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DATA FROM GEOTHERMAL TEST WELLS NEAR MOUNT HOOD, OREGON

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# DATA FROM GEOTHERMAL TEST WELLS NEAR MOUNT HOOD, OREGON

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## EXPLANATION OF DATA

This report includes well specifications, drillers' logs, and temperature logs of geothermal test wells drilled at 7 sites near Mt. Hood Oregon. The wells were drilled in 1979 and 1980 under contract to the U.S. Geological Survey. The project, funded by the U.S. Department of Energy, was part of an interagency effort to determine the geothermal potential of Mt. Hood. The Agencies involved were U.S. Department of Energy, U.S. Forest Service, U.S. Geological Survey, and Oregon Department of Geology and Mineral Industries.

Locations of the Geological Survey wells are shown in figure 1. Also shown are locations of two deep geothermal test wells in the Old Maid Flat area that were drilled by other agencies. The numbering system for well identification is shown on figure 2.

Descriptions of lithology are based on examination of drill cuttings with the aid of a binocular microscope. Many of the surveys listed in table 1 were made by the authors, using wireline-logging equipment mounted in a small van; most of the surveys listed for the Pucci chairlift site were made by an oilfield service company. Temperature surveys shown in figures 3-9 were made with portable and van-mounted equipment employing thermistor probes that have an accuracy and precision of 0.01°C or better.

Twenty samples of drill cuttings from the Pucci chairlift well were submitted to the Geothermal Laboratory at Southern Methodist University, Dallas, Texas. Bulk or solid-component thermal conductivities were determined under the direction of Dr. David D. Blackwell; the values range from 3.90 to 5.21 mcal/cm. sec. °C.

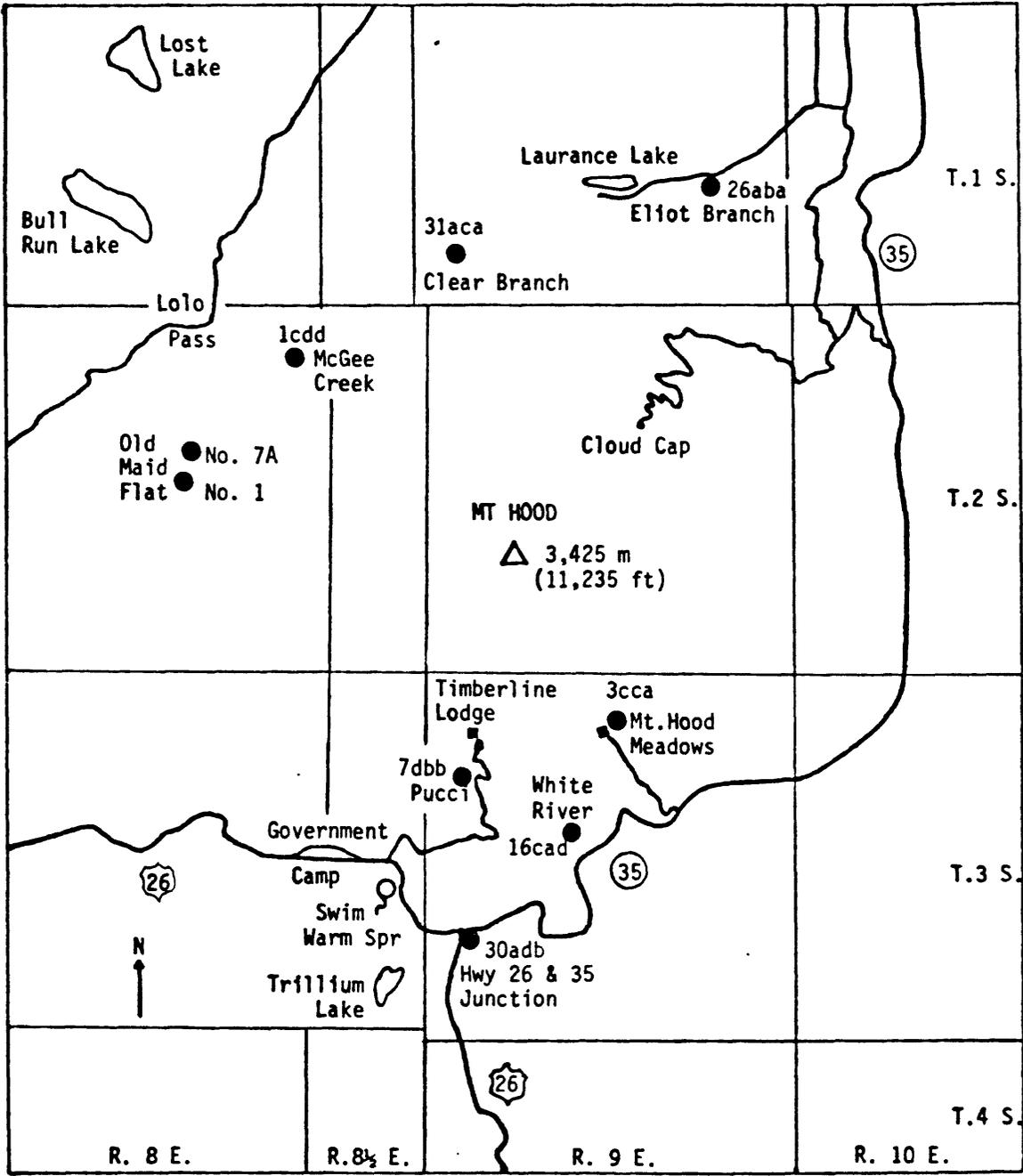


FIGURE 1.-- Map of Mt. Hood area showing locations of geothermal wells.

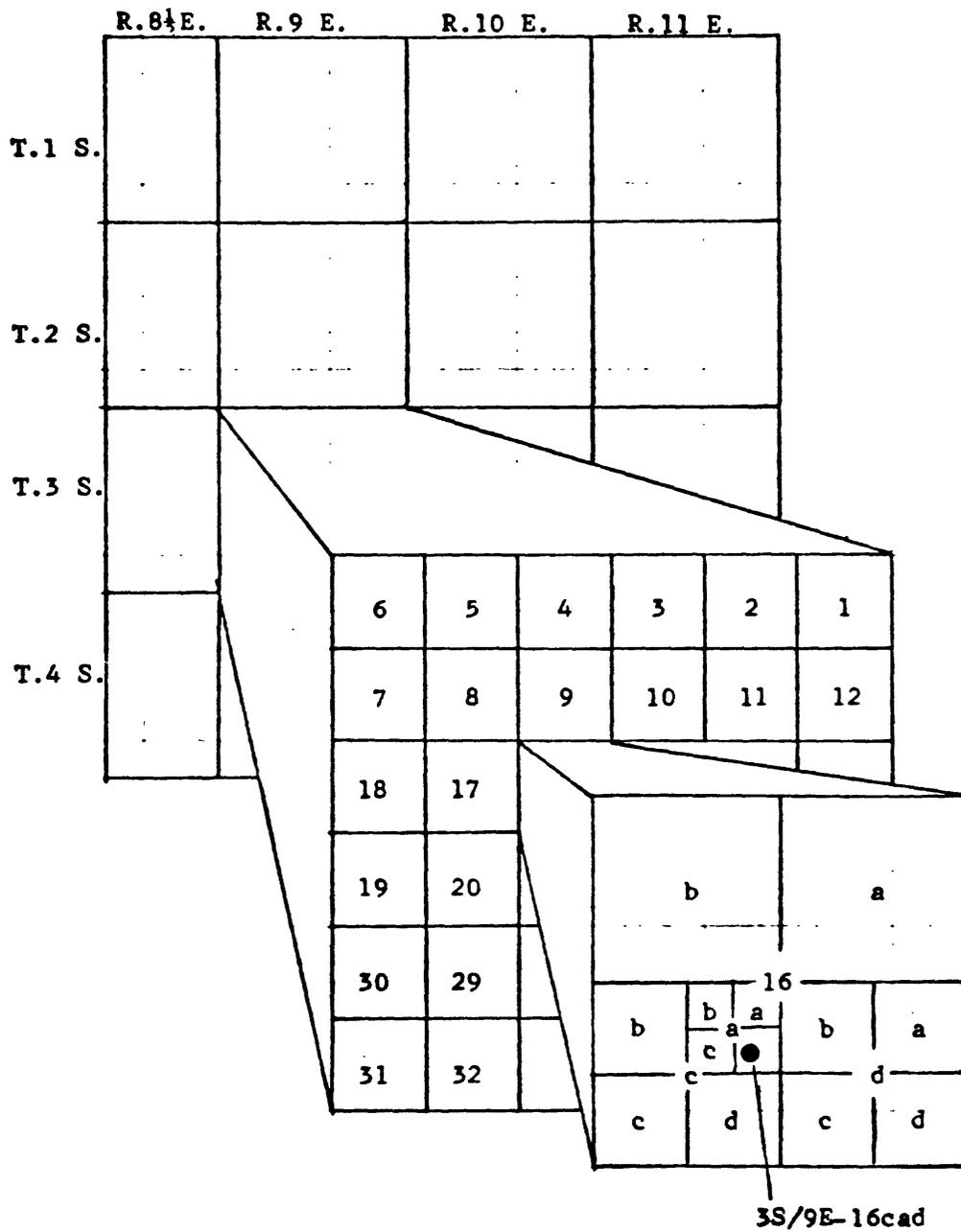


FIGURE 2. -- Well-numbering system.

TABLE 1 -- Specifications and drillers' logs of wells.

1S/9E-26aba. Eliot Branch site. Cathedral Ridge quadrangle (7.5'). Hood River County, Oregon. 45°27'35" N. 121°37'58" W. Alt. 860 m (2,820 ft). Drilled in 1980 to 220 m (720 ft) by American Deep Drilling & Exploration, Oregon City, Oregon, using air-rotary method (including air hammer to install casing).

Construction: 26-cm (10 1/4-in) inside diameter welded casing, surface to 78 m (256 ft). 20.6-cm (8 1/8-in) id welded casing, surface to 92 m (301 ft). 5-cm (2-in) inside diameter tubing, surface to 218 m (715 ft), with 2-m (6-ft) well screen on end. 20.0-cm (7 7/8-in) hole from 92 m (301 ft) to 220 m (720 ft).

Water level in tubing: 34.8 m (114 ft), Oct. 1980.

Logs and surveys:	Depth (m)
Lithology (see generalized lithology below)	0 - 220
Temperature, Nov. 22, 1980 (max 10.3°C)	0 - 217
Gamma	1 - 220
Caliper	69 - 220

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Generalized Lithology	Thick- ness (meters)	Depth (meters)
Clastic debris; angular to subrounded volcanoclastic particles; degree of alteration variable	84	84
Mudflow deposits; about 50 percent crystals, with plagioclase, hypersthene, and hornblende	17	101
Lithic mudflow; subrounded to angular volcanic clasts	6	107
Lithic mudflow; subrounded to angular volcanic clasts; hematite alteration	18	125
Porphyritic hypersthene andesite	2	127
Mudflow or clastic debris	16	143
Porphyritic hypersthene andesite	3	146
Mudflow or clastic debris; 75 percent crystals of plagioclase, hypersthene	3	149
Porphyritic hypersthene andesite	10	159
Mudflow or clastic debris; subangular volcanic clasts, and crystals	3	162
Clastic debris; subrounded volcanic clasts	3	165
Mudflow or clastic debris; subangular volcanic clasts, and crystals	15	180
Mudflow or clastic debris, some hematite-stained, includes clasts of hypocrySTALLINE basalt	19	199
Porphyritic hypersthene andesite	2	201
Mudflow or clastic debris; hematite-stained, altered	9	210
Mudflow or clastic debris; more rounded and altered than above	10	220

TABLE 1 -- Specifications and drillers' logs of wells (continued).

1S/9E-31aca. Clear Branch site. Cathedral Ridge quadrangle (7.5'). Hood River County, Oregon. 45°26'30" N. 121°42'57" W. Alt. approx. 1,280 m (4,200 ft). Drilled in 1980 to 311 m (1,020 ft) by American Deep Drilling & Exploration, Oregon City, Oregon, using air-rotary and mud-rotary methods.

Construction: 20.6-cm (8 1/8-in) inside diameter welded casing, surface to 69 m (226 ft). 5-cm (2-in) inside diameter tubing, surface to 311 m (1,020 ft), with sealed end. 20.0-cm (7 7/8-in) hole 69 m (226 ft) to 311 m (1,020 ft).

Water level in casing: Above land surface.

Logs and surveys:	Depth (m)
Litology (see generalized lithology below	0 - 311
Temperature, Nov. 19, 1980 (max. 10.86°C)	0 - 311
Caliper	0 - 69 69 - 306
Gamma	3 - 311
Spontaneous potential/resistivity (single point)	69 - 300

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Generalized Lithology	Thick- ness (meters)	Depth (meters)
Colluvial deposits; angular clasts of hornblende andesite, pyroxene andesite	5	5
Epiclastic debris; assortment of clasts of andesite, basalt, and crystals of plagioclase, and hypersthene; some hematite staining and hydrothermal alteration	74	79
Hypersthene andesite flows; partly fractured and permeable	26	105
Fluvial (?) debris; rounded clasts of andesite, basalt, and crystals; hydrothermally altered; partly silty	12	117
Cemented epiclastic debris; matrix of small crystals and orange and green clay; abundant hydrothermal alteration	40	157
Epiclastic debris; angular to rounded volcanic lithic and crystal debris	16	173
Hypersthene andesite, fractured; clay matrix	4	177
Cemented epiclastic debris of andesite and basalt; some clay matrix, alteration of fragments	55	232
Hypersthene andesite flow	3	235
Cemented, altered, andesite debris	6	241
Hypersthene andesite flow	5	246
Cemented epiclastic debris of andesite, some basalt; varying degrees of oxidation	65	311

TABLE 1 -- Specifications and drillers' logs of wells (continued).

2S/8E-1cdd. McGee Creek site. Bull Run Lake quadrangle (7.5'). Hood River County. 45°25'08" N. 121°46'06" W. Alt. 915 m (3,000 ft). In 1979 drilled to 235 m (770 ft) by Skyles Well Drilling, Oregon City, Oregon. In 1980 deepened to 610 m (2,000 ft) using mud-rotary method by Orvail Buckner Well Drilling, Redmond, Oregon.

Construction: 20.6-cm (8 1/8-in) inside diameter welded casing, surface to 45 m (147 ft), cemented to surface. 5-cm (2-in) inside diameter tubing, surface to 608 m (1,994 ft), with 2-m (6-ft) well screen on end. 20.0-cm (7 7/8-in) hole from 46 m (150 ft) to 610 m (2,000 ft).

Water Level in tubing: Approximately 10 m (30 ft) below land surface.

Logs and surveys:	Depth (m)
Lithology (see generalized lithology below)	0 - 610
Temperature, Aug. 12, 1980 (max 60.0°C)	0 - 608
Gamma	2 - 603
Caliper	45 - 608
Resistivity, single point	45 - 323

Generalized Lithology	Thick- ness (meters)	Depth (meters)
Volcanic and glacial debris, including mudflows, block and ash deposits; fragments of andesite and dacite	47	47
Pyroxene andesite, with hematite alteration	20	67
Mudflow or flow breccia, altered	9	76
Porphyritic pyroxene andesite, highly altered	52	128

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Generalized Lithology	Thick- ness (meters)	Depth (meters)
Mudflow deposits	3	131
Pyroxene andesite, highly altered	6	137
Mudflow deposits, highly altered	6	143
Pyroxene andesite, altered	12	155
Hornblende andesite, altered	34	189
Pyroxene andesite	11	200
Epiclastic volcanic deposits	4	204
Hornblende andesite, fresh	16	220
Pyroxene andesite	15	235
Hornblende andesite	39	274
Reddish-gray clay	37	311
Dark-gray pyroxene andesite	24	335
Mudflow deposits; altered lithic clasts	6	341
Pyroxene andesite	16	357
Mudflow deposits; mostly plagioclase crystals	15	372
Pyroxene andesite	6	378
Mudflow deposits; mostly plagioclase crystals	20	398
Hornblende andesite flows	29	427
Mudflow deposits; about 25 percent crystals	46	473
Andesitic lavas, hydrothermally altered, with interbedded flow breccias	39	512
Pyroxene andesite	8	520
Mudflow deposits; altered lithic clasts	23	543

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Generalized Lithology	Thick- ness (meters)	Depth (meters)
Pyroxene andesite, altered	7	550
Mudflow deposits: 60 percent lithic clasts, altered	23	573
Hornblende andesite	15	588
Mudflow deposits; lithic clasts, altered	13	601
Hornblende andesite, slightly altered	9	610

3S/9E-3cca. Mt Hood Meadows site. Mount Hood South quadrangle (7.5'). Hood River County, Oregon. 45°20'00" N. 121°39'36" W. Alt. approx. 1,665 m (5,460 ft). Drilled in 1980 to 355 m (1,165 ft) by American Deep Drilling & Exploration, Oregon City, Oregon, using mud-rotary method.

Construction: 20.6-cm (8 1/8-in) inside diameter welded casing, surface to 50 m (165 ft) 5-cm (2-in) inside diameter tubing, surface to 352 m (1,155 ft), with sealed end. 20.0-cm (7 7/8-in) hole from 50 m (165 ft) to 355 m (1,165 ft).

Water level: Not determined; hole filled with drilling mud.

Logs and surveys:	Depth (m)
Lithology (see generalized below)	0 - 355
Temperature, Nov. 18, 1980 (max 11.6°C)	5 - 350
Gamma	3 - 355

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Generalized Lithology	Thick- ness (meters)	Depth (meters)
Colluvium; andesite, rare basalt	4	4
Epiclastic debris; andesite, basalt; subangular to rounded; soft clay matrix	13	17
Porphyritic hypersthene andesite	7	24
Epiclastic debris; andesite, basalt, clay matrix; hematite stained	6	30
Porphyritic hypersthene andesite, partly fractured and oxidized	15	45
Interflow of andesitic debris; oxidized	3	48
Porphyritic hypersthene andesite	3	51
Epiclastic debris; andesite, some basalt	2	53
Porphyritic hypersthene andesite	11	64
Epiclastic debris of basalt, andesite	8	72
Porphyritic hypersthene andesite	10	82
Basalt flow; brownish black, porphyritic	6	88
Epiclastic debris; subround to subangular andesite and basalt fragments, with some pale orange clay	107	195
Basalt flow; black, porphyritic	9	204
Epiclastic debris; andesite and basalt	30	234
Porphyritic hypersthene andesite	15	249
Epiclastic debris; hematite weathering	7	256
Basalt flow; dark gray, porphyritic	7	263
Epiclastic debris; basalt and andesite	6	269
Porphyritic hypersthene andesite	10	279
Interflow zone of debris; hematite-stained	3	282

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Generalized Lithology	Thick- ness (meters)	Depth (meters)
Basalt flow; grayish black, porphyritic, oxidized	8	290
Porphyritic hypersthene andesite; oxidized	11	301
Epiclastic debris; andesitic	32	333
Epiclastic debris; basaltic	12	345
Basalt flow; dark gray, porphyritic	3	348
Epiclastic debris; basalt, with some andesite	7	355

3S/9E-7dbb. Pucci chairlift site. Mount Hood South quadrangle (7.5').

Clackamas County, Oregon. 45°19' 18" N. 121°42'46" W. Alt. 1,628 m (5,340 ft). In 1979 drilled to 274 m (900 ft) using air-rotary method and to 610 m (2,002 ft) using mud-rotary method by Orvail Buckner Well Drilling, Redmond, Oregon. In 1980 deepened to 1,220 m (4,003 ft) using mud-rotary method by Holman Drilling Corp., Spokane, Washington; completed Oct. 1980.

Construction: 26-cm (10 1/4-in) inside diameter welded casing, surface to 61 m (200 ft); cemented to surface. 20.6-cm (8 1/8-in) inside diameter welded casing, surface to 189 m (620 ft). 15.6-cm (6 1/8-in) welded casing, surface to 438 m (1,437 ft); suspended inside 15.6-cm casing with casing hanger; packers in annulus between casing and hole at 948 m (3,110 ft), 1,030 m (3,380 ft), and 1,095 m (3,590 ft); slot perforation 1,098 m (3,600 ft). 15.2-cm (6-in) open hole from 1,107 m (3,630 ft) to 1,220 m (4,003 ft).

Water Level in casing: 573 m (1,880 ft) below land surface, Nov. 26, 1980. During drilling, water level as shallow as 80 m (260 ft), as on Sept.

TABLE 1 -- Specifications and drillers' logs of wells (continued).

20, 1979, when depth of well was 190 m (622 ft). On Dec. 3, 1979 water level approx. 215 m (700 ft), inside tubing then installed to 604 m (1,980 ft).

Logs and surveys:	Depth (m)	
Lithology (see generalized lithology, following).	0 - 1,220	
Temperature - Dec. 3, 1979	0 - 580	
- Dec. 25, 1980; not stabilized	0 - 1,052	
Television survey (videocassette), 15.6-cm casing	0 - 366	
Gyroscopic directional survey	0 - 438	
Casing profile caliper, in 15.6-cm casing	0 - 471	
Open-hole caliper	438 - 1,220	
Spontaneous potential	438 - 1,220	
Dual induction (resistivity)	438 - 1,220	
Natural gamma	438 - 1,220	
Density	438 - 1,220	
Neutron - porosity	438 - 1,220	
Acoustic velocity	438 - 1,220	
Microseismogram (fracture finder)	438 - 1,220	
	Thick- ness (meters)	Depth (meters)
Generalized Lithology		
Volcanic debris	67	67
Pyroxene andesite flow	30	97
Epiclastic volcanic deposits	6	103

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Generalized Lithology	Thick- ness (meters)	Depth (meters)
Andesite flows	31	134
Epiclastic volcanic deposits	6	140
Reddish-gray and gray pyroxene andesite flows	76	216
Epiclastic volcanic deposits, with some hydrothermal alteration	59	275
Pyroxene andesite	18	293
Epiclastic volcanic deposits, with some hydrothermal alteration	220	513
Pyroxene andesite	8	521
Epiclastic volcanic deposits	23	554
Reddish-gray to gray pyroxene andesite	9	563
Black, diktytaxitic olivine basalt	9	572
Epiclastic volcanic deposits	12	584
Pyroxene andesite	12	596
Epiclastic volcanic deposits	5	601
Hypersthene andesite	9	610
Epiclastic volcanic deposits	20	630
Hypersthene andesite	9	639
Epiclastic volcanic deposits	6	645
Pyroxene andesite	8	653
Volcanic deposits, with hematite alteration	38	691
Hypersthene andesite	6	697
Epiclastic volcanic deposits	15	712
Vesicular pyroxene andesite, partly oxidized	19	731
Epiclastic volcanic deposits	6	737

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Generalized Lithology	Thick- ness (meters)	Depth (meters)
Orange and brownish-gray altered andesite	43	780
Epiclastic volcanic deposits, highly altered, with chlorite, hematite, and limonite	22	802
Pyroxene andesite flows, hydrothermally altered	49	851
Clastic andesite deposits, altered	11	862
Reddish-brown pyroxene andesite	22	884
Andesitic deposits, hydrothermally altered	9	893
Dark, altered pyroxene andesite	19	912
Epiclastic volcanic deposits, altered	7	919
Reddish-brown andesite, with hematite alteration	12	931
Epiclastic volcanic deposits, altered	9	940
Dark, porphyritic pyroxene andesite flows, with chlorite alteration	98	1038
Epiclastic volcanic deposits, with secondary mineralization	52	1090
Proxene andesite, with gray to black chlorite alteration	9	1099
Epiclastic volcanic deposits; intensely altered lava fragments	43	1142
Grayish-brown pyroxene andesite, varying from fresh to altered	78	1220

3D/9E-16cad. White River pit site. Mount Hood South quadrangle (7.5').  
Hood River County, Oregon. 45°18'22" N. 121°40'34" W. Alt. approx.  
1,330 m (4,360 ft). Drilled to 305 m (1,002 ft) in 1979 by Harness

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Drilling Co., Tucson, Arizona, using mud-rotary method.

Construction: 17.8-cm (7-in) inside diameter welded casing surface to 71 m (232 ft). 5-cm (2-in) id tubing, surface to 288 m (945 ft), with 2-m (6-ft) well screen on end. 15.9-cm (6 1/4-in) hole from 71 m (1,002 ft).

Water level in tubing 44 m (144 ft), Aug. 13, 1980.

Logs and surveys:	Depth (m)
Temperature, Nov. 21, 1980 (max 15.8°C)	0 - 290
Gamma	2 - 290

Lithology - Preliminary examination shows that to total depth of 305 m (1,002 ft), formation consists of volcanoclastic debris, dominated by fragments derived from Mount Hood andesite flows.

3S/9E-30adb. Highway 26 & 35 junction site. Mount Hood South quadrangle (7.5'). Clackamas County, Oregon. 45°16'56" N. 121°42'35" W. Alt. 1,107 m (6,630 ft). Drilled to 35 m (114 ft) by Orvail Buckner Well Drilling, Redmond, Oregon, using air-rotary method, and to 294 m (965 ft) by Harness Drilling Co., Tucson, Arizona, using mud-rotary method; completed Sept. 1980.

Construction: 31-cm (12-in) id welded casing, surface to 35 m (114 ft). 20.6-cm (8 1/8-in) welded casing, surface to 66 m (216 ft). 5-cm (2-in) id tubing, surface to 291 m (955 ft), with 2-m (6-ft) well screen on end. 25-cm (9 7/8-in) hole, 68 m (223 ft) to 107 m (350 ft); 20.0-cm (7 7/8-in) hole to 294 m (965 ft).

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Water level in tubing: Approx. 25 m (82 ft) below land surface, Nov. 1980.

Logs and surveys:	Depth (m)	
Lithology (see preliminary description below)	0 - 294	
Temperature, Nov. 20, 1980 (max 15.5°C)	5 - 288	
Caliper	68 - 293	
Gamma	3 - 293	
Spontaneous potential-resistivity (single point)	66 - 293	
Preliminary description of lithology	Thick-ness (meters)	Depth (meters)

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Alluvial deposits of andesitic volcanic debris	69	69
Volcanic debris; dark andesitic fragments, basaltic fragments, ash	73	142
Vesicular basalt	3	145
Olivine basalt	35	180
Volcanic debris; dark andesitic fragments, basaltic fragments, ash, clays	114	294

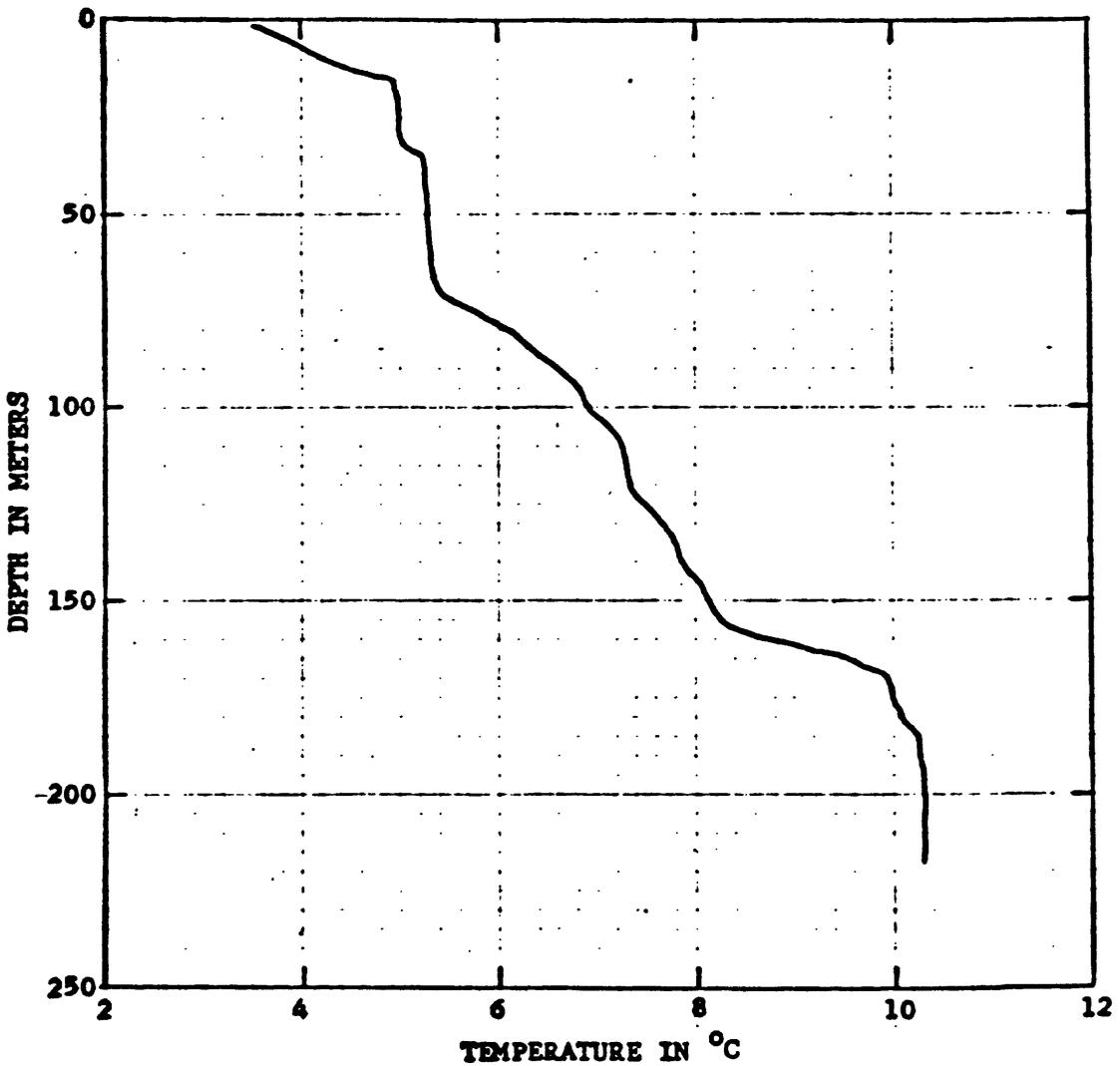


FIGURE 3 -- Graph of temperature measurements in well 1S/9E-26aba.

Elliot Branch site, Mt. Hood area, Oregon.  $45^{\circ}27'35''$  N.  $121^{\circ}37'58''$  W.  
 Altitude 860 meters (2,820 feet). Temperature measurements  
 November 22, 1980 by J. Robison & J. Blevins.

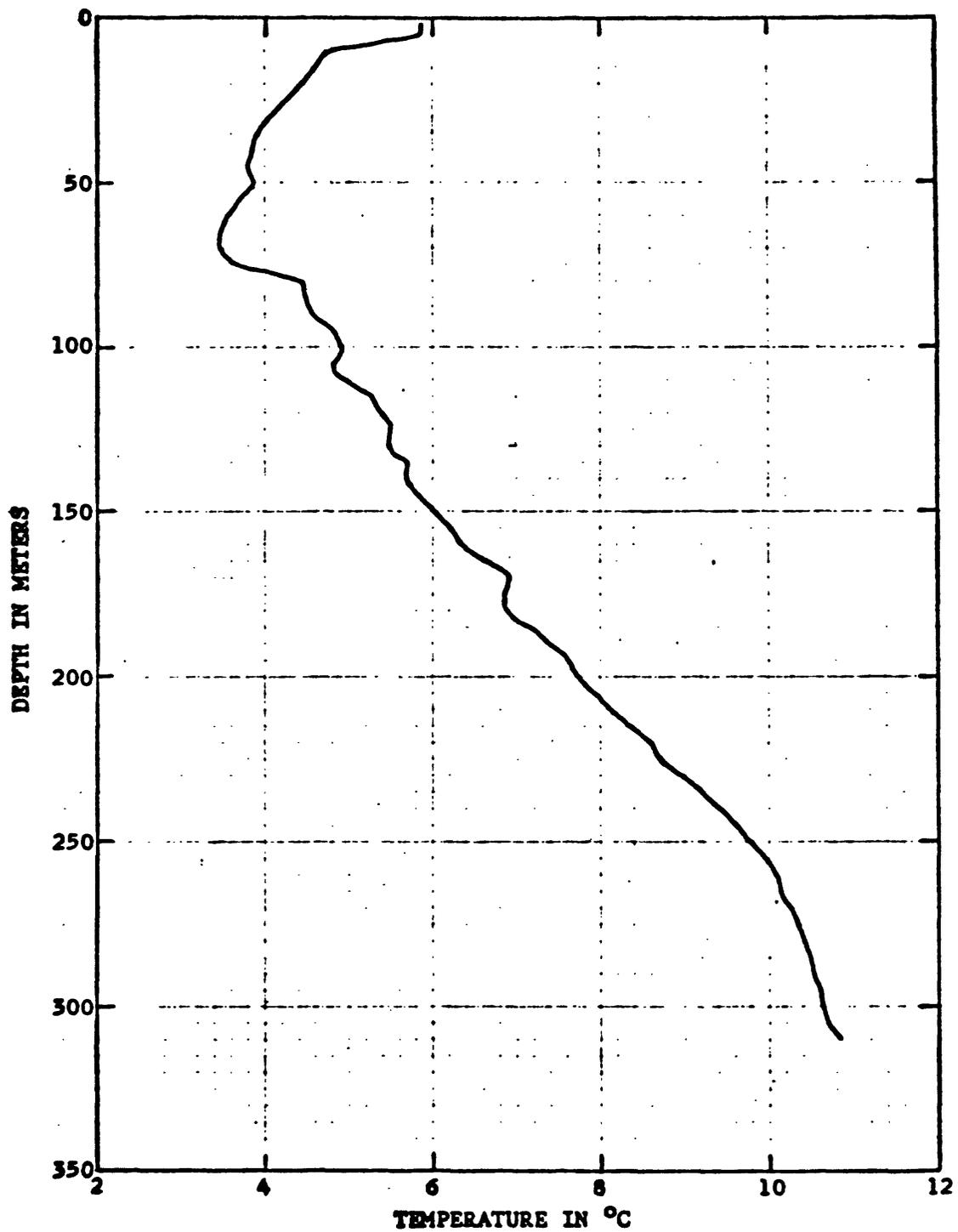


FIGURE 4 -- Graph of temperature measurements in well 1S/9E-31aca.

Clear Branch site, Mt. Hood area, Oregon.  $45^{\circ}26'30''$  N.  $121^{\circ}42'57''$  W.  
 Altitude approximately 1,250 meters (4,100 feet). Temperature  
 measurements November 19, 1980 by J. Robison & J. Blevins.

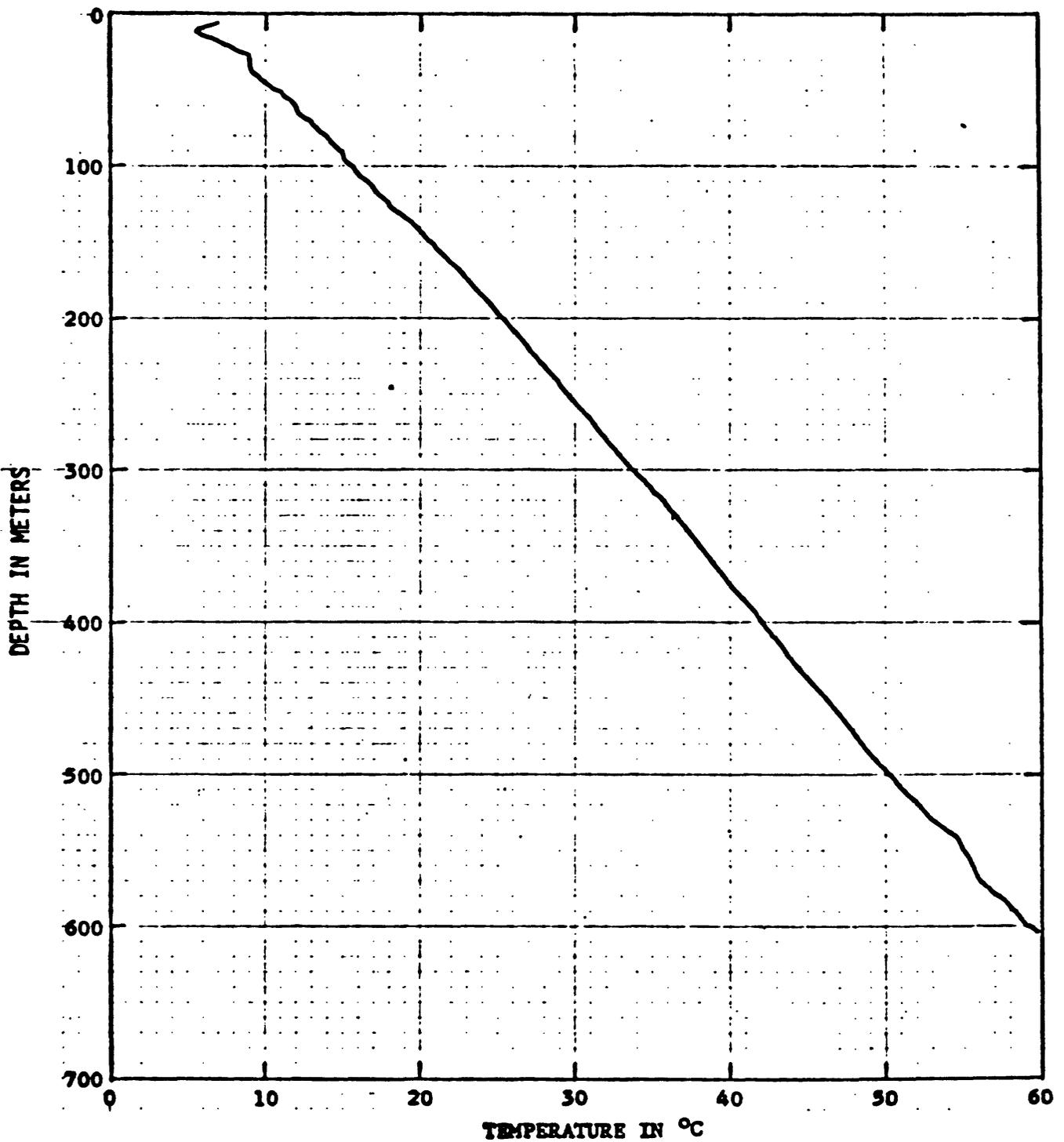


FIGURE 5 -- Graph of temperature measurements in well 2S/8E-1cdd.

McGee Creek site, Mt. Hood area, Oregon. 45°28'08" N. 121°46'08" W.  
 Altitude 915 meters (3,000 feet). Temperature measurements August 12,  
 1980 by R. Spafford, Southern Methodist University.

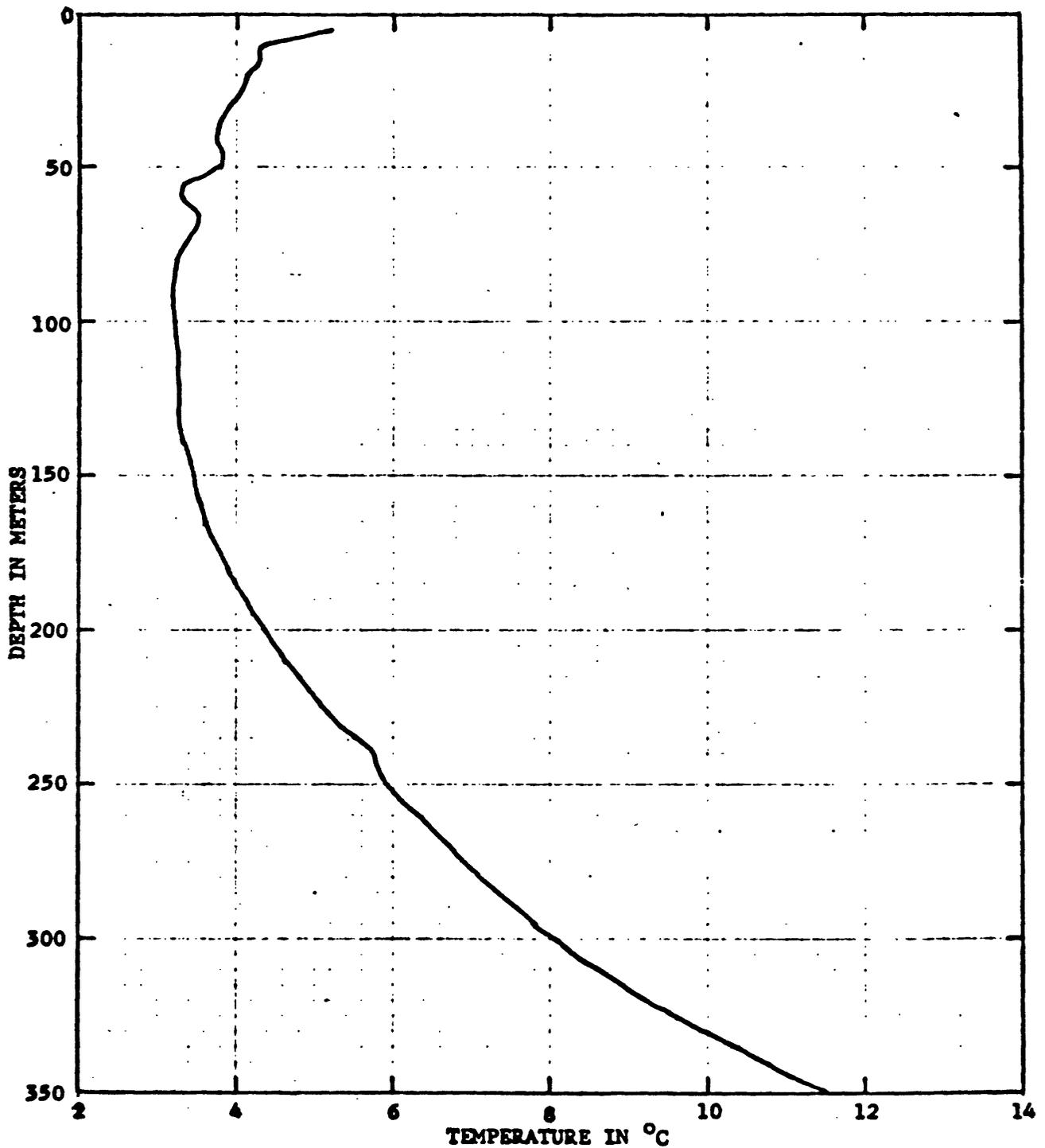


FIGURE 6 -- Graph of temperature measurements in well 3S/9E-3cca.

Mt. Hood Meadows site, Mt. Hood area, Oregon.  $45^{\circ}20'00''$  N.  
 $121^{\circ}39'36''$  W. Altitude approximately 1,665 meters (5,460 feet).  
 Temperature measurements November 18, 1980 by J. Robison & J. Blevins.

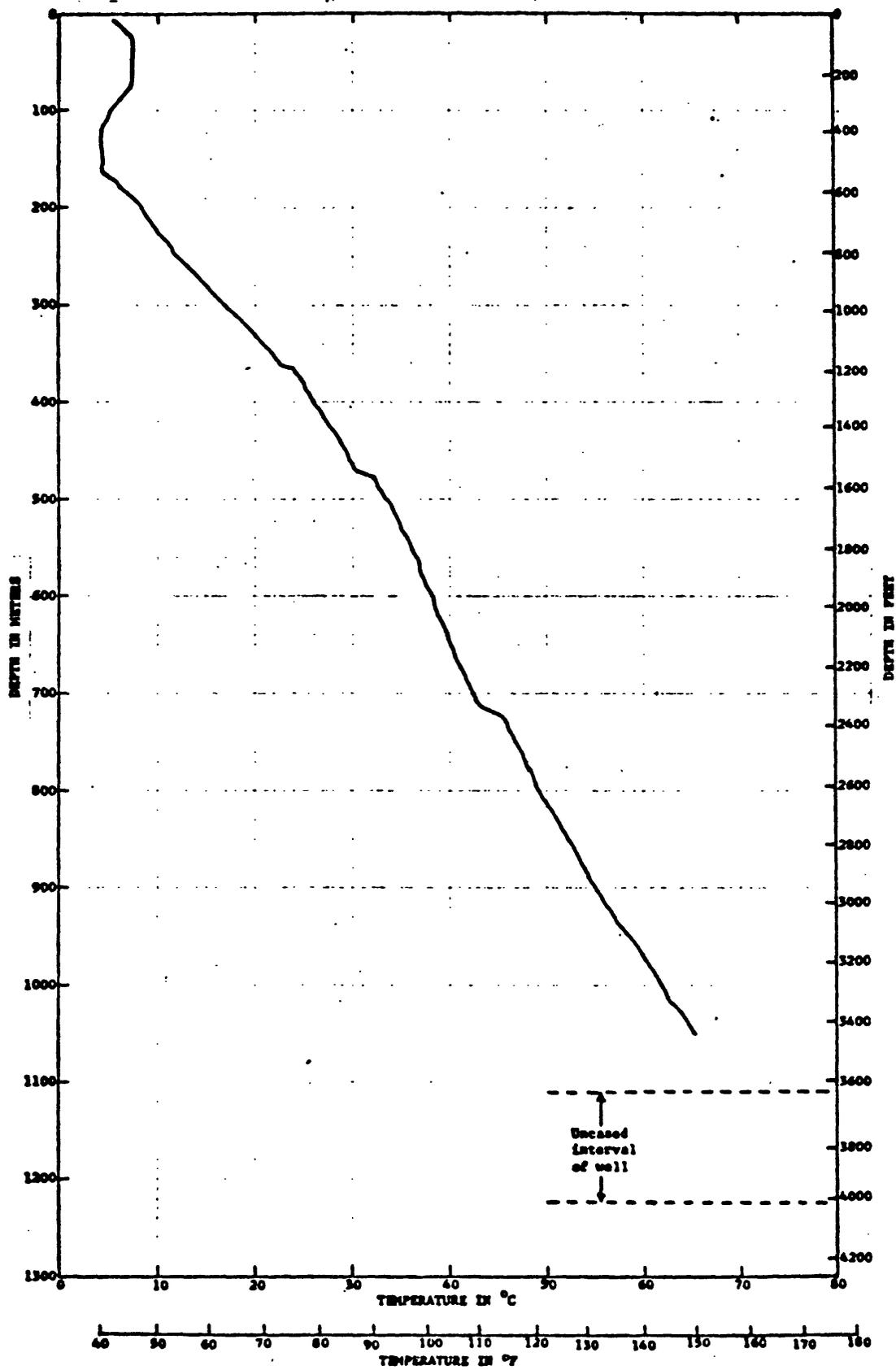


FIGURE 7 -- Graph of temperature measurements in well 35/9E-76bb.

Pucci chairlift site, Mt. Hood area, Oregon.  $45^{\circ}19'18''$  N.  $121^{\circ}42'46''$  W.  
 Altitude 1,628 meters (5,340 feet). Temperature measurements October 25, 1980  
 by G. Black, Oregon Department Geology and Mineral Industries.

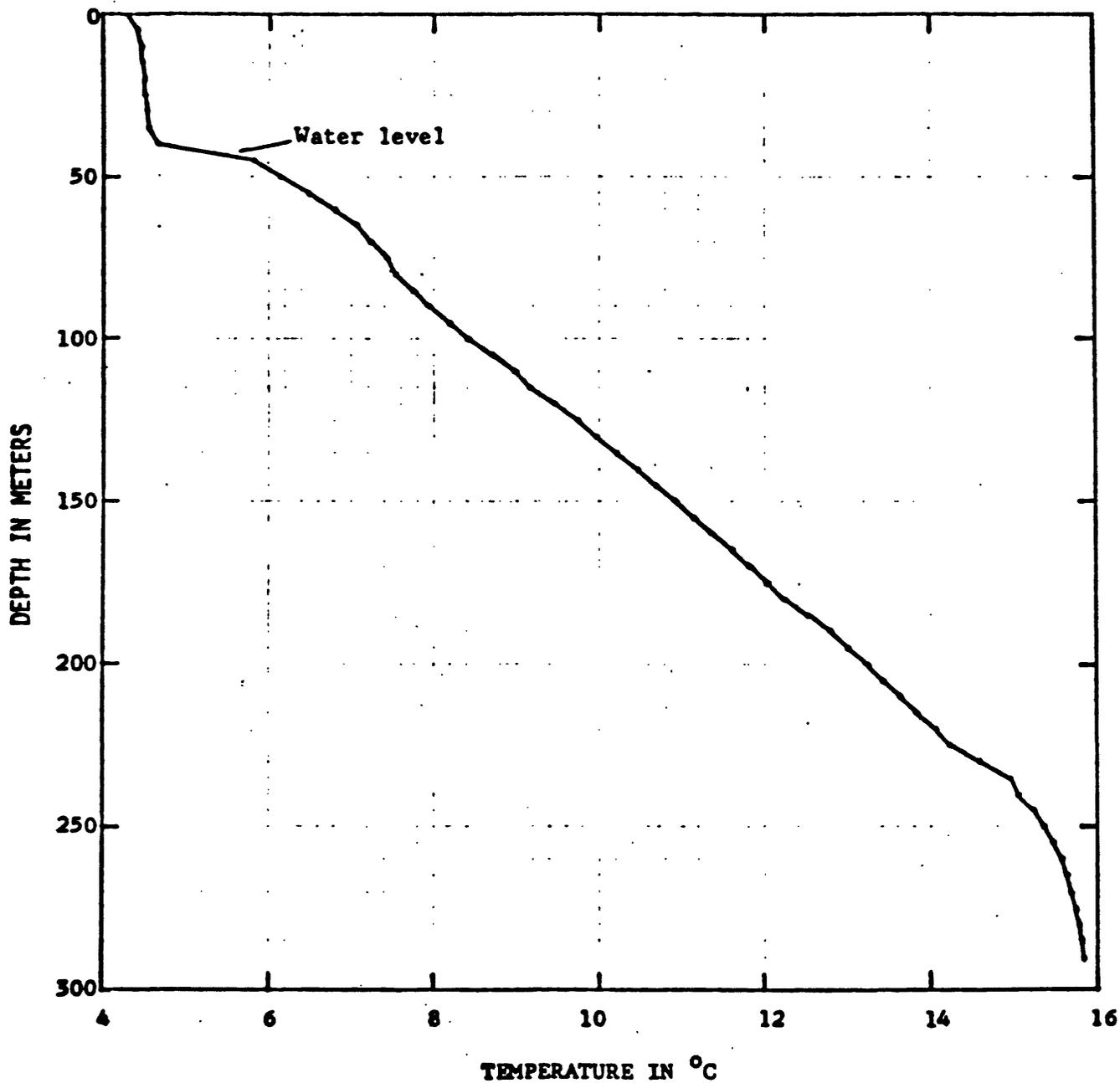


FIGURE 8 -- Graph of temperature measurements in well 3S/9E-16cad.

White River pit site, Mt. Hood area, Oregon. 45°18'22" N.  
 121°40'34" W. Altitude approximately 1,330 meters (4,360 feet).  
 Temperature measurements November 21, 1980 by J. Robison & J. Blevins.

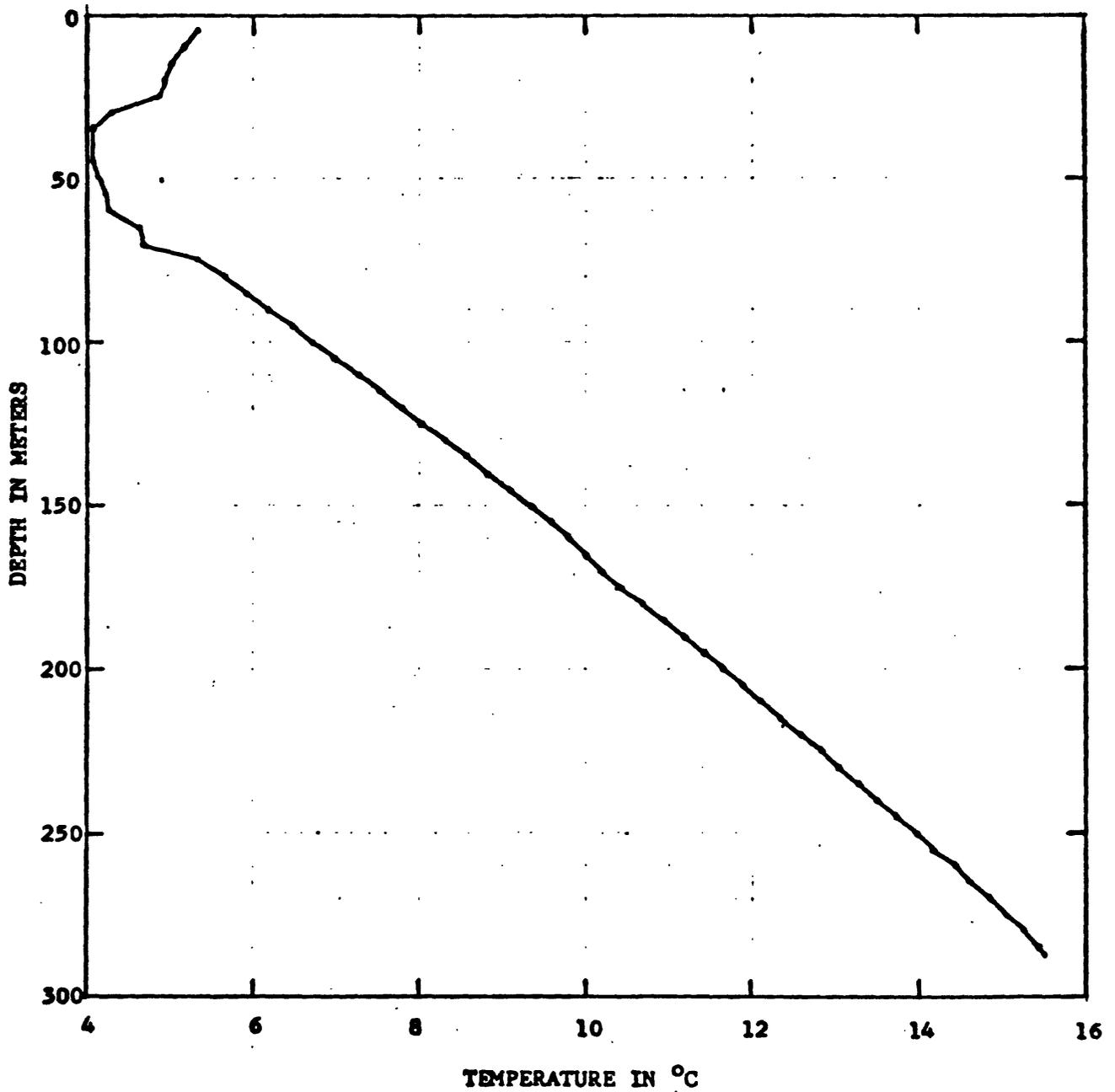


FIGURE 9 -- Graph of temperature measurements in well 3S/9E-30adb.

Highway 26 & 35 junction site, Mt. Hood area, Oregon.

45°16'56" N. 121°42'35" W. Altitude 1,107 meters (3,630 feet).

Temperature measurements November 20, 1980 by J. Robison & J. Blevins.