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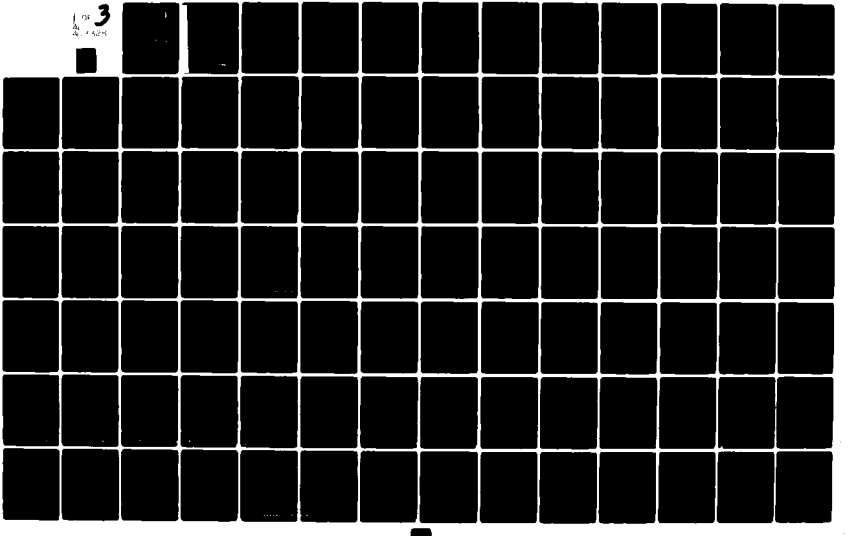

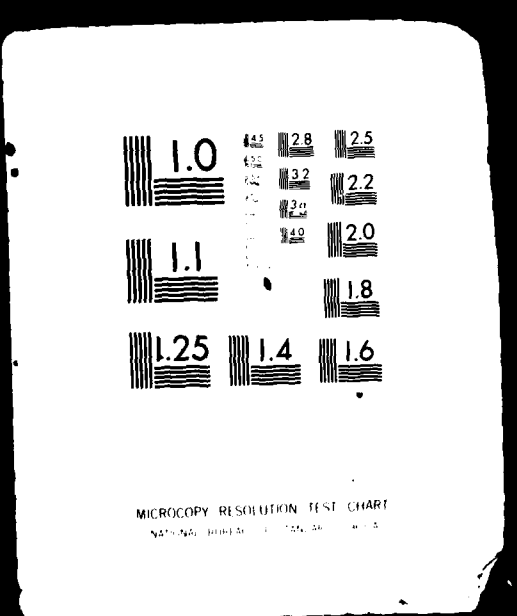

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GEOTECHNICAL EVALUATION

VOLUME VI
NEVADA-UTAH
VERIFICATION STUDIES, FY 79
GEOTECHNICAL DATA
GARDEN-COAL CDP, NEVADA

PREPARED FOR
SPACE AND MISSILE SYSTEMS ORGANIZATION (SAMSO)
NORTON AIR FORCE BASE, CALIFORNIA

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Consulting Engineers and Geologists

FN-TR-27-VI

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Prepared for:

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Space and Missile Systems Organization (SAMSO)
Norton Air Force Base, California 92409

Prepared by:

Fugro National, Inc.
3777 Long Beach Boulevard
Long Beach, California 90807

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report verifies suitable areas for deployment of the MX system + provide preliminary physical + engineering characteristics of the soils. Included are base data consisting of [illegible] logs, seismic analyses, compaction tests, and seismic refraction surveys.

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VOLUME VI
GEOTECHNICAL DATA, GARDEN-COAL CDP

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DRAWINGS IN POCKET

FOREWORD

This report was prepared for the Department of the Air Force, Space and Missile Systems Organization (SAMSO), in compliance with Contract No. F04704-78-C-0027, CDRL Item 005A2. It presents geological, geophysical, and geotechnical data and evaluates the suitability of portions of Nevada and Utah for siting the MX Land Mobile Advanced ICBM System.

This report is the first of several Verification reports which will be prepared. The objectives are to verify sufficient suitable area for deployment of the MX System and to provide preliminary physical and engineering characteristics of the soils. The Verification Studies are the final phase of a site-selection process which was begun in 1977. Previous studies have been termed Screening, Characterization, and Ranking. In preparing this report, it has been assumed that the reader is familiar with these previous studies.

Results of the FY 79 Verification studies are contained in 11 volumes as follows:

Geotechnical Results

Volume 1A - Sections 1.0, 2.0, and 3.0 contain Introduction, Results and Conclusions, and Recommendations for Future Studies. Sections 4.0 through 6.0 contain summary geotechnical data for Whirlwind, Snake East, and Hamlin CDP's.

Volume 1B - Sections 7.0 through 10.0 contain summary geotechnical data for White River North, Garden-Coal, Reveille-Railroad and Big Smoky CDP's.

Geotechnical Data Volumes

Volume II - Whirlwind CDP
Volume III - Snake East CDP
Volume IV - Hamlin CDP
Volume V - White River North CDP
* Volume VI - Garden-Coal CDP
Volume VII - Reveille-Railroad CDP
Volume VIII - Big Smoky CDP
Volume IX - Dry Lake CDP
Volume X - Ralston CDP

* This volume is presented herein.

SECTION 1.0

GEOLOGIC STATION DATA

EXPLANATIONS OF GEOLOGIC STATION DATA

Geologic stations were established at selected locations throughout the CDP at which detailed descriptions of surficial basin-fill deposits or rock were recorded. Locations of all geologic stations are shown in Drawing 1, Activity Location Map. All data taken on surficial basin-fill units at these stations are listed in Table 1-1 and an explanation of the column headings in the table is given below. 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 1-1	Explanation
Station Number	Geologic stations are numbered sequentially. Where more than one geologic field team worked in a CDP, stations made by each team are differentiated with a letter (A, B, or C) following the station number.
Geologic Unit	Generic geologic unit only, i.e. the grain-size designation (f, s, g, c) is omitted from surficial basin-fill units. The letter B in the unit designation indicates a buried deposit not exposed at the surface.
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.
USCS	Soil class according to the Unified Soil Classification System.

Munsell Color	Soil color based on Munsell Soil Color Chart.
Source Rock Types(s)	Rock types of coarse clasts 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 1-1. 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) Moist, 3) 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) Stratified Tabular, 2) Stratified Other (lensed, cross bedded, discontinuous beds), 3) Nonstratified
11 (Cementation Induration)	1) None, 2) Weak, 3) Moderate, 4) Strong
12 (Depth to Cemented Layers)	Depth to layer (in centimeters) exhibiting cementation induration described in Column 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) Stage I, 2) Stage II, 3) Stage III, 4) Stage IV, 5) None

Drainage

DP (M)	Average depth of drainages (in meters)
WD (M)	Average width of drainages (in meters)
Slope (%)	Average slope of ground surface (in percent grade)
Sample	Number of samples taken

GENERALIZED GEOLOGIC UNITS

Explanation

Surficial Basin-fill Units

A1 Younger Fluvial Deposits - Major modern stream channel and flood-plain deposits.

A2 Older Fluvial Deposits - Older incised stream channel and flood-plain deposits in elevated terraces bordering major modern drainages.

A3 Eolian Deposits - Wind-blown 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 - Alluvial deposits consisting of debris flow and water-laid alluvium near mountain fronts, grading into predominantly water-laid alluvium deposited in shifting distributary channels near the basin center. Younger (A5y), intermediate (A5i), and older (A5o) alluvial fans are differentiated by surface soil development, terrain conditions, and present depositional/erosional environment.

Grain sizes of these deposits (except A3 deposits, which are exclusively sandy) are indicated by a single letter (f, s, g, or c) 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 (ML, CL, MH, CH)

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

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

c - coarse grained with greater than 30 percent boulders and cobbles (generally GP, GW, GM, GC)

ROCK UNITS

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

- I1 Intrusive - Plutonic rocks formed by solidification of molten material beneath the surface (e.g., granite, granodiorite, diorite, gabbro).
- I2 Extrusive (intermediate and acidic) - Volcanic rocks of intermediate and acidic compositon formed by solidification of molten material at or near the surface, (e.g., rhyolite, latite, dacite, andesite).
- I3 Extrusive (basic) - Volcanic rocks of basic composition, generally formed by solidification of molten materials at or near the surface (e.g., basalt).
- I4 Extrusive (pyroclistic) - Rocks formed by accumulation of volcanic ejecta (e.g., ash, tuff, welded tuff, agglomerate).

S Sedimentary (undifferentiated) - Rocks formed by accumulation of clastic solids, organic solids and/or chemically precipitated minerals.

- S1 Arenaceous and/or Siliceous Rocks - Composed of sand size particles (e.g., sandstone, orthoquartzite) or of cryptocrystalline silica (e.g., opal, chert).
- S2 Carbonate Rocks - Composed predominantly of calcium carbonate detritus or chemical precipitates (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 (undifferentiated) - Rocks formed through recrystallization in the solid state of preexisting rocks by heat and pressure (e.g., gneiss, schist, hornfels, metaquartzite).

SOIL DESCRIPTION — TERRAIN

STATION NUMBER	GEOL UNIT	PPS MM	PPS SR	GRAIN SIZE SC	SC	SS	BF	USCS	MUNSELL COLOR	SOURCE ROCK TYPE(S)	*PHYSICAL PROPERTIES 6	7	8	9	10	11	12	13	14	15	DRAINAGE CP(M)	AQ(M)	SLOPE (%)	SAMPLE
NGCG01A	ASI	062								I4 S2 S1	2	2			*	4	007	2	2	4	2.5	014	02	U
NGCG01B	ASY	170	00	00	25	075	00T	SM	05.0YR4/4	I2	3	7	1	2	2	2	074	*			4.0	100	02	M
NGCG02A	AAB	060	00	00	10	088	002	SW	10.0YR5/6	I4	7	1	1	2	3	2		?		L				
NGCG02A	ASY	064	00	00	01	075	024	SM	10.0YR5/4	I4 S2	3	2	1	3	3	1		?	1	5	.2	010	22	C
NGCG02B	ASY	025	00	00	20	040	00T	SP	07.5YR4/4	I2	*	2	1	2	3	2	060	3	2	1	.0		*	C
NGCG03A	AAO		00	00	07	093	007	SP-SM	10.0YR6/3			2	1	3	3	1			1	4				
NGCG03B	ASI	080	07	20	30	045	00*	GP	07.5YR5/4	S2	2	2	2	3	3	4	015	7	1	3	3.0	006	06	C
NGCG04A	AAC		00	00	00	005	095	ML	10.0YR7/4			1	2	2	3	1			1	4			01	C
NGCG04B	ASY	070	00	00	25	075	00T	SM	07.5YR4/4	I2	2	2	1	2	?	1		2	1	5				
NGCG05A	AI	021	00	00	07	003	097	CL	10.0YR6/3	I4 S2		1	3	3	3	1			1	5	.3	002	01	F
NGCG05B	ASI	100	00	05	55	045	000	GP	07.5YR4/4	S2 I2	2	2	1	2	3	3	027	2	1	3	2.5	050	6W	C
NGCG06A	AAO		00	00	00	005	195	ML	10.0YR5/6			2	2	2	?	2	022		1	1			10	F
NGCG06B	ASY	090	00	30	60	030	010	GP-GM	07.5YR4/4	S2	2	2	2	2	3	1		2	1	5	.5	010	55	C
NGCG07A	ASY	016	00	00	05	090	005	SP-SM	07.5YR5/6	I4	*	2	1	3	3	1		2	1	5	.3	005	01	C
NGCG07B	ASY	081	04	00	08	010	090	ML	10.0YR6/4			2	2	2	3	1			1	5			10	F
NGCG08A	ASY	150	00	01	15	070	015	SM	10.0YR5/6	I4	2	2	1	3	3	1		2	1	1	1.0	006	03	C
NGCG08B	ASY	022	00	00	40	060	00T	SP	07.5YR6/4	I2	2	2	1	2	3	1		3	1	5	.5	015	34	C
NGCG09A	ASI	300	05	10	10	075	015	SM		I4	3	2	1		3	3	021	3	2	2	1.5	010	01	C
NGCG10A	ASI	300	01	01	10	075	015	SM	10.0YR5/3	I4	3	2	1		3	3	022	2	2	2	1.0	005	26	F
NGCG11A	ASY	130	00	05	10	082	00A	SM-SW	10.0YR5/6	I4 S2	3	2	1	3	3	2	040	2	1	1	.2	003	01	F
NGCG12A	ASY	060	00	00	10	083	007	SM-SW	10.0YR5/6	I4	2	2	1	3	3	1		?	1	1	.1	005	01	F
NGCG13A	ASI	100	00	03	15	075	010	SM-SW	10.0YR5/8	S2 I4	3	2	1	3	3	3	040	2	2	3	1.3	010	02	C
NGCG14A	ASY	120	00	07	10	075	015	SM	10.0YR5/6	I4 S2	2	2	1	3	?	1		?	1	1	1.3	004	03	C
NGCG15A	ASY	080	00	00	05	085	010	SM-SW	10.0YR5/3	S2 I4	3	2	1	3	3	2	049	2	1	2	.5	003	02	C
NGCG16A	ASY	080	00	00	20	065	015	SM	10.0YR5/6	S2 I4	3	2	1	3	3	2	035	2	1	?	.7	005	02	C
NGCG17A	ASY	140	00	01	03	093	004	SP	10.0YR5/6	I4	2	2	1	3	3	2	047	?	2	1	.7	005	01	C
NGCG18A	ASY	150	00	02	10	050	020	SC	10.0YR5/6	S2 I4	3	2	1	3	3	2	032	2	2	1	1.5	010	22	C
NGCG19A	AI		00	00	03	088	009	SM-SW	10.0YR5/6	I4 S2	3	1	1	3	3	2	050	2	2	1	.1	001		F
NGCG20A	ASY	150	00	05	20	065	015	SM	10.0YR5/6	S2 I4	2	2	1	3	3	2	041	2	1	1	.3	004	02	C
NGCG21A	ASY	120	00	02	40	048	012	SM-SW	10.0YR6/6	S2 I4	3	2	1	*	3	?		?	2	1	.2	002	21	F
NGCG22A	ASI	060								I4	2	2				*	C12	2		4	.3	015	01	F
NGCG23A	AAO	022	00	00	10	GRA	002	SW		I4 S2	5	2	1	2	1	2	040		1	1				
NGCG24A	AAO	080	00	00	00	010	090	ML	07.5YR6/6			1	2	3	3	1			1	5	.3	001		
NGCG25A	AAO	080	00	00	00	C30	070	ML	10.0YR6/6			1	2	3	3	1			1	5	.3	001		
NGCG26A	AAC	300	00	00	00	005	095	ML	07.5YR5/6			1	2	3	3	1			1	5	.2			
NGCG27A	ASY	116	00	07	40	050	010	SW-SM	07.5YR5/6	I2	3	2	1	*	3	2		2	1	1	.5	C0F	36	
NGCG28A	ASY	166	00	05	55	033	012	SW-GM		S2	3	2	1	3	3	2		?	1	1	.5	010	04	
NGCG29A	ASY	183	00	15	45	040	015	GM	10.0YR4/4	S2	3	2	1	3	?	2		?	2	1	.5	005	31	
NGCG30A	ASY	081	00	07	50	042	00F	SW-GM	10.0YR5/4	S2	*	2	1	3	3	2		?	1	1				
NGCG31A	ASY	220	00	01	35	055	010	SM	10.0YR6/6	S2	3	2	1	3	3	2	029	2	?	1	.5	007	00	D
NGCG32A	ASY	180	00	15	45	047	00N	SW-GM	10.0YR4/6	S2	3	2	1	3	3	1	029	?	1	1	.5	010	06	
NGCG33A	ASY	084	00	02	07	080	013	SM	10.0YR5/6	I4	*	2	1	3	3	2		?	1	1	.7	016	22	
NGCG34A	ASY	037	00	00	30	058	012	SM-SC	05.0YR5/6	I4	*	2	1	*	3	2	031	2	2	1	.8	015	22	
NGCG35A	ASI	300	07	07	35	045	020	SC	10.0YR5/6	S2 I4 S1	2	2	2	3	3	2	036	2	1	2	1.0	15	31	
NGCG36A	ASY	040	30	00	03	037	060	ML	10.0YR4/4	S2 I2	2	2	1	?	2	1		2	1	5	2.0	010	71	
NGCG37A	ASI	180	00	03	15	070	012	SM	10.0YR5/6	S2 I4	2	2	1	3	3	3	026	2	2	2	1.5	310	37	D
NGCG38A	ASY		00	00	00	040	060	ML	10.0YR4/4			2	1	2	3	1			2	5	.2	001	51	
NGCG39A	ASY	240	30	00	07	060	040	SM	10.0YR5/4	I4 S2	3	2	1	3	3	1			2	5	.1	005	31	
NGCG40A	ASI	080	00	07	20	060	020	SM	10.0YR5/3	I4 S2	2	2	1		*	4	018	2	1	*	1.0	310	37	
NGCG41A	ASY	050	00	30	10	054	006	SM-SW	07.5YR6/4	I4		2	1	3	3	1		?	3	1			02	
NGCG42A	ASI	700	07	20	10	080	010	SM-SP	10.0YR5/6	S1 I4 S2	3	2	1	3	3	4	029	2	1	3	2.0	011	.02	
NGCG43A	ASI	700	02	20	20	065	015	SM	10.0YR5/3	I4 S1 S2	2	2	1	3	3	3	040	2	1	3	4.0	015	01	
NGCG44A	ASY	530	05	15	45	040	015	SM		S1 S2	*	2	1	3	3	2		?	1	1	1.2	007	04	
NGCG45A	ASI	380	31	02	35	050	015	SM	10.0YR5/6	S2 S1	*	2	1	3	3	4	025	2	2	2	1.5	015	14	
NGCG46A	ASY	137	00	11	40	053	007	SM-SW	10.0YR5/3	S2 S1	2	2	1	3	3	2		2	1	1	.5	004	04	
NGCG47A	ASI	200	00	04	30	058	010	SM-SC	10.0YR5/6		*	2	1	3	3	2	024		2	2	1.4	010	34	
NGCG48A	ASI	050	00	00	10	070	020	SM	10.0YR5/4		*	2	1	3	3	3	041	2	1	2			31	
NGCG49A	ASY	130	00	02	30	067	001	SC	07.5YR5/8	I4	*	3	2	4	3	2	036	2	2	1			02	
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NGCG62A	ASY		00	00	07	055	045	SM	10.0YR4/4	I4 S2	4	2	1		3			2			.3	001	00	
NGCG63A	ASY	020	00	00	01	069	030	SP-SM	10.0YR4/3	I4 S2	3	2	1					2			1.2	003	32	
NGCG64A	ASI	240	00	07	20	060	020	SC	07.5YR5/6	I4	2	2	1	3	3	2	042	2		2	3.0	010	00	
NGCG65A	ASI	130	00	07	40	047	013	SM	10.0YR7/4	S2	4	2	1	3	3	2	040	2		2	1.5	110	56	
NGCG66A	ASY	165	00	02	35	050	015	SP	07.5YR5/6	S2	3	2	1	3	3	2	034	2		1	1.0	008	02	
NGCG67A	AAC	010	00	00	07	010	090	ML	10.0YR6/3	S2		2	2		3						.2	005	05	
NGCG68A	AAO		00	00	00	010	090	ML-CL	10.0YR4/2			2	1								.2	002	01	
NGCG69A	ASI	180	00	01	55	340	005	SW-GM		S2	3	1	1		3			4			2.0	007		
NGCG70A	ASY	030	00	00	05	060	035	SM	10.0YR5/3	S2	2	2	1					2			.2	007	09	
NGCG71A	AI		00	00	00	900	100	CL	10.0YR4/4			1	2	2	1									
NGCG72A	I2																							
NGCG73A	ASY	110	00	07	50	025	025	GC	10.0YR4/4	S2 I2	5	3	3	3	3	1		2	2	1	.0	000	0	
NGCG74A	I2																							

*PHYSICAL PROPERTIES :
6 = GRAIN SHAPE
7 = MOISTURE CONTENT
8 = PLASTICITY FINES
9 = CONSISTENCY
10 = STRUCTURE
11 = CEMENTATION-INDURATION
12 = DEPTH TO CEMENTED LAYER(CM)
13 = WEATHERING OF CLASTS
14 = SOIL PROFILE DEVELOPMENT
15 = CALICHE DEVELOPMENT

GEOLOGIC STATION DATA
VERIFICATION SITE, GARDEN-COAL, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 1-1

UGRO NATIONAL, INC.

2 JUL 79

SECTION 2.0

GROUND-WATER DATA

EXPLANATIONS OF GROUND-WATER DATA

Existing ground-water data were collected from all available sources. These data were updated where possible from measurements taken during Fugro field operations, and all data are shown on Table 2-1. Locations of water wells and boreholes in which water-level measurements were available are shown in Drawing 1. Well numbers listed in Column 1 (Table 2-1) refer to well locations in Drawing 1. Actual well numbers giving location according to the Bureau of Land Management Land Survey System are shown in Column 2.

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.

WELL NO.	WELL LOCATION NUMBER*	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	5N/59E-32d1	-	-	58 (18)	1963	-	1
W2	4N/59E-6d1	-	200 (61)	9 (3)	1963	-	1
W3	4N/59E-6d2	-	80 (24)	10 (3)	1963	-	1
W4	4N/59E-8b1	-	-	12 (4)	1963	-	1
W5	4N/58E-23d1	-	-	15 (5)	1963	-	1
W6	4N/58E-36a1	5200 (1585)	-	24 (7)	1963	5176 (1578)	1,2
W7	3N/58E-15b1	5300 (1615)	260 (79)	235 (72)	1960	5065 (1544)	1,2
W8	2N/59E-22b1	5200 (1585)	250 (76)	Dry	-	-	1,2
W9	1N/58E-4b1	5000 (1524)	25 (8)	Dry	-	-	1,2
W10	1S/57E-3a1	5600 (1707)	620 (189)	570 (174)	-	5030 (1533)	1,2
W11	25/58E-11a1	5200 (1585)	118 (36)	100 (30)	1963	5100 (1554)	2
W12	2S/60E-1d1	4900 (1494)	499 (152)	Dry	1963	-	1

* Mt. Diablo Baseline and Meridian

** References:

1. Eakin (1963b)
2. U.S.G.S. (1978)

NOTE: *All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.*

GROUND-WATER DATA
VERIFICATION SITE
GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1

FUGRO NATIONAL, INC.

SECTION 3.0

SEISMIC REFRACTION DATA

EXPLANATIONS OF SEISMIC REFRACTION DATA

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 of the geophone array from geophone 1 to geophone 24.

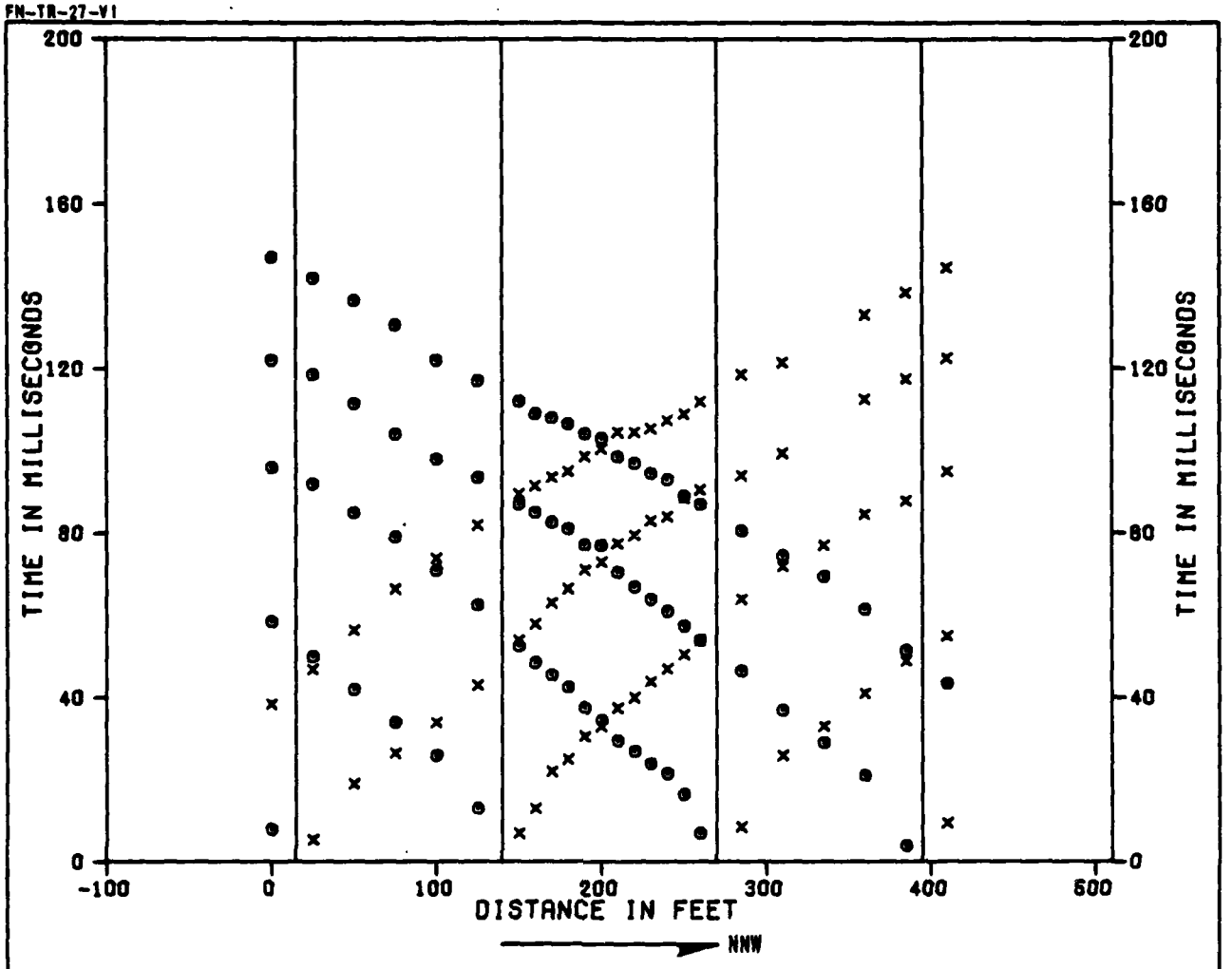
Travel Time Versus Distance Graph (Upper Half of Figure)

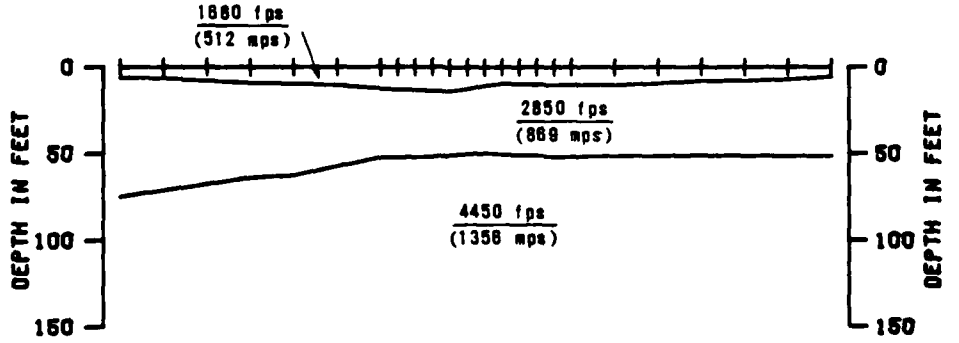
This is a travel time versus distance graph. The abscissa represents distance; the ordinate, time. The six vertical lines represent the locations of shots (designated as F, G, H, I, J, and K). The symbol, X, denotes travel times at geophones that were located to the right of a shot. The symbol, ⊙, denotes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

FN-TR-27-V1





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

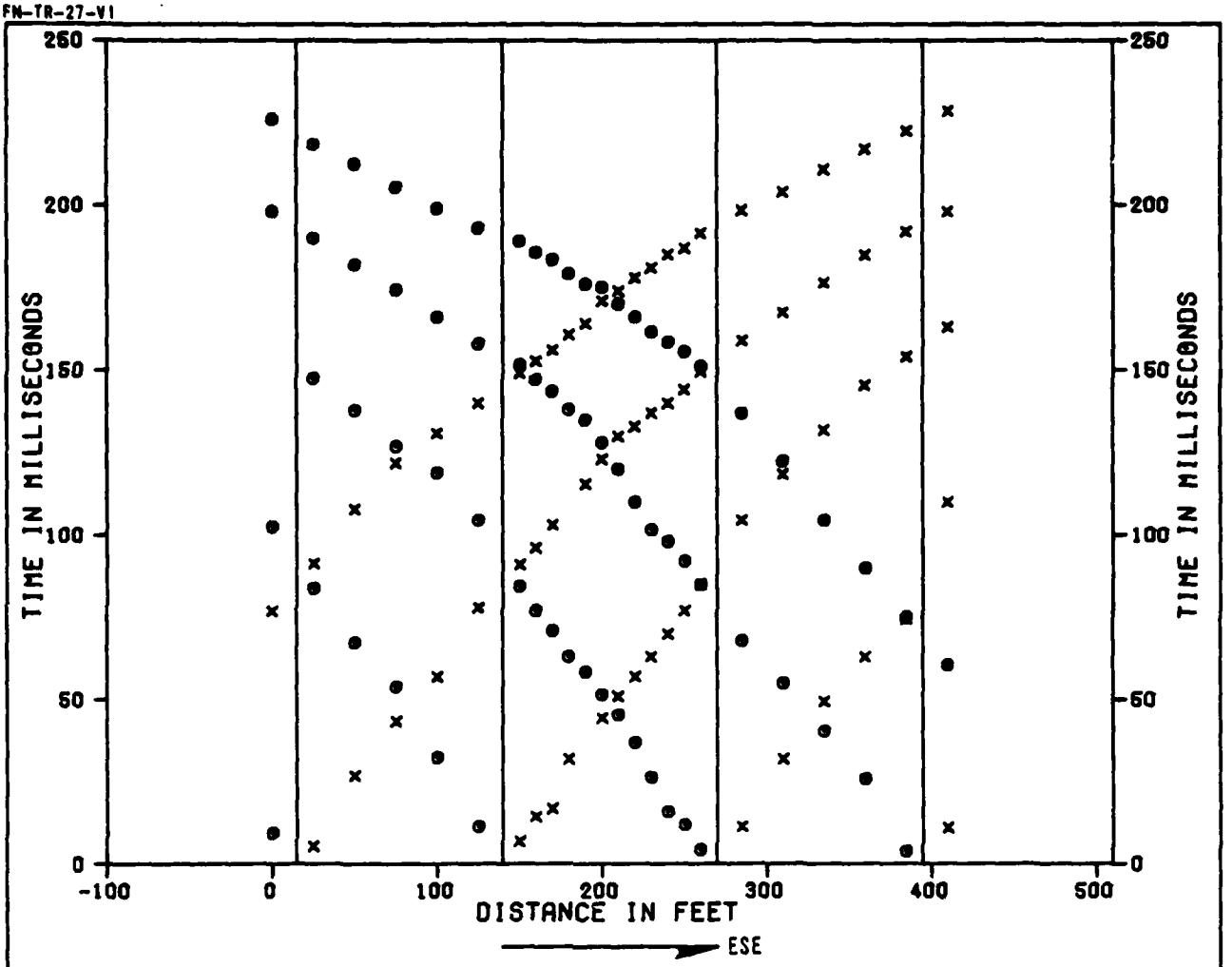
SEISMIC REFRACTION LINE GC-S-1
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

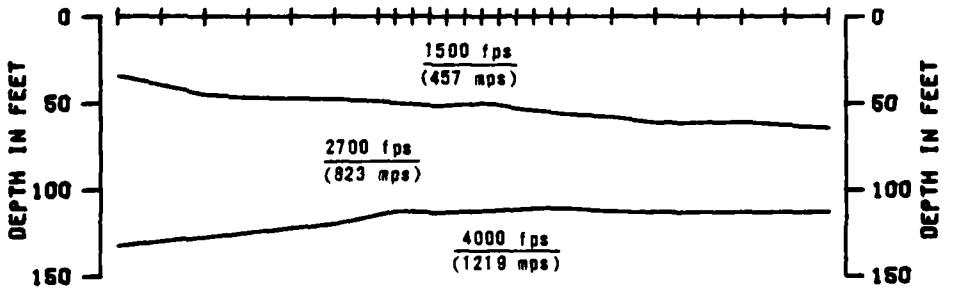
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

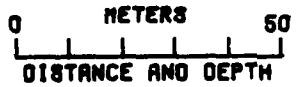
FIGURE
3-1

FUGRO NATIONAL, INC.

2 JUL 79







× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-2
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-2

FUGRO NATIONAL, INC.

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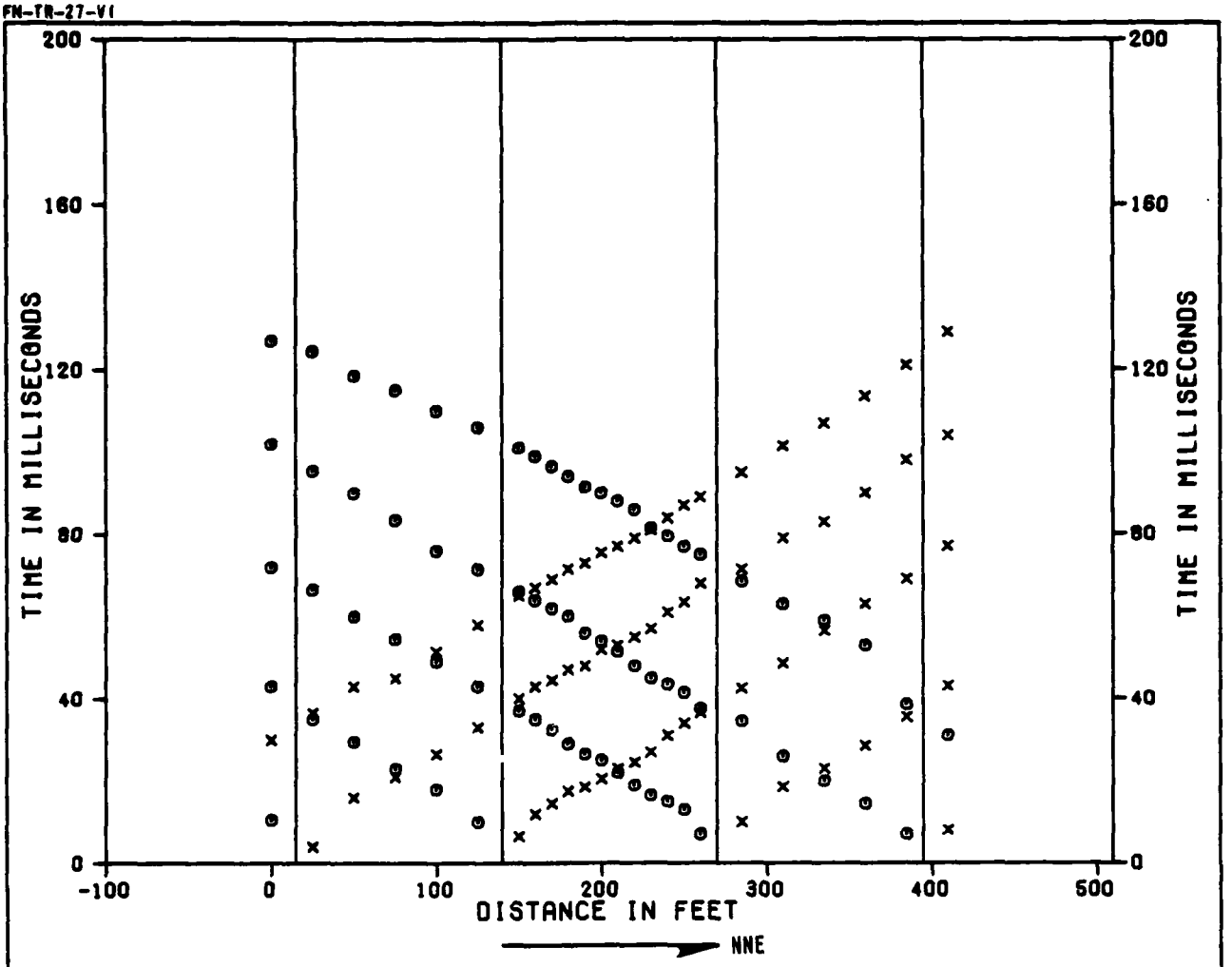
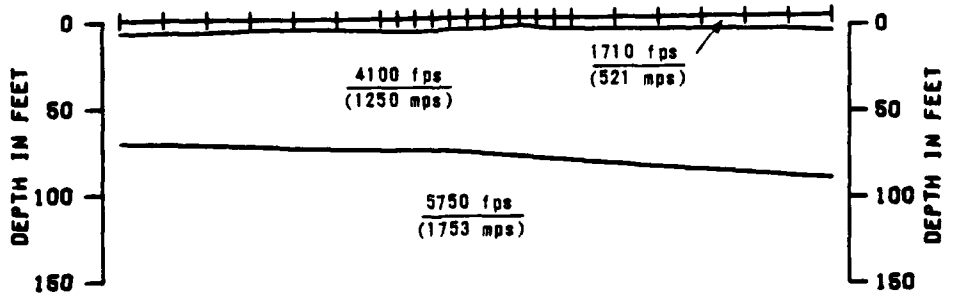
FN-TR-27-V1





0 METERS 60

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-3
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

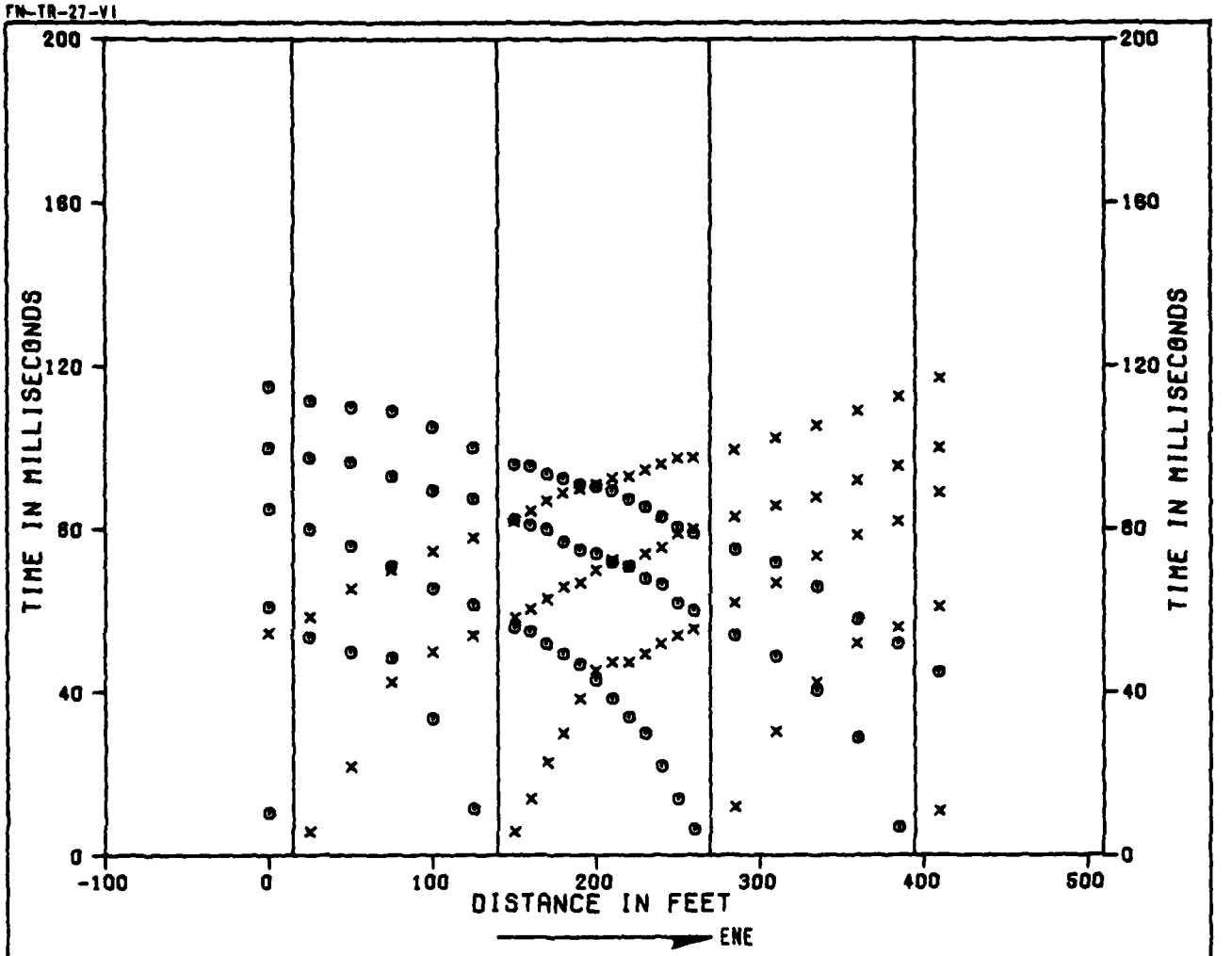
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

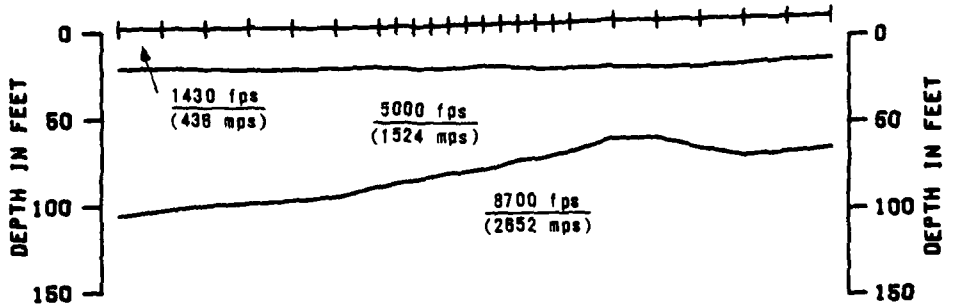
FIGURE 3-3

UGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VI





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-4
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-4

FUGRO NATIONAL, INC.

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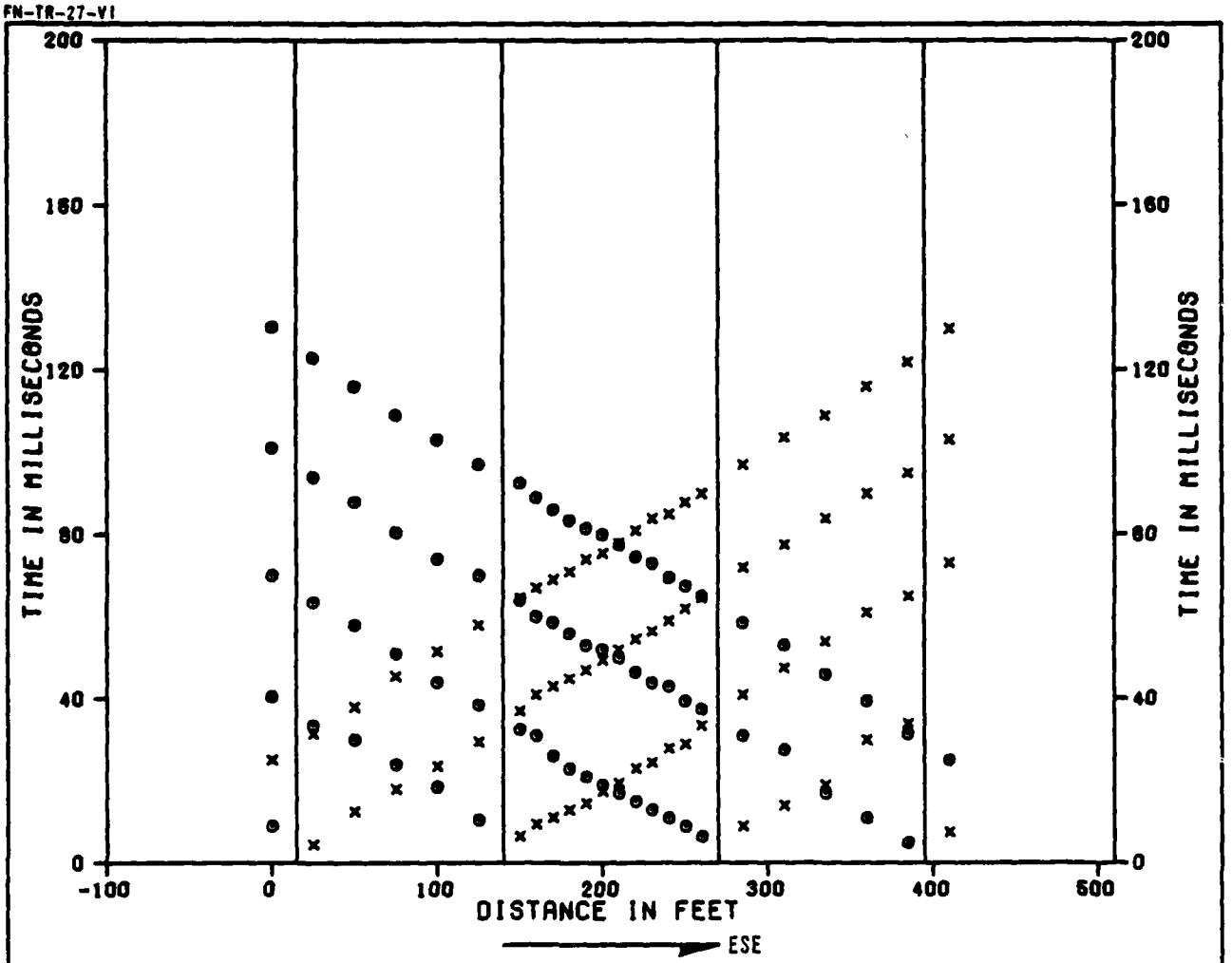
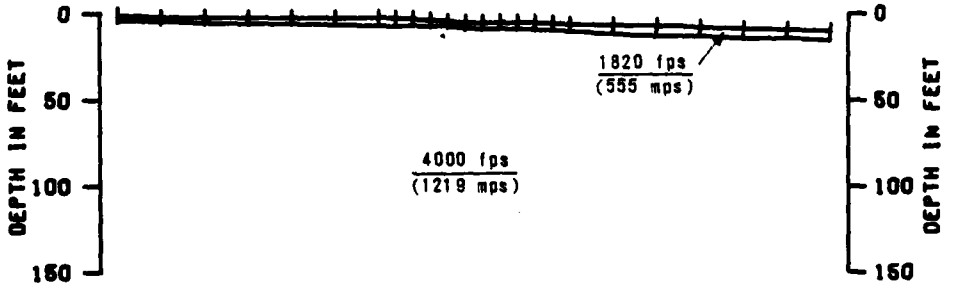
FN-TR-27-VI





0 METERS 50
DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-5
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-5

FUGRO NATIONAL, INC.

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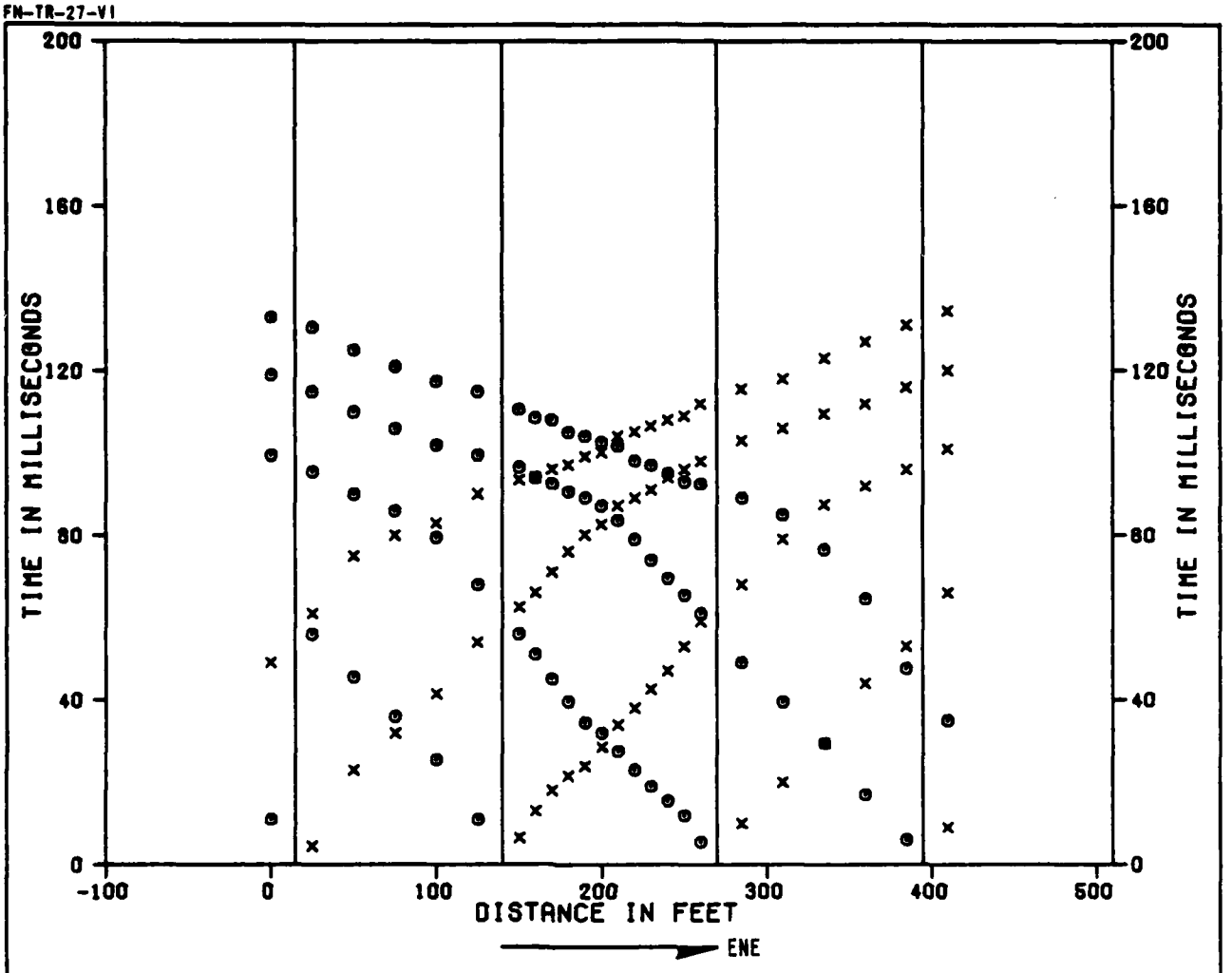
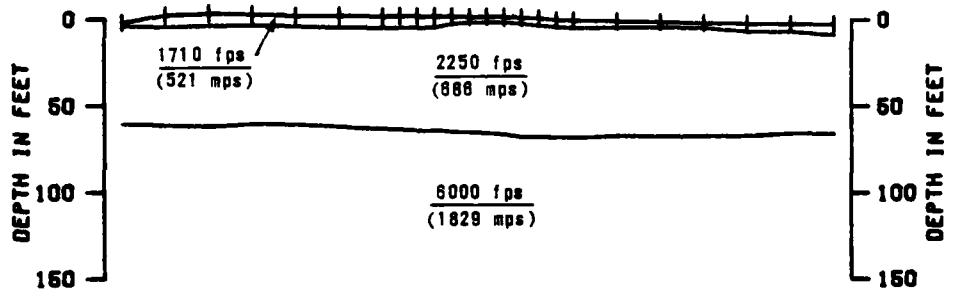
FN-TR-27-VI





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-6
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-6

FUGRO NATIONAL, INC.

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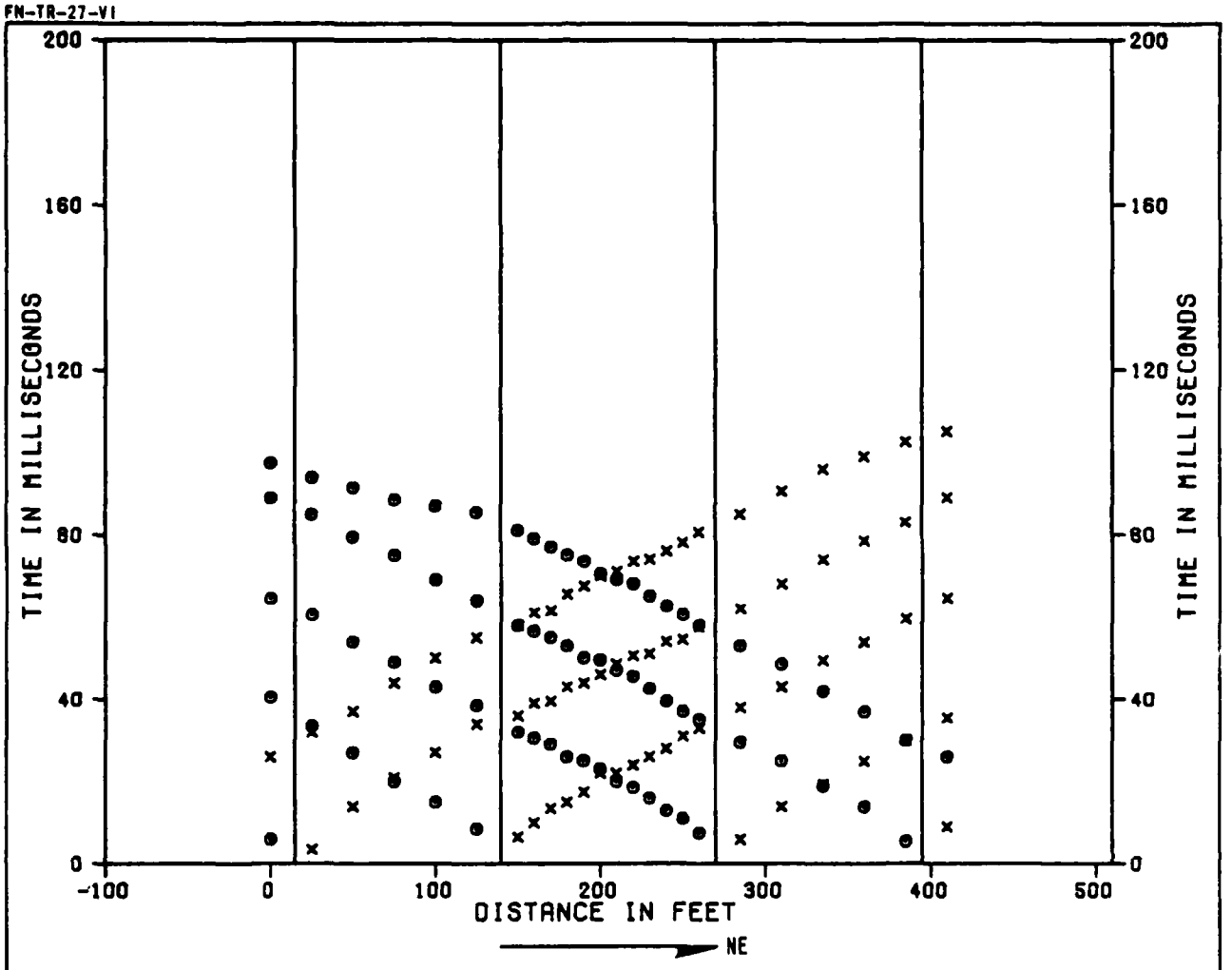
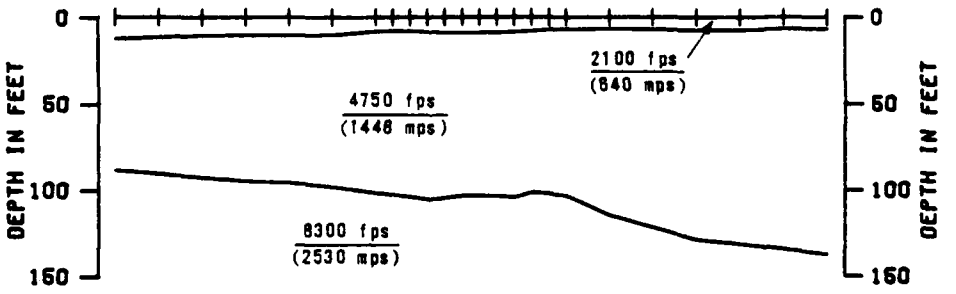
FN-TR-27-VI





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-7
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

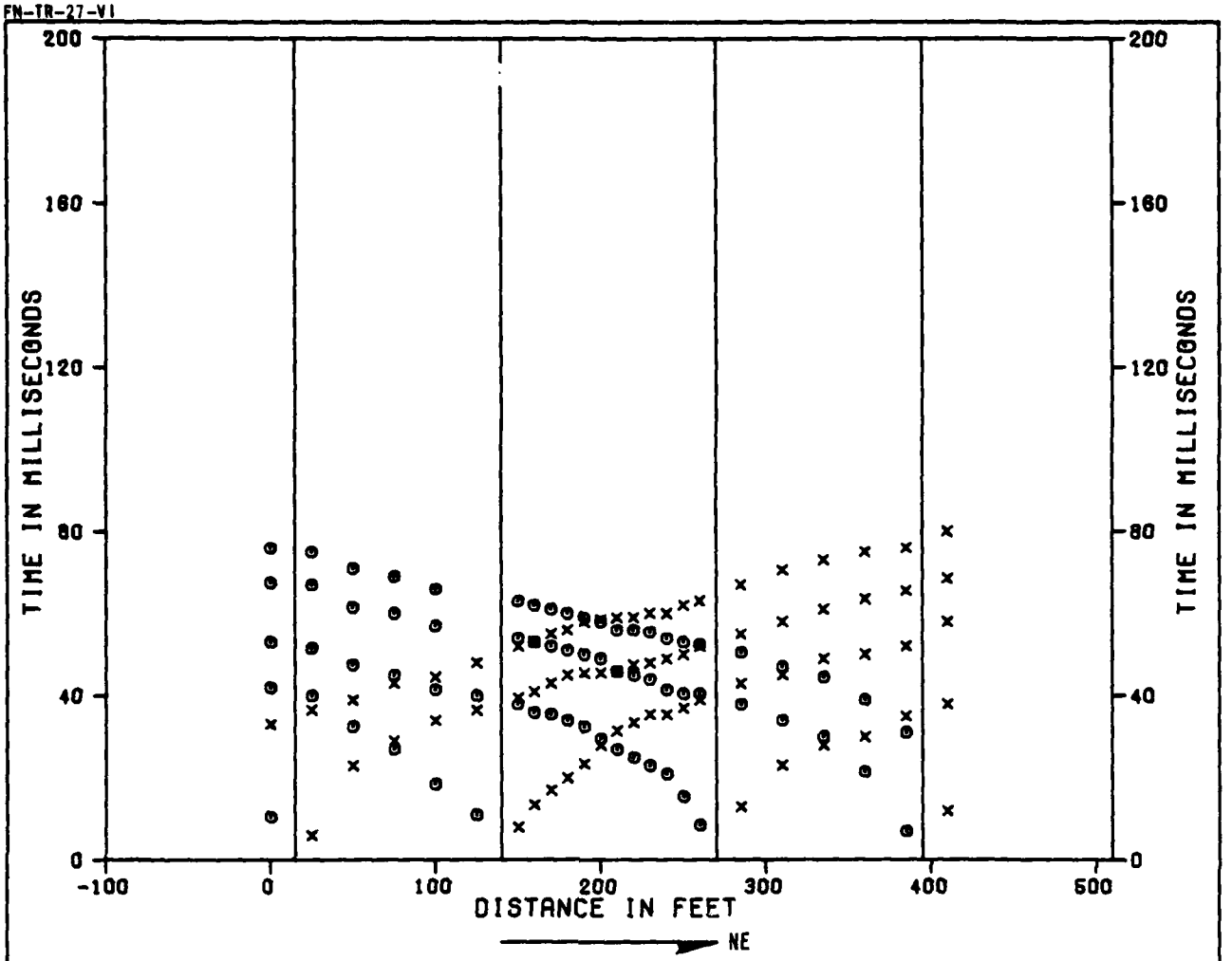
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

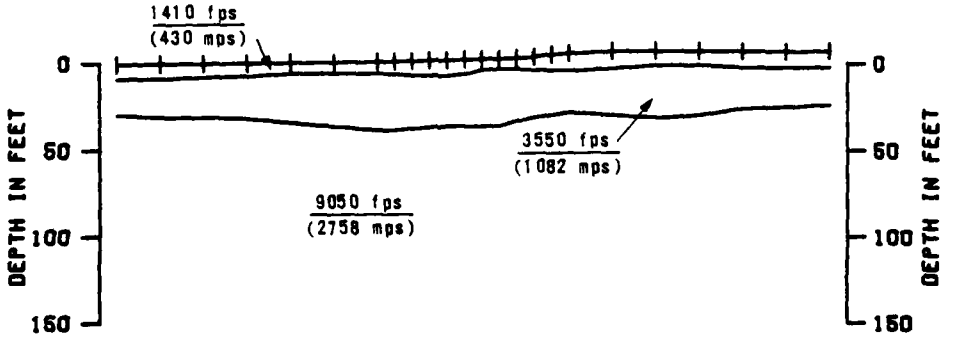
FIGURE 3-7

FUGRO NATIONAL, INC.

2 JUL 78

FN-TR-27-VI





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-8
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

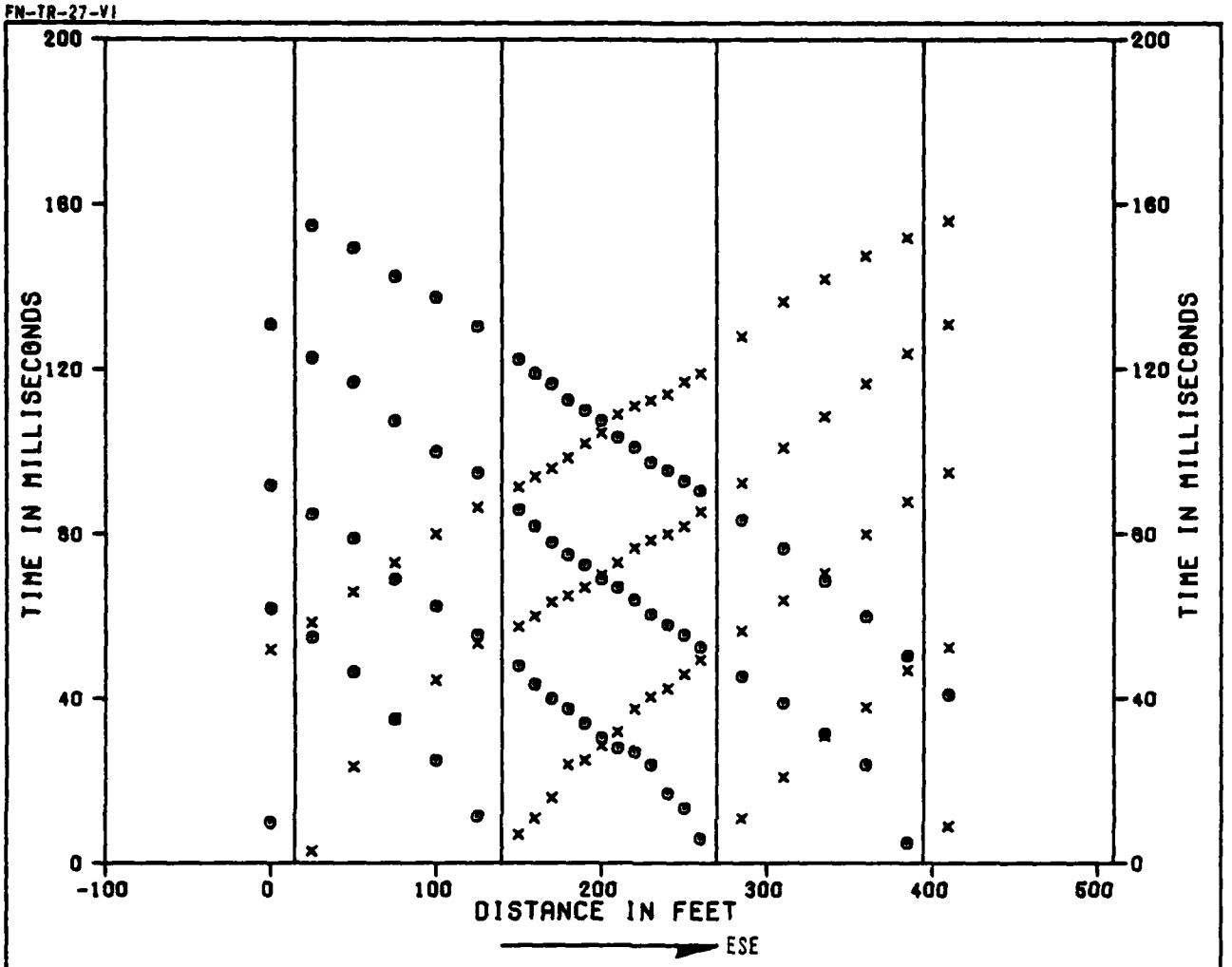
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

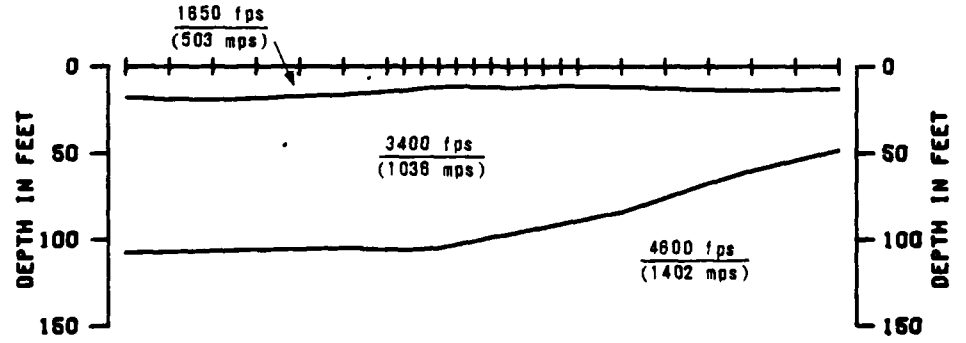
FIGURE
3-8

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VI





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-9
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

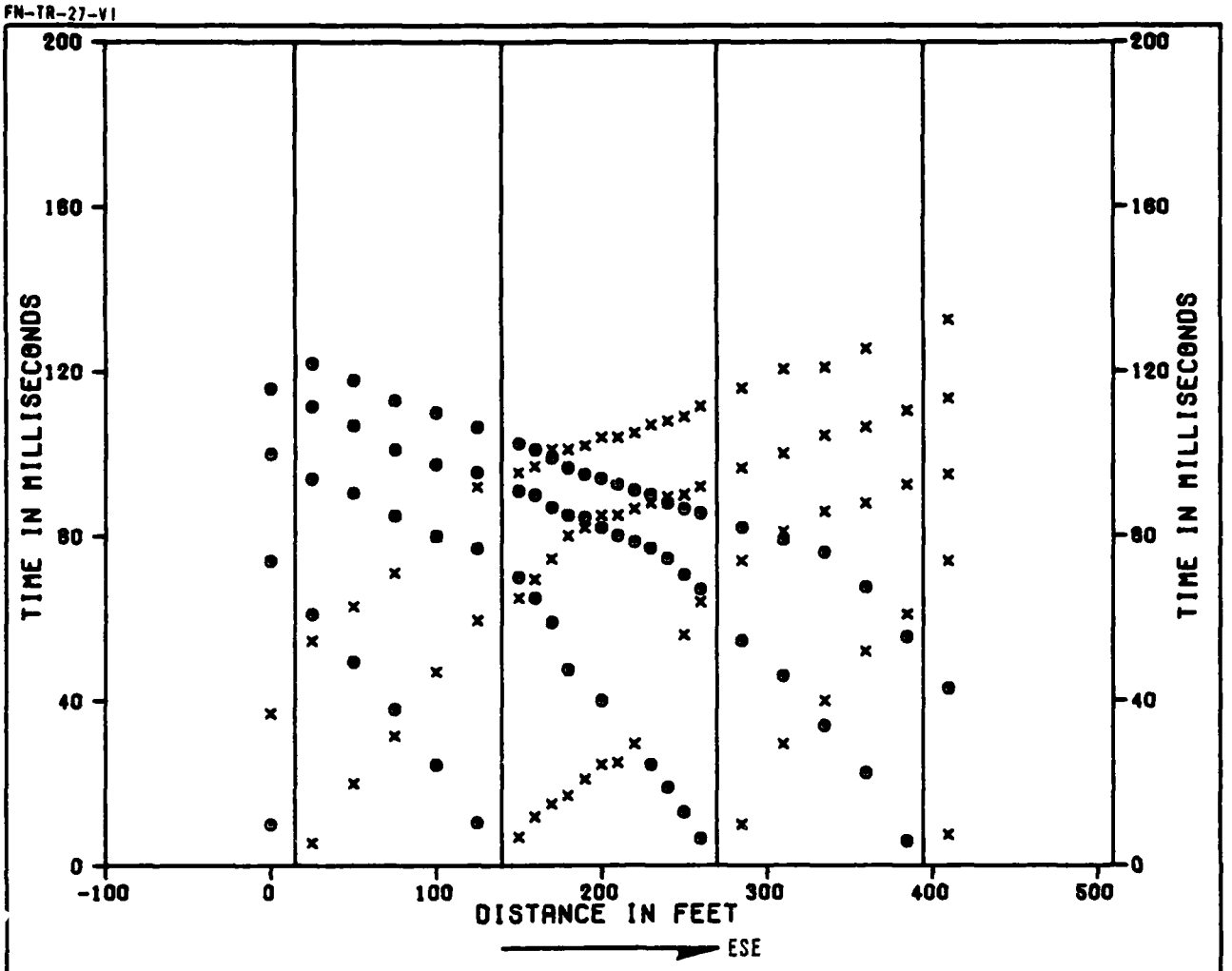
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

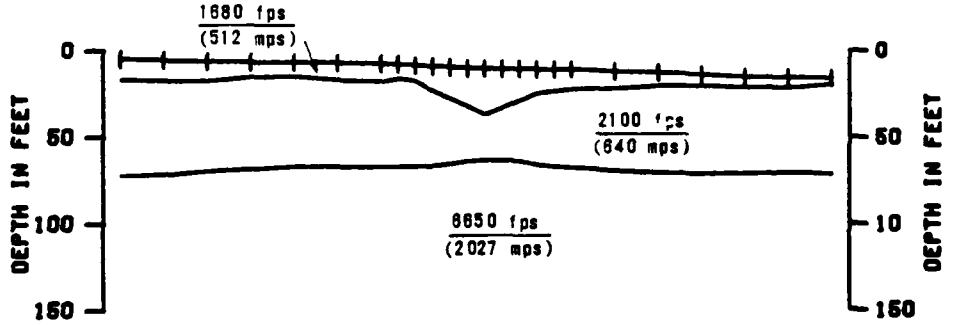
FIGURE 3-9

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VI





0 METERS 60

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

● TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-10
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

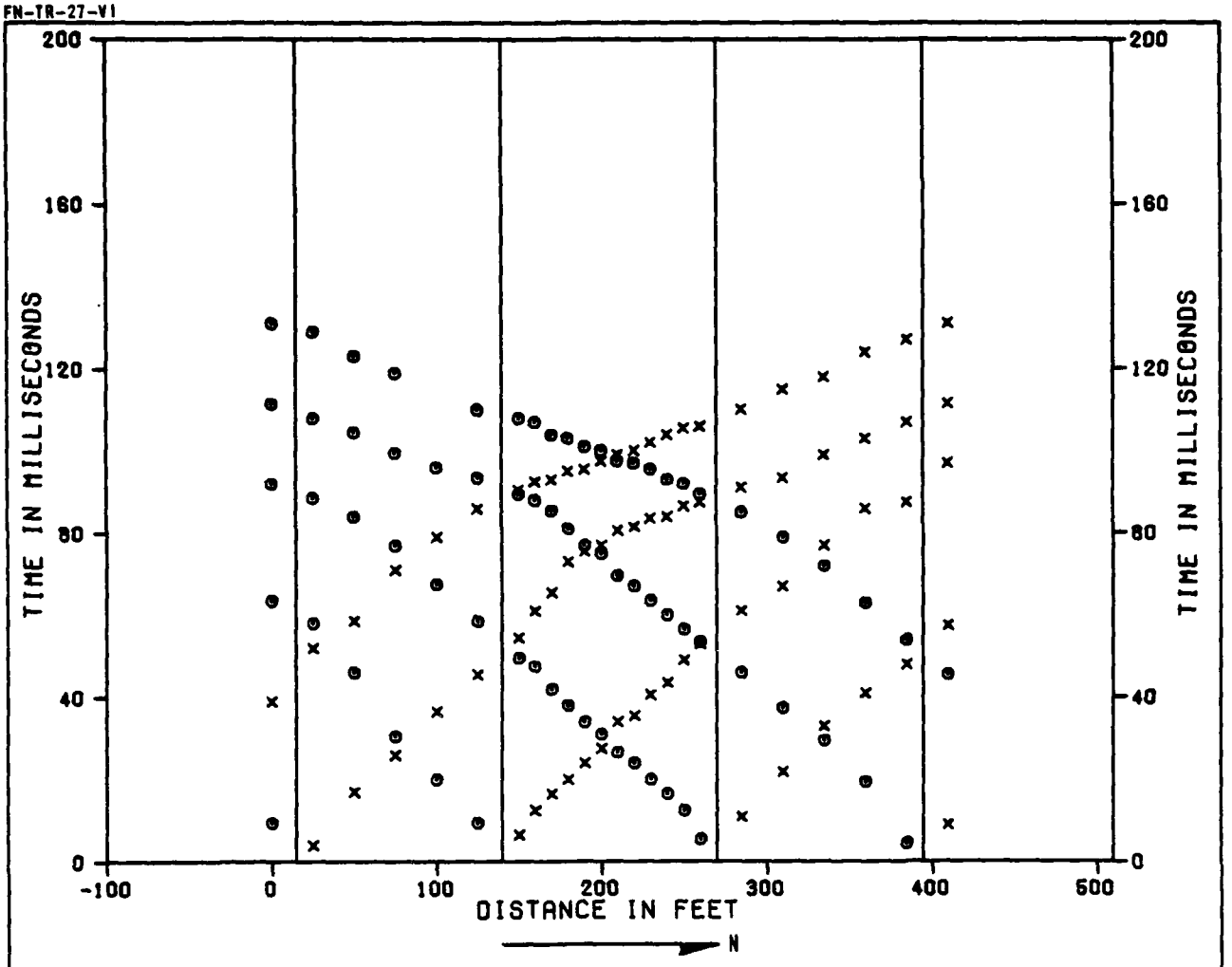
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

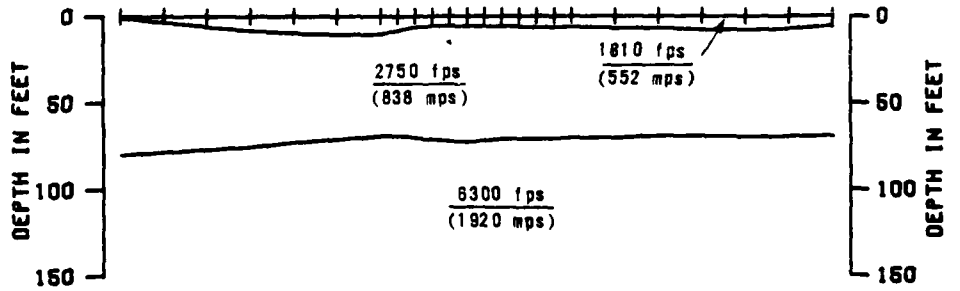
FIGURE 3-10

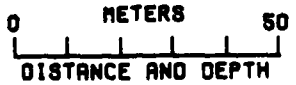
FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V1







× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-11
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

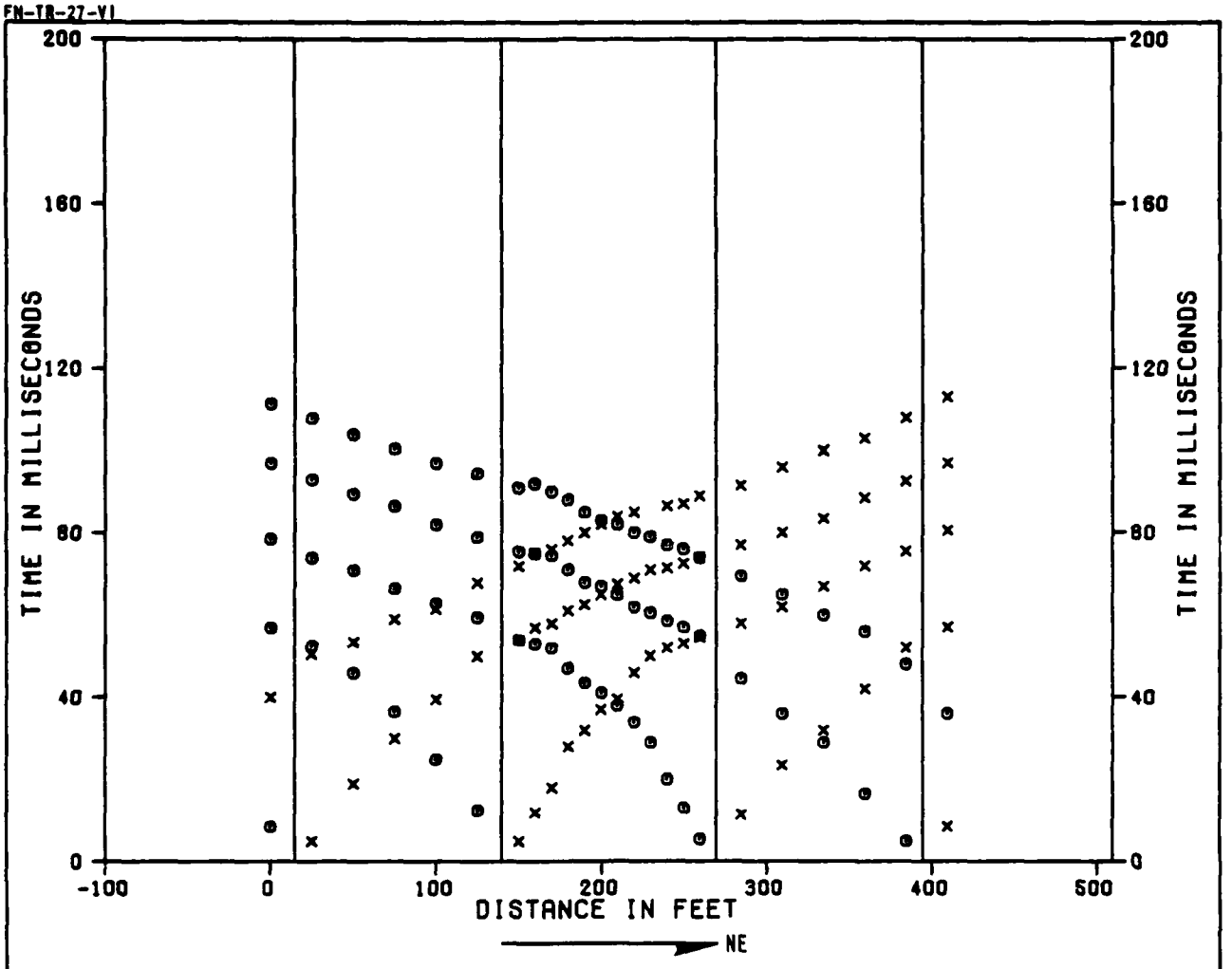
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

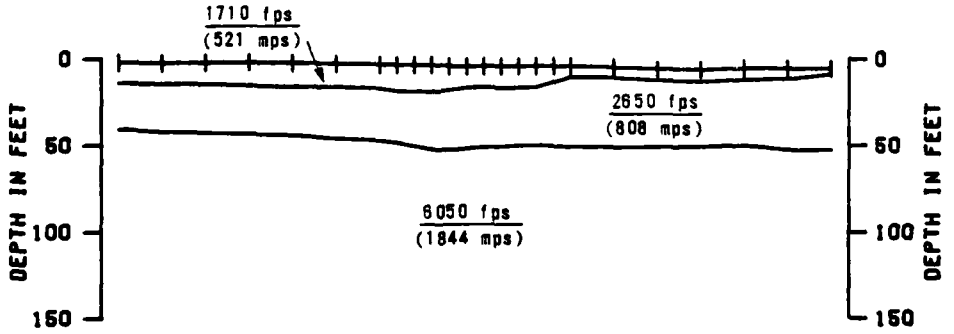
FIGURE
3-11

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VI





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-12
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

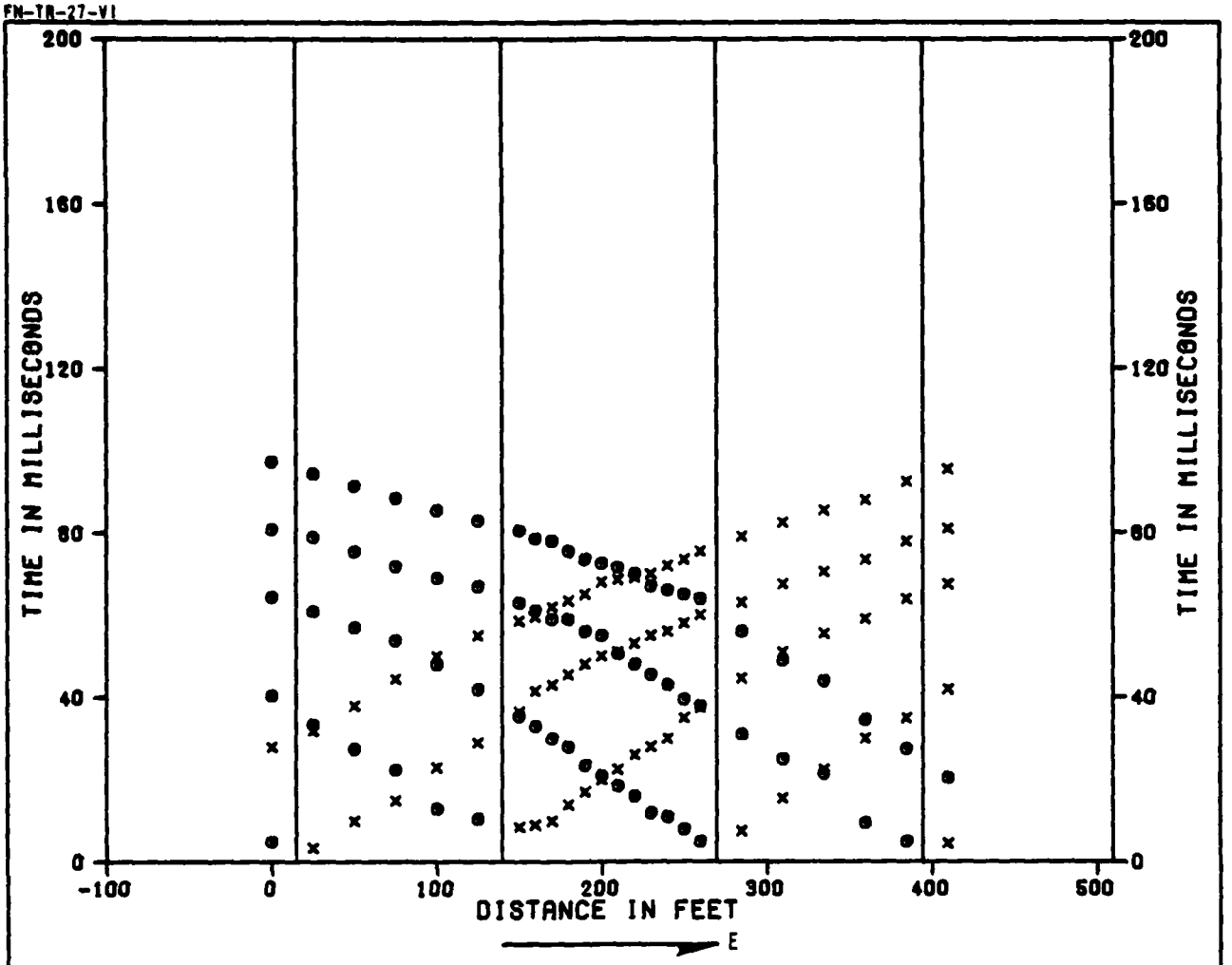
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

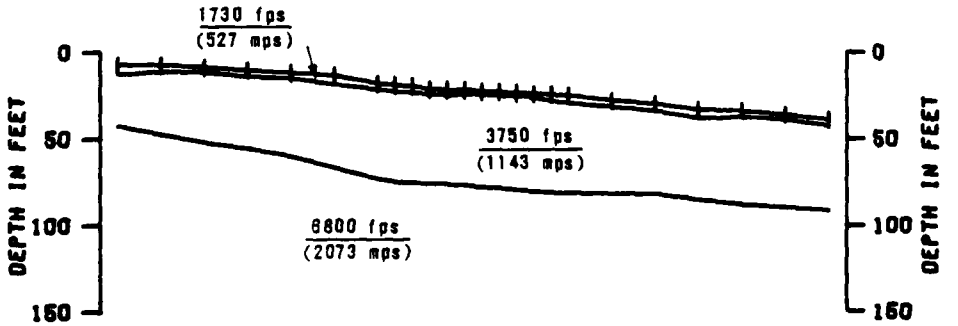
FIGURE 3-12

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VI





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-13
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

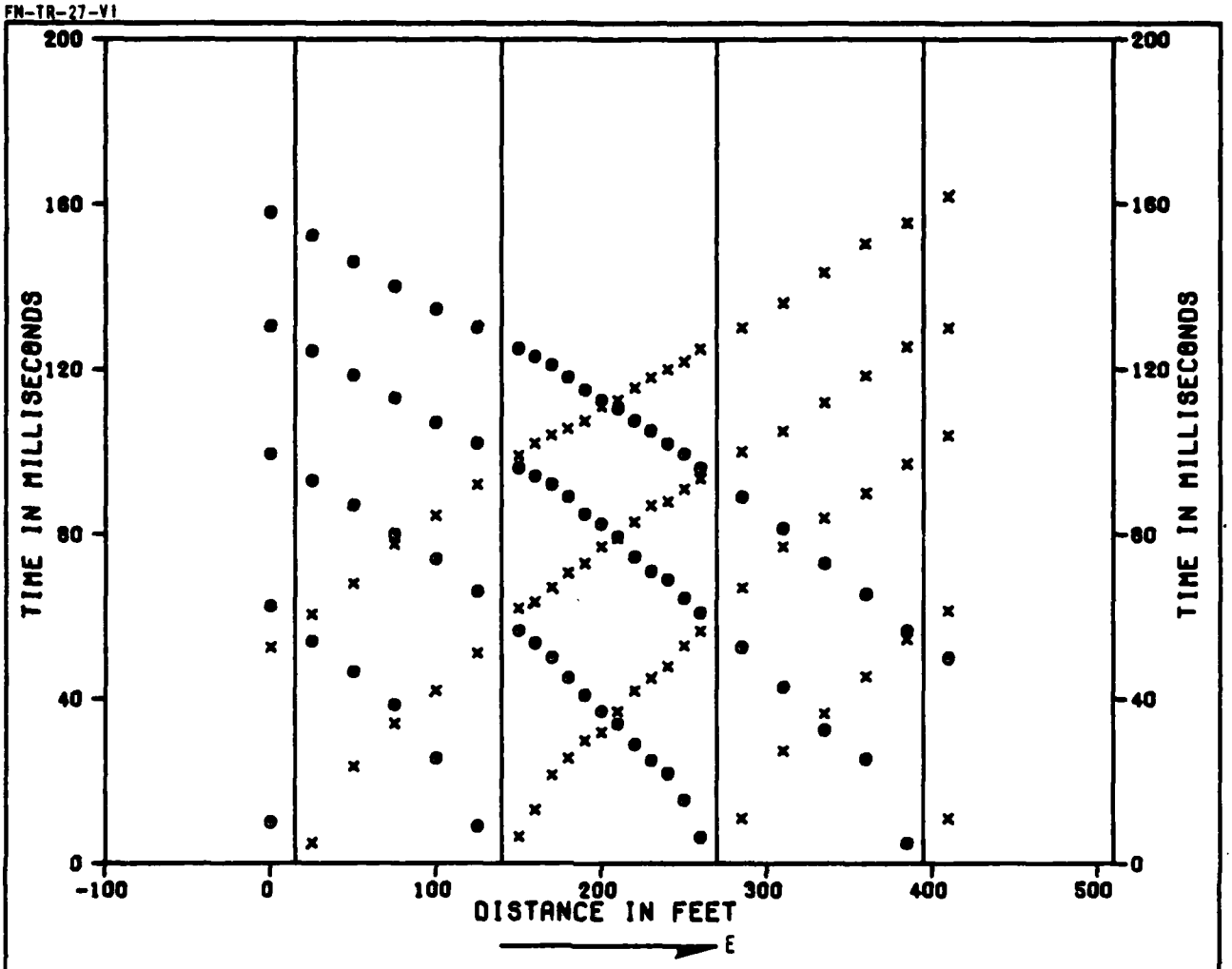
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

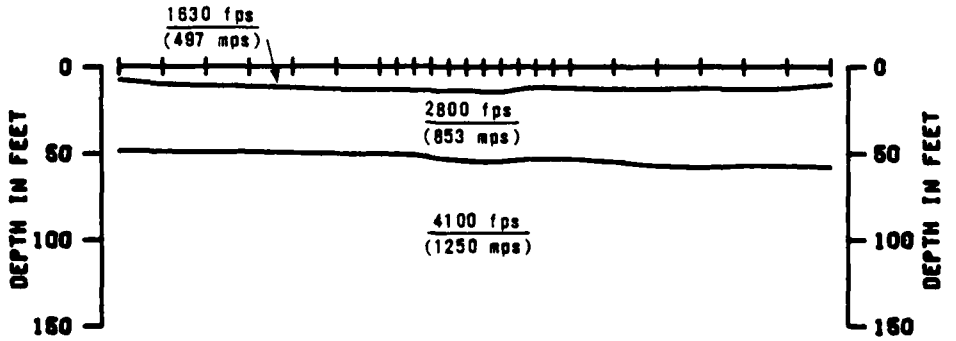
FIGURE 3-13

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VI





0 METERS 60

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-14
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

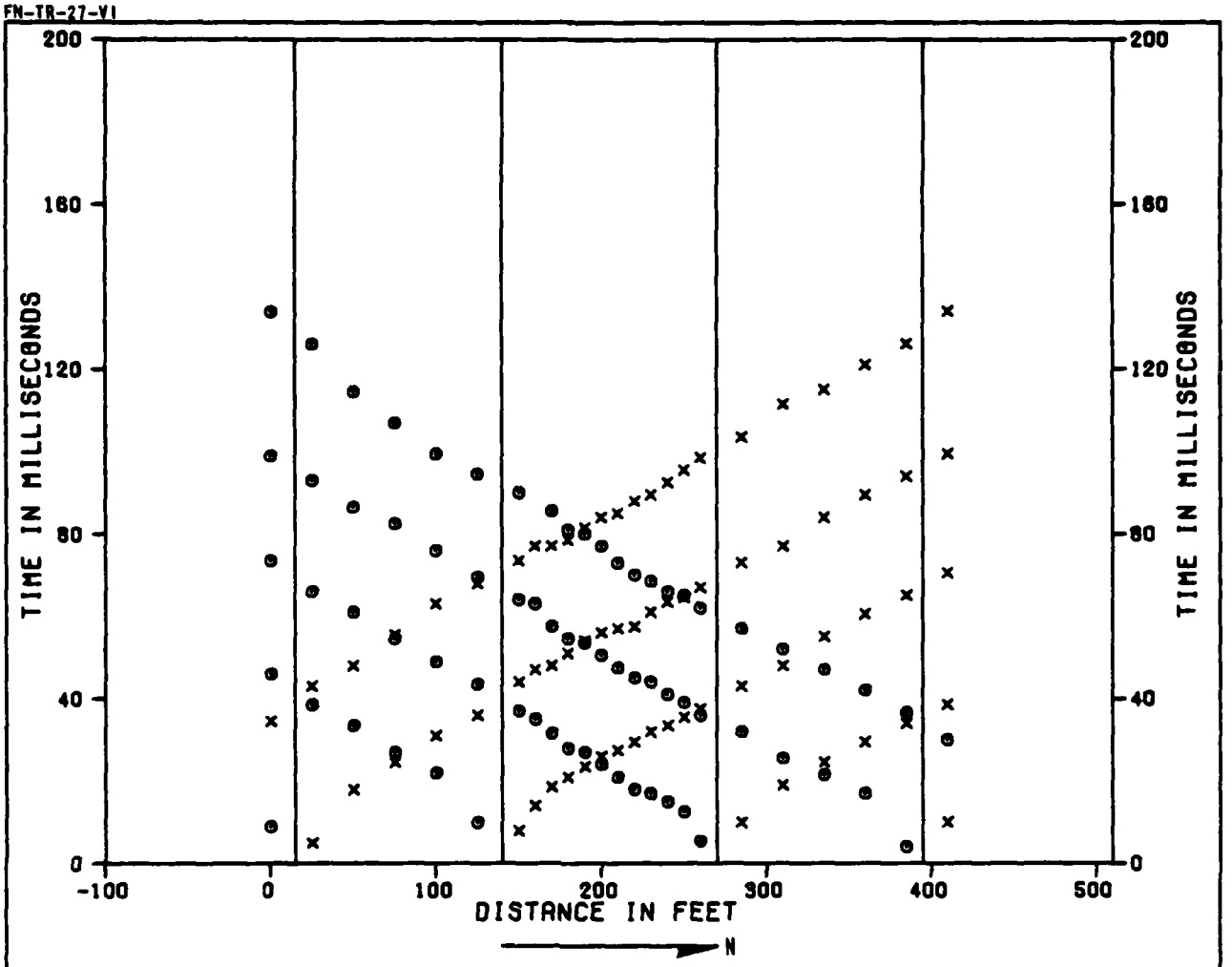
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

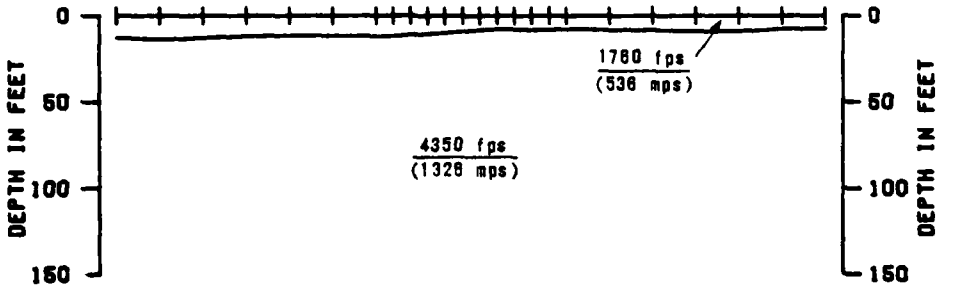
FIGURE
3-14

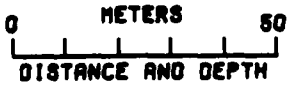
FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V1







× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-15
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

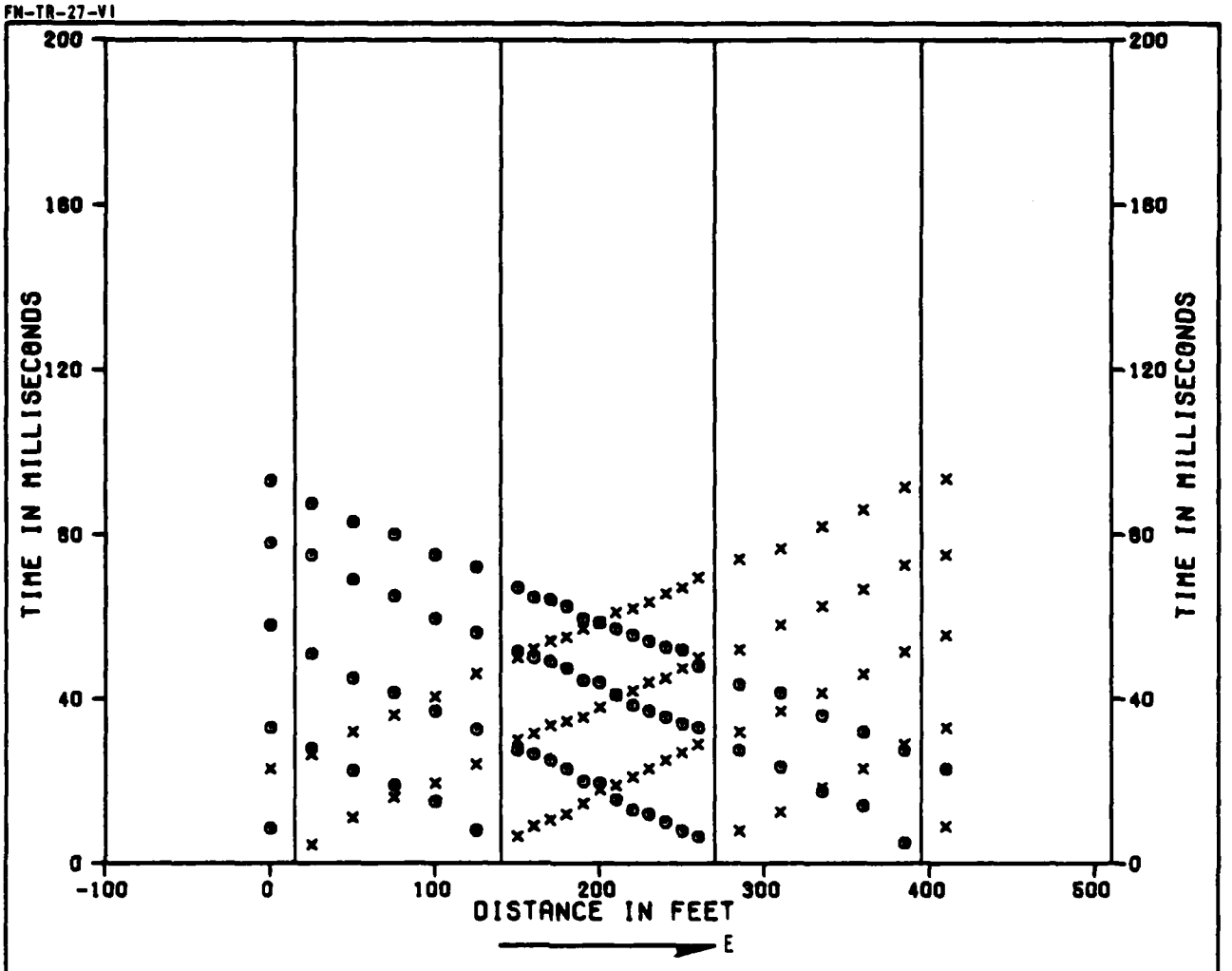
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

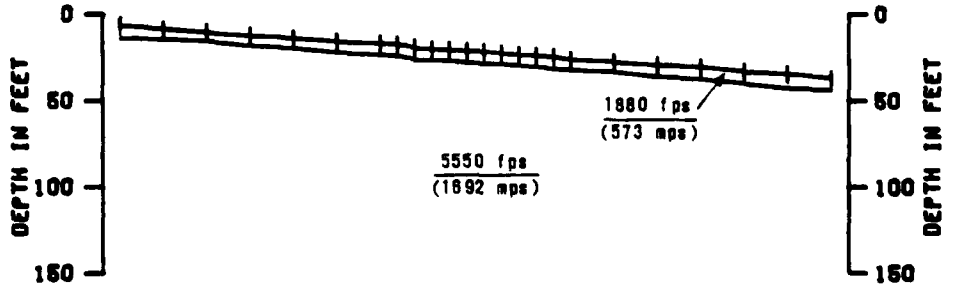
FIGURE 3-15

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VI





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

● TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-16
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

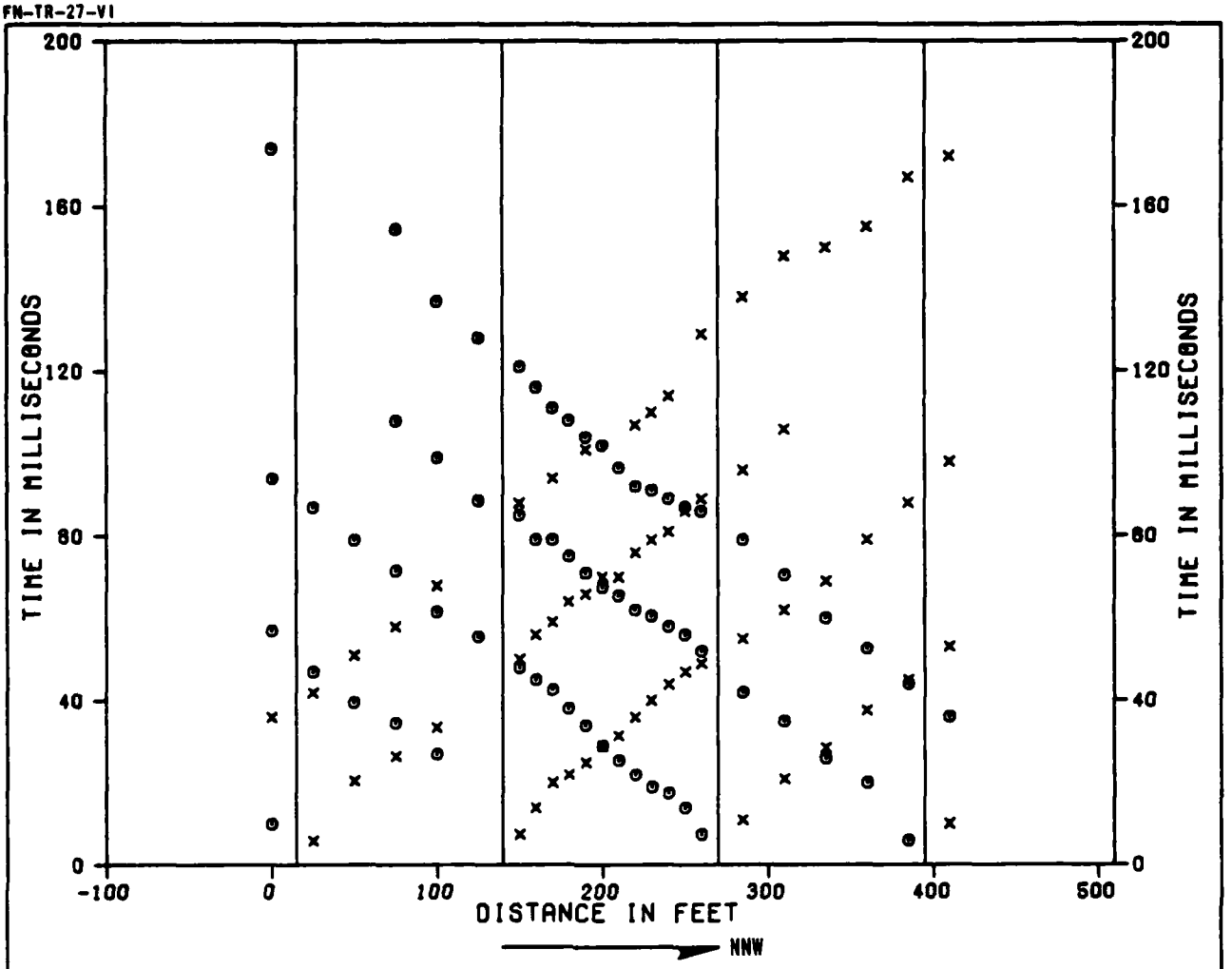
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

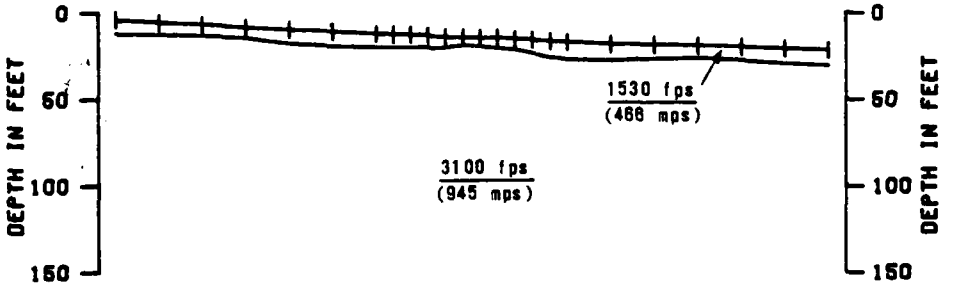
FIGURE 3-16

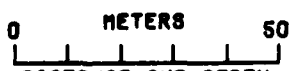
FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VI







× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-17
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

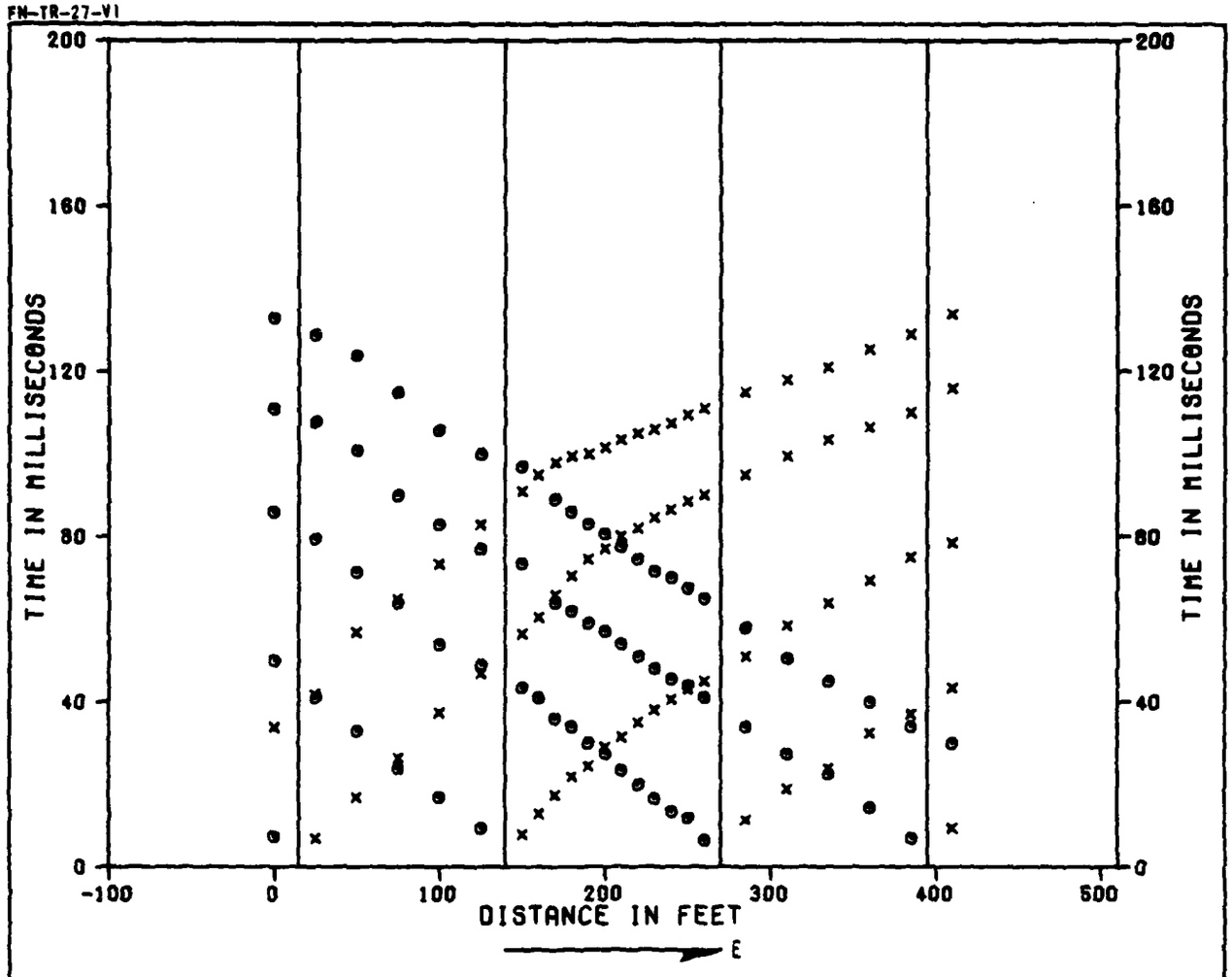
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

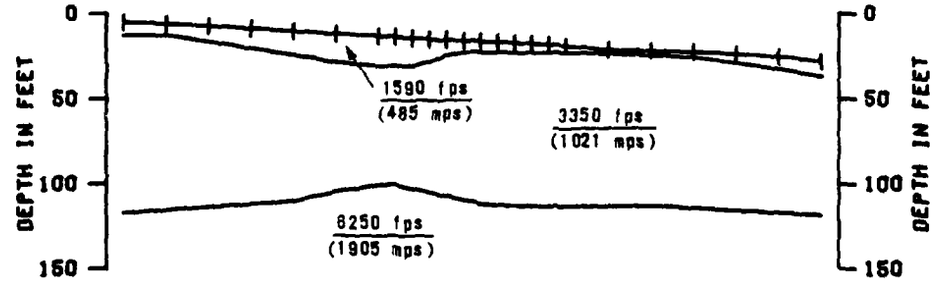
FIGURE
3-17

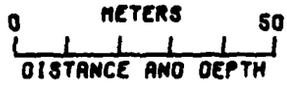
FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V1







× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE GC-S-18
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

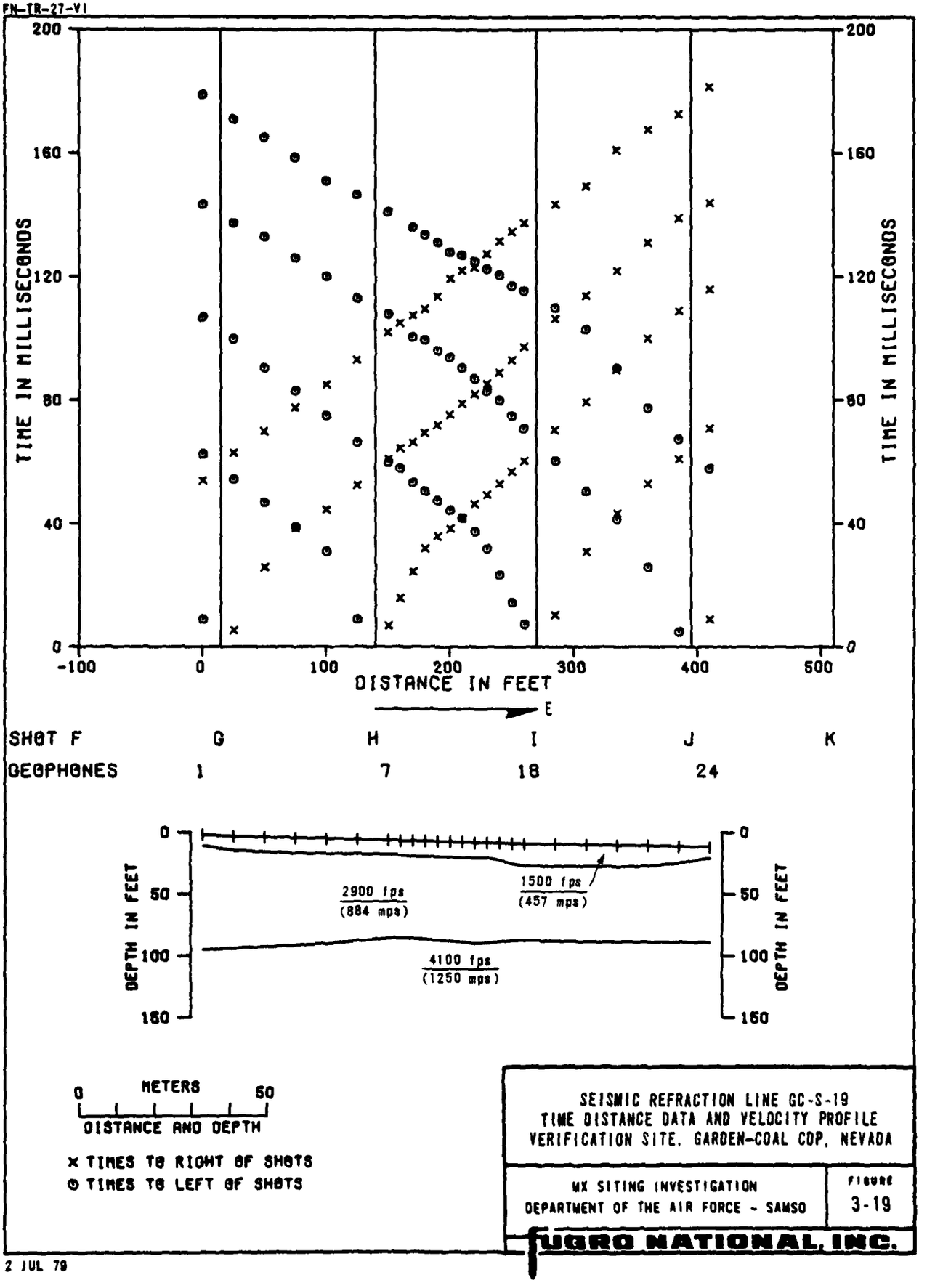
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-18

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VI



SEISMIC REFRACTION LINE GC-S-19
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-19

FUGRO NATIONAL, INC.

2 JUL 79

SECTION 4.0

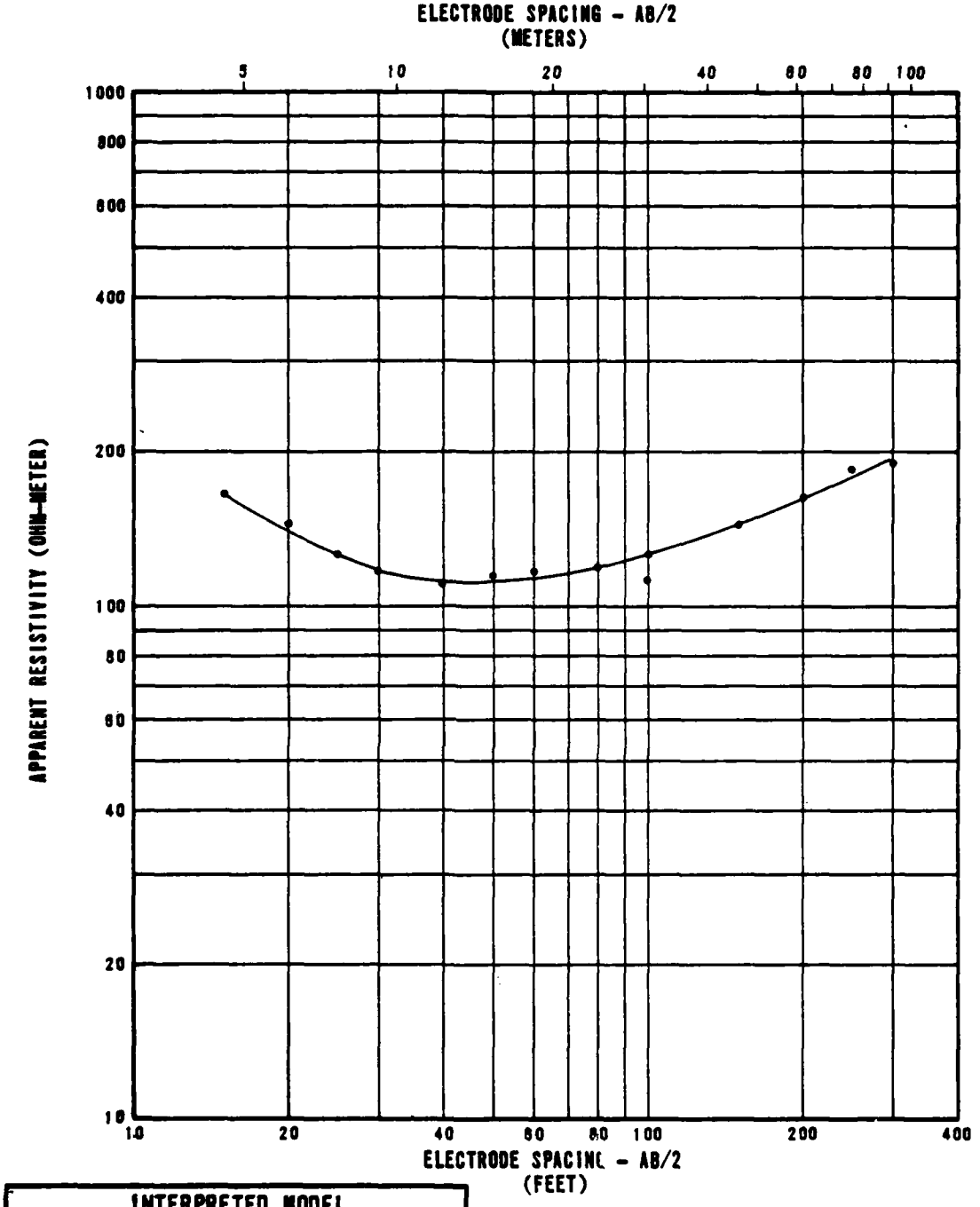
ELECTRICAL RESISTIVITY DATA

EXPLANATIONS OF ELECTRICAL RESISTIVITY DATA

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	200
9	3	100
45	14	130
139	42	440

RESISTIVITY SOUNDING GC-R-1
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

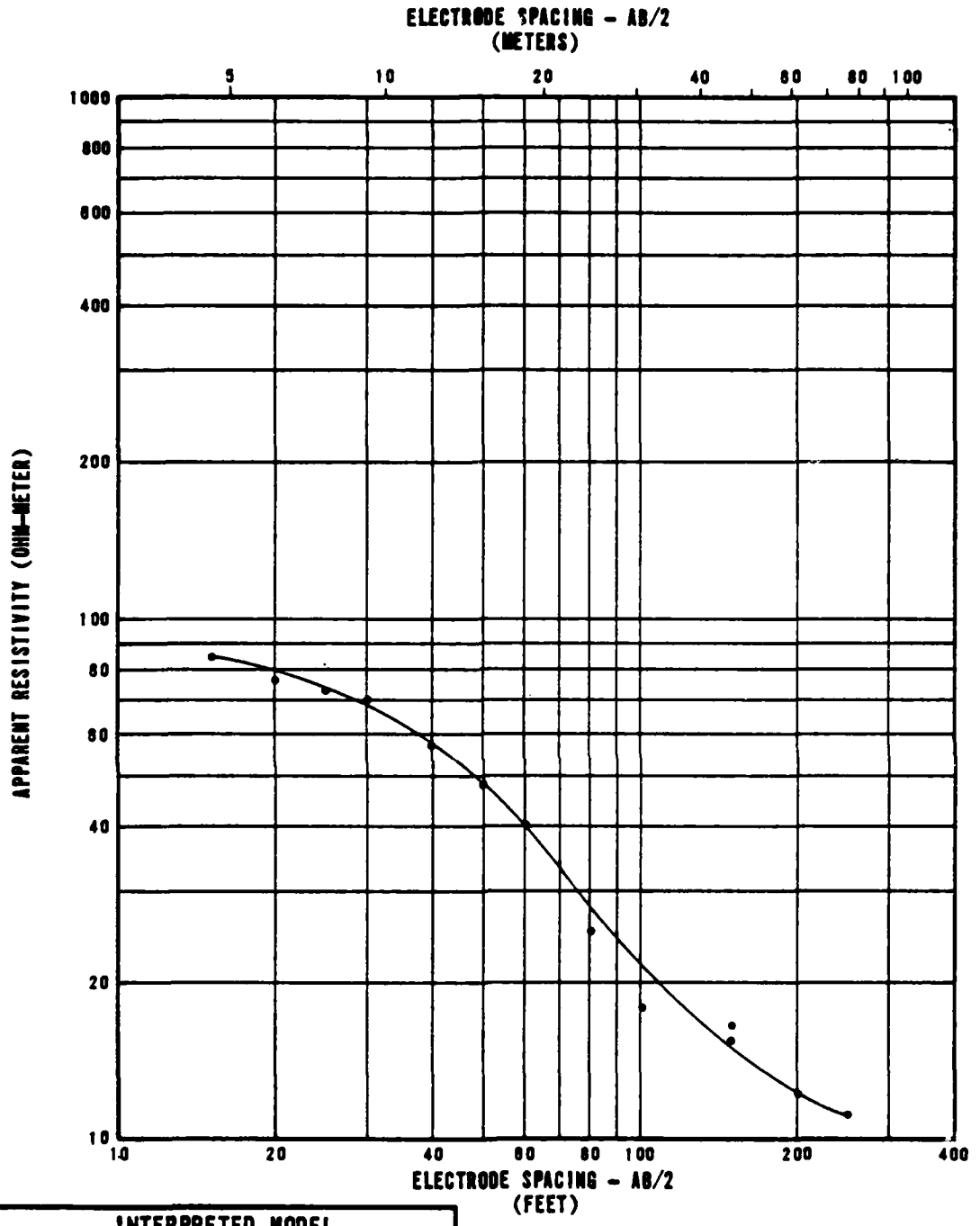
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-1

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	85
21	6	25
52	16	11

RESISTIVITY SOUNDING GC-R-2
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

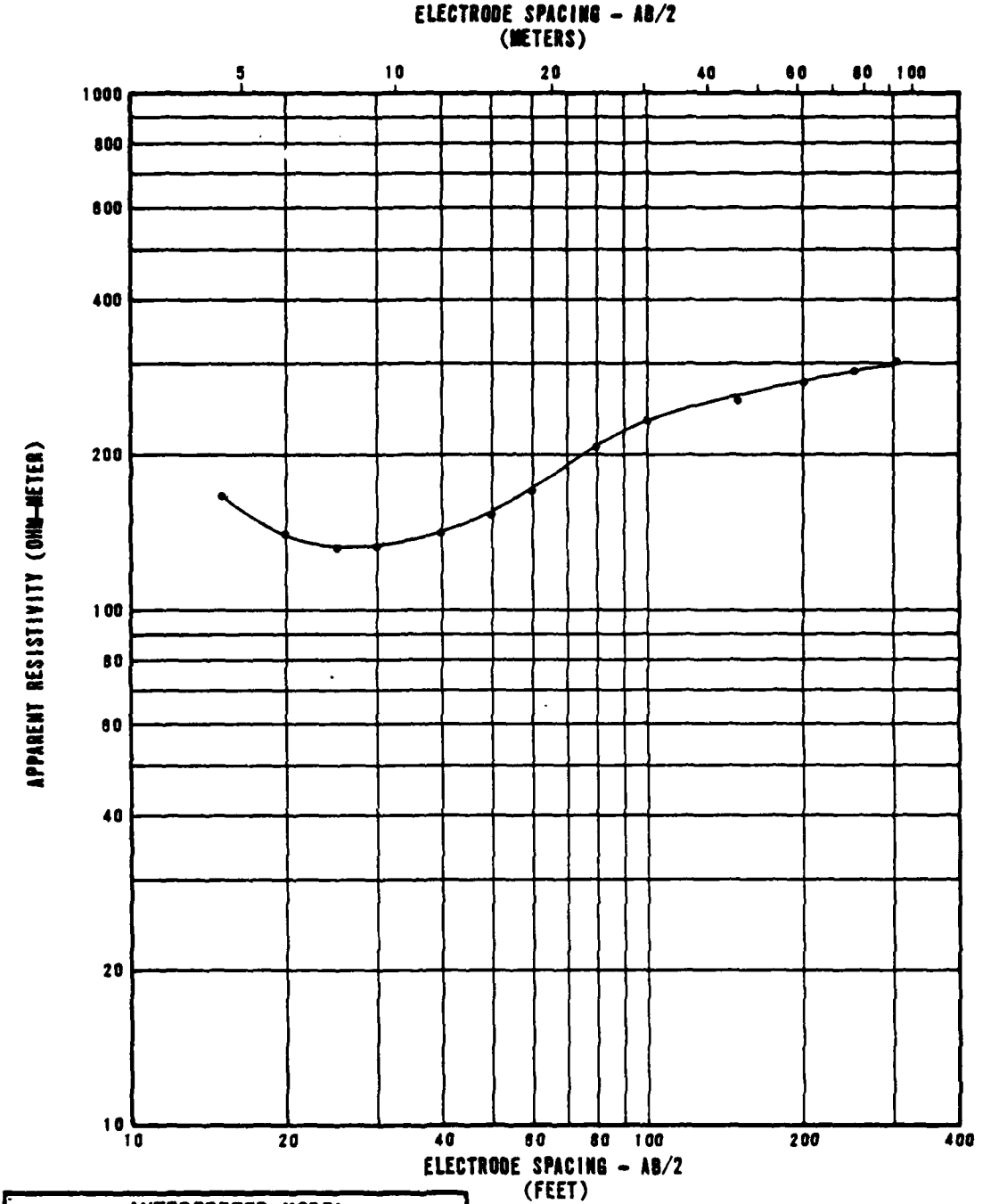
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-2

FUGRO NATIONAL, INC.

2 JUL 79

AFV-1E



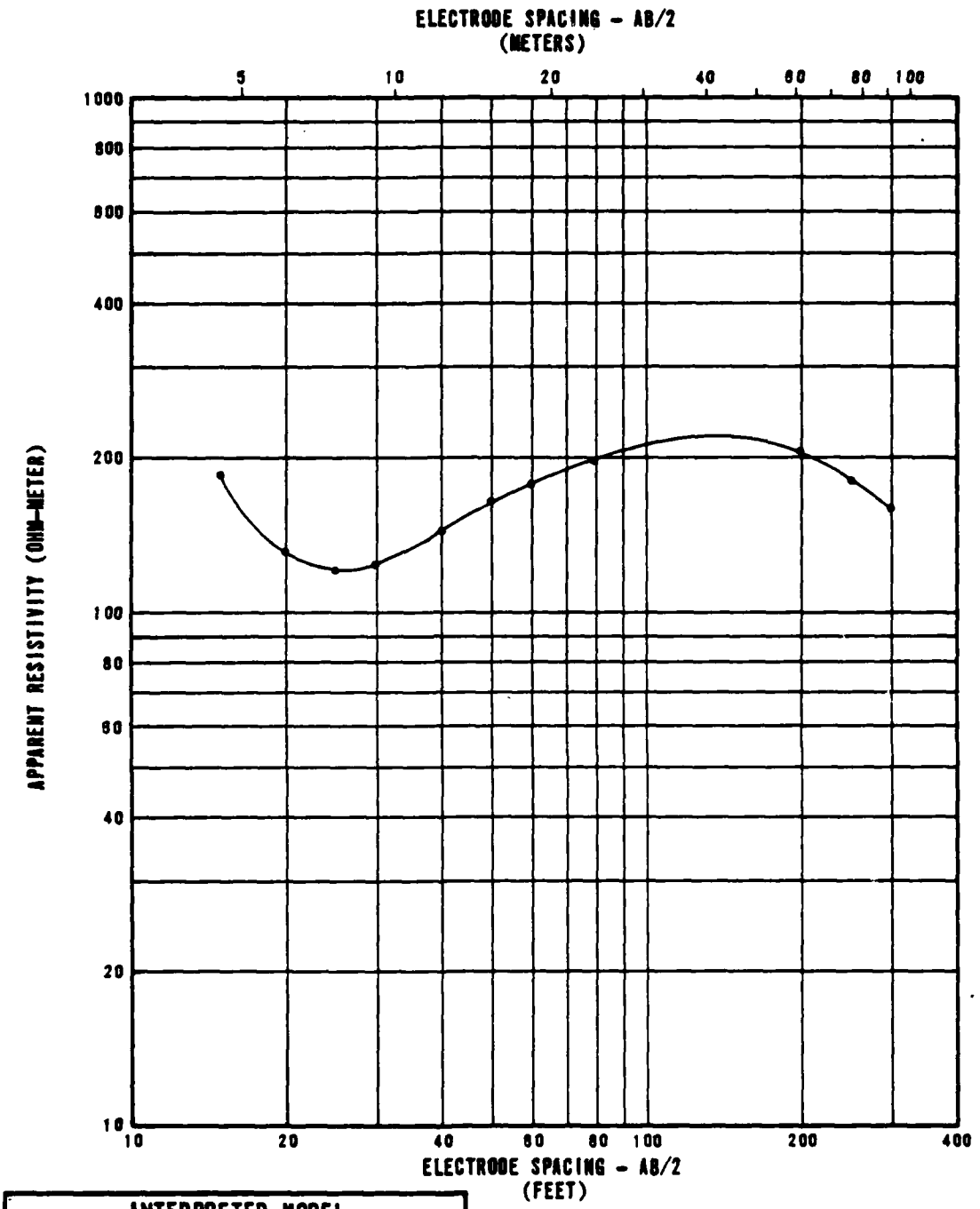
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	220
6	2	120
34	10	920
44	13	380
85	26	280
225	69	380

RESISTIVITY SOUNDING GC-R-3
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-3

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	300
7	2	65
15	5	340
93	28	80

RESISTIVITY SOUNDING GC-R-4
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

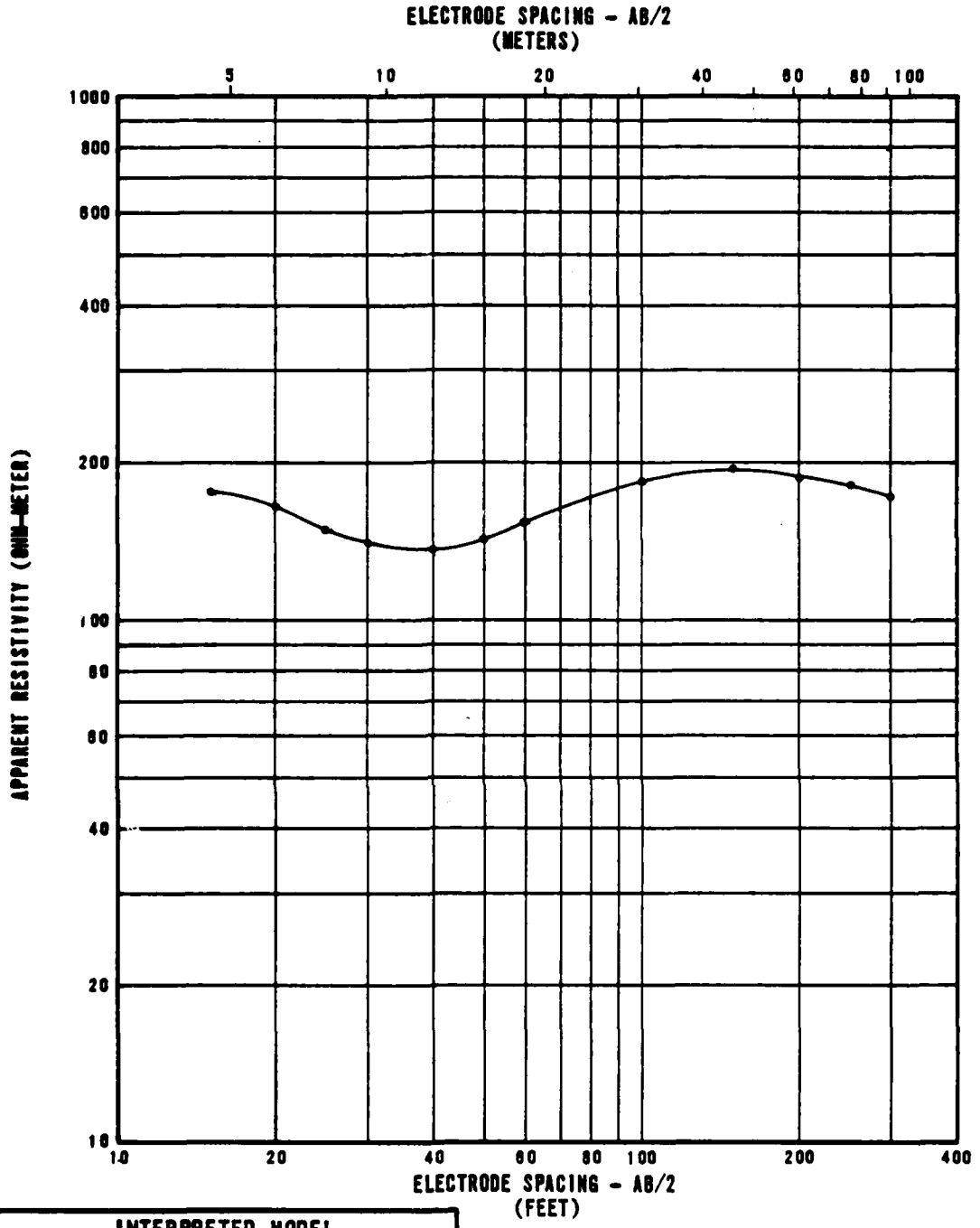
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-4

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



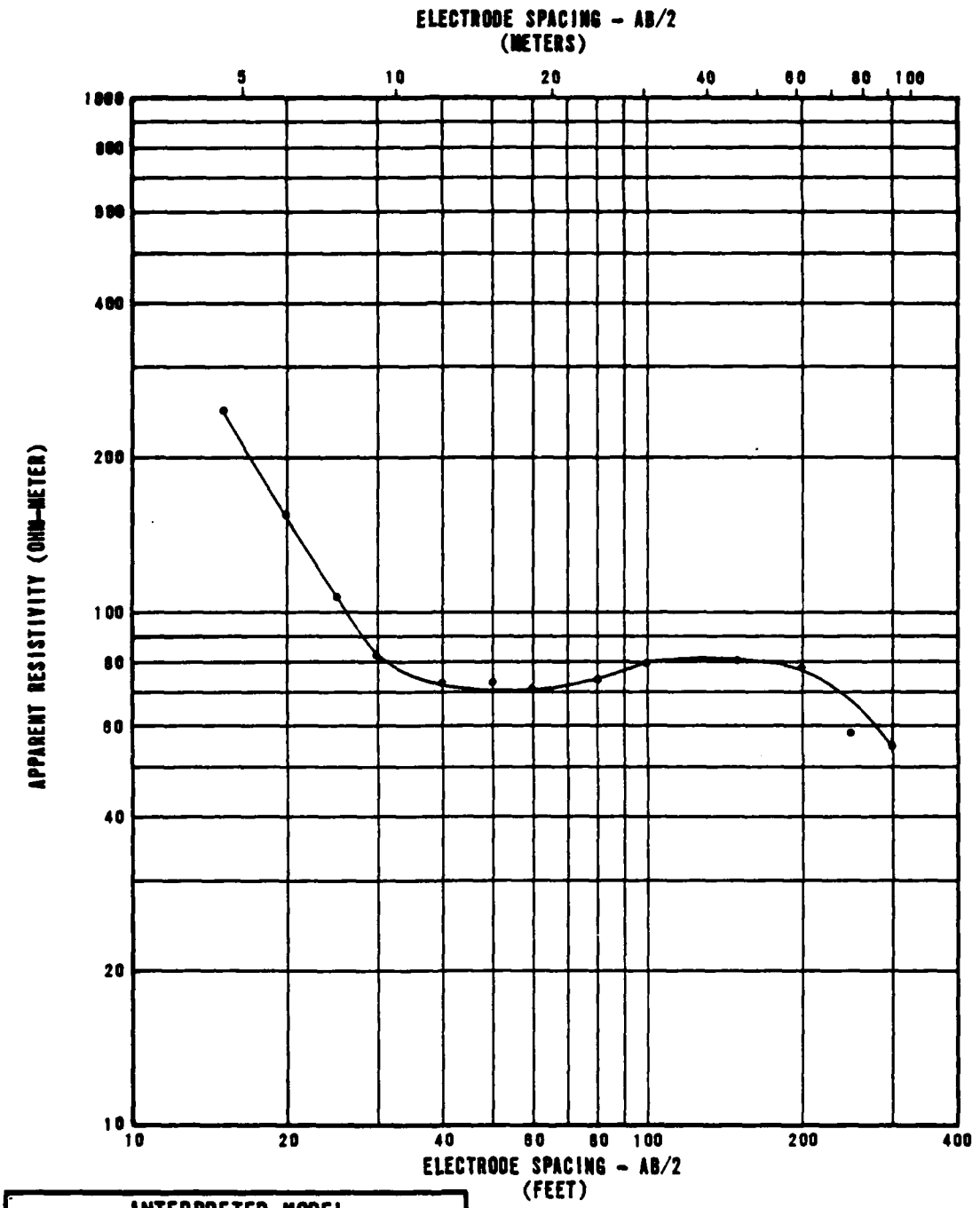
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	190
10	3	100
40	12	480
68	21	100

RESISTIVITY SOUNDING GC-R-5
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-5

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	250
11	3	110
18	5	25
34	10	130
89	27	40

RESISTIVITY SOUNDING GC-R-6
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN- NOA

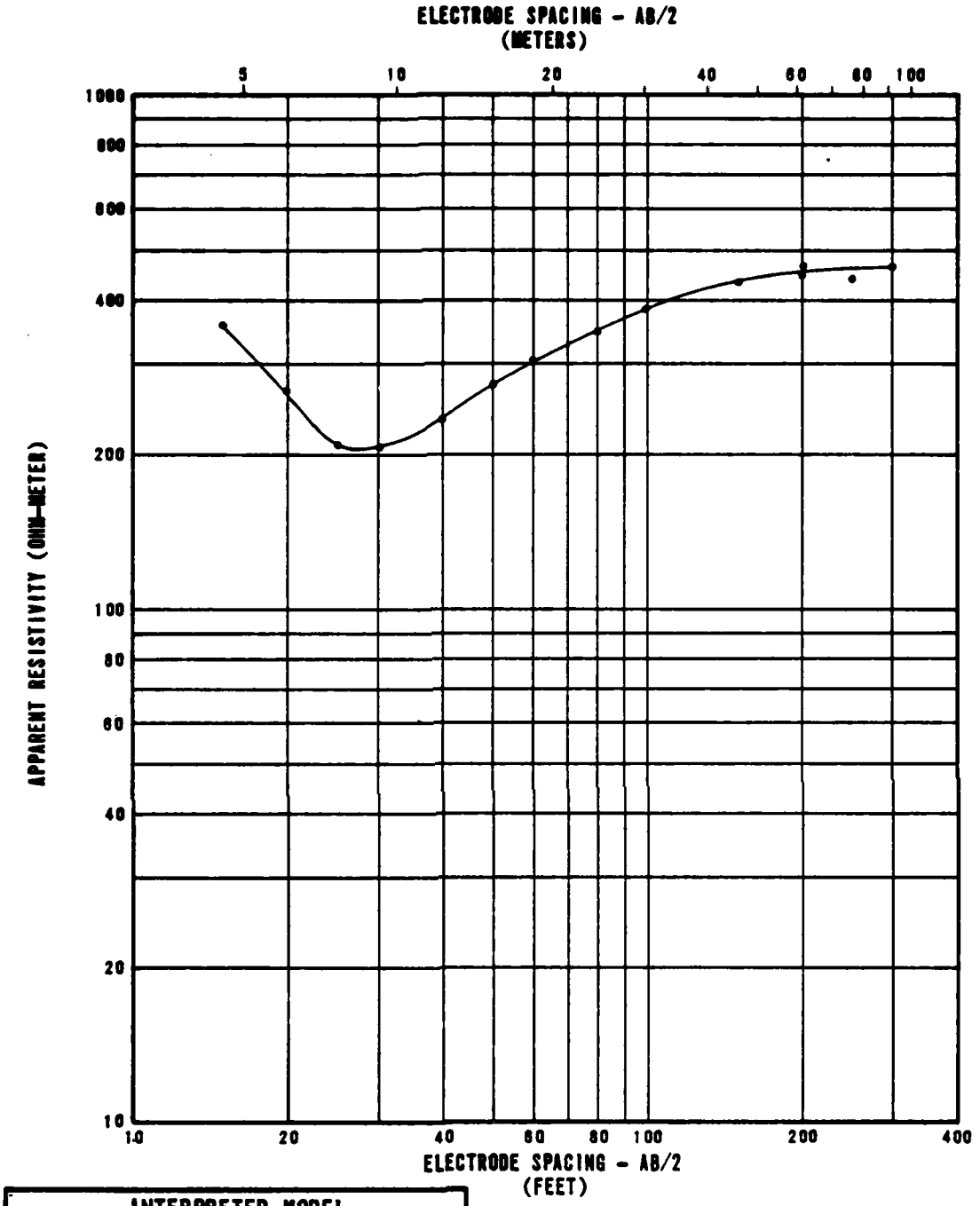
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-6

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	540
9	3	90
19	6	640
91	28	430

RESISTIVITY SOUNDING GC-R-7
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

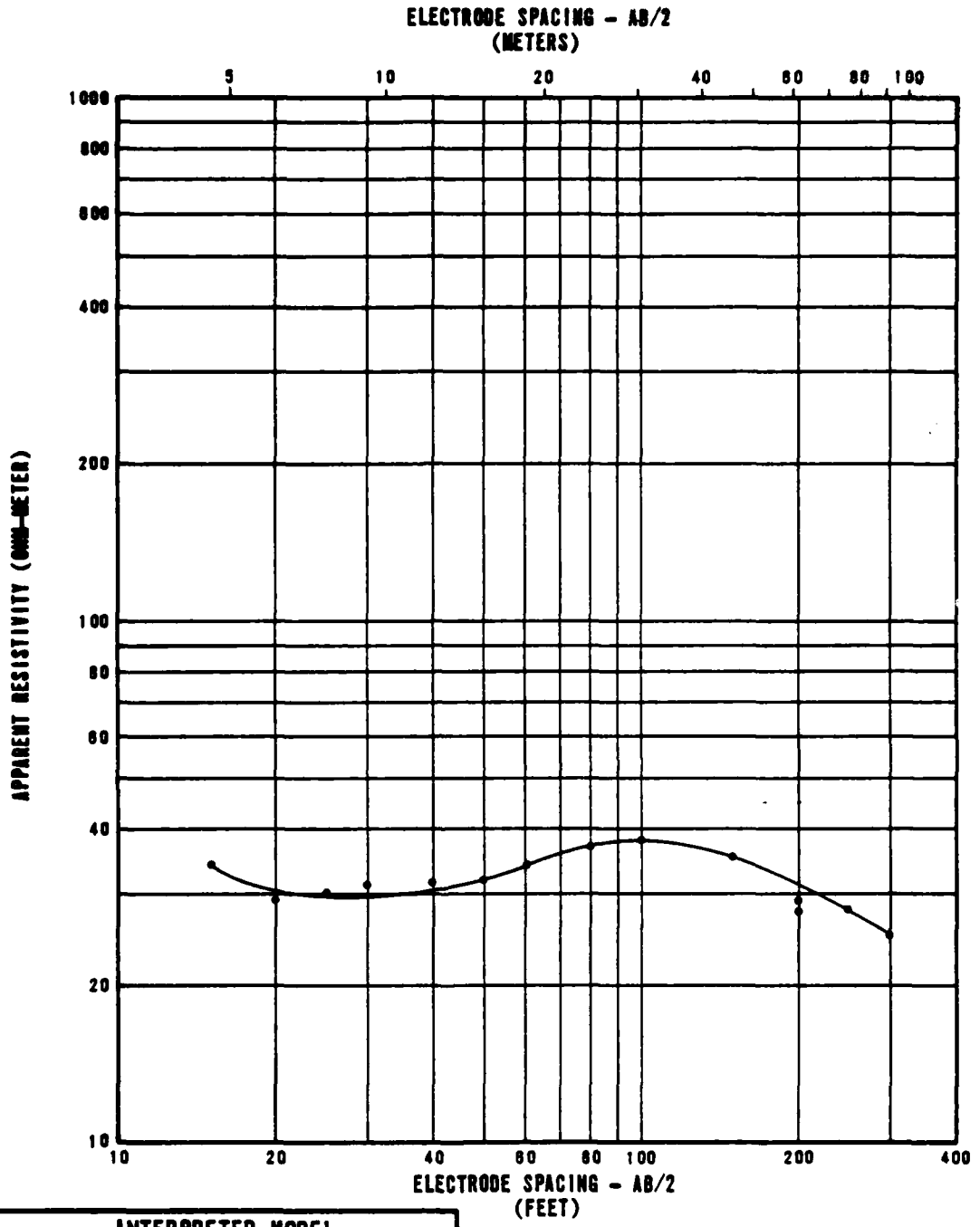
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-7

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	30
25	8	60
75	23	18

RESISTIVITY SOUNDING GC-R-8
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

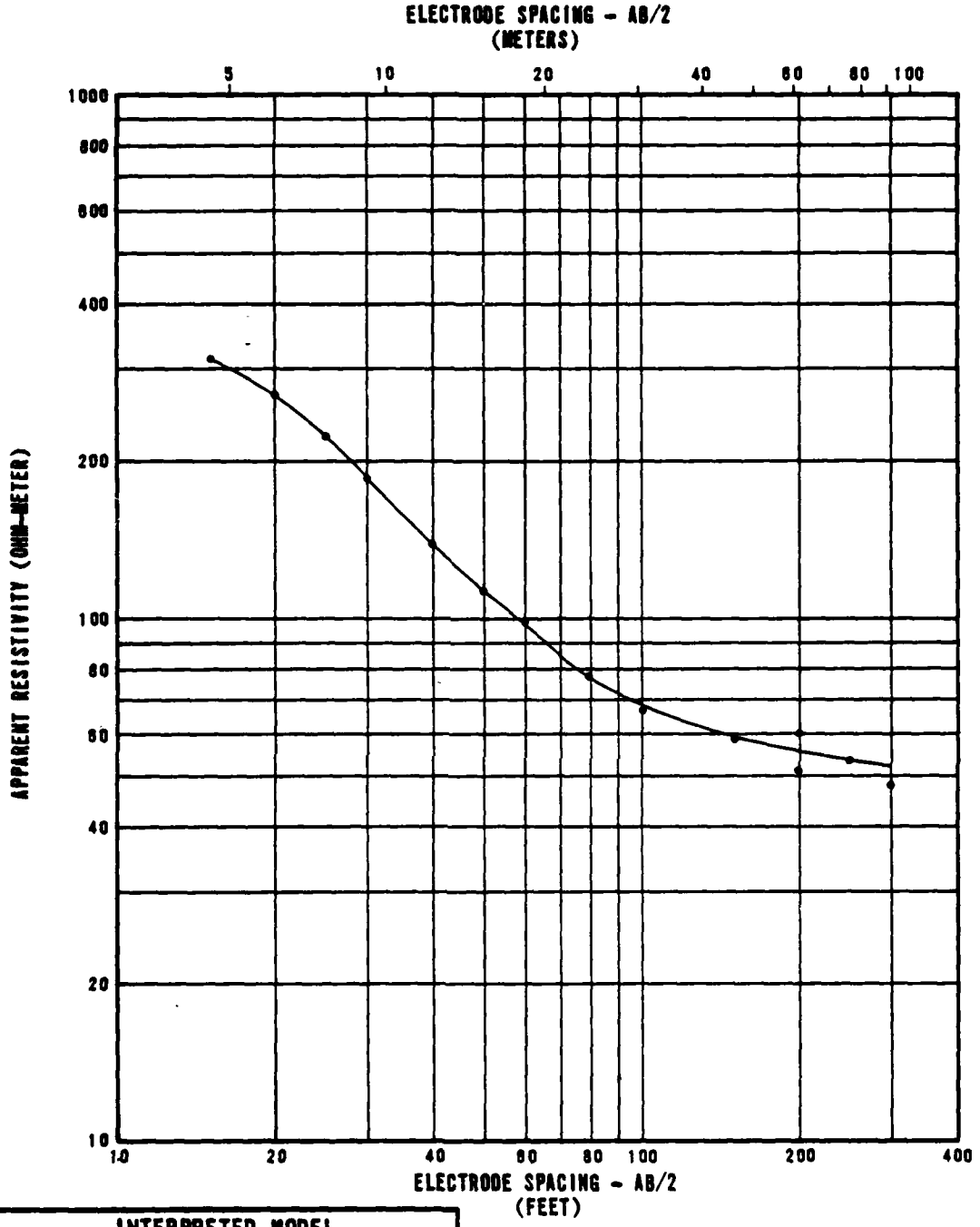
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-8

FUGRO NATIONAL, INC.

2 JUL 78

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	380
11	3	85
200	61	20

RESISTIVITY SOUNDING GC-R-9
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

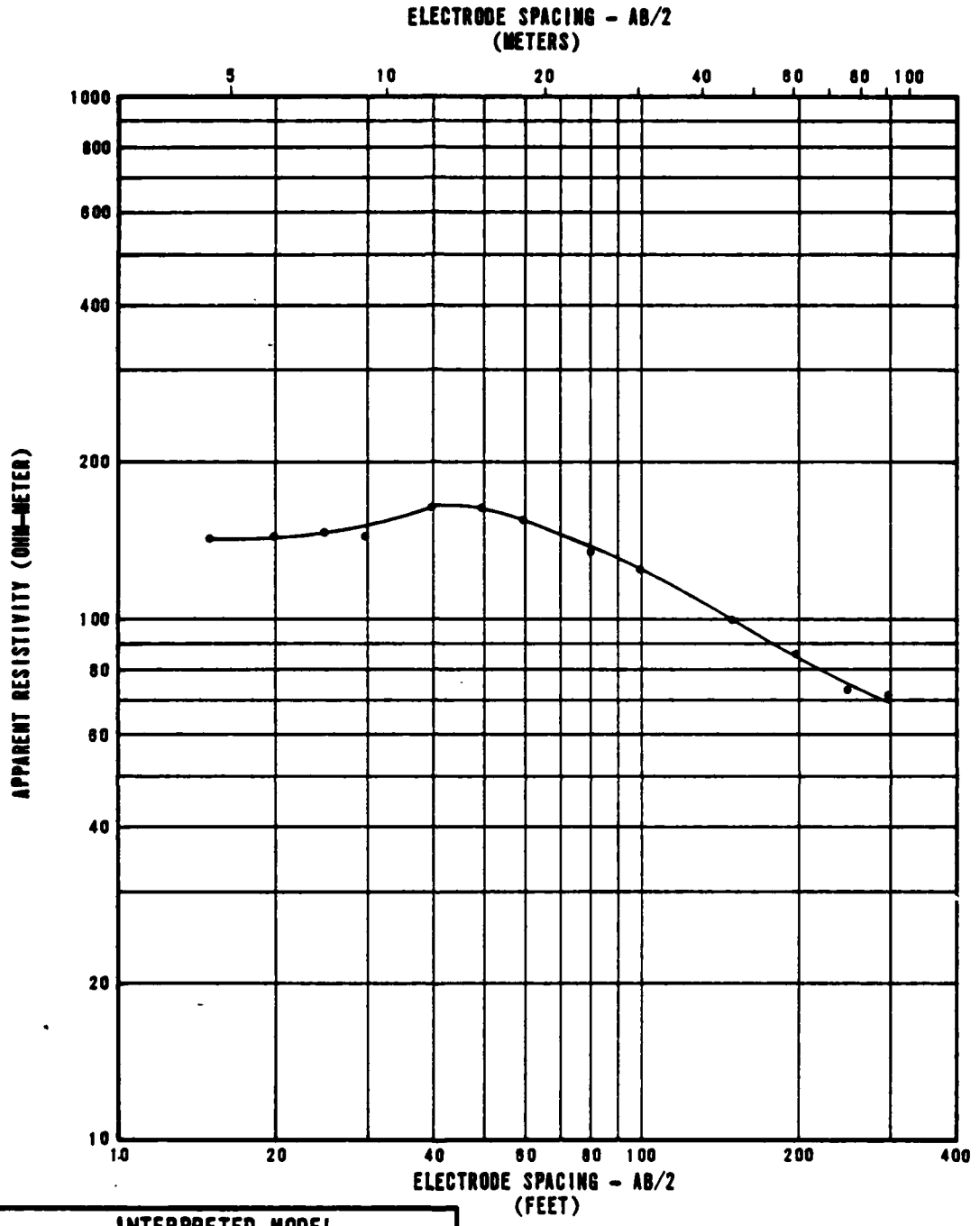
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-9

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	130
15	5	240
39	12	70

RESISTIVITY SOUNDING GC-R-10
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

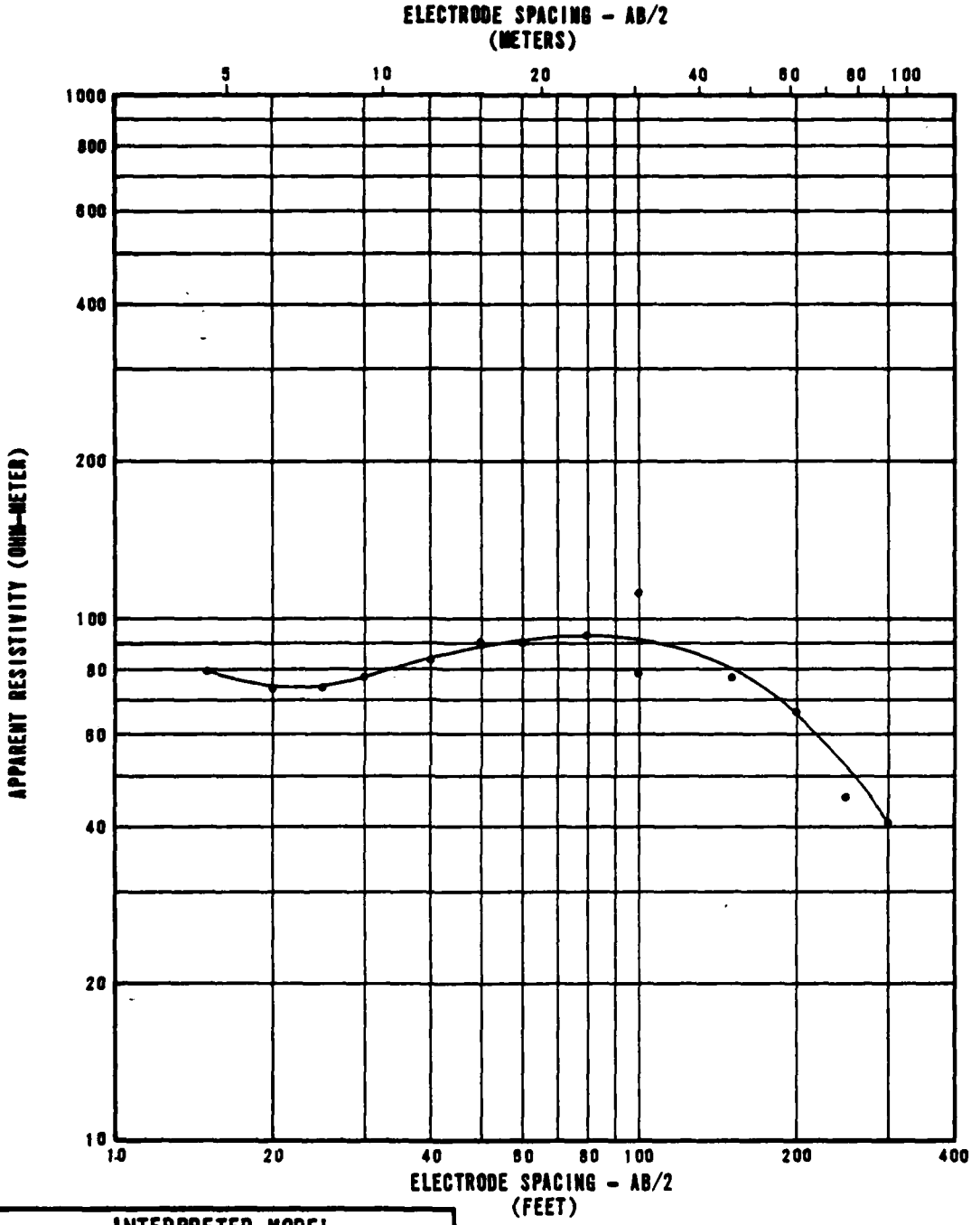
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-10

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	70
23	7	190
57	17	35

RESISTIVITY SOUNDING GC-R-11
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

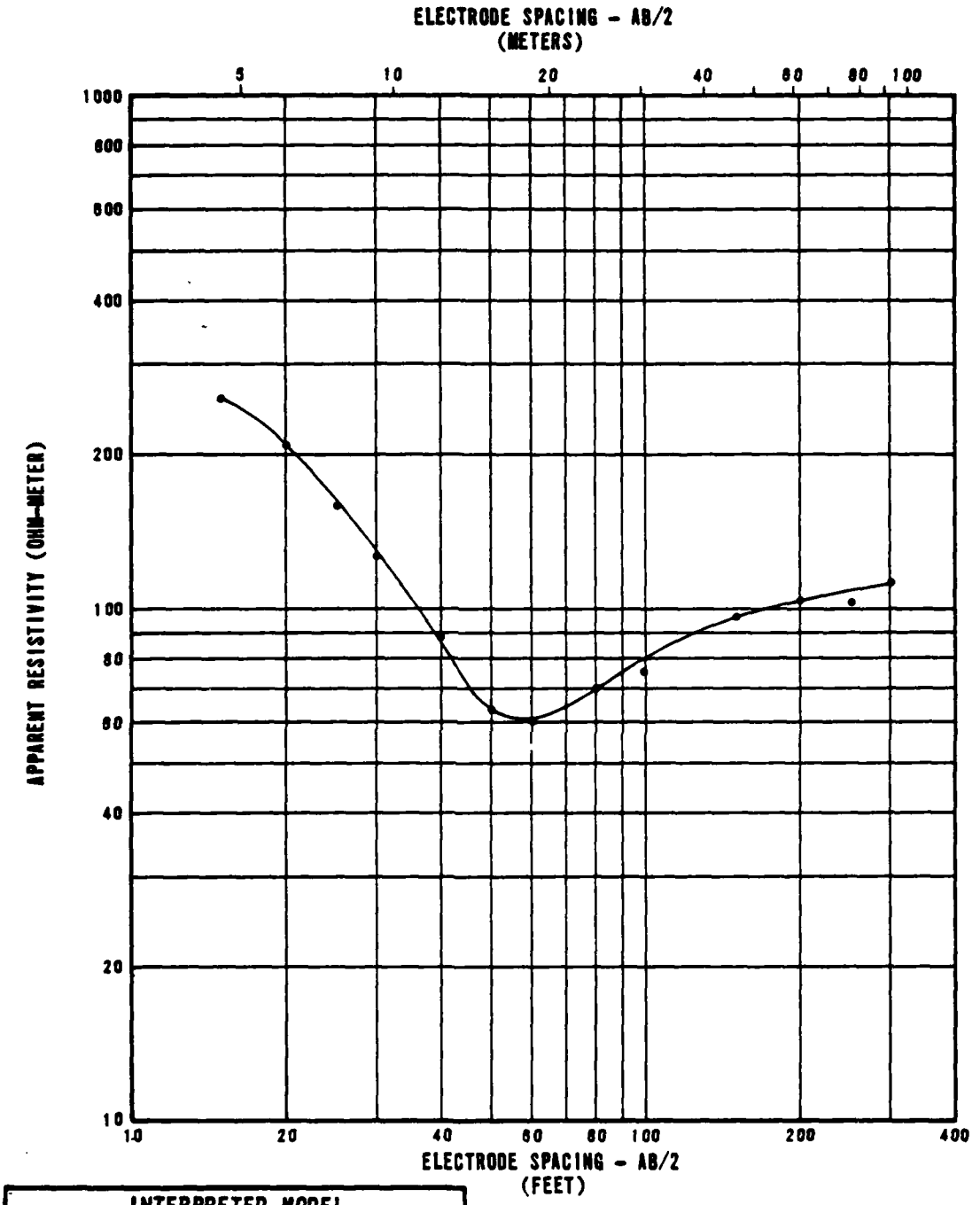
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-11

FUGRO NATIONAL, INC.

2 JUL 78

AFV-15



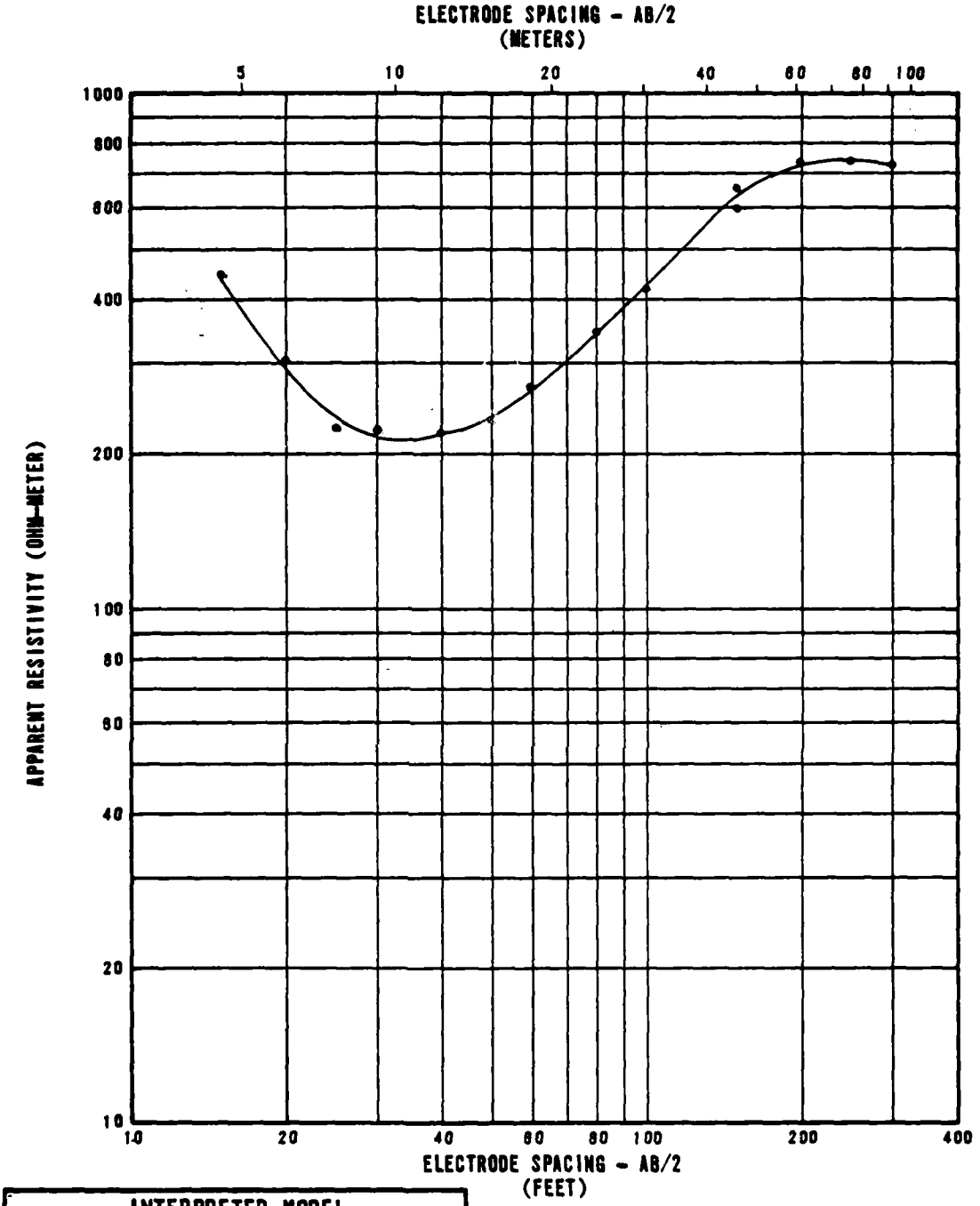
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	320
10	3	140
17	5	18
26	8	130

RESISTIVITY SOUNDING GC-R-12
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-12

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	640
10	3	100
25	8	830
51	16	1610
168	51	580

RESISTIVITY SOUNDING GC-R-13
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

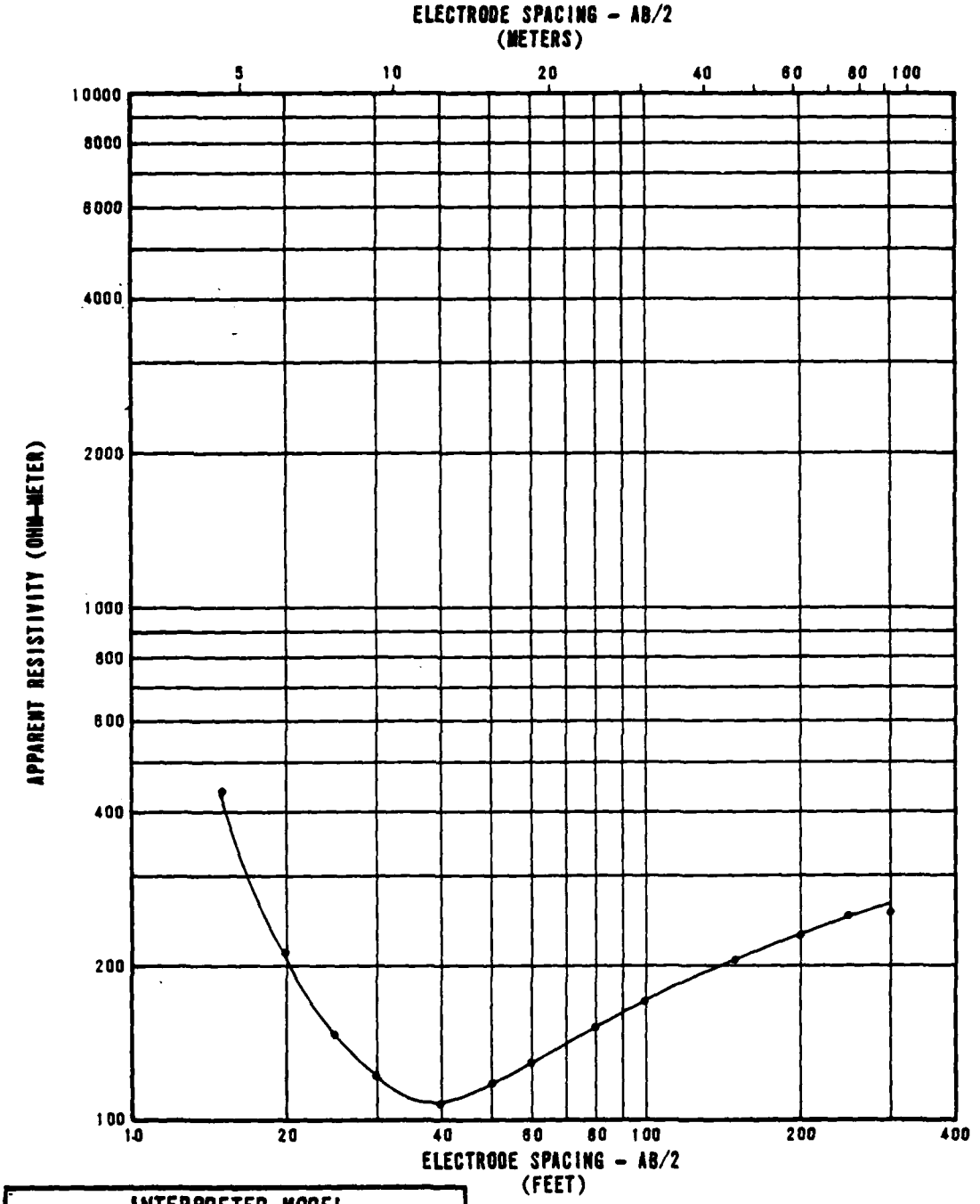
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-13

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	390
10	3	45
19	6	290

RESISTIVITY SOUNDING GC-R-15
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL COP. NEVADA

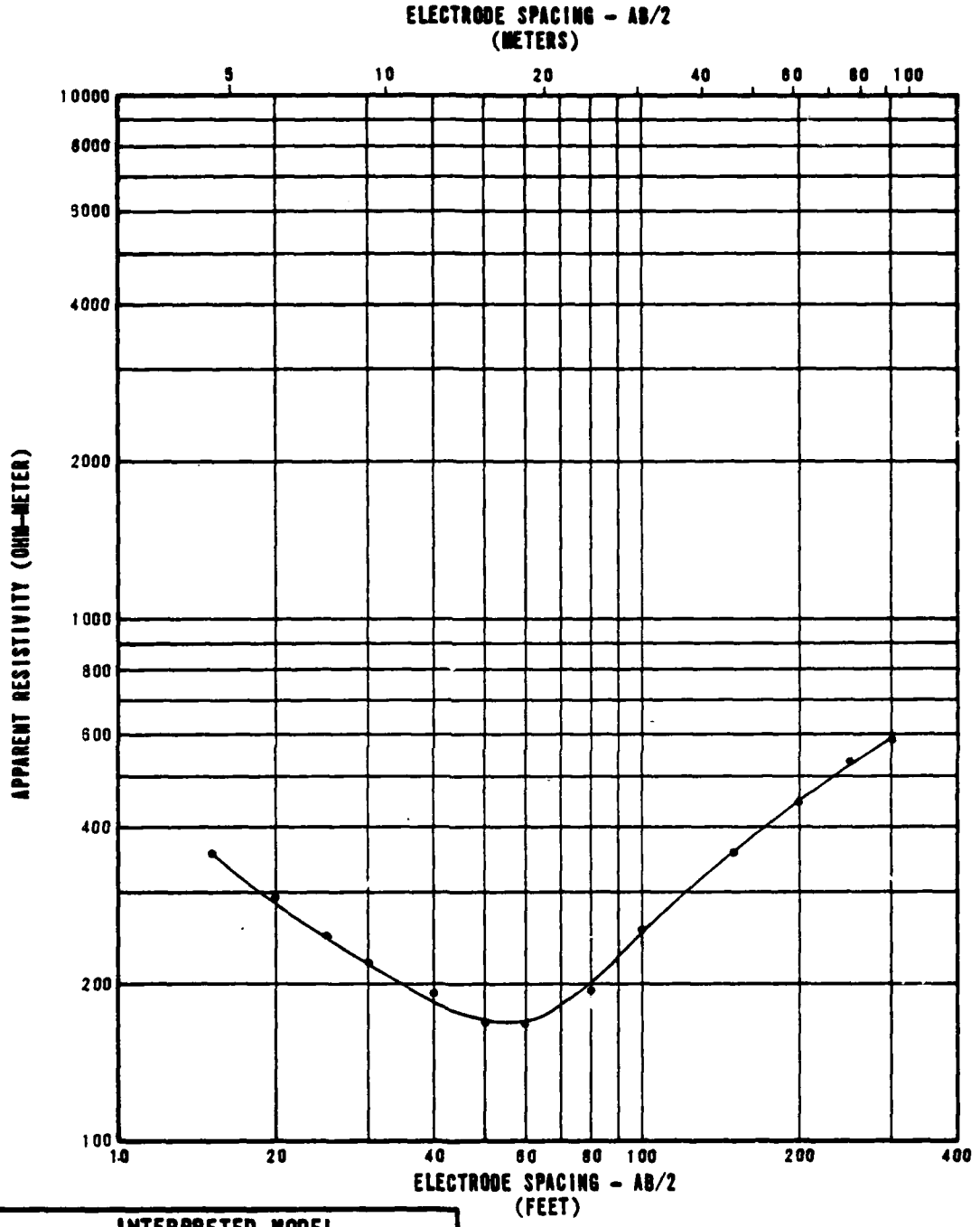
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-14

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	470
10	3	110
49	15	1380

RESISTIVITY SOUNDING GC-R-16
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

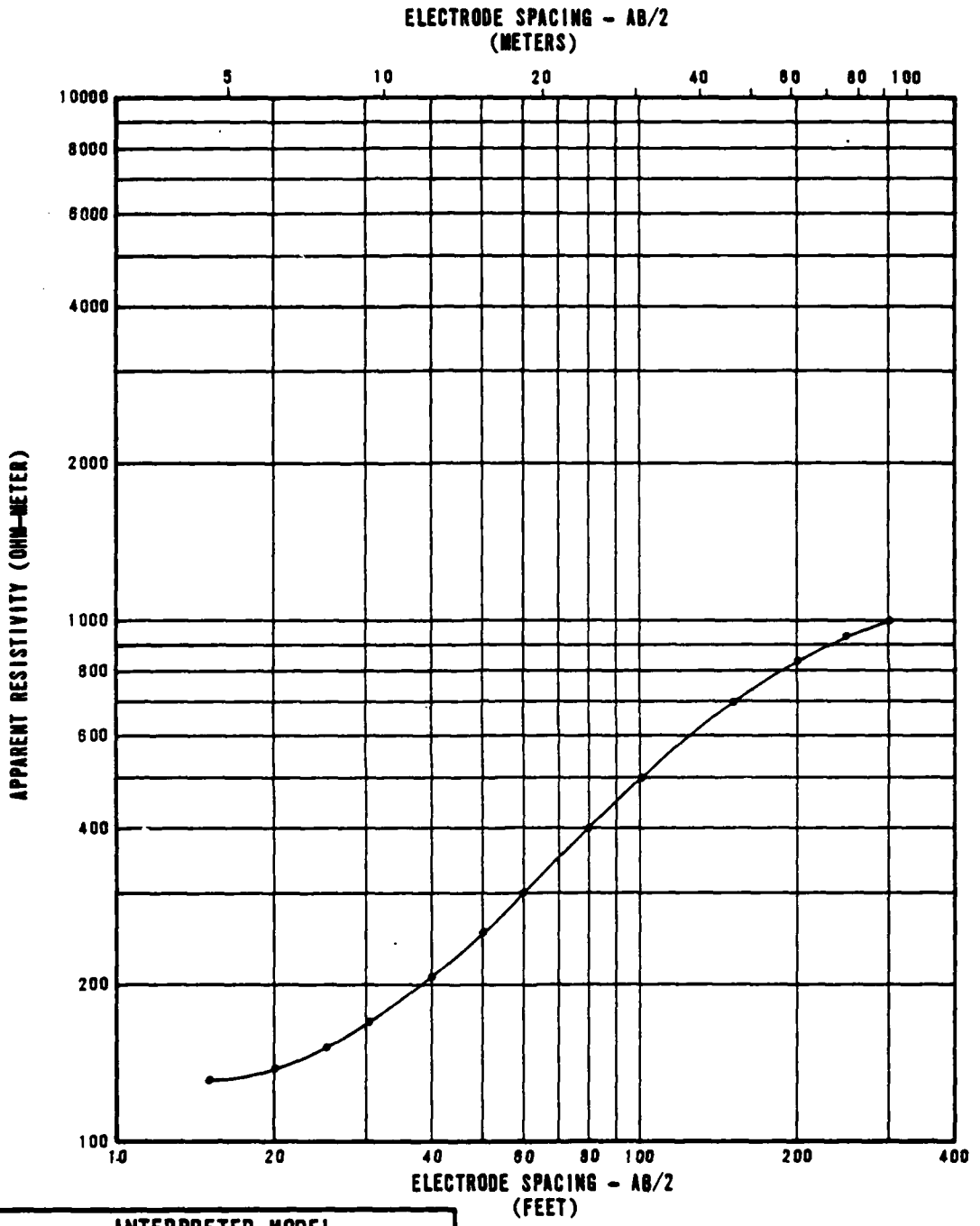
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-15

FUGRO NATIONAL, INC.

2 JUL 78

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	120
23	7	1020
34	10	5780
65	20	1890

RESISTIVITY SOUNDING GC-R-17
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

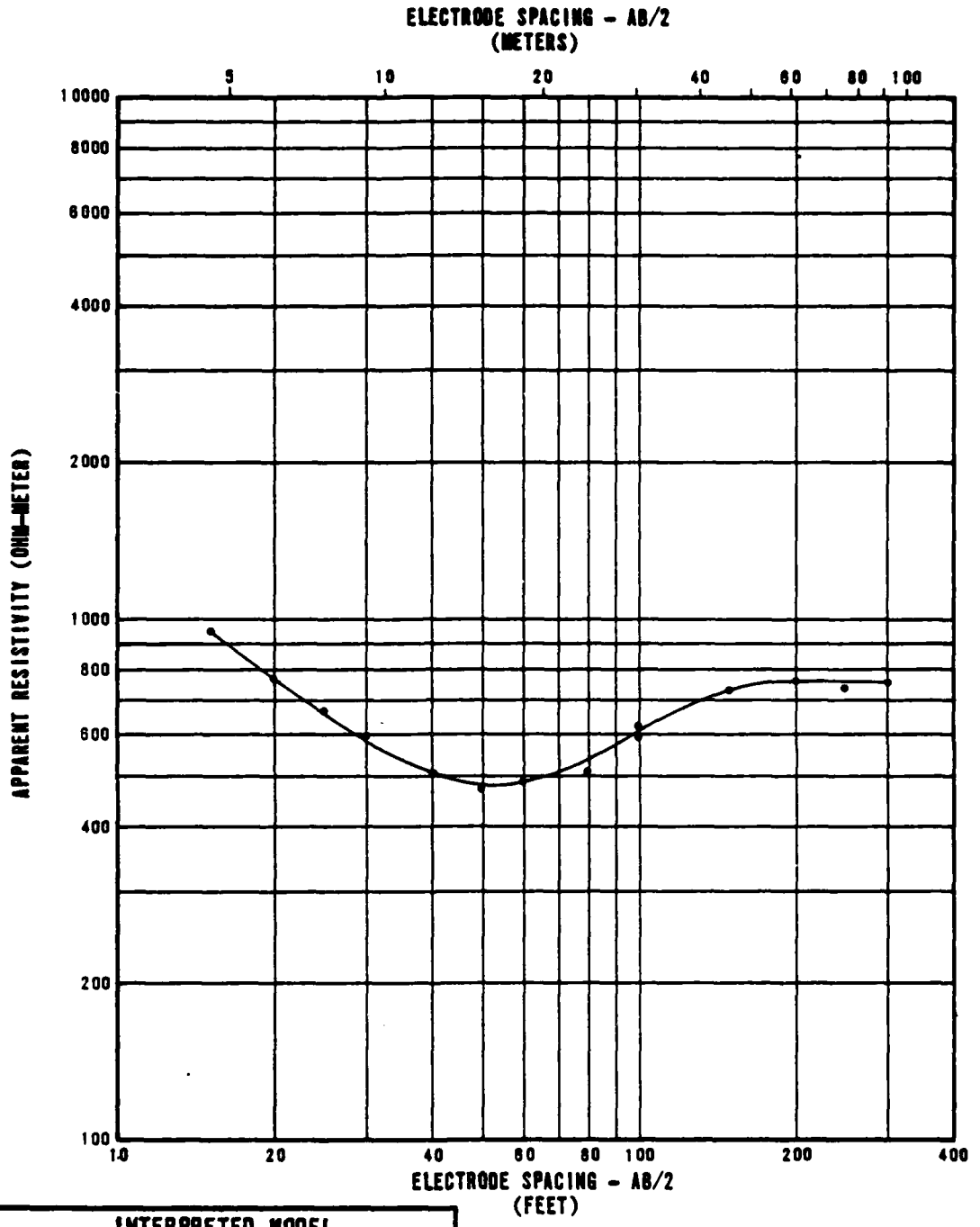
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-16

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	9	1230
8	2	400
48	15	1300
122	37	630

RESISTIVITY SOUNDING GC-R-18
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

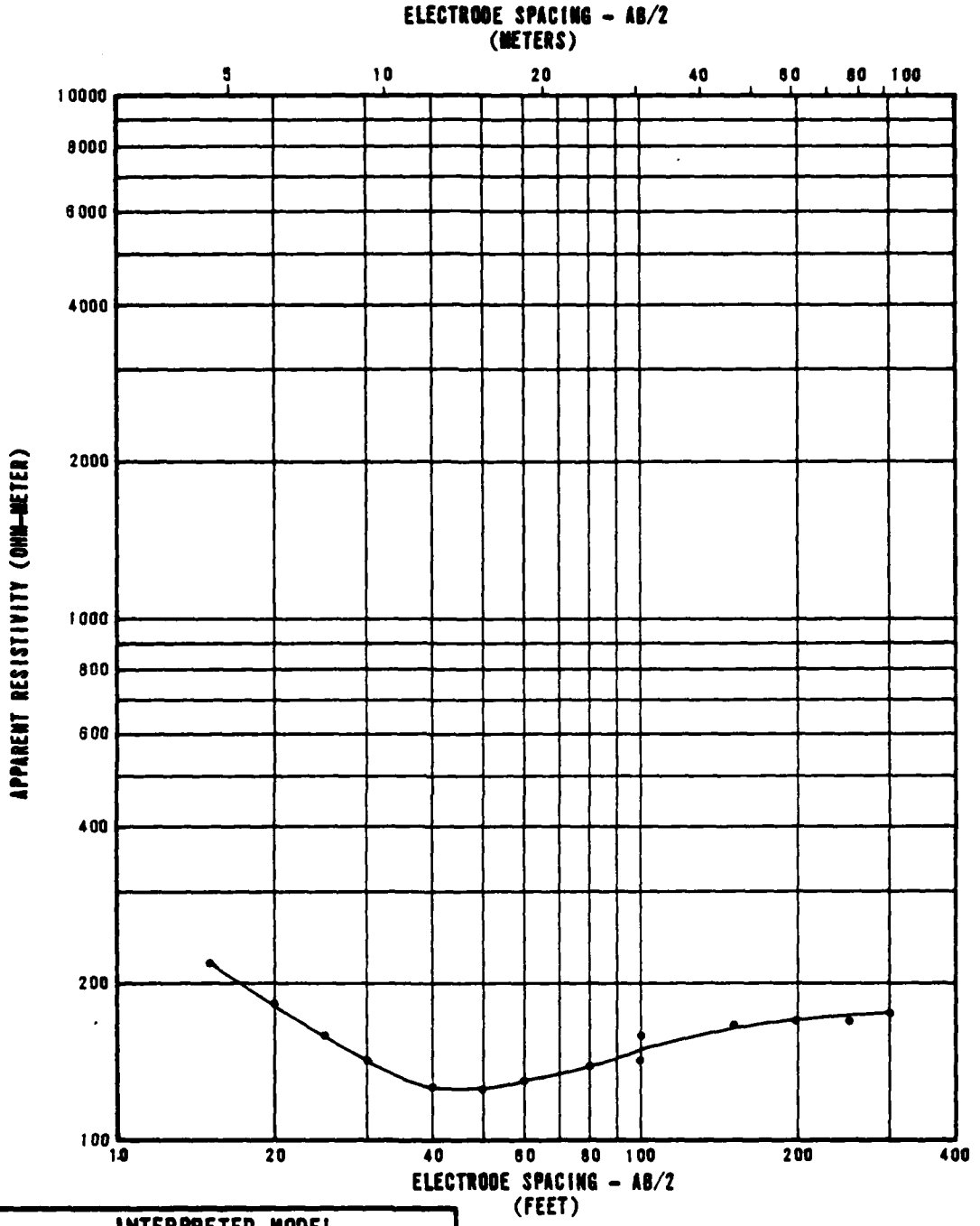
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

Figure
4-17

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	260
7	2	120
43	13	260
76	23	160

RESISTIVITY SOUNDING GC-R-19
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-18

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15

SECTION 5.0

GRAVITY DATA

EXPLANATIONS OF GRAVITY DATA

Gravity data were not available in time (prior to June 1979) for incorporation into this report. A supplemental report containing gravity data and results will be issued at a later date.

SECTION 6.0

BORING LOGS

EXPLANATIONS OF BORING, TRENCH, AND TEST PIT LOGS

All data from borings, trenches, and test pits are presented on standard Fugro National logs in Sections 6.0 and 7.0. The following explanations are provided as a key to the logs.

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

WW-B-1
WW - abbreviation for the site (e.g., WW-Whirlwind)
B - abbreviation for activity (e.g., B-boring, T-trench, P-test pit)
1 - number of activity

B. Sample Type - Different sampling techniques were used and the symbols are explained at the bottom of tne boring logs. For details of sampling techniques, see Section A5.0 of Appendix 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 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 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 D 2488-69, Description of Soils (Visual-Manual Procedure) were followed. Solid lines across the column indicate 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	- no feel of moisture
Slightly Moist	- much less than normal moisture
Moist	- normal moisture for soil
Very Moist	- much greater than normal moisture
Wet	- for soils below the water table (if known)

UNIFIED SOIL CLASSIFICATION SYSTEM

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 6-1

FUGRO NATIONAL, INC.

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

Consistency	N Value (ASTM D 1586-67)
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:

Consistency	Shear Strength (ksf)	Shear Strength (kn/m^2)	Field Guide
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 porous 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 - >21% (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, >31)

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 (8 and 30 cm).

A boulder is a rock fragment, usually rounded by weathering or abrasion, with an average diameter of 12 inches (30 cm) 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, trench wall stability, loss of drilling fluid in the boring, 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. Seive Analysis - The numbers represent the percentage by dry weight (ASTM D 422-63) of each of tne following soil components:

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

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

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

L. Atterberg Limits (LL and PI) -

LL - Liquid Limit, the water content corresponding to tne 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, within 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.

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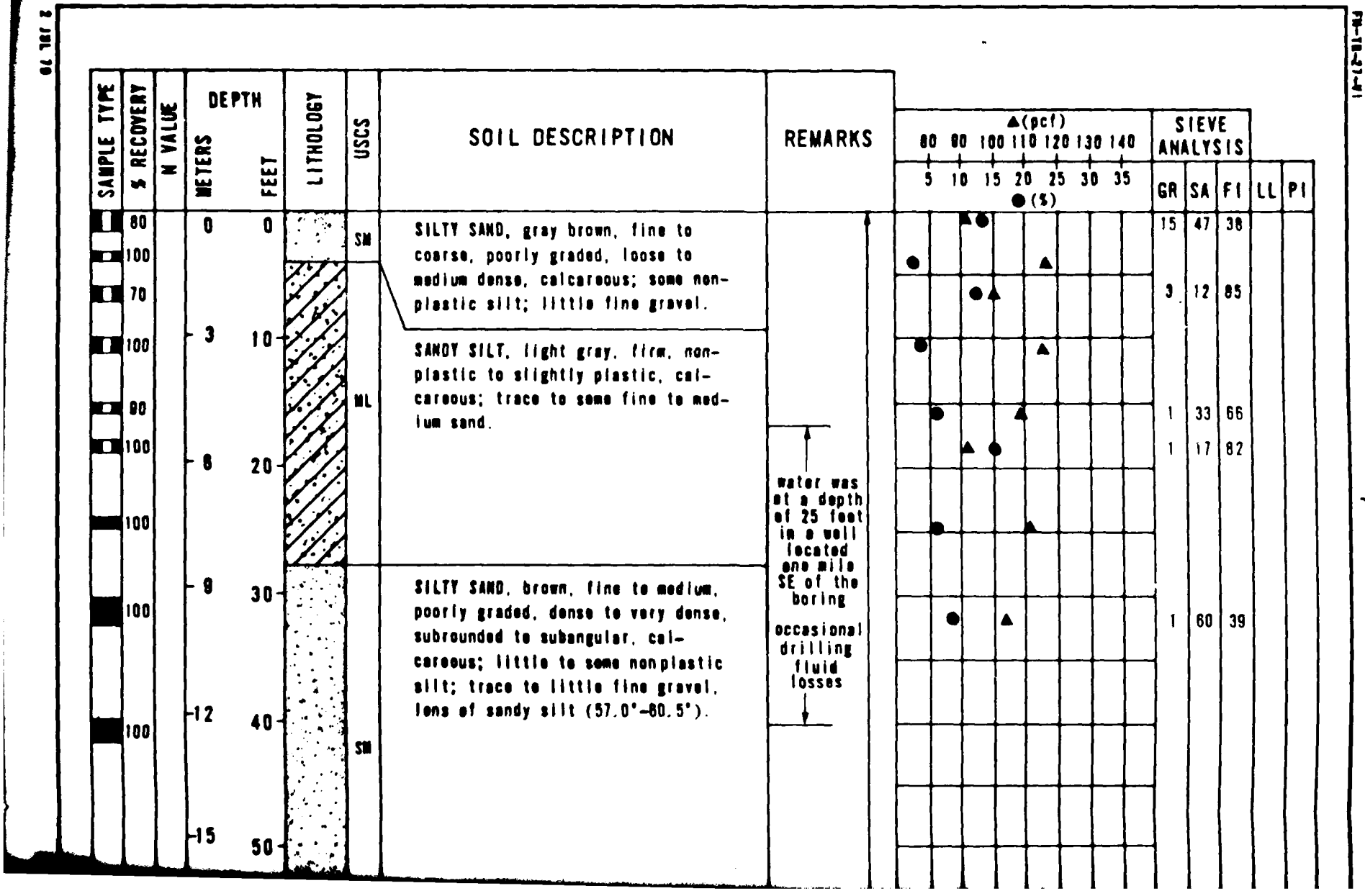
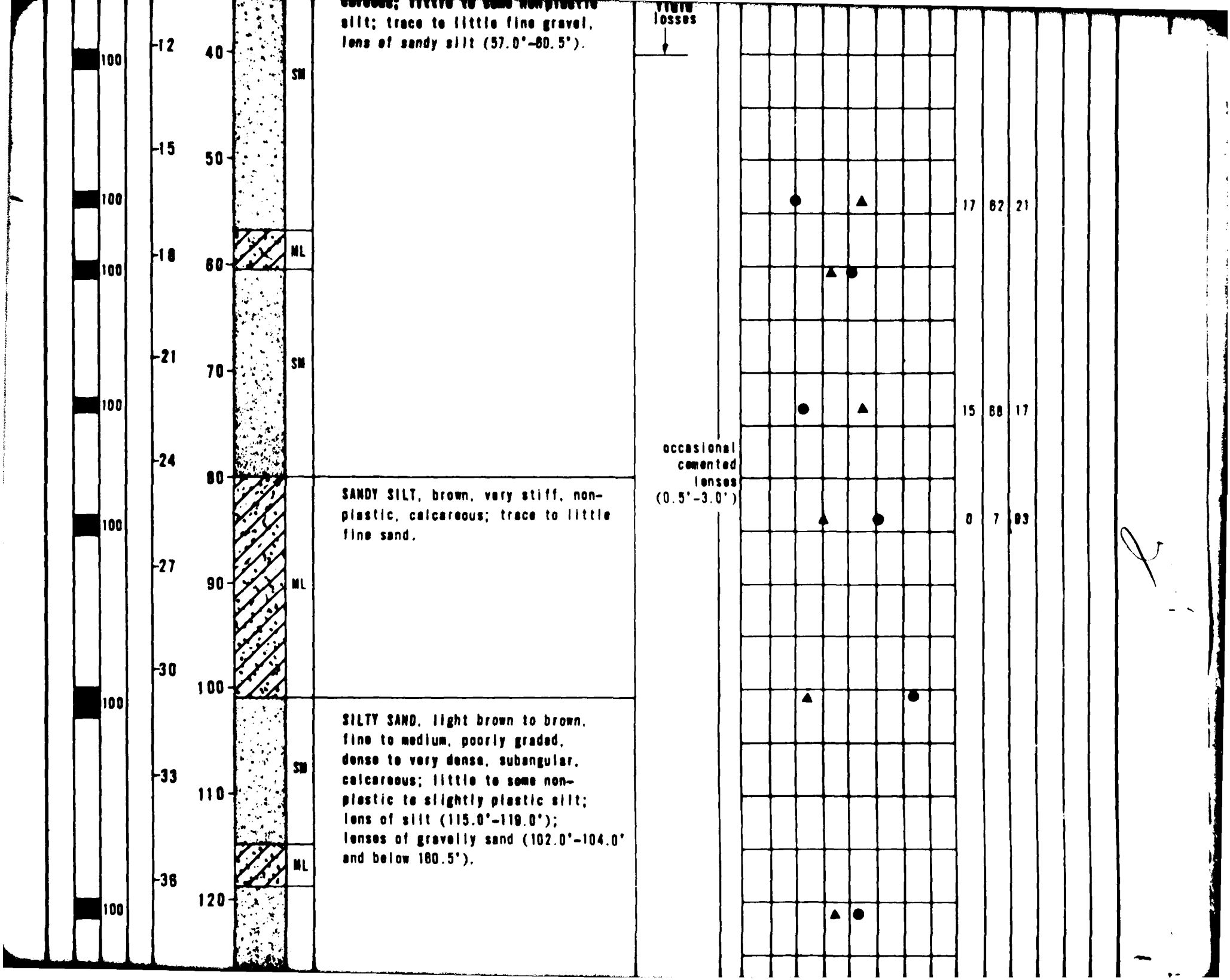
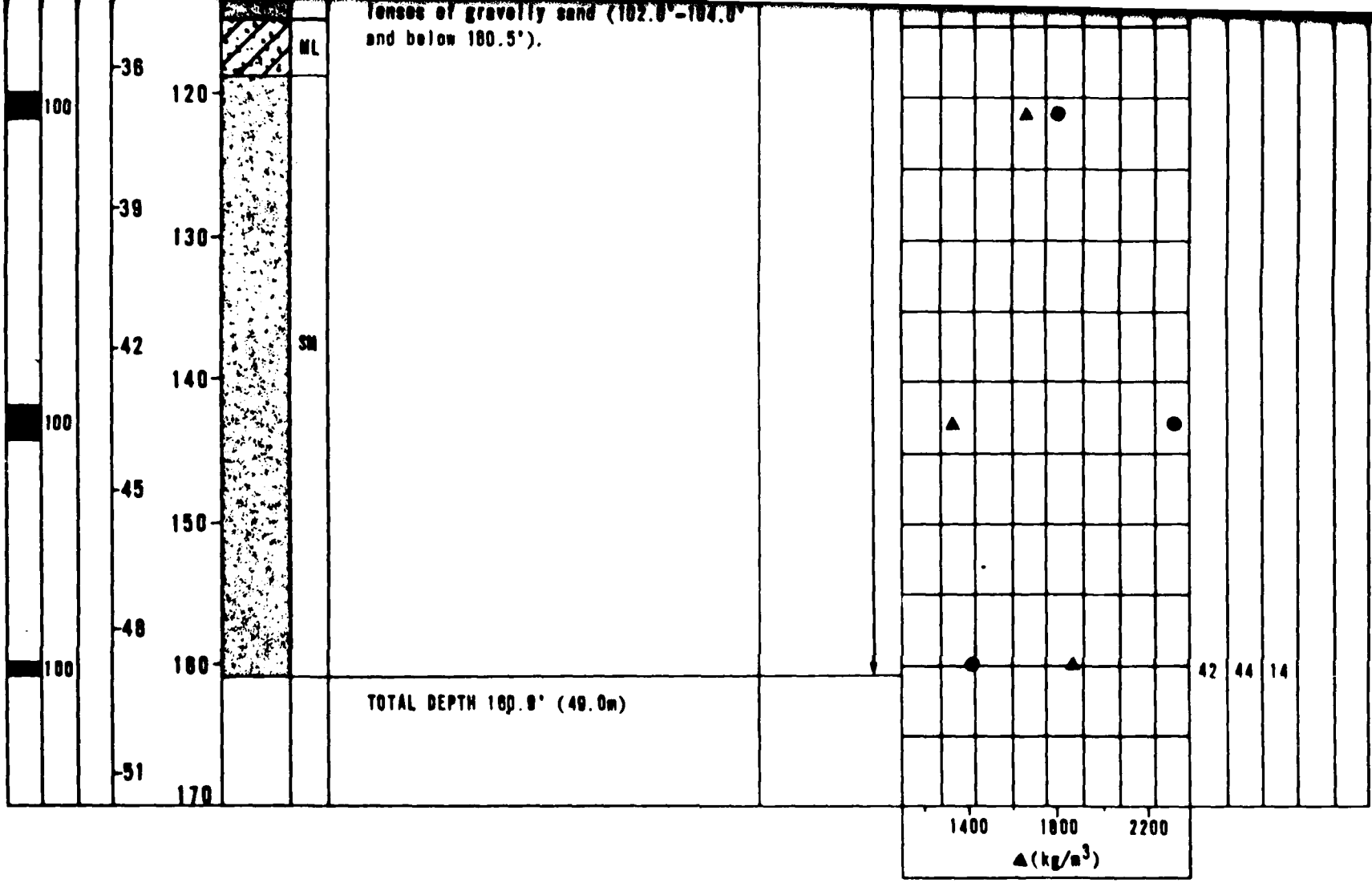



losses
100
100
100
100
100
100
100
12
15
18
21
24
27
30
33
36
40
50
60
70
80
90
100
110
120
SM
ML
SM
SM
ML
ML
SILTY SAND, light brown to brown, fine to medium, poorly graded, dense to very dense, subangular, calcareous; little to some non-plastic to slightly plastic silt; lens of silt (115.0'-119.0'); lenses of gravelly sand (102.0'-104.0' and below 180.5').
SANDY SILT, brown, very stiff, non-plastic, calcareous; trace to little fine sand.
occasional cemented lenses (0.5'-3.0')
17 82 21
15 88 17
0 7 93



lenses of gravelly sand (102.0'-104.0' and below 180.5').

EXPLANATION

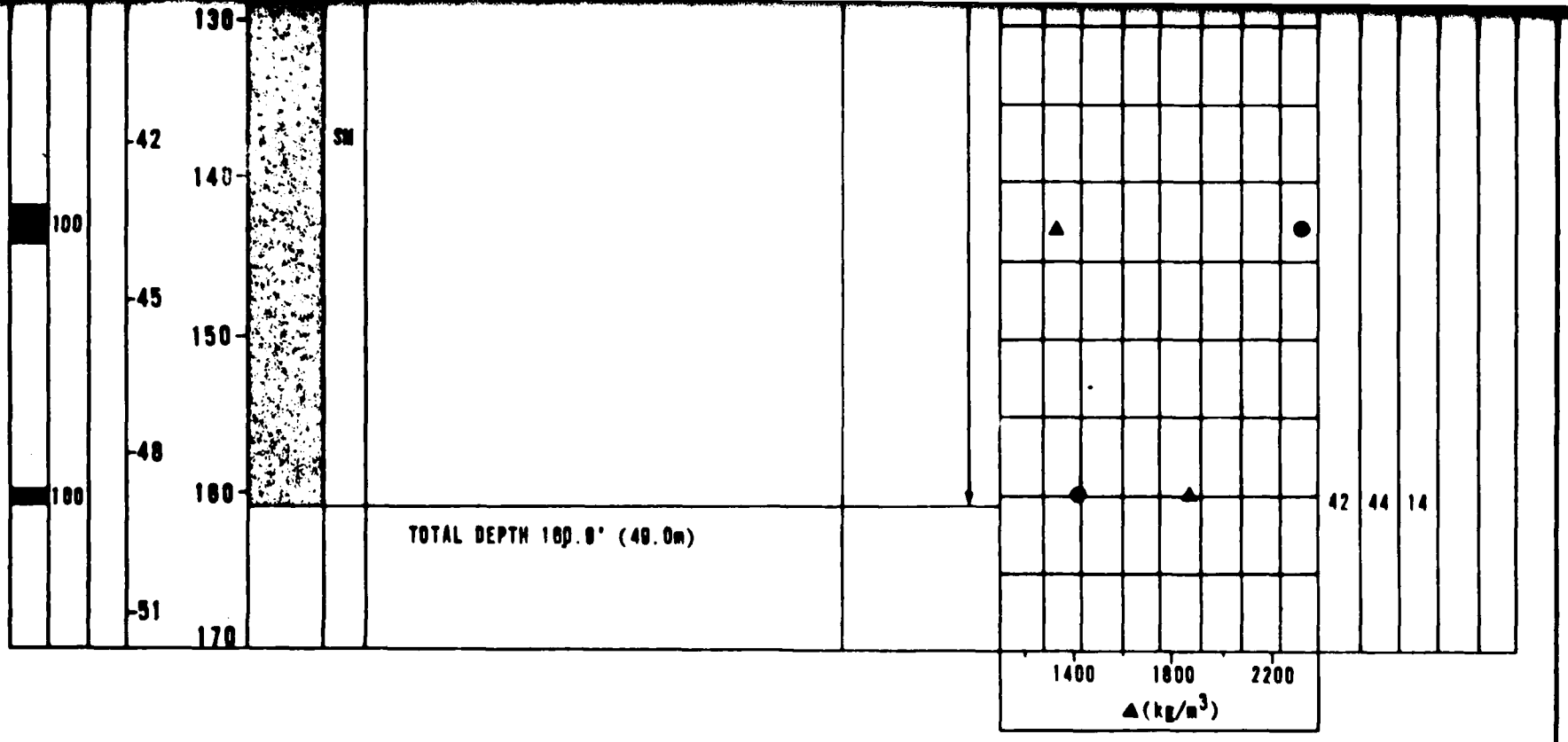
- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)

BORING DETAILS

ELEVATION	: 5310' (1618m)
SURFICIAL GEOLOGIC UNIT	: A4o
DATE DRILLED	: 12-13 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: See remarks

FUGRO MATIS

LOG OF BORING 56-
VERIFICATION SITE, GARDEN-
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE



EXPLANATION

- FUGRO 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	: 5310' (1618m)
SURFICIAL GEOLOGIC UNIT	: A4o
DATE DRILLED	: 12-13 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: See remarks

FUGRO NATIONAL, INC.

LOG OF BORING SC-8-1

VERIFICATION SITE, GAMBER-COAL COP. NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 8-1

AFT-86

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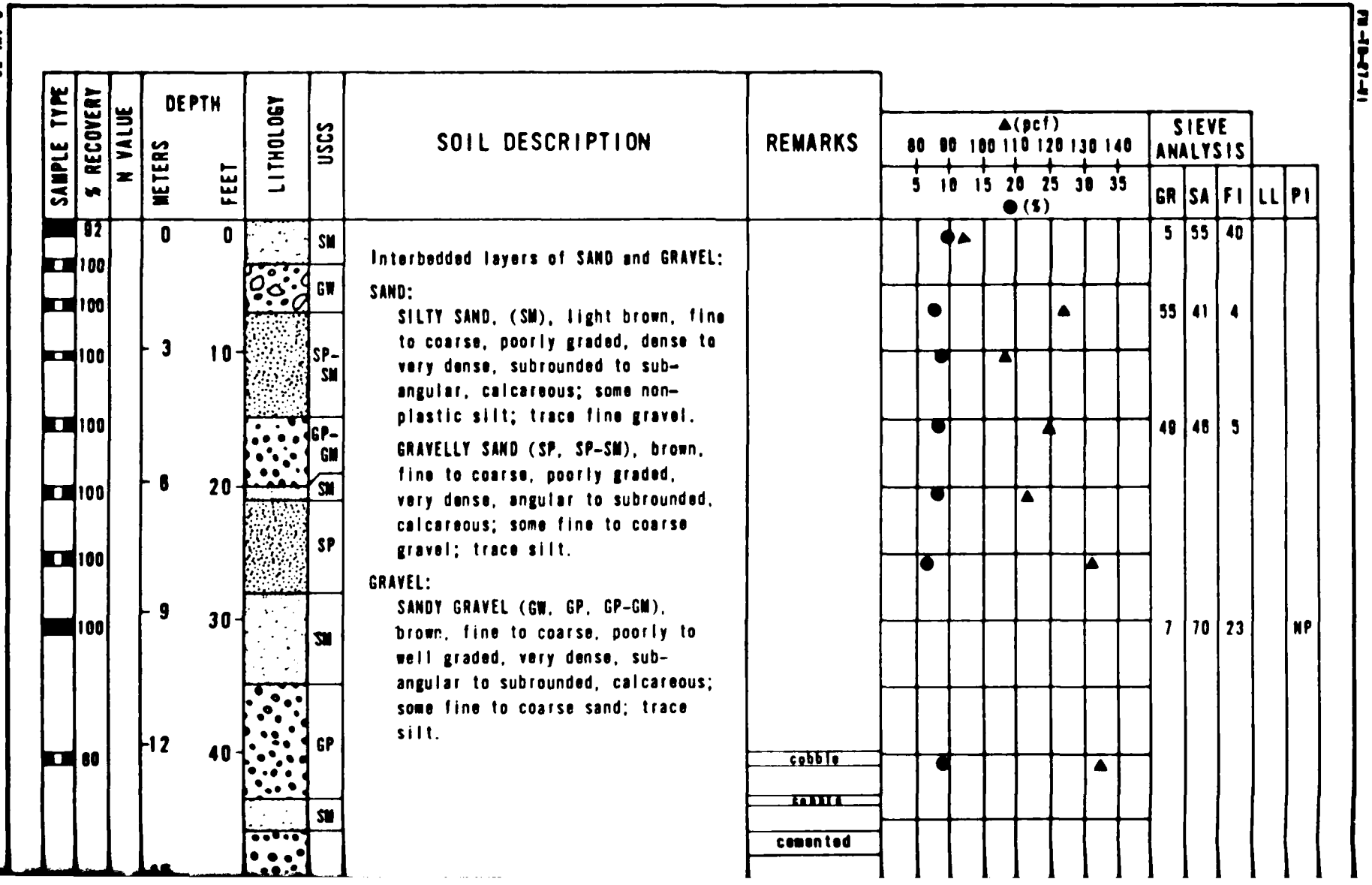
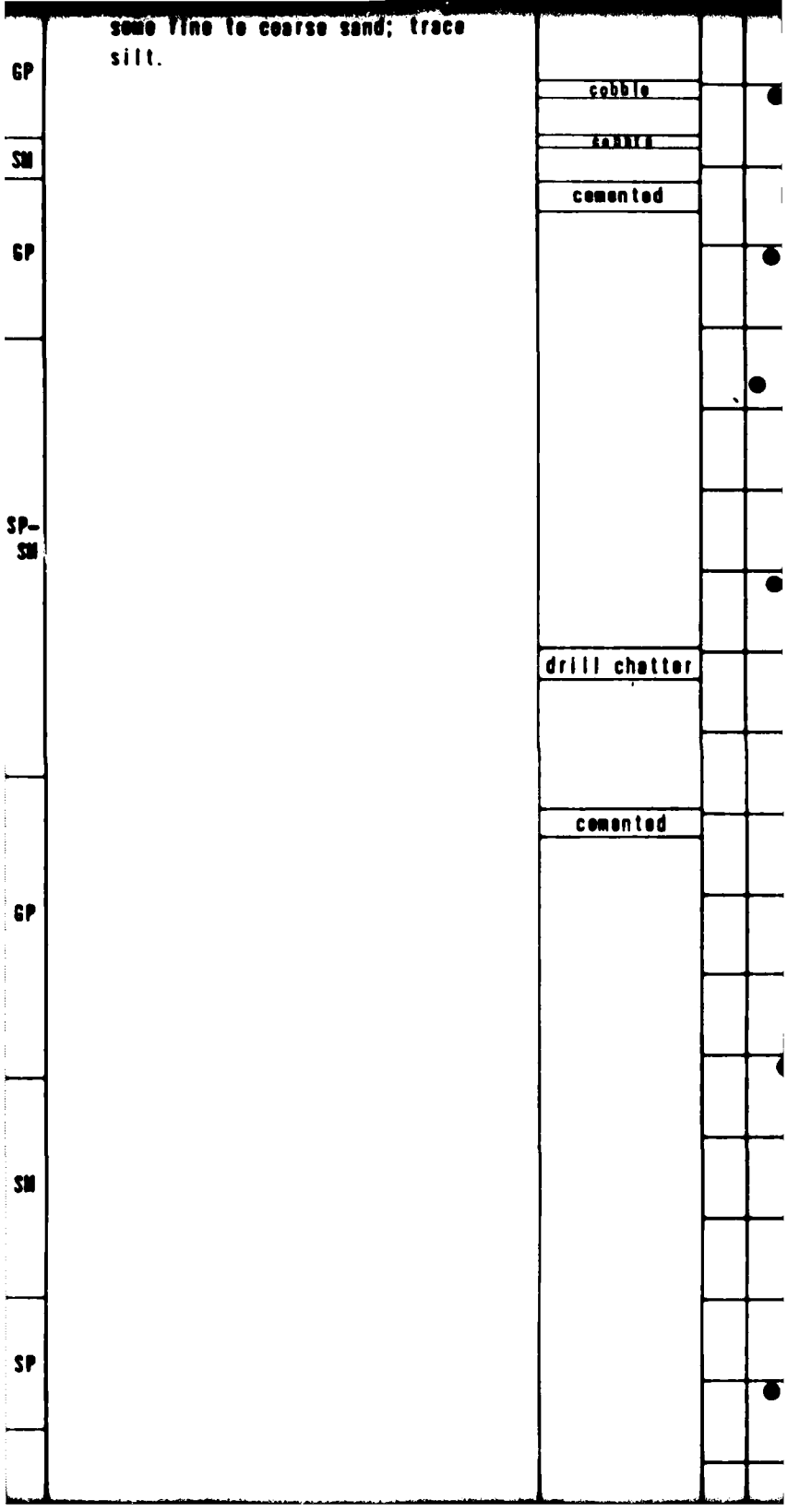
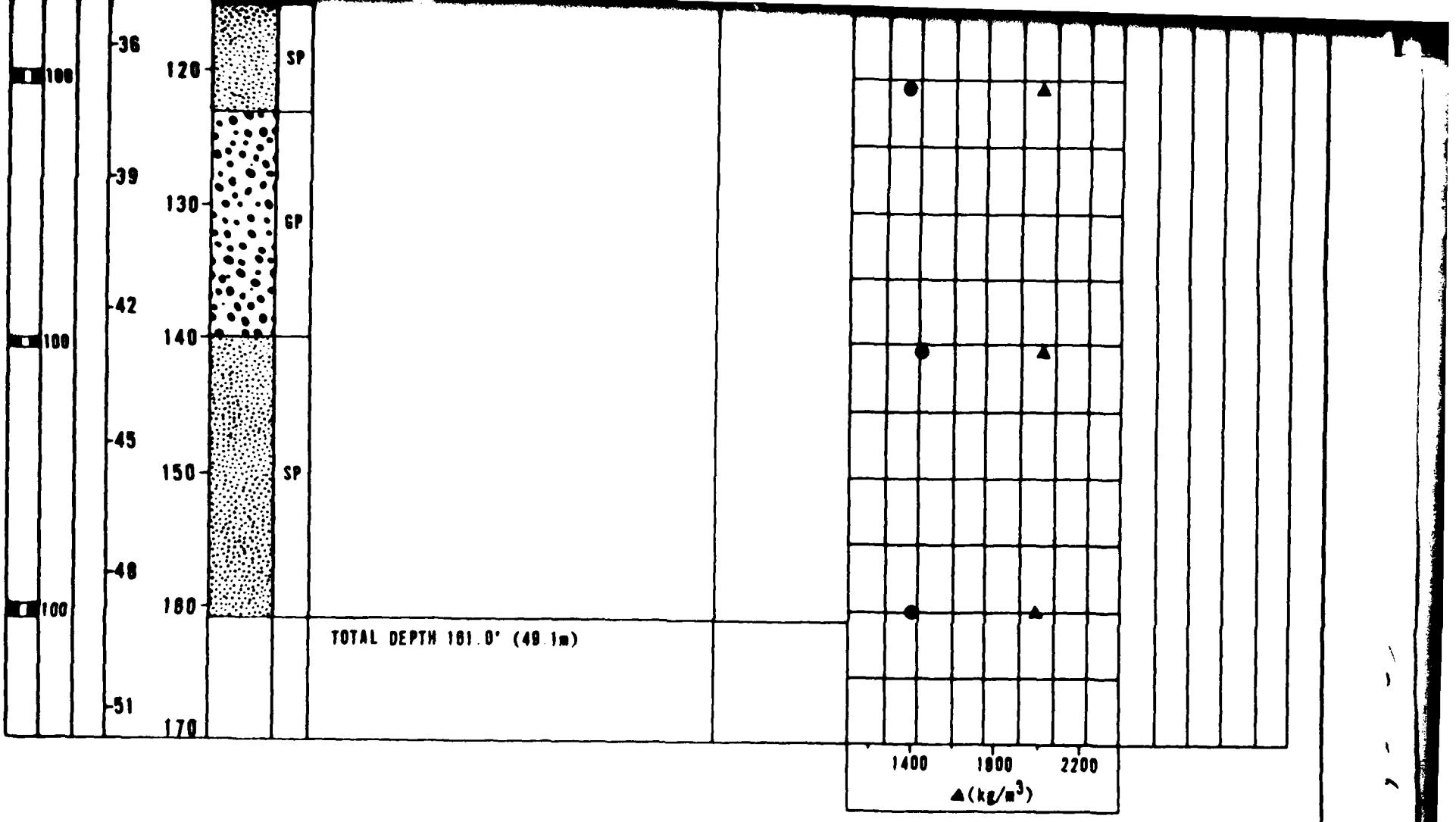



some fine to coarse sand; trace silt.
GP
cobble
SM
cemented
GP
SP-SM
drill chatter
cemented
GP
SM
SP



EXPLANATION

- FUGRO 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)

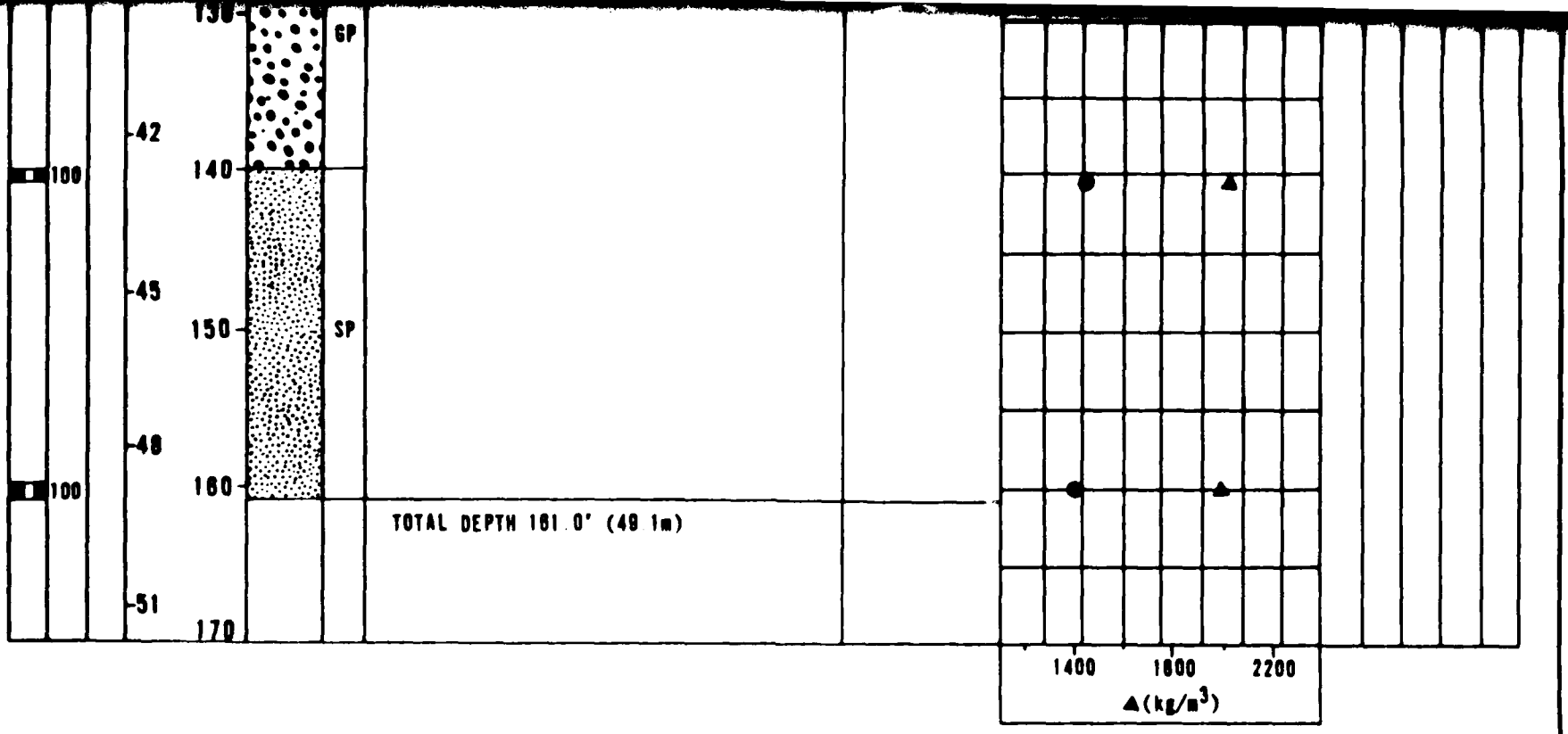
BORING DETAILS

ELEVATION	: 5290' (1612m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 13-14 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATION

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE

LOG OF BORING SC-9
VERIFICATION SITE, GARDEN-CO



EXPLANATION

- FUGRO 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	: 5290' (1612m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 13-14 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL, INC.

LOG OF BORING SC-B-2
VERIFICATION SITE, GARDEN-COAL COP., NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 6-2

AFS-0

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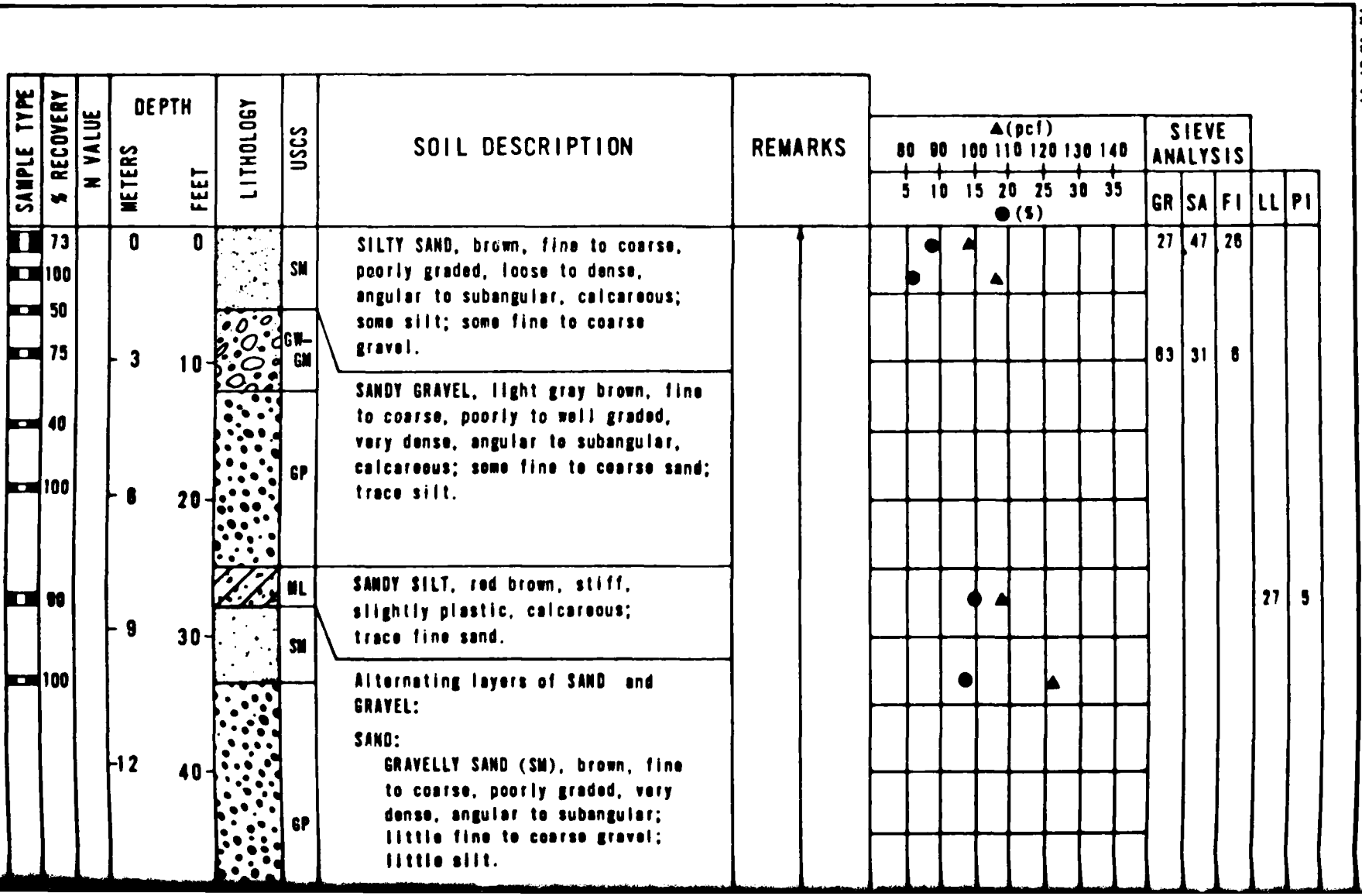
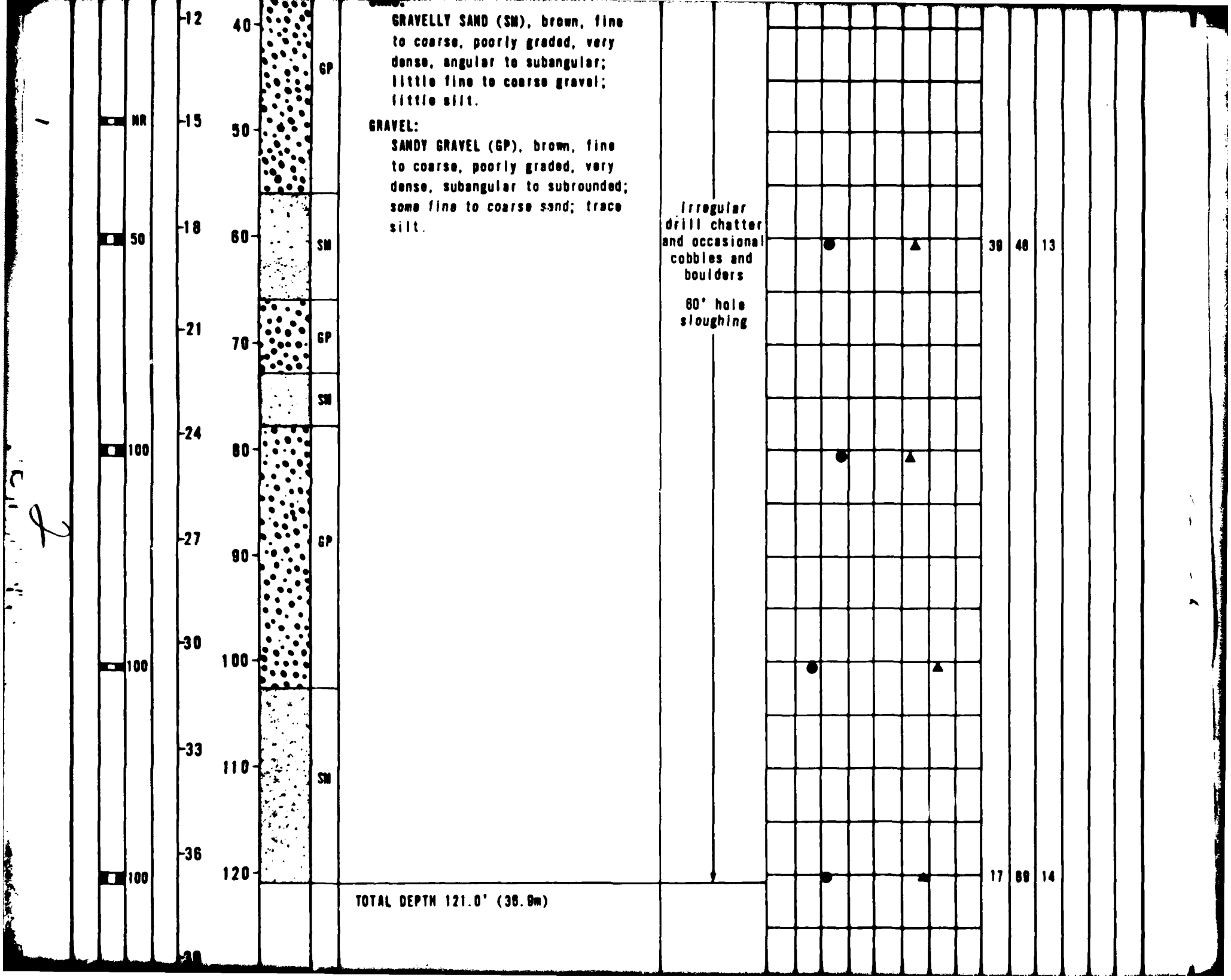
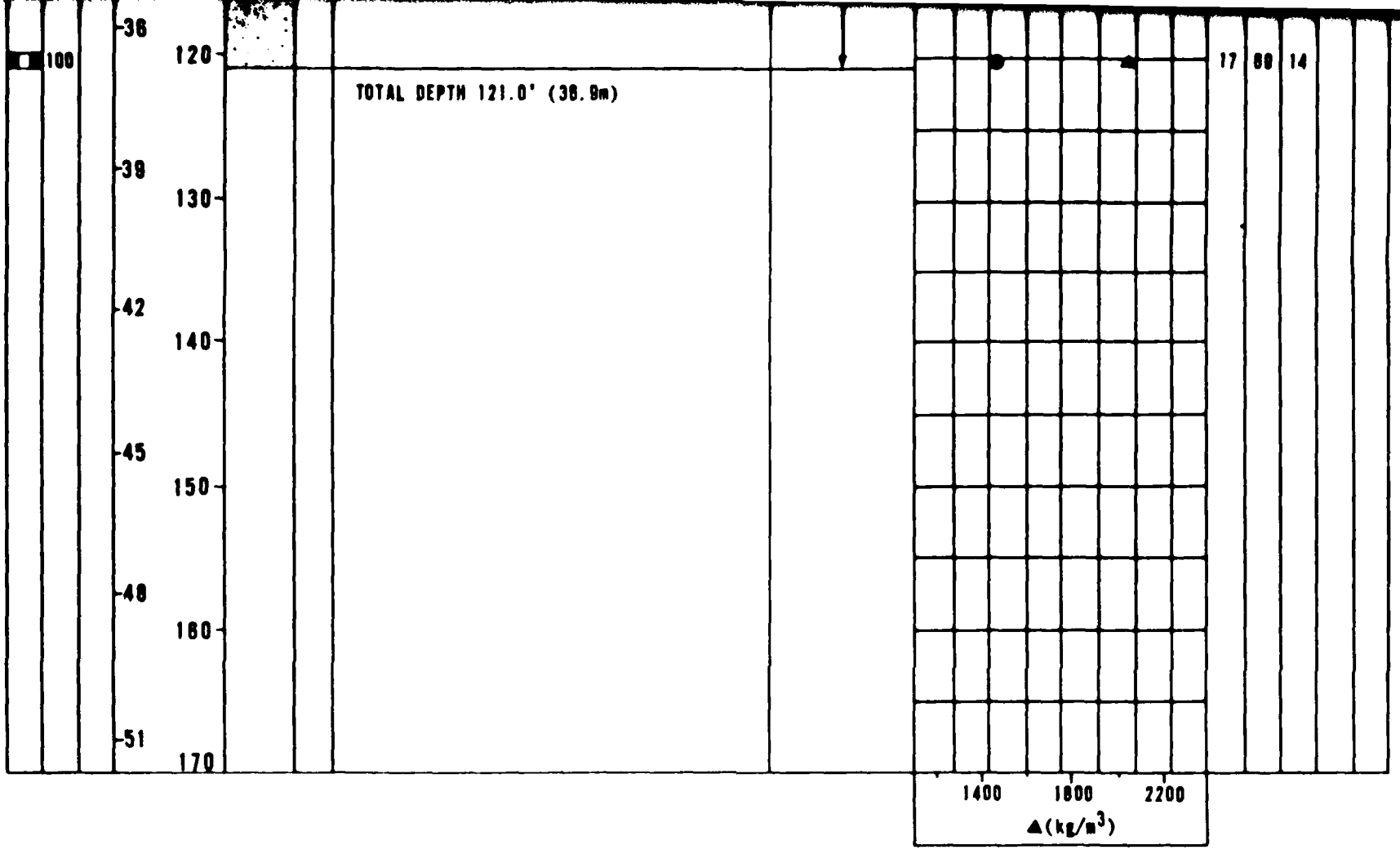



GRAVELLY SAND (SM), brown, fine to coarse, poorly graded, very dense, angular to subangular; little fine to coarse gravel; little silt.
GRAVEL:
SANDY GRAVEL (GP), brown, fine to coarse, poorly graded, very dense, subangular to subrounded; some fine to coarse sand; trace silt.
Irregular drill chatter and occasional cobbles and boulders
60' hole sloughing
TOTAL DEPTH 121.0' (36.9m)
NR
50
100
100
100
GP
SM
GP
SM
GP
SM
39 46 13
17 69 14



EXPLANATION

- FUGRO 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

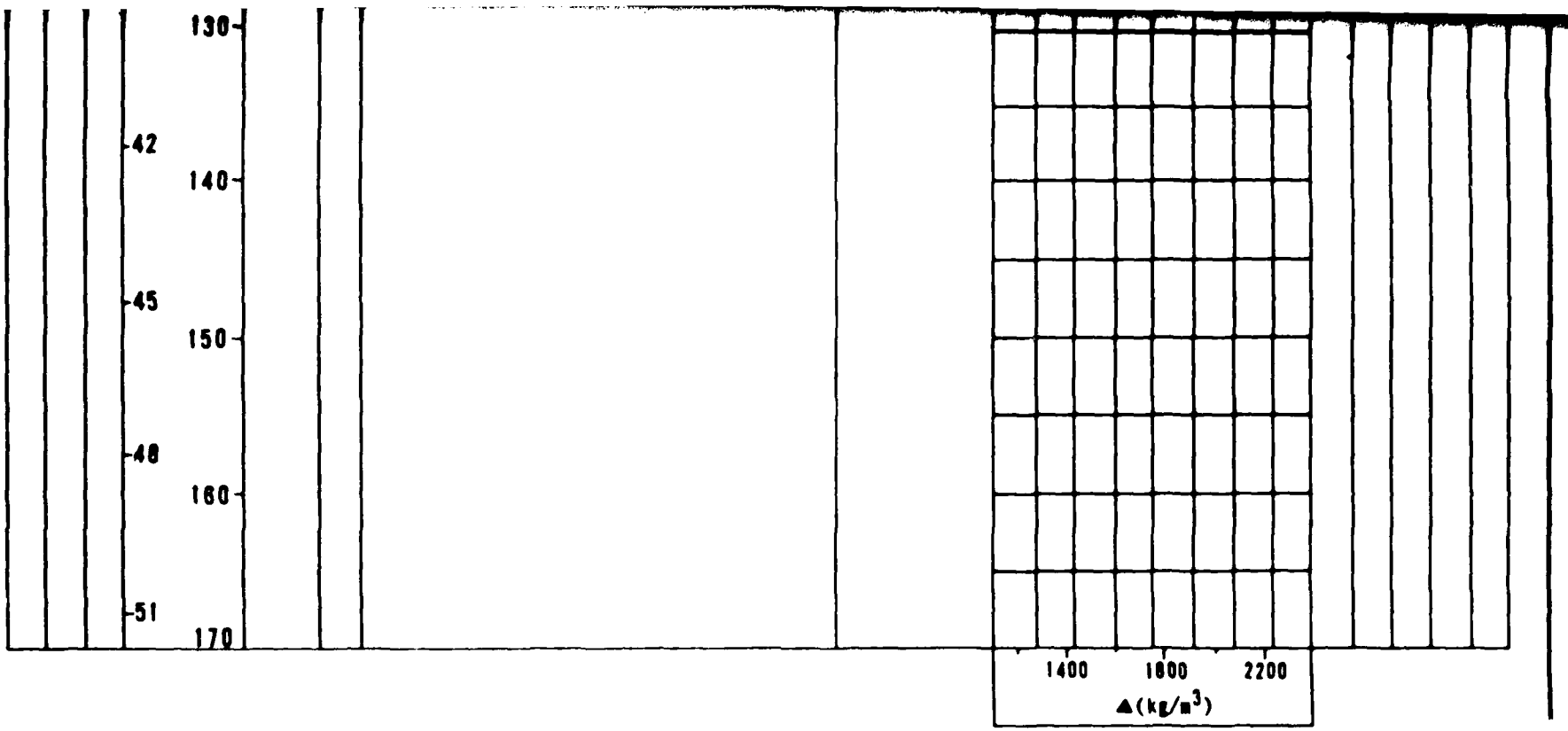
ELEVATION	: 5650' (1722m)
SURFICIAL GEOLOGIC UNIT	: A5I
DATE DRILLED	: 14-15 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

VERIFICATION SITE, GARDEN-COAL

LOG OF BORING SC-B-3



EXPLANATION

- FUGRO 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	: 5650' (1722m)
SURFICIAL GEOLOGIC UNIT	: A5I
DATE DRILLED	: 14-15 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING GC-B-3
VERIFICATION SITE, GARDEN-COAL COP. NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 6-3

FUGRO NATIONAL, INC.

AFV-06

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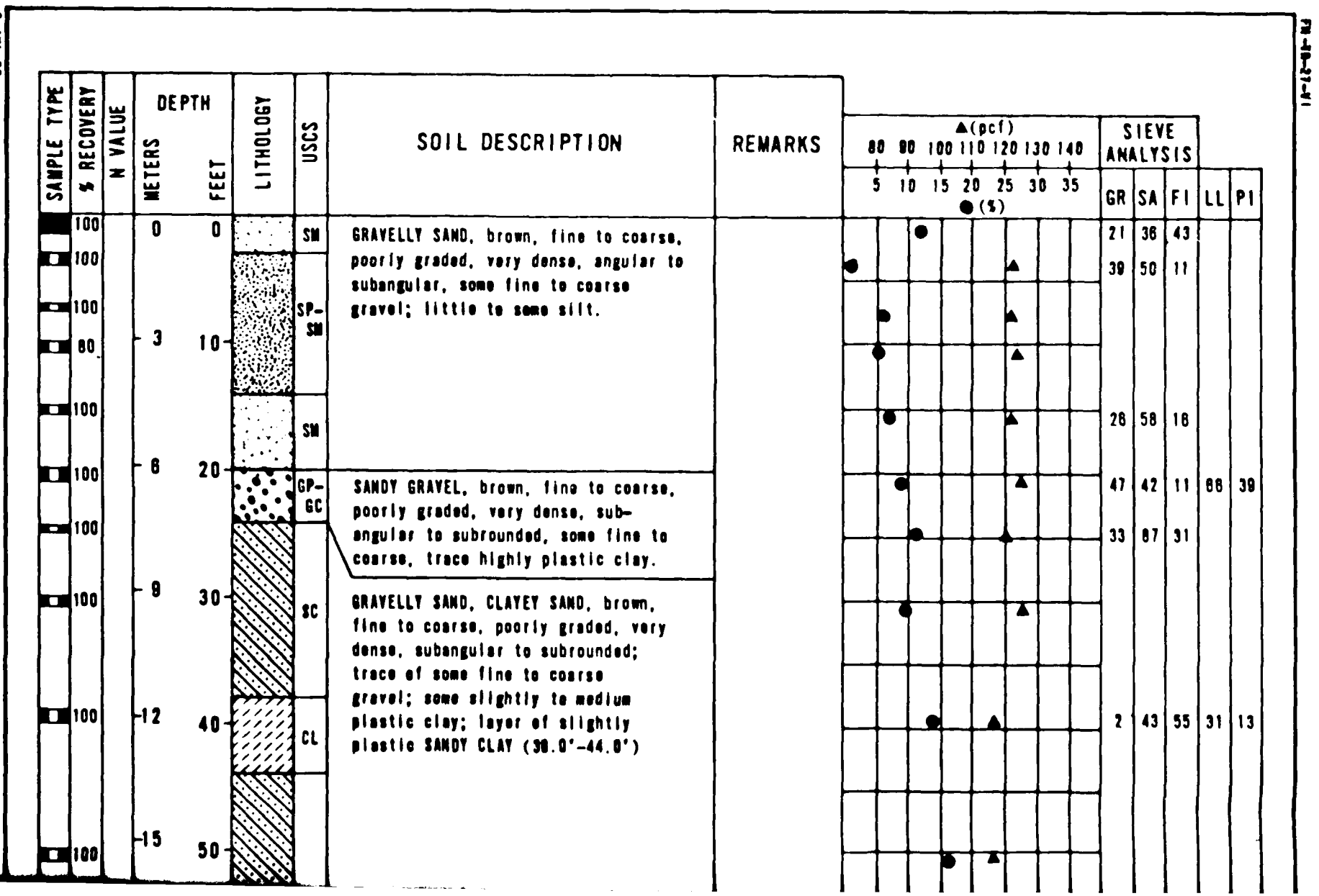
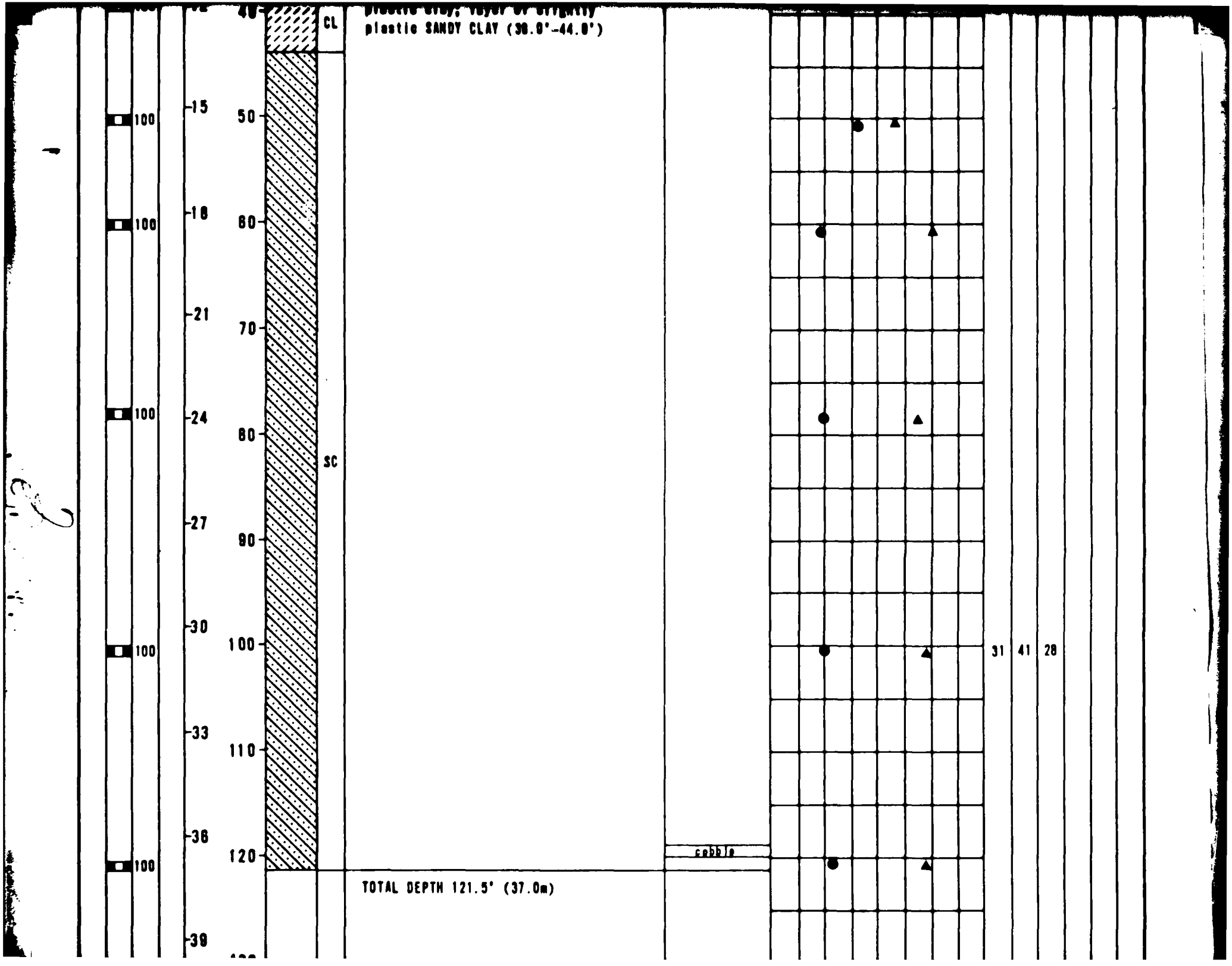
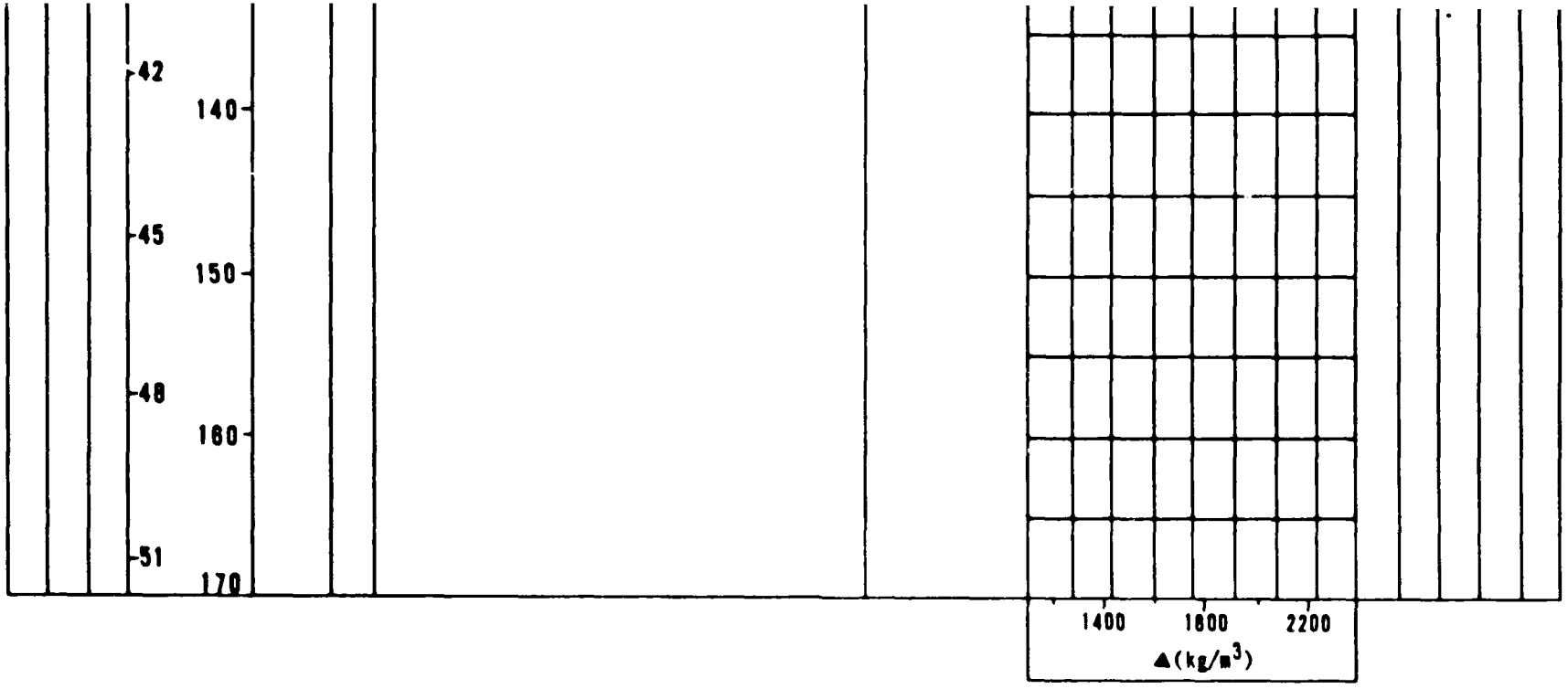



plastic SANDY CLAY (38.0'-44.0')
CL
SC
100
100
100
100
100
15
18
21
24
27
30
33
36
39
40
50
60
70
80
90
100
110
120
cobble
TOTAL DEPTH 121.5' (37.0m)
31 41 28



EXPLANATION

- FUGRO 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

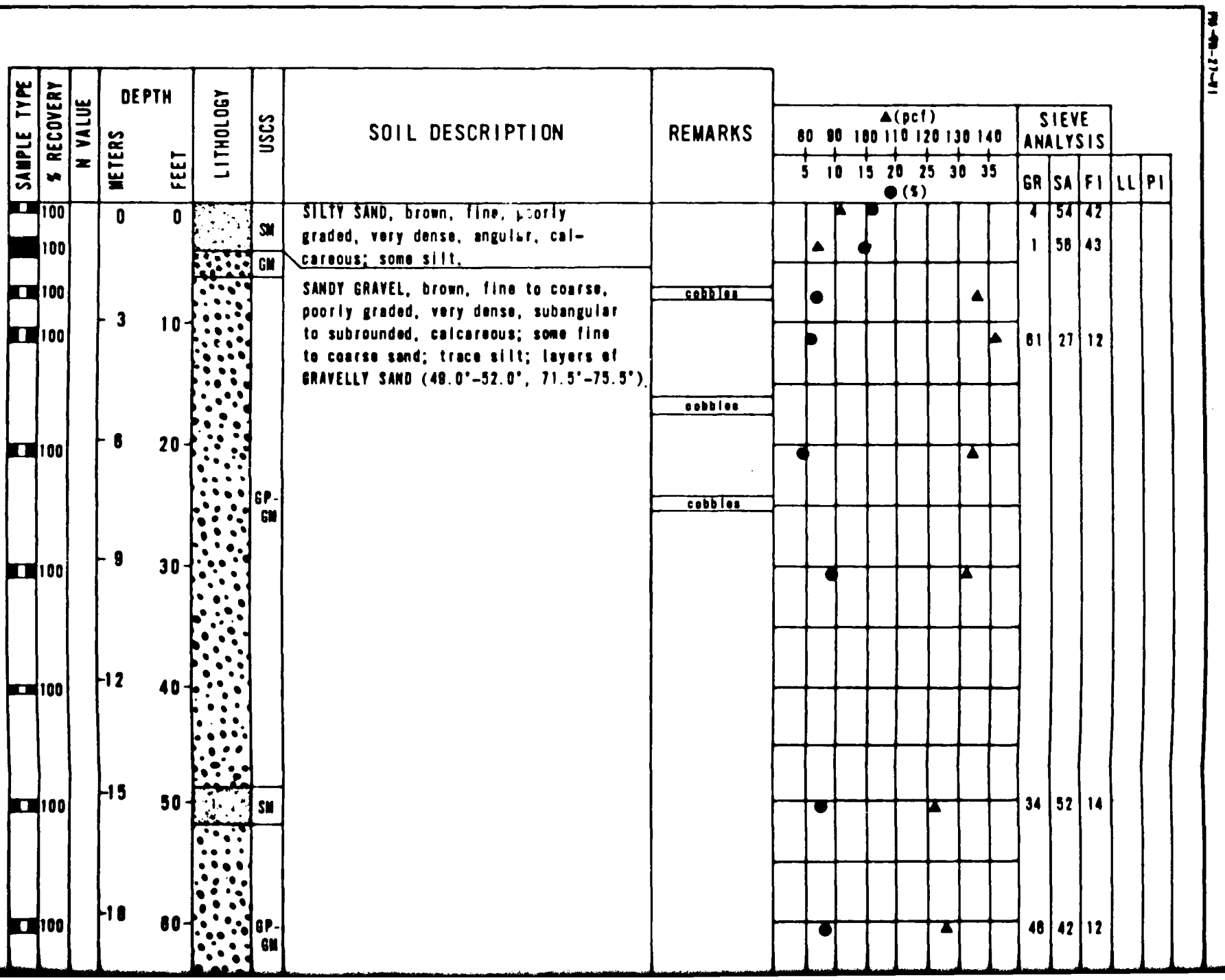
BORING DETAILS

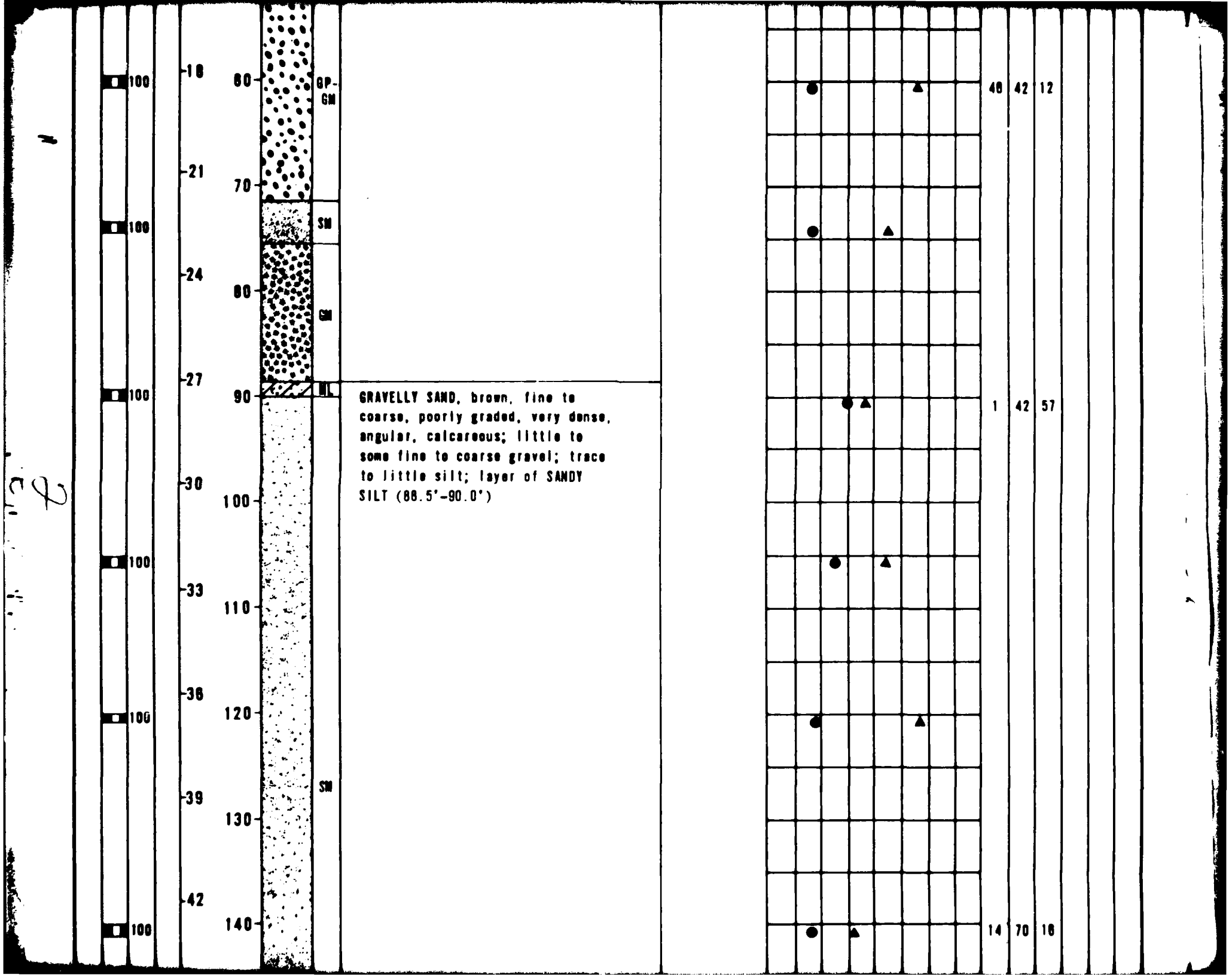
ELEVATION	: 4975' (1516m)
SURFICIAL GEOLOGIC UNIT	: A5y/A1
DATE DRILLED	: 18 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

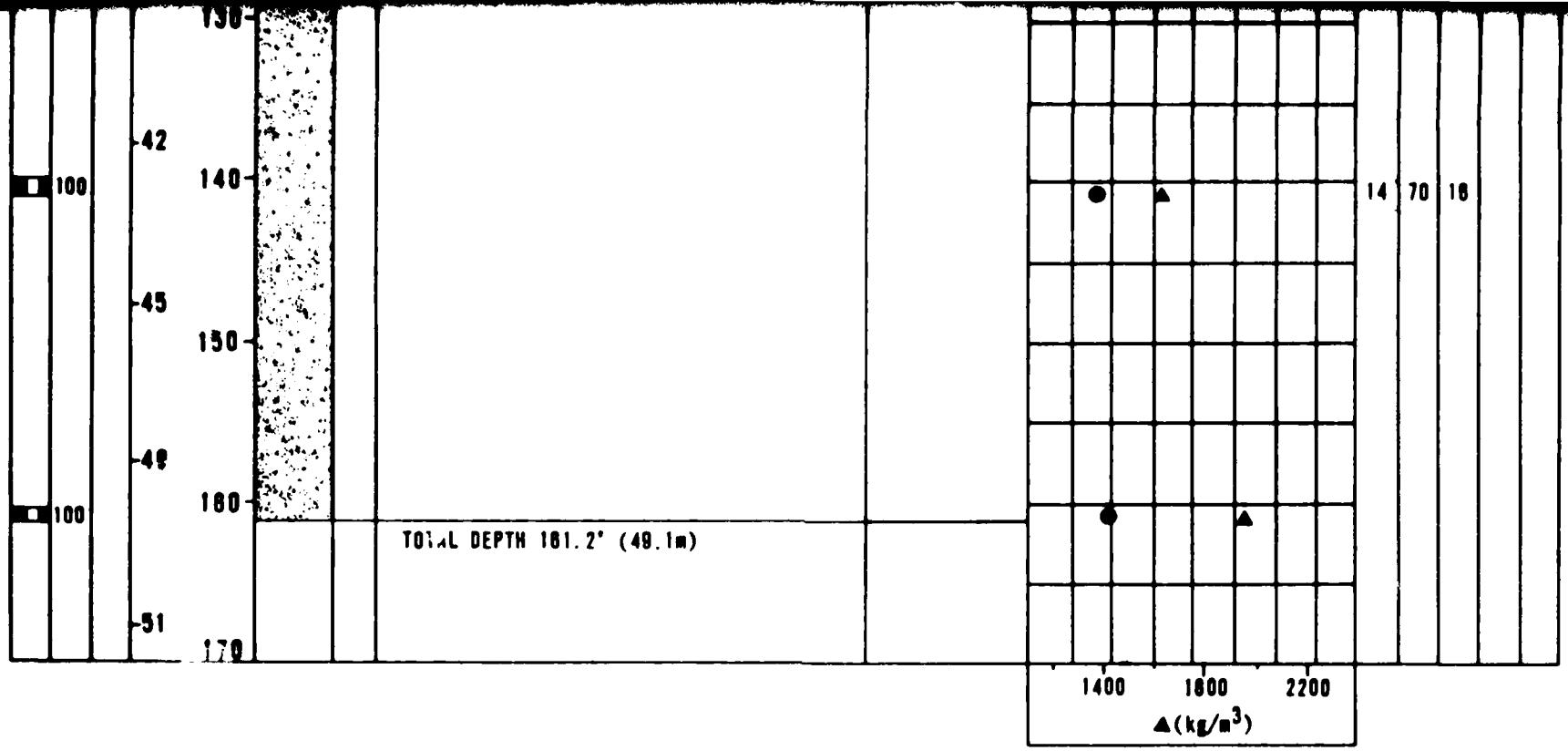
VERIFICATION SITE, GAMMON-COAL CO., NEVADA
LOG OF BORING GC-5-4

FUGRO NATIONAL, INC.
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO
FIGURE 6-4

CHECKED BY _____ APPROVED BY _____




100
100
100
100
100
100
18
21
24
27
30
33
36
39
42
80
70
80
90
100
110
120
130
140
GP-GM
SM
GM
SM
GRAVELLY SAND, brown, fine to coarse, poorly graded, very dense, angular, calcareous; little to some fine to coarse gravel; trace to little silt; layer of SANDY SILT (88.5'-90.0')
46 42 12
1 42 57
14 70 16



EXPLANATION

- FUGRO 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	: 5780' (1765m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 16-17 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL, INC.

LOG OF BORING BC-B-5

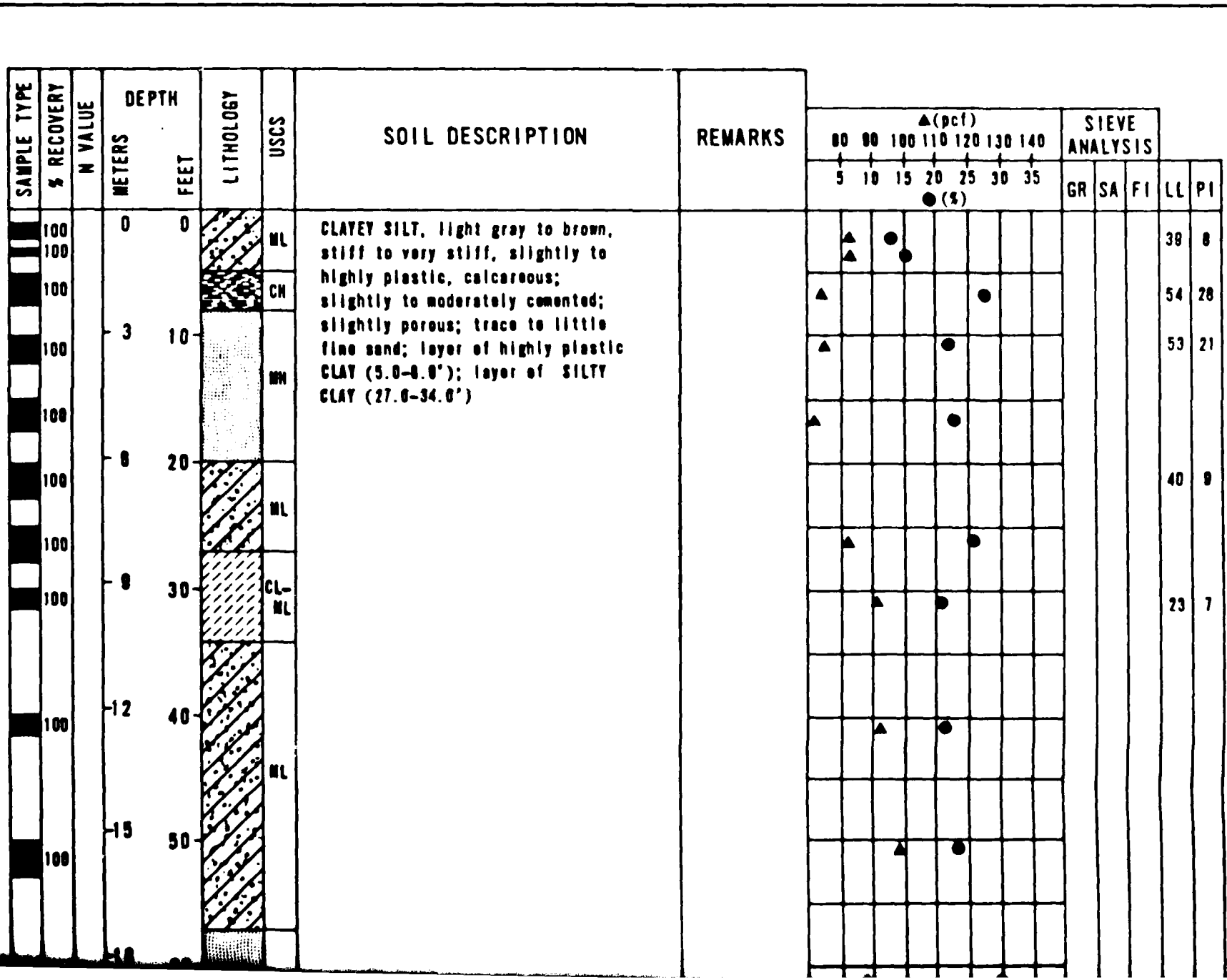
VERIFICATION SITE, RAMEN-COAL COP, NEVADA

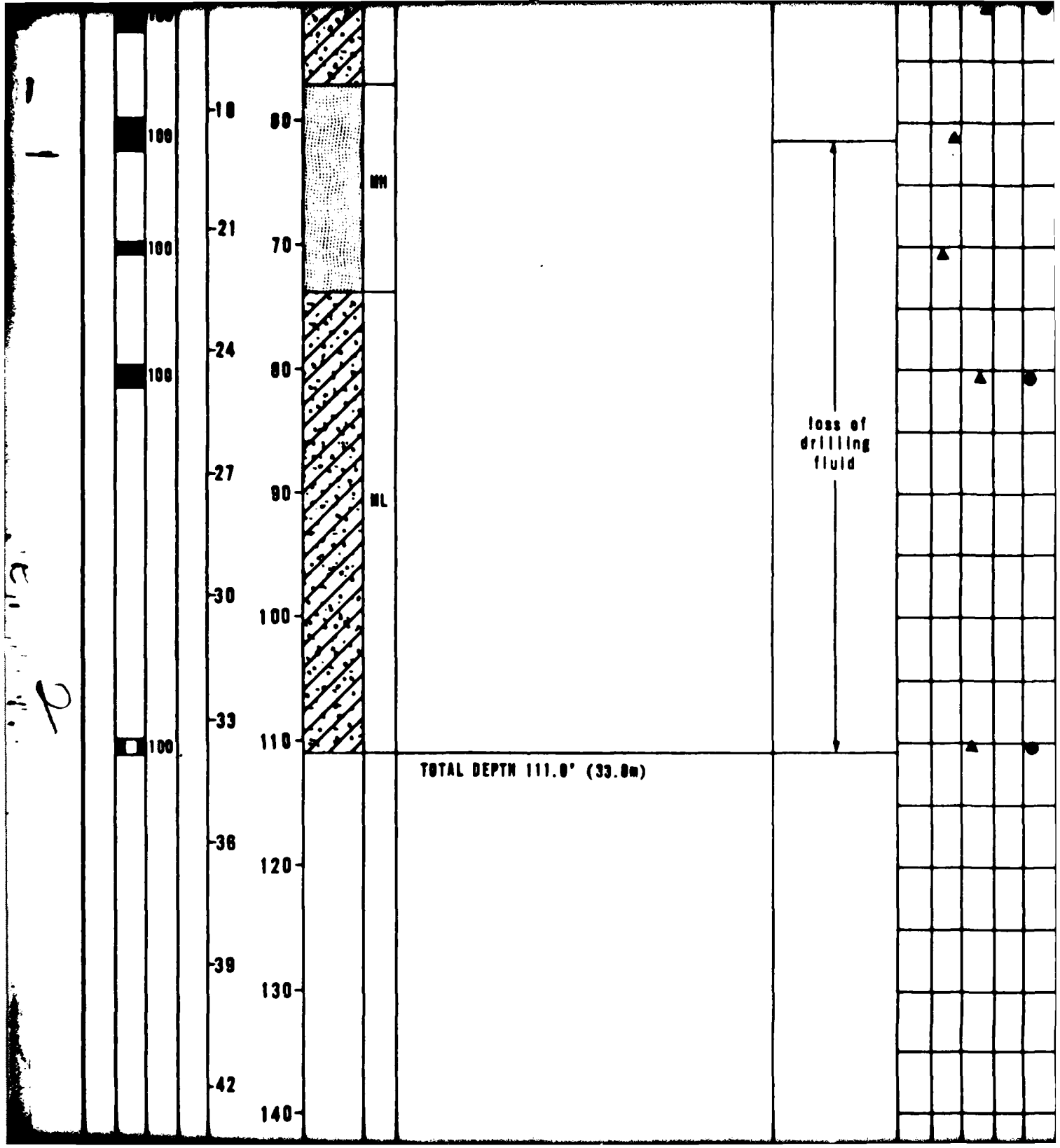
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

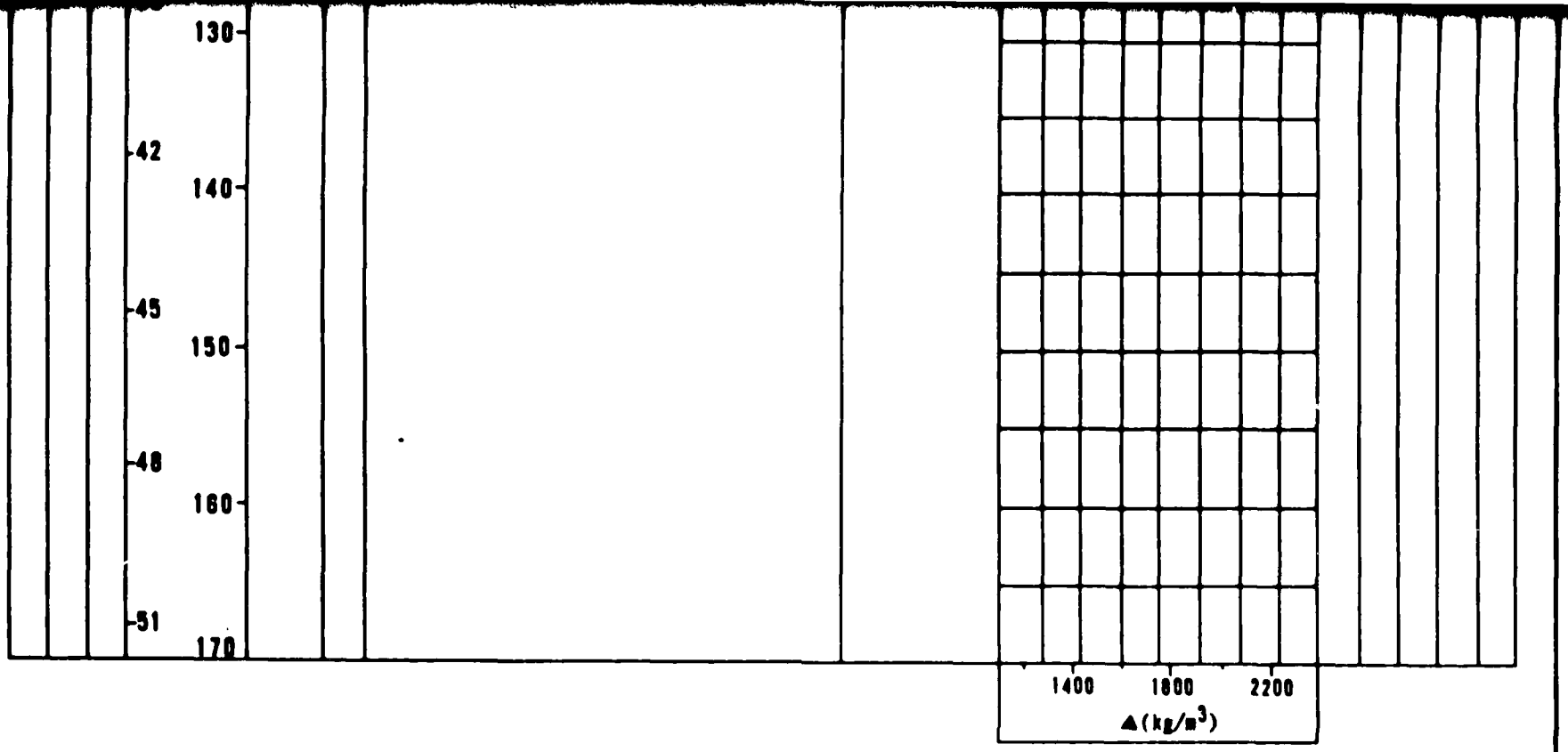
FIGURE B-5

APV-86

CHECKED BY _____ APPROVED BY _____




100
100
100
100
18
21
24
27
30
33
36
39
42
80
70
80
90
100
110
120
130
140
MH
ML
loss of drilling fluid
TOTAL DEPTH 111.0' (33.8m)



EXPLANATION

- FUGRO 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	: 4980' (1518m)
SURFICIAL GEOLOGIC UNIT	: A4o/A1
DATE DRILLED	: 18-19 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING EC-8-6
VERIFICATION SITE, RANGELY, COLO.

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
E-6

FUGRO NATIONAL, INC.

SECTION 7.0

TRENCH AND TEST PIT LOGS

EXPLANATIONS OF TRENCH AND TEST PIT LOGS

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

FN-TR-27-V1

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular, calcareous; some silt.	vertical walls stable			32		NP
		2			medium dense							
	1	4		GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, slightly moist, subangular to angular, calcareous; some fine to coarse sand.						
	2	8		SM	medium dense	SILTY SAND, brown to gray green, fine to coarse, poorly graded, dry, angular, calcareous; some silt; trace fine gravel.						
	3	10		GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, angular to subangular, calcareous; some fine to coarse sand.						
	4	12		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, calcareous; little silt; trace fine gravel.						
		14				TOTAL DEPTH 14.0' (4.3m)						
	5	16										
		18										
	6	20										

CHECKED BY _____ APPROVED BY _____

TRENCH DETAILS

SURFACE ELEVATION : 5310' (1618m)
DATE EXCAVATED : 12 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A4o
TRENCH LENGTH : 15.0'
TRENCH ORIENTATION : E - W

LOG OF TRENCH GC-T-1
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-1

FUGRO NATIONAL, INC.

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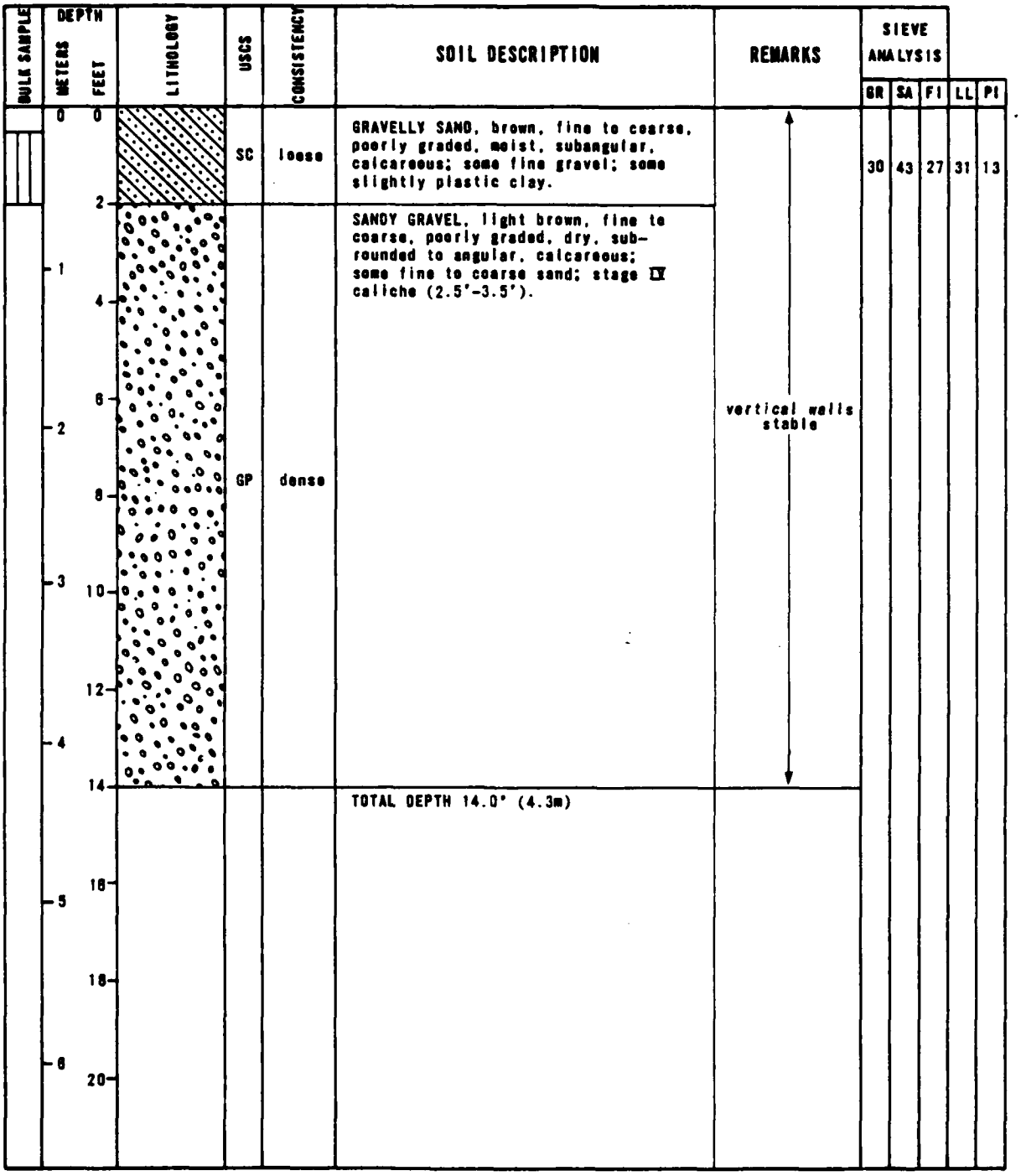

TRENCH DETAILS

SURFACE ELEVATION : 5290' (1612m)
DATE EXCAVATED : 13 December 1978
SURFICIAL GEOLOGIC UNIT : A5y
TRENCH LENGTH : 15.0'
TRENCH ORIENTATION : SE - NW

LOG OF TRENCH GC-T-2
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-2

FUGRO NATIONAL, INC.

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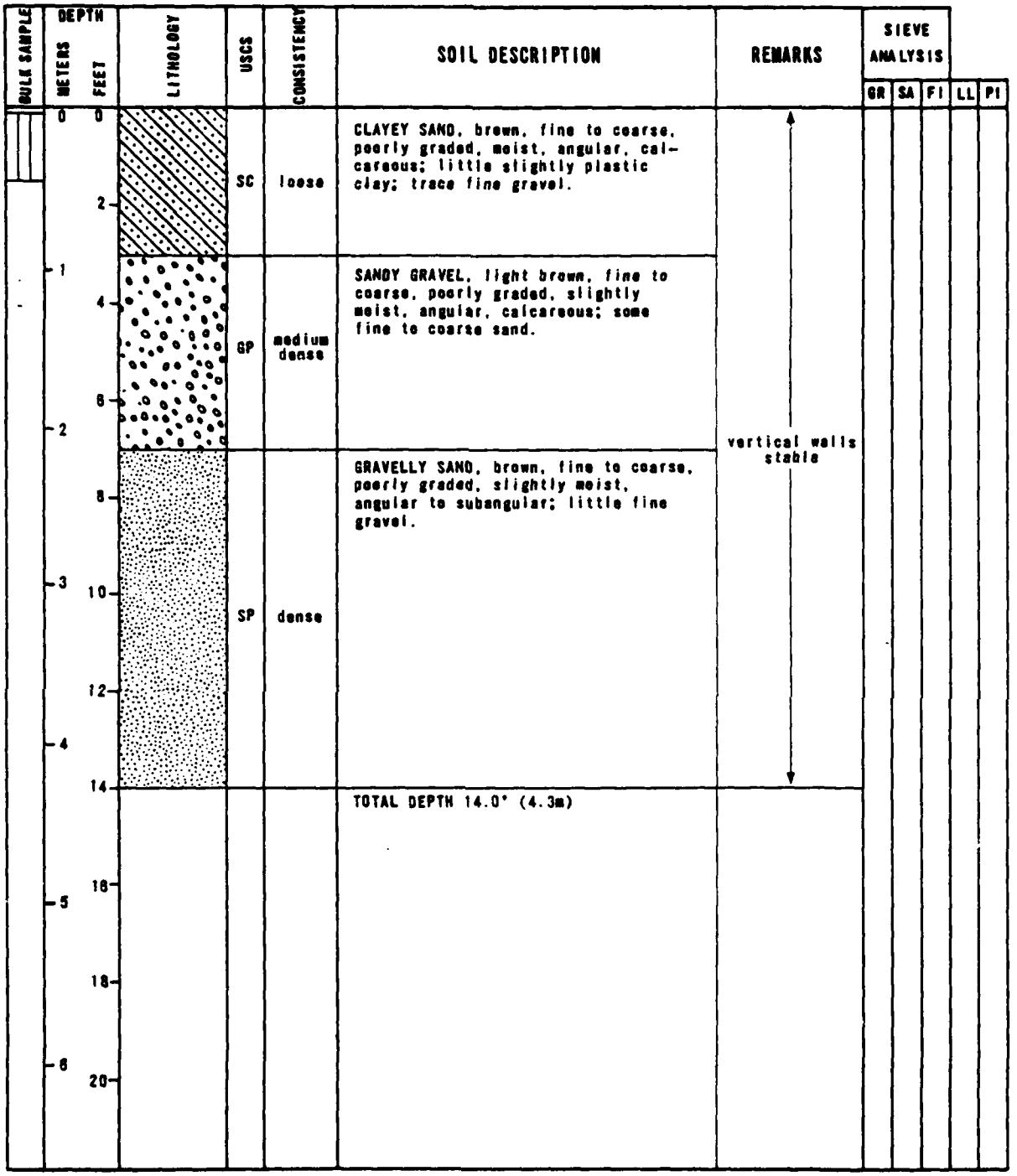

CHECKED BY _____ APPROVED BY _____

TRENCH DETAILS

SURFACE ELEVATION	: 4975' (1518m)
DATE EXCAVATED	: 13 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT	: A5y/A1
TRENCH LENGTH	: 15.0'
TRENCH ORIENTATION	: NW - SE

LOG OF TRENCH GC-T-3
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-3

FUGRO NATIONAL, INC.

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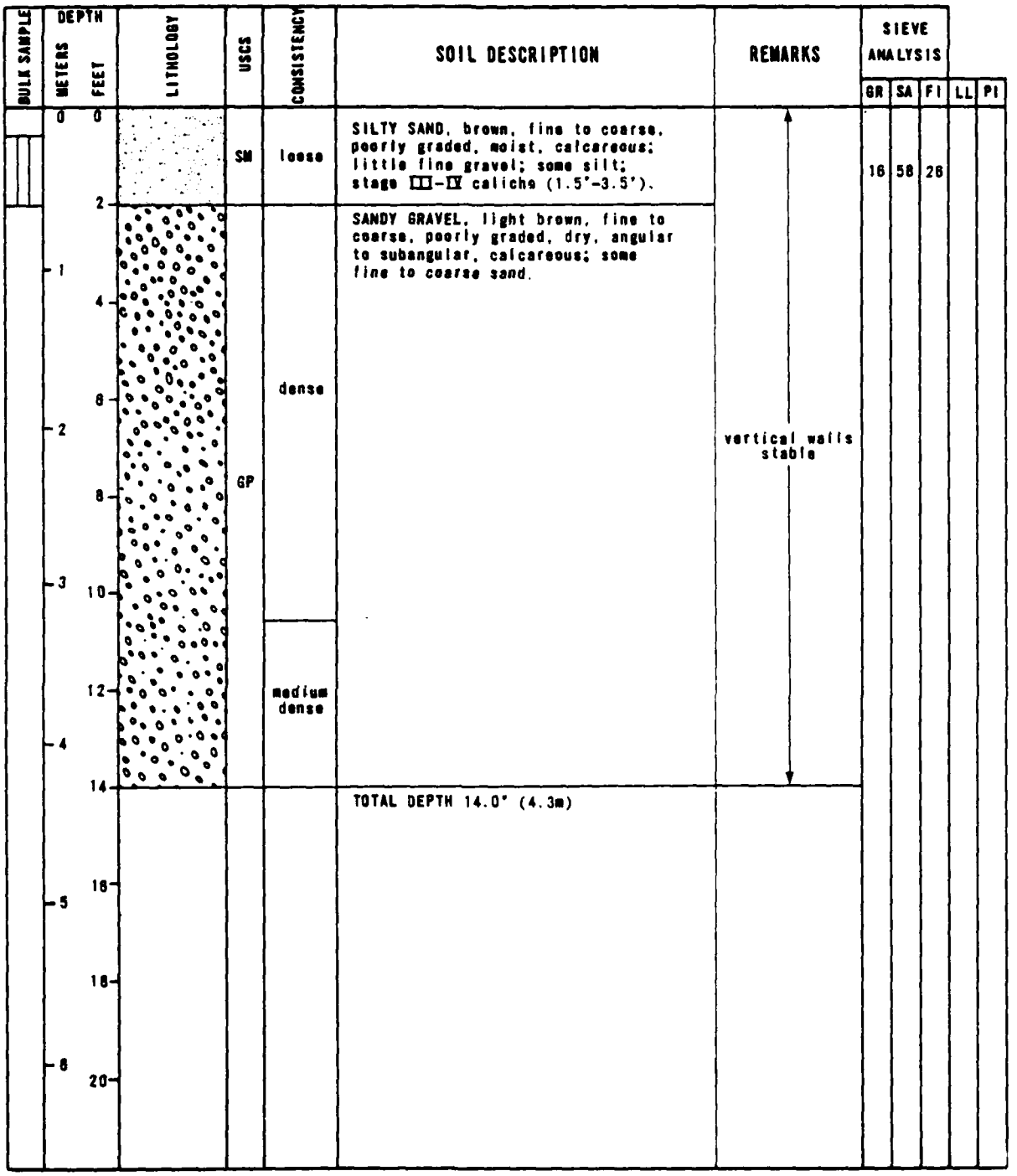

TRENCH DETAILS

SURFACE ELEVATION : 5650' (1722m)
DATE EXCAVATED : 14 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A5I
TRENCH LENGTH : 14.0'
TRENCH ORIENTATION : NW - SE

LOG OF TRENCH GC-T-4
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-4

FUGRO NATIONAL, INC.

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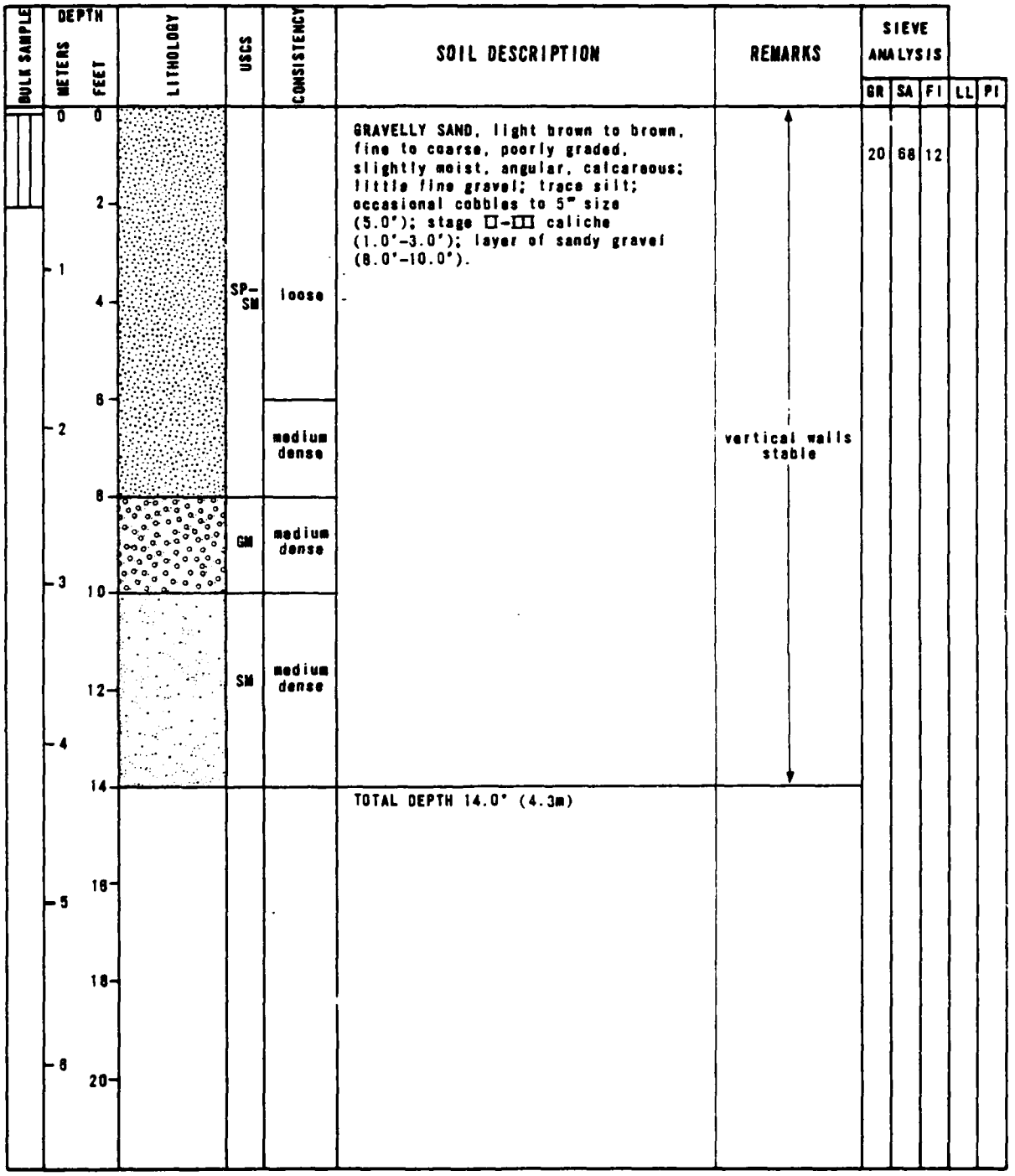
FN-TR-27-VI



CHECKED BY _____ APPROVED BY _____

TRENCH DETAILS

SURFACE ELEVATION	: 5840' (1780m)
DATE EXCAVATED	: 12 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT	: A5i
TRENCH LENGTH	: 14.0'
TRENCH ORIENTATION	: SW - NE

LOG OF TRENCH GC-T-5
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-5

FUGRO NATIONAL, INC.

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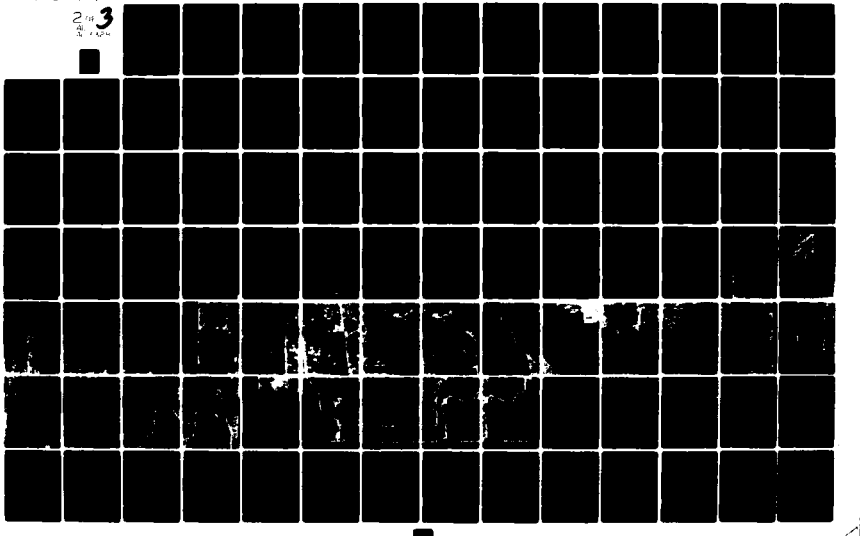
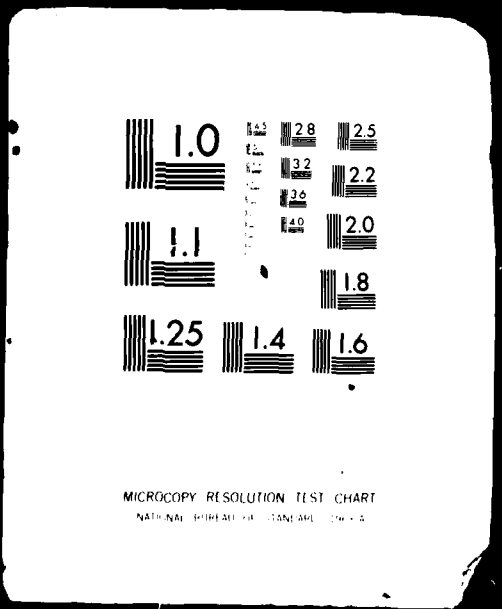
AD-A113 388 FUGRO NATIONAL INC LONG BEACH CA F/G 13/2
MX SITING INVESTIGATION GEOTECHNICAL EVALUATION. VOLUME VI. NEV--ETC(U)
AUG 79 F04704-80-C-0006
UNCLASSIFIED FN-TR-27-6 NL



2 OF 3

AD

A113328



FN-TR-27-VI

BULK SAMPLE	DEPTH METERS	DEPTH 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 coarse, poorly graded, slightly moist, angular, calcareous; some silt; trace fine gravel.				48		
	1	4										
		6			loose	SAND, brown, fine to coarse, poorly graded, dry, angular, calcareous; trace silt; trace fine gravel.	vertical walls stable					
	2	8										
		10		SP		GRAVELLY SAND, brown, fine to coarse, poorly graded, dry, angular, calcareous; some fine gravel.						
	3	12			medium dense							
	4	14				TOTAL DEPTH 14.0' (4.3m)						
	5	16										
		18										
	6	20										

TRENCH DETAILS

SURFACE ELEVATION : 5525' (1684m)
DATE EXCAVATED : 15 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A5y/A1
TRENCH LENGTH : 14.0'
TRENCH ORIENTATION : E - W

LOG OF TRENCH GC-T-6
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-6

FUGRO NATIONAL, INC.

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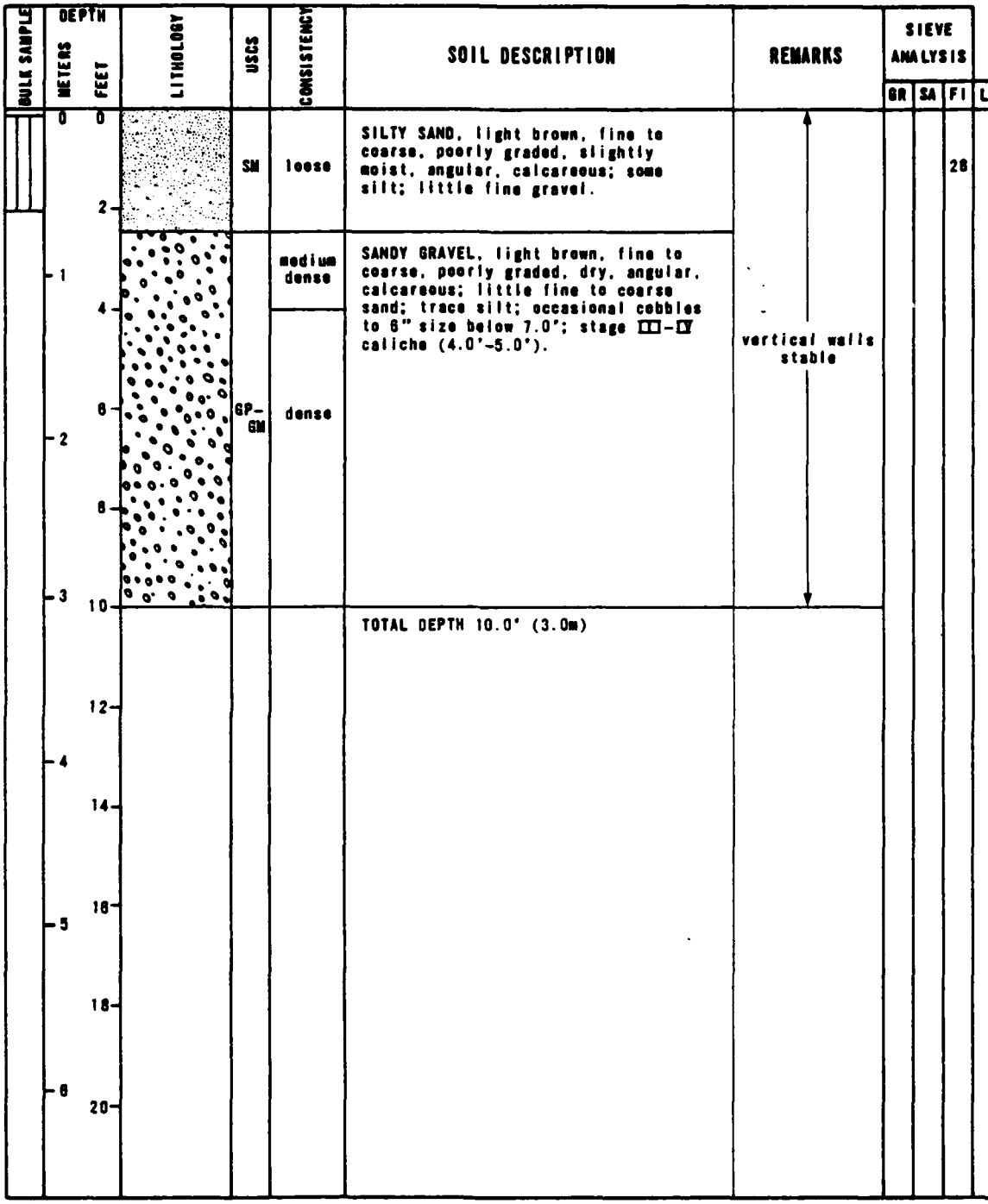

TRENCH DETAILS

SURFACE ELEVATION : 5790' (1765m)
DATE EXCAVATED : 18 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A5y
TRENCH LENGTH : 13.0'
TRENCH ORIENTATION : N - S

LOG OF TRENCH GC-T-7
VERIFICATION SITE, GARDEN COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-7

FUGRO NATIONAL, INC.

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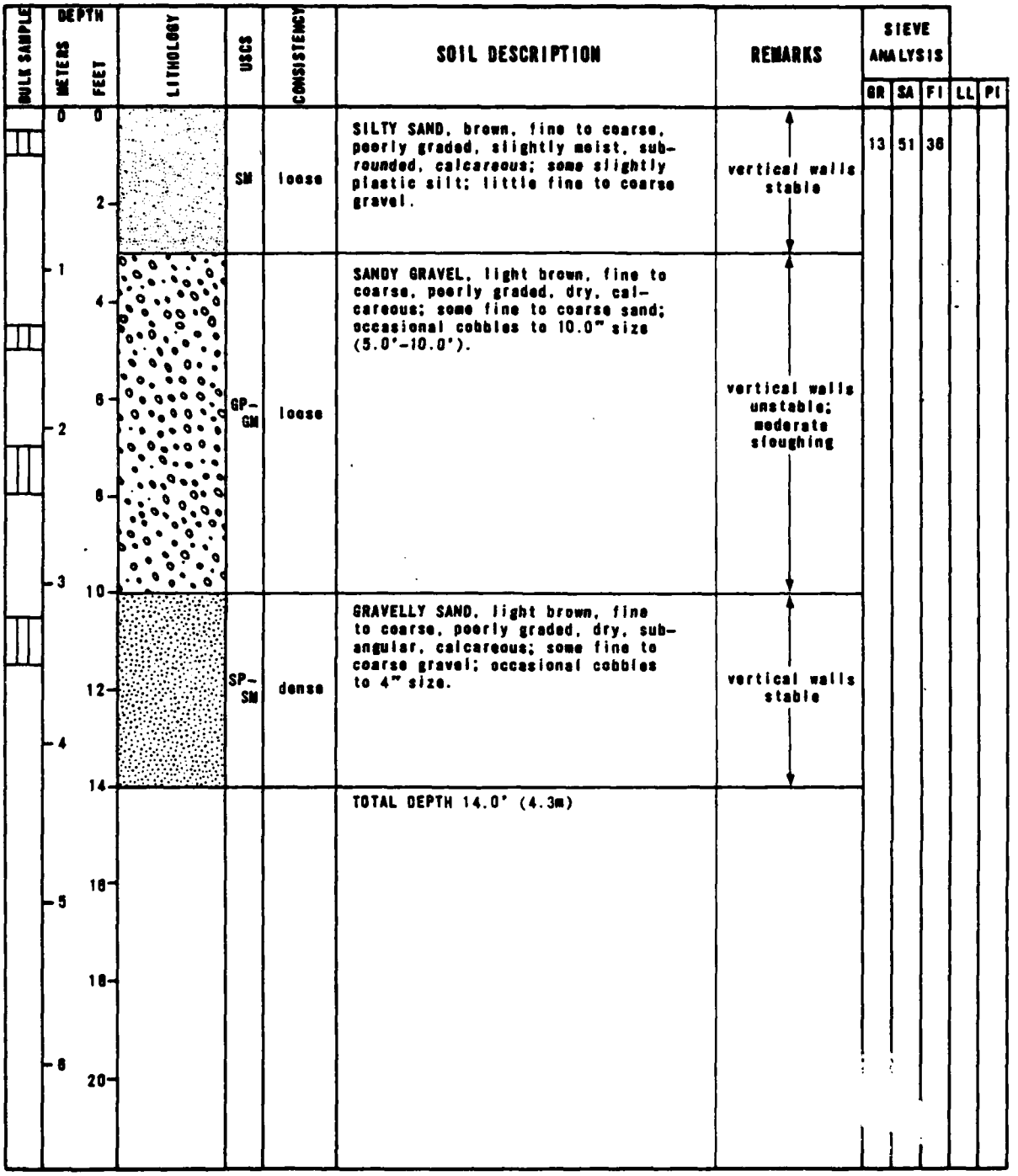
FN-TR-27-V1



TRENCH DETAILS

SURFACE ELEVATION : 5175' (1577m)
DATE EXCAVATED : 18 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A5y
TRENCH LENGTH : 15.0'
TRENCH ORIENTATION : N - S

LOG OF TRENCH GC-T-8
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-8

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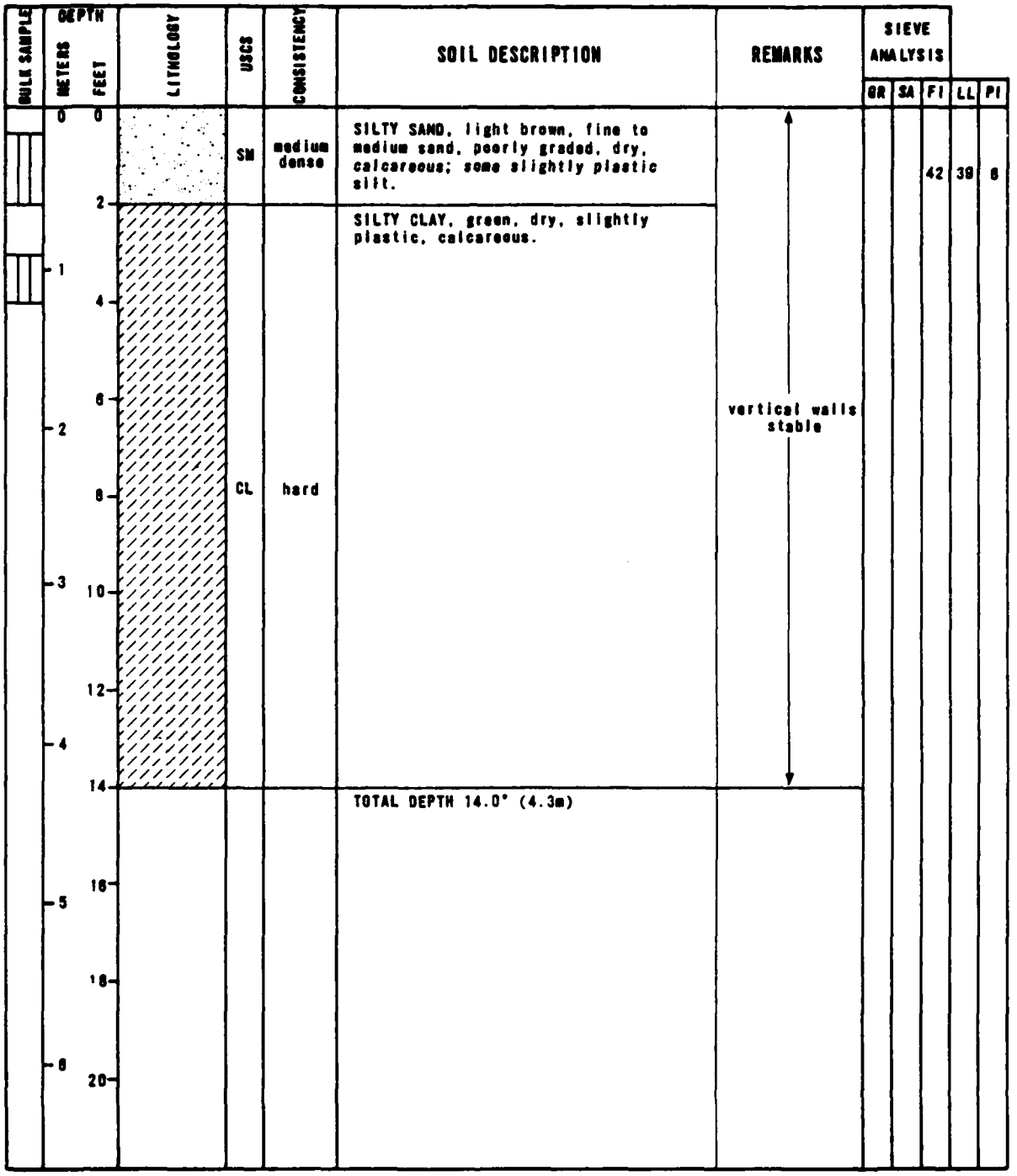
FN-TR-27-VI



TRENCH DETAILS

SURFACE ELEVATION : 4980' (1518m)
DATE EXCAVATED : 19 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A4o/A4
TRENCH LENGTH : 14.0'
TRENCH ORIENTATION : E - W

LOG OF TRENCH GC-T-9
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-9

FUGRO NATIONAL, INC.

2 JUL 79

AFV-04

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FN-TR-27-VI

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				SAND, red gray, fine to coarse, poorly graded, moist, angular to subangular, calcareous; little fine gravel.	vertical walls unstable;	18	80	2		
		2										
	1	4		SP	loose							
		6										
	2	8										
	3	10				TOTAL DEPTH 9.0' (2.7m)	caving of soil was too extensive to excavate below 9.0'					
		12										
	4	14										
	5	16										
		18										
	6	20										

CHECKED BY _____ APPROVED BY _____

TRENCH DETAILS

SURFACE ELEVATION : 4990' (1521m)
DATE EXCAVATED : 18 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A5y/A4o
TRENCH LENGTH : 13.0'
TRENCH ORIENTATION : N - S

LOG OF TRENCH GC-T-10
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-10

FUGRO NATIONAL, INC.

2 JUL 79

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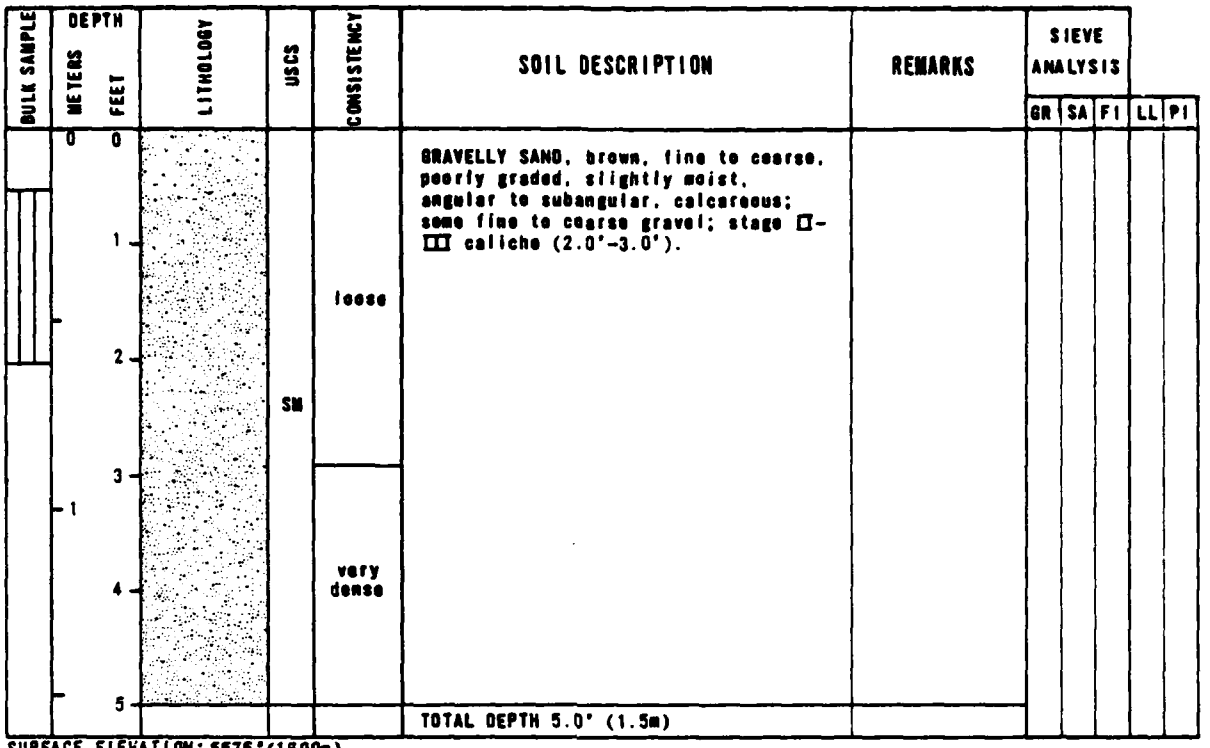
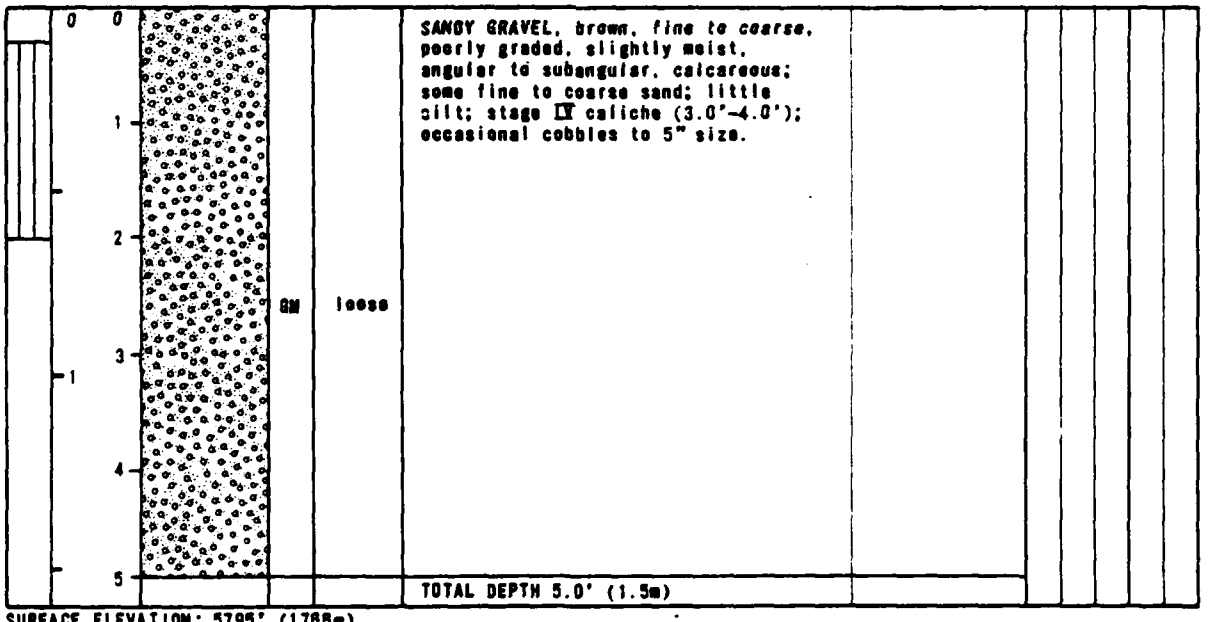
FN-TR-27-V1



SURFACE ELEVATION: 5575' (1699m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-1



SURFACE ELEVATION: 5795' (1766m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT GC-P-2

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-1 AND GC-P-2
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-11

FUGRO NATIONAL, INC.

2 JUL 78

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little fine to coarse gravel; little silt; stage III caliche (2.5'-3.5').						
		1										
		2										
	1	3			dense							
		4										
		5				TOTAL DEPTH 4.5' (1.4m)						

SURFACE ELEVATION: 5810' (1771m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT GC-P-3

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SC	loose	GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, angular, calcareous; some fine to coarse gravel; trace slightly plastic clay; stage III caliche (1.75'-2.0').						
		1										
		2				TOTAL DEPTH 2.0' (0.6m)						
	1	3										
		4										
		5										

SURFACE ELEVATION: 5700' (1737m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-4

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-3 AND GC-P-4
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-12

FUGRO NATIONAL, INC.

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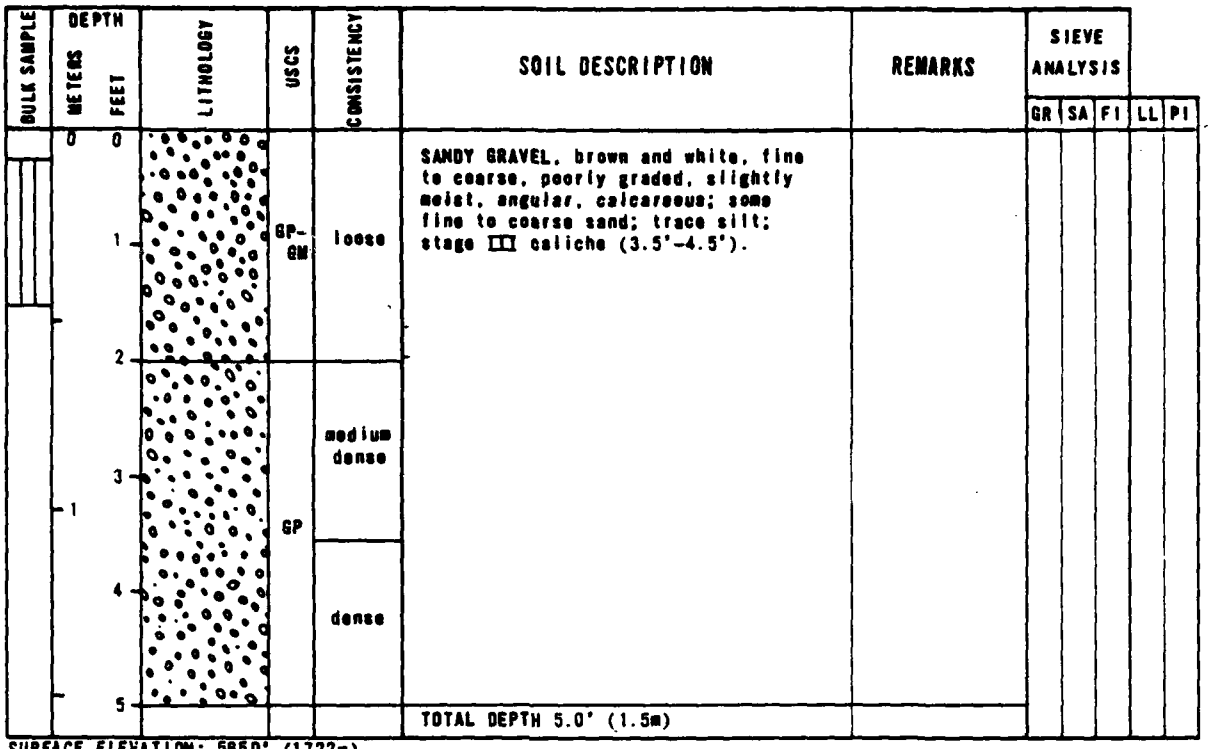
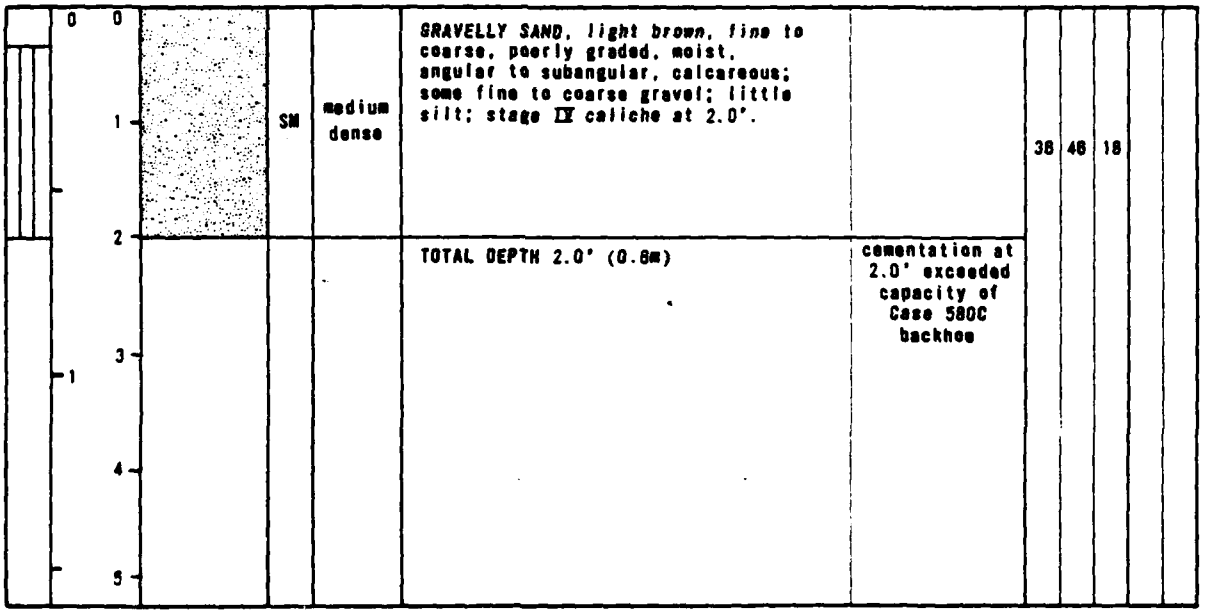


SURFACE ELEVATION: 5850' (1722m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT GC-P-5



SURFACE ELEVATION: 5500' (1676m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-6

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-5 AND GC-P-6
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-13

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				SILTY SAND, brown to white, fine to coarse, poorly graded, moist to dry, angular, calcareous; some silt; occasional cobbles to 5.5" size.						
		1			loose							
		2										
	1	3		SM								
		4			medium dense							
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5120' (1561m)
SURFICIAL GEOLOGIC UNIT: A1

LOG OF TEST PIT GC-P-7

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, angular, calcareous; some fine to coarse sand; trace silt.						
		1										
		2		GP-GM	medium dense							
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5150' (1570m)
SURFICIAL GEOLOGIC UNIT: A1

LOG OF TEST PIT GC-P-8

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-7 AND GC-P-8
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-14

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, angular, calcareous; some silt; little fine to coarse gravel.						
		1										
		2		GM	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little fine to coarse sand; stage I-II caliche (2.0'-5.0').						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5210' (1588m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-9

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, brown, fine to coarse, poorly graded, moist, angular to subangular, calcareous; some silt.						
		1										
		2										
	1	3		ROCK		RHYO-DACITE PORPHYRY, red, weathered, banded.						
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5300' (1615m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-10

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-9 AND GC-P-10
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-15

FUGRO NATIONAL, INC.

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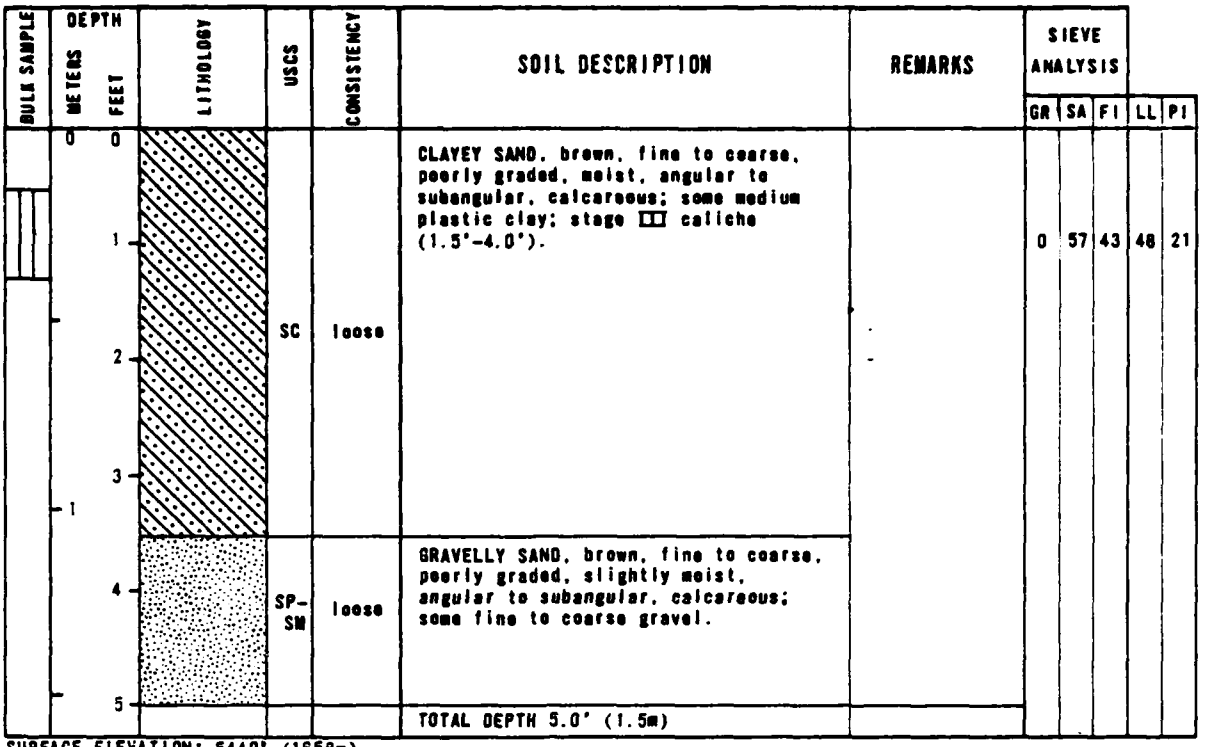
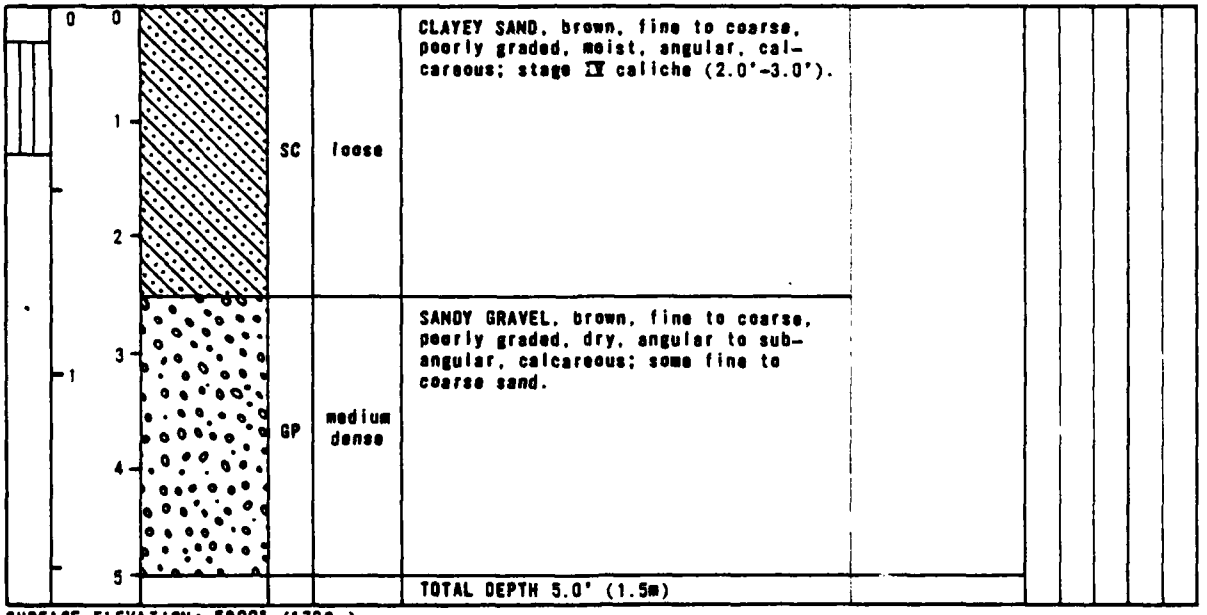


SURFACE ELEVATION: 5440' (1658m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-11



SURFACE ELEVATION: 5800' (1768m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT GC-P-12

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-11 AND GC-P-12
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-16

UGRO NATIONAL, INC.

2 JUL 79

AFV-03

FN-TR-27-VI

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				CLAYEY SAND, brown, fine to coarse, poorly graded, moist, angular, calcareous; some slightly plastic clay; little fine to coarse gravel; stage III caliche (3.0'-5.0').		20	56	24		
		1										
		2		SC	medium dense							
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6100' (1859m)
SURFICIAL GEOLOGIC UNIT: $A5_o$

LOG OF TEST PIT GC-P-13

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS
	0	0				CLAYEY SAND, brown, fine to coarse, poorly graded, moist, angular, calcareous; little slightly plastic clay; stage I caliche (2.0'-3.0').	
		1		SC	medium dense		
		2				GRAVELLY SAND, brown, fine to coarse, poorly graded, moist, angular, calcareous; some fine gravel.	
	1	3					
		4		SP	medium dense		
		5				TOTAL DEPTH 5.0' (1.5m)	

SURFACE ELEVATION: 5500' (1678m)
SURFICIAL GEOLOGIC UNIT: $A5_i$

LOG OF TEST PIT GC-P-14

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-13 AND GC-P-14
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-17

UGRO NATIONAL, INC.

2 JUL 79

AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		GP	loose	SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, *angular to subangular, calcareous*; some fine to coarse sand; trace silt; stage III-IV caliche below 1.5'.						
		1										
		2				TOTAL DEPTH 1.75' (0.5m)	cementation at 1.75' exceeded capacity of Case 580C backhoe					
	1	3										
		4										
		5										

SURFACE ELEVATION: 5690'.(1734m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-15

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		GM	loose	SANDY GRAVEL, light brown, fine to *coarse*, poorly graded, slightly moist, angular, calcareous; some fine to coarse sand; little silt.						
		1				TOTAL DEPTH 1.0' (0.3m)	cementation at 1.0' exceeded capacity of Case 580C backhoe					
		2										
	1	3										
		4										
		5										

SURFACE ELEVATION: 6100' (1859m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT GC-P-16

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-15 AND GC-P-16
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-18

FUGRO NATIONAL, INC.

2 JUL 79

AFV-03

FN-TR-27-VI

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SC	loose	CLAYEY SAND, brown, fine to medium, poorly graded, slightly moist, calcareous; little slightly plastic clay; stage II caliche (3.0'-4.75'); stage III (4.75'-5.0').						
		1										
	1	2										
		3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5340' (1628m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-17

	0	0		SC	loose	CLAYEY SAND, brown, fine to medium, poorly graded, slightly moist, calcareous; little slightly plastic clay; stage I caliche (4.75'-5.0').						
		1										
	1	2										
		3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5300' (1615m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT GC-P-18

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-17 AND GC-P-18
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-19

FUGRO NATIONAL, INC.

2 JUL 79

AFV-03

FN-TR-27-V1

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, angular, calcareous; some silt; trace fine gravel; stage □-□□ caliche (3.0'-3.75').						
		1										
		2										
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5520' (1682m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-19

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		ML	soft	SANDY SILT, light brown, slightly moist, slightly plastic, calcareous; some fine sand.		0	22	78		
		1										
		2		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little silt.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5550' (1692m)
SURFICIAL GEOLOGIC UNIT: A5y/A1

LOG OF TEST PIT GC-P-20

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LOGS OF TEST PITS GC-P-19 AND GC-P-20
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FIGURE 7-20

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FN-TR-27-V1

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		GM	loose	SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse sand; little silt; stage IV caliche below 1.5'.						
		1										
		2				TOTAL DEPTH 1.75' (0.5m)	cementation at 1.75' exceeded capacity of Case 580C backhoe					
	1	3										
		4										
		5										

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

LOG OF TEST PIT GC-P-21

	0	0		SP	loose	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine angular gravel; trace silt.						
		1										
		2										
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5800' (1768m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-22

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-21 AND GC-P-22
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FIGURE 7-21

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

SURFACE ELEVATION: 6000' (1829m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-23

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, sub-rounded, calcareous; little silt.						
		1										
		2		SM	medium dense					17		
		3				GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry, sub-angular, calcareous; trace fine gravel; stage I caliche below 4.7'.						
	1											
		4		SP	medium dense							
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5640' (1719m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-24

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LOGS OF TEST PITS GC-P-23 AND GC-P-24
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FIGURE 7-22

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SC	medium dense	CLAYEY SAND, dark brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; some slightly plastic clay; little gravel.		14	60	26		
		1										
		2										
	1	3		SP	medium dense	GRAVELLY SAND, brown to light brown, fine to coarse, poorly graded, slightly moist to dry, subrounded, calcareous; little gravel.						
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5350' (1631m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-25

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		CL	firm	SANDY CLAY, brown, slightly plastic, calcareous; some fine subangular sand.				51		
		1										
		2										
	1	3										
		4		SP	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; some fine gravel.						
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5125' (1562m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT GC-P-26

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS GC-P-25 AND GC-P-26
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

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FIGURE 7-23

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				GRAVEL, brown, fine to coarse, poorly graded, dry, subrounded, calcareous; trace fine to medium sand, trace slightly plastic silt.						
		1										
		2										
	1	3		GP	dense							
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4998' (1523m)
SURFICIAL GEOLOGIC UNIT: A5y/A4a

LOG OF TEST PIT GC-P-27

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, sub-angular, calcareous; some silt; trace fine gravel; stage III caliche (2.0'-3.5').						
		1			loose							
		2		SM								
	1	3			medium dense							
		4				TOTAL DEPTH 3.5' (1.1m)	cementation at 3.5' exceeded capacity of Case 580C backhoe					
		5										

SURFACE ELEVATION: 5005' (1526m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT GC-P-28

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LOGS OF TEST PITS GC-P-27 AND GC-P-28
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FIGURE 7-24

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0			firm	CLAYEY SILT, light brown, slightly plastic, calcareous.					31	4
		1										
						CLAYEY SILT, gray, slightly plastic, calcareous.						
		2		ML								
		3			hard							
	1											
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4990' (1521m)
SURFICIAL GEOLOGIC UNIT: A4e

LOG OF TEST PIT GC-P-29

	0	0										
		1										
		2										
		3										
	1											
		4										
		5										

SURFACE ELEVATION:
SURFICIAL GEOLOGIC UNIT:

LOG OF TEST PIT

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LOG OF TEST PIT GC-P-29
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

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FIGURE 7-25

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SECTION 8.0

SURFICIAL SAMPLE LOGS

EXPLANATIONS OF SURFICIAL SAMPLE LOGS

Finalized logs of the surficial samples are presented in this section. The explanations provided here are to serve as general guidelines to reading the logs.

A. Designations - Surficial samples are identified as follows:

SE-CS-1

SE - abbreviation for the site (e.g., SE - Snake East)
CS - abbreviation for surficial sample
1 - number of activity

B. Ground Surface Elevation - Indicated elevations on the logs are estimated from topographic maps of the study area within 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 Symbol; see Table 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.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS GR	SA	FI	LL	PI
GC-CS-7	5350 (1631)	A5y	0.0-2.0 (0.0-0.8)	SM	SILTY SAND, brown to white, fine to coarse, poorly graded, angular to subangular, calcareous; some silt; trace fine gravel; stage III caliche (1.5'-2.0').					
GC-CS-8	5150 (1570)	A5y	0.0-1.5 (0.0-0.5)	SM	SILTY SAND, brown, fine to coarse, poorly graded, angular to subangular, calcareous; some slightly plastic silt, little fine to coarse gravel.	20	42	38		
			1.5-2.0 (0.5-0.8)	GP	SANDY GRAVEL, light brown, fine, poorly graded, subangular, calcareous; some fine to coarse sand; trace silt; stage II caliche (1.75'-2.0').					
GC-CS-12	5175 (1577)	A5y	0.0-2.0 (0.0-0.8)	GP-GM	SANDY GRAVEL, brown, fine, poorly graded, angular, calcareous; some fine to coarse sand; trace silt.					
GC-CS-15	5320 (1622)	A5i	0.0-0.75 (0.0-0.2)	ROCK	RHYOLITE PORPHYRY, red, glassy, massive.					
GC-CS-18	5400 (1646)	A5y	0.0-2.0 (0.0-0.8)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, angular, calcareous; some silt.					
GC-CS-21	5750 (1573)	A5i	0.0-0.5 (0.0-0.2)	GP	SANDY GRAVEL, light brown, fine, poorly graded, angular, to subangular, calcareous; some fine to coarse sand.					
			0.5-2.0 (0.2-0.8)	ML	SANDY SILT, brown, slightly plastic, calcareous; some fine sand.					
GC-CS-22	5980 (1817)	A5i	0.0-2.0 (0.0-0.8)	CL	SANDY CLAY, brown, slightly plastic, calcareous; some fine to medium sand, stage IV caliche at 2.0'.	1	27	72		
GC-CS-25	5510 (1679)	A5y	0.0-2.0 (0.0-0.8)	SC	CLAYEY SAND, brown, fine to coarse, poorly graded, angular, calcareous; some slightly plastic clay; some fine to coarse gravel.	25	43	32		
GC-CS-27	4900 (1494)	A5y/A1	0.0-2.0 (0.0-0.8)	GP-GM	SANDY GRAVEL, brown, fine to coarse, poorly graded, angular to subrounded; some fine to coarse sand; trace silt.	51	44	5		
GC-CS-29	5590 (1704)	A5y	0.0-2.0 (0.0-0.8)	SM	SILTY SAND, light brown, fine, poorly graded, calcareous; some slightly plastic silt.					

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
GARDEN-COAL CDP, NEVADA

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FIGURE 8-1
1 OF 2

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ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
GC-CS-31	5800 (1707)	A5y	0.0-2.0 (0.0-0.6)	GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, calcareous; some fine to coarse sand; little silt; stage III-IV caliche (1.5'-2.0').					
GC-CS-33	5800 (1768)	A5y	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, angular, calcareous; some silt; some fine gravel.					
GC-CS-35	5630 (1718)	A5y	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular to angular, calcareous; some silt; trace fine gravel.					
GC-CS-39	5500 (1676)	A5i	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular, calcareous; some nonplastic silt; little fine gravel.	15	60	25		
GC-CS-41	5300 (1615)	A5y	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular, calcareous; some nonplastic silt.	3	69	28		
GC-CS-42	5225 (1593)	A5y	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular, calcareous; some nonplastic silt; little fine gravel.	14	48	38		NP
GC-CS-45	5075 (1547)	A1/A2	0.0-2.0 (0.0-0.6)	SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, subangular, calcareous; some fine to coarse gravel; little nonplastic silt.	28	57	15		
GC-CS-48	5040 (1536)	A5y	0.0-2.0 (0.0-0.6)	SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, subangular, calcareous; some fine to coarse gravel; little nonplastic silt.	23	64	13		
GC-CS-50	4982 (1519)	A4o/A4	0.0-2.0 (0.0-0.6)	ML	CLAYEY SILT, brown to green, slightly plastic, calcareous.				41	4
GC-CS-52	4990 (1521)	A5y	0.0-2.0 (0.0-0.6)	ML	SANDY SILT, light brown, nonplastic, calcareous; some fine sand.			56		
GC-CS-53	4995 (1522)	A5y	0.0-2.0 (0.0-0.6)	ML	SANDY SILT, light brown, nonplastic, calcareous; some fine sand.	0	33	67		

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
GARDEN-COAL COP, NEVADA

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FIGURE 8-1 2 OF 2

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SECTION 9.0

LABORATORY TEST RESULTS

EXPLANATIONS OF LABORATORY TEST RESULTS

Laboratory test results are presented in this section. Table 9-1 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 9-2 through 9-6 and Figures 9-1 through 9-3 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 table presents the ASTM designations for the tests performed during the investigation.

Type of Test	ASTM Designations
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 (by 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 Symbols are given here; see Table 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 as 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 tne

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_o). 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 (ksf) 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. pH is an index of the acidity or alkalinity of a soil in terms of the logarithm of the reciprocal of the hydrogen i- concentration. ASTM test procedure designations for these chemical tests are included in the table at the beginning of the "Explanation of Laboratory Test Results".

O. CBR - California Bearing Ratio (CBR) is the ratio (in percent) of the resistance to penetration developed by a subgrade 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".

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY							
				STANDARD SIEVE OPENING							U S
				BLDRS.	COBBLES		GRAVEL				
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4
C-B-1	D-1	0.7-1.4	0.21-0.43						1	92	85
	D-2	3.2-3.9	0.98-1.19								
	D-3	6.2-6.9	1.89-2.10							100	97
	D-4	10.2-10.9	3.11-3.32								
	D-5	15.2-15.9	4.63-4.85							100	99
	D-6	18.2-18.9	5.55-5.76							100	99
	P-7	24.0-24.8	7.32-7.56								
	P-8	31.2-31.9	9.51-9.72							100	99
	P-9	40.0-40.8	12.20-12.44								
	P-10	53.5-54.4	16.31-16.58								
	P-10	54.4-54.7	16.58-16.67					100	94	84	73
	P-11	60.0-60.8	18.29-18.53								
	P-12	73.0-73.7	22.25-22.46								
	P-12	73.7-74.2	22.46-22.62						1	97	85
	P-13	84.0-84.6	25.60-25.79								
	P-13	84.6-85.2	25.79-25.97								
	P-13	85.2-85.8	25.97-26.15								
	P-14	100.7-101.4	30.69-30.91								
	P-15	120.8-121.7	36.82-37.09								
	P-16	142.7-143.4	43.49-43.71								
	P-17	160.0-160.9	48.77-49.04					100	97	74	58
C-B-2	P-1	0.0-0.4	0.00-0.12						100	99	95
	D-3	6.2-6.9	1.89-2.10					100	96	65	45
	D-4	10.0-10.4	3.05-3.17								
	D-5	15.2-15.9	4.63-4.85					100	88	75	51
	D-6	20.2-20.9	6.16-6.37								
	D-7	25.2-25.9	7.68-7.89								
	P-8	30.0-31.2	9.14-9.51						100	97	93
	D-9	40.4-40.8	12.31-12.44								
	D-10	50.0-50.7	15.24-15.45								
	D-11	58.2-58.9	17.74-17.95								
	D-12	70.0-70.4	21.34-21.46						100	82	65
	D-13	84.0-84.4	25.60-25.73								
	D-14	100.0-100.4	30.48-30.60				100	66	56	45	35
	D-15	120.1-120.6	36.61-36.76								
	D-16	140.2-140.7	42.73-42.89								
	D-17	160.4-160.9	48.89-49.04								
C-B-3	D-1	1.2-1.9	0.37-0.58					100	83	78	73
	D-2	3.2-3.9	0.98-1.19								
	D-4	9.0-9.5	2.74-2.90				100	75	58	47	37
	D-7	27.0-27.7	8.23-8.44								

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro 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

CHECKED BY _____ APPROVED BY _____

CENT FINER BY WEIGHT									ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED		
		U S STANDARD SIEVE NO					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE
		SAND				SILT OR CLAY														
/4"	3 8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m^3)				(pcf)	(kg m^3)	
00	92	85	79	68	53	38						SM	91.2	1461	13.8	43.9	0.85			
												SM	118.7	1902	3.1	20.3	0.42			
	100	97	95	94	92	85						ML	100.5	1610	12.9	51.3	0.68			
												ML	117.7	1886	4.4	27.4	0.43			
	100	99	98	94	83	66						ML	109.6	1756	5.8	28.9	0.54			
	100	99	99	97	91	82						ML	90.9	1456	15.2	48.0	0.85			
												ML	110.5	1770	6.1	31.6	0.53			
	100	99	99	94	73	39	6	2				SM	104.1	1668	8.8	38.3	0.62			
												ML	76.2	1221	32.7	73.0	1.21			
												SM	114.4	1833	9.9	56.9	0.47			
94	84	73	62	46	31	21						SM								
												SM	104.2	1669	21.4	93.5	0.62			
												SM	115.8	1855	11.6	70.4	0.46			
00	97	85	72	52	26	17						SM								
												ML	99.6	1596	25.8	100.0	0.69			
			100	99	97	93						ML								
												ML	94.8	1519	29.0	100.0	0.78			
												ML	95.2	1525	31.8	100.0	0.77			
												SM	104.9	1680	21.5	95.7	0.61			
												SM	82.0	1314	38.3	98.1	1.05			
97	74	58	45	31	21	14						SM	117.4	1881	9.8	60.8	0.44			
00	99	95	90	70	52	40						SM	94.3	1511	10.4	35.6	0.79			
96	65	45	32	12	5	4						GW	125.1	2004	8.5	66.1	0.35			
												SP-SM	108.5	1738	9.2	45.2	0.55			
88	75	51	37	18	8	5						GP-GM	119.7	1918	7.7	50.8	0.41			
												SM	112.3	1799	8.0	43.2	0.50			
												SP	131.4	2105	7.2	66.6	0.28			
00	97	93	85	66	40	23					NP	SM	100.3	1607	10.0	43.5	0.62			
												GP	134.8	2159	8.9	96.9	0.25			
												GP	124.0	1986	8.4	63.1	0.36			
												SP-SM	108.1	1732	7.3	35.2	0.56			
00	82	65	50	32	18	12						SP-SM	120.0	1922	9.3	62.4	0.40			
												GP	116.6	1868	12.9	78.0	0.45			
56	45	35	26	10	6	5						GP	127.7	2046	10.0	84.6	0.32			
												SP	125.8	2015	7.9	63.3	0.34			
												SP	126.4	2025	10.2	82.9	0.33			
												SP	124.1	1988	8.8	66.4	0.36			
3	78	73	68	52	37	26						SM	98.9	1584	9.2	35.2	0.70			
												SM	108.1	1732	6.3	30.7	0.56			
8	47	37	29	14	8	6						GW-GM								
									27	22	5	ML	109.2	1749	15.1	75.3	0.54			

stem

med
port

1

2

PI	USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
		DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)							
		(pcf)	(kg/m³)				(pcf)	(kg/m³)								
	SM	91.2	1461	13.8	43.9	0.85										
	SM	118.7	1902	3.1	20.3	0.42									*	
	ML	100.5	1610	12.9	51.3	0.68				2.71						
	ML	117.7	1886	4.4	27.4	0.43										
	ML	109.6	1756	5.8	28.9	0.54										
	ML	90.9	1456	15.2	48.0	0.85							*			
	ML	110.5	1770	6.1	31.6	0.53										
	SM	104.1	1668	8.8	38.3	0.62										
	ML	76.2	1221	32.7	73.0	1.21										
	SM	114.4	1833	9.9	56.9	0.47										
	SM															
	SM	104.2	1669	21.4	93.5	0.62										
	SM	115.8	1855	11.6	70.4	0.46										
	SM															
	ML	99.6	1596	25.8	100.0	0.69					*					
	ML															
	ML	94.8	1519	29.0	100.0	0.78					*					
	ML	95.2	1525	31.8	100.0	0.77										
	SM	104.9	1680	21.5	95.7	0.61										
	SM	82.0	1314	38.3	98.1	1.05										
	SM	117.4	1881	9.8	60.8	0.44										
	SM	94.3	1511	10.4	35.6	0.79										
	GW	125.1	2004	8.5	66.1	0.35										
	SP-SM	108.5	1738	9.2	45.2	0.55										
	SP-GM	119.7	1918	7.7	53.8	0.41										
	SM	112.3	1799	8.0	43.2	0.50										
	SP	131.4	2105	7.2	66.6	0.28										
NP	SM	100.3	1607	10.0	43.5	0.62				2.69			*	*		
	GP	134.8	2159	8.9	96.9	0.25										
	GP	124.0	1986	8.4	63.1	0.36										
	SP-SM	108.1	1732	7.3	35.2	0.56										
	SP-SM	120.0	1922	9.3	62.4	0.40										
	GP	116.6	1868	12.9	78.0	0.45										
	GP	127.7	2046	10.0	84.6	0.32										
	SP	125.8	2015	7.9	63.3	0.34										
	SP	126.4	2025	10.2	82.9	0.33										
	SP	124.1	1988	8.8	66.4	0.36										
	SM	98.9	1584	9.2	35.2	0.70										
	SM	108.1	1732	6.3	30.7	0.56										
	GW-GM															
5	ML	109.2	1749	15.1	75.3	0.54				2.70						

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-1 1 OF 4

FUGRO NATIONAL, INC.

AFV-01

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT								
				STANDARD SIEVE OPENING							U S ST	
				BLDRS.	COBBLES		GRAVEL					
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10
GC-B-3	D-8	33.0-33.5	10.06-10.21									
	D-9	60.5-60.9	18.44-18.56					100	88	72	61	48
	D-10	80.3-80.9	24.48-24.66									
	D-11	100.0-100.3	30.48-30.57									
	D-12	120.2-120.9	36.64-36.85					100	97	93	83	60
GC-B-4	P-1	0.0-0.7	0.00-0.21					100	96	83	79	70
	D-2	3.2-3.9	0.98-1.19					100	90	76	61	47
	D-3	7.0-7.4	2.13-2.26									
	D-4	10.4-10.9	3.17-3.32									
	D-5	15.0-15.4	4.57-4.69					100	92	83	74	64
	D-6	20.2-20.9	6.16-6.37					100	94	71	53	38
	D-7	24.5-24.9	7.47-7.59					100	87	76	67	58
	D-8	30.2-30.6	9.20-9.33									
	D-9	39.4-39.9	12.01-12.16						100	99	98	97
	D-10	50.4-50.9	15.36-15.51									
	D-11	60.4-60.9	18.41-18.56									
	D-12	78.4-78.9	23.90-24.05									
	D-13	100.4-100.9	30.60-30.75					100	94	83	69	56
	D-14	121.0-121.4	36.88-37.00									
GC-B-5	D-1	0.2-1.9	0.06-0.58						100	98	96	95
	P-2	3.0-4.5	0.91-1.37							100	99	98
	D-3	7.0-7.7	2.13-2.35									
	D-4	10.7-11.4	3.26-3.47					100	74	54	39	29
	D-5	20.0-20.6	6.10-6.28									
	D-6	30.2-30.9	9.20-9.42									
	D-8	50.2-50.9	15.30-15.51					100	93	78	66	51
	D-9	60.2-60.9	18.35-18.56					100	77	65	54	39
	D-10	74.2-74.9	22.62-22.83									
	D-11	90.0-90.6	27.43-27.61							100	99	98
	D-12	105.2-105.9	32.06-32.28									
	D-13	120.0-120.6	36.58-36.76									
	D-14	140.2-140.9	42.73-42.95						100	97	86	74
	D-15	160.5-161.1	48.92-49.10									
GC-B-6	P-1	1.0-2.2	0.30-0.67									
	P-2	3.0-3.5	0.91-1.07									
	P-3	5.0-7.5	1.52-3.35									
	P-4	10.0-10.6	3.05-3.23									
	P-5	15.0-15.7	4.57-4.79									
	P-6	21.4-22.0	6.52-6.71									
	P-6	22.0-22.6	6.71-6.89									

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro 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

CHECKED BY _____ APPROVED BY _____

NT FINER BY WEIGHT								ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED		
	U S STANDARD SIEVE NO					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)
	SAND				SILT OR CLAY														
3 8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg·m³)				(pcf)	(kg·m³)	
											GP	120.6	1932	13.7	93.2	0.40			
72	61	48	26	16	13						SM	123.6	1980	12.0	89.4	0.36			
											SM	120.8	1935	14.3	97.7	0.40			
											SM	132.6	2124	8.6	86.1	0.27			
93	83	60	23	17	14						SM	128.8	2063	10.8	94.4	0.31			
83	79	70	58	49	43						SM			12.0					
76	61	47	26	14	11						SP-SM	120.8	1935	2.2	15.2	0.40			
											SP-SM	120.9	1937	6.9	47.2	0.39			
											SP-SM	123.6	1980	5.2	38.7	0.36			
83	74	64	35	20	16						SM	120.5	1930	7.1	48.4	0.40			
71	53	38	22	14	11			66	27	39	GP-GC	124.5	1994	8.7	66.3	0.36			
76	67	58	47	37	31						SC	120.3	1927	11.8	79.3	0.40			
											SC	125.5	2011	9.6	75.9	0.34			
99	98	97	86	68	55			31	18	13	CL	116.7	1870	14.[illegible]	85.4	0.44			
											SC	116.7	1870	15.[illegible]	94.4	0.44			
											SC	130.2	2086	9.3	85.9	0.29			
											SC	121.4	1945	9.6	67.2	0.39			
83	69	58	40	31	28						SC	128.8	2063	10.3	90.6	0.31			
											SC	128.9	2065	11.9	104.2	0.31			
98	96	95	93	71	42						SM	90.7	1453	15.9	50.0	0.86			
100	99	98	95	77	43						SM	84.3	1350	15.1	40.9	1.00			
											GM	137.8	2208	7.4	90.3	0.22			
54	39	29	22	17	14						GP-GM	140.9	2257	6.1	83.9	0.20			
											GP-GM	134.4	2153	5.1	54.1	0.25			
											GP-GM	133.1	2132	9.9	100.0	0.27			
78	66	51	28	17	14						SM	120.7	1934	7.2	49.3	0.40			
65	54	39	22	15	12						GP-GM	126.4	2025	8.5	68.8	0.33			
											SM	113.6	1820	9.7	54.0	0.48			
100	99	98	92	76	57						ML	108.0	1730	14.9	71.8	0.56			
											SM	113.9	1825	12.2	68.9	0.48			
											SM	128.2	2054	9.2	79.5	0.31			
97	86	74	47	24	16						SM	100.9	1616	9.6	38.7	0.67			
											SM	123.0	1970	10.2	74.3	0.37			
								39	31	8	ML	82.3	1318	13.6	35.0	1.05			
											ML	82.4	1320	15.4	39.8	1.04			
								54	26	28	CH	75.1	1203	28.1	60.9	1.24			
								53	32	21	MH	73.5	1177	22.3	46.7	1.29			
											MH	70.7	1133	22.4	43.9	1.38			
								40	31	9	ML	80.3	1286	23.4	57.4	1.10			
											ML	80.6	1291	23.2	57.6	1.[illegible]			

ATTERBERG LIMITS (b)		USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
			DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)							
PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)								
		GP	120.6	1932	13.7	93.2	0.40										
		SM	123.6	1980	12.0	89.4	0.36										
		SM	120.8	1935	14.3	97.7	0.40										
		SM	132.6	2124	8.6	86.1	0.27										
		SM	128.8	2063	10.8	94.4	0.31										
		SM			12.0												
		SP-SM	120.8	1935	2.2	15.2	0.40										
		SP-SM	120.9	1937	6.9	47.2	0.39										
		SP-SM	123.6	1980	5.2	38.7	0.36										
		SM	120.5	1930	7.1	48.4	0.40										
27	39	GP-GC	124.5	1994	8.7	66.3	0.36										
		SC	120.3	1927	11.8	79.3	0.40										
		SC	125.5	2011	9.6	75.9	0.34										
18	13	CL	116.7	1870	14.4	85.4	0.44										
		SC	116.7	1870	15.9	94.4	0.44										
		SC	130.2	2086	9.3	85.9	0.29										
		SC	121.4	1945	9.6	67.2	0.39										
		SC	128.8	2063	10.3	90.6	0.31										
		SC	128.9	2065	11.9	104.2	0.31									*	
		SM	90.7	1453	15.9	50.0	0.86										
		SM	84.3	1350	15.1	40.9	1.00										
		GM	137.8	2208	7.4	90.3	0.22									*	
		GP-GM	140.9	2257	6.1	83.9	0.29										
		GP-GM	134.4	2153	5.1	54.1	0.25										
		GP-GM	133.1	2132	9.9	100.0	0.27										
		SM	120.7	1934	7.2	49.3	0.40										
		GP-GM	126.4	2025	8.5	68.8	0.33										
		SM	113.6	1820	9.7	54.0	0.48										
		ML	108.0	1730	14.9	71.8	0.56										
		SM	113.9	1825	12.2	68.9	0.48										
		SM	128.2	2054	9.2	79.5	0.31										
		SM	100.9	1616	9.6	38.7	0.67										
		SM	123.0	1970	10.2	74.3	0.37									*	
31	8	ML	82.3	1318	13.6	35.0	1.05				2.63						
		ML	82.4	1320	15.4	39.8	1.04									*	
26	28	CH	75.1	1203	28.1	60.9	1.24						*				
32	21	MH	73.5	1177	22.3	46.7	1.29										
		MH	70.7	1133	22.4	43.9	1.38										
31	9	ML	80.3	1286	23.4	57.4	1.10					*			*		
		ML	80.6	1291	23.2	57.5	1.10					*					

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, GARDEN-[illegible]AL COR, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-1 1 OF 4

FUGRO NATIONAL, INC.

AFV-01

1 3

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT								
				STANDARD SIEVE OPENING							U S ST	
				BLDRS.	COBBLES		GRAVEL					
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10
GC-B-6	P-7	25.0-26.0	7.62-7.92									
	P-8	30.0-31.3	9.14-9.54									
	P-9	40.0-41.2	12.19-12.56									
	P-10	50.0-52.8	15.24-16.09									
	P-11	61.5-62.2	18.75-18.96									
	P-12	70.0-70.8	21.34-21.58									
	P-13	80.0-81.6	24.38-24.87									
	D-14	110.2-110.3	33.59-33.80									100
GC-T-1	B-1	0.1-2.0	0.03-0.61									
GC-T-2	B-1	0.5-2.0	0.15-0.61				100	95	89	82	70	61
GC-T-4	B-1	0.5-2.0	0.15-0.61						100	93	84	72
GC-T-5	B-1	0.1-2.0	0.03-0.61				100	99	96	91	80	61
GC-T-6	B-1	0.1-2.0	0.03-0.61									
GC-T-6	b-2	4.0-5.0	1.22-1.52									
GC-T-7	B-1	0.1-2.0	0.03-0.61									
GC-T-8	B-1	0.5-1.0	0.15-0.30					100	98	94	87	81
GC-T-9	B-1	0.5-2.0	0.15-0.61									
GC-T-10	B-1	0.25-2.0	0.08-0.61							100	82	61
GC-P-5	b-1	0.25-1.5	0.08-0.46									
GC-P-6	B-1	0.25-2.0	0.08-0.61					100	95	85	64	52
GC-P-10	b-2	3.0-3.5	0.91-1.07									
GC-P-11	B-1	0.5-1.25	0.15-0.38								100	94
GC-P-12	b-1	0.25-1.25	0.08-0.38									
GC-P-13	B-1	0.25-2.0	0.08-0.61						100	91	80	67
GC-P-20	b-1	0.5-2.0	0.15-0.61								100	98
GC-P-24	B-1	1.0-2.0	0.30-0.61									

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro 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

CHECKED BY _____ APPROVED BY _____

PERCENT FINER BY WEIGHT										ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACT	
OPENING			U S STANDARD SIEVE NO					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY	
GRAVEL			SAND				SILT OR CLAY													
1½"	3 4"	3 8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg m³)				(pcf)	(kg m³)
													ML	81.3	1302	25.8	64.9	1.07		
										23	26	7	CL-ML	86.7	1389	20.6	59.2	0.94		
													ML	91.6	1467	21.8	70.3	0.84		
													ML	98.2	1573	24.5	92.5	0.72		
													MH	88.9	1424	29.7	89.8	0.89		
										63	32	31	MH	86.7	1389	31.4	90.1	0.94		
													ML	96.8	1551	21.5	78.4	0.74		
				100	99	95	88			41	28	13	ML	92.3	1479	21.3	78.1	0.8[illegible]		
							32					NP	SM							
95	89	82	70	61	46	34	27			31	18	13	SC						127.6	2044
	100	93	84	72	52	37	26						SM							
99	96	91	80	61	32	17	12						SP-SM						120.4	1929
							48						SM							
													SP-SM							
							28						SM							
100	98	94	87	81	70	51	36						SM						121.9	1953
							42			39	31	8	SM							
		100	82	61	7	3	2						SP							
													GP-GM							
100	95	85	64	52	35	23	18						SM							
													Rock							
			100	94	80	58	43			48	27	21	SC							
													SC							
	100	91	80	67	38	28	24						SC							
			100	98	94	87	78						ML							
							17						SM							

tion System

performed
this report

ERG (b)		USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
			DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)							
	PI		(pcf)	(kg. m^3)				(pcf)	(kg m^3)								
		ML	81.3	1302	25.8	64.9	1.07										
5	7	CL-ML	86.7	1389	20.6	59.2	0.94						*				
		ML	91.6	1467	21.8	70.3	0.84										
		ML	98.2	1573	24.5	92.5	0.72										
		MH	88.9	1424	29.7	89.8	0.89									*	
2	31	MH	86.7	1389	31.4	90.1	0.94						*				
		ML	96.8	1551	21.5	78.4	0.74										
8	13	ML	92.3	1479	21.3	70.1	0.82						*				
	NP	SM															
8	13	SC						127.6	2044	9.5							*
		SM															
		SP-SM						120.4	1929	12.0							*
		SM														*	
		SP-SM														*	
		SM															
		SM						121.9	1953	9.7							*
31	8	SM															
		SP															
		GP-GM														*	
		SM															
		Rock														*	
27	21	SC															
		SC														*	
		SC															*
		ML															
		SM														*	

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE B-1
3 OF 4

FUGRO NATIONAL, INC.

AFV-01

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WE							
				STANDARD SIEVE OPENING							U S
				BLDRS.	COBBLES		GRAVEL				
		FEET	METERS	24"	12"	8"	3"	1½"	3 4"	3 8"	4
GC-P-25	B-1	1.0-1.5	0.30-0.46						100	94	86
GC-P-26	B-1	1.0-2.0	0.30-0.61								
GC-P-29	b-1	0.25-1.0	0.08-0.30								
GC-CS-9	B-1	0.5-1.5	0.15-0.46						100	91	80
GC-CS-22	b-1	0.5-2.0	0.15-0.61							100	99
GC-CS-25	B-1	0.25-2.0	0.08-0.61					100	93	85	75
GC-CS-27	B-1	0.5-2.0	0.15-0.61				100	97	89	66	49
GC-CS-39	b-1	0.5-2.0	0.15-0.61						100	95	85
GC-CS-41	b-1	0.5-2.0	0.15-0.61							100	97
GC-CS-42	b-1	0.5-2.0	0.15-0.61						100	95	86
GC-CS-45	b-1	0.5-2.0	0.15-0.61					100	87	80	72
GC-CS-46	b-1	0.5-2.0	0.15-0.61					100	97	90	77
GC-CS-5	P-1	0.25-0.75	0.08-0.23								
GC-CS-5	b-1	0.5-2.0	0.15-0.61								
GC-CS-5	P-1	0.5-2.5	0.15-0.61								

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro 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

CHECKED BY _____ APPROVED BY _____

T FINER BY WEIGHT								ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED		
	U S STANDARD SIEVE NO					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)
	SAND					SILT OR CLAY													
3 8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg m^3)				(pcf)	(kg m^3)	
94	86	76	56	37	26						SC								
					51						CL								
								31	27	4	ML								
91	80	69	54	43	38						SM								
100	99	97	89	78	72						CL								
85	75	66	51	38	32						SC								
66	49	35	14	7	5						GP-GM								
95	85	72	49	32	25						SM								
100	97	93	79	47	28						SM								
95	86	73	59	46	38					NP	SM								
80	72	64	48	26	15						SM								
90	77	61	36	19	13						SM								
								41	37	4	ML								
					56						ML								
		100	98	86	67						ML								

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ERG (b)		USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
	PI		DRY UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (kg m^3)	MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY (pcf)	MAXIMUM DRY DENSITY (kg m^3)	OPTIMUM MOISTURE (%)							
		SC															*
		CL														*	
7	4	ML															
		SM															
		CL															
		SC															
		GP-GM															
		SM															
		SM															
	NP	SM															
		SM															
		SM															
37	4	ML															
		ML															
		ML															

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9.1 4 OF 4

FUGRO NATIONAL, INC.

AFV-01

CHECKED BY _____ / _____ APPROVED BY _____ / _____

2 JUL 78

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	TYPE OF TEST	DRY DENSITY		MOISTURE CONTENT (%)	CONFINING PRESSURE (σ_3)		MAXIMUM DEVIATOR STRESS ($\sigma_1-\sigma_3$)		STRAIN RATE (%/min)	BACK PRESSURE	
		FEET	METERS			pcf	kg/m^3		ksf	kN/m^2	ksf	kN/m^2		ksf	kN/m^2
GC-B-1	P-13	84.0-84.8	25.60-25.79	ML	CD	99.6	1596	25.8	8.0	383	18.5	886	.004	0	0
		84.8-85.2	25.79-25.96	ML	CD				12.0	575	20.8	996	.004	0	0
		85.2-85.8	25.96-26.15	ML	CD	94.8	1519	29.0	16.0	766	19.5	934	.004	0	0
GC-B-6	P-8	21.4-22.0	6.52-6.71	ML	CU	80.3	1286	23.4	22.8	1092	7.8	373	.004	18.7	895
		22.0-22.8	6.71-6.89	ML	CU	80.6	1291	23.2	25.3	1211	11.0	527	.004	17.3	828

SUMMARY OF TRIAXIAL COMPRESSION TEST RESULTS
VERIFICATION SITE, GARDEN-GOAL COP. NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-2

FUGRO NATIONAL, INC.

AFV-10

FN-TR-27-V1

CHECKED BY _____ / _____ APPROVED BY _____ / _____

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	UNCONFINED COMP. STRENGTH		DRY DENSITY		MOISTURE CONTENT (%)	DEGREE OF SATURATION (%)	HEIGHT/ DIAMETER
		FEET	METERS		ksf	kN/m²	pcf	kg/m³			
GC-B-2	P-8	30.0-31.2	9.14-9.51	SM	3.5	168	100.3	1607	10.0	38.8	2.40
GC-B-6	P-3	6.2-6.8	1.89-2.07	CH	4.7	225	76.8	1230	21.7	49.1	2.40
	P-8	30.0 31.3	9.14-9.54	CL-ML	3.0	144	86.7	1389	20.6	59.1	1.74
	P-12	70.0-70.8	21.34-21.58	MH	4.3	206	86.7	1389	31.4	89.9	2.40
	D-14	110.2-110.9	33.59-33.80	ML	17.3	828	92.3	1479	21.3	69.6	2.00

SUMMARY OF UNCONFINED COMPRESSION TEST RESULTS
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-3

WOODWARD-CLYDE CONSULTANTS

2 JUL 79

AFY-09

FM-TR-27-VI

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	NORMAL STRESS		MAXIMUM SHEAR STRENGTH	
		FEET	METERS		ksf	kN/m^2	ksf	kN/m^2
GC-B-1	D-6	18.2-18.9	5.55-5.76	ML	2.0	96	2.18	104
				ML	4.0	192	3.83	174
				ML	8.0	383	5.73	274

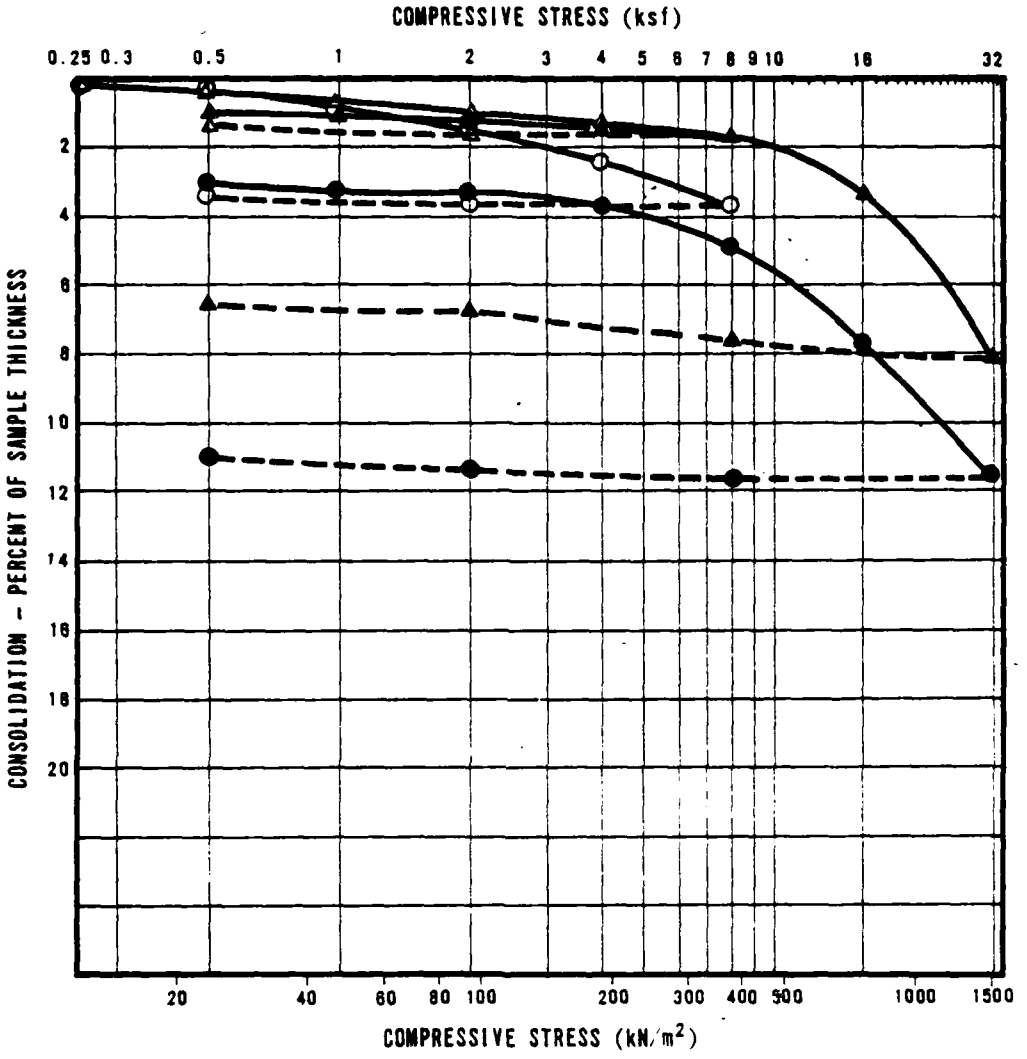
CHECKED BY _____ APPROVED BY _____

SUMMARY OF DIRECT SHEAR TEST RESULTS
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-4

FUGRO NATIONAL, INC.



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			
○	GC-B-2	P-8	30.0-30.1	9.14-9.17	SM	91.3	1463	25.2	0.85	80.5
△	GC-B-6	P-8	20.0-20.1	6.10-6.13	ML	67.5	1081	45.5	1.50	82.2

○ AT FIELD MOISTURE
● AFTER ADDITION OF WATER
——— COMPRESSION
– – – REBOUND

CONSOLIDATION TEST RESULTS
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-1

UGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-02

CHECKED BY _____ APPROVED BY _____

ACTIVITY NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	pH	WATER SOLUBLE				CALCIUM CARBONATE
		FEET	METERS			SODIUM	CHLORIDE	SULPHATE	CALCIUM	
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
GC-B-1	D-2	3.2-3.9	0.98-1.19	SM	7.6	102	10	<5	56	255
GC-B-4	D-14	121.0-121.4	36.88-37.00	SC	7.1	22	15	1070	108	539
GC-B-5	D-3	7.0-7.7	2.13-2.35	GM	7.2	214	91	155	59	160
	D-15	160.0-161.1	48.77-49.10	SM	7.4	37	11	5	85	345
GC-B-6	P-2	3.0-3.5	0.91-1.07	ML	7.2	159	74	176	126	583
	P-11	60.0-62.2	18.29-18.96	MH	7.6	241	15	577	76	349
GC-T-6	B-1	0.1-2.0	0.03-0.61	SM	7.1	16	10	37	73	397
	b-2	4.0-5.0	1.22-1.52	SP-SM	7.1	320	221	682	225	229
GC-P-5	b-1	0.25-1.5	0.08-0.46	GP-GM	7.3	11	11	185	165	409
GC-P-10	b-2	3.0-3.5	0.91-1.07	ROCK	-	70	14	<5	19	175
GC-P-12	b-1	0.25-1.25	0.08-9.38	SC	7.1	34	11	186	124	475
GC-P-24	B-1	1.0-2.0	0.30-0.61	SM	7.0	5	15	37	94	267
GC-P-26	B-1	1.0-2.0	0.30-0.61	CL	7.1	6	13	127	153	400

SUMMARY OF CHEMICAL TEST RESULTS
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

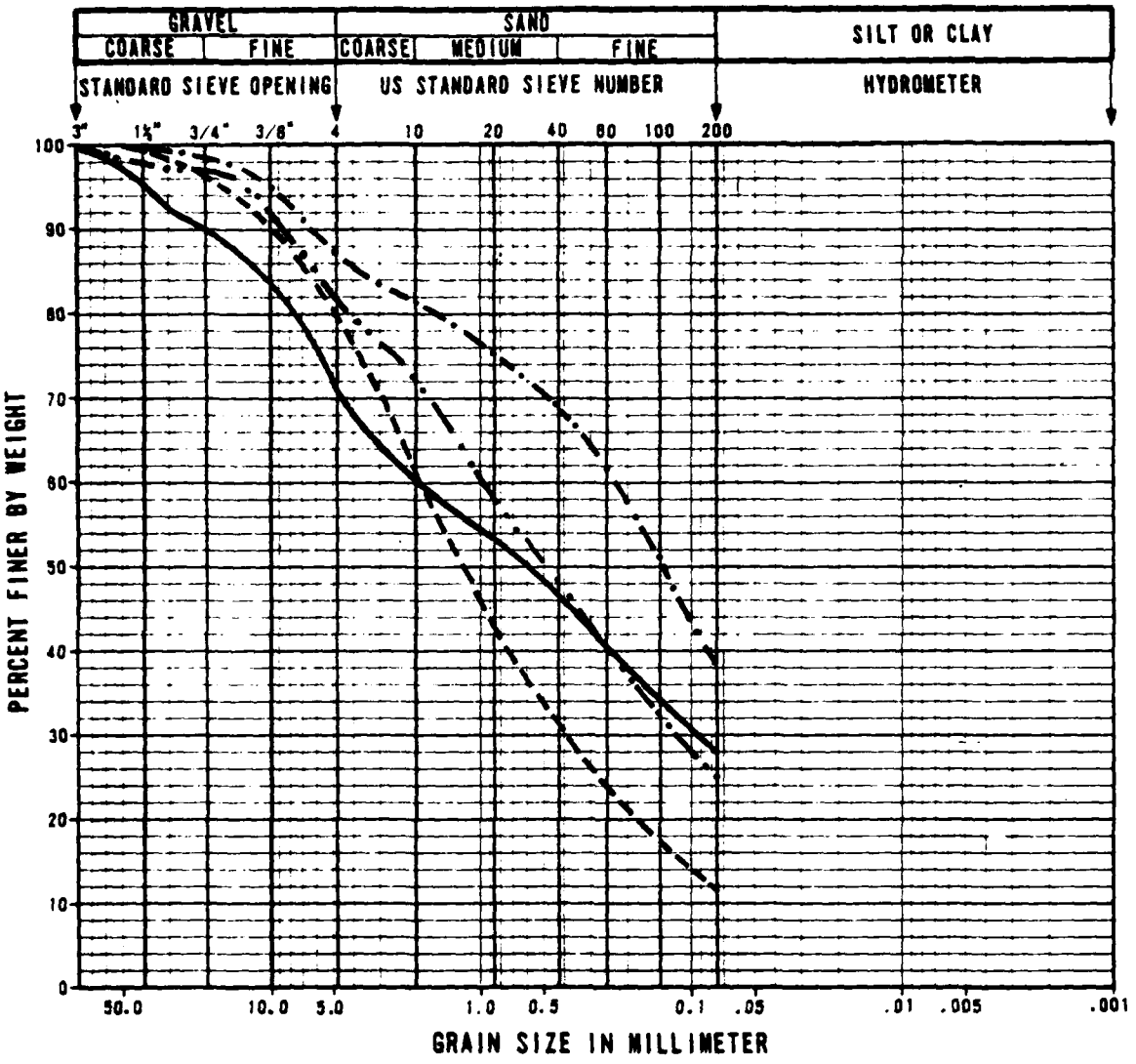
TABLE 9-5

FUGRO NATIONAL, INC.

2 JUL 78

AFV-07

FN-TR-27-V1



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
———	A	GC-T-2	0.5-2.0	0.15-0.61	SC
– – –	B	GC-T-5	0.1-2.0	0.03-0.61	SP-SM
—·—	C	GC-T-8	0.5-2.0	0.15-0.61	SM
—··—	D	GC-P-25 GC-P-13	1.0-1.5 0.25-2.0	0.30-0.46 0.08-0.61	SC

GRAIN SIZE CURVES, CBR TESTS
VERIFICATION SITE, GARDEN-COAL COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-2

FUGRO NATIONAL, INC.

CHECKED BY ____ APPROVED BY ____

CHECKED BY _____ / _____ APPROVED BY _____ / _____

2 JUL 79

FN-TR-27-VI

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/m³		pcf	kg/m³			
A	SC	27	31	13		127.6	2044	9.5	123.4	1977	9.4	96.7	53
									118.5	1898	9.5	92.9	30
									112.5	1802	9.0	88.2	9
B	SP-SM	12				120.4	1929	12.0	115.6	1852	11.9	96.0	41
									109.1	1748	12.5	90.6	27
C	SM	36				121.9	1953	9.7	115.9	1857	8.9	95.1	61
									109.4	1753	8.9	89.7	18
									105.8	1695	9.2	86.8	10
D	SC	25	31	11		126.0	2018	10.5	124.2	1990	10.6	98.6	79
									118.5	1898	10.3	94.0	39
									112.8	1807	10.3	89.5	16

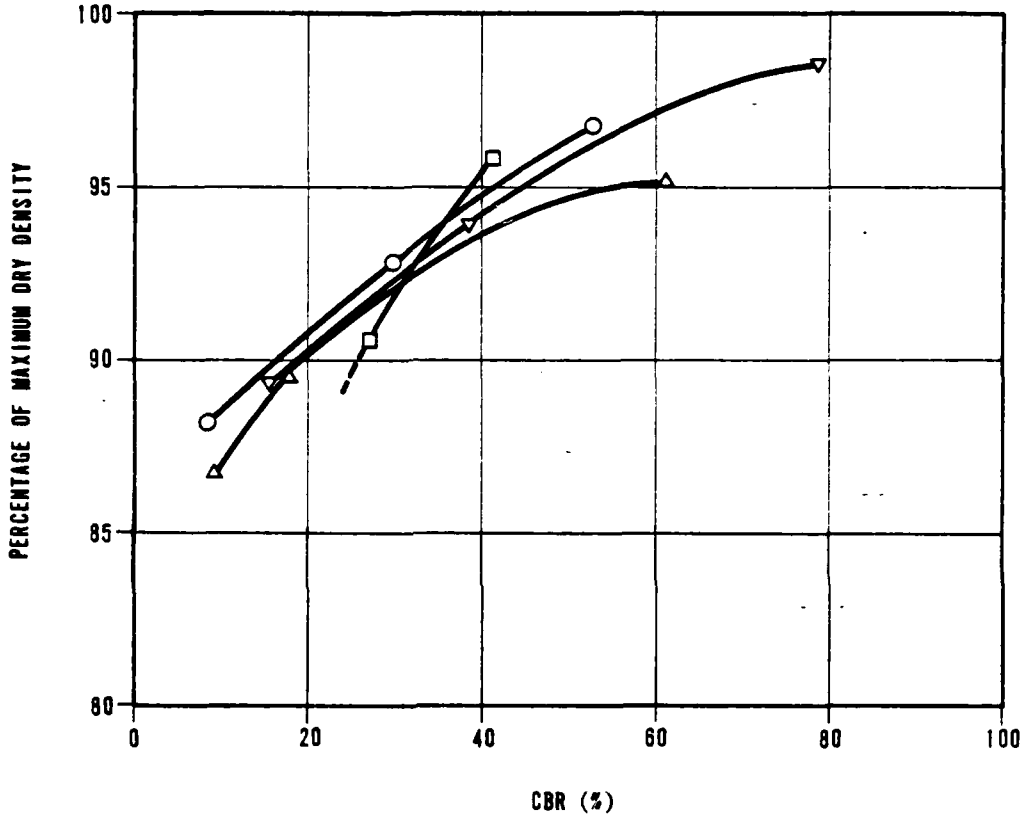
CALIFORNIA BEARING RATIO (CBR) TEST RESULTS
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-6

WOODWARD-CLYDE CONSULTANTS

AFV-13



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	A	SC
□	B	SP-SM
△	C	SM
▽	D	SC

CHECKED BY _____ APPROVED BY _____

CALIFORNIA BEARING RATIO (CBR) CURVES
VERIFICATION SITE, GARDEN-COAL CDP, NEVADA

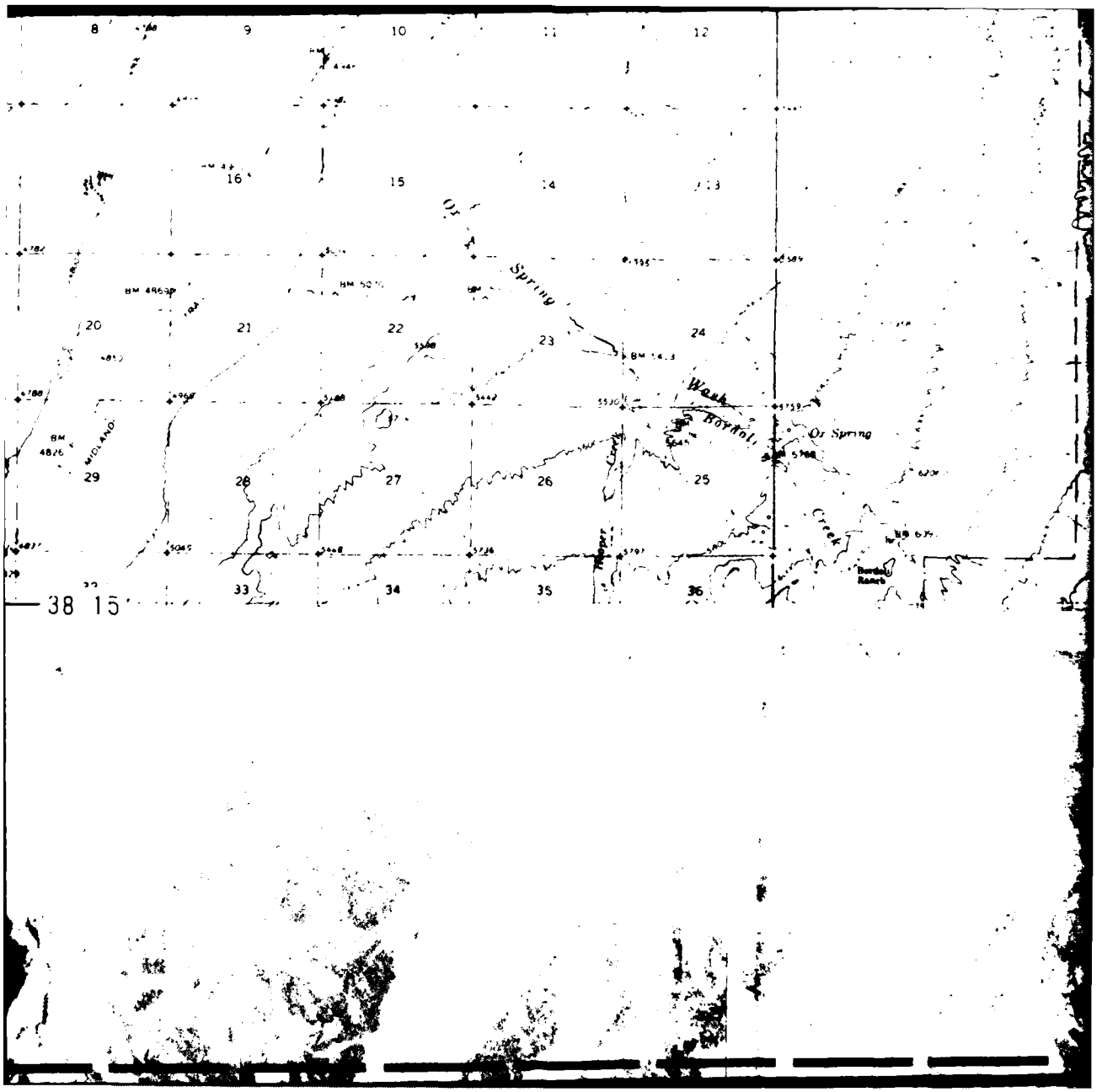
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-3

FUGRO NATIONAL, INC.

2 JUL 79

AFV-14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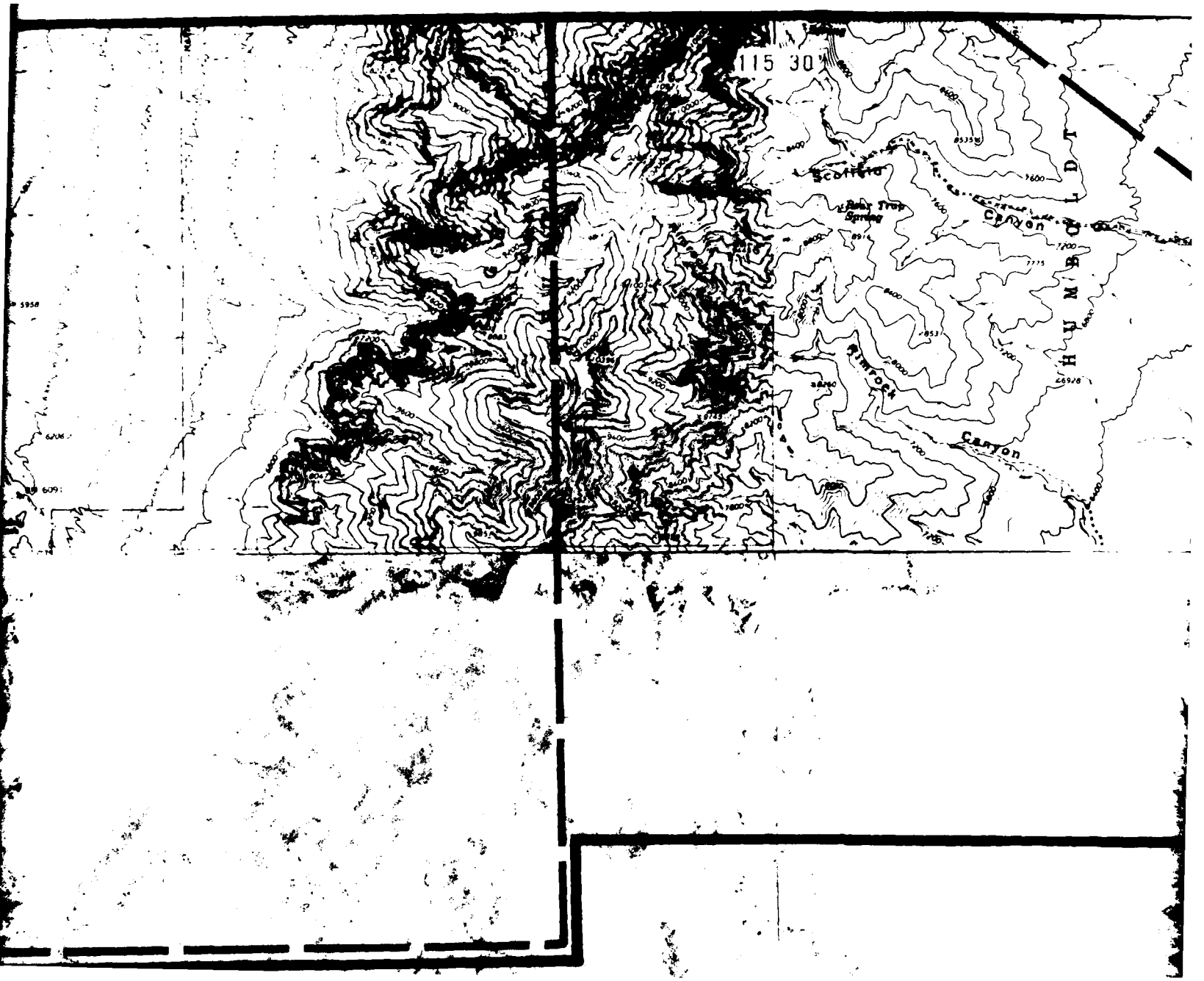
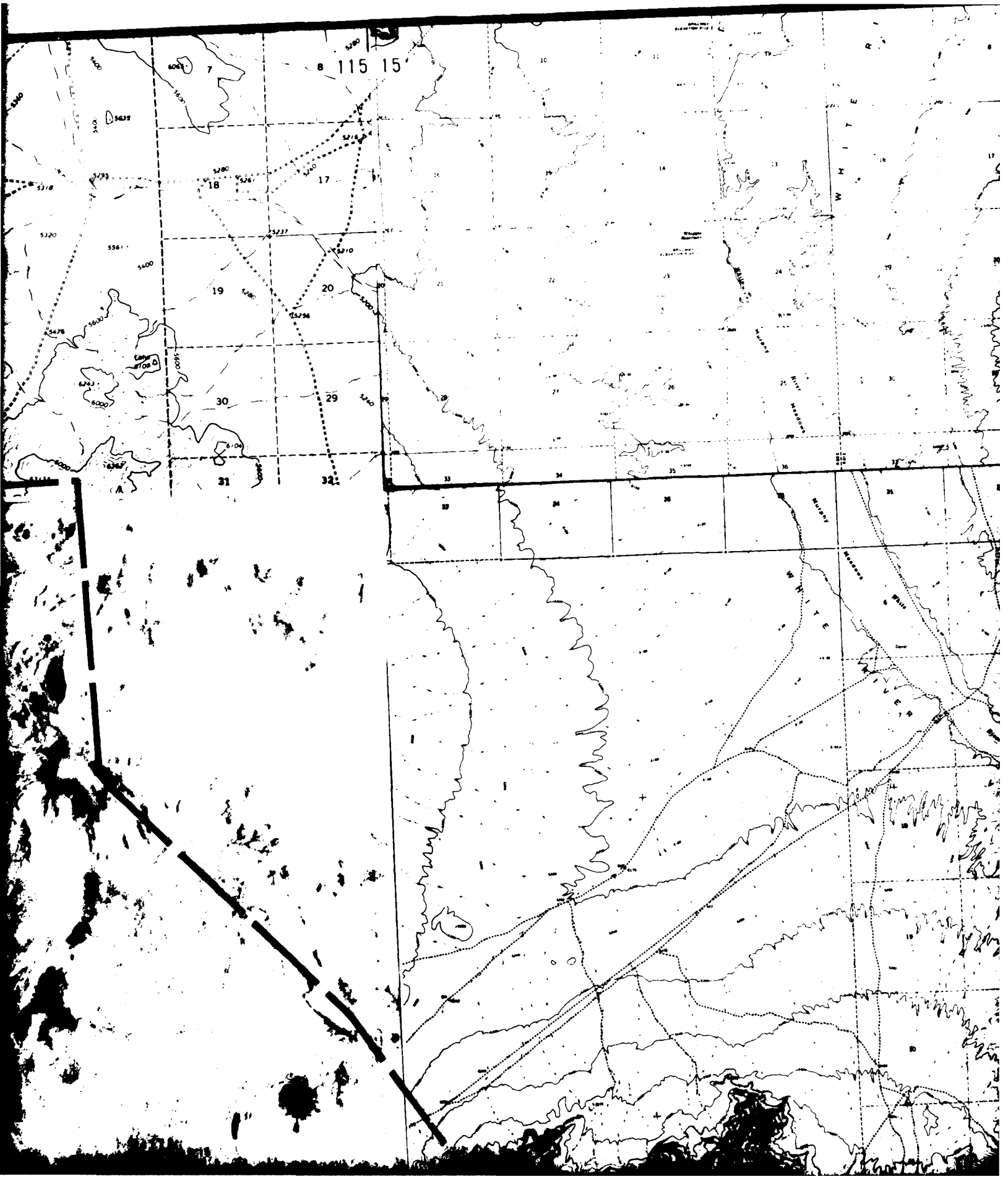
9
10
11
12
16
15
14
13
Spring
20
21
22
23
24
Wash
Borrow
Ox Spring
29
28
27
26
25
Creek
33
34
35
36
38 15


115 30'
Scottie
Baby Trap Spring
Canyon
HUMBOLDT
Rimrock
Canyon


Wash
INDEPENDENCE BOUNDARY
Scofield
Wash
GARDEN
VALLEY
JEEP TRAIL
BM 5435
BM 5461
BM 5435
6-17A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18
17
19
20
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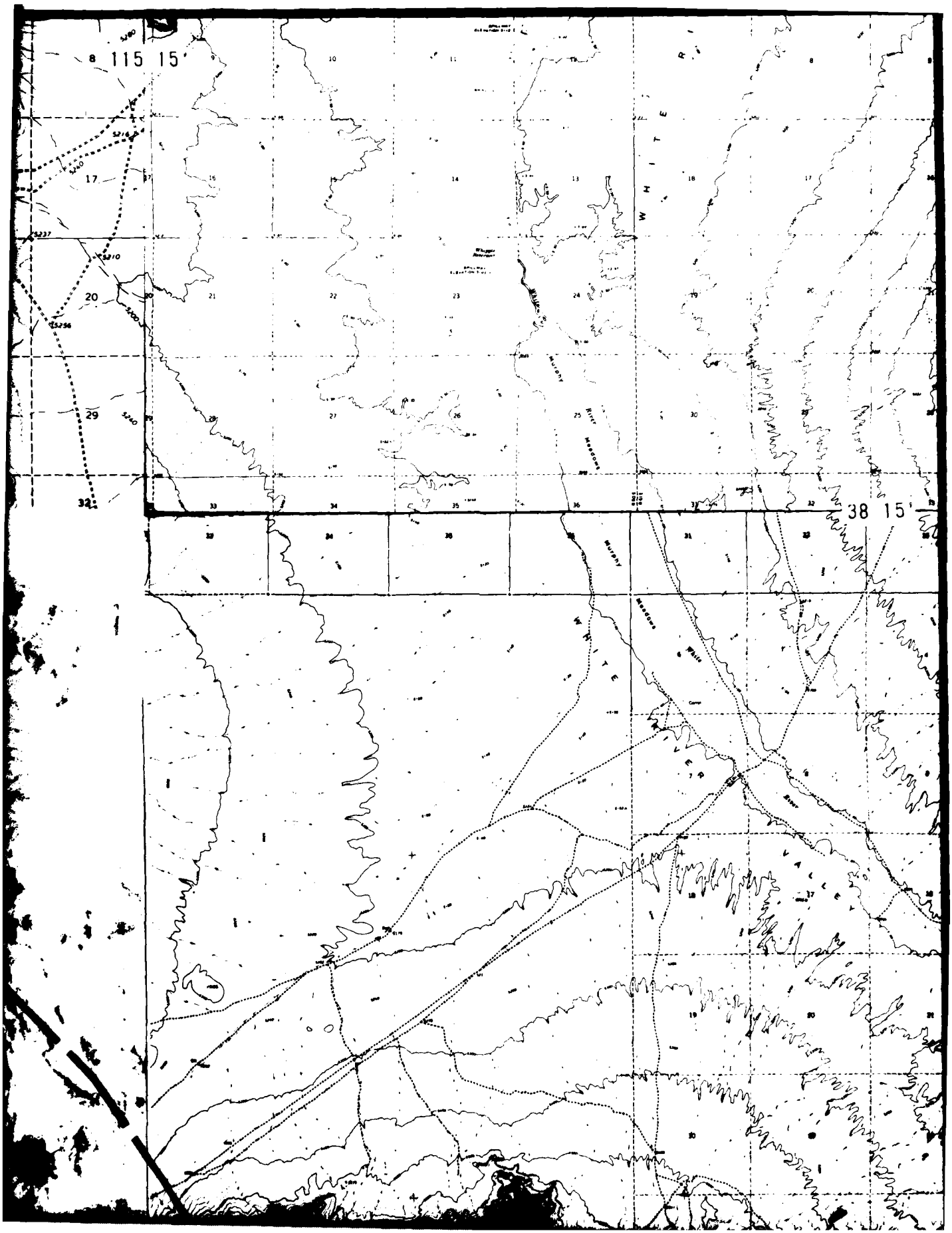
29
31
32
WHITE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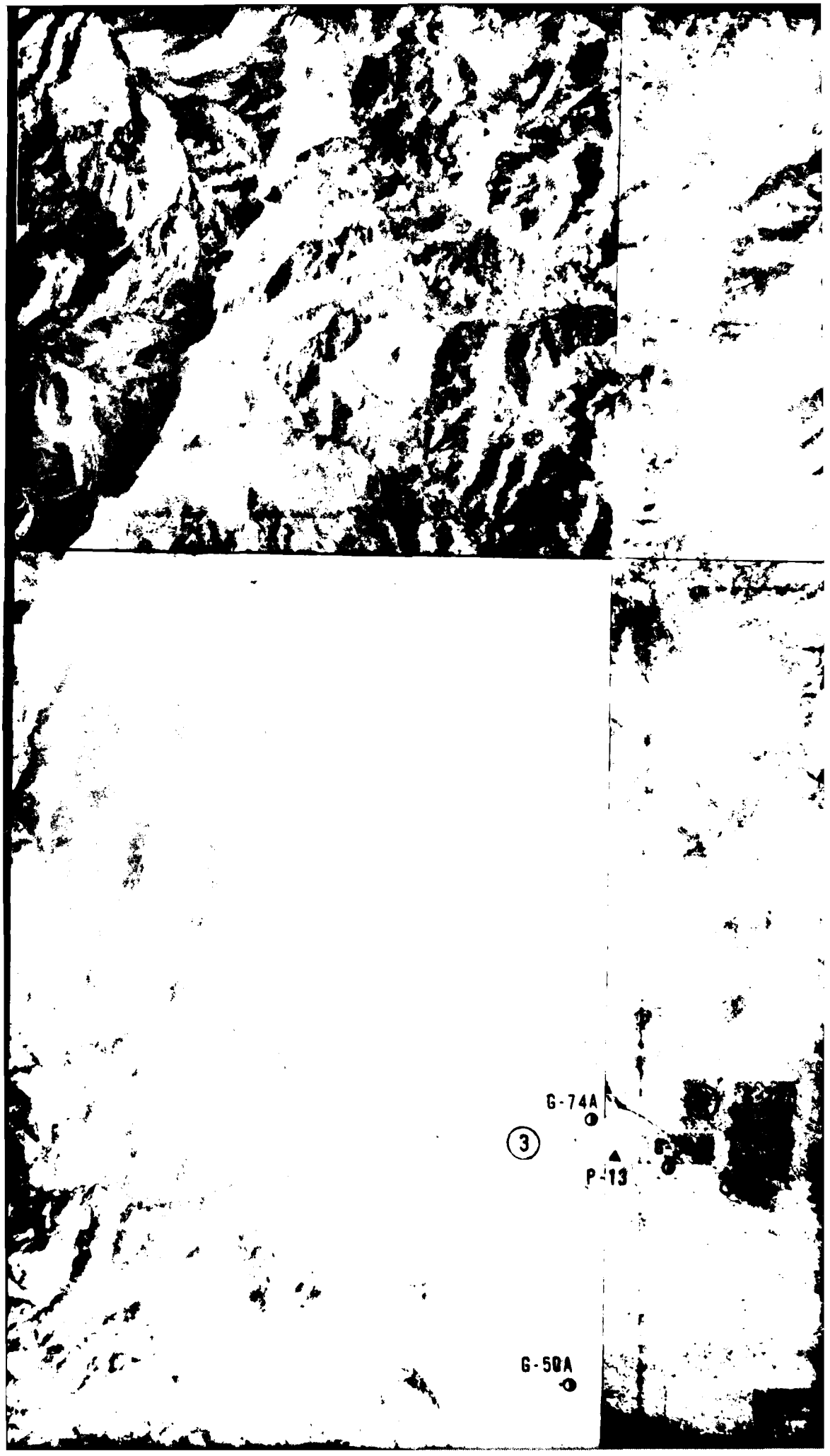
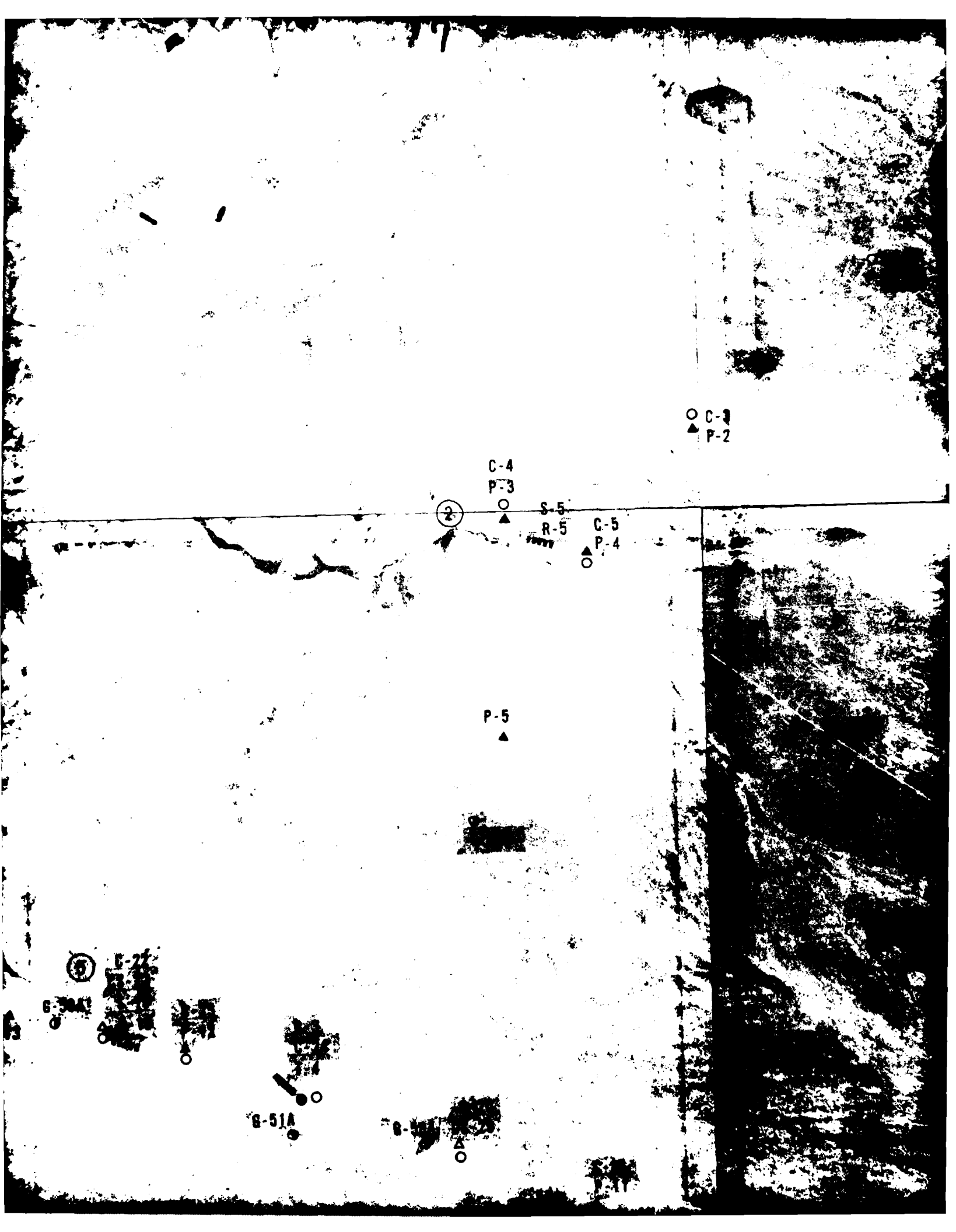
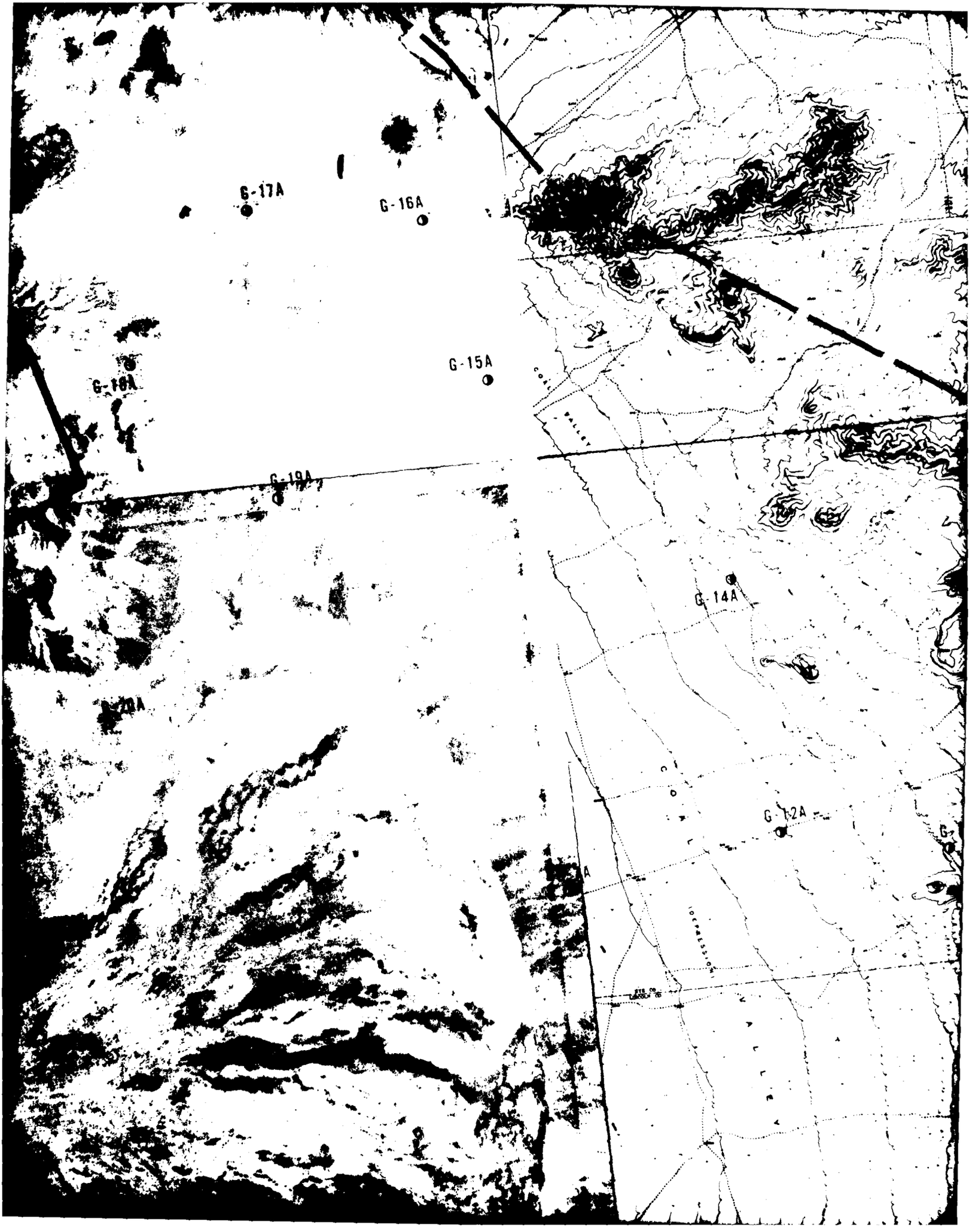
38 15'
WHITE
WHITE
MURPHY
MURPHY
MEADOWS
MEADOWS
17
20
29
32


G-74A
3
P-13
G-50A


C-3
P-2
C-4
P-3
2
S-5
R-5
C-5
P-4
P-5
5
C-2
G-50A
G-51A


G-69A
WZ
G-71A
R-4
C-11
P-8
C-12
CS-12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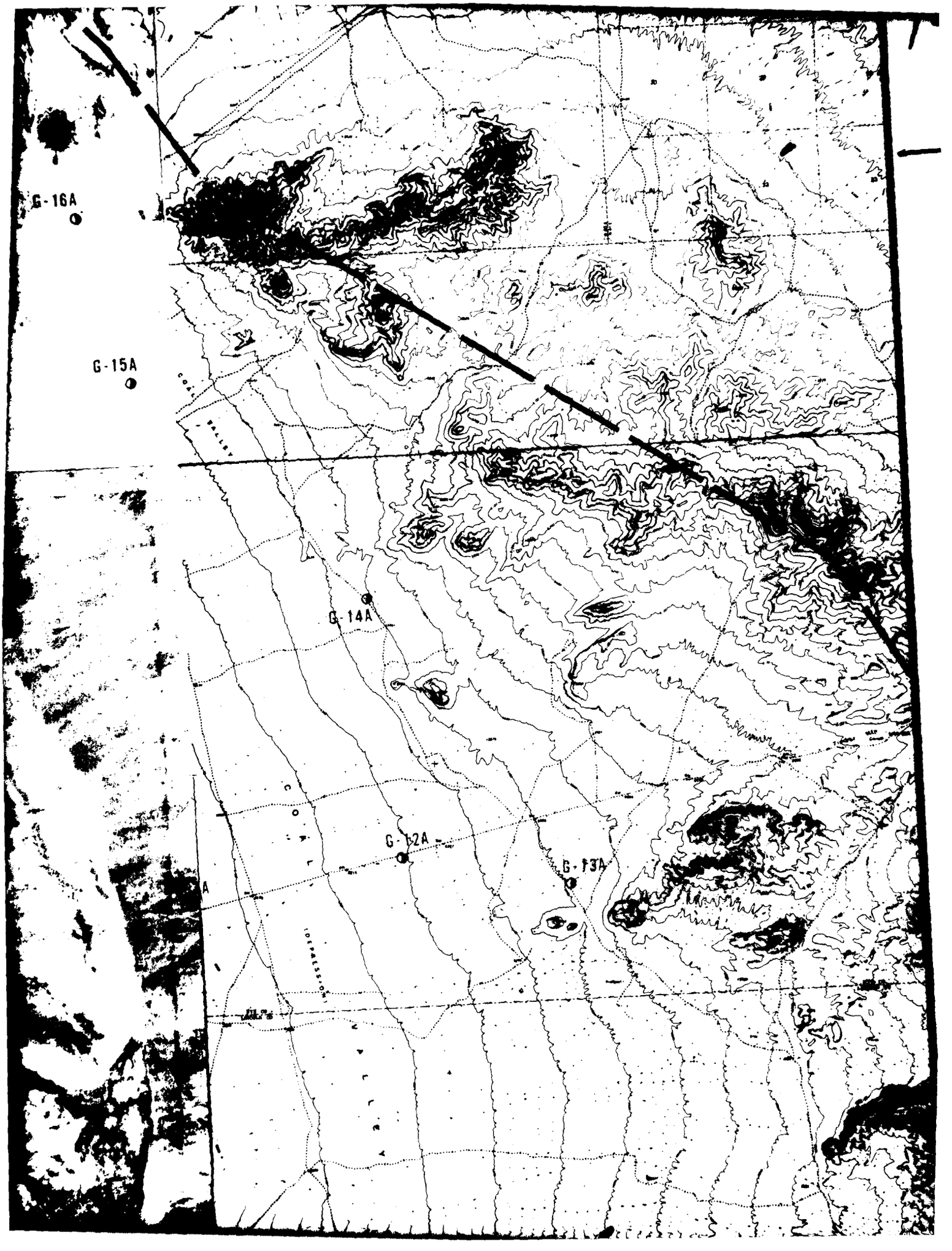
G-14A
G-12A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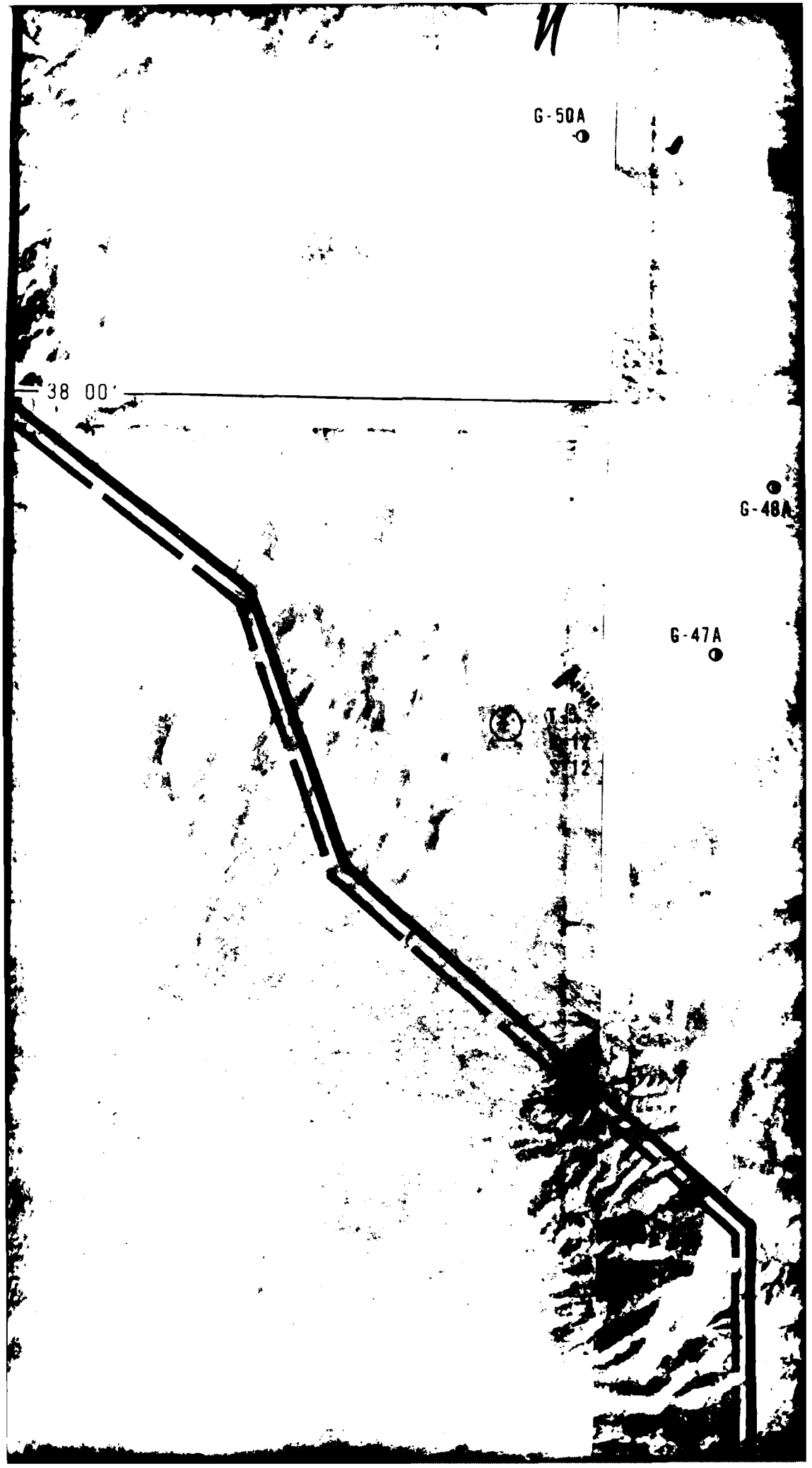
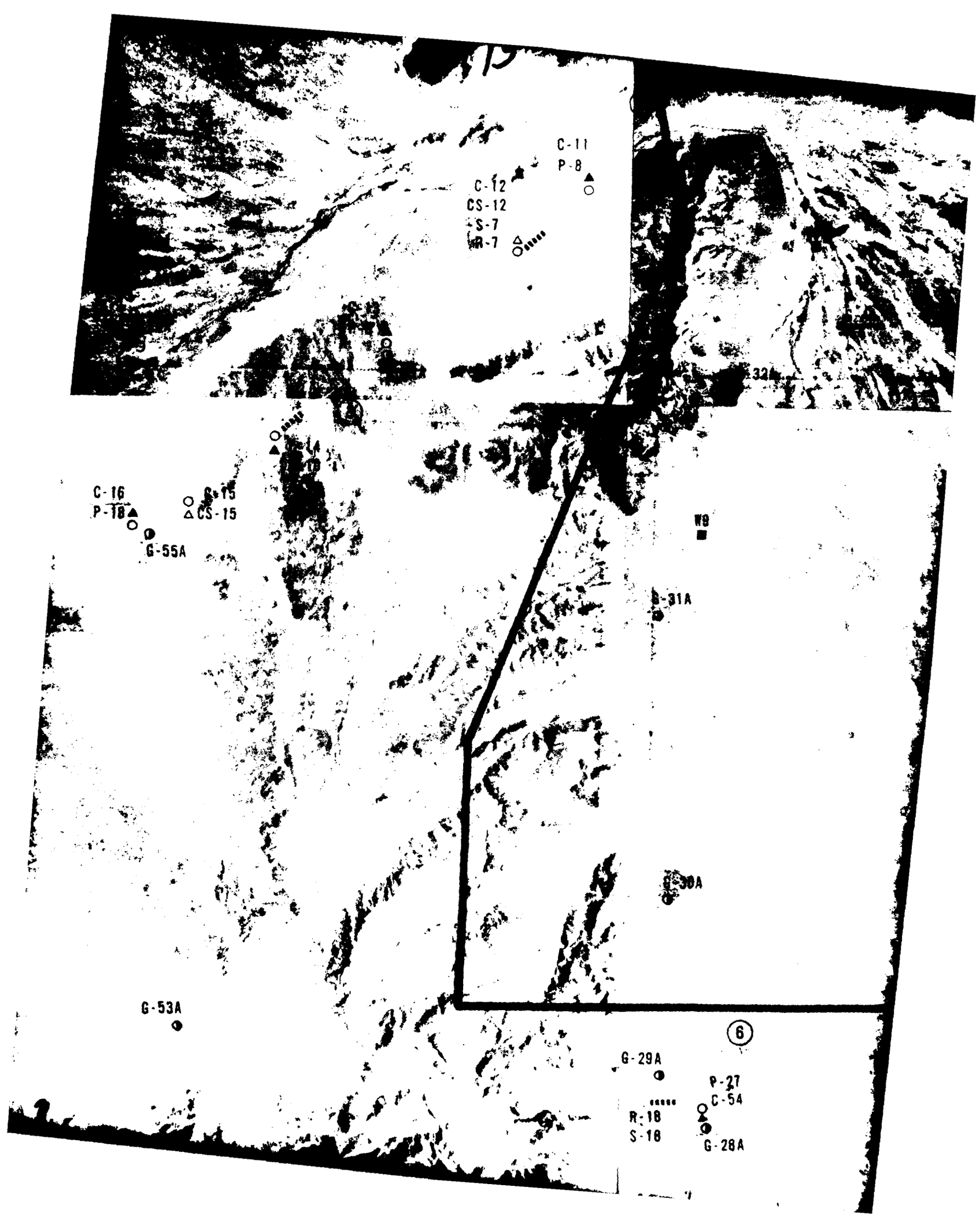
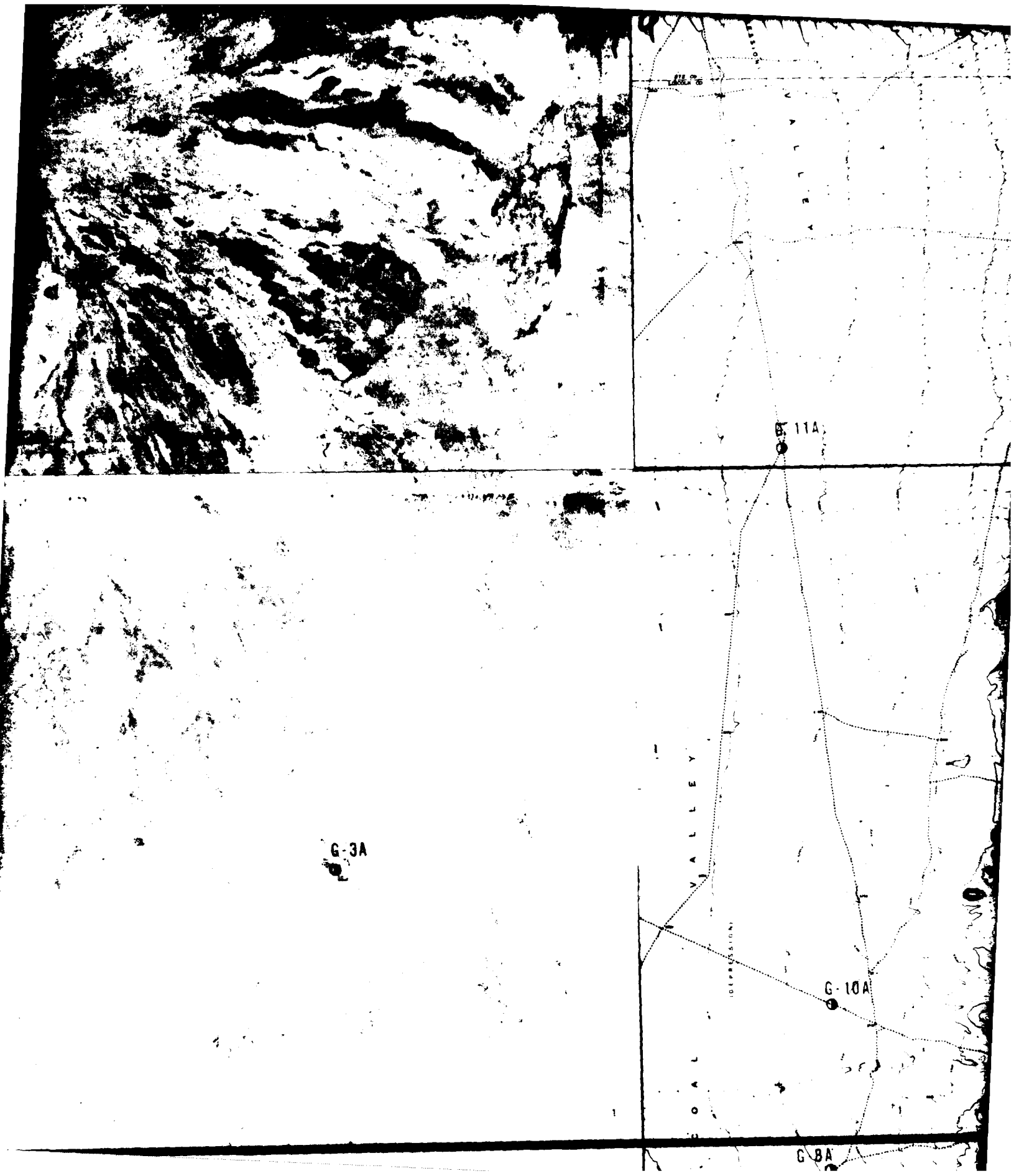
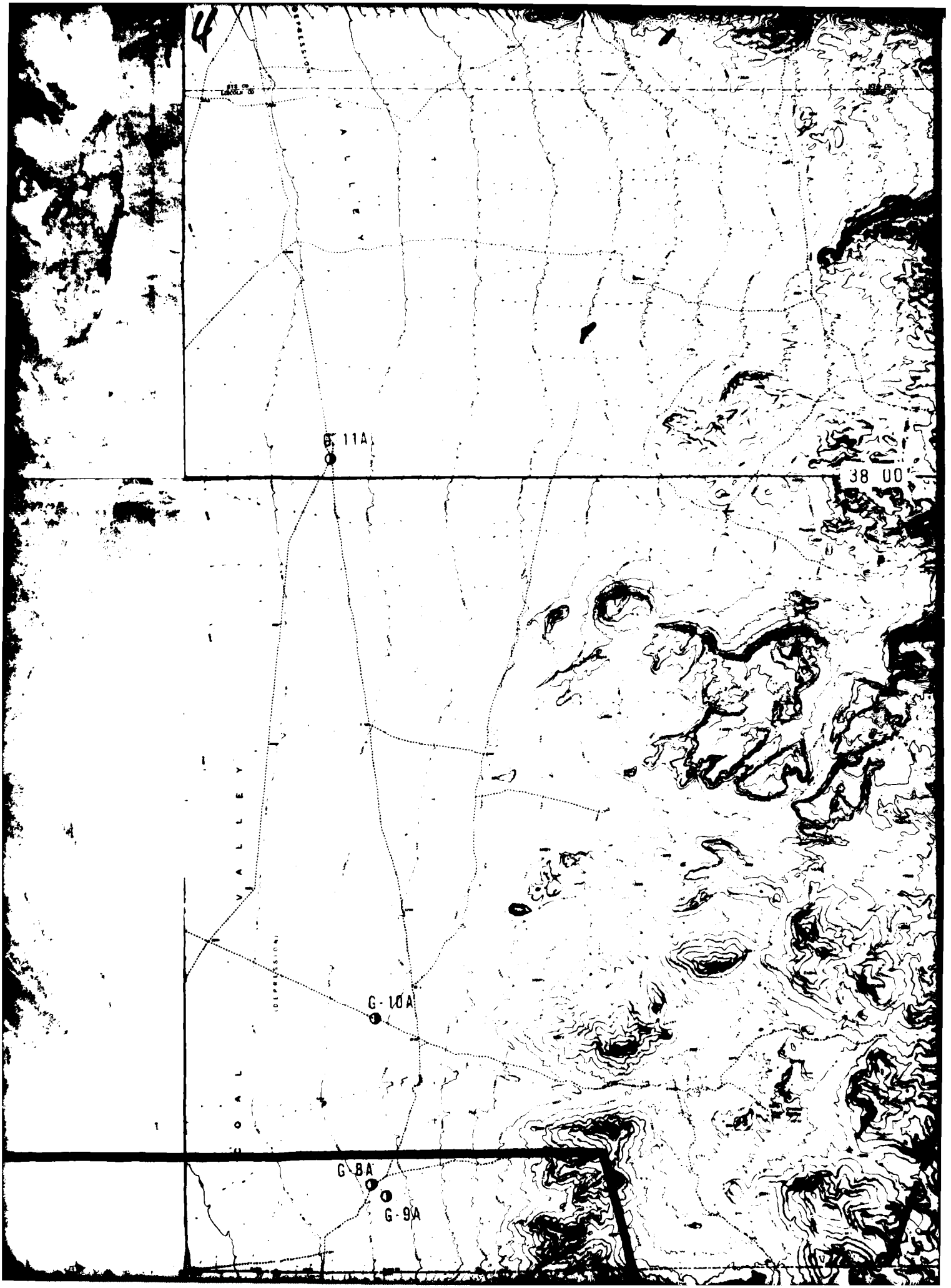
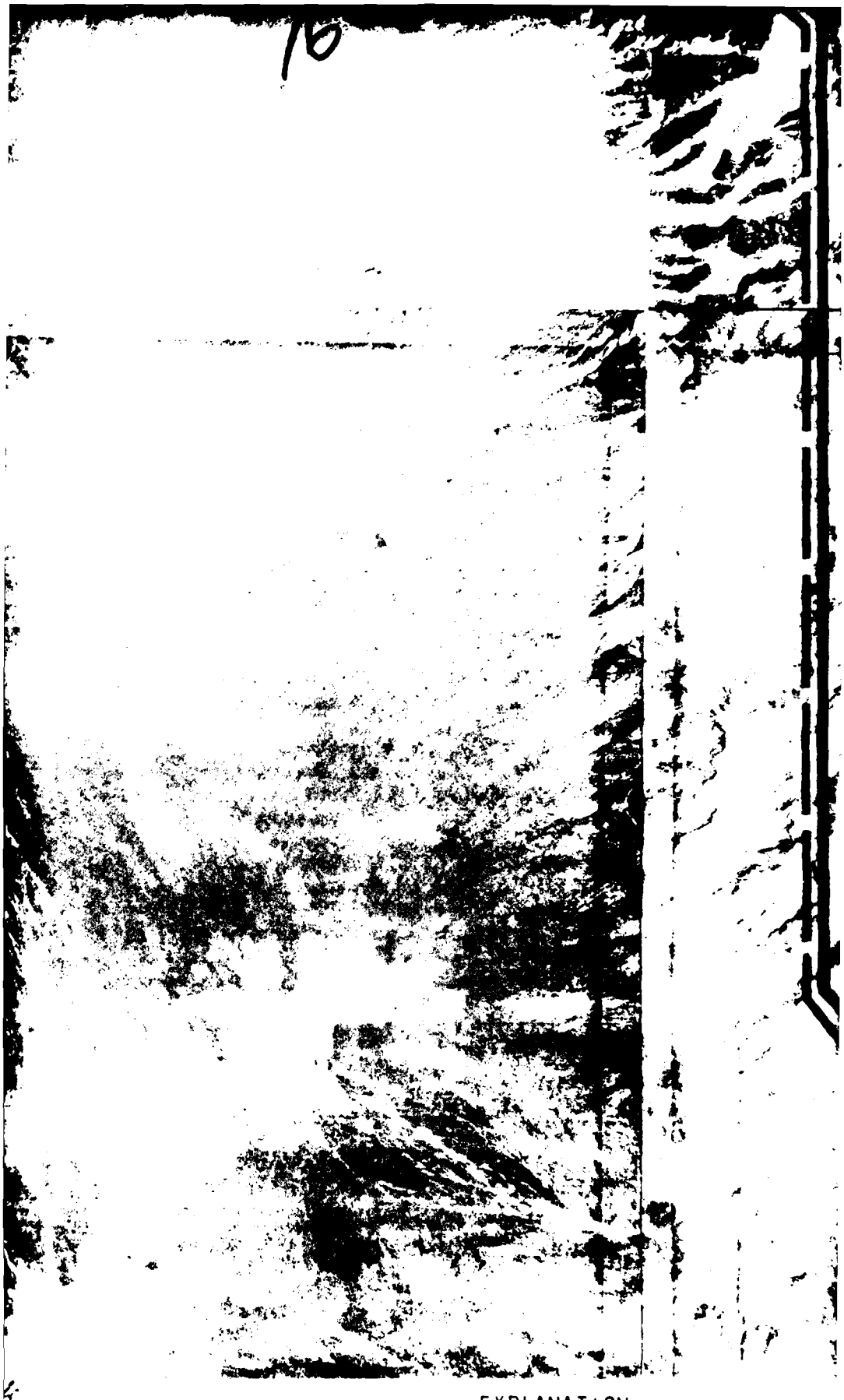

G-50A
38 00'
G-48A
G-47A

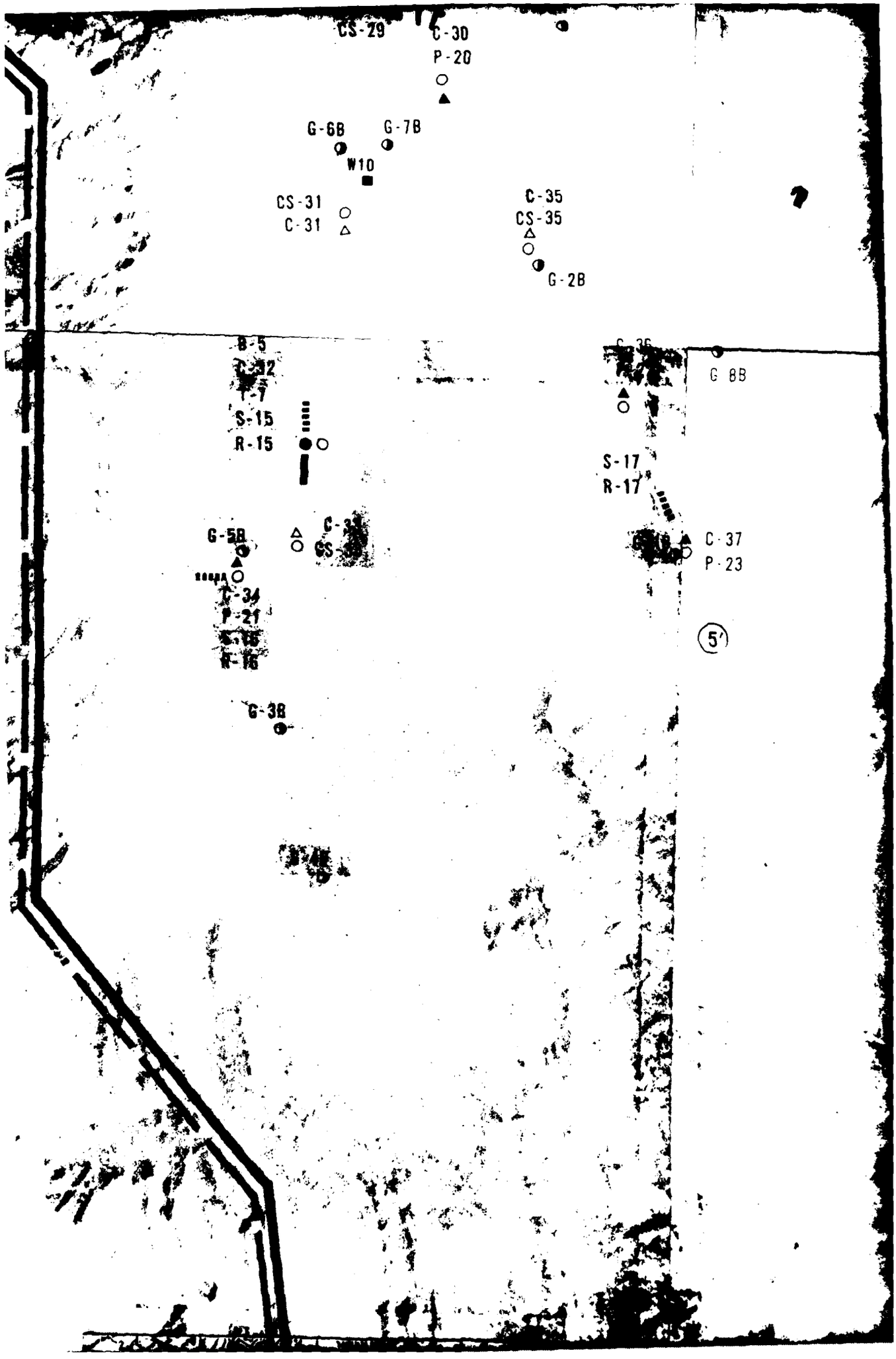

P-14
S-11
R-11
G-48A
C-21
CS-21
G-47A
G-46A
C-20
P-15
4
P-16
S-13
R-13
C-19
T-6
S-14
R-14
P-19
G-44A
C-29
CS-29
C-30
P-20
G-52A
G-68
G-78
W10
CS-31
C-31
C-35
CS-35

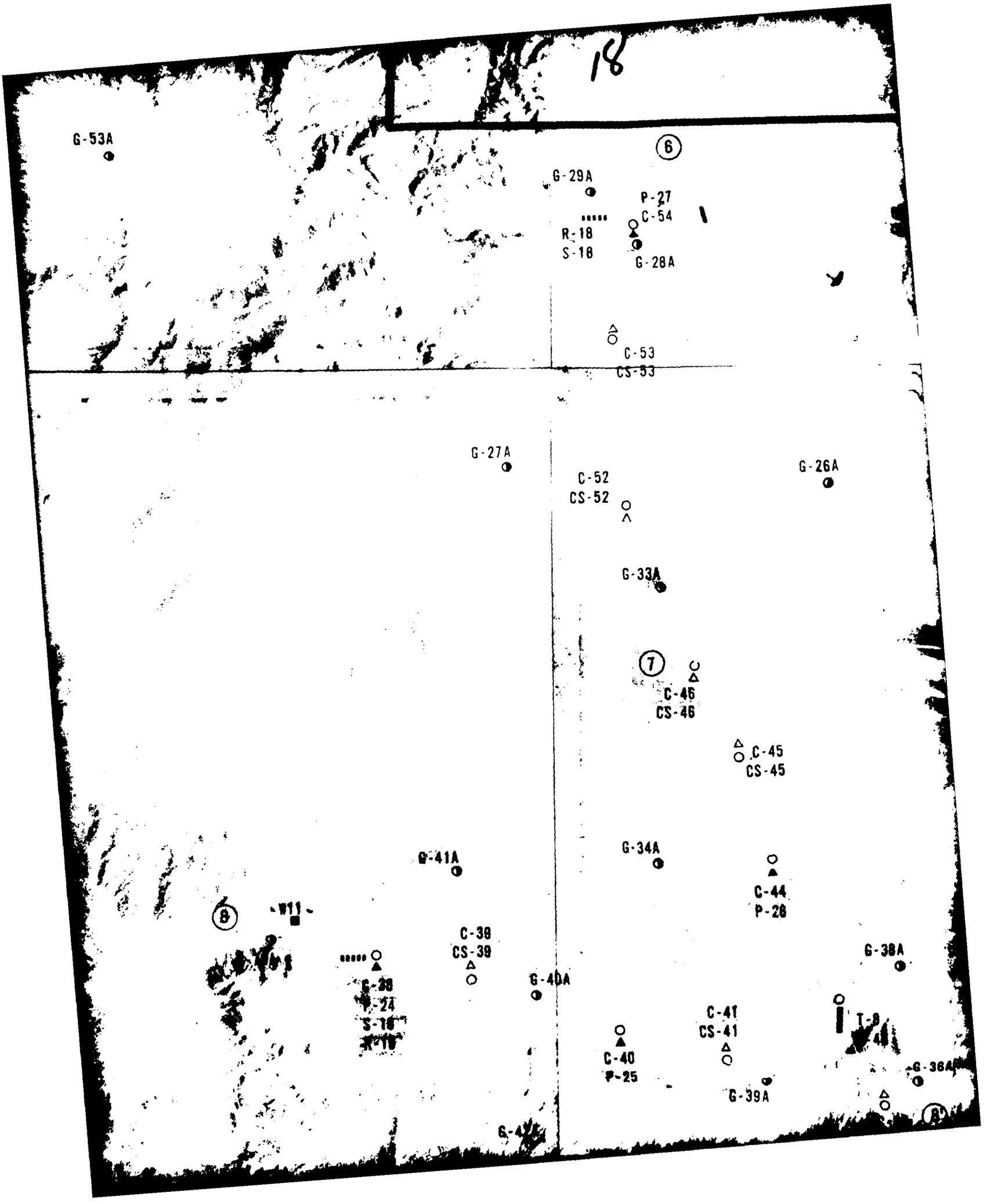

C-11
P-8
C-12
CS-12
S-7
MR-7
32
C-16
P-18
CS-15
G-55A
W9
S-31A
S-30A
G-53A
6
G-29A
P-27
C-54
R-18
S-18
G-28A

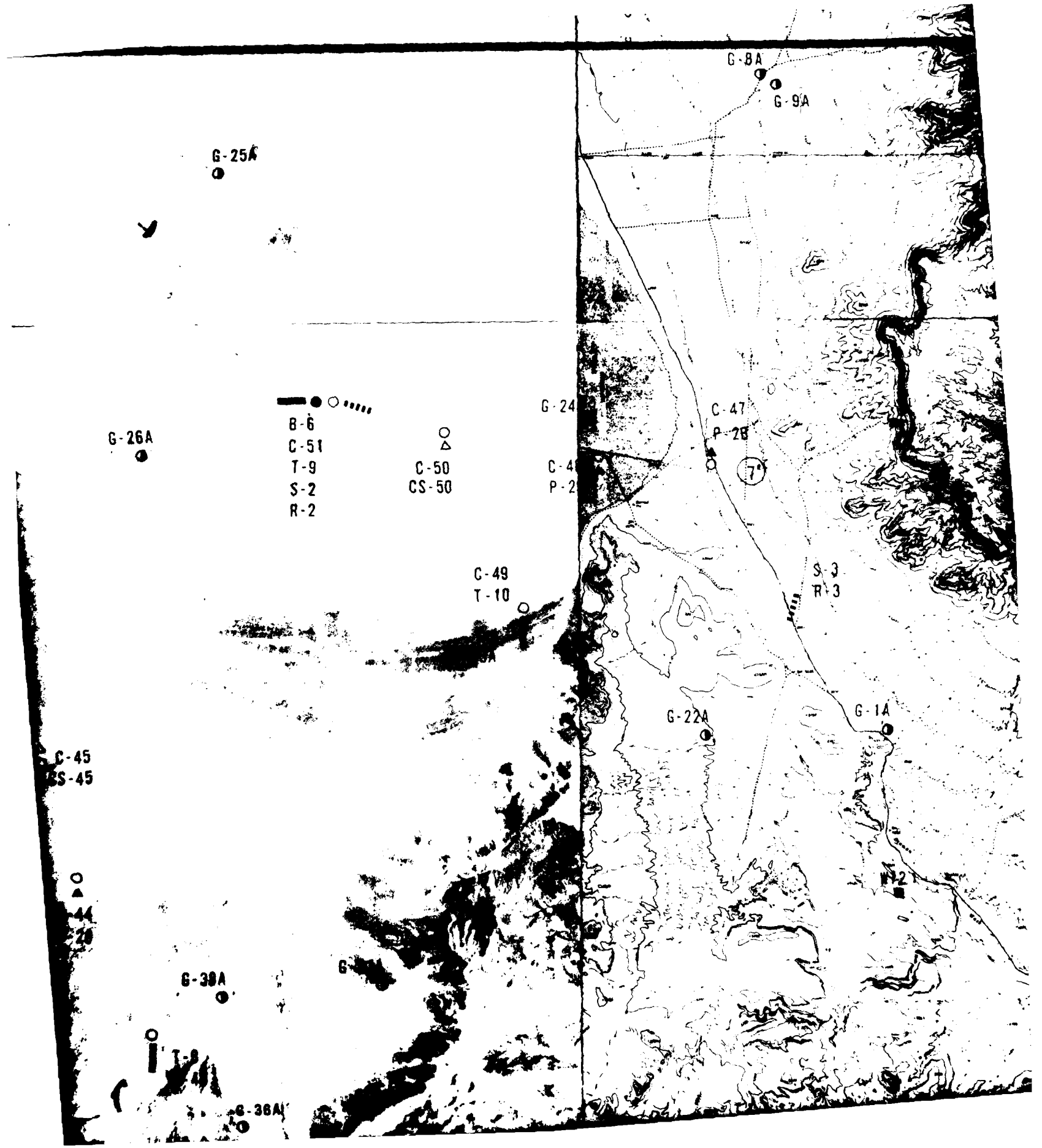

G-11A
G-3A
VALLEY
G-10A
G-8A

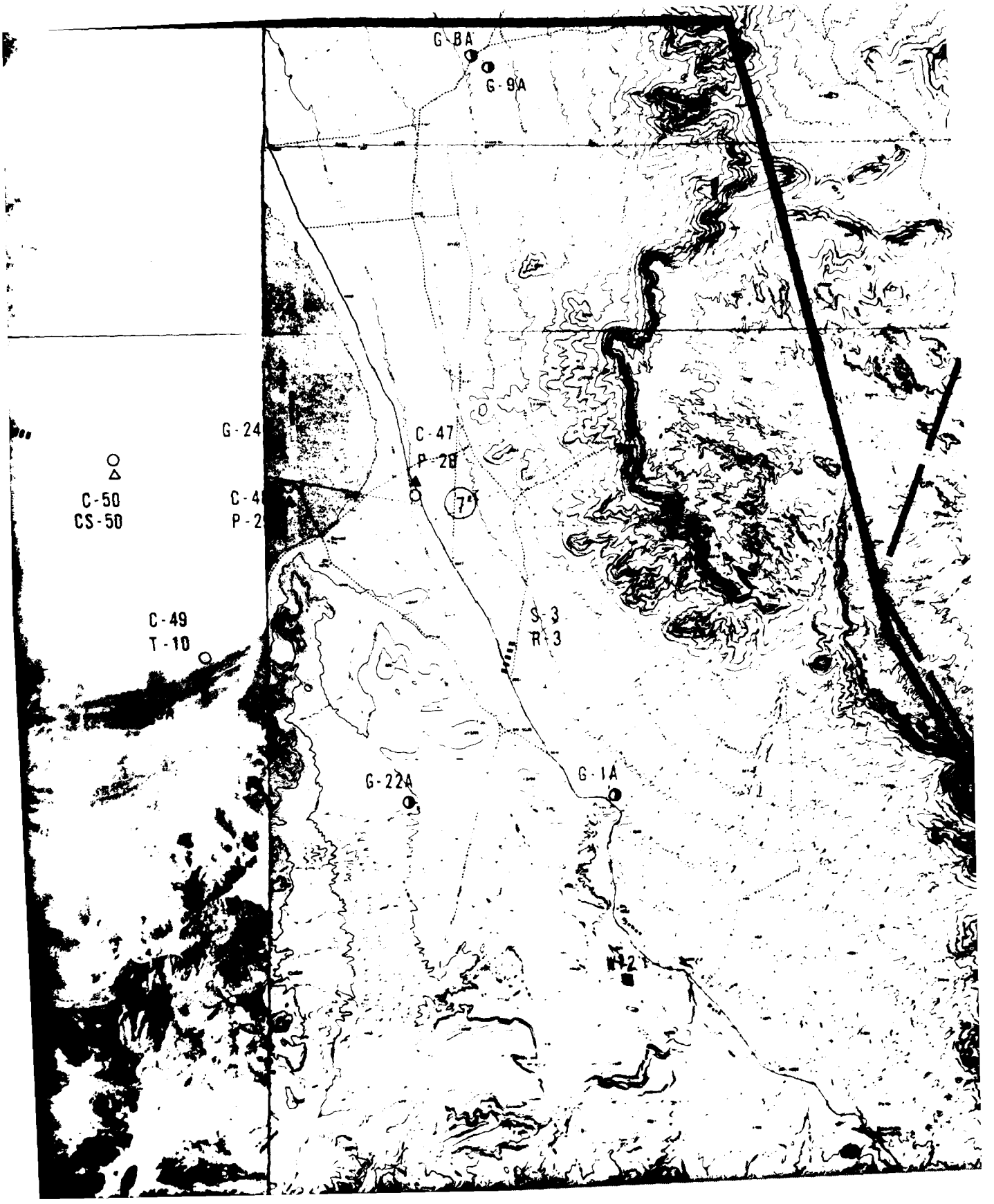

G-11A
38 00
VALLEY
(DEPRESSION)
G-10A
G-8A
G-9A

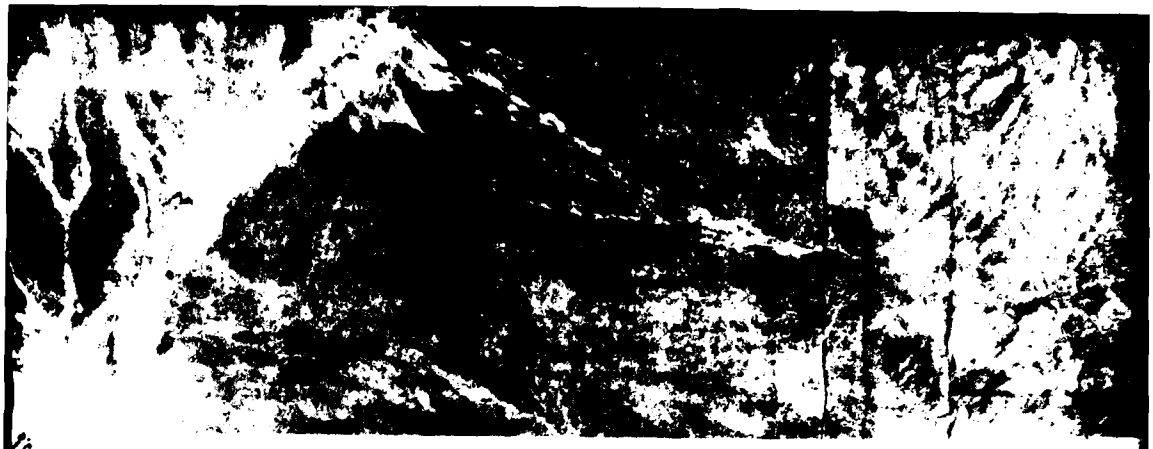

10
EXPLANATION
GEOLOGIC STATION
GROUND WATER LEVEL MEASUREMENT
BORING
CONE PENETROMETER TEST (CPT)
37 45'


CS-29
C-30
P-20
G-6B
G-7B
W10
CS-31
C-31
C-35
CS-35
G-2B
B-5
C-32
T-7
S-15
R-15
S-17
R-17
G 8B
G-5B
C-37
P-23
C-34
P-21
R-16
G-38
5'


G-53A
6
G-29A
P-27
C-54
R-18
S-18
G-28A
C-53
CS-53
G-27A
G-26A
C-52
CS-52
G-33A
7
C-46
CS-46
C-45
CS-45
G-34A
G-41A
C-44
P-26
8
W11
C-39
CS-39
G-38A
G-40A
C-41
CS-41
C-40
P-25
G-39A
G-36A


G-8A
G-9A
G-25A
G-26A
B-6
C-51
T-9
S-2
R-2
C-50
CS-50
G-24
C-4
P-2
C-47
P-28
7
C-49
T-10
S-3
R-3
G-22A
G-1A
C-45
S-45
G-39A
G-36A

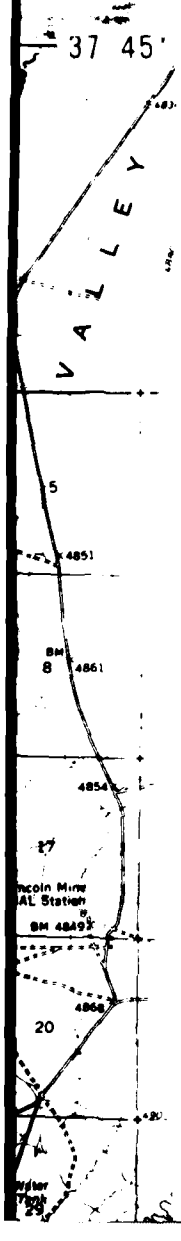

G-8A
G-9A
G-24
C-47
P-28
C-50
CS-50
C-4
P-2
C-49
T-10
S-3
R-3
G-22A
G-1A
W-2



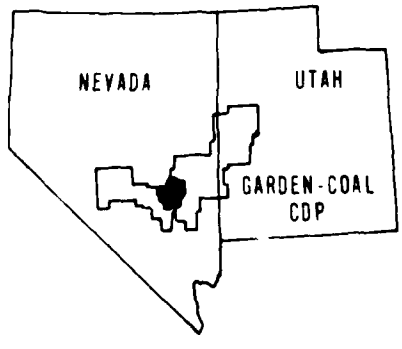
EXPLANATION

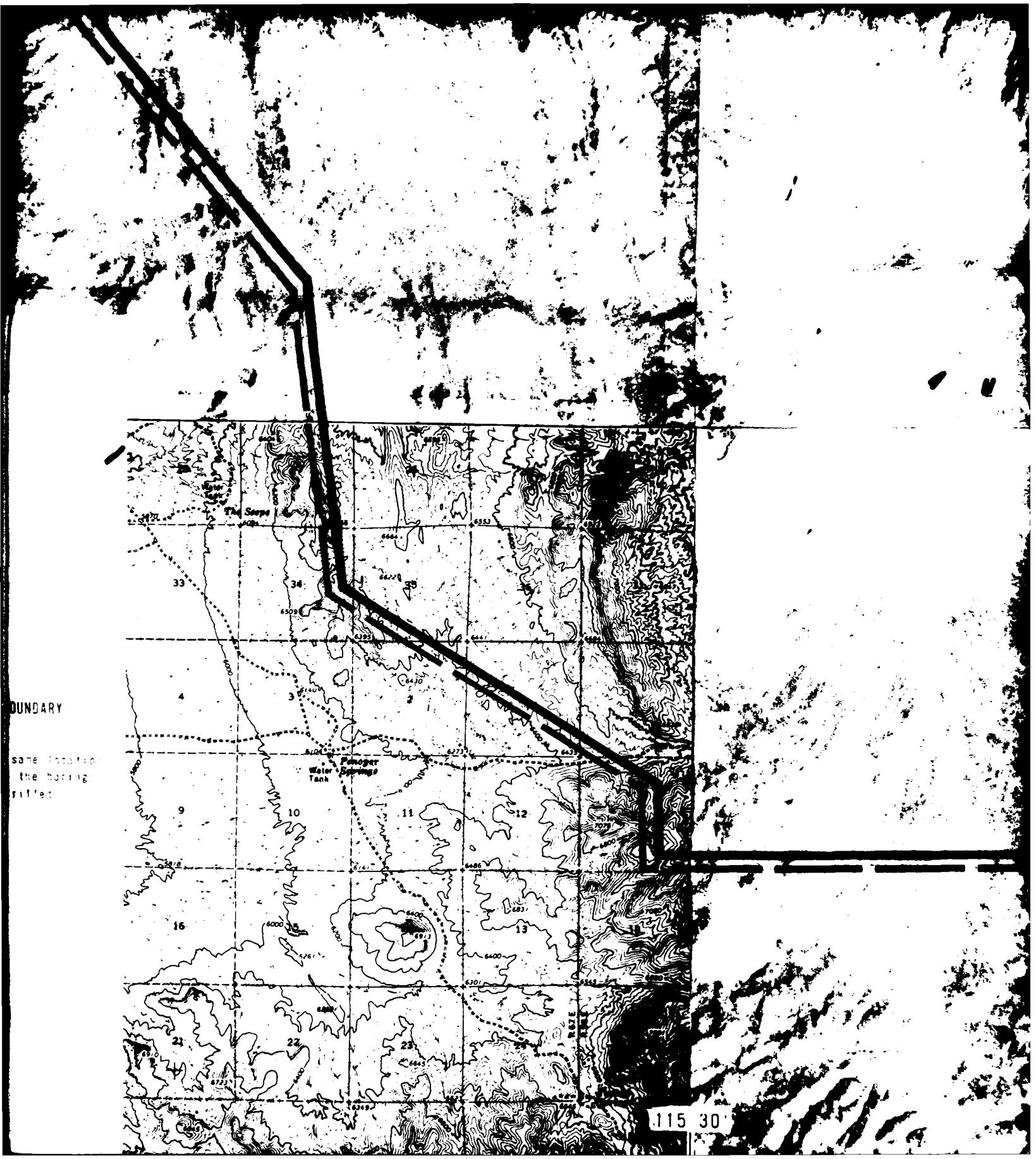
- G-1A GEOLOGIC STATION
- W1 GROUND WATER LEVEL MEASUREMENT
- B-1 BORING
- C-1 CONE PENETROMETER TEST (CPT)
- CS-1 SURFACE SAMPLE AT CPT LOCATION
- T-1 TRENCH
- P-1 TEST PIT
- S-1 SEISMIC REFRACTION LINE
- R-1 ELECTRICAL RESISTIVITY LINE
- (1)—(1') ACTIVITY LINE
- VERIFICATION SITE BOUNDARY
- CANDIDATE DEPLOYMENT PARCEL (CDP) BOUNDARY

NOTE Where multiple activities were performed at the same location the correct location is designated by either (1) the boring symbol or (2) the CPT symbol if no boring was drilled.



LOCATION MAP

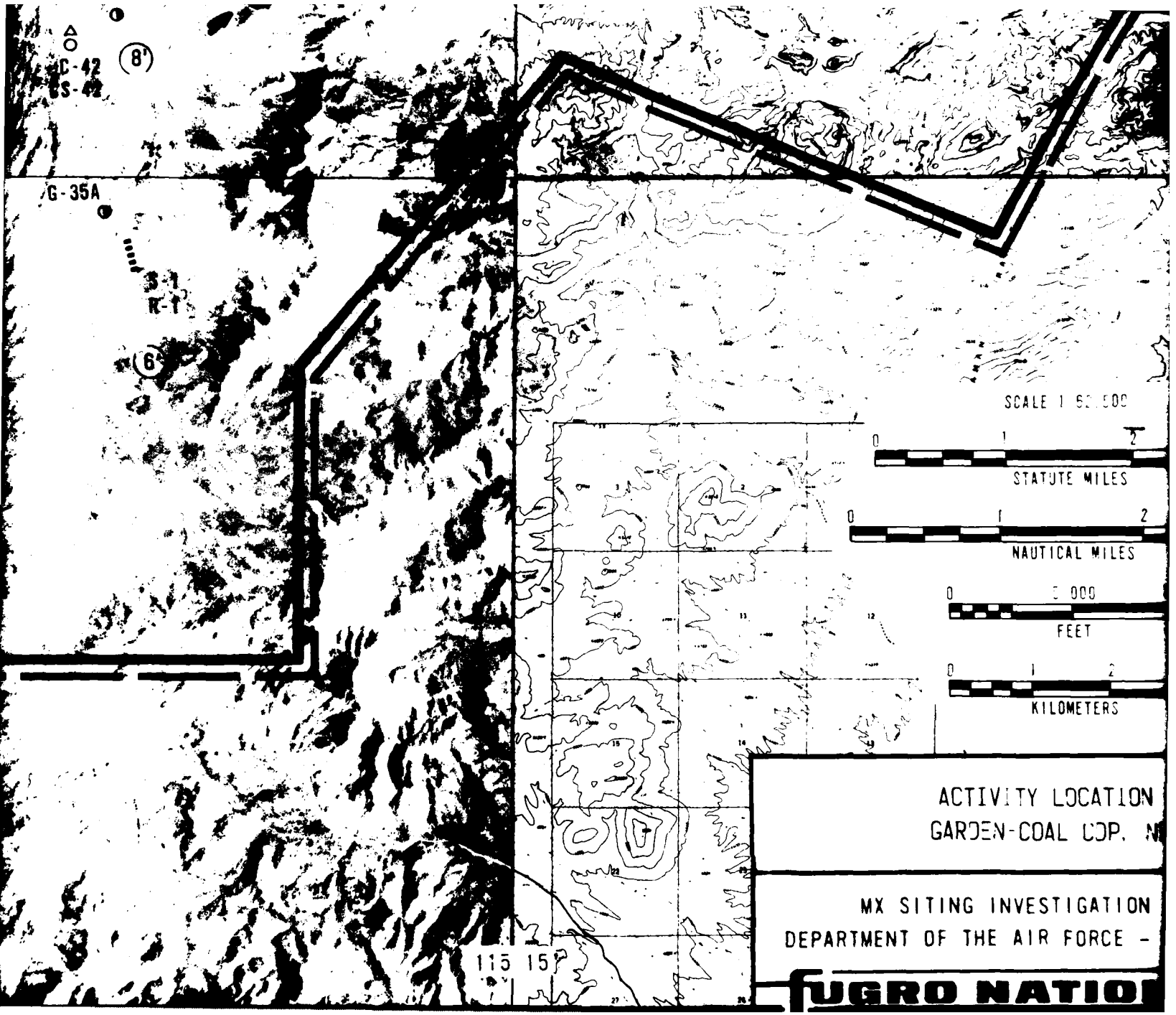


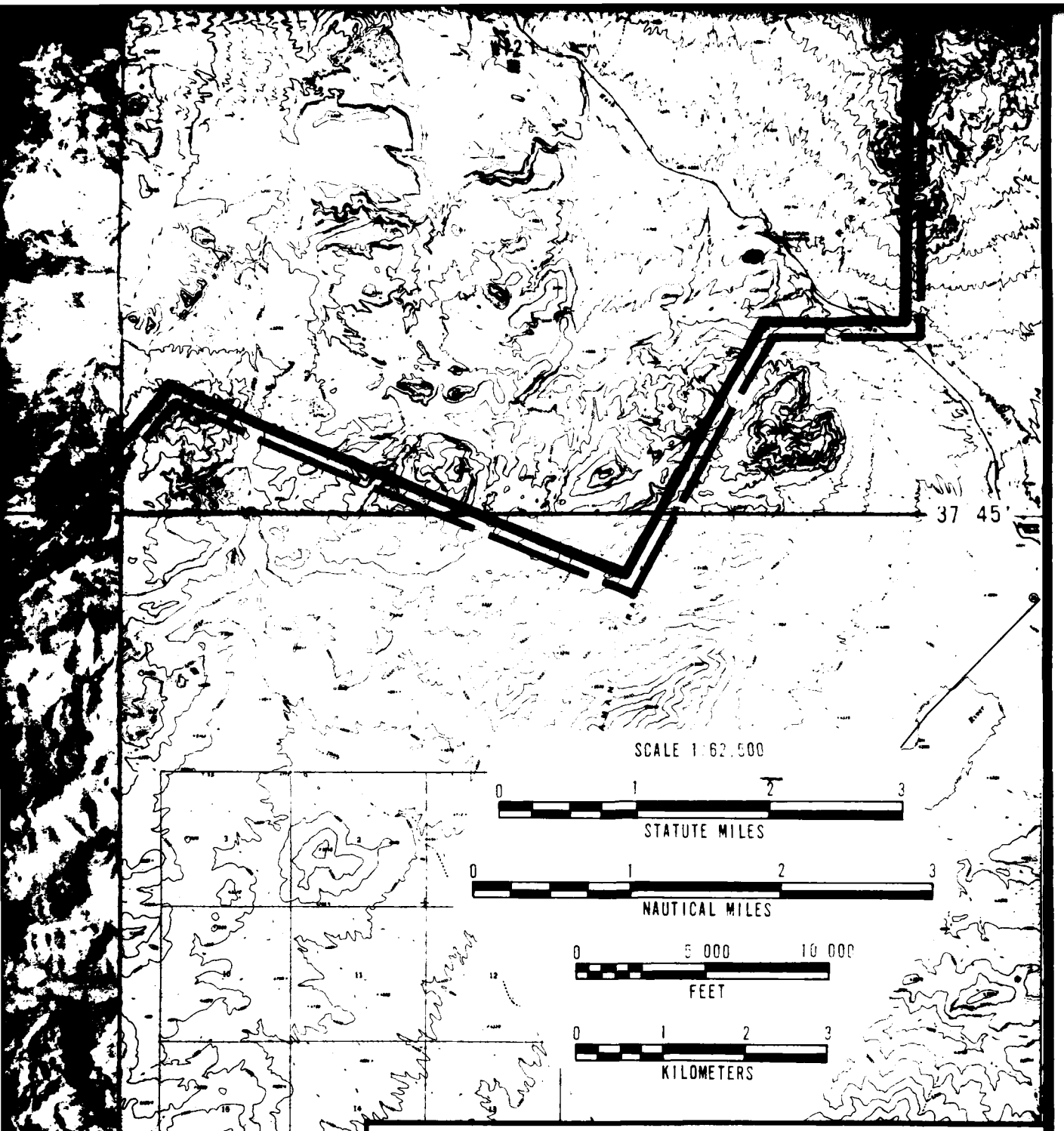


DUNDARY

same location
the boring
rifted


G-41A
W11
C-39
CS-39
C-38
P-24
S-18
R-18
G-40A
G-42A
G-34A
C-44
P-28
G-38A
C-41
CS-41
C-40
P-25
G-39A
G-36A
C-42
CS-42
G-43A
G-35A
8
8'
6


C-42
S-42
8'
G-35A
R-1
6'
SCALE 1 62 500
0 1 2
STATUTE MILES
0 1 2
NAUTICAL MILES
0 3 000
FEET
0 1 2
KILOMETERS
115 15
ACTIVITY LOCATION
GARDEN-COAL COP. N
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE -
FUGRO NATIO



ACTIVITY LOCATION MAP
GARDEN-COAL COP. NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

DRAWING
1

FUGRO NATIONAL, INC.

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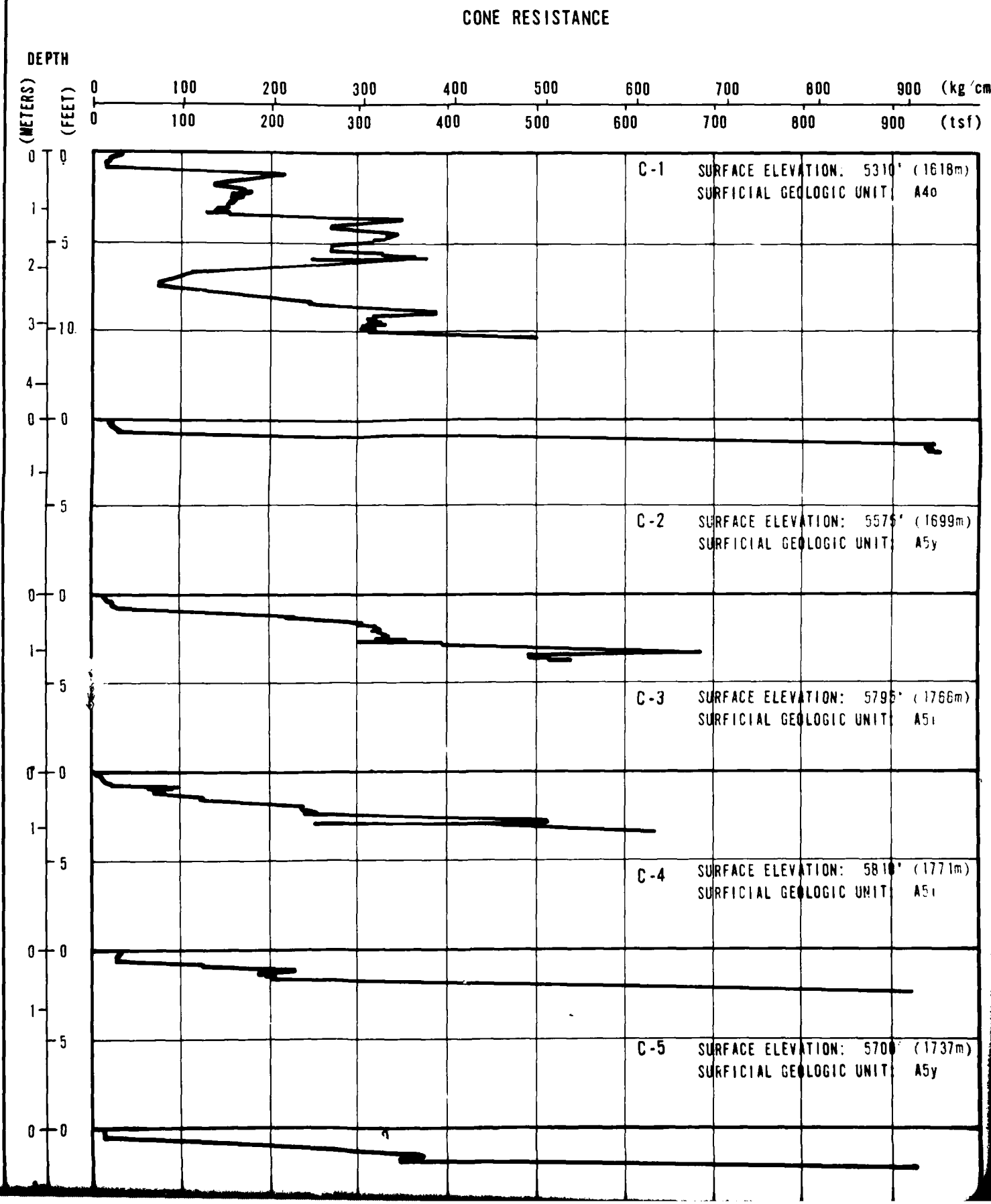
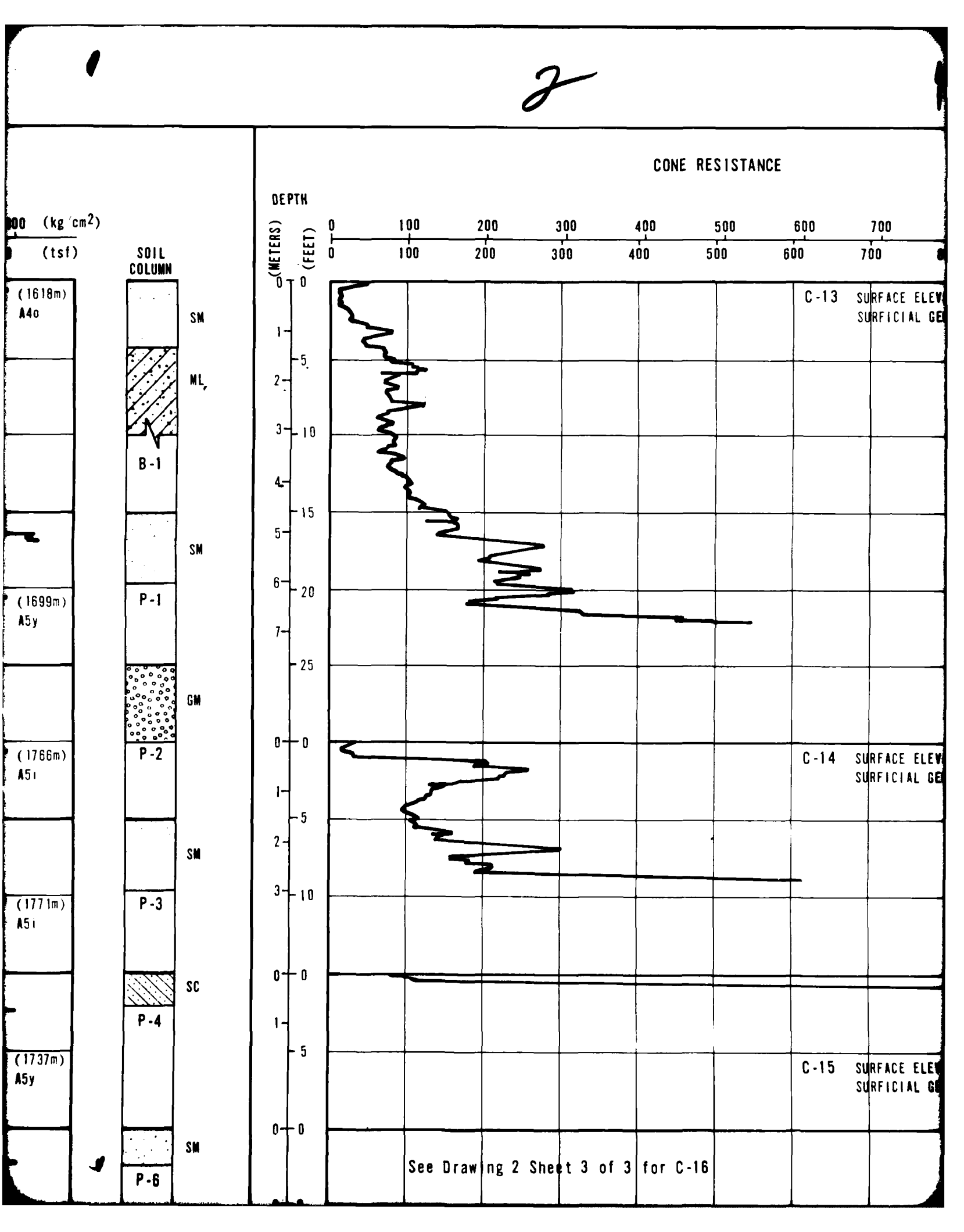
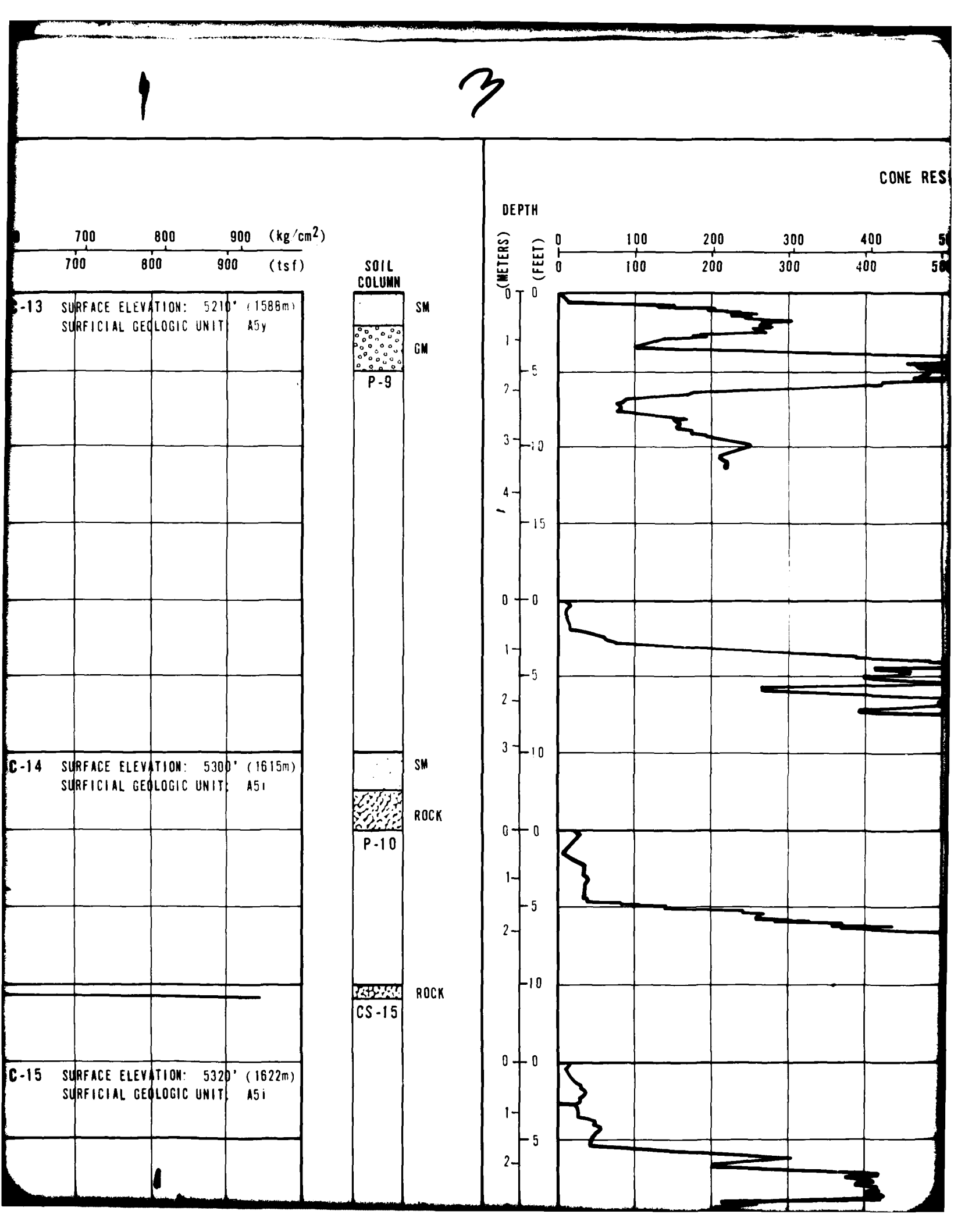
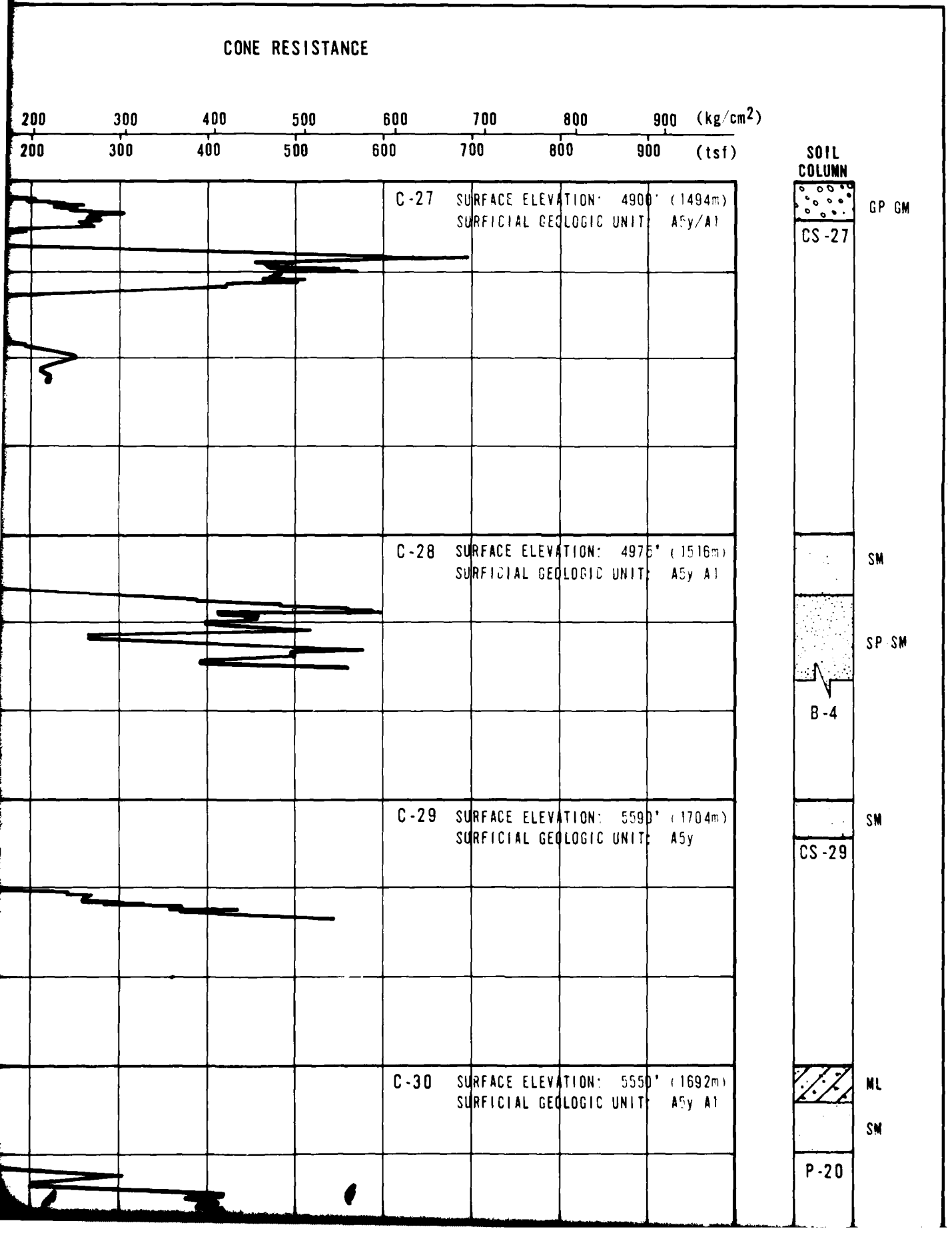
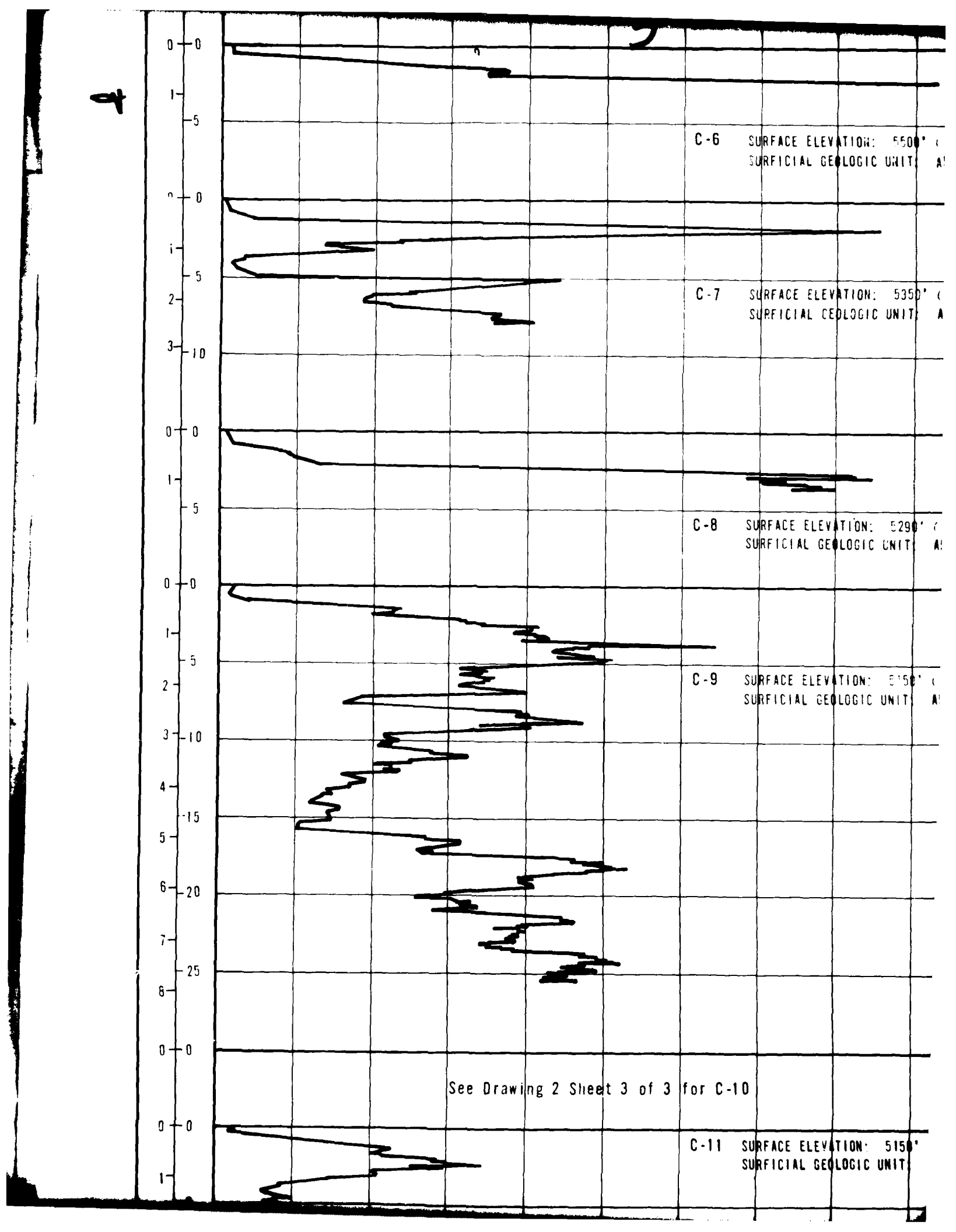
FN-TR-27-VI

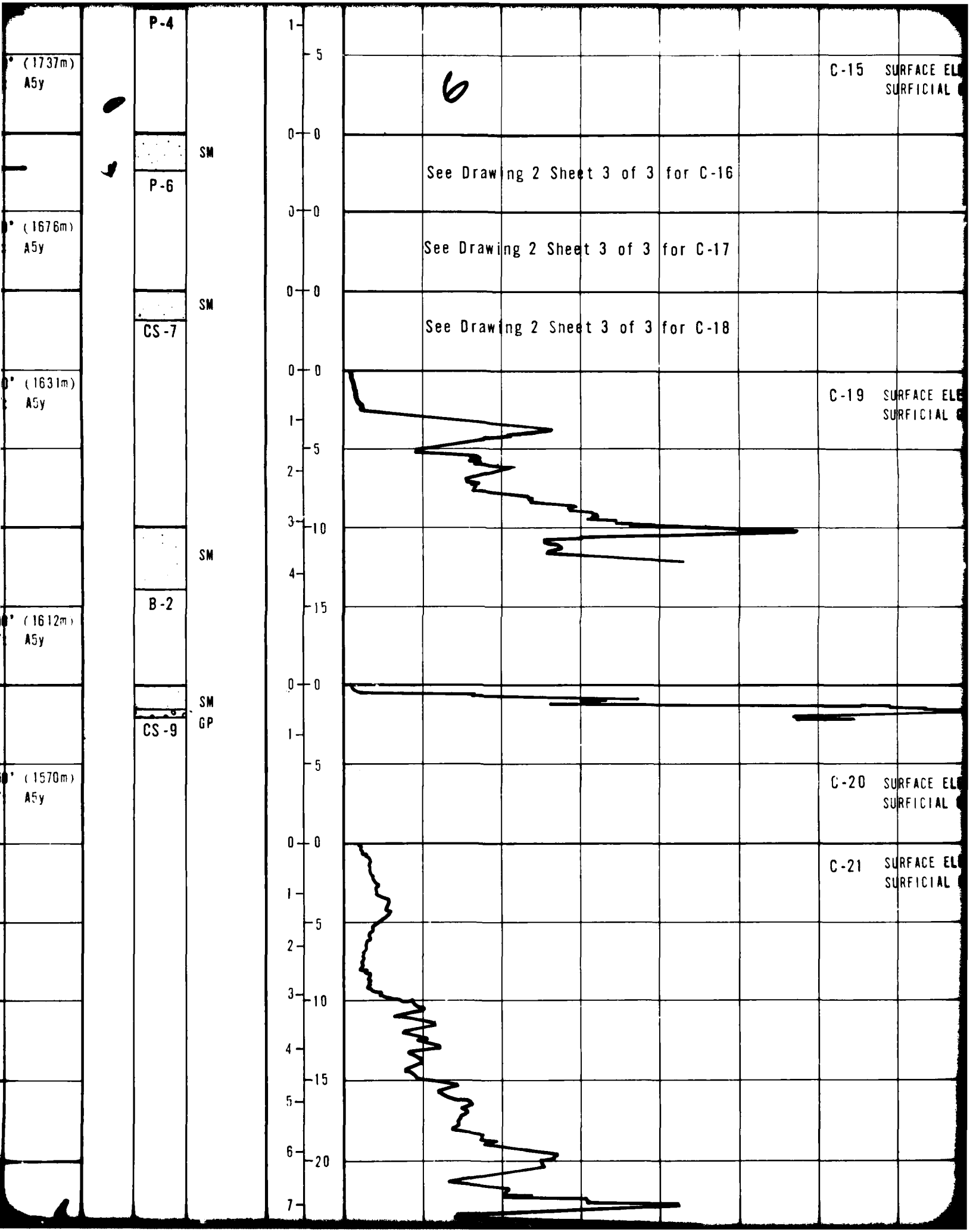

CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700 800 900 (kg/cm2)
0 100 200 300 400 500 600 700 800 900 (tsf)
C-1 SURFACE ELEVATION: 5310' (1618m)
SURFICIAL GEOLOGIC UNIT: A4o
C-2 SURFACE ELEVATION: 5575' (1699m)
SURFICIAL GEOLOGIC UNIT: A5y
C-3 SURFACE ELEVATION: 5795' (1766m)
SURFICIAL GEOLOGIC UNIT: A5r
C-4 SURFACE ELEVATION: 5810' (1771m)
SURFICIAL GEOLOGIC UNIT: A5r
C-5 SURFACE ELEVATION: 5700' (1737m)
SURFICIAL GEOLOGIC UNIT: A5y

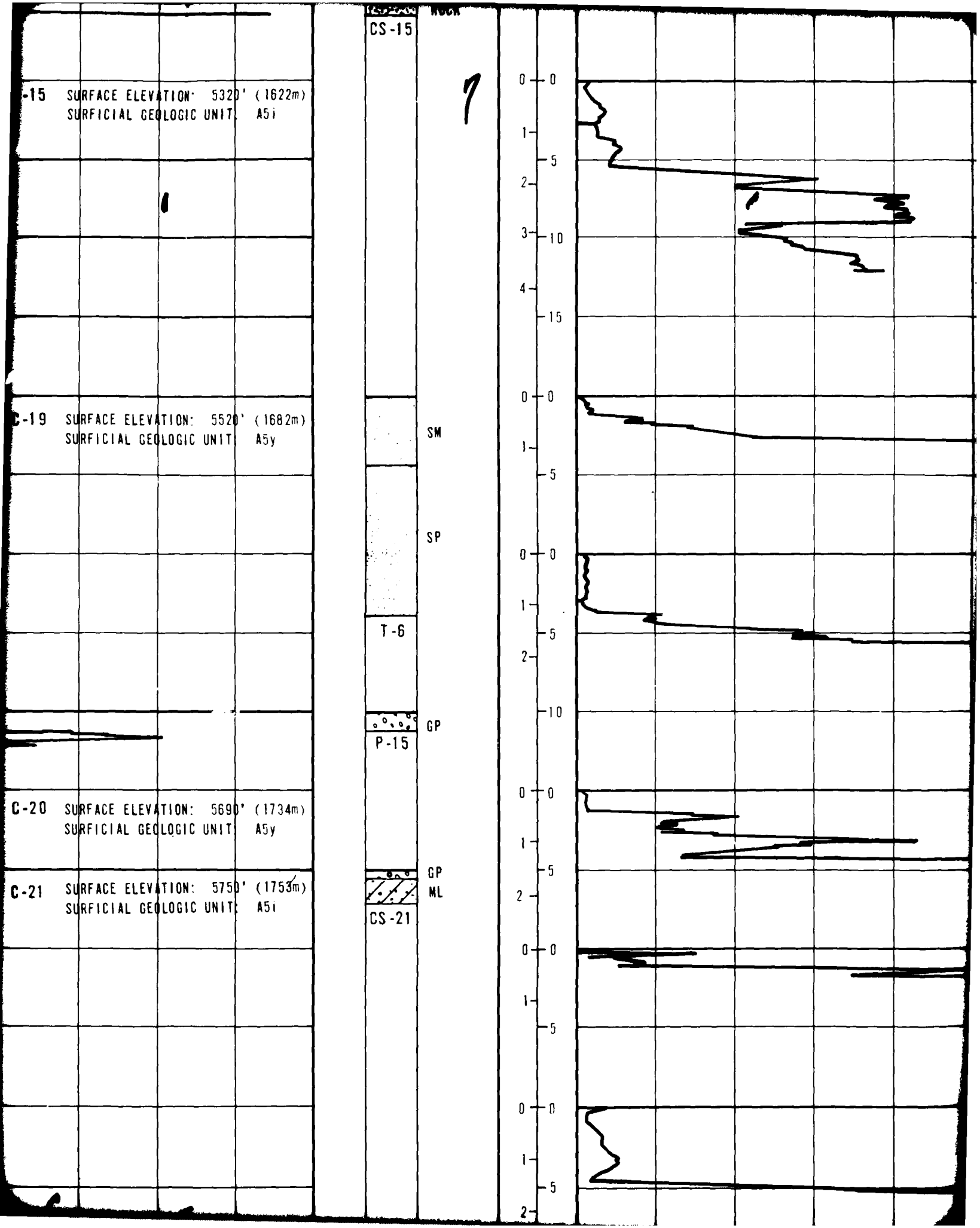

CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0
100
200
300
400
500
600
700
(kg/cm2)
(tsf)
SOIL COLUMN
(1618m)
A4o
(1699m)
A5y
(1766m)
A5i
(1771m)
A5i
(1737m)
A5y
SM
ML
B-1
SM
P-1
GM
P-2
SM
P-3
SC
P-4
SM
P-6
C-13 SURFACE ELEV
SURFICIAL GE
C-14 SURFACE ELEV
SURFICIAL GE
C-15 SURFACE ELE
SURFICIAL G
See Drawing 2 Sheet 3 of 3 for C-16


700
800
900
(kg/cm2)
700
800
900
(tsf)
SOIL COLUMN
-13 SURFACE ELEVATION: 5210' (1588m)
SURFICIAL GEOLOGIC UNIT: A5y
SM
GM
P-9
C-14 SURFACE ELEVATION: 5300' (1615m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
ROCK
P-10
ROCK
CS-15
C-15 SURFACE ELEVATION: 5320' (1622m)
SURFICIAL GEOLOGIC UNIT: A5i
CONE RES
DEPTH
(METERS)
(FEET)
0
100
200
300
400
0
100
200
300
400
0
1
2
3
4
0
1
2
3
0
1
2
0
1
2
0
1
2
5
10
15
5
10
5
10
5
5


CONE RESISTANCE
200 300 400 500 600 700 800 900 (kg/cm2)
200 300 400 500 600 700 800 900 (tsf)
SOIL COLUMN
C-27 SURFACE ELEVATION: 4900' (1494m)
SURFICIAL GEOLOGIC UNIT: A5y/A1
GP GM
CS-27
C-28 SURFACE ELEVATION: 4975' (1516m)
SURFICIAL GEOLOGIC UNIT: A5y A1
SM
SP SM
B-4
C-29 SURFACE ELEVATION: 5590' (1704m)
SURFICIAL GEOLOGIC UNIT: A5y
SM
CS-29
C-30 SURFACE ELEVATION: 5550' (1692m)
SURFICIAL GEOLOGIC UNIT: A5y A1
ML
SM
P-20


C-6 SURFACE ELEVATION: 5500'
SURFICIAL GEOLOGIC UNIT:
C-7 SURFACE ELEVATION: 5350'
SURFICIAL GEOLOGIC UNIT:
C-8 SURFACE ELEVATION: 5290'
SURFICIAL GEOLOGIC UNIT:
C-9 SURFACE ELEVATION: 5150'
SURFICIAL GEOLOGIC UNIT:
See Drawing 2 Sheet 3 of 3 for C-10
C-11 SURFACE ELEVATION: 5150'
SURFICIAL GEOLOGIC UNIT:


P-4
SM
P-6
SM
CS-7
SM
B-2
SM
GP
CS-9
(1737m)
A5y
(1676m)
A5y
(1631m)
A5y
(1612m)
A5y
(1570m)
A5y
C-15 SURFACE EL
SURFICIAL
See Drawing 2 Sheet 3 of 3 for C-16
See Drawing 2 Sheet 3 of 3 for C-17
See Drawing 2 Sheet 3 of 3 for C-18
C-19 SURFACE EL
SURFICIAL
C-20 SURFACE EL
SURFICIAL
C-21 SURFACE EL
SURFICIAL


-15 SURFACE ELEVATION: 5320' (1622m)
SURFICIAL GEOLOGIC UNIT: A5i
C-19 SURFACE ELEVATION: 5520' (1682m)
SURFICIAL GEOLOGIC UNIT: A5y
C-20 SURFACE ELEVATION: 5690' (1734m)
SURFICIAL GEOLOGIC UNIT: A5y
C-21 SURFACE ELEVATION: 5750' (1753m)
SURFICIAL GEOLOGIC UNIT: A5i
CS-15
SM
SP
T-6
GP
P-15
GP
ML
CS-21

C-30 SURFACE ELEVATION: 5550' (1692m)
SURFICIAL GEOLOGIC UNIT: A5y A1

ML
SM
P-20

GM
CS-31

C-31 SURFACE ELEVATION: 5600' (1707m)
SURFICIAL GEOLOGIC UNIT: A5y

SM
GM
B-5

C-32 SURFACE ELEVATION: 5790' (1765m)
SURFICIAL GEOLOGIC UNIT: A5y

SM
CS-33

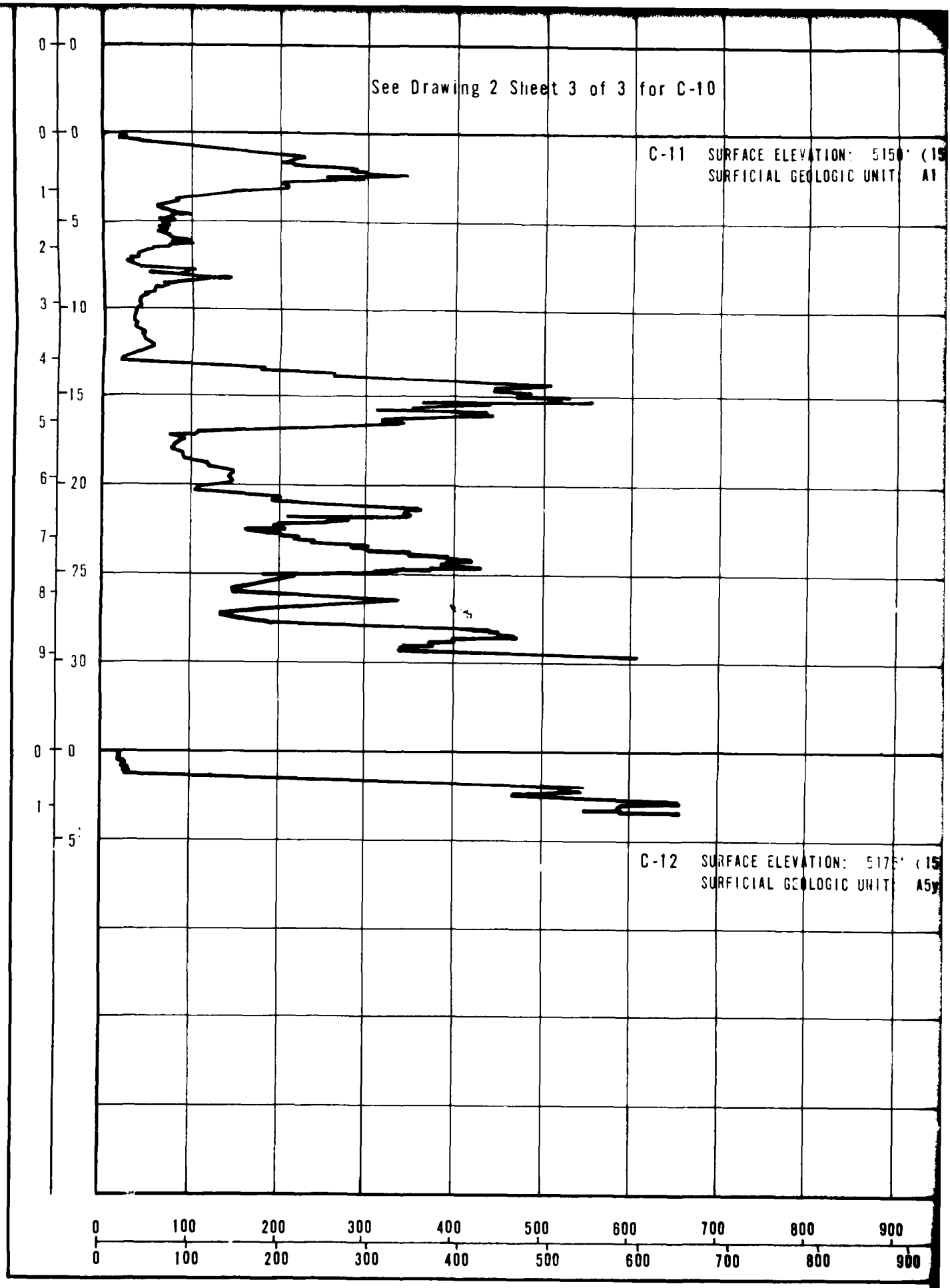
C-33 SURFACE ELEVATION: 5800' (1768m)
SURFICIAL GEOLOGIC UNIT: A5y

GM
P-21

C-34 SURFACE ELEVATION: 5990' (1826m)
SURFICIAL GEOLOGIC UNIT: A5y

C-35 SURFACE ELEVATION: 5639' (1716m)
SURFICIAL GEOLOGIC UNIT: A5y

SM-CS
CS-35



CHECKED BY _____ APPROVED BY _____

2 JUL 79

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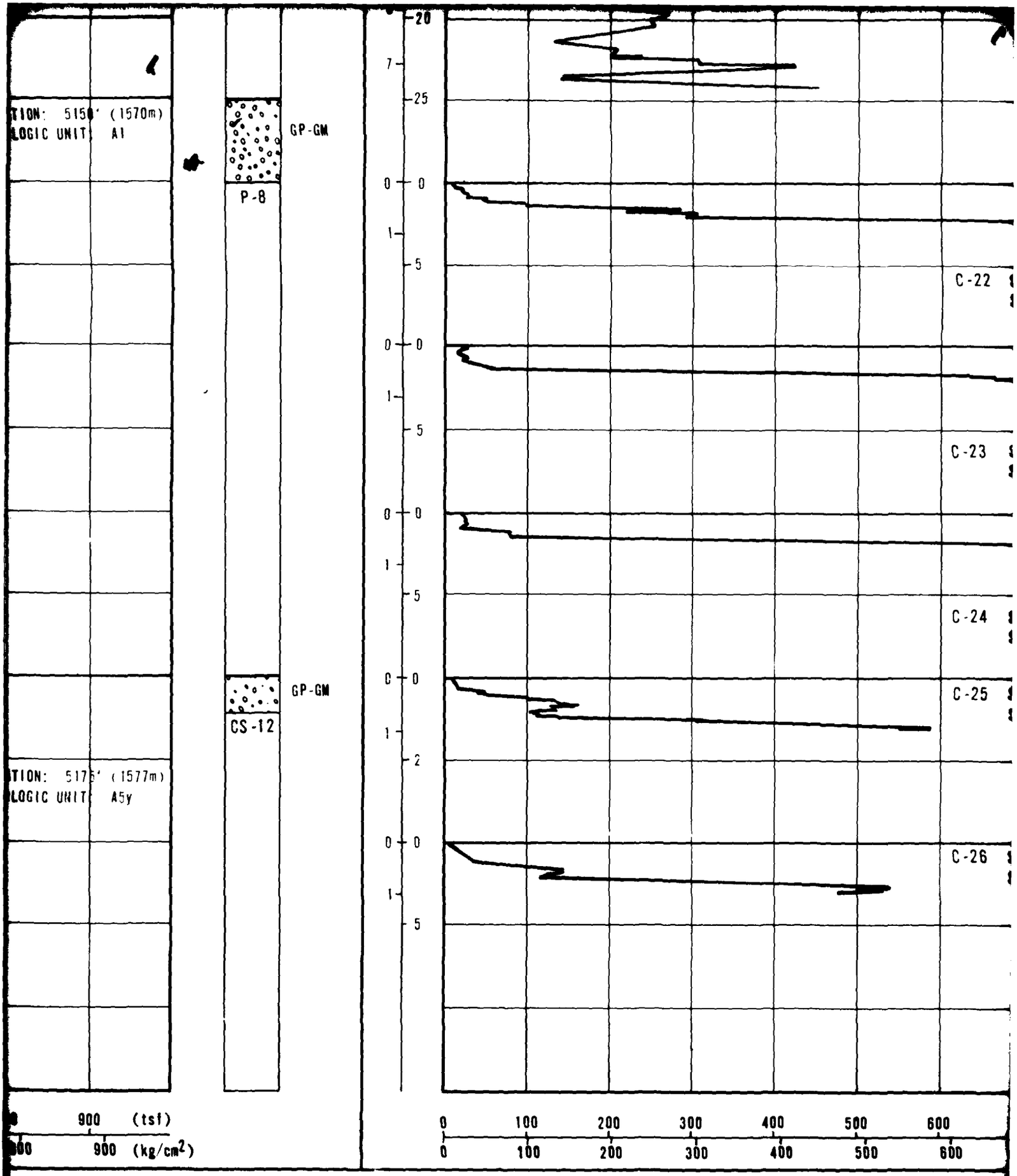
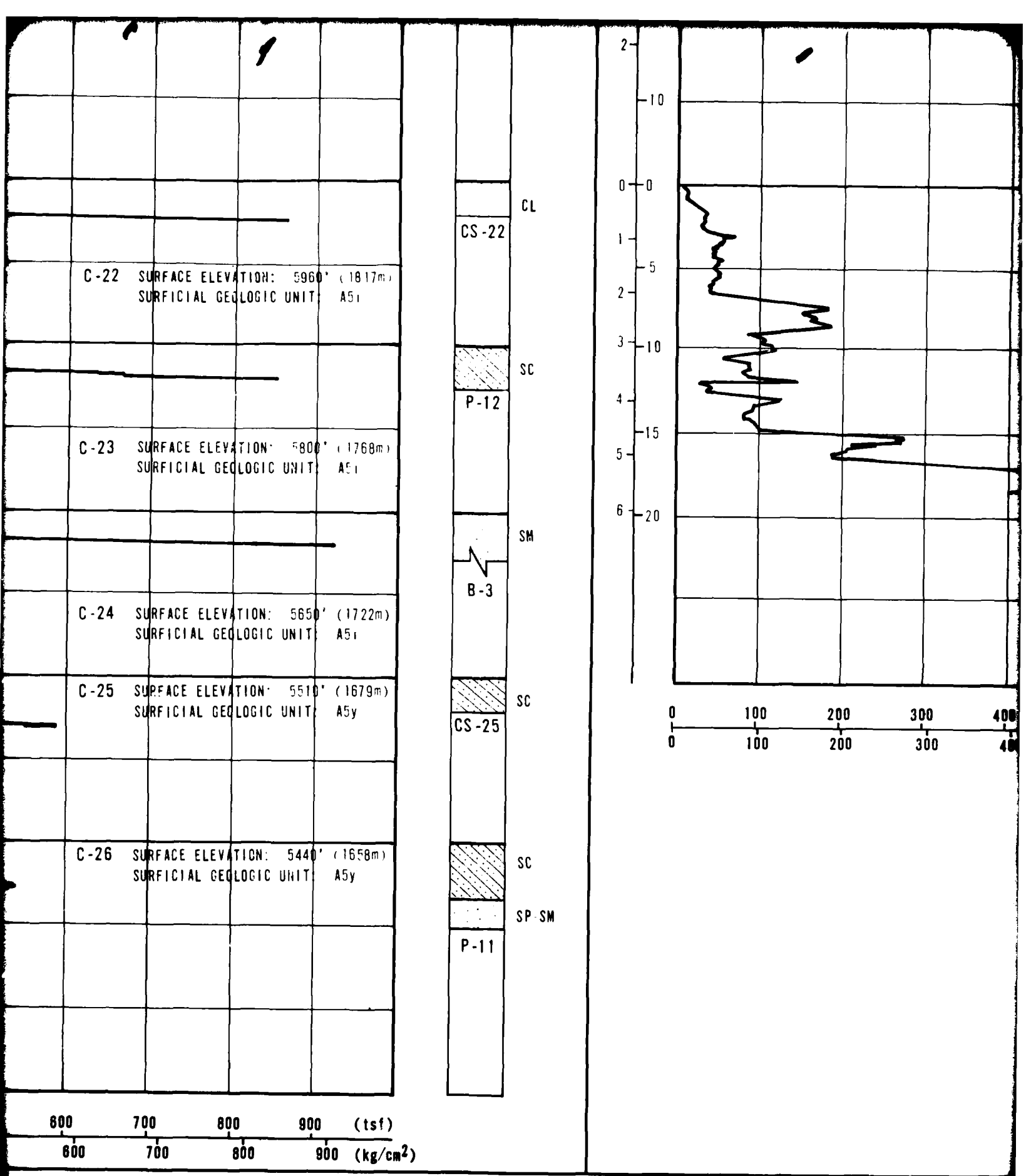
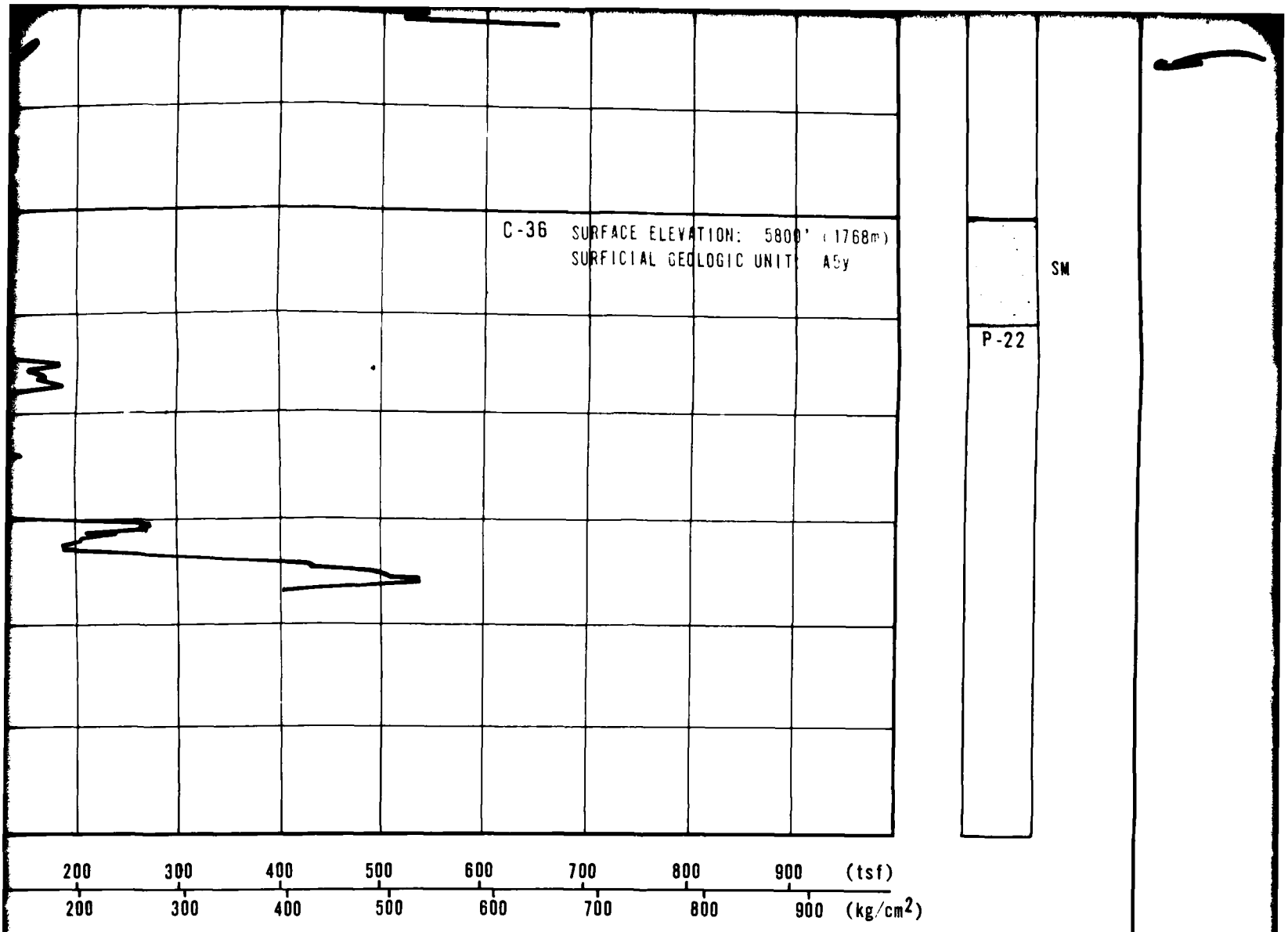

TION: 5150' (1570m)
LOGIC UNIT: A1
GP-GM
P-8
GP-GM
CS-12
TION: 5175' (1577m)
LOGIC UNIT: A5y
900 (tsf)
900 (kg/cm²)
20
7
25
0
0
1
5
C-22
0
0
1
5
C-23
0
0
1
5
C-24
0
0
1
2
C-25
0
0
1
5
C-26
0
100
200
300
400
500
600
0
100
200
300
400
500
600


C-22 SURFACE ELEVATION: 5960' (1817m)
SURFICIAL GEOLOGIC UNIT: A5r
C-23 SURFACE ELEVATION: 5800' (1768m)
SURFICIAL GEOLOGIC UNIT: A5r
C-24 SURFACE ELEVATION: 5650' (1722m)
SURFICIAL GEOLOGIC UNIT: A5r
C-25 SURFACE ELEVATION: 5510' (1679m)
SURFICIAL GEOLOGIC UNIT: A5y
C-26 SURFACE ELEVATION: 5440' (1658m)
SURFICIAL GEOLOGIC UNIT: A5y
CL
CS-22
SC
P-12
SM
B-3
SC
CS-25
SC
SP-SM
P-11
600 700 800 900 (tsf)
600 700 800 900 (kg/cm²)
2 10
0 0
1 5
2 10
3 15
4 20
5
6
0 100 200 300 400
0 100 200 300



CONE PENETROMETER TEST RESULTS
VERIFICATION SITE
GARDEN-COAL CDP. NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

DRAWING
2
1 OF 3

FUGRO NATIONAL, INC.

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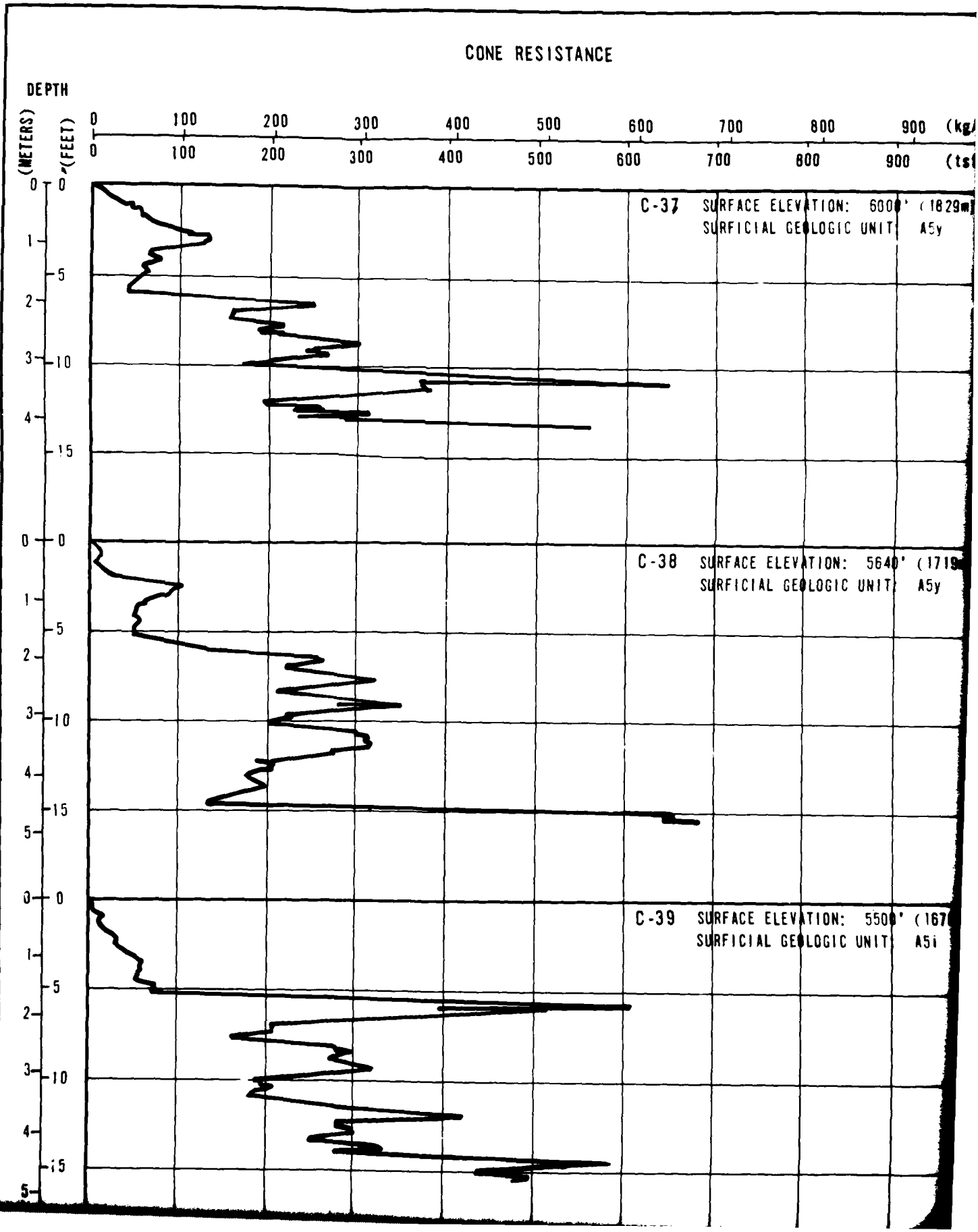
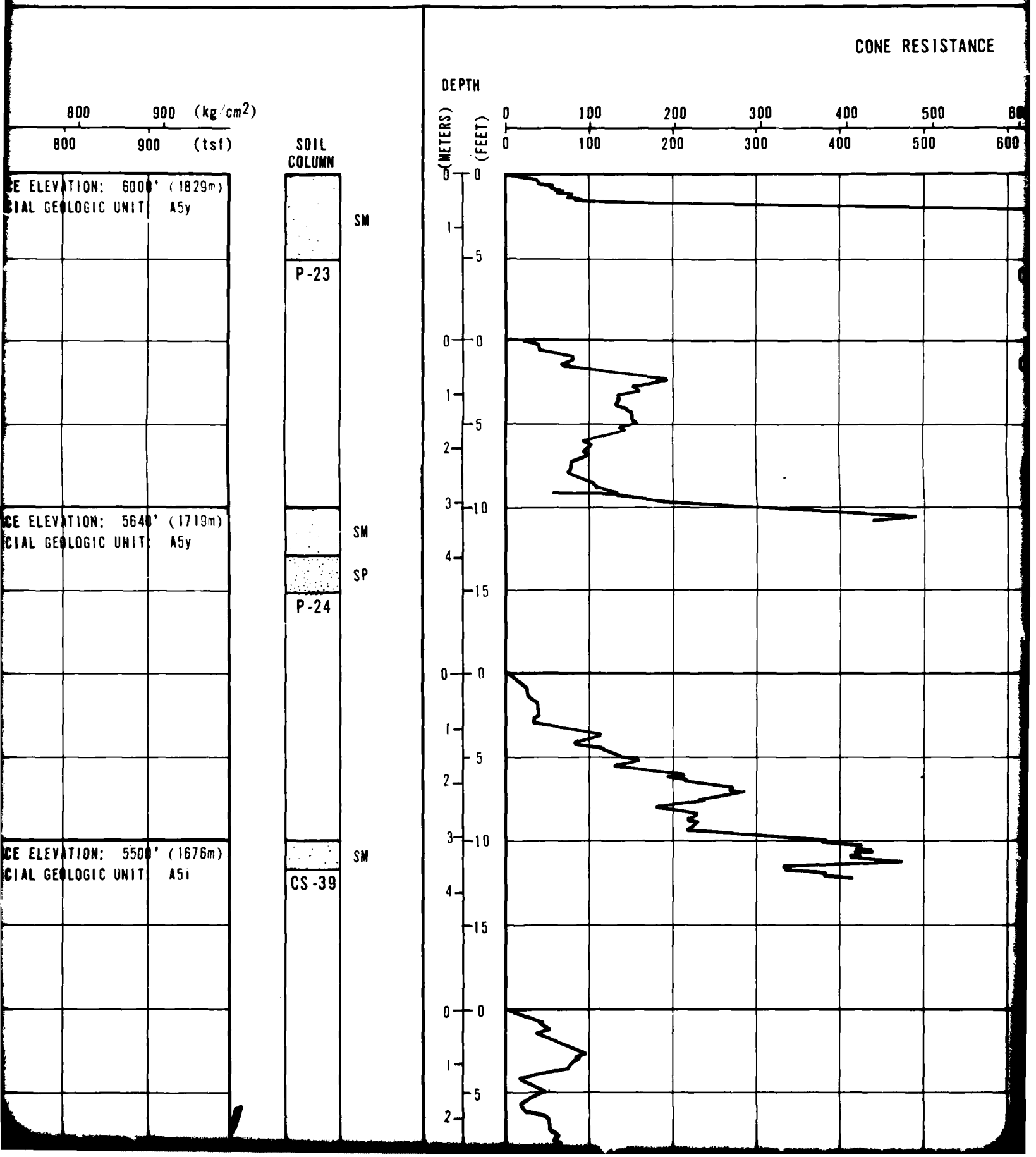
FN-TR-27-VI


CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700 800 900 (kg/
0 100 200 300 400 500 600 700 800 900 (ts
C-37 SURFACE ELEVATION: 6000' (1829m
SURFICIAL GEOLOGIC UNIT: A5y
C-38 SURFACE ELEVATION: 5640' (171
SURFICIAL GEOLOGIC UNIT: A5y
C-39 SURFACE ELEVATION: 5500' (167
SURFICIAL GEOLOGIC UNIT: A5i

1 2-


CONE RESISTANCE
DEPTH
800 900 (kg/cm²)
800 900 (tsf)
SOIL COLUMN
0 100 200 300 400 500 600
0 100 200 300 400 500 600
(METERS)
(FEET)
CE ELEVATION: 6000' (1829m)
CIAL GEOLOGIC UNIT: A5y
SM
P-23
CE ELEVATION: 5640' (1719m)
CIAL GEOLOGIC UNIT: A5y
SM
SP
P-24
CE ELEVATION: 5500' (1676m)
CIAL GEOLOGIC UNIT: A5i
SM
CS-39

E RESISTANCE

500 600 700 800 900 (kg/cm^2)

500 600 700 800 900 (tsf)

SOIL COLUMN

DEPTH

(METERS) 0 100 200 300

(FEET) 0 100 200 300

C-47 SURFACE ELEVATION: 5005' (1526m)
SURFICIAL GEOLOGIC UNIT: A5i

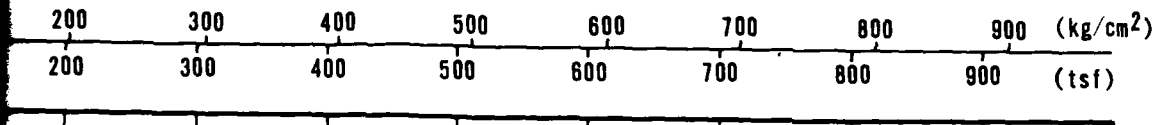
C-48 SURFACE ELEVATION: 4990' (1521m)
SURFICIAL GEOLOGIC UNIT: A5y A4o

C-49 SURFACE ELEVATION: 4990' (1521m)
SURFICIAL GEOLOGIC UNIT: A5y

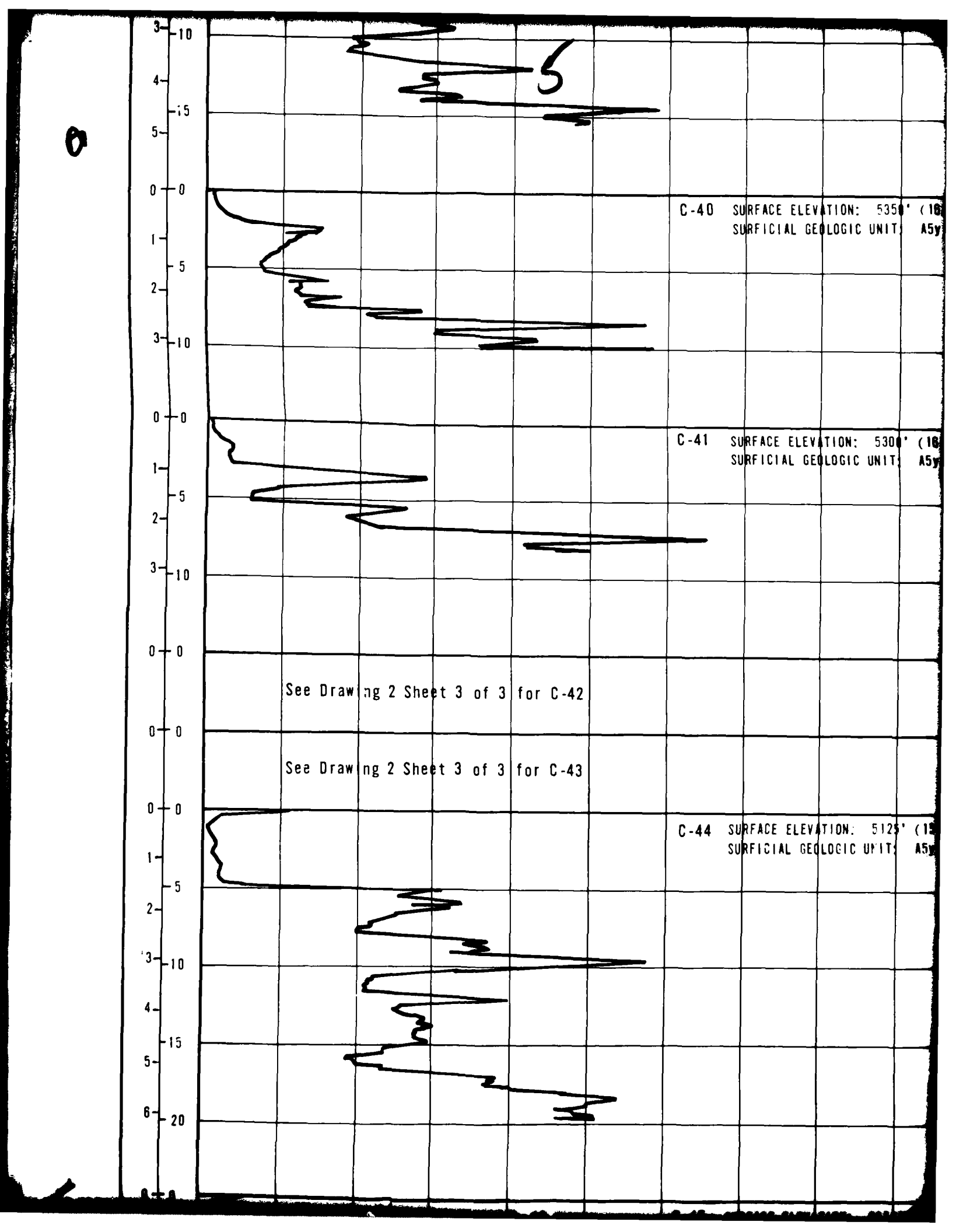
C-50 SURFACE ELEVATION: 4982' (1519m)
SURFICIAL GEOLOGIC UNIT: A4o A2

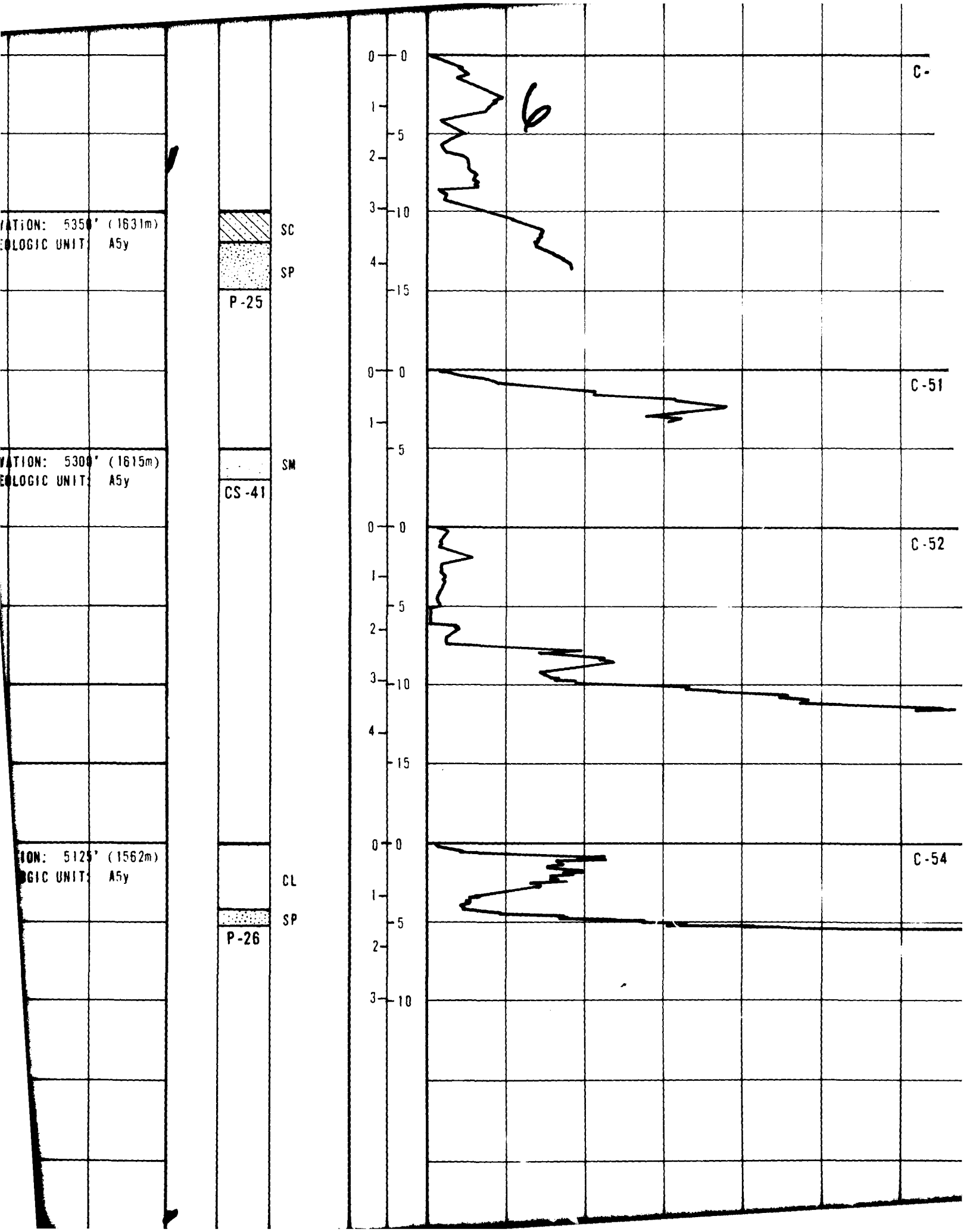
1 4

CONE RESISTANCE



SOIL COLUMN


C-40 SURFACE ELEVATION: 5350' (16
SURFICIAL GEOLOGIC UNIT: A5y
C-41 SURFACE ELEVATION: 5300' (16
SURFICIAL GEOLOGIC UNIT: A5y
See Drawing 2 Sheet 3 of 3 for C-42
See Drawing 2 Sheet 3 of 3 for C-43
C-44 SURFACE ELEVATION: 5125' (15
SURFICIAL GEOLOGIC UNIT: A5y


VATiON: 5350' (1631m)
EOLOGIC UNIT: A5y
SC
SP
P-25
VATION: 5300' (1615m)
EOLOGIC UNIT: A5y
SM
CS-41
ION: 5125' (1562m)
GIC UNIT: A5y
CL
SP
P-26
0
1
2
3
4
0
5
10
15
C-
C-51
C-52
C-54

C-50 SURFACE ELEVATION: 4982' (1519m)
SURFICIAL GEOLOGIC UNIT: A4o A2

C-51 SURFACE ELEVATION: 4980' (1518m)
SURFICIAL GEOLOGIC UNIT: A4o A4

C-52 SURFACE ELEVATION: 4990' (1521m)
SURFICIAL GEOLOGIC UNIT: A4o

C-54 SURFACE ELEVATION: 4998' (1523m)
SURFICIAL GEOLOCIC UNIT: A5y/A4o

AD-A113 328 FUGRO NATIONAL INC · LONG BEACH CA F/G 13/2
MX SITING INVESTIGATION GEOTECHNICAL EVALUATION, VOLUME VI, NEV--ETC(U)
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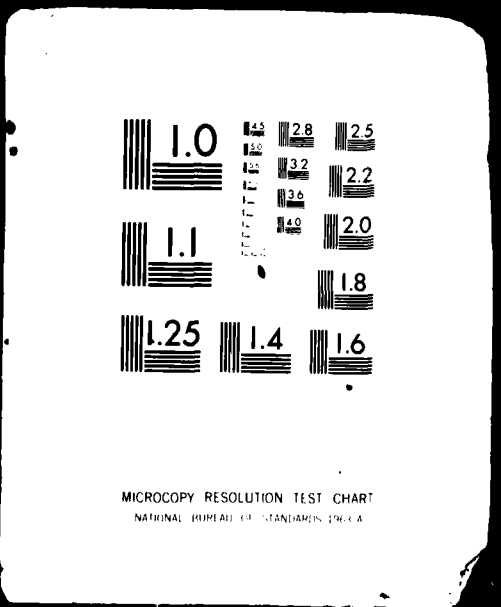
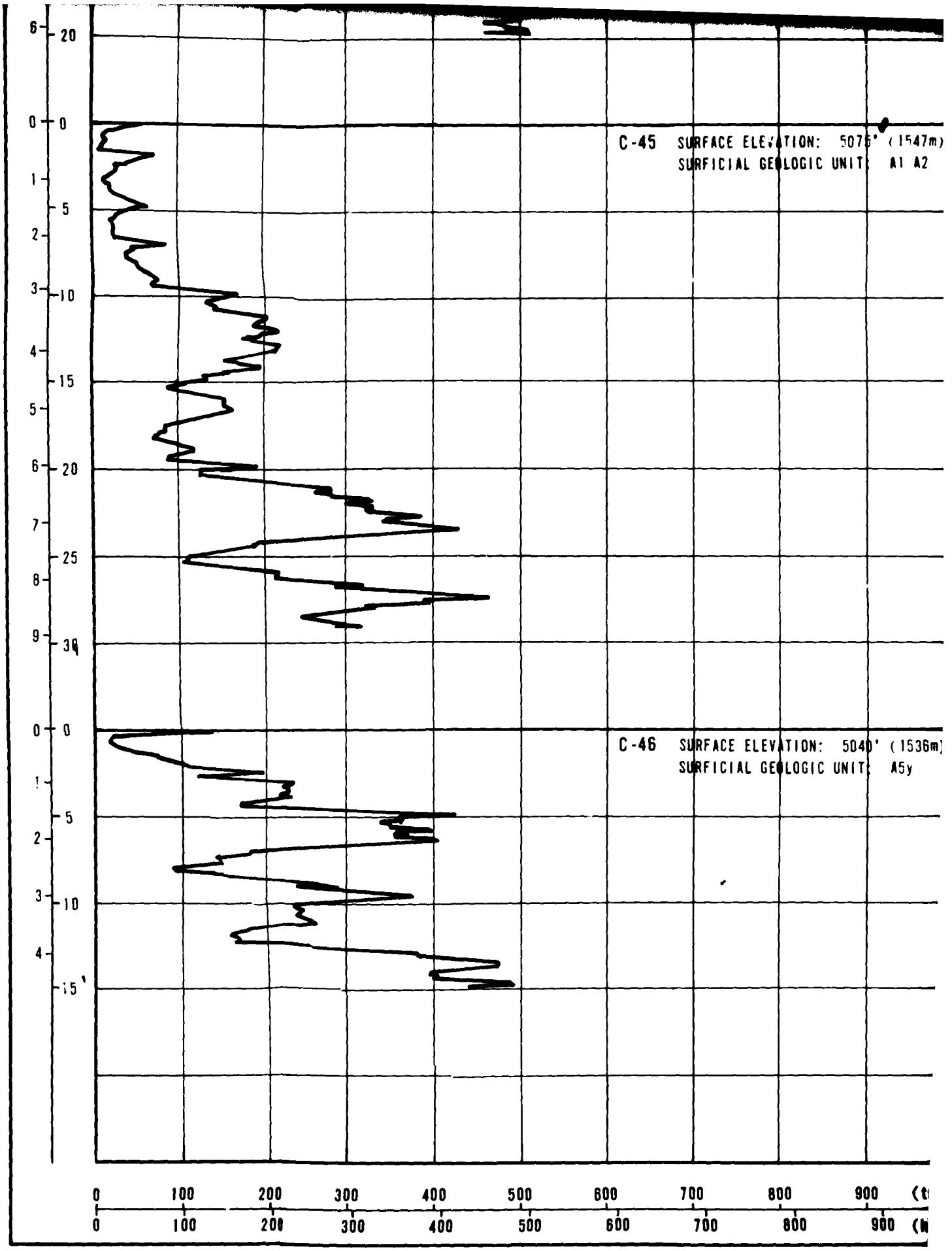
UNCLASSIFIED FN-TR-27-6 NL





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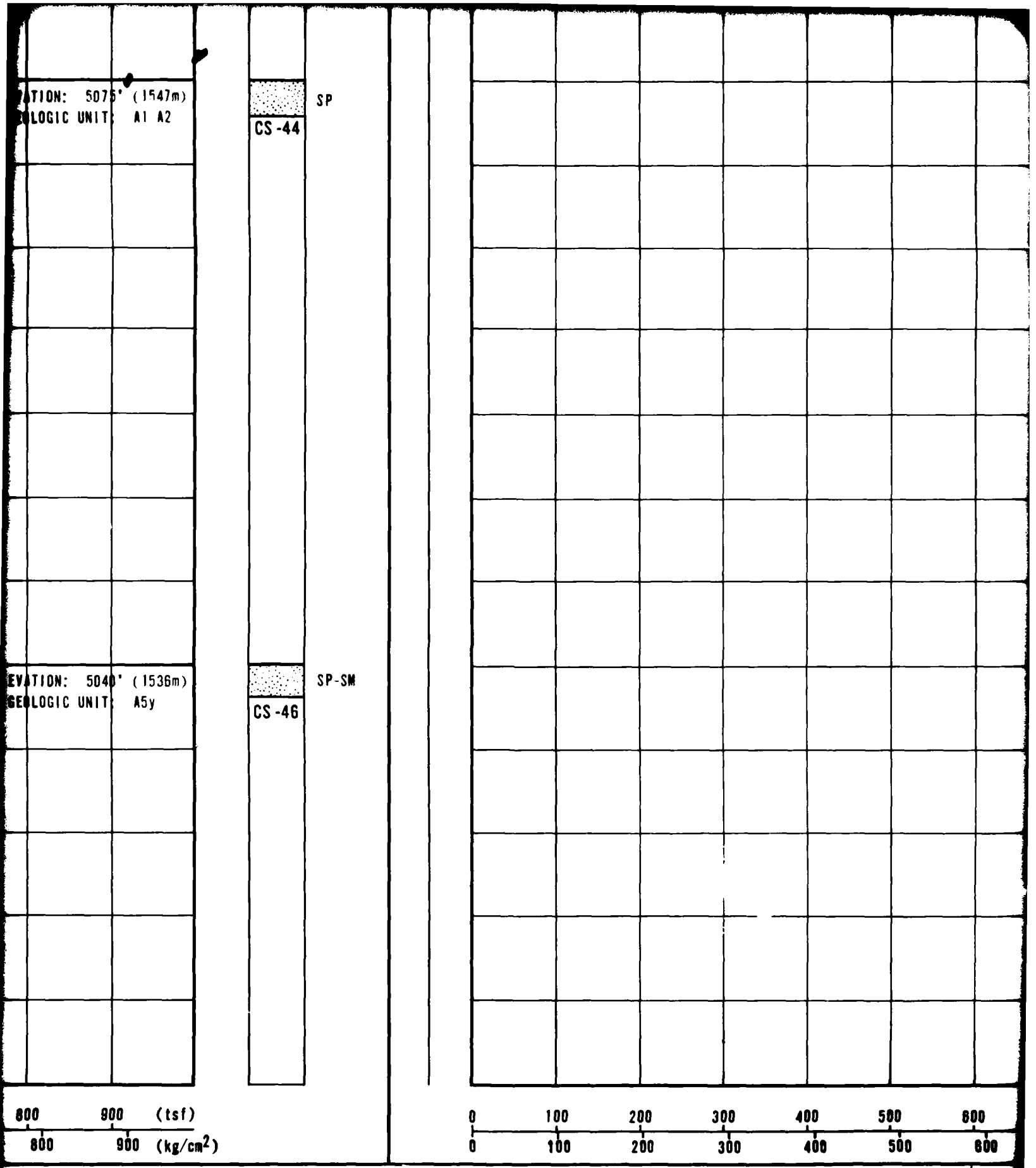
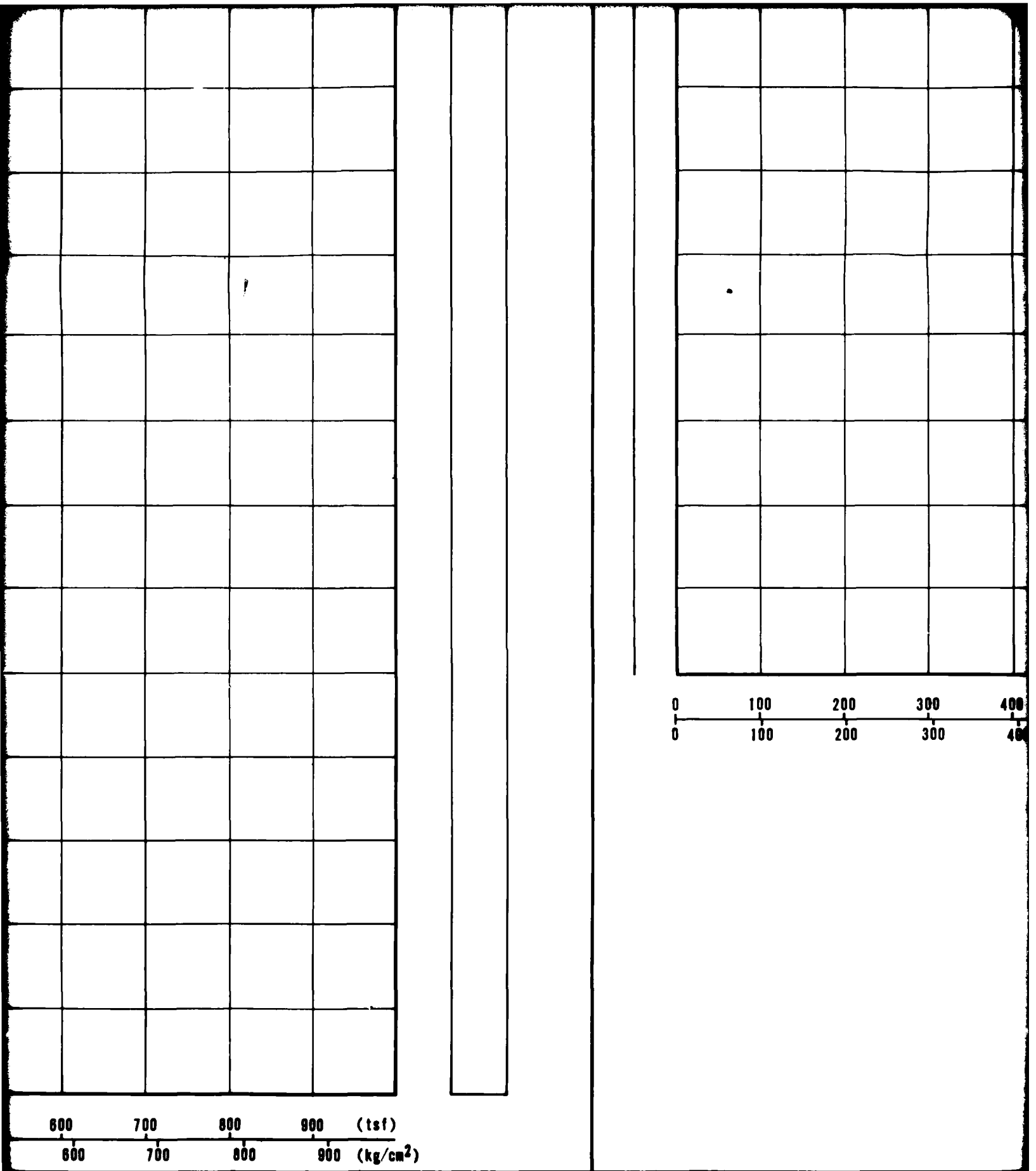
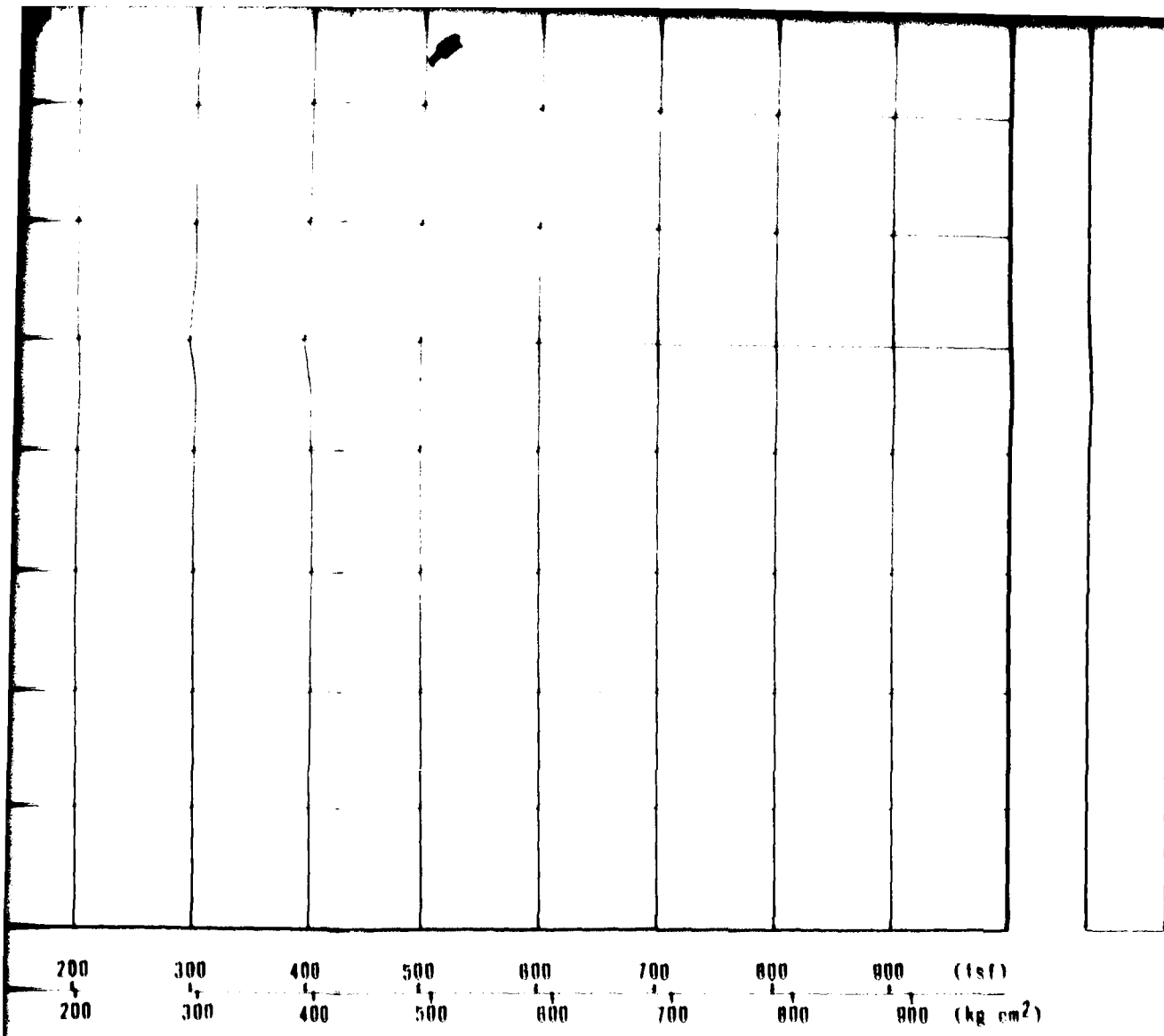

ATION: 5075' (1547m)
LOGIC UNIT: A1 A2
SP
CS-44
EVATION: 5040' (1536m)
GEOLOGIC UNIT: A5y
SP-SM
CS-46
800
900
(tsf)
800
900
(kg/cm2)
0
100
200
300
400
500
600
0
100
200
300
400
500
600

10


0
100
200
300
0
100
200
300
600
700
800
900
(tsf)
600
700
800
900
(kg/cm²)



CONE PENETROMETER TEST RESULTS
VERIFICATION SITE
GARDEN-COAL CDP. NEVADA

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DEPARTMENT OF THE AIR FORCE - SAMSO

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2
2 OF 3

FUGRO NATIONAL, INC.

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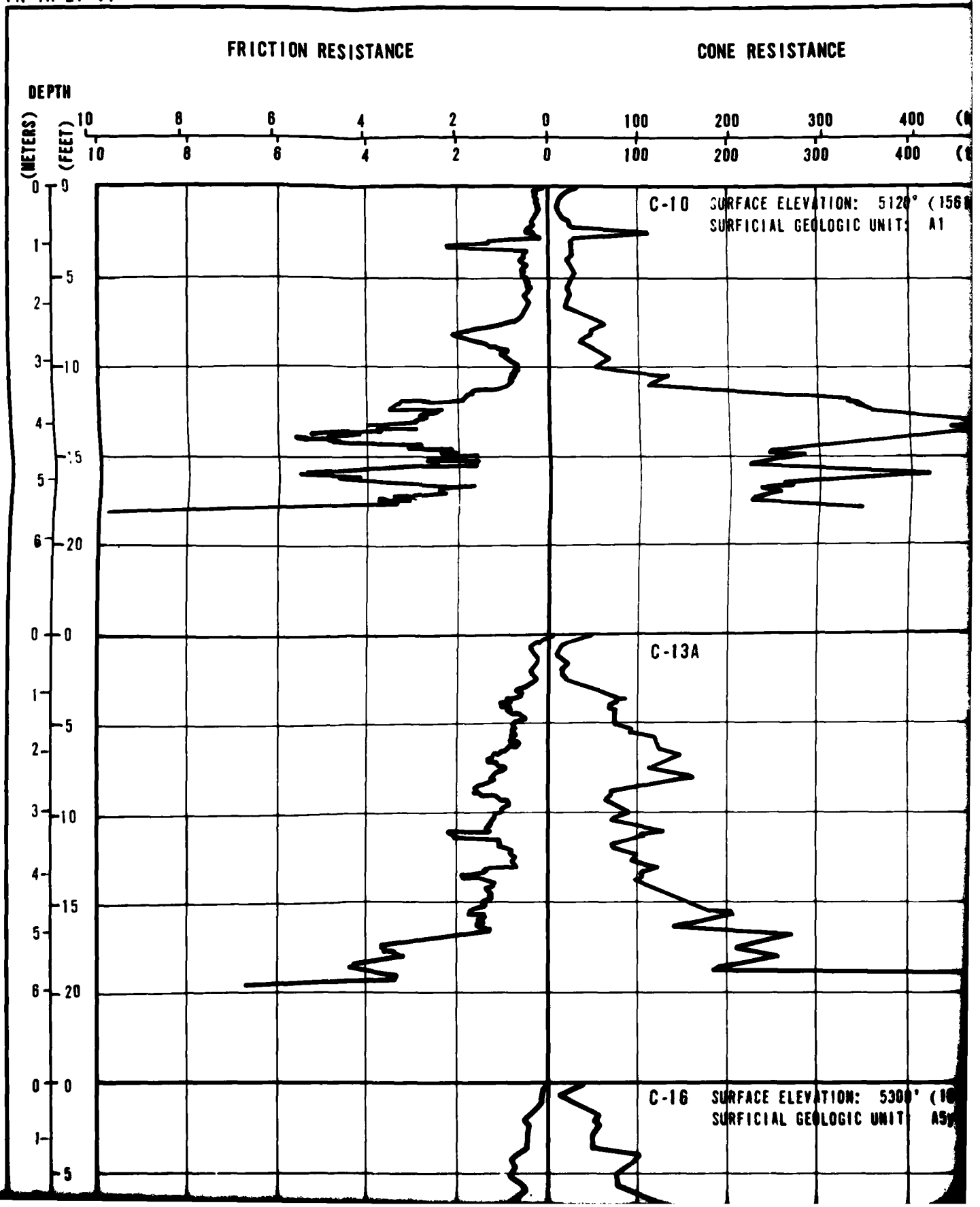
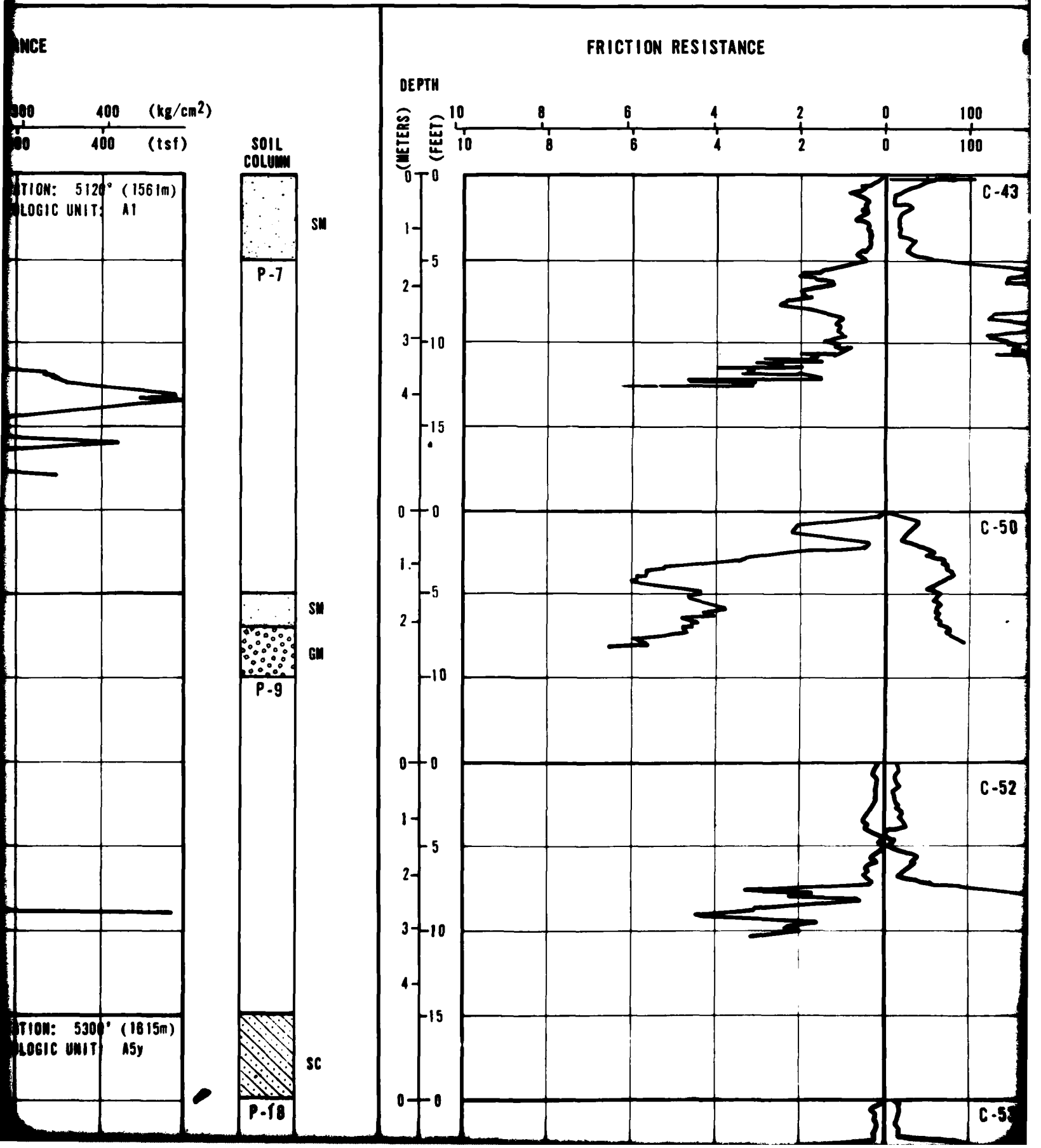
FN-TR-27-VI


FRICTION RESISTANCE
CONE RESISTANCE
DEPTH
(METERS)
(FEET)
10 8 6 4 2 0
100 200 300 400
C-10 SURFACE ELEVATION: 5120' (156
SURFICIAL GEOLOGIC UNIT: A1
C-13A
C-16 SURFACE ELEVATION: 5300' (16
SURFICIAL GEOLOGIC UNIT: A5


NCE
00 400 (kg/cm2)
00 400 (tsf)
TION: 5120' (1561m)
LOGIC UNIT: A1
TION: 5300' (1615m)
LOGIC UNIT: A5y
SOIL COLUMN
SM
P-7
SM
GM
P-9
SC
P-18
FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
10 8 6 4 2 0 100
C-43
C-50
C-52
C-53

CONE RESISTANCE

FRICTION RESISTANCE

100 200 300 400 (kg/cm²)

100 200 300 400 (tsf)

DEPTH

(METERS) 10 8 6 4 2

(FEET) 10 8 6 4 2

SOIL COLUMN

C-43 SURFACE ELEVATION: 5175' (1577m)
SURFICIAL GEOLOGIC UNIT: A5y

SM

GP-GM

SP-SM

T-8

C-50 SURFACE ELEVATION: 4982 (1519m)
SURFICIAL GEOLOGIC UNIT: A40 A2

C-52 SURFACE ELEVATION: 4990 (1521m)
SURFICIAL GEOLOGIC UNIT: A5y

C-53 SURFACE ELEVATION: 4995' (1522m)

1 4

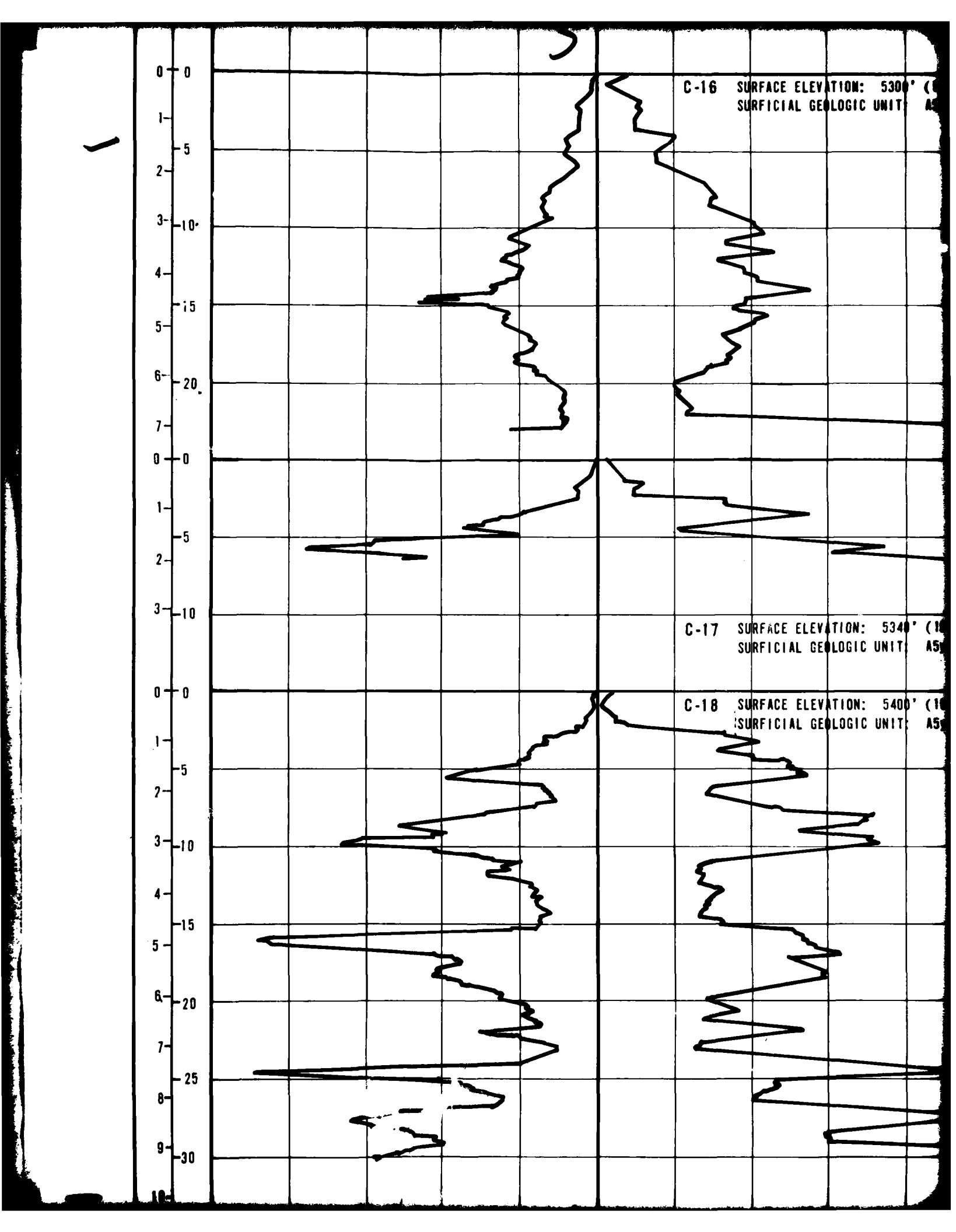
RESISTANCE

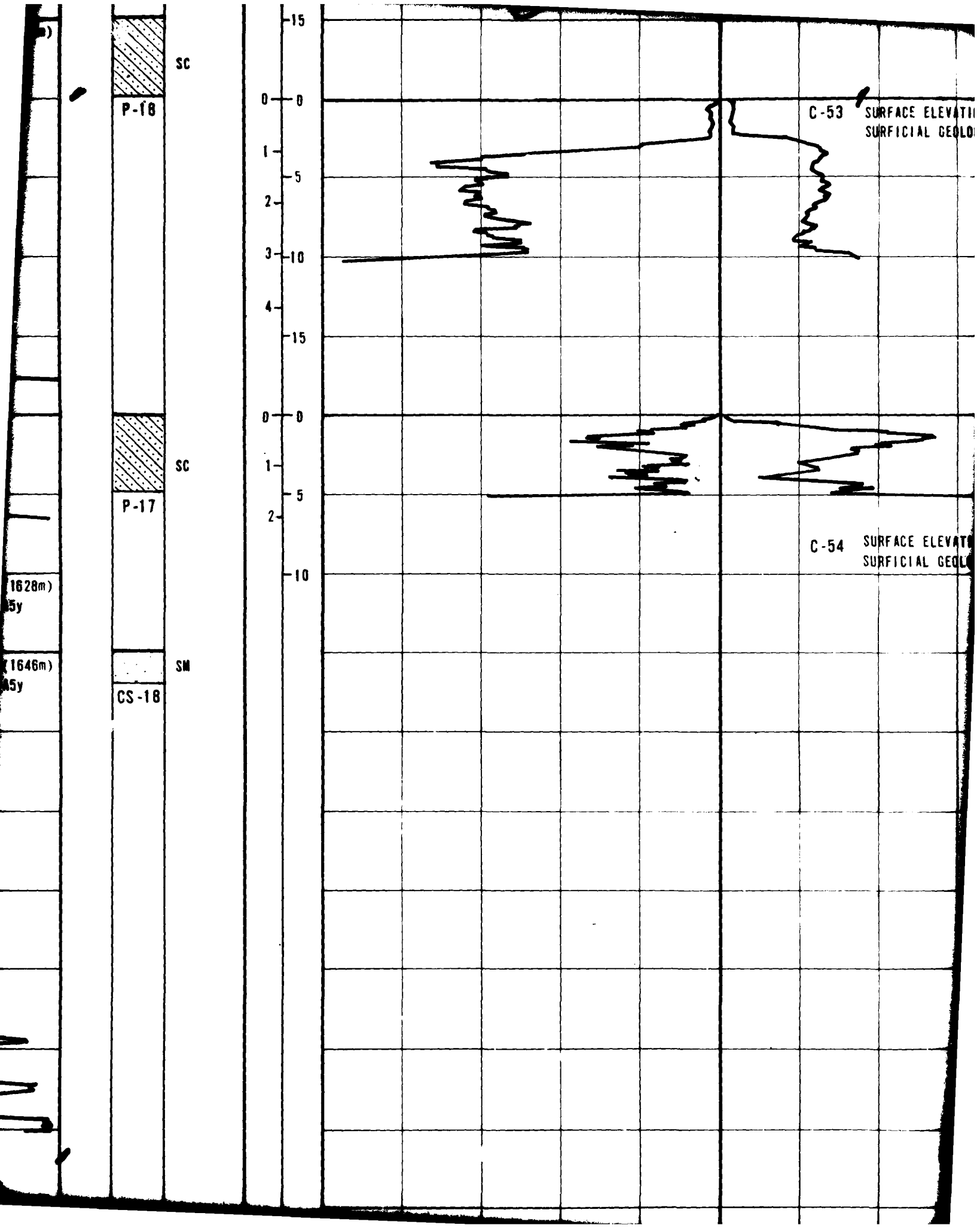
CONE RESISTANCE

4 2 0 100 200 300 400 (kg/cm^2)

4 2 0 100 200 300 400 (tsf)

SOIL COLUMN

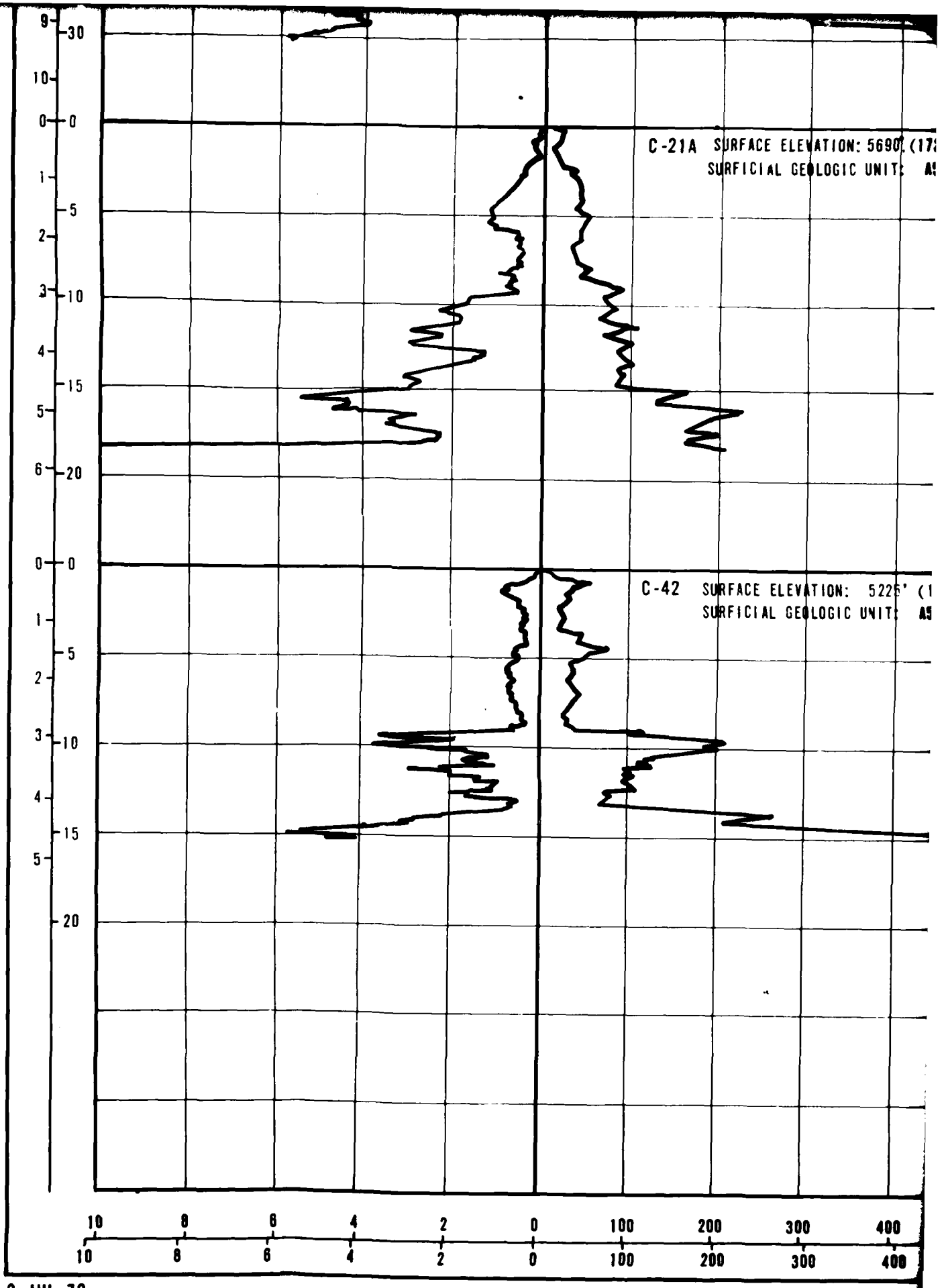

C-16 SURFACE ELEVATION: 5300' (
SURFICIAL GEOLOGIC UNIT: A
C-17 SURFACE ELEVATION: 5340' (1
SURFICIAL GEOLOGIC UNIT: A5
C-18 SURFACE ELEVATION: 5400' (1
SURFICIAL GEOLOGIC UNIT: A5
0 0
1 5
2 10
3 15
4 20
5 25
6 30


SC
P-18
SC
P-17
SM
CS-18
15
0
0
1
5
2
10
3
4
15
0
0
1
5
2
10
C-53 SURFACE ELEVATI
SURFICIAL GEOLO
C-54 SURFACE ELEVAT
SURFICIAL GEOL
1628m)
5y
1646m)
5y

LEVATION: 4995' (1522m)
GEOLOGIC UNIT: A5y

E ELEVATION: 4998 (1523m)
IAL GEOLOGIC UNIT: A5y

8



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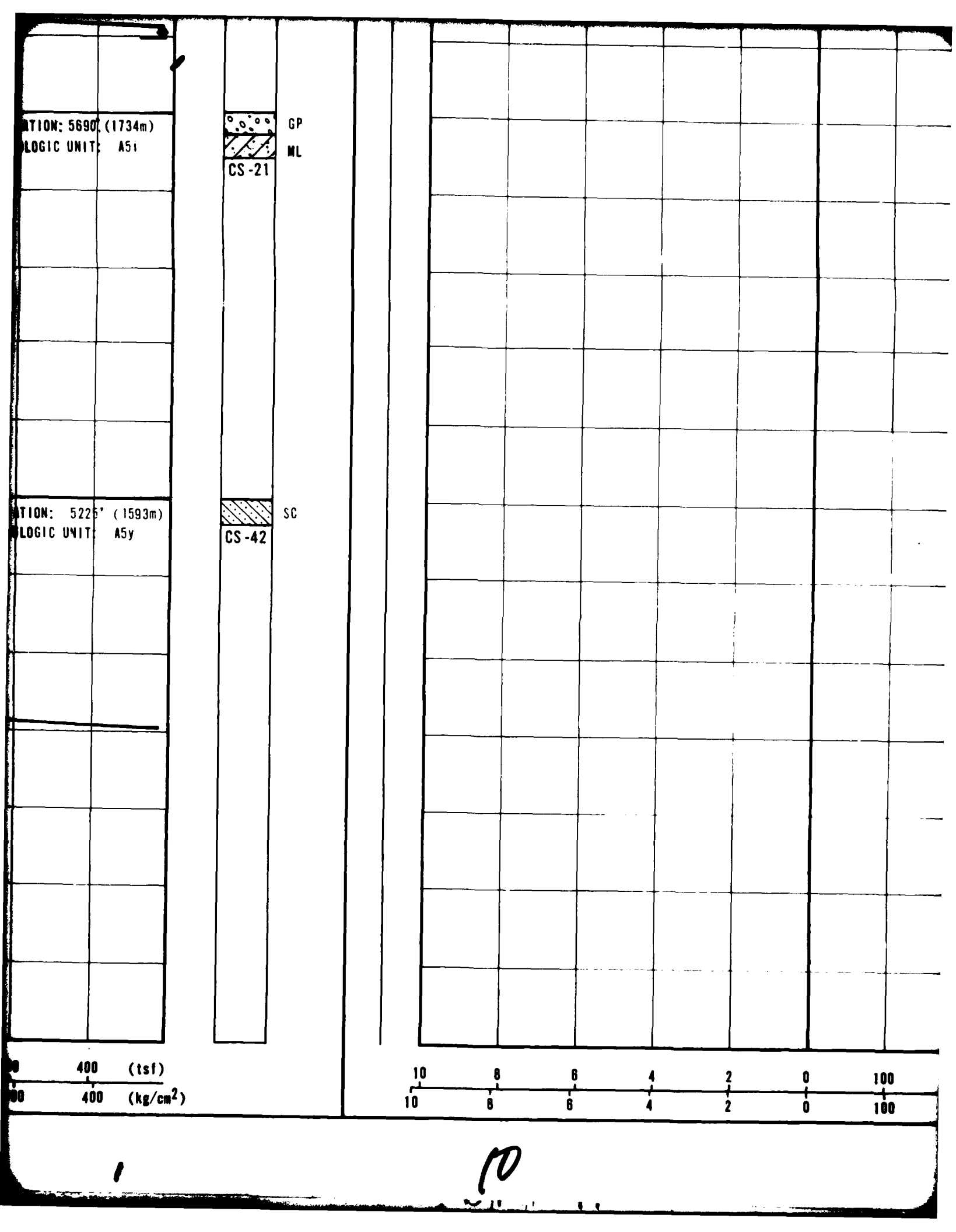
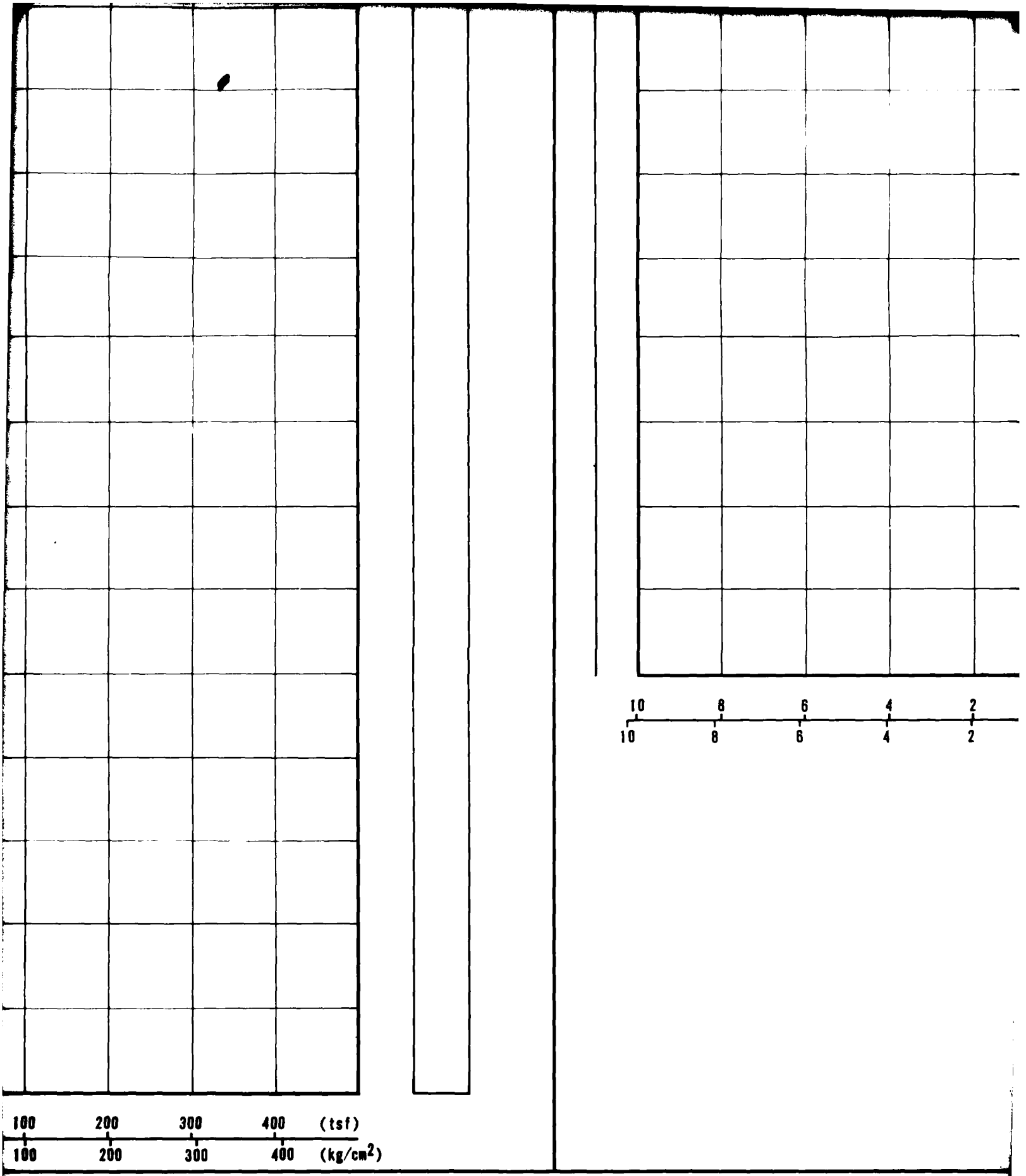
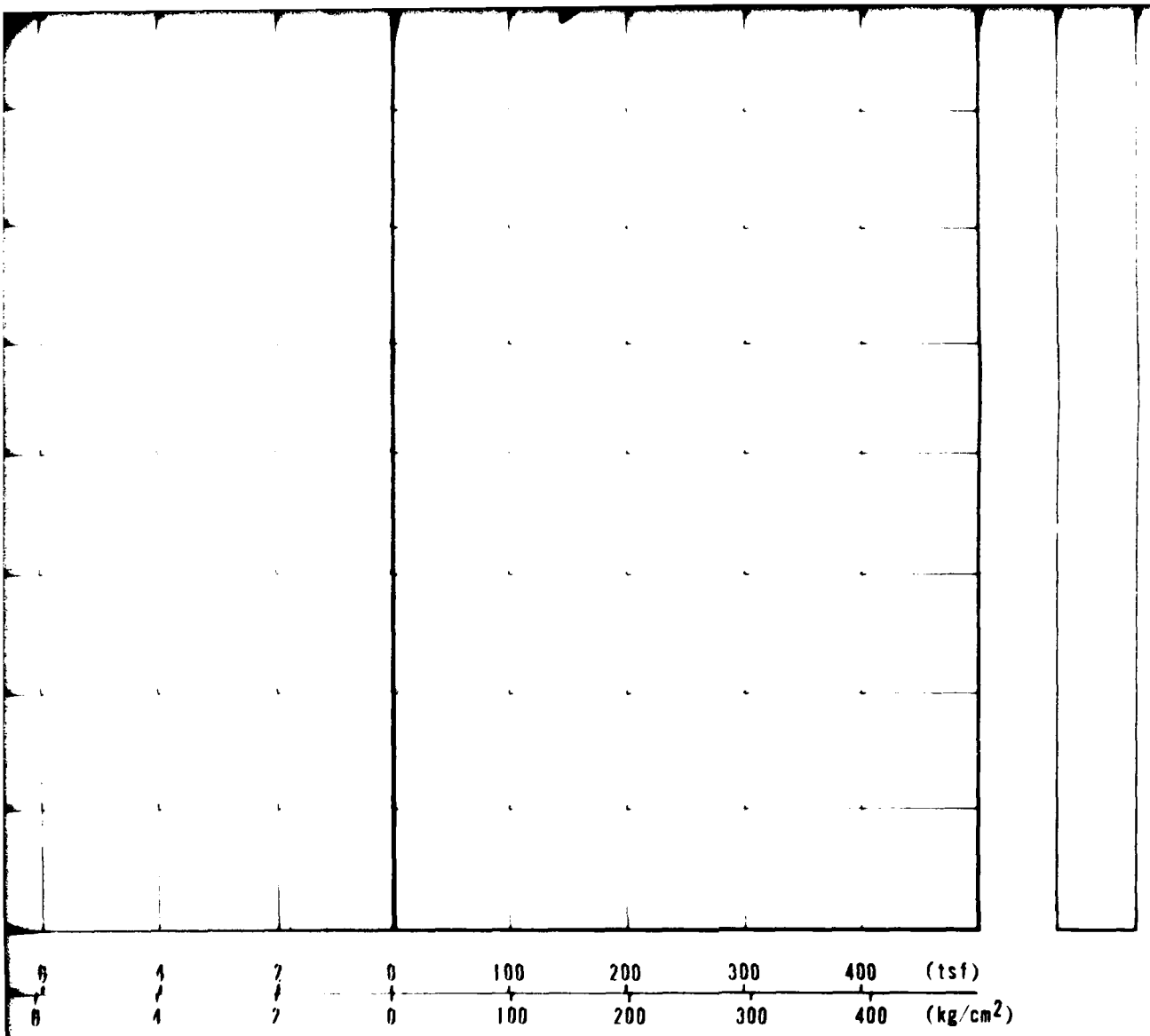

TION: 5690' (1734m)
LOGIC UNIT: A5i
GP
ML
CS-21
TION: 5225' (1593m)
LOGIC UNIT: A5y
SC
CS-42
400 (tsf)
400 (kg/cm²)
10 8 6 4 2 0 100
10 8 6 4 2 0 100


10 8 6 4 2
10 8 6 4 2
100 200 300 400 (tsf)
100 200 300 400 (kg/cm²)



FRICTION RESISTANCE TEST RESULTS
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2
3 OF 3

FUGRO NATIONAL, INC.

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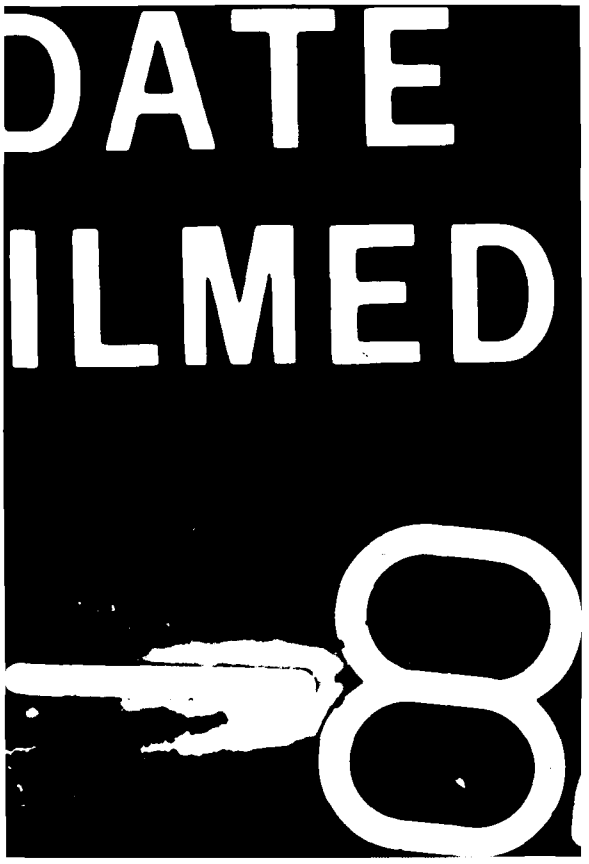
DATE
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8