CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
3550 N. Central Ave, 2nd floor
Phoenix, AZ, 85012
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

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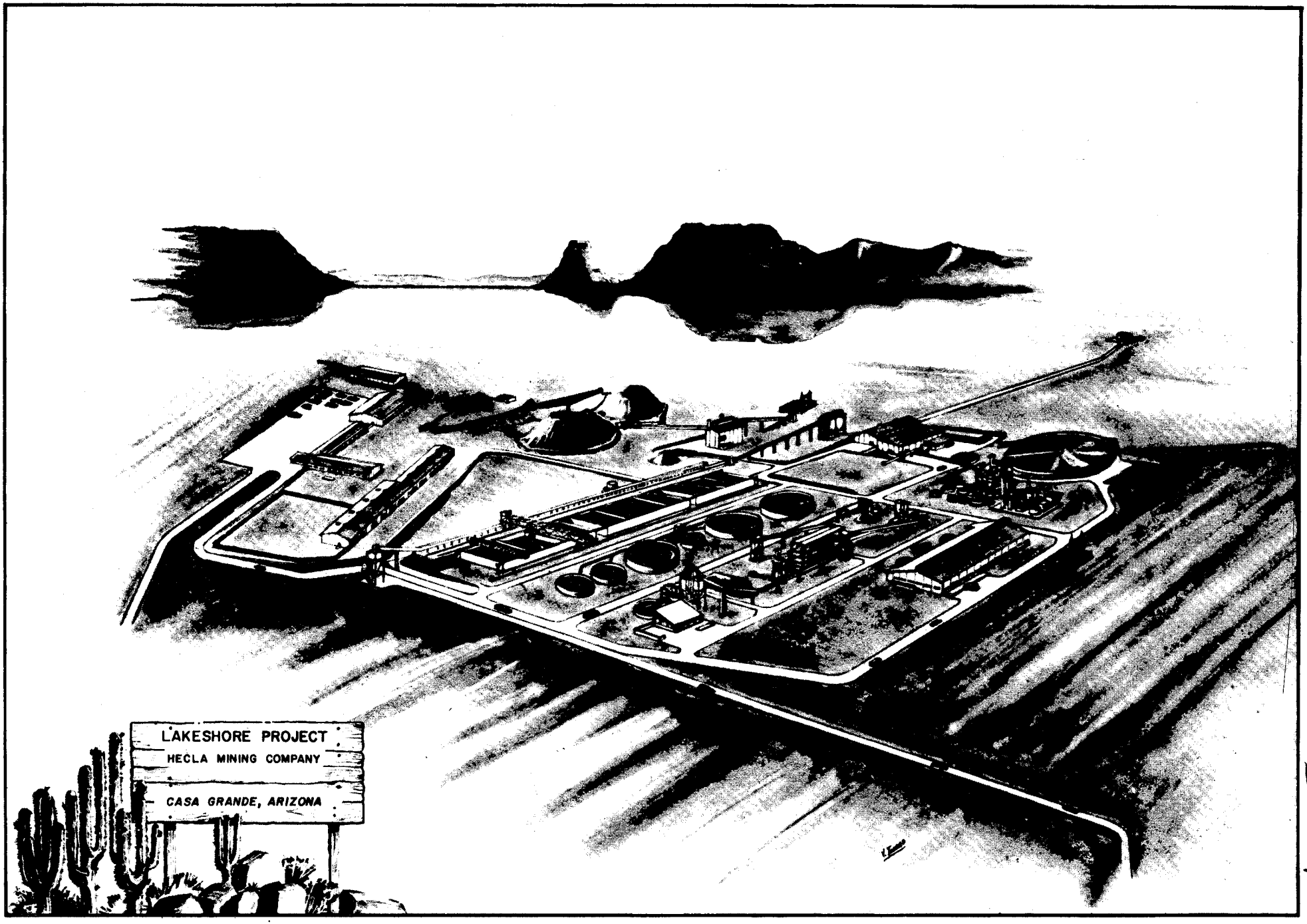

LAKESHORE PROJECT
HECLA MINING COMPANY
CASA GRANDE, ARIZONA

INTERIUM REPORT: LAKESHORE EVALUATIONS

BY: W. N. Hoskins

BACKGROUND

The Lakeshore property is located about thirty-one miles southeast of Casa Grande, Arizona, within the Papago Indian Reservation and Casa Grande mining district, Pinal County. (Sections 25, 26, 35, 36; T10S, R4E, Silver Reef Quandrangle). The Lakeshore deposit is situated on the southwest piedmont of the Slate Mountains at an elevation of about 1800 feet.

Work first began in this area in the early 1880's; however, after a shallow shaft and some horizontal drifting had been done, the copper market failed and the claims were abandoned. In 1905 the property was again relocated and a small quantity of ore from the old mine dumps was shipped to nearby smelters. In 1914 the property changed hands and the new owners, Frank and Charles Leonard, sank a new shaft to 225 feet and began mining the high grade portion of the ore body. In 1917 the Atlas Development Compny leased the mine and shipped 850 tons of 5.2% copper ore. Two years later, after Atlas Development Company terminated the lease, the owners did more exploration and mined a total of about 12 tons of high grade (15%) copper and in 1929 production ceased.

In 1949 the United States Bureau of Mines (USBM) investigated the Lakeshore property by performing geologic and topographic mapping, exploratory drilling (one diamond drill hole and 5 churn drill holes for a total of 2,872 feet) and metallurgical test work. Shortly after the USBM investigation was completed, the property was acquired by Transarizona Resources, Inc. From 1956 to 1962 Trans~~merica~~ Resources developed a small

oxide open pit mine on the copper deposit and, jointly with the USBM, designed a special benification process to separate the copper from the host rock. Metallurgical and technical problems could not be satisfactorily solved and Transarizona Resources went into receivership.

During 1962 - 1966 Transarizona Resources tried to interest several large mining companies in the properties. El Paso Natural Gas Company examined the property in 1962 and started a small drilling program in 1963. In 1966 the Narragansett Wire Company acquired the outstanding stock of Transarizona Resources, cured the receivership, and in 1967 became a wholly owned subsidary of El Paso Natural Gas.

During 1967, El Paso Natural Gas started extensive geological and geophysical investigations of the operating property and adjacent land which culminated in discovery of the large copper deposit concealed beneath alluvium to the west of the small open pit mine. In 1968 they opened their exploration records for inspection by a number of major mining companies and is known to have received several offers of participation. Finially, in February 1969 an agreement was concluded with Hecla Mining Company in which Hecla relinquished 16.8% of its stock to El Paso National Gas for a 50% interest and operating control of the property.

RESERVES AND GRADE

Harper and Reynolds, at the 1969 Mining Congress meeting, reported that in February 1969, with a total of 77 drill holes located in an area 3000' by 4000', spaced at 350' to 400' apart, and ranging in depth from 700' to 3200' (total footage: 127,000'), reserves and grade were:

241 x 10^6 tons sulfides @ 0.70% Cu

207 x 10^6 tons oxides @ 0.71% Cu

23.6 x 10^6 tons tactite @ 1.69% Cu

472 x 10^6 tons total ore.

with minor values of Mo S_2, Au, and Ag.

At the November 1969 New Mexico Mining Association annual meeting, C. E. Barron, senior mining geologist with El Paso Natural Gas reported the same figures.

An earlier report, completed January 14, 1969 by R. F. Hewlett of Computech Research, Ltd. reported the following reserves based on 22 drill holes: 322, 319, 280 tons @ 0.81% Cu.

Several personal communications between Ken Jones (Essex) and unnamed parties cast doubt on the validity of some portions of the ore reserve information. Careful review of the raw data would be desirable in order to confirm the reserves and grade.

FINANCIAL ANALYSIS

The financial analysis of the Lakeshore property was based on information obtained from previously mentioned reports and second hand information. At best, the final answer is in the "ball park". Due to the variability of data it was decided to use an analysis based on business risk and a computer program developed especially for economic evaluation of mining properties.

Risk analysis is a comprimise between conventional and theoretical analytic procedures. Conventional analysis involves cash flow computations based on deterministic variables (those variables for which one value

only is used) from which the output is used to determine capital investments. In conventional analysis no attempt is made to incorporate the variability of input data. Risk analysis provides management with information on the extent of risk involved in an investment by using data in ~~for~~ the form of probability distributions. In other words, the grade of ore is generally known between high and low limits and is indicated by a statistical weighted mean value. For example, a copper grade is known to be between 0.75% to 0.95% with a mean of 0.85%. Conventional methods use the 0.85% as the true grade, whereas, Risk analysis would use 0.85% as the mean with a standard deviation of 0.10%. In Risk analysis all variables, except those known to be constant, can be input with their probable variation and the final result is an answer that gives the probability of acheiving a certain net present value of investment or return on investment.

As an additional modification, the program calculates the financial feasibility of the property using the wealth growth rate concept. Wealth growth rate involves using as input data, the rate of interest on capital, and using this rate as the growth rate of all positive cash flow monies. Conventional discounted cash flow-return on investment methods used the return on investment as the growth rate of positive cash flows. If the rate of return for the investment is large then the final result is inflated, because the method assumes that all incoming money is reinvested at the same rate.

The following is a list of the input data used in calculating the wealth growth rate on investment for a hypothetical Essex - El Paso Natural Gas joint venture. The values are approximations based on the combined knowledge of the Essex Metallurgy and Mining staff. It has been assumed that Essex will gain control of Hecla by some means and El Paso Natural Gas will write

off their capital expenditures at the to date.

A. Mining Method: Underground block caving

B. Fixed Variables:

1.	Federal tax rate	48.0%
2.	State and Local tax rate	1.5%
3.	Depletion rate	15.0%
4.	Operating days per year	350
5.	Rate of capital	10.0%
6.	Pre production period - years	4.0
7.	Mill concentrate grade (% Cu)	26.0%
8.	Mill recovery	93.0%

C. Stochastic Variables ~~(values uncertain~~

1.	Mine capacity	a. 40,000 TPD b. 50,000 TPD c. 60,000 TPD
2.	Water and land acquisition	$50,000,000 max $40,000,000 mean $30,000,000 min
3.	Reserves (tons)	472,000,000 max 370,000,000 mean 320,000,000 min
4.	Grade (constant)	0.80% Cu
5.	Exploration costs	$2,500,000 max $2,000,000 mean $1,500,000 min
6.	Royalty (on production only)* *also determined at a constant rate of 5%	10% max 7% mean 5% min
7.	Mining recovery	92% max 90% mean 88% Min
8.	Smelting and refining costs standard deviation	$67.60/ton conc = $5.00/ton

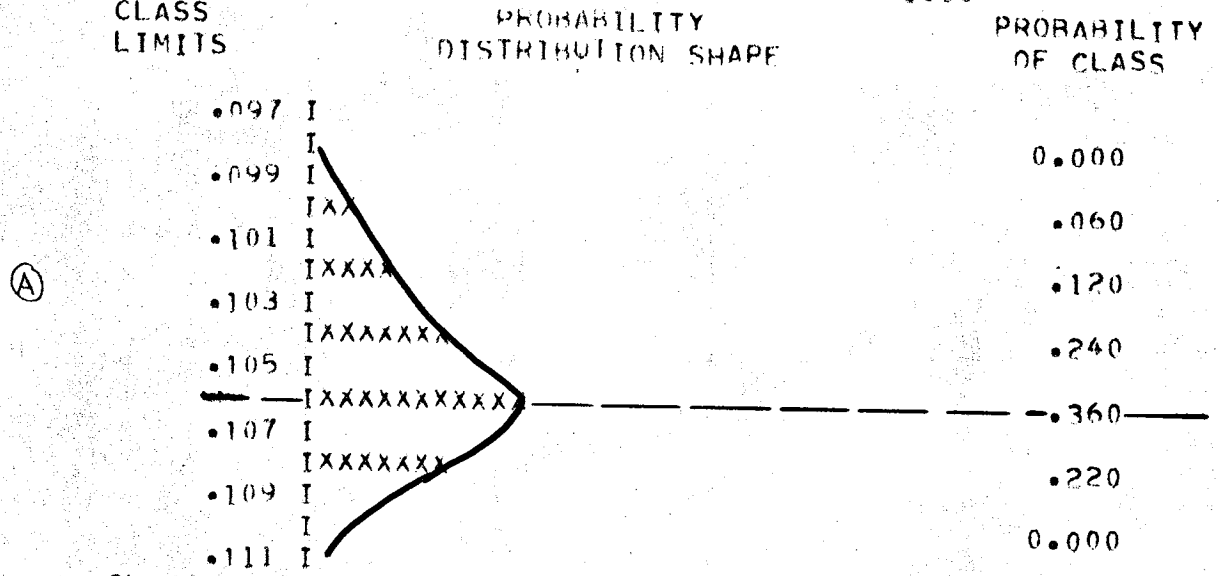
9.	Copper price (per pound cu) standard deviation	$0.60 = $0.03
10.	Mining costs (per ton of ore) standard deviation	$1.60 = $0.10
11.	Development costs (per ton of ore) standard deviation	$1.00 = $0.10
12.	Milling costs (per ton of ore) standard deviation	$0.85 = $0.05
13.	Capital investment costs for replacement of equipment	$6,000,000
14.	Salvage value of equipment	$5,000,000
15.	Capital investment	$150,000,000
	a. 40,000 TPD standard deviation	= $10,000,000
	b. 50,000 TPD standard deviation	$160,000,000 = $10,000,000
	c. 60,000 TPD standard deviation	$180,000,000 = $10,000,000
16.	Development costs	
	a. 40,000 TPD standard deviation	$15,000,000 = $2,000,000
	b. 50,000 TPD standard deviation	$17,000,000 = $2,000,000
	c. 60,000 TPD standard deviation	$20,000,000 = $2,000,000
17.	Working capital for property	
	a. 40,000 TPD	$8,000,000
	b. 50,000 TPD	$9,000,000
	c. 60,000 TPD	$10,000,000

CAPACITY= 40000. TONS PER DAY

WEALTH GROWTH RATE AS INVESTMENT CRITERION
REQUIRED RATE OR COST OF CAPITAL = .10

MINIMUM	.100
MEAN	.105
MOST LIKELY	.106
MAXIMUM	.108
STANDARD DEVIATION	.002
COEFFICIENT OF VARIATION	.02

PROBABILITY CRITERION EXCEEDS 0.00 = 1.00



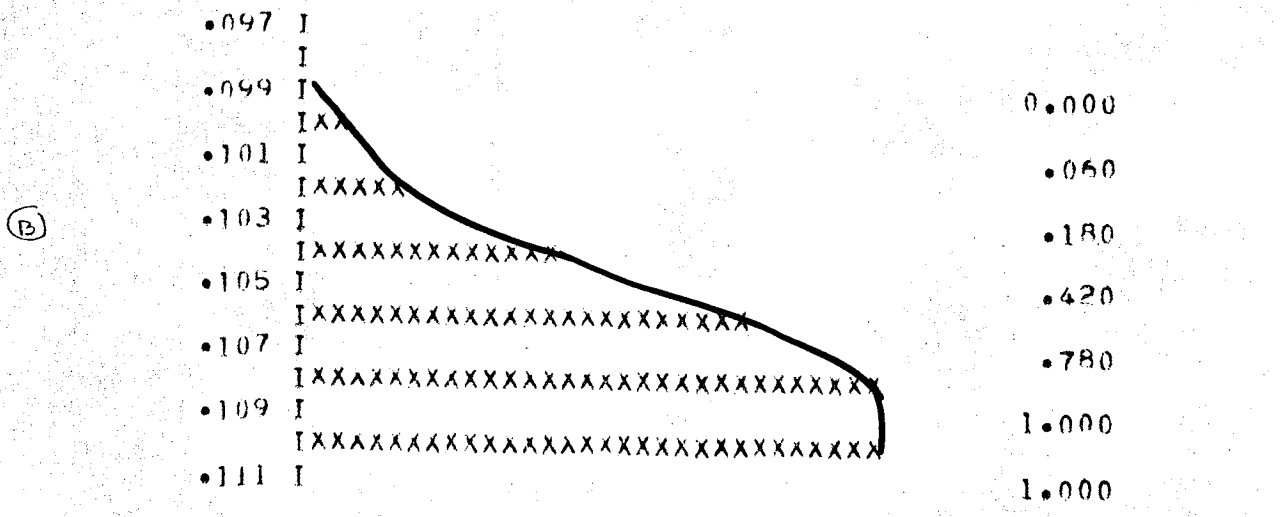


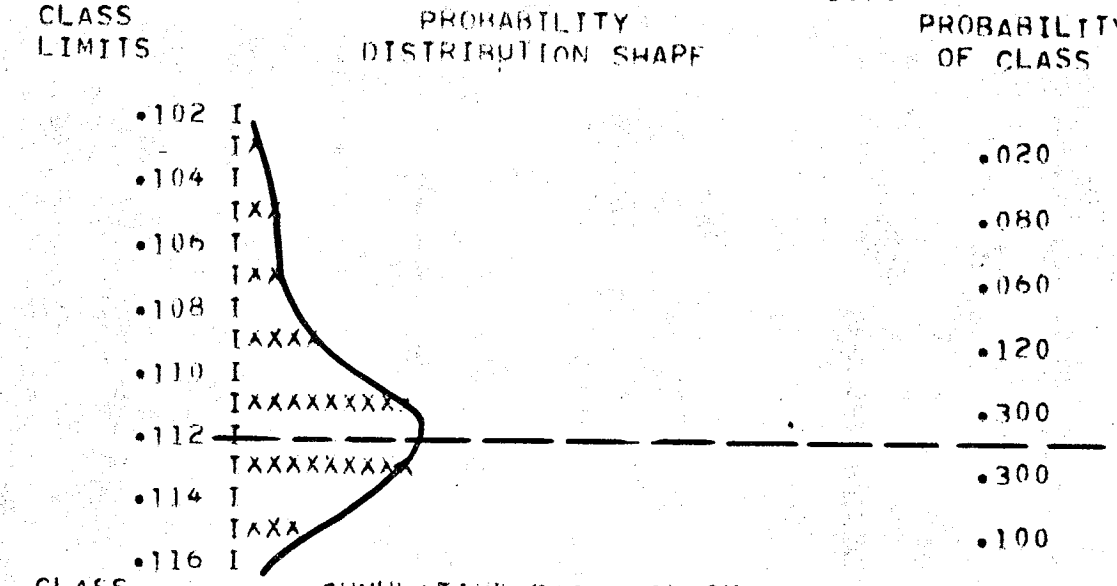
Figure 1 Probability Curves 40,000 TPD

CAPACITY= 50000. TONS PER DAY

WEALTH GROWTH RATE AS INVESTMENT CRITERION
REQUIRED RATE OR COST OF CAPITAL = .10

MINIMUM	.103
MEAN	.111
MOST LIKELY	.112
MAXIMUM	.116
STANDARD DEVIATION	.003
COEFFICIENT OF VARIATION	.03

PROBABILITY CRITERION EXCEDES 0.00 = 1.00



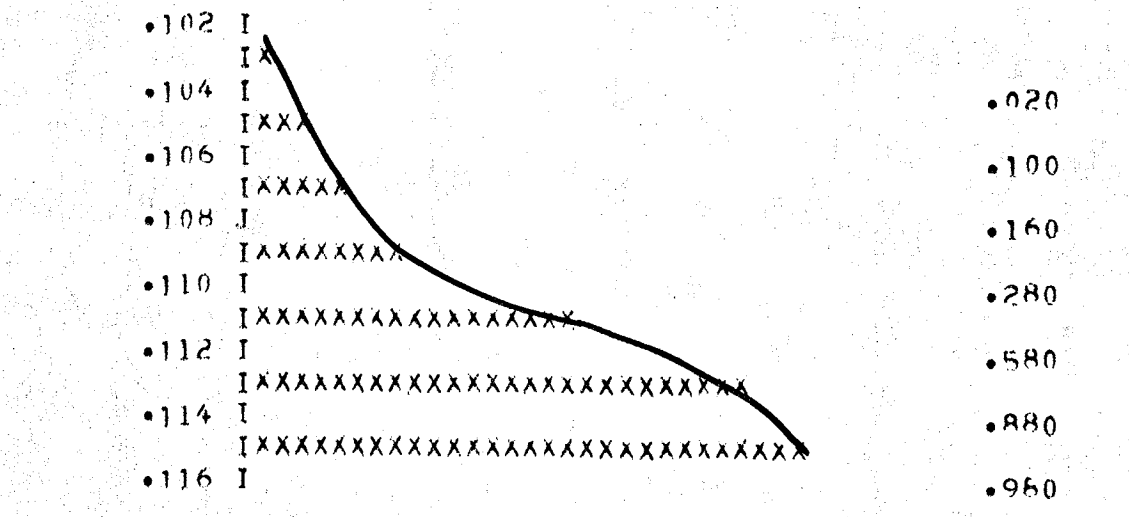


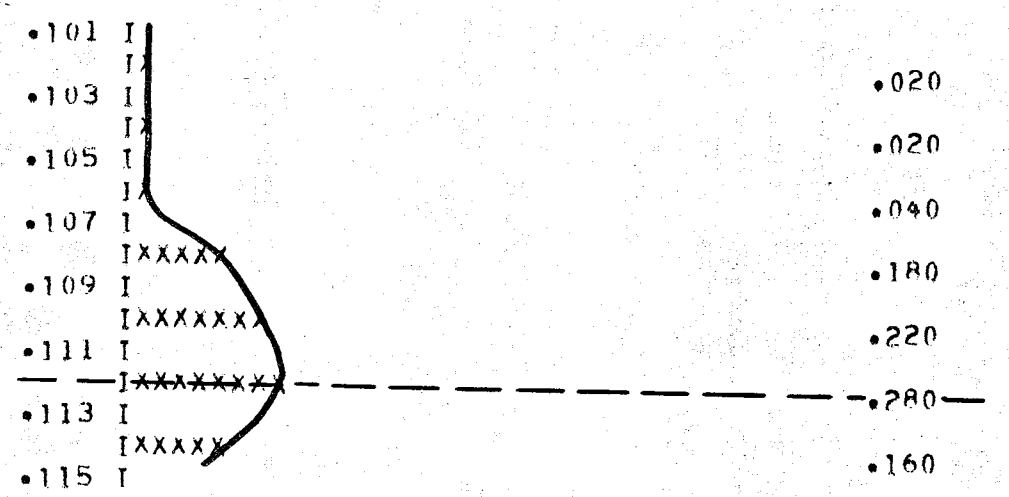
Figure 2 Probability Curves 50,000 TPD

CAPACITY= 60000. TONS PER DAY

WEALTH GROWTH RATE AS INVESTMENT CRITERION
REQUIRED RATE OR COST OF CAPITAL = .10

MINIMUM	.102
MEAN	.110
MOST LIKELY	.112
MAXIMUM	.115
STANDARD DEVIATION	.003
COEFFICIENT OF VARIATION	.03

PROBABILITY CRITERION EXCEDES 0.00 = 1.00



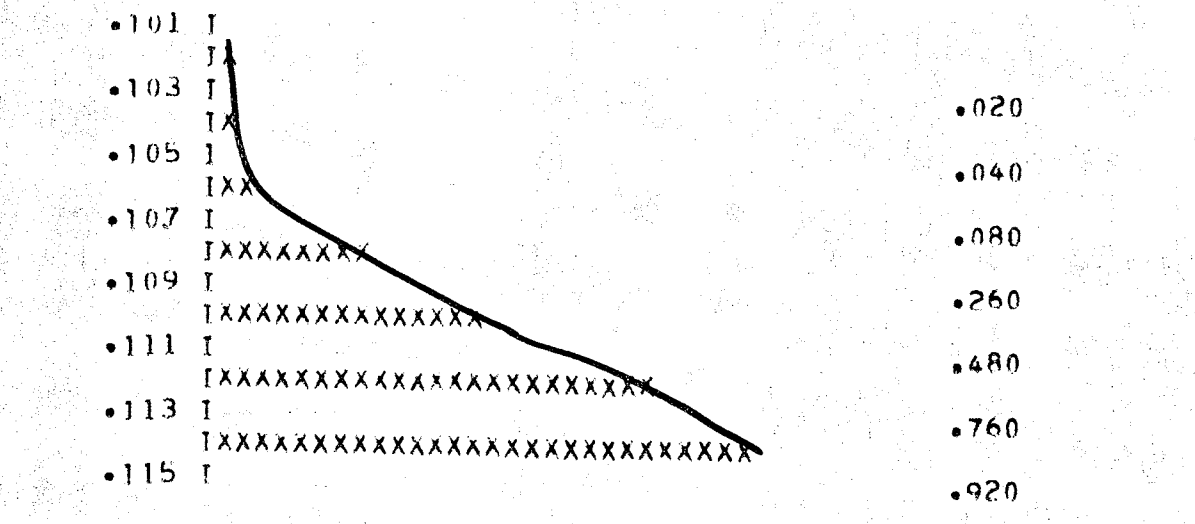


Figure 3 Probability Curves 60,000 TPD

List of References:

1. Barron, C.E., "Exploration at Lakeshore Mine", presented at annual meeting, New Mexico Mining Assoc., Nov. 16-19, 1969.
2. Hewlett, R.F., "El Paso Natural Gas Company, Lakeshore Property, Preliminary Report", January 14, 1969.
3. Hecla Mining Company, 1972 Annual Report.
4. Freeman, G.A., C. Rampacek, and L.G. Evans, "Copper Segregation at the Lakeshore Mine", AIME Annual meeting, St. Louis, Mo., 27 Feb. 1961.
5. Leech, W. D., "Documentation of a Computer Program using the Business Risk Analysis Technique Applied to Preliminary Economic Evaluation of Mining Properties", Term Report, U of Arizona, November 1972.
6. Hertz, D.B., "Risk Analysis in Capital Investment ", Harvard Business Review, Boston, Mass., about 1963.
7. Kim, Y.C., "The Risk Analysis Approach to Investment Decision Making", Kennecott Copper Corp., Scientific and Engineering Computer Center, S.L.C., Utah. 8 Dec. 1967.
8. Harper, H.E. and J.R. Reynolds, "The Lakeshore Copper Deposit", paper presented at 1969 Mining Congress in San Francisco.
9. Romslo, T.M., "Investigation of the Lakeshore Copper Deposits, Pinal County, Arizona" U.S.B.M. RI4706, July 1950.

ARIZONA SECTION

Society of Mining Engineers
Underground Mining Division
Spring Meeting

May 18, 1974

PROGRAM

Registration	8:00-9:00 a.m.
Tours	9:00-12:30 p.m.
Lunch	12:30-1:45 p.m.
Program	1:45-3:30 p.m.
Welcoming	J. H. Hunter-Project Manager
Location & History	Craig Hansen-Geologist
Geology	Dan Munter-Geologist
Mine Planning	Hans Nilberg-Mine Engineer
Shotcrete	Jeremiah Chitunda-Mine Engineer
Plant Facilities	Tom Phillips-Chief Elec.&Mech. Eng.
Metallurgy	J. G. Craig-Plant Sup't

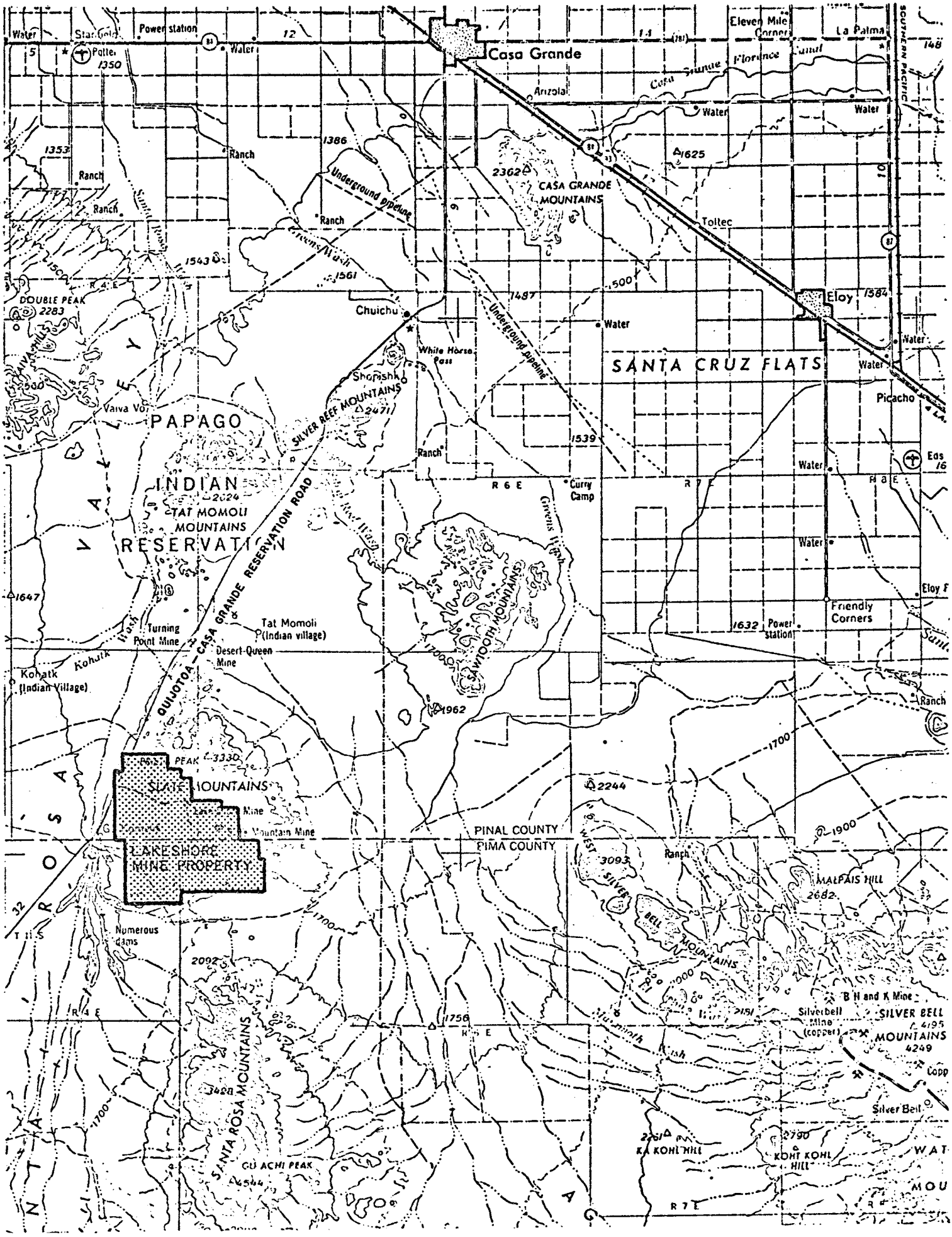
LAKESHORE MINE

HECLA MINING COMPANY

L A K E S H O R E

AT A GLANCE

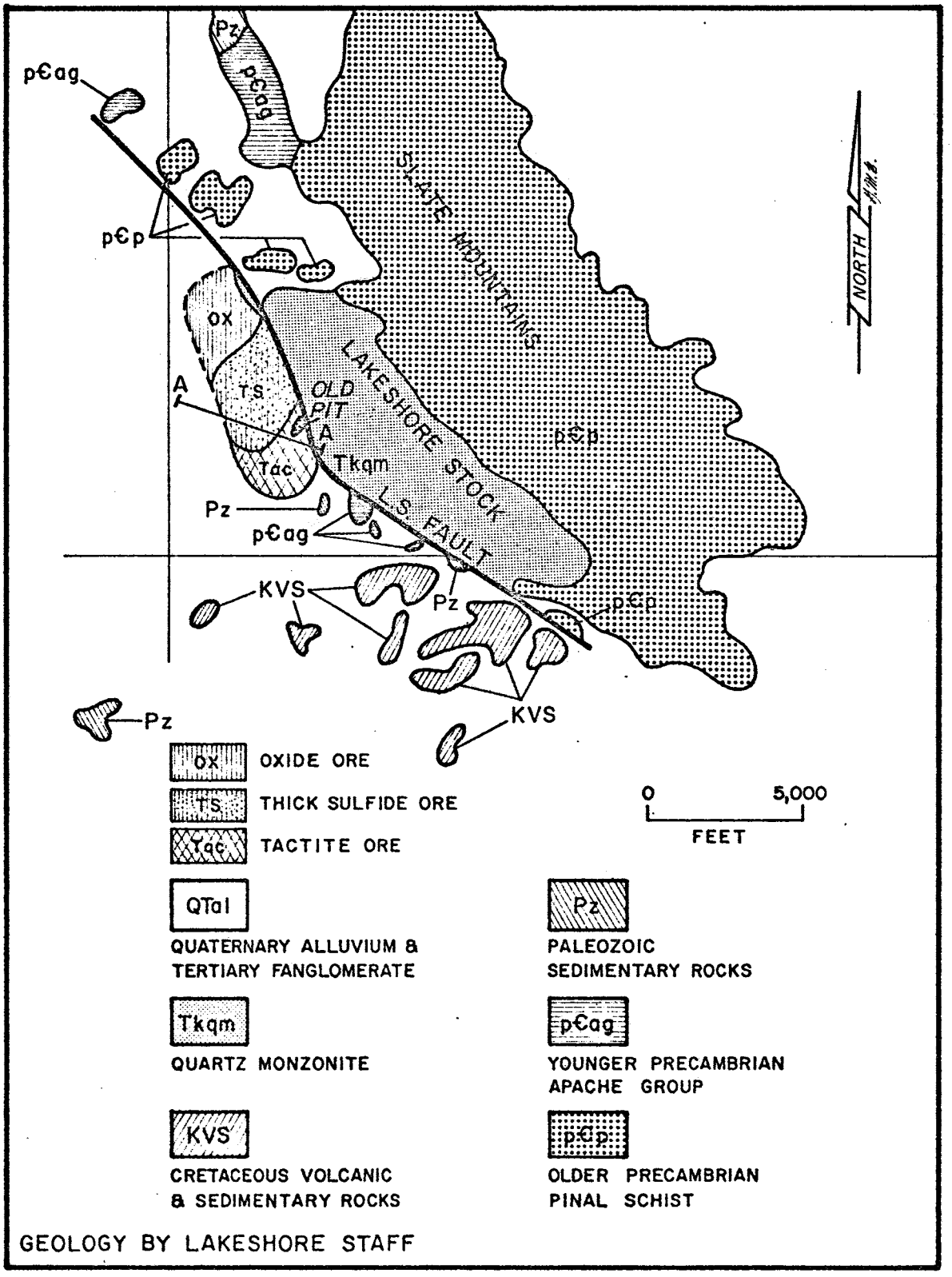
Location:	Slate Mountains 28 miles south-southwest of Casa Grande, Arizona 70 miles south of Phoenix, and 60 miles northwest of Tucson.
Elevation:	1900 feet above sea level
Ecosystem:	Typical Sonoran Desert
Temperature Range: (1970 - 1973 records)	22^{o} F Low 116^{o} F High
Annual Precipitation:	8 inches
Property:	10,500 acres
Ownership:	Leased from The Papago Tribe by El Paso Natural Gas Co. (50%) and Hecla Mining Co. (50%)
Operator:	Hecla Mining Co.
Work Force:	1200 maximum (construction and development phase) 1200 (production)
Mining Method:	Underground
Ore Treatment:	Hydrometallurgical
Planned Production:	9,150 tons/day sulfide ore 6,450 tons/day oxide ore



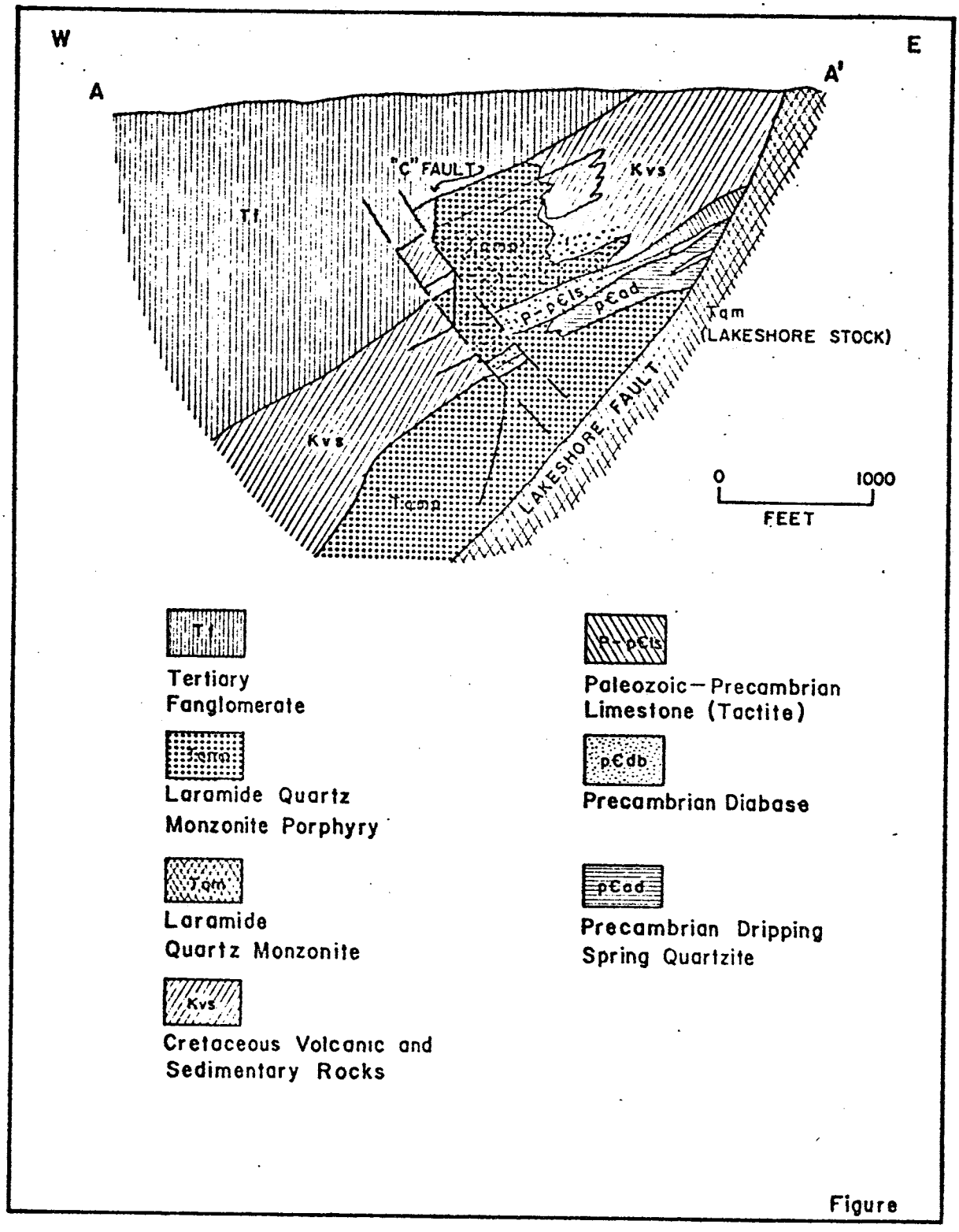
INDEX MAP SHOWING LOCATION OF LAKESHORE MINE PROPERTY

SCALE: 1" = 4 miles

Fig. 1

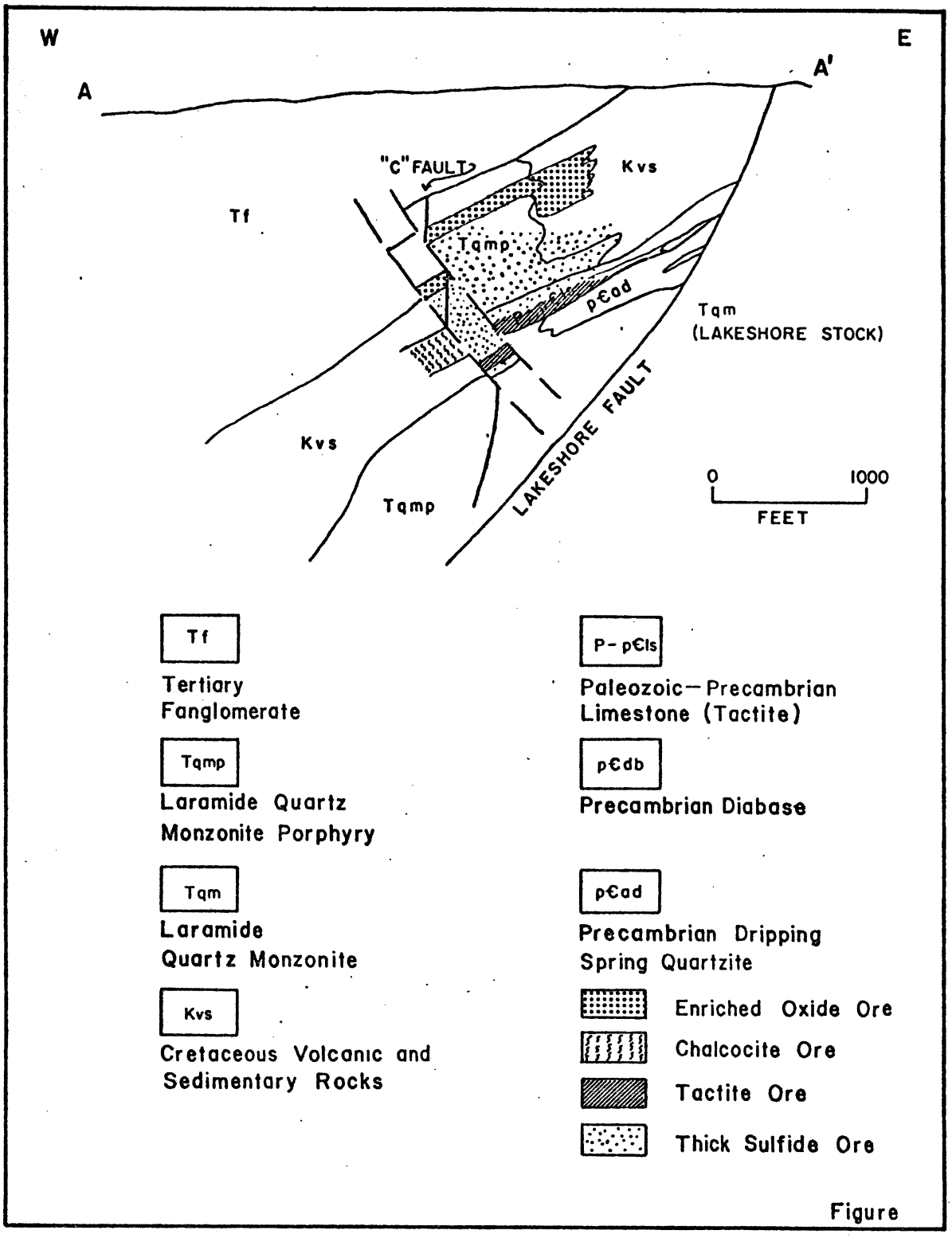


SURFACE GEOLOGY, LAKESHORE MINING AREA



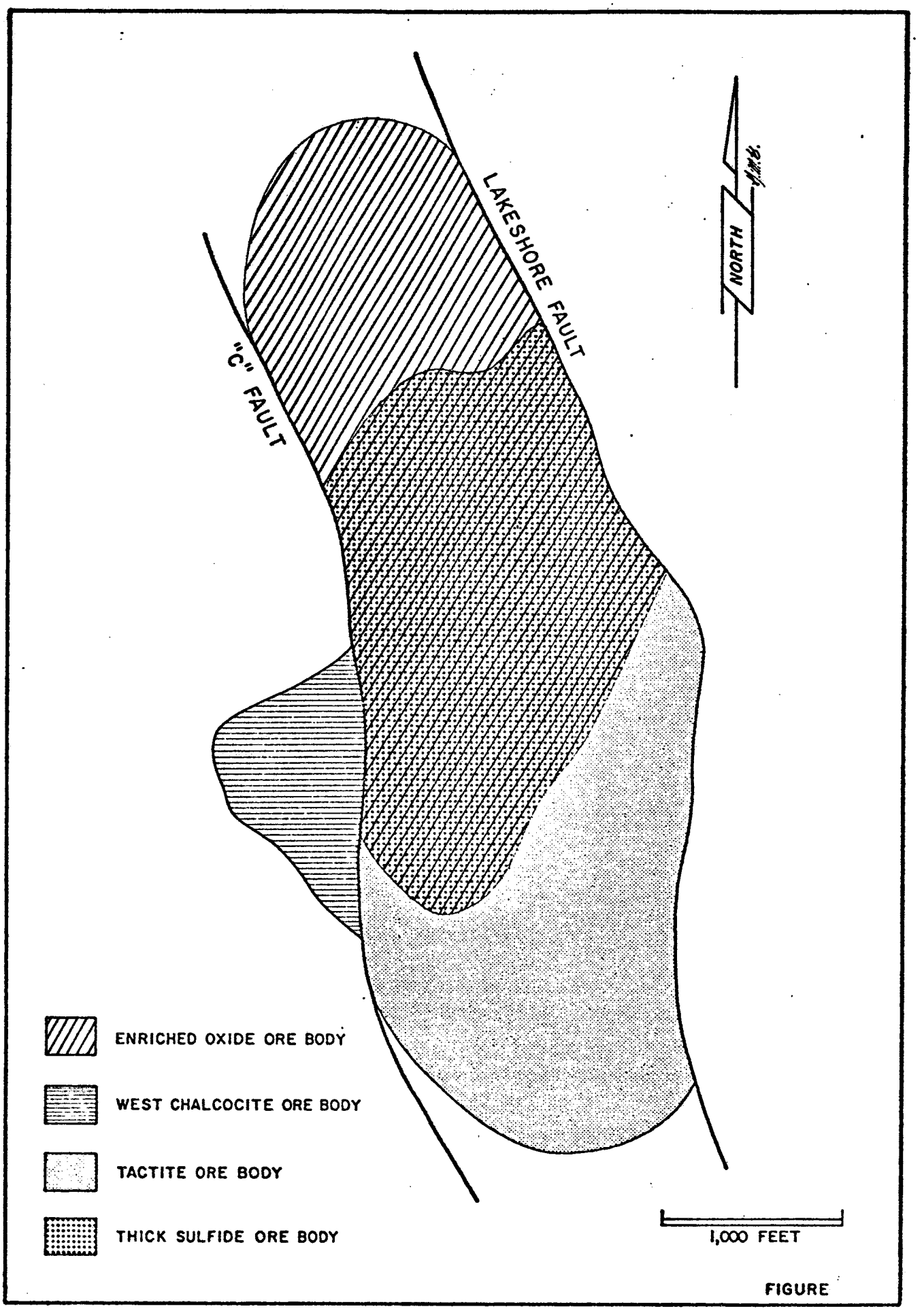
Figure

GENERALIZED GEOLOGIC CROSS SECTION, LAKESHORE MINE, ARIZONA



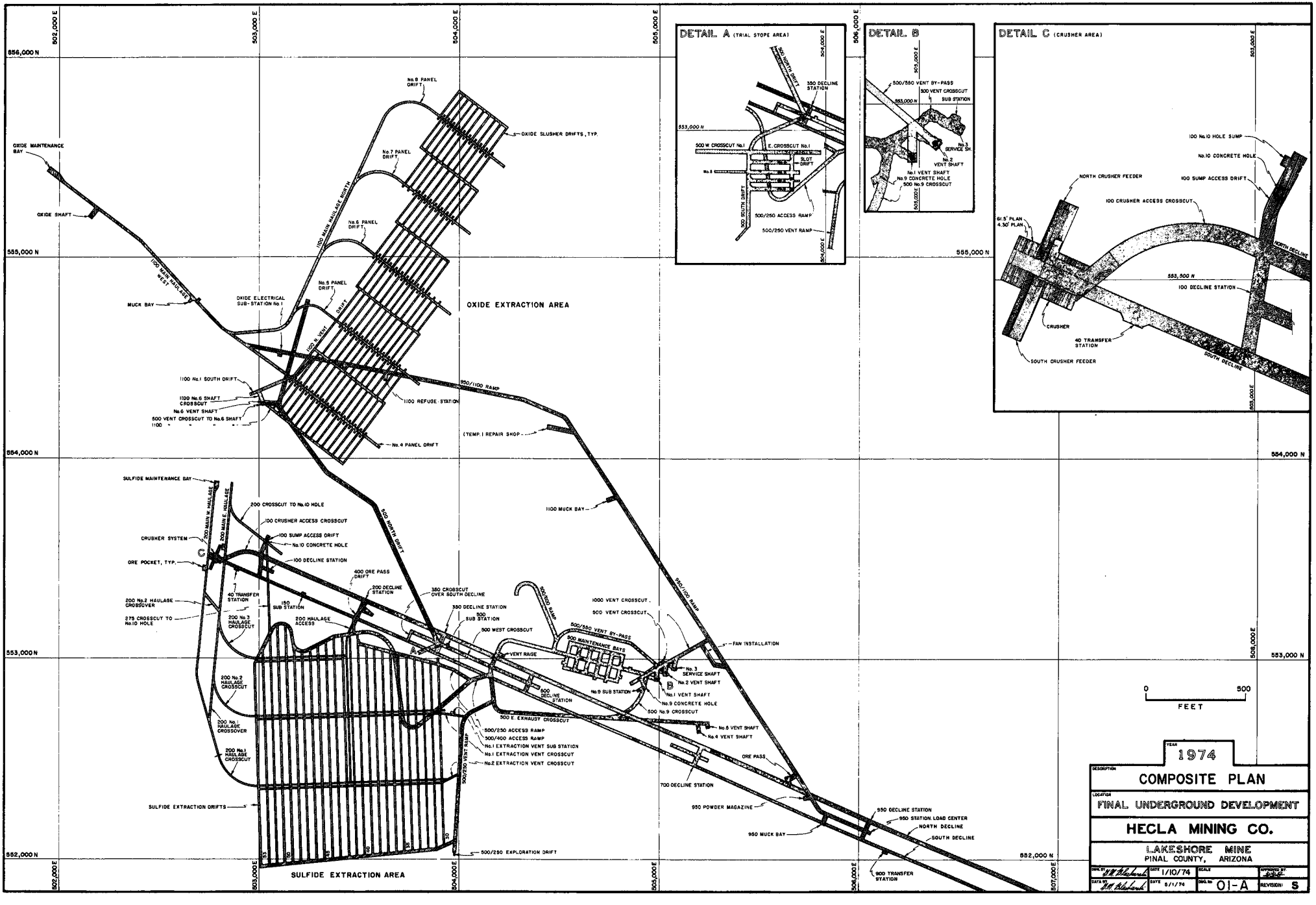
Figure

GENERALIZED ECONOMIC CROSS SECTION, LAKESHORE MINE, ARIZONA



FIGURE

GENERALIZED COMPOSITE ECONOMIC PLAN: LAKESHORE ORE BODY



YEAR 1974

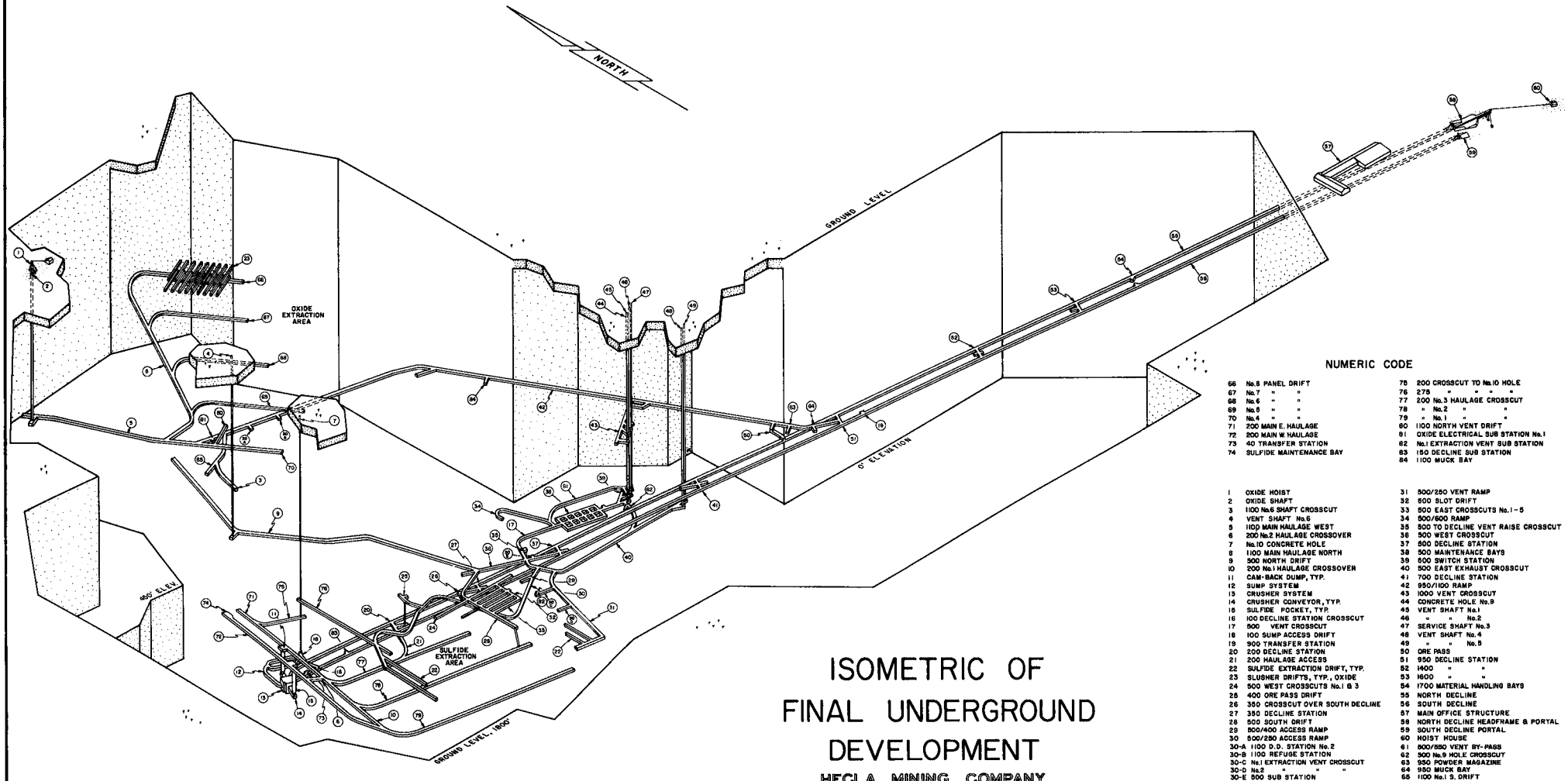
DESCRIPTION: COMPOSITE PLAN

LOCATION: FINAL UNDERGROUND DEVELOPMENT

HECLA MINING CO.

LAKESHORE MINE
PINAL COUNTY, ARIZONA

DRN. BY	DATE	SCALE	APPROVED BY
J.W. Blackwell	1/10/74		
DATE BY	DATE	DWG. No.	REVISION:
J.W. Blackwell	5/1/74	01-A	S



ISOMETRIC OF FINAL UNDERGROUND DEVELOPMENT

HECLA MINING COMPANY

LAKESHORE MINE

DWG. BY: J. M. Blanchard DATE: 5/1/73

SCALE: 1" = 324'

NUMERIC CODE

66	No.8 PANEL DRIFT
67	No.7 " "
68	No.6 " "
69	No.5 " "
70	No.4 " "
71	200 MAIN E. HAULAGE
72	200 MAIN W. HAULAGE
73	40 TRANSFER STATION
74	SULFIDE MAINTENANCE BAY
75	200 CROSSCUT TO No.10 HOLE
76	275 " " " "
77	200 No.3 HAULAGE CROSSCUT
78	" No.2 " "
79	" No.1 " "
80	1100 NORTH VENT DRIFT
81	OXIDE ELECTRICAL SUB STATION No.1
82	No.1 EXTRACTION VENT SUB STATION
83	150 DECLINE SUB STATION
84	1100 MUCK BAY

1	OXIDE HOIST
2	OXIDE SHAFT
3	1100 No.6 SHAFT CROSSCUT
4	VENT SHAFT No.6
5	1100 MAIN HAULAGE WEST
6	200 No.2 HAULAGE CROSSOVER
7	No.10 CONCRETE HOLE
8	1100 MAIN HAULAGE NORTH
9	300 NORTH DRIFT
10	200 No.1 HAULAGE CROSSOVER
11	CAM-BACK DUMP, TYP.
12	SUMP SYSTEM
13	CRUSHER SYSTEM
14	CRUSHER CONVEYOR, TYP.
15	SULFIDE POCKEY, TYP.
16	100 DECLINE STATION CROSSCUT
17	500 VENT CROSSCUT
18	100 SUMP ACCESS DRIFT
19	900 TRANSFER STATION
20	200 DECLINE STATION
21	200 HAULAGE ACCESS
22	SULFIDE EXTRACTION DRIFT, TYP.
23	SLUSHER DRIFTS, TYP., OXIDE
24	500 WEST CROSSCUTS No.1 & 3
25	400 ORE PASS DRIFT
26	350 CROSSCUT OVER SOUTH DECLINE
27	350 DECLINE STATION
28	500 SOUTH DRIFT
29	500/400 ACCESS RAMP
30	500/250 ACCESS RAMP
30-A	1100 D.D. STATION No.2
30-B	1100 REFUGE STATION
30-C	No.1 EXTRACTION VENT CROSSCUT
30-D	No.2 " " "
30-E	500 SUB STATION
31	500/250 VENT RAMP
32	500 SLOT DRIFT
33	500 EAST CROSSCUTS No.1-5
34	500/600 RAMP
35	500 TO DECLINE VENT RAISE CROSSCUT
36	500 WEST CROSSCUT
37	500 DECLINE STATION
38	500 MAINTENANCE BAYS
39	500 SWITCH STATION
40	500 EAST EXHAUST CROSSCUT
41	700 DECLINE STATION
42	950/1100 RAMP
43	1000 VENT CROSSCUT
44	CONCRETE HOLE No.9
45	VENT SHAFT No.1
46	" " No.2
47	SERVICE SHAFT No.3
48	VENT SHAFT No.4
49	" " No.5
50	ORE PASS
51	950 DECLINE STATION
52	1400 " "
53	1600 " "
54	1700 MATERIAL HANDLING BAYS
55	NORTH DECLINE
56	SOUTH DECLINE
57	MAIN OFFICE STRUCTURE
58	NORTH DECLINE HEADFRAME & PORTAL
59	SOUTH DECLINE PORTAL
60	HOIST HOUSE
61	500/550 VENT BY-PASS
62	500 No.9 HOLE CROSSCUT
63	950 POWDER MAGAZINE
64	950 MUCK BAY
65	1100 No.1 S. DRIFT

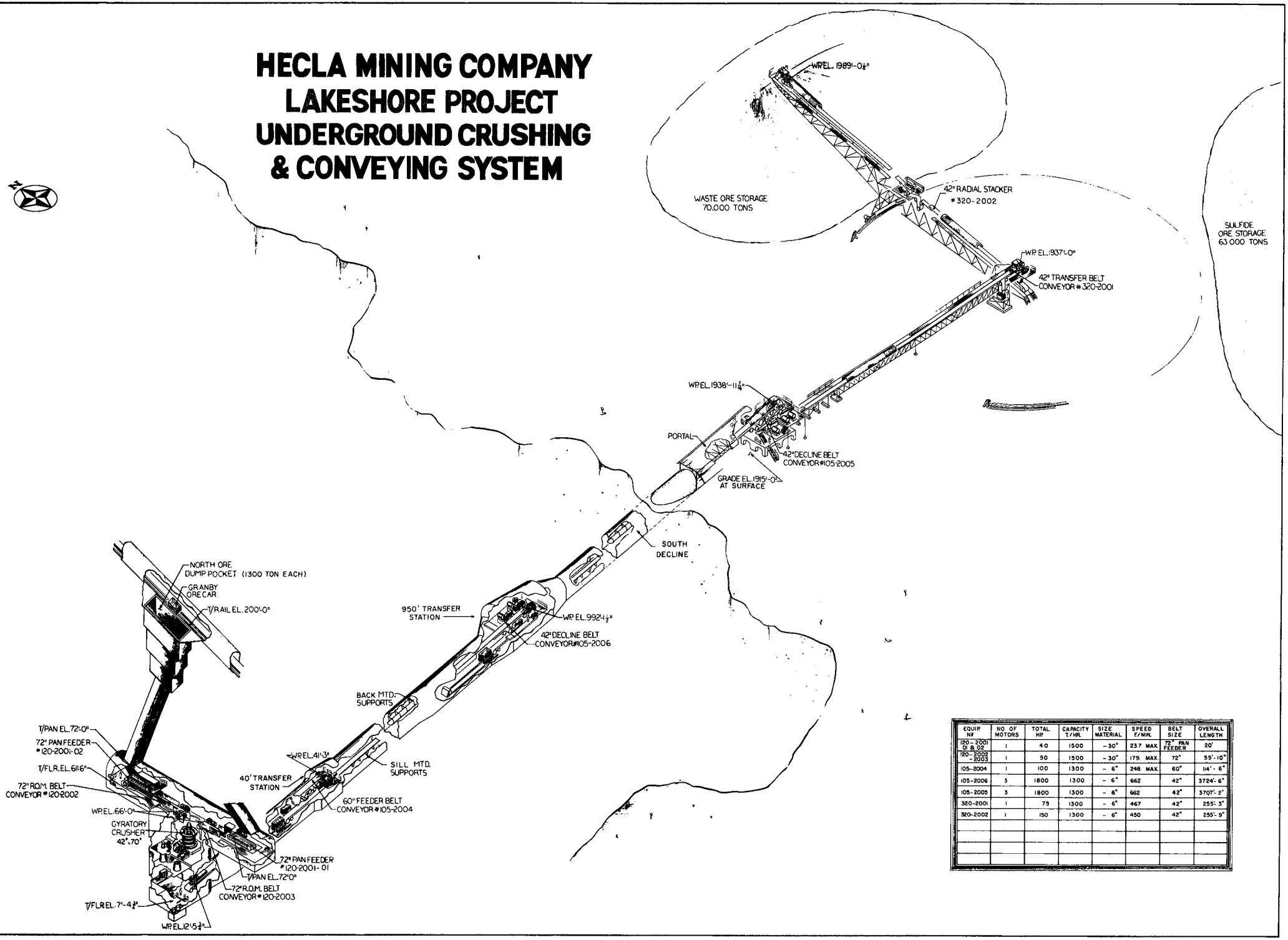
COLOR CODE

735	DECLINES, DECLINE STATIONS & SUMP SYSTEM
745	500 LEVEL DEVELOPMENT
736.5	1100 " "
740.5	ORE HANDLING SYSTEM
737	VENT SHAFTS & RAISES

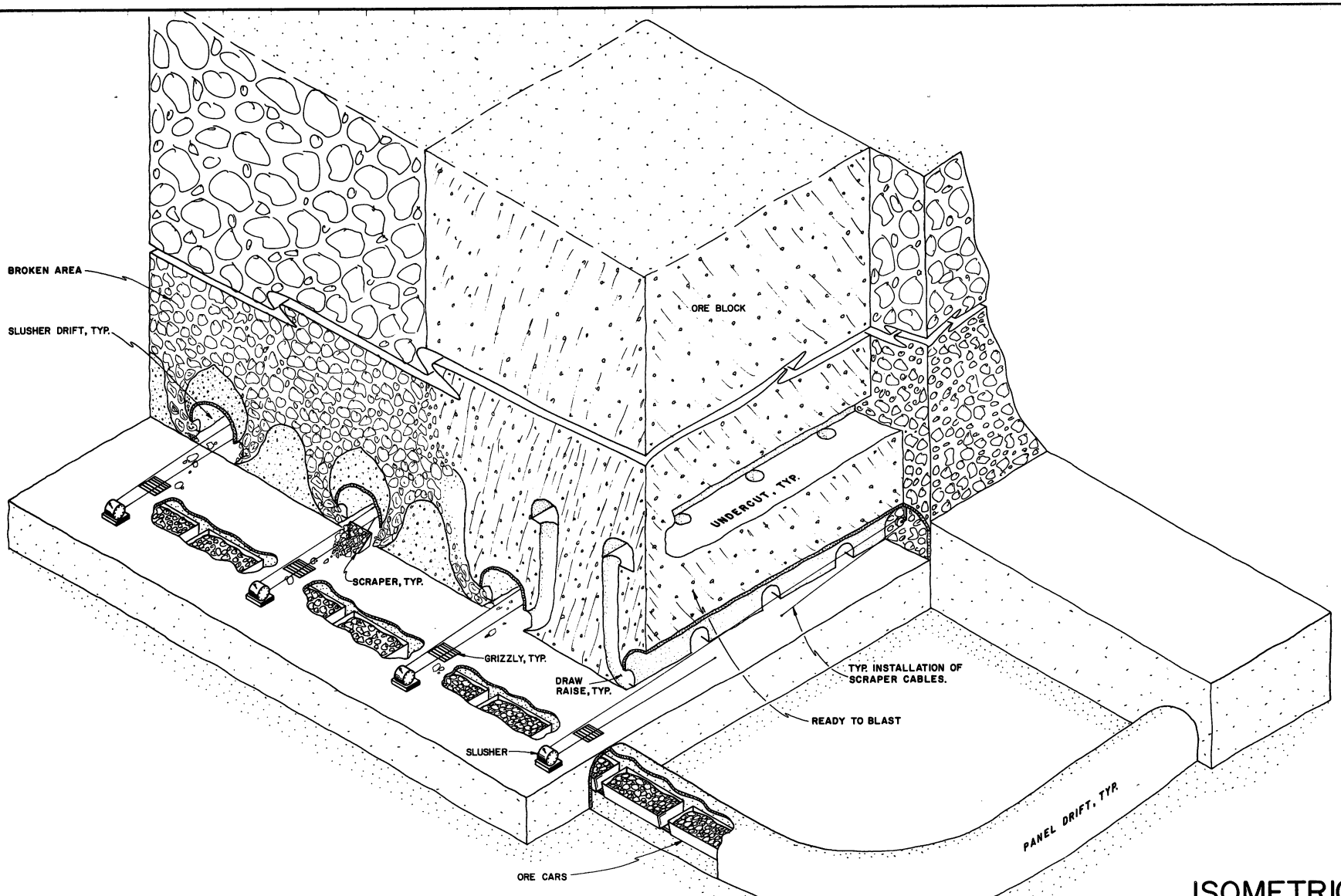
REV. L 1/29/74

DWG. No: 002-B

HECLA MINING COMPANY
LAKESHORE PROJECT
UNDERGROUND CRUSHING & CONVEYING SYSTEM



EQUIP. N#	NO. OF MOTORS	TOTAL HP	CAPACITY T/HR.	SIZE MATERIAL	SPEED F/MIN.	BELT SIZE	OVERALL LENGTH
120-2001 01 & 02	1	40	1500	-30"	237 MAX.	72" PAN FEEDER	20'
120-2002 -2003	1	50	1500	-30"	179 MAX.	72"	55'-10"
105-2004	1	100	1300	- 6"	248 MAX.	60"	114'- 6"
105-2006	3	1800	1300	- 6"	662	42"	3724'- 6"
105-2005	3	1800	1300	- 6"	662	42"	3707'- 2"
320-2001	1	75	1300	- 6"	467	42"	255'- 3"
320-2002	1	150	1300	- 6"	450	42"	255'- 9"

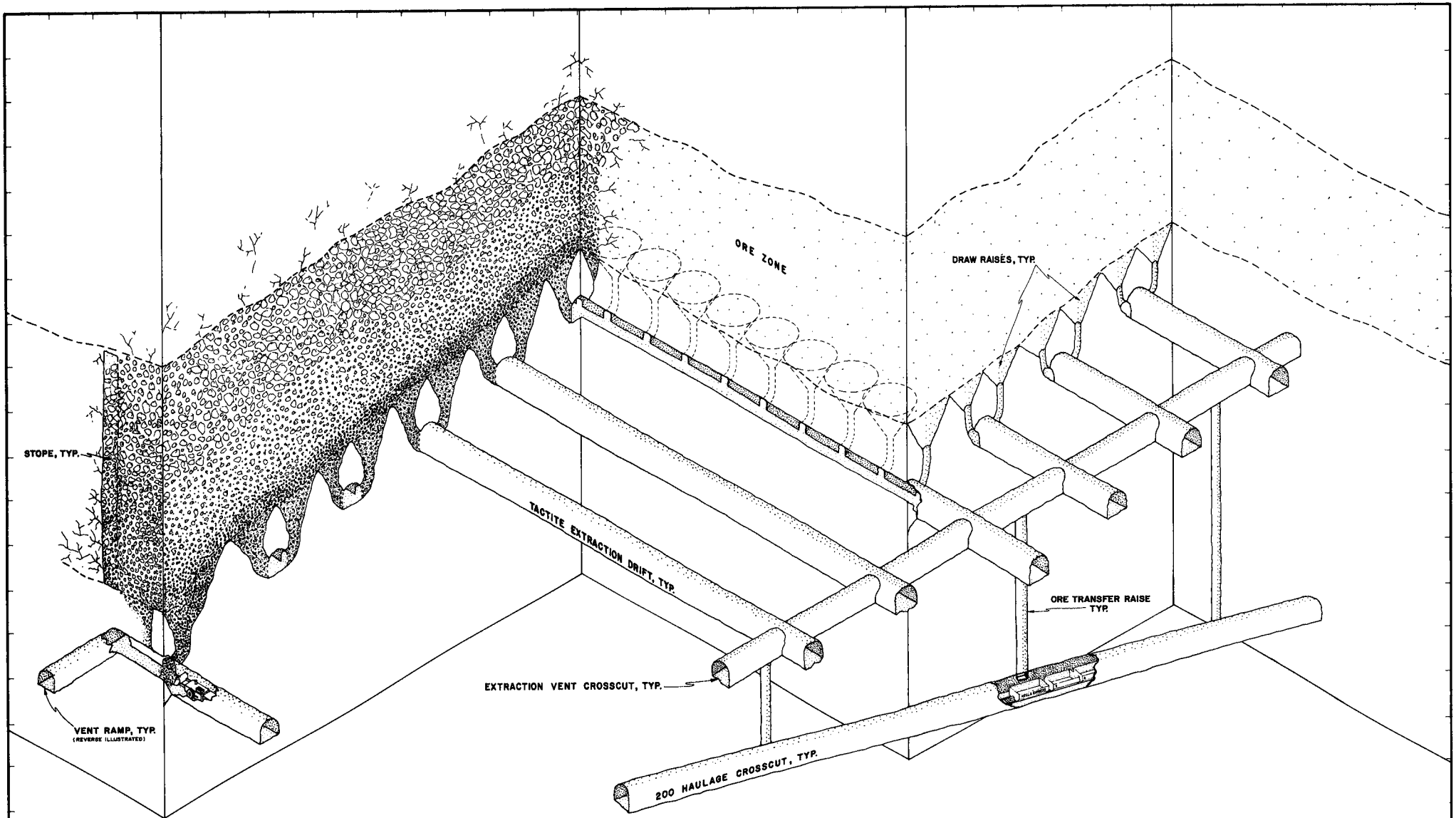


ISOMETRIC OF OXIDE CAVING SYSTEM

HECLA MINING COMPANY
LAKESHORE PROJECT

DWG. BY: J.M. Blaharski DATE: 12/6/73

DWG. 03-B



ISOMETRIC OF SULFIDE CAVING SYSTEM

HECLA MINING COMPANY

LAKESHORE PROJECT

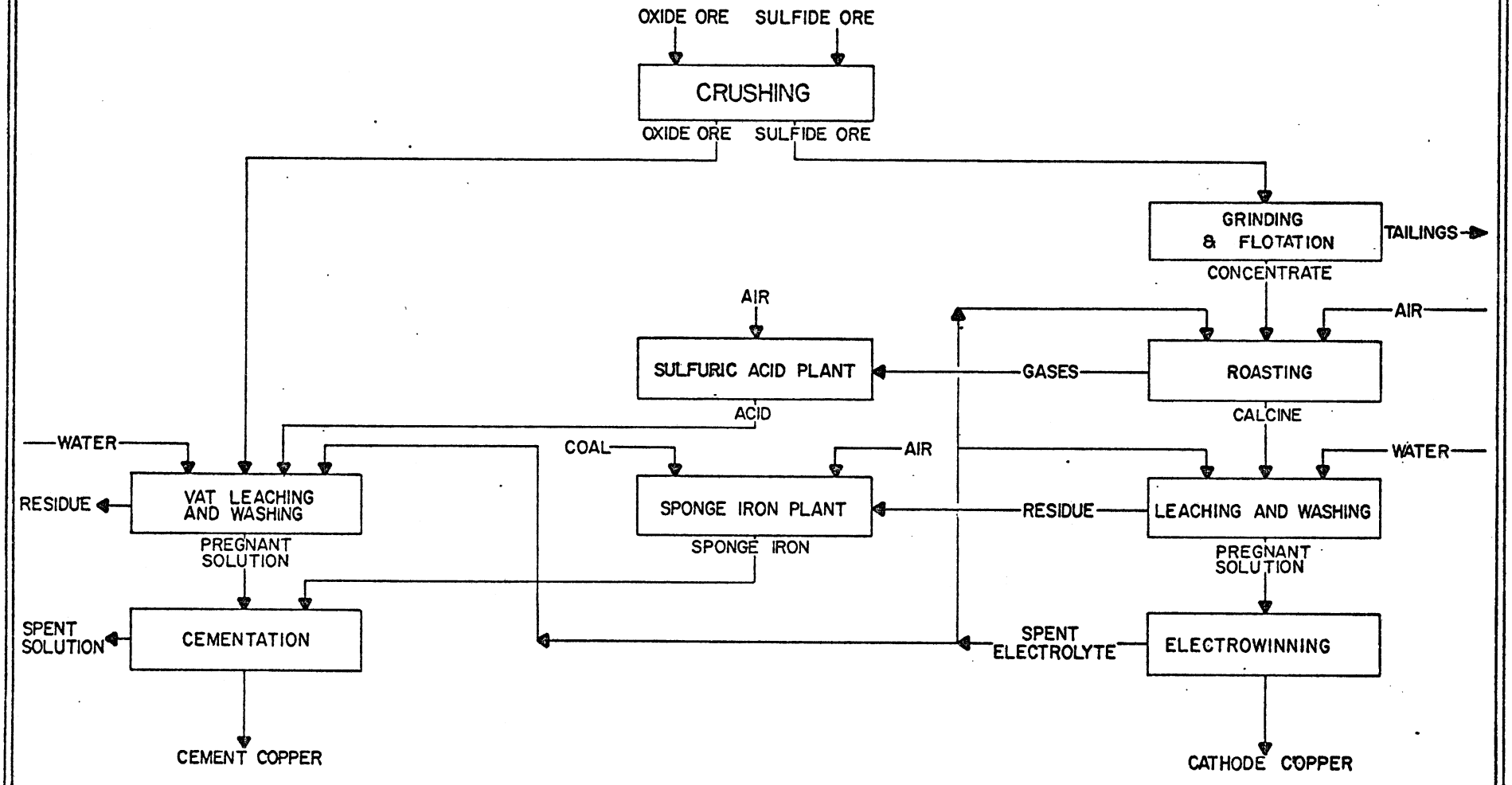
DWG. BY: *J.M. Blachanski* DATE: 4/23/74

DWG. 04-B

PROPOSED PLANT SURFACE FACILITIES

HECLA MINING COMPANY
LAKESHORE MINE
CASA GRANDE, ARIZONA

Lakeshore Project
Plant Flowsheet



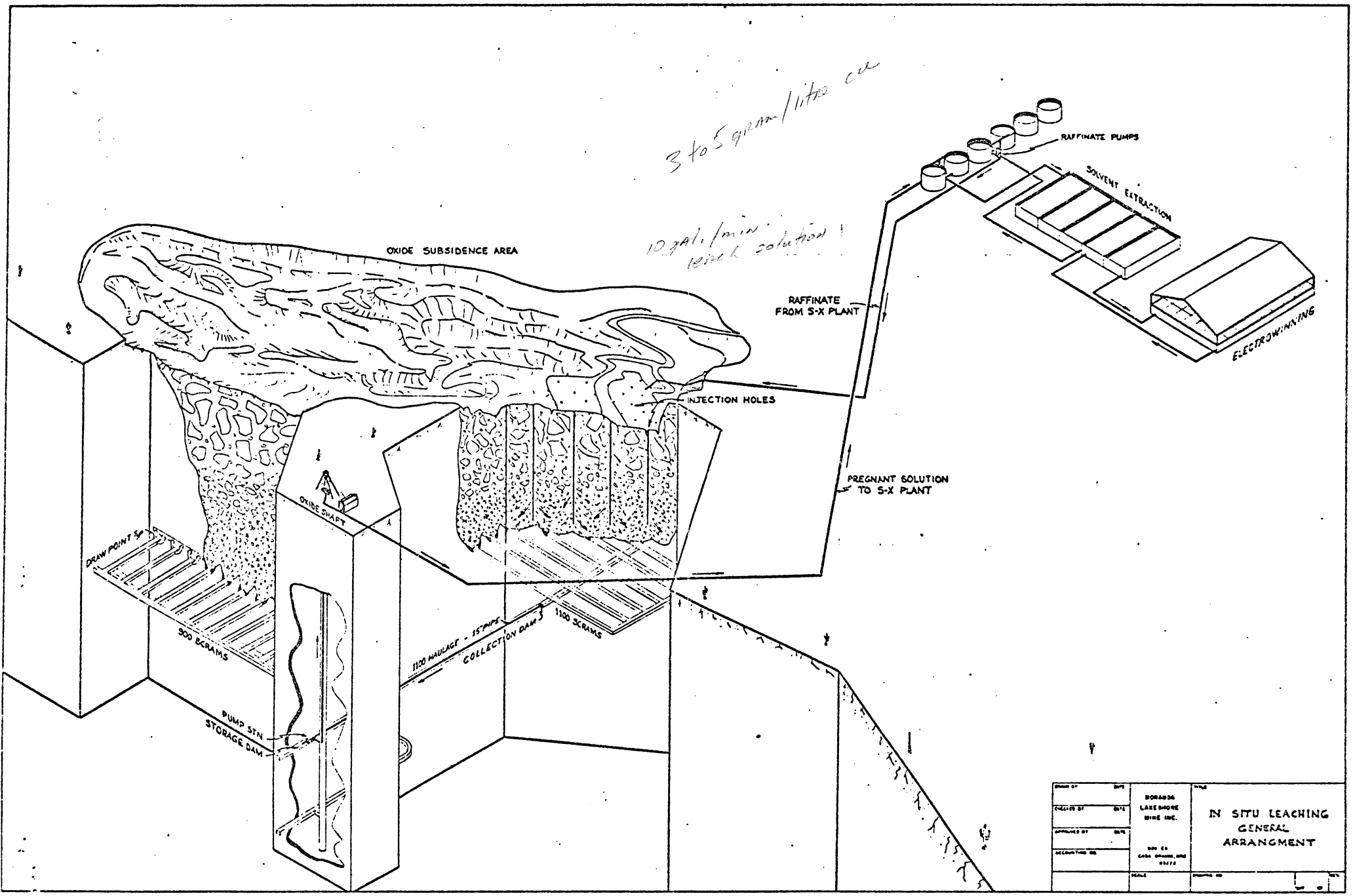
84 STAFF

~~230~~ hourly

140,000 T/mo

3,000,000 # of Cu 99.6% pure electro-won CATHODE

25# to 28# Cu / T. of ore


3 to 5 gram/litre cu
10 gal./min
RAFFINATE PUMPS
SOLVENT EXTRACTION
OXIDE SUBSIDENCE AREA
RAFFINATE FROM S-X PLANT
ELECTROWINNING
INJECTION HOLES
PREGNANT SOLUTION TO S-X PLANT
OXIDE SHAFT
DRAW POINT
900 SCRAMS
1100 SCRAMS
1100 HAULAGE - 35° DIPS
COLLECTION DAM
PUMP STN
STORAGE DAM
ROMANOS LAKESHORE MINE INC.
IN SITU LEACHING GENERAL ARRANGMENT

FOR CIRCULATION

FILE MEMO

July 12, 1971

HECLA'S LAIRD PROJECT

Met in Wallace, Idaho July 6, 1971 with Bill Love, President, and Bill Griffith of Hecla Mining Co. Purpose of the meeting was to (1) determine the status of Hecla's Laird Project and (2) restate our interest in copper from the Lakeshore Project.

The Laird deposit is partially proven but additional drilling and underground work are planned. Development will proceed for 3-4 years at a rate of about $500,000/year. The rate of development will in part depend upon a 40 mile highway being built by the government.

Love estimates reserves will be 350 million tons at 0.45% copper, 0.03% MoS_2 and some silver. The mineralization is principally chalcopyrite with some bornite. The estimated concentrate grade is 28%.

Metallurgical tests have been conducted but more extensive tests will be run on bulk samples collected underground. MoS_2 metallurgy still is to be studied.

The location is remote, thus the completion schedule on the roads is critical to the mine development. The weather apparently is not as adverse as the location suggests.

Hecla's schedule is generally as follows: (1) drilling development 3-4 years, and (2) facilities engineering and construction 3 years. This indicates the earliest production date would be 1977. They anticipate that they will need to relinquish some equity to develop the property. However, they do not plan to sell an equity until the reserves are established.

The work on the Lakeshore project is proceeding. I again admonished regarding the quality limitations of electrowon cathodes. They plan to produce significant tonnages from a pilot plant and would like for us to test and evaluate their production.

H. Lanier

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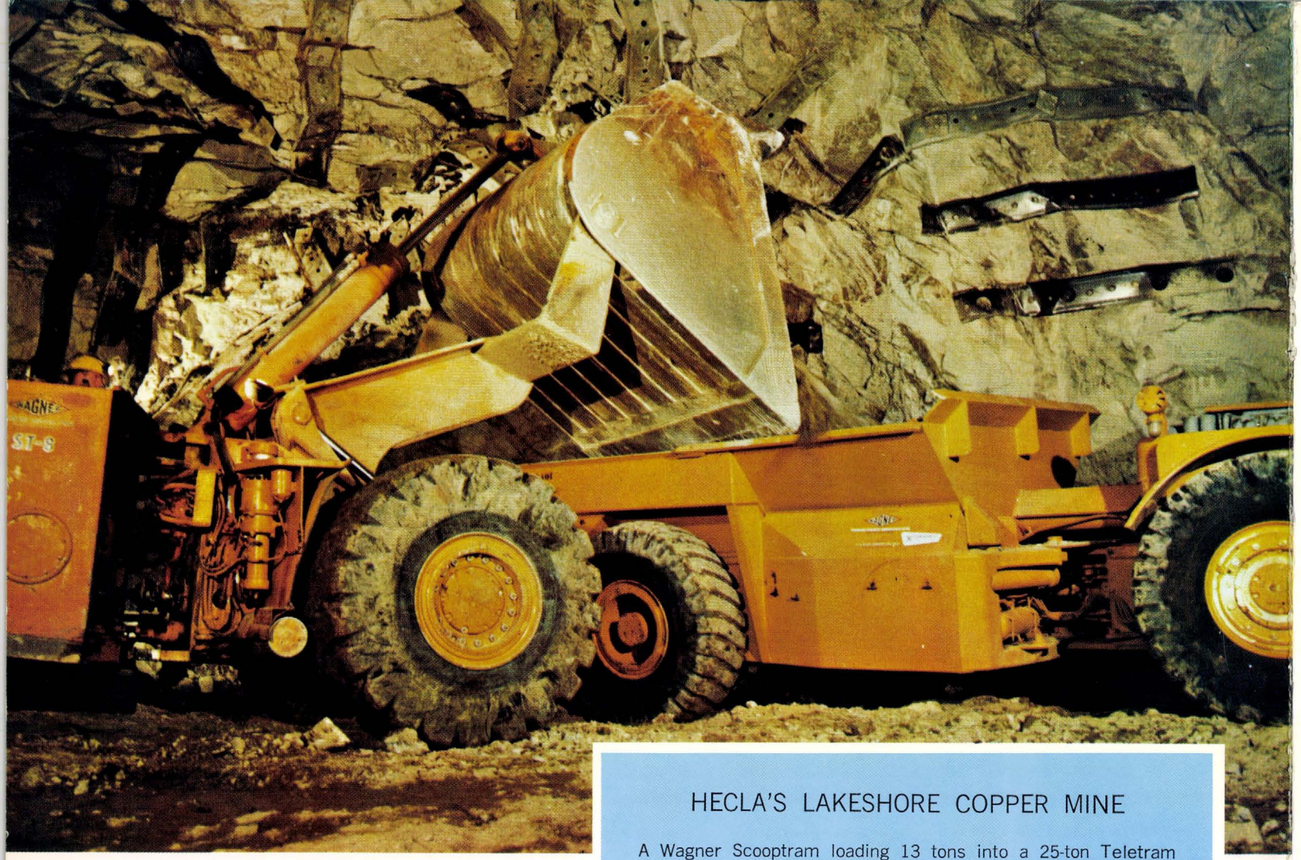
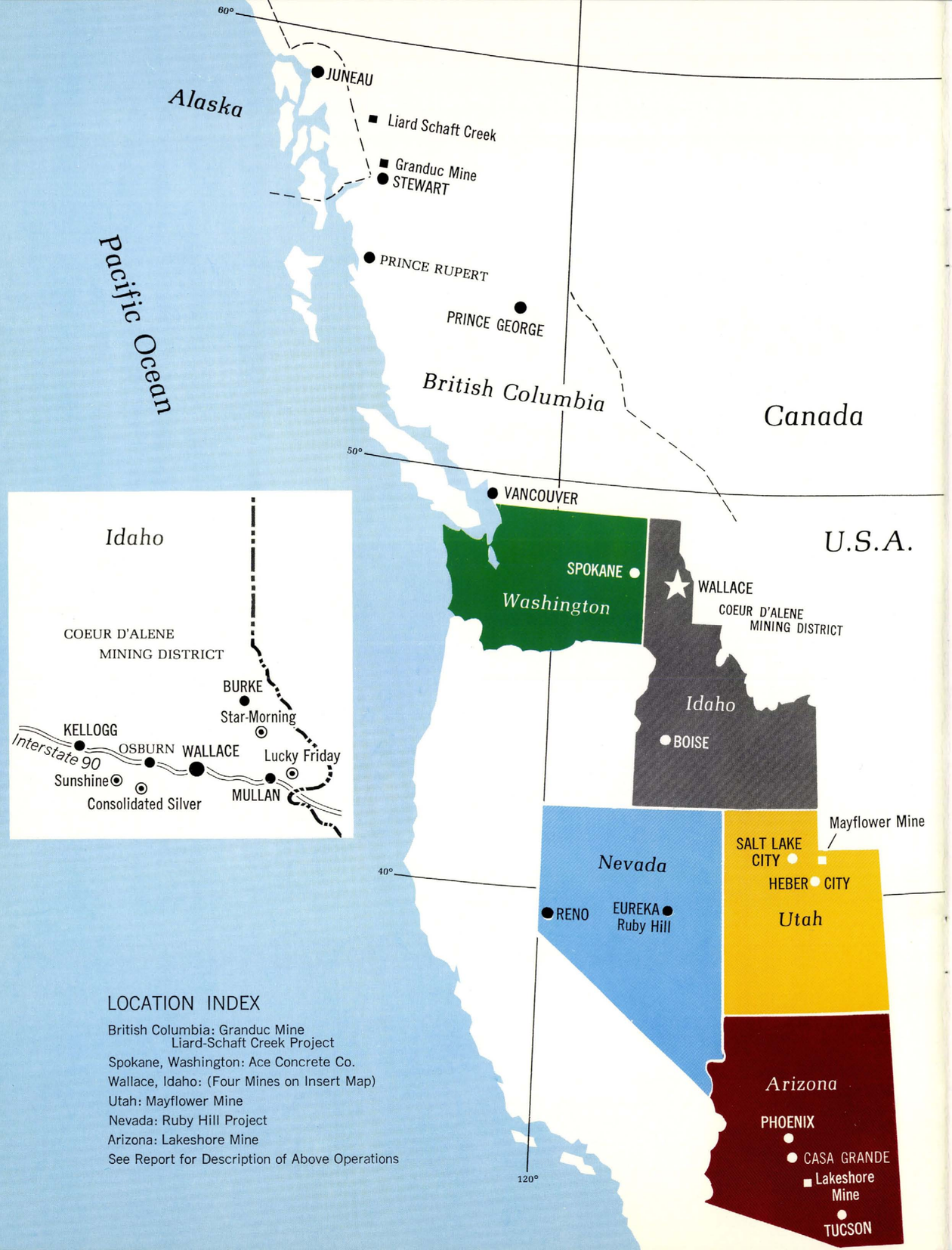


HECLA'S LAKESHORE COPPER MINE

A Wagner Scooptram loading 13 tons into a 25-ton Teletram truck.

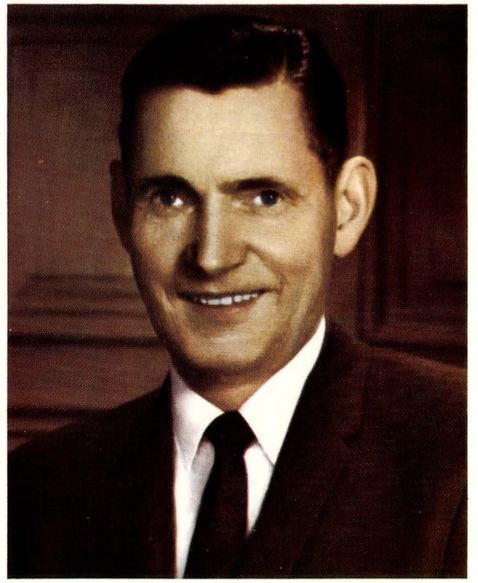
A Scooptram transporting 8 cu. yards of broken rock from the face of one of the 15° declines to the surface.

1970 ANNUAL REPORT
HECLA MINING COMPANY



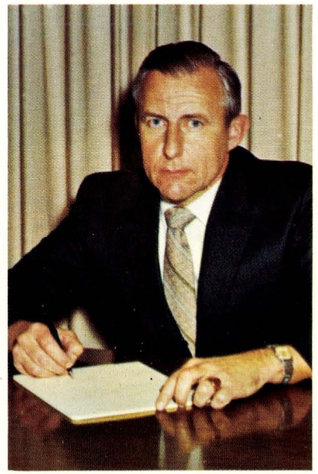
LOCATION INDEX

British Columbia: Granduc Mine
Liard-Schaft Creek Project
Spokane, Washington: Ace Concrete Co.
Wallace, Idaho: (Four Mines on Insert Map)
Utah: Mayflower Mine
Nevada: Ruby Hill Project
Arizona: Lakeshore Mine
See Report for Description of Above Operations



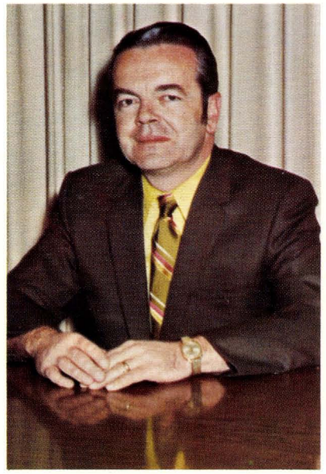
Lester J. Randall
Chairman of the Board
and Chief Executive Officer

William H. Love
President — General Manager
and Chief Operating Officer



Gordon M. Miner
Vice President — Operations

Herbert E. Harper
Vice President — Exploration



William J. Grismer
Secretary-Treasurer

Auditors' Report

Lybrand, Ross Bros. & Montgomery
Certified Public Accountants

To the Board of Directors and
Stockholders of Hecla Mining Company:

We have examined the consolidated balance sheet of HECLA MINING COMPANY and WHOLLY OWNED SUBSIDIARIES as of December 31, 1970 and the related statements of income, changes in stockholders' equity and source and use of funds for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances. We made a similar examination for the year ended December 31, 1969.

In our opinion, the aforementioned statements present fairly the consolidated financial position of Hecla Mining Company and Wholly Owned Subsidiaries at December 31, 1970 and 1969 and the results of their operations, changes in stockholders' equity and source and use of funds for the years then ended, in conformity with generally accepted accounting principles applied on a consistent basis.

Lybrand, Ross Bros. & Montgomery

New York
February 12, 1971

Hecla Mining Company

Incorporated under the Laws of the State of Washington, July, 1898

Capitalization—8,000,000 shares of a par value of 25¢ each ($2,000,000) of which 6,080,800 shares were issued and outstanding on December 31, 1970

MAIN OFFICE, HECLA BUILDING, WALLACE, IDAHO 83873

OFFICERS

LESTER J. RANDALL.....Chairman of the Board
WILLIAM H. LOVE.....President
RICHARD N. HUNT.....Vice President
GORDON M. MINER.....Vice President-Operations
HERBERT E. HARPER.....Vice President-Exploration
WILLIAM J. GRISMER.....Secretary and Treasurer

DIRECTORS

ROBERT B. FULTON
Vice President—Exploration, Newmont Mining Corporation, New York, N. Y.

*HORTON HERMAN
Partner in Paine, Lowe, Coffin, Herman and O'Kelly, Attorneys at Law, Spokane, Wash.

RICHARD N. HUNT
Formerly Director, Vice President and Chief Geologist of and now Consultant to the U. S. Smelting, Refining and Mining Company, Salt Lake City, Utah (Retired), Vice President of Hecla Mining Company.

KENNETH LIEBER
Director and Senior Vice President of Cyprus Mines Corporation, Los Angeles, Calif.

*WILLIAM H. LOVE
President and General Manager of Hecla Mining Company.

**LESTER J. RANDALL
Chairman of the Board and Chief Executive Officer of Hecla Mining Company.

HOWARD R. SHORT
Investor (Retired).

*Member of Executive Committee
**Chairman of Executive Committee

General Manager.....William H. Love
Manager of Operations.....Gordon M. Miner
Manager of Mills.....J. Gordon Craig
Chief Geologist.....Herbert E. Harper
Assistant to the President.....Gerald Turnbow
Chief Engineer.....Wallace E. Crandall
Personnel Manager.....Gus Voltolini
Comptroller.....Thomas T. Giles
Research Director.....William A. Griffith
Investment Manager.....Philip M. Lindstrom

EASTERN TRANSFER AGENT
Registrar and Transfer Company, 140 Cedar Street, New York, N. Y. 10006

EASTERN REGISTRAR
Manufacturers Hanover Trust Company, 40 Wall Street, New York, N. Y. 10015

WESTERN TRANSFER AGENT
Spokane and Eastern Branch, Seattle-First National Bank, Spokane, Washington 99210

WESTERN REGISTRAR
National Bank of Washington, Spokane, Washington 99210

Shares of the Corporation are traded on the New York Stock Exchange, New York, N. Y., the Spokane Stock Exchange, Spokane, Wash., and the Pacific Coast Stock Exchange, San Francisco, Calif.

HECLA MINING COMPANY

Seventy-third Annual Report of the Directors of Hecla Mining Company for the year ended December 31, 1970

ANNUAL MEETING

The annual meeting of shareholders will be held at the Ridpath Hotel, Spokane, Washington, on Thursday, April 29, 1971 at 9 A.M., Pacific Daylight Time.

CONTENTS

3. *Income Taxes:*

Income taxes refundable and deferred arise mainly from mine development expenses which are deferred in the financial statements and deducted currently in the income tax returns.

4. *Investment in Granduc Mines, Limited (N.P.L.):*

5½% Redeemable preferred stock $100 par value (100% owned)	$ 4,855,430
Common stock (35.4% owned)	5,183,970
	$10,039,400

On October 1, 1965 Granduc leased substantially all of its properties in British Columbia, Canada for a term of 50 years (with an option to renew for 25 years) to American Smelting and Refining Company and a wholly owned subsidiary of Newmont Mining Corporation. Under the terms of the lease, the lessees are to provide all necessary funds, services and equipment to put the mine into production. Granduc is to receive a royalty of 22½% of the defined net proceeds realized after the date of beginning operations on the first 32,500,000 tons of ore and 25% thereafter. As a condition of the lease, Hecla waived its right to dividends on its preferred stock and Newmont waived interest on its prior advances to Granduc until the date of beginning operations. Limited production commenced on November 1, 1970.

5. *Properties, Plants and Equipment:*

Properties, plants and equipment at December 31, 1970 comprise:

	Cost	Reserve
Lakeshore copper property (Note 8):		
Mining properties	$ 3,172,989	$ 107,721
Deferred development costs	7,465,796	
Plants and equipment	5,238,041	831,449
	15,876,826	939,170
Other:		
Mining properties	1,701,143	941,482
Deferred development costs	2,906,937	789,413
Plants and equipment	6,051,047	5,032,406
Land	99,572	
	$26,635,525	$ 7,702,471

Depletion is computed on a unit-of-production basis and is based on estimated ore reserves. Depreciation is computed, generally, on the declining-balance and unit-of-production methods. Amortization is computed on a straight-line method over an eight-year period.

6. *Stock Options:*

In April 1970 the stockholders approved a new stock option plan providing for the issuance of qualified stock options to officers and key employees at 100% of fair market value on the dates the options are granted and reserved 100,000 shares of authorized and unissued capital stock for that purpose. The options are to be granted for a period of five years, exercisable during the first two and one-half years as to one-half the number of shares and during the second two and one-half years as to the other half. No options have been granted under this plan. A previous 1964 plan had similar terms and conditions. At December 31, 1969 and 1970, 11,628 shares at a price of $18.54 per share were reserved for options granted under the 1964 plan and no shares were reserved for granting of additional options under this plan. The shares and the price per share have been adjusted for the 1970 2% stock dividend.

7. *Pension Plans:*

The Company and its wholly owned subsidiaries have pension plans covering substantially all employees. Total pension expense charged to income was $184,439 for 1970 and $140,127 for 1969. The Company's policy is to fund pension costs accrued. These amounts include actuarially computed current service costs, amortization of prior service costs on a 10% per year basis in respect of all plans except for one plan under which the Company provides full accrual of prior service costs for employees becoming eligible during the year.

8. *Commitments:*

The Company is developing a large copper ore deposit in Arizona (the Lakeshore Properties) which involves capital expenditures which may ultimately approximate $100,000,000.

9. *Capital Stock:*

In April 1970 the stockholders approved an increase in the authorized capital stock of the Company from 6,000,000 shares of 25¢ par value to 8,000,000 shares of 25¢ par value.

dend, and the Directors do not presently intend that further dividends will be declared or paid for the remainder of the year. A stock dividend of two percent (2%) was also paid in 1970. In announcing this dividend, it was stated that the Directors deemed it advisable to conserve funds to assist in financing preproduction costs at the Company's Lakeshore Arizona copper properties.

No fractional shares will be issued in connection with the stock dividend. If the aggregate amount of Hecla stock owned by you on May 14, 1971 is more or less than an even multiple of fifty (50) shares, you will receive an Order Form which will establish the fact that you own a fractional share accruing to you as a result of such stock dividend. Full details concerning this matter will be sent you in the near future, including instructions as to arrangement for sale of odd-lot shares should you wish to sell the shares which you will receive.

Production for the first quarter of 1971 as compared with the first quarter of 1970 was as follows:

	First Quarter 1971	First Quarter 1970
Tons of ore produced ..	118,867	115,725
Ounces of silver	1,610,882	1,608,071
Ounces of gold	15,519	16,191
Tons of lead	7,689	7,610
Tons of zinc	2,245	2,407
Tons of copper	525	481

Hecla's share of production from properties in which a major interest is owned and related assays for the first three months of 1971 were as follows:

Lucky Friday mine, Mullan, Idaho - 51,415 tons assaying 16.4 oz. of silver, 11.6% lead and 1.3% zinc; Star-Morning Unit Area, Burke, Idaho - 15,741 tons assaying 3.0 ozs. of silver, 6.1% lead and 6.2% zinc; Mayflower mine, Heber City, Utah - 30,057 tons assaying .57 oz. of gold, 4.8 oz. of silver, 3.6% lead, 2.4% zinc and 1.1% copper; Sunshine Unit Area, Kellogg, Idaho - 21,654 tons assaying 28.2 oz. of silver and 0.6% copper.

In early April, the Company assigned to Newmont Exploration Limited a one-half interest in Hecla's Agreement involving the properties of Alice Consolidated Mines, Inc. located in the Coeur d'Alene Mining District and situated midway between Wallace and Mullan, Idaho. In exchange for the assignment, Newmont Exploration has agreed to equally share the cost of the work program with Hecla. The Operating Agreement between Alice Consolidated and Hecla became effective December 1, 1970. It is contemplated that exploration of the area will involve shaft sinking, laterals and diamond drilling. Surface geologic work and drilling in preparation for this program will be initiated during the summer of 1971. Golconda Mining Corporation, the principal shareholder of Alice Consolidated Mines, has a 20% interest in the lease and Operating Agreement, subject to defined terms and conditions. The Operating Agreement provides that the Lessees shall invest all funds and recoup the same from any production which may be obtained from the properties, after which profits will be split among the Lessees and Alice Consolidated Mines, Inc.

L. J. RANDALL
Chairman of the Board

W. H. LOVE
President and
Chief Executive Officer

May 3, 1971

FIRST QUARTER REPORT

Three Months
Ended March 31, 1971

Wallace, Idaho

HECLA MINING COMPANY

Consolidated Statement of Income

For the Three-Month Periods Ending March 31-1971 and March 31-1970

	Three Months Ended	
	March 31 1971 (estimated)	March 31 1970 (estimated)
Sales of concentrates and products	$ 5,411,340	$ 6,393,016
Dividend income	76,826	97,236
Interest and other income	51,192	113,604
Gain on sale of securities - net of loss on sale of silver futures in 1970	64,350	6,407
Total revenue	5,603,708	6,610,263
Deduct		
Cost of sales	3,850,633	3,779,544
Exploration and development - Outside projects	171,561	285,021
Consolidated Silver Project	90,939	89,979
Administrative and other miscellaneous expenses	69,185	70,248
Depreciation, depletion and amortization	107,078	101,927
Total deductions	4,289,396	4,326,719
Income before federal and state taxes on income	1,314,312	2,283,544
Estimated taxes on income		
Currently payable	(311,700)	176,700
Deferred	660,900	578,200
	349,200	754,900
Net income	$ 965,112	$ 1,528,644
Average shares outstanding during period	6,080,800	6,080,800*
Net income per share	$ 0.16	$ 0.25*
Average metal prices		
Silver - (Per ounce, Handy & Harman, N.Y.)	$ 1.63	$ 1.88
Gold - (Per ounce, London price)	$ 38.15	$ 34.71
Lead - (Per pound, New York)	13.50c	16.50c
Zinc - (Per pound, St. Louis)	15.02c	15.50c
Copper - (Per pound, Domestic)	50.31c	56.08c

***Adjusted to reflect shares issued pursuant to the 2% stock dividend paid August 1 to shareholders of record May 15, 1970.**

TO THE SHAREHOLDERS OF
HECLA MINING COMPANY

Over 4,803,000 shares of stock representing 79% of the 6,080,800 shares issued and outstanding were represented in person or by proxy at the annual meeting of shareholders held in Spokane, Washington on April 29, 1971. Messrs. Robert B. Fulton, Horton Herman, Richard N. Hunt, Kenneth Lieber, W. H. Love, L. J. Randall and H. R. Short were reelected as Directors. The selection of Lybrand, Ross Bros. and Montgomery as auditors was approved.

A review of 1970 results, along with a 1971 first quarterly progress report was presented by the company officials to the individuals present at the well-attended shareholders' meeting. The review covered exploration and development activity, mining operations, financial status and a comprehensive report on the activities at the Lakeshore property in Arizona. A short question and answer period followed the presentation.

The following officers were reelected by the Directors to serve for the ensuing year: Mr. L. J. Randall, Chairman of the Board; Mr. W. H. Love, President and Chief Executive Officer; Mr. Gordon M. Miner, Vice President - Operations; Mr. Herbert E. Harper, Vice President - Exploration; Mr. Richard N. Hunt, Vice President, and Mr. William J. Grismer, Secretary-Treasurer.

At the shareholders' meeting Mr. Randall noted that he will reach the age for compulsory retirement under the Company's pension plan within the next two years. Under the circumstances, he felt it advisable to step down as Chief Eecutive Officer of the Company. He will continue as Chairman of the Board of Directors and the Executive Committee. Upon his recommendation, the Board of Directors appointed Mr. W. H. Love as Chief Executive Officer of the Company.

Consolidated net earnings for the First Quarter of 1971 of $965,000 or $0.16 per share were reported. This compares with $816,000 or $0.14 per share for the Fourth Quarter of 1970 and $1,528,000 or $0.25 per share for the First Quarter of 1970. The decline in income in the last two quarters is principally attributable to materially lower metal prices as compared to the first quarter of 1970. Net working capital (current assets less current liabilities) at March 31, 1971 totaled $10,665,000 as compared with $10,785,000 at December 31, 1970 and $11,255,000 at March 31, 1970.

Following the annual stockholders' meeting the Board of Directors declared a stock dividend of two percent (2%) (one share for each fifty shares) payable upon the outstanding capital shares. Stock certificates will be mailed on or about August 2, 1971 to stockholders of record as of the close of business on May 14, 1971. This stock dividend is being paid in lieu of a cash divi-

Hecla Mining Company
and Wholly Owned Subsidiaries

Consolidated Statement of Changes in Stockholders' Equity

For the Years Ended December 31, 1970 and 1969

	Capital Stock		Capital	Earnings Retained in
	Shares	Amount	Surplus	the Business
Balances, December 31, 1968 (Note 1)	5,957,208	$ 1,489,302	$ 9,437,045	$27,810,355
Exercise of stock options	4,600	1,150	82,366	
Cash dividends paid				(3,645,196)
Net income for year				4,874,154
Balances, December 31, 1969	5,961,808	1,490,452	9,519,411	29,039,313
Dividends paid:				
Cash				(1,043,258)
Stock dividend, 2%	119,231	29,808	2,790,239	(2,820,047)
Net income for year				4,715,058
Balances, December 31, 1970	6,081,039	$ 1,520,260	$12,309,650	$29,891,066

The accompanying notes are an integral part of the financial statements.

Notes to Financial Statements

1. Acquisition of Net Assets of Transarizona Resources, Inc.:

On September 12, 1969 the Company acquired substantially all of the assets of Transarizona Resources, Inc. for 1,000,000 shares of its authorized and unissued capital stock in a transaction accounted for as a pooling of interests. December 31, 1968 balances shown in the statement of changes in stockholders' equity reflect restatements resulting from this acquisition (increases of $250,000 and $5,730,205 in capital stock and capital surplus and a decrease of $1,334,723 in earnings retained in the business).

2. Listed Capital Stocks and Commodity Margin Deposits:

Details of listed capital stocks at December 31, 1970 are as follows:

	Number of Shares	Cost	Value Based On Market Quotations Dec. 31, 1970	Feb. 12, 1971
American Smelting and Refining Company	52,400	$ 1,335,748	$ 1,441,000	$ 1,441,000
Newmont Mining Corporation	38,125	764,621	1,038,906	1,158,047
St. Joe Minerals Corporation	15,400	347,131	408,100	446,600
New York and Honduras Rosario Mining Co.	31,620	692,056	517,936	652,163
Foote Mineral Co.	19,100	625,963	224,425	265,013
Foote Mineral Co. Convertible Preferred	7,900	322,172	213,300	227,125
Others		97,342	206,643	260,930
		$ 4,185,033	$ 4,050,310	$ 4,450,878

During 1970 the Company realized gains on sales of listed capital stocks in the amount of $498,248 which were partially offset by a loss, before related income tax benefits, of $430,676 on sales of matured silver futures contracts. The Company also provided $990,400 for possible losses on silver futures contracts maturing in the first half of 1971 and on silver bullion held. December 31, 1970 quotations for silver futures contracts maturing in the second half of 1971 were $214,000 below the prices at which the contracts were purchased, after related income tax benefits.

Financial Highlights

	1970	1969
Sales	$24,235,590	$24,019,091
Income before income taxes, depreciation, depletion and amortization	$ 7,407,221	$ 7,535,007
Depreciation, depletion and amortization	$ 518,563	$ 420,853
Federal and state taxes on income	$ 2,173,600	$ 2,240,000
Net Income	$ 4,715,058	$ 4,874,154
Net income per share (weighted average of shares outstanding)	$ .78	$ .80(1)
Dividends per share	$ .172(1)	$ .69(1)
Net working capital	$10,786,770	$11,924,663
Per share of stock outstanding	$1.77	$1.96(1)
Shares of capital stock outstanding at end of period	6,080,800	6,080,803(1)

NOTE: (1) Adjusted to reflect 2% stock dividend paid in August 1970.

73rd Annual Report of
HECLA MINING COMPANY

To the Shareholders of HECLA MINING COMPANY:

The year 1970 marked continuing progress in our program to assure the long-term future of Hecla as an independent and diversified producer of non-ferrous metals. This objective continues at presently producing mines, at the Lakeshore copper property which is now being developed for production, and in our search for new opportunities.

Consolidated net income for 1970 was $4,715,058, or 78¢ per share, as compared to $4,874,154, or 80¢ per share for the prior year after adjustment for the 2% stock dividend paid in 1970. Net income for the current year continued to be adversely affected by lower silver prices which have declined from an average price of $2.12 in 1968 to $1.78 in 1969 and $1.76 per ounce for 1970. The price of lead decreased 3¢ per pound during the last half of the year from 16½¢ to 13½¢ per pound, and zinc decreased ½¢ during the third quarter from 15½¢ to 15¢ per pound.

A cash dividend of 17½¢ per share was paid in the first quarter of 1970, and a stock dividend of 2% was paid on August 1, 1970, as compared to cash dividends of 70¢ per share paid in 1969. The stock dividend paid in 1970 assisted in conserving funds needed for financing preproduction costs at the Company's Lakeshore Arizona copper property.

As of December 31, 1970 net working capital (current assets less current liabilities) totalled $10,787,000 as compared with $11,924,000 at the beginning of the year.

In 1968, Hecla embarked on a planned program of buying silver futures. World consumption has materially exceeded production for several years. We were convinced, as were many authorities on the subject, that over the long-term period the price of silver would trend upward and that our shareholders would ultimately benefit substantially. It was also our policy to renew contracts as they matured. However, that program has not been successful, and a loss of $431,000 was incurred on silver futures contracts which matured during the year. A provision has also been made in our 1970 consolidated statement of income for possible additional after-tax losses of $700,000 on 925,000 ounces of silver bullion owned by the Company and 150 silver futures contracts maturing in the first half of 1971. In addition to the silver futures contracts referred to above, Hecla owns 107 additional futures contracts maturing in the second half of 1971 which, if sold on December 31, 1970, would have resulted in an after-tax loss of $214,000.

After starting the above program of buying silver futures, we acquired the Lakeshore property. We

LIABILITIES	1970	1969
Current Liabilities:		
Accounts payable and accrued expenses	$ 2,677,017	$ 1,354,537
Accrued taxes	1,696,095	1,448,284
Total current liabilities	4,373,112	2,802,821
Deferred income taxes (Note 3)	3,256,700	674,200
Commitments (Note 8)		
STOCKHOLDERS' EQUITY (statement annexed)		
Capital stock, 25¢ par value:		
Authorized 1970, 8,000,000 shares; 1969, 6,000,000 shares; issued 1970, 6,081,039 shares; 1969, 5,961,808 shares (Notes 6 and 9)	1,520,260	1,490,452
Capital surplus	12,309,650	9,519,411
Earnings retained in the business	29,891,066	29,039,313
	43,720,976	40,049,176
Less, Capital stock reacquired, at cost:		
1970, 239 shares; 1969, 235 shares	2,687	2,660
Total stockholders' equity	43,718,289	40,046,516
	$51,348,101	$43,523,537

The accompanying notes are an integral part of the financial statements.

Hecla Mining Company
and Wholly Owned Subsidiaries

Consolidated Balance Sheets

December 31, 1970 and 1969

ASSETS	1970	1969
Current Assets:		
Cash	$ 838,736	$ 802,412
Certificates of deposit and accrued interest	1,586,724	1,446,290
Government securities, at cost and accrued interest (approximate market)	1,083,747	1,994,488
Listed capital stocks, at cost (market $4,050,310 and $6,125,001) (Note 2)	4,185,033	5,033,609
Silver bullion, at lower of cost or market (Note 2)	1,512,381	
Commodity margin deposits (Note 2)	1,581,082	1,235,519
Due from sales of products	1,610,861	1,700,971
Accounts and notes receivable, including, in 1970, $846,800 income taxes refundable (Note 3)	1,908,583	1,853,116
Inventories, at lower of average cost or market	780,786	613,700
Prepaid expenses	71,949	47,379
Total current assets	15,159,882	14,727,484
Investments and interests in mining properties, at cost:		
Day Mines, Inc. (13.5% owned; market, $3,893,801 and $4,978,151)	3,628,798	3,628,798
Sunshine Mining Company (3.8% owned; market, $2,525,000 and $2,800,000)	2,574,087	2,574,087
Granduc Mines, Limited (N.P.L.) (Note 4)	10,039,400	10,039,400
Other	516,661	514,856
Properties, plants and equipment, at cost (Note 5)	26,635,525	17,843,844
Accumulated depreciation, depletion and amortization	(7,702,471)	(6,292,477)
Other assets	496,219	487,545
	$51,348,101	$43,523,537

are presently conserving funds to develop that property, and for that reason we do not presently plan on renewing our silver futures contracts as they mature. Nevertheless, we stress our optimism for appreciable increases in the future price of silver because of the sizeable imbalance between production and consumption.

Total production and average prices received for Hecla's share of principal metals produced during the past two years are itemized as follows:

	1970		1969	
	Total Production	Average Price Received	Total Production	Average Price Received
Silver	6,245,087 oz.	$ 1.761	6,558,393 oz.	$ 1.781
Gold	52,103 oz.	$35.65	53,935 oz.	$40.70
Lead	27,467 Tons	15.62¢	27,651 Tons	14.90¢
Zinc	9,479 Tons	15.32¢	9,047 Tons	14.60¢
Copper	1,906 Tons	57.70¢	1,895 Tons	47.53¢

New ore developed in our operating properties was generally sufficient to replace the year's production.

The Company's major achievement in 1970 was the progress realized in planning and development at the Lakeshore copper property. The twin declines being driven to provide underground access to the deposit had progressed to a slope distance of 4,700 feet at the date of this report, and it is anticipated that the first development ore from underground operations will be extracted about mid-1971.

In addition to normal development at operating mines, Hecla conducted a substantial exploration and development program at several other properties. Expenditures increased from $1,656,000 in 1969 to $1,741,000 in 1970, including $917,000 capitalized as development, expended on the Liard-Paramount copper-molybdenum property. This property is located about 100 miles north of Stewart, British Columbia. Our drilling results indicate a mineralized deposit in the several-hundred-million ton open pit class.

Good progress was made at the Consolidated Silver property near Osburn, Idaho (formerly the Silver Summit mine), where Hecla's share of expenditures in 1970 was $366,000, as compared to $275,000 in 1969.

The Granduc mine of Granduc Mines, Limited, in which Hecla owns a principal stock interest, commenced milling operations on November 1, 1970. It is anticipated that sustained and full scale production capacity of 7500 tons of ore per day will be achieved during 1971. This new copper mine, situated north of Stewart, British Columbia, is under lease to Granduc Operating Company and American Smelting and Refining Company.

Management is most aware of the many environmental issues, and your Company's efforts for pollution control and better housekeeping, initiated a number of years ago, are sincere and continuing.

Lead is one of our principal products, and we urge shareholders to view cautiously the recently publicized proposal for removal of lead from gasoline based on the assumption it will reduce pollution from automobile engine exhausts. In fact, such removal of lead may result in other more serious and costly problems.

It is anticipated that stable labor-management relations at all properties will continue during the forthcoming year.

The following pages of this report set forth more detailed information with respect to exploration and development activity, mining operations and interests, production analysis, metal markets and prices and financial analyses.

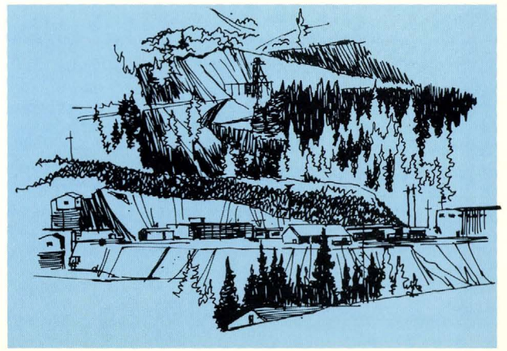
Our sincere appreciation is expressed on behalf of Management and the Board of Directors for the loyal support of our employees and to the shareholders for their continuous support and valued interest in our efforts toward growth for the Company.

BY ORDER OF THE BOARD OF DIRECTORS

L. J. RANDALL
Chairman of the Board

W. H. LOVE
President and General Manager

February 19, 1971



EXPLORATION AND DEVELOPMENT ACTIVITY

Hecla's search for additional mineral deposits in the Western United States and Canada continued during 1970, and primary efforts were directed toward finding economic deposits of gold, silver, copper-molybdenum, lead, zinc and uranium ores.

Hecla's principal exploration office is maintained at the corporate headquarters in Wallace, Idaho, with other offices in Reno, Nevada; Denver, Colorado; and Vancouver, B. C.

Property examination and exploration and development expenditures related to non-producing properties amounted to $1,741,000 in 1970. This amount compares to $1,656,000 in 1969 and $1,865,000 in 1968. The 1970 figure includes capitalized development expenditures amounting to $917,000 on the Liard-Paramount Schaft Creek property.

The Liard-Paramount property, located on Schaft Creek about 100 miles north of Stewart, B. C., is Hecla's most promising project in Canada. During 1970, twenty-four holes aggregating 29,159 feet were drilled on the Liard property and three holes totaling 3,416 feet were drilled on the adjacent Paramount property. These holes were drilled as part of a program to further outline the zones of copper-molybdenum mineralization and confirm the continuity of mineralization indicated by wider-spaced drilling in 1968 and 1969. Development is incomplete; however, our drilling results continue to indicate that the mineralized deposit is in the several hundred-million-ton open pit class. Engineering studies are continuing and further development drilling is scheduled for 1971. The property is still serviced only by air, and road access to the property must await completion of the Stewart-Cassiar highway.

Hecla investigated other areas of interest in Western Canada and continued participation in an exploration syndicate. Further geologic evaluation and drilling on properties in the Yukon Territory failed to disclose anything of economic interest.

A number of properties were examined and broad areas of interest were studied in Nevada and Arizona in search for precious and base metals, and in Utah, Arizona and Texas for uranium. The deep drilling at the Bristol Silver property near Pioche, Nevada was unsuccessful in finding mineralization, and no further work is planned. Several uranium prospects were tested with drilling during 1970, but no deposits of present economic interest were found. Some of the properties were dropped, one was leased, and two have been retained for further evaluation and possible long-range potential.

In the Coeur d'Alene District of Idaho, Hecla's largest project, outside our producing mines, was at Consolidated Silver Corporation's property (formerly the Silver Summit mine and adjacent properties) which is under lease to Asarco and Hecla. Sinking of the Silver Summit shaft from the 3000' level to the 4000' level is now underway. It is anticipated that the shaft will eventually be deepened to the 5000' or 5500' level, for deeper development of previously productive veins and to explore other vein systems located within the consolidated properties. During 1970 the Southeast lateral on the 4000' level was driven 2,090 feet to explore the easterly extension of the Silver Summit vein and fault system. Four holes totaling 4,859 feet were drilled from the 4000' Southeast lateral, and four holes aggregating 4,561 feet were drilled on other levels, with only minor mineralization being disclosed thus far. No work has yet been done on the 4000' level in the Chester vein-Polaris fault area located in the northerly portion of the properties.

Other projects in the Coeur d'Alene District, now underway or planned, include the Nine Corporation property north of Wallace, the Alice Consolidated properties between Wallace and Mullan, and the D.I.A., North Abot and West Independence properties in the Lucky Friday and Star-Morning areas. On the North Abot property a surface diamond drill hole was drilled to a depth of 900 feet to test the downward extension of the Pilot vein. The vein was intersected at 874 feet but contained only minor lead mineralization. At the Nine Project, one inclined surface hole was drilled to a depth of 2100 feet to test a favorable fault wedge of ground west of Dobson Pass. No significant mineralization was found, but the results are considered inconclusive and further work may be done in 1971. Initial preparation work for the start of the D.I.A. Project from the Lucky Friday 4050' level was accomplished during the year and the project should be under way late in 1971. The D.I.A. properties include the Gold Hunter, Independence and Abot properties lying north and west of the Company's Lucky Friday mine. Likewise, preparation work is in progress for the commencement of a lateral on the Star-Morning mine 7300' level which will be driven easterly to explore the West Independence area.

The various agreements involving the consolidation of properties now under the ownership of Alice Consolidated Mines, Inc. were finalized late in 1970 and the operating agreement between Alice and Hecla became effective December 1, 1970. The consolidated area lies east of the formerly productive Golconda Mine located midway between Wallace and Mullan. It is contemplated that exploration of the area will involve shaft sinking, laterals and diamond drilling. Surface geologic work and drilling in preparation for this program will be initiated during 1971.

Consolidated Statements of Income

For the years ended December 31, 1970 and 1969

	1970	1969
Income:		
Sales of concentrates and products	$24,235,590	$24,019,091
Gain (loss) on sales of securities and silver futures (Note 2)	67,572	(504,584)
Dividend income	363,840	548,961
Interest and other income	380,301	455,751
	25,047,303	24,519,219
Costs and Expenses:		
Cost of sales	14,443,711	13,668,558
Exploration	458,544	1,381,126
Consolidated Silver Project	365,754	275,262
General and administrative	601,833	747,860
Property and excise taxes	1,223,079	1,231,795
Other	75,324	100,464
	17,168,245	17,405,065
Provision for loss on silver bullion and futures (Note 2)	990,400	
	18,158,645	17,405,065
Income before provision for income taxes	6,888,658	7,114,154
Provision for income taxes, including federal income taxes of $1,790,600 and $1,908,000 (Note 3):		
Currently payable	(408,900)	1,767,500
Deferred	2,582,500	472,500
	2,173,600	2,240,000
Net income	$ 4,715,058	$ 4,874,154
Per share of capital stock:		
Net income	$ 0.78	$ 0.80*
Dividends paid	$ 0.172*	$ 0.69*

*Adjusted to reflect 2% stock dividend paid in August 1970.

Note: Costs and expenses include provisions for depreciation, depletion and amortization of $518,563 in 1970 and $420,853 in 1969.

The accompanying notes are an integral part of the financial statements.

Hecla Mining Company and Wholly Owned Subsidiaries

Consolidated Statements of Source and Use of Funds for 1970 and 1969

	1970	1969
Source of Funds:		
Net income	$ 4,715,058	$ 4,874,154
Depreciation, depletion and amortization	518,563	420,853
Increase in deferred income taxes (Note 3)	2,582,500	472,500
Exercise of stock options		83,516
	7,816,121	5,851,023
Use of Funds:		
Dividends paid, cash	1,043,258	3,645,196
Property additions, net:		
Lakeshore copper property, excluding $4,262,535 net book value of properties acquired for 1,000,000 shares of Hecla stock in 1969	6,874,568	3,800,553
Other	1,025,682	553,394
Increase in other assets	10,506	186,002
	8,954,014	8,185,145
Decrease in working capital	$ (1,137,893)	$ (2,334,122)

The accompanying notes are an integral part of the financial statements.

MINING OPERATIONS and INTERESTS

LUCKY FRIDAY MINE

Coeur d'Alene District—Idaho

The wholly-owned Lucky Friday mine produced a total of 200,448 tons of ore assaying 14.35 ounces of silver per ton, 9.81% lead, and 1.09% zinc.

The development of the 3650′ level was essentially completed during the year. The width of the vein and the grade of the ore exposed on the 3650′ level was comparable to exposures on the levels being mined above. The ore developed on this new level resulted in an increase in the calculated ore reserves from 598,000 tons at the beginning of the year to 624,000 tons at year end.

The excavation of the 4050′ station was completed. Two short crosscuts were driven and a main pump station and sumps completed. A water-bearing fault structure has caused adverse ground conditions in the main shaft at and below the 4050′ level. A grouting program planned to reduce water flow and stabilize the ground was well along at the end of the year.

The mine is in good condition and it is anticipated that this operation will continue its substantial contribution to the Company's earnings.

SUNSHINE UNIT AREA

Coeur d'Alene District—Idaho

Hecla Mining Company, Sunshine Mining Company and Silver Dollar Mining Company own the ores produced from the Sunshine Unit Area. Hecla's 33.25% share of Unit Area production was 82,424 tons of ore assaying 33.75 ounces of silver per ton.

Development of the Chester Vein system on the 5000′ and 5200′ levels during the year was essentially completed. Preparatory work is underway to develop a new level at the 5400′ elevation, and the No. 10 production shaft has been extended to just below the 6000′ level. Hecla's share of the estimated Unit Area ore reserves was 292,000 tons as of January 1, 1971, as compared to 276,000 tons at the beginning of 1970.

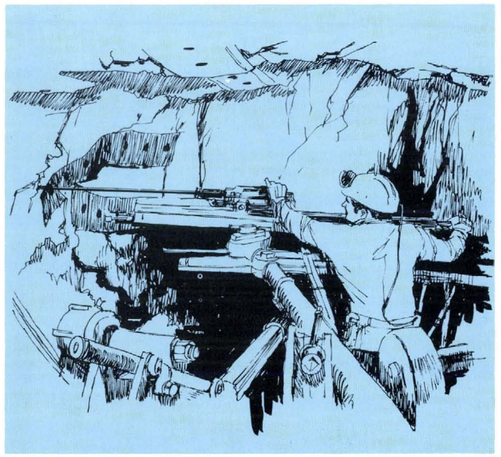
In order to improve the environmental conditions underground, a seven-foot diameter circular hole was bored from the surface to the 1900′ level and the new opening is now in use to exhaust air from the mine.

CHESTER MINING COMPANY

Coeur d'Alene District—Idaho

Chester Mining Company, in which Hecla owns a 54.2% stock interest, receives a royalty on ores mined from the "Chester Area" (a strip of ground 400 feet wide and approximately 1500 feet in length adjoining the Sunshine Unit Area) which is leased to the owners of the Sunshine Unit Area.

A total of 6,039 tons of ore assaying 32.39 ounces of silver per ton were mined above the 4600′ level from the "Chester Area" in 1970. Ore



reserves were essentially depleted at year end, and further production will depend on development of new ore shoots below the 4600′ level. Drifting on the 5000′ level has disclosed encouraging mineralization which will require further development.

STAR-MORNING UNIT AREA

Coeur d'Alene District—Idaho

Hecla owns a 30% interest in production derived from the Star-Morning mine, and also receives a royalty on production from the Morning section of the mine. The Bunker Hill Company owns the remaining 70% interest in production.

The mine produced 215,544 tons of ore during 1970, of which Hecla's share was 64,663 tons assaying 2.45 ounces of silver, 5.24% lead and 6.77% zinc. Hecla's share of the computed ore reserves increased from 257,000 tons at the beginning of the year to 326,000 tons at the end of the year. The increase in ore reserves resulted principally from development work on the 7300′ level. The No. 4 shaft project, designed to facilitate mining of the deep Star-Morning ores below the 7100′ level, was essentially completed. This extensive project, which was started in 1966, included development of a new main production shaft equipped with a large new hoisting plant at the main 2000′ tunnel level (capable of hoisting over 7000′ in a single vertical lift), installation of additional underground air compressor capacity, and an enlarged and improved ventilation system.

Following completion of the new shaft, production from the Star-Morning veins on the 7300′ level was started and sinking to establish the 7500′ level is underway.

MAYFLOWER MINE

Park City District—Utah

Hecla leases the Mayflower mine from New Park Mining Company and under terms of the Agreement a royalty of 50% of defined net operating profit is paid to New Park.

Mine production for 1970 totaled 115,762 tons of ore assaying 0.48 ounces of gold per ton, 5.18 ounces of silver per ton, 4.52% lead, 2.85% zinc, and 0.99% copper. Ore reserves at year end were estimated to be 240,000 tons, compared to 257,000 tons on January 1, 1970 and 309,000 tons on January 1, 1969.

In last year's annual report it was noted that development of the 2600′ level had encountered generally disappointing results, with a marked shortening of ore shoots as compared to the 2400′ level above. During 1970 development headings on the 2800′ level reached the downward projections of the productive segments of the veins with equally disappointing exposures. Results obtained on these two levels caused a curtailment of development work, and continued production from

EARNINGS AND DIVIDENDS OF PRIOR YEARS

The following is a 10-year summary of earnings and dividends per share. Shares outstanding are based upon the weighted average number of shares outstanding for each year where such average differs significantly from shares outstanding at the end of the year.

	Total Earnings	Average Number Shares Outstanding*	Net Income Per Share*	Dividends Paid Per Share *	Dividends Paid Per Share **
1961	$1,337,025	3,327,717	$ .40	$ .17	$ .25
1962	1,479,750	3,327,711	.44	.17	.25
1963	1,846,227	3,327,705	.55(1)	.23	.3375
1964	5,198,379	5,804,133(2)	.90	.50	.615(3)
1965	5,825,845	5,817,635	1.00(1)	.48	.60(4)
1966	6,843,424	5,970,841	1.15(1)	.46	.575
1967	5,372,206	6,051,030	.89	.49	.60
1968	4,643,466(5)	6,070,565	.76(5)	.53	.65
1969	4,874,154	6,076,959	.80	.60	.70
1970	4,715,058	6,080,800	.78	.17	.175

**Adjusted to reflect the 1 for 1 stock distribution in 1968, the 1,000,000 shares issued in 1969 to acquire net assets of Transarizona Resources, Inc. on a pooling of interests basis and the 2% stock dividend in 1970.*

***Adjusted to reflect 1 for 1 stock distribution in June 1968.*

(1) Net income per share includes extraordinary net capital gains on sales of capital stock of other companies as follows: 1963 $.09; 1965 $.02; 1966 $.14.

(2) In 1964, 2,472,775 shares were issued when Lucky Friday Silver-Lead Mines Company was merged into Hecla.

(3) $.35 per share in cash plus two shares of The Bunker Hill Company (market value 26.5¢ per share of Hecla) for each 100 shares of Hecla.

(4) $.375 per share in cash plus two shares of The Bunker Hill Company (market value 22.5¢ per share of Hecla) for each 100 shares of Hecla.

(5) Restated to reflect results of operations of Transarizona Resources, Inc. acquired during 1969 on a pooling of interests basis. Years prior to 1968 were not adjusted to reflect Transarizona operations as such results were not material for those years.

ZINC

Estimated 1970 world zinc supply, according to the British Metal Corporation, increased about 1% to 5,535,000 tons and world zinc consumption of 5,402,000 tons decreased 1.8% from the record use in 1969.

U. S. slab zinc consumption was about 1,180,000 tons of which 556,000 tons was from newly-mined U. S. production and the balance from secondary production and imports. This compares to 1,368,000 tons in 1969 of which 553,000 tons was from newly-mined domestic production and the balance from secondary production and imports.

The most notable influence on the zinc price was the increase of slab zinc stocks at U. S. producers plants by 66,000 tons to 156,000 tons at year end, despite substantial smelter production cutbacks.

Consumption by the automotive industry normally accounts for one-third of the total U. S. consumption of zinc for die castings, galvanized steel, brass and bronze, and zinc oxide. This industry was adversely affected by a strike and a general decline in the economy and used less zinc in 1970 than in any year since 1962. Appliance manufacturers, the second largest consumer of zinc die castings, and the construction industry which uses most of the galvanized steel, suffered sharp losses in demand and also used substantially less zinc.

The U. S. Government stockpile inventory decreased by 22,000 tons during 1970 from 1,142,000 tons to 1,120,000 tons.

The domestic prime western price of zinc decreased ½¢ on August 21 to 15¢ per pound. The average price for the year was 15.3¢.

COPPER

World copper production, according to the British Metal Corporation, increased 6.3% to 6,918,000 tons as compared to 6,510,000 tons in 1969.

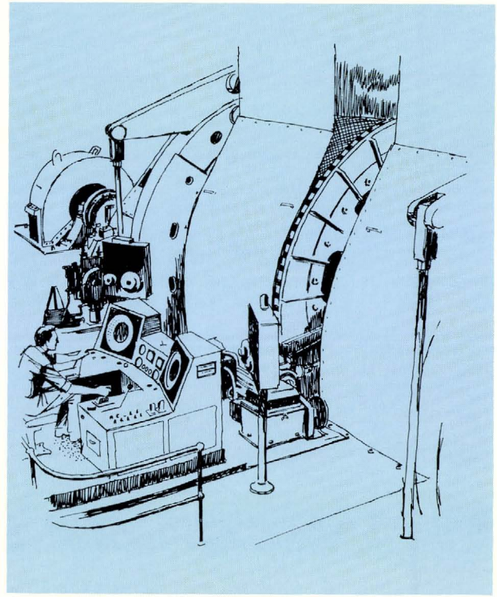
World copper consumption increased 2.5% to 6,665,000 tons as compared to 6,505,000 tons in 1969.

Free world refined stocks of copper, as reported by members of the Copper Institute, who represent about 90% of free world production, were 478,000 tons at year end as compared to 281,000 tons at the end of 1969. The U. S. portion of the above figures was 161,000 tons and 46,000 tons respectively.

In addition to refined stocks noted above, there are stocks of copper held by fabricators. Free world refined fabricators' inventory is unknown. However, in addition to the U. S. refined stocks held by refineries and non-consumers, described above, the U. S. copper fabricating industry's refined stocks were 515,000 tons as compared to 502,000 tons at the end of 1969.

Much of the world copper sales are on the basis of copper trading and limited physical sales on the London Metal Exchange (L.M.E.). The L.M.E. cash price was 76¢ at the beginning of 1970, reached a high of 81.5¢ on April 14, a low of 45.8¢ on December 7, and closed the year at 46.9¢ per pound.

The domestic producers' price reached a 1970 high of 60¢ on March 31, a low of 53¢ on November 30, and at year end was 53¢ per pound.



upper levels is rapidly depleting known ore reserves. A broad overall geological review and appraisal of the future potential of the mine is underway to help determine what further development expenditures, if any, can be justified.

Development work in the Park City Utah and San Diego properties was discontinued in 1969, and the agreements with those companies were terminated.

LAKESHORE PROPERTY

Pinal County, Arizona

The Lakeshore copper property, discovered by El Paso Natural Gas Company in 1966 on the Papago Indian Reservation, and located south of Casa Grande, Arizona, was acquired by Hecla in September, 1969. Following extensive diamond drilling in 1967 and 1968, which in general outlined the magnitude of the deposit, examination by several mining companies was made with a view toward participation. Hecla's examination led to agreements which were approved by the shareholders in May, 1969, and which resulted in Hecla's acquisition of a 50% interest in the property for 1,000,000 shares of Hecla stock. Hecla is the operator of the property and will advance all funds required to bring the property into production. The funds advanced will be recouped by Hecla out of future revenues from the property and thereafter net income will be divided equally between Hecla and El Paso.

The Lakeshore deposit is a very large and important asset. The details of planning and engineering required to achieve maximum economic recovery are complex. Principal elements of this intricate program consist of diamond drilling to accurately ascertain the characteristics of the deposit, underground development of both oxidized and sulfide zones of the deposit, leach testing and pilot-plant treatment of oxidized materials, roast-leach-electrowinning testing and pilot-plant treatment of sulfide material, water development, detailed mine planning, power source and distribution, consideration of mine and processing alternatives and financial studies. This work is being conducted by the Hecla staff, with assistance from outside engineering firms. This program, which is proceeding very satisfactorily, should be completed near the end of this year, and will be followed by detailed engineering design and plant construction.

During the past year, Hecla has continued surface drilling, which now totals over 234,000 feet. This drilling has served to "fill in" and confirm the results of previous wider-spaced drilling, as well as to provide detailed data concerning the deposit which is required for mine planning, and to also develop extensions of the deposit. Some further information is needed and the drill program is continuing, although at a reduced rate.

Two declines, one with a 14′ x 12′ cross section and the other with a 18′ x 12′ cross section, are being driven on a minus 15° slope to provide underground entry to the deposit. Good progress has been made in the declines and on February 19, 1971 they had reached a slope distance of over 4,700 feet, and a vertical depth of 1,200 feet. Present plans are to continue driving the declines to a slope length of 7,500 feet, about 1,900 feet below the surface. Crosscuts will be driven from the declines to the deposit, and this work will be followed by underground development of both oxidized and sulfide zones of the deposit.

Metallurgical process development and preliminary engineering continued throughout the year. The segregation plant, formerly operated by El Paso in connection with its near-surface operations, is being converted into a pilot concentrator. Feed for the pilot concentrator will be supplied from underground development headings to be driven in the sulfide ore zone. Concentrate production will be processed in a pilot roast-leach-electrowinning plant, on which construction has started. A pilot oxide ore treatment plant will also be constructed, with feed supplied from underground development work in the oxidized zone of the deposit. Final determination of the size and scope of the ultimate metallurgical treatment process will be based on results obtained from the pilot metallurgical plants.

Consideration of external sources of financing, which will be needed to bring the property to full production capacity, have continued during the past year. To this point of time, all financing has been from internal Company resources.

CONSOLIDATED SILVER CORPORATION

Coeur d'Alene District—Idaho

Consolidated Silver Corporation's property is a consolidation of Hecla's Silver Summit property with seven adjoining properties which became effective February 1, 1969. The consolidated property, together with a parcel of property owned by Merger Mines Corporation, is leased by Consolidated Silver to American Smelting and Refining Company (Asarco) under a 50-50 profit-sharing operating agreement. Asarco assigned a one-fourth interest in the lease and operating agreement to Hecla, and Hecla was appointed operator of the property. As a result of the transactions, Hecla will be entitled to approximately 37½% of income which may be realized from the property, 25% being attributable to stock ownership in Consolidated Silver and 12½% to interests as a Lessee.

Under the terms of the lease, Asarco and Hecla are required to expend a minimum of $500,000 during each of the first five years of the agree-

ment, with a minimum expenditure of $100,000 during each succeeding year.

The work program during 1970 consisted of diamond drilling on the 3000′ and 4000′ levels, crosscutting and lateraling on the 4000′ level, and extension of the main Silver Summit shaft to a depth of 3,590 feet. When the shaft reaches the 4000′ level, a sinking hoist will be installed to enable deepening of the shaft to the 5000′ or 5500′ level for further development of known vein systems and other favorable geological targets.

There was no ore production during 1970. The Lessees devoted their efforts to the deep-level development program. Ore reserves at the end of the year were estimated at 28,000 tons.

GRANDUC MINES, LIMITED (N.P.L.)

British Columbia

The Granduc mine, north of Stewart, British Columbia, was leased to Granduc Operating Company, a wholly-owned subsidiary of Newmont Mining Corporation, and to American Smelting and Refining Company in 1965. These two companies share the lease equally and are required to expend all funds necessary to bring the property to production.

In addition to Hecla's 1,189,700 shares of the outstanding common stock representing 35.4% ownership, Hecla is the sole owner of the redeemable preferred stock of Granduc Mines, numbering 1,050,000 shares.

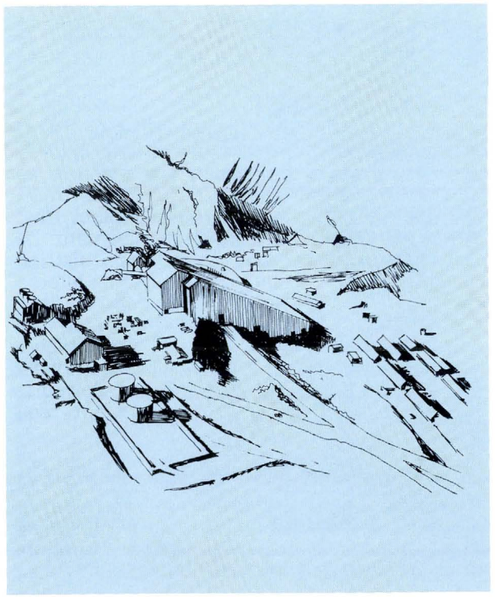
The 7500 tons-per-day plant facility at Tide Lake and the Stewart dock facilities were completed in the fall of 1970. The total development and construction program was unfortunately delayed as a result of labor strikes in 1969 and 1970. The mine, underground crushing plant and the concentrator were put into operation on a limited scale on November 1, 1970. Recent production has been at the rate of approximately 3,000 tons of ore per day and is gradually being increased. It is anticipated that full-rated capacity of 7500 tons of ore per day will be achieved during 1971, and that production will ultimately be expanded to about 9,000 tons per day.

As mentioned in the annual report for last year, original feasibility studies estimated the commercial ore body at 32,510,000 tons, with an average grade of 1.93% copper before dilution. These ore reserves were recalculated on the basis of a revised mine development plan, and are presently estimated to be 43,343,000 tons averaging 1.73% copper before dilution.

After the date of beginning operations, Granduc Mines, Limited will receive a royalty of 22½% of defined operating profits, before deducting preproduction costs incurred by the Lessees, on the first 32,500,000 tons of ore milled and 25% thereafter. It is anticipated that the date of beginning operations will occur in 1971. The phrase "date of beginning operations" referred to above is defined in the Lease Agreement as the date of commencement of the three-year Canadian federal income tax exemption period.

In accordance with the terms of the Lease Agreement a minimum of 80% of first royalty income received by Granduc Mines, Limited is committed to concurrent redemption of Hecla's 1,050,000 shares of 5½% preferred stock, $5,250,000 (Canadian) and advances of $5,427,589 (Canadian) made by Newmont Mining Corporation, plus dividends and interest, respectively, which will accumulate thereon after the date of beginning operations. Hecla waived dividends of 5½% on its preferred shares and Newmont likewise waived interest of 5½% on its advances for the period prior to the date of beginning operations.

During 1970 Granduc Mines, Limited continued an exploration and development program of its mineral properties in the general Granduc area, which are not under lease to Granduc Operating Company and American Smelting and Refining Company, and also reviewed other prospects in the Stewart, B. C. area. No important discoveries resulted from field work, and Granduc Mines' search for good mineral prospects in northern British Columbia continues.



METAL MARKETS AND PRICES

SILVER

On November 10, 1970, the U. S. Treasury discontinued its public sales of silver. Prior to that date the U. S. Treasury had sold 195 million ounces in 1967, 180 million ounces in 1968, 89 million ounces in 1969, and 67 million ounces in 1970. The U. S. Treasury has disposed of over 2 billion ounces of silver during the past 12 years, including 673 million ounces during the past 5 years. These sales have created an oversupply resulting in a very depressing effect on the market.

The price of silver was $1.84 at the beginning of 1970, reached a high of $1.93 on January 29, a low of $1.57 on December 10, and at year end was $1.63 per ounce. The average price for the year was $1.76.

Preliminary Handy & Harman figures for 1970 indicate 397 million ounces of free world consumption and 247 million ounces of new production, resulting in a 150 million ounce deficit. The 150 million ounce gap between the free world new production and free world industrial consumption plus foreign coinage use was filled by scrap and bullion inventory.

United States 1970 mine production is estimated by the U. S. Bureau of Mines to be 44 million ounces and U. S. consumption to be 129.6 million ounces, including 0.7 million ounces used by the Treasury in minting 4.8 million 40% silver half dollars. Comparable figures for 1969 were 42 million ounces of new mine production and consumption of 161.1 million ounces including 19.6 million ounces used in minting half dollars.

Although the United States exported 153 million ounces of silver during the years 1964 through 1969, during the first 10 months of 1970 imports exceeded exports by 29 million ounces.

On December 31, 1970, President Nixon signed legislation which provides for the minting of 150 million commemorative Eisenhower silver dollars containing 40% silver. Approximately 47 million ounces of silver presently held by the Government will be required to mint these coins, of which 22 million ounces will be derived from the silver in Treasury's remaining 25 million ounces of bullion and the balance from the strategic reserve, which was reduced from 165 million ounces to 139.5 million ounces.

We expect the price to fluctuate but predict a strong upward trend as inventories are consumed.

LEAD

According to preliminary estimates of the British Metal Corporation, 1970 world production increased about 4% to 3,782,000 tons, and world consumption increased about 2.8% to 3,784,000 tons. The 1969 statistics were production of 3,633,000 tons and consumption of 3,682,000 tons.

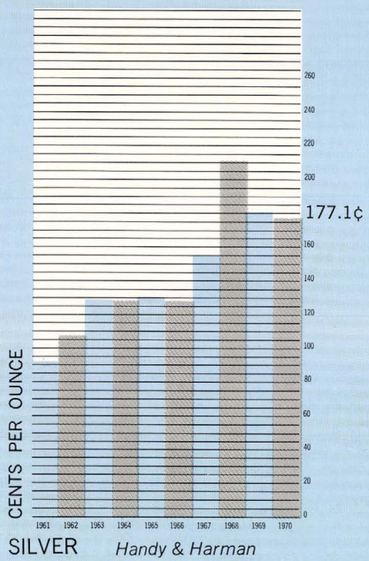
U. S. supply for 1970 totaled about 1,537,000 tons, which included 585,000 tons of mine production, 590,000 tons recovered from secondary production, and 362,000 tons of imported metal. This compares with a total supply of 1,503,000 tons in 1969, which included 509,000 tons of mine production, 605,000 tons of secondary production, and 389,000 tons of imported lead. Estimated U. S. consumption in 1970 of 1,340,000 tons represented a decrease of 3.5% compared to 1969.

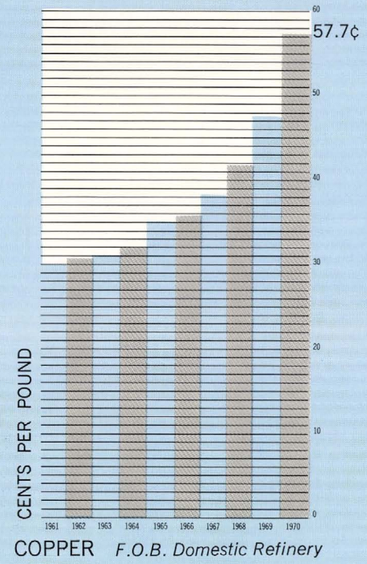
Lead stocks at U. S. primary smelters and refineries increased about 85,000 tons to 275,000 tons at year end, and the U. S. government stockpile decreased about 16,000 tons to 1,137,000 tons.

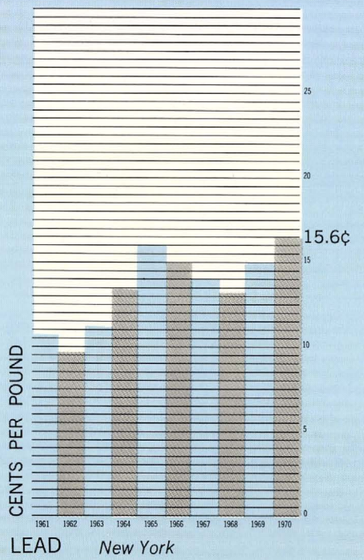
The domestic lead price was 16.5¢ at the beginning of the year, but decreased 3¢ during the last half of the year to 13.5¢ at the end of the year. The average price for the year was 15.6¢.

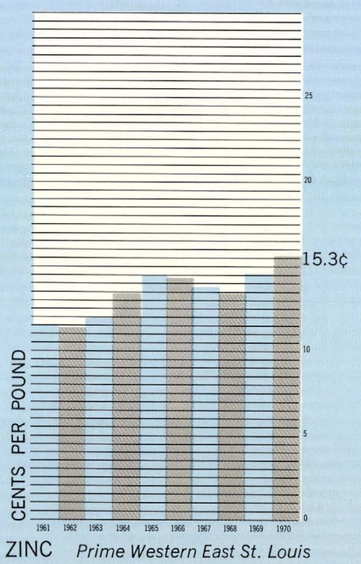
During the year considerable controversy developed over the use of tetraethyl lead in gasoline. Much evidence, including published statements from the U. S. Bureau of Mines, supports the conclusion that vehicle exhaust problems will not be solved but may be increased by the removal of lead from gasoline.

10 YEARS OF METAL PRICES









SOURCE:
Average annual metal prices as quoted by Metals Week.
The average London gold price was $41.10 in 1969 and $35.95 in 1970.

RUBY HILL PROJECT

Eureka, Nevada

This property, which was allowed to flood after being placed on a standby basis in the spring of 1966, is leased by Hecla, Newmont Mining Corporation, Cyprus Exploration Company, Richmond-Eureka Mining Company and Silver Eureka Corporation, with Hecla being the operator. The lease requires definitive expenditures during its 15-year period of extension.

During 1970, a surface drilling program was continued, coupled with further efforts to improve metallurgical recoveries from the complex Ruby Hills ores.

ACE CONCRETE CO.

Spokane, Washington

This wholly-owned subsidiary is one of the major firms in the Spokane area producing ready-mix concrete and sand and gravel, and markets a broad line of prestress and precast concrete products used in building and highway bridge construction. Ace also owns and operates a ready-mix concrete plant and distribution facility in Moscow, Idaho, which serves the Moscow, Idaho and Pullman, Washington area, and a portable aggregate plant which is operated at various locations in the Northwest.

The financial statements of this wholly-owned subsidiary are consolidated with those of Hecla; operating results for 1970 were quite satisfactory.

DAY MINES, INC.

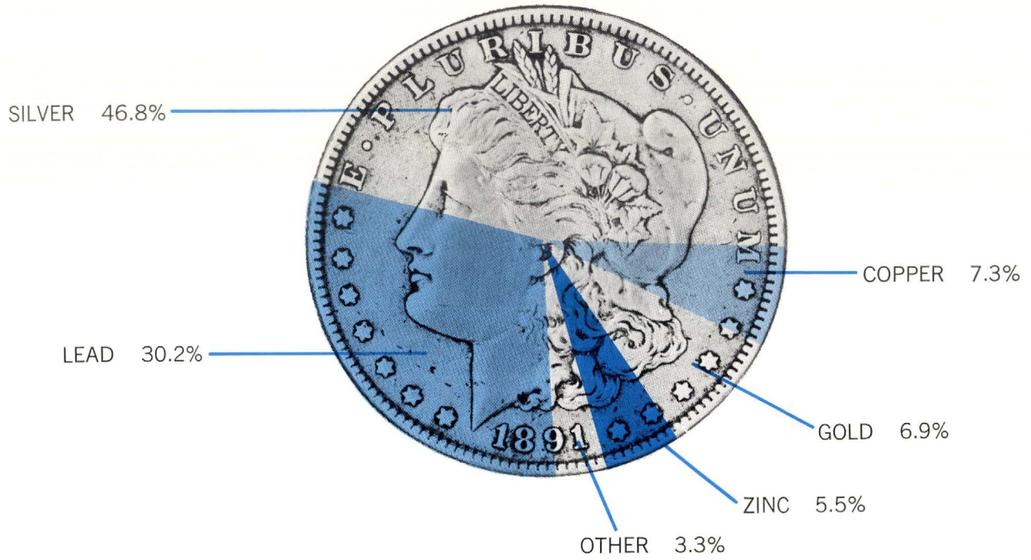
Wallace, Idaho

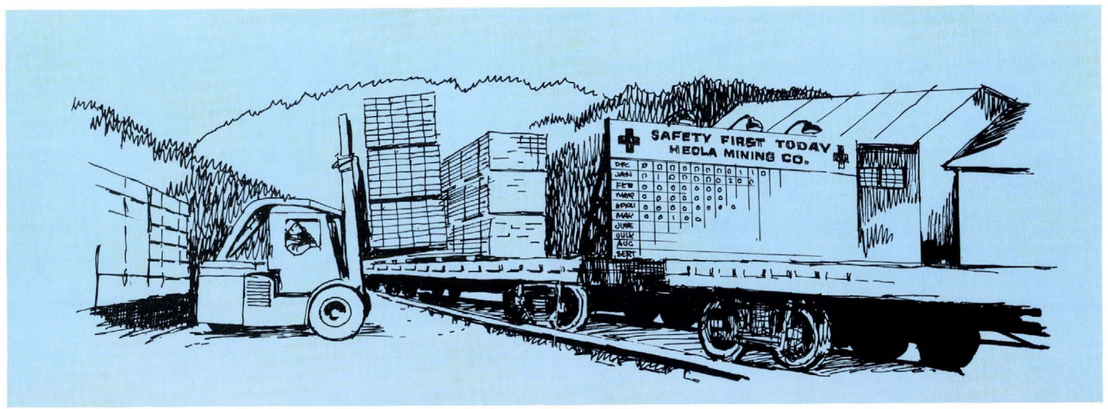
At year end Hecla owned 394,309 shares (13.5%) of the capital stock of Day Mines, Inc., a Wallace, Idaho company. For 1970 Day Mines reported a net loss on a preliminary basis estimated at $53,000, or 1.8¢ per share, as compared to a net profit of $494,000, or 17.1¢ per share in 1969. Day Mines has submitted the following statement of activities for 1970:

> "Fourth quarter activity at the Dayrock mine, near Wallace, was concentrated on extension of drifts east and west along the vein system at the new 1600 and 1750 levels from the Hornet winze. Ore segments totalling 480 feet in length have been developed on 1600 level to date and the 1750 level development is following closely behind. The mill has operated at capacity, about 220 tons per day, on ore from the development headings since mid-October. Ore showings on the two new levels are distinctly better than those in preceding higher levels. Unfortunately, lead and silver prices are lower now than they have been for two years.
>
> Gold-silver production from the operations at Republic, Washington, was low in the third quarter but returned to normal in the fourth quarter, assisted by a progressive increase in the price received for gold.
>
> Normal production continued at the Galena mine near Wallace (DMI participates 25% in the Asarco lease on the property). Development of the 133 vein, first on 3700 level and then on 3400 level, has served to maintain Galena's ore reserves for the year.
>
> On December 18, officers of Silver Star Mines, Inc. and DMI signed an agreement whereby the mining property of Silver Star will be developed and operated from adjoining workings of the Dayrock mine, on two profit-sharing bases: 65% DMI and 35% Silver Star in one area; 55% DMI and 45% Silver Star in the more distant areas.
>
> On January 8 agreements were signed which open the east half of the property of Sterling Mining Company Ltd. (142 acres) to exploration, development and possible production through adjoining Galena mine facilities. Asarco, DMI, Callahan Mining Corporation and Sterling are parties to this new leasing arrangement, which has been under negotiation for a number of years.
>
> DMI earnings in 1970 were reduced as a result of a five-month suspension of production at the Dayrock mine for shaft deepening; extraordinary exploration expenses were involved elsewhere. DMI has elected to charge non-recurring Caladay exploration costs of $287,000 to current expense. By so doing, a net operating loss is recorded that should result in an adjustment of 1969 income taxes; estimated to produce a refund of $160,000 to DMI."

PRODUCTION ANALYSIS

The sketch opposite graphically illustrates Hecla's sales income from metallic concentrates produced during the year.





1970 production by mines and metals produced was as follows:

	Tons of Ore Mined	Ounces Gold	Ounces Silver	Tons Lead	Tons Zinc	Tons Copper
Lucky Friday Mine	200,448	1,305	2,814,459	19,192	2,017	257
Sunshine Unit Area (1)	82,424		2,730,077			545
Star-Morning Unit Area (1)	64,663		148,520	3,135	4,265	
Mayflower Mine	115,762	50,798	552,031	5,140	3,197	1,104
	463,297	52,103	6,245,087	27,467	9,479	1,906

(1) Reflects Hecla's share of production from these properties.

The following table represents combined production of Hecla Mining Company for the past five years:

	Tons of Ore Mined	Ounces Gold	Ounces Silver	Tons Lead	Tons Zinc	Tons Copper
1966	480,852	62,862	7,073,773	30,600	12,106	1,796
1967 (1)	445,463	66,045	6,146,917	24,443	12,083	1,790
1968 (1)	378,466	59,725	4,974,480	16,857	9,507	1,734
1969	441,292	53,935	6,558,393	27,651	9,047	1,895
1970	463,297	52,103	6,245,087	27,467	9,479	1,906

(1) Both 1967 and 1968 production were materially reduced as a result of a strike at the Lucky Friday mine which shut down that operation from October 15, 1967 to June 15, 1968.

Dec. 15, 1970

FILE MEMO

HECLA, BAGDAD, CITY SERVICES
FLASH SMELTER

In a conversation with Dave Lincoln on 12-14-70 I learned that he had joined with Hecla Mining, City Services, in a study of pyro-metallurgical processes for treatment of concentrates.

On 12-15-70 I called Bill Griffith of Hecla to learn more of this joint program and to see if there was some opportunity for Essex to join. Griffith indicated that they did not want to extend it to too many parties in that it would be difficult to make decisions. City Services and Hecla have been discussing joint processing of concentrates from the inception of the Hecla program at Lakeshore.

The three companies have retained Jan Reimer, a consultant from Canada, to investigate various processes, primarily the Outokumpu Flash Smelting process. Their feasibility study will be completed by next September; however, they are expecting preliminary estimates by March. At that point they may decide to accept additional participation.

Griffith indicated that with two friends in the program (namely, Hecla and Bagdad) he felt that we would do well not to participate in the program in that we will be advised as to the outcome.

H. Lanier

cc: P.W. O'Malley

August 21, 1970

Mr. W. A. Griffith
Research Director
Hecla Mining Company
P.O. Box 320
Wallace, Idaho 83873

Dear Bill:

The analyses of the two cathode samples have been completed by Kennecott and the results are as follows:

Element	Cathode #18 - PPM		Cathode #28 - PPM	
	CSSL	KCC	CSSL	KCC
Cu	99.99		99.99	
O_2	130	180	140	220
S	<50	17	50	15
Fe	< 5	5	<5	5
Pb	2.4	3	3.8	3
Sn	<1	<1	1.2	<1
Bi	1.6	1.3	1.8	1.3
Sb	<2	<3	<2	<3
Mo	<5	1	<5	1
Te	<2	<2	<2	<2
Se	0.8	1.0	1.1	1.2
Ag	<3	2	<3	2
Ni	<1	<2	<1	<2
As	<2	2	<2	2
Zn	<10	—	<10	—

These are surprisingly good checks between the laboratories. All of the results indicate that copper is of very good quality. Normally in cathodes you do not have that high an oxygen, however, in the melting operation the oxygen will go between 2-4 hundred PPM. The critical factor in the melting is the sulfur content which is acceptable in both

Mr. W. A. Griffith
Research Director
Hecla Mining Company
Wallace, Idaho 83873

August 21, 1970

cases. Bismuth is at the threshold level where it could cause some problems with annealing properties, however, with the other impurities in the range indicated this would not be critical. In summary, if you could continue to make copper of this grade it would be an excellent grade of an electrolytic cathode.

If I can be of further assistance to you, please let me know.

Very truly yours,

ESSEX INTERNATIONAL, INC.

Howard Lanier, General Manager
Copper Operations

HL:td

HECLA MINING COMPANY
208 752-1251
WALLACE, IDAHO 83873
P. O. BOX 320

August 10, 1970

Mr. Howard Lanier, Manager
Copper Processing Operations
Essex International, Inc.
2030 East Speedway
Tucson, Arizona

Dear Howard:

I am enclosing with this letter samples of two electrowon cathodes which we have produced in our pilot operations at Hazen Research. I would appreciate it if you could have them analyzed by your friends in Kennecott as we discussed over the telephone.

For your information, the analyses reported on these two samples by Chicago Spectro Service Laboratory are as follows:

Element	Cathode #18	Cathode #28
Cu	99.99%	99.99%
O_2	.013%	.014%
S^2	<50 ppm	50 ppm
Fe	<5	<5
Pb	2.4	3.8
Sn	<1	1.2
Bi	1.6	1.8
Sb	<2	<2
Mo	<5	<5
Te	<2	<2
Se	0.8	1.1
Ag	<3	<3
Ni	<1	<1
As	<2	<2
Zn	<10	<10
	6 Day	6 Day

ELEMENT	CATHODE #18 – PPM		CATHODE #28 – PPM	
	CSSL	KCC	CSSL	KCC
Cu	99.99		99.99	
O_2	130	180	140	220
S				
Fe				

We appreciate very much your assistance in obtaining these analyses for us, and shall look forward to your evaluation of the results with keen interest.

Sincerely yours,

W. A. Griffith
Research Director

WAG:skm

Enclosures: 2

cc: File

Samples sent to KCC: (8/12/70)

Spl. No.	Description
Lot 18	Cathode #18
Lot 28	Cathode #28

JRB

UTAH REFINERY
QUALITY CONTROL DEPARTMENT

Date: 8-20-70

To: Howard

Here are the results on your lot 18 + 28. The other samples are cathodes we are shipping to Essex.

Not too much out of line on 18 + 28 except bismuth + moly but I wouldn't think they would cause troubles with the cathodes.

Regards,
Norm

AUG 21 1970
RECEIVED

KENNECOTT COPPER CORPORATION - UTAH REFINERY
SPECTROGRAPHIC ANALYSIS REPORT

MATERIAL Cathode Cu **FILM NO.** 2525 **DATE** 8-14-70

Essex	Ag	Pb	Ni	Fe	Sb	As	Bi	Sn	Te	
9375 B.L. Cath. 29 B TOP	17	1	<2	3	3.0 <2	1.5	<.3	<1	<2	
9376 Bot	10	1	↓	↓	↓	↓	↓	↓		
9377 31 B TOP	17	2.5	↓	↓	↓	↓	↓	↓		
9378 Bot	10	1	↓	↓	↓	↓	↓	↓		
9397 Essex lot 18	22	3	↓	5	↓	2	1.3	↓		
9398 lot 28	22	✓	↓	✓	↓	✓	✓	↓		

KENNECOTT COPPER CORPORATION - UTAH REFINERY
SPECTROGRAPHIC ANALYSIS REPORT

MATERIAL Essex Cathode Cu FILM NO. 2525 DATE 8-20-70

	Si	Mo* PPM		Ox PPM	S PPM	Se				
9375	<1	ND								
9376	↓	↓								
9377										
9378										
9397		5		180	17	1.0				
9398	1	1		220	15	1.2				

* Moly values are estimates based on sensitivities of lines as reported by NBS monograph tables.

INVESTIGATION OF THE LAKE SHORE COPPER DEPOSITS, PINAL COUNTY, ARIZ.

BY T. M. ROMSLO

* * * * * * * * * * **Report of Investigations 4706**

UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary
BUREAU OF MINES
James Boyd, Director

Work on manuscript completed March 1950,. The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Report of Investigations 4706."

July 1950

INVESTIGATION OF THE LAKE SHORE COPPER DEPOSITS, PINAL COUNTY, ARIZ.

by

T. M. Romslo[1/]

CONTENTS

1/ Mining engineer, U. S. Bureau of Mines, Tucson Branch, Minerals Division, Tucson, Ariz.

Report of Investigations 4706

TABLES

ILLUSTRATIONS

INTRODUCTION AND SUMMARY

The Lake Shore property, located in the early 1880's, contains copper-bearing deposits that have been developed by surface excavations, underground workings, and churn-drill holes. Intermittent operation of the property ended in 1929 with a total recorded production of 280,000 pounds of copper.

The property is near the foot of the Slate Mountains, which are made up mainly of schist, probably the Pinal formation of pre-Cambrian age. In the mine area there are a few outcrops of granite, which is exposed over a large area east of the property. Other outcropping rocks on the property are limestone, quartzite, and diabase. The limestone and quartzite probably are the Mescal and Troy formations of pre-Cambrian and Cambrian age, respectively.

The predominant copper mineral is chrysocolla, a hydrous silicate that occurs mainly as fracture filling in bedded schist. It is also the principal copper mineral in the shear zone at the schist-granite contact and in limestone southeast of the main workings.

Investigation of the Lake Shore property by the Bureau of Mines included both topographic and geologic mapping, exploratory drilling, and metallurgical test work. One diamond-drill hole and five churn-drill holes were completed for a total of 2,872.5 feet. Drilling started January 19 and was completed May 13, 1949.

ACKNOWLEDGMENTS

These investigations were initiated in 1942 when O. M. Bishop, formerly a mining engineer of the Bureau of Mines, examined the property with the object of determining ore reserves and obtaining samples for metallurgical tests. Appreciation is extended to Frank M. Leonard, Jr., one of the owners of the property, for accompanying the engineer during the examination, for relating the history of the property, and for supplying an assay map of the mine workings and assay graphs of the churn drill holes. Later in the same year, T. C. Denton, also a former mining engineer of the Bureau, obtained additional samples for metallurgical tests.

The Bureau wishes to thank Nels P. Peterson of the U. S. Geological Survey for mapping both the surface and the underground geology during brief visits to the property in January and March 1949.

The investigations made during the Bureau's drilling program were supervised by J. H. Hedges, Chief, Tucson Branch, Mining Division, and analytical work was by Ray Stiles, under J. Bruce Clemmer, chief, Tucson Branch, Metallurgical Division. Metallurgical tests by the Bureau in 1942 and 1943 were made at the Salt Lake City station with H. G. Poole in charge. Clemmer and

Carl Rampacek conducted the tests at Tucson in 1949 and prepared the text on metallurgical tests. Transit surveys of the surface and underground workings, started by the author, were completed by M. H. Berliner, mining engineer of the Tucson Branch, Bureau of Mines.

Acknowledgment is made to the Indian Service of the Department of the Interior for grading an entry road to the mine and for providing a source of domestic and drilling water from a well at the nearby Indian Village of Komelik.

LOCATION AND ACCESSIBILITY

The Lake Shore mine is in the Papago Indian Reservation and the Casa Grande mining district, Gila and Salt River Base Line and Meridian, secs. 25 and 36, T. 10 S., R. 4 E., Pinal County, Ariz. (fig. 1). It may be reached from Casa Grande, a town on the Southern Pacific Railroad and State Highway 80, by traveling southwestward 28.2 miles on a well-maintained dirt road and thence 2.6 miles east on a desert road to the property.

PHYSICAL FEATURES AND CLIMATE

The Lake Shore mine is on the southwest piedmont of the Slate Mountains at an altitude of about 1,800 feet. The mountain range trends northwestward and reaches its maximum altitude of 3,330 feet at Prieta Peak, about 2 miles north of the mine.

Vegetation is of the desert variety, typical of the lower altitudes of southern Arizona. Palo Verde trees and Saguaro cactus are prominent.

Winters are mild and summers are hot. At Ajo, about 60 miles west of the property, the annual mean temperature is 71°, with a range from 17° to 115°. The annual precipitation averages about 9.3 inches.

PROPERTY AND OWNERSHIP

The Lake Shore property consists of three patented lode mining claims: the Arizona, Copper Bell, and Isabella (fig. 2). N. Frank Leonard, Butte, Mont., owns 96 percent of the stock of the Hidden Treasure Mining Co., which is the holder of the property.

There are no buildings or equipment on the property.

HISTORY AND PRODUCTION

The mine was located early in the 1880's by Trout and Atchinson. A shaft was sunk, and some drifting was done before 1884, when the property was abandoned because of failure of the copper market. In 1905, B. S. Wilson relocated the mine and shipped some ore sorted from the dump. In 1914 he sold the property to Frank M. and Charles Leonard. A new shaft was sunk to the 225-foot level, and development of the ore body was started on three levels. In 1917 the Atlas Development Co., Chicago, Ill., leased the mine and shipped 850 tons of 5.2 percent copper ore to a smelter at Sasco, Ariz. In 1919,

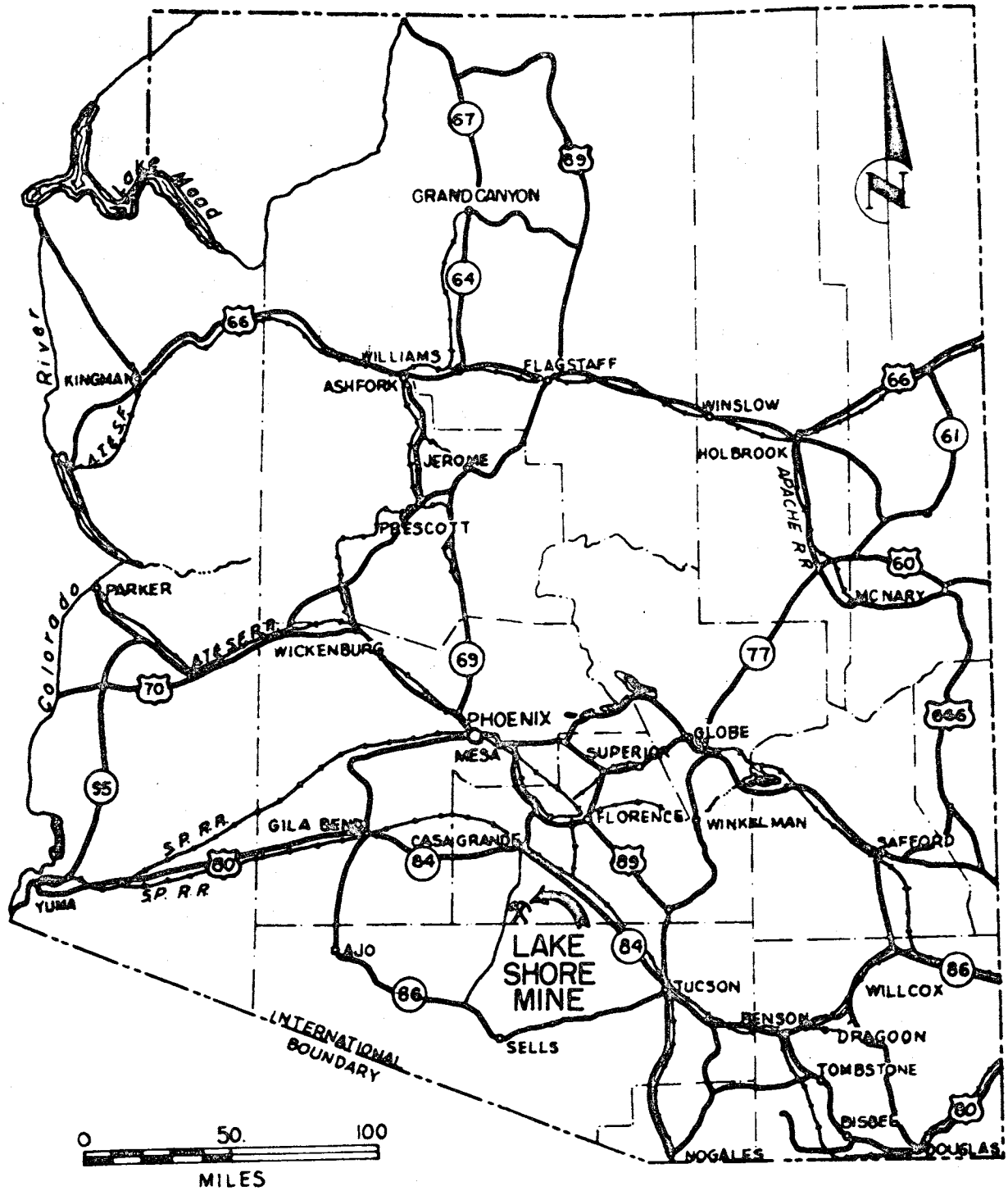


Figure 1. - Location map, Lake Shore copper project, Pinal County, Ariz.

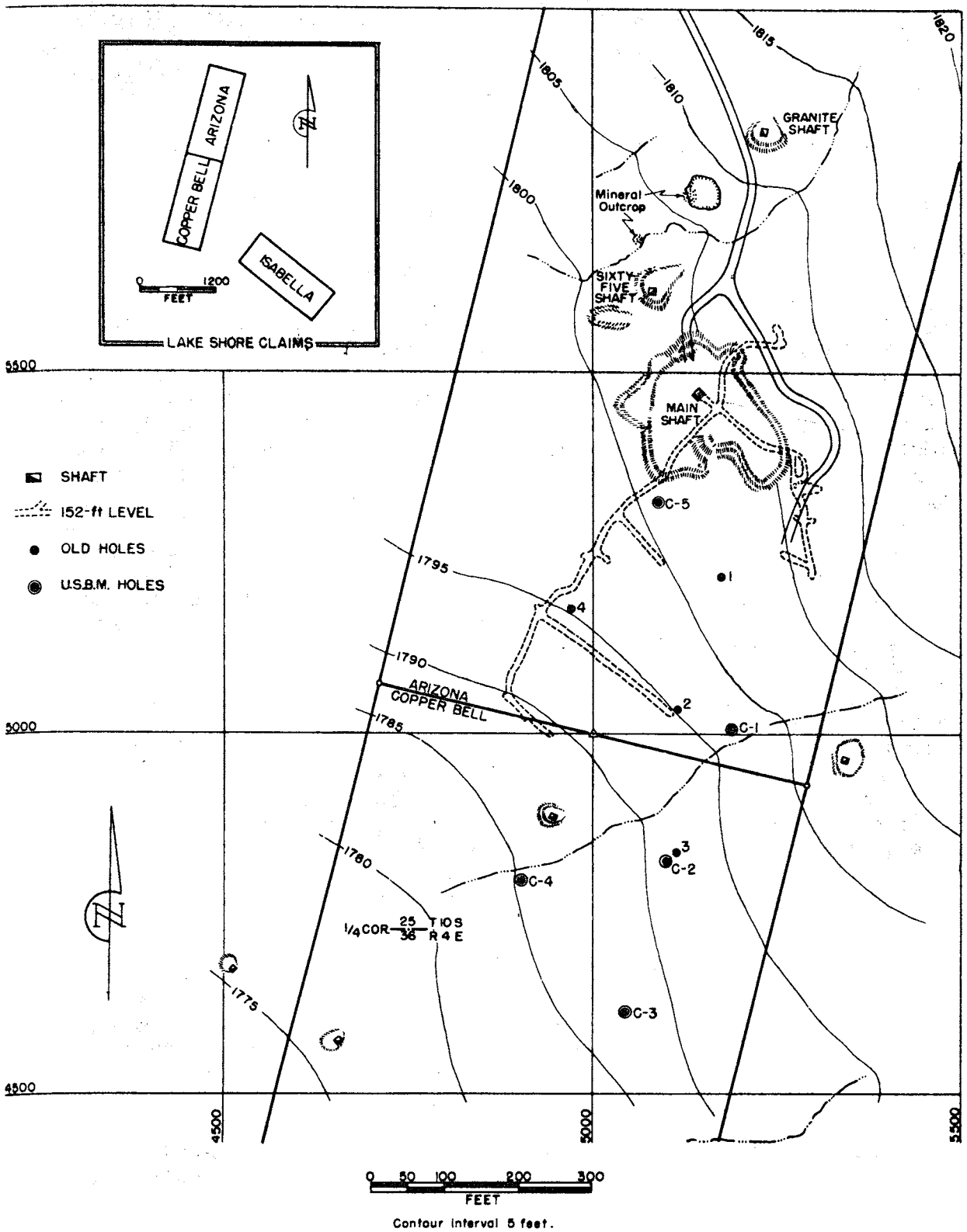


Figure 2. - Surface map, Lake Shore copper deposits, Pinal County, Ariz.

after terminating the lease, the Leonards drilled 5 churn drill holes and sank two winzes. During this period 12 tons of 15 percent copper ore in sulfide form was mined from the schist-granite contact zone on the 285-foot level. The last reported production was in 1929, when ore was trucked from the mine dump to Casa Grande for shipment.

Total production from the property is reported to have been 280,000 pounds of copper.[2/]

GEOLOGY

General

The Slate Mountains are composed mainly of schist, tentatively identified as the Final formation of pre-Cambrian age. Biotite granite has intruded the schist near the southwest end of the mountain range. It crops out over a very small area on the Isabella claim and is prominently exposed east of the Lake Shore property. Other rock exposures on the property are confined to a small area of altered schist on the Arizona claim and to limestone, quartzite, and diabase on the Isabella claim. The limestone and quartzite are probably the Mescal and Troy formations of pre-Cambrian and Cambrian age, respectively.

Deposits

Copper mineralization is associated with a fault that has an average strike of about S. 11° W. and a dip of 60° to 70° west (figs. 3 and 4). Granite, probably an integral part of the intrusive mass, forms the block east of the fault. On the west side of the fault is a bed of highly altered, intensely fractured, fine-grained rock that has been classified as schist. A thin bed of quartzite is spottily present near the base of the schist. Underlying the schist is an intensely altered mass of rock tentatively classified as andesitic lava or tuff. Part of this formation can be identified megascopically as andesite. Spottily present in the andesite is a very fine-grained unidentified rock of light color and stony appearance. Of similar occurrence and texture is a dark-colored rock tentatively identified as basalt. The schist strikes about S. 37° W. and dips 37° to 45° east. South of the main shaft, a comparatively small body of granite is in contact, on the west, with the fault.

Copper mineralization occurs sparingly throughout the bedded rocks but is concentrated mainly at the base of the schist and in the fault zone. The planes of the fault and the planes of the bedded rocks diverge to form a trough that plunges to the southwest at an angle of about 24°.

Mineralogy

The following is an analysis of a 158-pound sample submitted to the Salt Lake City Station for metallurgical testing in 1942.

2/ Elsing, M. J., and Heineman, R.E.S., Arizona Metal Production: University of Ariz. Bull. 140.

Insol.	Oxide								
	SiO_2	Fe	CaO	S	Cu	Cu*	Al_2O_3	Zn	Pb
49.4	37.1	17.5	5.1	Nil	2.3	2.15	6.5	Nil	Nil

*Soluble in dilute H_2SO_4 saturated with sulfur dioxide.

The late R. E. Head,3/ of the Bureau of Mines, stated:

> Examination of thin sections prepared from representative pieces of the ore indicate that basically two types of copper association are represented. In addition to the copper-bearing material, there appears to be also an indeterminate quantity of rock that is virtually free of copper.
>
> In the one type of copper occurrence, the ground mass is almost entirely quartzitic. Chrysocolla, the copper silicate, occurs in this type of rock as a filling in fractures both in the rock itself and in the quartz particles.
>
> In some of these fracture fillings the chrysocolla occurs as masses of hairlike fibers intermixed with calcite and clay-like material. In addition to this type of association, the chrysocolla is also present as a shell or coating on many of the quartz particles. In some cases, aggregates of very small quartz particles are cemented together with chrysocolla, which occurs as films so thin as to amount to scarcely more than stains.
>
> In the other type of association, the chrysocolla is distributed uniformly through the claylike ground mass in the form of minute veinlets and also as fracture fillings. This association of chrysocolla with the gangue is very intimate, and examination of thin sections showed that the individual clay particles were ringed with copper carbonate.
>
> The ore contains an appreciable quantity of magnetic iron oxide, magnetite.

Subsequent investigation of other samples of the ore in connection with metallurgical testing showed the copper to be present mainly in the silicate form as chrysocolla and some dioptase. Also present is a yellowish copper mineral, which is probably a silicate. A trace of sulfide-copper is present mainly as chalcocite.

A little pyrite and a small amount of native copper were seen in the cuttings from the fault zone at churn-drill hole C-2.

3/ Head, R. E. (deceased), Preliminary Microscopic Examination of oxidized ore from the Lake Shore Mines, Arizona: August 1942.

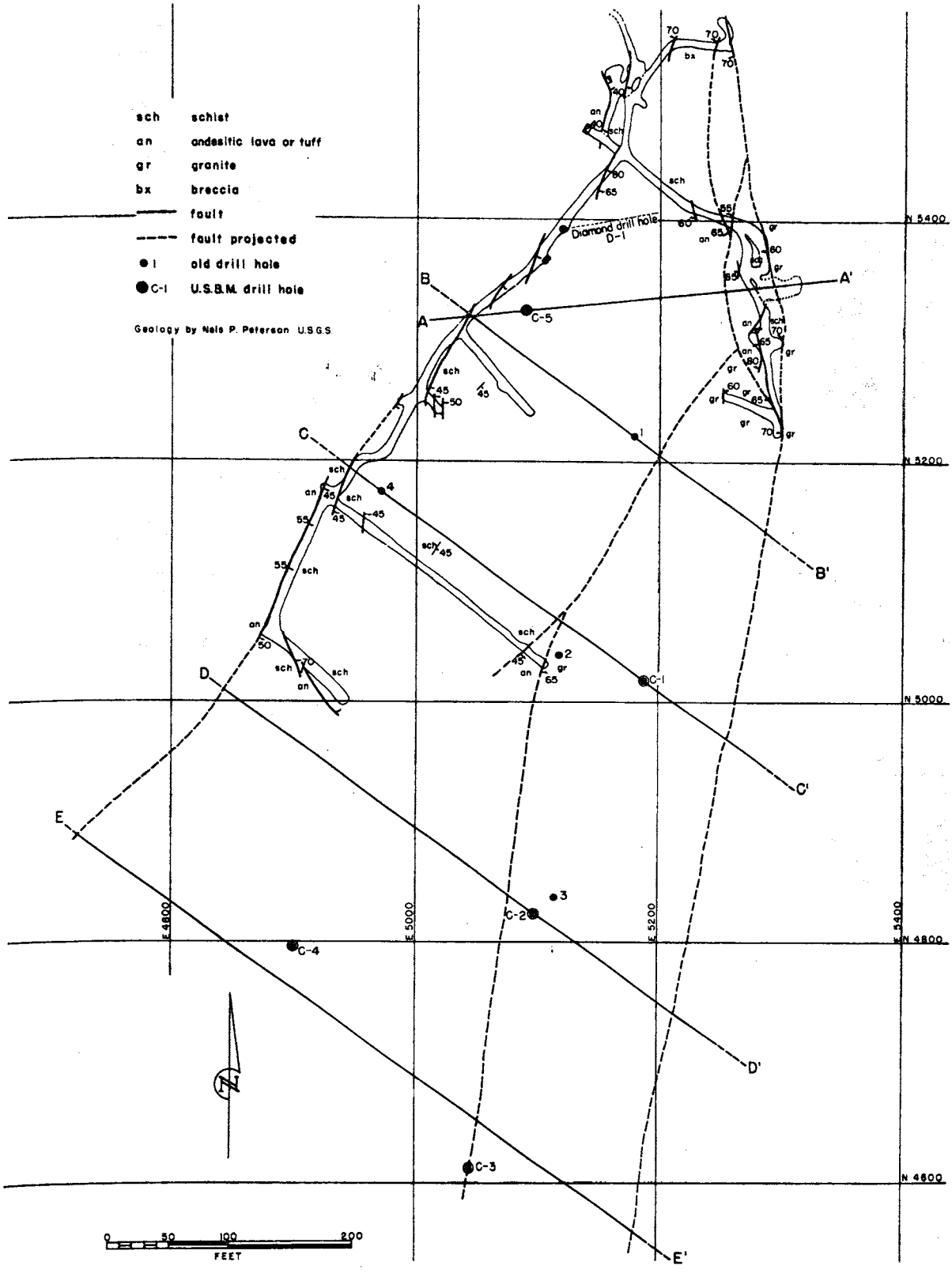
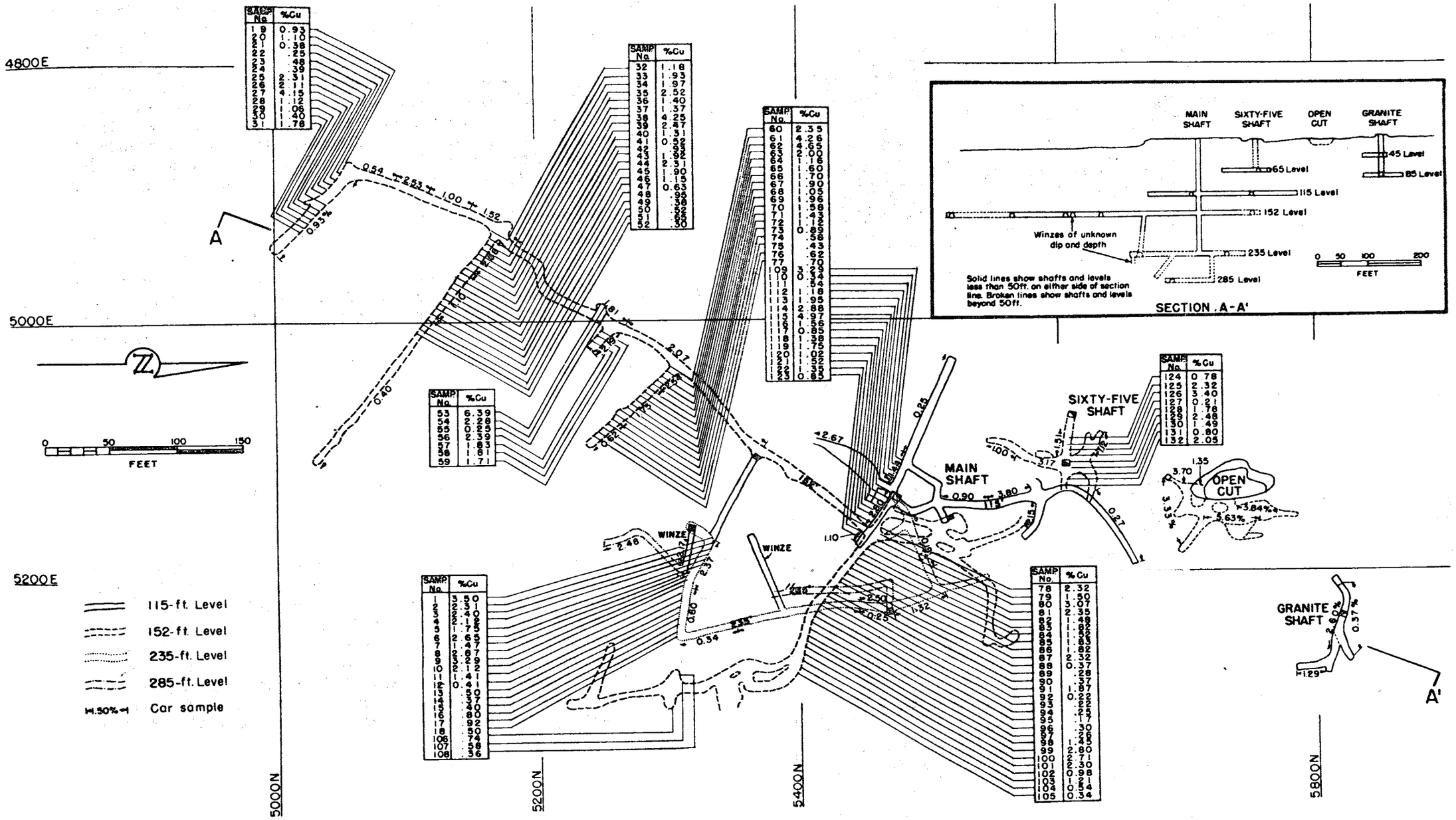


Figure 3. - Geologic map, 152-foot level, Lake Shore copper deposits, Pinal County, Ariz.



SAMP No.	%Cu
1	0.93
20	1.10
21	0.38
22	.25
23	.48
24	.39
25	2.31
26	2.11
27	4.15
28	1.12
29	1.06
30	1.40
31	1.78

SAMP No.	%Cu
32	1.18
33	1.93
34	1.97
35	2.52
36	1.40
37	1.37
38	4.25
39	2.87
40	1.31
41	0.52
42	.38
43	1.92
44	2.31
45	1.90
46	1.15
47	0.63
48	.95
49	.38
50	.52
51	.65
52	.30

SAMP No.	%Cu
53	6.39
54	2.28
55	0.85
56	2.39
57	1.83
58	1.81
59	1.71

SAMP No.	%Cu
60	2.35
61	4.26
62	4.65
63	2.00
64	1.16
65	1.60
66	1.70
67	1.90
68	1.05
69	1.96
70	1.58
71	1.43
72	1.12
73	0.89
74	.56
75	.43
76	.62
77	.70
78	3.93
79	0.44
80	.54
81	1.18
82	1.95
83	2.88
84	4.97
85	1.56
86	0.85
87	.38
88	1.75
89	1.02
90	.52
91	.55
92	0.65

SAMP No.	%Cu
124	0.78
125	2.32
126	3.40
127	0.21
128	1.78
129	2.48
130	1.49
131	0.80
132	2.05

SAMP No.	%Cu
1	5.50
2	3.10
3	2.40
4	2.92
5	1.75
6	2.65
7	4.57
8	2.67
9	2.29
10	2.12
11	1.41
12	4.10
13	.57
14	.37
15	.40
16	.80
17	.92
18	.50
106	.74
107	.58
108	.36

SAMP No.	%Cu
78	2.32
79	1.50
80	3.07
81	2.35
82	1.48
83	1.82
84	1.85
85	1.82
86	2.32
87	2.32
88	0.37
89	.28
90	.37
91	0.87
92	0.22
93	.22
94	.25
95	.17
96	.30
97	.29
98	1.45
99	2.80
100	2.71
101	2.50
102	0.98
103	1.05
104	0.54
105	0.34

Figure 4. - Assay map, Lake Shore copper deposits, Pinal County, Ariz.

MINE WORKINGS (figs. 2, 3, and 4)

The main shaft is vertical and fully timbered into a 4-foot square hoisting compartment and a 2-1/2- by 4-foot manway compartment. It is 235 feet deep and at present is accessible to the water that stands at 221 feet below the collar of the shaft. Levels at depths from the surface of 115, 152, and 235 feet have been opened from the shaft, whereas the bottom or 285-foot level has been developed from two winzes sunk from the 235-foot level. Lineal development on the four levels consists of over 2,700 feet of drifts and crosscuts. Near the footwall of the bedded deposit are two small stopes on the 115-foot level and two on the 152-foot level (fig. 3). Another small stope on the 152-foot level is in the schist-granite contact zone.

The Sixty-Five shaft and the Granite shaft, both inaccessible, are situated 130 feet northwest and 350 feet northeast of the main shaft, respectively. The Sixty-Five shaft, 65 feet deep, has one level at its bottom. The Granite shaft has two levels - one at a depth of 45 feet and the other at its bottom of 83 feet. About midway between the two shafts is an open cut in the only surface exposure of ore on the property. It was the source of several cars of ore.

A longitudinal section through the main workings is shown on the assay map (fig. 4).

In addition to the above workings, there are several shallow shafts and pits.

WORK BY THE BUREAU OF MINES

Field Work

During examination of the mine by the Bureau of Mines in 1942, sampling was confined to the 115- and 152-foot levels, because the lower workings were flooded with the water, which stood at 228 feet below the collar of the shaft. Seven channel samples were cut to duplicate corresponding samples that are similarly numbered on figure 4. In addition, six samples, each weighing 25 to 55 pounds, were cut from six crosscuts. These, also, were channel samples and, with the exception of sample 100, were cut from channels that carry similar numbers. Sample 100 represents the material exposed in a section of the crosscut on the 115-foot level. Analyses of the samples are shown in table 1.

TABLE 1. - Analyses of channel samples

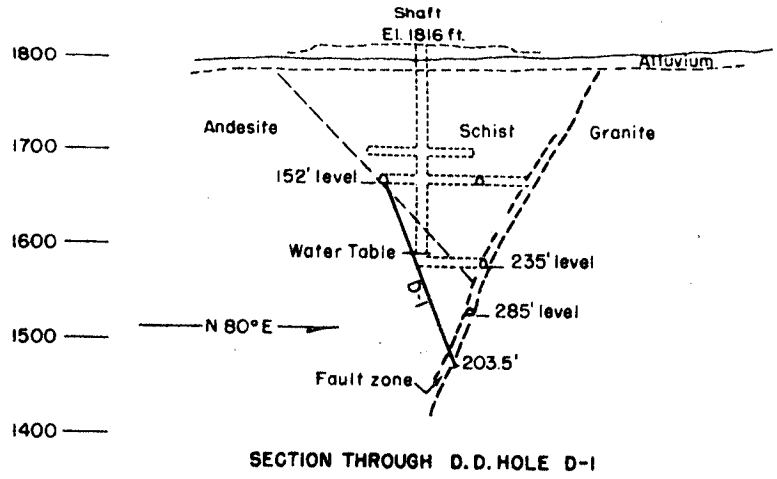
Level	Sample	Width, feet	Percent copper
115.....	114	5	3.54
115.....	115	5	4.39
115.....	116	5	1.90
152.....	61	5	2.69
152.....	62	5	2.18
152.....	63	5	2.81
152.....	64	5	1.28
115.....	100	38	2.69
115.....	113-116	20	2.17
152.....	25-31	35	1.90
152.....	32-39	40	2.27
152.....	60-63	20	2.56
152.....	78-87	50	1.74

A 158-pound sample was made of the six large samples for metallurgical tests. Later in the same year four additional samples were taken for metallurgical testing. Each of these represented 50 continuous feet of crosscut and ranged in weight from 272 to 619 pounds. They were taken from crosscuts at the shaft on the 115- and 152-foot levels and from the first and second crosscuts south of the shaft on the 152-foot level.

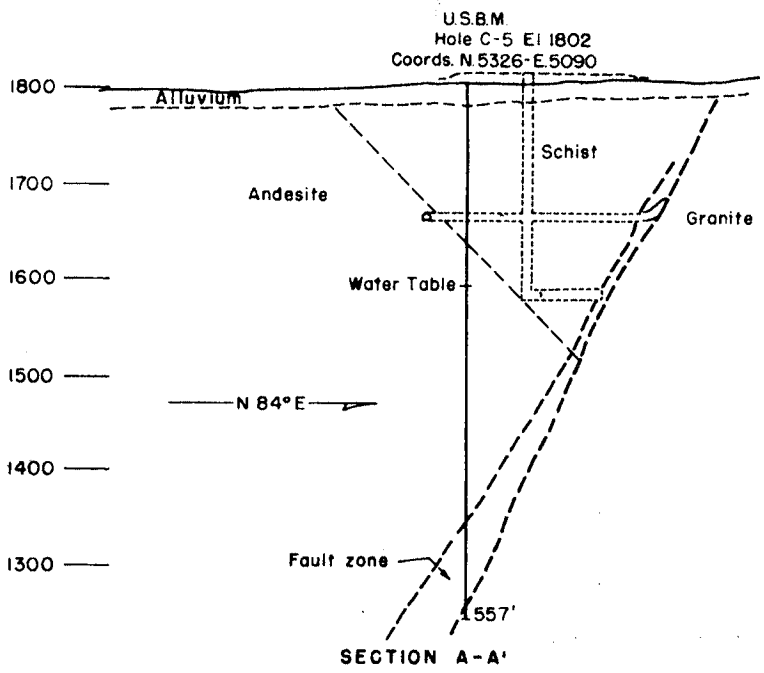
Active work on the exploratory project started November 22, 1948. The first truck loads of equipment and supplies, after being assembled and conditioned in Tucson, were hauled to the mine on December 6. While a complete camp to accommodate 25 to 30 men was being built and equipped, work was started on rehabilitation of the main shaft. Shaft work consisted of replacing the collar and second sets of timbers and making minor repairs to both the hoisting and manway compartments. A tripod was placed over the shaft, and a hoist was installed. Two 210-c.f.m. compressors were placed near the shaft, and an air line was installed to the site of diamond drill hole D-1. Track was laid, the drill station was drilled and blasted, and the muck was trammed to the shaft and hoisted to the surface in buckets. While the diamond drill hole was being drilled, the air line and track were advanced, and two more drill stations were drilled and blasted. The muck from these stations was hoisted to the surface after diamond drilling was completed. A total of about 100 tons of broken rock was removed from the mine.

A transit survey of the surface and underground workings started while the camp was being built showed that available maps could be used for laying out the drilling program. This work, as completed, included plumbing the main shaft, transit surveys of the 115- and 152-foot levels, and topographic surveys of the area shown in this report, the Isabella claim, and a 25-acre area adjoining the Isabella claim on the east.

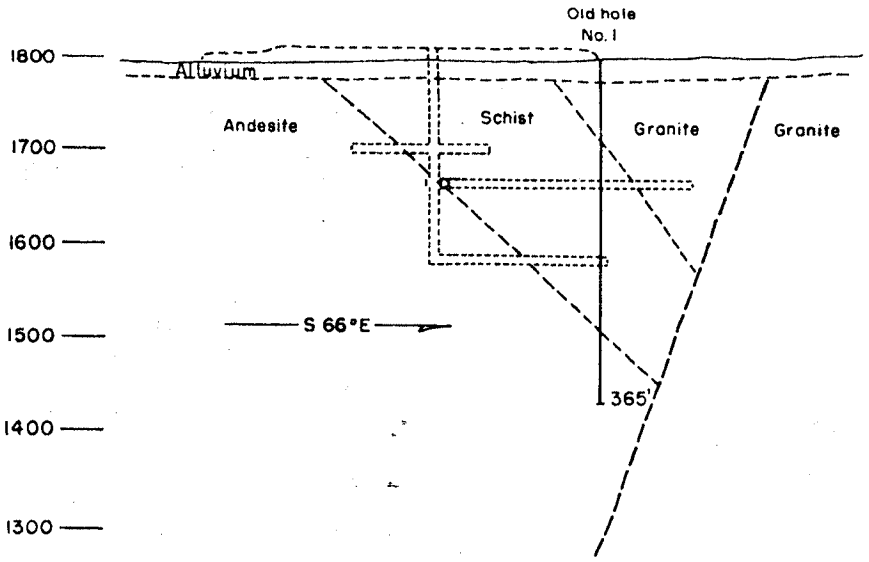
Diamond drilling, consisting of one hole completed at a depth of 203.5 feet, was started January 19 and completed March 18. A vertical section through the hole is shown in figure 5, and the assays of samples are given in the log of the hole that is appended to this report. Original plans included diamond-drilling 6 or 8 holes from underground stations, each designed to



SECTION THROUGH D.D. HOLE D-1



SECTION A-A'



SECTION B-B'

Figure 5. - Geologic sections, Lake Shore copper deposits, Pinal County, Ariz.

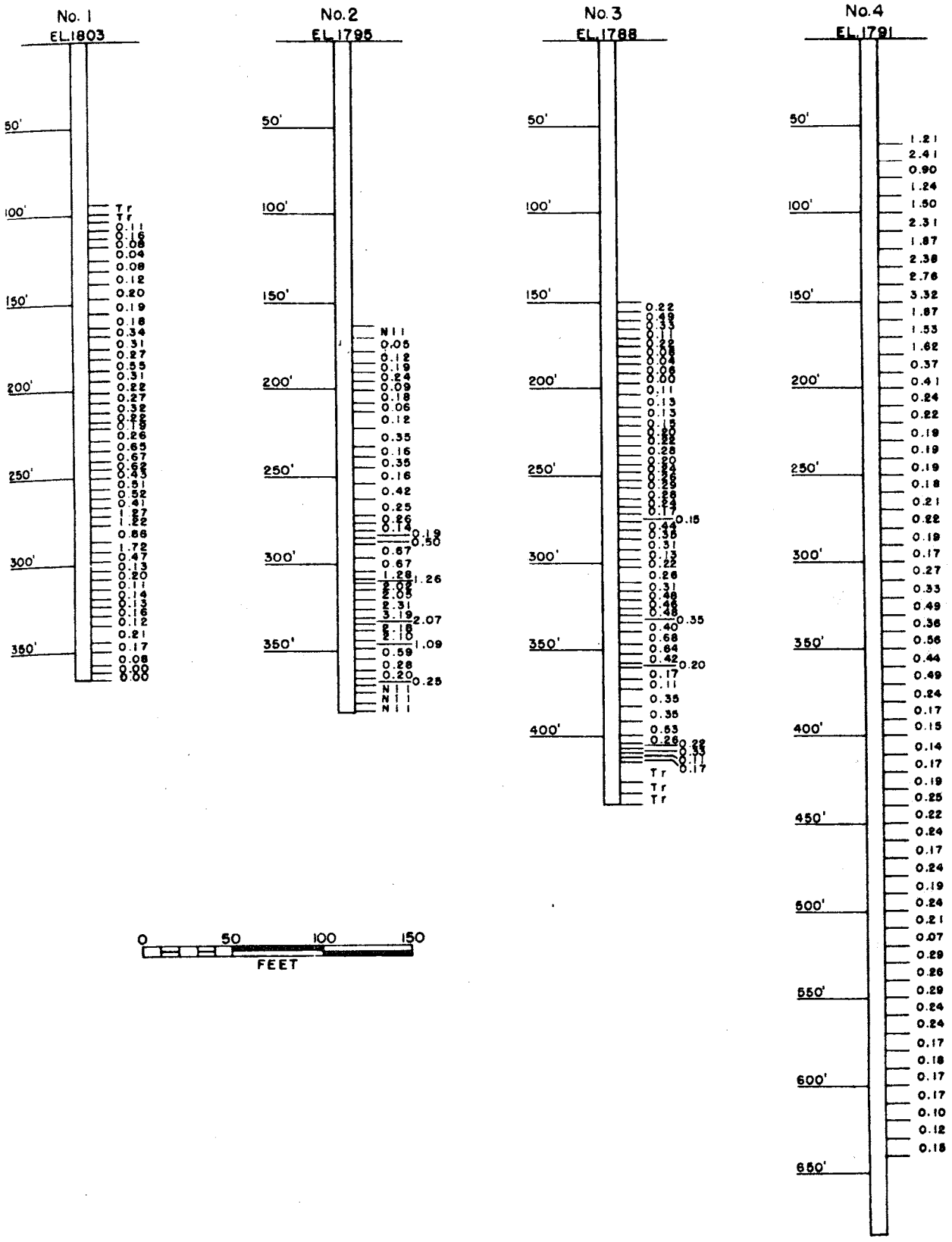


Figure 6. - Assay graphs, old churn drill holes, Lake Shore copper deposits.

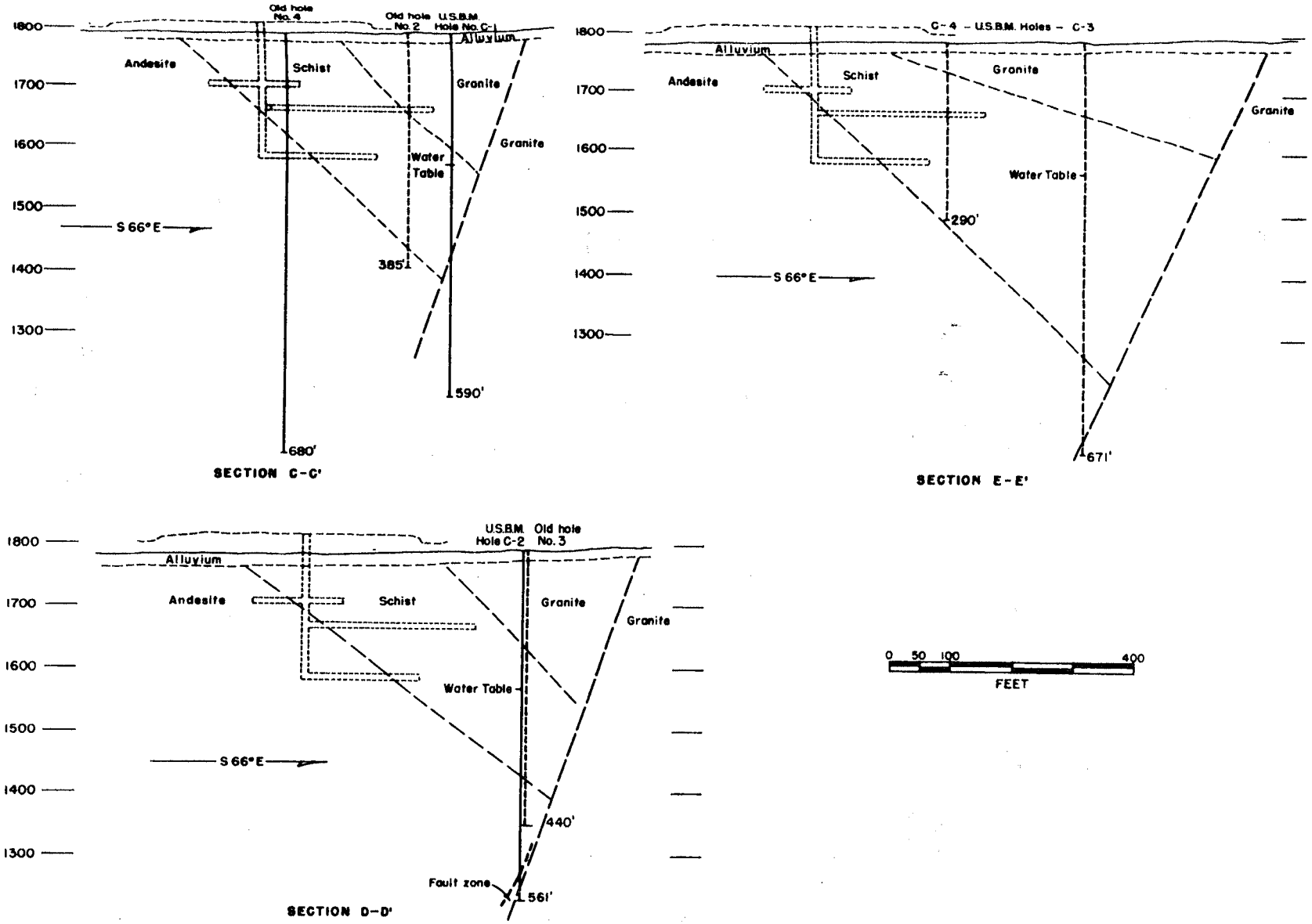


Figure 7. - Geologic sections, Lake Shore copper deposits, Pinal County, Ariz.

intersect the fault zone below the water table at intervals along the strike of the fault. Diamond drilling was terminated upon completion of one hole because costs were excessive to both the contractor and the Government. From the collar of the hole to the fault zone the rock is intensely fractured, and core recovery averaged about 6 percent. In general, after drilling a section of the rock the hole would close in as soon as the core barrel was removed.

Repeated cement jobs on portions of the hole failed, and in these cases it was necessary to drive the casing ahead. Attempts to advance the hole by blasting also failed. The contractor also tried unsuccessfully to keep the hole open and to consolidate the ground ahead of the bit by freezing. This operation consisted in using fuel oil cooled by dry ice as the circulating medium. Little trouble was experienced in penetrating the fault zone, where core recovery averaged 3.6 percent. The diamond drill was operated two shifts daily for 6 days a week. Double-tube core barrels 5 and 10 feet long were used. Drilling data for the hole, which was numbered D-1, follow:

Diamond-drilling data

Hole	Depth, ft.	Stand-pipe (3-inch)	Feet							
			Drilled			Reamed		Cased		
			NX	BX	AX	BX to NX	AX to BX	BX	AX	Cemented
D-1	203.5	11.0	34.0	94.0	64.5	33.0	18.0	78.0	157.0	146.5

Churn drilling, consisting of five holes for a total depth of 2,669 feet, was started January 13 and completed May 13, 1949. The rock was easy to drill, but, being ravelly, it was generally necessary to carry casing close to the bottom of the hole. The drill was operated two or three shifts daily, mainly on a two-shift basis, for 6 days a week.

Pertinent drilling data are given in table 2, and the logs of holes drilled by the Bureau are appended. Assay graphs of four of the churn-drill holes put down by the owners in 1919 are shown in figure 6.

Sections through the churn drill holes are shown on figure 7.

Drill-hole samples for analysis totaled 295, of which 56 were from the diamond-drill hole and 239 were from the churn-drill holes. Drill cuttings were dried, weighed, and reduced in size with a Jones splitter, and core samples were weighed and split. One half of each core sample and the samples of drill cuttings were sent to Tucson for analysis. The other half of the core was placed in core boxes, which were stored in the Bureau core house in Tucson. Two large samples of muck from the diamond-drill stations also were sent to Tucson for metallurgical tests.

Three thousand lineal feet of road work was done. This consisted of repairs to existing roads and building new roads to drilling sites but does not include 2.6 miles of 20-foot-wide road from the Casa Grande-Ajo road to the mine, which was built by the Indian Service of the Interior Department.

All drill holes were capped with a Bureau marker showing project number, hole number, and date of completion.

TABLE 2. - Churn-drilling data

Churn-drill hole	Feet											
	Depth	Drilled, bit size (inches)				Cased, pipe size (inches)				Reamed, bit size (inches)		
		12	10	8	6	12	10	8	6	10-12	8-10	6 - 8
C-1...	590.0	250.0	115.0	225.0		20.0	382.0			50.0	6.0	
C-2...	561.0	155.0	105.0	200.0	101.0	12	205.0	452.5	546.0	20.0	31.0	15.0
C-3...	671.0	250.0	90.0	160.0	171.0	194.0	321.0	477.0	641.0	67.0	46.0	111.0
C-4...	290.0	250.0	40.0			31.0						
C-5...	557.0	175.0	250.0	105.0	27.0	155.0	412.5	466.0	526.0	169.0		
	2,669.0	1,080.0	600.0	690.0	299.0	412.0	1,320.5	1,395.5	1713.0	306.0	83.0	126.0

Copper Analyses

The Lake Shore samples were analyzed for copper by conventional procedures. Total copper was determined by the long iodide method, using a mixture of hot concentrated hydrochloric, nitric, and sulfuric acid for decomposition of the minus 100-mesh samples. Samples that contained 0.5 percent or more of copper were reassayed for acid-soluble copper with a 5-percent solution of sulfuric acid saturated with sulfur dioxide to dissolve the copper silicates, oxides, and carbonates. Common practice is to report the acid-soluble assay as "oxide" copper, and the difference between the total and oxide assays is reported as "sulfide" copper.

Although such analyses would indicate that many of the Lake Shore samples contain 0.5 percent or more of sulfide copper, microscopic examination failed to reveal more than a trace of copper sulfides. Furthermore, the sulfur content of the samples was too small to account for this quantity of copper. Subsequent examination and microchemical tests on sink-float fractions of the Lake Shore ore indicated that this copper is associated with the gangue minerals as minute inclusions of an unidentified copper mineral that is somewhat more refractory toward leaching than chrysocolla.

The total and acid-soluble copper contents of samples from holes drilled by the Bureau are shown in the logs.

Metallurgical Tests[4/]

The five samples from an examination of the mine in 1942 were submitted to the Salt Lake City Station for metallurgical tests. An analysis of a 158-pound character sample is shown in the section on mineralogy of the ore. The analyses of the other samples are given in table 3. The samples from crosscuts Nos. 1 to 3 on the 152-foot level, numbered to the south from the crosscut at the shaft, were identified as Nos. Ar-4.1, Ar-4.2, and Ar-4.3, respectively, and the sample from the 115-foot level was numbered Ar-4.4.

The Salt Lake City metallurgical tests revealed that the mineral association in the samples was too intimate for beneficiation by ore-dressing methods. Acid leaching of the ore was not attractive owing to the presence of lime, which caused excessive acid consumption. Tests employing the reducing-roast and ammonia-leach process extracted as much as 86 percent of the copper. In these tests, minus 20-mesh material was roasted with coke in an atmosphere of natural gas for 1 hour at 500° to 600° C. to reduce the copper. The samples were then cooled to 180° C. and quenched in water. Leaching was carried out at 25 percent solids in a combination air-mechanical agitation tank for 4 hours, using a 10 percent solution of ammonium hydroxide and ammonium carbonate in equal parts, containing the equivalent of 0.3 pound potassium cyanide per ton of ore. The leach residues were filter-washed with ammonia and water.

4/ Prepared by Carl Rampacek and J. Bruce Clemmer, metallurgists, Bureau of Mines, Tucson Branch, Metallurgical Division, Tucson, Ariz.

TABLE 3. - Analyses of metallurgical samples

Sample	Insol.	Percent										Oz./ton		Cu soluble in 10% solution (24 hr.)	
		SiO_2	Fe	CaO	S	Zn	Pb	Cu	Ox Cu*/	Al_2O_3	MgO	Au	Ag	H_2SO_4	NH_4OH
4.1	45.7	31.6	17.1	7.9	.08	Nil	Nil	1.71	1.60	7.9	11.3	Nil	Tr.	1.33	Nil
4.2	62.9	41.6	5.35	10.7	.07	0.15	Nil	1.29	1.28	9.9	10.6	Nil	Tr.	1.25	Nil
4.3	35.4	25.8	29.2	5.2	<.05	Nil	Nil	2.18	1.79	3.6	11.3	Nil	Tr.	1.75	Nil
4.4	66.2	54.6	7.25	4.5	<.05	Nil	Nil	1.66	1.59	5.7	9.7	Nil	Tr.	1.32	Nil

*/ Copper soluble in dilute sulfuric acid saturated with sulfur dioxide.

Metallurgical tests were made subsequently at the Tucson station on a composite sample taken from drill stations 1, 2, and 3 on the 152-foot level. Analysis of the sample gave 3.51 percent total copper, 2.96 percent acid-soluble copper, 8.25 percent iron, 1.73 percent calcium carbonate, 0.04 percent sulfate-sulfur, and 0.01 percent sulfide-sulfur. The copper was present predominately as chrysocolla and dioptase, with only traces of sulfides and carbonates.

Batch flotation of the ore ground to pass 65 or 200 mesh made with conventional sulfide and nonsulfide collecting agents failed to effect separation. The trace of sulfides, largely chalcocite, floated readily, but recovery of the chrysocolla and dioptase was poor, regardless of the conditions employed.

Acid leaching and leach-precipitation-flotation of the sample also were investigated. The results of a number of bottle leaching tests are summarized in table 4. The tests on portions of the ore ground to pass 10, 20, and 65 mesh were made at 50 percent solids with different quantities of acid and various contact periods.

The leaching tests revealed that about 375 pounds of acid, 4.1 times the theoretical based on the acid-soluble copper content of the feed, were required for a good extraction of copper from the 10, 20, and 65-mesh feeds. Although the finer material leached more rapidly, a 24-hour contact was essential for an 88 to 90 percent extraction of the total copper. The acid consumed varied from 4.1 to 4.4 pounds per pound of copper extracted. Neither longer leaching nor use of more acid materially improved copper extraction. Cursory tests on charges of the ore ground to 200 mesh gave slightly higher copper extractions but not enough to justify the added cost of finer grinding.

Although the chrysocolla in the ore is amenable to leaching, long contact with excessive acid is required to dissolve the 0.5 percent or more of copper that is intimately associated with the gangue. Tests were made to determine if the refractory copper could be extracted within a reasonable period by employing stronger acid solutions. The dry ore was mixed with the desired quantity of acid and enough water to give an agglomerated or pasty charge containing about 75 percent solids. A 50 percent acid solution proved adequate, but more concentrated acid was used in some of the tests. The agglomerated charges were permitted to stand at room temperature for various lengths of time and then were leached 15 minutes with water to extract the solubilized copper. Tests were made on 10-, 20-, and 65-mesh feeds with 375 pounds of acid per ton and varying the contact period from 1 to 24 hours. The stagnant leaching of the agglomerated charges gave copper extractions almost identical to those of bottle leaching at 50 percent solids, as recorded in table 4.

Although stagnant leaching of the acid-agglomerated charges at room temperature failed to improve extraction of the refractory copper, supplementary tests revealed that moderate heating of the agglomerules expedited solution of the copper for an improved recovery. The results of several tests on 10-, 20-, and 65-mesh portions of the ore are summarized in table 5. The charges were mixed for about 5 minutes with the quantity of acid shown and just enough water to form agglomerules. These were heated in a muffle

furnace to give a substantially dry sulfated product, which was subsequently leached with water for 15 minutes to extract the copper. For convenience, the sulfated products were leached at 33 percent solids. In other tests, however, leaching at 50 percent solids gave equally good results, and it seems likely that adequate leaching could be obtained in even thicker pulps.

TABLE 4. - Bottle leaching of Lake Shore ore.

Leaching time, hr.	Mesh feed	H_2SO_4 added, lb./ton	H_2SO_4 consumed		Extraction, percent of total copper
			Lb./ton	Lb/lb of copper extracted	
1	65	105	102	3.8	38.5
1	65	155	151	3.7	58.7
1	65	205	180	3.4	75.5
1	65	260	198	3.6	78.3
1	65	310	209	3.7	80.9
1	65	360	210	3.6	82.3
1	65	410	219	3.8	82.3
1	65	205	180	3.4	75.5
2	65	205	183	3.3	78.1
4	65	205	195	3.4	80.3
1	65	375	201	3.5	82.3
4	65	375	231	3.8	87.3
8	65	375	239	3.8	88.6
12	65	375	247	4.0	89.2
24	65	375	259	4.1	90.0
1	20	375	198	3.6	77.8
4	20	375	232	3.9	84.3
8	20	375	250	4.2	84.9
12	20	375	264	4.3	87.2
24	20	375	275	4.4	89.7
1	10	375	171	3.4	72.6
4	10	375	212	3.7	82.3
8	10	375	228	3.8	84.9
12	10	375	236	3.9	86.0
24	10	375	258	4.2	88.3

TABLE 5. - Results of acid-sulfating tests.

Mesh of feed	Sulfating treatment: H_2SO_4 added, lb./ton	Sulfating treatment: Furnace temp., °C.	Sulfating treatment: Time, Min.	H_2SO_4 consumed: Lb./ton	H_2SO_4 consumed: Lb/lb of copper extracted	Extraction, percent of total copper
10	375	25	60	195	3.7	75.4
10	375	250	7.5	328	5.7	81.8
10	375	250	15	352	5.9	84.9
10	375	250	30	366	6.1	85.2
20	375	25	60	224	4.0	79.5
20	375	250	7.5	344	5.6	87.7
20	375	250	15	364	5.9	87.5
20	375	250	30	375	6.0	88.6
65	375	25	60	233	4.0	83.6
65	375	75	7.5	264	4.2	89.5
65	375	75	15	300	4.6	92.0
65	375	75	30	318	4.9	92.6
65	375	250	7.5	351	5.3	94.0
65	375	250	15	375	5.7	94.0
65	375	250	30	375	5.8	94.2
65	375	400	7.5	368	5.6	93.7
65	375	400	15	375	5.8	92.3
65	375	400	30	375	5.9	90.6
65	105	250	15	105	2.9	50.7
65	155	250	15	155	3.0	72.9
65	205	250	15	205	3.5	84.9
65	310	250	15	310	4.8	92.0
65	375	250	15	375	5.7	94.0
65	410	250	15	410	6.2	94.3

The tests demonstrated that moderate heating of an agglomerated or pasty charge converts the copper to the sulfate form, which is amenable to rapid leaching with water. Provided enough acid was used, a 7.5- to 15-minute heat at temperatures between 75° and 400° C. permitted good extraction of the copper from the 10-, 20-, and 65-mesh feeds. The optimum temperature for sulfating the Lake Shore ore appears to be about 250° C. Although a temperature of 400° C. is permissible, a higher temperature dehydrates the sulfate and necessitates leaching of the calcine with weak acid. Virtually all of the acid employed in the sulfating procedure is consumed. No free acid, or only minor quantities, was found in the leach liquors. The moderate heat treatment increases solution of the clay and iron minerals in the ore, and the acid consumed per pound of copper dissolved is higher than in bottle leaching. The greater consumption of acid, however, is offset by the higher extraction of copper and the shorter treatment period required. The sulfated charges from tests made at 250° C. were compact and dry, regardless of the quantity of acid used. The calcines produced at lower sulfating temperatures were slightly moist. No difficulty was experienced in leaching the calcines, as they slaked readily upon addition of water, and the copper sulfate dissolved

rapidly. The leached residues thickened readily and were much easier to filter than those from the bottle leaching tests. The mild heat treatment apparently dehydrates the colloidal silica and increases the filtration rate.

Copper extraction in the acid-sulfating tests decreased with increasing coarseness of the feed. Incomplete extraction of the copper in the 10- and 20-mesh feeds may be attributed to slow diffusion of acid through the particles during the short agglomerating and heating periods. Acid-sulfating gave somewhat lower extractions on coarse feeds than bottle leaching. As regards the time required for comparable copper extractions, however, acid-sulfating is superior. The results of several tests by the two procedures are given in table 6.

TABLE 6. - Comparison of acid sulfating and bottle leaching of 10-, 20-, and 65-mesh ore.

Mesh of feed	Method	H_2SO_4 added, lb./ton	H_2SO_4 consumed		Extraction, percent of total copper
			Lb./ton	Lb./lb. of copper extracted	
10.....	15-min. acid sulfating and 15-min. water leach.	375	352	5.9	84.9
10.....	8-hour bottle leach.	375	228	3.8	84.9
20.....	15-min. acid sulfating and 15-min. water leach.	375	364	5.9	87.5
20.....	12-hour bottle leach.	375	264	4.3	87.2
65.....	15-min. acid sulfating and 15-min. water leach.	375	375	5.7	94.0
65.....	72-hour bottle leach.	412	377	5.6	93.8

Supplementary tests were made to observe the deportment of the ore toward leaching-precipitation-flotation. The results of a typical leach-float test employing bottle leaching are given in table 7. The ore was ground in a rod mill to pass 65 mesh and leached for 2 hours at 50 percent solids, 205 pounds of sulfuric acid being used per ton of ore. Part of the free acid remaining in the pulp was neutralized with hydrated lime, and the cement copper was then precipitated with iron nails. After neutralization of substantially all the remaining free acid, the cement copper was floated, Minerac A being used as the collector. Single-cleaning of the rougher froth yielded a cement copper concentrate that assayed 71.42 percent copper and represented a recovery of 73.2 percent. Leach-flotation of 200-mesh portions of the ore gave almost identical results. Depending on the reagents employed, 76 to 80 percent of the copper was recovered as a rougher product assaying 35 to 40 percent copper. Inability to obtain a higher copper recovery by leach-flotation can be attributed to incomplete dissolution of the refractory copper silicate rather than to inferior flotation of the cement copper. The copper content of flotation tailings and of residues from comparable leaching tests were almost identical.

TABLE 7. - Bottle leaching-precipitation-flotation of 65-mesh ore.

Product	Weight, percent	Assay, percent total copper	Distribution, percent total copper
Copper concentrate	3.5	71.42	73.2
Middling	9.3	1.77	4.8
Rougher froth	12.8	20.82	78.0
Tailing	87.2	0.86	22.0
Composite	100.0	3.42	100.0

	Pounds per ton					
				Flotation		
Reagent	Leaching	Precipitation		Conditioner	Rougher	Cleaner
H_2SO_4	206	-		-	-	-
$Ca(OH)_2$	-	16.0		24.0	-	-
Minerac A	-	-		0.2	-	-
Pine oil	-	-		-	0.04	0.02
			Iron nails			
Time (min.)	120	15	30	5 2.5	5	2.5
pH	1.75	2.85	3.40	4.90 -	4.5	5.0

Other tests were made with more acid in the leaching step in an effort to obtain more complete extraction of the copper. The tests were not successful. The large quantity of free acid remaining in the leached pulp vitiated both precipitation and flotation of the cement copper. Prohibitive quantities of lime were required to neutralize the acid, and the pulps became so contaminated with salts that flotation of the cement copper was incomplete. When neutralizing steps were omitted, precipitation of the copper was incomplete, and much iron was dissolved by the free acid. The iron salts and residual acid inhibited subsequent flotation of the copper. These and other tests demonstrated that excess acid must be avoided in conventional leach-float procedures.

Precipitation-flotation tests also were made on acid-sulfated charges. The results of a typical test made on the 65-mesh feed and employing 375 pounds of acid per ton for sulfating are given in table 8. The acid-agglomerated ore was heated 15 minutes at 250° C. and then leached 15 minutes with water at 50 percent solids. As the leach pulp was substantially free of acid, the neutralizing steps before copper precipitation and flotation were not necessary. Single-stage cleaning of the rougher froth yielded a cement copper concentrate that assayed 69.7 percent copper and represented a recovery of 89.7 percent; the rougher concentrate accounted for 90.7 percent of the copper. Flotation of the cement was excellent and copper losses in the tailings were due primarily to presence of undissolved silicates.

Excellent results also were obtained on acid-sulfated charges of the ore by precipitating the copper during the water-leaching step. Simultaneous leaching and precipitation gave a somewhat finer and darker-colored cement copper than two-stage treatment, but it was readily amenable to flotation.

TABLE 8. - Precipitation-flotation of acid-sulfated ore.

Product	Weight, percent	Assay, percent total copper	Distribution, percent total copper
Copper concentrate.....	4.4	69.70	89.7
Middling.....	4.9	0.71	1.0
Rougher froth.....	9.3	33.35	90.7
Tailing.....	90.7	0.35	9.3
Composite.....	100.0	3.42	100.0

	Pounds per ton					
				Flotation		
Reagent	Sulfating treatment	Water extraction 1/	Precipitation	Conditioner	Rougher	Cleaner
H_2SO_4.....	375		-	-	-	-
Minerec A.....			-	0.30	-	-
Pine oil.....			-	0.04	0.04	-
			Iron nails			
Temperature, °C. .	250					
Time, minutes.....	15		30	2.5	5	2.5
pH.....		3.15	3.15	3.5	3.5	3.6

1/ 15-minute agitation with water at 50 percent solids at room temperature.

Summary and Conclusions of Metallurgical Tests

The Lake Shore ore is refractory toward leaching. A long contact period with a large excess of acid is necessary to obtain a high copper extraction. Acid-sulfating at temperatures between 75° and 400° C. is superior to conventional leaching. Acid-sulfating requires more acid than flood or trickle leaching but is offset by the higher copper extraction and the shorter treatment period required. On other less refractory ores, the quantities of acid required for acid sulfating and bottle leaching were almost identical.

The leach liquors from conventional leaching of the Lake Shore ore contain much free acid, whereas, those from acid-sulfated charges were virtually free of acid. In leaching-precipitation or leaching-precipitation-flotation procedures, where free acid in the leach liquor or ore pulp is objectionable, acid sulfating should have merit.

Flotation of the Lake Shore ore by usual sulfide and nonsulfide collectors was ineffective. Leach-precipitation-flotation gave good copper recoveries. In conjunction with the leach-float procedure, acid-sulfating was superior to bottle leaching. When using flood or trickle leaching, the excess acid remaining in the pulp must be partly neutralized before precipitation and flotation of the cement copper. As virtually no free acid remains in the acid-sulfated pulps, the neutralizing steps before precipitation and flotation are unnecessary, thus simplifying the procedure. Simultaneous leaching and precipitation of the copper from acid-sulfated charges also gave good results.

DRILL-HOLE LOGS

Hole D-1

Location: N. 5391, E. 5119
Elevation of collar: 1,664 ft.
Depth: 203.5 ft.

Dip: -73°
Bearing: N. 80° E.
Date: 1/19 to 3/18/49

Footage From-	Footage To-	Feet	Percent copper Total	Percent copper Acid-soluble	Oz./ton Au	Oz./ton Ag	Description and remarks
0	11.0	11.0	1.48	1.48			Schist.
11.0	16.0	5.0	.26				Andesite.
16.0	21.0	5.0	.28				Do.
21.0	26.0	5.0	.25				Do.
26.0	32.0	6.0	.44				Do.
32.0	35.0	3.0	.40				Do.
35.0	40.0	5.0	.33				Do.
40.0	45.0	5.0	.34				Do.
45.0	50.0	5.0	.25				Do.
50.0	53.0	3.0	.20				Do.
53.0	58.0	5.0	.21				Do.
58.0	61.5	3.5	.20				Do.
61.5	65.5	4.0	.24				Do.
65.5	70.5	5.0	.20				Do.
70.5	75.5	5.0	.17				Do.
75.5	78.0	2.5	.18				Do.
78.0	81.5	3.5	.17				Do.
81.5	86.2	4.7	.18				Do.
86.2	88.2	2.0	.18				Do.
88.2	90.7	2.5	.18				Do.
90.7	94.6	3.9	.28				Do.
94.6	99.6	5.0	.14				Do.
99.6	104.9	5.3	.17				Do.
104.9	110.0	5.1	.17				Do.
110.0	115.0	5.0	.18				Do.
115.0	120.0	5.0	.19				Do.
120.0	125.0	5.0	.17				Do.
125.0	127.0	2.0	.10				Do.
127.0	132.0	5.0	.17				Do.
132.0	137.0	5.0	.13				Do.
137.0	140.0	3.0	.19				Do.
140.0	145.0	5.0	.19				Do.
145.0	148.3	3.3	.19				Do.
148.3	153.3	5.0	.22				Do.
153.3	156.7	3.4	.16				Do.
156.7	161.7	5.0	.14				Do.
161.7	163.7	2.0	.13				Do.
163.7	168.5	4.8	.13				Do.
168.5	173.5	5.0	.13				Do.
173.5	178.5	5.0	1.45	1.20	)		Shear zone.
178.5	180.5	2.0	.46	.25	)		Do.
180.5	185.5	5.0	.83	.57	Tr	0.1	Do.
185.5	189.2	3.7	.89	.60	)		Do.
189.2	193.5	4.3	.68	.42			Do.
193.5	203.5	10.0					Granite.

Hole C-1

Location: N. 5007, E. 5188
Elevation of collar: 1,796 ft.

Depth: 590.0 ft.
Date: 1/13 to 2/4/49

Footage			Percent copper		
From-	To-	Feet	Total	Acid-soluble	Description and remarks
0	20	20.0			Sand and gravel.
20	193	173.0			Weathered granite.
193	195	2.0	0.31		Schist and clay.
195	205	10.0	.33		Schist.
205	215	10.0	.36		Schist, water table at 211.0 ft.
215	225	10.0	.32		Schist.
225	235	10.0	.31		Do.
235	245	10.0	.27		Do.
245	250	5.0	.34		Do.
250	255	5.0	.26		Do.
255	265	10.0	.36		Do.
265	275	10.0	.41		Do.
275	285	10.0	.39		Do.
285	295	10.0	.27		Do.
295	305	10.0	.35		Do.
305	310	5.0	.39		Do.
310	315	5.0	.42		Do.
315	320	5.0	.43		Do.
320	325	5.0	.61	0.36	Do.
325	330	5.0	.57	.29	Do.
330	335	5.0	.51	.28	Do.
335	340	5.0	.34		Quartzite and schist.
340	345	5.0	.36		Do.
345	350	5.0	.28		Do.
350	355	5.0	.38		Do.
355	360	5.0	.39		Do.
360	365	5.0	.25		Contact - schist and granite.
365	370	5.0	.16		Schist and granite.
370	375	5.0	.14		Granite and schist.
375	380	5.0	.10		Do.
380	385	5.0	.14		Do.
385	550	165.0			Granite.
550	555	5.0			Shear zone, clay.
555	590	35.0			Granite.

Hole C-2

Location: N. 4813, E. 5098
Elevation of collar: 1,792 ft.

Depth: 561.0 ft.
Date: 2/11 to 3/5/49

Footage			Percent copper		
From-	To-	Feet	Total	Acid-soluble	Description and remarks
0	20	20.0			Sand and gravel.
20	155	135.0			Weathered granite.
155	165	10.0	0.23		Schist.
165	175	10.0	.22		Do.
175	185	10.0	.22		Do.
185	195	10.0	.23		Do.
195	205	10.0	.33		Do.
205	215	10.0	.32		Do.
215	225	10.0	.32		Schist, water table at 220 ft.
225	235	10.0	.31		Schist.
235	245	10.0	.48		Do.
245	255	10.0	.53	0.06	Do.
255	260	5.0	.51	.06	Do.
260	270	10.0	.62	.06	Do.
270	280	10.0	.46		Do.
280	290	10.0	.54	.06	Do.
290	300	10.0	1.03	.22	Do.
300	305	5.0	.57	.19	Do.
305	310	5.0	.50	.15	Do.
310	315	5.0	1.25	.55	Do.
315	320	5.0	.89	.40	Do.
320	325	5.0	.90	.33	Do.
325	330	5.0	.91	.31	Do.
330	335	5.0	.80	.28	Do.
335	340	5.0	.54	.17	Do.
340	345	5.0	.98	.29	Do.
345	350	5.0	.63	.19	Do.
350	355	5.0	.62	.18	Do.
355	360	5.0	.68	.21	Do.
360	365	5.0	.34		Do.
365	370	5.0	.31		Andesite.
370	375	5.0	.29		Do.
375	380	5.0	.26		Do.
380	385	5.0	.28		Do.
385	390	5.0	.62	0.09	Do.
390	395	5.0	.31		Do.
395	405	10.0	.24		Do.
405	415	10.0	.22		Do.
415	425	10.0	.22		Do.
425	435	10.0	0.26		Do.
435	445	10.0	.19		Do.
445	455	10.0	.15		Do.
455	460	5.0	.19		Do.
460	470	10.0	.18		Quartzite.
470	480	10.0	.18		Do.
480	490	10.0	.14		Do.

Hole C-2, Cont'd.

Footage			Percent copper		
From-	To-	Feet	Total	Acid-soluble	Description and remarks
490	500	10.0	0.16		Andesite.
500	510	10.0	.16		Do.
510	520	10.0	.23		Do.
520	525	5.0	.51	0.19	Shear zone.
525	530	5.0	.79	.48	Do.
530	535	5.0	.89	.63	Do.
535	540	5.0	1.43	.91	Shear zone. Little pyrite and native copper.
540	545	5.0	1.27	.57	Shear zone.
545	547	2.0	.74	.28	Schist.
547	550	3.0	.72	.30	Schist and granite.
550	555	5.0	.65	.27	Do.
555	561	6.0			Granite.

Hole C-3

Location: N. 4610, E. 5045 Depth: 671.0 ft.
Elevation of collar: 1,788 ft. Date: 3/9 to 4/2/49

Footage			Percent copper		
From-	To-	Feet	Total	Acid-soluble	Description and remarks
0	10	10			Sand and gravel.
10	125	115.0			Weathered granite.
125	135	10.0	0.33		Schist.
135	145	10.0	.22		Do.
145	155	10.0	.31		Do.
155	165	10.0	.40		Do.
165	175	10.0	.32		Do.
175	185	10.0	.27		Do.
185	195	10.0	.23		Do.
195	205	10.0	.16		Do.
205	215	10.0	.10		Do.
215	225	10.0	.16		Schist, water table at 225 ft.
225	235	10.0	.17		Schist.
235	245	10.0	.22		Do.
245	255	10.0	.17		Do.
255	265	10.0	.16		Do.
265	275	10.0	.25		Schist, shear - much Fe oxide.
275	285	10.0	.25		Schist.
285	295	10.0	.27		Do.
295	305	10.0	.30		Schist, shear - much Fe oxide.
305	315	10.0	.32		Schist.
315	325	10.0	.25		Do.
325	335	10.0	.27		Schist, shear - much Fe oxide.
335	345	10.0	.22		Schist.
345	355	10.0	.20		Do.

Hole C-3, Cont'd.

Footage			Percent copper		Description and remarks
From-	To-	Feet	Total	Acid-soluble	
355	365	10.0	0.23		Schist.
365	375	10.0	.20		Do.
375	385	10.0	.25		Do.
385	395	10.0	.15		Schist, shear - much Fe oxide.
395	405	10.0	.15		Schist.
405	415	10.0	.24		Do.
415	425	10.0	.18		Do.
425	435	10.0	.13		Do.
435	445	10.0	.12		Do.
445	455	10.0	.19		Do.
455	465	10.0	.14		Do.
465	475	10.0	.12		Do.
475	485	10.0	.13		Do.
485	495	10.0	.15		Do.
495	500	5.0	.18		Do.
500	510	10.0	.26		Do.
510	520	10.0	.23		Do.
520	530	10.0	.12		Andesite, shear - much Fe oxide.
530	540	10.0	.15		Andesite:
540	550	10.0	.14		Do.
550	560	10.0	.13		Do.
560	570	10.0	.12		Do.
570	580	10.0	.10		Do.
580	590	10.0	.14		Do.
590	600	10.0	.23		Andesite, shear - much Fe oxide.
600	605	5.0	.20		Andesite.
605	610	5.0	.24		Do.
610	615	5.0	.20		Do.
615	620	5.0	.14		Do.
620	625	5.0	.13		Do.
625	630	5.0	.18		Do.
630	635	5.0	.15		Do.
635	640	5.0	.14		Do.
640	645	5.0	.18		Do.
645	650	5.0	.26		Do.
650	655	5.0	.42		Andesite and granite.
655	660	5.0	.23		Granite and andesite.
660	671	11.0			Granite.

Hole C-4

Location: N. 4795, E. 4900
Elevation of collar: 1,786 ft.

Depth: 290.0 ft.
Date: 4/15 to 4/19/49

Footage			Percent copper		
From-	To-	Feet	Total	Acid-soluble	Description and remarks
0	10	10.0			Sand and gravel.
10	50	40.0			Weathered granite.
50	60	10.0	0.35		Schist.
60	70	10.0	.33		Do.
70	80	10.0	.32		Do.
80	90	10.0	.35		Do.
90	100	10.0	.30		Do.
100	110	10.0	.36		Do.
110	120	10.0	.35		Do.
120	130	10.0	.17		Do.
130	140	10.0	.58	0.11	Do.
140	150	10.0	.33		Do.
150	160	10.0	.27		Do.
160	170	10.0	.23		Do.
170	180	10.0	.47		Do.
180	190	10.0	.82	0.52	Do.
190	200	10.0	1.23	.76	Do.
200	210	10.0	1.50	.65	Do.
210	220	10.0	1.55	.90	Do.
220	225	5.0	1.75	1.16	Do.
225	230	5.0	1.02	.66	Schist, water table at 225 feet.
230	235	5.0	1.31	1.00	Schist.
235	240	5.0	3.05	2.80	Do.
240	245	5.0	2.31	1.95	Do.
245	250	5.0	1.94	1.27	Do.
250	255	5.0	1.51	.96	Do.
255	260	5.0	1.54	.98	Do.
260	265	5.0	1.75	.97	Do.
265	270	5.0	.61	.36	Schist and quartzite.
270	290	20.0			Quartzite.

Hole C-5

Location: N. 5326, E. 5090
Elevation of collar: 1,801 ft.

Depth: 557.0 feet
Date: 4/20 to 5/13/49

Footage			Percent copper		
From-	To-	Feet	Total	Acid-soluble	Description and remarks
0	25	25.0			Sand and gravel.
25	35	10.0	0.49		Schist.
35	45	10.0	.41		Do.
45	55	10.0	.40		Do.
55	65	10.0	.45		Do.
65	75	10.0	.87	0.41	Do.

Hole C-5 Cont'd.

Footage			Percent copper		
From-	To-	Feet	Total	Acid-soluble	Description and remarks
75	85	10.0	1.05	0.52	Schist.
85	95	10.0	1.18	.65	Do.
95	105	10.0	1.55	.96	Do.
105	115	10.0	2.10	1.19	Do.
115	125	10.0	1.69	1.00	Do.
125	135	10.0	1.76	1.10	Do.
135	140	5.0	2.21	1.14	Do.
140	145	5.0	2.08	1.16	Do.
145	150	5.0	1.87	1.13	Do.
150	155	5.0	2.15	1.41	Do.
155	160	5.0	1.65	1.39	Do.
160	165	5.0	.70	.39	Andesite.
165	175	10.0	.32		Do.
175	185	10.0	.26		Do.
185	195	10.0	.15		Do.
195	205	10.0	.15		Do.
205	215	10.0	.16		Do.
215	225	10.0	.10		Do.
225	235	10.0	.18		Andesite. Water table at 230 ft.
235	245	10.0	.16		Andesite.
245	255	10.0	.10		Do.
255	265	10.0	.14		Do.
265	275	10.0	.16		Do.
275	285	10.0	.16		Do.
285	295	10.0	.16		Do.
295	305	10.0	.15		Do.
305	315	10.0	.13		Do.
315	325	10.0	.18		Do.
325	335	10.0	.18		Do.
335	345	10.0	.20		Do.
345	355	10.0	.29		Do.
355	365	10.0	.19		Do.
365	375	10.0	.23		Do.
375	385	10.0	.18		Do.
385	395	10.0	.28		Do.
395	405	10.0	.20		Do.
405	415	10.0	.15		Do.
415	425	10.0	.15		Do.
425	430	5.0	.26		Do.
430	435	5.0	.08		Do.
435	440	5.0	.08		Do.
440	445	5.0	.95	0.67	Do.
445	450	5.0	.34		Do.
450	455	5.0	.19		Do.
455	460	5.0	1.88	1.73	Shear zone.
460	465	5.0	2.61	2.53	Do.

3790

Hole C-5, Cont'd.

Footage			Percent copper		Description and remarks
Feet-	To-	Feet	Total	Acid-soluble	
465	470	5.0	1.78	1.55	Shear zone.
470	475	5.0	1.17	1.07	Do.
475	480	5.0	1.16	1.06	Do.
480	485	5.0	1.40	1.16	Do.
485	490	5.0	2.48	2.25	Do.
490	495	5.0	1.97	1.73	Do.
495	500	5.0	.91	.73	Do.
500	505	5.0	2.41	1.92	Do.
505	510	5.0	.50	.33	Do.
510	515	5.0	.73	.50	Do.
515	520	5.0	.73	.49	Do.
520	525	5.0	.18		Do.
525	530	5.0	1.54	1.26	Do.
530	535	5.0	2.98	2.31	Do.
535	540	5.0	3.06	2.51	Do.
540	545	5.0	2.09	1.65	Do.
545	550	5.0	.53	.38	Andesite and granite.
550	557	7.0			Granite.

19 May 1973

Notes from Arizona AIME Inspection tour of San Manuel.

(1) Conversation with Hecla - Lakeshore employee:

A. There is a good chance the property will not meet the 1975 goal set for full production.

B. Production goal is 16,000 TPD.

C. Au and Ag is too low to recover with current metallurgical process. Metallurgical process is still in development stage.

D. A test panel for block caving is currently being tried with no results to date.

E. All things considered this employee felt that Hecla would make a go of the project.

Hecla - Lakeshore

9,000 TPD of sulfides } mixed oxides + sulfides = 0.7%
5,000 TPD of Oxides } ≈ 120 x 10⁶ tons. 1%.

To date - $105 x 10⁶ capital investment
- Cites Service - Hecla selling back some interest
- 9% loss rate of underground miners. - no replacement
5 injuries and one death.
472 x 10⁶ tons reserve based on open pit design

Pinto Valley - $130 x 10⁶

Cut off on oxides - 0.1% Cu have gone to 0.07%
≈ 300 x 10⁶ tons - that could double in next few years

P.D. Leach - 400 TP week - $1 x 10⁶ installation

18 Vats with conveyor. 2 men operate

Mine - 240,000 TPD - ore 50,000 TPD
Stripping ratio: 4.8 : 1 grade - 0.7% (?) [11.7 lb/ton]
Cut-off grade - 0.4 % sulfides
" " 0.2 % leach
overburden - 30' - 600'
ground water problems may cause slope stability problems

50,000 × 11.7 = 294 tons/day or ≈ 300 TPD

Open pit 300 × 365 = 109,500 TPY

Cities Service : Miami East -

Mining from 3300' level - cut-and-fill method

- 1.5 - 2.0% grade - cut-off - 0.9 - 1.0%

restrict mining under old ~~mill~~ smelter site until new smelter site is completed.

30.×10^6 tons

1.

Hecla Mining Company April 22, 1970

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To avoid the air pollution problem they are planning to roast, leach and electrowin the sulfides. The SO_2 from roasting will be converted to sulfuric acid which will be used for leaching the oxides. They plan to use the Lurgi Process to make iron sponge for cementation of the leached copper.

Mine output will be 80,000 tons/year, one half as E. W. cathodes and one half as precipitates. There will be a problem of silver in the range of three to four O.P.T. in the precipitates. This makes it somewhat desirable to ship it to a smelter. I suggested a simple oil flotation to scalp off a high grade precipitate leaving the silver in the tails with other impurities which would go to a smelter. Treatment of the precipitates is not decided.

The processing plant may be designed to accept concentrates from another company; thus, the output may be as much as 130,000 T.P.Y. Hecla will actually control 20,000 T.P.Y. of cathodes and 25,000 T.P.Y. of precipitates. There is a possibility for us to deal on some of El Paso's half and some of the toll copper. Griffith will raise the question with El Paso and the possible toll source and then advise us.

I made arrangements to test their pilot plant production when it is available. Also I am to give them assistance on refining problems and counsel them in the marketing aspects.

Hecla is not interested in a merger, acquisition or partnership. They have some capital available except for an additional $100,000,000.00 which they are now raising. The two relationships which interest them are:

1) Long term purchase agreement which would give them market security and yet enjoy some margin above producer's price.

2) A long term agreement with a capital advance against future copper. Order of magnitude of the advance would be 10 - 30 million.

Of the two proposals I stressed the first. He would like a letter of intent and a statement of a starting position for negotiations. This he would like next week. They want a letter as an instrument to support their financing program to show market stability.

We did not deal in specific numbers but it is evident he wants more than producer price but will discount for E. W. cathode grade.

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1. 10 year contract.

   One-third of difference between the six months - one year future market dealer price and the producer price, less a 2¢ discount for E. W. quality.

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To EGH from D. Kelly

2-2-73

Howard Kramer

Re: Hecla Mining

Hecla owns 50% of Lake Shore (Arizona) Copper deposit. The other 50% is owned by El Paso Natural Gas Co.

The size of the ore body has not fully been defined (or at least, not published). The average grade is reported to be .7%. Production is scheduled to start in 1975.

Hecla's net worth is about $50 million. Based on today's market price for their stock of $15/share, the market value of their stock totals $95 million. ~~Hecla~~ A merger without dilution of earnings would allow Essex to pay only $50 million. So a $45 million premium (Difference between market $95 mm and Book or Non-Dilution $50 mm) would represent the 50% of Lake Shore ore deposit. The question: is it worth anywhere near $45 mm? Data to be considered: Potential earnings from Lake Shore; Is this a reason why El Paso would not want this because they own 16.8% of Hecla; what will the annual production be for Lake Shore and can SX get the Cluster? Who will have the smelter? etc. — —

2-2-73

Hecla Mining

It is well to point out that Hecla has no long term debt. Liabilities are $12 million or 25% of the Net Worth. It appears they could carry the debt necessary to bring in the mine and concentrator. ~~and~~ Since El Paso is to furnish half the financing, it appears ~~the~~ Hecla could afford their half of all the cost incl. smelter & refinery

A merger of Hecla into SX at "market" value of $95 million would take 1,900,000 shares of SX common. Could this be worth it for Essex?

D.

ESSEX AND HECLA
PROJECTED COMBINED EARNINGS - 1972

ESSEX SHARES OF COMMON (8,847,813 SH x $4.00 EARNINGS) $ 35,391,252

HECLA " " " (6,329,879 SH x $.53 EARNINGS) 3,354,836

Estimated Combined Earnings - 1972 $ 38,746,088

No. of ESSEX SHARES TO HECLA FOR:		VALUE HECLA NET $
(a) Without diluting SX earnings: 838,709 sh x $50 =		$ 41,935,450
(b) Book Value 12/31/72		47,788,000
(c) Recent Market Value (2/1/72, $15 x 6,329,879 sh)		94,948,185
(d) Equal exchange based on current market prices of common stocks, i.e., SX at $50 and Hecla at $15.		
$50 ÷ $15 = 3 1/3 Hecla to 1 SX;		
6,329,879 ÷ 3 1/3 = 1,900,864 SX shares		

e) Dilution of SX of Hecla is exchanged at Current Market:

Essex & Hecla Combined Earnings - 1972, $ 38,746,088

SX shares	8,847,813	$4.000 Earnings/sh.
Hecla (Exch.)	1,900,864	1.77 " "
Total	10,748,677	$ 3.60 " "

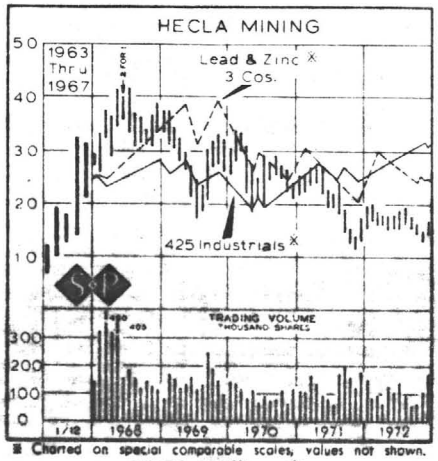
COMBINED BALANCE SHEET
DECEMBER 31, 1971

	ESSEX	HECLA	ELIM.	TOTAL
Current Assets	289,014	12,235	—	301,249
Investments & Other Assets	6,108	17,211		23,319
Goodwill	5,134	—		5,134
Fixed Assets - Net	107,652	30,349		138,001
Treasury Stock	—	3	(3)	—
	407,908	59,798	(3)	467,703
Current Liabilities	62,122	4,652		66,774
Long Term Debt	115,757	—		115,757
Other Liabilities	6,332	7,358		13,690
Preferred Stock	553	—		553
Common Stock	8,800	1,551	(3)	10,348
Paid In Surplus	21,068	15,262		36,330
Retained Earning	193,276	30,975		224,251
	407,908	59,798	(3)	467,703
TOTAL NET WORTH	223,697	47,788	(3)	271,482
LIABILITIES	184,211	12,010	—	196,221
DIFFERENCE	39,486	35,778	(3)	75,261

Hecla Mining

Stock—	Price Jan. 8'73	Dividend	Yield
CAPITAL	16¼	[2]—	[2]—

RECOMMENDATION: Hecla, the leading U.S. silver producer, has interests in several mines in Idaho's Coeur d'Alene district and normally derives about half of its income from silver operations. A 50% interest is held in a large copper project which is not scheduled to start up until 1975. The shares remain a speculation on movements in world silver quotations, with longer-range prospects dependent on the success of the copper project.



X Charted on special comparable scales, values not shown.

SALES (Million $)

Quarter:	1972	1971	1970	1969	1968
March.....	6.04	5.41	6.39	5.88	3.65
June.....	5.60	6.24	6.27	6.07	4.36
Sept.....	4.57	6.24	5.94	6.04	5.84
Dec.		5.86	5.64	6.03	6.28

For the nine months ended September 30, 1972, sales declined 9.4%, year to year, reflecting reduced output of silver, gold and lead, partially stemming from the Sunshine Silver Mine fire. Margins narrowed, damaged by lower ore yields of gold, silver and lead and rising administrative costs, and operating income fell 20%. Dividend and interest income was down, but capital gains were slightly higher. Following reduced depreciation charges and cutbacks in spending for exploration and the Consolidated Silver Project, the drop in pretax income was pared to 17%. After taxes at 26.4%, against 31.3%, net income was down 11%, to $0.46 a share from $0.52 (adjusted). Earnings for the 1972 interim were before a $0.04 a share charge for costs of the Sunshine Mine Fire.

[3]CAPITAL SHARE EARNINGS ($)

Quarter:	1972	1971	1970	1969	1968
March.....	0.16	0.16	0.24	0.21	.....
June.....	0.15	0.19	0.20	0.20	.....
Sept.....	0.15	0.16	0.18	0.17	[4]0.46
Dec.		0.12	0.13	0.19	0.28

PROSPECTS

Near Term—Sales for 1972 may have reached $22 million, versus 1971's $23.7 million. Earnings (before special items) are not estimated to have differed significantly from 1971's $0.64 a share (adjusted for the 1972 2% stock dividend).

Sales and earnings in 1973 should benefit from an anticipated year-to-year improvement in silver prices and a resumption of full production at the Sunshine Silver Mine, expected by the end of the first quarter. Somewhat weaker lead prices may be restricting, however, and silver quotations remain heavily subject to speculative influences. On balance, earnings should exceed the estimated 1972 level. An early resumption of cash dividends is not foreseen; 2% stock dividends have been paid annually since 1970.

Long Term—Earnings will continue to follow closely movements in silver prices until the Lakeshore copper property begins production. Copper production is expected to assume the greatest significance following the opening of that property, anticipated in 1975.

RECENT DEVELOPMENTS

On July 6, 1972 a suit filed by a minority stockholder against the company's directors for transactions in silver futures contracts was dismissed with prejudice. The decision was subsequently appealed.

In December, 1972 the Sunshine Silver Mine began limited operations. The mine, in which Hecla has a 33⅓% interest, was closed by a fire on May 2, 1972. Full operation is expected late in 1973's first quarter.

In December, 1972 Hecla and El Paso Natural Gas Co. agreed, subject to a favorable tax ruling, that El Paso would assume a 50% working interest in development of their jointly owned Lakeshore copper property. Previously, Hecla was to provide full development financing.

DIVIDEND DATA

Payment in the past 12 months:

Amt. of Divd.	Date Decl.	Ex-divd. Date	Stock of Record	Payment Date
2%Stk.	Apr. 28	May 8	May 12	Aug. 4'72

[1]Listed N.Y.S.E.; also listed Pacific Coast & Spokane S.Es. & traded PBW S.E. [2]2% in stk. on Aug. 4, 1972. [3]Adj. for stk. divs. of 2% ea. in 1972, 1971 & 1970. [4]Nine mos.

Published at Ephrata, Pa. Editorial & Executive Offices, 345 Hudson St., New York, N.Y. 10014
Vol. 40, No. 9 Friday, January 12, 1973 Sec. 14

[2]INCOME STATISTICS (Million $) AND PER SHARE ($) DATA

Year Ended Dec. 31	Net Sales	% Oper Inc. of Sales	Oper. Income	Depr., Depl. & Amort.	Net Bef. Taxes	[1]Net Income	[4]Capital Share ($) Data [1]Earns.	Divs. Paid	Price Range	Price-Earns. Ratios
1972--	----	---	---	---	---	---	---	[5]---	20 -13	----
1971--	23.75	27.7	6.59	0.45	5.78	4.01	0.64	[5]---	26½ -11¾	41-18
1970--	24.24	35.0	8.49	0.52	6.89	4.72	0.75	0.16½	32⅜ -17⅞	43-24
1969--	24.02	36.6	8.79	0.42	7.11	4.87	0.76	0.66	35¼ -16¼	46-21
1968--	20.13	37.3	7.50	0.36	7.06	4.64	0.74	0.61¼	38⅞ -24¼	52-33
1967--	20.20	39.3	7.94	0.51	7.50	5.37	1.03	0.56½	29½ -19⅞	29-19
1966--	21.40	43.7	9.36	0.52	8.98	6.01	1.17	0.54¼	30½ -13	26-11
1965--	20.05	44.6	8.95	0.36	8.45	5.71	1.14	[3]0.35½	16½ -11¾	14-10
1964--	18.83	45.5	8.57	0.43	7.79	5.20	1.04	[3]0.33	18 - 9¼	17- 8
1963--	8.83	18.6	1.65	0.46	1.73	1.55	0.64	0.32	11⅛ - 6¼	17-10
1962--	5.99	22.6	1.35	0.19	1.89	1.48	0.61	0.23½	7¼ - 4¾	12- 8

[2]PERTINENT BALANCE SHEET STATISTICS (Million $)

Dec. 31	Gross Prop.	Capital Expend. (Net)	Cash Items	Inventories	Receivables	Current Assets	Current Liabs	Net Workg Cap	Cur. Ratio Assets to Liabs.	Long Term Debt	% Book Val. Com. Sh.
1971--	37.95	10.87	6.00	0.80	5.35	12.24	4.65	7.58	2.6-1	Nil	7.55
1970--	26.64	7.90	9.21	0.78	3.52	15.16	4.37	10.79	3.5-1	Nil	6.91
1969--	17.84	4.35	9.28	0.61	3.55	14.73	2.80	11.92	5.3-1	Nil	6.33
1968--	14.51	0.80	12.79	0.53	2.56	17.22	2.96	14.26	5.8-1	Nil	6.13
1967--	9.46	1.10	8.54	0.53	5.68	14.79	2.69	12.10	5.5-1	Nil	6.18
1966--	8.40	0.34	15.47	0.48	2.15	18.15	5.31	12.84	3.4-1	Nil	5.70
1965--	7.32	0.11	8.62	0.45	1.71	12.50	4.43	8.07	2.8-1	Nil	4.40
1964--	7.32	N.A.	10.47	0.46	5.47	18.42	9.68	8.74	1.9-1	Nil	3.68
1963--	6.62	N.A.	4.91	0.54	1.65	7.16	1.55	5.61	4.6-1	Nil	6.25
1962--	5.86	N.A.	2.70	0.55	1.96	5.28	1.12	4.15	4.7-1	0.07	5.53

[1]Bef. spec. chgs. of $0.30 a sh. (net) in 1962 & bef. spec. cr. of $0.12 in 1963, $0.02 in 1965 & $0.16 in 1968. Incl. Transarizona Resources, aft. 1967 & Lucky-Friday, aft. 1963. [3]Plus 1/100 sh. of Bunker Hill Com. [4]Adj. for 2-for-1 split in 1969 & stk. divs. of 2% ea. in 1972, 1971 & 1970. [5]Pd. stk.-see footnote 4. N.A.—Not Available.

Fundamental Position

Hecla is the leading U. S. silver producer, mainly through the Lucky Friday Mine and its 33¼% interest in the Sunshine Unitized Area, both in the Coeur d'Alene District of Idaho. Interests in several other properties are held and the company conducts substantial exploration efforts. In 1971, Hecla's interests in mine output comprised 6,369,914 ounces of silver (16% of the U.S. total), 32,170 tons of lead, 10,323 tons of zinc, 59,974 ounces of gold and 2,214 tons of copper. Silver provided 43% of sales, lead 33%, gold 9%, copper 7%, zinc 6% and other 2%.

Production from the Lucky Friday mine in 1971 was 213,394 tons of ore grading 16.0 ounces of silver per ton, 11.3% lead and 1.35% zinc. Ore reserves at the end of 1971 were 552,000 tons, down from the year-earlier 624,000 tons. Development work is under way at the 4050-foot level.

A 33¼% interest is held in the Unitized Area property operated by Sunshine Mining. Hecla's share of 1971 production was 84,212 tons of ore assaying 33.75 ounces of silver. Its share of reserves was 321,000 tons at January 1, 1972.

Hecla operates and owns a 30% interest in the Star-Morning Unit Area in Idaho; its share of 1971 output was 73,816 tons assaying 2.82 ounces of silver, 5.53% lead and 6.72% zinc. Its share of year-end reserves was 261,000 tons.

Hecla operates and receives half of the profits from the Mayflower mine in Utah. Output in 1971 was 124,354 tons averaging 0.51 ounce of gold per ton, 5.12 ounces of silver, 4.01% lead, 2.44% zinc and 1.26% copper. Year-end reserves were 181,000 tons.

Hecla has a 35% equity interest in Granduc Mines whose British Columbia copper property is leased to American Smelting and Newmont Mining for development. A 13.5% interest is held in Day Mines, which holds a 25% interest in the Galena mine and has a number of other silver interests in and around the Coeur d'Alene region.

Hecla holds a 50% interest in the Lakeshore copper property near Casa Grande, Arizona and is the operator of the property. El Paso Natural Gas Co. holds the remaining 50%. Ore reserves have not been finally determined, but are expected to be substantial, with an average ore grade around 0.7%. Commencement of full production is scheduled for early 1975.

Cash dividends have been omitted since the March, 1970 payment. Three 2% stock dividends have since been declared.

Shareholders: 12,426. Employees: 1,350.

Finances

Day Mines Inc. has filed a registration statement on behalf of Hecla covering the possible sale of Hecla's holdings of 394,309 Day Mines common shares. Hecla has not yet decided whether it will proceed with the secondary offering.

CAPITALIZATION

LONG TERM DEBT: None.

CAPITAL STOCK: 6,329,897 shs. ($0.25 par); an El Paso Natural Gas Co. subsidiary owns 16.8% and Golconda Corp. owns 11.0%.

Incorporated in Wash. in 1898. Office—Hecla Bldg., Wallace, Idaho 83873. Pres—W. H. Love. Secy-Treas—W. J. Grismer. Dirs—L. J. Randall (Chrmn), R. B. Fulton, H. Herman, W. H. Love, H. F. Magnuson, E. McL. Tittmann, W. B. Warren. Transfer Agents—Registrar & Transfer Co., NYC; Seattle-First National Bank, Spokane, Wash. Registrars—Manufacturers Hanover Trust Co., NYC; National Bank of Washington, Spokane, Wash.