

BEFORE THE INDUSTRIAL COMMISSION
OF THE STATE OF NORTH DAKOTA

IN THE MATTER OF A HEARING CALLED ON A MOTION OF THE
COMMISSION TO CONSIDER THE APPLICATION OF CONOCO INC.
FOR AN ORDER AUTHORIZING THE DISPOSAL OF COLLECTED
WATER FROM OPEN SOURCES INTO THE DAKOTA FORMATION
THROUGH THE DICKINSON-HEATH SAND UNIT WELL NO. 23,
LOCATED IN THE SW SW OF SECTION 30, TOWNSHIP 140
NORTH, RANGE 96 WEST, STARK COUNTY, NORTH DAKOTA.

CASE NO. 1880
ORDER NO. 2099

ORDER OF THE COMMISSION

BY THE COMMISSION:

Pursuant to legal notice this cause came on for hearing at 1:00 p.m. on the 19th day of May, 1980, in Bismarck, North Dakota, before Lee C. Gerhard, Trial Examiner appointed for the purpose by the Industrial Commission of North Dakota, hereinafter referred to as the "Commission."

NOW, on this 24th day of June, 1980, the Commission, a quorum being present, having considered the testimony adduced and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That no objections to this application have been received by the Commission.

(3) That the amount of water collected from open sources in the Dickinson Field exceeds that which can be disposed of by evaporation from surface pits, and in order to prevent damage to surface lands and prevent pollution of potable waters, the water should be disposed of by injection into the subsurface.

(4) That the Dakota Group in the Dickinson Field area contains natural water of sufficient salinity to be unsuitable for domestic, irrigation or livestock use.

IT IS THEREFORE ORDERED:

(1) That the Dakota Group in and under the Dickinson Field be, and is hereby designated a disposal reservoir.

(2) That Conoco Inc. is hereby authorized to dispose of produced water and water collected from open sources into the Dakota Formation through the Dickinson-Heath Sand Unit Well No. 23, located in the SW SW of Section 30, Township 140 North, Range 96 West, Stark County, North Dakota.

(3) That authorization in (2) above is given on the condition that Conoco comply with all the provisions of (6) below.

(4) That the State Geologist is hereby authorized to approve requests to utilize individual wells in the Dickinson Field for the injection of salt water into the Dakota Group.

(5) That the State Geologist may prescribe such procedures as he deems necessary to assure compliance with all applicable rules and prevent the pollution of potable waters.

(6) That such procedures shall include, but not be limited to, the following:

(a) That the porous intervals above, and below, the proposed injection interval be properly protected by cement.

(b) That injections be through tubing and a suitable packer set, and maintained, so as to isolate the injection interval.

(c) Operations shall be conducted in accordance with all applicable rules of the Commission and any applicable rules subsequently promulgated by the Commission.

(d) Injection operations shall be suspended immediately if so directed by the office of the State Geologist and shall be subject to his constant supervision.

(e) That the amounts of water injected monthly, the source thereof, and the average injection pressure be reported to the State Geologist at the same time that crude oil production reports are submitted.

(7) That this order shall remain in full force and effect until further order of the Commission.

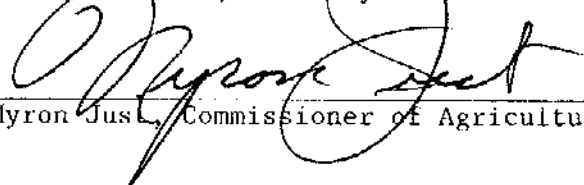
DONE, in Bismarck, North Dakota, this 24th day of June, 1980.

THE NORTH DAKOTA INDUSTRIAL COMMISSION

Arthur A. Link, Governor



Allen F. Olson, Attorney General



Myron Just, Commissioner of Agriculture

SCHUMBERGER

LATEROLOG
WITH GAMMA RAYCOUNTY STARK, N.D.
FIELD or LOCATION WEST DICKINSON
WELL FRENZEL #2

COMPANY CONTINENTAL OIL CO

COMPANY CONTINENTAL OIL COMPANY

WELL FRENZEL #2 (DHSU #23)

FIELD WEST DICKINSON

COUNTY STARK STATE NORTH DAKOTA

LOCATION SW/SW

Other Services:

Sec. 30 Twp. 140N Rge. 96W

SLC

Permanent Datum: GL Elev. 2512
Log Measured From KB 12 Ft. Above Perm. Datum Elev.: K.B. 2524
Drilling Measured From KB G.L. 2512

Date 9-1-67

Run No. ONE

Depth—Driller 7985

Depth—Logger 7977

Btm. Log Interval 7972

Top Log Interval 619

Casing—Driller 8-5/8" 619

Casing—Logger 619

Bit Size 7-7/8"

Type Fluid in Hole SM-STARCH

Dens. Visc. 10.5 50

pH Fluid Loss 8 ml

Source of Sample FLOWLINE

R_m @ Meas. Temp. .078 @ 73 °FR_{mf} @ Meas. Temp. .044 @ 73 °FR_{mc} @ Meas. Temp. -- @ -- °FSource: R_{mf} R_{mc} M --

Time Since Circ. .035 @ 172 °F

Max. Rec. Temp. 172 °F

Equip. Location 4553 WLSTN

Recorded By ZMERZLIKAR

Checked By MR. MARK R. PATTSHELL

The well name, location and borehole reference data were furnished by the customer.

REMARKS

Changes in Mud Type or Additional Samples

Date Sample No.
Depth—Driller
Type Fluid in Hole

Scale Changes

Type Log Depth Scale Up Hole Scale Down Hole

Dens. Visc.
pH Fluid Loss ml

Source of Sample

R_m @ Meas. Temp. @ °F
R_{mf} @ Meas. Temp. @ °F
R_{mc} @ Meas. Temp. @ °F
Source: R_{mf} R_{mc}
R_m @ BHT @ °F
R_{mf} @ BHT @ °F
R_{mc} @ BHT @ °F

Equipment Data

Pad Type Tool Pos. Other

Run No. Tool Type
ONE LGT-B

Equip. Used: CART. No. C-111

PANEL No. A-16

SONDE No. B-113

Spacing: BEAM WIDTH: 1'

GUARD LENGTH: 5'

B-06-6711073033

GAMMA RAY

API UNITS

GAMMA RAY ZERO 0 DIV. TO LEFT

OF THIS LINE

0 120

120 240

Depths

LATEROLOG

CONDUCTIVITY

MILLIMHOS/M (1000/OHM.M)

2000

1000

0

RESISTIVITY

OHM.M

0 8 16 25 50 ∞
4 12 20 33 100

Calibration

Calibration

Elec. Zero

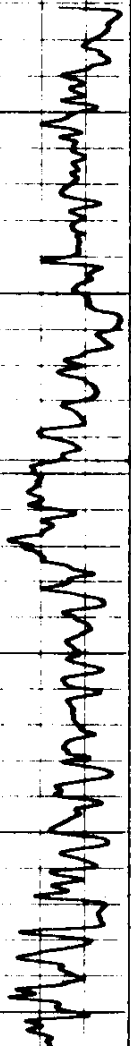
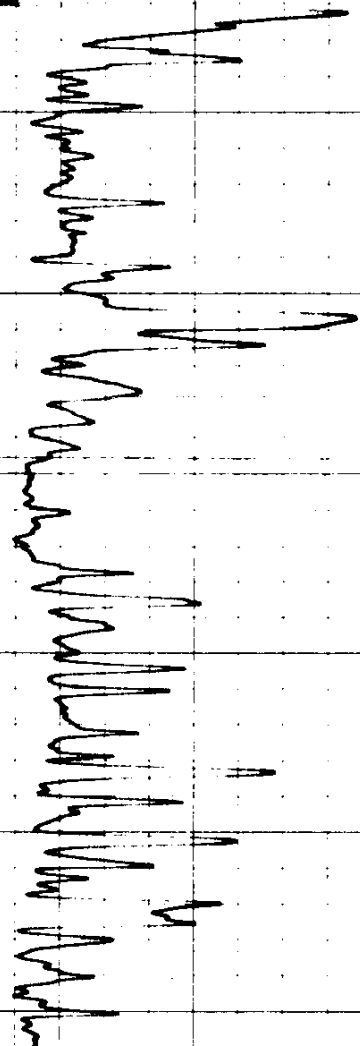
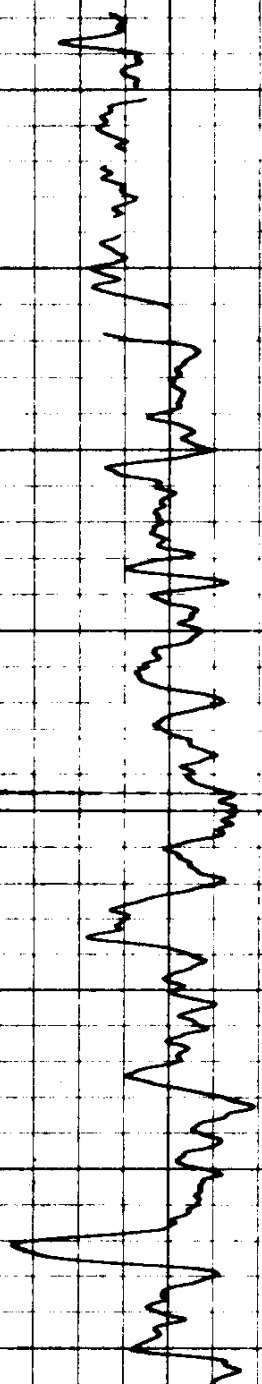
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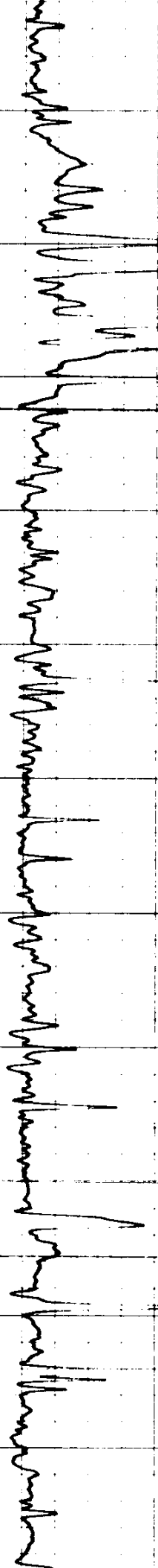
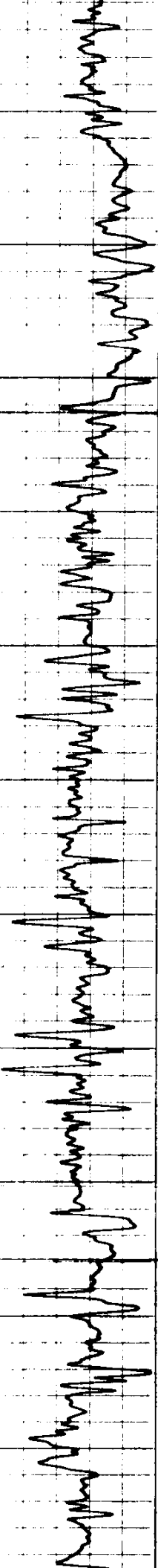
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Casing

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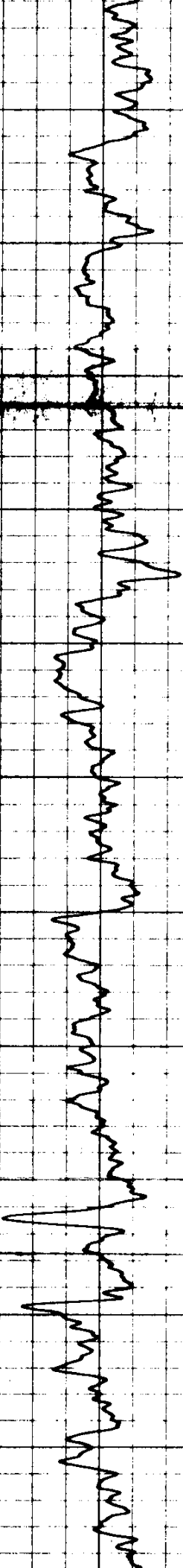
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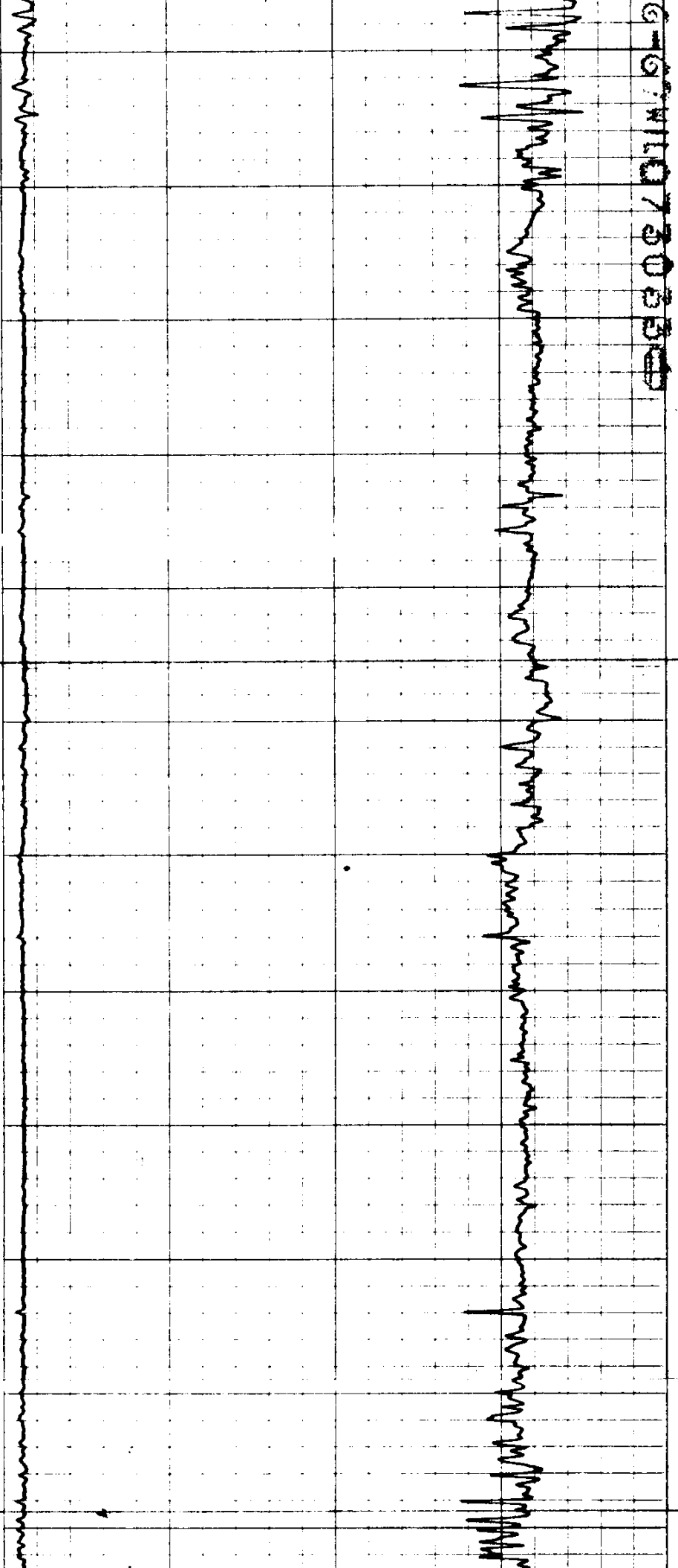
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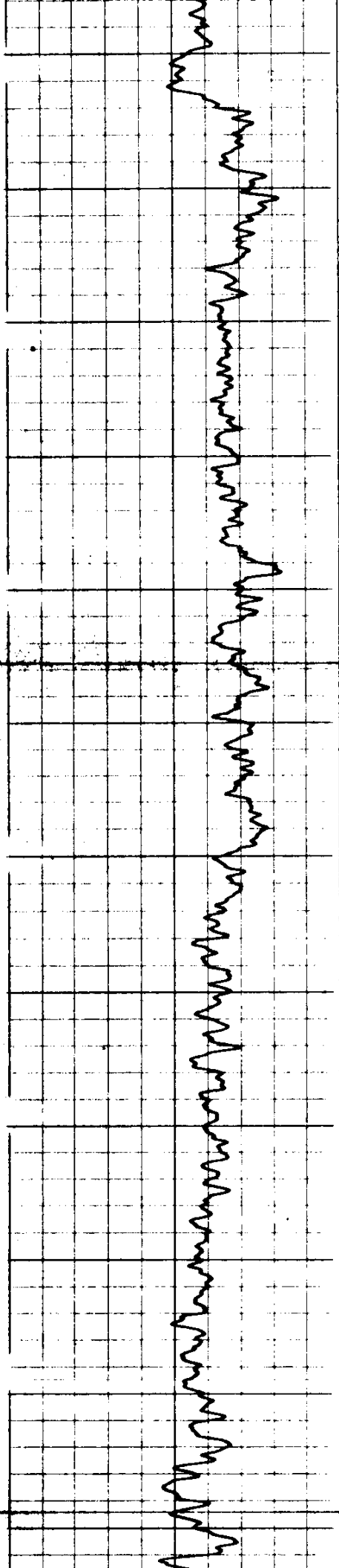
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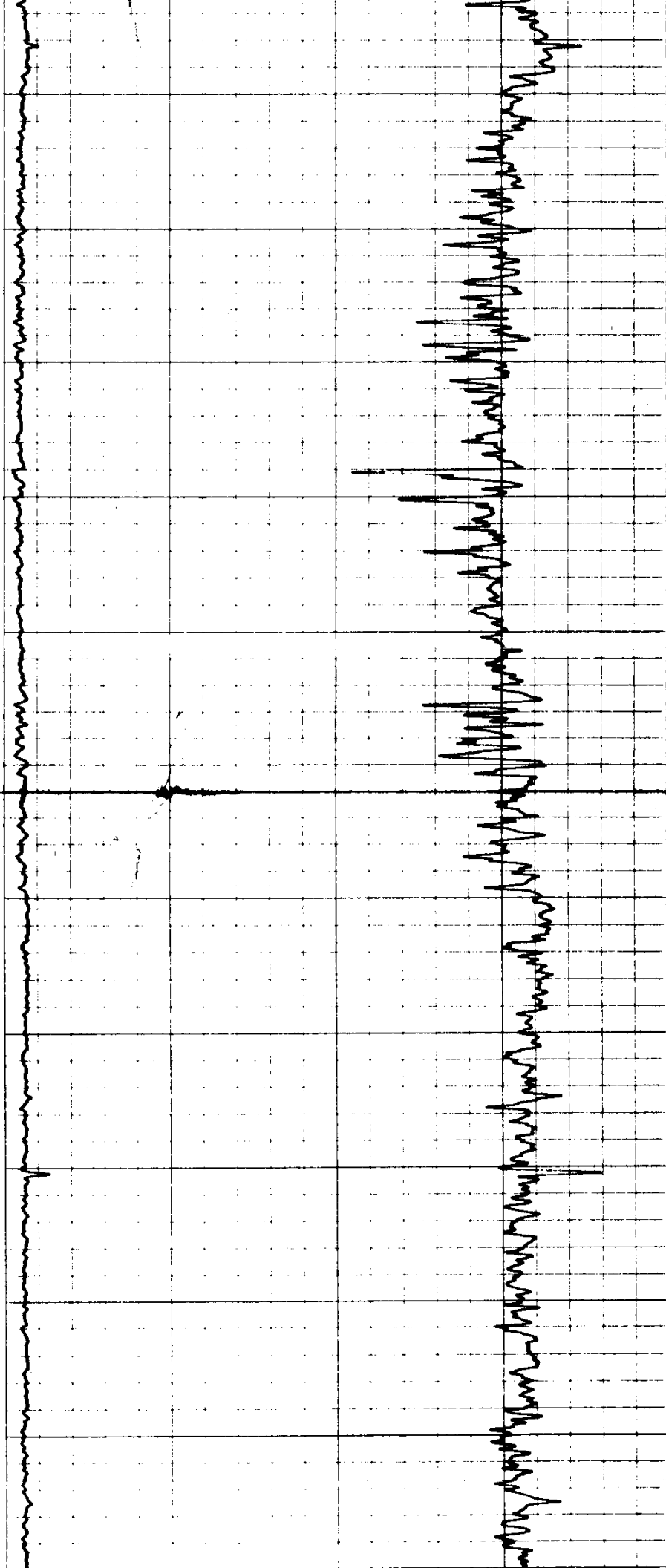


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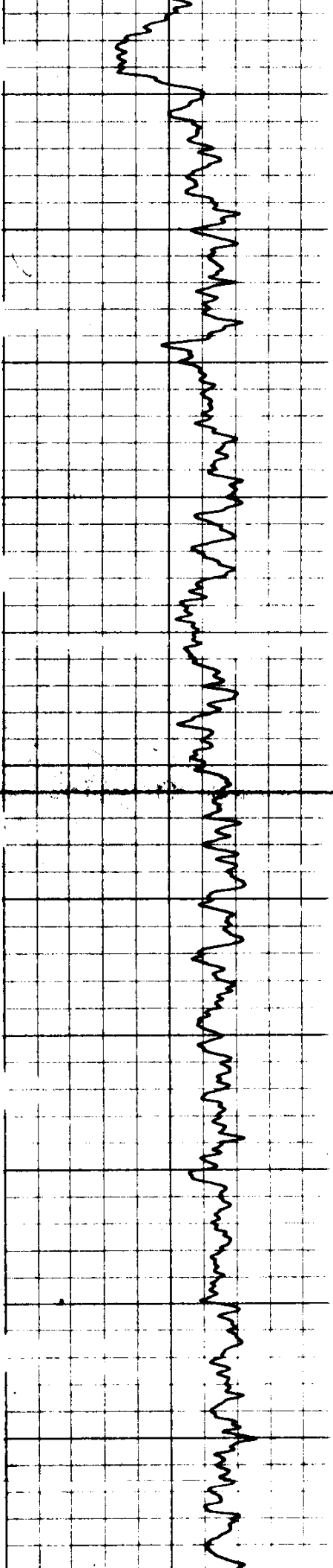


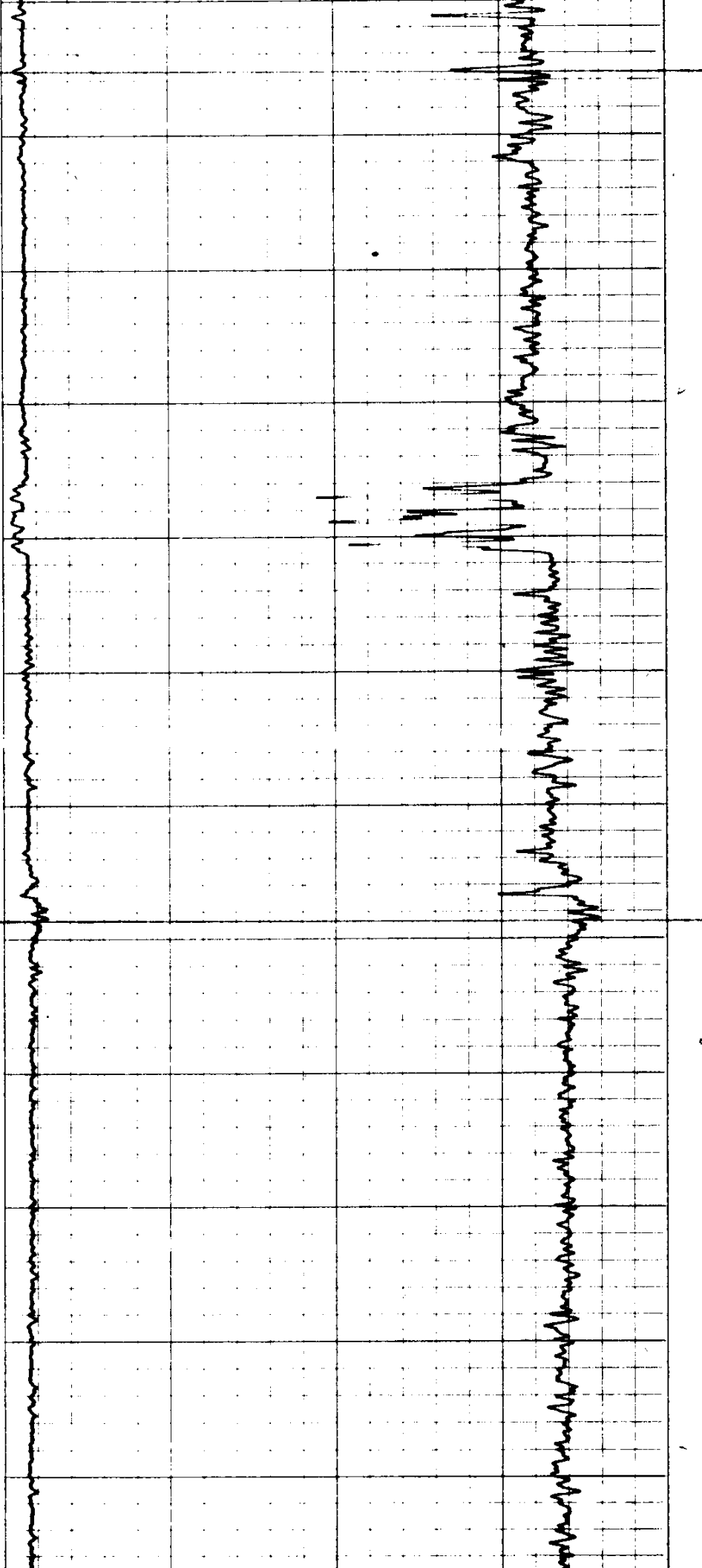
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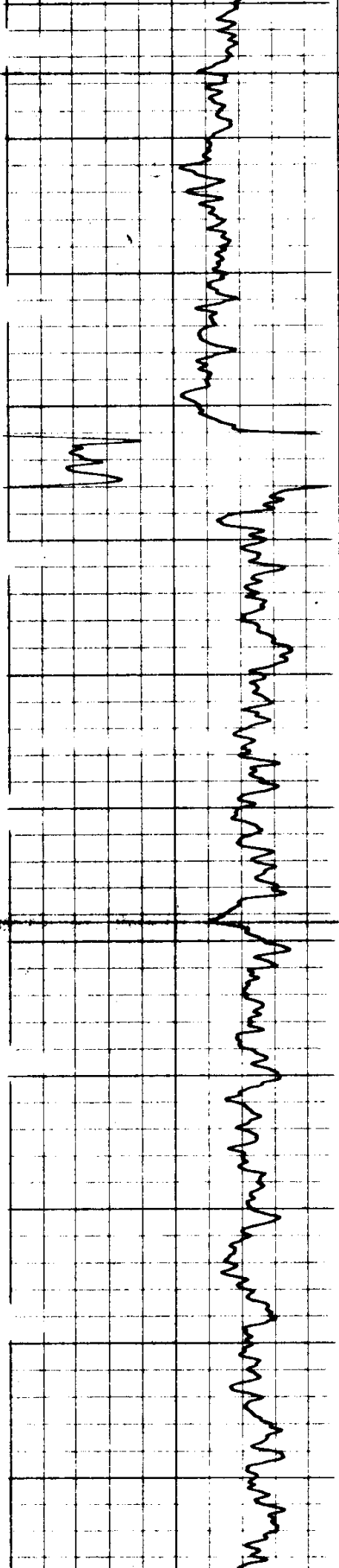


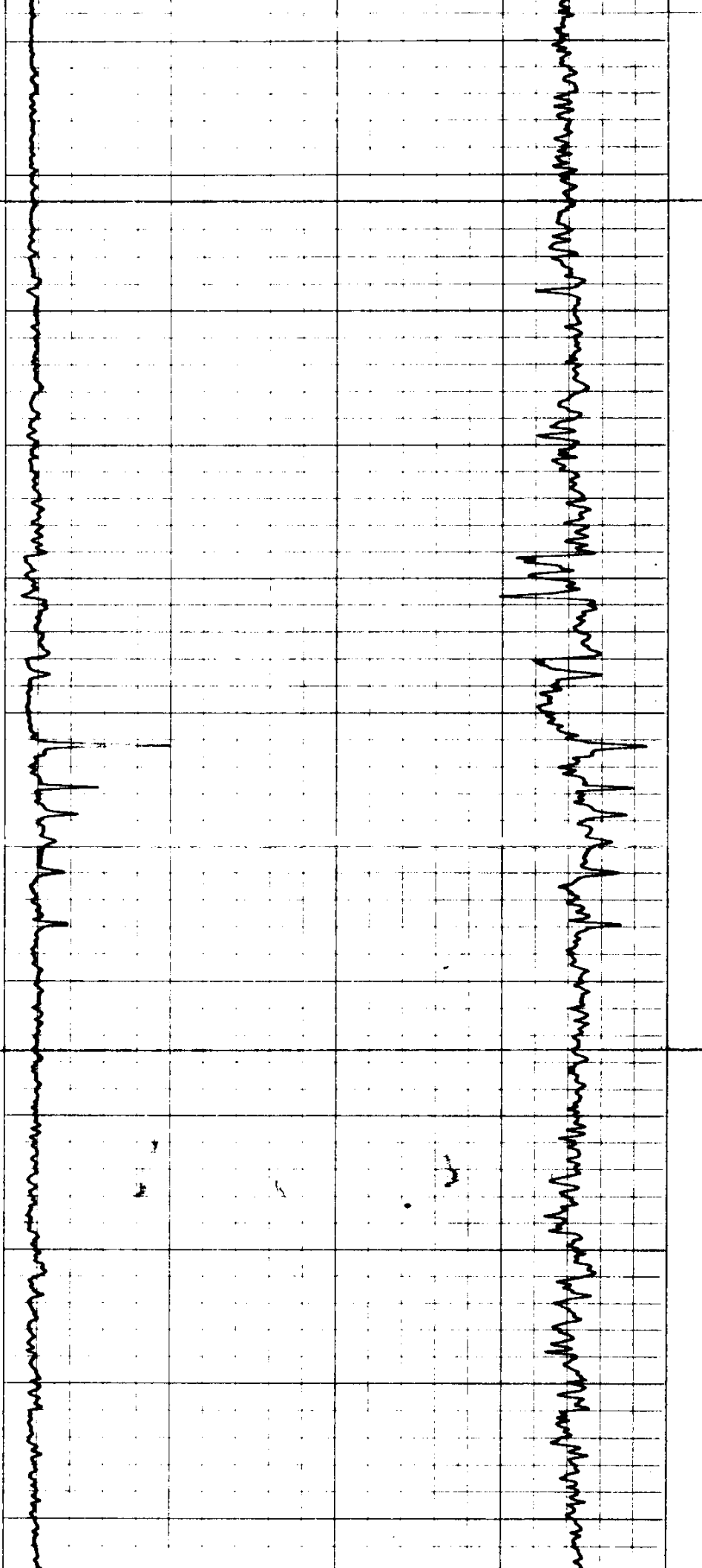
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3300 3400 3500 3600 3700 3800





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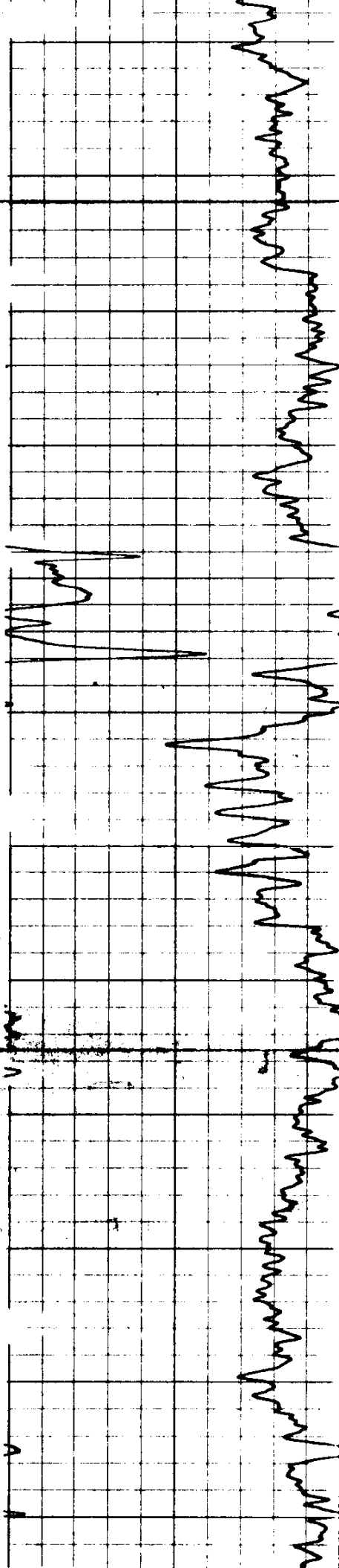
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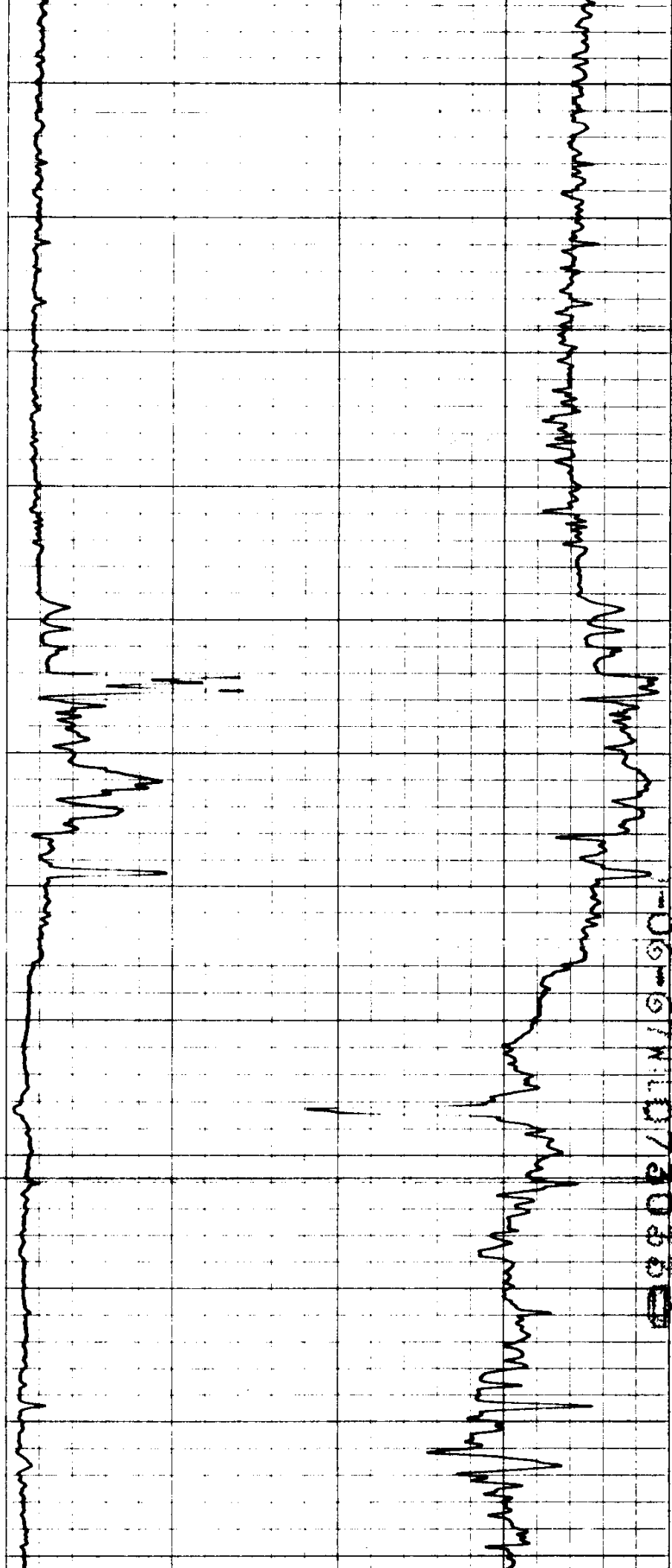
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06-07-07 2033



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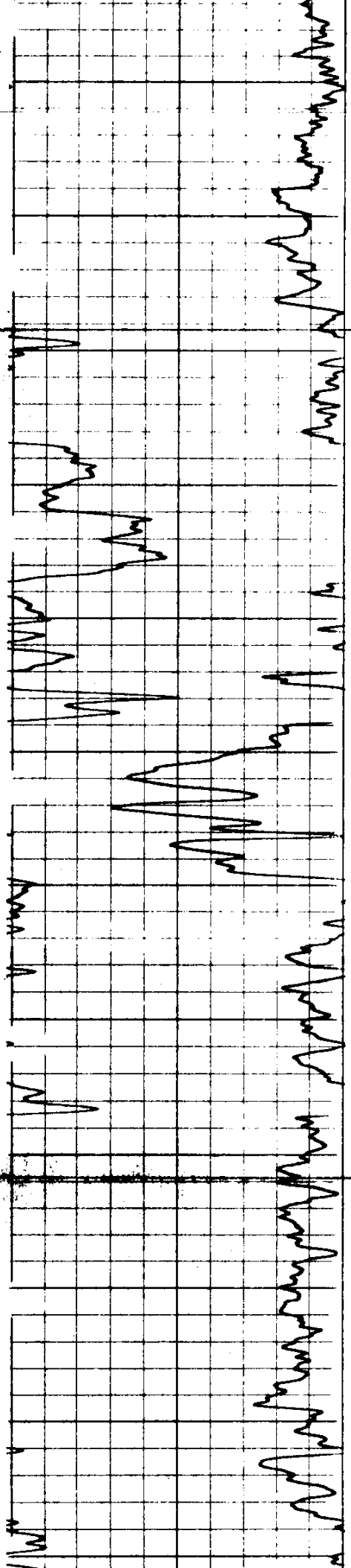
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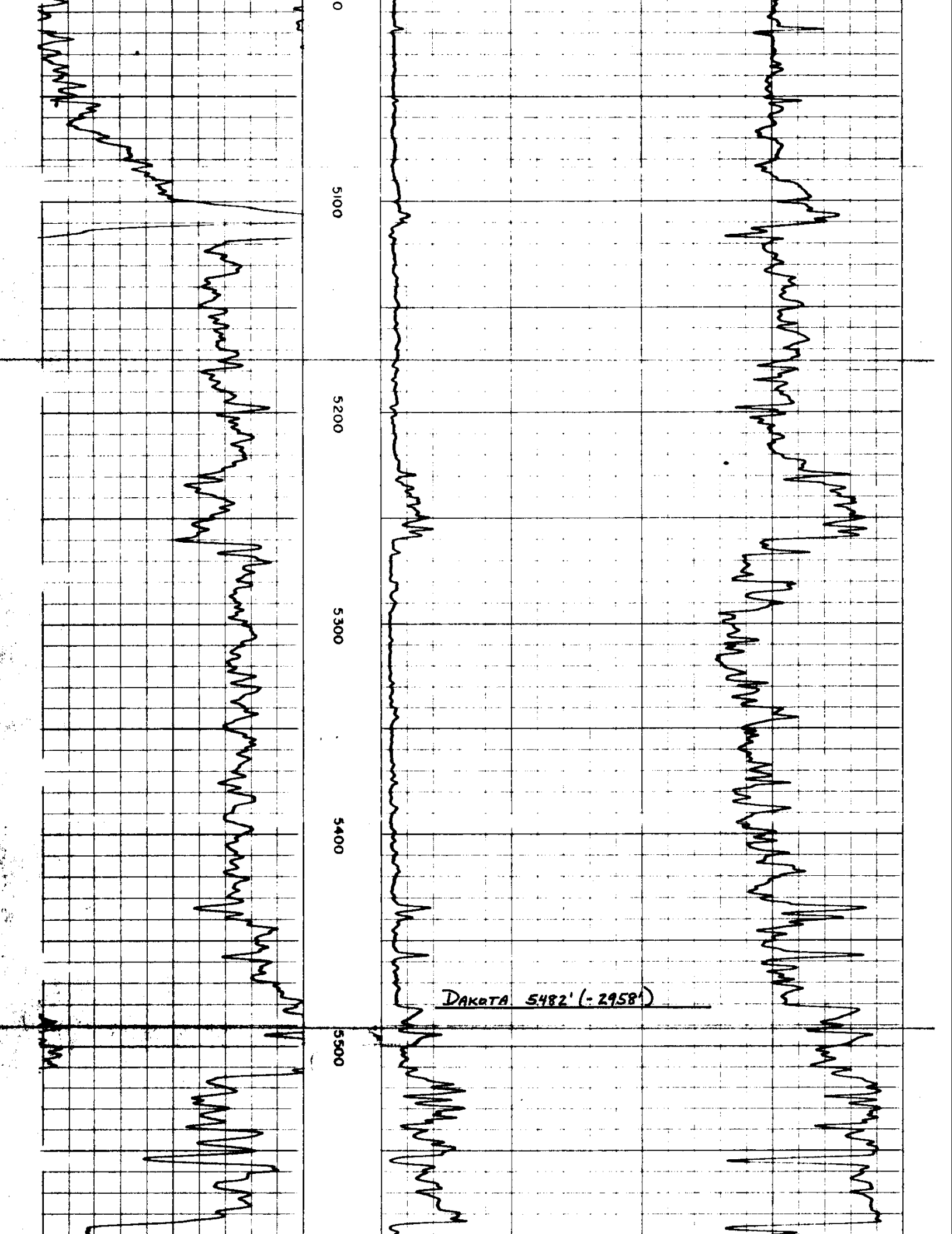
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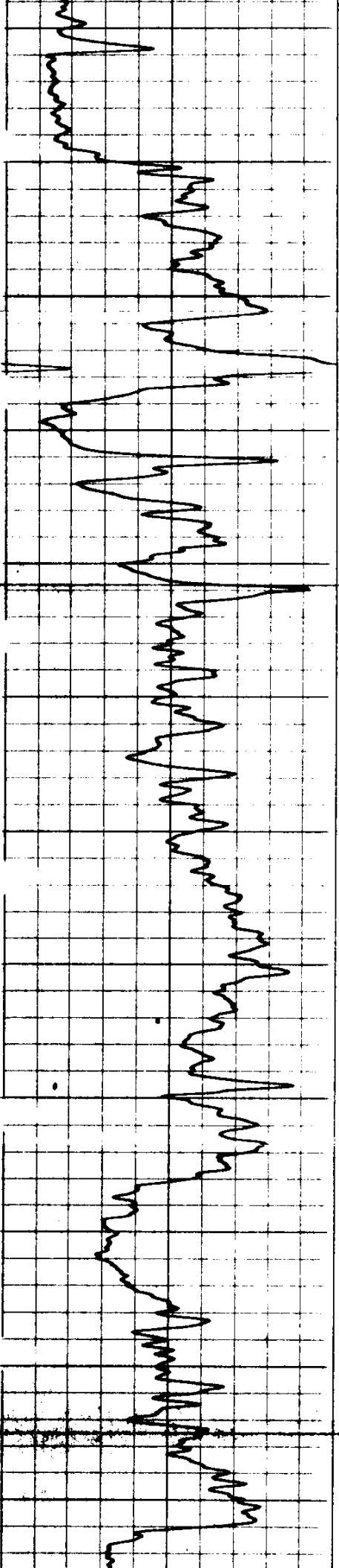
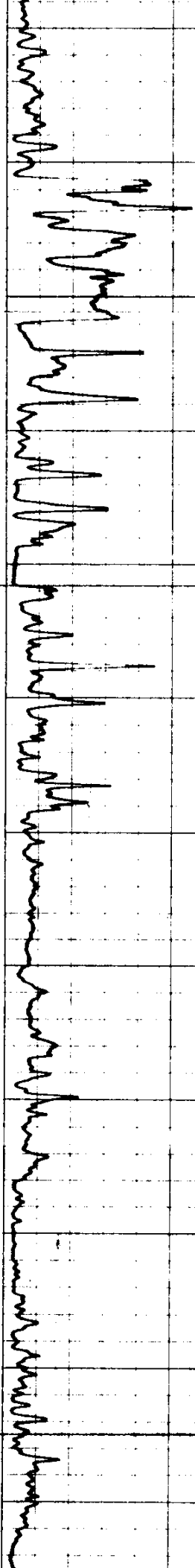
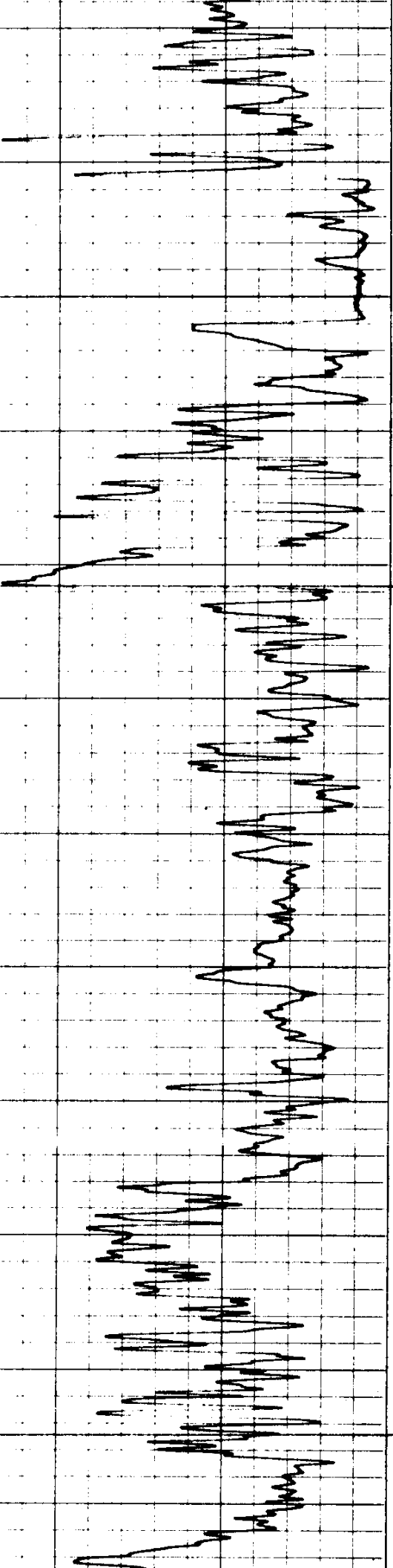
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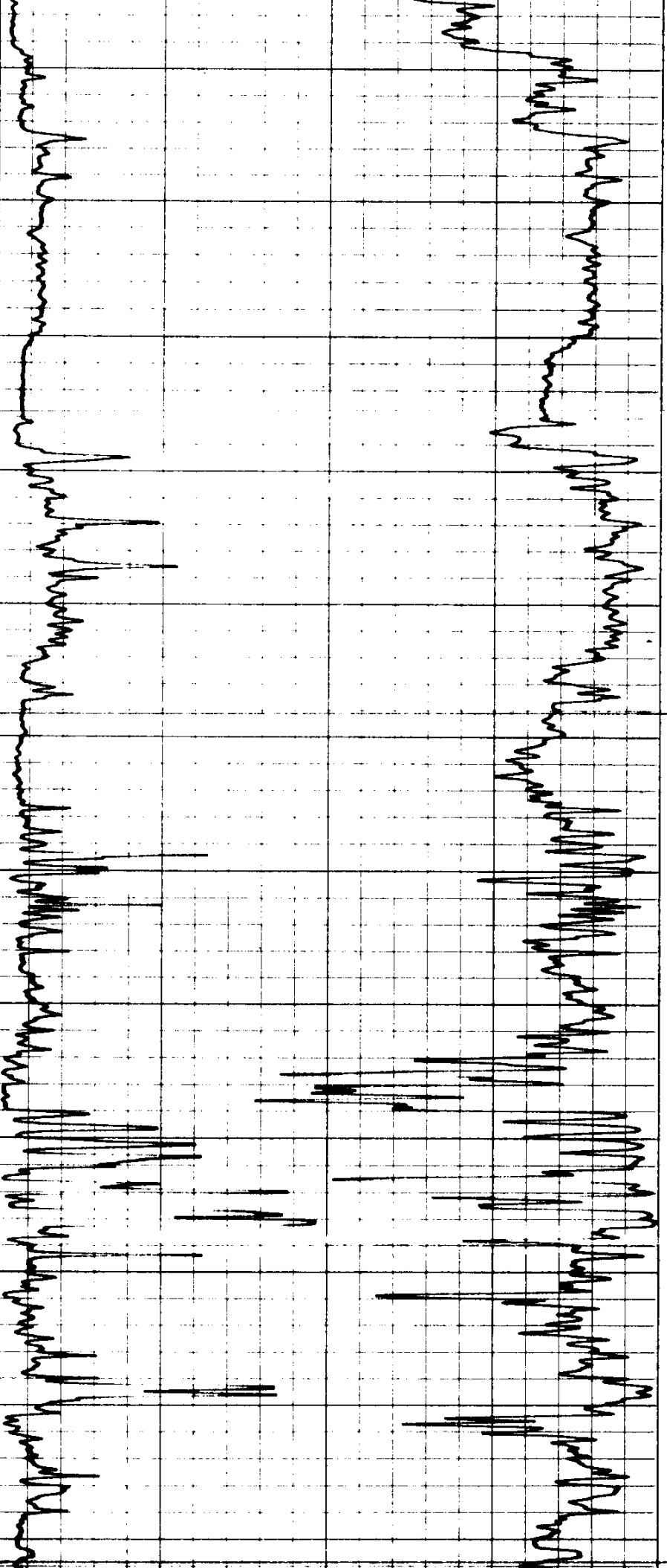
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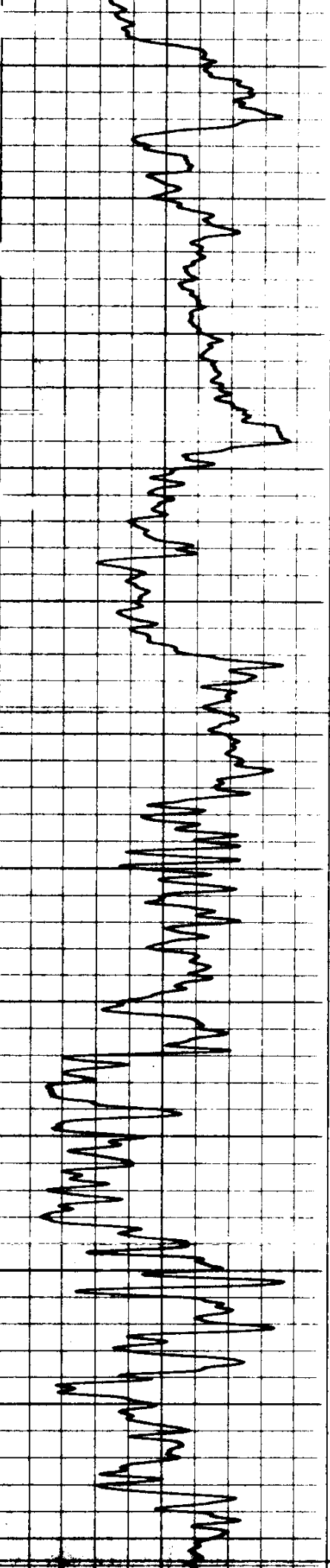
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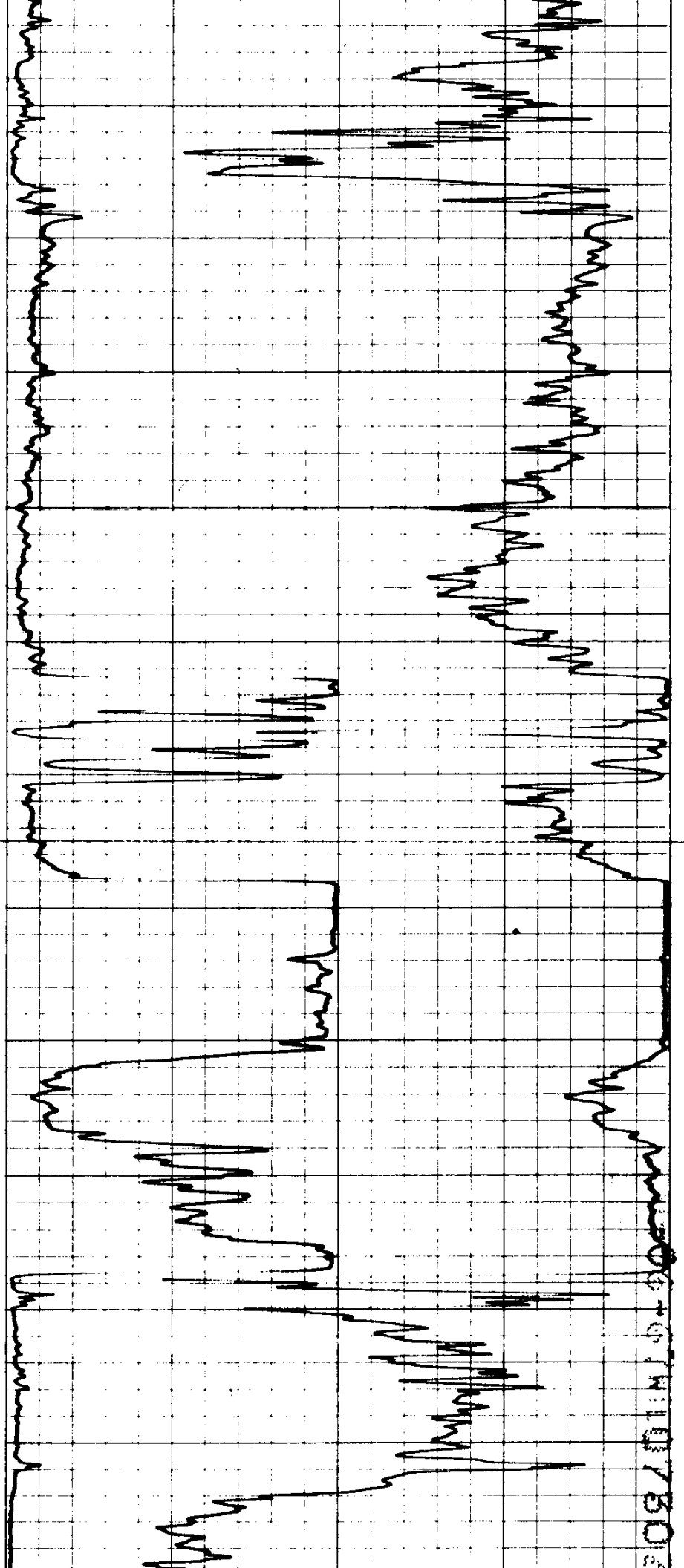
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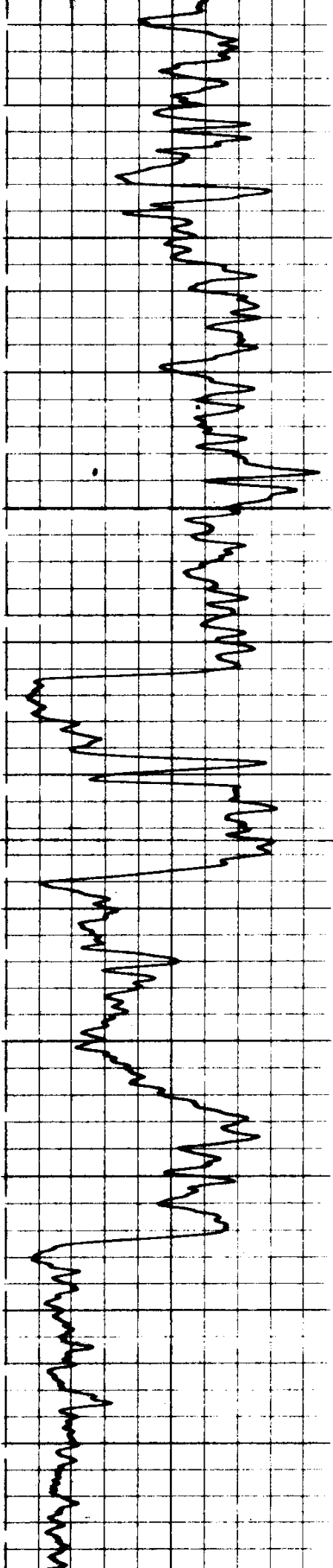
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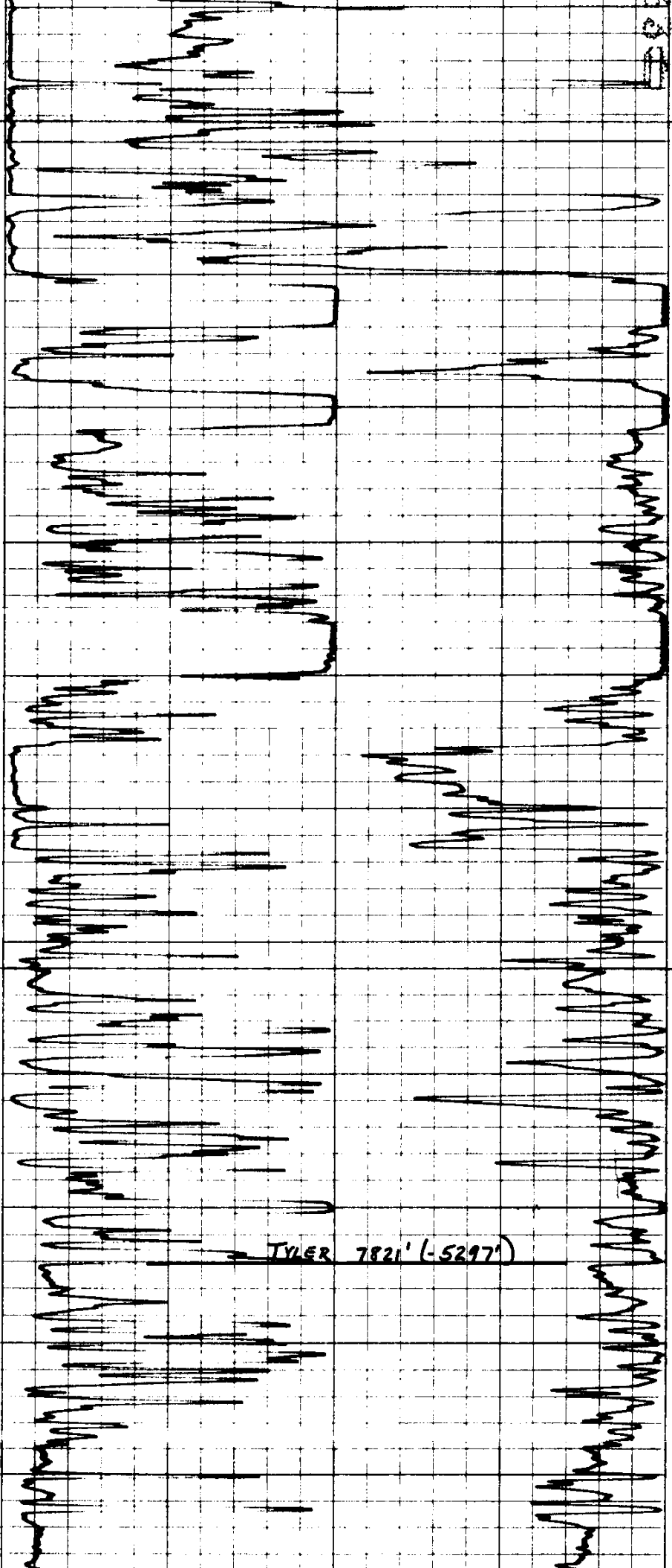


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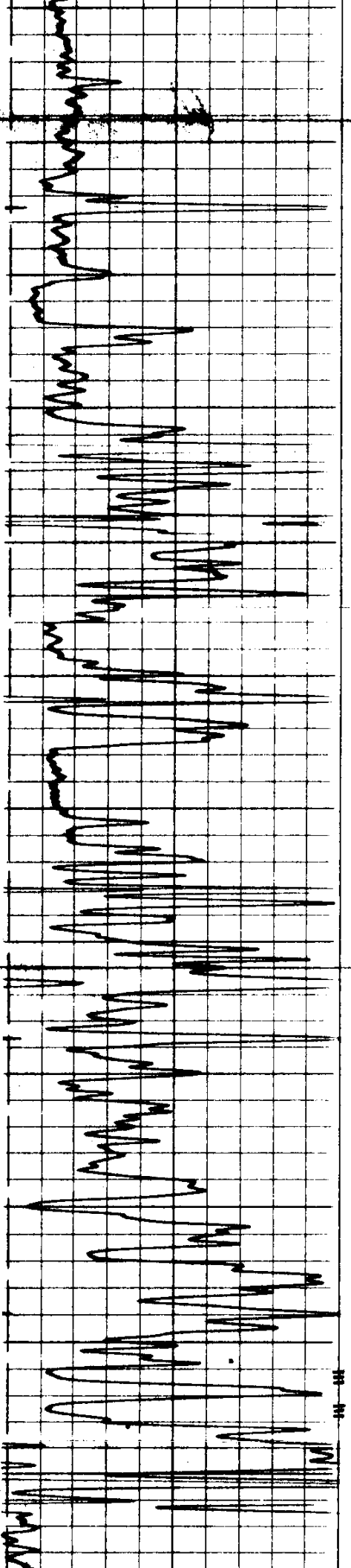
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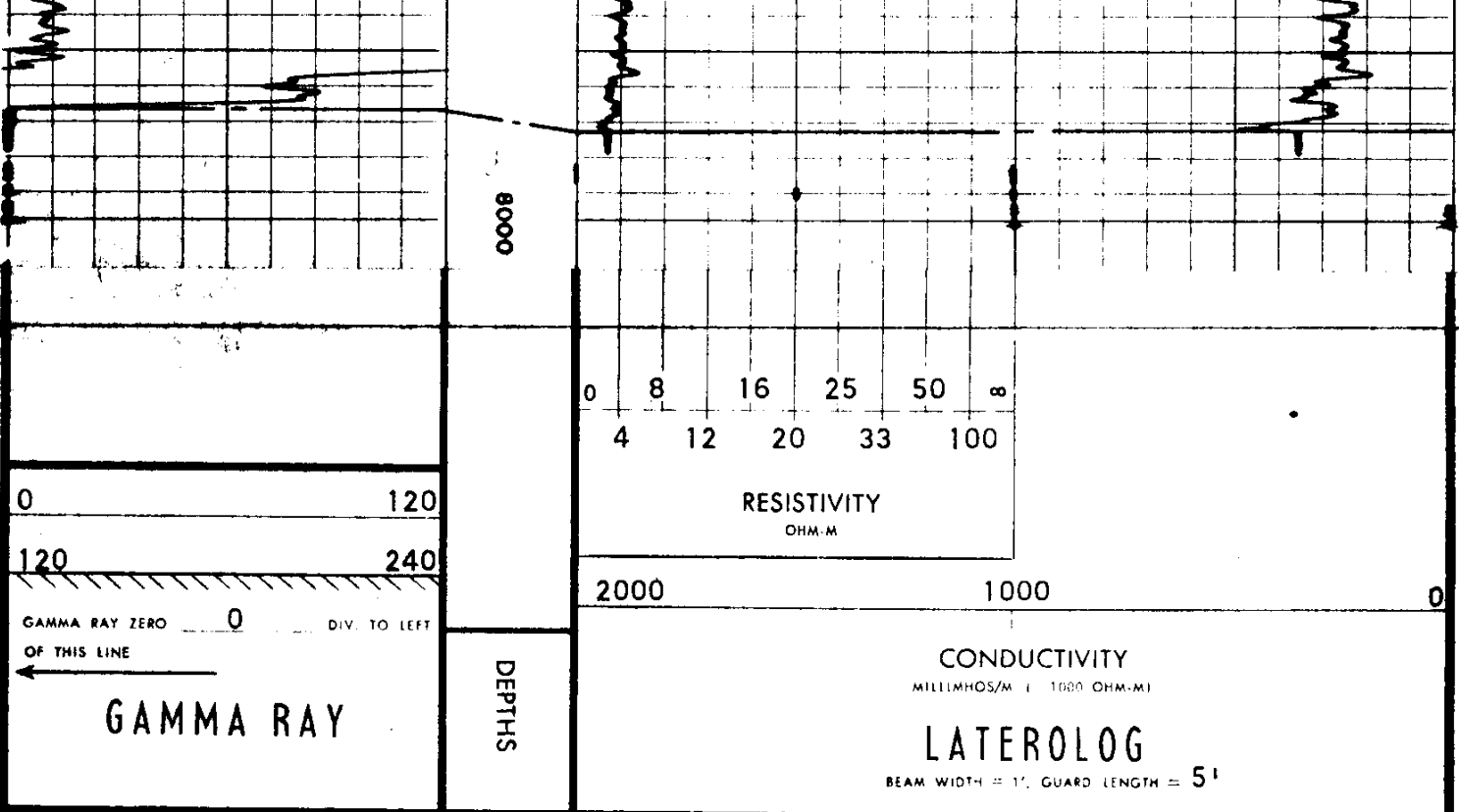
7700

7800

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TYLER 7821' (-5297')





COMPANY CONTINENTAL OIL COMPANY

WELL FRENZEL #2

FIELD WEST DICKINSON

COUNTY STARK STATE NORTH DAKOTA

Rm .078 @ 73

Rmf .044 @ 73

Rmc -- @ --

BHT 172

F

SWSC FR 7972

SWSC TD 7977

DRLR TD 7985

Elev:

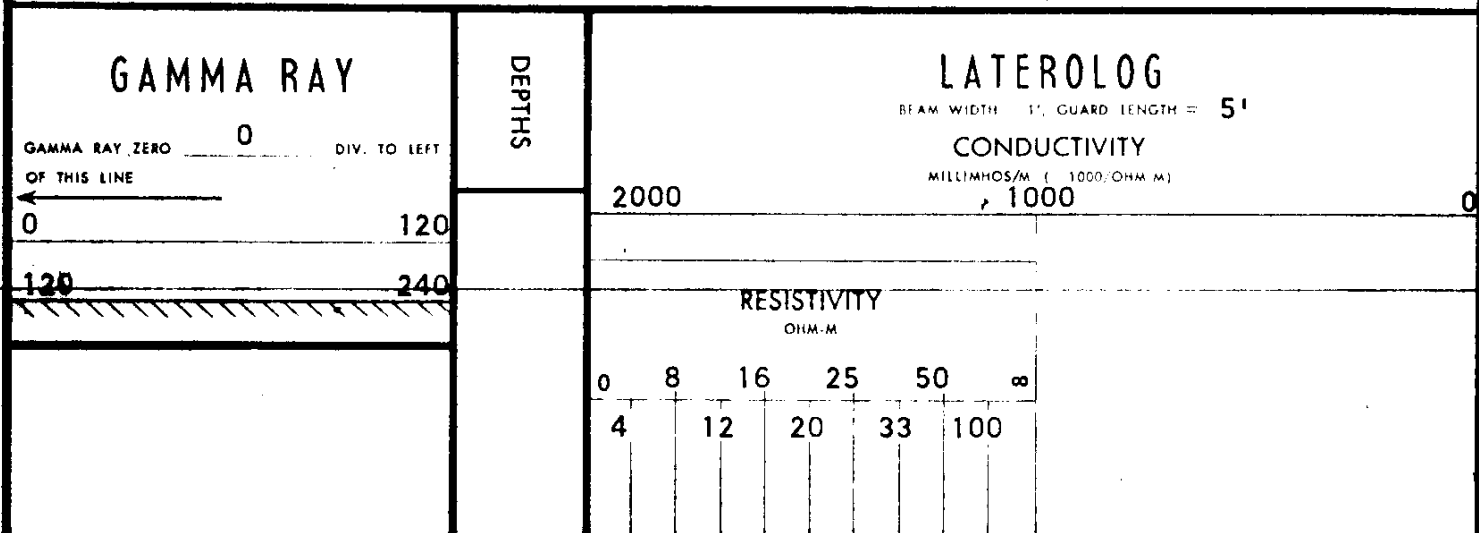
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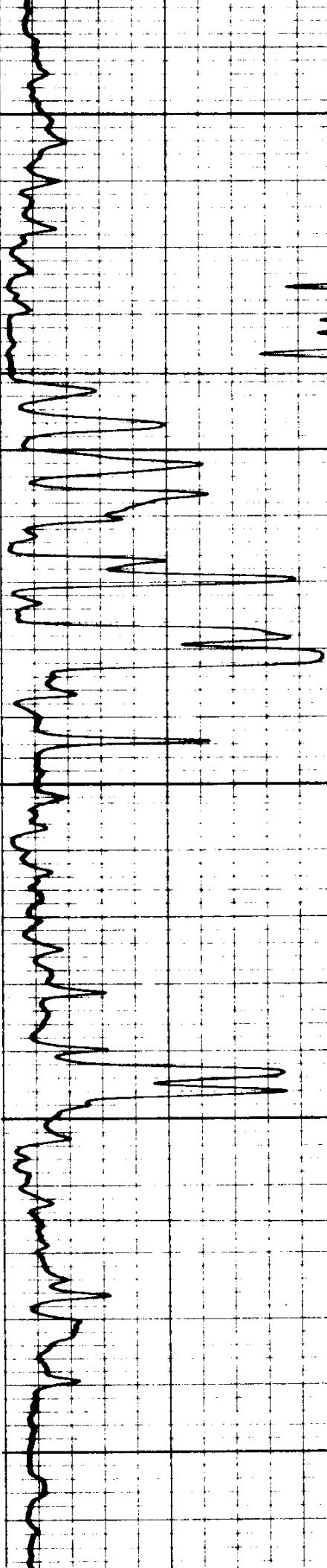
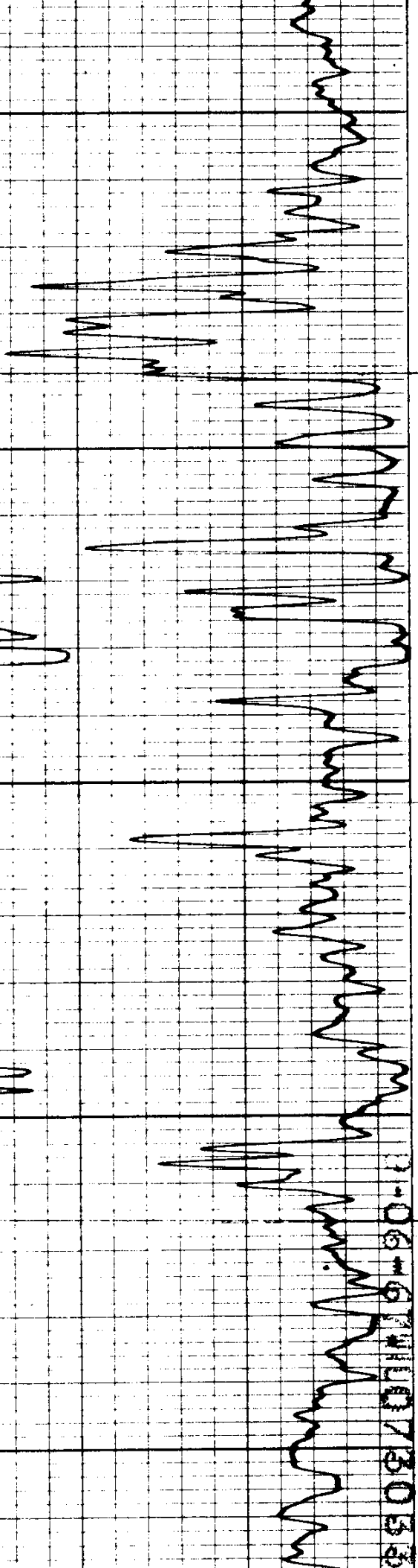
GL 2512

DETAIL LOG

5"=100'

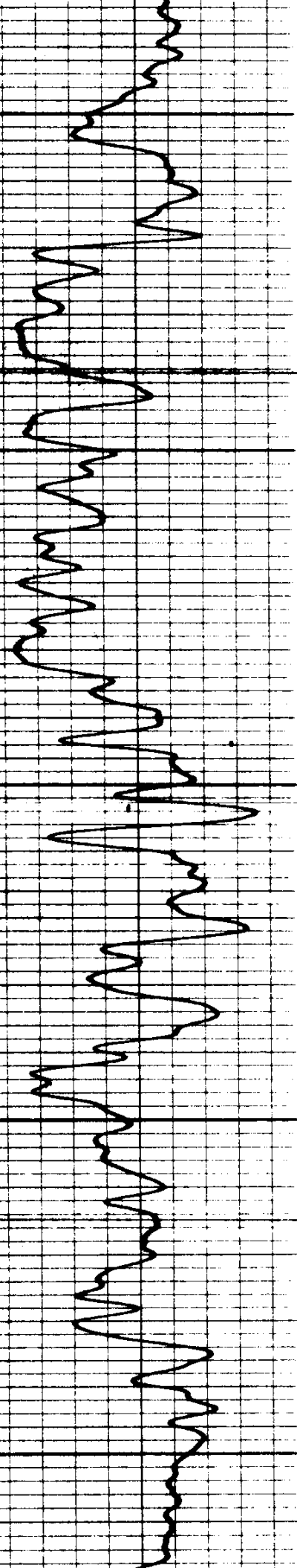


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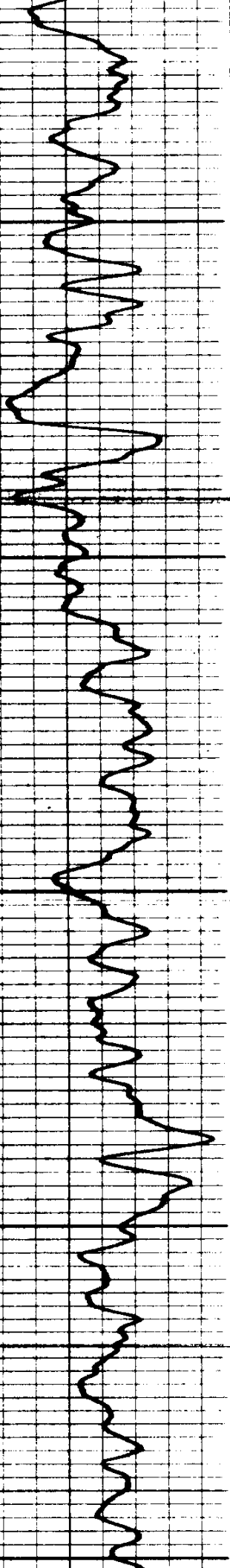
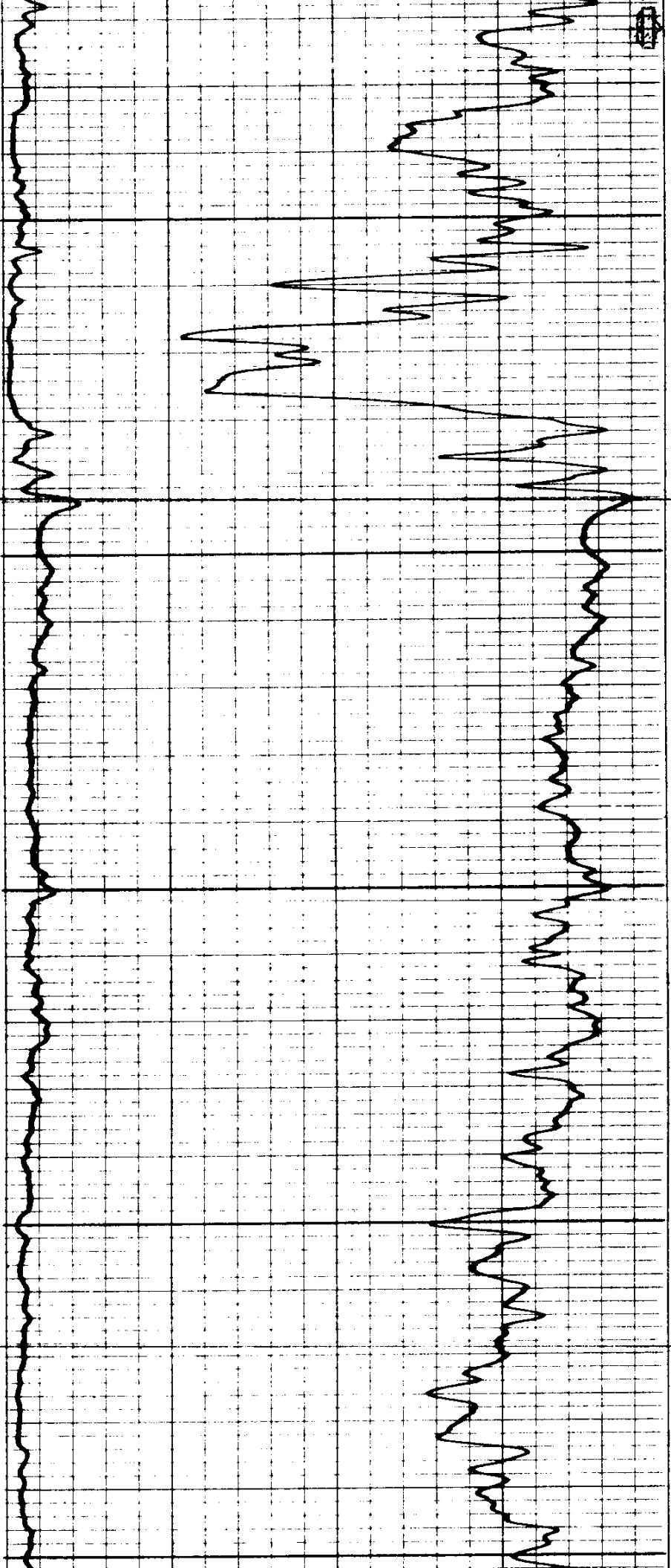
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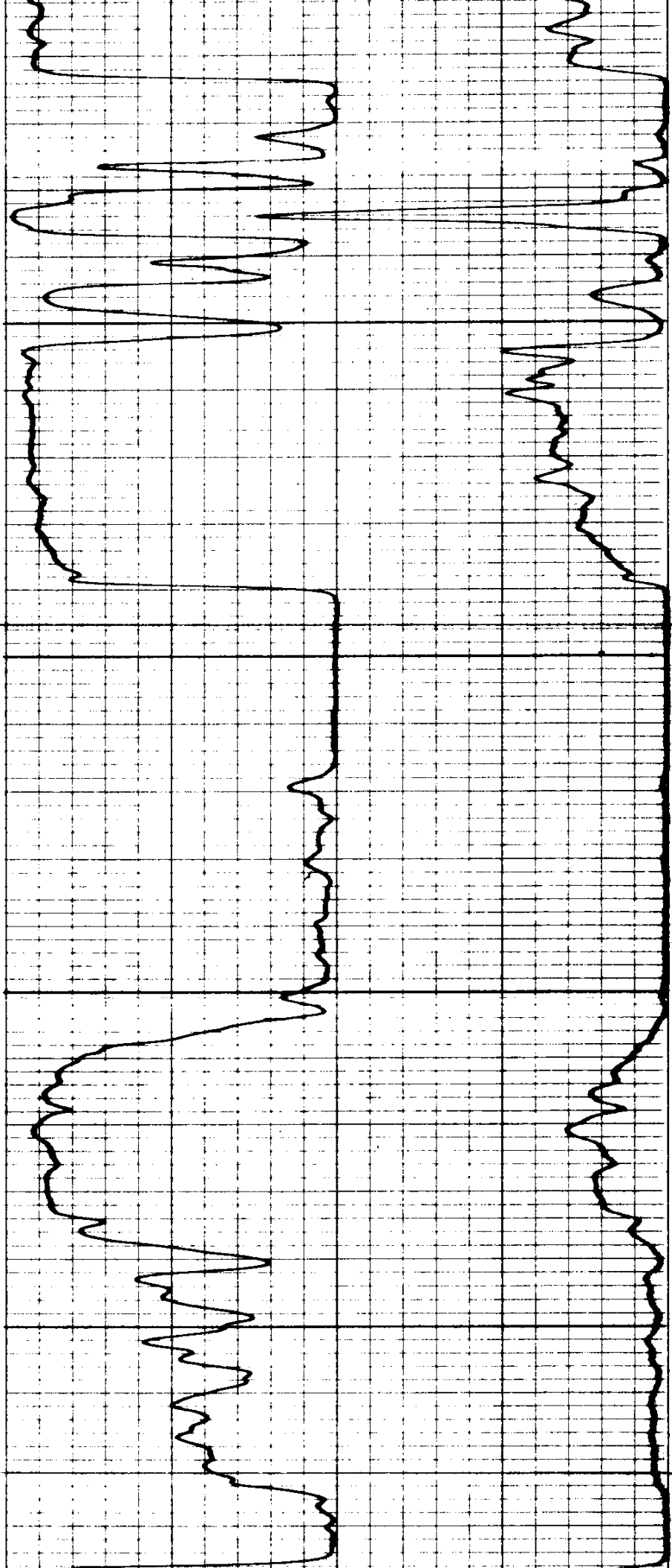


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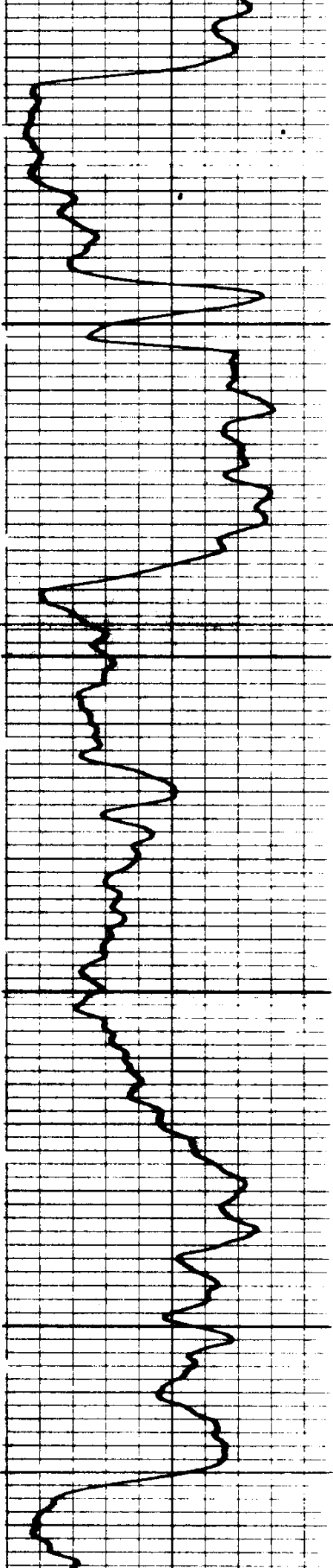




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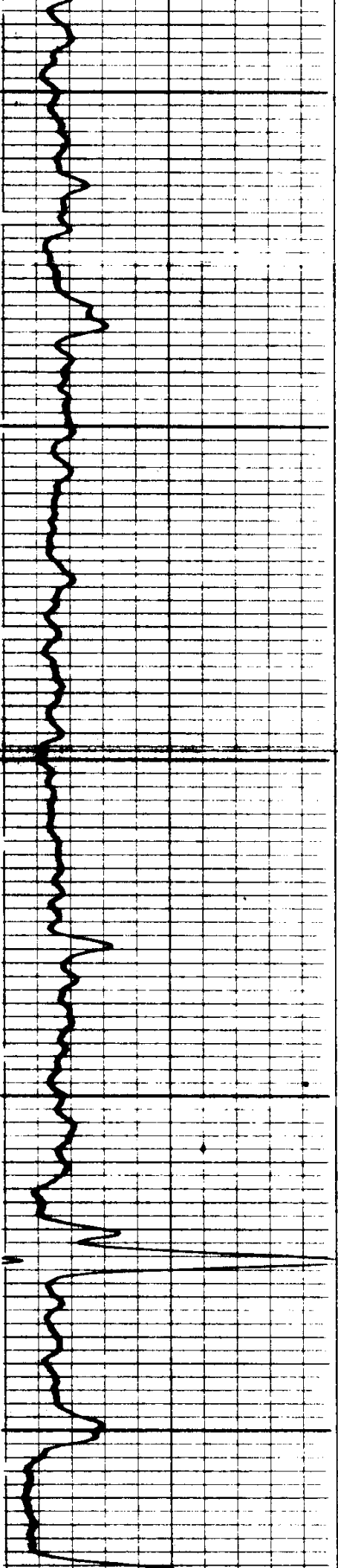
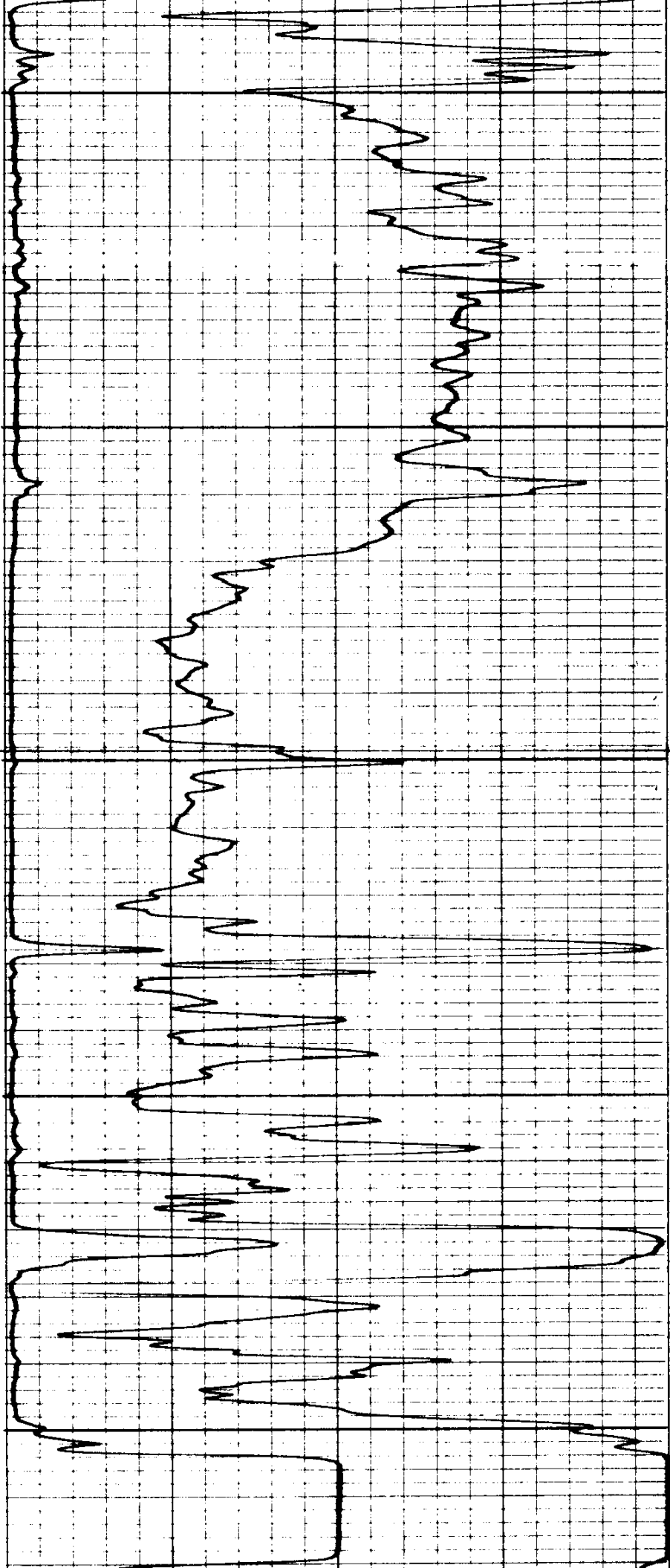
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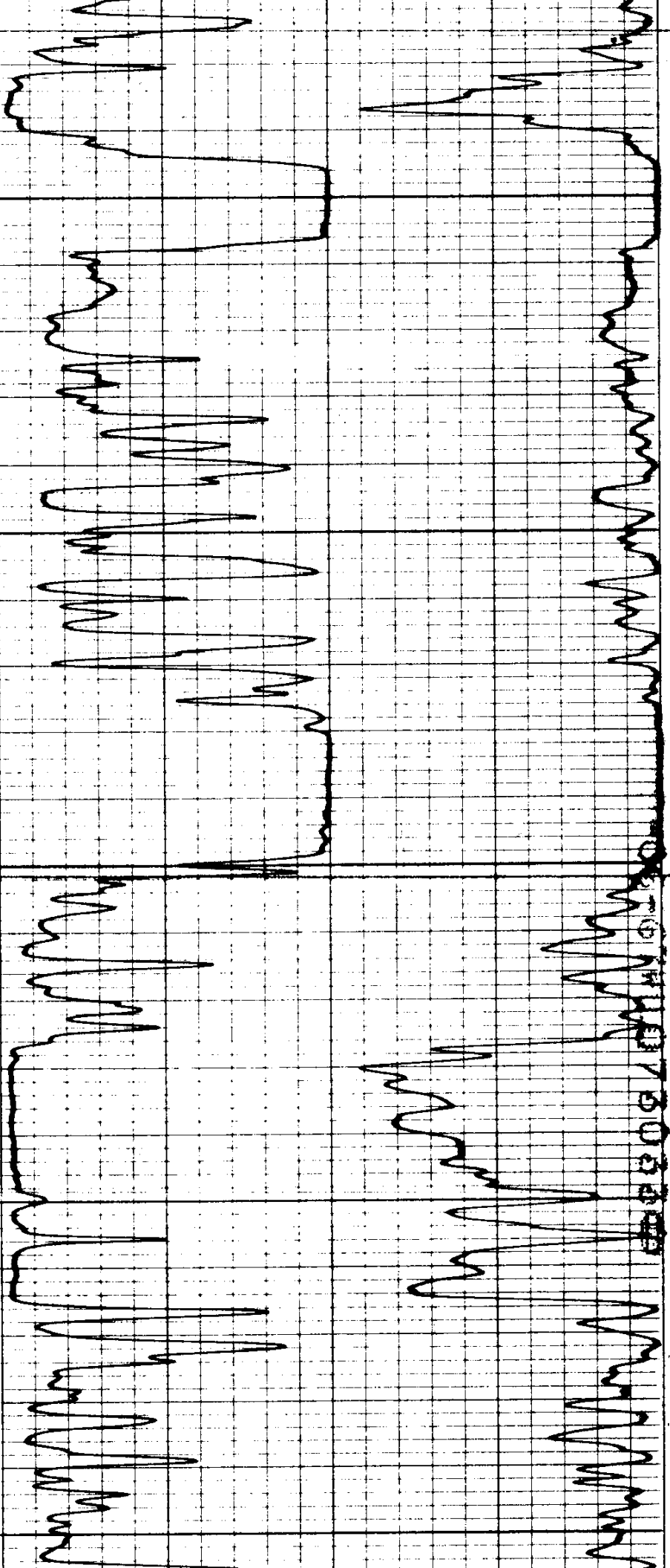
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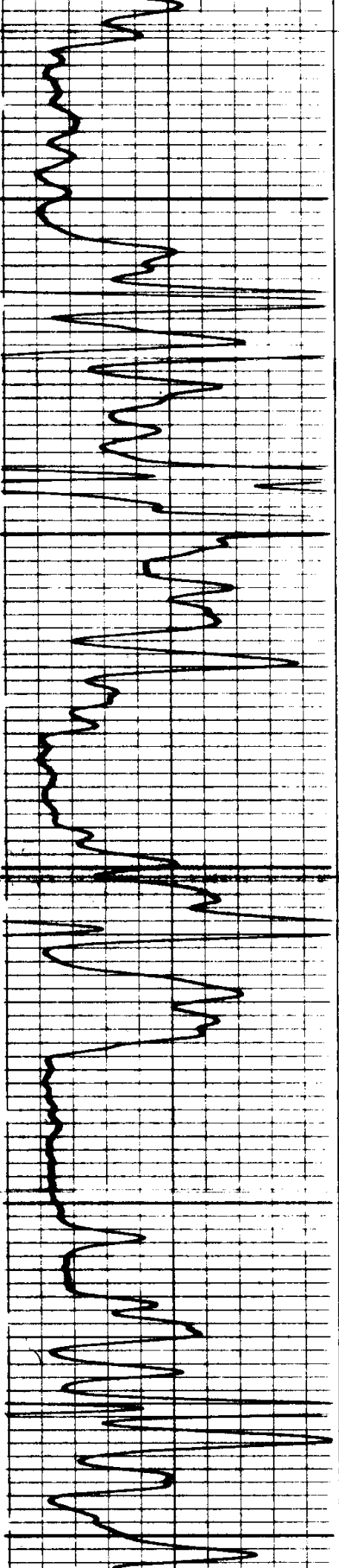


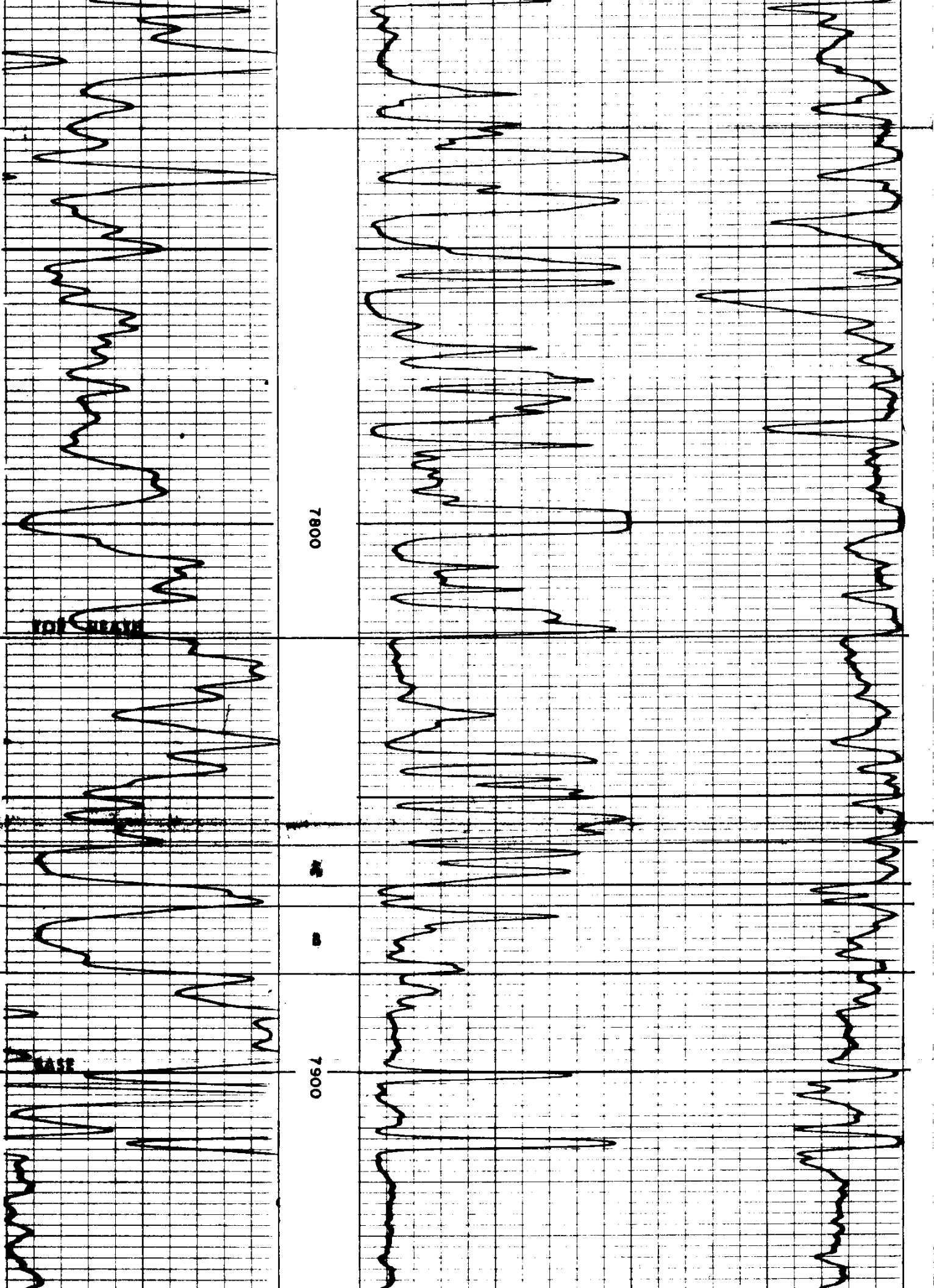


7500

7600

7700





8000

Calibration

Calibration

Elec. Zero

Mech. Zero

0 8 16 25 50 8
4 12 20 33 100

RESISTIVITY

OHM-M

2000

1000

0

0 120

120 240

GAMMA RAY ZERO 0

DIV. TO LEFT

OF THIS LINE

GAMMA RAY

DEPTHS

CONDUCTIVITY

MILLIMHOS-M [= 1000/OHM-M]

LATEROLOG

BEAM WIDTH = 1', GUARD LENGTH = 5'

COMPANY CONTINENTAL OIL COMPANY

WELL FRENZEL #2

FIELD WEST DICKINSON

COUNTY STARK STATE NORTH DAKOTA

Rm .078 @ 73 F

Rmf .044 @ 73 F

Rmc --- @ -- F

BHT 172 F

SWSC FR 7972

SWSC TD 7977

DRLR TD 7985

Elev:

KB 2524

DF

GL 2512

RADIOACTIVITY CALIBRATION DATA

GAMMA RAY CAL @ 200 AM
GAMMA RAY UNITS PER TRACK

Cps 470 Tc 6 Sps = 500

9800

Gamma Ray Background
Cps 55 Tc = 6 Sens = 500

G. R. Calibration Zero

0066

Formation Reading

At Log Sens.: Gamma Ray
SENS = 300 TC = 1

0066

Formation Reading

At Log Sens.: Gamma Ray
SENS = 300 TC = 2

Formation Reading

At Cal. Sens.: Gamma Ray
SENS = 500 TC = 2

0086

RADIOACTIVITY CALIBRATION DATA

COMPANY CONTINENTAL OIL COMPANY

Rm .078 @ 73 °F

SWSC FR 7972

WELL FRENZEL #2

Rmf .044 @ 73 °F

SWSC TD 7977

Rmc --- @ -- °F

DRLR TD 7985

FIELD WEST DICKINSON

BHT 172 °F

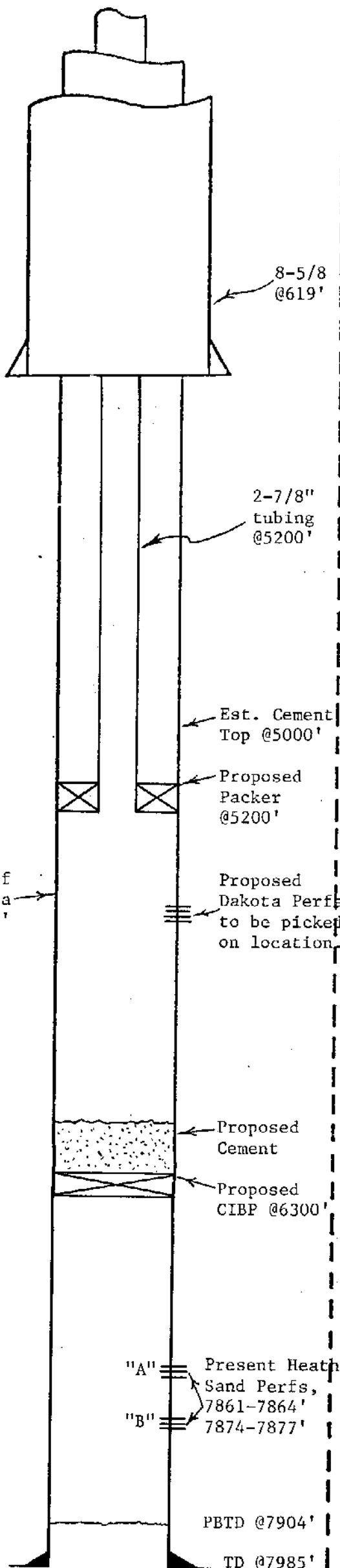
Elev:

COUNTY STARK STATE NORTH DAKOTA

KB 2524

DF

GL 2512



FIELD Dickinson Heath Sand Unit

POOL & WELL NO. Proposed Dakota Water Disposal - No. 23

WELL STATUS TSI

LOCATION 660 FSL, 660 FWL (SW SW), Sec. 30, T140N, R96W,
Stark County, North Dakota

ELEVATION 2512' GRD 2523' RE

TOTAL DEPTH 7985' PBTB 7904'

SURFACE CASING 8-5/8", 24#, J-55 @619'

Cemented with 400 sacks.

PRODUCTION CASING 5 1/2", 14# (0-4255'), 15.5# (4255-6580'),
& 17# (6580-7985')

Cemented with 800 sacks Poz.

LINER None

PRESENT COMPLETION Heath Sand Perfs

"A" 7861-64' & "B" 7874-77'

TUBING 2-7/8" @5200'

RODS None

PUMP UNIT None

HISTORY

BEFORE THE INDUSTRIAL COMMISSION
OF THE STATE OF NORTH DAKOTA

IN THE MATTER OF THE APPLICATION OF
CONOCO INC. FOR AN ORDER AUTHORIZING
THE DISPOSAL OF COLLECTED WATER FROM
OPEN SOURCES INTO THE DAKOTA FORMATION
THROUGH THE DICKINSON HEATH SAND UNIT
WELL NO. 23, LOCATED IN SW $\frac{1}{4}$ SW $\frac{1}{4}$ SECTION
30, TOWNSHIP 140 N, RANGE 96W, DICKINSON
HEATH SAND UNIT, STARK COUNTY, NORTH
DAKOTA

1880

APPLICATION

COMES NOW, Conoco Inc., a Delaware corporation (hereinafter called "Applicant"), authorized to do business in the State of North Dakota, and makes application to the Industrial Commission of the State of North Dakota for approval to dispose of collected water from open sources into the Dakota formation through Dickinson Heath Sand Unit Well No. 23, located 660 feet from the south line and 535 feet from the west line of Section 30, Township 140 N, Range 96W, Dickinson Heath Sand Unit, Stark County, North Dakota.

In support of this application, Applicant respectfully states and shows as follows:

I.

Applicant is the Unit Operator for the Dickinson Heath Sand Unit, Stark County, North Dakota.

II.

North Dakota Commission Order No. 1202 approved a statutory type Unit and established administrative procedures and special operating rules for the Dickinson Heath Sand Unit on March 13, 1973.

III.

The Unit lands are being waterflooded successfully.

IV.

The water injection system for the Dickinson Heath Sand Unit comprises 17 injection wells through which is injected a total of approximately 12,000 barrels of water per day, composed of 7,000 barrels of produced Heath formation water and 5,000 barrels of make-up Dakota formation water taken from water supply Well No. 44 located in the SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 25, Township 140N, Range 96W in the Dickinson Heath Sand Unit area. In addition to produced Heath formation water and make-up produced Dakota formation water, approximately 500 barrels of water per month of water collected from open

sources such as swab pits, floor drains, and overflow drains are periodically injected through the water injection plant for distribution to the injection wells.

V.

The above referred to water collected from open sources is stored in a disposal tank located adjacent to the Unit water injection plant in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 25, Township 140 N, Range 96W. The tank is periodically emptied into a skimmer tank before being mixed with the main injection water at the plant.

VI.

The water collected from open sources has an extremely high oxygen content. It is the major factor in the continual problem of injection well plugging in the Dickinson Heath Sand Unit. There has not been any oxygen scavenger found that will effectively remove oxygen from this source of water. It is the corrosion products from the injection lines between the water injection plant and the wells which cause the well plugging problems.

VII.

If the water collected and stored in the disposal tank could be injected into the Dakota formation through Dickinson Heath Sand Unit Well No. 23, located in the SW $\frac{1}{4}$, SW $\frac{1}{4}$ Section 30, Township 140N, Range 96W, the major source of oxygen corrosion and related solids could be eliminated from the Heath formation injection system.

VIII.

The Dickinson Heath Sand Unit Well No. 23 has been shut in since November 1978 because of high producing water cut. The well has no future value to the continuation of the Heath formation waterflood. It is sufficiently far from the Dakota water supply Well No. 44 that, in Applicant's judgment, contamination of Dakota formation water produced from Well No. 44 will not occur. It is anticipated that as higher water cuts occur in the Dickinson Heath Sand Unit producing wells, there will be less reliance in the future on Dakota water as an injection water source.

IX.

Attached as Exhibit "A" is a plot showing the location of the proposed disposal well plus the producing, injection, shut-in, and abandoned wells within the Dickinson Heath Sand Unit area.

X.

Attached as Exhibit "B" is an electric log of the proposed disposal well showing

the Dakota interval and the perforated Heath formation interval in the well.

XI.

The proposed disposal well, Unit Well No. 23, was drilled to a total depth of 7985 feet; 5½"OD, 14, 15.5, and 17 pound per foot casing was run and set at 7985 feet and cemented with 800 sacks of cement. The top of the cement is estimated to be at 5000 feet, 500 feet above the top of the Dakota formation in the well. The Heath formation is perforated through the intervals 7861-7864 feet and 7874-7877 feet. Plugged back total depth is 7904 feet.

XII.

Attached as Exhibit "C" is a schematic of how the proposed disposal well will be equipped for injection into the Dakota formation. A permanent bridge plug will be set above the Heath formation at 6300' and capped with three (3) sacks of cement. If a cement bond log indicates the need, a block squeeze will be performed to isolate the Dakota formation from the Heath formation below and from the overlying formations. The Dakota formation sands will be perforated through the interval 5585-5810 feet, and injection of collected open source water will be through 2-7/8" tubing with an injection packer set at 5200'.

XIII.

It is proposed to periodically inject the contents of the disposal tank at a maximum rate of approximately 50 barrels of water per day into the Dakota formation through Unit Well No. 23. Anticipated total volume per month is 500 barrels.

XIV.

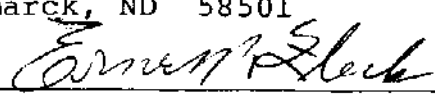
Granting the Application herein requested will be in the public interest by eliminating a source of corrosion which plagues Unit operation and enabling more efficient flooding of the Heath formation in the Dickinson Heath Sand Unit to occur.

WHEREFORE, this Applicant respectfully requests that the matter aforesaid be set for hearing at the regular May 1980 meeting of the North Dakota Industrial Commission, and that the Commission grant permission to dispose of collected open source water into the Dakota formation through Unit Well No. 23 and give such order as the Industrial Commission of the State of North Dakota may deem just and proper in accordance with the rules and regulations of the State of North Dakota.

Dated this 25th day of April 1980.

Conoco Inc.

By FLECK, MATHER, STRUTZ & MAYER, Ltd.
Attorneys for the Applicant
600 Dakota Northwestern Building
Bismarck, ND 58501

By 
Ernest R. Fleck

CERTIFICATE OF PUBLICATION

THE DICKINSON PRESS
Dickinson, North Dakota

STATE OF NORTH DAKOTA, }

County of Stark. }

GLORIA FOSTER

, of said state and county, being first duly sworn, on oath says: That S he is the BOOKKEEPER of the Dickinson Press, Inc., publisher of THE DICKINSON PRESS, a daily newspaper of general circulation, printed and published at Dickinson, in said county and state, and has been such during the time hereinafter mentioned; and that advertisement headed

NOTICE OF PUBLICATION

ND INDUSTRIAL COMMISSION \$9.00*

a printed copy of which is hereunto annexed, was printed and published in THE DICKINSON PRESS, and in the regular and entire issue of each and every number 1 consecutive weeks, commencing on the 6 day of MAY A. D. 19 80, and ending on the 6 day of MAY A. D., 19 80, both inclusive.

Sworn to and subscribed to before me this 6 day of

MAY A. D. 19 80.

9.00

Date 5-12-80

WH
HAROLD NELSON

State Printer

ED J. HAUCK
Notary Public, STARK COUNTY, N. DAK.
My Commission Expires JUNE 6, 1985

NOTICE OF PUBLICATION N. D. INDUSTRIAL COMMISSION BISMARCK, NORTH DAKOTA

The State of North Dakota by its Industrial Commission hereby gives notice pursuant to law and the rules and regulations of said Commission promulgated thereunder of the following public hearing to be held at 1:00 p.m. on May 19, 1980, in the Large Hearing Room, State Capitol Building, Bismarck, North Dakota. For the purposes of this hearing, an examiner will be appointed by the Commission for the purpose of receiving testimony and exhibits.

STATE OF NORTH DAKOTA TO:

All named parties and persons having any right, title, interest or claim in the following case and notice to the public. CASE NO. 1880: On a motion of the Commission to consider the application of Conoco Inc. for an order authorizing the disposal of collected water from open sources into the Dakota Formation through the Dickinson-Heath Sand Unit Well No. 23, located in the SW SW of Sec. 30, T140N, R96W, Stark County, North Dakota.

Signed by
Arthur A. Link,
Governor
Chairman, N. D.
Industrial Commission
(Published May 6, 1980)