GL 04926_3 Geothermex Dev.

GeothermEx 901 MENDOCINO AVE. BERKELEY, CA. 94707

JAMES B. KOENIG (415) 524-9242
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21 January, 1977

Mr. Ron Barr, President
Earth Power Group
P.O.Box 1566
Tulsa, OK 74101

Dr. Dean Pilkington
AMAX Exploration, Inc.
4704 Harlan Street
Denver, CO 80212

Dear Dean and Ron:

Enclosed are the temperature gradient survey records for the Bully Creek area, holes 15, 28, 29, 21, and 25 and for the North Vale area, holes 77-1 and 77-2. I have noted the gross lithology on the records for the convenience of Dean making preliminary heat flow estimations. I have also enclosed with Dean's material the daily driller's time charges with my approvals and indications of any disagreements.

The 5 additional holes drilled at Bully Creek in 1977 clearly confirmed the anomaly we had described after the December, 1976 drilling, as well as confirming southern limits of the anomaly. The data from holes 15 and 29 are indicative of high temperatures at reasonably shallow depths, less than 2 kilometers. The gradient of about 130°C/km at 29 is equivalent to greater than 6 HFU and the gradient at 15 of about 90°C/km is equivalent to about 6-HFU if K of 5 is used for the rocks at 29 and K of 6+ is used for the basalt at 15. However, these average and approximate HFU values should await verification by petrographic and/or thermal conductivity studies of the cuttings. I am shipping the cuttings from all holes to AMAX unless instructed otherwise during discussions with the recipients of this letter.

There does not appear any way in which the data from hole 28 can be reconciled with lithology to avoid a sharp termination of the anomaly towards the northeast. The temperature data from holes 21 and 25 also terminate the anomaly, toward the southwest. This was expected. The Chevron holes in T. 18 S. had low dTs and we anticipated a northwest trending anomaly.

The information obtained from the 2 holes drilled at the southwestern part of the North Vale-Stringer/Jackson property provided a pleasant surprise. While we cannot ignore the possibility that we are merely observing the near-surface effects of a shallow warm water flow, we should obtain more data to verify or dismiss the apparent strong anomaly.

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Hole 77-2 has dT of more than 220°C/km in the lower part of the hole. Even if a mean K of 3 is used, more than 6 HFU obtain. It appears most important to examine the property northward from the holes at 77-1 and 77-2. I recommend that 3 new holes be sited in T. 16 S., R. 44 E., S. 26, 27, 28 and 34. An additional hole or holes may be planned elsewhere, depending upon the outcome of drilling and data collection in the initial holes. I have attached an overlay map with recommended new hole locations. Mr. Jackson (Sr.),whom I met in the field on 17 January, indicated that access would be possible for a drill if there was no additional significant snow or rain.

Please consider the program for adoption during the present dry winter or the warmer spring months. Leonard Justice, operating out of Meridian, Idaho,probably has the lowest mobilization charge. Ron would have figures for Justice's charges. On the other hand, you may want to schedule the work coincident with other planned activities at the western part of the Bully Creek property. In any case, GeothermEx would be available to supervise the operation and perform technical services should you require our assistance.

I will telephone to each of you on 26 January, after you have had time to consider the information herein, to answer questions and discuss any points you may raise. Please telephone to me at Ashland if you want to contact me before that date. I will be completing the Bully Creek report at my office.

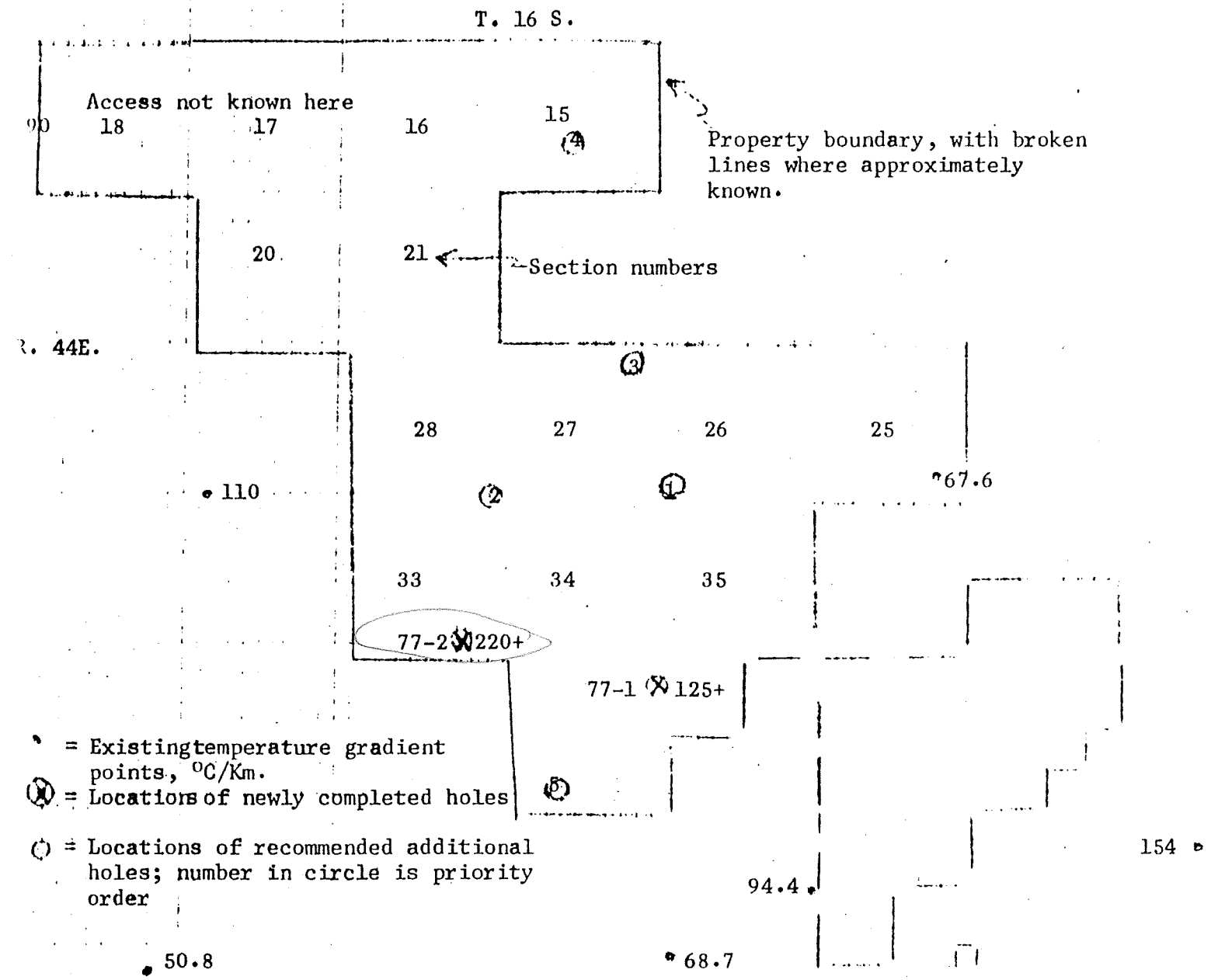
Yours truly,

Murray C. Gardner

MCG:m

Enclosures

cc: J. B. Koenig



Map of the North Vale-Stringer/Jackson property showing existing temperature gradient information and locations of recommended additional temperature gradient holes.

TEMPERATURE - DEPTH LOG

Location SOUTH SIDE OF ROAD, AT CANYON ENTRANCE Date 16 JAN 77 / 10 JAN 77

Map BROGAN, OR., 15 MIN

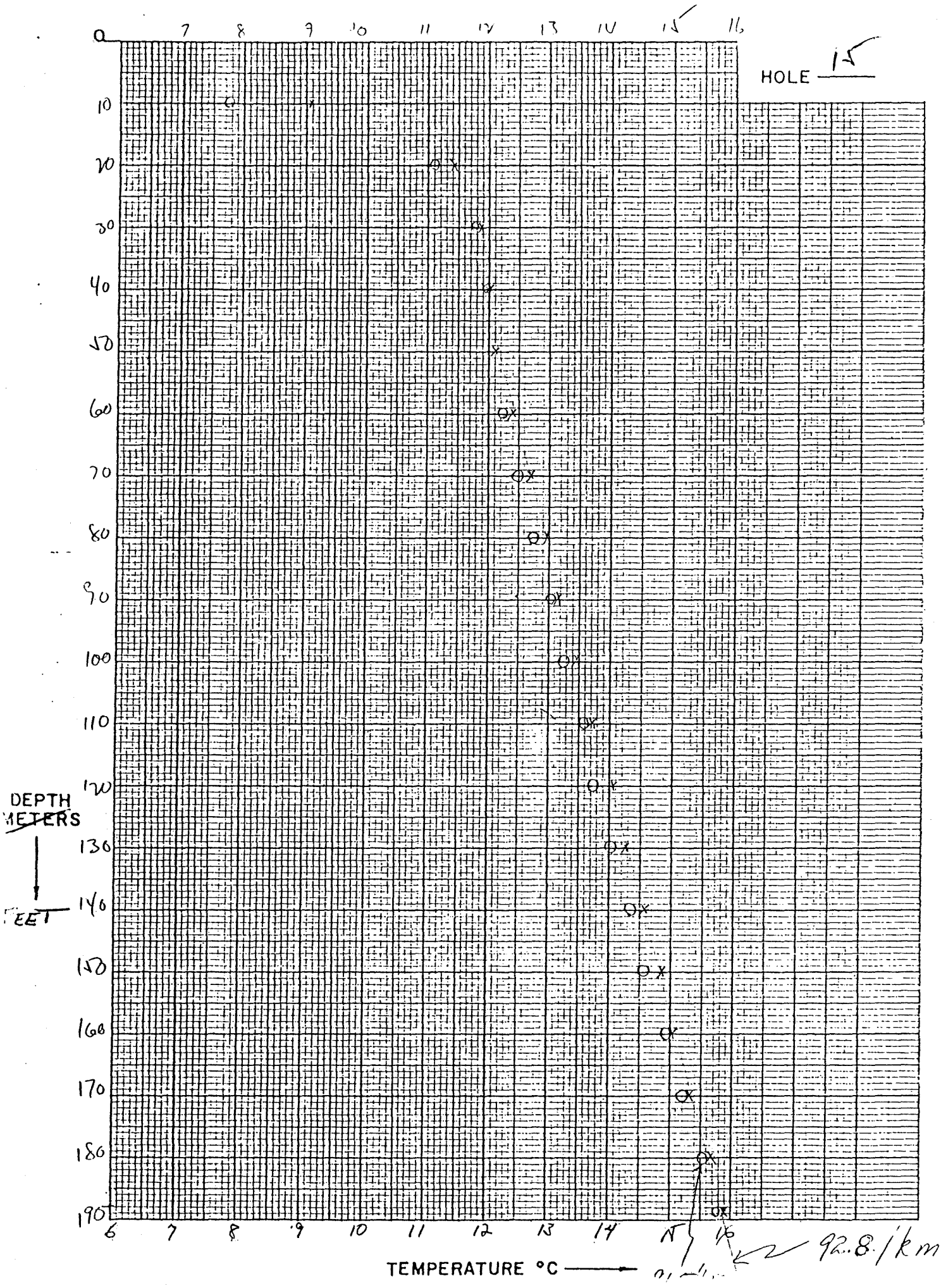
Property BULLY CREEK T 17S R 4½ E sec NE4, 24

Drill Hole 15 Date Drilled 8 JAN 77 Elevation 3,500 ft.

Instrument ENVIRO LABS Operator GARDNER, GARDNER

Comments

Depth (~~meters~~) feet	Instr. Reading	Temp. °C	ΔT	Gradient °C/Km Avg.	Comments
10		7.75 9.07	3.37 2.36		
20		11.12 11.43	.67 .44		BASALT TO BOTTOM ↓
30		11.79 11.87	.19 .13		
40		11.98 12.00	.10		2+ GPM, H_2O FLOW ↓
50		MISSED 12.10	.30		
60		12.24 12.40	.26 .30		
70		12.50 12.70	.25 .25		
80		12.75 12.95	.26 .20		
90		13.01 13.15	.25 .30		
100		13.26 13.45	.30 .25		
110		13.56 13.70	.17 .35		
120		13.73 14.05	.23 .23		3+ GPM, H_2O FLOW ↓
130		14.05 14.28	.26 .30		
140		14.32 14.58	.23 .24		
150		14.55 14.82	.40 .20		
160		14.95 15.02	.25 .28		
170		15.20 15.30	.34 .38		STRONG, ↓ GPM, FLOW
180		15.54 15.68	.25/10 .25/10'		OF H_2O, + INCREASING
188'		15.76 15.90		1ST 92.8°/km Run 90'→190' ↓ 2d Run 91.5°/km	


HOLE 15
DEPTH METERS
FEET
TEMPERATURE °C
92.8 /km

TEMPERATURE - DEPTH LOG

16 JAN 77

Location SADDLE AT CURVE IN ROAD Date 10 JAN 77

Map JAMIESON, OR, 15 MIN

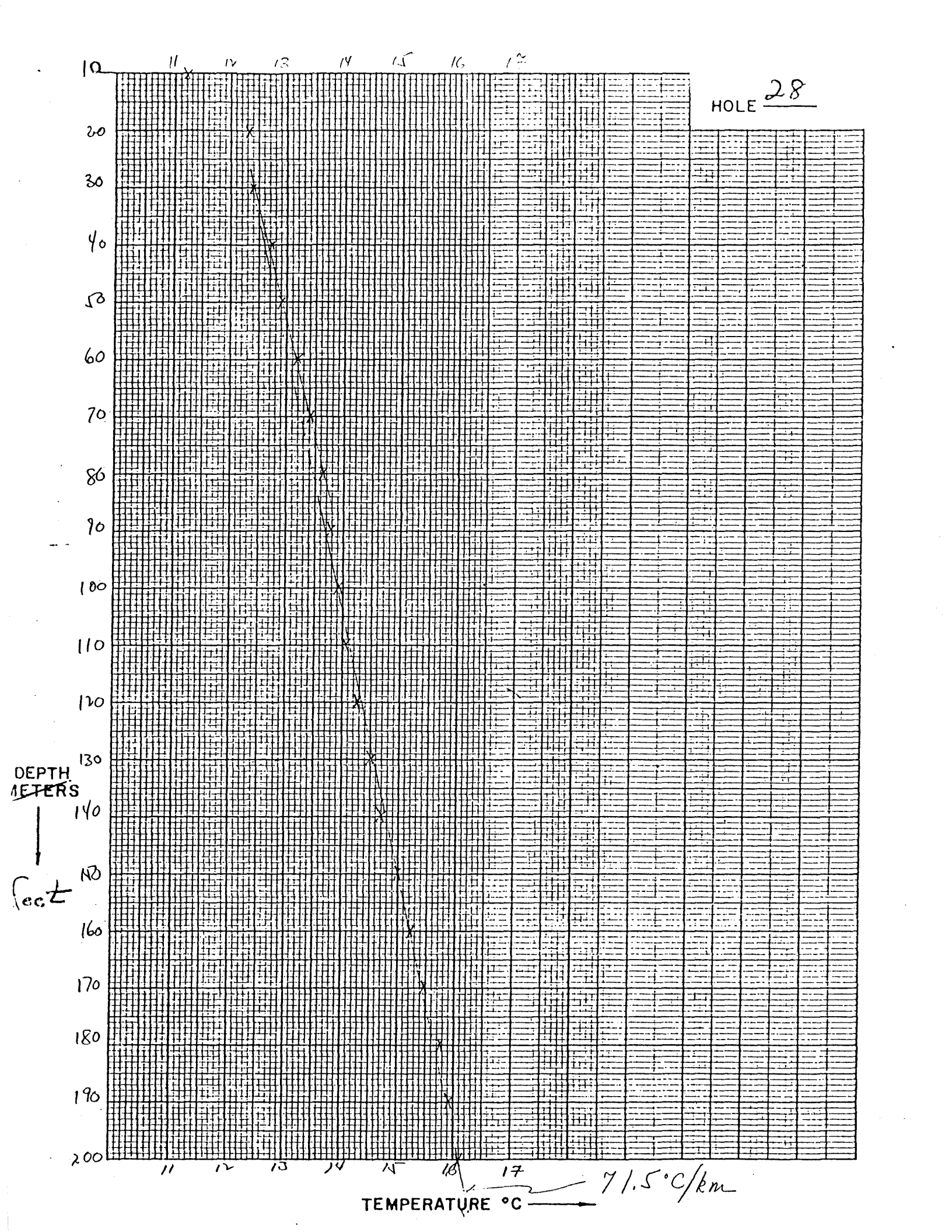
Property BULL CREEK T 17S R 43E sec NW 4 29

Drill Hole 28 Date Drilled 9 JAN 77 Elevation 3,420 ft.

Instrument ENVIRO LABS Operator GARDNER, GARDNER

Comments

Depth (~~meters~~) feet	Instr. Reading	Temp. °C	ΔT	Gradient °C/Km Avg.	Comments
10		8.30 11.70	3.65		HOLE IS DRY
20		11.95 12.35	1.16 .16		
30		12.11 12.40	.05 .29		Medium-grain gray tuffaceous
40		12.40 12.72	.32 .40		sandstone ↓
50		12.80 12.91	.19 .22		
60		13.02 13.20	.29 .24		
70		13.26 13.41	.21 .18		
80		13.44 13.61	.20 .20		
90		13.64 13.78	.17 .22		some basalt frags in ss
100		13.86 13.91	.13 .26		
110		14.12 14.06	.15 .18		
120		14.30 14.27	.21 .22		
130		14.52 14.50	.23 .18		some basalt frags in ss
140		14.70 14.70	.26 .31		
150		14.01 14.98	.28 .21		
160		15.22 15.22	.24 .20		silt in ss
170		15.42 15.46	.24 .22		silt, clay, chert in ss
180		15.64 15.73	.27 .30		
190		15.94 15.91	.18 .18		break at 197' to a dark
200		16.12 16.09	.18 .19		gray vitric tuffac. ss
210		16.31 16.20	.11	1st Run: 71.5 °C/km, 100	
215		16.50			-m depths


HOLE 28
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
DEPTH METERS
feet
11
12
13
14
15
16
17
18
TEMPERATURE °C
71.5°C/km

TEMPERATURE - DEPTH LOG

13 JAN 77

Location DUE EAST OF JUNCTION ~1.5 MI. ST FLAG Date 11 JAN 77

Map JAMIESON OR, 15 MIN

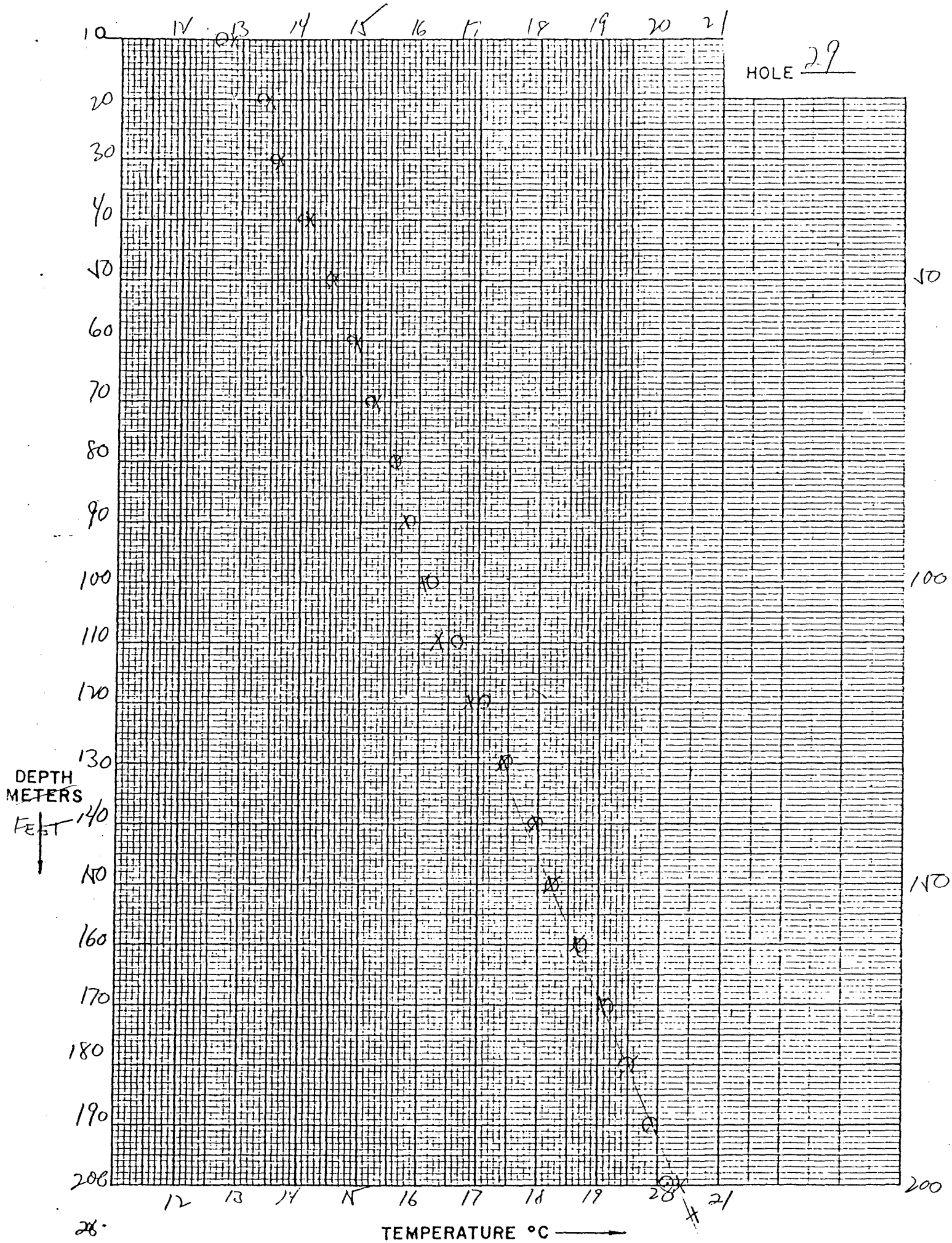
Property BULLY CREEK T 17S R 43E sec SE 4, 32

Drill Hole 29 Date Drilled 10 JAN 77 Elevation 3,180 ft.

Instrument ENVIRO LABS Operator GARDNER, GARDNER

Comments

Depth (~~meters~~) feet	Instr. Reading	Temp. °C	ΔT	Gradient °C/Km Avg.	Comments
10		12.62 12.84	.71		
20		13.33 13.42	.48 .23		
30		13.56 13.61	.20 .45		Tan-brown med-grain
40		14.01 14.11	.40 .46		Tuffaceous sandstone +
50		14.47 14.51	.40 .37		silty clay
60		14.84 14.93	.42 .30		
70		15.14 15.26	.33 .46		
80		15.60 15.59	.20 .27		
90		15.87 15.79	.33 .41		
100		16.28 16.09	.20 .34		20% dark gray vitreous
110		16.62 16.39	.30 .48		basalt
120		17.10 16.89	.20 .37		Variegated ss, claystone,
130		17.47 17.41	.72 .45		tuff
140		17.92 17.95	.54 .37		to 20% basalt
150		18.29 18.21	.26 .42		
160		18.71 18.64	.43 .41		
170		19.12 19.06	.42 .37		
180		19.49 19.42	.46 .34	138.7°c/km,* 100-200', 1ST RUN	
190		19.83 19.91	.39 .36	128.3°c/km 100-200', 2nd run	at 195', dark gray sandstone
200		20.19 20.32	.41 ~.40/10		* Computed, 141° from-
206 TD		20.41 20.55	~.40/10		graph


HOLE 29
DEPTH METERS
FEET
TEMPERATURE °C
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
12
13
14
15
16
17
18
19
20
21

TEMPERATURE - DEPTH LOG

Location BASE OF SLOPE, N SIDE OF COTTONWOOD CRK Date 13 JAN 77 16 JAN 77

Map BROGAN, OR., 15 MIN

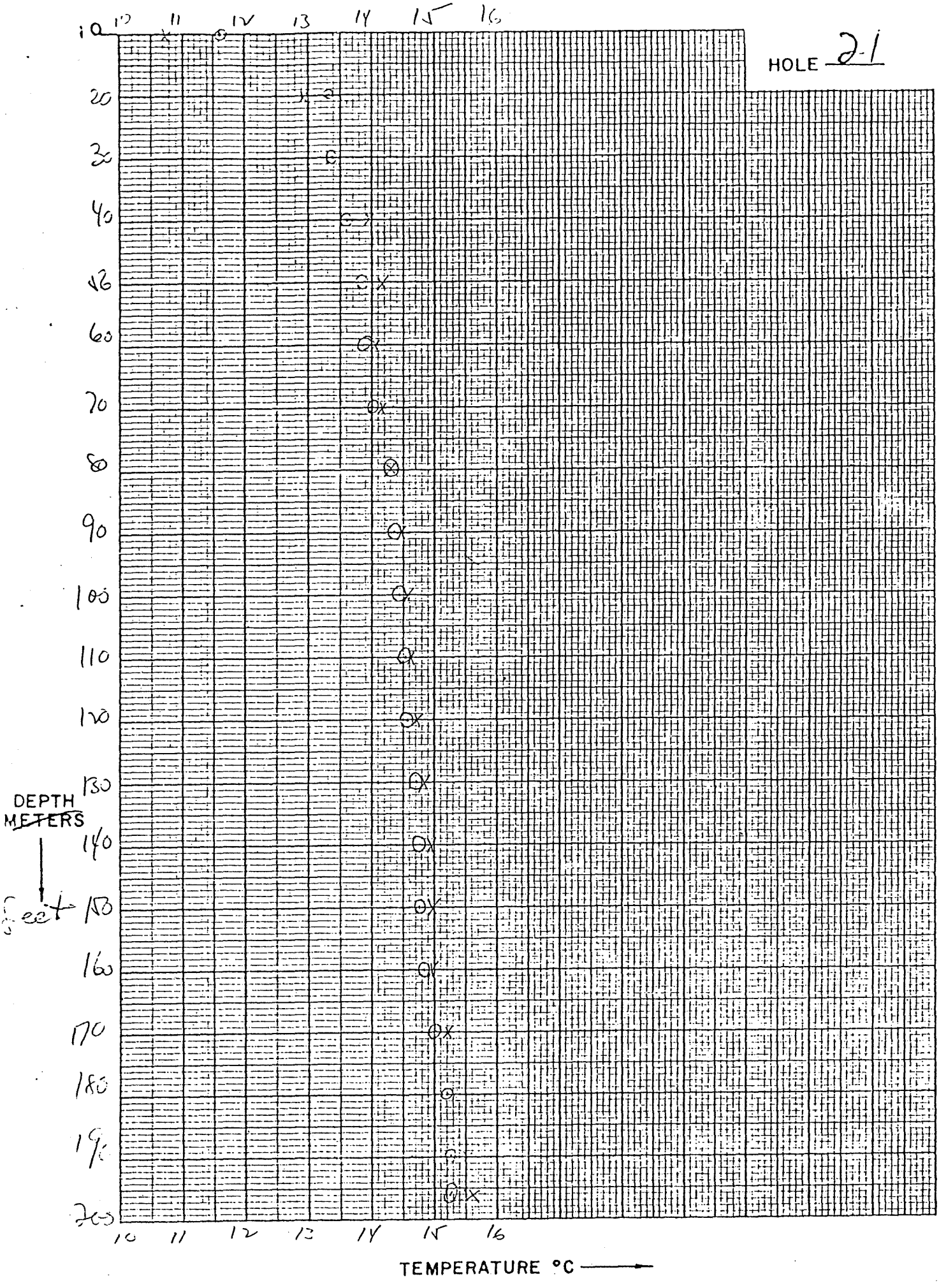
Property BULLY CREEK T 18 S R 42 E sec SE 4, 2

Drill Hole 21 Date Drilled 12 JAN 77 Elevation 2980 ft.

Instrument ENVIRO LABS Operator GARDNER, GARVER

Comments

Depth (~~meters~~) FEET	Instr. Reading	Temp. °C	ΔT	Gradient °C/Km Avg.	Comments
10		11.62 10.75	1.70		
20		13.32 12.95	2.20 .03		
30		13.35 MISSED	— .35		Tan tuffaceous siltstone;
40		13.60 13.94	— .25		brown silty clay ↓
50		13.85 14.15	+ .21 + .04		
60		13.89 14.05	— .10 + .11		
70		14.00 14.08	+ .03 .30		some chert
80		14.30 14.30	.22 .06		
90		14.36 14.44	.14 .07		
100		14.43 14.54	.10 .09		Gray tuffaceous siltstone,
110		14.52 14.59	.05 .06		black claystone
120		14.58 14.71	.12 .12		
130		14.70 14.82	.11 + .06		
140		14.76 14.94	.12 — .01		
150		14.75 14.97	.03 + 0.8		some chert
160		14.83 14.94	.01 .19		
170		14.92 15.22	.28 .11		
180		15.13 15.34	.18 .12		Some dark gray fine grained
190		15.25 15.54	.20 —		tuffaceous sandstone
198 TD casing		15.25 15.65	.29/10'	37.7°C/km 100'-200' depth, 1st	STRONG FLOW WATER,
200 T.D. Hole					>4 gpm @ 198'


HOLE 2-1
10 11 12 13 14 15 16
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
DEPTH METERS
feet
10 11 12 13 14 15 16
TEMPERATURE °C

TEMPERATURE - DEPTH LOG

Location CROSSROADS, NW CORNER Date 14 JAN 77

Map BROGAN, OR, NW.N

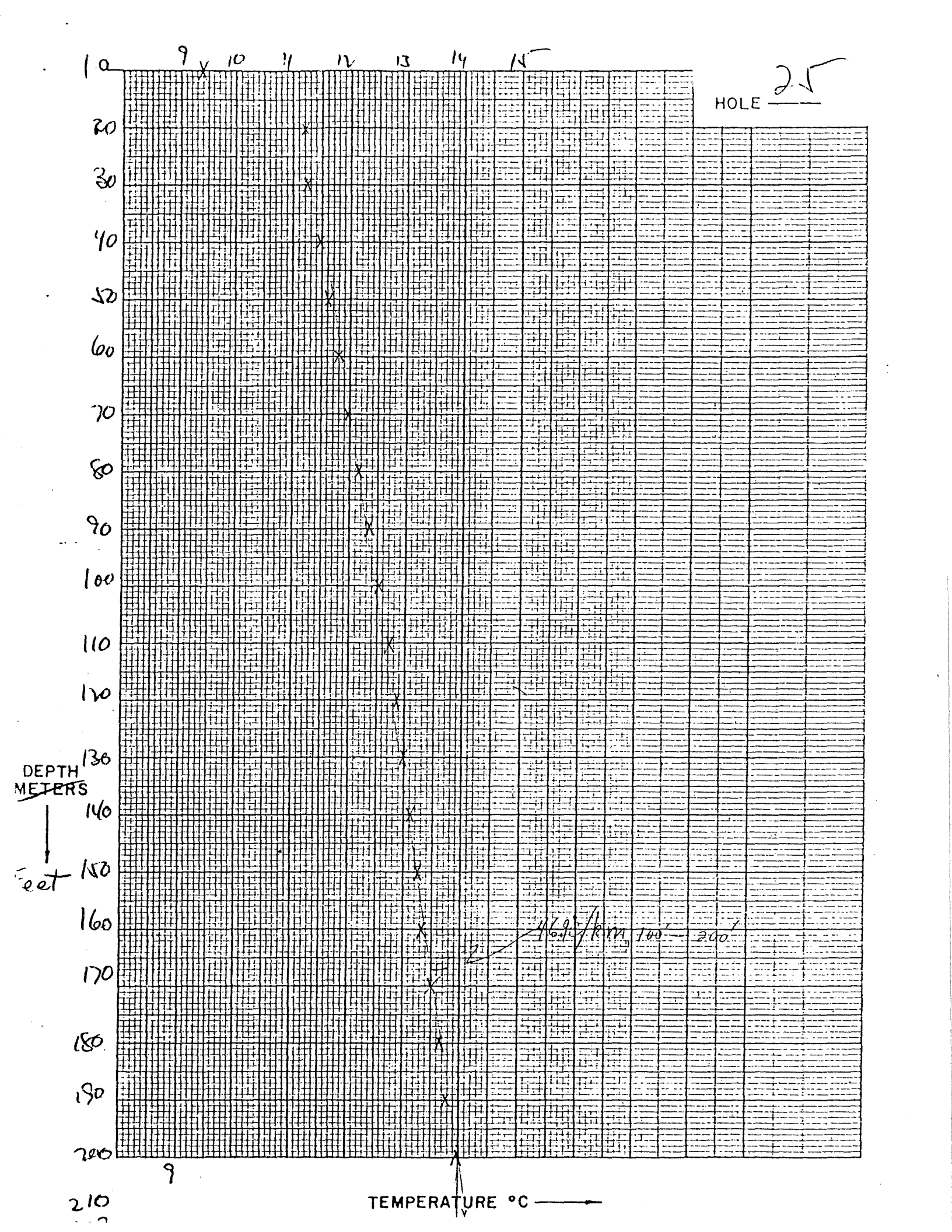
Property BULLY CREEK T 18S R 4½E sec SW 4, 12

Drill Hole 2V Date Drilled 13 JAN 77 Elevation 3,100 ft.

Instrument ENVIROTECH Operator GARDNER

Comments ONE MEASUREMENT ONLY

Depth (~~meters~~) FEET	Instr. Reading	Temp. °C	ΔT	Gradient °C/Km Avg.	Comments
10		9.40			
20		11.10	1.70		Variegated pink, tan tuffaceous silt loam, to ss
30		11.15	0.05		
40		11.48	0.13		
50		11.62	0.14		
60		11.80	0.18		
70		11.97	0.17		
80		12.18	0.21		
90		12.33	0.15		Tan, med gran. tuff. ss, oxidat
100		12.54	0.21		Dk gray, hard, tuffaceous silt loam - ss ↓
110		12.72	0.18		
~~120~~		12.85	0.13		
130		12.98	0.13		
140		13.10	0.12		
150		13.23	0.13		
160		13.32	0.09		
170		13.48	0.16		
180		13.64	0.16		
190		13.76	0.12		
200		13.97	0.21	46.9°C/km	
210		14.11	0.14	100'-200' depth.	
219		14.22	0.11/10		


HOLE 25
9
10
11
12
13
14
15
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
DEPTH METERS
Feet
46.9 j/km 100' — 200'
9
TEMPERATURE °C

TEMPERATURE - DEPTH LOG

Location S side of trail, in saddle Date 17 JAN 77

Map JAMIESON, OR, 15 MIN

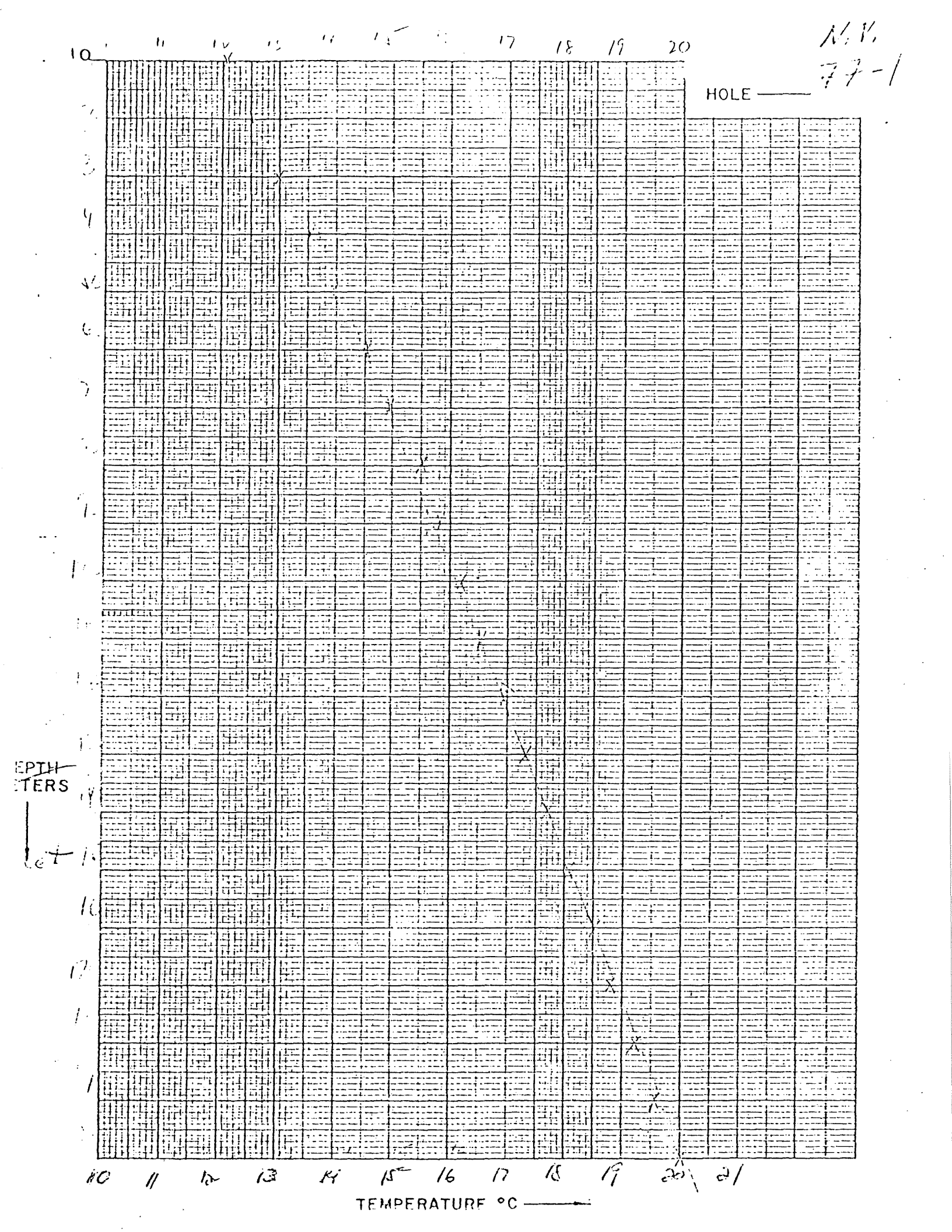
Property NORTH VALE - {JACKSON / STRINGER} T 17S R 44E sec NE 4, 3

Drill Hole 77-1 Date Drilled 15 JAN 77 Elevation 2400 ft.

Instrument ENVIROLABS Operator G. DAEK

Comments

Depth (~~meters~~) Feet	Instr. Reading	Temp. °C	ΔT	Gradient °C/Km	Avg.	Comments
10		12.05				HOLE DRY TO T.D.
20		12.52	0.47			Buff to pinkish tan med. fine
30		13.00	.48			grain tuffaceous sandstone ↓
40		13.53	.53			
50		13.94	.41			
60		14.55	.61			
70		14.98	.43			
80		15.51	.53			Change at ~86' to med. gray
90		15.87	.36			sticky tuffaceous silty
100		16.20	.33			claystone - swells + slicks
110		16.55	.35			
120		16.91	.36			
130		17.30	.39			
140		17.70	.40			
150		18.06	.36			
160		18.51	.42			
170		18.81	.30			
180		19.20	.39			
190		19.58	.38	120 °C/Km,		
200		20.02	.44	110-200'; 130 °C/Km		
204		20.14	.36/10	1'-200'.		


HOLE
TEMPERATURE °C

TEMPERATURE - DEPTH LOG

Location N OF FENCE LINE Date 17 JAN 77

Map JAMIESON, OR. 15 MIN

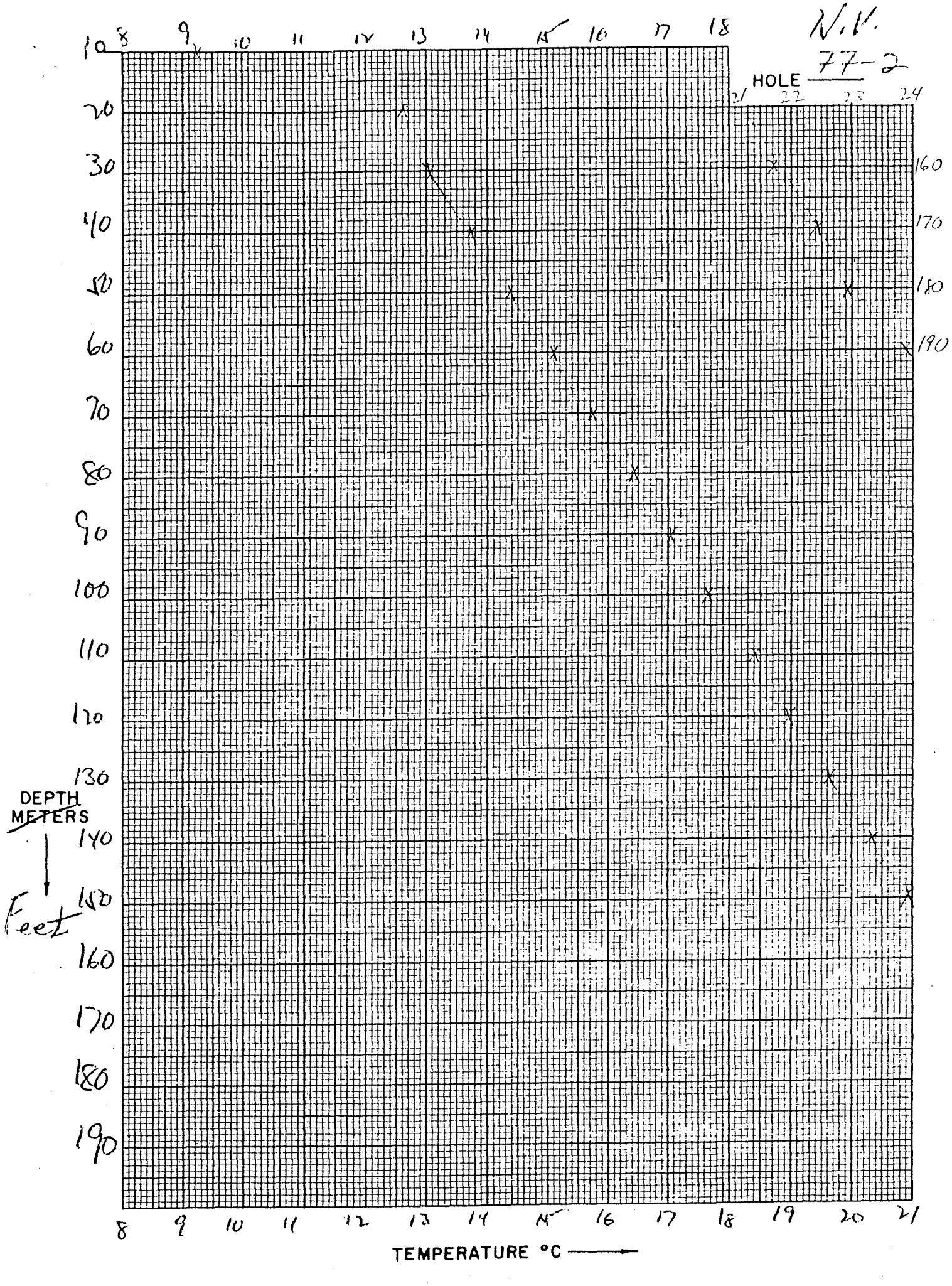
Property NORTH VALLEY (JACKSON STRINGER) T 16S R 44E sec SE 4 33

Drill Hole 77-2 Date Drilled 15 JAN 77 Elevation 2400 ft.

Instrument ENVIRO LAB Operator GARDNER

Comments

Depth (Feet) (meters)	Instr. Reading	Temp. °C	ΔT	Gradient °C/Km Avg.	Comments
10		9.25			
20		12.65	3.40		
30		13.07	.42		
40		13.74	.67		medium gra, tuffaceous silt-claystone ↓
50		14.39	.65		
60		14.11	.72		
70		15.77	.66		
80		16.48	.65		>2 gpm water entering hole
90		17.06	.64		
100		17.66	.60		
110		18.40	.74		
120		18.99	.59		increase, water
130		19.64	.65		
140		20.34	.70		
150		20.52	.18		
160		21.71	.79		
170		22.45	.74		
180		22.91	.46		
190		23.89	.98		
200					


N.V.
77-2
HOLE
8 9 10 11 12 13 14 15 16 17 18
21 22 23 24
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190
160 170 180 190
DEPTH
METERS
Feet
8 9 10 11 12 13 14 15 16 17 18 19 20 21
TEMPERATURE °C