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GEOEXPLORATION AND MINERAL RESEARCH
TUCSON, ARIZONA

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BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578

Mr. E. Grover Heinrichs
Vice President
Heinrichs Geoexploration Company
P. O. Box 5671
Tucson, Arizona 85703

Dear Mr. Heinrichs:

In answer to your request I am enclosing a copy of the paper on exploration at Lakeshore that I prepared for the annual meeting of the New Mexico Mining Association which was held in El Paso on November 16 - 19, 1969.

Thank you.

Sincerely,

Claude E. Barron

Claude E. Barron
Senior Mining Geologist
Mining Division

CEB:mp

EXPLORATION AT LAKESHORE MINE

Pinal County, Arizona

By

Claude E. Barron
Senior Mining Geologist
El Paso Natural Gas Company

ABSTRACT

As the result of a general reconnaissance of the Slate Mountain area, an interpretation of the geology was made that assumed (1) the oxide tactite ore body in the Lakeshore Pit had been overturned by tilting to the northwest, (2) that these metasediments would be in place underlying the andesite west of the pit and would trend generally northwest parallel to the trend of the Slate Mountains, and (3) that the strong northwest and north-south fault and fracture system which was exposed in the pit would offer channels for migrating mineralized solutions permitting the deposition of sulphides at depth.

A proposed correlation of this interpretation with Induced Polarization anomalies involved an area that extended to the south and northwest of the Lakeshore Pit. This area was recommended for deep drilling to test the weak I. P. anomalies for sulphide mineralization.

Contour maps based on assay and geological data from gyroscopically surveyed drill holes offered control for delineation and computer evaluation of the discovered ore body.

EXPLORATION AT LAKESHORE MINE

Pinal County, Arizona

Claude E. Barron

Senior Mining Geologist

El Paso Natural Gas Company

INTRODUCTION

The Lakeshore mineral deposit outcrops on the southwest piedmont of the Slate Mountains in Section 25, T10S, R4E, Pinal County, Arizona. This location is in the Papago Indian Reservation, approximately 30 miles south of Casa Grande, Arizona.

In the Basin and Range Province of southwest Arizona, the Slate Mountains form an arcing outcrop that trends from northwest to north, and reaches an elevation of 3330 feet at Prieta Peak near the center of the range. The Lakeshore Mine, about 2 miles south of Prieta Peak, is at an elevation of approximately 1800 feet. Vegetation in the valley is of the desert variety, capable of surviving in the hot summer temperature and the few inches of annual precipitation.

PREVIOUS WORK

Rocks in the Slate Mountains were described in an unpublished thesis by Hogue (1) in 1940. The Lakeshore copper deposits were investigated by the U. S. Bureau of Mines (2) in 1950. Precambrian and Paleozoic sedimentary rocks of the area were described by McClymonds (3) in 1959. Geologic maps prepared by the Arizona Bureau of Mines (4) in 1960 show rocks in the Slate Mountain area range in age from Precambrian to Quaternary. Sedimentary rocks of the northern Slate Mountains have been described in detail in an unpublished thesis by Hammer (5) in 1961. Other work describing surface geology and sub-surface data obtained from shallow drilling is contained in several unpublished reports made by consultants for Transarizona.

HISTORY

The mineral outcrop, consisting primarily of copper silicates and iron oxides, was located by Trout and Atchison in the early 1880's. Abandoned in 1884, the property was relocated by B. S. Wilson in 1905. In 1914 Wilson sold the property to Frank M. and Charles Leonard.

The Leonards, who developed the ore body on three levels while working through a 225 foot vertical shaft, leased the property in 1917. This lease was terminated in 1919. The next noteworthy work to be conducted was an examination of the property by the U. S. Bureau of Mines in 1942 which initiated an investigation that started in 1948 and concluded with a report in 1950.

In November 1955, the three patented claims of the Lakeshore property and the Drake claims, consisting of three patented and 19 unpatented claims, were obtained by George Freeman under a lease-option agreement from Treasure State Mining Company. In 1956, a 580 acre lease surrounding these claims was obtained from the Bureau of Indian Affairs by Dwight McClure and George Freeman. In 1960 the Bureau of Indian Affairs approved an assignment of the lease to Transarizona Resources Inc.

El Paso Natural Gas Company's interest in the property was initiated by an invitation to examine the property in September 1962. At that time, the writer made an examination of the mine and plant. Transarizona had developed the mine as a small open pit. Exploration drilling on a closely-spaced drill pattern indicated $\pm$ 1.5 million tons of $\pm$ 1.75% copper oxide. Level maps and cross-sections prepared from the drill data indicated the mineral deposit formed a V-shaped trough that plunged to the southwest, and was controlled by faults.

The Plant had been designed for a copper segregation process that was followed by flotation.

As a result of the examination, a recommendation for a more complete evaluation of the property was made but the request was not approved. However, in June 1963, a limited amount of drilling was conducted in the open pit and a feasibility study of the segregation process was made.

In August 1966, under the direction of the Mining Division of El Paso Natural Gas Company, an induced Polarization survey was conducted on the Lakeshore property by McPhar Geophysical Limited and, at the same time, the writer began a general geological survey of the area.

In September 1966 a core drilling program was initiated to investigate the I. P. anomalies that were discovered on the property.

In February 1969, El Paso Natural Gas Company announced an agreement with Hecla Mining Company for development of a major new copper discovery made by the Mining Division on the Lakeshore property.

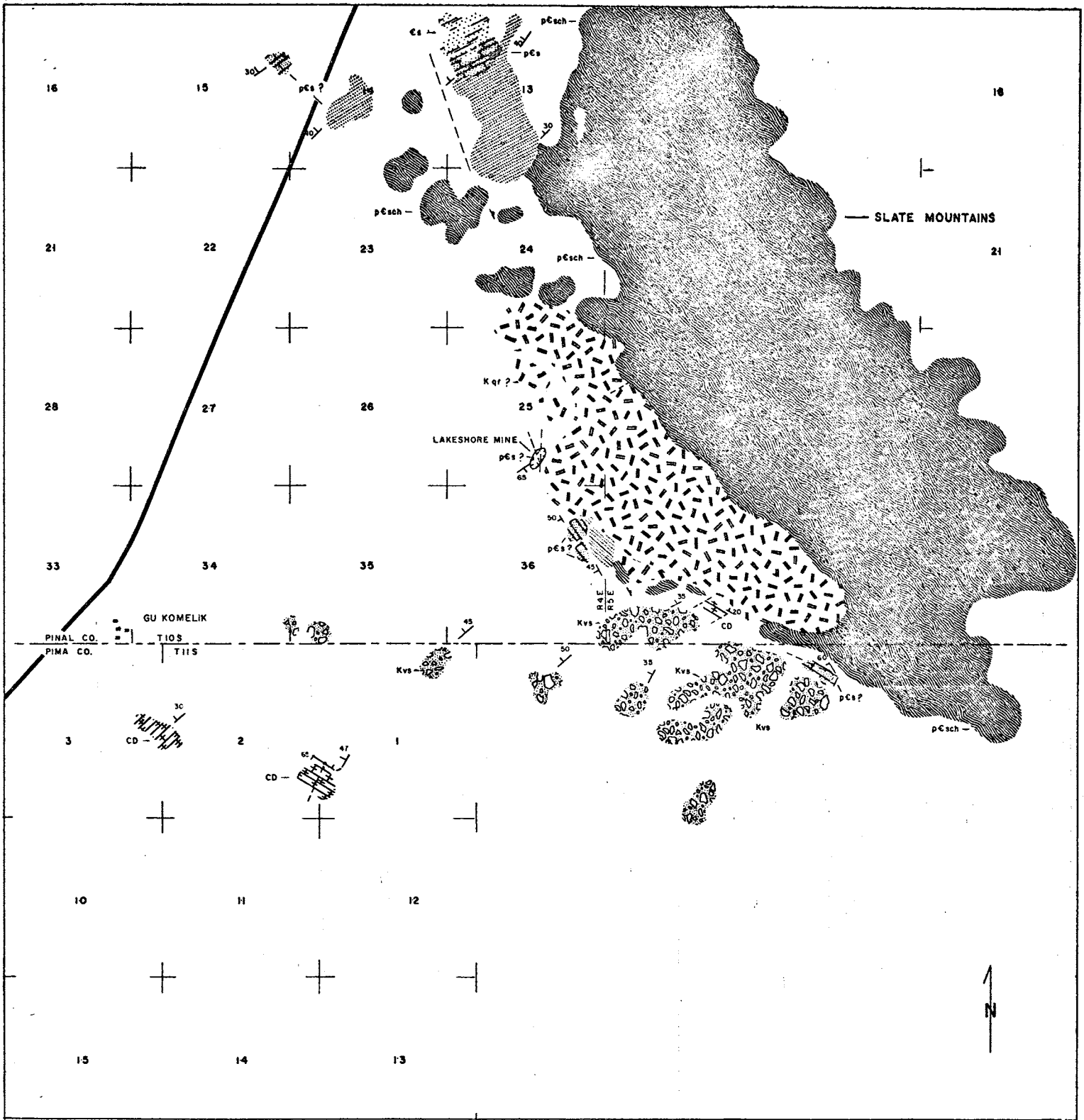
GENERAL GEOLOGY

Reconnaissance of the Slate Mountain Area

The Slate Mountains (Fig. 1), composed primarily of the Pinal Schist formation of Precambrian age (4), strike N $\pm$ 45W and dip $\pm$ 50° NE. Near the center of the mountains, an elongated mass of quartz diorite has intruded the schist. This intrusive mass tends to parallel the foliation of the schist and was identified as being Precambrian in age (4). However, recent work by P. E. Damon and R. L. Mauger (6) has dated this intrusive by the potassium-argon process as Laramide (Cretaceous-Tertiary). Along the northeast slopes of the mountains, the schist dips under the alluvium and fanglomerates at the edge of the valley.

At the north end of the Slate Mountains, the Pioneer Shale, the Dripping Springs Quartzite, and the Mescal Limestone of the Precambrian Apache Group (4) strike N $\pm$ 40° E and dip $\pm$ 45° NW. These northwest dipping metasediments overlie the northwest trending Pinal Schist with angular unconformity. Overlying the Apache Group is the Abrigo Limestone and Troy Quartzite of Early Cambrian age (4) and the limestone, quartzite and shales of Devonian and Carboniferous age (4). Along the southwest slope of the Slate Mountains and to the southeast, outcrops of these formations generally dip to the southwest and strike parallel with the trend of the mountains.

Around the southwest periphery of the Slate Mountains and protruding through the valley fill, are outlying hills of Devonian and Carboniferous limestone, Cretaceous volcanic and sedimentary rocks and Tertiary andesite and breccia (4). The Devonian



QUATERNARY ALLUVIUM

CRETACEOUS SEDIMENTARY AND VOLCANIC ROCKS

CRETACEOUS? GRANITE (QUARTZ DIORITE)

CARBONIFEROUS AND DEVONIAN LIMESTONE

CAMBRIAN BOLSA QUARTZITE

YOUNGER PRECAMBRIAN MESCAL LIMESTONE

YOUNGER PRECAMBRIAN DRIPPING SPRINGS QUARTZITE AND PIONEER SHALE

OLDER PRECAMBRIAN PINAL SCHIST

0 4000
SCALE IN FEET

45 ATTITUDE OF BEDS

FOLIATION

FAULT OR SHEAR ZONE

OPEN PIT

SECTION CORNER

GENERALIZED GEOLOGIC MAP OF THE SLATE MOUNTAIN AREA PINAL CO., ARIZONA

MODIFIED FROM GEOLOGIC MAP OF PINAL CO., ARIZONA BY THE ARIZONA BUREAU OF MINES, 1959

BASE MAP FROM U.S.G.S. TOPOGRAPHIC MAP

C.E.B. 9-11-69

Fig. 1

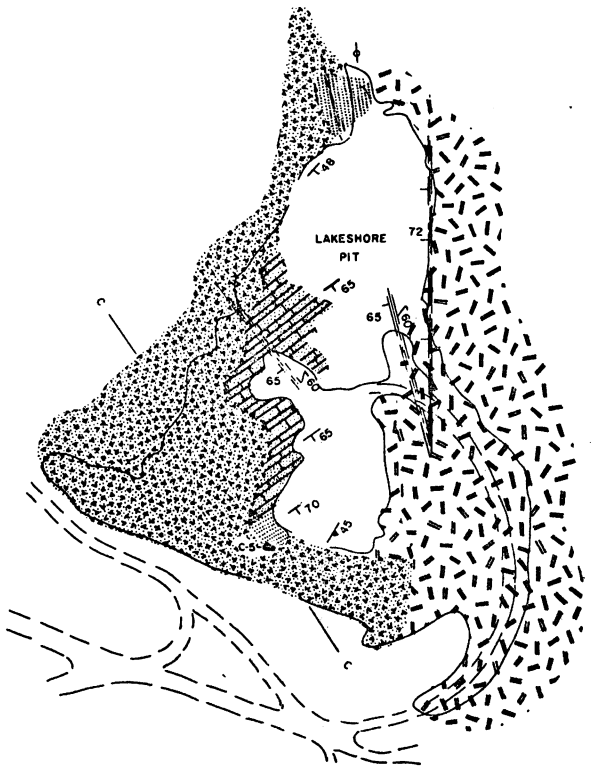
and Carboniferous limestone and dolomite have been folded along an apparent northwest trending axis and then tilted to the northwest. In the area southwest of the Lakeshore mine, the breccia and the underlying Cretaceous volcanic and sedimentary rock strikes N $\pm$ 50° E and dips $\pm$ 45° NW.

Small faults have apparently displaced sedimentary bedding and igneous and sedimentary contacts in these outlying hills. However, any evidence of large faults has been covered by the alluvium. The poles of the measured attitudes of joints and fractures, plotted on a stereographic projection, indicates a preferred orientation of N 30° E with 45° SE dip, N 40° E with 45° NW dip, and N 65° E with 66° SE dip.

Geology of the Lakeshore Pit

At the Lakeshore Mine, a small open pit was excavated by Transarizona (Fig. 2). Near the center of the pit, mineralized banded tactite overlaid by a fine-grained quartzite, striking N $\pm$ 50 E and dipping $\pm$ 60° SE, was exposed. These metasediments terminate on the east side of the pit where they are in contact with diorite along a very strong oblique slip dip fault that strikes NW and dips 65° SW. Merging with this fault is a strong north-south fault that dips 74° W.

Along the west wall of the pit, altered and fractured andesite occurs on the footwall of an andesite and metasediment contact which shows slickensides. This contact, striking N $\pm$ 40° E and dipping $\pm$ 50° SE,forms the footwall of the oxide ore body.



OC-5 U.S.B.M. DRILL HOLE

ALLUVIUM

ANDESITE

GRANITE (QUARTZ DIORITE)

METASEDIMENTS (TACTITE)

BANDED METASEDIMENTS

ATITUDE OF METASEDIMENTS

FOLIATION

FAULT

GENERAL GEOLOGY
OF THE
LAKESHORE PIT

SEPTEMBER 1966

SCALE 1" = 100' C.E.B.

Fig. 2

At the north end of the pit, a fine-grained, banded quartzite, striking N ± 10° W with vertical dip, has been exposed in contact with the diorite on the footwall side of the NW striking fault zone.

The south end of the pit has been cut through highly altered and fractured andesite with foliation striking N ± 30° E and dipping ± 45° SE. This andesite overlays the metasedimentary rock and forms the hanging wall of the oxide ore body.

Drill hole data from close space drilling, conducted by Transarizona, indicated that the northeast end of the ore body had been offset to the northwest on the footwall side of the NW striking fault zone.

Drilling conducted by the U. S. Bureau of Mines (2) in 1948 had encountered quartzite underlying andesite at 460 feet in hole C-2, and at 270 feet in hole C-4. In hole C-5, from 455 feet to 545 feet, copper oxides were encountered in a section described by the Bureau as a shear zone (Fig. 3).

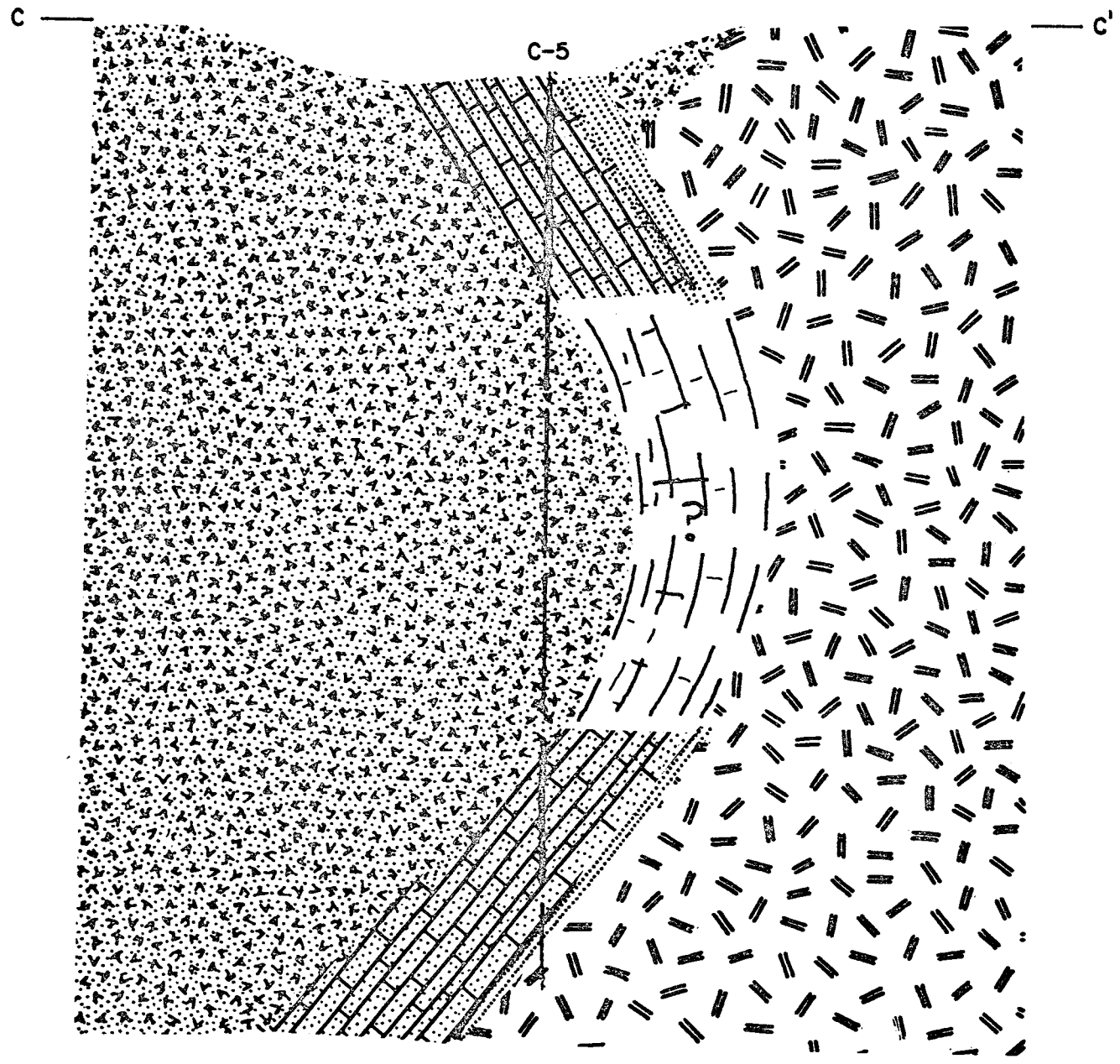
GEOPHYSICAL SURVEY

Induced Polarization Survey

During August and September of 1966, a combined resistivity and induced polarization survey was conducted on the mineral lease and the claims southwest of the Slate Mountains (Fig. 4).

A dipole-dipole electrode configuration, with 500 foot electrode spread length, was used to apply current and measure potential along parallel north-south lines, with ± 1200 foot east-west separations. Alternating current of 0.3 and 5 cycles per second were used to determine the I. P. effect. In addition to the north-south survey, an east-west survey, using shorter electrode spread lengths, was made over the Lakeshore fault system.

Fig. 3



CROSS-SECTION C-C'
LOOKING N 55 E
SCALE 1" = 100'

INTERPRETATION, BY THE WRITER, OF THE MINERALIZATION ENCOUNTERED BY THE U.S.B.M. IN CHURN DRILL HOLE No. C-5

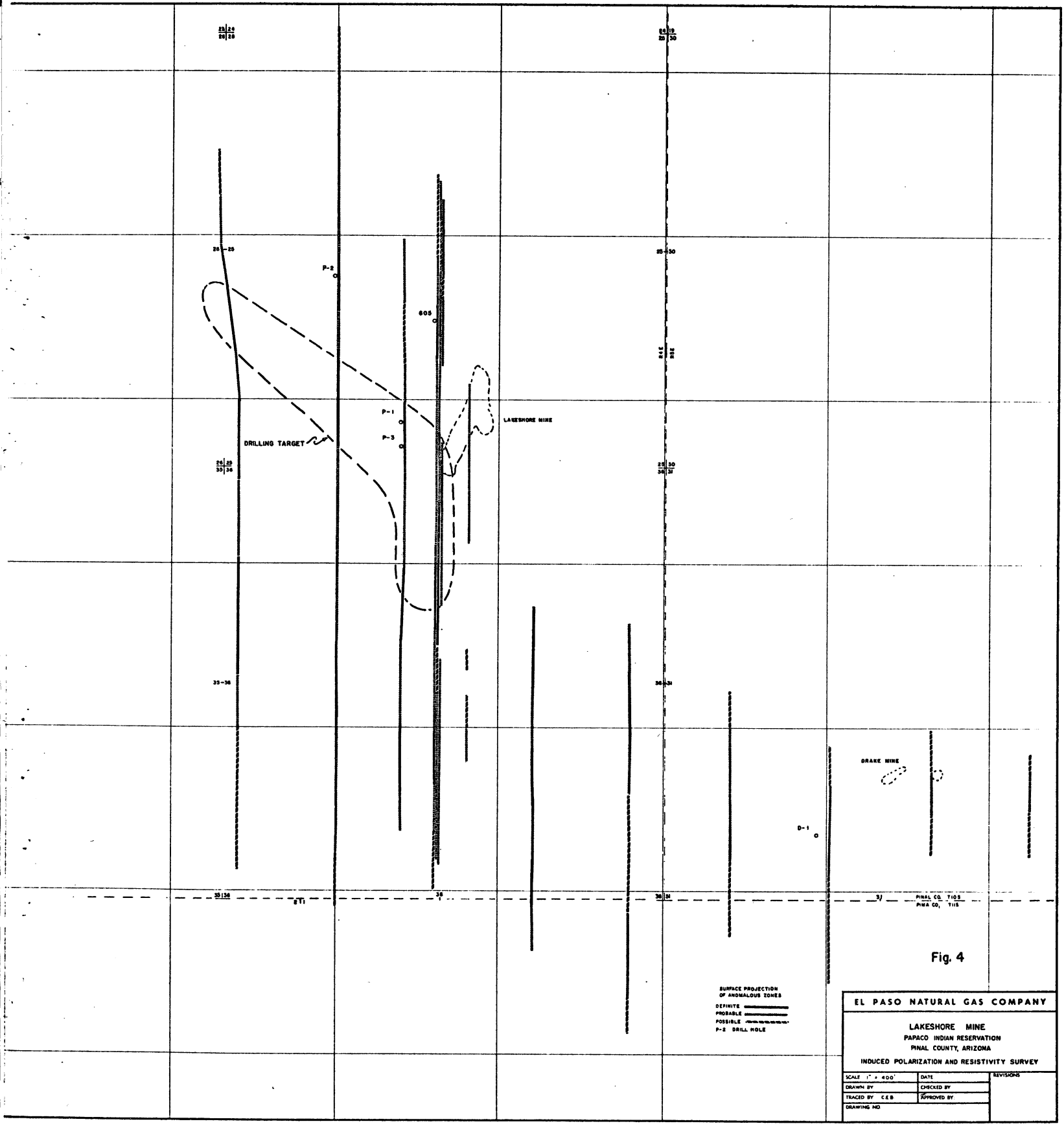


Fig. 4

EL PASO NATURAL GAS COMPANY

LAKESHORE MINE
PAPAGO INDIAN RESERVATION
PINAL COUNTY, ARIZONA
INDUCED POLARIZATION AND RESISTIVITY SURVEY

SCALE 1" = 400'	DATE	REVISIONS
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TRACED BY C.E.B	APPROVED BY	
DRAWING NO.		

Testing I. P. Anomalies

Several I. P. anomalies were recorded along the north-south survey lines. To test the anomalies, core drilling began at locations D-1 and 605 (Fig. 4). Core hole D-1 was located in the area of a reported anomaly ± 1200 feet southwest of the Drake oxide pit. This test hole was cored for 500 feet through andesite breccia without encountering sulphide mineralization and then abandoned. Hole 605 was an old rotary drill hole which had been terminated in a weakly mineralized porphyry at a drill depth of ± 288 feet. This location was on an I. P. anomaly ± 750 feet north of the Lakeshore pit. Core drilling began at 288 feet and copper oxide mineralization was encountered along fractures in an altered biotite porphyry and in and near the contacts of the biotite porphyry and sections of altered andesite of varying thickness. This hole was anandoned at 790 feet because of drilling conditions without encountering sulphide mineralization.

With the completion of D-1 and 605, the testing of two additional I. P. anomalies began at locations P-1 and P-2 (Fig. 4). Drill hole P-2 was located on an I. P. anomaly ± 1500 feet northwest of hole 605. Core drilling was conducted through 800 feet of fanglomerate without encountering oxide or sulphide mineralization, and the hole was abandoned. The fanglomerate consisted of angular to sub-angular fragments of sedimentary and volcanic rock that was weakly cemented but did not display the prominent high-angle slickenside fracture system that had been encountered in hole 605.

At Hole P-1, located on an I. P. anomaly ± 700 feet west of the Lakeshore pit, low grade copper oxide mineralization was encountered in a fractured and altered andesite and andesite breccia. These andesites had been intruded by a few thin sill-like masses of biotite porphyry. At a drill depth of 750 feet where the drill was still in oxides, a re-evaluation of the I. P. data and a review of the geology was made.

INTERPRETATION OF GEOLOGY

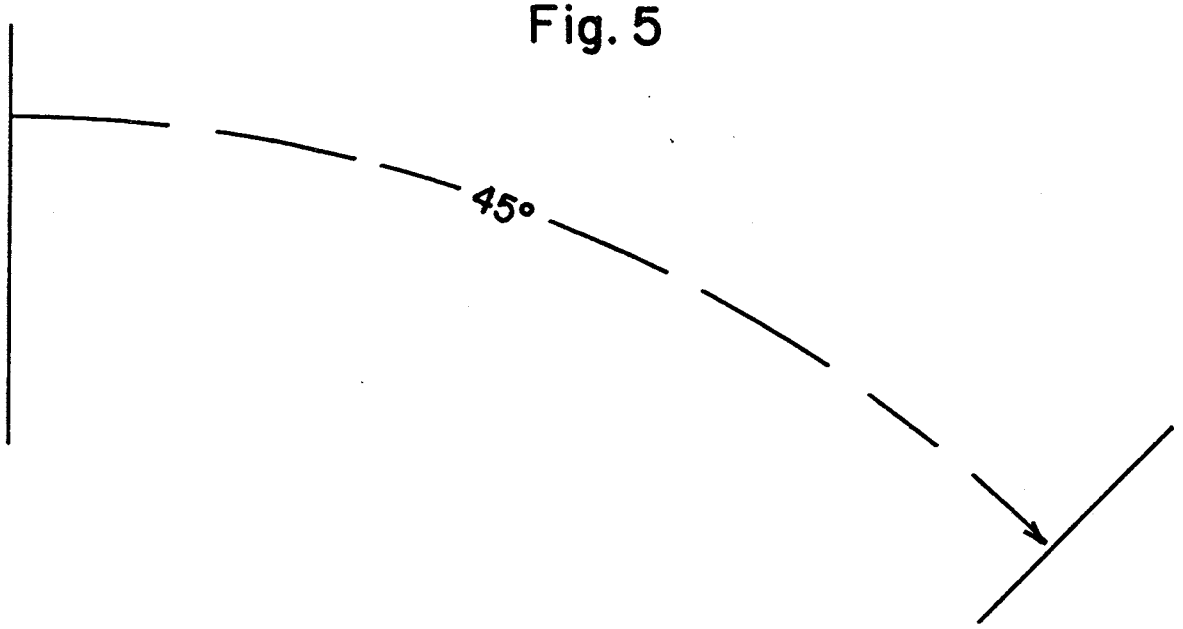
In an attempt to correlate surface geology with subsurface data obtained from core holes, the writer assumed:

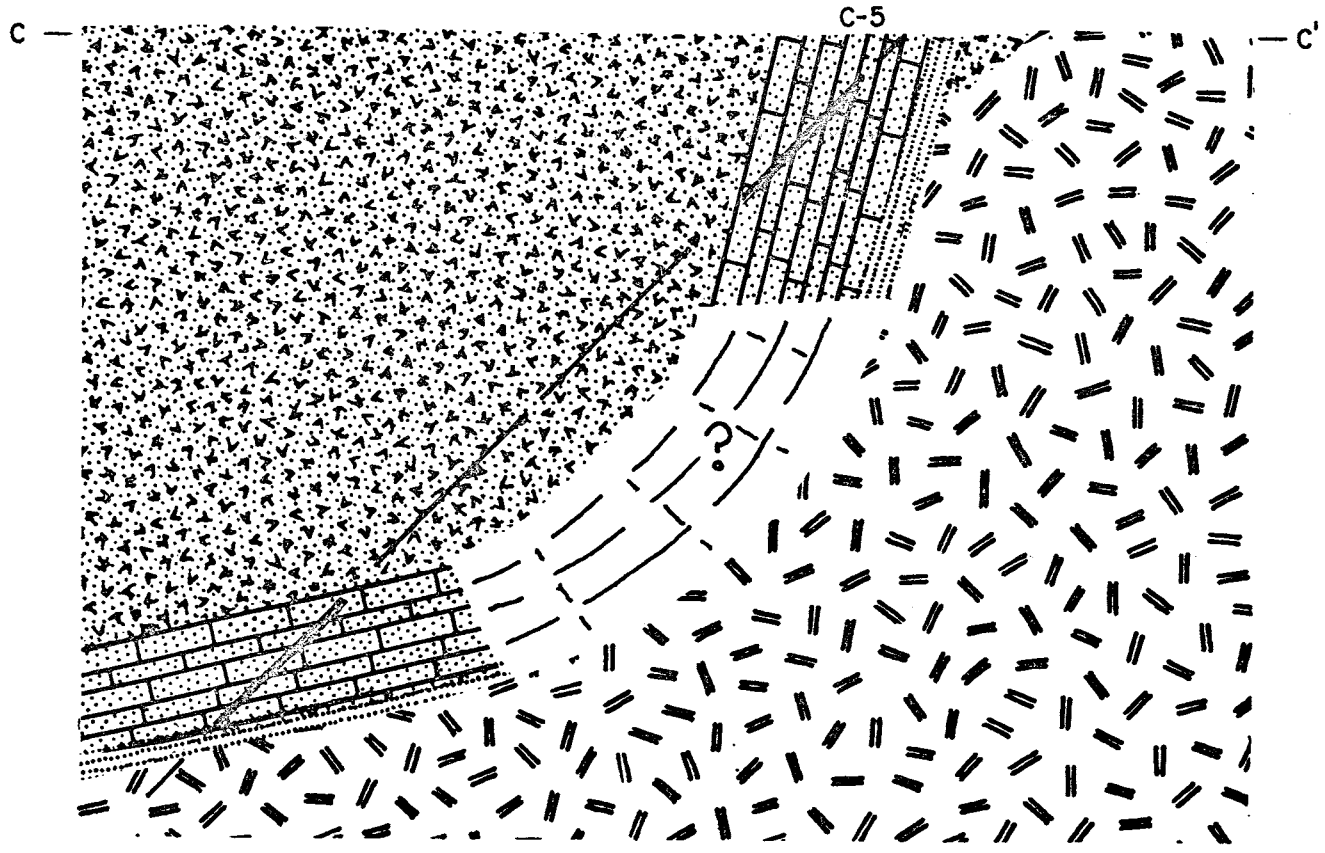
(1) The andesite and breccia encountered in drill hole P-1 are extrusive and the biotite porphyry encountered in hole 605 and P-1 is younger than the andesite and younger than the biotite hornblende porphyry that has intruded the Pinal Schist to the east;

(2) The high angle slickenside fracture system encountered in hole P-1 and 605 is parallel to the fault and fracture system observed in the Lakeshore pit;

(3) The present attitude of the Cretaceous volcanic and sedimentary rocks cropping out southwest of the Slate Mountains represents the youngest structural trend in the area, and that this trend, striking N ± 50° E and dipping ± 45° NW, has been superimposed on the older structural system in the area;

Fig. 5





CROSS-SECTION C-C'

LOOKING N 55 E

SCALE 1" = 100'

ASSUMED ATITUDE OF THE METASEDIMENTS
PRIOR TO TILTING TO THE NORTHWEST

(4) If the metasediments outcropping in the Lakeshore pit were rotated about a horizontal axis trending N 50° E to a pre-45° tilt attitude, the metasediments would then be dipping steeply to the northwest and be overlaid by the andesite (Fig. 5).

(5) The mineralization, encountered by the U. S. Bureau of Mines (2) in churn drill hole C-5 at a drill depth of 455 feet to 545 feet, is the continuation down dip of the mineralized metasediments and these metasediments would continue to the northwest to underlie the andesite (Fig. 3).

In summation then, this interpretation requires that the metasedi tend down dip from the oxide outcrop and lie under the andesite to the nor The trend of the metasediments is controlled by the northwest trend of th Mountains, the strong northwest and north-south fault and fracture syste intrusive. Movement of mineralized solutions were controlled by this ph vironment and sulphide mineralization should be encountered at depth.

RECOMMENDED DRILLING TARGET

To try to correlate this interpretation with the indicated I. P. anor plotted anomalies extending to the south of the Lakeshore pit and the anor echelon to the northwest of the pit were encircled. This enclosed an area wide extending from near the center of Section 36 north to Section 25, the to the west line of Section 25 (Fig. 4). This area offered the best possib of projected geology and plotted I. P. anomalies. The enclosed area was as the drilling target for the Lakeshore project.

DELINEATION OF MINERALIZATION

Drilling and Recording of Data

With the encounter of sulphide mineralization in metasediments, an accelerated drilling program began. Rotary drilling was used to penetrate the andesites and breccias. When the rotary hole was completed to a pre-determined depth, casing was set and a wire line diamond drill was then moved onto the prepared location. NX size tools (2-1/8 inch core diameter) were used until drill depth or drilling conditions required the hole diameter to be reduced; then BX size tools (1-5/8 inch core diameter) were used. Average recovery of core was over 90%.

From the recovered core, the following data and observations were recorded and sketched on the logs: rock type, alterations, mineralization, amount of fracturing, angle of fracturing and pitch of the slickensides, fault breccia and gouge, and contacts of major rock type changes.

When core holes were completed, they were surveyed for drift and inclination with a multiple-shot gyroscopic survey instrument. Degree of inclination and bearing of drift were recorded on 100 foot intervals and at major contacts.

With this drill hole survey data, the assay and geological data could be plotted in both vertical and horizontal positions with a high degree of accuracy (Fig. 6).

Subsurface Mapping

To maintain control of drilling and indicate attitude and limits of assay and geological data, the following subsurface contour maps were prepared:

(1) The andesite-tactite contact

(2) The tactite-quartzite contact

(3) The quartzite-diorite contact

(4) The top and bottom of mineralization within the tactite

(5) The upper contact of the mineralized biotite porphyry

(6) The top and the lower drilling cut off of sulphide

(7) The top and bottom of oxide

(8) Base of the fanglomerate

With the above contoured data, isopach maps were drawn indicating direction and thickness of high grade oxides, sulphides, tactite, and mineralization within the tactite.

With the same contour maps, cross-sections could be drawn in any direction without regard to drift or alignment of core holes.

Interpretation of Subsurface Data

From the subsurface data, the following interpretations were made:

(1) The contours of the andesite-tactite contact form a subsurface that strikes $\pm$ north and dips $\pm$ 30° W (Fig. 7).

(2) The contours at the tactite-quartzite contact form a subsurface that strikes N $\pm$ 20° W and dips $\pm$ 20° SW, then turns to the northeast and dips to the northwest (Fig. 8). The curving contours

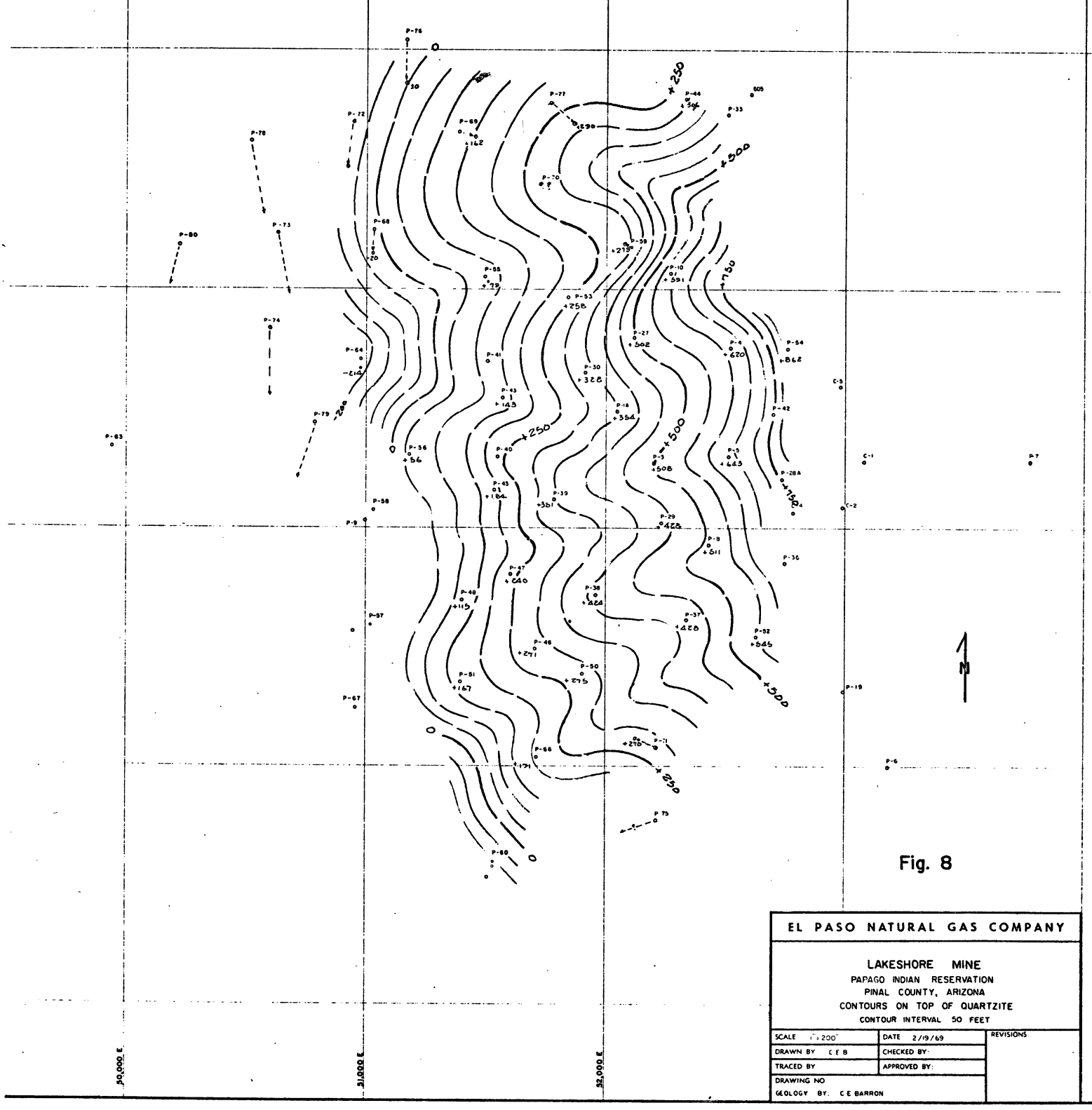


Fig. 8

EL PASO NATURAL GAS COMPANY		
LAKESHORE MINE PAPAGO INDIAN RESERVATION PINAL COUNTY, ARIZONA CONTOURS ON TOP OF QUARTZITE CONTOUR INTERVAL 50 FEET		
SCALE 1" = 200'	DATE 2/19/69	REVISIONS
DRAWN BY C E B	CHECKED BY:	
TRACED BY	APPROVED BY:	
DRAWING NO		
GEOLOGY BY: C E BARRON		

form a weakly nosing subsurface structure that plunges to the southwest. As the overlying andesite-tactite contact approaches this plunging structure, a thinning of the tactite occurs along a northeast trend and wedge-like thicknesses of tactite occur to the northwest and southeast of this zone of thinning. This thickening and thinning is best illustrated by an isopach of the tactite (Fig. 15).

(3) The more consistent thickness of mineralization, within the tactite, occurs in the wedge-like thickness southeast of the zone of thinning. Contours on the top and bottom of this mineralized thickness conform with the N 20 W strike and 20° SW dip of the underlying quartzite. The line of intersection of this mineralization with the overlying andesite trends NE and plunges SW, and terminates this thickness of mineralization in the zone of thinning. To the south and southeast of the zone of thinning, an increasing thickness of massive garnet and epidote occurs over the mineralization, and the mineralized horizon is divided into an upper and lower mineral thickness by an interbedded, fine-grained quartzite. Underlying this sulphide mineralization, a black and gray banded tactite is in contact with the underlying quartzite. This sequence of metasediments, which has been intruded by diabase and biotite porphyry, continues to the south and southeast until it has apparently been displaced by a major fault that trends N $\pm$ 20 W.

(4) To the east the metasediments are in contact with the diorite. Contours on this contact form a north trending subsurface that dips ± 60° W (Fig. 9).

(5) To the west the metasediments have been intruded by the biotite porphyry along a northeast trending contact zone. Along this contact zone the intrusive forms sills of irregular masses that occur in both the metasediments and the andesite. Better grade mineralization occurs along this zone of multiple sills (Fig. 16).

(6) Northwest of this contact zone the stock-like intrusive forms a more homogenous emplacement within the andesite but continues to form sills within the metasediments. Further to the northwest, the intrusive again forms a contact zone of multiple sills within the andesite (Fig. 16).

(7) Contours on top of the oxidized intrusive trend N 55 E and form a ± 40° slope along the northwest side (Fig. 10). On the southeast side the contours indicate a much steeper slope, and to the southwest, the intrusive apparently has been displaced in this horizon by a high angle normal fault that strikes ± N 20 W. Limits of the intrusive have not been determined to the north and northeast.

(8) Contours on top of the oxide mineralization form an irregular horizon in the subsurface west of the Lakeshore pit; then this horizon forms a northwestern dip and passes through the top of the mineralized intrusive. As the oxide zone passes through the

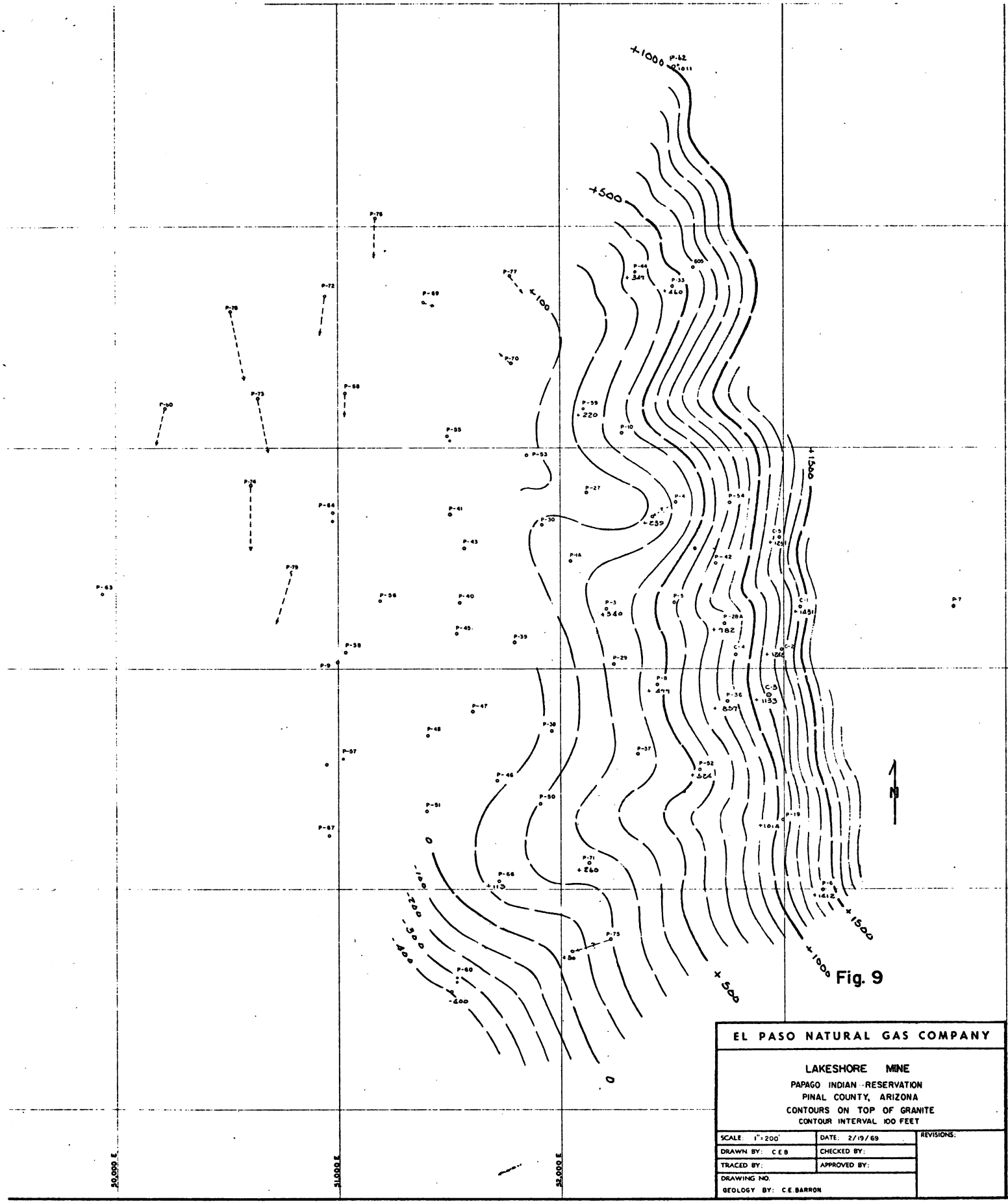


Fig. 9

EL PASO NATURAL GAS COMPANY

LAKESHORE MINE

PAPAGO INDIAN RESERVATION
PINAL COUNTY, ARIZONA
CONTOURS ON TOP OF GRANITE
CONTOUR INTERVAL 100 FEET

SCALE: 1"=200'	DATE: 2/19/69	REVISIONS:
DRAWN BY: C.E.B	CHECKED BY:	
TRACED BY:	APPROVED BY:	
DRAWING NO.		
GEOLOGY BY: C.E. BARRON		

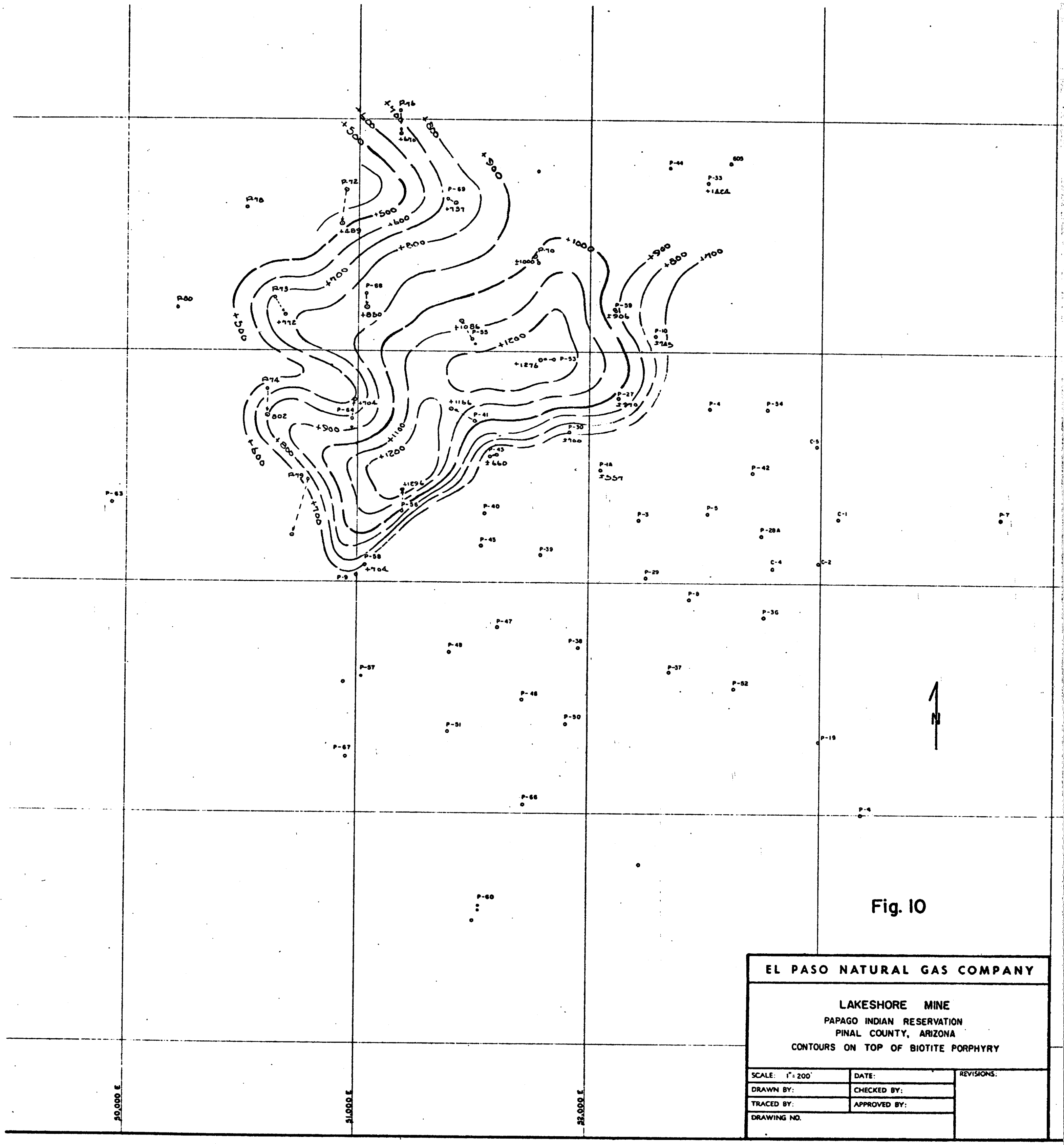


Fig. 10

EL PASO NATURAL GAS COMPANY

LAKESHORE MINE
PAPAGO INDIAN RESERVATION
PINAL COUNTY, ARIZONA
CONTOURS ON TOP OF BIOTITE PORPHYRY

SCALE: 1" = 200'	DATE:	REVISIONS:
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DRAWING NO.		

upper part of the intrusive, a ± 100 foot thick blanket of ± 1.5% copper oxide mineralization occurs at the base of the oxides. This mineralization trends to the northeast along the top of the intrusive and dips to the northwest. As the dip of the oxide mineralization increases to the northwest, the high grade oxide mineralization thins and a zone of chalcocite has formed an enriched upper thickness of sulphide mineralization (Fig. 11).

(9) Contours at the top of sulphide mineralization form a low trough that plunges to the southwest along the southeast flank of the biotite porphyry intrusive. This oxide-sulphide transition horizon then climbs to its highest elevation within the top of the intrusive and forms a northeast trend that dips to the NW. To the southwest the contours turn sharply to the northwest or southeast and form a N ± 20° W trending horizon that dips ± 70° SW (Fig. 12).

(10) The isopach of the sulphides indicates a wedge-like thickness of mineralization. The thin edge, ± 300 feet thick, occurs along the northeast trending contact zone of the intrusive and the metasediments. To the northwest of this contact zone and along the apparent fault zone, the mineralized zone thickens to over 1000 feet. Some core holes in this zone have an average assay value of .85% copper for 1000 feet of recovered core. The limits of mineralization to the northwest and north of this area have not been determined (Fig. 14).

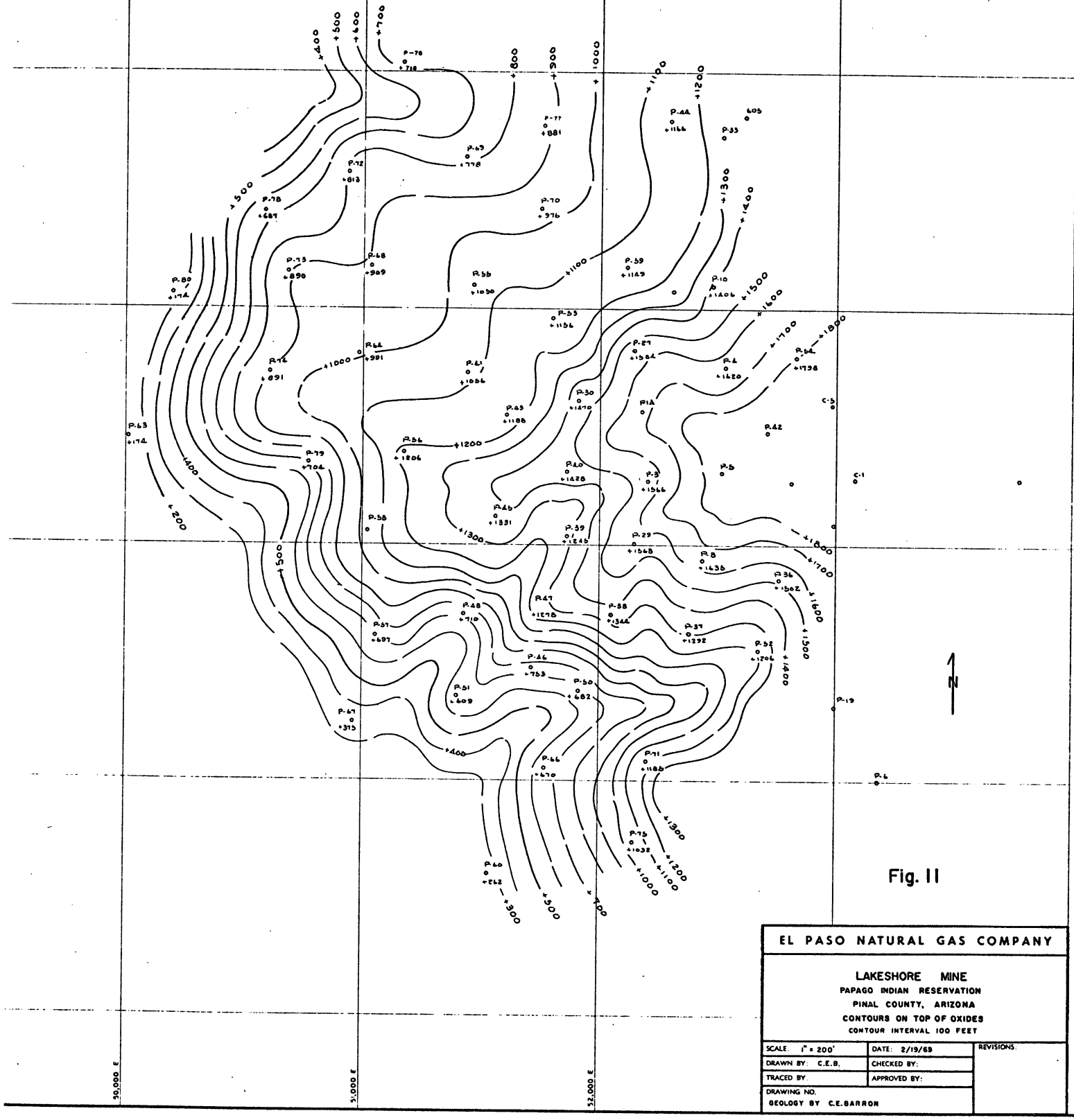

Fig. 11

EL PASO NATURAL GAS COMPANY		
LAKESHORE MINE PAPAGO INDIAN RESERVATION PINAL COUNTY, ARIZONA CONTOURS ON TOP OF OXIDES CONTOUR INTERVAL 100 FEET		
SCALE: 1" = 200'	DATE: 2/19/69	REVISIONS:
DRAWN BY: C.E.B.	CHECKED BY:	
TRACED BY:	APPROVED BY:	
DRAWING NO. GEOLOGY BY C.E. BARRON		

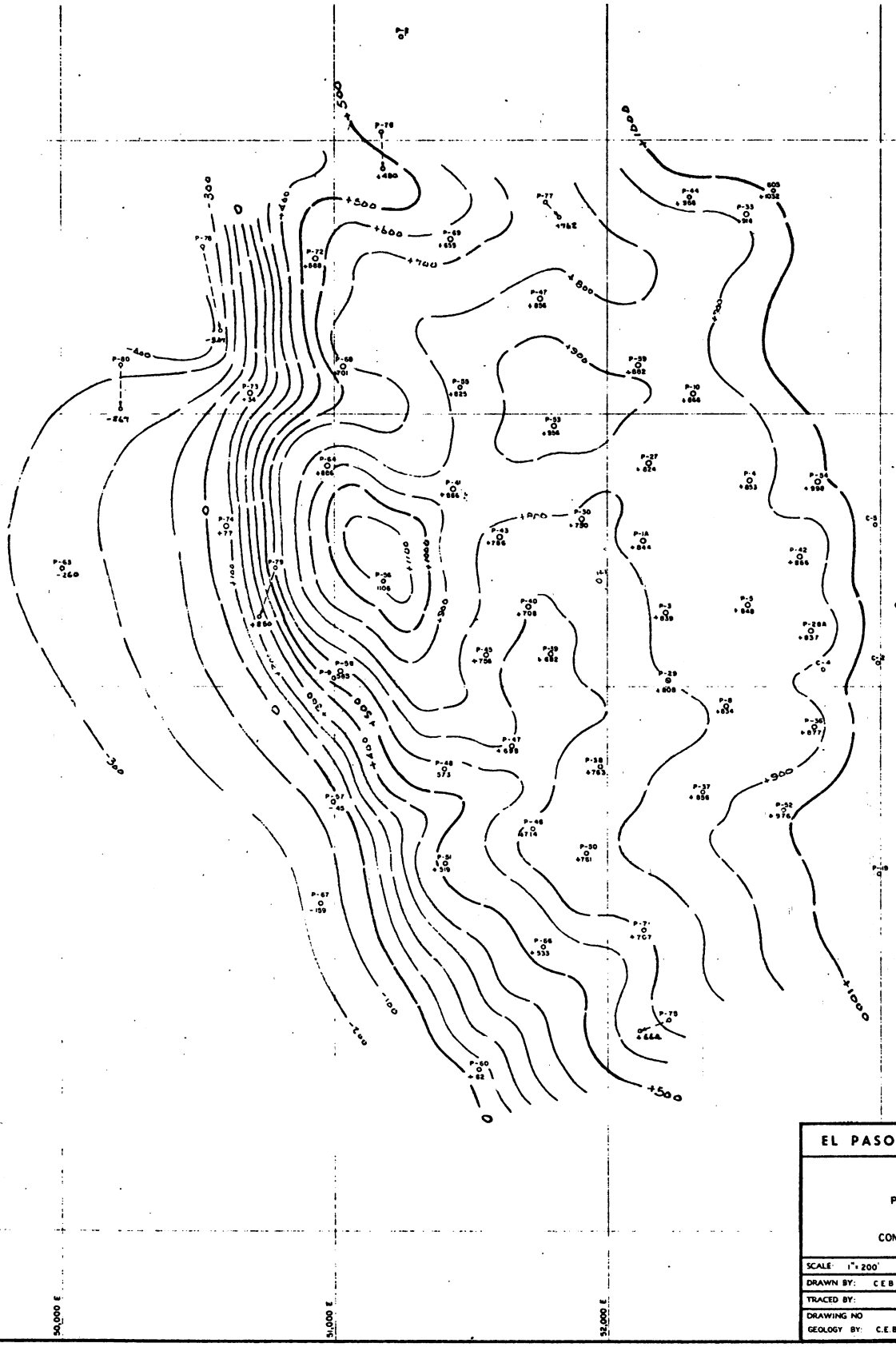

Fig. 12

EL PASO NATURAL GAS COMPANY		
LAKESHORE MINE PAPAGO INDIAN RESERVATION PINAL COUNTY, ARIZONA CONTOURS ON TOP OF SULPHIDES CONTOUR INTERVAL 100 FEET		
SCALE: 1" = 200'	DATE: 2/19/69	REVISIONS:
DRAWN BY: C.E.B	CHECKED BY:	
TRACED BY:	APPROVED BY:	
DRAWING NO		
GEOLOGY BY: C.E. BARRON		

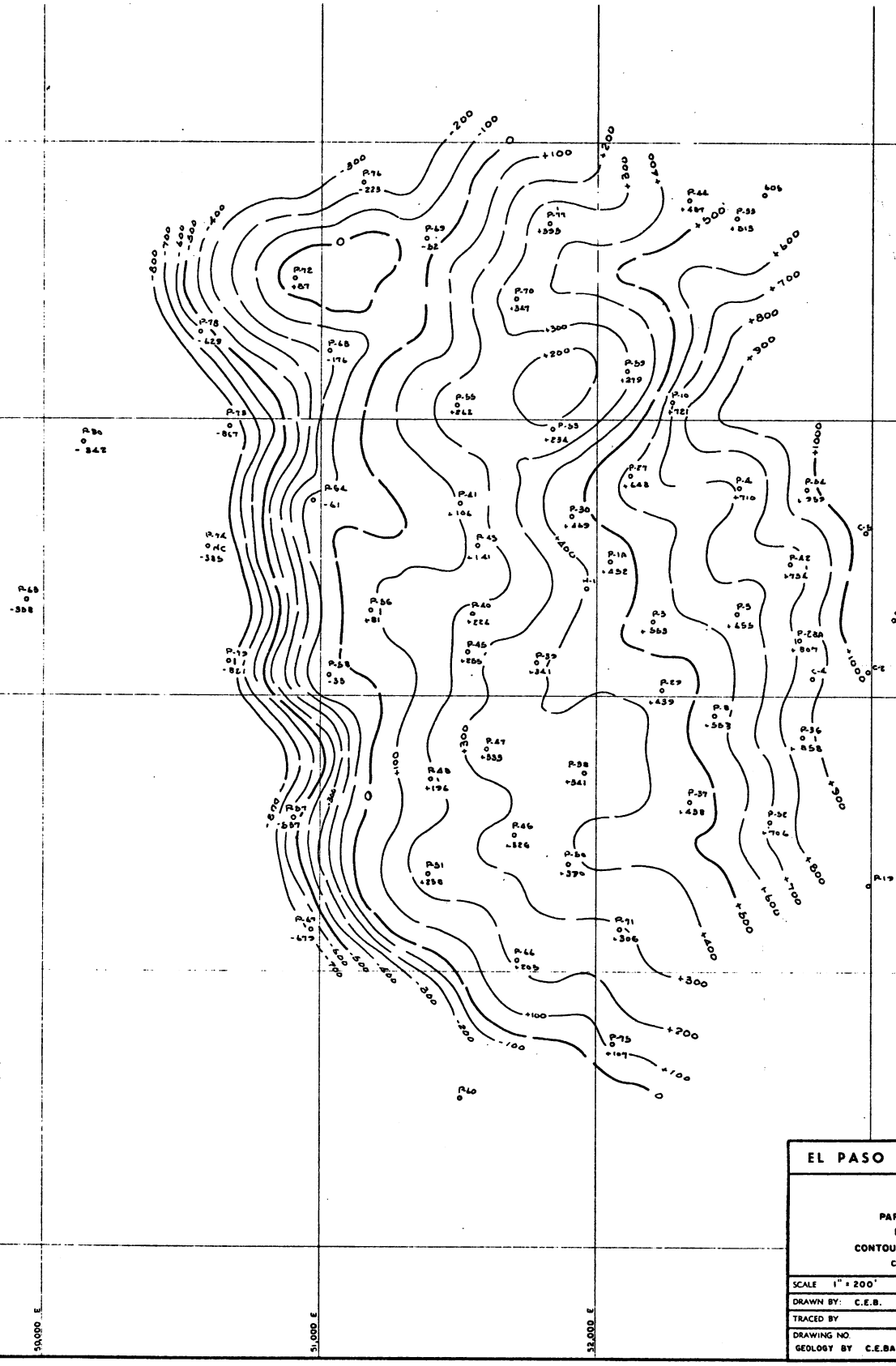

Fig. 13

EL PASO NATURAL GAS COMPANY		
LAKESHORE MINE PAPAGO INDIAN RESERVATION PINAL COUNTY, ARIZONA CONTOURS AT LOWER SULPHIDE CUT-OFF CONTOUR INTERVAL 100 FEET		
SCALE 1" = 200'	DATE: 2/19/69	REVISIONS:
DRAWN BY: C.E.B.	CHECKED BY:	
TRACED BY	APPROVED BY:	
DRAWING NO.		
GEOLOGY BY C.E.BARRON		

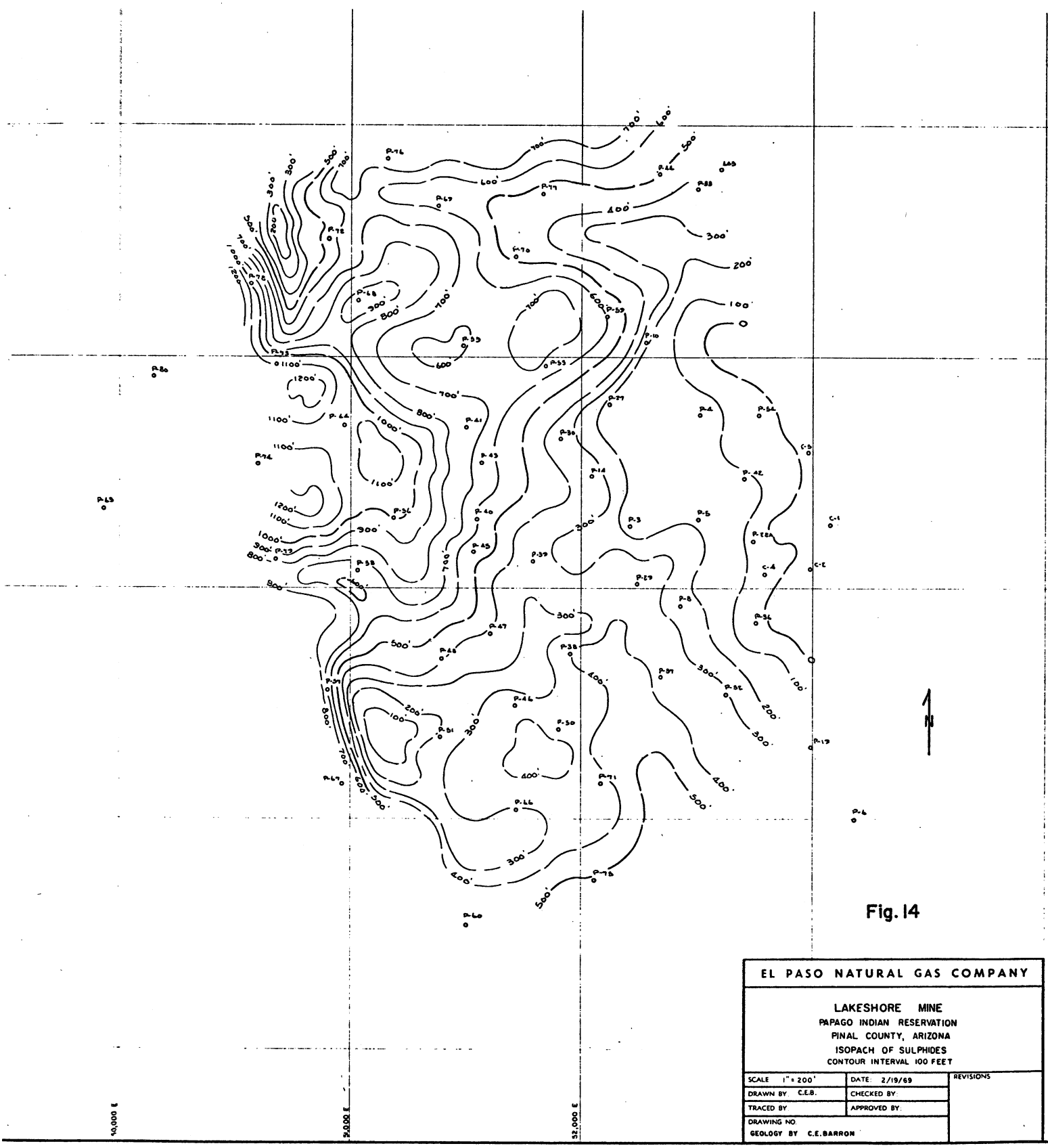

Fig. 14

EL PASO NATURAL GAS COMPANY		
LAKESHORE MINE PAPAGO INDIAN RESERVATION PINAL COUNTY, ARIZONA ISOPACH OF SULPHIDES CONTOUR INTERVAL 100 FEET		
SCALE 1" = 200'	DATE: 2/19/69	REVISIONS
DRAWN BY C.E.B.	CHECKED BY:	
TRACED BY	APPROVED BY:	
DRAWING NO. GEOLOGY BY C.E.BARRON		

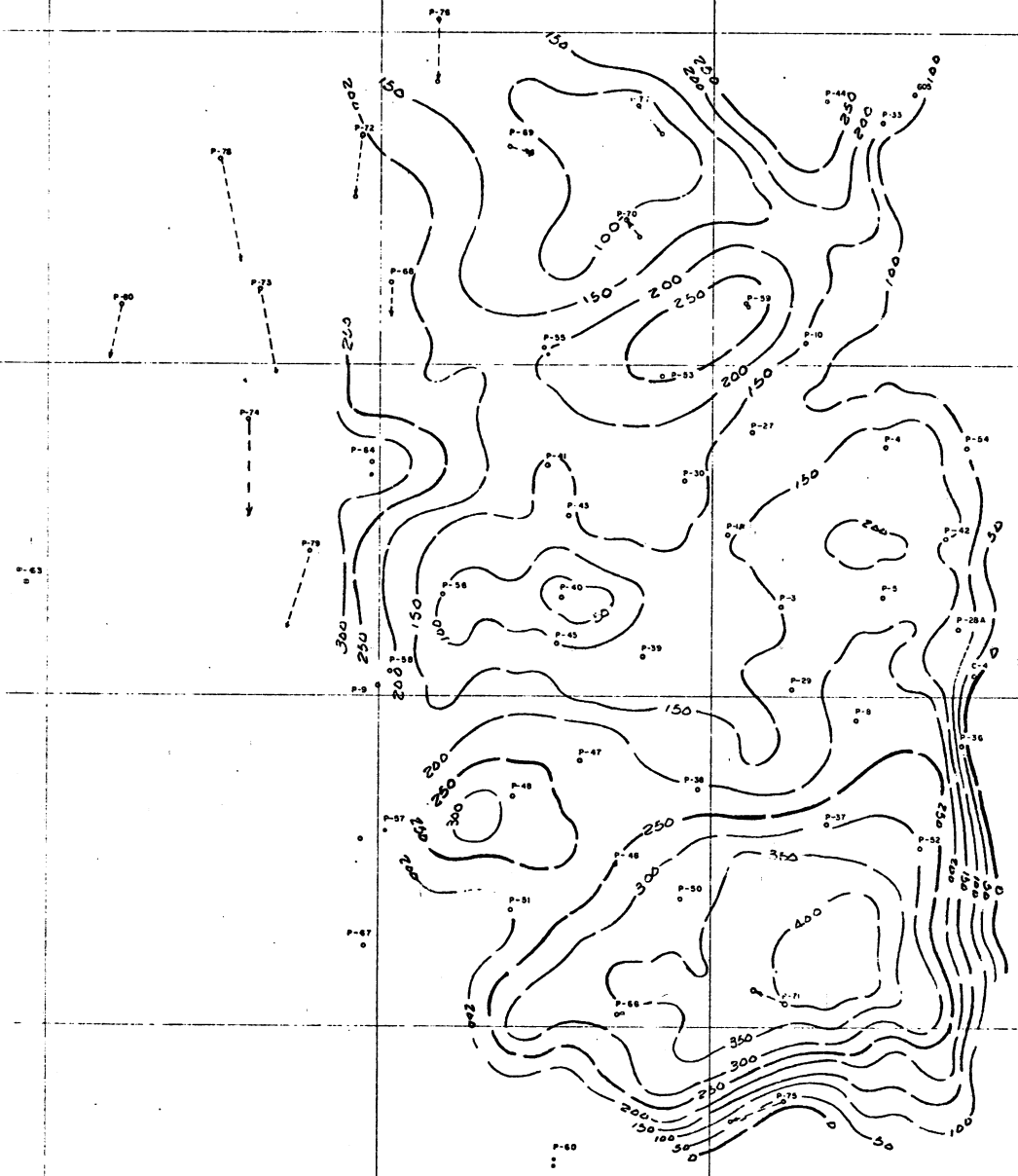

Fig. 15

EL PASO NATURAL GAS COMPANY		
LAKESHORE MINE PAPAGO INDIAN RESERVATION PINAL COUNTY, ARIZONA ISOPACH OF TACTITE CONTOUR INTERVAL 50 FEET		
SCALE 1" = 200'	DATE 2/19/69	REVISIONS.
DRAWN BY: C E B	CHECKED BY:	
TRACED BY:	APPROVED BY:	
DRAWING NO. GEOLOGY BY: C E BARRON		

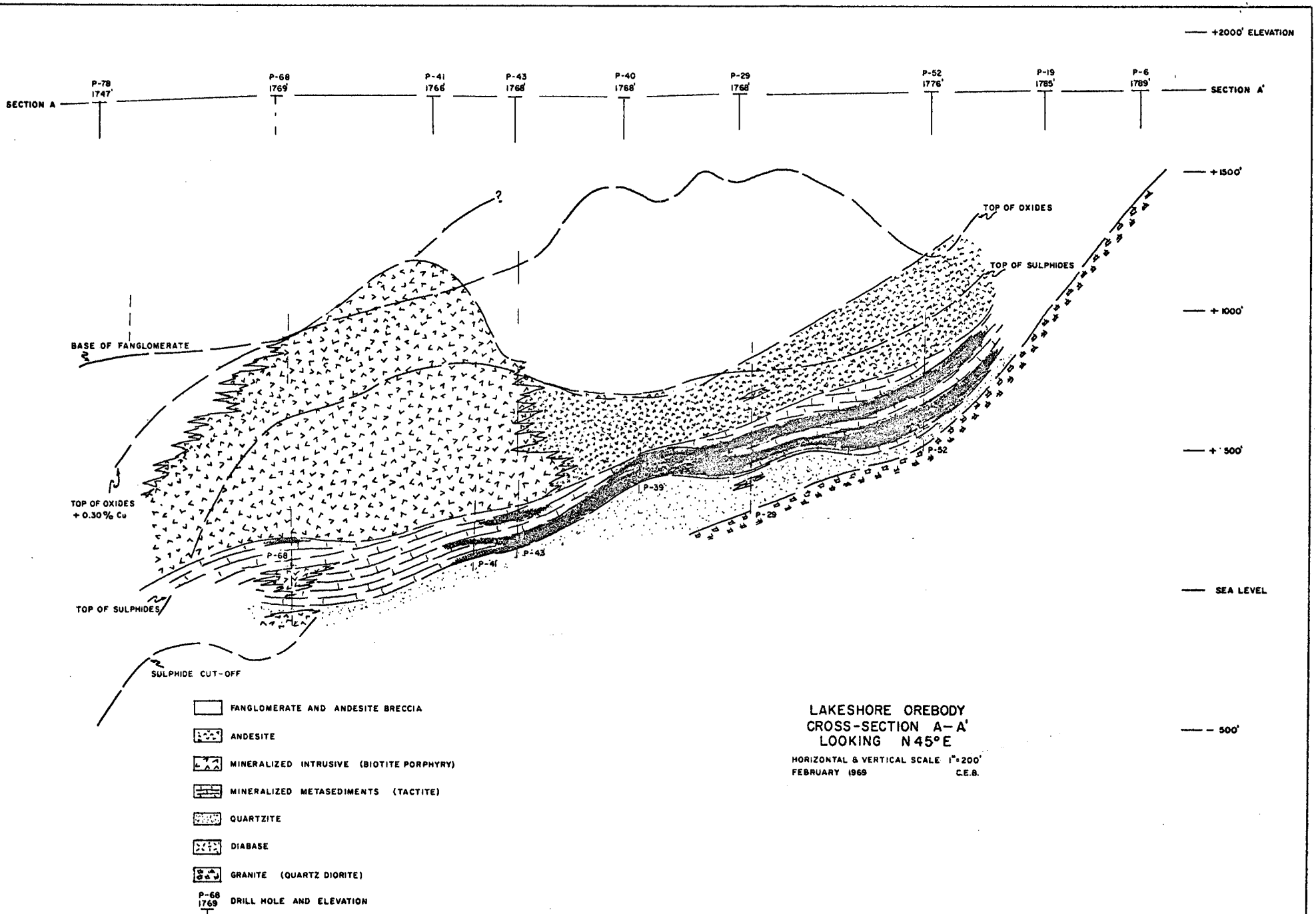
+2000' ELEVATION
SECTION A
P-78 1747'
P-68 1769'
P-41 1766'
P-43 1768'
P-40 1768'
P-29 1768'
P-52 1776'
P-19 1785'
P-6 1789'
SECTION A'
+1500'
+1000'
+500'
SEA LEVEL
-500'
TOP OF OXIDES
TOP OF SULPHIDES
BASE OF FANGLOMERATE
TOP OF OXIDES +0.30% Cu
SULPHIDE CUT-OFF
P-52
P-39
P-29
P-68
P-43
P-41
FANGLOMERATE AND ANDESITE BRECCIA
ANDESITE
MINERALIZED INTRUSIVE (BIOTITE PORPHYRY)
MINERALIZED METASEDIMENTS (TACTITE)
QUARTZITE
DIABASE
GRANITE (QUARTZ DIORITE)
P-68 1769 DRILL HOLE AND ELEVATION
LAKESHORE OREBODY
CROSS-SECTION A-A'
LOOKING N45°E
HORIZONTAL & VERTICAL SCALE 1"=200'
FEBRUARY 1969 C.E.B.

Fig. 16

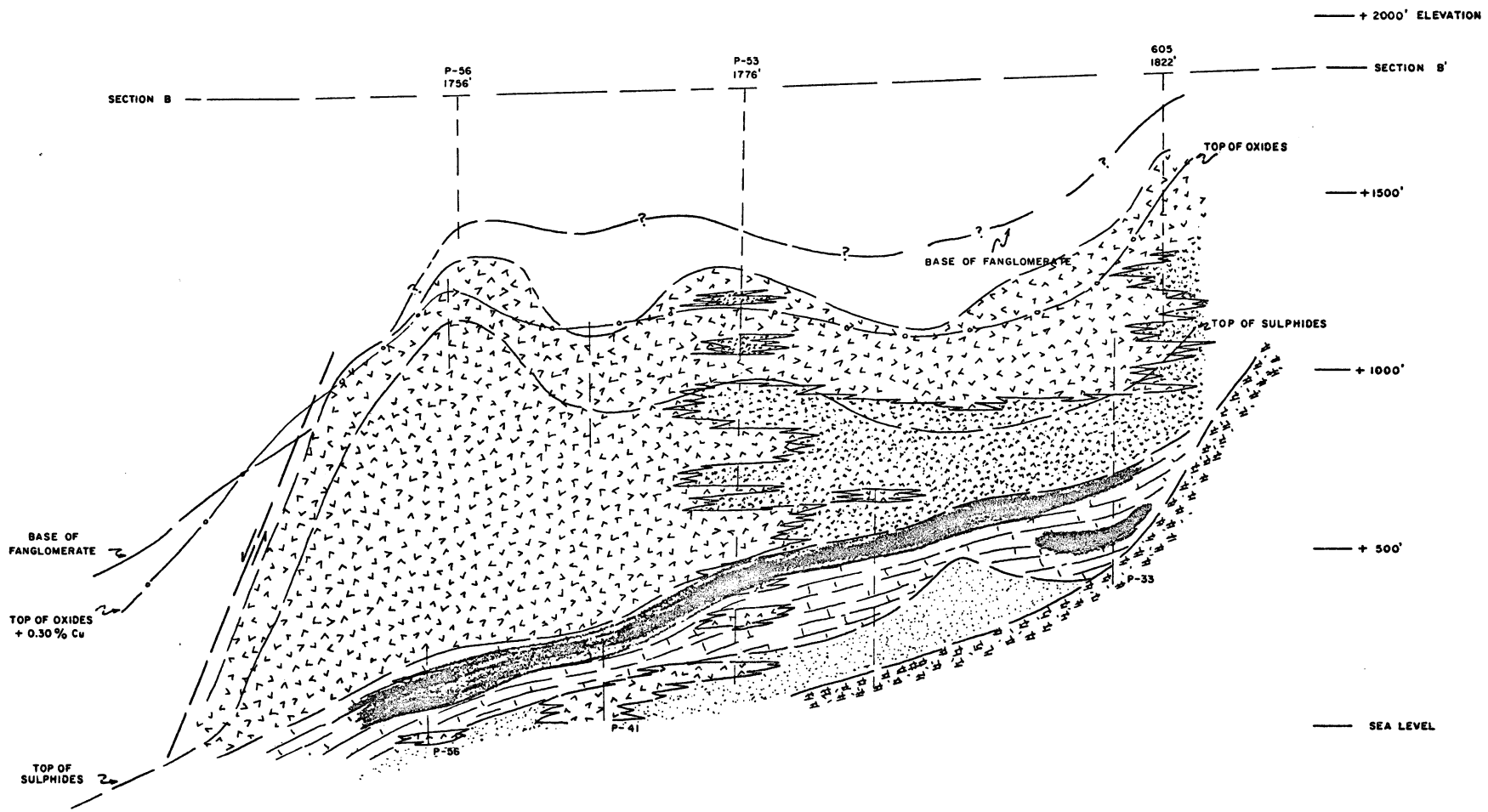
+ 2000' ELEVATION
SECTION B
P-56
1756'
P-53
1776'
605
1822'
SECTION B'
TOP OF OXIDES
+1500'
BASE OF FANGLOMERATE
TOP OF SULPHIDES
+ 1000'
BASE OF
FANGLOMERATE
+ 500'
TOP OF OXIDES
+ 0.30 % Cu
P-33
SEA LEVEL
P-41
P-56
TOP OF
SULPHIDES
- 500'
FANGLOMERATE AND ANDESITE BRECCIA
ANDESITE
MINERALIZED INTRUSIVE (BIOTITE PORPHYRY)
MINERALIZED METASEDIMENTS (TACTITE)
QUARTZITE
GRANITE (QUARTZ DIORITE)
P-53
1776
DRILL HOLE AND ELEVATION
LAKESHORE OREBODY
CROSS-SECTION B-B'
LOOKING N45° W
HORIZONTAL & VERTICAL SCALE 1"= 200'
FEBRUARY 1969
C.E.B.

Fig. 17

(11) Overlying the highly fractured and altered andesite, biotite porphyry and tactite is a relatively unfractured, weakly cemented fanglomerate that thickens from ± 100 feet at the edge of the valley to ± 1500 feet around the southwest end of the biotite porphyry and is apparently in contact with the altered and oxidized top of this intrusive.

In summation, the geological data indicates the occurrence of mineralization at Lakeshore to be the result of the emplacement of a weakly mineralized biotite porphyry. This stock-like mass formed a multiple sill contact with eroded and deformed metasediments and the overlying andesites and breccia. The processes of contact metamorphism formed tactite or skarn in the metasediments and a higher grade of sulphide mineralization was deposited in the more favorable carbonates. Post-mineral faulting and fracturing formed channels for erosion, leaching, and enrichment of mineralization. This mineral deposit was tilted to the northwest and underwent a second period of erosion and oxidization. This oxidized and fractured surface was then buried by the present overlying fanglomerate (Fig. 17).

COMPUTER EVALUATION

During March and April of 1968, a computer evaluation of the assay and geological data from 23 core holes was performed by an independent consultant (7). This evaluation provided the following information:

(1) Ore reserves, tonnage and grade of the sulphide and oxide mineralization for various cut-off grades and thicknesses;

(2) Level plans at various vertical intervals showing contours of sulphide copper values;

(3) Vertical cross-sections of the sulphide copper values;

(4) A confidence interval analysis to determine future drilling requirements; and

(5) A financial analysis based on ore reserves of varying cut off grades, and the following parameters - mining cost and mining methods, concentrator capacity and recovery, metal prices, capital requirements and financing, royalty, sales agreements, and taxation.

In May 1968, ore reserves based on assay and geological data from 23 holes was reported as follows:

1. Tactite reserves, based on a cut-off grade of 0.75% copper, were 13.7 million tons with an average grade of 1.84% copper.
2. Porphyry reserves including tactite, based on a cut-off grade of 0.50% copper, were 59 million tons with an average grade of 0.99% copper.

During September 1968, the assay and geological data was again submitted to an independent consultant (8) for computer evaluation. The following reserves were reported:

1. Porphyry reserves based on mineralization with a thickness greater than 200 feet and a cut-off grade of 0.50% copper were 86 million tons with an average grade of 0.81% copper. This included tactite material lying under the porphyry.

2. Tactite reserves, outside the porphyry area and with a cut-off grade of 1.00% copper, were 10 million tons with an average grade of 1.73% copper.

In November 1968, with the data from 42 core holes, the following up-dated ore reserves, classified as a total of proved and probable, were reported:

1. Porphyry reserves based on mineralization with a thickness greater than 200 feet and a cut-off grade of 0.50% copper, were 132.0 million tons with an average grade of 0.81% copper. This included 9 million tons of tactite material lying under the porphyry.
2. Tactite reserves, outside the porphyry area and with a cut-off grade of 1.00% copper, were 10 million tons with an average grade of 1.73% copper.
3. Oxide reserves, based on a cut-off grade of 0.50% copper, were 85 million tons with an average grade of 0.81% copper.

On February 7, 1969, with data from 51 core holes, the following ore reserves classified as a total of proved and probable, were reported:

1. Porphyry reserves, based on a cut-off grade of 0.40% copper, were 241 million tons with an average grade of 0.70% copper.
2. Tactite reserves, based on a cut-off grade of 1.00% copper, were 24 million tons with an average grade of 1.69% copper.
3. Oxide reserves, based on a cut-off grade of 0.40% copper, were 207 million tons with an average grade of 0.71% copper.

CONCLUSION

In the opinion of the writer, the discovery of sulphide mineralization at Lakeshore was the result of a successful interpretation of combined geologic and geophysical data. The rotation of the mineralized metasediments to an assumed pre-tilt attitude gave a reason for projecting these metasediments to the northwest. The I. P. anomalies were correlated with this assumed northwest projection.

At the end of this phase of the exploration program, the majority of mineralized core holes have been collared within or near the limits of the proposed drilling target (Fig. 18). The interpretation that assumed overturning of metasediments by tilting to the northwest has been strengthened by three core holes which were collared in the oxide ore body and again entered mineralized metasediments at depth after penetrating the andesites. The discovery of the mineralized tactite led to the discovery of sulphide mineralization in the biotite porphyry intrusive and a "porphyry copper" deposit.

The gyroscopic drift survey of drill holes accurately located the subsurface position of the assay and geologic data that was obtained from the diamond drill cores, and gave the necessary vertical and horizontal control for the preparation of subsurface maps and cross sections and for computer evaluation of the mineral deposit.

Computer evaluation proved to be an efficient and rapid method of obtaining and updating grade and tonnage estimates during the exploration program.

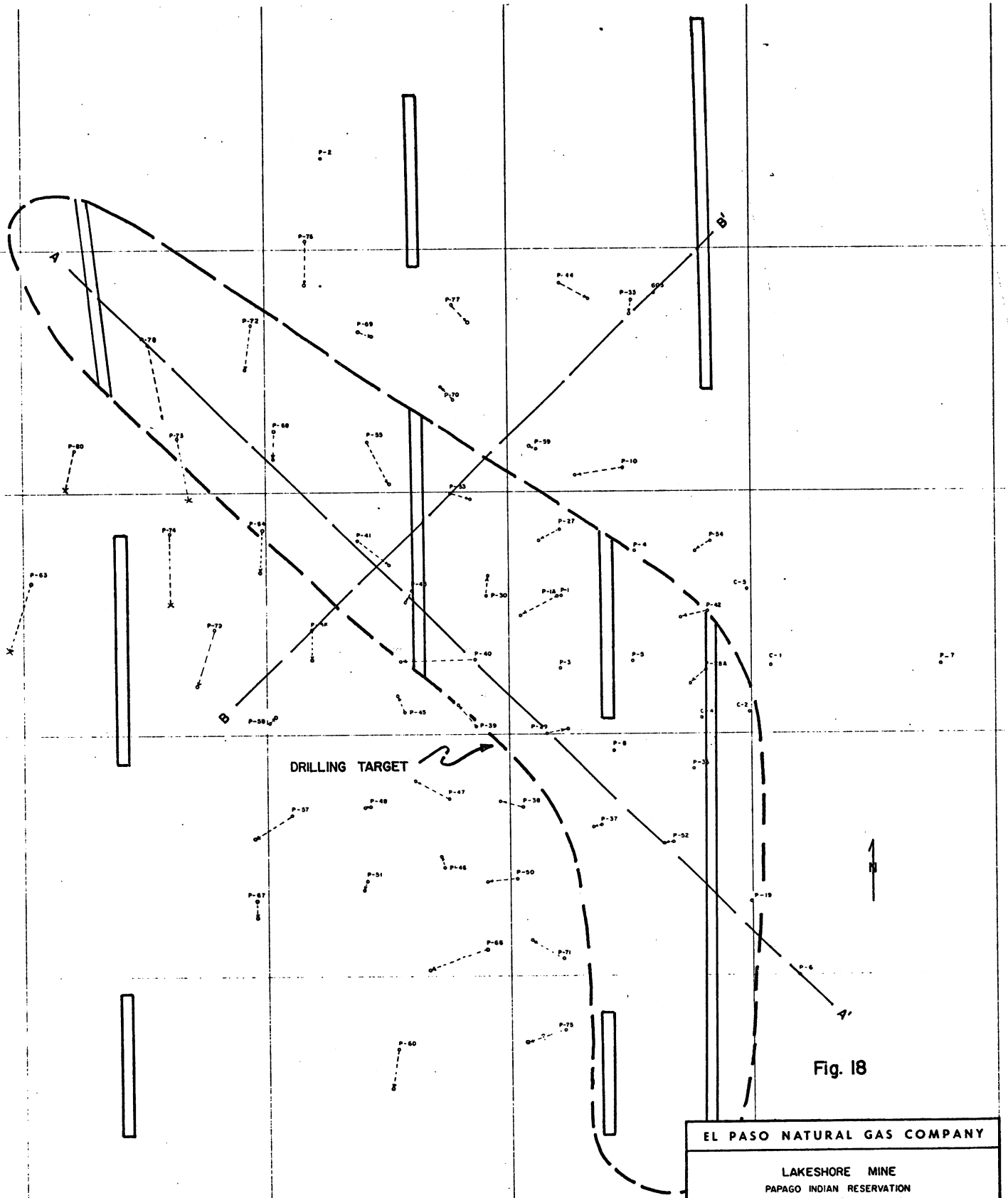

Fig. 18

EL PASO NATURAL GAS COMPANY

LAKESHORE MINE
PAPAGO INDIAN RESERVATION
PINAL COUNTY, ARIZONA
MAGNETIC AND GYROSCOPIC DRIFT SURVEY

SCALE 1"=200'	DATE 2/19/69	REVISIONS
DRAWN BY: C.E.B	CHECKED BY:	
TRACED BY:	APPROVED BY:	
DRAWING NO.		

ACKNOWLEDGMENTS

The author wishes to thank the members of the Mining Division of El Paso Natural Gas Company for helpful comments and criticism on the paper; and is grateful to Doctors W. S. Strain and Earl M. P. Lovejoy of the Geology Department, University of Texas at El Paso, for reading the paper and suggesting improvements.

ACKNOWLEDGMENTS

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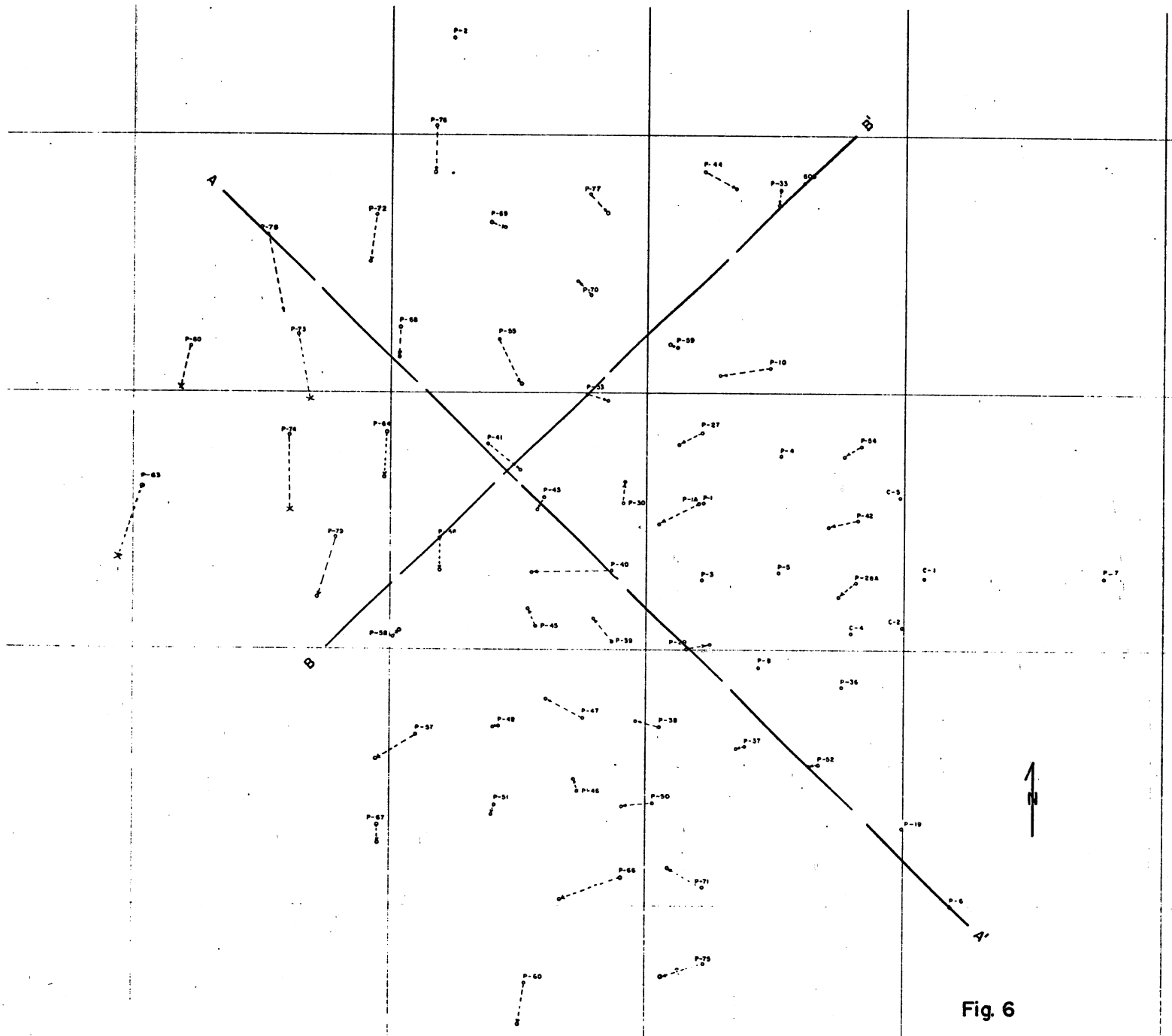


Fig. 6

EL PASO NATURAL GAS COMPANY		
LAKESHORE MINE PAPAGO INDIAN RESERVATION PINAL COUNTY, ARIZONA MAGNETIC AND GYROSCOPIC DRIFT SURVEY		
SCALE 1" = 200'	DATE: 2/19/69	REVISIONS
DRAWN BY: C.E.B.	CHECKED BY:	
TRACED BY	APPROVED BY:	
DRAWING NO.		

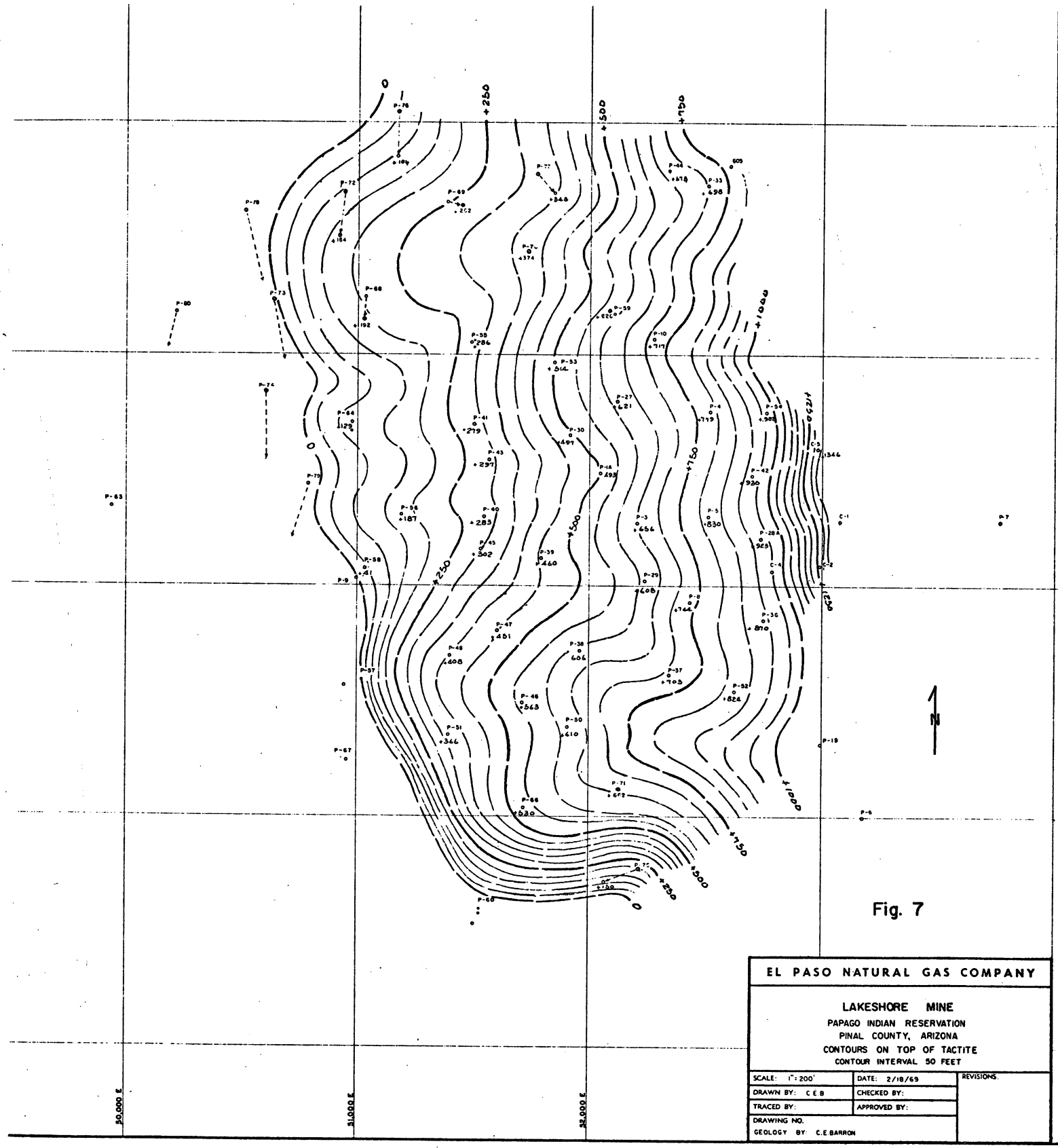


Fig. 7

EL PASO NATURAL GAS COMPANY		
LAKESHORE MINE PAPAGO INDIAN RESERVATION PINAL COUNTY, ARIZONA CONTOURS ON TOP OF TACTITE CONTOUR INTERVAL 50 FEET		
SCALE: 1" = 200'	DATE: 2/18/69	REVISIONS.
DRAWN BY: C.E.B	CHECKED BY:	
TRACED BY:	APPROVED BY:	
DRAWING NO.		
GEOLOGY BY: C.E.BARRON		

File: Pinal Copper. Pinal Cty., Ariz

PINAL COPPER CORPORATION

401 East Indian School Road, Suite 107 • Phoenix, Arizona 85012 • (602) 279-6402

SXM
FEB 23 1973
RECEIVED

February 21, 1973

Mr. Paul I Eimon
Essex International, Inc.
1704 West Grant Road
Tucson Arizona 85705

Dear Mr. Eimon:

Thank you so much for your letter of February 5, 1973 in reply to ours of January 17.

This morning was the first time Marvin Larson and I have had to discuss the matter you have suggested. We think it deserves some careful thought.

As soon as some kind of a decision is made, one of us will be in contact with you again.

Thank you kindly for your interest.

Sincerely yours

PINAL COPPER CORPORATION

Edward Hopkins Jr.

President

EH/h

4/27/71

[redacted] FILE (Pinal Copper Co.)

I. Report on the Greenback Mining Company Oct 24, 1923 F. H. Royer

(A) 7 mining claims + 2 fractions in one group

(B) 52 claims taken up around Greenback ✠ 2 1915

Gold Veins (C) (1) Au-bearing qtz veins 5-12' wide cutting andesite & andesite schist - 3 veins striking nearly E-W & dip ±50° South.

Veins some dem. & degree mineralization known to 96' depth. Gold values (@ $20/oz) $8.80 to $97.60/ton selected samples $194.40 - $428, $1094.90/ton.

(2) 2 other E-W veins with some Au

II Report to Greenback Mining Company Los Angeles, California April 3, 1926 by C. W. BOTSFORD

(A) Company has 70 claims covering veins

(B) Geology - Pinal Schist intruded by qtz. monzonite porphyry.

(1) South ½ property porphyry covered by schist (roof) Schist continues several miles to south striking ± N 70° E with dips to South.

(2) Porphyry cut by dikes & apophyses of more "acid" (granite aplites, pegmatites & qtz. vein dikes) rocks.

(?) West ½ highbridge on the Silver Queen claims is hard dense porphyry (Neck of intrusive). Host rock (schists) are intensely silicified.

Intrusion dome shaped with upper surface cut by veins which continue into schist.

Eastern part district cut by many small "basic" dikes; many which follow vein fissures & are younger than mineralization.

(3) 12 + branching Vein Systems N 70° E to N 70° W & dip 45°-50° South. — west part property, large vein strike

qtz veins

N/10° W & appears to limit others. Most southerly vein on Hilltop Nos 4 & 5 dip vert. & may mark limit of vein system to south (also intrusion).

(4) Silver becomes more abund. with depth as gold changes from free to telluride gold. Black Ag minerals + bismuth & V. Also Mn & Fe ox w/ Cu & Zn in lower levels. All in brecciated qtz. vein & country rock. - Younger calcite, qtz, manganiferous calcite & barite.

(5) Description of existing shafts & proposed exploration

III (A) Letter from C.A. Barber Anaconda to George Freeman July 31, 1962
Returning reports by:
- C.H. Dunning, Jan 9, 1956
- Ariz. B. Mines April 12, 1955
- AS & RCo Smelter Return Hayden Plant April 18, 1952
- C.W. Butsford April 3, 1926
- F.W. Royer Oct. 24, 1923

Continue study Pinal Copper Corp. property.

(B) Letter C.A. Barber to George Freeman Feb. 9, 1965 Giving Anaconda's Results of Assay of samples from 1963-64 assessment drilling on Pinal Copper Corp's land. They agree with previous assay data. Terminate 3 year surveillance of property. Assays 591-681 @ 2 ft. intervals say 4 oz ppm Ag & up to 20 ppm Mo. (591-620)(29') 0.05 Cu; (624-673)(49') 0.19 Cu; (673-681)(8) 0.10% Cu.
- These compare with assays of older work.

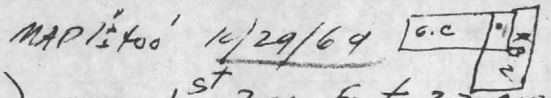
FOR Pinal Copper & Uranium Corp Phoenix

May 21, 1955 DH #3, 1.4% Cu; DH #5, 3.32% Cu; DH #8 3.4% Cu; DH #14 1.5% Cu. (C.H. Dunning samples(?) Assayed by Ariz Test Lab Phoenix.

Dec. 20, 1955 FOR Mr. Herold Ferris Pinal Copper & Uranium Corp Phoenix Ariz Testing Lab. (C.H. Dunning Samples?)
11 Samples 0.3 TO 3.0% Cu.

June 5, 1956 10 Samples for Pinal Copper Corp by Ariz Test Lab Complete essays (not in order) 0.28 – 2.25% Cu.

IV. Letter & Drill maps, essay data To Bill STRICKland from John Reynolds EL PASO NAT. GAS. May 18, 1970 AND M & Phys Geophysical Report Sept. 23, 1966.

(A) DRILL HOLE No. 1 OVERLAP AREA OF GOOD COPPER & KICK BACK No. 2 claims FROM MAP 1"=100' 10/29/64 

(530' T.D.) (9/7/46 - 9/28/66) (Log - J.J. Snider) — 1st 200 feet 33 ASSAYS AV 0.42% Cu — 1st 530' (T.D.) 66 ASSAYS AV. 0.286% Cu OXID. ZONE (Between ≈225' - 340' MIXED) ≈ 225' Sil. Andesite cut by Qtz veins ≈ 100' - 120' with ABUNDANT Green/Blue Cu Ox~ AT ≈ 225 And. less silicified(?) ~ AT 348' Rock decomposed granitic rock?

(B) DRILL HOLE No. 2 ≈ 2000' NNE of DH No. 1. It's at NW cor. of Copper Bell No. 5 (320' T.D.) (9/29/66 - 10/10/66) (Log - J.J. Snider) OXID. ZONE ≈ 190' - Andesite with 20' debris on top.

(C) Letters from Metler Bros. Drilling Co. Nov. 15, 1966 & Nov. 25, 1966

DRILLING COSTS 1909.15 — DH1 530'
BITS (DIAMOND) 882.05 — DH2 320'
$2791.20 for 850'
≈ $3.30/FT.

(D) Letter from NAE PHAR GEOPHYSICS Oct 31, 1966 $1021.25
INV. ID SURVEY 4¾ DAYS Oper. @ $215/DAY
¼ Equip breakdown
CREW EXPENSES 607.17
$1628.42

(E) Letter from W.H. Nordin (EL PASO) to Bill STRICKLAND Oct 29, 1969. Breakdown costs Pinal Copper ground 9-12/196

PAYROLL LABOR	1,036.69
" TAXES & INS.	40.87
Equipment use	288.10
Expense Accts	1272.94
Contractors	
NAE PHAR Geophysics	1628.42
METTLER BROS DRILLING Co.	6,437.28
	$10,703.98

No. Holes & footage (Rod getting data)

NOTE METTLER DRILLED FOR TRANS ARIZONA & EL PASO

(F) Legal of Pinal Copper claims & Docket & Page No. 25 of 9/15/66
≈ 65 claims

(G) Disclaimer deed Trans Arizona, Inc. TO Papago Minerals, Inc
52 Claims 9/12/69

IP anomalies on Pine/Copper's claims show the wide spread presence of disseminated metallic mineralization

500' N-S — Line 43 W° - only weak IP effects & is believed to be east of more concentrated zones of mineralization.

Line 48 W° - Two zones of more concentrated mineralization

500' N-S — zone extends ± 1 mile (N-S) from 15S to 30N. Magnitude of IP results suggests an increase of metallic concentration at depth at 5S TO 5N & 15N TO 25N.

IP 2 320 TD — The northern anomaly was detected with 300 intervals & is

300' N-S — moderate in magnitude but definite

Line 51 W° - The northern anomaly checked (300' int.)

300' N-S — between 43 & 53 W & the anomaly is definite & results similar to those of Line 48 W

Line 53 W° - The entire length of the line anomalous

500' N-S — but a narrow zone of slightly increased IP effects about 15 S. & again checks the northern anomaly which centers about 20 N.

500' E-W — LINE 7 +50N - E-W line thru center claim group. The IP anomaly extends west of 35W (the apparent resistivities in this area are typical for fractured, altered acid intrusive rock. To the east of 35W where resistivities at depth (meas. for n=3,4) show a higher value. this may be due to decrease in porosity of the granitic rocks indicating decrease in intensity of alteration. Another inc. in IP effects meas. for large electrode separations

(n=3,4) at 53W to 48W are probably due to the zone of more conc. mineralization to the north. The definite anomaly at 73W to 63W checks with that defined by previous survey (IP) (in blue) DRILLED?

500' E-W

Line 0+00S - E-W line, Relatively unaltered (?) (less porous) rocks extend east from about 35W.

There is shallow narrow weak IP anomaly centered about 2+50W that should be checked by 300' or 200' electrode intervals. Source could be narrow (25'-100') of relatively concentrated metallic mineralization. — Weak to moderate effects to west agree with results of N-S lines.

EP1 #1) 530' TD.

Conclusions & Recommendations

Results show zone of disseminated metallic min. extend well beyond area already tested by drilling. — New anom. zones in same as ones previously checked & amt. sulfides should be same.

Wkly anom. effects mass over very large areas indicate 1-2% sulfides with large IP effects areas containing 3-5% sulfides. Could be economic — Drilling Recommended

① Line 48W 0+00 vertical 700' } EP-1
② " 48W 2+50N " 500' } EP-2
③ " 48W 2+50N " 500' }

It is obvious that mineralization (zones) could be traced N & W

V A.B. WALKER CLAIM MAP SCALE 1"=400' FEB., 1958
GOLDHILL - TITIAN - GOLD KING GROUP WHICH JOINS
PINAL COPPER'S GROUND TO THE SOUTH — 20 CLAIMS including
2 FRACTIONS — POSSIBLY "SOUTH CLAIMS"

NOTE POSITIVE I P ANOMALY on South end Pre EP Line "A"
Fits in Titian #5 & GAP To South.

VI (2) AREA LOC. MAP OF CLAIMS on Pegago Res. (BLACK)

VII Copy letter STRICKLAND to ESSEX 9/25/58 (BLACK)

VIII McPHAR Geophysical Report To EL PASO Sept. 23, 1966

Claims Group underlain by granite rocks & locally outcrops show alteration & weathered remnants of sulfides. Several drill holes in outcrop area & previous geophysical work & drilling has shown alteration & mineralization extend in to adjacent areas under cover of Tertiary sediments.

Cu Sulfides included with pyrite as disseminations in altered rocks has not been intersected over large areas in ore grade by previous drilling.

Purpose of this survey: to outline complete zone of Mineralization so additional drilling can be carried out.

6 NEW LINES with 300' & 500' electrode intervals

CHARLES H. DUNNING
MINING ENGINEER
PHOENIX, ARIZONA

OFFICE
817 W. MADISON ST.
PHONE ALPINE 3-6272

RESIDENCE
1638 W. EARLL DR.
PHONE AMHERST 5-1132

January 9, 1956

Pinal Copper & Uranium Corporation
4318 North Central Avenue
Phoenix, Arizona

Gentlemen:

Pursuant to your request, I have made a new or additional examination of your group of copper claims on the Papago Indian Reservations, south of Casa Grande, Arizona.

A previous examination and report was made in May, 1955, but since that time there has been considerable additional exploration by drilling, and further data is available on which to base opinions.

Rather than refer to the old report it is thought that this report would be clearer if it included the pertinent matter covered before.

LOCATION AND CLAIMS

The group consists of 106 mining claims or about 2000 acres, and is situated 42 miles southwest of Casa Grande on the northern slope and outlying valley of the Cimarron Hills.

Probably 40 or 50 claims would be sufficient for your present purposes, but Congress recently passed a bill allotting mineral rights on the Papago Reservation to the tribe, and after it was passed mining locations may be more difficult and expensive to obtain. As all your locations were prior to this act you are in no way effected.

GEOLOGY - GENERAL

The terrain consists of a basement of Pinal Schist which has been invaded by magmas solidfying as various phases of granitic porphyry, quartz monzonite porphyry, and dioritic porphyry.

The geology at the site was quite thoroughly studied and reported upon in 1920 by Dr. G.M. Butler of the University of Arizona. There has been no cause for any change in opinions since that time, and as this is an economic, rather than a technical report, may it suffice to say that I fully agree with Dr. Butler.

LOCALIZED GEOLOGY AND ECONOMIC IMPLICATIONS VARIOUS GEOLOGICAL SITUATIONS

Your group of claims cover several square miles, and while the basis geology outlined above applies to the general terrain there are on your group several separate geological situations, which should be treated, and also explored separately.

Unfortunately you do not have a general map of your group, with prominent markers on the ground. To get to some points on your group it is necessary to travel via roundabout roads, and then one only has a general idea of where he is. I have however, drawn a blocked out claim map and indicated thereon the approximate location of the situations to be discussed.

CENTRAL SITUATION

The central area may not prove in the long run to be "central" but is so designated at the present time. It was a natural starter for exploration because there were outcroppings of commercial ore, a water well that had drilled through ore, and an intriguing geological situation generally.

Most of your present 27 drill holes have been put down in this area.

From one open cut a test carload was shipped to smelter some years ago and assayed 2.89% copper. Copy of this smelter return is on file. Dr. Butler reports that the water well passed through 290 feet of low grade ore.

In this area the rock consists of the various phases of porphyry mentioned above and also contains some silicified zones of dykes which are sparsely mineralized.

The general course of mineralization is from the southeast to the northwest. It is bounded on the east by a major fault, on the north by valley fill, on the west gravelly fill, and on the south it contacts the schist, which constitutes a situation in itself. The total area of this Central Situation is approximately 500,000 sq. ft.

In the softer portions of this area there is generally no copper showing in the outcrop, but one need dig a few inches before copper is encountered. Angle drilling has shown: good copper in the softer areas, special enrichment along the contacts with the harder zones, very low grade copper in the hard zones themselves.

These conditions lead one to believe that the entire area was originally one of moderate or low grade content, much like the hard zones. The softer zones have been amenable to leaching and such leached copper has precipitated and enriched such soft zones for some vertical distance immediately below the surface. The hard zones have been comparitively unleached but have acted as dams against percolating solutions causing extra enrichment along their walls.

It would therefore seem that you are already in as much of a secondarily enriched zone, with your drill holes as you can hope for. The present water level was not the controlling factor in this secondary enrichment, and it is doubtful if you will find further enrichment, or commercial ore, below that indicated by your present drilling, in this Central Area.

This does not preclude there being a good sized open pit mine of leachable ore in this area. You will have to contend with some low grade hard ribs which you may be able to dodge in mining, or execavate and waste like ordinary overburden. And you are especially fortunate in having practically no ordinary overburden to remove, thereas in most Arizona open pit mines the ratio of waste overburden that must be removed is about two tons waste to one ton ore.

SOUTHEAST SITUTATION

This area, prospected by Hole #22 seems to comprise the extension of a mineralized condition spurring off from the Central Area. A general sample of Hole #22

assayed 2.00% copper. Drilling proof that there was continuity between the Central Area and this situation would add large tonnage to "assured ore", and economic features to an open pit.

SOUTH SITUATION

In the general area designated as the "South Situation" geological conditions are quite different. Here the mineralization is in schist. Bands of the schist that are normal, and predominate, show intense leaching, with traces of copper remaining. Oxidized iron minerals are of the type that once contained copper. Silicious lenses that are normal to such a schist, are unleached but show copper approaching commercial grade.

Schists of this type, when invaded by copper bearing intrusions are often more receptive to replacement by copper than monzonitic type rocks, thus forming higher grade ores. This highly mineralized and leached schist area could easily form rich secondary, and commercial primary, ore zones. It has good possibilities of developing into the best producer of any area you have. It should be explored by preliminary drilling.

NEAR WEST SITUATION

Proceeding west from the Central Area the terrain is mostly covered with alluvium, except for some croppings in washes (such as situation 30 - q.v.). But at a distance of about 1/2 mile an area of highly kaolinized monzonite or rhyolite outcrops. There are a few ten foot prospect holes showing a little copper.

Kaolinization is an alteration of the constituents of rhyolitic type rocks caused by chemically charged solutions. Such conditions portend mineralization when they occur where economic minerals are indicated in the altering solutions. Such situations are also prone to subsequent leaching.

Such an area of kaolinization, with a bit of copper remaining, in a general area of copper mineralization, certainly justifys exploration by drilling. Here there could well be a secondary zone of the chalcocite type.

FAR WEST SITUATION

This area, from a mile to a mile and a half west of the Central Area again shows a highly mineralized condition. It cannot be defined, mapped, nor tied in geologically

until there is a survey with ground markers. To the south it seems to tie into unmineralized achist; to the west it is covered with later volcanic flows. But generally speaking there is a lot of good looking country there that warrants exploration.

NORTHEAST SITUATION

Immediately northeast of your Central Area there seems to be a band or zone of comparitively unmineralized rock. Further northeast drill holes #16 and 18 were put down and penetrated soft, leached, low copper bearing material. This area looks doubtful but justifies a bit of further exploration.

SITUATION "30"

For lack of a better name I have called this area "30" because assay samples taken there happened to be numbered 30, 31, and 32. Here we have a hard silicified zone cropping across a gulch. No copper was apparent but a peculiar shade of some of the red "iron" led me to suspect red copper oxide. An average sample assayed ,90% copper. Sample #31 was taken of a different type of porphyritic material on the hangingwall side of the silicified zone. It was leached and showed no visible copper, but assayed .30%. Sample #32 was taken of the same hard silicified band as sample 30, where it outcrops through the gravel fill about 100 yards wouteast from #30. It assayed 1.20% copper.

This general area warrants exploratory drilling. Like the South Situation, the values in the hard rib, and slight remaining values in its soft neighbor indicates important secondary values at reasonable depth in the leachable material.

TONNAGE AND AVERAGES

Twenty seven diamond drill holes have been put down but they have not been systematically spaced (see map) nor have the cores or sludges been consistently assayed.

At the time of my examination in May 1955, I sampled the cores from holes 3, 5, 8, & 14. These were selected as being fairly representative of the general area covered by the then 15 holes. Assays were as follows:

Hole #3	1.40%
Hole #5	3.30
Hole #8	3.40
Hole #14	1.50

More recently I have sampled the cores from other holes with results as follows:

#3 upper portion	3.00%
#14 middle portion	1.50
#20 from 25' to 45'	2.80
#22 general	2.00
#23 general	1.40
#26 general	1.60
#27 general	.50

This last lot of assays, represented by the attached certificate, were selected for the following purposes:

(a) To check or train the eye in estimating other holes or cores.

(b) To supply a diversified set of standards so that quick colormetric assays can be made at the mine.

(c) To obtain definite and positive results in at least a few holes and in some unknown situations (the 30s).

The average of all of the above assays is about 2,00% copper. Judgement indicates that the average of all the holes, or of the area covered by the holes would be somewhat less - probably 1.40% to 1.60%. And in considering this area or tonnage a further allowance must be made for the very low grade hard ribs mentioned above, although they may not have to be mined.

The general area covered by the holes, without including some outlying holes, is approximately 640,000 sq. ft. Deducting 20% for some islands that would be better left unmined we have about 500,000 sq. ft. At an average depth of 150 feet which is as much as can be assured at present, the tonnage is such a block would be about 4,000,000.

It must be born in mind that because of the irregularity of the holes the above tonnage cannot be stated as positive. However, such tonnage does seem well assured. It should also be born in mind that this comparatively small area is a small portion indeed, of the total probable commercial area or areas.

LEACHING TESTS

A copper leaching test made by the Arizona Bureau of Mines, April 12, 1955, shows the oxidized ore to be amenable to sulphuric acid leaching. Head sample was 2.01% copper, extraction 81.2%, and acis consumption 70.5 lbs per ton or ore. This ratio of 1.75 lbs of acid to 1.0 lb of copper is normal. Cost of acid in operating a plant on that grade of ore would be about 1.00 per ton. On lower grade ore it would be proportionally less.

JUSTIFICATION FOR LEACHING PLANT

With an assurance of several million tons of ore containing in the neighborhood of 30 lbs copper per ton, and showing good amenability to leaching, you are well justified in considering a moderate sized leaching plant of say 500 to 1000 tons per day.

~~But~~ before such plant is installed or designed very thorough tests should be made on the various types of your ore, on a pilot plant basis.

COSTS AND GENERAL ECONOMICS

On a basis of 500 to 1000 tons of leaching ore per day from open pit I would estimate that your operating costs should not be greater than the following:

MINING:	Mining and delivery to plant, including necessary stripping of overburden, and wasting of non-commercial islands.....		1.00
MILLING:	Acid and iron	1.50	
	Labor and other	1.50	3.00
OVERHEAD AND TAXES:	(Not including income taxes).....		.50
MARKETING:	(Deducted from value of copper)		
	Total		$ 4.50 per ton

Assuming 30 lbs copper per ton and 80% extraction you would recover 24 lbs of copper per ton. The present market for copper is 43¢ but it would be a bit sanguine to project such price very far in the future. A price of 36¢ would seem a fair basis for estimates. If the market is 36¢ you will actually receive about 33¢ the difference covering freight, refining and sales costs (marketing).

24 lbs copper @ 33¢	$ 7.92
Deducting operating costs	4.50
Profit before income taxes.....	$ 3.42 per ton

CAPITAL

To achieve this operating profit rather large capital expenditure will have to be made. They will be discussed further under "Recommendations", but generally speaking a well engineered plan for coordinate drilling of the Central Area, and exploratory and some coordinate drilling of the other areas will require....$ 500,000.

Pilot plant and thorough testing of the ore, together with cost of the above mentioned leaching plant.....$ 300,000.

Miscellaneous and corporate expenses, and operating capital.....$ 200,000.

Total.....$ 1,000,000.

MAPS

Attached to this report is a map showing the block of claims with the above mentioned areas roughly outlined. Also a map, drawn in coordinates, of the area where most of the drilling has been done. Present drill holes are spotted on this map, and it is recommended that further drilling be done with vertical holes at these coordinates.

RECOMMENDATIONS

All of the old drill cores or sludges should be assayed and mapped. Such map should show the respective elevation of the collars of th holes.

A survey should be made of the claims, erecting prominent claim corners, each with a tag showing what corner it is. Then a geological map should be prepared using these corners as field markers.

Coordinate drilling should be carried on in the Central Area. This will result in your being able to segregate the ore and waste zones, estimate definite or positive tonnages, average values, and thickness of ore and overburden at all points. This is all essential information before planning your pit operation.

Exploratory drilling should be carried on in the other areas mentioned, to be followed by at least some coordinate drilling as soon as preliminary information is obtained.

An engineer or mettalurgist experienced in copper leaching should be employed at least part time, and a pilot plant can be built and put in operation as soon as practicle. All types of ore from all locations should be tested.

Coordinate drilling and pilot plant tests could well reach conclusive results simultaneously, and you would then be ready to design and install a commercial plant.

Roads should be repaired to stand up under heavy traffic, and the waste material from pilot plant operation, or from overburden excavation, should be useful for that purpose.

Systematic sampling of drill cores and/or sludges should be carried on continuously and the results tabulated and mapped.

CONCLUSION

You have a large but not definitely measurable tonnage of commercial ore, and very large areas of probable ore.

If development and operation is carried on according to good engineering practice the project should be very successful.

Respectfully submitted,

Chas H Dunning

CHARLES H. DUNNING

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Charles H. Dunning

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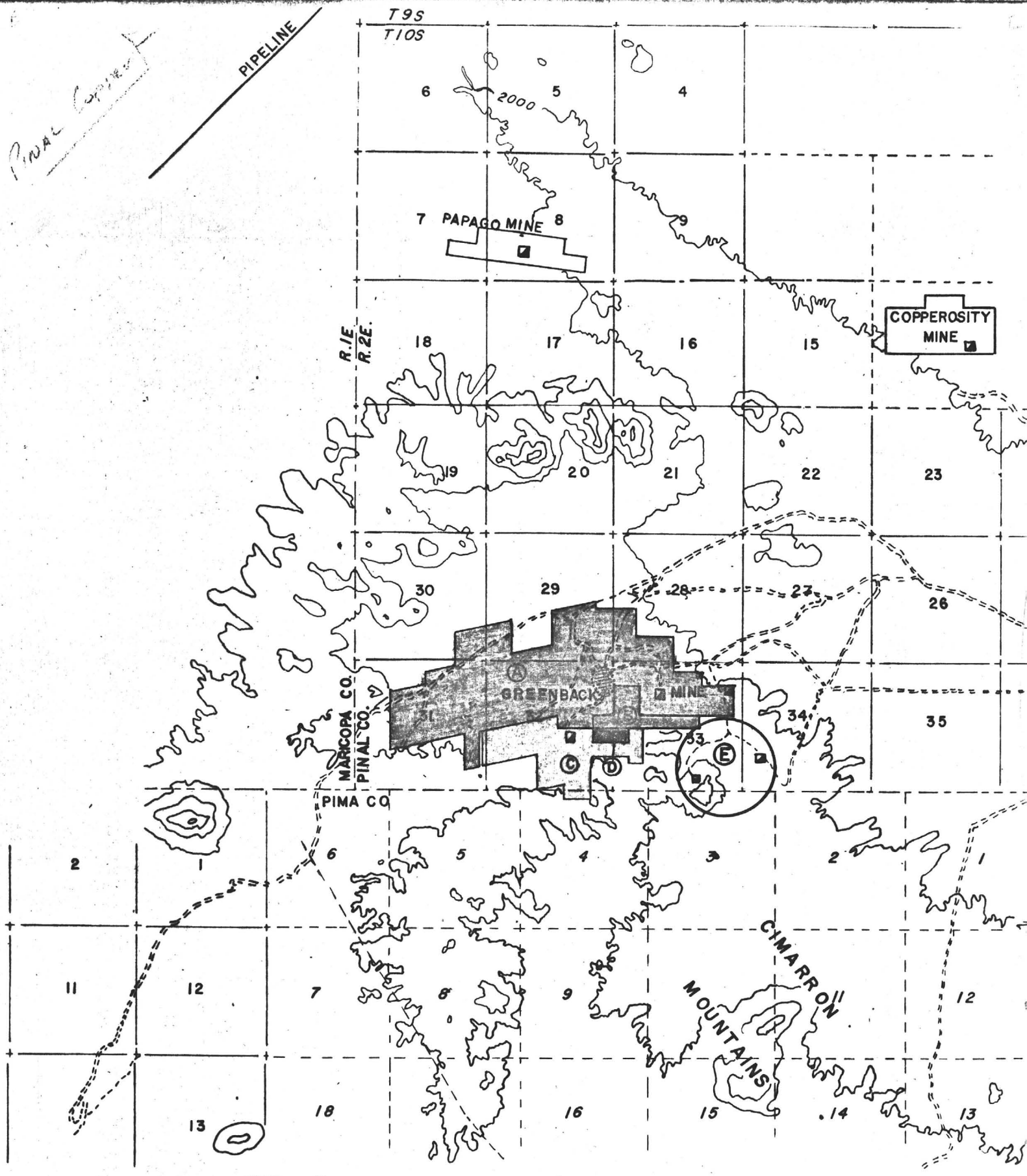
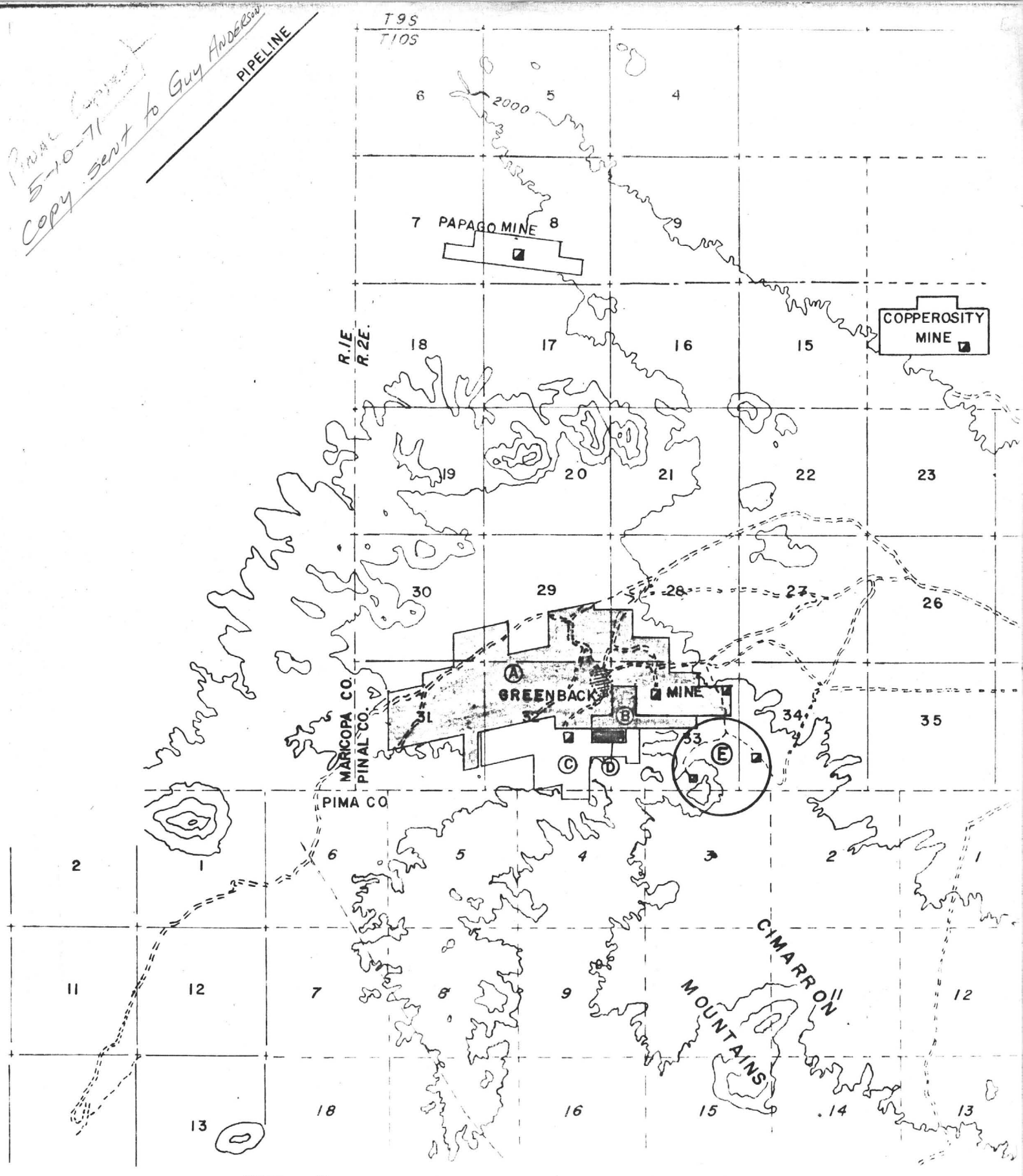

T9S
T10S
PIPELINE
PINAL COPPER
6
5
4
2000
7
PAPAGO MINE
8
9
COPPEROSITY MINE
R.1E
R.2E.
18
17
16
15
19
20
21
22
23
30
29
28
27
26
GREENBACK MINE
A
C
D
E
31
33
34
35
MARICOPA CO.
PINAL CO.
PIMA CO
2
1
6
5
4
3
2
1
11
12
7
8
9
CMARRON MOUNTAINS
12
13
18
16
15
14
13
Ⓐ Pinal Copper Corp. Claims and area of interest
Ⓑ C Black Claims and area of interest
Ⓒ South Claims and area of interest
Ⓓ Black and Ogden Claims and area of interest
Area of extensive Explor. and Devel.

PINAL COPPER & VICINITY
FROM NW 1/4 SEC. 32 T. 105, R.2E.

View of
Gold Workings
to S.E.

Looking
Northerly
from
Workings

View
Northerly
of
Cathedral
Rock
from
Workings


Pinal Copper
5-10-71
Copy sent to Guy Anderson
PIPELINE
T9S
T10S
6
5
4
2000
7
PAPAGO MINE
8
9
COPPEROSITY
MINE
R.1E.
R.2E.
18
17
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30
29
28
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GREENBACK
MINE
A
B
C
D
E
31
32
33
34
35
MARICOPA CO.
PINAL CO.
PIMA CO.
2
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7
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12
18
16
15
14
13
CIMARRON
MOUNTAINS
A Pinal Copper Corp Claims and area of interest
B C Black Claims and area of interest
C South Claims and area of interest
D Black and Ogden Claims and area of interest
Area of extensive Explor. and Devel.

EL PASO NATURAL GAS DH 1
9/7/66 - 9/28/66
METLER BROS DRILLING CO.

	%Cu	
0	0.3	SILLIFIED ANDESITE W/Cu OX.
	0.29	
	0.42	
	0.40	
	0.69	INC. Cu/Fe OX.
	0.63	
	0.68	
50	0.66	
	0.44	
	1.08	
0.62	0.2-0.1	
		WHITE ANDESITE 75-76.5
		NO VIS. Cu
		GOOD Cu less Fe
	0.62	FAIR Cu (54-82 = 0.84% Cu)
100	0.63	Def. change TO QUARTZ
	0.15	
	0.40	Def change Fe, stn Frac.
	0.33	Def change Sil. ANDESITE 117.5
	0.43	
	0.33	
	0.21	BADLY FRAC. W/NO VIS Cu
	0.13	SANDY CORE
150	0.11	
	0.61	GOOD CORE LESS Fe OXE FRACS Inc. Cu
	0.50	MAJOR SHEAR
	0.34	FRAC. GOOD Cu
	0.37	
	0.40	
	0.43	
	0.28	SOME REMNANT SULFIDES
	0.29	
	0.26	
200	0.37	
	0.18	HEAVY FRACS, GOUGE, Cu/oil
	0.15	NO VIS Cu
	0.20	
	0.21	SOME SULFIDES (?)
0.18	0.25	MAJOR SHEAR BROKEN AND.
	0.24	TR Sulfides ? Cu w/Gouge
	0.29	
	0.30	
250	0.24	Decomposed Altered Soft
	0.29	w/Cu OX
	0.14	
	0.08	TR Cu Good Lighter CORE
	0.09	BRAZEN ANDESITE CHIPS
	0.10	& SOFT CLAY ZONES
		CHANGE AT 283 CORE FIRM
	0.17	WHITE w/ SPARSE Fe OX
		NO Green-Blue Cu OX.
	0.12	TR. Sulfides
300	0.14	CORE INDURATED GRAY
	0.15	TO BLUE TR Sulfides
	0.15	
	NA	Fine diss. Py
	NA	
	NA	
	NA	
	NA	
	NA	
	0.11	??? CHANGED TO DECOMP. GRANITE
350		343-348
	0.08	MORE SOLID CORE TR Sulfides
	NA	
	NA	
	NA	CORE Lighter Color Inc Sulfides
	0.05	
	0.08	CORE SOLID WHITE w/NS Py. 280
	NA	
	NA	
	NA	CORE DECOMPOSED
	NA	
400		
	0.08	
	NA	
	NA	
	NA	
	NA	
	NA	
	0.05	
	NA	
	0.04	
450		Inc PYRITE
	NA	
	NA	
	0.08	
	NA	
	0.08	
	NA	
	NA	CHALCOPYRITE
	NA	
	0.12	HEAVY Py on FRAC w/Cu
	NA	
500	0.16	TR Cu
	NA	
	NA	
	0.09	
	0.11	
		T.D. 530

MIXED OXID-RED

+.3% Cu cutoff
115' @ .517

EL PASO NAT. GAS D.H. 2
9/29/66 – 10/10/66

0 0000

ALLUVIAL FILL DEBRIS
" " "
" " "

ALT. ANDESITE (FRACTURED)
LIGHT BRN WITH HEAVY BLACK
IRON OXIDE IN FRACTURES

50

ANDESITE LIGHTER COLOR 41-73
RED & BLACK FROM
ANDESITE BRN COLOR MORE FRAGS.

100

ANDESITE MORE ALTERED
GOUGE AT 119 & 126; 138 147

150

AT 152 LESS ALT, W/ TR SULFIDE
PYRITE 158-165 in ALT Andesite

LESS ALT W/ PYRITE & FROM in fracs.

END OXIDE 186-191
GRY SHEARED gouge w/ Pyrite

200

White Gouge seam at 213

Inc. Pyrite 238-245

250

THICK GOUGE ZONE WITH
PYRITE T. 26

300

T.D. 320

REDUCED ZONE
OXIDIZED

0.286
66 | 18.890
132
569
528
410
396
14

66 ASSAYS
AV. 0.286 +0/0 CU
FOR 530'

FIRST 200'
33 ASSAY = 13.90
AV. 0.42 +0/0 CU

0.42
33 | 13.90
132
70
66
40

T

30
29
42
40
69
63
68
66
44
1.08
82
20
10
62
63
15
40
35
43
33
21
13
11
61
50
34
37
40
43
28
27
26 36
13.90 37 27
28
35
21
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24
29
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8
8
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12
16
9
11 65
18.89 T +1/66