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DAVID SUSSMAN

MAY 12 1989

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April 26, 1989

TO: David Sussman

FM: Daniel L. Carrier RE: GLASS MOUNTAIN BOREHOLE AND WELL DATA


This memo contains summary data from temperature boreholes and exploratory wells drilled in and around the Glass Mountain KGRA, Medicine Lake Highland, California. Principal facts for the boreholes and deep wells are presented in chronological order in Tables 1 and 2, respectively. Included in the tables are information on completion dates, total depths, bottom hole temperatures and gradients, and mineralogy. In addition, production and casing information are included for the wells in the "comments" section of Table 2. By convention, those boreholes and wells drilled inside the Glass Mountain Federal unit are designated as "GMF", and those drilled outside the unit are designated as "ML" or "MLF". These data were all obtained from Unocal files. The information presented here is current through March, 1989, and will be updated as new wells are added.

A location map for the boreholes and wells is shown in Figure 1. Figures 2 to 7 contain composite temperature-depth profiles for all the wells and groups of the boreholes. Individual temperature-depth profiles are presented in Appendix 1. Principal facts for boreholes and wells are shown on a summary map in Plate 1.

68-8 p.13

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Table 1: Principal facts for temperature boreholes drilled in the Glass Mountain KGRA 1981-1984. See Figure 1 for locations.

TEMP. BOREHOLES	ELEV. (FEET)	TD (FEET)	BHT(*F) (DEPTH)	BHG (*F/100') INTERVAL (FEET)	TMAX (*F) (DEPTH)*	COMPANY	DATE	COMMENTS
ML 1-81	5640	600/ETD	40.4 (600)	0.2 400-600	44.2 (50)	Unocal	10/81	Unaltered; isothermal to TD.
ML 2-81	6400	^{233m} 764 725/ETD	38.7 (725)	0 675-725	54.0 (125)	Unocal	11/81	Unaltered; isothermal to TD.
GMF 56-3	6800	1788	134.5 (1788)	10.1 1425-1788	134.5	Unocal	09/82	Zeolite-smectite alteration from <205'-1058'; argillic alteration 1058'-TD; isothermal to 500'.
GMF 44-33	6940	2263	377.2 (2232)	-1.64 1800-2200	396.3 (1580)	Santa Fe Phillips	09/82	Zeolite-smectite 300'-1350', argillic 1350'-TD; significant water entry @ 2260', isothermal to 775'.
GMF 87-13	6720	918	309 (918)	28.0 650-918	309	Unocal	10/82	Bottom hole temp. exceeded tool capabilities, and a maximum reading thermometer was used to measure the temperature. Zeolite-smectite 242'-900', argillic 900'-TD; no isothermal section.
GMF 84-17	6960	1636	239.9 (1636)	11.7 1500-1636	239.9	Unocal	10/82	Zeolite-smectite alteration 1419'-TD; isothermal to 175'.
GMF 17-6	6720	4009	478.5 (3980)	11.5 3840-3980	478.5	Santa Fe Phillips	11/82	Zeolite-smectite 1280'-2680', argillic 2680'-TD; isothermal to 125'
MCF 51-2	5473	1836	49.6 (1836)	-.4 1575-1780	64.2 (1025)	Unocal	08/83	Zeolite-smectite 900'-1150', isothermal to 675', possible zone of lateral fluid flow 900'-1100'.
ML 52-30	6380	1972	84.0 (1972)	6.8 1750-1972	84.0	Unocal	08/83	Zeolite-smectite 1100-TD; isothermal to 1375'.
ML 36-28	6700	2146	192.7 (2132)	19.3 1658-2121	192.7	Phillips	09/83	Zeolite-smectite 1500'-2084'; argillic 2084'-TD; isothermal to 145'
ML 75-6	6600	1998	110.4 (1983)	8.6 1775-1983	110.4	Unocal	09/83	Zeolite-smectite 1050'-TD; isothermal to 1050'.
ML 54-19	6200	2201	98.4 (2191)	13.8 1940-2180	98.4	Unocal	10/83	Zeolite-smectite 1900'-TD; isothermal to 1250'.
ML 65-26	6230	2180	150.1 (2171)	2.7 2025-2171	150.1	Unocal	10/83	Not altered; isothermal to 1175'.
GMF 45-36	6960	4000	369.9 (3967)	2.6 3560-3967	369.9	Santa Fe	10/83	Zeolite-smectite 1000'-1820', argillic 1820'-2500', and 3430'-3720' propylitic 2500'-3430' and 3720'-TD; isothermal to 1150'.
ML 29-1A	6640	3080 (2800)	158.6 (2800)	9.8 2640-2800	158.6	Anadarko	10/83	Zeolite-smectite 2803'-TD; isothermal to 1250'.

*Depth is shown if different from the depth used for BHT.

Table 1 Cont'd.

TEMP. BOREHOLES	ELEV. (FEET)	TD (FEET)	BHT(*F) (DEPTH)	BHG (*F/100') INTERVAL (FEET)	TMAX (*F) (DEPTH)*	COMPANY	DATE	COMMENTS
GHF 28-32	7240	(OH)3460 (DP)4500	528.2 (4495)	9.0 4182-4495	528.2	Santa Fe Phillips	11/83 10/84	Zeolite-smectite 800'-TD; isothermal to 1500'. <i>z/s - 2150-2450</i> <i>A - 2480-2500</i>
ML 57-11	6100	(OH)1982 (RD)3002	117.8 (3002)	5.5 2500-3000	117.8	Unocal Phillips	11/83 10/84	Zeolite-smectite 2929'-TD; isothermal to 950'.
ML 57-13	6140	3002	136.5 (2968)	10.9 2740-2860	136.5	Phillips	07/84	Zeolite-smectite 1035'-2115', argillic 2115'-TD; isothermal to 1250'
ML 68-16	6330	2939	140.8 (2935)	5.5 2844-2935	140.8	Phillips	07/84	Zeolite-smectite 2227'-TD; isothermal to 1800', possible fluid flow in the 2500'-2900' interval. Located in Section 21 and not Section 16.
ML 62-21	6590	2142	311.4 (2125)	8.8 1921-2124	311.4	Phillips	08/84	Zeolite-smectite 1554'-3503'; isothermal to 2450'.
ML 86-23	6040	3503	163.1 (3502)	6.5 3320-3492	163.1	Phillips	09/84	Zeolite-smectite 2932'-TD; isothermal to 2000'.
ML 18-34	5860	3500	137.4 (3475)	15.6 3351-3475	137.4	Phillips	10/84	Unaltered; isothermal to 2500'.
ML 27-27	5800	3000	88.0 (2995)	5.5 2655-2969	88.0	Phillips	10/84	Zeolite-smectite 1462'-TD; isothermal to 2350'.
ML 14-23	6560	3000	174.9 (3000)	11.4 2600-2949	174.9	Unocal	11/84	Zeolite-smectite 2480'-2680', argillic 2680'-3460', propylitic 3460'-TD; isothermal to 1250'.

*Depth is shown if different from the depth used for BHT.

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Table 2. Principal facts for deep exploratory wells drilled in the Glass Mountain Unit 1984-1988. See Figure 1 for locations.

DEEP EXPLORATORY WELLS

<u>TEMP.</u> <u>BOREHOLES</u>	<u>ELEV.</u> <u>(FEET)</u>	<u>TD</u> <u>(FEET)</u>	<u>BHT(*F)</u> <u>(DEPTH)</u>	<u>BGH (*F/100')</u> <u>INTERVAL (FEET)</u>	<u>TMAX</u> <u>(DEPTH)*</u>	<u>COMPANY</u>	<u>DATE</u>	<u>STATUS</u>	<u>COMMENTS</u>
GMF 17A-6	6740	9620	429.5 (9436)	5.5 8964-9436	499 (4357)	Santa Fe Phillips	08/84	SUSP.	Casing: 20" from 0-577', 13 3/8" from 0-3750', 12 1/4" open hole to TD. History: a parting occurred in the 13 3/8" casing at 3612'-3629'. A 9 5/8" liner was run from 0-3104' (cemented) and a 9 5/8" liner was hung 3554'-4240' (cemented); a bridge plug was placed at 4800' and top of plug is at 4650'. The 3250'-3350' and 3450'-3550' intervals were perforated and tested. No significant production was found. BHT is from a temperature survey run to TD two days after an injection test and prior to placing the cement plug. Maximum temp. is from survey to 4550' taken after the cement plug was in place and the well was shut in for 252 days. Granitic rocks were drilled from 7760'-TD. Propylitic alteration from 3900'-TD.
GMF 68-8	6991	(OH)6571 (DP)8417	540 (6525) 556 (8100)	3.6 6000-6525 0 7900-8100	540 (6525) 556 (7900)	Unocal Unocal	08/85 07/88	POTEN. PROD.	Casing: 13 3/8" from 0-1084', 9 5/8" from 912'-3515', 7" perforated liner hung from 3377'-8410'. Liner plugged from 8100'-8410'. Multiple productive zones: 5000 to 5600' and at 6500 ±200'. Produced 300K #/hr TMF and 72K #/hr STM at 102 psia and at an estimated 500 BTU/#. Propylitic alteration from 3000' to TD.
GMF 31-17	7000	8787	541.5 (8400)	5.8 8000-8400	541.5	Unocal	09/88	POTEN. PROD.	Casing: 13 3/8" from 0-1123', 9 5/8" from 911-3074', 7" perforated liner from 2890' to 8777'. Liner plugged to 8400'. Productive interval: 3760' to 3920'; produced 480K #/hr TMF and 78K #/hr STM at 102 psia and at an estimated 425 BTU/#. Multiple granitic dikes observed from 8110' to TD. Propylitic alteration from 2700' to TD.

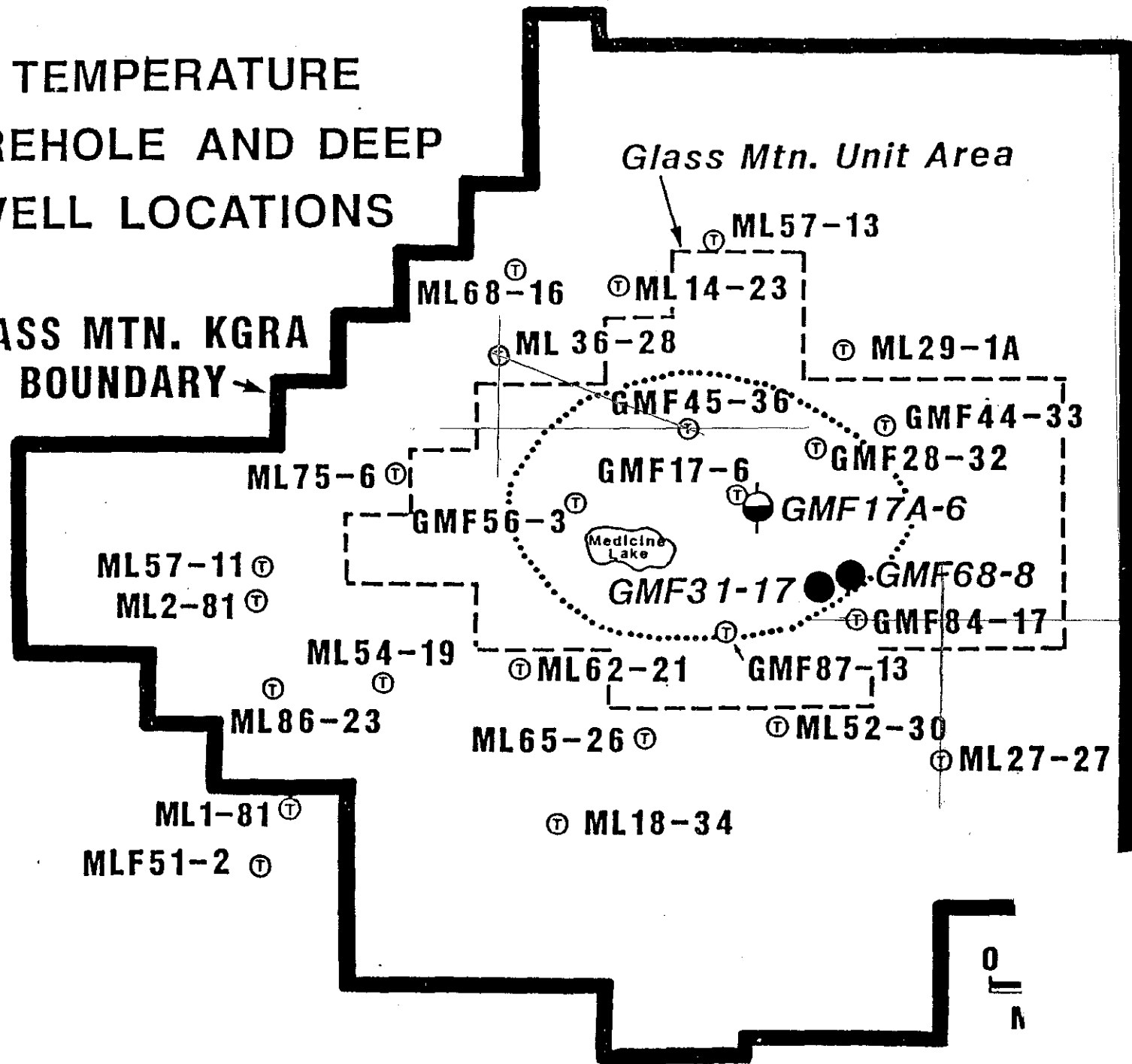
* Depth is shown if different from the depth used for BHT.

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TEMPERATURE BOREHOLE AND DEEP WELL LOCATIONS

GLASS MTN. KGRA
BOUNDARY



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Figure 1

TEMPERATURE BOREHOLE AND DEEP WELL LOCATIONS

GLASS MTN. KGRA
BOUNDARY →

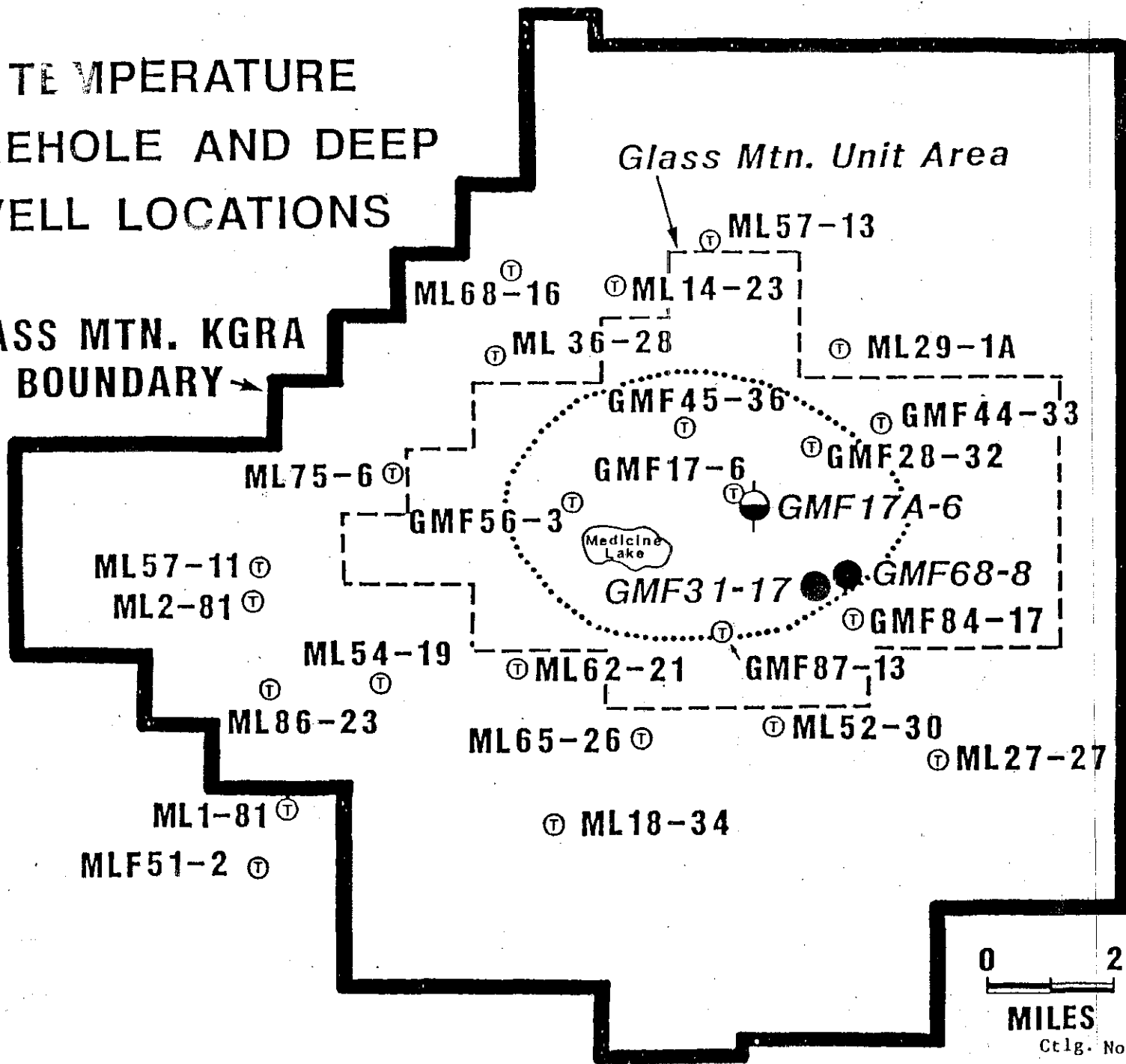


Figure 1

TEMPERATURE, °F

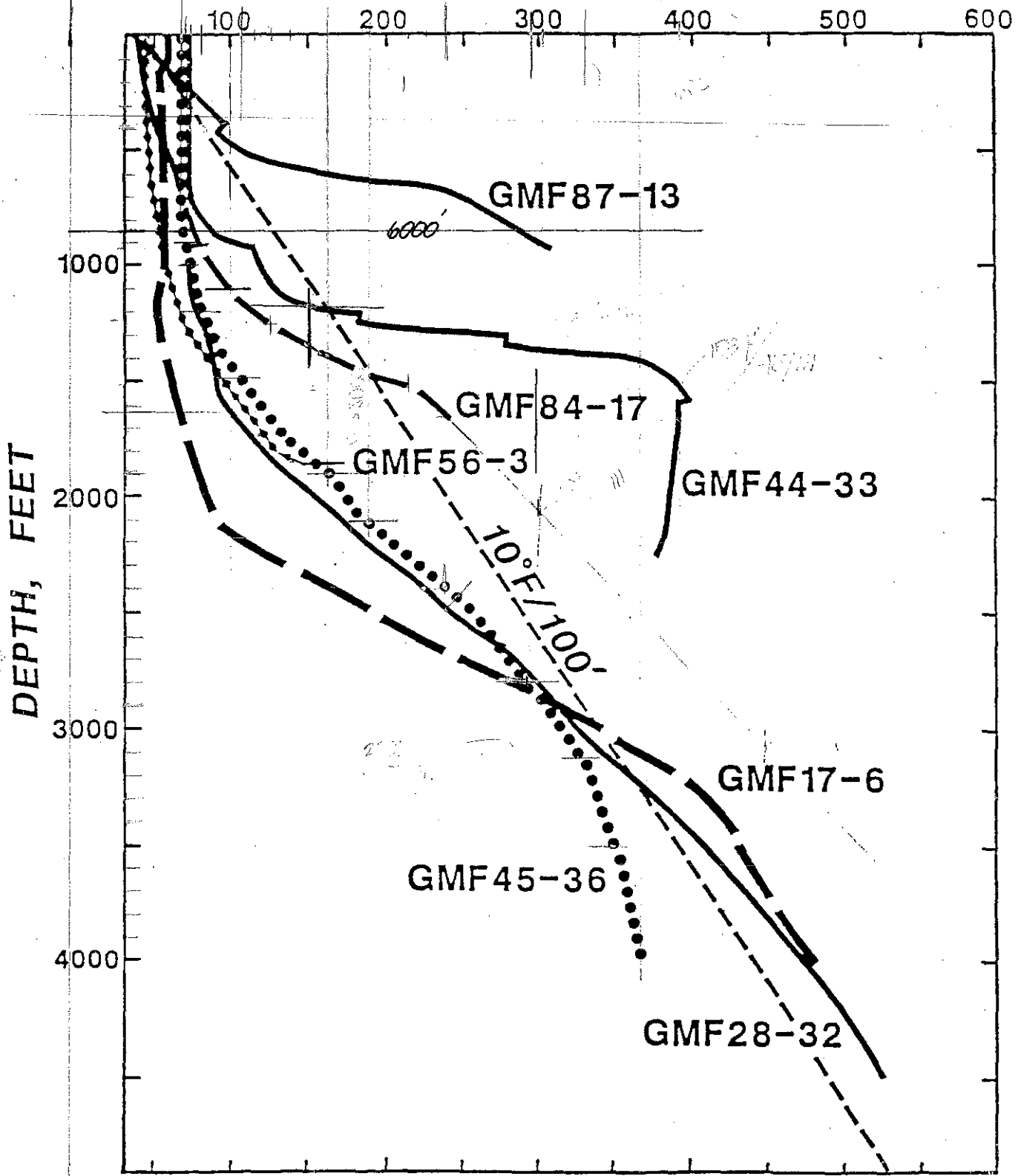


Figure 2: Temperature and depth profiles for boreholes located in the Glass Mountain Unit.

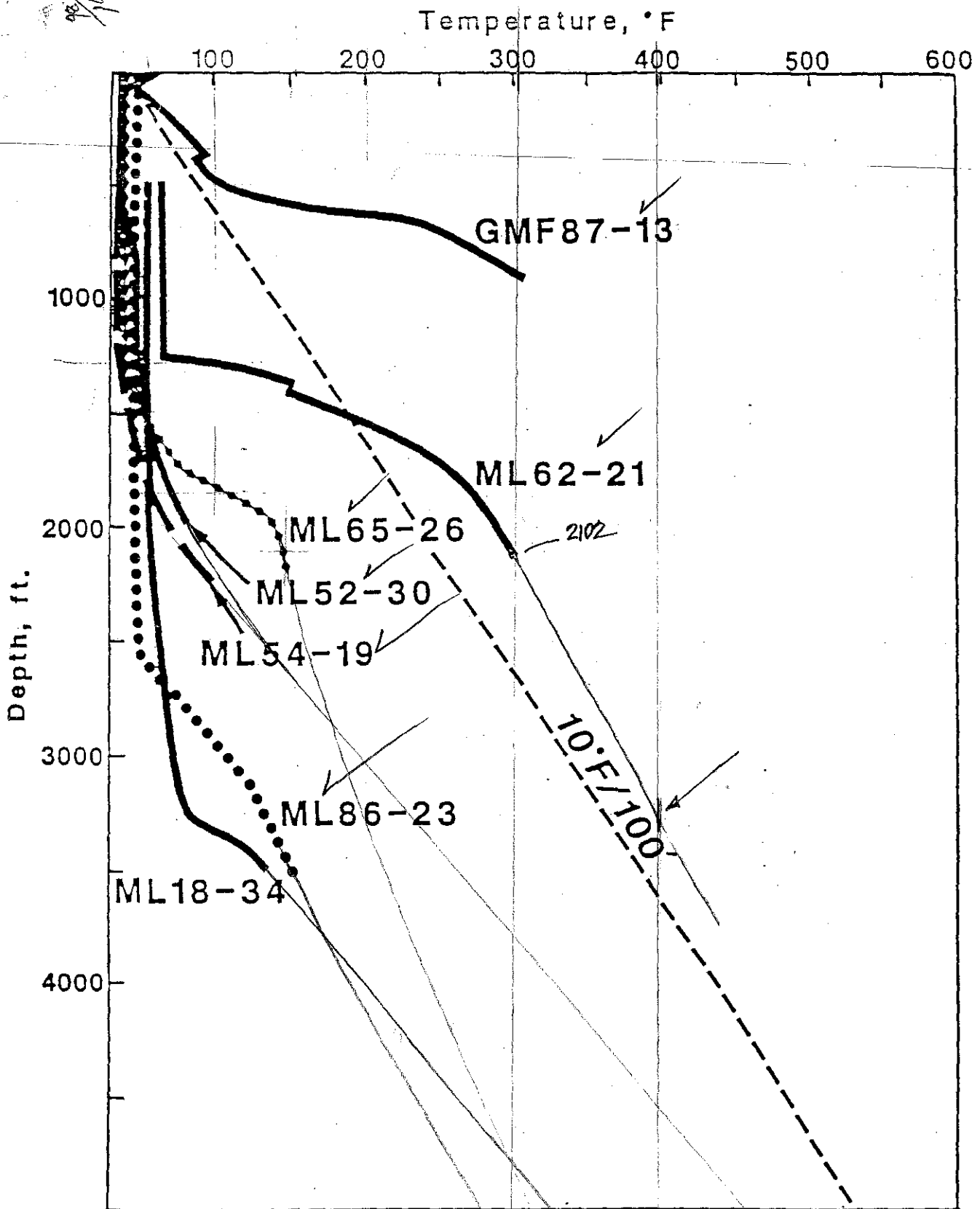


Figure 3: Temperature - depth profiles for boreholes located southwest of the Glass Mountain Unit. GMF87-13 is shown for reference.

965
1000

TEMPERATURE, °F

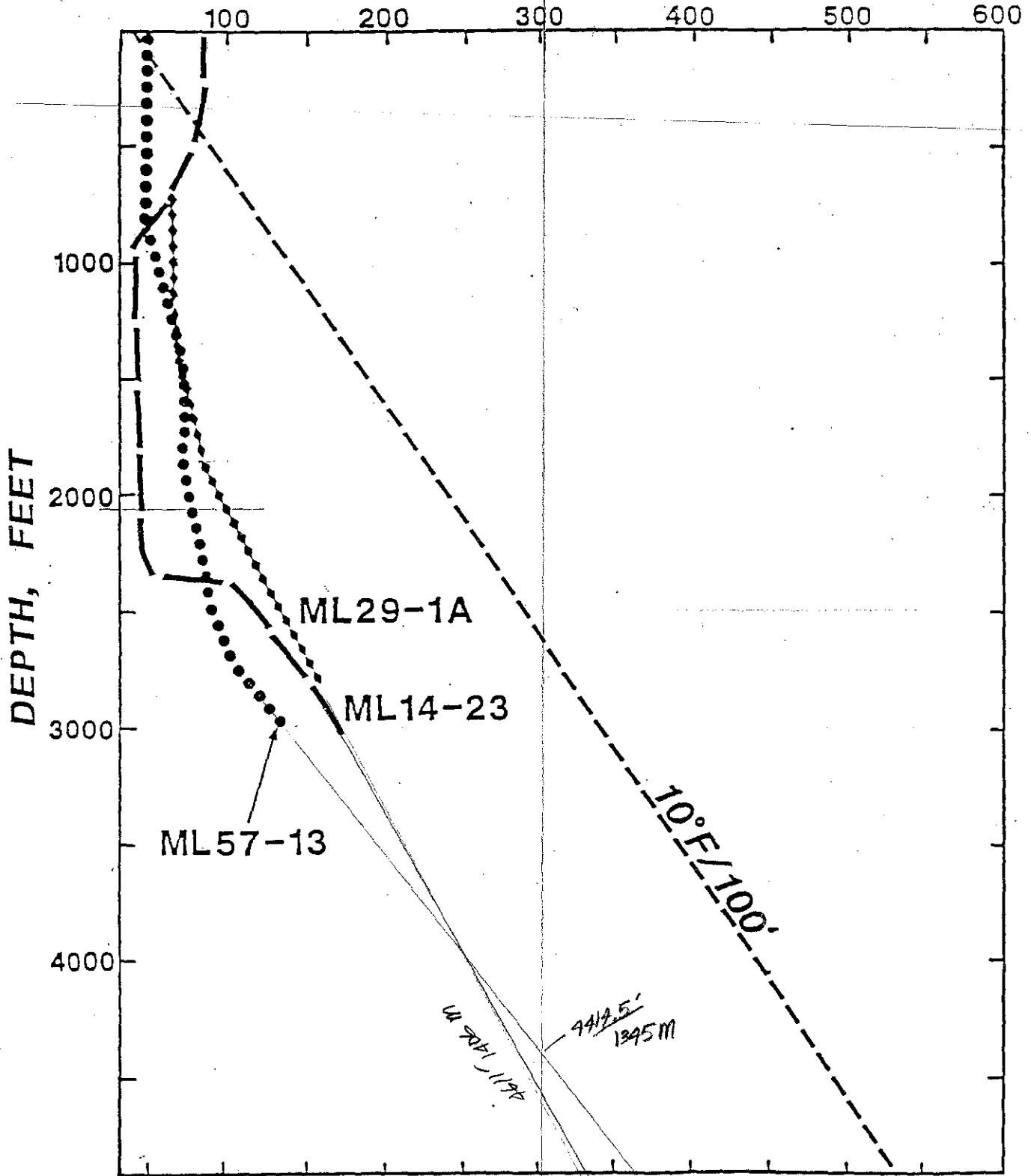


Figure 5: Temperature - depth profiles for boreholes drilled north of Glass Mountain Unit.

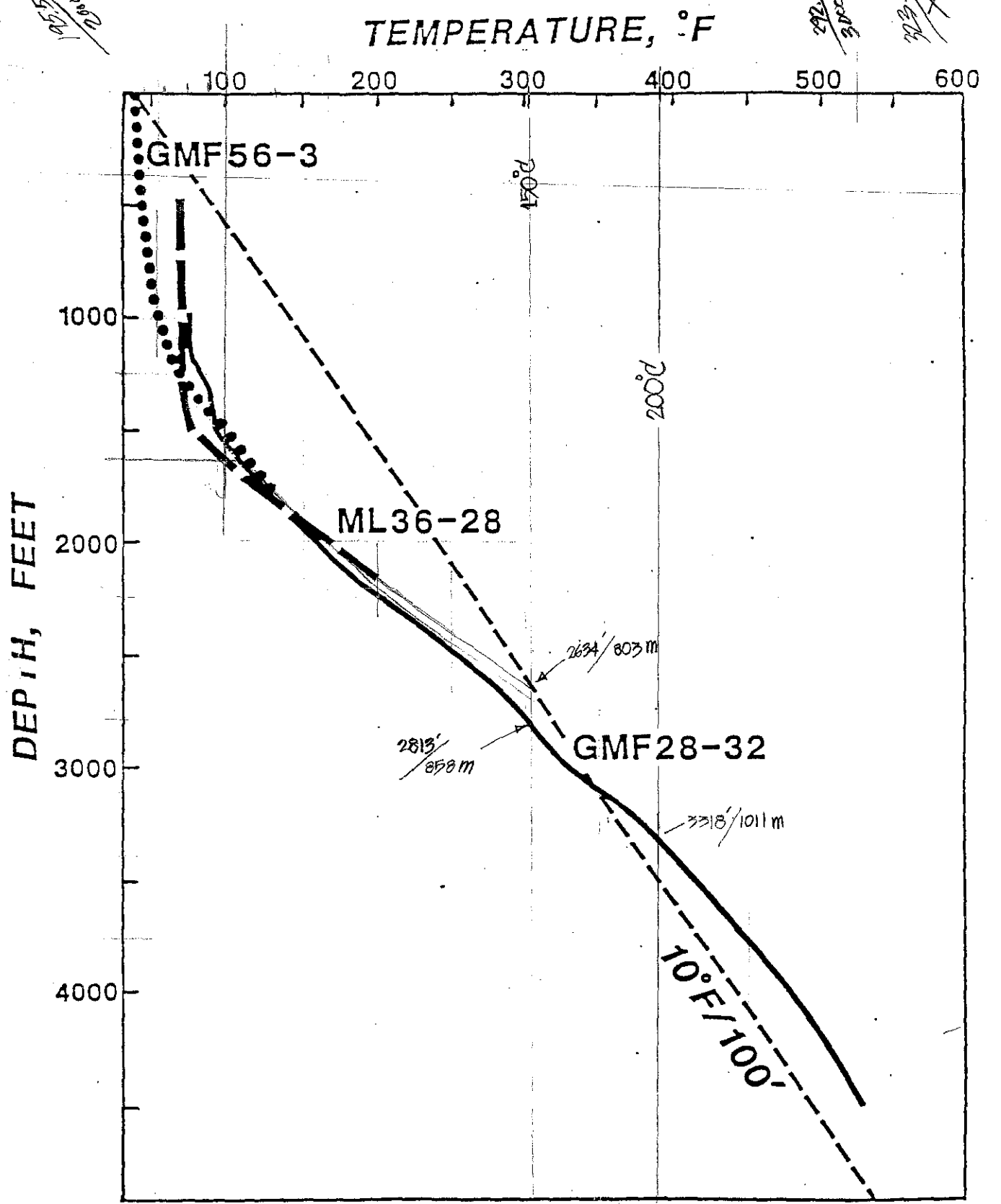
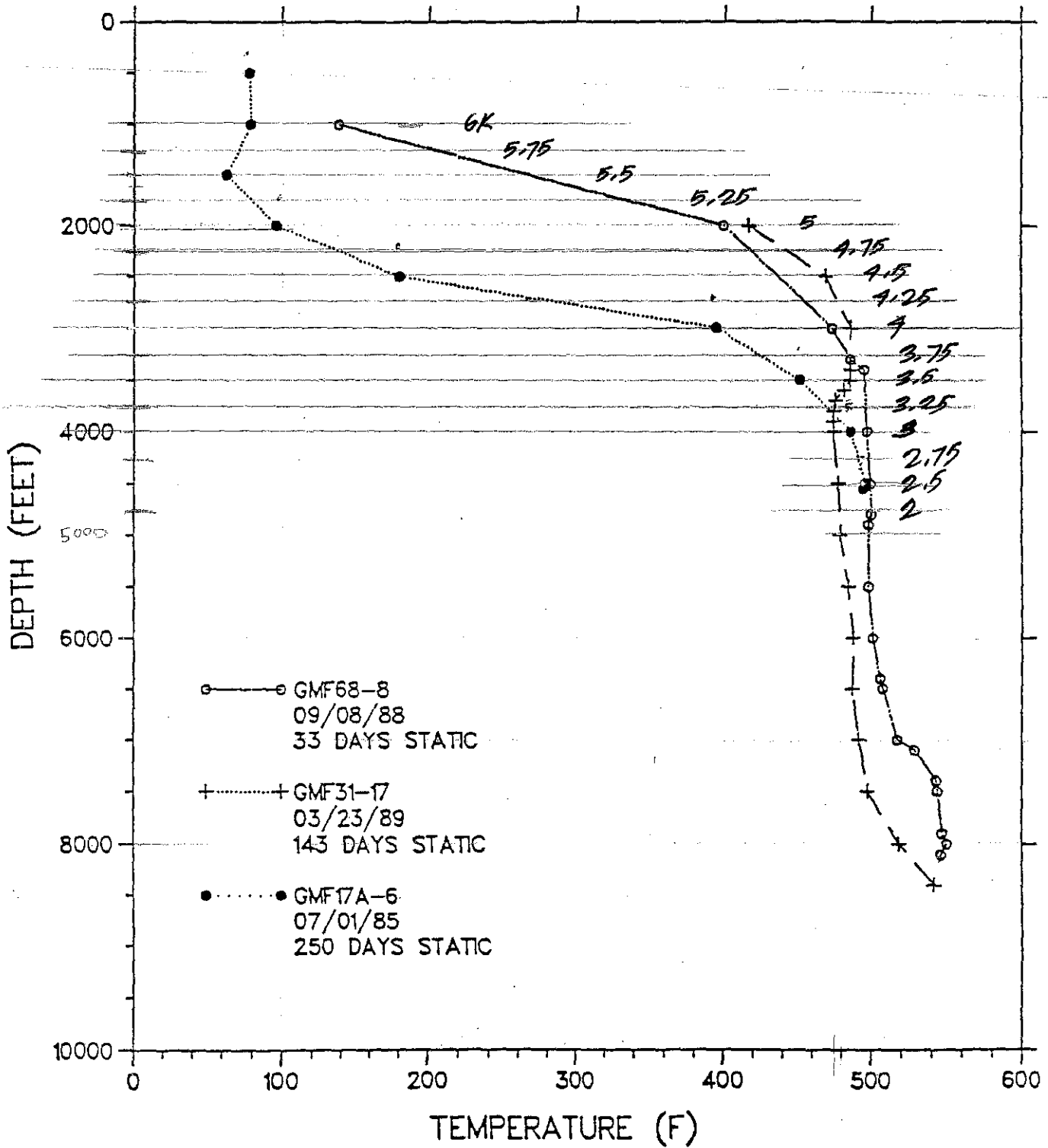


Figure 6: Temperature - profiles for boreholes GMF56-3, GMF28-32 and ML36-28.

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GMF68-8, GMF31-17, AND GMF17A-6



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Figure 7: Temperature - depth profiles for three exploratory wells drilled at Glass Mountain. Temperatures for GMF68-8 have not fully returned to undisturbed formation temperatures.