed to determine if there has been any movement of contaminants from the adjacent used shafts.

VII. ADDITIONAL SUPPORT

We need to have Engineering locate the five test holes by LASL coordinate system and establish elevation at top of casing (surface string) and land surface. Data will be used to determine gradient of contact between Units 5 and 6 of the tuff, the most probable pathway for any horizontal movement of water from the area. Additionally, an elevation measurement at the top of CH-2 is desirable.

WDP/AJA:mar
Attachments

Xc: D. M. Kerr, DIR, MS 100
R. H. Campbell, NSP-T+V, MS 670
H. S. Jordan, H-DO, MS 400

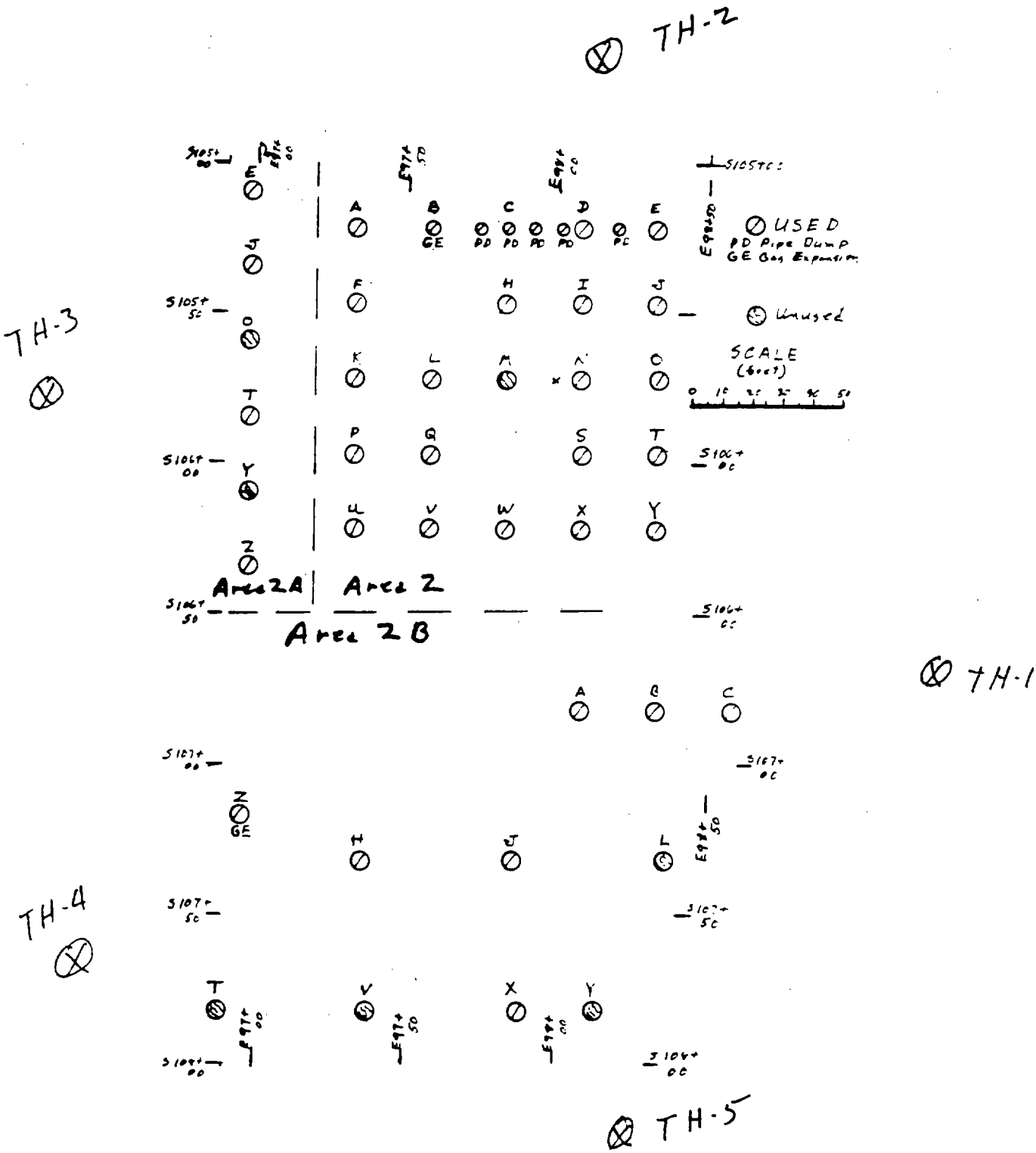

Fig. 1. Approximate location of Test Holes adjacent to Areas 2, 2A, and 2B.

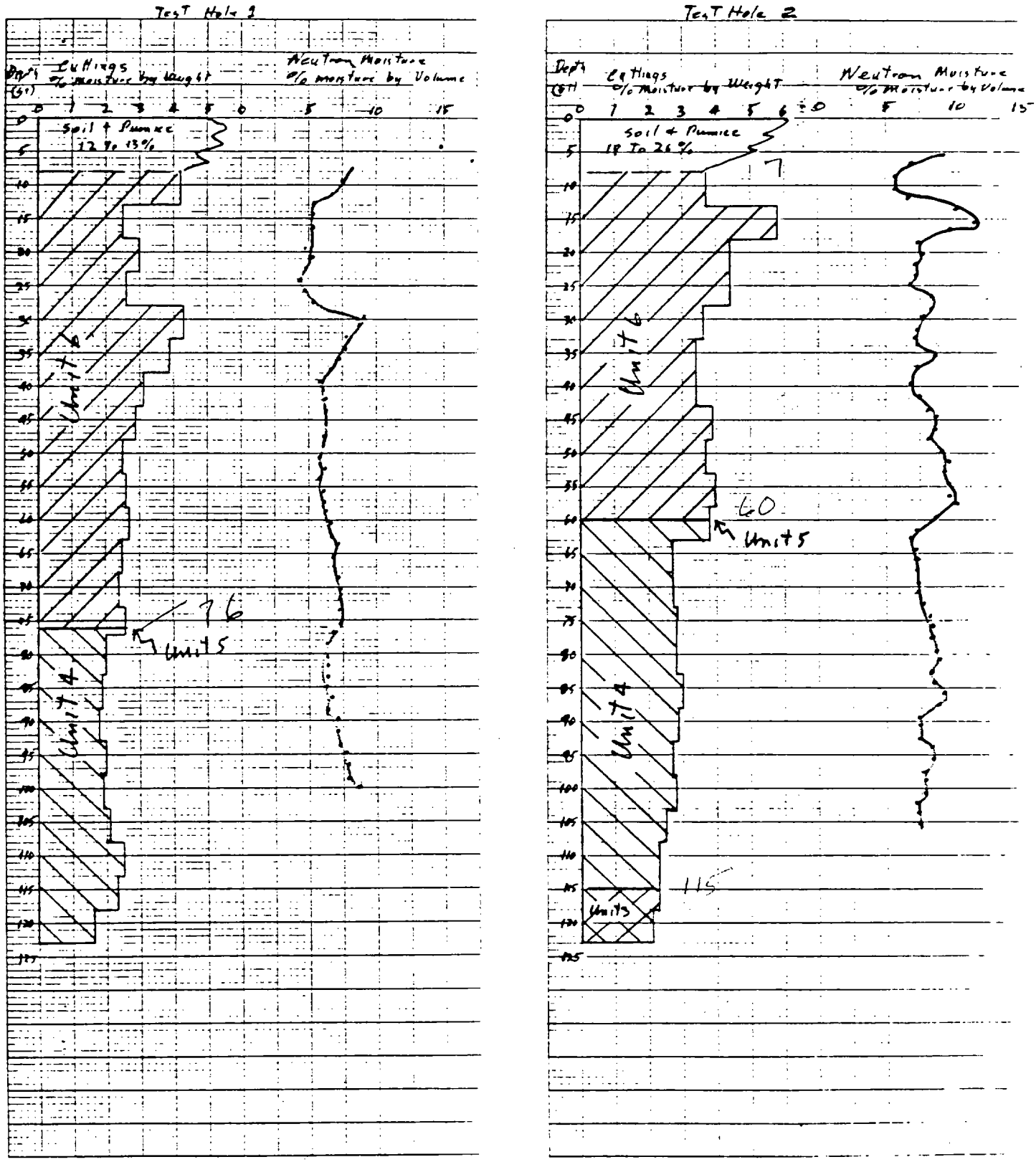

Fig. 2. Geologic and neutron logs of Test Holes TH-1 and TH-2.

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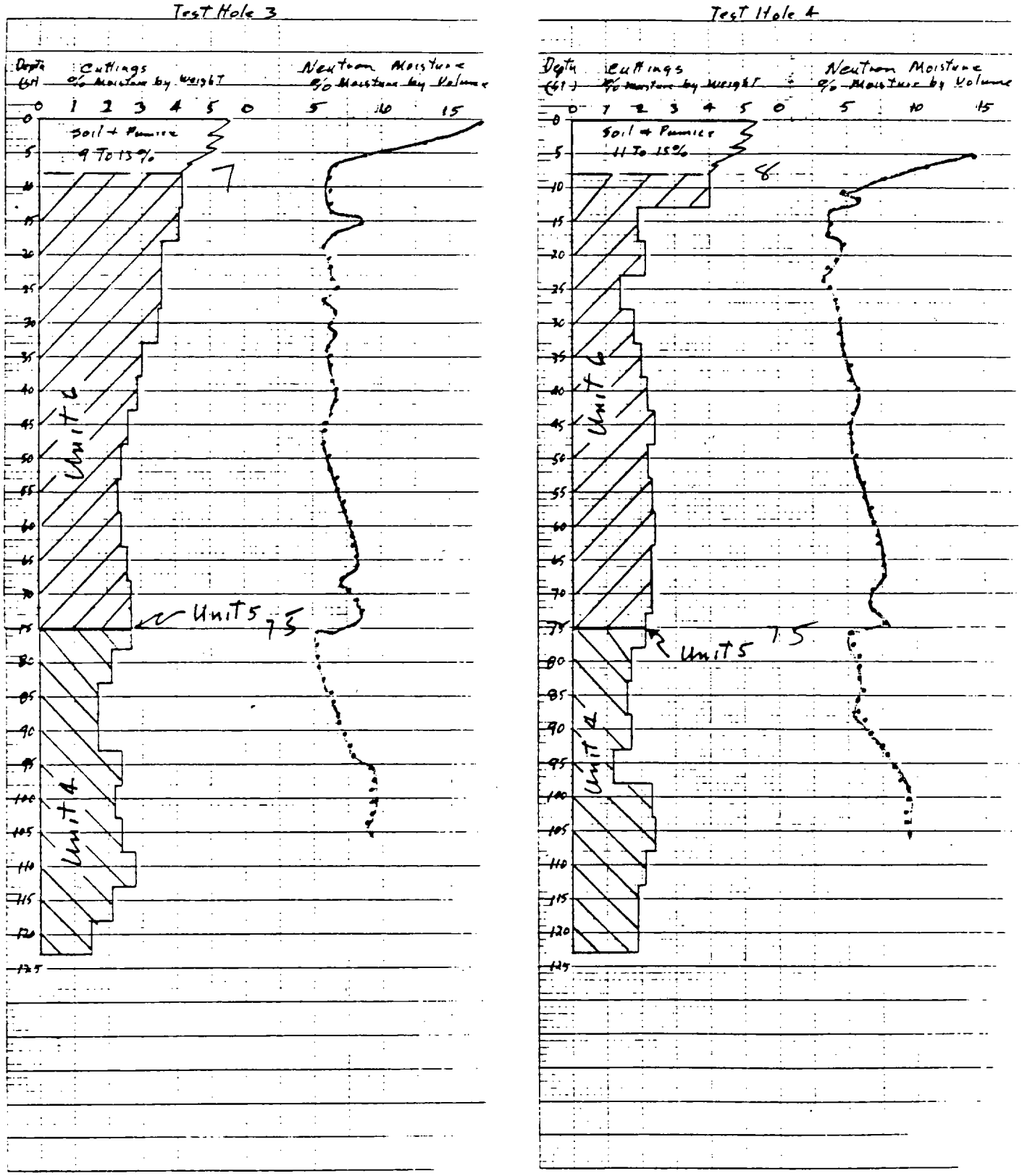

Fig. 3. Geologic and neutron logs of Test Holes TH-3 and TH-4.

UNCLASSIFIED [redacted]

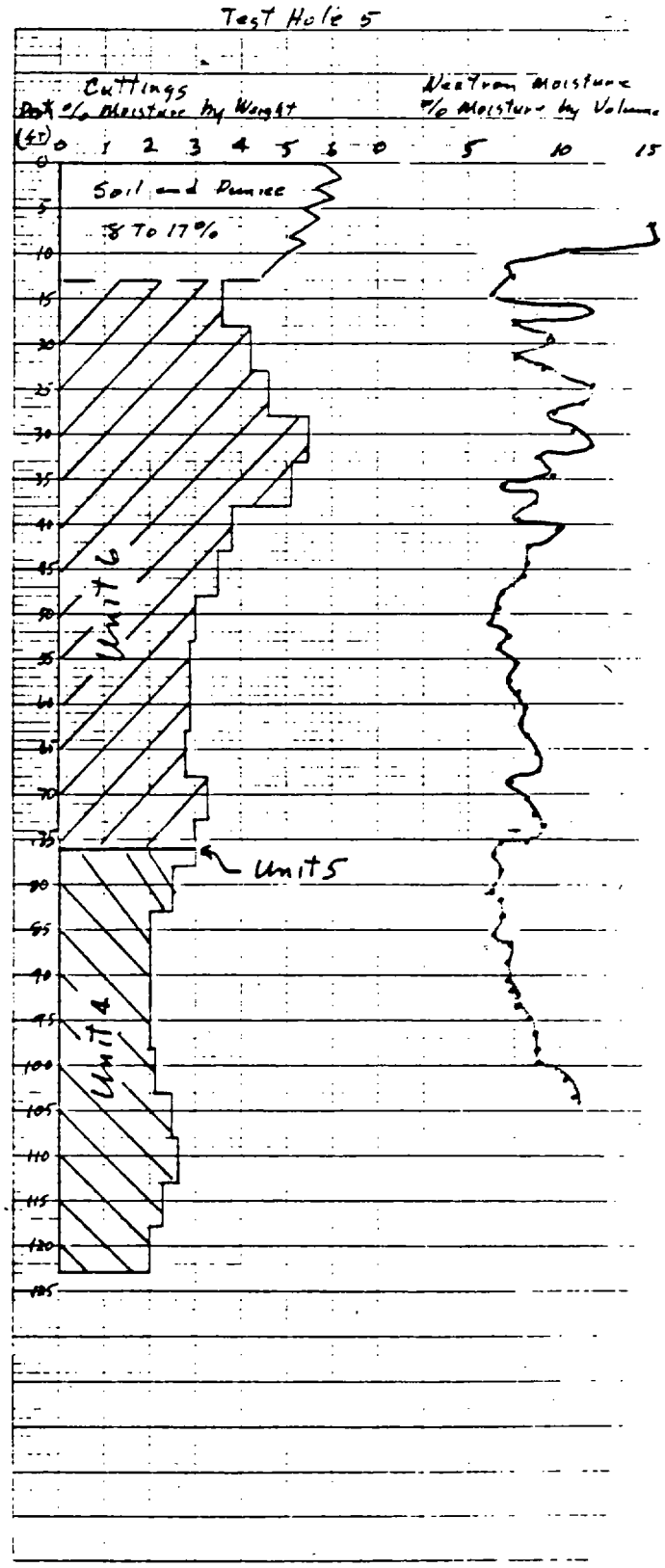

Fig. 4. Geologic and neutron logs of Test Hole TH-5.

UNCLASSIFIED [redacted]

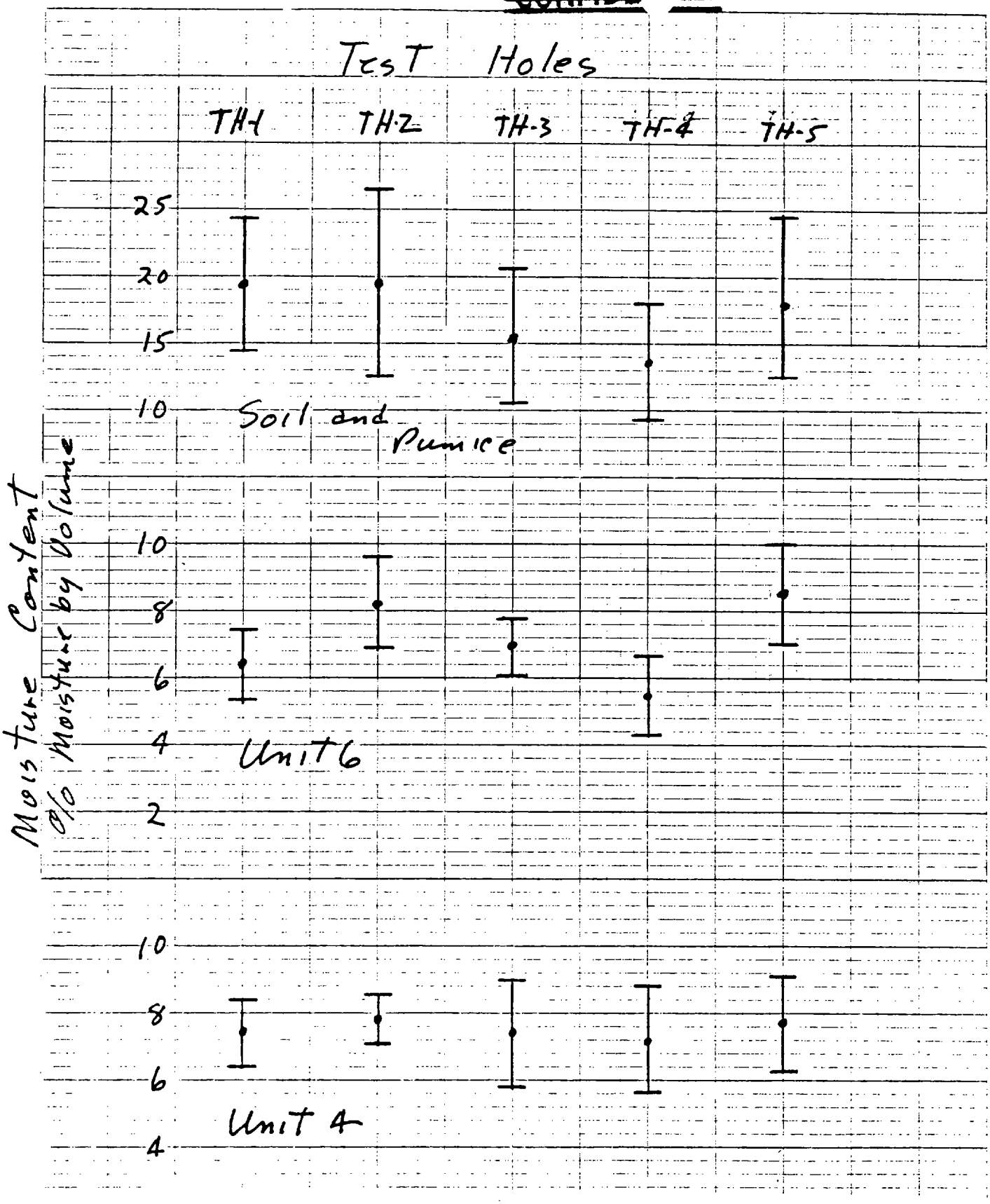

Fig. 5. Average moisture content of pumice and soil and tuff of Unit 4 and 6 in test holes.

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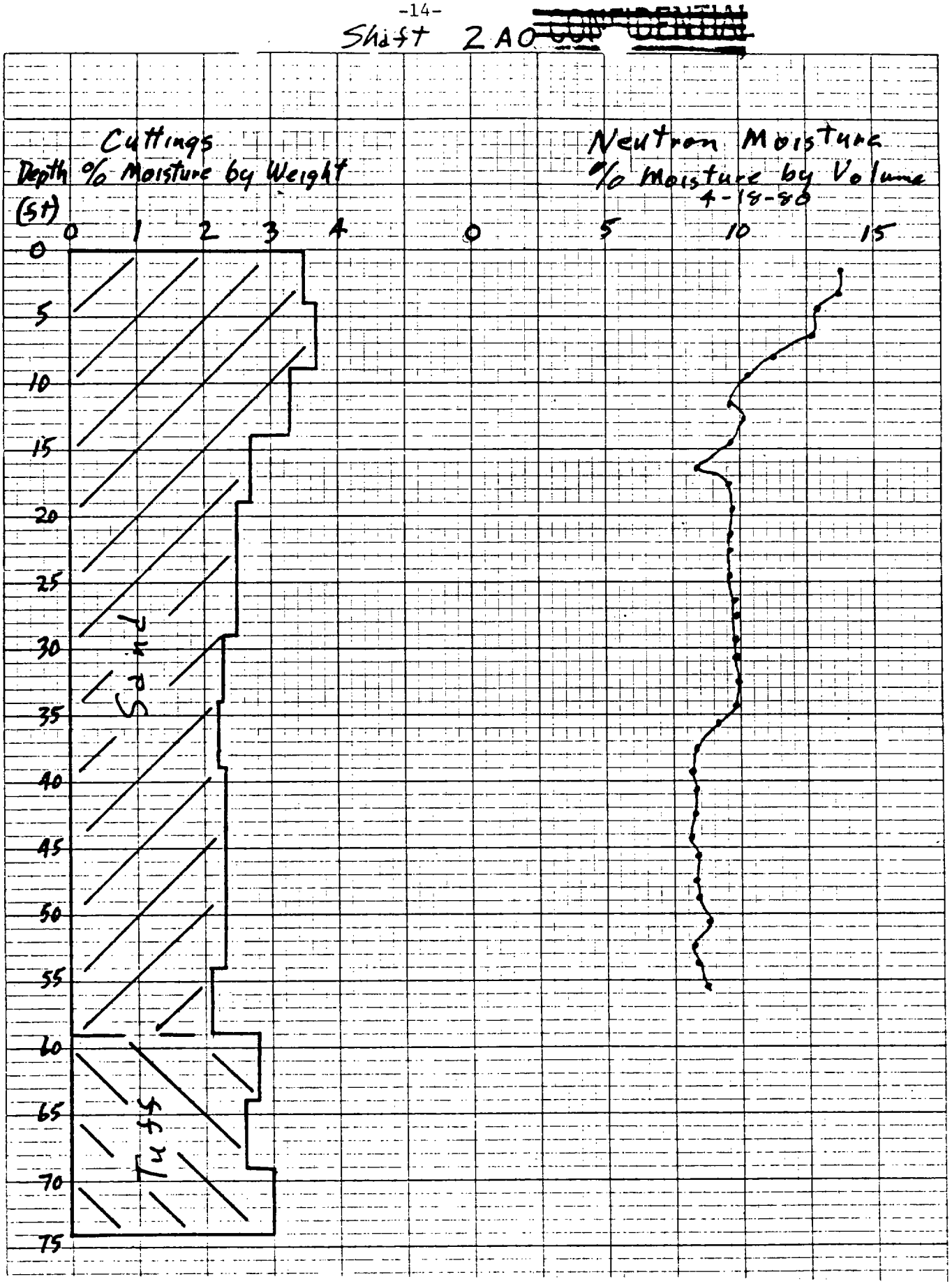

Fig. 6. Geologic and neutron logs of Shaft 2A-0.

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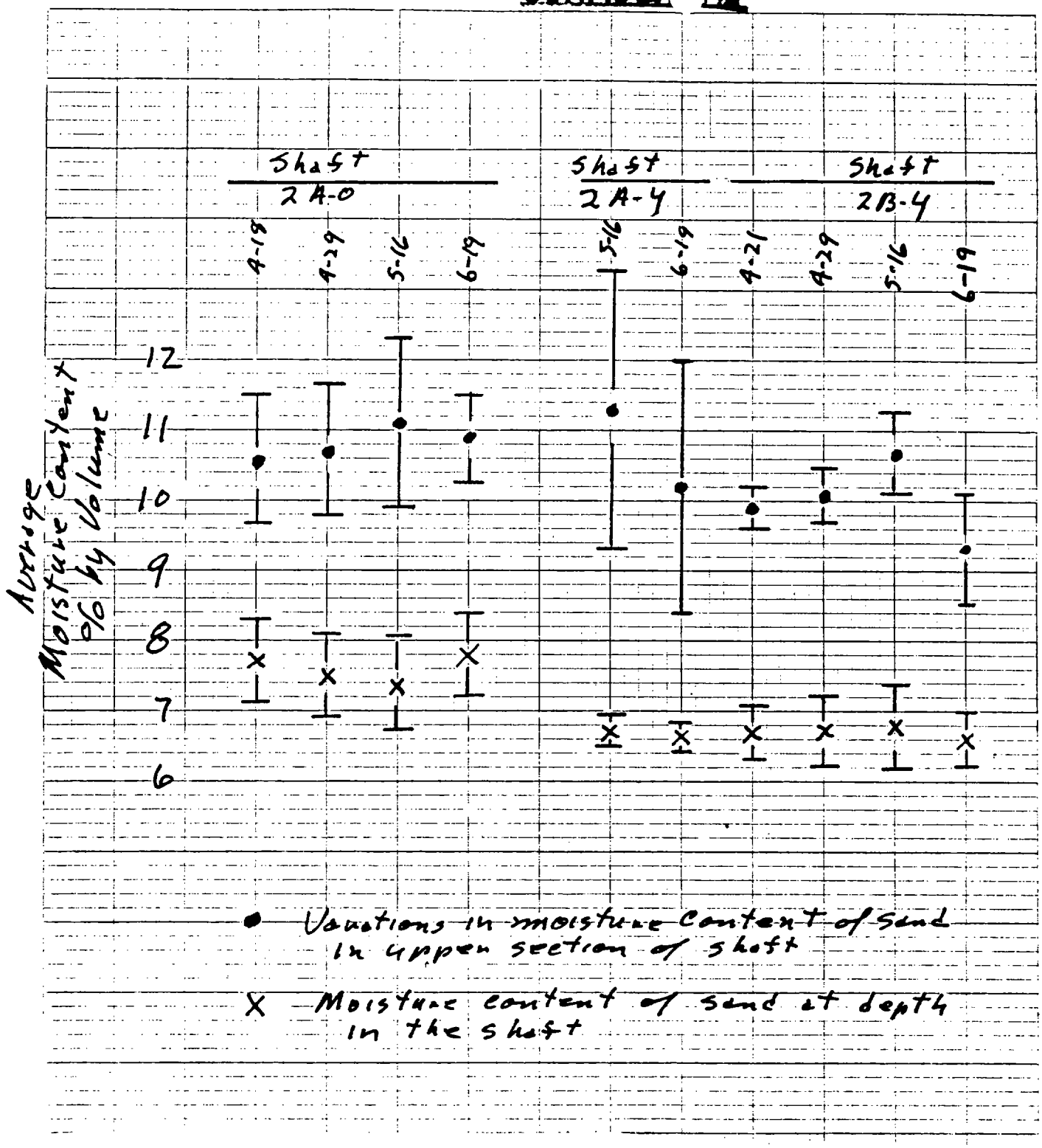

Fig. 7. Average moisture content of sand in Shafts 2A-0, 2A-Y, and 2B-Y.

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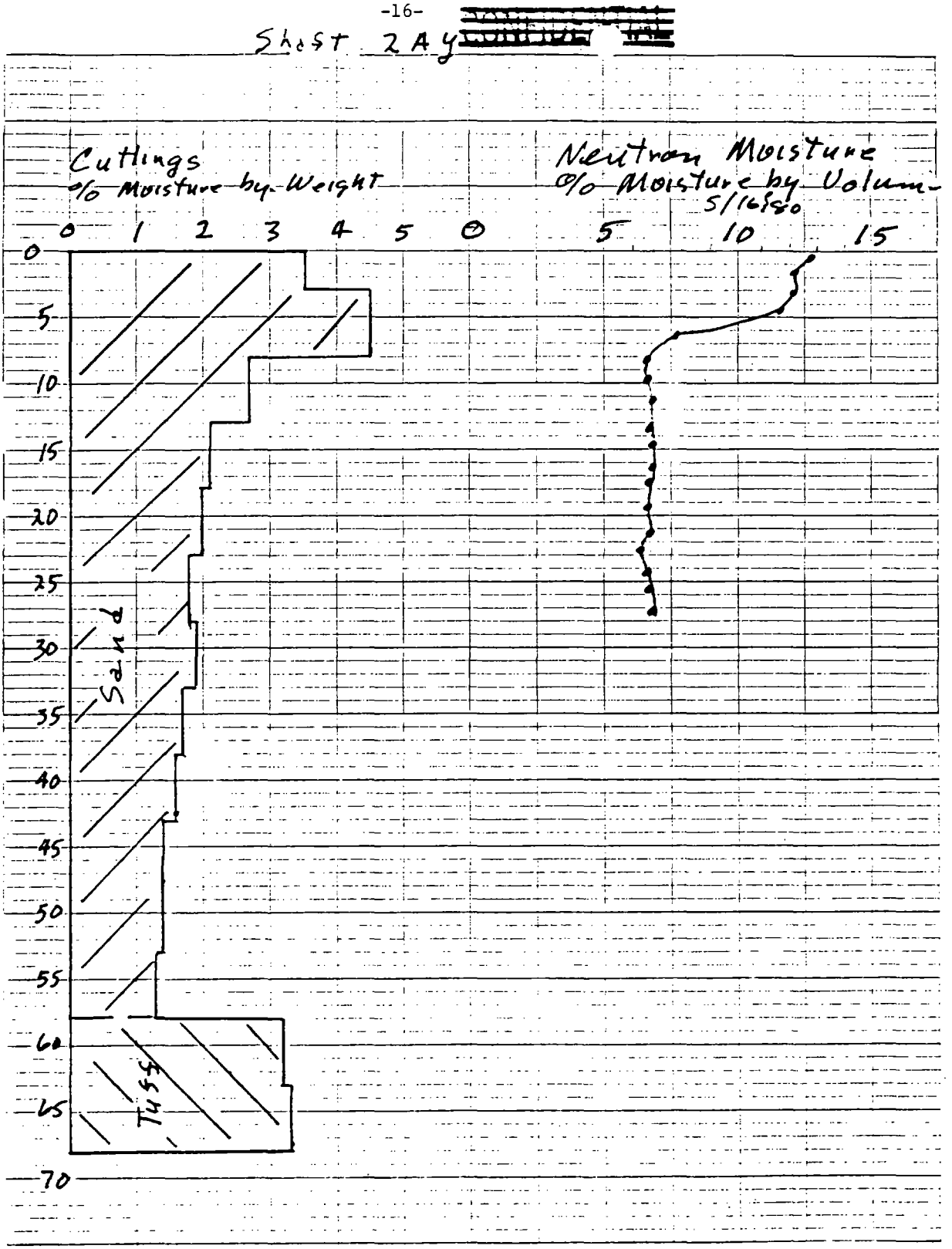

Fig. 8. Geologic and neutron logs of Shaft 2A-Y.

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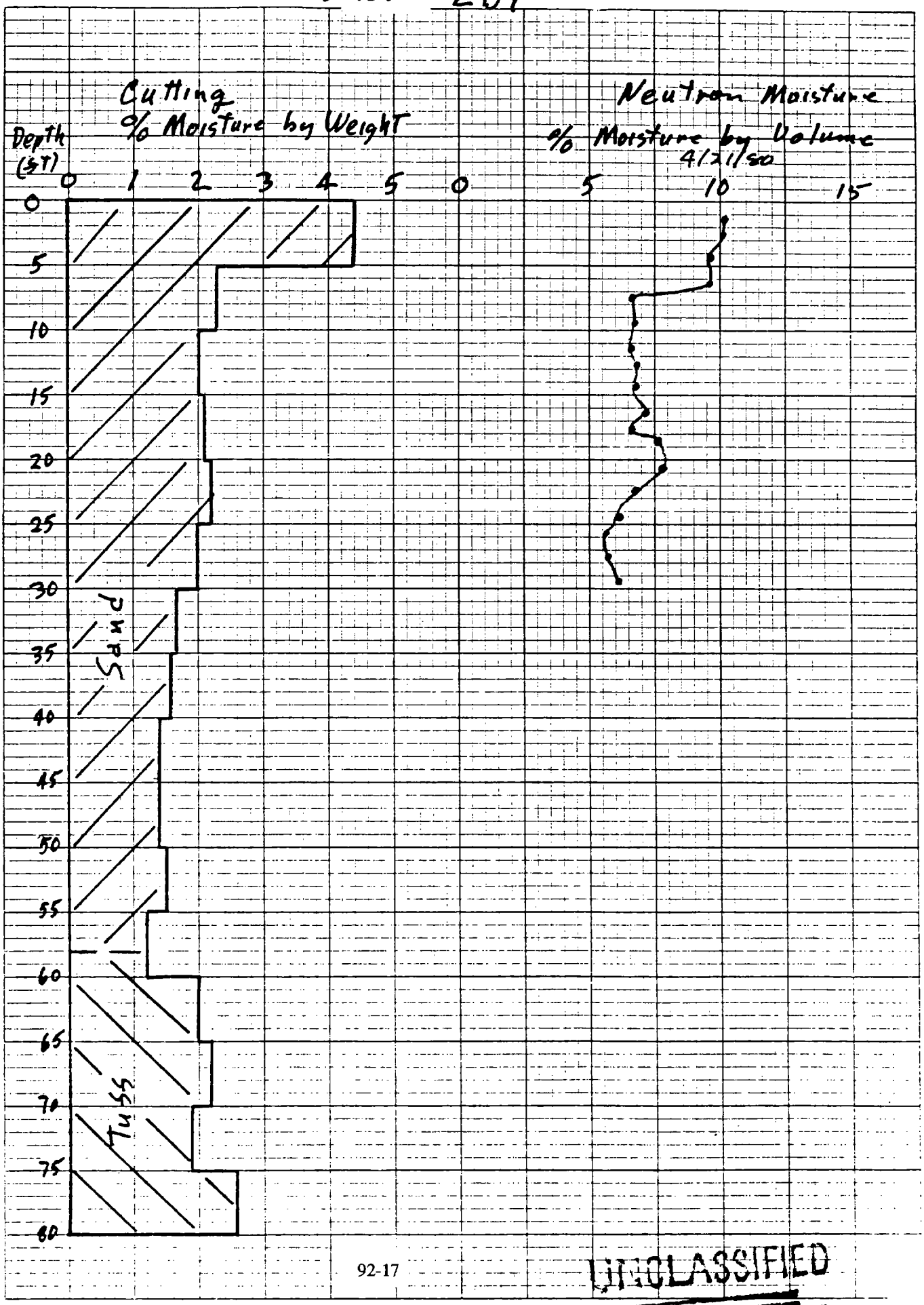

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Fig. 9. Geologic and neutron logs of Shaft 2B-Y.

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OFFICE MEMORANDUM

TO : Price Fernon, ENG 2, MS 984

DATE: September 3, 1980

FROM : W. D. Purtymun, H-8

SUBJECT : TEST BORINGS, TELECOMMUNICATIONS CENTER MODIFICATION, BLDG. SM-200, TA-3, L.J. 6309-3.

SYMBOL : H8-80-612

MAIL STOP: 490

Log of two test borings on September 2 are as follows:

Test Hole 1 (Southeast-80 ft out, 2 ft east)
Fill, dark brown - 0-6 ft.
Tuff, light reddish-gray - moderately welded - 6-13.

Test Hole 2 (Southwest - 80 ft out, 17 ft. west)
Fill, dark brown - 0-6 ft.
Tuff, gray, moderately welded 6-13 ft.

Tuff as penetrated by the test holes generally has a safe bearing capacity of 5000 lbs./sq. ft.

WDP:vh

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OFFICE MEMORANDUM

TO : R. Riedel, ENG 2, MS 984 DATE: September 3, 1980

FROM : W. D. Purtymun, H-8 WDP

SUBJECT : TEST BORINGS, LITHIUM HYDRIDE MACHINING, BLDG. SM-102, TA-3
L.J. 6495-3

SYMBOL : H8-80-611

MAIL STOP: 490

Logs of two test borings on September 2 are as follows:

Test Hole 1 (West)
Tuff, gray, moderately welded 0-13 ft.

Test Hole 2 (East)
Tuff, light reddish-gray, moderately welded 0-13 ft.

Moderately welded tuff as penetrated by test holes generally has a safe bearing capacity of 5000 lbs/sq. ft.

WDP:vh

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OFFICE MEMORANDUM

TO : Mike Ragsdale, ENG-2, MS 984 DATE: October 6, 1980

FROM : W. D. Purtymun, H-8

SUBJECT : TEST BORINGS, WAREHOUSE AND STORAGE BLDG., MPF-16, TA-53; L.J. 6317-53

SYMBOL : H8-80-665

MAIL STOP: 490

Two test borings were drilled at the east and west end of the proposed building. The holes were located on, and penetrated about, 8 ft. of a moderately welded tuff. The tuff has a good bearing capacity and no problem should be encountered.

WDP:vh

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OFFICE MEMORANDUM

TO : Charles King, P-DO, MS 460

DATE: November 14, 1980

FROM : W. [redacted] H-8

SUBJECT : TEST HOLE NEAR BLDG. M, TA-53

SYMBOL : H8-80-763

MAIL STOP: 490

A test hole was drilled to a depth of 52 ft northeast of Bldg. M on November 13, 1980.

Geologic Log	Feet From	Feet To
Soil and Fill	0	2
Unit 3, tuff moderately welded, gray; section from 14 to about 20 ft. weathered to a brownish gray, excessive moisture.	2	20
Unit 2A, tuff, moderately welded, brownish gray; upper section 20 to about 26 ft weathered.	20	52

The moderately welded tuff of both units will allow excavation with a "bucket auger." No pumic pockets were encountered during drilling. The zone (excessive moisture) at a depth of about 14 to 20 ft may effect the stability of the wall of a shaft; in other sections the wall will be stable.

Cuttings from the hole are being analyzed for moisture content, tritium, and gamma activity. As soon as results are available, I will forward them to you.

WDP:vh

xc: Don Doehling, ENG-4, MS 822

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OFFICE MEMORANDUM

TO : File

DATE: November 17, 1980

FROM : W. D. Fortymun, H-8

SUBJECT : TEST HOLES BAYO AND PUEBLO CANYONS

SYMBOL : H8-80-764

MAIL STOP: 490

The following test holes were drilled for Ford, Bacon, and Davis (F, B, and D) on November 12 and 13, 1980. The hole numbers are as used by FB and D. Samples were collected at 3 ft intervals to a depth of 15 ft and then in 5 or 7 ft intervals. The samples were given to Don Mayfield for storage.

Bayo Canyon	Feet From	Feet To
Hole 317-8		
Soil	0	6
Tuff	6	12
Hole 317-1		
Soil	0	18
Tuff	18	25
Hole 317-2		
Soil	0	27
Tuff	27	37
Hole 317-7		
Soil	0	2
Tuff	2	18
Hole 317-3		
Soil	0	14
Tuff	14	20
Hole 317-4		
Soil and Sand	0	14
Tuff	14	37
Hole 317-6		
Soil	0	12
Tuff	12	37

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TO: File **DATE:** November 17, 1980

Most of the tuff encountered in the holes in Bayo Canyon was badly weathered with some of the holes encountering pumice near the bottom.

Pueblo Canyon	Feet	
Hole 321-14	From	To
Alluvium	0	1
Clay	1	12
Hole 321-15		
Alluvium	0	7
Sand and Clay	7	12
Basalt	12	13

WDP:vh

xc: Don Mayfield, H-8

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LOS ALAMOS, NEW MEXICO 87544

OFFICE MEMORANDUM

TO : R. S. Powell, H-8, MS 518 DATE: January 19, 1981

FROM : W. D. Purtymun, H-8

SUBJECT : PIT #27, INSPECTION JANUARY 19, 1981

SYMBOL : H8-81-44

MAIL STOP: 490

A geologic inspection was made of Pit #27 with reference to guidelines issued for construction and use of solid waste pit. Joint frequence appeared to be about one major joint for every seven feet of pit wall. This is normal for the area. Joint openings were few and not of a size to require remedial action. The pit itself is dug into Unit 2b of the Tshirege Member of the Bandelier Tuff. The contact of two ash flows that make up Unit 2b is about 12 to 15 feet below the land surface.

One large slab of tuff is about to fall out of the southwest wall of the pit. It should be removed prior to use of the pit. Surface runoff should be diverted from the pit. Otherwise, the pit is suitable for use.

We are arranging to have the walls of the pit photographed by ISD with you (Sid) as contact. When "as built" drawings are complete, we would like a set. Depending on schedule, we may wish to map joints and fractures for additional record.

WDP:vh

xc: J. L. Warren, H-7, MS 518

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OFFICE MEMORANDUM

TO : Mike Ragsdale, ENG-2, MS 984 DATE: January 19, 1981

FROM : W[redacted], H-8

SUBJECT : TEST HOLE WASTE DEMONSTRATION SITE, LS-6

SYMBOL : H8-81-43

MAIL STOP: 490

The tuff underlying the proposed Waste Demonstration Site is Unit 3 of the Tshirege Member of the Bandelier Tuff. It is a moderately-welded tuff with density ranging from 70 to 115 lbs/ft^3, and has a safe bearing capacity of 5000 to 10 000 lbs/ft^2. Major joints systems in the tuff are near vertical, ranging from 70° to 90° from the horizontal. As the joints were formed and the ashflow cooled, the orientation in the horizontal plain is random. The joint frequency is about one major joint for each 6 to 8 ft along the wall of an open pit. The tuff should be easily excavated with a back hoe.

The tuff encountered in the four test holes was essentially the same.

NE HOLE	(ft)
Soil	0-2
Tuff, light pink, weathered	2-4
Tuff, light gray	4-28

SE HOLE	
Soil	0-2
Tuff, light gray	2-28

NW HOLE	
Soil	0-2
Tuff, light pink weathered	2-3
Tuff, light gray	3-28

SW HOLE	
Soil	0-2
Tuff, light pink weathered	2-3
Tuff, light gray	3-28

WDP:vh

xc: G. DePoorter, LS-6, MS 495

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Telephone Ext:

OFFICE MEMORANDUM

TO : Merle Bunker, P-2 Group Leader, MS 776 DATE: February 23, 1981

THRU : Wayne R. Hansen, H-8 Group Leader

FROM : W. D. Purtyman and Naomi Becker, H-8

SUBJECT : STABILITY OF ROCKS ON WALLS AND SLOPES OF LOS ALAMOS CANYON ABOVE TA-2

SYMBOL : H8-81-133

MAIL STOP : 490

A reconnaissance was made of the north canyon wall on February 19, 1981, at the request of A. Lyle, P-2. The last inspection of the slope was made on December 12, 1979 (H8-79-526). Since the last inspection, only one rock, about 300 to 400 lbs., has lodged in the rock catcher on the north wall on the canyon. It is located between posts 4 and 5. It should be removed or broken up and wire spacers repaired.

Two dead trees, one located on the north wall inside the security fence (chain link), the second just outside the security fence on the north wall at the west end, should be removed. If they come down they may take out the security fence. The one north of the building could slide into the structure when it falls. For safety, they should be removed.

With reference to the north wall, the western end of the rock catcher appears to be in the area of greatest rock fall potential. The cables and posts of the rock catcher make a slight bend to the south. Consideration should be given to stringing a second net of spaced cables through the angle of the bend, using existing posts. The existing rock catcher net of cables are low in this area. This was discussed with A. Lyle on February 19, 1981.

Inspection of the slope failed to detect any rocks that were unstable or any other evidence of recent movement besides that noted above. It may be advisable to consider contracting for a Geologic Consultant to look at the area in reference to rock falls as an independent review of past work.

WDP:NB/mlk

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OFFICE MEMORANDUM

TO : Charles King, P-DO, MS 460

DATE: April 7, 1981

FROM : W. D. Purtymun, H-8

SUBJECT : TEST HOLE NEAR BLDG. M, TA-53
(see Memo H8-80-763, 11/14/80)

SYMBOL : H8-81-212

MAIL STOP : 490

A test hole was drilled to a depth of 52 ft, northeast of Bldg. M on November 13, 1980. The follow presents the moisture content, gross gamma activity, and tritium content of the tuff.

Depth (ft)	Moisture Content (% Weight)	Gross Gamma (NCPM/G)	^3H (pCi/mL)
0 - 2	7	5 ± 0.1	6.4 ± 0.4
2 - 7	9	7 ± 0.1	2.0 ± 0.3
7-12	11	5 ± 0.1	0.7 ± 0.3
12-17	17	7 ± 0.1	0.0 ± 0.3
17-22	14	7 ± 0.1	0.7 ± 0.3
22-27	8	7 ± 0.1	0.8 ± 0.3
27-32	6	7 ± 0.1	0.0 ± 0.3
32-37	5	8 ± 0.1	0.4 ± 0.3
37-42	7	9 ± 0.2	0.3 ± 0.3
42-47	6	9 ± 0.2	0.5 ± 0.3
47-52	6	9 ± 0.2	0.7 ± 0.3

Excessive moisture occurs to a depth of about 22 ft. The tuff in the interval of 12-17 ft is just about saturated and may give a bit of trouble in construction of the shaft.

Gross gamma activity of the cutting is normal, shows no contamination. Tritium from land surface to about 7 ft is low but present. Probably occurs from operations at the site in the form of fallout with precipitation.

If I can be of further help, feel free to call.

WDP/mlk

xc: Don Doehling, ENG-4, MS 822
Jerry Miller, H-1, MS 810

101-1

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UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext:

OFFICE MEMORANDUM

TO : Kirk Ellard, ENG-2, MS 984 DATE: April 7, 1981

FROM : W. D. Purtymun, H-8

SUBJECT : CHARACTERISTICS OF THE TUFF NEAR HRL - WASTE WATER PUMPING, L.J. 6625-0

SYMBOL : H8-81-215

MAIL STOP: 490

The waste water below HRL is along the top of a bench on the north wall of Los Alamos Canyon. The bench is formed by Unit 2 of the Tshirege Member of the Bandelier Tuff. In this area Unit 2 is a light pinkish gray, moderate to welded tuff consisting of quartz and numerous sanidine crystals and crystal fragments, with minor amounts of rock fragments of latite, rhyolite, and devitrified pumice, some mafic minerals in a matrix of ash. The porosity of a moderate to welded tuff can range from 25 to 40% by volume with densities that range from 95 to 120 lbs/cu ft.

The surface of the exposed tuff of Unit 2 is "case hardened" by weathering. Due to the porosity of the tuff, moisture (precipitation) is absorbed dissolving mineral from the tuff. The minerals are returned to the surface by evaporation as the tuff dries out where they are precipitated to form a rind (case hardened).

WDP/mlk

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Telephone Ext:

OFFICE MEMORANDUM

TO : File

DATE: April 8, 1981

FROM : [redacted] Purtymun, H-8

SUBJECT : LOG OF SHALLOW TEST HOLES AT WASTE "Area C."

SYMBOL : H8-81-216

MAIL STOP: 490

Eighteen shallow test holes were drilled in Area C on March 18, 1981, to obtain samples for radiochemical analyses. The holes were drilled using a 4-inch diameter auger to a depth of about 8 ft. Samples were collected from land-surface to 3 ft and 3 to 8 ft for analyses.

The following presents a log of the holes. The location of holes are found in Area C Surveillance Log Book No. 22691 held by Don Mayfield, H-8 (Page 81).

	Range in Feet		
Hole No.	Soil	Tuff (Weathered)	Tuff (Unweathered)
C102	0-2	2-5	5-8
C103	0-2	2-4	4-8
C104	0-3	3-4	4-8
C105	0-3	3-8	-
C106	0-3	3-8	-
C107	0-4	4-8	-
C108	0-2	2-4	4-8
C109	0-3	3-8	-
C110	0-6[a]	6-8	-
C111	0-3	3-8	-
C112	0-3	3-5	5-8
C113	0-4	4-5	5-8
C114	0-4	4-6	6-8
C117	0-2	2-5	5-8
C118	0-3	3-5	5-8
C119	0-3	3-8	-
C120	0-3	3-7	7-8
C121	0-2	2-4	4-8

[a]May be fill

The soil zone ranges from about 2 to 4 ft. At hole C110 there appeared to be about 6 ft of fill material overlying weathered tuff.

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The weathered tuff beneath the soil zone contains some clays as well as stratas of unweathered tuff. The weathering of tuff to clay probably takes place along joints in the upper part of the tuff. In the cutting, the weathered tuff ranges in color from light to dark brown. Foundations can probably be placed into the weathered tuff if consideration is given to their design.

The unweathered tuff is light gray, moderately welded tuff. It is part of Unit 3 of the Tshirege Member of the Bandelier Tuff.

Attached is a memo H-8-M-2124, April 28, 1971 which presents results of test drilling and penetration tests at Area "C" in regard to formation design for the weather tower.

WDP/mlk

Enc.

xc: Harry Jordan, H-DO, MS 400
Don Mayfield, H-8, MS 490
Steve Diamond, WX-4, MS 985

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LOS ALAMOS, NEW MEXICO 87545
Telephone Ext :

OFFICE MEMORANDUM

TO : Sid Powell, H-7, MS 518

DATE: April 29, 1981

FROM W. D. Purtymun, H-8 WDP

SUBJECT :INSPECTION, ADDITION TO PIT #27

SYMBOL :H8-81-264

MAIL STOP :490

About 2,900 cubic yards of storage was added to Pit #27 in March 1981, by excavation of tuff from the pit floor (ENG R-5031). This extended the depth of the original pit about 9 ft with the base of the pit now at an elevation of 6673 ft. The floor or base of the pit is now about 15 ft above the floor of the adjacent canyon, which is tributary to Pajarito Canyon and about 70 ft above the floor of Pajarito Canyon.

Inspection of wall and floor of the new excavation indicated that the Pit is in compliance with the guidelines issued for construction and use of solid waste pits. For original geologic inspection of Pit 27, see Memo H8-81-44 (1/19/81).

WDP:vh

xc: J. L. Warren, H-7, MS 518

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Telephone Ext :

OFFICE MEMORANDUM

TO : Mike Burkett, WX-8 , MS 777 DATE: May 15, 1981

FROM : W. D. Purtymun, H-8 WDP

SUBJECT : TEST HOLES AT PROPOSED SOLAR POND

SYMBOL : H8-81-314

MAIL STOP : 490

Seven (7) test holes were augered in the area of the proposed solar pond east of TA-46. The holes penetrated Unit 3 of the Tshirege member of the Bandelier tuff. Unit 3 in this area is a moderately welded tuff consisting of quartz and sanidine crystals and crystal fragments, few rock fragments of dark gray rhyolite and gray pumice in a light gray ash matrix. Unit 3 is overlain in the area by a thin soil zone of dark brown clay soil. Similar moderately welded tuff of Unit 3 at TA-55 was determined to have allowable bearing pressure about 12 x 10^3 lbs/sq ft, while the compacted fill of natural soil had an allowable bearing pressure of 5 x 10^3 lbs/sq. ft. (Dames and Moore, 1972, Report of Geologic, Foundation, Hydrologic, and Seismic Investigation, Plutonium Processing Facility, Los Alamos Scientific Laboratory, Los Alamos, New Mexico).

The holes encountered 1 to 2 ft of soil overlying the tuff. Some of the hole encountered joints or fractures as the cutting changed color from a light gray to a dark gray, light brown and some clay were present. The change in color at the cutting reflect weathering along the joints prior to development of the soil zone. Joints in the tuff of Unit 3 will be encountered every 5 to 7 ft of the wall (proposed solar pond). The joints are near vertical; however, some low angle joints may occur. The orientation of the joints is random. There may be some block fallout of the pond wall where two joints intersect in tuff back of the pond face.

The moderately welded tuff will excavate easily with heavy equipment.

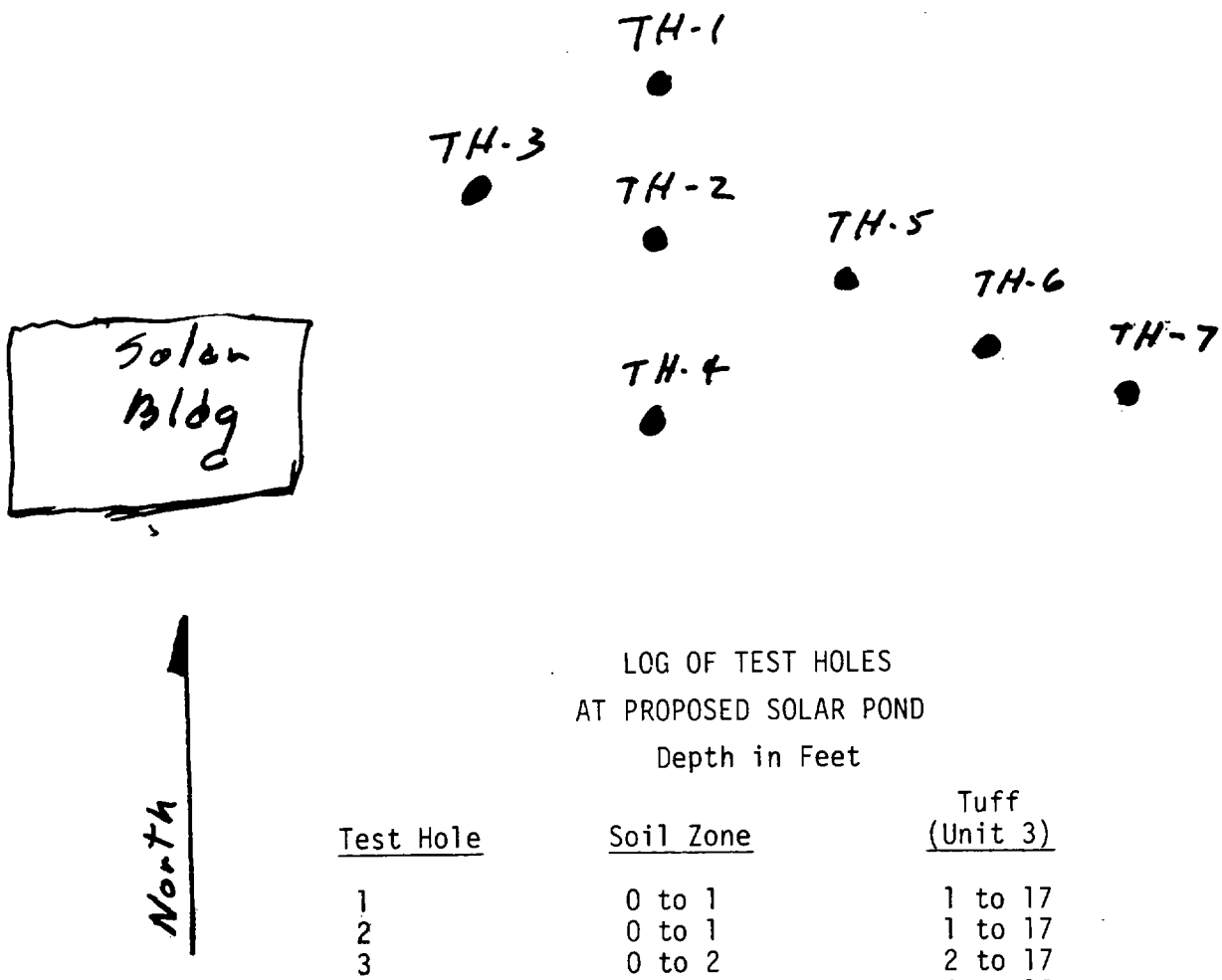
The logs of the holes are attached; locations are shown on attached sketch.

WDP/mlk

Attach. (a/s)

SKETCH MAP SHOWING LOCATION OF TEST HOLES (TH)

AT PROPOSED SOLAR POND (Not to Scale)



LOG OF TEST HOLES

AT PROPOSED SOLAR POND

Depth in Feet

Test Hole	Soil Zone	Tuff (Unit 3)
1	0 to 1	1 to 17
2	0 to 1	1 to 17
3	0 to 2	2 to 17
4	0 to 2	2 to 12
5	0 to 2	2 to 12
6	0 to 2	2 to 12
7	0 to 1	1 to 12

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LOS ALAMOS, NEW MEXICO 87545
Telephone Ext :

OFFICE MEMORANDUM

TO : Billy Bowles, WX-7, MS 950

DATE: May 21, 1981

FROM : W. D. Purtymun, H-8

SUBJECT : GENERALIZED GEOHYDROLOGY OF TA-22

SYMBOL : H8-81-325

MAIL STOP : 490

The follow is a generalized description of the geohydrology of TA-22 as you requested on May 15, 1981.

WDP:vh

Enc.: (a/s)

TA-22 is located along the western edge of the Pajarito Plateau adjacent to the flanks of the Sierra de los Valles. The area is at an elevation of about 7 500 feet with the mesa north of the site open and fairly flat. The surface of the mesa is cut by a few small channels that drain into Pajarito Canyon.

The surface of the mesa is formed by a brown clay soil. The thickness ranges from a few feet to as much as 12 feet. The soil is derived from weathering of the underlying tuff or volcanic rocks.

Volcanic rocks and sediments underly the site at the western edge of the plateau. A generalized section showing rock units and their thickness is based on a test hole located about one mile to the northeast.

UNIT	THICKNESS (FEET)	DEPTH (FEET)
Bandelier Tuff		
Tshirege Member	620	620
Otowi Member	215	835
Guaje Member	60	895
Tschicoma Formation	350	1 245
Puye Formation	390	1 635
Tschicoma Formation	270	1 905
Puye Formation	10	1 915
Tschicoma Formation	510+	2 425

The Bandelier Tuff consists of three members: Tshirege, Otowi, and Guaje, from youngest to oldest. The Tshirege Member is composed of a series of nonwelded to welded ashflows of rhyolite tuffs. The flow underlying the site is a welded tuff. The Otowi Member is a nonwelded pumicious ashflow of rhyolite tuff while the Guaje Member is made up of an ashfall rhyolite pumice.

The Tschicoma Formation is composed of latite and quartz latite flows and pyroclastic rocks. The Puye Formation is composed of gravels and boulders of latite, quartz latite, rhyolite and pumice in a matrix of silt and sand.

The individual ashflow of the Bandelier Tuff dip gently eastward off the flank of the mountains formed by the Tschicoma Formation. As the tuff are volcanic in origin, they are highly jointed due to the cooling. The Pajarito Fault is a north-south trending fault that lies about 1.5 miles west of the site. It is a normal fault, down-thrown to the east. The

The displacement is estimated at 400 ft. The Water Canyon Fault is north-south trending terminates about 0.5 miles to the south of the site, and is a normal fault with maximum displacement of 80 feet. The movement on both faults has been post-Bandelier.

Drainage from the site is into Pajarito Canyon that is confluent to the Rio Grande. The stream in the Canyon is intermittent. The alluvium is thin, but may contain small amounts of water seasonally. The water is perched on the underlying tuff. There is no water perched in the volcanic rocks and sediments above the main aquifer. The main aquifer of the Los Alamos Area is the only aquifer capable of municipal and industrial water supply. The top of the aquifer at the site lies at a depth of about 1 200 feet in the lower part of the Tschicoma Formation or upper part of the Puye Formation. The aquifer slopes gently eastward from the recharge area in the Jemez Mountains to the discharge area along the Rio Grande.

LOS ALAMOS SCIENTIFIC LABORATORY
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LOS ALAMOS, NEW MEXICO 87544

OFFICE MEMORANDUM

TO : Mike Ragsdale, ENG-2, MS 984

DATE: August 27, 1981

FROM : W. D. Purtymun, H-8

SUBJECT : SOLAR EVAPORATION OF LOW LEVEL RADIOACTIVE WASTE WATER, L. J. 6526-50 TEST BORINGS

SYMBOL : H8-81-514

MAIL STOP: 490

Log of test borings drilled 8/24/81 near TA-50 are as follows:

	(Feet) From	To
Test Hole 1 (NE Corner)		
Soil, brown clay with some sand and gravels, almost saturated above contact with underlying tuff 3 to 7 ft.	0	7
Tuff, brown, weathered, moderately welded, wet from 7 to 9 ft.	7	23
Test Hole 2 (SE Corner)		
Soil, brown, clay, with some sand and gravel	0	7
Tuff, brown weathered, moderately welded, extremely wet 15-17 ft. (probably fracture) and 17-24 ft; Dry 24 to 27 ft.	7	27
Test Hole 3 (SW Corner)		
Soil, brown, clay with sand and gravel	0	8
Tuff, brown, weathered, moderately welded	8	23
Test Hole 4 (NW Corner)		
Soil, brown, clay with some sand and gravel, extremely wet 3 to 7 ft.	0	8
Tuff, brown, weathered moderately welded, wet 7 to 8 ft.	7	13

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The wet soil at base of soil zone encountered in Test Holes 1 and 4 and wet tuff, probably a fracture in tuff 15 to 17 ft in Test Hole 2 is drainage of sanitary waste from the tile field south of TA-50. The presence of water in the soil and tuff will reduce the bearing capacity of the moderately welded tuff as it is in the process of weathering.

A set of borings were drilled on 8/26/81 west of the previous location. The logs are as follows:

	(Feet) From	To
NE Corner		
Soil, clay, brown with some sand and gravel	0	5
Tuff, brown, weathered moderately welded	5	22
NW Corner		
Log same as NE Corner, Tuff appears to be dryer; completed in tuff at 17 ft.		
SE Corner		
Soil, clay, brown with sand and gravel	0	6
Tuff, brown , weathered, moderately welded; wet zone clay (probably fracture) 8 to 10 ft.	6	17
SW Corner		
Same as NW corner; completed in tuff at 17 ft.		

The foundation should be set into top of tuff. The base of the soil zone at both locations contains more moisture, especially at the first location, than is usually encountered.

WDP:vh

xc: Price Fernon, ENG-2, MS 984

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LOS ALAMOS, NEW MEXICO 87544

OFFICE MEMORANDUM

TO : K. O. Ellard, ENG-2, MS 984 DATE: August 27, 1981

FROM : W. D. Purtymun, H-8

SUBJECT : TEST BORING: ELEVATOR INSTALLATION, BLDG. SM-29; L. J. 6691-3.

SYMBOL : H8-81-513

MAIL STOP: 490

The following is a log of test boring near CMR Bldg.

	(Feet) From	To
Soil or fill, brown, clay with sand and gravel; wet 3 to 6 ft.	0	6
Tuff, brown, weathered, moderately welded; wet 15 to 17 ft probably fracture	6	23

Wet soil or fill overlying the tuff at 3 to 6 ft probably is the result of lawn irrigation. I would set the foundation down into the top of the tuff.

WDP:vh

xc: Price Fernon, ENG. 2, MS 984

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Sid Powell, H-7, MS 592

DATE: August 31, 1981

THRU:

MAIL STOP/TELEPHONE:

FROM: W. D. Purtymun, H-8

SYMBOL: H8-81-520

SUBJECT: INSPECTION OF SHAFT FOR DISPOSAL OF MATERIAL FROM THE MESON FACILITY

The walls of the two intersecting shafts are badly broken along the intersection of east and west walls due to a large southeast-west trending joint. Three or four blocks on the west wall and two on the east wall are now keystoned (held in), but may fall out during disposal operations. Extreme care should be taken.

The exposed walls of the shaft are badly broken; however, the walls are in no worse condition than have been encountered in the open pits. The shafts meet existing criteria for receiving solid wastes.

WDP/mlk

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Jim White, H-7, MS 518

DATE: January 19, 1982

THRU:

MAIL STOP/TELEPHONE: 490;667-5021

FROM: Wayne R. Hansen, H-8 Group Leader

SYMBOL: H8-82-22

SUBJECT: REFERENCE MATERIAL ON AREA L, TA-54, CHEMICAL STORAGE AND DISPOSAL AREA

Area L is used for storage and disposal of chemical or toxic waste materials. The storage area consists of a pit 12 ft. wide, 200 ft. long and about 12 ft. deep, with ramps on long dimension. The wastes are buried in layers interbedded with tuff. The pit was filled and a cover of crushed tuff has been compacted over the waste. Trenches in the area were also used for disposal; however, these have now been filled and covered. One small pit is now being used for disposal of bulk liquids. Wastes are now being disposed of in shafts 2 to 6 ft in diameter and about 60 ft. deep. Containers of liquids, chemicals or oils are placed in the shafts, which are then back-filled with crushed tuff.[1]

Area L, TA-54, is located on Mesita del Buey, a narrow southeast trending mesa that is part of the Pajarito Plateau (Fig. 1). The surface of the mesa at Area L is covered with a thin clay-like soil and is underlain by a series of ashflow and ash falls of dry rhyolite tuff. The tuff is underlain by volcanic flow rocks of basalt and sediments. The pit and trenches are completed into Unit 2b of the Tshirege Member of the Bandelier Tuff, while the shafts extend through Unit 2b into the top of Unit 2a.

Surface drainage from the mesa at Area L is to the north into an unnamed canyon that is a tributary to Canada del Buey (Fig. 1). Stream flow in the unnamed Canyon and Canada de Buey is intermittent, occurring only from heavy thunder shower activity during the summer. Canada del Buey is a tributary to the Rio Grande.

The main aquifer of the Los Alamos area lies at a depth of about 950 ft at Area L. Overlying the main aquifer is about 340 ft of dry rhyolite tuff and 610 ft of volcanic flow rocks and sediments. Hydrologic data collected during construction of two supply wells into the aquifer (one located one mile west, the other, two miles northwest), encountered no water perched in sediments or volcanics above the main aquifer. Two test holes drilled in Pajarito Canyon south of Area L encountered no perched water below the stream channel alluvium.[2] Movement of water in the main aquifer beneath Area L is the southeast toward the Rio Grande where a part is discharged into the river through seeps and springs.[3] Movement in the aquifer is estimated from aquifer test at about 1 ft/day.[4]

REFERENCES:

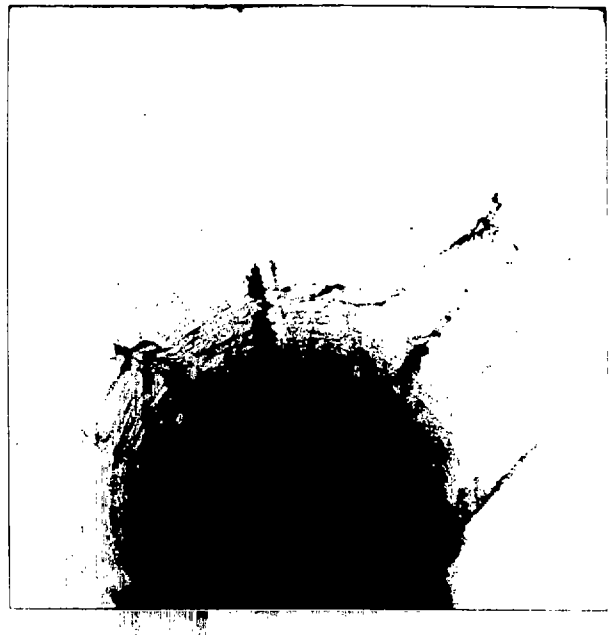
1. Materials Disposal Area L, Los Alamos Scientific Laboratory, ENG-R-3650.

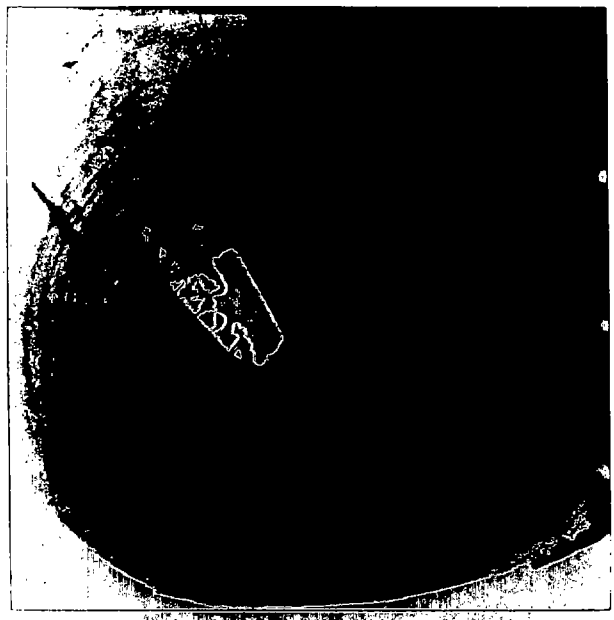
2. R. L. Cushman, "An Evaluation of the Aquifer and Well Characteristics of the Municipal Well Fields in Los Alamos and Guaje Canyons near Los Alamos, New Mexico," U.S. Geol. Survey Water Supply Paper 1809-D (1965).

3. R. L. Griggs, "Geology and Ground Water Resources of the Los Alamos Area, New Mexico," U.S. Geol. Survey Wastes Supply Paper 1753 (1964).

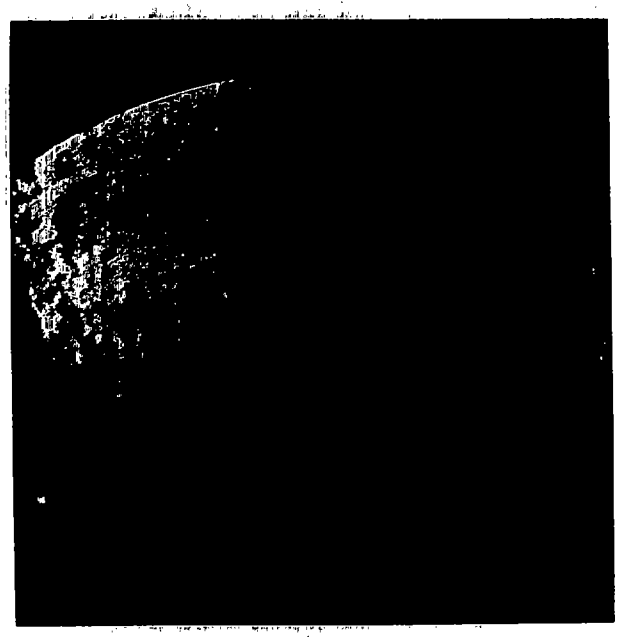
4. C. V. Theis and C. S. Conover, "Pumping Test in the Los Alamos Canyon Well Field near Los Alamos, New Mexico," U.S. Geol. Survey Water Supply Paper 1619-I (1962).

5. W. D. Purtymun and W. R. Kennedy, "Geology and Hydrology of Mesita del Buey," Los Alamos Scientific Laboratory report LA-4660 (1971).

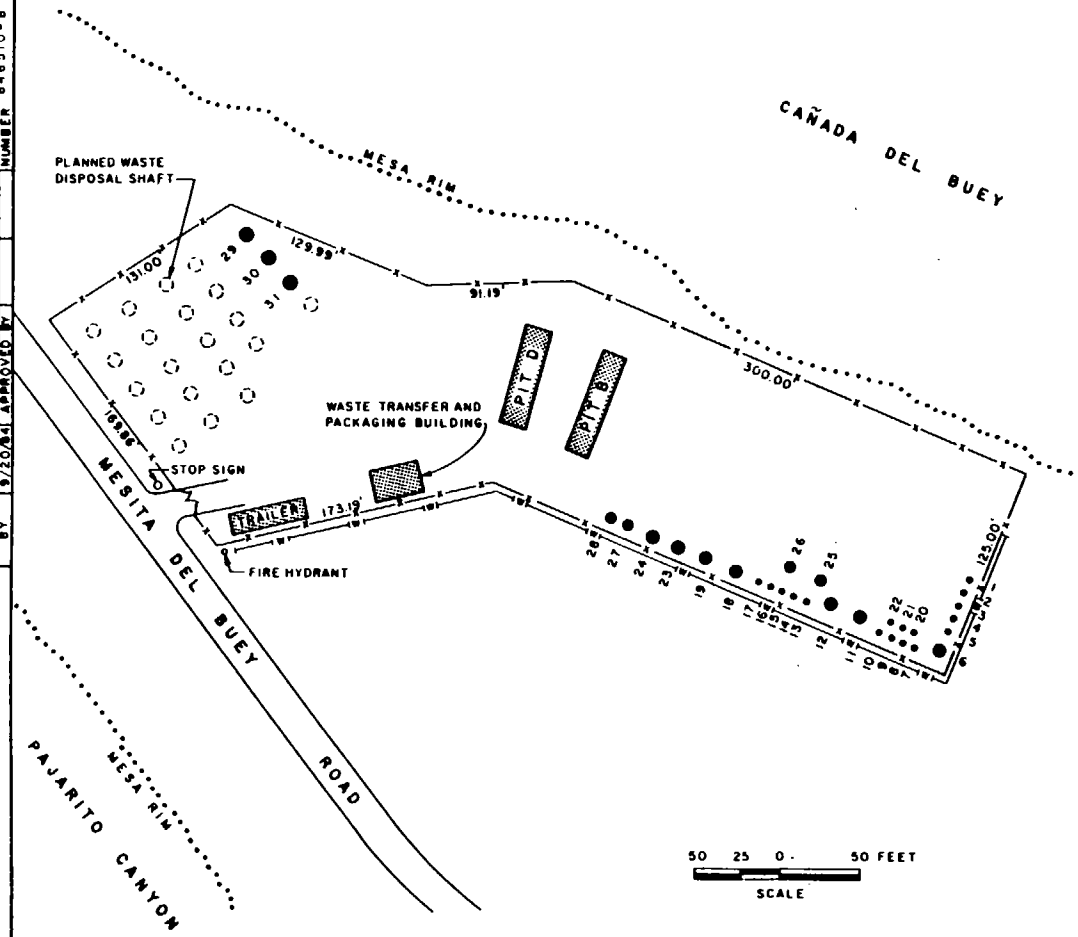




Area L Shaft 29
February 29, 1984



Area L Shot 29
February 29, 1988



AREA L SHAFTS[1]				
SHAFT NO.	SHAFT DIAMETER (FEET)	DATE DRILLED	DATE CAPPED	CONTENTS
1	3	1980	9/83	ORGANICS[2]
2	3	2/75	7/79	ACIDS & BASES
3	3	2/75	11/78	INORGANIC
4	3	2/75	5/80	ORGANIC
5	3	2/75	6/77	WASTE OIL
6	8	6/75	6/79	REACTIVE
7	3	6/75	6/79	REACTIVE
8	3	6/75	6/79	REACTIVE
9	3	6/75	6/79	GAS CYLINDERS
10	3	6/77	6/79	WASTE OIL
11	8	6/78	7/79	WASTE OIL/SOLVENT
12	8	1/78	7/79	WASTE OIL/SOLVENT
13	3	6/79	5/82	INORGANIC
14	3	6/79	5/82	REACTIVE
15	3	6/79	5/82	REACTIVE
16	3	6/79	5/82	GAS CYLINDERS
17	3	6/79	5/82	ORGANIC
18	8	6/79	6/80	WASTE OIL
19	8	4/80	5/82	WASTE OIL
20	3	4/80	5/83	INORGANIC
21	3	4/80	OPEN	GAS CYLINDERS
22	3	4/80	3/80	ORGANIC
23[3]	8	4/82	3/84	WASTE OIL
24[4]	8	4/82	4/84	ORGANIC & WASTE OIL
25	6	9/82	OPEN	INORGANIC
26	6	9/82	3/84	ORGANIC
27	4	1/82	OPEN	SPECIAL[5]
28	4	1/82	OPEN	SPECIAL
29	6	12/83	6/84	ORGANIC
30	6	12/83	OPEN	ORGANIC
31	6	12/83	OPEN	EMPTY

NOTES:
(1) ALL SHAFTS ARE APPROXIMATELY 60 FEET DEEP.
(2) SHAFT ONE CONTAINS WASTES NOT IN DRUMS.
(3) PRIOR TO SHAFT 25, LIQUIDS WERE DISPOSED OF IN DRUMS WITHOUT ADDING ABSORBENTS.
(4) MIDDLE SECTION OF THIS SHAFT NOT USED.
(5) USED FOR MISCELLANEOUS WASTE REQUIRING SEPARATE ISOLATION.

DRAFT

FIGURE 2-8

TA-54 AREA L
WASTE MANAGEMENT FACILITIES

PREPARED FOR

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LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY | L.L.F. 9/20/84 | CHECKED BY | APPROVED BY | DRAWING NUMBER 846510-B

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Dean Keller, ENG DO, MS 700

DATE: January 27, 1982

THRU:

MAIL STOP/TELEPHONE: 490/667-7952

FROM: W. D. Purtymun, H-8 WDP

SYMBOL: H8-82-39

SUBJECT: TEST HOLE WEST OF OMEGA REACTOR BLDG.

A test hole was augered to a depth of 28 feet west of Structure No. TA-2-1 on January 21, 1982. The log of the hole is as follows:

	Depth (ft) From	Depth (ft) To
Soil or backfill, light brown, silty sand with some gravels and pebbles; loosely consolidated with moderate amount of moisture.	0	6
Gravels, pebbles, and cobbles in a brown silty sand, unconsolidated; deposit by stream in Los Alamos Canyon; water perched in gravel above tuff; water encountered at a depth of about 13 ft below land surface; water level in the gravel fluctuates with volume found in stream channel to south; water tables are generally highest in spring from snowmelt runoff and in late summer and early fall from summer thunder storm runoff.	6	17
Tuff, light reddish brown, weathered, non-welded to moderately welded, some clay; a large amount of moisture in the tuff below the contact with the overlying saturated gravels; however, at depth 25 to 28 ft tuff adhering on the auger seemed quite dry.	17	34

The area west of the building is disturbed to depth of 6 to 10 ft with utility lines (i.e., fire mains, piping for cooling water from the reactor to the cooling tower, and miscellaneous electrical or control cables; Photography and layout on file with A. R. Lyle CNC-5). The fill in the trenches is probably loosely consolidated as is the underlying gravels. Design for foundations for shielding should be based on about 3000 lbs/sq. ft, as we discussed at the site on 1/21/82. Presence of water in the gravel may result in settling of the foundation 2 to 4 inches when load is applied.

WDP:vh

xc: A. R. Lyle, CNC-5, MS 776

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Steve Diamond, Q-11, MS-K573

DATE: March 16, 1982

THRU:

MAIL STOP/TELEPHONE: K490/667-7952

FROM: W. D. Purtymun, H-8 WDP

SYMBOL: H8-82-131

SUBJECT: SOIL USED FOR DIKES AROUND OIL STORAGE

Soils on the "finger-like" mesas of the Pajarito Plateau was formed by weathering of the underlying rhyolite tuff. The soil has the greater thickness near the axis of the mesa and thins toward the canyon rims where the tuff is exposed. The natural soil formed on the mesa has an average density of about 160 lbs/cu. ft. Studies indicate little, if any, infiltration of water from precipitation through the soil zone into the underlying tuff indicating that the soil has a low permeability.[1] The permeability of natural soil ranges from <0.5 to 2 inch/hr.[2] Soil compacted 90% will have a much lower permeability.

The soil zone near TA-50, including weathered zone at the top of the tuff, ranges from five to seven feet. The soil is described as light brown clay with some sand and gravel. The primary soil constituents are quartz and feldspar, some rock fragments of latite, rhylote, and occasional pumice in a fine sand to clay matrix. Clay minerals are mainly montmorillonite and lilte[3].

Conclusions: Soil derived from weathering of the tuff, compacted 90%, will form an effective barrier to contain an oil spill from storage until "clean-up measures" are undertaken.

WDP:vh

See attached References

REFERENCES

1. J. H. Abrahams and others, "Distribution of Moisture in Soil and Near-Surface Tuff on the Pajarito Plateau, Los Alamos County, New Mexico," U.S. Geol. Survey Prof. Paper 424-D (1961).

2. J. W. Nyham, "Soil Survey of Los Alamos County, New Mexico," Los Alamos Scientific Laboratory report LA-6779-MS.

3. E. Staritzky, "Petrographic Examination of Local Soils," Los Alamos Scientific Laboratory report, LA-741 (1949).

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: R. L. Reidel, ENG-2, MS 984

DATE: May 24, 1982

THRU:

MAIL STOP/TELEPHONE:

FROM: W. D. Purtymun, H-8

SYMBOL: H8-82-283

SUBJECT: TEST BORINGS, SECURITY AND SAFEGUARDS UPGRADING, TA-41; L.J. 6709-41

Subsurface investigation was made for the new parking area at TA-41. Two test holes were drilled as located on ENG-C 43921, Sheet C2. Logs of both holes were similar.

Test Hole 1 and 2

Sandy Soil, brown, some gravels	0 to 3 ft
Cobbles and boulders in a matrix of sand and gravels	3 to 14 ft
Tuff, brown, weathered to sand with a few rock fragments of rhyolite	14 to 18 ft

Water was encountered at a depth of about 10.5 ft in the gravels and boulders; water recharged from stream flow perched on the weathered tuff. Water table will fluctuate with amount of water in the nearby stream channel.

No subsurface problem should be encountered in extending the parking area if routine compaction is completed prior to applying asphalt.

WDP:vh

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Chris Sanchez, ENG-2, MS-984

DATE: July 14, 1982

THRU:

MAIL STOP/TELEPHONE: K490/667-5021

FROM: W. D. Purtymun, H-8 WDP

SYMBOL: H8-82-379

SUBJECT: TEST BORINGS, TRITIUM PROCESSING FACILITY ROAD AND FENCE, TA-16; L.J. 6981-16

Eight test borings ranging in depth from 8 and 13 ft. were drilled along the centerline of the road layout from Anchor Ranch Rd. to the New Tritium Processing Facility. The logs of the holes are as follows: locations are distances in feet from Anchor Ranch Road (Fig. 1).

WDP:vh

	Depth (feet) From	To
Test Hole 0 + 25		
Soil, silty clay, brown (wet 3 to 4 ft and 7 to 8 ft)	0	8
Tuff, light tan, weathered (wet)	8	10
Tuff, light gray, moderately welded	10	13
Test Holes 2 + 25; 4 + 25; 6 + 10; and 8 + 20		
Soil, silty clay, light brown (dry)	0	3
Tuff, light gray, moderately welded	3	8
Test Hole 10 + 20		
Soil, silty clay, light brown (dry)	0	3
Soil, light tan, silty clay, hard pan (dry)	3	6
Tuff, light pinkish gray, moderately welded	6	8
Test Hole 12 + 00		
Soil, silty clay, light brown (dry)	0	2
Tuff, light pinkish gray, moderately welded	2	8
Test Hole 13 + 10		
Soil, brown (mostly organic material, decomposed leaves and pine needles)	0	0.5
Tuff, light gray, moderately welded	0.5	8

Test hole 0 + 25 is located east of a drainage ditch that contains processing water, thus the excess moisture and weathered tuff encountered in the hole. Test hole 10 + 20 contained "hard pan" at a depth of 3 to 6 ft beneath the soil zone. The "hard pan" is poorly developed soil that has completely dried out. It is very hard, much like adobe and is difficult to drill.

With the exception of the excessive moisture encountered in test hole 0 + 25, I can see no problem with normal road construction. The drainage ditch of processing water may have to be realigned. Some soil (wet) may have to be removed to stabilize the area.

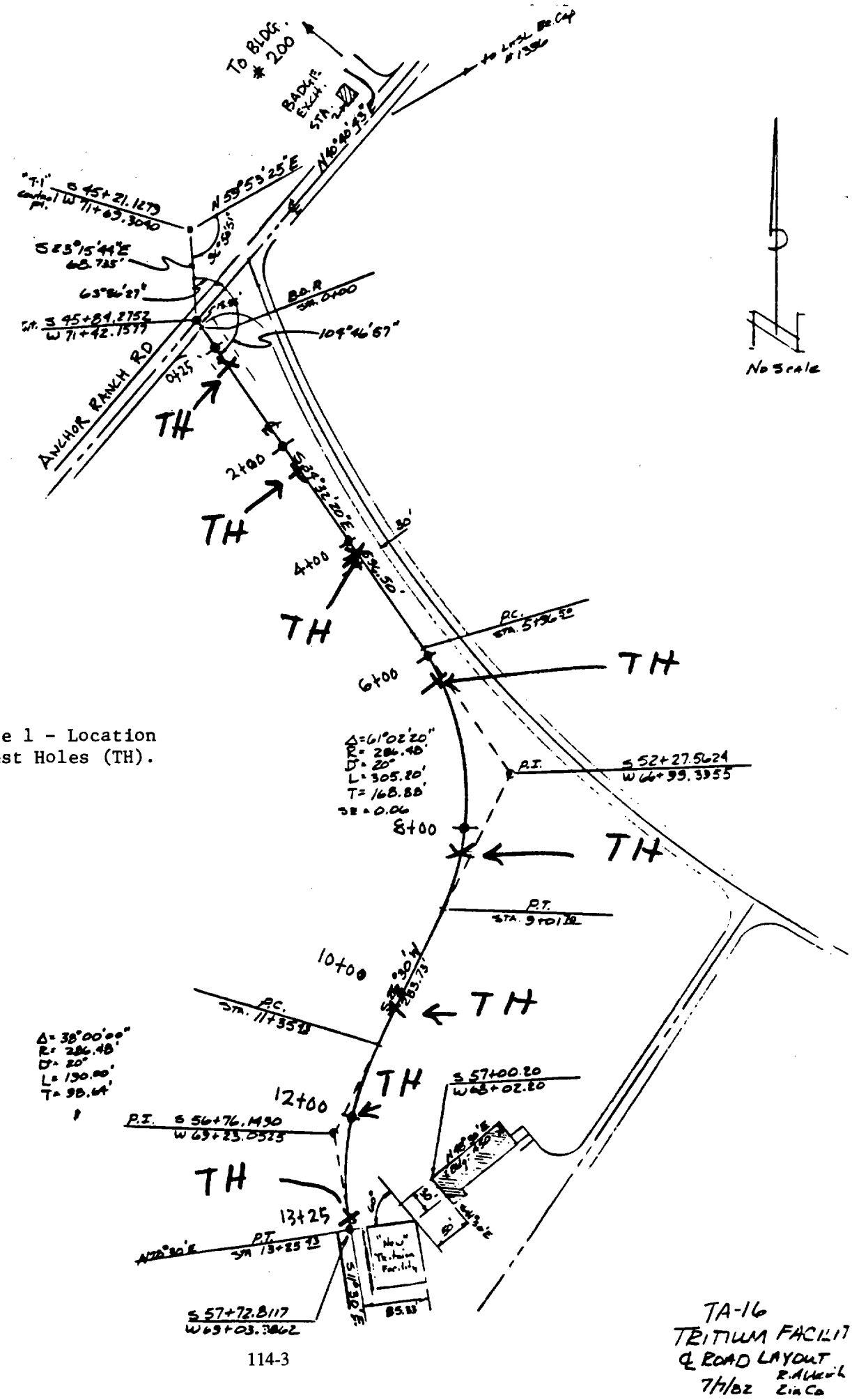


Figure 1 - Location of Test Holes (TH).

TA-16
TRITIUM FACILITY
& ROAD LAYOUT
7/1/82 R. Alkerk Zia Co

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Wally McCorkle

DATE: August 6, 1982

THRU:

MAIL STOP/TELEPHONE: H-8-K490/667-3134

FROM: W. D. Purtymun WDP

SYMBOL: H-8-82-418

SUBJECT: Analyses for Ra^{226} (Fenton Hill)

Results, average of two analyses (X±SD).

Frenton	Hill	Discharge	4-14	0.11±0.08 pCi/ℓ
"	"	"	4-15	0.75±1.00 pCi/ℓ
"	"	"	4-16	0.06±0.01 pCi/ℓ
"	"	"	4-19	0.07±0.06 pCi/ℓ
"	"	"	4-20	0.14±0.01 pCi/ℓ
"	"	"	4-21	0.05±0.01 pCi/ℓ

WDP:fs

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Karen Balo, H-7, MS E516 DATE: September 23, 1982

THRU: W. R. Hansen, H-8 Group Leader MAIL STOP/TELEPHONE: K490/5021

FROM: W. D. Purtymun, H-8 SYMBOL: H8-82-470

SUBJECT: OIL DISPOSAL SHAFT, SHAFT AREA L.

It was reported when shaft 25 was dug that a nest containing baby rats was recovered with the cutting some where between 40 and 60 ft as the hole was being reamed. The presence of the nest indicates some communication of the shaft with the land surface.

The contact between the ashflows unit 2B (upper unit) and Unit 2A (underlying unit) occurs at a depth of about 35 ft. The contact along the wall of Pajarito Canyon south of Area L is indicated by weathering of the soft material at the contact with horizontal cavities extending back from the cliff face under the mesa. Several middens or pack rat nests are found on the contact. Along the wall of Canada de Buey north of Area L the contact is covered with rockfall material, weathered tuff, and tree and plant litter that form the surface of the north facing slope of the canyon.

A major north-south trending near vertical joint intersects the south wall of the shaft 25 and extends into the north wall. Along the joint on the south wall at a depth of about 28 to 36 ft there is a large hole that extends back into the wall of the shaft. A smaller similar type hole occurs in the north wall at a slightly deeper depth. These two holes are at/or near the contact between the two ashflow units. It is suspected that there is communication (a hole) from the shaft along the contact to the outcrop on Canyon wall of Pajarito Canyon.

On August 17 an attempt was made to obtain pictures of the wall of the shaft by modifying a bore wall (well) TV camera. The shaft monitored by the TV camera failed to obtain clear pictures.

An attempt was made on August 18 to determine if connection exists along the contact from the outcrops on the Canyon wall (north and south) to shaft 25.

Smoke grenades were dropped in the shaft, the shaft sealed and the shaft pressurized by an air blower. Tests were run in morning and afternoon. No smoke was observed at the contact of the two ashflows on the canyon walls to the north and south of the shaft. Smoke did fill the adjacent shaft from an open joint.

It appears, though it hasn't been proven, that an opening exists from shaft 25 to the outcrop in the canyon wall to the south. It is suggested that a portion of the shaft from below the contact at a depth of about 36 ft to about a depth of 28 be filled with crushed tuff. This should eleiminate any wide spread oil movement along the contact between the two ashflows from oil stored above the 28 ft. level. The tuff will provide material to absorp the oil.

WDP:pt

cc: John Warren, H-7, MS E516.

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Merle Bunker, CNC-5, Group Leader, MS G766 DATE: September 23, 1982

THRU: Wayne R. Hansen, H-8 Group Leader MAIL STOP/TELEPHONE: K490/7952

FROM: W. D. Purtymun, H-8 SYMBOL: H8-82-485

SUBJECT: STABILITY OF ROCKS ON WALLS AND SLOPES OF LOS ALAMOS CANYON ABOVE TA-2

A reconnissance was made of the north canyon wall on September 21, 1982, at the request of A. Lyle, CNC-5. The last inspection of the slope was made on February 23, 1981 (H8-81-133). Since the last inspection was made, no rocks have lodged in the rock catches or in the security fence.

As previously stated in the last memo (H8-81-133). The rock catcher between post 4 and 5 on the east end should be repaired and the rock in the catcher should be broken up or removed. Dead trees between the security fence and building should be removed.

Inspection of the slope failed to detect any rocks that were unstable; however, there appears to be a number of blocks along the canyon rim that are potential for rock fall. Thus, the rock catcher should be kept in repair.

WDP:pt

cc: A. Lyle, CNC-5, MS G776

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, H-7, MS-J592
THRU: Wayne R. Hansen, H-8 Group Leader
FROM: W. D. Purtymun, H-8

DATE: October 20, 1982

MAIL STOP/TELEPHONE: K490/7952

SYMBOL: H-8-82-535

SUBJECT: INSPECTION OF PIT 33, AREA G, TA-54, OCTOBER 8, 1982

A geologic inspection was made of Pit 33 with reference to guidelines issued for construction and use of solid pits.

The pit is dug into unit 2b of the Tshirege Member of the Bandelier Tuff. At Pit 33, Unit 2b consists of two ashflows. The contact is indicated by a zone of large dark gray devitrified pumice fragment on the top of the lower ashflow. The pumice zone is near horizontal and is as much as 6 ft in thickness though in some places becomes indistinct. The zone occurs at a depth of about 10 to 15 ft in the east wall and at a depth of about 15 to 20 ft in the west wall of the pit.

The tuff in both ashflows is a moderately welded tuff consisting of quartz and sanidine crystals and crystal fragments, some latite, and pumice in a gray ash matrix. The upper ashflow is slightly denser (harder) than the lower flow as seen by slower and more difficult excavation.

The tuff in the walls of the pit is broken by joints which formed as the ashflow cooled. Most of the joints, major or master joints, are vertical or near vertical. They range from closed to open. Some joint openings are clay filled or clay platted. The joint frequency is about the same as in other pits in the area, about one master joint for 6 to 8 ft of pit wall. The joint openings are not of a size to require remedial action.

We have documented the wall of the pit by photographs taken by ISD. When the "as built" drawings of the pit are complete we would like a set.

Surface runoff should be diverted from entering the pit, otherwise Pit 33 is suitable for use.

WDP:amc

cc: John Warren, H-7, MS-E516

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, H-7, MS J592

DATE: December 1, 1982

FROM: W. D. Purtymun, H-8

MAIL STOP/TELEPHONE: K490/7-7952

SYMBOL: H-8-82-629

SUBJECT: LOCATION OF SHAFTS, AREA G, TA-54

The three new shafts located near the west end of Pit 2 are in compliance with guide lines issued for construction of pits for solid wastes. The new shafts are to be located between shafts (filled and capped) No. 50, 60, 59, and 34 (ENG R-4464).

118 120 119

The shafts, 6 ft. in diameter, will be about 60 ft. deep. They should penetrate Unit 2b and will be completed into the lower Unit 2a of the Tshirege Member of the Bandelier Tuff. Both units are moderately welded ashflow. The shafts will encounter some near vertical to vertical points that will cause some blocks to dislodge from the shaft walls. This should cause no problem in completion or use of the shaft to dispose of wastes.

As the shafts are in a present shaft disposal area, we would like to obtain samples of the tuff every 10 ft. during drilling of the pilot hole. The samples should be collected in plastic bags to contain the moisture, marked as to date, shaft number, and depth of collection. Please notify us when construction begins and we will assist in setting up a sampling scheme.

WDP/hy

File

sent 10/28/82

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Ed Hoth, Eng-2, MS-M984

DATE: October 26, 1982

THRU:

MAIL STOP/TELEPHONE: K490/7952

FROM: W. D. Purtymun, H-8

SYMBOL: H-8-82-553

SUBJECT: TEST HOLE AT LS-6 EXPERIMENTAL SITE

A 4-inch diameter test hole was drilled to a depth of 32 ft at the site. The hole penetrated about 4.5 ft of soil and weather tuff and about 27.5 ft of a moderately welded tuff of Unit 3 of the Tshirege Member of the Bandelier Tuff. The tuff was light gray consisting of quartz and sanidine crystals and crystal fragments, a few small rock fragments of gray rhyolite and white pumice in a gray ash matrix. The moisture content of the tuff was low, about 5% by volume or less.

The moderately welded tuff will be easily worked with a backhoe, bulldozer, or a bucket auger.

The tuff is broken by a number of vertical to near vertical joints. Intersection of these joints behind the walls of a pit or shaft may allow the blocks to fall into the excavation. During and after excavation the walls should be inspected to determine if there are any loose blocks that should be removed.

WDP:amc

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Karen Balo, H-7, MS E516

DATE: February 15, 1983

THRU: W. R. Hansen, H-8 Group Leader

MAIL STOP/TELEPHONE: K490/7-5021

FROM: W. D. Purtymun, H-8

SYMBOL: H8-83-139

SUBJECT: INSPECTION OF SHAFTS 23, 24, 25, AND 26 AREA L, TA-54

The shafts at Area L are dug through Unit 2B (upper unit) and into Unit 2A (underlying unit) of the Tshirege Member of the Bandelier Tuff. These units are moderately welded ashflows of rhyolite tuff. The contact between the two units occurs at about 35 ft. The small diameter of the shafts, 4 to 6 ft, preclude a good examination of the shaft walls for joints or contact between ashflows.

Shafts 23 and 24 are 4-ft diameter shafts drilled to a depth of about 60 ft. They are located on the west end of the shaft disposal area next to the fence. The shafts exhibit few joints and no blocks pulled loose during the construction.

Shafts 25 and 26 are 6-ft diameter shafts drilled to a depth of about 60 ft. They are located north of a group of shafts drilled along the fence in the eastern part of Area L. The walls of the shaft were smooth, showing few joints and only a few blocks pulled loose from the joints during construction. In shaft 25, there were a series of small blocks pulled loose from a southwest trending joint on the west wall from a depth of about 12 to 29 ft. In shaft 26, there was a small block pulled out of the east wall at a depth of about 12 ft.

When the covers were removed from shafts 25 and 26, there was a strong odor of benzene and toluene in the shafts. Organic compounds, oils and solvents were disposed of in shafts (filled and capped) to the south of

shafts 25 and 26. At the time these organics were disposed, there was no material to fix the fluids in the barrels. It appears that these barrels have ruptured or corroded through, releasing fluids from the barrels. Liquid organic materials are now mixed with vermiculite or to tuff prior to disposal. The benzene and toluene are highly volatile and thus are moving in a vapor phase through open joints or fractures in the tuff or along the contact between the two ashflows. In disposing of wastes into these shafts, I would use an excess of tuff dug from the shafts to fill the void space between the walls of the shaft and waste containers.

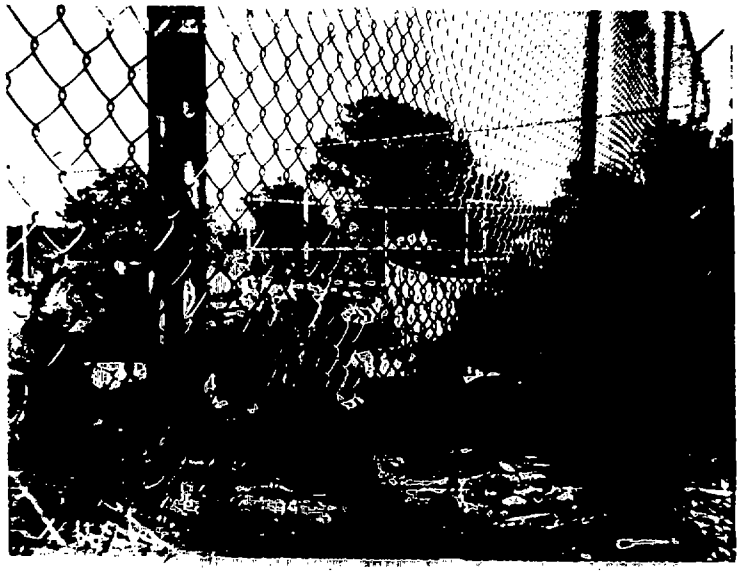
Construction of two other shafts in the vicinity of shafts 25 and 26 was terminated and the shafts filled with cutting when strong oil or solvent odors were encountered. When possible these shafts, though they do not contain wastes, should be capped to prevent any deep infiltration of water from precipitation or runoff into tuff.

Your suggestion to move any additional shafts to the west end of the area should be implemented. Location should be at least 50 ft from the canyon rim.

WDP/pb

Cy: John Warren, H-7, MS E516
Don Mayfield, H-8, MS K490

Area L TA-54
Chemical Pit
Disposal ≈ 1971



121-3

Area L TA-54
Storage ≈ 1971

Note; See Draft Report Purtymun 1971 - "Waste Storage at Area H, J, and L

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, H-7, MS J592

DATE: February 15, 1983

THRU: W. R. Hansen, H-8 Group Leader

MAIL STOP/TELEPHONE: K490/7-5021

FROM: W. D. Purtymun, H-7

SYMBOL: H8-83-140

SUBJECT: INSPECTION OF SHAFTS 118, 119, AND 120 IN AREA G, TA-54

The three shafts in Area G are located west of Pit No. 2 in the shaft disposal area. They are constructed through Unit 2B and underlying Unit 2A into the top of Unit 1B.

Shaft 118 - Drilled to a depth of 65 ft/8ft diameter. Contact between two ashflows at about 12 ft (Unit 2B and 2A) and encountered white nonwelded pumiceous at Unit 1B at about 48 ft. A southeast trending joint was broken out on the south wall of the shaft from about 20 to 28 ft.

Shaft 119 - Drilled to a depth of about 62 ft/8 ft diameter. I did not notice contact between Unit 2B and 2A; however, the top of white nonwelded pumiceous occurred at 43 ft. A block was pulled out of an east-west joint between 24 and about 31 ft depth on the east wall of the shaft.

Shaft 120 - Drilled to a depth of about 63 ft/8 ft diameter. Contact between Unit 2B and 2A at about 10 ft; top of white pumiceous at Unit 1B at about 53 ft. A west wall block was out at about 25 to 35 ft from the east-west trending joint.

Samples of tuff were collected at about 10 ft intervals during the drilling of the 4-ft diameter pilot hole of Shaft 119. The moisture content of the tuff was low, probably less than 10% by volume. The moisture was distilled out and the samples analyzed for tritium. The results are as follows:

Depth (ft)	Tritium (nCi/ℓ)
10	50
20	1200
30	5000
40	7000
50	1500
60	700

The tritium concentrations are very high; however the moisture content of tuff is very low. The tritium is migrating from an adjacent shaft that contains tritium wastes in the vapor phase. Migration takes place through the open joints and fractures and along contacts between the ashflow units.

The changes in atmosphere pressure exert a pumping action on the vapors containing tritium in the joints, fractures, and contacts between ashflows, allowing tritium to escape from the open shaft in vapor phase during periods of barometeric lows.

Cuttings from the shafts piled on the land surface will also contain tritium associated with moisture. Evaporation from the cutting pile will distribute the tritium to the atmosphere. Dilution of tritium in the atmosphere will reduce concentrations to acceptable levels. An air sampler located a couple of hundred feet northwest of the three shafts failed to detect any increase in tritium concentrations during the month of December. The shafts were drilled during the period December 15 through 21, 1982.

There is no apparent reason why the shafts can not be used for the disposal of wastes. They meet the guidelines of December 10, 1980. I would recommend that as wastes are placed in the shaft, tuff from the cutting pile be dumped into the shaft to fill the void space between the waste--whether in boxes or barrels. This should be done as the wastes are added to the shaft.

WDP/pb

Cy: John Warren, H-7, MS E516
Don Mayfield, H-8, MS K490

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, H-7, MS J592

DATE: April 1, 1983

THRU: Wayne R. Hansen, H-8 Group Leader

MAIL STOP/TELEPHONE: K490/7-7952

FROM: W. D. Purtymun, H-8

SYMBOL: H8-83-225

SUBJECT: INSPECTION OF SHAFTS 154 AND 155, AREA G, TA-54

The two shafts are 3 ft in diameter and about 65 ft deep. They penetrate about 40 ft of Unit 2B and terminate about 25 ft into Unit 2A of the Tshirege member of the Bandelier Tuff. Both ashflows are of a moderately welded tuff.

Shaft 154 - The east wall of the shaft has a block and some minor horizontal layering at a depth of 26 ft. This may represent a contact between two ashflows within Unit 2B. An east-west joint at the surface dips north and intersects the north wall at 18 ft. The shaft is not straight but drifts off to the southeast as much as 1.5 to 2 ft in 65 ft.

Shaft 155 - There is a tuff blockout (wedge about 1 ft on a side) where two joints intersect within the east wall from the surface of the 3-ft shaft to a depth of about 22 ft. There are no other notable features in the shaft walls, which are smooth with few joints. The shaft is straight.

The shaft, to be used for disposal of packaged tritium wastes, will be cased with 30-inch CMP to help restrict the movement of tritium in the vapor phase as occurs at other shaft locations at Area G. The integrity of the casing will be tested by monitoring tubes between the casing and shaft wall while the integrity of the packaged tritium wastes (55-gal. drums with wastes encased in asphalt) will be monitored by tubes placed in the casing filled with the waste containers.

The shafts meet the guidelines for disposal of solid waste at Area G as outlined by memorandum H7-80-660, December 10, 1980.

WDP:les

Cy: John Warren, H-7, MS E516
Don Mayfield, H-8, MS K490

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: David Trujillo, ENG-2, MS M984 DATE: April 11, 1983

THRU: Wayne R. Hansen, H-8 Group Leader MAIL STOP/TELEPHONE: K490/7-7952

FROM: W. D. Purtymun, H-8 SYMBOL: H8-83-254

SUBJECT: TEST HOLES REQUESTED BY ENG-2 AT TA-55

Four test holes were drilled on March 16, 1983, to determine geologic conditions for the foundation design for the office addition PF-3, TA-55 (Lab. Job No. 664-55). The test holes were located north of BLDG PF-3 (see ENG Drawing SK-7176 for locations). Logs of the holes are as follows:

Test Hole No.	Elevation (ft)	Log (ft) Fill	Tuff
1	7981.2	0-7	7-12
2	82.0	0-7	7-12
3	82.0	0-6	6-12
4	82.0	0-5	5-7

The fill material consisted of soil and crushed tuff. It was quite wet (moisture content probably in excess of 20% by volume). The underlying rhyolite tuff is composed of quartz, sanidine crystal, and crystal fragments, a few rock fragments of latite and rhyolite in an ash matrix. The tuff penetrated by the test holes is also quite wet. The matrix of the tuff is dark gray and appears partly weathered from the excess moisture.

The test holes are in an area covered by asphalt. Excessive moisture in the fill and tuff penetrated by the test holes is the result of water that has infiltrated into the exposed fill north of Bldg. PF-2 and the retaining wall south fo Bldg. PF-6 (ENG Drawing SK-7176). The water has moved north in the fill under the asphalt. The asphalt cover prevents evaporation (drying out) from the fill and tuff penetrated by the test holes.

If we can be of further service, please call.

WDP/pb

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: R. L. Riedel, ENG-2, MS M984

DATE: May 3, 1983

FROM: W. D. Purtymun, H-8

MAIL STOP/TELEPHONE: K490/7-7952

SYMBOL: H8-83-307

SUBJECT: TEST HOLES, TRAILER REPLACEMENT FACILITY, BLDG MD-22, TA-54, L.J. 6867-54

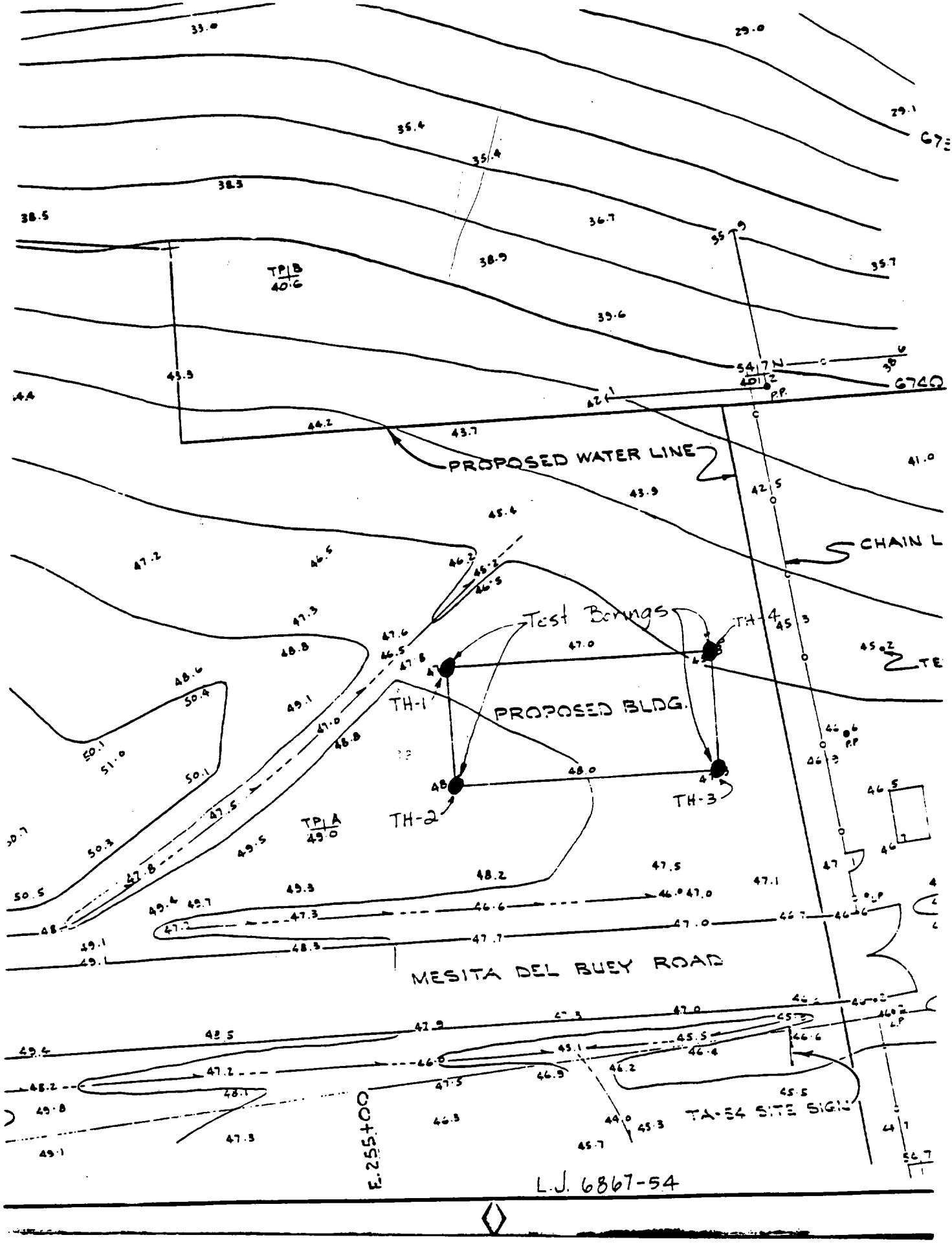
Four test borings were augered in the area of the proposed Bldg. MD-22 on May 2, 1983. The log of the holes were about the same except for the thickness of the soil zone. The soil zone was thin ranging from about 2 ft in test hole 1 to one ft or less in the other three test holes (see sketch for test hole location). The test holes penetrated 16 to 18 ft of Unit 2b of the Tshirege Member of the Bandelier Tuff. It is a moderately welded tuff composed of quartz and sanidine crystals and crystal fragments, a few small rock fragments of latite and rhyolite in a light gray ash matrix. The moderately welded tuff has a safe bearing capacity of 3000 to 5000 lbs/sq ft. The tuff has numerous joints and fractures most of which are vertical or near vertical. The joints or fractures will not be a problem.

In reference to a shaft as a drain field for a septic tank, a nearby test hole indicated the contact between Unit 2b and underlying Unit 2a at a depth of about 50 ft. I would locate the shaft as far as practical from the canyon rim. This will restrict any liquid in the shaft from moving to the canyon walls through either joints or the contact between ash flows. There should be no problem if you locate the shaft north of the proposed building as you indicated.

Enclosed is a copy of the design criteria for septic tank drain field (shafts).

WDP/pb

Enc. a/s


PROPOSED WATER LINE
CHAIN L
Test Borings
TH-1
TH-2
TH-3
TH-4
PROPOSED BLDG.
MESITA DEL BUEY ROAD
TA-54 SITE SIGN
E. 255+00
L.J. 6867-54

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: E. J. Hoth, ENG-2, MS M984

DATE: May 25, 1983

FROM: W. D. Purtymun, HSE-8 WDP. pb

MAIL STOP/TELEPHONE: K490/7-7952

SYMBOL: HSE8-83-358

SUBJECT: TEST BORINGS, TA-51, MAY 23, 1983

Four test borings were augered in the area of the proposed Environmental Research Laboratory (Ref. 11, L.J. 6629-51) and Environmental Science Center (Ref. 12, TA-51, L.J. 6651-51). The soil zone at the locations ranged from 2 to 3 ft in thickness. The soil is a light brown clay soil with a few rock fragments of latite and rhyolite. The soil zone is underlain by Unit 3 of the Tshirege Member of the Bandelier Tuff. Unit 3 is a moderately welded, light gray tuff. It is composed of quartz and sanadine crystals and crystal fragments, a few rock fragments of dark gray latite and rhyolite, and minor amounts of pumice in a light gray ash matrix. The moderately welded tuff has a safe bearing capacity of about 5000 lbs/sq. ft.

The soil zone in test hole 1 was about 3 ft thick; test hole 2, about 2.5 ft thick; test hole 3, about 3 ft thick; and test hole 4, about 2 ft thick. The test borings penetrated 20 to 21 ft of Unit 3, a moderately welded light gray tuff. The moisture content of the soil may be as much as 15% moisture by volume; however, the underlying tuff is quite dry, estimated at less than 5% moisture by volume.

The test borings encountered no anomalies either in the soil or the tuff that would effect the foundation design. Location of the test holes is shown on the attached figure 1.

WDP/pb

Att. a/s

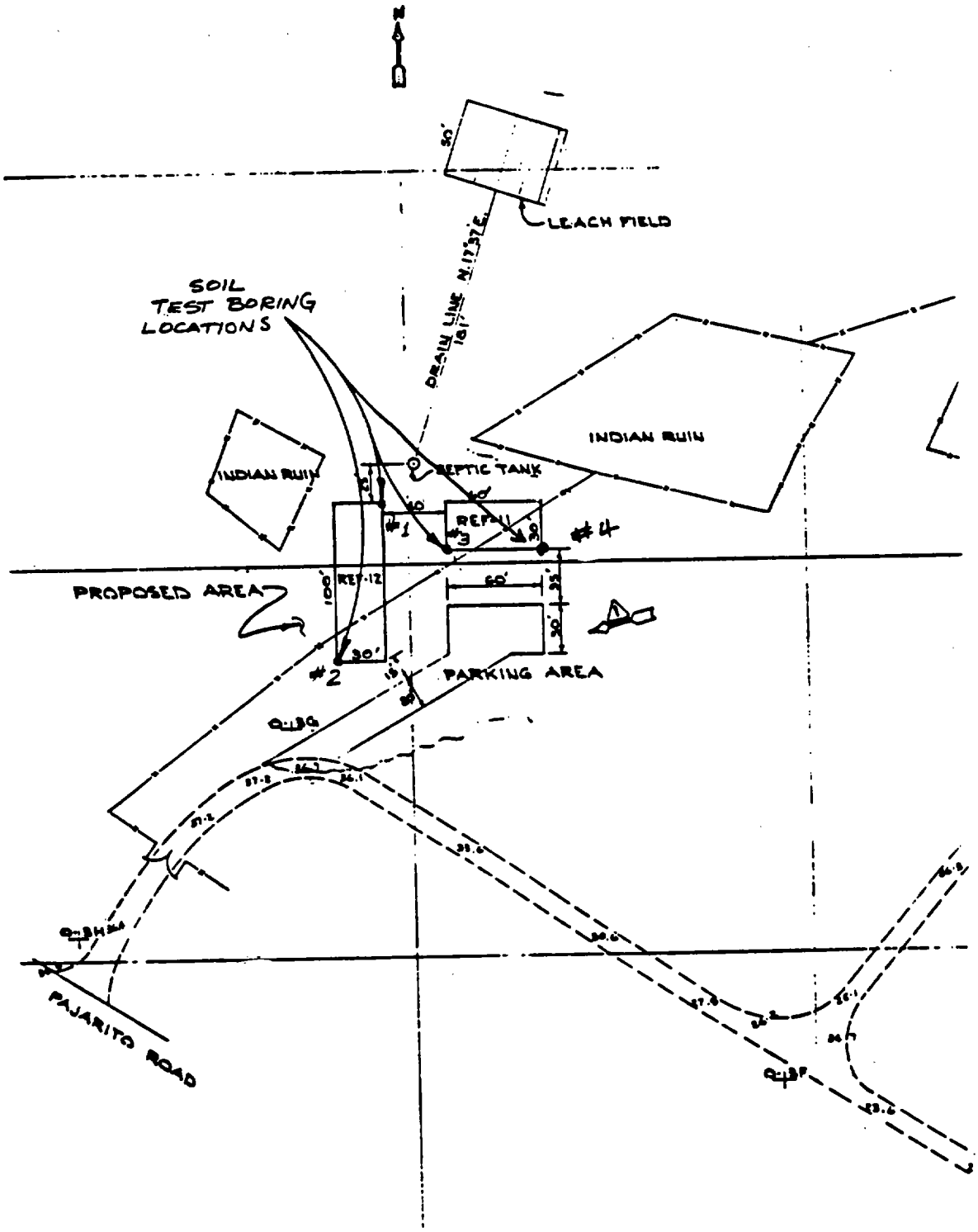


Fig. 1 Location of Test Borings at TA-51, May 23, 1983

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO David Trujillo, ENG-2, M984

DATE August 3, 1983

FROM W. D. Purtymun, HSE-8

MAIL STOP/TELEPHONE K490, 7952

SYMBOL

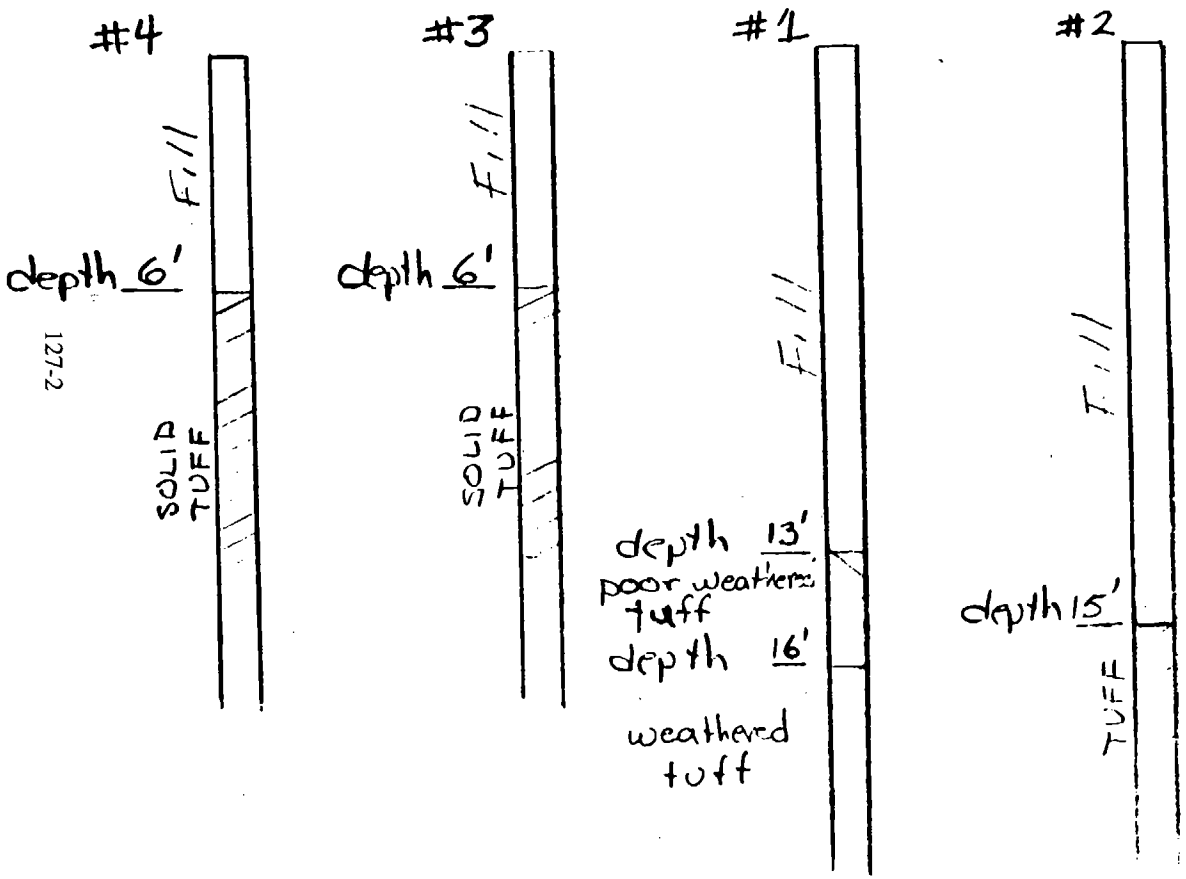
SUBJECT HSE8-83-530

TEST BORINGS AT TA-35

Attached is location and logs of test borings at proposed addition to Bldg. TSL-85, TA-35.

7/19/83 dwt

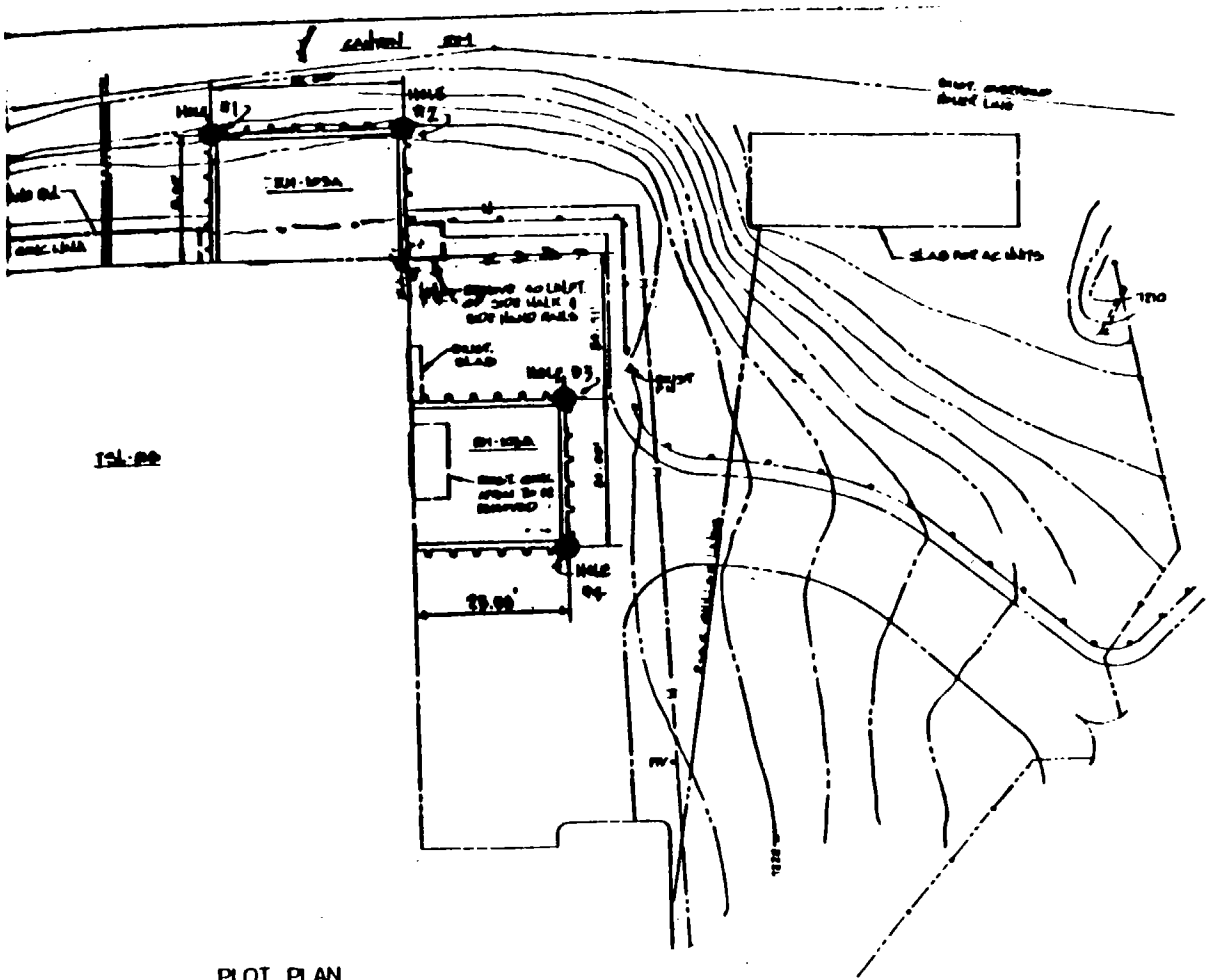
All depths vertically down from hub next to hole



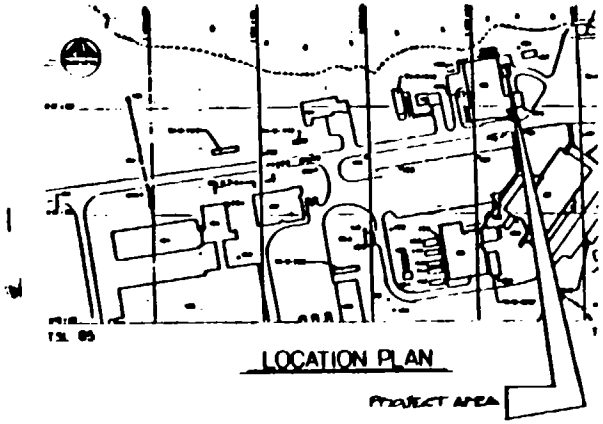
SEE ATTACHED CIVIL PLOT PLAN FOR LOCATION OF TEST HOLES

BORINGS BY PURTYMUN HSE.

127-2



PLOT PLAN
SCALE 1"=10'



LOCATION PLAN

LEGEND

EXIST CONST
NEW CONST
CONST. TO BE REMOVED

TEST HOLE LOCATION

THIS JOB MUST BE INSPECTED AND ANY CHANGES APPROVED BY _____
PHONE: _____

Los Alamos

KRYPTON FLUORIDE PROJECT

CIVIL PLOT PLAN & LEGEND

TA-33

DEPARTMENT OF ENERGY

C-2

7272-35

ENG-C44221

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Dick Crombie, ENG-11 Group Leader, MS M701 DATE August 19, 1983

FROM W. D. Purtymun, HSE-8 MAIL STOP/TELEPHONE: K490/7-7952

SYMBOL HSE8-83-550

SUBJECT LOG OF TEST HOLES IN CANADA DEL BUEY

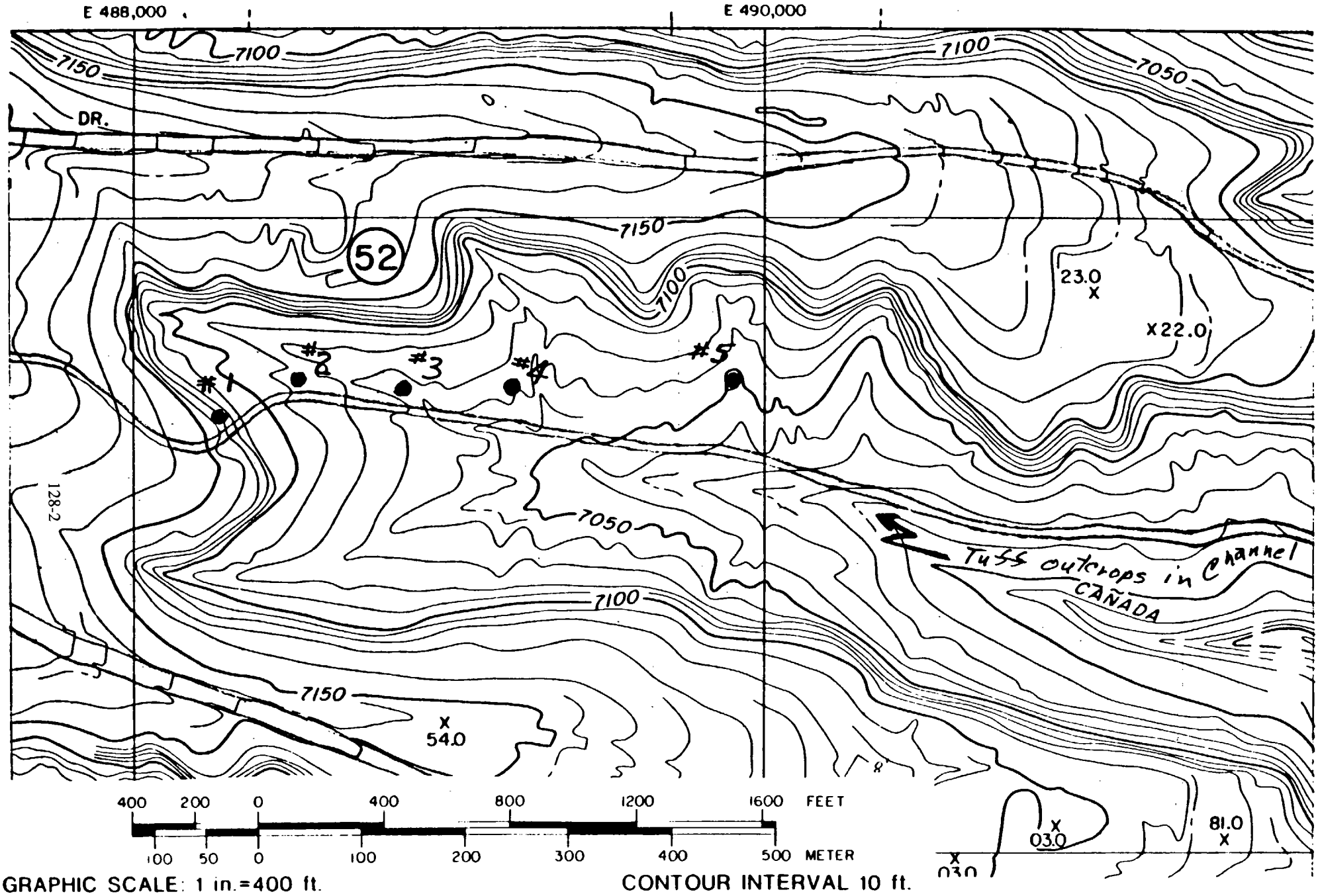
	(feet) From	To
Test Hole 1		
Soil and weathered tuff	0	12
Tuff, light gray, non-to-moderately welded	12	17
Test Hole 2		
Soil and weathered tuff	0	22
Tuff, light brown, non-to-moderately welded, weathered	22	27
Test Hole 3		
Soil and weathered tuff	0	22
Tuff, light brown, non-to-moderately welded, weathered	22	27
Test Hole 4		
Soil and weathered tuff	0	9
Tuff, light gray, non-to-moderately welded	9	12
Test Hole 5		
Soil and weathered tuff	0	7
Tuff, light gray, non-to-moderately welded	7	12

Attached is a map showing the location of the test holes. East of Test Hole 5 the tuff is exposed in the channel. The material logged as soil and weathered tuff may be used for fill material. The underlying tuff non-to-moderately welded may also be considered for fill material. It is only slightly consolidated and does contain some weathered clay, especially in the head of the canyon. Samples were collected for compacted permeabilities as requested by Jim Hewitt. I understand he will have the test made by a commercial laboratory.

WDP:pb

Att: a/s

Cy: Jim Hewitt, Holmes and Narver, ENG-11, MS M701



Location of Test Holes in Upper Cañada del Buey

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Welton Smith, ENG-1, MS-M713

DATE: August 22, 1983

FROM: W. D. Purtymun, HSE-8

MAIL STOP/TELEPHONE: K490/667-7952

SYMBOL: HSE8-83-564

SUBJECT: TEST HOLES FOR PERCOLATION TESTS

Three holes were augered northwest of the Environmental Science Center (TA-51) in the area of the drain field for the center. The holes encountered the same lithologic section.

	(ft) From	To
Soil, dark brown, clayey	0	1
Tuff, light gray, moderately welded, quartz and sanidine crystals and crystal fragments, small rock fragments of latite and rhyolite in a light gray ash (A single ashflow, Unit 3)	1	52

A single hole was augered at the site for the Administration Building at Area G (TA-54). The hole encountered two ashflows, Upper Unit 2B and Lower Unit 2A of the Tshirege Member of the Bandelier Tuff.

	(ft) From	To
Soil, brown clayey	0	1
Tuff, light gray, moderately welded, few rock fragments of latite, quartz and sanidine crystals in a light gray ash matrix (Unit 2B)	1	37
Tuff, light pinkish gray, moderately welded, few rock fragments of latite and rhyolite, gray pumice, quartz and sanidine crystals in an ash matrix Unit 2A)	37	52

The hole is located about 40 ft west of the northwest corner of the fence.

WDP:mlk

xc: Price Fernon, ENG-2, MS M984

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: R. L. Riedel, ENG-2, MS M984

DATE: August 24, 1983

FROM: W. D. Purtymun, HSE-8 WDP

MAIL STOP/TELEPHONE: K490/7-7952

SYMBOL: HSE8-83-570

SUBJECT: TEST BORINGS, CHEMICAL SURETY MATERIALS FACILITY, SM-29, TA-3, L.J. 6862-3

Seven test holes were drilled on the west side of Bldg. SM-29 south of Wing 1 (Fig. 1). The bedrock (tuff) is exposed in the area. Only a thin section (generally less than 1 ft) of gravel and soil was encountered overlying the tuff. The tuff penetrated by the holes was a single ashflow. The tuff is moderately welded, light pinkish gray, with quartz and sanidine crystals and crystal fragments, a few small rock fragments of gray latite and pumice in an ash matrix. The depth of the test holes is as follows:

	Depth (ft)
TH-1	22
TH-2	17
TH-3	12
TH-4	22
TH-5	22
TH-6	22
TH-7	22

The holes did not encounter any anomalies in the tuff.

Three test holes were drilled on the west side of Bldg. 29 south of Wing 4 (Fig. 2). The location of the holes is in the area between the building and the parking lot. There is some roof drainage into this area resulting in a greater zone of weathering and greater than normal moisture content of the soil and tuff. The log of the three test holes is as follows:

	(Ft) From	To
TH-8		
Soil or fill, brown, clayey, wet	0	4
Tuff, brown, weathered, wet	4	7
Tuff, light pinkish gray, moderately welded	7	22

TH-9		
Soil or fill, brown, clayey, wet	0	5
Tuff, brown, weathered, wet	5	8
Tuff, light pinkish gray, moderately welded	8	22
TH-10		
Soil or fill, brown, wet	0	5
Tuff, light brown, weathered, wet	5	7
Tuff, light pinkish gray, moderately welded	7	22

WDP:les

Attachment: Figs. 1 and 2

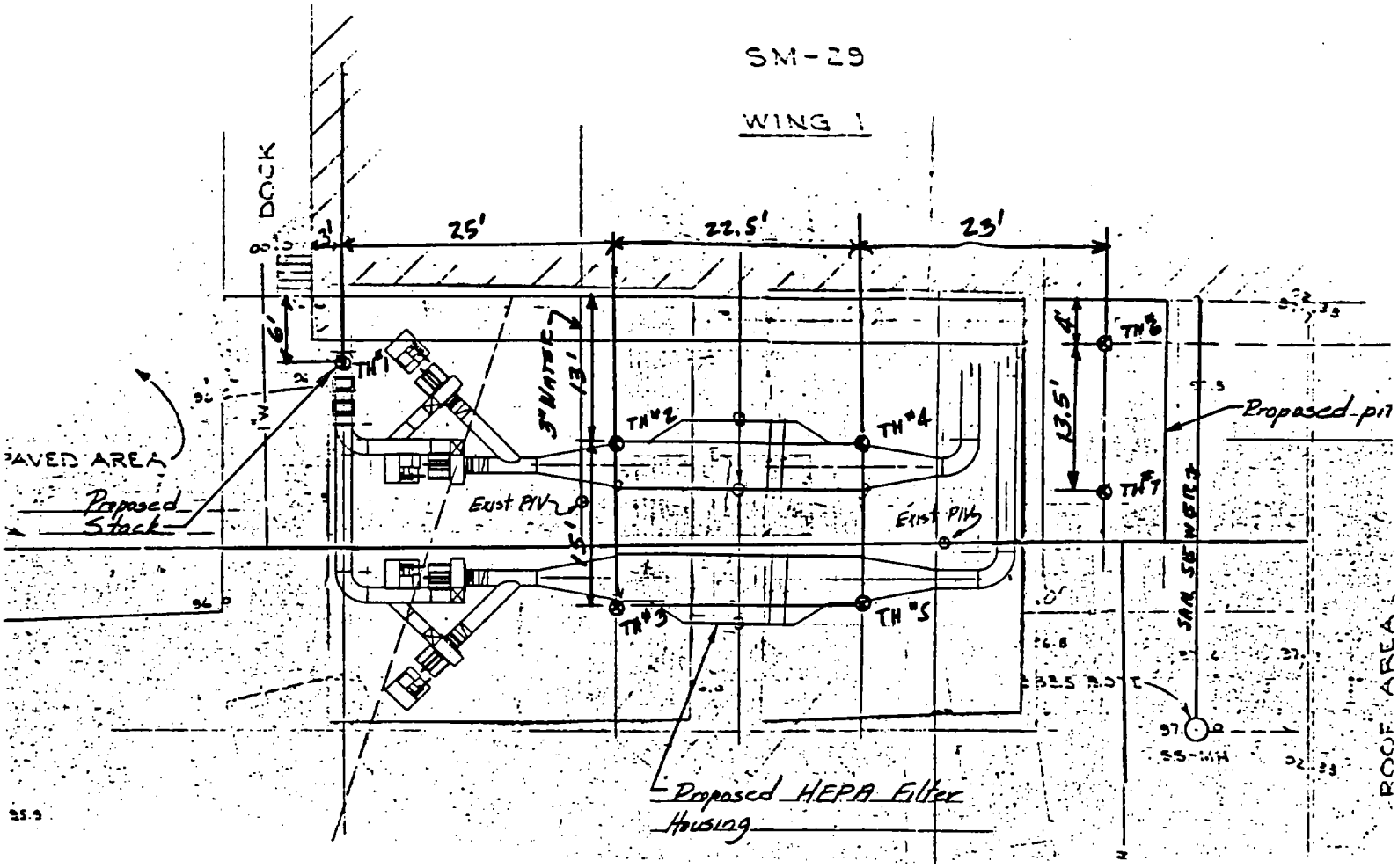


Fig. 1 Location of Test Holes 1 through 7, south of Wing 1, SM-29

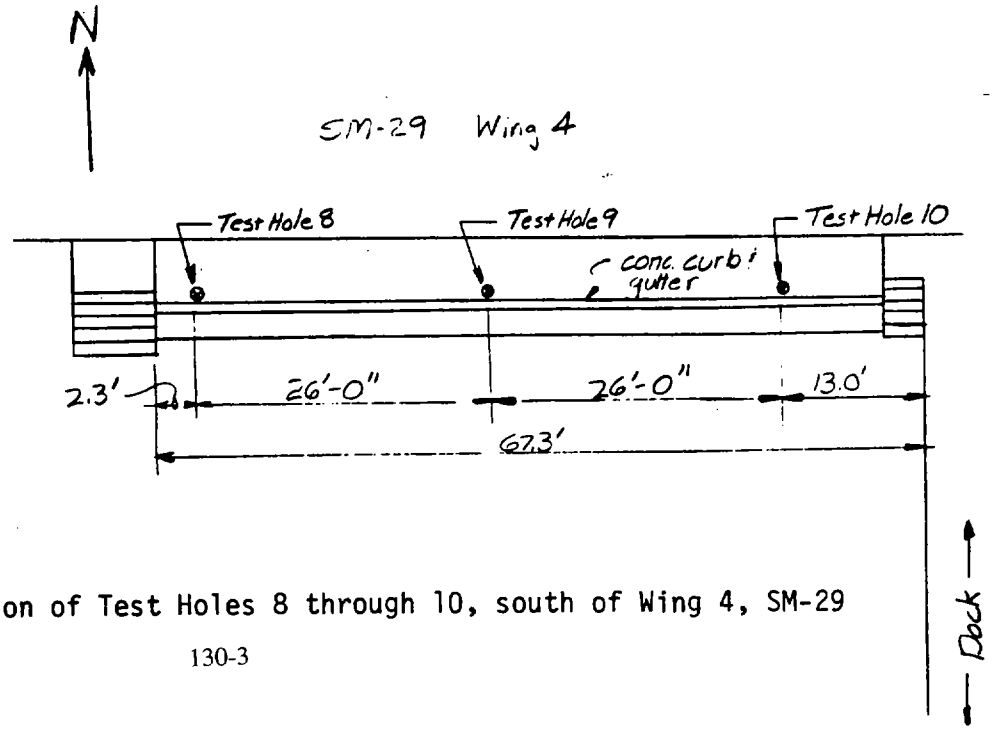


Fig. 2 Location of Test Holes 8 through 10, south of Wing 4, SM-29

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Merle Bunker, CNC-5 Group Leader, MS G766 DATE: July 25, 1983

THRU: Wayne R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/75021

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-83-513

SUBJECT: STABILITY OF ROCKS ON WALLS AND SLOPES OF LOS ALAMOS CANYON ABOVE TA-2

A reconnaisance was made of the north wall of Los Alamos Canyon above the site on May 26, 1983. The reconnaissance was made at the request of A. Lyle, CNC-5. The last inspection of the slope was made on September 21, 1982 (H8-82-485). Since the last inspection was made, no rocks have lodged in the rock catchers or in the security fence. There has been no movement of rocks or rock falls on the slope.

The inspection of the slope failed to detect any rocks that are unstable; however, there appears to be a number of blocks along the canyon rim that are potential for rock fall. If rocks should dislodge, the slope below the cliff face (most unstable area), rock catchers, and security fences above the buildings should prevent the rocks from causing any damage.

The north wall of the canyon was photographed in early June by IS-7 (Neg. No. CN 8303121 through CN 8303130). The photos are in color and are on file with A. Lyle CNC-5. They were taken from the access road south of the stream and are overlapping views from west to east. The pictures document the upper rim of the canyon, the area for potential rock fall. The pictures are to be used for comparison with future inspections.

WDP/pb

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Richard Crombie, ENG-11 Group Leader, MS M701 DATE: September 14, 1983

THRU: W. R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/667-7952

FROM: W. D. Purtymun, Don Van Etten & Naomi Becker SYMBOL: HSE8-83-608

SUBJECT: PROPOSED BARROW PIT IN MORTANDAD CANYON

To facilitate long-range plans for the Laboratory, Robert Turner, ENG-11, informally requested in September 1981 that HSE-8 consider locating a barrow area for a large volume of fill material to be used in construction at the Laboratory. The past source of fill material located south of Pajarito Acres in Potrillo Canyon had been depleted.

One possible location that could furnish a large volume of fill material proposed to ENG-11 was in lower Mortandad Canyon. The area was visited with ENG-11 and a preliminary study was made in October 1981. ENG-11 placed no time constraints upon completion of the study. The purpose of this report is to document the study that was made in the canyon.

If the proposed barrow area discussed in the attached report is to be considered for use at any time in the future, it is necessary to protect this resource by rehabilitating the existing infiltration tank and constructing a second tank immediately.

WDP:mlk

Attach: Report on proposed barrow pit in Mortandad Canyon

Cy: Robert Turner, ENG-11, MS M701

GEOLOGIC DESCRIPTION OF THE PROPOSED BARROW AREA IN MORTANDAD CANYON

Summary:

The fill material in Mortandad Canyon is a sand with mixed with silt and clay. In the study area there is a volume of about 170 x 10^3 yds^3 of fill material available in the upper 9 yds of the canyon bottom. An additional 3 x 10^6 yds^3 of fill material are probably available in the canyon east of the study area. About 2.5 miles of existing road will have to be repaired or improved or a new road about 0.5 miles in length be constructed to connect with paved road in Sandia Canyon. The latter is recommended. Of immediate concern is if this reach of Mortandad Canyon is to be used as a barrow area the tank to retain runoff west of barrow area should be rehabilitated (remove sediments) and enlarged and a second tank constructed. The retention of storm runoff west of the proposed barrow area is necessary to prevent contamination of the fill material by transport and dispersion of contaminated sediments from the midreach of Mortandad Canyon, which receives treated radioactive liquid wastes from the industrial treatment plant at TA-50.

I. INTRODUCTION

Mortandad Canyon is one of the many long, narrow, southeast trending canyons that is cut into the Bandelier Tuff.[1] The Bandelier Tuff forms the upper surface of the Pajarito Plateau. Mortandad Canyon heads on the western edge of the Pajarito Plateau and is tributary to the Rio Grande to the east (Fig. 1).

Liquid industrial effluents from the Waste Treatment Plant at TA-50 are released into the midreach of Mortandad Canyon. The treated effluents contain trace amounts of radionuclides.[2] The effluents, some waste water, and occasional storm runoff maintain surface flow in a

short reach of the canyon. The surface flow recharges a small body of shallow ground water in the alluvium below the effluent outfall from TA-50. The concentrations of radionuclides in the effluent, waste water, storm runoff, and shallow aquifer are reduced by ion exchange and adsorption with fine materials in the alluvium. A high "build-up" of radioactivity in the alluvium near the effluent outfall does not occur as the radionuclides in the alluvium are transported and dispersed down the canyon by storm runoff. The distance of the transport and dispersion of radionuclides is limited to within the Laboratory area. This is because the small drainage area of the canyon does not produce a large volume of runoff and there is a large volume of unsaturated alluvium to adsorb the runoff when it does occur.[3]

A. Location of Barrow Area

The barrow pits are located east of the area contaminated by the transport of radionuclides by storm runoff. Test holes drilled in the alluvium of the canyon indicate that the alluvium underlying the barrow area does not contain perched water.[3] The eastern limits of the shallow ground perched in the alluvium occurs about 2500 ft west of the proposed site. The western extent of the barrow area is at or near the area of contamination transported by storm runoff, while the eastern edge extends down the canyon to the Laboratory boundary, which is with the Sacred Land of San Ildefonso Pueblo. The area investigated is at the eastern edge of the contaminated area.

II. OCCURRENCE OF ALLUVIUM

The use of alluvium in the canyon is proposed for the fill material. The alluvium in the canyon is derived from weathering of the Bandelier Tuff. It is composed of two units: an upper sand unit about 20 ft thick that was formed by mechanical erosion of the tuff, and a lower sandy clay unit that is a section of tuff that has weathered in place.[1]

The upper sand unit is composed of gravels, sand, silt and clays, while the underlying sandy clay unit contains a slightly larger percentage of silts and clay. In general, the silt and clay portion of the alluvium is small, less than 10% by weight in the upper sandy clay unit. A typical particle size distribution for the upper sand unit is as follows:

Grade	Size Range (mm)	Distribution (Per cent by Weight
Granules	2.36 - 3.96	5.5
Very Coarse Sand	1.17 - 2.36	22.5
Coarse Sand	0.589 - 1.17	42.5
Medium Sand	0.245 - 0.589	16.5
Fine Sand	0.147 - 0.293	5.5
Very Fine Sand	0.074 - 0.147	1.5
Silt and Clay	- 0.074	6.0

The alluvium consists of very few boulders, cobbles, and pebbles of rhyolite tuff intermixed with sand, silts and clay. The sand consists mainly of medium to very coarse grained crystals, crystal fragments of quartz and sanidine, and fragments of rhyolite tuff. There are very few small rock fragments of rhyolite, latite, and dacite that were incorporated within the ashflow that has weathered to form the alluvium.

The alluvium increases in thickness downgradient in the canyon. At observation Well MCO-9 the upper sand unit is 20 to 25 ft thick underlain by a lower sand clay unit that is over 40 ft thick. At MCO-10 the upper sand unit is about 20 ft thick underlain by over 60 ft of the sand clay unit. In the lower part of the canyon at the Laboratory boundary, seismic data confirmed by a test hole indicates the alluvium (upper sand and lower sand clay unit) is about 120 ft thick.[2] Physical and hydrologic characteristics of the fill material are being determined by an outside

contractor. The results will be tabulated and transmitted as soon as results are received.

A. Monitoring Dispersion of Radionuclides by Storm Runoff

Hydrologic studies began in Mortandad Canyon in November of 1960. Since that time there has been no runoff to transport radionuclides out of the canyon (disposal area) onto the Sacred Area (Fig. 1). The major transport of radionuclides has occurred and terminated west of the Sacred Area. It is within this area that contains no transported radionuclides that the location of the barrow pit is proposed.

1. Radionuclides in Sediments 1978 and 1981. The major radionuclides released with the effluents into Mortandad Canyon from the treatment plant at TA-50 are ^{238}Pu, ^{239}Pu, and ^{137}Cs. These radionuclides are bound to the sediments in the stream channel. These sediments in the reach of effluent flow in the canyon are further transported and dispersed by storm runoff.[4] One of the largest runoff events that has occurred in the canyon was late November 1978 and was about 102 ft^3/sec at the gaging station near the effluent outfall. The event was preceeded by several days of snow and rain that saturated the channel, causing the largest of the number of events to flow and transport contaminated sediment to near MCO-9 (Fig. 2).

A survey was made of the sediments in the canyon on December 4, 1978 to determine the extent of the transport and dispersion of the radionuclides in the suspended and bed sediments. The survey was made by collecting sediment samples every 300 ft down the channel to the Laboratory boundary with the Sacred Land. The samples were analyzed for ^{238}Pu, ^{239}Pu, and ^{137}Cs (Table I). The results of the analyses indicated that transport of Pu and Cs ended between Stations 14 and 15. Based on regional soil sample fallout concentrations, background ^{238}Pu is 0.008 pCi/g; background ^{239}Pu is 0.028 pCi/g; and background ^{137}Cs is 0.92 pCi/g.[4] The ^{238}Pu at Stations 14 and 5 is at fallout levels (0.008 pCi/g). The ^{239}Pu at Station

14 (0.099 pCi/g) and at Station 15 (0.049 pCi/g) is slightly elevated when compared to fallout levels (0.028 pCi/g). The ^{137}Cs concentrations decrease from 0.43 pCi/g at Station 14 to 0.26 pCi/g at Station 15. These concentrations are below fallout levels of 0.92 pCi/g.

A second survey was made in October 1981 where sediment samples were collected and analyzed for ^{137}Cs and gross gamma (Table I). The results of the analyses indicate only minor amounts of ^{137}Cs east of Station 14, most at or slightly above the background level of 0.92 pCi/g.

Based on the two surveys (1978 and 1981) the transport of contaminated sediments by storm runoff ended between Station 14 and Station 15.

2. In-Situ Radionuclide Survey. An in-situ survey was made of sediments in the area (grid area shown Fig. 1) by laying out a detailed grid (Fig. 3). The in-situ measurements are calculated by assuming a uniform distribution of radionuclides with depth. The stations in the grid are laid out on 83 ft centers (25 m). The in-situ gamma spectra were taken at the 17 grid stations with an intrinsic germanium detector operated from the HSE-8 Environmental Surveillance van. Samples of sediment to a depth of 5 cm were taken at 9 of the 17 grid stations and analyzed in the laboratory for ^{137}Cs. The in-situ gamma specra was used to determine the ^{137}Cs surface concentrations, which was compared to the results of analyses in the laboratory (Table II). The in-situ and analytical measurements for ^{137}Cs are indicative of the transport of contaminants by storm runoff.

Four of the in-situ ^{137}Cs measurements (A-6, C-6, D-6, and F5.5) were slightly above background levels of 0.92 pCi/g. The location of these samples are near the toe of the talus slope along the north side of the canyon. They are above the braided channel that would carry the storm runoff. Samples analyzed in the laboratory from grid locations A-3, A-6, C-2, and C-6 contained concentrations of ^{137}Cs slightly above background

levels (Table II). There is slight correlation between the in-situ measurement and laboratory analyses.

There appear to be some slightly elevated concentrations of ^{137}Cs in the in-situ and laboratory analyses; however, the concentrations are not exceedingly high and are of such low concentrations that they do not appear to be associated with transported contamination in the channel. In-situ measurement in the channel at Station 8 and near Station 12 were 11.4 and 4.9 pCi/g, respectively. The sediments at these stations reflect transport of contaminated sediments in the disposal area.

3. Test Holes in Grid Area. Thirteen test holes were drilled in a grid area of 420 ft square (Fig. 4). The depth of the holes ranged from 28 to 48 ft (Table III). All but two of the holes were completed in alluvium or weathered tuff (sediment). Two holes located near the northern edge of the canyon below the cliff (Hole A-7 and F-6) penetrated 10 and 8 ft of unweathered tuff, respectively (Table III).

The cutting from the upper section of the test holes (0-3 ft and from 3 to 8 ft) were analyzed for ^{137}Cs and gross gamma activity (Table IV). The ^{137}Cs and gross gamma activity in the cutting were at or near limits of detection and were well below background levels (0.92 pCi/g) for surface soil.

III. VOLUME OF ALLUVIUM

The volume of alluvium in the canyon that can be removed for fill material is computed for the grid area and estimated for a portion of the canyon.

The grid area contains about 168 x 10^3 yd^3 (cubic yards) of fill material based on the area (18.7 x 10^3 yd^2) and depth of the test holes (9 yds). An additional 168 x 10^3 yd^3 would be available if excavation can be made to a depth of 18 yds.

The barrow pit can be extended east of the grid area for 700 yds (2100 ft). Based on a width of 140 yds (~420 ft) and an average depth of 18 yds (54 ft) about 1.8×10^6 yds^3 of fill material would be available. There is probably an additional 1×10^6 yds^3 of fill material east of this area to the Laboratory and Sacred Area boundary.

IV. DEVELOPMENT OF THE BARROW AREA

An archaeology survey was made of the area in July 19~~75~~62. The only cultural resource recorded as LA-30638 is located southwest of the grid area (See Appendix A). Recommendations are made to preserve this site within A.

Development of the barrow area should be made systematically. In view of possible transport of contaminates into the area by exceeding the large runoff event, the existing infiltration tank in the canyon west of the grid area should be rehabilitated and a second tank added. <u>If the proposed barrow area is to be considered, to protect this resource this work should be done immediately</u>. Rehabilitation of the existing tank entails removal of sediments that have collected in the tank and enlarge it slightly. A second tank should be constructed east of the present tank (downgradient) in the canyon. The purpose of the infiltaration tanks is to impound runoff in order to allow infiltration of the runoff into the thick section of unsaturated alluvium (over 40 ft) and retain suspended sediments containing radionuclides as previously discussed.

At the grid area, about 0.5 to 1 ft of sediments should be removed from the braided channel area and used to build a dike in the low channel west of the grid area. This would prevent any local or runoff in the canyon west of the proposed grid area from entering the barrow pit.

Transport of material from the barrow area could be on the existing road that is located on the mesa south of Mortandad Canyon. It joins

Pajarito Road east of TA-52. The road is quite primitive and will have to be improved. The length of this unimproved road is 2.5 miles. It is recommended that a road from the barrow area be constructed over the low mesa to the north of the proposed barrow area, connecting to the paved road in Sandia Canyon (the Laboratory Truck Route). This results in a shorter road construction (0.5 miles) and would result in equal or shorter haul for the fill material if used in the TA-3 area.

References

1. E. H. Baltz, J. H. Abrahams, and W. D. Purtymun, "Preliminary Report on the Geology and Hydrology of Mortandad Canyon near Los Alamos, New Mexico with Reference to Disposal of Liquid, Low-Level Radioactive Wastes," U.S. Geol. Survey Open-File Report (1962).

2. W. D. Purtymun, "Dispersion and Movement of Triutium in a Shallow Aquifer in Mortandad Canyon at the Los Alamos Scientific Laboratory," Los Alamos Scientific Laboratory report LA-5716-MS (1974).

3. W. D. Purtymun, W. R. Hansen, and R. J. Peters, "Radiochemical Quality of Water in the Shallow Aquifer in Mortandad Canyon 1967-1978," Los Alamos National Laboratory report LA-9675-MS (1983).

4. Environmental Surveillance Group, "Environmental Surveillance at Los Alamos during 1982," Los Alamos National Laboratory report LA-9762-ENV (1983).

TABLE I

RADIOCHEMICAL ANALYSES OF SEDIMENTS
(Results in pCi/g except as noted)

Station	December 4, 1978			October 28, 1981	
	^{238}Pu	^{239}Pu	^{137}Cs	^{137}Cs	Gross Gamma*
6	0.352±0.036	0.365±0.036	9.40±1.40	---	---
7	0.269±0.030	0.376±0.038	8.00±1.20	---	---
8	0.194±0.024	0.289±0.032	5.40±0.80	---	---
9	0.259±0.026	0.230±0.024	8.80±1.20	---	---
10	0.149±0.020	0.231±0.042	6.90±1.00	---	---
11	0.153±0.020	0.322±0.034	4.30±0.60	7.50±0.60	6.6±0.26
12	0.125±0.018	1.280±0.100	0.67±0.10	6.80±0.60	8.1±0.24
13	0.026±0.006	0.104±0.018	0.89±0.28	6.50±0.60	12.0±0.34
13A	---	---	---	2.70±0.32	15.0±0.38
14	0.002±0.004	0.099±0.018	0.43±0.16	0.45±0.16	13.0±0.34
14A	---	---	---	1.70±0.24	15.0±0.36
15	0.001±0.004	0.049±0.014	0.26±0.08	0.82±0.18	13.0±0.34
15A	---	---	---	1.30±0.26	13.0±0.34
16	---	---	0.60±0.12	0.64±0.16	5.7±0.26
16A	---	---	---	0.29±0.14	4.5±0.24
17	---	---	0.59±0.32	0.95±0.12	4.8±0.24
18	---	---	0.72±0.20	0.72±0.14	4.6±0.24
19	---	---	0.75±0.16	---	---
20	0.000±0.002	0.021±0.008	0.43±0.26	---	---
21	---	---	0.34±0.08	---	---
22	---	---	0.23±0.16	---	---
23	---	---	0.50±0.16	---	---

*No. of counts per minute/g (NCPM/G)

Note: ± value represents twice the uncertainty term for that analysis.

TABLE II

CESIUM-137 SURVEY OF AREA
(pCi/g)

	In-Situ	Laboratory Analysis*
A-1	0.47±0.08	---
A-2	0.36±0.08	0.41±0.06
A-3	0.46±0.08	1.09±0.12
A-4	0.43±0.08	---
A-5	0.45±0.08	1.36±0.12
A-6	1.25±0.14	2.83±0.36
A-7	0.37±0.08	---
B-3	0.42±0.08	0.50±0.10
B-5	0.49±0.08	0.18±0.04
C-2	0.45±0.08	1.32±0.18
C-4	0.45±0.08	0.91±0.16
C-6	1.29±0.14	2.33±0.14
D-5	0.50±0.08	---
D-6	1.23±0.14	---
E-7	0.78±0.14	---
F-5.5	1.06±0.14	---
F-6	0.65±0.12	---

*Depth 0-5 cm analysis in Lboratory

Note: ± value represents twice the uncertainty term for that analysis.

TABLE III

LOG OF TEST BORINGS

Hole Number	Depth (ft) Alluvium or Weathered Tuff (Brown)	Depth (ft) Unweathered Tuff (Gray)
A-1	0 - 28	---
A-4	0 - 48	---
A-7	0 - 18	18 - 28
B-2	0 - 28	---
B-6	0 - 28	---
C-3	0 - 28	---
C-5	0 - 28	---
D-4	0 - 28	---
E-3	0 - 28	---
E-5	0 - 28	---
F-2	0 - 28	---
F-4	0 - 28	---
F-6	0 - 20	20 - 28

TABLE IV

CESIUM-137 IN CUTTINGS FROM TEST HOLE
(pCi/g)

Test Hole	Depth (ft) 0 - 3	3 - 8
A-1	0.09±0.18	0.15±0.10
A-4	0.15±0.14	0.02±0.20
A-7	0.18±0.12	0.10±0.16
B-2	0.04±0.06	0.05±0.04
B-6	0.05±0.06	0.06±0.06
C-3	0.05±0.06	0.08±0.04
C-5	0.01±0.04	0.03±0.10
D-4	0.15±0.06	0.01±0.08
E-3	0.14±0.20	0.03±0.12
E-5	0.07±0.08	0.13±0.16
F-2	0.07±0.10	0.01±0.08
F-4	0.06±0.06	0.06±0.08
F-6	0.09±0.08	0.02±0.14

Note: ± value represents twice the uncertainty term for that analyses.

TABLE V

GROSS GAMMA IN CUTTINGS FROM TEST HOLES
(NCPM/G)

Test Hole	Depth (ft) 0 - 3	3 - 8
A-1	8.0±0.28	6.8±0.26
A-4	4.8±0.24	5.2±0.24
A-7	7.4±0.28	7.4±0.28
B-2	3.9±0.24	7.5±0.28
B-6	3.8±0.24	4.6±0.24
C-3	7.0±0.26	7.4±0.28
C-5	4.3±0.24	5.8±0.26
D-4	7.2±0.28	5.5±0.26
E-3	6.8±0.13	7.7±0.28
E-5	4.3±0.12	5.1±0.24
F-2	9.2±0.15	8.1±0.28
F-4	4.3±0.12	4.2±0.24
F-6	8.5±0.14	5.7±0.26

Note: ± value represents twice the uncertainty term for that analysis.

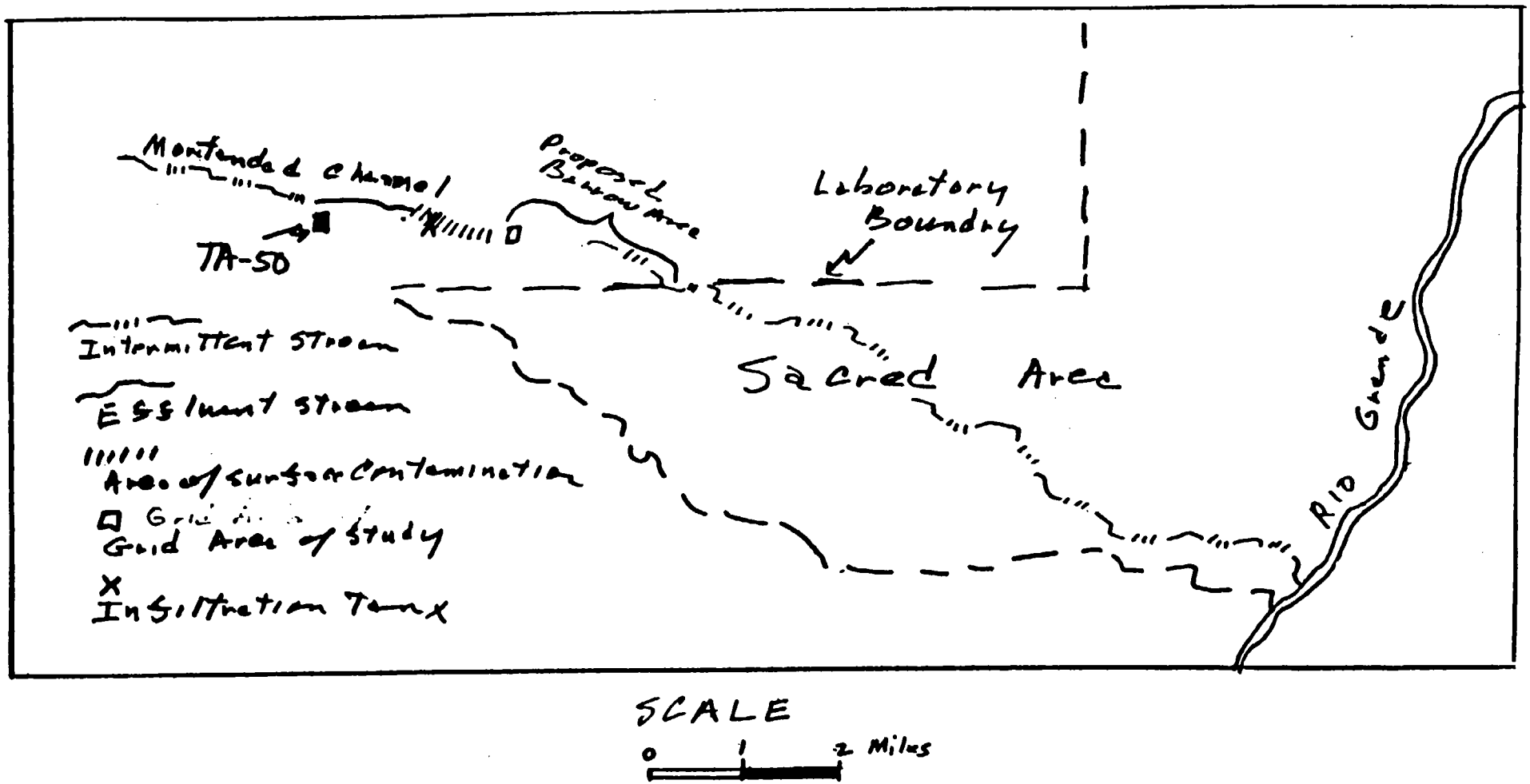


Figure 1.– Sketch Map Showing Location of Proposed Borrow Area

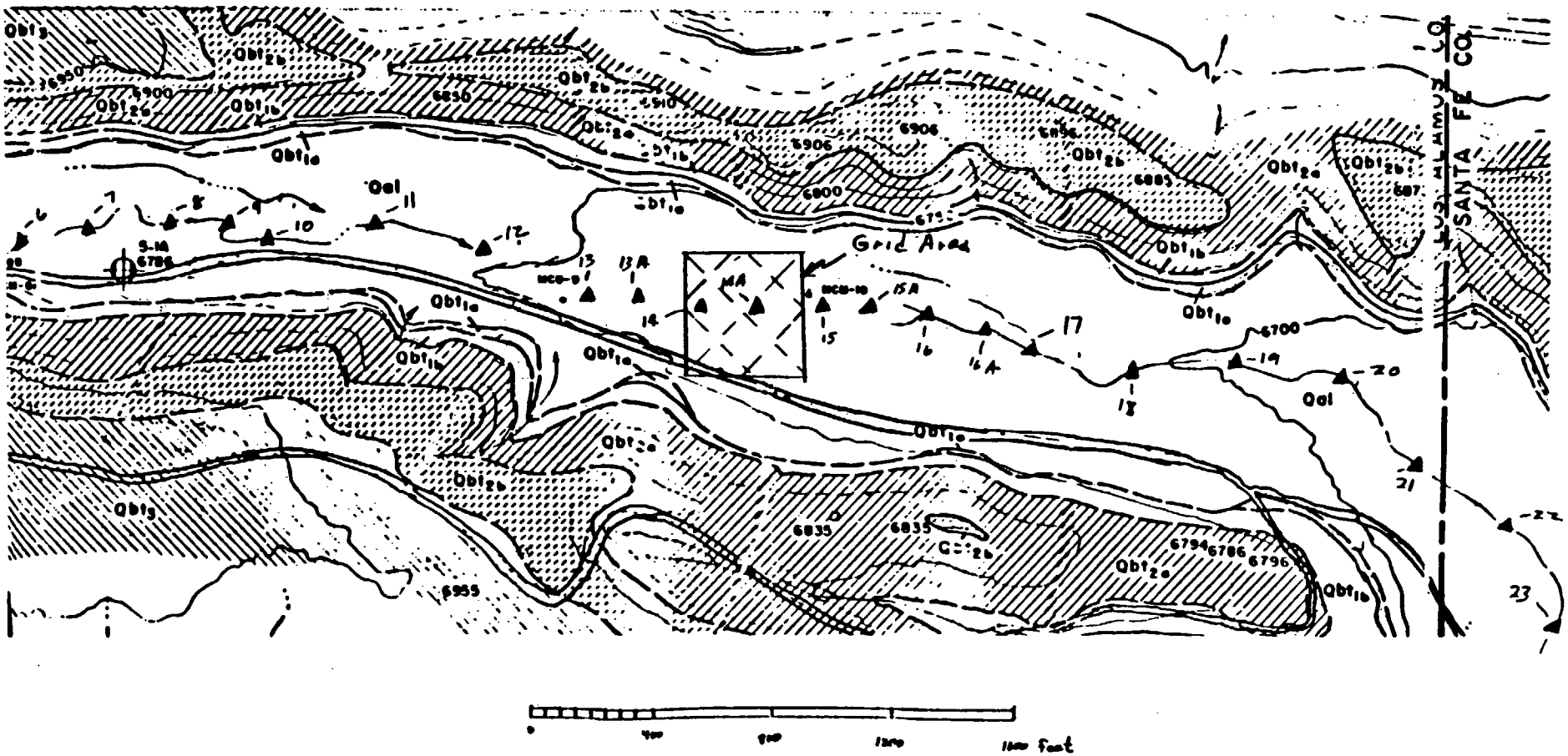


Figure 2- Location of Sediment Stations, 1978 and 1981

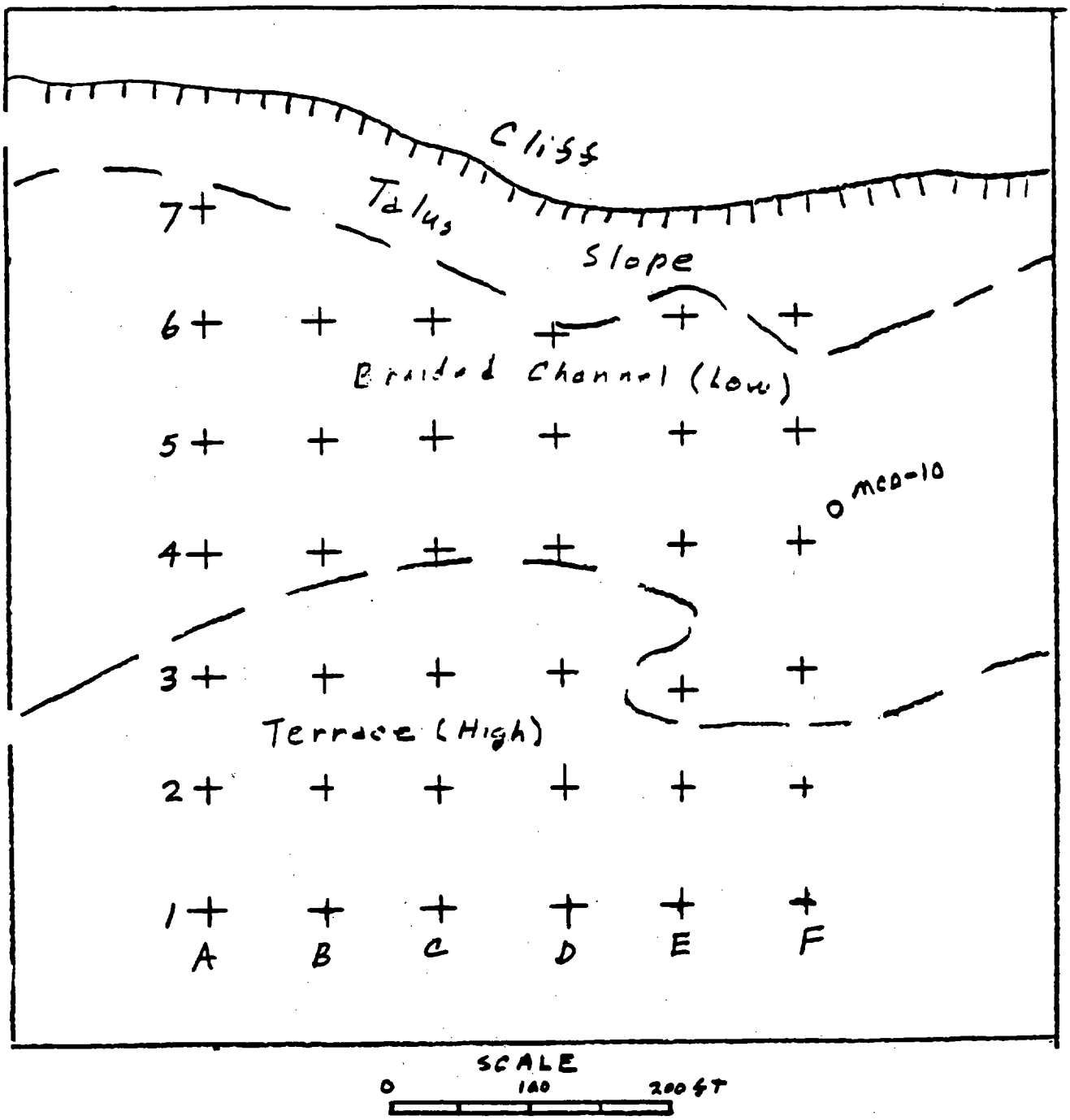


Figure 3.- Grid Area used in location of Test borings and radiation survey

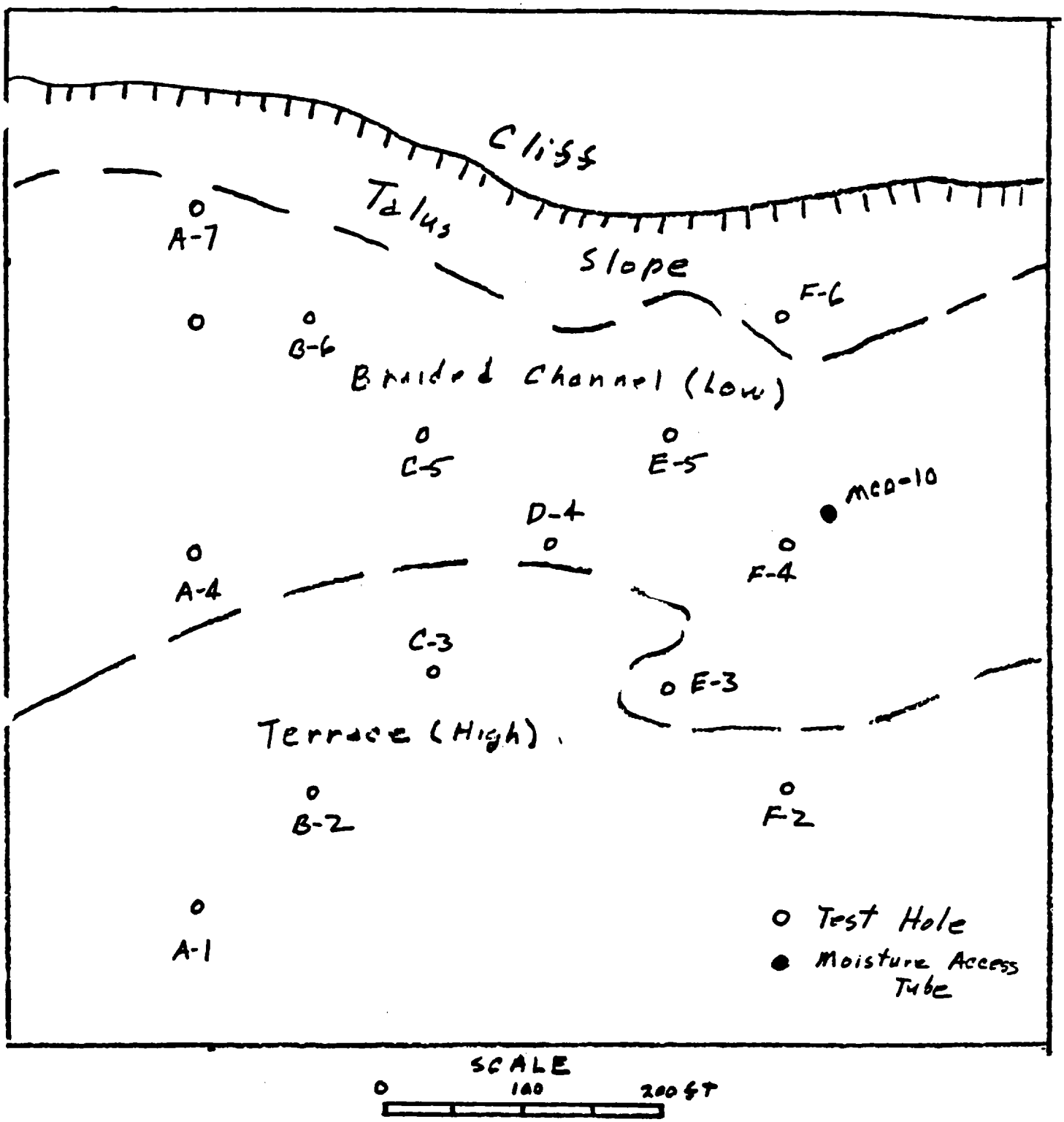


Figure 4.- Location of Test borings in Grid Area

APPENDIX A

ARCHEOLOGICAL AND CULTURAL SURVEY

Museum of New Mexico: Memorandum

Date: 7/15/82

To: Ken Rea, H-8, thru Wayne R. Hansen, H-8 Group Leader

From: David H. Snow

Subject: ARCHEOLOGICAL SURVEY, Mortandad Canyon

I have inspected cultural resources recorded as LA 30638 (see attached Museum of New Mexico Site Survey form), on 6/16/82, as a result of being informed of proposed borrow pit activities in the area. The site lies on a low terrace above the floor of Mortandad Canyon, 2600 feet (792m) west of the Santa Fe County line, and 1200 feet (366m) north of the Sandoval County line, in Sec. 24, Township 19N, Range 6E, Los Alamos County, on lands owned and managed by Los Alamos National Laboratory. The brief description of this historic site, a 20th century line camp or similar seasonal use site that is provided in the survey form, is augmented here by the information recorded by me in June.

LA 30638 appears to have consisted of a temporary structure, presumably constructed of logs (represented by several badly burned timbers) and roofed by sheets of corrugated metal present on the site; a cement lined rock walled cistern which may have had a plank top and a bucket hoist; a flimsy pole and barbed wire corral, and as yet undetermined but suspected surface features suggested by a possible stone foundation alignment near the cliff base, and a slight rectangular depression near the corral (see attached sketch map). The site lies at the base of the south wall of Mortandad canyon and additional temporary structures may have existed at the base of the canyon wall immediately to the south of the center of the site.

Artifacts observed can be divided into several categories based on their presumed role and function in site activities: (1) those that suggest repeated functional requirements, such as stove parts, metal buckets, pails and paint cans altered for continued use after the original contents were used, dish fragments, mason jar and similar glass containers and, of course, the construction materials, including nails; (2) those that represent use-discard such as food tins, cartridges, and bottle glass. The latter, in particular, seem to represent transient and probably repeated use of the site since they consist of sardine (or similarly packaged fish) tins, condensed milk cans, coffee cans and a minimum of bulky, breakable bottles. The former category consists of items which might be expected to remain at a site that saw repeated short-term use (over-night to up to a week or more in duration) to aid in preparing meals, collecting water, storage of perishable, and protection from rodents, insects or other animals for periods of time.

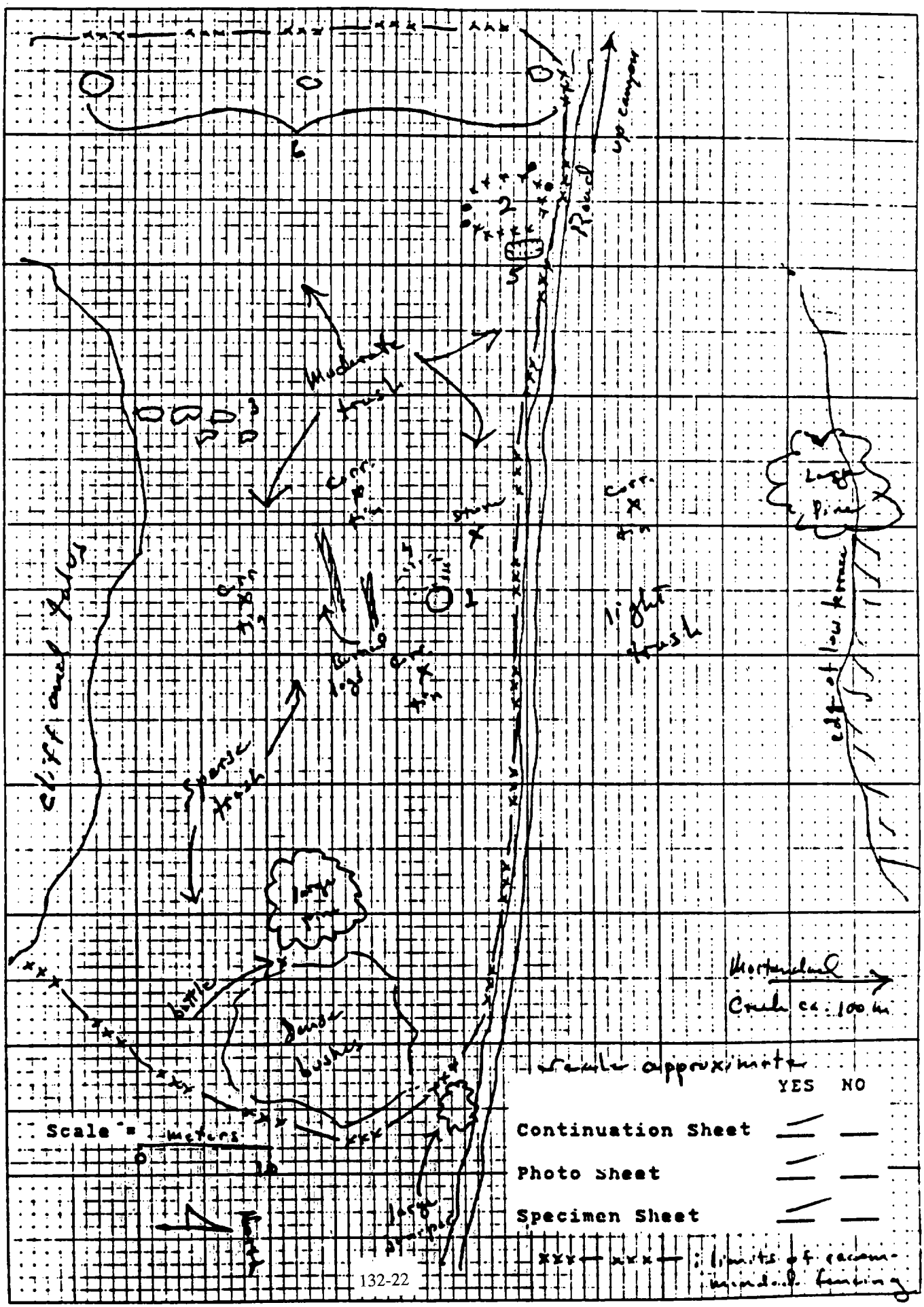
The artifact assemblage represents, pending additional analysis and identification, a limited use configuration during the period ca. AD 1920-40. Federal control of the area in January 1941 precludes use of the site for traditional purposes after that date. A single piece of purple glass may represent an 'heirloom' possession (manganese was no longer added to glass flux after 1921) or it may indicate use of the site prior to 1921.

While archeologists have pieced together a reasonable picture of prehistoric live on the Pajarito Plateau based, in part, on information generated

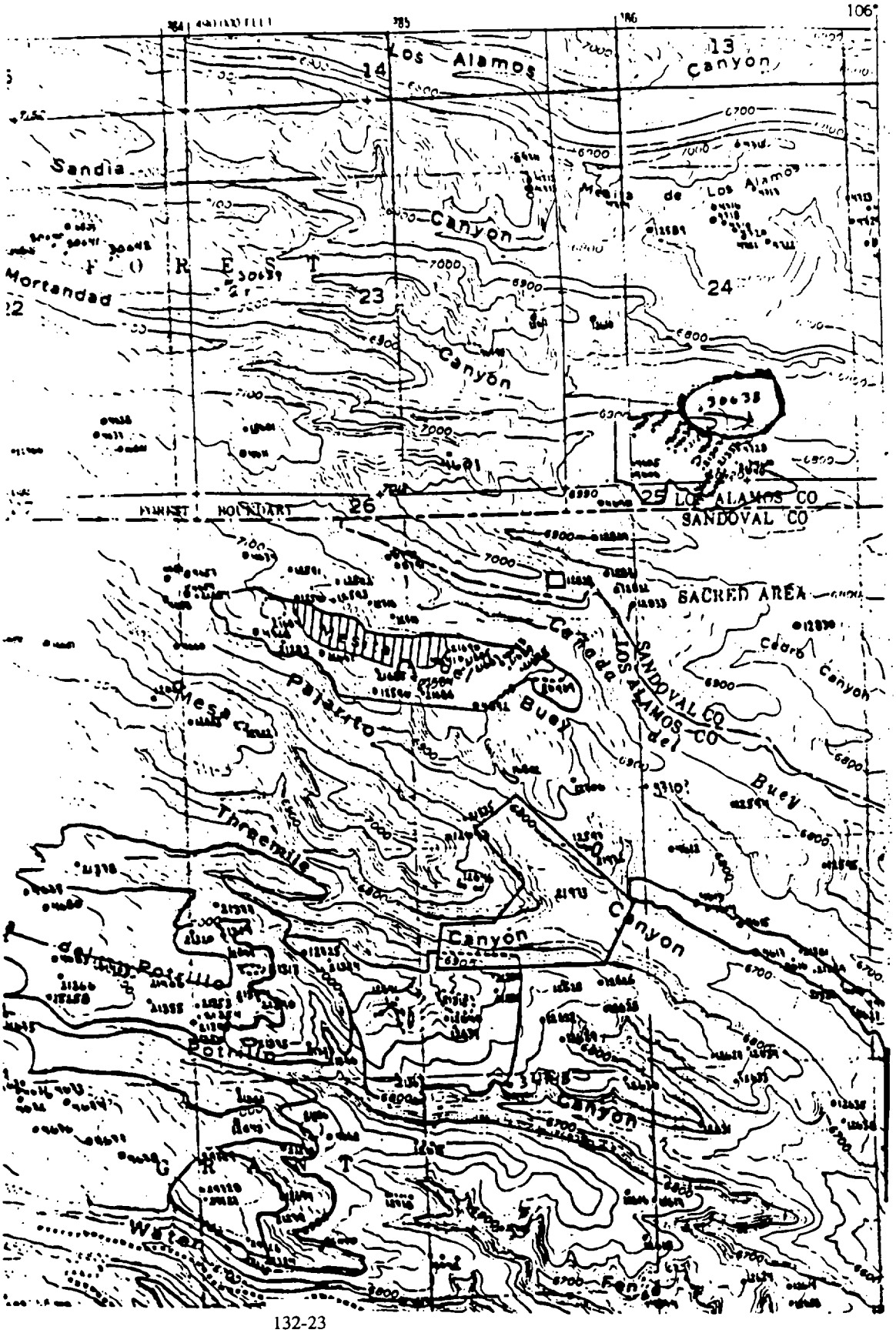
through the auspices of LANL, virtually nothing is known of the use of the region prior to US Government occupation of much of the region in the 20th century. LA 30638 represents a segment of the local and regional data base known and suspected to exist, which can inform on a variation of traditional western US life-styles, that of the 'cowboy'. As practiced by traditional hispano cultural participants during the years following US occupation in 1848, the seasonal transhumance pattern of herding (both sheep and cattle) contrasts with a similar pattern involving seasonal crop specialization in areas typified by the Pajarito Plateau.

There are apparently similar sites on LANL land but, lacking 100% survey, the target population of seasonal Anglo/Hispano sites of which LA 30638 is an as yet unknown sample, its significance for future scientific and cultural research is high. Such research is aimed at elucidating and explaining local transhumant patterns of the late 19th and 20 centuries with particular focus on agricultural patterns in the Tewa Basin. For this reason we recommend preservation in place until such time as the potential data base is adequately identified and quantified for assessment of its contribution to local and regional culture history and processes.

Recommendations. Using the cistern as an approximate center of the architectural and artifact distribution, that is, the site limits, an area was paced off which represents the zone of potential adverse impact on the site. This area is indicated on the attached sketch map and measures approximately 35-40 m N-S and 80 m E-W, and includes a buffer zone around the limits to the east and west. No architecture was noted north of the road, although scattered artifacts are present; in the event borrow activities occur in this direction, the surface should be 100% collected to preserve existing artifacts connected with the use of LA 30638. Fencing should be erected as indicated on the map prior to borrow activities to protect the site. In the event this site cannot be avoided it is recommended that a program of mitigative action be formulated and submitted to the appropriate Federal and State officials for review and concurrence.


Moderate brush
Light brush
Sparse brush
Dense bushes
Cliff and talus
Road
up canyon
edge of low terrace
Large pine
Shortcut Creek ca. 100 m
Scale approximate
YES NO
Continuation Sheet
Photo Sheet
Specimen Sheet
Scale = meters
0
10
limits of recommended fencing

FRIJOLES QUADRANGLE
NEW MEXICO
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 FRIJOLES 15 QUADRANGLE



MUSEUM OF NEW MEXICO ARCHAEOLOGICAL SURVEY LA'L SURVEY Project SITE NO.: L.A. 30638

Site name MORTANDAD RANCH SITE (NOT THE HISTORIC NAME) Quad no. ____ : ____ Field No. T 300

Quad source ~~USGS WHITE ROCK QUAD.~~ Fri; 0/ES Accessibility: 4-wh. dr. ____ foot ____ sedan ____ backhoe ____

____ ¼ of the SW ¼ of the SE ¼, Sec. 24, T. 19 ~~S~~ N., R. 6 ~~W~~ E., County LOS ALAMOS State N M

Location UTM: EASTING 13 386 290 NORTHING 39 68 900

0.4 MILE W OF FOOT OF HILL (PUYE DRIVE). 10M SO. OF ROAD. Elevation 6780'

Stake location (MNM, Other) ____

Site is in what nearest named drainage? IN MORTANDAD CANYON Nearest town LOS ALAMOS Nearest highway SH 4

Ownership DOE Informant ____

FEATURES *(indicate number)*: Pit houses ____ Kivas ____ Surface rooms: Slab/Jacal ____ Masonry ____ Adobe ____ Other ____

Refuse area *(direction)* ____ Hearths ____ Burials ____ Sherd/Chipping area ____ Grids/Dams/Terraces/Borders ____ Petroglyphs/Pictographs ____

Trails/Steps/Toeholds ____ Other ____

PLAN *(check ✓)*: 1-room ____ Arc ____ Linear ____ L-shaped ____ C-shaped ____ F-shaped ____ E-shaped ____ ( )-shaped ____

Enclosed plaza: by a wall ____ by rooms ____ Scattered dwelling units ____ Indeterminate ____ Other ____

Single-tier ____ Double-tier ____ ( )-tiers ____ Part double-tier ____ Part ( )-tiers ____ Orientation ____ Exposure ____

Modern structures on site ____

Nature and depth of fill ____ Area of site ____ x ____ meters/feet

Condition: Undisturbed ____ Eroded ____ Pot-hunted ____ Pottery/Artifact abundance: 0, 10's, 100's, 1000's Multiple component site? ____

SITUATION *(check ✓)*: Valley bottom ____ Bench/Terrace ____ Slope ____ Ridge ____ Mesa top ____ Cliff edge ____ Overhang ____ Cave ____

Dune ____ Other ____

Terrain: Level ____ Broken ____ Slopes to *(direction)* ____ Surface deposits: Alluvium ____ Colluvium ____ Aeolian ____ Talus ____ Residual ____

Soil: Rocky ____ Gravelly ____ Sandy ____ Clayey ____ Other ____ Local outcrops: Sandstone ____ Shale ____ Limestone ____

Basalt ____ Tuff ____ Caliche ____ Other ____ Arable land *(type, distance & direction)* ____

Water *(distance & direction)*: River ____ Arroyo ____ Stream confluence ____

Spring/Seep ____ Bedrock pool ____ Local vegetation patterns ____

Field remarks HISTORIC SITE. RANCH SITE. PROBABLY EARLY 20TH C.
A WELL, OR CISTERN. MASONRY W/CEMENT LINING. CIRCULAR CROSS SECTION BUT FUNNEL-LIKE IN CROSS SECTION. 2M. DIAMETER AT SURFACE, 2+M. DEEP. BOTTOM IS FILLED W/TRASH - EXACT DEPTH NOT KNOWN. NO INDICATION OF HOUSE EXCEPT FOR CHARRED PLANKS AND ABOUT 10 PIECES OF CORRUGATED IRON ROOFING. TIN CANS ON GROUND.
LOCAL STORY - SMALL FRAME HOUSE USED BY TROOPS DURING WW II AS GUARD POST. MEN SET HOUSE AFIRE ONE MORNING WHILE PREPARING BREAKFAST AND HOUSE WAS DESTROYED. MAYBE — MEN ON GUARD DUTY DO NOT USUALLY PREPARE THEIR ~~OWN~~ OWN MEALS. PERHAPS A HEATING STOVE SET THE FIRE.

Excavation requirements: Labor ____ Time ____ Registered site? National ____ State ____

CULTURE ____ (component 1) / ____ (component 2) Phase or Date ____ (component 1) / ____ (component 2)

Zone ____ Locality ____ Photo: B/W ____ Color ____

Lab remarks ____

Field recorder STEEN Date 20 APRIL 81 Survey collections storage: Survey cabinet ____ Drawer ____

Lab recorder ____ Date ____ Bulk cabinet ____ Drawer ____

4-1-73

CODED BY TJL DATE 8/18/81

1

3

2

4

Photos for LA 30638
color originals on file with H-8

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: R. L. Marsh, ENG-9, MS M702

DATE: October 28, 1983

FROM: W. D. Purtymun, HSE-8

MAIL STOP/TELEPHONE: K490/7-7952

SYMBOL: HSE8-83-723

SUBJECT: TEST BORINGS FOR PROPOSED BUILDING IN MUSEUM PARKING LOT

The following presents the log of the test holes, while locations are shown on Figure 1.

	(Feet)	
Test Hole 1	From	To
Asphalt and gravel	0	1
Tuff, light brown to reddish gray	1	6
Tuff, brownish gray	6	28
Test Hole 2		
Asphalt and gravel	0	1
Tuff, light brown to reddish gray	1	7
Tuff, brownish gray	7	28
Test Hole 3		
Asphalt and gravel	0	1
Fill, light brown, silty sand	1	3
Tuff, brownish gray	3	28
Test Hole 4		
Asphalt and gravel	0	1
Fill, light brown silty sand	1	2
Tuff, light reddish brown	2	9
Tuff, brownish gray	9	28
Test Hole 5		
Fill, gravel and sand	0	4
Tuff, brownish gray	4	28
Test Hole 6		
Soil, light brown	0	2
Tuff, brownish gray	2	28

The tuff exhibited a variety of color, due perhaps to deposition near the source area (Valles Caldera); however, the test holes penetrate only one ashflow unit. The unit is a moderately welded tuff. The tuff is composed of quartz and sanidine crystals and crystal fragments, a few small rock fragments of pumice, rhyolite and latite in an ash matrix. The moderately welded tuff has a safe bearing capacity of about 5000 lbs/sq. ft. The moisture content of the tuff appeared quite dry, estimated at about 5% by volume.

The test borings encountered no anomalies in the tuff that would effect foundation design.

WDP:pb

Att. Fig. 1 - Location of Test Holes in Museum Parking Lot.

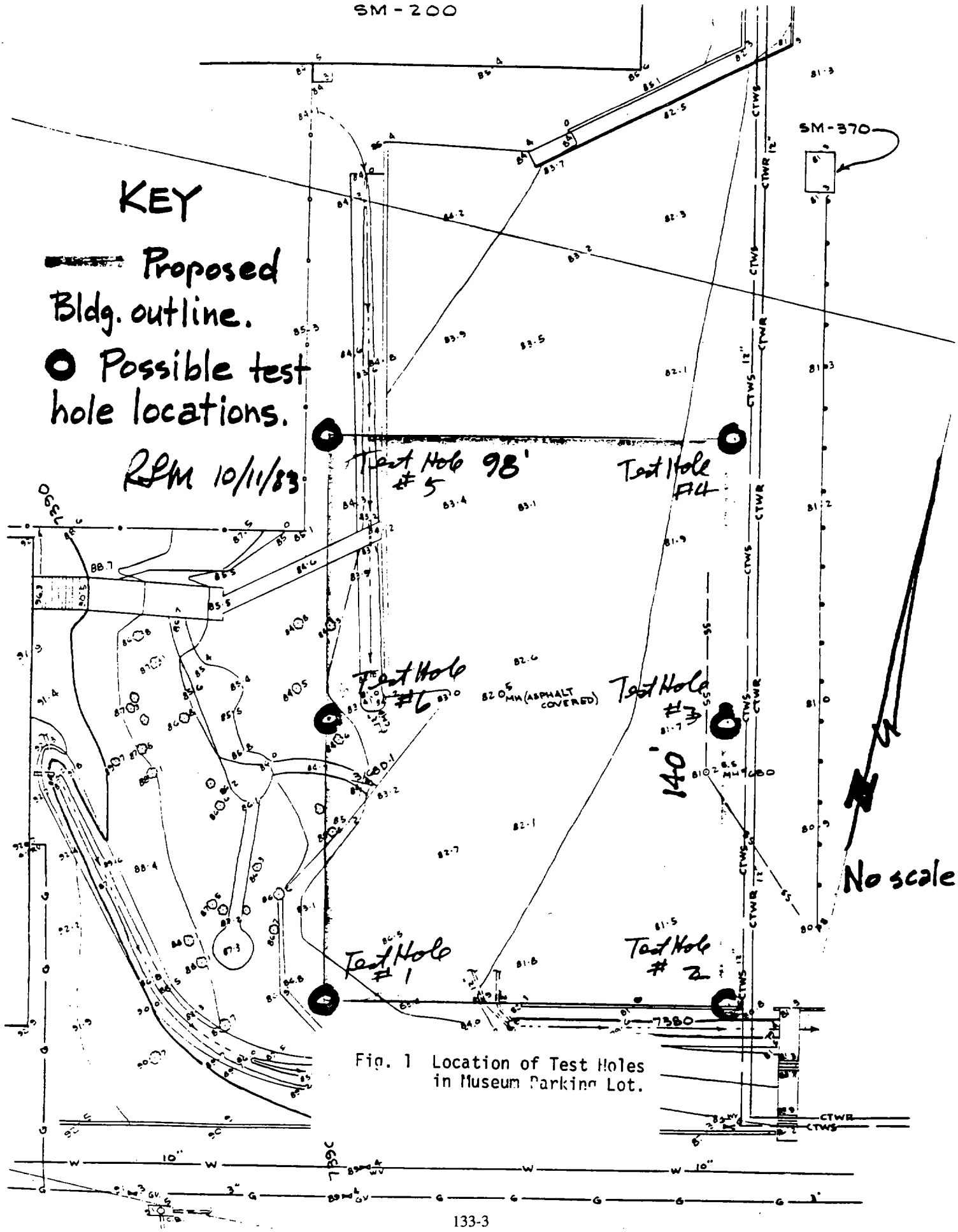


Fig. 1 Location of Test Holes in Museum Parking Lot.

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Dean Miller, ZIA Co, MS-A199

DATE October 31, 1983

FROM W. D. Purtymun, HSE-8

MAIL STOP/TELEPHONE K490/667-7952

SYMBOL HSE8-83-726

SUBJECT TEST BORINGS SIGMA MESA

The following logs are of three test holes drilled on Sigma Mesa.

	(Set) From	To
Hole #1		
Soil, light brown, silty loam	0	4
Tuff, light pinkish gray	4	58
Tuff, light brownish gray	58	108
Hole #3		
Soil, light brown, silty loam	0	3
Tuff, light pinkish gray	3	38
Hole #7		
Soil, light brown, silty loam	0	4
Tuff, light pinkish gray	4	38

The tuff penetrated by the deep test hole represents two ashflow units; however, the units are very similar as they are moderately welded tuffs. The tuff units are composed of quartz and sanidine crystal and crystal fragments, a few small rock fragments of dense dark gray rhyolite and latite in an ash matrix. The moisture content of the tuff is low, probably around 5% by volume.

The moderately welded tuff has a safe bearing capacity of about 5000 lbs/sq ft. The tuff contains joints and fractures, most of which are vertical or near vertical.

The test borings encountered no anomalies that would effect foundation design or the construction of a 100 ft shaft using the bucket auger rig.

The bucket auger tends to pull blocks of tuff from the shaft walls when the pilot hole is being reamed to a larger diameter. This occurs due to the presence of the vertical or near vertical joints in the tuff.

To construct a shaft with smooth walls, drilling or reaming the pilot hole to a larger diameter should be made in several increases in diameters, instead of one step. However, if reaming the pilot hole to a larger diameter, for example 4 ft to 11 ft, can be made in only one step, the drilling should be smooth, not in a sudden broken manner, cutting only a small amount of tuff at each turn of the auger. Either method should produce a shaft with smooth walls.

WDP:mlk
cc: Vern Penny, ZIA Co. MS-A199

(25)
A/VI

MISCELLANEOUS INVESTIGATIONS

Group HSE-8 furnishes geologic, hyudrologic, and test drilling support to other groups in the Laboratory and Zia Company. The investigations in 1983 included test borings for preliminary foundation investigations, rock fall reconnaissance, support to the U.S. Geological Survey in construction of a test facility, and investigation of a barrow pit. The data collected during these investigations supplements the environmental monitoring program. The data plays an important part in disposal and storage of wastes as well as locations of the monitoring net for disposal areas.

A. Test Borings, Foundation Design or Geologic Information

Ad. Bldg
LS-6 test A
Personnel
South of Ad. Bldg.

Ten investiations were made for the Laboratory and Zia Company in 1983. Forty-seven test holes were drilled with a total of 358 m of soil, fill or tuff penetrated.

April 11: Ta-55, Office Addition, ENG-2:

Four test holes ranging in depth from 2 to 4 m penetrated fill material overlying the moderately welded tuff of Unit 3.

May 3: TA-54, Proposed Building, ENG-2:

Four test holes 5.5 m in depth penetrated a thin soil zone and were completed in a moderately welded tuff of Unit 2B.

May 25: TA-51, Proposed Environmental Research Laboratory, ENG-2:

Four test holes 6.7 m in depth penetrated a thin soil zone and were completed in a moderately welded tuff of Unit 3.

August 3: TA-35, Proposed addition to Building, ENG-2:

Four test holes 8.5 m in depth penetrated a thick section of fill material and are completed in a mdoerately welded tuff of Unit 3. The test holes were located on fill material next to the run of Mortandad Canyon.

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: R. L. Marsh, ENG-9, MS K702 DATE: January 5, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-7952

FROM: W. D. Partymun, HSE-8 SYMBOL: HSE8-84-13

SUBJECT: SOIL TEST BORINGS FOR PROPOSED VISITOR ENTRY STATION, SM-43 (REF: ENG-9-754-83)

Six test borings were drilled at locations shown on Figure 1. The locations are differ from the proposed hole location plan. Access with the rig in the area was limited due to vehicles parked in the area. Log of the borings are as follows:

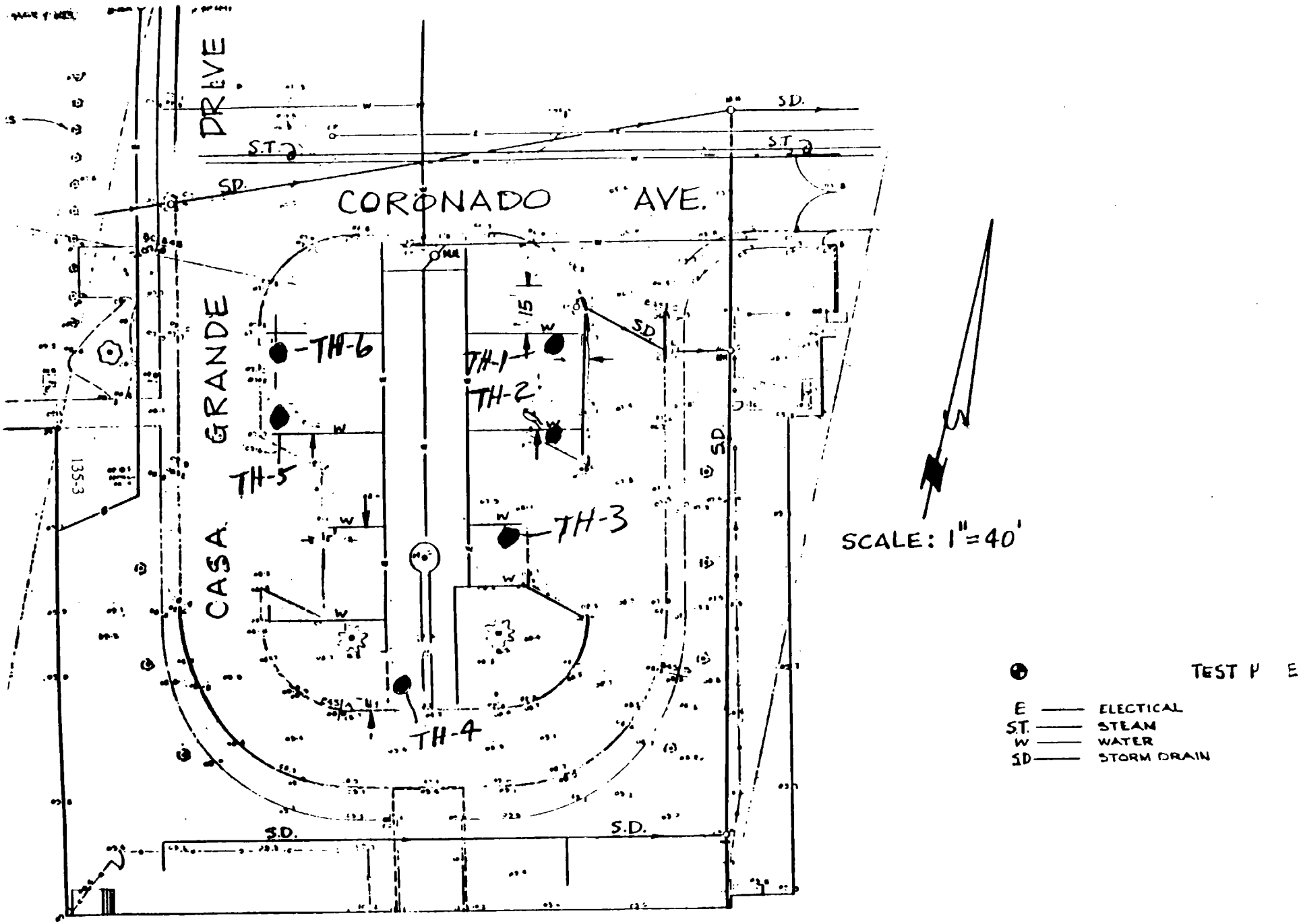
	(ft) From	(ft) To
Test Hole 1		
Soil, brown, clay, wet	0	4
Soil, black, clay, wet	4	5
Soil, brown containing weathered pumice, wet	5	8
Tuff, light reddish brown, upper 2 ft, weathered and wet	8	23
Test Hole 2		
Soil, brown, clay, wet	0	5
Soil, brown, containing some minor amounts of pumice, wet	5	7
Soil, brown, clayey wet, maybe intensely weathered tuff	7	10
Tuff, light reddish brown, upper 2 ft weathered, wet	10	23
Test Hole 3		
Soil, brown, clay, wet	0	6
Soil, brown, containing weathered pumice, wet	6	8
Tuff, light reddish brown, upper 2 ft weathered, wet	8	23
Test Hole 4		
Soil, brown, some clay, wet	0	6
Tuff, light reddish brown, upper 3 ft weathered, wet; two zone of brick red tuff at about 11 and 15 ft (probably joints)	6	23

	(ft) From	To
Test Hole 5		
Soil, brown, clay, wet	0	6
Tuff, light reddish brown, upper 2 ft weathered and wet	6	23
Test Hole 6		
Soil, brown, clay, wet	0	7
Tuff, light reddish brown, upper 4 ft weathered, wet, joint filled with wet clay at about 9 ft	7	23

The foundations should be extended into the unweathered tuff which is at a depth of 8 to 12 ft. The soil or fill material penetrated in the upper part of the holes is quite wet probably in the order of 30 to 45% moisture by volume and contains a large amount of clay. The clay is quite plastic. The tuff, unweathered, has a safe bearing capacity of about 3000 lbs/sq ft. The foundation should extend into the unweathered tuff. The unweathered tuff is a light reddish brown moderately welded tuff consisting of quartz and sanidine crystals and crystal fragments, a few small rock fragments of pumice, latite and rhyolite in an ash matrix. The test holes encountered no anomalies in the unweathered tuff which would effect the foundation design.

WDP:pb

Att: a/s



SM-43

Figure 1. Approximate Location of Test Holes

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, HSE-7, MS J592

DATE: October 31, 1983

FROM: W. D. Purtymun, HSE-8

MAIL STOP/TELEPHONE: K490/667-7952

SYMBOL: HSE8-83-728

SUBJECT: SHAFT INSPECTION

Shafts No. 191 and 192 for disposal of wastes from the Meson Facility and Shafts No. 121, 122, 123, and 124 in the shaft deposit area were inspected and meet criteria for disposal of solid wastes as set forth in guidelines of December 10, 1980, Memo. H-7-80-660

Shafts No. 191 and 192 are composite or connected three (3) 8-ft diameter shafts. These shafts contain numerous blocks of tuff pulled from shaft wall during construction. Extreme caution should be exercised in working around these shafts as surface is undercut on the north side where blocks of tuff have fallen or pulled out of the shaft wall.

WDP:mlk

cc: John Warren, HSE-7, MS-E516
Don Mayfield, HSE-8, MS K490

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, HSE-7, MS J592

DATE: November 16, 1983

FROM: W. D. Purtymun, HSE-8 WDP

MAIL STOP/TELEPHONE: K490/7-7952

SYMBOL: HSE8-83-787

SUBJECT: PIT 26 INSPECTION - NOVEMBER 10, 1983

Pit 26, Area G, TA-54, was inspected to determine if the pit complies with the guidelines issued for the construction and use of pits for the disposal of solid radioactive wastes (H7-80-660, December 10, 1980).

The pit is dug into Unit 2b of the Tshirege member of the Bandelier Tuff. The unit in the pit consists of two ash flows. The contact between the two flows occurs at an elevation of about 6992 ft. The contact is shown by an increase in the amount and size of dark gray devitrified pumice fragments in the top of the lower ash flow. The contact is nearly horizontal, though in places becomes indistinct. The tuff in both flows is a gray moderately welded tuff, consisting of quartz and sanidine crystals and crystal fragments with a few rock fragments of rhyolite, latite, and pumice in a gray ash matrix.

The tuff in the walls of the pit is broken by joints that formed as the ash flows cooled. Most of the major joints are vertical or nearly vertical. They range from closed to open. Beneath the thin soil zone (less than 1 ft thick) exposed in the walls of the pit, the joints are filled with clay. At depth the joints may be filled with clay or open slightly with the joint face weathered with a thin layer of clay. The fresh joint faces exposed in the walls are the result of excavation of the pit; the tuff pulled apart. The frequency of the joints is about one master joint for every 6 to 8 ft of wall of the pit. This frequency is normal at Area G. The floor of the pit is covered with a layer of crushed tuff. The joint openings in the walls or joint systems in the floor (filled with tuff) are not of a size to require remedial action.

The pit is about 310 ft long, 50 ft wide, with a maximum depth of 35 ft (Engineer Drawing No. R-5030). The floor of the pit is ramped at the long dimension to allow construction and vehicle access during disposal operations. Total excavation of tuff was 22,200 cubic yards.

The long dimension of the pit is northeast-southwest. The "spill point" or lowest area is the southwest corner of the pit.

In summary, the inspection of Pit 27 indicates that the pit is in compliance with the guidelines and is suitable for disposal of wastes. The finished pit has been documented by photographs that are on file in HSE-8.

WDP:mlk

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Richard Crombie, ENG-11 Group Leader, MS M701 DATE February 3, 1984

FROM W. D. Purtymun MAIL STOP/TELEPHONE K490/7-7952

SYMBOL HSE8-84-79

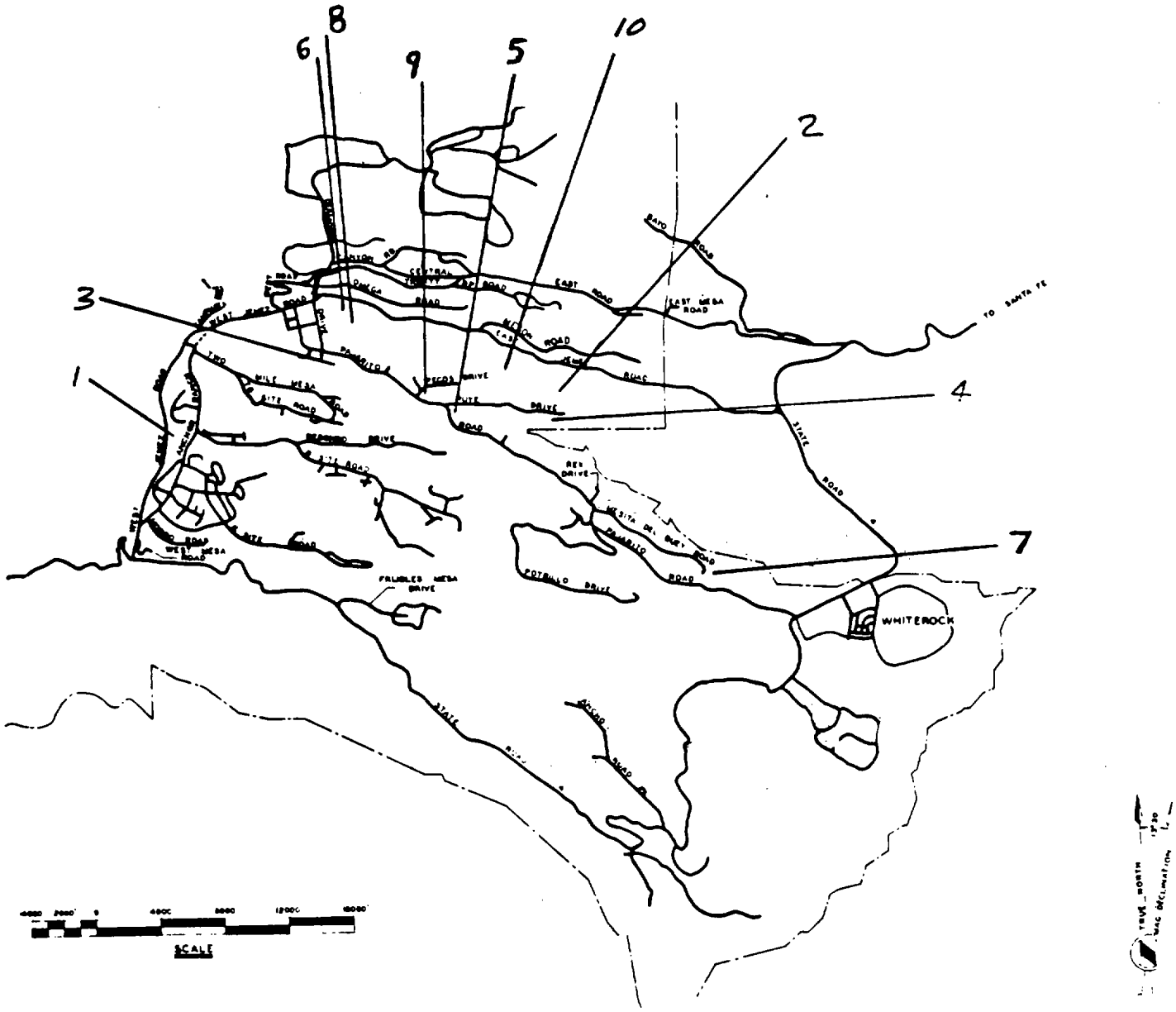
SUBJECT LOCATION AND DESCRIPTION OF SOIL SAMPLING STATIONS

Attached are locations and descriptions of soils that were analyzed for physical properties by Fox and Associates and by New Mexico State at Las Cruces.

WDP:les

Attach: a/s

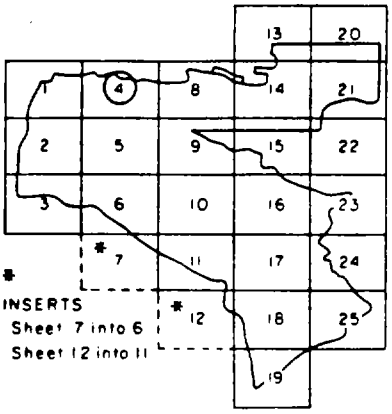
Cy: Dean Keller, ENG-4, MS M700



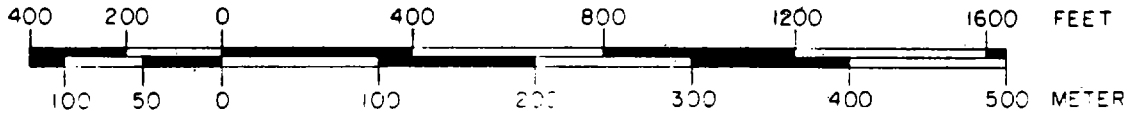
Generalized Locations of Sample Stations

1. Gravel pit near S-Site (South Site)
2. Mortandad (Canyon)
3. S of building (east of TA-59 and tank)
4. Soil near Mortandad ruins
5. Canada del Buey
6. Sandia near Sant. Landfill
7. Area of fill (Area G, TA-54)
8. Sandia behind dump (Sandia Canyon)
9. Fill near TA-50
10. Gravel pit near Meson

SHEET LAYOUT

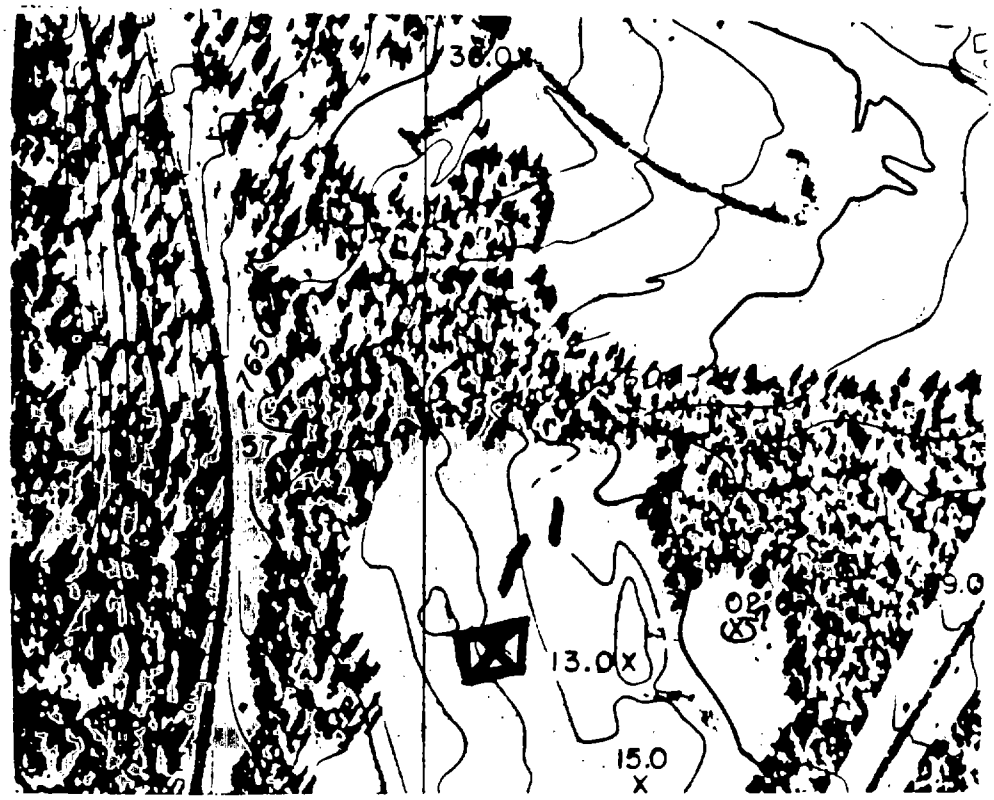


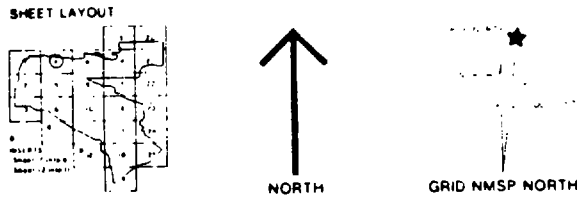
MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS UTILIZING 1:30,000 & 1:28,000 PHOTOGRAPHY OBTAINED DURING NOVEMBER 1976 WITH A ZEISS RMK A 15/23 CAMERA OF 153.42mm CALIBRATED FOCAL LENGTH. MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE).
MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.



GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

The ten locations of the sampling stations are shown on sections of the Ortho/Topo series of maps. The maps in this series are on file with Engineering Group 2 (ENG-2). The layout sheet is shown above. The map scale is 1 inch = 400 feet and contour interval 10 feet. Samples collected were representative of the media, either soil, alluvium, or tuff. A brief description of the material tested is included on the location and description sheets that follow this page. Tuff units referred to are from the Tshirege member of the Bandelier Tuff. The tuff sampled is crushed in a size range from sand to gravel.

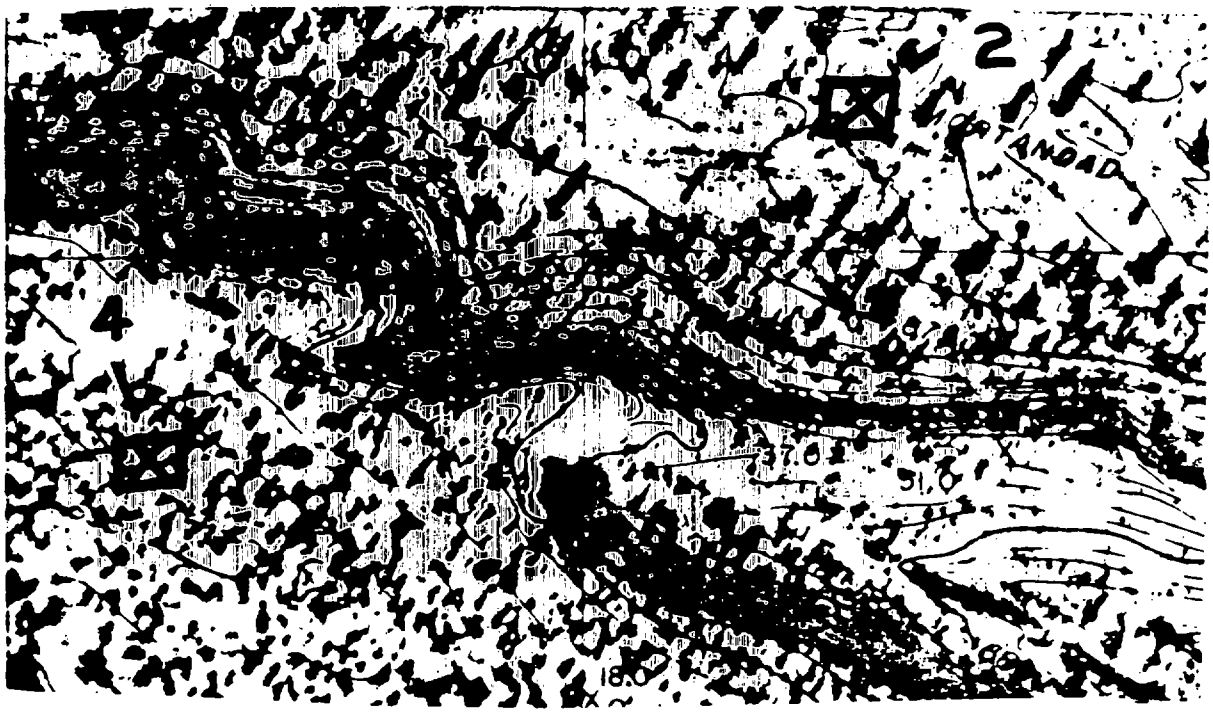


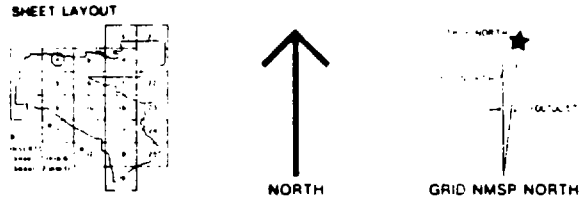


Location is on sheet 2 of 25.

Location 1 - Gravel Pit near S-Site (South Side)

Sample is of alluvium deposited on the western edge of the Pajarito Plateau from Valle Canyon. The gravels represent transport from the flanks of the mountain west of the plateau and consist of volcanic debris, boulders of latite, rhyolite, and densely welded tuff in a matrix of sand and gravel. The alluvium or gravels from this area were used in the past for fill and roadbed material. The volume of gravels remaining is unknown.





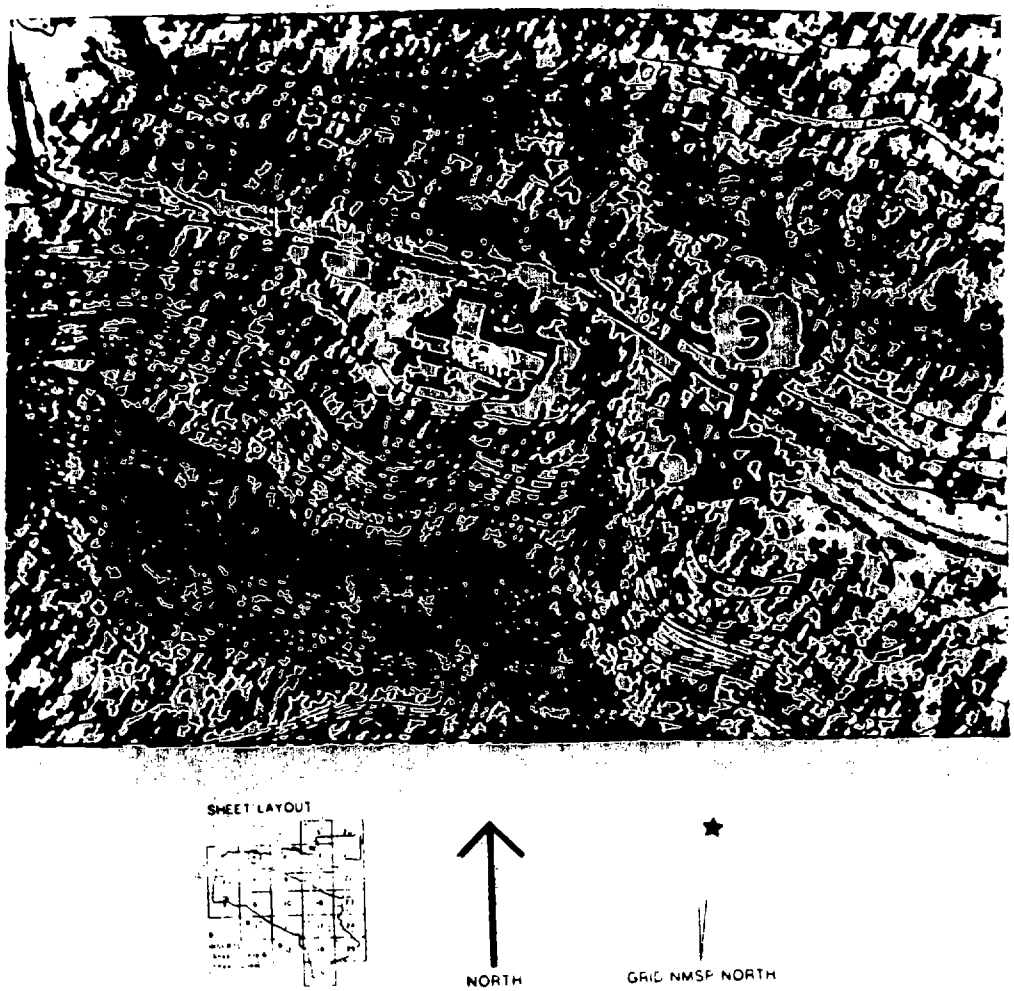
Locations on sheet 10 of 25.

Location 2 - Mortandad (Canyon)

Sample of alluvium derived from weathering and erosion of the tuff, deposited on the floor of Mortandad Canyon. The alluvium consists mainly of quartz and sanidine crystals and crystal fragments, a few small rock fragments of tuff, latite, and rhyolite is a silty sand matrix. Area proposed as a barrow pit for fill material (memo HSE8-83-608.

Location 4 - Soil near Mortandad Ruins

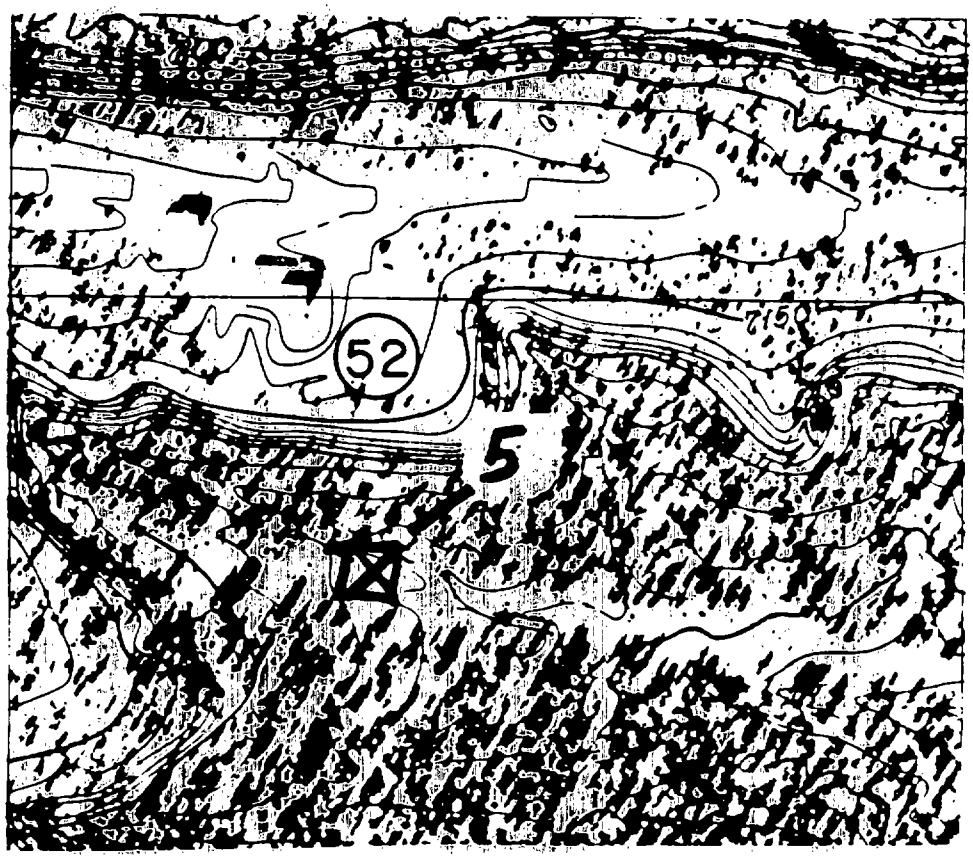
Sample of soil derived from weathering of underlying tuff of Unit 3, maximum thickness at 2 feet. (For comparison of a soil at a higher elevation in pines see Location 3.)

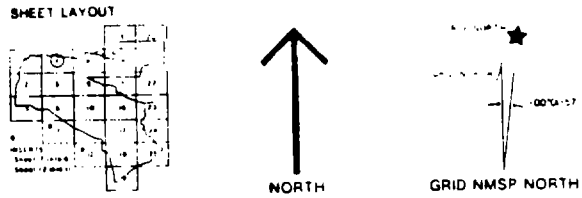


Location on sheet 4 of 25.

Location 3 - S of Building (East of TA-59 and Tank)

Sample of soil derived from weathering of Unit 3. Thickness less than 3 feet. (For comparison of a soil at a lower elevation in pinon and junipers see Location 4.)

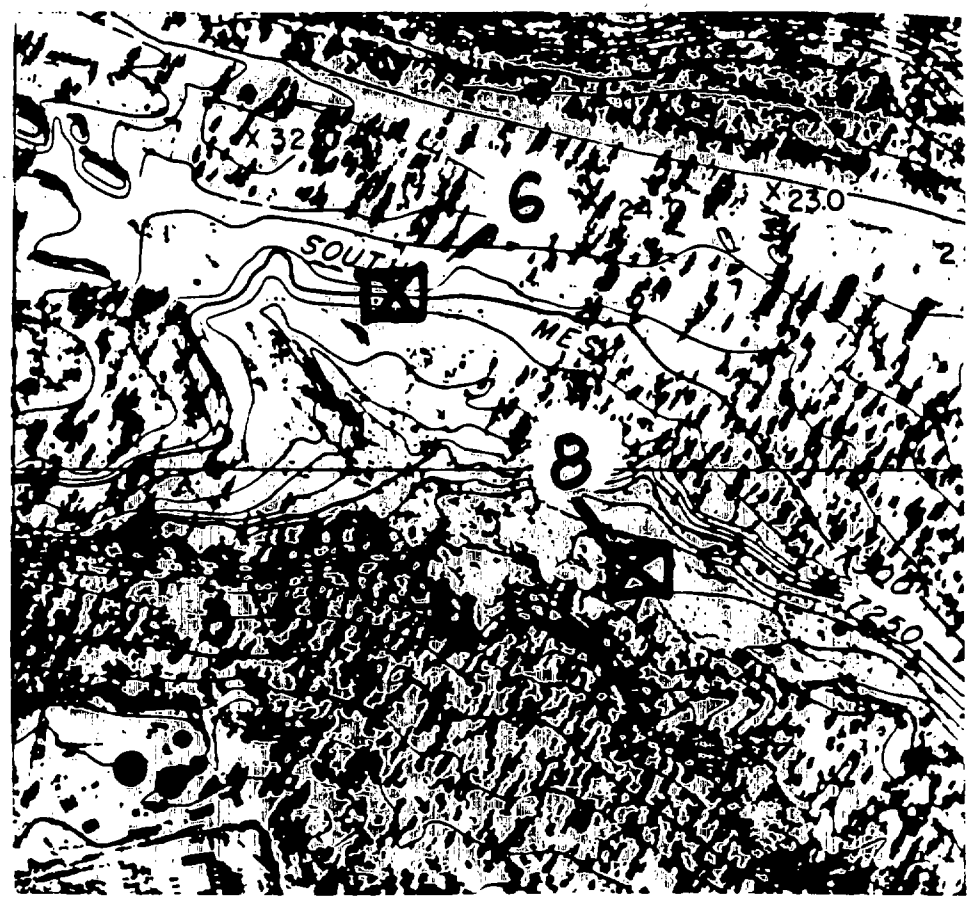


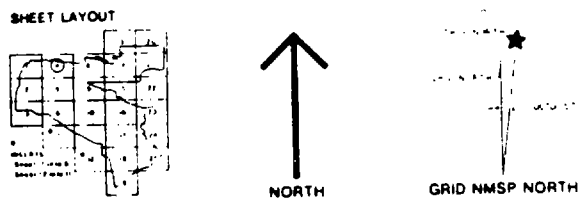


Location on sheet 9 of 25.

Location 5 - Canada del Buey

Samples of weathered tuff from an area considered for a sanitary landfill (memo HSE8-83-550). Tuff weathered from Unit 3 and underlying Unit 2B. Consists of quartz and sanidine crystals and crystal fragments, small rock fragments of dense latite and rhyolite in a weathered silty sand matrix.





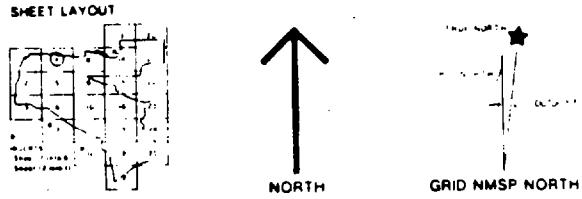
Locations on sheet 4 of 25.

Location 6 - Sandia near Sanitary Landfill

Sample of soil and some tuff excavated from pit that will be to cover sanitary wastes. Soil derived from weathering of Unit 3, the underlying tuff.

Location 8 - Sandia behind Dump (Sandia Canyon)

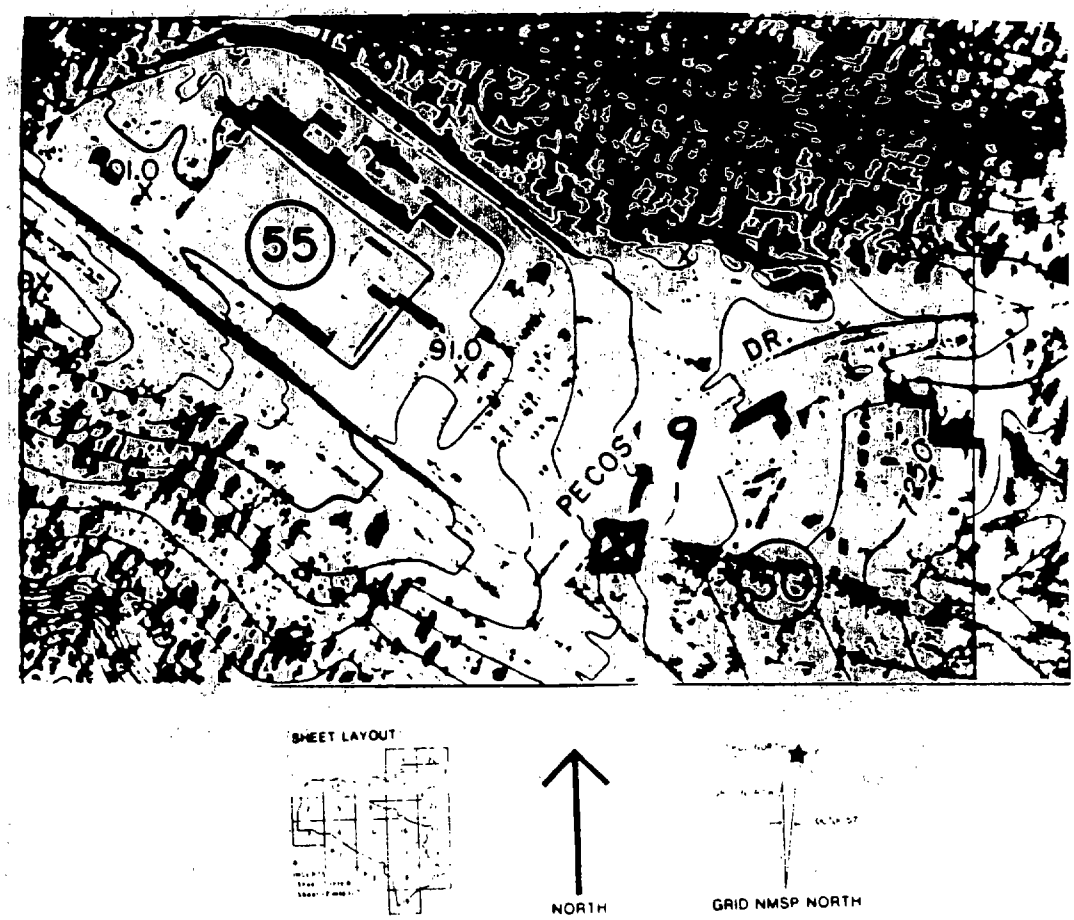
Samples of alluvium from stream channel derived from weathering of Units 2 and 3. Quartz and sanidine crystals and fragments, small rock fragments of tuff, rhyolite, and latite in a silty sand matrix. Proposed for use as fill and cover material for a sanitary landfill in canyon. Alluvium is probably less than 4 to 5 feet thick.



Location on sheet 16 of 25.

Location 7 - Area of Fill (Area G, TA-54)

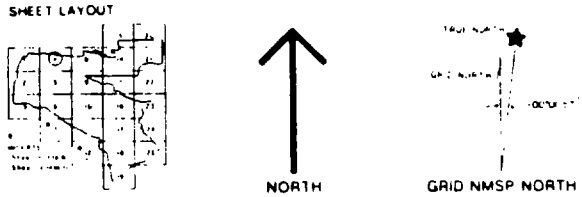
Samples of moderately welded tuff of Unit 2B excavated from a radwaste pit for solid wastes. Used for cover material between layer of wastes and final cover. Unit 2B consists of quartz and sanidine crystals and crystal fragments, small rock fragments of pumice, dense rhyolite and latite in a gray ash matrix.



Location on sheet 4 of 25.

Location 9 - Fill near TA-50

Sample of final cover used to cap the northwest corner of Area C, which consists of pits filled with radwastes. The material consists of a mixture of soil, weathered, and fresh tuff.



Location on sheet 8 of 25.

Location 10 - Gravel Pit near Meson

Sample of moderately welded tuff of Unit 2B consisting of quartz and sanidine crystals and crystal fragments, a few small rock fragments of pumice, dense rhyolite and latite is a gray ash matrix. Material from pit is used for fill and cover material.

OCT 17 1983

COLLEGE OF AGRICULTURE AND HOME ECONOMICS

DEPARTMENT OF CROP AND SOIL SCIENCES
Box 3Q/Las Cruces, New Mexico 88003
Telephone (505) 646-3405

NEW MEXICO STATE UNIVERSITY

October 12, 1983

2-L53-K95371

Los Alamos National Lab
Accounting Department
P.O. Box 1663
Los Alamos, NM 87545

Soil analysis (Lab #4461-4470)

Sample	pH	mmhos/cm EC	ESP	% OM	------ppm------ N	P	K
1 Gravel Pit Near S-Site	6.75	0.33	0.2	0.26	1.8	3.2	7.1
2 Mortandad	7.02	0.22	0	0.13	0.9	1.5	9.4
3 S of Building	6.58	0.35	2.9	1.08	0.4	0.9	13.4
4 Soil Near Mort. Ruins	6.73	0.47	2.4	0.33	0.6	1.2	5.7
5 Canada del Buey	6.52	0.38	1.4	0.56	0.4	1.5	9.5
6 Sandia Near Sant. Landfill	6.67	0.38	0.4	1.27	1.5	2.1	19.5
7 Area of Fill	7.89	1.58	5.5	0.23	4.3	1.2	18.2
8 Sandia Behind Dump	6.38	1.72	2.3	0.75	0.3	0.6	4.3
9 Fill Near TA 50	7.39	1.43	2.7	0.69	2.5	3.2	27.1
10 Gravel Pit Near Meson	8.27	0.17	5.1	0	0.3	0.9	2.9

Sample	Texture	1/3 bar	15 bar	cm/hr Hydraulic Cond.
Gravel Pit Near S-Site	Sandy Loam	8.7	5.1	16.1
Mortandad	Sand	4.3	2.5	30.0
S of Building	Silt Loam	15.8	7.3	0.7
Soil Near Mort. Ruins	Silt Loam	9.2	4.7	4.2
Canada del Buey	Silt Loam	14.2	6.3	3.0
Sandia Near Sant. Landfill	Silt Loam	13.5	5.8	1.3
Area of Fill	Silt Loam	11.7	3.1	4.2
Sandia Behind Dump	Silt Loam	15.1	6.1	1.3
Fill Near TA 50	Silt Loam	14.3	6.2	4.8
Gravel Pit Near Meson	Sand	5.2	1.3	51.8

cc Mr. Crombie/Purtymun
Mr. Archie Velarde

Job No. 430670

Project: LF3-K9537-1

Sieve Analysis on Soil from Canada Del Buey, sampled by Client on September 6, 1983.

SIEVE ANALYSIS

Sieve Size	% Passing
No. 4	100
No. 10	98
No. 40	77
No. 80	72
No. 200	61.6

MOISTURE CONTENT

5.6% (as received)

FALLING HEAD PERMEABILITY TEST

8.85×10^{-7} feet per minute

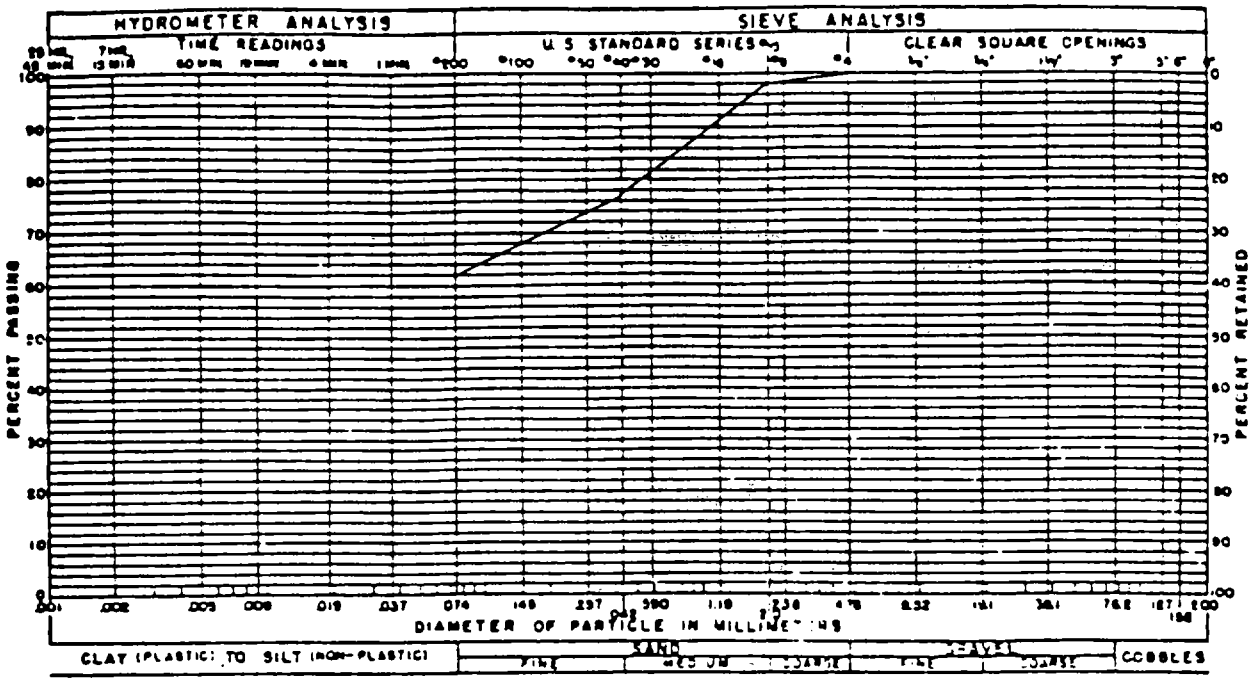
ATTERBERG LIMITS

Liquid Limit - No Value

Plasticity Index - Non Plastic

F. M. FOX & ASSOCIATES, INC.
Consulting Engineers and Geologists

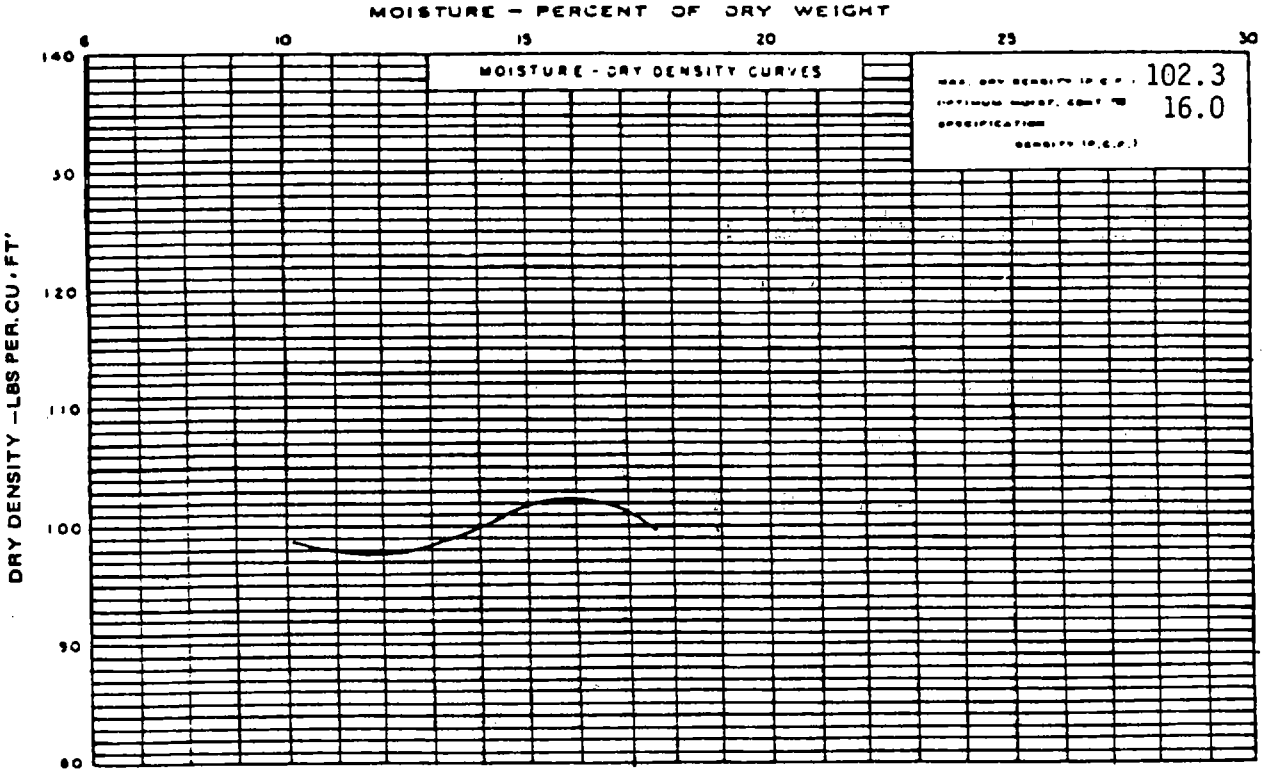
F. M. FOX & ASSOCIATES, INC.
3412 BRYN MAWR DRIVE, N.E.
ALBUQUERQUE, NEW MEXICO 87107
(505) 884-0900



GRADATION TEST RESULTS

GRAVEL 0 % SAND 38 % SILT AND CLAY 62 %

LIQUID LIMIT NV % PLASTICITY INDEX NP %



COMPACTION TEST RESULTS

COMPACTION TEST PROCEDURE AASHTO T-99, Method A

SAMPLE OF SILT, very sandy, brown (ML)

FROM Canada Del Buey Date Sampled: 9/6/83 FIG.

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Dave Trujillo, ENG-2, MS M984

DATE: February 21, 1984

FROM: W. D. Purtymun, HSE-8 WDP

MAIL STOP/TELEPHONE: K490/7-7952

SYMBOL: HSE8-84-112

SUBJECT TEST HOLE, GAS FACILITY

The log of the hole is as follows:

Asphalt	0 - 1 ft
Fill material and gravel	1 - 3 ft
Tuff, weathered, light gray	3 - 4 ft
Tuff, moderately welded, dark gray	4 - 7 ft

The moderately welded tuff contained some excess moisture, but should have a safe bearing capacity of 3000 to 4000 lb/sq ft. A joint penetrated near the bottom of the hole (brick red cuttings) should cause no problem with the design.

WDP:les

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Harry Patterson, HSE-7, MS E516 DATE: March 1, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-7952

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-129

SUBJECT: INSPECTION OF SHAFT 29, AREA L, TA-54

Shaft 29, dug in December 1983, was inspected on February 29, 1984, and determined suitable for disposal of organic wastes. The shaft is 6 ft. in diameter and about 65 ft. deep. The shaft is not straight but drifts to the north about 4 to 5 ft. at total depth of 65 ft. The shaft penetrated two ash flows of rhyolite tuff. The upper flow is Unit 2 B and the underlying flow is Unit 2 A of the Tshirege Member of Bandelier Tuff. The contact between the two Units occurs at a depth of about 22 ft. Joints and fractures were few in the walls of the shaft. One near vertical joint occurred in the upper flow terminating at the contact at about 22 ft. The joint was trending east-west and intersected the shaft in the northeast and northwest quadrant. A few roots were present in the upper 15 ft. of the joint. Several small blocks of tuff were pulled from the joint when the shaft was being reamed to the 6-ft. diameter. Brown clay plates the joint face in the upper part of the shaft.

The shaft is suitable to disposal of packaged organic wastes.

WDP:pb

Cy: Karen Balo, HSE-7, MS E516

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: [redacted]l Purtyman, HSE-8, MS-K490 DATE: March 16, 1984

FROM: Miguel D. Salazar, HSE-7, Disposal Sites Engineer MAIL STOP/TELEPHONE: K592/7-6095

SYMBOL: HSE-7B-84-12

SUBJECT: PIT 29 EXCAVATION

We propose to excavate Pit 29 by changing the end slopes from 1 on 3 to 1 on 2.5 and 1 on 5 to 1 on 2.5. The side walls slopes will be excavated per our usual practices. An entrance and exit ramp will be excavated constructed as shown on figure 1, 2, and 3.

The modified end slopes will give us additional burial volume on this pit.

We foreseen no operational problems nor any design criteria breachment.

Please advise and approve or disapprove this proposal.

MDS/rfg

xc: K. A. Balo, HSE-7, MS-K592

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: R. L. Riedel, ENG-2, MS M984 DATE: April 27, 1984

THRU: W. R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun and N. M. Becker, HSE-8 SYMBOL: HSE8-84-291

SUBJECT: TEST BORING AT BUILDING SM-410-TA-3, BUILDING ADDITION; L.J. 7671-3

A test hole was augered north of building SM-410, TA-3, near Test Hole 1 as indicated on your drawing. Only one hole was drilled as access with the drill rig was limited. The hole penetrated about 5 ft of soil or fill material that was quite wet. It was underlain by about one foot of dark gray tuff that contained a large amount of moisture. This in turn was underlain by a fairly dry light to dark gray moderately welded tuff. The hole was completed at a depth of about 12 ft. The tuff has a safe bearing capacity of about 5000 lbs/sq. ft.

The wet soil or fill overlying the tuff is the result of snow melt on the north side of the building and lawn irrigation. The foundation should be set down into the tuff.

WDP:NMB:pb

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Harry Patterson, HSE-7, MS E516 DATE: 21 May 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-0810

FROM: W.D. Purtymun, HSE-8 WDP/pb SYMBOL: HSE8-84-357

SUBJECT: INSPECTION OF SHAFT 31, AREA L, TA-54

Shaft 31, dug April 1984, was inspected on May 7, 1984, and determined suitable for disposal of organic wastes. The shaft is 6 feet in diameter and 61 feet deep. As with Shaft 29, it is not straight, but drifts to the North 3 to 4 feet at a total depth of 61 feet. The shaft penetrated two ash flows of rhyolite tuff. The upper flow is Unit 2B and the underlying flow in Unit 2A of the Tshirege Member of the Bandelier Tuff. The contact between the two ash flow occurs at a depth of about 20 to 22 feet. A major joint in Unit 2B strikes east-west and dips slightly to the northwest and terminates at the contact between the two ash flows. A second joint, below the contact in Unit 2A, strikes northeast-southwest is near vertical. At a depth of about 45 feet, a block of tuff about 1.5 feet wide, 3 feet long, and 1.5 to 2.5 feet within the wall of the shaft was pulled out during construction.

The shaft is suitable for disposal of packaged organic wastes.

WDP/ls

Cy: Karen Balo, HSE-7, MS E517

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, HSE-7, MS J592 DATE: 21 May 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-0810

FROM: W.D Purtymun, HSE-8 SYMBOL: HSE8-84-356

SUBJECT: LOCATION OF DECONTAMINATION PIT

The new pit is to be located in the southwest corner of the proposed Pit 31. This pit replaces the old decontamination pit that was destroyed during the contruction of Pit 29. The new pit will be about 50 feet long, 20 feet wide, and about 5 feet deep with an entrance ramp on the long dimension. About 0.5 feet of gravel will be placed in the floor of the pit.

The location of the pit and limited use (deconamination of suspect contamination of vehicles or equipment at the site) will not compromise the use of the area for storage and disposal of solid wastes.

WDP/ls

Cy: B. Mayers, HSE-7, MS J592

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: David Trujillo, ENG-9, MS M984

DATE: May 30, 1984

FROM: W. D. Purtymun, HSE-8

MAIL STOP/TELEPHONE: K490/0810

SYMBOL: HSE8-84-414

SUBJECT: TEST HOLES TA-3, SOUTH OF BLDG. 210

The log of four test holes are numbered in sequence as drilled.

	Feet From	Feet To
Test Hole 1		
Asphalt, soil and fill	0	2
Tuff, wet, weathered	2	5
Tuff, light reddish brown, moderately welded	5	12
Test Hole 2		
Asphalt, soil and fill	0	2
Tuff, wet, weathered	2	4
Tuff, light reddish brown, moderately welded	4	17
Test Hole 3		
Asphalt, soil and fill	0	2
Tuff, light reddish brown, moderately welded	2	17
Test Hole 4		
Soil and fill	0	2
Tuff, light reddish brown moderately welded	0	6

Tuff in the upper few feet of the hole contained excessive moisture probably due to the asphalt road and to the fill in the adjacent water line. The moderately welded tuff has a safe bearing capacity of about 5000 lbs/sq ft. Tuff near the southeast corner of the building is at the surface.

WDP:mlk

Mailed 5/31/84

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Merle Bunker, INC-5 Group Leader, MS G776 DATE: June 15, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 SYMBOL: HSE8-84-466

SUBJECT: STABILITY OF ROCKS ON WALLS AND SLOPES OF LOS ALAMOS CANYON ABOVE TA-2

A reconnaissance was made of the north wall of Los Alamos Canyon above the site on June 15, 1984. The reconnaissance was made at the request of A. Lyle, INC-5. The last inspection of the canyon walls was made on May 26, 1983 (Memo HSE8-83-513). Since the last inspection was made, no rocks have lodged in the rock catcher or in the security fence. There has been no apparent movement of rocks or rock falls on the slope. The security fence and rock catcher appear to be in good shape.

The standing dead pines located between the buildings and security fence on the north wall of the canyon have been removed as recommended in a previous memo.

The inspection failed to detect any rocks that are unstable; however, there appears to be a number of blocks that are potential for rock fall. If the rocks should dislodge, the slope below, rock catcher and the security fence above the buildings should prevent the rock falls from causing any damage.

WDP:mm

Cy: A. Lyle, INC-5, MS G776

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: P. C. Hunt, ENG-2, MS M984 DATE: June 28, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 SYMBOL: HSE8-84-498

SUBJECT: METEOROLOGICAL TOWER INSTALLATION, TA-16, L. J. 7580-16, TEST BORINGS

Two test holes were drilled at the site. One at the center of the foundation of the tower and a second about 10 feet west. The second test hole was to verify the log of the first. The units penetrated were of the same thickness.

	DEPTH (FEET)	
	From	To
Clayey soil, brown, containing a few small rock fragments, moist in zone so that clay balls up on auger.	0	8
Clayey soil, light brown containing light gray pumice fragments.	8	11
Clayey soil, brown, moist, dense, hard.	11	13
Tuff, light pinkish gray, moderately welded, quartz and sanidine crystals and crystal fragments, a few rock fragments of gray ryhyolite in an ash matrix.	13	22

The moderately welded tuff has a safe bearing capacity of about 5000 pounds per square feet. The test borings encountered no anomalies either in soil or tuff that would effect the foundation design.

WDP:mm

Cy: HSE-DO, MS P228

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Harry Patterson, HSE-7, MS E516 DATE: June 28, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 SYMBOL: HSE8-84-497

SUBJECT: INSPECTION OF SHAFT 30, AREA L, TA-54

Shaft 30 is 6 feet in diameter and about 65 feet deep. When inspected on June 26, 1984, the shaft had several stacks of barrels emplaced and covered with tuff. About the upper 40 feet of the shaft was open.

The upper part of the shaft penetrated 23 feet to 25 feet of Unit 2B with the lower part of the shaft completed in Unit 2A of the Tshirege Member of the Bandelier Tuff. There were no major blocks of tuff or open joints in the wall of the shaft. The shaft had fewer joints in the upper 40 feet than were observed in adjacent shaft 29 (HSE8-84-129) and shaft 31 (HSE8-84-357).

Based on observation in the lower part of shafts 29 and 31 and inspection of the upper part of shaft 30, there is no geologic or hydrologic factor that would prevent the use of the shaft for disposal of packaged organic wastes.

Shaft 30 is suitable to disposal of packaged organic wastes.

WDP:mm

Cy: K. Balo, HSE-7, MS E516
HSE-DO, MS P228

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: L. Bailey, ENG-9, MS M702

DATE: July 9, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader, MS K490

MS/LOC/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, [redacted] HSE-8

SYMBOL: HSE8-84-537

SUBJECT: SUBSURFACE INVESTIGATION TA-16, IN REGARDS TO WEAPONS SUBSYSTEM LABORATORY (ENG-9-491-84).

Four test holes were augered west of the new Tritium Building to determine the properties of the tuff. The holes are to be located on an Engineering Drawing at a later date. They are laid out in a general north-south line and are numbered from north to south.

There was little or no soil overlying the tuff in the area. The tuff penetrated by the test holes is Unit 6 of the Tshirege Member of the Bandelier Tuff. It consists of guartz and sandidine crystals and crystal fragments, a few small fragments of dark gray rhyolite and dacite in a light pinkish gray ash matrix. The ash flow is dense and hard. It is moderately welded grading into a welded tuff.

The test holes ranged from 15 to 22 ft. in depth. There was little if any change in lithology of the tuff penetrated by the test holes; however, it did show an increase in welding at depth. The tuff became denser or the degree of welding became greater with depth. The following logs show the break in welding:

HOLE	DEPTH (FT.) From	To
Test Hole 1		
Moderately Welded Tuff	0	12
Welded Tuff	12	16
Test Hole 2		
Moderately Welded tuff	0	12
Welded Tuff	12	22

HOLE	DEPTH (FT.) From	To
Test Hole 3		
Moderately Welded Tuff	0	10
Welded Tuff	10	22
Test Hole 4		
Moderately Welded Tuff	0	7
Welded Tuff	7	15

The break between the moderately welded and welded tuff shown on the above logs is approximate. Test holes 1 and 4 were terminated at depths of 16 and 15 feet as the tuff was to hard and dense (welded) to auger. The moderately welded tuff 12 feet (Test Hole 1) to 7 feet (Test Hole 4) can probably be ripped with earth moving equipment. However, it is doubtful if the equipment can remove the welded tuff below depths of 12 feet (Test Hole 1) and 7 feet (Test Hole 4).

WDP:mm

Cy: D. Miller, ENG-9, MS M702

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Richard Romero, HSE-8, MS K490 DATE: July 13, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader, MS K490 MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-553

SUBJECT: LOG OF TEST HOLES-ACID SEWER LINE REMOVAL

The following logs were compiled as test holes were augered for samples. The locations are referenced to survey location (HSE8-84-522) east and west of initial point hole 00+00.

HOLE	DEPTH (FT.) From	To
Hole 00+60W		
Soil or fill, brown, clayey soil with a few rock fragments of tuff.	0	5
Tuff, moderately welded, reddish brown, weathered.	5	12.5
Hole 00+40W		
Soil or fill, tan, clay soil, some sand with a few rock fragments of tuff.	0	6
Tuff, moderately welded, brown, weathered.	6	12.5
Hole 00+20W		
Soil or fill, tan as above.	0	4
Tuff, moderately welded, tan to reddish brown, some weathering.	4	12.5
Hole 00+20E		
Soil or fill, tan to brown, clayey soil.	0	3
Tuff, moderately welded, tan, little or no weathering.	3	12.5

HOLE	DEPTH (FT.) From	To
Hole 00+40E		
Soil or fill, brown, clay soil, some rock fragments of tuff.	0	3
Tuff, moderately welded, gray to dark gray, little if any weathering.	3	12.5
Hole 00+60E		
Soil or fill, tan to brown, clayey soil, few rock fragments of tuff.	0	3
Tuff, moderately welded, gray to dark gray, little ir any weathering.	3	12.5

WDP:mm

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, HSE-7, MS J592 DATE: July 13, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader, MS K490 MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-554

SUBJECT: INSPECTION OF PIT 29 - AREA TA-54, JULY 6, 1984

An inspection was made of Pit-29 with reference to Guidelines (H7-80-660) issued for construction and use of solid waste pits in TA-54 on Mesita del Buey.

The pit is dug into Unit-2B of the Tshirege Member of the Bandelier Tuff. The Unit consists of two ashflows. The contact occurs at about the elevation of 6700 feet. The contact is shown by an increase in the amount and size of dark devetrified pumice fragments in the top of the lower ash flow. The contact is near horizontal, though in places the contact becomes indistinct. The tuff in both ashflows is a moderately welded tuff, consisting of quartz and sanidine crystals and crystal fragments with a few small rock fragments of gray rhyolite, latite, and pumice in a gray ash matrix. It also contains a few dark gray devitrified pumice fragments.

The pit is unique as it was constructed with a vehicle access ramp in the northwest corner. By constructing in this manner the ramps were excavated at a steeper grade thus allowing more waste to be accommodated in the pit. The deepest portion of the pit is about 46 feet at the center line of marker 2+50. To reduce the chance of rock falls or slabs of tuff dislodging from the sides of the pit, two benches were constructed in the walls of the long dimension. Also, the walls are also slightly sloped to the center of the pit. In general, the maximum dimensions of the pit are about 200 feet long, 80 feet wide at surface and 40 feet wide at base.

The walls of the pit contain numerous joints, on the average of one master joint for about 6 to 8 feet of wall length. The joints range from open as much as 2 inches to closed. On close inspection of the open joints, especially the large openings, it was determined that these openings were caused construction. The nature of the joints, were no different than noted in inspection of other pits in the area. Joints opening in the floor of the pit have been filled with crushed tuff during construction. Runoff into the pit have aided in distributing the tuff in open joints, insuring a good seal. Surface drainage should be diverted from the pit.

We have documented the walls of the pits in photographs taken by IS-7. When a set of the "as built" drawing of the pit is complete, we would like a set.

As the inspection indicated, the pit meet the "guidelines", and can be used for disposal of solid wastes.

WDP:mm

Cy: J. Warren, HSE-7, MS E516
K. Balo, HSE-7, MS E516

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Los Alamos, New Mexico 87545

memorandum

TO: R. L. Riedel, ENG-2, MS M984 DATE: July 18, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-569

SUBJECT: TEST BORING FOR TA-46, ADDITION TO BUILDING W-158 AND TA-55, ADDITION TO BUILDING PF-7

ADDITION TO BUILDING W-158

Two test borings were made at locations 1 and 4 (adjacent to existing building), as were unable to position the rig over the other two locations on the sides of the bunkers.

TEST HOLE 1	DEPTH (FT.) From	To
Fill, brown, silty clayey, sand, with a few small rock fragments, moisture est. at 10% to 15%.	0	6
Tuff, light pinkish gray, moderately welded, quartz and sanidine crystals, and crystal fragments and a few rock fragments of gray rhyolite, some moisture (est. less than 10%).	6	18
Tuff, gray, moderately welded (as described above.	18	22

TEST HOLE 4		
Fill, brown, silty clayey sand (as described in TH-1).	0	5
Tuff, light pinkish gray, moderately welded (as described in TH-1).	5	12

The foundation for the new building should be set onto the tuff.

ADDITION TO BUILDING PF-7

Two test borings, west and east, were augered north of Building PF-7.

LOG OF TEST HOLES WEST AND EAST	DEPTH (FT.) From	To
Asphalt	0	~1
Tuff, light brown, moderately welded, badly weathered, moisture ~ 10% by vol. contained excessive moisture 15% to 20% at depth 5 to 7 feet, tuff appears sandy in cutting consisting mostly of quartz crystals and crystal fragments, a few small rock fragments of dark gray rhyolite and latite in a brown weathered ash matrix.	1	7
Tuff, light pinkish gray, moderately welded, some weathering, consists of quartz and sanidine crystals and crystal fragments, a few small rock fragments of dark gray rhyolite and latite, moisture content est. at less than 10%.	7	18

Lithologic log of both test holes were the same.

It appears from nearby excavation that the upper section of tuff 1 to 5 feet maybe a competent rock in which the footing may be set. The excessive moisture at depths of 5 to 7 feet may reduce the bearing capacity of the overlying tuff somewhat.

WDP:mm

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memorandum

TO: E. J. Roth, ENG-2, MS M984 DATE: July 18, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-570

SUBJECT: TEST BORINGS TA-55, GUARD TOWER INSTALLATION

Two test borings were augered near the northwest and southwest corners of the security fence of TA-55.

NORTHWEST CORNER	DEPTH (FT.) From	To
Fill or tuff, badly weathered, excessive moisture, quartz and sanidine crystals and crystal fragments, rock fragments of dark gray rhyolite; 0-5 ft. light gray; 5-11 ft. brown, excessive moisture est. 15-20%, 9 to 11 ft.; 11-19 dark gray, est, moisture 10 to 15%.	0	19
Tuff, light gray, moderately welded, quartz and sanidine crystals and crystal fragments, few small rock fragments of dark gray rhyolite in a light gray matrix of ash (moisture est. varies with depth but less than 10%).	19	37
SOUTHWEST CORNER		
Soil or fill brown, clayey soil.	0	4
Tuff, light gray moderately welded (as described above). Moisture 4 to 9 ft. est. at less than 10%; 9 to 10 ft. about 15%; 10-18 ft. less than 10%.	4	18

Foundation should probably be into the tuff (19 ft. NW corner, 4 ft. SW corner). Moderately welded tuff has a safe bearing capacity of about 5000 lb./sq. ft.

WDP:mm

Cy: M. Smith, Zia EFED, MS A199
HSE-DO, MS P228
CRM-4 (2), MS A150

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Los Alamos, New Mexico 87545

memorandum

TO: Joe C. Skalski, Jr., ESS-4, MS J979

DATE: August 2, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8

SYMBOL: HSE8-84-638

SUBJECT: TEST BORINGS AT POND GT-2 and EE-1

The subsurface investigation at Ponds GT-2 and EE-1 were requested by Joe Skalski, ESS-4.

A. Pond GT-2

The dam at Pond GT-2 is scheduled for demolition and the pond area for cleanup and restoration if no further drilling is scheduled for GT-2. Should further drilling be scheduled the pond will be repaired and used for drilling fluids. Four test holes were drilled adjacent to and in the remaining eastern section of the dam (dam has been breached in order to help dry out pond sediments) to determine physical characteristics of fill and depth to compentent rock. Logs of the test holes were prepared as the holes were drilled. Moisture contents were estimated from cuttings, i.e., <20% moisture indicates depth section logged could have a maximum moisture content of as much as 20%. Approximate locations of test holes are shown on sketch of Figure 1.

TH-1 (Below Dam)	Depth (Ft.) From	To
Fill, silty, sand, some gravel brown (<10% moisture).	0	4
Fill, silty sand, some gravel contains organic natural, dark brown to black (<20% moisture).	4	5
Fill, silty sand, some gravel brown (<20% moisture).	5	9
Tuff, light grayish brown, moderately welded (<10% moisture).	9	17

NOTE: Hole uncased, open 14 ft., also dry 3 hours after drilled.

	Depth (Ft.)	
TH-2 (Adjacent and Below Dam		
Fill, silty sand, some gravel, brown (<10% moisture).	0	3
Fill, silty sand, some gravel, contains organic material, dark brown to black (<20% moisture).	3	7
Fill, silty sand, some gravel, brown (10-15% moisture).	7	9
Tuff, light grayish brown, moderately welded (<10% moisture).	9	17

NOTE: Hole uncased, open 15 ft. also dry 3 hrs. after drilled.

TH-3 (Top of Dam West)		
Fill, silty sand, some gravel, brown (<10% moisture).	0	3
Fill, silty sand, some gravel contains organic material, dark gray to black (<20%-10% moisture).	3	11
Tuff, dark gray, moderately welded (~ 10% moisture).	11	17

NOTE: Hole uncased, open 15 ft. also dry 3 hrs. after drilled.

TH-4 (Top of Dam East)		
Fill, silty sand some gravel, brown (~ 10% moisture).	0	3
Fill, silty sand, some gravel, organic material (~ 15% moisture).	3	4
Tuff, dark gray, moderately welded (<10% moisture).	4	17

NOTE: Hole uncased, open 14 ft. also dry 3 hrs. after drilled.

The fill material overlying the tuff, dark gray to black contains some organic material from seepage of water from the pond. The moisture content at the fill tuff contact is about 20% by volume; but, apparently does not contain any free water. The tuff at depth logged in from the holes is a competent rock, capable of supporting heavy equipment.

B. Pond EE-1

Three test holes were drilled and cased with 2-inch plastic pipe in the southwest corner of the berm Pond EE-1. The holes were drilled to evaluate the competency of the berm and provide a method to monitor seepage through the berm. The berm in this area is about 10 ft. wide at the top and stands 10 to 15 ft. above the land surface outside the berm. The lower 8 ft. of the plastic casing is perforated with 1/4 inch holes. The annulus around the casing and hole were filled with gravel to about 2 ft. of land surface. The upper two ft. were sealed with compacted silty sand. Logs of the holes were prepared as they were drilled. Approximate locations of the holes are shown on sketch of Figure 2.

HOLE 1	Depth (Ft.) From	To
Fill, silty sand, light brown, (<10% moisture).	0	7
Fill, silty sand, brown, (<15% moisture).	7	10
Fill, silty sand, dark brown (<20% moisture).	10	15
Tuff, light brown to tan, moderately welded (<15% moisture).	15	20

NOTE: Hole cased with 20 ft. of pipe which extends 2 ft. above LSD water level in hole 17.5 ft. top casing 1 hr. after completion.

HOLE 2	Depth (Ft.) From	To
Fill, silty sand, light brown (≈ 10% moisture).	0	9
Fill, silty sand, brown (<20% moisture).	9	16
Tuff, light brown, moderately welded.	16	22

NOTE: Hole cased with 20 ft. pipe which extends 1.5 ft. above LSD. Hole dry 1 hr. after completion.

HOLE 3	Depth (Ft.) From	To
Fill, silty sand, light brown (≈ 10% moisture).	0	11
Fill, silty sand, dark brown (<20% moisture).	11	14
Tuff, light brown to tan, moderately welded (≈ 10% moisture).	14	17

NOTE: Hole cased with 18.6 ft. of pipe which extends 2 ft. above LSD. Hole dry 1 hr. after completion.

The fill in the berm of Pond EE-1 is a silty sand with some gravel. The three holes were drilled through the fill material into the top of the tuff. Hole 1 encountered some free water, apparently seepage at the contact at the base of the fill and on top of the tuff. The other two holes were dry one hour after they were completed. The fill in the berm is stable and should cause no trouble when the pond is filled. However, when the pond is filled water levels in the holes should be monitored and the base of the berm outside the pond inspected frequently to determine if excess free water is building up in the fill that could cause failure.

WDP:mm

Cy; Bob Hendron, ESS-4, MS J979

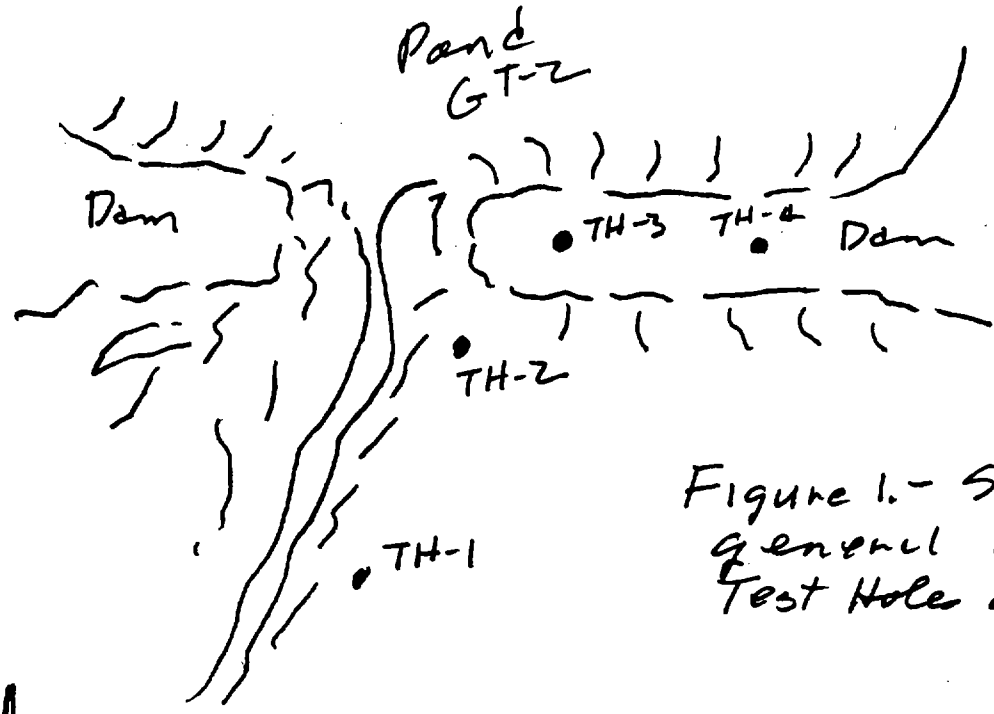

Figure 1.- Sketch showing general Location of Test Holes at Pond GT-2

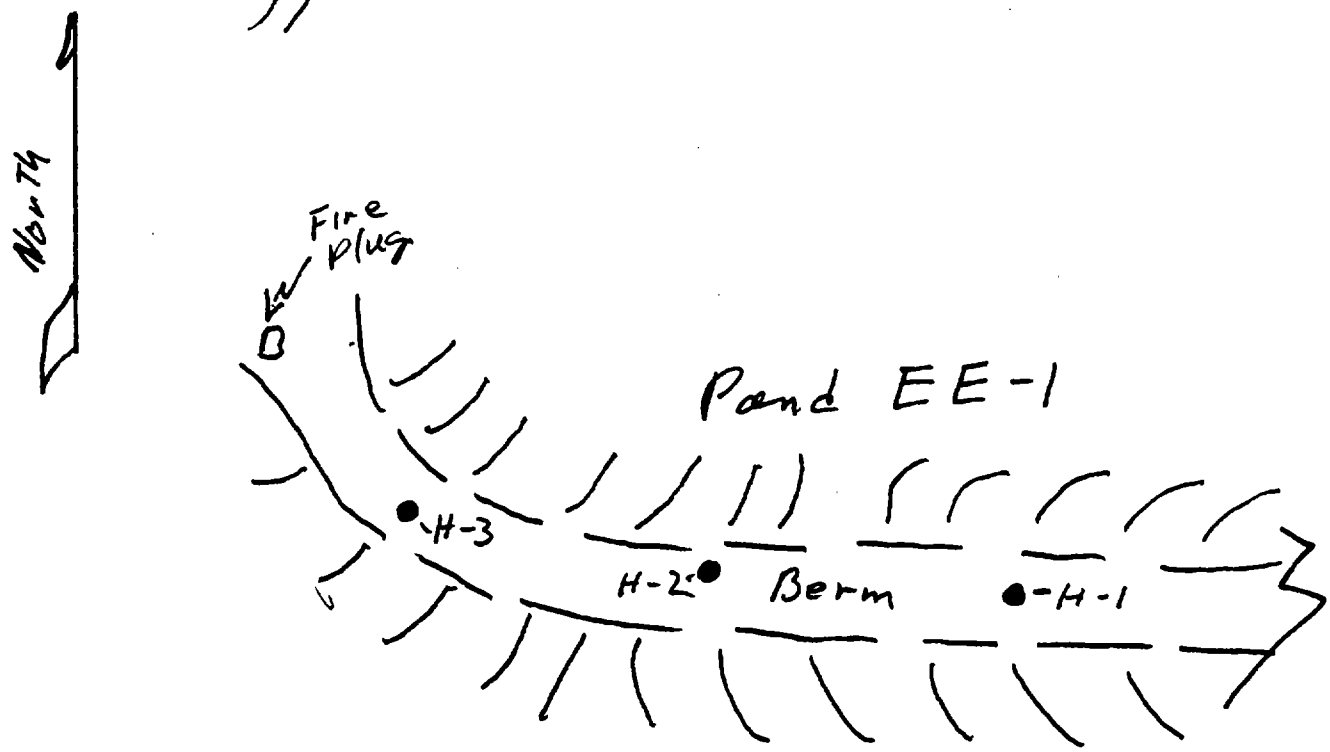

Figure 2.- Sketch showing general Locations of Holes at Pond EE-1

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Los Alamos, New Mexico 87545

memorandum

TO: Dean Keller, ENG-9, MS M702 DATE: September 10, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader, MS K490 TOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-767

SUBJECT: TEST BORINGS, ROAD REALIGNMENT NEAR TA-55

Three test holes were drilled west of the three proposed retaining structures to determine the physical characteristics of the tuff.

TEST HOLE 1	DEPTH (ft.) From	To
Near Station 24+00		
Tuff, light gray, densely to moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments of latite or rhyolite in an ash matrix.	0	17
Tuff, light tan, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments of latite and gray rhyolite in an ash matrix; slight increase in quartz crystals at about 37 ft.	17	52

TEST HOLE 2		
Near Station 33+50		
Tuff, light pinkish, moderately welded tuff, quartz and sanidine crystals and sanidine crystals and crystal fragments, a few small rock fragments in an ash matrix.	0	16
Tuff, tan, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments in an ash matrix, increase in quartz crystals at 42 ft.	16	52

TEST HOLE 3	DEPTH (ft.) From	To
Near Station 39+50		
Tuff, gray, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments of latite and rhyolite in an ash matrix.	0	19
Tuff, tan, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments in an ash matrix.	19	52

Tuff penetrated by the test holes is very similar in lithology and degree of welding but probably represents two and probably three ash flow 0 to ≈ 17 ft., ≈ 17 to ≈ 40 ft., and ≈ 40 ft. to 52 ft. It is a moderately welded tuff with a safe bearing capacity of about 5000 lbs./sq. ft. If you have further questions please feel free to contact me.

WDP:mm

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Wayne R. Hansen, HSE-8 Group Leader, MS K490 DATE September 19, 1984

FROM W. Purtymun, N. Becker, M. Maes; HSE-8 MAIL STOP/TELEPHONE K490/7-0810

SYMBOL HSE8-84-812

SUBJECT PROPOSED GEOHYDROLOGIC ENVIRONMENTAL INVESTIGATION AND ESTABLISHMENT OF A GEOHYDROLOGIC MONITORING SYSTEM AT AREA L, TA-54

A preliminary investigation is to be undertaken at Area L (Chemical Waste Disposal Area) to: 1) determine the hydrologic characteristics of the tuff, 2) to determine if migration of chemicals or oils out from existing pits or shafts has occurred, 3) establish a system to monitor for possible infiltration of moisture which could cause potential transport of oil or chemicals, and 4) establishing observation wells in the adjacent canyons.

The method of study includes the drilling and sampling of three core holes. Drilling and construction of five moisture access holes for use with the neutron-moisture logger will also be accomplished.

Core Holes

Three core holes are to be drilled in Area L. Locations are: 1) adjacent to seepage pit B (liquid lithium hydroxide release), 2) adjacent to shaft 12 (oil in drums), and 3) adjacent to shaft 24 (vermiculite-oil mixture in drums). Holes are to be drilled using a hollow stem auger to a depth of about 100 ft. Drive split spoon or auger cores will be collected at about a 10 ft. interval. Upon completion of drilling and sampling, the holes will be used to determine if vapor migration (vapor from organic compounds) of organics from the shafts or pits exists in the tuff. Samples will be collected by pumping air from the holes or through the use of packers to pump air from selected depths within the holes. The methods employed will depend on results of analyses of cores.

Analyses of Cores

Cores are to be analyzed to determine if migration of chemicals or oils has occurred. Initial core analyses will be determined as described

below; however, unused portions of the cores will be retained if further analyses are necessary.

1. Moisture content shall be determined of all cores.

2. Cores taken from near the seepage pit will be analyzed for Li, Cr, Cu, NH_4F_2, F, and TDS (Total Dissolved Solids).

3. Cores taken near shafts will be analyzed for total organic carbon.

4. A special set of cores will be collected outside of Area L and analyzed for the above constituents or compounds to provide background for comparison of analyses from within Area L.

Moisture Monitoring

Five moisture acess holes will be constructed (four within Area L and one on the mesa outside the area) to measure the distribution and possible movement of moisture in the tuff. The depth of holes will be determined from the moisture analyses of cuttings and the core hole samples. Holes will be constructed using a 3-inch auger and cased with aluminum tubing to provide a monitoring capability with the neutron-moisture equipment. Cuttings from these holes will be collected over a 5 ft. interval and the moisture content will be determined.

Observation Wells in the Adjacent Canyons

Six observation wells will be constructed, three in Pajarito Canyon and three in Canada del Buey. In each canyon, there will be one well upgradient from Area L, one opposite L, and one below Area G. These will be completed down to the alluvium-bedrock contact, and will be cased with 4 in. PVC casing which is perforated in the bottom 8-ft. section. These wells will become part of the monitoring system for the disposal areas on Mesita del Buey.

The proposed program will take about six weeks to complete the drilling and construction phase. It will require about three people full time. Cost for chemical analyses will be kept to minimun as described. Data analyses and report preparation can be sandwiched within the program. Routine monitoring of moisture distribution should not take more than one day a month for the first year.

WP:NB:MM:mm

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Harry Patterson, HSE-7, MS E516

DATE: September 19, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8

SYMBOL: HSE8-84-813

SUBJECT: SHAFT 32, AREA L, TA-54

Completion of shaft 32 (pilot hole 4 ft. diameter ≈ 15 ft. deep) was terminated due to construction problems. A large fracture in the northwest wall caused the hole to drift 1.5 to 2 ft. to the northwest at a depth of about 15 ft. Due to the fracture and drift, it was concluded that standard shaft reamed to a 6 ft. diameter, 65 ft. deep could not be completed.

The existing shaft 32 (≈ 15 ft. deep) should be used for disposal and sealed to prevent infiltration of precipitation into the tuff.

WDP:mm

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Price Feron, ENG-2, MS M984 DATE: September 20, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader, MS K490 MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-814

SUBJECT: TEST BORINGS, KRYPTON FLUORIDE PROJECT, PHASE C, L.J. 7272-35

The area designated for locations of the test holes was almost inaccessible for the rig due to temporary buildings and trailers. We were able to complete three holes in the general area. The designations are from west to east, locations are known to Paul Kleinen (RKE) who was at the site when the holes were drilled. The holes are located on the northern edge of the mesa, with Hole 1 located northeast of Building 183.

HOLE 1	DEPTH (FT.) From	To
Fill, brown, silty clay with rock fragments of tuff, some small rock fragments of rhyolite.	0	3
Tuff, light gray, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments of rhyolite in ash matrix.	3	10
HOLE 2		
Fill, brown (as above).	0	3
Tuff, light gray to light brown (as above).	3	17
HOLE 3		
Fill, brown (as above).	0	7
Tuff, light gray to light brown (as above).	7	17

The fill material is not compacted, contains some moisture (about 10% to 12% by volume). The tuff is a moderately welded tuff and should have a safe bearing capacity of 5000 lb/sq. ft. Paul indicated that additional holes would be requested when temporary buildings and trailers are moved out of the way.

WDP:mm

Cy: Paul Kleinen, (RKE), MS M703

Los Alamos

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Los Alamos, New Mexico 87545

memorandum

TO: P. C. Hunt, ENG-2, MS M984 DATE: October 10, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader, MS K490 OP/TELEPHONE: K490/7-0810
JC Hansen, Acting GL, 10/10/84

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-891

SUBJECT: ADVANCE LASER ADDITION, BLDG. TSL-128, TA-35, LJ 7205-35; TEST BORINGS

Five test holes were drilled west of Bldg. TSL-128 as requested.

	DEPTH (FT.) From	To
HOLE 1		
Asphalt and fill.	0	1
Tuff, light tan to gray, moderately welded, quartz and sanidine crystals and crystal fragments, small rock fragments of dark gray latite in gray ash matrix.	1	12
HOLE 2		
Fill, brown, sandy.	0	1
Tuff, light gray to tan moderately welded (as above).	1	12
HOLE 3		
Asphalt, fill and soil, brown to dark brown, silty, clayey, few rock fragments.	0	8
Tuff, light gray to tan moderately welded (as above).	8	13

HOLE 4	DEPTH (FT.) From	To
Asphalt, fill, and soil (as above).	0	2
Tuff, light gray to tan moderately welded (as above).	2	13

HOLE 5		
Asphalt, fill, and soil (as above).	0	7
Tuff, light gray to tan, moderately welded (as above).	7	13

Foundation should be set into tuff. The tuff is a moderately welded, moisture content estimate 8-10% by volume, safe bearing capacity of about 5000 lb/ft^2.

WDP:mm

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Los Alamos, New Mexico 87545

memorandum

TO: D. Romero, ENG-2, MS M984 DATE: October 10, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader, MS K490 STOP/TELEPHONE: K490/7-0810
J.C. Dunderson, Acting GL, 10/10/84

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-889

SUBJECT: CEMENT STORAGE AND HANDLING SYSTEM, TA-55, LJ 7703-55, TEST BORINGS

The test boring was made as you requested.

	DEPTH (FT.) From	To
Fill, dark brown to brown, mainly silt and clay, some sand not compacted, moisture content (water and organic) ~10 to 15%.	0	18
Tuff, light gray, moderately welded, quartz and sanidine crystals and fragments, some rock fragments of dark gray latite in gray ash matrix.	18	22

The fill material contains organic fluids which gave off explosive vapors in the cutting and open hole. Test indicated a variety of organics present. Prior to any excavation in the area, HSE-5 should be contacted (Leroy Garcia, reference Reg. #3897, Data Sheet 84-224).

The foundation should be set into the tuff unless the fill is reworked and compacted. The tuff is a moderately welded tuff with a bearing capacity of about 5000 lb/ft^2.

WDP:mm

Cy: Tom Keenan, MST-12, MS E501
Leroy Garcia, HSE-5, MS K486

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, HSE-7, MS J592

DATE: October 11, 1984

THRU: Wayne R. Hansen, HSE-8 Group Leader, MS K490

OP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8

SYMBOL: HSE8-84-901

SUBJECT: SHAFT INSPECTION

Shafts 126, 127, and 128 were inspected on October 11, 1984 and meet criteria for disposal of solid wastes as set forth in guidelines of December 10, 1980 (Memo H-7-80-660).

The shafts are straight, 6 ft. in diameter and about 65 ft. deep. The shafts penetrated three ashflow units. The upper contact between Units 2B and 2A occur at a depth of about 12 ft. Both ashflows are a moderately welded tuff. The lower contact between Units 2A and 1B occurs at a depth of about 53 ft. Unit 1B is a nonwelded tuff. The few fractures or joints in the wall of the shaft are of no consequence. The shafts are suitable for disposal of solid wastes.

WDP:mm

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Dean Miller, ENG-9, MS M702 DATE: October 18, 1984

THRU: Alan K. Stoker, HSE-8 Acting Group Leader, MS K490 TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-932

SUBJECT: SOIL BORINGS AND SUBSURFACE INVESTIGATIONS, TA-16

Four (4) test borings were made northwest of TA-16 on October 16, 1984 as you requested (ENG-9-763-84). The holes penetrate soil and badly weathered tuff. They are numbered clockwise from the southwest corner of the proposed building to northeast corner.

HOLE 1	DEPTH (FT.) From	To
Soil, silty loam, brown to dark brown, some small rock fragments.	0	9
Tuff, tan to light brown, weathered into silt, clay with a few small rock fragments, moisture content exceedingly high in places, up to an estimated 20-25% by volume.	9	22
HOLE 2		
Soil (as above).	0	5
Pumice, light gray, appears saturated.	5	8
Tuff, tan to light brown weathered to silt and clay exceedingly wet, estimate 20 to 25% by volume.	8	22

HOLE 3	DEPTH (FT.) From	To
Soil (as above).	0	9
Tuff, tan to light brown weathered to silt and clay.	9	16
HOLE 4		
Soil (as above).	0	10
Tuff, tan to light brown, weathered to silt and clay.	10	22

Soil and tuff has weathered in place with the contact between the soil and tuff not clearly defined. The tuff has weathered to silt and clay with a few small rock fragments. The weathered tuff in the two holes next to the fence contained a high moisture content (estimated 20-25% by volume). The weathered tuff in the two holes farthest from the fence was a little dry with the moisture content of silt and clay ranging from 15 to 20% by volume.

Pumice layer was encountered in Hole 2 between soil and tuff. Pumice appears saturated, many contain free water. The pumice is El Cajete Member of Valles Rhyolite which is found along the western edge of the Pajarito Plateau adjacent to the lower flank of the mountain.

The soil is a silty loam. The soil moisture varies from an estimated 10 to 20% by volume.

I have no recommendation for the bearing capacities or foundation due to the thick section of unconsolidated material, silt and clay, and excessive moisture content. I would look at foundation design of the new building that was constructed south of the proposed building site. I am sure they encountered similar geologic units and conditions.

WP:mm

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: E. J. Hoth, ENG-2, MS M984 DATE: October 29, 1984

THRU: Alan K. Stoker, HSE-8 Acting Group Leader MS K490 TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-960

SUBJECT: SUBSURFACE INVESTIGATION - SECURITY ENHANCEMENTS, TOWER INSTALLATIONS TA-18, L. J. 7847-18

Three test holes were drilled at TA-18 as you requested on October 22, 1984 (ENG-2-84-995). The test holes are numbered in sequence of drilling. Test Hole 1 near Kiva No. 2, Test Hole 2 near junction of road to Kiva No. 2 and Kiva No. 3 and Test Hole 3 near Kiva No. 1.

TEST HOLE 1	DEPTH (FT.) From	To
Soil, dark brown, sandy	0	3
Alluvium, brown, mainly sand, with a minor amount of gravels, unconsolidated, contains water perched on underlying tuff from 9 to 14 ft.	3	14
Tuff, light tan, containing quartz and sanidine fragments, a few small rock fragments in a matrix weathered to sand, silt, and clay (extremely wet from overlying perched water).	14	28

TEST HOLE 2		
Soil, dark brown, sandy	0	2
Alluvium, brown, (as in Test Hole 1) contains water perched on underlying tuff from 8 to 12 ft.	2	12
Tuff, light tan, weathered (as in Test Hole 1).	12	23

TEST HOLE 3	DEPTH (FT.) From	To
Soil, dark brown sand and gravel	0	2
Alluvium, brown gravel, pebbles, cobbles and probably some boulders in a matrix of silt, clay, and sand, contains water perched on underlying tuff from 13 to 18 ft.	2	18
Tuff, tan, weathered (as in Test Hole 1).	18	32

Water was encountered in all the test holes perched in alluvium and on the underlying tuff. As typical of water in alluvium in canyons on the Pajarito Plateau, the water table is highest during the spring from snowmelt and in later summer from showers.

The alluvium in test holes 1 and 2 is derived from weathering and erosion of the tuff, thus is mainly sand. The alluvium in test hole 3 is derived from weathering and erosion of the tuff and volcanic rocks (latite and rhyolites) that form the flanks of the mountains to the west. It is made up of rock fragments, gravels to cobbles in a matrix of sand, silt and clay.

WDP:mm

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Harry Patterson, HSE-7, MS E516

DATE: November 19, 1984

THRU: Thomas C. Gunderson, HSE-8 Acting Group Leader

MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8

SYMBOL: HSE8-84-1047

SUBJECT: SUBJECT INSPECTION OF SHAFT 33, AREA L, TA-54

Please disregard Memorandum HSE8-84-902, dated October 11, 1984. The shaft inspected was shaft 33 instead of shaft 32.

Shaft 33 was inspected on October 11, 1984. The shaft is 6 ft. in diameter and about 65 ft. deep. The shaft is not straight but drifts to the north about 2 ft. at a depth of 65 ft.

The shaft penetrated two ashflow units of rhyolite tuff. The upper Unit 2A and lower Unit 2B are moderately welded tuff. The contact between the two units occur at a depth of about 25 to 27 ft. There several blocks of tuff pull from the southeast wall of the shaft along a near vertical joint at a depth from 18 to 35 ft. Remainder of the shaft walls are fairly smooth, with only a few joints encountered.

The shaft is suitable for disposal of packaged organic wastes.

WDP:mm

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: D. Gutierrez, ENG-2, MS M984 DATE: November 19, 1984

THRU: Tom Gunderson, Acting Group Leader MS K490 MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-84-1041

SUBJECT: TEST BORINGS, PREFABRICATED OFFICE BUILDING, BUILDING RC-33, TA-48; L.J. 7318-48, PHASE B

Two test borings at TA-48 were completed as you requested in ENG-2-84-1049.

TEST HOLE 1	DEPTH (FT.) From	To
(Near Building) Fill, brown, a few small rock fragments of latite and rhyolite in a matrix of clay, silt and sand (reworked and weathered tuff), unconsolidated.	0	5
Tuff, dark gray, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments of rhyolite and latite in a dark gray ash matrix, some excess moisture estimated to range from 8 to 10% by volume.	5	12
TEST HOLE 2		
Fill, brown (as above).	0	6
Tuff, dark gray, moderately welded (as above).	6	13

Fill overlying tuff is unconsolidated and not suitable to complete a foundation in to unless compacted. The moderately welded tuff has a safe bearing capacity of about 5000 lbs/sq ft. The test borings encountered no anomalies in the tuff that would effect foundation design.

WDP:mm

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Los Alamos, New Mexico 87545

memorandum

TO: Dan Miles, ESS-1, MS J979 DATE: January 15, 1985

THRU: Tom Gunderson, HSE-8 Acting Group Leader, MS K490 MAIL STOP/TELEPHONE: K490/0810

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-85-48

SUBJECT: EVAPORATION AND ESTIMATED INFILTRATION FROM PONDS AT FENTON HILL, 1984

In 1984 pond GT-1 (upper pond) was full having an approximate surface area of 11,100 ft^2, annual evaporation 48 inches, resulting in evaporation loss about 340,000 gal.

Pond GT-3 contained water seven months (Jan-July 63%, Technical Report 31 NMSE). The surface area of the pond is 6,500 ft^2, seven months evaporation, 30 inches resulting about 123,000 gal evaporation.

EVAPORATION

Pont GT-1	12 months	340,000 gal
Pont GT-3	7 months	123,000 gal
1984 TOTAL EVAPORATION ≈		463,000 gal

Annual infiltration loss (1,400,000 gal) is based on pond areas and precentage of pond area to annual infiltration loss reported in LA-8217-PR.

Pond GT-1	11,200 ft^2	55%
Pond GT-2	2,800 Ft^2	14%[a]
Pond GT-3	6,500 ft^2	31%
	20,500 ft^2	

[a] Destroyed and filled about 1980.

Pond GT-1 0.55 x 1,400,000 gal = annual infiltration of 777,000 gal

Pond GT-3 0.31 x 1,400,000 gal = annual infiltration of 434,000 or for 7 months = 253,000 gal

INFILTRATION

GT-1	12 months	777,000 gal
GT-3	7 months	253,000 gal
1984 Total Infiltration =		1,030,000 gal

WDP:mm

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: P. C. Hunt, ENG-2, MS M984 DATE: February 12, 1985

THRU: A. K. Stoker, HSE-8 Deputy Group Leader, MAIL STOP/TELEPHONE: K490/7-0813

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-85-140

SUBJECT: **TEST BORINGS, FOURIER TRANSFORM SPECTROMETER FACILITY, BUILDING WA-200, TA-46; L.J. 7552-46**

Seven test borings at TA-46 were completed as you requested in ENG2-85-87. Test hole TH-7 was not drilled as access with the drill rig was not possible.

	DEPTH (FT.) From	To
Test Hole TH-1		
Soil, brown, clayey with some gravel	0	4
Soil, brown, clayey, wet	4	6
Tuff, light gray, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments of dark gray rhyolite in gray ash matrix	6	13
Test Hole TH-2		
Soil, brown, clayey with some gravel, wet (15 to 25% by volume) at base	0	4
Tuff, light gray, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments of dark gray rhyolite in gray ash matrix	4	13
Test Hole TH-3		
Soil, brown (as above)	0	4
Tuff, light gray, moderately welded (as above)	4	12

	DEPTH (FT.) From	To
Test Hole TH-4		
Soil, brown (as above)	0	4
Tuff, light gray, moderately welded (as above)	4	13
Test Hole TH-5		
Soil, brown (as above)	0	6
Tuff, light gray, moderately welded (as above)	6	13
Test Hole TH-6		
Soil, brown (as above)	0	3
Tuff, light gray, moderately welded (as above)	3	13
Test Hole TH-7		
(Not drilled)		
Test Hole TH-8		
Soil, brown (as above)	0	3
Tuff, light gray, moderately welded (as above)	3	13

There was an excess of moisture (est. 15 to 25% by volume) in the base of the soil overlying the tuff. This is a seasonal effect with the soil drying out in the late spring and summer and becoming wet again in late fall, winter, and early spring. Unless the soil is compacted and drained, the foundations should be completed into the tuff. The moderately welded tuff has a safe bearing capacity of about 5000 lbs/sq ft. The test borings encountered no anomalies in the tuff that would effect foundation design.

WDP:mm

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: E. J. Hoth, ENG-2, MS M984 DATE: March 6, 1985

THRU: Thomas C. Gunderson, HSE-8 Group Leader, MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 SYMBOL: HSE8-85-216

SUBJECT: **TEST BORINGS - SAFEGUARDS AND SECURITY UPGRADES: GUARDPOST INSTALLATION, SM-29, TA-3; POWER AND LIGHTING TA-41 and TA-18**

TEST HOLES TA-3	DEPTH (FT.) From	To
Test Hole 1		
Soil, brown, clayey, silty, sandy, moisture content est. 15 to 20% by volume (wet), very plastic.	0	3.5
Tuff, light brown, moderately welded.	3.5	7
Test Hole 2		
Soil, brown, clayey silty with some sand, moisture content est. 15-20% by volume (wet) very plastic.	0	3
Tuff, light pinkish, gray, moderately welded.	3	5

Soil is plastic when wet, should make allowances for even small loads. Tuff was dry with a safe baring capacity of 5000 lbs/ft^2.

TEST HOLES TA-41		
Test Hole 3		
Sand and gravels mixed with silt and clay, moisture 10-15% by volume.	0	15

Sand and gravels are apparently fill material places adjacent to buildings to north. Compaction should allow foundations for light loads.

TEST HOLES TA-18	DEPTH (FT). From	To
Test Hole 4 (Near Bldg. PL-1		
Soil, brown, clayey silty, with some sand, moisture content range 10 to 20% by volume, plastic in places.	0	15
Test Hole 5 (Near Bldg. PL-31		
Asphalt	0	0.5
Sand and gravels, mixed with some silts and clay.	0.5	13
Test Hole 6 (Near West of Guard Station		
Sand and gravels, mixed with some silt and clay	0	14

No water was encountered in the test holes. Sand and gravels compacted should bear light loads. Soil in Test Hole 4 plastic in places should receive special consideration even for light loads.

WDP:mm

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Harry Patterson, HSE-7, MS E516 DATE: March 6, 1985

THRU: Thomas C. Gunderson, HSE-8 Group Leader, MS K490 MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 SYMBOL: HSE8-85-215

SUBJECT: **INSPECTION OF SHAFT 34, AREA L, TA-54**

Shaft 34 was inspected on March 4, 1985. The shaft is 6 ft in diameter and about 63 ft deep. The shaft drifts to the north about 2 ft at a depth of 63 ft.

The shaft penetrated two ashflow units of rhyolite tuff. Both units 2A and 2B are moderately welded tuffs. The contact between the ashflow occurs at a depth of about 25 to 27 ft. There are several blocks of tuff out of the north and northeast wall of the shaft from a depth of about 10 to 34 ft. These blocks were pulled loose from a series of near vertical east-west and southwest-northeast trending joints in the north and northeast walls of the shaft. One east-west joint with a dip of about 45 degrees to the south cuts the south wall of the shaft at about 22 ft. The rising west limb of the joint contains a large open joint (22 to 18 ft). The joint open 2 to 6 inches for 3 to 4 ft is formed by construction where the auger has pulled a block of tuff loose along the joint. The wall in the lower part of the shaft 34 to 63 ft contains few if any joints.

The shaft is suitable for disposal of packaged organic wastes; however, crushed tuff should be used to fill the voids between each lift of barrels as they are placed in the shaft. This will result in a better envelope of tuff between the barrels and shaft walls.

WDP:mm

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: David Trujillo, Eng-9, MS-M984 DATE: April 9, 1985

THRU: Thomas C. Gunderson, HSE-8 Group Leader, MS-K490 TELEPHONE: K490/7-0810

FROM: W.D. Purtymun, HSE-8 SYMBOL: HSE8-85-375

SUBJECT: **TEST BORINGS, GEOCHEMISTRY ANALYTICAL BLDG. SM-494, TA-3, L.J. 7804-35.**

Four test borings were completed at TA-3 as you requested in Memo ENG-285-310.

	DEPTH (FT.) From	To
TEST HOLE NE CORNER		
Soil and fill, dark brown, clayey, exceeding wet down to about 6 ft., a few fragments of tuff and rhyolite rock fragments.	0	9
Reworked tuff and pumice, (water-laid) reworked tuff dark brown with small rock fragments of tuff and rhyolite, silts, sands, and gravels of the reworked tuff, some lenses of white pumice.	9	13
Tuff, dark reddish brown, moderately welded, quartz and sanidine crystals and crystal fragments, a few rock fragments in a dark brown ash matrix, tuff slightly weathered below contact with reworked tuff.	13	19
Tuff, light brown moderately welded, quartz and sanidine crystals and crystal fragments with a few rock fragments in a light brown ash matrix.	19	34

TEST HOLE SE CORNER	DEPTH (FT.) From	To
Soil or fill, dark brown, clayey, wet to about 6 ft.	0	8
Tuff, light reddish brown, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments in a fine ash matrix.	8	18
TEST HOLE NW CORNER		
Asphalt and fill, fill, brown, clayey.	0	4
Reworked tuff, reddish brown, a few small rock fragments, clayey.	4	6
Tuff, light gray, moderately welded.	6	13
TEST HOLE SW CORNER		
Soil or fill, dark brown, clayey, a few small rock fragments.	0	5
Tuff,light gray, moderately, welded.	5	13

The foundation should be set into the tuff. The moderately welded tuff underlying the soil, fill, or reworked tuff has a safe bearing capacity of about 5000 pounds per square foot. The test borings encountered no anomalies in the tuff that would effect the foundation design.

WDP:mm

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: T. C. Gunderson, HSE-8, MS K490

DATE: July 9, 1985

THRU: D. D. Simes

MAIL STOP/TELEPHONE: M984/7-7302

FROM: R. E. Lucero

SYMBOL: ENG-2-85-770

SUBJECT: REQUEST FOR TEST HOLE DRILLING

Request that a test hole be drilled on the east side of building TD-91, TA-22 to determine the permeability of this area for a A.W. Pit.

R. E. Lucero
ENG-2 Engineering Studies

Taken care of

REL/bac

Cy: W. D. Purtymun, HSE-8, MS K490
N. Mezins, MS H822
M. Davis, MS P952
W. Mangum, MS H822
ES/LJ 8063-22
ENG-2 File

Hole 1 near AWP
0 - 12 Soil
12 - 38 Tuff Wet
170 yd East AWP
Hole 2
0 - 8 Soil
8 - 32 Tuff, light gray
no pumice - moderately welded

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, HSE-7, MS J592

DATE: August 16, 1985

THRU: Thomas C. Gunderson, HSE-8 Group Leader
MS K490

MAIL STOP/TELEPHONE: K490/0810

FROM: W. D. Purtymun, HSE-8

SYMBOL: HSE8-85-981

SUBJECT: **INSPECTION OF SHAFTS AT TA-54, AREA G**

Shafts 128, 129, 130, 131, 132, and 133 were inspected on August 14, 1985, and met the criteria for disposal of solid wastes as set forth in guidelines of December 10, 1980 (Memo H7-80-660).

The shafts penetrated three ashflows. A contact between two ashflows of Unit 2B occurs at a depth of about 14 ft. The lower contact between Units 2B and underlying Unit 2A occurs at about 52 ft. The shafts are straight with very few fractures or joints in the shaft walls. The joints and fractures are of no consequence. The shafts are suitable for disposal of solid wastes.

WDP:mlk

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Price Feron, ENG-2 Assoc. Group Leader
MS M984

DATE: August 16, 1985

THRU: Thomas C. Gunderson, HSE-8 Group Leader
MS K490

MAIL STOP/TELEPHONE: K490/0810

FROM: W. D. Purtymun, HSE-8

SYMBOL: HSE8-85-982

SUBJECT: **LABORATORY CONSTRUCTION, BLDG. SM-141, TA-3, L.J. 7918-3 TEST BORING**

One test hole was drilled at the location as directed by Shaski Kavde. The log of the hole is as follows:

	Depth (ft) From	To
Fill, dark gray to black, sand and gravels with a few thin lense of wet light-brown clay	0	7
Soil, light brown, clay to fine sand, wet, plastic	7	9
Tuff, light gray, quartz and sanidine crystals and crystal fragments; a few small, gray rock fragments of rhyolite or latite, moderately welded	9	15
Tuff, brick red, same as above, moderately welded	15	18

The foundations should be set into the tuff. The moderately welded tuff at a depth of 9 ft has a safe bearing capacity of about 5000 lb/sq ft. The test boring encountered no anomalies in the tuff that would effect proper foundation design.

Price, could you see that Shaski of Raymond Kaiser Engineers gets a copy of this memo? Thanks.

WDP:mlk

xc: Shashi Kavde (c/o Price Feron) MS M984

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Price Feron, ENG-2 Assoc. Group Leader, MS M984 — DATE: September 3, 1985

THRU: Thomas C. Gunderson, HSE-8 Group Leader, MS K490 — MAIL STOP/TELEPHONE: K490/0810

FROM: W. D. Purtymun, HSE-8 — SYMBOL: HSE8-85-983

SUBJECT: **LABORATORY CONSTRUCTION, COOLING TOWER ADDITION AND UPGRADE, SM-285, TA-3**

One shallow test hole was drilled at the location as directed by Scott C. Richardson.

The log of the hole is as follows:

	Depth (ft) From	Depth (ft) To
Fill, gray, sand and gravel beneath asphalt	0	1.5
Tuff, light gray to light brown, quartz and sanidine crystals and crystal fragments, a few small rock fragments of gray rhyolite, moderately welded	1.5	8.0

The tuff has a safe bearing capacity of about 5000 lbs/sq ft. No anomolies were encountered in the tuff that would cause concern in the foundation design.

Price, could you see that Scott of Holmes and Narver, Inc. gets a copy of this memo? Thanks.

WDP:cel

xc: Scott C. Richardson (c/o Price Feron, MS M984)

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, HSE-7, MS J592

DATE: October 7, 1985

THRU: Thomas C. Gunderson, HSE-8 Group Leader

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8

SYMBOL: HSE8-85-1218

SUBJECT: INSPECTION OF SHAFT C-11, AREA G, TA-54

Shaft C-11 was inspected on October 3, 1985, and meets the criteria for disposal of solid wastes as set forth in guidelines of December 10, 1980 (Memo H7-80-660).

The shaft is 6 ft in diameter and 64 ft deep. The shaft is straight with a few fractures or joints in the shaft wall. One small block (about 2 ft by 3 ft) is pulled out of the west wall at about 40 ft. The contact between Unit 2B and underlying Unit 2A occur at about 40 ft.

The shaft is suitable for disposal of solid wastes.

WDP:brm

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Chris Sanchez, ENG-2, MS M984

DATE: October 16, 1985

THRU: Thomas C. Gunderson, HSE-8 Group Leader

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8

SYMBOL: HSE8-85-1213

SUBJECT: TEST HOLES, BLDG. SM-200 TA-3; L.J. N7954-3

Nine test holes were drilled at or adjacent to location shown on Figure 1 as requested in Eng-2-85-1085.

The logs of the holes are as follows:

	Depth (ft) From	To
Test Hole 1		
Fill, dark gray to brown, sands and gravels with lots of silts and clay; extremely wet (15-25% moisture by volume) above contact with underlying tuff.	0	3
Tuff, light brownish gray, quartz and sanidine crystals and crystal fragments, a few small rock fragments of gray rhyolite and dark gray pumice in an ash matrix; moderately welded.	3	8
Test Hole 2		
Fill, dark gray to brown as described in Test Hole 1.	0	4
Tuff, light reddish brown, a few quartz and sanidine crystals and crystal fragments, a few small rock fragments of latite and pumice in an ash matrix; moderately welded.	4	8
Tuff, light brownish gray as described in Test Hole 1.	8	13

<u>Test Hole 3</u>		
Fill, dark gray to brown as in Test Hole 1.	0	6
Tuff, light brownish gray as in Test Hole 1.	6	13
<u>Test Hole 4</u>		
Fill, dark gray to brown as in Test Hole 1.	0	4
Tuff, light brownish gray as in Test Hole 1.	4	8
<u>Test Hole 5</u>		
Fill, dark gray to brown as in Test Hole 1.	0	7
Tuff, light brownish gray as in Test Hole 1.	7	13
<u>Test Hole 6</u>		
Fill, dark gray to brown as in Test Hole 1.	0	5
Tuff, light brownish gray as in Test Hole 1.	5	8
<u>Test Hole 7</u>		
Fill, dark gray to brown as in Test Hole 1.	0	7
Tuff, light brownish gray as in Test Hole 1.	7	13
<u>Test Hole 8</u>		
Fill, dark gray to brown as in Test Hole 1.	0	8
Tuff, light brownish gray as in Test Hole 1.	8	13
<u>Test Hole 9</u>		
Fill, dark gray to brown as in Test Hole 1.	0	8
Tuff, light brownish gray as in Test Hole 1.	8	13

The foundations should be set into the tuff. The moderately welded tuff has a safe bearing capacity of about 5,000 lb/sq ft. The test borings encountered no anomalies in the tuff that would effect the proper foundation design.

WDP:brm

Enclosure: Figure 1 (Map)

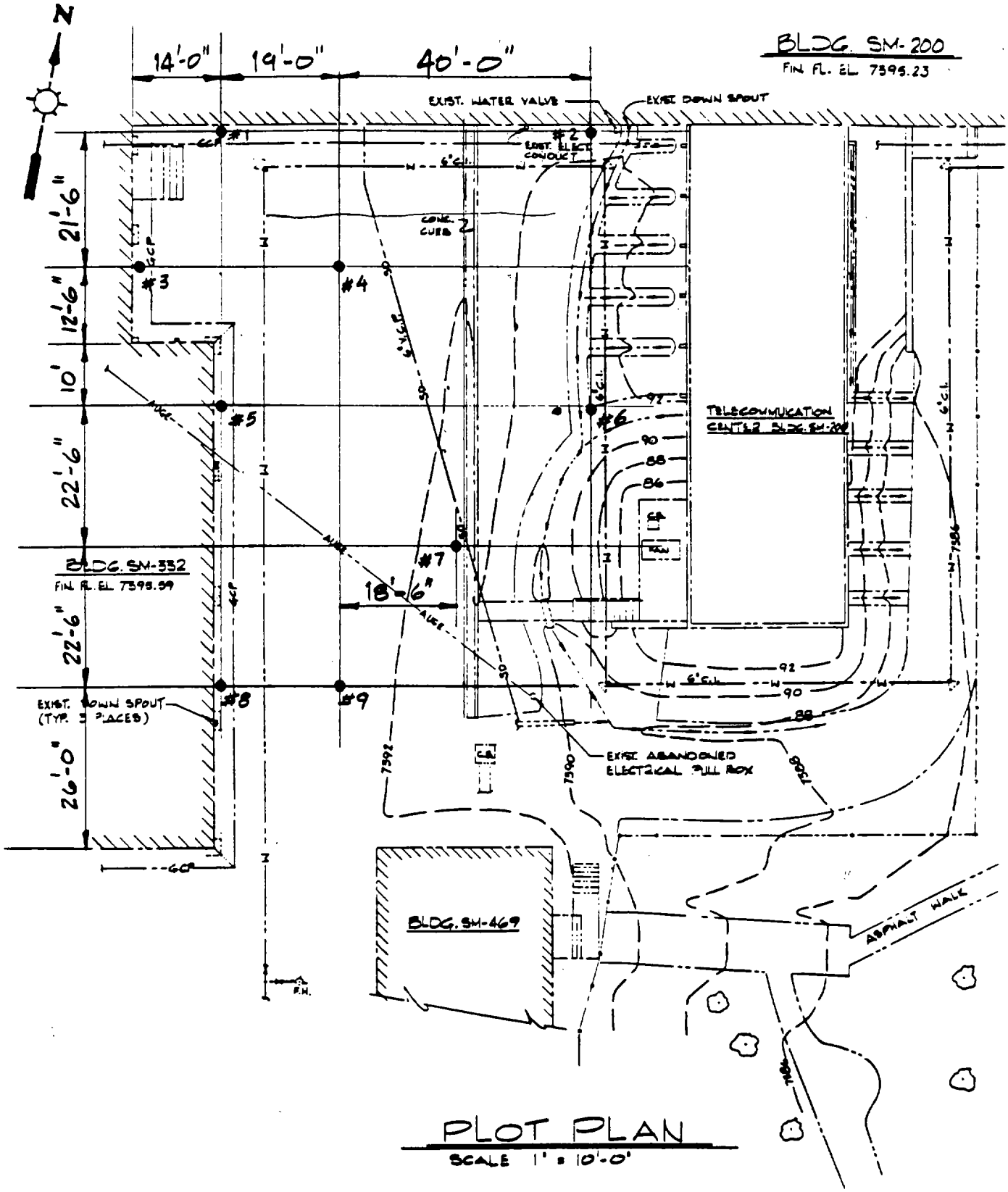

Figure 1. - Location of Test Holes 1 through 9 near Bldg. SM-200

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Merle Bunker,
INC-5 Group Leader, MS G776

DATE: October 16, 1985

THRU: Thomas C. Gunderson,
HSE-8 Group Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8

SYMBOL: HSE8-85-1278

SUBJECT: STABILITY OF ROCKS ON WALLS AND SLOPES OF LOS ALAMOS CANYON ABOVE TA-2

A reconnaissance was made of the north wall of Los Alamos Canyon above the site on October 6, 1985 at the request of Merle Bunker, Isotope and Nuclear Chemistry Group (INC-5). The last inspection was made of the canyon walls on June 15, 1984.

Since the last inspection there have been no rock falls or movement of rocks or blocks of tuff on the slope or cliff above TA-2. The security fence and rock catchers on the north wall above TA-2 were inspected and are in good shape.

There are a number of rocks and blocks of tuff on the slope and cliffs above TA-2 that have the potential to cause rock falls. If any rocks should dislodge, the slope below, rock catchers, and security fence above the buildings should prevent the rock falls from causing any damage.

WDP:brm

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Ralph G. Martinez, ENG-2, MS M984

DATE: February 18, 1986

THRU: Thomas C. Gunderson, HSE-8 Group Leader

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 WP

SYMBOL: HSE8-86-216

SUBJECT: TEST BORINGS AT BUILDING 200, TA-3, LJ 8233-3

Two test holes were drilled at or adjacent to locations shown on Figure 1. The holes were requested in memorandum ENG-2-86-95 (February 5, 1986). Previous Test Holes 1 through 9 were drilled in October 1985 and reported in memorandum HSE8-85-1213.

The logs at holes 10 and 11 are as follows:

	Depth (ft) From	Depth (ft) To
Test Hole 10		
Fill, dark gray to brown, silts and clay, with some gravel, wet (est. 10-20% moisture by volume) above contact with underlying tuff	0	4
Tuff, light brownish gray, quartz and sanidine crystals and crystal fragments, a few small fragments of gray rhyolite and dark gray pumice in an ash matrix; moderately welded.	4	7
Test Hole 11		
Fill, dark gray to brown as described in Test Hole 10.	0	3
Tuff, light brownish gray, moderately welded as described in Test Hole 10.	3	7

The foundations should be set into the tuff. The moderately welded tuff has a safe bearing capacity of about 5,000 lbs/sq ft. It should be noted that just east of Test Holes 10 and 11 a north-south water line is present. The test borings encountered no anomalies in the tuff that would effect foundation design.

WDP:brm

Enclosure: Figure 1 (map)

Cy: C. Sanchez, ENG-2, MS M984
K. Ellard, ENG-DO, MS P915
Liaison Office, MS K717
A. Loya, ENG-4, MS B252
T. Lansford, Kaiser Engr., MS M703

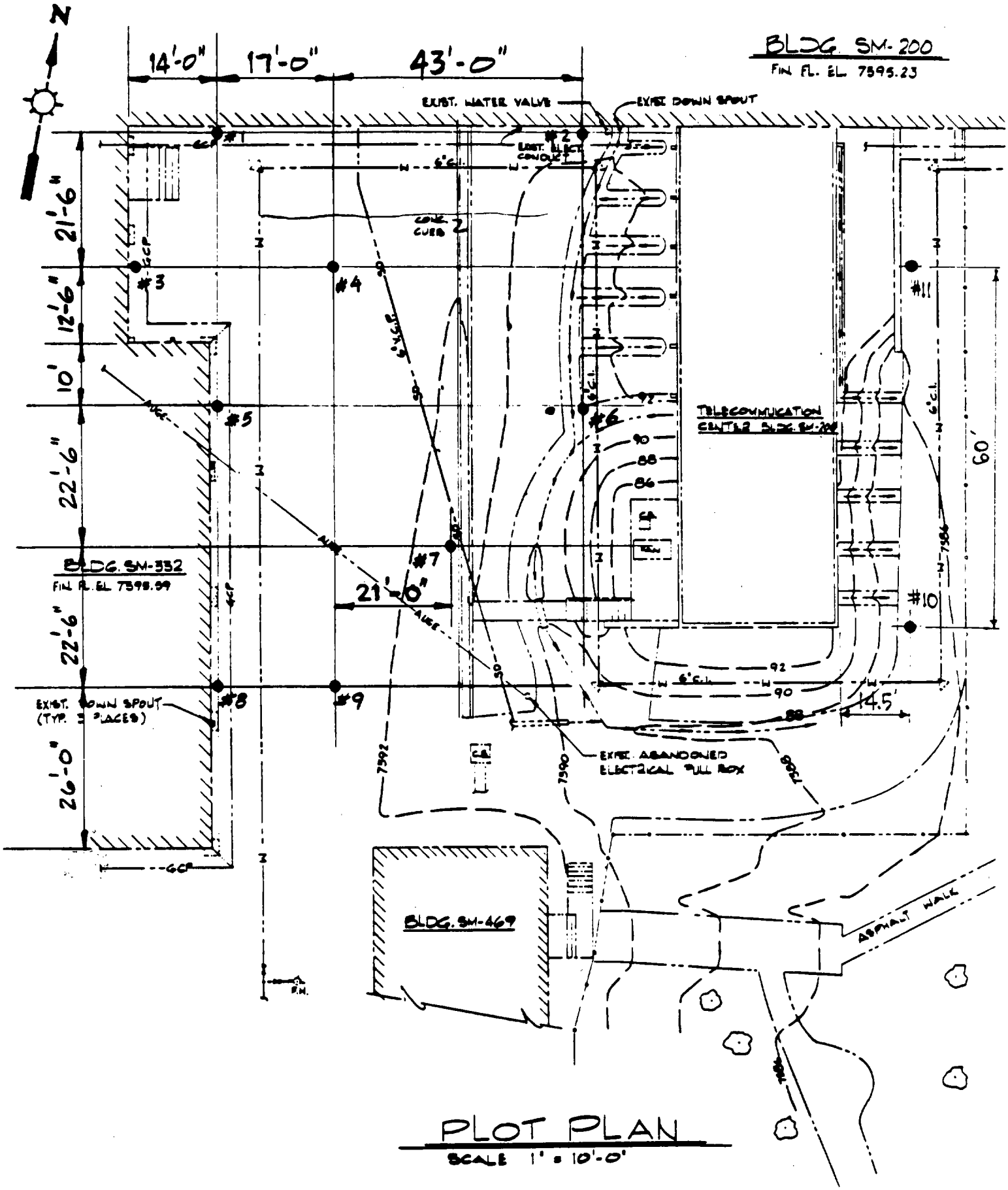


Figure 1. - Location of Test Holes 1 through 11 near Bldg. SM-200

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Dean Miller, ENG 9, MS M702

DATE: April 7, 1986

THRU: Thomas C. Gunderson, HSE-8 Group Leader, K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8

SYMBOL: HSE8-86-376

SUBJECT: SOIL BORINGS AT TA-35 AND TA-16

A subsurface investigation was made at TA-35 and TA-16 on March 26, 1986 as requested in ENG-9-200-86.

The test borings at TA-35 are just to the southeast of a nest of injection and monitoring wells that were used by the U.S. Geological Survey and old "Group H-6" to study the behavior of liquids injected into the tuff. As I recall about 0.5×10^6 gal of water was injected into the tuff through an injection zone about 55 to 65 ft below land surface. The tests ran about 6 months in 1964 and 1965. Capillary movement in low moisture range was about 20 ft above the top of the injection zone. Moisture moved horizontal about 90 ft in the low moisture range (20% near injection zone to <5% by volume outward to 90 ft) as the result of capillary movement. The major movement was downward to about 240 ft. beneath the injection zone when capillarity hung the moisture (injected water) in the tuff. The spindle shape was a maximum of 25 to 30% by volume in the spindle beneath the injection zone. Three attachments, map and tables, are for your information. The two test holes (1986) at TA-35 penetrated and were completed in a moderately welded tuff.

Test Hole 1	Depth (ft) From	To
Gravel and soil dark brown, soil clayey.	0	3
Tuff, dark gray, moderately welded, quartz and sanidine crystals and crystal fragments, a few rock fragment pumice, latite, and mylonite in a ash matrix; Moisture content estimate's at 10 - 15% by volume.	3	32

Test Hole 2	Depth (ft) From	To
Gravel and soil as in Test Hole 1	0	2
Tuff, light gray moderately welded as in Test Hole 1; moisture of tuff lower them in TH-1, <5 to 10% by volume (est).	2	43

The moderately welded tuff is about 110 ft thick at the proposed location. The water injected in the tuff should not cause any problem with the foundation design. The bearing capacity of this unit at TA-55 (about 0.5 mi west) has a safe bearing capacity of about 5000 lbs/ft^2. Location of test holes 1 and 2 are shown on figure 9 (enclosed). Locations are approximate and were not surveyed.

Four test holes were augered at TA-16 at the location of the proposed building. Locations are numbered clockwise, test holes 1 through 4, starting with test hole 1 near transformer. Three of the holes were completed through fill and soil, a silt and clay into the top of a badly weathered tuff. The fourth hole penetrated the above section and was completed in a weathered tuff containing numerous pumice fragment. Test holes 1 and 2 encounters excess moisture in the fill and soil and in the upper part of silt and clay unit.

Test Hole 1	Depth (ft) From	To
Fill and soil, clayey, dark brown, excess moisture (estimate 20 to 25% by vol.) from 4 to 6 ft, fine grained, plastic.	0	6
Silt and clay, brown, moisture content decrease from estimated 20% by volume at base of soil to about 10% at increasing depth, fine grained, plastic in places.	6	21
Tuff, badly weathered, light brown, contain an abundance of silt and clay, a few small rock fragments of rhyolite, and sand size quartz and ramidine crystal and crystal		

Test Hole 1 (Cont)	Depth (ft) From	To
fragments.	6	28

Test Hole 2	Depth (ft) From	To
Fill and soil, clayey, dark brown, as in Test Hole 1; plastic.	0	6
Silt and clay, brown as in Test Hole 1; plastic.	6	18
Tuff, badly weathered, light brown, as in Test Hole 1.	18	23
Test Hole 3		
Fill and soil clayey, dark brown, dryer than Test Hole 1, (estimate 10 to 15% by volume), plastic.	0	6
Silt and clay, brown, as in Test Hole 1; plastic in places.	6	17
Tuff, badly weathered, light brown as in Test Hole 1.	17	23
Test Hole 4		
Soil and fill, dark brown as in Test Hole 3, (estimate moisture 10 to 15% by volume).	0	7
Silt and clay, brown, fine grained plastic in places.	7	19
Tuff, brown, badly weathered as in Test Hole 1.	19	34
Tuff, brown, weathered, contain numerous pumice fragments.	34	42

I have no recommendations for bearing capacities or foundation design due to the thick section of unconsolidated material, silt and clay, and excessive moisture content especially in

test holes 1 and 2. I would look at the foundation design of the new building under construction and nearing completion west of the entrance to TA-16. The test boring at this location encountered similar conditions as were encountered in the present locations (HSE8-84-932; October 18, 1984).

WDP:tp

Attachments: Figure 9.--Location of test holes at site 1 and 2, TA-50 and site 1, TA-52

Table 1.--Geologic section and estimated and effective porosity of tuff units at sites 1 and 2. (Approximate altitude of land-surface 7,250 feet)

Table 2.--Hydrologic characteristics in relation to porosity of a unit of the Tshirege Member in the Los Alamos area. (Analysis by the U.S. Geol. Survey)

Table 3.--Construction data of wells at Site 2.

Table 62.--Site 2, TA-50, liquid injection test holes.

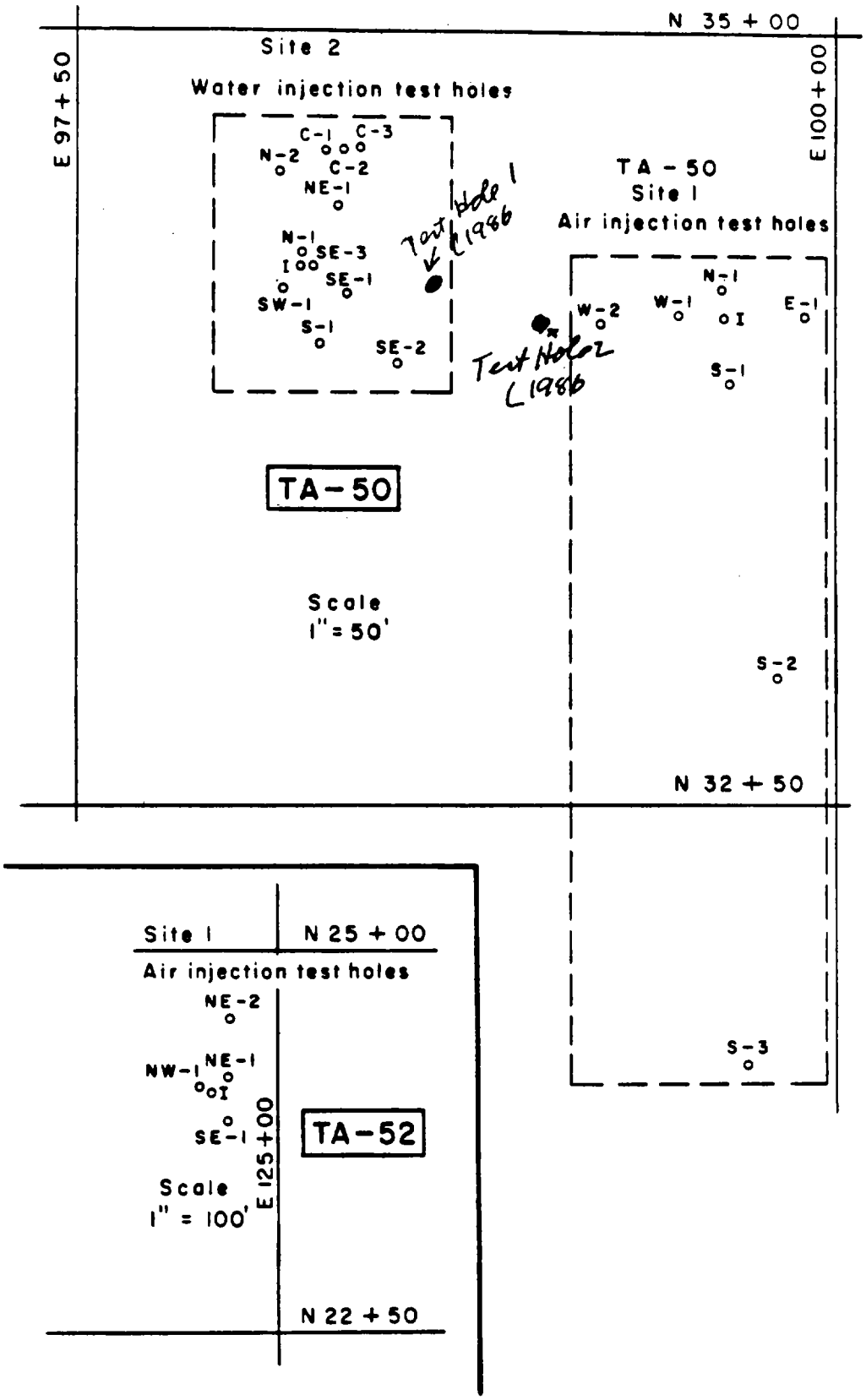


Figure 9.--Location of test holes at site 1 and 2, TA-50 and site 1, TA-52.

Map from "Records of wells, Test holes, springs and Surface Water Stations in the Los Alamos Area, New Mexico," U.S. Geol. Survey Admin. Rept. (1966), in files of HSE-8 - shown on map are approximate location of Test Holes 1 and 2 (1986).

Table 1.--Geologic section and estimated and effective porosity of tuff units at sites 1 and 2. Approximate altitude of land-surface 7,250 feet).

Unit	Thickness (feet)	Depth (feet)	Effective 1/ porosity (percent)	Porosity 1/ (percent)
Tshirege Member				
Moderately welded tuff	110	110	38	46
Welded tuff	120	230	33	37
Moderately welded tuff	20	250	38	46
Nonwelded tuff	45+	295+	54	60

1/ Estimated from moisture and density logging.

Table 2.--Hydrologic characteristics in relation to porosity of a unit of the Tshirege Member in the Los Alamos area. (Analysis by the U.S. Geol. Survey)

Sample	Porosity (percent)	Specific yield (percent)	Specific retention (percent)	Coefficient of permeability (gdp per sq ft)
1	54	38	16	6
2	50	34	16	3
3	47	27	20	2
4	41	24	17	0.1
5	38	18	20	.9

Note: Decrease in porosity indicates an increase in degree of welding.

Table 3.--Construction data of wells at Site 2.

Hole designation	Date Drilled	Diameter (inches)	Depth (feet)	Remarks
N-2	Sept. 1965	5	112	
NE-1	Sept. 1965	5	118	
N-1	Nov. 1964	5	97	
I	Nov. 1964	5	67	Tests 1 and 2, Disposal well.
SE-3	Oct. 1965	4	295	
SW-1	Nov. 1964	5	97	Test 3 Disposal well.
SE-1	Nov. 1964	5	97	
S-1	Oct. 1965	4	295	
SE-2	Sept. 1965	5	112	

Note: Holes were augered except for SE-3 and S-1 which were drilled by air-rotary.

Tables from "Test on and design of disposal wells at Los Alamos, New Mexico" U.S. Geol. Survey unpublished rept. in files of HSE-8

Table 62.--Site 2, TA-50, liquid injection test holes (cont)

USGS hole designation	USGS location number	AEC-LASL designation (structure number)	AEC-LASL coordinates	Drilling date	Altitude of land surface (feet above mean sea-level)	Diameter of hole (inches)	Depth (feet)	Type of drilling
C-2	19.6.22.3121	TA-509-14	N 34+62 E 98+38	Dec 1964	Approx. 7,248	5	8	Do.
C-3	19.6.22.312m	TA-50-15	N 34+63 E 98+43	Dec 1964	Approx. 7,248	5	8	Do.

Note: All holes are drilled in tuff. Hole I, the injection well, has an injection tube and an observation tube set in gravel from 55 ft to 65 ft. The bottom 2 ft from 65 ft to 67 ft are filled with crushed tuff. The hole is cemented from the surface to the top of the gravel pack at 55 ft. Hole C-1, a calibration hole, cased with 1.5 in. steel tubing. Hole C-2, a calibration hole, open hole; Hole C-3, a calibration hole, is cased with 2 in. plastic tubing.

Tables from "Records of Wells, Test Holes, Springs, and Surface Water Stations in the Los Alamos Area, New Mexico," U.S. Geol. Survey Admin. Rept (1966) in bits of HSE-8

Table 62.--Site 2, TA-50, liquid injection test holes

USGS hole designation	USGS location number	AEC-LASL designation (structure number)	AEC-LASL coordinates	Drilling date	Altitude of land surface (feet above mean sea-level)	Diameter of hole (inches)	Depth (feet)	Type of drilling
N-2	19.6.22.312a	TA-50-16	N 34+55 E 98+18	Sept 1965	7,247.7	5	1[illegible]2	Auger
NE-1	19.6.22.312b	TA-50-17	N 34+34 E 98+36	Sept 1965	7,246.6	5	1[illegible]8	Do.
N-1	19.6.22.312c	TA-50-18	N 34+29 E 98+26	Nov 1964	7,245.2	5	[illegible]7	Do.
I	19.6.22.312d	TA-50-19	N 34+24 E 98+26	Nov 1964	7,244.7	5	67	Do.
SE-3	19.6.22.312e	TA-50-20	N 98+23 E 98+28	Oct 1965	7,244.6	4	2[illegible]5	Rotary, air
SW-1	19.6.22.312f	TA-50-21	N 34+17 E 98+19	Nov 1964	7,244.4	5	[illegible]7	Auger
SE-1	19.6.22.312g	TA-50-22	N 34+15 E 98+39	Nov 1964	7,234.9	5	[illegible]7	Do.
S-1	19.6.22.312h	TA-50-23	N 33+99 E 98+30	Oct 1965	7,242.9	4	2[illegible]5	Rotary, air
SE-2	19.6.22.312j	TA-50-24	N 33+92 E 98+56	Sept 1965	7,241.6	5	1[illegible]2	Auger
C-1	19.6.22.312k	TA-50-13	N 34+62 E 98+33	Dec 1964	Approx. 7,248	5	8	Do.

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: A. D Miller, ENG-9, MS M702 DATE: June 13, 2986

THRU: Thomas C. Gunderson, HSE-8 Group Leader MAIL STOP/TELEPHONE: K490/7-5021

FROM: W. D. Purtymun, HSE-8 SYMBOL: HSE8-86-706

SUBJECT: TEST HOLE TA-48, RADIOCHEMICAL DATA WING FOR WEAPONS DIAGNOSTIC

Only one test hole was drilled due to limited access to the area of investigation. The location is shown as Test hole #2 on attached sketch. Work was completed on June 11, 1986.

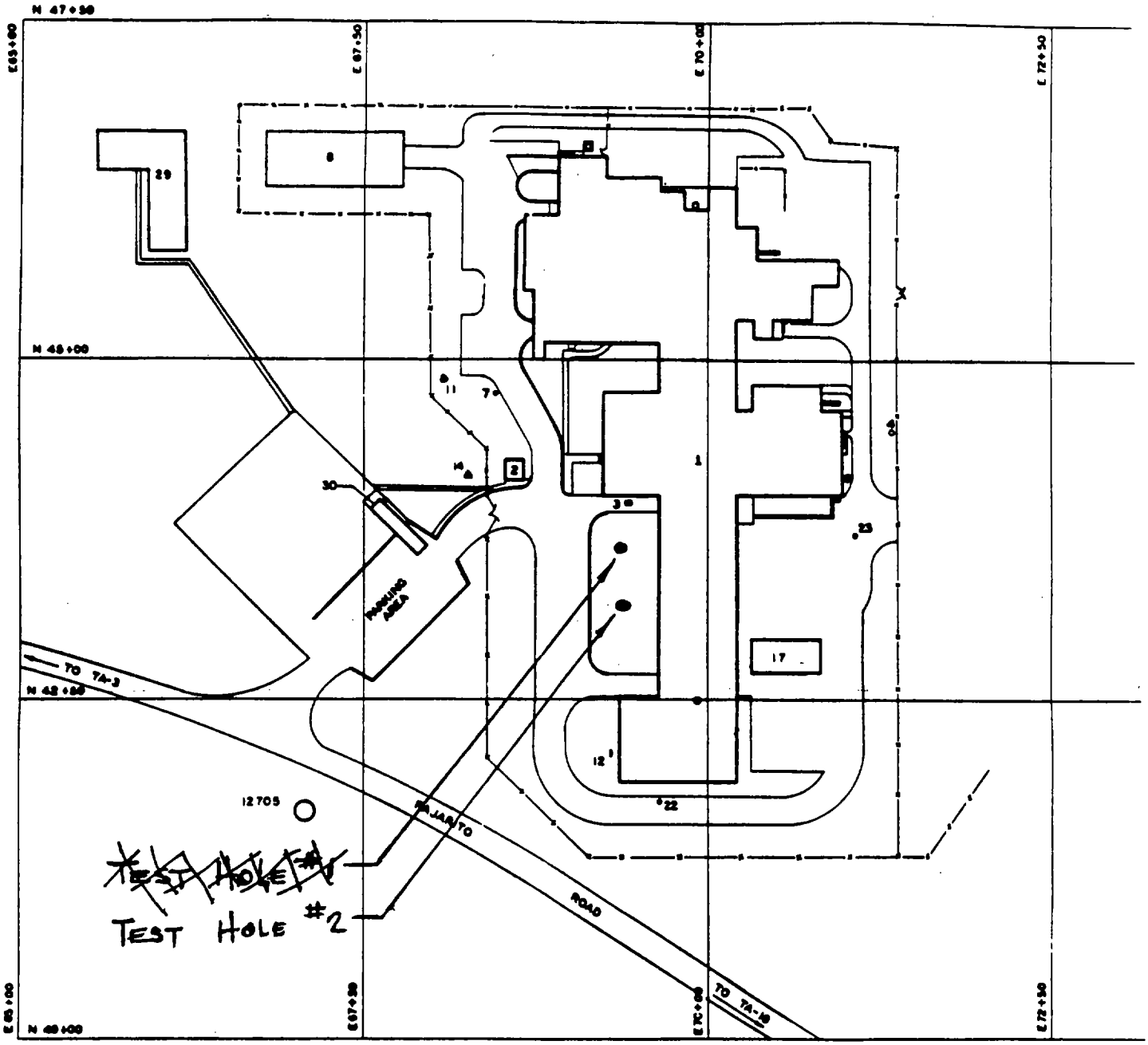
Log of Test Hole

	Depth (ft) from	to
Soil, brown, clayey, with some gravel and sand, wet (10% to 15% by moisture volume estimated) in places up to about 6ft, dryer (5% to 10% moisture by volume estimated) 6 to 8 ft.	0	8
Tuff, gray, moderately welded, a few quartz and sanidine crystals and crystal fragments, a few rock fragments of dark gray rhyolite, devitrified dark gray pumice fragments in a fine ash matrix	8	18

The tuff is moderately welded with a safe bearing capacity of about 5000 lbs\sq ft. No anomalies were encountered in the tuff that would effect formulation design.

WDP:tp

Cy: T. Buhl, HSE-8, MS K490



TA-48

Sketch Map showing location of Test Hole drilled at TA-48

The Zia Company
Memorandum

Thru: Will Hobbs, Department Head - EMTD
Materials Testing/Inspection Dept. - 667-7098

To: Dean Miller, LANL **Date:** June 27, 1986
ENG-9

From: Karl Horner, QA Engineer 3 - EMTD
Materials Testing/Inspection Dept. - 667-7098

Subject: TEST HOLE AT TA-48 - RADIOCHEMICAL DATA WING FOR DIAGNOSTIC - GEOTECHNICAL INVESTIGATION
W.O. #5-55-0097

EMTD-192

Submitted herewith is the above subject final report. This report presents the investigation and test work through June 26, 1986. Should you have any questions concerning this report, please contact at your convenience.

WH:KH/rr

Attachment

cc: ARMD (No Attachment)

TEST HOLE TA-48

RADIOCHEMICAL DATA WING

FOR WEAPONS DIAGNOSTIC

W.O. #6-5509-36

I. Summary of Conclusions

This structure may be founded on the undisturbed clayey sand soil found below the buried A horizon soil at a depth of approximately 3.5 feet. Footings thus founded may be designed using a safe soil pressure of 4,000 pounds per square foot for round or square footings and 3,800 pounds per square foot for continuous wall footings.

II. Introduction

Proposed for construction at this site is an addition to the existing Building No. 1. The proposed addition will consist of a single storied, slab-on-grade structure utilizing bar joist framing and steel stud bearing walls. The approximate dimensions of the addition are 29 feet wide by 96 feet long.

III. Site Description

The site of the proposed construction slopes gently to the west and is covered by a layer of landscaping gravel which contains various trees and shrubs. It is most likely that the site is covered by some amount of fill material.

IV. Conclusions and Recommendations

The upper 3.0 to 4.0 feet at the location of the only boring that was possible to make indicates a fill material overlying an A horizon soil. This buried soil acts as a permeability barrier which causes the overlying materials to have a higher than normal moisture content.

The overlying fill material as well as A horizon soil exhibit a low bearing capacity when tested by Standard Penetration Tests. Immediately underlying the soil horizon the soils are noticeably dryer and the Standard Penetration blow counts increase to more than 30 BPF.

Soft weathered Tuff was encountered at a depth of 9.5 feet and refusal of Standard Penetration test was encountered at a depth of 10.9 feet.

It is recommended that this structure be founded on undisturbed soils found immediately below the buried A horizon soil. Such footings may be designed using a safe soil pressure of 4,000 pounds per square foot for round or square footings and 3,800 pounds per square foot for continuous wall footings.

The in-place fill soils appear to be reasonably well compacted and capable of sustaining an area loading of 1500 pounds per square foot. It is recommended that the materials supporting the floor slab be tested to insure uniform compaction of at least 93% of maximum dry density as determined by ASTM D-1557.

KH/rr - June 25, 1986

Descriptive Terms

Standard Penetration Test		
Granular Soils	Blows Per Foot	Cohesive Soils
Very Loose	0 - 5	Very Soft
Loose	6 - 10	Soft
Slightly Compact	11 - 20	Stiff
Compact	21 - 35	Very Stiff
Dense	36 - 70	Hard
Very Dense	70+	Very Hard

Dry - No apparent soil moisture

Moist - Slight soil moisture content

Damp - Soil moisture content below the Plastic Limit

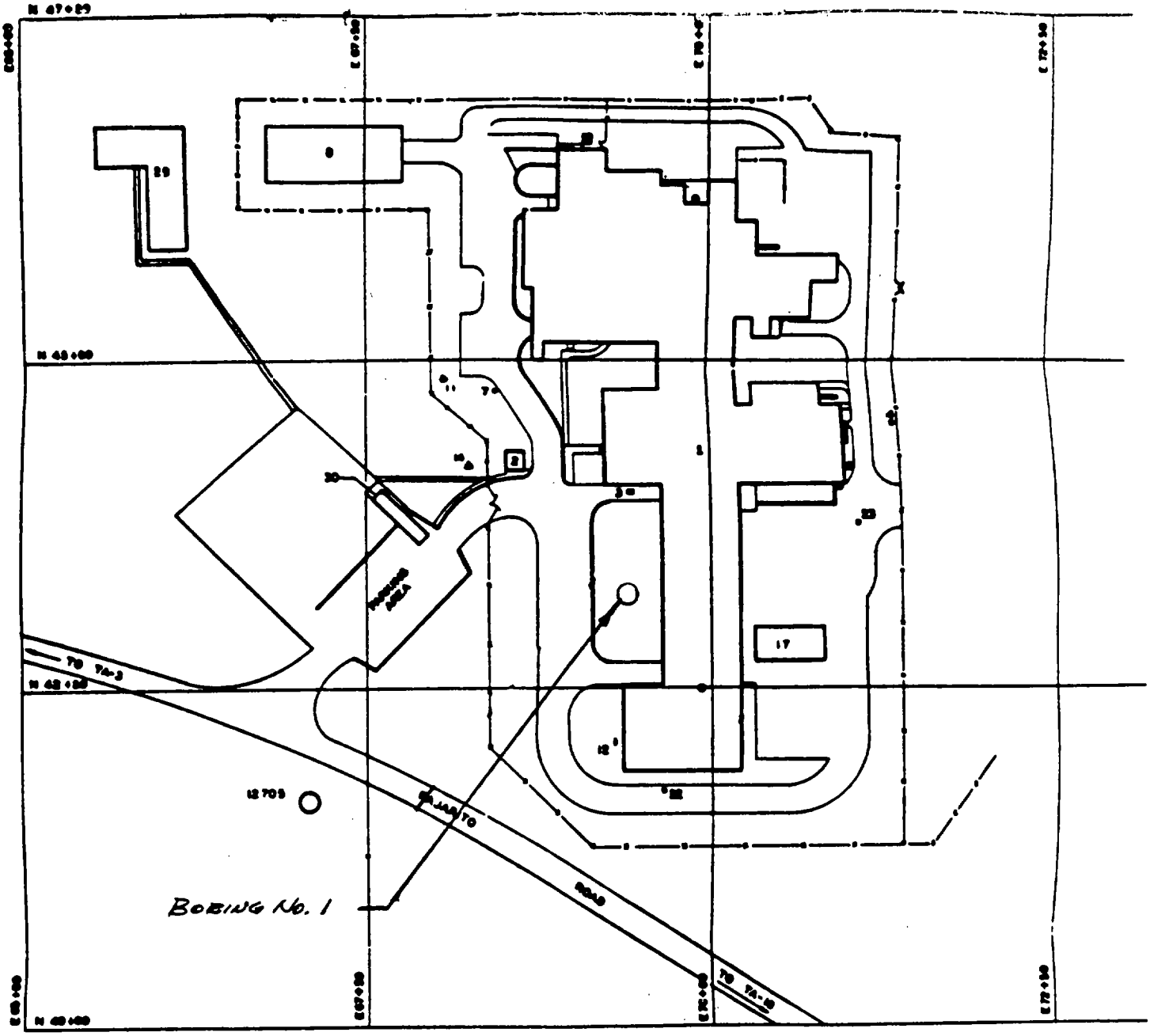
Very Damp - At or near the Plastic Limit

Wet - Soil moisture above the Plastic Limit near Liquid Limit

Very Wet - Minor amount of free water above Liquid Content

Saturated - Free water

Test Hole at TA-48
Radiochemical Data Wing
for Weapons Diagnostic
W.O. #6-5509-36



Test Hole at TA-48
Radiochemical Data Wing
for Weapons Diagnostic
W.O. #6-5509-36

TEST BORING LOG

Radia Chemical Data Wing for Weapons Diagnostic

BORING NO: 1 LOC See Boring Location Plot

SCALE: 1 IN= 5 FT. BORING DATE 6-19-86 BY Fox / G.W. LEVELS BY --- CHECKED ---

EL. WATER LEVEL None DATE 6-19-86 EL ____ DATE ____ EL ____

BM NO. LOC.

BS	HI	FS	EL	REMARKS
				Top of Ground

FM	LOG	ELEVATION	REMARKS	S NO.	TOOL	BPF	% M	WT. #/CU. FT.
Probable Fill			Top of Ground					
			Slightly compact brown clayey sand. 3.0					
Soil "A" Horizon	3.5		Slightly compact brown clayey sand 9.0	1	S.P.	11	wet	
			Black organic soil (A Horizon) 8 to 10 inches Thick 5.0					
Soil Mantle	5		Slightly compact brown clayey sand 6.0	2	S.P.	12		
			8.0					
			Compact brown clayey sand & some 9.0	3	S.P.	34	slightly damp	
			Tuff fragments 9.5					
Bandelier Tuff	10		Weathered Tuff 10.9	4	SP	Refusal at 10.9 feet.		
			Bottom Hole					

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Phillip C. Hunt, ENG-2, MS M984 — DATE: July 22, 1986

THRU: Thomas C. Gunderson, HSE-8 Group Leader, MS K490 — MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 — SYMBOL: HSE8-86-861

SUBJECT: TEST BORINGS, GROUND TEST ACCELERATOR NO 2, TA-53, LJ 7770-53

Six test holes were drilled at the site as requested in memorandum 7770-53 TST (July 1, 1986). The holes were located in and around the transformer station (Fig. 1).

Test holes 3, 4, 5, and 6 encountered a fill material of tuff ranging from 3 to 8 ft in thickness overlying the undisturbed moderately welded bed rock. Test holes 1 and 2 encountered undisturbed tuff at a depth of about 2 ft. The logs of the test holes are as follows.

Test Hole 1	Depth (ft) From	To
Fill material, same asphalt underlain by gravel	0	2
Tuff, gray, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments of dark gray dense rhyolite and pumice in an ash matrix.	2	18

Test Hole 2	Depth (ft) From	To
Fill material, some asphalt underlain by gravel	0	2
Tuff as in Test Hole 1, upper surface of tuff wet (moisture content est. 10 to 15% by volume).	2	13

Test Hole 3	Depth (ft) From	To
Fill material, same asphalt underlain by gravel.	0	1
Fill material tuff gray to light brown, some clay weathering.	1	4
Tuff, light gray to light brown, moderately welded, quartz and sanidine crystals and crystal fragments, same small rock fragments of gray rhyolite and pumice.	4	13

Test Hole 4	Depth (ft) From	To
Fill material gravel.	0	2
Fill material, tuff, gray light brown, some clay weathering (moisture est. 10-20% by volume).	2	7
Tuff as in Test Hole 3.	7	13

Test Hole 5	Depth (ft) From	To
Fill material, tuff as in Test Hole 4.	0	8
Tuff as in Test Hole 4.	8	15

Test Hole 6	Depth (ft) From	To
Fill material, tuff as in Test Hole 4.	0	3
Tuff, light brown, moderately welded, quartz and sanidine crystals and crystal fragments, small rock fragments, rhyolite and pumice	3	8
Tuff, gray to light brown, moderately		

welded	8	12

The undisturbed tuff (moderately welded) has a safe bearing capacity of about 5,000 lbs per sq ft. The fill material (tuff) can be compacted to result in a bearing capacity of 3,000 to 4,000 lbs per sq ft. The test holes encountered no anomalies in the fill material or bed rock tuff which would cause problems in foundation design.

WDP:brm

Cy: T. Buhl, HSE-8, MS K490

Attachment: Figure 1

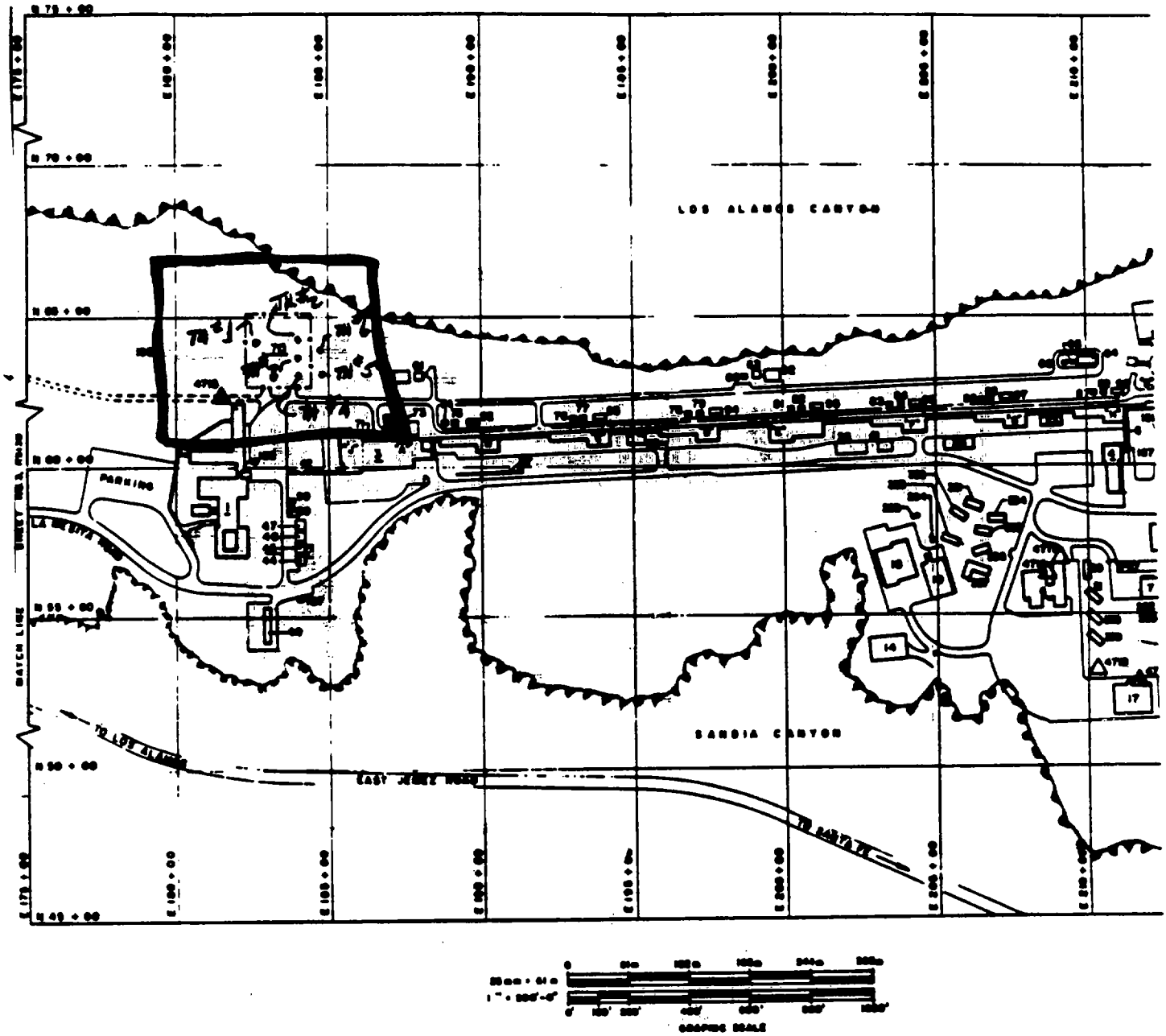


Figure 1. Location of Test Holes in and adjacent to Transformer Station, TA-53

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Thomas C. Gunderson, HSE-8 Group Leader

DATE: August 1, 1986

THRU: Thomas E. Buhl, HSE-8 Associate Group Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun and Donald VanEtten, HSE-8

SYMBOL: HSE8-86-883

SUBJECT: CONSTRUCTION OF RETENTION PONDS IN MORTANDAD CANYON

Industrial liquid effluents from Laboratory operations contain radionuclides and are processed at the plant at TA-50. The treatment removes most of the radionuclides before the remaining effluents are released into Mortandad Canyon. Mortandad Canyon has a small drainage area that heads on the Pajarito Plateau. Steam flow occurs in the upper-reach of the canyon as the result of the effluent release and storm runoff. The effluents and storm runoff recharge a small body of perched water in the alluvium. This shallow aquifer is of limited extent, confined within the Laboratory.

The major transport of radionuclides in the effluent-release area from TA-50 is by storm runoff. The radionuclides remaining in the effluent are adsorbed or attached to silts and clays in the sediments of the stream channel. Storm runoff transports 90 to 95% of the radionuclides in the suspended and bed load sediments while the remaining 5 to 10 % is transported in solution. Contamination is high near the effluent outfall and decreases down gradient in the canyon. The largest surface water losses occur in the mid-reach of the canyon where the stream is not well defined as it braids out on the canyon floor. The canyon widens and the alluvium thickens. It is within this area that efforts have been undertaken to insure that contamination is retained within the Laboratory. The purpose of injection wells and retention ponds was to store the runoff and sediments until the runoff is lost by infiltration into the unsaturated alluvium and evapotranspiration. The depth to water in the alluvial aquifer ranges from 40 to 45 ft in this reach of the canyon.

Five injection wells were constructed in the stream channel in 1974. The wells were 12 in. in diameter and about 20 ft deep. They were filled with course gravel. Runoff events during 1974 and 1975 filled the gravels in the wells with fine sediments,

decreasing the permeability of the alluvium adjacent to the shaft wall. The wells lost their effectiveness to control the runoff. In the spring of 1976 two retention ponds were constructed in the stream channel. The ponds were about 15 ft wide, 25 ft long, and averaged about 7 ft in depth. The average capacity for each pond was about 20,000 gallons (740 cubic yards) for a total of 40,000 gallons (1,480 cubic yards).

As the ponds began to fill with sediments a third pond was constructed in 1980 below the upper two ponds. This pond had a diameter of about 80 ft and had a depth of about 6 ft. The capacity was estimated at 225,000 gallons (1100 cubic yards).

In September 1983 the upper two ponds were filled with sediments and were of no use to control runoff. The third pond was about half full of sediments. Rehabilitation or new retention ponds were needed. The location of a proposed barrow pit was in an uncontaminated reach of the canyon bottom down gradient from the shafts and retention ponds. Rehabilitation of the retention ponds was needed to protect the proposed barrow pit fill material. The study indicated that the lower reach of the canyon on the Laboratory west of the boundary contained about 3,000,000 cubic yards of fill material that could be used for construction (HSE-8-83-608).

In the spring of 1986 the remaining pond was filled to capacity with sediments. Runoff events in the preceeding period had been small. There had been no transport of contaminated sediments from the upper canyon into the proposed barrow pit area or on to San Ildefonso Pueblo Land.

Three ponds were constructed in June 1986. Pond 1 is about 45 ft by 55 ft and ranged in depth from 4.5 to about 10 ft (Fig. 1). This pond has a capacity of about 118,000 gallons (581 cubic yards). Shortly after the pond was finished runoff filled a part of the pond. A week later the pond was dry as the runoff infiltrated into the unsaturated alluvium was lost to evaporation. Pond 2 is about 80 ft by 105 ft and about 10 ft deep. It has a capacity of about 628,000 gallons (3111 cubic yards). Pond 3 is about 32 ft wide and 150 ft long with a depth ranging from 6 to 10 ft. This pond has a capacity of about 287,000 gallons (1,422 cubic yards). No runoff has accumulated in Pond 2 or 3 as of this date (July 1986). Total capacity of the three ponds is about 1,033,000 gallons (5,114 cubic yards).

The ponds were constructed with front loaders. They are dug into the alluvium on the canyon floor. The lithology ranges from a silty-clay sand to a clean sand. There are no cobbles or boulders as the canyon heads on the plateau and is cut into the tuff. All materials range from silt and clay to a small amount of gravel size rock fragments of tuff, latite, or rhyolite. The inlet to the ponds is at stream level with no confining dams or berms. The berms around the ponds built from the excavated alluvium have a surface area of about 10,000 sq.ft. This surface area was planted with 30 lbs of blue grama grass seed and 20 lbs of yellow sweet clover on July 8, 1986. The cost of the excavation was about $5,898 or about $1.15 per cubic yard.

Those who worked on this project deserve recognition and a vote of thanks. They are Max Maes, Dave McInroy, and Fred Brown.

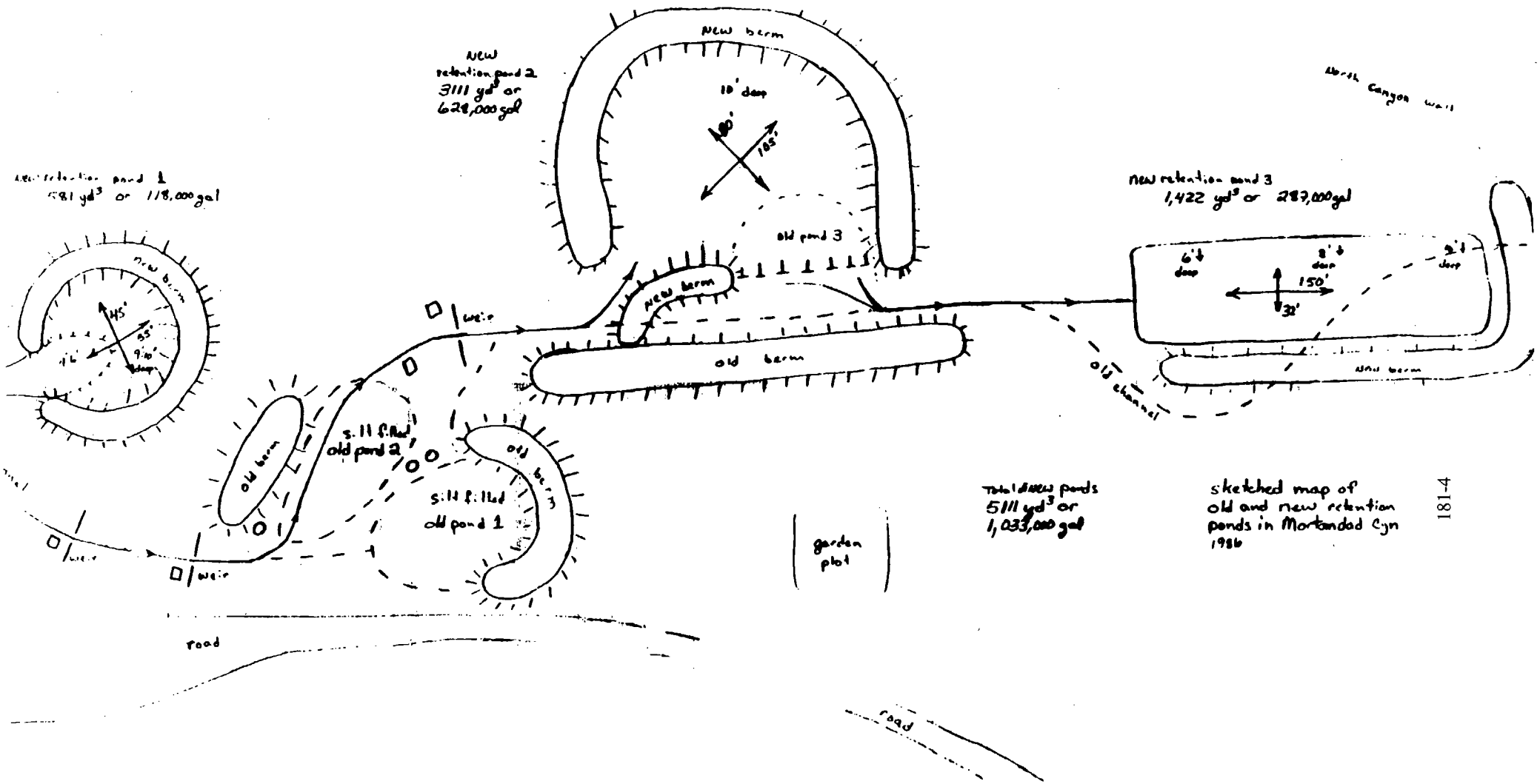
Pictures of the ponds constructed in 1977, 1980, and in 1986 are attached. Sketch map showing location of old and new retention ponds is also attached.

WDP:DVE:brm

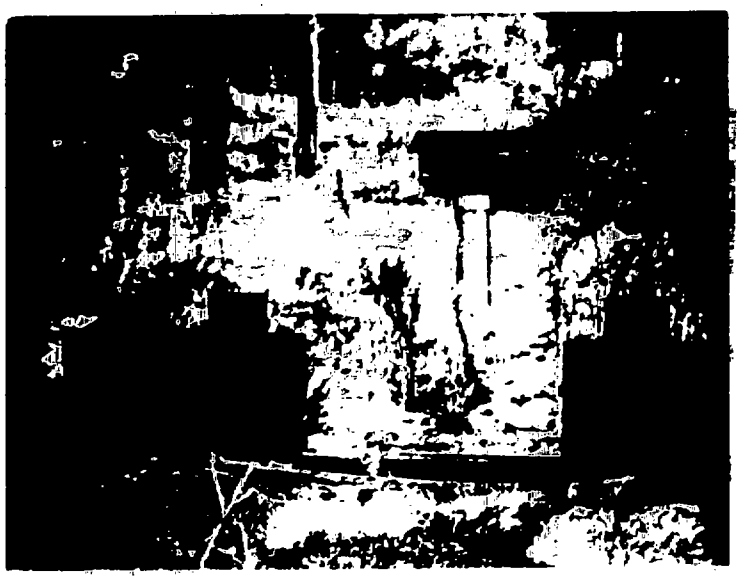
Attachments: a/s

Cy: W. Hansen, HSE-DO, MS K491
M. Maes, HSE-8, MS K490
D. McInroy, HSE-8, MS K490
F. Brown, HSE-8, MS K490

SKETCH MAP SHOWING LOCATION OF OLD AND NEW RETENTION PONDS

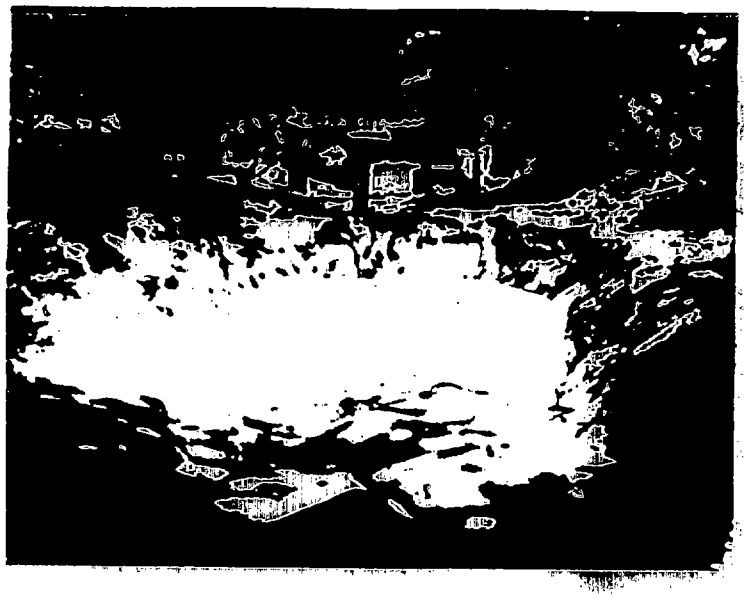


Old Pond 1 - filled with water; looking upstream, August 1976.



Old Pond 2 - filled with runoff; looking upstream through weir, 1977.

Runoff heading into Old Pond 2 in August 1977.



Old Pond 2 (1977) filled with runoff, August 1976.

Old Pond 2 after construction (1977) looking downstream.

Old Ponds 1 and 2 (1977) filled with sediments May 1986

Inlet of Ponds 1 and 2 showing runoff in Pond 1, August 1976.

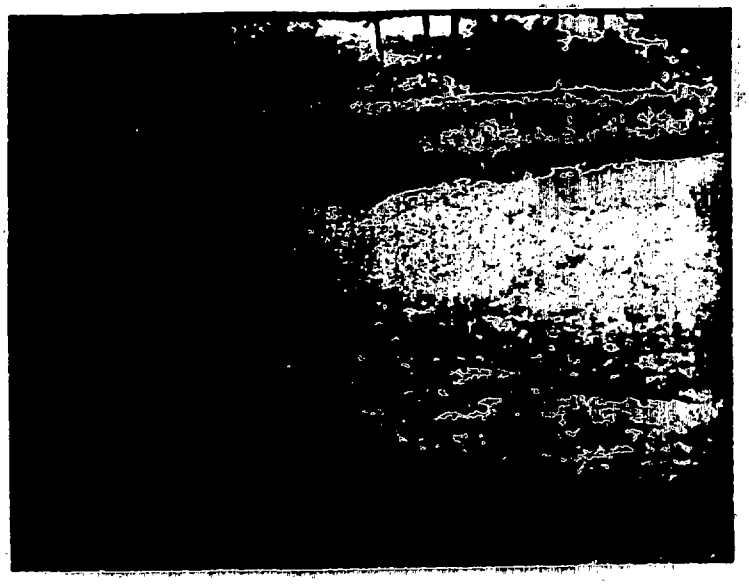
Old Pond 1 filled with sediments, May 1986.

Old Pond 1 (right) and Old Pond (left) filled with sediments, May 1986.

New Pond 1 - looking down from north rim of canyon.

New Pond 1 - showing ponded runoff, June 1986.

New Pond 1 - showing runoff through inlet, June 1986.

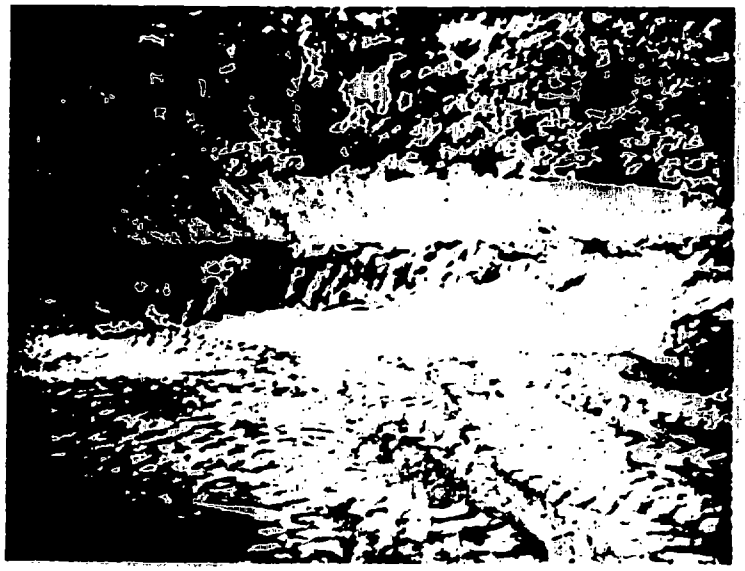


Lower End of Pond 1 filled with sediments, May 1986.

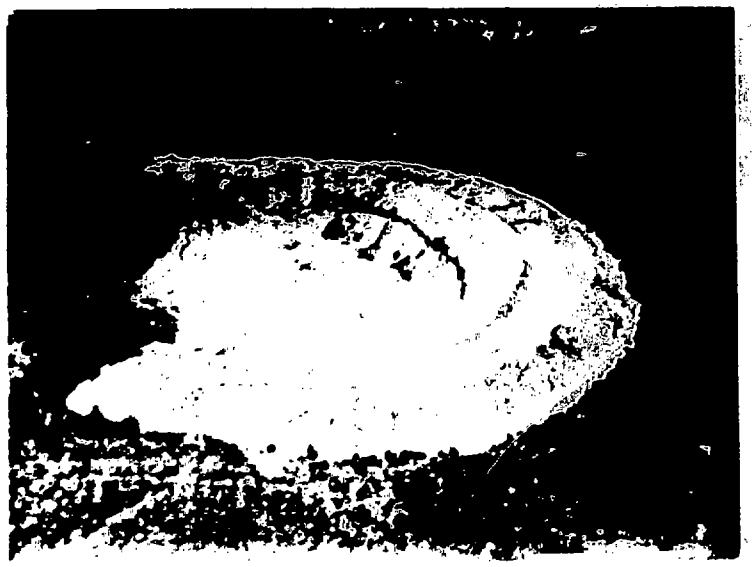
Old Pond 3 filled with sediments; looking across inlet, May 1986.

Old Pond 3, full of sediments, looking downstream, May 1986.

New Pond 2 during construction; looking through inlet to Old Pond 3, June 1986.



New Pond 2 during construction; looking through inlet, June 1986.



New Pond 2 - looking down from north rim of canyon, July 1986.

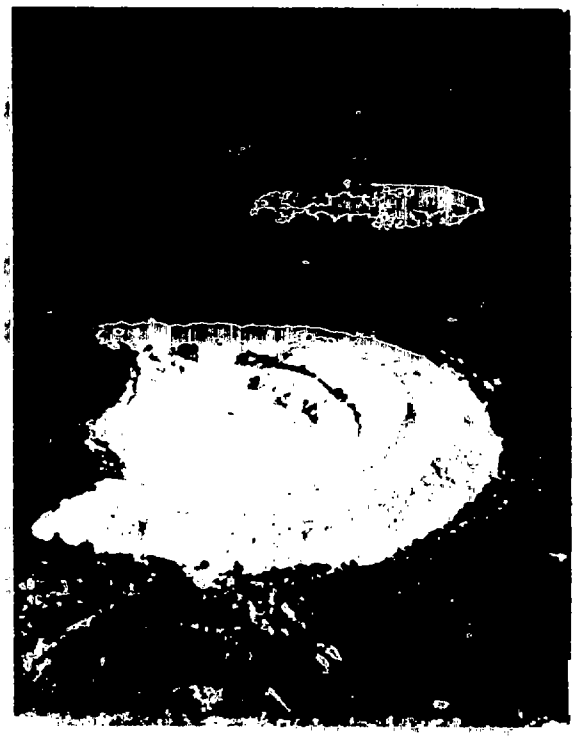
New Pond 3 during construction; looking downstream, June 1986.

New Pond 3 - looking down from north rim of canyon.

New Pond 3 - looking upstream. June 1986.

New Pond 2 during construction, June 1986.

New Ponds 1 (top) and 2 (center) and (bottom) - looking up the canyon from north rim, July 1986.



New Pond 1 (top) and 2 - looking down from north rim of canyon, July 1986

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Roy Lucht, Deputy
Group Leader, M-8, J960

DATE: August 15, 1986

THRU: Thomas C. Gunderson
HSE-8 Group Leader

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8

SYMBOL: HSE8-86-943

SUBJECT: TEST HOLES IN POTRILLO CANYON AT PROPOSED LOCATION FOR A ROCKET SLED TRACK (TA-36-12)

Seven test holes were augered in Potrillo Canyon on August 1 and 4, 1986. The holes were located along a 2000 ft line, the proposed location for a rocket sled track. Potrillo Canyon is cut into a series of ashfalls and ashflows of rhyolite tuff. The canyon floor is formed by a brown silty soil. The soil itself is underlain by a rhyolite tuff which is weathered in place, and which in turn is underlain by a light gray pumiceous tuff. The end products of the weathering of the ash matrix of the rhyolite tuff is montmorillonite and illite clay minerals. Montmorillonite clays are characterized by swelling when wet and shrinkage with water loss.

A description of the soils and tuff encountered in the test holes is presented in the following text. The logs of the test holes are summarized on Table 1 and are shown in a generalized cross-section in Figure 1.

1. SOILS: Soil, silty, brown, loose consolidated; clay to sand size fragments of quartz, sanidine crystals and crystal fragments, scattered small rock fragments of tuff, pumice, dense rhyolite and dense latite, in a matrix of clay-silt to very-fine sand. The upper part of the unit is a reworked ashflow rhyolite tuff weathered to a soil, while the lower unit is a soil that has developed in place from an ashflow tuff. The total thickness of the soil in the canyon ranges from 8 to 14 ft.

2. WEATHERED TUFF: Tuff, light brown, weathered to a silty sand containing quartz, sanidine crystals and crystal fragments, scattered rock fragments of pumice, dense rhyolite,and dense latite, a few lenses of clay (probably the end product of weathered pumice fragments) The lower one to four feet at the base of the unit contains numerous pebble size

rock fragments of dense rhyolite and latite. The ashflow tuff is weathered in place and ranges in thickness from 15 to 26 ft.

3. PUMICEOUS TUFF: Tuff, light gray, pumiceous, non-welded to moderately welded, consisting of quartz, sanidine crystals and crystal fragments, scattered small rock fragments of dense rhyolite and dense latite, numerous pumice fragments up to 3/4 in. in length, in a matrix of light gray pumaceous ash. The sections near the upper contact appear to be weathered to a light brown in some of the test holes. Total thickness of the pumiceous tuff is unknown as the depth of test holes did not extend below this unit.

4. MOISTURE: The cuttings from the test holes were fairly dry. Estimated soil moisture in the silty soil and weathered tuff ranges from about five percent to eight percent by volume and in a few places may reaches about twelve percent by volume. The underlying pumiceous tuff has an estimated soil moisture of less than than 10% by volume.

The test holes encountered no perched water in the soil or underlying tuffs. Based on previous studies there is little chance that any perched water exists in the tuff or in the underlying volcanic sediments above the top of the main aquifer. The top of the main aquifer is at a depth of about 750 ft below canyon bottom.

Soil characteristics will require that the access road along the rocket track be surfaced in order to assure all weather travel. The road and track foundation will have to be constructed to allow free drainage of surface runoff in the area. At present there is no well defined surface drainage across the proposed location for the track. Combining the road with the track foundation will simplify the drainage, eliminating any ponding of water between the road and track.

The test borings encountered no perched water, no excessive soil moisture,or other anomalies in the soil, weathered tuff, or pumiceous tuff that could effect a proper foundation design for the proposed rocket sled track.

WDP:brm

Attachments: a/s

Cy: J. Steiger, M-8, MS J960
J. Repa, M-8, MS J960
D. Miller, ENG-4, MS 702
T. Buhl, HSE-8, MS K490

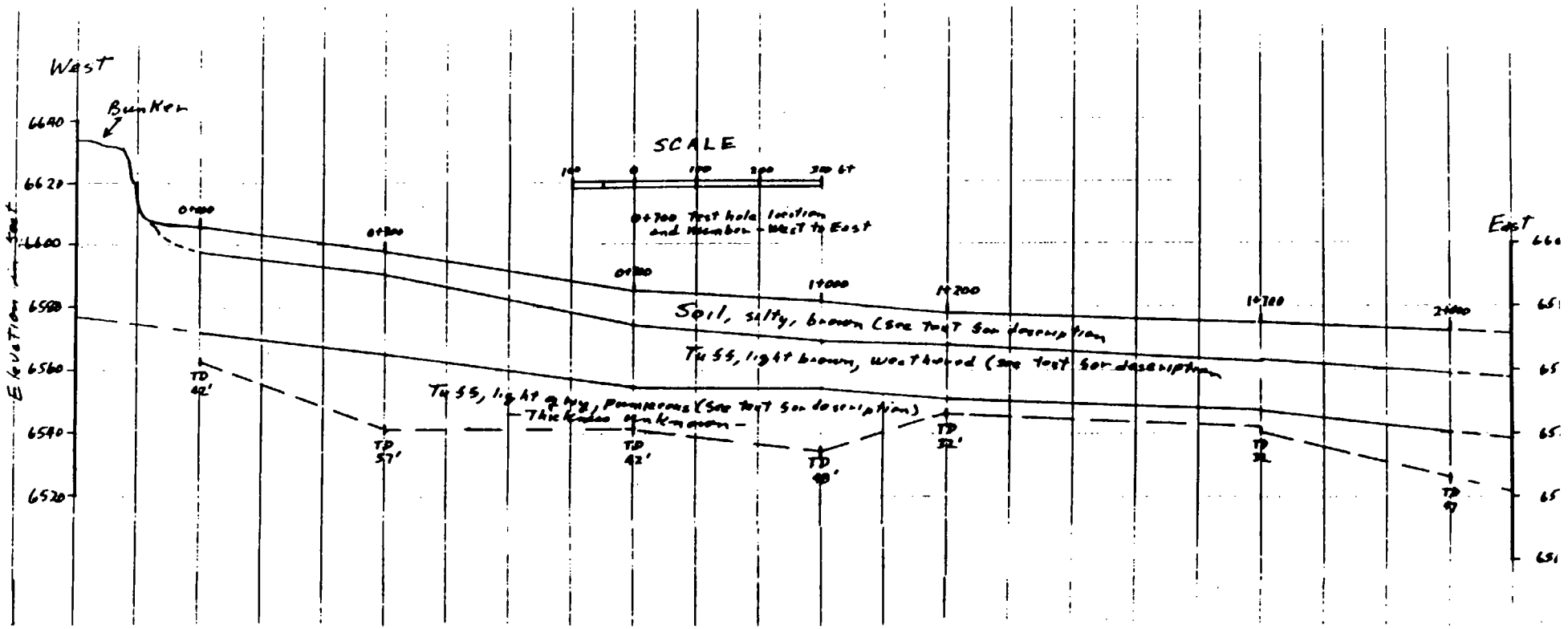


Figure 1. - Generalized geologic section showing units across Potrillo Canyon

Table I
LOG OF TEST HOLES
(Log depth in feet)

Log[1]	0+000	0+300	0+700	1+000	1+200	1+700	2+000
Soil, silty, brown	0-8	0-8	0-10	0-12	0-10	0-11	0-14
Tuff, light brown, weathered	8-34	8-33	10-30	12-27	11-27	11-26	14-32
Tuff, light gray, pumiceous	34-42	33-57	30-42	27-48	27-32	26-32	32-47
Elevation (feet)[2]	6605	6598	6585	6581	6578	6575	6573
Total Hole depth (feet)	42	57	42	48	32	32	47

.....

[1] See text for log description
[2] Estimated from LANL topographic sheet 16 of 25 (Lab. Job No. 5682).

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: A. D. Miller, ENG-9, MS M702

DATE: May 19, 1986

THRU: Thomas C. Gunderson, HSE8 Group Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0818

FROM: W. D. Purtymun, HSE-8,

SYMBOL: HSE8-86-584

SUBJECT: SOIL BORINGS - PROCESS EQUIPMENT STORAGE BUILDING, TA-16 (REF. ENG-9-330-86)

Four holes were augered at the proposed building site on May 13, 1986. In general the investigation indicated a soil zone 5 to 6 ft. thick of a brown to dark brown clayey soil. The soil was underlain by the "El Cajate Pumice", a clay to sand with pumice fragments ranging from very small sand to pebble size pumice fragments. In the four holes the "El Cajate" exhibited various degrees of weathering with different moisture contents. The location of the holes are keyed to the sketch map attached.

Test Hole 1	Depth (ft.) From	To
Soil-clayey, brown to dark brown with a few small rock fragments of latite and pumice; wet clayey soil at base (15 to 20% moisture by volume est.).	0	6
Sand-loosely consolidated, weathered, tan, quartz, sandine, latite and pumice fragments; few lenses of wet clay (plastic).	6	10
Sand-loosely consolidated, with stringers of wet clay, plastic, contain numerous pumice fragments.	10	18

Test Hole 2	Depth (ft.) From	To
Soil-clayey, brown to dark brown as in Test Hole 1.	0	5
Clay-black, plastic, wet, (15 to 25% by volume est.) with a few sand size rock or crystal fragments (tests at site indicate no explosives) probably contain excess organics.	5	14
Sand-loosely consolidated, weathered tan, includes stringers of wet clay, material becomes dryer at depth, contains numerous pumice fragments.	14	27

Test Hole 3	Depth (ft.) From	To
Soil-clayey, brown to dark brown as in Test Hole 1	0	6
Sand-loosely consolidated, tan to brown, some weathered stringers of wet clay, numerous pumice fragments wet in places (15 to 20% by volume, est.).	6	11
Sand-brown, as above but some what drier.	11	18

Test Hole 4	Depth (ft.) From	To
Soil-brown to dark brown as in Test Hole 1.	0	5
Sand-loosely consolidated tan to brown, some clay.		

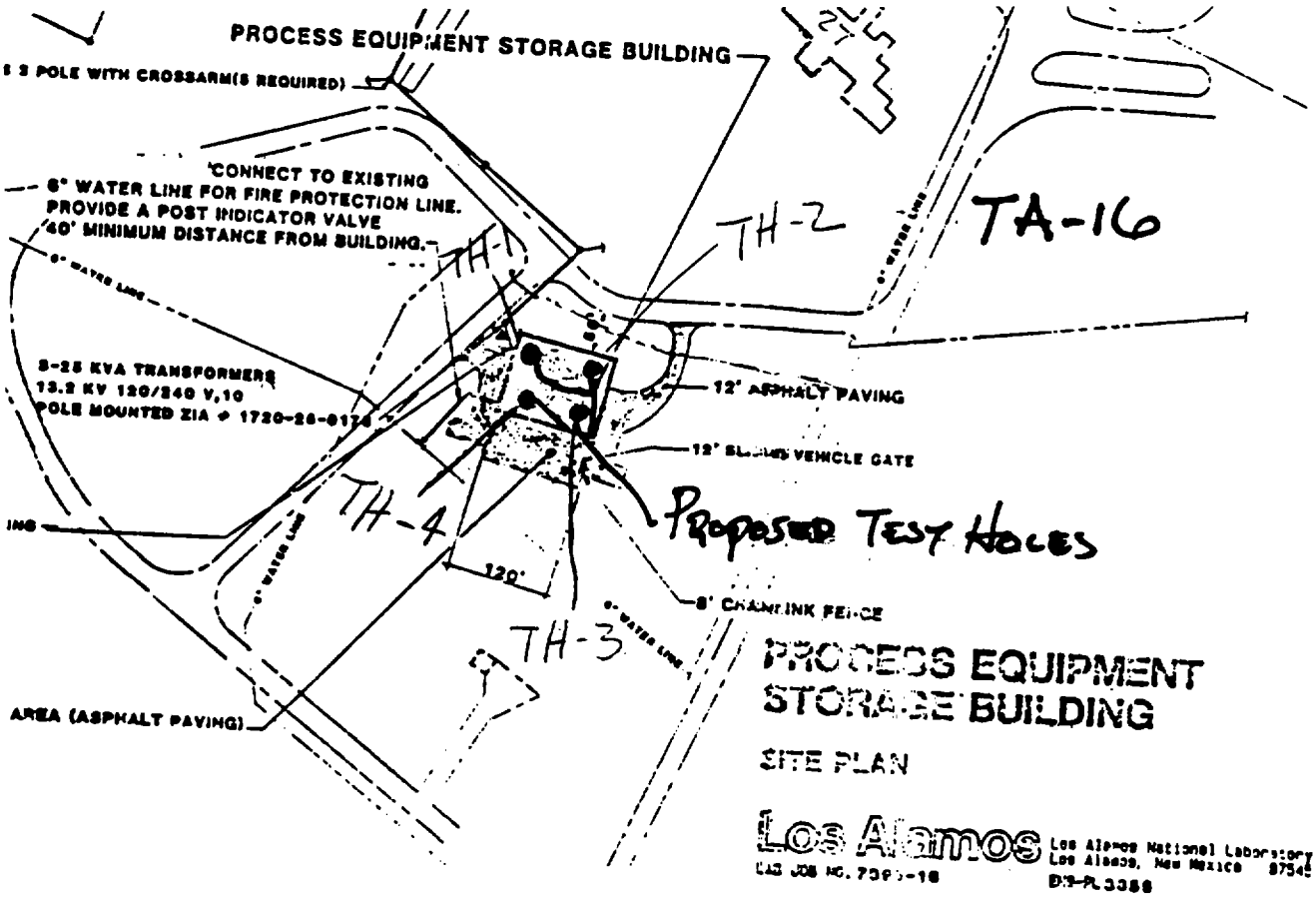
stringers and numerous pumice fragments, moisture content (10 to 15% by volume est.).	5	13
Pumice-tan to brown, some weathering, fragments from sand to pebble size pumice.	13	15

I have no recommendations for bearing capacities or foundation design because of the presence of the El Cajate Pumice. There is no data available on the El Cajate for bearing capacities. We need a detail foundation study at the site for design criteria and for reference on future design where the El Cajate Pumice is encountered.

WDP:tp

Attachments: a/s

Cy: T. E. Chandler, WX-12, MS C932



SKETCH MAP SHOWING LOCATION OF TEST HOLES

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: David A. Sprenkle,
MS M703 (Merrick)

THRU: Thomas C. Gunderson, TG
HSE-8 Group Leader, MS K490

DATE: May 27, 1986

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 WDP

SYMBOL: HSE8-86-608

SUBJECT: TEST HOLES - METEOROLOGICAL TOWER INSTALLATION, TA-0

Four test borings were performed at the tower installation, TA-0, on Frijoles Mesa, May 21, 1986. The test borings were requested by ENG-2 (Foley) for Merrick, an engineering company.

Logs of hole indicate a thin clayey soil, layer of pumice (El Cajete Pumice), and underlain by a moderately welded tuff.

Test Hole North	Depth (ft) From	- To
Soil, dark brown, clayey, some pumice fragments	0	1
Pumice, light brown to brown, weathered in places, some clay lenses, loosely consolidated	1	6
Tuff, light grey, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments of rhyolite, latite, and devetrified pumice in an ash matrix	6	13

Test Hole Southeast	Depth (ft) From	- To
Soil, clayey as in Test Hole North	0	1
Pumice, as in Test Hole North	1	6

	Depth (ft) From	- To
Tuff, moderately welded, as in Test Hole North	6	17

Test Hole Southwest	Depth (ft) From	- To
Soil, clayey as in Test Hole North	0	1
Pumice, as in Test Hole North	1	5
Tuff, as in Test Hole North	5	17

Test Hole Tower	Depth (ft) From	- To
Soil, clayey as in Test Hole North	0	1
Pumice as in Test Hole North	1	6
Tuff as in Test Hole North	6	17

The foundations or footings should be set into the tuff. The pumice is unconsolidated and has a poor bearing capacity. The moderately welded tuff at the site has a safe bearing capacity of about 5,000 lbs/sq ft. The test boring encountered no anomalies in the tuff that would effect foundation design.

WDP:brm

Cy: W. Eberhardt, ENG-DO, MS K721
W. Foley, ENG-2, MS M984
R. Kull, MS 703 (Merrick)

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Marvin Tillery, HSE-7, MS J592

DATE: July 14, 1986

THRU: Thomas C. Gunderson, JG
HSE-8 Group Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8 WDP

SYMBOL: HSE8-86-811

SUBJECT: INSPECTION OF SHAFTS, AREA G, TA-54

Two shafts in the new tritium disposal field, No. 136 and No. 137, were inspected July 9. The shafts are 6 ft in diameter and about 65 ft deep. The shafts are completed in the Tshirege Member of the Bandelier tuff. The shafts penetrated about 50 ft of Unit 2B and are completed about 15 ft in to the top of Unit 2A. Both units are moderately welded. No anomolies in the tuff exposed in the shaft walls were noted.

Two shafts in the PCB shaft disposal field, No. 12 and No. 13, were also inspected on July 9. The shafts are about 6ft in diameter and about 65 ft deep. They are also completed in the moderately welded tuff units of the Tshirege Member. The shafts penetrated about 40 ft of Unit 2B and are completed about 25 ft in to Unit 2A. No anomolies in the tuff exposed in the shaft walls were noted.

The four shafts are suitable for the disposal of wastes.

WDP:tp

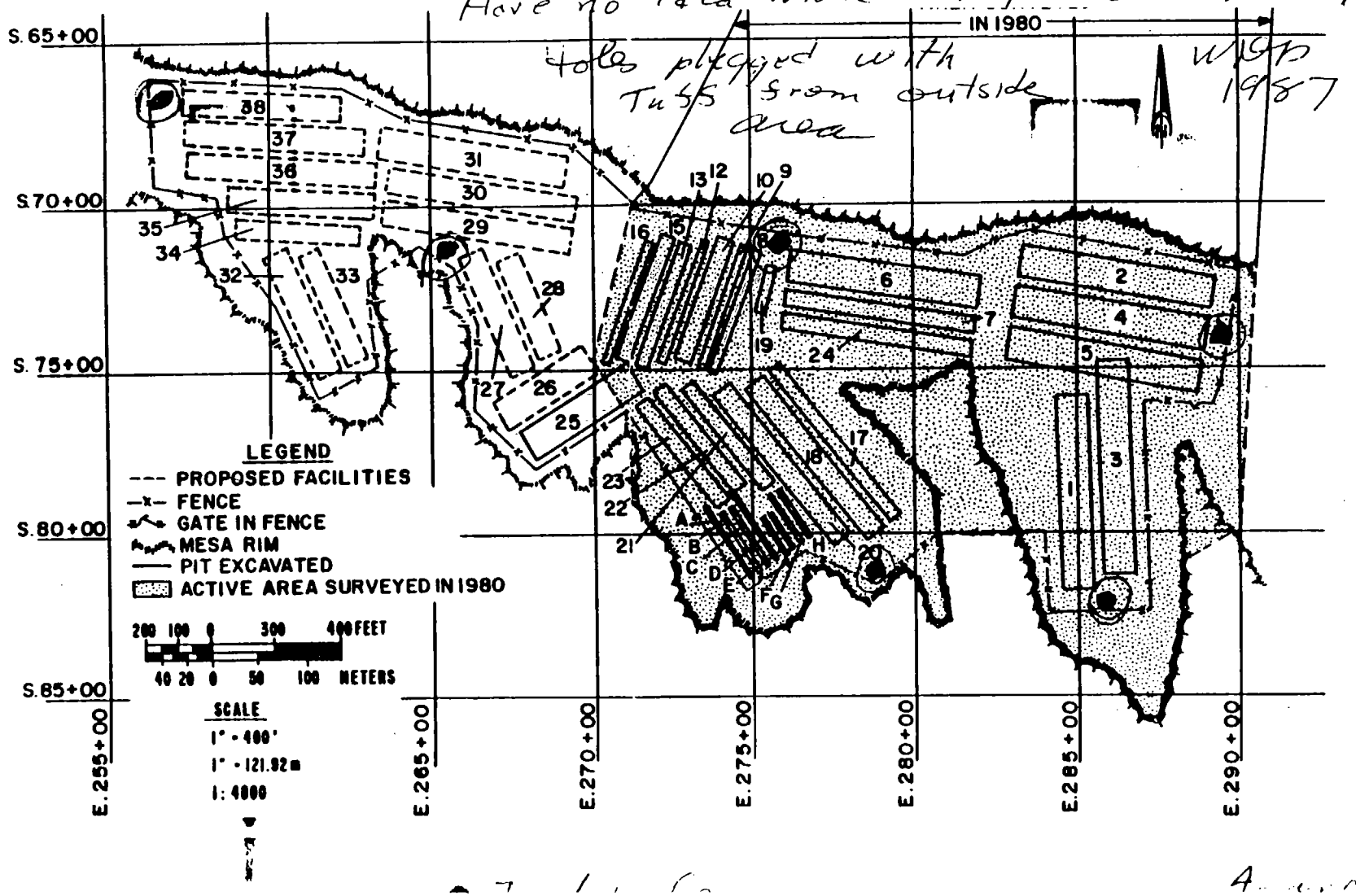
Cy: T. Buhl, HSE-8, MS K490
A. Drypolcher, HSE-8, MS K490
C. Nylander, HSE-8, MS K490

No IC

HSE-7/B-87-16

Renumber shafts
C 12 = 13 as of 4/17/87
C 13 = 12 as of 4/17/87

Test Holes Drilled Son
Don Mayfield ≈ 1979 – 6 Holes
≈ 60 ft deep – Sampled 0-3,
There after in 5 ft intervals
Have no idea where analyses results are!



Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Will Polzer, HSE-12, MS K495

DATE: May 7, 1987

THRU: Thomas C. Gunderson, HSE-8 Group Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8

SYMBOL: HSE8-87-527

SUBJECT: GEOLOGIC DATA, TA-21

I could not find a geologic section published for TA-21. The following was prepared from a log of Test Well 3 and geologic maps. Mean altitude of TA-21 used was 7150 ft.

	(feet)		
	Thickness	From	To
Bandelier Tuff			
Tshirege Member			
Nonwelded to Welded Ashflows	400	0	400
Otowi Member			
Massive Nonwelded ashflow	220	400	620
Guaje Member			
Pumice fall	50	620	670
Puye formation			
Volcanic Debris	90	670	760
Basalt			
Flow and interflow Sedments	100	760	860
Puye formation			
Volcanic Debris	450	860	1310
Tesuque formation			
Silstone and sandstone with some interbedded Basalts	2500 +	1310	3810 +

The main aquifer occurs in the lower part of the Puye Formation at a depth of about 1250 ft below the surface of the mesa at TA-21. There is no perched water above the main aquifer based on data from Hole H-19 (Below Bridge at Los Alamos Canyon). Test Well 3 (in Los Alamos Canyon) and Test Well 4 (at TA-45, abandoned). Perched waters occurs in the alluvium of Los Alamos Canyon south of TA-21. There is no hydrologic connection between wastes in the ground at TA-21 and perched

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Thomas C. Gunderson,
HSE-8 Group Leader, MS K490

DATE: April 23, 1987

THRU: Thomas Buhl, TB
HSE-8 Associate Group Leader

MAIL STOP/TELEPHONE: K490/7-0818

FROM: William D. Purtyman, HSE-8 WP
Allan Stoker, HSE-8 AS

SYMBOL: HSE8-87-502

SUBJECT: TEST HOLES EAST OF HSE-8 TRAILER, TA-59

Three test holes were drilled east of the Environmental Surveillance Group (HSE-8) trailer (OH-22) at TA-59. The holes were to determine thickness of fill (soil and gravels) overlying the tuff.

Hole 1, located 15 ft east of the trailer, encountered about 14 ft of fill over the tuff. The hole was drilled to a depth of 28 ft.

Hole 2, located about 50 ft east of Hole 1, encountered about 15 ft of fill. The hole was drilled to a depth of 28 ft.

Hole 3, located about 10 ft north of Hole 2, encountered 11 ft of fill over the tuff. The hole was drilled to a depth of 23 ft.

The fill consisted of soil and gravels derived from tuff. The soil encountered in lenses was dark brown siltly sandy loam. The gravels consisted of sand-gravel to boulder size fragments of tuff. The moisture content of fill encountered in hole 1 was high, estimated moisture content ranged from 20 to 30% by volume. The hole is located in an area that receives runoff from parking area and drive way. The moisture content of fill encountered in holes 2 and 3 was somewhat less, estimated ranging from 10 to 20% by volume.

The tuff underlying the fill is a rhyolite, moderately welded, consisting of quartz and sanidine crystals and crystal fragments, a few small dense rock fragments dark gray rhyolite and some dark gray pumice in an ash matrix.

WDP:AS:lh

Cy: M. Ragsdale, ENG-2, MS M984
S. Rhodes, ENG-2, MS M984
J. Lindahl, ENG-DO, MS K717

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: E. F. Homuth, ESS-3, MS F659

DATE: June 9, 1986

THRU: Thomas C. Gunderson, HSE-8 Group Leader

MAIL STOP/TELEPHONE: K490/7-5021

FROM: W. D. Purtymun, HSE-8

SYMBOL: HSE8-86-661

SUBJECT: LOG OF HOLE DRILLED FOR STRAIN GAGE AT TA-33-24 (CONTROL BLDG)

The lithology, color, and changes in drilling were used to establish the contacts between ash flow units. The upper section of the Mesa at TA-33 is composed of Unit 2b of the Tshirege Member of the Bandelier tuff. The hole was completed in to the top of Unit 1a at a depth of about 97 ft. Elevation of land surface at the hole is about 6412 ft.

	Depth (ft) From	To
Unit 2b		
Tuff, light reddish brown, moderately welded, quartz and sanidine crystals and crystal fragments, a few small rock fragments of dense dark gray rhyolite, dark gray devetrified pumice fragments, in a fine ash matrix.	0	38
Unit 2a		
Tuff, light gray, moderately welded, a few quartz and sanidine crystals, and fragments, a few rock fragments of dense dark gray rhyolite increase in number and size of dark gray devetrified pumice fragments, in a fine ash matrix.	38	61

	Depth (ft) From	To
Unit 1b		
Tuff, gray to pink, moderately welded. Tuff brown, quartz and sanidine crystals and crystal fragments, slight increase in rock fragments of dense gray rhyolite, dark brown devetrified pumice fragments in a fine ash matrix.	61	89
Unit 1a		
Tuff, light pinkish gray, non-welded to moderately welded, tuff brown, quartz and sanidine crystal fragments, rock fragments of dense dark gray rhyolite, and large gray devetrified fragments pumice in a fine ash matrix.	89	97

WDP:tp

Cy: T. Buhl, HSE-8, MS K490

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Thomas Gunderson, HSE-8, MS-K490

DATE: June 11, 1987

FROM: Timothy H. Larkin

MAIL STOP/TELEPHONE: MS-J980/7-1101

SYMBOL: ESS-4-87-133

SUBJECT: ROOT TOMOGRAPHY RESEARCH PROGRAM

In support of the Root Tomography Research Program, we need several shallow holes greater than 2-in. diam drilled into the ground. The proposed locations of these holes is TA-33 near Bldg 87. The ground near Bldg 87 is fairly uniform volcanic tuff. This may take about one afternoon of William Purtyman's time. Please contact me if you have any questions. We will appreciate any support in drilling these holes as soon as possible but at your convenience.

THL/jm

Cy: T. Larkin, ESS-4, MS-J980
ESS-4 File

Drilled 6 holes - 4-inch dia
6/25/87

at TA-33
12 inches to 36 inches
apart

Tuesday

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Merle Bunker,
INC-5 Group Leader, MS G776

DATE: June 17, 1987

THRU: Thomas C. Gunderson,
HSE-8 Group Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 WDP

SYMBOL: HSE8-87-655

SUBJECT: STABILITY OF ROCKS ON WALLS AND SLOPES OF LOS ALAMOS CANYON ABOVE TA-2

A reconnaissance was made of the north and south walls of Los Alamos Canyon above the site on June 11, 1987 at the request of Merle Bunker. The last inspection was made of the canyon wall on October 6, 1985.

There have been no rock falls or movement of rocks or blocks of tuff on the slope or cliff above TA-2 since the last inspection. The security fence north and south around the site are in good condition. These provide a barrier to small rock falls or slides. The rock catcher, steel posts, cables, and wire spacers, on the north wall are in good repair.

There are a number of rocks and blocks of tuff on the slope and cliffs above TA-2 that have a potential to cause rock falls. This inspection failed to detect any rocks or block of tuff that were unstable, however, if rocks should dislodge, the slope below, rock catchers, and the security fence above the buildings should prevent the rock falls from causing any damage.

WDP:tms

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Melvin McCorkle,
ENG-DO, MS K717

DATE: July 16, 1987

THRU: Thomas C. Gunderson,
HSE-8 Group Leader, MS K490
Thomas E. Buhl,
Associate Group Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun and Alan Stoker
HSE-8

SYMBOL: HSE8-87-762

SUBJECT: TEST HOLE TA-16 PACKAGE TREATMENT SYSTEM (FOR OUTFALL 005)

A test hole, requested by Anthony Drypolcher, of the Environmental Surveillance Group, (HSE-8), of the proposed site was augered to a depth of about 10 ft on July 9. There is little or no soil or fill material overlying the tuff. The tuff is light gray, moderately welded containing a few crystals and crystal fragments of quartz and sanidine, a few small rock fragments of dark gray rhyolite and pumice.

The tuff has a bearing capacity of 5,000 to 8,000 lbs/sq ft. The foundation should be set 2 to 2.5 ft into the tuff.

WDP:lh

Cy: A. Drypolcher, HSE-8, MS K490
S. Carson, Delta H. Engineering, P.O. Box 2023, Santa Fe, NM 87504
CRM-4 (2), MS K490

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Gilbert Montoya, ENG-2, MS H822

DATE: March 24, 1987

THRU: Thomas C. Gunderson, HSE-8 Group Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtyman, HSE-8

SYMBOL: HSE8-87-359

SUBJECT: TEST BORINGS MPF -3, TA-53 ENG - 2JRS-87-5205

Three test borings were completed March 18 on the beam line east of MPF-3. The three test holes were completed in tuff that is representative of the materials that will be excavated for the beam-channel. The locations of the holes were at stations 5+97, 7+90, and 12+90 of the sketch map furnished with the request memorandum.

The three test borings were drilled into and completed in to Unit 3 of the Tshirege Member of the Bandelier Tuff. There was little or no soil cover at the three locations and the lithology of the tuff penetrated at each hole was the same. The tuff is rhyolite in composition, light gray, moderately welded, containing quartz and sanidine crystals and crystal fragments, rock fragments of dense rhyolite, latite, and pumice in a gray ash matrix.

Cooling joints in the tuff will be near vertical with random orientation. To prevent large blocks from falling from the walls of the excavation, the slope of the walls should about 1 to 3. The excavation should be inspected upon completion to determine stability with regards to loose blocks caused by intersecting joints within the walls.

The moderately welded tuff can be excavated with heavy equipment. No anomalies were encountered in the tuff that would effect excavation.

Cy: T. Montoya, ENG-2, MS H822
T. Buhl, HSE-8, MS K490

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Richard Romero, HSE-8, MS K490 DATE: August 31, 1987

FROM: William D. Purtymun, HSE-8 MAIL STOP/TELEPHONE: K490/7-0810

SYMBOL: HSE8-87-925

SUBJECT: LOG OF HOLES AT JUNCTION SR-4 AND MAIN HILL ROAD, AUGUST 19, 1987

Hole 1
Located near stream channel and pits

	(ft) From	To
Soil, silty to medium sand	0	1
Gravels, fine to very coarse sand, a few cobbles and boulders	1	3
Gravels, cobbles and boulders in a matrix of sand.	3	7

Note: Three holes in area; no penetration below 7 to 8 ft.

Hole 2
Located south of Hole 1 about 70 ft

	(ft) From	To
Soil, silty to medium sand	0	1
Gravels, fine to coarse sand, a few pebbles, cobbles and boulders	1	3
Gravels, cobbles and boulders in a matrix of sand	3	8
Clay, plastic, light gray to reddish brown	8	12

Note: Four holes in area; three holes, no penetration below 6 to 7 ft; fourth hole bottomed in clay at 12 ft.

Hole 3
East of hole 2, outside fence

	(ft)	
	From	To
Soil, silty to medium sand	0	1
Gravels, few cobbles and boulders in sand matrix	1	6
Clay, plastic	6	7

Note: Three holes in area, bottomed in clay.

Term "no penetration" indicates basalt, the auger did not "walk" as would occur in cobbles and boulders.

Samples collected using continuous core (3 1/4 inch ID) hollow stem auger. Core recovery from 0 to 60%. As sand and gravel unconsolidated, at least 3 holes were required at each location to obtain enough sample for the various analyses.

WDP:tms

Cy: T. Buhl, HSE-8, MS K490
L. Soholt, HSE-8, MS K490

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Edward J. Hoth, ENG-2, MS M984 DATE: September 28, 1987

THRU: Thomas E. Buhl, HSE-8, MS K490 MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 SYMBOL: HSE8-87-1057

SUBJECT: SOIL BORINGS, NEAR INTERSECTION PAJARITO AND PUYE ROADS

Five test holes were augered at the site as requested by ENG-2. The area on top of the mesa is relatively flat; however, there are several shallow depressions and low berms that indicate the soil zone has been disturbed. The log of the test holes is given in the following table.

	Range in feet	
	Soil	Tuff
TH-1	0-3	3-12
TH-2	0-3	3-12
TH-3	0-4	4-12
TH-4	0-5	5-11
TH-5	0-4	4-12

The soil zone ranged in thickness from 3 to 5 feet. The soil is a brown clayey loam at the surface grading to a light brown sandy loam (tuff weathered in place) above the tuff.

The tuff ranged in color from a light reddish brown to a light gray. The tuff is moderately welded, composed of quartz and sanidine crystals and crystal fragments, a few small rock fragments of dense dark gray rhyolite and gray pumice.

Foundation should be set into tuff. The moderately welded tuff have a safe bearing capacity of 3,000 to 5,000 square feet. No anomalies were encountered in the tuff that would affect foundation design.

WDP:smm

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Miguel Salazar, HSE-7, MS J592

DATE: October 30, 1987

THRU: Thomas Buhl,
HSE-8 Section Leader, MS K490

MAIL STOP/TELEPHONE: K490/7-0810

FROM: William Purtymun, HSE-8

SYMBOL: HSE8-87-1220

SUBJECT: INSPECTION OF SHAFTS AT AREA G, TA-54

Shaft 140, 6 ft dia, 61 ft deep; Shaft 141, 6 ft dia, 60 ft deep; Shaft 142 4 ft dia, 60 ft deep; and Shaft 143, 4 ft dia, 63 ft deep were inspected on August 30, 1987. The shafts are completed in the Tshirege Member of the Bandelier Tuff. They penetrated about 50 ft of Unit 2b and are completed into the top of Unit 2a. Both units are moderately welded. No anomolies in the tuff exposed in the shafts were noted.

Also inspected was Shaft 196, a double shaft (6 ft dia, intersecting NE 56 ft deep and SW 53 ft deep) used for disposal or storage of wastes from the Los Alamos Meson Physics Facility. Numerous fractures occured in both shafts along with blocks of tuff pulled from the shaft walls. The shafts are in the Tshirege Member with the contact between Unit 2b and Unit 2a at a depth of about 18 ft. Both units are moderately welded.

The shafts are suitable and meet the guidelines for disposal of wastes at Area G.

WDP:TB:smm

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Joe Skalski, ESS-4, MS J981

DATE: December 2, 1987

FROM: William D. Purtyman, HSE-8

MAIL STOP/TELEPHONE: K490/7-0810

SYMBOL: HSE8-87-1308

SUBJECT: NEW PUMP WELL FH-1

When the old pump is pulled from well FH-1 call us (Purtyman 7-0810 or Stoker 7-0818) and we will come over and sound the depth of the well and get a water-level measurement. FH-1 was completed at a depth of about 450 ft. (slotted screen 389 to 449 ft.) In 1980 it was reported open to a depth of 445 ft. When pulled in October 1985, the well depth was reported at 430 ft.

At the same time we will get a water-level measurement and sound the depth of well FH-2. The well was completed at a depth of 450 ft. with the lower 59 ft. consisting of torch slotted pipe. Tests on the well indicate a specific capacity of about 1 gpm/ft. of drawdown at a discharge rate of 40 gpm at the end of 40 minutes.

The current water-level is about 374 ft. below land surface. The saturated thickness of the aquifer penetrated by the aquifer is about 76 ft. When the old pump from FH-1 is installed in well FH-2 it should be set about 15 ft. off the bottom. When we sound the well we can give you the exact depth. It should be in the range of 430 to 435 ft.

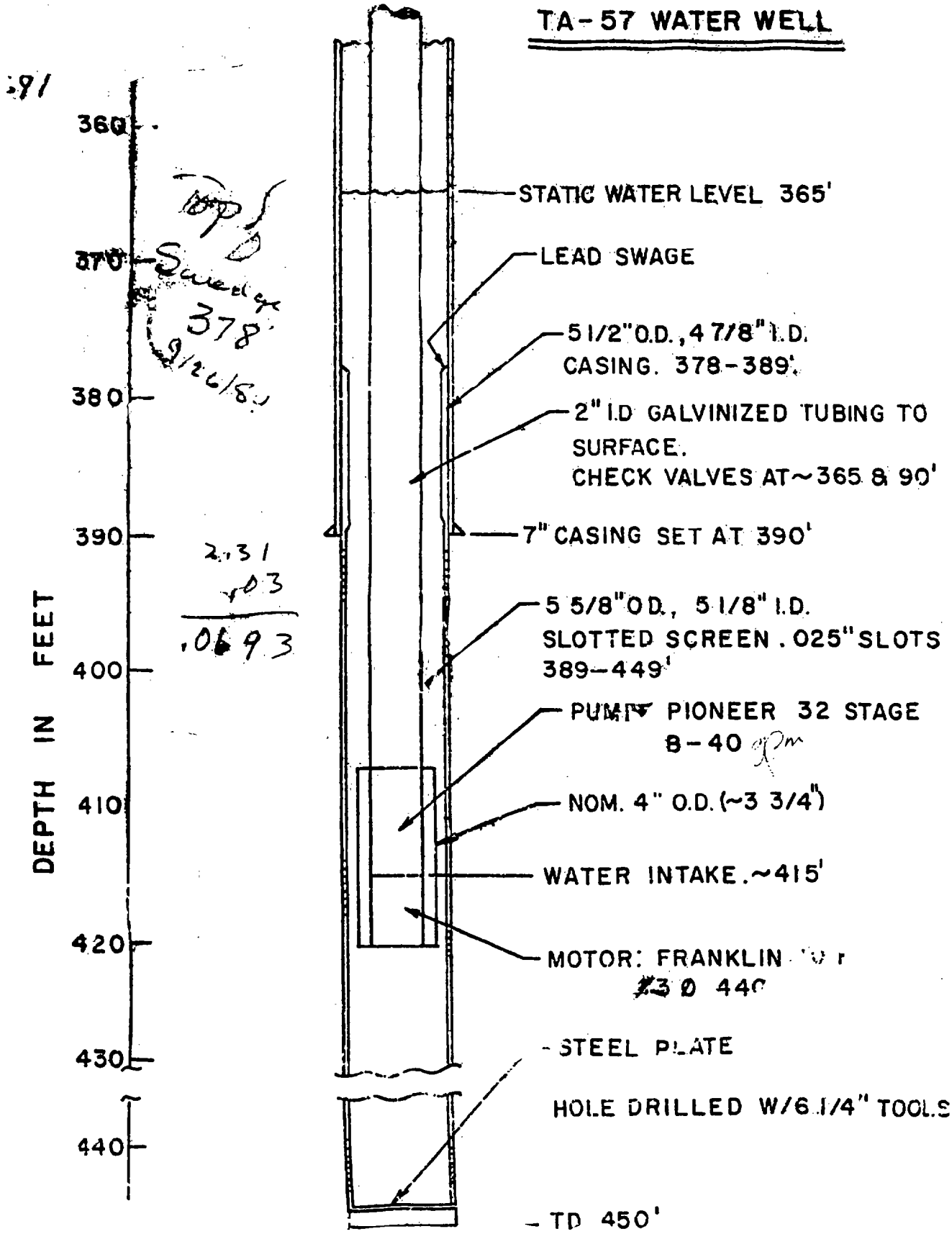
Attached is a copy of the construction record of Well FH-1 for your information.

WDP:jm

Attachment: a/s

Cy: A. Stoker, HSE-8, MS K490

TA-57 WATER WELL



Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: R. M. Joppa, ENG-1, MS K721

DATE: March 16, 1988

FROM: W. D. Purtymun, HSE-8

MAIL STOP/TELEPHONE: K490/7-0810

SYMBOL: HSE8-88-179

SUBJECT: TEST HOLE EAST JEMEZ ROAD TELEPHONE DUCT BANK

As you requested, thirteen test holes were augered along the proposed East Jemez Road Telephone Duct Bank from the bridge eastward to Technical Area (TA) 53. Attached is a log of the holes with locations keyed to Engineering Drawing No. ENG-C 45383.

Outwash of cobbles and boulders in a matrix of gravels overlie the tuff at the Bridge and eastward to TH-5 (54+40). Pockets of cobbles and gravels may be encountered eastward from TH-5 to TH-6 (71+90). Eastward from TH-6 to TA-53 the surface of the mesa is underlain by Unit 3 of the Tshirege member of the Bandelier Tuff. Unit 3 is a light gray to light brown (dependent on weathering) moderately welded tuff consisting of quartz and sanidine crystals and crystal fragments, and a few small rock fragments (pebble size) of dark gray latite and rhyolite in a gray ash matrix. The moderately welded tuff should be easy to excavate. Only a thin soil (up to 2 feet) overlies the tuff eastward from TH-6.

If I can be of further assistance please call me at 667-0810.

WDP:bjh

Cy: K. K. Martinez, PAA, EBED, MS A199

TEST HOLE	LOCATION	LOG	FT FROM	FT TO
TH-1	1 + 25	Cobbles, boulders in sands and gravels	0	5
		Reworked tuff with a few cobbles and boulders	5	8
TH-2	14 + 15	Cobbles, boulders in silts, sands, and gravels	0	8
TH-3	19 + 05	Cobbles, boulders in silts, sands,and gravels	0	8
TH-4	35 + 50	Cobbles, boulders in silts, sands, and gravels	0	5
		Tuff, light pinkish gray, moderately welded	5	8
TH-5	54 + 40	Clayey soil, light brown	0	4
		Tuff light gray, moderately welded	4	8
TH-6	71 + 90	Clayey soil, light brown	0	2
		Tuff, light gray, moderately welded	2	8
TH-7	85 + 15	Tuff, light gray, moderately welded	0	8
TH-8	99 + 65	Clayey soil, light brown	0	1
		Tuff, light gray, moderately welded	1	8
TH-9	117 + 75	Clayey soil, light brown	0	2
		Tuff, light gray moderately welded	2	6
TH-10	146 + 60	Tuff, light gray to light brown moderately welded	0	8

TH-11	156 + 80	Tuff, light gray moderately welded	0	8
TH-12	160 + 30	Tuff, light brown, weathered sandy	0	4
		Tuff, light gray moderately welded	4	8
TH-13	163 + 80	Tuff, light brown to light gray, weathered, sandy	0	8

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Merle Bunker, INC-5, MS-G776

DATE: November 1, 1988

THRU: Thomas Buhl, HSE-8

MAIL STOP/TELEPHONE: K490/7-0810

FROM: W. D. Purtymun, HSE-8

SYMBOL: HSE8-88-653

SUBJECT: STABILITY OF ROCKS ON WALLS AND SLOPES OF LOS ALAMOS CANYON ABOVE TECHNICAL AREA (TA) 2

A reconnaissance was made of the north wall of Los Alamos Canyon above the site on October 28, 1988 at the request of Gerald Ramsey of the Research Reactor Group (INC-5). The last inspection was made of the canyon walls on June 11, 1987. The north wall of the canyon presents the greatest rock fall potential with damage to the buildings at the site.

There have been no rock falls or movements of rocks or blocks of tuff on the slopes or cliff above TA-2 since the last inspection. The rock catcher on the north wall above the sites (steel posts, cables, and spacers) is in good repair. The rock catcher is the primary containment of any rock falls that may occur. The security fence around the site and below the rock catcher provides the secondary containment for any rock falls that may break and penetrate the rock catcher.

A rock fall occurred in early June 1988 at TA-41 to the west of TA-2. A block of welded tuff estimated from 10 to 11 tons penetrated the rock catcher and one security type fence and came to rest at the second security fence. Other than damage to the rock catcher (which did its job) and the two fences there was no damage or injury at the site.

As stated in past inspections, there are a number of rocks and blocks of tuff on the slope and cliffs above TA-2 that are potential rock falls that could cause damage. This inspection failed to detect any rocks or blocks of tuff that were unstable. However, as the potential exists and coupled with the recent rock fall at TA-41 it is suggested that the security fence be modified to provided additional strength for the secondary containment.

The strength of the security fence could be improved by attaching and stringing 0.5-inch steel cables to reinforce the

fence. Four cables set at different heights should be set in to a dead man at the east and west end of the fence. The security fence as it is provides some secondary containment; however, with the attached cables the entire fence would take up the shock of a rock fall and provide additional protection to the building and personnel at the site.

WDP:bjh

Cy: William Radzinski, Eng-6, MS-M700
Gerald Ramsey, INC-5, MS-G776

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: William Radzinski, ENG-6, MS M700 DATE: November 10, 1988

THRU: Thomas Buhl, HSE-8, MS K490 MAIL STOP/TELEPHONE: K490/7-0810

FROM: William D. Purtymun, HSE-8 SYMBOL: HSE8-88-671

SUBJECT: POTENTIAL ROCK FALLS ON THE NORTH WALL OF LOS ALAMOS CANYON AT TECHNICAL AREA (TA)41

The buildings and other facilities at TA-41 are located north of the east west trending stream channel of Los Alamos Canyon. The depth of the canyon at TA-41 is over 200 feet. The walls of the canyon are formed by several units of Tshirege Member of the Bandelier Tuff. The tuff of the south wall of the canyon has weathered to a steep slope that is covered with a heavy growth of trees and vegetation. The tuff on the north wall of the canyon has weathered into a slopes and benches (nonwelded and moderately welded tuff) broken shear drops or cliffs (moderately and welded tuff). There is little or no vegetation on the north wall except pine on the slopes and benches. The moderately welded and welded tuff are broken by numerous vertical to near vertical joints that formed as the tuff cooled after emplacement from the Valles Caldera. The moderately welded and welded tuff (broken by the numerous joints) that form the cliffs on the north wall form the greatest potential for rock falls that can cause damage to the buildings and facilities at TA-41.

H8-77-871 dated 12/28/77

A reconnaissance was made of the rock fall potential at TA-41 (Rock falls at Proposed Location for New Tritium Handling Facility at TA-41, Memo H8-77-871, November 28, 1977, attached). The memo describes the rock fall potential at the site and recommending remedial action with the installation of rock catchers. The rock catchers were installed across the area of greatest concern. These rock catchers took the blunt of the rock fall that occurred in early June 1988.

The rock fall that occurred in June 1988 dislodged from the second bench, rolled down the slope and pitched over the first bench into the rock catcher and two security fences on the slope. It came to rest on slope after it had penetrated the rock catcher and the security fences. Other than damage to the rock catcher and the fences there was no damage or injuries at the site.

A earlier rock fall (late 1950s or early 1960s) penetrated the security fence and came to rest next the building. This occurred along the western part of the site. Damage was confined to the fence.

A reconnaissance was made of the north wall of the canyon above TA-41 on October 28, 1988 in the company of Bill Radzinski, Eng-6. The inspection failed to detect any rock or blocks of tuff that are unstable and could possible become a hazard as a rock fall. Potential rock falls are impossible to detect. They are triggered by weathering, excessive precipitation, freezing and thawing, and possible seismic activity.

The emplacement of the ash flows and the condition of the tuff units that exist above the site indicate that the potential for rock falls are present. This potential and the occurrence of past and the recent rock fall at the site indicate that protection should be taken in the areas not covered by the rock catcher.

Protection to the buildings and personnel can be accomplished by using the security fence as a rock catcher; however, these fences must be modified. This can be accomplished with additional posts (5-inch diameter steel cemented up right in 6-foot holes) and by attaching four lines of 0.5-inch diameter cables to the posts and existing posts and fence. The security fence thus modified will take up the shock of a rock fall and provide additional protection to the buildings and personnel at the site.

Rock catchers similar to the present ones should be considered in the areas designated as high risk areas (buildings near the fence or little slope between the fence and building).

WP/TB:jm

Attachment: a/s

Cy: B. Banks, WX-5, MS G780

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Stanley Zygmunt, HSE-7, MS E518

DATE: July 7, 1988

THRU: Marjorie Martz Emerson, HSE-8

MAIL STOP/TELEPHONE: K490/7-0810

FROM: [redacted]

SYMBOL: HSE8-88-368

SUBJECT: METEOROLOGICAL TOWER TEST HOLES

In response to memo (HSE-7-88-256), five test holes were augered on June 22 at the proposed site for the meteorology tower. The site is located on the top of Two-Mile Mesa, north of TA-40. The soil forming the surface of the mesa is well developed; however, it thins to the north at the edge of the canyon. The tuff underlying the soil, ranges from light gray to a brick red, depending on the amount of weathering. It is a moderately welded tuff containing quartz and sanidine crystals and crystal fragments and a few rock fragments of dense rhyolite, latite, and pumice in an ash matrix. The foundation for the tower should be set through the soil zone into the tuff. The moderately welded tuff has a safe bearing capacity of about 5,000 lbs/square foot.

You indicated the anchors at 120 and 240 feet from the tower will be set below the frost line in the soil or tuff. The soil or tuff underlying the tower and anchors should be compacted prior to pouring the concrete. After the concrete has set, the fill material along side of the foundation and anchors should be compacted to minimize the infiltration of precipitation.

No anomalies were encountered in the tuff that would affect the foundation or anchor design. The logs of the test holes are as follows:

Log of Holes	(Feet) From	To
Center Location		
Soil, light brown, clayey	0	4
Tuff, light gray, moderately welded, weathered to light brownish gray from 4 to 6 ft.	4	12
22.5° - 240 ft. Location		
Soil, light brown, sandy	0	2
Tuff, light gray, moderately welded	2	13
142.5° - 120 ft. Location		
Soil, light brown, clayey	0	4
Tuff, light pinkish brown to brick red, moderately welded, weathered	4	11
Tuff,light gray, moderately welded	11	13
142.5° 240 ft. Location		
Soil, light brown, clayey	0	4
Tuff, light gray to light pink, moderately welded	4	9
Tuff, light reddish brown to brick red, moderately welded	9	13
262.5° - 240 ft. Location		
Soil, light brown, clayey	0	3
Tuff, light gray moderately welded	3	13

WDP:MME:smm

Cy: R. Koenig, HSE-7, MS E518
B. Bowen, HSE-8, MS K490

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: John Harper, HSE-7, MS-J592 DATE: May 4, 1989

THRU: Thomas Buhl, HSE-8, MS K490 MAIL STOP/TELEPHONE: K490/7-0810

FROM: Bill Purtymun, HSE-8 SYMBOL: HSE8-89-265

SUBJECT: **COMPLETION INSPECTION OF SHAFTS AREA G, TA-54**

The following is a list of shafts inspected on May 1, 1989. The shafts are completed in the Tshirege Member of the Bandelier Tuff. They penetrated about 50 feet of Unit 2B, and are completed into the top of Unit 2A. Both units are a moderately welded tuff. No anomalies were detected in the tuff exposed in the walls of the shafts. The shafts are suitable and meet the guidelines for disposal of wastes at Area G (H7-70-660, December 10, 1980).

Shaft No.	Diameter (ft)	Approximate Depth (ft)
142	4	65
143	4	65
144	6	65
145	6	65
146	6	65
147	4	65
148	4	65
149	4	65

BP:lrc

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Gilbert M. Montoya, HSE-7, MS E520 DATE: July 7, 1989

FROM: W.D Purtyman and Alan Stoker, HSE-8 MAIL STOP/TELEPHONE: K490/7-5021

SYMBOL: HSE8-89-421

SUBJECT: LOG SIX TEST HOLE TA-35, LAPRE REACTOR (JUNE 26-30, 1989)

Test hole numbers are in sequence that they were drilled, ie. line west to east (holes 1, 2, 3, 4, and 5) and south of line (hole 6).

	Feet From	Feet To
Test Hole 1		
Asphalt and gravel	0	1
Fill, gravels and clay	1	3
Tuff, light gray, moderately welded tuff, quartz, sanidine crystals, and crystal fragments, few very small rock fragments of pumice and rhyolite in gray ash matrix; fractures at 8 ft. (45 degrees) and at 21 ft. (near horizontal) clay filled; moisture content about 15% by volume (tuff in place, not fill)	3	23
Test Hole 2		
Asphalt and gravel	0	1
Fill, tuff and clay, boulders of tuff at 3, 5, and 6 ft, brown clay 6.5 to 8 ft., mixture of clay, tuff, and tuff boulders 8 to 16 ft.	1	16
Tuff, light gray, similar to that in hole one (1), moisture content about 15% by volume, horizontal fracture at 20 ft. clay filled (tuff in place, not fill).	16	23
Test Hole 3		
Asphalt and gravel	0	1
clay and gravels	1	2
Fill, medium to course sand apparently placed around		

reactor, moisture content est. 10 to 15% by volume.	2	19
Concrete pad at 19 ft., Pulled out with bit. Stainless steel tubing about 1/4 in. in diameter, 6 ft. long. Hole caved to 3 ft. when auger was removed.		19
<u>Test Hole 4</u>		
Asphalt and gravel	0	1
Clay and gravel	1	2
Fill, alternating clay, tuff, and tuff boulders, about 25% in clay, less in tuff 15 to %.	2	17
Tuff, light gray, similar to that in Hole 1 and 2 moisture content about 15% by volume (tuff in place, not fill).	17	23
<u>Test Hole 5</u>		
Ashpalt and gravel	0	1
Silty, clayish, brown soil, (in place, not fill)	1	4
Tuff, light gray, similar to that in Holes 1, 2, and 4, fracture at 11 ft.. (horizontal) and 18 ft. (45 degrees) clay filled (tuff in place, not fill).	4	23
<u>Test Hole 6</u>		
Asphalt and gravel	0	1
Fill, alternating clay and tuff, tuff boulders increase below 13 ft. clay lens 14 to 15 ft..	1	16
Tuff, light gray, similar to that in Holes 1, 2, 4, and 5 (tuff in place, not fill).	16	23

The test holes were filled with cement (1.5 yd 3/ 200 lbs. of gravel, 100 lbs of bentonite) on June 30, 1989.

WDP/AS:cac

Cy: Eddie Lujan, HSE-8 , MS K490
Lars Soholt, HSE-8, MS K490

To: William Radzinski ENG-6, MS-D451

From: W. D. Purtymun, HSE-8

Subject: POTENTIAL ROCK FALL ON THE NORTH WALL OF LOS ALAMOS CANYON AT TECHNICAL AREA 41

An inspection of the rock fall potential at TA-2 was made on November 29, 1989 at the request of INC-5. At the same time a brief inspection was made of the rock fall potential at TA-41. The last inspection was made October 28,1988.

The inspection failed to detect any rock or blocks of tuff forming the slope and rim rock of the canyon that are unstable and could possible become a hazard as a rock fall. Potential rock falls are near impossible to detect as they are triggered by weathering, erosion, excessive precipitation, freezing and thawing, and possible seismic activity.

The physical characteristics of the tuff and block of tuff on the slope and cliffs above the site indicate that potential for rock falls are present. This potential and the occurrence of past (late 1950s or early 1960s) and the recent rock fall (1988) at the site indicate that protection should be taken in the areas not covered by the rock catcher.

Other than the security fence from Bldg. 4 to the western end of the site there is no protection from rock falls. Additional protection could be added by modifying the fence with 0.5 inch steel cable. This and other suggested remedial action related to rock fall at the site is covered in the enclosure ((HSE8-88-6710).

Cy: C.B. Banks, WX-5, MS-G780

memo never sent - file WP41.DOC recovered from BD Purtymun's computer, dated 12/7/89

See memo #HSE-8:90-62

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Merle Bunker, INC-5, MS G776 DATE: January 29, 1990

THRU: Thomas Buhl, HSE-8, MS K490 MAIL STOP/TELEPHONE: K490/7-0810

TB for WDP 1/31/90

FROM: William Purtymun, HSE-8 SYMBOL: HSE-8:90-62

SUBJECT: STABILITY OF ROCKS ON WALLS AND SLOPES OF LOS ALAMOS CANYON ABOVE TECHNICAL AREA (TA) 2

A reconnaissance was made of the north and south walls of Los Alamos Canyon above TA-2 on November 29, 1989 at the request of Mike Kaufman (INC-5). The last inspection was made of the canyon walls on October 28, 1988.

There have been no rock falls or movements of rocks or blocks of tuff on the slopes or cliff above TA-2 since the last inspection. The north wall of the canyon presents the greatest potential for rock fall that could damage the buildings at the site. The rim of the north wall of the canyon is formed by near vertical to vertical cliffs underlain by a steep slope that extends to the canyon floor. There are only a few trees on the slope. Major rock fall that could cause damage would be from the tuff outcrops that form the rim of the canyon. This potential for rock fall has been recognized as a rock catcher (steel posts set in to concrete, cables, and cable spacers) has been installed on the slope. A security fence for the site is located 10 to 20 ft.down from the rock catcher. The rock catcher on the slope is in good repair. The rock catcher is the primary containment of any rock fall that may occur. The security fence around the site and below the rock catcher provides the secondary containment for any rock fall that may penetrate the rock catcher.

The south wall of the canyon above the site has a low potential for rock fall as this steep, north facing slope has only a few small tuff outcrops that could contribute rock fall blocks. The slope is covered with a growth of trees that would contain and break up a rock fall block if it should occur. The security fence at the base of the slope would also serve as a rock catcher.

As stated in previous inspections, there are a number of rocks and blocks of tuff on the slope and cliffs above TA-2 that have the potential for rock falls that could cause damage. This inspection failed to detect any rocks or blocks of tuff that were iminently unstable. However, as the rock fall potential exists it is suggested that the security fence on the north canyon wall be modified to provide additional strength for secondary containment.

The strength of the security fence could be improved by attaching and stringing 0.5-inch steel cables to reinforce the fence to take additional shock. Four cables set at different heights should be set into anchors at the east and west ends of the fence. The security fence as it exists provides secondary containment; however, with the attached cables the entire fence would take up the shock of a rock fall and provide additional protection to the building and personnel at the site.

WP:TB:smm

Cy: W. Radzinski, ENG-6, MS D415
M. Kaufman, INC-5, MS G776

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Micheline Devaurs, HSE-DO/ER, MS K491 DATE: June 19, 1990

FROM: A. Stoker and S. McLin, HSE-8 MAIL STOP/TELEPHONE: K490/7-0817

SYMBOL: HSE-8:90-538

SUBJECT **REVIEW OF INSTALLATION WORK PLAN SECTION (HSE-DO/ER:131)**

We have reviewed the subject draft and offer some comments and suggestions. The first several paragraphs identify some general issues.

From an overall viewpoint, we basically prefer the modelling approach being taken in this effort compared to others seen recently. There is a more focused attempt to utilize information from the actual setting.

In terms of the objectives stated in your cover memo, only objective 2 appears to be fulfilled, and objective 3 is partly addressed. However, there doesn't seem to be any attempt, either by comparing alternate cap designs or by comparing a cap to no cap, to assess the advantages of capping. This objective seems essential to address if the Workplan is to propose capping and prevention of infiltration as a principal generic remediation method.

Some of the assumptions should probably be adjusted to more completely reflect actual knowledge of the geohydrology and other characteristics. For example, why not call tritium the non-reactive tracer. Tritium is present in the wastes, and moves directly as part of the water molecule. To assume plutonium is non-reactive simply invites unnecessary criticism when it is known to adsorb fairly well on the tuff. Further, if you want to model plutonium, why not use some of the information developed by Essington and Polzer over the years on adsorption on the local tuff?

We strongly endorse and applaud the effort to represent the actual geologic section. Again, some adjustments would make better use of actual knowledge. The geologic section at TA-21 can be interpolated with reasonable confidence using data from Test Wells 2 and 3 (T-2 and T-3) and the recently drilled water supply well Otowi 4 (O-4). The approximate locations of these wells are depicted in the attached figure. (Test wells T-2 and T-3 were drilled in November of 1949.) The attached table summarizes our interpretation of the geologic section likely to be encountered beneath TA-21. This table also includes suggested values of porosity and intrinsic permeabilities

interpreted from US Geological Survey records and the in-situ studies performed at Area G by Bendix Field Engineering Co. in the mid-1980s. Bill Purtymun provided much of the insight in suggesting appropriate values.

The following comments are keyed to paragraphs in the draft, which we numbered sequentially for convenience of reference.

Paragraph 2 (Abstract). We don't see any discussion in the draft to indicate how effective the capping is at inhibiting movement. Seems you would at least need to run a comparison with no cap. We don't find any clear identification in the discussion as to which parameters are the most influential.

Paragraph 3. We don't find any discussion or supporting analysis of the effect of the engineered barriers or monitor station locations.

Table 1. What is the rationale for making the "near" and "far" field saturated hydraulic conductivities so different?

Paragraph 6. If you have not already done so, we suggest using some of the data developed by BFEC in their study of Areas L and G to establish the parameters for the relative permeability and capillary pressure models.

Paragraph 8. Were the Langmuir parameters representative of any particular contaminant-matrix combination? We suggest that you get some input from Ed Essington and Eric Fowler (EES-15) about parameters that could represent plutonium on local tuff based on their experiments over the years.

Paragraph 9. Again, try to get some real sorption data from Essington and Fowler.

Paragraph 10. Calling the generic non-reactive tracer "plutonium" will not serve the Laboratory very well from a perception standpoint. We suggest you either call it tritium, which is present in the waste and moves with the water as part of the water molecules, or simply use the "non-reactive tracer" terminology without associating it with a particular contaminant. To model a "reactive" tracer, plutonium might be acceptable if appropriate parameters could be used.

Paragraph 11. This is a much better attempt to model the real geohydrologic section that any previous modelling effort and we applaud your efforts. We suggest you take the next step and make use of the good data that is available on what the geologic section beneath TA-21 really is to refine Figure 10 and Table 2.

Our best current interpretation is presented in the attached Table. This conceptual section would also represent many other locations fairly well. It includes some features, in addition to those in your Figure 10 and Table 2, that may be important in terms of migration. Specifically we call your attention to the inclusion of a Basalt layer interfingered in the Puye Conglomerate and to the Totavi Lentil, a cobble and boulder layer, just below the fanglomerate member where the water surface of the main aquifer often appears. The table also includes some suggested representative values for porosities and intrinsic permeabilities from actual field measurements. An additional detail is the fact that the Tshirege tuff, the uppermost portion of the Bandelier tuff, generally has four major cooling units, each with different hydrologic properties, but generally decreasing permeability with depth (see footnotes in table). The point you note about inapplicability of Darcy's law to cobbles may also apply to modelling of the Totavi Lentil.

Paragraph 12. Wouldn't it be more appropriate to assume all the contaminant to be in the crushed tuff? The cobbles and gravel were added as "clean" capping materials.

Paragraph 14. Please call the non-reactive material tritium or don't associate it with a particular contaminant. In the case of tritium, the half-life is about 13.5 years so there would be increasingly greater reduction in concentrations with time.

Paragraph 17. As noted before, it should not be necessary to rely on "distant site" (NTS we presume ?) data if you would talk to Essington and Polzer and get some local data.

Paragraph 18. We agree and endorse the need for more actual field data to provide a basis for better modelling. One detail, in relation to the discussion of fracture distribution and characteristics, is that the in-situ BFEC work at Area G found no major differences between measured conductivities in the injection tests in fractured and unfractured zones.

AS:SM:bjh

Cy: T. Buhl, HSE-8, MS K490

INTERPOLATED GEOLOGIC SECTION FOR TA-21
Based on Logs from T-2, T-3, and O-4

	Thickness (feet)	Depth (feet)	Porosity (percent)	Permeability (darcies)
Bandelier Tuff				
Tshirege Tuff	350	350	30-40	0.1-0.5[a]
Unit 2b				0.5-2[b]
Unit 2a				0.3-1[b]
Unit 1b				0.6[b]
Unit 1a				0.2-0.3[b]
Tsankawi pumice	10	360	50-60	0.5
Otowi tuff	230	590	40-60	1.0
Guaje pumice	40	630	55-65	0.5
Puye Conglomerate				
Fanglomerate[c]	100	730	35	5
Basalts	125	855	10-15	1
Fanglomerate	360	1215	35	5
Totavi Lentil[d]	70	1285	50	400
Water Surface		1285		

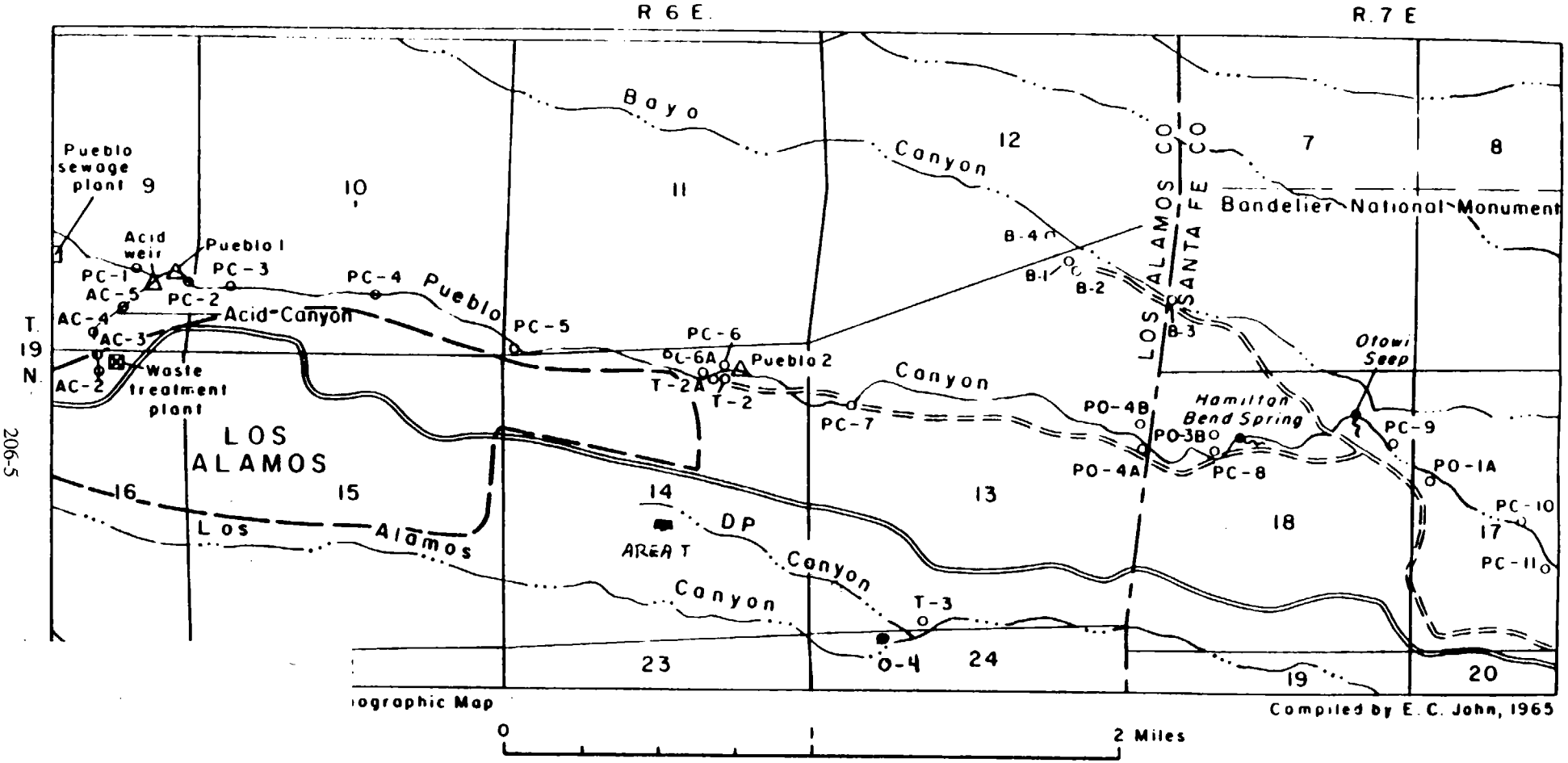
NOTES:

[a] Ranges of permeabilities from US Geological Survey work in 50s and 60s probably representing a reasonable average for the Tshirege member. BFEC work at Area G included a water injection test that gave a range of about 0.5 to 1.0 with an average of about 0.8 for all four units.

[b] Ranges of permeabilities for each individual cooling unit of the Tshirege member from BFEC work, includes values from in-situ vacuum and water injection tests and laboratory analyses of cores.

[c] The upper fanglomerate layer contains one significant clay layer, 5-10 feet thick, that is probably responsible for a perched zone of water that occurs at depths of 117 ft in T-2 and about 253 ft in O-4.

[d] The Totavi lentil includes large cobbles and boulders a foot or more in dimension in a matrix of sand and clays, permeability from pump tests in T-2 and T-3.



ıographic Map

EXPLANATION

o PC-6
Test or observation well

△ Pueblo 1
Surface water sampling station

ıtion of well, spring, stream, and alluvium sampling points in Acid, Pueblo, and Bayo Canyons.

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GROUND WATER BRANCH PROGRAMS WITH THE U.S. ATOMIC ENERGY COMMISSION AND THE LOS ALAMOS SCIENTIFIC LABORATORY AT LOS ALAMOS, NEW MEXICO, 1946-1972

by

William D. Purtymun

The Ground Water Branch operating out of the Albuquerque began a series of studies at Los Alamos in 1946 that continued to 1972. The contracts were with the Atomic Energy Commission [AEC (now U.S. Dept. of Energy)] and with the Los Alamos Scientific Laboratory [LASL (now Los Alamos National Laboratory)]. The studies were mainly related to low level radioactivity disposal and their effects on the environment, and with the development of a municipal and industrial water supply.

The District Engineers during this period were C.V. Theis, C.S. Conover, W.E. Hale, and S.W. West. Project Chiefs were R.L. Griggs (1946-1954), J.E. Weir (1954-1957), J.H. Abrahams (1957-1962), W.D. Purtymun (1962-1969), and T.E. Kelly (1969-1972).

Little was known of the geology and water resources of the area in 1946 so that basic investigations were conducted to determine geology, the occurrence of surface and ground water, quality of water (waste and natural), and the effects of waste disposal on the environment. The number of reports that resulted from the investigations and studies reflects the work of the Water Resource Division. These early efforts laid the basic frame for work that is being carried on today (1990) at Los Alamos (i.e., environmental restoration and monitoring; and long ranging planning and development of a dependable municipal-industrial water supply).

The reports by the Survey were published (Water-Supply Papers and Prof. Papers) and unpublished (Open-file and Administrative release) reports. A history of the Ground Water Branch (type of programs and results) and personnel that worked at Los Alamos is best exemplified by listing reports and authors. Other people that spent short tours of duty at Los Alamos that are not mentioned as authors are Fred Bush, Al LaSala, and George Dinwiddie. Drilling of test wells and moisture access tubes were performed by the Survey's Hydrologic Laboratory in Denver, with Ivan Johnson and Gene Shuter supervising.

Copies of published and unpublished reports (many are not accessible, especially the Admin rel reports in Survey libraries) are available for inspection at the Environmental Community Reading Room, 2101 Trinity Drive, Los Alamos, NM. The Reading Room is maintained by the Los Alamos National

Laboratory as part of the operating permit granted to the Laboratory by the U.S. Environmental Protection Agency.

I. WATER-SUPPLY PAPERS AND PROFESSIONAL PAPERS

Report titles are listed below and indicate respective programs. Also shown are report number, year issued, and author or authors. These data are sufficient to identify reports for documentation of the history of Survey involvement at Los Alamos, and represents a comprehensive literature search.

1. "Geology and Hydrology of the Valle Grande and Valle Toledo", WSP-1619Y, (1963), C.S. Conover and C.V. Theis.

2. "Pumping Tests in the Los Alamos Canyon Well Field", WSP-1619-I, (1962), C.V. Theis and C.V. Conover.

3. "Geology and Ground-Water Resources of the Los Alamos Area", WSP-1753, (1964), R.L. Griggs.

4. "An Aquifer Evaluation of Aquifer and Well Characteristics", WSP-1809D, (1963), R.L. Cushman.

5. "Distribution of Moisture in Soil and Tuff", Prof-Paper, 424-D, (1961), J.H. Abrahams, J.E. Weir, and W.D.Purtymun.

6. "Movement of Snowmelt Water in the Alluvium", Prof-Paper, 450-B, (1962), J.H. Abrahams, E.H. Baltz, and W.D. Purtymun.

7. "Source of Carbon Dioxide in Tuff", Prof-Paper 650-B, (1969), J.L. Kunkler.

8. "The Measurement of Atmospheric Pressure and Subsurface-Gas Pressure In Tuff", Prof-Paper 650-D, (1969), J.L.Kunkler.

9. "Equipment Used to Map Shafts", Prof-Paper 424-D, (1961), J.E. Weir and E.H. Baltz.

10. "Distribution of Radioactivity in Alluvium", Prof-Paper, 550-D, (1966), W.D. Purtymun, G.L. Jackson, and E.C. John.

11. "Development of Ground-Water Supplies on the Pajarito Plateau", Prof-Paper 650-D, (1969), W.D. Purtymun and J.B. Cooper.

II. UNPUBLISHED REPORTS

The unpublished reports consist of Open-file reports and Administrative reports released to the AEC and LASL. These reports as previously stated are available for inspection at the LANL Library at Los Alamos. The reports fall in to three categories: Water Supply, Waste Studies, and General Reports. These are discussed in order. The general category contains reports of specific locations or sites related to geohydrology, waste studies, or engineering. Brief tiles, type of issue and date, and author or authors are used to document this section of the history and activities of the Ground Water Branch.

A. WATER SUPPLY

Water supply studies began in 1947 in the Valle Grande west of Los Alamos. When a supply could not be obtained there, test wells drilled along the Rio Grande indicated a supply could be obtained from the main aquifer in Los Alamos and Guaje Canyons east of Los Alamos. The main aquifer is the only aquifer in the area capable of municipal and industrial supply. The aquifer rises westward from the Rio Grande beneath the plateau (Los Alamos). The water in the aquifer moves is eastward beneath the plateau with some discharge through seeps and springs into the Rio Grande in White Rock Canyon. The depth of water ranges from over 1,200 ft along the western edge of the plateau to about 600 ft along the eastern edge. Test holes and wells located near the Rio Grande were artesian. Eventually 13 wells were drilled from 1946 through 1952 in Los Alamos and Guaje Canyons east of Los Alamos. Their depths ranged from 870 to 2,000 ft with water levels from near land surface (some were artesian when completed) to 470 ft. Their yields ranged from 300 to 600 gpm. One additional well was added to the Los Alamos field in 1960 (550 gpm) and another well added to the Guaje field in 1964 (350 gpm). Three high yield wells (600 to 1,500 gpm) were drilled on the Pajarito Plateau in 1965 through 1967. The completed depth of these wells ranged from about 2,300 ft to 2,500 ft. The Ground Water Branch selected well sites, determined geology, performed aquifer tests, and advised on well construction. Using the hydrologic data collected during the construction of these early wells, four additional high yield wells (1,000 to 1,500 gpm) were developed on the plateau in the period 1980-1990 by the Department of Energy and the Laboratory.

The Survey collected hydrologic data on a weekly and monthly basis on the aquifer when each well was placed on line. These data were reviewed annually and results submitted in a letter report to the AEC with recommendations for well and well field operations for the coming year. Few of the letter reports survived the different administrations; however, the hydrologic data (1947-1971)

scattered throughout a number documents has been compiled into a single Laboratory report (LA-5040-MS, 1972). The Laboratory has continued to compile this data and issue annual reports which are invaluable to insure a continuing dependable water supply. Survey reports related to documentation and development of water supply included the following reports:

1. "Site Location for a Supply Well adjacent to State Road 4", Admin rel (1961), W.D. Purtymun and R.L. Cushman.

2. "Site Location For A Supply Well in Guaje or Rendija Canyon", Admin rel (1963), W.D. Purtymun.

3. "Site Location for a Supply Well in Pajarito Canyon", Admin rel (1964), W.D. Purtymun and E.C. John.

4. "Site Locations for Five Water Supply-Wells", Admin rel (1965), W.D. Purtymun and J.B. Cooper.

5. "Pumping Tests of February and March 1965 of Guaje Well No. 6", Admin rel (1965), J.B. Cooper.

6. "Records of Water-Supply Wells Guaje 6, Pajarito PM-1 and PM-2", Admin rel (1966), J.B. Cooper, W.D. Purtymun, and E.C. John.

7. "Records of Water-Supply Well Pajarito PM-3", Open-file rept (1966), W.D. Purtymun.

B. WASTE STUDIES

The initial waste studies were to determine the effect of the release of untreated liquid radioactive wastes from 1943-50, and of treated wastes from 1950-1964 on the environment. The main treatment plant released effluents into Acid-Pueblo Canyon, while the smaller treatment plant released effluents in to DP-Canyon, a tributary to Los Alamos Canyon near the middle of the plateau. Acid-Pueblo is confluent with Los Alamos Canyon, which in turn is a tributary to the Rio Grande. The initial studies were made to establish the chemical and radiochemical quality of surface water, ground water in the alluvium (observation wells generally less than 25 ft in depth), perched water in the fanglomerate (test well 120 ft in depth) and basalts (test well 210 ft) in Pueblo Canyon, and the main aquifer (7 test wells and all supply wells with water levels from near land surface to about 1,200 ft). Surface water in the Rio Grande and Rio Chama were also part of the monitoring network. This monitoring network is part of the present monitoring system used by the Laboratory (1990).

The Survey reports related to monitoring of the quality of water are as follows:

1. "Chemical and Radiochemical Quality of Surface and Ground Water 1949-1955", Admin rel (1962), J.E. Weir, J.H. Abrahams, J.R. Waldon, and W.D. Purtymun.

2. "Chemical and Radiochemical Quality of Surface and Ground Water, 1956 through June 1957", Admin rel (1966), J.H. Abrahams.

3. "Chemical and Radiochemical Quality of Surface and Ground Water, July 1957 through June 1961", Admin rel (1966), J.H. Abrahams and W.D. Purtymun.

4. "Chemical and Radiochemical Quality of Surface and Ground Water, July 1961 through June 1962", Admin rel (1966), W.D. Purtymun.

5. "Chemical and Radiochemical Quality of Surface and Ground Water, July 1962 through June 1963", Admin rel (1966), W.D. Purtymun.

6. "Chemical and Radiochemical Quality of Surface and Ground Water, July 1963 through June 1964", Admin rel (1966), W.D. Purtymun and E.A. Enyart.

7. "Chemical and Radiochemical Quality of Surface and Ground Water, July 1964 through June 1965", Admin rel (1966), W.D. Purtymun.

8. "Chemical and Radiochemical Quality of Surface and Ground Water, July 1965 through June 1966", Admin rel (1967), W.D. Purtymun and J.L. Kunkler.

9. "Chemical and Radiochemical Quality of Surface and Ground Water, July 1966 through June 1967", Admin rel (1969), W.D. Purtymun and J.L. Kunkler.

10. "U.S. Geological Survey Chemical and Radiochemical Analyses of Water in the Los Alamos Area, 1960 through 1968", Admin rel (1969), W.D. Purtymun.

11. "Hydrology of Waste Disposal Systems, Los Alamos, New Mexico, 1949 through 1961", Admin rel (1964) Submitted for WSP, W.D. Purtymun, J.H. Abrahams, and, J.R. Avrett.

The chemical and radiochemical quality of water and hydrologic data in these and later reports related to disposal areas. These data are summarized in an informal Laboratory report entitled, "Geohydrology of the Pajarito Plateau with reference to Quality of Water 1949-1972" (W.D. Purtymun). The quality of water data from the Survey is also found in a Laboratory report (LA-8890-ENV, DOE/ENV-0005/30, 1981).

A new waste treatment plant for radioactive liquid wastes was built in 1960. The effluent from this plant is released in to Mortandad Canyon. The Ground Water Branch did a preliminary investigation of the canyon and set up a monitoring system (observation holes in the alluvium that range in depth from 11 to 67 ft). The Survey also installed a test well into the main aquifer (WL 960 ft, depth 1065 ft), moisture access holes, and gaging stations in Mortendad Canyon. The Survey reports related to evaluation to the release of effluents in to this canyon are as follows:

1. "Preliminary Report on the Geology and Hydrology of Mortandad Canyon", Open-file rept (1963), E.H. Baltz, J.H. Abrahams, and W.D. Purtymun.

2. "Progress Report on the Hydrology of Mortandad Canyon, July 1961 to June 1963", Admin rel (1964), W.D. Purtymun.

3. "Disposal of Industrial Effluents in to Mortandad Canyon, Los Alamos County", Admin rel (1966), Submitted for a WSP, W.D. Purtymun.

C. GENERAL REPORTS

The following reports were prepared by the Ground Water Branch at the request of AEC or the Laboratory. These reports relate to the geohydrology or waste investigations at Los Alamos.

1. "Geology of the Micro-Seismograph Station at S-Site", Admin rel (1968), W.D. Purtymun.

2. "Geology and Hydrology of Area G, Mesita del Buey", Admin rel (1966), W.D. Purtymun (reprinted as LA-4660 by LASL).

3. "Geology and Hydrology of White Rock Canyon from Otowi to Frijoles", Admin rel (1966), W.D. Purtymun (reprinted as LA-8635-MS by LASL).

4. "Records of Wells, Test Holes, Springs, and Surface Water Stations in the Los Alamos Area", Open-file rept (1967), E.C. John, E. Enyart, and W.D. Purtymun.

5. "Geology and Physical Properties of the Near-Surface Rocks at Mesita del Los Alamos", Open-file rept (1966), W.D. Purtymun (reprinted as LA-3728 by LASL).

6. "Distribution of Moisture and Radioactivity is the Soil and Tuff at the Contaminated Waste Pit near TA-21", Open-file rept (1966), W.D. Purtymun and W.R.Kennedy.

7. "Physical Properties of the Tshirege Member of the Bandelier Tuff with Reference to Use as Building and Ornamental Stone", Open-file rept (1965), W.D. Purtymun and F.C. Koopman.

8. "Geologic and Hydrologic Environment of Radioactive Waste-Disposal Sites at Los Alamos", Admin rel (1963), J.H. Abrahams.

9. "Equipment Used to Study Movement of Water in the Bandelier Tuff", Admin rel (1966), J.H. Abrahams.

10. "Hydrologic Characteristics of the Tshirege Member of the Bandelier Tuff with Reference to the Injection of Treated Low-Level Radioactive Liquids", Admin rel (1964), F.C. Koopman and W.D. Purtymun.

11. "Tests and Design of Disposal Wells", Admin rel (1967), (reprinted in part as LA-11511-MS by LASL) W.D. Purtymun and E.A. Enyart.

12. "Volume, Rate, and Energy of Air Transferred Through Test Holes in the Bandelier Tuff", Admin rel (1968), (reprinted in part as LA-5725-MS by LASL), W.D. Purtymun and F.C. Koopman.

13. "Geology and Hydrology of TA-49, Frijoles Mesa, Los Alamos County, New Mexico", Admin rel (1962), (reprinted in part as LA-11135-MS by LASL), J.E. Weir and W.D. Purtymun.

14. "The Distribution of Moisture in Soil and Underlying Tuff at TA-49, Frijoles Mesa Los Alamos County, New Mexico", Admin rel (1962), W.D. Purtymun.

15. "Physical Properties of and Movement of Water in The Bandelier Tuff, Los Alamos and Santa Fe Counties, New Mexico", Admin rel (1963), J.H. Abrahams.

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