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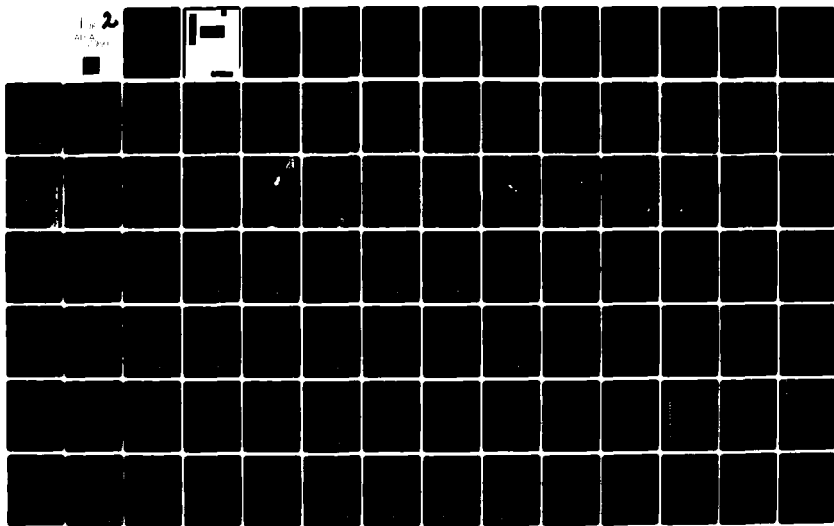
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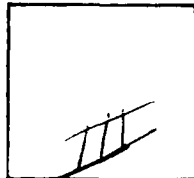


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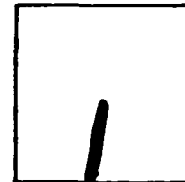
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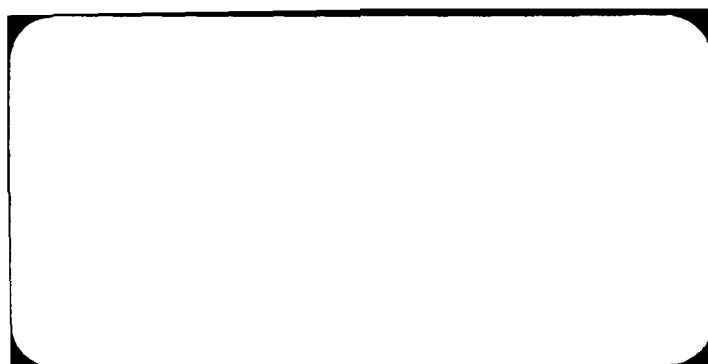
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MX SITING INVESTIGATION
GEOTECHNICAL EVALUATION
VERIFICATION STUDY - CAVE VALLEY
NEVADA
VOLUME II - GEOTECHNICAL DATA

Prepared for:

U.S. Department of the Air Force
Ballistic Missile Office (BMO)
Norton Air Force Base, California 92409

Prepared by:

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26 October 1981

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FOREWORD

This volume of geotechnical data was compiled for the Department of the Air Force, Ballistic Missile Office (BMO), in compliance with Contract No. F04704-80-C-0006, CDRL Item 004A6. It contains the field data and laboratory test results from the Verification investigation of Cave Valley. A synthesis of these data are available in Volume I (E-TR-27-CV-I).

The data in each section of this volume are preceded by an explanation of the format and terms used in the compilation.

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1.0 ACTIVITY MAP AND GEOGRAPHIC COORDINATES

Explanation: Locations of all field activities are shown in Drawing II-1-1, Activity Location Map (in pocket). The geodetic and Universal Transverse Mercator (UTM) coordinates of all activities are listed in Table II-1-1.

E-TR-27-CV-II

CAVE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETTIC COORD.				UTM COORD.	
	LAT.		LONG.		ZONE 12	
	DEG	MIN	DEG	MIN	N(KM)	E(KM)

BORING SITES						
CV- B01	38	19.36	114	53.67	4243.51	684.06
CV- B02	38	28.17	114	52.40	4259.84	685.54
CV- B03	38	38.39	114	50.12	4278.82	688.41
CV- B04	38	35.34	114	47.31	4273.29	692.61

CPT SITES						
CV- C01	38	21.09	114	50.25	4246.83	688.96
CV- C02	38	20.60	114	51.27	4245.89	687.50
CV- C03	38	20.13	114	52.38	4244.97	685.91
CV- C04	38	19.36	114	53.67	4243.51	684.06
CV- C05	38	18.55	114	55.45	4241.95	681.50
CV- C06	38	24.95	114	48.72	4254.01	691.02
CV- C07	38	24.29	114	50.03	4252.74	689.15
CV- C08	38	25.23	114	51.71	4254.43	686.67
CV- C09	38	25.80	114	53.82	4255.41	683.57
CV- C10	38	26.95	114	54.92	4257.50	681.92
CV- C11	38	28.17	114	52.40	4259.84	685.54
CV- C12	38	27.26	114	50.89	4258.22	687.76
CV- C13	38	26.47	114	49.60	4256.80	689.68
CV- C14	38	26.64	114	48.28	4257.16	691.59
CV- C15	38	27.62	114	46.44	4259.04	694.23
CV- C16	38	31.84	114	47.22	4266.80	692.90
CV- C17	38	31.25	114	45.71	4265.77	695.12
CV- C18	38	35.34	114	47.31	4273.29	692.61
CV- C19	38	38.39	114	50.12	4278.82	688.41
CV- C20	38	38.55	114	49.60	4279.14	689.16

GEOLOGIC STATIONS						
CV-GS01	38	17.47	114	53.00	4240.03	685.11
CV-GS02	38	47.55	114	49.32	4295.79	689.16
CV-GS03	38	41.09	114	49.64	4283.83	688.98
CV-GS04	38	40.36	114	46.40	4282.60	693.71
CV-GS05	38	39.97	114	48.04	4281.81	691.35
CV-GS06	38	38.21	114	50.63	4278.47	687.67
CV-GS07	38	29.59	114	47.14	4262.65	693.12



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GEODETTIC AND UTM COORDINATES
OF ACTIVITY LOCATIONS
CAVE VALLEY, NEVADA

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TABLE II-1-1

CAVE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETTIC COORD.				UTM COORD.	
	LAT.		LONG.		ZONE 12	
	DEG	MIN	DEG	MIN	N(KM)	E(KM)
CV-GS08	38	31.87	114	47.00	4266.87	693.23
CV-GS09	38	35.68	114	46.22	4273.96	694.19
CV-GS10	38	36.90	114	47.26	4276.16	692.62
CV-GS11	38	35.30	114	47.58	4273.20	692.23
CV-GS12	38	31.13	114	49.99	4265.41	688.92
CV-GS13	38	23.89	114	48.99	4252.05	690.68
CV-GS14	38	25.85	114	48.41	4255.69	691.44
CV-GS15	38	26.20	114	49.25	4256.31	690.20
CV-GS16	38	27.35	114	51.02	4258.37	687.57
CV-GS17	38	28.25	114	53.60	4259.96	683.78
CV-GS18	38	25.24	114	54.04	4254.37	683.28
CV-GS19	38	22.42	114	54.90	4249.12	682.14
CV-GS20	38	23.20	114	49.15	4250.77	690.48
CV-GS21	38	17.61	114	54.53	4240.24	682.88
CV-GS22	38	18.56	114	55.38	4241.98	681.60
CV-GS23	38	19.44	114	56.59	4243.56	679.80
CV-GS24	38	21.32	114	54.67	4247.09	682.52
CV-GS25	38	21.92	114	54.88	4248.21	682.18
CV-GS26	38	18.98	114	53.50	4242.82	684.32
CV-GS27	38	19.22	114	51.45	4243.32	687.30
CV-GS28	38	20.58	114	50.78	4245.85	688.22
CV-GS29	38	19.97	114	54.59	4244.61	682.69
CV-GS30	38	18.00	114	54.14	4240.97	683.43
CV-GS31	38	42.18	114	50.67	4285.82	687.44
CV-GS32	38	37.14	114	46.54	4276.63	693.66
CV-GS33	38	39.26	114	46.11	4280.57	694.18
CV-GS34	38	38.60	114	49.43	4279.23	689.40
CV-GS35	38	37.53	114	48.58	4277.28	690.67
CV-GS36	38	36.28	114	48.71	4274.98	690.54
CV-GS37	38	33.48	114	48.80	4269.79	690.54
CV-GS38	38	35.26	114	45.32	4273.21	695.51
CV-GS39	38	22.55	114	49.31	4249.56	690.27
CV-GS40	38	24.82	114	49.14	4253.76	690.42
CV-GS41	38	24.99	114	48.36	4254.10	691.55
CV-GS42	38	26.75	114	48.50	4257.35	691.27
CV-GS43	38	27.06	114	47.13	4257.98	693.25
CV-GS44	38	27.23	114	46.29	4258.31	694.46
CV-GS45	38	34.26	114	47.35	4271.29	692.61
CV-GS46	38	31.07	114	45.22	4265.46	695.84



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GEODETTIC AND UTM COORDINATES
OF ACTIVITY LOCATIONS
CAVE VALLEY, NEVADA

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TABLE II-1-1

CAVE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETTIC COORD.				UTM COORD.	
	LAT.		LONG.		ZONE 12	
	DEG	MIN	DEG	MIN	N(KM)	E(KM)
CV-GS47	38	30.43	114	47.12	4264.20	693.11
CV-GS48	38	27.99	114	47.94	4259.67	692.03
CV-GS49	38	29.14	114	51.14	4261.68	687.32
CV-GS50	38	32.23	114	48.77	4267.47	690.63
CV-GS51	38	24.96	114	51.43	4253.94	687.08
CV-GS52	38	25.84	114	53.00	4255.51	684.76
CV-GS53	38	27.07	114	54.04	4257.76	683.20
CV-GS54	38	22.78	114	53.61	4249.83	684.00
CV-GS55	38	18.75	114	55.88	4242.32	680.87
CV-GS56	38	20.32	114	55.22	4245.23	681.76

REFRACTION LINES

CV- S01	38	21.09	114	50.25	4246.83	688.96
CV- S02	38	35.30	114	45.83	4273.26	694.76
CV- S03	38	31.25	114	45.71	4265.77	695.12
CV- S04	38	27.62	114	46.44	4259.04	694.23
CV- S05	38	26.95	114	54.92	4257.50	681.92
CV- S06	38	28.17	114	52.40	4259.84	685.54
CV- S07	38	24.95	114	48.72	4254.01	691.02
CV- S08	38	18.55	114	55.45	4241.95	681.50
CV- S09	38	38.13	114	47.94	4278.41	691.58
CV- S10	38	28.27	114	54.06	4259.97	683.11

RESISTIVITY LINES

CV- R01	38	21.09	114	50.25	4246.83	688.96
CV- R02	38	35.30	114	45.83	4273.26	694.76
CV- R03	38	31.25	114	45.71	4265.77	695.12
CV- R04	38	27.62	114	46.44	4259.04	694.23
CV- R05	38	26.95	114	54.92	4257.50	681.92
CV- R06	38	28.17	114	52.40	4259.84	685.54
CV- R07	38	24.95	114	48.72	4254.01	691.02
CV- R08	38	18.55	114	55.45	4241.95	681.50
CV- R09	38	38.13	114	47.95	4278.41	691.57
CV- R10	38	28.27	114	54.06	4259.97	683.11



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GEODETTIC AND UTM COORDINATES
OF ACTIVITY LOCATIONS
CAVE VALLEY, NEVADA

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TABLE JT-1-1

CAVE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETTIC COORD.				UTM COORD.	
	LAT.		LONG.		ZONE 12	
	DEG	MIN	DEG	MIN	N(KM)	E(KM)

SURFICAL SOIL SAMPLES

CV-CS03	38	20.13	114	52.38	4244.97	685.91
CV-CS07	38	24.29	114	50.03	4252.74	689.15
CV-CS12	38	27.26	114	50.89	4258.22	687.76
CV-CS14	38	26.64	114	48.28	4257.16	691.59
CV-CS20	38	38.55	114	49.60	4279.14	689.16

TEST PITS

CV- P01	38	35.30	114	45.83	4273.26	694.76
CV- P02	38	31.84	114	47.22	4266.80	692.90
CV- P03	38	31.25	114	45.71	4265.77	695.12
CV- P04	38	26.95	114	54.92	4257.50	681.92
CV- P05	38	25.23	114	51.71	4254.43	686.67
CV- P06	38	27.62	114	46.44	4259.04	694.23
CV- P07	38	21.09	114	50.25	4246.83	688.96
CV- P08	38	20.60	114	51.27	4245.89	687.50
CV- P09	38	18.55	114	55.45	4241.95	681.50

TRENCH SITES

CV- T01	38	35.34	114	47.31	4273.29	692.61
CV- T02	38	38.39	114	50.12	4278.82	688.41
CV- T03	38	26.47	114	49.60	4256.80	689.68
CV- T04	38	28.17	114	52.40	4259.84	685.54
CV- T05	38	25.80	114	53.82	4255.41	683.57
CV- T06	38	24.95	114	48.72	4254.01	691.02
CV- T07	38	19.36	114	53.67	4243.51	684.06

WATER WELL SITES

CV- 001	38	38.55	114	49.60	4279.14	689.16
CV- 002	38	37.63	114	48.57	4277.47	690.69



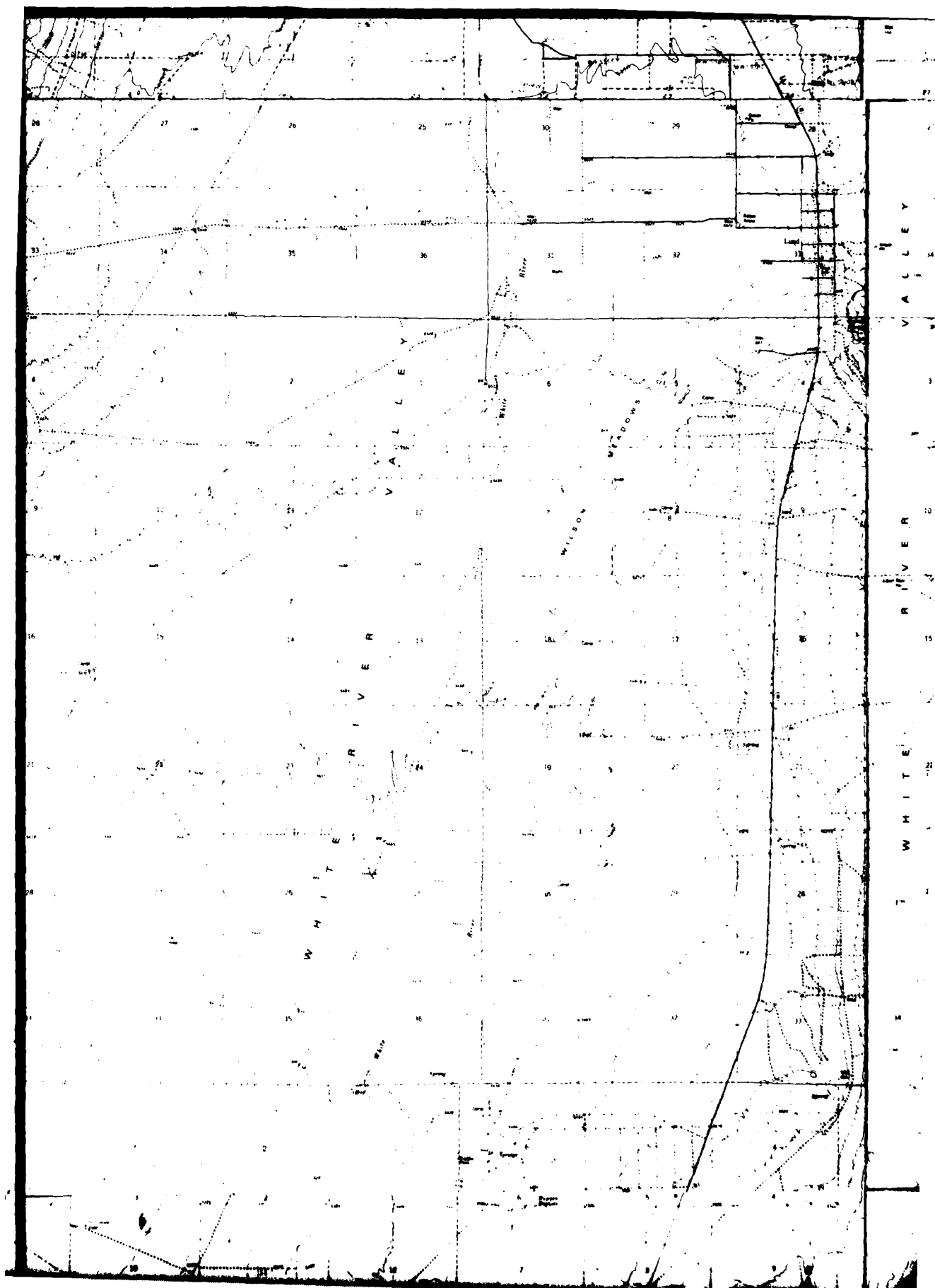
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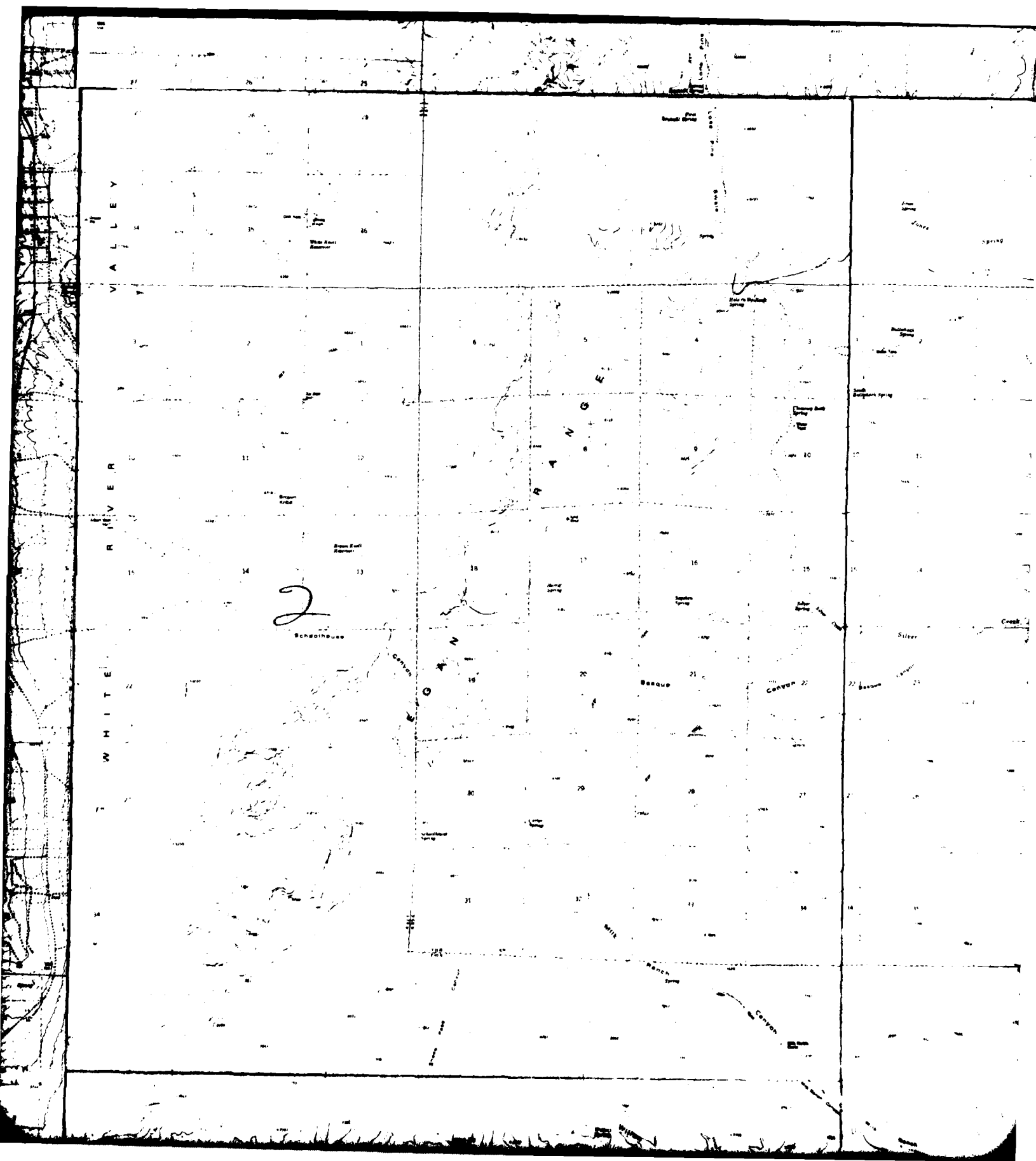
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CAVE VALLEY, NEVADA

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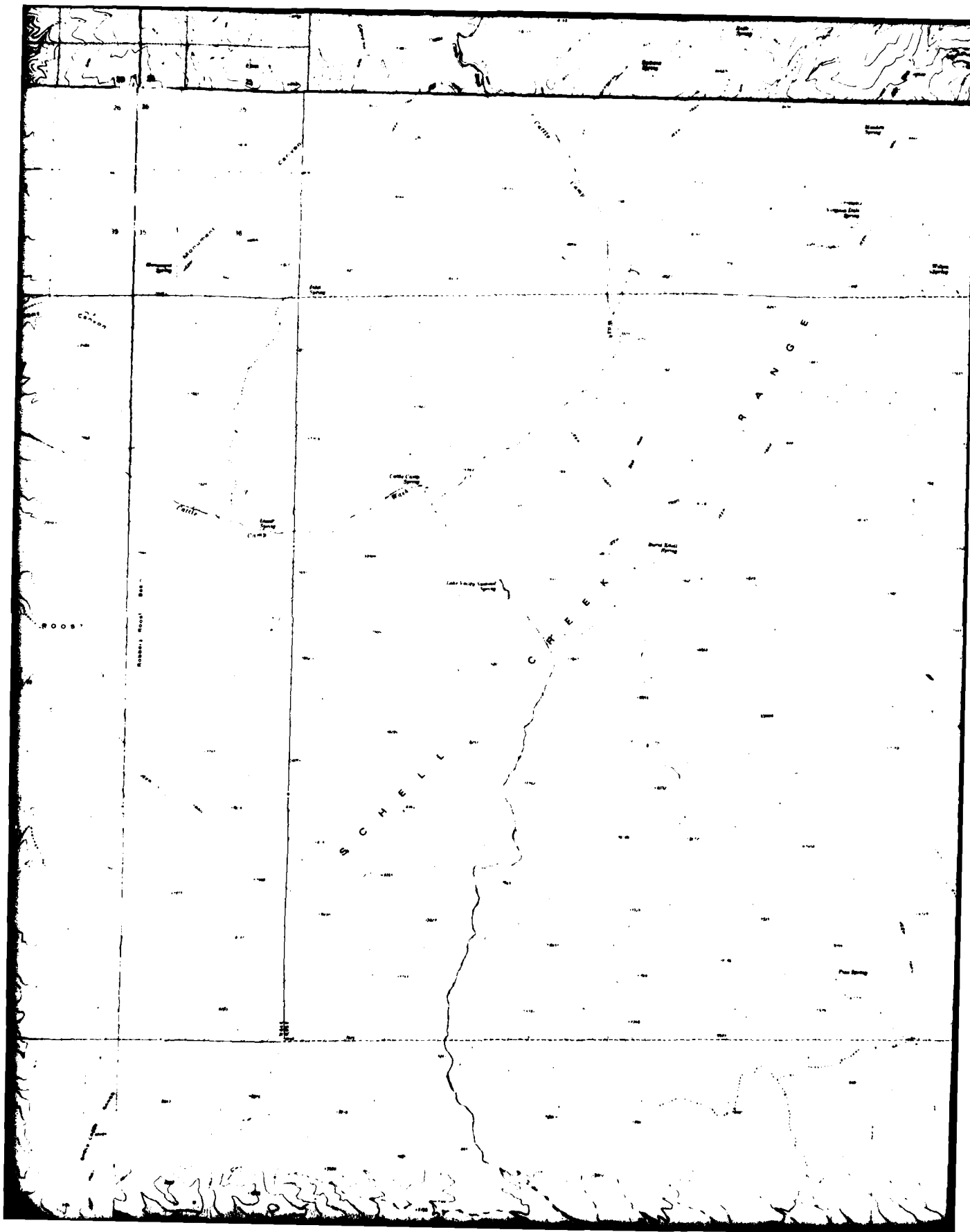
PAGE 4 OF 4

TABLE II-1-1



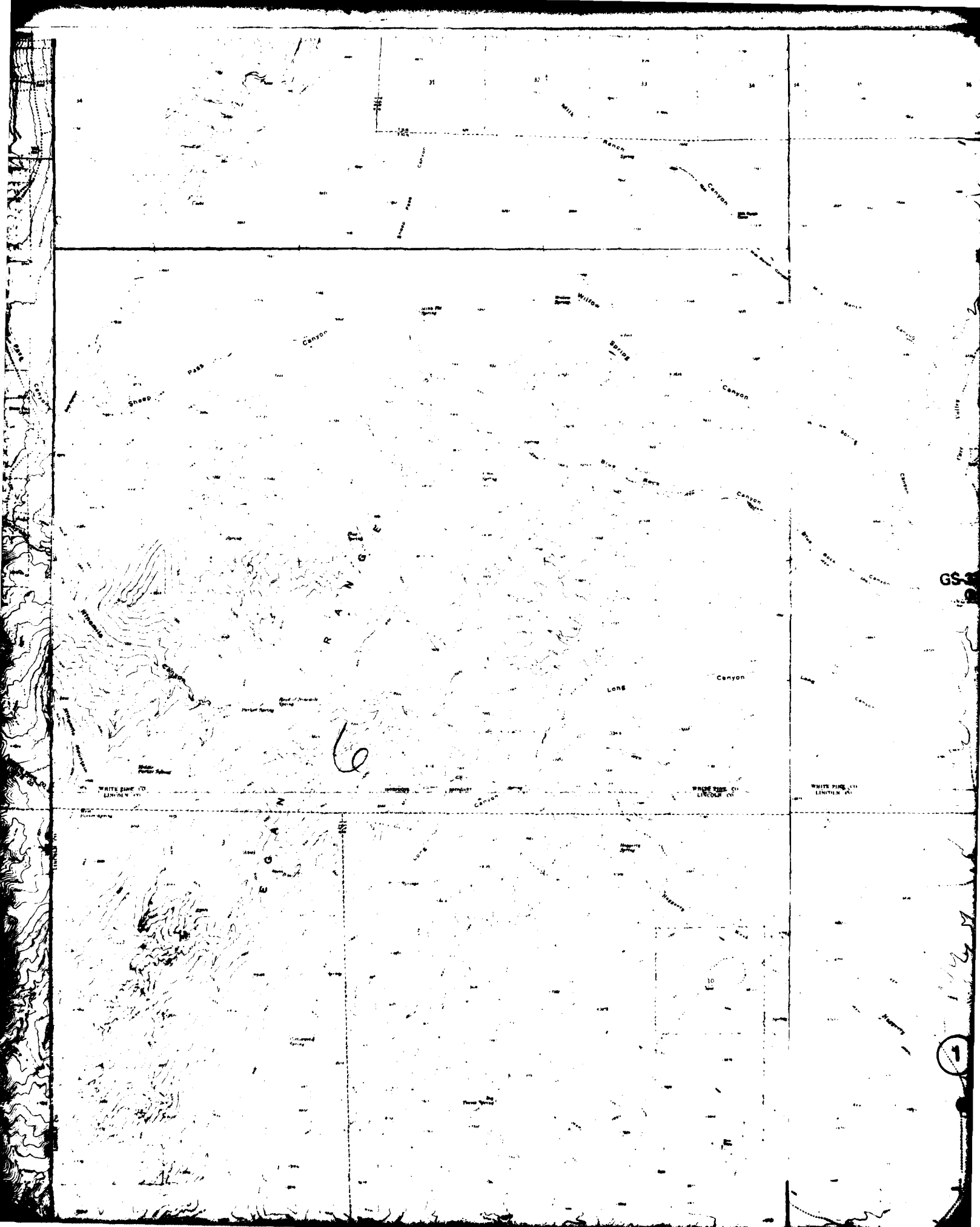


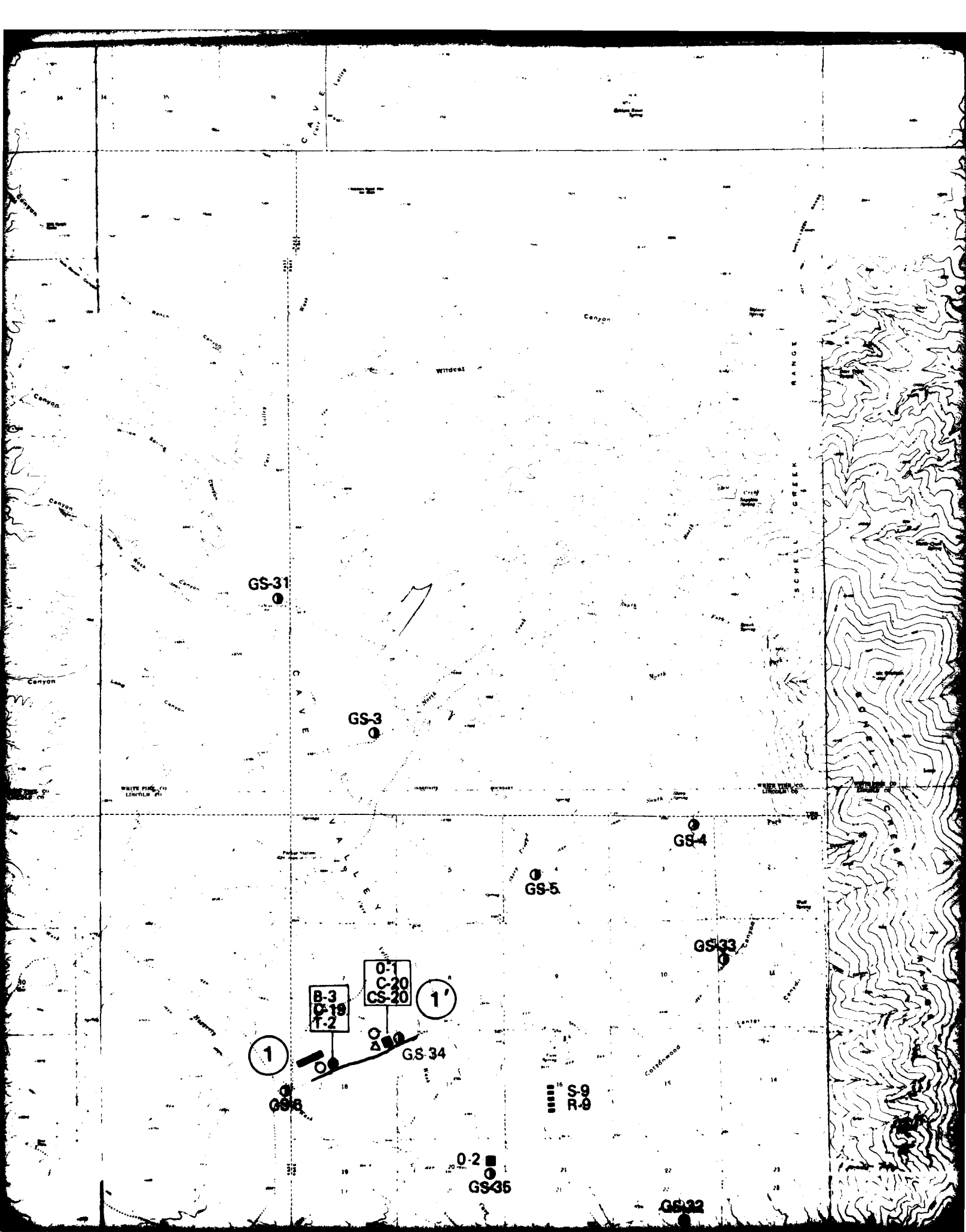


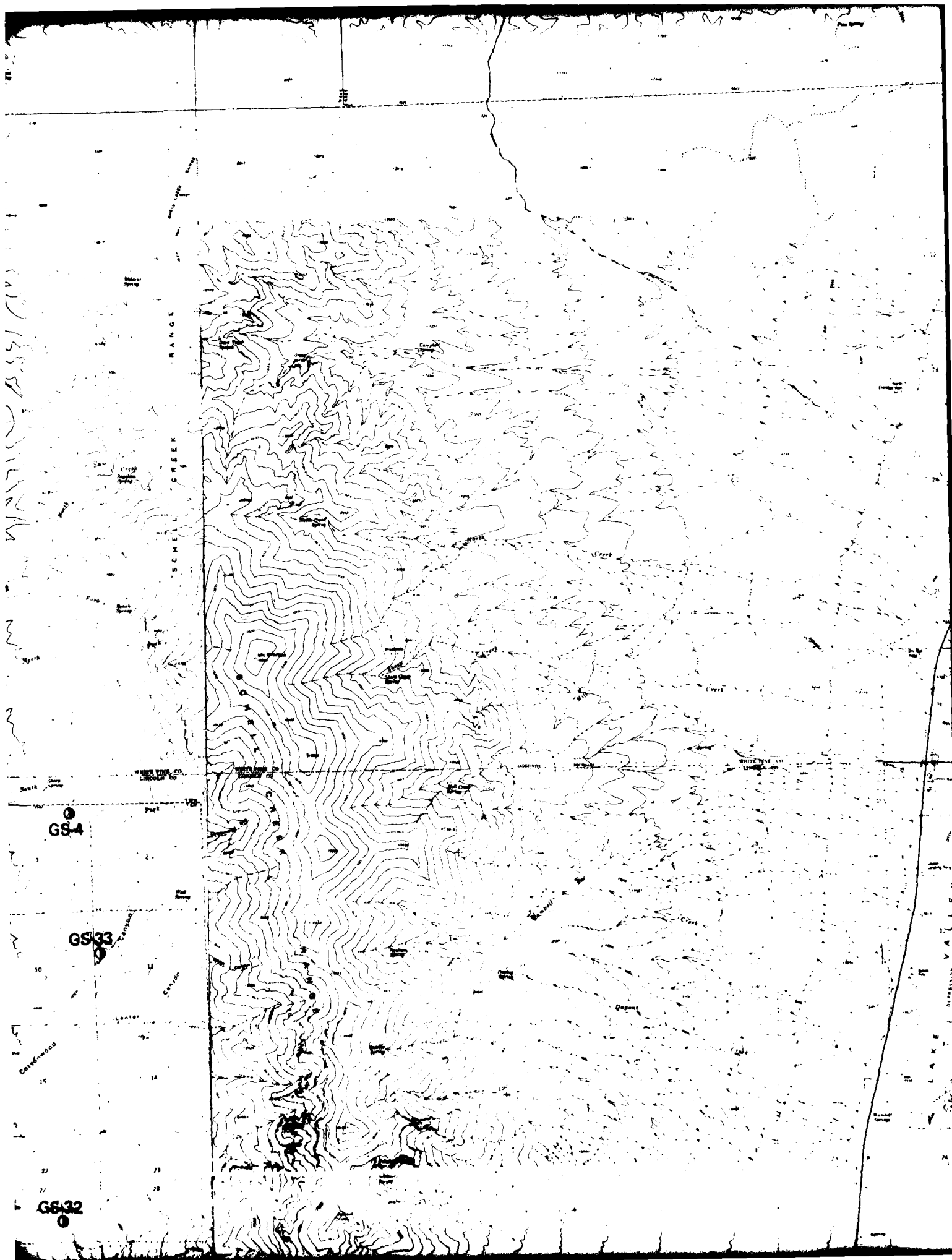


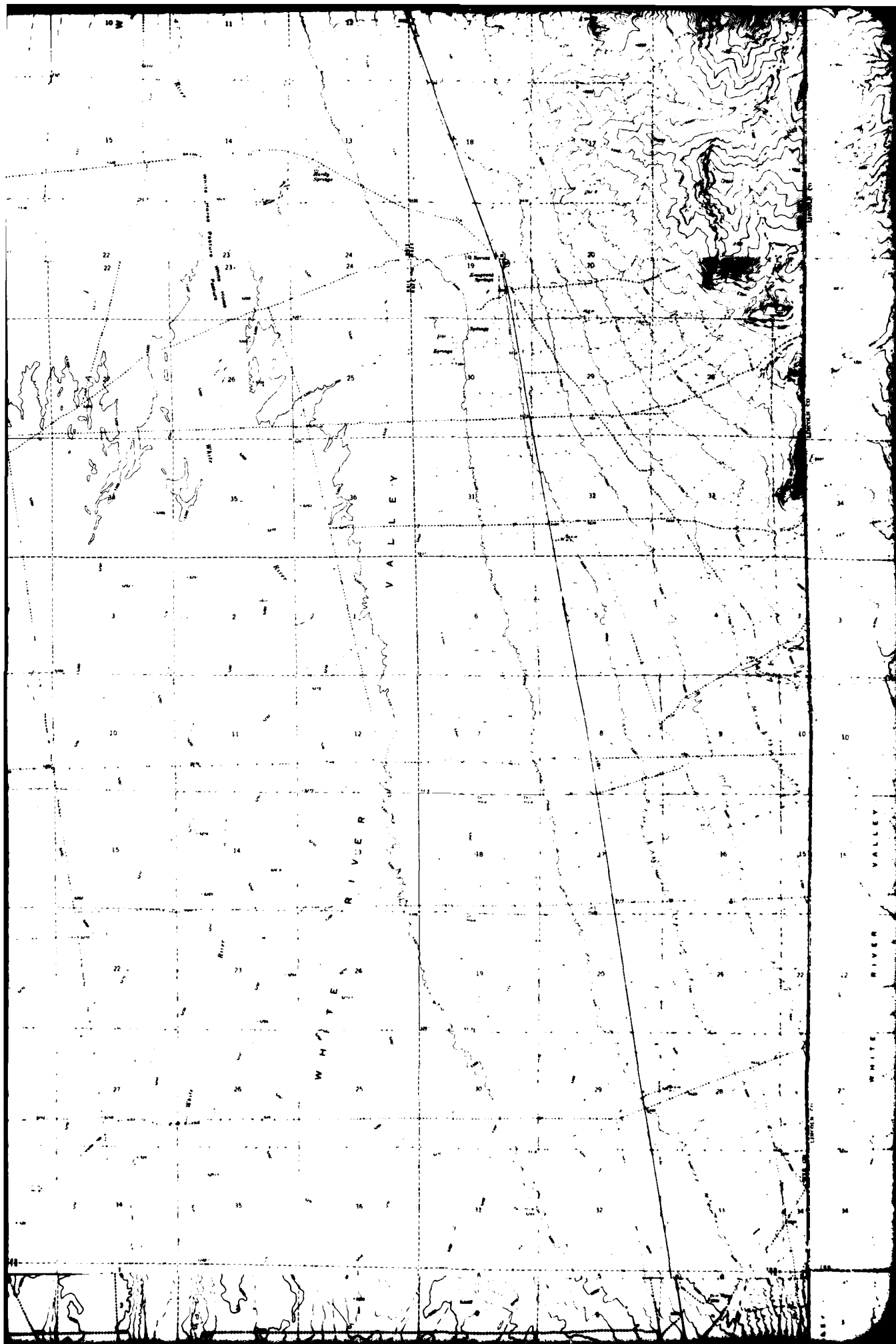
T 10 N

T 9 N

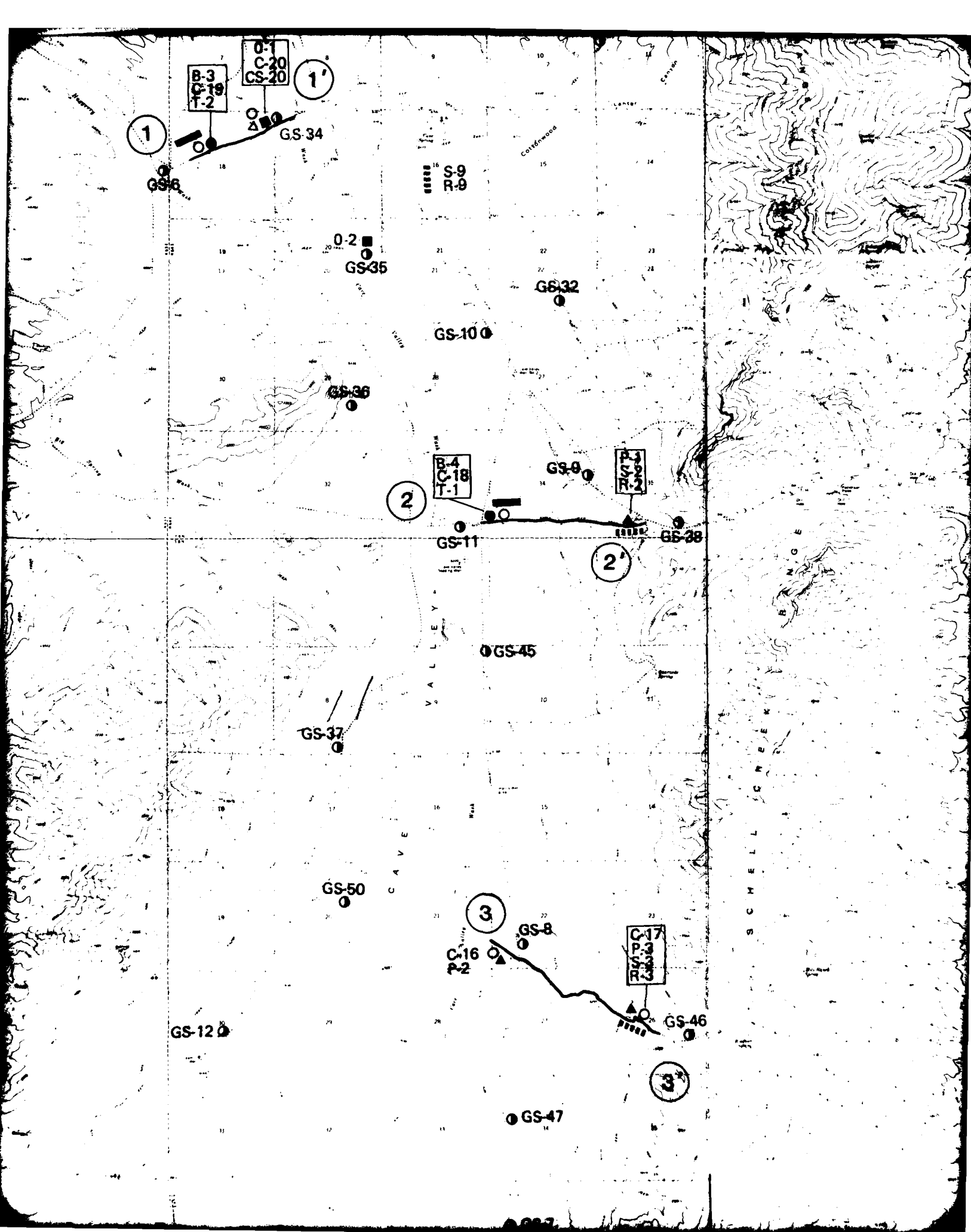


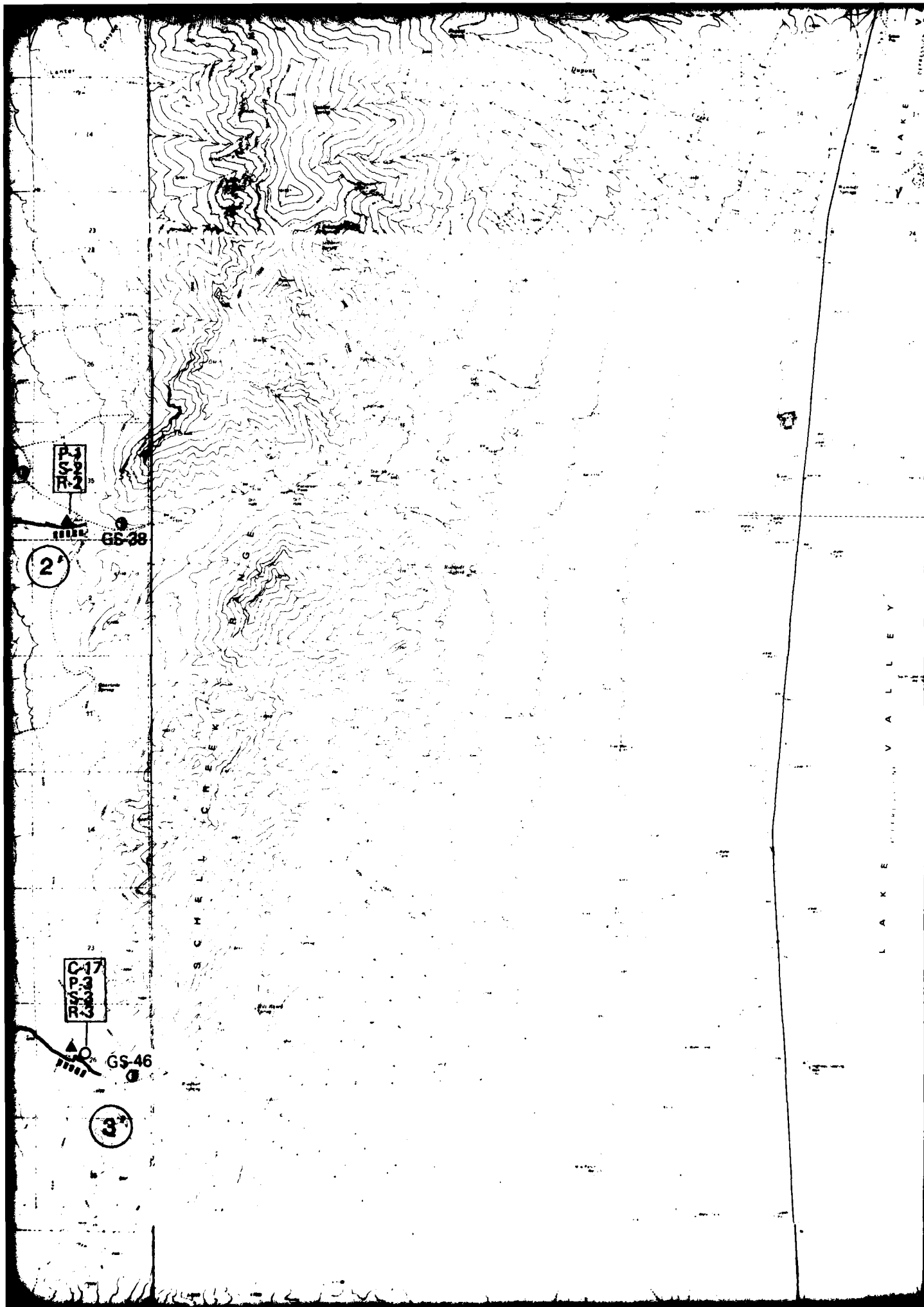


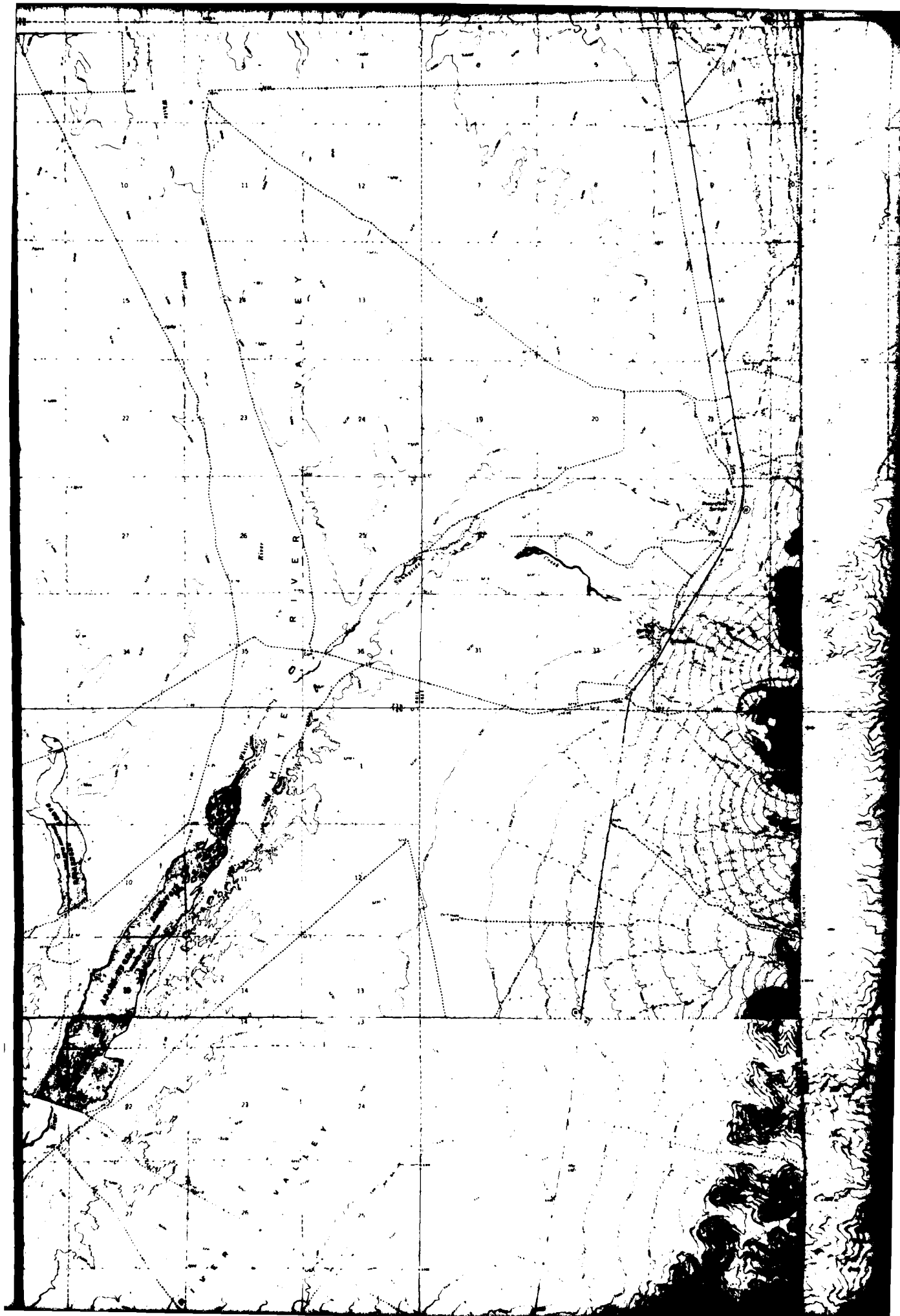


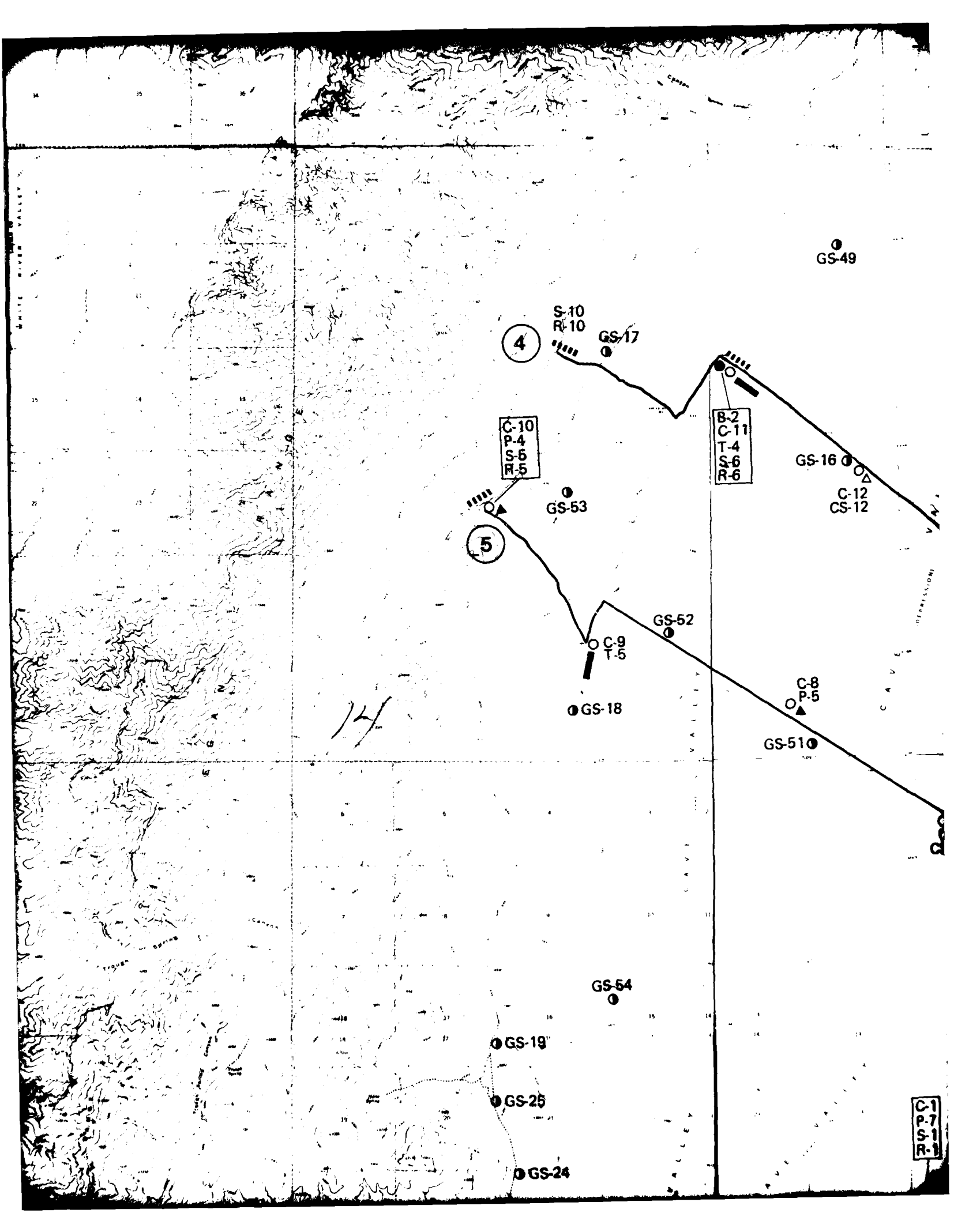












GS-49

S-10
R-10
4
GS-17

C-10
P-4
S-6
R-5

GS-53

5

B-2
C-11
T-4
S-6
R-6

GS-16
C-12
CS-12

GS-52

C-9
T-5
GS-18

C-8
P-5

GS-51

GS-54

GS-19

GS-25

GS-24

C-1
P-7
S-1
R-1

3

GS-47

GS-7

GS-48

C-15
P-6
S-4
R-4

4'

GS-43

GS-44

C-13
T-2

GS-42

C-14
CS-14

GS-15

GS-14

5'

GS-40

GS-41

C-6
T-6
S-7
R-7

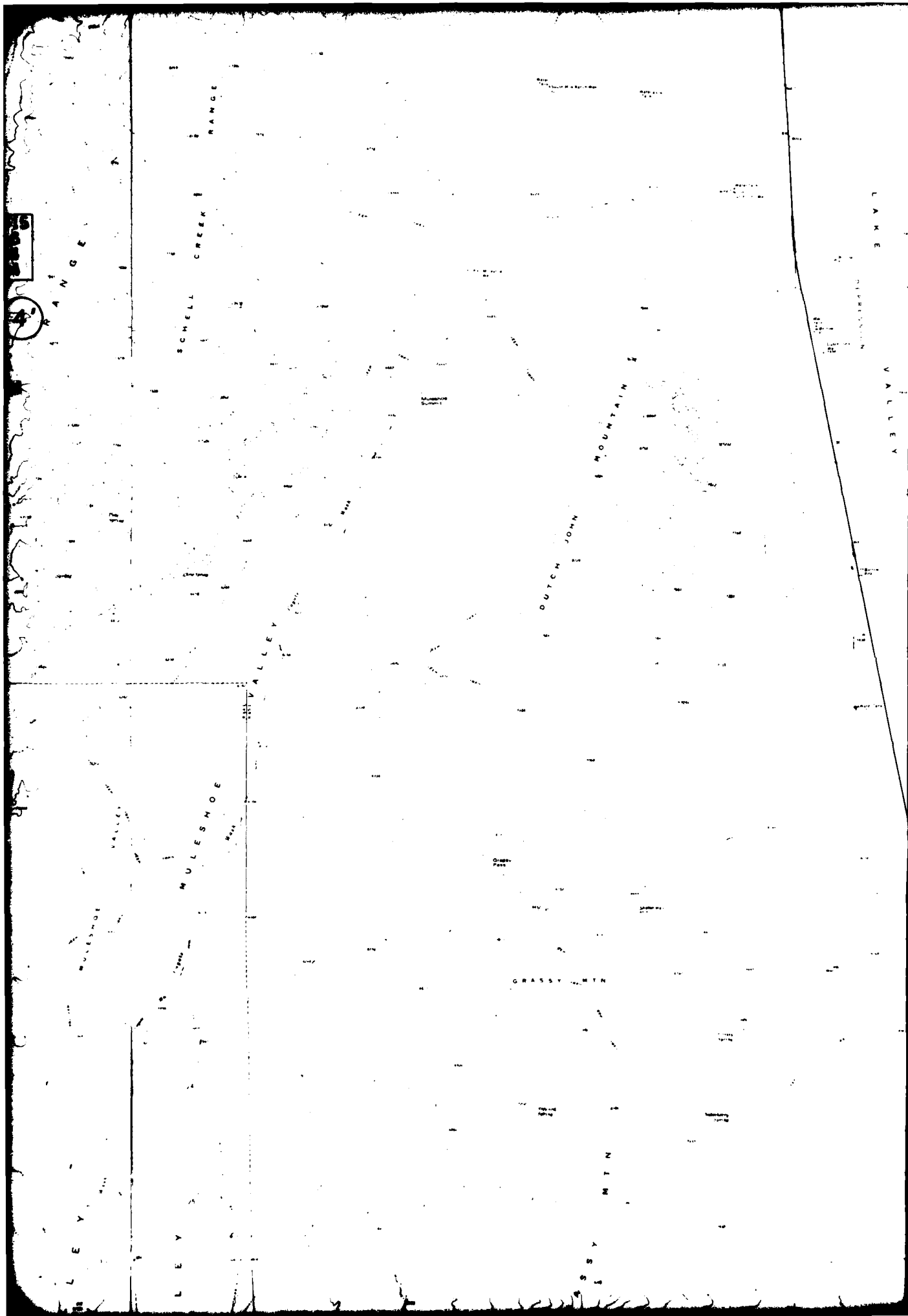
C-7
CS-7

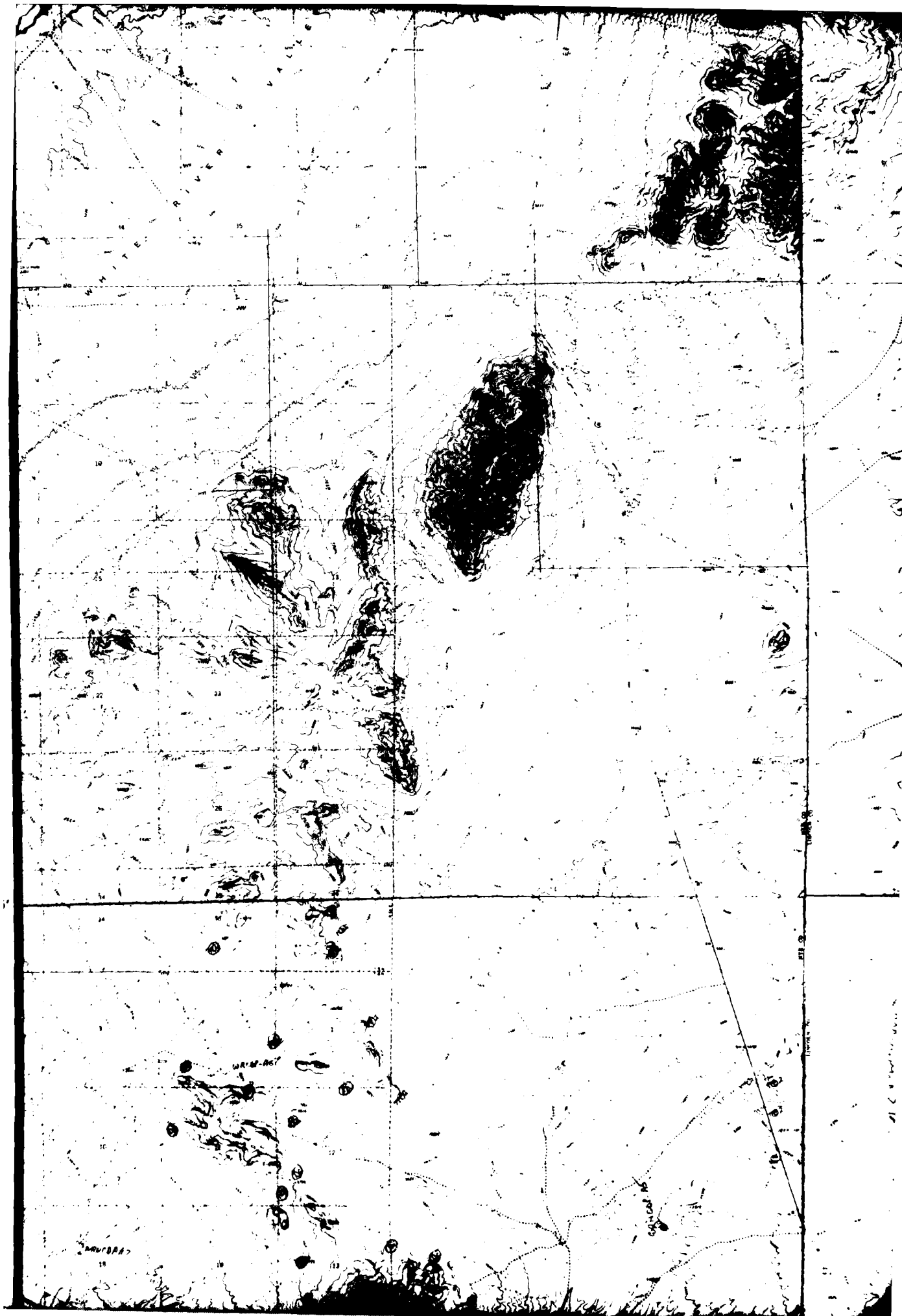
GS-13

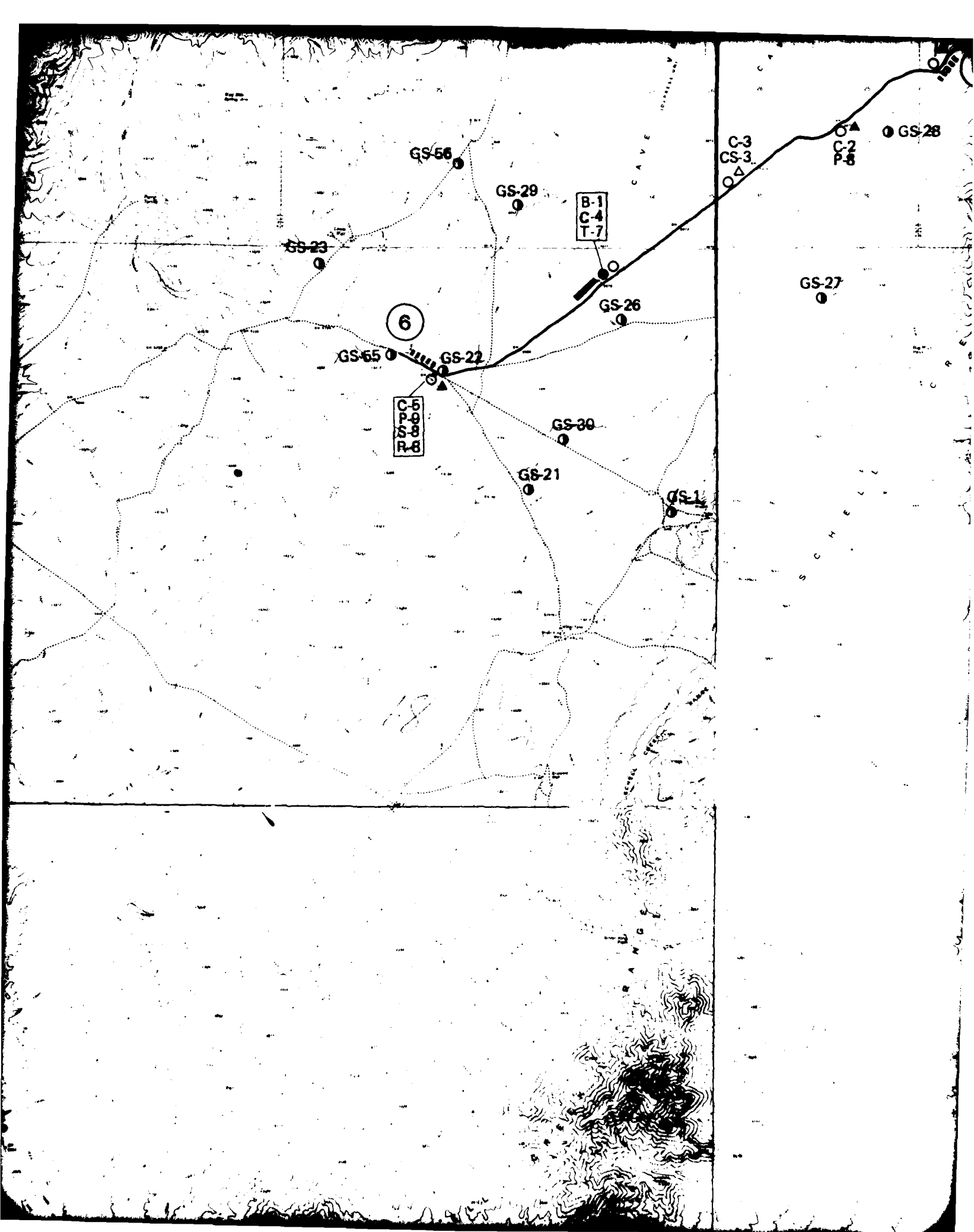
GS-20

GS-39

C-1
P-7
S-1
R-1







CS-1
P-7
S-1
R-1

6'

GS-28

M U L E S H O E

M U L E S H O E

NORTH

SCALE 1:50,000

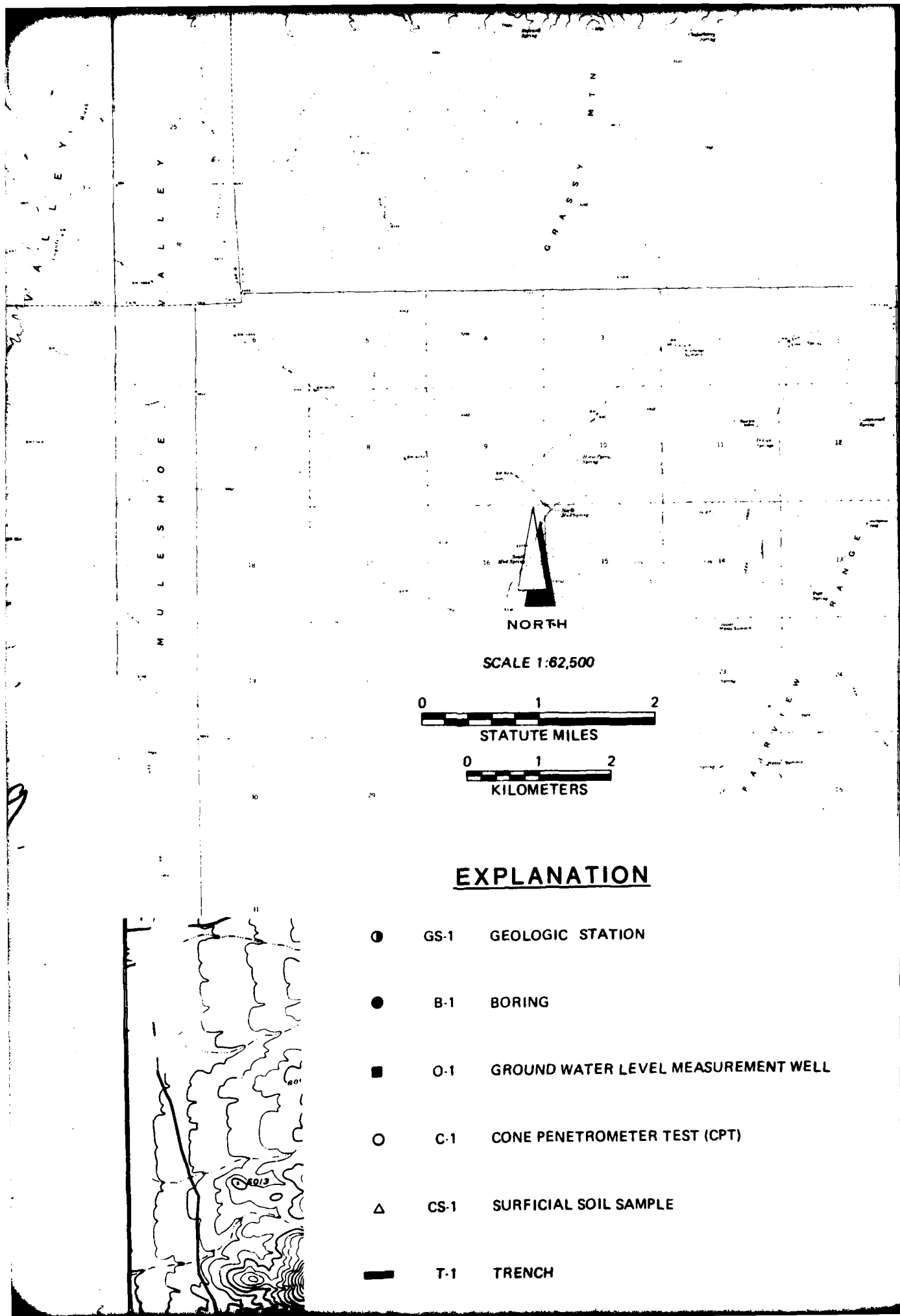
0 1
STATUTE

0 1
KILOMETER

EXPLANATION

- GS-1 GEOLOG
- B-1 BORING
- O-1 GROUND
- C-1 CONE P
- △ CS-1 SURFIC
- T-1 TREND

19



SCALE 1:62,500



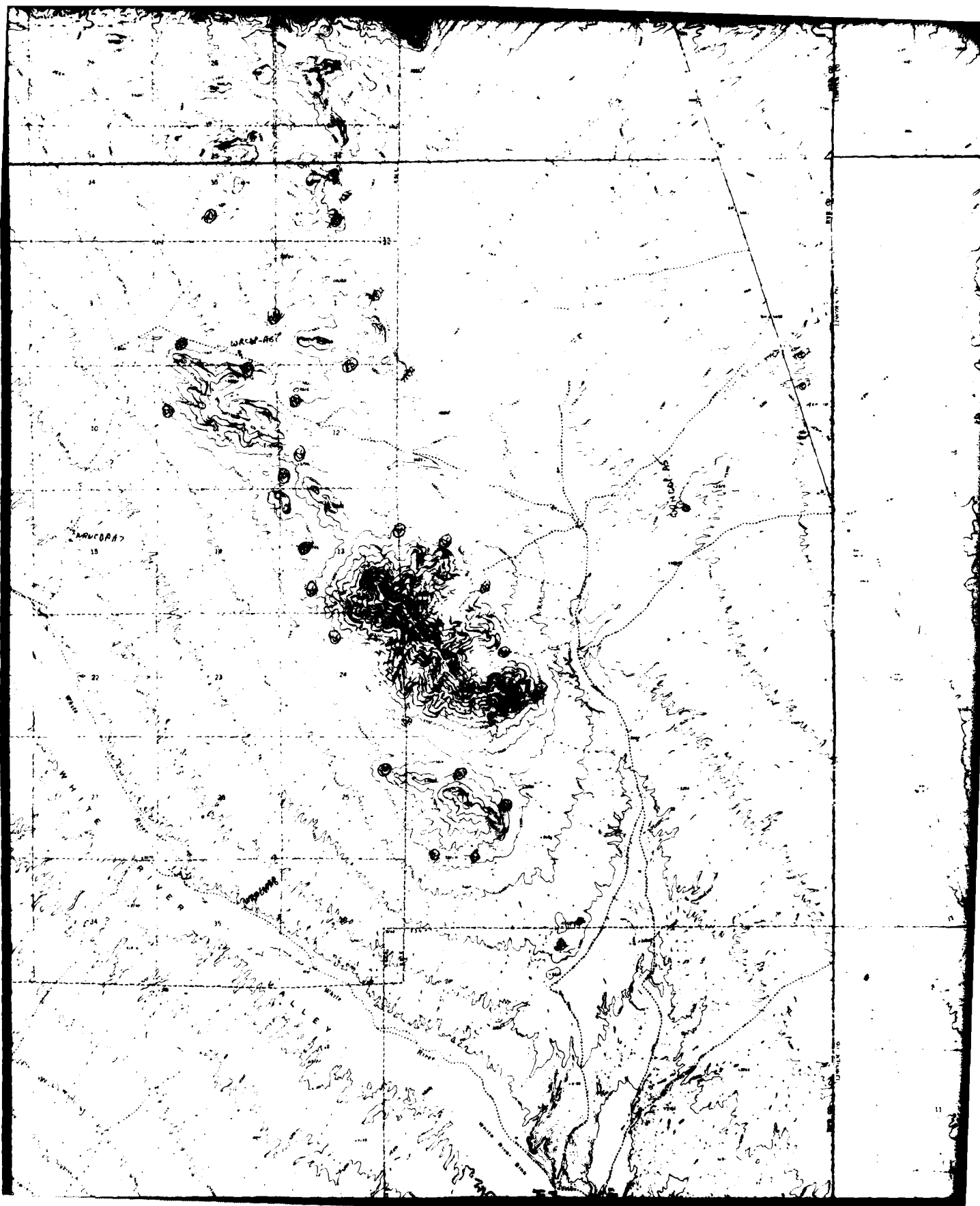
STATUTE MILES

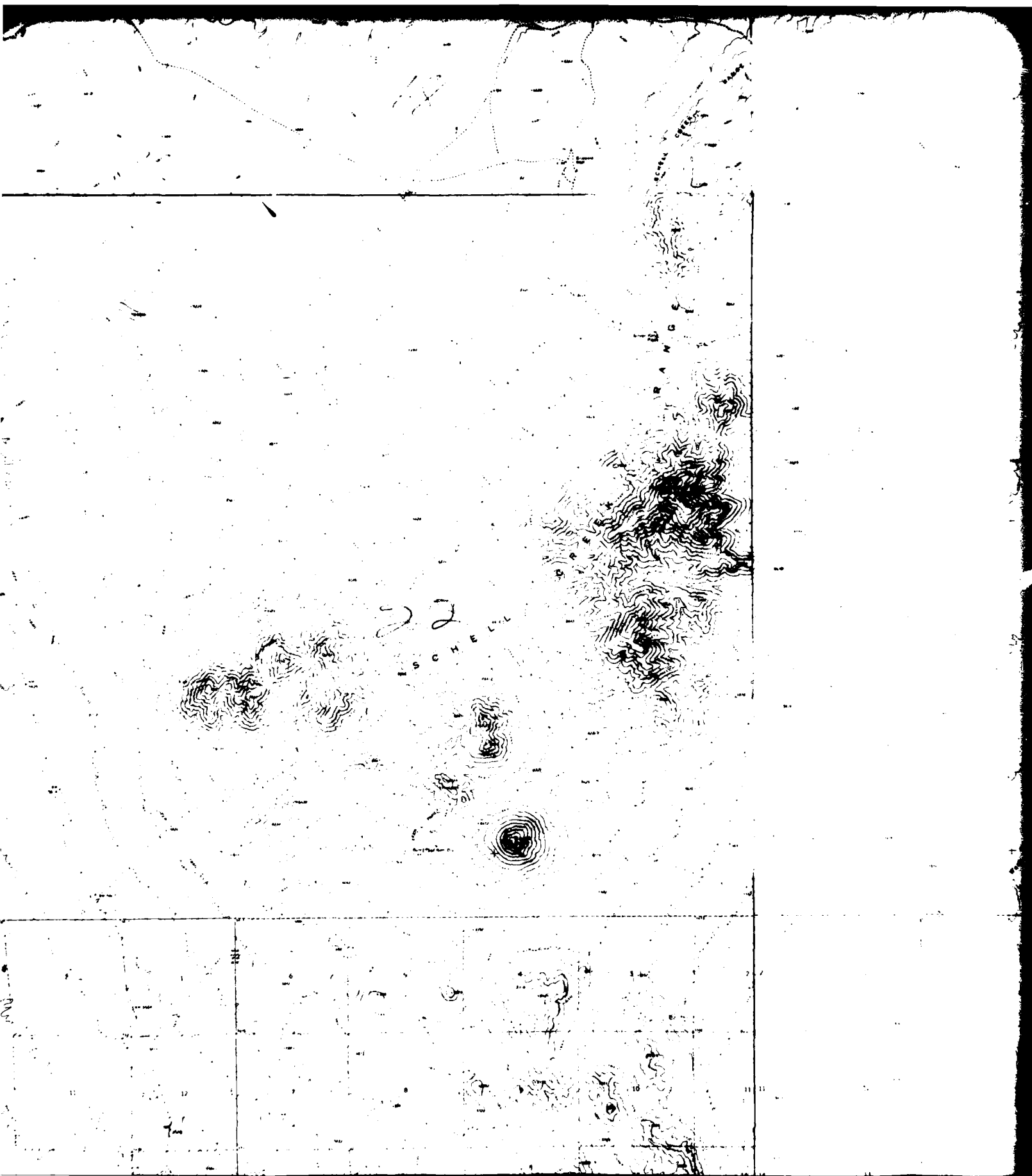


KILOMETERS

EXPLANATION

- GS-1 GEOLOGIC STATION
- B-1 BORING
- O-1 GROUND WATER LEVEL MEASUREMENT WELL
- C-1 CONE PENETROMETER TEST (CPT)
- △ CS-1 SURFICIAL SOIL SAMPLE
- T-1 TRENCH





STATE

0
KILOM

EXPLA

① GS-1 GEOLO

● B-1 BORING

■ O-1 GROUND

○ C-1 CONE P

△ CS-1 SURFIC

— T-1 TRENO

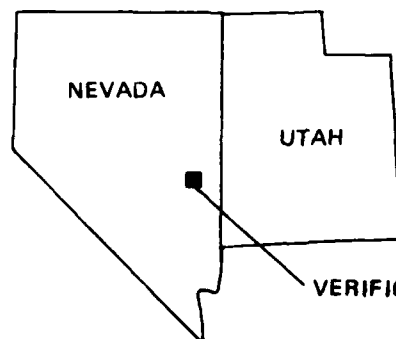
▲ P-1 TEST P

..... S-1 SEISM
R-1 ELECT

① = ①' ACTIV

NOTE: Due to the exaggerated combination of active boring (1st) or the G accurately located map

LOCATION MAP



NEVADA

UTAH

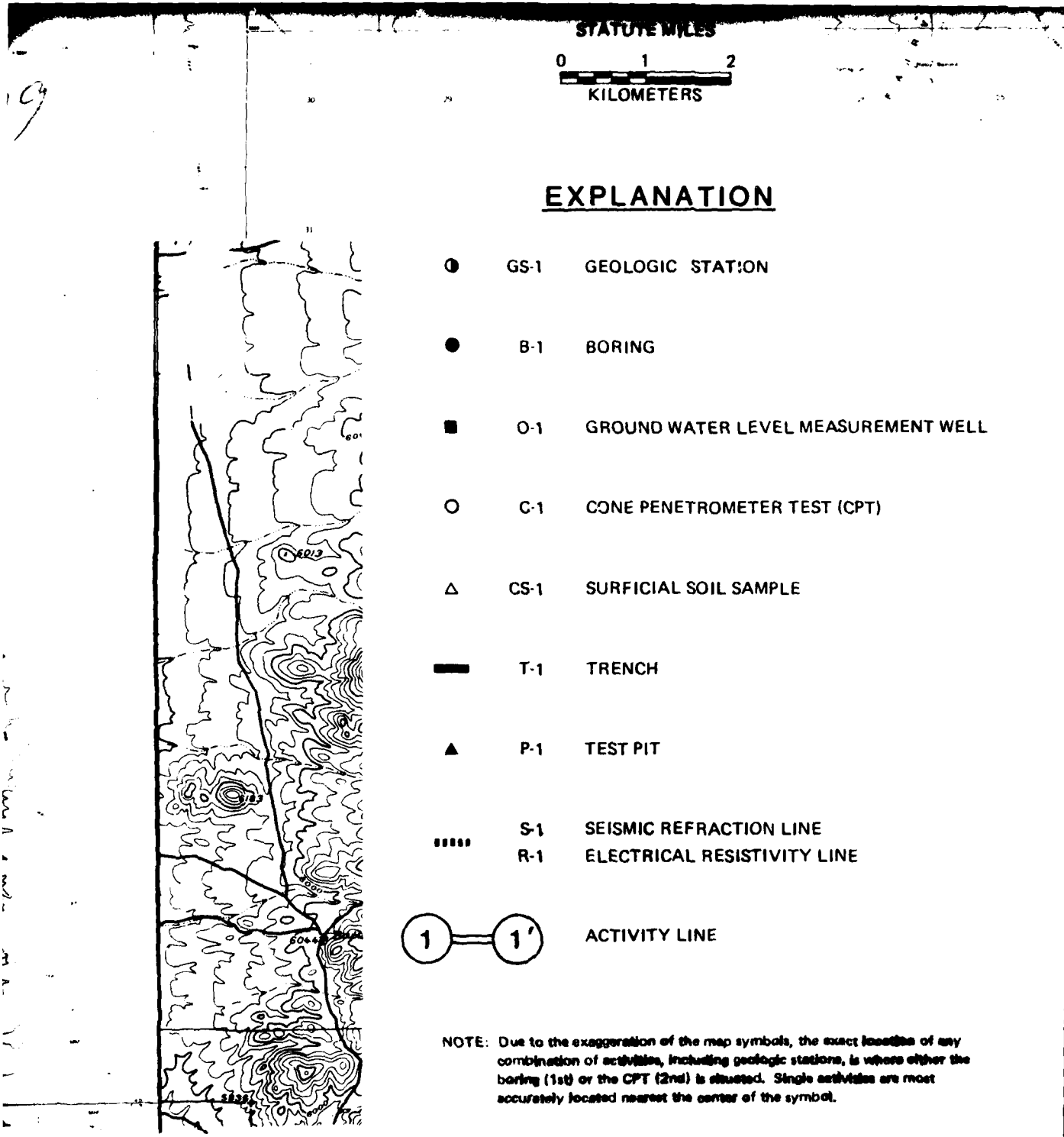
VERIFICATION STUDIES FY80

Ertec

The Earth Technology Corporation

ACTIVIT
CAVE V

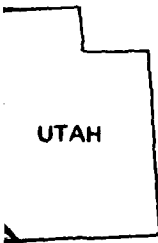
26 OCT 81



EXPLANATION

- ① GS-1 GEOLOGIC STATION
- B-1 BORING
- O-1 GROUND WATER LEVEL MEASUREMENT WELL
- C-1 CONE PENETROMETER TEST (CPT)
- △ CS-1 SURFICIAL SOIL SAMPLE
- T-1 TRENCH
- ▲ P-1 TEST PIT
- S-1 SEISMIC REFRACTION LINE
R-1 ELECTRICAL RESISTIVITY LINE
- ① — ①' ACTIVITY LINE

NOTE: Due to the exaggeration of the map symbols, the exact location of any combination of activities, including geologic stations, is where either the boring (1st) or the CPT (2nd) is situated. Single activities are most accurately located nearest the center of the symbol.



UTAH

VERIFICATION STUDIES FY80



MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE
BMO/AFRC-MX

ACTIVITY LOCATION MAP CAVE VALLEY, NEVADA

26 OCT 81

DRAWING II-1-1

2.0 GEOLOGIC STATION DATA

Explanation: Detailed descriptions of surficial basin-fill deposits and/or rock units were recorded at geologic stations established at selected locations throughout the valley. All data taken on surficial basin-fill units at the geologic stations are listed in Table II-2-1, and an explanation of the column headings in the table is given below. An example of the field data sheet is shown in Figure II-2-1. At stations where rock descriptions were made, only geologic unit designations are listed. A general explanation of all geologic unit symbols used in Verification studies is included at the end of this section.

Column Heading Table II-2-2

Explanation

Station Number	Geologic stations are numbered sequentially. (e.g., NCVG001; N= Nevada-Utah Study Area; CV= Valley abbreviation [Cave]; G= Geology Station).
Geol. Unit	Generalized mapped geologic unit (see explanation below). The grain-size designations (s, g, and f) indicate sand, gravel, and fines, respectively.
MPS (mm)	Average Maximum Particle Size in millimeters.
Grain Size (%B, %C, %G, %S, %F)	Estimated particle size distribution using the Unified Soil Classification System. Percentages of boulders (%B) and cobbles (%C) are based on the entire deposit, whereas percentages of gravel (%G), sand (%S), and fines (%F) are taken only on the fraction composed of particles less than 3 inches (76 mm) in diameter. Note: The symbol Ø (occasional) indicates between 1 and 5 percent; zero indicates 0 to 1 percent.
*	Laboratory analyses of selected soil samples using the Unified Soil Classification System.

USCS	Soil class according to the Unified Soil Classification System.
Munsell Color	Soil color based on standard Munsell Soil Color Charts.
Source Rock Types	Rock types of coarse clasts (gravel) listed in order of abundance.
Physical Properties	Data listed in columns 6 through 15 address specific soil properties. These are listed below in parentheses following the column heading number and are also listed at the bottom of Table II-2-1. Data are coded with each numerical entry referring to a specific soil condition as listed below.

- | | |
|-------------------------------|--|
| 6 (Grain Shape) | 1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well rounded |
| 7 (Moisture Content) | 1) Dry, 2) Slightly Moist, 3) Moist, 4) Very Moist, 5) Wet |
| 8 (Plasticity of Fines) | 1) None, 2) Low, 3) Medium, 4) High |
| 9 (Consistency) | Coarse grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense
Fine grained: 1) Soft, 2) Firm, 3) Stiff, 4) Hard |
| 10 (Structure) | 1) Non-stratified, 2) Stratified, tabular, 3) Stratified, other (lensed, cross bedded, discontinuous beds) |
| 11 (Cementation-Induration) | 1) None, 2) Weak, 3) Moderate, 4) Strong |
| 12 (Depth to Cemented Layer) | Depth to layer (in centimeters) exhibiting cementation-induration described in Column heading 11 (above) |
| 13 (Weathering of clasts) | 1) Fresh, 2) Slight, 3) Moderate, 4) Very |
| 14 (Soil Profile Development) | 1) None (A-C profile), 2) Poor (incipient B-horizon), 3) Well (prominant B-horizon) |
| 15 (Caliche Development) | 1) None, 2) Stage I, 3) Stage II, 4) Stage III, 5) Stage IV |

Terrain Terrain information at the data location is broken into the following categories:

Drainage Depth - Average depth of drainages (in feet)
(ft)

Drainage Width - Average width of drainage (in feet)
(ft)

Slope (%) - Average width of drainages (in feet)

Sample - Number of samples taken

GENERALIZED GEOLOGIC UNITS

Explanation

Surficial Basin-fill Units

- A1 Younger Fluvial Deposits - Major recent stream channel and floodplain deposits.
- A2 Older Fluvial Deposits - Older incised stream channel and floodplain deposits in elevated terraces bordering major recent drainages.
- A3 Eolian deposits - Windblown deposits of sand occurring as either thin sheets (A3s) or dunes (A3d).
- A4 Playa and Lacustrine Deposits - Deposits occurring in modern, active playas (A4) or in either inactive playas or older lake beds and abandoned shorelines associated with extinct lakes (A4o).
- A5 Alluvial Fan Deposits - Bodies of stream deposits whose surfaces approximate segments of cones or a coalescing set of cones which radiate downslope from mountain fronts. Old-age (A5o), intermediate-age (A5i), and young-age (A5y) fans are differentiated on the basis of surface morphology, drainage pattern, soil development, induration/cementation, and where applicable, its surface expression relative to pluvial lake shoreline features.
- A6 Plio-Pleistocene Sediments - Alluvial deposits locally composed of highly cemented gravels and sands near mountain fronts and/or pluvial deposits (sands and silts) from Pliocene lake beds. These deposits are distinguished from relatively younger units on the basis of surface morphology, soil development, degree of cementation and induration, and terrain conditions.

Grain sizes of these deposits are indicated by a single letter (f, s, or g) following the geologic unit symbol. These letters indicate the predominant grain size and range of soil types according to the Unified Soil Classification System.

f - fine-grained clays and silts (ML, CL, MH, CH)

s - sands (SP, SW, SM, SC)

g - gravels (GP, GW, GM, GC)

ROCK UNITS

I Igneous (undifferentiated) - Rocks formed by solidification of a molten or partially molten mass.

I1 Intrusive Rocks - Plutonic rocks formed by solidification of molten material beneath the surface (e.g., granite, granodiorite, diorite, gabbro).

I2 Extrusive Rocks (intermediate and acidic) - Volcanic rocks of intermediate and acidic composition formed by solidification of molten material at or near the surface, (e.g., rhyolite, latite, dacite, andesite).

I3 Extrusive Rocks (basic) - Volcanic rocks of basic composition, generally formed by solidification of molten materials at or near the surface (e.g., basalt).

I4 Extrusive Rocks (pyroclastic) - Rocks formed by accumulation of volcanic ejecta (e.g., ash, tuff, welded tuff, agglomerate).

S Sedimentary (undifferentiated) - Rocks formed from the consolidation of accumulated clastic materials, organic material, and/or chemically precipitated minerals.

S1 Arenaceous and/or Siliceous Rocks - Composed of sandsize particles (e.g., sandstone, orthoquartzite) or of cryptocrystalline silica (e.g., opal, chert).

S2 Carbonate Rocks - Composed predominantly of calcium carbonate formed by organic or inorganic precipitation (e.g., limestone, dolomite, chalk).

S3 Argillaceous Rocks - Composed of clay and silt-sized particles (e.g., siltstone, shale, claystone).

- S4 Evaporite Rocks - Precipitated from solution as a result of evaporation (e.g., halite, gypsum, anhydrite, sylvite).
- S5 Coarse Clastic Rocks - Composed of gravel sized or larger clasts (e.g., conglomerate, breccia).
- M Metamorphic Rocks (undifferentiated) - Rocks formed through recrystallization in the solid state of preexisting rocks by heat and pressure.
 - M1 Coarse grained rocks formed by higher-grade regional metamorphism, either banded or granular (e.g., gneiss, granulite, amphibolite).
 - M2 Fine grained schistose rocks formed by lower grade regional metamorphism (e.g., schist, slate, phyllite).
 - M3 Nonfoliated rocks formed chiefly by contact metamorphism (e.g., hornfels, marble).
 - M4 Metaquartzite - rocks formed by metamorphism of highly siliceous rocks.

E-TR-27-CV-II

SOIL DESCRIPTION														TERRAIN											
STATION NUMBER	GEOLOGIC UNIT	MPS MM	GRAIN SIZE					USCS	MUNSGILL COLOR	SOURCE ROCK TYPES	PHYSICAL PROPERTIES											DRAINAGE (F1)		SLOPE (X)	SAMPLE
			XB	XC	XD	XS	XF				6	7	8	9	10	11	12	13	14	15	DEPTH	WIDTH			
CVG50	ASIS	40	0	0	15	80	5	SP-SM	10.0YR4/4 S2		3	3	1	2	1	2	26	2	2	3	0.0		6	1	
CVG50	ASIS	70	0	0	5	70	25	SM	10.0YR6/4 S2		2	3	1	3	1	2	24	2	1	3	32.8	164.0	5	1	
CVG50	AGIS	200	0	0	40	40	20	GM-SM	7.5YR5/4 S1 S2		2	3	1	3	1	2		2	2	2	9.8	39.4	4	0	
CVG50	ASOG	700	0	40	60	40	0	GM			3	5	1	3	1	1		2	2	2	9.1	49.2	12	0	
CVG50	AGIS	320	0	40	40	45	15	SM	7.5YR4/4 S1		3	3	1	3	1	2		2	2	2	4.9	26.2	5	1	
CVG50	ASIS	30	0	0	2	88	10	SP-SM	7.5YR4/4 I2 S2		3	3	1	3	1	4	22	2	3	5	16.4	49.2	1	0	
CVG50	A40F		0	0	0	5	95	ML	10.0YR5/3		3	2	7	1	1			1	1	1	0.0			1	
CVG50	ASYS	62	0	0	1	60	39	SM	10.0YR4/3 S2		2	1	1	2	1	1		2	1	2	1.0	13.1	2	1	
CVG50	ASYS	52	0	0	10	88	2	SP	7.5YR5/6 S2		2	3	1	4	1	1		2	1	2	9.8	19.7	2	0	
CVG50	ASYS	180	0	0	35	60	5	SP-SM	7.5YR5/4 S1 S2		3	3	1	3	1	1		2	1	1	0.7	9.8	4	0	
CVG50	A1 F		0	0	0	5	95	ML-CL	10.0YR4/3		2	3	3	8	1	1		1	1	1	0.0			1	
CVG50	ASIS	23	0	0	10	65	25	SM	10.0YR6/6 S2		2	3	1	3	1	3	40	2	1	3	1.0	9.8	3	0	
CVG50	A40S	60	0	0	40	45	15	SM	10.0YR4/6 S2		3	3	1	4	1	2		2	2	2	0.0			1	
CVG50	A40S	30	0	0	45	47	8	SM	10.0YR4/6 S2		3	3	1	3	1	2		2	2	2	0.0			1	
CVG50	A40S	15	0	0	1	84	15	SM	10.0YR3/3 S1 S2		3	3	1	4	1	1		2	1	2	0.7			1	
CVG50	A40S		0	0	0	95	5	SP-SM	10.0YR6/4		2	3	1	3	1	1		1	1	1	0.7			1	
CVG50	ASIS	110	0	0	5	70	25	SC	7.5YR5/4		2	3	2	3	3	3	29	2	2	4	3.3	16.4	3	0	
CVG50	A40F		0	0	0	5	95	CL	10.0YR6/4		2	3	3	8	1	1		1	1	1	0.7			1	
CVG50	ASIS	121	0	0	35	55	10	SM	10.0YR5/4		2	3	1	3	1	3	29	2	2	3	6.6	32.8	3	0	
CVG50	A40G	100	0	0	60	25	15	GM	10.0YR4/4 S2		3	3	2	2	1	1		2	1	2	0.0			1	
CVG50	A40S	45	0	0	0	85	15	SM	10.0YR4/4		2	1	2	3	1	1		2	1	1	0.0			1	
CVG50	ASYS	35	0	0	3	92	5	SP-SM	10.0YR4/3 I2		3	3	1	3	1	1		3	1	1	1.0	3.3	2	1	
CVG50	ASOG	95	0	0	30	50	20	SM	10.0YR4/3 I2		2	3	2	2	1	3	26	2	2	4	16.4	49.2	4	0	
CVG50	A40S	35	0	0	0	85	15	SM	10.0YR4/3		2	1	2	3	1	2	35	1	2	2	0.0			1	
CVG50	ASIS	70	0	0	30	65	5	SP-SM	10.0YR4/4 S2 I2		3	3	1	2	1	1		2	2	2	4.9	9.8	4	1	
CVG50	A40F		0	0	0	30	70	ML	10.0YR6/3		1	2	7	1	2	29		1	2	2	0.0			1	
CVG50	ASYS	40	0	0	25	65	10	SP-SM	10.0YR4/3 S2		3	3	2	2	1	1		2	1	2	0.0		8	0	
CVG50	ASYS	90	0	0	50	45	5	GF-GM			3	3	2	2	1	1		2	1	2	1.6	3.3	4	0	
CVG50	A40S	50	0	0	40	56	4	SP	10.0YR4/3 S2 I2 S1		2	1	1	2	1	1		2	1	2	4.9	9.8		0	
CVG50	A40G	50	0	0	45	25	30	SM			2	1	3	3	1	1		2	1	2	0.3	9.8		0	
CVG50	A1 F		0	0	0	0	100	* ML	10.0YR3/4		2	1	3	8	1	1		2	1	1	1.6	6.6	1	1	
CVG50	ASOG	100	0	5	50	40	10	GF-GM	S1 M2 S2 I2		2	1	1	2	1	1		2	2	2	1.6	3.3	8	0	
CVG50	ASIG	100	0	10	65	25	10	GF-GM	S1 I2		2	1	2	2	1	1		2	2	2	60.7	689.0	10	0	
CVG50	A1	70	0	0	30	30	40	ML	10.0YR4/4 S2 I2		2	1	3	8	1	1		1	3	1	1.6	3.3	2	1	
CVG50	A1 S	100	0	0	40	45	15	SM	10.0YR4/3 S2 I4 S1		2	1	3	2	1	1		2	2	2	3.3	6.6	1	0	
CVG50	AS1	130	0	0	35	35	30	* GM-SM	10.0YR3/3 S2		2	1	1	2	1	2	30	1	2	4	1.0	3.3	8	1	
CVG50	ASYS	30	0	0	0	40	60	* ML	10.0YR4/4		1	3	8	1	1			1	2	1	0.7	3.3	2	1	
CVG50	S2																							1	
CVG50	ASYS	30	0	0	0	40	60	ML	10.0YR5/3		1	3	8	1	1			1	2	1			2	0	
CVG50	A40S	1	0	0	5	60	35	* SM	10.0YR5/4		3	1	1	3	1	2	40	1	1	1			1	1	
CVG50	S2																							1	
CVG50	A40G	75	0	0	60	35	5	GF-GM	S2 I2		2	1	1	2	1	1		2	1	2	0.0			0	
CVG50	ASIS	70	0	0	40	45	15	SM	10.0YR4/4 I4 S2		3	1	3	2	1	4	25	3	1	4	1.6	3.3	4	0	
CVG50	S2																							1	
CVG50	ASYS	85	0	0	20	65	15	SM	S2		2	1	2	3	1	1		2	1	3	1.6	6.6	3	0	
CVG50	S2																							1	
CVG50	ASYS	80	0	0	40	40	20	SM	10.0YR4/3 S2 S1		2	1	2	3	3	2	25	2	1	3	1.6	6.6	2	0	
CVG50	ASYS	15	0	0	1	59	40	* SM	10.0YR4/3		2	1	2	3	1	1		2	1	2			1	1	
CVG50	A40S	10	0	0	23	54	23	* SM	10.0YR5/3 S2		2	1	2	3	1	1		2	1	1			1	1	
CVG50	ASYS	100	0	0	55	25	20	GM	S2 S1		3	1	2	2	3	2	70	2	2	2	1.6	3.3	1	0	
CVG50	A40S		0	0	0	80	20	SM	10.0YR5/3		3	1	1	2	1	1		1	1	1	0.7	3.3		0	
CVG50	A40S	2	0	0	2	53	45	* SM	10.0YR6/3		3	1	1	2	3	1		1	1	1	0.3		0	1	
CVG50	S2																							1	
CVG50	A40F		0	0	0	35	65	CL	10.0YR6/3		1	4	8	1	1			1	1	1	0.7	3.3	0	0	
CVG50	S2																							1	
CVG50	ASIS	110	0	10	15	50	35	* SM	10.0YR3/4 S2 S1		2	1	3	3	1	2	32	1	1	3	3.3	9.8	4	1	

EXPLANATION: PHYSICAL PROPERTIES

6: GRAIN SHAPE	9: CONSISTENCY	12: DEPTH TO CEMENTED LAYER (CM)	13: CALIBRE DEVELOPMENT
7: MOISTURE CONTENT	10: STRUCTURE	13: WEATHERING OF CLASTS	14: SOIL PROFILE DEVELOPMENT
8: PLASTICITY OF FINES	11: CEMENTATION-INDURATION	14: SOIL PROFILE DEVELOPMENT	NOTE: 0-OCCASIONAL (1-SK)
			NOTE: *LAB DATA

Note: Refer to Figure II-2-1 for an explanation of the numerical values listed under the physical properties column.



MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE
BMO/AFRC-MX

GEOLOGIC STATION DATA
CAVE VALLEY, NEVADA

28 OCT 81

TABLE II-2-1

E-TR-27-CV-II

Station No.

CSR VALLEY CLAS STATION #						
1	2	3	4	5	6	7

 Described Geol. Unit

UNIT GS			
8	9	10	11

Date _____ Complete Geol. Unit _____

Observers _____ Field Photo Nos. _____

Air Photo No. _____ Sample (No=0, Yes=1)

12

SOIL PROPERTIES

1. Grain-Size Distribution: MPS (mm) - grain size of coarsest fraction; boulders and cobbles - percent of total; gravel, sand, and fines - percent less than 3 inches.

MPS				B				C				G				S				F				
13	14	15	16	17	18	19																		

2. USCS Symbol

28	29	30	31

3. Descriptive Name (one adjective only) _____

4. Munsell Color (not applicable to gravel)

32	33		34	35	36	37		38
		.					/	

5. Lithology of gravel, cobbles, boulders: give rock type (I1, I2, M, etc.) in order of abundance.

38	40	41	42	43	44	45	48	47	48

6. Grain Shape (coarse grained soil only): 1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well-rounded.

49

7. Moisture Content: 1) Dry, 2) Slightly moist, 3) Moist, 4) Very moist, 5) wet

50

8. Plasticity of Fines: 1) None, 2) Low, 3) Medium, 4) High

51

9. Consistency:

Coarse-grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense

Fine-grained: 6) Soft, 7) Firm, 8) Stiff, 9) Hard

52

10. Structure: 1) Non-stratified-(homogeneous), 2) Stratified-tabular, 3) Stratified-other; if 3) describe _____

53

11. Cementation-Induration: 1) None, 2) Weak, 3) Moderate, 4) Strong

54	

12. Depth to Cemented Layer (cm)

55	56	57

13. Weathering of boulders, cobbles, and gravel:

1) Fresh, 2) Slight, 3) Moderate, 4) Very

50

14. Degree of Soil Profile Development: 1) None (A-C profile), 2) Poor (incipient E-horizon), 3) Well (prominent E-horizon)
- Describe _____

50

15. Degree of Caliche Development: 1) None, 2) Stage I, 3) Stage II, 4) Stage III, 5) Stage IV
- Describe _____

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FIELD DATA SHEET
PAGE 1 OF 2

26 OCT 81

FIGURE II-2-1

3.0 GROUND-WATER DATA

Explanation: Existing ground-water data in Cave Valley were collected from all available sources. These data were updated where possible from measurements taken during Ertec field operations, and all data are shown in Table II-3-1. Locations of water wells drilled by Ertec Western, Inc. are shown in Drawing II-1-1. Data from published water wells and wells drilled by Ertec Western, Inc. are shown in Drawing 3-4. Well numbers listed in the left hand column of Table II-3-1 refer to well locations shown on Drawing 3-4. Actual well numbers giving location, according to the Bureau of Land Management Land Survey System (Figure II-3-1), are shown in the second column.

Water levels generally refer to the static ground-water table in the unconfined basin-fill aquifer. Perched conditions or levels in artesian aquifers are noted where known.

E-TR-27-CV-II

WELL NO.	WELL LOCATION NUMBER * (Twp-Rge-Sec)	ELEVATION OF GROUND SURFACE FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE FEET (METERS)	DATE MEASURED	ELEVATION FEET (METERS) ABOVE M.S.L.	
W1	N11/63E-25b	7040 (2146)	5015 (1529)	—	8-67	—	3
W2	N10/63E-25ab	6620 (2018)	20 (6)	20 (6)	3-80	6600 (2012)	5 (1)
W3	N9/63E-1aa	6560 (1999)	—	2 (0.6)	1962	6558 (1999)	1
W4	N9/64E-6bd	6490 (1978)	—	Flowing 2-3gpm	3-80	6490 (1978)	5
W5	N9/63E-22ab	6790 (2069)	6264 (1909)	—	5-65	—	3
W6	N9/64E-27bc	6400 (1951)	315 (96)	238 (73)	3-80	6161 (1878)	5 (2)
W7	N8/64E-4a	6220 (1897)	—	141 (43)	3-80	6079 (1853)	5
W8	N8/64E-15bc	6159 (1877)	375 (114)	280 (85)	3-80	5879 (1792)	5
W9	N8/64E-30cd	6080 (1853)	—	322 (98)	3-80	5758 (1755)	5 (1)
W10	N7/63E-15db	6020 (1835)	385 (117)	233 (71)	3-80	5787 (1764)	5 (1)
W11	N7/64E-19dda	6000 (1829)	265 (81)	215 (66)	3-80	5785 (1763)	5 (2,3)
W12	N7/63E-29bd	6320 (1926)	488 (149)	288 (88)	8-70	6032 (1839)	4
O-1	N9/64E-18aa	6435 (1961)	101 (31)	Dry	11-80	—	5
O-2	N9/64E-20ad	6350 (1935)	200 (61)	Abandoned	7-80	—	5
WRO-1	N7/63E-14ab	6010 (1832)	452 (138)	231 (70)	8-80	5779 (1761)	5

* MOUNT DIABLO BASELINE MERIDIAN

** REFERENCES

1. EAKIN, 1962.
2. NEVADA STATE ENGINEERS WELL LOGS.
3. SHILLING AND GARSIDE, 1968.
4. GARSIDE AND OTHERS, 1977.
5. ERTEC WESTERN FIELD MEASUREMENT, 1980, AND WATER RESOURCES STUDY. PARENTHETICAL REFERENCES INDICATE ORIGINAL WELL LOGS.



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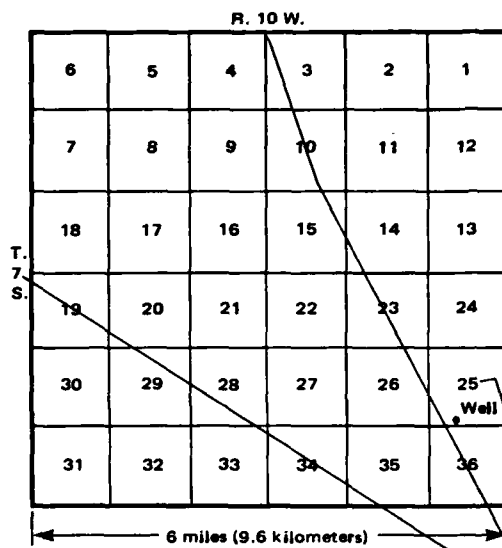
GROUND-WATER DATA
CAVE VALLEY, NEVADA

26 OCT 81

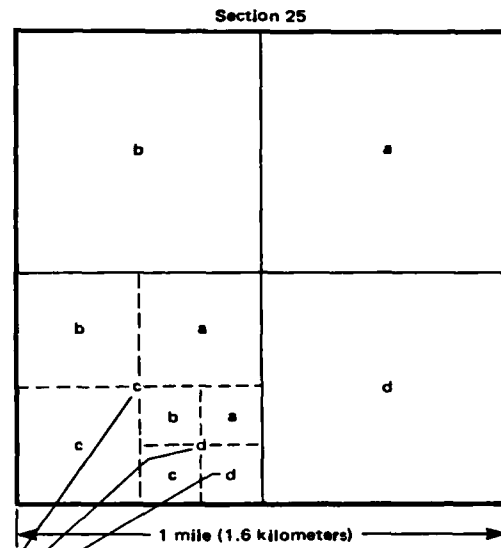
TABLE II-3-1

E-TR-27-CV-II

SECTIONS WITHIN A TOWNSHIP



TRACTS WITHIN A SECTION



7S-10W-25cdc



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BUREAU OF LAND MANAGEMENT
LAND SURVEY NUMBERING SYSTEM

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FIGURE II-3-1

4.0 SEISMIC REFRACTION DATA

Explanation: Each figure shows seismic wave travel times plotted versus surface distance between the energy source (shot) and the detector (geophone) for a single seismic line. Distances are measured along the line from geophone number 1 which is designated as zero distance. Distances to the right (on the paper) of geophone 1 are positive. The direction arrow gives the approximate direction along the geophone array from geophone 1 to geophone 24.

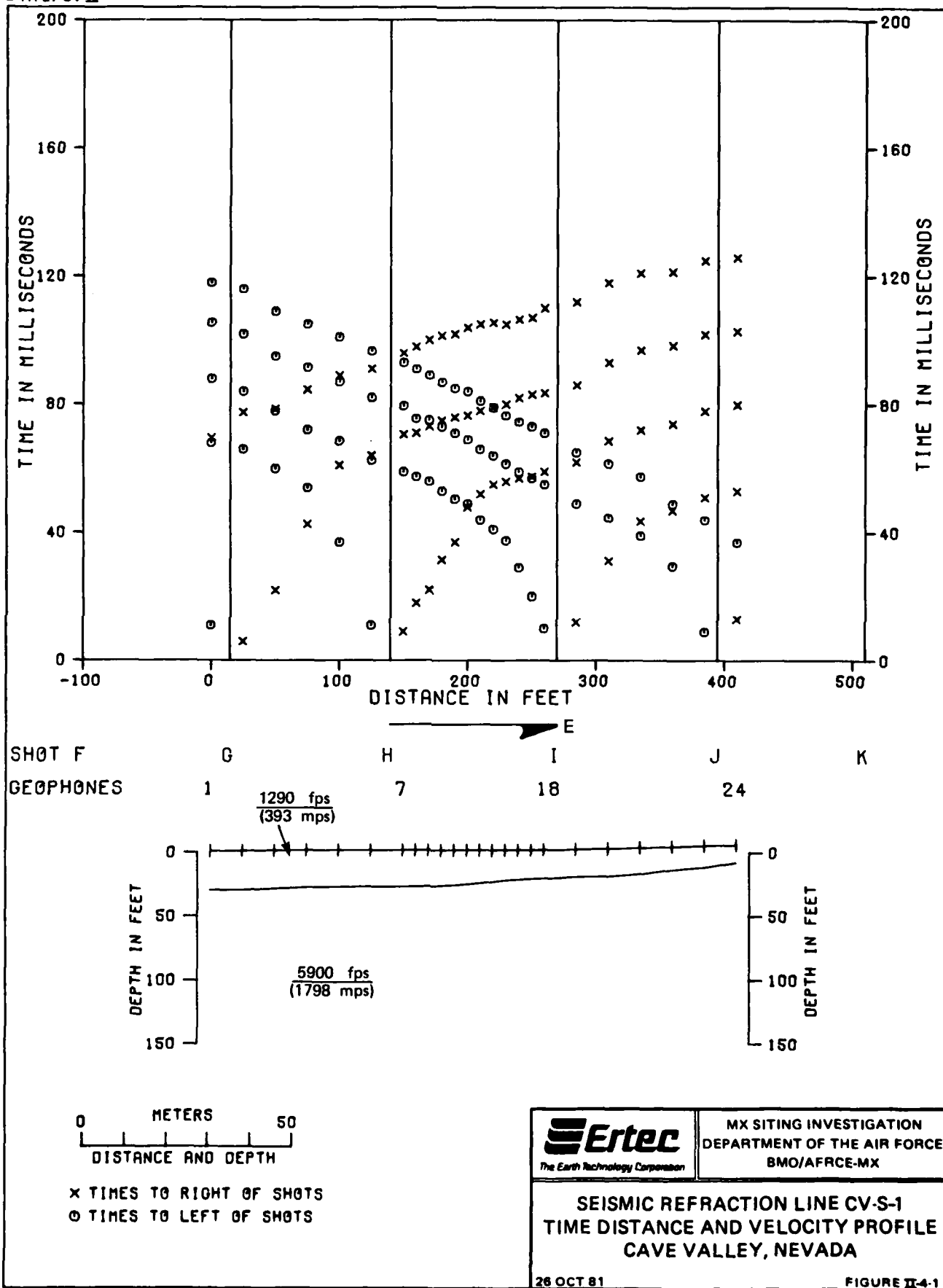
Travel Time Versus Distance Graph (Upper Half of Figure)

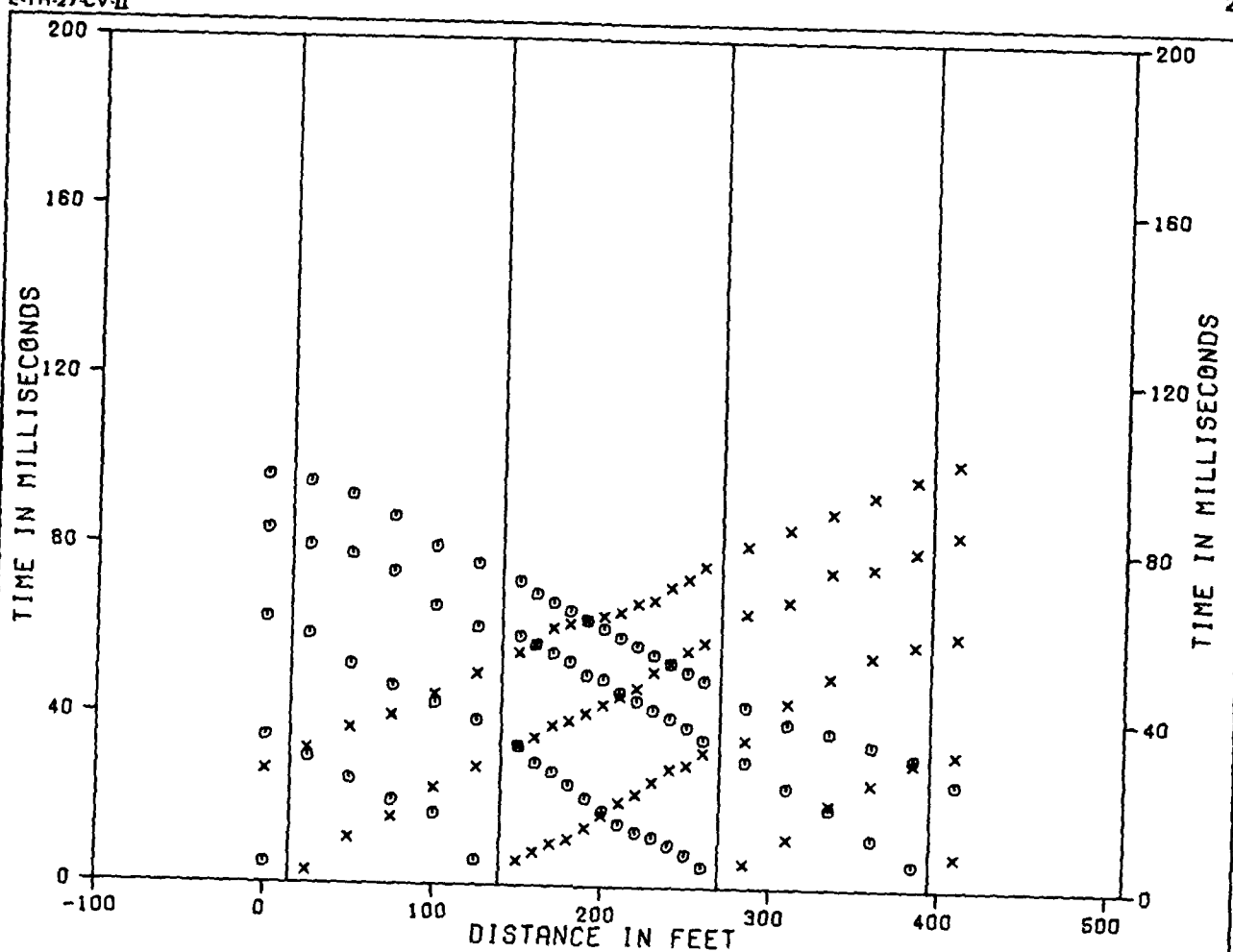
This is a travel time versus distance graph. The abscissa represents distance; the ordinate, time. The six vertical lines represent the locations of shots (designated as F, G, H, I, J, and K). The symbol, X, denotes travel times at geophones that were located to the right of a shot. The symbol, @, denotes travel times that were located to the left of shots.

Velocity Cross Section (Lower Half of Figure)

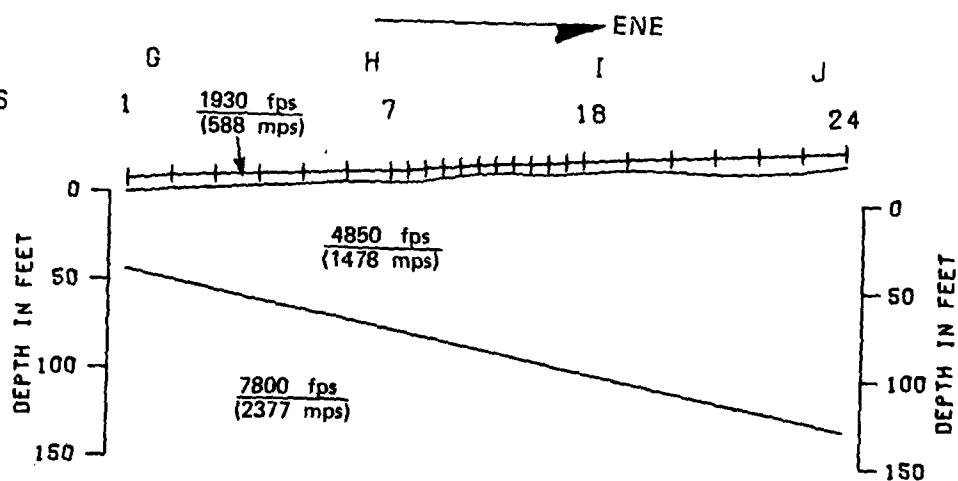
This is an interpreted velocity cross section beneath the seismic line. The top line represents the ground-surface profile. The short vertical lines crossing the top line mark the geophone positions. The depth scale is plotted relative to a point on the line which was arbitrarily chosen as "zero elevation" at the time the line was surveyed. The additional lines across the cross section represent the interpreted boundaries between layers of material with different compressional wave

velocities. These boundaries are commonly called "refractors". The velocity interpreted to be representative of each layer is shown.





SHOT F
GEOPHONES



x TIMES TO RIGHT OF SHOTS
o TIMES TO LEFT OF SHOTS

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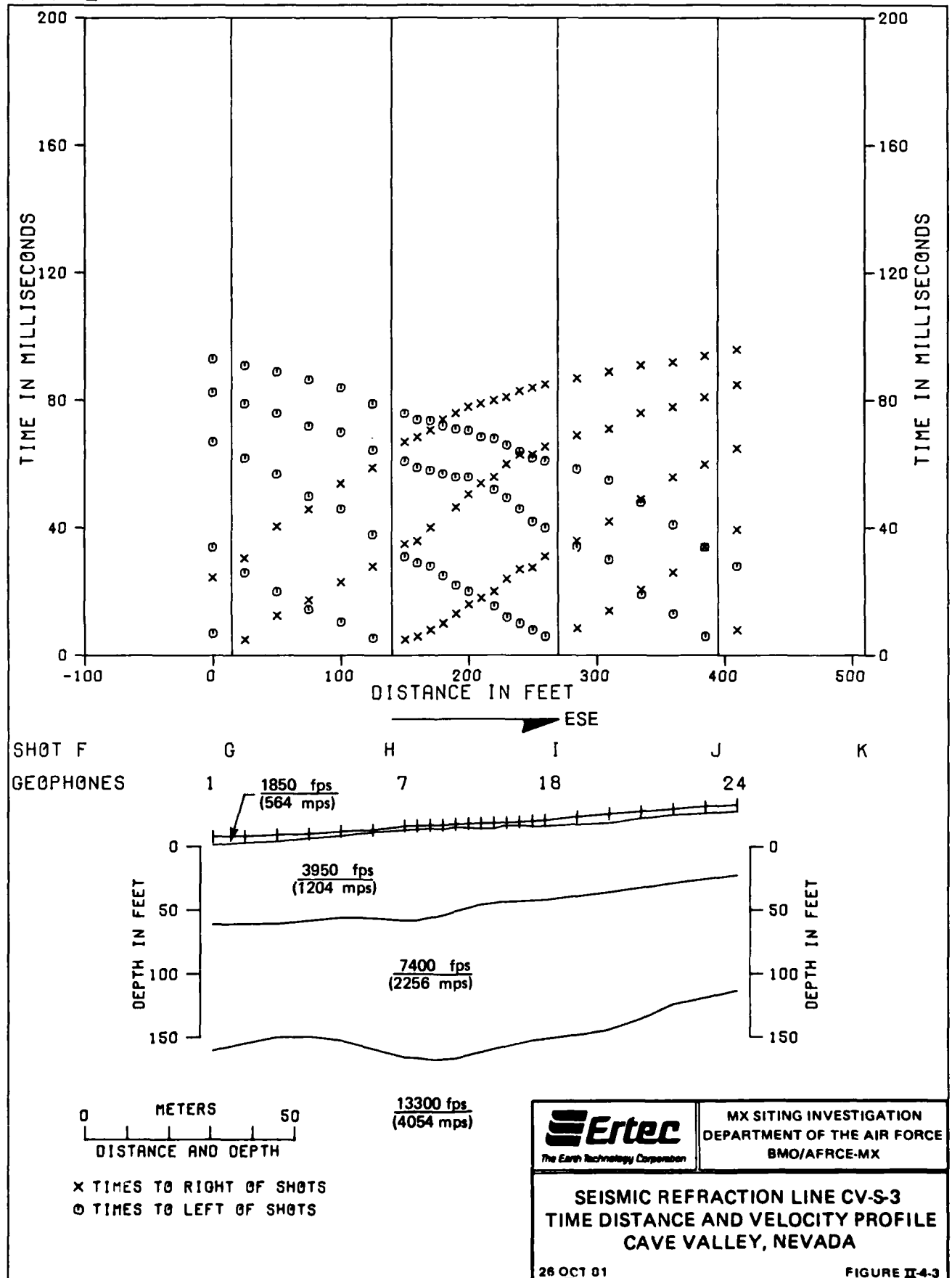
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SEISMIC REFRACTION LINE CV-S-2
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

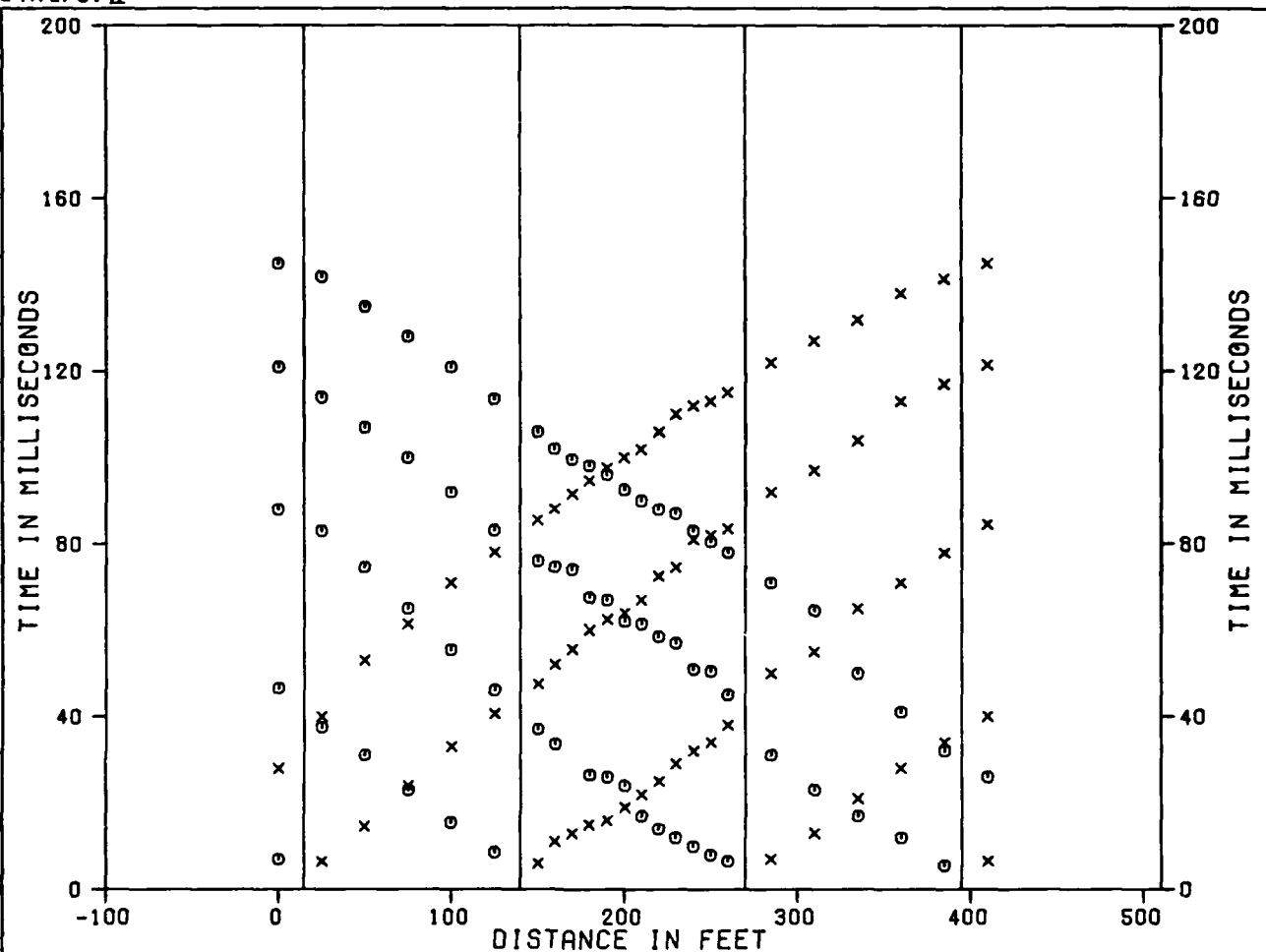
28 OCT 81

FIGURE II-4-2

E-TR-27-CV-II



E-TR-27-CV-II



SHOT F
GEOPHONES

G

H

I

J

K

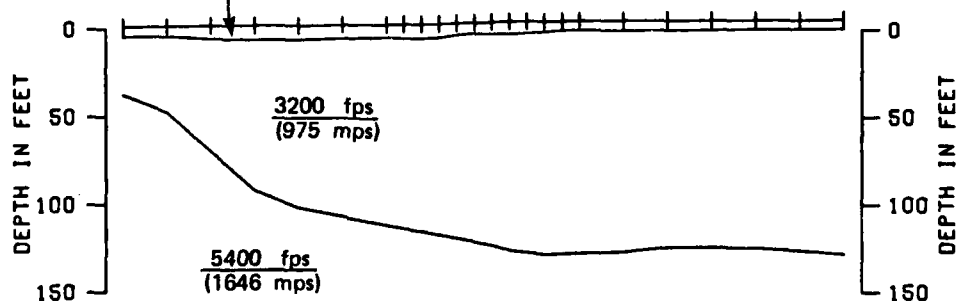
1

7

18

24

1790 fps
(546 mps)



0 METERS 50
DISTANCE AND DEPTH

x TIMES TO RIGHT OF SHOTS
o TIMES TO LEFT OF SHOTS

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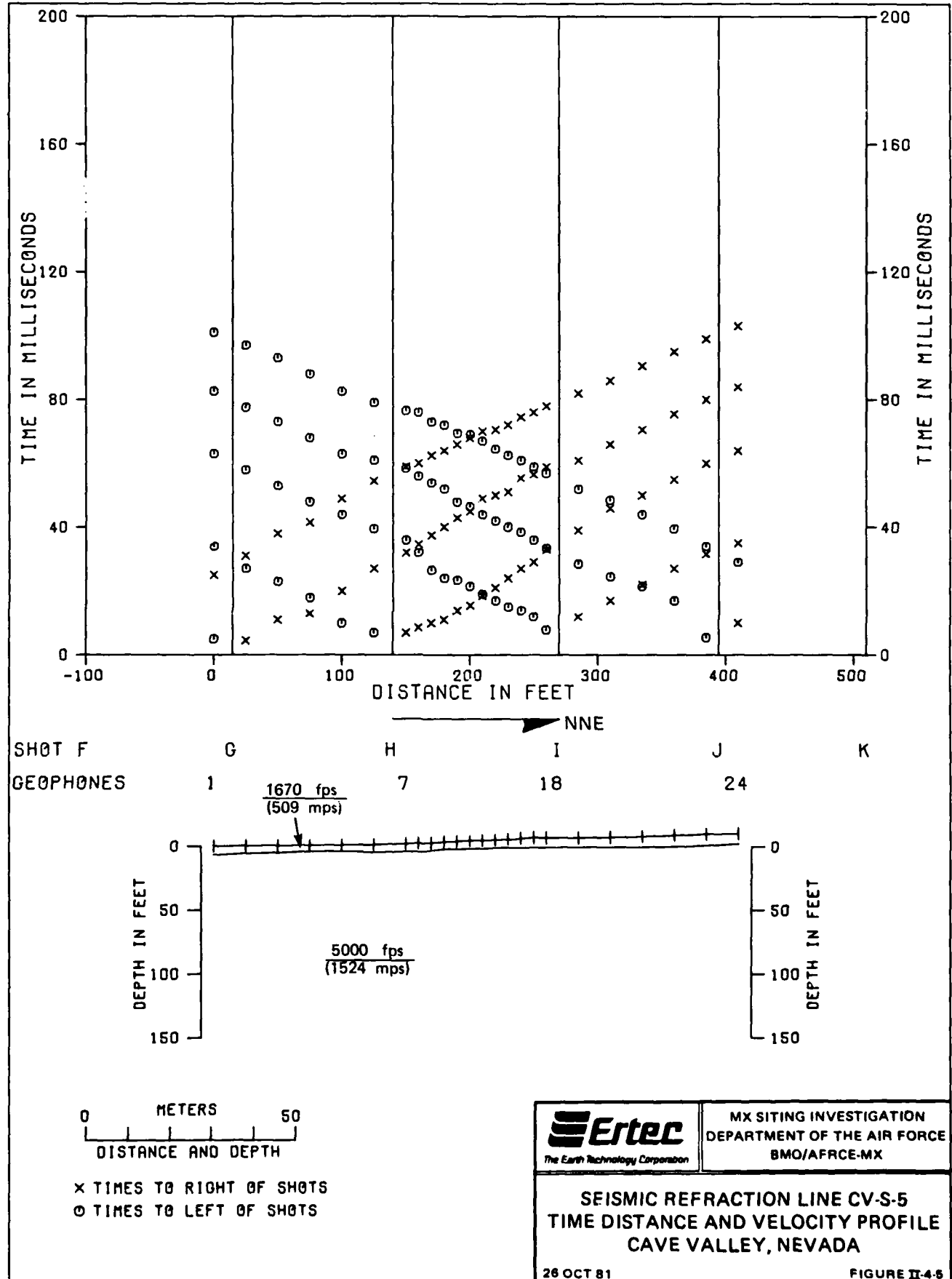
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SEISMIC REFRACTION LINE CV-S-4
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

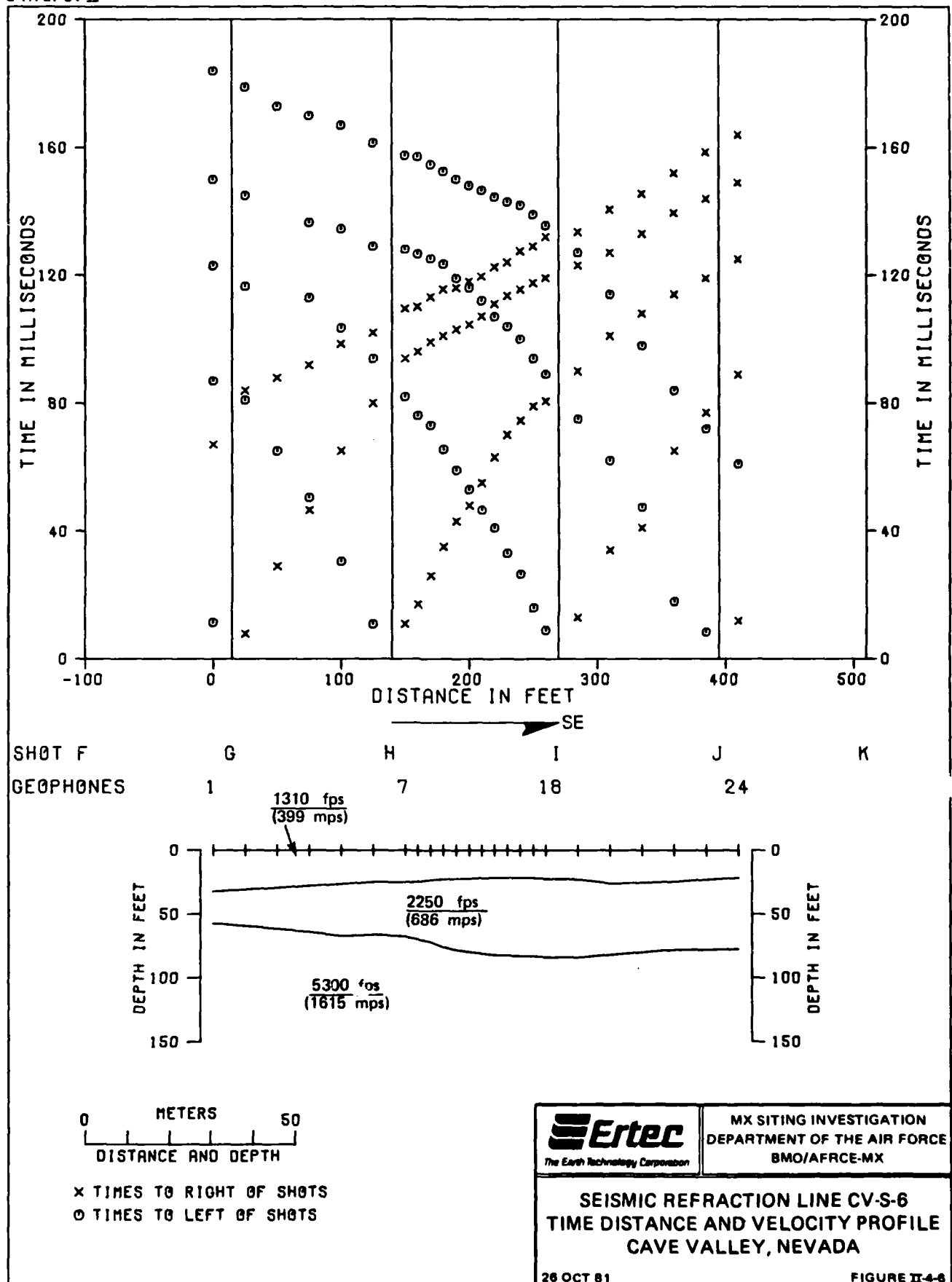
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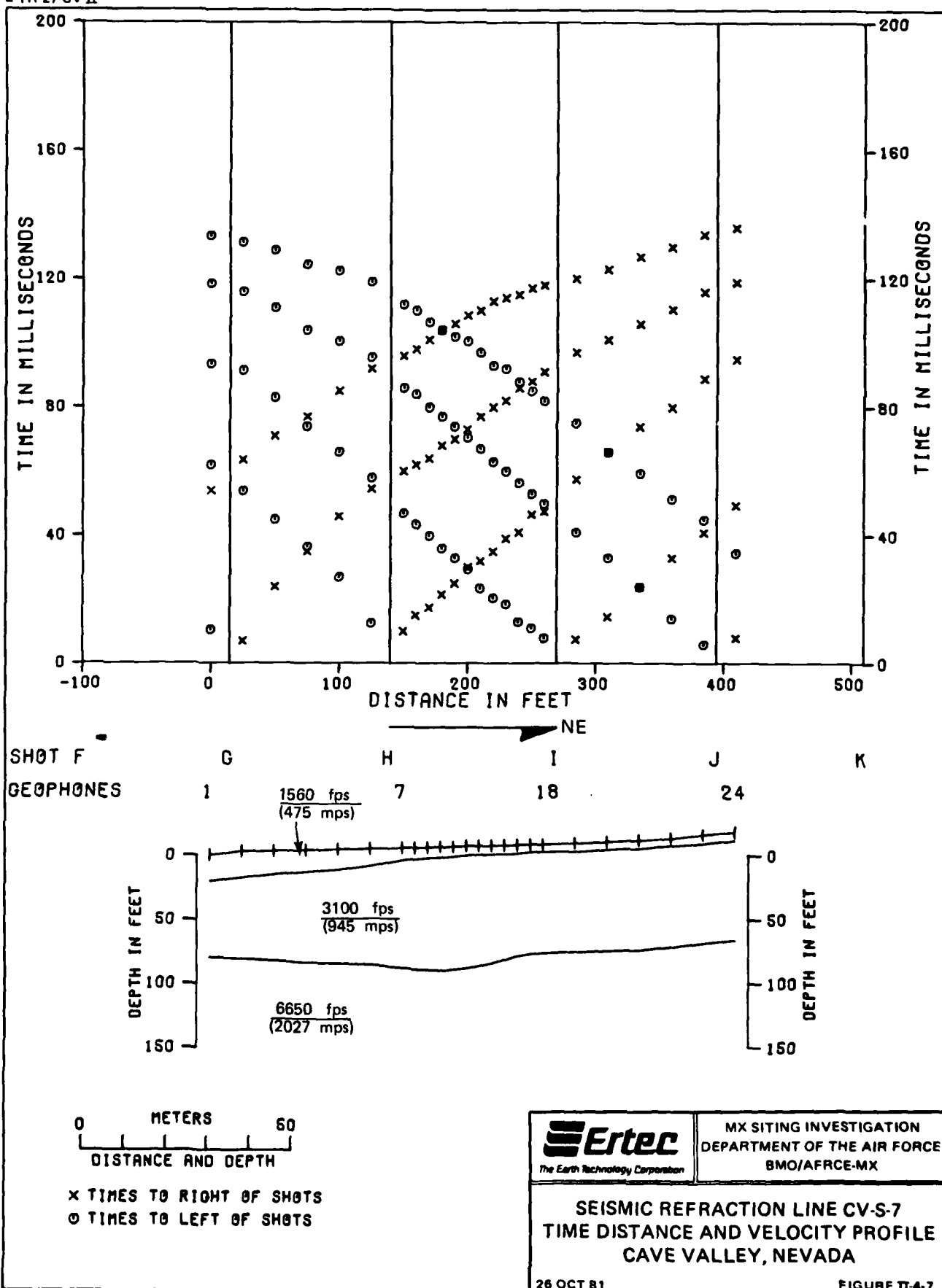
FIGURE II-4-4

E-TR-27-CV-II

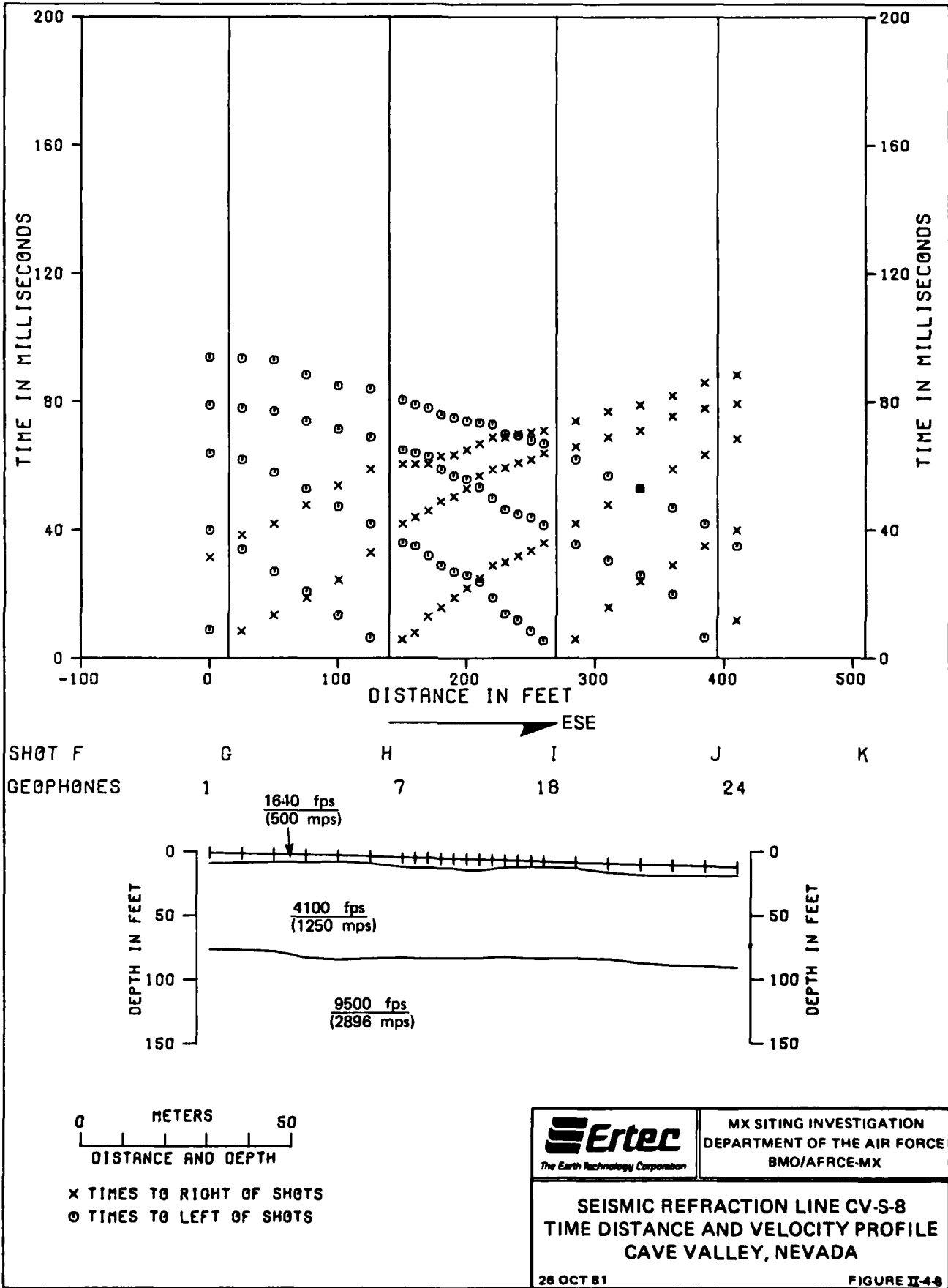


E-TR-27-CV-II

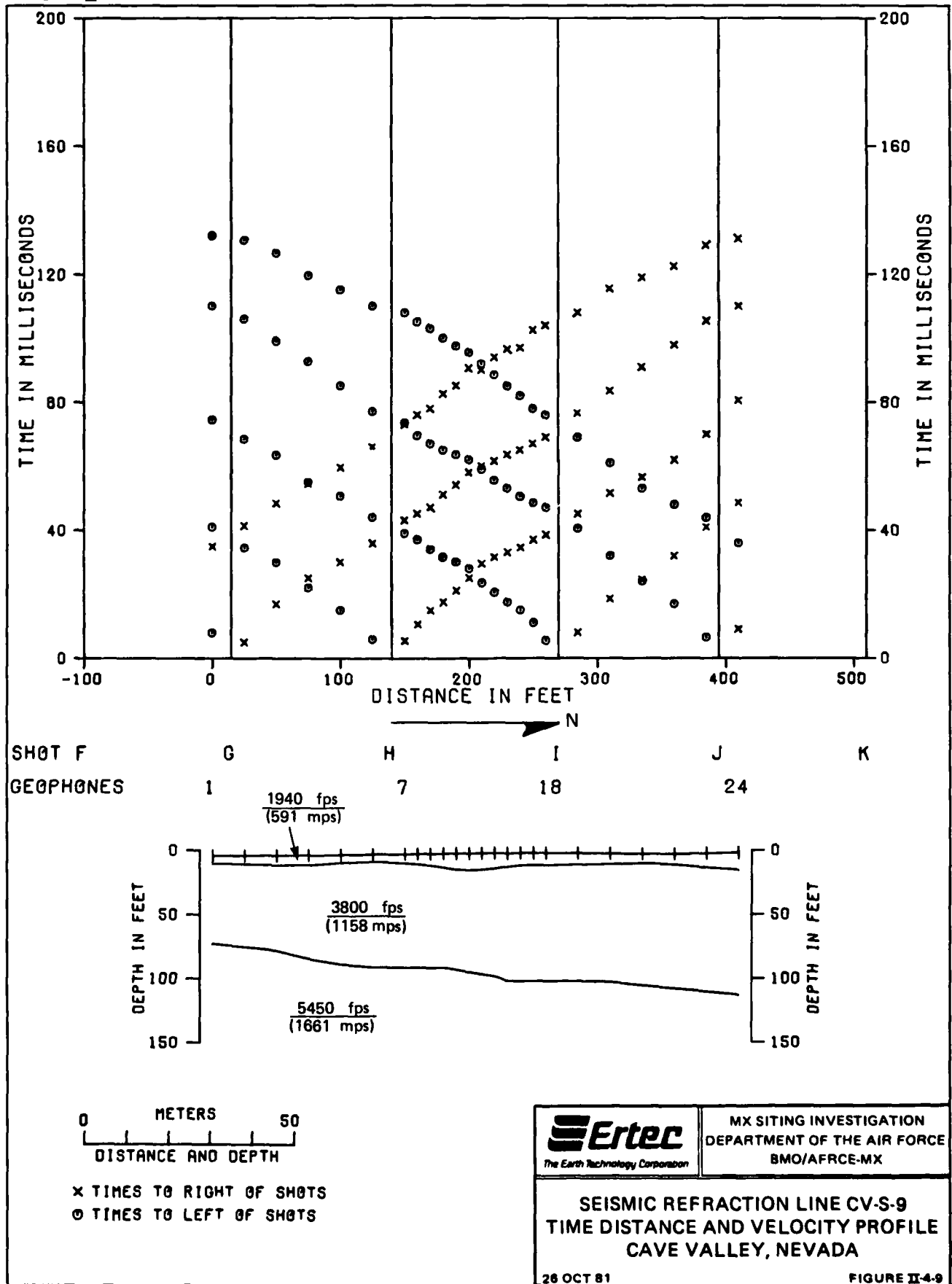




E-TR-27-CV-II



E-TR-27-CV-II

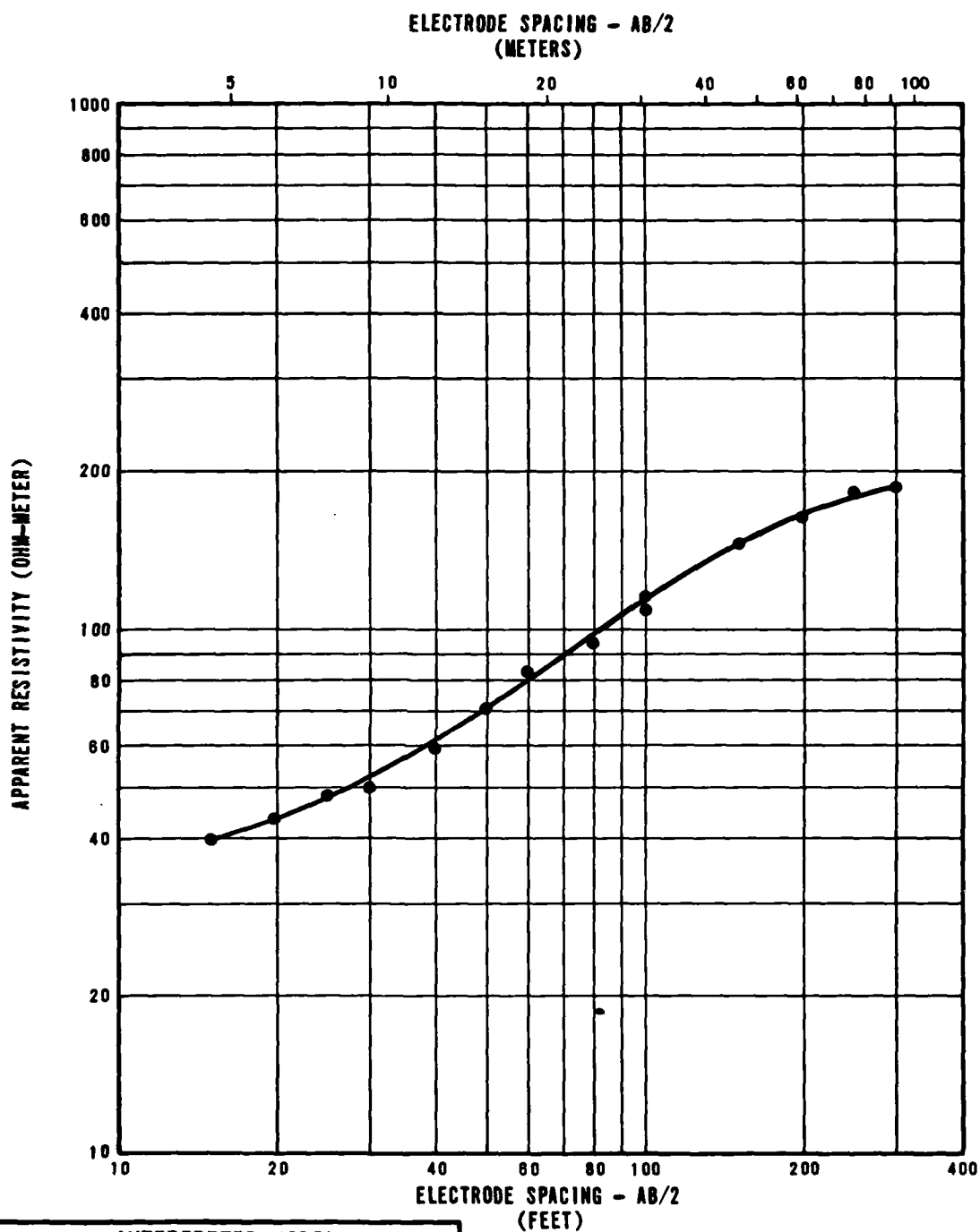


5.0 ELECTRICAL RESISTIVITY DATA

Explanation: Each figure in this section presents the data obtained from a resistivity sounding and a tabulated model of resistivity layers that would produce a curve similar to the observed curve.

The upper portion of the figures is a graph in which measured apparent resistivity values in ohm-meters are plotted versus one-half the distance between the current electrodes.

The interpreted model tabulated at the bottom of the page shows a combination of true resistivity layers and thicknesses obtained by matching theoretical curves to the field curve.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	35
18	5	180

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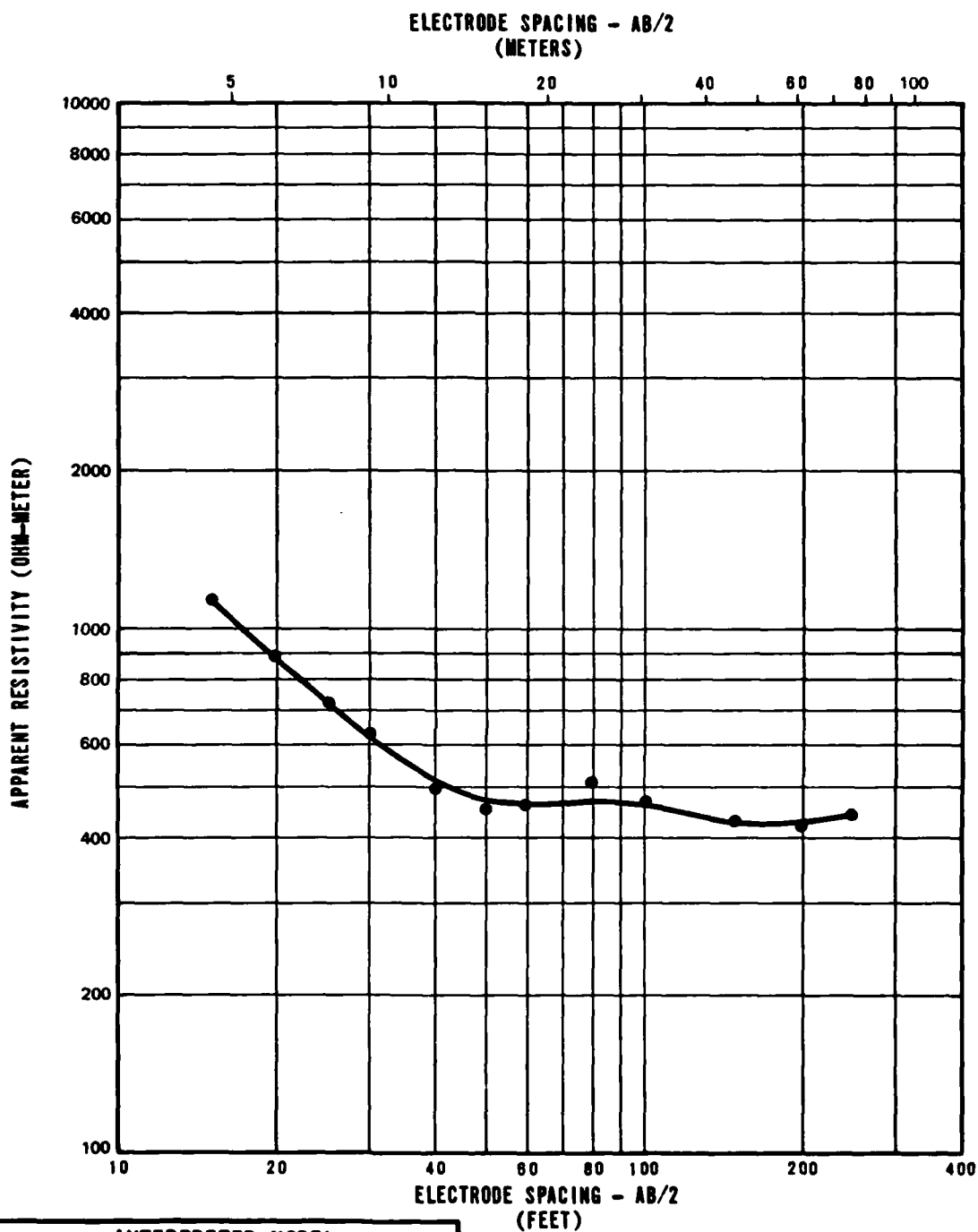
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RESISTIVITY SOUNDING CV-R-1
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-1

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	1490
10	3	260
20	6	490
81	25	220

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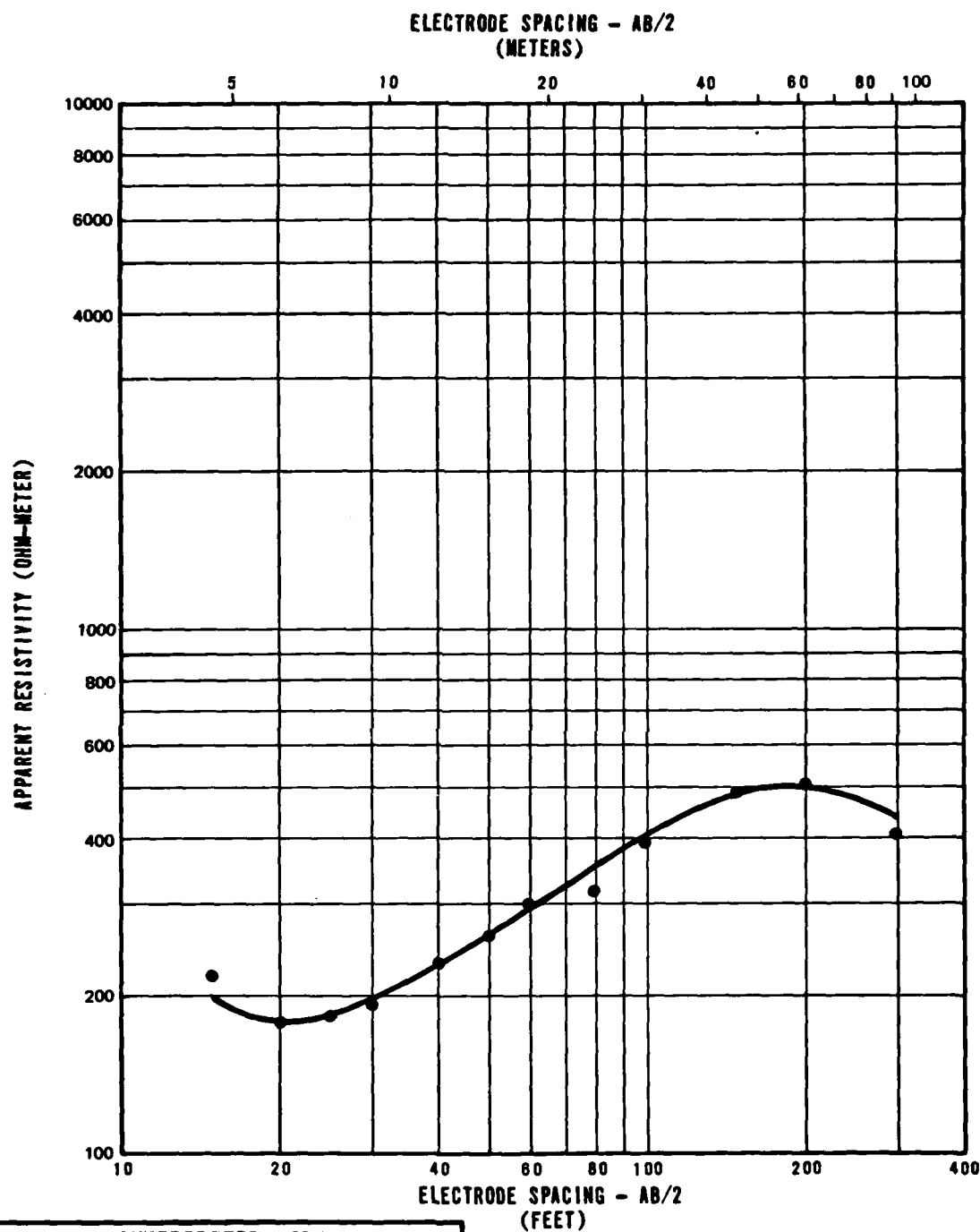
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RESISTIVITY SOUNDING CV-R-2
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

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FIGURE II-5-2

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	280
5	2	140
24	7	1010
100	30	220

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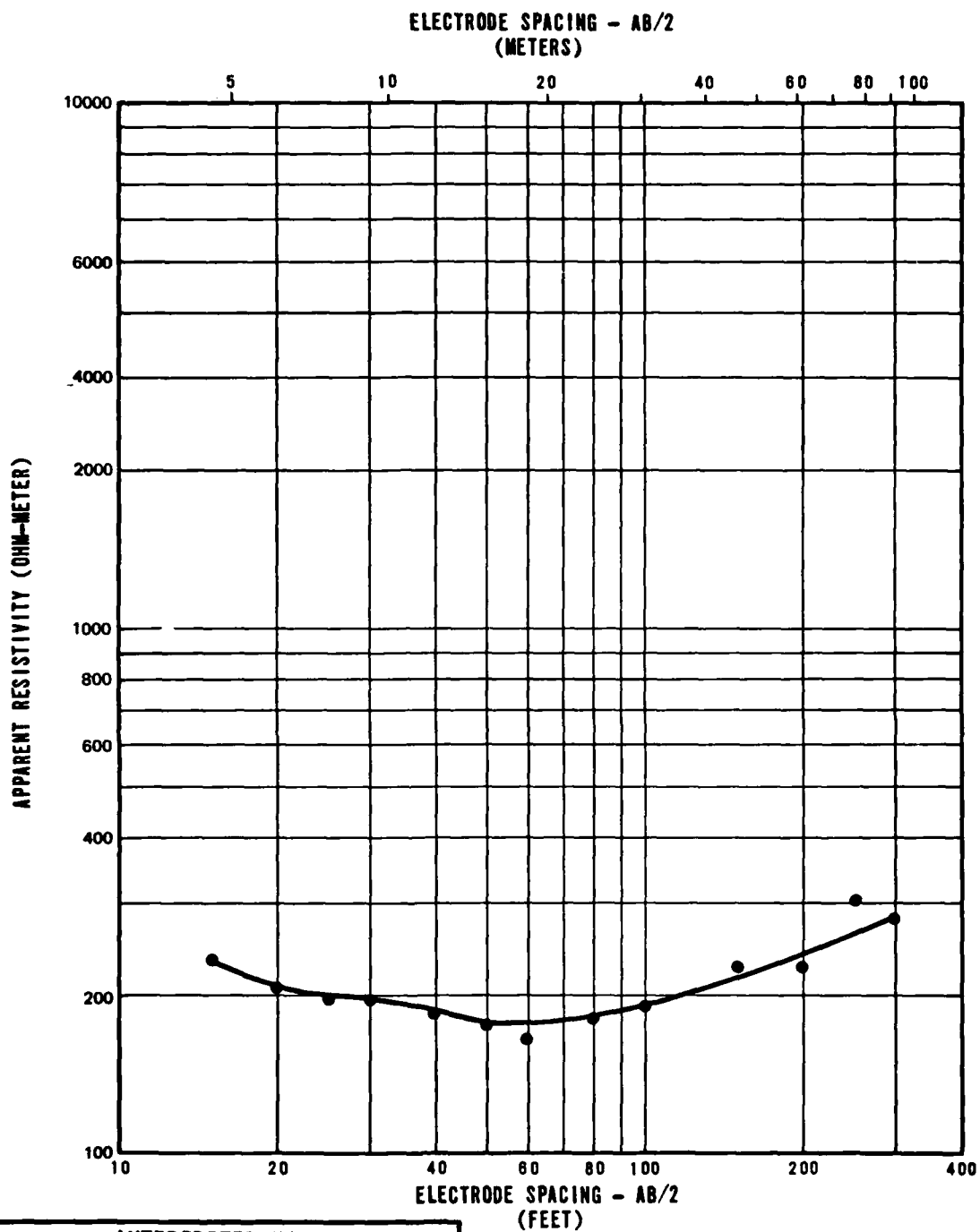
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RESISTIVITY SOUNDING CV-R-3
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-3

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	270
7	2	170
84	26	370



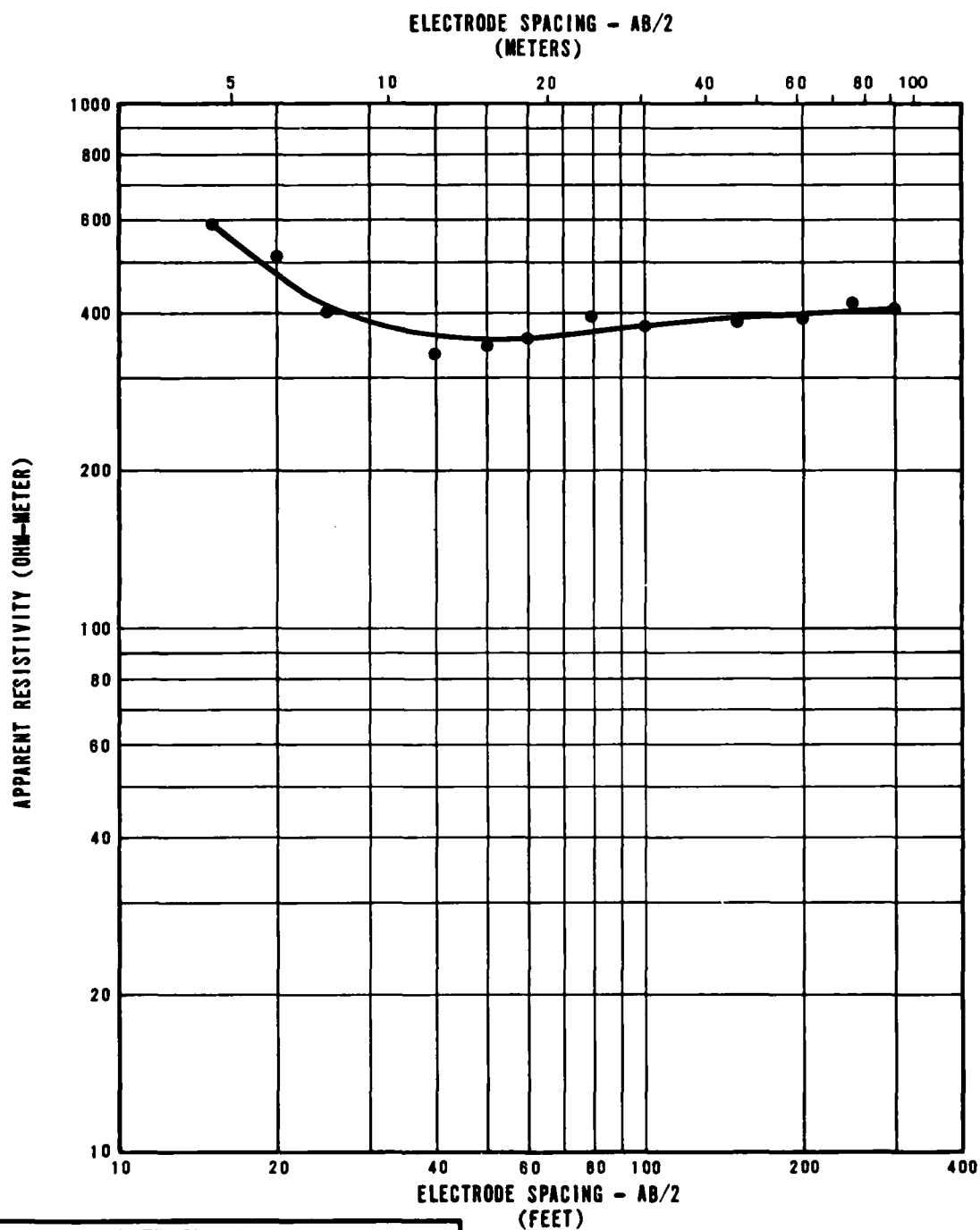
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RESISTIVITY SOUNDING CV-R-4
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-6-4

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	770
5	2	360
29	9	430

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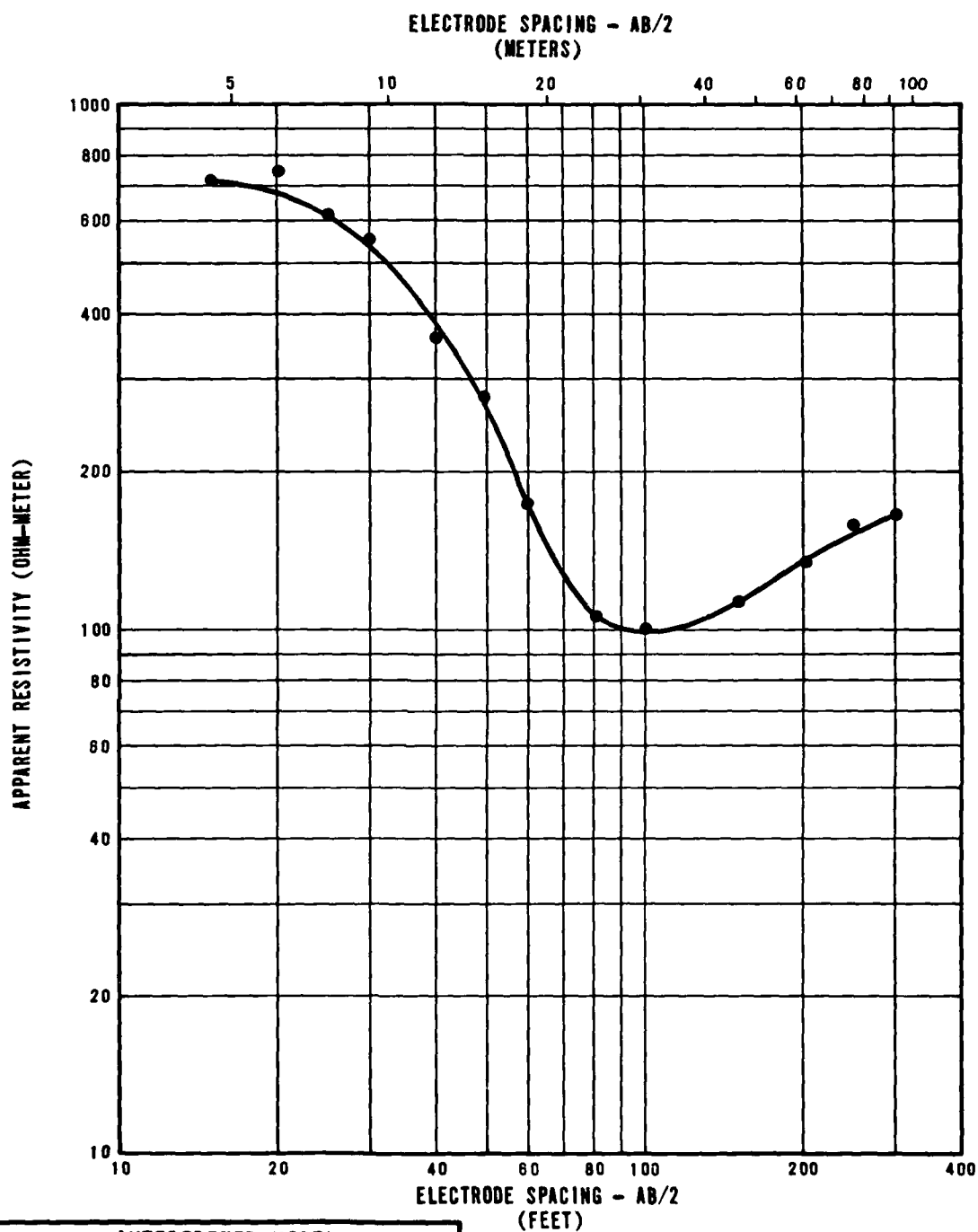
RESISTIVITY SOUNDING CV-R-5
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-5

AFV-15

E-TR-27-CV-II



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	660
15	5	240
27	8	11
36	11	250

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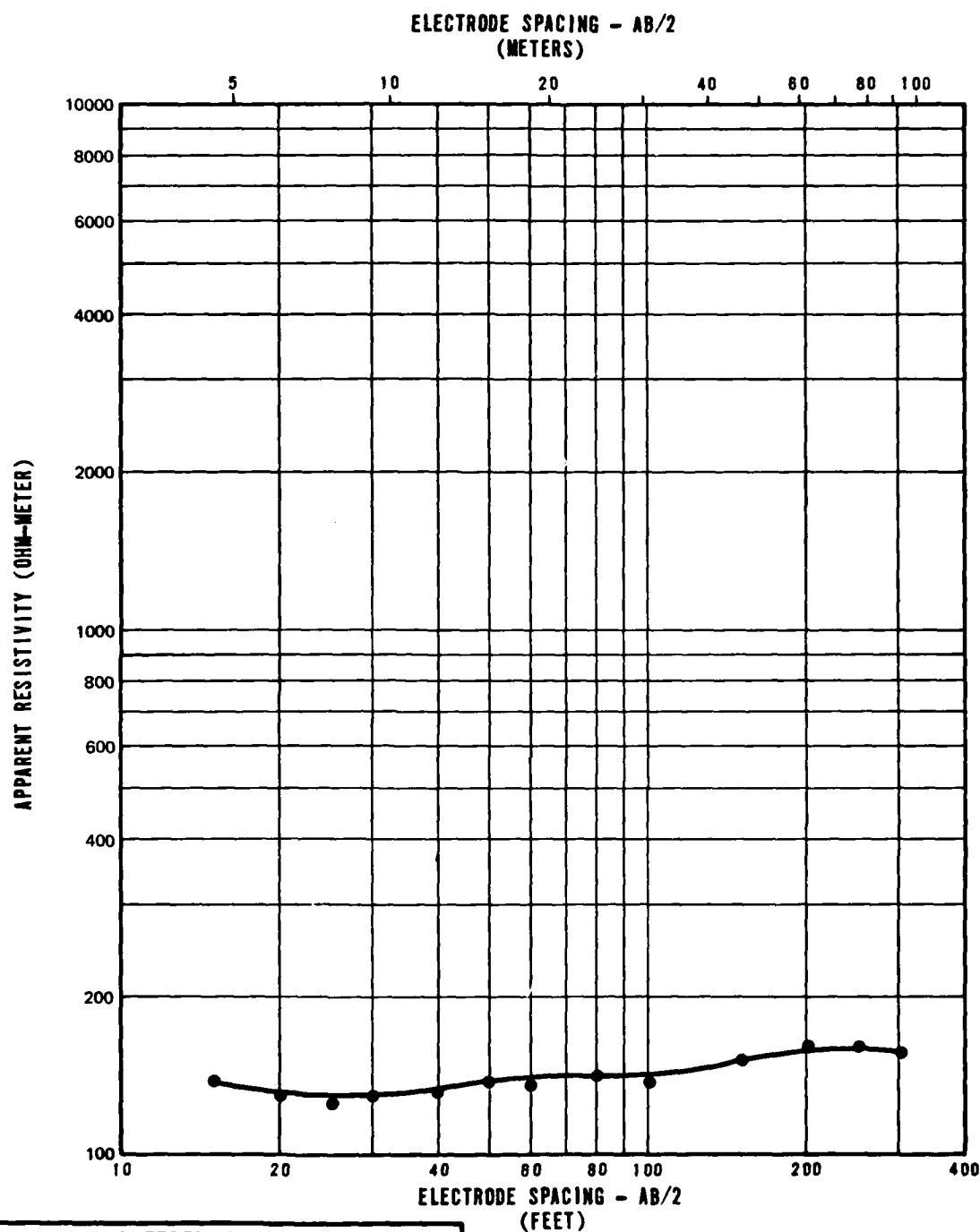
RESISTIVITY SOUNDING CV-R-6
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-6

AFV-15

E-TR-27-CV-II



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	150
9	3	110
24	7	160

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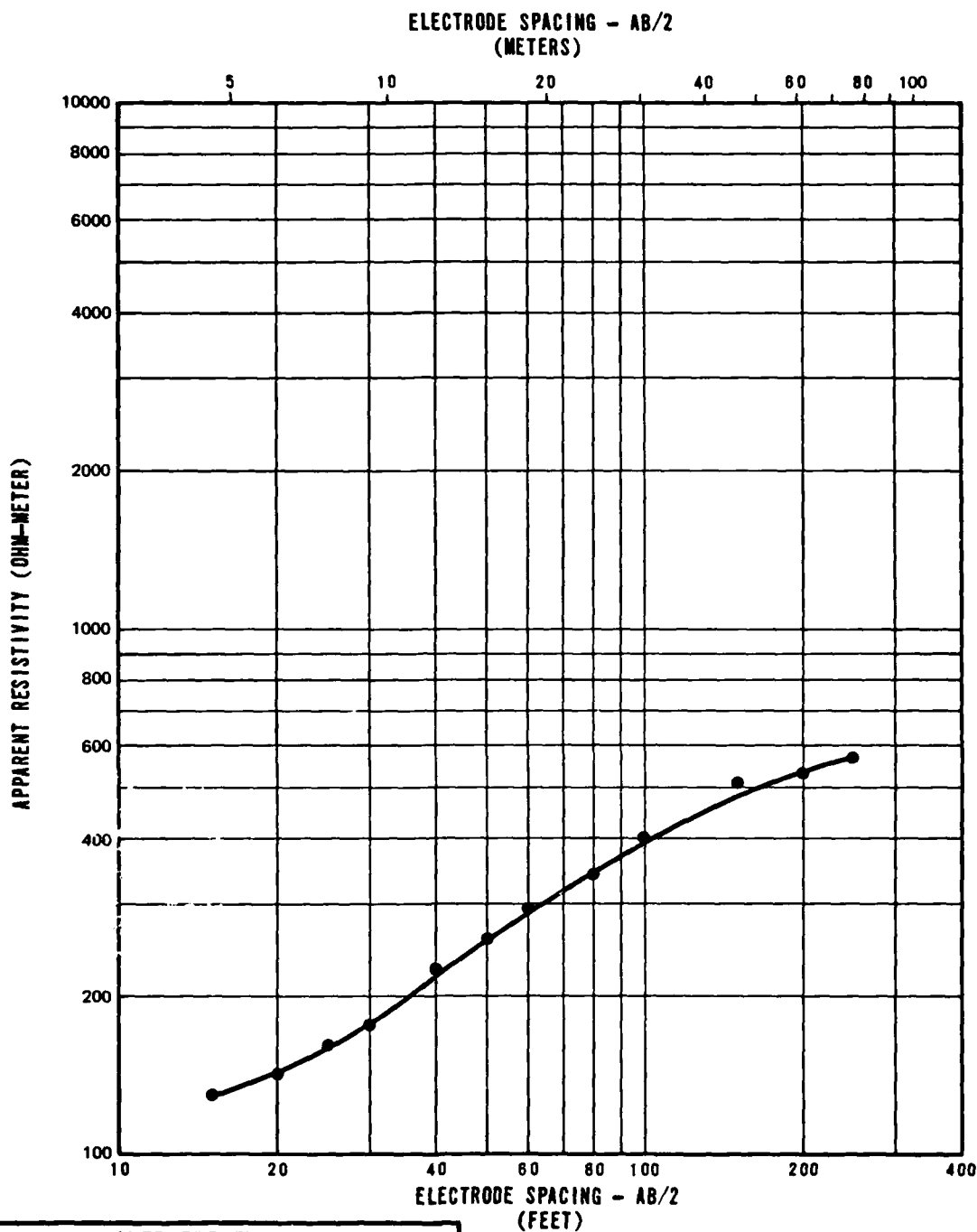
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RESISTIVITY SOUNDING CV-R-7
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

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FIGURE II-6-7

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	120
18	5	760

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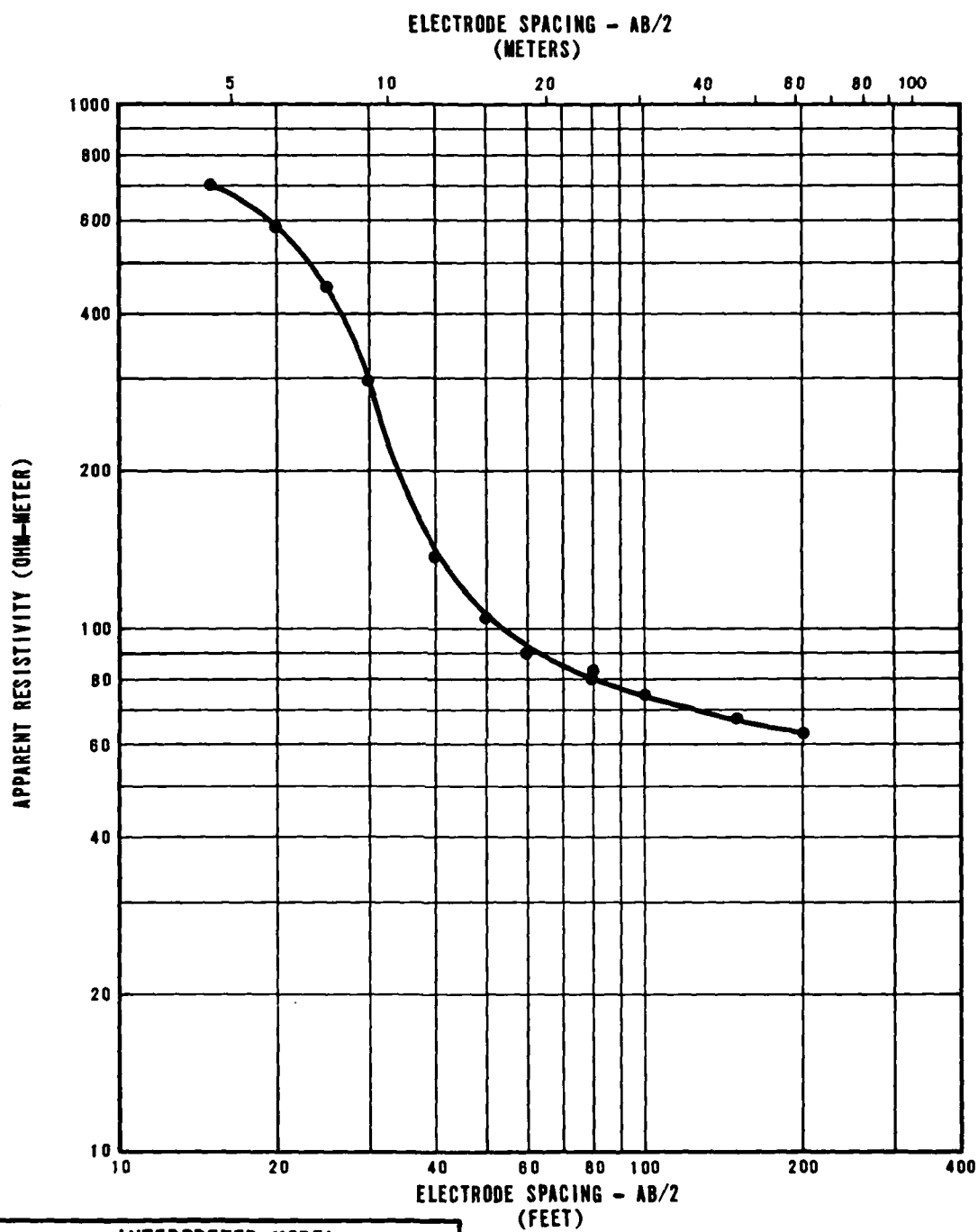
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RESISTIVITY SOUNDING CV-R-8
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-8

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	850
13	4	90
70	21	50

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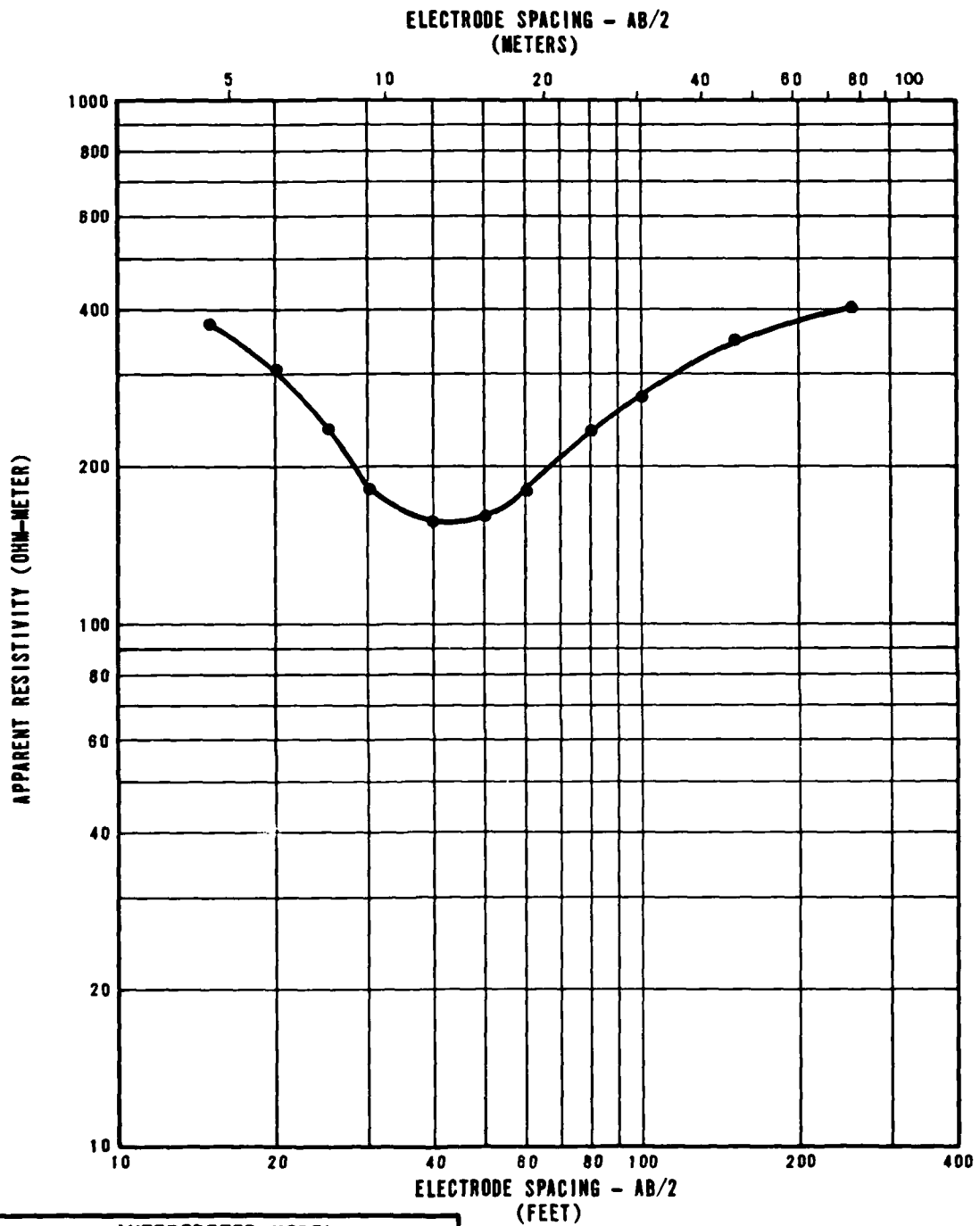
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RESISTIVITY SOUNDING CV-R-9
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

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FIGURE II-5-9

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	520
10	3	110
16	5	35
21	7	510

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RESISTIVITY SOUNDING CV-R-10
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-10

AFV-15

6.0 BORING LOGS

Explanation: All data from borings, trenches, and test pits are presented on standard Ertec Western logs in Sections 6.0 and 7.0. Explanations of the column headings on the logs are as follows:

- A. Designations - Borings, trenches, and test pits are identified as follows:

CV-B-1

CV - abbreviation for the valley (e.g., CV-Cave)

B - abbreviation for activity (e.g., B-boring, T-trench)
P-test pit)

1 - number designation of activity

- B. Sample Type - Different sampling techniques were used and the symbols are explained at the bottom of the boring logs. For details of the sampling techniques, see Section A5.0 of Appendix A in Volume I. Horizontal lines, to scale, indicate the depth where sampling was attempted.
- C. Percent Recovery - The numbers shown represent the ratio (in percent) of the soil sample recovered in the sampler to the full penetration of the sampler.
- D. N Value - Corresponds to standard penetration resistance, which is the number of blows required to drive a standard split-spoon sampler for the second and third of three 6-inch (15 cm) increments with a 140-pound (63.5 kg) hammer falling 30 inches (76 cm) (ASTM D 1586-67).
- E. Depth - Corresponds to depth below ground surface in meters and feet.
- F. Lithology - Graphic representation of the soil and rock types.

- G. USCS - Unified Soil Classification System (see Table II-6-1 for complete details) symbols.
- H. Soil Description - Except in cases where samples were classified based on laboratory test data, the descriptions are based on visual classification. The procedures outlined in ASTM D 2487-69, Classification of Soils for Engineering Purposes, and ASTM D 2488-69, Description of Soils (Visual-Manual Procedure), were followed. Solid lines across the column indicate a known change in strata at the depth shown.

Definitions of some of the terms and criteria to describe soils and conditions encountered during the exploration follow.

Gradation : A coarse-grained soil is well-graded if it has a wide range in grain size and substantial amounts of most intermediate particle sizes.

Poorly graded indicates that the soil consists predominantly of one size (uniformly graded) or has a wide range of sizes with some intermediate sizes obviously missing (gap-graded).

Moisture : Dry (D) - no feel of moisture - dry like powder
Slightly Moist (SM) - much less than optimum moisture
Moist (M) - near optimum moisture for soil - provides apparent cohesion
Very Moist (VM) - much greater than optimum moisture
Wet (W) - for soils below the water table or near saturation

Consistency: Consistency descriptions of coarse-grained soils (GW, GP, GM, GC, SW, SP, SM, SC) are as follows.

Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)				Group Symbols	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is larger than No. 200 sieve size	Sands More than half of coarse fraction is larger than No. 4 sieve size	Clean sands (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes				
Fine-grained soils More than half of material is smaller than No. 200 sieve size	Silts and clays More than half of fine fraction is smaller than No. 4 sieve size	Sands with fines (appreciable amount of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing Nonplastic fines (for identification procedures, see ML below) Plastic fines (for identification procedures, see CL below)	GW	Well graded sands, gravelly sand mixtures, little or no fines	Give typical name: Indicate approximate percentages of sand, silt, and clay; surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compaction, cementation, and moisture conditions and drainage characteristics Example: Silty sand, gravelly; about 20% hard, angular gravel particles 1-in. maximum size; rounded and subangular sand grains and silt; with low to medium plastic fines; with low to medium plastic fines; well compacted and moist in place; alluvial sand; (SM)	$C_u = \frac{D_{60}}{D_{10}}$ $C_c = \frac{D_{30}^3}{D_{10} \times D_{60}}$ Not meeting all gradation requirements for GW Alterberg limits below "A" line, or P_f less than 4 Alterberg limits above "A" line, with P_f greater than 7
				GP	Poorly graded sands, gravelly sand mixtures, little or no fines		
				GM	Silty sands, poorly graded sand-silt mixtures		
				GC	Clayey sands, poorly graded sand-silt mixtures		
Identification Procedures on Fraction Smaller than No. 40 Sieve Size	Silts and clays More than half of fine fraction is smaller than No. 4 sieve size	Sands with fines (appreciable amount of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing Nonplastic fines (for identification procedures, see ML below) Plastic fines (for identification procedures, see CL below)	SW	Well graded sands, gravelly sand, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ $C_c = \frac{D_{30}^3}{D_{10} \times D_{60}}$ Not meeting all gradation requirements for SW Alterberg limits below "A" line, or P_f less than 4 Alterberg limits above "A" line, with P_f greater than 7
				SP	Poorly graded sands, gravelly sand, little or no fines		
				SM	Silty sands, poorly graded sand-silt mixtures		
				SC	Clayey sands, poorly graded sand-silt mixtures		
				ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity		
				CL	Inorganic clays of low to medium plasticity, silty clays, sandy clays, silty clays, lean clays		
				OL	Organic silts and organic silts of low plasticity		
Highly Organic Soils	Silts and clays More than half of fine fraction is smaller than No. 4 sieve size	Sands with fines (appreciable amount of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing Nonplastic fines (for identification procedures, see ML below) Plastic fines (for identification procedures, see CL below)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
				CH	Inorganic clays of high plasticity, fat clays		
				OH	Organic clays of medium to high plasticity		
				PI	Peat and other highly organic soils		

From Wagner, 1937.

These procedures are to be performed on the minus No. 40 sieve size particles, approximately 1/4 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking):

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky. Then shake the pat vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a lively consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface; the pat stiffens and finally cracks or crumbles. The rapidly squeezing action in identifying the character of the fines in a soil, whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction.

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

Determine percentages of gravel and sand from grain size curve

Depending on percentages of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows:

GW, GP, GM, GC, SW, SP, SM, SC

Not meeting all gradation requirements for GW

Alterberg limits below "A" line, or P_f less than 4

Alterberg limits above "A" line, with P_f greater than 7

Not meeting all gradation requirements for SW

Alterberg limits below "A" line, or P_f less than 4

Alterberg limits above "A" line, with P_f greater than 7

Not meeting all gradation requirements for SM

Alterberg limits below "A" line, or P_f less than 4

Alterberg limits above "A" line, with P_f greater than 7

Not meeting all gradation requirements for SC

Alterberg limits below "A" line, or P_f less than 4

Alterberg limits above "A" line, with P_f greater than 7

Plasticity chart for laboratory classification of fine grained soils

Liquid limit

Plasticity chart

for laboratory classification of fine grained soils

Field Identification Procedure for Fine Grained Soils or Fractions

After removing particles larger than No. 40 sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by rolling it between the palms into a thread one-eighth inch in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens. Finally loose its plasticity, and crumbles when the thread is rolled into a ball. The ball is then rolled into a thin flat strip whereas a typical silt has the smooth feel of flour.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands have about the same slight dry strength, but can be distinguished from the former by the fact that the silt and silt clay both crumble whereas a typical silt has the smooth feel of flour.

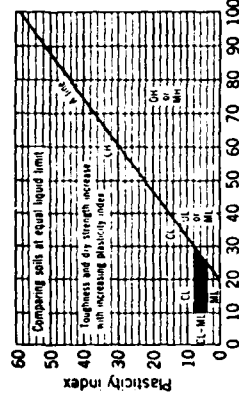
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TABLE II-6-1



Plasticity chart for laboratory classification of fine grained soils

From Wagner, 1957.
 a. Boundary classifications. Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.
 All sieve sizes on this chart are U.S. standard.

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

Dilatancy (Reaction to shaking):

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky. Place the pat in the open palm of one hand and shake horizontally striking vigorously against the palm of the other hand. Observe the changes to a lively consistency and becomes alveolar. When the sample is squeezed between the fingers, the water and blows disappear from the surface, the pat stiffens and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing are used to determine the dilatancy of the soil.

Very fine sand has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Highly Organic Soils

After removing particles larger than No. 40 sieve size, a specimen of soil about one-half inch cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture before being remoulded. The soil is then rolled into a thread about one-eighth inch in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

A slight kneading action continued until the lump crumbles.

The fourier thread near the plastic limit and the stiffer lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay, which occurs below the A-line, or highly organic clays and silts, which occur above the A-line.

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

Field Identification Procedure for Fine Grained Soils or Fractions

After removing particles larger than No. 40 sieve size, a specimen of soil about one-half inch cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture before being remoulded. The soil is then rolled into a thread about one-eighth inch in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

A slight kneading action continued until the lump crumbles.

The fourier thread near the plastic limit and the stiffer lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay, which occurs below the A-line, or highly organic clays and silts, which occur above the A-line.

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

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UNIFIED SOIL CLASSIFICATION SYSTEM

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TABLE II-6-1

<u>Consistency</u>	<u>N Value</u> <u>(ASTM D 1586-67)</u>
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

Consistency descriptions of fine-grained soils
(ML, CL, MH, CH,) are as follows:

<u>Consistency</u>	<u>Shear Strength</u> <u>(ksf) (kN/m²)</u>		<u>Field Guide</u>
Very Soft	0.25	12	Sample with height equal to twice the diameter, sags under own weight
Soft	0.25- 0.50	12 - 24	Can be squeezed between thumb and forefinger
Firm	0.50- 1.00	24- 48	Can be molded easily with fingers
Stiff	1.00- 2.00	48- 96	Can be imprinted with slight pressure from fingers
Very Stiff	2.00- 4.00	96- 192	Can be imprinted with considerable pressure from fingers
Hard	over 4.00	over 192	Cannot be imprinted by fingers

Grain Shape: Angular - particles have sharp edges and relatively plane sides with unpolished surfaces.

Subangular - particles are similar to angular but have somewhat rounded edges.

Subrounded - particles exhibit nearly plane sides but have well-rounded corners and edges.

Rounded - particles have smoothly curved sides and no edges.

Calcareous : Containing calcium carbonate; presence of calcium carbonate is commonly identified on the basis of reaction with dilute hydrochloric acid.

Caliche : Soils cemented by calcium carbonate and/or other soluble minerals by upward-moving solutions.

Degree of Cementation: (Stages of development of caliche profile)

Stage	Gravelly Soils	Nongravelly Soils
I	Thin, discontinuous pebble coatings	Few filaments or faint coatings
II	Continuous pebble coatings, some interpebble fillings	Few to abundant nodules, flakes, filaments
III	Many interpebble fillings	Many nodules and internodular fillings
IV	Laminar horizon overlying plugged horizon	Increasing carbonate impregnation

Secondary Material : Example - Sand with trace to some silt
 Trace - 5-12% (by dry weight)
 Little - 13-20% (by dry weight)
 Some - >20% (by dry weight)

Plasticity : Plasticity index is the range of water content, expressed as a percentage of the weight

of the oven-dried soil, through which the soil is plastic. It is defined as the liquid limit minus the plastic limit. Descriptive ranges used on the logs include:

Nonplastic	(PI, 0 - 4)
Slightly Plastic	(PI, 4 - 15)
Medium Plastic	(PI, 15 - 30)
Highly Plastic	(PI, >30)

Cobbles and
Boulders :

A cobble is a rock fragment, usually rounded by weathering or abrasion, with an average diameter ranging between 3 and 12 inches (76 and 305 mm).

A boulder is a rock fragment, usually rounded by weathering or abrasion, with an average diameter of 12 inches (305 mm) or more.

- I. Remarks - This column was provided on boring and trench logs for comments regarding drilling difficulty, number and size of cobbles or boulders encountered, loss of drilling fluid in the boring, trench wall stability, and other conditions encountered during drilling and excavations.
- J. Dry Density and Moisture Content - The boring logs include a graphical display of laboratory test results for dry density (ASTM D 2937-71) in pounds per cubic foot and kilograms per cubic meter and moisture content (ASTM D 2216-71) in percent from representative samples taken during drilling. The symbols are explained at the bottom of the boring logs.

K. Sieve Analysis - The numbers represent the percentage by dry weight (ASTM D 422-63) of each of the following soil components:

GR - Gravel, rock particles that will pass . 3-inch (76 mm) sieve and are retained on the No. 4 (4.75 mm) sieve.

SA - Sand, soil particles passing the No. 4 sieve and retained on the No. 200 (0.075 mm) sieve.

FI - Fines, silt or clay, soil particles passing the No. 200 sieve.

L. Atterberg Limits (LL and PI) -

LL - Liquid Limit, the water content corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

M. Miscellaneous Information -

Elevations - indicated elevations on the logs are estimated from topographic maps of the study area with an accuracy of half the contour interval.

Surficial Geologic Unit - indicates the surficial geologic unit in which the activity is located.

Date Drilled - indicates the period from beginning to completion of the activity.

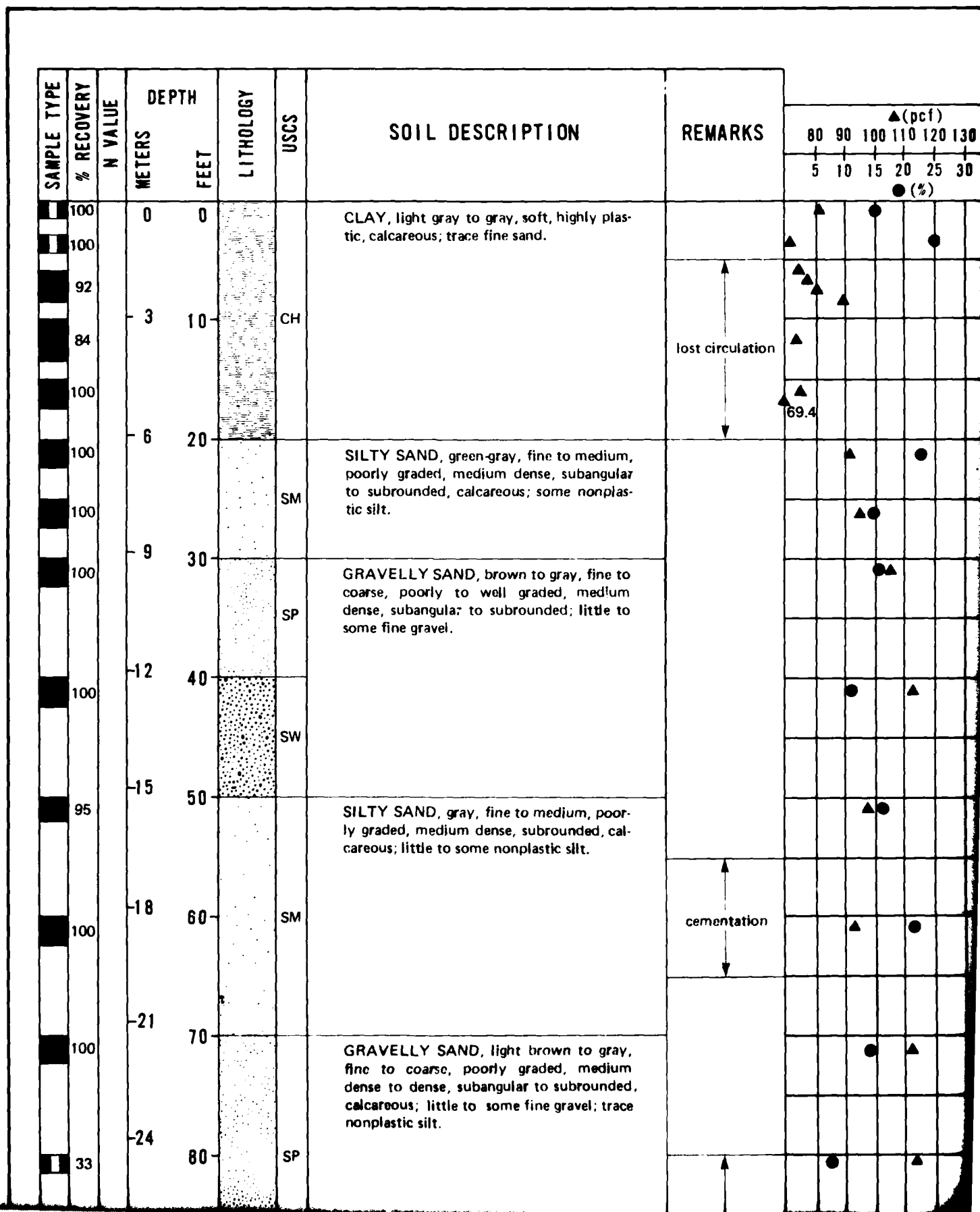
Drilling Method - signifies the type of drilling procedure used such as rotary wash.

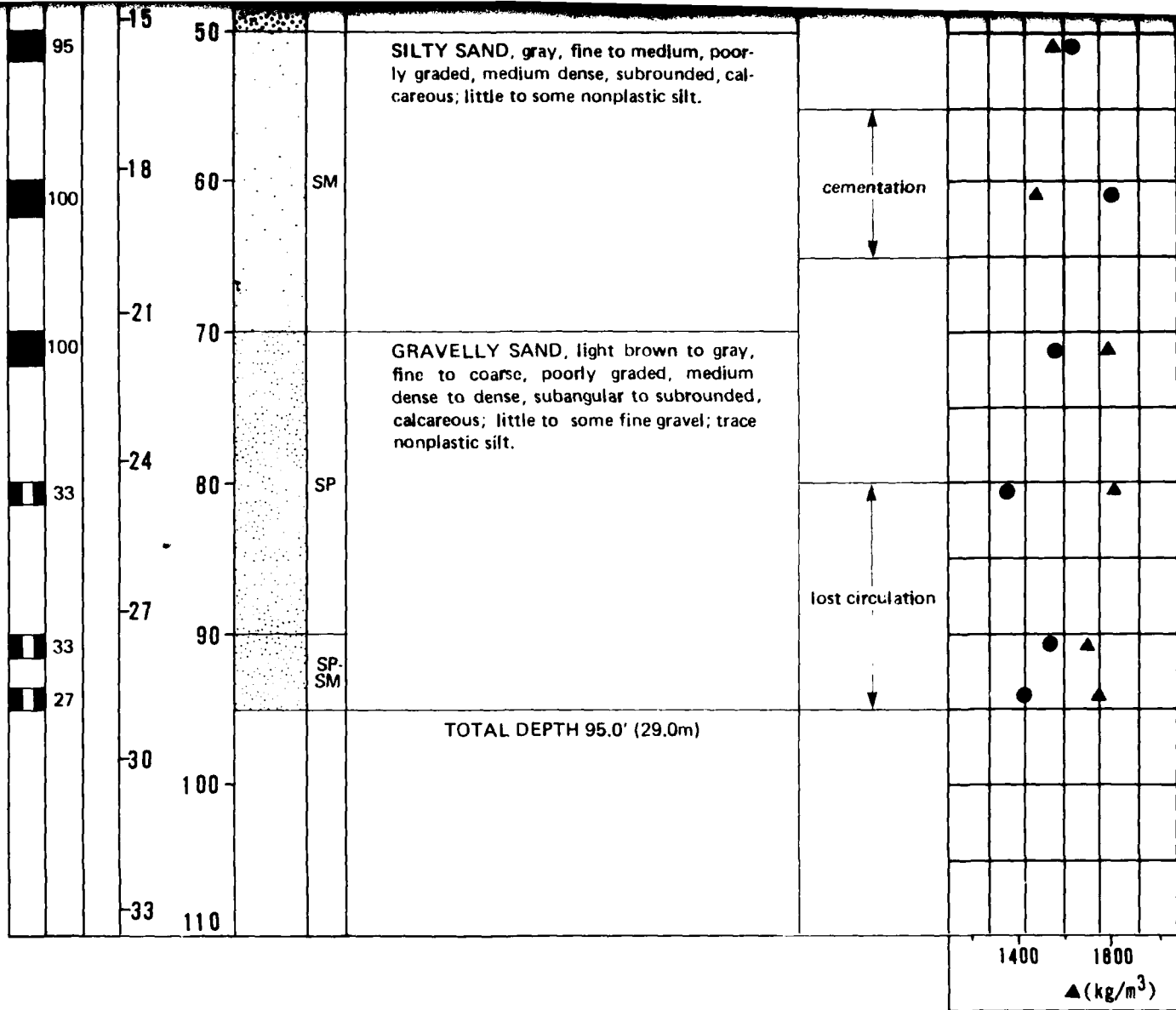
Hole Diameter - nominal size of boring drilled.

Water Level - indicates depth from ground surface to water table where encountered.

Trench Length - length at ground surface of final trench excavation.

Trench Orientation - bearing of longitudinal trench centerline.





EXPLANATION

- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

BORING DETAILS

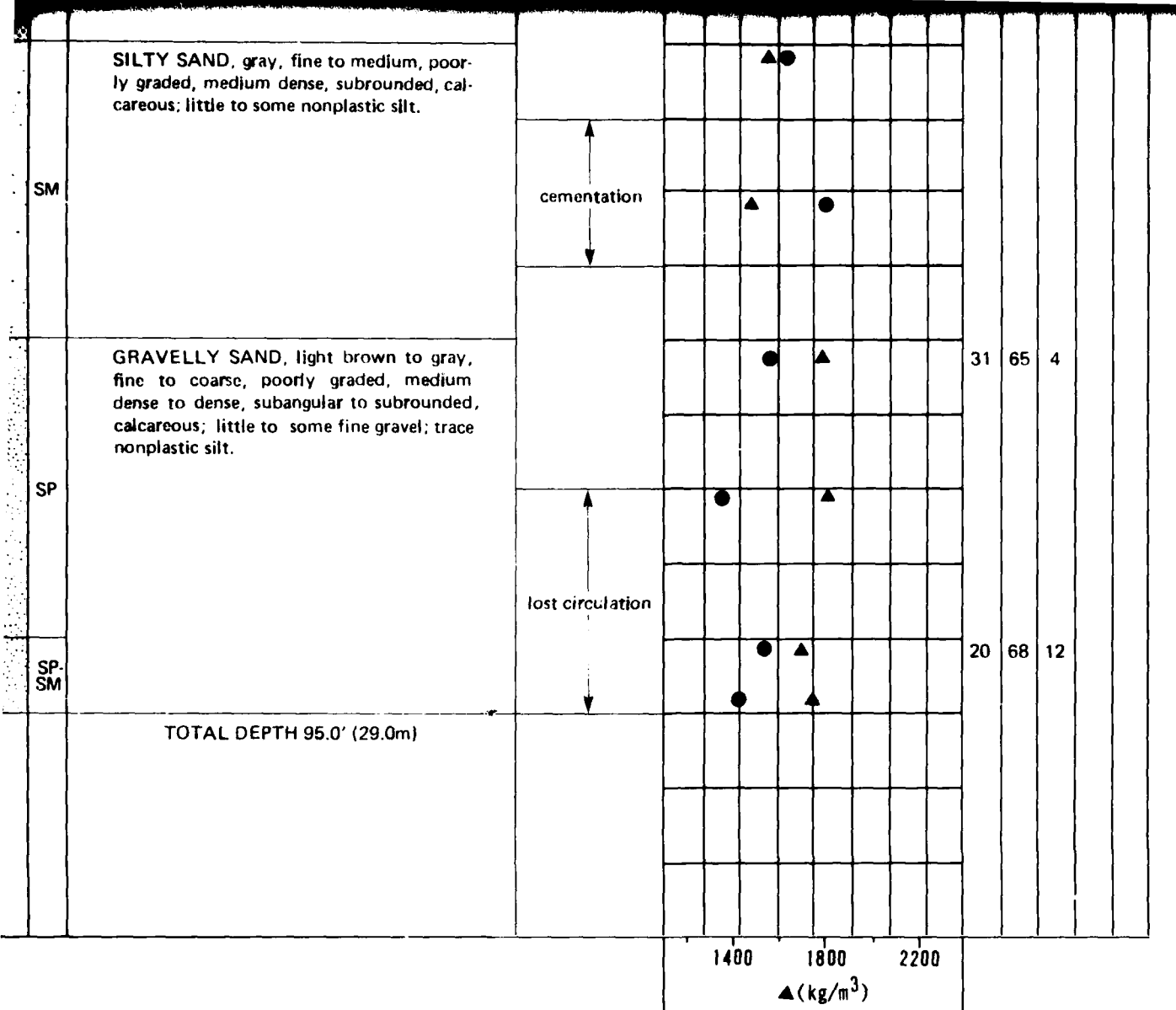
ELEVATION
SURFICIAL GEOLOGIC UN
DATE DRILLED
DRILLING METHOD
HOLE DIAMETER
WATER LEVEL

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FIGURE D-6-1



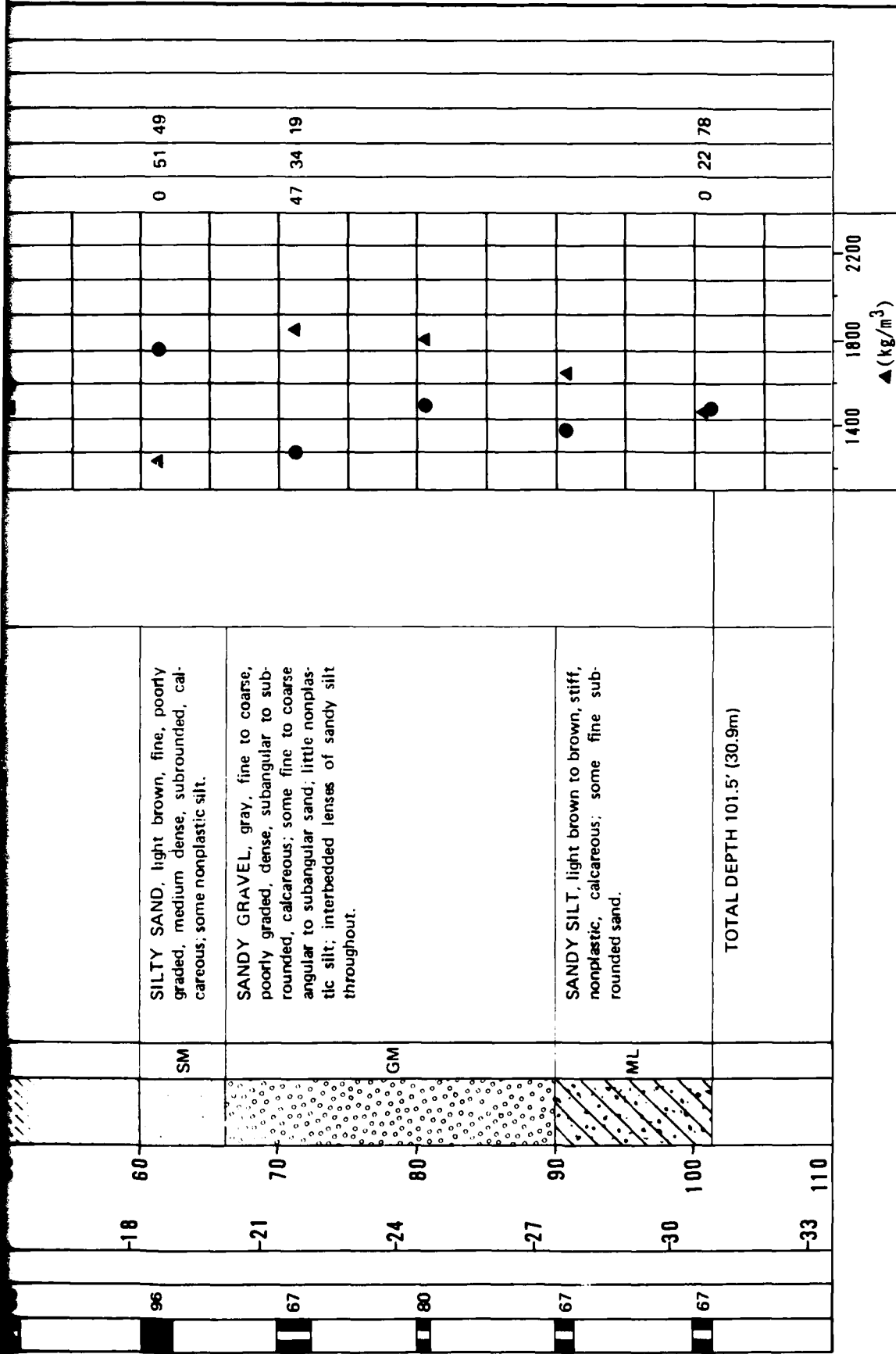
EXPLANATION

- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- ▲ STANDARD PENETRATION RESISTANCE
- UNIT WEIGHT (ASTM: D-2937-71)
- MOISTURE CONTENT (ASTM: D-2216-71)

BORING DETAILS

ELEVATION : 5980' (1823m)
 SURFICIAL GEOLOGIC UNIT : A4o
 DATE DRILLED : 5-6 November 1979
 DRILLING METHOD : Rotary Wash
 HOLE DIAMETER : 4 7/8" (124mm)
 WATER LEVEL : Not Encountered

SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	▲(pcf)													SIEVE ANALYSIS				
									80	90	100	110	120	130	140	GR	SA	FI	LL	PI						
	67		0	0		SM	SILTY SAND, light brown, fine to medium, poorly graded, medium dense, subrounded, calcareous; some nonplastic silt.		●	▲							0	63	37							
	67						SAND, dark gray, fine to coarse, poorly graded, loose, subangular to subrounded, calcareous; trace fine angular to subangular gravel.		●		▲						11	85	4							
	100		-3	10		SP																				
	100					ML	SILT, light gray, firm, nonplastic, calcareous.		▲				●				0	3	97		NP					
	62		-6	20		CL-ML	SANDY CLAY-SANDY SILT, gray, firm, slightly plastic, calcareous; some fine subrounded sand.		●	▲	▲						1	25	74	25	6					
	100					SP	GRAVELLY SAND, light brown, fine to coarse, poorly graded, medium dense, subangular, calcareous; some fine gravel.		●		▲						27	69	4							
	100		-9	30		ML	SILT, light brown, firm, nonplastic, calcareous.		▲	▲	●	●					0	4	96	28	1					
	100		-12	40			SANDY CLAY, light brown to gray, firm, slightly plastic, calcareous; little fine to coarse subrounded sand; trace fine subangular gravel.				▲	●					5	15	80	26	8					
	53		-15	50		CL					▲	●														
	96		-18	60		SM	SILTY SAND, light brown, fine, poorly graded, medium dense, subrounded, calcareous.		▲				●				0	51	49							



EXPLANATION

- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE**

BORING DETAILS

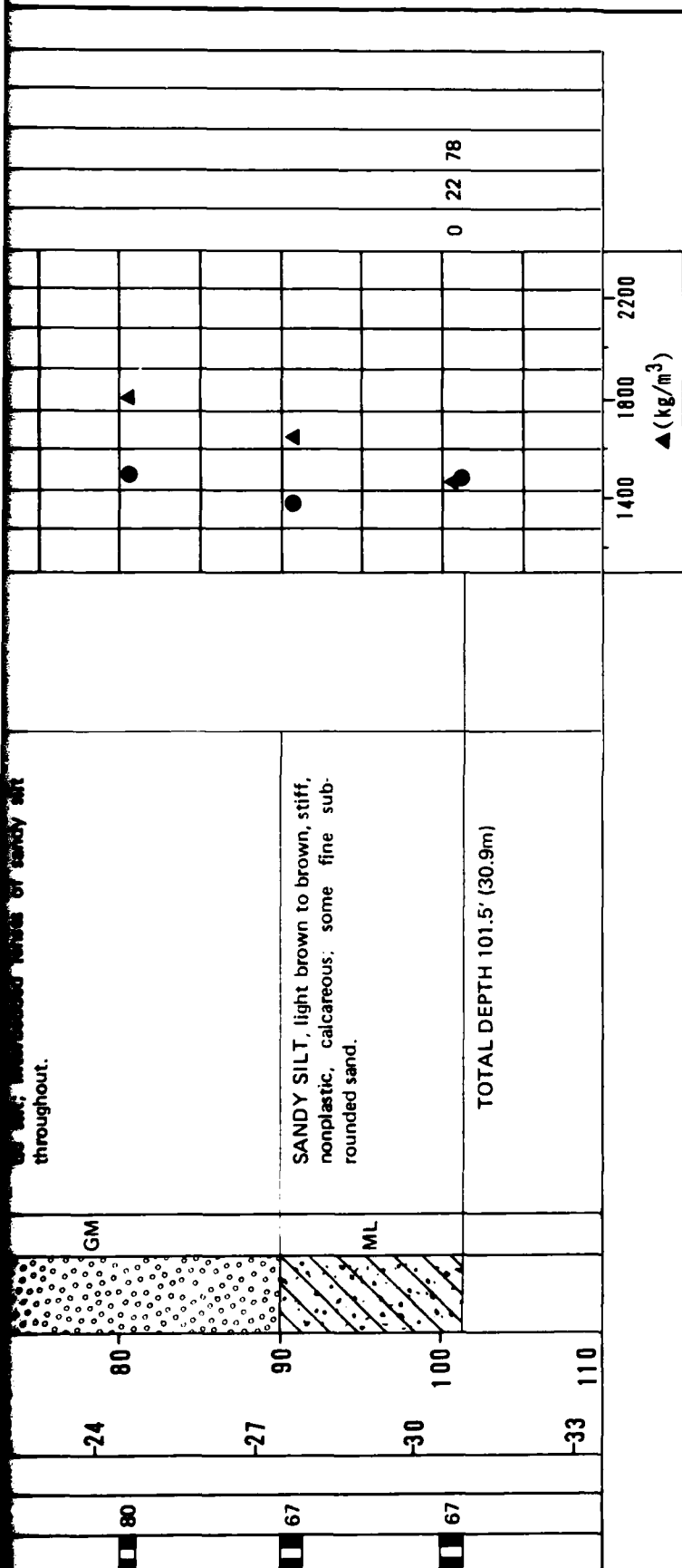
ELEVATION : 6010' (1832m)
 SURFICIAL GEOLOGIC UNIT : A4o
 DATE DRILLED : 14 November 1979
 DRILLING METHOD : Rotary Wash
 HOLE DIAMETER : 4 7/8" (124mm)
 WATER LEVEL : Not Encountered

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**LOG OF BORE
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EXPLANATION

■ ERTEC DRIVE SAMPLE

□ BULK SAMPLE

■ PITCHER TUBE SAMPLE

□ STANDARD PENETRATION TEST SAMPLE

▨ CORE SAMPLE

N - STANDARD PENETRATION RESISTANCE

▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)

● - MOISTURE CONTENT (ASTM: D-2216-71)

NR - NO RECOVERY

BORING DETAILS

ELEVATION : 6010' (1832m)
 SURFICIAL GEOLOGIC UNIT : A4o
 DATE DRILLED : 14 November 1979
 DRILLING METHOD : Rotary Wash
 HOLE DIAMETER : 4 7/8" (124mm)
 WATER LEVEL : Not Encountered

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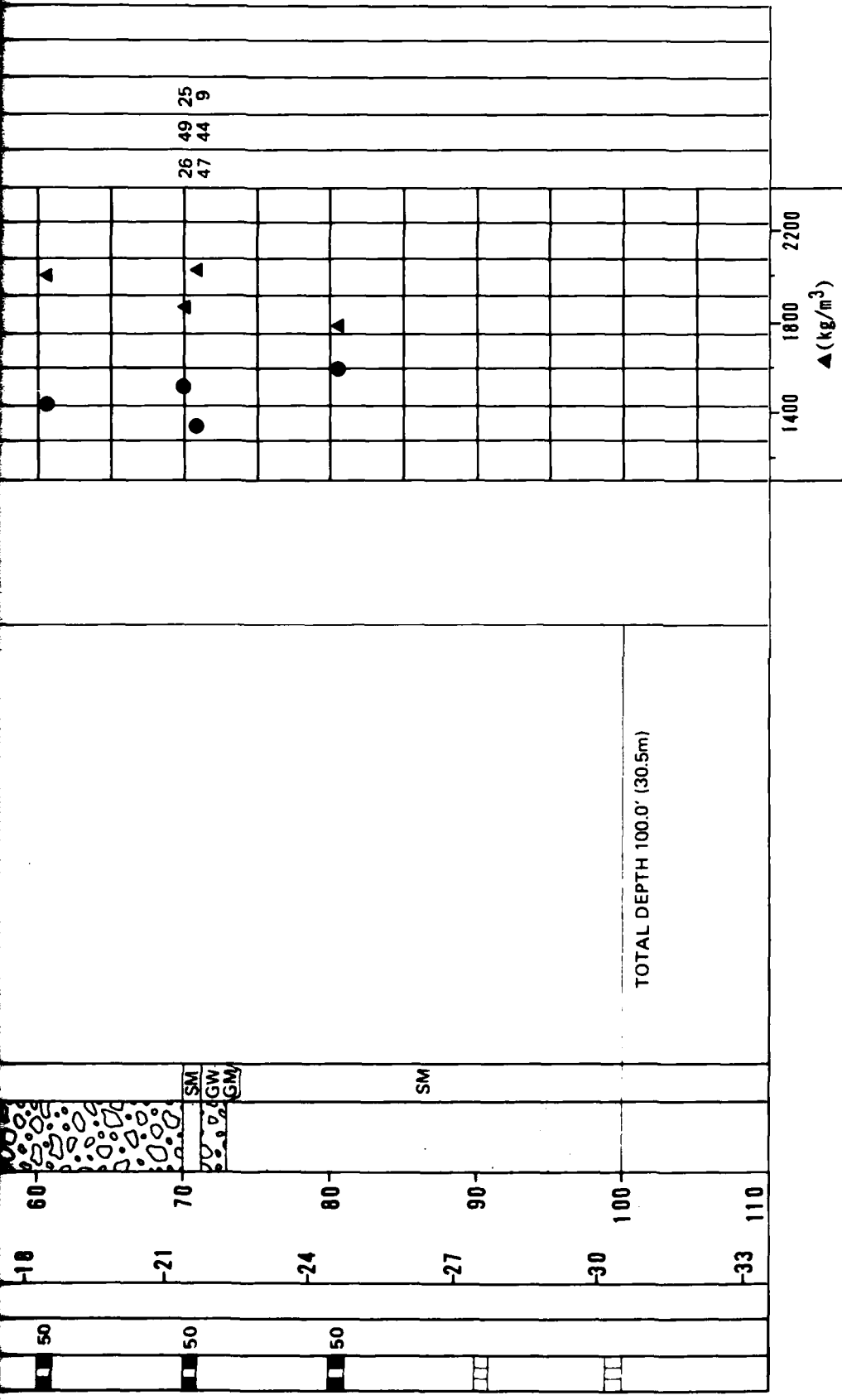
LOG OF BORING CV-B-2
 CAVE VALLEY, NEVADA

26 OCT 81

FIGURE B-6-2

2

3



EXPLANATION

- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- ▨ CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- - MOISTURE CONTENT (ASTM: D-2216-71)

BORING DETAILS

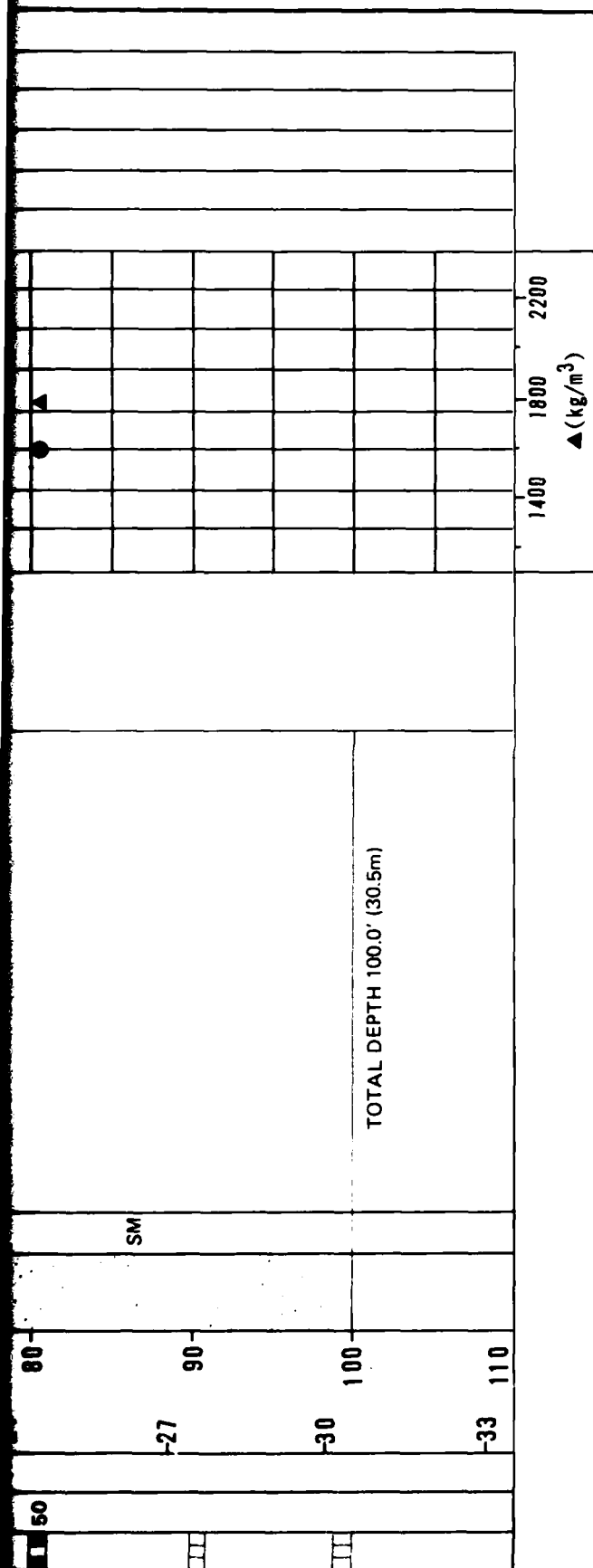
ELEVATION : 6500' (1981m)
 SURFICIAL GEOLOGIC UNIT : A5i
 DATE DRILLED : 14 November 1979
 DRILLING METHOD : Rotary Wash
 HOLE DIAMETER : 4 7/8" (124mm)
 WATER LEVEL : Not Encountered



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LOG OF BORING CV-5
 CAVE VALLEY, NEVA

28 OCT 81



EXPLANATION

■ ERTEC DRIVE SAMPLE

□ BULK SAMPLE

■ PITCHER TUBE SAMPLE

□ STANDARD PENETRATION TEST SAMPLE

▨ CORE SAMPLE

N - STANDARD PENETRATION RESISTANCE

▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)

● - MOISTURE CONTENT (ASTM: D-2216-71)

NR - NO RECOVERY

BORING DETAILS

ELEVATION : 6500' (1981m)
 SURFICIAL GEOLOGIC UNIT : A5i
 DATE DRILLED : 14 November 1979
 DRILLING METHOD : Rotary Wash
 HOLE DIAMETER : 4 7/8" (124mm)
 WATER LEVEL : Not Encountered

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LOG OF BORING CV-B-3
 CAVE VALLEY, NEVADA

28 OCT 81

FIGURE B-6-3

SAMPLE TYPE	% RECOVERY	N VALUE	METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS
			0	0		ML	SILT, brown, soft, nonplastic, trace fine sand.	
	50 100 100		-3	10		SM	SILTY SAND, brown, fine to medium, poorly graded, loose to dense, angular, calcareous; little to some nonplastic silt.	
			-6	20		GM	SANDY GRAVEL, gray, fine to coarse, poorly graded, very dense, subrounded to angular; some fine to coarse sand.	cobbles
			-9	30		GP	GRAVEL, light gray, coarse, poorly graded, very dense, angular.	boulders
	50		-12	40		GP-GC	SANDY GRAVEL, red-brown to gray-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse sand; little medium plastic clay.	
	50		-15	50		SC	GRAVELLY SAND, yellow-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse gravel; little medium plastic clay.	
			-18	60		GM	SANDY GRAVEL, red-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse sand; some	

[illegible]

GRAVELLY SAND, yellow-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse gravel; little medium plastic clay.

SANDY GRAVEL, red-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse sand; some nonplastic silt.

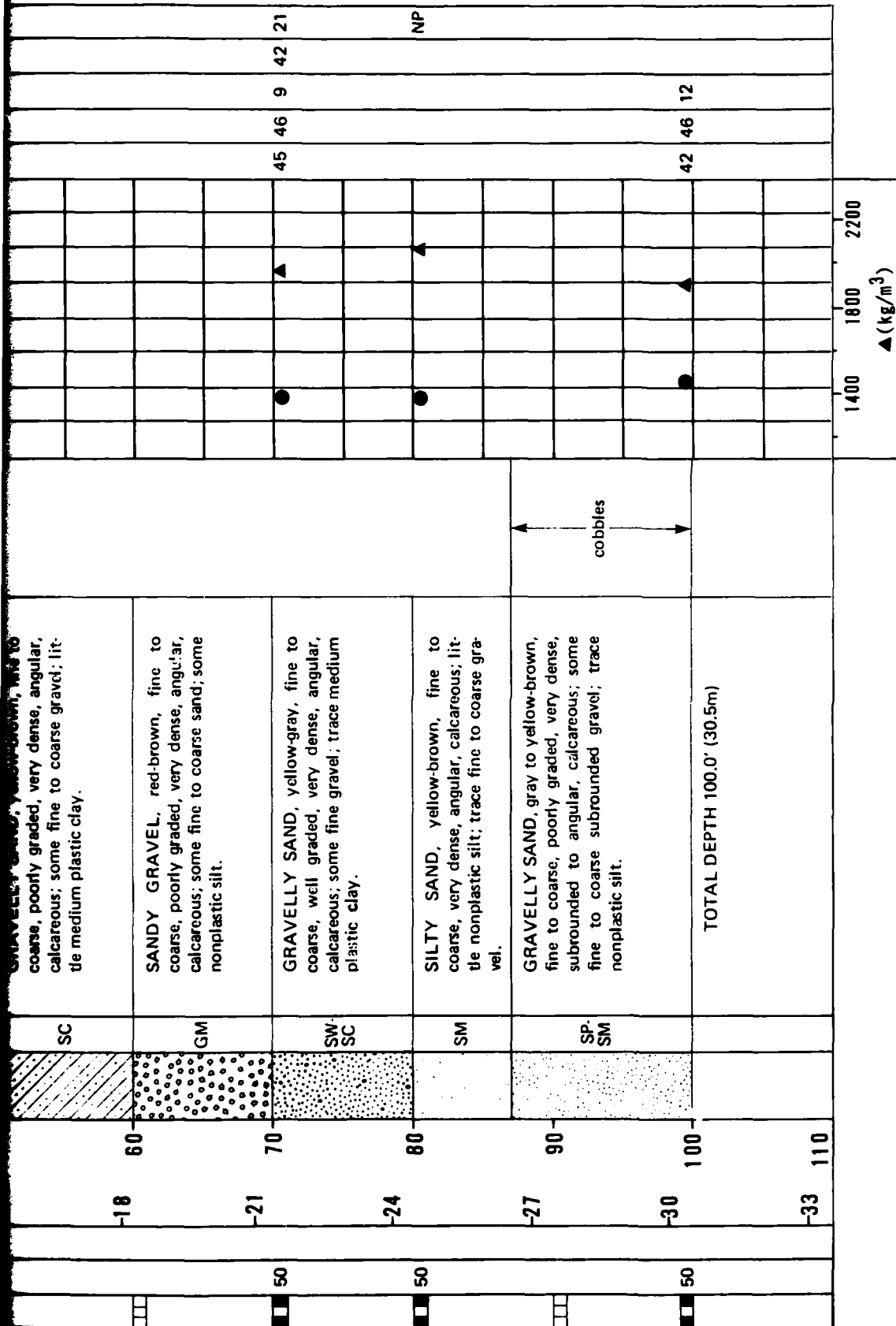
GRAVELLY SAND, yellow-gray, fine to coarse, well graded, very dense, angular, calcareous; some fine gravel; trace medium plastic clay.

SILTY SAND, yellow-brown, fine to coarse, very dense, angular, calcareous; little nonplastic silt; trace fine to coarse gravel.

GRAVELLY SAND, gray to yellow-brown, fine to coarse, poorly graded, very dense, subrounded to angular, calcareous; some fine to coarse subrounded gravel; trace nonplastic silt.

cobbles

TOTAL DEPTH 100.0' (30.5m)



EXPLANATION

- ERTEC DRIVE SAMPLE
- BU' K SAMPLE
- FITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N - STANDARD PENETRATION RESISTANCE

BORING DETAILS

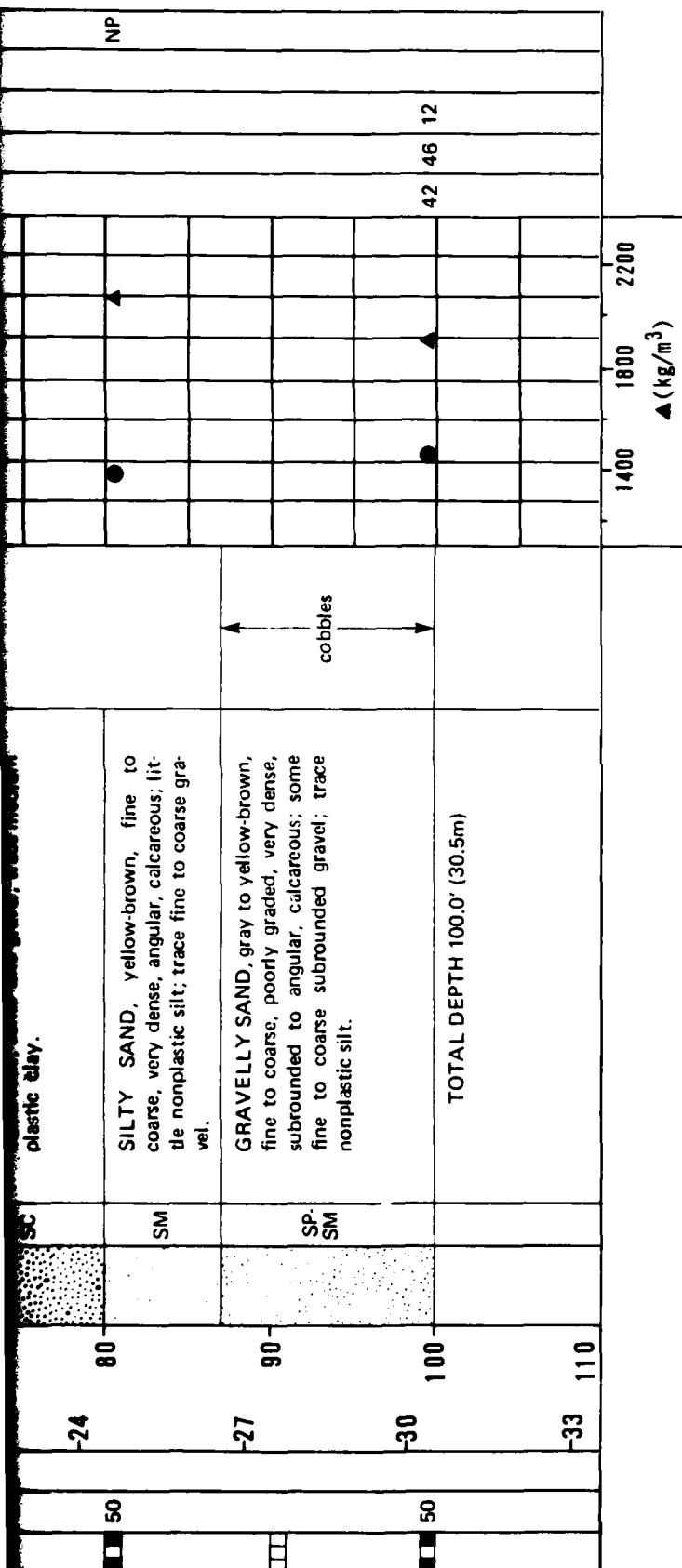
ELEVATION : 6240' (1902m)
SURFICIAL GEOLOGIC UNIT : A1
DATE DRILLED : 15 November 1979
DRILLING METHOD : Rotary Wash
HOLE DIAMETER : 4 7/8" (124mm)
WATER LEVEL : Not Encountered

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EXPLANATION

■ ERTEC DRIVE SAMPLE

□ BULK SAMPLE

■ PITCHER TUBE SAMPLE

□ STANDARD PENETRATION TEST SAMPLE

▨ CORE SAMPLE

N - STANDARD PENETRATION RESISTANCE

▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)

● - MOISTURE CONTENT (ASTM: D-2216-71)

NR - NO RECOVERY

BORING DETAILS

ELEVATION : 6240' (1902m)
 SURFICIAL GEOLOGIC UNIT : A1
 DATE DRILLED : 15 November 1979
 DRILLING METHOD : Rotary Wash
 HOLE DIAMETER : 4 7/8" (124mm)
 WATER LEVEL : Not Encountered

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LOG OF BORING CV-B-4
 CAVE VALLEY, NEVADA

26 OCT 81

FIGURE 22-6-4

7.0 TRENCH AND TEST PIT LOGS

See Section 6.0, "Boring Logs", for explanation.

E-TR-27-CV-II

BULK SAMPLE	DEPTH		LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
	METERS	FEET						GR	SA	FI	LL	PI
	0	0				SILTY SAND, brown, fine to medium, poorly graded, slightly moist, subangular to subrounded, calcareous; some non-plastic silt.		3	68	29		NP
	2											
	4											
	6			SM	medium dense							
	8											
	10											
	12			GP	medium dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse sand; trace cobbles to 12" size.		56	40	4		
	14											
	16											
	18											
	20											
						TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 6240' (1902m)
 DATE EXCAVATED : 18 October 1979
 SURFICIAL GEOLOGIC UNIT : A1
 TRENCH LENGTH : 16.0' (4.9m)
 TRENCH ORIENTATION : E - W



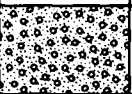
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LOG OF TRENCH CV-T-1
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-7-1

E-TR-27-CV-II

BULK SAMPLE	DEPTH		LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
	METERS	FEET						GR	SA	FI	LL	PI
	0	0		GM	medium dense	SANDY GRAVEL, brown and white, fine to coarse, poorly graded, dry, angular to subangular, calcareous; some fine to coarse sand; little nonplastic silt; stage IV caliche (1.0' - 1.5'). TOTAL DEPTH 1.5' (0.5m)	vertical walls stable cementation at 1.5' exceeded capacity of Case 580C backhoe	49	33	18		
		2			very dense							
	1											
	4											
	6											
	2	6										
	8											
	3	10										
	12											
	4	14										
	16											
	5	16										
	18											
	6	20										

TRENCH DETAILS

SURFACE ELEVATION : 6500' (1981m)
 DATE EXCAVATED : 18 October 1979
 SURFICIAL GEOLOGIC UNIT: A5i
 TRENCH LENGTH : 8.0' (2.4m)
 TRENCH ORIENTATION : E - W



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LOG OF TRENCH CV-T-2
 CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-7-2

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E-TR-27-CV-II

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0										
	0										
	2		SM	loose	SILTY SAND, light brown, fine to medium, poorly graded, dry, subangular to subrounded, calcareous; some non-plastic silt.						
	1										
	4										
	6		SP	loose	SAND, brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; interbedded lenses of fine gravel.	vertical walls sloughing					
	8										
	10										
	12		CL	stiff	CLAY, brown, medium plastic, slightly moist, calcareous; trace fine sand.	vertical walls stable				41	21
	14										
	16										
	18										
	20										
					TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 5995' (1827m)
 DATE EXCAVATED : 18 October 1979
 SURFICIAL GEOLOGIC UNIT : A4o
 TRENCH LENGTH : 18.0' (4.9m)
 TRENCH ORIENTATION : E - W



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LOG OF TRENCH CV-T-3
 CAVE VALLEY, NEVADA

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FIGURE II-7-3

TRENCH DETAILS



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**LOG OF TRENCH CV-T-4
CAVE VALLEY, NEVADA**

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FIGURE II-7-4

E-TR-27-CV-II

BULK SAMPLE	DEPTH		LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
	METERS	FEET						GR	SA	FI	LL	PI
	0	0				SANDY CLAY, brown to light olive, dry to slightly moist, slightly plastic, calcareous; some fine to medium subangular to subrounded sand; stage III caliche (5.0' - 8.0').	vertical walls stable	0	22	78	35	12
	2				firm							
	4			CL								
	6				hard							
	8					SILTY SAND, light gray-brown, fine, poorly graded, slightly moist, subangular to subrounded, calcareous; some nonplastic silt; occasional caliche nodules.		0	60	40		NP
	10											
	12			SM	dense							
	14											
						TOTAL DEPTH 14.0' (4.3m)						
	16											
	18											
	20											

TRENCH DETAILS

SURFACE ELEVATION : 5985' (1824m)
 DATE EXCAVATED : 19 October 1979
 SURFICIAL GEOLOGIC UNIT : A5y
 TRENCH LENGTH : 16.0' (4.9m)
 TRENCH ORIENTATION : NW - SE



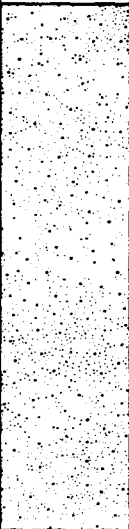
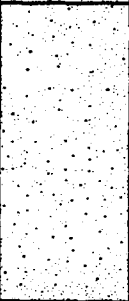
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LOG OF TRENCH CV-T-5
CAVE VALLEY, NEVADA

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FIGURE II-7-5

E-TR-27-CV-II

BULK SAMPLE	DEPTH		LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
	METERS	FEET						GR	SA	FI	LL	PI
	0	0		SM	medium dense	SILTY SAND, dark brown, fine to medium, poorly graded, dry, subangular to subrounded, calcareous; some nonplastic silt.	vertical walls stable					
		2										
	1	4										
		6										
	2	8										
		10										
	3	10		SM	medium dense	SILTY SAND, white, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some slightly plastic silt; trace fine to coarse subangular gravel; occasional shell fragments; occasional cobbles and boulders to 14" size.		11	52	37		
		12										
	4	14										
		16										
	5	16				TOTAL DEPTH 14.0' (4.3m)						
		18										
	6	20										

TRENCH DETAILS

SURFACE ELEVATION : 6210' (1893m)
 DATE EXCAVATED : 19 October 1979
 SURFICIAL GEOLOGIC UNIT: A5y
 TRENCH LENGTH : 16.0' (4.9m)
 TRENCH ORIENTATION : E - W



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LOG OF TRENCH CV-T-6
 CAVE VALLEY, NEVADA

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FIGURE II-7-6

E-TR-27-CV-II

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0				CLAY, brown to olive-brown, slightly moist, highly plastic, calcareous.						
	2										
	4										
	6										
	8										
	10										
	12										
	14										
	16										
	18										
	20										
					TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 5980' (1823m)
 DATE EXCAVATED : 20 October 1979
 SURFICIAL GEOLOGIC UNIT : A4a
 TRENCH LENGTH : 16.0' (4.9m)
 TRENCH ORIENTATION : NE - SW



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LOG OF TRENCH CV-T-7
 CAVE VALLEY, NEVADA

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FIGURE II-7-7

E-TR-27-CV-II

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0		SM	medium dense	SILTY SAND, dark brown, fine to coarse, poorly graded, dry, angular to subangular, calcareous; some nonplastic silt; trace fine to coarse angular gravel.	vertical walls stable					
	1		GM	very dense	SANDY GRAVEL, white, fine to coarse, poorly graded, dry, angular to subangular, calcareous; some fine to coarse sand; little nonplastic silt; stage IV caliche.		54	28	18		
	2				TOTAL DEPTH 2.0' (0.6m)	cementation at 2.0' exceeded capacity of Case 580C backhoe					
	3										
	4										
	5										

SURFACE ELEVATION: 8440' (1963m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT CV-P-3

	0				SANDY GRAVEL, brown, fine to coarse, poorly graded, dry, subangular, calcareous; some fine to medium subangular to sub-rounded sand; trace nonplastic silt; some cobbles to 10" size (1.8' - 5.0').	vertical walls sloughing					
	1										
	2		GP-GM	medium dense							
	3										
	4										
	5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 8190' (1887m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT CV-P-4

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LOGS OF TEST PITS CV-P-3 AND CV-P-4
CAVE VALLEY, NEVADA

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FIGURE II-7-9

E-TR-27-CV-II

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0				SANDY SILT, light brown, dry, nonplastic, calcareous; some fine subrounded sand.	vertical walls stable					
	1										
	2		ML	stiff			0	34	66		NP
	3										
	4		CL	stiff	SILTY CLAY, light olive, slightly moist, slightly plastic, calcareous; trace fine subrounded sand.					29	11
	5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5980' (1823m)
SURFICIAL GEOLOGIC UNIT: A4o

LOG OF TEST PIT CV-P-5

	0				SANDY GRAVEL, brown, fine to coarse, poorly graded, dry, angular to subangular, calcareous; some fine to coarse sand; trace nonplastic silt.	vertical walls sloughing					
	1		GP-GM	medium dense							
	2				SANDY GRAVEL, white, fine to coarse, poorly graded, dry, subrounded, calcareous; little fine to coarse subangular to subrounded sand; stage I-II caliche.						
	3		GP	dense							
	4										
	5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6325' (1928m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT CV-P-6



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LOGS OF TEST PITS CV-P-5 AND CV-P-6
CAVE VALLEY, NEVADA

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FIGURE II-7-10

SURFACE ELEVATION: 5990' (1826m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o

SURFACE ELEVATION: 5970' (1820m)
SURFICIAL GEOLOGIC UNIT: A4o

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**LOGS OF TEST PITS CV-P-7 AND CV-P-8
CAVE VALLEY, NEVADA**

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FIGURE D-7-11

E-TR-27-CV-II

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0										
	1		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some nonplastic silt; trace fine gravel.		11	56	33		NP
	2				GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse gravel; little nonplastic silt.						
	3		SM	medium dense							
	4										
	5										
					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6030' (1838m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT CV-P-9

	0										
	1										
	2										
	3										
	4										
	5										

SURFACE ELEVATION:
SURFICIAL GEOLOGIC UNIT:



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LOG OF TEST PIT CV-P-9
CAVE VALLEY, NEVADA

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FIGURE D-7-12

8.0 SURFICIAL SOIL SAMPLE LOGS

Explanation: Finalized logs of the surficial soil samples are presented in this section. Explanations of the column headings on the logs are as follows:

- A. Activity Number - Surficial samples are identified as follows:

CV-CS-1

CV - abbreviation for the valley (e.g., CV - Cave)

CS - abbreviation for surficial sample

1 - number designation of activity

- B. Ground Surface Elevation - Indicated elevations on the logs are estimated from topographic maps of the study area with an accuracy of half the contour interval.
- C. Surficial Geologic Unit - Indicates the surficial geologic unit in which the activity is located.
- D. Depth - Indicates depth interval for which soil description is given.
- E. USCS - Unified Soil Classification System; see Table II-6-1 of Section 6.0, "Boring Logs", for details of USCS.
- F. Soil Description - Soil is described based on field visual descriptions and/or laboratory test results. See Section 6.0, "Boring Logs", for procedures of soil description.
- G. Sieve Analysis, LL and PI - These are from results of laboratory tests. See Section 6.0, "Boring Logs", for explanation.

E-TR-27-CV-II

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
CV-CS-3	5975 (1821)	A4o	0.0 - 2.0 (0.0 - 0.6)	CL	CLAY, olive-brown, medium plastic, calcareous.					
CV-CS-7	5980 (1823)	A4o	0.0 - 2.0 (0.0 - 0.6)	CL	SILTY CLAY, light brown, slightly plastic, calcareous.					
CV-CS-12	6005 (1830)	A4o	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to medium, poorly graded, subangular to subrounded; some nonplastic silt.					
CV-CS-14	6010 (1832)	A4o	0.0 - 2.0 (0.0 - 0.6)	GP-GM	SANDY GRAVEL, white to gray, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace nonplastic silt.	48	45	7		
CV-CS-20	6435 (1961)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, angular to subangular, calcareous; little nonplastic silt; trace fine to coarse angular gravel.					



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LOGS OF SURFICIAL SOIL SAMPLES
CAVE VALLEY, NEVADA

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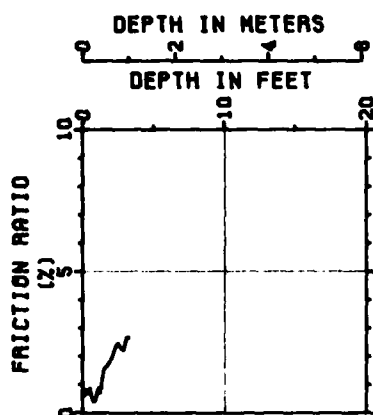
FIGURE II-6-1

9.0 CONE PENETROMETER TEST RESULTS

Explanation: The figures in this section show the results of the cone penetrometer tests. The terms used in the figures are defined below.

- A. Depth - Corresponds to depth below ground surface.
- B. Friction Resistance - The resistance to penetration developed by the friction sleeve, equal to the vertical force applied to the sleeve divided by its surface area. This resistance is the sum of friction and adhesion.
- C. Cone Resistance - The resistance to penetration developed by the cone, equal to the vertical force applied to the cone divided by its horizontally projected area.
- D. Friction Ratio - The ratio of friction resistance to cone resistance.
- E. Designation - Each cone penetrometer test is identified by a number: for example C-1.
 - C - abbreviation for the CPT
 - 1 - number designation of the test
- F. Surface Elevation - Indicated elevations on the figures are estimated from topographic maps of the study area and are accurate within one-half the contour interval.
- G. Surficial Geologic Unit - Indicates the surficial geologic unit in which the test was located.

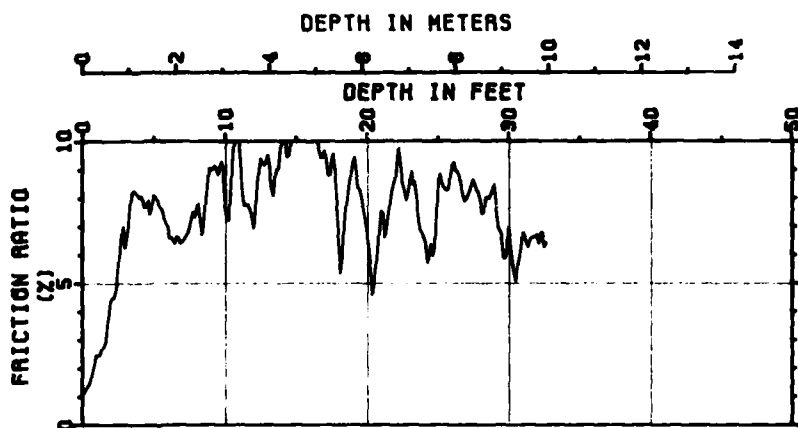
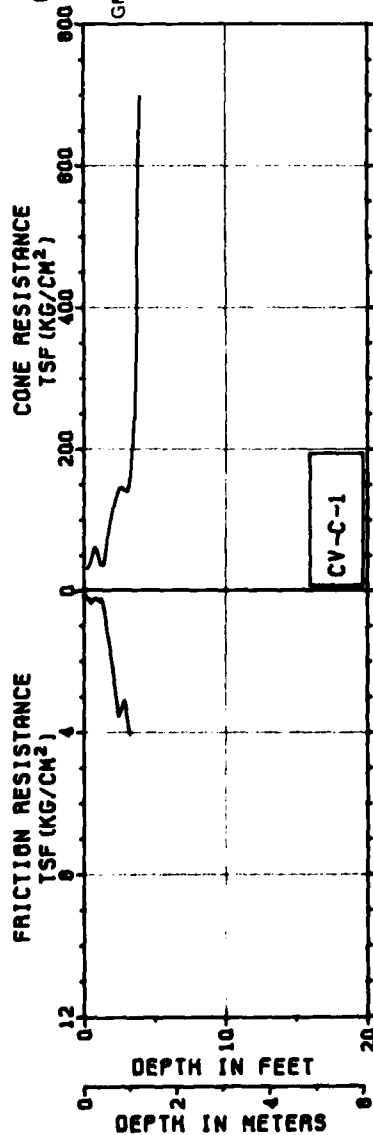
H. Soil Column - A graphical presentation of the soil type versus depth at each cone penetrometer test location. The USCS symbol for each different soil type is listed immediately to the left of the soil column. Immediately below the soil column, the activity number for the corresponding boring, trench, or test pit, or surficial soil sample at each CPT location is given.



SOIL COLUMN

GM

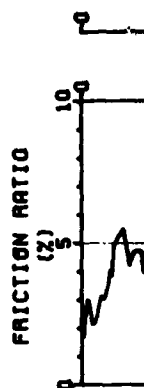
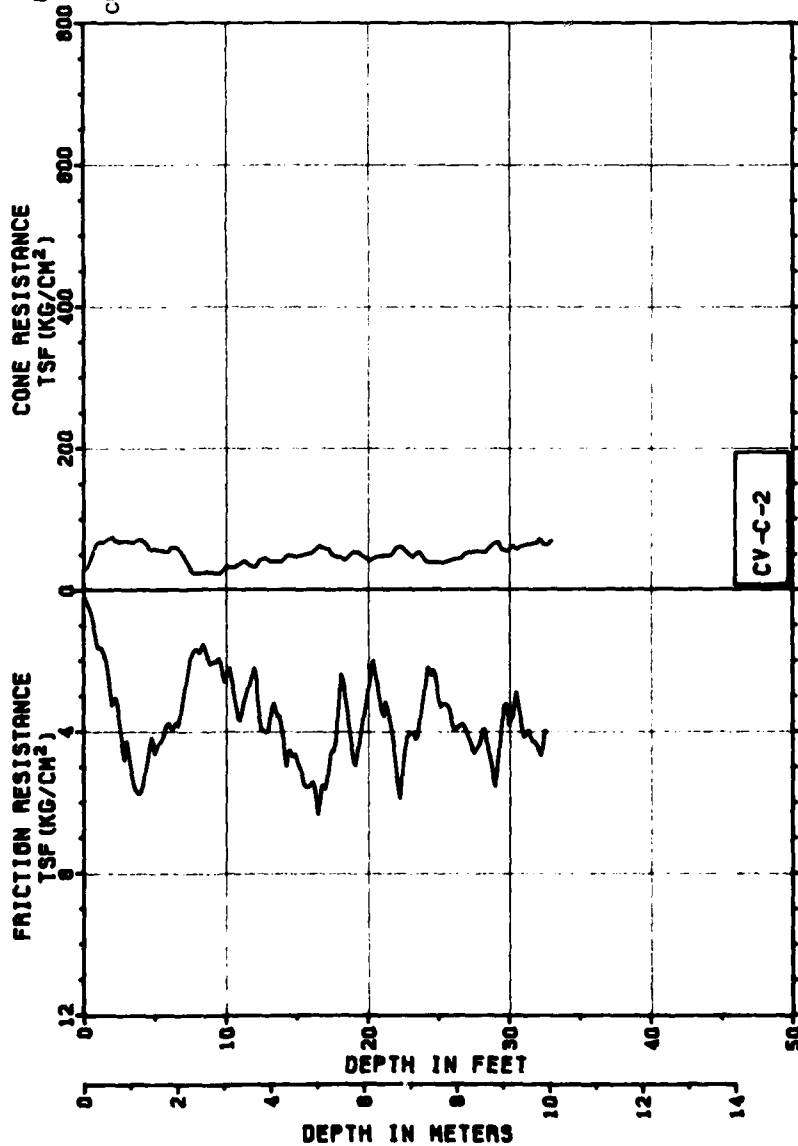
P-7



SOIL COLUMN

CH

P-8

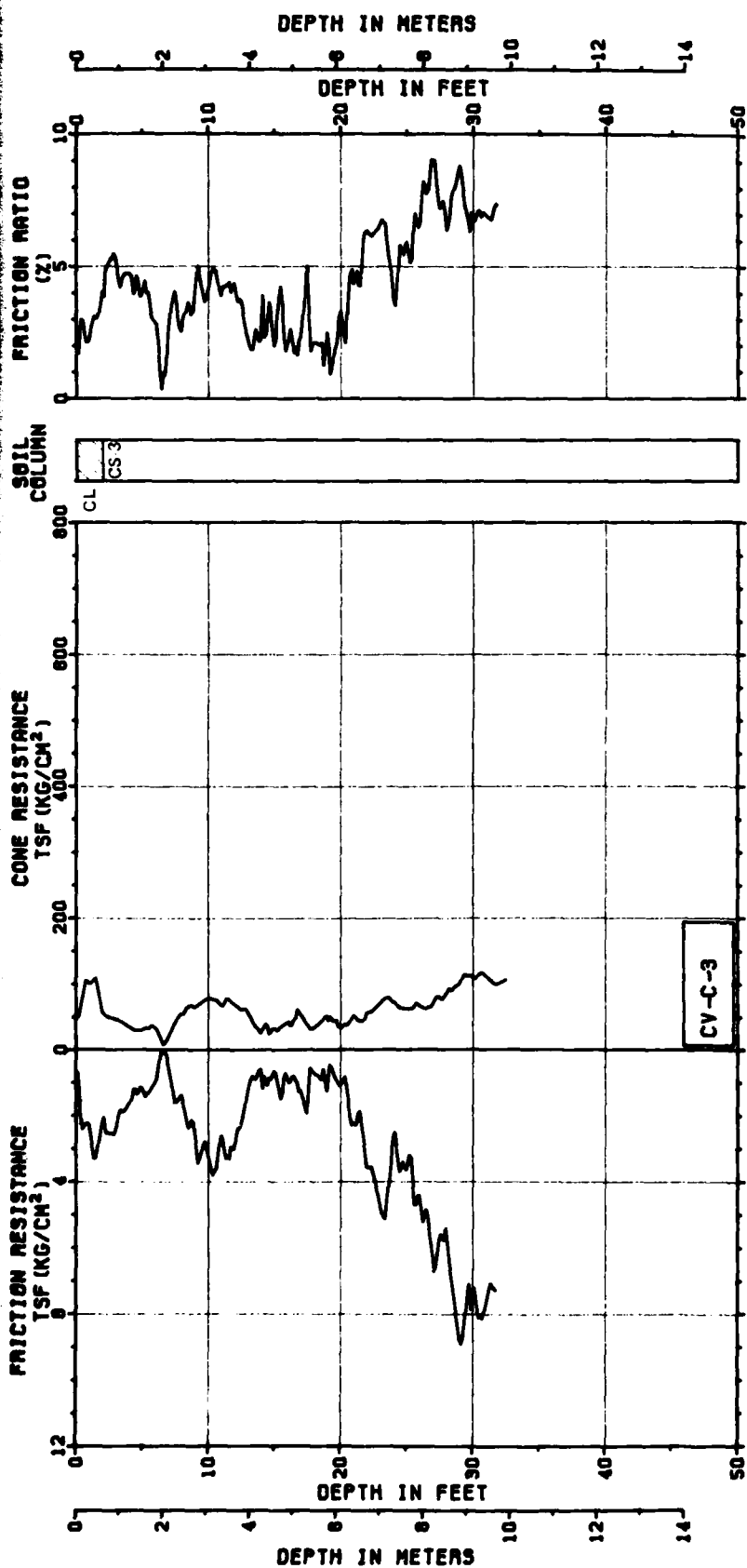


SOIL COLUMN

CL

CS-3





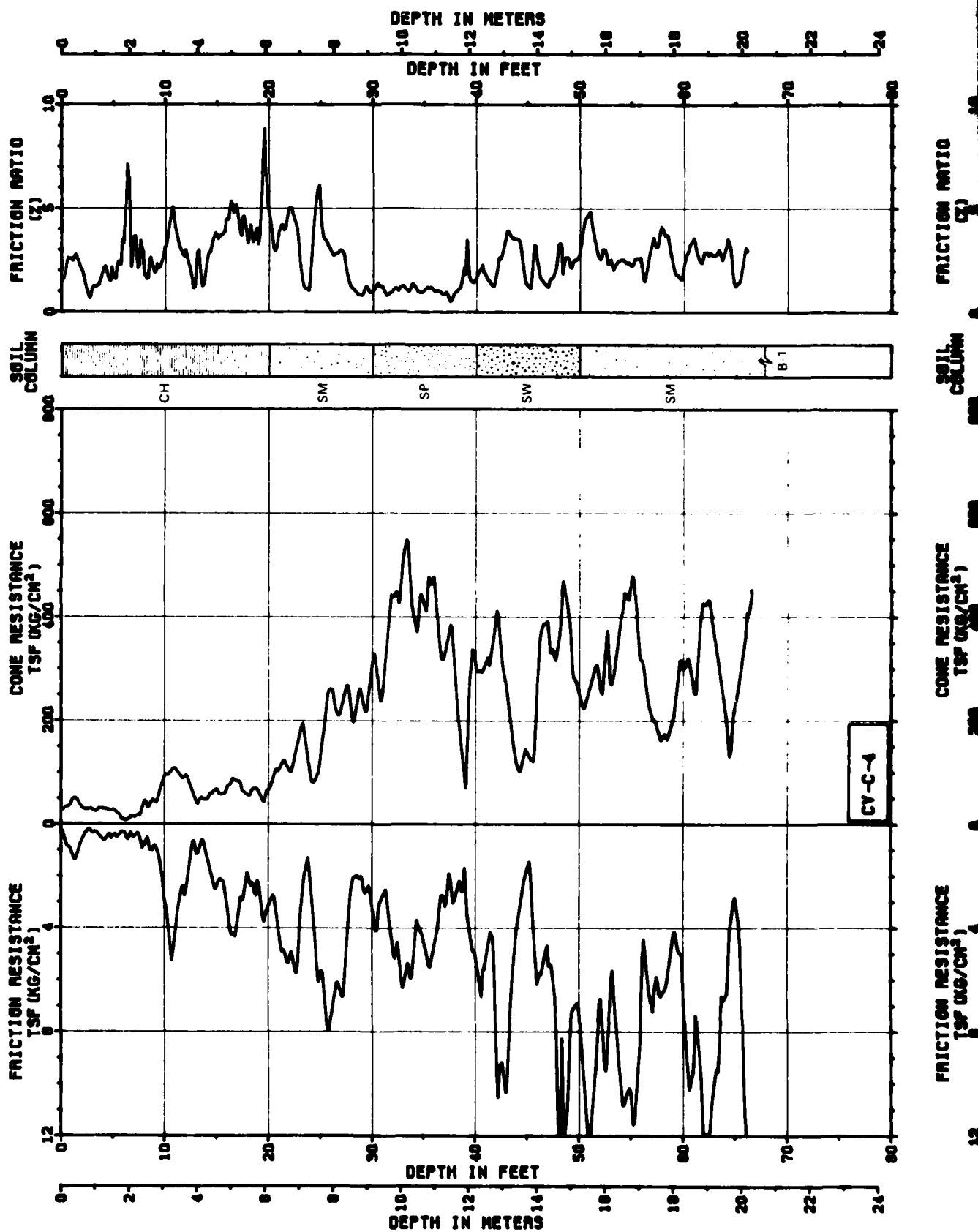
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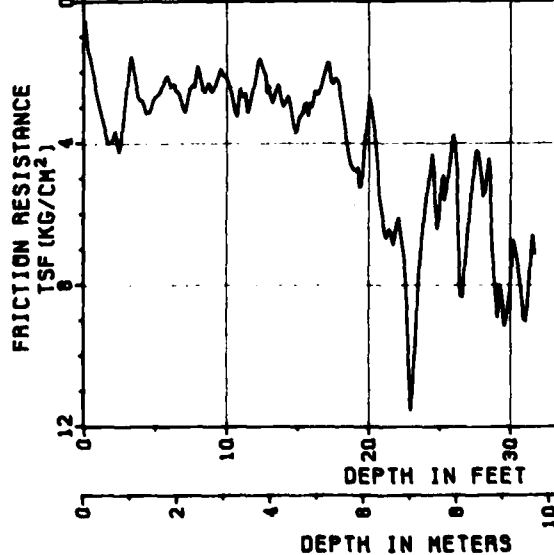
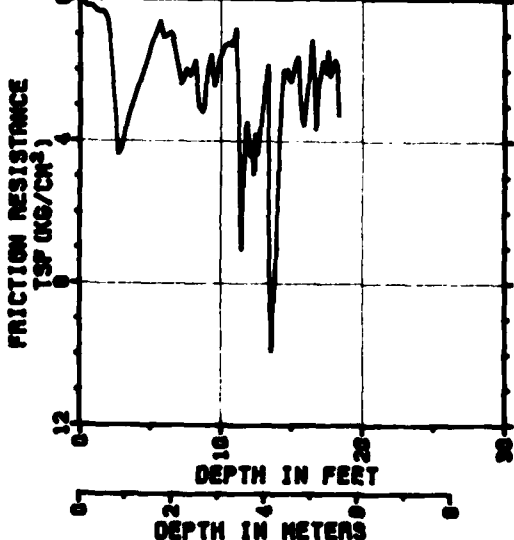
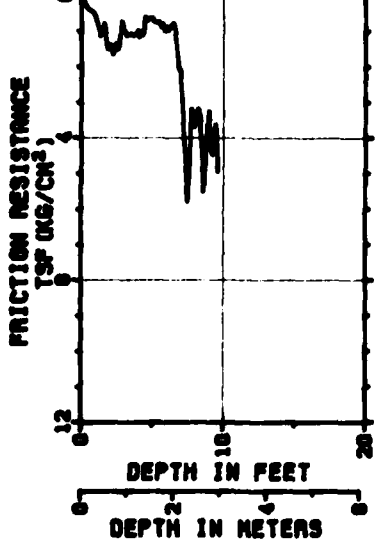
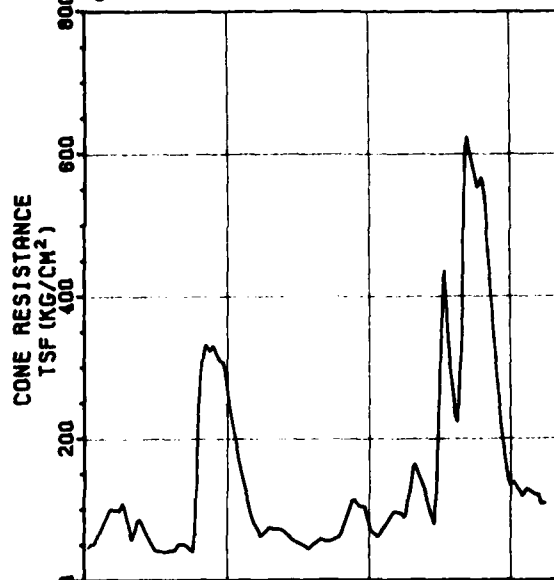
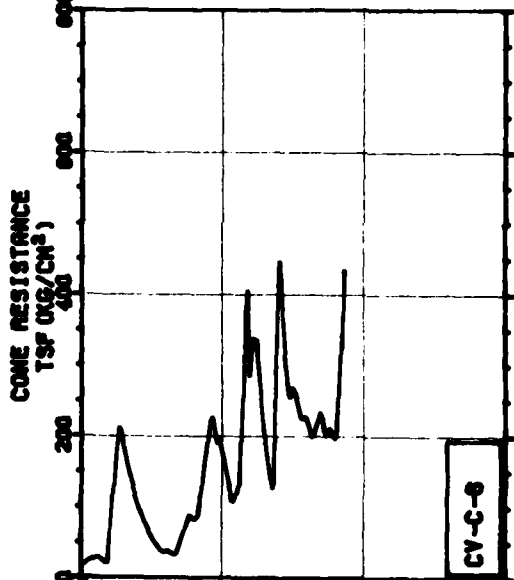
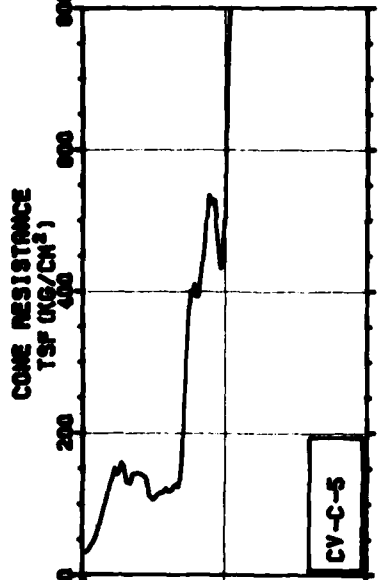
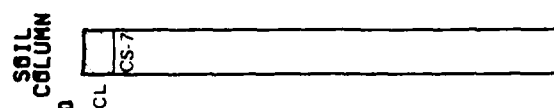
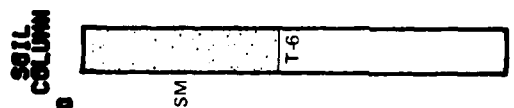
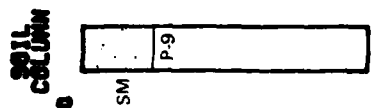
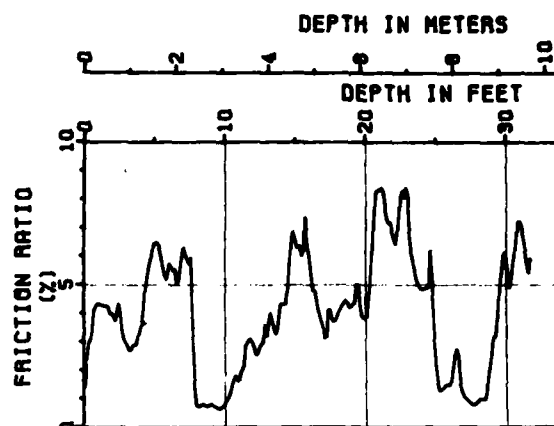
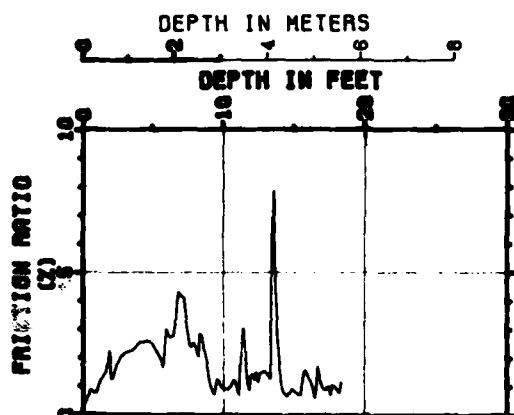
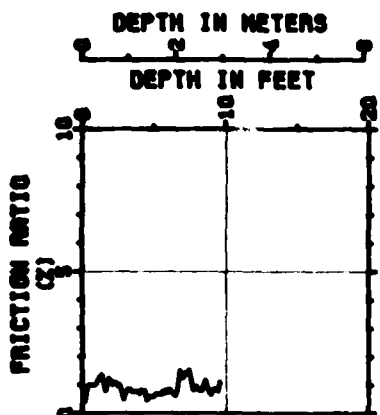
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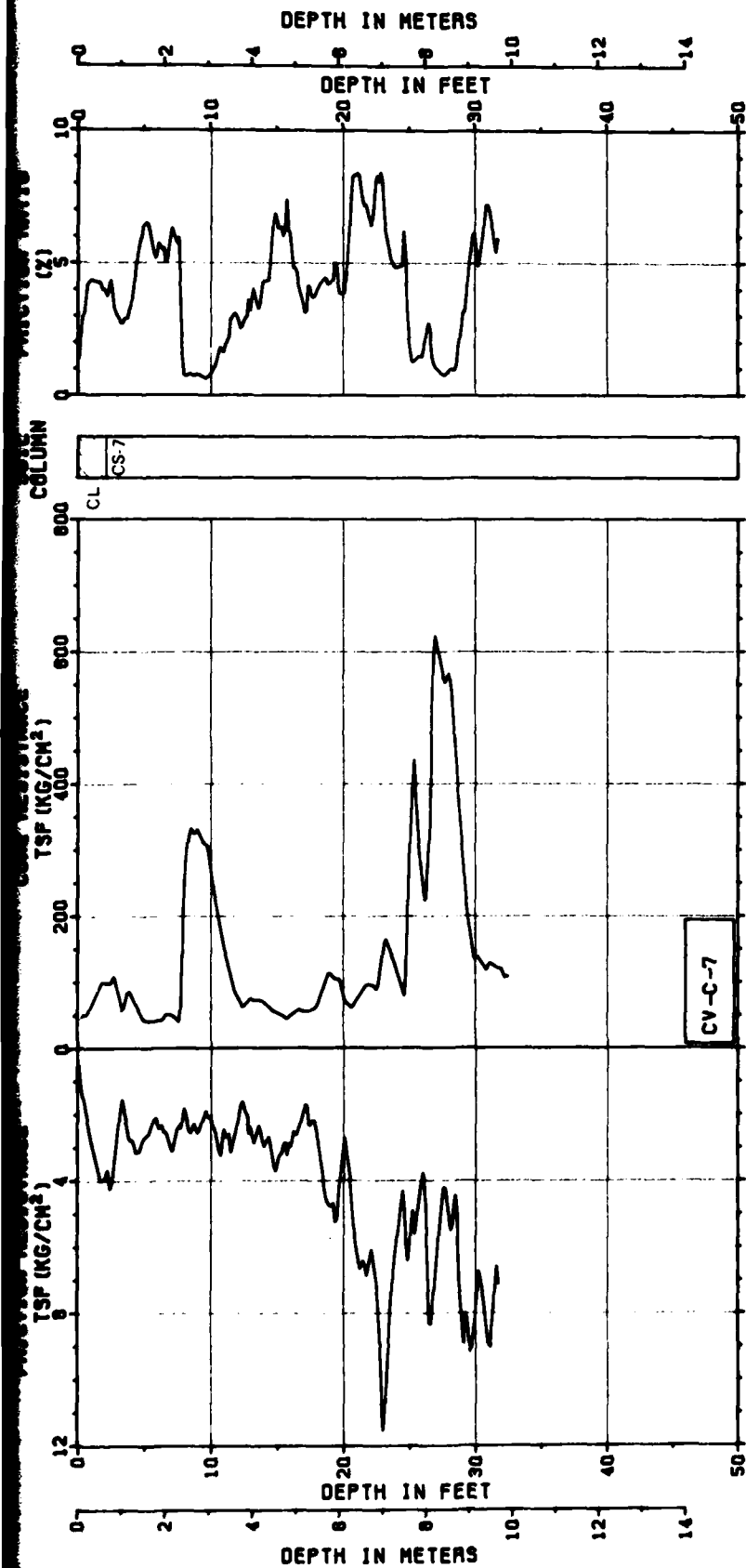
CONE PENETROMETER TEST RESULTS
CAVE VALLEY, NEVADA
PAGE 1 OF 6

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FIGURE II-9-1







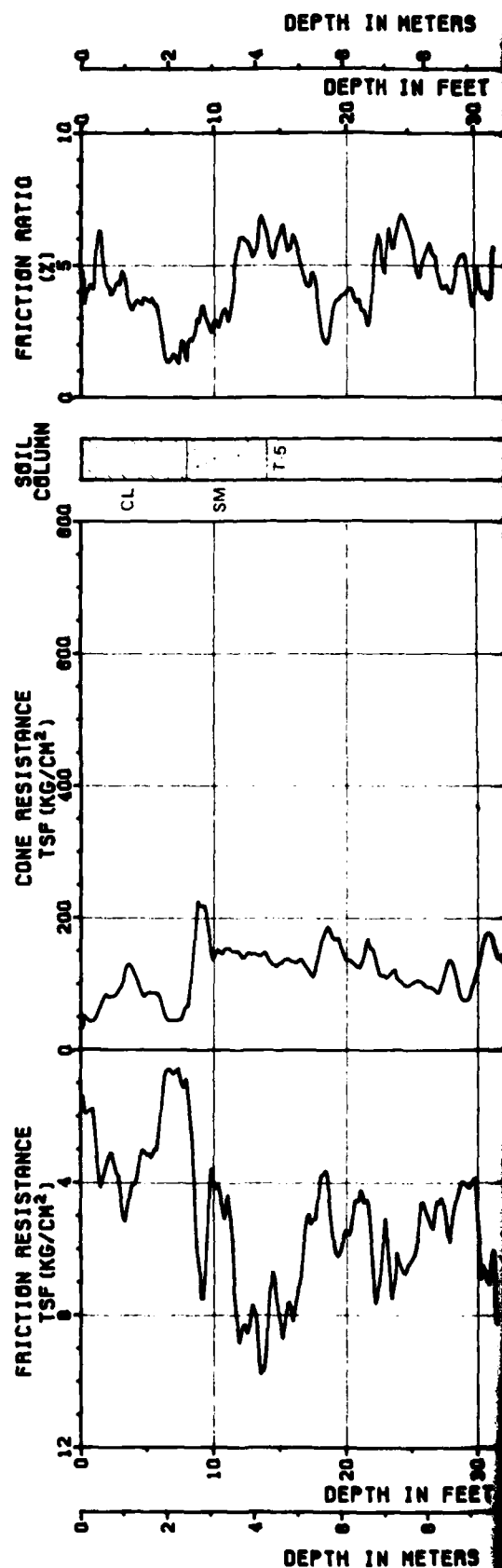
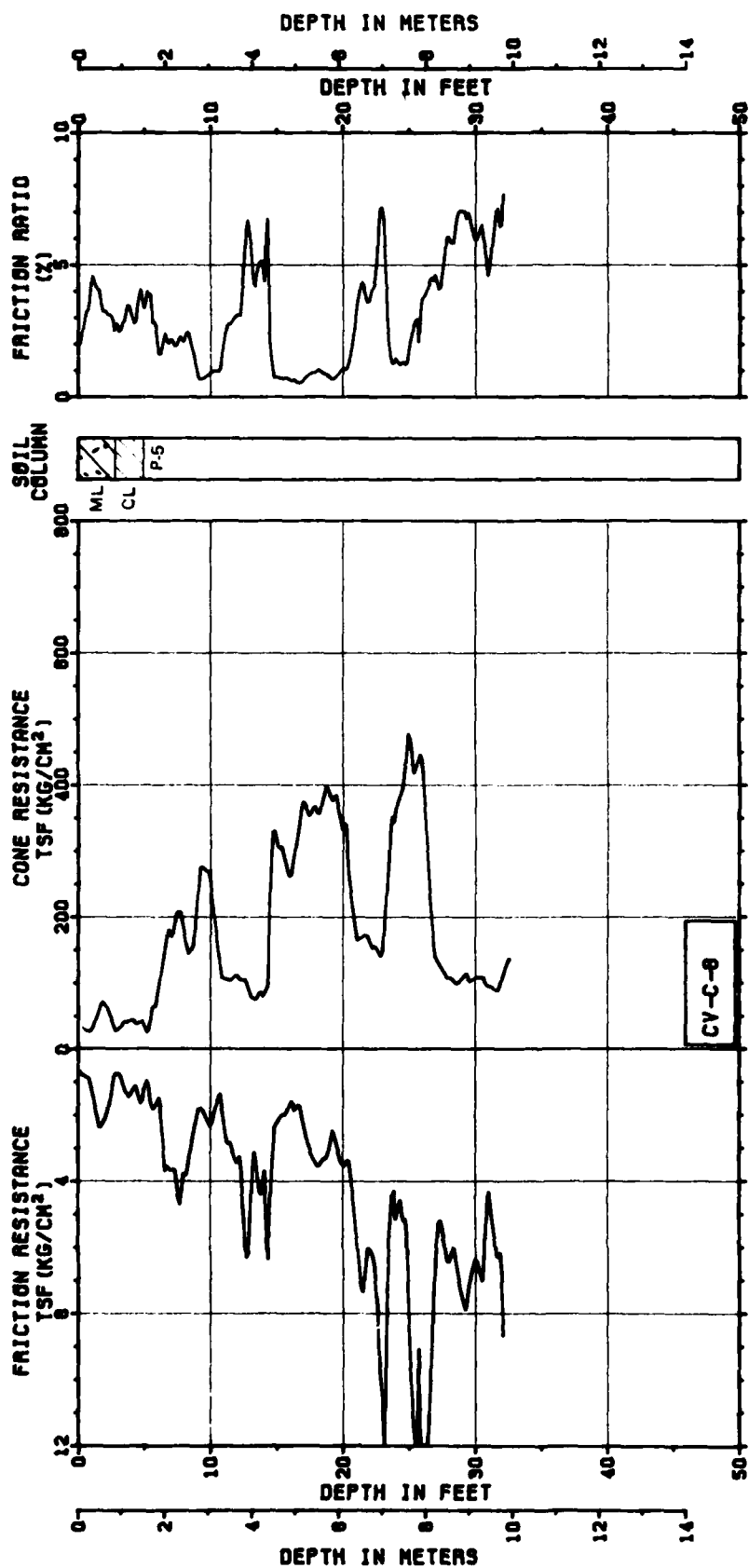
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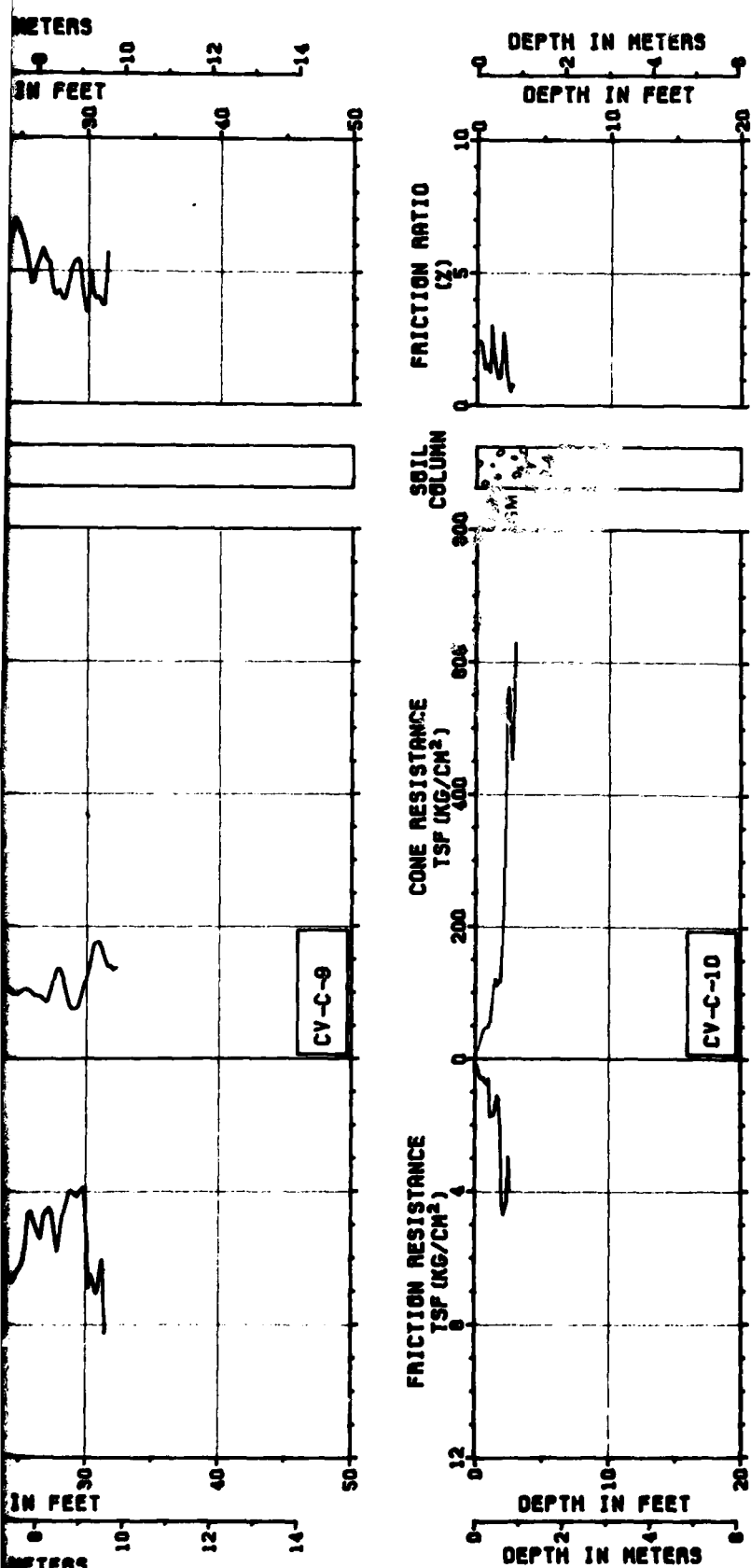
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CONE PENETROMETER TEST RESULTS
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FIGURE II-9-1



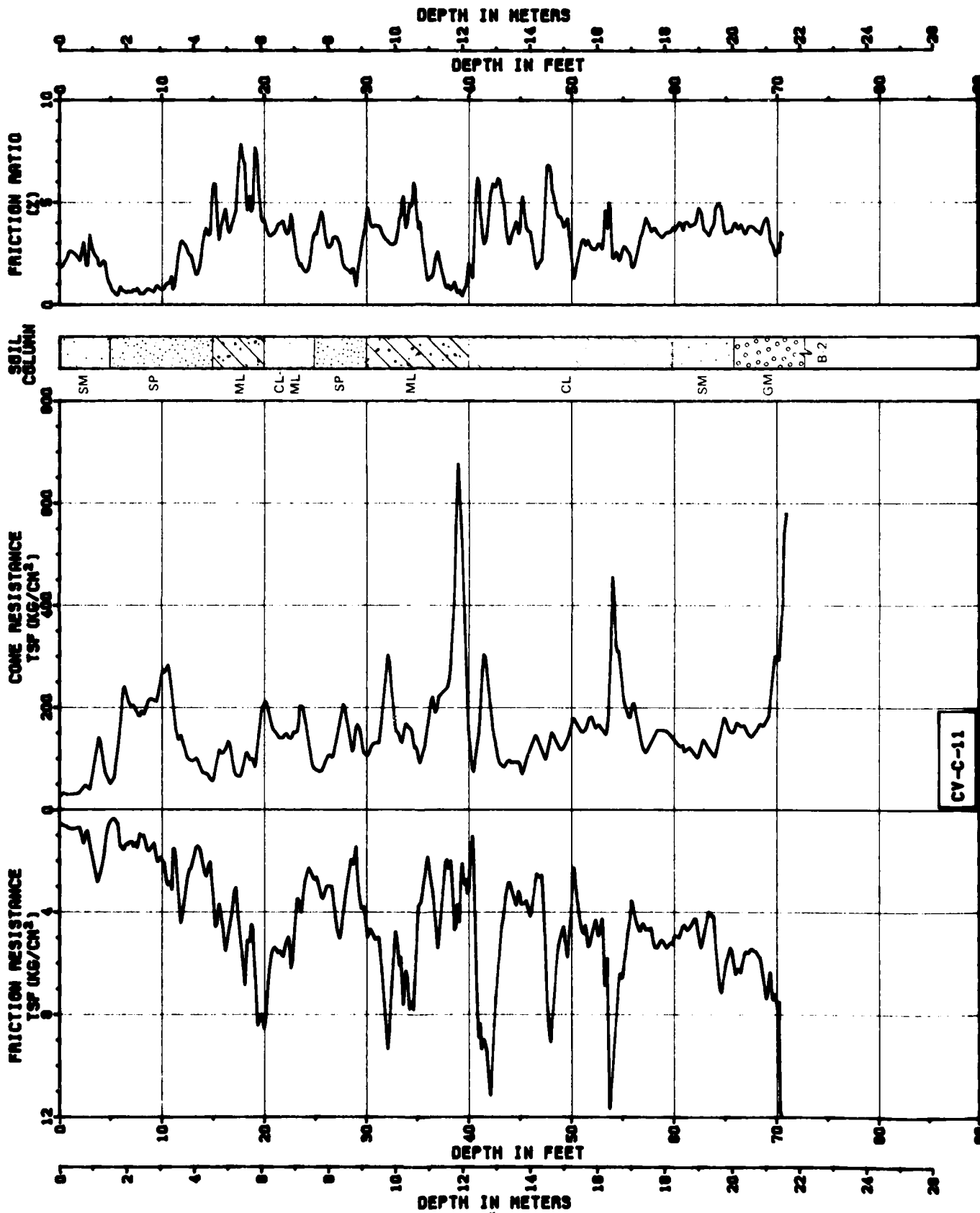


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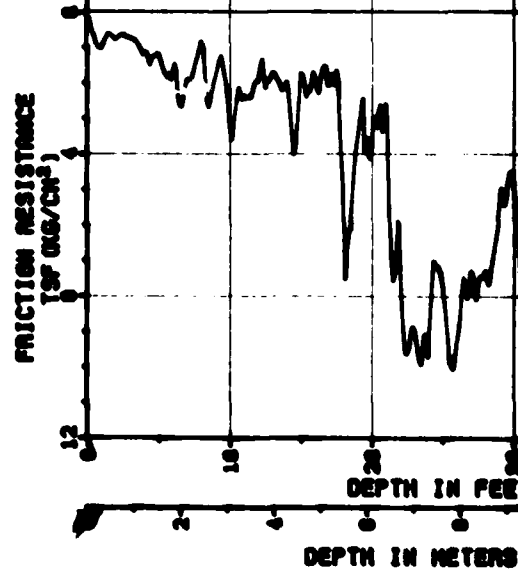
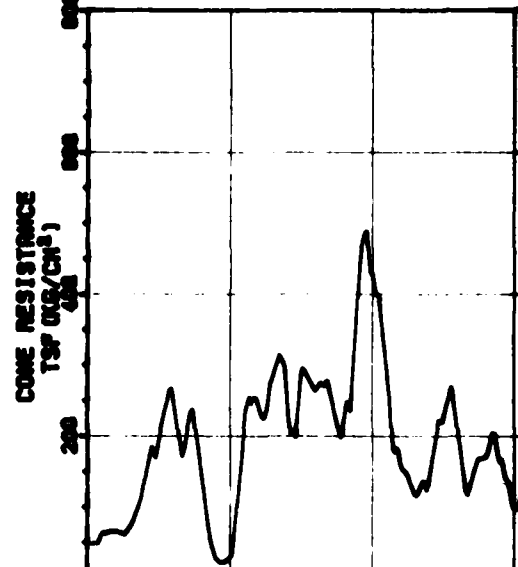
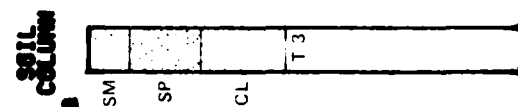
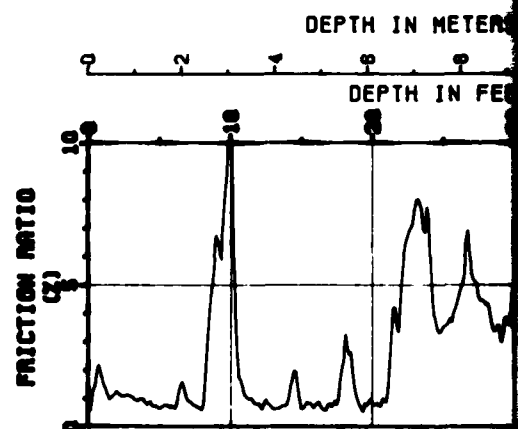
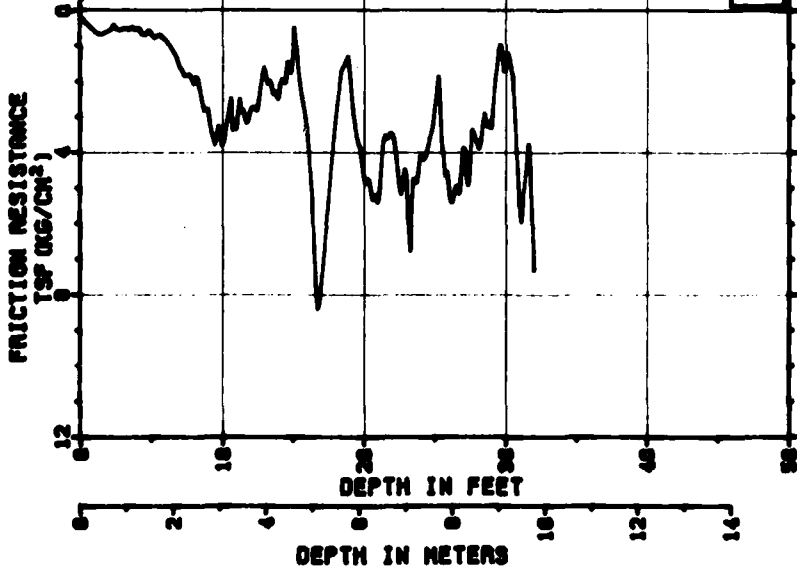
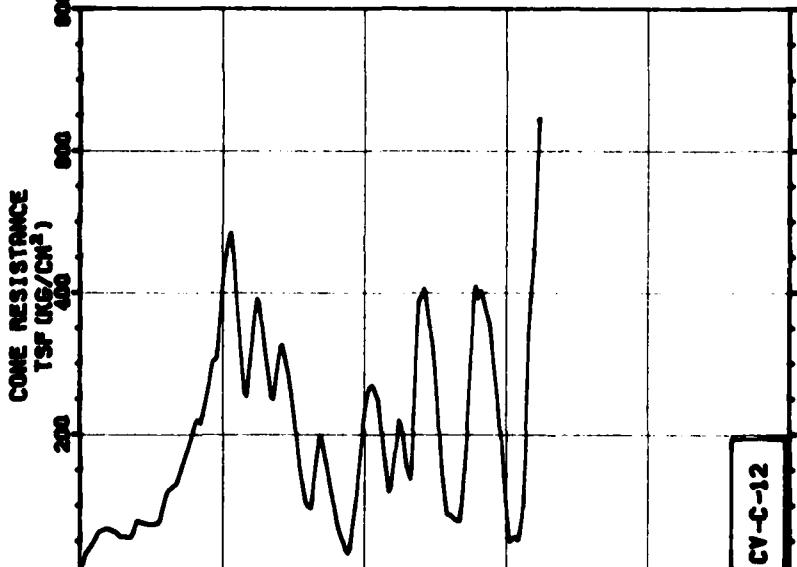
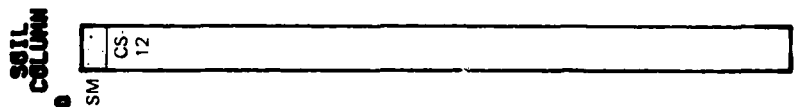
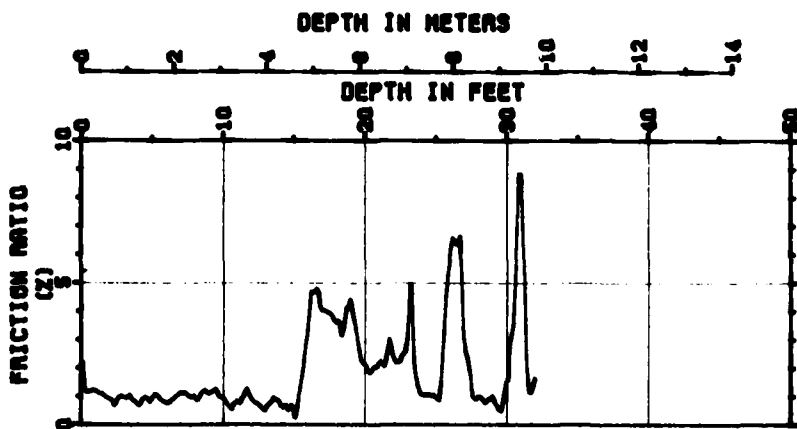
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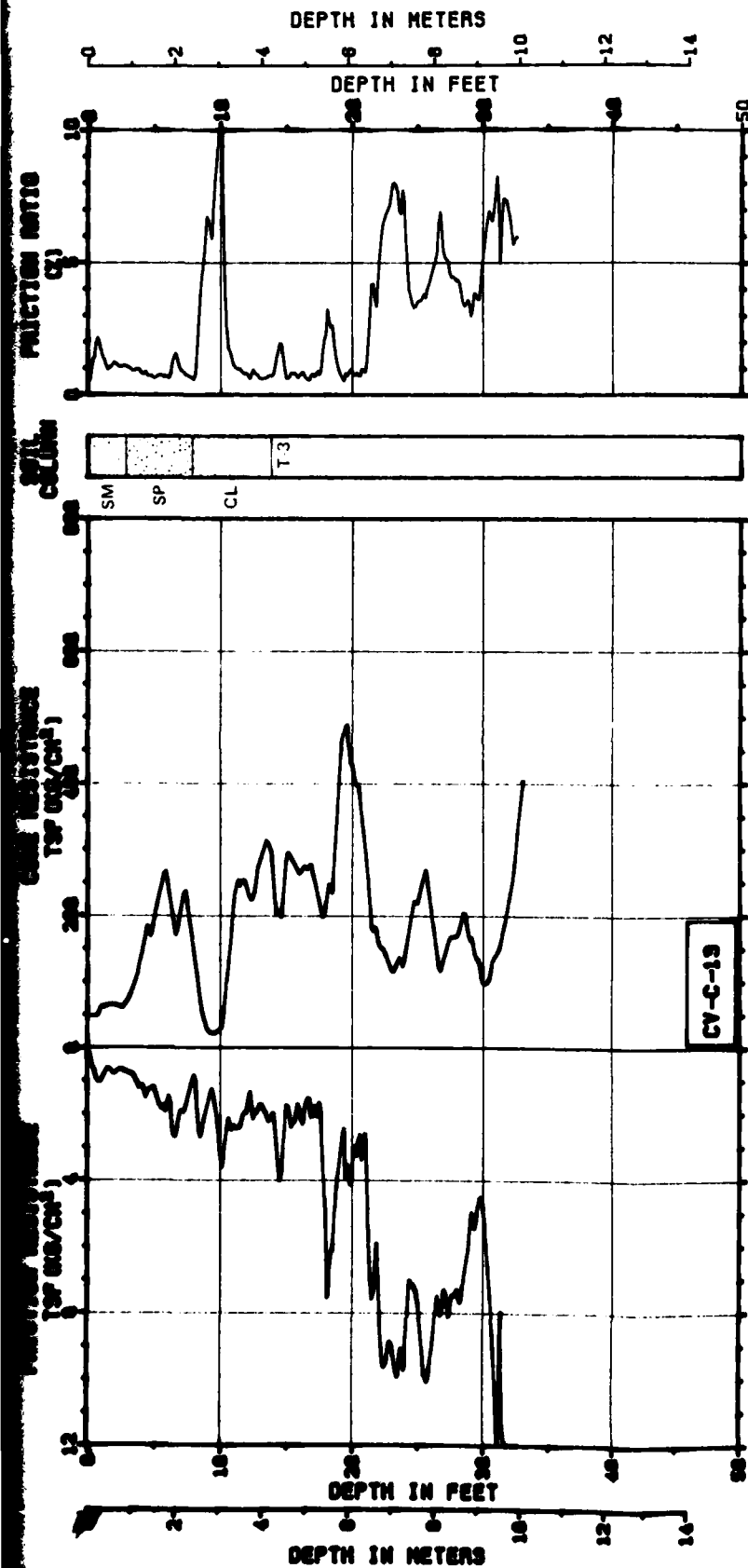
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FIGURE II-9.1



CV-C-11





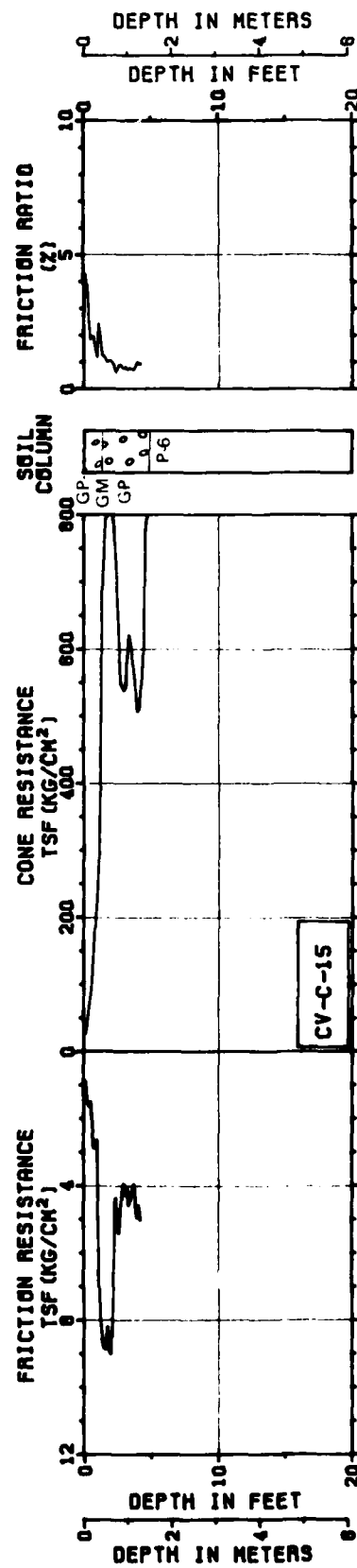
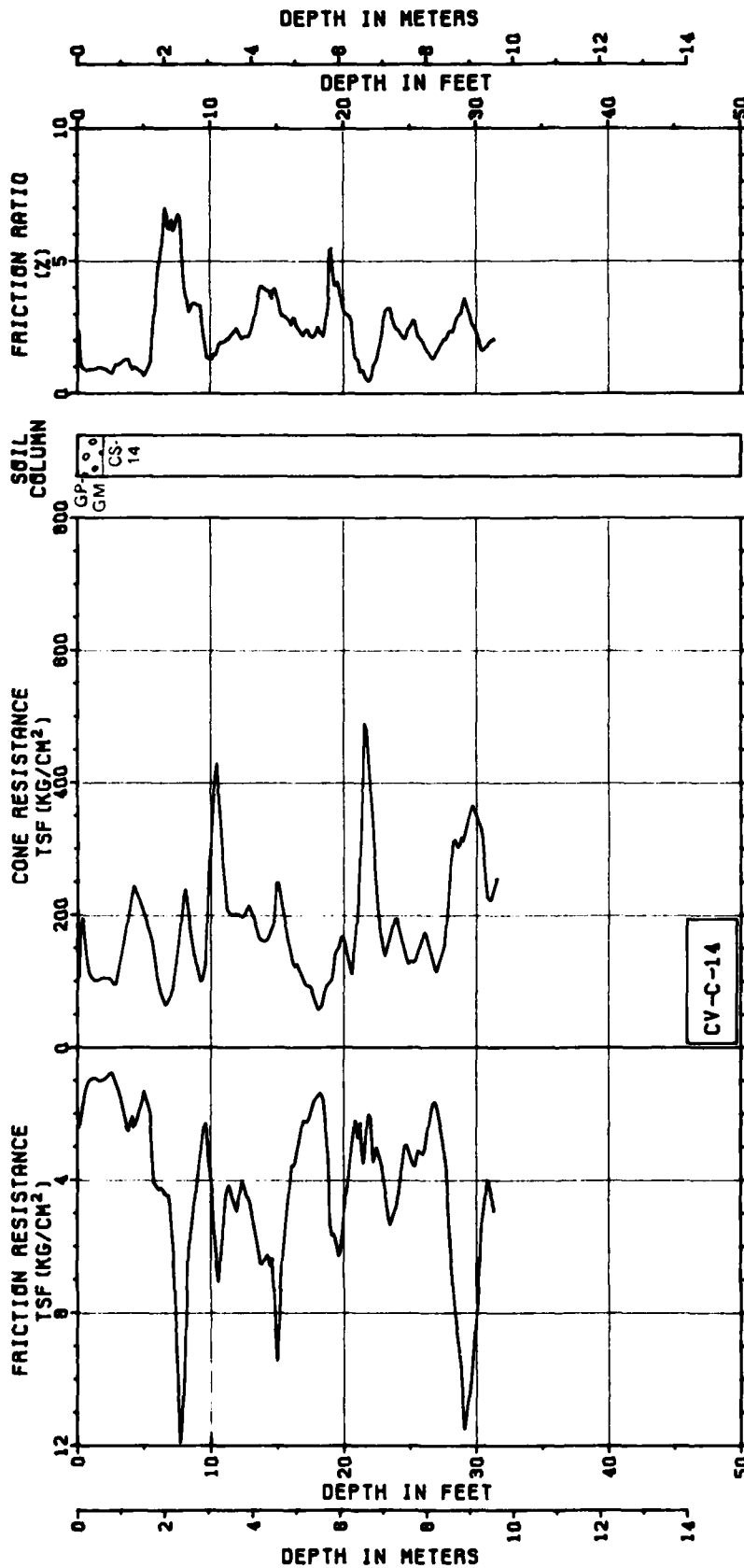
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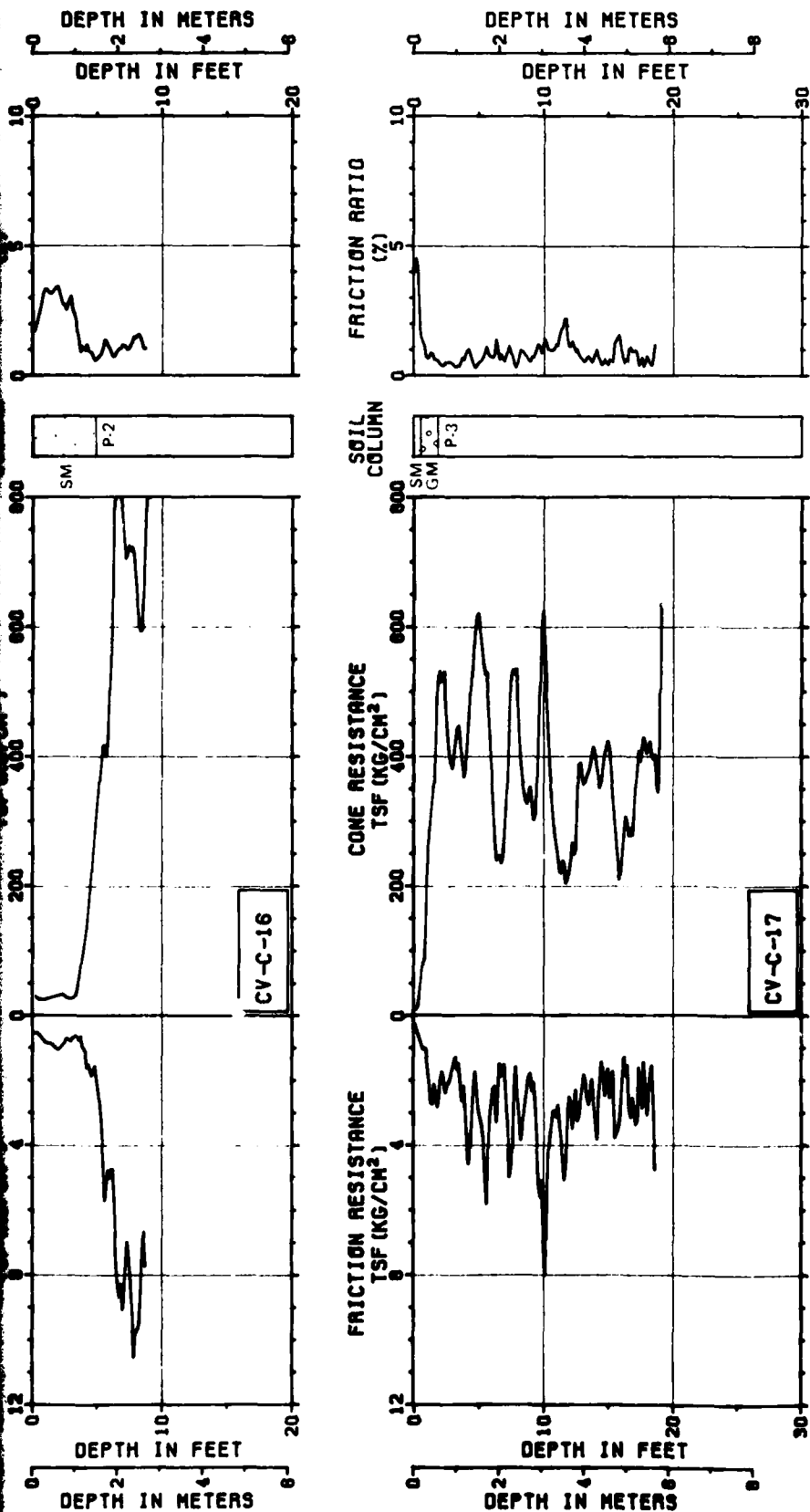
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CONE PENETROMETER TEST RESULTS
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FIGURE II-9 1





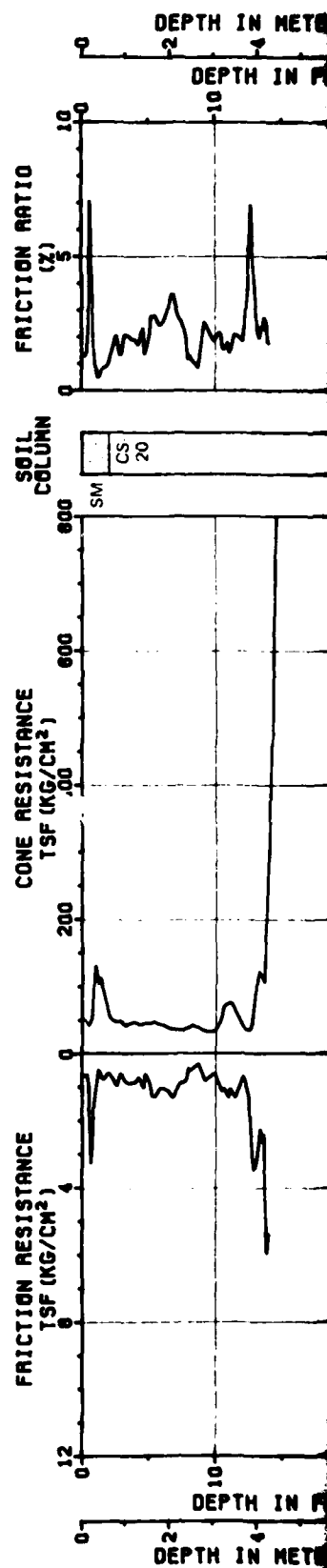
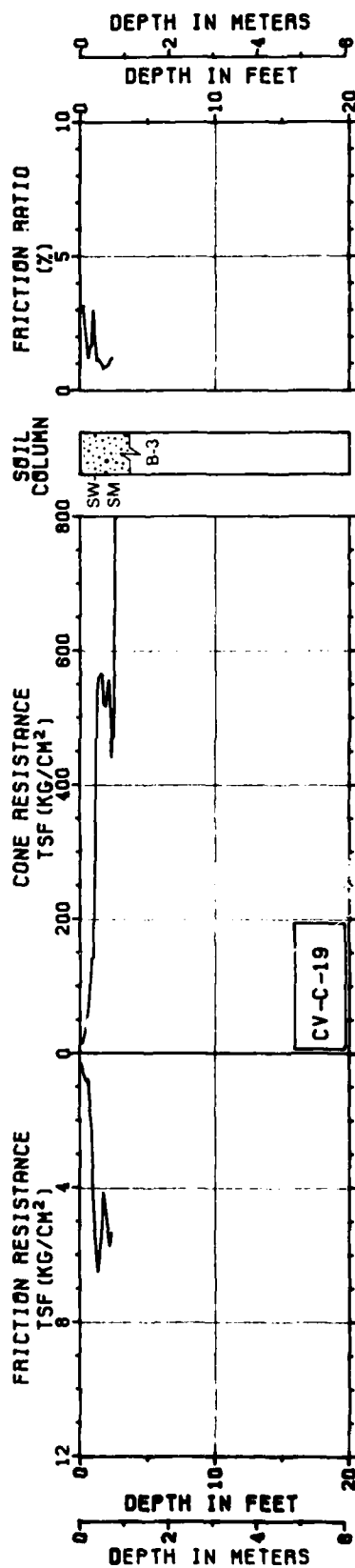
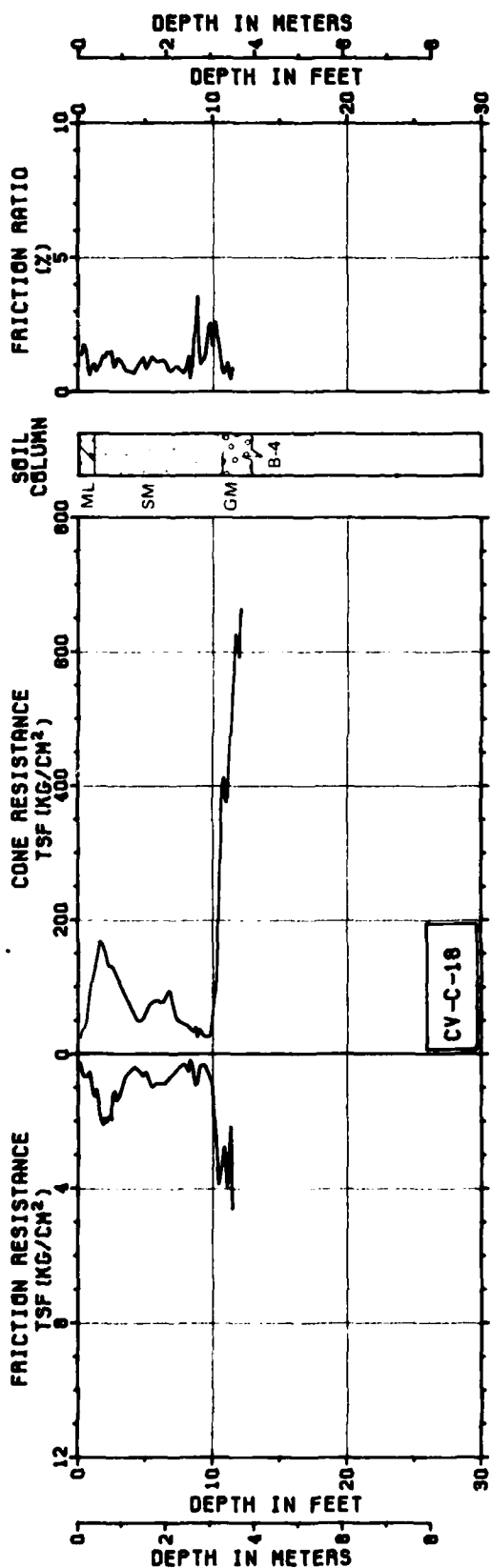
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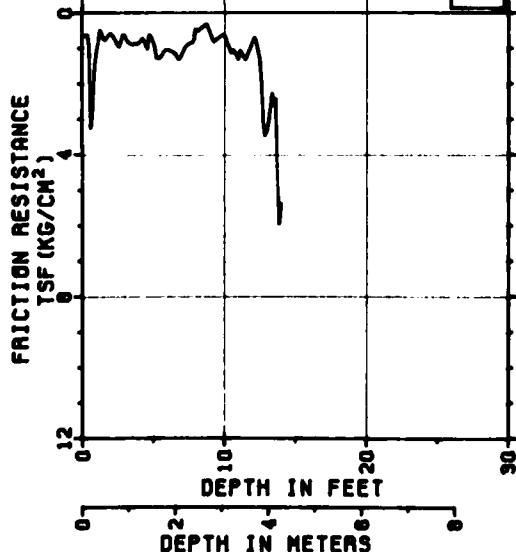
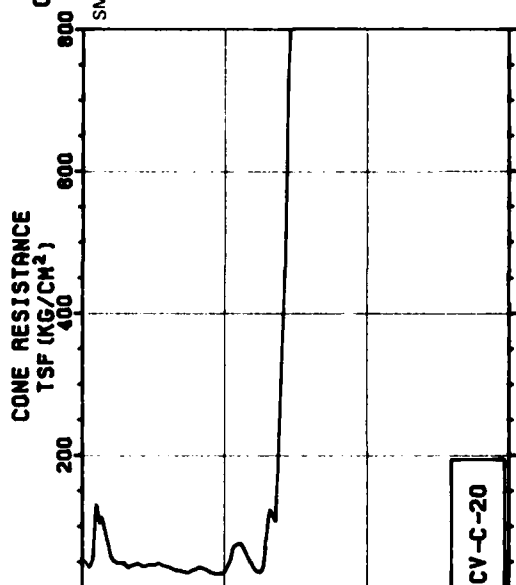
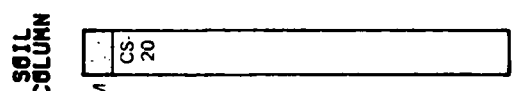
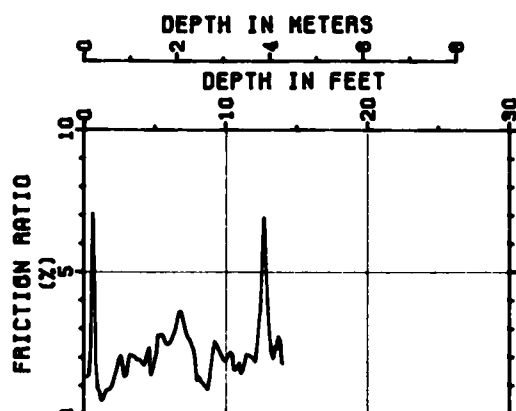
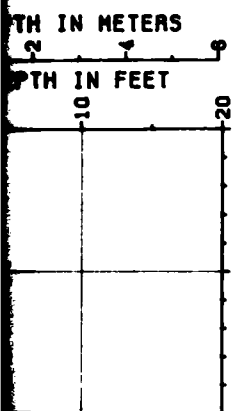
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CONE PENETROMETER TEST RESULTS
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FIGURE T-9.1





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**CONE PENETROMETER TEST RESULTS
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FIGURE II-9 1

2

10.0 LABORATORY TEST RESULTS

Explanation: Table II-10-1 contains a summary of laboratory test results. This table contains results of sieve analysis; plasticity data; in-situ dry unit weight, moisture content, degree of saturation, and void ratio for drive and Pitcher samples; results of compaction tests; and specific gravity of solids. Other tests such as triaxial compression, unconfined compression, direct shear, consolidation, chemical, and California Bearing Ratio (CBR) are indicated on the table. Tables II-10-2 through II-10-6 and Figures II-10-1 through II-10-3 present results of triaxial compression, unconfined compression, direct shear, consolidation, chemical, and CBR tests.

All tests were performed in general accordance with the American Society for Testing and Materials (ASTM) procedures. The following list presents the ASTM designations for the tests performed during the investigation.

<u>Type of Test</u>	<u>ASTM Designations</u>
Particle Size Analysis	D 422-63
Liquid Limit	D 423-66
Plastic Limit	D 424-59
Unit Weight	D 2937-71
Moisture Content	D 2216-71
Compaction	D 1557-70
Specific Gravity of Solids	D 854-58
Triaxial	D 2850-70
Unconfined Compression	D 2166-66
Direct Shear	D 3080-72
Consolidation	D 2435-70
Test for Alkalinity (pH)	D 1067-70
Water Soluble Sodium	D 1428-64
Water Soluble Chloride	D 512-67
Water Soluble Sulphate	D 516-68
Water Soluble Calcium	D 511-72
Calcium Carbonate	D 1126-67
California Bearing Ratio (CBR)	D 1883-73

Explanation for the tables and figures presented in this section are as follows:

- A. Activity Number - Boring, trench, test pit, or surficial sample designation.
- B. Sample Number - Prefix indicates the type of sample; explanation is at the bottom of the table.
- C. Sample Interval - This is the depth range measured from ground surface over which the sample was obtained.
- D. Percent Finer by Weight - Presents the results of laboratory particle size analysis (ASTM D 422-63) performed on representative soil samples at the depth indicated. The numbers represent the percent (of dry weight) of the total sample weight passing through each sieve size indicated.
- E. Atterberg Limits (ASTM D 423-66 and D 424-59)
 - LL - Liquid Limit, the water content (as percent of soil dry weight) corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).
 - PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).
 - PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.
 - NP - Nonplastic.
- F. USCS - Unified Soil Classification System symbols are given here; see Table II-6-1 in Section 6.0, "Boring Logs", for complete details of USCS system.

- G. In Situ - Presents results of tests on drive and Pitcher samples.

Dry Unit Weight - indicates dry unit weight of soil determined as per ASTM D 2937-71.

Moisture Content - weight of water reported in percent of dry weight of soil sample (ASTM D 2216-71).

Saturation - the degree of saturation in a soil sample is defined as the ratio (in percent) of the volume of water to the volume of all voids in the soil.

Void Ratio - the numerical ratio of the volume of voids to the volume of solids in a soil specimen.

- H. Compacted - Indicates results of laboratory maximum dry density and optimum moisture content test per ASTM D 1557-70.

- I. Specific Gravity of Solids (ASTM D 854-58) - Indicates the ratio of 1) the weight in air of a given volume of soil solids at a stated temperature, to 2) the weight in air of an equal volume of distilled water at a stated temperature.

- J. Triaxial - The triaxial compression tests were performed in accordance with the procedures of ASTM D 2850-70. The following explanations and definitions apply.

Triaxial Compression Test - a cylindrical specimen of soil is surrounded by a fluid in a pressure chamber and subjected to an isotropic pressure. An additional compressive load is then applied, directed along the axis of the specimen called the axial load.

Consolidated-Drained (CD) Test - a triaxial compression test in which the soil was first consolidated under an all-around confining stress (test chamber pressure) and was then compressed (and hence sheared) by increasing the vertical stress. "Drained" indicates that excess pore water pressure generated by strains are permitted to dissipate by

the free movement of pore water during consolidation and compression.

Consolidated-Undrained (CU) Test - a triaxial compression test in which essentially complete consolidation under the confining (chamber) pressure is followed by a shear test at constant water content.

Confining Pressure (σ_3) - the isotropic chamber pressure applied to the soil specimen during consolidation and compression.

Maximum Deviator Stress ($\sigma_1 - \sigma_3$) - the difference between the major and minor principal stresses in the specimen at failure. The major principal stress on the specimen is equal to the unit axial load plus the chamber pressure, and the minor principal stress on the specimen is equal to the chamber pressure.

Strain Rate - axial strain, ϵ , at a given stress level is defined as the ratio of the change in length (ΔL) of the specimen to the original length of the specimen (L_0). The rate of strain was controlled during the test so that this ratio increased at equal increments for each minute of testing.

Back Pressure - pressure in excess of atmospheric applied to the pore water of a soil sample. Back pressure is usually applied to 1) increase saturation of the sample, or 2) simulate the actual in-situ pressure regime.

- K. Unconfined Compression - Test procedures were as described in ASTM D 2166-66. Unconfined compressive strength is defined as the load per unit area at which an unconfined prismatic or cylindrical specimen of soil will fail in a simple compression test. In these methods, unconfined compressive strength is taken as the maximum load attained per unit area or the load per unit area at 20 percent axial strain, whichever occurred first during the performance of a test.
- L. Direct Shear - The procedures of ASTM D 3080-72 were followed for direct shear testing. In this test, soil under an

applied normal load is stressed to failure by moving one section of the soil container (shear box) relative to the other section. Normal stress is the value of load per unit area acting perpendicular to the plane of shearing. Maximum shear strength is defined as the maximum resistance of a soil to shearing (tangential) stresses.

- M. Consolidation (ASTM D 2435-70) - A consolidation test is a test in which a cylindrical soil specimen is laterally confined in a ring and compressed between porous plates. The term "consolidation", as used here, indicates the gradual reduction in volume of the soil mass resulting from an increase in compressive stress (axial load per unit area).
- N. Chemical - The chemical tests performed on soil samples included: pH; water soluble sodium, chloride, sulphate, calcium; and calcium carbonate content. The pH is an index of the acidity or alkalinity of a soil in terms of the logarithm of the reciprocal of the hydrogen ion concentration. ASTM test procedure designations for these chemical tests are included in the list on the first page of this Explanation.
- O. CBR - California Bearing Ratio (CBR) is the ratio (in percent) of the resistance to penetration developed by a sub-grade soil to that developed by a standard crushed-rock base material. The procedures for conducting a CBR test were as outlined in ASTM D 1883-73. The materials tested

for CBR were also analyzed for particle-size distribution (ASTM D 422-63) and compaction characteristics (ASTM D 1557-70). The term "percentage of maximum density" indicates the ratio (as a percentage) of the compacted sample dry unit weight to maximum dry density obtained in the laboratory from ASTM D 1557-70, "Moisture-Density Relations of Soils Using 10-pound (4.5-kg) Hammer and 18-inch (457-mm) Drop."

D-2	3.3 - 3.7	1.00 - 1.13			
P-3	6.3 - 6.8	1.92 - 2.07			
P-3	7.0 - 7.5	2.13 - 2.29			
P-3	7.6 - 8.1	2.32 - 2.47			
P-3	7.6 - 8.1	2.32 - 2.47	0	7	93
P-4	10.8 - 11.6	3.29 - 3.54			
P-5	16.5 - 17.4	5.03 - 5.30			
P-5	17.4 - 18.0	5.30 - 5.49			
P-6	20.8 - 21.6	6.34 - 6.58			
P-7	25.8 - 26.6	7.86 - 8.11	0	76	24
P-8	30.8 - 31.6	9.39 - 9.63	19	77	4
P-9	40.8 - 41.6	12.44 - 12.68	26	70	4
P-10	50.8 - 51.6	15.48 - 15.73			
P-11	60.8 - 61.6	18.53 - 18.78			
P-12	70.8 - 71.6	21.58 - 21.82	31	65	4
D-13	80.8 - 81.3	24.63 - 24.78			
D-14	90.5 - 91.0	27.58 - 27.74	20	68	12
D-15	94.0 - 94.6	28.65 - 28.83			
D-1	2.3 - 2.9	0.70 - 0.88	0	63	37
D-2	5.3 - 5.9	1.62 - 1.80			
D-3	7.3 - 7.9	2.23 - 2.41	11	85	4
P-4	15.1 - 16.7	4.60 - 5.09	0	3	97
P-5	20.1 - 20.9	6.13 - 6.37			
P-5	20.9 - 22.6	6.37 - 6.89	1	25	74
P-6	25.9 - 26.7	7.89 - 8.14	27	69	4
P-7	30.9 - 31.7	9.42 - 9.66	0	4	96
P-7	30.2 - 30.7	9.20 - 9.36			
P-7	31.0 - 31.5	9.45 - 9.60			
P-7	31.8 - 32.3	9.69 - 9.85			
P-8	40.9 - 41.7	12.47 - 12.71	5	15	80
D-9	50.0 - 50.8	15.24 - 15.48			
P-10	60.9 - 61.7	18.56 - 18.81	0	51	49
D-11	70.0 - 70.8	21.34 - 21.58	47	34	19

		CH	75.7	1213	36.1
		CH	69.4	1112	44.8
		SM	90.7	1453	22.7
	NP	SM	95.1	1524	14.4
		SP	104.9	1680	15.8
		SW	112.6	1804	11.1
		SM	96.8	1551	16.4
		SM	92.7	1485	21.5
		SP	112.5	1802	13.9
		SP	113.7	1821	7.4
		SP-SM	107.8	1727	13.3
		SP-SM	109.9	1761	9.9
		SM	86.5	1386	7.0
		SP	105.3	1687	2.6
		SP	116.9	1873	15.3
	NP	ML	71.7	1149	28.7
		CL-ML	100.9	1616	10.9
19	6	CL-ML	98.0	1570	10.7
		SP	109.9	1761	6.9
27	1	ML	77.0	1234	27.2
		ML	77.4	1240	26.6
		ML	78.0	1250	25.2
		ML	89.6	1435	20.0
18	8	CL	99.6	1596	17.6
		CL	93.1	1491	15.2
		SM	77.8	1246	20.5
		GM	116.5	1866	4.9

[illegible]

	D-7	20.3 - 20.8	6.19 - 6.34	52	39	9	
	D-8	25.5 - 26.0	7.77 - 7.92	35	41	24	
	D-9	30.5 - 31.0	9.30 - 9.45	46	46	8	
	D-11	50.2 - 50.7	15.30 - 15.45	53	37	10	
	D-12	60.2 - 60.7	18.35 - 18.50				
	D-13	70.3 - 70.6	21.43 - 21.52	26	49	25	
	D-13	70.6 - 70.8	21.52 - 21.58	47	44	9	
	D-14	80.3 - 80.8	24.48 - 24.63				
CV-B-4	D-2	3.0 - 3.5	0.91 - 1.07				
	P-3	5.0 - 5.8	1.52 - 1.77				
	P-3	5.8 - 6.6	1.77 - 2.01	0	75	25	
	P-3	5.8 - 6.6	1.77 - 2.01				
	P-3	6.6 - 7.1	2.01 - 2.16				
	P-4	8.0 - 9.0	2.44 - 2.74	0	82	18	
	D-7	30.3 - 30.8	9.24 - 9.39	58	30	12	
	D-8	40.3 - 40.8	12.28 - 12.44				
	D-9	50.3 - 50.8	13.33 - 15.48	24	57	19	
	D-11	70.3 - 70.8	21.43 - 21.58	45	46	9	
	D-12	80.3 - 80.8	24.48 - 24.63				
	D-14	99.3 - 99.8	30.27 - 30.42	42	46	12	
CV-T-1	B-1	0.5 - 2.0	0.15 - 0.61	3	68	29	
	b-2	11.0 - 12.0	3.35 - 3.66	56	40	4	100
CV-T-2	B-1	0.5 - 1.5	0.15 - 0.46	49	33	18	
CV-T-3	b-3	10.0 - 11.0	3.05 - 3.35				
CV-T-4	B-1	0.5 - 2.0	0.15 - 0.61	1	58	41	
CV-T-5	B-1	0.5 - 2.0	0.15 - 0.61	0	22	78	
	b-3	10.0 - 11.0	3.05 - 3.35	0	60	40	
CV-T-6	b-2	10.0 - 11.0	3.05 - 3.35	11	52	37	
CV-P-1	B-1	0.5 - 2.0	0.15 - 0.61	43	43	14	
CV-P-3	b-1	0.5 - 1.5	0.15 - 0.46	54	28	18	
CV-P-5	b-1	0.5 - 2.0	0.15 - 0.61	0	34	66	

BY WEIGHT					ATTERBERG LIMITS (b)			USCS (c)	IN SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (f)	UNCONFINED COMPRESSION
STANDARD SIEVE NO.		PARTICLE SIZE (mm)							DRY UNIT WEIGHT		CONTENT MOISTURE (%)	SATURA- TION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE			
NO.		SILT OR CLAY			LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)				
40	100	200	.005	.001	LL	PL	PI												
80	64	54			31	29	2	ML	95.2	1525	18.4	67.6	0.71				2.61		
17	11	9						GP-GM	112.2	1797	14.3	77.0	0.50						
35	26	24			32	21	11	SC	113.9	1825	10.7	60.6	0.48						
18	10	8						GW-GM	123.9	1985	9.4	70.5	0.36						
20	12	10						GW-GM	127.2	2038	10.2	84.4	0.33						
								GW-GM	126.1	2020	10.5	84.7	0.34						
45	32	25						SM	116.6	1868	12.7	77.0	0.45						
21	12	9						GW-GM	128.5	2059	7.0	61.2	0.31						
								SM	112.5	1802	14.9	81.2	0.50						
								SM	114.3	1831	6.2	35.0	0.47				*		
								SM	99.0	1586	11.0	42.5	0.70				*		
92	41	25					NP	SM	93.4	1496	10.6	35.6	0.80				*		
								SM	99.1	1588	11.7	45.1	0.70				*		
								SM	94.5	1514	11.7	40.4	0.78				*		
94	34	18						SM	100.6	1612	6.8	28.4	0.63				2.63		
18	14	12			42	18	24	GP-GC	122.5	1962	9.5	68.6	0.38						
								GP-GC	119.4	1913	12.6	83.2	0.41						
44	22	19			34	16	18	SC	123.8	1983	12.9	96.8	0.36						
23	12	9			42	21	21	SW-SC	123.2	1974	8.6	62.8	0.37						
							NP	SM	128.7	2062	7.9	68.8	0.31						
25	15	12						SP-SM	119.2	1910	10.7	70.1	0.41						
90	42	29					NP	SM						128.6	2060	9.0	2.68		
29	8	4						GP											
28	23	18						GM											
					41	20	21	CL											
92	66	41						SM						112.5	1802	14.0			
95	85	78	20	5	35	23	12	CL						106.0	1698	20.0	2.64		
98	67	40					NP	SM											
64	48	37						SM											
41	21	14						GM											
33	25	18						GM											
97	81	66					NP	ML											
					29	18	11	CL											

USCS (c)	IN SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (1)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
	DRY UNIT WEIGHT		CONTENT MOISTURE (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE							
	(pcf)	(kg/m³)				(pcf)	(kg/m³)								
ML	95.2	1525	18.4	67.6	0.71				2.61						
GP-GM	112.2	1797	14.3	77.0	0.50										
SC	113.9	1825	10.7	60.6	0.48										
GW-GM	123.9	1985	9.4	70.5	0.36									*	
GW-GM	127.2	2038	10.2	84.4	0.33										
GW-GM	126.1	2020	10.5	84.7	0.34										
SM	116.6	1868	12.7	77.0	0.45										
GW-GM	128.5	2059	7.0	61.2	0.31										
SM	112.5	1802	14.9	81.2	0.50									*	
SM	114.3	1831	6.2	35.0	0.47						*				
SM	99.0	1586	11.0	42.5	0.70					*					
SM	93.4	1496	10.6	35.6	0.80										
SM	99.1	1588	11.7	45.1	0.70					*					
SM	94.5	1514	11.7	40.4	0.78					*					
SM	100.6	1612	6.8	28.4	0.63				2.63			*			
GP-GC	122.5	1962	9.5	68.6	0.38										
GP-GC	119.4	1913	12.6	83.2	0.41										
SC	123.8	1983	12.9	96.8	0.36										
SW-SC	123.2	1974	8.6	62.8	0.37									*	
SM	128.7	2062	7.9	68.8	0.31										
SP-SM	119.2	1910	10.7	70.1	0.41										
SM						128.6	2060	9.0	2.68						*
GP															
GM															
CL															
SM						112.5	1802	14.0							*
CL						106.0	1698	20.0	2.64						*
SM															
SM															
GM															
GM															
ML														*	
CL															



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SUMMARY OF LABORATORY
TEST RESULTS
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TABLE II-10.1

[illegible]

NOTES:

- (a) Sample types
 SS - Standard split spoon
 P - Pitcher
 D - Ertec Drive
 B,b - Bulk
 (b) NP - Not Plastic
- (c) USCS - Unified Soil Classification System
 (d) * Indicates that test has been performed
 and results are included in this report

[illegible]

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	MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE BMO/AFRCE-MX
SUMMARY OF DIRECT SHEAR TEST RESULTS CAVE VALLEY, NEVADA	
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SUMMARY OF CHEMICAL TEST RESULTS CAVE VALLEY, NEVADA	
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COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m ³		pcf	kg/m ³			
A	SM	29		NP	2.68	128.6	2060	9.0	121.5	1946	9.0	94.5	36
									116.2	1852	8.5	90.4	18
B	SM	41				112.5	1802	14.0	107.8	1727	15.2	95.8	33
									104.4	1672	14.5	92.8	27
									100.7	1613	14.8	89.6	17
C	CL	78	35	12	2.64	106.0	1698	20.0	100.9	1616	20.5	95.2	17
									97.6	1564	21.4	92.0	11
									92.4	1480	20.8	87.2	8
D	CH	97	60	41		103.0	1650	22.2	101.5	1626	21.4	98.5	8
									98.3	1575	21.4	95.5	3
									88.9	1424	21.1	86.3	2

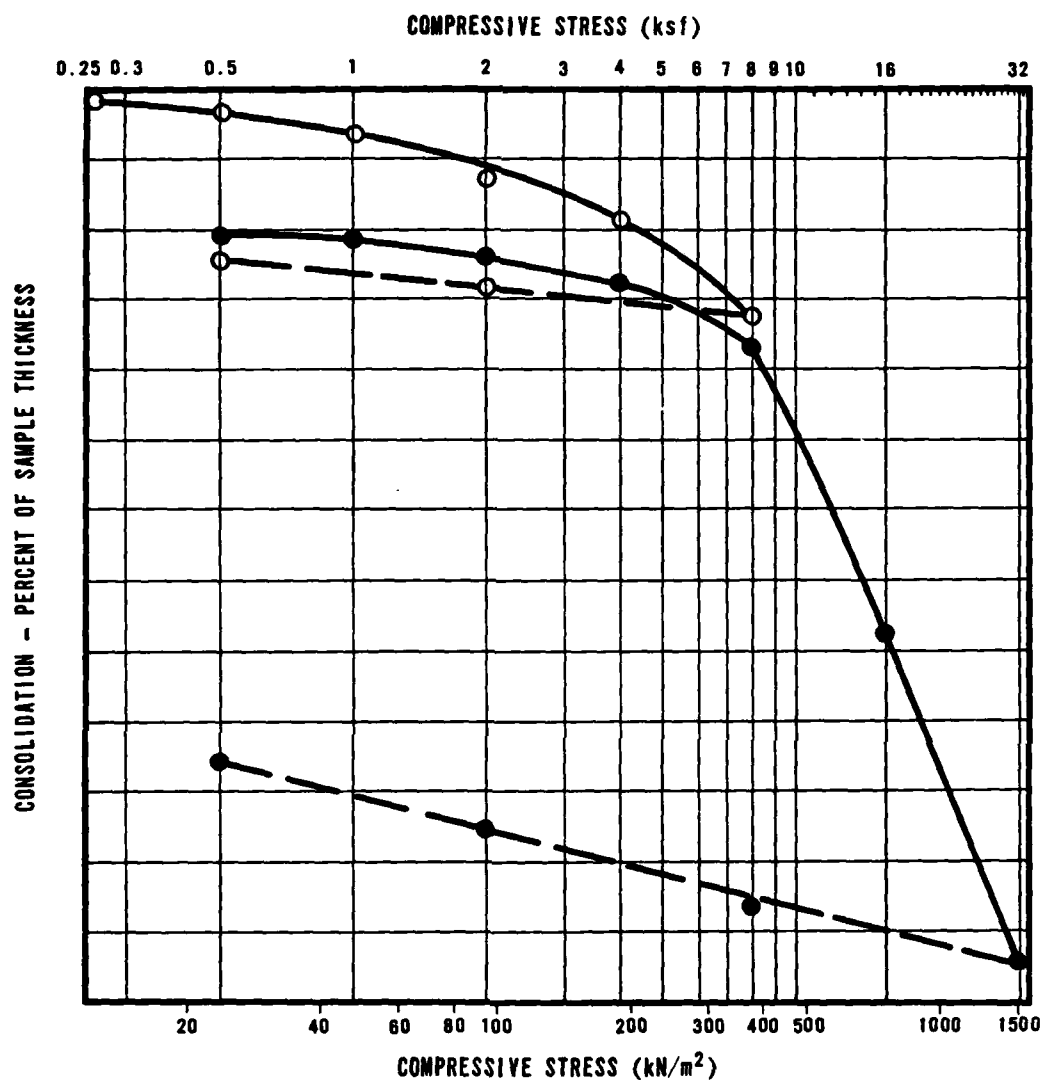


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CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
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TABLE II-10-6



SYMBOL	BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	INITIAL DRY DENSITY		INITIAL MOISTURE CONTENT (%)	INITIAL VOID RATIO	INITIAL DEGREE OF SATURATION (%)
			FEET	METERS		pcf	kg/m³			
○	CV-B-1	P-5	16.5 - 17.4	5.03 - 5.30	CH	75.7	1213	36.1	1.23	79.4

- AT FIELD MOISTURE
 ● AFTER ADDITION OF WATER
 — COMPRESSION
 - - - REBOUND

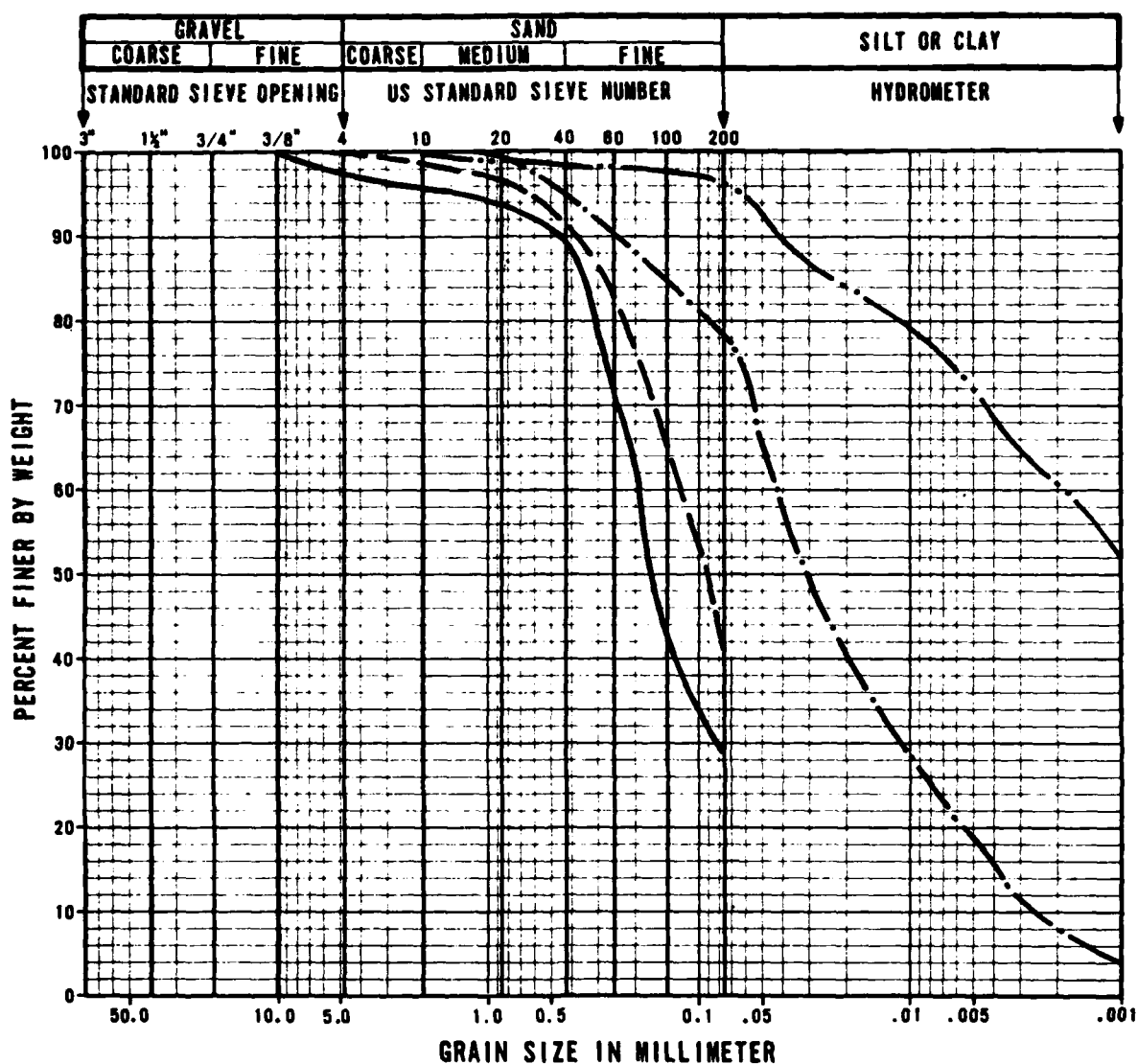
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**CONSOLIDATION TEST RESULTS
 CAVE VALLEY, NEVADA**

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FIGURE II-10-1



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
—	A	CV-T-1	0.5 - 2.0	0.15 - 0.61	SM
- -	B	CV-T-4	0.5 - 2.0	0.15 - 0.61	SM
- . -	C	CV-T-5	0.5 - 2.0	0.15 - 0.61	CL
- - -	D	CV-P-8	0.5 - 2.0	0.15 - 0.61	CH

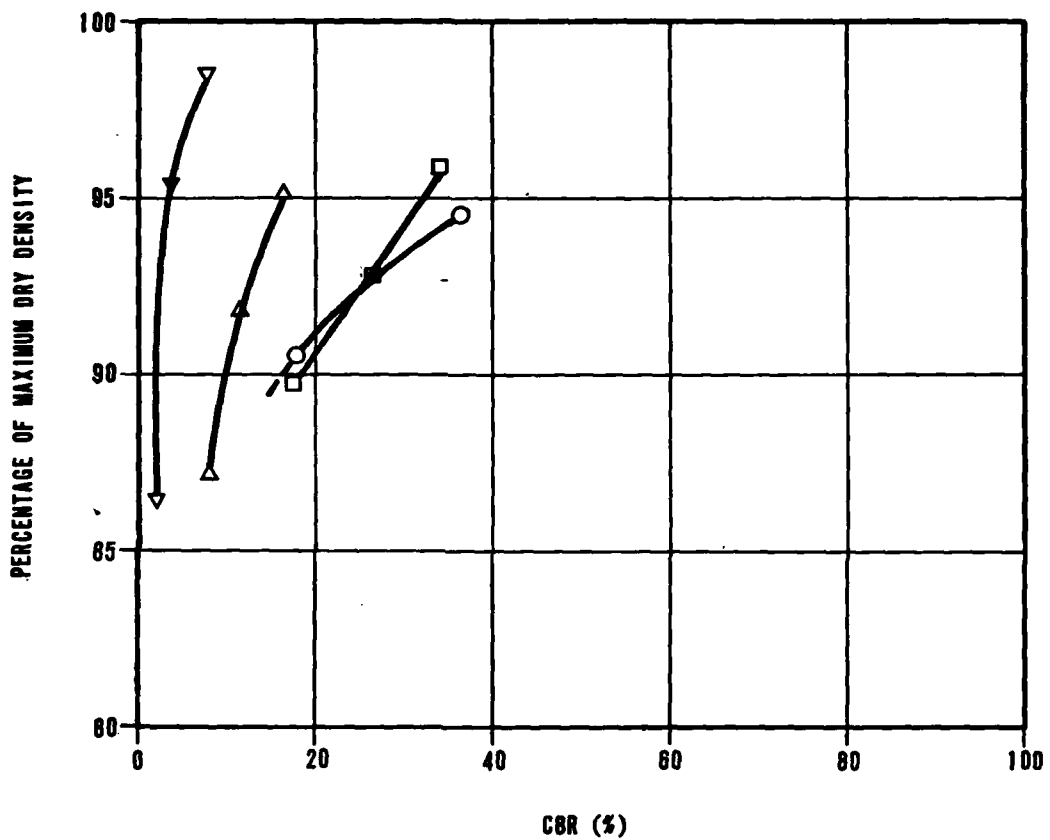
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GRAIN SIZE CURVES, CBR TESTS
CAVE VALLEY, NEVADA

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FIGURE II-10-2



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	A	SM
□	B	SM
△	C	CL
▽	D	CH

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CALIFORNIA BEARING RATIO
(CBR) CURVES
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FIGURE II-10-3

DATE
ILME