

*Oregon O. F. 64*

Principal facts and preliminary interpretation  
for gravity profiles and  
magnetometer profiles in the Alvord Valley, Oregon

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## Introduction

These geophysical data were collected in order to investigate faults and thickness of alluvium near three hot spring areas in the Alvord Valley area of east-central Oregon: Borax Lake, Mickey Hot Spring, and Alvord Hot Springs. The hot springs are associated with alluviated valleys formed by down-faulting and folding of the country rock which is predominantly mafic volcanic rocks of Tertiary age (Walker and Repenning, 1965).

Simple Bouguer anomaly values are reported here for 185 gravity stations in the Alvord Valley area. The stations are located between  $42^{\circ}15'$  and  $42^{\circ}45'$  north latitude and between  $118^{\circ}15'$  and  $118^{\circ}45'$  west longitude. Except for three isolated stations, the data provide seven detailed gravity profiles across areas of possible geothermal interest in Alvord Valley. Three figures (Figs. 1, 2, and 3) show the locations of these profiles at a scale of 1:24,000 and six more figures (Figs. 4 to 9) show the actual gravity profiles at the same scale.

The ground level magnetic data consist of 10 magnetic profiles (Fig. 10, a through h) collected with a continuously recording truck-mounted magnetometer together with an index map (Fig. 11) showing the location of the profiles, which were collected in the general vicinity of the gravity profiles.

## Gravity Data

The gravity data were collected with LaCoste-Romberg Meter G17B along roads at a station spacing of 100-200 m. Elevations were surveyed with an alidade and are accurate to  $\pm 0.7$  m absolute and to  $\pm 0.03$  m relative

to adjacent stations. The elevation datum for profiles 1, 2, 3, 6, and 7 is from spot elevations on topographic maps; the elevation datum for profiles 4 and 5 is by surveying altimeter. Local terrain corrections relative to adjacent stations are negligible so that relative accuracy of adjacent stations is about  $\pm 0.03$  mgal.

The base station is bench mark N65, located 4 km north of Fields, Oregon. This project base was tied to ACIC base 0474-1 at the Winnemucca airport, Winnemucca, Nevada, which in turn was tied to U.S. Geological Survey Base A at Menlo Park, California. Observed gravity for these bases is as follows (datum of Woollard and Rose, 1963):

BM N65, near Fields, Oregon	979973.63 mgal
ACIC 0474-1, Winnemucca, Nevada	979824.89
USGS Base A, Menlo Park, Ca.	979958.74

#### Gravity data format

The principal facts for all 185 gravity stations are listed in table 1. Each data column is described below.

1. STATION column - An alphanumeric combination of up to 5 characters used for station identification.
2. LATITUDE and LONGITUDE columns - Values are listed in degrees and minutes to the nearest hundredth of a minute. These values were determined from U.S. Geological Survey topographic quadrangle maps at a scale of 1:24,000 for profiles 1, 2, 3, 6, and 7 and from U.S. Bureau of Land Management maps at a scale of 1:62,500 for

profiles 4 and 5. Values were checked for errors by obtaining a computer plot of the stations and comparing this to the hand-plotted stations.

3. ELEV. column - The station elevation is in feet to the nearest tenth.
4. OBSV. GRAV. column - Each station's observed gravity value is reported to the nearest hundredth of a milligal.
5. THEO-GRAV column - The theoretical gravity value for each station is determined by the formulae given [under number 6].
6. FAA column - The free air gravity anomaly values for each station are listed to the nearest hundredth of a milligal. The formula used in calculating these values is:

$$FAA = OG - TG + (.09411549 - .000137789 \sin^2 \theta)E - .0000000067E^2$$

where FAA is the free air anomaly in milligals

O.G. is the observed gravity in milligals

T.G. is the theoretical gravity in milligals

obtained by the International Gravity Formula of 1950

$$TG = 978049[1 + .0052884 \sin^2 \theta - .0000059 \sin^2(2\theta)]$$

$\theta$  is latitude

E is elevation in feet.

7. BA1 column - The listed simple Bouguer anomaly values were determined to the nearest hundredth of a milligal for a crustal density of 2.67 g/cm<sup>3</sup> according to the formula:

$$BA1 = FAA - .012774 \times 2.67E$$

8. The remaining columns (CC, TC, CBA1, CBA2) relate to the calculation of terrain corrections and therefore are irrelevant to this report, being artifacts of the computer program.

### Preliminary Gravity Interpretation

The simple Bouguer gravity anomaly profiles (Figs. 4-9) provide information on the possible subsurface distributions of rock masses of various densities. The steep east-sloping gravity gradient in the profiles on the west side of the valley (Figs. 4, 5, 8, and 9) is the result of the large thick mass of low-density valley fill in the center of the basins of Alvord Valley. Superimposed on this gradient are various smaller, but geologically significant, features. Inflection points are likely located above concealed faults and such features are identified on the profiles as well as on the geologic map.

The small gravity highs (0.5 mgal) associated with faults on profiles 2 and 3 near Borax Lake (Figs. 4 and 5) are of particular interest for geothermal evaluation. The features are 0.3 to 1.0 km wide and, because of their small width and narrow marginal gradients, must be caused by density differences within 100 to 200 m of the surface. The association of these anomalies exclusively with faults in alluvium containing hot waters suggests that the highs are caused by partial cementation of the alluvium at the faults which increases the alluvium density by filling pore space with silica or calcium carbonate. Faults and hot springs known from surface mapping are also noted on the gravity profiles as are magnetic features observed on continuous magnetic profiles collected by truck-mounted magnetometer. The correlations between the various data sets are relatively good. Faults are located on the gravity profiles at the steepest gradient (the inflection point) except on profiles 2 and 3 (figs. 4 and 5) which

involve faulted alluvium. Profile 1 (fig. 4) is of interest because any major basin bounding fault, if present, must be west of station 001 as the steepest gradient was not located. Station 001 is located within 100 m of Tertiary volcanic rock outcrops and, judging by the reconnaissance geologic map of Walker and Repenning (1965) it seems unlikely that a major fault is located within this 100 m gap. Hence the valley in this area may well be primarily the result of downwarping alone.

Profile 4 (Fig. 6) is located at the north end of Alvord Desert and is along a road which crosses a postulated fault (Tectonic Sketch Map, Walker and Repenning, 1965). This fault connects the fault on the northwest side of the valley containing Mickey Hot Spring with the fault near Alvord Hot Springs. The irregular and small gravity relief (2.9 mgal) of profile 4, however, does not suggest a major fault.

Profile 5 (Fig. 7) crosses the area of Mickey Hot Spring and indicates a small gravity low with a residual amplitude of about -1.4 mgal. The low suggests a small basin of alluvium, down-faulted at the hot spring, and with a maximum thickness of perhaps 75 m. Alternatively, the gravity minimum may be due to different types of volcanic bedrock with slightly differing densities that have here been juxtaposed by faulting.

Profile 6 (Fig. 8) shows a steep gravity gradient with an inflection point, indicating a major fault, at Alvord Hot Springs. Profile 7 (Fig. 9) in the Andrews quadrangle near Serrano Spring (not a hot spring) is similar and also indicates a fault near the spring.

#### Magnetic data

The magnetic profiles (Fig. 10, a through h) were collected along roads by a continuously recording truck-mounted flux-gate magnetometer

mounted approximately 13 ft. above the ground. The data tapes were photographically reduced to a scale of approximately 1:62,500 so that they may be compared easily with the traverse map, Fig. 11 (scale 1:62,500 from Bureau of Land Management maps). Full scale on the tapes (i.e., from 1 to 11) is 2000 gammas. Location points are the hand-numbered tic marks on the pen tracing along the top of the tapes and are also plotted on the traverse map.

Occasional datum shifts on the magnetic profiles were necessary to keep the recorder on scale and are indicated on the records by a four-digit push-button setting (pbs) number. The first digit refers to the number of 2000-gamma increments which have been added to the basic instrument datum level (48,400 gammas); the second digit refers to the number of 400-gamma increments; the third digit refers to the number of 100-gamma increments; and the fourth digit refers to the number of 20-gamma increments. The sum of the four products (increment value times number of increments) added to the basic instrument datum (48,400 gammas) gives the approximate absolute value of the earth's field when added in turn to the reading on the tape trace.

The magnetic records document the magnetic effects of nearby rocks as well as a variety of man-made magnetic effects. Anomalies of the latter type include culverts, bridges, vehicles, iron or steel fences, metal pipes, etc. In general such anomalies are distinguished as very sharp, short-wavelength spikes which may be positive or negative depending on the relative locations of source and magnetometer. The instrument

operators have crossed out or flagged most of these man-made features on the record, at the time of the magnetic survey. Some unnoticed man-made effects, however, may be superimposed on the natural magnetic record.

#### Magnetic interpretation

The highly magnetic Tertiary volcanic rocks which form the surrounding mountains of Alvord Valley also underlie the non-magnetic alluvium and lake deposits of the valley itself. Where this alluvial material is more than a few tens of meters thick, the high frequency anomalies caused by nearby buried magnetic volcanic rocks are subdued and only longer wavelength magnetic anomalies are perceived on the record. Thus an abrupt change from a jagged short-wavelength record to a smooth record implies a sudden change of the position of the volcanic rocks from a near-surface location to one of considerable depth. Such an abrupt change is therefore considered to be good evidence for a steeply dipping fault contact. A more gradual change from rough to smooth record is for similar reasons interpreted as a gently dipping contact, more likely a depositional contact of alluvium on volcanic rocks.

The magnetic profiles have been annotated to indicate the interpreted faults and contacts. These annotations are also plotted on the traverse map, Fig. 11. Most geophysically located contacts are in reasonably good agreement with the geologic map of Walker and Repenning (1965) but the magnetic profiles also show some contacts that differ from those on the geologic map.

A very significant area of magnetic "noise" is shown on the magnetic records of traverses A-1 and A-10 (Figs. 10a and 10h) in the area where



the traverse crosses the faults near the hot springs of Borax Lake. This zone of small magnetic anomalies is associated with small gravity anomalies and the magnetic anomalies are caused by minor amounts of magnetic minerals at depths of less than 200 feet in the alluvium. The association of magnetic anomalies with gravity anomalies may indicate that chemical reactions of the hot saline waters have generated small amounts of magnetic minerals near the fault in the otherwise nonmagnetic alluvium.

Magnetic profiles A-5 and A-7 (figs. 10e and 10f) cross Alvord Desert. Using the method of a horizontal width of steepest gradient (Vacquier and others, 1951), a series of maximum depths to magnetic material, presumably volcanic basement, were calculated from the profiles near the middle of the valley. The maximum depths range from 400 to 500 m.

## References

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**Table 1. Principal facts for 185 gravity stations  
in the Alvord Desert area, Oregon**

1

BM	NKS	GBV	979973.63	METER	Q17	READING	T+D	OBSV-GRAY	THEO-GRAY	FAA	BA1	CC	TC	CBA1	CBA2
STA	LATITUDE	LONGITUDE	ELEV												
A011	42 19.63	118 39.08	4137.7	3478.6A	0.03	979979.16	980388.50	1.29	1.29	-20.31	-161.43	1.29	0.00	-162.71	-141.38
A010	42 19.60	118 39.19	4145.0	3479.27	0.03	979979.77	980388.46	1.29	1.29	-18.96	-160.33	1.29	0.00	-161.62	-140.24
A009	42 19.58	118 39.32	4153.8	3480.01	0.03	979980.55	980388.43	1.29	1.29	-17.33	-159.00	1.29	0.00	-160.29	-138.87
A008	42 19.57	118 39.43	4161.1	3480.56	0.03	979981.12	980388.41	1.29	1.29	-16.05	-157.97	1.29	0.00	-159.26	-137.81
A007	42 19.54	118 39.53	4168.8	3481.04	0.02	979981.61	980388.37	1.29	1.29	-14.79	-156.97	1.29	0.00	-158.26	-136.77
A006	42 19.52	118 39.64	4177.6	3481.52	0.02	979982.12	980388.34	1.30	1.30	-13.43	-155.91	1.30	0.00	-157.21	-135.67
A005	42 19.50	118 39.76	4190.7	3481.75	0.02	979982.36	980388.31	1.30	1.30	-11.93	-154.86	1.30	0.00	-156.15	-134.55
A004	42 19.48	118 39.87	4209.5	3481.90	0.02	979982.51	980388.27	1.30	1.30	-9.98	-153.55	1.30	0.00	-154.84	-133.44
A003	42 19.45	118 39.99	4235.2	3481.67	0.02	979982.27	980388.23	1.31	1.31	-7.75	-152.20	1.31	0.00	-153.50	-131.67
A002	42 19.43	118 40.09	4255.3	3481.68	0.02	979982.28	980388.21	1.31	1.31	-5.83	-150.96	1.31	0.00	-152.26	-130.33
A001	42 19.41	118 40.18	4270.8	3482.07	0.02	979982.69	980388.18	1.31	1.31	-3.93	-149.59	1.31	0.00	-150.90	-128.88
B012	42 20.03	118 39.19	4149.1	3480.30	0.01	979980.83	980389.10	1.29	1.29	-18.16	-159.67	1.29	0.00	-160.96	-139.56
B025	42 19.87	118 37.84	4082.0	3477.18	-0.06	979977.50	980388.86	1.28	1.28	-27.56	-166.78	1.28	0.00	-168.06	-147.01
B026	42 19.86	118 37.77	4078.4	3477.17	-0.07	979977.48	980388.85	1.28	1.28	-27.90	-167.00	1.28	0.00	-168.28	-147.25
B027	42 19.87	118 37.71	4072.6	3477.27	-0.07	979977.58	980388.86	1.28	1.28	-28.36	-167.26	1.28	0.00	-168.53	-147.53
B028	42 19.88	118 37.64	4067.8	3477.38	-0.07	979977.70	980388.88	1.28	1.28	-28.71	-167.45	1.28	0.00	-168.72	-147.75
B029	42 19.89	118 37.59	4063.7	3477.39	-0.07	979977.71	980388.89	1.28	1.28	-29.10	-167.70	1.28	0.00	-168.97	-148.02
B030	42 19.88	118 37.54	4063.1	3477.25	-0.07	979977.56	980388.88	1.28	1.28	-29.29	-167.87	1.28	0.00	-169.14	-148.19
B031	42 19.86	118 37.50	4063.5	3477.01	-0.07	979977.31	980388.85	1.28	1.28	-29.47	-168.06	1.28	0.00	-169.33	-148.38
B032	42 19.83	118 37.42	4062.5	3476.78	-0.08	979977.06	980388.80	1.28	1.28	-29.77	-168.33	1.28	0.00	-169.60	-148.65
B033	42 19.79	118 37.35	4063.2	3476.63	-0.08	979976.90	980388.74	1.28	1.28	-29.40	-168.38	1.28	0.00	-169.66	-148.70
B034	42 19.77	118 37.27	4062.6	3476.48	-0.08	979976.74	980388.71	1.28	1.28	-29.99	-168.55	1.28	0.00	-169.82	-148.87
B035	42 19.75	118 37.23	4062.4	3476.40	-0.08	979976.66	980388.68	1.28	1.28	-30.06	-168.61	1.28	0.00	-169.88	-148.94
B036	42 19.73	118 37.17	4062.4	3476.22	-0.09	979976.46	980388.65	1.28	1.28	-30.23	-168.78	1.28	0.00	-170.05	-149.10
B037	42 19.72	118 37.13	4062.1	3476.09	-0.09	979976.33	980388.64	1.28	1.28	-30.38	-168.92	1.28	0.00	-170.19	-149.24
B038	42 19.71	118 37.06	4062.3	3475.93	-0.09	979976.16	980388.62	1.28	1.28	-30.51	-169.06	1.28	0.00	-170.33	-149.38
B039	42 19.70	118 37.01	4062.4	3475.88	-0.09	979976.11	980388.61	1.28	1.28	-30.54	-169.09	1.28	0.00	-170.36	-149.41
B040	42 19.68	118 36.95	4061.9	3475.81	-0.09	979976.03	980388.58	1.28	1.28	-30.63	-169.16	1.28	0.00	-170.44	-149.49
B041	42 19.67	118 36.91	4060.9	3475.83	-0.09	979976.05	980388.56	1.28	1.28	-30.69	-169.19	1.28	0.00	-170.46	-149.52
B042	42 19.65	118 36.84	4061.2	3475.78	-0.09	979976.00	980388.53	1.28	1.28	-30.68	-169.19	1.28	0.00	-170.46	-149.52
B043	42 19.64	118 36.79	4062.0	3475.71	-0.09	979975.93	980388.52	1.28	1.28	-30.66	-169.20	1.28	0.00	-170.47	-149.53
B044	42 19.63	118 36.73	4061.4	3475.78	-0.09	979976.00	980388.50	1.28	1.28	-30.63	-169.15	1.28	0.00	-170.42	-149.48
B045	42 19.61	118 36.64	4062.4	3475.81	-0.09	979976.03	980388.47	1.28	1.28	-30.48	-169.03	1.28	0.00	-170.30	-149.35
B025	42 19.87	118 37.84	4082.5	3477.22	-0.09	979977.51	980388.86	1.28	1.28	-27.50	-166.74	1.28	0.00	-168.02	-146.96
B024	42 19.88	118 38.01	4087.0	3477.40	-0.09	979977.70	980388.88	1.28	1.28	-26.90	-166.30	1.28	0.00	-167.57	-146.50

RM N65	GBV 979973.63	METER 017	READING 3473.51	T-D 0.00	D1 2.67	D2 2.27	TC	CBA1	CH2	
STA	LATITUDE	LONGITUDE	ELEV	READING	T-D	ORSV-GRAY	TWFO-GRAY	FAA	BAL	CC
B023	42 19.87	118 38.11	4090.3	3477.33	-0.09	979977.54	980388.86	-26.74	-166.24	1.28
B022	42 19.87	118 38.17	4093.2	3477.21	-0.09	979977.41	980388.86	-26.59	-166.19	1.28
B021	42 19.88	118 38.31	4100.3	3477.32	-0.09	979977.53	980388.88	-25.82	-165.67	1.28
B020	42 19.89	118 38.41	4104.2	3477.53	-0.09	979977.75	980388.89	-25.25	-165.23	1.28
B019	42 19.88	118 38.54	4109.3	3477.71	-0.09	979977.94	980388.88	-24.57	-164.72	1.28
B018	42 19.89	118 38.65	4115.1	3477.89	-0.09	979978.13	980388.89	-23.85	-164.20	1.29
B017	42 19.97	118 38.78	4121.6	3478.82	-0.09	979979.10	980389.01	-22.39	-162.96	1.29
B016	42 20.02	118 38.86	4127.7	3479.02	-0.08	979979.32	980389.09	-21.67	-162.45	1.29
B015	42 20.04	118 38.97	4133.0	3479.53	-0.08	979979.45	980389.12	-20.67	-161.63	1.29
B014	42 20.06	118 39.00	4135.7	3479.78	-0.08	979980.11	980389.15	-20.18	-161.24	1.29
B013	42 20.02	119 39.08	4141.4	3479.95	-0.08	979980.29	980389.09	-19.41	-160.66	1.29

RM N65 GBV 979973.63 METER G17 READING 3473.45 T.O 0.00 D1 2.67 D2 2.27

3

STA	LATITUDE	LONGITUDE	ELEV	READING	T.O	OBSV-GRAY	THEO-GRAY	FAA	BA1	CC	YC	CBA1	CBA2
A010	42 19.60	118 39.19	4145.0	3479.30	0.01	979979.76	980388.46	-18.97	-160.34	1.29	0.00	-161.62	-140.25
B013	42 20.02	118 39.08	4141.4	3479.74	0.02	979980.23	980389.09	-19.46	-160.71	1.29	0.00	-162.00	-140.65
B025	42 19.86	118 37.84	4082.5	3477.10	0.02	979977.47	980388.85	-27.52	-166.76	1.28	0.00	-168.04	-146.99
B051	42 19.68	118 36.42	4064.1	3475.52	-0.05	979975.75	980388.58	-30.70	-169.32	1.28	0.00	-170.59	-149.63
B052	42 19.68	118 36.36	4063.8	3475.58	-0.06	979975.80	980388.58	-30.68	-169.28	1.28	0.00	-170.55	-149.60
B053	42 19.68	118 36.31	4067.4	3475.40	-0.06	979975.61	980388.58	-30.53	-169.25	1.28	0.00	-170.53	-149.55
B054	42 19.68	118 36.24	4077.1	3474.75	-0.06	979974.93	980388.58	-30.30	-169.35	1.28	0.00	-170.63	-149.60
B055	42 19.69	118 36.19	4079.5	3474.72	-0.07	979974.89	980388.59	-30.13	-169.27	1.28	0.00	-170.54	-149.50
B056	42 19.69	118 36.15	4080.7	3474.62	-0.07	979974.79	980388.59	-30.12	-169.30	1.28	0.00	-170.57	-149.53
B057	42 19.73	118 36.12	4081.0	3474.42	-0.08	979974.57	980388.65	-30.37	-169.56	1.28	0.00	-170.83	-149.79
B058	42 19.69	118 36.06	4081.0	3474.22	-0.08	979974.36	980388.59	-30.52	-169.71	1.28	0.00	-170.98	-149.94
B059	42 19.70	118 36.01	4075.8	3474.26	-0.09	979974.39	980388.61	-30.99	-170.00	1.28	0.00	-171.28	-150.26
B060	42 19.70	118 35.95	4068.2	3474.59	-0.09	979974.74	980388.61	-31.36	-170.11	1.28	0.00	-171.39	-150.41
B061	42 19.70	118 35.90	4059.7	3475.24	-0.09	979975.42	980388.61	-31.48	-169.94	1.28	0.00	-171.21	-150.28
B062	42 19.70	118 35.83	4054.2	3475.81	-0.09	979976.01	980388.61	-31.40	-169.68	1.27	0.00	-170.95	-150.04
B063	42 19.71	118 35.78	4052.1	3476.13	-0.09	979976.35	980388.62	-31.28	-169.48	1.27	0.00	-170.75	-149.86
B064	42 19.71	118 35.73	4051.7	3476.25	-0.09	979976.47	980388.62	-31.19	-169.38	1.27	0.00	-170.65	-149.76
B065	42 19.72	118 35.63	4050.0	3476.35	-0.10	979976.57	980388.64	-31.27	-169.40	1.27	0.00	-170.67	-149.79
B050	42 19.68	118 36.47	4061.6	3475.72	-0.10	979975.91	980388.58	-30.78	-169.31	1.28	0.00	-170.58	-149.64
B049	42 19.67	118 36.51	4064.3	3475.51	-0.10	979975.69	980388.56	-30.73	-169.35	1.28	0.00	-170.62	-149.66
B048	42 19.64	118 36.54	4064.8	3475.57	-0.10	979975.75	980388.52	-30.58	-169.21	1.28	0.00	-170.48	-149.52
B047	42 19.61	118 36.57	4065.7	3475.63	-0.11	979975.80	980388.47	-30.39	-169.06	1.28	0.00	-170.33	-149.37
B046	42 19.59	118 36.62	4062.0	3475.82	-0.11	979976.00	980388.44	-30.51	-169.05	1.28	0.00	-170.33	-149.38

## ALVING DESERT

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BM 65	GBV 979973.63	METER G17	READING	T+0	ORSV-GRAY	THEO-GRAY	FAA	BAL	CC	TC	CBA1	CBA2
STA												
C070	42 41.16	118 21.17	4312.3	0.04	980006.21	980420.76	-9.10	-156.18	1.32	0.00	-157.50	-135.27
C063	42 41.09	118 21.13	4259.2	0.04	980004.70	980420.66	-10.50	-155.76	1.31	0.00	-157.07	-135.11
C064	42 41.01	118 21.05	4211.6	0.04	980012.97	980420.54	-11.58	-155.22	1.30	0.00	-156.52	-134.80
C067	42 40.94	118 21.00	4180.9	0.04	980015.02	980420.43	-12.31	-154.91	1.30	0.00	-156.20	-134.64
C066	42 40.87	118 20.95	4156.2	0.04	980016.43	980420.33	-13.11	-154.87	1.29	0.00	-156.16	-134.73
C085	42 40.42	118 19.60	4117.6	0.02	980024.37	980419.65	-8.14	-148.57	1.29	0.00	-149.85	-128.62
C084	42 40.44	118 19.67	4095.6	0.03	980025.70	980419.68	-8.90	-148.59	1.28	0.00	-149.87	-128.75
C084	42 40.47	118 19.75	4089.8	0.04	980025.91	980419.73	-9.29	-148.77	1.28	0.00	-150.05	-128.96
C083	42 40.50	118 19.85	4085.6	0.04	980025.55	980419.77	-10.08	-149.43	1.28	0.00	-150.70	-129.63
C082	42 40.55	118 19.96	4080.6	0.04	980025.28	980419.85	-10.90	-150.07	1.28	0.00	-151.35	-130.31
C081	42 40.60	118 20.08	4075.8	0.04	980024.96	980419.92	-11.74	-150.75	1.28	0.00	-152.02	-131.01
C080	42 40.65	118 20.18	4072.1	0.05	980024.65	980420.00	-12.47	-151.36	1.28	0.00	-152.63	-131.63
C079	42 40.69	118 20.28	4068.4	0.05	980024.35	980420.06	-13.18	-151.94	1.28	0.00	-153.22	-132.24
C078	42 40.72	118 20.35	4065.3	0.05	980023.90	980420.10	-13.97	-152.62	1.28	0.00	-153.90	-132.93
C077	42 40.75	118 20.41	4065.8	0.05	980023.48	980420.15	-14.19	-153.06	1.28	0.00	-154.33	-133.36
C076	42 40.74	118 20.49	4070.7	0.05	980022.83	980420.13	-14.56	-153.40	1.28	0.00	-154.67	-133.68
C075	42 40.73	118 20.59	4087.8	0.06	980021.18	980420.12	-14.59	-154.01	1.28	0.00	-155.29	-134.21
C074	42 40.72	118 20.67	4100.1	0.06	980020.02	980420.10	-14.58	-154.42	1.28	0.00	-155.70	-134.56
C073	42 40.74	118 20.80	4118.9	0.06	980018.67	980420.13	-14.19	-154.67	1.29	0.00	-155.95	-134.72
C072	42 40.75	118 20.85	4124.4	0.07	980018.32	980420.15	-14.03	-154.70	1.29	0.00	-155.98	-134.72
C071	42 40.78	118 20.90	4142.0	0.07	980017.13	980420.19	-13.62	-154.89	1.29	0.00	-156.17	-134.81

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STN	LATITUDE	LONGITUDE	ELFV	READING	T+D	ORSV-GRV	THEO-GRV	F&A	HAI	CC	TC	CBAL	CBAL2
0097	42 32.45	118 31.47	4013.6	3494.82	0.08	979996.01	980407.71	-34.32	-171.21	1.27	0.00	-172.47	-151.78
0098	42 32.45	118 31.54	4023.9	3495.13	0.08	979996.33	980407.71	-33.03	-170.27	1.27	0.00	-171.53	-150.78
0099	42 32.45	118 31.72	4031.8	3495.88	0.09	979997.13	980407.71	-31.49	-169.00	1.27	0.00	-170.27	-149.48
0099	42 32.45	118 31.83	4040.6	3496.91	0.09	979998.21	980407.71	-29.59	-167.40	1.27	0.00	-168.67	-147.83
0093	42 32.45	118 31.95	4053.7	3498.10	0.09	979999.45	980407.71	-27.11	-165.37	1.27	0.00	-166.64	-145.74
0092	42 32.53	118 32.00	4059.2	3498.78	0.10	980000.17	980407.83	-25.99	-164.44	1.28	0.00	-165.71	-144.78
0091	42 32.56	118 32.04	4071.0	3498.97	0.10	980000.39	980407.87	-24.71	-163.56	1.28	0.00	-164.83	-143.84
0090	42 32.62	118 32.09	4097.3	3497.97	0.10	979999.32	980407.96	-23.39	-163.14	1.28	0.00	-164.42	-143.29
0089	42 32.69	118 32.14	4169.5	3493.78	0.10	979994.94	980408.07	-21.09	-163.30	1.29	0.00	-164.59	-143.09
0088	42 32.76	118 32.15	4211.8	3491.83	0.10	979992.90	980408.17	-19.26	-162.91	1.30	0.00	-164.21	-142.50
0087	42 32.83	118 32.18	4238.6	3490.55	0.10	979991.56	980408.28	-18.19	-162.75	1.31	0.00	-164.05	-142.20
E112	42 38.53	118 25.26	4095.2	3494.75	0.06	979995.92	980416.82	-35.86	-175.53	1.28	0.00	-176.81	-155.69
E111	42 38.64	118 25.31	4097.0	3495.92	0.06	979996.20	980416.98	-35.57	-175.31	1.28	0.00	-176.58	-155.46
E110	42 38.75	118 25.32	4099.0	3495.33	0.06	979996.52	980417.15	-35.22	-175.03	1.28	0.00	-176.30	-155.17
E109	42 38.81	118 25.35	4102.2	3495.33	0.06	979996.52	980417.24	-35.01	-174.92	1.28	0.00	-176.20	-155.05
E108	42 38.87	118 25.38	4105.5	3495.45	0.05	979996.64	980417.33	-34.68	-174.70	1.28	0.00	-175.98	-154.81
E107	42 38.97	118 25.42	4109.1	3495.64	0.04	979996.83	980417.48	-34.30	-174.45	1.28	0.00	-175.73	-154.54
E106	42 39.05	118 25.44	4113.5	3495.64	0.04	979996.83	980417.60	-34.01	-174.30	1.29	0.00	-175.58	-154.37
E105	42 39.16	118 25.48	4119.3	3495.71	0.04	979996.90	980417.76	-33.55	-174.05	1.29	0.00	-175.33	-154.09
E104	42 39.22	118 25.52	4127.7	3495.61	0.04	979996.80	980417.85	-32.96	-173.74	1.29	0.00	-175.02	-153.74
E103	42 39.32	118 25.54	4134.3	3495.56	0.04	979996.74	980418.00	-32.54	-173.55	1.29	0.00	-174.83	-153.51
E102	42 39.40	118 25.56	4137.5	3495.72	0.03	979996.90	980418.12	-32.20	-173.32	1.29	0.00	-174.60	-153.27
E101	42 39.51	118 25.60	4142.1	3495.79	0.03	979996.97	980418.29	-31.86	-173.13	1.29	0.00	-174.42	-153.06
E100	42 39.57	118 25.63	4145.4	3495.80	0.03	979996.99	980418.38	-31.63	-173.02	1.29	0.00	-174.30	-152.93
E099	42 39.69	118 25.67	4152.8	3495.59	0.03	979996.77	980418.56	-31.33	-172.97	1.29	0.00	-174.26	-152.85
E098	42 39.79	118 25.69	4167.1	3494.99	0.02	979996.02	980418.71	-30.88	-173.01	1.29	0.00	-174.30	-152.81



## ALVORD DESERT

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BM N65	GBV 979973.63	METER G17	READING 3473.50	T+D 0.00	D1 2.67	D2 2.27	TC	CHAI	CRA2	
STA	LATITUDE	LONGITUDE	ELEV	READING	T+D	OBSV-GRAY	THEO-GRAY	FAA	BAI	CC
F153	42 18.36	118 35.09	4054.7	3474.76	0.10	979975.05	980386.60	-30.31	-168.60	1.27
F152	42 18.33	118 35.20	4054.8	3474.59	0.11	979974.88	980386.56	-30.42	-168.72	1.27
F151	42 18.31	118 35.31	4057.3	3474.27	0.11	979974.55	980386.53	-30.49	-168.87	1.28
F150	42 18.28	118 35.45	4057.8	3474.13	0.12	979974.41	980386.48	-30.54	-168.93	1.28
F149	42 18.26	118 35.55	4062.5	3473.78	0.12	979974.05	980386.45	-30.43	-168.99	1.28
F148	42 18.23	118 35.71	4056.4	3474.20	0.12	979974.49	980386.41	-30.52	-168.87	1.28
F147	42 18.20	118 35.83	4057.4	3474.23	0.12	979974.52	980386.36	-30.35	-168.73	1.28
F146	42 18.18	118 35.95	4058.2	3474.26	0.12	979974.55	980386.33	-30.21	-168.62	1.28
F145	42 18.16	118 36.06	4057.8	3474.42	0.12	979974.72	980386.30	-30.05	-168.45	1.28
F144	42 18.13	118 36.21	4059.0	3474.52	0.12	979974.82	980386.26	-29.79	-168.23	1.28
F143	42 18.10	118 36.33	4058.7	3474.77	0.12	979975.08	980386.21	-29.51	-167.94	1.28
F142	42 18.07	118 36.45	4059.8	3474.88	0.12	979975.20	980386.17	-29.25	-167.72	1.28
F141	42 18.05	118 36.58	4062.5	3474.86	0.12	979975.18	980386.14	-28.99	-167.54	1.28
F140	42 18.01	118 36.70	4063.3	3474.93	0.12	979975.25	980386.08	-28.78	-167.36	1.28
F139	42 17.97	118 36.85	4066.7	3474.84	0.12	979975.16	980386.02	-28.49	-167.19	1.28
F138	42 17.95	118 37.00	4069.6	3474.60	0.12	979974.91	980385.99	-28.44	-167.24	1.28
F137	42 17.93	118 37.10	4076.6	3474.28	0.11	979974.56	980385.96	-28.10	-167.14	1.28
F136	42 17.91	118 37.22	4080.8	3474.23	0.11	979974.51	980385.93	-27.73	-166.91	1.28
F135	42 17.88	118 37.34	4084.3	3473.97	0.11	979974.24	980385.88	-27.62	-166.92	1.28
F134	42 17.87	118 37.45	4092.1	3473.27	0.11	979973.50	980385.87	-27.61	-167.17	1.28
F133	42 17.85	118 37.54	4100.0	3472.54	0.11	979972.74	980385.84	-27.60	-167.44	1.28
F132	42 17.83	118 37.65	4106.1	3471.75	0.11	979971.91	980385.81	-27.82	-167.87	1.28
F131	42 17.80	118 37.77	4112.0	3471.06	0.10	979971.18	980385.76	-27.95	-168.20	1.28
F130	42 17.78	118 37.89	4111.5	3470.87	0.10	979970.98	980385.73	-28.17	-168.40	1.28
F129	42 17.75	118 38.00	4118.3	3470.28	0.10	979970.37	980385.69	-28.10	-168.56	1.29
F128	42 17.73	118 38.11	4118.9	3470.49	0.10	979970.59	980385.66	-27.80	-168.28	1.29
F127	42 17.71	118 38.23	4120.3	3470.71	0.09	979970.81	980385.63	-27.41	-167.94	1.29
F126	42 17.68	118 38.35	4124.1	3470.97	0.09	979971.08	980385.58	-26.74	-167.40	1.29
F125	42 17.66	118 38.47	4127.2	3471.24	0.09	979971.36	980385.55	-26.14	-166.90	1.29
F124	42 17.64	118 38.60	4133.0	3471.49	0.09	979971.62	980385.52	-25.30	-166.26	1.29
F123	42 17.62	118 38.71	4137.7	3471.80	0.09	979971.95	980385.49	-24.50	-165.63	1.29
F122	42 17.58	118 38.83	4144.9	3471.97	0.09	979972.13	980385.44	-23.59	-164.96	1.29
F121A	42 17.56	118 38.94	4150.1	3472.29	0.09	979972.46	980385.41	-22.74	-164.28	1.29
F121	42 17.55	118 38.96	4152.1	3472.37	0.09	979972.54	980385.39	-22.45	-164.06	1.29
F120	42 17.54	118 39.06	4157.3	3472.70	0.08	979972.88	980385.38	-21.61	-163.40	1.29
F119	42 17.51	118 39.18	4162.0	3473.12	0.08	979973.32	980385.33	-20.68	-162.64	1.29
F118	42 17.49	118 39.28	4171.2	3473.23	0.08	979973.43	980385.30	-19.67	-161.94	1.30
F117	42 17.47	118 39.39	4178.4	3473.65	0.08	979973.87	980385.27	-18.53	-161.04	1.30
F116	42 17.44	118 39.52	4188.7	3473.85	0.08	979974.08	980385.23	-17.31	-160.17	1.30
F115	42 17.42	118 39.64	4200.5	3473.95	0.08	979974.19	980385.20	-16.06	-159.33	1.30
F114	42 17.39	118 39.78	4223.8	3473.42	0.08	979973.63	980385.15	-14.38	-158.44	1.30
F113	42 17.37	118 39.88	4229.9	3473.72	0.07	979973.94	980385.12	-13.48	-157.74	1.31
F155	42 17.56	118 39.93	4248.4	3473.45	0.07	979973.65	980385.41	-12.30	-157.20	1.31
F155	42 17.56	118 39.93	4248.4	3473.44	0.05	979973.62	980385.41	-12.33	-157.23	1.31

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STA	LATITUDE	LONGITUDE	GBV	979973.63	METER	G17	READING	3473.56	T+D	0.00	D1	2.67	D2	2.27	CC	TC	CBA1	CBA2
F155	42 17.56	118 39.93		4248.4	3473.52	0.04	979973.63	980385.41			-12.32	-157.22			1.31	0.00	-158.52	-136.62
F155	42 17.56	118 39.93		4248.4	3473.54	0.02	979973.63	980385.41			-12.32	-157.22			1.31	0.00	-158.52	-136.62
B025	42 19.87	118 37.84		4082.5	3477.19	0.01	979977.44	980388.86			-27.57	-166.81			1.28	0.00	-168.08	-147.03
B024	42 19.88	118 38.01		4087.0	3477.37	0.01	979977.63	980388.88			-26.97	-166.37			1.28	0.00	-167.64	-146.57
B023	42 19.87	118 38.11		4090.3	3477.23	0.00	979977.47	980388.86			-26.80	-166.31			1.28	0.00	-167.59	-146.49
B022	42 19.87	118 38.17		4093.2	3477.17	0.00	979977.41	980388.86			-26.59	-166.20			1.28	0.00	-167.47	-146.37
B021	42 19.88	118 38.31		4100.3	3477.28	0.00	979977.53	980388.88			-25.83	-165.67			1.28	0.00	-166.95	-145.81
F155	42 17.56	118 39.93		4248.4	3473.58	-0.02	979973.64	980385.41			-12.32	-157.22			1.31	0.00	-158.52	-136.62
156	42 15.89	118 40.47		4243.5	3474.22	-0.03	979974.30	980382.90			-9.62	-154.35			1.31	0.00	-155.65	-133.78
157	42 16.55	118 42.00		4670.8	3458.15	-0.03	979957.49	980383.89			12.76	-146.56			1.37	0.00	-147.92	-123.85

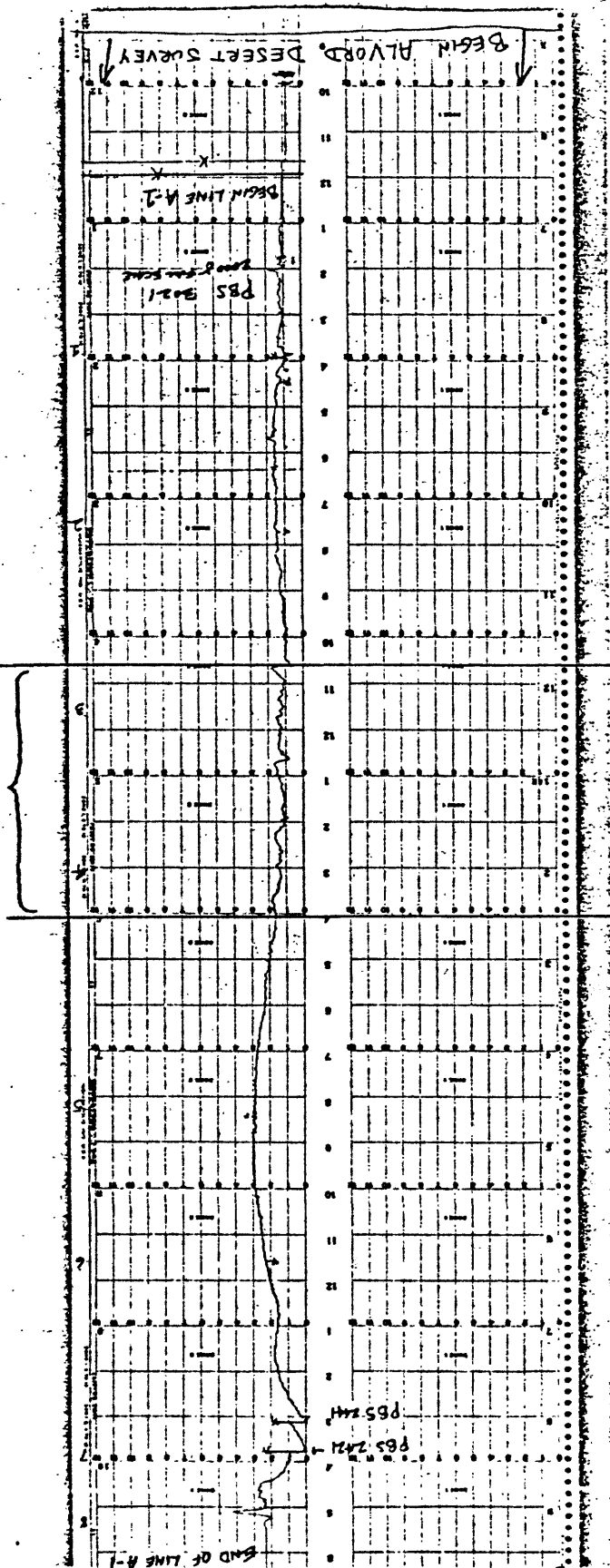
BM N65 GRV 979973.63 METER G17 READING 3473.50 T+D 0.00 01 2.67 02 2.27

STA	LATITUDE	LONGITUDE	ELEV	READING	T+D	ORSV-GRV	THEO-GRV	FAA	BA1	CC	TC	CBA1	CBA2
167	42 37.59	114 24.95	4053.9	3497.75	0.02	979999.01	980415.41	-35.23	-173.50	1.27	0.00	-174.77	-153.86
166	42 37.70	114 24.98	4055.7	3497.33	0.03	979998.58	980415.58	-35.66	-173.98	1.27	0.00	-175.25	-154.34
165	42 37.78	114 25.01	4061.2	3496.64	0.03	979997.91	980415.70	-35.94	-174.45	1.28	0.00	-175.73	-154.78
164	42 37.86	114 25.05	4067.3	3496.10	0.04	979997.31	980415.82	-36.08	-174.81	1.28	0.00	-176.08	-155.10
163	42 37.95	114 25.09	4075.8	3495.30	0.04	979996.47	980415.95	-36.26	-175.27	1.28	0.00	-176.54	-155.53
162	42 38.04	114 25.11	4082.2	3494.83	0.05	979995.99	980416.09	-36.27	-175.50	1.28	0.00	-176.78	-155.73
161	42 38.13	114 25.12	4077.9	3495.09	0.05	979996.26	980416.22	-36.54	-175.62	1.28	0.00	-176.90	-155.87
160	42 38.23	114 25.19	4085.1	3494.62	0.06	979995.78	980416.40	-36.52	-175.85	1.28	0.00	-177.13	-156.06
159	42 38.36	114 25.21	4086.3	3494.77	0.06	979995.94	980416.57	-36.42	-175.79	1.28	0.00	-177.06	-155.99
158	42 38.44	114 25.25	4091.7	3494.66	0.06	979995.82	980416.69	-36.15	-175.70	1.28	0.00	-176.98	-155.88
173	42 26.77	118 31.36	4011.9	3485.83	0.11	979986.64	980399.20	-35.34	-172.17	1.27	0.00	-173.44	-152.75
172	42 26.78	118 31.51	4012.0	3486.13	0.11	979986.95	980399.21	-35.03	-171.87	1.27	0.00	-173.13	-152.44
171	42 26.78	118 31.65	4011.9	3486.43	0.11	979987.27	980399.21	-34.73	-171.56	1.27	0.00	-172.82	-152.14
170	42 26.78	118 31.79	4012.2	3486.71	0.11	979987.56	980399.21	-34.41	-171.25	1.27	0.00	-172.51	-151.82
169	42 26.78	118 31.95	4015.1	3487.05	0.11	979987.91	980399.21	-33.78	-170.72	1.27	0.00	-171.98	-151.28
168	42 26.77	118 32.05	4026.0	3486.66	0.10	979987.50	980399.20	-33.16	-170.47	1.27	0.00	-171.74	-150.98
176	42 26.75	118 32.28	4036.8	3486.52	0.09	979987.34	980399.17	-32.27	-169.95	1.27	0.00	-171.22	-150.40
175	42 26.75	118 32.17	4028.6	3486.78	0.09	979987.61	980399.17	-32.77	-170.17	1.27	0.00	-171.44	-150.66
185	42 26.83	114 33.19	4079.2	3491.87	0.05	979992.90	980399.29	-23.70	-162.52	1.28	0.00	-163.79	-142.80
184	42 26.81	118 33.33	4075.5	3493.47	0.05	979994.57	980399.26	-21.49	-160.50	1.28	0.00	-161.77	-140.75
183	42 26.82	118 33.46	4080.9	3494.95	0.05	979996.12	980399.27	-19.45	-158.64	1.28	0.00	-159.91	-138.87
182	42 26.81	118 33.56	4082.5	3496.68	0.04	979997.92	980399.26	-17.49	-156.73	1.28	0.00	-158.00	-136.95
181	42 26.80	118 33.64	4088.3	3496.94	0.04	979998.19	980399.24	-16.66	-156.10	1.28	0.00	-157.37	-136.29
180	42 26.80	118 33.73	4091.2	3497.48	0.03	979998.74	980399.24	-15.83	-155.37	1.28	0.00	-156.64	-135.55
179	42 26.79	118 33.82	4093.4	3497.80	0.03	979999.08	980399.23	-15.27	-154.89	1.28	0.00	-156.16	-135.05
178	42 26.81	118 33.98	4103.8	3497.35	0.03	979998.61	980399.26	-14.80	-154.76	1.28	0.00	-156.04	-134.88
177	42 26.87	118 34.08	4107.0	3497.16	0.02	979998.40	980399.35	-14.79	-154.87	1.28	0.00	-156.15	-134.97

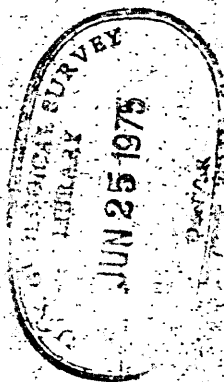
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ZONE OF  
MAGNETIC ANOMALIES



MAGNETIC PROFILE A-1



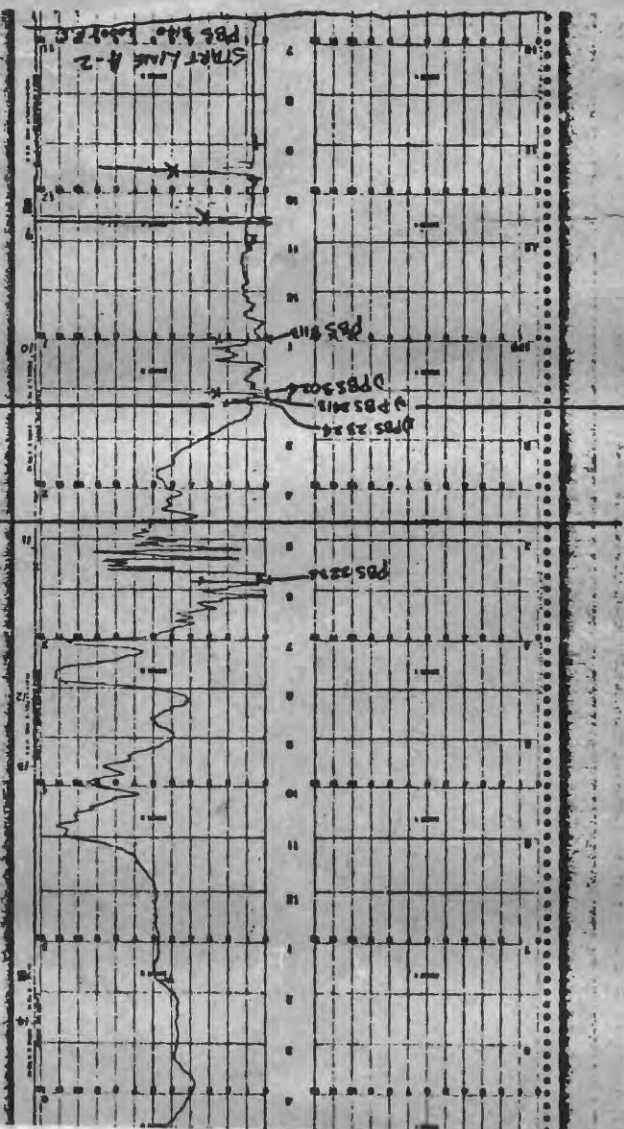
Oregon O.F. 64

Figure 106

FAULT?

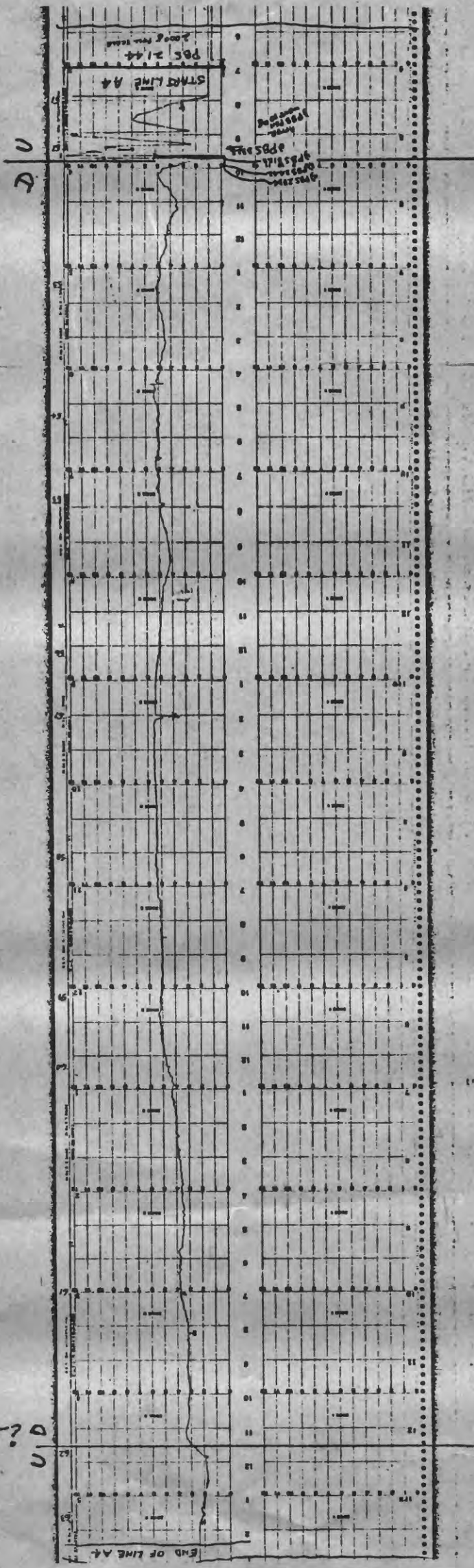
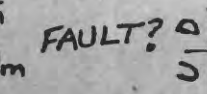
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MAGNETIC PROFILE A-2





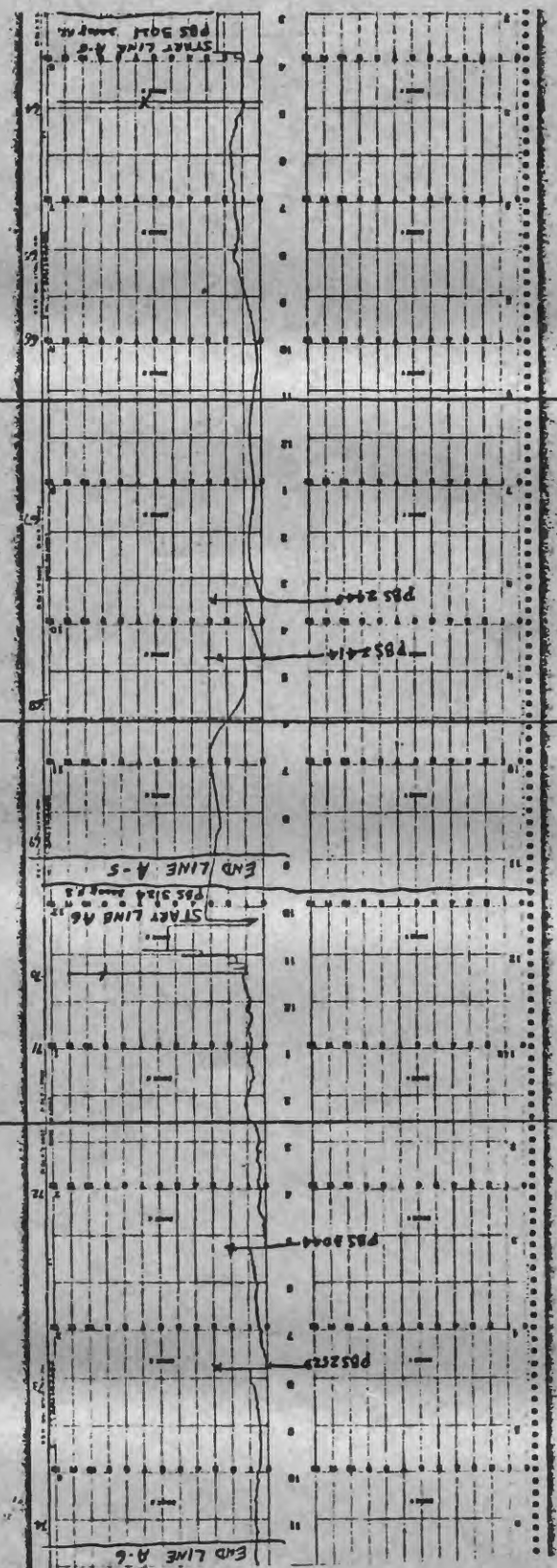
MAGNETIC PROFILE A-4

Figure 10e

Depth  $\leq 400m$

Depth  $\leq 400m$

Depth  $\leq 25m$



MAGNETIC PROFILES A-5 and A-6



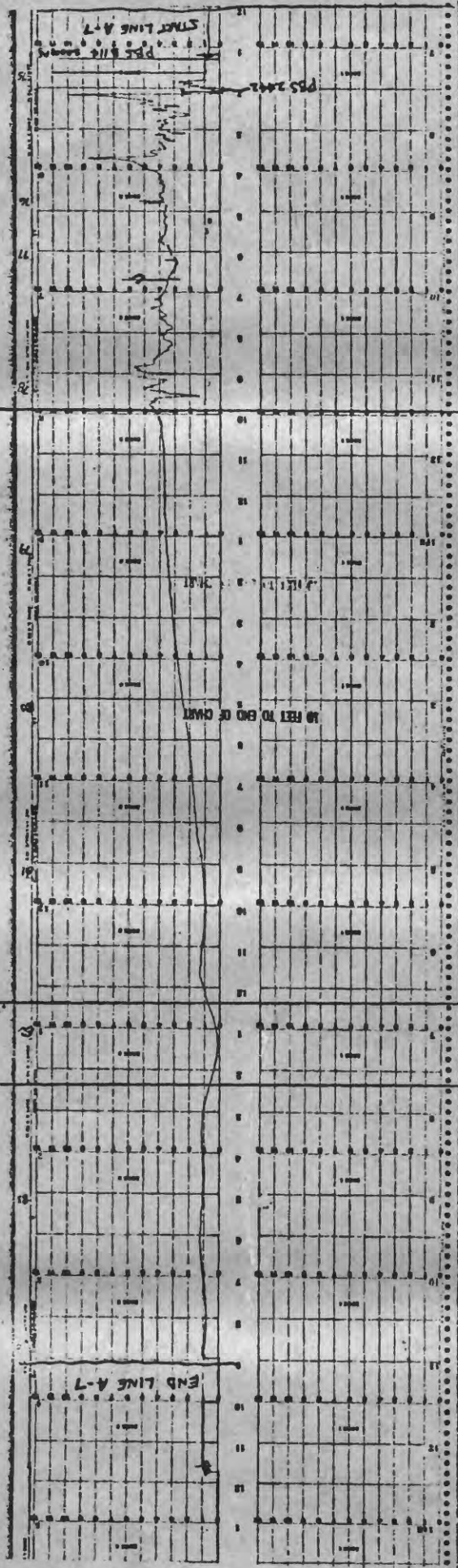
Figure 10f

FAULT

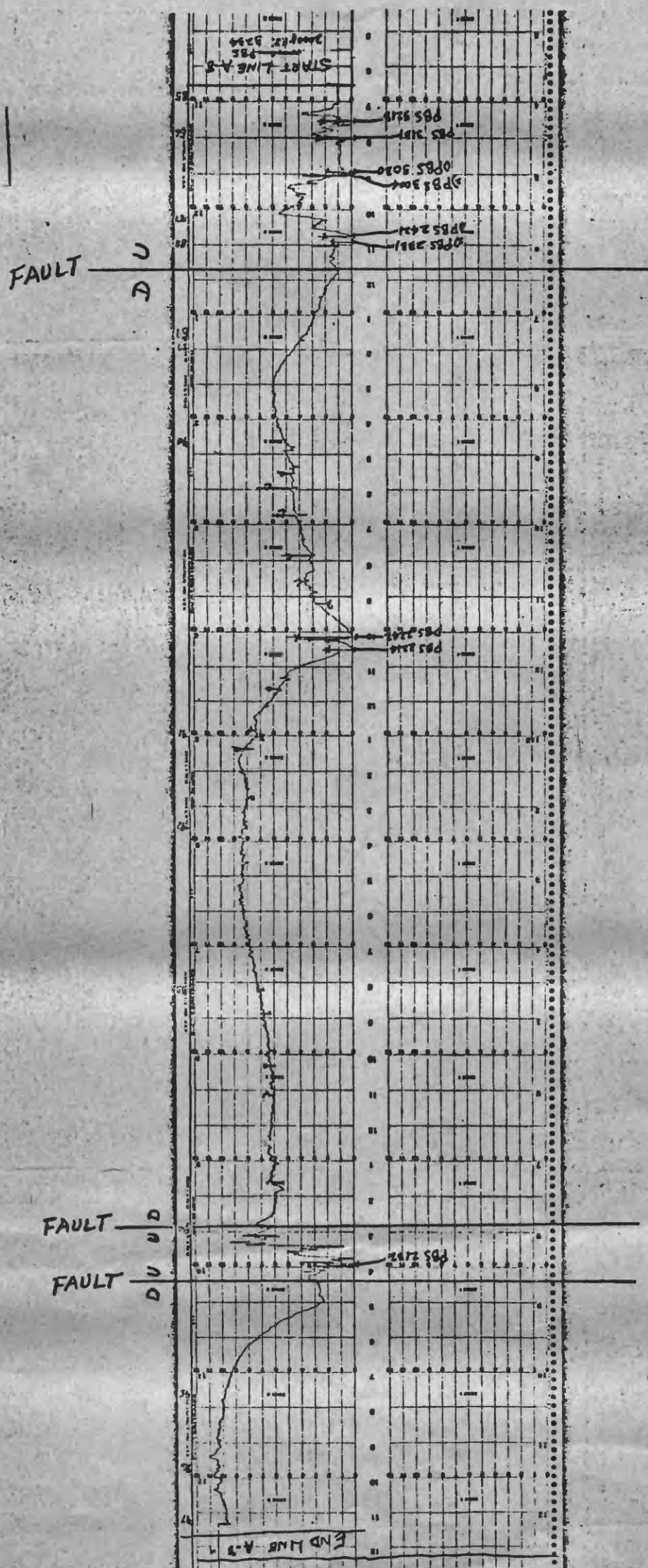
U  
D

Depth  $\leq 450$  m

Depth  $\leq 500$  m



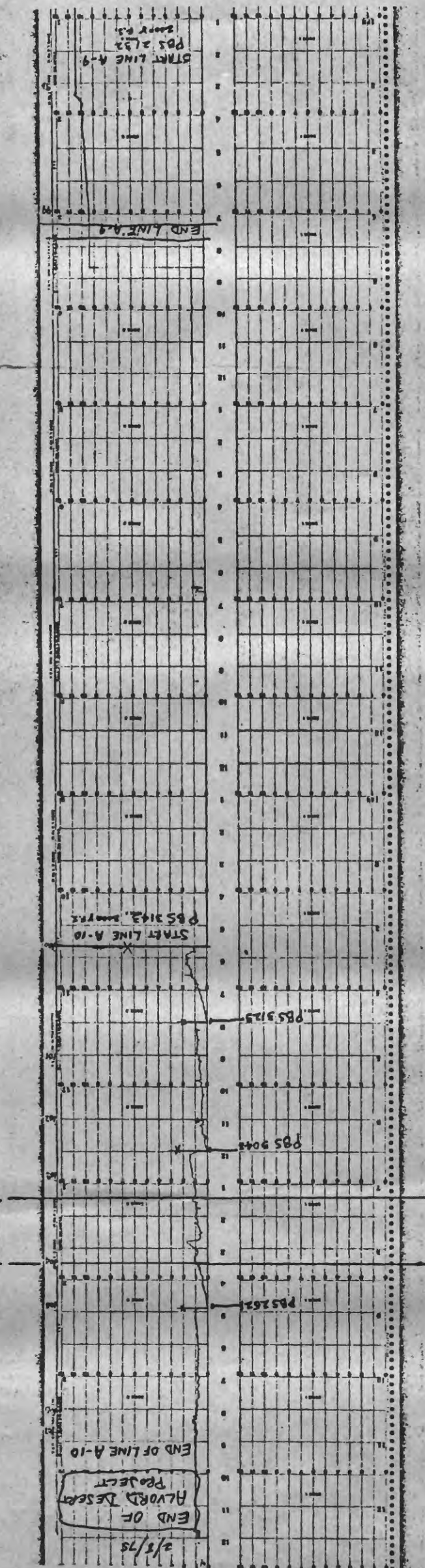
MAGNETIC PROFILE A-7



MAGNETIC PROFILE A-8



Figure 10h



MAGNETIC PROFILES A-9 and A-10

OREGON D.F. 64

Figure 106

FAULT?

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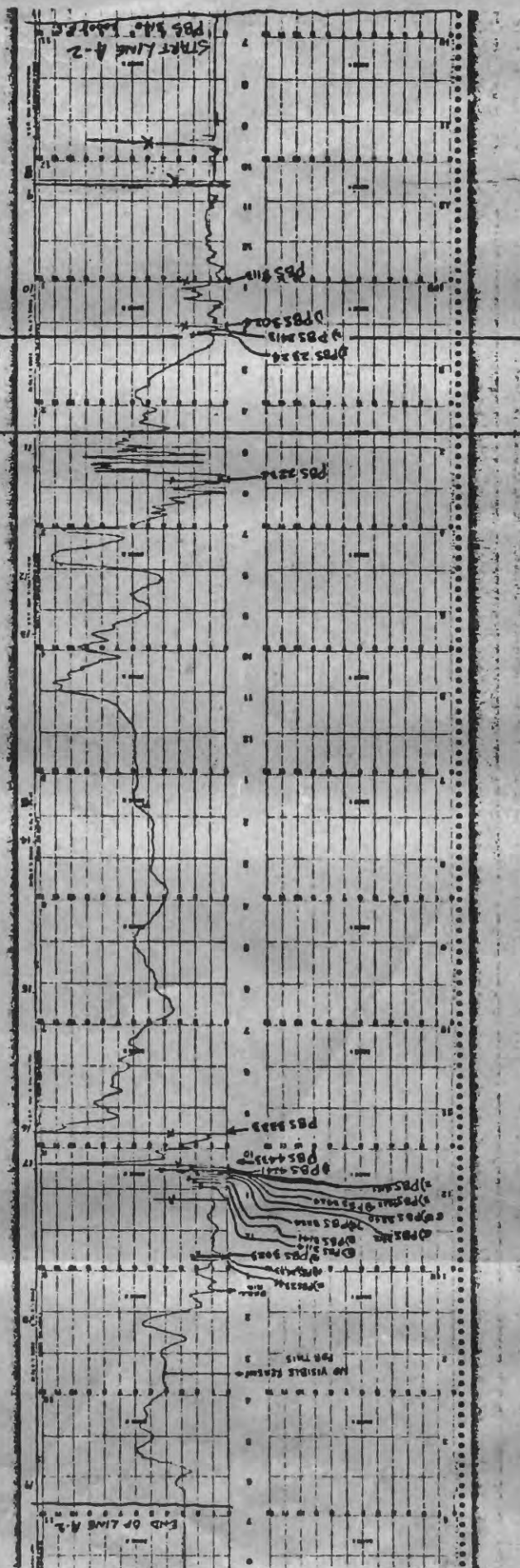
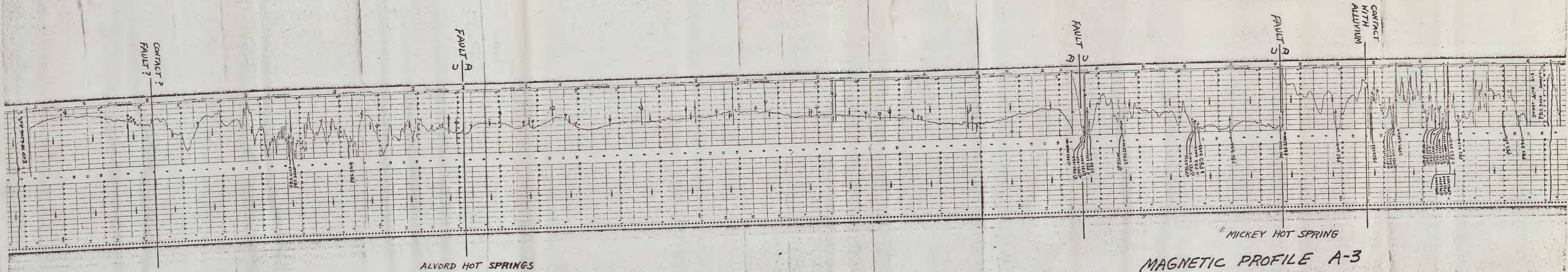




Figure 10c



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