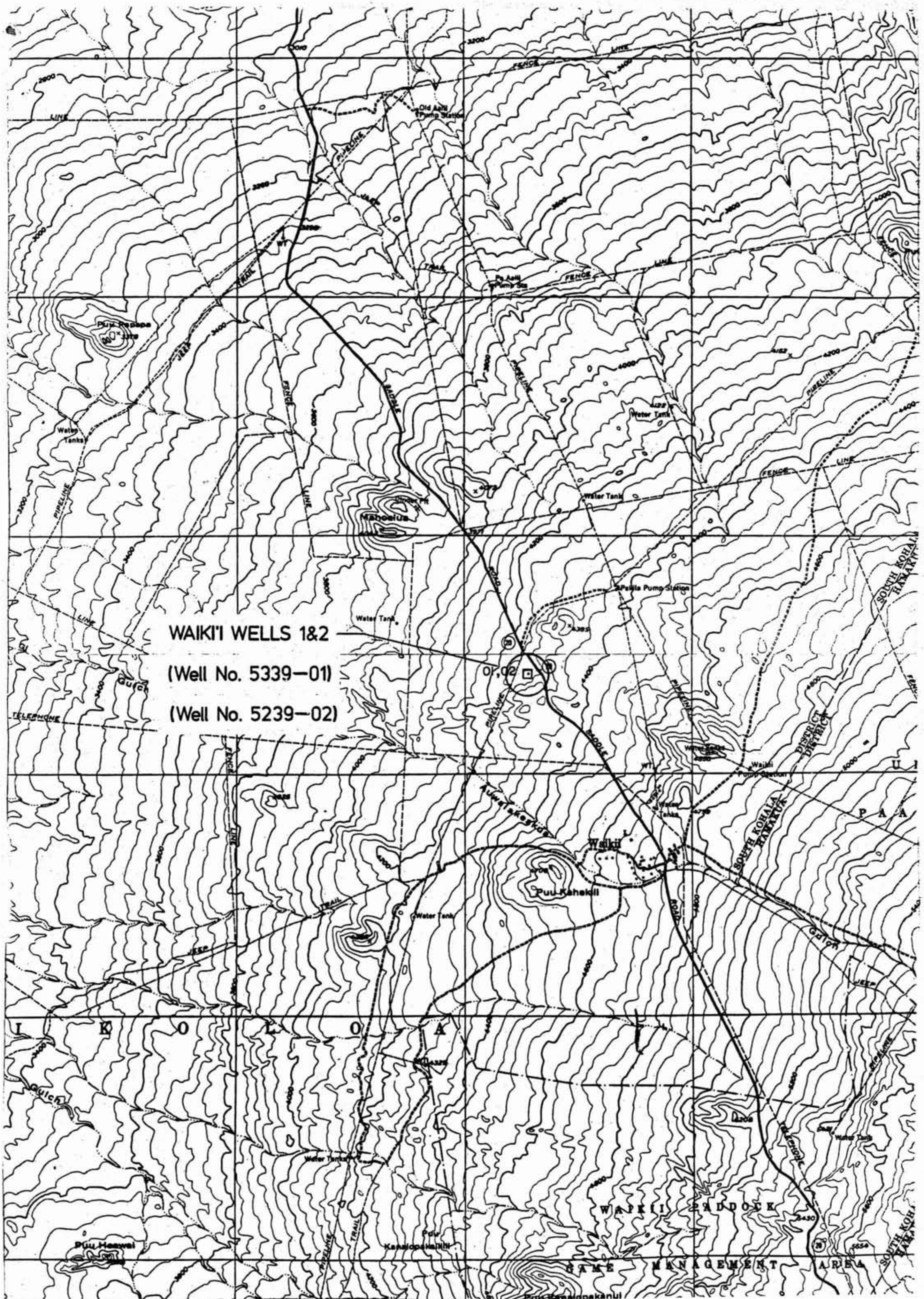
WAIKI'I WELLS 1&2
(Well No. 5339—01)
(Well No. 5239—02)
Puu Pepapa
Water Tanks
Mahoelua
Cinder Pit
Old Aalii Pump Station
Pu Aalii Pump Sta
Water Tank
Paliila Pump Station
Waikii Pump Station
Waikii
Puu Kahekili
Auwaiakeakua
Water Tanks
Puu Kanakaleonui
Puu Heawai
Puu Kanaiopakahiki
I K O L O A
WAIKII PADDOCK
GAME MANAGEMENT AREA
SOUTH KOHALA
HAMAKUA
DISTRICT
PIPELINE
FENCE
LINE
TRAIL
JEEP
ROAD
SADDLE
TELEPHONE
Gulch

DRAFT

WAIKII RANCH WATER SOURCE

AT

WAIKII, SOUTH KOHALA, HAWAII

PREPARED FOR

KREMKOW PROPERTIES, INC.

PREPARED BY

BARRETT, HARRIS & ASSOCIATES, INC.

IN ASSOCIATION WITH

JOHN F. MINK

Conclusions

1. Waikii Well 1 is located in the west rift zone of Mauna Kea volcano.

2. The static water table is approximately 1,500 feet above sea level.

3. The aquifer which is tributory to the well evidently is voluminous. At a constant pumping rate of 162 gpm the drawdown was stable at 19 feet after 72 hours of pumping.

4. With a large enough pump the well can yield at least 1.0 mgd. Drawdown at this rate would be approximately 134 feet. In high level dike aquifers where sea water intrusion is not a threat, absolute value of drawdown is not the critical measure of success; stability at a given rate is more meaningful.

5. The ground water may be heated to a slight extent (less than 10°F) by a deep heat source. Evidence also suggests that heating is caused by the normal geothermal gradient. Neither alternative explanation can be stated as the most likely at this time.

JOHN F. MINK
Hydrologist

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE 08/2

195225155394401 - [redacted] JERRY KREMKOW, [redacted] DISTRICT CODE 15

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	AGENCY COLLECTING SAMPLE (CODE NUMBER) (00027)	AGENCY ANALYZING SAMPLE (CODE NUMBER) (00028)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	PH LAB (STANDARD UNITS) (00403)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)
MAY 19...	1345	9715	80020	460	8.0	.66	8.3	9.9	71	8.2

DATE	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	ARSENIC TOTAL (UG/L AS AS) (01002)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA) (01007)	BERYLLIUM, TOTAL RECOVERABLE (UG/L AS BE) (01012)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD) (01027)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR) (01034)	COBALT, TOTAL RECOVERABLE (UG/L AS CO) (01037)
MAY 19...	[redacted]	54	.4	64	2	<100	<10	<1	<10	<1

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
PROCESS DATE 08/23/

195225155394401 - [redacted] JERRY KREMKON, [redacted] DISTRICT CODE 15

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU) (01042)	IRON, SUS-PENDED RECOV-ERABLE (UG/L AS FE) (01044)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE) (01045)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	MANGA-NESE, SUS-PENDED RECOV. (UG/L AS MN) (01054)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN) (01055)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MOLYB-DENUM, TOTAL RECOV-ERABLE (UG/L AS MO) (01062)	NICKEL, TOTAL RECOV-ERABLE (UG/L AS NI) (01067)
MAY 19...	11	460	480	23	5	9	30	21	18	10

DATE	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG) (01077)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN) (01092)	ALUM-INUM, TOTAL RECOV-ERABLE (UG/L AS AL) (01105)	LITHIUM TOTAL RECOV-ERABLE (UG/L AS LI) (01132)	SELE-NIUM, TOTAL (UG/L AS SE) (01147)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG) (71900)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	LAB ID NUMBER (UNITS) (99998)
MAY 19...	<1	190	280	10	1	<.1	475	152	3150000

...CES INTERNATIONAL, INC.
2828 PAA STREET, SUITE 2085
HONOLULU, HAWAII 96819
PHONE: (808) 839-7727 • RCA TELEX 7238672

LETTER OF TRANSMITTAL

DATE: June 14, 1983
JOB NO.: J-276/277/279
ATTENTION:
RE: Waikii Ranch Well and Pump
Waikii, Hawaii
Phases I, II, & III

TO: Mr. Gerald Kremkow
Waikii Ranch Asssociates
P. O. Box 539
Honolulu, Hawaii 96809

GENTLEMEN:

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items
☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☒ Report

COPIES	DATE	NO.	DESCRIPTION
1			Laboratory Analysis Report

RECEIVED
'83 JUN 15 A8:56
DIV. OF WATER & LAND DEVELOPMENT

THESE ARE TRANSMITTED as checked below:
☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
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☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ 19_____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS _____

COPY TO John Mink - w/encl. (2 copies)
✓ Dan Lum - w/encl. (1 copy)
DLNR, DOWALD

SIGNED D. O. Craddick Jr.
If enclosures are not as noted, kindly notify us
D. O. Craddick, Vice President

...ABORATORIES
...ical Corpor...
...Aii 96781 PHONE: ...-1271

JOB NO. 5016
DATE 06-10-83
PAGE 1 OF 1

...TORY ANALYSIS REPORT

TO: WATER RESOURCES INTERNATIONAL ATTN: MR. D. CRADDICK
ADDRESS: 2828 PAA ST., ROOM 2085, HONOLULU, HI 96819 PHONE: 829-7727
SAMPLES OF: WAIKII (WELL WATER) RANCH PUMP NO. 1

SAMPLED BY: MR. D. CRADDICK SAMPLING DATE: 05-20-83 TIME: 1400
RECEIPT DATE: 05-20-83 TIME: 1545

DATE SAMPLE ANALYZED						
TIME SAMPLE ANALYZED						
SAMPLE TYPE						
SAMPLE DESCRIPTION						
	UNITS					
ARSENIC	Mg/L		0.004			
BARIUM	Mg/L		0.15			
CADMIUM	Mg/L		< 0.005			
CHROMIUM	Mg/L		< 0.01			
LEAD	Mg/L		< 0.02			
MERCURY	Mg/L		< 0.001			
SELENIUM	Mg/L		< 0.002			
SILVER	Mg/L		< 0.01			
NITRATE	Mg/L		0.63			
FLOURIDE	Mg/L		0.45			
TURBIDITY	NTU		1.7			
pH			8.37			
CHLORIDES	Mg/L		18.7			
SODIUM	Mg/L		54.4			
HARDNESS	Mg/L	as $CaCO_3$	62.0			
ENDRIN	Mg/L		< 0.00005			
LINDANE	Mg/L		< 0.00005			
METHOXYCHLOR	Mg/L		< 0.001			
TOXAPHENE	Mg/L		< 0.003			
2,4-D	Mg/L		< 0.005			
2,4,5-T (SILVEX)	Mg/L		< 0.001			

BORATORY REMARKS: Samples analyzed according to "Methods for Chemical Analysis of Water and Wastes", U.S. ...vironmental Protection Agency, March, 1976.

Benji Fujimoto

May 24, 1983

MEMORANDUM FOR THE RECORD

FROM: Dan Lum

SUBJECT: Pumping Test, Waikii Well 5239-01, Hawaii, May 18-20, 1983

Summary. The Waikii Well was pump tested for 70+ hours on May 18-20, 1983, at a rate of 162 gpm and 20± ft. drawdown which appeared to have stabilized. The temperature of the water at the surface discharge measured 89°F. The digital sensor installed near the bottom of the test pump registered 82°F. The chloride content of the water was reported to be 5 ppm. The elevation of the static water level is reported to be 1500 ft.

Well Description. The Waikii Well is located 5.2 miles eastward from the junction of the Saddle Road and old Belt Road, a couple hundred feet off the right side of the Saddle Road at the foot of a cinder cone. The well's coordinates are: 155° 39' 44" long. and 19° 52' 25" lat. The reported ground elevation of the terraced well site is 4260 ft. and the well's depth, 4350 ft. The depth to water is 2760 ft., giving a head of 1500 ft. The well casing is 13 inches nominal diameter.

The casing was installed to a depth of 3500+ ft. (initially sealed and floated to its depth), grouted at the bottom ±100 ft., and then gun-perforated with 500 holes of 3/4 inches diameter below the water table.

Test Pump. A specially designed TRW/Reda submersible pump with 200+ stages, a 2300V-200+ H.P. 60 cycle motor was used for the test. The electrical power was obtained from a 440V diesel generator and step-up transformer. The pump reportedly drew 50+ amps. The down-hole power cable was armored and 1 to 1½ inches in diameter.

Down-hole Sensor. A TRW/Reda pressure sensor with a digital readout at the surface, was installed at the bottom of the pump to measure temperature and water level. Because the sensor operated off the 2300V Cable, no static water level could be obtained. However, the drawdown was estimated from the water level read several seconds after the pump was started.

Pumping Rate. The pumping rate was measured with a 3 to 4-inch flowmeter.

DANIEL LUM

PART A - PRIMARY DRINKING WATER REGULATIONS

2. Coverage

2.1 This Chapter shall apply to each public water system, unless the public water system meets all of the following conditions:

A. It consists only of distribution and storage facilities (and does not have any collection and treatment facilities);

B. It obtains all of its water from, but is not owned or operated by, a public water system to which such regulations apply;

C. It does not sell water to any person; and

D. It is not a carrier which conveys passengers in interstate commerce.

3. Maximum Contaminant Levels for Inorganic Chemicals

3.1 The maximum contaminant level for nitrate is applicable to both community water systems and non-community water systems. The levels for the other inorganic chemicals apply only to community water systems. Compliance with maximum contaminant levels for inorganic chemicals is calculated pursuant to Section 11.

3.2 The following are the maximum contaminant levels for inorganic chemicals other than fluoride:

Contaminant	Level, Milligrams Per Liter
Arsenic	0.05
Barium	1.
Cadmium	0.010
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as N)	10.
Selenium	0.01
Silver	0.05

3.3 When the annual average of the maximum daily air temperatures for the location in which the community water system is situated is the following, the maximum contaminant levels for fluoride are:

Temperature Degrees Fahrenheit	Degrees Celsius	Level, Milligrams Per Liter
53.7 nd below	12.0 and below	2.4
53.8 to 58.3	12.1 to 14.6	2.2
58.4 to 63.8	14.7 to 17.6	2.0
63.9 to 70.6	17.7 to 21.4	1.8
70.7 to 79.2	21.5 to 26.2	1.6
79.3 to 90.5	26.3 to 32.5	1.4

4. Maximum Contaminant Levels--Organic Chemicals

4.1 The following are the maximum contaminant levels for organic chemicals. They apply only to community water systems. Compliance with maximum contaminant levels for organic chemicals is calculated pursuant to Section 12.

	Level, Milligrams Per Liter
A. Chlorinated hydrocarbons:	
Endrin (1,2,3,4,10, 10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octa-hydro-1,4-endo, endo-5,8-di-methano naphthalene).	0.0002
Lindane (1,2,3,4,5,6-hexachloro-cyclohexane, gamma isomer).	0.004
Methoxychlor (1,1,1-Trichloro-2, 2-bis (p-metho-xyphenyl) ethane).	0.1
Toxaphene ($C_{10}H_{10}Cl_8$-Technical chlorinated camphene, 67-69 percent chlorine).	0.005
B. Chlorophenoxys:	
2,4-D, (2,4-Dichlorophenoxyacetic acid).	0.1
2,4,5-TP Silvex (2,4,5-Trichloro-phenoxypropionic acid).	0.01

5. Maximum Contaminant Levels--Turbidity

5.1 The maximum contaminant levels for turbidity are applicable to both community water systems and non-community water systems using surface water sources in whole or in part. The maximum contaminant levels, measured at a representative entry point(s) to the distribution system, are:

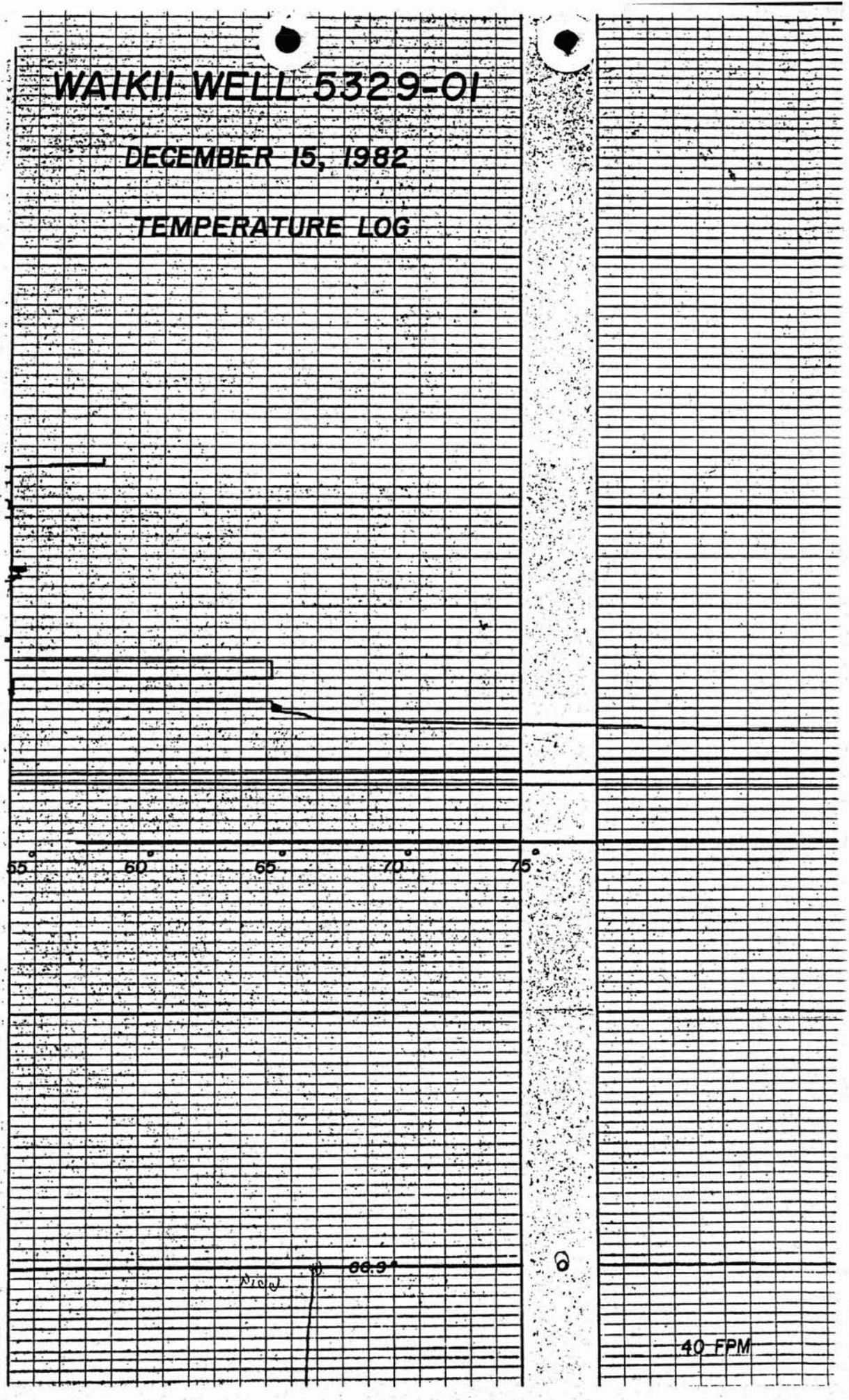
A. One turbidity unit (TU), as determined by a monthly average pursuant to Section 10 except that five or fewer turbidity units may be allowed if the supplier of water can demonstrate to the Director that the higher turbidity does not do any of the following:

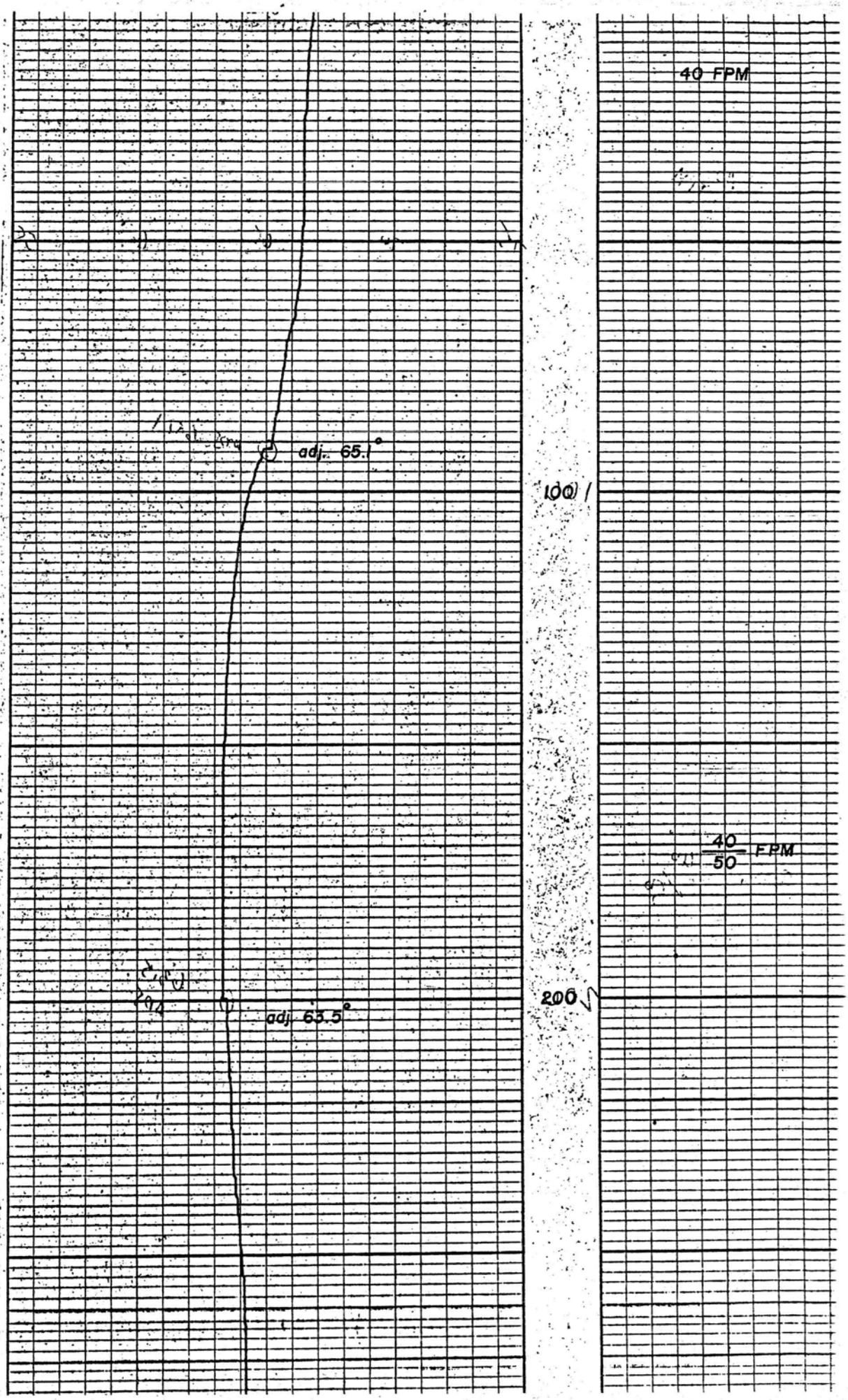
(1) Interfere with disinfection;

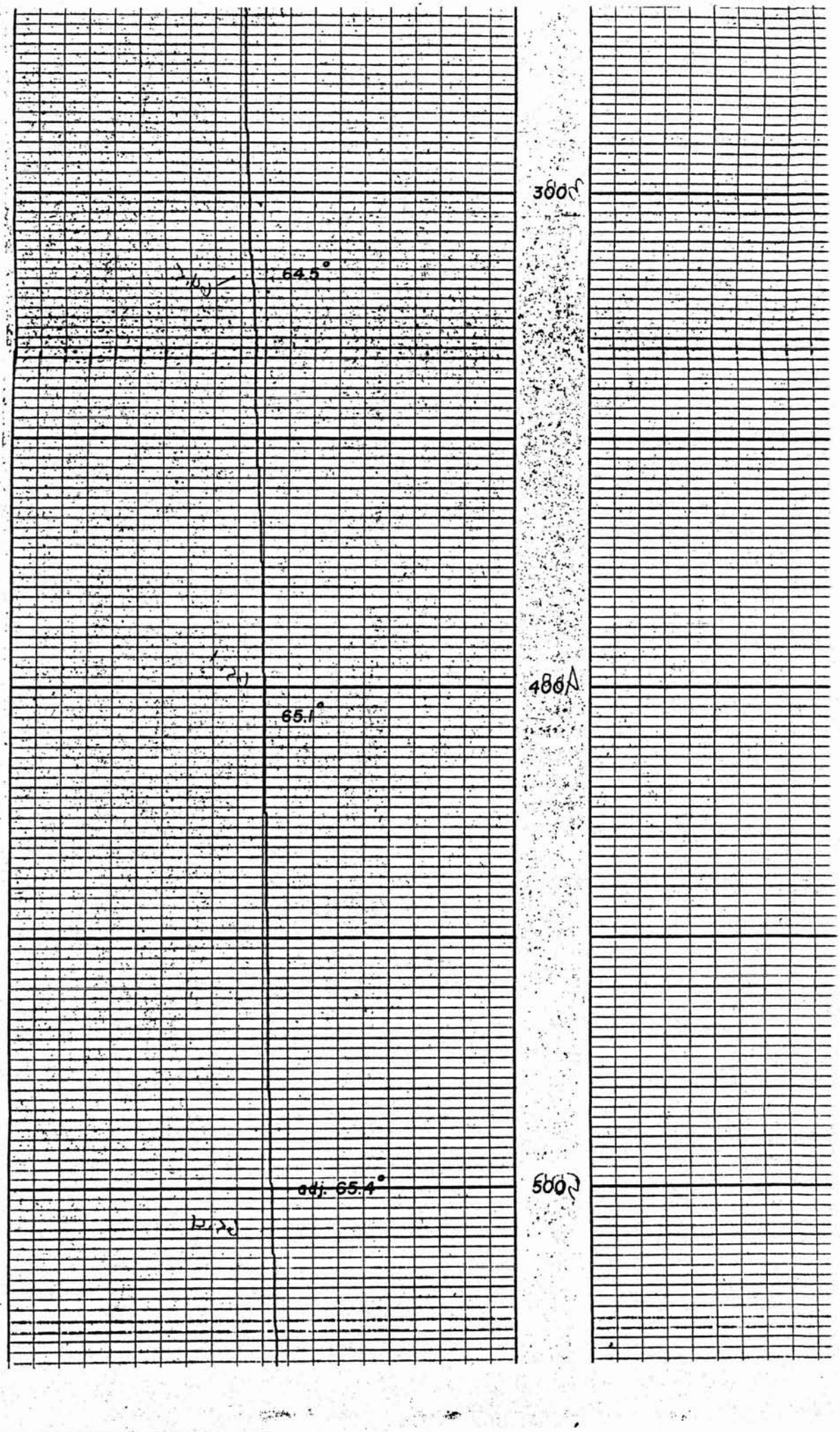
(2) Prevent maintenance of an effective disinfectant agent throughout the distribution system; or

(3) Interfere with microbiological determinations

B. Five turbidity units based on an average for two consecutive days pursuant to Section 10.


WAIKII WELL 5329-01
DECEMBER 15, 1982
TEMPERATURE LOG
55°
60°
65°
70°
75°
66.9°
40 FPM

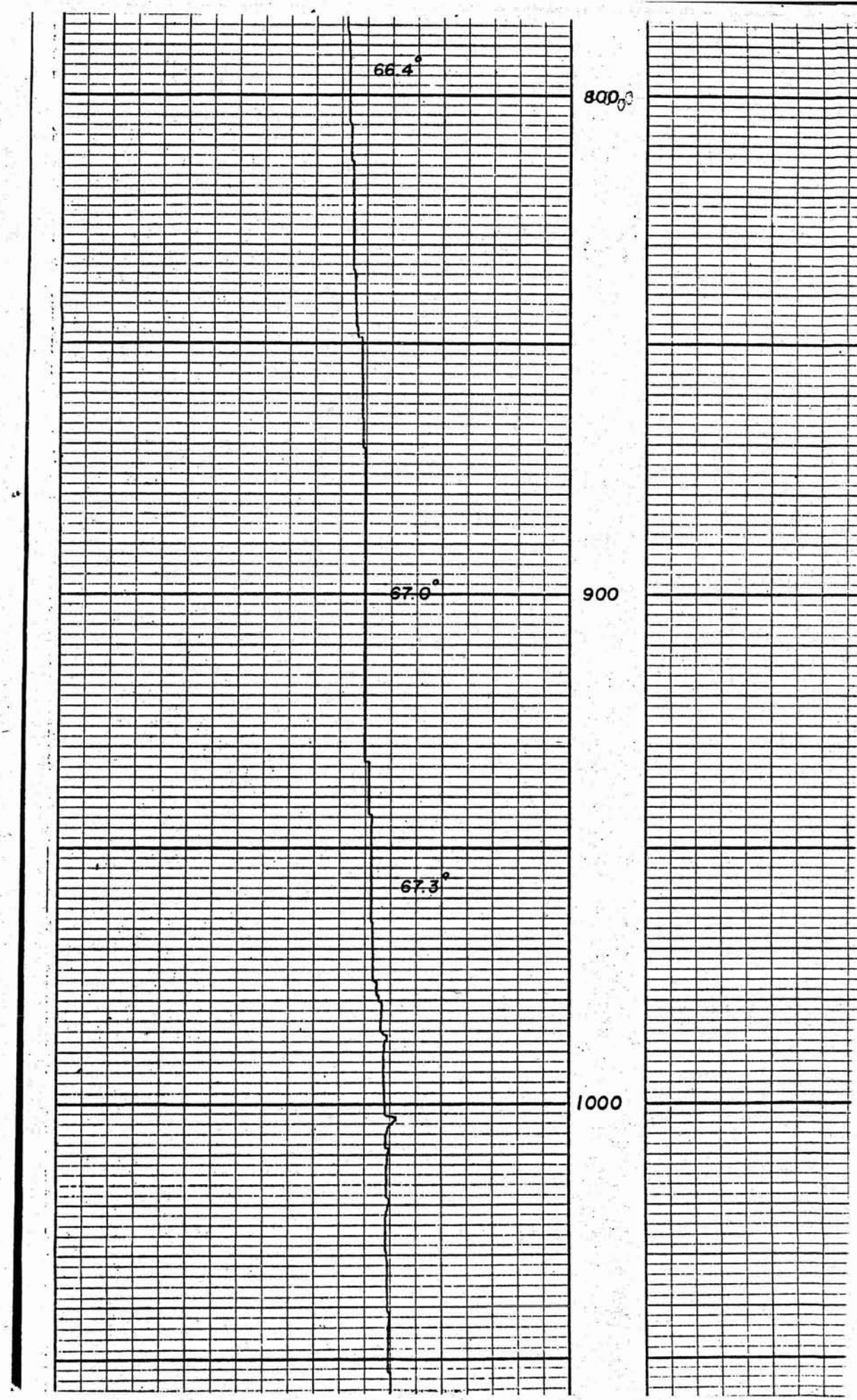

40 FPM
adj. 65.1°
100
adj. 63.5°
200
40/50 FPM

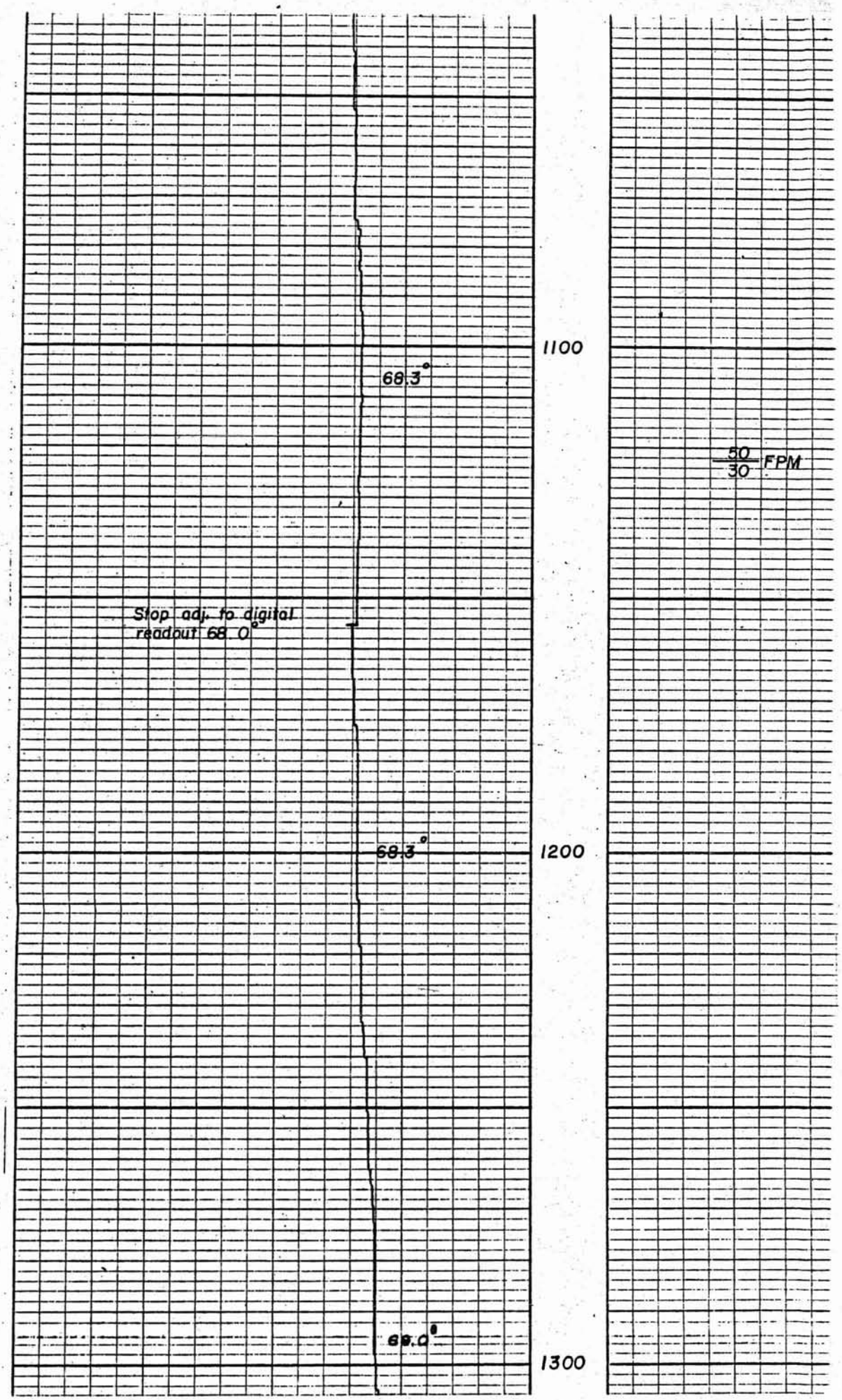

64.5°
65.1°
adj. 65.4°

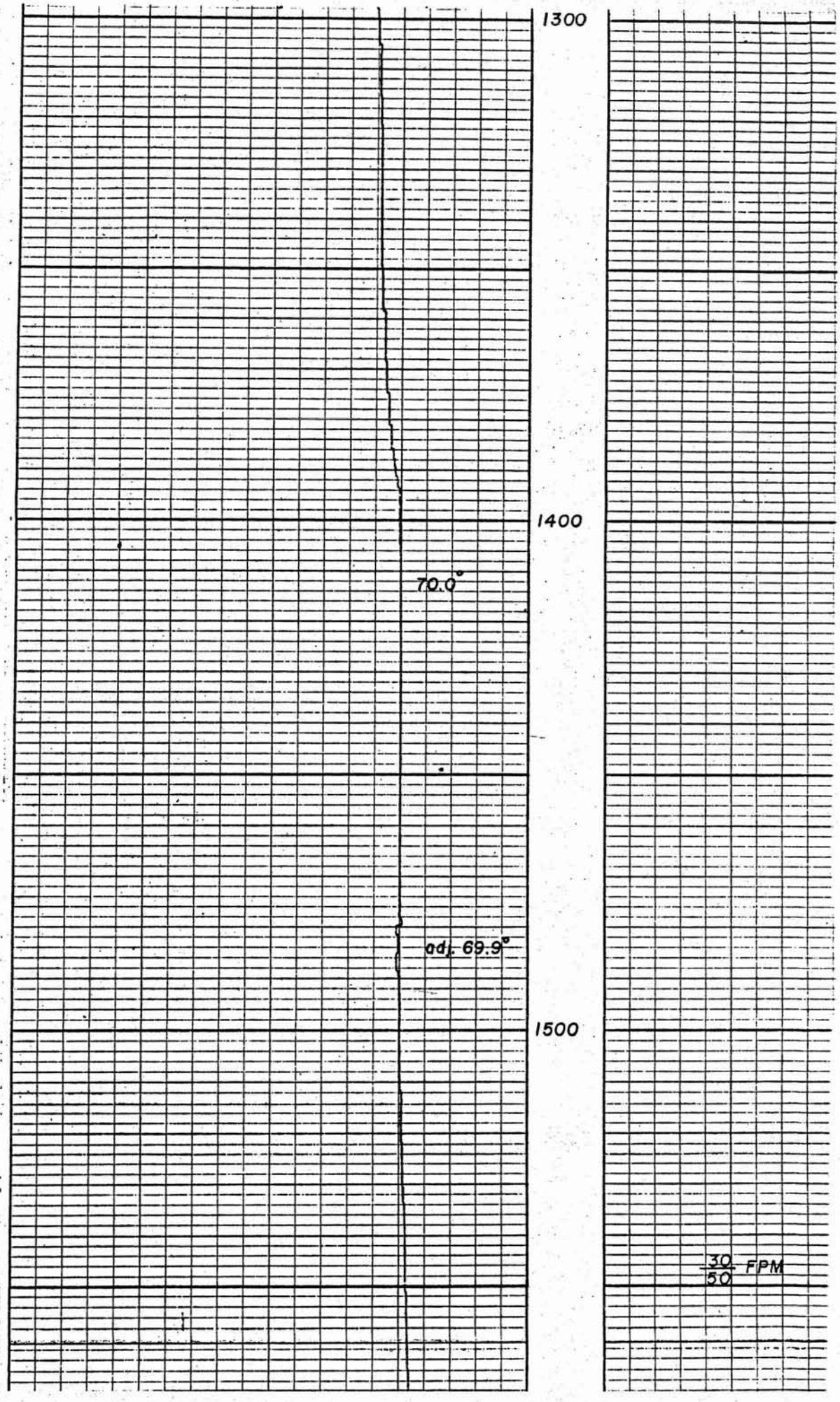
65.8°

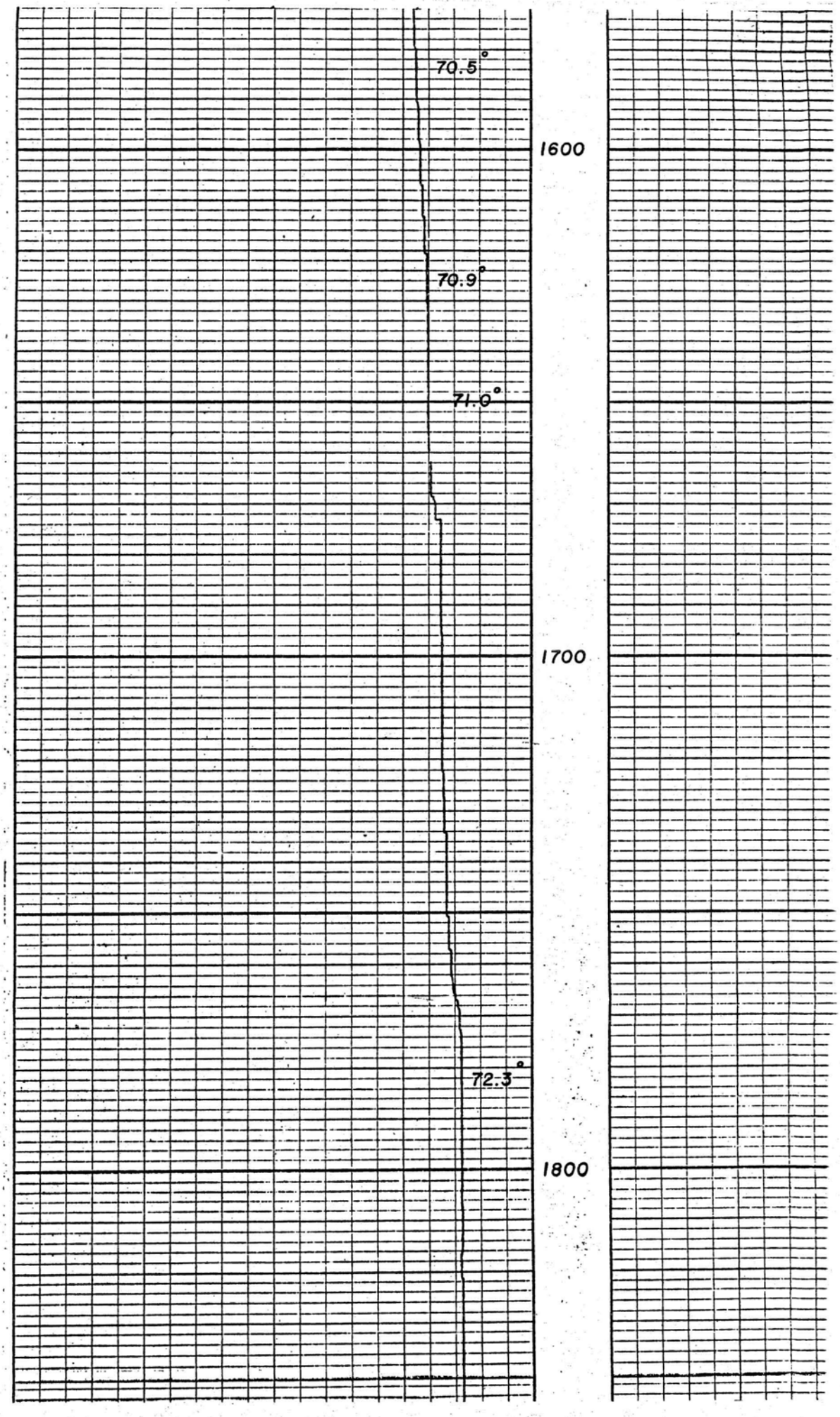
66.0°

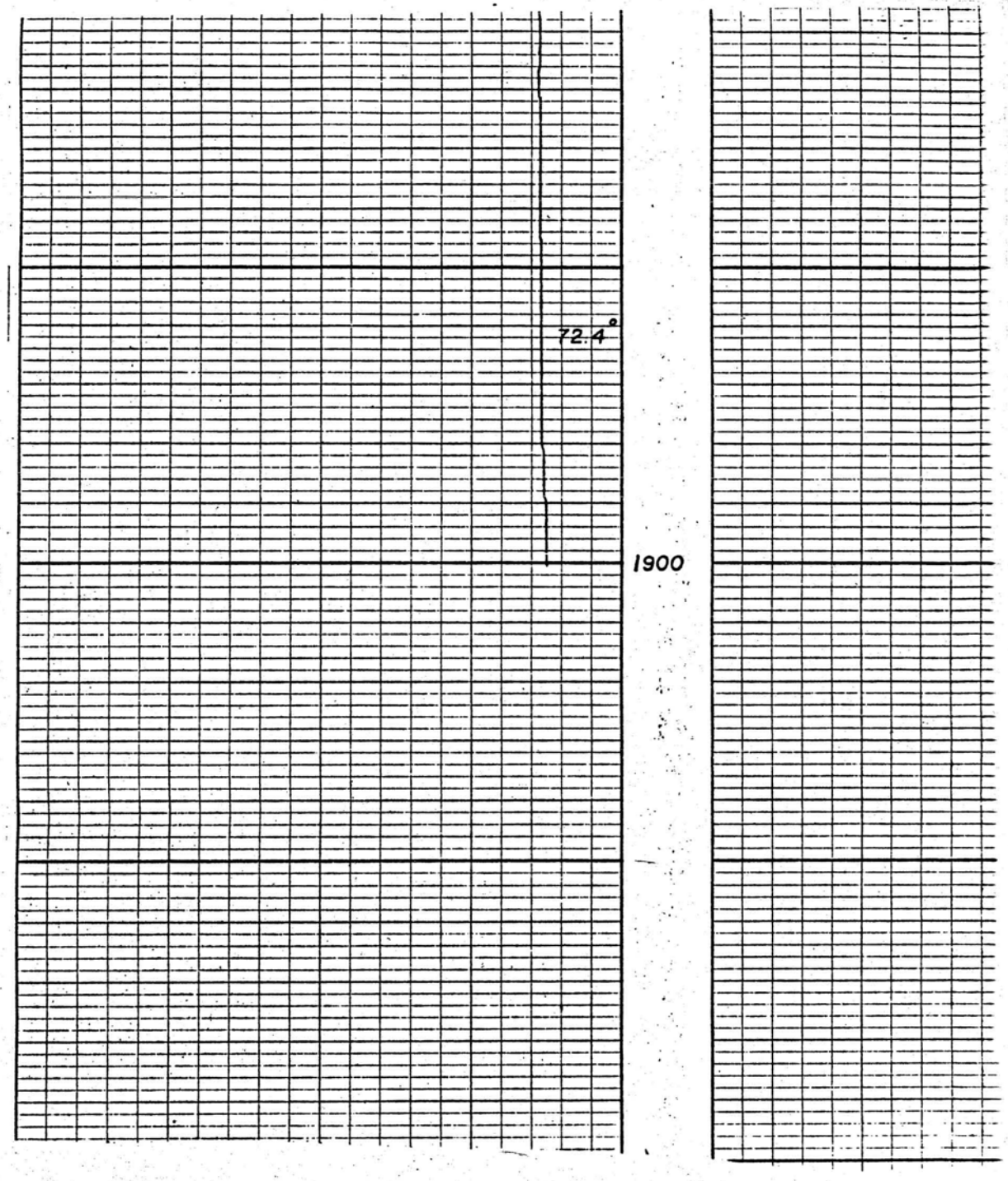
66.4°


66.4°
800
67.0°
900
67.3°
1000


1100
68.3°
50/30 FPM
Stop adj. to digital readout 68.0°
68.3°
1200
68.0°
1300


1300
1400
70.0°
adj. 69.9°
1500
30
50
FPM


70.5°
1600
70.9°
71.0°
1700
72.3°
1800

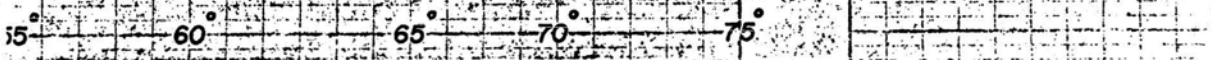

72.4°
1900

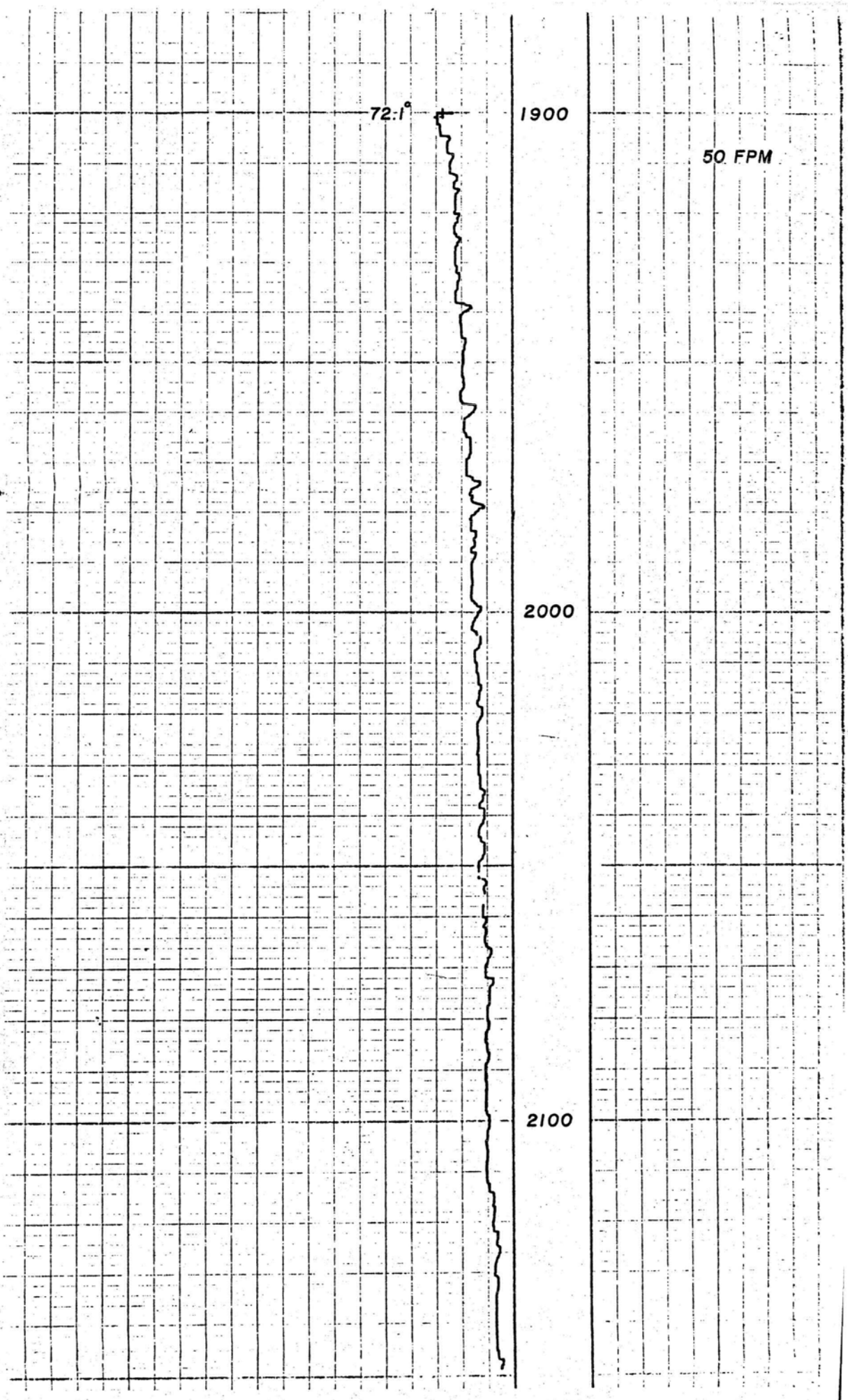
WAIKII WELL 5329-01

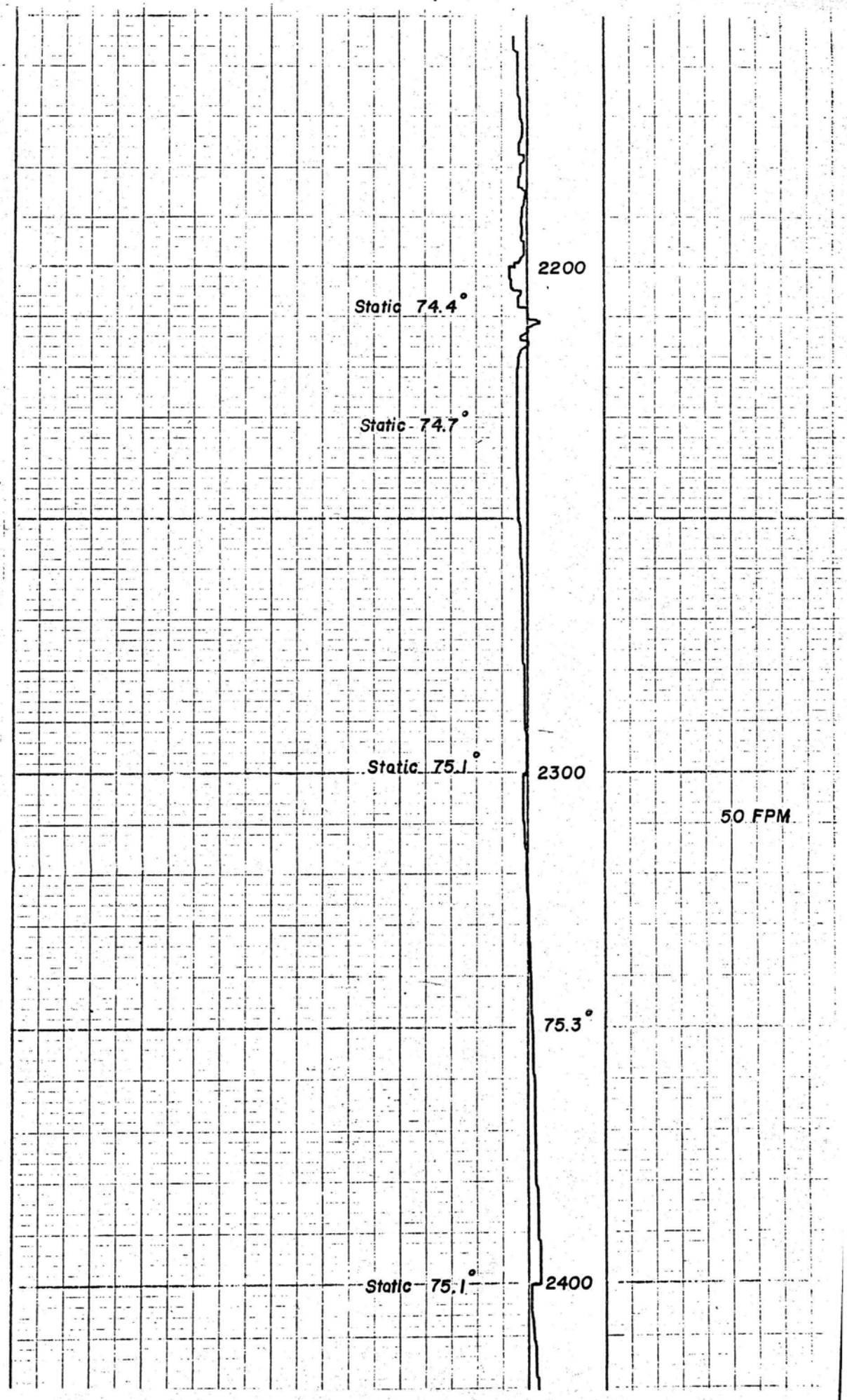
DECEMBER 15, 1982

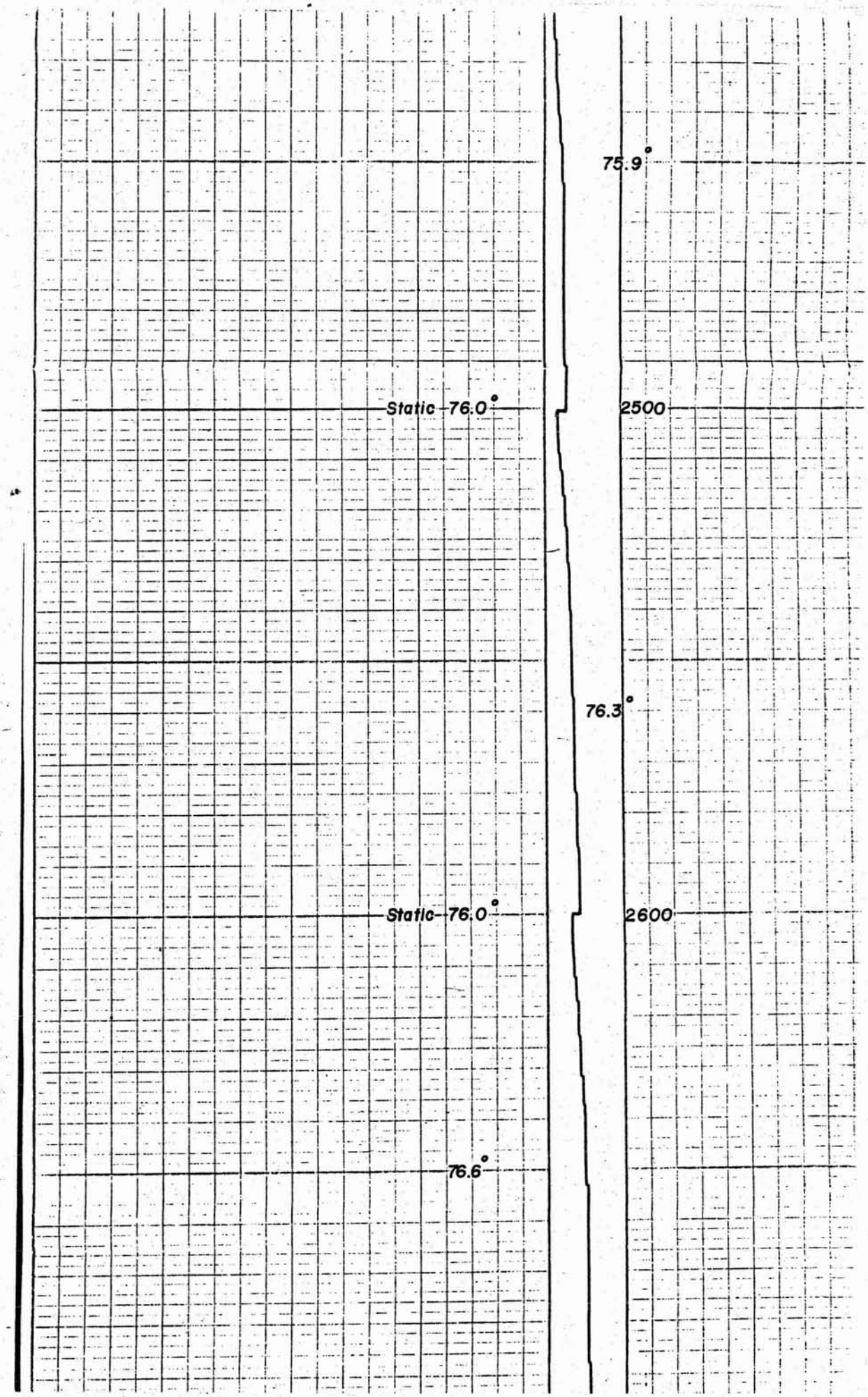
TEMPERATURE LOG

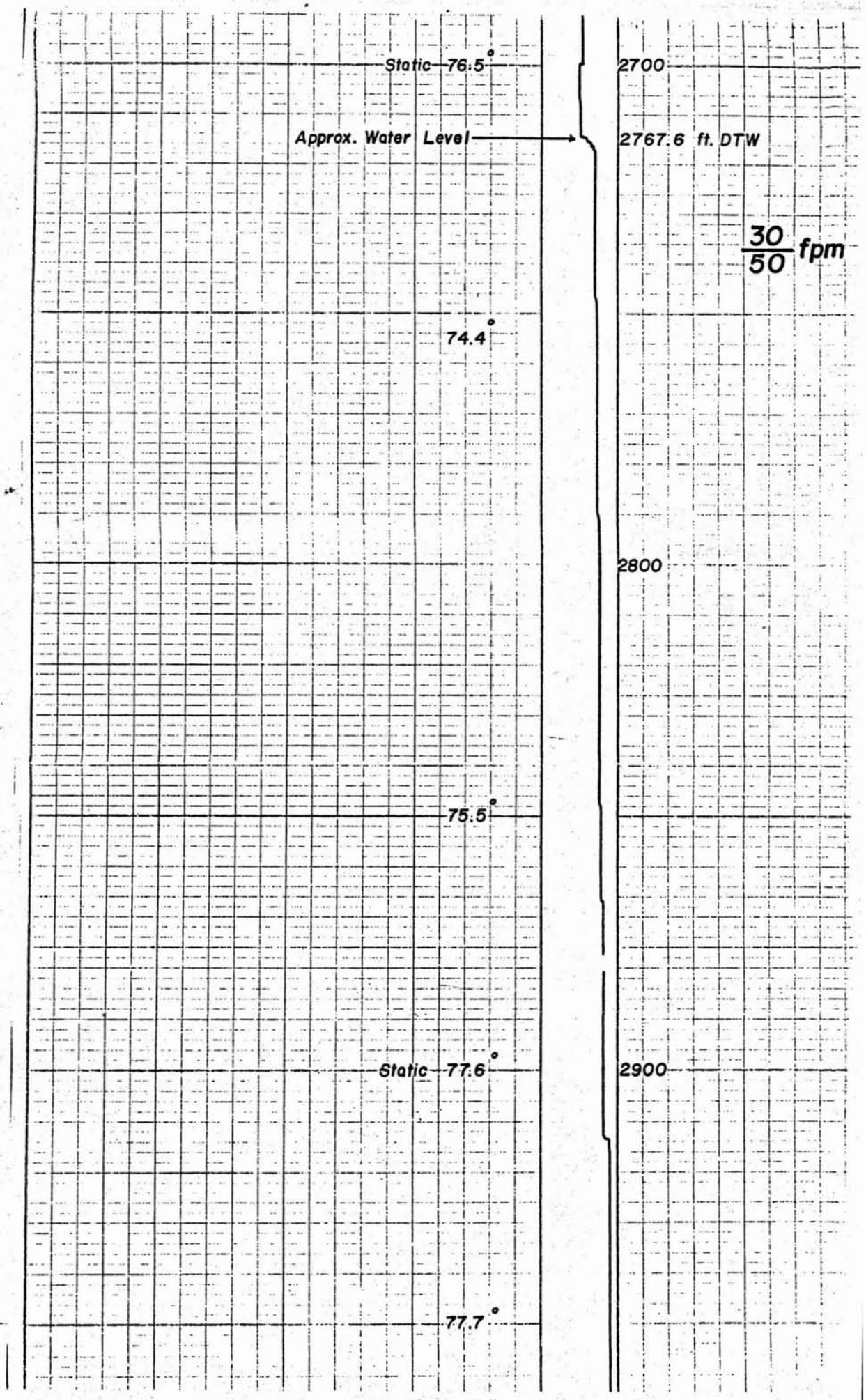
roll 2

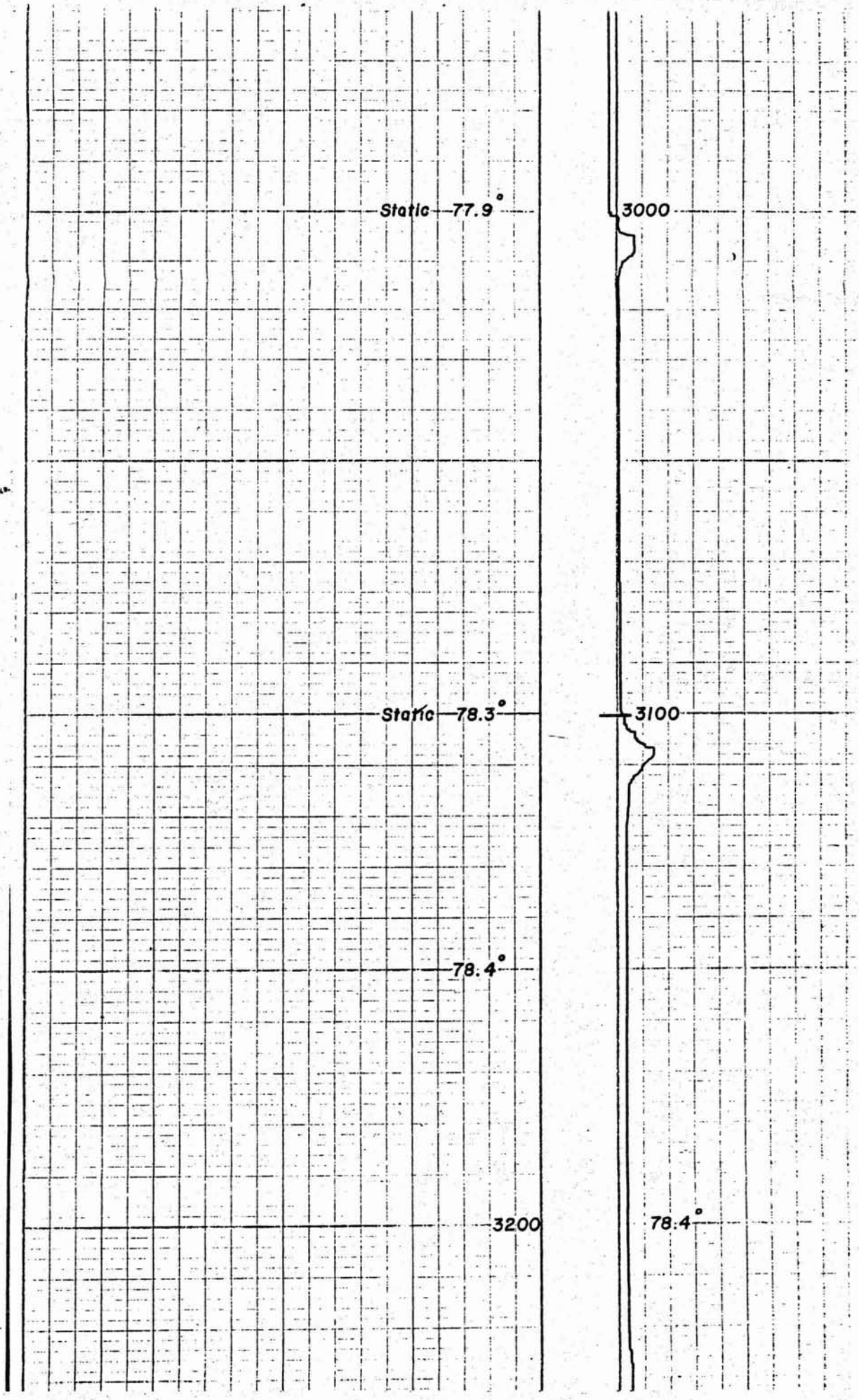


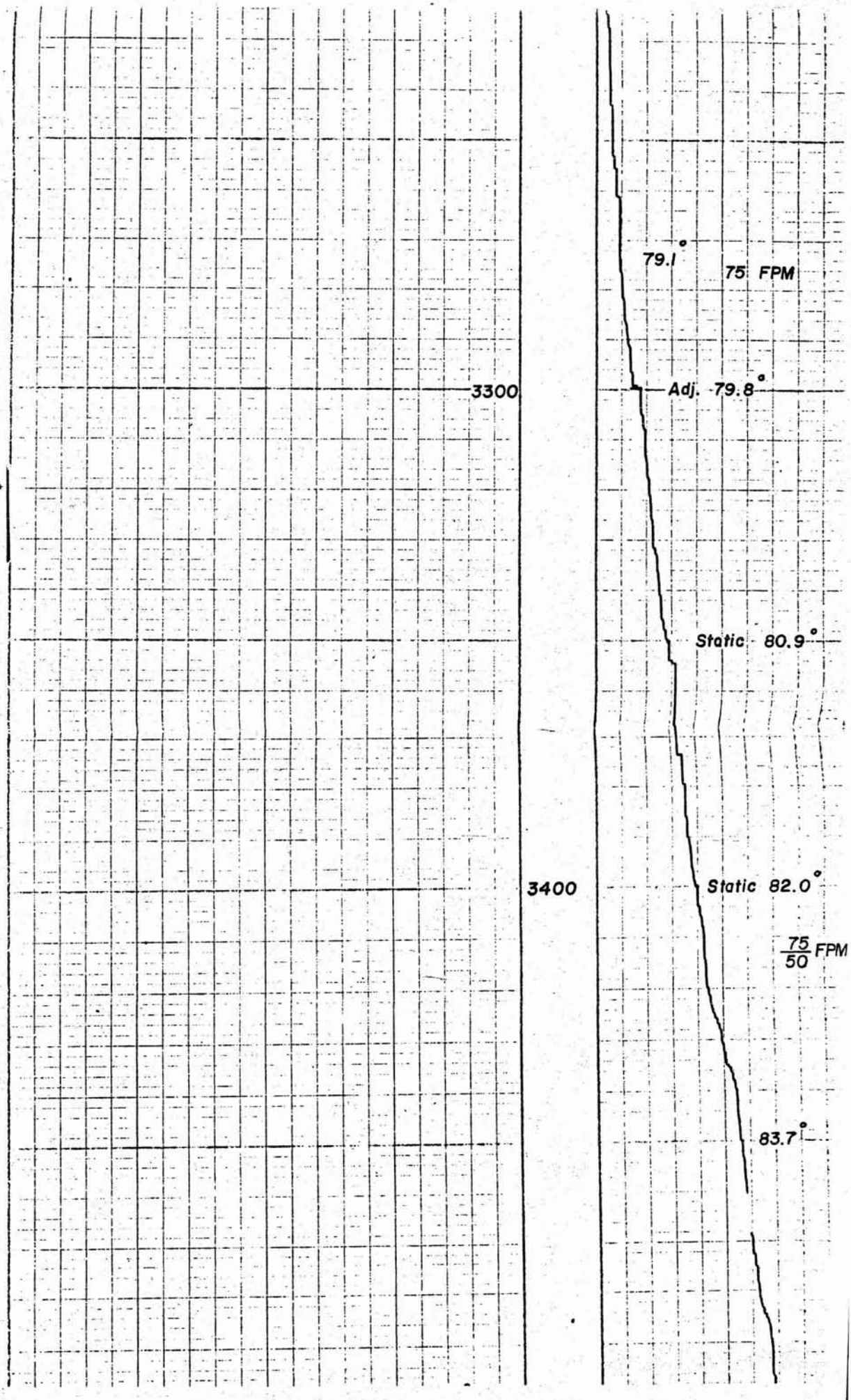

72:1°
1900
2000
2100
50 FPM

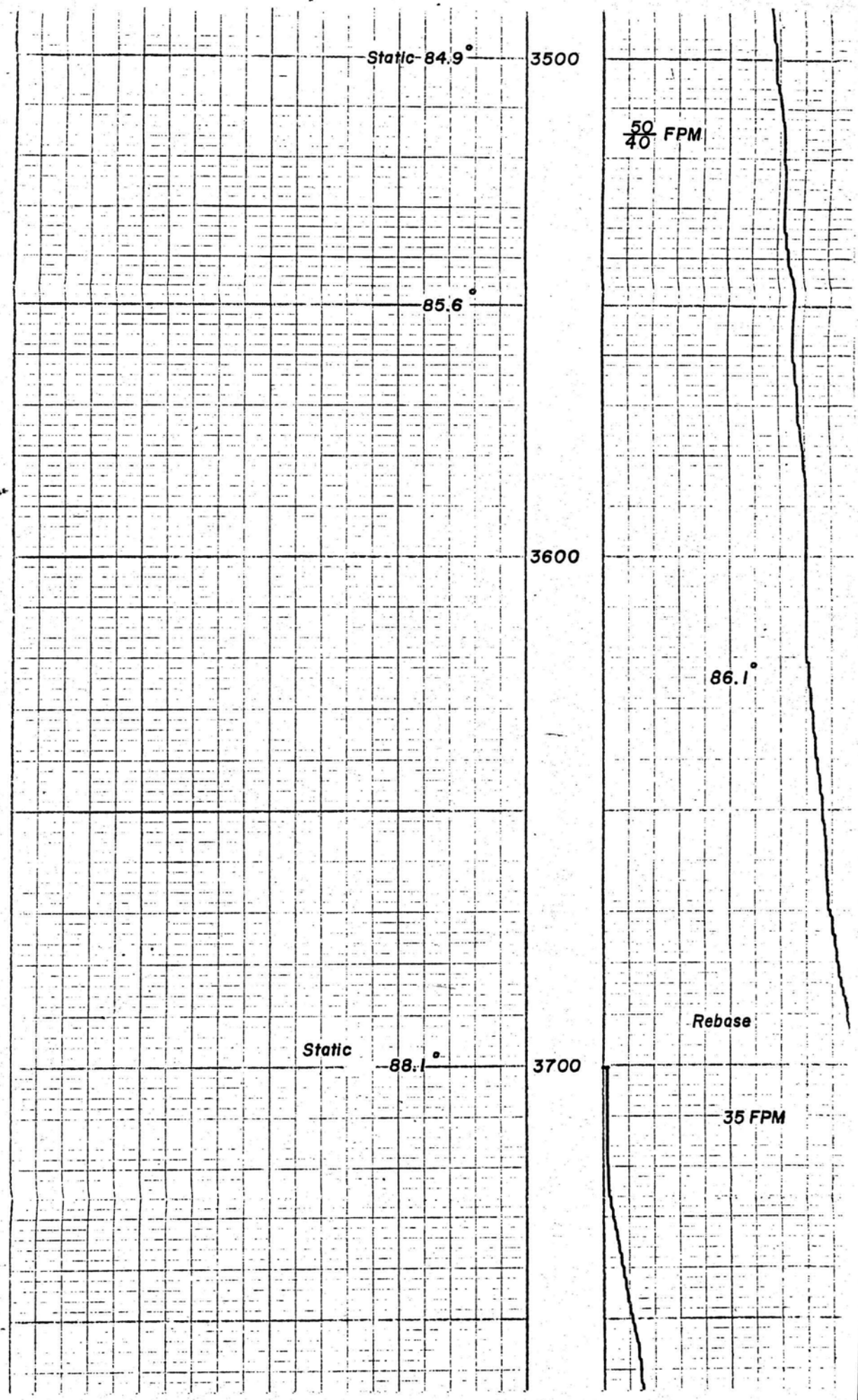

2200
Static 74.4°
Static 74.7°
Static 75.1°
2300
50 FPM
75.3°
Static 75.1°
2400

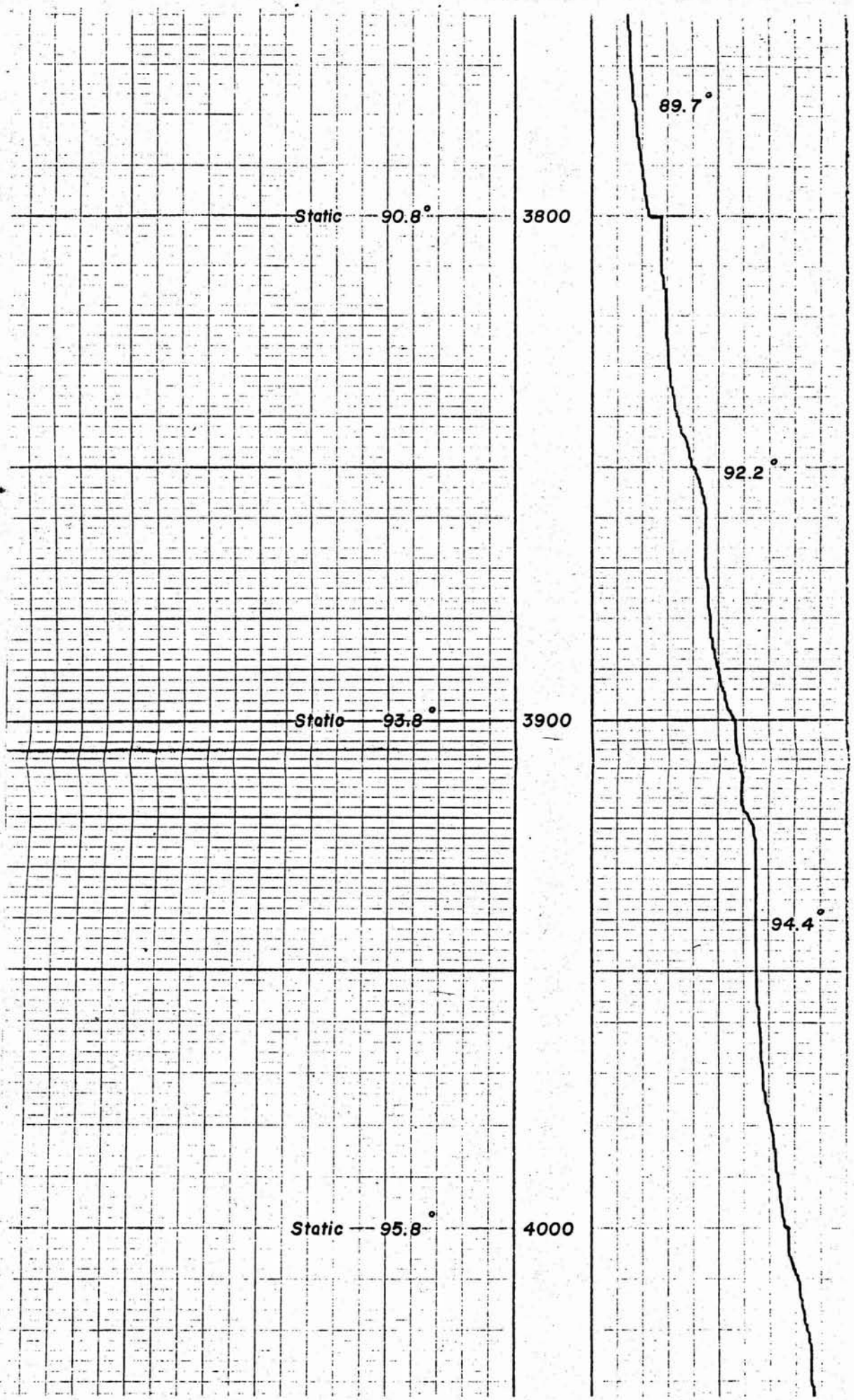

75.9°
Static 76.0°
2500
76.3°
Static 76.0°
2600
76.6°


Static 76.5°
Approx. Water Level
74.4°
75.5°
Static 77.6°
77.7°
2700
2767.6 ft. DTW
30/50 fpm
2800
2900


Static 77.9°
3000
Static 78.3°
3100
78.4°
3200
78.4°


79.1°
75 FPM
3300
Adj. 79.8°
Static 80.9°
3400
Static 82.0°
75/50 FPM
83.7°


Static- 84.9°
3500
50/40 FPM
85.6°
3600
86.1°
Rebase
Static
88.1°
3700
35 FPM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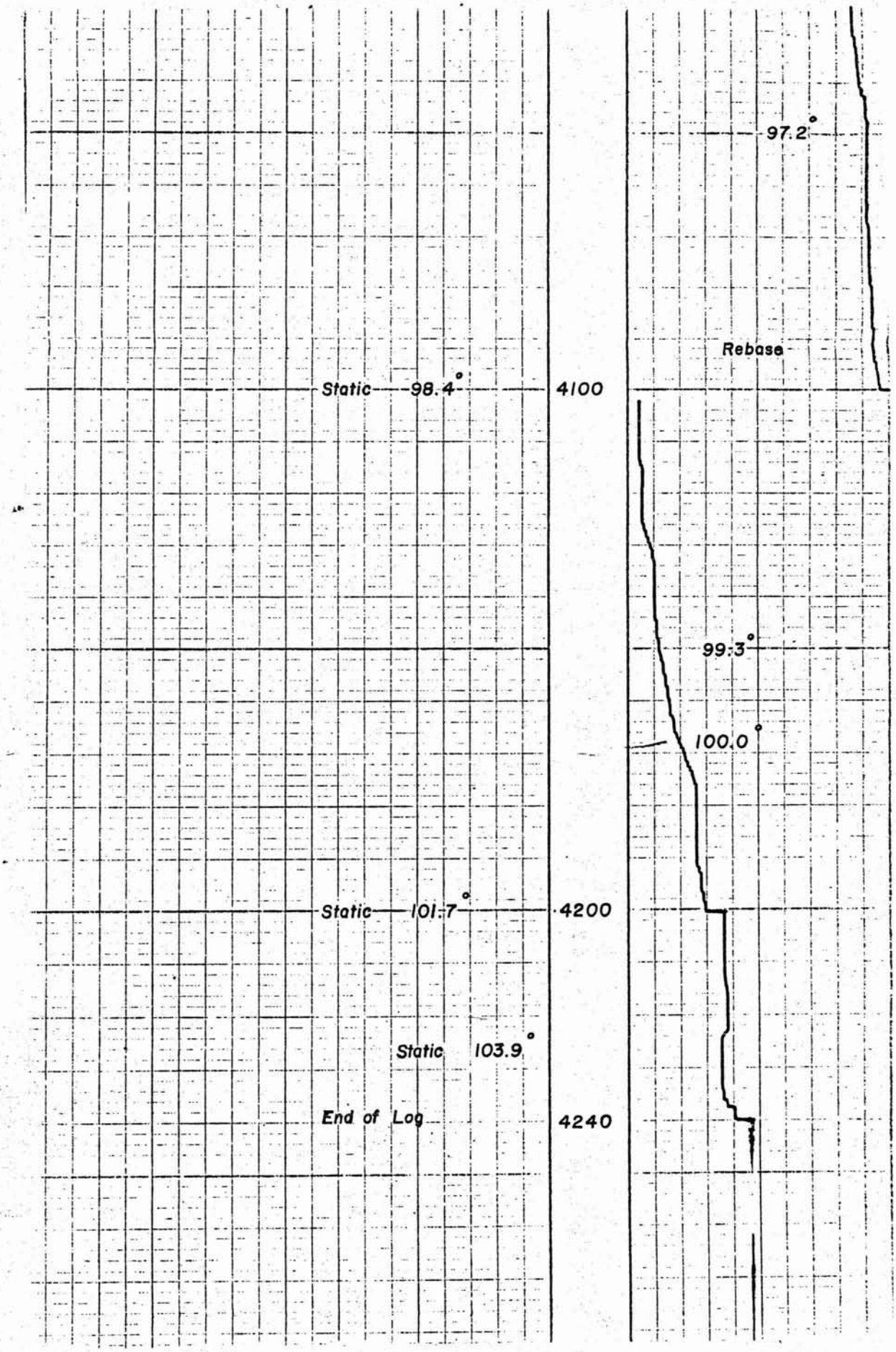
Static — 90.8°
3800
92.2°
Static — 93.8°
3900
94.4°
Static — 95.8°
4000


97.2°
Rebase
Static 98.4°
4100
99.3°
100.0°
Static 101.7°
4200
Static 103.9°
End of Log
4240

DOWALD Form 71(1)

State of Hawaii

DEPARTMENT OF LAND & NATURAL RESOURCES

DIVISION OF WATER AND LAND DEVELOPMENT

RECEIVED STATE

DRILLER'S REPORT

DESCRIPTION

Date of report March 22, 1989 Person filing report Howard T. Akagi

A. OWNER Waiki'i Ranch WELL NAME Waiki'i Ranch Well #2 ISLAND Hawaii

B. GENERAL LOCATION Waiki'i Ranch, Waiki'i, Hawaii

C. DRILLING COMPANY Water Resources International, Inc. Robert J. Richardson

D. TYPE OF RIG Rotary DRILLING COMPLETED 11/09/88 (month year) DRILLER Sidney Gonsalves

E. ELEVATION, msl: Top of drilling platform 4,000 ± ft. Bench mark and method used to determine
Height of drilling platform above ground surface 10 ft. elevation: 4,010 ft.

F. HOLE SIZE: 17½ inch dia. to 85 ft. below drilling platform.
12¼ inch dia. to 505 ft. below drilling platform.
9-7/8 inch dia. to 3,300 ft. below drilling platform.

G. CASING INSTALLED: 6-5/8 in. I.D. x 3/8 in. wall solid section to 2,810 ft. below drilling platform.
6-5/8 in. I.D. x 3/8 in. wall perforated section to 3,310 ft. below drilling platform.
Type of perforation

H. ANNULUS: Grouted 500 ft. to 10 ft. below drilling platform.
Gravel packed None ft. to ft. below drilling platform.

I. PERMANENT PUMP INSTALLATION:
Pump type, make, serial no. REDA Pump Capacity 100 g.p.m.
Motor type, H.P., voltage, r.p.m. 2,300
Depth of pump intake setting 3,040 ft. below Drilling Platform which elevation is 4,000± ft.
Depth of bottom of airline None ft. below which elevation is ft.

HYDROLOGY

J. INITIAL WATER LEVEL 2,730 ft. below drilling platform. Date of measurement. October 26, 1988

K. INITIAL CHLORIDE: ppm, total depth of well 3,310 ft. below drilling platform 10 ft. (Sampling Date)

L. PUMPING TESTS: Reference point (R.P.) used: which elevation is ft.

Date None					Date				
Start water level ft. below R. P.					Start water level ft. below R. P.				
End water level ft. below R. P.					End water level ft. below R. P.				
Depth of well ft. below R. P.					Depth of well ft. below R. P.				
Elapsed Time (hours)	Rate (gpm)	Draw-down (ft.)	Cl- (ppm)	Temp. °F	Elapsed Time (hours)	Rate (gpm)	Draw-down (ft.)	Cl- (ppm)	Temp. °F
to					to				
to					to				
to					to				
to					to				
to					to				
to					to				

SUBSURFACE FORMATION

M. DRILLER'S LOG:

Depth, ft.	Rock Description & Remarks	Water Level ft.	Depth, ft.	Rock Description & Remarks	Water Level ft.
0 to 33	Lava Rock		2,890 to 3,150	Decomposed Rock	
33 to 44	Hard Rock		3,150 to 3,300	Med/Hard Rock	
44 to 84	Hard Rock		to		
84 to 106	Med/Hard Rock		to		
106 to 162	Hard Rock		to		
162 to 326	Soft Rock		to		
326 to 684	Decomposed Rock		to		
684 to 886	Hard Rock		to		
886 to 1534	Decomposed Rock		to		
1534 to 2326	Hard Rock		to		
2326 to 2890	Med/Hard Rock		to		

N. REMARKS:

FOR DRILLER'S USE
Job Name WAIKI'I RANCH WELL #2
Job No. J-345

INSTRUCTIONS: Send three(3) copies to: Manager-Chief Engineer, Division of Water and Land Development, P. O. Box 373, Honolulu, Hawaii 96809.

REFERENCES: Chapter 178, entitled "Artesian Wells, Generally," HRS, as amended by Act 123 SLH 1970. Honolulu Board of Water Supply, "Rules and Regulations Providing for the Protection, Development and Conservation of Water Resources." Sec't 8-105(j). "Powers, Duties and Functions of the Board," Charter of the City and County of Honolulu, 1959.

FOR OFFICIAL USE
Latitude 19 52 25
Longitude 155 39 44
Well No. 5239-02