FRENCH PETROLEUM COMPANY OF CANADA LTD

NORTHWEST TERRITORIES

REPORT ON A SEISMIC SURVEY BY REFLECTION METHOD

TRAIL CREEK

JANUARY 12, 1968 - FEBRUARY 13, 1968

COMPAGNIE GENERALE DE GEOPHYSIQUE

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FRENCH PETROLEUM COMPANY OF CANADA LTD.

TRAIL CREEK

Report on a Seismic Survey by
Reflection Method

Cross - Sections 1-18

January 12th - February 13th, 1968

COMPAGNIE GENERALE DE GEOPHYSIQUE

THIS IS EXHIBIT "C" ATTACHED
TO AND MADE A PART OF THE
STATUTORY DECLARATION OF ROBERT
ALLAN WALL SWORN BEFORE ME THIS 21st
DAY OF JUNE, A.D. 1968.

A NOTARY PUBLIC in and for the
Province of Alberta

Page

LIST OF FIGURES

LIST OF ENCLOSURES

LIST OF TIME SECTIONS

Number	Line	From SP	To SP
1	SL 44 A	1	50
2	SL 44 A	49	83
3	SL 36	1	31
4	SL 36	32	75
5	SL 26	1	25
6	SL 26	23	58
7	SL 26	59	82
8	SL 26	80	117
9	SL 59	1	38
10	SL 59	36	69
11	SL 69 A	1	38
12	SL 69 A	36	72
13	SL 71	1	15
14	SL 45	110	76
15	SL 45	75	26
16	SL 45	32	16 X
17	SL 45	15	B
18	SL 40	1	37

FOREWORD

Party S. 3909 of COMPAGNIE GENERALE DE GEOPHYSIQUE carried out, on behalf of FRENCH PETROLEUM COMPANY OF CANADA LTD., a seismic survey by reflection method, in Sibbeston Lake area, Northwest Territories (61°30"- 62° N and 122°15"- 122°30"W).

The survey was conducted between January 12, 1968, date of first drilling, and February 13, 1968, date of last shot, according to the terms of the contract signed by FRENCH PETROLEUM COMPANY OF CANADA LTD., and COMPAGNIE GENERALE DE GEOPHYSIQUE on January 19, 1968.

The party was headed by A. LEBIS, Party Chief and R. PRICE, Party Manager. The crew was supervised by M. EIDSNESS.

FIG.1

C.G.G. S.3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

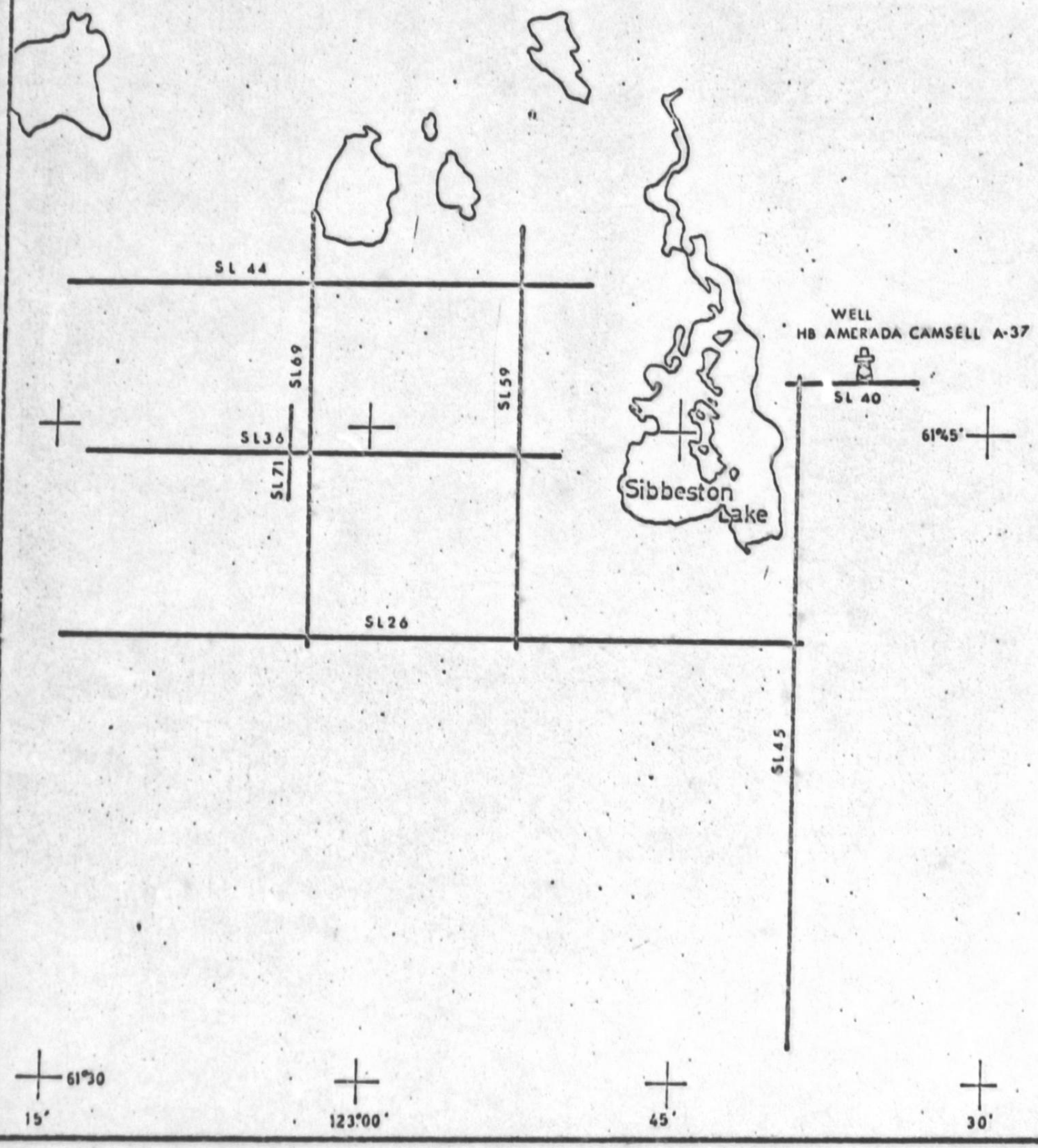
SCHEMATIC LOCATION MAP

SIBBESTON LAKE AREA

TRAIL CREEK SURVEY

SCALE: 1" = 4 MILES

JAN.12,1968 – FEB.13,1968



CHAPTER I

GENERAL INFORMATION

1.1 Geological and Geophysical Outlines

The following geological and geophysical information was provided by FRENCH PETROLEUM COMPANY OF CANADA LTD.

11.1 Surface Geology

No information was available within the area surveyed but outcrops of the Nahanni Range, which is near the western edge of the survey, indicates a facies change in the Manetoe formation which was expected to continue throughout the survey, approximately along line SL 36.

11.2 Stratigraphical Data

The Hudson's Bay Amerada Camsell A 37 Well, to which the survey is tied, provides the following information:

0' - 200'	quaternary drift
200' - 1030'	Upper Devonian and Horn River shales

Then, comes a sequence of shales and carbonates of middle and lower Devonian age:

1030' - 1600'	Nahanni Limestone
1600' - 1690'	Headless formation
1690' - 1860'	Landy formation
1860' - 2432'	Arnica Dolomite

The well was drilled to a total depth of 3284' and did not penetrate the Cambrian formation. The depth of the Precambrian basement is therefore unknown.

Dolomite reefs were only expected below the top of the Nahanni formation.

11.3 Structural Data

The survey is situated to the east of the Nahanni range and is separated from this range by the Nahanni thrust fault.

The depth to the Cambrian, as shown by the Hudson's Bay Amerada Camsell A 37 Well, is approximately 2400', but was expected to increase near the Nahanni fault with possible minor faults or tectonic changes.

11.4 Geophysical Data

Aeromagnetic and gravity surveys carried out in the area confirmed that the basement is shallow in the eastern part of the survey, near the Hudson's Bay Amerada Camsell A 37 Well, and increases rapidly to the west.

Velocity data obtained from the Hudson's Bay Amerada Camsell A 37 Well and the Tenneco Root River 160 located at 62°39'32" W and 123°24'29" N, shows that the top of the Nahanni carbonates is a good reflector. The possibility of deeper reflectors coinciding with the Headless formation and the top of the Cambrian, should not be overlooked.

A seismic survey was carried out 200 miles north in the very similar "Root River area". A reflector corresponding to the top of the Nahanni formation is of fair quality. Reefs give no reliable reflection as the velocity contrast is not great.

1.2 Seismic Program

The proposed program for this reconnaissance survey consisted of 95 miles of seismic line employing 300% stack. The western portion of the survey was to be recorded with a half mile spread (distance from shot point to remote trace 2530') and the eastern portion with a quarter mile spread (distance from shot point to remote trace 1265').

The objective was to delineate any features favorable for the accumulation of oil and/or gas.

FIG. 2
C.G.G. S. 3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

PARTY COMPOSITION

PERSONNEL and EQUIPMENT

SIBBESTON LAKE AREA
TRAIL CREEK SURVEY
JAN. 12 - FEB. 13, 1968.

PERSONNEL

CALGARY

OFFICE
- 1 Party Chief
- 1 Chief Computer
- 1 Computer

CATS
- 4 Drivers
- 1 Supervisor
- 1 Cook

FIELD

SEISMIC
- 1 Party Manager
- 1 Observer
- 1 Junior Observer
- 1 Shooter
- 1 Shooter Helper
- 2 Surveyors
- 2 Rodmen
- 6 Helpers

CAMP
- 1 Cook
- 2 Cook Helpers
- 1 Camp Attendant

DRILLING
- 4 Drillers and 4 helpers (Jan. 6, - Jan. 9,)
- 8 Drillers and 8 helpers (Jan. 10, - Jan. 14, + Jan. 16 and 19,)
- 6 Drillers and 6 helpers (Jan. 15 and 16 + Jan. 18, - Jan. 30,)
- 4 Drillers and 4 helpers (Feb. 1 - Feb. 14,)
- 3 Water truck drivers
- 1 Driller Supervisor

EQUIPMENT

TECHNICAL

- 1 AS 626 X Amplifier set
- 1 PMR 20 Recorder
- 1 VT 6 camera
- 2 blasters SIE SCD 2000 BA
- 1 Salmoiraghi 4150
- 1 Wild Theodolite No. 63135
- 12 28 pairs - 4 take-out seismic cables, 230 feet between take-out
- 11 26 pairs - 6 take-out seismic cables, 155 feet between take-out
- 540 L2AU 20 cps geophones

VEHICLES

GMC 940 27
- 1 recorder unit (4 x 4)
- 1 shooting unit (4 x 4)
- 1 cable unit (4 x 4)

FORD 100 ½ T.
- 1 Party Manager unit (4x2)

GMC 3/4 T.
- 1 cable unit (4 x 4)
- 1 surveyor unit (4 x 4)

DRILLING

- 1 Mayhew Top Drive (Jan. 6 - Feb. 14,)
- 1 Carrey Top Drive (Jan. 22 - Jan. 29, + Feb. 11,)

Mayhews Conventional:
- 2 (Jan. 6, - Jan. 9,)
- 4 (Jan. 10, - Jan. 14, + Jan. 16 and 19,)
- 3 (Jan. 15 and 16 + Jan. 18, - Jan. 30,)
- 2 (Feb. 1, - Feb. 14,)

- 1 Maintenance truck
- 1 Crew truck
- 3 Pick-up ½T.
- 2 Water-trucks

Additional water-trucks:
- 2 (Jan. 7 - Jan. 27,)
- 3 (Jan. 28 - Feb. 13,)

CAMP:
- 1 30 KVA Generator set
- 1 5 KVA Generator set
- 1 10' x 24' Kitchen-diner unit
- 1 10 x 52 Diner-Storage unit
- 1 10 x 36 Washcar unit
- 1 10 x 52 Bunk-office (14 men) unit
- 2 10 x 52 16 man Bunkhouse unit

CATS:
- 2 D6 (Dec. 2, 1967 - Feb. 1, 1968)
- 1 T18 (Dec. 11, - Dec. 14, 1967)
- 2 D7 (Dec. 30, 1967 - Jan. 3, 1968)
- 1 D7 (Feb. 3, - Feb. 7,)

CHAPTER II

PERFORMANCE

2.1 Party Composition

21.1 Seismic

Figure 2 shows the composition of the crew for personnel and equipment. The seismic recording and surveying equipment were provided by COMPAGNIE GENERALE DE GEOPHYSIQUE. One MANDREL Remote Firing Control System, two battery chargers, two cap testers, one signal generator and an oscilloscope were used in addition to the equipment shown in the figure.

21.2 Drilling

BIG INDIAN DRILLING CO. LTD., supplied two Mayhew 1000 conventional drills, one Mayhew top-drive, two water trucks and a workshop repair truck and two pickups for the duration of the survey.

Two Mayhew conventional drills were supplied by MORRIS BROS DRILLING LTD., one until January 19 and the other until January 30. TOWN & COUNTRY WATER WELL BORING LTD., supplied a Carey top-drive from January 22 to January 29. All of these drills were working on a double shift basis.

Three spare water trucks were used during the survey. One 1500 gallon capacity truck was supplied by STAN PIEBIAK, a 1750 gallon capacity by D. GABOURY and an 1850 gallon capacity truck by LAWRENCE TRUCKING LTD., from January 27 to completion of the survey.

21.3 Camp

The camp was provided by ATCO INDUSTRIES LTD., and the catering by FORTIER & ASSOCIATES. The generator sets were provided by CORONET MACHINE & SUPPLY LTD.

21.4 Bulldozing

Two D6 wide pad dozers were used for most of the survey. These dozers were supplied by BOREK CONSTRUCTION LTD., from Dawson Creek.

Operations began on December 2, 1967 to clear the access road to the area. Due to extremely soft surface conditions, these dozers dropped into the muskeg and two additional dozers were employed during the periods December 11 to 14 and December 19 and December 21 for towing purposes.

For the period December 30, 1967 to January 3, 1968 two additional dozers were used for line cutting.

LEE CONSTRUCTION LTD., provided a dozer from February 3 to February 7, after the original dozers had left and a new program was decided upon.

2.2 History

A surveyor arrived in Fort Simpson on December 12, 1967 and stayed in the cat camp until the remainder of the crew arrived.

The Party Manager, the recording crew, and three drills left Calgary on January 6. Two more drills left Calgary on January 10.

The first shot point was drilled on January 12 and the first shot recorded on January 14, 1968.

FIG. 3
C.G.G. S.3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

SIBBESTON LAKE AREA
TRAIL CREEK SURVEY
JAN. 12 - FEB. 13, 196

STATISTICS

		DECEMBER				JANUARY			FEBRUARY			TOTAL			
		TD18	D6	D7	Total	D6	D7	Total	D6	D7	Total	TD 18	D6	D7	Total
DOZING hours	Access road	71	1,209	32	1,312	153		153				71	1,362	32	1,465
	Line opening		44	88	132	943	124	1,067		21	21		987	233	1,220
	Scaring lines					213		213		22	22		213	22	235
	Walking					49	8	57	22	40	62		71	48	119
	Total	71	1,235	120	1,444	1,358	132	1,490	22	83	105	71	2,633	335	3,039
DRILLING	Holes					1,228			649			1,877			
	Shot Points					409			216			625			
	Footage					55,975			29,220			85,195			
	A- Drilling hours					1,927.50			789.50			2,717			
	B- Move-in, Move-out hours					282			24 (2)			306			
	C- Moving hours					375.50			155			530.50			
	D- Stand-by					162 (1)			126			288			
	Total hours					2,747			1,094.50			3,841.50			
	Field hours (A + C)					2,303			944.50			3,247.50			
	Feet/drilling hours					29.04			37.01			31.36			
	Feet/field hours					24.31			30.94			26.23			
	Feet/total hours					20.37			26.70			22.18			
	Experiment hours					17.25			143.50			160.75 (4)			
	Experiment footage					420			4,590			5,010 (5)			
RECORDING	Length of spread					2,640'			2,640'		1320'	2,640'		1320'	
	New shot points					344			171		106	545 (3)		106	
	Reshot (including WZ shots)					42			10		6	52		6	
	Mileage (subsurface)					57.833			28.833		8.833	86.666		[illegible]	
	A- Recording hours					145			53		43	198		43	
	B- Moving hours					53.25			15.50		11.50	68.75		11.50	
	Move-in hours					55						55			
	Stand-by hours (beginning of survey)					10						10			
	Experiment hours					13.75			27.50			41.25			
	Field hours (A + B + Experiment Hr.)					212			96		54.50	308		54.50	
	Total hours					277			96		54.50	373		54.50	
	SP/recording hour					2.372			2.585		2.465	2.429		2.465	
	SP/field hour					1.623			2.000		1.945	1.803		1.945	
	SP/total hour					1.242			1.781		1.945	1.380		1.945	
	Miles per recording hour					.395			.430		.205	.404		.205	
CONSUMPTIONS — RECORDING PRODUCTS	Magnetic tapes					385			293			678			
	Photographic paper (rolls)					24			13			37			
	Photographic products:														
	Fixer (cans)					25			22			47			
	Developer (cans)					39			20			59			
	Explosive pounds					7,475			3,775			11,250			
	Blasting caps (60')					1,444			740			2,184			
CONSUMPTIONS — DRILLING PRODUCTS	Bran (pounds)					5,900			3,100			9,000			
	Mud (pounds)					8,400			3,850			12,250			
	Insert bits					176			101			277			
	Auger bits					91			20			111			
	Starter bits					18			29			47			
	Rock bits					106			17			123			
	Auger inserts					62			178			240			

(1) 8 hours due to cats
(2) move-in hours to Ft. Simpson only.
(3) including 34 experiments.
4) already in "Total hours"
5) already in "Footage"

Dozing was completed on February 6, and drilling on February 12. The last shot was recorded on February 13, 1968.

2.3 Statistics

Production or consumption of main items are shown in Figure 3.

23.1 Drilling

Drilling conditions were generally very rough. Gravel, sand and boulders were predominant. The average footage drilled was 22.18 feet per hour. Because of the hard drilling, bit consumption was very high. Statistics are shown in Figure 3.

23.2 Recording

Lines were generally rough throughout the area. The cats had to be used in the western portion of the area to tow the drills and recording equipment. Travel time represents 25% of the total time in the field.

Considerable experimenting was done using eighteen geophones per trace, which slowed up recording production.

It should also be noted that low production of the recorders is due directly to the poor drilling conditions.

23.3 Bulldozing

Dozing of the access road commenced on December 2, 1967 and operations were completed on February 6, 1968. Because of the soft patches of muskeg, which were encountered throughout the survey, and the very rough terrain, the cost of bulldozing per mile is relatively high.

FIG.4
C.G.G. S.3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

WORKING CONDITIONS

	SIBBESTON LAKE AREA TRAIL CREEK SURVEY JAN. 12 - FEB. 13, 1968.
LOCATION	
Camp Site	Camp site 1 at the intersection of line SL 69 and SL 36, 105 miles from Fort Simpson. Camp site 2, 2.5 miles west of intersection of lines SL 59 and SL 26 on line SL 26, 90 miles from Fort Simpson.
Communication	To Calgary through Fort Simpson by air or road. Telephone communication through Mobile Station 2M4502. Base Hay River.
Weather	Cold during all the survey, with several snow falls.
PERSONNEL	
Helpers	From Calgary for the recording crew. From Calgary or Edmonton for the drilling crew.
Organization of labour	2 shifts a day for the drilling crew. 2 shifts a day for the bulldozing crew.
SUPPLY	
Water	From springs, river and lake in the field.
Food	Delivered by Fortier and Associates Services Ltd. from High Level.
Propane	From Canadian Propane Consolidated Ltd. (Hay River)
Tools & Mud	Mud from Explosives Ltd. Tools from Canadian Oil and Tools Ltd., Walker MacDonald and Gruner Ltd.
Fuel & Lubricants	Delivered by Imperial Oil Ltd. (Fort Simpson and Hay River).
Explosives & Blasting Caps	Delivered by Explosives Ltd. (Fort Simpson).
Tapes & Photo Products	From Dalcan Equipment Ltd. in Calgary.

2.4 Working Conditions

Temperatures during the course of the survey were extremely cold. A low of 65° to 70° below zero was recorded on two or three occasions. Because of these extreme cold temperatures, break downs were numerous. It was necessary to run the truck engines 24 hours a day and as a result fuel consumption was very high.

Despite the cold weather some muskeg patches remained unfrozen, particularly on line 44, and as a result this line had to be temporarily abandoned.

The access road as well as the lines were very rough and because of this the camp arrived in a state of disrepair.

Many man hours were spent repairing trailers to get them in a livable condition.

2.5 Technical Conditions

25.1 Bulldozing

Due to small muskeg patches, many small detours were necessary. The dozers had difficulty climbing a hill near the west end of line SL 36. One shift was spent looking for a detour around this hill.

Because of the rough terrain, many hours were spent back blading the lines to make them as smooth as possible.

Lines were dozed into all the lakes, so water would be more readily available for the drills.

25.2 Surveying

The survey was tied to the Hudson's Bay Amerada Camsell A 37 Well.

FIG. 5
C.G.G. S.3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

SURVEYING

SIBBESTON LAKE AREA
TRAIL CREEK SURVEY
JAN. 12 - FEB. 13, 1968.

REFERENCE DOCUMENTS		Location map supplied by FPCC (Scale 1" = 1 mile).
PROJECTION SYSTEM		N.W.T. "Grid" System - Survey located on grid 95GNE. Coordinates given in feet from the north-east corner of each grid.
REFERENCE DATA		Hudson Bay Amerada Camsell A 37 well. 61° 46' 9" 15 N K.B. elevation: 1186' 122° 35' 55" 3 W
MAGNETIC	DECLINATION	The Theodolite Wild To serial number 63135 was used. Values of declination were obtained by sun shots. A value of 38.7 grades was used for the whole survey. In camp No. 1: 38.74 grades on the 5th of January. In camp No. 2: 38.74 grades on the 1st of February and 38.89 grades on the 16th of January.
CLOSURES	ELEVATION	Two loops were closed; misclosures are shown on figure.6. Total misclosure: 1 foot for 30.5 miles. Average quadratic error: 0.36 feet per square root mile.
CLOSURES	PLANIMETRY	Misclosures are shown on figure 6. Average quadratic error on X: 19 feet per square root mile. Average quadratic error on Y: 12 feet per square root mile.
LOCATION MAP		Shot point location map: 1" = 1 mile, enclosure 1.

FIG. 6

C.G.G. S. 3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

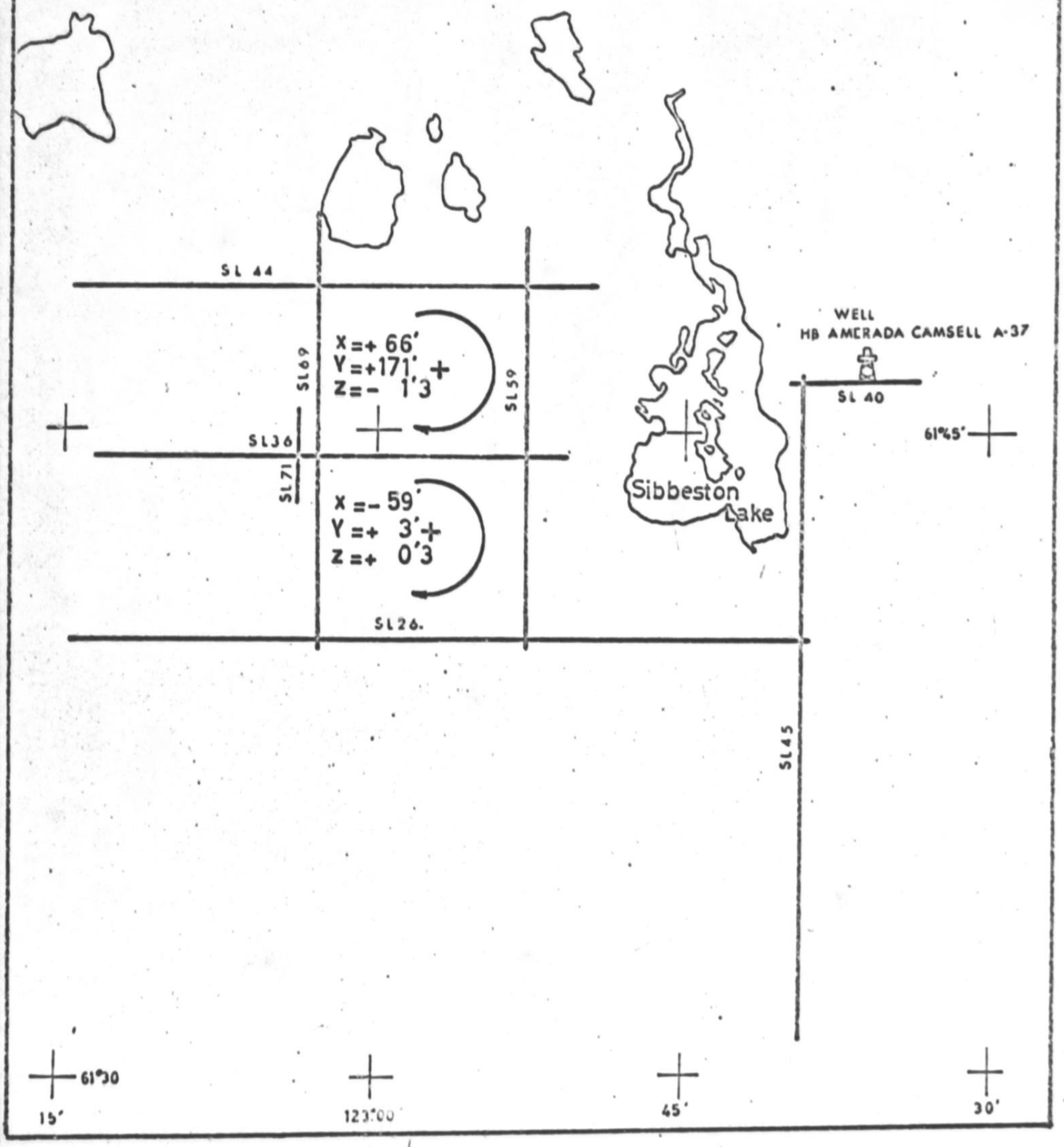
MISCLOSURES SKETCH

SIBBESTON LAKE AREA

TRAIL CREEK SURVEY

JAN.12,1968 – FEB.13,1968

SCALE: 1" = 4 MILES



Two surveyors, both employed by C.G.G., conducted the survey. A Wild To survey instrument and a Salmoiraghi transit were used to measure distances and elevations. The levelling was not completed as quickly as anticipated because of numerous breakdowns of the survey units.

Misclosures in planimetry and elevations are shown in figure 6.

25.3 Drilling

As shown in the statistics, the footage drilled by the top-drive is greater per hour than that shown by the conventional drills. However, the top-drive could not drill over the entire area and had to pick locations where better digging prevailed.

25.4 Recording

A S.E.R.C.E.L. AS 626 X amplifier set was used in conjunction with an S.I.E. P.M.R 20 magnetic recorder to conduct the survey.

The shot point pattern adopted was three holes in line, 75 feet apart and 45 feet deep.

Two different spread lengths were used during the survey. The western part of the area was recorded with a 2640 foot spread (lines 44, 59 and 26 south of line 45). The eastern part was recorded using a 1320 foot spread (lines 45 north and line 40).

a) 2640 foot spread

With this cable length, the geophone layout was 24 traces, 9 geophones per trace, 25 feet between geophones, 220 feet between traces. The shot point was in the centre of the spread, between traces 12 and 13, except at the end of some lines where one shot was recorded between traces 20 and 21 (or 4 and 5). The geophones on the

FIG. 7
C.G.G. S.3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

RECORDING

SIBBESTON LAKE AREA
TRAIL CREEK SURVEY
JAN. 12 - FEB. 13, 1968.

RECORDING SYSTEM	SERCEL AS 626 X Amplifier set SIE PMR 20 Magnetic recorder SIE VT 6 Oscillograph
CHARACTERISTICS OF AMPLIFIERS	Frequency range : 14 to 160 cps Instrument noise: 0.2 microvolts (500 ohms source) Input impedance : over 300 ohms parallel with 50 Henries Low cut filters : 14 - 17 - 20 - 24 - 28 - 34 cps High cut filters: 28 - 40 - 56 - 80 - 110 - 160 cps Automatic gain control : total range 110 dB
CABLES	12 four take out cables - 930 feet long - 230 feet between take out - 28 pairs of conductors. 11 six take out cables - 935 feet long - 155 feet between take out - 26 pairs of conductors. 2 two hundred foot jumpers.
GEOPHONES	540 geophones L2AV 20 cps. with winter bases, mounted in 60 groups of 9 geophones, 25 foot spacing 2 geophones (Up Hole)
PERIODIC TESTS	Amplifiers - daily Recorder - daily Tuh and TB - daily
SPREAD	24 traces split spread 220' between traces or 110' between traces
SHOT POINT	Three 45' deep holes in line, 75' apart. Total charge: 15 lbs.
RECORDING INSTRUMENT SETTINGS	Filters: 1/20 - 110 cps. Trip delay: 200 to 400 seconds. AGC common: Initial: -50 to -60 db Final Maximum Sill:0.32 to 32 microvolts.

traces near the shot point were folded back to reduce noise. Thirty four shot points on lines 49 and 45 were recorded with 18 geophones per trace, 12.5 feet between geophones

b) 1320 foot spread

Using this spread, the distance between traces was reduced to 110 feet with 9 geophones per trace at 12.5 foot intervals. The shot point, when using a 1320 foot spread, was directly on a trace which was disconnected when the shot was fired.

FIG. 8
C.G.G. S.3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

EXPERIMENTS

SIBBESTON LAKE AREA
TRAIL CREEK SURVEY
JAN. 12 - FEB. 13, 1968

DATE	LINE	SHOT POINT	SHOT NUMBER	NUMBER OF HOLES	DEPTH (')	CHARGE (lbs)	REMARKS
Jan. 14	44	1	1	3	50	15	
		1	2	2	40	10	
		1	3	2	40	10	
		2	5	3	50	15	Best record
		2	6	3	40	7.5	
		2	7	1	38	5	
		3	8	2	50	10	
		4	9	2	45	10	Best record
		4	10	2	40	10	
		5	11	3	50	15	
Jan. 15	44	23	5	3	45	30	Experiment on charge shows no improvement.
		25	7	1	100	15	Experiment on depth shows no improvement.
		25	8	1	76	15	no improvement
		25	9	2	45	15	Best record of 7,8,9.
		26	10	1	100	15	Experiment on depth no improvement
		26	11	1	68	20	no improvement
		26	12	2	45	10	
		26	13	3	35	30	Best record of 12,13
Jan. 17	44	49	10	3	45	15	110' between holes. Best records of 9,10,11
		49	11	2	45	20	110' between holes
		50	13	3	45	15	55' between holes
		50	14	3	35	30	55' between holes -- H. F. Record
		50	12	3	45	30	75' between holes, best record of 12, 13, 14
Jan. 19		21	8	5	45	25	Best record of 7, 8
		24	12	6	45	25	Best record of 11, 12
		33	24	4	45	20	Best record of 23, 24

CHAPTER III

RESULTS

3.1 Experiments (Figure 8)

Experiments were conducted at the beginning of the survey to determine the shot point pattern, hole depth and charge size. From previous knowledge in the area, the indication was that a 3 hole pattern in line, 75 feet apart, 50 feet deep with an explosive charge of 5 pounds in each hole, would provide the optimum shooting parameters.

From the experiments, it was decided that no noticable difference in record quality was apparent using a 45 or a 50 foot shot hole. A charge of 15 pounds is sufficient powder, but improvements in quality could be obtained by using more holes per shot point, with the extreme distance between holes extended to 220 feet.

3.2 Corrections

Corrections were calculated in Calgary by the computing office.

32.1 Surface Corrections

Corrections were calculated at every shot point by using:

$$Ct = CPE + CS$$

where Ct is the total correction

$$CPE = \frac{-Z-Zdp-D}{Vc}$$

$$CS = \frac{-Z-Zdp-d}{Vc} - Tuh$$

Zdp = datum plane elevation above sea level
Z = surface elevation
D = maximum depth of charge
d = minimum depth of charge
Tuh = uphole time in seconds
Vc = correction velocity

FIG. 9
C.G.G. S. 3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

MOVE-OUT STUDY

Lines 44A, 36, 26, 71, 69, 59

SIBBESTON LAKE AREA
TRAIL CREEK SURVEY
JAN. 12, - FEB. 13, 1968

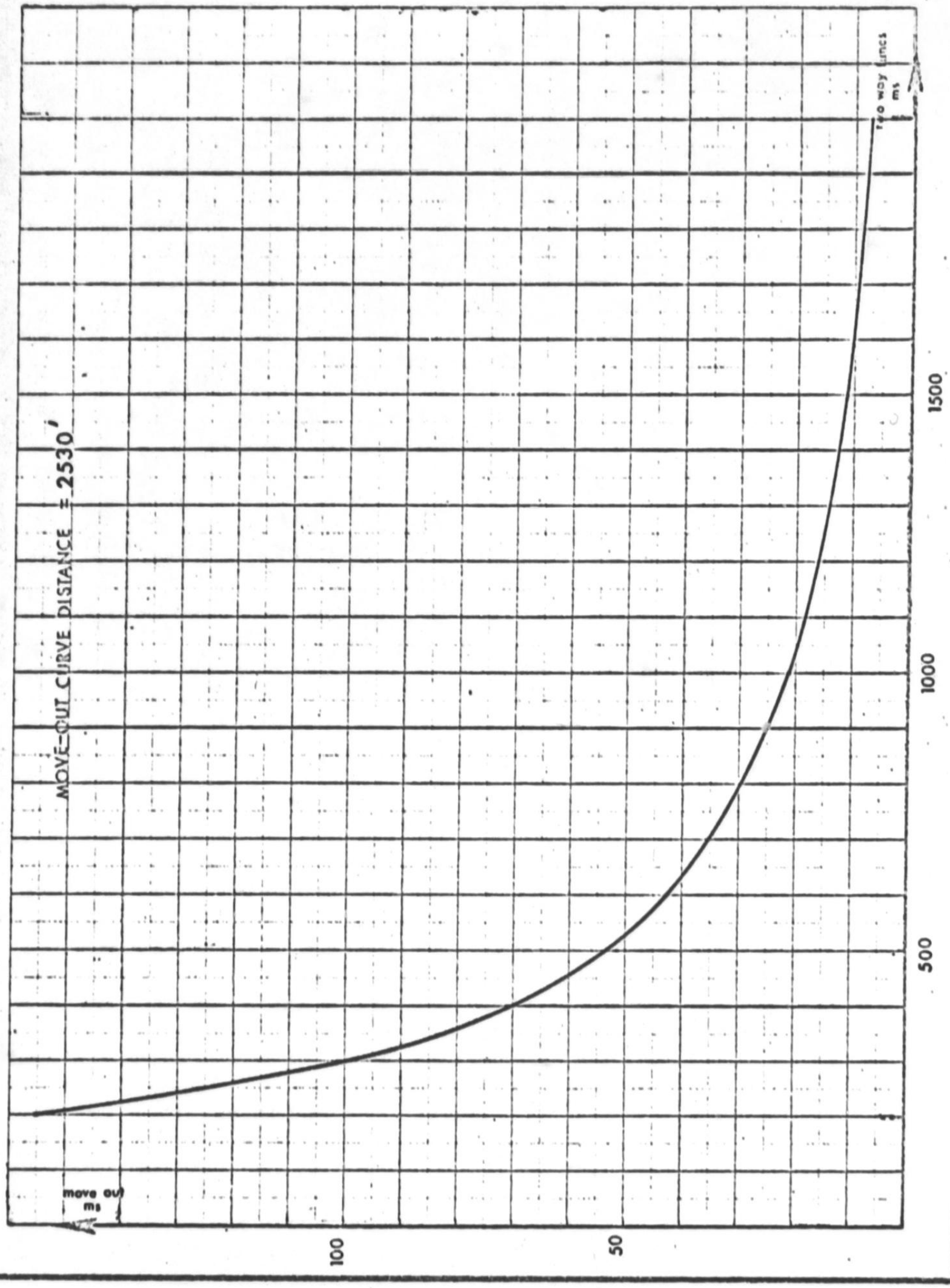


FIG. 9 bis
C.G.G. S. 3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

MOVE-OUT STUDY

Line 45, S.P. 26 to 110

SIBBESTON LAKE AREA
TRAIL CREEK SURVEY
JAN. 12 - FEB. 13, 1968

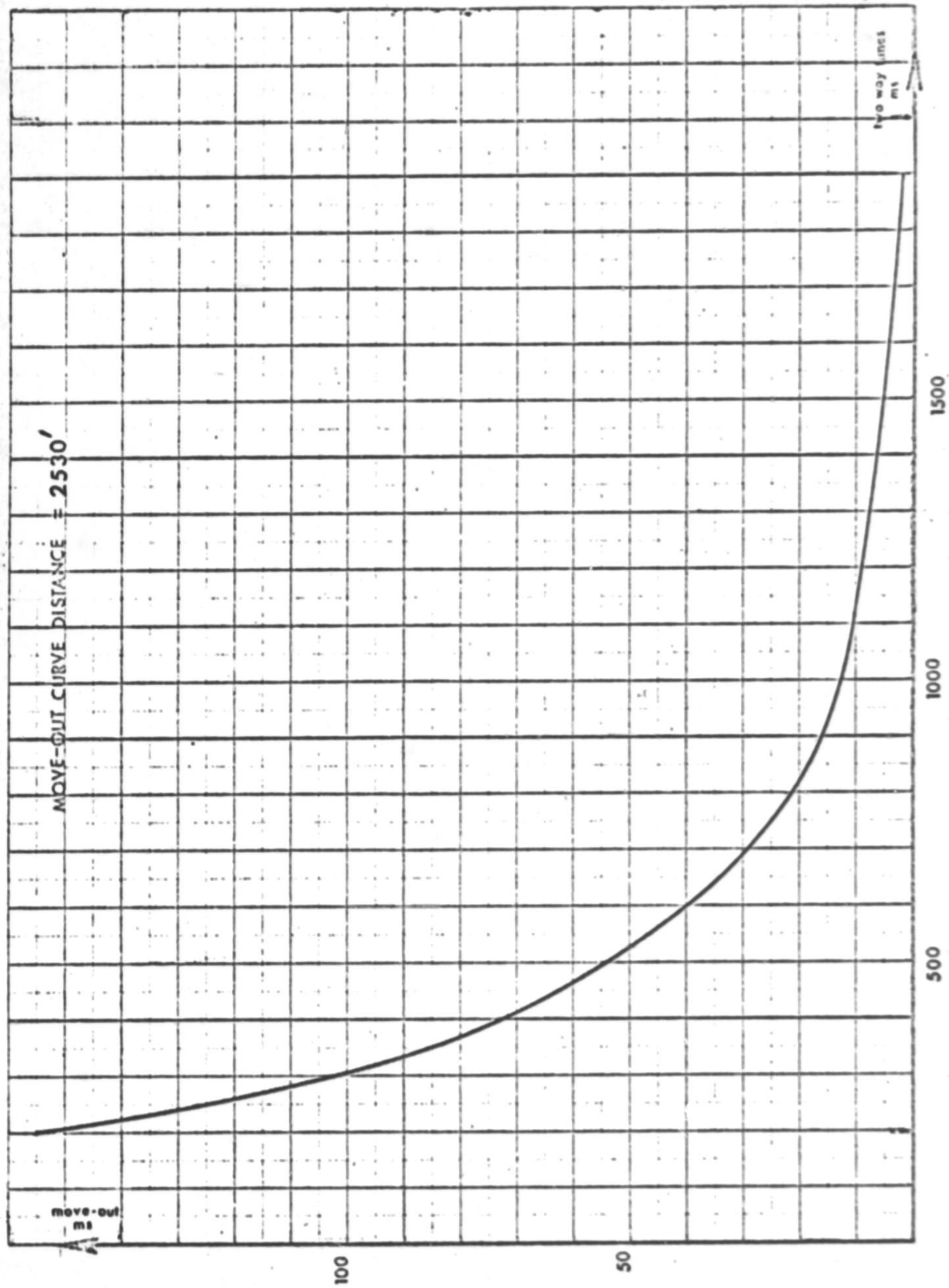


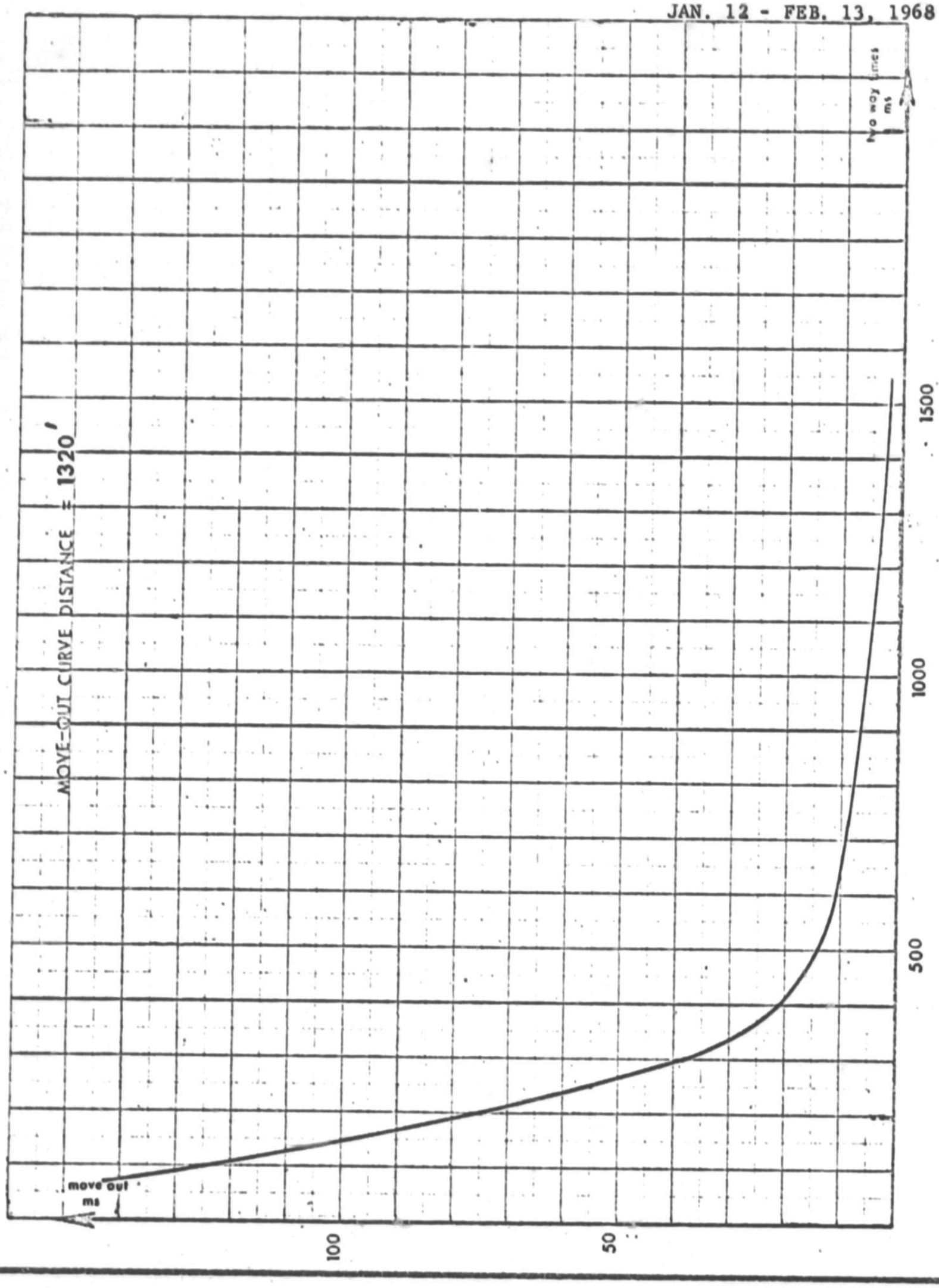
FIG. 9ter
C.G.G. S. 3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

MOVE-OUT STUDY

Line 45, S.P. B to 32
Line 40

SIBBESTON LAKE AREA
TRAIL CREEK SURVEY
JAN. 12 - FEB. 13, 1968



A correction velocity of 7000 feet per second and a datum plane of 1100 feet above sea level were chosen in agreement with F.P.C.C.

These corrections were applied to every shot point and individual trace corrections were calculated by using NMO playbacks.

The entire area is covered by drift of variable thickness which has a vertical velocity of 6600 feet per second. The underlying formation has a higher velocity of 11,000 feet per second and the velocity contrast may be responsible for the poor quality of records which occur from time to time.

32.2 Move-out Corrections

AΔT analysis was conducted to determine the velocity function. A single velocity function is applicable over most of the area. NMO play-backs enabled the computing office to check this function and to readjust it whenever necessary.

Figures 9 show the average function used.

CHAPTER IV

ANALYSIS OF THE RESULTS

4.1 Description of the Sections

41.1 Presentation of the Sections

The sections are presented with galvanometer traces and variable density superimposed. The horizontal scale is approximately 6 inches to the mile for 2640 foot spreads and 12 inches to the mile for 1320 foot spreads.

The vertical scale is 7.5 inches per second, two way time.

Recording and playback parameters are shown on the section labels. All sections were processed with a numerical filter 20 - 25, 50 - 55.

41.2 Quality of the Results

The general quality of the sections is fair. There is no difficulty in plotting Horizons A and B, except in the eastern part of the survey, on the east end of line SL 44 A (S.P. 77 to S.P. 83), the east end of line SL 36 (S.P. 72 to S.P. 75), the east end of line SL 26 (S.P. 96 to S.P. 117), line SL 45 and line SL 40 where Horizon A is too shallow. Horizon C is poor over most of the survey, but in the western part, its quality is fair.

The quality of the reflectors is shown on each time contour map.

41.3 Identification of the Seismic Horizons

All times mentioned hereafter are two way times.

A comparison between reflections on the sections and reflections

FIG. 10

C.G.G. S.3909

FRENCH PETROLEUM COMPANY OF CANADA LTD.

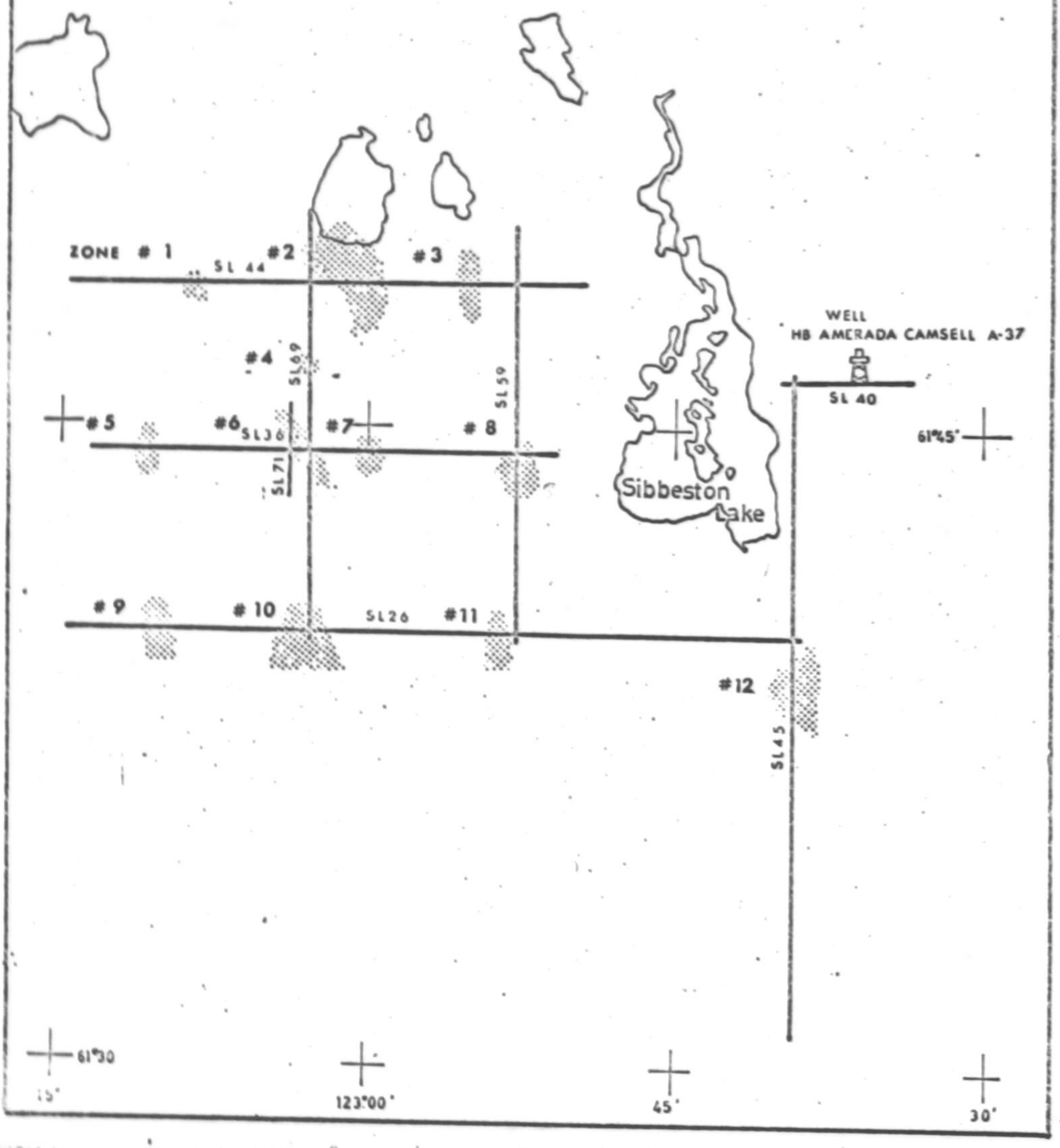
AREAS OF INTEREST

SIBBESTON LAKE AREA

TRAIL CREEK SURVEY

JAN.12,1968— FEB.13,1968

SCALE: 1" = 4 MILES



Source on the sonic log from the Hudson Bay Amerada Camsell A-37 well, allows an estimated geological identification of the horizons.

Horizon	Geology	Depth Below +1100 Seismic Datum	Time on Record Section Corrected @ 7000'/s.	Time (Raw) On Seismogram
"A"	?	?	?	?
"B"	Nahanni	943'	.305 (Trough)	.347
"C"	Top Cambrian	2354'	.442 (Peak)	.484

- The reflection carried for Horizon "A" in the western portion of the area cannot be correlated at this location.
- The reflection for Horizon "B" appears to correlate on all lines within the prospect.
- The event at Horizon "C" is generated from a velocity change of 21,700'/sec. to 17,700'/sec. at 2440 feet below K.B. elevation and should result in a negative reflection.
- The well terminated at a depth of 3280 feet below K.B. or an approximate record section time of -.548.
- The playback centre polarity appears reversed to that of the original field monitor.

41.4 Particular Features

Two particular types of features are noticable on the sections.

414.1 Possible reef areas

The interval time between horizons "A" and "B" increases suddenly in places. In these places the continuity and alignment of horizon "A" is very poor.

Twelve of these areas are noted. They are shown in figure 10 and a photo-reduction of the sections is presented with the horizon A time contour map.

It is to be noted in connection with these areas, that the sections always show a greater time interval in the eastern part of these areas than in the western part.

Examples are listed below:

Line	Zone Number	S.P. from - to	Minimum Interval time
SL 36	6	23	.200
		30 - 43	.218
SL 44 A	2	33	.208
		45 - 57	.227
SL 26	10	28	.198
		39 - 66	.220

On line SL 69 A, from shot points 1 to 18, an Automatic Velocity Analysis was performed by GEODIGIT, using the BNVT digital processing program. This allows a better determination of the variation of the vertical velocities to obtain a better stack. This section has been reprocessed with these results and deconvolved before stack. A better resolution is obtained and the picking of horizon A is possible without any doubt.

It would probably be useful to reprocess the tapes in these areas using the same technique for a better interpretation.

414.2 Deep information

On line SL 45 some deep reflections are recorded. They show a poor to fair continuity and strong south dip.

On enclosure 7, a photo-reduction of line SL 45 illustrates this information.

Horizon C possibly corresponds to an eroded surface of disconformity. It would be interesting to try to obtain a better definition of the vertical velocities of these deep events to determine whether they may be related to some sedimentary formation. This could be done either by an Automatic Velocity Analysis or by refraction velocity shooting.

4.2 Contour Maps

42.1 Horizons Mapped and Accuracy

Three horizons were mapped:

Horizon A:	Enclosure 2	Isochron - Enclosure 5
Horizon B:	Enclosure 3	Isochron - Enclosure 6
Horizon C:	Enclosure 4	

The reflection times were taken from the sections. As no weathering correction was applied, the values are dependent upon the accuracy of the surface corrections.

The vertical velocity used to determine these surface corrections was a constant 7,000 feet per second throughout the whole survey. However, in some areas, it is noted that the vertical velocity varies and can reach a value ranging from 10,000 to 11,000 feet per second. With such a vertical velocity, an error of 8 milliseconds, two-way time, would be possible to reduce the time to the datum plane for a shot point and/or geophone located 100 feet above or below the datum plane.

42.2 Description of Maps

a) Horizon C - Time Contour Map

The tectonical nature of this horizon can be easily described by saying that it is a monocline dipping westwards, with several smooth undulations and some faults. The dip increases westwards by as much as 150 milliseconds one way time over a horizontal distance of approximately 4,000 feet; with a vertical velocity of 20,000 feet per second; this gives 1,000 feet of dip over a horizontal distance of 4,000 feet or a very sharp dip angle of 14°.

Five faults cut this horizon; they are shown and numbered on the time contour map. Fault F1 is the most extended; its location coincides with a zone of bad results on the sections and it is impossible to determine the throw or its value. It must be noted that due to the steep dip, a migrated section may allow a better interpretation of this area. The correlation of this fault from line SL 44 A to line SL 36 is uncertain but the north-south direction is the most probable.

Fault F2 is conformable with a throw of about 15 milliseconds two way time, and is well underlined by a diffraction hyperbolae.

Fault F3 is the best defined and shows a throw of 40 milliseconds two way time on line SL 69 A and almost 30 milliseconds two way time on line SL 71. The quality of results is not as good on line SL 71 as on line SL 69 A but the correlation is good. The direction of this fault is roughly southeast - northwest.

Fault F4 striking in a south-southeast - north northwest direction

delineates a graben with fault F3. The withdrawal of the deep beds thus created a centroclinal which is the main feature breaking the monotony of the monocline.

Fault F5 is conformable with a throw of about 30 milliseconds two way time and is probably of the same type as fault F2.

b) Time contour maps - Horizon B and Isochron B-C

The isochron map between Horizons B and C shows a regular increase of thickness from east to west, with some variations usually correlated with faults; a small decrease in thickness occurs with faults F2 and F4, but mainly a thick zone corresponds to the centroclinal, indicating that sedimentation was more intense in this sunken area.

The main difference between Horizon B and Horizon C is that the faults cutting Horizon C do not always cut Horizon B. Since fault F1 is in a zone of bad results, it is difficult to be positive as far as the amount of the throw is concerned, but it is probable that Horizon B is faulted as Horizon C is. Fault F2 shows a smaller throw on Horizon B than on Horizon C, and faults F3 and F4 appear only as a flexure on Horizon B. Nevertheless, the increased thickness in the sunken area does not destroy the centroclinal shape which is still shown by Horizon B.

c) Time contour maps - Horizon A and Isochron A-B

The general dip of Horizons B and C affects Horizon A, but only fault F1 appears possible on this horizon. The main and more interesting features of Horizon A are the possible reef areas. One of these areas (No. 6) is situated on the western edge of the sunken zone corresponding to fault F3 and fault F4 of

Horizon C. Area No. 5 is situated on the upper (western) edge of fault F1. Area No. 8 is also located on a flat zone near fault F5 on the upper side.

The isochron map of Horizons A and B indicates that the thickness increases westwards, but local variations of thickness seem to be closely related to possible reef areas. The increase of thickness of sediments in the sunken zone connected with fault F3 and fault F4 of Horizon C which are noted on the isochron map of Horizons B and C, are also noted on this isochron map, and the centroclinal shape that characterizes this area on Horizons B and C disappears on Horizon A.

CONCLUSION

The purpose of the survey was to perform a wide loop seismic reconnaissance of the area and to tie it to the Hudson Bay Amerada Camsell A-37 well.

The survey lasted 33 days from January 12, 1968, (first drilling day) to February 13, 1968 (last shooting day), for a total of 427½ recording hours.

Two different spreads were used:

Spread	Recorded miles	Recorded shot points
1 mile split	86.666	545
½ mile split	8.833	106
TOTAL	95.499	651

All the seismic lines were recorded using a 300% C.D.P. technique.

The average drilling production was 26.23 feet per field hour.

A three hole pattern, 45 feet deep, was used to load a total explosive charge of 15 pounds.

Unforeseen severe weather and drilling conditions did not allow the anticipated production.

As requested, the surface corrections do not take into account the weathered zone thickness variations.

The quality of the results varies throughout the survey. Improvement in quality is noted when the sedimentary section thickens.

The area appears as a large monocline dipping westward.

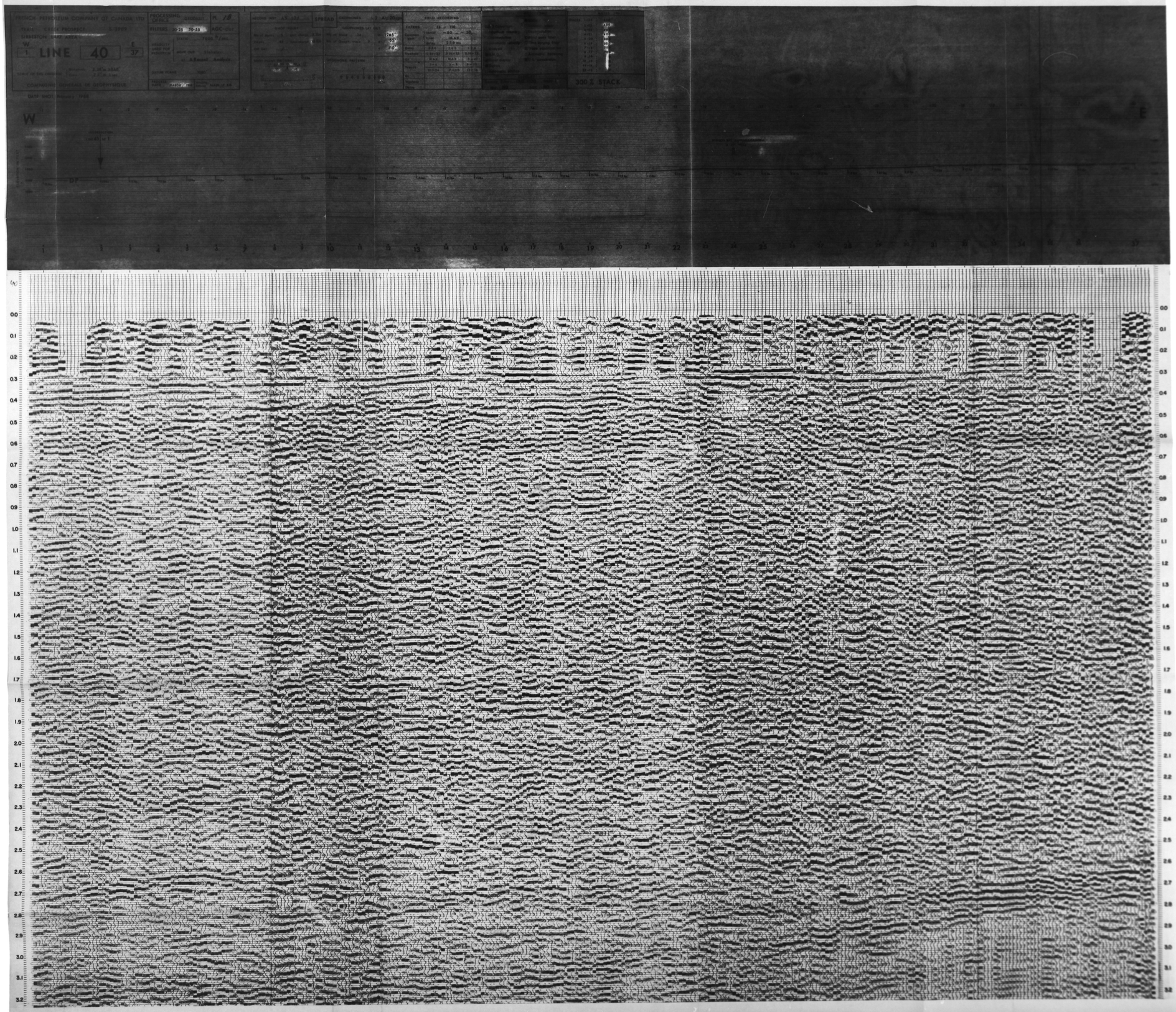
Three horizons were mapped and show twelve areas which can be interpreted as reef zones. A test of special processing (automatic velocity analysis and deconvolution) was done on line SL 69 A (Zone 2). The continuity of the reflector improves and higher resolution is obtained. It would be beneficial to reprocess the sections crossing these twelve areas to obtain better information.

On line SL 45, some deep reflections are recorded. Special processing to determine vertical velocities, or refraction shooting to define horizontal velocities would help to determine if these reflections correspond to some sedimentary formations.

Calgary, May 14, 1968

L. FRION
Canadian Branch Manager

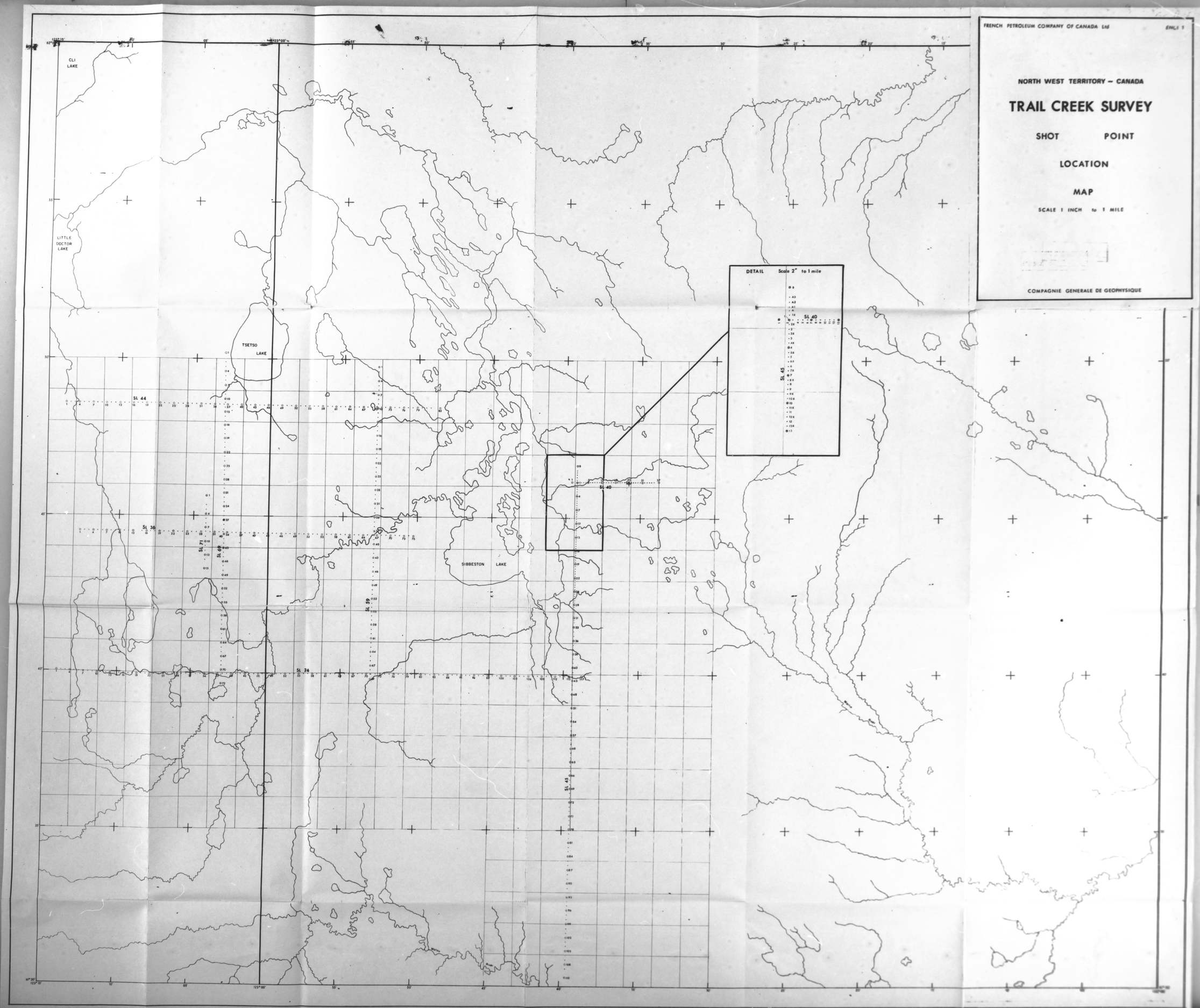
A. LE BIS
Party Chief

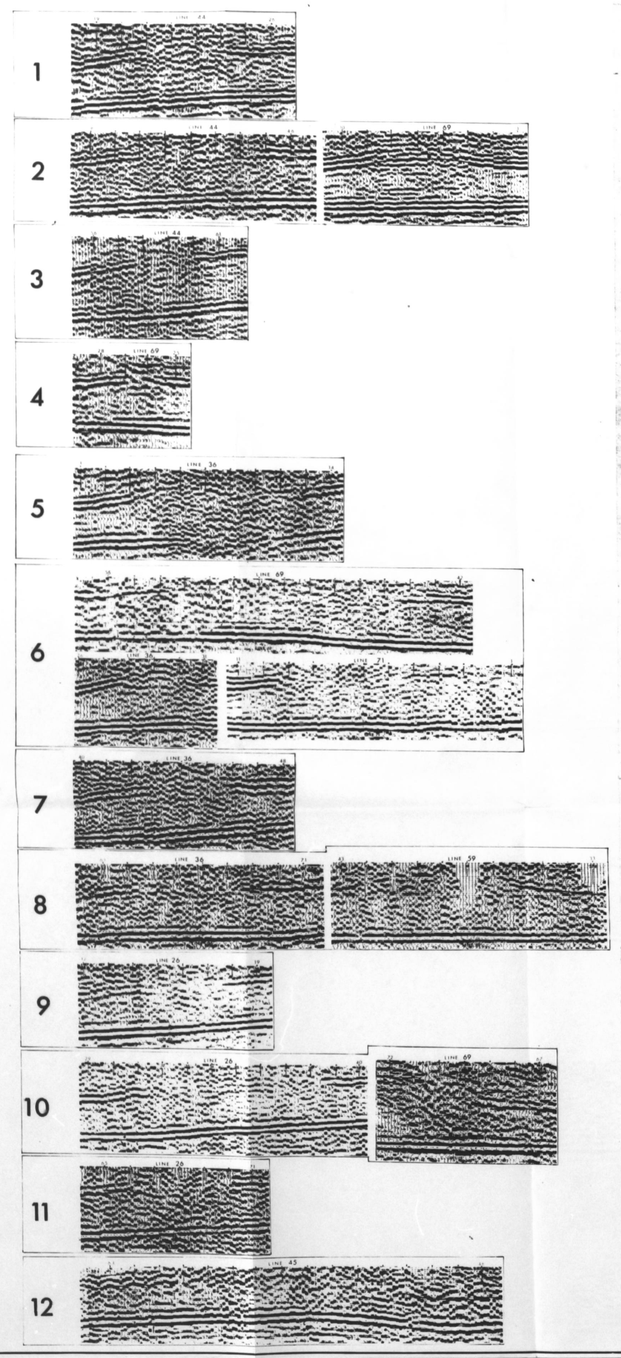


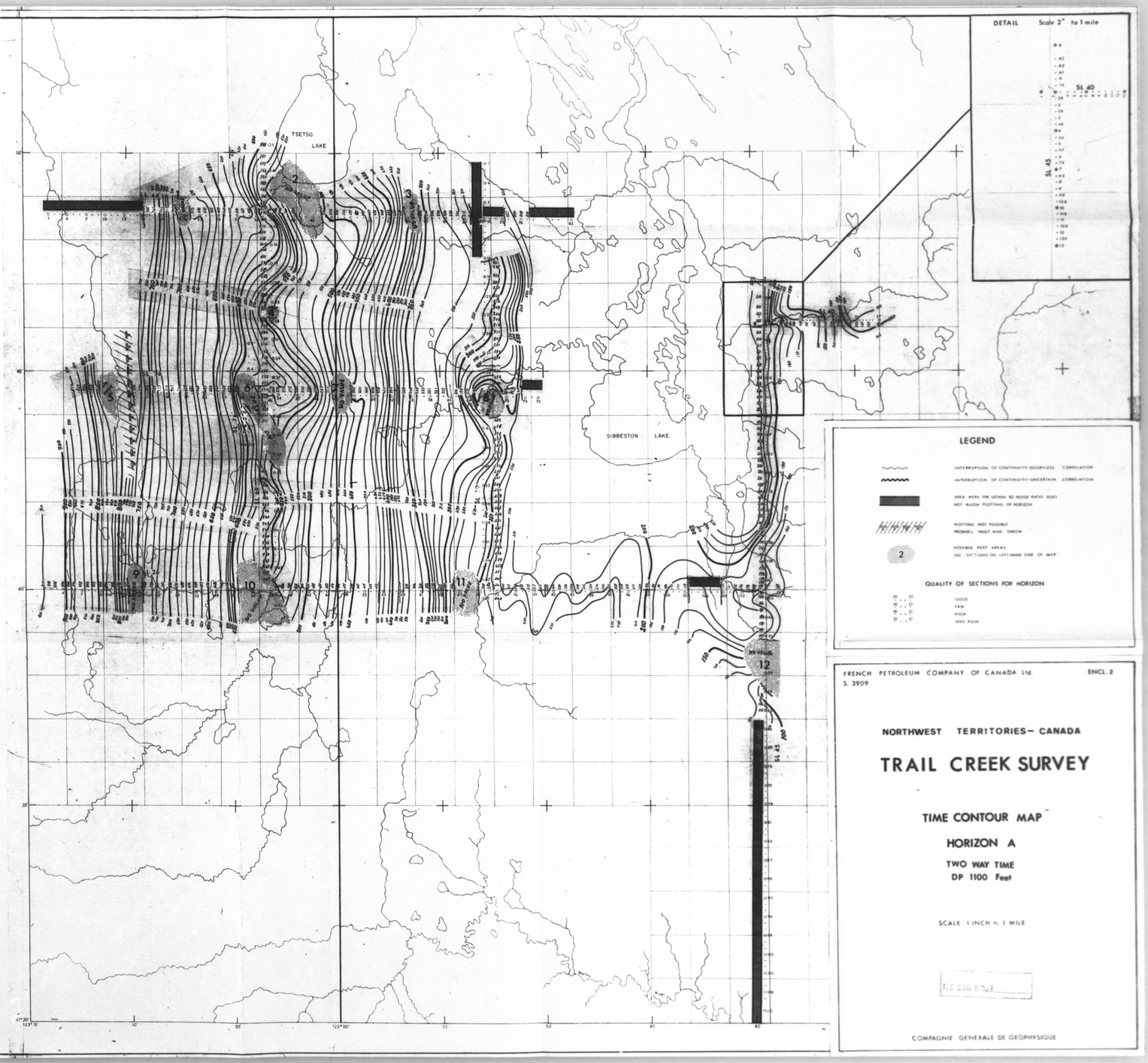
NOTE
The legibility of this drawing is substandard and may result in poor microfilm reproduction.

LIST OF TIME SECTIONS

Number	Line	From SP	To SP
1	SL 44 A	1	50
2	SL 44 A	49	83
3	SL 36	1	31
4	SL 36	32	75
5	SL 26	1	25
6	SL 26	23	58
7	SL 26	59	82
8	SL 26	80	117
9	SL 59	1	38
10	SL 59	36	69
11	SL 69 A	1	38
12	SL 69 A	36	72
13	SL 71	1	15
14	SL 45	110	76
15	SL 45	75	26
16	SL 45	32	16 X
17	SL 45	15	B
18	SL 40	1	37


FRENCH PETROLEUM COMPANY OF CANADA Ltd
EMLS 1
NORTH WEST TERRITORY – CANADA
TRAIL CREEK SURVEY
SHOT POINT
LOCATION
MAP
SCALE 1 INCH to 1 MILE
COMPAGNIE GENERALE DE GEOPHYSIQUE
DETAIL Scale 2" to 1 mile
CLI LAKE
LITTLE DOCTOR LAKE
TSETSO LAKE
SIBBESTON LAKE
SL 44
SL 36
SL 71
SL 69
SL 59
SL 26
SL 40
SL 45
123°00'





FRENCH PETROLEUM COMPANY OF CANADA Ltd. ENCL. 2
S. 3909

NORTHWEST TERRITORIES– CANADA

TRAIL CREEK SURVEY

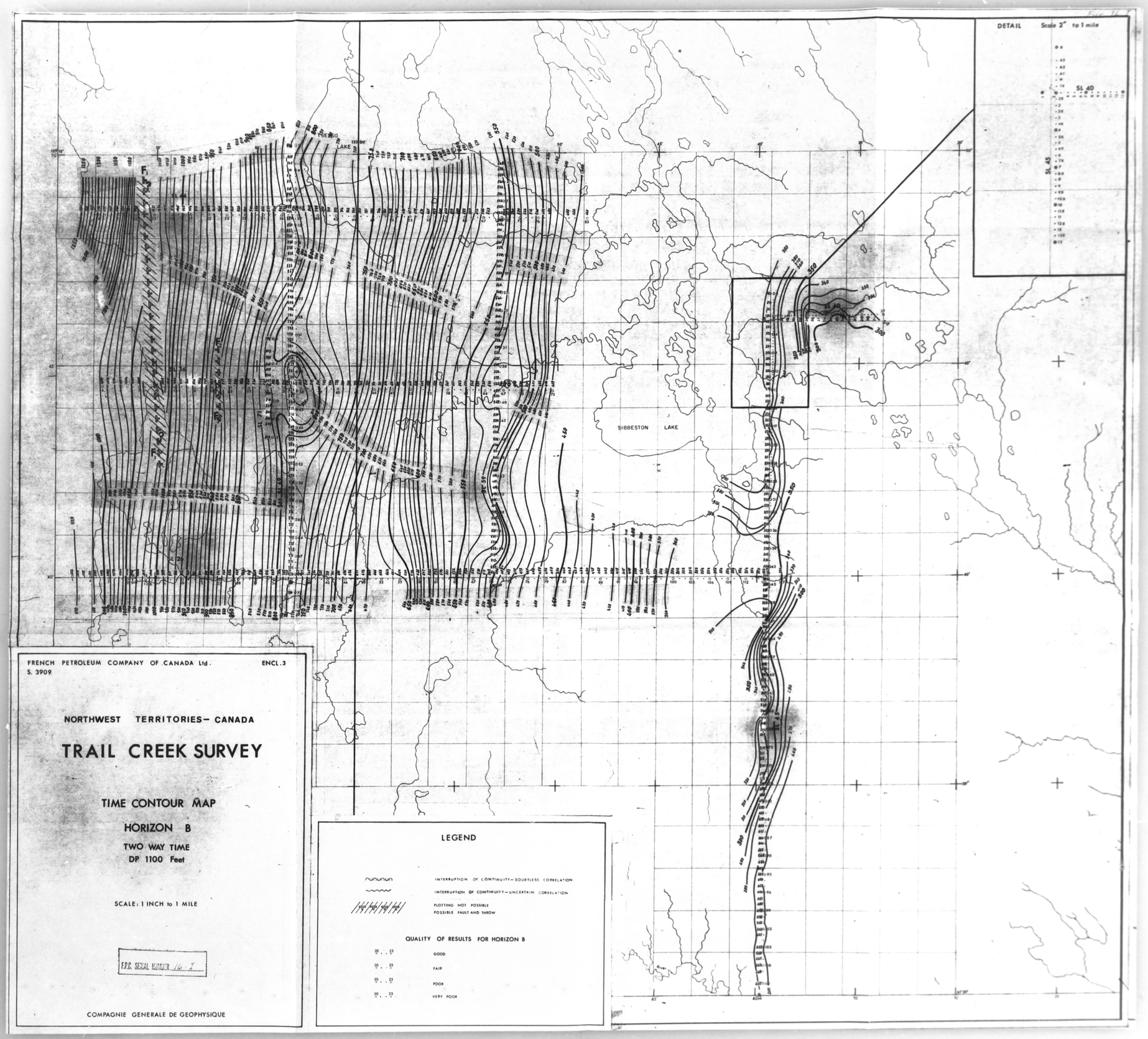
TIME CONTOUR MAP

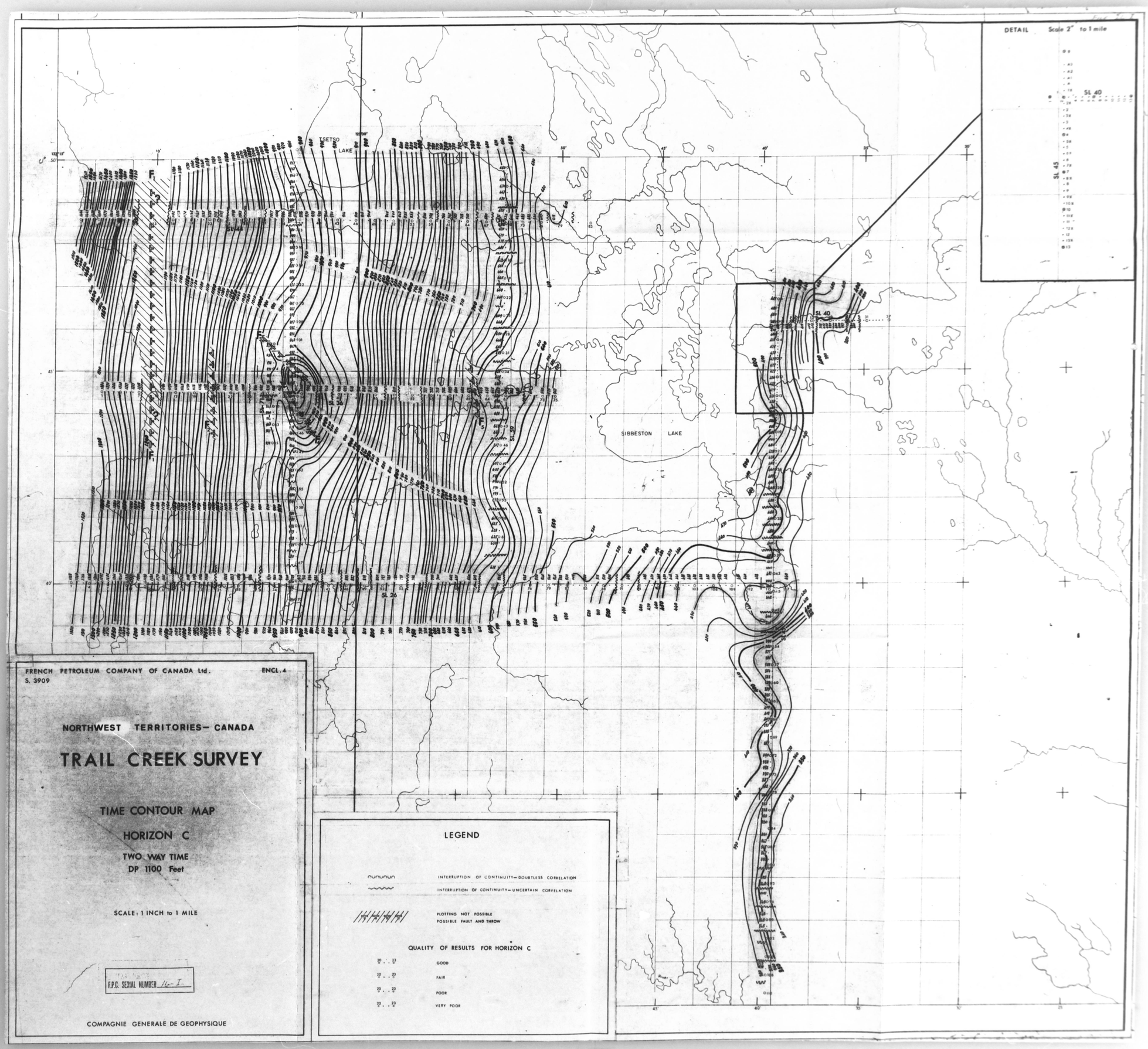
HORIZON A

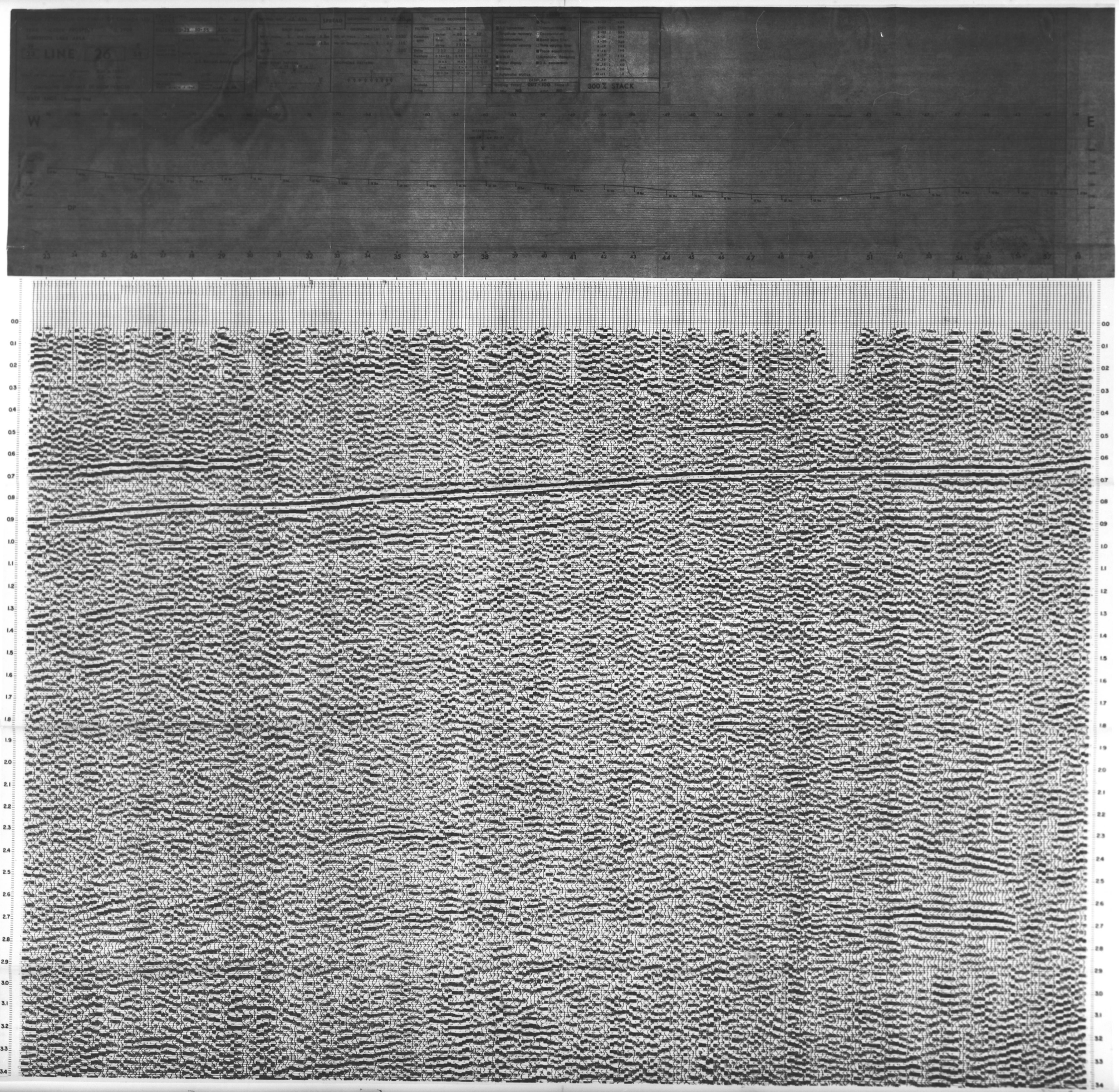
TWO WAY TIME
DP 1100 Feet

SCALE 1 INCH = 1 MILE

COMPAGNIE GENERALE DE GEOPHYSIQUE


DETAIL Scale 2" to 1 mile
SL 40
SL 45
SIBBESTON LAKE
FRENCH PETROLEUM COMPANY OF CANADA Ltd.
S. 3909
ENCL. 3
NORTHWEST TERRITORIES– CANADA
TRAIL CREEK SURVEY
TIME CONTOUR MAP
HORIZON B
TWO WAY TIME
DP 1100 Feet
SCALE: 1 INCH to 1 MILE
F.P.C. SERIAL NUMBER 16-I
COMPAGNIE GENERALE DE GEOPHYSIQUE
LEGEND
INTERRUPTION OF CONTINUITY–DOUBTLESS CORRELATION
INTERRUPTION OF CONTINUITY–UNCERTAIN CORRELATION
PLOTTING NOT POSSIBLE
POSSIBLE FAULT AND THROW
QUALITY OF RESULTS FOR HORIZON B
GOOD
FAIR
POOR
VERY POOR


DETAIL Scale 2" to 1 mile
SL 40
SL 45
TSETSO LAKE
SIBBESTON LAKE
SL 40
SL 26
FRENCH PETROLEUM COMPANY OF CANADA Ltd.
S. 3909
ENCL. 4
NORTHWEST TERRITORIES— CANADA
TRAIL CREEK SURVEY
TIME CONTOUR MAP
HORIZON C
TWO WAY TIME
DP 1100 Feet
SCALE: 1 INCH to 1 MILE
F.P.C. SERIAL NUMBER 16-I
COMPAGNIE GENERALE DE GEOPHYSIQUE
LEGEND
INTERRUPTION OF CONTINUITY—DOUBTLESS CORRELATION
INTERRUPTION OF CONTINUITY—UNCERTAIN CORRELATION
PLOTTING NOT POSSIBLE
POSSIBLE FAULT AND THROW
QUALITY OF RESULTS FOR HORIZON C
GOOD
FAIR
POOR
VERY POOR



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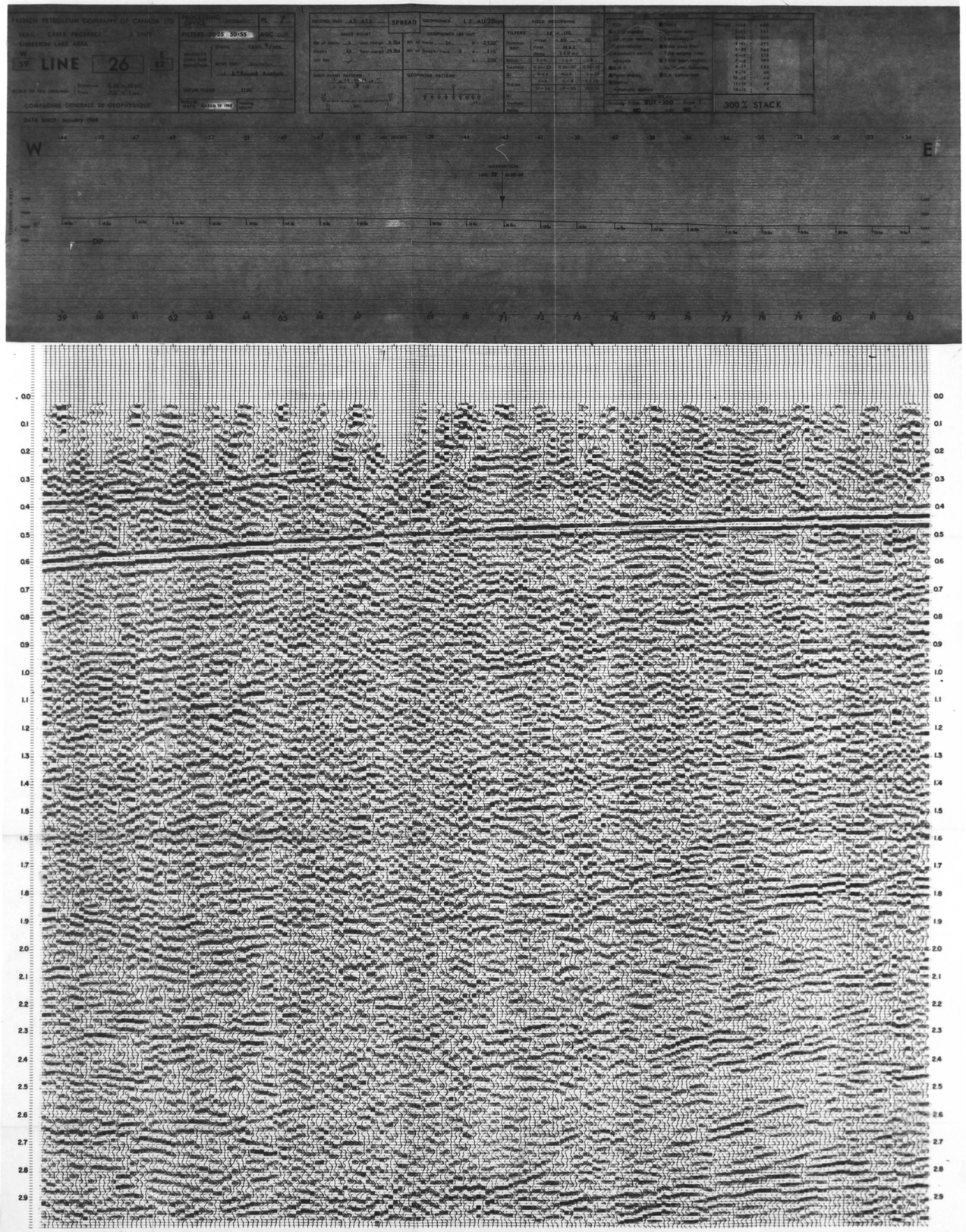
The legibility of this drawing is substandard and may result in poor microfilm reproduction.



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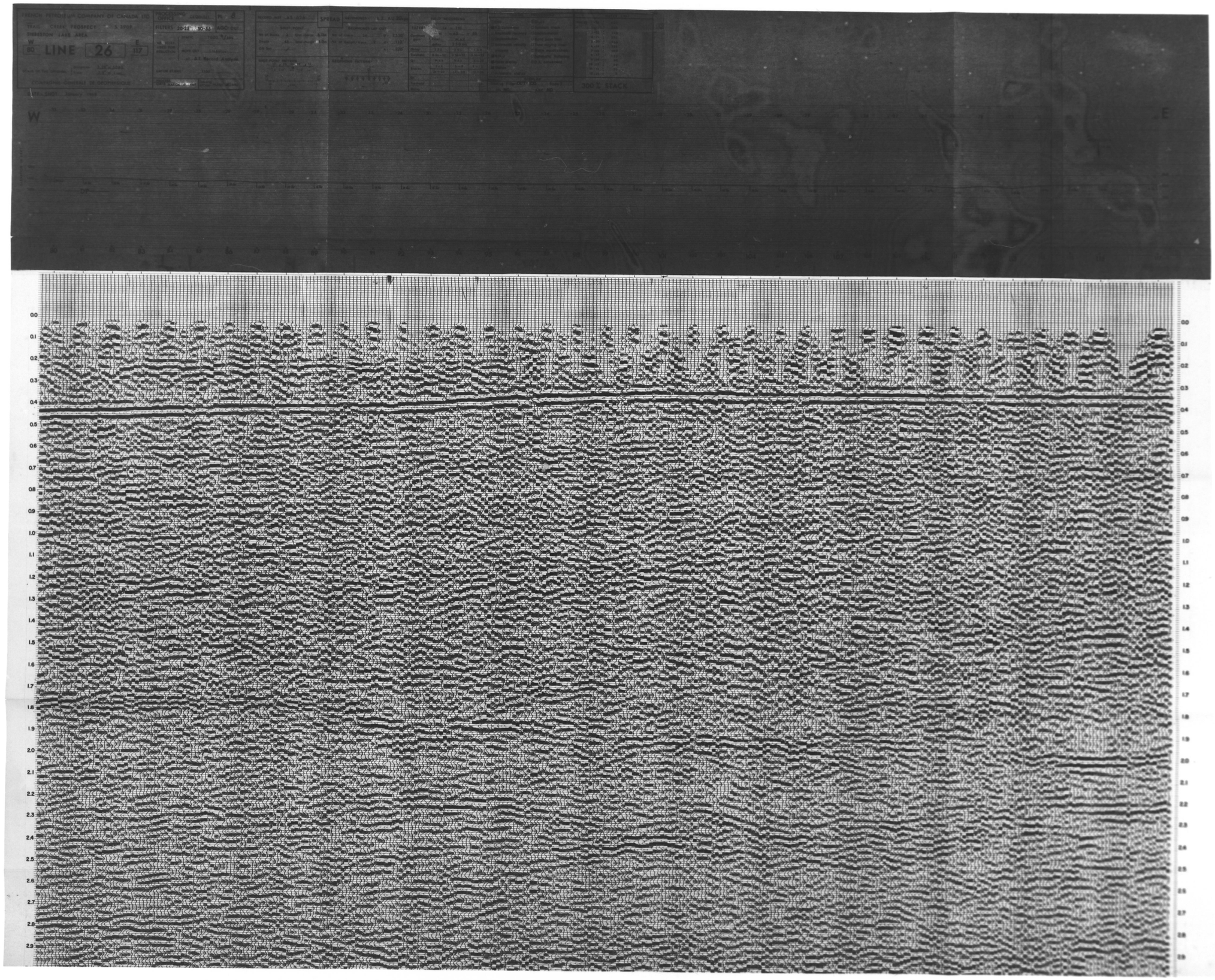

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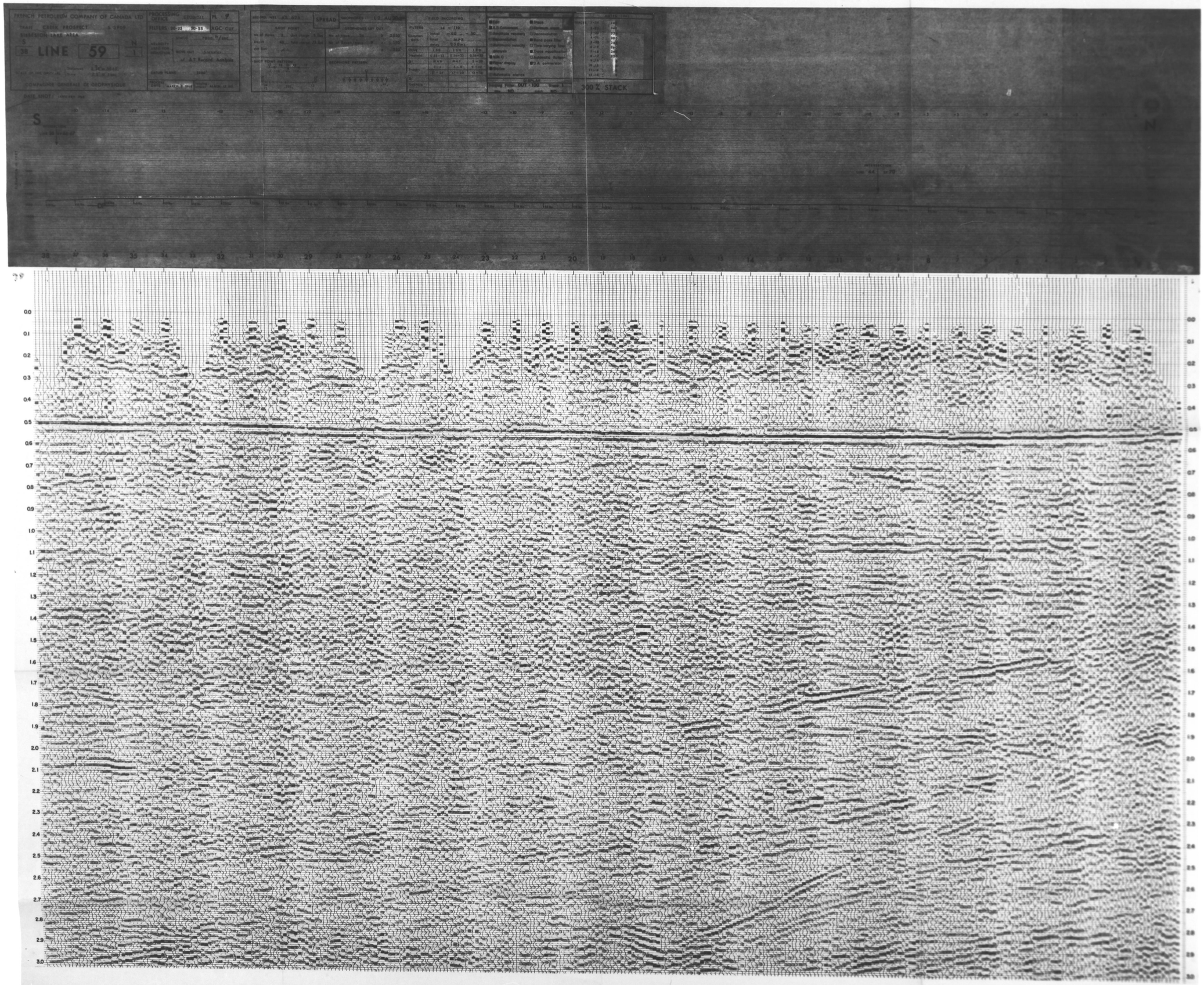

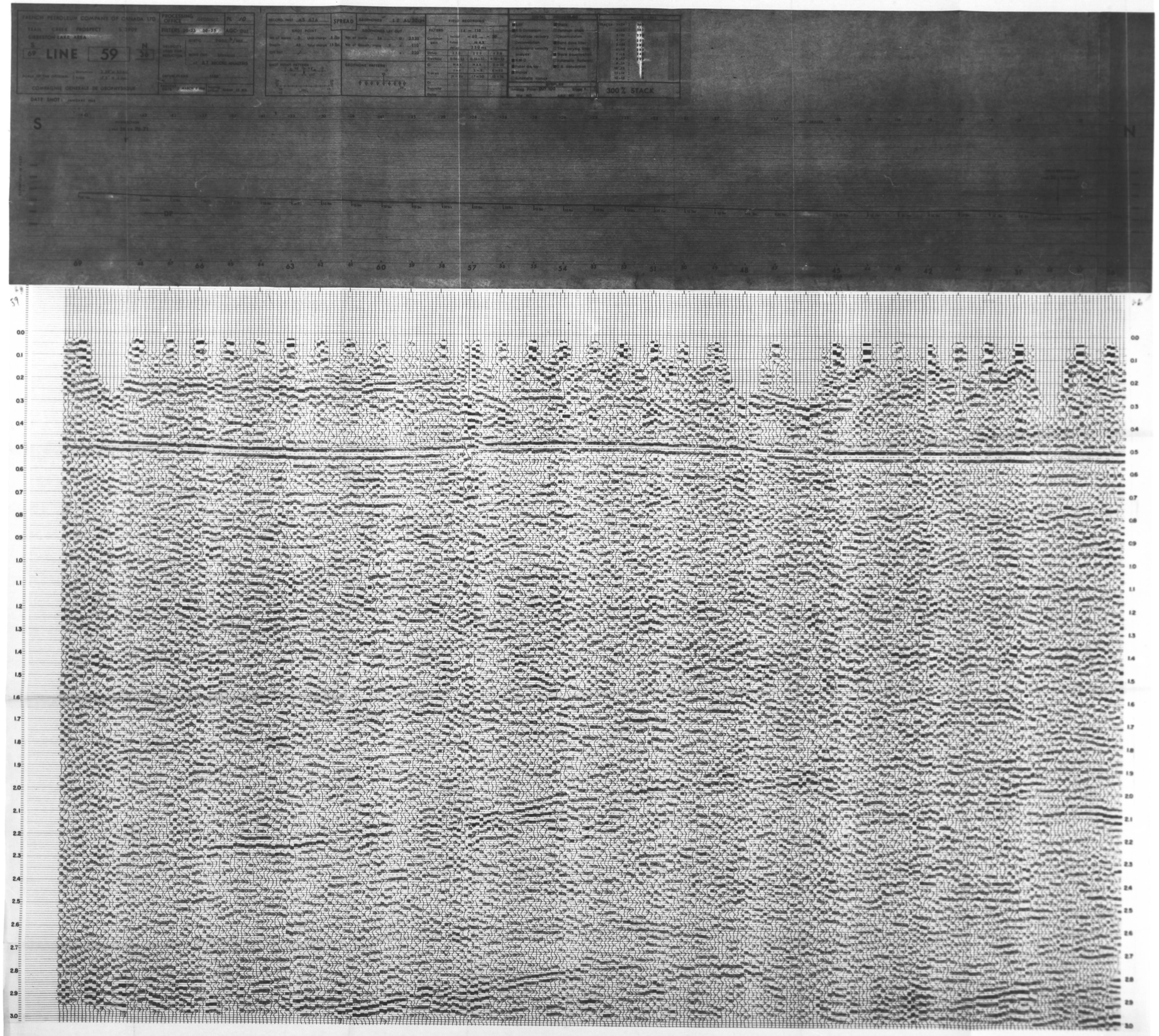

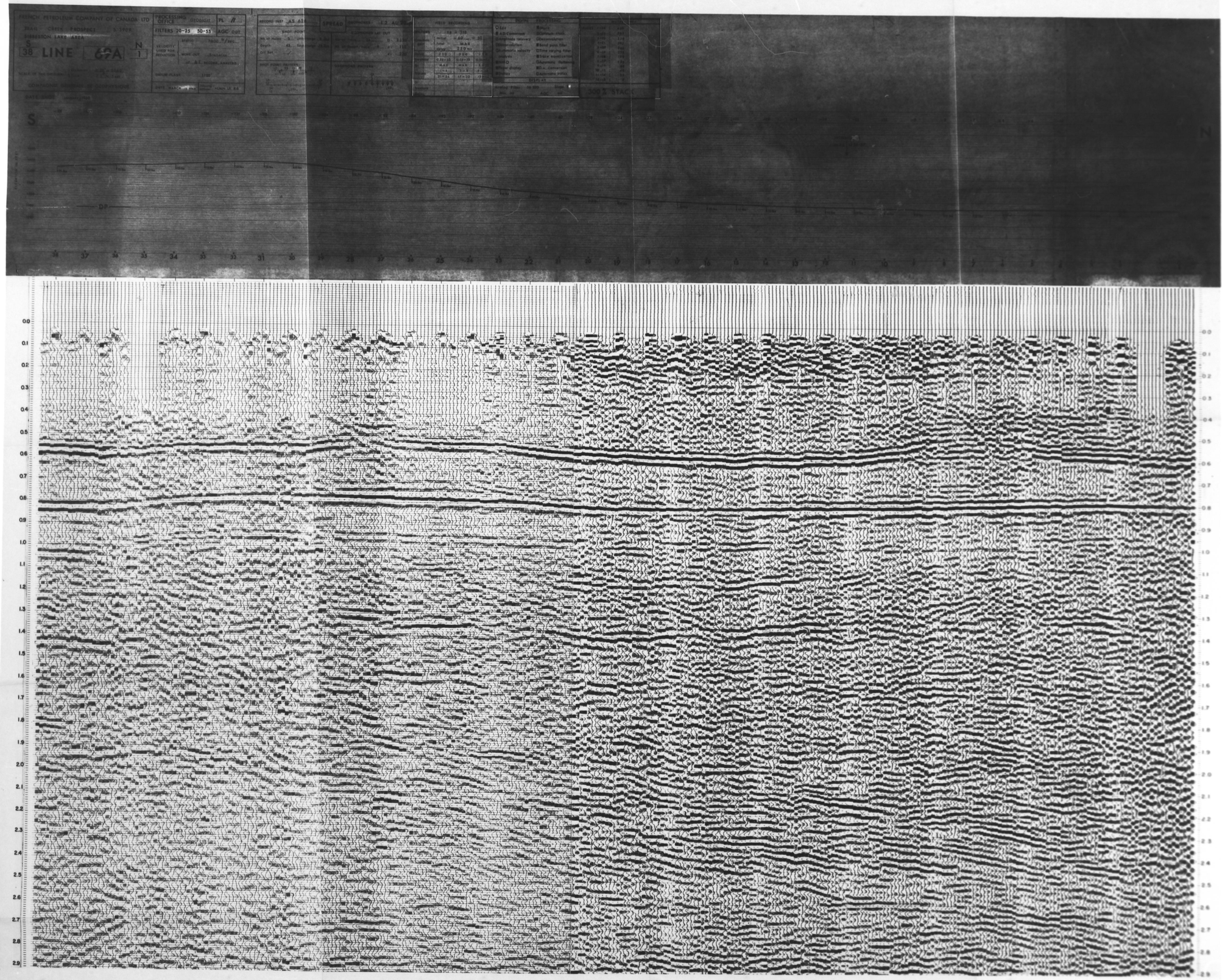

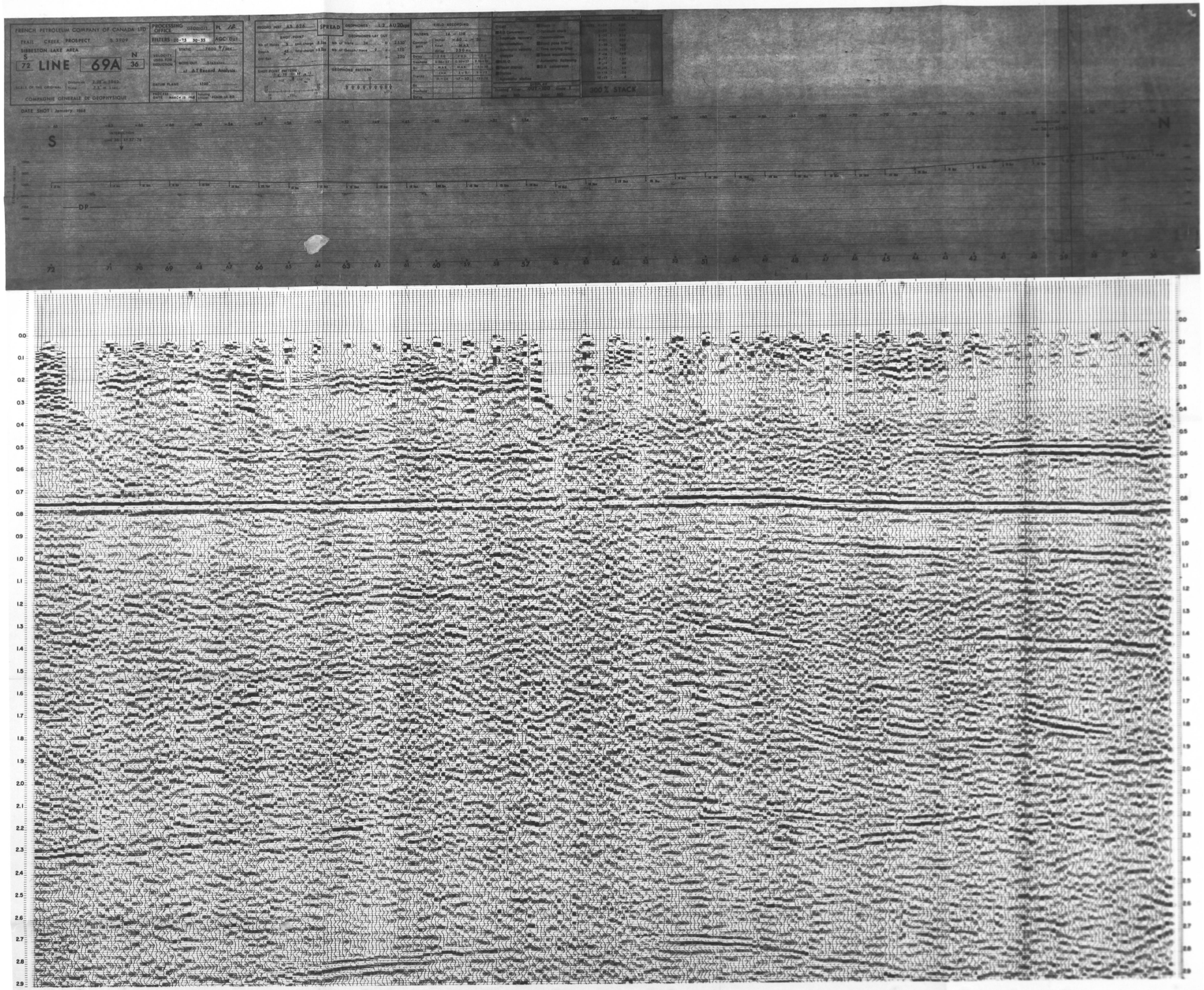

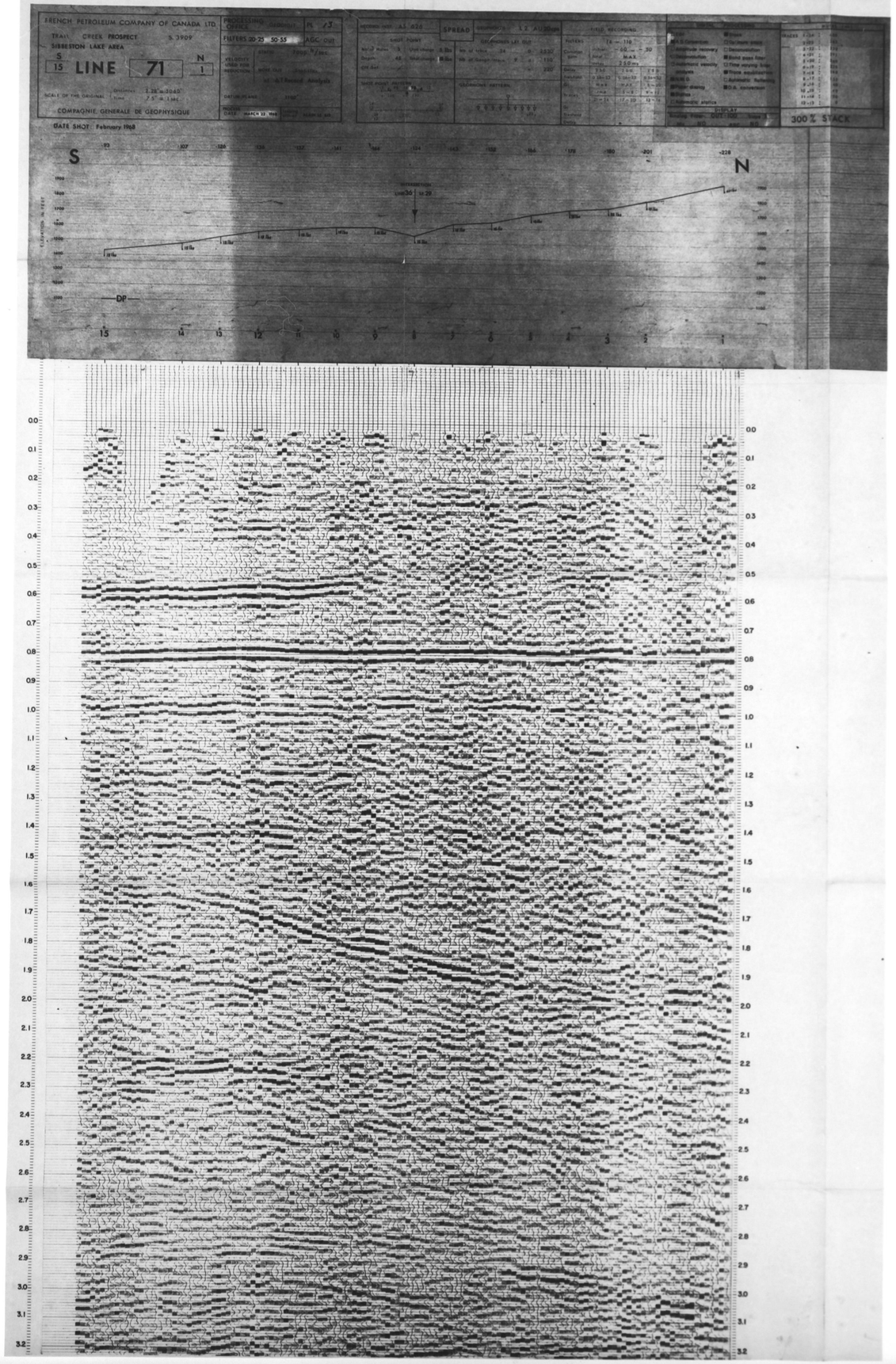

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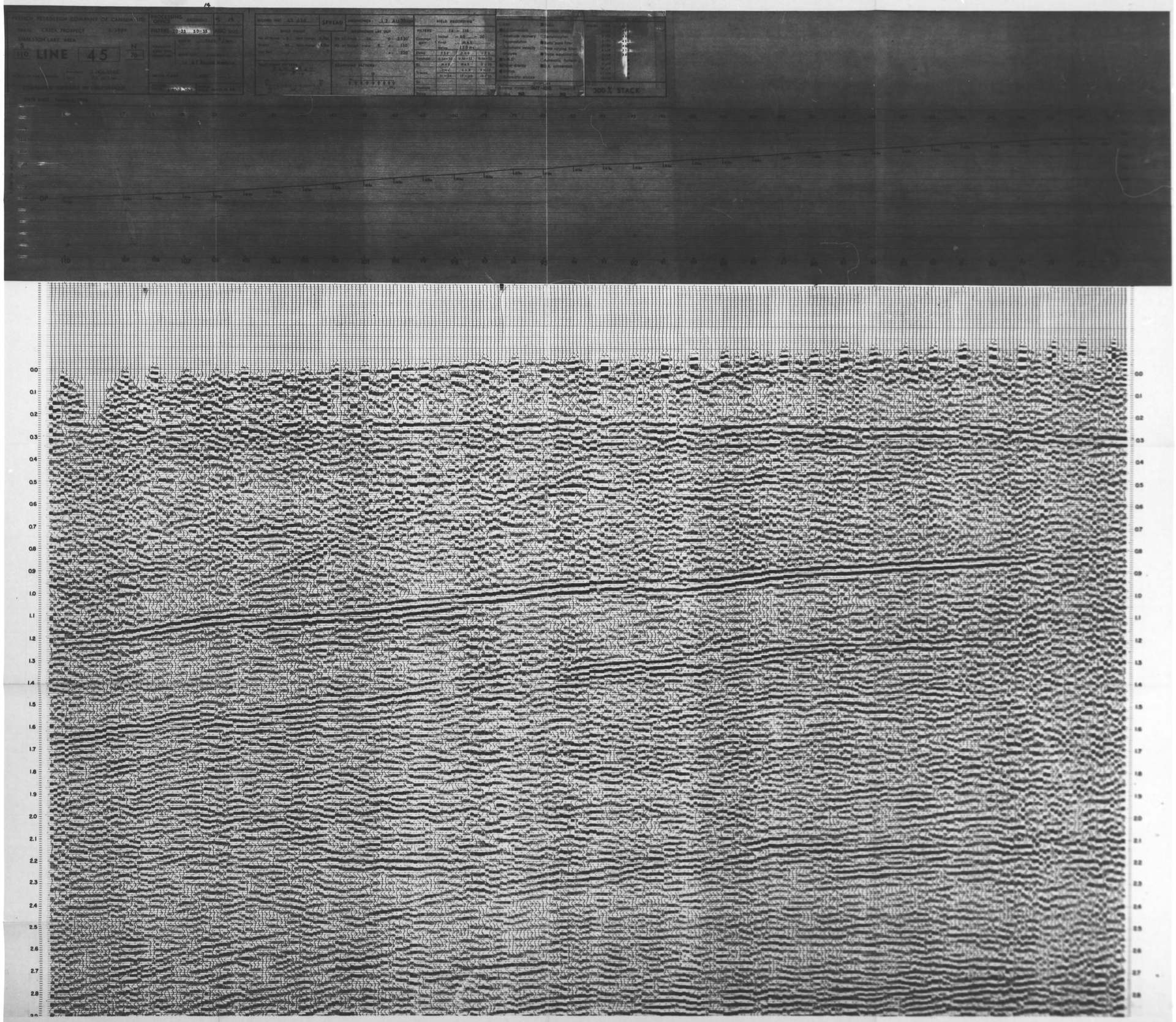

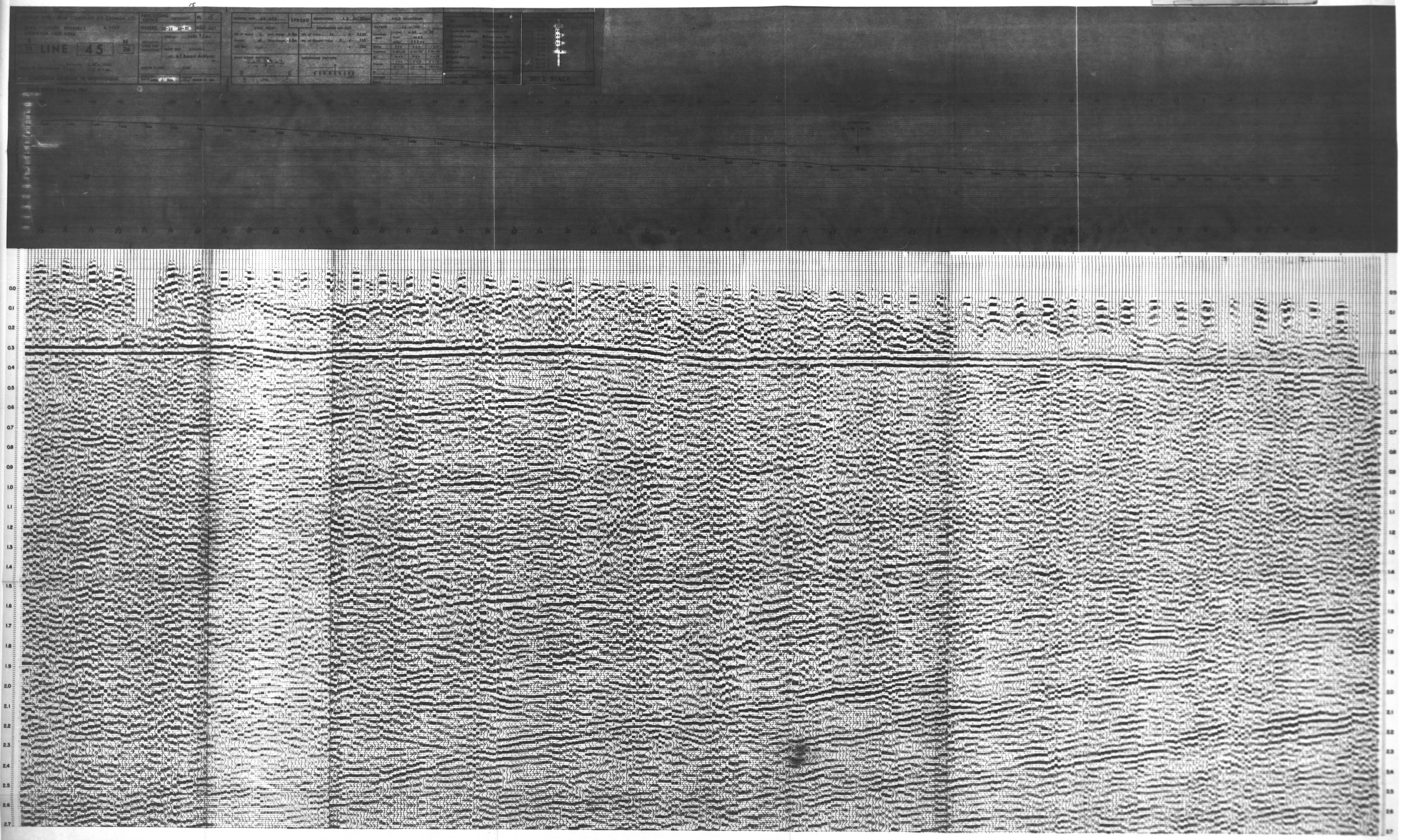

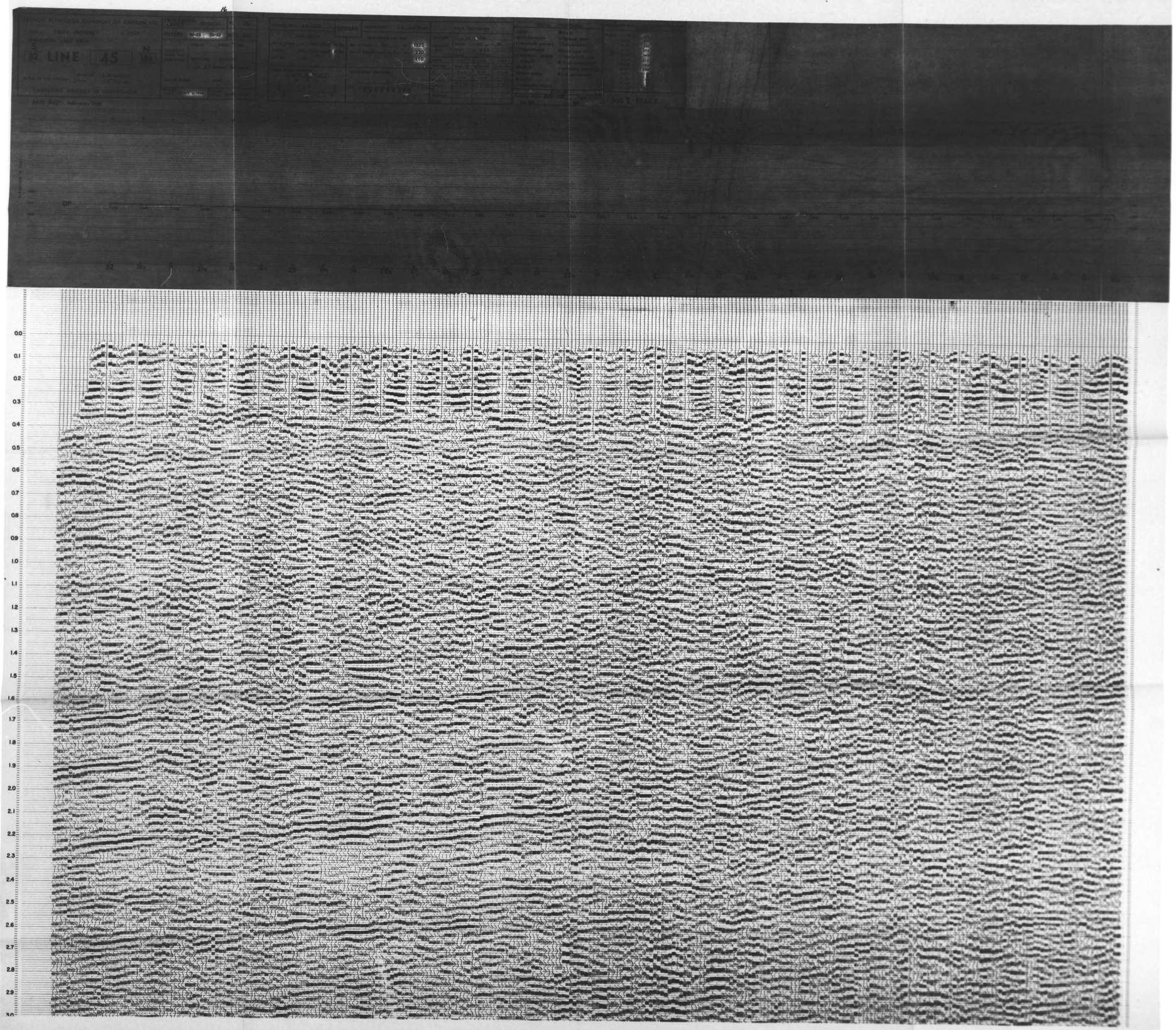

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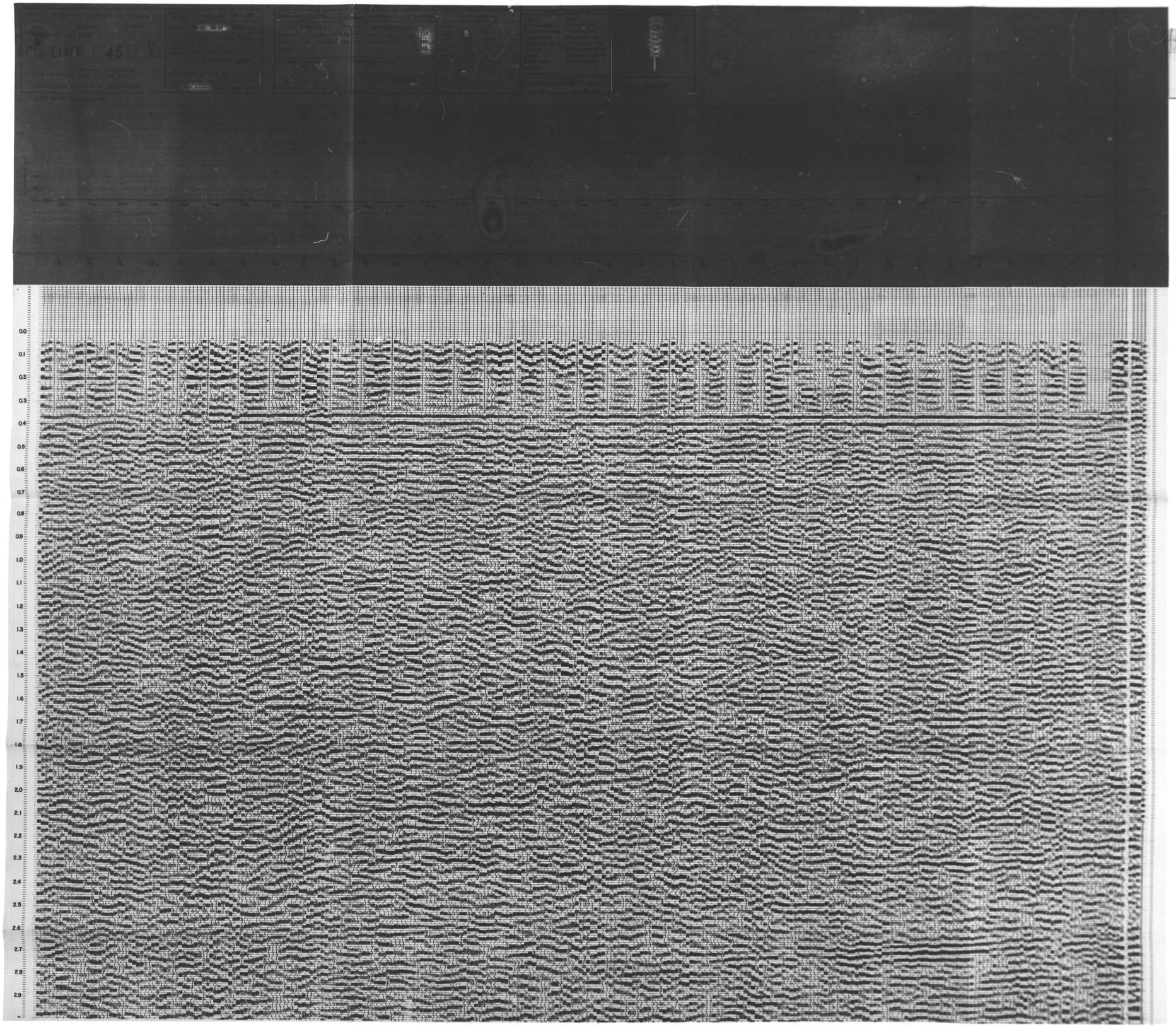

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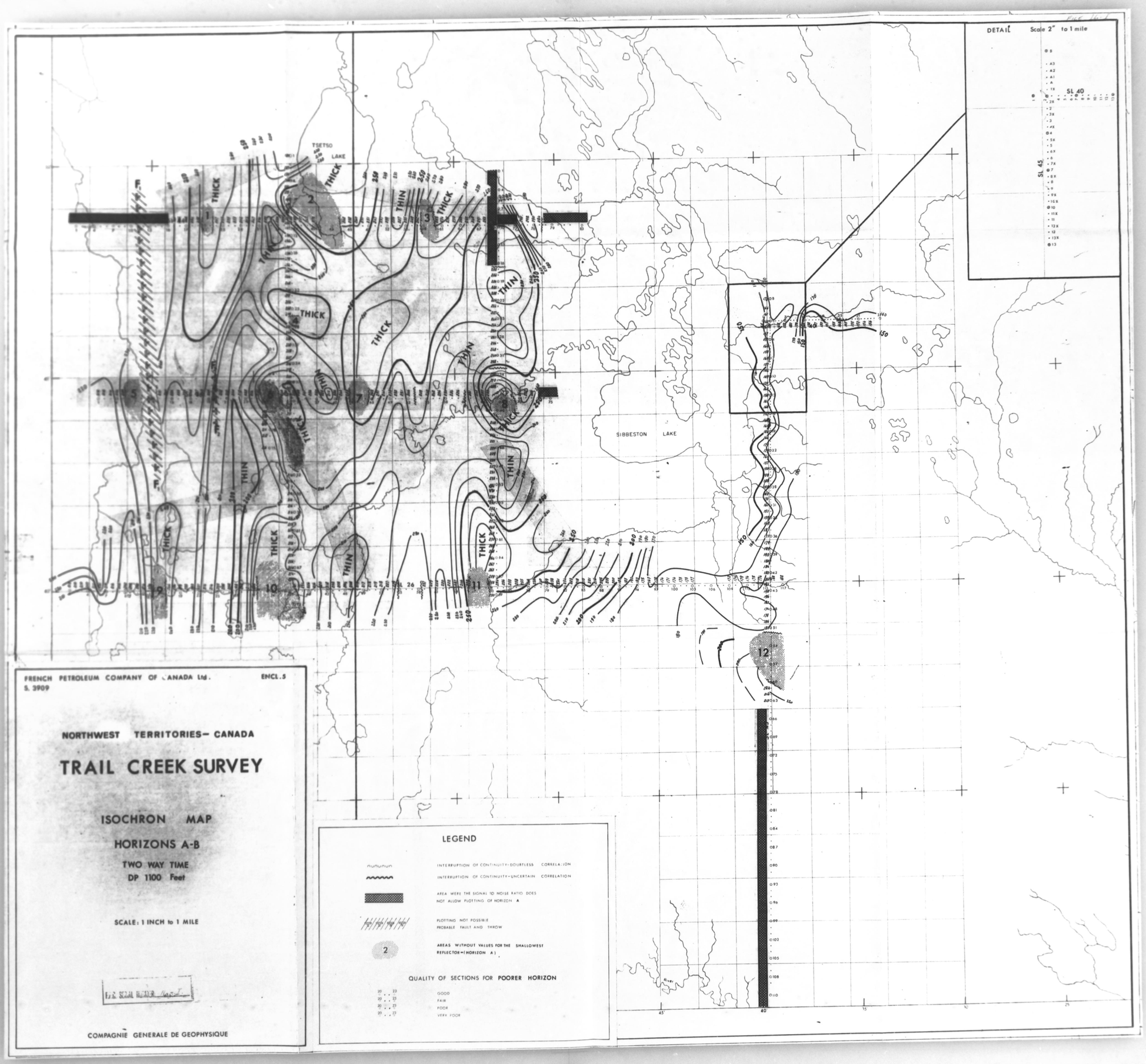
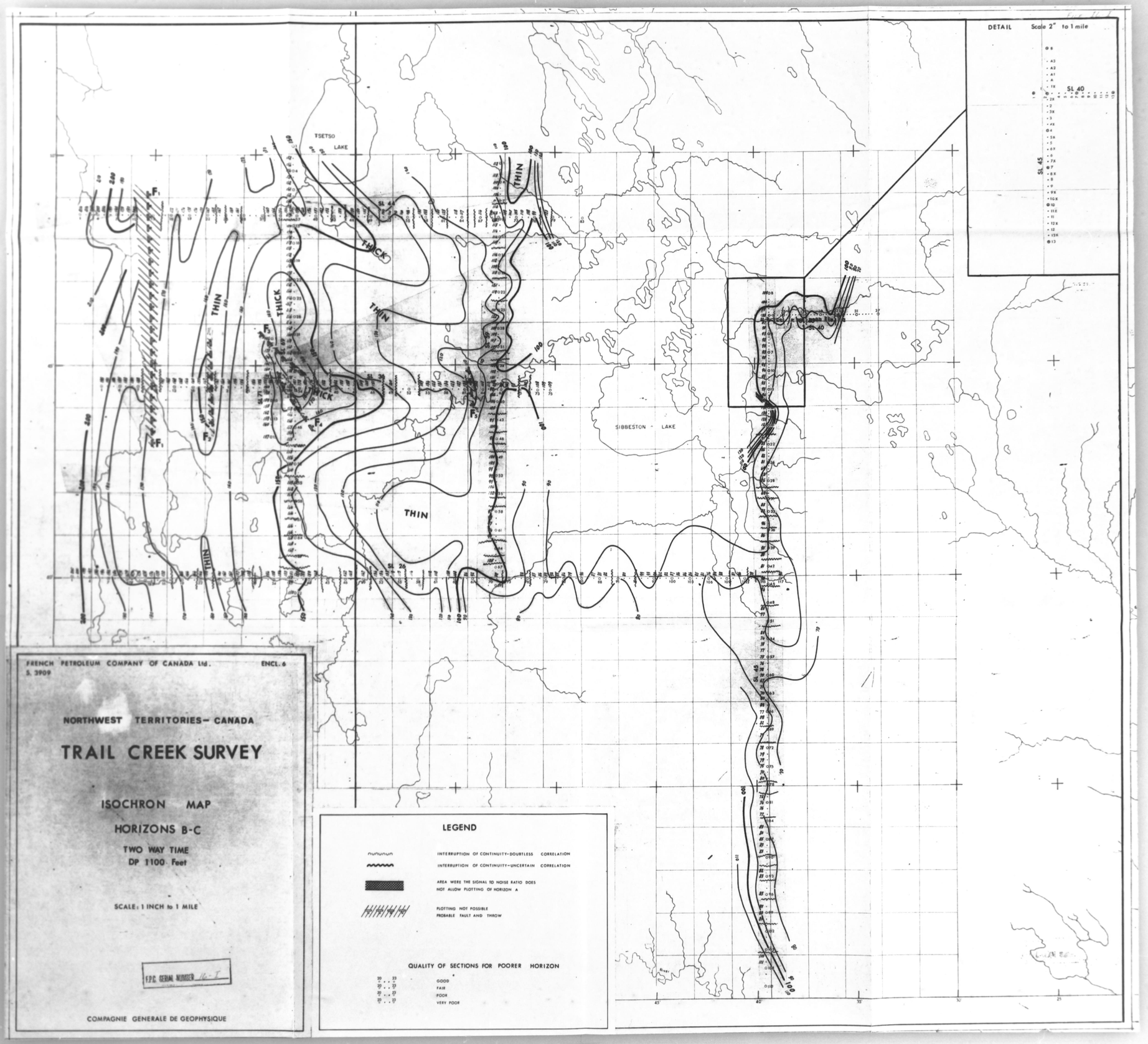

DETAIL Scale 2" to 1 mile
SL 40
SL 45
TSETSO LAKE
SIBBESTON LAKE
THICK
THIN
FRENCH PETROLEUM COMPANY OF CANADA Ltd.
S. 3909
ENCL. 5
NORTHWEST TERRITORIES— CANADA
TRAIL CREEK SURVEY
ISOCHRON MAP
HORIZONS A-B
TWO WAY TIME
DP 1100 Feet
SCALE: 1 INCH to 1 MILE
COMPAGNIE GENERALE DE GEOPHYSIQUE
LEGEND
INTERRUPTION OF CONTINUITY-DOUBTLESS CORRELATION
INTERRUPTION OF CONTINUITY-UNCERTAIN CORRELATION
AREA WERE THE SIGNAL TO NOISE RATIO DOES NOT ALLOW PLOTTING OF HORIZON A
PLOTTING NOT POSSIBLE PROBABLE FAULT AND THROW
AREAS WITHOUT VALUES FOR THE SHALLOWEST REFLECTOR=(HORIZON A)
QUALITY OF SECTIONS FOR POORER HORIZON
GOOD
FAIR
POOR
VERY POOR



FRENCH PETROLEUM COMPANY OF CANADA Ltd. ENCL. 6
S. 3909

NORTHWEST TERRITORIES— CANADA

TRAIL CREEK SURVEY

ISOCHRON MAP

HORIZONS B-C

TWO WAY TIME
DP 1100 Feet

SCALE: 1 INCH to 1 MILE

COMPAGNIE GENERALE DE GEOPHYSIQUE

FRENCH PETROLEUM COMPANY OF CANADA Ltd.
S. 3909

ENCL. 7

NORTH WEST TERRITORIES– CANADA

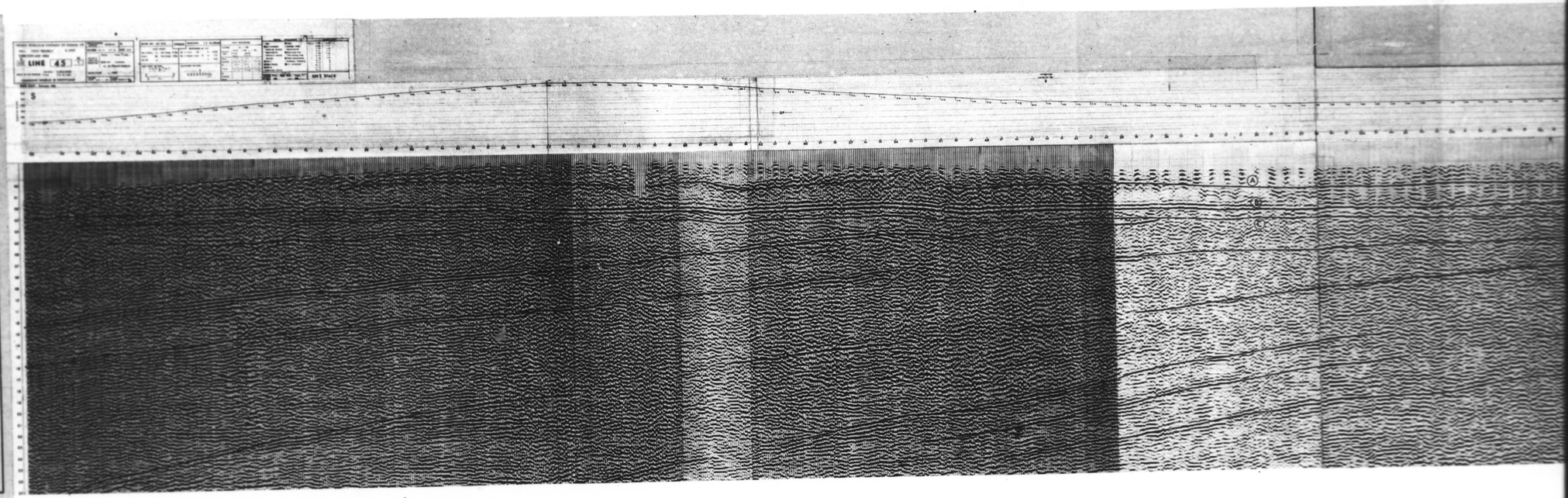
TRAIL CREEK SURVEY

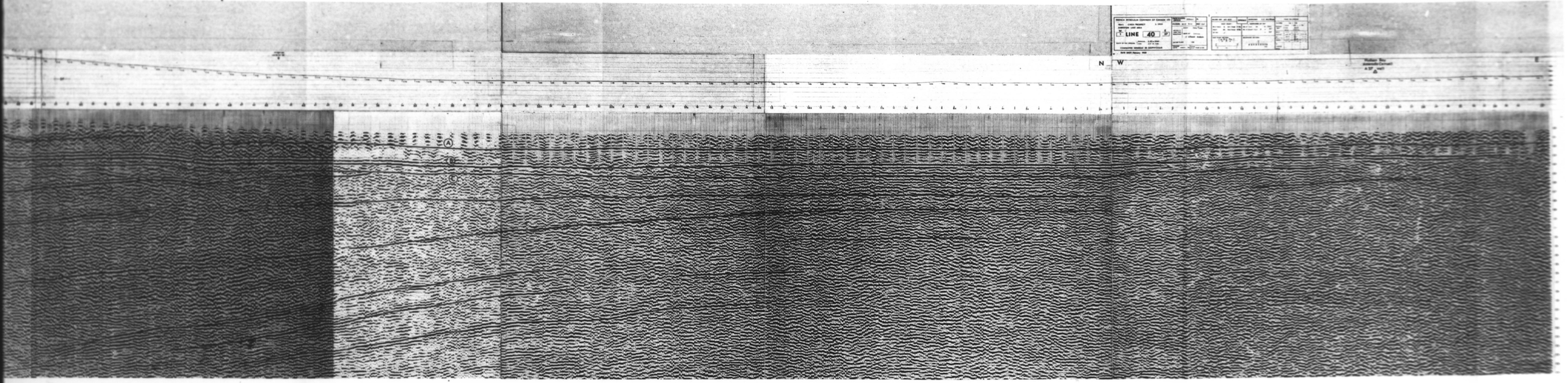
PHOTOREDUCTION

LINES 45 & 40

REDUCTION: 1:3

COMPAGNIE GENERALE DE GEOPHYSIQUE





2 of 2

— NOTE —

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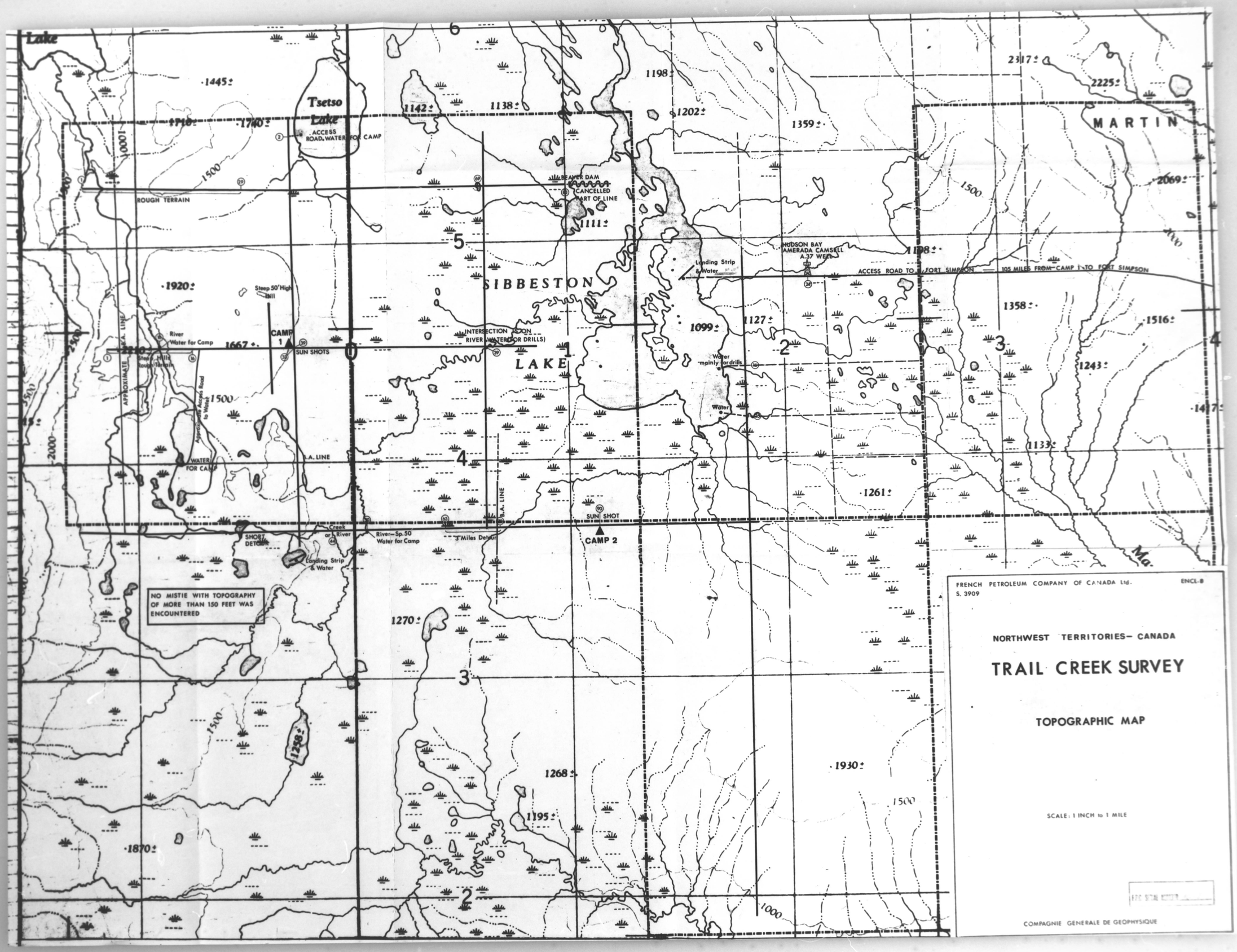
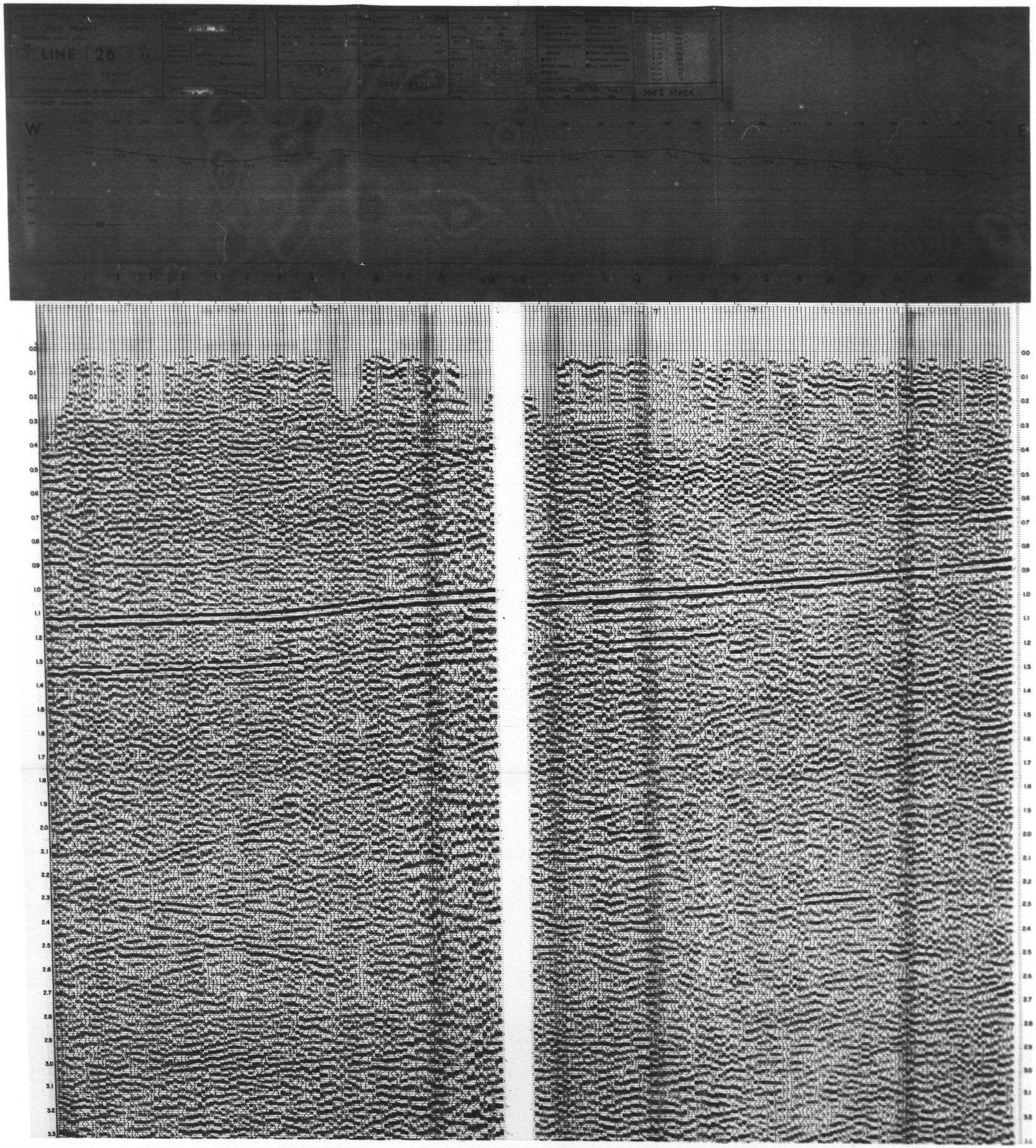
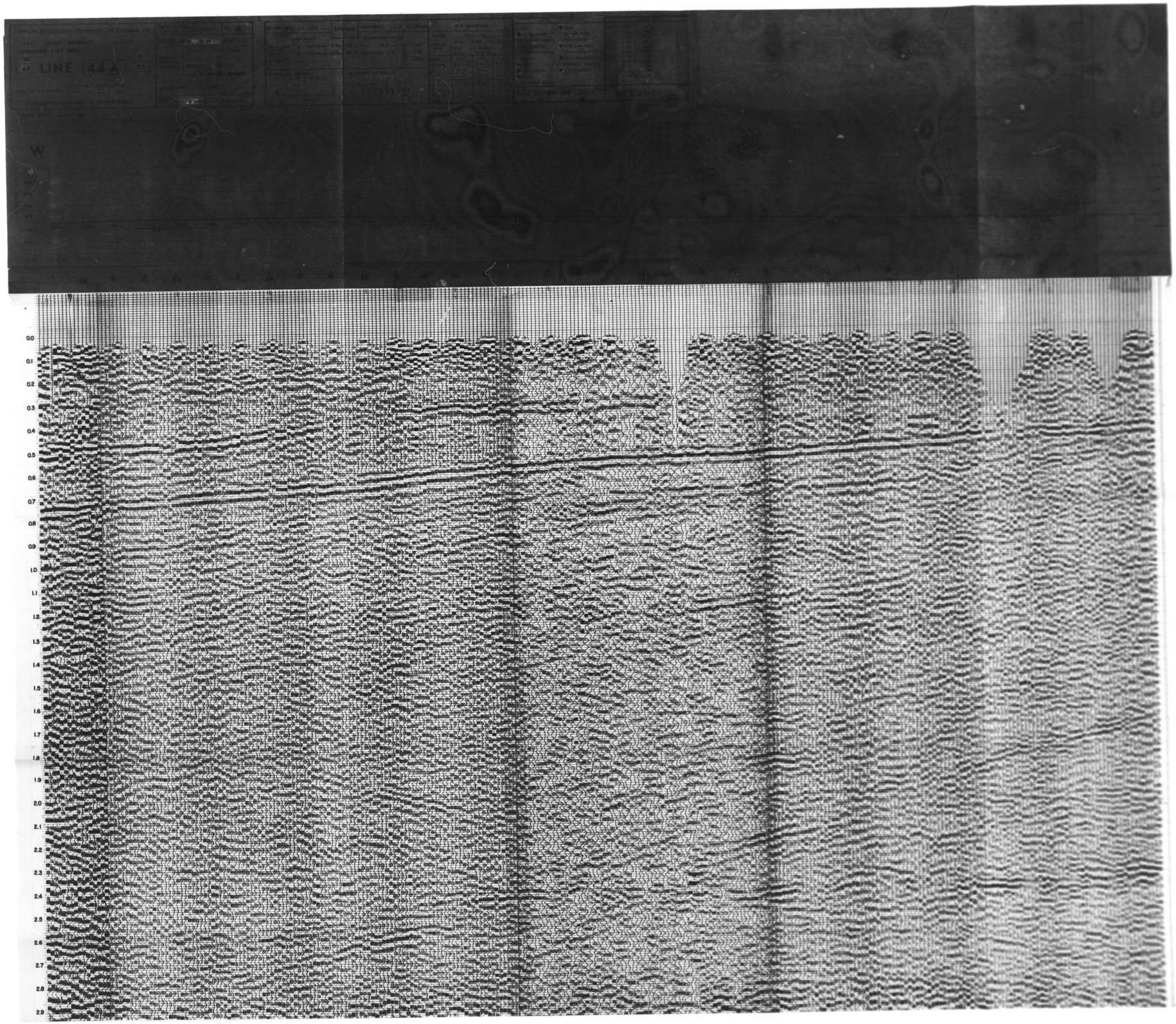
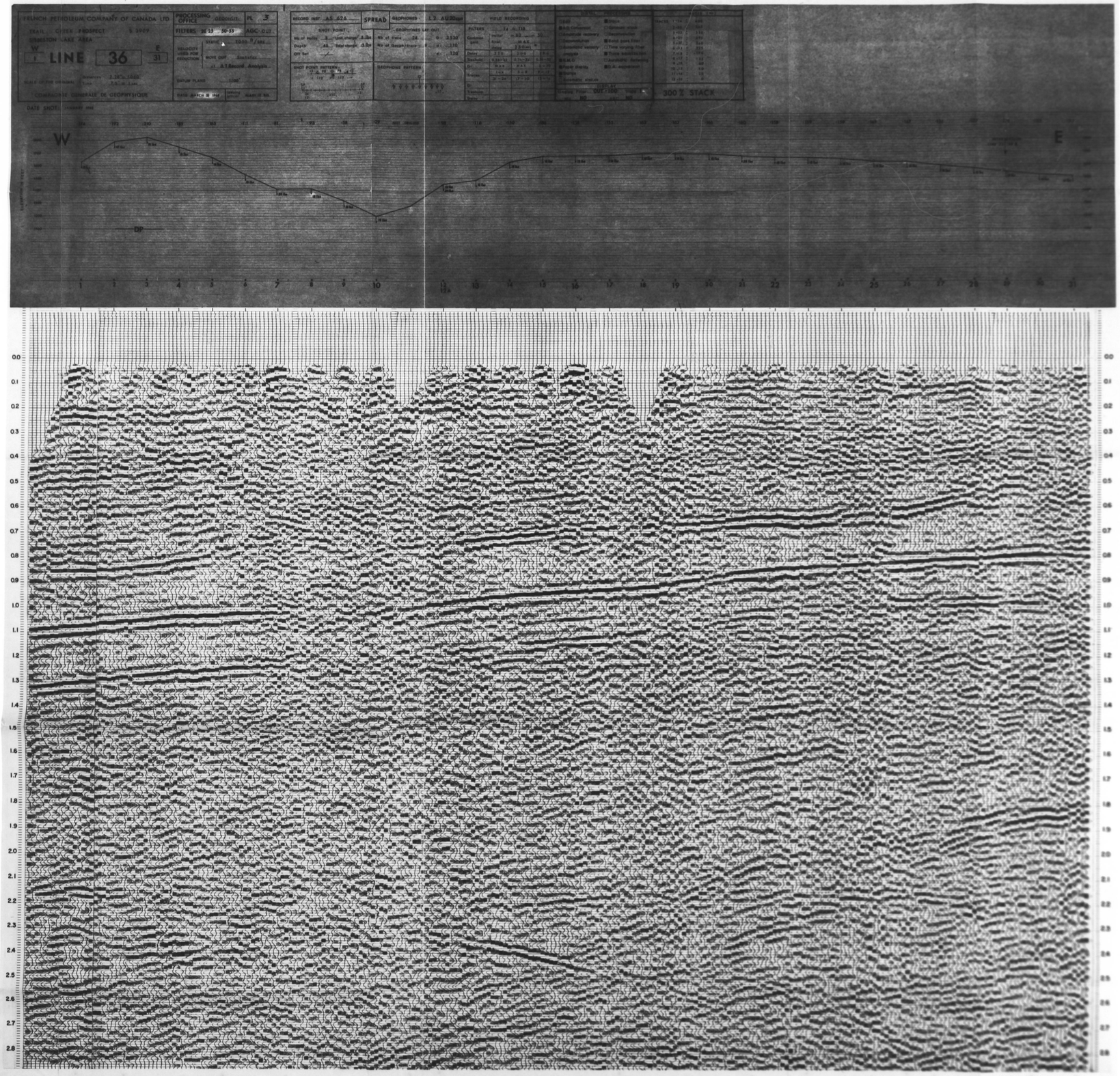
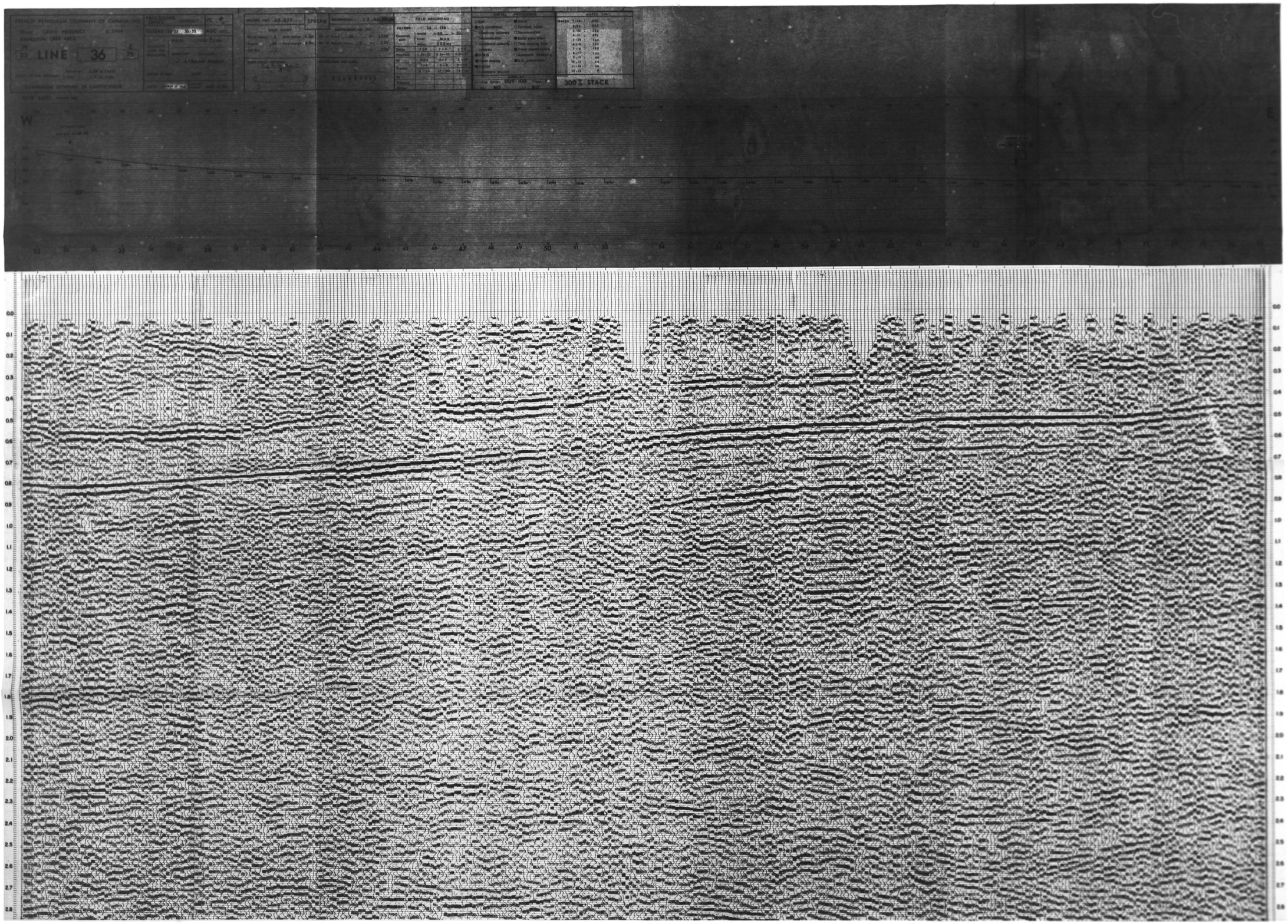

Lake
Tsetso Lake
ACCESS ROAD, WATER FOR CAMP
ROUGH TERRAIN
BEAVER DAM CANCELLED PART OF LINE
SIBBESTON
LAKE
MARTIN
HUDSON BAY AMERADA CAMSELL A-37 WELL
Landing Strip & Water
ACCESS ROAD TO FORT SIMPSON — 105 MILES FROM CAMP 1 TO FORT SIMPSON
Steep 50' High Hill
River Water for Camp
CAMP 1
SUN SHOTS
INTERSECTION ACSON RIVER (WATER FOR DRILLS)
Water mainly for drills
Water
APPROXIMATE B.A. LINE
Approximate Access Road to West
WATER FOR CAMP
B.A. LINE
SUN SHOT
CAMP 2
SHORT DETOUR
Creek or River
River—Sp. 50 Water for Camp
3 Miles Detour
Landing Strip & Water
NO MISTIE WITH TOPOGRAPHY OF MORE THAN 150 FEET WAS ENCOUNTERED
Mag.
FRENCH PETROLEUM COMPANY OF CANADA Ltd.
S. 3909
ENCL-8
NORTHWEST TERRITORIES— CANADA
TRAIL CREEK SURVEY
TOPOGRAPHIC MAP
SCALE: 1 INCH to 1 MILE
COMPAGNIE GENERALE DE GEOPHYSIQUE

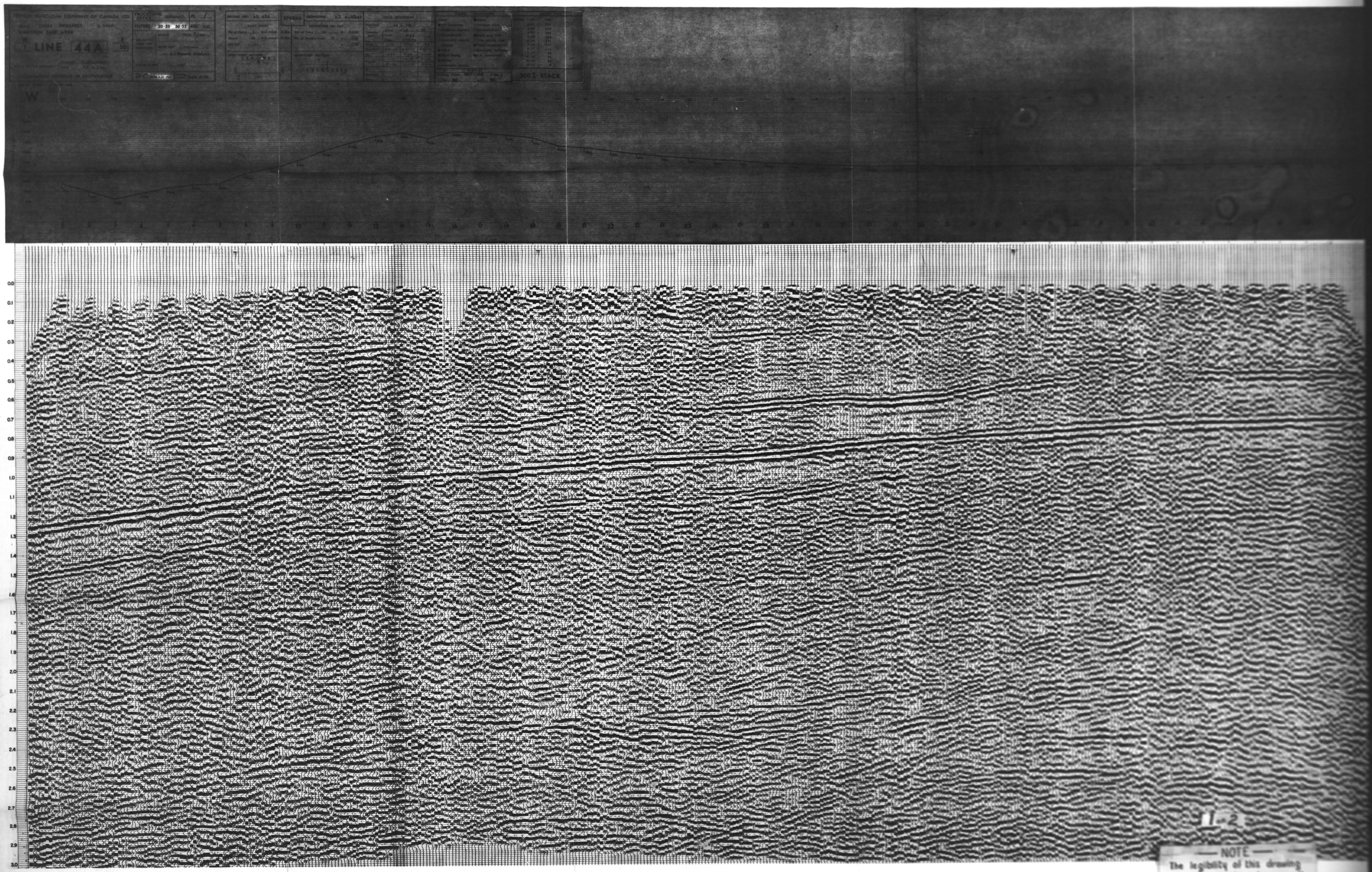


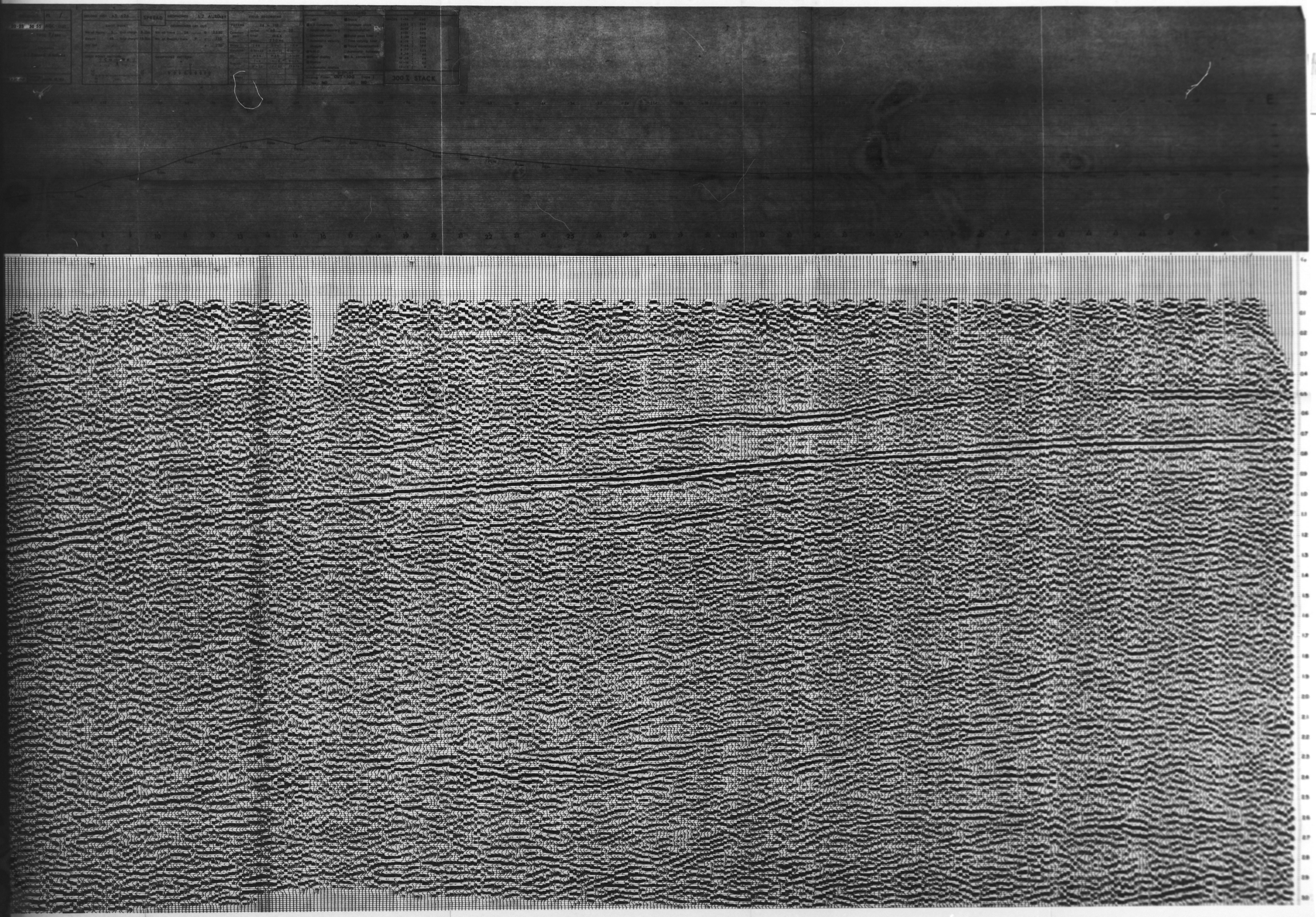


— NOTE —
The legibility of this drawing is substandard and may result in poor microfilm reproduction.









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