

SURFACE ELEVATIONS  
 DATE FEBRUARY 1971 (REV)  
 DATUM ELEVATION REFERENCE 1855 ft  
 CONTOUR INTERVAL 50 ft

**RAVEN PROSPECT SEISMIC REPORT 1971**  
**Northwest Territories**

**No. 104 G-10**

**Project 5640**

**Submitted to**

**GOBLES OIL AND GAS LIMITED**

**by**

**BOWMAN & SCHULTE LTD.**

**Calgary, Canada**

**250-6-4-6**



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**SEISMIC REPORT**

on the

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## CONTENTS

Abstract

Location Map

1. Introduction

2. Objective

3. Discussion of Results

4. Conclusions and Recommendations

Appendix I	Statistical Summary	(Contained in
Appendix II	Field Techniques	(
Appendix III	Interpretation Procedures	(Contractor's Operations
		(
		(Report Supplement

Enclosures:

Maps\*

I Surface Elevation

II Slave Point (?) Structure

III Arnica (?) Structure

IV Chinchaga (?) Structure

V Slave Point to Arnica Isochron

VI Arnica to Chinchaga Isochron

VII Slave Point II Structure

VIII Jean Marie to Slave Point II Interval

\* Note Identifications of all horizons speculative

Record Sections: 4 Ext., 5 Ext., 12 & 14



### ABSTRACT

An interpretation of approximately 57 miles of seismic data in the Raven area of the Northwest Territories was performed for Gobles Oil and Gas Company by Bowman & Schulte Ltd. of Calgary.

The study consisted of the review of approximately 43 miles of 400% data acquired in 1970 plus the integration of approximately 14 miles of 600% detail shooting acquired in 1971.

The objective of the 1971 shooting was to detail an interesting seismic anomaly suggested in the first work. The geological objectives were to map the attitudes of the subsurface with emphasis on Middle Devonian Carbonates.

The results of the survey are considered reliable and have been successful in defining an interesting thickening within the Middle Devonian carbonates in an area where structural closure can be shown. The geological interpretation of the several seismic anomalies are:

1. The gross north divergence between the Jean Marie and the Slave Point II events can be construed as the

locus of an old hinge or shelf edge with thickening of the Middle Devonian carbonates back of the edge ; suggestive of an old barrier reef system. The lateral extensions of this "barrier reef" are not defined by control.

2. Unusual bumps at the Jean Marie level are probably the result of reefing in that zone. Two areas are sighted which may be the locale of Jean Marie reefs.
3. Inspection of early isochron maps shows the form of early structure while inspection of the structure maps shows the present structure and the degree of uplift in the northeast after Jean Marie time.

The recommendations include the review of all subsurface data to determine the persistence of the hinge line and "barrier reef" system. It is recognized that without Jean Marie control it may be impossible to distinguish barrier reefs from patch or large pinnacle reefs but the most promising areas may be located at the furthest updip elbow of the barrier reef system somewhere to the northwest.



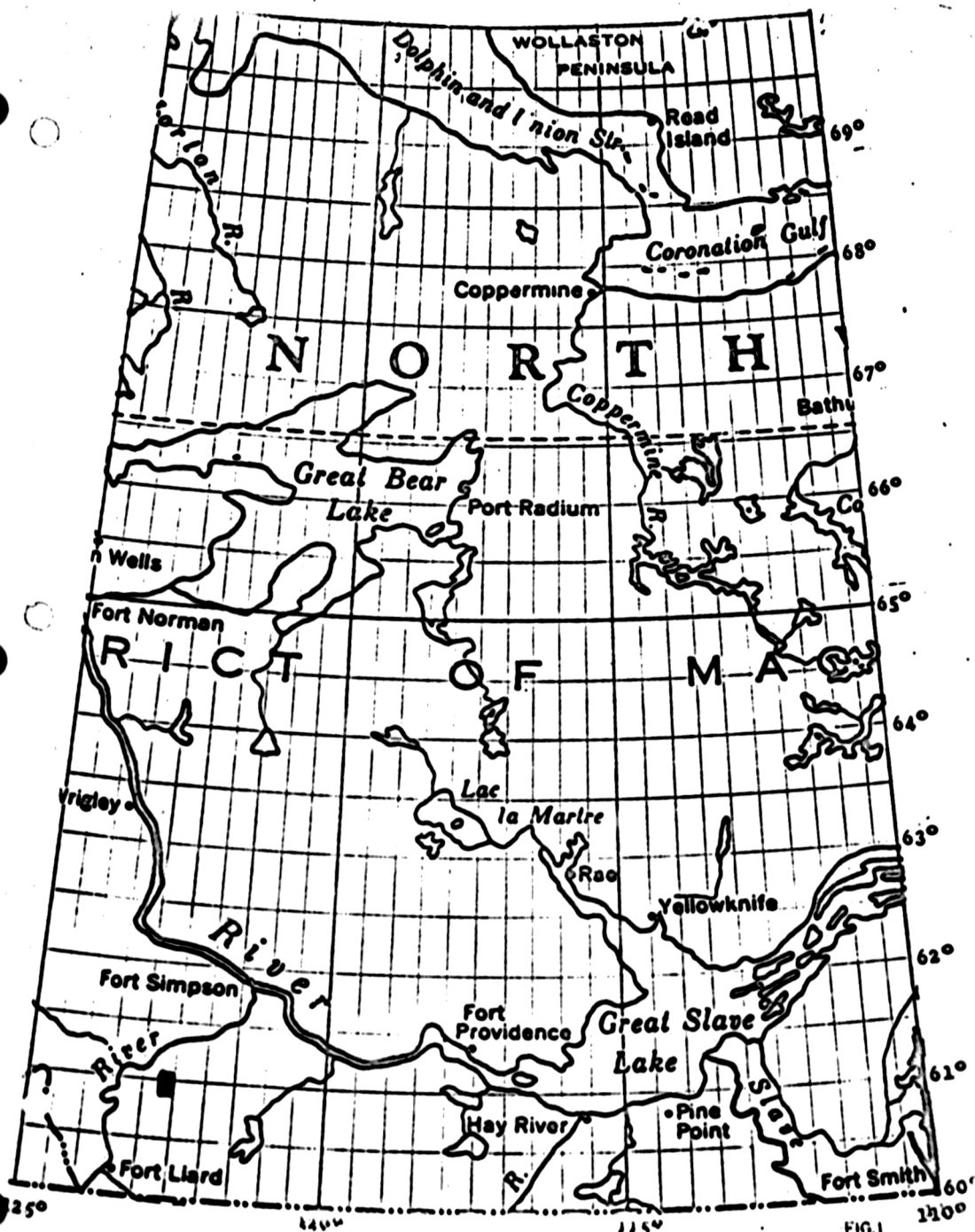


FIG. 1

## 1. INTRODUCTION

A seismic survey was interpreted in the Raven area of the Northwest Territories for Gobles Oil and Gas Limited by Bowman & Schulte Ltd., of Calgary during early 1971.

The data was acquired by Canwest Geophysical Limited of Calgary during February 1971 using the field parameters and techniques outlined in Appendix II. Summary of statistical data is presented in Appendix I.

Processing of the data was performed by the Teledyne Exploration data centre in Calgary; salient processing and data preparation factors are outlined in Appendix III.

The Raven area is situated approximately 65 miles north of the British Columbia boundary and approximately thirty miles east of South Nahanni. The northeastern corner of the area proper is formed by the intersection of longitude  $122^{\circ} 30'$  and latitude  $61^{\circ}$ .

The prospect is accessible by the Winter Tractor trail northeast from Fort Nelson to the shore of Cormack Lake then via existing winter trails westward to the centre of the area.



The topography of the area is characterized by a high land mass in the southeast progressively eroded to the northwest into a major tributary of the Liard River. See surface elevation map.

Geologically, the prospect is located on the northwest flank of the Tathlina Uplift and perhaps on the postulated northern extension of the Petitot-Kotcho reef complex. Geological data is sparse and the regional structural configurations deduced from the scanty subsurface control could be reformed with the superimposition of local features.

## 2. OBJECTIVES

The primary objective of the survey and interpretation was to detail an interesting seismic anomaly found by previous shooting. Emphasis was placed on the definition of a possible reef buildup within Middle Devonian carbonates.

## 3. DISCUSSION OF RESULTS

The results of the seismic interpretation are considered reliable and are presented in the form of four subsurface structural control maps and three isochronal maps of zones of interest. Copies of structural record sections showing the

suggested interpretation are included as an integral part of the report and serve as the basic data from which this interpretation was derived.

#### QUALITY OF DATA

The overall appearance of the record sections is one of a single band of energy associated with Middle Devonian beds and little in the way of continuous shallow information. Shallow data is truly non-existent in the north and west but as the lines progress southward away from the surface outcrop of Devonian beds, shallow information becomes more definitive. An attempt was made to map an event above the postulated Slave Point identification, however, the control seen is limited.

The appearance of multiple energy, with the surface or near surface weathering boundary as the upper element, and the Cretaceous - Devonian contact as the lower element, is disturbing, especially in those instances (south end of Line 2) where the geometry and velocity functions cause the multiple to intercept the Middle Devonian energy band. The superposition of multiple and primary energy at such places is deleterious to a confident mapping of the Middle Devonian beds and it is suggested that perhaps this condition exists

in the area of the Amoco Murphy Cormack N-33 well. The condition is not bothersome in the northern and western portions of the area.

The great elevation changes, shown on the subsurface elevation map to exist in this area, were believed to have been effectively removed by the static corrections applied to the data. A 10,000'/s refraction was used to measure the amount of overburden and in fact the top of the refractor may be related to the top of the Devonian.

#### IDENTIFICATIONS

The identifications of all the seismic events is conjectural and based on the extrapolation of sonic data from a well 15 miles to the west.

### 3. DISCUSSION OF RESULTS

#### RESULTS

The Slave Point, Arnica, and Chinchaga structural control maps show contouring configurations essentially the same as those presented in the first report, however, all have been modified in the areas of the additional control.

The seismic trough found between the Slave Point event and the Arnica event was interpreted because of peculiar action on the Slave Point event; the analysis is presented on the Slave Point II structural control map. This interpretation is considered superior to the old Slave Point map.

The new data has resulted in the definition of a structurally high closure near the intersection of Lines 14 and 1. The weakness in the closure is to the north and east but as much as twenty milliseconds of confirmed closure remains. In terms of depth this amounts to something more than 120 feet.

The Slave Point to Arnica and the Arnica to Chinchaga Isochron maps complement one another with the deeper interval showing thick areas in the place of thin trends on the shallow interval. Note that both maps describe early structural form on the Arnica zone.

To further analyze the habit of the early structure another interval map was prepared. The Jean Marie to Slave Point Isochron was constructed to show structural conditions at a later date and the results were rewarding. The gross north divergence measured from the anomalous area near the intersection of lines 1 and 14 suggests greater relief than

can be described by reef buildup alone so that native structure existed on underlying beds at Arnica time, that the thickening within the Arnica was probably due to reefing and that the locale on which this thickening occurred was probably an old hinge or shelf edge. The conditions mentioned above point to barrier reef habits. The definition of the lateral extent of this condition is limited by the control.

Although a Jean Marie structure map has not been prepared, anomalies have been found at this level which merit comment. Reference should be made to the record sections of Lines 12 and 5 Extension. Both lines illustrate unusual thickening and divergence at Jean Marie locally and the interpretation can be made of the existence of Jean Marie reefing. Note also that another event above the Jean Marie also shows similar reef type conditions. The quality of data and the lack of continuity at Jean Marie level precludes further analysis at this time.

#### 4. CONCLUSIONS AND RECOMMENDATIONS

The results of the review and data integration have been successful in defining a closed seismic anomaly. The data is considered reliable and interpretation proposed confidently.

The maps and record sections describe an area where Middle Devonian barrier type reefing probably occurred with an intensified buildup near the intersection of two lines presenting a closed present day structure.

The closure is thought to be one of a number which may be encountered along a trend system which can be outlined by early isochron maps.

It is recommended that a study be made of the area to the northwest to ascertain a northwestern elbow of this trend system for this would represent the maximum updip position of the reef trend and the final migration limit. This is proposed in place of an immediate test because a similar anomaly further updip may provide a more desirable location to test the major unknown condition -- that of good porosity development.

BOWMAN & SCHULTE LTD.

A handwritten signature in dark ink, appearing to read 'H. E. Bowman', is written over the typed name.

H. E. Bowman

February 10, 1971



## INTRODUCTION

A seismic reflection survey was conducted by Canwest Geophysical Limited, Party #21, in the Raven area of the Northwest Territories, for the Cankeo Gas Company. A total of 13.7 miles were recorded during the period January 7, 1971 through January 11, 1971. (See Figure #1, Area Location Map).

In order to enhance shallow reflections, a shorter station interval is necessary thus making the stacking fold larger.

## OPERATIONS

### A. Accessibility

The prospect is accessible by the utilization of the winter Tractor Trail which extends northeast from Fort Nelson to the south shore of Cormack Lake. The prospect lies approximately thirty-five (35) miles west of Cormack Lake and was reached by using existing seismic trails.

The topography consisted of very steep bush covered hills. The maximum relief in the area is approximately 1,100 feet.

## B. Surveying

Horizontal and vertical control was maintained with a Wilde T-16 Theodolite.

Vertical ties were made to lines previously shot for Cankees by Canwest.

## C. Recording

The recording equipment consisted of a 48-trace recorder with a DFS III Binary Gain Amplifier system and a TI-508 digital tape transport. The recorded tape output was in the SEG "A" 9-track, 48 trace digital format.

A dry write camera provided field read after writes which served as monitor records.

The receptors used were Mark Model L-2 geophones with a natural frequency of 14 cps. (See Figure 2).

The field recording parameters are as follows:

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| 1. Type of recording                 | 1200% C.D.P., 48-trace<br>symmetrical |
| 2. Geophone group center<br>interval | 220 feet                              |
| 3. Shotpoint interval                | 440 feet                              |

- |    |                                   |                               |
|----|-----------------------------------|-------------------------------|
| 4. | Geophones per trace               | 9                             |
| 5. | Geophone pattern length (in line) | 200 feet                      |
| 6. | Spread length                     | 5280' - 220';<br>220' - 5280' |
| 7. | Three hole pattern spacing        | 110 feet                      |

See Production Layout, Figure 3 and Stacking Diagram, Figure 4, Appendix I, Field Recording Statistics.

D. Drilling

The drilling was done using seven drills. They consisted of four top drives, one conventional drill and two Sewell Auger. Three hole patterns were drilled to a depth of 50 feet and each hole loaded with 2-1/2 lbs. of geogel. Drilling commenced January 4, 1971 and was completed on January 10, 1971. (See Appendix II and III).

E. Computations

The field data was corrected to a horizontal reference plane of 1,300 feet using a datum velocity of 10,000 feet per second. A normal uphole correction was used where the dynamite charge penetrated the 10,000 feet per second refractor. However, when the 10,000 feet per second

layer was not penetrated by the charge, the following formulas were utilized to correct for the additional amount of LVL between the hole depth and the 10,000 feet per second layer.

$$f = \frac{V_R - V_{sw}}{(\cos \sin^{-1} \frac{V_{sw}}{V_{ssw}}) V_R}$$

$$\text{Delay time due to Drift Layer} = f (T_{ssw} - T_{sw})$$

where  $f$  = factor

$V_R$  = replacement velocity

$V_{sw}$  = (2,000 to 6,000) ft. per second

$V_{ssw}$  =  $V_R$  (usually) 10,000 feet per second

$T_{ssw}$  =  $V_{ssw}$  intercept

$T_{sw}$  =  $V_{sw}$  intercept

#### F. Data Preparation and Processing

All data was processed at the CMR data center, with the data preparation being done by Canwest. The processing at CMR was monitored by Canwest personnel.

The velocity function and other processing parameters were determined from the previous work.

The processing parameters and sequence used are

as follows:-

1. Normal moveout removal
2. Digital Bandpass Filtering
  - a. Time 0.0 - 3.0 seconds
  - b. Band 16-20 Hz : 50-56 Hz
3. Paper display
4. Static Application (structural)
5. Trace gather
6. Stack and final drafted film display

It should be noted that the final stack presentation represents only a 6-fold stack as only the inside 12 traces, on either side of the 48 trace split, were used in the stack.

Respectively submitted  
CANWEST GEOPHYSICAL LIMITED



D.F. Chow

## APPENDIX I

### RECORDING STATISTICS:

1. Date commenced, first shot	January 7, 1971
2. Date completed, last shot	January 11, 1971
3. Number of 10 hour days, recording	3.9
4. Number of 10 hour days, driving (including move time).	3.4
5. Number of miles recorded	13.7
6. Number of profiles recorded	156
7. Total number of shots taken	160
8. Total amount of dynamite used	1235 lbs.
9. Total number of caps used	508

## APPENDIX II

### DRILLING STATISTICS:

1.	Date commenced	January 4, 1971
2.	Date completed	January 11, 1971
3.	Number of 10 hour days,drilling	35.1
4.	Number of 10 hour days, driving (including move-time)	28.2
5.	Total number of holes drilled	460
6.	Total footage drilled	22,360
7.	3-1/2" inserts used	150
8.	4-1/2" inserts used	2
9.	4-1/2" rock bits used	11
10.	5-1/4" starter bits used	2
11.	Mud used	1150 lbs.

### APPENDIX III

#### BULLDOZING AND EXTRA HOURS:

1.	Number of 10 hour days, bulldozing	2.25
2.	Extra water truck (2) usage, number of 10 hour days	19.60



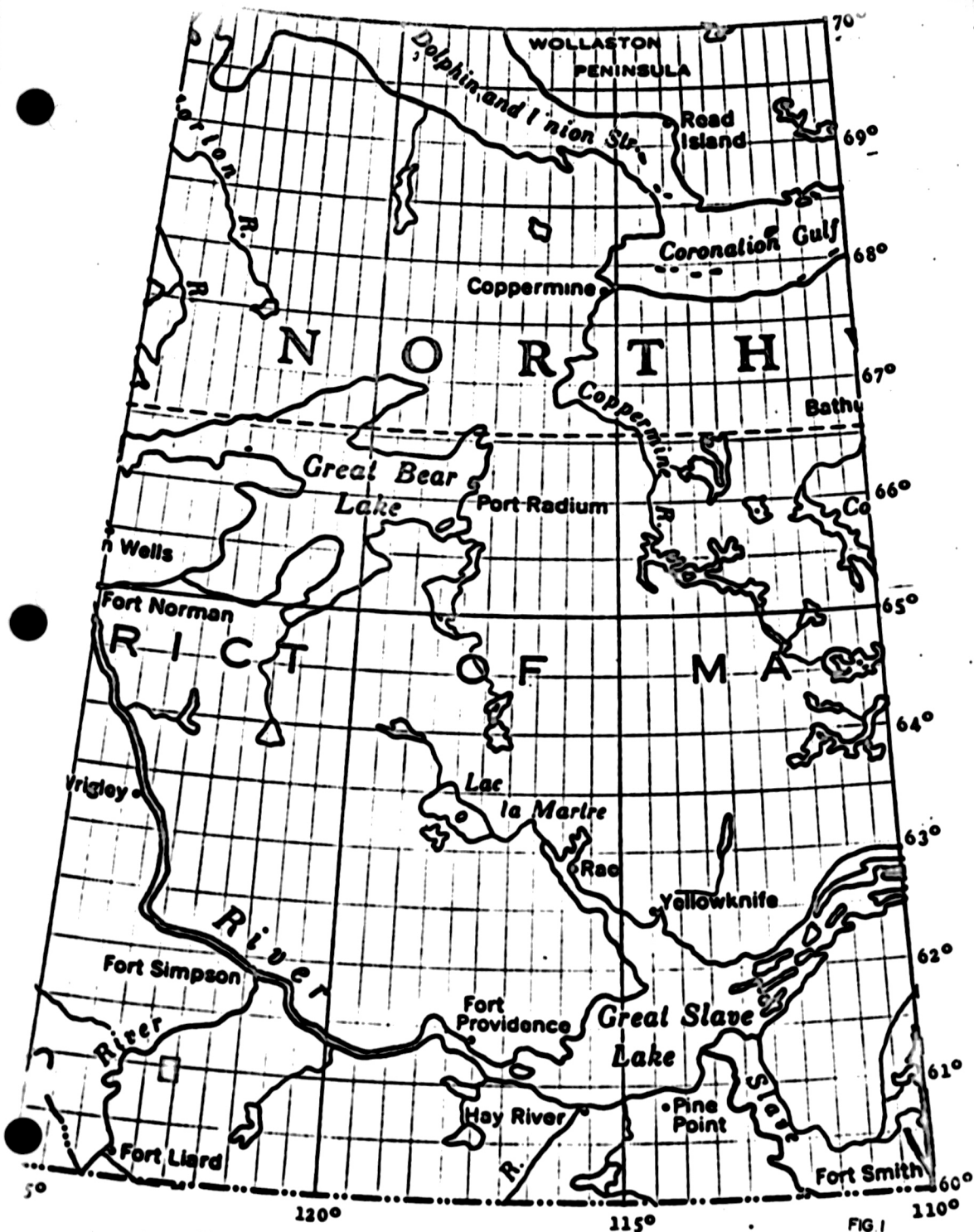


FIG 1

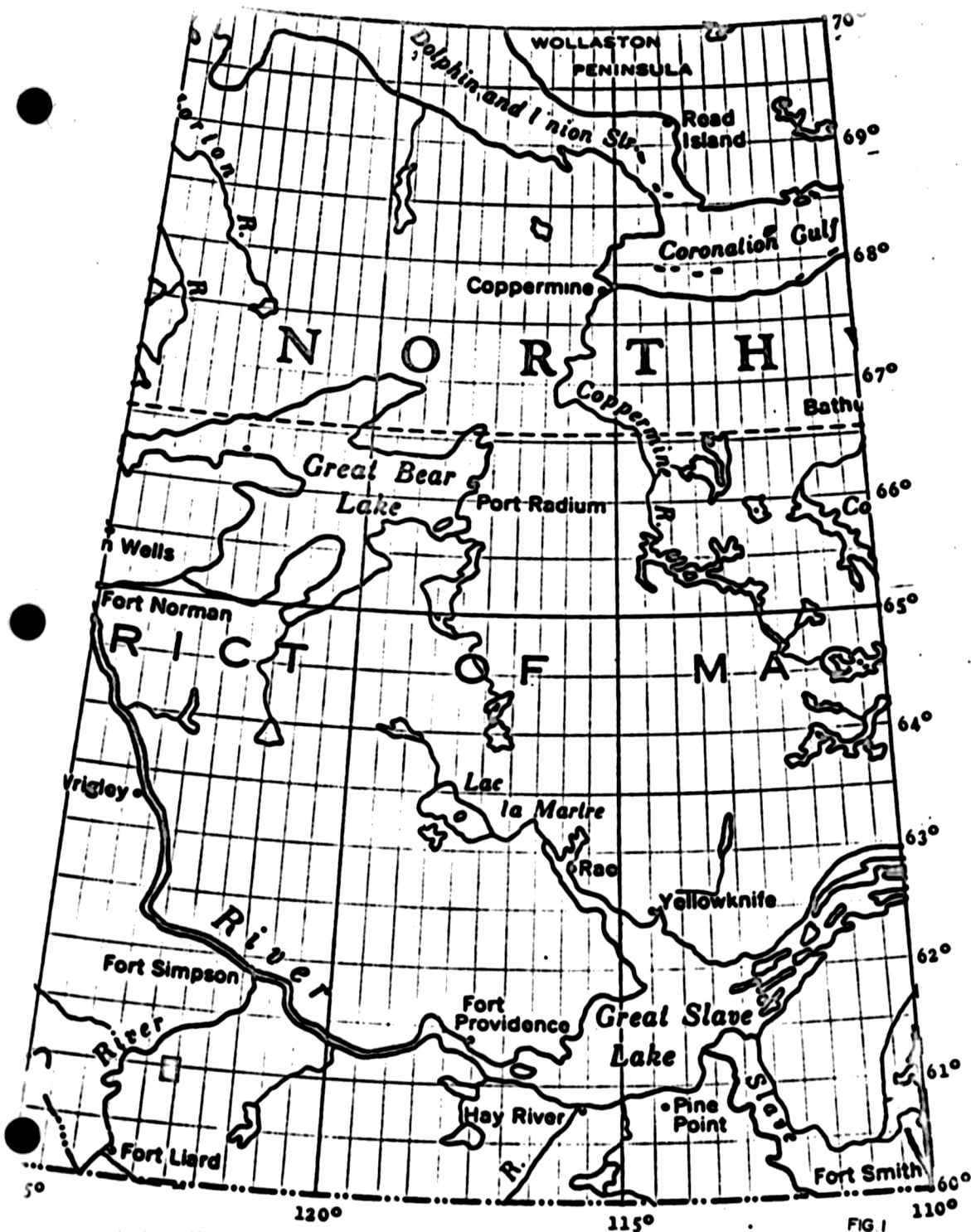


FIG 1

Prospect: Raven N.W.T.

Canwest Geophysical Ltd.

Client: Cankee Gas Company

Date: Jan., 1971

<u>Line No.</u>	<u>SP No.</u>	<u>Footage</u>	<u>Formation</u>
<u>3 hole patterns 55' apart</u>			
CW 4	401	0 - 50	Muskeg, gravel, shale
	402	0 - 50	Muskeg, gravel, shale
	403	0 - 50	Muskeg, gravel, shale, rock
	404	0 - 50	Muskeg, gravel, shale
	405	0 - 50	Shale, gravel
	406	0 - 50	Clay, shale, gravel, rock
	407	0 - 50	Shale
	408	0 - 50	Clay, rock, gravel
	409	0 - 50	Muskeg, rock, shale
	410	0 - 50	Muskeg, clay, sandstone, shale
	411	0 - 50	Muskeg, clay, rock, shale
	412	0 - 50	Muskeg, clay, rock, shale
	413	0 - 50	Clay, shale, rock
	414	0 - 50	Muskeg, hard shale
	415	0 - 50	Hard shale
	416	Not Shot	
	417	"	
	418	"	
	419	"	
	420	0 - 50	Muskeg, clay, rock, shale
	421	0 - 50	Clay, shale
	422	0 - 50	Muskeg, clay, rock, shale
	423	0 - 50	Muskeg, clay, shale, rock
	424	0 - 50	Muskeg, clay, shale
CW 12	425A	0 - 50	Muskeg, shale
	B	0 - 50	Muskeg, shale
	C	0 - 50	Muskeg, shale
	D	0 - 50	Muskeg, shale
	426	0 - 50	Muskeg, shale
	427	0 - 50	Muskeg, clay, shale
	428	0 - 50	Muskeg, clay, hard shale
	429	0 - 50	Muskeg, clay, shale
	430	No Hole	
	431	No Hole	
	432	0 - 50	Clay, rock
	433	No Hole	
	434	0 - 50	Rock, Sandstone, gravel, clay
	435	0 - 50	Clay, gravel, shale
	436	0 - 50	Shale, rock, gravel
	437	0 - 50	Sand, rock
	438	0 - 50	Gravel, shale
	439	0 - 50	Clay, sand, rock
	440	0 - 50	Muskeg, core rock
	441	0 - 50	Muskeg, rock, shale
	442	0 - 50	Rock, clay, gravel
	443	0 - 50	Clay, rock, gravel, sand
	444	0 - 50	Gravel, boulders, clay
	445	0 - 50	Gravel, clay

Prospect: Raven, N.W.T.

<u>Line No.</u>	<u>SP No.</u>	<u>Footage</u>	<u>Formation</u>
CW 12	446	0 - 50	Gravel, clay,
	447	0 - 50	Gravel, clay
	448	0 - 50	Clay, gravel
	449	0 - 50	Boulders, rock, gravel, clay
	450	0 - 50	Clay, boulders
	451	0 - 45	Clay, gravel, clay
	452	0 - 40	Clay, gravel
	453	0 - 50	Muskeg, rock, gravel, shale
	454	0 - 45	Clay, rock, gravel
	455	0 - 50	Clay, rock, gravel, shale
	456	0 - 50	Clay, sandstone, shale
	457	0 - 50	Sand, gravel
	458	0 - 50	Sand, gravel
	459	0 - 50	Muskeg, clay, shale, rock
	460	0 - 50	Muskeg, clay, shale
	461	0 - 50	Muskeg, gravel, sand, shale
	462	0 - 50	Sand, rock
	463	0 - 50	Rock, sand
	464	0 - 50	Clay, rock, gravel, boulders
	465	0 - 50	Clay, rock, boulders
	466	0 - 50	Gravel, clay
	467	0 - 50	Gravel, rock, shale
	468	No Hole	
	469	0 - 50	Muskeg, shale, rock
	470	No Hole	
	471	0 - 50	Gravel, shale
CW 5	472	0 - 50	Clay, gravel, rock
	473	0 - 50	Clay, gravel, boulders
	474	0 - 50	Gravel, rock
	475	0 - 50	Clay, boulders, gravel
	476	0 - 50	Clay, gravel
	477	0 - 50	Muskeg, clay, gravel
	478	0 - 50	Clay, rock, shale
	479	0 - 50	Gravel, shale, rock
	480	0 - 50	Clay, rock, shale, gravel
	481	0 - 50	Rock, clay
	482	0 - 50	Gravel, rock, shale
	483	0 - 50	Clay, shale, gravel
	484	0 - 50	Gravel, sand
	485	0 - 50	Boulders, shale
	486	0 - 50	Sand, rock
	487	0 - 50	Sand, rock
	488	0 - 50	Rock, sand
	489	0 - 50	Gravel, rock, shale
	490	0 - 50	Gravel, rock, shale
	491	0 - 50	Shale, rock, gravel
	492	0 - 50	Shale, gravel, boulders
	493	0 - 50	Clay, rock, gravel

Prospect: Raven, N.W.T.

<u>Line No.</u>	<u>SPNo.</u>	<u>Footage</u>	<u>Formation</u>
CW 14	494	0 - 50	Rock, sandstone
	495	0 - 50	Rock, sand, sandstone
	496	0 - 50	Clay, rock, shale
	497	0 - 50	Clay, sand, rock, shale
	498	0 - 50	Clay, rock, gravel, shale
	499	0 - 50	Gravel, rock, shale, boulders
	500	0 - 50	Clay, rock, sand
	501	0 - 50	Clay, boulders, gravel, rock
	502	0 - 50	Boulders, rock, clay
	503	0 - 50	Muskeg, clay, shale, sandstone, rock
	504	0 - 50	Muskeg, clay, shale
	505	0 - 50	Muskeg, clay, shale, sandstone
	506	0 - 50	Rock, sand
	507	0 - 50	Rock, gravel
	508	0 - 50	Clay, gravel
	509	0 - 50	Clay, sandstone
	510	0 - 50	Clay, sandstone
	511	No Hole	
	512	0 - 50	Clay, gravel, rock, boulders
	513	0 - 50	Boulders, rock
	514	0 - 50	Clay, boulders
	515	0 - 50	Clay, rock, gravel
	516	0 - 50	Hard shale, rock
	517	0 - 50	Clay, sand, rock
	518	0 - 50	Gravel, shale
	519	0 - 50	Muskeg, clay, shale, rock
	520	0 - 50	Muskeg, clay, shale, rock
	521	0 - 50	Muskeg, clay, shale
	522	0 - 50	Clay, sandstone, shale
	523	0 - 50	Clay, rock, shale
	524	0 - 50	Clay, rock, shale, sandstone
	525	0 - 50	Clay, rock
	526	0 - 50	Shale, gravel, rock
	527	0 - 50	Clay, sand, rock
	528	0 - 50	Clay, sand, clay, rock
	529	0 - 50	Muskeg, sandstone, shale
	530	0 - 50	Gravel, shale
	531	0 - 50	Clay, sand, sandstone
	532	0 - 50	Rock, sandstone
	533	0 - 50	Clay, rock, shale
	534	0 - 50	Clay, rock, shale
	535	0 - 50	Gravel, rock, boulders, shale
	536	0 - 50	Clay, gravel, rock
	537	0 - 50	Clay
	538	0 - 50	Gravel, rock
	539	0 - 50	Muskeg, clay, shale, rock
	540	0 - 50	Clay, rock, shale
	541	0 - 50	Muskeg, clay, shale, sandstone
	542	0 - 50	Muskeg, clay, shale, sandstone
	543	0 - 50	Clay, rock, gravel

Prospect: Raven, N.W.T.

Prospect: Raven, N.W.T.

<u>Line No.</u>	<u>SP. No.</u>	<u>Footage</u>	<u>Formation</u>
CW 14	544	0 - 50	Muskeg, clay, shale, sandstone
	545	0 - 50	Clay, rock, shale
	546	0 - 50	Clay, rock, shale
	547	0 - 50	Gravel, shale
	548.	0 - 50	Muskeg, gravel, shale
	549	0 - 50	Clay, boulders, rock
	550	0 - 50	Clay, boulders
	551	0 - 50	Clay, boulders
	552	0 - 50	Clay, boulders, sandstone
	553	0 - 50	Clay, rock, boulders, sandstone
	554	0 - 50	Clay, rock
	555	0 - 50	Muskeg, gravel
	556	0 - 50	Muskeg, gravel, rock, sandstone
	557	0 - 50	Clay, rock, shale, sandstone
	558	0 - 50	Clay, rock, gravel, shale
	559	0 - 50	Clay, rock, shale
	560	0 - 50	Clay, rock, shale
	561	0 - 50	Clay, gravel
	562	0 - 50	Clay, rock, gravel
	563	0 - 50	Muskeg, clay, shale, sandstone
	564	0 - 50	Muskeg, clay, shale, sandstone
	565	0 - 50	Clay, gravel
	566	0 - 50	Clay, gravel
	567	0 - 50	Sand, gravel
	568	0 - 50	Clay, rock, shale

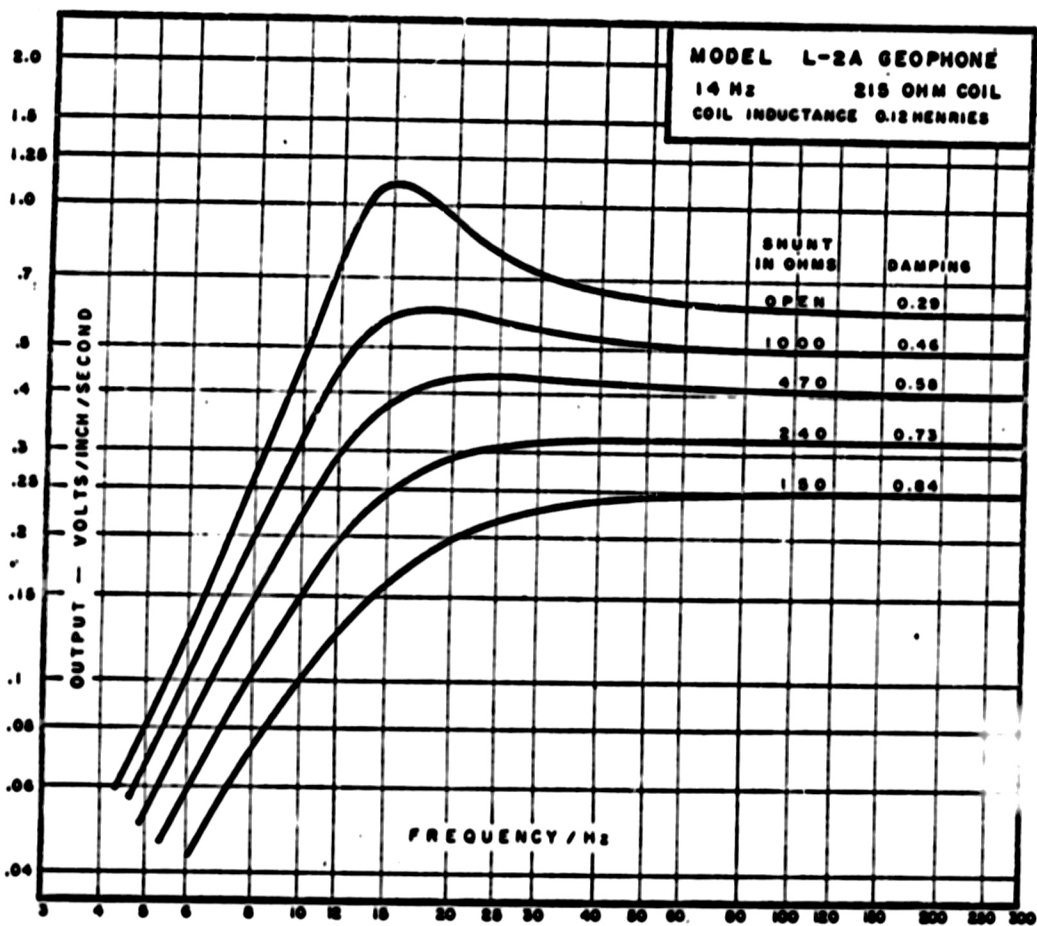
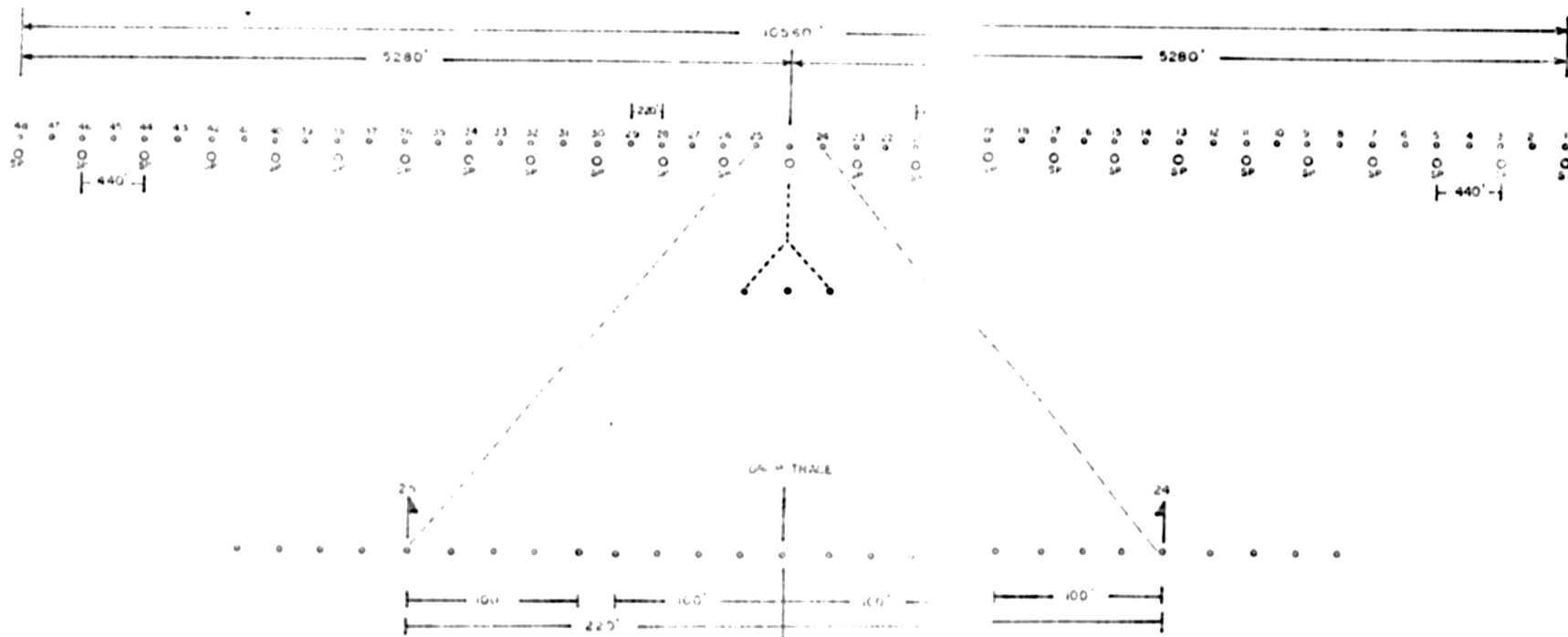


FIG 2

# SPREAD LAYOUT DIAGRAM

## RAVEN

NORTH OR EAST



SHOT HOLE PATTERN

SHOT POINT INTERVAL

HOLE DEPTH

ENERGY SOURCE

GEOPHONE GROUP CENTRES

GEOPHONES

3 HOLE

440'

90 FEET

DYNAMITE

200'

2' HOLE DIA.

ANY 25' SPACING

FIG 3



1200% SUBSURFACE COVERAGE

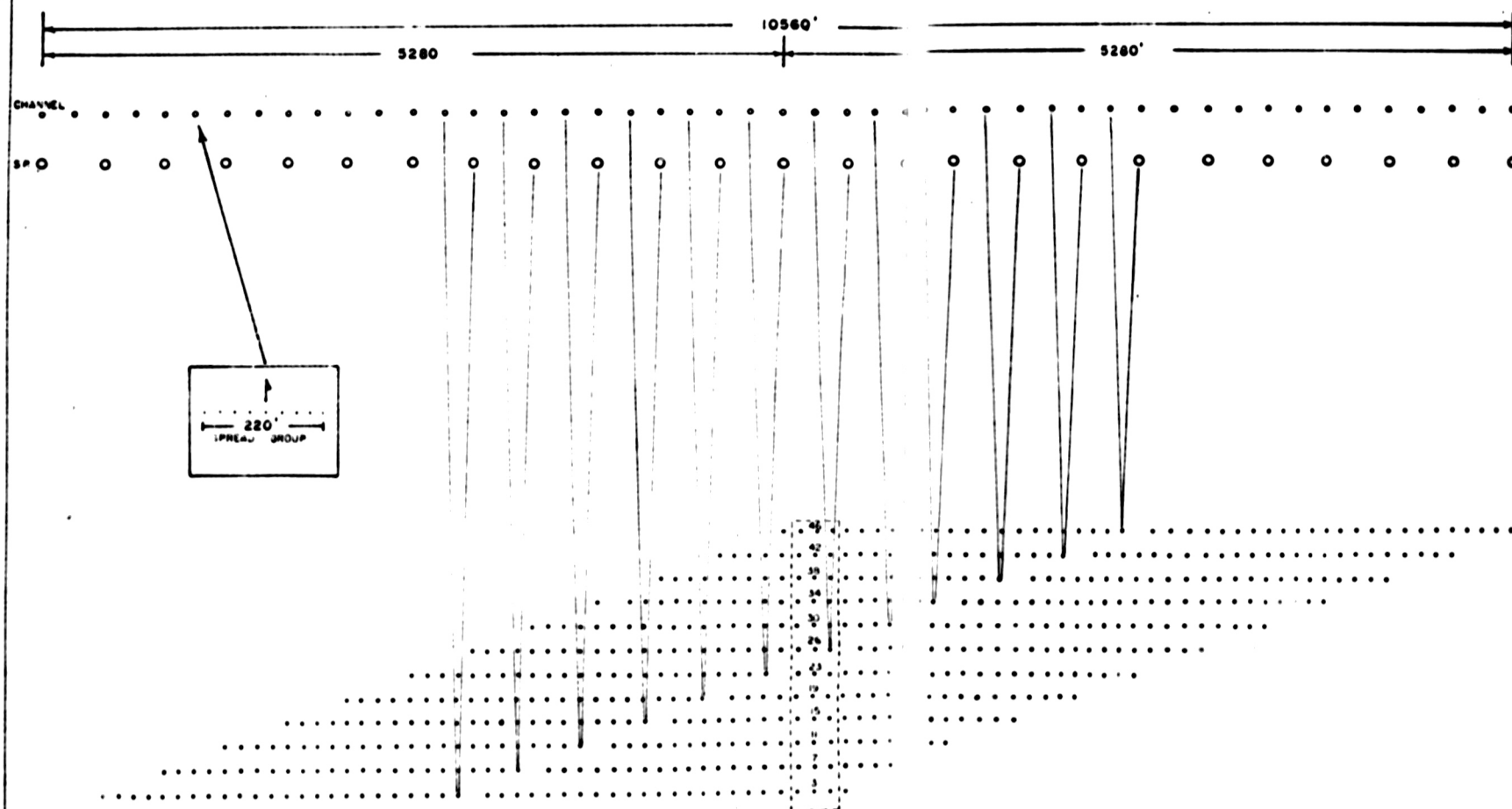
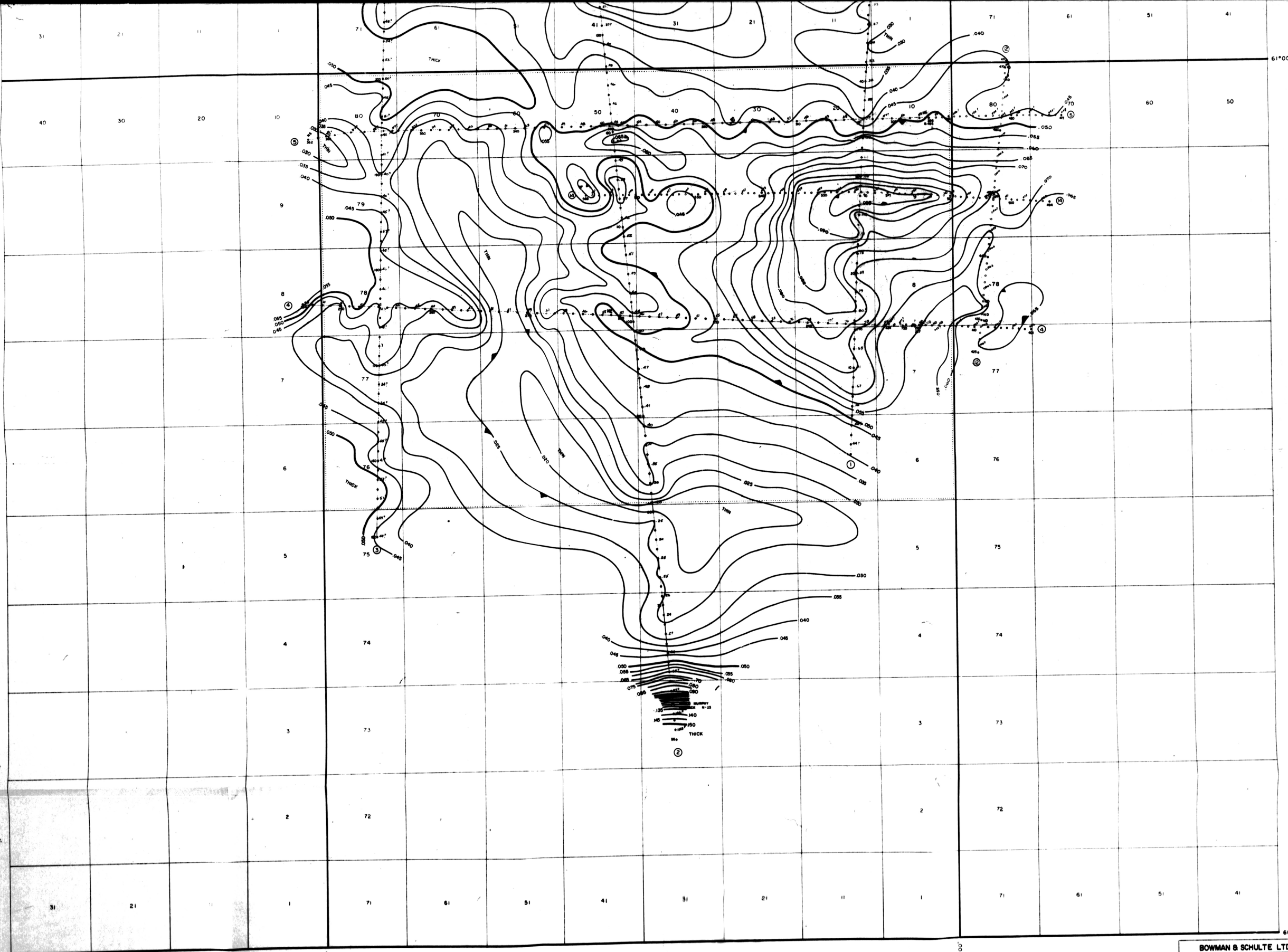
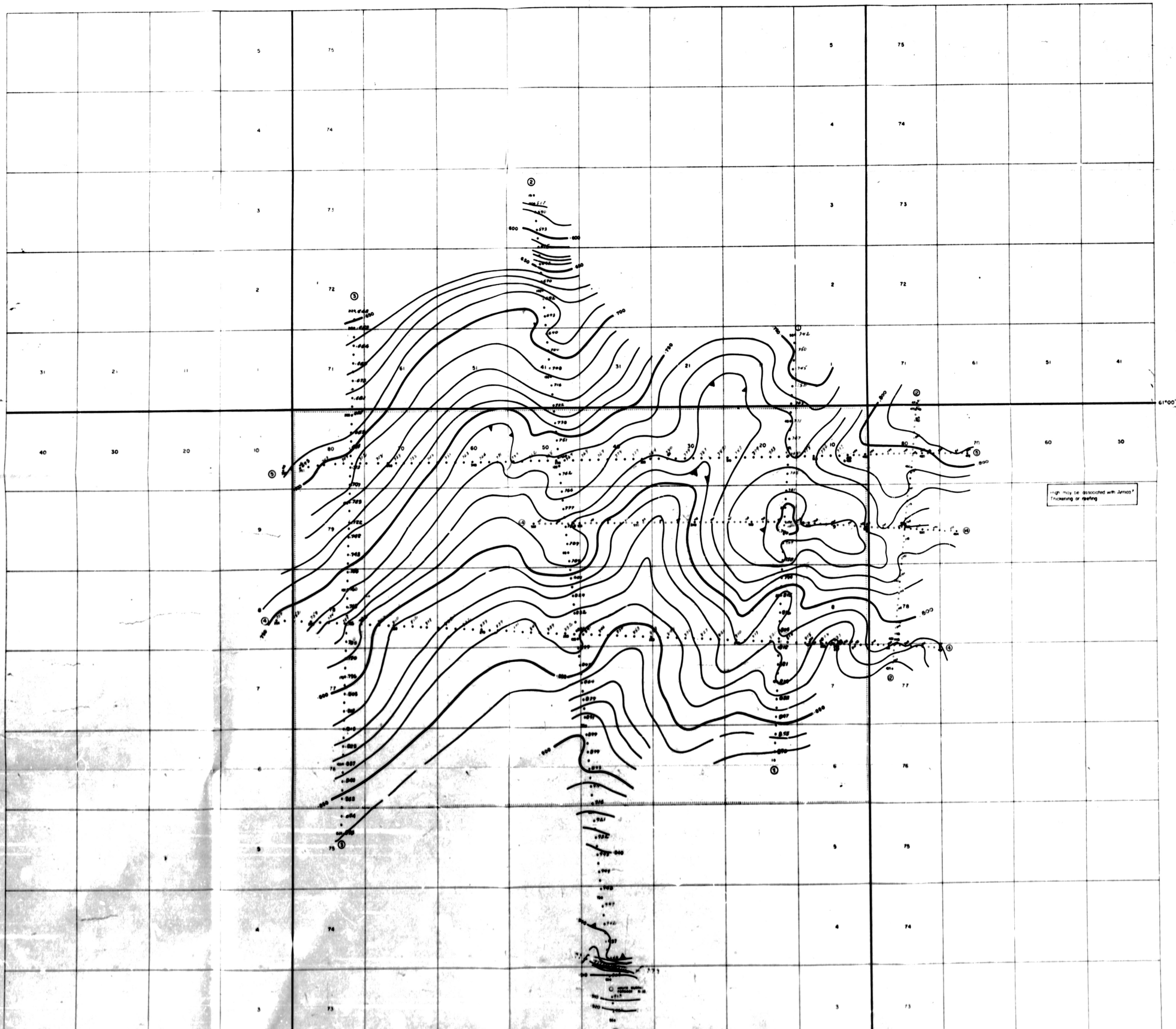


FIG. 4

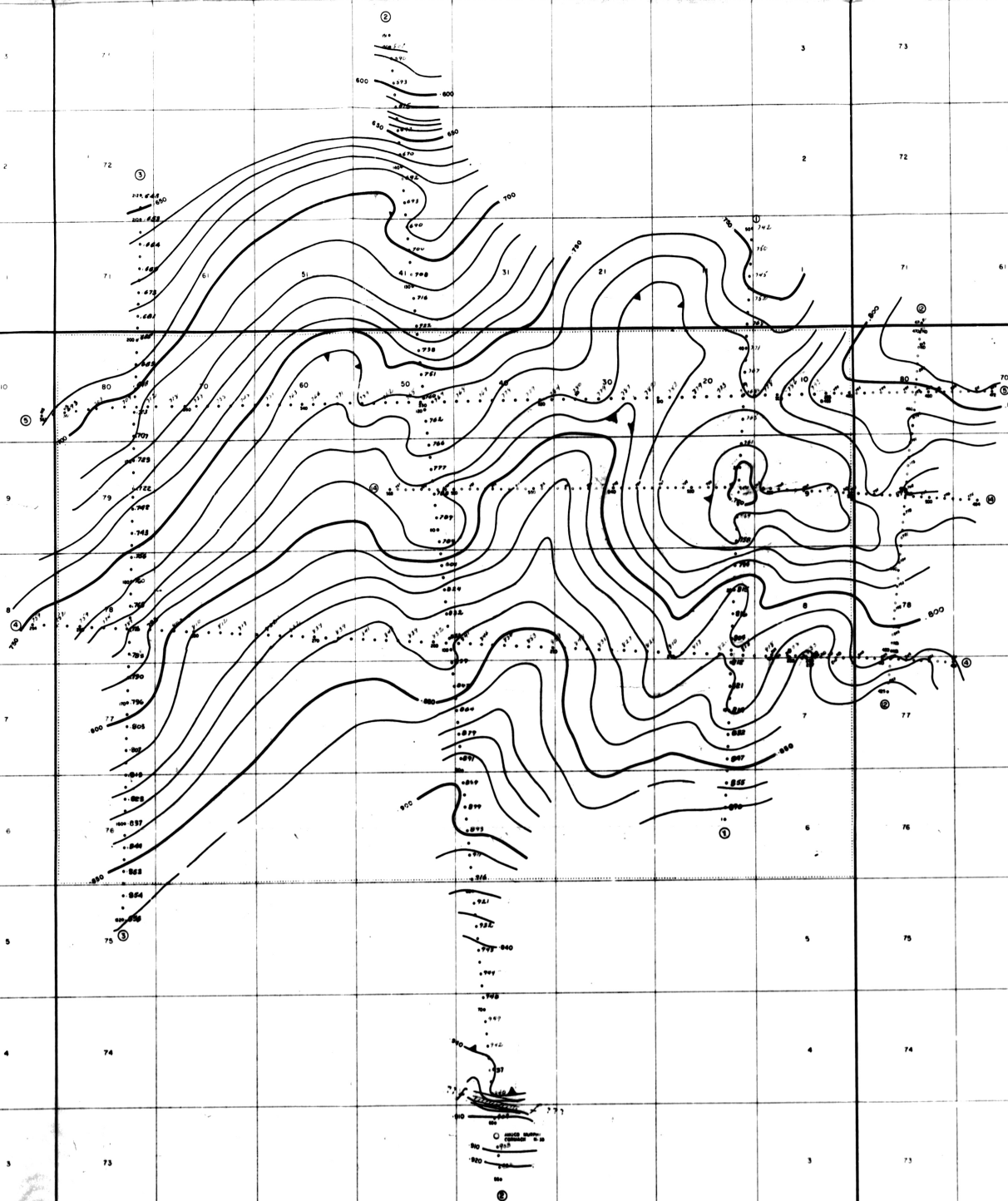




BOWMAN & SCHULTE LTD. FOR  
GOBLES OIL AND GAS LIMITED  
RAVEN  
NEAR ARNICA TO NEAR CHINCHAGA  
ISOCHRONAL CONTROL  
J.S. LEBER 1/70 CONTOUR INTERVAL 0.05 SEC  
EXPLORATION  
H.E. BOWMAN 2/71







High may be associated with Area 1  
Thinning or rippling

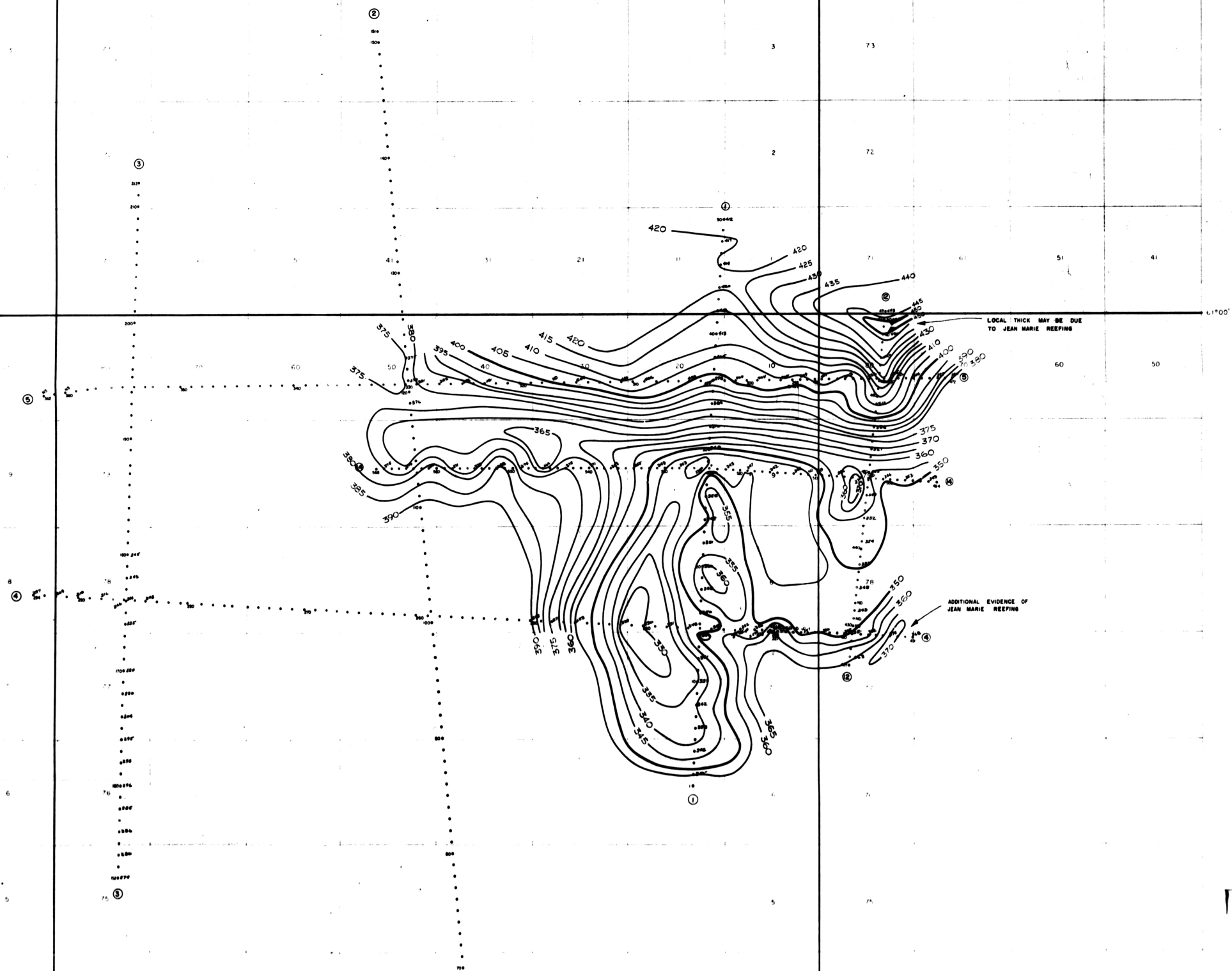
- EXPLANATION
- Location
  - Oil Well
  - Oil Well Abandoned
  - Dry Well
  - Gas Well
  - Gas Well Abandoned
  - Water Well
  - Water Well Abandoned
  - Water Well (Dry)

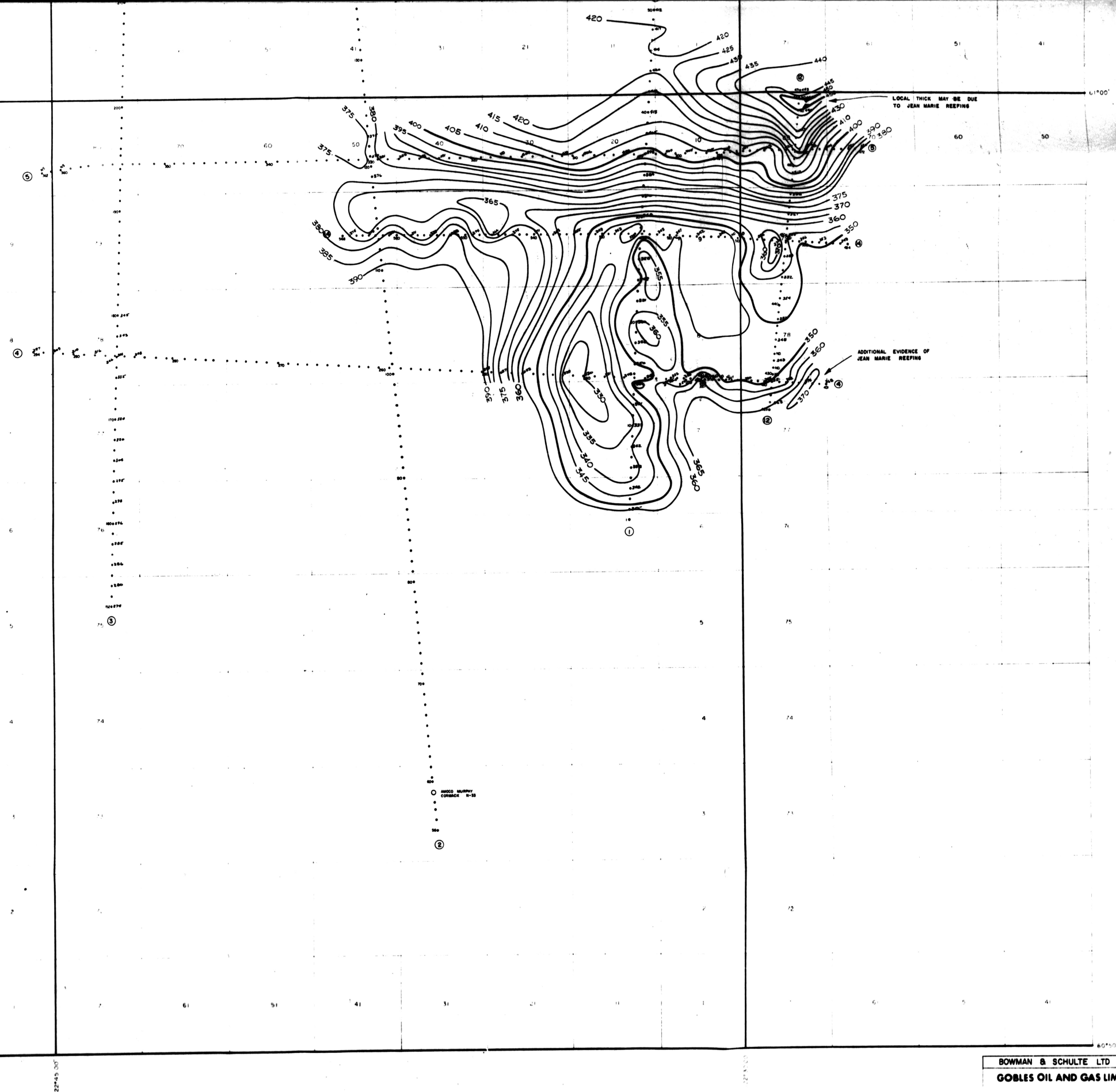
BOHMAN & SCHLITZ LTD. FOR  
GOBLES OIL AND GAS LIMITED

RAYEN  
SLAVE POINT  
STRUCTURAL CONTROL

DATE: 1968  
BY: J. B. L. 1968  
CONTOUR INTERVAL: 500  
ELEVATION: 1000  
SCALE: 1" = 1000'

\* IDENTIFICATION QUESTIONABLE





**BOWMAN & SCHULTE LTD for**  
**GOBLES OIL AND GAS LIMITED**

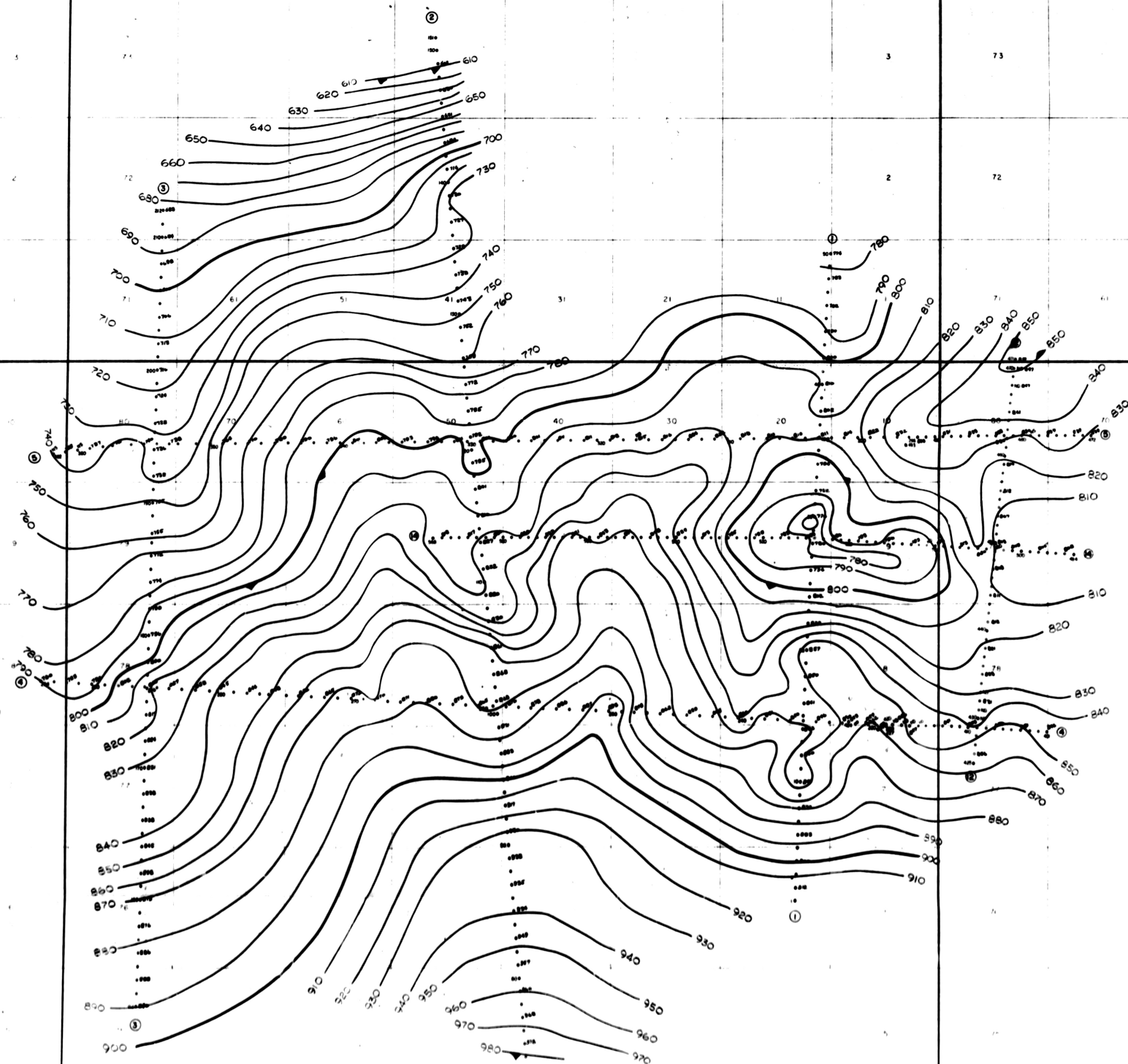
**RAVEN**  
NWT

**JEAN MARIE ? to SLAVE POINT II**

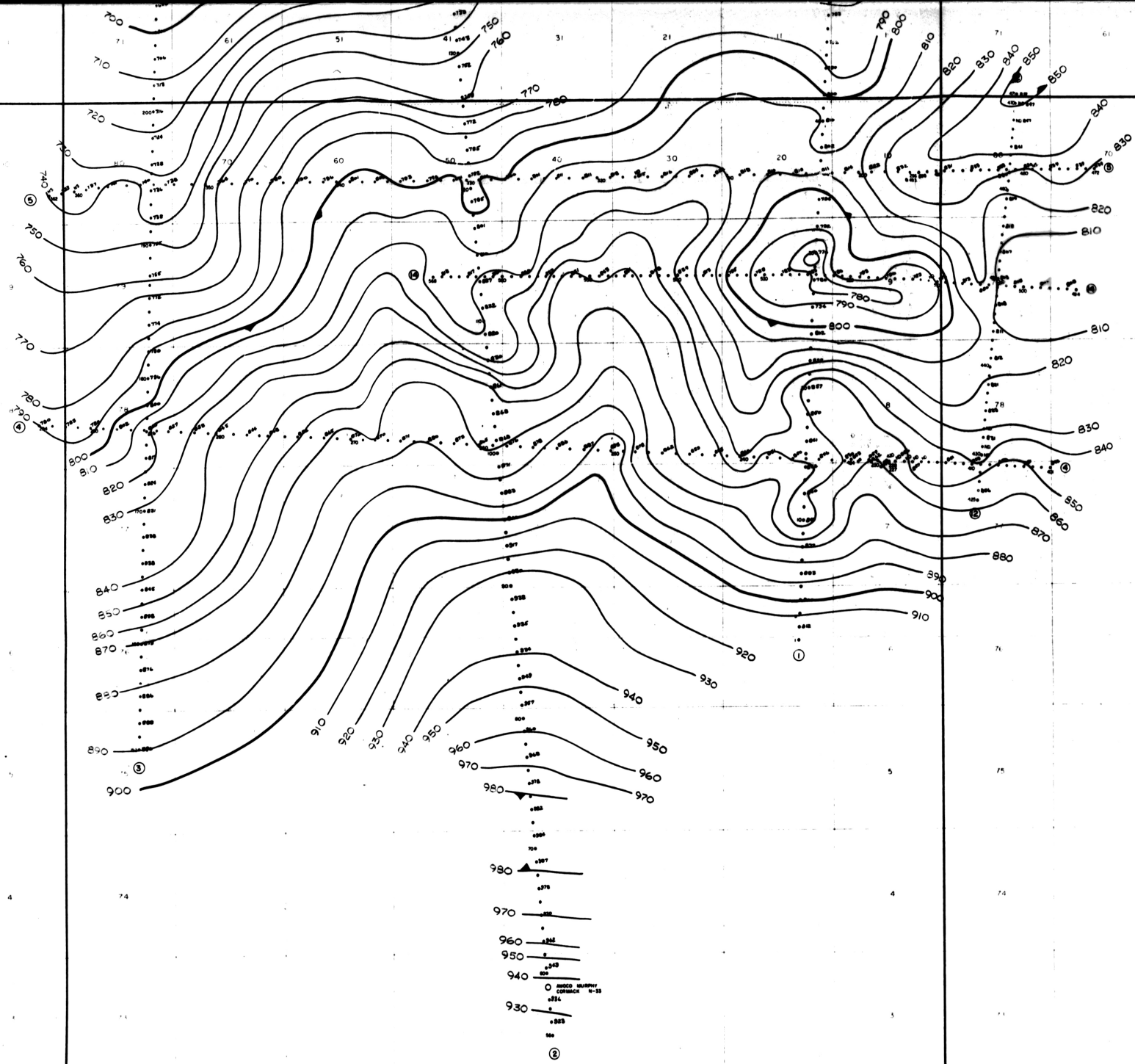
1/5 - 4ppx 1/7.70 CONTOUR INTERVAL: 005 SEC

EXPLORATION

H.E. BOWMAN 2/7/ 2'-time 157







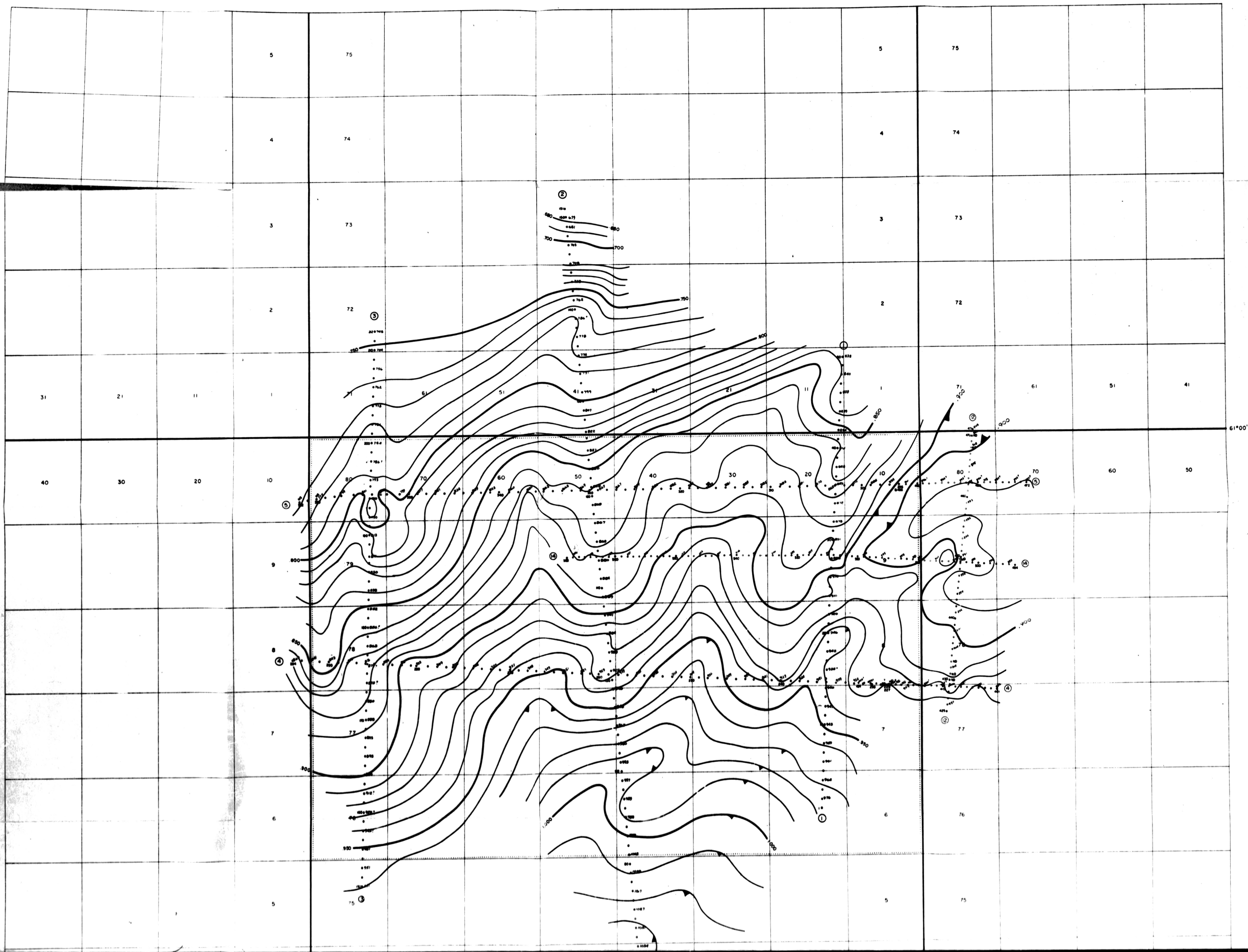
BOWMAN & SCHULTE LTD for  
 GOBLES OIL AND GAS LIMITED

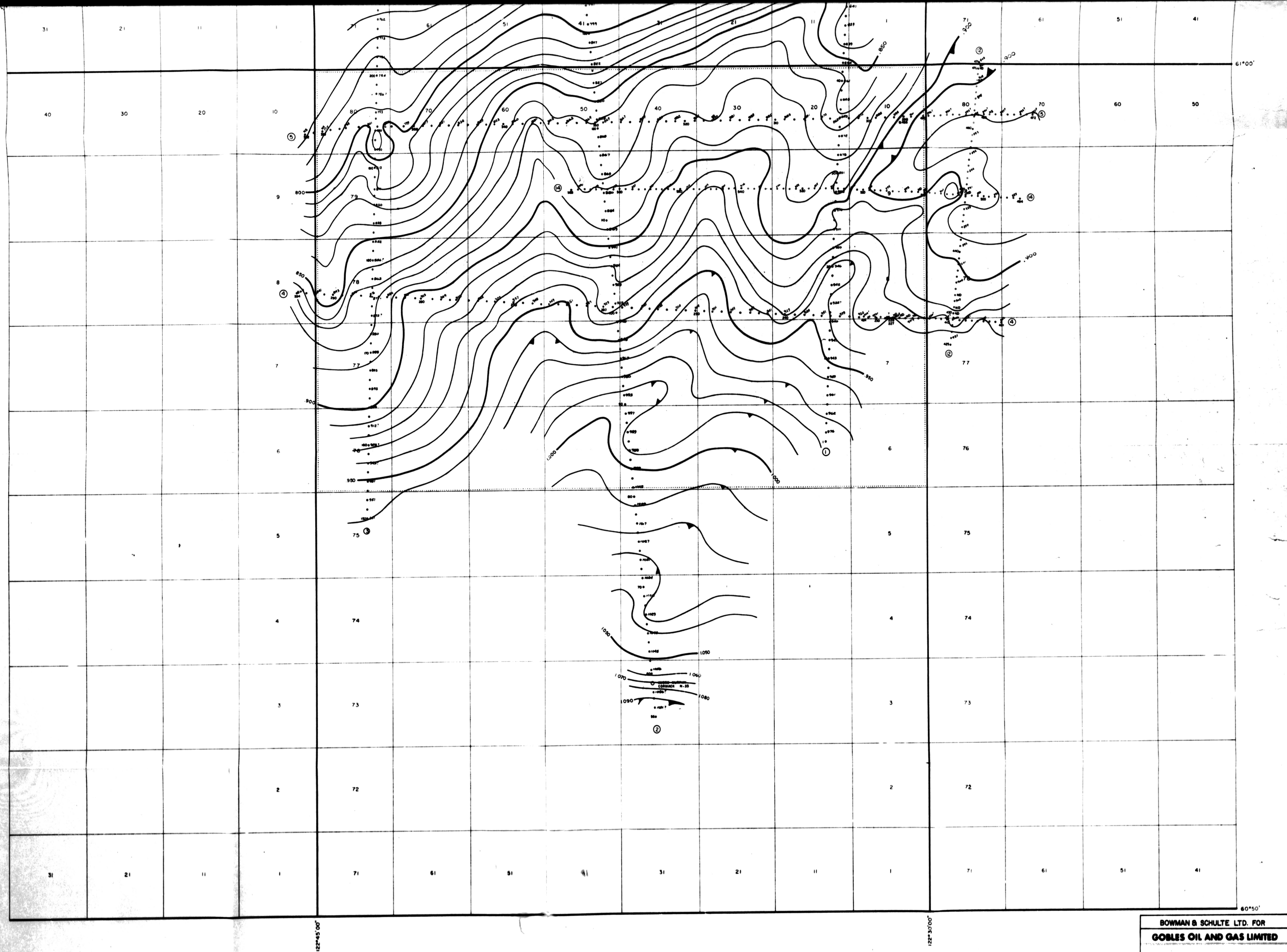
RAVEN  
 NW

SLAVE POINT II

1:50,000 1:70 CONTOUR INTERVAL: 100 FEET  
 EXPLORATION

H.E. BOWMAN 2/71 2 1/16 157

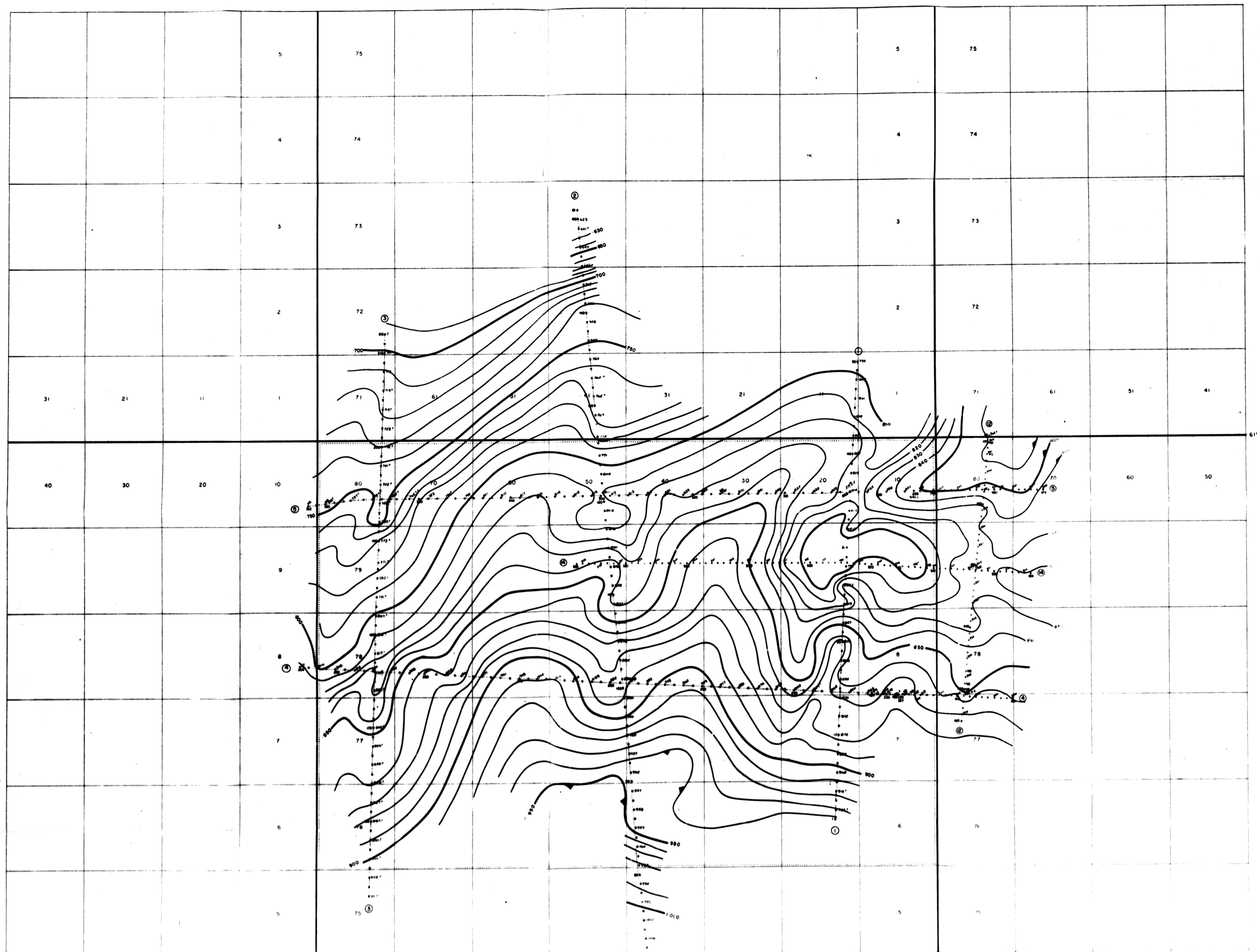


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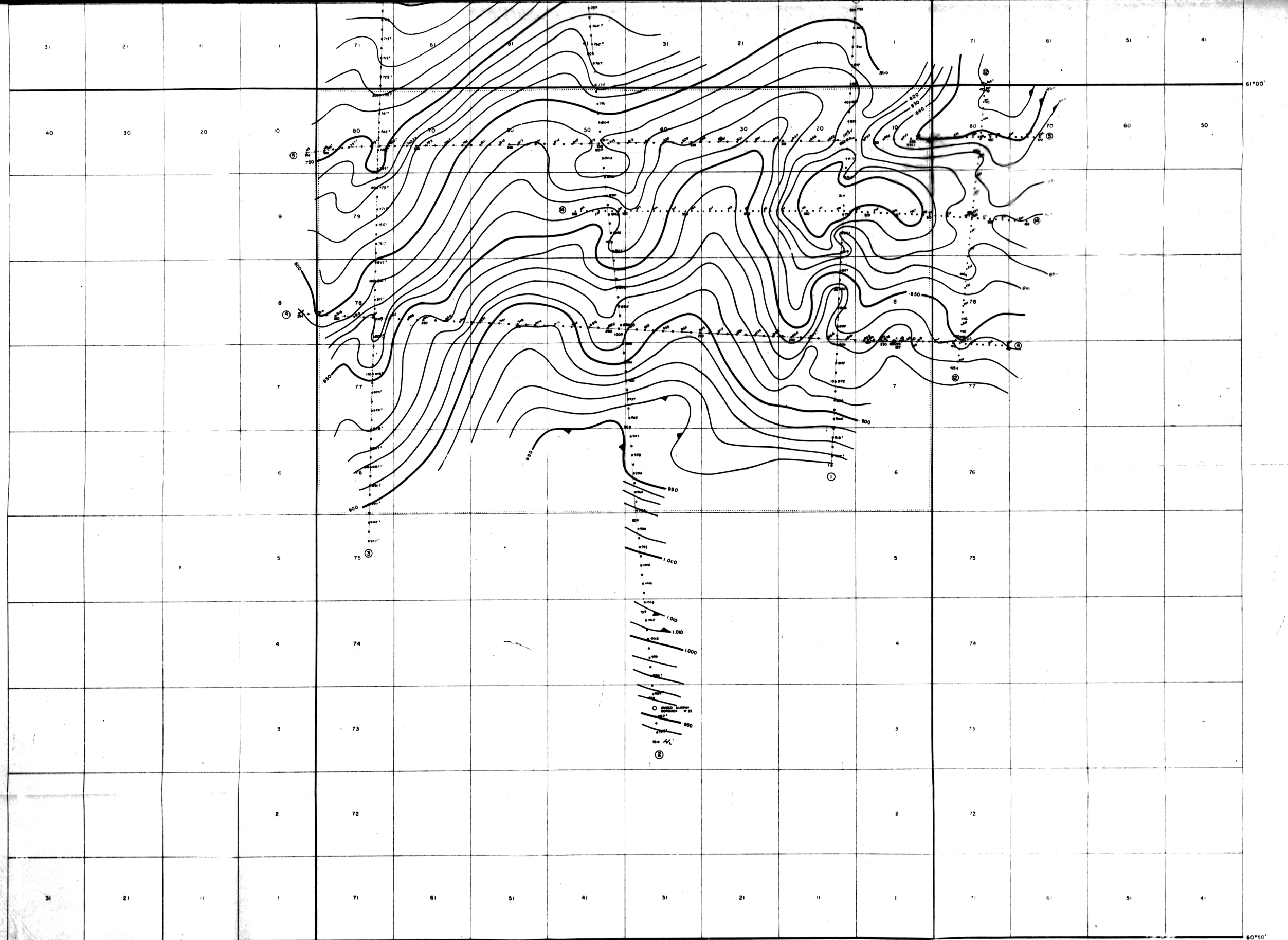
**BOWMAN & SCHULTE LTD. FOR  
GOBLES OIL AND GAS LIMITED**

**RAVEN**  
N.W.T.  
**NEAR CHINCHAGA**  
**STRUCTURAL CONTROL**

J.S. Lopez	1.770	CONTOUR INTERVAL: 010	
DATUM ELEVATION: 1300' ASL		LIPT EXPLORATION	
DATUM VELOCITY: 10,000 ft/s	REV 2/78	SCALE 2"=1 mile	Map No. 151







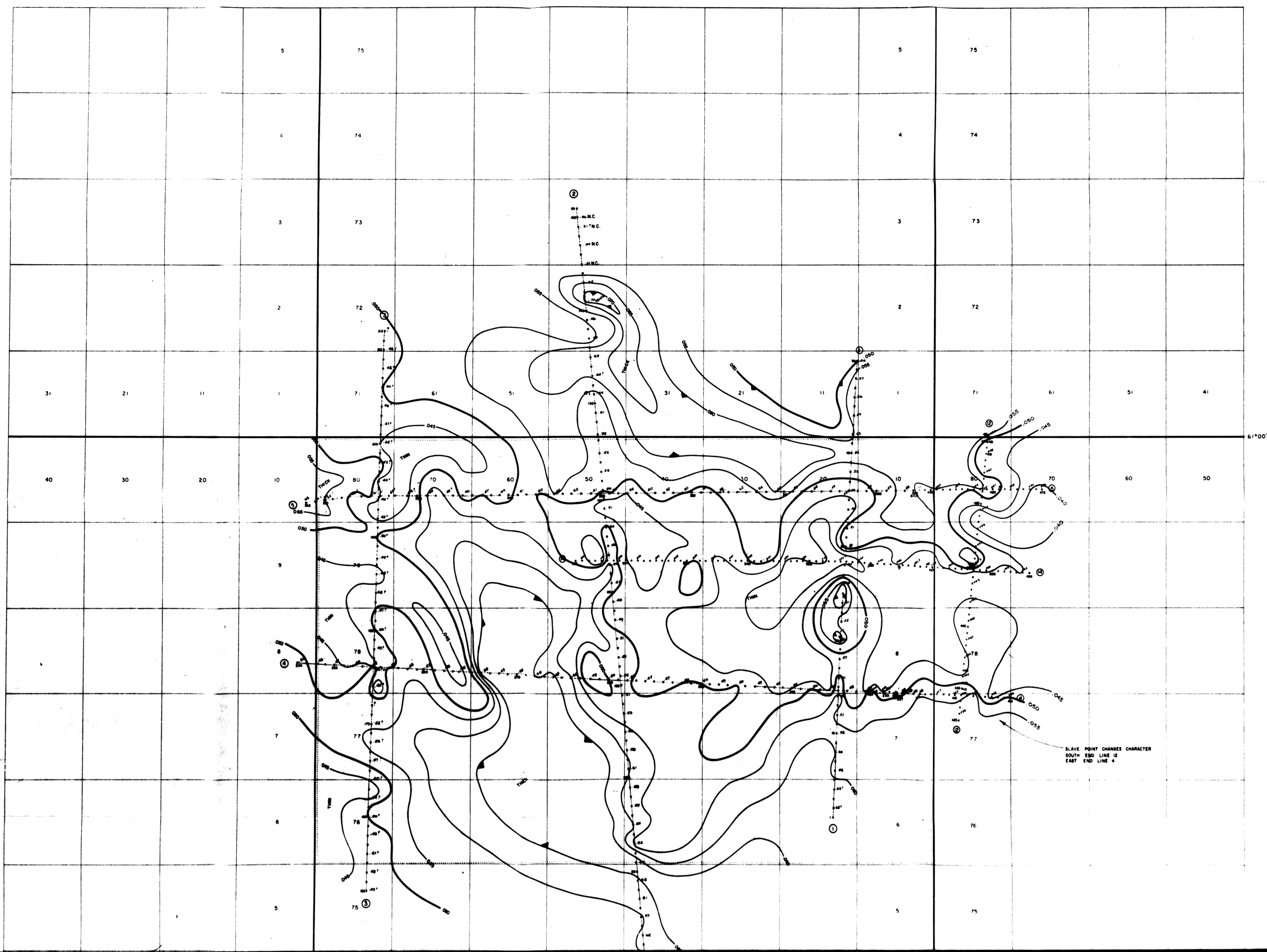
**BOWMAN & SCHULTE LTD FOR  
GOBLES OIL AND GAS LIMITED**

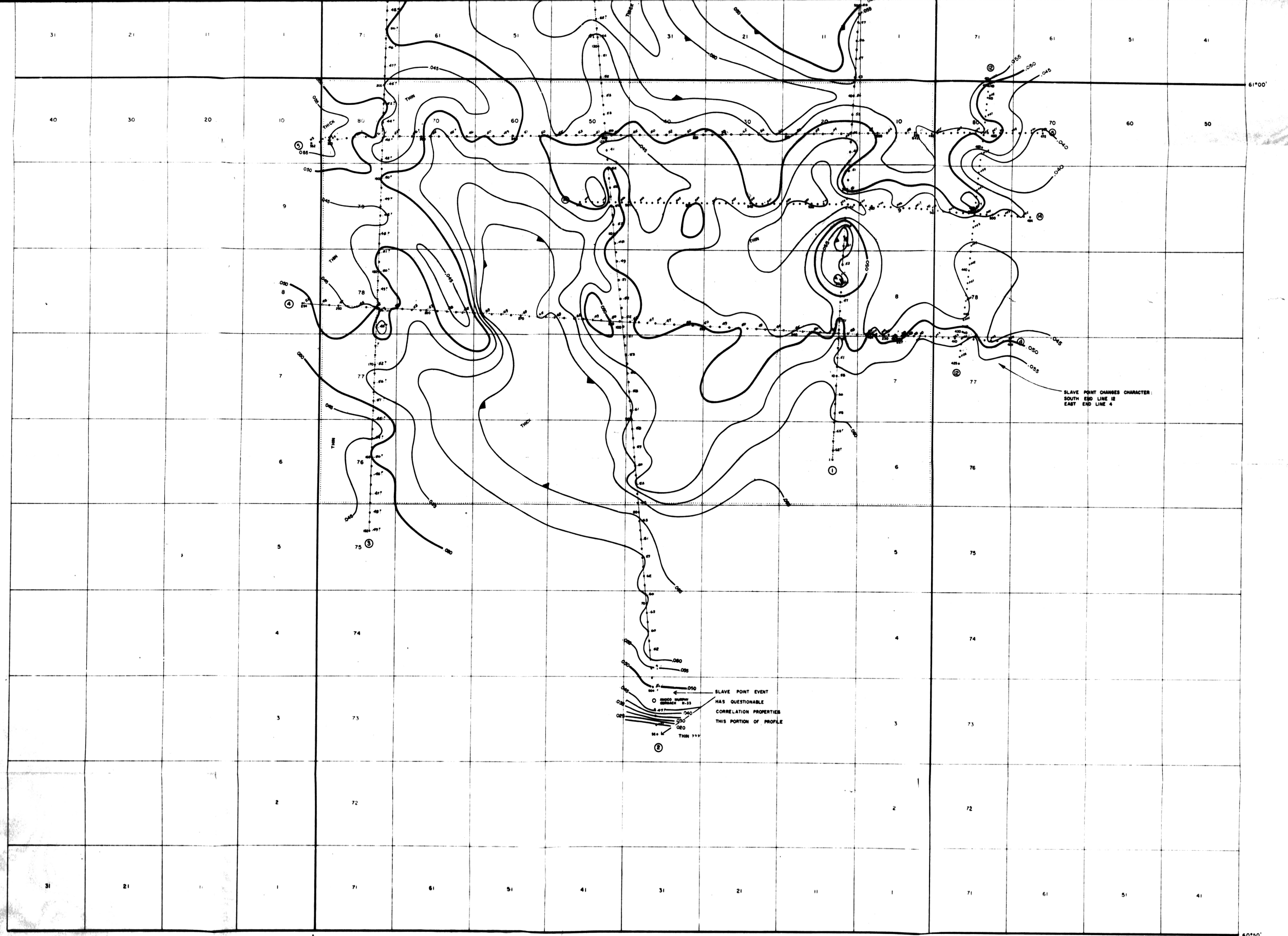
RAVEN  
NWT  
NEAR ARNICA  
STRUCTURAL CONTROL

**EXPLANATION**

- Location
- Oil Well
- ◆ Gas Well Above Line
- ◇ Gas Well
- ◆ Gas Well Above Line
- Gas Well Below Line
- Water Injection Well
- Salt Water Injection Well
- Water Pump

J S Lepos 1770 CONTOUR INTERVAL: 010 sec  
 DATUM ELEVATION: 1500' ASL  
 DATUM VELOCITY: 10,000 ft/sec  
 REV 2/71  
 2" - 1 mile  
 157

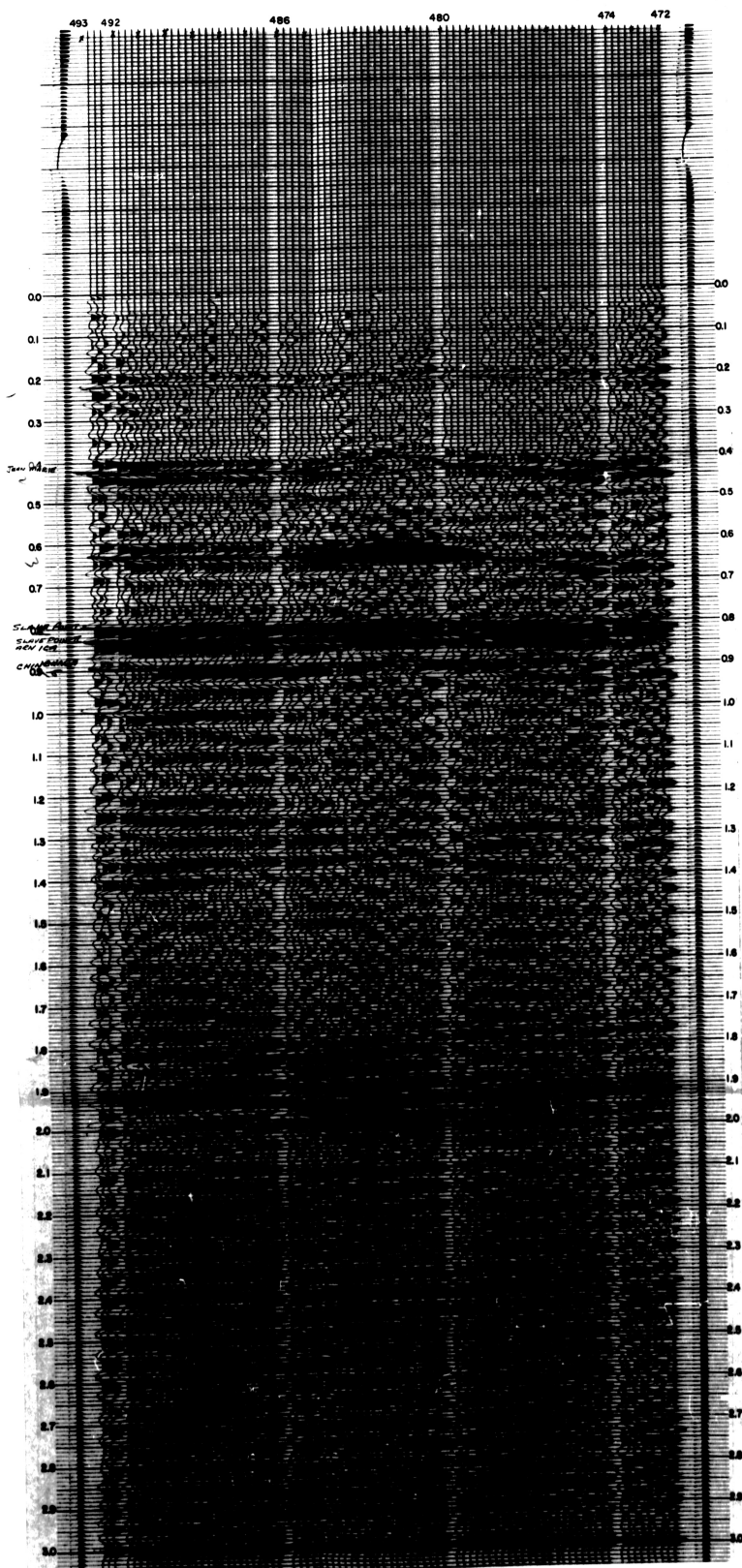




**BOWMAN & SCHULTE LTD. FOR  
GOBLES OIL AND GAS LIMITED**

**RAVEN**  
NWT  
**SLAVE POINT TO NEAR ARNICA**  
**ISOCRONAL CONTROL**

J 5 Legah 1770 CONTOUR INTERVAL 005 sec  
EXPLORATION  
H E BOWMAN 2/71 All 2"-mile M N 157



LINE CW - 5

DIRECTION

PROJECT RAVEN

CANKEE GAS COMPANY

Structure ☒ Neotoma Flat At  
Datum Velocity 10,000'/SEC, Datum 1300' ASL  
Spread 5060', Shotpoint Interval 440', Group Interval 220'  
Stack 600, % 100% Coverage  
Stackmeters 660' TO 0.350 & 2640' TO 0.650 SECS.  
TAPERED BETWEEN

PLAYBACK DATA		RECORDING DATA
INSTRUMENTS	18 M 360/44 M S 12	
AMPLIFIER TYPE	G A 33	
FILTER	OUT-1/90	
AUTOMATIC GAIN CONTROL	OFF	
MR	NIL	

DIGITAL PROCESSING

☒ FILTER TIME 0.0 3.0 SPECTRUM 16.20.50.56 Hz WITH INOTCH  
☐ FILTER TIME 1 SPECTRUM 1 Hz WITH INOTCH  
TIME 2 SPECTRUM 2 Hz WITH INOTCH  
TIME 3 SPECTRUM 3 Hz WITH INOTCH  
TIME 4 SPECTRUM 4 Hz WITH INOTCH

☐ DECONVOLUTION ☐ SPLIT ☐ TIME & SCALE ☐ SQUARED ☐ HIGHER POWER  
A/C WINDOW 1 SPECTRUM 1 Hz  
A/C WINDOW 2 SPECTRUM 2 Hz  
OPERATOR LENGTH PH OPERATOR INTERVAL MS  
MERGE ZONE MS

☐ AMPLITUDE RECOVERY SPHERICAL DIVERGENCE ☐  
DATA DEPENDENT GAIN ☐  
FIXED AMPLITUDE ☐

☐ NMO

☒ TRACE GATHER STATICS BY ☐ TXL ☐ CLIENT

☐ FULLY CORRECTED

☒ STACK

☒ ADDITIONAL STATICS & OMTS

☐ MINIMOVE, REVISED NMO

☐ MULTI-CHANNEL FILTER - TYPE \_\_\_\_\_  
AMOUNT \_\_\_\_\_ WINDOW LENGTH \_\_\_\_\_ MS

☐ AUTOCORRELOGRAM START \_\_\_\_\_ MS END \_\_\_\_\_ MS LAGS \_\_\_\_\_ MS

PROJECT SURVEYED BY CANWEST GEOPHYSICAL LIMITED

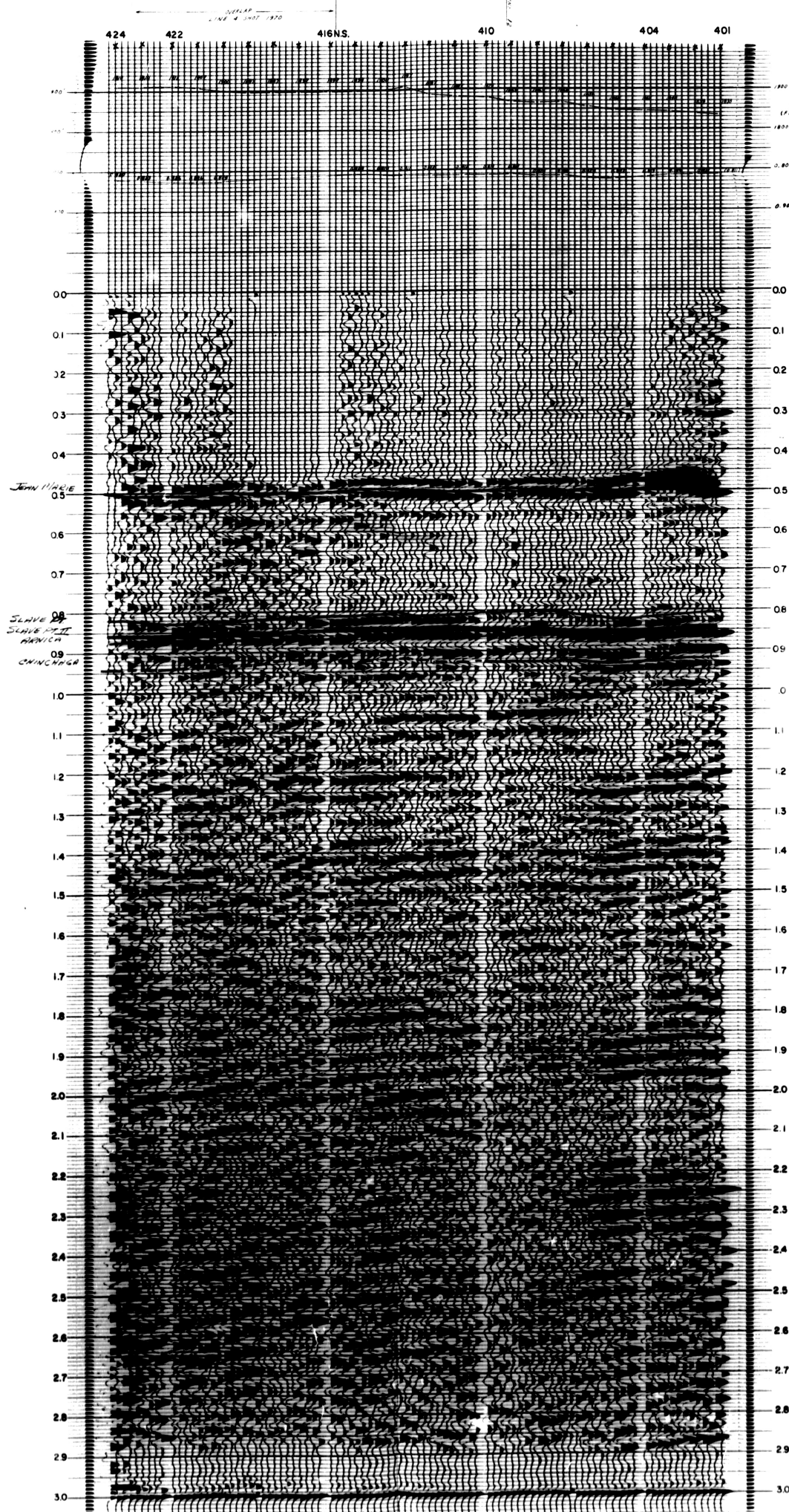
SECTION PROCESSED BY

DATE FEB 3 1971



TXL





LINE CW-4

DIRECTION

PROJECT RAVEN

CANKEE GAS COMPANY

Structural ☒ Isoschron Flat At

Datum Velocity 10,000' / SEC Datum 1300' ASL

Spread 5060' Shotpoint Interval 440' Group Interval 220'

Stack 600 % 100% Coverage

Stackmiles 660' TO 0.350 & 2640' TO 0.650 SECS

TAPERED BETWEEN

PLAYBACK DATA		RECORDING DATA	
INSTRUMENTS	I.B.M. 360/44 M.S.12	DFS III	
AMPLIFIER TYPE	G.A.33	BGA	
FILTER	OUT-1/90	12/18 - 124	
AUTOMATIC GAIN CONTROL	OFF		
W X	NIL	NIL	

DIGITAL PROCESSING

2. FILTER TIME 0.0 3.0 SPECTRUM 16 20/50 56 Hz WITH NOTCH

3. FILTER TIME SPECTRUM 1 Hz WITH NOTCH

TIME 2 SPECTRUM 2 Hz WITH NOTCH

TIME 3 SPECTRUM 3 Hz WITH NOTCH

TIME 4 SPECTRUM 4 Hz WITH NOTCH

4. DECONVOLUTION ☐ Scale var ☐ Time Scale var ☐ East Squares ☐ Hubert Four

A.C. WINDOW SPECTRUM 1 Hz

S.C. WINDOW 2 SPECTRUM 2 Hz

WINDOW LENGTH OPERATOR INTERVAL ms

5. AMPLITUDE RECOVERY SPHERICAL DIVERGENCE ☐

DATA DEPENDENT GAIN ☐

FIXED AMPLITUDE BY ☐

6. NMO

7. TRACE GATHER STATICS BY ☐ TXL ☐ CLIENT

8. FULLY CORRECTED

9. STACK

10. ADDITIONAL STATICS & OMITS

11. MINIMOVE, REVISED NMO

12. MULTI-CHANNEL FILTER - TYPE

AMOUNT WINDOW LENGTH ms

13. AUTOCORRELOGRAM

START ms END ms AUS 2ms

14. PROJECT SURVEYED BY CANWEST GEOPHYSICAL LIMITED

SECTION PROCESSED BY

DATE, FEB 3, 1971

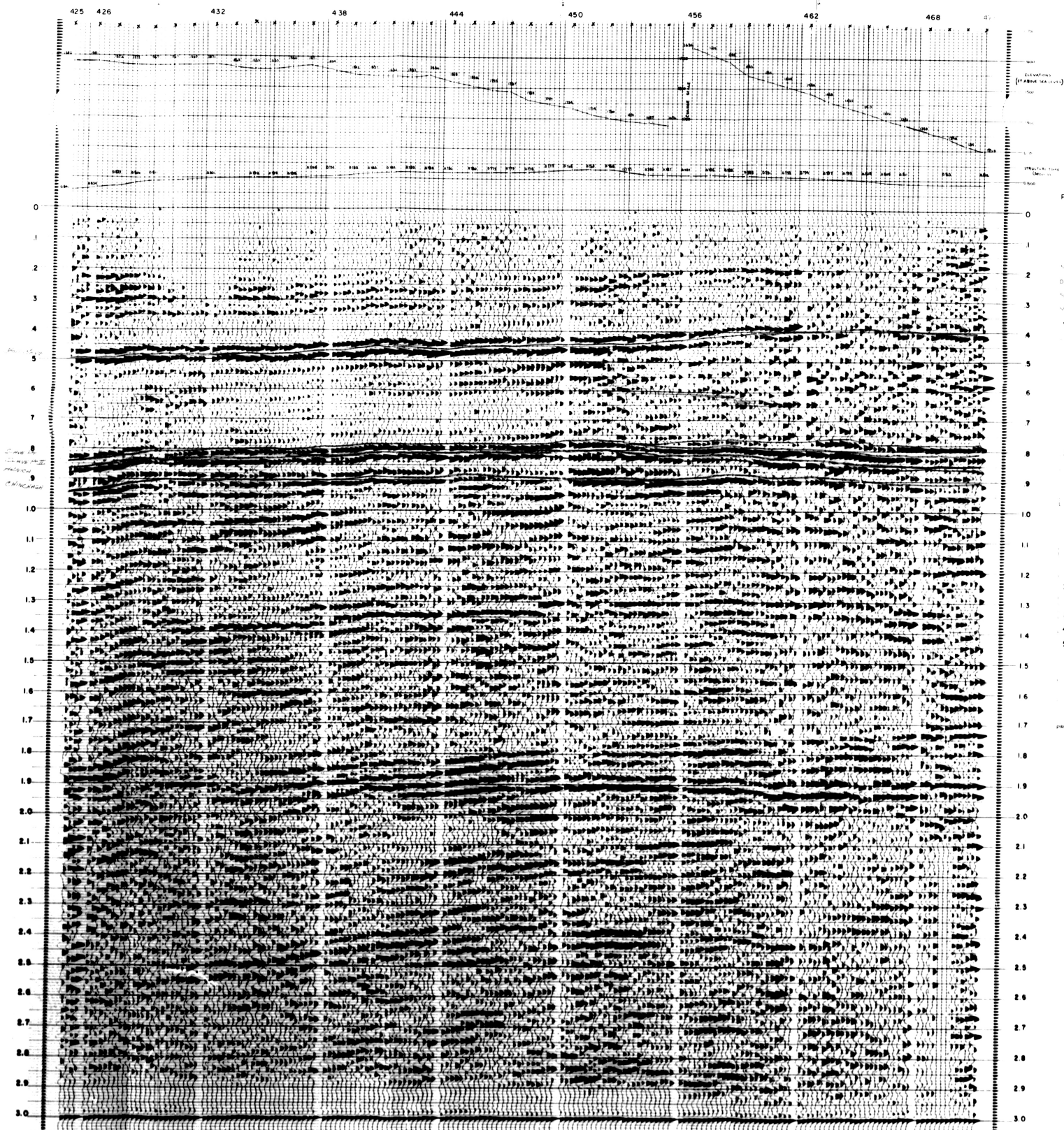


TXL









ELEVATION  
(STATION 11111)

LINE CW-12

DIRECTION NORTH

PROJECT RAVEN

KANKEE GAS COMPANY

Survey 10,000' SEC 1300' ASL  
 Spacing 5060' 440' 220'  
 Scale 600'  
 Time 1980 TO 2640 TO 0.300 SECS.

PLAYBACK DATA		RECORDING DATA	
IBM 36044 MS 12	DFS III		
GA 33	BGA		
OUT-17 90	12/18-124		
	NIL		NIL

DIGITAL PROCESSING

2 0.0 30 16 20.50 56  
 3 0.0 30 16 20.50 56  
 4 0.0 30 16 20.50 56  
 5 0.0 30 16 20.50 56  
 6 0.0 30 16 20.50 56  
 7 0.0 30 16 20.50 56  
 8 0.0 30 16 20.50 56  
 9 0.0 30 16 20.50 56  
 10 0.0 30 16 20.50 56  
 11 0.0 30 16 20.50 56  
 12 0.0 30 16 20.50 56  
 13 0.0 30 16 20.50 56  
 14 0.0 30 16 20.50 56  
 15 0.0 30 16 20.50 56  
 16 0.0 30 16 20.50 56  
 17 0.0 30 16 20.50 56  
 18 0.0 30 16 20.50 56  
 19 0.0 30 16 20.50 56  
 20 0.0 30 16 20.50 56  
 21 0.0 30 16 20.50 56  
 22 0.0 30 16 20.50 56  
 23 0.0 30 16 20.50 56  
 24 0.0 30 16 20.50 56  
 25 0.0 30 16 20.50 56  
 26 0.0 30 16 20.50 56  
 27 0.0 30 16 20.50 56  
 28 0.0 30 16 20.50 56  
 29 0.0 30 16 20.50 56  
 30 0.0 30 16 20.50 56

PROJECT ACQUISITION BY CANWEST GEOPHYSICAL LIMITED

SECTION OF SEISMIC

DATE FEB 5 1981

**TXL**