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NCBC GULFPORT
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LETTER REPORT REGARDING AIR MONITORING REPORT FOR THE REMOVAL ACTION ALONG 28TH STREET NCBC GULFPORT MS

10/31/1995

ABB ENVIRONMENTAL

ASEA BROWN BOVERI

NCBC Gulfport Administrative Record
Document Index Number

39501 - ASSOCIATED AO
02.02.00.0005

October 31, 1995

Mr. Art Conrad
Code 1865
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, SC 29418

Dear Mr. Conrad:

SUBJECT: Letter Report, Air Monitoring Report for the Removal Action along 28th Street, Naval Construction Battalion Center, Gulfport, Mississippi, Contract No. N62467-89-D-0317/096

INTRODUCTION

This report discusses the objectives, procedures, and results of the air monitoring program conducted during the 28th Street Naval Construction Battalion Center (NCBC) Defense Road construction project in Gulfport, Mississippi. Documentation of the removal action can be found in the interim removal action, 28th Street construction letter report (ABB Environmental Services, Inc. [ABB-ES], 1995). Airborne dioxins and furans were monitored using the TO-9 sampling and analyzed using U.S. Environmental Protection Agency (USEPA) Method 8290, as described in the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (USEPA, 1988).

OBJECTIVES

The objective was to evaluate the concentration of airborne dioxin and assess the potential health exposure effects related to excavation work performed along 28th Street. Upwind and downwind air sampling was conducted before and during site activities that could result in maximum exposure to dioxin in the air. During the sampling events, meteorological conditions were monitored and site activity was documented.

ABB Environmental Services, Inc.

1400 Centerpoint Blvd.
Suite 158
Knoxville, Tennessee 37932-1968

Telephone
(423) 531-1922

Fax
(423) 531-8226

PROCEDURES

The air monitoring program was conducted over six 24-hour periods: 1 day of background monitoring and 5 days of excavation monitoring. Each sampling station used high-volume samplers specifically designed to sample for dioxins; one sampler was placed upwind and the other downwind of site activity. The site activity typically included heavy equipment operation to remove and transport sediment and soil from one of the outfalls (Figure 1, Attachment A) along 28th Street to the sediment-handling area. Excavation activity occurred at only one site each day.

A portable meteorological station was used to determine sampling conditions for each sampling event. The sampling locations are shown on Figure 1. The portable meteorological station was installed on the open lot directly across from Outfall 3 next to 28th Street. Wind direction and wind speed were monitored at 10 feet above land surface, and temperature was monitored at 5 feet above ground level. This site was selected because it was close to a majority of the sampling sites and free of obstructions affecting local meteorological conditions. A copy of the meteorological chart is provided in Attachment C.

Sampling Events The TO-9 method specifies that the desired air sample volume is 325 cubic meters (m^3) to detect dioxin below 1-5 picograms per cubic meter (pg/m^3). To obtain this volume, the samplers needed to run for 24 hours at a flow rate of 230 liters per minute (ℓ/m). These parameters were set, as were the target sample time and flow rate.

Before the start of the first sample event, each sampler was calibrated in accordance with 40 Code of Federal Regulations (CFR) 50, Appendix B: High Volume Sampling Method Calibration Procedures (USEPA, 1993). Based on the local weather conditions and data from the onsite meteorological station and prior to each sampling event, the two samplers were situated upwind and downwind of site activity. At the start and end of each sampling event, applicable data were recorded, including date and time, location, sample number, and magnehelic reading. The field notes are included in Attachment D. The individual sampling events are summarized below.

Event No. 1. Sampling Event No. 1 began on Tuesday, July 11, at 12:25 p.m. and continued until 6:25 a.m. on Wednesday, July 12. Until 7:00 p.m., the wind was from the south with an average wind speed of approximately 4 miles per hour (mph). After 7:00 p.m., the wind direction was variable due to calm conditions with an average wind speed of approximately 1 mph.

The sampling location was at the sediment-handling trench that was being constructed that day (Figure 1, Attachment A). The upwind sampler was located 30 feet directly south of the trench and the downwind sampler was located 30 feet northeast of the trench. All trenching activity occurred before Tuesday at 7:00 p.m. The samplers were representative of upwind and downwind conditions until calm wind conditions occurred at 7:00 p.m.

Event No. 2. Sampling Event No. 2 began at 8:10 a.m. on Wednesday, July 12, and ended at 7:46 a.m. on Thursday, July 13. The prevailing wind direction during the sampling event was shifting from the northeast to the southeast with an average wind speed of approximately 3 mph.

The upwind sampler was located 100 feet west of the 28th Street Base guard gate near Outfall 4, inside the base and south of 28th Street (Figure 1, Attachment A). The downwind sampler was located immediately northeast of Outfall 4 and 2 feet from residential property. This sample, collected during the interval when there was no excavation activity, was considered indicative of background conditions.

Event No. 3. Sampling Event No. 3 began at 9:38 a.m. on Thursday, July 13, and ended at 8:23 p.m. on Friday, July 14. The prevailing wind direction during the sampling event was east-southeasterly with an average wind speed of approximately 5 mph.

The sampler locations were the same as for Event No. 2. During this sampling event, removal activities of Outfall 4 were conducted. Activities pending during this sampling event included pumping water from the trench, removing a piece of culvert, and removing sediments with a gradall. The jumpsaw used to cut the culvert caused the circuit breaker (also connected to samplers) to trip several times. However, the sampling time lost during these intervals was minimal. There appeared to be relatively low fugitive dust resulting from heavy equipment operation.

The meteorological conditions were similar between sampling Event No. 2 and Event No. 3; therefore, any changes in the dioxin in air concentration are likely due to site activity. A field blank was also taken during this event.

Event No. 4. Sampling Event No. 4 began at 10:12 a.m. on Friday, July 14, and ended at 7:43 a.m. on Saturday, July 15. The prevailing wind direction was easterly with an average wind speed of 6 mph from 10:00 a.m. to 10:00 p.m. After this time, the wind direction was variable due to calm wind speed (approximately 1 mph).

The upwind sampler was located approximately 100 feet east of the meteorological station (Figure 1, Attachment A). The downwind sampler was located directly west of Outfall 3. During sampling, some of the sediment being removed by the gradall hit the downwind sampler cover, but the effect on the sample was considered negligible given the high moisture content of the soil. The sampler locations with respect to meteorological data indicate ambient air concentrations representative of upwind and downwind conditions.

Event No. 5. Sampling Event No. 5 began at 9:33 a.m. on Monday, July 17, and ended at 10:05 a.m. on Tuesday, July 18. The prevailing wind direction was west-northwesterly with an average wind speed of 4 mph.

The sample locations were in the identical positions as they were for Event No. 4. Several strong wind gusts occurred at 4:00 p.m., creating fugitive dust, and the effect on the sample is unknown. However, the sampling conditions from a meteorological perspective are considered typical given the short duration of these gusts.

Event No. 6. Sampling Event No. 6 began at 2:36 p.m. on Tuesday, July 18, and ended at 2:00 p.m. on Wednesday, July 19. The prevailing wind direction was northwesterly with an average wind speed of 4 mph.

Initially, the upwind sampler was located at the same location as for Events No. 4 and No. 5, and the downwind sampler was located immediately north of Outfall 1 near a residence property line. However, 30 minutes after the start of sampling, the motor on the downwind sampler seized, so the upwind sampler was moved to the downwind location.

Dioxin Sampling Procedures Sampling and analysis for dioxin were conducted in accordance with USEPA Method TO-9, as found in the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air.

Quanterra Environmental Services (Quanterra) was contracted to provide sampling media and laboratory analyses. Filters and adsorbent cartridges (polyurethane foam [PUF] plugs) were cleaned, dried, wrapped

in aluminum foil, and stored in air-tight jars for shipment. The filters and PUF plugs were inspected upon receipt at the onsite trailer and remained in the storage jars until installation on the sampler.

A General Metal Works Model PS-1 sampler was used for collecting air samples. Prior to installation in the field, both upwind and downwind samplers were calibrated in accordance with USEPA's High Volume Sampling Method, indicated in 40 CFR, Part 50, Appendix B (USEPA, 1993). Copies of the calibration sheets are included in Attachment E.

According to Method TO-9, a "dummy" PUF cartridge and filter were installed on the calibrated sampler to compare flow rates calculated from the calibration orifice (traceable flow rates) with flow rates calculated with the calibration curve generated for each sampler (indicator flow rate). This was performed prior to each sampling event on both samplers. All indicated flow rates were within 11 percent of traceable flow rates. The flow rate verification sheet is included in Attachment F.

After flow rate verification, a filter and PUF cartridge were installed on the sampler. The voltage regulators were adjusted for maximum flow rates to obtain as close to the recommended 225 ℓ/m flow rate as possible. Sample start times, stop times, and flow rates are indicated on the chains of custody, which are included in Attachment G.

ANALYTICAL PROGRAM

Samples, filters, and PUF cartridges were wrapped in the original aluminum foil and placed back into the air-tight jars for shipment. The samples were shipped on the same day as collection. In accordance with Method TO-9, Quanterra analyzed the samples using USEPA Method 8290 (1986) to determine the concentrations of dioxins and furans in ambient air. The laboratory results are included in Attachment H.

RESULTS

The air sampling parameters and analytical results from the six sampling events are provided in Table 1, Attachment B. Average 24-hour air dioxin concentrations during the six sampling events ranged from 2.6×10^{-7} to 5.3×10^{-9} micrograms per cubic meter ($\mu g/m^3$). Comparing these air concentrations to the dioxin USEPA Region III Risk-Based Screening Air Concentration (associated with a 1 in a million residential cancer risk) of 5×10^{-8} $\mu g/m^3$ indicates a potential lifetime cancer risk of up to 5×10^{-6} for residential receptors due to inhalation of soil particulates. However, this risk estimate is based on numerous highly conservative and unrealistic exposure assumptions, and the actual risks are expected to be much lower.

CONCLUSIONS

These results indicate that cancer risks due to inhalation of soil particulates are well within the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) acceptable cancer risk range of 1×10^{-6} to 1×10^{-4}. A comparison of the upwind and downwind results in Table 1 indicates that excavation activities on 28th Street added little or no dioxin to the ambient air, and it would be expected that this would also hold true for particulates generated by normal traffic activity in the area. Also, excavation

activities added little or no dioxin to the ambient air, as indicated by the similar results from upwind and downwind locations and when compared to the background samples OU4-3-DN and OU4-4-UP.

The only upwind and downwind sample discrepancy occurred during Event No. 5 at Outfall 3. The elevated result for OU3-9-DN may likely be the result of a series of strong wind gusts that generated large clouds of dust. The dust clouds were carried from the east-southeast to the west-northwest in the path of the downwind sampler.

Very truly yours,

ABB Environmental Services, Inc.

Penny Baxter
Task Order Manager

Bob Fisher
Hydrogeologist

Attachments

ATTACHMENT A

FIGURE

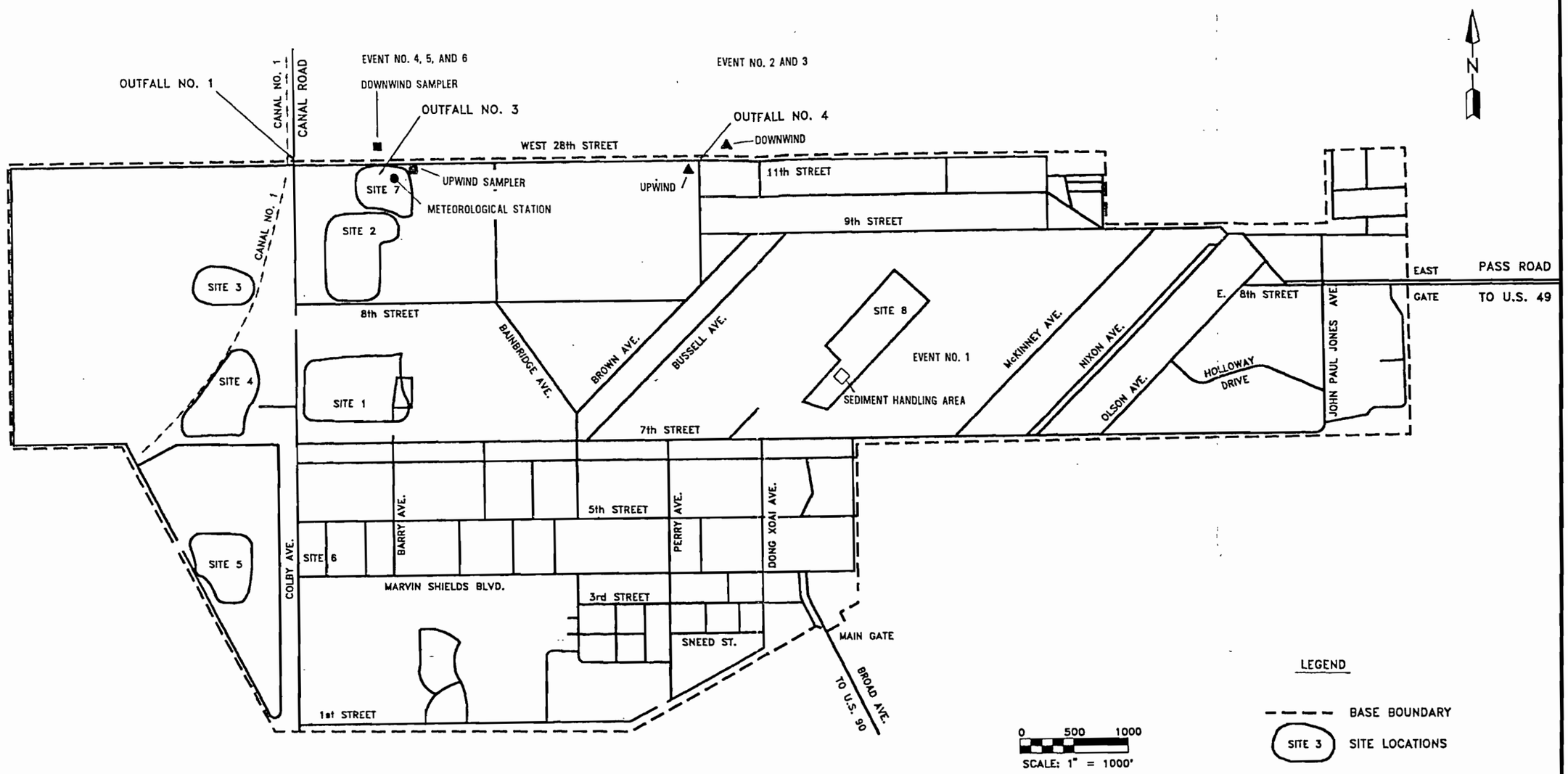


FIGURE 1

NCBC FACILITY LAYOUT

LETTER REPORT
BASEWIDE SAMPLING

NCBC GULFPORT
GULFPORT, MISSISSIPPI

C:\DWGS\GULFPORT\BASE\NCBC\8505.28\FIGURE1\JSL\950831

ATTACHMENT B

TABLE

Table 1
Air Sampling Parameters and Analytical Results

Air Sampling Letter Report
28th Street Construction Project
Naval Construction Battalion Center Gulfport
Gulfport, Mississippi

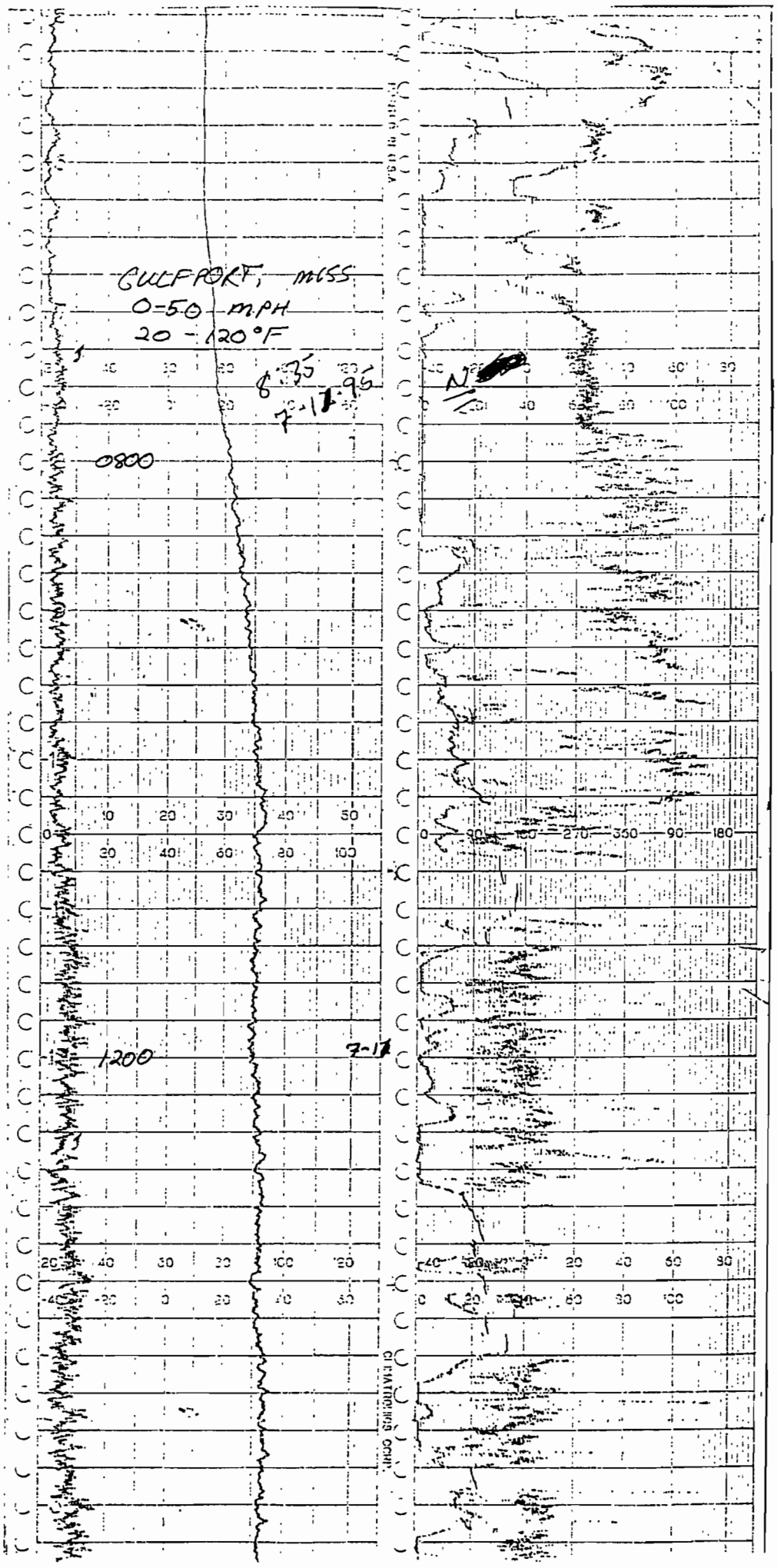
Sample Event	Sample Number	Sample Date	Flow Rate (ℓ/min)	Elapsed Time (min.)	Sample Volume (m^3)	TCDD TEQ (pg/sample)	TCDD Concentration ($\mu g/m^3$)
1	HO-1-DN	7/11 - 7/12	114	1,140	131	16	1.2×10^{-7}
1	HO-2-UP	7/11 - 7/12	153	1,140	175	24	1.4×10^{-7}
2	OU4-3-DN	7/12 - 7/13	112	1,416	159	0.32	2.0×10^{-9}
2	OU4-4-UP	7/12 - 7/13	129	1,302	168	0.34	2.0×10^{-9}
3	OU4-5-DN	7/13 - 7/14	115	1,421	163	1.6	9.8×10^{-9}
3	OU4-6-UP	7/13 - 7/14	119	1,441	171	0.12	7.0×10^{-10}
3	Field Blank	7/13 - 7/14	-	-	-	0.17	-
4	OU3-7-UP	7/14 - 7/15	142	1,229	174	0.26	1.5×10^{-8}
4	OU3-8-DN	7/14 - 7/15	130	1,256	163	0.19	1.2×10^{-9}
5	OU3-9-DN	7/17 - 7/18	126	1,435	181	47	2.6×10^{-7}
5	OU3-10-UP	7/17 - 7/18	112	1,472	184	1.4	7.6×10^{-9}
6	OU1-12-DN	7/18 - 7/19	125	1,404	175	2.2	1.3×10^{-8}

Notes: Based on U.S. Environmental Protection Agency Tetrachlorodibenzodioxin (TCDD) Toxic Equivalency (TEQ) Factors (1989).

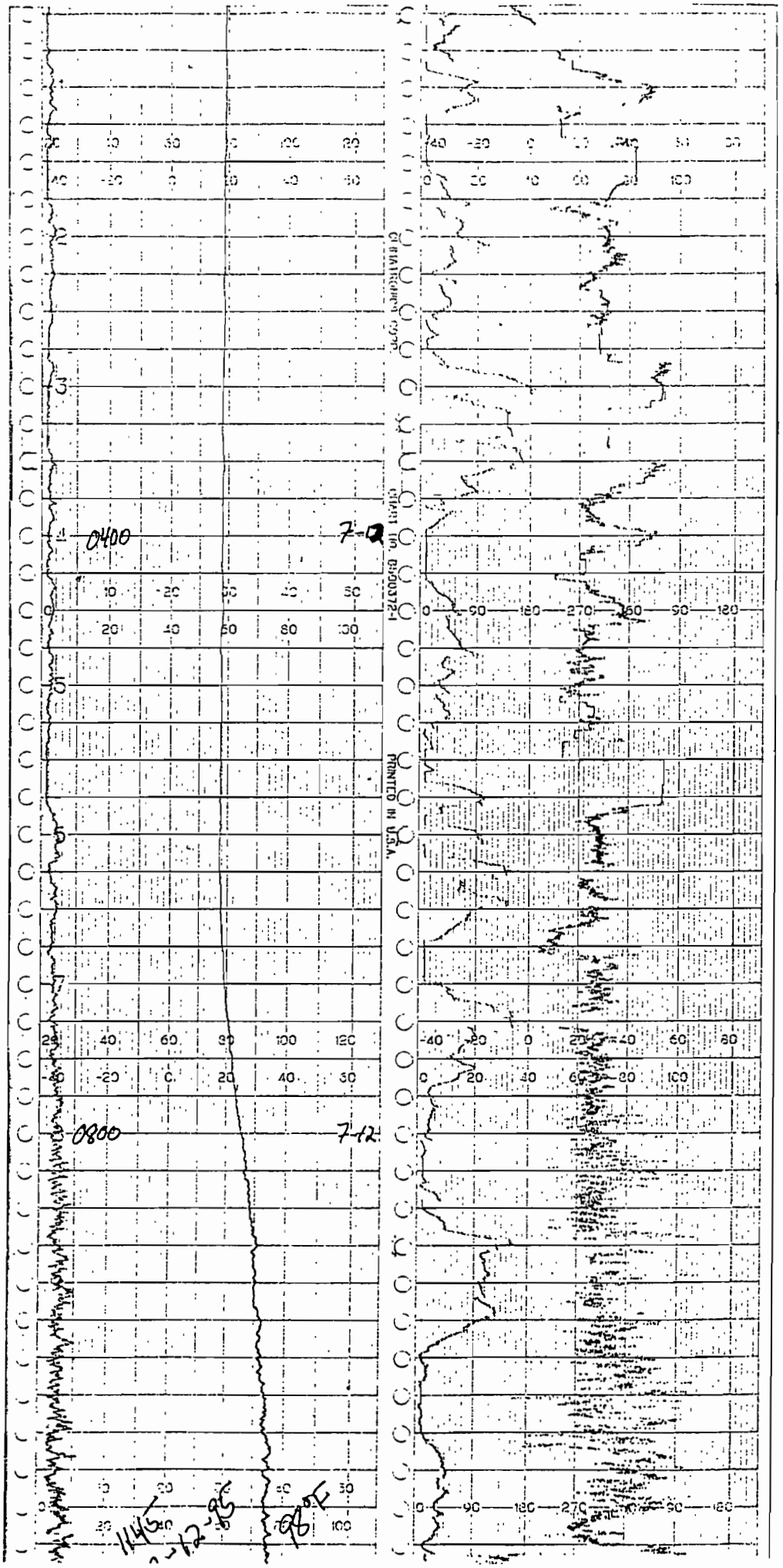
ℓ/min = liters per minute.
m^3 = cubic meters.
pg = picogram.
$\mu g/m^3$ = microgram per cubic meter.

ATTACHMENT C

METEOROLOGICAL CHART


GULFPORT, MISS
0-50 MPH
20 - 120°F
8:35
7-17-95
N
0800
1200
7-17
CLIMATRONICS CORP.

1600
7-12
2000
7-12
2400
7-12
7-12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7-12
1145
2-12-95
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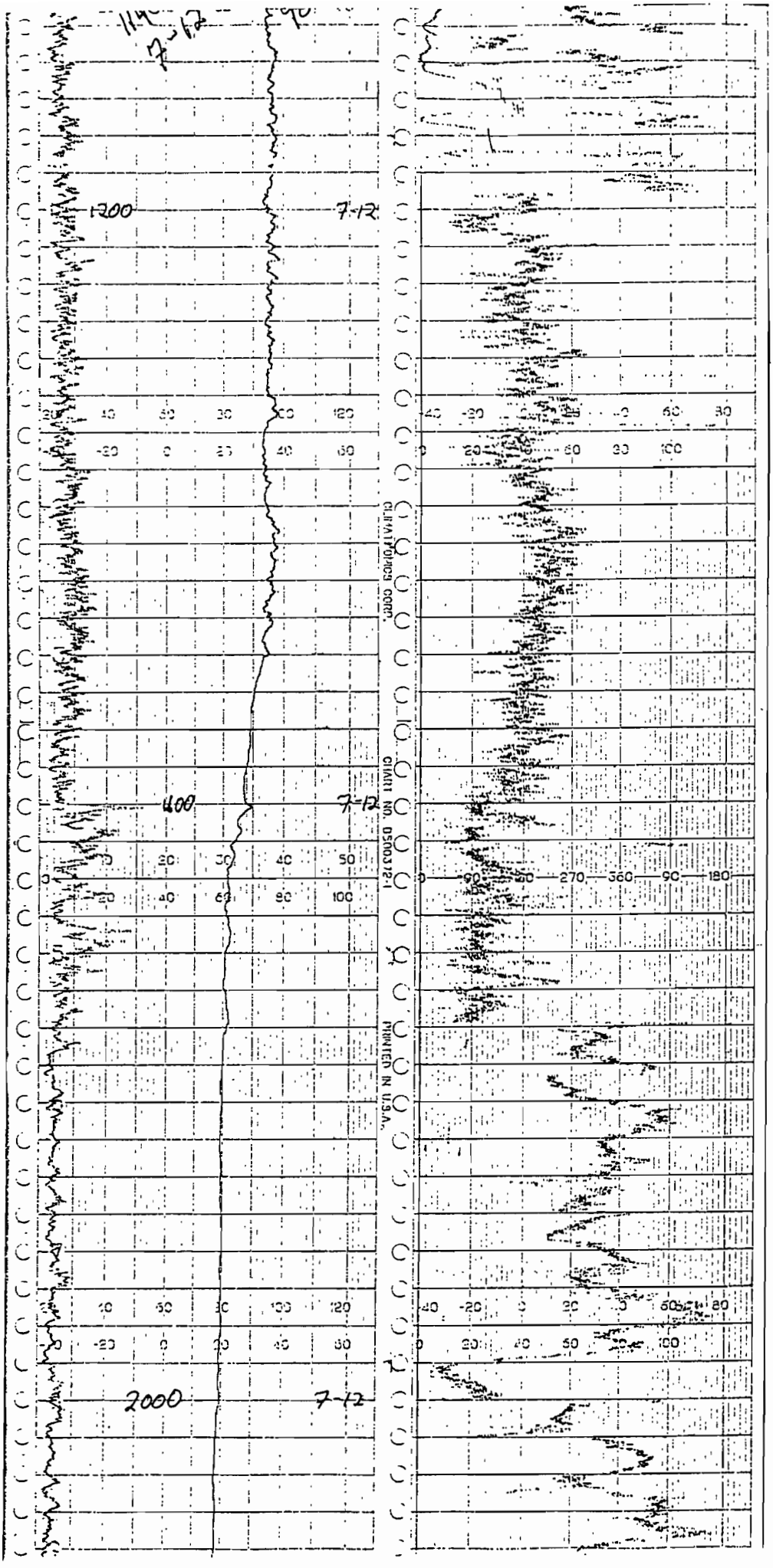

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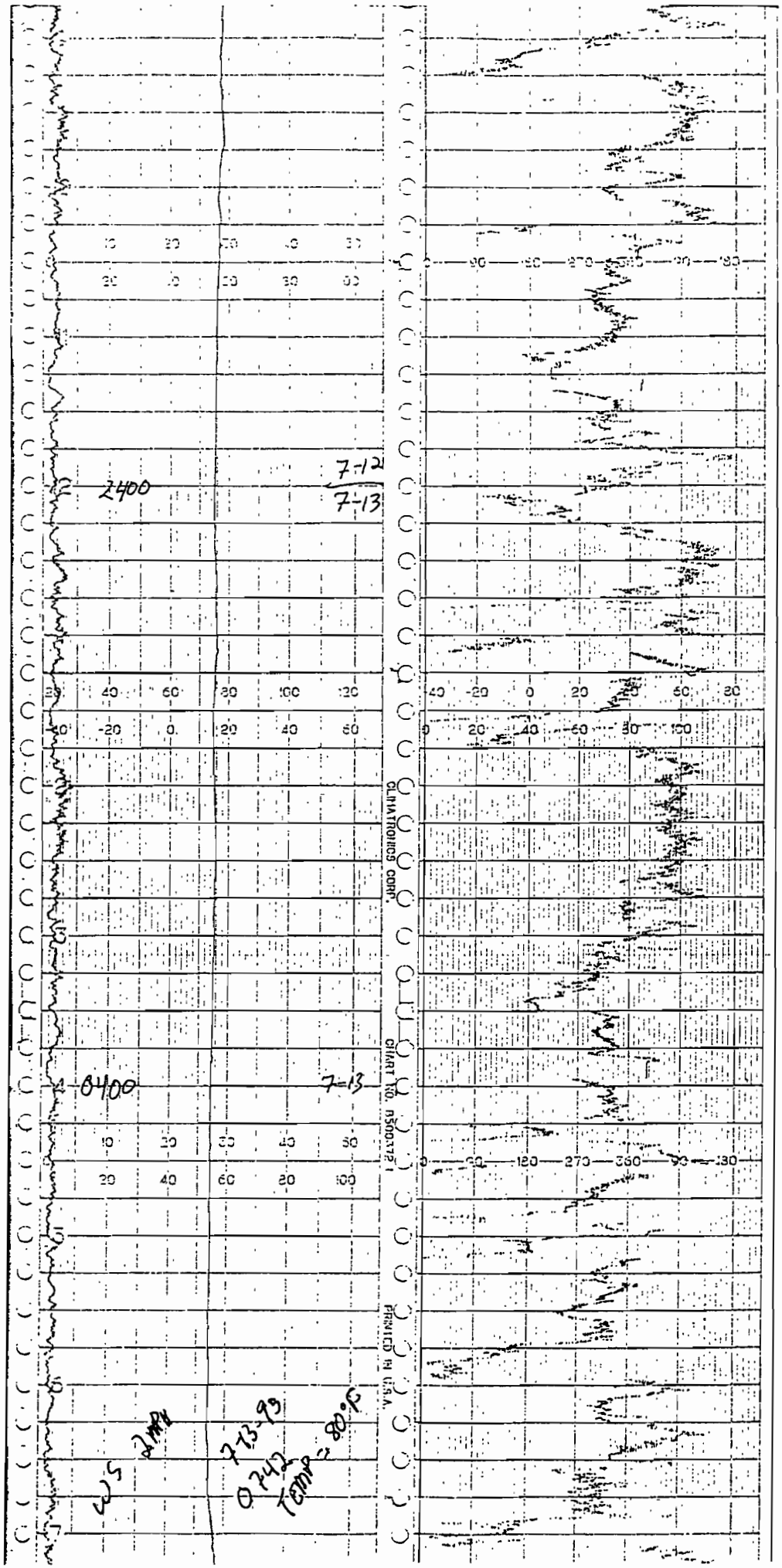
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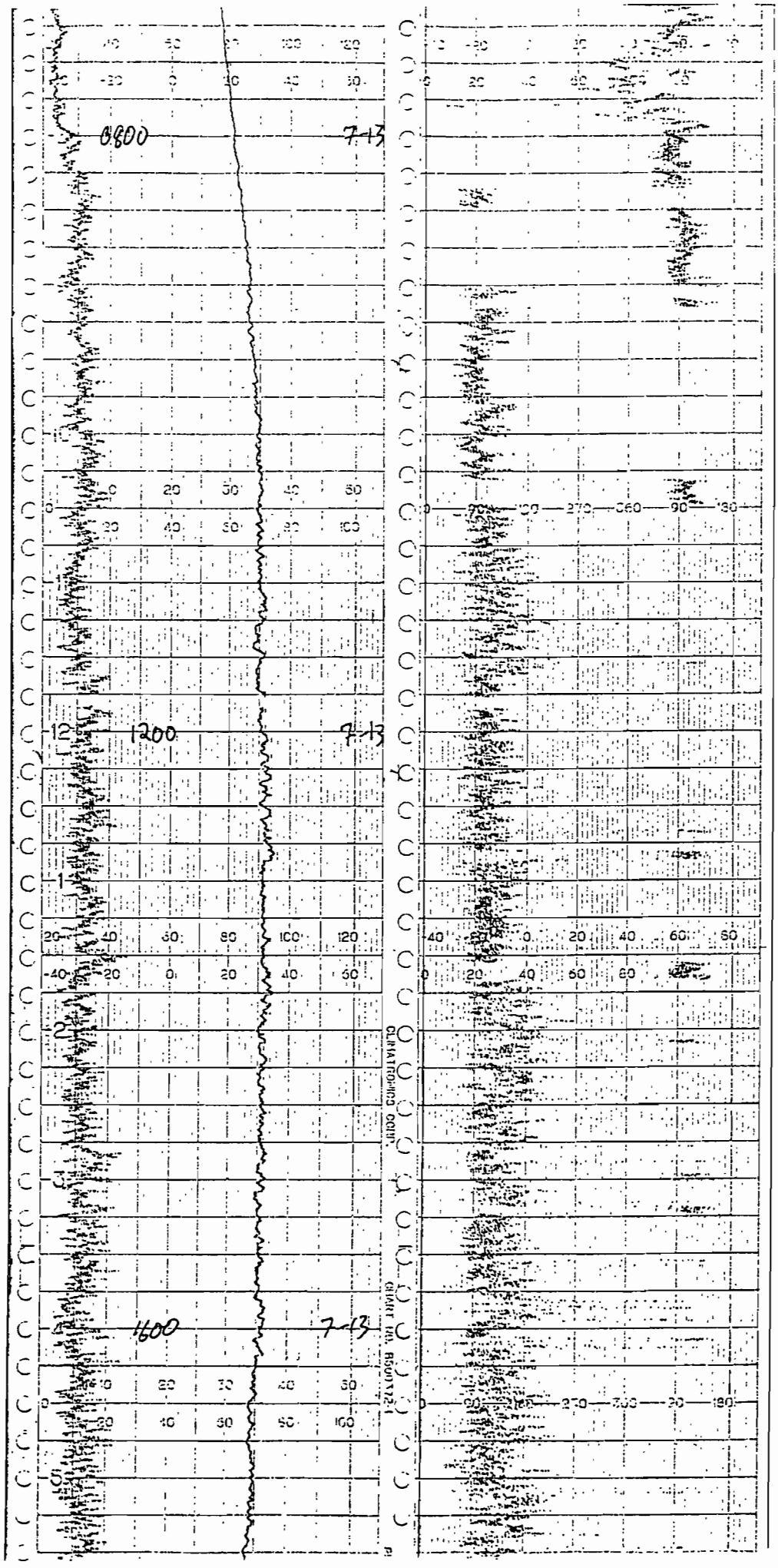
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7-13
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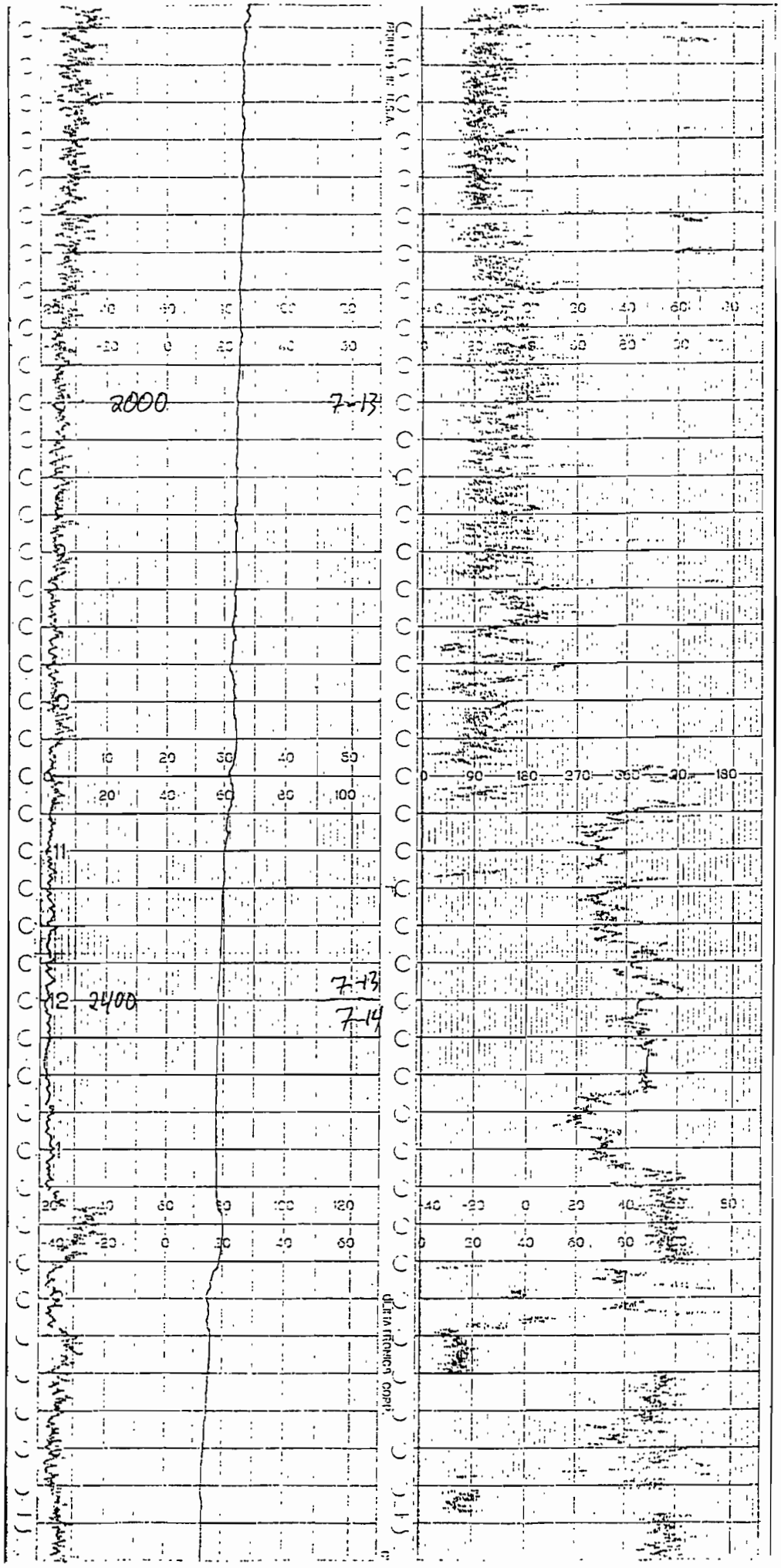
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2400
7-13
7-14
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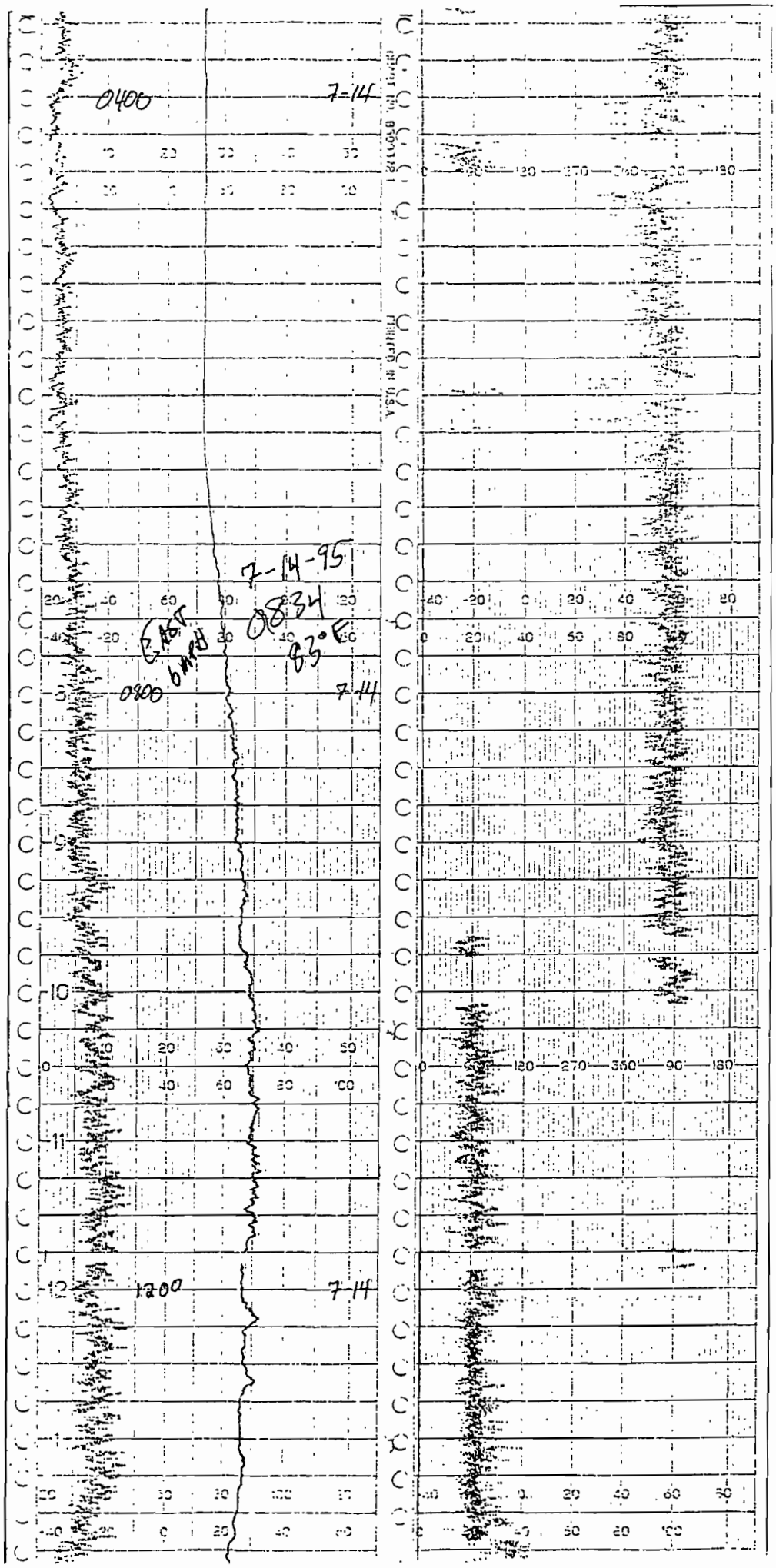
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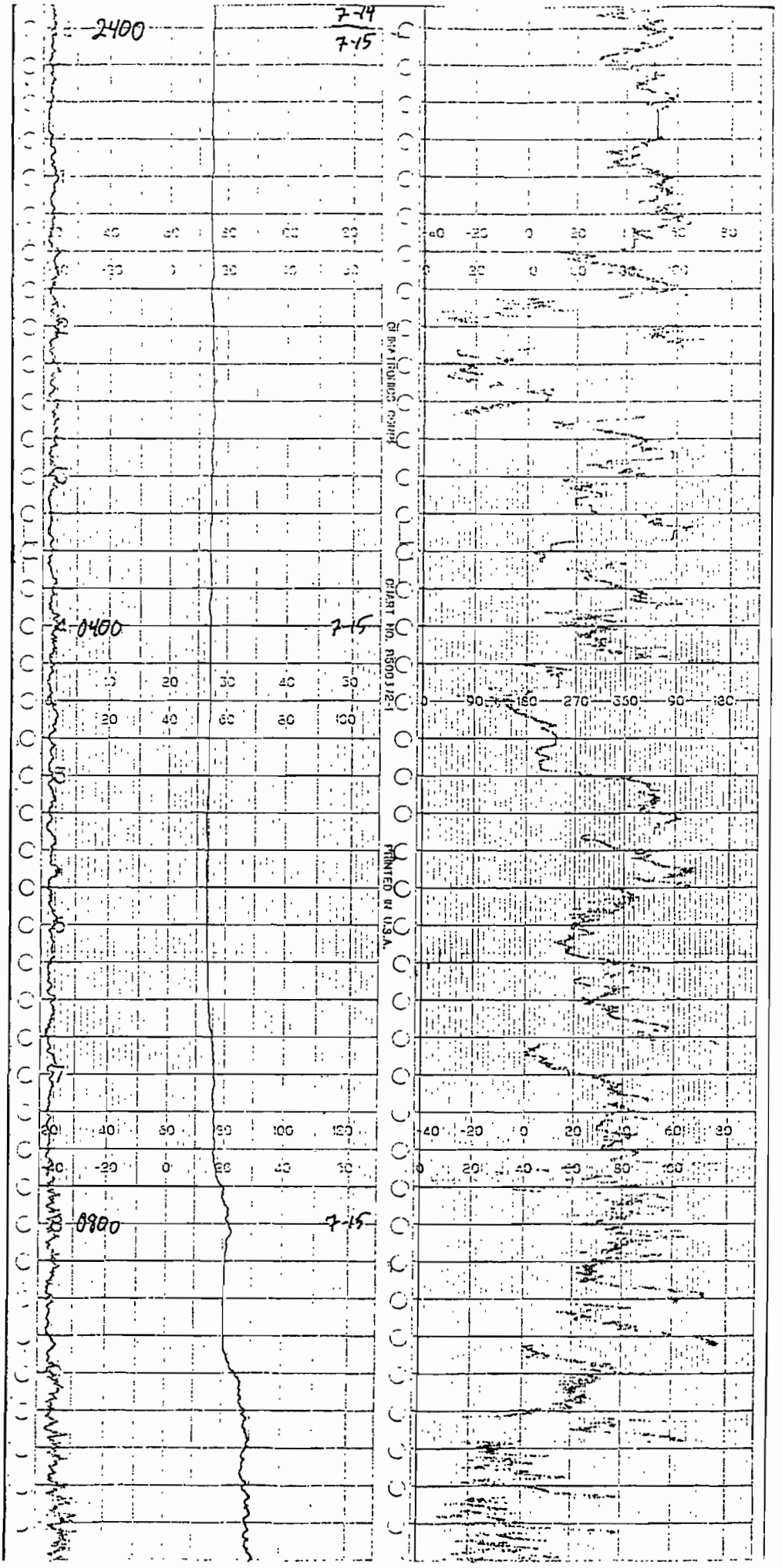
7-14
7-14-95
0834
EAST
6MPH
83°E
0800
7-14
1200
7-14

End 10-?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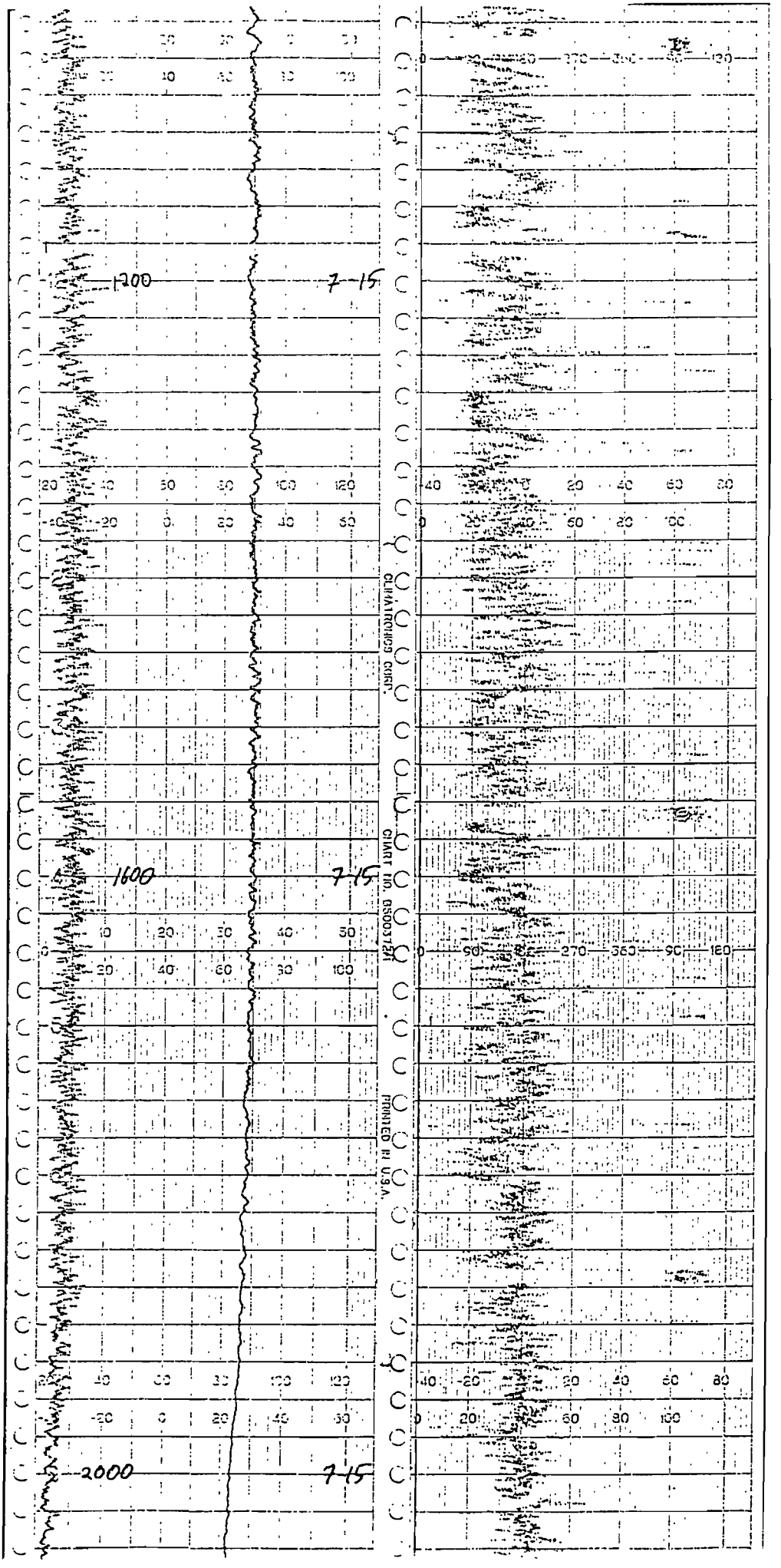
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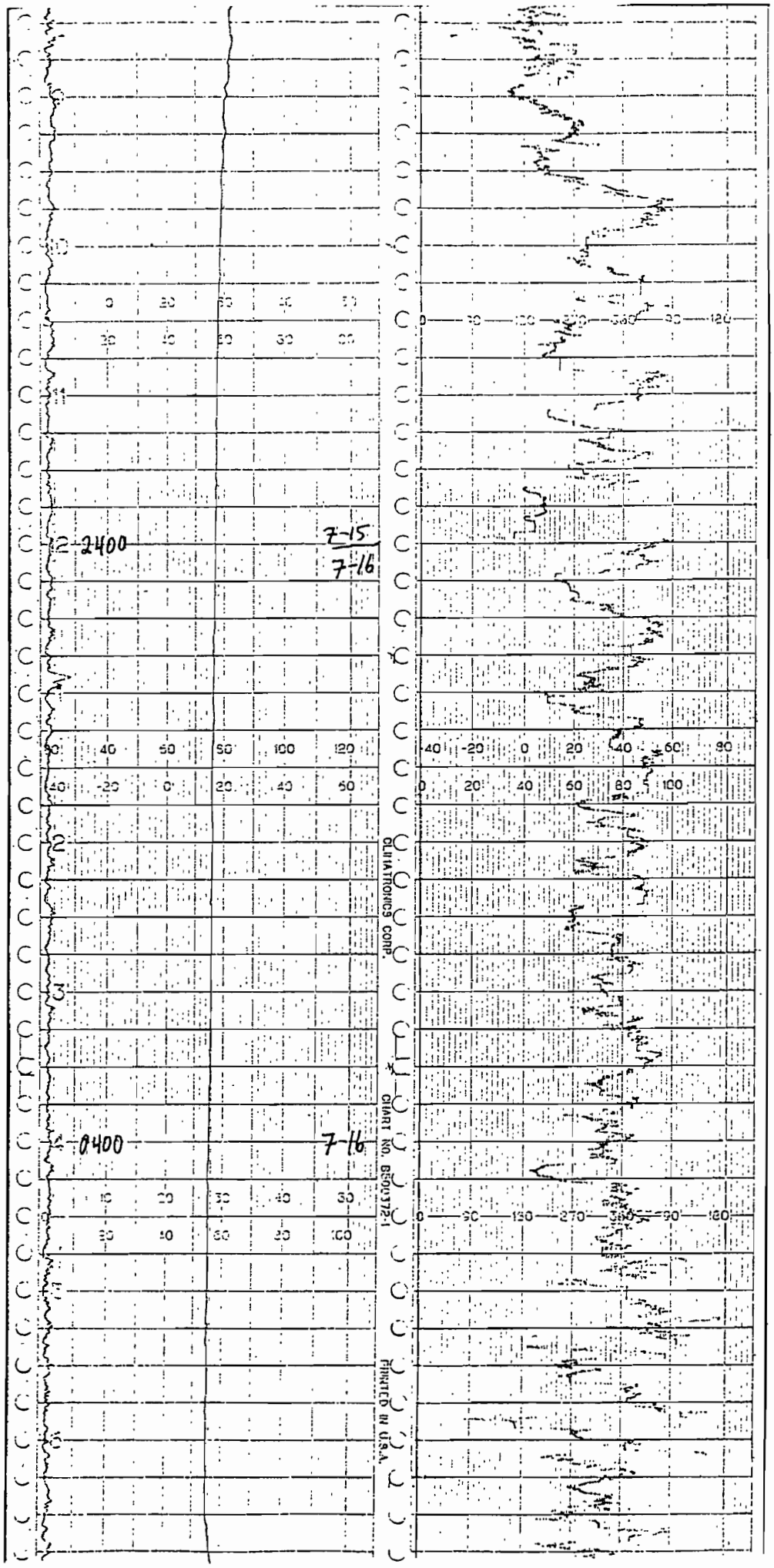
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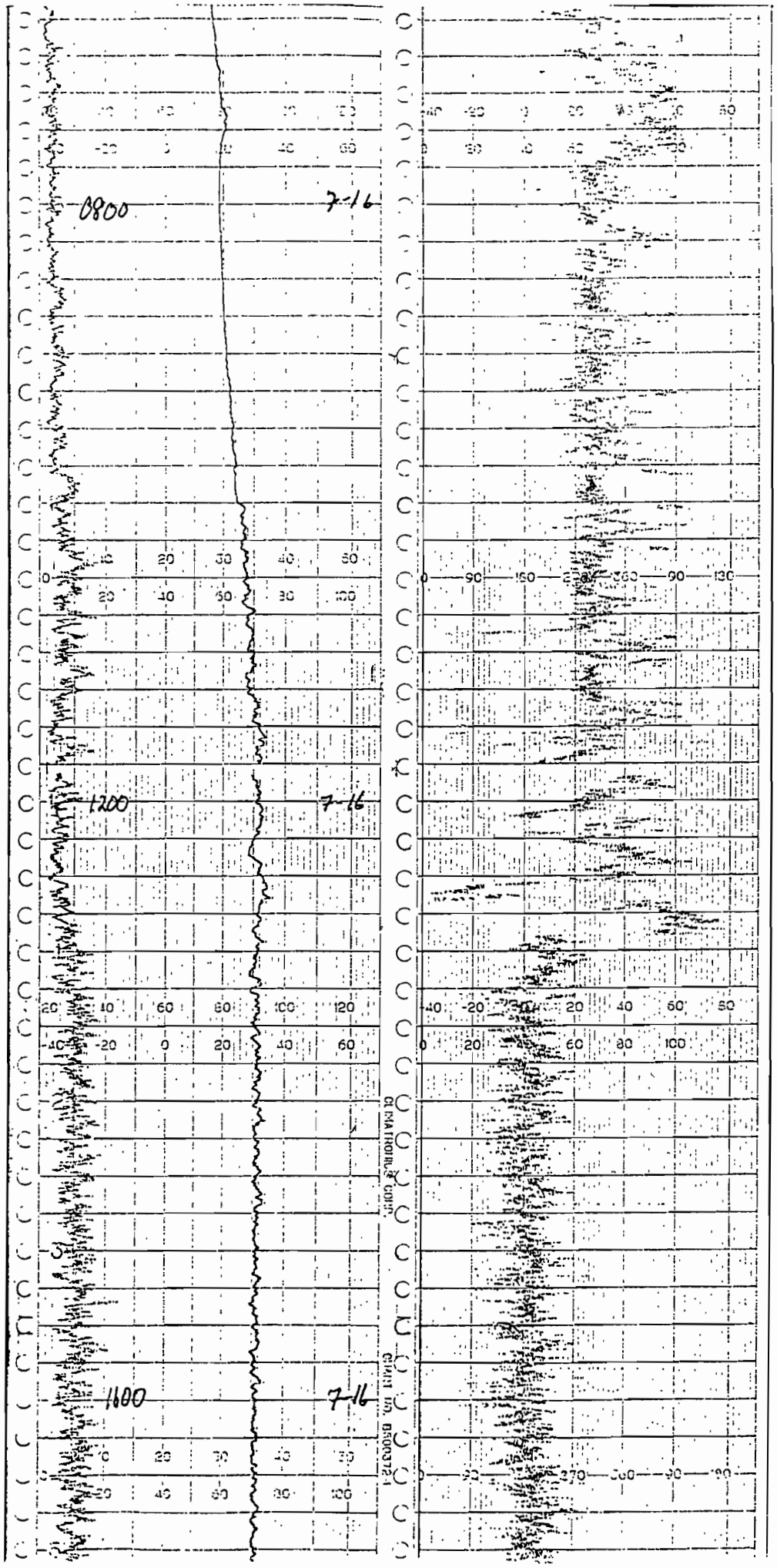
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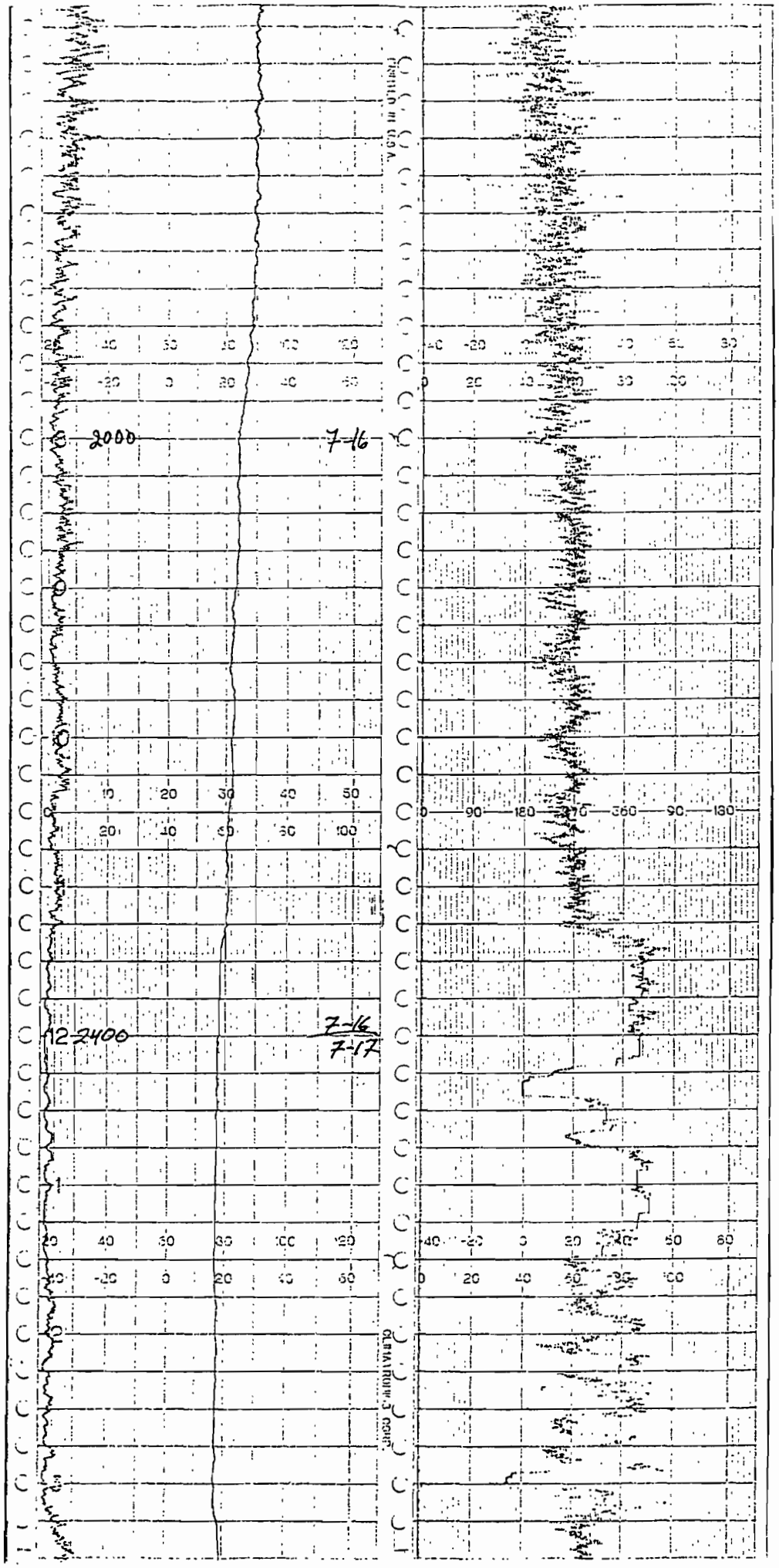
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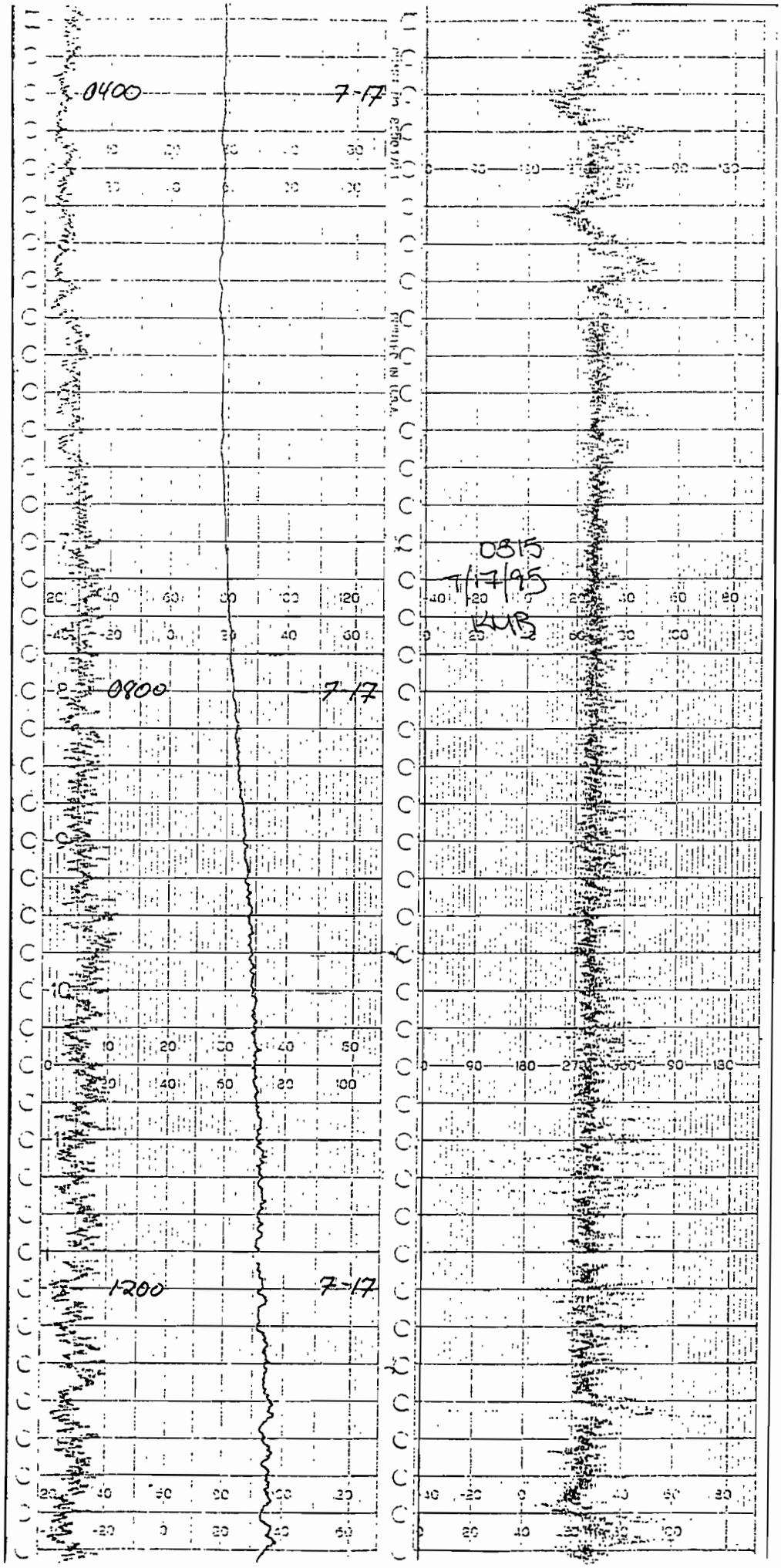
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7/17/95
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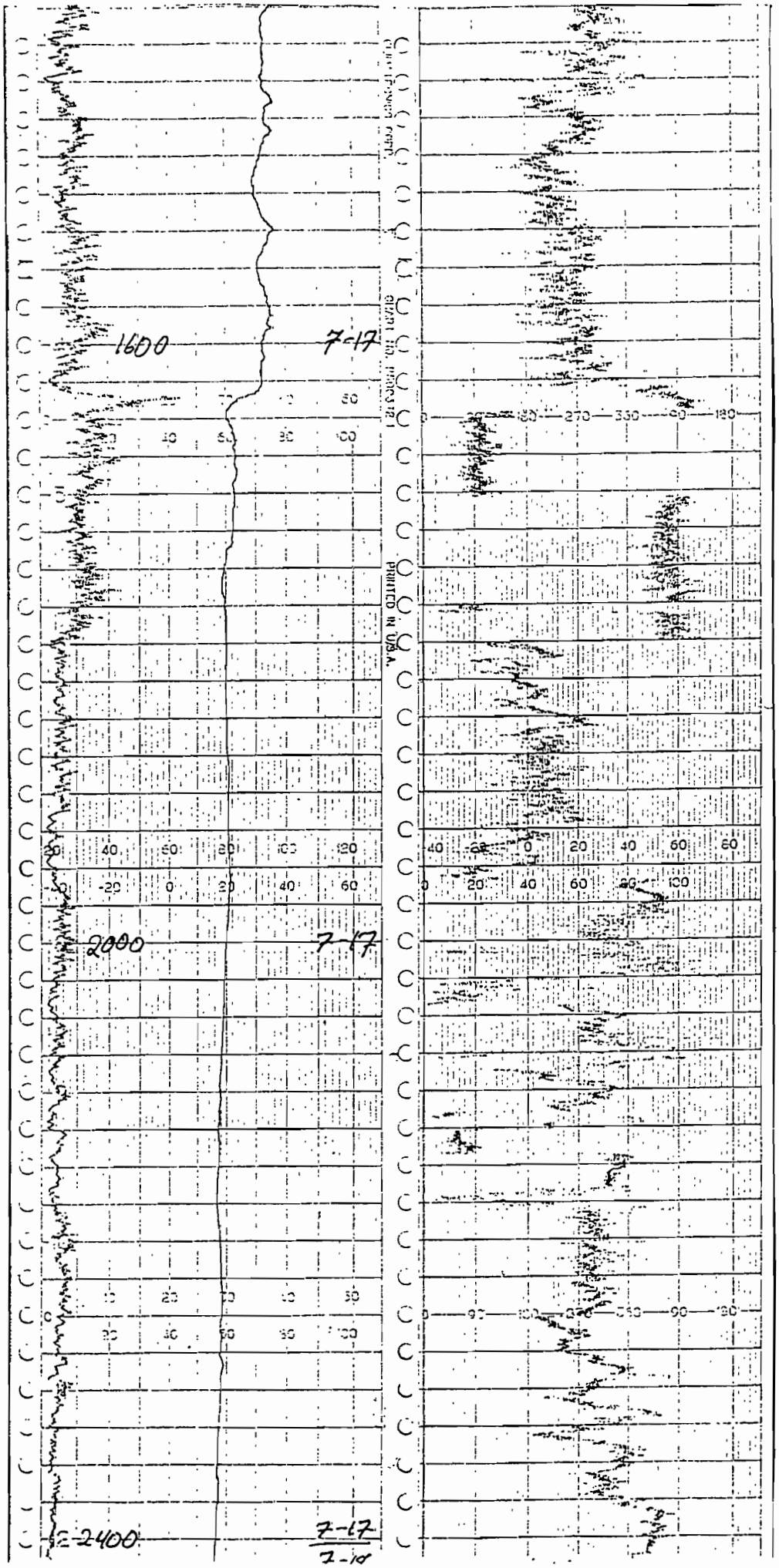
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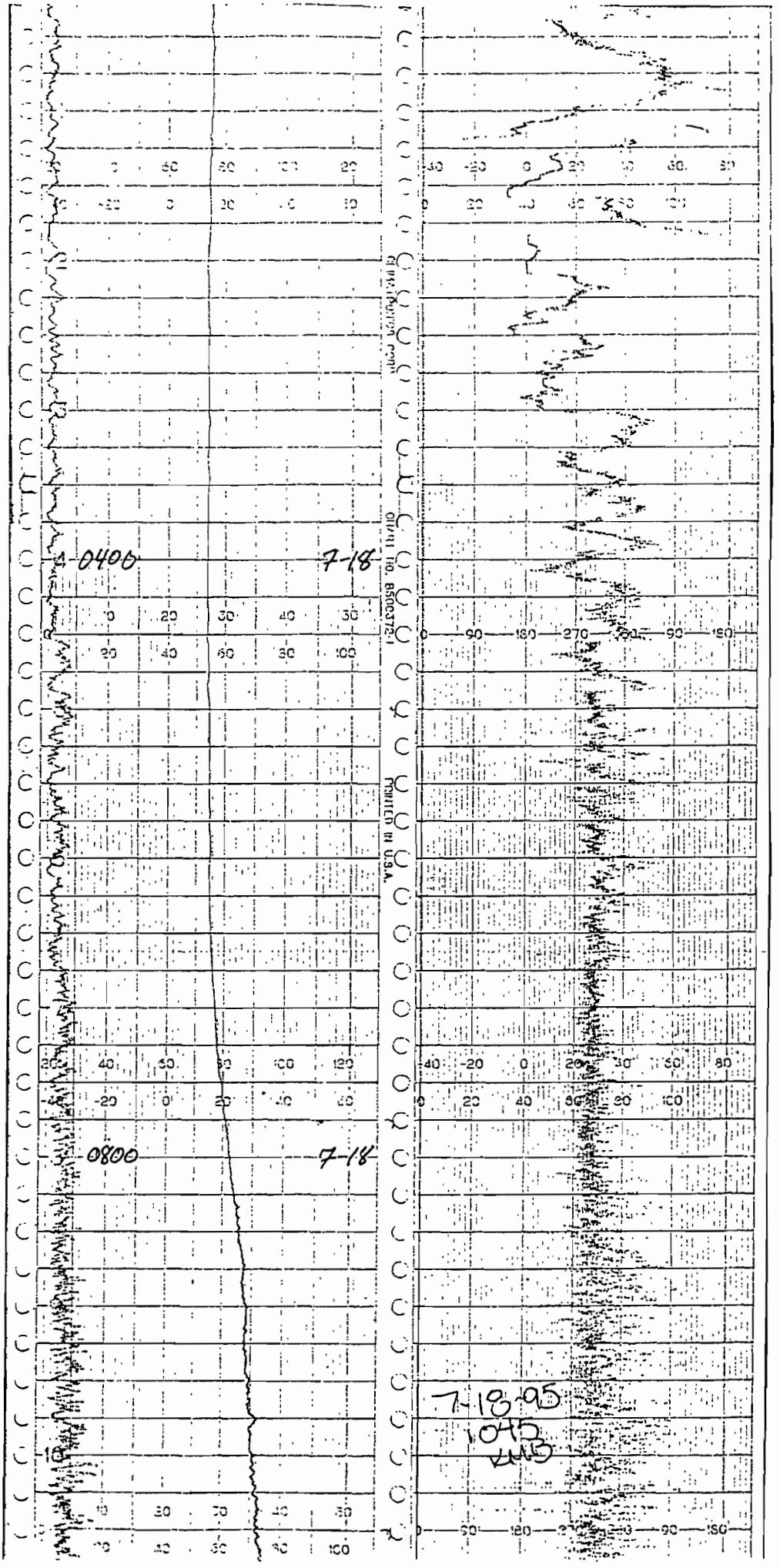
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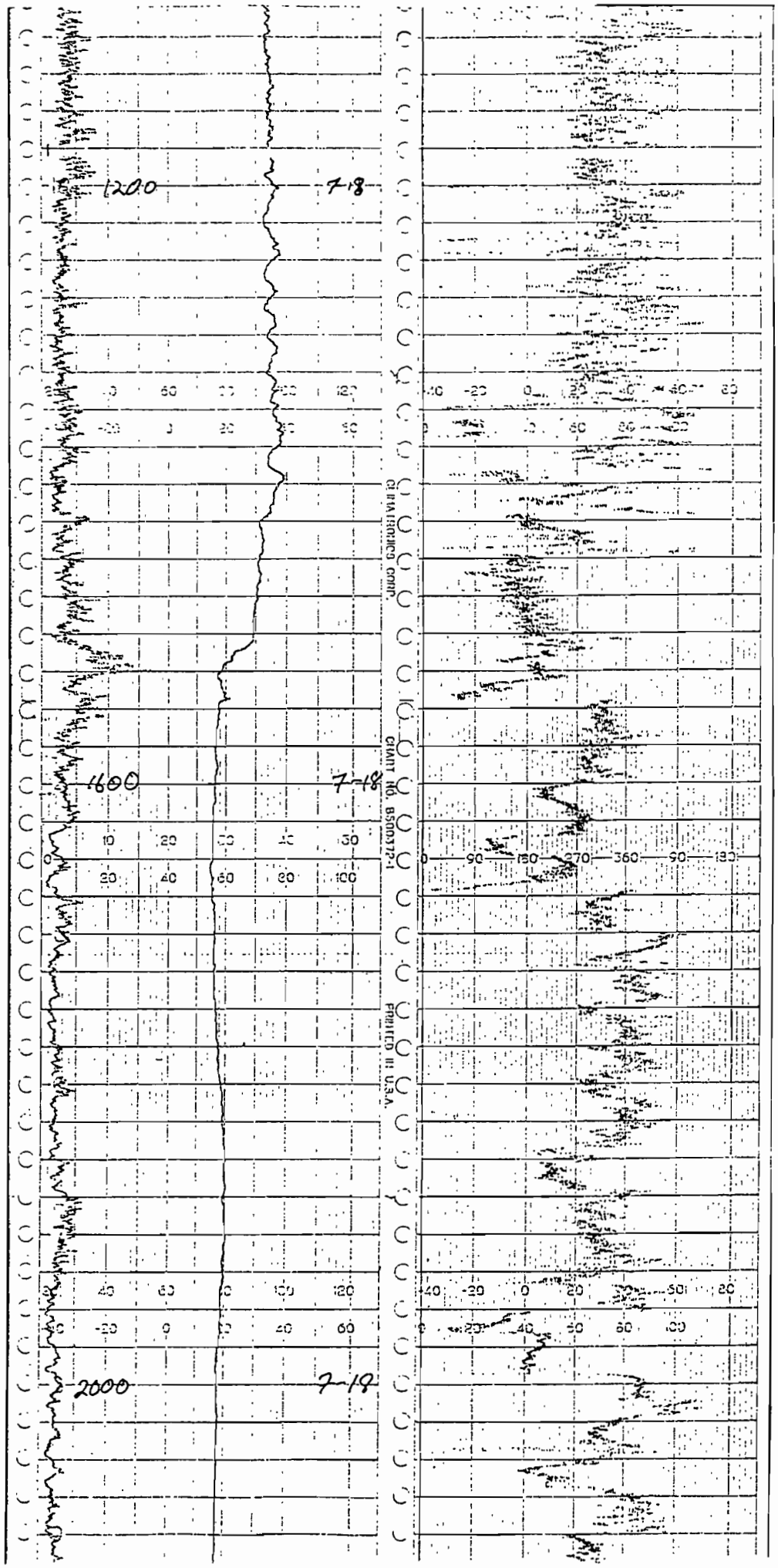
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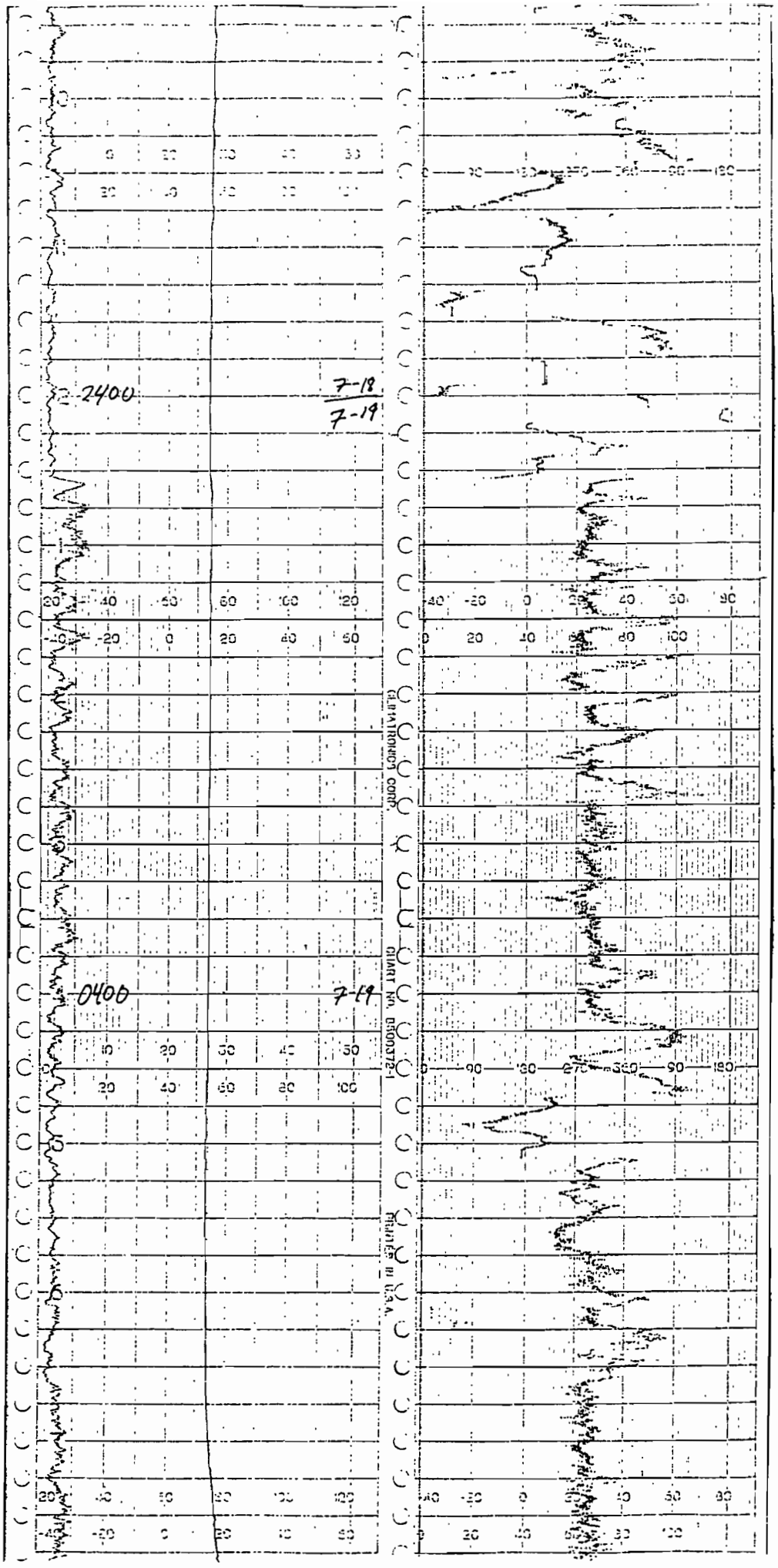
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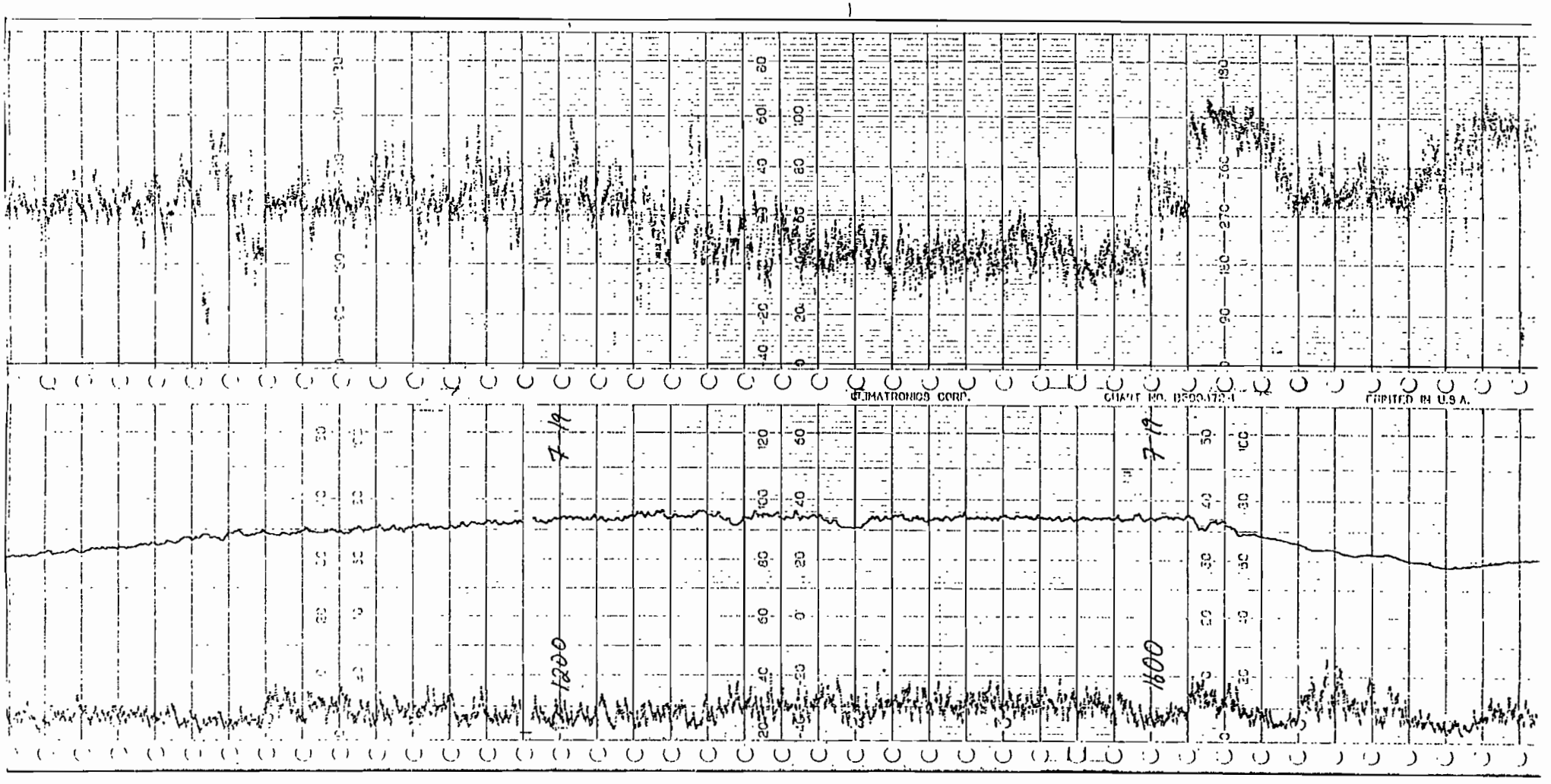
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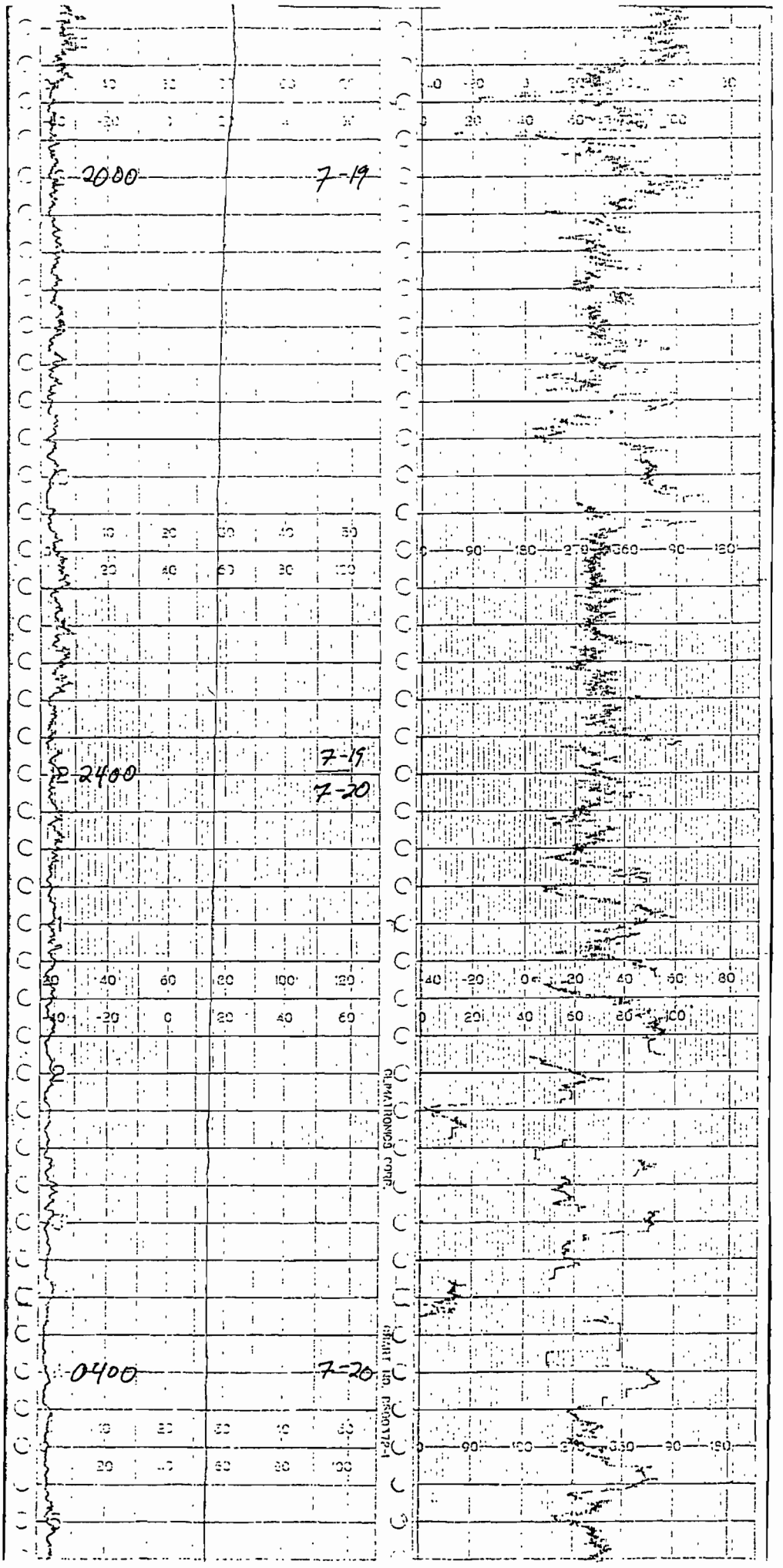
2000
7-19
2400
7-19
7-20
0400
7-20
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ATTACHMENT D

FIELD NOTES

GULFPORT

7-10 Set up met station @ OU3?

7-11 630 ~~B.P.~~ B.P. 29.94 winds WNW shifting to S

Checked met station, WD miniservo pen bent so that it rubs against paper

1200 Sample ID HO-1-DN in cassette holder 3B for downwind

Sample ID HO-2-UP in GRASBY holder for upwind

1225 START SAMPLER ID LOCATED NORTH OF TRENCH 1390-1 ~~START~~ ETI: 754400 MAG: 15.0 3B

1230 START SAMPLER ID LOCATED SOUTH OF TRENCH 6181 START ETI: 83932 MAG: 22.0 GRASBY

1232 SAMPLER 1390-1 MAG: 14.0

1400 GAS 1/2 FULL AFTER 3 hrs

Sampler S/N 6181 Cal curve

Slope (m) = 34.62 Int (b) = -1.87 corr. coeff. (r) = .9981

1530 CAE flowrates? GMW → 80-543-7412

CAE doesn't know why flowrate is so low

1630 GAS 3/8 FULL ~~AFTER~~ 5 1/2 hrs
SAMPLER S/N 1390-1 MAG: 13.5 ET: 757036

7-12 0625 B.P. 29.94 TEMP: 82°F
SAMPLER 1390-1 MAG: 14.0 765924 end of sample

0631
SAMPLER 6181 MAG: 23.0 85863 end of sample

0810 SAMPLE OU4-3-DN
Start sampler 1390-1 w/ 3B holder ET: 765960 MAG: 15.0

sampler located North of 28th Street w/ generator close by

0840 SAMPLE:
start sampler 6181 MAG: 16.0 ETI: 85876 OU4-4-UP

1115
S/N 1390-1 MAG: 13.0

1152
S/N 6181 MAG: 14.0

1523
S/N 1390-1 MAG: 13.0 ETI STOPPED @ 766473, hit ETI and it restarted DO NOT USE ETI READINGS

1530
S/N 6181 ETI 86420 UNIT HAS BEEN UNPLUGGED MAG: 14.0

86420
85876
544

Sample reduction

SAMPLE:
HO-1-DN FROM SAMPLER : 1390-1 CASSETTE : 38

AVERAGE MAG : 14.2 STARTED : 1225 ENDED: 0625

TOTAL TIME: 1140 min

CALCULATED FLOWRATE : .114 m^3/min

TOTAL VOLUME : 131.5 m^3

SAMPLE : HO-2-UP SAMPLER: 6181 CASSETTE: GRAGEBY

AVERAGE MAG : 22.5 STARTED: 1230 ENDED : 0631

TOTAL TIME : 1141 min

CALCULATED FLOWRATE : .153 m^3/min

TOTAL VOLUME : 174.9 m^3

2200
S/N 1390-1 MAG : 14.0
S/N 6181 MAG: 16.0

7-13 0740 B.P. 29.97 TEMP 80°F
0746
S/N 6181 MAG : 15.0 ETI 880.46 End of sample
0825
S/N 6181 AUDIT ΔH 1.5" MAG: 16.0
0835
S/N 1390-1 ~~not~~ generator ran out of gas, was on @ 746, will assume stop time of 0746
mag : 14.5
0840 S/N 1390-1 AUDIT ΔH 1.4" MAG : 16.5
0930 SAMPLE OU4-5-DN IN CASSETTE HOLDER: 38
OU4-6-UP IN CASSETTE HOLDER: GRAGEBY
0938
SAMPLE OU4-6-UP IN SAMPLER 6181 STARTED
ETI 880.52 MAG: 15
0949
SAMPLE OU4-5-DN IN SAMPLER 1390-1 STARTED
MAG: 18

redraw curve w/ -1 from reg. on 6181

b = -.944 m = 36.98

1130 Winds are from the SE, upwind and downwind samplers location are OK for the morning

Activities for trending include pumping out water, pump-sawing the culvert and "gradall" shoveling of soil

Given the moisture in soil and low close samplers to road, particulate concentration could likely be impacted from road traffic.

1212 sampler S/N 1390-1 MAG: 16.5

1225 sampler S/N 6181 MAG: 14.0

1410 sampler S/N 1390-1 MAG: 17.0

1415 S/N 6181 MAG: 14.0

SAMPLE REDUCTION

SAMPLE: OU4-3-DN SAMPLER: 1390-1 CASSETTE: 38

AVG. MAG: 13.75 STARTED: 0810 ENDED: 0746

TOTAL TIME: 1416 MIN

CALCULATED FLOWRATE: .112 m^3/MIN

TOTAL VOLUME: 158.6 m^3

SAMPLE: OU4-4-UP SAMPLER: 6181 CASSETTE: GRASEBY

AVG. MAG: 15.0 STARTED: 858.76 ETI ENDED: 880.46 ETI

TOTAL TIME: 1302 MIN

CALCULATED FLOWRATE: .129 m^3/MIN

TOTAL VOLUME: 167.6 m^3

1700 sampler S/N 1390-1 MAG: 17.0

1705 sampler S/N 6181 MAG: 14.0

1800 left site

7-14 0752 Samples 1390-1 MAG: 17.0 End of sample

0823 Samples 6181 MAG: 14.0 End of sample

ETI: 903.26

0928 AUDIT on S/N 6181 ΔH: 2.1" MAG: 19

B.P. 30.02 TEMP = 83°F

1000 OU3-8-DN IN CASSETTE: 3B

OU3-7-UP IN CASSETTE: GRASEBY

1015 AUDIT ON S/N 1390-1 ΔH = 1.8" MAG: 18

1121 GRASEBY ON S/N 6181 MAG: 18

1135 3B ON S/N 1390-1 MAG: 13.5

GET SAMPLE START TIMES FROM JOHN, SHOULD BE ~10:30

1138 Field blank taken

ATTACHMENT E

SAMPLER CALIBRATION DATA SHEETS

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET

Run No.	(1) Meter reading start V_i (m^3)	(2) Meter reading stop V_f (m^3)	(3) Sampling time t (min)	(4) Volume measured V_m (m^3)	(5) Differential pressure (at inlet to volume meter) ΔP (mm Hg or kPa)	(6) (X) Flow rate Q_{std} (std m^3/min)	(7) Pressure drop across orifice ΔH ☐ (in) or ☐ (cm) of water	(7a) (Y) $\sqrt{\Delta H\left(\frac{P_1}{P_{std}}\right)\left(\frac{298}{T_1}\right)}$
1								
2								
3								
4								
5								
6								

RECORDED CALIBRATION DATA

Standard volume meter no. _____

Transfer standard type: ☐ orifice ☐ other

Model No. _____ Serial No. _____

(8) P_1: _____ mm Hg (or kPa) (10) P_{std}: 760 mm Hg (or 101 kPa)

(9) T_1: _____ K (11) T_{std}: 298 K

Calibration performed by: _____

Date: _____

CALCULATION EQUATIONS

(1) $V_m = V_f - V_i$

(2) $V_{std} = V_m\left(\frac{P_1 - \Delta P}{P_{std}}\right)\left(\frac{T_{std}}{T_1}\right)$

(3) $Q_{std} = \frac{V_{std}}{t}$

LEAST SQUARES CALCULATIONS

Linear (Y = mX + b) regression equation of $Y = \sqrt{\Delta H(P_1/P_{std})(298/T_1)}$ on $X = Q_{std}$ for Orifice Calibration Unit (i.e., $\sqrt{\Delta H(P_1/P_{std})(298/T_1)} = mQ_{std} + b$)

Slope (m) = _____ Intercept (b) = _____ Correlation coefficient (r) = _____

To use for subsequent calibration: $X = \frac{1}{m}(Y-b)$; $Q_{std} = \frac{1}{m}\left(\sqrt{\Delta H\left(\frac{P_1}{P_{std}}\right)\left(\frac{298}{T_1}\right)} - b\right)$

Figure 4. Example of orifice transfer standard certification worksheet.

HIGH-VOLUME AIR SAMPLER CALIBRATION WORKSHEET

Site Location: GULFPORT, MISS

Date: 7-11-95 Barometric Pressure, P_2 mm Hg (or kPa) 29.94

Calibrated By: ARC Temperature, T_2 (K) 96.4°F

Sampler No. GPS-1 Serial No. 1390-1

Transfer std. type: ORIFICE/FIXED Serial No. 671C

$corr = \sqrt{\Delta H\left(\frac{29.94}{29.92}\right)\left(\frac{298.15}{308.9}\right)}$

$= \sqrt{\Delta H \cdot 9658}$

P_{std} = 760 mm Hg (or 101 kPa)

Optional: Average barometric pressure: P_a = _____

Seasonal average temperature: T_a = _____

No.	ΔH Pressure drop across orifice ☐ (in) or ☐ (cm) of water	$\sqrt{\Delta H\left(\frac{P_2}{P_{std}}\right)\left(\frac{298}{T_2}\right)}$	(X) Q_{std} (from orifice certification) std m^3/min	I Sampler flow rate indication (arbitrary)	(Y) For specific pressure and temperature corrections (see Table 1) ☐ I or ☐ $\sqrt{I\left(\frac{P_2}{P_{std}}\right)\left(\frac{298}{T_2}\right)}$ or ☐ $I\sqrt{\left(\frac{P_2}{P_{std}}\right)\left(\frac{298}{T_2}\right)}$	For incorporation of average pressure and seasonal average temperature (see Table 1) ☐ I or ☒ $\sqrt{I\left(\frac{P_2}{P_a}\right)\left(\frac{T_a}{T_2}\right)}$ or ☐ $I\sqrt{\left(\frac{P_2}{P_a}\right)\left(\frac{T_a}{T_2}\right)}$
1	0.55	0.729	.0733	6.0		2.407
2	0.70	0.822	.0822	8.0		2.780
3	0.90	0.932	.0927	10.0		3.108
4	1.18	1.067	.1056	12.0		3.404
5	1.43	1.175	.1159	14.5		3.742
6	0			0		

LEAST SQUARES CALCULATIONS

Linear regression of Y on X: Y = mX + b; Y = appropriate expression from Table 1; $X = Q_{std}$

Slope (m) = ↓ 30.16 Intercept (b) = ↓ 0.255 Correlation Coeff. (r) = .9953

To determine subsequent flow rate during use: $X = \frac{1}{m}(Y-b)$; $Q_{std} = \frac{1}{m}$ ([appropriate expression from Table 2] - b)

Figure 5. Example of high-volume air sampler calibration worksheet.

[47 FR 54912, Dec. 6, 1982; 48 FR 17355, Apr. 22, 1983]

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET

Run No.	(1) Meter reading start V_i (m^3)	(2) Meter reading stop V_f (m^3)	(3) Sampling time t (min)	(4) Volume measured V_m (m^3)	(5) Differential pressure (at inlet to volume meter) ΔP (mm Hg or kPa)	(6) (X) Flow rate Q_{std} (std m^3/min)	(7) Pressure drop across orifice ΔH ☐ (in) or ☐ (cm) of water	(7a) (Y) $\sqrt{\Delta H\left(\frac{P_1}{P_{std}}\right)\left(\frac{298}{T_1}\right)}$
1								
2								
3								
4								
5								
6								

RECORDED CALIBRATION DATA

Standard volume meter no. _____

Transfer standard type: ☐ orifice ☐ other

Model No. _____ Serial No. _____

(8) P_1: _____ mm Hg (or kPa) (10) P_{std}: 760 mm Hg (or 101 kPa)

(9) T_1: _____ K (11) T_{std}: 298 K

Calibration performed by: _____

Date: _____

CALCULATION EQUATIONS

(1) $V_m = V_f - V_i$

(2) $V_{std} = V_m\left(\frac{P_1 - \Delta P}{P_{std}}\right)\left(\frac{T_{std}}{T_1}\right)$

(3) $Q_{std} = \frac{V_{std}}{t}$

LEAST SQUARES CALCULATIONS

Linear ($Y = mX + b$) regression equation of $Y = \sqrt{\Delta H(P_1/P_{std})(298/T_1)}$ on $X = Q_{std}$ for Orifice Calibration Unit (i.e., $\sqrt{\Delta H(P_1/P_{std})(298/T_1)} = mQ_{std} + b$)

Slope (m) = _____ Intercept (b) = _____ Correlation coefficient (r) = _____

To use for subsequent calibration: $X = \frac{1}{m}(Y-b)$; $Q_{std} = \frac{1}{m}\left(\sqrt{\Delta H\left(\frac{P_2}{P_{std}}\right)\left(\frac{298}{T_2}\right)} - b\right)$

Figure 4. Example of orifice transfer standard certification worksheet.

HIGH-VOLUME AIR SAMPLER CALIBRATION WORKSHEET

Site location: GULFPORT, MISS.

Date: 7-11-95 Barometric Pressure, P_2 mm Hg (or kPa) 29.94

Calibrated By: [illegible] Temperature, T_2 (K) 96.4°F = 35.8°C = 308.9°K

Sampler No. GPS-1 Serial No. 6181

Transfer std. type: ORIFICE/FIXED Serial No. 691C

$COR = \sqrt{\Delta H\left(\frac{29.94}{29.92}\right)\left(\frac{298.15}{308.9}\right)}$

$= \sqrt{\Delta H}\ .9658$

P_{std} = 760 mm Hg (or 101 kPa)

Optional:

Average barometric pressure: P_a = 757

Seasonal average temperature: T_a = 25°C

No.	ΔH Pressure drop across orifice ☒ (in) or ☐ (cm) of water	$\sqrt{\Delta H\left(\frac{P_2}{P_{std}}\right)\left(\frac{298}{T_2}\right)}$	(X) Q_{std} (from orifice certification) std m^3/min	I Sampler flow rate indication (arbitrary)	For specific pressure and temperature corrections (see Table 1) (Y) ☐ I or ☐ $\sqrt{I\left(\frac{P_2}{P_{std}}\right)\left(\frac{298}{T_2}\right)}$ or ☐ $I\sqrt{\left(\frac{P_2}{P_{std}}\right)\left(\frac{298}{T_2}\right)}$	For incorporation of average pressure and seasonal average temperature (see Table 1) (Y) ☐ I or ☒ $\sqrt{I\left(\frac{P_2}{P_a}\right)\left(\frac{T_a}{T_2}\right)}$ or ☐ $I\sqrt{\left(\frac{P_2}{P_a}\right)\left(\frac{T_a}{T_2}\right)}$
1	~~2.3~~ 0.85	~~1.265~~ .907	~~0.126~~ .0903	6		2.41
2	1.20	1.077	~~1.211~~ .0970 .142	10		3.11
3	1.65	1.262	~~0.159~~ .1342	14		3.68
4	2.0	1.390	~~0.172~~ .145	17		4.05
5	2.3	1.490	~~0.181~~ .146	20		4.39
6	0		0	-1.0		-0.98

LEAST SQUARES CALCULATIONS

Linear regression of Y on X: $Y = mX + b$; Y = appropriate expression from Table 1; $X = Q_{std}$

Slope (m) = ~~34.62~~ Intercept (b) = ~~1.87~~ Correlation Coeff. (r) = ~~.9981~~ .9979

To determine subsequent flow rate during use: $X = \frac{1}{m}(Y-b)$; $Q_{std} = \frac{1}{m}$([appropriate expression from Table 2] - b)

SLOPE (m) = 34.83 (b) = -.677

Figure 5. Example of high-volume air sampler calibration worksheet.

[47 FR 54912, Dec. 6, 1982; 48 FR 17355, Apr. 22, 1983]

ATTACHMENT F

FLOW RATE VERIFICATION DATA SHEET

ANDRÉ CASAVANT /

Performed by JOHN KIRKLAND Calibration Orifice S/N 691 C Ambient Temperature 96.4 °C

Date/Time July 11, 1985 1230 Manometer S/N NA Bar. Press. 29.94 mm Hg

Sampler S/N	Variac Setting V	Timer OK? Yes/No	Calibration Orifice Data: Manometer, in. H_2O ($W/\sqrt{\Delta H_{corr}}$)	Calibration Orifice Data: Flow Rate scm/min[a]	Sampler Venturi Data: Magnehelic, in. H_2O ($W/\sqrt{T_a}$)	Sampler Venturi Data: Flow Rate scm/min[b]	% Difference Between Calibration and Sample Venturi Flow Rates	Comments
6181	MAX	YES 7-11 1230	2.35/1.506	.148	22/4.61	.152 ~~.187~~	2.7	OK
"	"	YES 7-12 730	1.50/1.204	.119	16/3.93	.132	10.7	MAX DURING SAMPLING NEVER WENT BELOW 20% NO NEED FOR RECAL
"	"	YES 7-13 825	1.50/1.204	.119	16/3.93	.132	10.7	"
		7-14 930	2.1/1.424	.140	19/4.28	.142	1.4	OK
		7-17	1.7/1.281	.126	14/3.68	.125	0.8	OK
13902	MAX	7-11 1230 ~~YES~~ NO	1.40/1.163	.115	14/3.68	.113	1.7	OK
"	"	~~YES~~ NO 7-12	1.55/1.223	.121	18/4.17	.130	7.4	OK
"	"	~~YES~~ NO 7-13	1.40/1.163	.115	16.5/3.99	.124	7.8	OK
		7-14	1.8/1.318	.130	18/4.17	.130	0	OK
		7-17 NO	1.4/1.163	.115	17/4.05	.126	9.6	OK
6181	MAX	7-18	1.4/1.163	.115	14/3.68	.125	8.7	OK

(a) From Calibration Tables for Calibration Orifice or Venturi Tube

(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Date check by _____ Date _____

TD9-36

FIGURE 3. EXAMPLE SAMPLING DATA SHEET

ATTACHMENT G

CHAINS OF CUSTODY

Chain of Custody Record

Quanter Environmental Services

OUA-4124-1

Client	Project Manager	Date	Chain Of Custody Number
HBB ENVIRONMENTAL SERVICES, INC	ANDRÉ CASAVANT	7-12-95	36624
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 1**
110 FRIE ST	(207) 828-3492 FAX (207) 772-4762		
City / State / Zip Code	**Site Contact**	**Lab Contact**	
PORTLAND / ME / 04101	BOB FISHER		
Project Name	**Carrier/Waybill Number**		
GULF PART AIR SAMPLING			
Contract/Purchase Order/Quote No			
GPT506-MO-8505.36			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Aqueous	Sed.	Soil	AIR	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	TO-9			ELAPSED TIME (min)	AVG MAG	FLOWRATE	TOTAL VOL.						Special Instructions/ Conditions of Receipt
HO-1-DN	7-11-95	1225-0625				✓	✓						✓		1140	1140	14.2	.114	131.5						
HO-2-UP	7-11-95	1230-0631				✓	✓						✓		1140	1158	22.5	.153	174.9						

Analysis (Attach list if more space is needed)

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☒ Other STANDARD

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: [signature]	7-12-95	1620	1. Received By		
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

Chain of Custody Record

Quanter Environmental Services

QUA-4124-1

Client	Project Manager	Date	Chain Of Custody Number
ABB - ENVIRONMENTAL SERVICES, INC.	ANDRÉ CASAVANT		36505

Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page
110 FREE ST	(207) 828-3472 FAX (207) 772-4762		1 of 1

City	State	Zip Code	Site Contact	Lab Contact
PORTLAND	ME	04101	BOB FISHER	RON BOVELL

Project Name	Carrier/Waybill Number
GULFPORT AIR SAMPLING	

Contract/Purchase Order/Quote No.: GFT506-MO-8505.36

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Aqueous	Sed.	Soil	AIR	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH		Analysis (Attach list if more space is needed): TO-9			ELAPSED TIME (min)	AVG MAG	FLOWRATE (m³/min)	TOTAL VOL (m³)						Special Instructions/ Conditions of Receipt: SAMPLER	CASS
QUA-3-DN	7-12-95	0810-0746				✓	✓							✓			1416	13.75	.112	158.6						1390-1	36
QUA-4-UP	7-12-95					✓	✓							✓			1302	150	.129	167.6						6181	GPAS

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: Andre Casavant	7-13-95	1615	1. Received By		
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

Chain of Custody Record

Quanterra Environmental Services

OUA-4124-1

Client	Project Manager	Date	Chain Of Custody Number
HSB ENVIRONMENTAL SERVICES	PENNY BAXTER	7-14-95	36763
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 1**
1400 CENTERPOINT BLVD	615-531-1922 531-8662		
City / State / Zip Code	**Site Contact**	**Lab Contact**	
KNOXVILLE TN 37932	B. FISHER	RON BOVELL	
Project Name	**Carrier/Waybill Number**		
GULFPORT AIR SAMPLING			
Contract/Purchase Order/Quote No			
CPT 516-AIR-8505.36			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Aqueous	Sed.	Soil	Air	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	TO-9			Analysis (Attach list if more space is needed): Elapsed Time	AUG AIRG	FLUORIDE	TOTAL VOL.						Special Instructions/ Conditions of Receipt
		1615 1710																							Summer Case
OU4-5 UP	7-14-95	AM/AM 949/752				✓	✓						✓			24H/24H	14.5	5/115	1.5L						1360-1
OU4-6 UP	7-14-95	AM/AM 933/823				✓	✓						✓												6181
FIELD BLANK	7-14-95	1030				✓	✓						✓												

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☑ Other Std.

QC Requirements (Specify):

	Date	Time		Date	Time
1 Relinquished By: Jeffrey R. Hubbard	7-14-95	1700	1. Received By		
2 Relinquished By			2. Received By		
3 Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

Chain of Custody Record

QUA-4124-1

Quanterra Environmental Services

Client: ABB ENVIRONMENTAL SERVICES	Project Manager: PENNY BAXTER	Date: 7-15-95	Chain Of Custody Number: 36501
Address: 1110 CENTERPOINT BLVD SUITE 150	Telephone Number (Area Code)/Fax Number: 615-531-1122, 615-531-8226	Lab Number:	Page 1 of 1
City: KNOXVILLE; State: TN; Zip Code: 37932	Site Contact: BOB FISHER	Lab Contact:	
Project Name: GULF PORT AIR SAMPLING	Carrier/Waybill Number:		
Contract Purchase Order/Quote No.: EPT 506-MC-8505.36			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Aqueous	Sed.	Soil	Air	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	TO-9			(MIN) TIME	Ethylene	Ethylene Glycol	Total Hydrocarbons					Special Instructions/ Conditions of Receipt
CL3-7 UP	7-15-95	1012S 743P				✓	✓						✓			122	19	.142	175					SAMPLER BASE
CL3-6 DN	7-15-95	1021S 725P				✓	✓						✓			125	14.7	.130	163.3					6181 GRASE
																								1390-1 3B

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☒ Other Std.

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By: [signature]	7-17-95	1615	1. Received By		
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments:

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

Chain of Custody Record

Quanterra Environmental Services

QUA-4124-1

Client	Project Manager	Date	Chain Of Custody Number
ABB ENVIRONMENTAL SERVICES	PENNY BAXTER	7-19-95	36502

Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page
1400 CENTERPOINT BLVD SUITE 1	615-531-1922, 615-531-8226		1 of 1

City	State	Zip Code	Site Contact	Lab Contact
KNOXVILLE	TN	37922	BOB FISHER	

Project Name	Carrier/Waybill Number
GULFPORT AIR SAMPLING	

Contract/Purchase Order/Quote No	
GPT 506-MO-8505.36	

Analysis (Attach list if more space is needed)

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Aqueous	Sed.	Soil	D/R	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	TO-9	Elapsed Time (min)	Avg. Mag.	Flowrate (m³/min)	Total Vol (m³)	Special Instructions/ Conditions of Receipt
CU3-9-DN	7-18-95	950 945				✓							✓	1435	153	.126	186	
CU3-10-UP	7-18-95	933 1005				✓							✓	1472	133	.125	184	
CU1-12-DN	7-19-95	1436 1400				✓							✓	1404	14.0	.125	175	

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☒ Other Std

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: John R. Kuhland	7-19-95	1510	1. Received By		
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

ATTACHMENT H

LABORATORY RESULTS

AMENDED

Quanterra Environmental Services

Toxicity Equivalents

The following results are based on EPA Toxicity Equivalence Factors (Method 8290 Table 10). For the first column of data (TEQ) zero is used for all ND results in calculating the toxicity equivalence. The second column of data (Maximum TEQ) is a maximum possible toxicity equivalent. The sample specific detection limits for ND results are used to calculate Maximum TEQs.

CAL ID:	CLIENT ID:	TEQ: (pg/sample)	MAXIMUM TEQ:(pg/sample)
082748-0001	HO-1-DN	16	21
082748-0002	HO-2-UP	24	29
082748-0003	OU4-3-DN	0.32	13
082748-0004	OU4-4-UP	0.34	13
082748-0005	OU4-5-DN	1.6	15
082748-0006	OU4-6-UP	0.12	8.8
082748-0007	FIELD BLANK	0.17	5.6

Quanterra
Environmental Services

Toxicity Equivalents

The following results are based on EPA Toxicity Equivalence Factors (Method 8290 Table 10). For the first column of data (TEQ) zero is used for all ND results in calculating the toxicity equivalence. The second column of data (Maximum TEQ) is a maximum possible toxicity equivalent. The sample specific detection limits for ND results are used to calculate Maximum TEQs.

CAL ID:	CLIENT ID:	TEQ:(pg/sample)	MAXIMUM TEQ:(pg/sample)
082995-0001	OU3-7 UP	0.26	8.7
082995-0002	OU3-8 DN	0.19	9.5

Quanterra
Environmental Services

Toxicity Equivalents

The following results are based on EPA Toxicity Equivalence Factors (Method 8290 Table 10). For the first column of data (TEQ) zero is used for all ND results in calculating the toxicity equivalence. The second column of data (Maximum TEQ) is a maximum possible toxicity equivalent. The sample specific detection limits for ND results are used to calculate Maximum TEQs.

CAL ID:	CLIENT ID:	TEQ:(pg/sample)	MAXIMUM TEQ:(pg/sample)
083053-0001	OU3-9-DN	47	58
083053-0002	OU3-10-UP	1.4	13
083053-0003	OU1-12-DN	2.2	31

ATTACHMENT I

GLOSSARY

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
CFR	Code of Federal Regulations
ℓ/m	liters per minute
$\mu g/m^3$	micrograms per cubic meter
m^3	cubic meters
mph	miles per hour
NCBC	Naval Construction Battalion Center
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
pg/m^3	picograms per cubic meter
PUF	polyurethane foam
Quanterra	Quanterra Environmental Services
USEPA	U.S. Environmental Protection Agency

ATTACHMENT J

REFERENCES

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ABB Environmental Services, Inc. (ABB-ES), 1995, Letter Report: Interim Removal Action, 28th Street Construction: prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), August.

U.S. Environmental Protection Agency (USEPA), 1986, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods: SW-846, 3rd edition.

USEPA, 1988, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, No. 600-A-89-017, June.

USEPA, 1989, Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans, March.

USEPA, 1993, Title 29, Code of Federal Regulations, Part 1910, Section 1000, Occupational Safety and Health Standards, Subpart Z - Toxic and Hazardous Substances, Air Contaminants: Revised July 1.