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## RESUME

### JAMES ROLLAND BROOKS

Address: 4 Verdosa Drive  
Pueblo, Colorado 81005  
Home Phone: 303 564-2530

#### PERSONAL DATA

Date of Birth: January 24, 1931  
Place of Birth: Port Huron, Michigan  
Height: 6 feet  
Weight: 170 lbs  
Health: Good  
Marital Status: Married

#### REGISTRATION

Professional Geologist State of Idaho, Registration No. 139

#### EDUCATION

Michigan Technological University 1948-1952 B.S. Geology  
South Dakota School of Mines and Technology 1954-1956 M.S. Geology

#### EXPERIENCE

May 1968 - July 1983 District Geologist, Southwest area, CF&I Steel Corporation.

Duties consisted of evaluation of coal, iron ore and limestone reserves; patenting mining claims and permitting properties; supervising exploration, shaft sinking and underground development at the Glove Mine near Amado, Arizona; and supervising non-ferrous exploration projects in Arizona, Nevada, New Mexico, and California.

Dec. 1956 - May 1968 Geologist, CF&I Steel Corporation.

Duties consisted of detailed geologic mapping both surface and underground, planning and supervising drilling programs, running geophysical and geochemical surveys and reconnaissance mapping.

As an employee of CF&I, I was responsible for finding a 50,000,000-ton hematite ore body in Gila County, Arizona; a 25,000,000-ton oxide copper deposit in Cochise County, Arizona, and several high-grade extensions of lead-zinc deposits in Santa Cruz County, Arizona.

1955 (summer employment) Geologist, Bear Creek Mining Company.  
Reconnaissance mapping and plane-table surveys.

Dec. 1952 - Sept. 1954 U.S. Army

Jun. 1952 - Dec. 1952 Geologist, U.S. Geological Survey, Florida  
Phosphate Project.

PROFESSIONAL SOCIETIES

Member AIME

PUBLICATIONS

"Wall Rock Contamination Adjoining Granite Pegmatites", M.S. Thesis,  
1956.

Dear Grover:

This letter of transmittal  
is normally inserted in  
"Section I" of the report;  
however, I felt it would  
be better if it were  
separate.

Respect

Yours



**CF&I STEEL CORPORATION**

A subsidiary of Crane Co.

P.O. Box 316

Pueblo, Colorado 81002

May 4, 1983

Mr. Grover Heinrichs, Vice President  
Commonwealth International, Inc.  
1802 West Grant Road, Suite 110-4  
Tucson, Arizona 85745

Dear Grover:

Enclosed find the report on Dragoon you requested.

Our present land status consists of 53 claims and 40 acres of state lease. We no longer have an agreement with the property owner or hold any prospecting permits.

Yours truly,

A handwritten signature in cursive script that reads 'Jim Brooks'.

James R. Brooks  
District Geologist

JRB/as  
Enclosure

**CF&I DRAGOON PROJECT**

**February 25, 1975**

**By**

**James R. Brooks**

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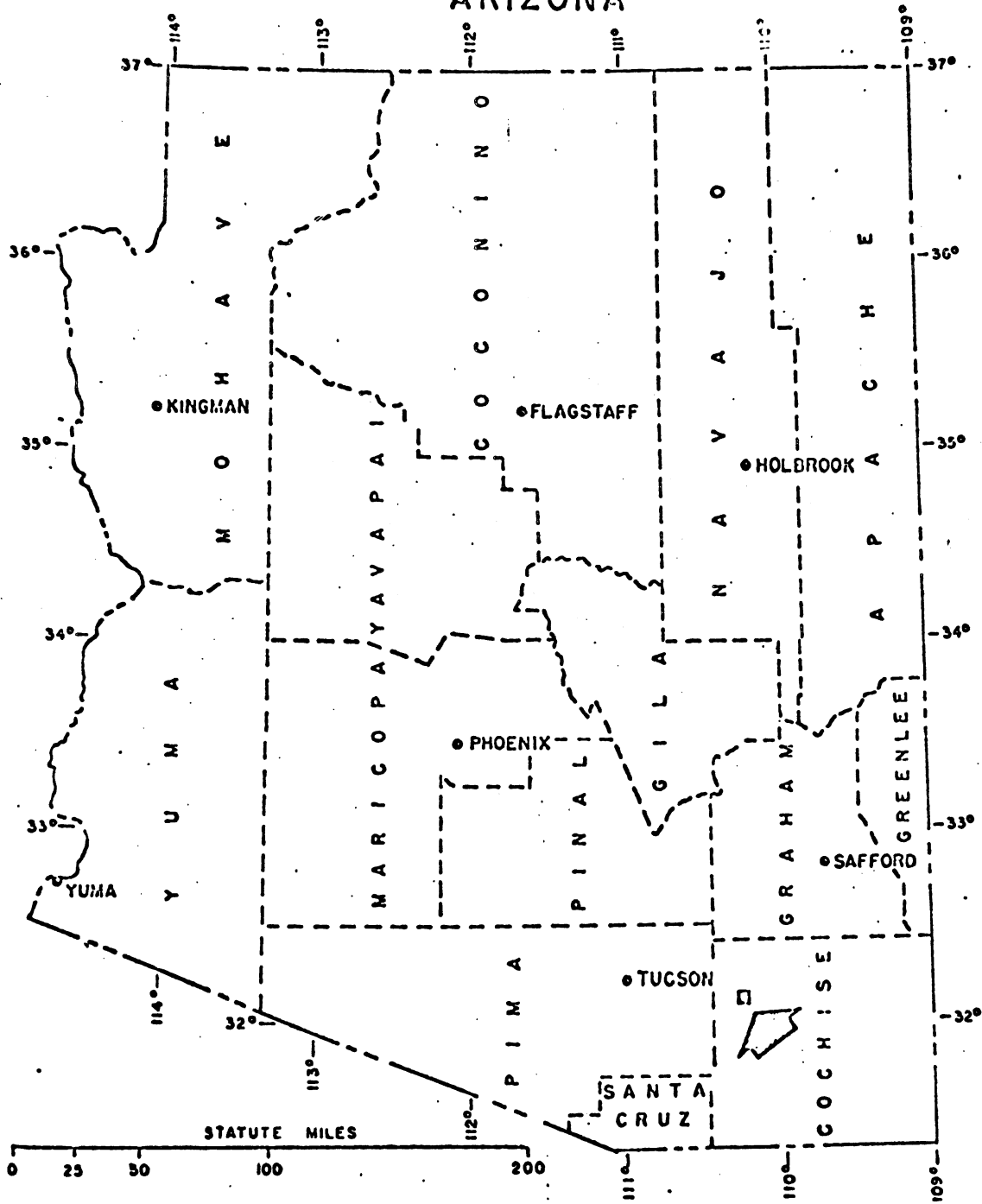
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GENERAL LOCATION OF  
DRAGOON AREA  
COCHISE COUNTY, ARIZONA  
ARIZONA



## SUMMARY

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The property is bisected by the main line of the Southern Pacific Railroad.

## INTRODUCTION

The Dragoon area, because of numerous copper shows and its proximity to Johnson Camp, has undergone several periods of mining and exploration activity. In 1909 the Empire Gold and Copper Company sank several shafts on thin copper veins with little or no success. Several exploration programs have been undertaken. The most recent was one executed by Phelps Dodge Corporation in 1965 and 1966.

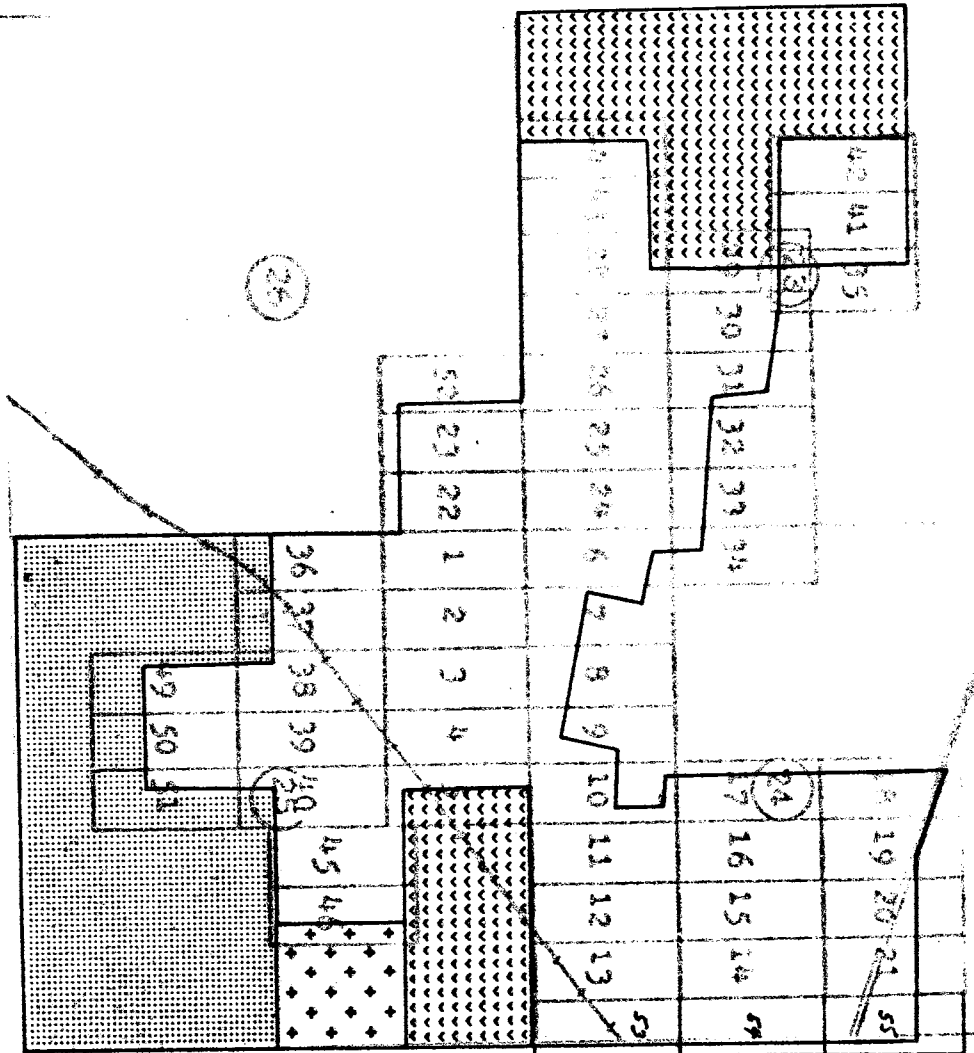
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1. Similarity of geology to Johnson Camp 6 miles north.
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3. A peculiarity in the aeromagnetic map flown by US Geological Survey in 1947.

During November and December 1967, negotiations were carried on simultaneously with Walter Diehl, Cyprus Mining Company, and Clifton Comstock while 50 federal lode claims were staked and prospecting permits were obtained on 600 acres of state land. Portions of this property have since been dropped. (See Plates I and II).

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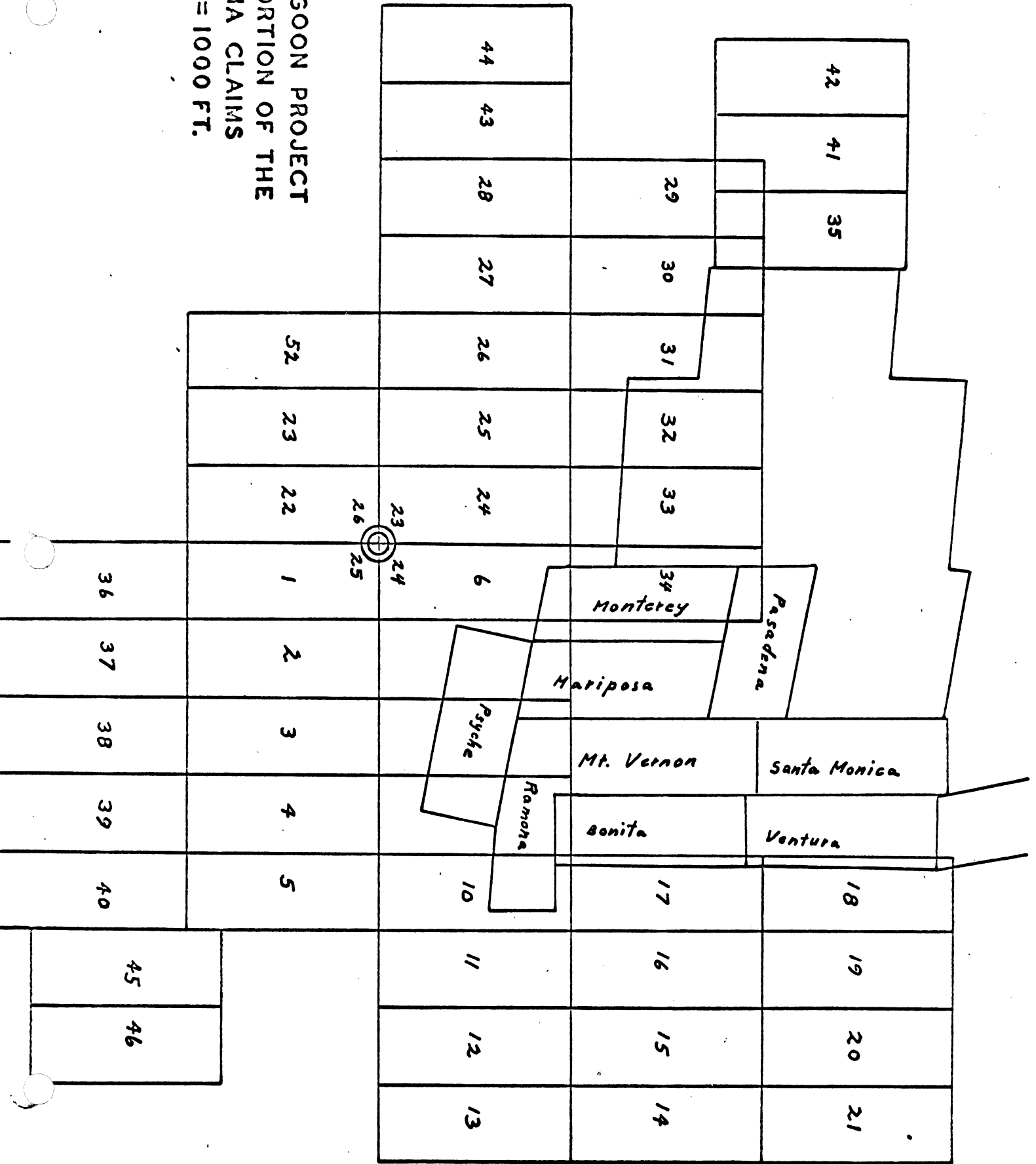
# PROPERTY MAP



STATE LEASE [diagonal hatching symbol]  
 STATE PERMIT [horizontal hatching symbol]  
 FEE LAND [dotted symbol]



DRAGON PROJECT  
A PORTION OF THE  
ALPHA CLAIMS  
1 III. = 1000 FT.



## LAND STATUS

The present property consists of 53 unpatented mining claims covering approximately 769.1 acres of patented surface, 239.8 acres of fee lands, two state mining leases comprising 40 acres, and a state prospecting permit of 280 acres.

The fee and surface ownership is under option from Clifton Comstock of Dragoon, Arizona, and expires on December 31, 1975. The option price under the present agreement is \$500,000. The state prospecting permit expires in March 1978. The property is also bisected by a 100-foot right of way of the Southern Pacific Railroad.

In December, 1970, CF&I optioned the property to The Superior Oil Company, who conducted drilling and leach tests. The option was dropped and the property returned to CF&I in November, 1974.

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The geology of the area according to Cooper (1964) is regarded as a southern zone of post-early Cretaceous thrust faults and is characterized by tight folds that trend northwest and by steep thrust faults that parallel the strike of the formations. The Texas Canyon quartz monzonite is younger than most structures and cuts them off on the west and probably also in depth. Contact metamorphism, everywhere evident, has healed fault zones and destroyed most primary sedimentary features.

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Drill hole 12 was spotted over the best IP anomaly and was drilled to 1,236 feet without encountering sulfides of significant consequence. Oxidation extended 900 feet below the surface and, therefore, renders the IP method of little importance in this area.



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During the period February 16, 1968, to March 10, 1970, CF&I drilled 24 holes totaling 18,975 feet and, as a result, blocked out approximately 5,000,000 tons of oxide copper ore averaging about 0.40 percent copper. Superior's drilling through 1973 totaled 64,117 feet in 80 holes and has geologically inferred 27,000,000 tons of material averaging 0.47 percent copper. (See Plate III). The average depth of overburden is about 200 feet.

# DRILL HOLE LOCATIONS

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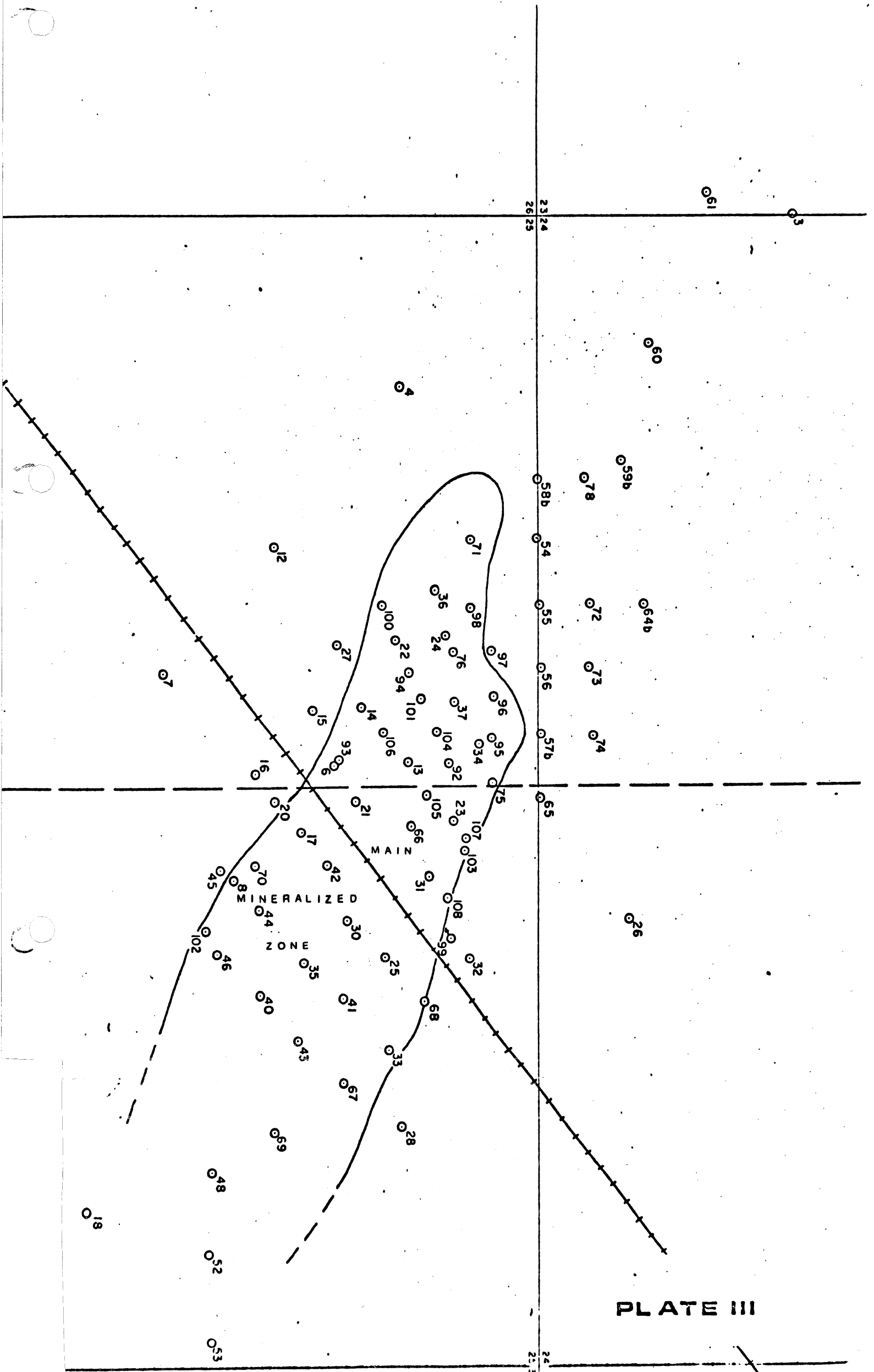


PLATE III

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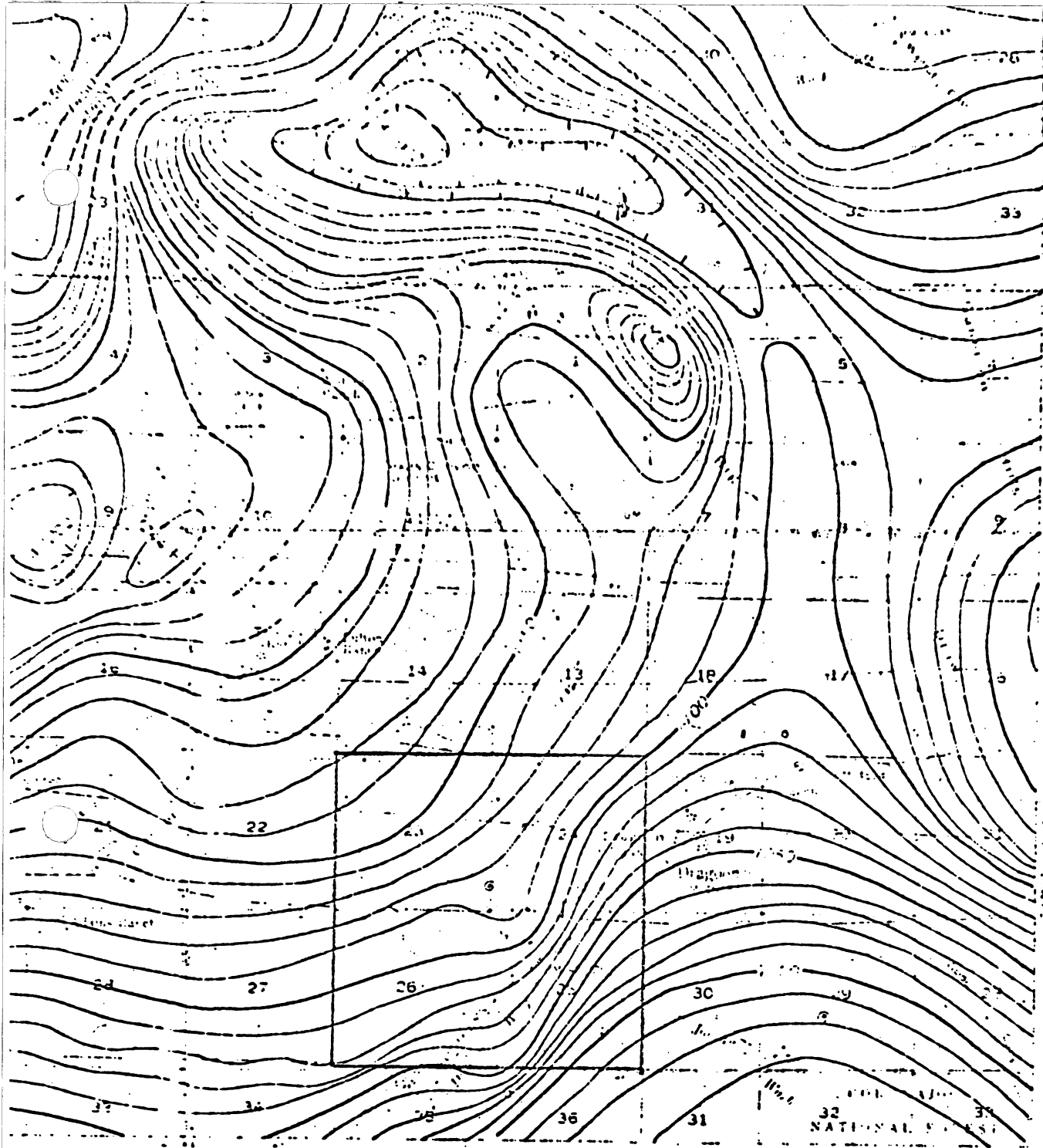
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INTERIOR GEOLOGICAL SURVEY WASHINGTON D C - 2289

Aeromagnetic survey flown at 500 feet above ground, 1947

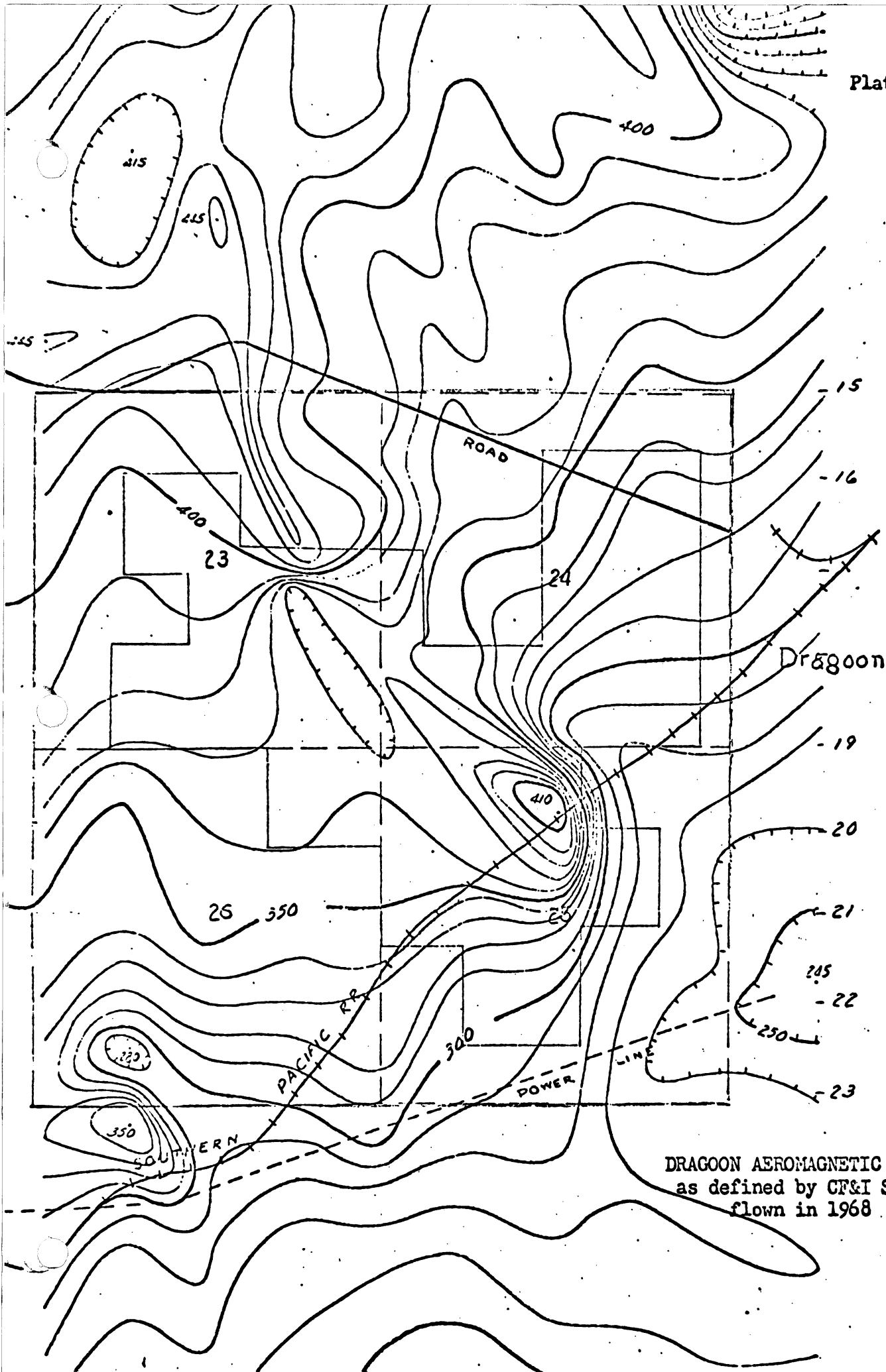
# DRAGON QUADRANGLE ARIZONA

## DRAGON AEROMAGNETIC ANOMALY as defined by USGS Survey flown in 1947

and others



GAMMAS



DRAGON AEROMAGNETIC ANOMALY  
as defined by CF&I Survey  
flown in 1968

### LEACH TESTS

Early in 1969, Dr. George H. Roseveare, Arizona Bureau of Mines, conducted a series of preliminary acid consumption and copper recovery tests to determine the feasibility of a sulfuric acid leach for the mineralized area in the vicinity of drill hole 6.

Rejects from drill hole 14 over the interval 219-419 were furnished in 25-foot increments for the tests. Results follow:

<u>Interval</u>	<u>Assay (%Cu)</u>	<u>Acid Consumed</u> (lb acid/lb Cu)	<u>% Cu recovered</u>
219 - 244	0.63	15.4	88.8
244 - 269	0.45	9.3	79.6
269 - 294	0.83	4.5	83.3
294 - 319	0.72	5.1	82.7
319 - 344	1.40	3.2	82.2
344 - 369	0.40	8.4	80.2
369 - 394	0.38	17.4	80.7
394 - 419	0.34	12.5	81.3

In view of the fact that most of the copper is acid soluble, heap leach recovery could be expected to be about 60 percent. In June, 1972, leach tests were performed on various rock units by Metcon Research, Inc. for Superior Oil. The results are as follows:

The following figures are averages of all tests for each sample submitted:

<u>Sample No.</u>	<u>Product</u>	<u>Assay</u>	<u>Percent Extraction</u>	<u>Acid Consumption</u>	
				<u>lb/ton</u>	<u>lb/lb Cu</u>
SD-M-1 Bolsa	Preg. Soln.	1.03 gpl	72.31	79.00	17.20
	Leach Tailing	0.09%			
	Calc. Head	0.33%			
SD-M-2 Earp	Preg. Soln.	0.92 gpl	57.78	125.60	26.90
	Leach Tailing	0.17%			
	Calc. Head	0.39%			
SD-M-3 Horquilla	Preg. Soln.	1.06 gpl	62.77	229.90	44.65
	Leach Tailing	0.15%			
	Calc. Head	0.41%			
SD-M-4 Abrigo	Preg. Soln.	1.80 gpl	69.63	156.30	19.56
	Leach Tailing	0.18%			
	Calc. Head	0.58%			

Column leach tests were then conducted on 6-inch core samples with separate tests being made on the Bolsa and Abrigo formations.

The copper extractions from both the Bolsa and Abrigo ore samples under heap-leaching conditions (minus 8" ore in 2' diameter, 10'-high column) were rather low, but not surprising. Bolsa sample with an extraction of 30 percent in 40 days and Abrigo ore with about 40 percent

extraction in 50 days represent a somewhat lower leaching rate than those obtained by oxide-copper heap-leaching plant practices. The mode of occurrence of copper mineralization in the ore samples indicate that leaching of finer size ore (about 2" to 3") would be more effective.

The above results clearly reveal that fracturing of the ore body would be necessary to obtain fair copper extractions under "insitu" mining conditions.

## INSITU EXPERIMENT

During the period from May 24, 1974, through July, 1974, limited acid injection and solution recovery tests were performed. The purpose of this test was to determine if copper minerals occurring in the Dragoon deposit could be dissolved and recovered by injecting acid solutions into the formation via an injection well and recovering them through another well containing a pump.

Results of this test indicate that copper can be dissolved insitu and brought to the surface via a pumping well. Copper solution grades generated during this test were subeconomic, but it is important to note that only one injection well was utilized. Solution grades were erratic, but did reach as high as 0.160 grams per liter on occasion. Dilution of the single injection well input by groundwater decreased the overall return solution grade appreciably. Simultaneous injection in, say, four wells around the recovery well would increase the copper content of the pump solutions. By the same token, simultaneous injection would also increase the amount of deleterious material formed as products of reaction.

During the test, large quantities of gypsum were formed as a result of the reaction of sulfuric acid and the free lime contained in the deposit. Formation of gypsum caused the failure of the initial recovery pump. It also precipitated on the pipe



and solution handling hardware. When the gypsum precipitated, it also brought copper out of solution with it. It is felt that the resultant precipitate was a mix of gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) and chalcantite ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ), as the precipitate had a very pronounced blue-green color and assayed 8.8 percent copper. This precipitate lowered the copper content of the recovery solutions.

Although this test has accomplished what it was designed for, economics of the process as a whole are still undetermined. Considerable additional work would be required to establish economics.

SD 100

SD 21

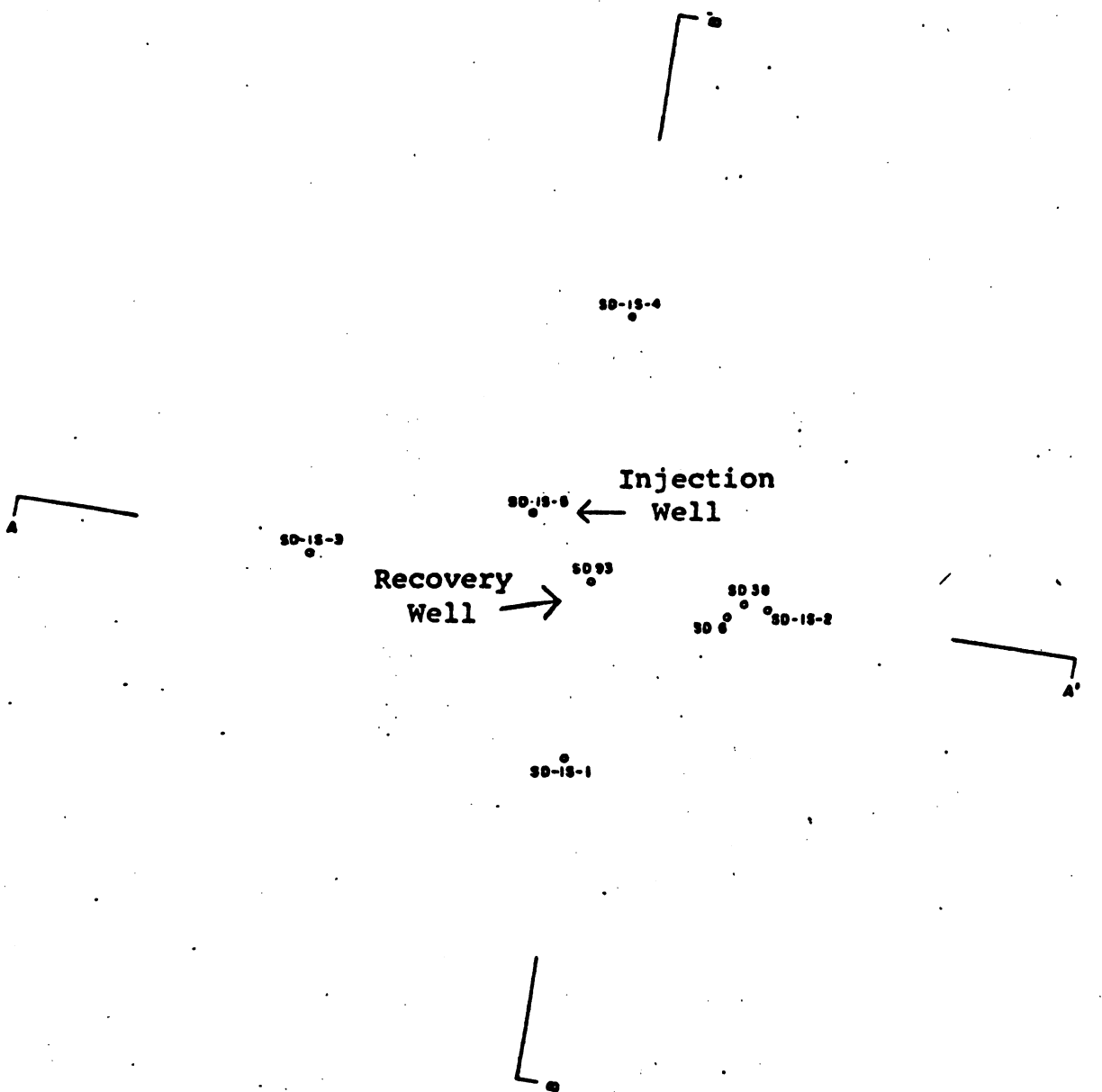
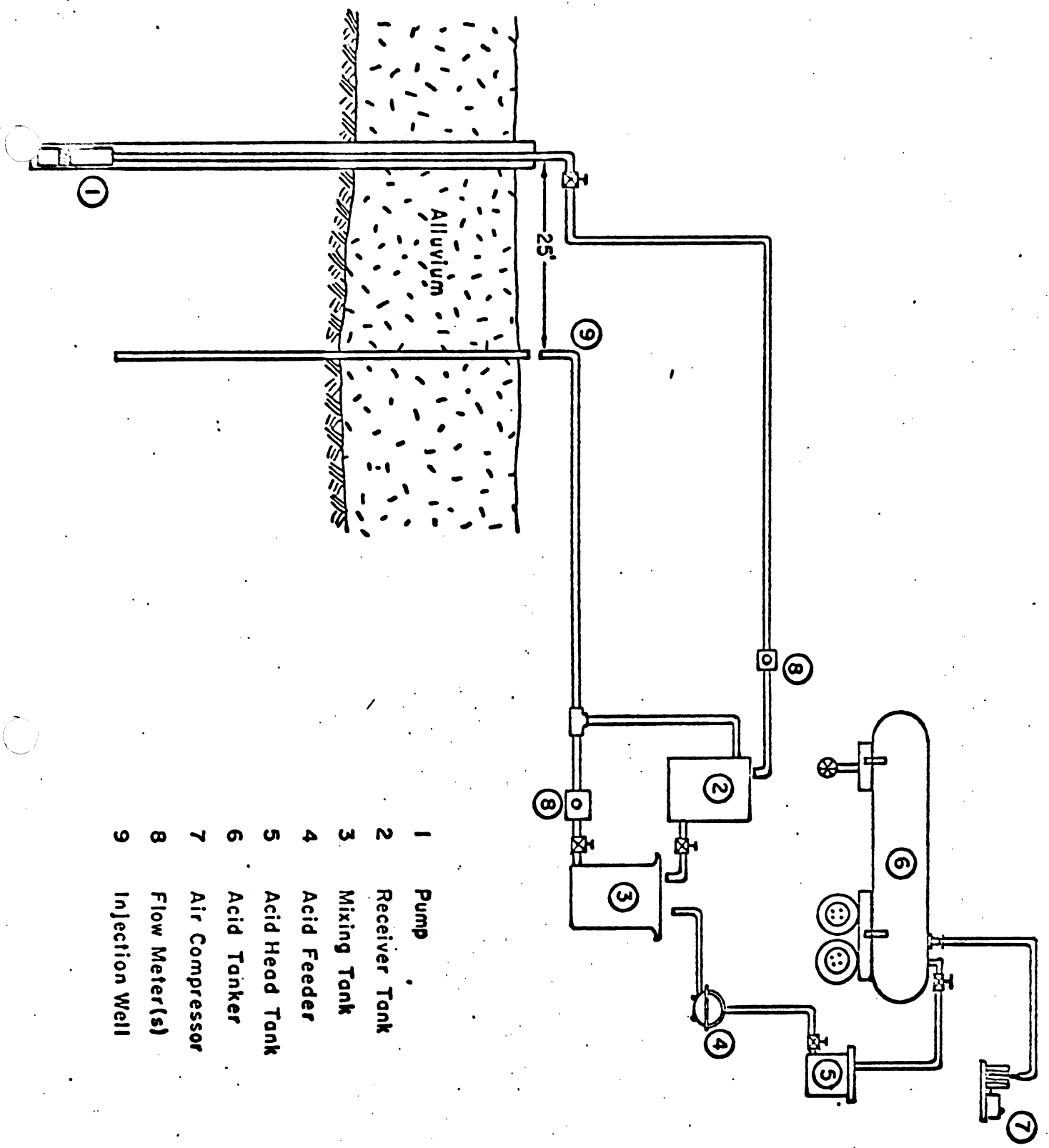


PLATE VI

<b>THE SUPERIOR OIL COMPANY Minerals Division</b>		
Title <b>DRILL HOLE PLAN MAP</b>		
Project and Location <b>DRAGON IN-SITU TEST</b>		
Compiled by:	R. W. B.	Scale 1" = 50'
Drawn by:	K. Percival	Date Sept. 1, 1973
Revised:	By:	Drawing No.



- 1 Pump
- 2 Receiver Tank
- 3 Mixing Tank
- 4 Acid Feeder
- 5 Acid Head Tank
- 6 Acid Tanker
- 7 Air Compressor
- 8 Flow Meter(s)
- 9 Injection Well

DIAGRAM OF INSITU PLANT

**CF&I DRAGON PROJECT**

**February 25, 1975**

**By**

**James R. Brooks**

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PLATES

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Property Map

Plate II

Claim Map Alpha Claims

Plate III

Drill Hole Locations

Plate IV

Dragoon Magnetic Anomaly  
USGS

Plate V

Dragoon Magnetic Anomaly  
CF&I

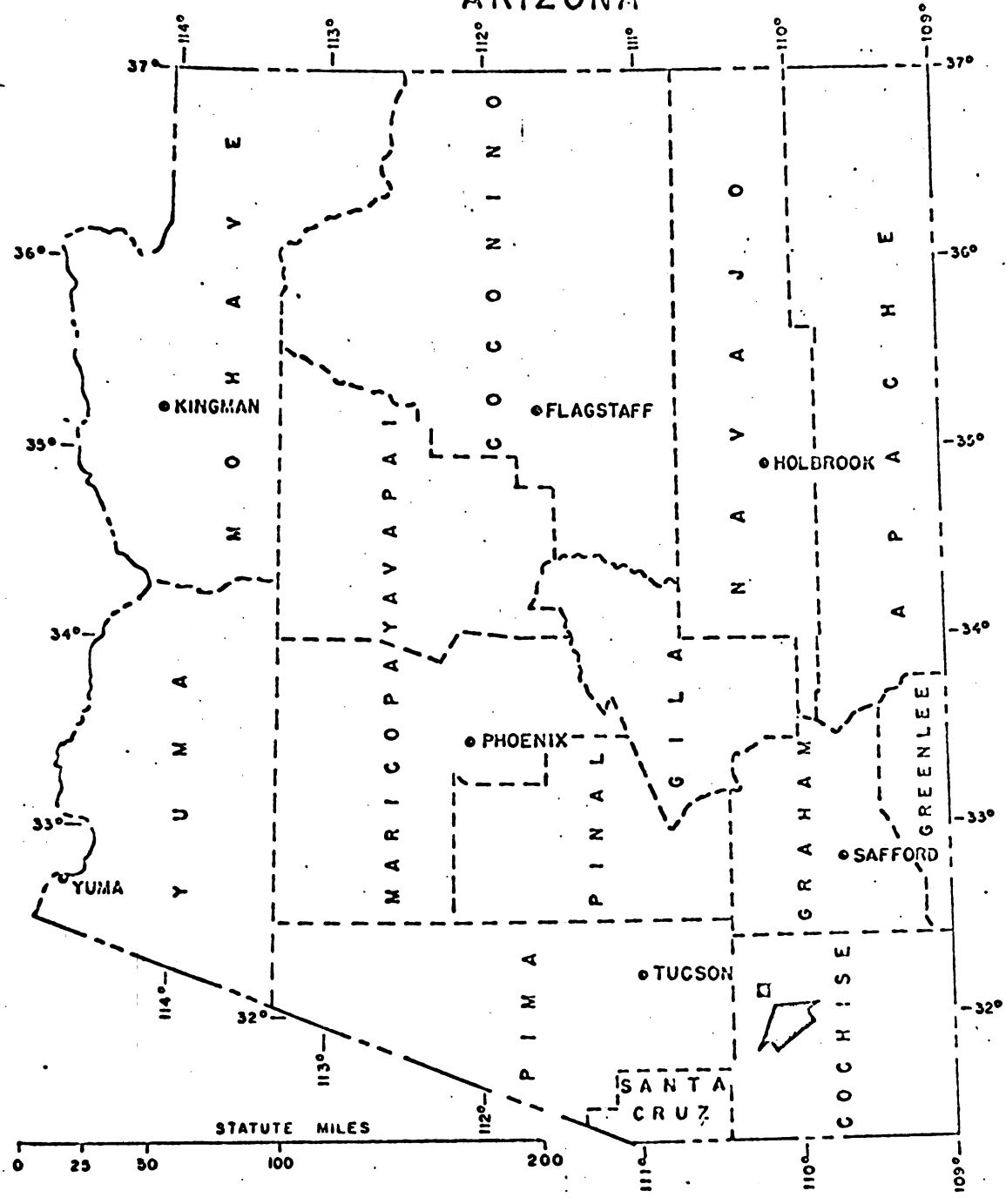
Plate VI

Insitu Test Plan Map

Plate VII

Diagram of Insitu Plant

GENERAL LOCATION OF  
DRAGOON AREA  
COCHISE COUNTY, ARIZONA  
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## SUMMARY

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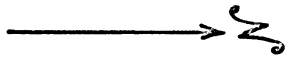
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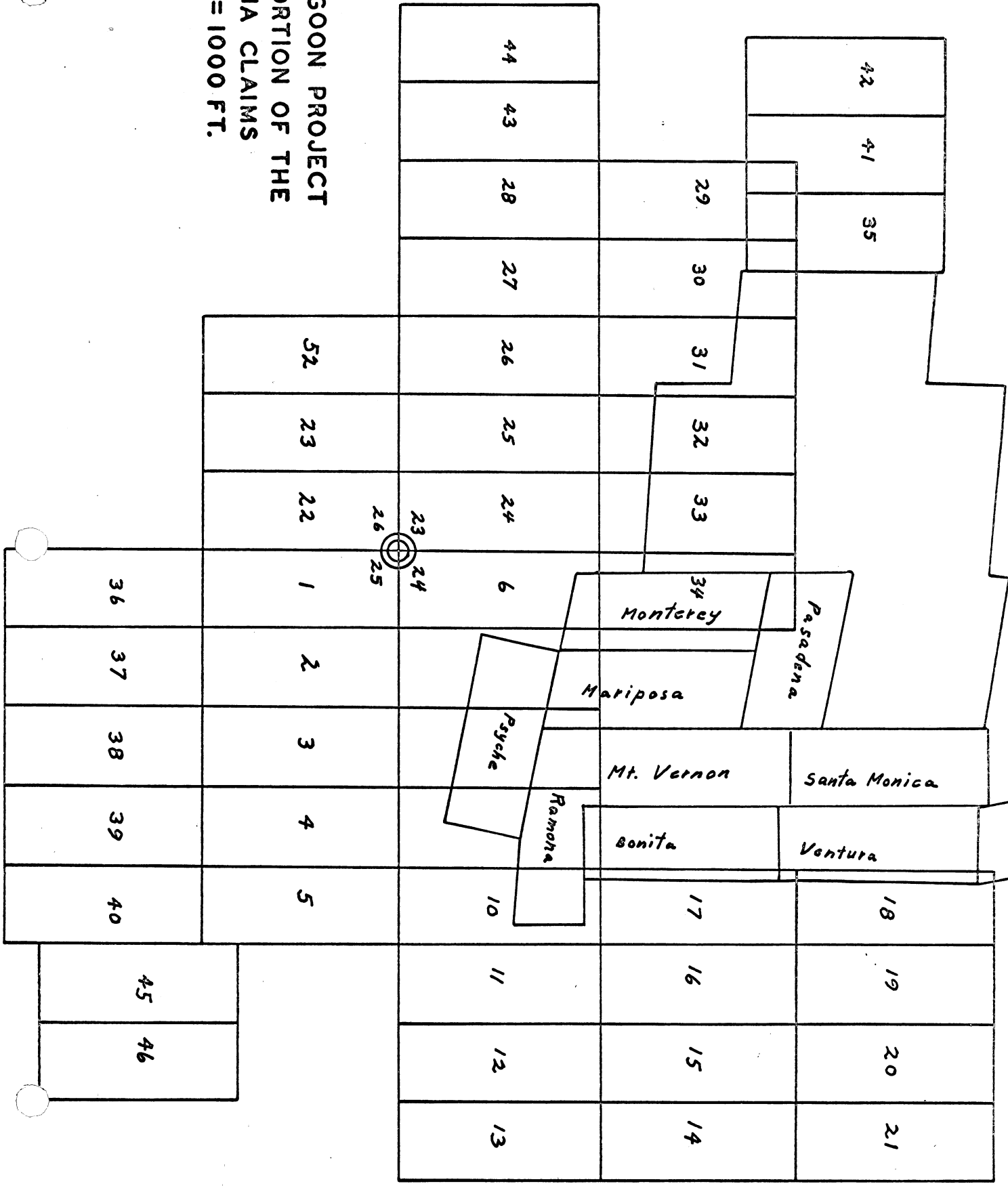
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DRAGOON PROJECT  
 A PORTION OF THE  
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LAND STATUS

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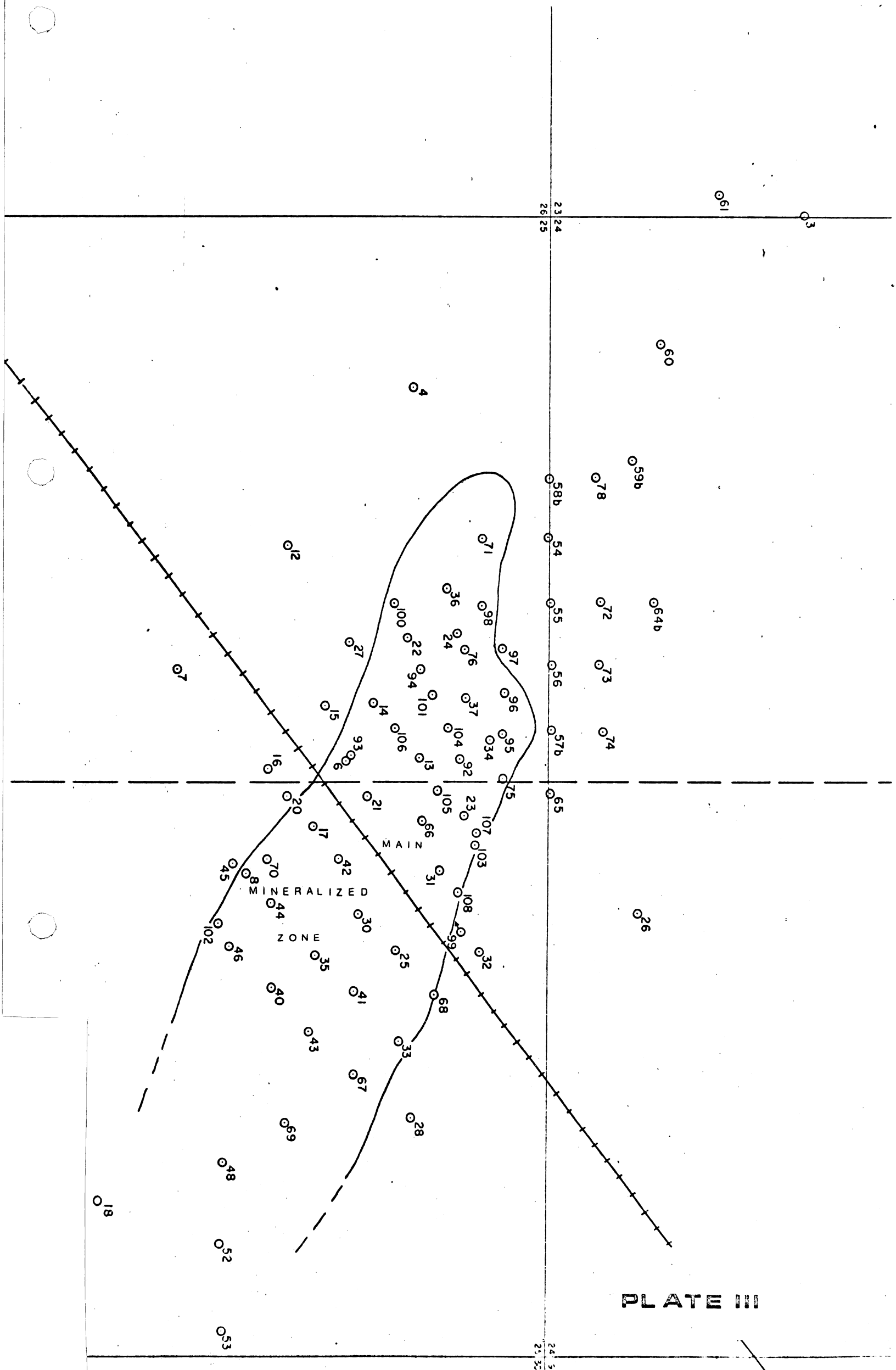
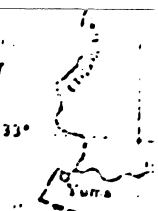
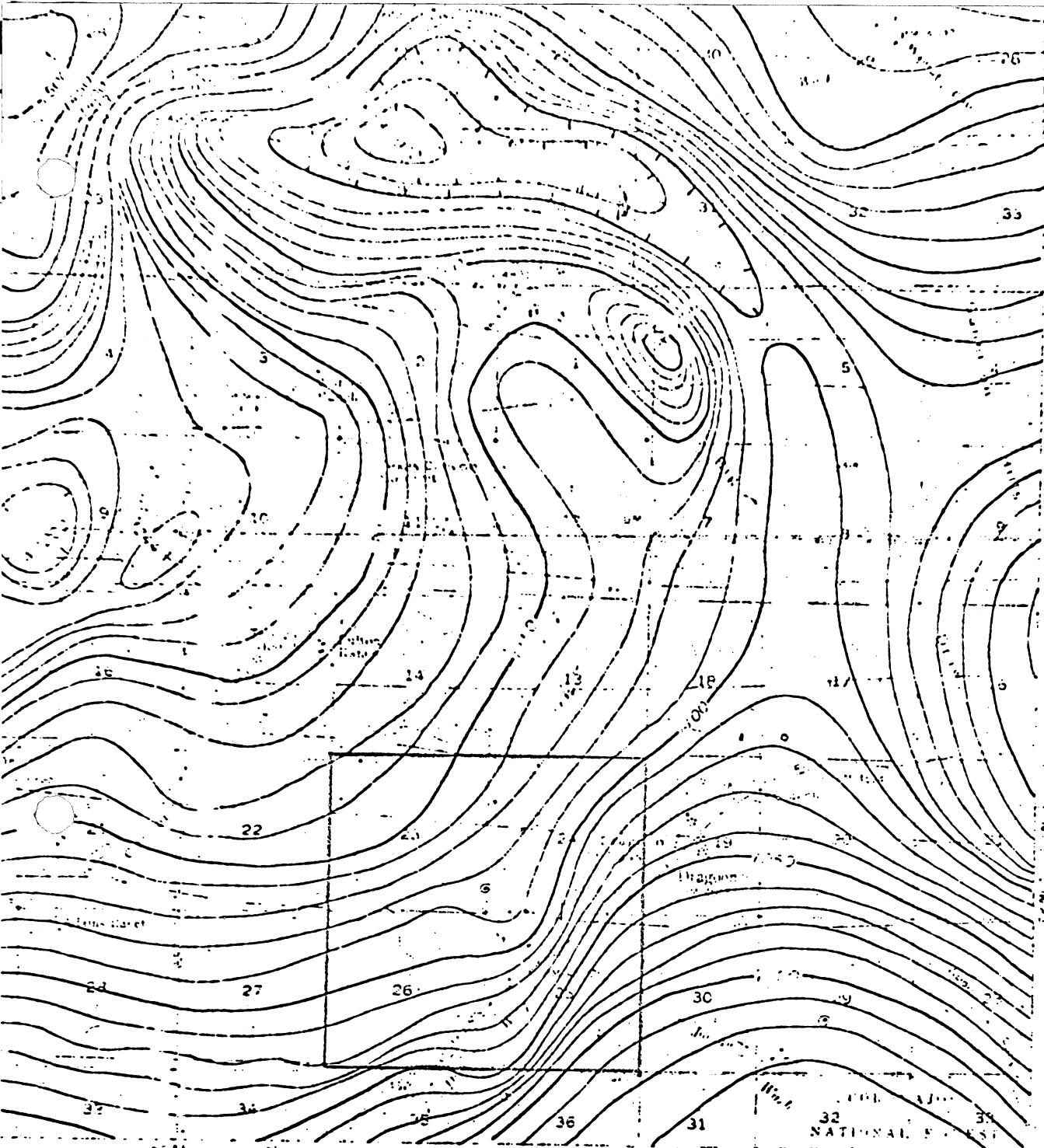


PLATE III





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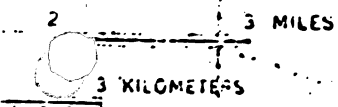
INTERIOR GEOLOGICAL SURVEY WASHINGTON D C --2389

Aeromagnetic survey flown at  
500 feet above ground, 1947

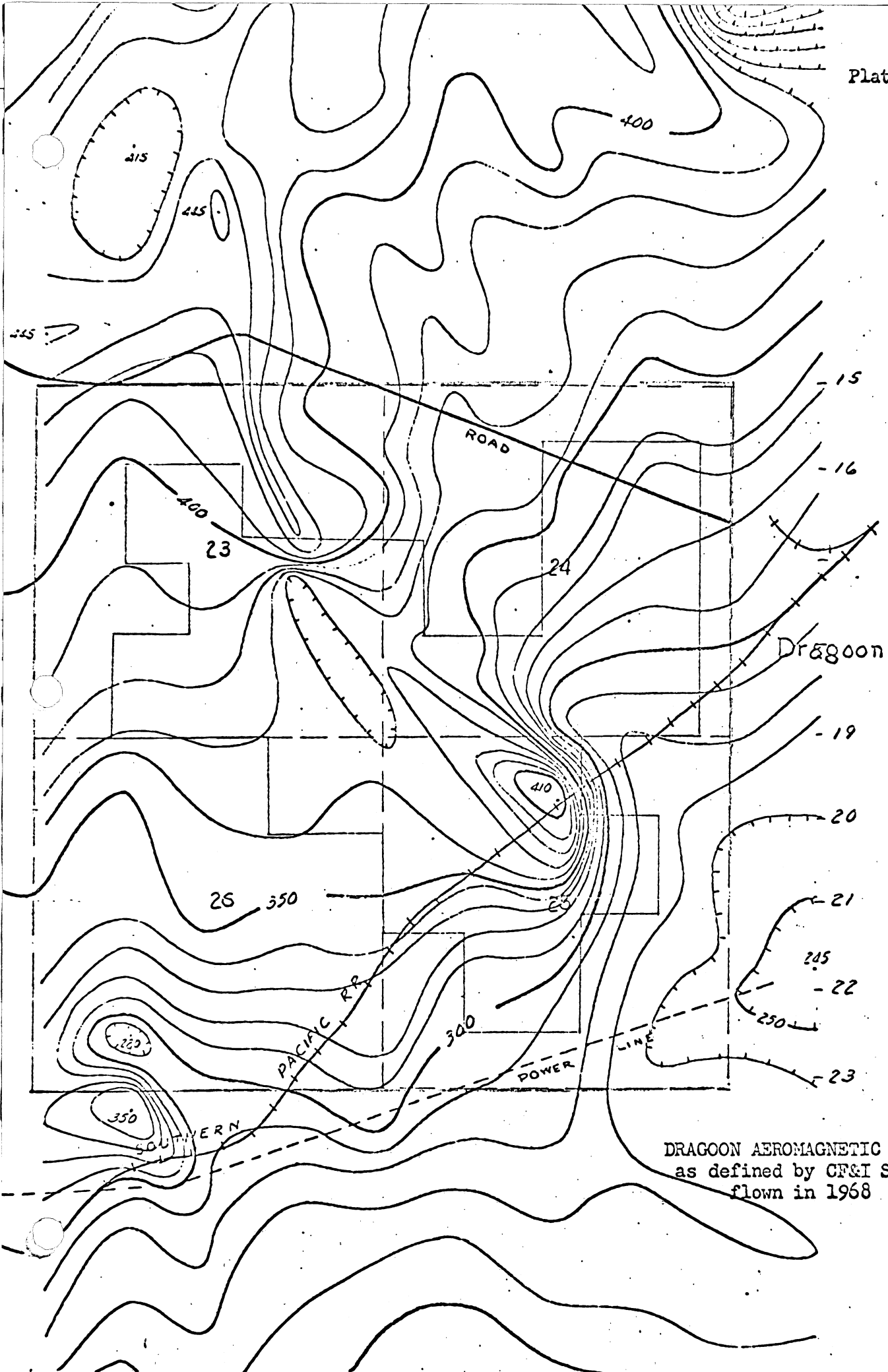
# DRAGON QUADRANGLE ARIZONA

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as defined by USGS Survey  
flown in 1947



GAMMAS



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Early in 1969, Dr. George H. Roseveare, Arizona Bureau of Mines, conducted a series of preliminary acid consumption and copper recovery tests to determine the feasibility of a sulfuric acid leach for the mineralized area in the vicinity of drill hole 6.

Rejects from drill hole 14 over the interval 219-419 were furnished in 25-foot increments for the tests. Results follow:

<u>Interval</u>	<u>Assay (%Cu)</u>	<u>Acid Consumed</u> (lb acid/lb Cu)	<u>% Cu recovered</u>
219 - 244	0.63	15.4	88.8
244 - 269	0.45	9.3	79.6
269 - 294	0.83	4.5	83.3
294 - 319	0.72	5.1	82.7
319 - 344	1.40	3.2	82.2
344 - 369	0.40	8.4	80.2
369 - 394	0.38	17.4	80.7
394 - 419	0.34	12.5	81.3

In view of the fact that most of the copper is acid soluble, heap leach recovery could be expected to be about 60 percent. In June, 1972, leach tests were performed on various rock units by Metcon Research, Inc. for Superior Oil. The results are as follows:

The following figures are averages of all tests for each sample submitted:

<u>Sample No.</u>	<u>Product</u>	<u>Assay</u>	<u>Percent Extraction</u>	<u>Acid Consumption</u>	
				<u>lb/ton</u>	<u>lb/lb Cu</u>
SD-M-1 Bolsa	Preg. Soln.	1.03 gpl	72.31	79.00	17.20
	Leach Tailing	0.09%			
	Calc. Head	0.33%			
SD-M-2 Earp	Preg. Soln.	0.92 gpl	57.78	125.60	26.90
	Leach Tailing	0.17%			
	Calc. Head	0.39%			
SD-M-3 Horquilla	Preg. Soln.	1.06 gpl	62.77	229.90	44.65
	Leach Tailing	0.15%			
	Calc. Head	0.41%			
SD-M-4 Abrigo	Preg. Soln.	1.80 gpl	69.63	156.30	19.56
	Leach Tailing	0.18%			
	Calc. Head	0.58%			

Column leach tests were then conducted on 6-inch core samples with separate tests being made on the Bolsa and Abrigo formations.

The copper extractions from both the Bolsa and Abrigo ore samples under heap-leaching conditions (minus 8" ore in 2' diameter, 10'-high column) were rather low, but not surprising. Bolsa sample with an extraction of 30 percent in 40 days and Abrigo ore with about 40 percent

extraction in 50 days represent a somewhat lower leaching rate than those obtained by oxide-copper heap-leaching plant practices. The mode of occurrence of copper mineralization in the ore samples indicate that leaching of finer size ore (about 2" to 3") would be more effective.

The above results clearly reveal that fracturing of the ore body would be necessary to obtain fair copper extractions under "insitu" mining conditions.

## INSITU EXPERIMENT

During the period from May 24, 1974, through July, 1974, limited acid injection and solution recovery tests were performed. The purpose of this test was to determine if copper minerals occurring in the Dragoon deposit could be dissolved and recovered by injecting acid solutions into the formation via an injection well and recovering them through another well containing a pump.

Results of this test indicate that copper can be dissolved insitu and brought to the surface via a pumping well. Copper solution grades generated during this test were subeconomic, but it is important to note that only one injection well was utilized. Solution grades were erratic, but did reach as high as 0.160 grams per liter on occasion. Dilution of the single injection well input by groundwater decreased the overall return solution grade appreciably. Simultaneous injection in, say, four wells around the recovery well would increase the copper content of the pump solutions. By the same token, simultaneous injection would also increase the amount of deleterious material formed as products of reaction.

During the test, large quantities of gypsum were formed as a result of the reaction of sulfuric acid and the free lime contained in the deposit. Formation of gypsum caused the failure of the initial recovery pump. It also precipitated on the pipe

and solution handling hardware. When the gypsum precipitated, it also brought copper out of solution with it. It is felt that the resultant precipitate was a mix of gypsum ( $\text{CaSO}_4\cdot 2\text{H}_2\text{O}$ ) and chalcantite ( $\text{CuSO}_4\cdot 5\text{H}_2\text{O}$ ), as the precipitate had a very pronounced blue-green color and assayed 8.8 percent copper. This precipitate lowered the copper content of the recovery solutions.

Although this test has accomplished what it was designed for, economics of the process as a whole are still undetermined. Considerable additional work would be required to establish economics.

SD-15-4

Injection Well ← SD-15-5

Recovery Well → SD-15-3

SD 93

SD 38

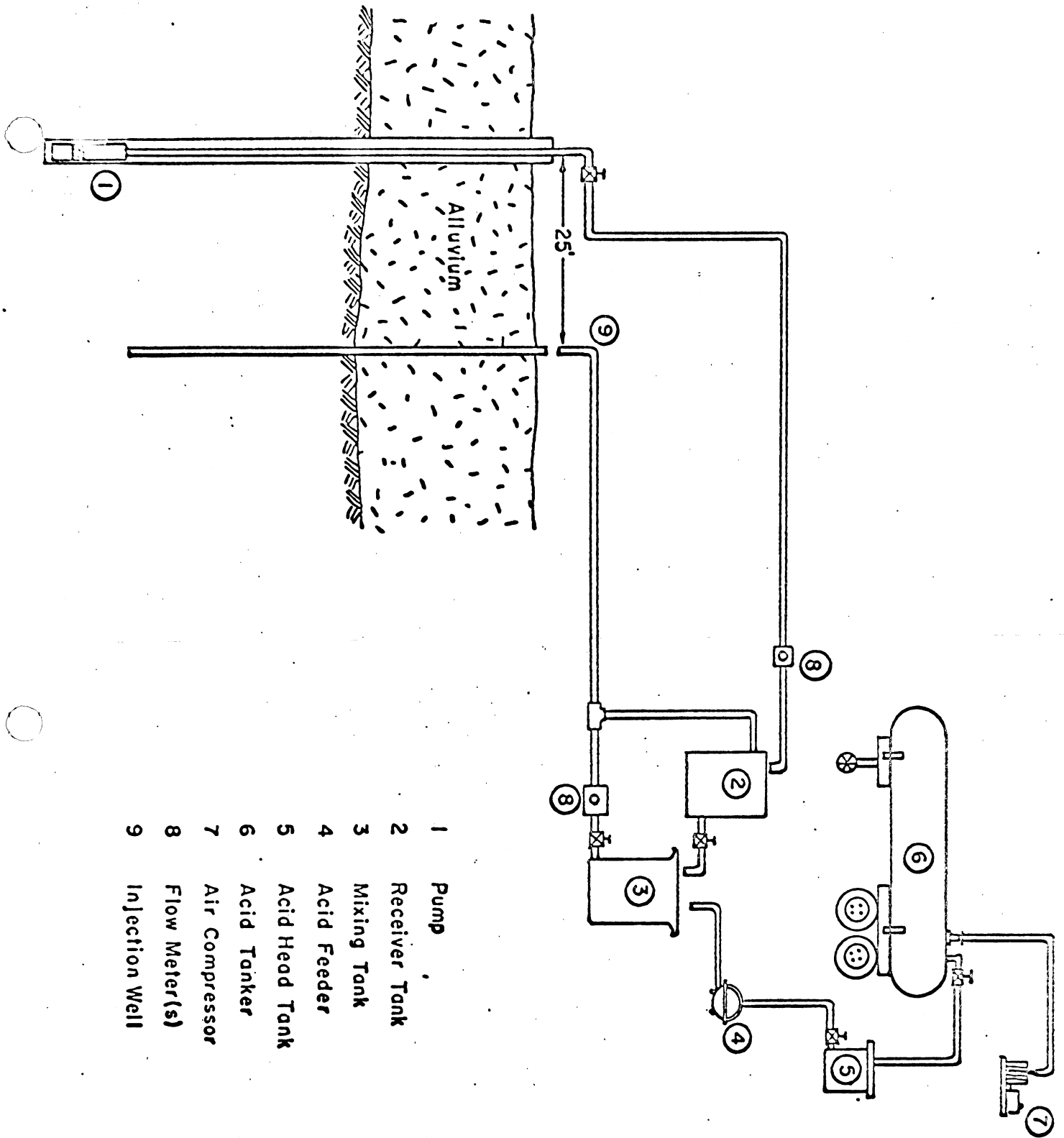
SD SD-15-2

SD-15-1

PLATE VI

<b>THE SUPERIOR OIL COMPANY</b>	
Minerals Division	
Title	
DRILL HOLE PLAN MAP	
Project and Location	
DRAGOON IN-SITU TEST	
Compiled by:	R. W. B.
Scale	1" = 50'
Drawn by:	K. Percival
Date:	Sept. 1, 1973
Revised:	By:
	Drawing No.





- 1 Pump
- 2 Receiver Tank
- 3 Mixing Tank
- 4 Acid Feeder
- 5 Acid Head Tank
- 6 Acid Tanker
- 7 Air Compressor
- 8 Flow Meter(s)
- 9 Injection Well

DIAGRAM OF INSITU PLANT