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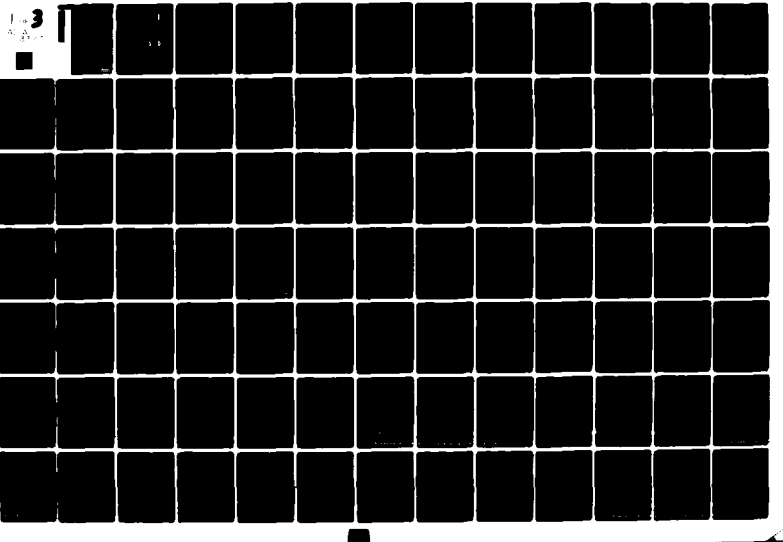

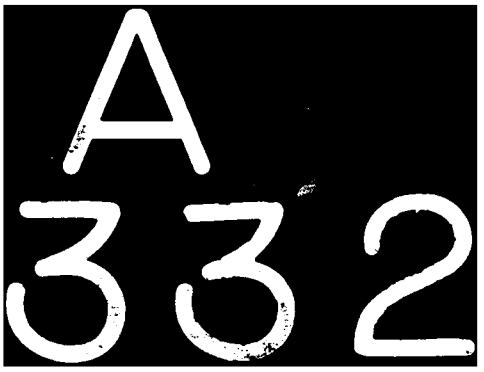
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AD-A113 327

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EN-TR-27-V

DOCUMENT IDENTIFICATION

Final

Contract F04704-78-C-0027 24 Aug. 79

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REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER: FN-TR-27-IV
2. GOVT ACCESSION NO.: AD-A113 327
3. RECIPIENT'S CATALOG NUMBER:

4. TITLE (and Subtitle): Volume IV Nev-Utah Verification Studies, FY 79, Geotechnical Data, White River North, COP, Nevada
5. TYPE OF REPORT & PERIOD COVERED: Final
6. PERFORMING ORG. REPORT NUMBER: FN-TR-27-IV

7. AUTHOR(s): Fugro National, Inc.
8. CONTRACT OR GRANT NUMBER(s): F04704-78-C-0027

9. PERFORMING ORGANIZATION NAME AND ADDRESS: Ertec Western Inc. (formerly Fugro National) P.O. Box 7765 Long Beach Ca 90807
10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 64312 F

11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Department of the Air Force Space and Missile Systems Organization Norton AFB Ca 92409 (SAMSO)
12. REPORT DATE: 24 Aug 79
13. NUMBER OF PAGES: 114

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office):
15. SECURITY CLASS. (of this report):
15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report): Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report): Distribution Unlimited

18. SUPPLEMENTARY NOTES:

19. KEY WORDS (Continue on reverse side if necessary and identify by block number): Ground-water, seismic, Gravity, logs, ~~lab test results~~ geology, trench logs, compaction, cone penetrometer, sieve analyses, terrain

20. ABSTRACT (Continue on reverse side if necessary and identify by block number): The ~~report~~ objectives of this report are to verify suitable area for MX system + provide pre-physical + engineering characteristics of the soils. Included are basic data consisting of long and trench logs, seismic refraction surveys, sieve analyses, soils, electrical resistivity, depth to water, and ~~depth to rocks~~

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FN-TR-27-V

MX SITING INVESTIGATION
GEOTECHNICAL EVALUATION
VOLUME V, NEVADA-UTAH
VERIFICATION STUDIES, FY 79
GEOTECHNICAL DATA
WHITE RIVER NORTH CDP, NEVADA

Prepared for:

U. S. Department of the Air Force
Space and Missile Systems Organization (SAMSO)
Norton Air Force Base, California 92409

Prepared by:

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3777 Long Beach Boulevard
Long Beach, California 90807

24 August 1979

VOLUME V
GEOTECHNICAL DATA, WHITE RIVER NORTH CDP

TABLE OF CONTENTS

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, annhydrite, 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, nornfels, metaquartzite).

SOIL DESCRIPTION | PHYSICAL PROPERTIES | TERRAIN

STATION NUMBER	GEOL UNIT	MPS	GRAIN SIZE	MUNSELL COLOR	SOURCE ROCK TYPE(S)	PHYSICAL PROPERTIES										DRAINAGE (DIR)	DRAINAGE (DEN)	SLOPE (%)	SAMPLE
						6	7	8	9	10	11	12	13	14	15				
%WRG01A	ASI	170	00 08 45	030 025	CM	1	1	1	2	3	2	020	2	2	3	340	002	6	2
%WRG01B	ASI	090	00 02 25	370 005	SP-SM	2	2	1	3	3	1		2	2	1	145	010	04	0
%WRG02A	ASI	165	00 31 15	070 015	SM	1	3	1	2	2	2	055	2	2	3	140	062	08	
%WRG02B	SS															+0			
%WRG03A	ASB	070	00 08 02	386 012	SM-SP	1	2	1	3	3	1		2	2	4				
%WRG03A	ASY	320	00 03 65	025 010	GP-GM	1	2	1	3	3	1		2	1	5	+5	005	00	
%WRG03P	AAP	083	00 00 00	390 010	SM-SP	1	2	2	4	3	3			1	5	345	075	20	0
%WRG04A	ASI	155	00 03 50	035 015	GM-SM	2	2	1	2	2	2	030	2	2	2	145	002	11	
%WRG04C	ASY	015	00 00 37	298 005	SP-SM	1	1	1	2	3	2			1	5			01	
%WRG04P	AZP	030	00 00 60	040 307	SP	1	2	1	2	2	1			1	1			11	
%WRG05A	ASY	120	30 31 55	030 011	GM	1	2	1	2	2	2	035	2	1	1	+4	002	25	
%WRG05P	AI	300	00 30 30	305 398	ML		3	3	2	3	1							00	
%WRG06A	AAO	004	00 00 00	305 094	ML-CL		3	3	2	3	1			1	5	+1	000	33	
%WRG06P	ASI	270	00 01 35	053 015	SM	1	2	1	3	3	1	032	3	2	2	145	024	22	
%WRG07A	AAO	025	00 30 01	075 125	SM	1	2	1	3	3	2	043	2	1	1	145	002	05	
%WRG07B	ASI	400	31 05 50	046 036	SP	1	1	1	4	2		020	2	2	3	943	040	06	
%WRG08A	ASY	375	00 00 35	045 020	SP	2	2	1	2	2	1	300	2	2	1	+5	007	34	
%WRG08B	ASY	002	00 00 37	290 010	SM-SP	2	2	1	2	3	1			2	5			02	
%WRG08E	AAB	003	00 00 00	095 015	SP	2	2	2	4	2	3			1	5				
%WRG09A	ASI	120	00 01 30	040 03C	SM	1	2	1	3	3	2	040	2	2	2	140	003	34	
%WRG09B	ASI	335	00 00 25	070 005	SP-SP	2	2	1	2	3	1	032	2	2	2			01	
%WRG10A	AAO	002	00 00 02	096 012	SM-SP	1	2	1	3	3	2	03M	3	2	4	140	100	00	
%WRG10B	AAO	001	00 00 00	265 095	ML		2	2	4	3	3			1	5				
%WRG11A	ASI	050	00 30 30	045 32M	SC	1	2	1	3	3	1	000	2	2	1	140	001	01	
%WRG11B	ASI	385	00 02 45	046 307	SM-SP	1	2	1	2	3	1		2	2	2	345	075	22	
%WRG12A	ASY	110	00 02 45	030 025	GC	1	3	2	2	2	1		2	1	4	+5	005	04	
%WRG12B	ASI	275	30 04 60	020 02L	SM	2	3	2	3	3	3	020	3	2	3	345	077	01	
%WRG13A	ASI	240	01 30 25	050 22R	SC	2	2	3	3	3	1		2	2	1	245	035	05	
%WRG13B	ASI	040	30 07 15	090 005	SP-SM	2	2	1	2	3	2	047	3	1	3			01	
%WRG14A	ASY	135	00 02 15	060 020	SM	3	3	2	3	1	2	055	3	2	1	140	001	07	
%WRG14P	ASI	020	00 01 10	375 015	SM	2	2	1	2	3	2	067	2	1	5				
%WRG15A	AAO	001	00 00 30	015 085	CL		2	3	2	2	1			1	5	+1	033	00	
%WRG15B	ASI	090	00 05 75	023 002	GP		3	2	1	2	2	055	2	1	1	145	010	07	
%WRG16A	ASI	345	00 30 15	060 325	SM-SC	2	3	1	3	3	2	04M	3	2	3	240	004	04	
%WRG16B	ASI	099	00 05 50	040 010	SP-GM	2	3	1	4	3	2	030	2	1	2	145	025	07	
%WRG17A	ASY	075	00 00 15	065 120	SM	2	2	1	3	3	1		2	1	5	+5	001	02	
%WRG17B	ASI	180	00 10 50	045 005	GP-GM	2	2	1	4	3	4	042	2	1	4	140	040	00	
%WRG18A	ASI	060	00 30 20	060 020	SM	1	2	1	3	3	2	03C	2	2	3	+7	002	02	
%WRG18B	ASY	078	00 02 60	028 012	GP-GM	1	2	2	3	3	1		2	1	1	+5	007	37	
%WRG19A	AAO	001	00 00 00	007 130	CL-ML		2	2	4	3	1					+4	001	01	
%WRG19B	ASI	240	37 07 25	070 005	SP-SP	2	2	1	3	3	4	03C	2	1	4	145	070	03	
%WRG20A	ASY	025	00 30 07	340 040	ML-SM	1	2	1	3	3	1		3	1	5	+3	002	02	
%WRG20B	ASI	390	00 10 50	035 015	GP	3	3	2	3	3	2	040	2	1	1	+5	001	01	
%WRG21A	ASY	130	30 02 30	055 01P	SM	1	2	1	4	2	1		2	2	1	140	002	16	
%WRG21B	ASI			07.5YR4/4												140	012	01	
%WRG22A	ASY	105	07 01 40	040 020	SP-SM	2	2	1	2	3	1		2	2	3	245	002	02	
%WRG22B	ASY	015	00 30 37	098 002	SP	2	2	1	2	3	1	055		1	5	140	020	02	
%WRG23A	ASI	095	00 02 50	035 015	SM-SM	1	2	1	3	3	1		2	1	1	145	003	06	
%WRG23S	ASI	160	31 15 65	233 002	SP	1	2	1	4	2	4	045	3	1	4	10+0	1+0	37	
%WRG24A	ASI	170	00 02 60	020 020	SM	1	2	2	3	3	3	027	2	1	4	145	10+	28	
%WRG24B	ASI	080	00 15 45	353 002	SP	1	2	1	4	3	3	02M	3	2	1	140	025	31	
%WRG25A	ASY	001	00 20 00	307 100	ML		2	2	3	3	1			1	5	+1	001	00	
%WRG25B	ASI	060	00 00 02	09R 0CT	SP	1	2	1	2	3	2	040	2	1	2				
%WRG26A	AI	307	00 00 00	005 095	CH-CL		3	4	4	3	1			1	5	+4C	03C	00	
%WRG26B	ASI	060	00 00 05	093 002	SP	2	2	1	2	3	4	016	3	1	4			00	
%WRG27A	ASY	340	00 00 01	069 030	SP	2	2	2	3	3	1		2	1	5	+2	002	07	
%WRG27B	ASI	200	00 30 50	045 005	GP-GM	1	2	1	2	3	1		2	2	1	145	00R	01	
%WRG28A	ASY	360	00 00 60	015 025	GM	1	2	2	2	3	1		2	2	1	145	103	08	
%WRG29A	ASY	130	00 03 60	030 010	GP-GM	2	2	1	2	3	1		2	1	5	14C	004	14	
%WRG30A	ASY	380	00 01 40	040 120	SM-GM	1	2	2	3	2	3	037	2	2	1	+C	03C	11	
%WRG31A	ASI	045	00 20 15	055 03G	SM	2	2	1	3	3	3	03C	2	2	3	+0	005	04	
%WRG32A	ASY	085	00 01 35	050 015	SM	2	2	1	3	3	1		2	2	5	+3	001	14	
%WRG33A	ASY	C01	00 00 00	300 100	ML			2	2	3	1			1	5	+0	000	33	
%WRG34A	ASI	363	00 00 30	350 020	SM	2	2	1	2	3	2	043	2	2	2	140	006	14	
%WRG35A	ASI	105	00 01 65	027 306	CP-GM	2	2	1	2	3	1		2	2	5	24C	06C	2R	
%WRG36A	ASI	06C	00 00 15	065 02C	SM	3	2	1	1	3	2	05A	2	2	2	+0	001	02	

*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, WHITE RIVER, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 1-1

UGRO NATIONAL, INC.

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	12N/62E-29B	5553 (1709)	112 (34)	26 (8)	1947	5527 (1701)	2
W2	12N/62E-30B	5558 (1710)	-	37 (11)	1947	5521 (1699)	2
W3	12N/62E-30C	5530 (1702)	50 (15)	22 (7)	1947	5508 (1695)	2
W4	12N/62E-33A	5594 (1721)	48 (15)	40 (12)	1947	5554 (1709)	2
W5	12N/62E-33D	5531 (1702)	-	24 (7)	1947	5507 (1694)	2
W6	11N/61E-16D	5470 (1683)	82 (25)	28 (9)	1948	5442 (1674)	2
W7	11N/61E-25B	5440 (1674)	-	15 (5)	1978	5425 (1669)	1
W8	11N/61E-27A	5440 (1674)	-	11 (3)	1978	5429 (1670)	1
W9	11N/61E-32B	5431 (1702)	48 (15)	43 (13)	1978	5388 (1658)	1
W10	11N/61E-35D	5417 (1667)	-	15 (5)	1978	5402 (1662)	1
W11	11N/61E-35D	5412 (1665)	171 (53)	14 (4)	1945	5398 (1661)	2
W12	11N/62E-4B	5531 (1702)	55 (17)	43 (13)	1948	5488 (1689)	2
W13	11N/62E-5D	5520 (1698)	30 (9)	3 (1)	1948	5517 (1698)	2
W14	11N/62E-6A	5503 (1693)	10 (3)	5 (2)	1947	5498 (1692)	2
W15	11N/62E-7B	5480 (1686)	-	18 (6)	1947	5462 (1681)	2
W16	11N/62E-17C	5460 (1680)	15 (5)	7 (2)	1948	5453 (1678)	2

* Mt. Diablo Baseline and Meridian

** References:
(1) Fugro field measurements (1978)
(2) U.S. Geological Survey (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
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1
1 OF 3

FUGRO NATIONAL, INC.

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.	
W17	11N/62E-19C	5442 (1674)	-	7 (2)	-	5435 (1672)	2
W18	11N/62E-28A	5639 (1735)	-	43 (13)	1978	5596 (1722)	1
W19	11N/62E-33D	5661 (1742)	130 (40)	7 (2)	-	5654 (1740)	2
W20	10N/60E-13C	5390 (1658)	-	50 (15)	1948	5340 (1643)	2
W21	10N/60E-24D	5374 (1653)	-	41 (13)	1948	5333 (1641)	2
W22	10N/60E-36B	5356 (1648)	-	50 (15)	1978	5306 (1633)	1
W23	10N/61E-11D	5376 (1654)	-	5 (2)	1947	5371 (1653)	2
W24	10N/61E-20A	5366 (1651)	-	22 (7)	1978	5344 (1644)	1
W25	10N/61E-26B	5344 (1644)	-	9 (3)	1947	5335 (1642)	2
W26	10N/61E-34A	5334 (1641)	-	6 (2)	1947	5328 (1639)	2
W27	10N/62E-17A	5762 (1773)	-	259 (80)	1978	5503 (1693)	1
W28	10N/62E-19A	5630 (1732)	-	149 (46)	1978	5481 (1686)	1
W29	9N/59E-5D	5885 (1810)	44 (14)	39 (12)	1957	5846 (1799)	2
W30	9N/60E-1A	5346 (1645)	40 (12)	50 (15)	1978	5296 (1630)	1
W31	9N/60E-15D	5505 (1694)	-	195 (60)	1978	5310 (1634)	1
W32	9N/61E-78	5341 (1643)	43 (13)	31 (10	1948	5310 (1634)	2

* Mt. Diablo Baseline

** References:

(1) Fugro field measurements (1978)

(2) U.S. Geological Survey (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
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1 2 OF 3

FUGRO NATIONAL, INC.

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.	
W33	8N/59E-3C	6660 (2049)	100 (31)	85 (26)	1967	6575 (2023)	2
W34	8N/60E-21A	5490 (1689)	-	500+ (154)	1978	<4990 (<1535)	2
W35	8N/60E-24D	5261 (161?)	-	35 (11)	1978	5226 (1608)	2
W36	8N/60E-27D	5480 (1686)	142 (44)	116 (36)	1948	5364 (1650)	2
W37	8N/60E-28A	5340 (1643)	-	117 (36)	1978	5223 (1607)	1
W38	8N/61E-33A	5250 (1615)	-	36 (11)	1978	5214 (1604	1
W39	7N/61E-4D	5245 (1614)	-	39 (12)	1978	5206 (1602)	1
W40	6N/60E-21A	5240 (1612)	-	89 (27)	1978	5151 (1585)	1
W41	4N/61E-16D	5094 (1567)	-	84 (26)	1963	5010 (1542)	2
W42	4N/61E-36A	5040 (1551)	-	90 (28)	-	4950 (1523)	2

* Mt. Diablo Baseline and Meridian

** References:
1. Fugro field measurements (1978)
2. U.S. Geological Survey (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
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1 3 OF 3

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.

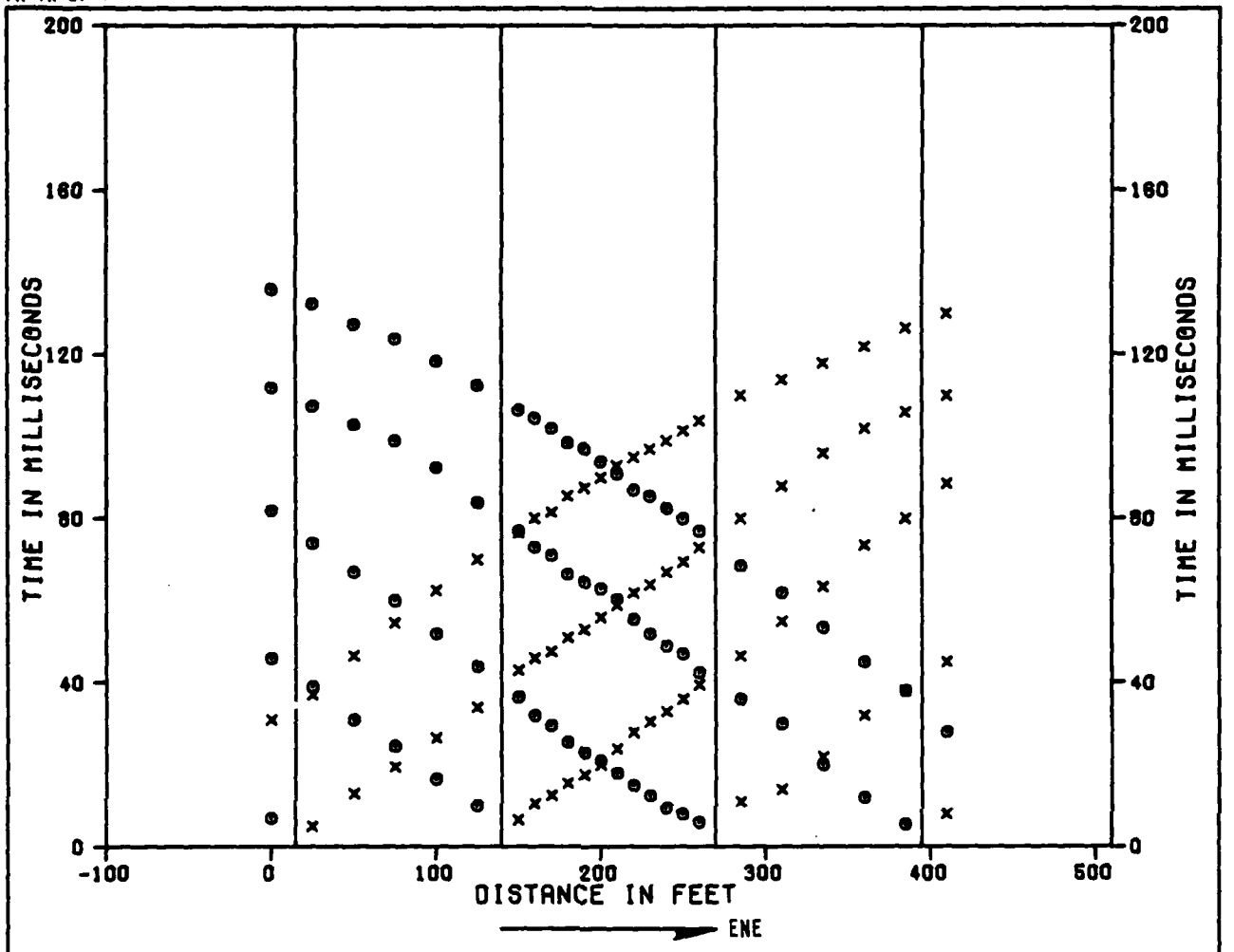
Travel Time Versus Distance Graph (Upper Half of Figure)

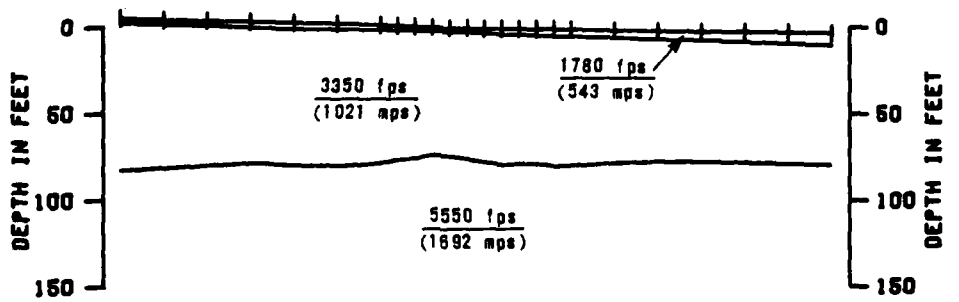
This is a travel time versus distance graph. The abscissa represents distance; the ordinate, time. The six vertical lines represent the locations of shots (designated as F, G, H, I, J, and K). The symbol, X, denotes travel times at geophones that were located to the right of a shot. The symbol, ⊖, denotes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





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE WR-S-1
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-1

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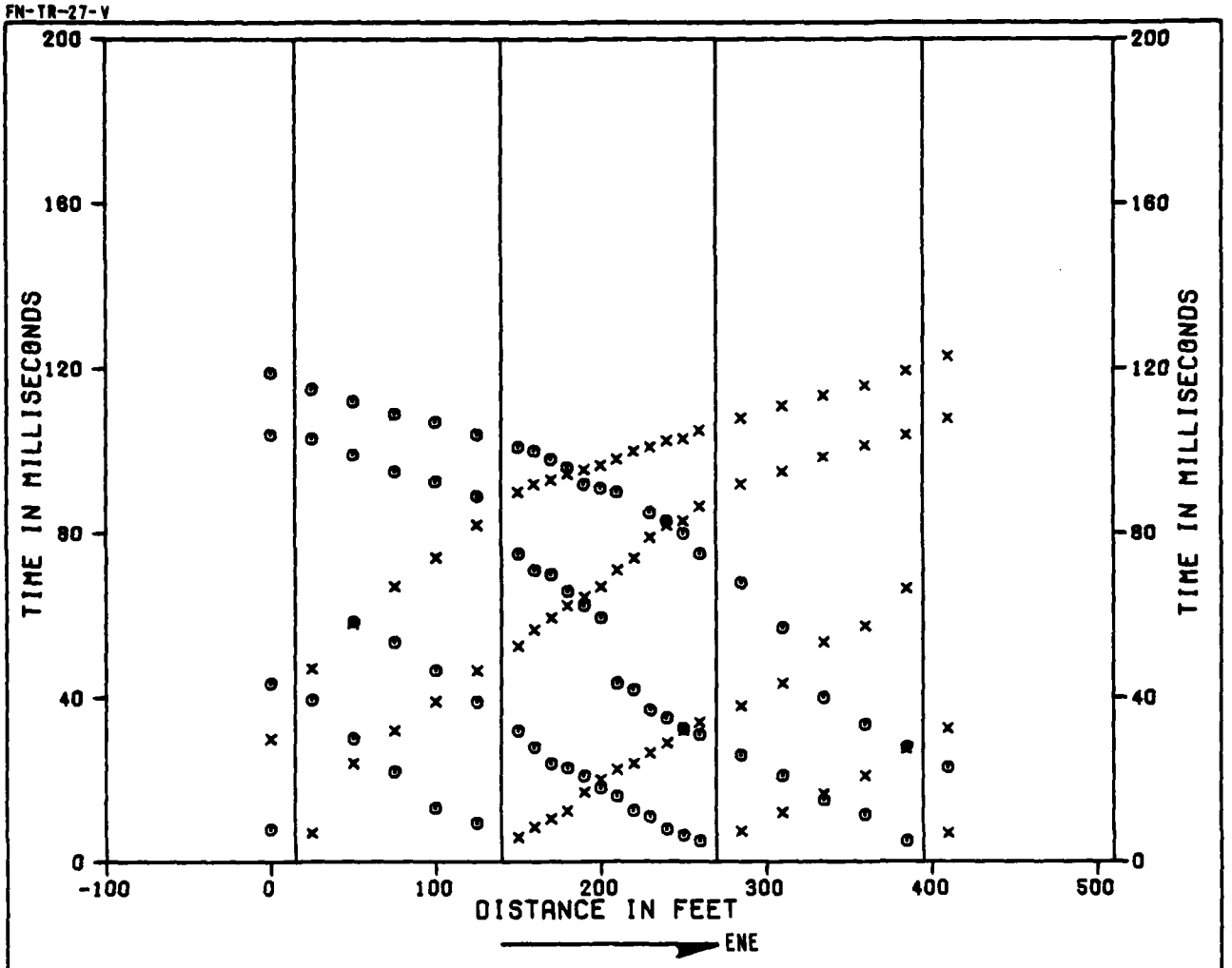
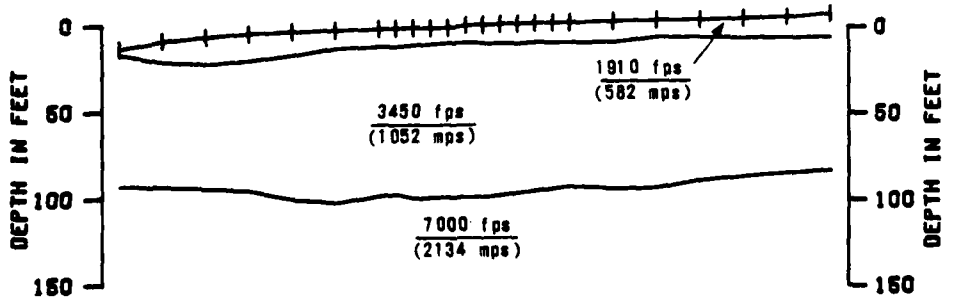
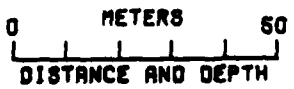
FN-TR-27-V







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

SEISMIC REFRACTION LINE WR-S-2
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-2

FUGRO NATIONAL, INC.

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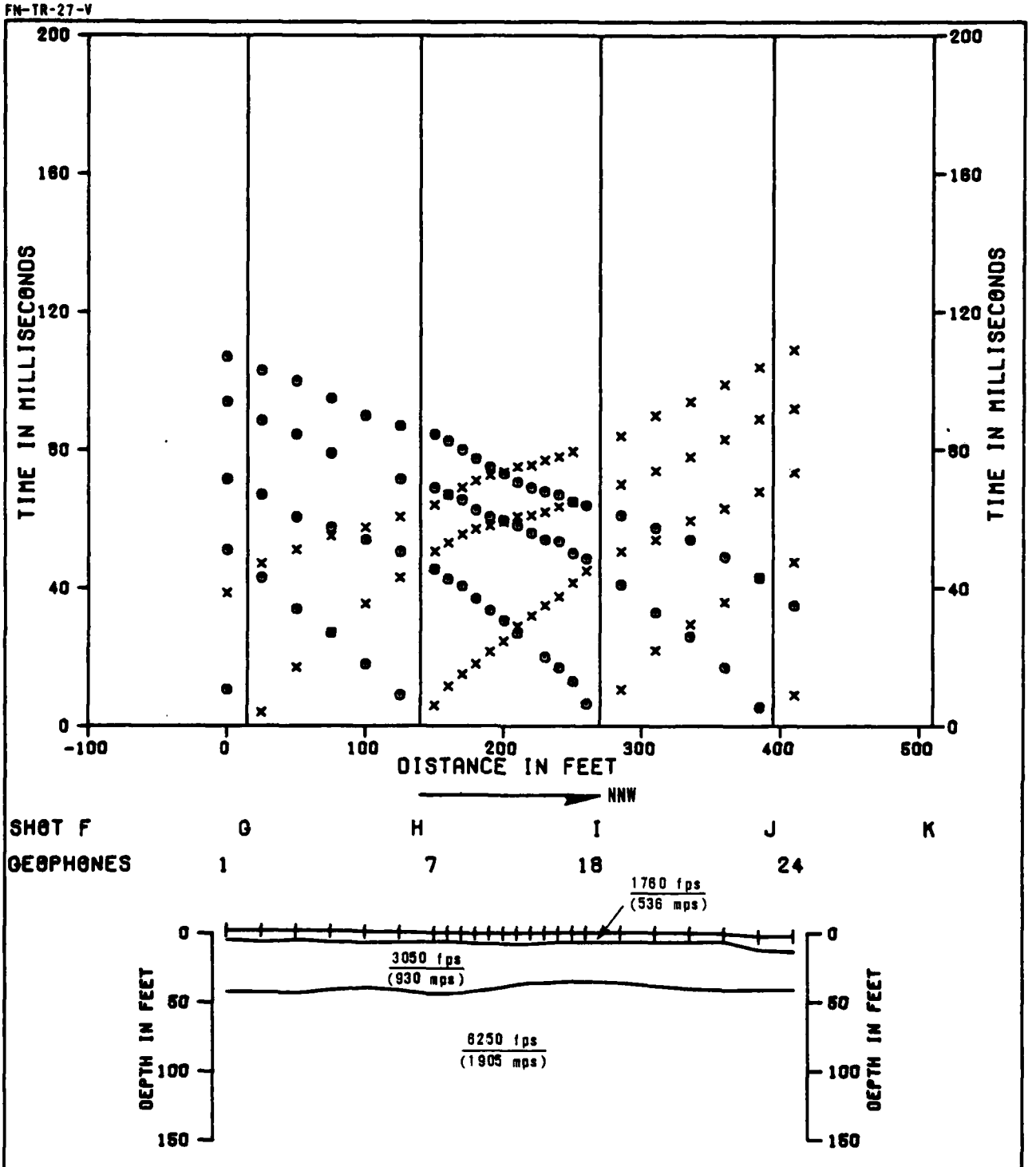

SEISMIC REFRACTION LINE WR-S-3
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-3

FUGRO NATIONAL, INC.

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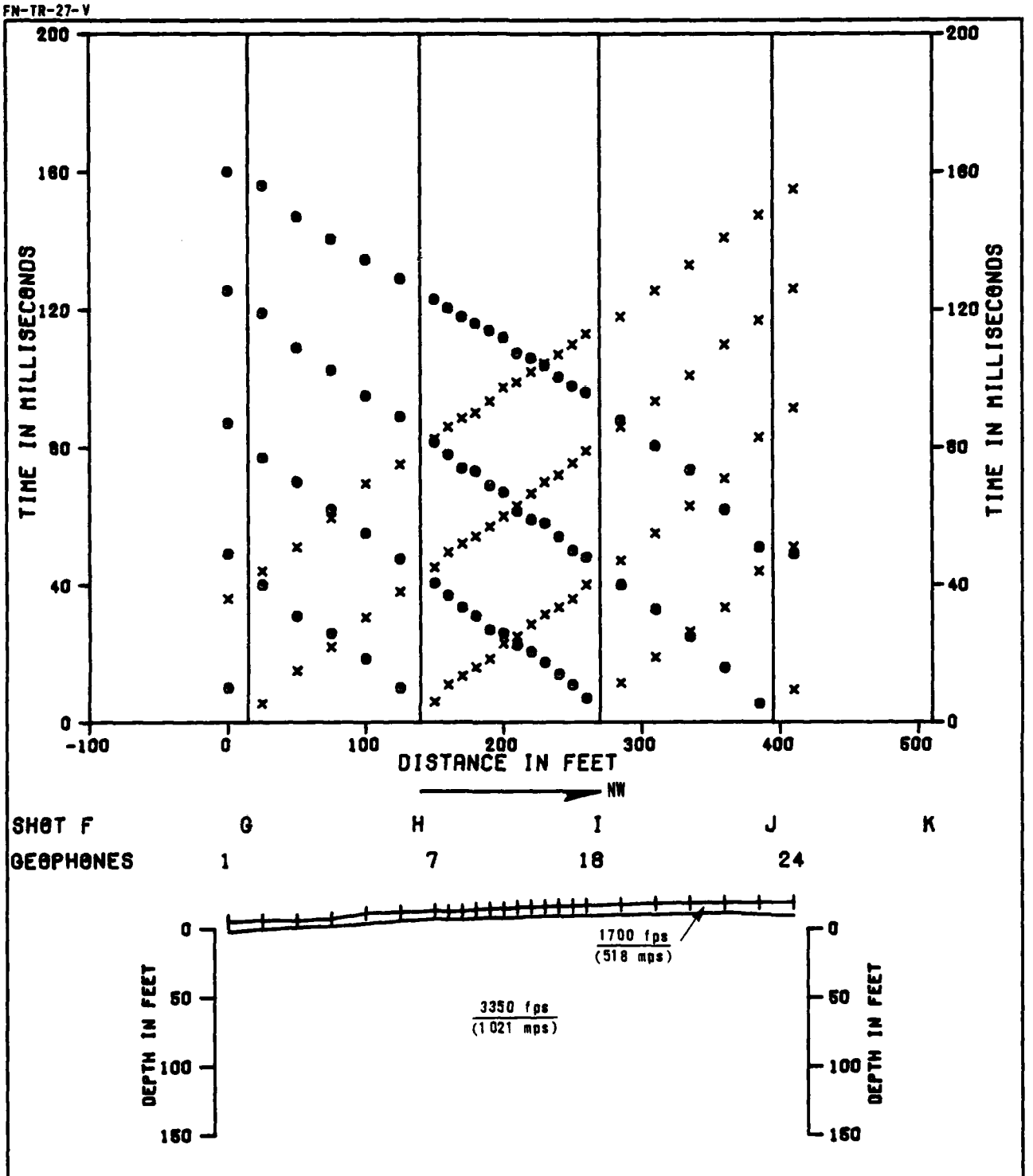
FN-TR-27-V



SEISMIC REFRACTION LINE WR-S-4
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-4

FUGRO NATIONAL, INC.

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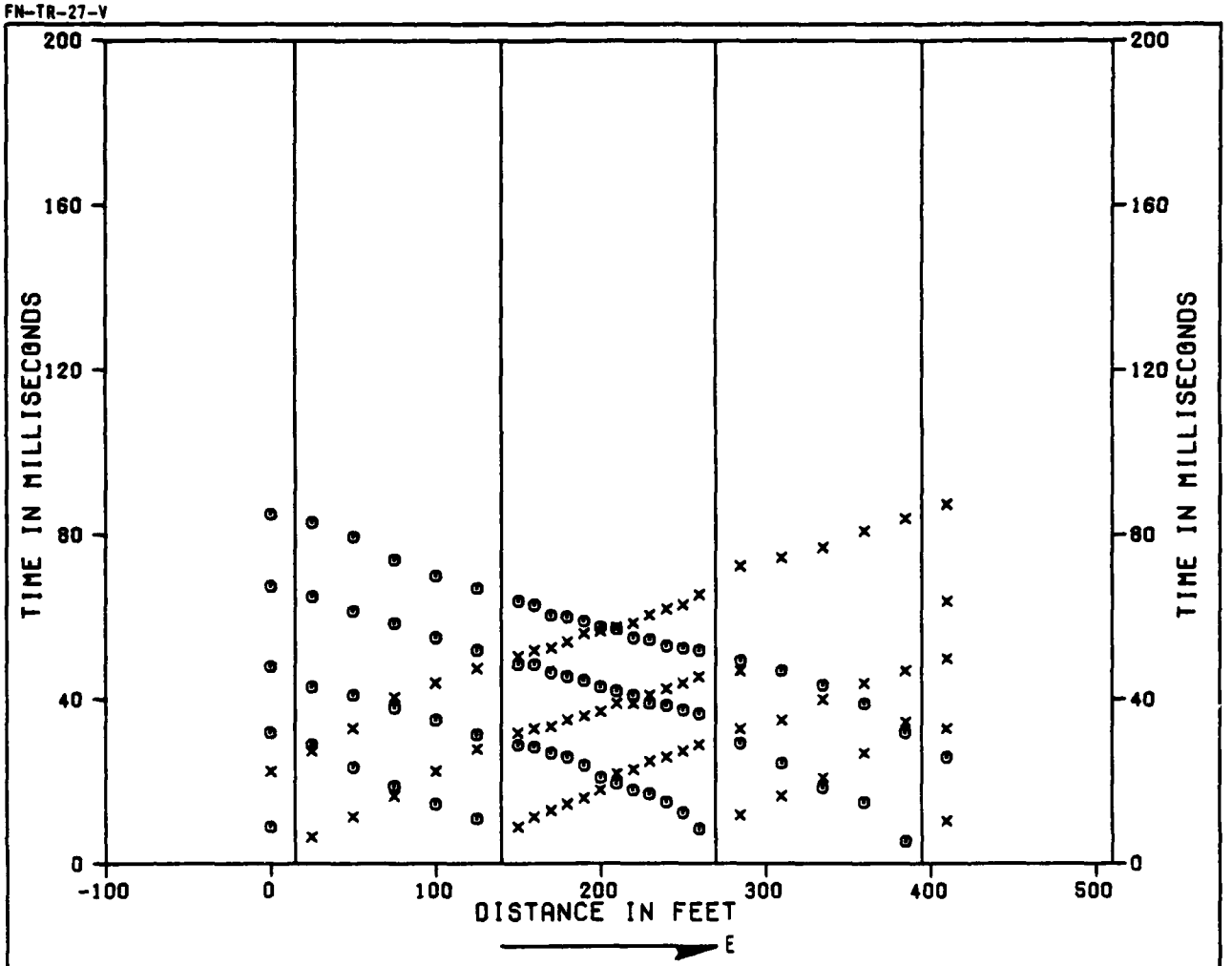
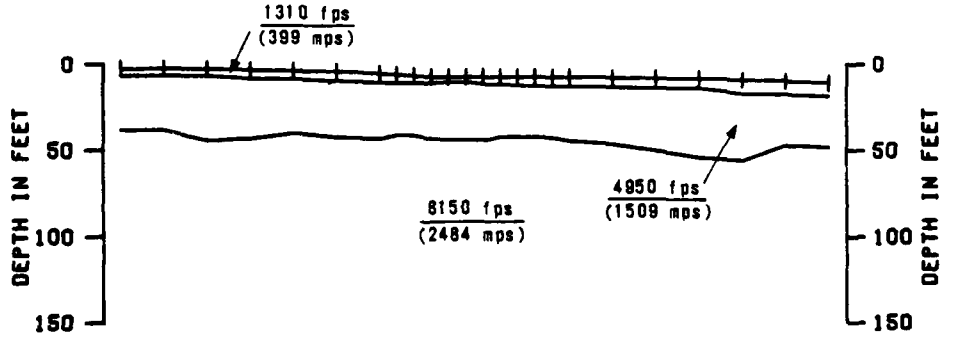
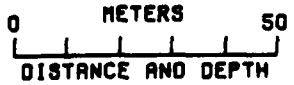
FN-TR-27-V







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

SEISMIC REFRACTION LINE WR-S-5
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-5

FUGRO NATIONAL, INC.

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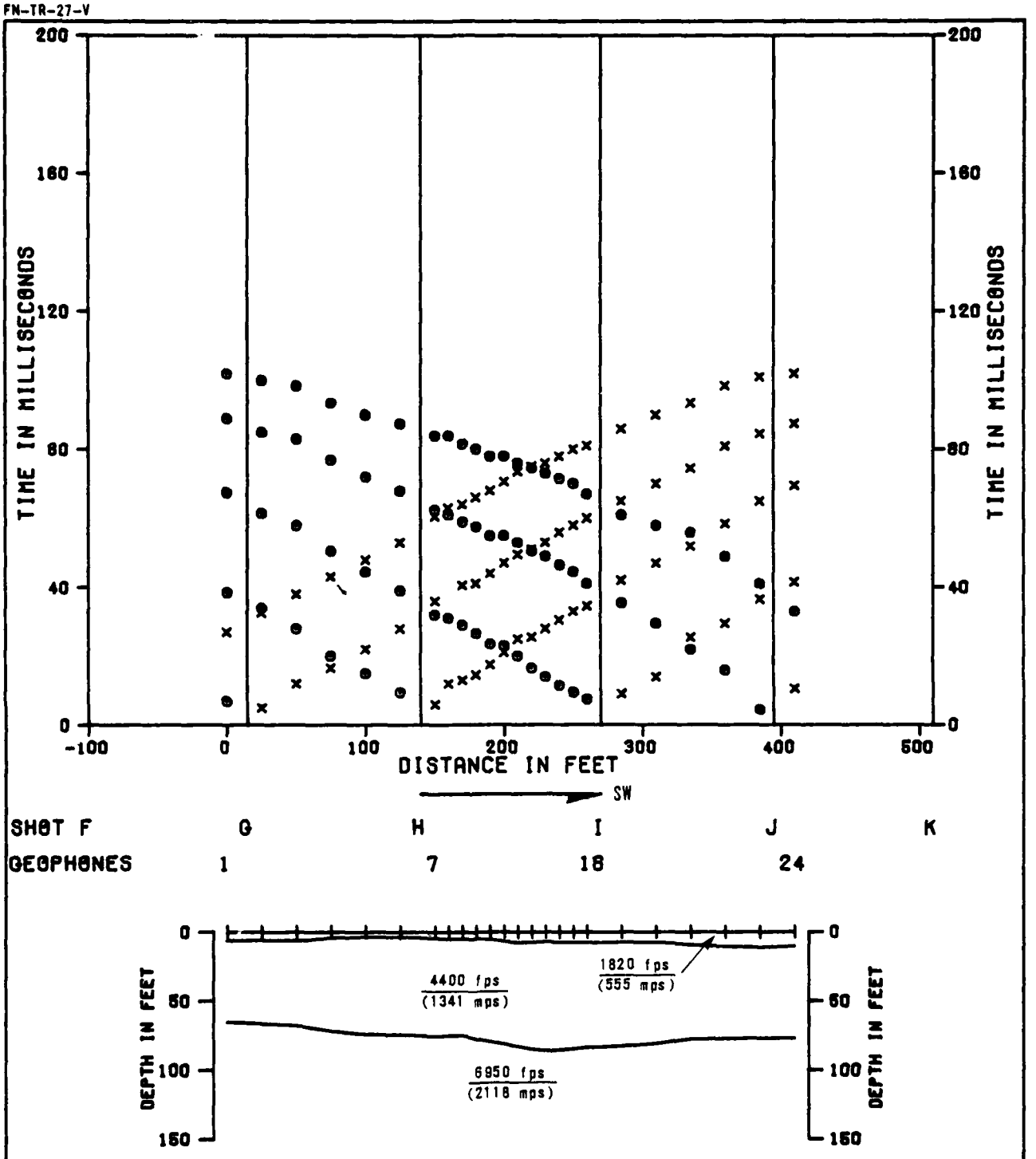

SEISMIC REFRACTION LINE WR-S-6
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-6

UGRO NATIONAL, INC.

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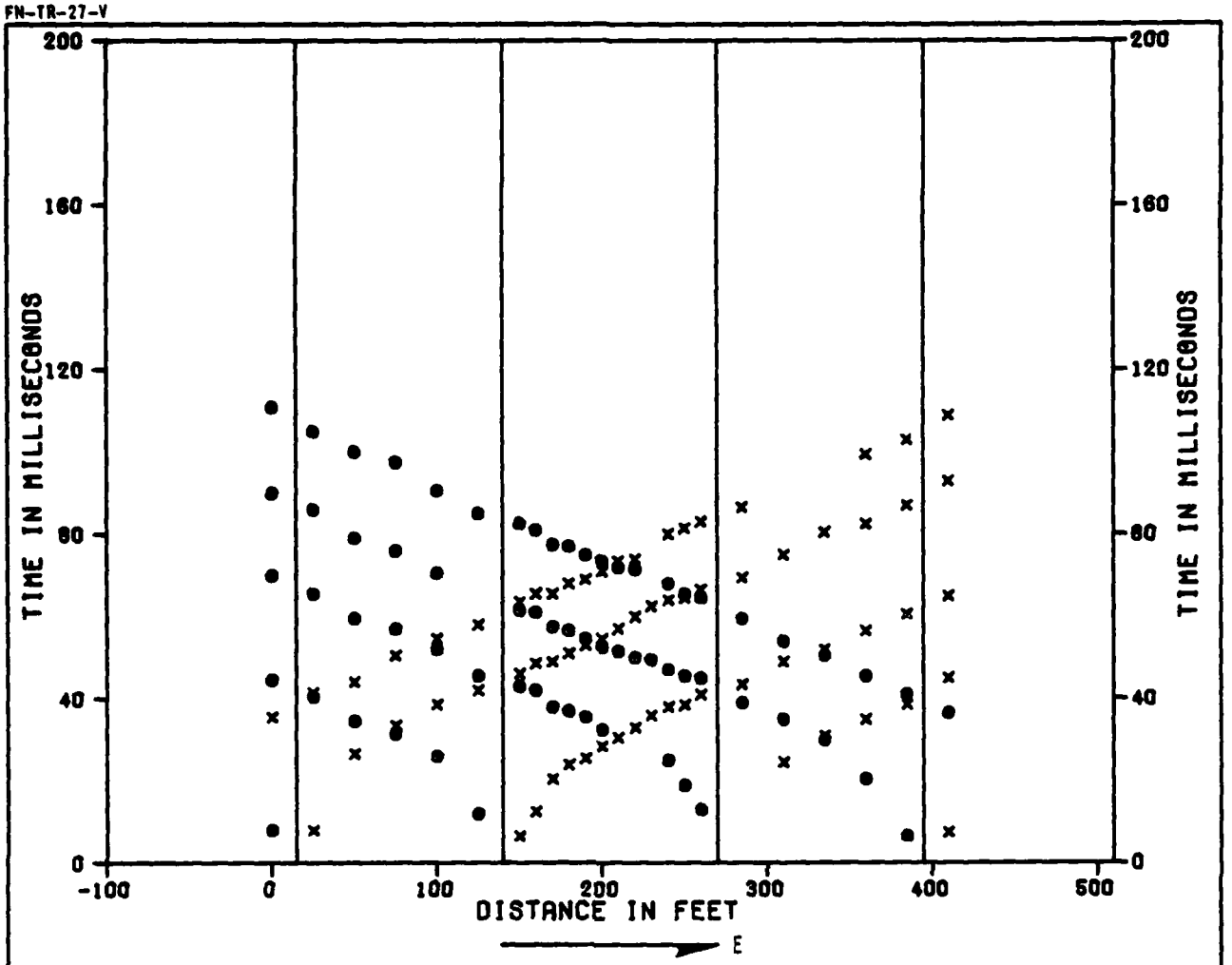
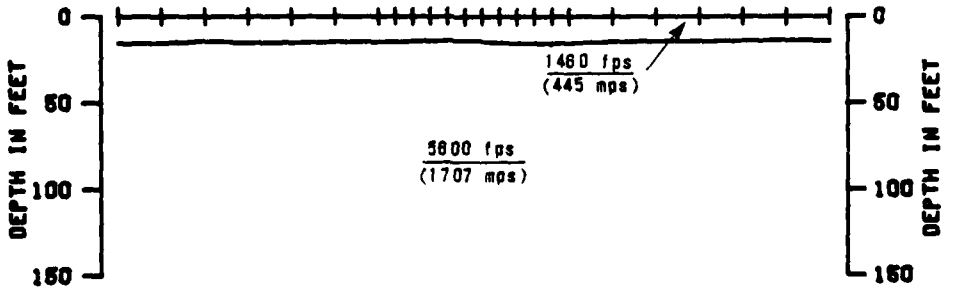
FN-TR-27-V





× TIMES TO RIGHT OF SHOTS
● TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE WR-S-7
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

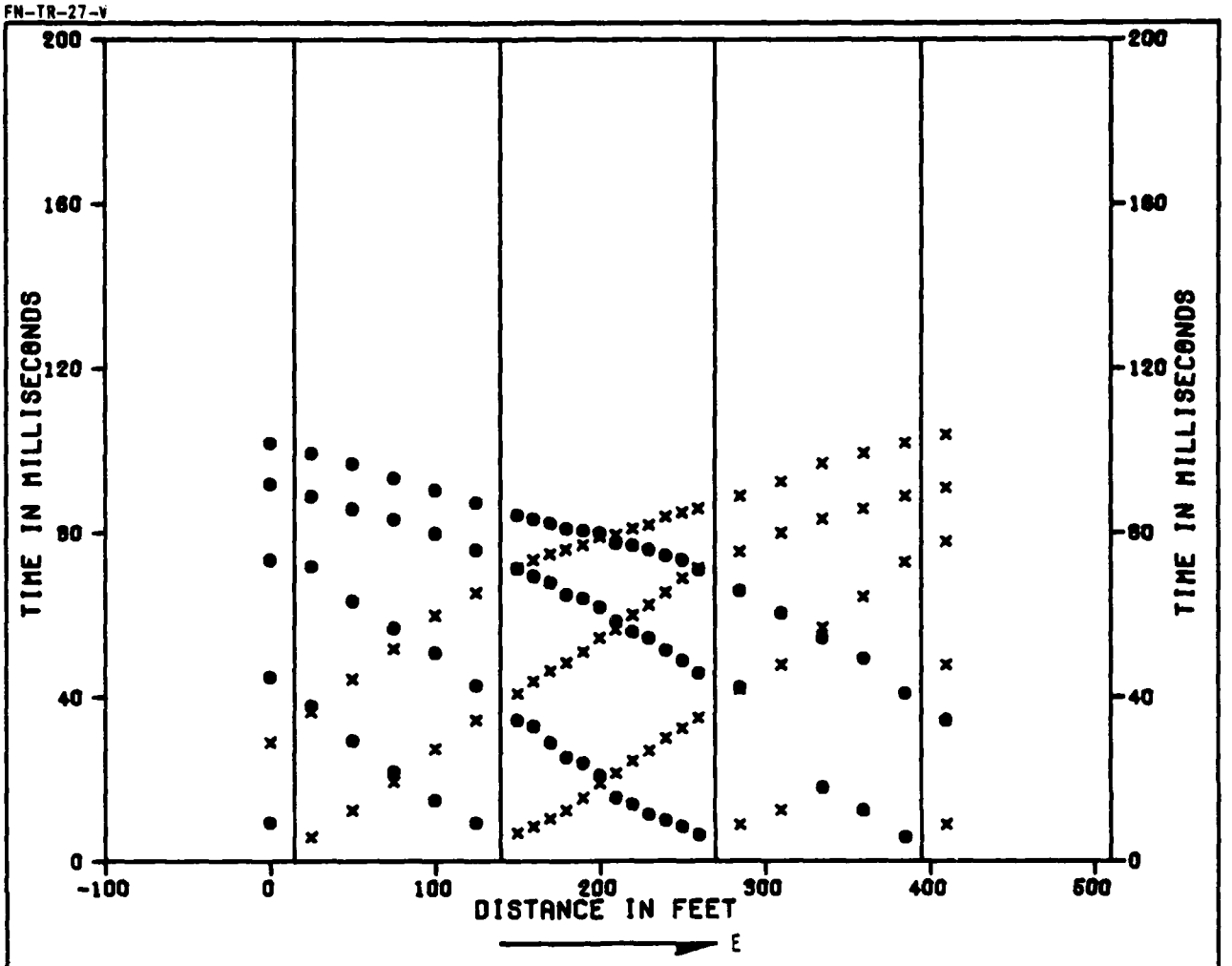
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

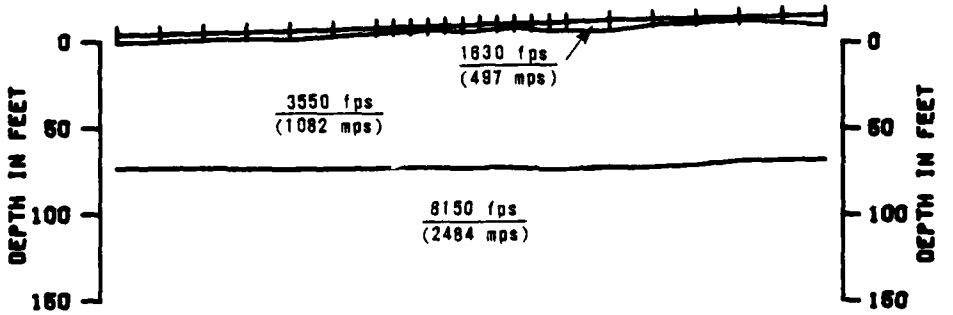
FIGURE
3-7

UGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

● TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE WR-S-8
TIME DISTANCE DATA AND VELOCTIY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

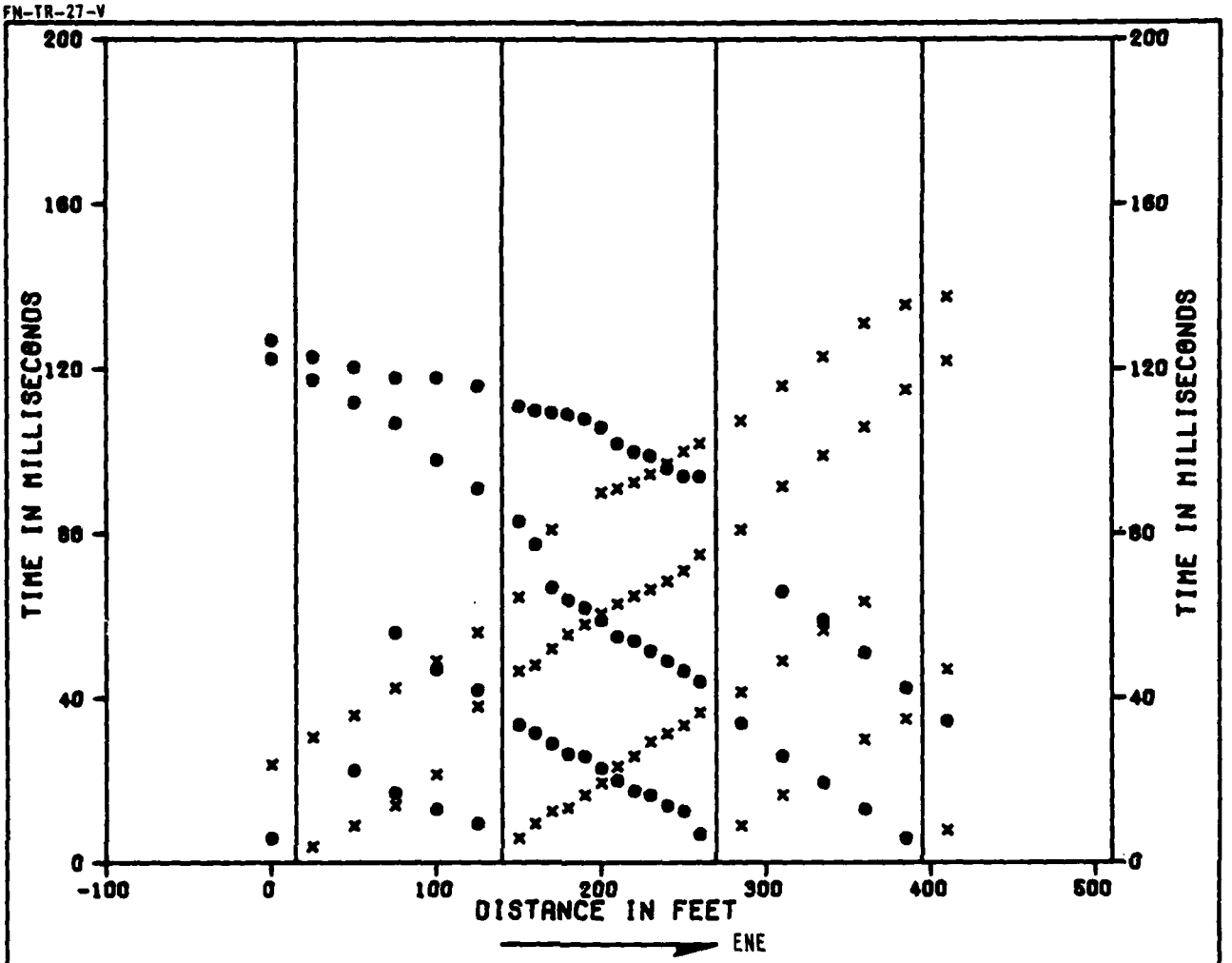
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

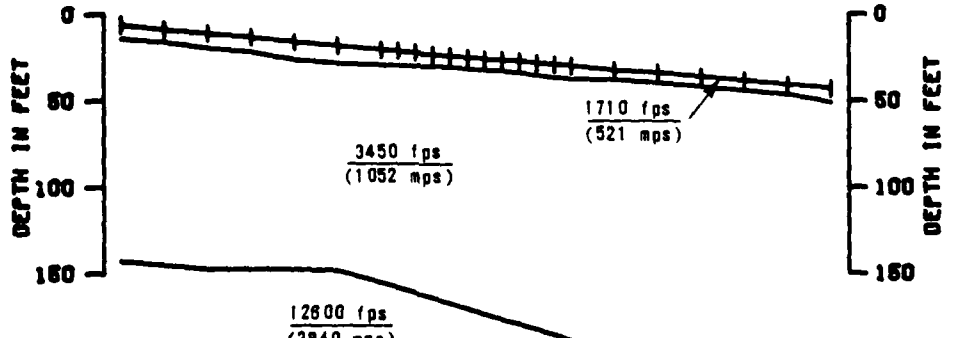
FIGURE
3-8

UGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V





× TIMES TO RIGHT OF SHOTS
● TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE WR-S-9
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

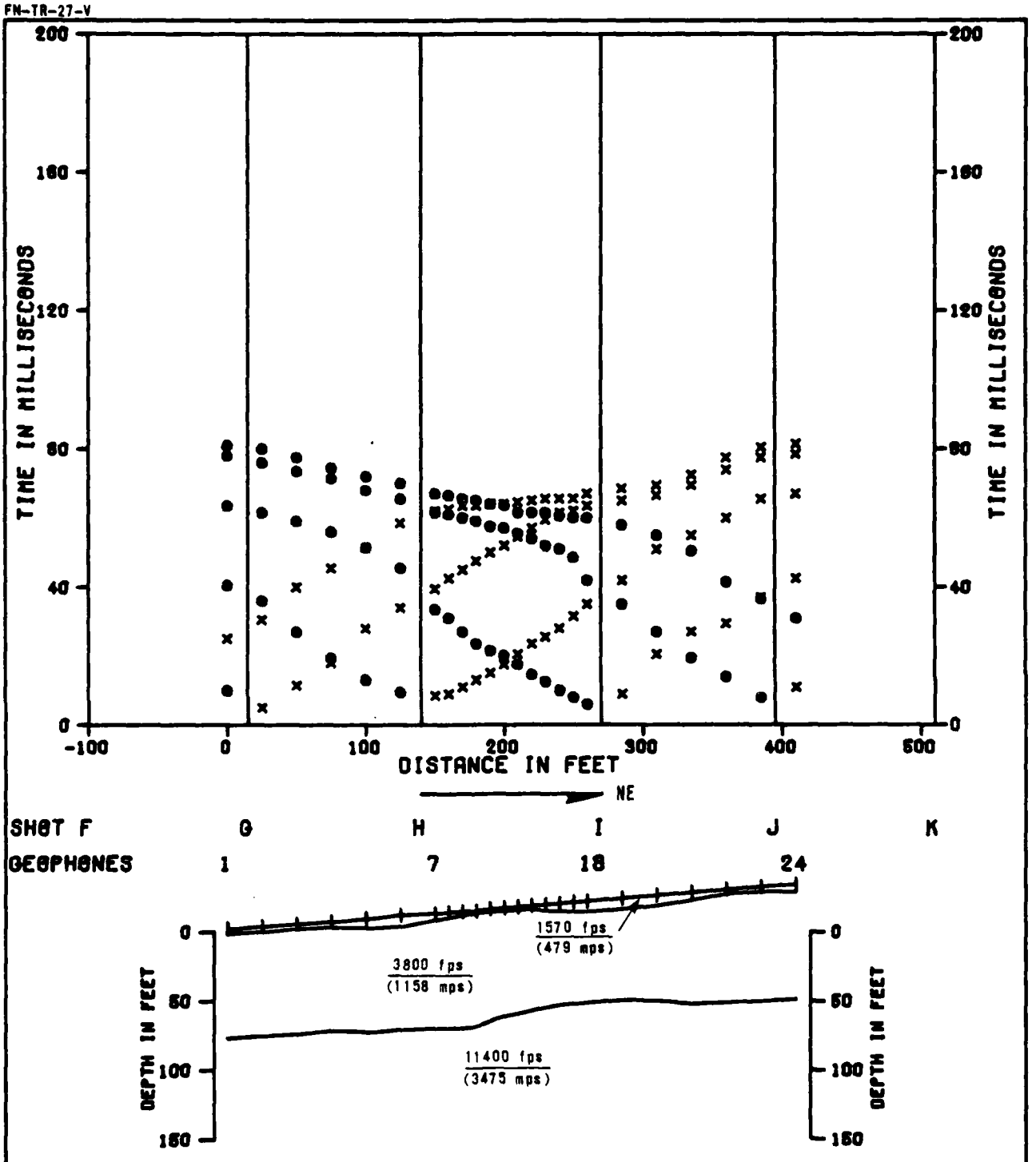
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-9

UGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V



SEISMIC REFRACTION LINE WR-S-10
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

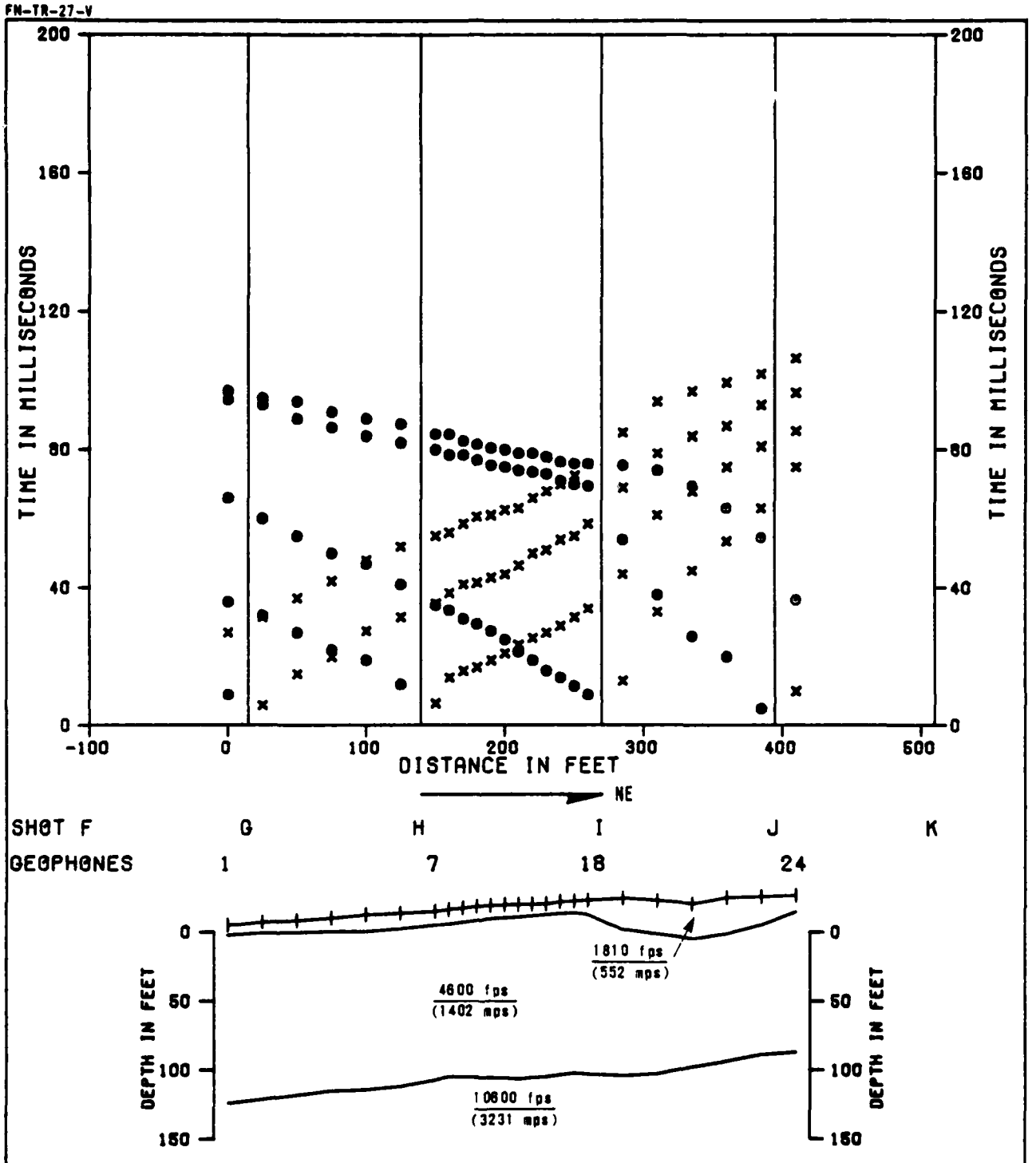
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-10

UGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V



SEISMIC REFRACTION LINE WR-S-11
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

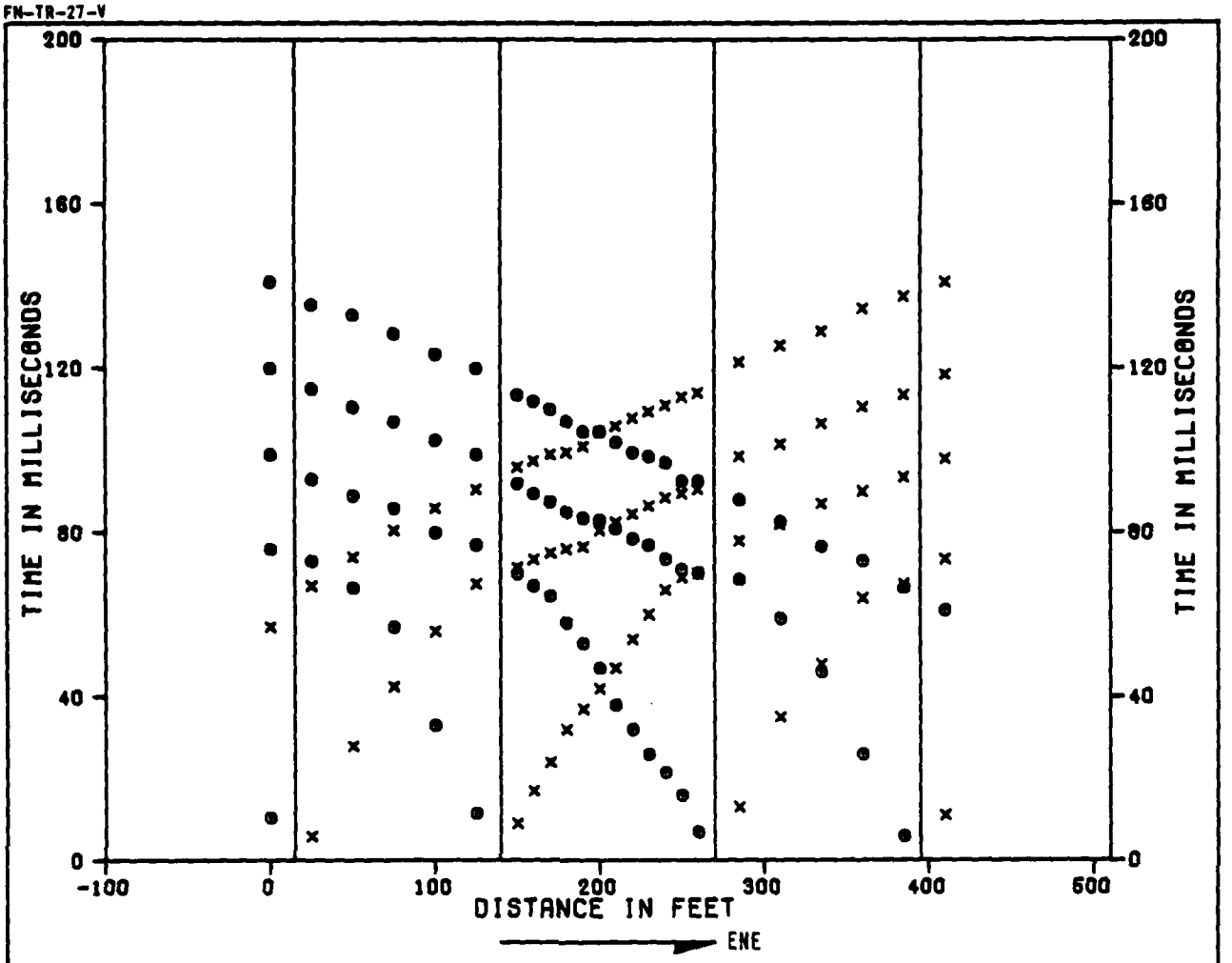
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

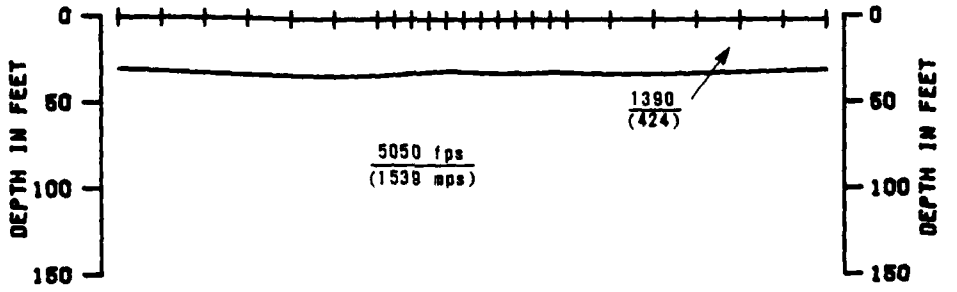
FIGURE
3-11

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V





0 METERS 50
DISTANCE AND DEPTH

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

SEISMIC REFRACTION LINE WR-S-12
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

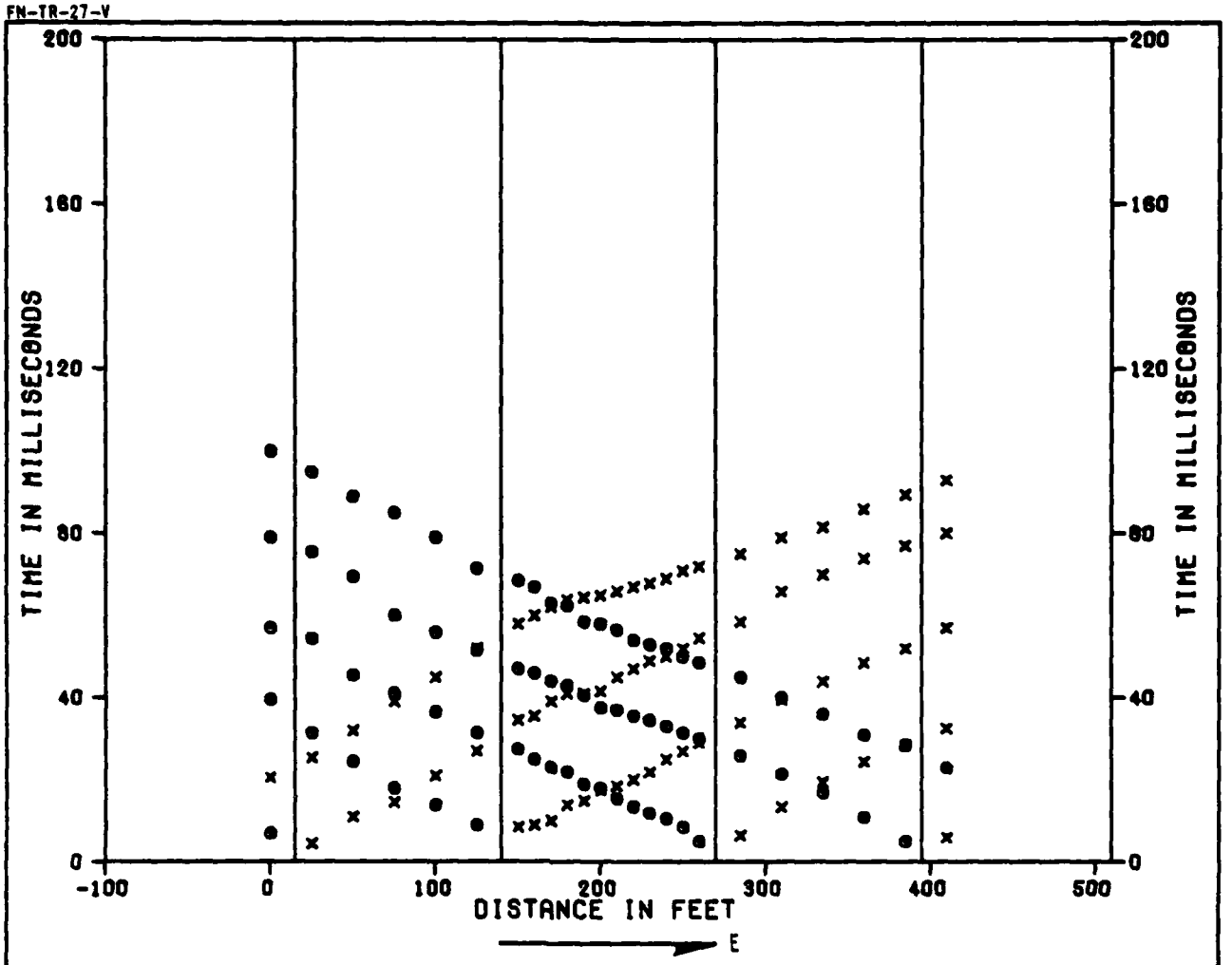
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

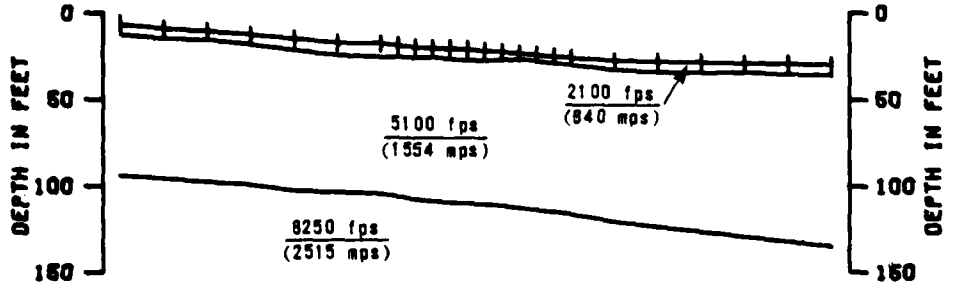
FIGURE
3-12

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

● TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE WR-S-13
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

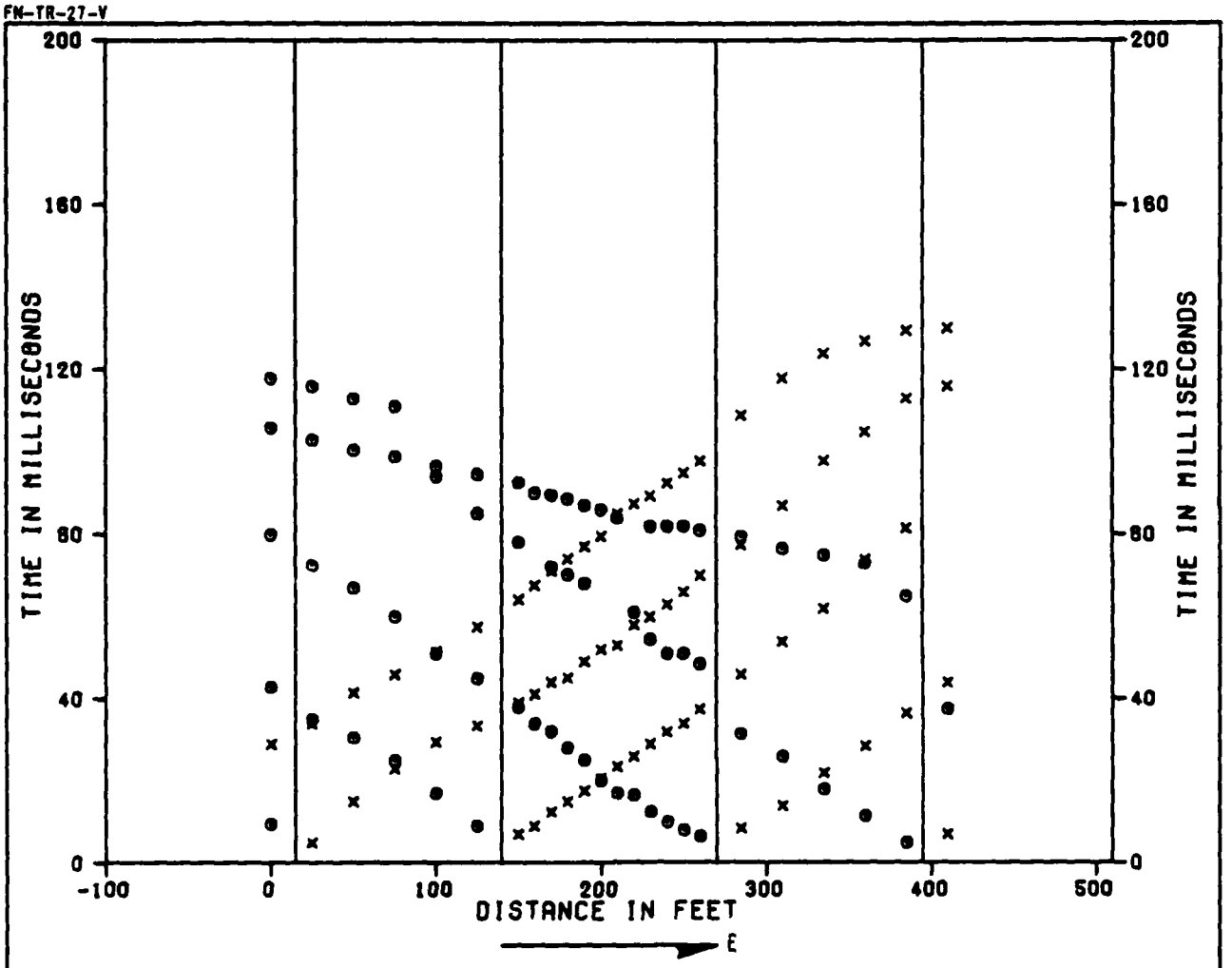
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

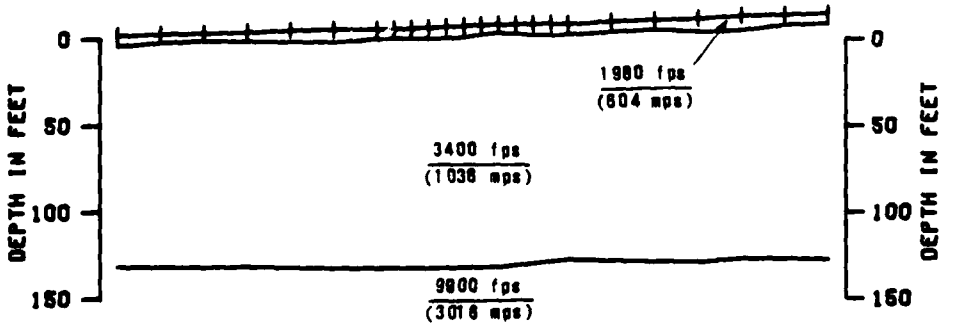
FIGURE
3-13

UGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE WR-S-14
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

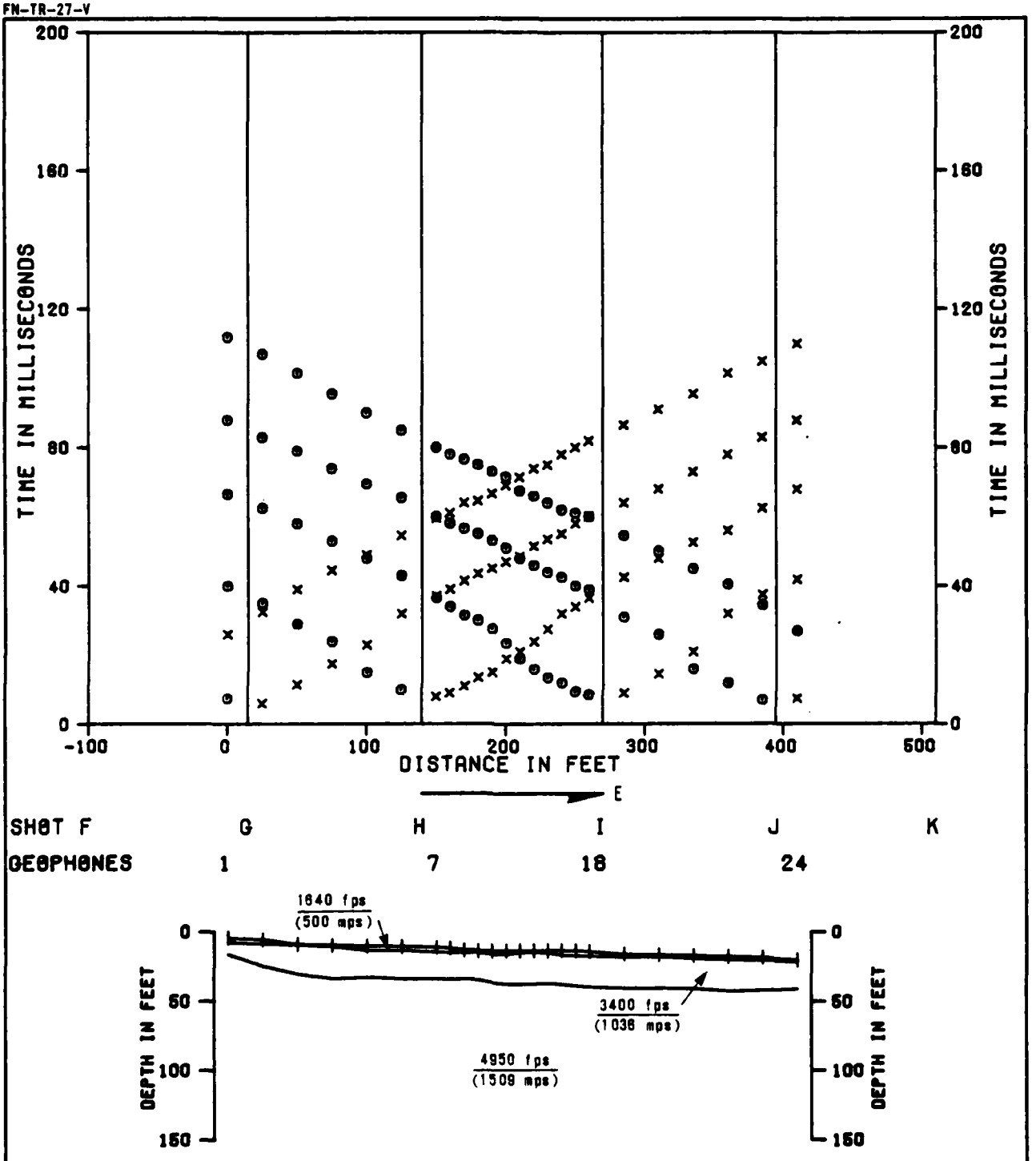
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-14

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V



SEISMIC REFRACTION LINE WR-S-15
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

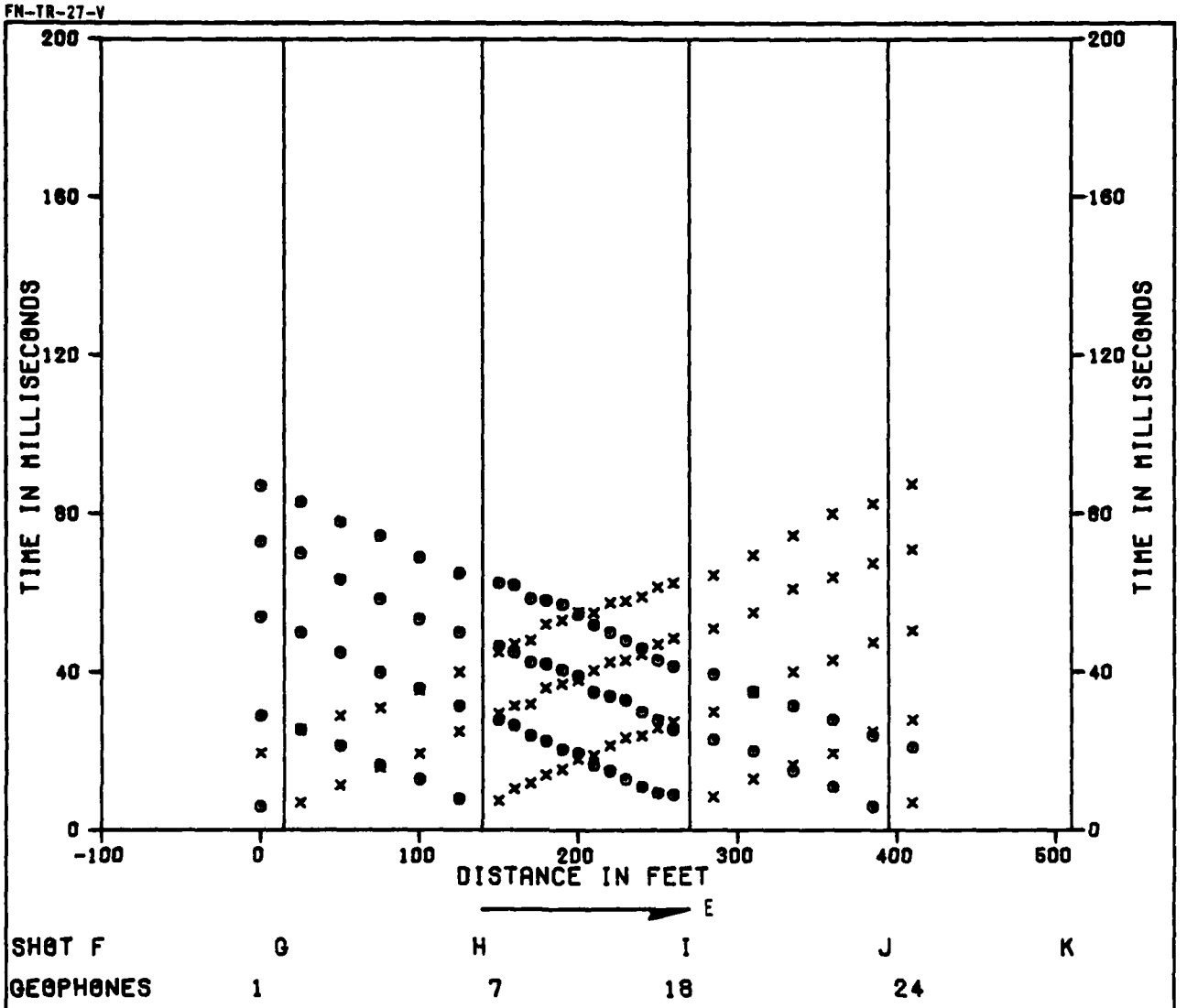
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

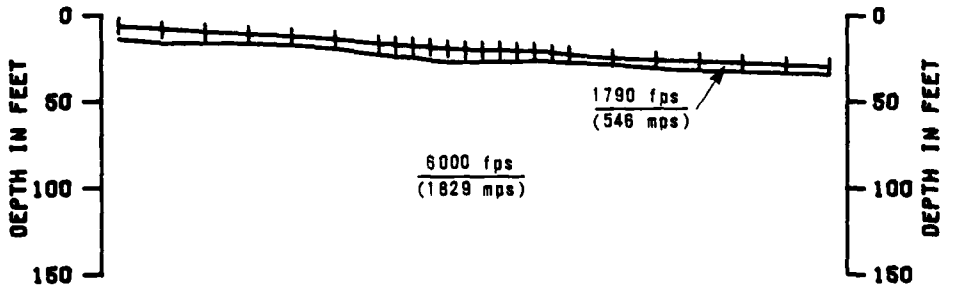
FIGURE
3-15

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V





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

SEISMIC REFRACTION LINE WR-S-16
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

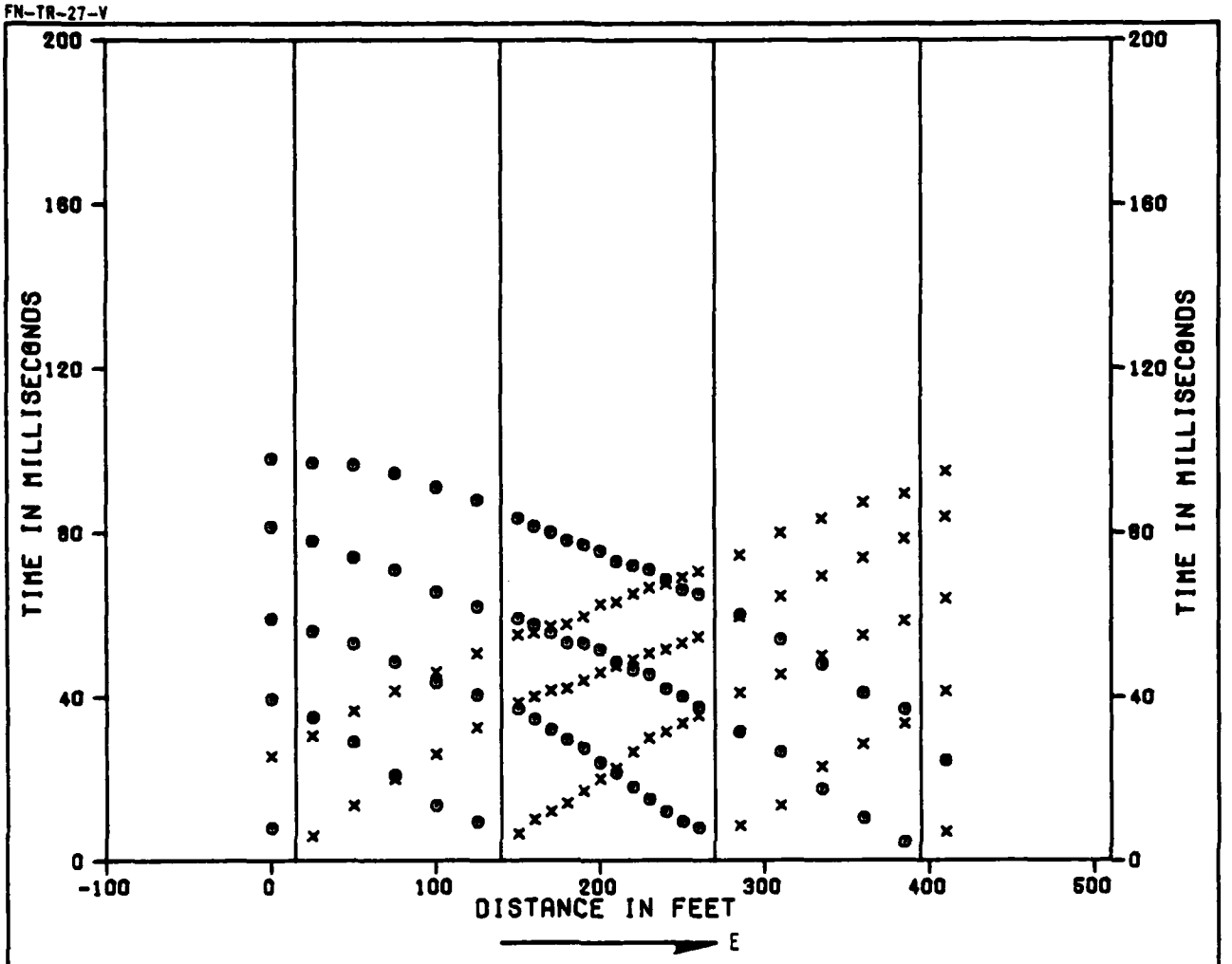
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

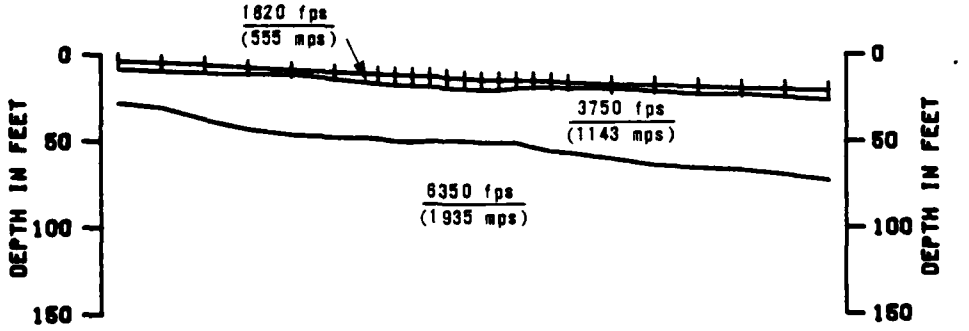
FIGURE
3-16

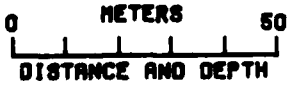
FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V







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

SEISMIC REFRACTION LINE WR-S-17
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

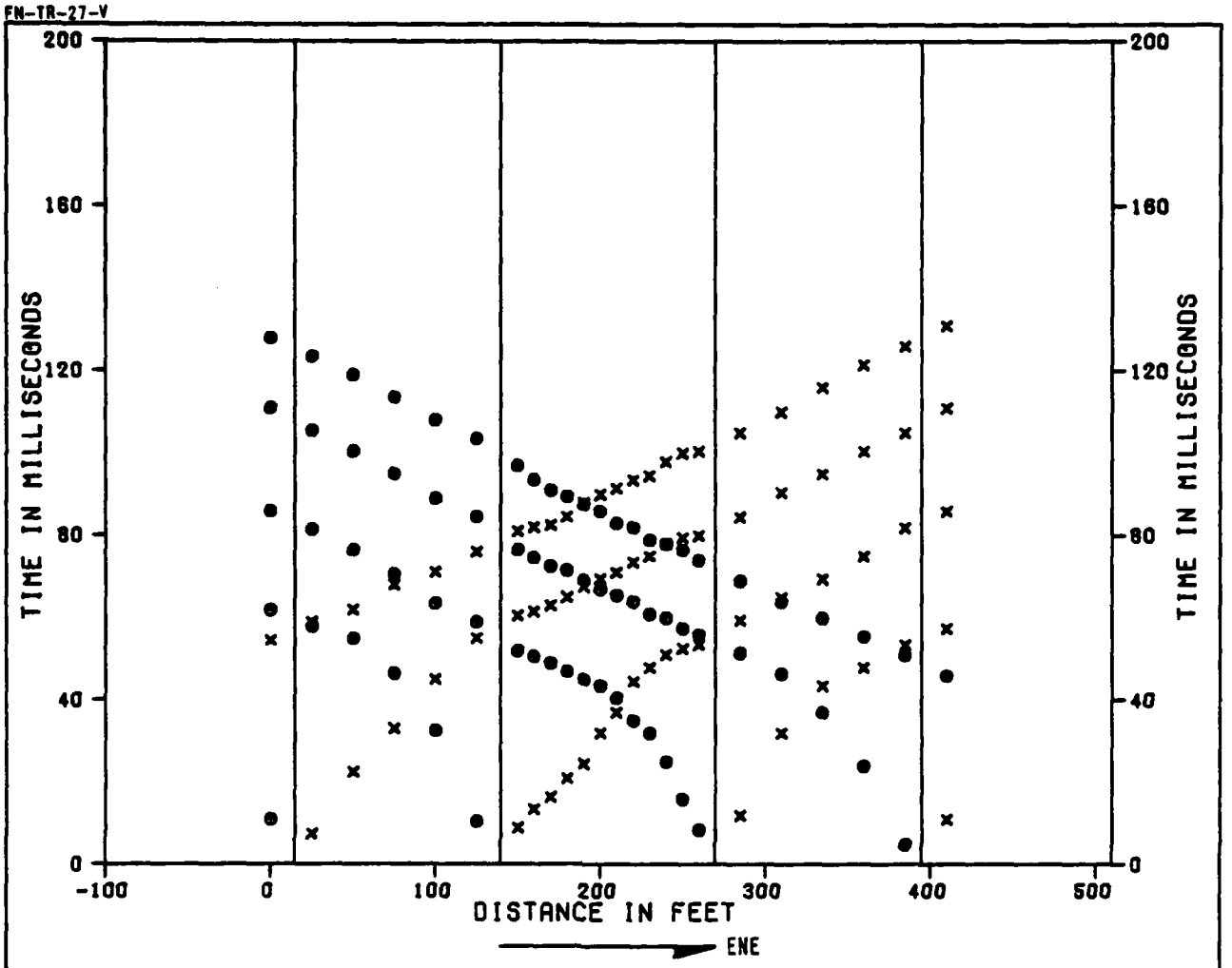
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

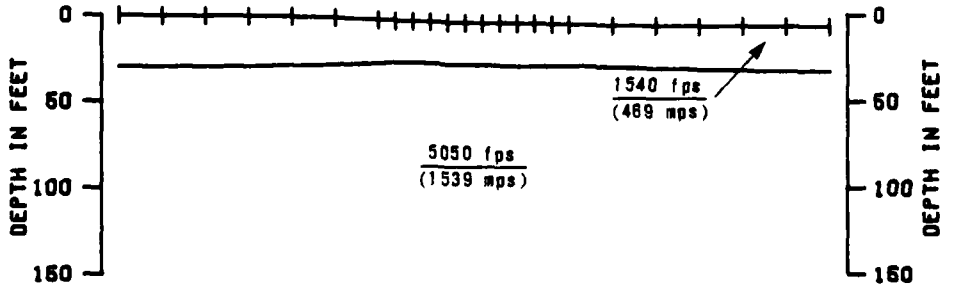
FIGURE
3-17

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE WR-S-18
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

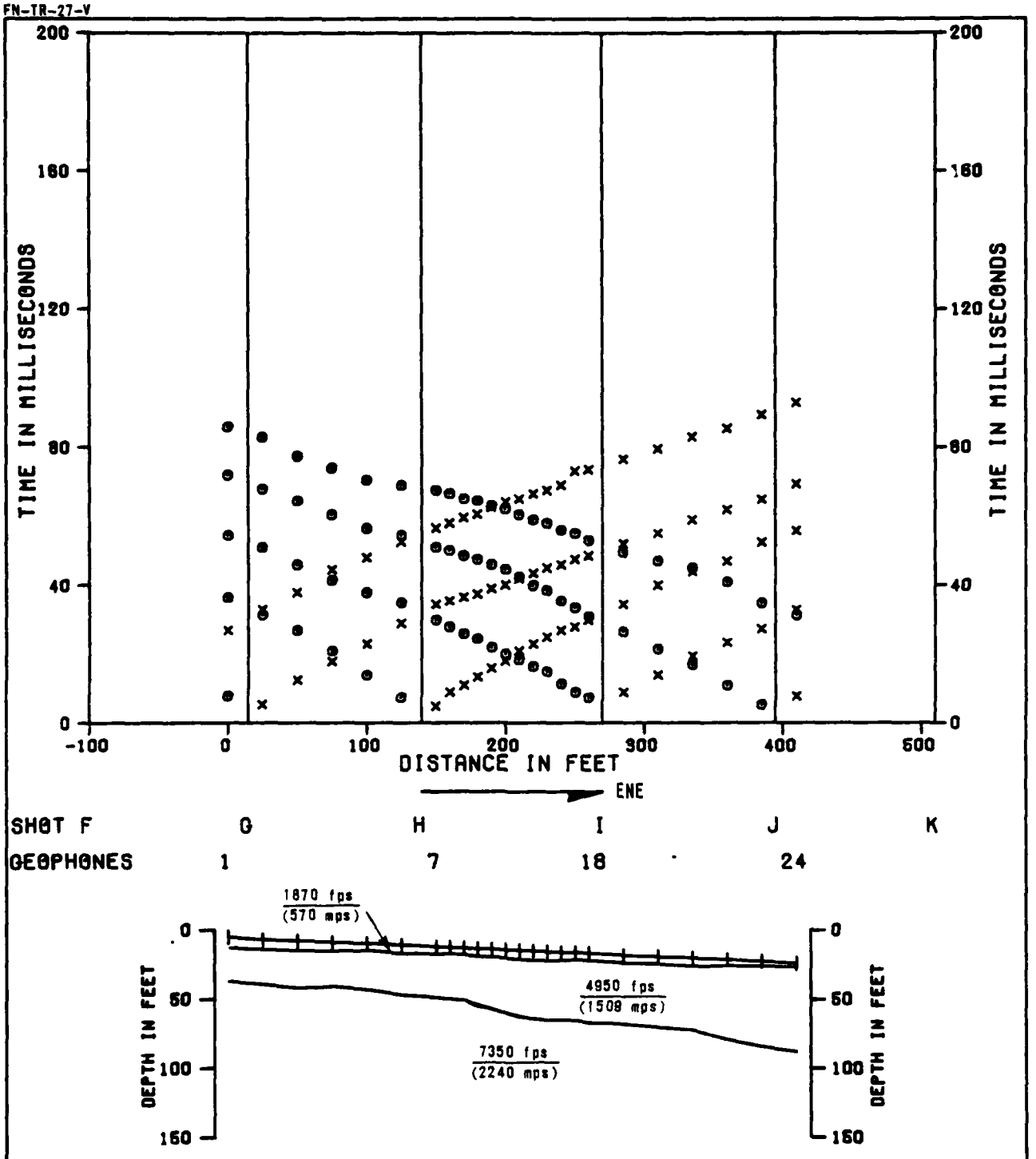
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-18

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-V



SEISMIC REFRACTION LINE WR-S-19
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-19

FUGRO NATIONAL, INC.

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SECTION 4.0

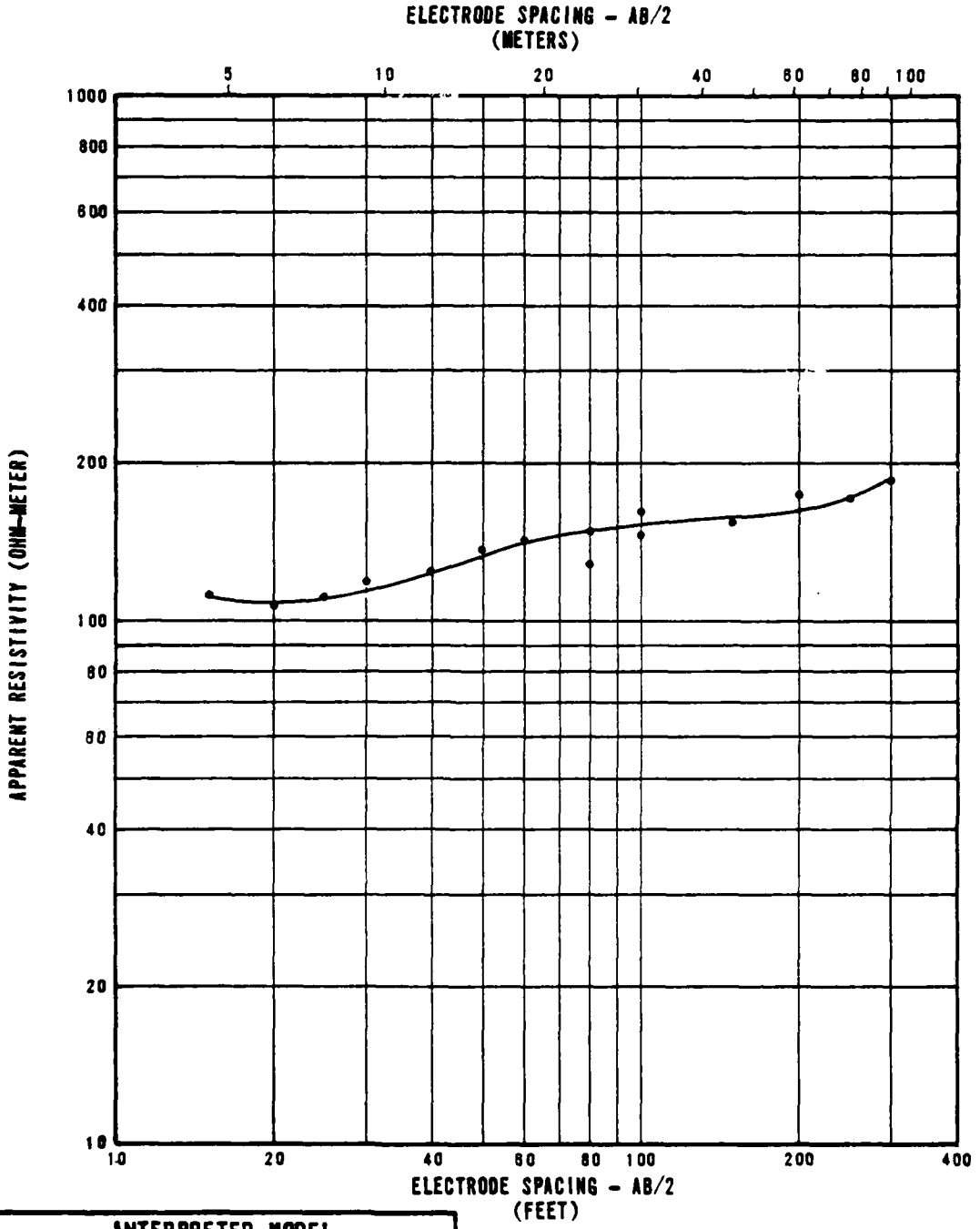
ELECTRICAL RESISTIVITY DATA

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.



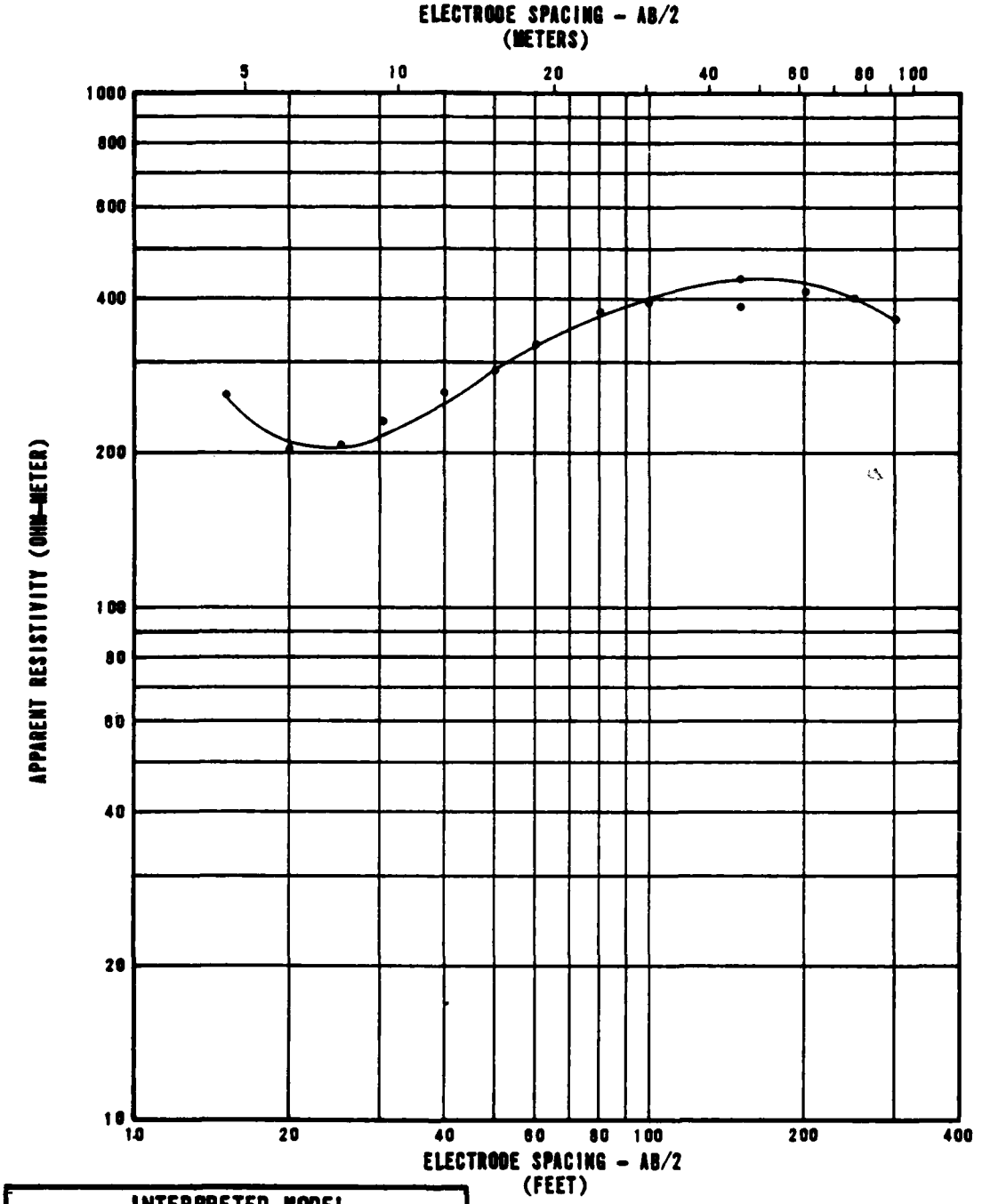
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	100
21	6	210
67	20	100
184	56	1700

RESISTIVITY SOUNDING WR-R-1
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-1

FUGRO NATIONAL, INC.



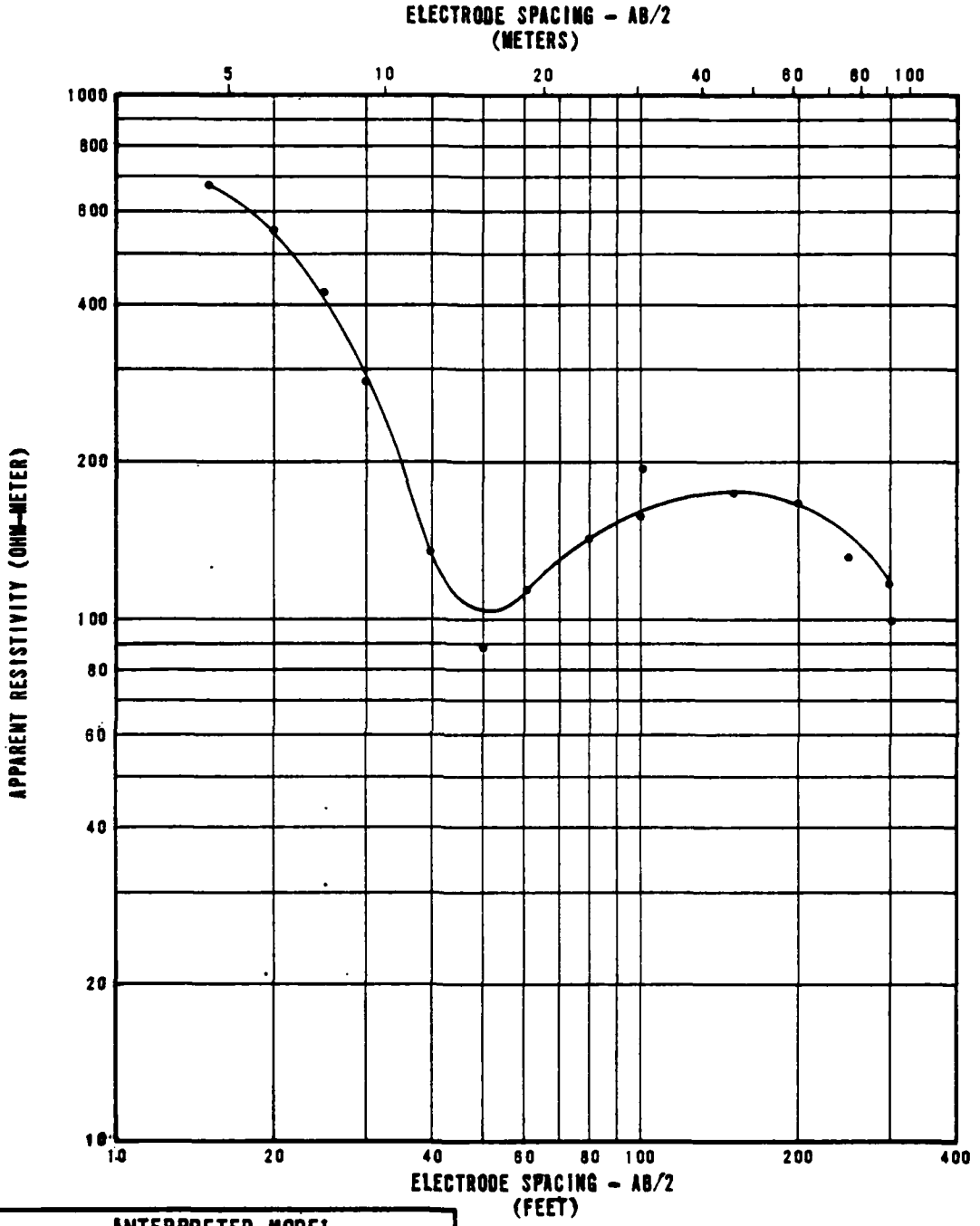
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	400
5	2	170
26	8	2490
37	11	420
122	37	170

RESISTIVITY SOUNDING WR-R-2
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-2

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	870
13	4	170
19	6	35
30	9	210
140	43	50

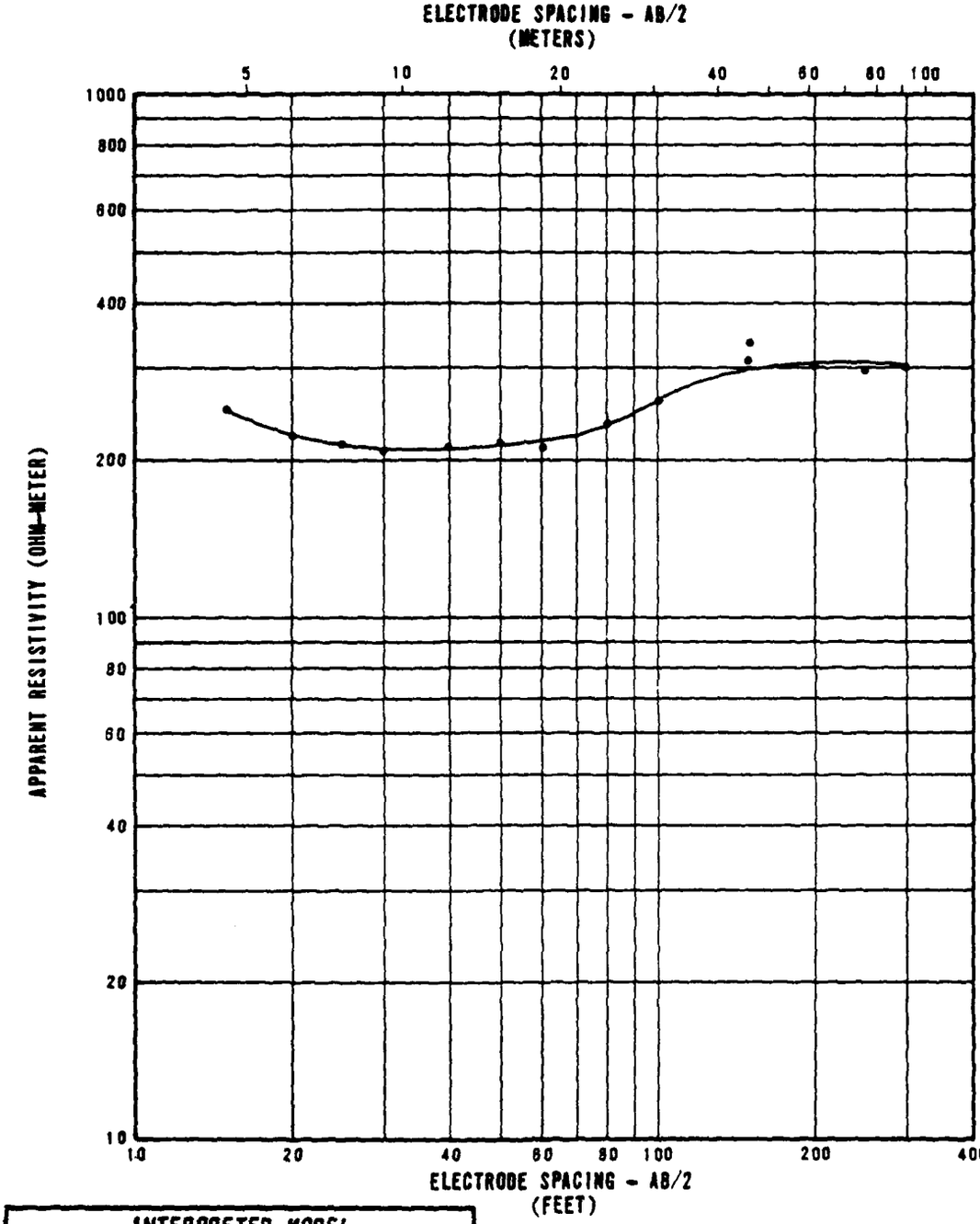
RESISTIVITY SOUNDING WR-R-3
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-3

FUGRO NATIONAL, INC.

FN-TR-27-V



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	300
7	2	180
38	12	380
189	58	220

RESISTIVITY SOUNDING WR-R-4
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-4

FUGRO NATIONAL, INC.

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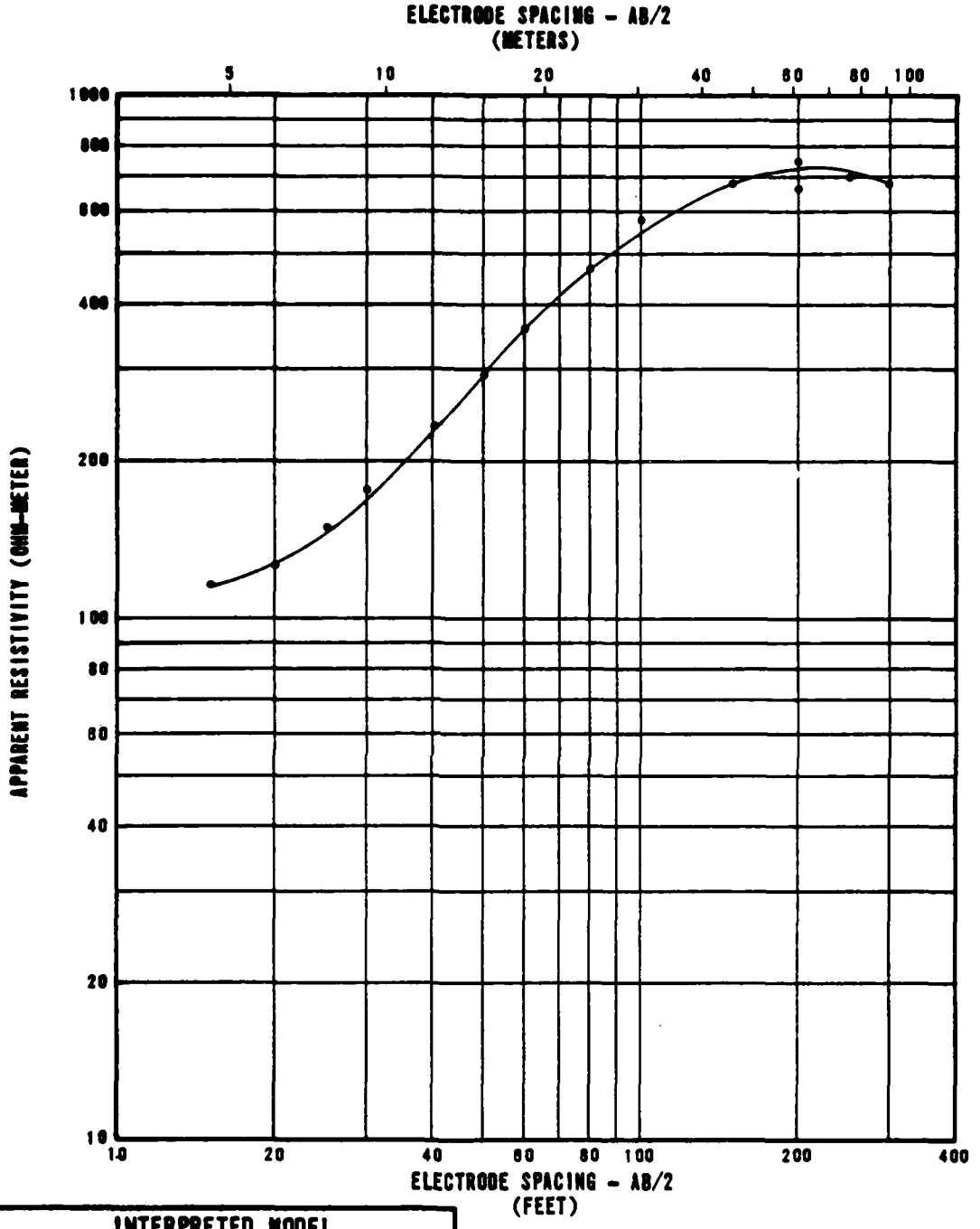
AFV-15



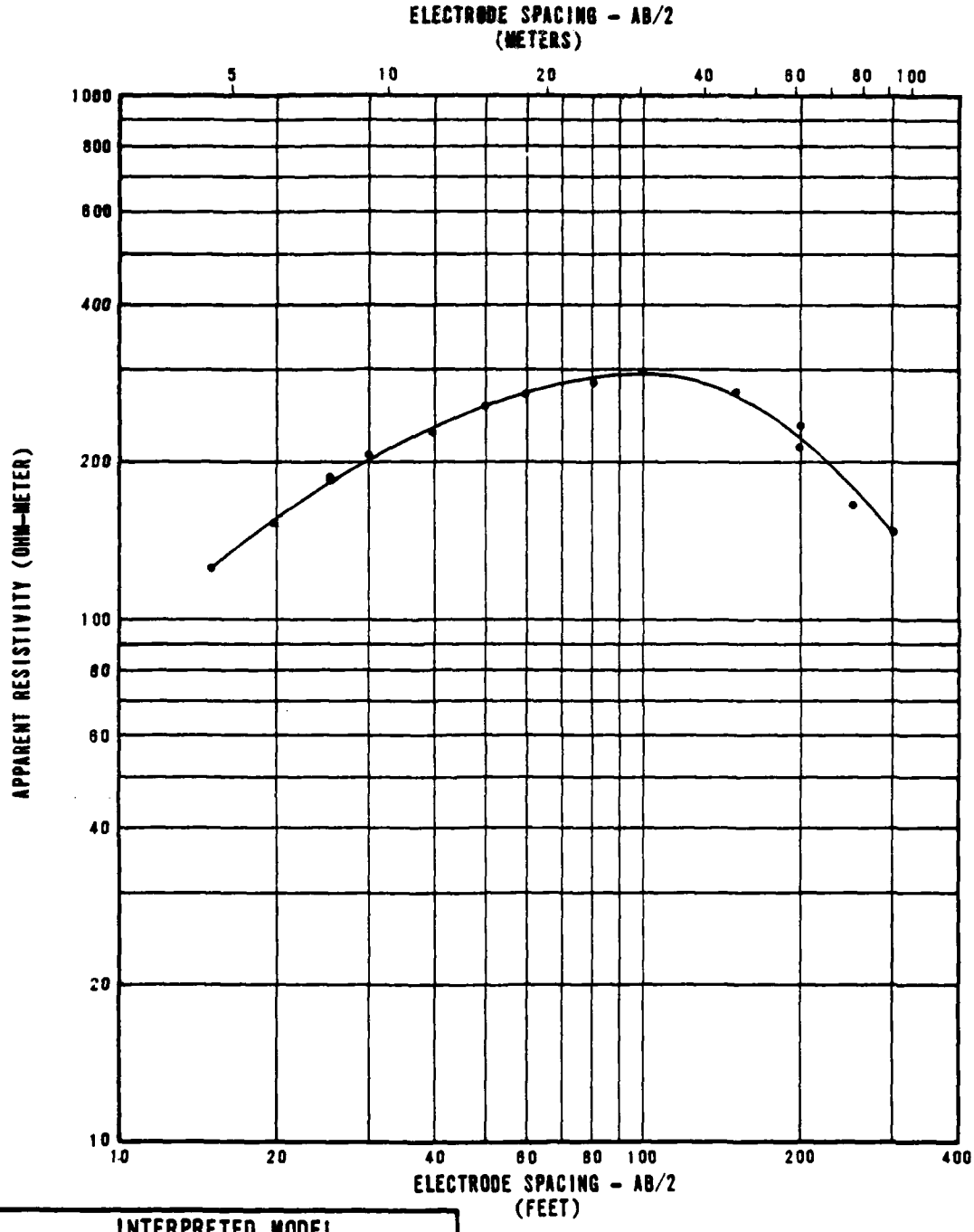
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	90
17	5	4750
42	13	680

RESISTIVITY SOUNDING WR-R-5
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-5

USRO NATIONAL, INC.



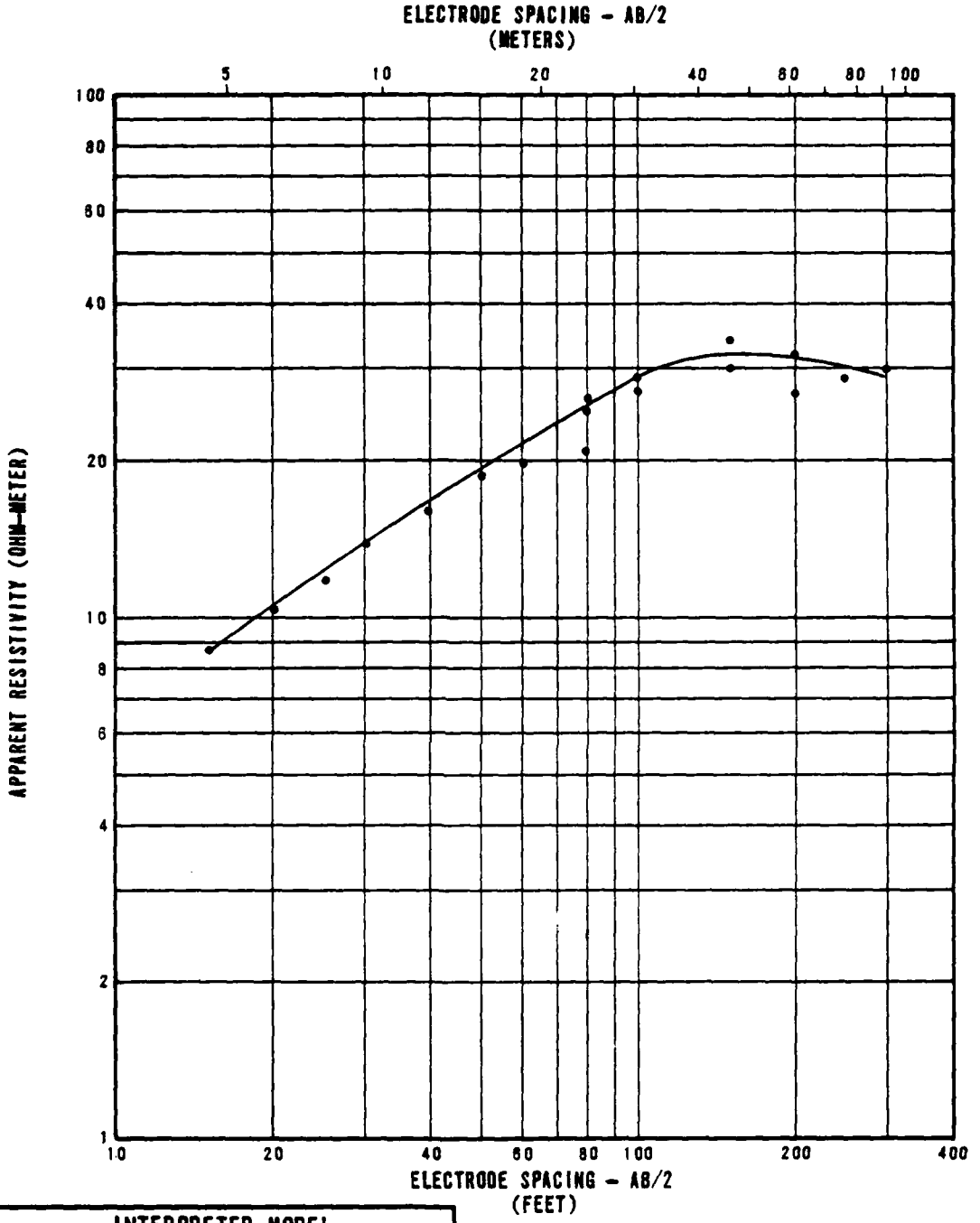
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	90
7	2	360
101	31	90
187	51	35

RESISTIVITY SOUNDING WR-R-6
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-6

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	6
9	3	30
25	8	60
66	20	30
168	51	15

RESISTIVITY SOUNDING WR-R-7
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

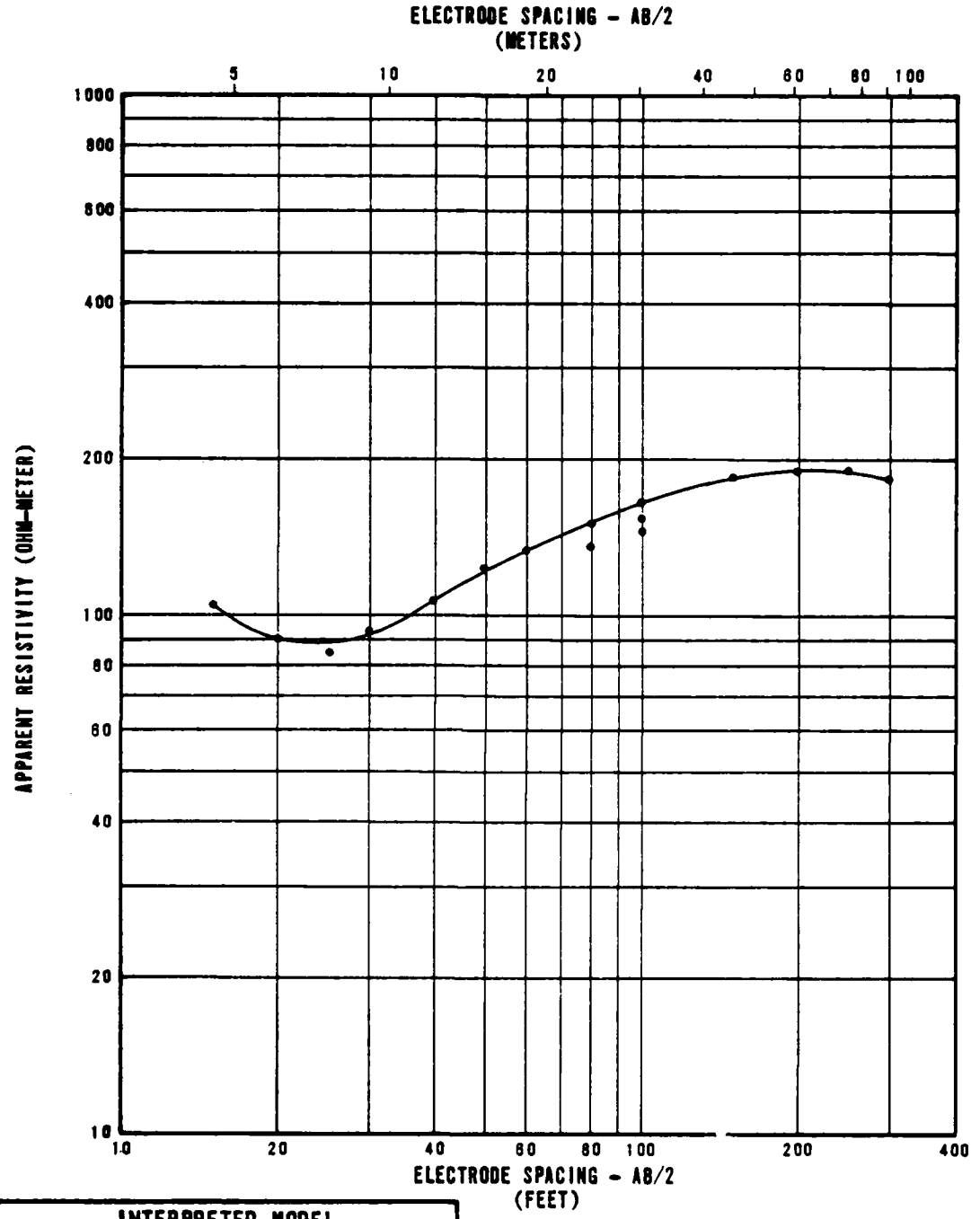
FIGURE 4-7

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15

FN-TR-27-4



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	160
6	2	70
26	8	380
62	19	170
205	62	110

RESISTIVITY SOUNDING WR-R-8
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

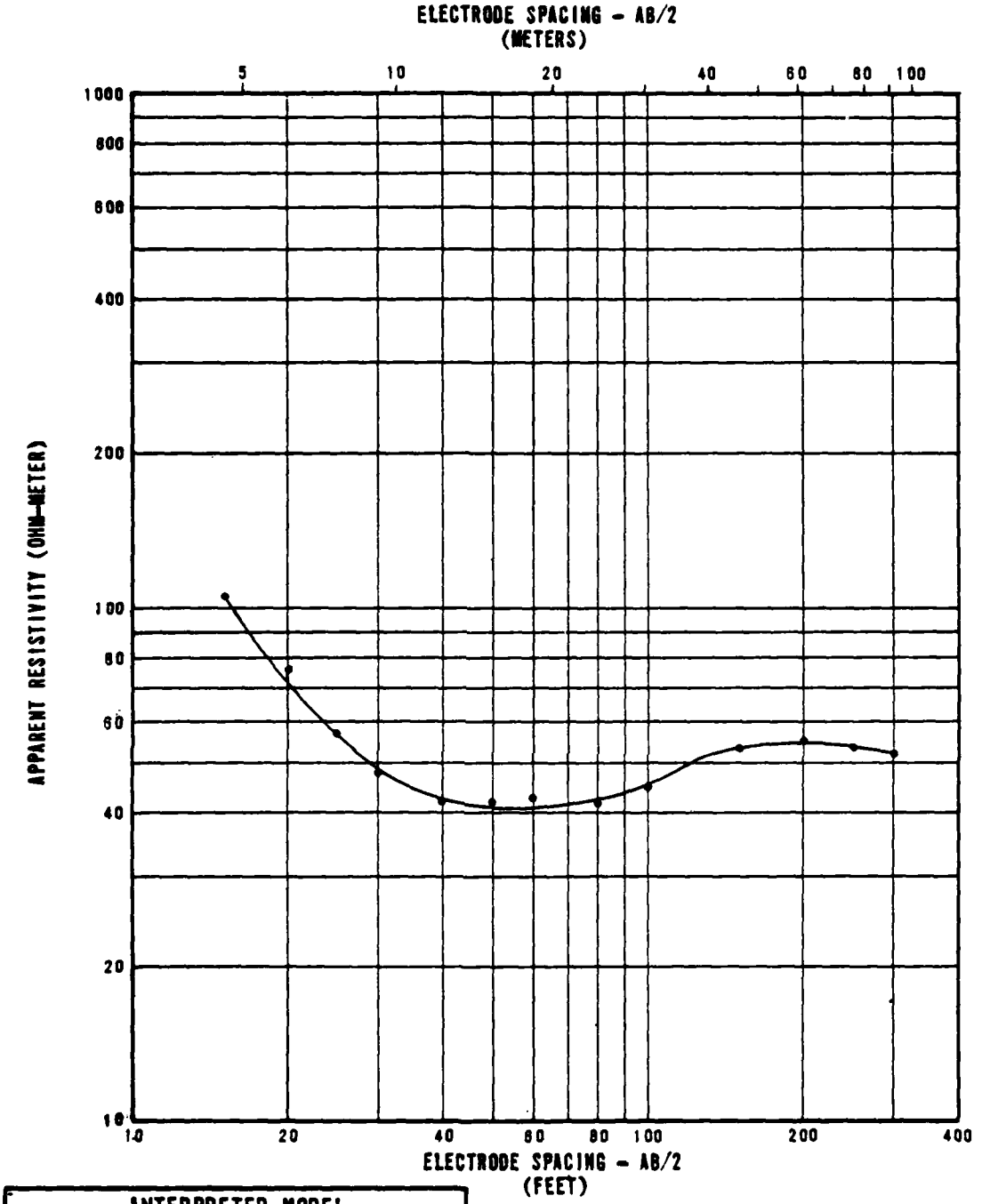
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-8

UGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	1940
7	2	370
58	18	790
166	51	320

RESISTIVITY SOUNDING WR-R-9
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

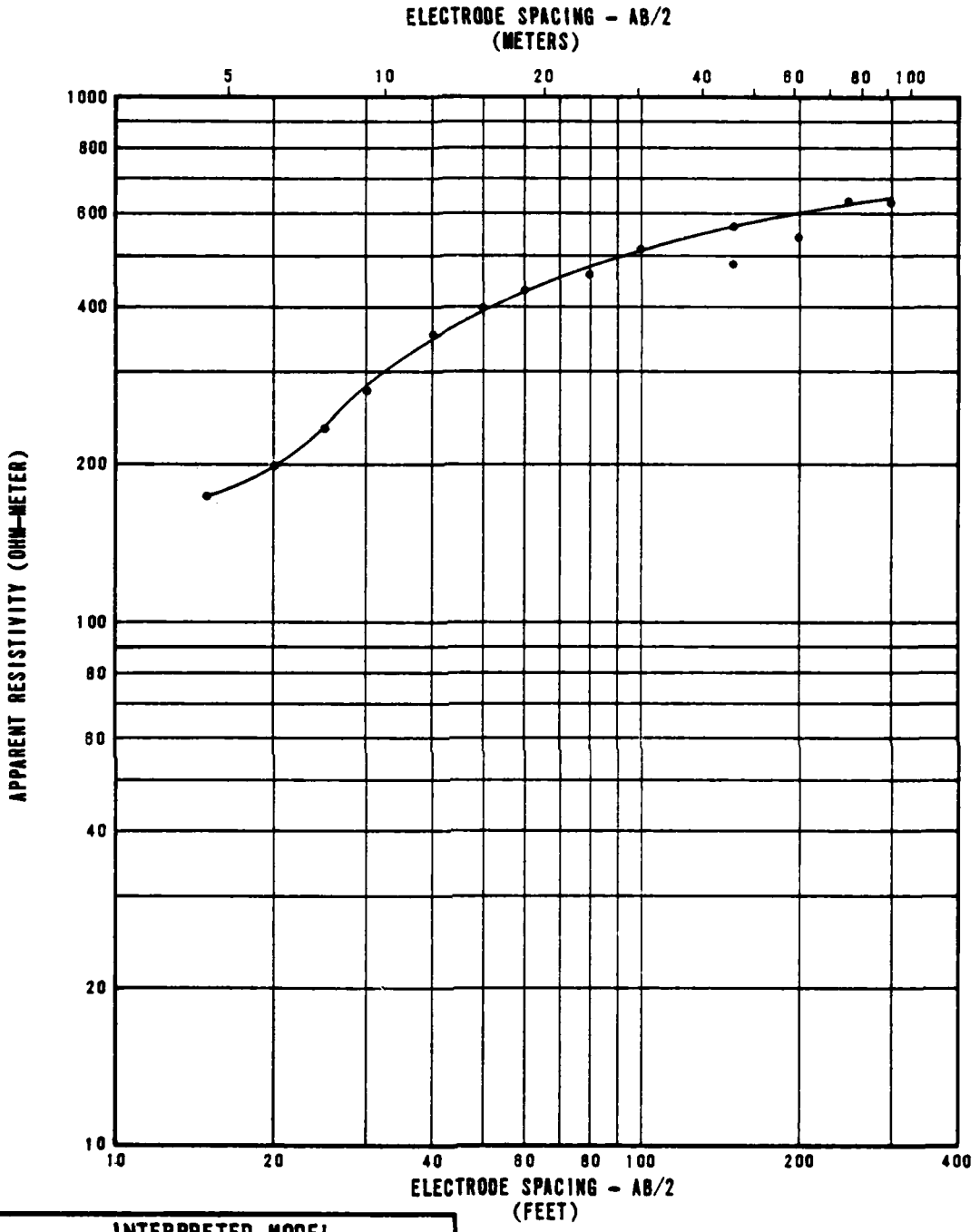
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSC

FIGURE
4-9

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



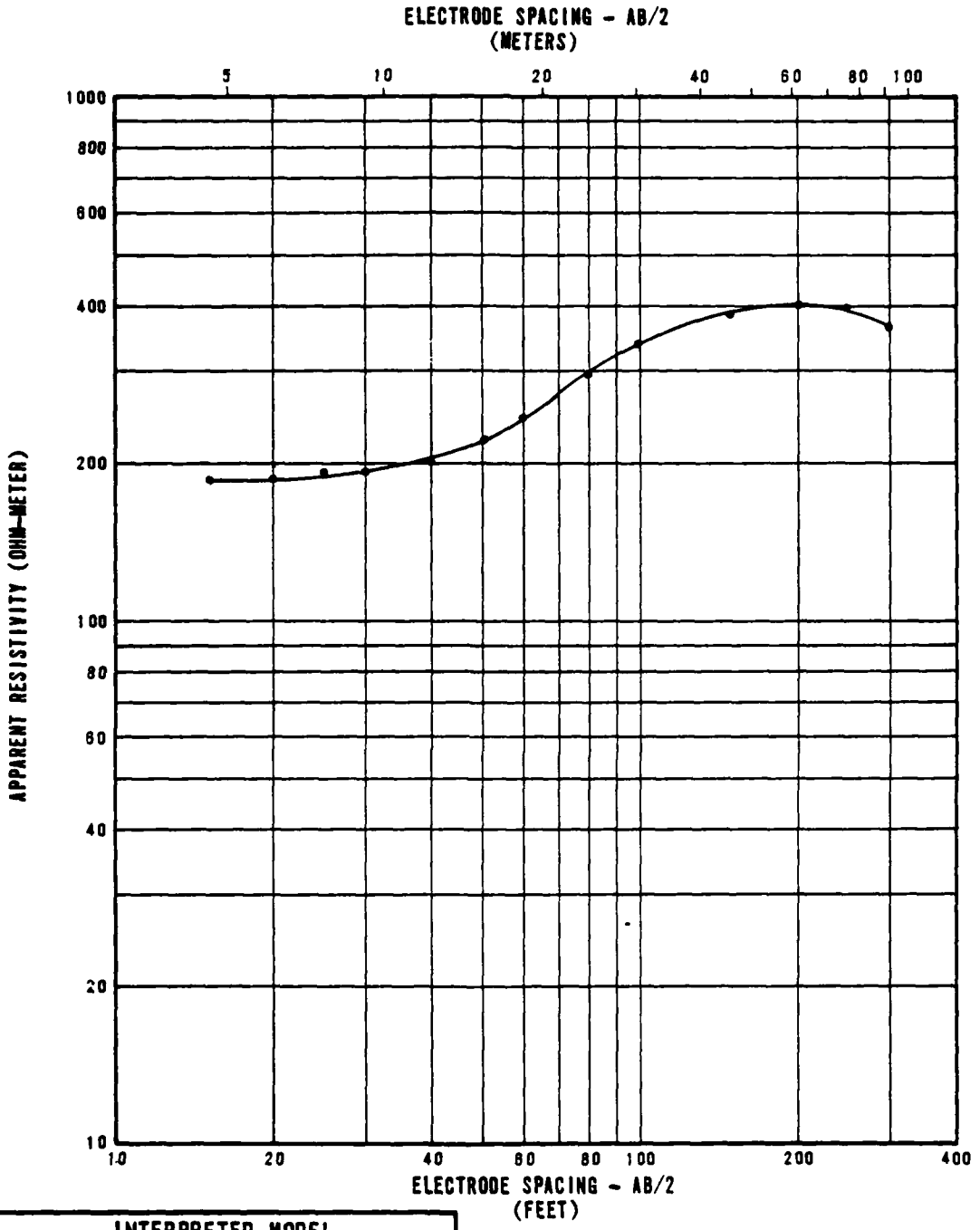
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	150
11	3	870

RESISTIVITY SOUNDING WR-R-10
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-10

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	190
33	10	590
190	58	75

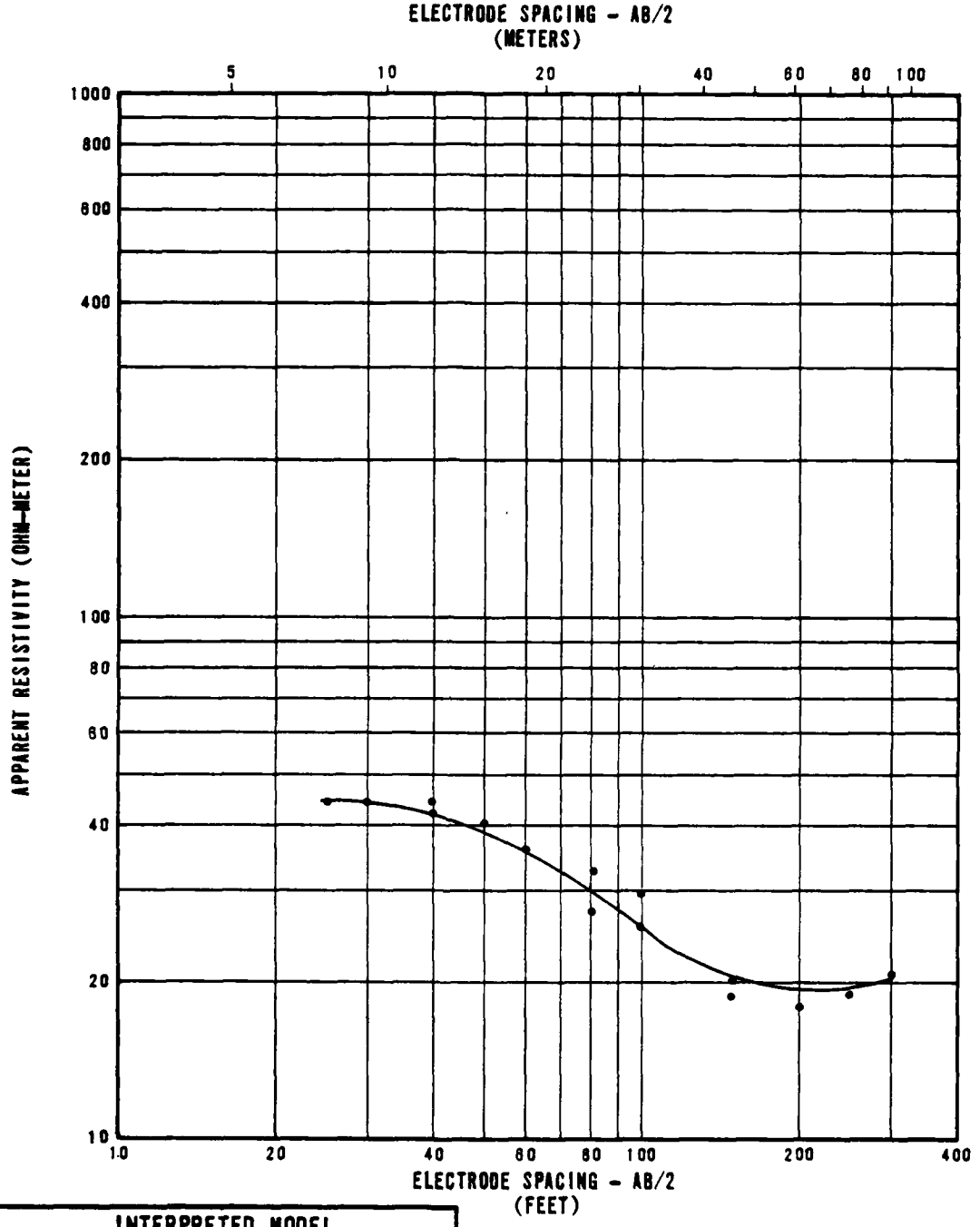
RESISTIVITY SOUNDING WR-R-11
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-11

FUGRO NATIONAL, INC.

FN-TR-27-V



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	45
36	11	14
144	44	35

RESISTIVITY SOUNDING WR-R-12
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

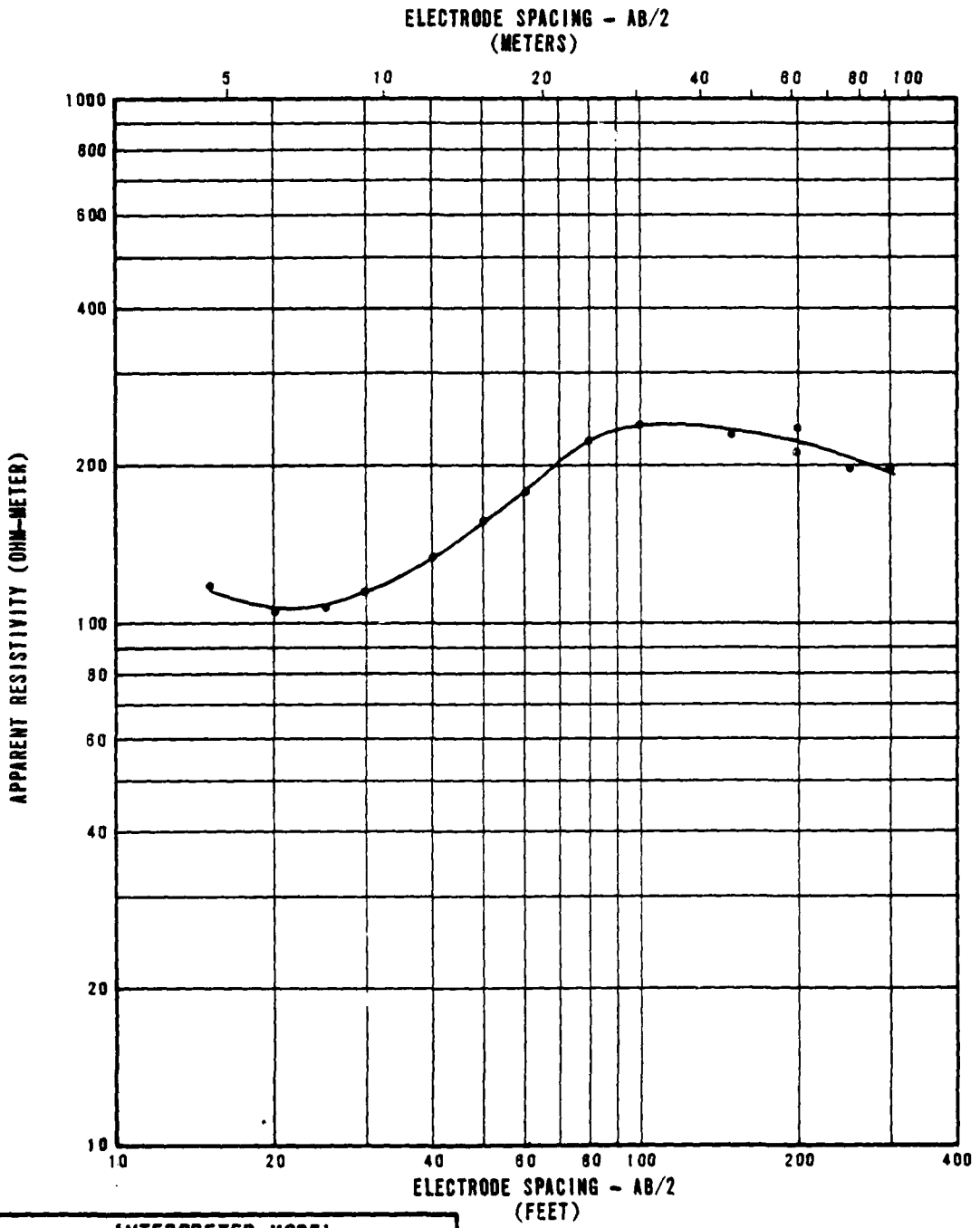
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-12

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



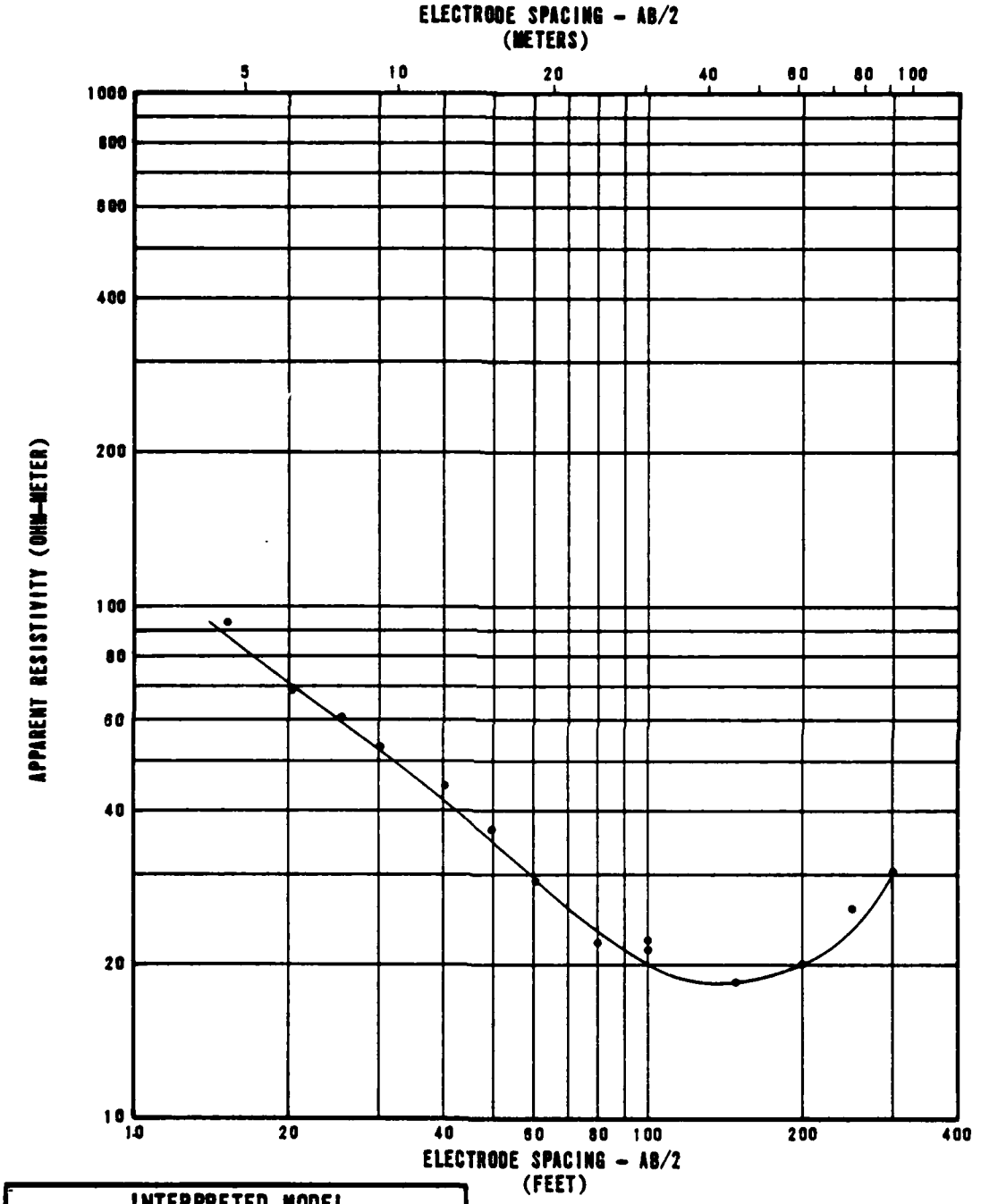
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	150
6	2	65
21	6	330
79	24	110

RESISTIVITY SOUNDING WR-R-13
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-13

UGRO NATIONAL, INC.



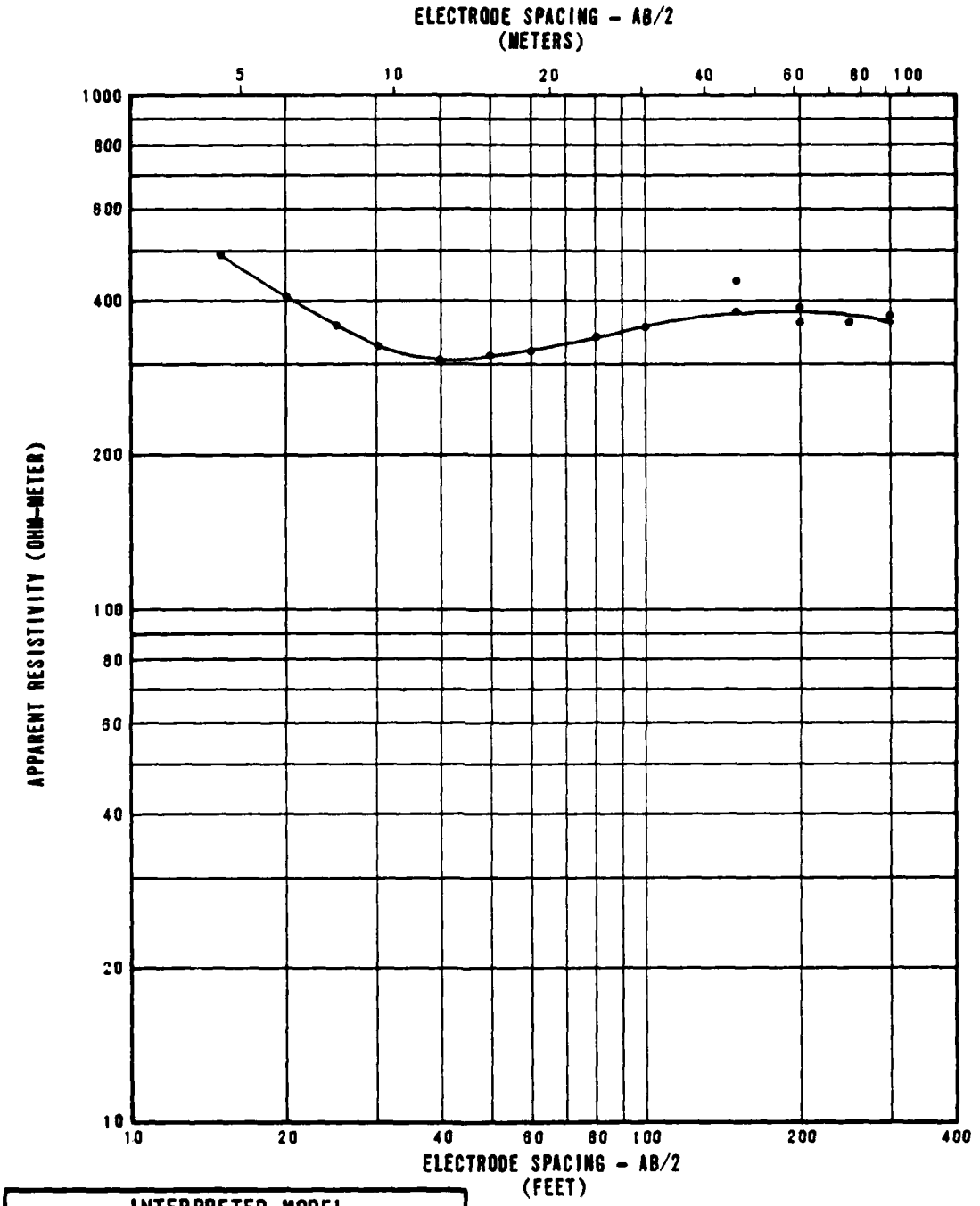
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	120
9	3	17
131	40	170
156	48	580

RESISTIVITY SOUNDING WR-R-14
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-14

FUGRO NATIONAL, INC.



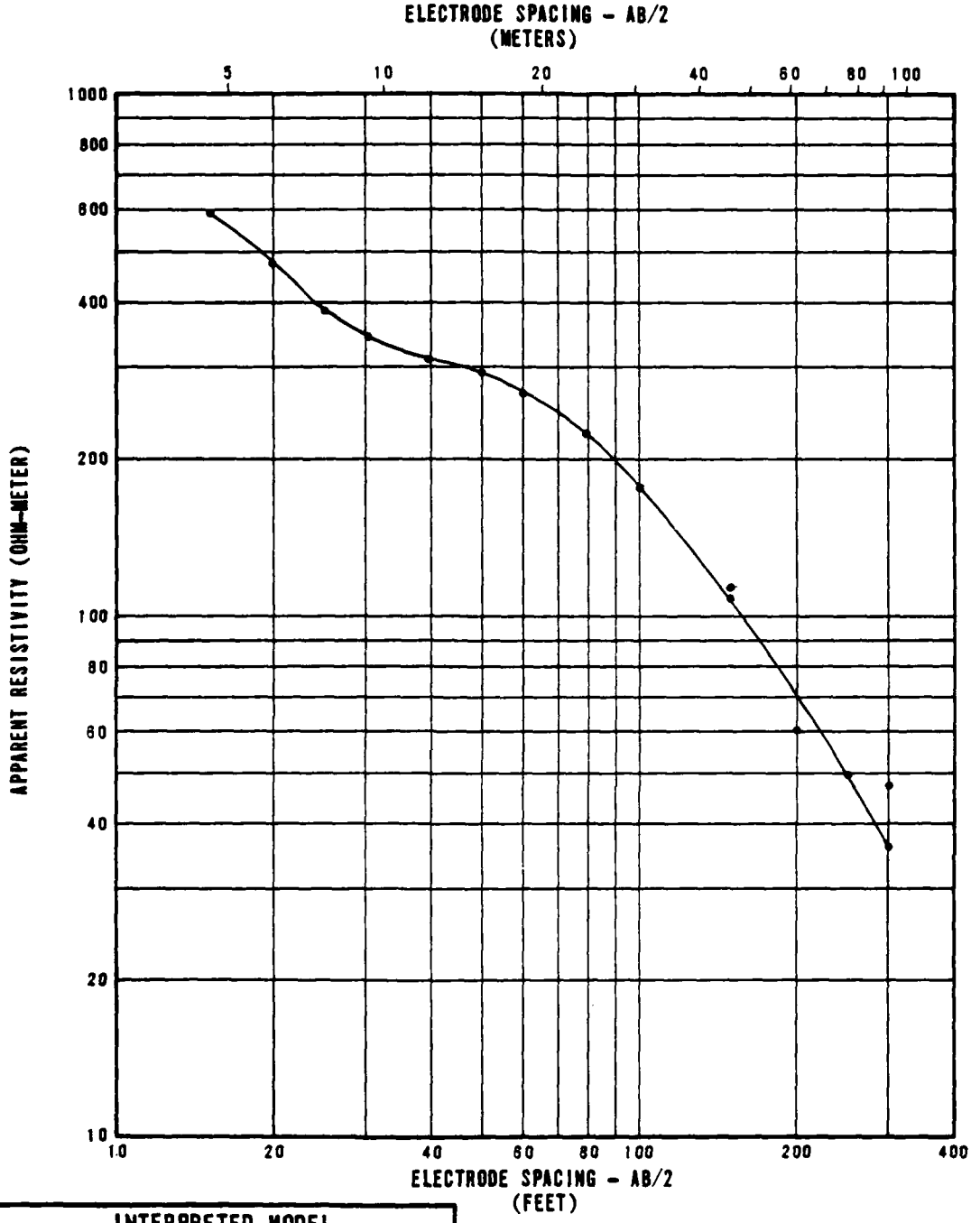
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	680
8	2	230
28	9	530
59	18	340

RESISTIVITY SOUNDING WR-R-15
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-15

FUGRO NATIONAL, INC.



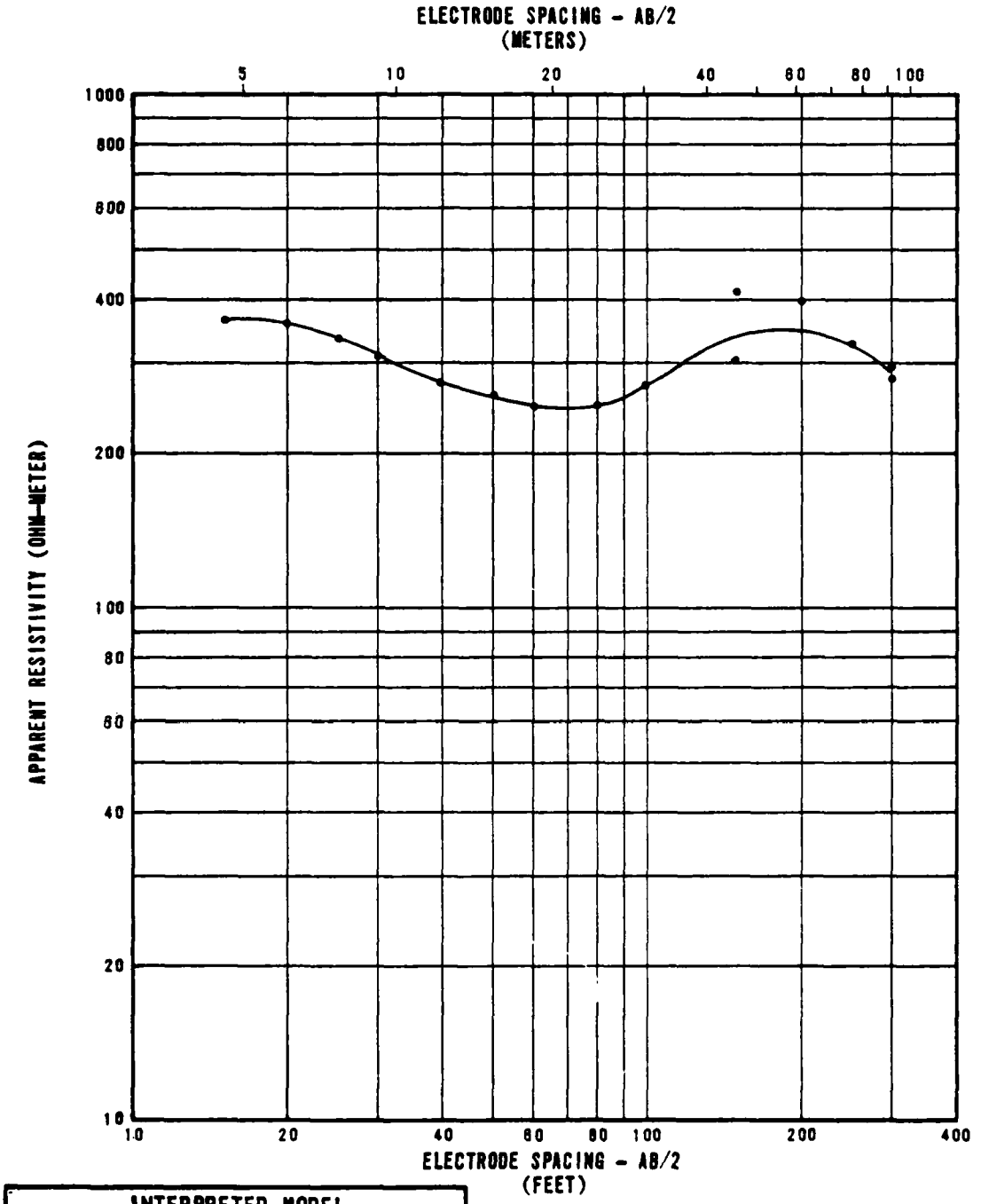
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	730
10	3	280
73	22	20

RESISTIVITY SOUNDING WR-R-16
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-16

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	390
14	4	200
63	19	2570
80	24	370
158	48	60

RESISTIVITY SOUNDING WR-R-17
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-17

FUGRO NATIONAL, INC.

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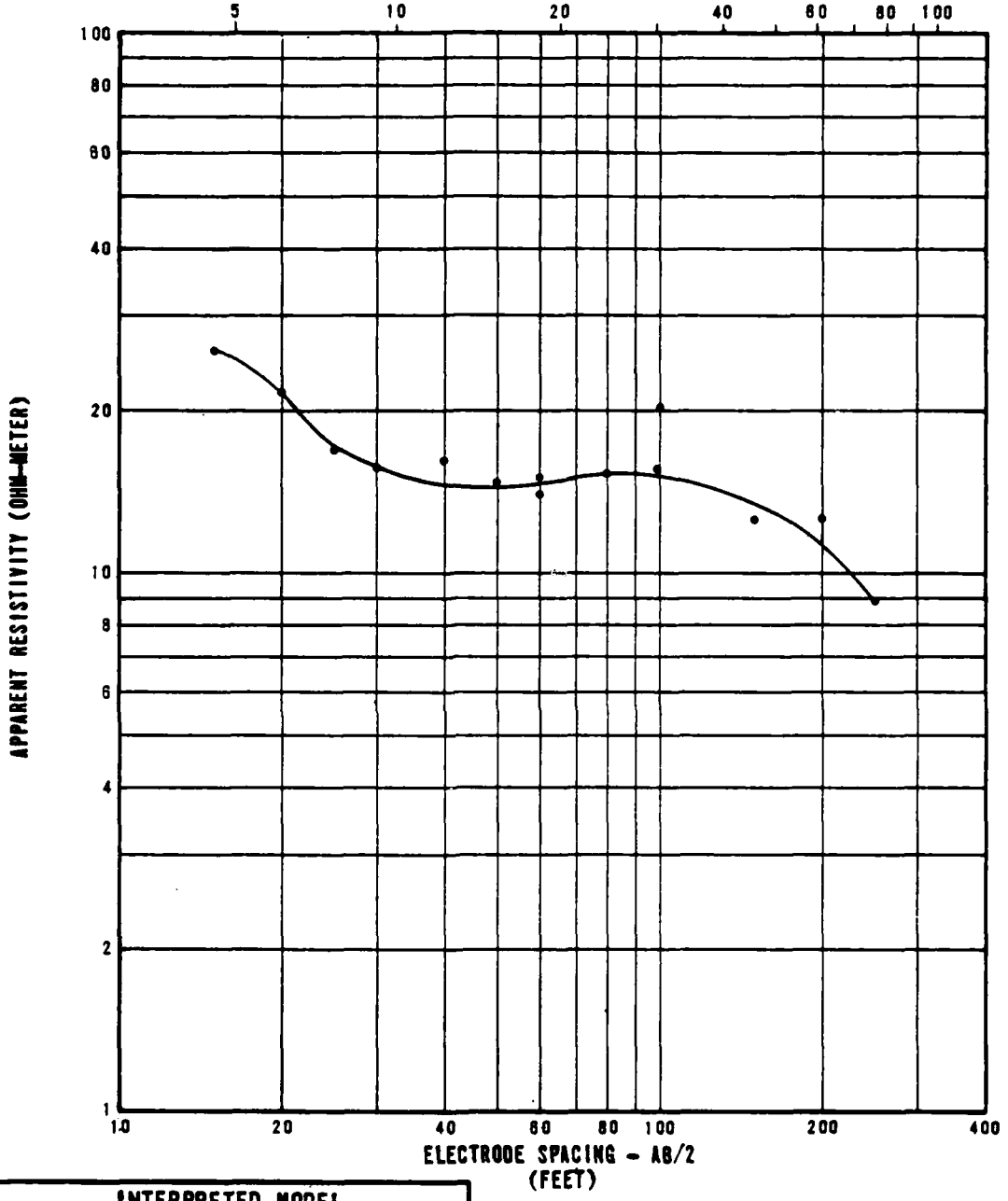


INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	35
10	3	8
21	6	25
74	23	4

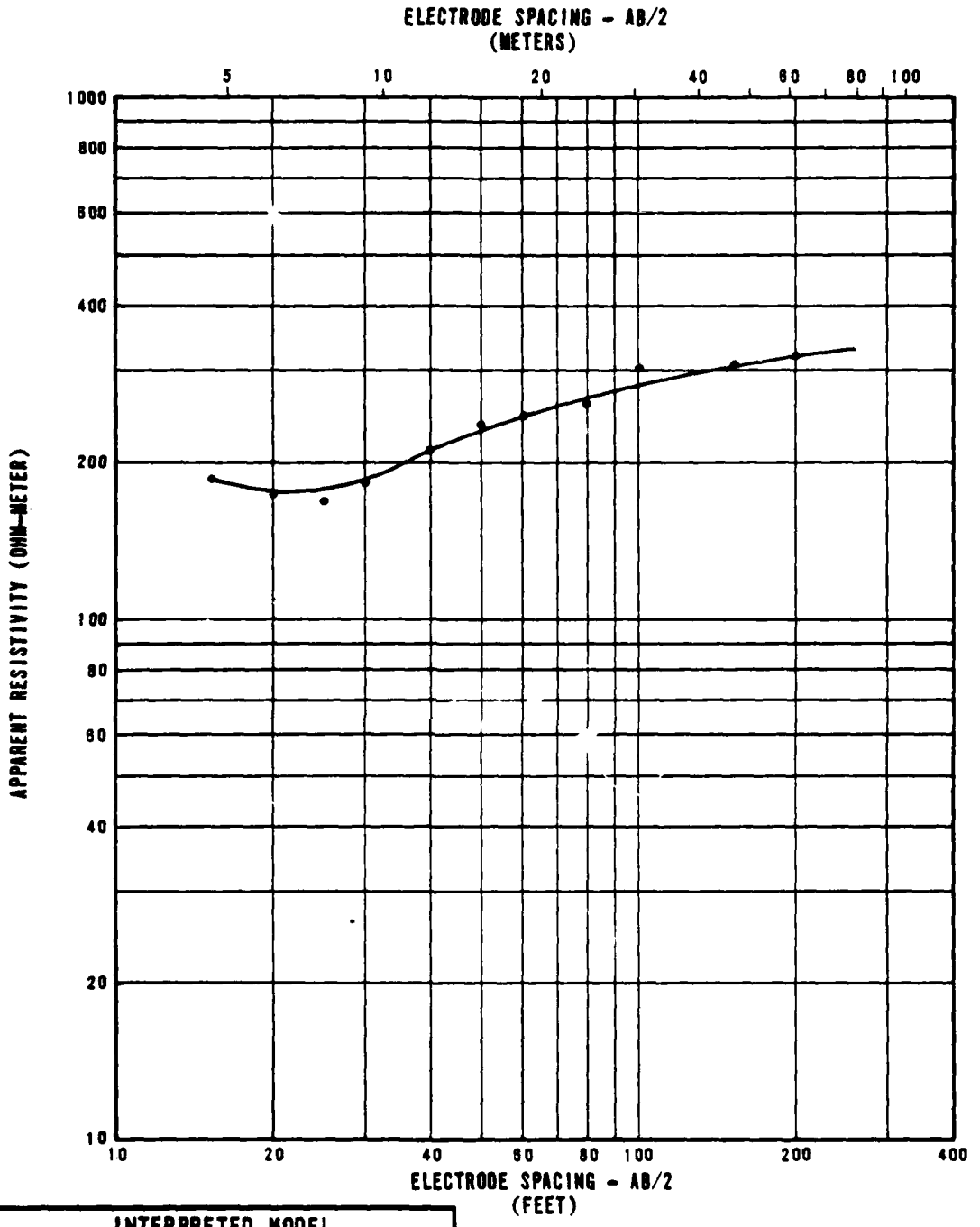
RESISTIVITY SOUNDING WR-R-18
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-18

FUGRO NATIONAL, INC.

FN-TR-27-V



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	200
7	2	150
20	6	340

RESISTIVITY SOUNDING WR-R-19
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH COP, NEVADA

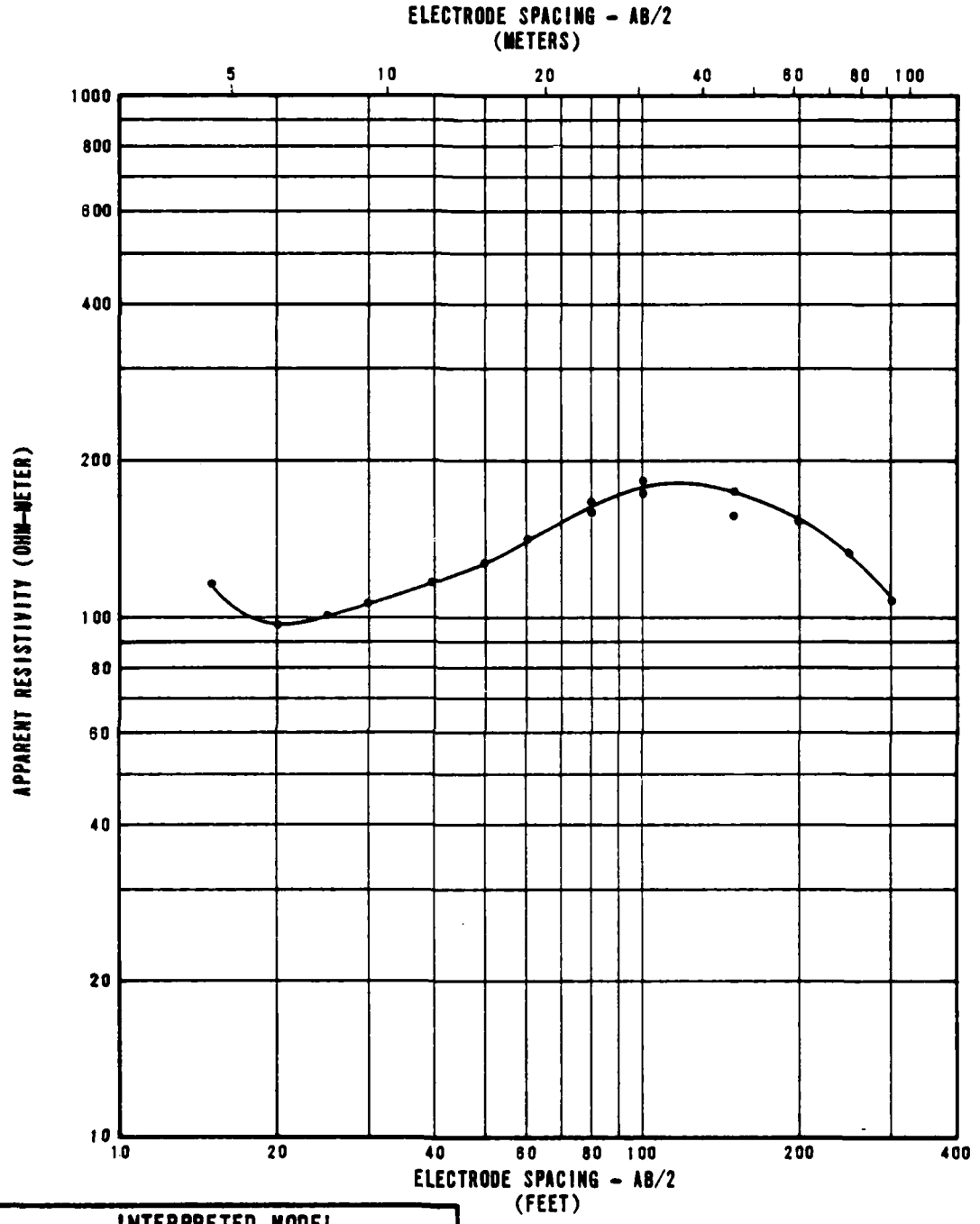
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-19

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



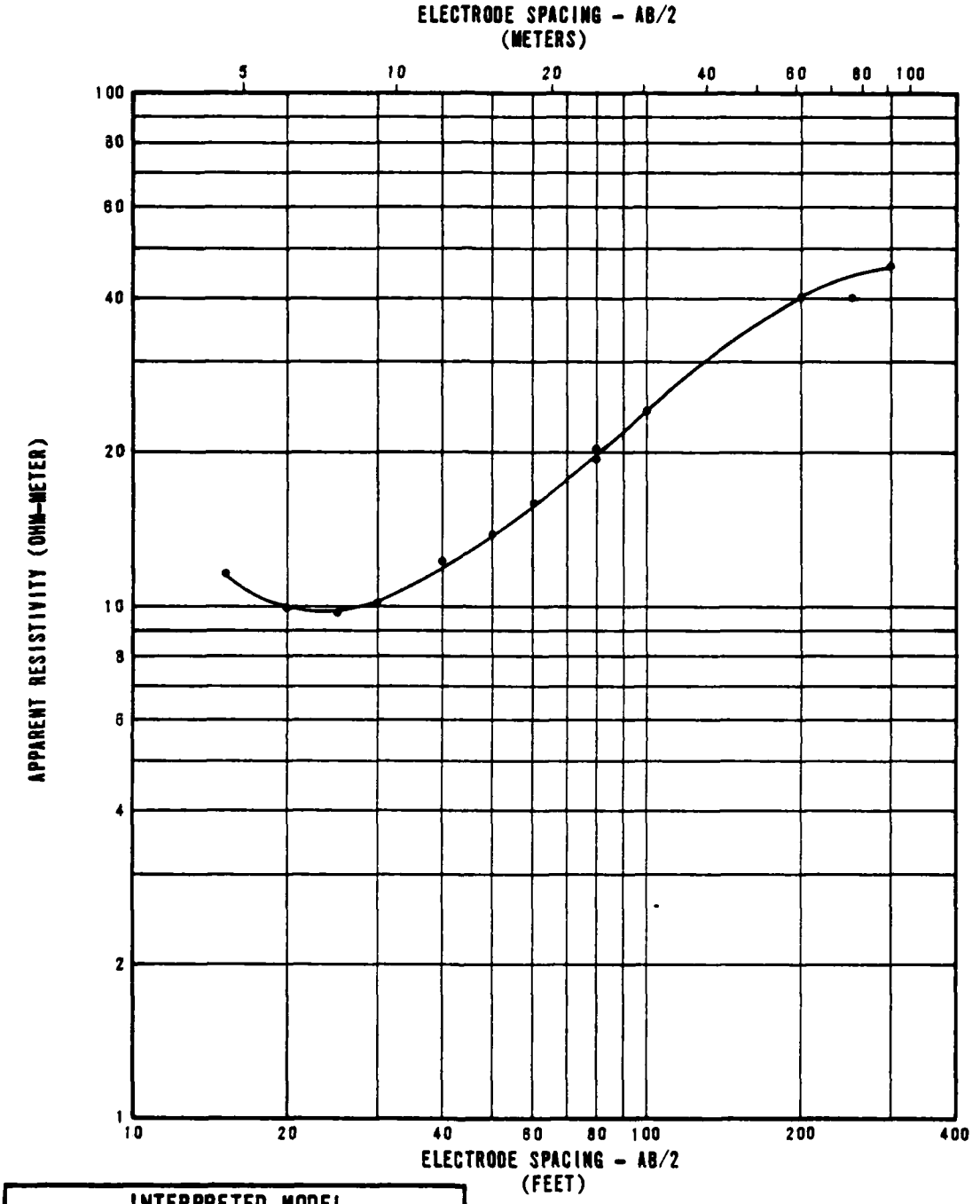
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	95
25	8	480
51	16	180
117	36	25

RESISTIVITY SOUNDING WR-R-20
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-20

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	9
28	8	70
172	52	50

RESISTIVITY SOUNDING WR-R-21
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

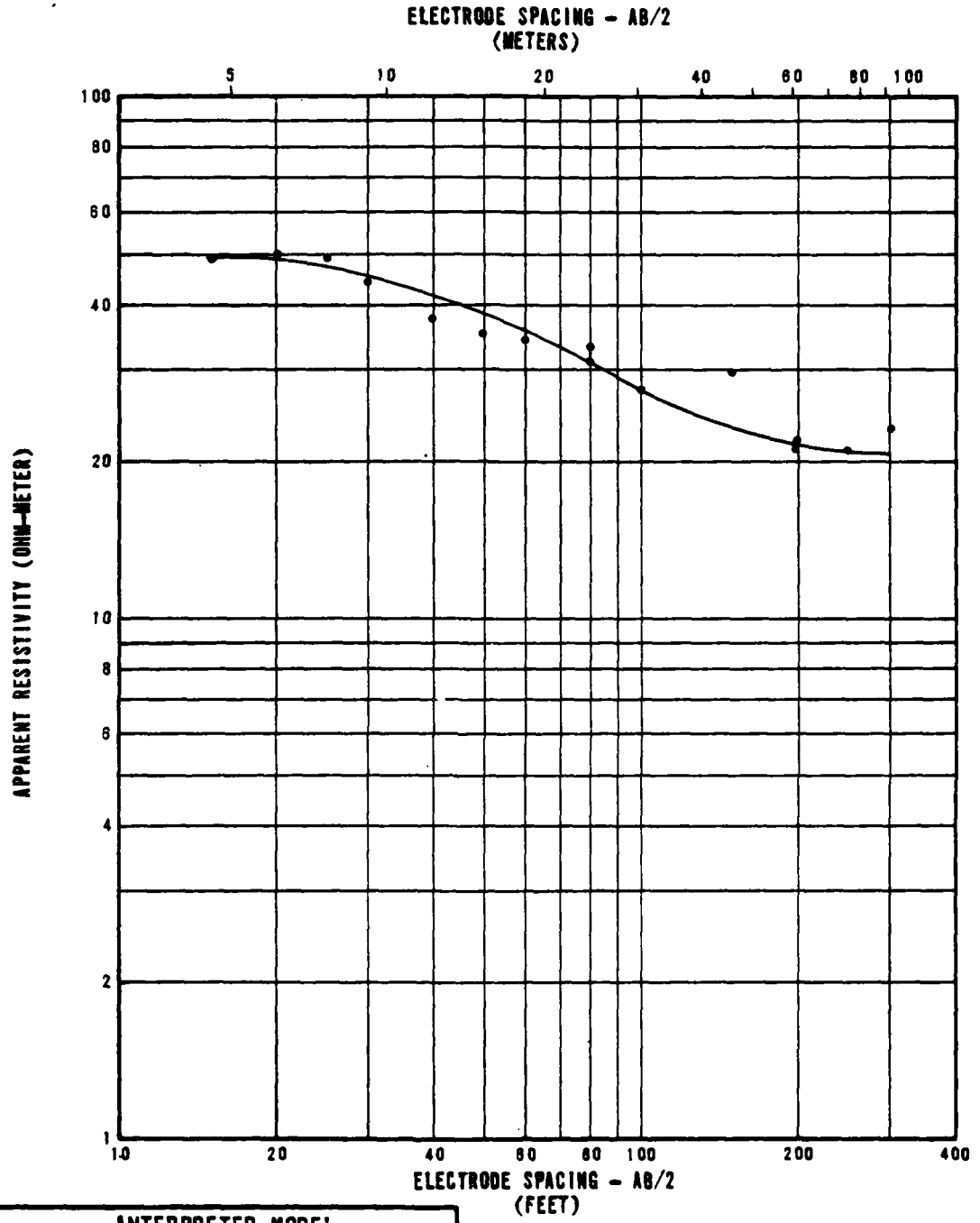
FIGURE
4-21

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15

FN-TR-27-V



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	50
31	9	20

RESISTIVITY SOUNDING WR-R-22
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-22

FUGRO NATIONAL, INC.

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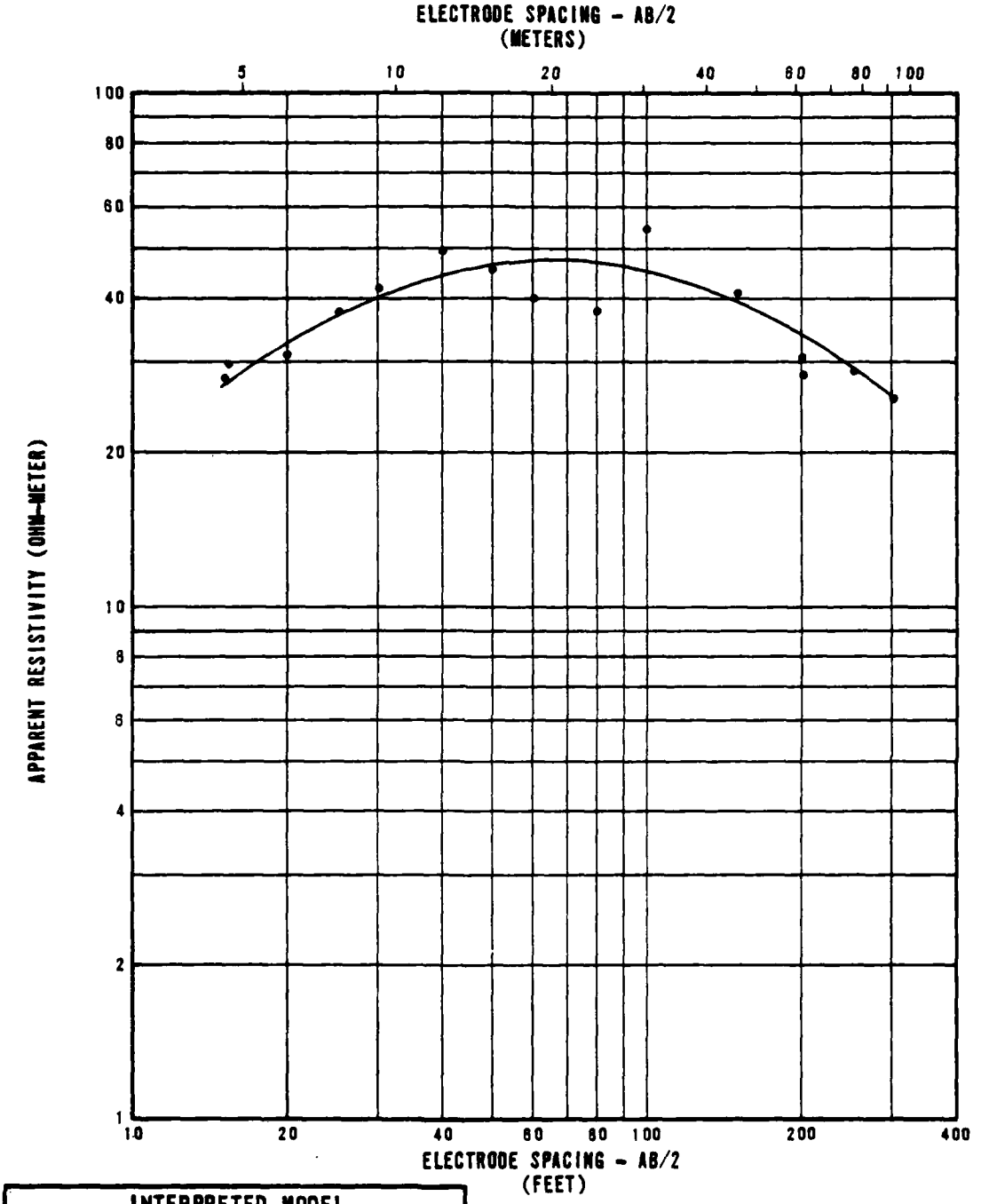
AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	19
7	2	65
42	13	40
101	31	17

RESISTIVITY SOUNDING WR-R-23
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE,
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-23

FUGRO NATIONAL, INC.

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 the 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

TABLE 6-1

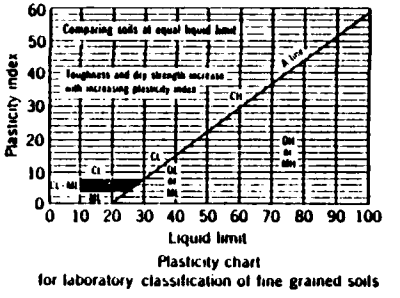
WR SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FUGRO NATIONAL, INC.

Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)				Group Symbols[a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is *larger* than No. 200 sieve size[b]	**Gravels** More than half of coarse fraction is larger than No. 4 sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	*GW*	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel, maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand, gravelly;* about 20% hard, angular gravel particles 1-in. maximum size, rounded and subangular sand grains coarse to fine, about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *GW* Atterberg limits below "A" line, or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols Atterberg limits above "A" line, with *PI* greater than 7
			Predominantly one size or a range of sizes with some intermediate sizes missing	*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)	*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures		
			Plastic fines (for identification procedures, see *CL* below)	*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures		
	Sands More than half of coarse fraction is smaller than No. 4 sieve size (For visual classification, the 1/4 in. size may be used as equivalent to the No. 4 sieve size)	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	*SW*	Well graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *SW* Atterberg limits below "A" line or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols Atterberg limits below "A" line with *PI* greater than 7
			Predominantly one size or a range of sizes with some intermediate sizes missing	*SP*	Poorly graded sands, gravelly sands, little or no fines		
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)	*SM*	Silty sands, poorly graded sand-silt mixtures		
			Plastic fines (for identification procedures, see *CL* below)	*SC*	Clayey sands, poorly graded sand-clay mixtures		
Fine-grained soils More than half of material is *smaller* than No. 200 sieve size (The No. 200 sieve size is about the smallest particle visible to naked eye)	Identification Procedures on Fraction Smaller than No. 40 Sieve Size						
		Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)			
	Silts and clays liquid limit less than 50	None to slight	Quick to slow	None	*ML*	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: *Clayey silt,* brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (*ML*)
		Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity	
	Silts and clays liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays	
		Medium to high	None to very slow	Slight to medium	*OH*	Organic clays of medium to high plasticity	
Highly Organic Soils		Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils	

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

Determine percentages of gravel and sand from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows:
Less than 5%: *GW, GP, SW, SP*
More than 12%: *GM, GC, SM, SC*
5% to 12%: *Borderline* cases requiring use of dual symbols



Plasticity chart
for laboratory classification of fine grained soils

From Wagner, 1957.

[a] *Boundary classifications.* Soils possessing characteristics of two groups are designated by combinations of group symbols. For example *GW-GC*, well graded gravel-sand mixture with clay binder.

[b] All sieve sizes on this chart are U.S. standard.

Field Identification Procedure for Fine Grained Soils or Fractions

These procedures are to be performed on the minus No. 40 sieve size particles, approximately 1/64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking).

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics).

After removing particles larger than No. 40 sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit).

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

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

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.

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

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 the 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 the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

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

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

NP - Nonplastic.

M. Miscellaneous Information -

Elevations - indicated elevations on the logs are estimated from topographic maps of the study area, 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.

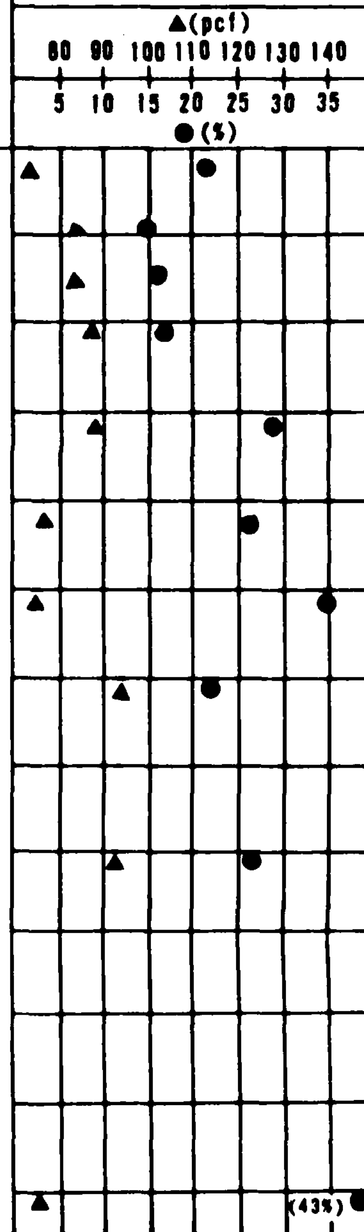
Water Level - indicates depth from ground surface to water table where encountered.

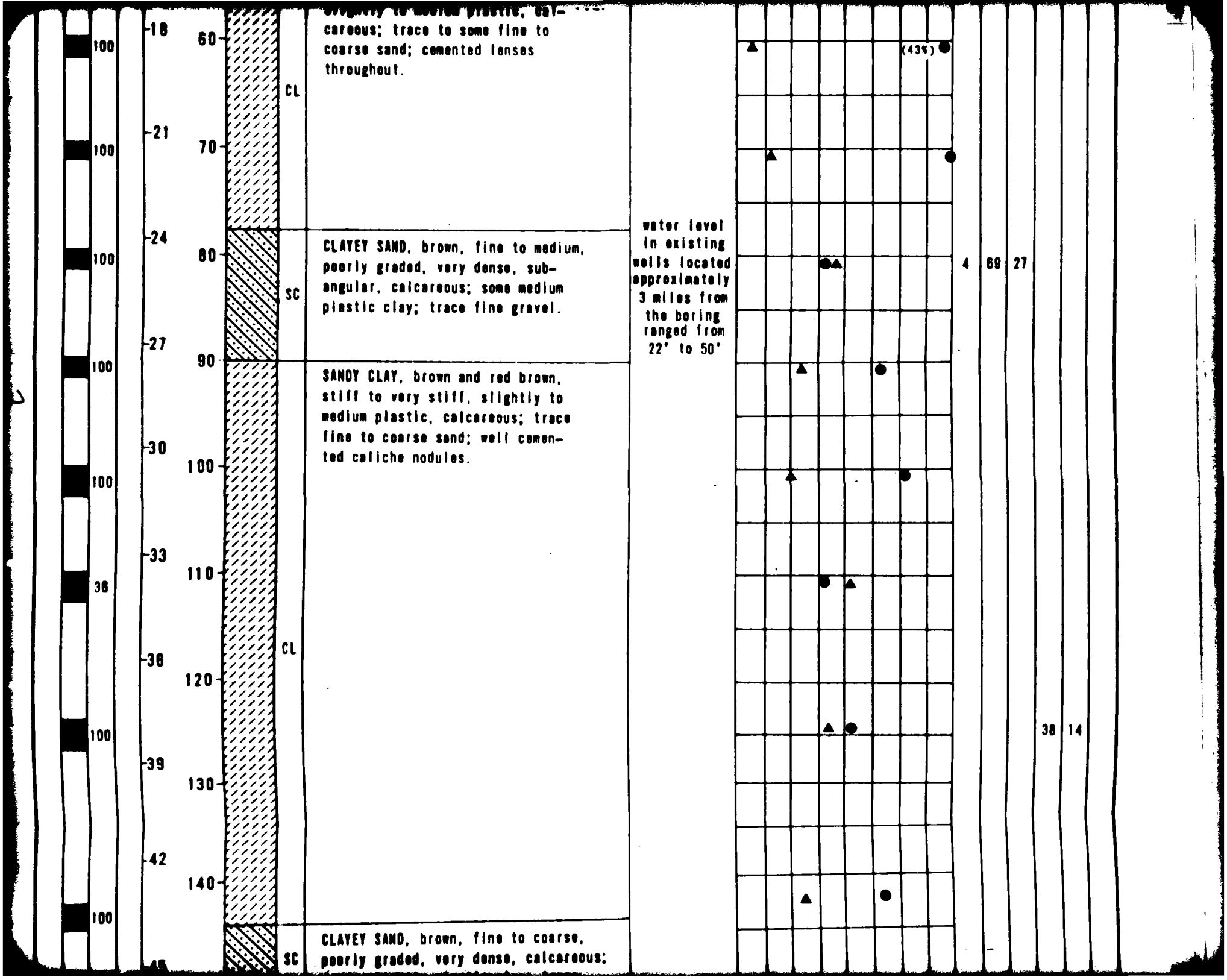
Trench Length - length at ground surface of final trench excavation.

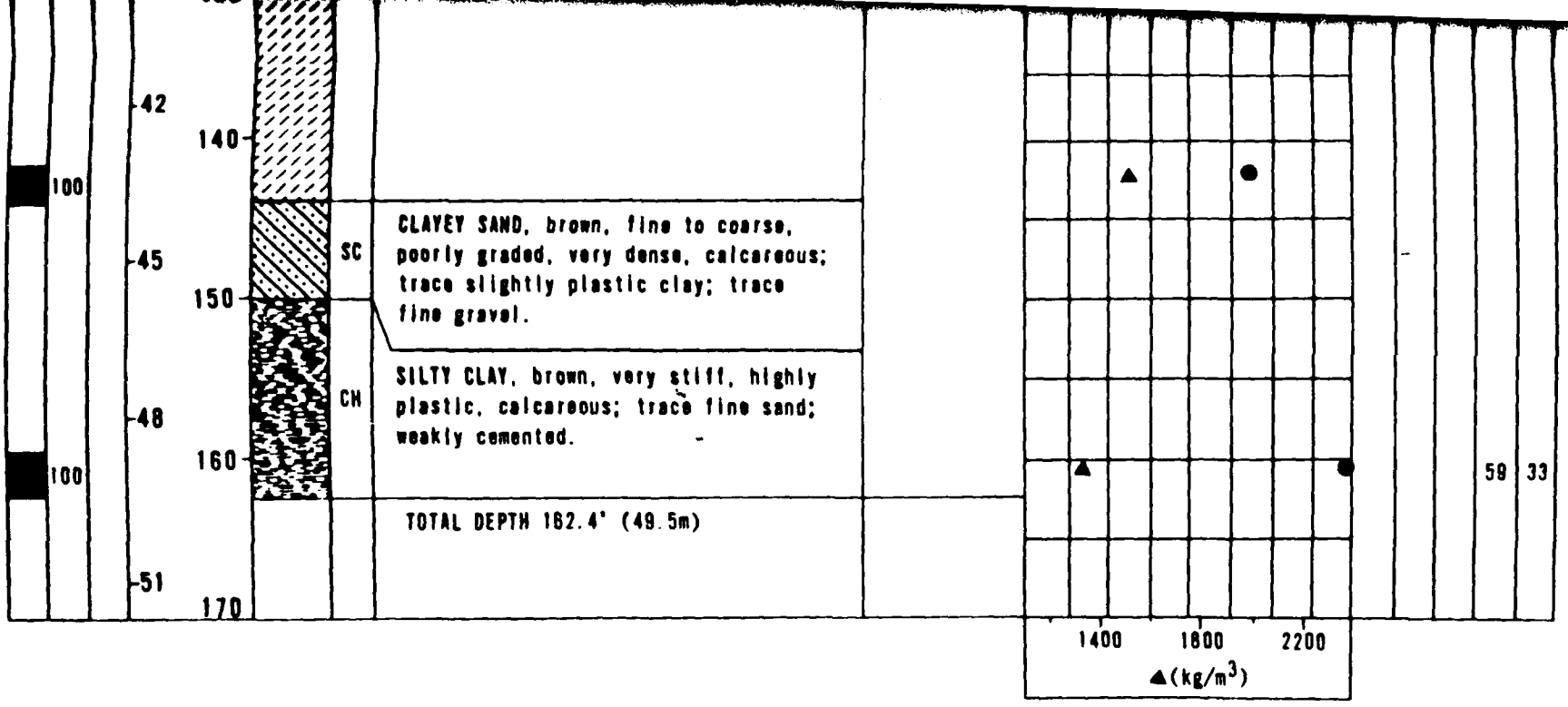
Trench Orientation - bearing of longitudinal trench centerline.

CHECKED BY ________ APPROVED BY ________

SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	98		0	0		SM	SILTY SAND, brown, fine, poorly graded, loose, subangular, calcareous; some silt.		0	70	30		
	70					CH	SILTY CLAY, light brown to brown, stiff to hard, medium to highly plastic, calcareous; trace to some fine to coarse sand; well cemented caliche nodules.		1	13	86		
	70											54	25
	100		3	10		CL			0	40	60	39	18
	100											37	14
	100		6	20		CH							
	100											82	47
	100		9	30		CL							
	100		12	40		SM	SILTY SAND, brown, fine, poorly graded medium dense, subangular; some silt; cemented caliche nodules.		4	68	28		
	100		15	50		CL	SILTY CLAY, light brown, hard, slightly plastic, calcareous; trace fine sand, lense of silty sand (51.0'-54.0').		0	31	69		
						SM							
	100		18	60			SANDY CLAY, brown, stiff to hard, slightly to medium plastic, calcareous; trace to some fine to coarse sand; cemented lenses						




100
100
100
100
100
38
100
100
18
21
24
27
30
33
36
39
42
60
70
80
90
100
110
120
130
140
CL
SC
CL
SC
carbonate; trace to some fine to coarse sand; cemented lenses throughout.
CLAYEY SAND, brown, fine to medium, poorly graded, very dense, sub-angular, calcareous; some medium plastic clay; trace fine gravel.
SANDY CLAY, brown and red brown, stiff to very stiff, slightly to medium plastic, calcareous; trace fine to coarse sand; well cemented caliche nodules.
CLAYEY SAND, brown, fine to coarse, poorly graded, very dense, calcareous;
water level in existing wells located approximately 3 miles from the boring ranged from 22' to 50'
(43%)
4
69
27
38
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)
- NR - NO RECOVERY

BORING DETAILS

ELEVATION	: 5374' (1638m)
SURFICIAL GEOLOGIC UNIT	: A5y/A4o
DATE DRILLED	: 1 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: See Remarks

FUGRO NATIONAL, INC.

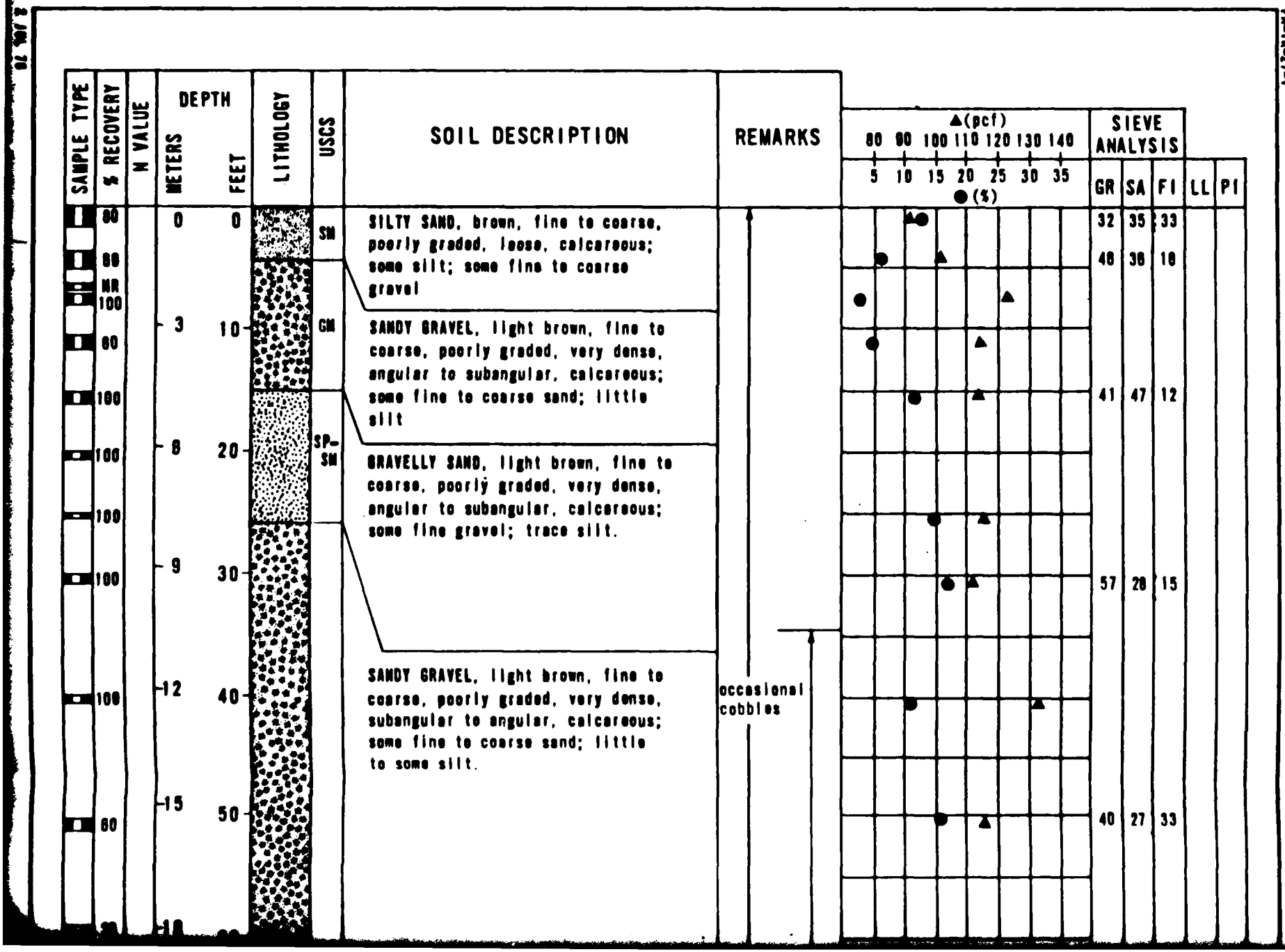
LOG OF BORING MR-6-3
VERIFICATION SITE, WHITE RIVER EXP., NEVADA

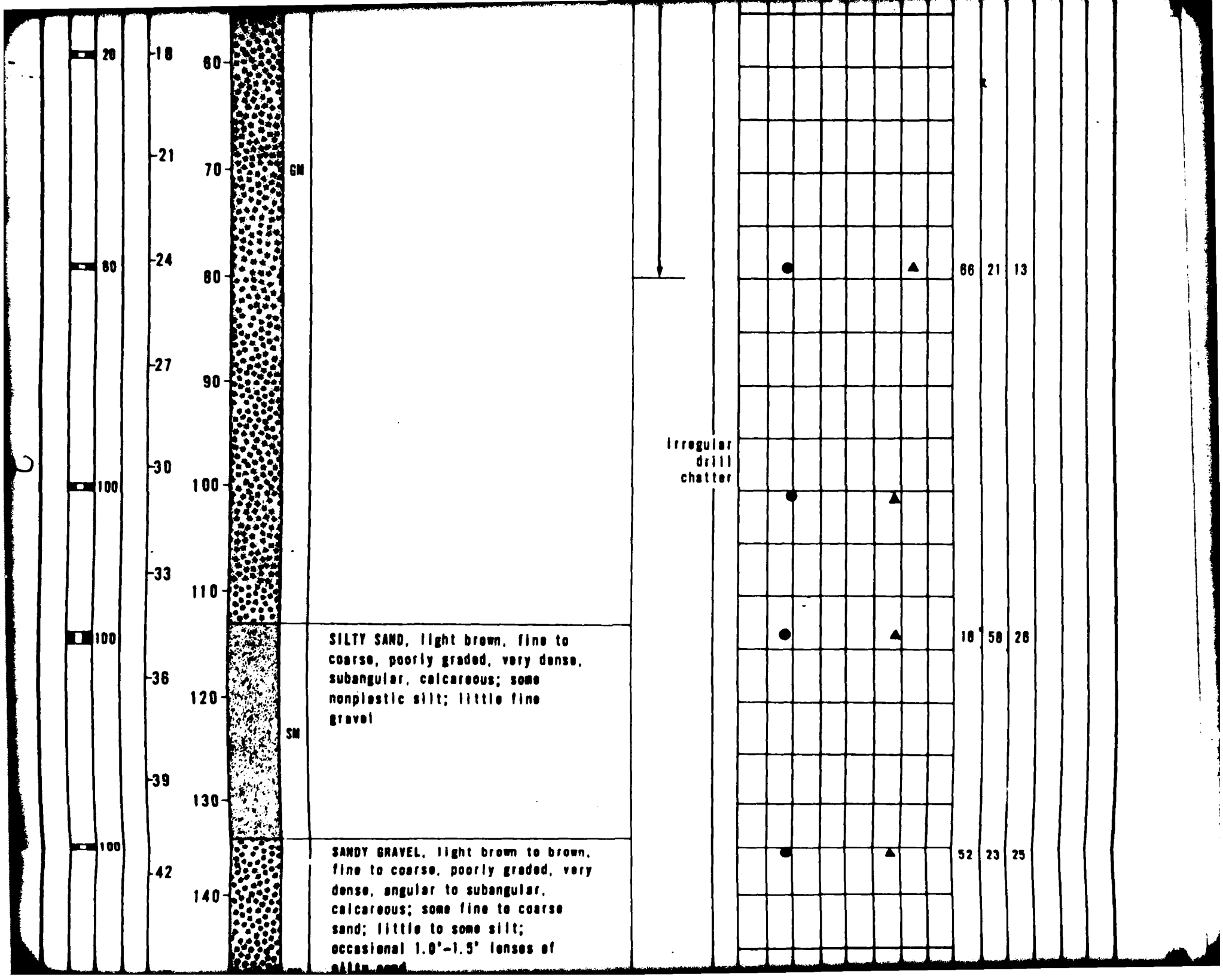
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

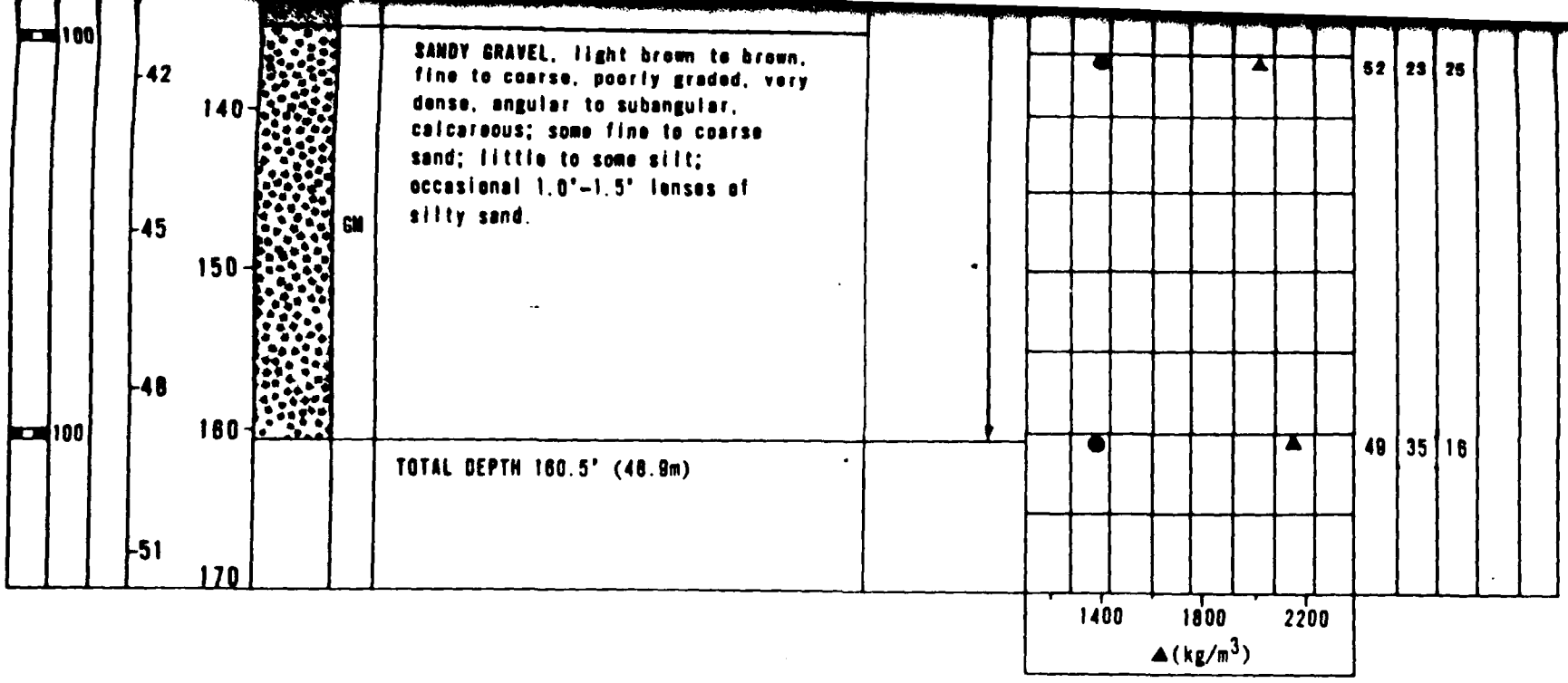
FIGURE 6-3

AFV-36

CHECKED BY _____ APPROVED BY _____




20
18
60
21
70
GM
80
24
80
27
90
irregular
drill
chatter
30
100
100
33
110
100
SILTY SAND, light brown, fine to coarse, poorly graded, very dense, subangular, calcareous; some nonplastic silt; little fine gravel
36
120
SM
39
130
100
SANDY GRAVEL, light brown to brown, fine to coarse, poorly graded, very dense, angular to subangular, calcareous; some fine to coarse sand; little to some silt; occasional 1.0'-1.5' lenses of
42
140
66 21 13
18 58 26
52 23 25



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	: 5670' (1728m)
SURFICIAL GEOLOGIC UNIT	: A5I
DATE DRILLED	: 29-30 November 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL, INC.

LOG OF BORING WR-B-2
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE B-2

APV-86

CHECKED BY _____ APPROVED BY _____

SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS
	100		0	0		SM	SILTY SAND, dark brown to light brown, fine to coarse, poorly graded, dense, subangular to subrounded, calcareous; trace to some silt.	
	100							
	100							
			3	10		CL	CLAYEY SILT, white to light gray, hard, slightly to highly plastic, calcareous; some sand; moderately to well cemented; lense of silty clay (9.0'-11.0'); lense of medium to coarse sand (14.0'-15.9'); and (22.0'-24.0'); lense of fine sub-rounded sand (66.5'-71.5').	
	100					ML		
						SP		
	83					MH		
			6	20				
	100					SP		
	100							
			9	30				
	100							
			12	40		MH		water level 39.0'
	100							
			15	50				
	100							
			18	60				

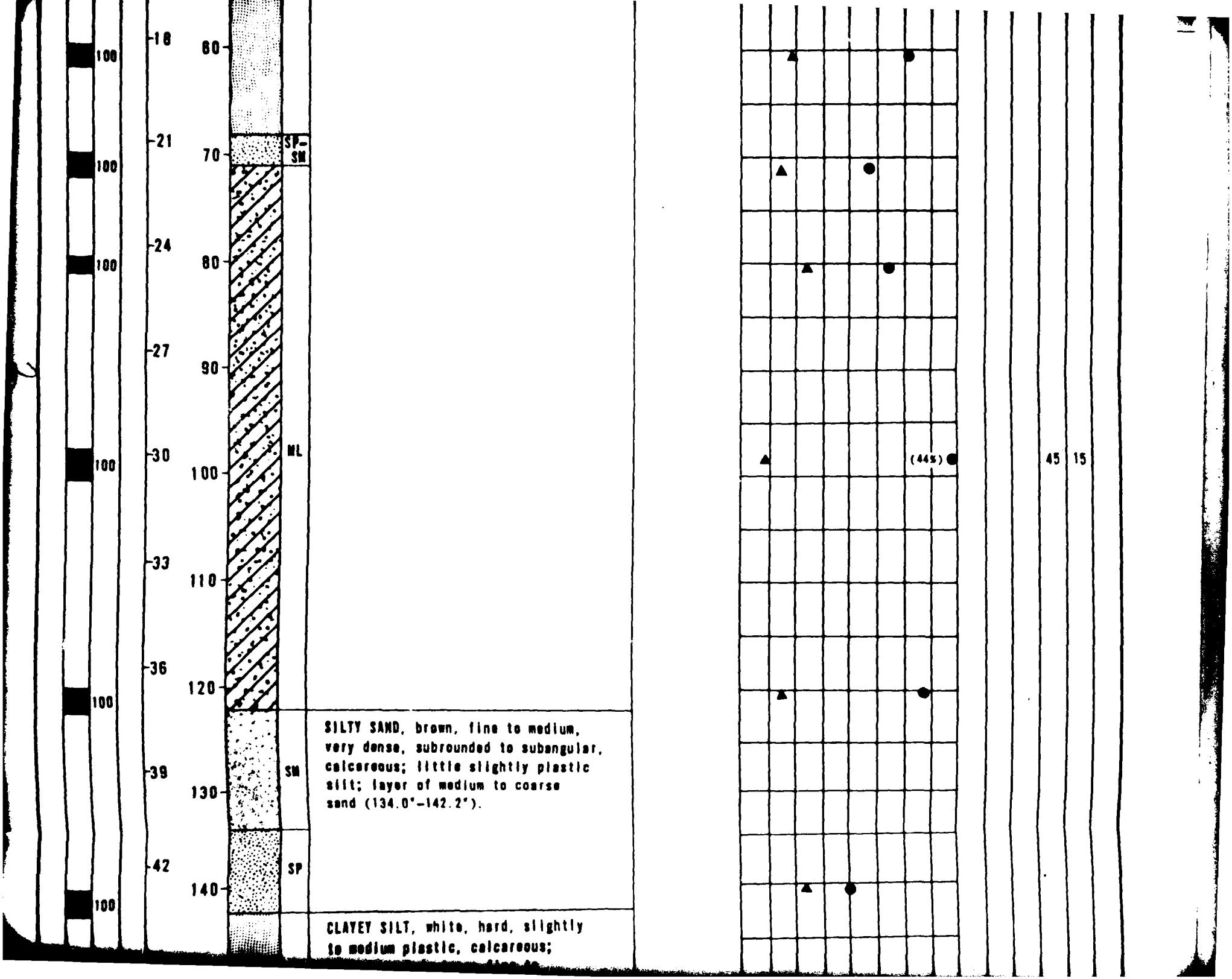
▲(pcf) 80 90 100 110 120 130 140

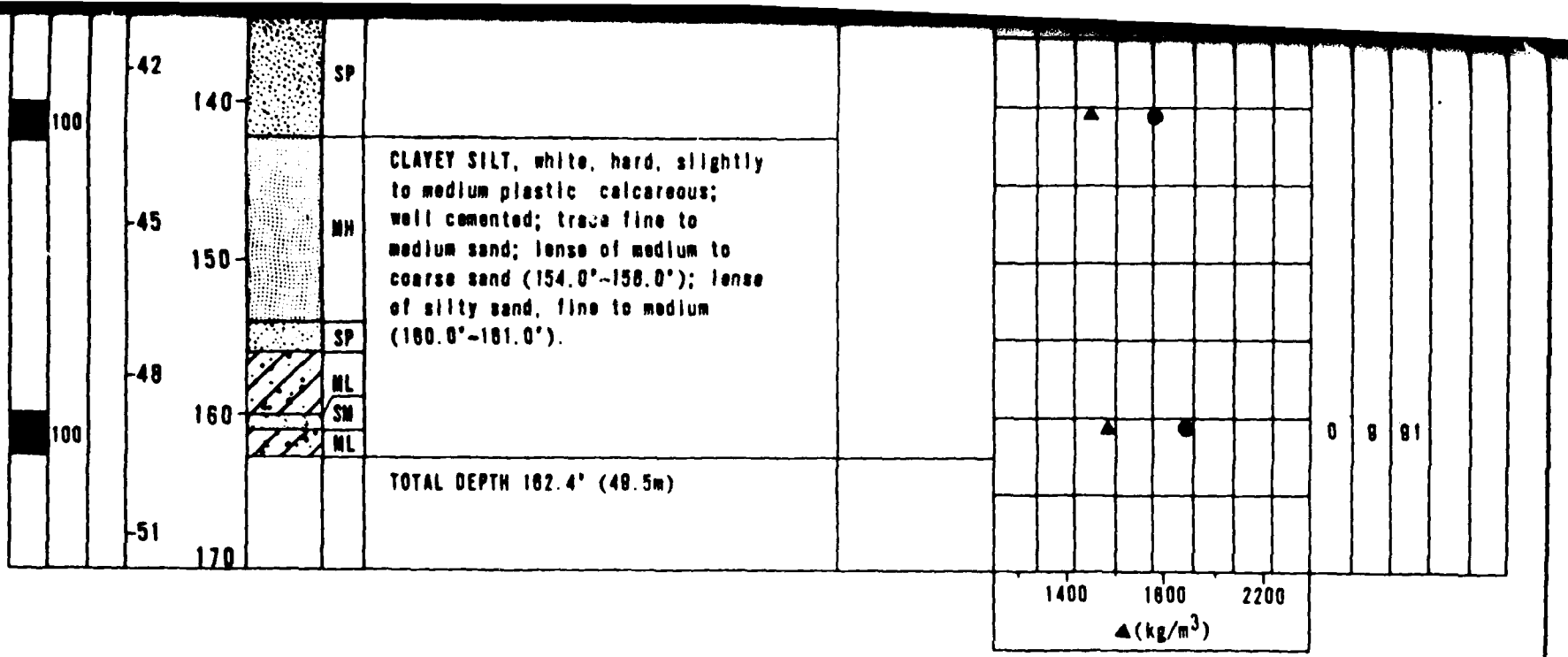
● (%) 5 10 15 20 25 30 35

(43%)

SIEVE ANALYSIS GR	SA	FI	LL	PI
0	66	34		
0	89	11		
			43	21
			45	17
			64	30
0	31	69		
1	47	52	59	19

FM-18-27-A


100
100
100
100
100
100
18
21
24
27
30
33
36
39
42
60
70
80
90
100
110
120
130
140
SP-SM
ML
SM
SP
(44%)
45
15
SILTY SAND, brown, fine to medium, very dense, subrounded to subangular, calcareous; little slightly plastic silt; layer of medium to coarse sand (134.0'–142.2').
CLAYEY SILT, white, hard, slightly to medium plastic, calcareous;



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	: 5245' (1599m)
SURFICIAL GEOLOGIC UNIT	: A4o
DATE DRILLED	: 28 November 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 5" (127mm)
WATER LEVEL	: 39.0' (11.9m)

FUGRO NATIONAL, INC.

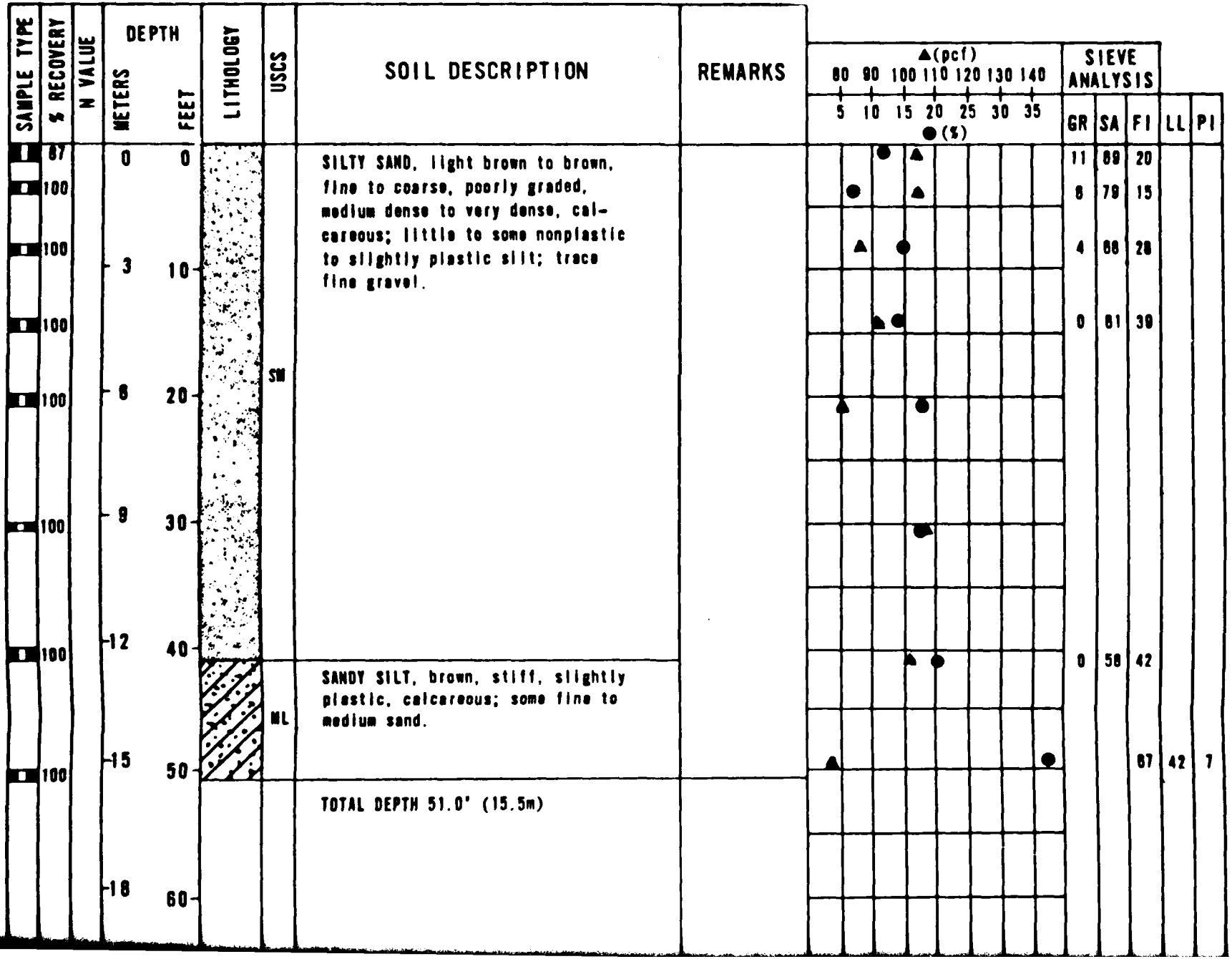
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

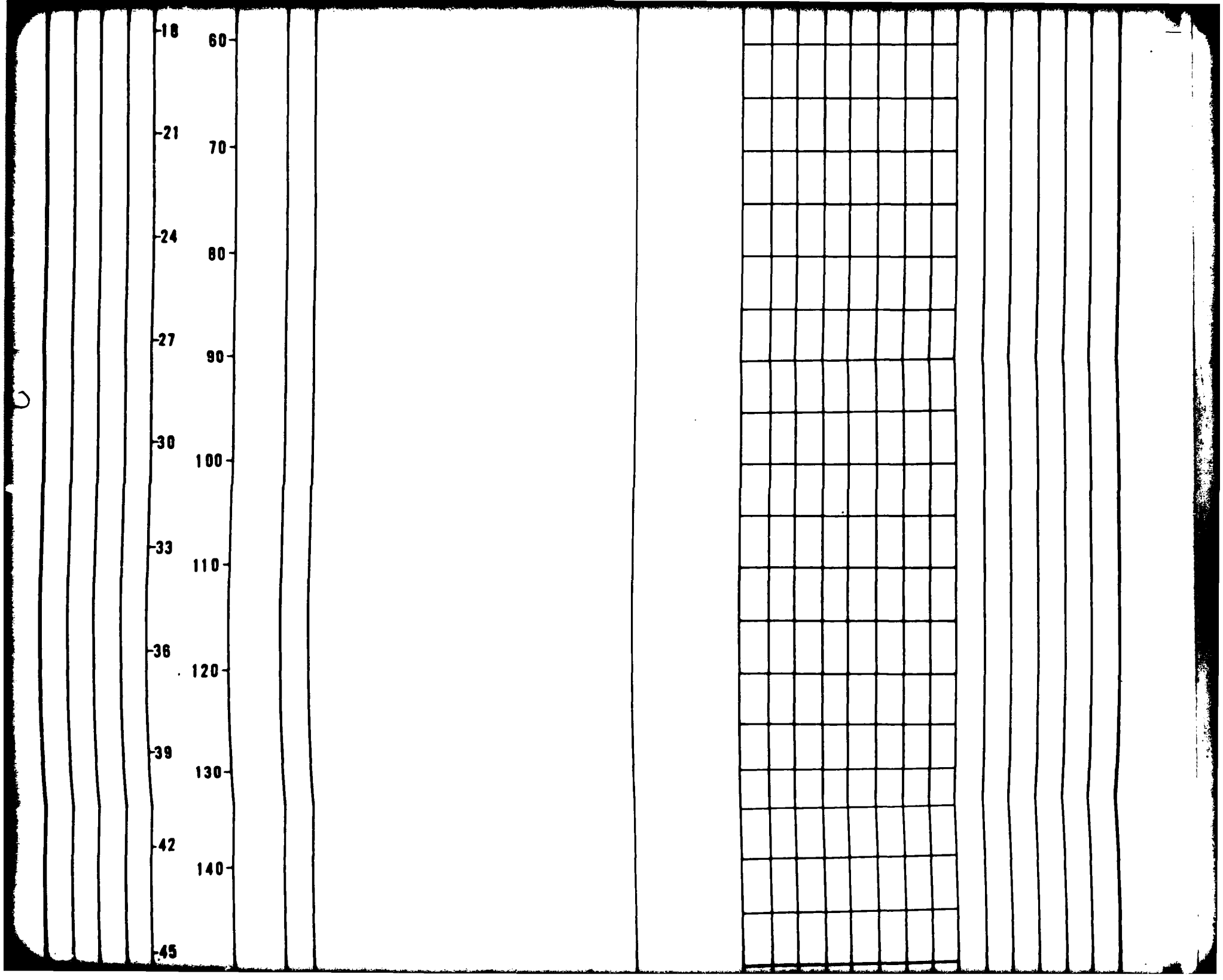
FIGURE 6-1

LOG OF BORING WR-B-1
VERIFICATION SITE, WHITE RIVER COP, NEVADA

AFV-86

CHECKED BY _____ APPROVED BY _____




18
21
24
27
30
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36
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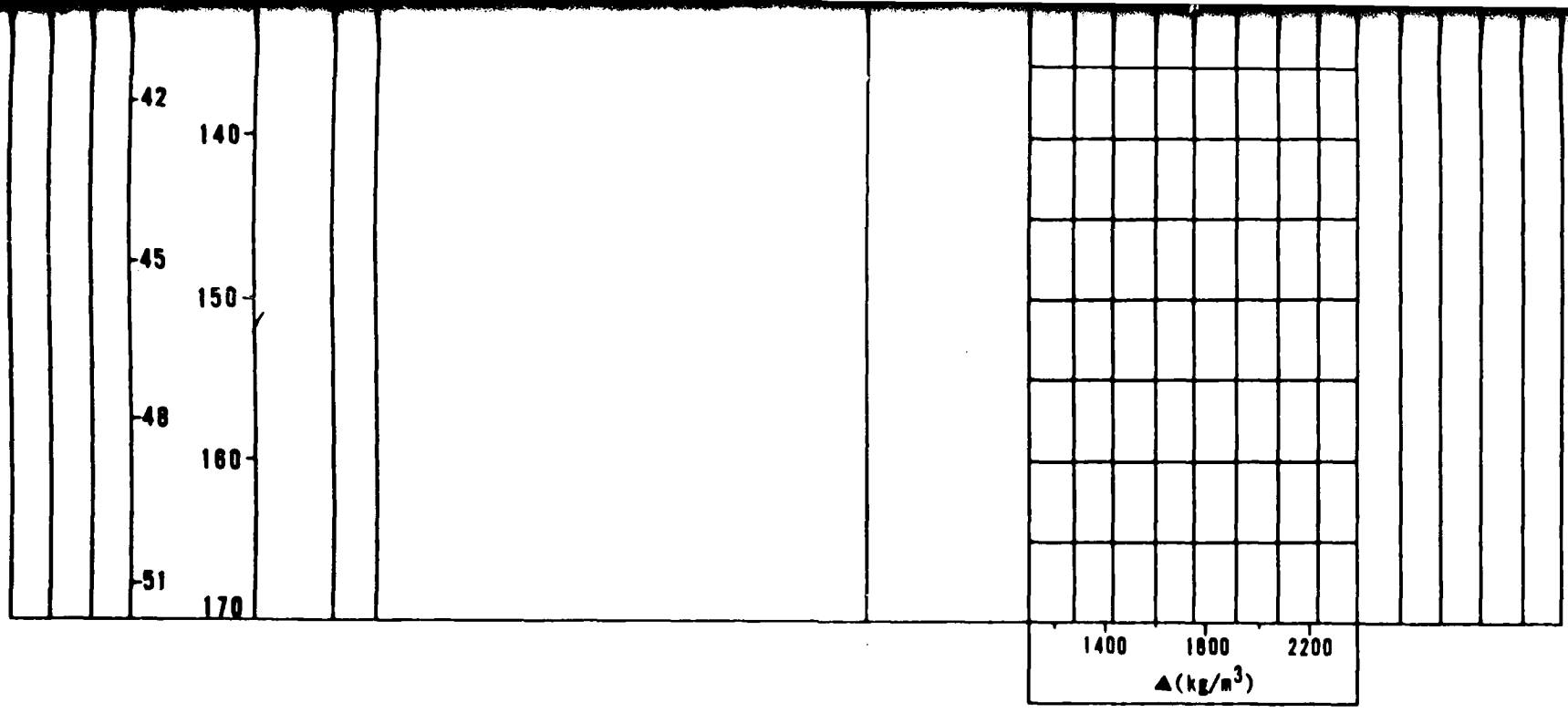
42
45
60
70
80
90
100
110
120
130
140



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	: 5240' (1597m)
SURFICIAL GEOLOGIC UNIT	: A5y (A4o)
DATE DRILLED	: 6 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL, INC.

LOG OF BORING MX-B-7
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

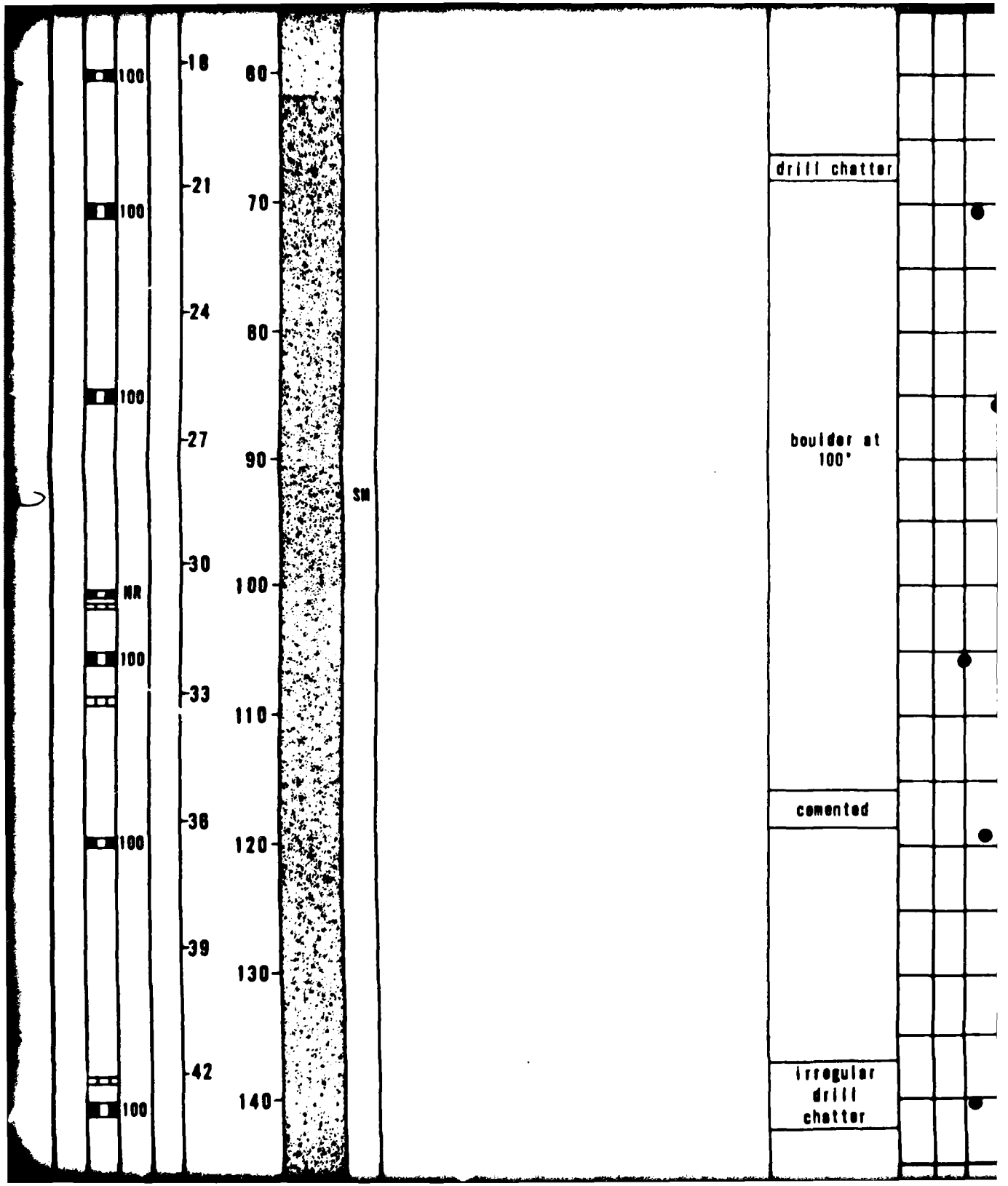
FIGURE 6-7

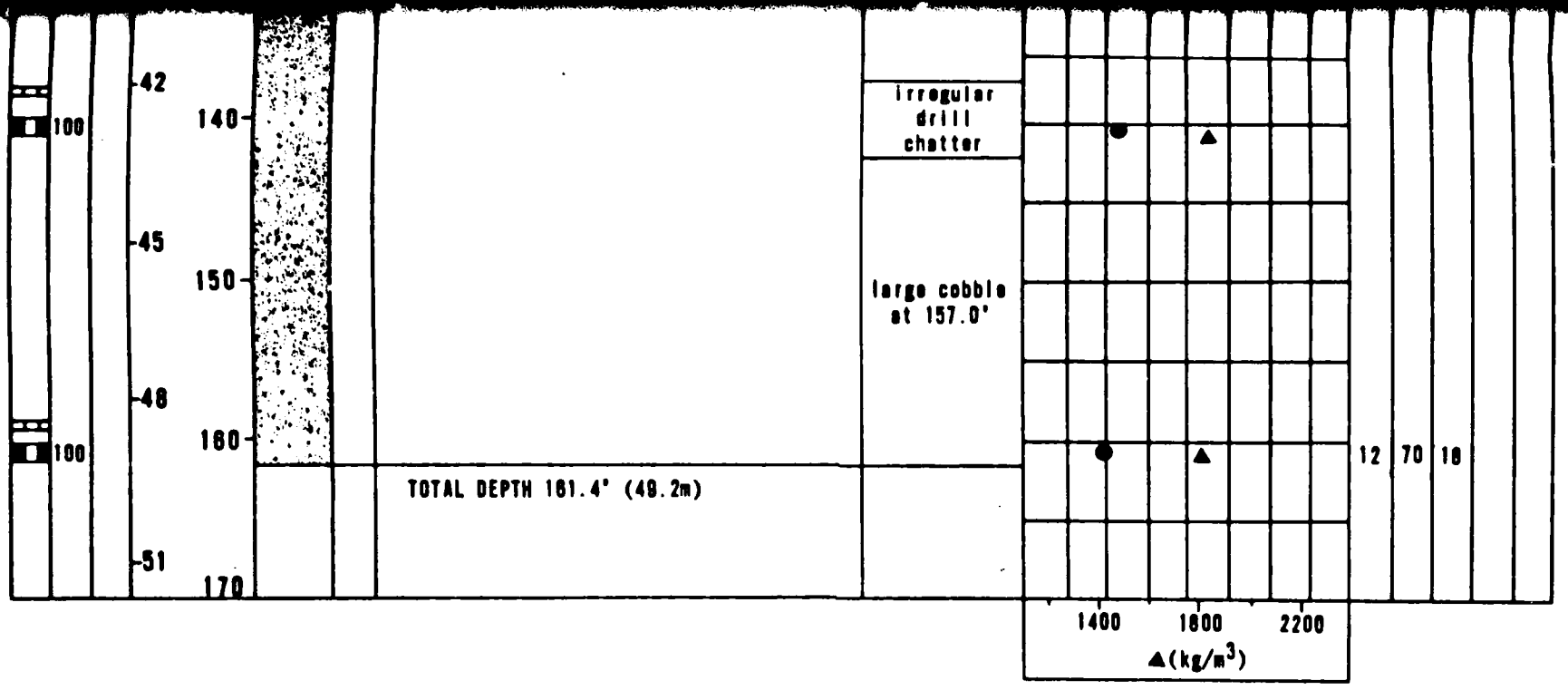
AFT-86

CHECKED BY _____ APPROVED BY _____

FM-18-27-A

SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	▲(pcf) 80 90 100 110 120 130 140 / ●(%) 5 10 15 20 25 30 35	SIEVE ANALYSIS GR	SA	FI	LL	PI
	93		0	0			GRAVELLY SAND, light brown to brown, fine to coarse, poorly graded, very dense, subangular, calcareous; some fine to coarse gravel; trace to some silt; cemented nodules.			27	47	26		
	80									28	50	22		
	100									47	52	11		
	100		3	10		SM								
	100									29	55	16		
	100		6	20		GW-GM	SANDY GRAVEL, light brown, fine to coarse, well to poorly graded, very dense, subangular, calcareous; some fine to coarse sand.			51	44	5		
	100													
	100		9	30		GP-GM				47	44	9		
	100		12	40			GRAVELLY SAND, yellow brown to red brown, fine to coarse, poorly graded, very dense, subangular, calcareous; trace to some fine to coarse gravel; trace to some silt; cemented lenses (3" -12") throughout.			6	83	31		
	100		15	50										
			18	60						20	66	17		


100
100
100
NR
100
100
100
18
21
24
27
30
33
36
39
42
60
70
80
90
100
110
120
130
140
SM
drill chatter
boulder at 100'
cemented
irregular drill chatter



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

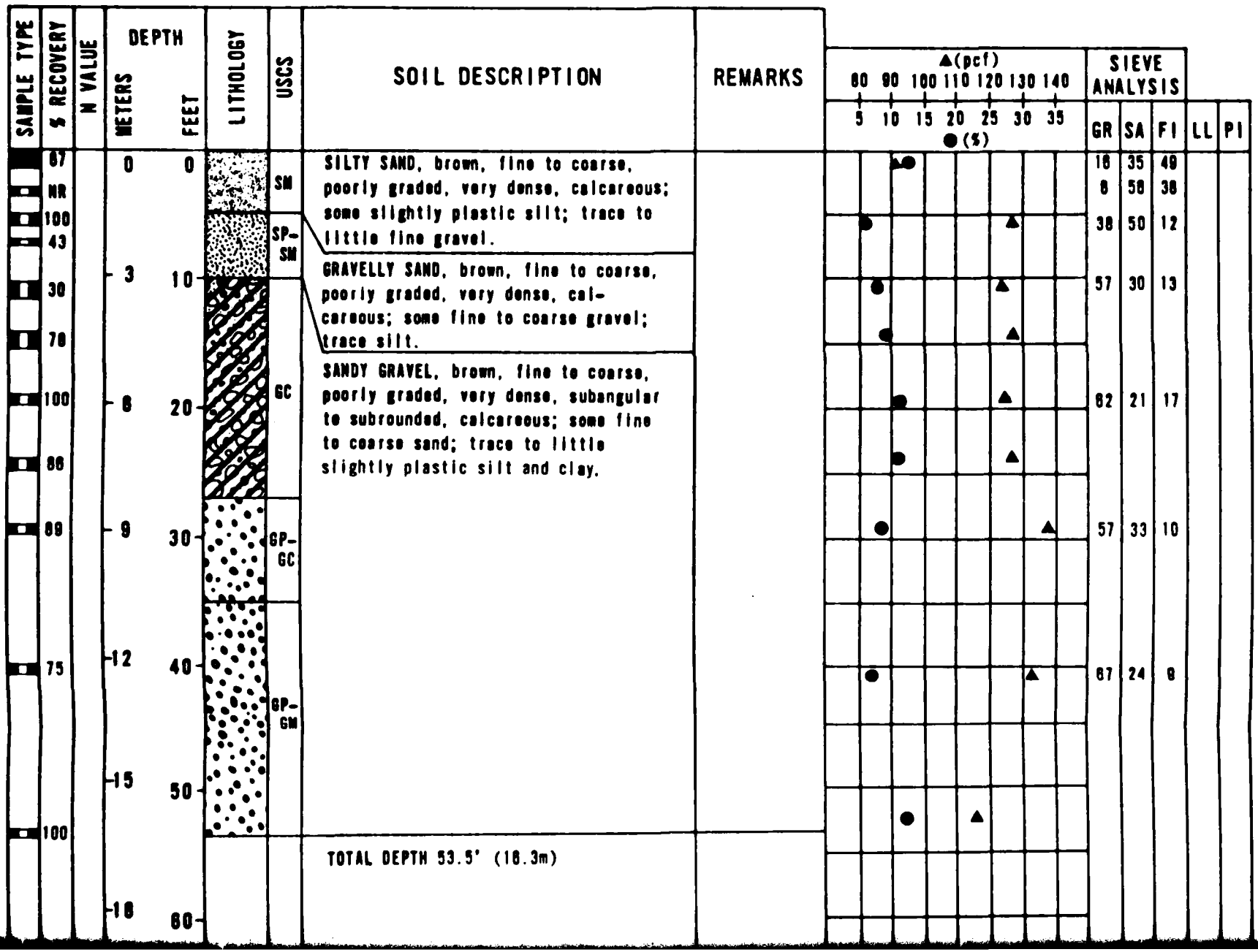
ELEVATION	:	5845' (1721m)
SURFICIAL GEOLOGIC UNIT	:	A5I
DATE DRILLED	:	4-5 December 1978
DRILLING METHOD	:	Rotary Wash
HOLE DIAMETER	:	4 7/8" (124mm)
WATER LEVEL	:	Not Encountered

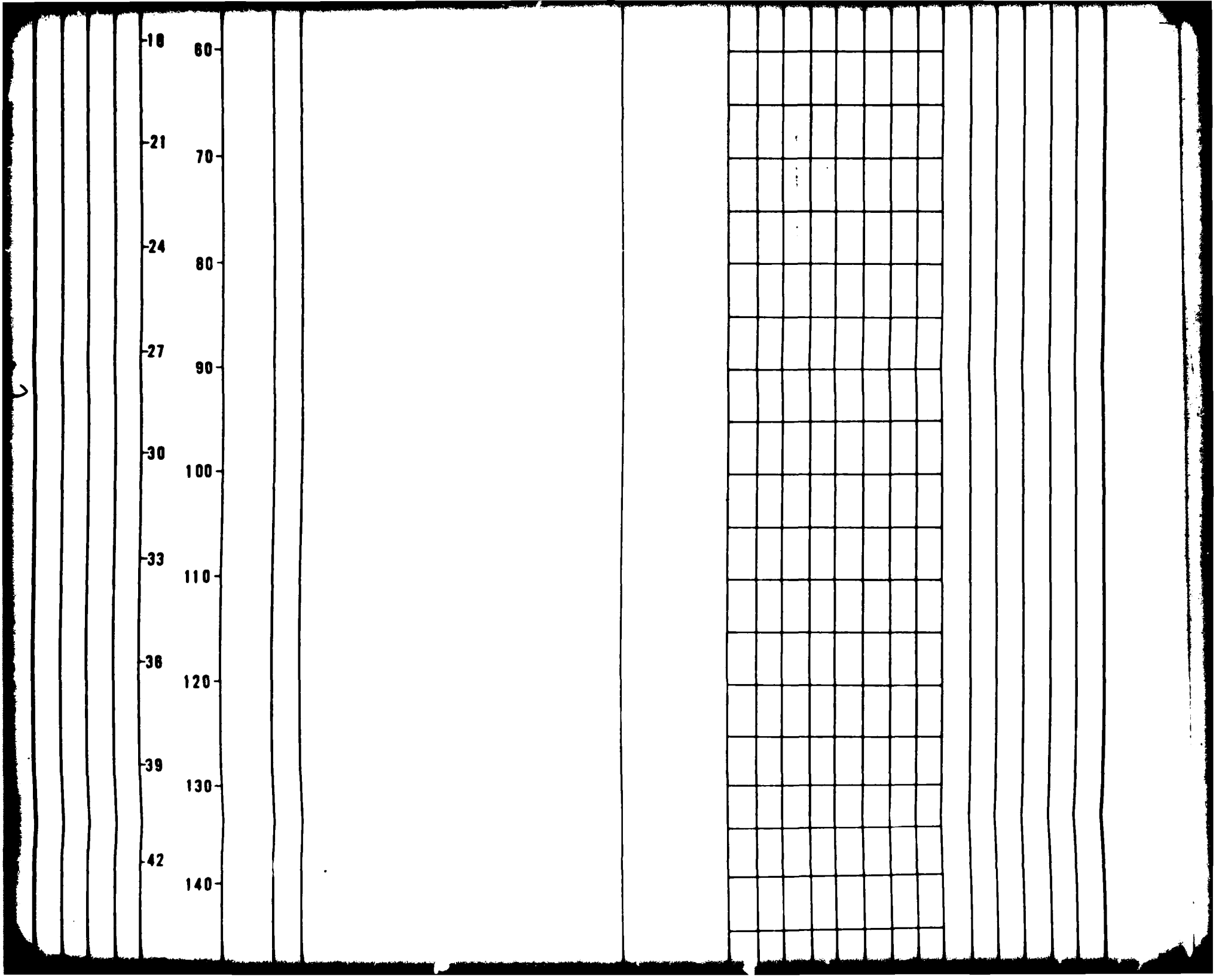
FUGRO NATIONAL, INC.

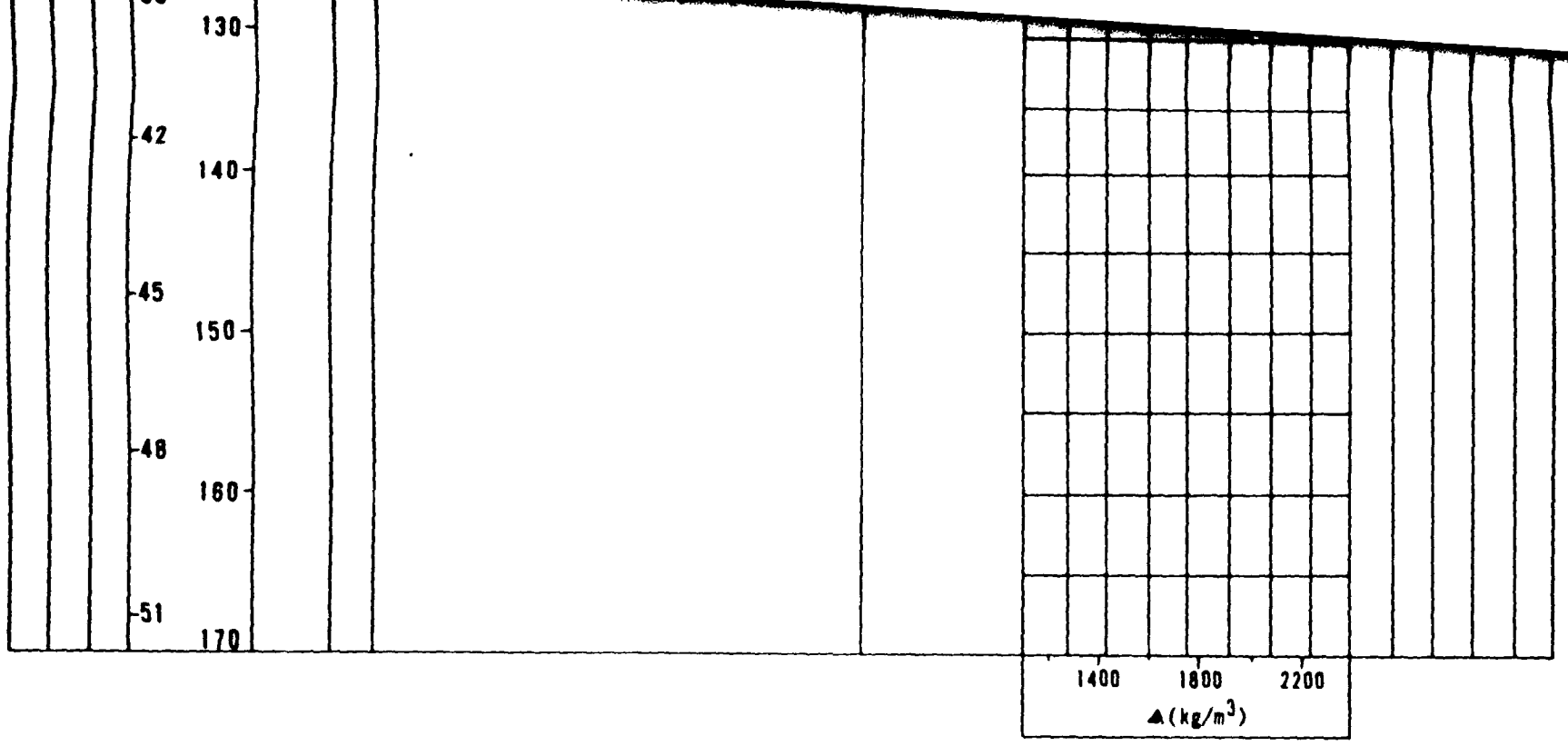
LOG OF BORING NR-6-6
VERIFICATION SITE, WHITE RIVER COP, NEVADA
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO
FIGURE 6-6

3

CHECKED BY _____ APPROVED BY _____




18
21
24
27
30
33
36
39
42
60
70
80
90
100
110
120
130
140



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	: 5636' (1718m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 3-4 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING WR-A-5
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 6-5

FUGRO NATIONAL, INC.

AFV-08

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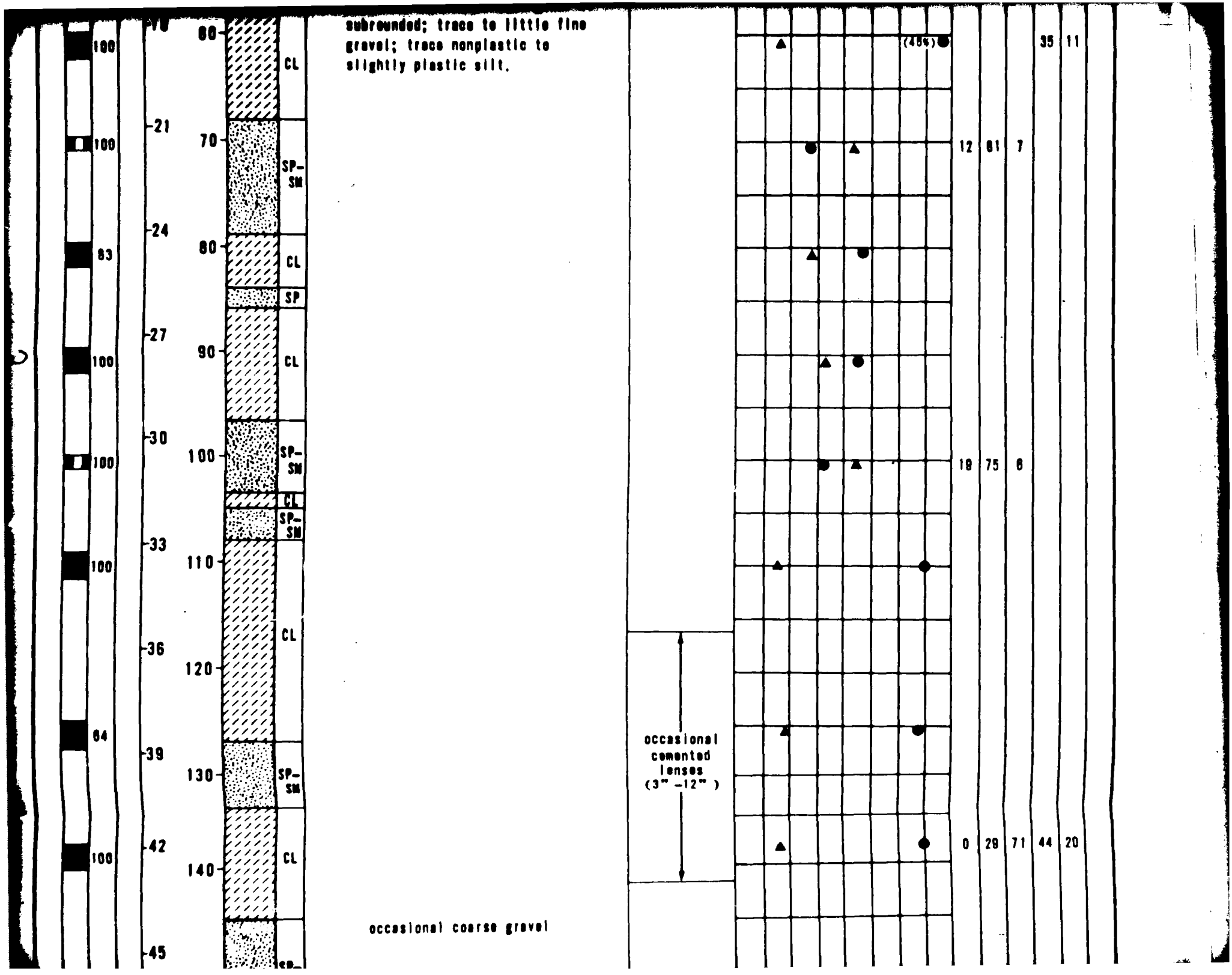
FM-TR-27-V

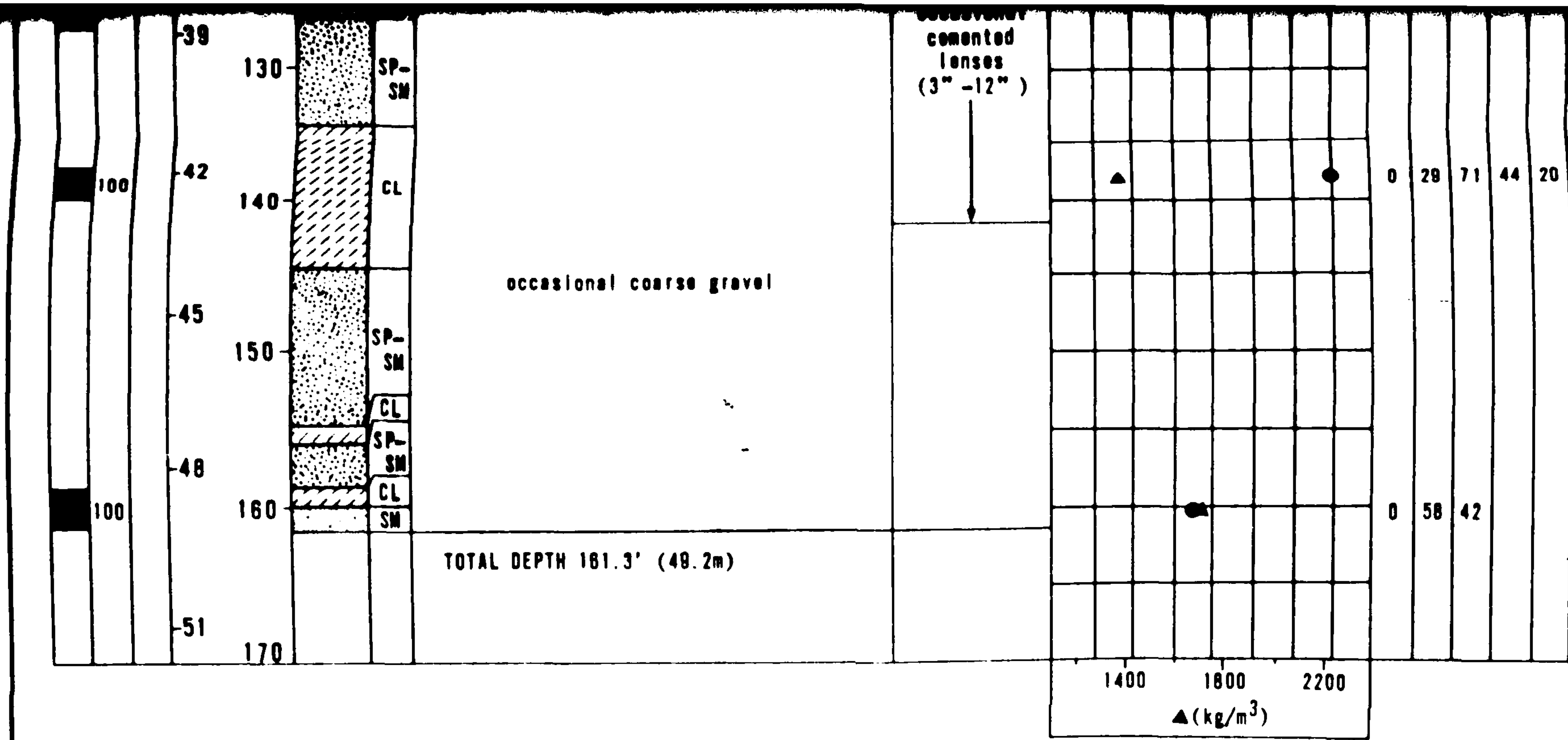
SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS
	100		0	0		SC	CLAYEY SAND, brown, fine to coarse, poorly graded, dense, subangular to subrounded, calcareous; some highly plastic clay.	water level at 11.0'
	100							
	67		3	10		ML	SANDY SILT, gray, stiff, medium plastic, calcareous; little silt.	
	57					SM	SILTY SAND and SAND, brown, fine to coarse, poorly graded, medium dense to dense, subrounded to subangular; trace to some silt.	
	93		6	20		SP-SM		
	73							
	100		9	30		SM		
	100							
	100		12	40		CL	Alternate layers of CLAY and SAND: CLAY: SILTY CLAY, brown, stiff to hard slightly to medium plastic, calcareous; trace fine sand. SAND: GRAVELLY SAND, brown to dark brown, fine to coarse, poorly graded, very dense, subangular to subrounded; trace to little fine gravel; trace nonplastic to	
	100					SW		
	100		15	50				
			18	60				

▲(pcf) 80 90 100 110 120 130 140
● (%) 5 10 15 20 25 30 35

SIEVE ANALYSIS				
GR	SA	FI	LL	PI
0	63	37		
4	56	40		
			46	18
3	89	8		
0	65	35		
0	76	24		NP
15	81	4		
			35	11

(45%)


subrounded; trace to little fine gravel; trace nonplastic to slightly plastic silt.
100
100
83
100
100
64
100
-21
-24
-27
-30
-33
-36
-39
-42
-45
80
70
80
90
100
110
120
130
140
CL
SP-SM
CL
SP
CL
SP-SM
CL
SP-SM
CL
SP-SM
CL
(48%)
12 81 7
18 75 6
0 29 71 44 20
35 11
occasional cemented lenses (3" -12")
occasional coarse gravel



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	: 5440' (1658m)
SURFICIAL GEOLOGIC UNIT	: A4o
DATE DRILLED	: 2-3 December 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 5" (127mm)
WATER LEVEL	: 11.0' (3.4m)

LOG OF BORING WR-B-4

VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE SAMSO

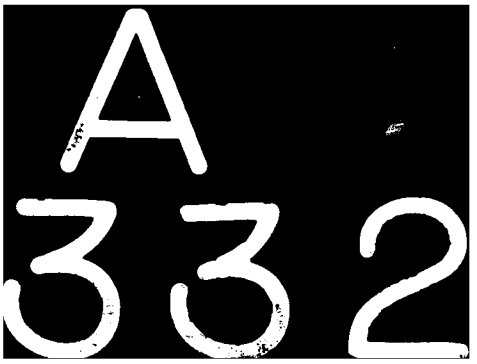
FIGURE B-4

FUGRO NATIONAL, INC.

AFV-86

AD-A113 327 FUGRO NATIONAL INC LONG BEACH CA F/G 8/13
MX SITING INVESTIGATION. GEOTECHNICAL EVALUATION. VOLUME V. NEV--ETC(U)
AUG 79 F04704-78-C-0027
UNCLASSIFIED FN-TR-27-5 NL

2 3


A
332

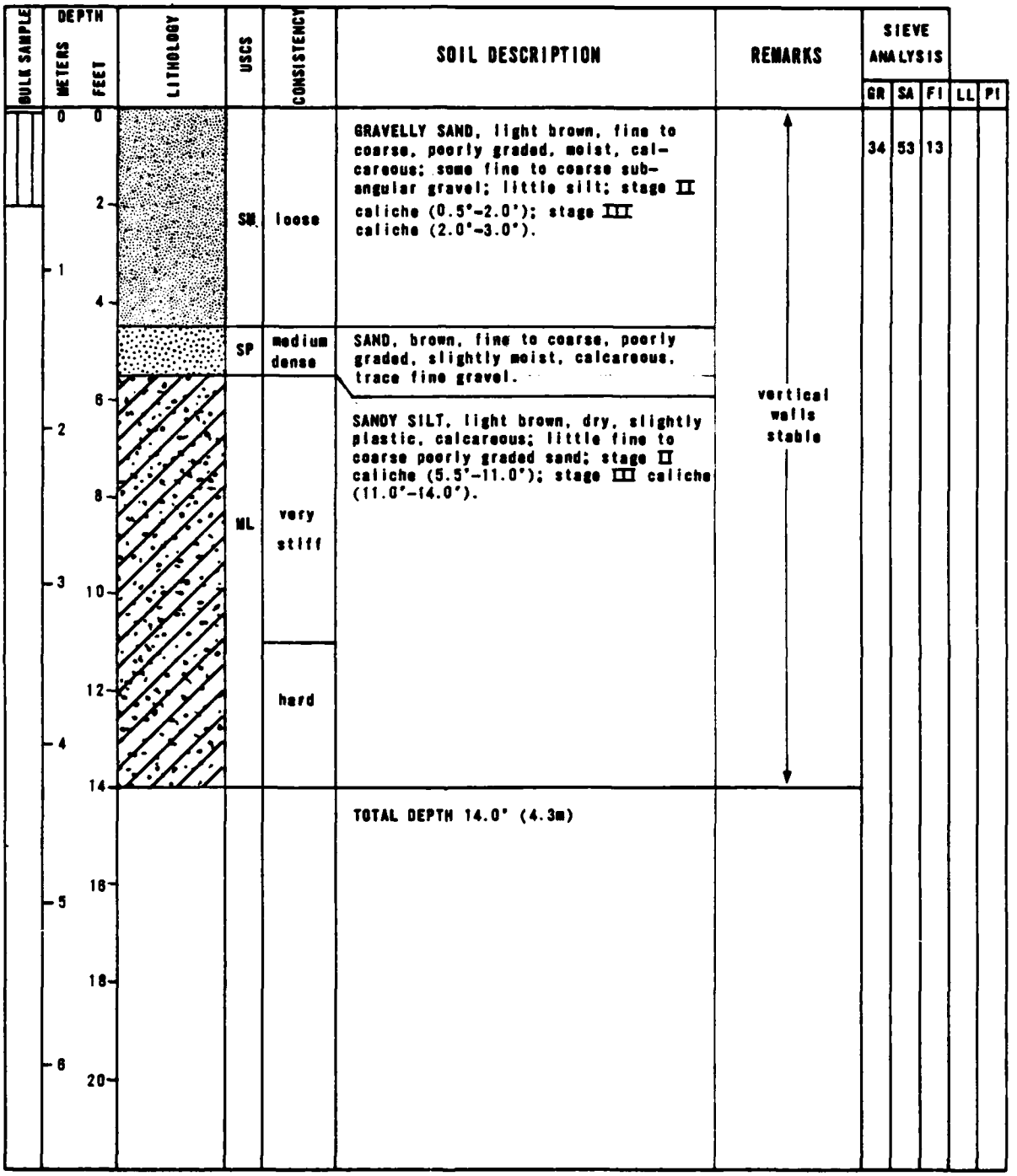
SECTION 7.0

TRENCH AND TEST PIT LOGS

EXPLANATIONS OF TRENCH AND TEST PIT LOGS

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

FN-TR-27-V



TRENCH DETAILS

SURFACE ELEVATION	:5240' (1597m)
DATE EXCAVATED	:28 NOVEMBER 1978
SURFICIAL GEOLOGIC UNIT	:A5y (A4e)
TRENCH LENGTH	:15.0' (4.6m)
TRENCH ORIENTATION	: E-W

LOG OF TRENCH WR-T-1
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-1

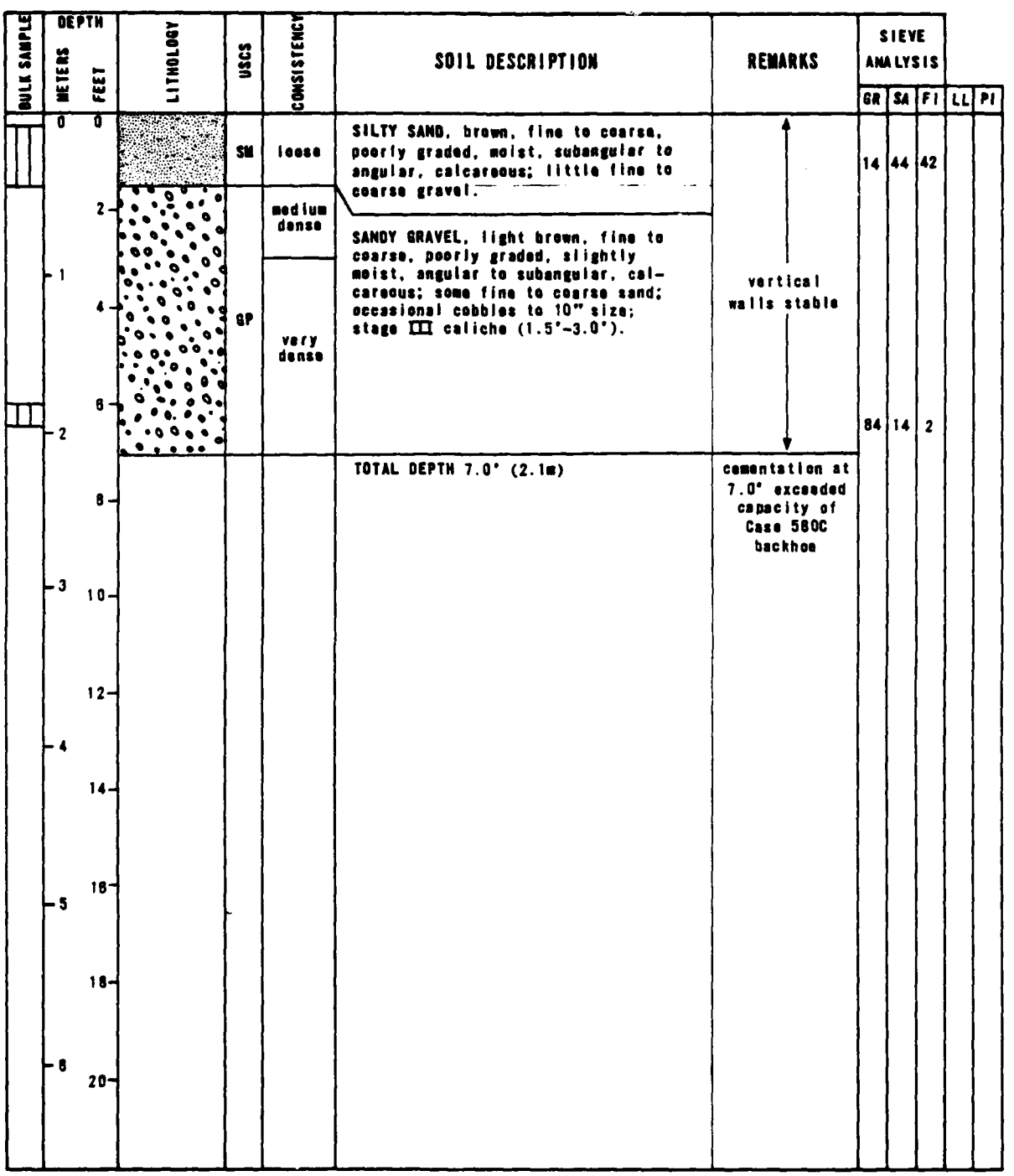
FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-04

FN-TR-27-V



TRENCH DETAILS

SURFACE ELEVATION : 5645' (1721m)
DATE EXCAVATED : 29 NOVEMBER 1978
SURFICIAL GEOLOGIC UNIT : Asf
TRENCH LENGTH : 12.0' (3.7m)
TRENCH ORIENTATION : NE-SW

LOG OF TRENCH WR-T-2
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-2

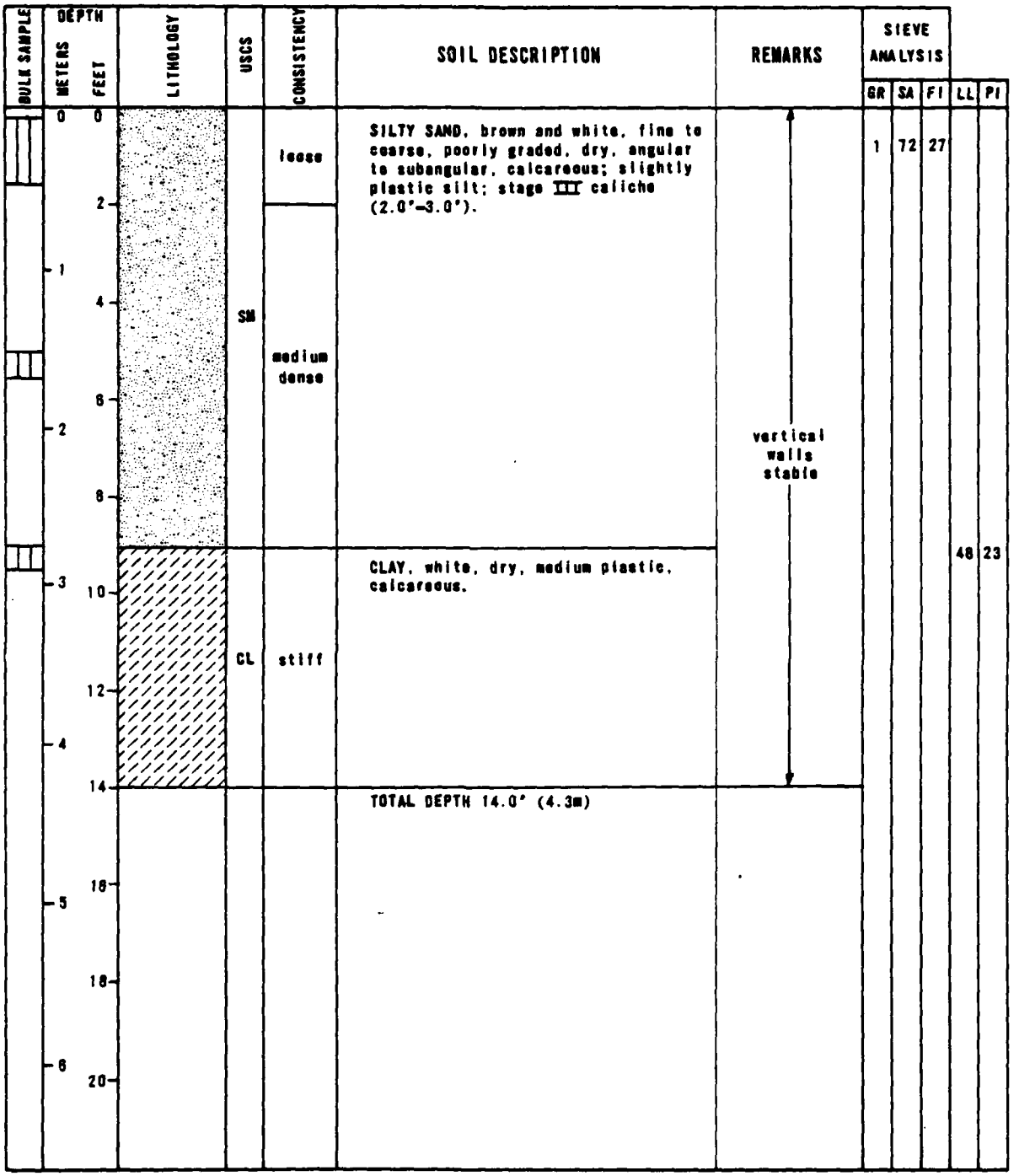
FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-04

FN-TR-27-V



TRENCH DETAILS

SURFACE ELEVATION : 5245' (1599m)
DATE EXCAVATED : 30 NOVEMBER 1978
SURFICIAL GEOLOGIC UNIT : A4e
TRENCH LENGTH : 15.0' (4.6m)
TRENCH ORIENTATION : E-W

LOG OF TRENCH WR-T-3
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-3

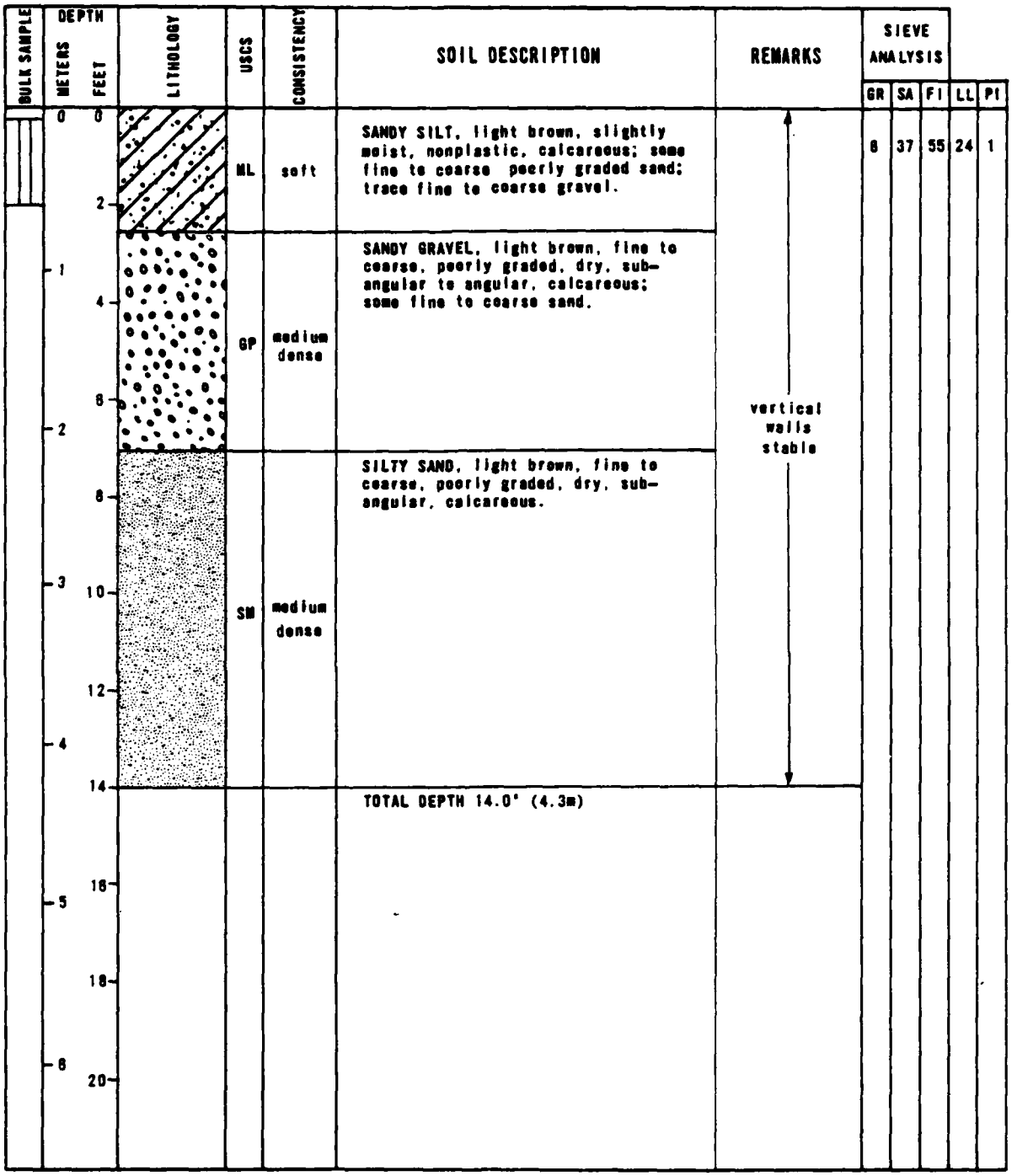
FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-04

FN-TR-27-V



TRENCH DETAILS

SURFACE ELEVATION : 5320' (1622m)
DATE EXCAVATED : 1 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A4e
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : E-W

LOG OF TRENCH WR-T-4
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-4

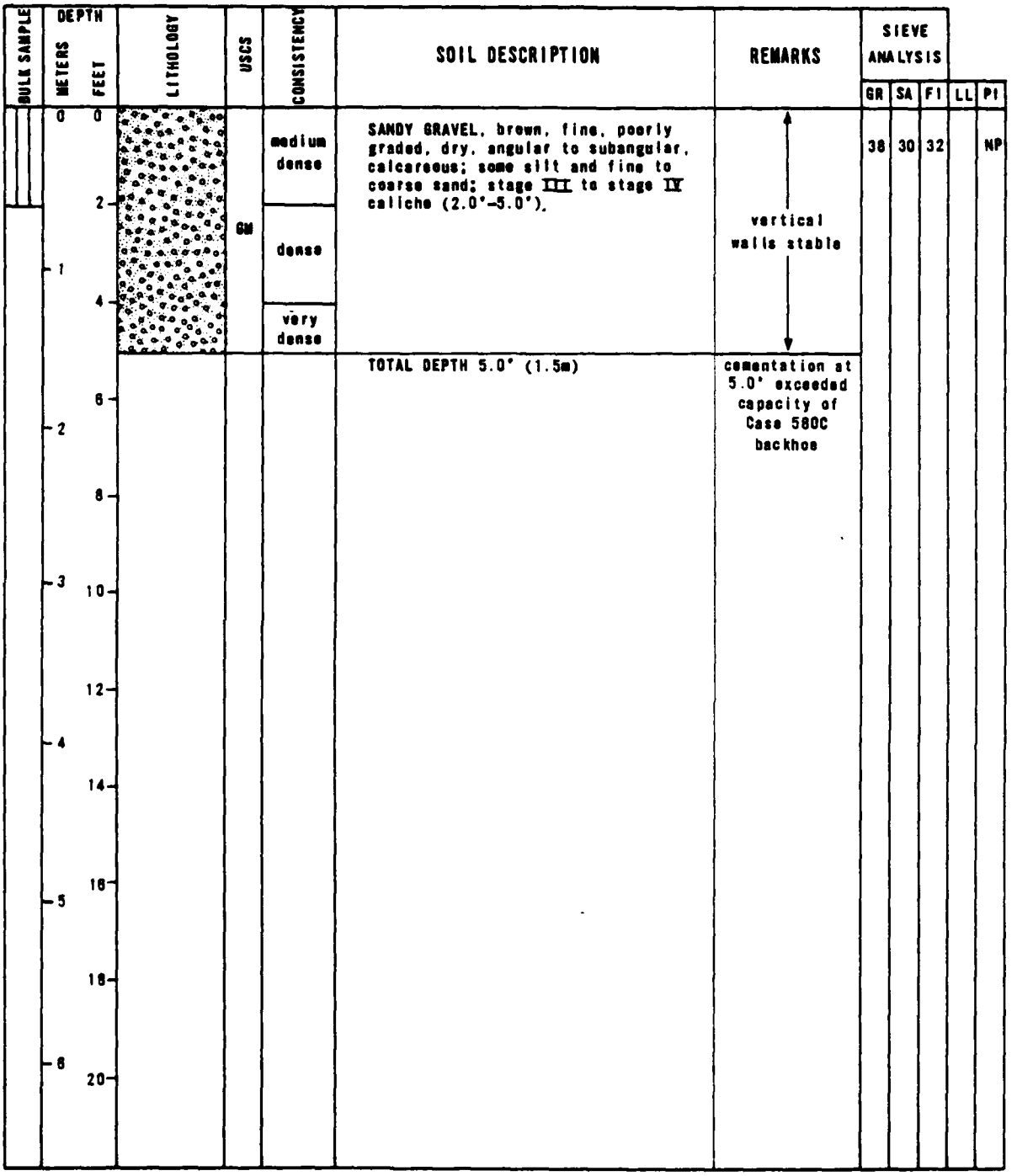
FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-04

FN-TR-27-V



TRENCH DETAILS

SURFACE ELEVATION : 5670' (1728m)
DATE EXCAVATED : 2 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : ASI
TRENCH LENGTH : 9.0' (2.7m)
TRENCH ORIENTATION : NE-SW

LOG OF TRENCH WR-T-5
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-5

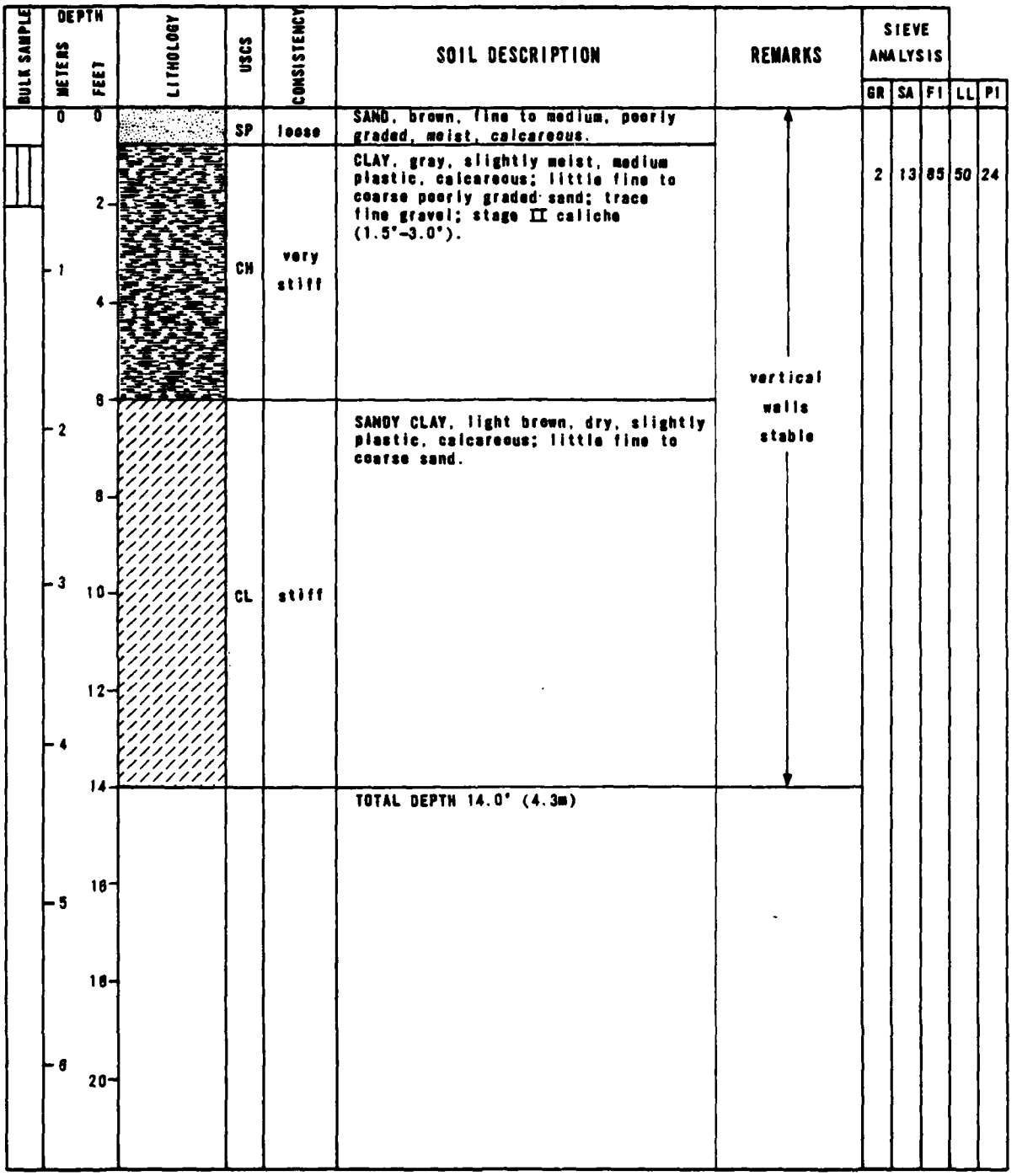
FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-04

FN-TR-27-V



CHECKED BY _____ APPROVED BY _____

TRENCH DETAILS

SURFACE ELEVATION : 5374' (1638m)
DATE EXCAVATED : 3 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A5y/A4e
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : E-W

LOG OF TRENCH WR-T-6
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-6

WOODWARD-CLYDE CONSULTANTS

FN-TR-27-V

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, calcareous; some nonplastic silt; little fine gravel.	vertical walls stable	15	36	49		NP
	1	2		GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, sub-angular to angular, calcareous; some fine to coarse sand; stage II caliche (1.5'-5.0').						
	2	4										
	2	6										
	3	8										
	3	10				TOTAL DEPTH 10.0' (3.0m)	cementation at 10.0' exceeded capacity of Case 580C backhoe					
	4	12										
	4	14										
	5	16										
	5	18										
	6	20										

TRENCH DETAILS

SURFACE ELEVATION : 5638' (1718m)
DATE EXCAVATED : 4 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A5y
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : E-W

LOG OF TRENCH WR-T-7
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-7

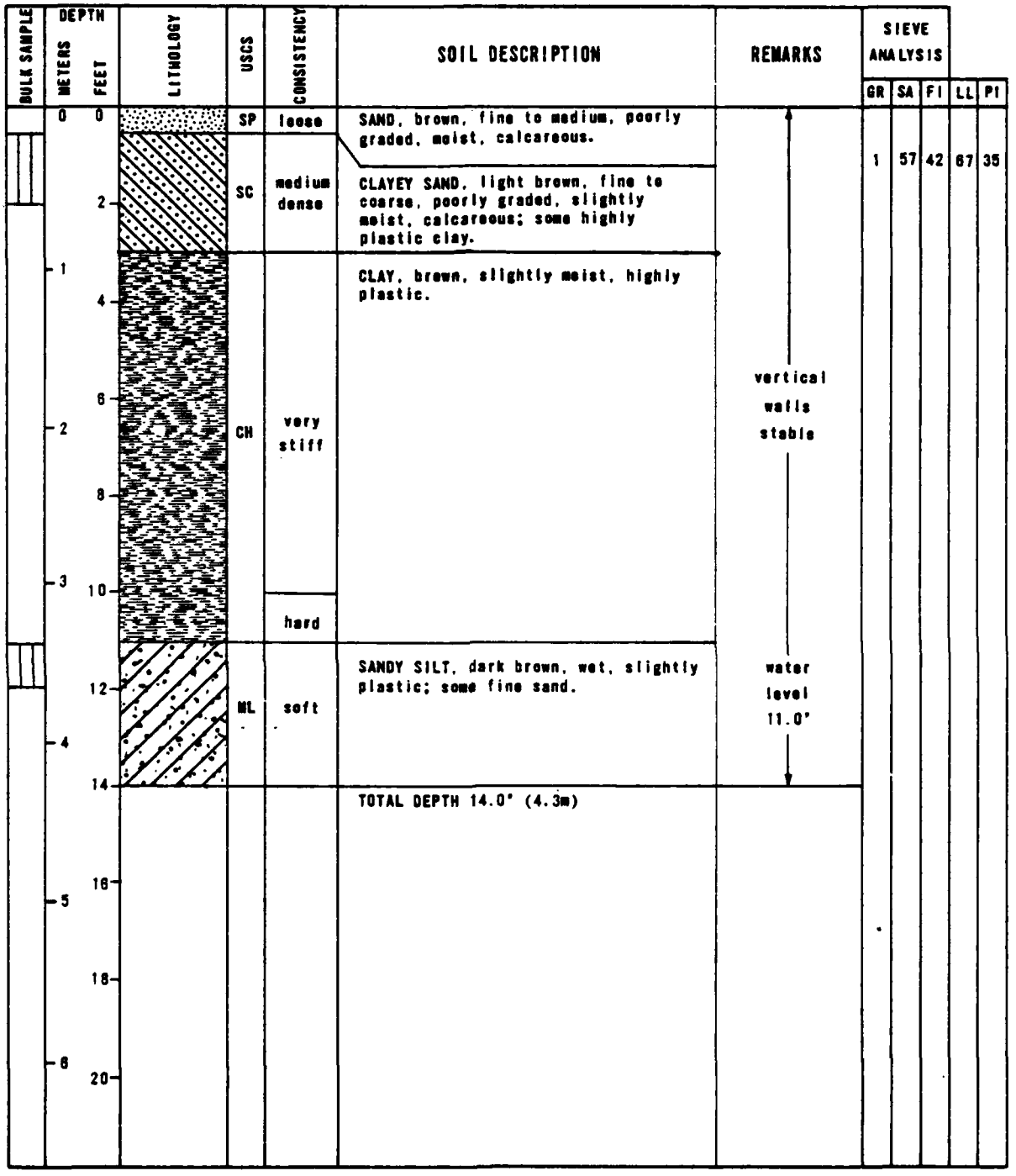
FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-04

FN-TR-27-V



TRENCH DETAILS

SURFACE ELEVATION : 5440' (1658m)
DATE EXCAVATED : 5 DECEMBER 1978
SURFICIAL GEOLOGIC UNIT : A4e
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : E-W

LOG OF TRENCH WR-T-8
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-8

FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-04

FN-TR-27-V

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		CL	soft	SANDY CLAY, brown, moist, slightly plastic, calcareous; some fine to coarse poorly graded sand; trace fine gravel.						
	1			GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some fine to coarse sand; stage I caliche (1.0'-5.0').						
	2											
	3	1										
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5397' (1645m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WR-P-1

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		CL	soft	SANDY CLAY, brown, moist, medium plastic, calcareous; little fine to coarse poorly graded sand; trace fine gravel.						
	1			GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, rounded to subangular, calcareous; little fine to coarse sand; stage II caliche (1.0'-5.0').						
	2											
	3	1										
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5485 (1672m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WR-P-2

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-1 AND WR-P-2
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

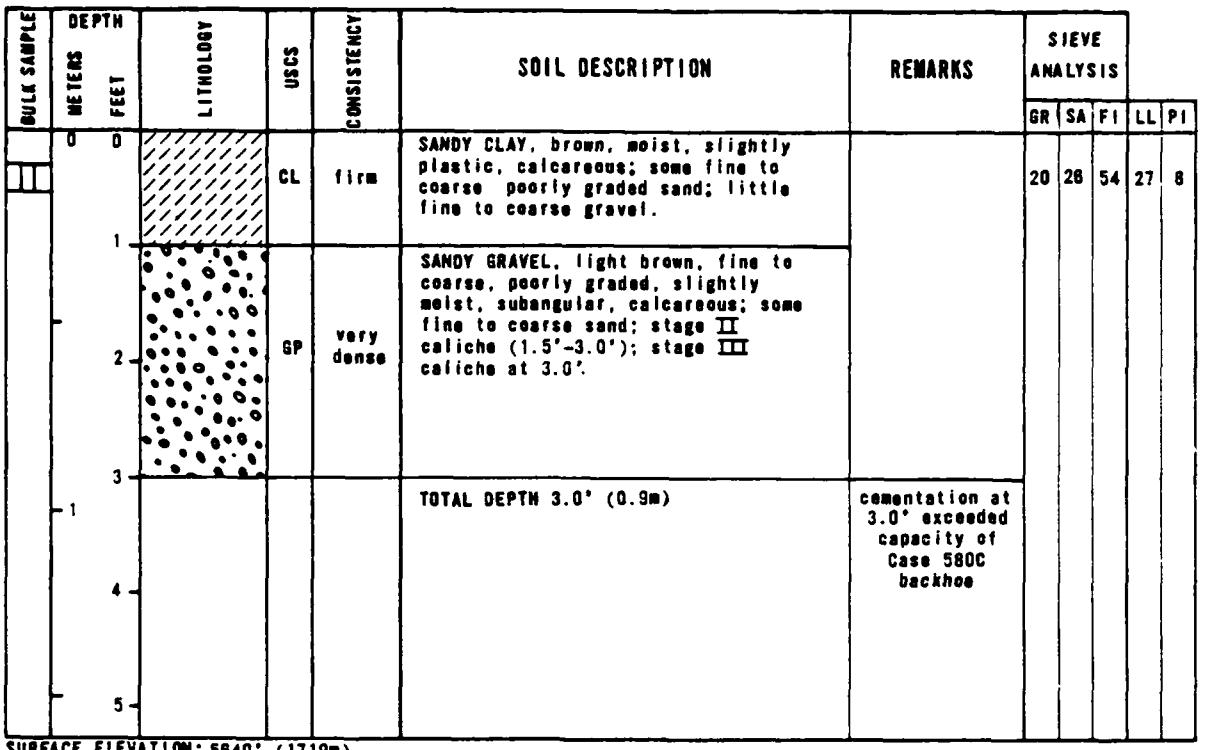
FIGURE 7-9

FUGRO NATIONAL, INC.

2 JUL 79

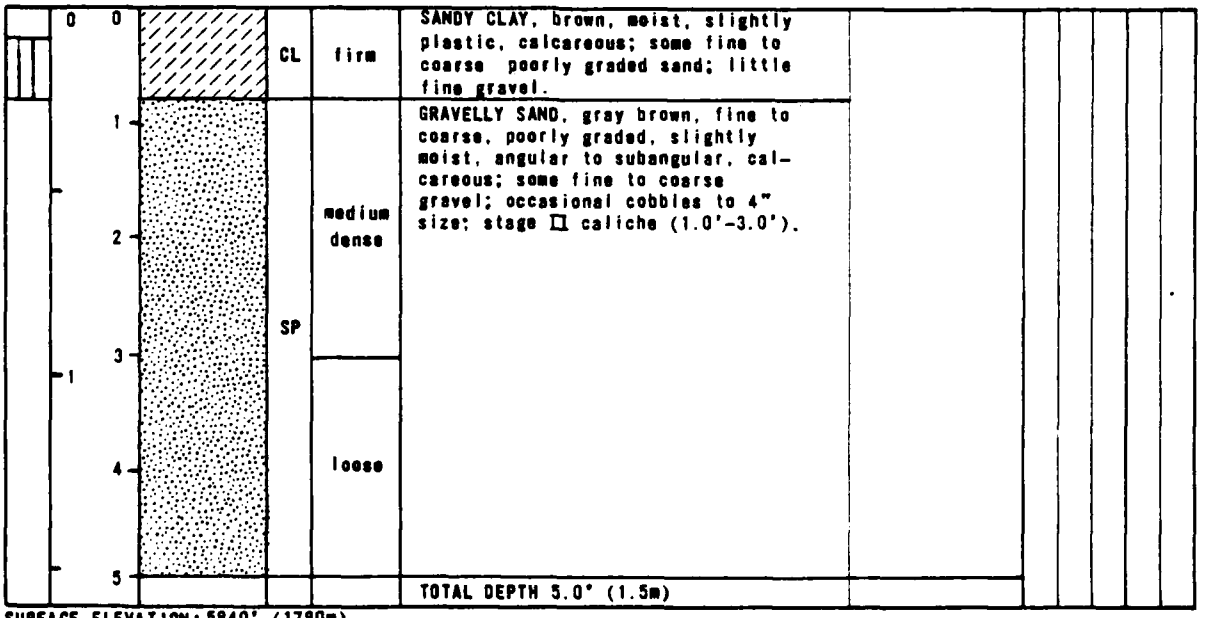
AFV-03

FN-TR-27-V



SURFACE ELEVATION: 5640' (1719m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT WR-P-3



SURFACE ELEVATION: 5640' (1780m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT WR-P-4

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-3 AND WR-P-4
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-10

FUGRO NATIONAL, INC.

2 JUL 79

AFV-03

FN-TR-27-V

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 and gray, fine to coarse, poorly graded, moist, subangular, calcareous; trace fine gravel.						
	1				medium dense							
		1										
	2											
	3											
		1										
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5430' (1655m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WR-P-5

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, subangular, calcareous; occasional cobbles to 5" size.		1	80	19		
	1											
		1										
	2											
	3											
		1										
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5485' (1672m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WR-P-6

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-5 AND WR-P-6
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-11

FUGRO 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		SM	loose	SILTY SAND, brown, fine to coarse, poorly graded, moist, subangular to angular, calcareous; some non-plastic silt; little fine gravel; stage II caliche (1.5'-2.5').		18	36	46		NP
	1				medium dense							
	2											
	3	1		GP	medium dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, sub-angular to angular, calcareous; some fine to coarse sand; stage I caliche (2.5'-5.0').						
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5530' (1686m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT WR-P-7

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, subangular to angular, calcareous.		4	59	37		
	1											
	2				medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, sub-angular to subrounded, calcareous; trace fine to coarse gravel; occasional cobbles to 8" size.						
	3	1										
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5330' (1625m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WR-P-8

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-7 AND WR-P-8
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-12

UGRO NATIONAL, INC.

FN-TR-27-V

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, subangular to angular, calcareous; some silt.		1	78	22		
		1										
		2										
		3		CL	stiff	SILTY CLAY, light brown, slightly moist, slightly plastic, calcareous; trace fine sand.						
	1	4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5230' (1594m)
SURFICIAL GEOLOGIC UNIT: A4c

LOG OF TEST PIT WR-P-9

	0	0		SM	loose	SILTY SAND, brown, fine to coarse, poorly graded, moist, subangular to angular, calcareous; stage III caliche (1.5'-5.0').						
		1										
		2			medium dense							
		3										
	1	4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5240' (1597m)
SURFICIAL GEOLOGIC UNIT: A4c

LOG OF TEST PIT WR-P-10

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-9 AND WR-P-10
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FIGURE 7-13

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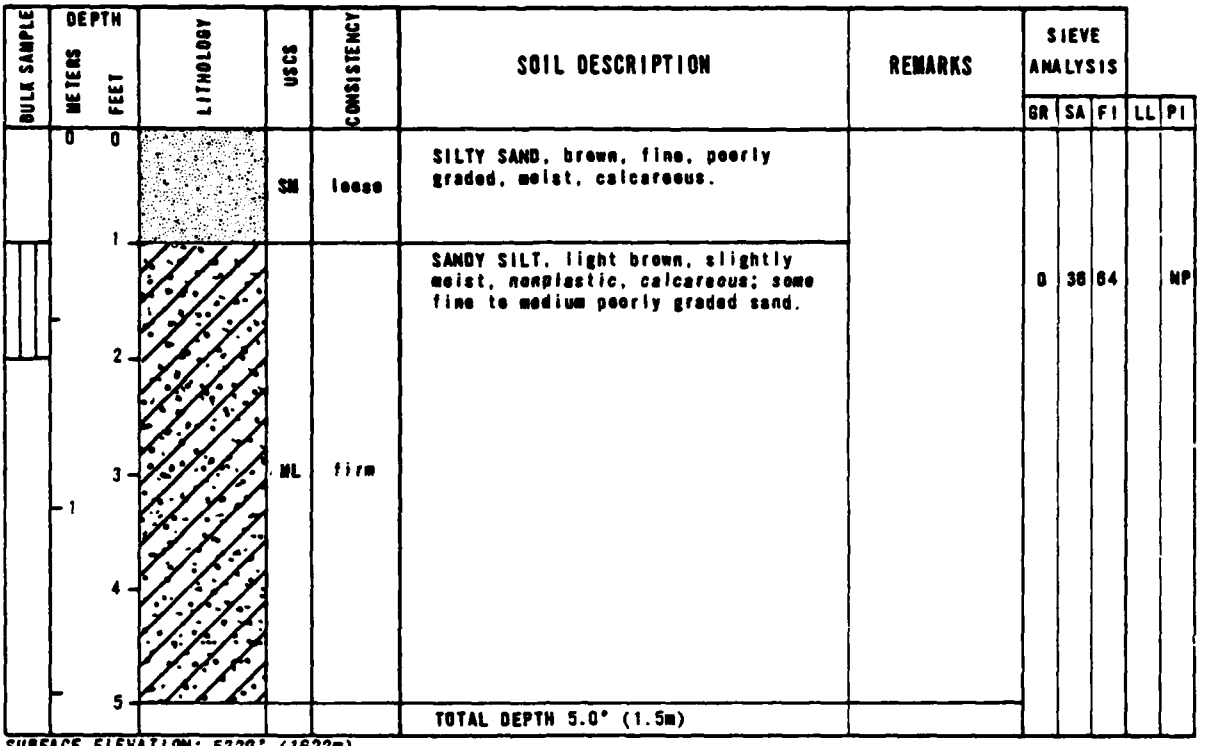
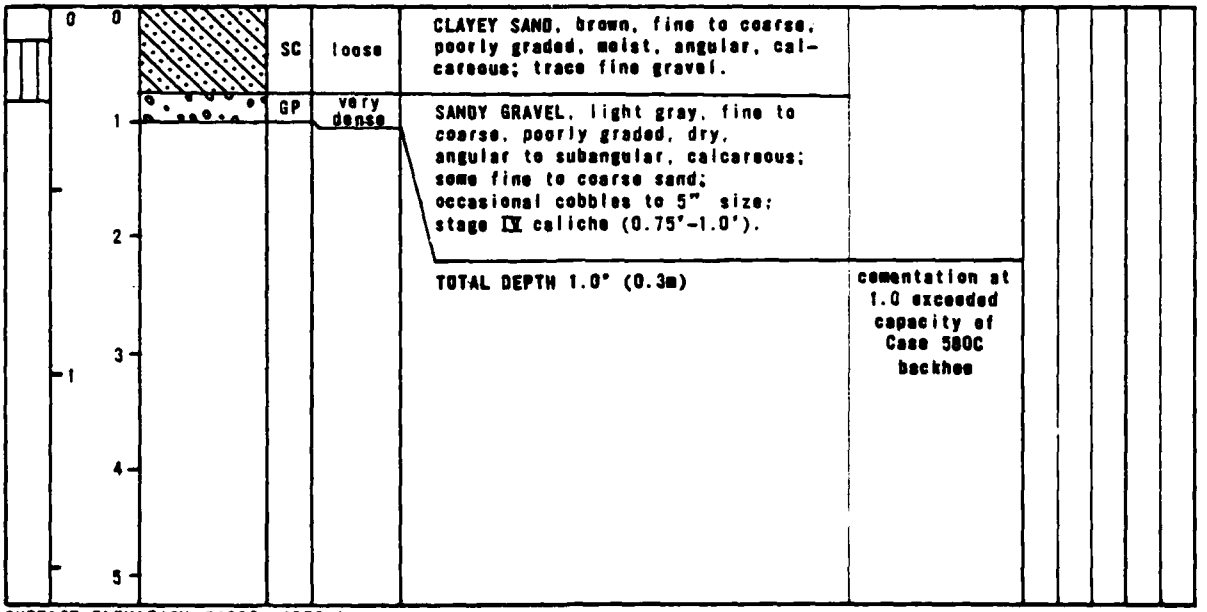
FW-TR-27-V



SURFACE ELEVATION: 5320' (1622m)
SURFICIAL GEOLOGIC UNIT: A4e

LOG OF TEST PIT WR-P-11



SURFACE ELEVATION: 5480' (1670m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WR-P-12

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-11 AND WR-P-12
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FIGURE 7-14

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FN-TR-27-V

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 nonplastic silt; trace fine gravel.		8	62	30		NP
	1											
		2		CL	stiff	SANDY CLAY, light brown, slightly moist, medium plastic, calcareous; some fine to medium poorly graded sand; stage III caliche (1.5'-2.5').						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5300' (1615m)
SURFICIAL GEOLOGIC UNIT: A1

LOG OF TEST PIT WR-P-13

	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, moist, angular, calcareous; trace fine gravel; stage III caliche (2.0'-3.5').		7	61	32		
		1										
		2			dense							
	1	3										
		4				TOTAL DEPTH 3.5' (1.1m)	cementation at 3.5' exceeded capacity of Case 580C backhoe					
		5										

SURFACE ELEVATION: 5420' (1652m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WR-P-14

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-13 AND WR-P-14
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FIGURE 7-15

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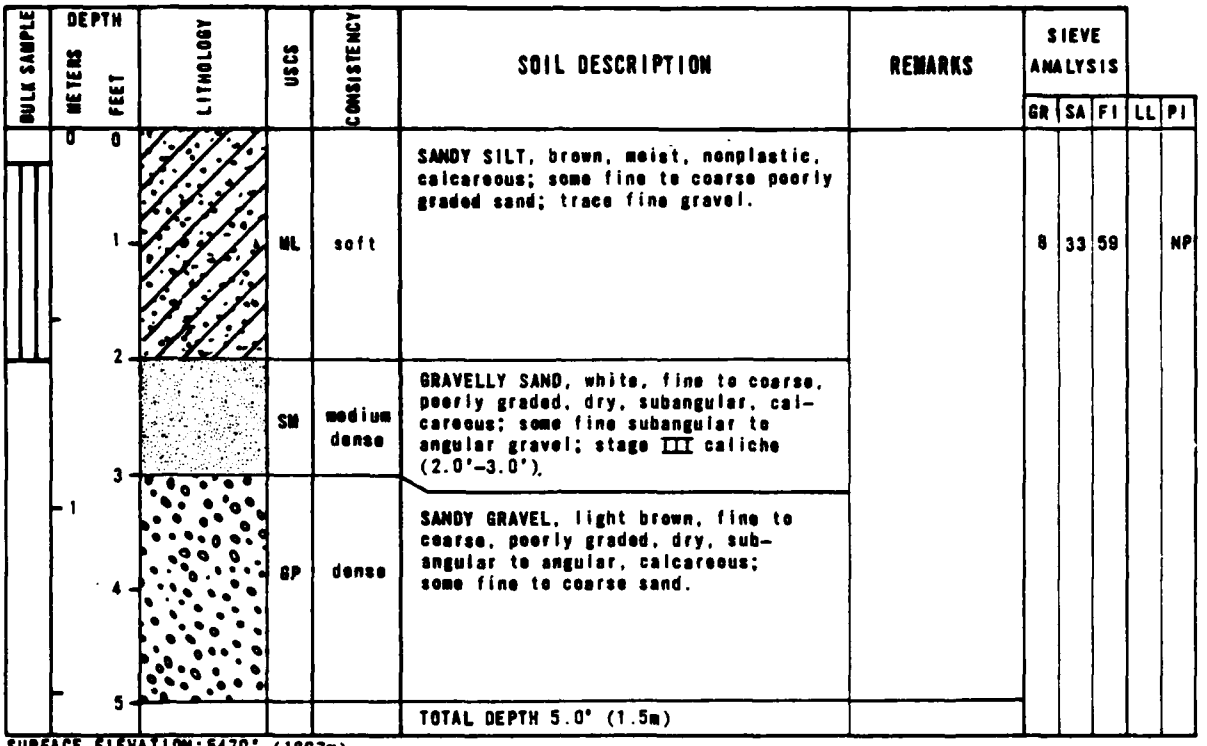
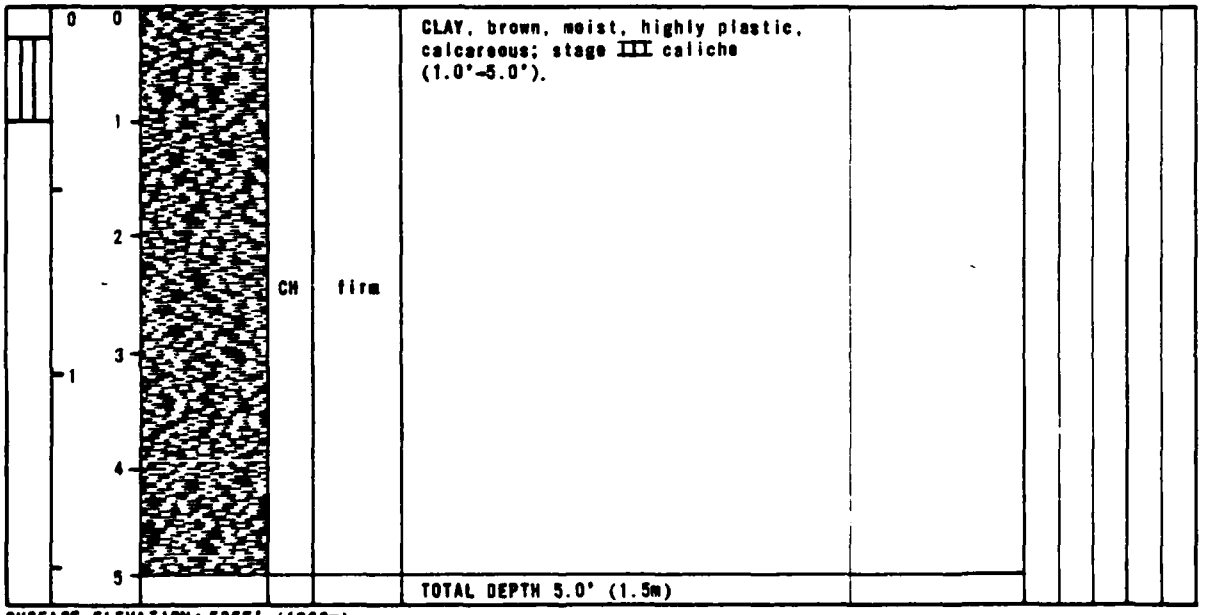
FN-TR-27-V



SURFACE ELEVATION: 5470' (1667m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WR-P-15



SURFACE ELEVATION: 5355' (1632m)
SURFICIAL GEOLOGIC UNIT: A4o

LOG OF TEST PIT WR-P-16

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-15 AND WR-P-16
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FIGURE 7-16

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FN-TR-27-V

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		ML	firm	SANDY SILT, brown, moist, nonplastic, calcareous; some fine to coarse sand; little fine gravel.		18	24	58	23	2
	1			GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little fine to coarse sand; stage I caliche (1.0'-2.0').						
	2											
	3	1										
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5485' (1672m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WR-P-17

	0	0		SM	loose	GRAVELLY SAND, brown, fine to coarse, poorly graded, moist, angular, calcareous; some fine gravel; occasional cobbles to 5" size; stage IV caliche (1.25'-1.50').						
	1					TOTAL DEPTH 1.5' (0.5m)	cementation at 1.5' exceeded capacity of Case 580C backhoe					
	2											
	3	1										
	4											
	5											

SURFACE ELEVATION: 5720' (1743m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WR-P-18

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-17 AND WR-P-18
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FIGURE 7-17

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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				SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; Sandy Gravel layer (2.0'-2.5').		15	45	40		
		1		SM	loose							
		2		GP	medium dense							
	1	3		SM	medium dense							
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5530' (1686m)
SURFICIAL GEOLOGIC UNIT: A4e

LOG OF TEST PIT WR-P-19

	0	0				CLAY, brown, moist, highly plastic, calcareous.						
		1										
		2		CH	stiff							
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5480' (1664m)
SURFICIAL GEOLOGIC UNIT: A4e

LOG OF TEST PIT WR-P-20

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-19 AND WR-P-20
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FIGURE 7-18

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FN-TR-27-V

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, calcareous; some fine to coarse gravel.		31	34	35		
	1			GP	very dense	SANDY GRAVEL, white, fine to coarse, poorly graded, dry, angular to subangular, calcareous; some fine to coarse sand; occasional cobbles to 5" size, stage IV caliche (1.0'-2.0').						
	2					TOTAL DEPTH 2.0' (0.6m)	cementation at 2.0' exceeded capacity of Case 580C backhoe					
	3											
	1											
	4											
	5											

SURFACE ELEVATION: 5500' (1676m)
SURFICIAL GEOLOGIC UNIT: A5f

LOG OF TEST PIT WR-P-21

	0	0		CL	stiff	CLAY, light brown, slightly moist, slightly plastic, calcareous; trace fine sand.					35	13
	1				very stiff	SANDY CLAY, light brown, slightly moist, slightly plastic, calcareous; some fine to medium poorly graded sand.						
	2											
	3											
	1											
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5440' (1658m)
SURFICIAL GEOLOGIC UNIT: A4o

LOG OF TEST PIT WR-P-22

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS WR-P-21 AND WR-P-22
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FIGURE 7-19

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SECTION 8.0

SURFICIAL SAMPLE LOGS

EXPLANATIONS OF SURFICIAL SAMPLE LOGS

Finalized logs of the surficial samples are presented in tnis 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
WR-CS-1	5638 (1718)	A5y	0.0-2.0 (0.0-0.6)	CL	SANDY CLAY, brown, slightly plastic, calcareous; some fine to coarse sand.					
WR-CS-3	6000 (1829)	A5y	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, angular, calcareous; some slightly plastic silt, some fine to coarse gravel.	30	35	35		
WR-CS-5	5400 (1646)	A4e	0.0-2.0 (0.0-0.6)	CL	SANDY CLAY, brown, slightly plastic, calcareous; little fine to medium sand.					
WR-CS-6	5380 (1634)	A1	0.0-2.0 (0.0-0.6)	CH	CLAY, red brown, highly plastic, calcareous; trace fine sand.					
WR-CS-7	5380 (1634)	A4e	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to medium, poorly graded, angular, calcareous; some slightly plastic silt.	1	67	32	35	10
WR-CS-11	5356 (1633)	A4e	0.0-2.0 (0.0-0.6)	CL	SILTY CLAY, brown, medium plastic, calcareous; trace fine sand.					
WR-CS-14	5560 (1695)	A5i	0.0-0.75 (0.0-0.2)	SM	SILTY SAND, brown, fine to medium, poorly graded, angular, calcareous; some silt; trace fine gravel.					
			0.75-2.0 (0.2-0.6)	GP	SANDY GRAVEL, white, fine to coarse, poorly graded, angular to subangular, calcareous; some fine to coarse sand, occasional cobbles to 6" size.					
WR-CS-15	5472 (1668)	A1	0.0-2.0 (0.0-0.6)	ML	SANDY SILT, light-brown, nonplastic, calcareous; some fine to medium sand.	1	24	75		NP
WR-CS-16	5470 (1667)	A4e	0.0-1.0 (0.0-0.3)	CL	SANDY CLAY, brown, slightly plastic, calcareous; little fine to medium sand.					
			1.0-2.0 (0.3-0.6)	ML	SANDY SILT, white, nonplastic, calcareous; some fine to medium sand.					
WR-CS-17	5460 (1664)	A4e	0.0-1.25 (0.0-0.4)	SM	SILTY SAND, brown, fine to medium, poorly graded, calcareous; some silt.					
			1.25-2.0 (0.4-0.6)	CL	SANDY CLAY, light brown, slightly plastic, calcareous; little fine sand.					
WR-CS-20	5480 (1670)	A4e	0.0-2.0 (0.0-0.6)	CL	SILTY CLAY, brown to white, slightly plastic, calcareous; little fine sand; stage III caliche.					
WR-CS-23	5360 (1634)	A4e	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, angular to subangular, calcareous; some silt; trace fine gravel.					

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
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FIGURE 8-1
1 OF 3

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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
WR-CS-24	5300 (1615)	A1	0.0-2.0 (0.0-0.6)	CH	CLAY, gray, highly plastic, calcareous.				98	66
WR-CS-26	5310 (1618)	A4e	0.0-2.0 (0.0-0.6)	CL	SILTY CLAY, brown gray, medium plastic, calcareous; little fine to medium sand.					
WR-CS-27	5312 (1619)	A4e	0.0-2.0 (0.0-0.6)	CH	SILTY CLAY, light brown, highly plastic, calcareous; trace fine sand.				69	40
WR-CS-28	5385 (1641)	A5y	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown to white, fine to coarse, poorly graded, angular, calcareous; trace silt; trace fine gravel; stage IV caliche (1.85'-2.0').					
WR-CS-32	5230 (1594)	A4e	0.0-0.75 (0.0-0.2)	ML	SANDY SILT, brown, slightly plastic, calcareous; little fine sand.					
			0.75-2.0 (0.2-0.6)	SP-SM	GRAVELLY SAND, light brown, fine to coarse, poorly graded, angular to subangular, calcareous; little fine gravel; trace silt.					
WR-CS-34	5285 (1605)	A4e	0.0-1.5 (0.0-0.5)	SM	SILTY SAND, brown, fine to coarse, poorly graded, angular to subangular, calcareous; trace silt.					
			1.5-2.0 (0.5-0.6)	SP-SM	GRAVELLY SAND, light brown, fine to coarse, poorly graded, angular to subangular, calcareous; some fine to coarse gravel; stage II-III caliche (1.5'-2.0').					
WR-CS-35	5210 (1588)	A4e	0.0-2.0 (0.0-0.6)	SC	CLAYEY SAND, brown to white, fine to coarse, poorly graded, calcareous; some slightly plastic clay.					
WR-CS-36	5210 (1588)	A4e	0.0-1.0 (0.0-0.3)	CL	SANDY CLAY, brown, slightly plastic, calcareous; some fine to medium sand.					
WR-CS-37	5360 (1633)	A4e	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown to white, fine to medium, poorly graded, calcareous; little to some silt; stage III caliche (1.5'-2.0').					
WR-CS-39	5270 (1606)	A5y	0.0-2.0 (0.0-0.6)	SC	CLAYEY SAND, brown to white, fine to coarse, poorly graded, angular to subangular, calcareous; some slightly plastic clay; stage III caliche (1.5'-2.0').					
WR-CS-40	5328 (1624)	A5y	0.0-2.0 (0.0-0.6)	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').	7	48	45		

LOGS OF SURFICIAL SOIL SAMPLES
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FIGURE 8-1
2 OF 3

FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
WR-CS-42	5440 (1658)	A5y	0.0-2.0 (0.0-0.6)	ML	SANDY SILT, brown to white, nonplastic, calcareous; some fine sand.	0	35	65		NP
WR-CS-44	5580 (1695)	A5i	0.0-2.0 (0.0-0.6)	CL	SANDY CLAY, brown to white, slightly plastic, calcareous; some fine to coarse sand; trace fine gravel; stage IV (1.5'-2.0').					
WR-CS-47	5540 (1689)	A5i	0.0-1.75 (0.0-0.5)	CL	SANDY CLAY, brown, slightly plastic, calcareous; some fine to medium sand; trace fine gravel.					
			1.75-2.0 (0.5-0.6)	SP-SM	GRAVELLY SAND, white, fine to coarse, poorly graded, subangular to angular, calcareous; some fine to coarse gravel; stage III caliche (1.75'-2.0').					
WR-CS-49	5290 (1612)	A5y	0.0-2.0 (0.0-0.6)	ML	SANDY SILT, brown, slightly plastic, calcareous; little fine sand.	0	19	81	31	7
WR-CS-50	5244 (1598)	A4e	0.0-2.0 (0.0-0.8)	SC	CLAYEY SAND, brown to white, fine to medium, poorly graded, calcareous; little slightly plastic clay; stage III caliche (1.75'-2.0').					
WR-CS-51	5230 (1594)	A4e	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, brown, fine to medium, poorly graded, calcareous; little silt.					
			1.0-2.0 (0.3-0.6)	CL	SILTY CLAY, light brown, slightly plastic, calcareous; trace fine to medium sand.					

LOGS OF SURFICIAL SOIL SAMPLES
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FIGURE 8-1
3 OF 3

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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 the

vertical stress. Drained indicates that excess pore water pressure generated by strains are permitted to dissipate by the free movement of pore water during consolidation and compression.

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

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

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

Strain Rate - axial strain, ε, at a given stress level is defined as the ratio of the change in length (ΔL) of the specimen to the original length of the specimen (L_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 ion 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 WEIGHT								
				STANDARD SIEVE OPENING							U S STA	
				BLDRS.	COBBLES		GRAVEL				SA	
		FEET	METERS	24"	12"	8"	3"	1½"	3/4"	3/8"	4	10
WR-B-1	P-1	0.8-1.6	0.24-0.49								100	96
	P-2	4.9-5.7	1.49-1.74								100	95
	D-3	7.5-8.2	2.29-2.50									
	P-4	10.0-10.9	3.05-3.32									
	P-4	10.9-11.8	3.32-3.60									
	P-5	15.9-16.5	4.85-5.88									
	P-5	16.5-17.2	5.03-5.24									
	P-5	17.2-17.9	5.24-5.46									
	P-6	20.0-20.8	6.10-6.34									
	P-7	25.0-25.9	7.62-7.89								100	97
	P-8	30.7-31.4	9.36-9.57									
	P-9	40.9-41.8	12.47-12.74									
	P-10	50.0-50.4	15.24-15.36							100	99	95
	P-10	50.4-51.2	15.36-15.61									
	P-11	60.0-60.9	18.29-18.56									
	P-12	70.8-71.6	21.58-21.82									
	P-13	80.8-81.3	24.63-24.78									
	P-14	98.0-98.8	29.87-30.11									
	P-15	121.4-122.1	37.00-37.22									
	P-16	140.5-141.4	42.82-43.10									
	P-17	160.8-161.6	49.01-49.26									100
WR-B-2	D-1	0.2-0.9	0.06-0.27					100	83	80	68	58
	D-2	3.5-4.0	1.07-1.22					100	90	68	54	44
	D-4	7.3-7.9	2.19-2.41									
	D-5	10.8-11.4	3.29-3.47									
	D-6	15.2-15.9	4.63-4.85						100	86	59	41
	D-8	25.0-25.4	7.62-7.74									
	D-9	30.0-30.6	9.14-9.33					100	66	49	43	37
	D-10	40.0-40.3	12.19-12.28									
	D-11	50.0-51.0	15.24-15.54					100	87	70	60	51
	D-13	79.0-79.3	24.08-24.17				100	57	49	40	34	28
	D-14	100.0-100.5	30.48-30.63									
	D-15	114.2-114.9	34.81-35.02						100	93	84	69
	D-16	135.0-135.4	41.15-41.27					100	80	64	48	40
	D-17	160.0-160.3	48.77-48.86					100	88	68	51	37
WR-B-3	P-1	0.8-1.6	0.24-0.49								100	97
	D-2	4.2-4.9	1.28-1.49							100	99	96
	D-3	7.3-7.9	2.23-2.41									
	P-4	10.0-10.8	3.05-3.29									
	P-4	10.8-11.3	3.29-3.44								100	99
	P-5	15.0-15.9	4.57-4.85									

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 _____

ER BY WEIGHT							ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY
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	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg m³)		
100	96	2	45	34						SM	92.6	1483	10.7	35.2	0.82				
100	95	51	16	11						SP-SM	99.7	1597	5.3	20.8	0.69				
										SM	96.6	1548	13.0	47.2	0.74				
										CL	92.2	1477	21.0	68.9	0.83				
							43	22	21	CL	83.2	1333	21.7	57.1	1.03				
										ML	85.9	1376	24.4	68.6	0.96				
							45	28	17	ML	93.8	1503	17.1	58.0	0.80				2.63
										ML	92.2	1477	29.3	95.7	0.83				
							64	34	30	MH	77.4	1240	33.6	77.2	1.18				
100	97	87	74	69						MH	74.6	1195	42.6	91.4	26				
										MH	80.6	1291	38.2	94.6	1.09				
										MH	76.1	1219	37.0	82.2	1.22				
99	95	74	57	52			59	40	19	MH									
										MH	76.8	1230	39.9	90.1	1.19				
										MH	89.9	1440	30.1	92.8	0.87				
										ML	93.2	1493	23.7	79.0	0.81				
										ML	92.7	1485	26.1	86.2	0.82				
							45	30	15	ML	79.2	1269	43.8	100.0	1.13				
										ML	85.1	1363	33.7	92.7	1.00				
										SP	93.4	1496	19.8	66.6	0.81				
	100	99	98	91						ML	97.9	1568	23.7	88.7	0.72				
68	58	48	40	33						SM	90.8	1455	12.9	40.7	0.86				
54	44	33	24	18						GM	101.1	1620	5.9	24.2	0.67				
										GM	121.4	1945	2.9	20.8	0.39				
										GM	115.2	1846	5.2	30.4	0.46				
59	41	26	17	12						SP-SM	115.4	1849	12.1	71.1	0.46				
										SP-SM	116.2	1862	14.9	89.7	0.45				
43	37	27	19	15						GM	112.6	1804	17.2	93.4	0.50				
										GM	133.2	2134	10.8	100.0	0.27				
60	51	43	38	33						GM	115.6	1884	15.5	96.7	0.43				
34	28	15		13						GM	135.9	2177	9.0	100.0	0.24				
										GM	128.0	2051	9.9	85.2	0.32				
84	69	42	30	26						SM	129.3	2071	7.6	67.2	0.30				
48	40	32	27	25						GM	126.4	2025	8.5	68.6	0.33				
51	37	24	19	16						GM	133.9	2145	8.9	92.3	0.26				
100	97		44	30						SM	74.0	1185	21.7	46.0	1.28				
99	96	93	89	86						CH	84.2	1349	15.3	41.2	1.00				
							54	29	25	CH	85.3	1367	16.0	44.3	0.98				
										CH	88.0	1410	16.9	49.9	0.91				
100	99	97	82	60			39		16	CL									
							37	23	14	CL	91.2	1461	27.8	88.6	0.85				

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ERG (b) 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	92.6	1483	10.7	35.2	0.82										
	SP-SM	99.7	1597	5.3	20.8	0.69										
	SM	96.6	1548	13.0	47.2	0.74									*	
	CL	92.2	1477	21.0	68.9	0.83						*				
21	CL	83.2	1333	21.7	57.1	1.03										
	ML	85.9	1376	24.4	68.6	0.96					*					
17	ML	93.8	1503	17.1	58.0	0.80				2.63	*					
	ML	92.2	1477	29.3	95.7	0.83					*					
30	MH	77.4	1240	33.6	77.2	1.18								*		
	MH	74.6	1195	42.6	91.4	26									*	
	MH	80.6	1291	38.2	94.6	1.09										
	MH	76.1	1219	37.0	82.2	1.22										
19	MH															
	MH	76.8	1230	39.9	90.1	1.19										
	MH	89.9	1440	30.1	92.8	0.87									*	
	ML	93.2	1493	23.7	79.0	0.81										
	ML	92.7	1485	26.1	86.2	0.82										
15	ML	79.2	1269	43.8	100.0	1.13										
	ML	85.1	1363	33.7	92.7	1.00									*	
	SP	93.4	1496	19.8	66.6	0.81										
	ML	97.9	1568	23.7	88.7	0.72									*	
	SM	90.8	1455	12.9	40.7	0.86										
	GM	101.1	1620	5.9	24.2	0.67										
	GM	121.4	1945	2.9	20.8	0.39										
	GM	115.2	1846	5.2	30.4	0.46										
	SP-SM	115.4	1849	12.1	71.1	0.46										
	SP-SM	116.2	1862	14.9	89.7	0.45										
	GM	112.6	1804	17.2	93.4	0.50							*			
	GM	133.2	2134	10.8	100.0	0.27										
	GM	96.6	1884	15.5	96.7	0.43										
	GM	135.9	2177	9.0	100.0	0.24										
	GM	128.0	2051	9.9	85.2	0.32										
	SM	129.3	2071	7.6	67.2	0.30										
	GM	126.4	2025	8.5	68.6	0.33										
	GM	133.9	2145	8.9	92.3	0.26										
	SM	74.0	1185	21.7	46.0	1.28										
	CH	84.2	1349	15.3	41.2	1.00										
25	CH	85.3	1367	16.0	44.3	0.98										
	CH	88.0	1410	16.9	49.9	0.91										
16	CL															
14	CL	91.2	1461	27.8	88.6	0.85						*				

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 8-1 1 OF 3

FUGRO NATIONAL, INC.

AFV-81

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT									
				STANDARD SIEVE OPENING							U S STANDAR		
				BLDRS.	COBBLES		GRAVEL				SAND		
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	4
WR-B-3	P-6	20.0-20.8	6.10-6.34										
	P-7	25.0-25.4	7.62-7.74										
	P-7	25.4-26.2	7.74-7.99										
	P-8	30.0-30.7	9.14-9.36										
	P-9	40.9-41.8	12.47-12.74						100	97	96	91	7
	P-10	50.0-50.8	15.24-15.48								100	99	8
	P-11	60.0-60.9	18.29-18.56										
	P-12	70.0-70.8	21.34-21.58										
	P-13	80.8-81.6	24.63-24.87							100	96	88	4
	P-14	90.0-90.8	27.43-27.68										
	P-15	100.9-101.8	30.75-31.02										
	P-16	110.2-111.0	33.59-33.83										
	P-17	124.9-125.8	38.07-38.34										
	P-18	142.8-143.6	43.53-43.77										
	P-19	160.8-161.7	49.01-49.29										
WR-B-4	P-1	0.8-1.7	0.24-0.76								100	96	7
	P-2	4.5-5.3	1.37-1.62						100	99	96	80	5
	P-3	7.9-8.6	2.41-2.62										
	P-4	10.0-10.8	3.05-3.29										
	P-5	15.0-15.6	4.57-4.75										
	P-5	15.6-16.2	4.75-4.94							100	97	78	2
	P-6	20.8-21.5	6.34-6.55										
	D-7	25.2-25.9	7.68-7.89										
	D-8	30.2-30.9	9.20-9.42								100	98	8
	P-9	36.0-36.7	10.97-11.19								100	97	6
	P-10	41.4-42.3	12.62-12.89										
	D-11	50.0-50.3	15.24-15.33						100	99	85	57	1
	P-12	60.9-61.8	18.56-18.84										
	D-13	70.2-70.9	21.40-21.61						100	96	88	64	2
	P-14	80.7-81.4	24.59-24.81										
	P-15	90.8-91.7	27.68-27.95										
	D-16	100.2-100.9	30.54-30.75						100	95	81	54	2
	P-17	109.9-110.7	33.50-33.74										
	P-18	125.0-125.8	38.10-38.34										
	P-19	137.6-138.4	41.94-42.18									100	9
	P-20	160.4-161.2	48.89-49.13								100	99	8
WR-B-5	P-1	0.1-0.7	0.03-0.21						100	92	84	77	7
	D-2	3.0-3.5	0.91-1.07						100	99	94	83	6
	D-3	5.2-5.9	1.58-1.80					100	93	80	62	37	2
	D-5	10.5-1.07	3.20-3.26					100	89	58	43	34	1
	D-6	14.5-14.8	4.42-4.51										

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 _____

ER BY WEIGHT							ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY
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	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg m³)		
										CH	77.7	1245	26.5	61.2	1.17				
							82	35	47	CH	76.5	1226	35.1	78.7	1.20				
										CH	68.2	1093	45.1	82.8	1.47				
										CL	94.5	1514	22.1	76.1	0.78				
96	91	78	53	28						SM	91.3	1463	27.1	86.6	0.85				
100	99	86	76	69						CL									
										CL	76.2	1221	43.0	96.0	1.21				
										CL	81.7	1309	40.5	100.0	1.06				
96	88	47	32	27						SC	108.6	1740	15.7	76.7	0.55				
										CL	94.6	1515	27.2	94.2	0.78				
										CL	89.9	1440	31.2	96.4	0.87				
										CL	110.8	1775	15.7	81.1	0.52				
							38	24	14	CL	103.7	1661	21.1	91.2	0.62				
										CL	95.4	1528	26.9	94.7	0.77				
							59	26	33	CL	82.6	1323	39.5	100.0	1.04				
100	96	72	48	37						SC	83.1	1331	23.9	62.7	1.03				
96	80	58	47	40						SC	94.4	1512	16.9	58.1	0.79				
							46	28	18	ML	85.6	1371	33.6	93.7	0.97				
										SM	90.1	1443	30.3	94.1	0.87				
										SP-SM									
97	78	27	15	8						SP-SM	107.4	1721	13.1	62.2	0.57				
										SP-SM	108.4	1737	19.3	93.4	0.56				
										SP-SM	113.3	1815	11.4	63.1	0.49				
100	98	88	58	35						SM	100.4	1608	23.9	95.1	0.68				
100	97	65	38	24	4	3			NP	SM	78.4	1256	36.2	84.9	1.15				
										CL	98.1	1572	32.1	100.0	0.72				
85	57	12	5	4						SW	110.5	1770	18.2	93.6	0.52				
							35	24	11	CL	87.4	1400	44.7	100.0	0.93				
88	64	24	8	7						SP-SM	114.2	1829	14.8	84.1	0.48				
										CL	98.7	1581	22.6	86.2	0.71				
										CL	101.5	1626	23.0	94.1	0.66				
81	54	26	8	6						SP-SM	114.9	1841	15.7	90.6	0.47				
										CL	84.7	1357	34.5	94.3	0.99				
										CL	89.3	1431	34.2	104.1	0.89				
	100	99	83	71			44	24	20	CL	86.0	1378	35.2	99.2	0.96				
100	99	88	67	42						SC	107.1	1716	17.6	82.8	0.57				
84	77	70	62	49						SM	90.9	1456	12.8	40.4	0.85				
94	83	60	46	38						SM									
62	37	20	14	12						SP-SM	126.7	2030	6.2	50.3	0.33				
43	34	19	14	13						GC	124.8	1999	7.9	61.3	0.35				
										GC	127.8	2047	9.9	84.0	0.32				

RG (b) PI	USCS (c)	IN-SITU DRY UNIT WEIGHT (pcf)	IN-SITU DRY UNIT WEIGHT (kg/m^3)	IN-SITU MOISTURE CONTENT (%)	IN-SITU SATURATION (%)	IN-SITU VOID RATIO	COMPACTED MAXIMUM DRY DENSITY (pcf)	COMPACTED MAXIMUM DRY DENSITY ($kg.m^3$)	COMPACTED OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
	CH	77.7	1245	26.5	61.2	1.17										
47	CH	76.5	1226	35.1	78.7	1.20										
	CH	68.2	1093	45.1	82.8	1.47								*		
	CL	94.5	1514	22.1	76.1	0.78										
	SM	91.3	1463	27.1	86.6	0.85										
	CL															
	CL	76.2	1221	43.0	96.0	1.21										
	CL	81.7	1309	40.5	100.0	1.06										
	SC	108.6	1740	15.7	76.7	0.55										
	CL	94.6	1515	27.2	94.2	0.78										
	CL	89.9	1440	31.2	96.4	0.87										
	CL	110.8	1775	15.7	81.1	0.52										
14	CL	103.7	1661	21.1	91.2	0.62										
	CL	95.4	1528	26.9	94.7	0.77										
33	CL	82.6	1323	39.5	100.0	1.04										
	SC	83.1	1331	23.9	62.7	1.03										
	SC	94.4	1512	16.9	58.1	0.79										
18	ML	85.6	1371	33.6	93.7	0.97						*				
	SM	90.1	1443	30.3	94.1	0.87										
	SP-SM												*			
	SP-SM	107.4	1721	13.1	62.2	0.57										
	SP-SM	108.4	1737	19.3	93.4	0.56										
	SP-SM	113.3	1815	11.4	63.1	0.49										
	SM	100.4	1608	23.9	95.1	0.68										
NP	SM	78.4	1256	36.2	84.9	1.15										
	CL	98.1	1572	32.1	100.0	0.72										
	SW	110.5	1770	18.2	93.6	0.52										
11	CL	87.4	1400	44.7	100.0	0.93										
	SP-SM	114.2	1829	14.8	84.1	0.48										
	CL	98.7	1581	22.6	86.2	0.71										
	CL	101.5	1626	23.0	94.1	0.66										
	SP-SM	114.9	1841	15.7	90.6	0.47										
	CL	84.7	1357	34.5	94.3	0.99										
	CL	89.3	1431	34.2	104.1	0.89										
20	CL	86.0	1378	35.2	99.2	0.96										
	SC	107.1	1716	17.6	82.8	0.57										
	SM	90.9	1456	12.8	40.4	0.85										
	SM															
	SP-SM	126.7	2030	6.2	50.3	0.33										
	GC	124.8	1999	7.9	61.3	0.35										
	GC	127.8	2047	9.9	84.0	0.32										

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-1

FUGRO NATIONAL, INC.

AFV-01

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT									
				STANDARD SIEVE OPENING							U S STANDI		
				BLDRS.	COBBLES		GRAVEL				SAM		
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	
	D-7	19.2-19.9	5.85-6.07					100	79	59	38	27	
	D-8	24.0-24.5	7.32-7.47										
	D-9	29.0-29.8	8.84-9.08					100	87	57	43	35	
	D-10	40.0-40.3	12.19-12.28				100	49	49	44	33	22	
	D-11	53.0-53.4	16.15-16.28										
WR-B-6	D-1	0.7-1.4	0.21-0.43						100	86	73	62	
	D-2	3.0-3.6	0.91-1.10						100	91	72	58	
	D-3	6.2-6.9	1.89-2.10					100	82	65	53	42	
	D-4	10.2-10.9	3.11-3.32										
	D-5	15.0-15.5	4.57-4.72						100	86	71	57	
	D-6	20.0-20.6	6.10-6.28						100	76	49	32	
	D-7	25.2-25.9	7.68-7.89										
	D-8	30.2-30.9	9.20-9.42					100	92	72	53	38	
	D-9	39.9-40.4	12.16-12.31						100	99	94	88	
	D-10	50.9-51.4	15.51-15.67										
	D-11	60.2-60.7	18.35-18.50					100	85	84	72	59	
	D-12	70.9-71.4	21.61-21.76										
	D-13	85.4-85.9	26.02-26.18						100	92	70	55	
	D-15	105.4-105.9	32.13-32.28										
	D-17	119.5-119.9	36.42-36.55										
	D-19	140.2-140.7	42.73-42.89										
	D-21	160.8-161.3	49.01-49.16						100	97	88	81	
WR-B-7	D-1	0.4-1.0	0.12-0.30						100	96	89	78	
	D-2	3.2-3.9	0.98-1.19							100	94	84	
	D-3	8.4-8.9	2.56-2.71							100	96	87	
	D-4	14.2-14.9	4.33-4.54								100	97	
	D-5	20.2-20.9	6.16-6.37										
	D-6	30.0-30.4	9.14-9.27										
	D-7	40.1-40.8	12.22-12.44								100	95	
	D-8	50.2-50.9	15.30-15.51										
WR-T-1	B-1	0.1-2.0	0.03-0.61					100	90	81	66	53	
WR-T-2	B-1	0.25-1.5	0.08-0.46				100	99	97	92	86	79	
	b-2	6.0-6.5	1.83-1.98				100	79	52	28	16	10	
WR-T-3	B-1	0.1-1.5	0.03-0.46							100	99	93	
	b-3	9.0-9.5	2.74-2.90										
WR-T-4	B-1	0.25-2.0	0.08-0.61					100	99	96	92	90	

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 _____

% BY WEIGHT							ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS
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	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)		
38	27	21	18	17						GC	124.5	1994	11.2	86.0	0.35				
										GC	128.3	2055	10.9	93.6	0.31				
43	35	17	11	10						GP-GC	138.3	2216	9.5	76.8	0.33				
33	22	14	11	9						GP-GM	131.5	2107	7.2	69.3	0.28				
										GP-GM	117.3	1879	12.5	77.5	0.44				
73	62	46	35	26						SM	91.8	1471	17.9	58.1	0.84				
72	58	40	28	22						SM	98.2	1573	7.4	28.0	0.72				
53	42	27	16	11						SM	118.0	1890	7.6	48.2	0.43				
										SM	115.6	1852	11.6	68.6	0.46				
71	57	37	22	16						SM	115.4	1849	11.7	68.6	0.46				
49	32	12	6	5						GW-GM	110.7	1773	15.8	81.9	0.52				
										GP-GM	121.5	1946	11.2	78.3	0.39				
53	38	19	12	9						GP-GM	116.1	1860	8.9	53.6	0.45				
94	88	68	44	31						SM	105.3	1687	16.9	76.1	0.60				
										SM	99.6	1596	14.0	54.6	0.69				
72	59	37	22	17						SM	107.2	1717	16.8	79.4	0.57				
										SM	110.5	1770	11.6	59.6	0.53				
70	55	40	31	21						SM	107.0	1714	14.7	69.3	0.57				
										SM	116.8	1871	10.0	61.3	0.44				
										SM	115.3	1847	13.4	78.7	0.46				
										SP-SM	114.9	1841	11.2	65.1	0.47				
88	81	64	32	18						SM	113.0	1810	10.1	55.5	0.49				
89	78	54	34	20						SM	102.7	1645	12.1	51.2	0.64				
94	84	42	21	15						SM	103.4	1656	7.2	30.8	0.63				
96	87	54	37	28						SM	86.5	1386	14.5	41.2	0.95				
100	97	86	64	39						SM	90.9	1456	13.7	43.4	0.85				
										SM	80.2	1285	17.6	43.1	1.10				
										SM	108.8	1743	18.0	88.8	0.55				
100	95	72	52	42	16	4				SM	101.3	1623	20.3	82.6	0.66				
				67			42	35	7	ML	77.6	1243	37.1	85.5	1.17				
66	53	29	17	13						SM						126.0	2019	9.0	
86	79	62	51	42						SM						114.5	1834	14.0	
16	10	6	4	2						GP									
99	93	67	38	27						SM									
							48	25	23	CL									
92	90	84	67	55			24	23	1	ML						122.8	1967	11.3	2.62

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/m^3)				(pcf)	(kg/m^3)								
	GC	124.5	1994	11.2	86.0	0.35										
	GC	128.3	2055	10.9	93.6	0.31										
	GP-GC	138.3	2216	9.5	76.8	0.33										
	GP-GM	131.5	2107	7.2	69.3	0.28										
	GP-GM	117.3	1879	12.5	77.5	0.44										
	SM	91.8	1471	17.9	58.1	0.84										
	SM	98.2	1573	7.4	28.0	0.72										
	SM	118.0	1890	7.6	48.2	0.43										
	SM	115.6	1852	11.6	68.6	0.46										
	SM	115.4	1849	11.7	68.6	0.46										
	GW-GM	110.7	1773	15.8	81.9	0.52										
	GP-GM	121.5	1946	11.2	78.3	0.39										
	GP-GM	116.1	1860	8.9	53.6	0.45										
	SM	105.3	1687	16.9	76.1	0.60										
	SM	99.6	1596	14.0	54.6	0.69										
	SM	107.2	1717	16.8	79.4	0.57							*			
	SM	110.5	1770	11.6	59.6	0.53										
	SM	107.0	1714	14.7	69.3	0.57										
	SM	116.8	1871	10.0	61.3	0.44										
	SM	115.3	1847	13.4	78.7	0.46										
	SP-SM	114.9	1841	11.2	65.1	0.47										
	SM	113.0	1810	10.1	55.5	0.49										
	SM	102.7	1645	12.1	51.2	0.64										
	SM	103.4	1656	7.2	30.8	0.63										
	SM	86.5	1386	14.5	41.2	0.95										
	SM	90.9	1456	13.7	43.4	0.85										
	SM	80.2	1285	17.6	43.1	1.10										
	SM	108.8	1743	18.0	88.8	0.55										
	SM	101.3	1623	20.3	82.6	0.66										
7	ML	77.6	1243	37.1	85.5	1.17										
	SM						126.0	2019	9.0							*
	SM						114.5	1834	14.0							*
	GP															
	SM															
23	CL															
1	ML						122.8	1967	11.3	2.62						*

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-1 3 OF 3

FUGRO NATIONAL, INC.

AFV-01

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT								
				STANDARD SIEVE OPENING							U S STAN	
				BLDRS.	COBBLES		GRAVEL				SA	
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10
WR-T-5	B-1	0.0-2.0	0.00-0.61						100	74	62	53
WR-T-6	B-1	0.75-2.0	0.23-0.61							100	98	96
WR-T-7	B-1	0.1-0.75	0.03-0.23						100	91	85	79
WR-T-8	B-1	0.5-2.0	0.15-0.61							100	99	94
WR-P-3	b-1	0.25-0.5	0.08-0.15					100	93	87	80	75
WR-P-6	b-1	0.25-2.0	0.08-0.61							100	99	96
WR-P-7	b-1	0.25-1.5	0.08-0.46						100	89	82	74
WR-P-8	b-1	0.25-1.0	0.08-0.30						100	98	96	94
WR-P-9	b-1	0.5-1.0	0.15-0.30							100	99	94
WR-P-11	B-1	1.0-2.0	0.30-0.61									100
WR-P-13	b-1	0.25-1.0	0.08-0.30						100	97	92	86
WR-P-14	b-1	0.25-1.25	0.08-0.38						100	95	93	87
WR-P-15	b-1	0.25-2.0	0.08-0.61						100	99	92	87
WR-P-16	b-1	0.25-1.0	0.08-0.30									
WR-P-17	b-1	0.25-1.0	0.08-0.30						100	92	82	76
WR-P-18	b-1	0.25-1.0	0.08-0.30									
WR-P-19	b-1	0.25-2.0	0.08-0.61						100	91	85	84
WR-P-20	b-1	0.25-1.5	0.08-0.46									
WR-P-21	b-1	0.25-1.0	0.08-0.30					100	83	79	69	59
WR-P-22	b-1	0.25-1.0	0.08-0.30									
WR-CS-3	b-1	0.25-1.0	0.08-0.30					100	84	76	70	63
WR-CS-7	b-1	0.25-1.0	0.08-0.30							100	99	94

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 _____

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 (%)	SPECIFIC GRAVITY
	SAND				SILT OR CLAY															
/8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)		
74	62	53	45	39	32	7	3			NP	GM									
00	98	96	93	86	85			50	26	24	CH						110.0	1762	19.0	
1	85	79	73	64	49					NP	SM									
00	99	94	70	52	42			67	32	35	SC						104.7	1677	20.7	
7	80	75	68	61	54	14	7	27	19	8	CL									
00	99	96	65	32	19						SM									
9	82	74	67	57	46	11	5			NP	SM									
8	96	94	75	52	37						SM									
00	99	94	61	32	22						SM									
		100	97	80	64					NP	ML									
7	92	86	62	41	30					NP	SM									
5	93	87	68	46	32						SM									
9	92	87	80	72	59					NP	SM									
											CH									
2	82	76	70	65	58			23	21	2	ML									
											SM									
1	85	84	80	63	40						SM									
											CH									
9	69	59	48	42	35						SM									
								35	22	13	CL									2.
5	70	63	50	41	35						SM									
0	99	94	71	46	32			33	25	10	SM									

ERBERG ITS (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/m^3)				(pcf)	(kg/m^3)								
	NP	GM															
26	24	CH						110.0	1762	19.0							*
	NP	SM															
32	35	SC						104.7	1677	20.7							*
19	8	CL															
		SM															
	NP	SM															
		SM															
		SM															
	NP	ML															
	NP	SM															
		SM															
	NP	SM															
		CH														*	
21	2	ML															
		SM														*	
		SM															
		CH														*	
		SM															
2	13	CL									2.61						
		SM															
5	10	SM															

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-1
4 OF 5

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT								
				STANDARD SIEVE OPENING							U S STAN	
				BLDRS.	COBBLES		GRAVEL					SA
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10
WR-CS-15	b-1	0.25-1.25	0.08-0.38							100	99	95
WR-CS-23	b-1	0.25-2.0	0.08-0.61									
WR-CS-24	B-1	0.5-2.0	0.15-0.61									
WR-CS-27	B-1	0.25-2.0	0.08-0.61									
WR-CS-36	B-1	0.25-1.5	0.08-0.46									
WR-CS-40	b-1	0.25-1.5	0.08-0.46						100	95	93	91
WR-CS-42	b-1	0.25-1.5	0.08-0.46									100
WR-CS-44	B-1	0.25-1.5	0.08-0.46									
WR-CS-49	b-1	0.25-1.0	0.08-0.30									100

CHECKED BY _____ APPROVED BY _____

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

PERCENT 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"	3/8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg m³)	
	100	99	95	90	83	75					NP	ML								
												SM								
									98	32	66	CH								
									69	29	40	CH								
												SM								
0	95	93	91	83	64	45						SM								
			100	98	83	65					NP	ML								
												CL								
			100	99	93	81	26	12	31	24	7	ML								

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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/m^3)				(pcf)	($kg\ m^3$)								
	NP	ML															
		SM														*	
32	66	CH															
29	40	CH															
		SM															*
		SM															
	NP	ML															
		CL														*	*
24	7	ML															

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

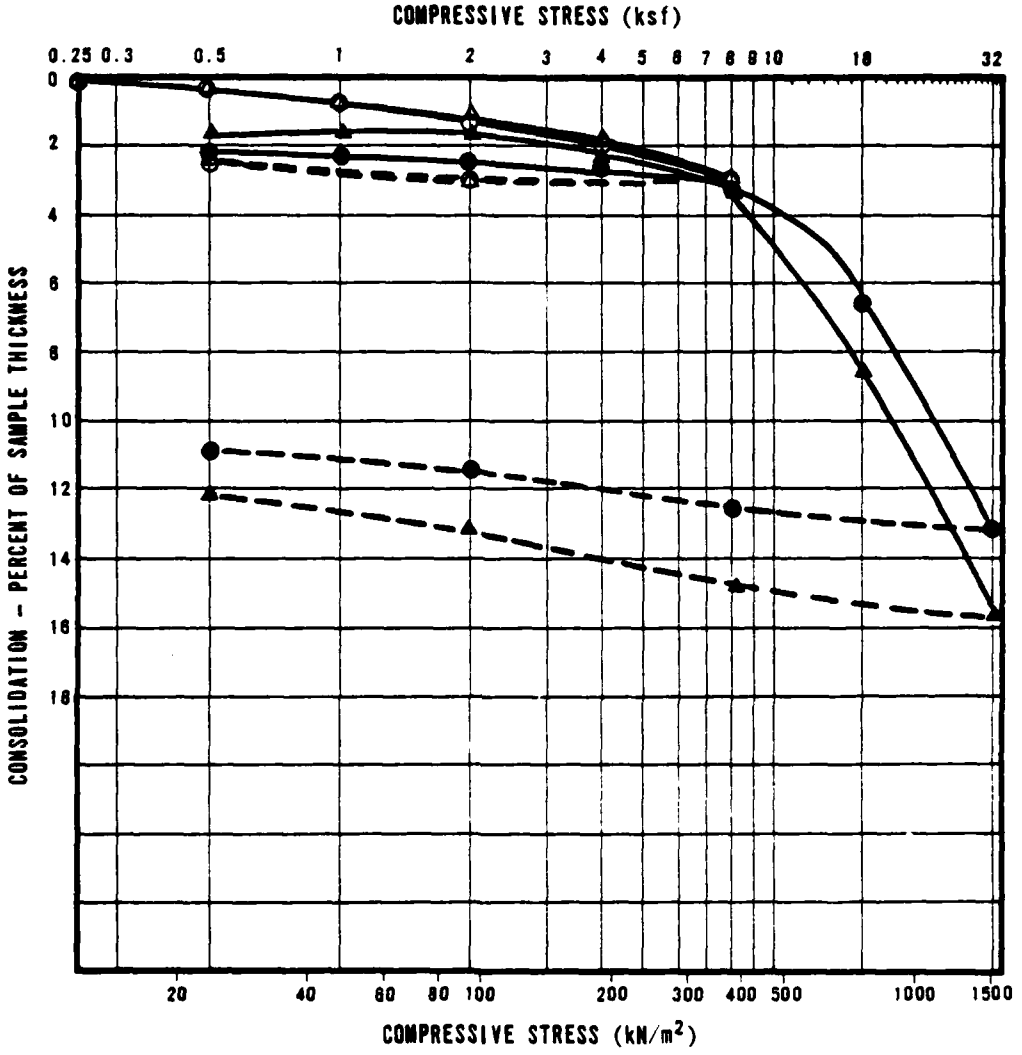
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-1
1 OF 1

FUGRO NATIONAL, INC.

AFV-01

FN-TR-27-V



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			
○	WR-B-1	P-6	20.0-20.8	6.10-6.34	MH	77.4	1240	33.6	1.18	77.2
△	WR-B-3	P-7	25.4-26.2	7.74-7.99	CH	68.2	1093	45.1	1.47	82.8

○ AT FIELD MOISTURE

● AFTER ADDITION OF WATER

——— COMPRESSION

– – – REBOUND

CONSOLIDATION TEST RESULTS
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-1

FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-02

CHECKED BY _____ / _____ APPROVED BY _____ / _____

FN-TR-27-V

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
WR-B-1	P-5	15.9-16.5	4.85-5.03	ML	CU	85.9	1376	24.4	2	96	15.7	752	.004	18.7	895
	P-5	16.5-17.2	5.03-5.24	ML	CU	93.8	1503	17.1	4	192	11.0	527	.004	18.7	895
	P-5	17.2-17.9	5.24-5.46	ML	CU	92.2	1477	28.3	8	384	15.2	728	.004	15.8	757

SUMMARY OF TRIAXIAL COMPRESSION TEST RESULTS
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-2

FUGRO NATIONAL, INC.

AFV-10

2 JUL 79

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/m^2	pcf	kg/m^3			
WR-B-1	P-4	10.0-10.9	3.05-3.32	CL	9.3	445	92.2	1477	21.0	68.9	2.4
WR-B-3	P-5	15.0-15.9	4.57-4.85	CL	5.0	239	91.2	1461	27.8	88.6	2.4
WR-B-4	P-3	7.9-8.6	2.41-2.62	ML	2.7	129	85.6	1371	33.6	93.7	2.4

SUMMARY OF UNCONFINED COMPRESSION TEST RESULTS
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-3

WOODWARD-CLYDE CONSULTANTS

2 JUL 79

FN-TR-27-V

AFV-09

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	NORMAL STRESS		MAXIMUM SHEAR STRENGTH	
		FEET	METERS		ksf	kN/m^2	ksf	kN/m^2
WR-B-2	D-9	30.0-30.6	9.14-9.33	GM	3.0	144	3.7	177
WR-B-4	P-5	15.0-15.6	4.57-4.75	SP-SM	1.5	72	1.2	57
	P-5	15.0-15.6	4.57-4.75	SP-SM	3.0	144	2.3	110
	P-5	15.0-15.6	4.57-4.75	SP-SM	4.5	215	3.2	153
WR-B-6	D-11	60.2-60.7	18.35-18.50	SM	6.0	288	7.8	373
	D-11	60.2-60.7	18.35-18.50	SM	9.0	431	10.9	522
	D-11	60.2-60.7	18.35-18.50	SM	12.0	575	11.1	531

CHECKED BY _____ APPROVED BY _____

SUMMARY OF DIRECT SHEAR TEST RESULTS
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-4

FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

FN-1R-27-V

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
WR-B-1	D-3	7.5-8.2	2.29-2.50	SM	6.8	314	422	104	103	553
	P-7	25.0-25.9	7.62-7.89	MH	6.9	89	19	<14	68	219
	P-11	60.9-61.9	18.56-18.87	MH	7.0	50	11	<13	63	263
	P-15	120.7-121.4	36.79-37.00	ML	7.0	55	15	<14	110	442
	P-17	160.8-161.6	49.01-49.26	ML	7.0	65	18	32	58	568
WR-P-16	b-1	0.25-1.0	0.08-0.30	CH	7.3	161	21	3438	122	643
WR-P-18	b-1	0.25-1.0	0.08-0.30	SM	7.2	81	22	380	162	468
WR-P-20	b-1	0.25-1.5	0.08-0.46	CH	7.1	442	22	4552	120	606
WR-CS-23	b-1	0.25-2.0	0.08-0.61	SM	7.0	765	601	846	219	612
WR-CS-44	B-1	0.25-1.5	0.08-0.46	CL	7.8	29	21	194	112	412

SUMMARY OF CHEMICAL TEST RESULTS
VERIFICATION SITE, WHITE RIVER COP, NEVADA

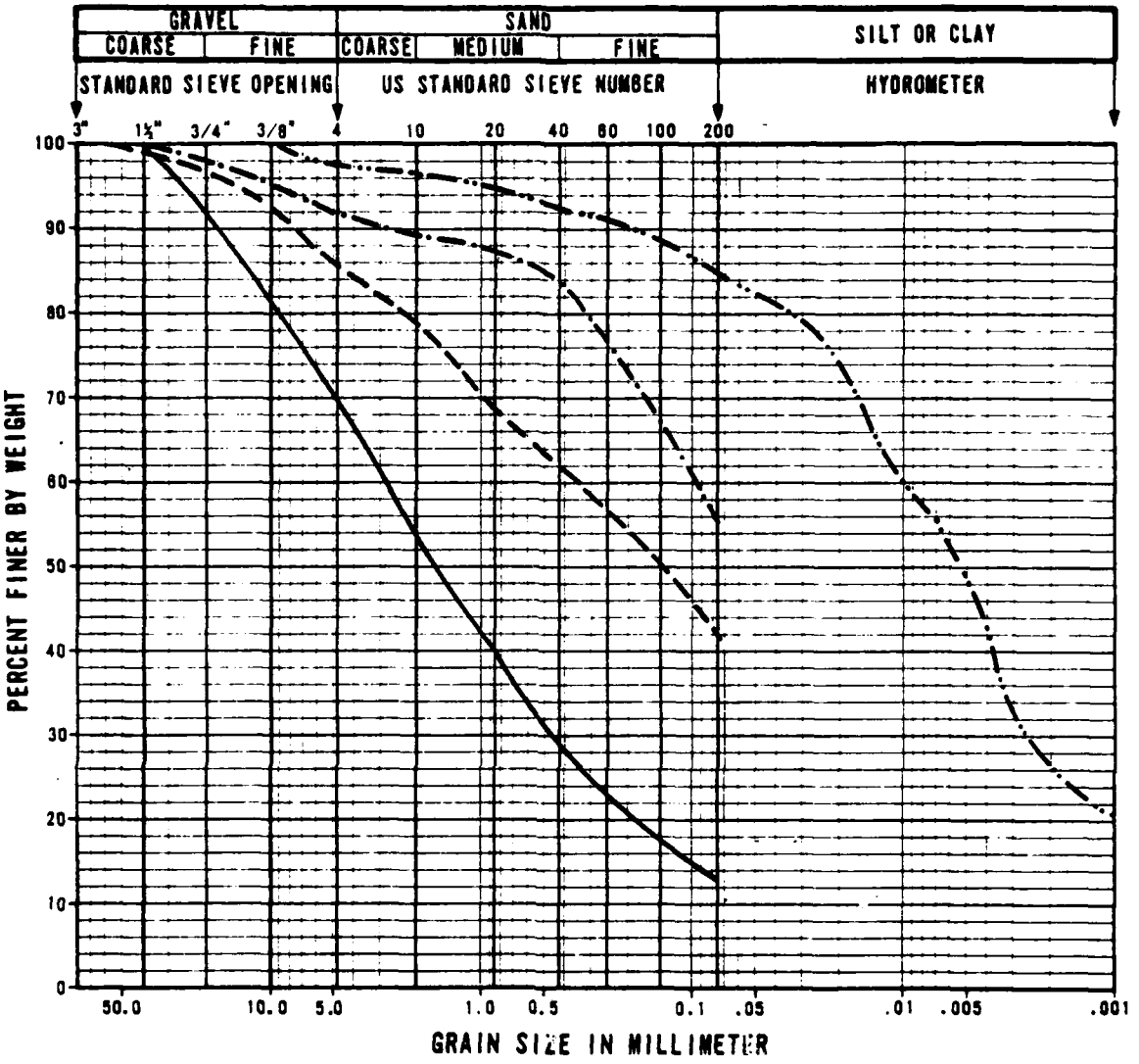
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-5

FUGRO NATIONAL, INC.

AFV-07

FN-TR-27-V



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
———	A	WR-T-1	0.1-2.0	0.03-0.61	SM
— — —	B	WR-T-2	0.25-1.5	0.07-0.46	SM
— · —	C	WR-T-4	0.25-2.0	0.07-0.61	ML
— ·· —	D	WR-T-6	0.75-2.0	0.23-0.61	CH

GRAIN SIZE CURVES, CBR TESTS
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-2
1 OF 2

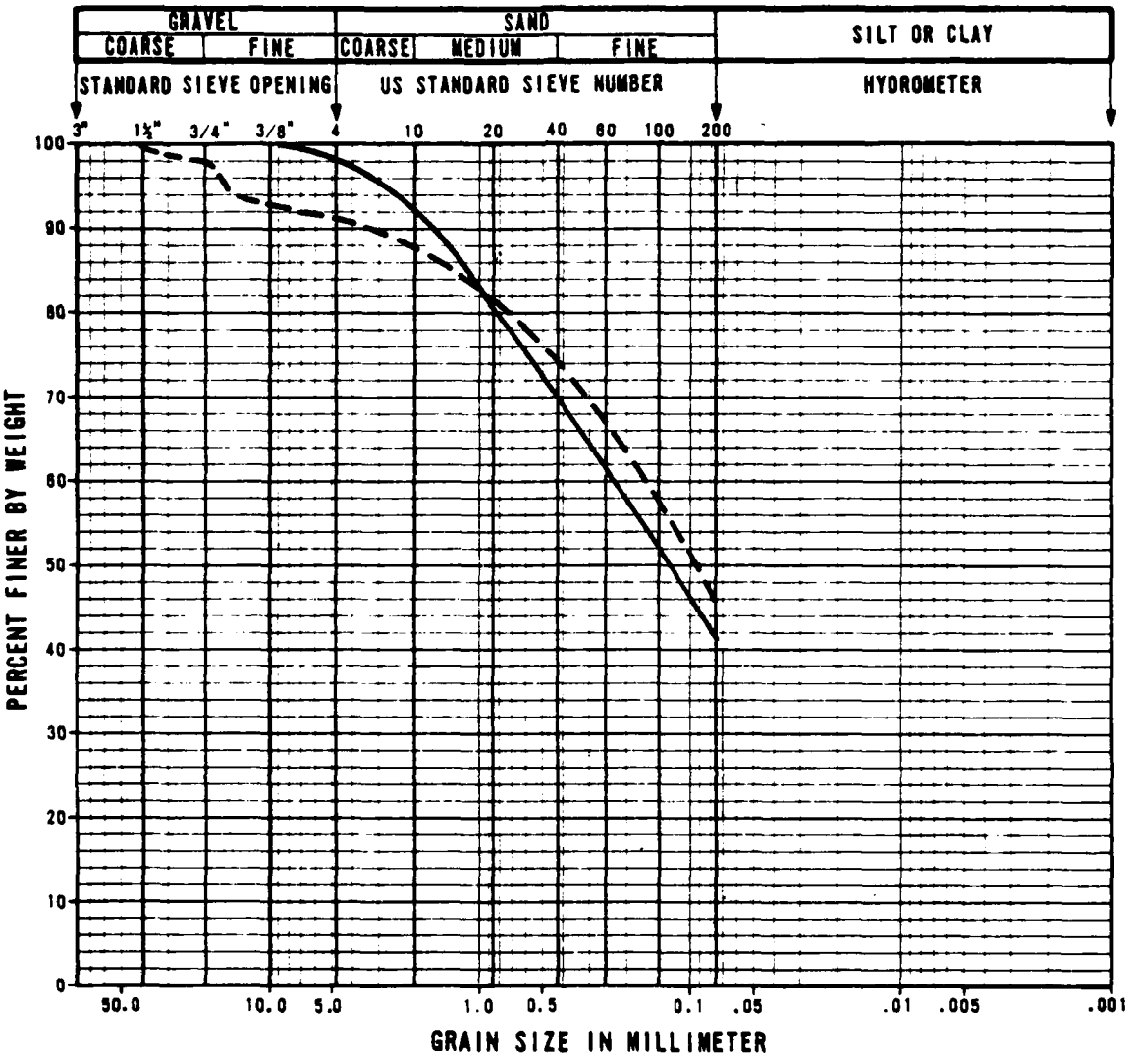
FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-12

FN-TR-27-V



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
———	E	WR-T-8	0.5-2.0	0.15-0.61	SC
- - -	F	WR-CS-36	0.25-1.50	0.08-0.46	SM
		WR-CS-44	0.25-1.50	0.08-0.46	

GRAIN SIZE CURVES, CBR TESTS
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-2 2 OF 2

FUGRO NATIONAL, INC.

CHECKED BY _____ APPROVED BY _____

2 JUL 79

AFV-12

CHECKED BY _____ / _____ APPROVED BY _____ / _____

2 JUL 79

FN-TR-27-V

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	SM	13				126.0	2019	9.0	115.8	1855	10.5	91.9	76
									113.8	1823	10.4	90.3	28
B	SM	42				114.5	1834	14.0	107.8	1727	14.7	94.1	49
									101.5	1626	14.3	88.6	13
									94.4	1512	13.9	82.4	2
C	ML	55	24	1	2.62	122.8	1967	11.3	113.5	1818	10.7	92.4	20
									104.1	1668	11.1	84.8	4
									93.6	1499	11.2	76.2	1
D	CH	85	50	24		110.0	1762	19.0	107.0	1714	19.0	97.3	5
									99.0	1586	19.3	90.0	3
									90.2	1445	19.5	82.0	2

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-6
1 OF 2

FUGRO NATIONAL, INC.

AFV-13

CHECKED BY _____ APPROVED BY _____

2 JUL 79

FN-TR-27-V

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			
E	SC	42	67	35		104.7	1677	20.7	102.9	1648	20.9	98.3	30
									94.7	1517	20.8	90.4	7
									85.3	1367	20.4	81.5	2
F	SM	46		NP		120.0	1922	13.3	118.7	1902	12.7	98.9	64
									109.3	1751	12.3	91.1	10
									102.5	1642	12.4	85.4	4

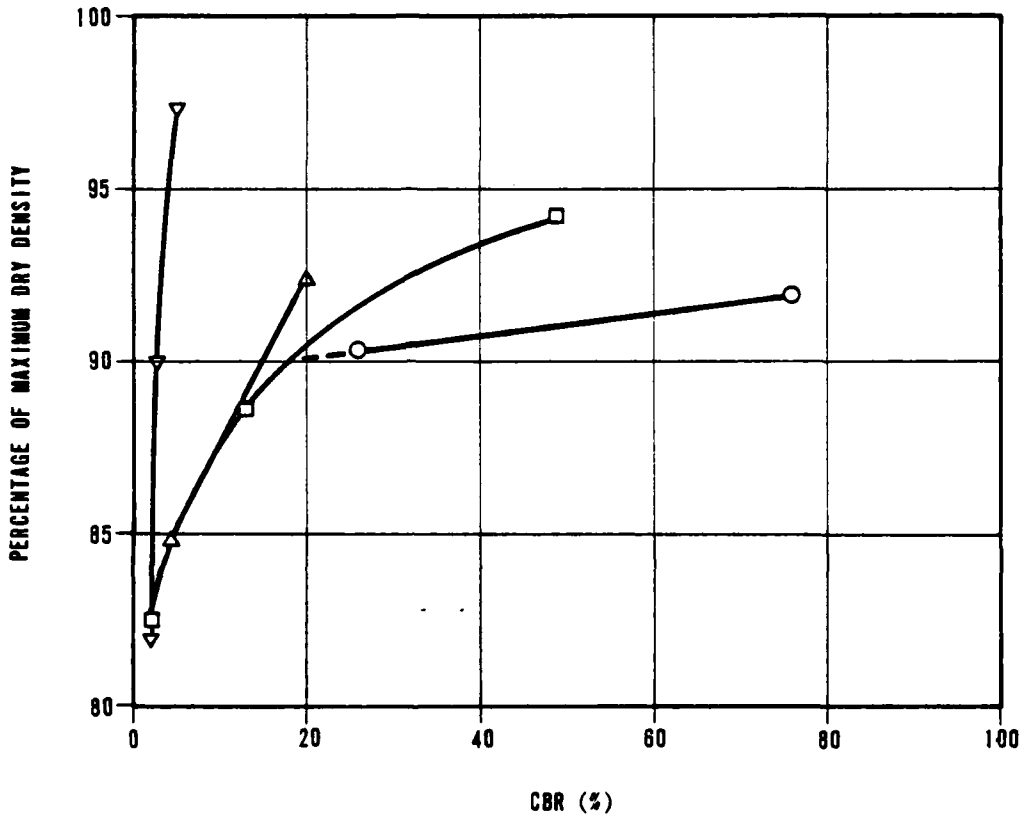
CALIFORNIA BEARING RATIO (CBR) TEST RESULTS
VERIFICATION SITE, WHITE RIVER COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-6 2 OF 2

FUGRO NATIONAL, INC.

AFV-13



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

CHECKED BY _____ APPROVED BY _____

CALIFORNIA BEARING RATIO (CBR) CURVES
VERIFICATION SITE, WHITE RIVER COP, NEVADA

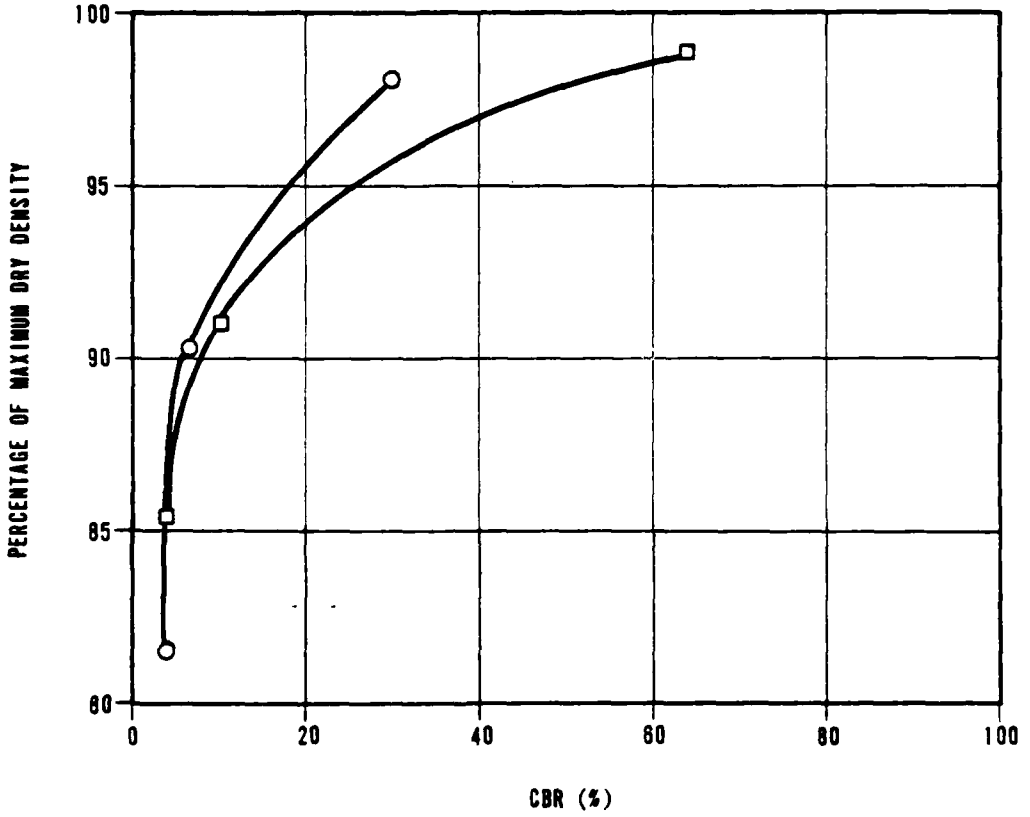
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-3
1 OF 2

FUGRO NATIONAL, INC.

2 JUL 79

AFV-14



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	E	SC
□	F	SM

CHECKED BY _____ APPROVED BY _____

CALIFORNIA BEARING RATIO (CBR) CURVES
VERIFICATION SITE, WHITE RIVER CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

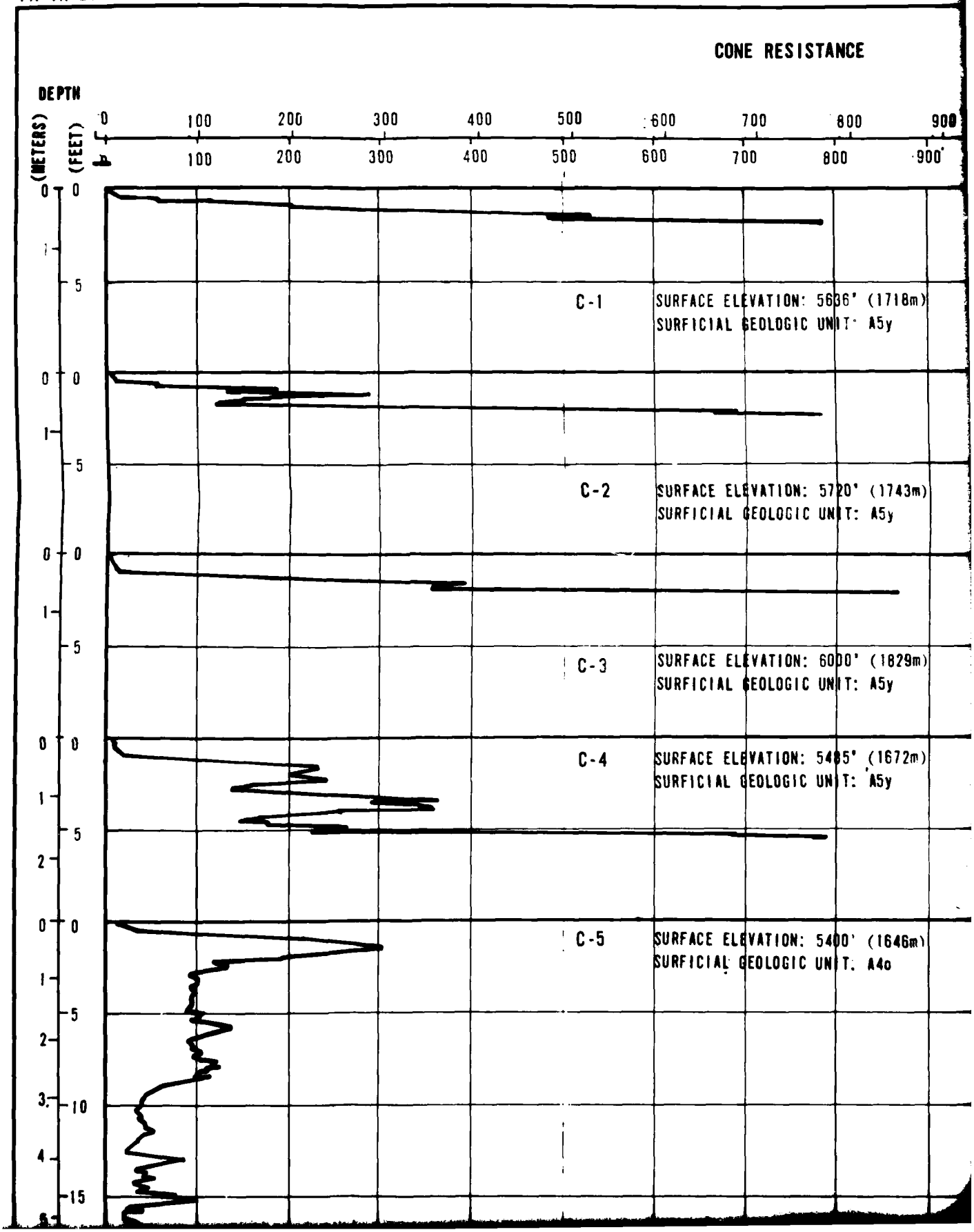
FIGURE 9-3 2 OF 2

FUGRO NATIONAL, INC.

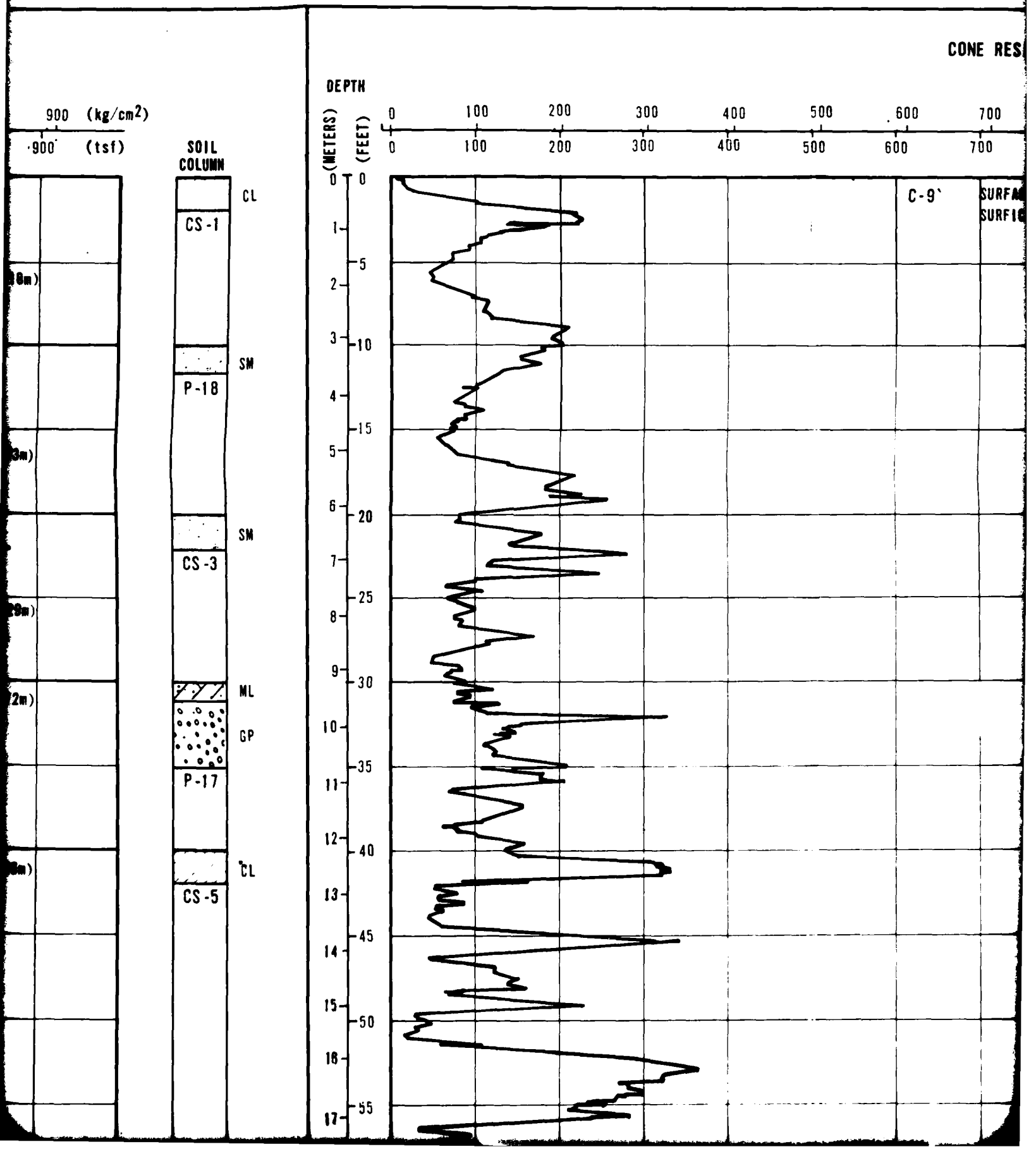
2 JUL 79

AFV-14

FN-TR-27-V


CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700 800 900
0 100 200 300 400 500 600 700 800 900
C-1
SURFACE ELEVATION: 5636' (1718m)
SURFICIAL GEOLOGIC UNIT: A5y
C-2
SURFACE ELEVATION: 5720' (1743m)
SURFICIAL GEOLOGIC UNIT: A5y
C-3
SURFACE ELEVATION: 6000' (1829m)
SURFICIAL GEOLOGIC UNIT: A5y
C-4
SURFACE ELEVATION: 5485' (1672m)
SURFICIAL GEOLOGIC UNIT: A5y
C-5
SURFACE ELEVATION: 5400' (1646m)
SURFICIAL GEOLOGIC UNIT: A4o

2


900 (kg/cm2)
900 (tsf)
SOIL COLUMN
CL
CS-1
SM
P-18
SM
CS-3
ML
GP
P-17
CL
CS-5
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700
0 100 200 300 400 500 600 700
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
0 5 10 15 20 25 30 35 40 45 50 55
C-9`
CONE RES
SURFA
SURFI

3

RESISTANCE

800 900 (kg/cm²)

800 900 (tsf)

SOIL COLUMN

SURFACE ELEVATION: 5374' (1638m)

SURFICIAL GEOLOGIC UNIT: A5y A4o

SM

CH

CL

CH

CL

SM

CL

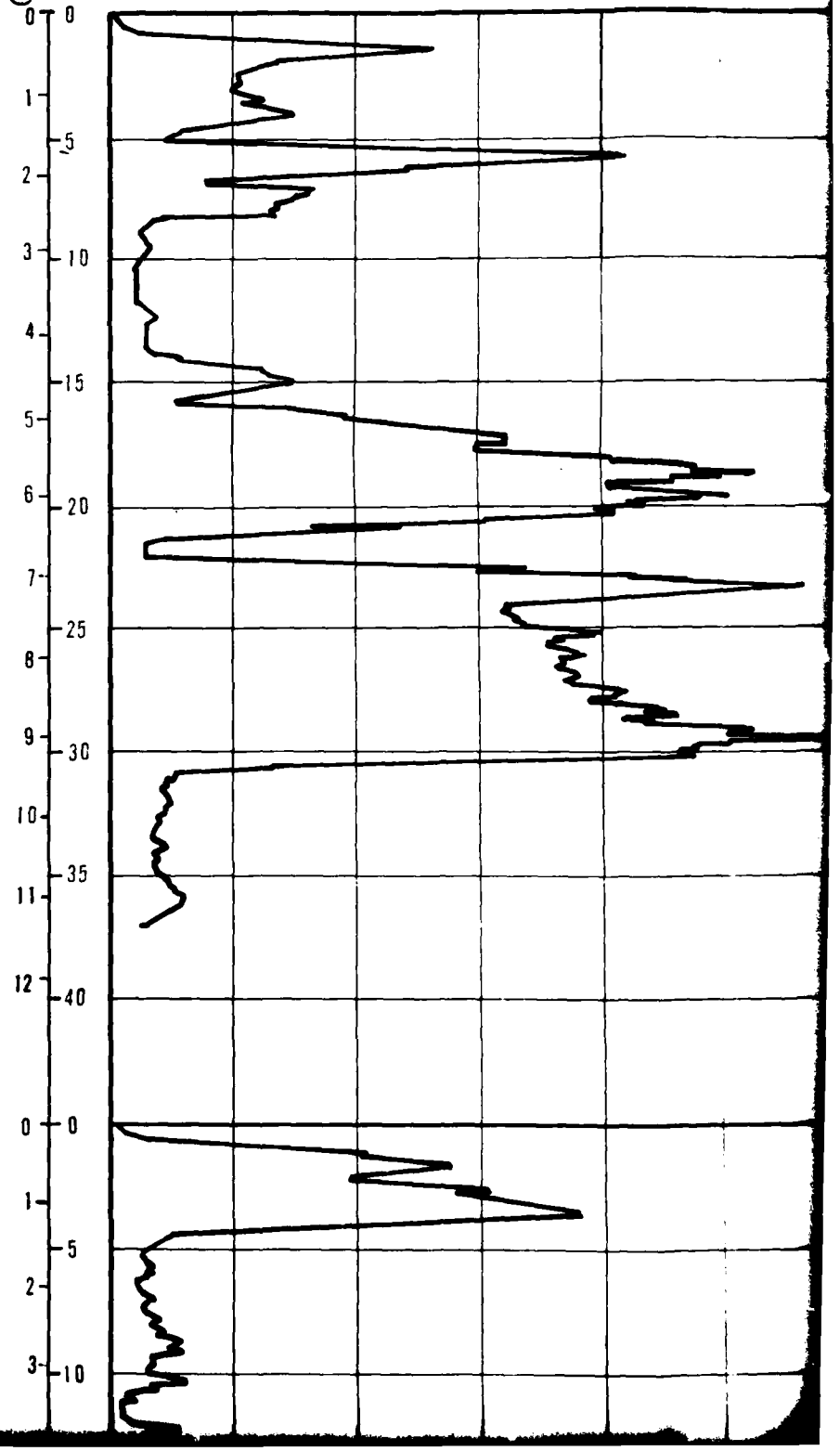
SM

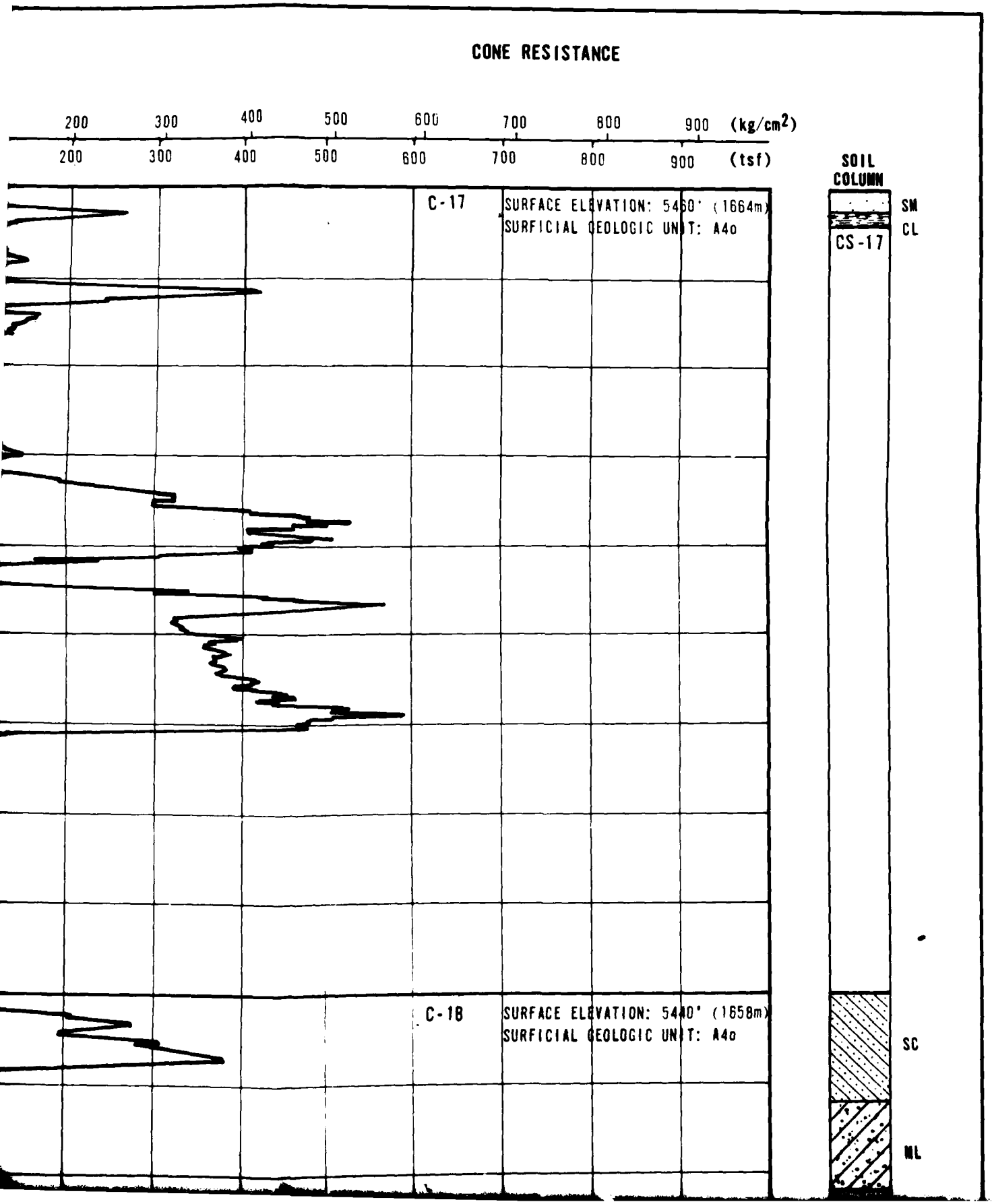
DEPTH

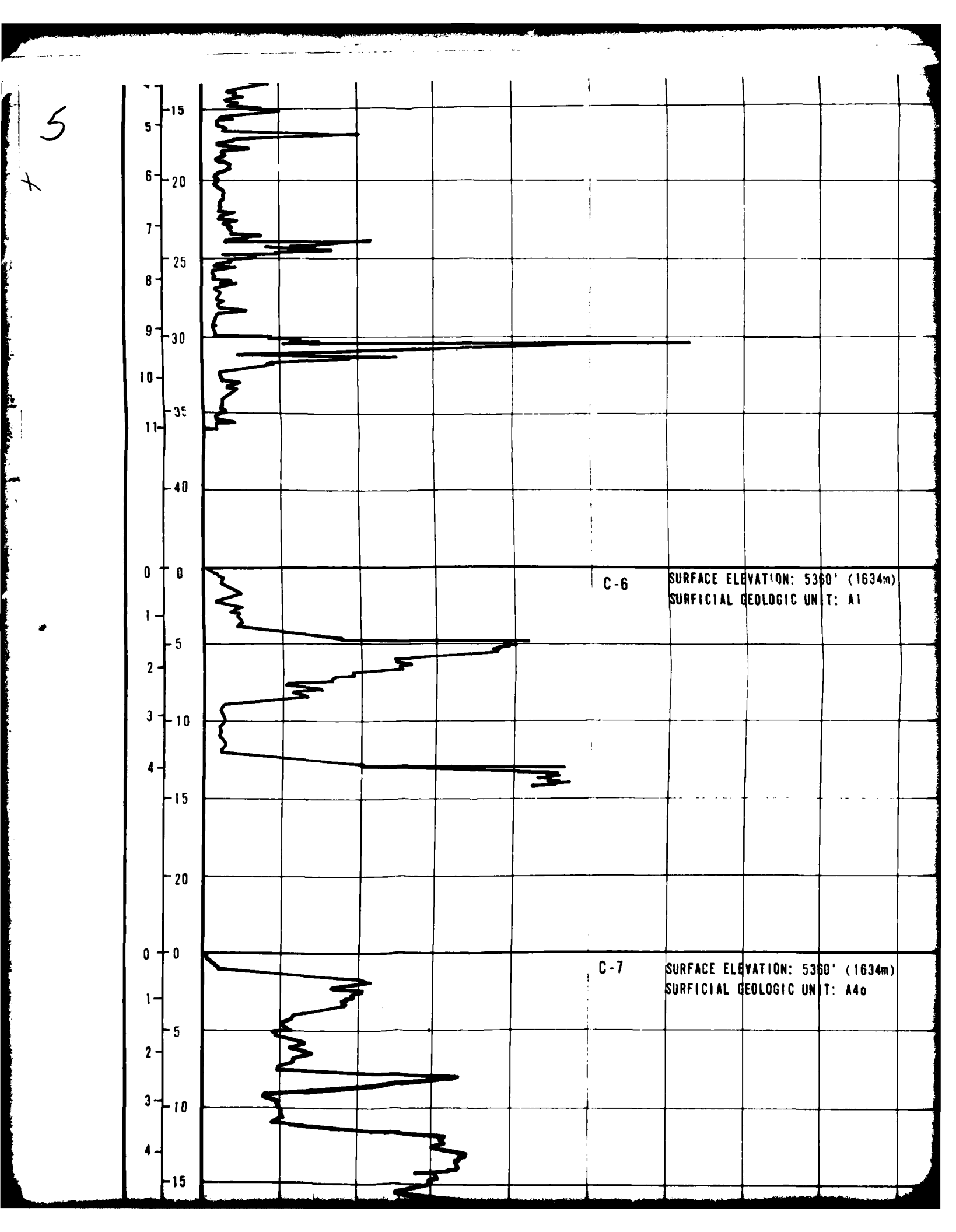
(METERS) (FEET)

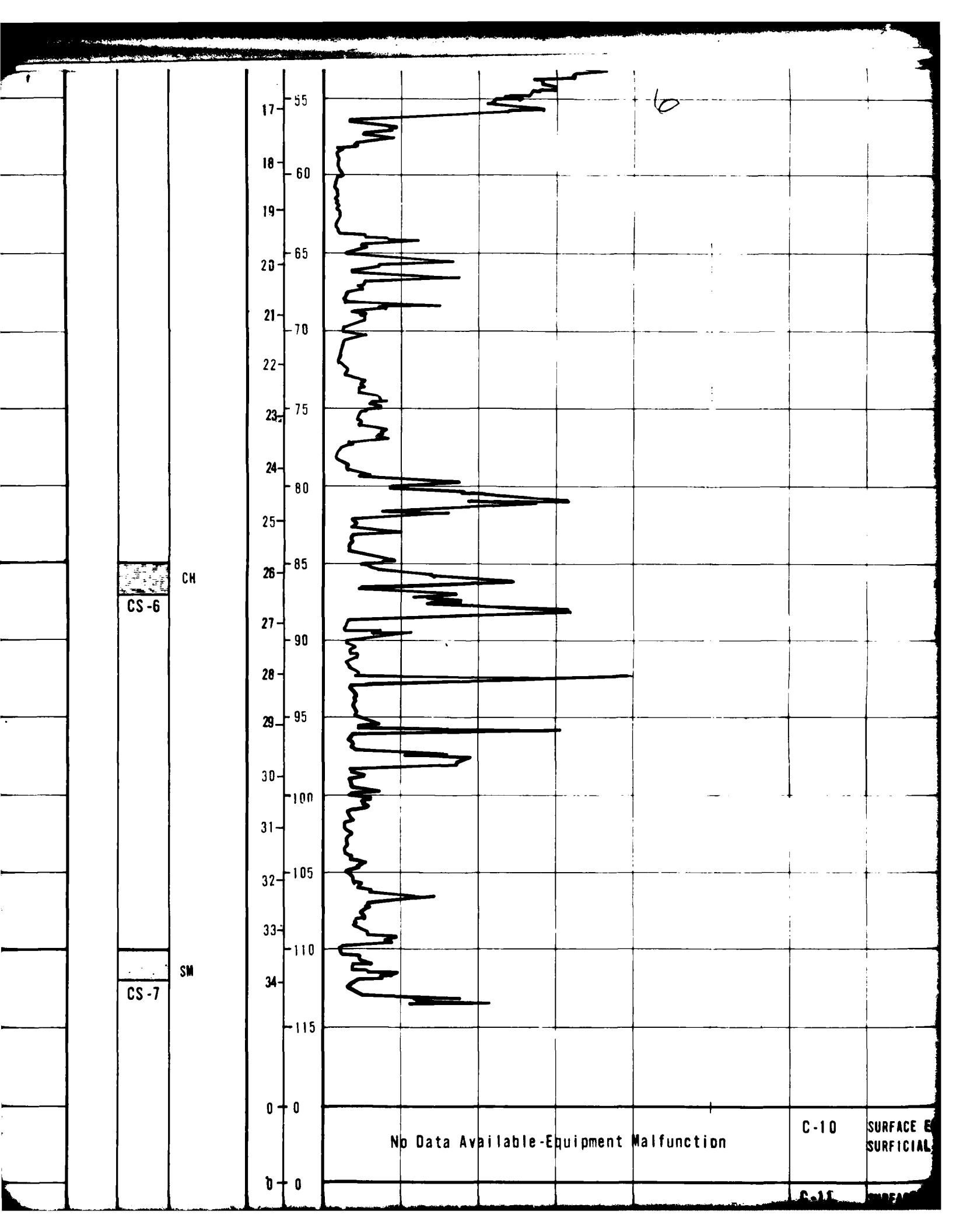
0 100 200 300 400 500

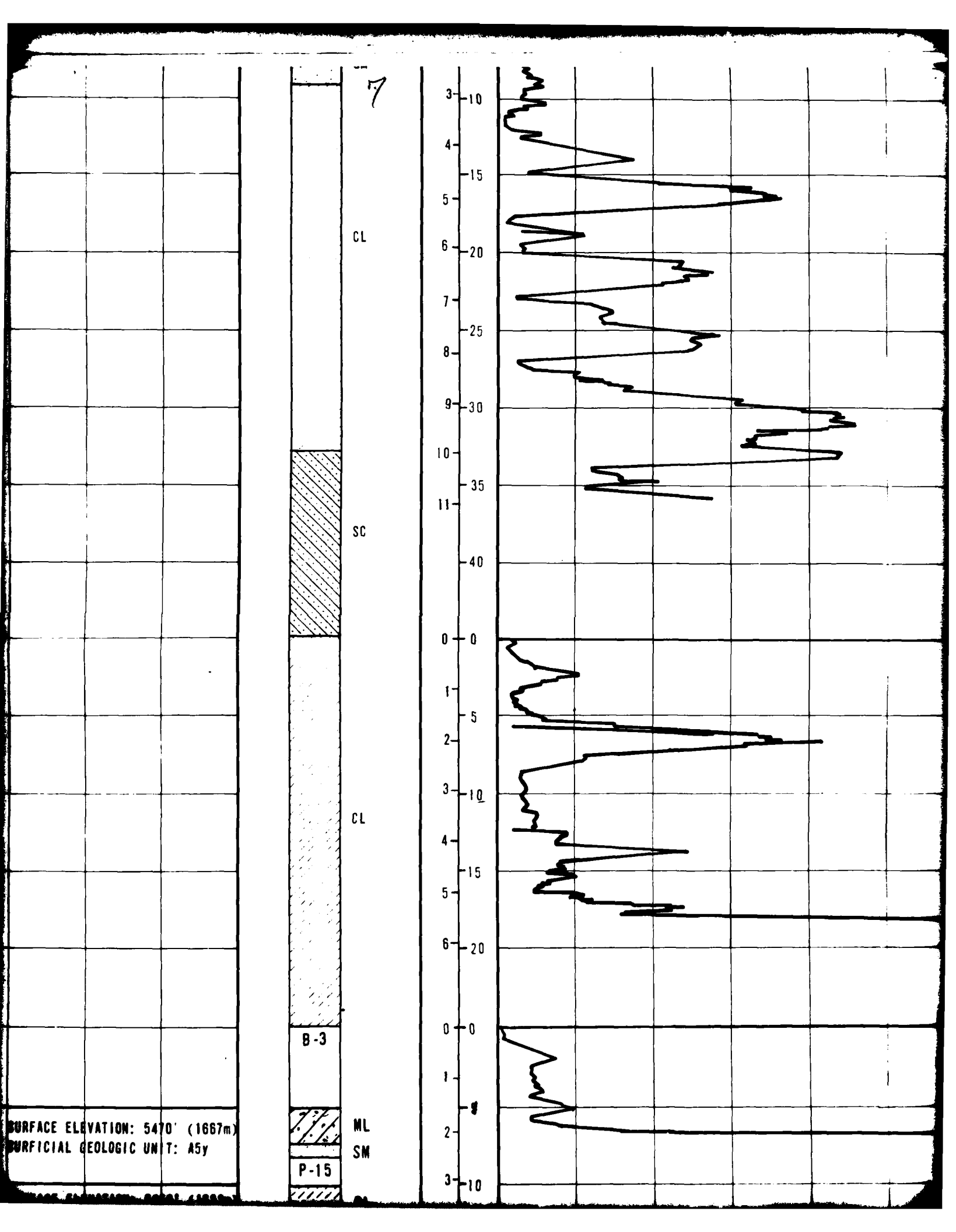
0 100 200 300 400 500

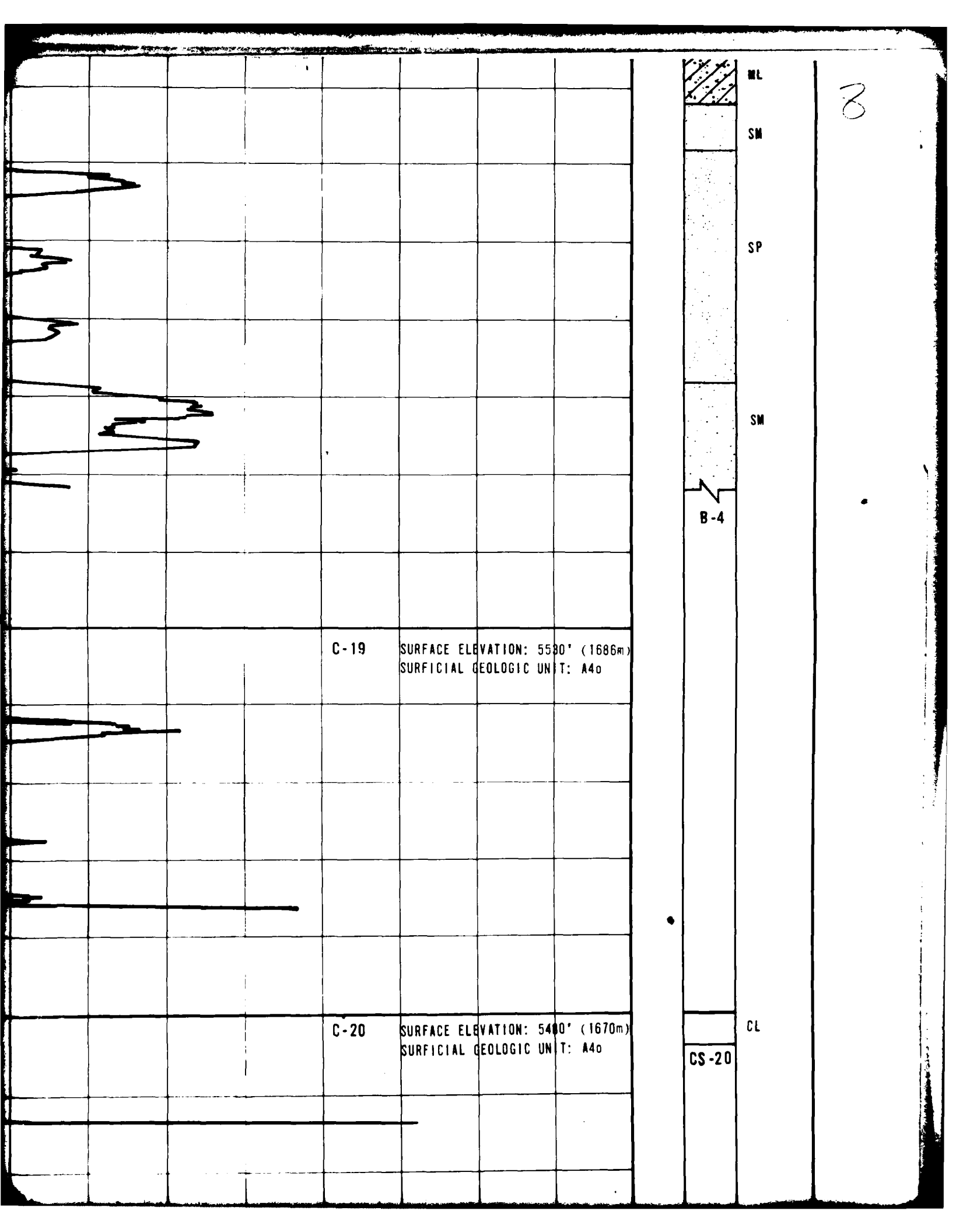


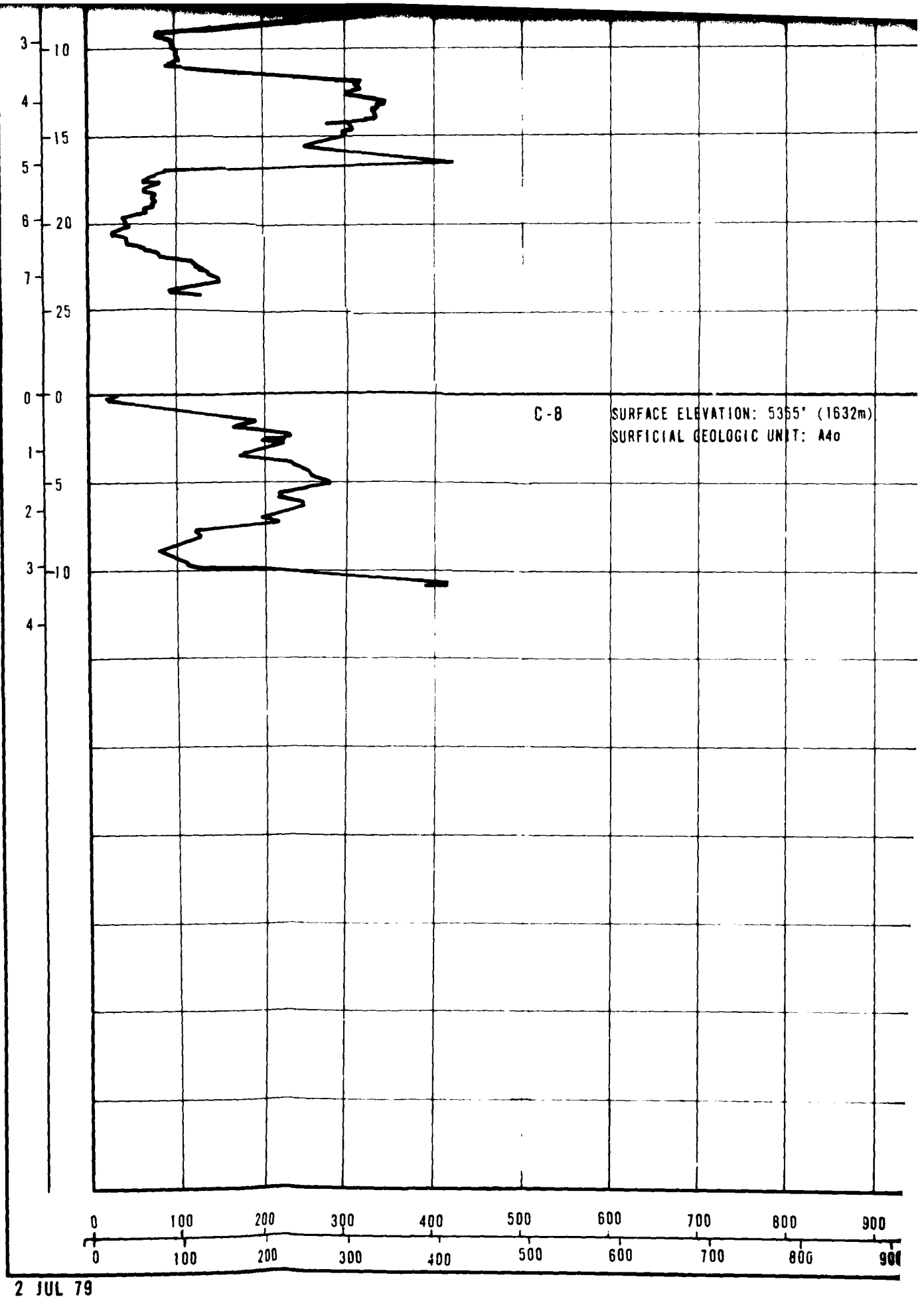

CONE RESISTANCE
200 300 400 500 600 700 800 900 (kg/cm2)
200 300 400 500 600 700 800 900 (tsf)
C-17
SURFACE ELEVATION: 5460' (1664m)
SURFICIAL GEOLOGIC UNIT: A4o
C-18
SURFACE ELEVATION: 5440' (1658m)
SURFICIAL GEOLOGIC UNIT: A4o
SOIL COLUMN
CS-17
SM
CL
SC
ML

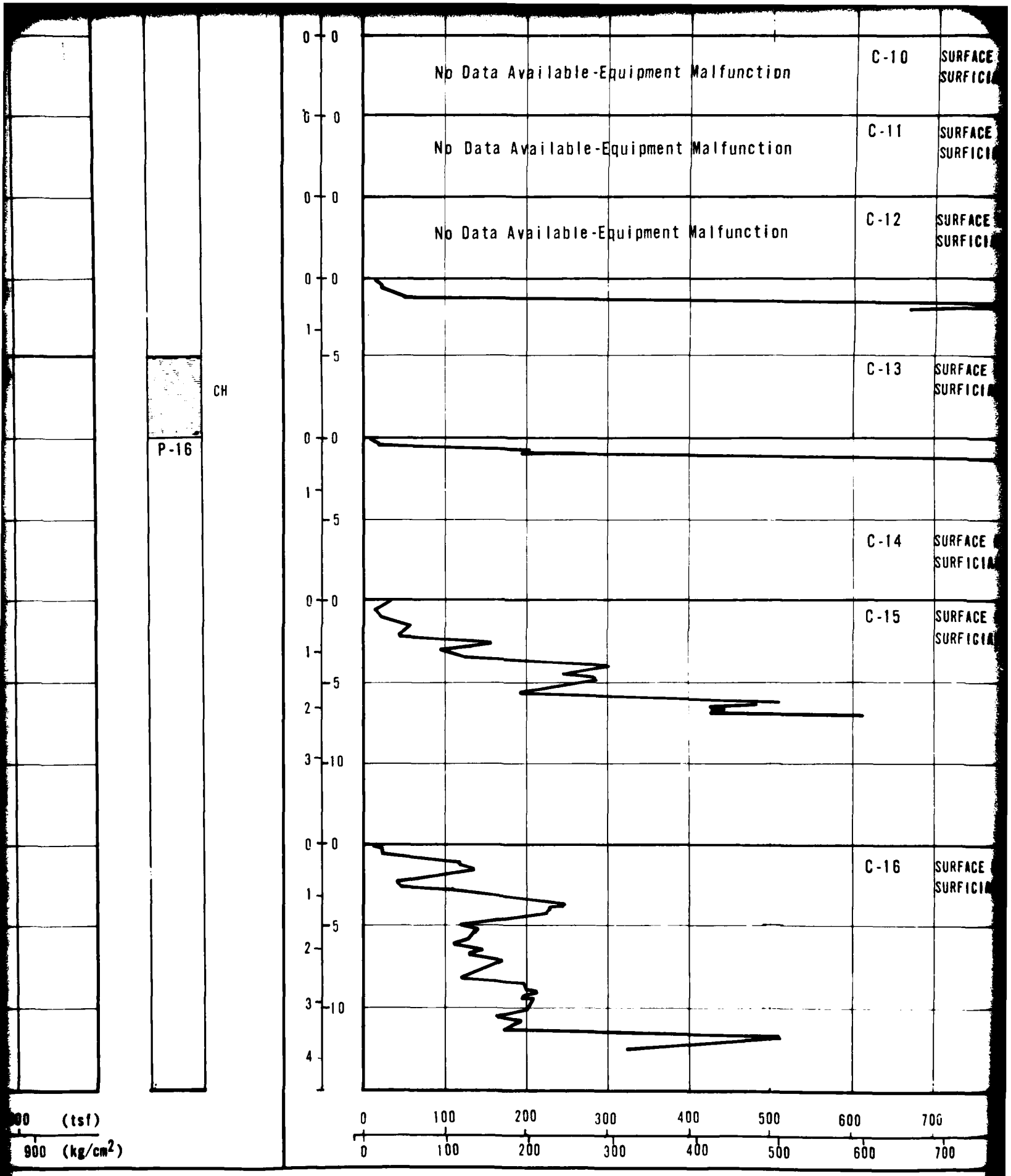

C-6
SURFACE ELEVATION: 5360' (1634m)
SURFICIAL GEOLOGIC UNIT: A1
C-7
SURFACE ELEVATION: 5360' (1634m)
SURFICIAL GEOLOGIC UNIT: A4o

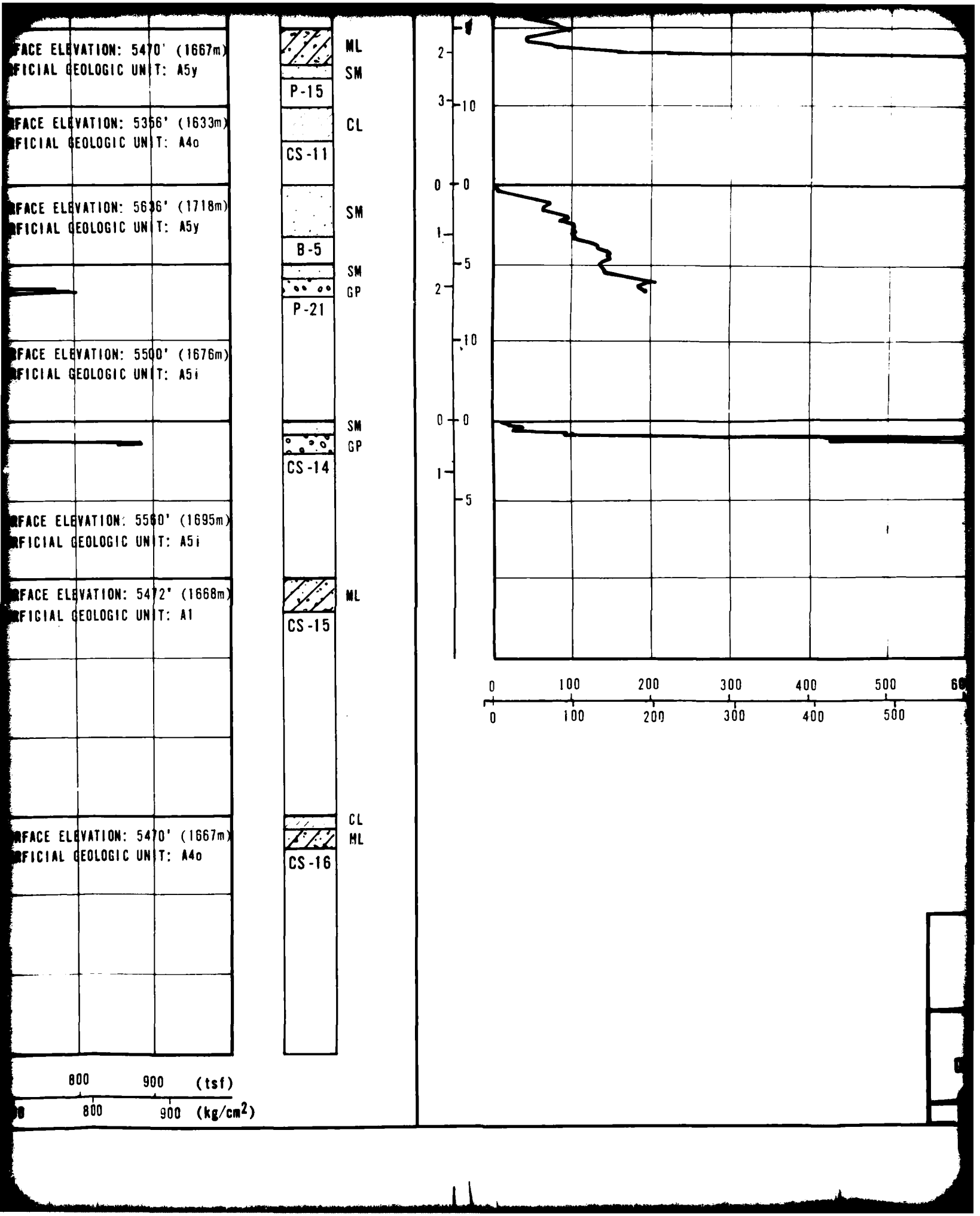

CH
CS-6
SM
CS-7
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
55
60
65
70
75
80
85
90
95
100
105
110
115
0
0
0
0
No Data Available-Equipment Malfunction
C-10
SURFACE E
SURFICIAL

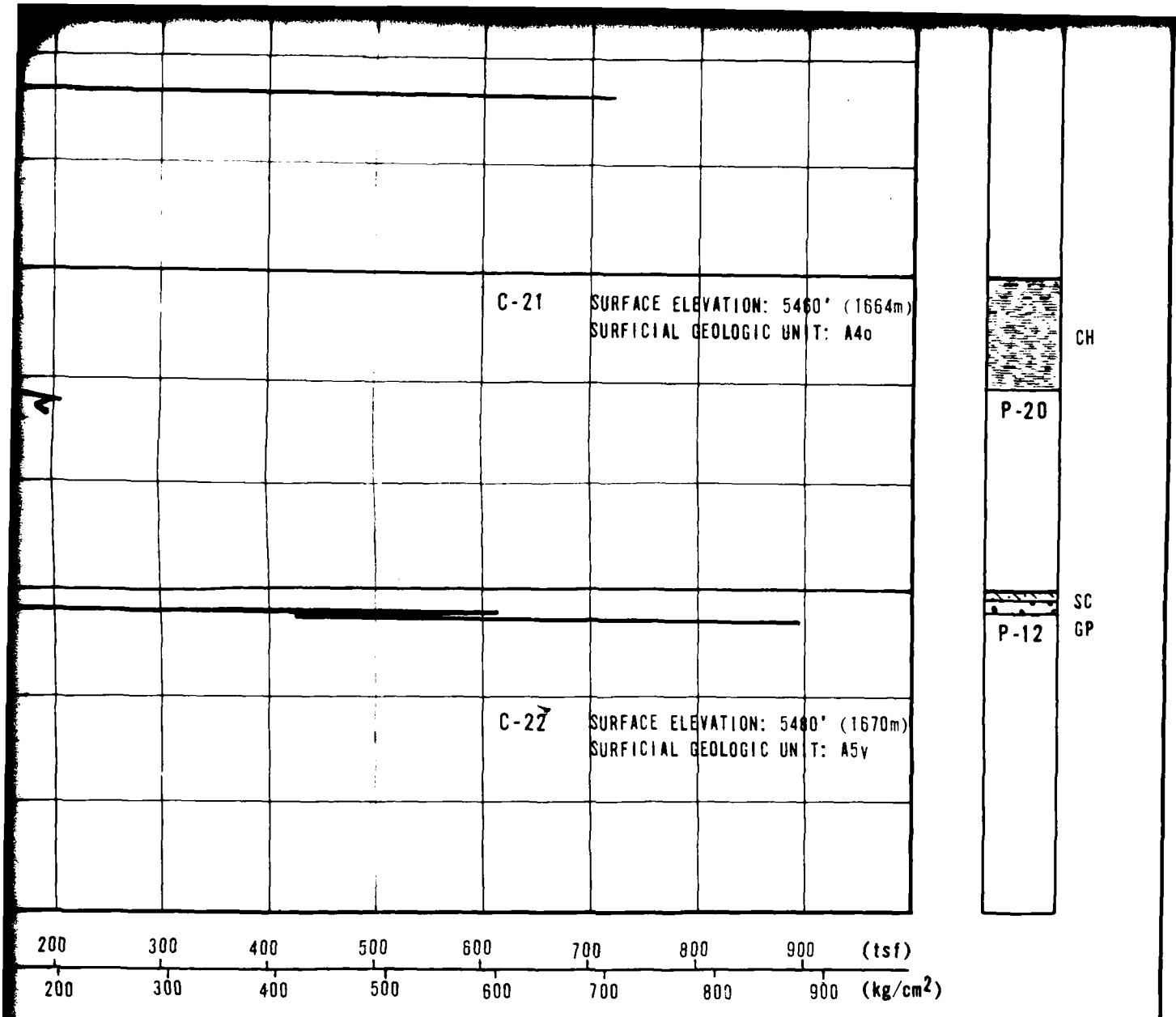

7
CL
SC
CL
B-3
ML
SM
P-15
SURFACE ELEVATION: 5470' (1667m)
SURFICIAL GEOLOGIC UNIT: A5y


ML
SM
SP
SM
B-4
C-19
SURFACE ELEVATION: 5530' (1686m)
SURFICIAL GEOLOGIC UNIT: A4o
C-20
SURFACE ELEVATION: 5480' (1670m)
SURFICIAL GEOLOGIC UNIT: A4o
CL
CS-20


C-8
SURFACE ELEVATION: 5355' (1632m)
SURFICIAL GEOLOGIC UNIT: A4o
3 10
4 15
5
6 20
7 25
0 0
1 5
2
3 10
4
0 100 200 300 400 500 600 700 800 900
0 100 200 300 400 500 600 700 800
CHECKED BY
APPROVED BY
2 JUL 79


CH
P-16
No Data Available-Equipment Malfunction
C-10
SURFACE
No Data Available-Equipment Malfunction
C-11
SURFACE
No Data Available-Equipment Malfunction
C-12
SURFACE
C-13
SURFACE
C-14
SURFACE
C-15
SURFACE
C-16
SURFACE
0 100 200 300 400 500 600 700
(tsf)
900 (kg/cm²)


FACE ELEVATION: 5470' (1667m)
FICIAL GEOLOGIC UNIT: A5y
FACE ELEVATION: 5366' (1633m)
FICIAL GEOLOGIC UNIT: A4o
FACE ELEVATION: 5636' (1718m)
FICIAL GEOLOGIC UNIT: A5y
FACE ELEVATION: 5500' (1676m)
FICIAL GEOLOGIC UNIT: A5i
FACE ELEVATION: 5560' (1695m)
FICIAL GEOLOGIC UNIT: A5i
FACE ELEVATION: 5472' (1668m)
FICIAL GEOLOGIC UNIT: A1
FACE ELEVATION: 5470' (1667m)
FICIAL GEOLOGIC UNIT: A4o
ML
SM
P-15
CL
CS-11
SM
B-5
SM
GP
P-21
SM
GP
CS-14
ML
CS-15
CL
ML
CS-16
800
900
(tsf)
800
900
(kg/cm2)
2
3
10
0
0
1
5
2
10
0
0
1
5
0
100
200
300
400
500
0
100
200
300
400
500



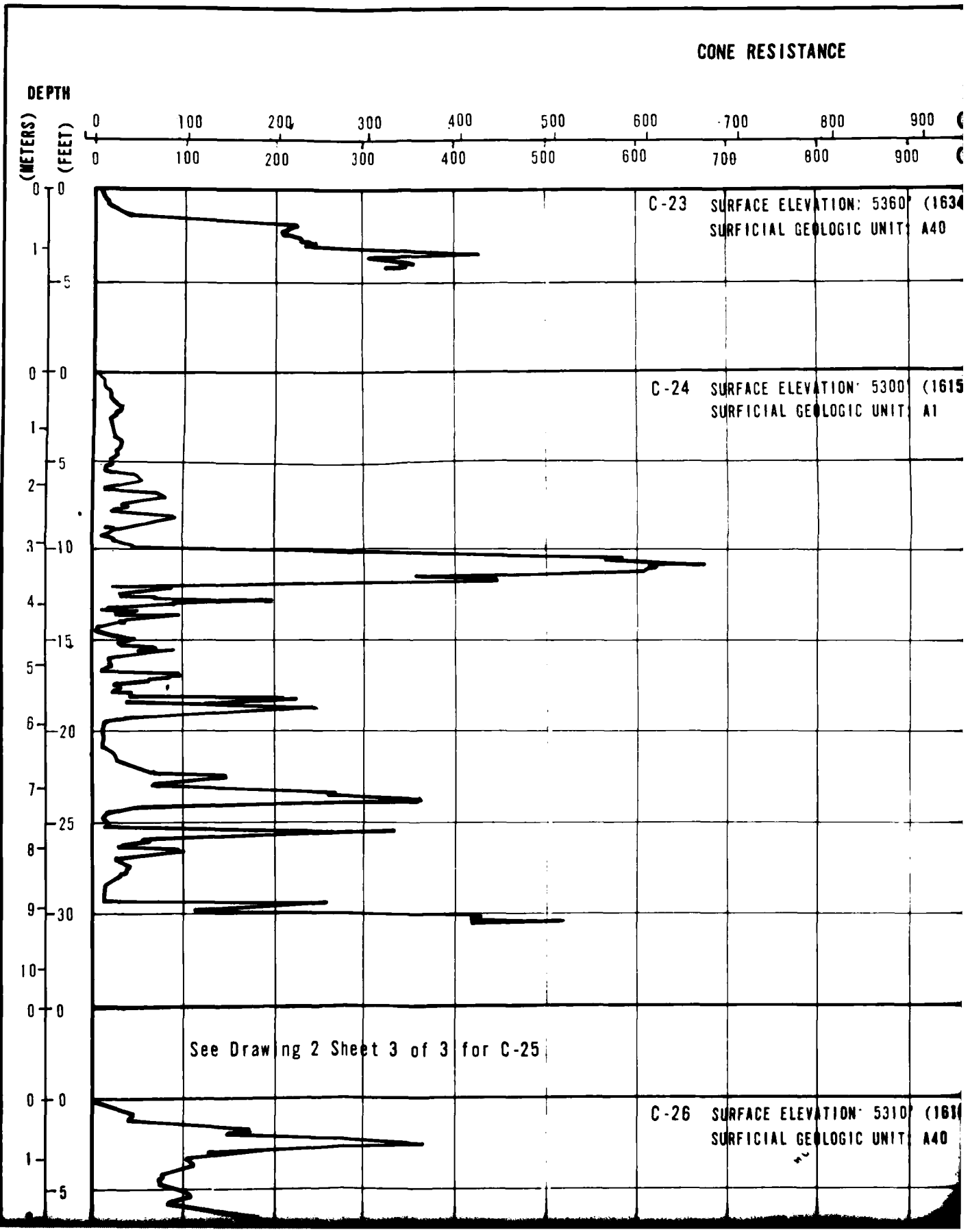
CONE PENETROMETER TEST RESULTS
VERIFICATION SITE
WHITE RIVER CDP, NEVADA

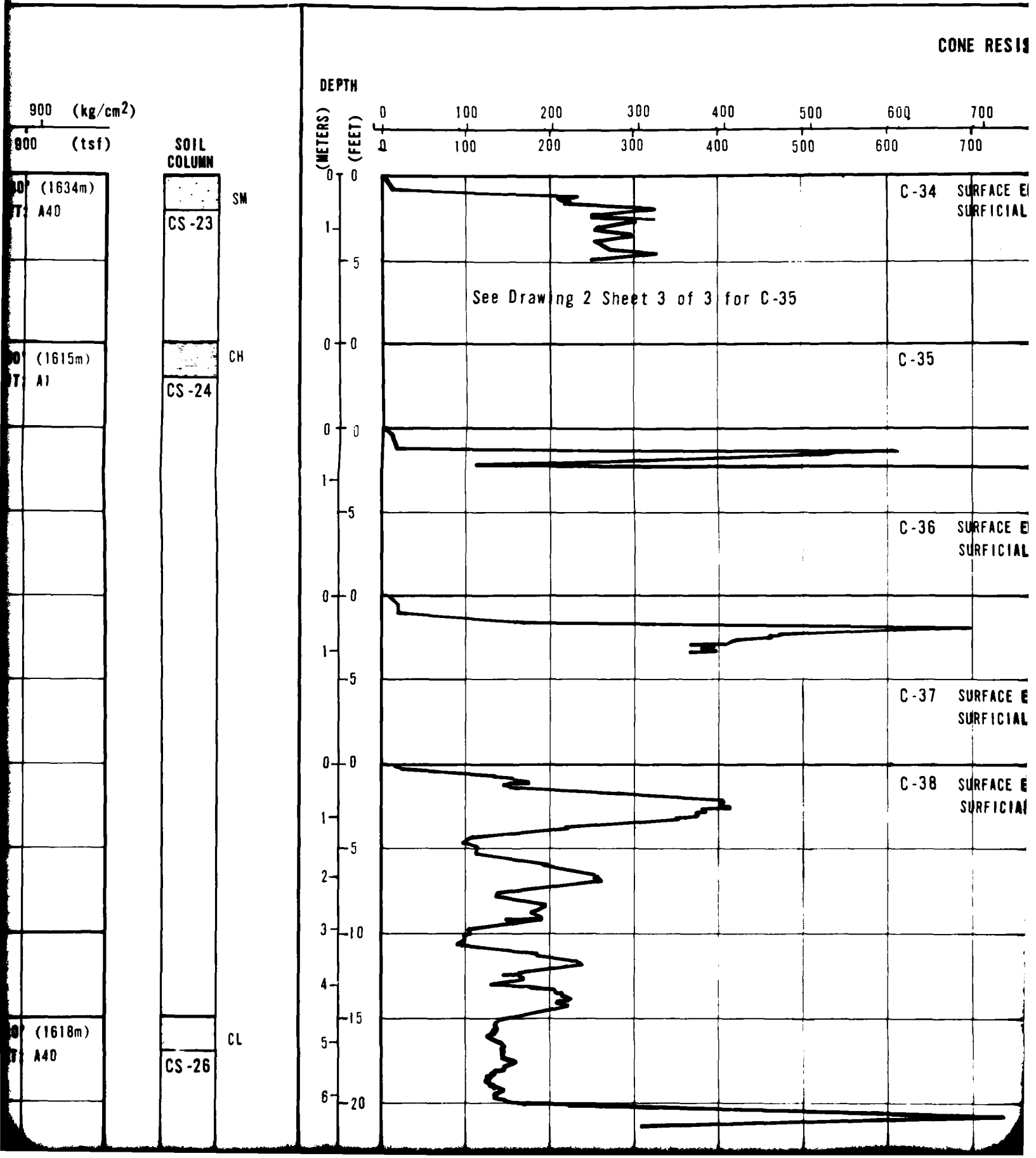
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

DRAWING
2
1 OF 3

FUGRO NATIONAL, INC.

FN-TR-27-V


CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700 800 900
0 100 200 300 400 500 600 700 800 900
C-23 SURFACE ELEVATION: 5360' (1634
SURFICIAL GEOLOGIC UNIT: A40
C-24 SURFACE ELEVATION: 5300' (1615
SURFICIAL GEOLOGIC UNIT: A1
See Drawing 2 Sheet 3 of 3 for C-25
C-26 SURFACE ELEVATION: 5310' (161
SURFICIAL GEOLOGIC UNIT: A40


CONE RESIS
900 (kg/cm2)
900 (tsf)
SOIL COLUMN
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700
(1634m)
A40
(1615m)
A1
(1618m)
A40
SM
CS-23
CH
CS-24
CL
CS-26
See Drawing 2 Sheet 3 of 3 for C-35
C-34 SURFACE EL
SURFICIAL
C-35
C-36 SURFACE EL
SURFICIAL
C-37 SURFACE EL
SURFICIAL
C-38 SURFACE EL
SURFICIAL

RESISTANCE

0 800 900 (kg/cm²)

800 900 (tsf)

FACE ELEVATIONS: 5265' (1605m)
FICIAL GEOLOGIC UNIT: A40

RFACE ELEVATIONS. 5210' (1588m)
RFICIAL GEOLOGIC UNIT: A40

RFACE ELEVATION: 5200' (1585m)
RFICIAL GEOLOGIC UNIT: A40

RFACE ELEVATION: 5240' (1597m)
RFICIAL GEOLOGIC UNIT: A5y 'A40

SOIL COLUMN

C-34 — SM, SP-SM

CS-36 — CL

CS-37 — SM

SM, SP, ML

T-1

DEPTH

(METERS) (FEET)

0 100 200 300 400 500

0 100 200 300 400 500 6

See Drawing 2 Sheet 3 of 3 for C-49

See Drawing 2 Sheet 3 of 3 for C-50

0 5 10 15 20 25 30

CONE RESISTANCE

200 300 400 500 600 700 800 900 (kg/cm^2)

200 300 400 500 600 700 800 900 (tsf)

rawing 2 Sheet 3 of 3 for C-49	C-48		
rawing 2 Sheet 3 of 3 for C-50	C-49		
	C-50		
	C-51	SURFACE ELEVATION: 5230' (1594m) SURFICIAL GEOLOGIC UNIT: A4o	
	C-52	SURFACE ELEVATION: 5245' (1599m) SURFICIAL GEOLOGIC UNIT: A4o	

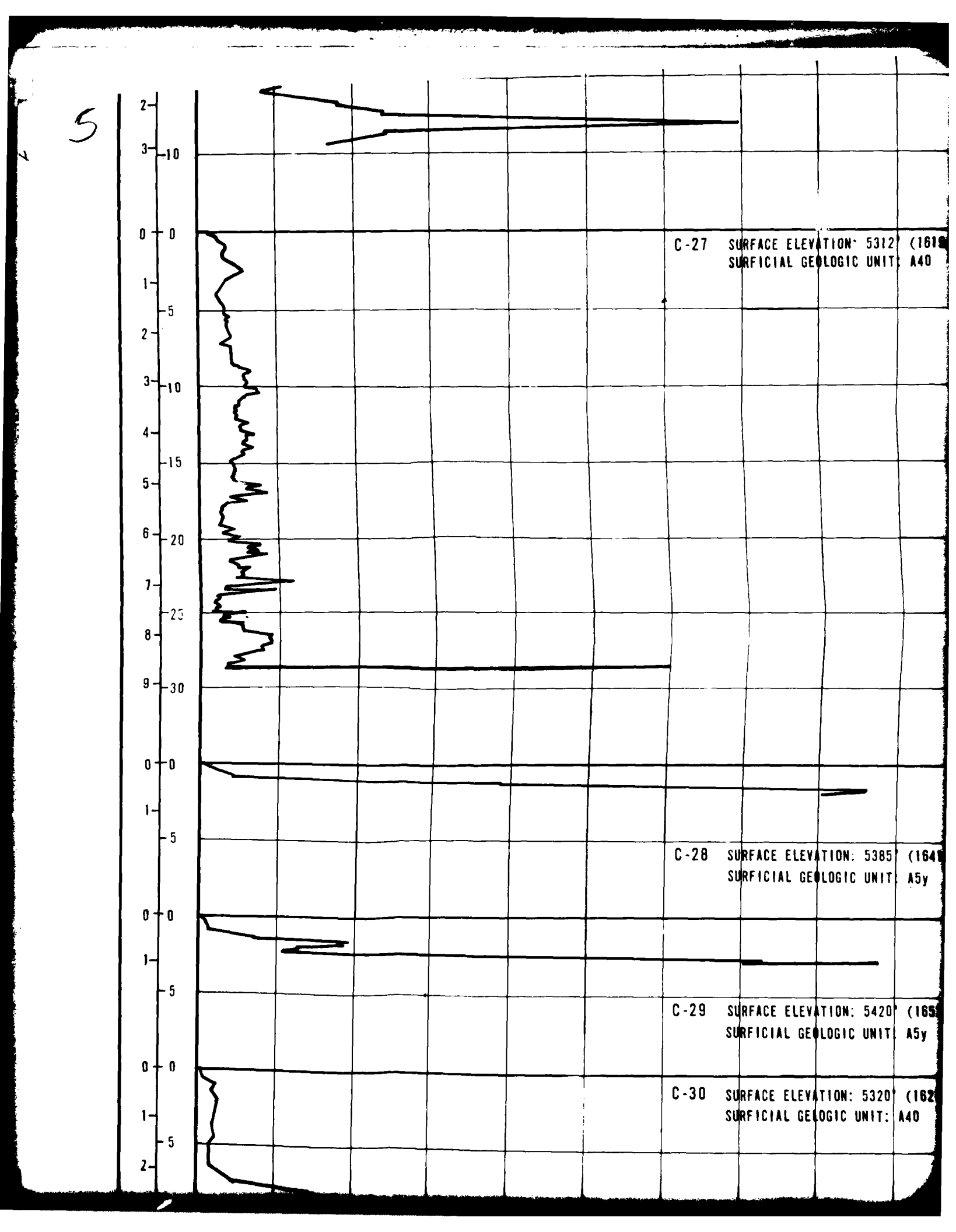
SOIL COLUMN

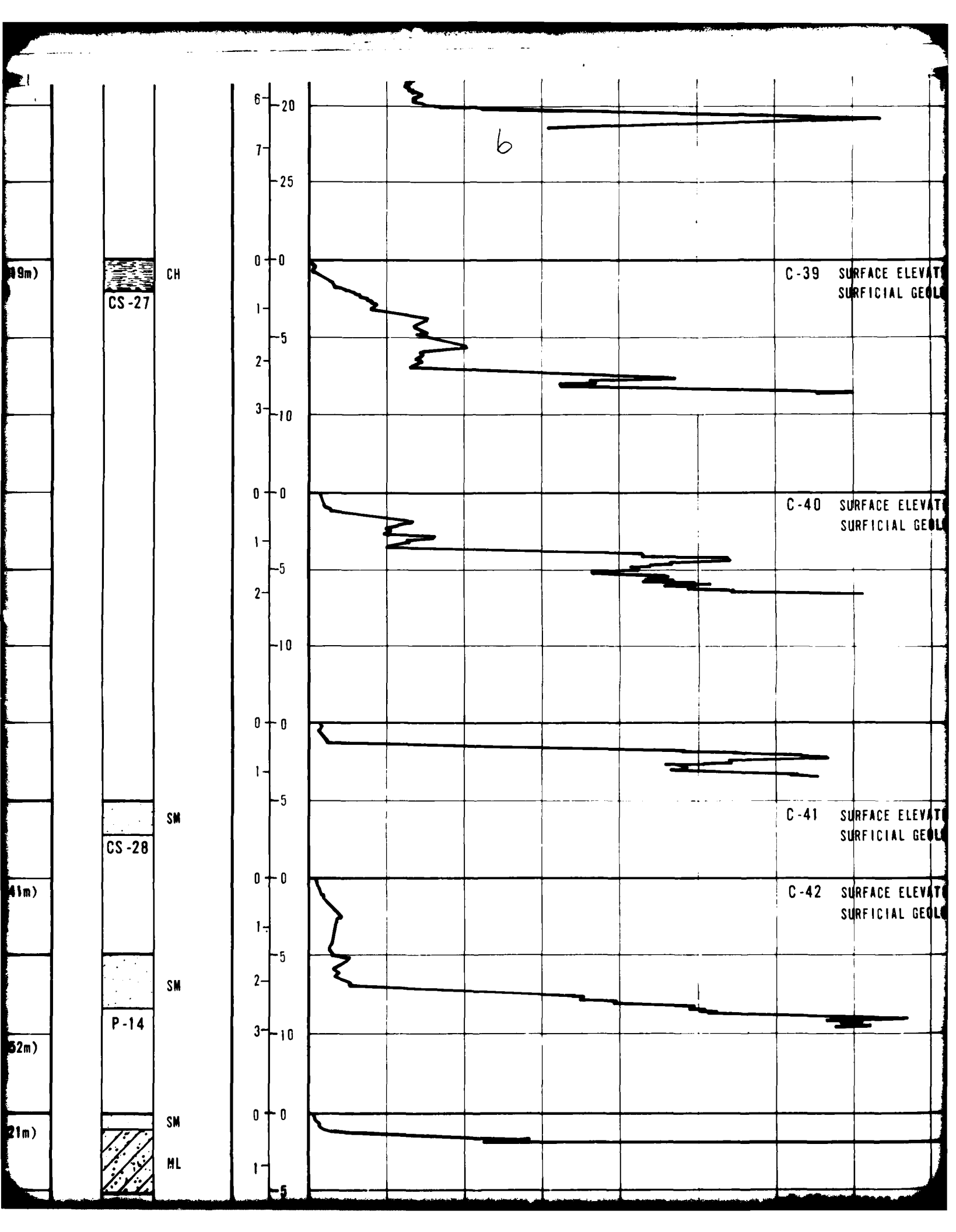
CS-51

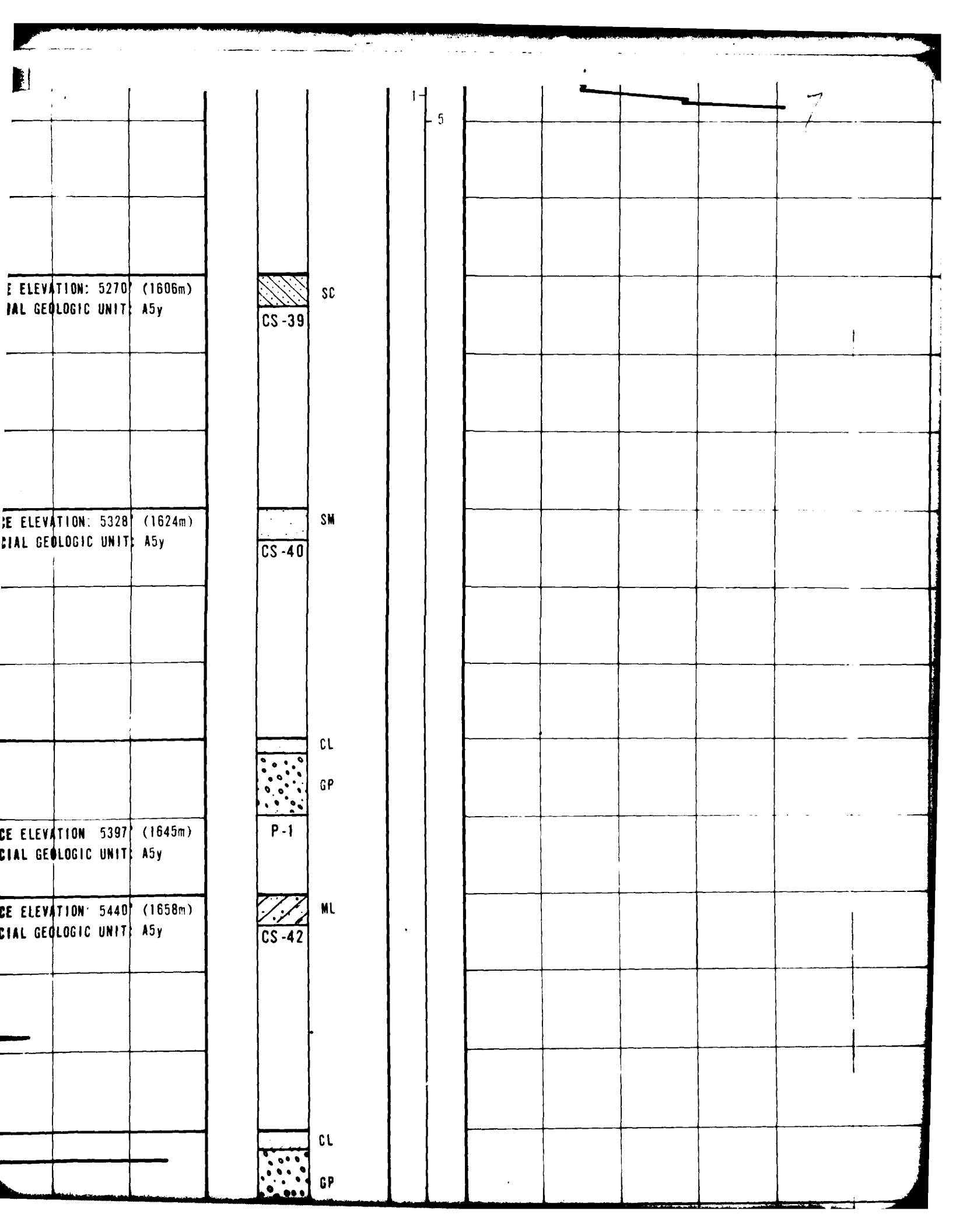
CL

SM

B-1


5
C-27 SURFACE ELEVATION: 5312' (161
SURFICIAL GEOLOGIC UNIT: A40
C-28 SURFACE ELEVATION: 5385' (164
SURFICIAL GEOLOGIC UNIT: A5y
C-29 SURFACE ELEVATION: 5420' (165
SURFICIAL GEOLOGIC UNIT: A5y
C-30 SURFACE ELEVATION: 5320' (162
SURFICIAL GEOLOGIC UNIT: A40

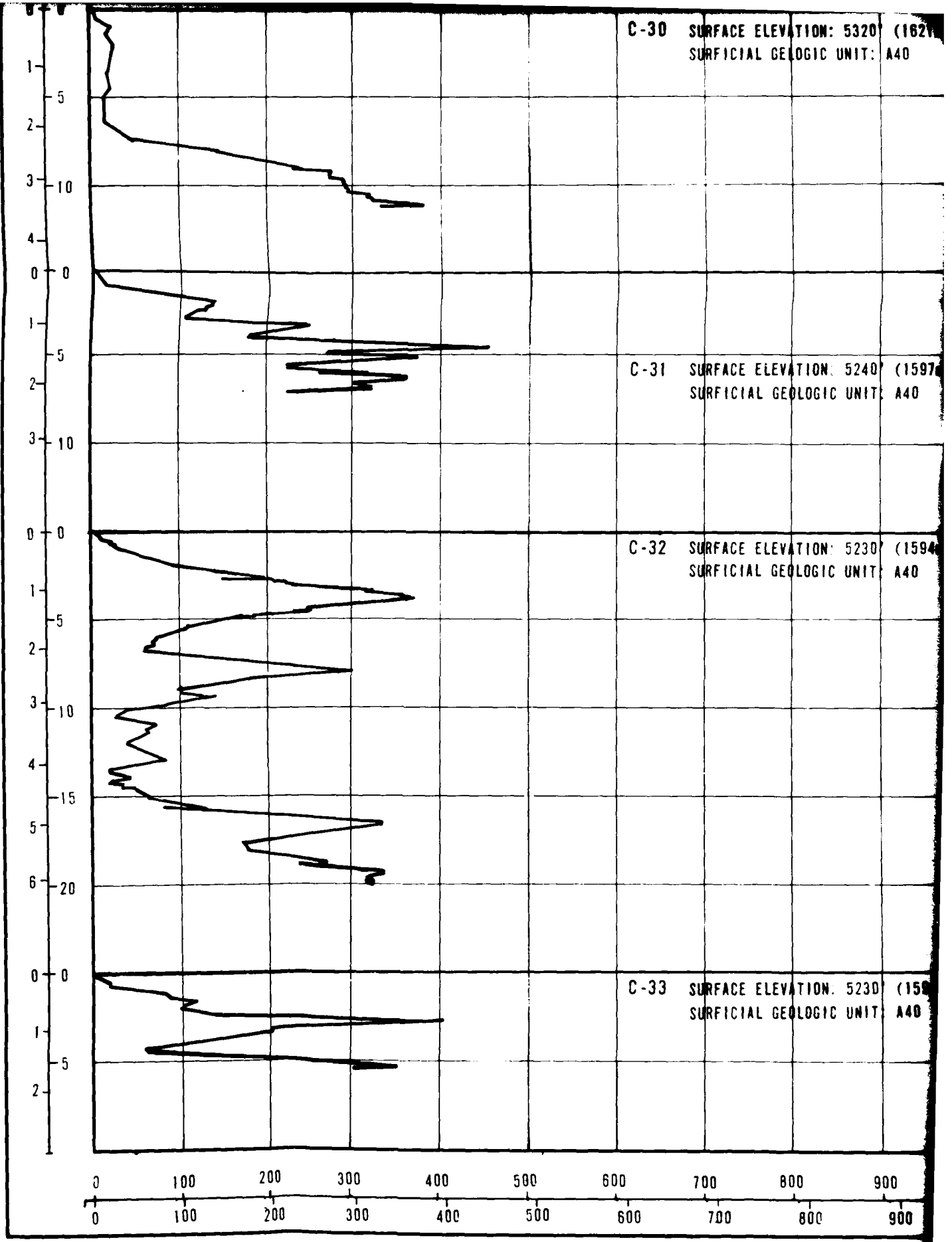

6
20
7
25
0
0
1
5
2
10
3
0
0
1
5
2
10
0
0
1
5
0
0
1
5
2
10
3
0
0
1
5
CH
CS-27
SM
CS-28
SM
P-14
SM
ML
C-39 SURFACE ELEVATI
SURFICIAL GEOL
C-40 SURFACE ELEVATI
SURFICIAL GEOL
C-41 SURFACE ELEVATI
SURFICIAL GEOL
C-42 SURFACE ELEVATI
SURFICIAL GEOL


E ELEVATION: 5270' (1606m)
IAL GEOLOGIC UNIT: A5y
SC
CS-39
CE ELEVATION: 5328' (1624m)
CIAL GEOLOGIC UNIT: A5y
SM
CS-40
CL
GP
CE ELEVATION 5397' (1645m)
CIAL GEOLOGIC UNIT: A5y
P-1
CE ELEVATION 5440' (1658m)
CIAL GEOLOGIC UNIT: A5y
ML
CS-42
CL
GP
1
5
7

SURFICIAL GEOLOGIC UNIT: A4o

SM

B-1



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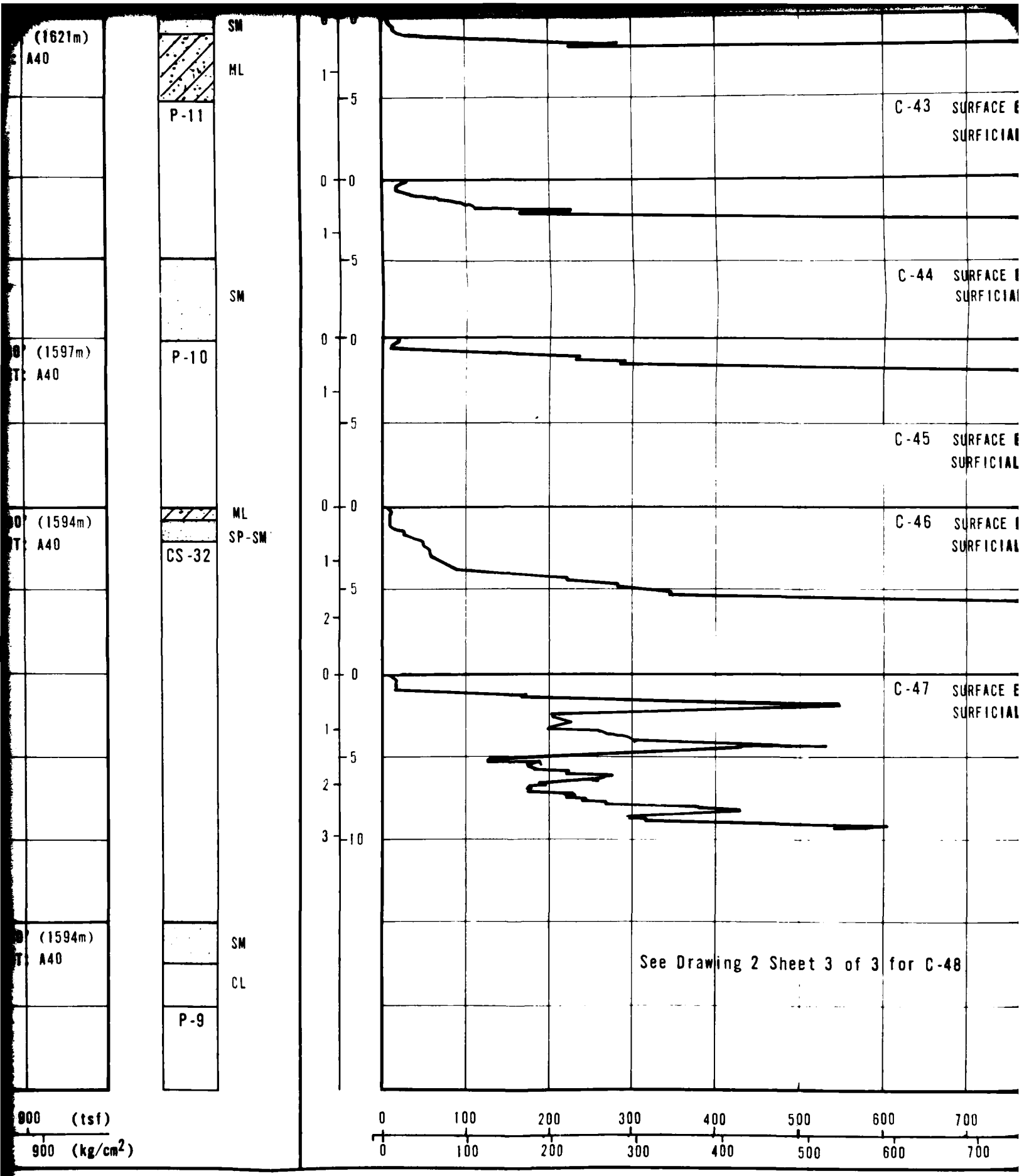
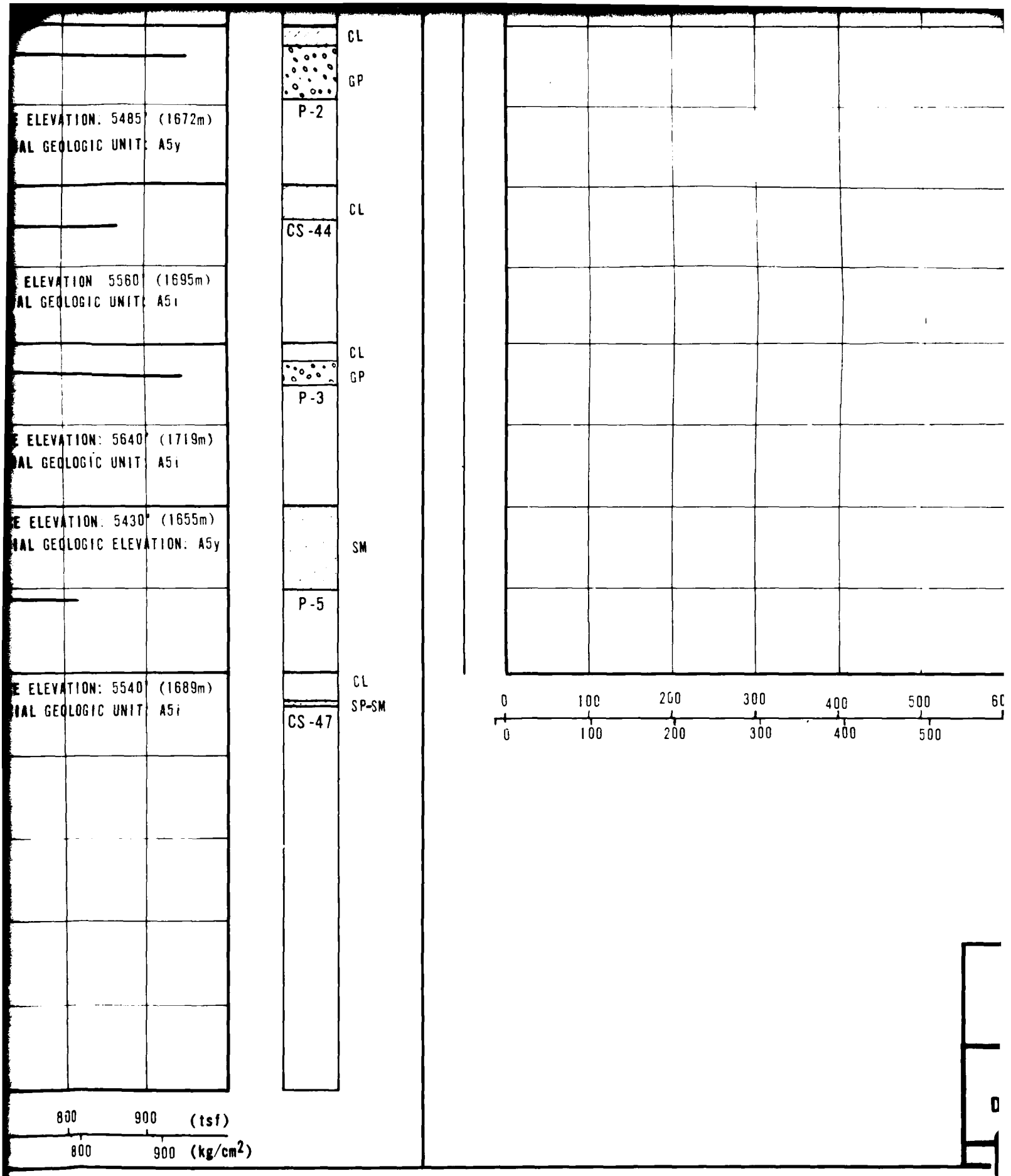
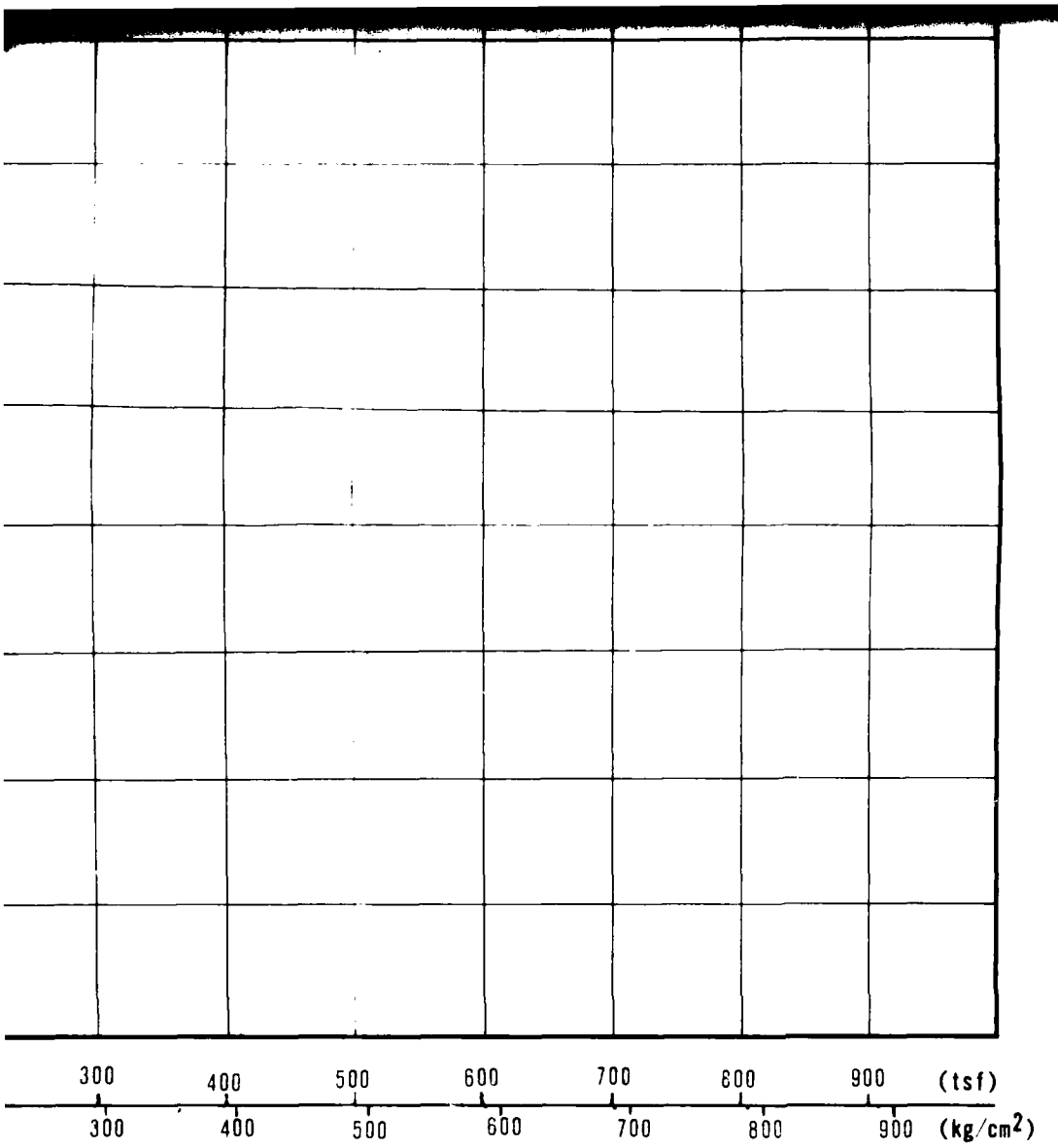
2 JUL 79


(1621m)
A40
SM
ML
P-11
SM
(1597m)
A40
P-10
ML
SP-SM
(1594m)
A40
CS-32
SM
CL
(1594m)
A40
P-9
C-43 SURFACE E
SURFICIAL
C-44 SURFACE E
SURFICIAL
C-45 SURFACE E
SURFICIAL
C-46 SURFACE E
SURFICIAL
C-47 SURFACE E
SURFICIAL
See Drawing 2 Sheet 3 of 3 for C-48
900 (tsf)
900 (kg/cm²)
0 100 200 300 400 500 600 700
0 100 200 300 400 500 600 700


CL
GP
P-2
CL
CS-44
CL
GP
P-3
SM
P-5
CL
SP-SM
CS-47
ELEVATION. 5485' (1672m)
AL GEOLOGIC UNIT: A5y
ELEVATION 5560' (1695m)
AL GEOLOGIC UNIT: A5i
ELEVATION: 5640' (1719m)
AL GEOLOGIC UNIT: A5i
E ELEVATION. 5430' (1655m)
AL GEOLOGIC ELEVATION: A5y
E ELEVATION: 5540' (1689m)
AL GEOLOGIC UNIT: A5i
0 100 200 300 400 500 60
0 100 200 300 400 500
800 900 (tsf)
800 900 (kg/cm2)



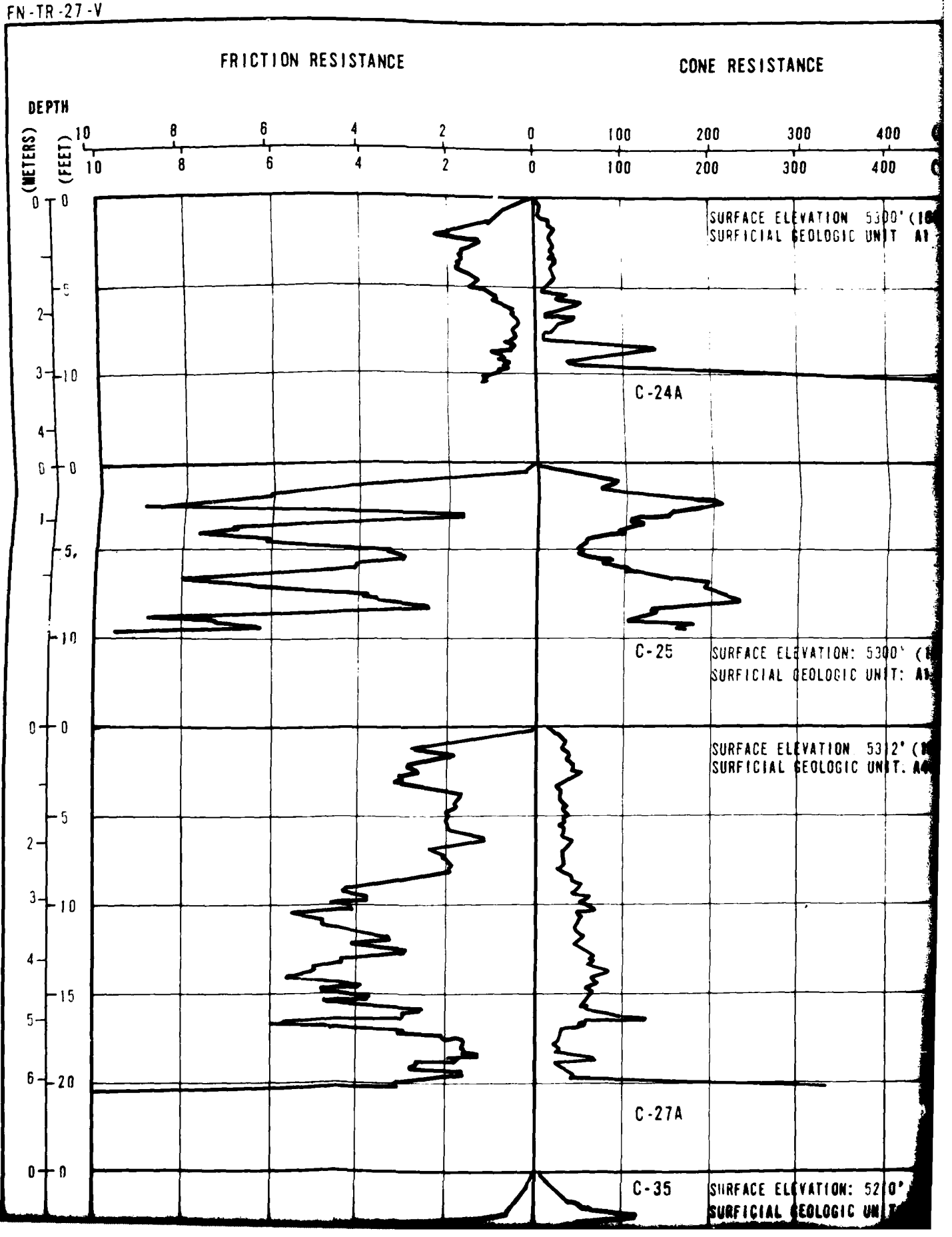
CONE PENETROMETER TEST RESULTS
VERIFICATION SITE
WHITE RIVER CDP. NEVADA

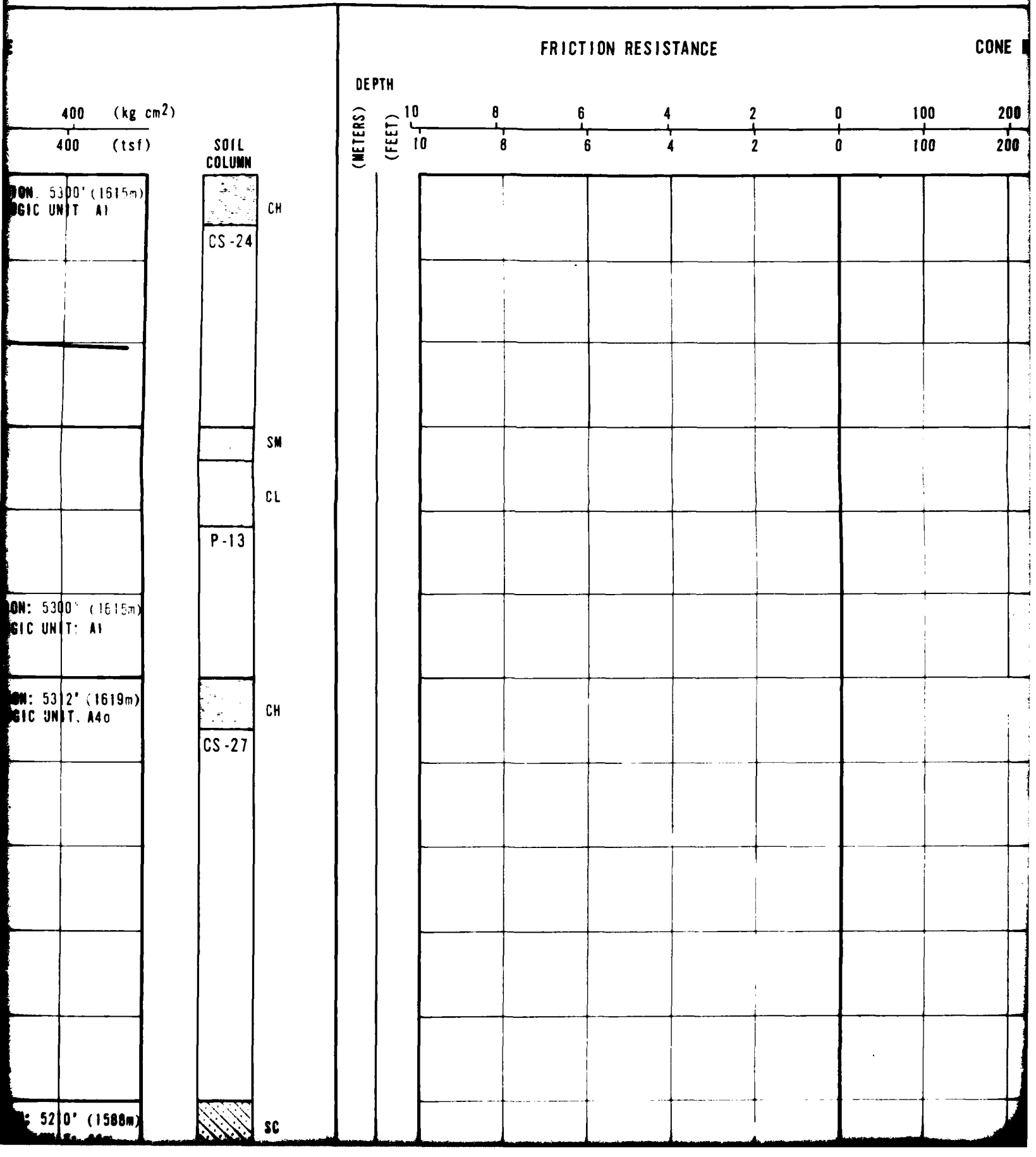
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

DRAWING
2
2 OF 3

FUGRO NATIONAL, INC.

FN-TR-27-V


FRICTION RESISTANCE
CONE RESISTANCE
DEPTH
(METERS)
(FEET)
10 8 6 4 2 0
100 200 300 400
SURFACE ELEVATION 5300' (1
SURFICIAL GEOLOGIC UNIT A1
C-24A
C-25
SURFACE ELEVATION: 5300' (
SURFICIAL GEOLOGIC UNIT: A1
SURFACE ELEVATION 53 2' (
SURFICIAL GEOLOGIC UNIT. A
C-27A
C-35
SURFACE ELEVATION: 52 0'
SURFICIAL GEOLOGIC UN T


400 (kg cm2)
400 (tsf)
SOIL COLUMN
ON. 5300' (1615m)
GIC UNIT A1
CH
CS-24
SM
CL
P-13
ON: 5300' (1615m)
GIC UNIT: A1
N: 5312' (1619m)
GIC UNIT. A4o
CH
CS-27
: 5210' (1588m)
SC
FRICTION RESISTANCE
CONE
DEPTH
(METERS)
(FEET)
10 8 6 4 2 0 100 200
10 8 6 4 2 0 100 200

3

CONE RESISTANCE

200 300 400 (kg/cm^2)

200 300 400 (tsf)

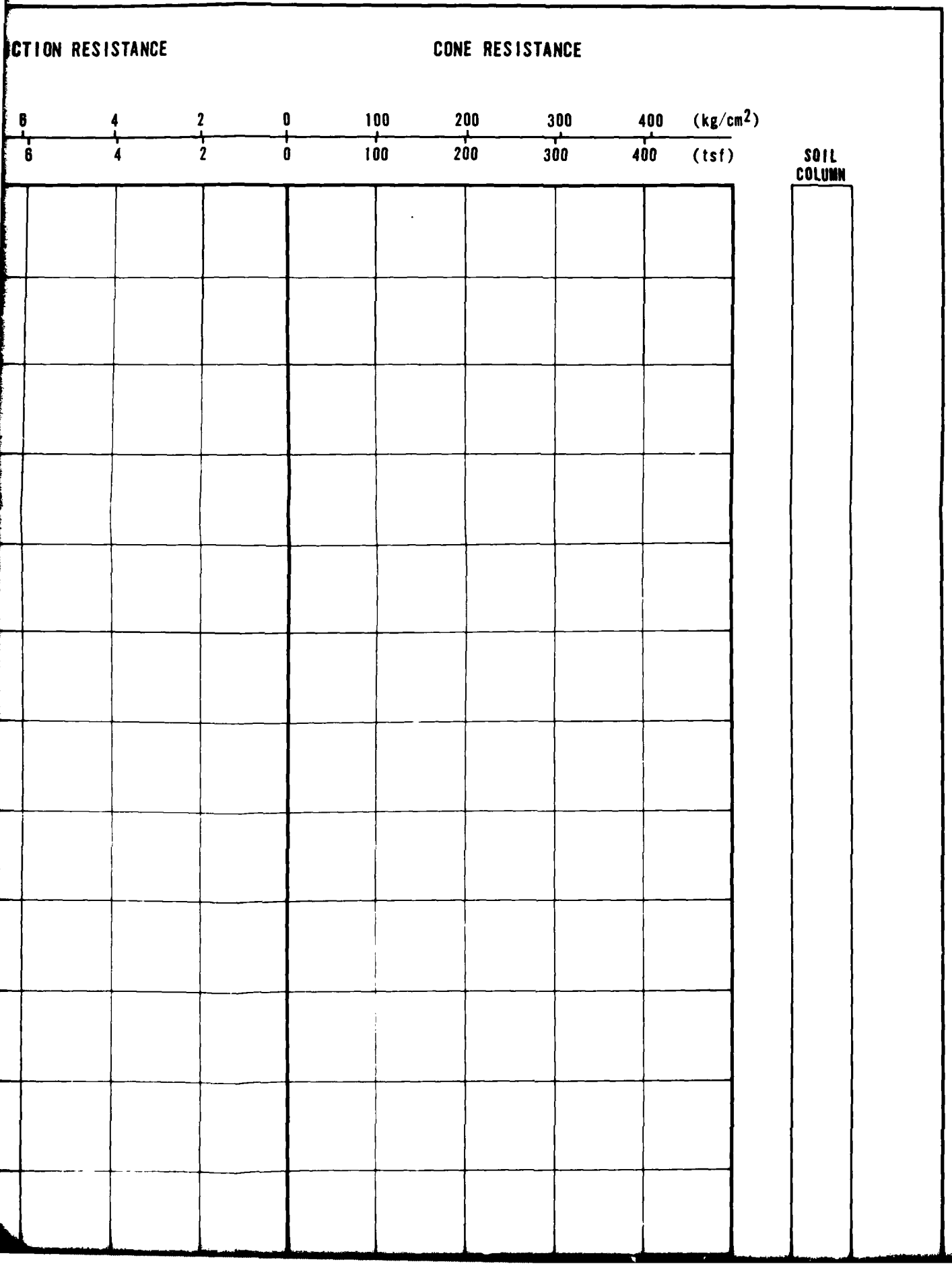
SOIL COLUMN

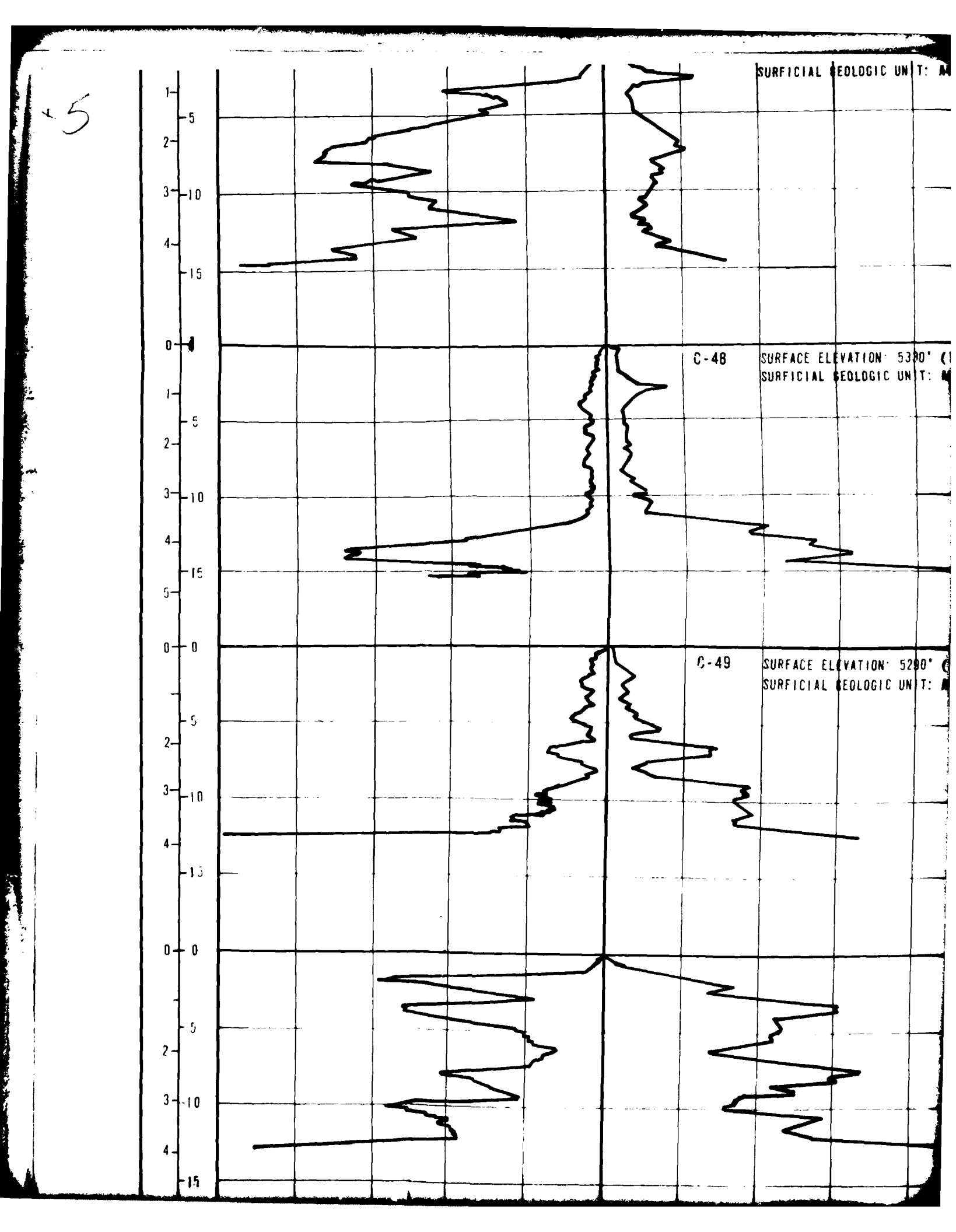
DEPTH

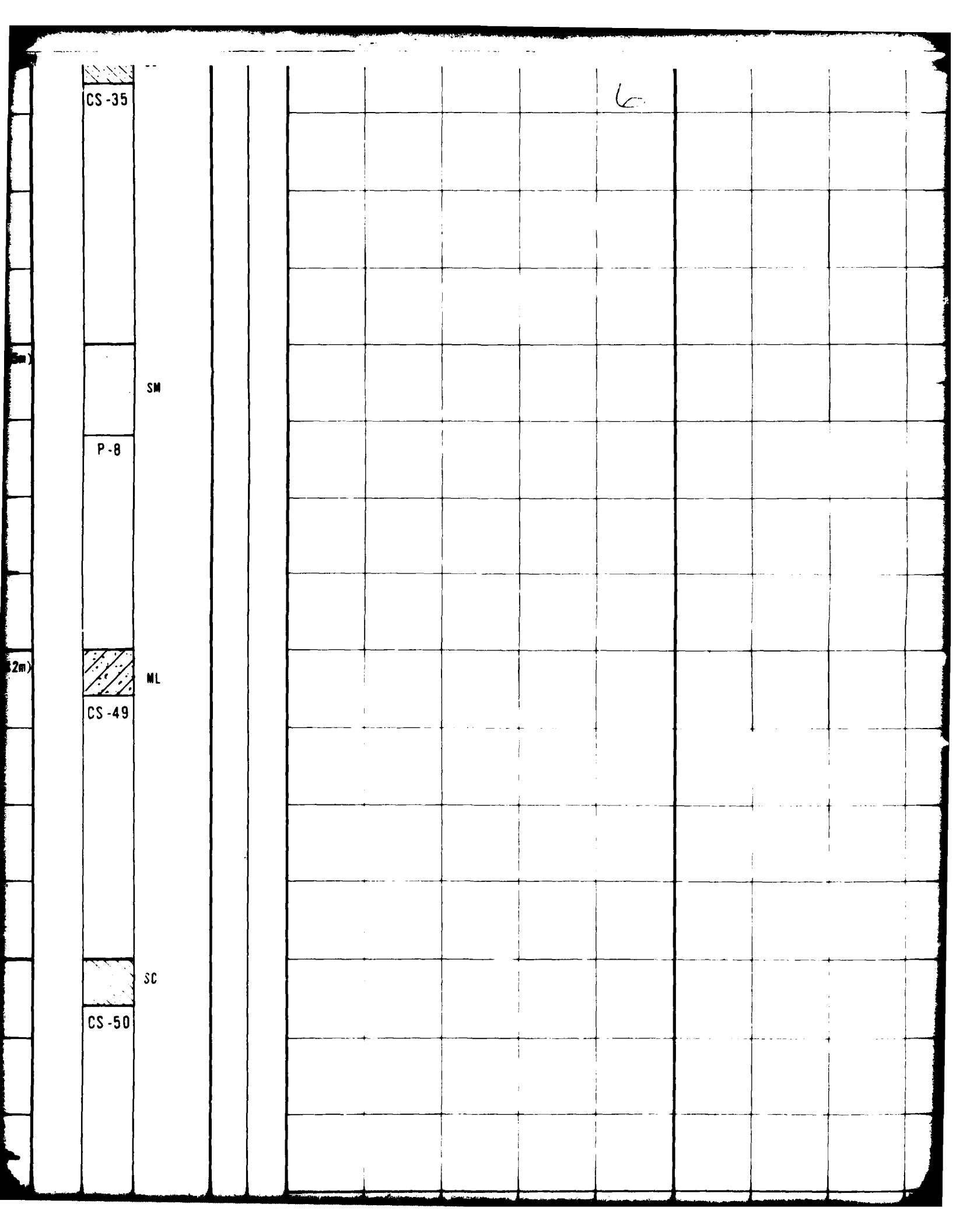
(METERS) (FEET) 10 8 6 4 2 0

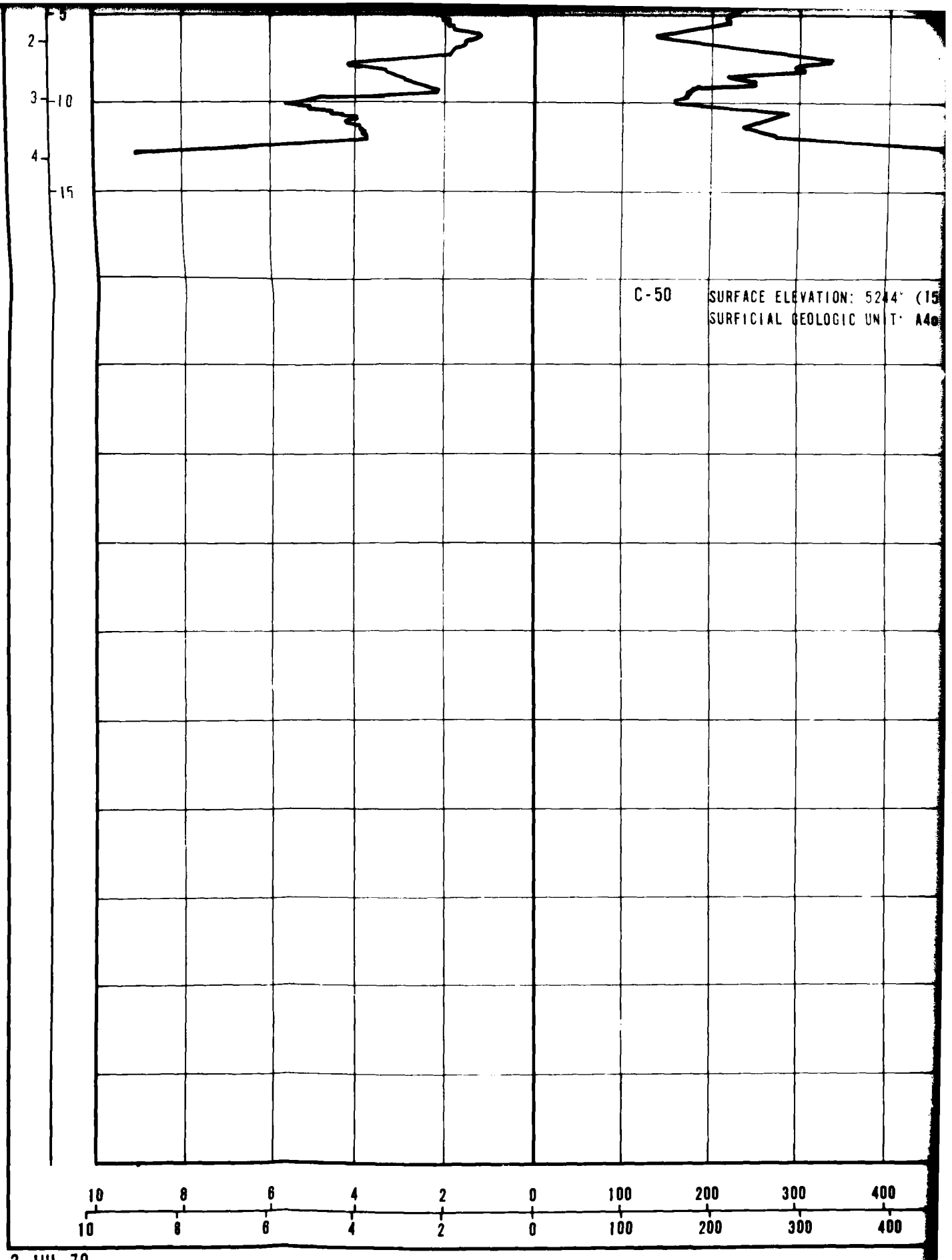
10 8 6 4 2 0

FRICTION RESISTANCE


CTION RESISTANCE
CONE RESISTANCE
6 4 2 0 100 200 300 400 (kg/cm2)
6 4 2 0 100 200 300 400 (tsf)
SOIL COLUMN


SURFICIAL GEOLOGIC UNIT:
C-48
SURFACE ELEVATION 5380'
SURFICIAL GEOLOGIC UNIT:
C-49
SURFACE ELEVATION 5290'
SURFICIAL GEOLOGIC UNIT:


CS-35
SM
P-8
ML
CS-49
SC
CS-50



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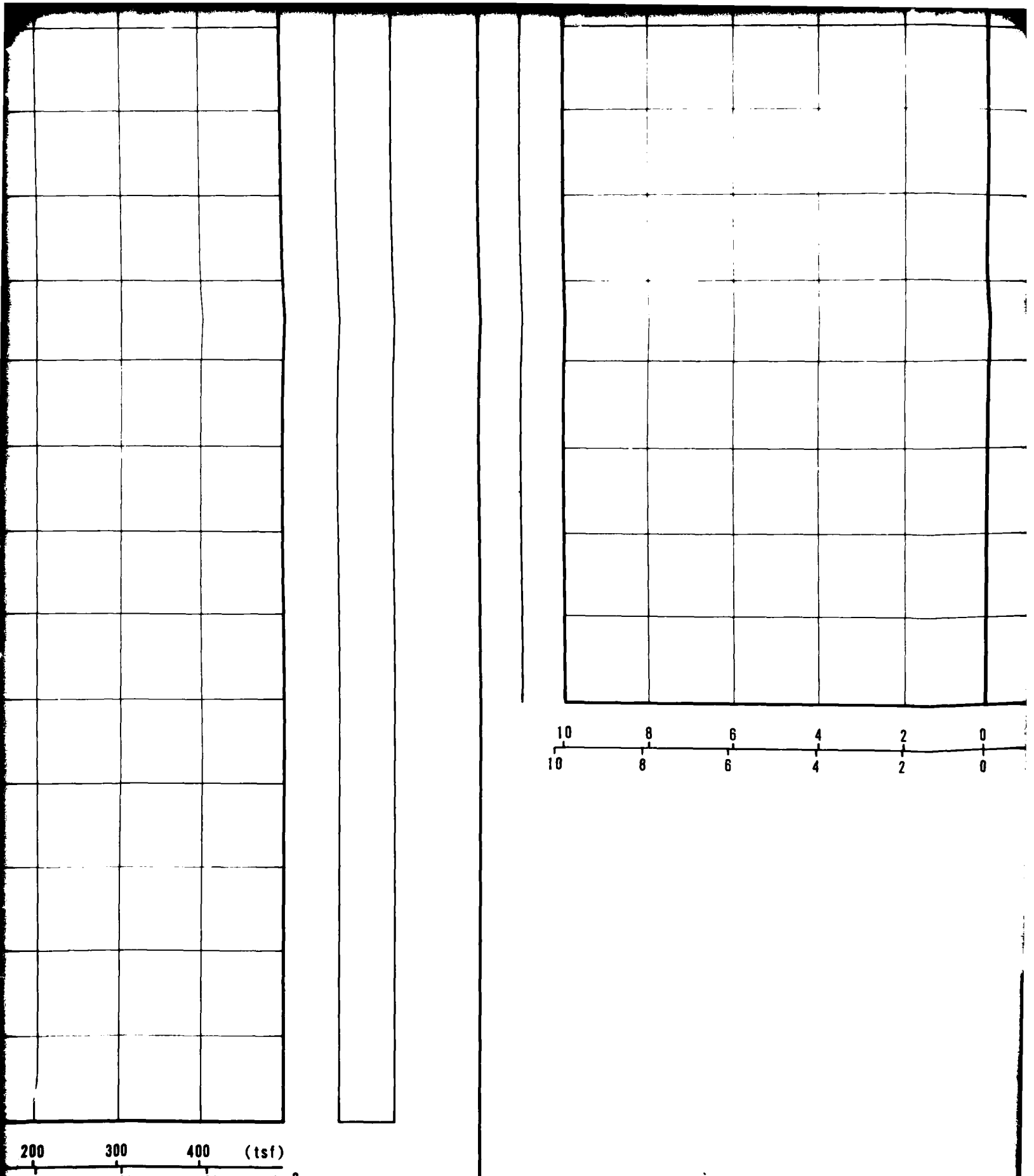
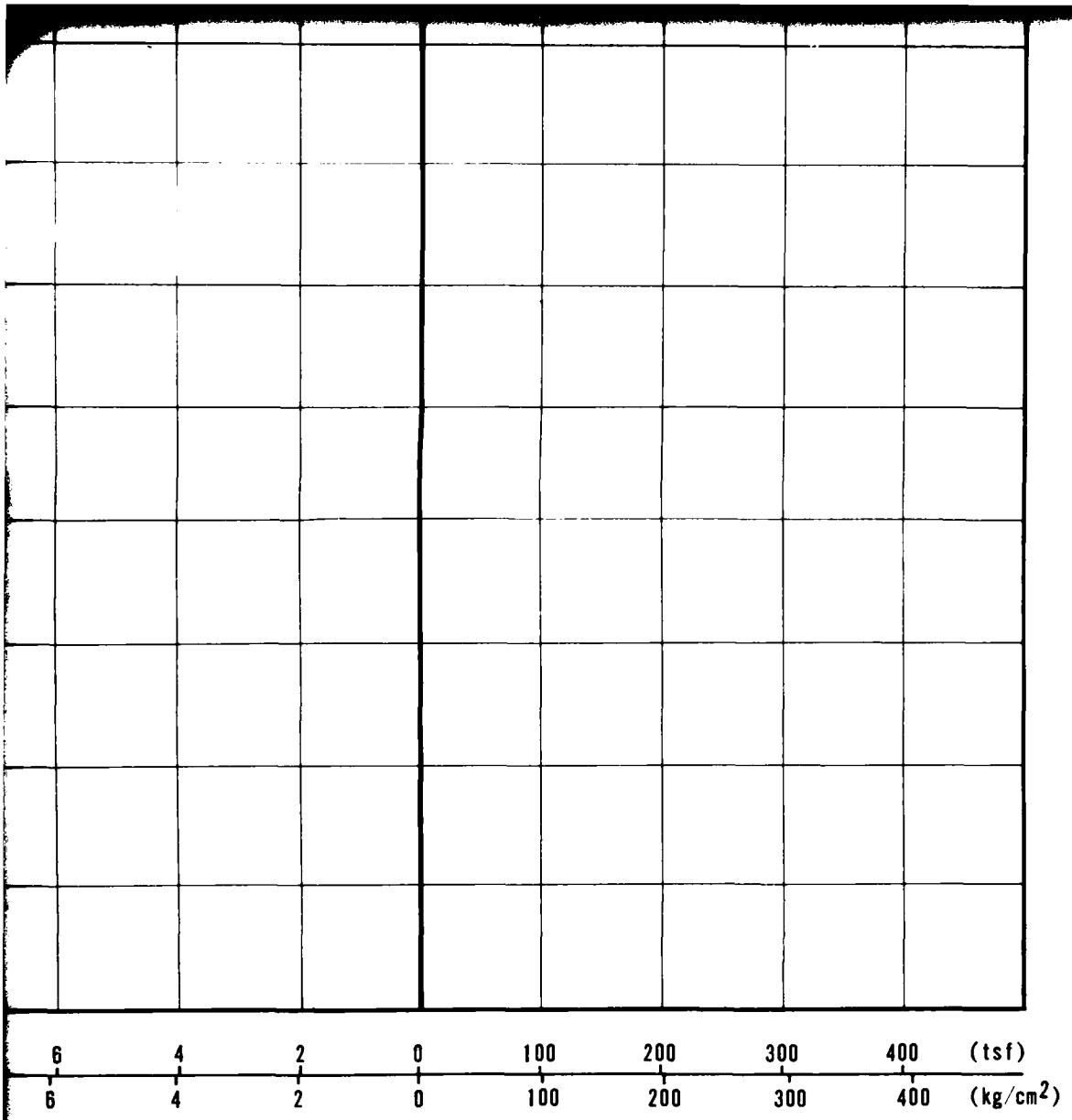
2 JUL 79

9


10 8 6 4 2 0
10 8 6 4 2 0
200 300 400 (tsf)
200 300 400 (kg/cm2)

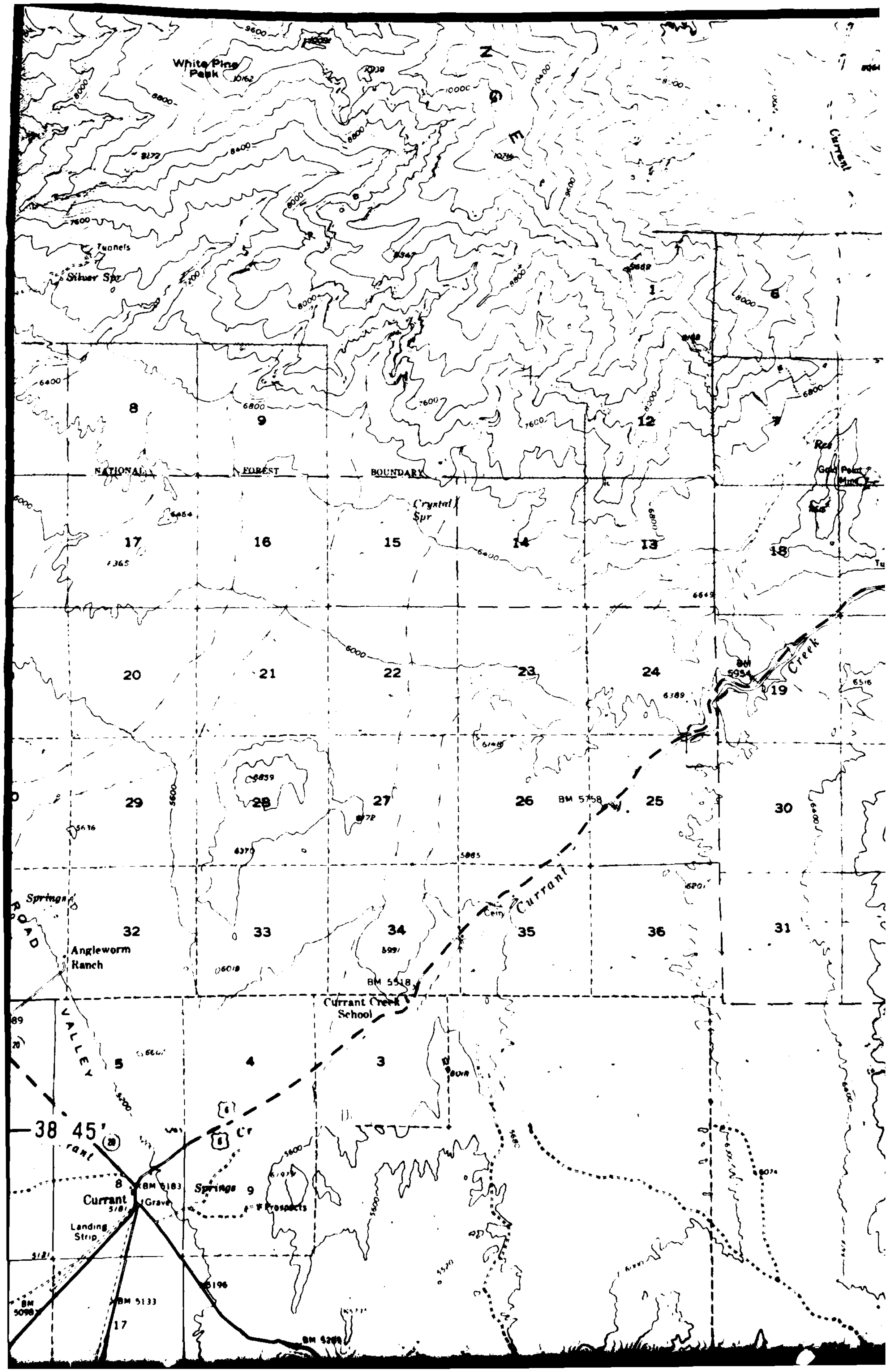


FRICTION RESISTANCE TEST RESULTS
VERIFICATION SITE
WHITE RIVER COP. NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

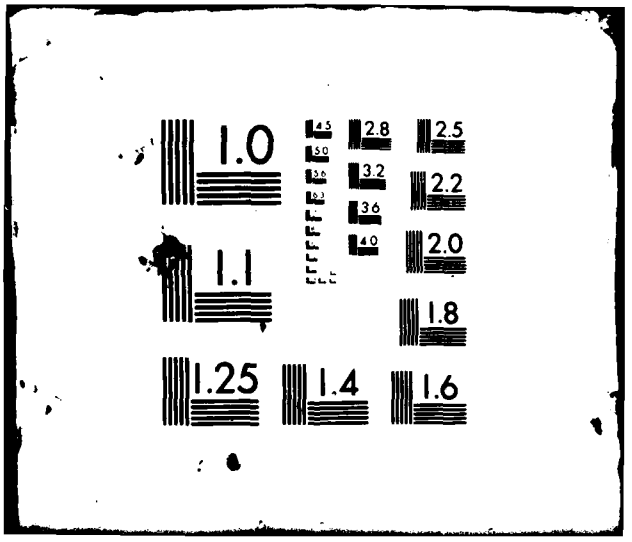
DRAWING
2
3 OF 3

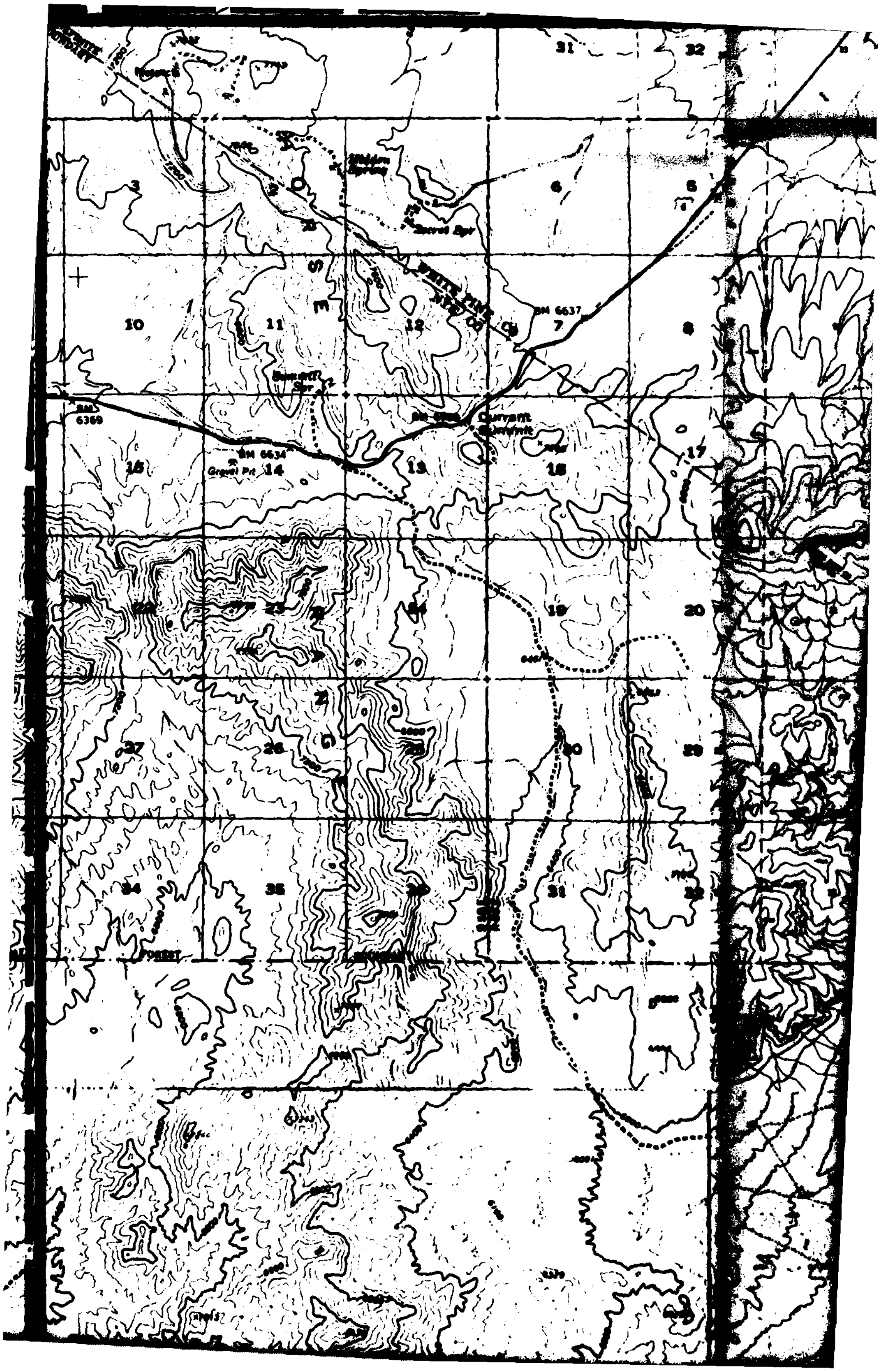
FUGRO NATIONAL, INC.


White Pine Peak
Silver Spr
Tunnels
NATIONAL FOREST BOUNDARY
Crystal Spr
Currant Creek
Currant Creek School
Angleworm Ranch
Springs
ROAD
VALLEY
38 45'
Currant
Landing Strip
Graves
Prospects
BM 5758
BM 5518
BM 5183
BM 5133
Res
Gold Point Mine
8
9
12
7
17
16
15
14
13
18
20
21
22
23
24
19
29
28
27
26
25
30
32
33
34
35
36
31
5
4
3
1
6

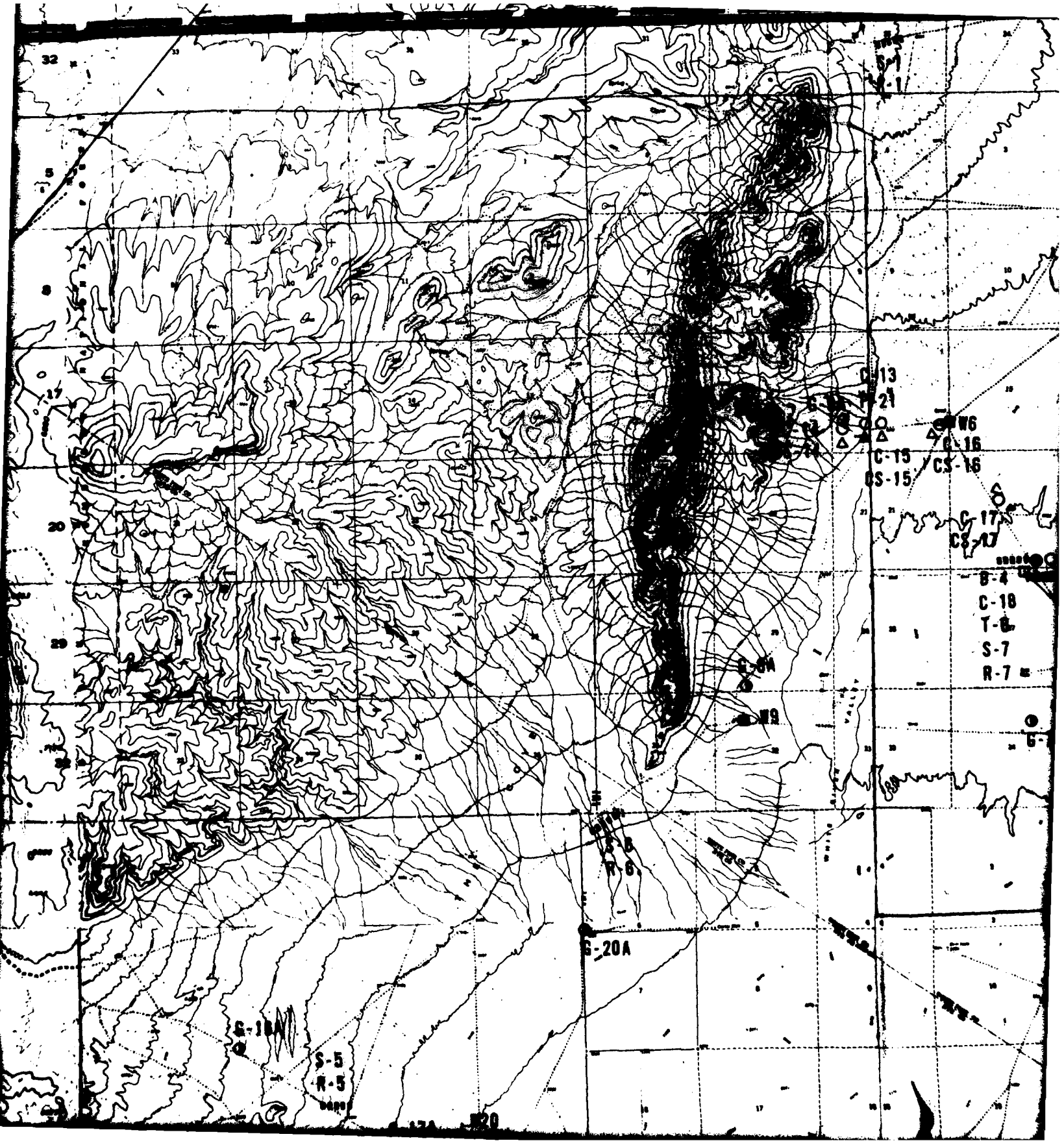
AD-A113 327 FUGRO NATIONAL INC LONG BEACH CA F/G 8/13
MX SITING INVESTIGATION. GEOTECHNICAL EVALUATION. VOLUME V. NEV--ETC(U)
AUG 79 F04704-78-C-0027
UNCLASSIFIED FN-TR-27-5 NL

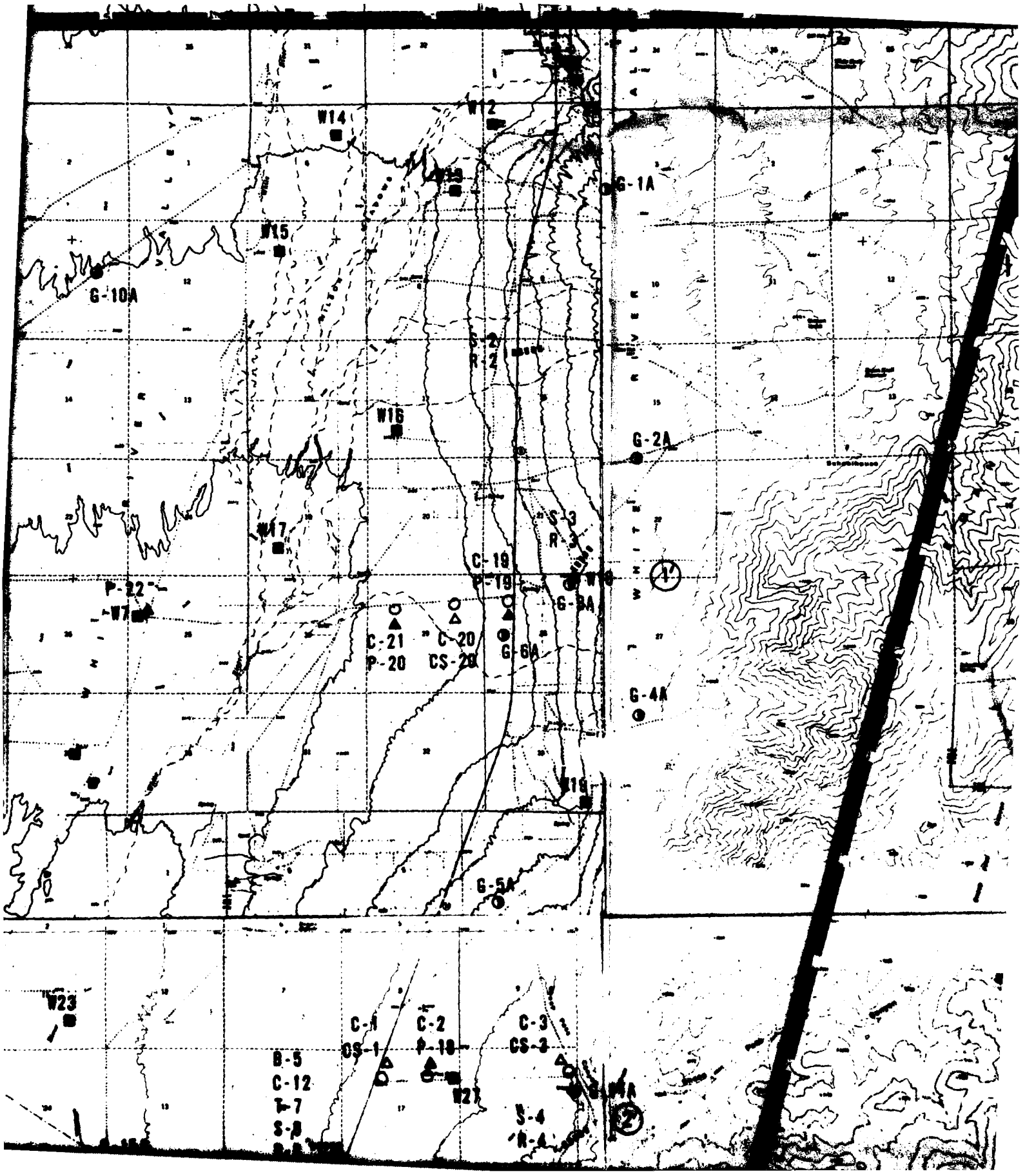
END
DATE FILMED
5 82
DTIC

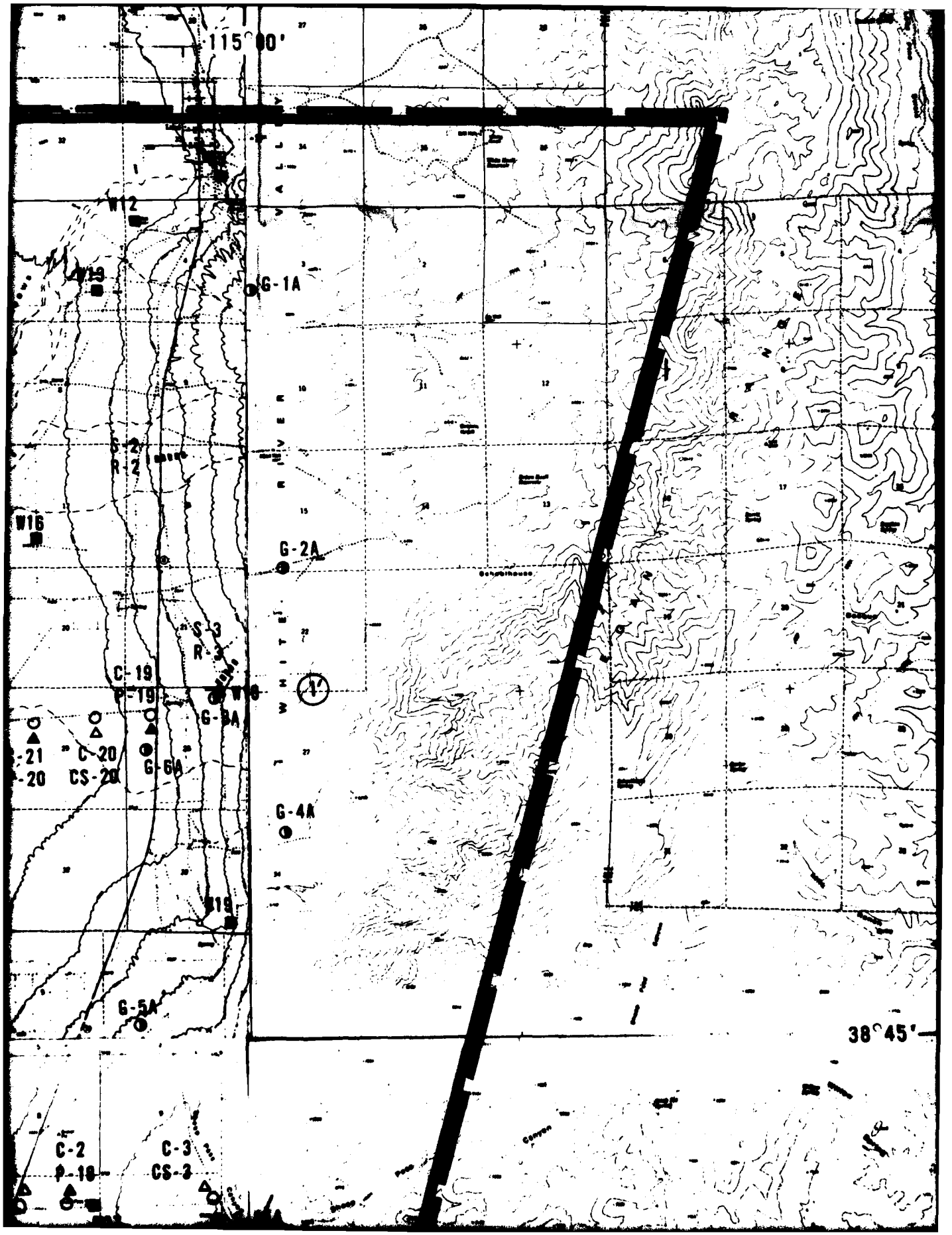

1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
7.1
8.0
9.0
10.0

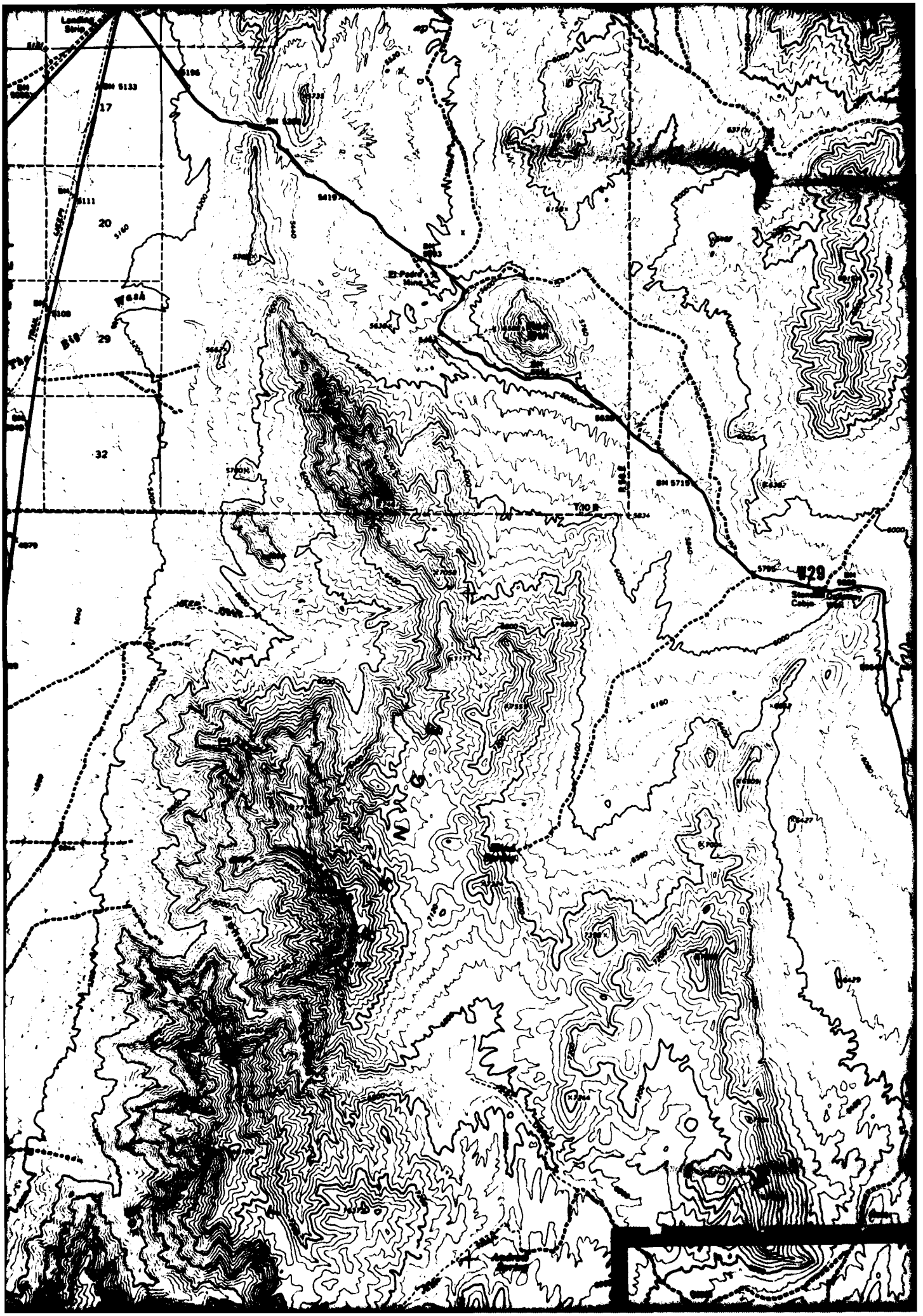


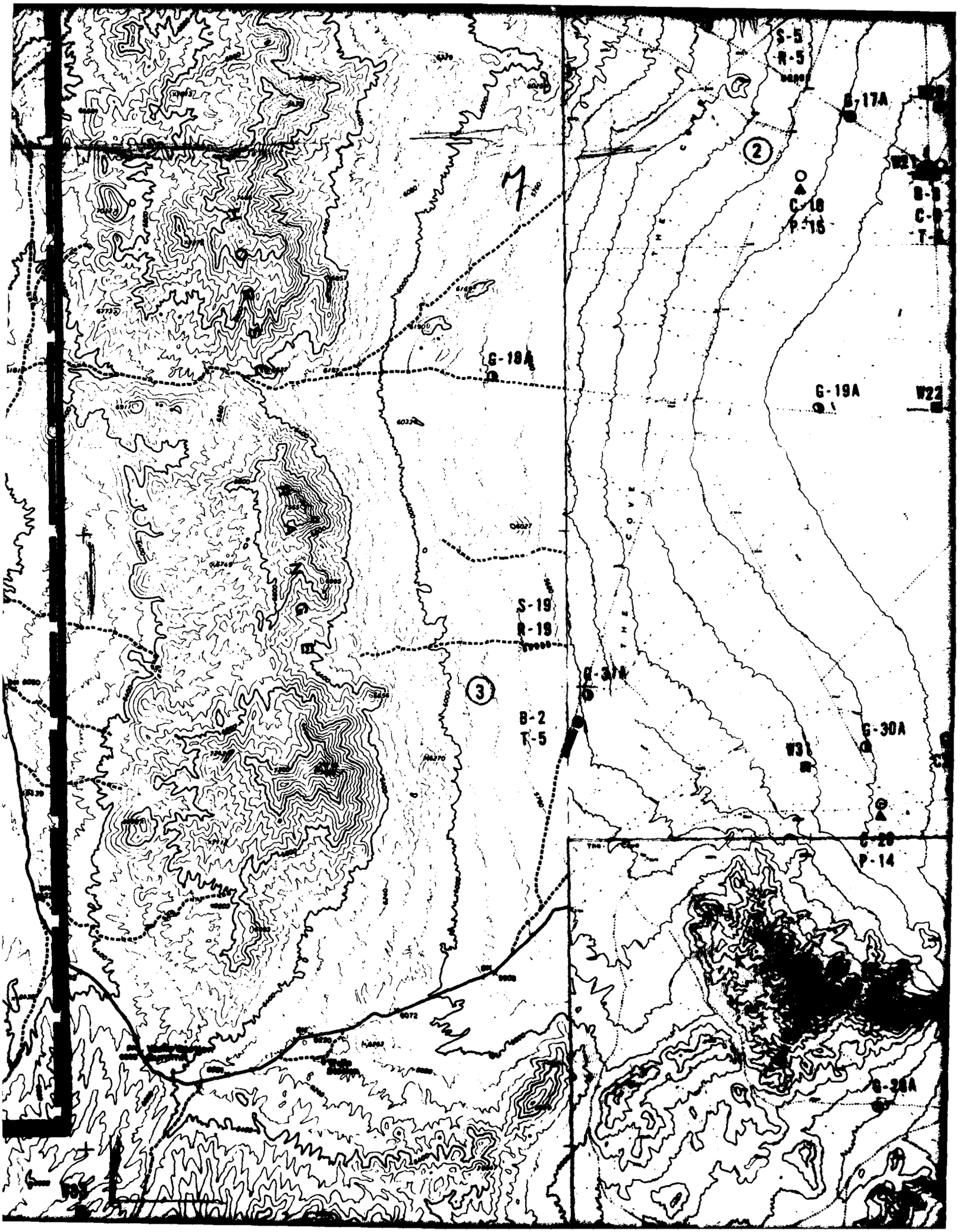
31
32
3
6
5
10
11
12
BM 6637
7
8
BM 6369
BM 6634
Gravel Pit
14
13
Currant Summit
18
17
19
20
27
26
30
29
34
35
31
32

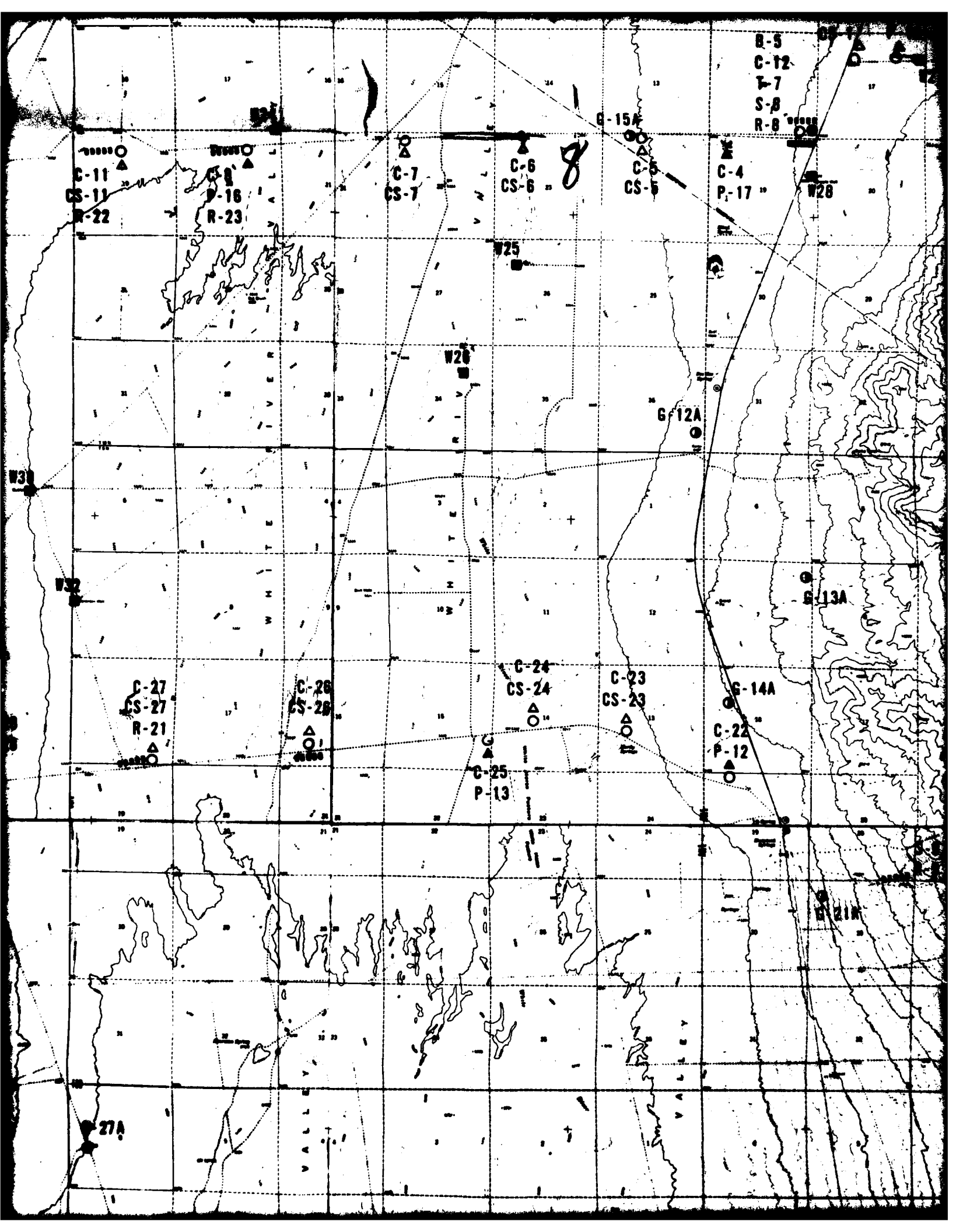

C-13
C-15
CS-15
W6
C-16
CS-16
C-17
C-18
T-6
S-7
R-7
W9
S-8
R-6
G-20A
G-18A
S-5
R-5

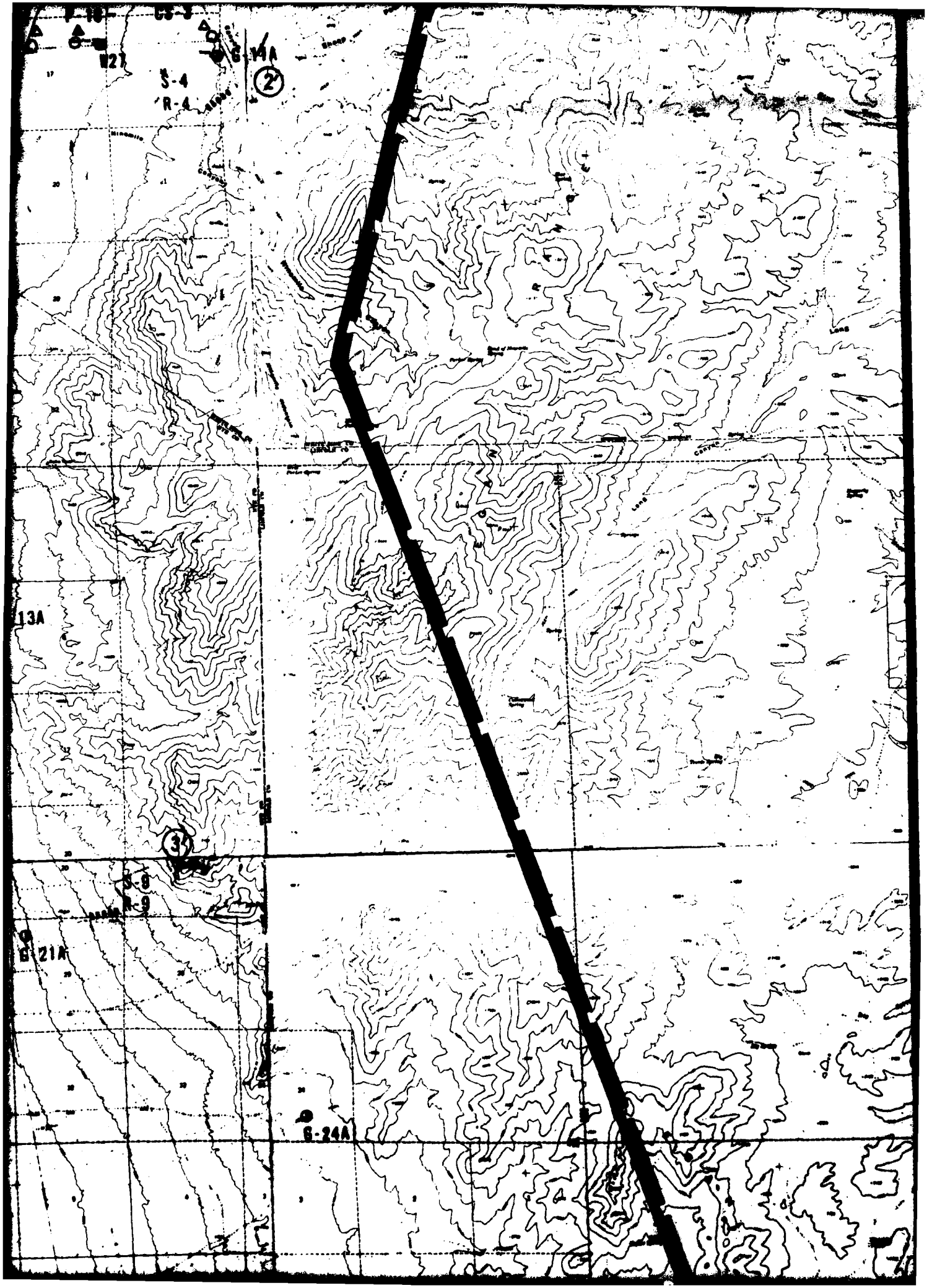

W14
W12
G-1A
W15
G-10A
S-2
R-2
W16
G-2A
W17
S-3
R-3
C-19
P-19
P-22
W7
G-3A
C-21
P-20
C-20
CS-20
G-6A
G-4A
W18
G-5A
W23
C-1
CS-1
C-2
P-18
C-3
CS-3
B-5
C-12
T-7
S-8
W21
S-4
R-4

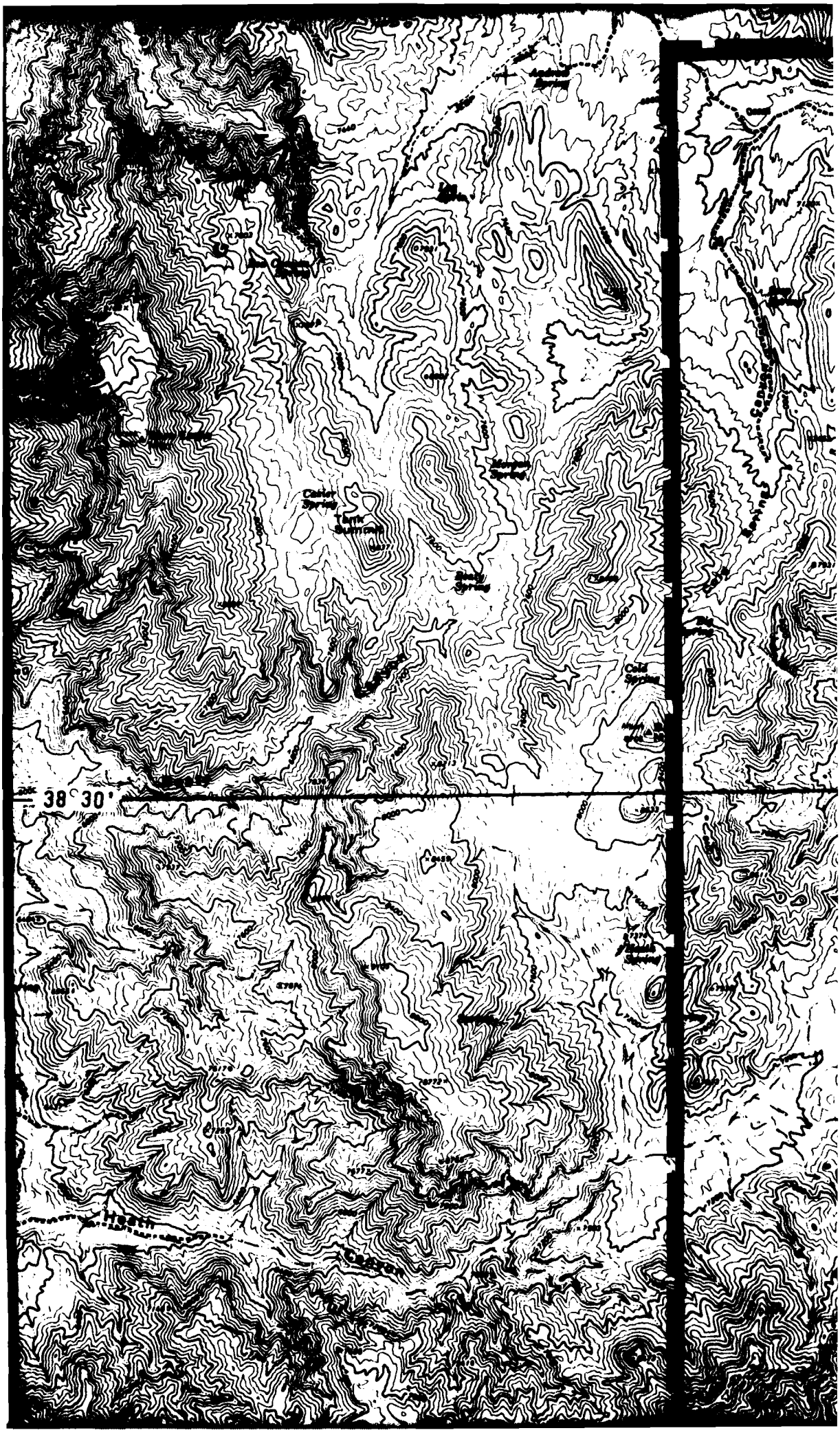

115°00'
W12
W19
G-1A
S-2
R-2
W16
G-2A
S-3
R-3
C-19
P-19
W18
G-3A
C-20
CS-20
G-6A
G-4A
W19
G-5A
38°45'
C-2
P-18
C-3
CS-3

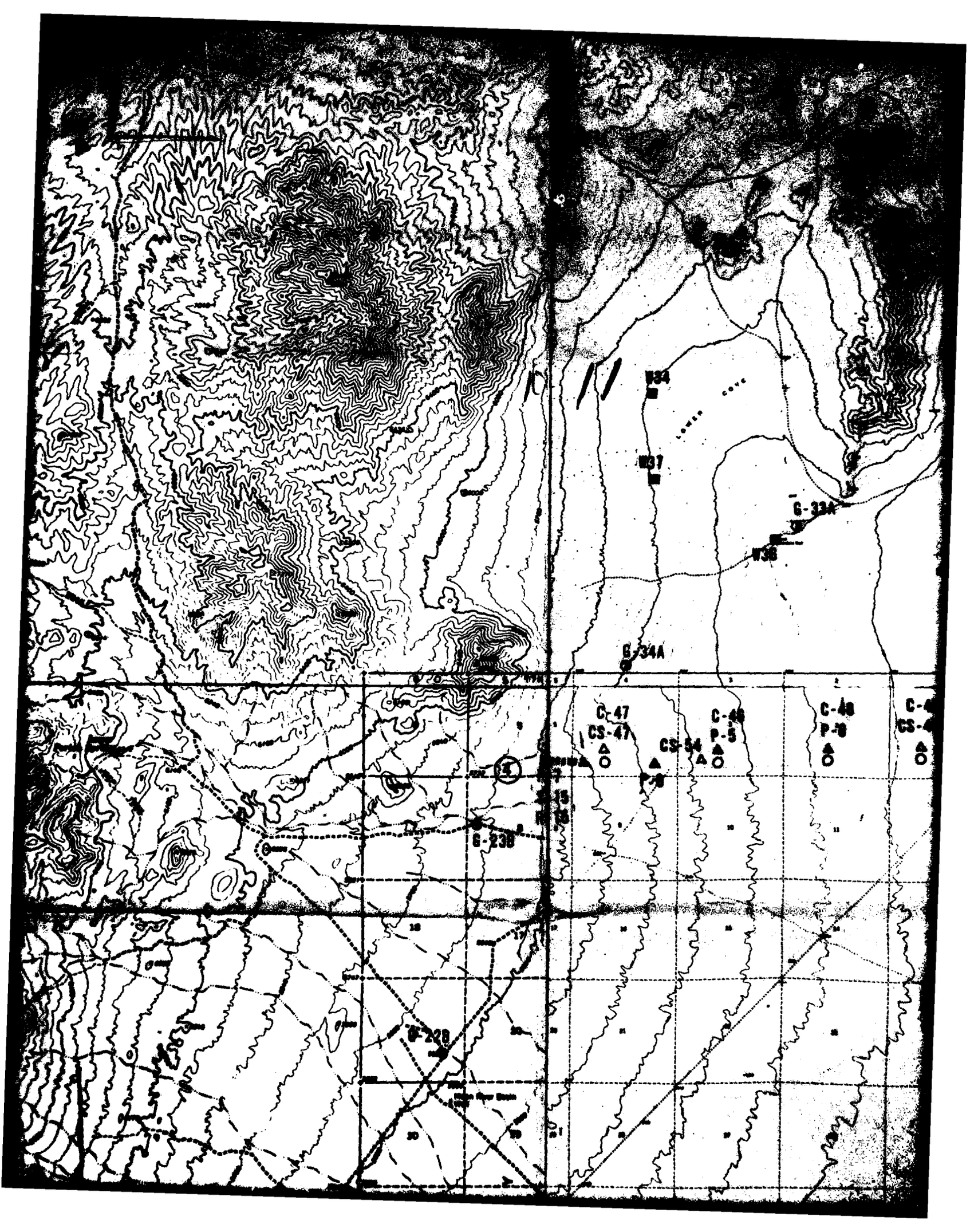


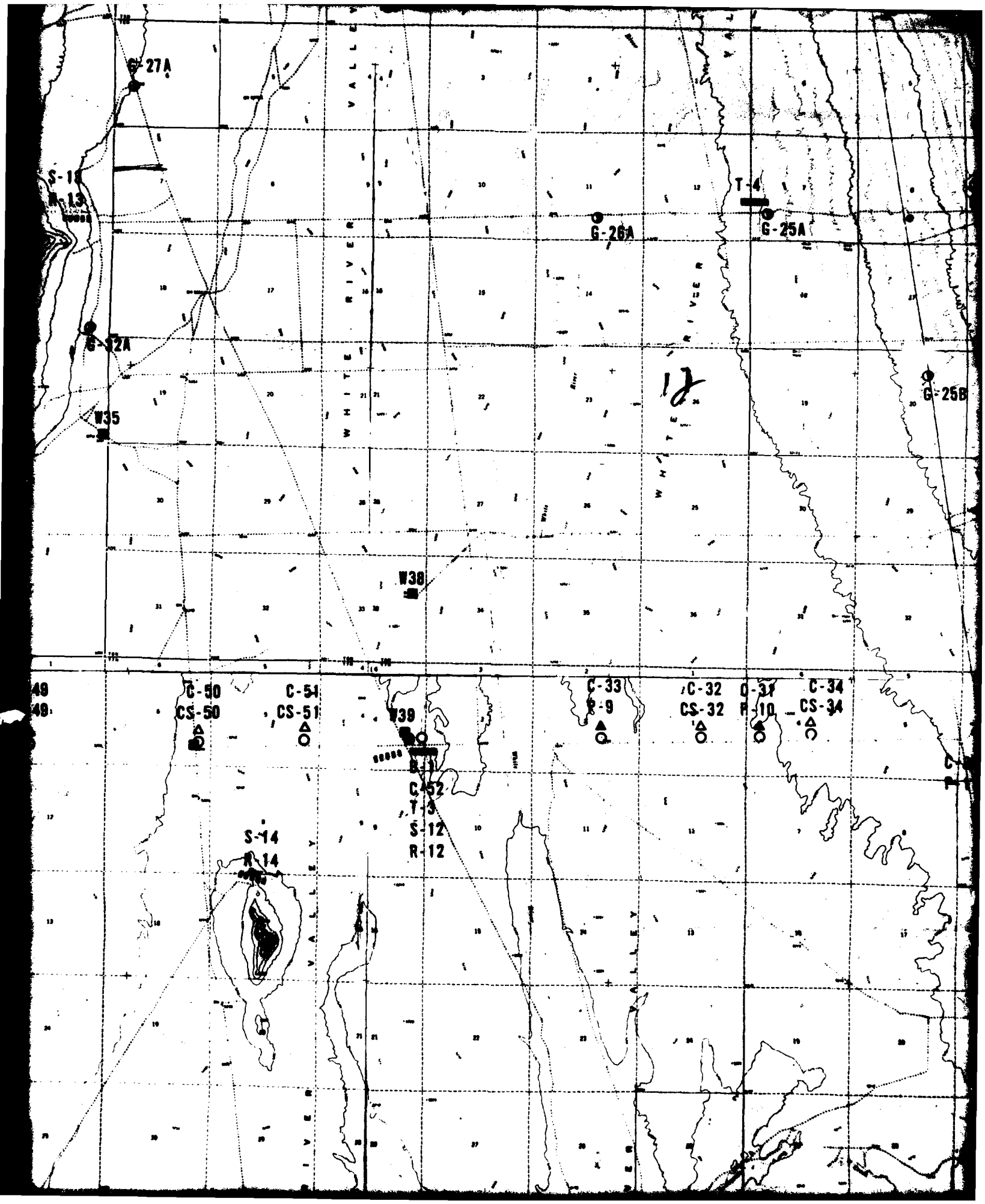

S-5
R-5
S-17A
2
W2
C-18
P-15
G-18A
G-19A
W22
S-19
R-19
3
G-31A
B-2
T-5
G-30A
W3
C-20
P-14
G-29A

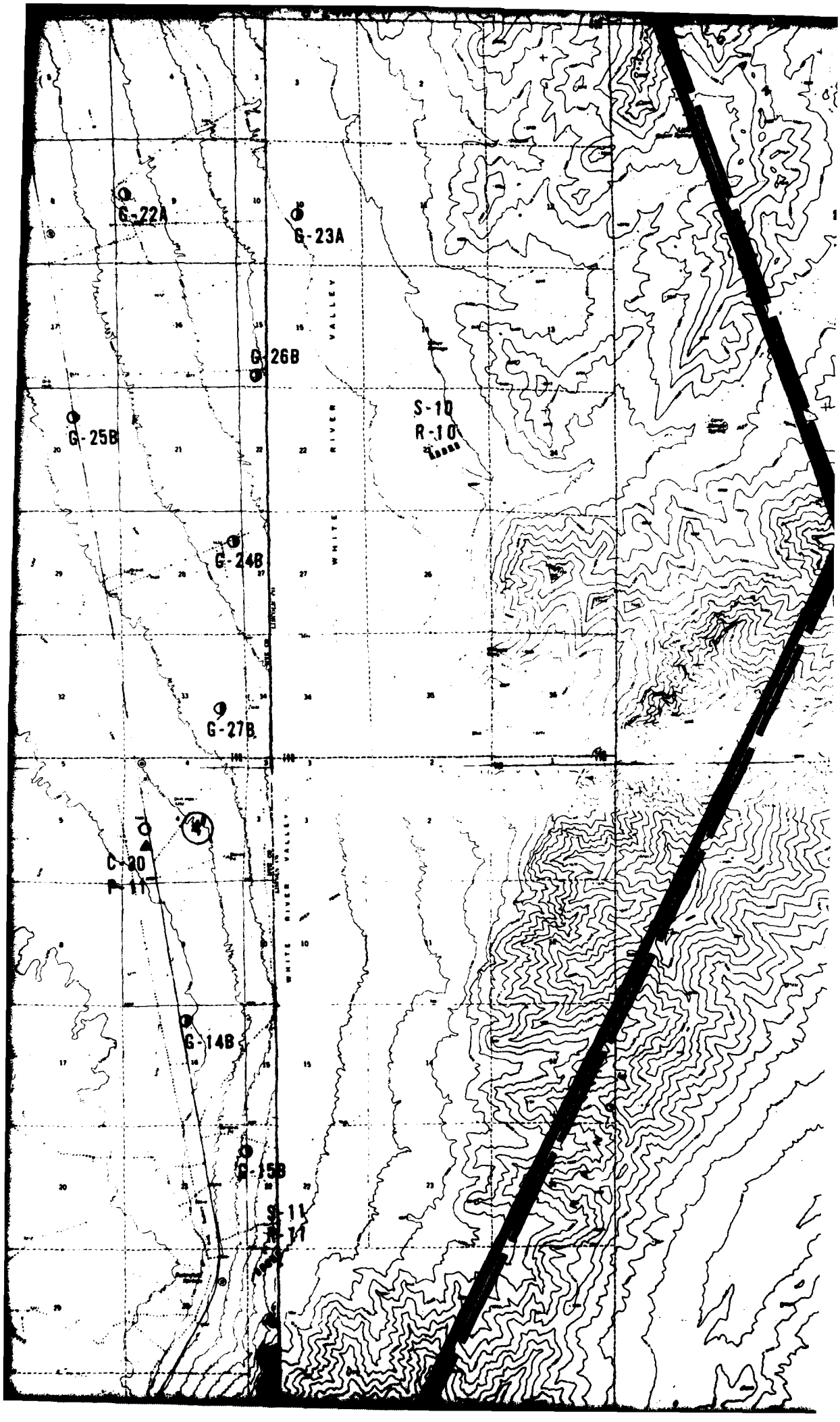

R-5
C-12
T-7
S-8
R-8
G-15A
C-11
CS-11
R-22
C-8
P-16
R-23
C-7
CS-7
C-6
CS-6
C-5
CS-5
C-4
P-17
W28
W25
W26
G-12A
W31
W32
G-13A
C-24
CS-24
C-23
CS-23
G-14A
C-27
CS-27
R-21
C-26
CS-26
C-22
P-12
C-25
P-13
G-21A
27A

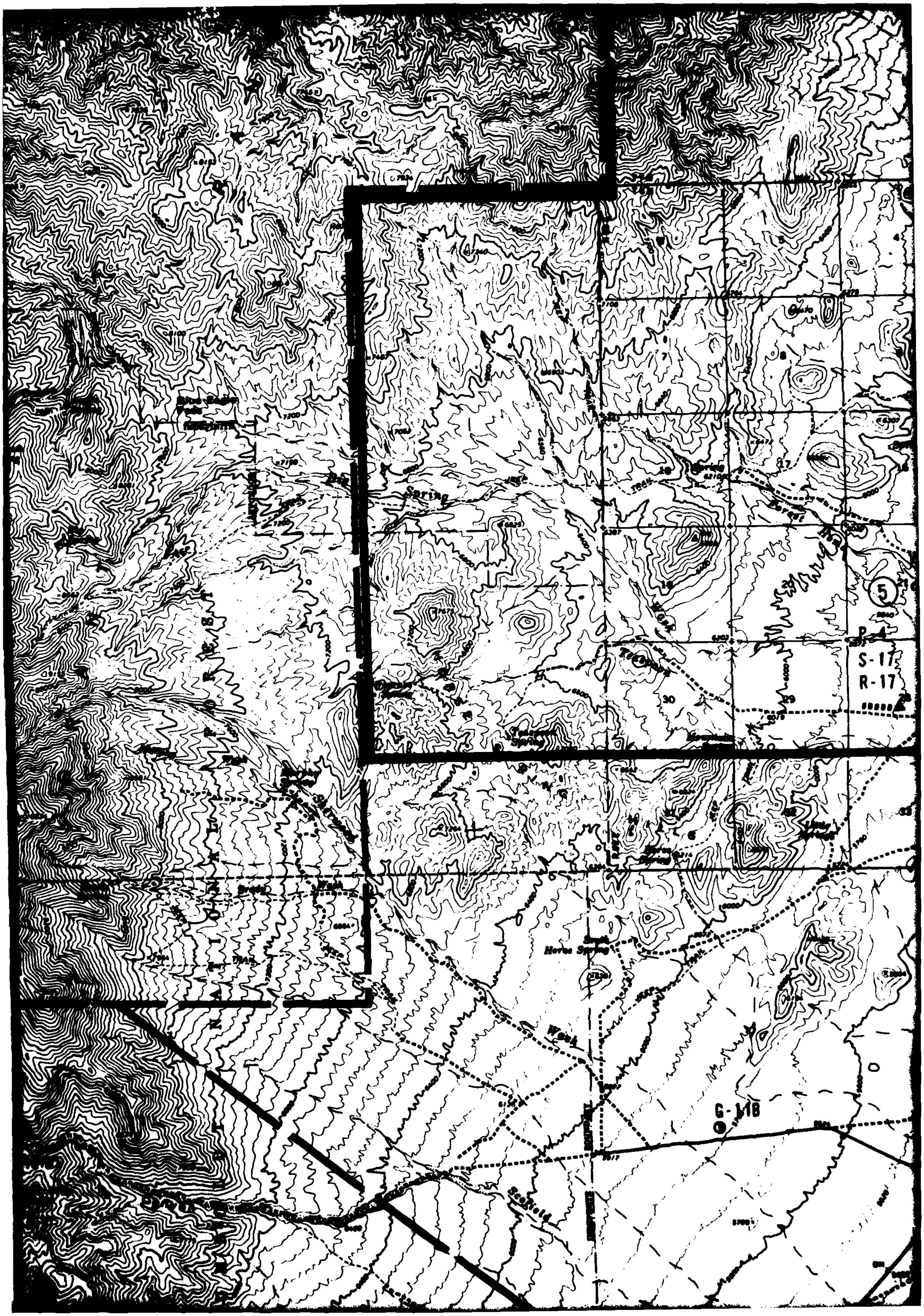

S-4
R-4
13A
S-8
R-9
G-21A
G-24A

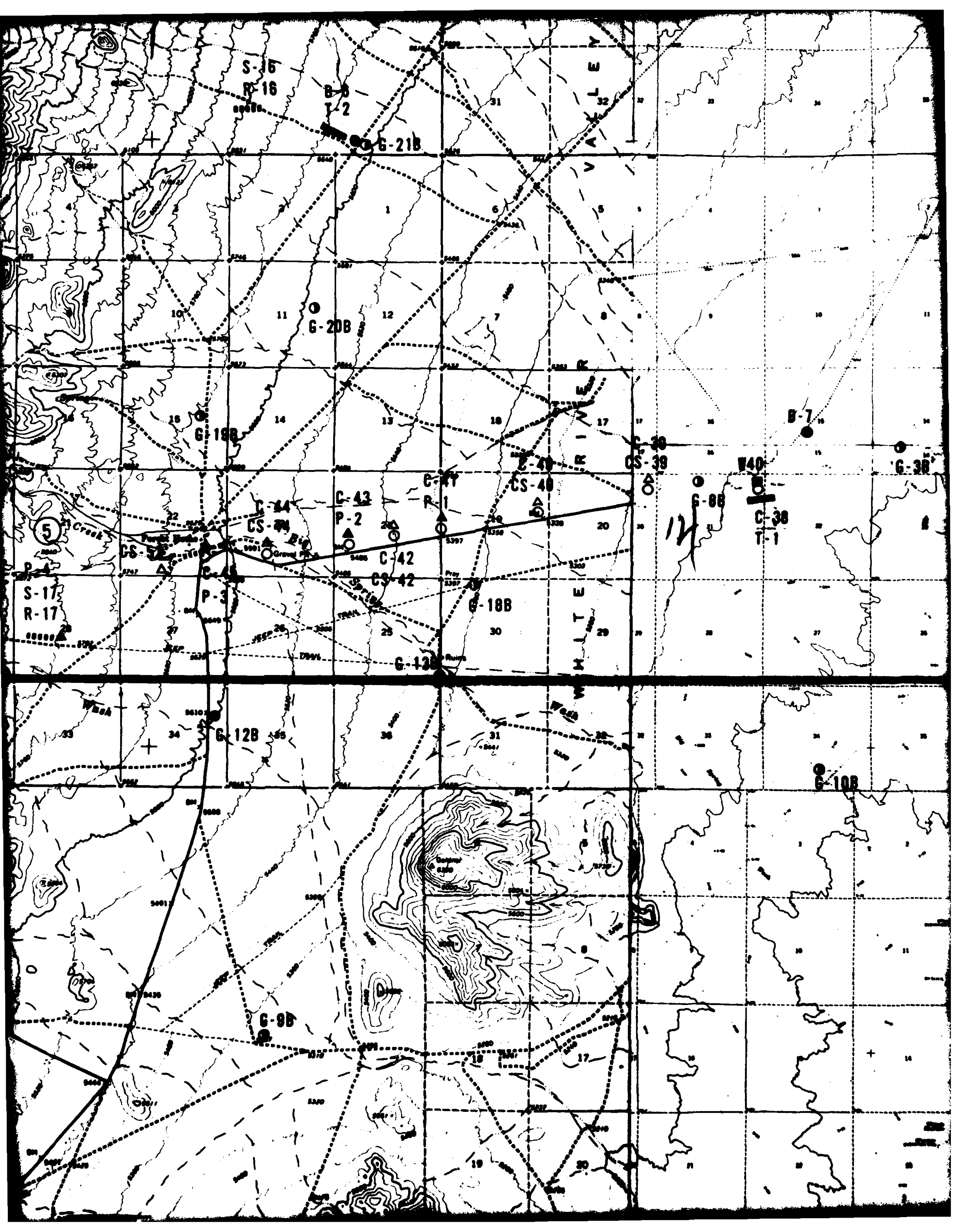

38° 30'
Castor Spring
Tank Summit
Cold Spring
Heath
Canon


W34
W37
G-33A
W38
G-34A
C-47
CS-47
CS-54
C-48
P-5
C-49
P-19
G-23B
G-22B

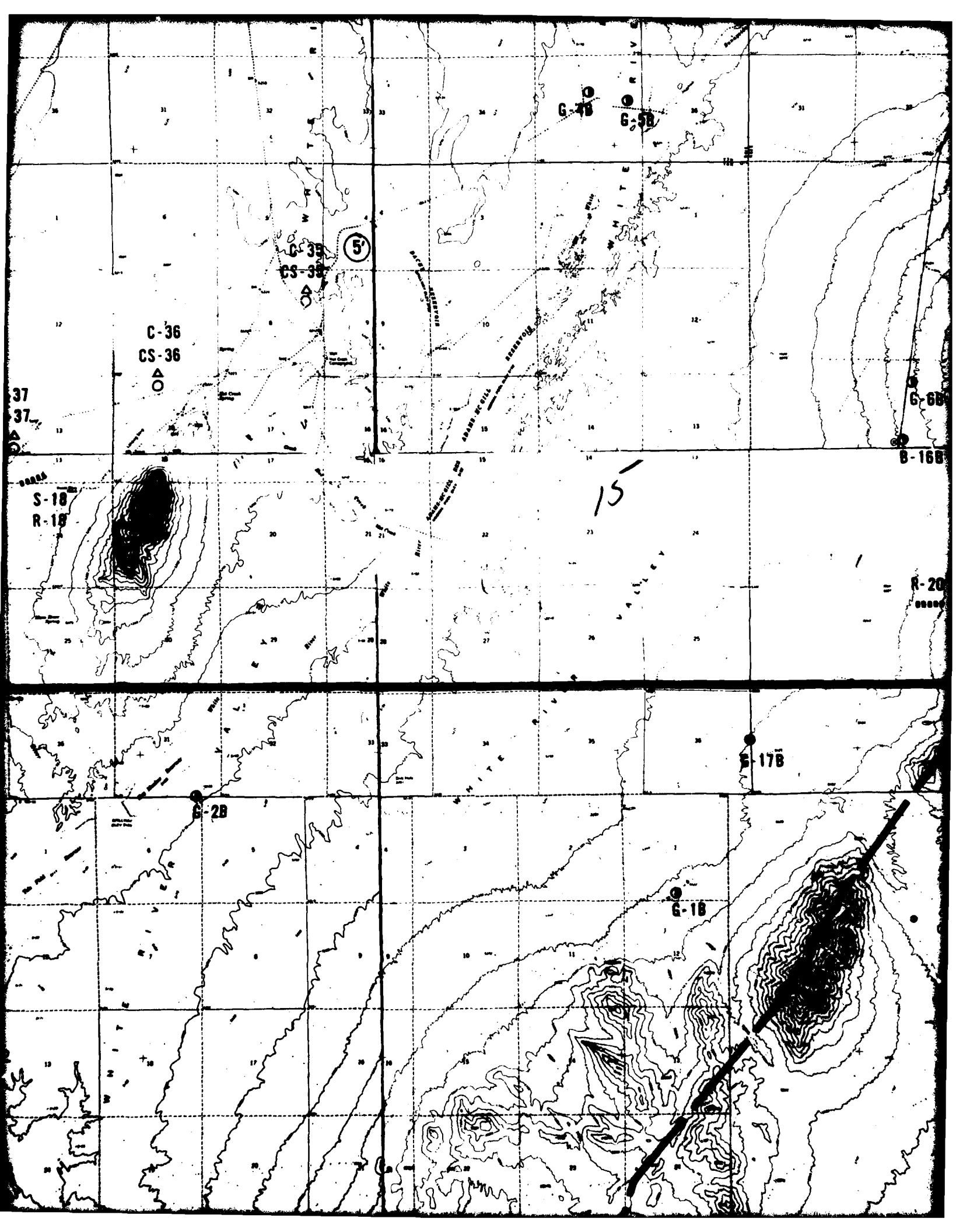

G-27A
S-13
R-13
G-26A
T-4
G-25A
G-25B
G-32A
W35
W38
W39
C-50
CS-50
C-51
CS-51
C-33
R-9
C-32
CS-32
C-31
R-10
C-34
CS-34
C-52
T-3
S-12
R-12
S-14
R-14
WHITE RIVER VALLEY
WHITE RIVER

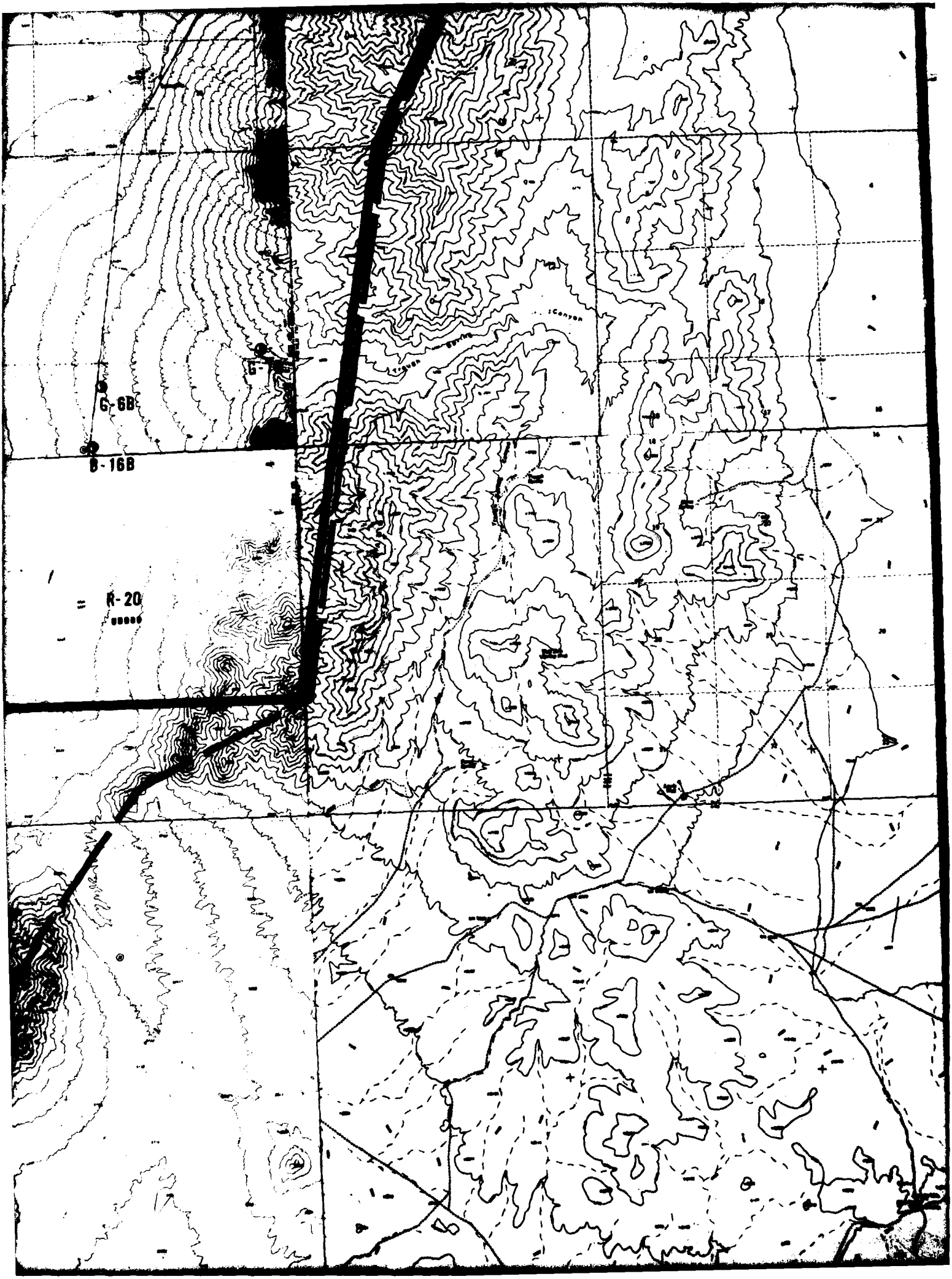

G-22A
G-23A
G-26B
G-25B
S-10
R-10
G-24B
G-27B
C-20
G-14B
G-15B
WHITE RIVER VALLEY


S-17
R-17
Wash

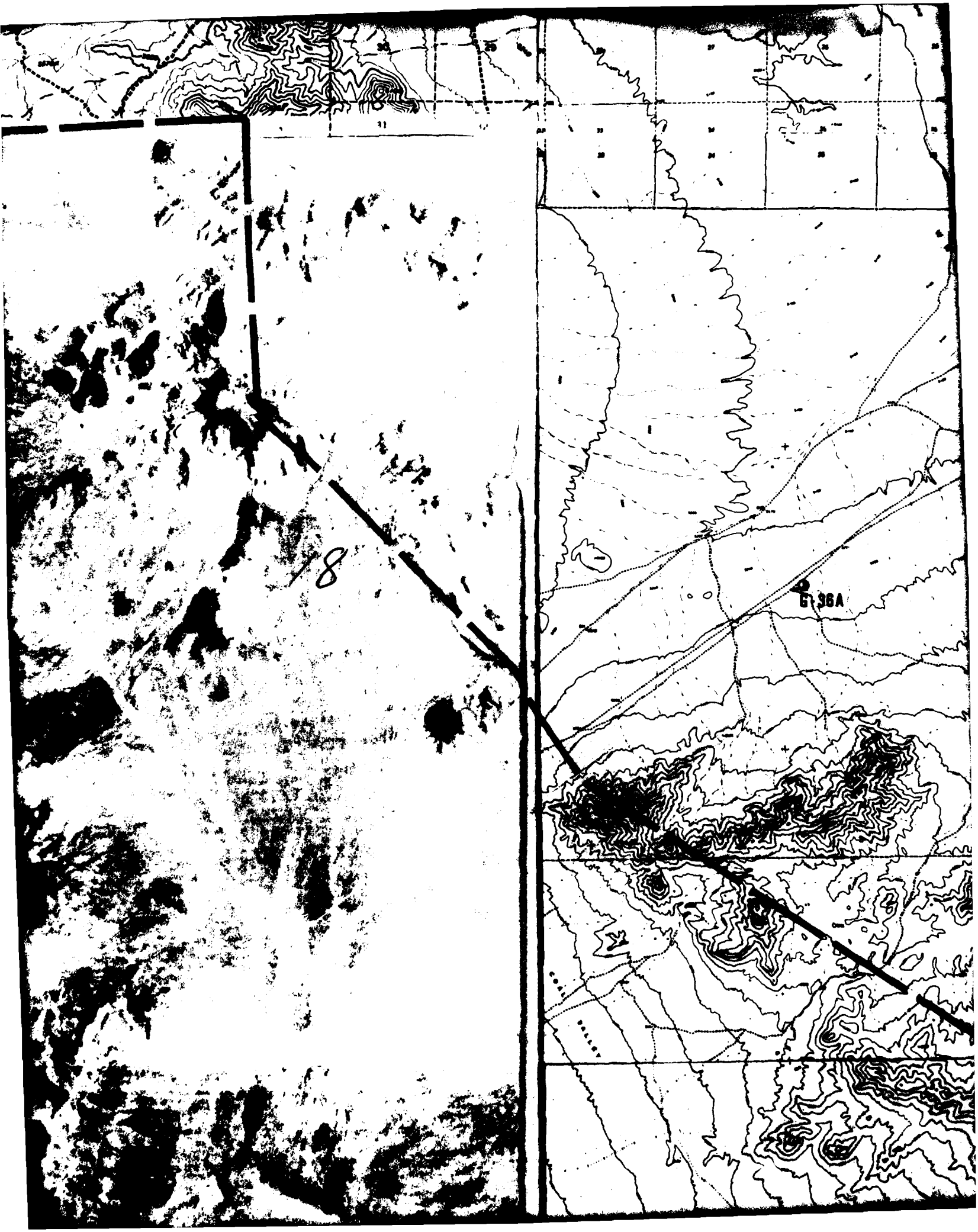


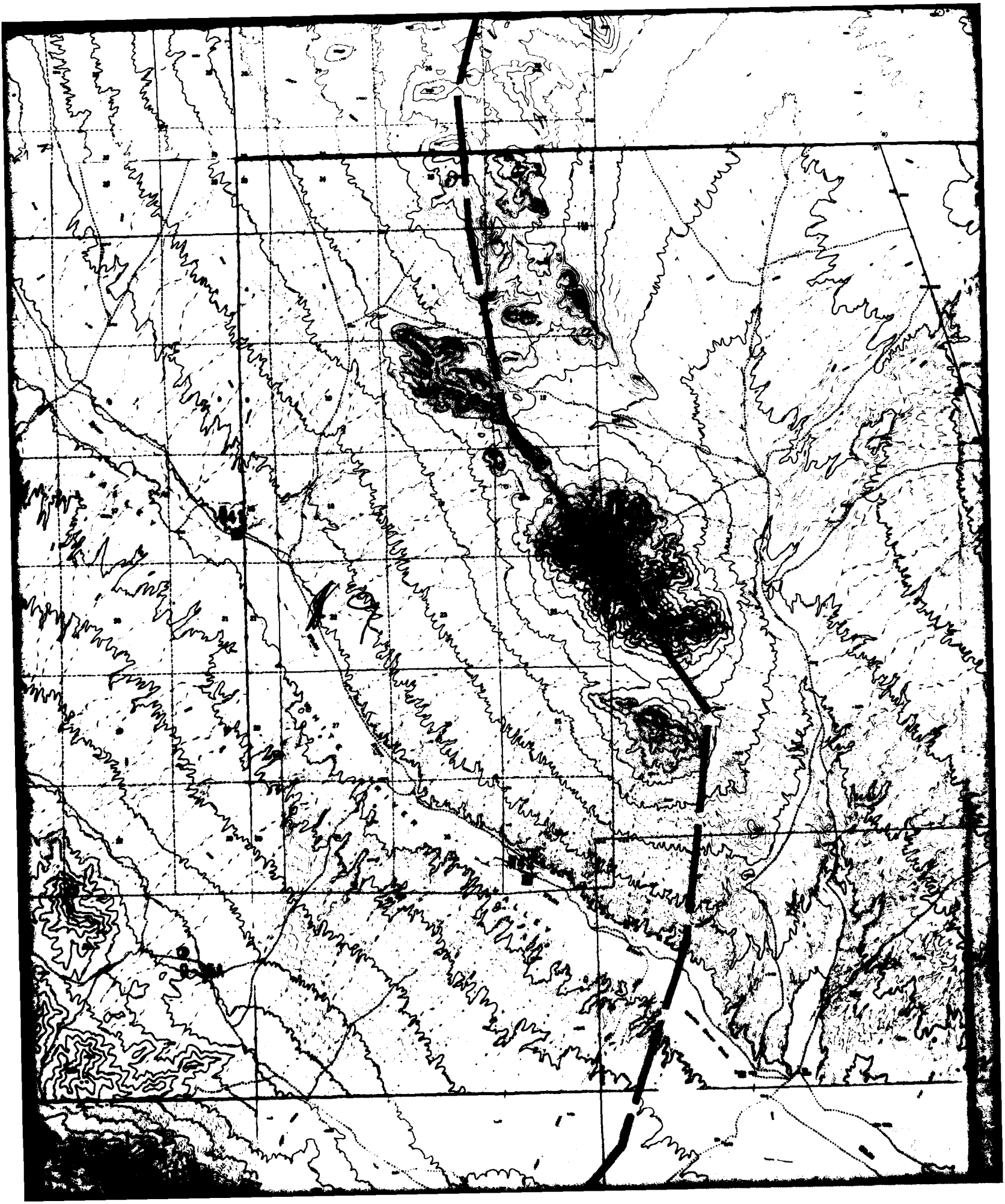
S-16
R-16
B-8
T-2
G-21B
G-20B
G-19B
C-44
CS-44
C-43
P-2
C-41
R-1
C-40
CS-40
C-39
CS-39
W40
G-8B
C-38
T-1
B-7
G-3B
CS-52
P-4
S-17
R-17
P-3
C-42
CS-42
G-18B
G-13B
G-12B
G-10B
G-9B
Creek
Big
Wash
TRAIL
JEEP

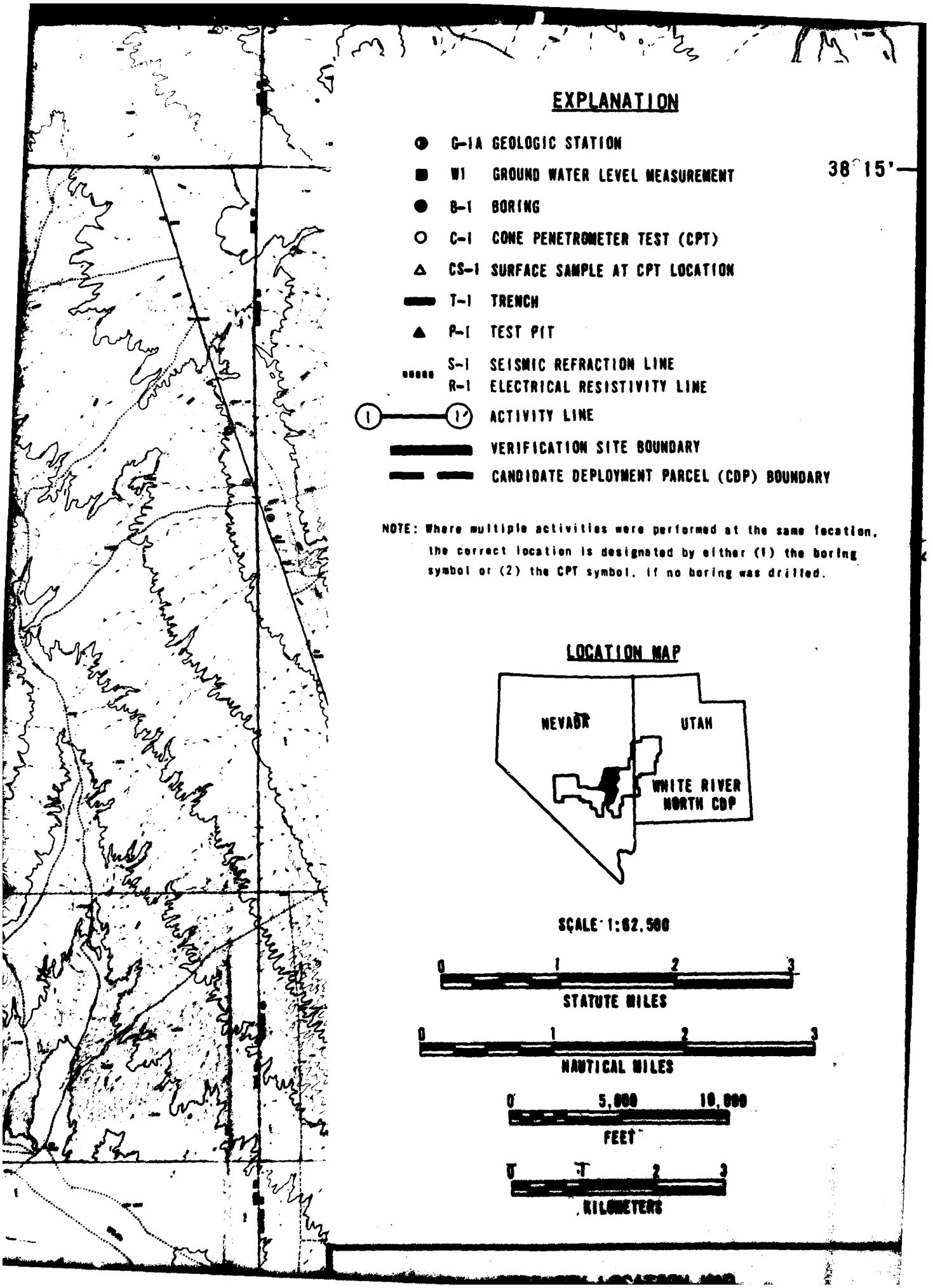

G-4B
G-5B
C-35
CS-35
5'
C-36
CS-36
37
37
G-6B
B-16B
S-18
R-18
15
R-20
G-17B
G-2B
G-1B


G-6B
B-16B
R-20

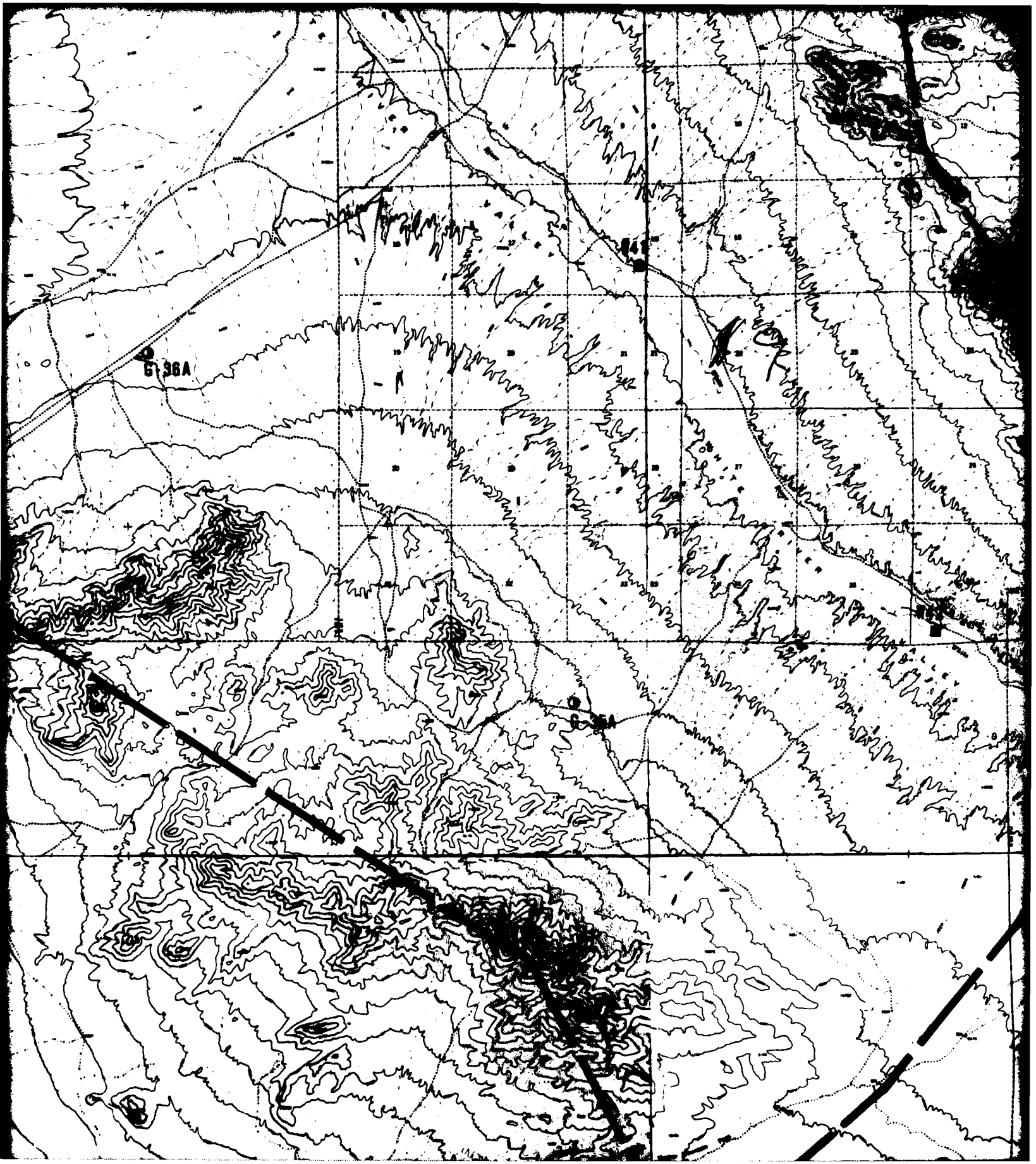

38°15'


18
G136A




EXPLANATION
G-1A GEOLOGIC STATION
W1 GROUND WATER LEVEL MEASUREMENT
38°15'
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
NEVADA
UTAH
WHITE RIVER NORTH CDP
SCALE 1:62,500
0 1 2 3
STATUTE MILES
0 1 2 3
NAUTICAL MILES
0 5,000 10,000
FEET
0 1 2 3
KILOMETERS


18
15'


G1 36A

T-1 TRENCH

P-1 TEST PIT

S-1 SEISMIC REFRACTION LINE

R-1 ELECTRICAL RESISTIVITY LINE

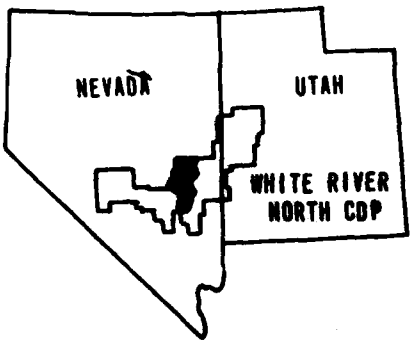
1 — 1' ACTIVITY LINE

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



SCALE 1:62,500

STATUTE MILES

NAUTICAL MILES

FEET

KILOMETERS

ACTIVITY LOCATION MAP
WHITE RIVER NORTH CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FUGRO NATIONAL


DAT
FILM