CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
520-770-3500
http://www.azgs.az.gov
inquiries@azgs.az.gov

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JDS

ASARCO

Southwestern Exploration Division

December 19, 1988

A.R. Raihl

Leaching Operations
Lakeshore Mine

On October 14, 1988 Steve Bywater, Kit Clifford, Pete Forrestal and I were given a tour of the Lakeshore leaching operations by Cyprus employees Ernie Arens and John Kline. We were taken underground and shown the Tool Crypt in situ leach (drill hole to drill hole in place leaching of undisturbed rock), the Lunchroom in situ leach (in situ leaching involving the drill hole injection of leach solutions into stress relieved rock and the recovery of solutions in the overlying block cave mine workings), and the solution collection system for the block cave in place leach operation. On the surface of the ground we were shown the area where the drill holes inject the leach solution into the block cave ground, and we were also shown the SX-EW plant. Cyprus considers most of their information on the in situ leaching in the Lunchroom and Tool Crypt areas to be proprietary information, and, consequently, we received only a general overview of the in situ leach operation.

Tool Crypt in Situ Leach

Crypus' in situ leach operations in the Tool Crypt area are considered a true drill hole to drill hole in situ leach. The rocks are undisturbed by the block cave operations, and solutions are injected through drill holes and recovered through drill holes. Cyprus employees at the Lakeshore Mine consider the in situ leach operation in the Tool Crypt to be of a production mode and not one of a pilot test.

The in situ leach operation at the Tool Crypt is designed to operate at constant pressure rather than constant volume as will be discussed later in this text. The flow rate is designed at 2000 gpm and can be varied to get the desired copper head grade.

The recovery and injection holes are drilled out one side of the drift. They are drilled in fans that are said to have been spaced 25 ft. apart but most appear to be only 15 ft. apart. In each fan there are 3 to 4 holes, and they are drilled in a vertical plane perpendicular to the axis of the drift in most cases. The holes in each fan vary from horizontal to an angle of -60° with the horizontal. In one drift the direction of the holes were orientated so that they could be as close to perpendicular to a certain set of fractures as possible.

The underground injection and recovery holes are drilled with a down-the-hole hammer, reverse circulation drill rig. The drill rig was built by Qubex International, and it is mounted on a boom for easy mobilization and setup.

The drill rig provides good samples for assay, a hole that doesn't ravel, and accurate straight holes up to 350 ft. deep. The rig drills 300 ft. per 6 hours shift using the down-hole hammer. All the drill holes are surveyed for possible deviation.

The holes are cased with 1" diameter stainless steel pipe with ¼" diameter drill hole perforations every 6 inches. The casing is welded together using couplings cut from 1¼" stainless steel pipe. Holes are grouted at 450 psi using a special cement grout that expands slightly as it hardens, and it sets in 20 minutes. Some of the casing and/or pipe for plumbing was described as being 3/16" stainless steel rated at 2500 psi.

The rock is described as having a permeability of 0.5 millidarcy, and the permeability is locally as high as 5 millidarcy. The rock has 7% porosity and an effective permeability of 10 to 15%.

It was mentioned that a potassium preflush was used in the Tool Crypt and/or the Lunchroom areas. Several years ago there was theoretical talk about using potassium rich leach solutions in the copper industry, but I haven't heard too much about the use of potassium rich solutions in leaching operations. Apparently the preflush is designed to dissolve some minerals and prevent the dissolution of other minerals. As previously mentioned, the injection and recovery of leach solutions is designed to operate at a constant pressure rather than a constant volume. Apparently pressure and pressure gradients are the critical operating criteria. The idea is to get a good flow pattern through the rocks; and this is done, in part, by creating a back pressure. For example, the leach solutions can be injected at 1000 psi and the flow from the recovery holes is cut back to create a back pressure of 250 psi. This creates a flow differential of 750 psi and causes the solutions to move through the rock in a predictable and acceptable manner.

Fluid flow is the keystone of the in situ leach operation. For its operations Cyprus uses fluid flow computer models by Bob Schmidt of the USBM. Bob Schmidt has done a lot of fluid flow work at the Lakeshore Mine and at the block cave in place leach operation at San Manuel. In addition, the USBM has put up funds for fluid flow monitor equipment at Lakeshore. The USBM's presence at Lakeshore goes back at least several years. The in situ leach operation is computer monitored using a 32 point pressure-flow recorder, and this equipment is said to be essential for controlling the flow of leach solution through the rocks.

Lunchroom In Situ Leach

The Lunchroom in situ leach operation consists of injecting leach solutions into stressed relieved ground immediately beneath the workings of a block caved stope, as shown in the following figure. As seen on our tour, the drill hole configuration in the Lunchroom in situ leach is very similar to that in

the Tool Crypt in situ leach area. At the Lunchroom there are fans of drill holes spaced approximately 15 feet apart. There are generally 2 to 3 drill holes per fan. All of the drill holes are drilled out one side of the drift, and the holes in each fan are in a plane that is vertical and perpendicular to the axis of the drift. In each fan there is typically a horizontal drill hole and one that is inclined 20° from the horizontal. At the end of the test area there is a fan of about 6 holes to provide back pressure and recovery monitor holes.

We were told that there are two holes in each fan so that one hole can be used to inject leach solutions into the KVS unit and the other hole can be used to inject leach solutions into the adjoining porphyry. Separate drill holes are used for each rock type because there is a substantial difference in leaching characteristics of porphyry versus that of the KVS. The KVS has a much higher permeability than porphyry, and the copper oxide mineralization occurs on fractures in the rock. Thus, it leaches well under low operating pressure. On the other hand, porphyry is much less permeable and the copper is often tied up in the clay of altered plagioclase sites. The KVS was described as leaching like a "toilet." And the best permeability in the porphyry was described as occurring near its contact with the KVS.

At the time of our visit, leach solutions were being injected into a number of the drill holes at 600 psi according to the gauges we saw.

Block Cave In Place Leach Operation

The block cave in place leach operation at Lakeshore has been well described in published reports (see AIME Preprint No. 85-367 entitled Evaluation of Underground Copper Leaching at the Lakeshore Mine by Kline, Behnke and Musgrove, Oct. 1985). We did get some additional information on the preparation of the drill holes for the distribution of the leach solutions into the block cave ground. Two million dollars were spent drilling 5900 ft. of 5-1/8" drill hole and casing it with PVC pipe. All the drill holes were drilled to the base of copper oxide mineralization approximately 20 ft. above the under cut level. The holes were drilled with a TH-100A drill using reverse circulation and an air hammer. The penetration rate was 240 ft. per 10 hour shift. All the holes were surveyed with a gyroscope upon completion. The PVC pipe used for casing was threaded and coupled using their own patented thread design.

Because of the ravelly nature of the ground, they developed their own special technique for casing the drill holes. This technique was said to save $5000 per drill hole. The drill holes were hammer drilled using reverse circulation down to the level of water at which point they converted to a tricone bit. The sub and the tricone bit were designed so that they could be dropped off the end of the drill rods by using a trigger on the bottom of the casing. The casing was inserted down the center of the dual wall pipe used for reverse

circulation, and the trigger on the bottom of the casing caused the bit and sub to drop off. The rods were then pulled out leaving the casing in the drill hole.

It was mentioned that $1 million worth of plastic casing and drill holes were lost because high strength acid was accidentally pumped down some of the drill holes and this ruined the PVC casing. Because of this, holes had to be redrilled in ground with a pH of 1 so special care had to be taken to protect the reverse circulation drill pipe. The new holes were then cased with 1-3/8" diameter stainless steel, and this casing was inserted into the drill holes through the 2-1/8" diameter inner tube of the reverse circulation rods.

Conclusion

The in situ leach operators at Lakeshore Mine feel that they have developed a revolutionary new mining technique. They feel that they have proven the mining technique works. They claim their in situ leach operation in the Tool Crypt area is one of production and not one of a pilot test. They feel that they can drift into an open pittable, acid soluble copper deposit and in situ mine it more cheaply than one could open pit mine and heap leach the same deposit. In addition, they have done extensive research to identify in situ mineable leach reserves in the western USA. However, it is not known if they have acquired any properties based on this mining technique.

H. G. Kreis

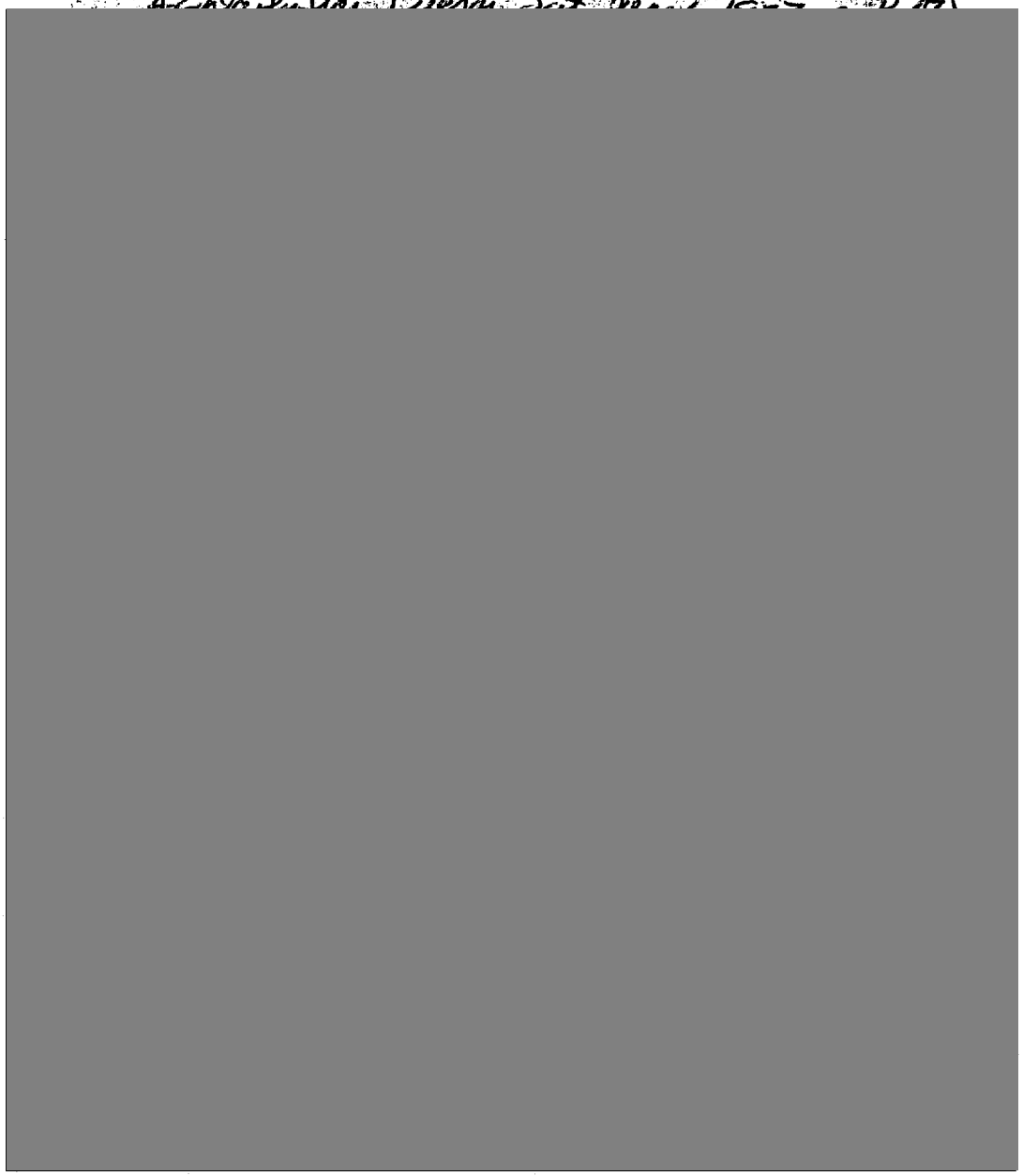
HGK:mek

H. G. Kreis

cc: F.T. Graybeal
W.L. Kurtz/J.D. Sell
S.A. Anzalone
D.E. Crowell

WLK

FILE



ASARCO

Mining Department

J. H. C.
AUG 24 1978

Memo To: J.E.A. MacDonald

From: S. A. Anzalone

Date: August 16, 1978

Lakeshore Mine
Geological Review

In response to an invitation from the Hecla Mining Co., Asarco personnel visited the Lakeshore Mine on August 9 & 10, 1978. The following summarizes the geological and related mining data obtained during that visit to the property located on the Papago Indian Reservation, Pinal and Pima Counties, Arizona. Geological information available for examination included geological logs, cross sections, plan maps, ore reserves and metallurgical data. Hecla personnel, and former employees acting as consultants for Hecla, conducted the technical sessions and mine tours. W. A. Griffith, Vice President Metallurgy for Hecla, chaired the meetings at Lakeshore. Dan Munter, former Senior Mine Geologist, provided a review of the geology and ore reserves. E. W. Cokayne, Mine Manager, reviewed mining methods and led a tour of the underground workings. Paul Musgrove, Metallurgical Manager, discussed the milling and metallurgical procedures and conducted a tour of the surface plant.

Objectives

Review all geological and related mining and metallurgical data, to assist in evaluating the long term economic potential of the Lakeshore property. Confirm the Lakeshore ore reserves and attempt to ascertain if Hecla and El Paso may have overlooked significant open pit ore potential included within the low grade copper oxide mineral inventory. Evaluate possible extensions of the known orebodies including the chalcocite blanket discovered west of the "C" fault. Provide geological input for determining the future economic potential of various alternative mining and milling plans with a view toward possible acquisition of the Lakeshore property.

Conclusions

1. The ore reserve figures provided by Hecla were prepared in an acceptable manner. They are suitable for utilization in Asarco's current Lakeshore evaluation.

2. The high grade copper oxide and porphyry sulphide ore is amenable to mining by block caving techniques.

3. The tactite ore has a more irregular distribution than anticipated and does not cave well. Under current or near term cost price projections it can not be mined profitably.

4. There is a substantial tonnage of low grade copper oxide material (± 0.32% Cu-acid soluble) at depths below 300'. This tonnage contains additional copper (± 0.30% Cu) in a non acid soluble form. The economics of mining and treating this material require additional study.

5. Mineralization has not been totally delineated. There is modest exploration potential for extensions of known mineral zones.

Ore Reserves

The Lakeshore ore reserves presented by Hecla were calculated with reasonable care and no obvious discrepancies in method and procedure were noted during examination of cross sections, geological maps and related data. Geological logs were detailed and all assays were given in total copper and acid soluble copper. 229 surface diamond drill holes (NX) plus 18 surface percussion holes have been completed on the property. Drilling is on approximately 200' centers. Hecla drilled 161 of the diamond drill holes and most of these cored the low grade oxide zone as well as some of the overlying Fanglomerate. Holes were logged with care and core recovery was approximately 90%. All holes were surveyed and temperature logged.

A considerable amount of BX confirmation panel drilling was completed from underground workings to further check the surface drill hole values. The panels drilled in the porphyry sulphide ore zone and high grade copper oxide zone provided good correlation with the surface holes. Panel drilling across the tactite zone produced numerous inconsistencies in grade and ore configuration. Large areas of

Ore Reserves (Cont'd)

silicate waste rock were encountered in areas thought to contain high grade tactite ore prior to the panel drilling. Ore grade prediction and production in the tactite zone based on surface holes proved to be extremely difficult.

Nine diamond drill holes on a 400' grid spacing penetrate the chalcocite blanket east of the "C" fault. Drill logs suggest that the ore intersepts are "sufficiently long and continuous between adjacent holes to assure that it comprises an insitu ore reserve." Additional drilling is required to firm up this reserve and also check for possible extensions of the chalcocite to the west and north. Current drill data indicates that the grade and thickness is diminishing in these directions but this should be checked to avoid missing additional chalcocite ore.

Geological cross sections with drill hole data were constructed by hand and cave panels for oxide, porphyry sulphide and tactite ore were laid out on them. All drill hole data was subsequently computerized and plotted on cross sections and plans utilizing the "inverse distance squared" technique. The final ore reserve was calculated from the computer generated cross sections. The computer generated cross sections correlate reasonably well with the hand drawn sections. Hecla stated that an open pit ore reserve model had been calculated by computer methods but this data was not available at Lakeshore. In Hecla's judgment, the open pit was not an attractive option at the time of their evaluation. Asarco was advised that the open pit data could be examined at their Wallace Idaho Office. Further inquiry through Herb Harper former Vice President Exploration Hecla Mining Company, revealed that Homestake and Superior Oil had also conducted open pit evaluations at the Lakeshore property. Homestake had Flour-Utah re-do their own evaluation and concluded that, given the extensive stripping involved, the relatively low grade of the copper oxides that would be encountered for many years, plus the lower leach copper recovery rate in the lower grade rock, an open pit could not compete with block caving under current mineral economics.

No low grade copper oxide open pit reserve figure was provided however Griffith and Munter indicated that the low grade oxide was included in the Lakeshore "mineral inventory" within the 0.10% Cu cutoff category. Extrapolating from their mineral inventory data, the low grade rock could average approx. 0.40% Cu (acid soluble) at a 0.20% Cu cutoff. They indicate in their 1978 reserve (Page 22) that "overlying dilution

Ore Reserves (Cont'd)

at Lakeshore contains approximately 0.30% acid soluble Cu over the oxide ores." Values for the low grade copper oxide calculated from cross sections in J. H. Courtright's Lakeshore Report suggests that the copper oxide grade might average approximately 0.46% Cu (total Cu) using a 0.20% Cu cutoff grade. Considering the above, there exists at the Lakeshore property, a substantial reserve of approximately 0.32% Cu (acid soluble) amenable to open pit mining. This could total approximately 100 million tons depending upon the configuration of the pit. The bulk of this material lies at a depth in excess of 300'. Nevertheless, its possible future economic potential should not be overlooked. While there is a considerable tonnage of copper metal tied up in these low grade oxides, the overall cost of mining and treating this material or just holding the property may prove to be too high over too long a period of time to make it worthwhile considering.

One reason the open pit plan did not appear to be an acceptable approach to Hecla was the discovery that a considerable amount of copper in the low grade oxide copper reserve was locked up in the biotite, layered silicates and clays. As such it is not amenable to leaching by standard low cost techniques. This feature will be discussed in more detail below.

In summary, the ore reserve figures provided by Hecla were prepared in an acceptable manner. They are suitable for utilization in Asarco's current Lakeshore evaluation.

Ore Reserve Tabulation

a. Copper 78¢/lb

b. 1977 Costs

Table I - Mineral Inventory

	Oxide Mineral Inventory		Sulphide Mineral Inventory	
Grade Cutoff	Tons	% Acid Soluble Copper	Tons	% Copper
0.10	825,375,000	0.45	808,583,000	0.47
0.30	142,583,000	0.72	523,083,000	0.62
0.40	103,000,000	0.86	401,500,000	0.70
0.50	79,583,000	0.99	293,583,000	0.80
1.00	28,250,000	1.52	50,583,000	1.39

Ore Reserve Tabulation (Cont'd)

Table II - In Situ Reserves

Ore Zone	Tons	% Acid Soluble Cu	Total Cu
Oxide Ore	23,374,000	1.47	
Sulphide			
Tactite	11,015,000		1.63
Porphyry	108,102,000		0.78
Chalcocite	19,062,000		1.41
Tot.Suls.	138,179,000		0.93

Table III - Diluted Reserves

(Mining Reserve)

Ore Zone	Tons	% Acid Soluble Cu	Total Cu
Oxide Ore	26,233,000	1.09	
Sulphide			
Tactite	11,342,000		1.14
Porphyry	107,200,000		0.68
Chalcocite	19,100,000		1.00
Tot.Suls.	137,642,000		0.76

The above figures were provided by Hecla. Details are available from the Hecla-Lakeshore Ore Reserve dated April 20, 1978. "The relatively high estimated dilution shown above for oxide, tactite and chalcocite ores as compared with dilution estimated for porphyry ore reflects the higher ore grade and shorter ore columns of those areas as compared with the porphyry."

Caving Characteristics

1. High Grade Oxide Ore

This material, primarily chrysocolla and tenorite in andesites and monzonite porphyry, caves readily into four to six inch fragments. It has an easy and rapid draw down with few hangups. Concreted mine workings stood up well under drawing conditions with very little pressure damage. Rock is highly fractured with moderate to strong hydrothermal and supergene alteration

Caving Characteristics
1. High Grade Oxide Ore (Cont'd)

features. Little difficulty is anticipated in caving this ore type. The first cave panel displayed rapid surface subsidence. The average thickness of this ore type is approx. 150' and it displays a relatively low grinding index.

2. Porphyry Sulphide Ore

This rock is well fractured quartz monzonite porphyry with moderate to strong hydrothermal effects. Sulphides, principally chalcopyrite and pyrite occur as disseminations, as fracture coatings and in veins. This rock type does not display the strong supergene effects noted in the high grade oxide zone, nevertheless, it should cave well. Slightly larger ore fragments may be produced but very few hangups should be expected. Thicker ore panels of approx. 400' should facilitate production performance. The average thickness is approx. 400' and the rock has a moderate to high grinding index.

3. Tactite Ore

This is a dense "tough" skarn containing numerous strong siliceous zones. The rock is poorly fractured except adjacent to strong faults that transect the tactite reserve area. These faults transmit and concentrate stress to working areas severely damaging concrete and steel arch supported slusher scram drifts. The tactite frequently breaks into very large 4 to 8 foot boulders and is difficult to draw. Numerous hangups have been experienced in the tactite cave area. The tactites dip approx. 20° to the west, and are frequently underlain in thrust fault contact with unstable and easily deformed Cretaceous sediments and volcanics. This has contributed to the difficulties encountered in mining this material. Surface subsidence has been noted above the tactite cave areas. The average cave panel thickness in the tactites is approximately 100'. The tactite has a high grinding index.

4. Chalcocite Sulphide Ore

This ore will cave in a manner similar to the porphyry sulphide ore. The chalcocite blanket should display more supergene effects then observed in the porphyry primary sulphide ore and this will assist in break up during caving. The average thickness is approx. 220'. The rock has a moderate grinding index.

If required, detailed geology may be obtained from the "Lakeshore Copper Mine Operations Review" Hecla Mining Company, July 1978 and J. H. Courtright's "Lakeshore Report" dated Jan. 2, 1978. 1968 ?

Leaching Characteristics of Low Grade Copper Oxide Mineralization

Based on metallurgical test work and leach plant experience, Hecla reported that a significant percentage of the total copper contained in the low grade oxide inventory was non acid soluble. All core assays were run for total Cu and acid soluble Cu. A review of the logs indicated that presence of 0.30% non acid soluble copper was fairly consistent in the entire oxide zone. Occasional runs as high as 1% non acid soluble Cu were observed in some of the high grade zones. However, a cursory check of the logs supported Hecla's belief that the average assay of the non acid sulphide copper was approx. 0.30% Cu.

Loss of this amount of copper in the low grade oxide zone diminishes the leach potential of the low grade copper oxide mineralization in an open pit mining plan. Musgrove stated that they ran various tests on this material to try to improve the recovery. This included a 90-day strong acid leach. "This did not touch the non acid soluble copper." To further check this problem, Hecla had four independent studies conducted on leachability and related mineralogical problems. Three of these were conducted by Hazen Research and one by Dr. Sidney Williams. Williams is in charge of Phelps Dodge's Geological Research Laboratory but does independent consulting work on occasion. These studies confirm the presence of ± 0.30% non acid soluble copper in the oxide mineral zone.

Early studies reported that the non acid soluble copper was tied up in goethite, layered silicates, feldspar phenocrysts and clays. Detailed petrographic and X-ray microprobe studies by Williams indicated that much of it was in fact tied up in hydrothermal biotite. Copies of these reports have been provided by W. Griffith of Hecla and are available in the Tucson Office (See Appendix A). In addition, Musgrove indicated that recovery of the acid soluble copper drops off in the low grade zone. He stated that approx. 75% of the acid soluble copper was recovered when treating low grade oxide ore in their leach plant. Test work by Hazen indicated that 60-70% of this non acid soluble copper could be recovered by a sulphuric acid bake or a segregation roast-ammonium leach. The cost of these recovery techniques is quite prohibitive and their consideration as a recovery process is unwarranted. A portion of this low grade acid soluble copper should be available through in-place leaching after the area has been block caved. The future economic significance of this copper is difficult to estimate at this time.

Hecla's work has shown that there is a substantial tonnage of low grade oxide copper in the 0.50-0.60 copper range overlying the high grade oxide and porphyry sulphide zones. Unfortunately only ± 0.32% acid soluble copper is actually available for heap or agitation leach.

Summary

The Lakeshore deposit is a major porphyry type copper occurrence containing substantial reserves of sub economic copper mineralization. Attempts to mine the deposit have proven unprofitable under recent economic conditions. The property is beset with numerous problems, among them mining difficulties, brought on by the overburden depth, difficult configuration and geometry of the mineralization plus troublesome rock type variations. Added to this are high holding costs, the uncertainity of future lease requirements and an unsettled partnership arrangement. Nevertheless, this is a substantial occurrence of copper that might be mined in the future particularly if there is a significant advance in mining technology such as a successful insitu leach system.

If the current economic evaluation indicates that a suitable mining plan or holding arrangement can be developed that will provide an acceptable economic return, a bid for the Hecla share of the Lakeshore copper deposit should be considered.

S. A. Anzalone

S. A. Anzalone
Chief Geologist

SAA/mc
encl.

Asarco staff in attendance:

J.E.A. MacDonald
D. E. Crowell
A. J. Kroha
V. Kudryk
W. L. Kurtz
G. Percival
M. L. Plass
R. J. Previdi

Appendix A

1. Mineralogical and Metallurgical Relationships of Lakeshore Oxidized Ore

   J. Kent. Perry
   Hazen Research, October 20, 1969

2. Oxide Ore Leaching
   Lakeshore Project

   S. Johnson
   R.S. Hodgson
   P.N. Thomas
   Hazen Research, February 23, 1971

3. Research Program
   Lakeshore Project

   C. Villached
   R.P. Meyerson
   P.N. Thomas
   Hazen Research, November 12, 1967

4. Petrographic and Laboratory Study of Core from Oxide and Sulphide Ore Lakeshore Mine

   Dr. Sidney A. Williams
   October 12, 1971

Lakeshore JHC · Enclosure 2

Aug '78

BASIC DATA

Diluted Ore Reserves - Oxides 26,233,000 tons @ 1.09% Cu
Sulfides 138,073,000 tons @ 0.76% Cu

Order of Mining - Sulfide ore @ 15-17,000 TPD (this schedule was altered slightly to accommodate some of the options)

Years	Type	TPY	Grade	Recovery
1- 6	Tactite/Porphyry	5,291,000	0.85%	85%
7-12	Porphyry	6,236,000	0.73%	87.5%
13-18	Porphyry/Chalcocite	6,050,000	0.75%	90%

Order of Mining - Oxide ore @ 6,000 TPD (this schedule was altered slightly to accommodate some of the options)

Years	TPY	Grade	Recovery
1- 4	2,216,000	1.14%	92%
5- 8	2,186,000	1.09%	92%
9-12	2,156,000	1.05%	92%

Operating Costs Per Ton Ore - Directs and Indirects

		Mining	Milling	
Oxides	- 6000 TPD	$ 10.44	$ 5.22	- alone
	- 6000 TPD	9.44	5.03	- w/sulfides
Tactites	- 5000 TPD	10.16	1.93	
Porphyry	- 5000 TPD	9.27	1.93	
	10000 TPD	8.34	1.93	
	15000 TPD	7.88	1.80	
Chalcocite	- 5000 TPD	9.50	1.93	
	10000 TPD	8.80	1.93	

Copper Produced - Sulfides 100% concentrate @ 24.7% copper
Oxides 84.66% cathodes @ 99.5% copper
15.34% precipitates @ 70.0% copper

Liquidation of Copper - Includes Indian royalty

	$1.00 Cu	$1.20 Cu	$1.40 Cu
Concentrate	$ .6161	$ .7820	$ .9479
Cathode (blister)	.8044	.9869	1.1695
Precipitate	.6873	.8591	1.0308

Cash Requirements Before Tax
(C = capitalized, E = expensed)

(X 1000)	Oxides Only	Oxides Plus 5000 TPD Sul.	Oxides Plus 10000 TPD Sul.	Oxides Plus 15000 TPD Sul.
Mining -Service shaft (C)	$ -	$ -	$ 1,700	$ 1,700
Service shaft (E)	-	-	4,300	4,300
Ore passes (E)	-	540	540	900
Haulage level (E)	-	-	500	500
General devel. (E)	-	-	2,502	2,854
Additional equip. (C)	250	250	-	500
Contingencies	-	81	1,432	1,614
Total	$ 250	$ 871	$ 10,974	$ 12,368
Milling - Entire Plant (C)	$ -0-	$ -0-	$ -0-	$ 15,000
Meet OSHA Standards- Elec. Plant (C)	$1,500	$ 1,500	$ 1,500	$ 1,500
Engineering & Misc. (E)	$1,000	$ 1,000	$ 1,000	$ 1,000
out - Administration/Holding (E)	$6,740	$ 6,740	$ 9,150	$ 13,480
Working Capital	$9,714	$14,812	$ 19,416	$ 23,441
Total	$19,204	$24,923	$ 42,040	$ 66,789

Wallace Miner Nov 11 '76

HECLA HAS HUGE 3RD PERIOD LOSS

Lakeshore Operations Big Factor In Poor Showing

Hecla experienced a consolidated net loss for the third quarter of 1976 of $2,724,045, or $0.40 per share, as compared to a net loss of $3,240,965, or $0.47 per share, for the second quarter of 1976 and net income of $1,509,748 or $0.22 per share for the third quarter of 1975, wrote president W. H. Love in the company's third quarter report to shareholders. The losses in the second and third quarters of 1976 resulted in an overall consolidated net loss for the first nine months of 1976 of $5,022,054, or $0.73 per share which compares with consolidated net income of $4,956,023 or $0.72 per share for the same period in 1975, he said.

Continuing on Love said, the principal reason for the loss in the third quarter was the company's one-half interest in the continued operating losses of the Lakeshore mine. Hecla's loss attributable to Lakeshore during the quarter was $4,988,723, which includes amortization and depreciation expense of $1,072,000 and interest on bank loans of $1,076,975. The Lakeshore mine, a 50-50 partnership with El Paso Natural Gas Company, was placed on an operational status for accounting purposes as of April 1, 1976. Net operational results from that time forward, including current interests costs, are reflected in the company's regular income accounts.

Losses also were experienced by the Sunshine Unit Area due to a labor strike, and Hecla's loss from this operation for the first nine months of 1976 was $205,295, or $0.03 per share, as compared to income for the same period of 1975 of $1,302,607 or $0.19 per share.

The company's earnings were also adversely affected by its equity in the net loss of Grandue Mines, Limited, for the first nine months of 1976 of $287,100, or $0.04 per share, as compared to a net loss of $502,500, or $0.07 per share, in the same period of 1975.

The operating assets of Ace Concrete Co. were sold for $2,000,000, and income in the third quarter from this discontinued operation, including $459,349 gain from the sale, amounted to $506,955 or $0.07 per share. This compares to income of $101,670, or $0.02 per share, in the second quarter of 1976 and $60,786, or $0.01 per share in the third quarter of 1975.

The price of copper remains depressed and this factor combined with higher than normal unit costs of the Lakeshore Mine in bringing the operation in Arizona to full production status has resulted in substantial operating losses. It is expected that these operating losses will be gradually reduced as production of copper increases, and that the mine will achieve a break-even cash flow status at full production rates and current prices. We anticipate that near-capacity production will be attained in the second quarter of 1977, he stated.

The oxide mine operation continues satisfactorily at near its rated capacity. Difficulties in the sulfide mine are gradually being worked out but the necessary changes require time along with the diligent efforts being provided by the capable people working at Lakeshore.

The metallurgical plants continue to operate well and are capable of attaining the projected production levels. In order to operate the plants as efficiently as possible, the crews have been reduced to size commensurate with production levels. Additionally, we have continued to treat concentrates purchased from outside sources to partially offset the production shortfall from the sulfide mine.

Hecla 50% share of production from the Lakeshore Mine for the first nine months of 1976 was 8,096 tons of copper, produced from 826,900 tons of ore mined.

The Lucky Friday and Star-Morning Unit continued to operate normally throughout the third quarter. Sunshine Mining Company, operator of the Sunshine Unit Area in which Hecla owns a 33.25% interest, has been closed by a strike since March

(Continued on Page 4)

Pollution Regulations Cause B.Hill Shutdown

The Bunker Hill Company announced that Idaho State air pollution control regulations again made it necessary to partially curtail operations at the company's lead smelter. Employee curtailments began on Thursday, Nov. 4, at 3 p.m.

Those departments which were curtailed beginning with 3-to-11 shift on Thursday were: the blast furnace, fuming plant, lead-refinery, casting and loading, OPP, baghouse service personnel and the common labor pool. Curtailment of belt crews began with the 3-to-11 shift on Friday.

All curtailed employees were asked to call in daily after 4 p.m. to receive their work assignments for the following day.

The lead smelter resumed full production beginning at 7 a.m. on Monday, Nov. 8, and all curtailed employees were requested to report for their regularly scheduled shift on that day.

SLIGHT LOSS RECORDED BY HOMESTAKE MINING

GOLD MINE OPERATES AT A LOSS FOR NINE MONTHS; OTHER REVENUES UP

Homestake Mining Co. has announced net income of $3.087 million, or 27 cents per share, on revenues of $28.679 million for the third quarter, according to Paul C. Henshaw, president.

This compares to net income of $4.076 million, or 36 cents per share, on revenues of $30.513 million for the same period last year.

For the first nine months, Homestake reports net income of $18.029 million, or $1.59 per share, as compared to net income of $20.256 million, or $1.79 per share, for the same nine months last year.

Net income for the first nine months of 1976 included a second quarter after-tax gain of $3 million, or 26 cents per share, from the sale of surface lands overlying coal properties in Wyoming, and a third quarter after-tax write-off of $600,000 or 5 cents per share, of the company's investment in the stock of Poseidon, Ltd., of Australia, he said.

Operations at the Homestake gold mine for the nine months ended Sept. 30 resulted in a loss before taxes of $523,000, compared with a profit before taxes of $12.975 million in the comparable period of 1975, he said.

Revenues from gold sales decreased by approximately $14 million through Sept. 30, compared with the same period of 1975. The principal reason for the decline in gold earnings was the decrease in gold prices, he said.

Revenues from the sale of uranium concentrates were $17.883 million through Sept. 30, compared with $10.035 million during the first three quarters of 1975. Income before taxes from uranium operations was $8.568 million through Sept. 30, compared with $4.581 million during the comparable period of 1975.

Uranium contributed 32 per cent of the company's operating income before taxes in the first nine months of 1976, he said. Uranium prices realized in 1976 were significantly higher than in 1975, he said.

"Uranium sales do not follow a uniform pattern," Henshaw said.

Washington School Gets Mining Grants

Eastern Washington State College has received a U.S. Department of Health, Education and Welfare grant of $16,000 to be used for scholarships to support advanced study in the fields of domestic mining, minerals, and mineral fuel conservation.

The award will help full-time graduate students of superior ability and demonstrated financial need to pursue an advanced degree in the fields.

KENNECOT GETS NEW V.P.

B. R. Smith, of Salt Lake City, Utah has been appointed executive vice president, Metal Mining Division, Kennecott Copper Corporation. Smith, who has been head of the company's Utah operations since 1972, will be moved to corporate headquarters in New York.

Mining Official Says Election Results Eventually Help Mineral Indu

Metal prices will rise and uranium exploration will be stimulated as a result of election, according to spokesman for the mining industry.

Phil Lindstrom, investments manager for Hecla Mining Co., at Wallace predicts rising metal prices because of higher inflation.

"Carter has said he would need four years to get things shaped up," Lindstrom said. "so don't look for any quick improvement. The budget will be unbalanced. There will be inflation. Based on relative values, metals will not be worth any more, but will be up in price due to the weakened dollar.

"Value and price are two different things. The value of metals will have to be designated in cheaper dollars, so they a higher designati

industry spokesm with the resoundi Initiative 325 by W and predicted bene

Tibor Elokusick Midnite Mines, Inc only producing u the Pacific Northw the sponsors of the estimated the resp electorate in maki

"We have no al clear power," he s did, nuclear power and cleanest meth

Klobusicky praise and said the decisi the failure of oth other states, will effect on the uran produce a slow up will encourage min

"Recent contract signed at $56 and for delivery in 198 indicates to me anticipated this ve

"Hopefully, this realize the need fo Lindstrom said, that the safety fac have to have the

"We are delight ton and other West ly defeated the because the develo is directly relate of any state," sai cutive director o Mining Association

Ben Harrison of said the defeat would be favorabl and he views the Lee Ray as helpfu industry.

"I think the ne soft-pedal some of al aspects that ha ing in the past," H

N'West Mining Assn. Raps At Politicians

A disturbing observation of current events is the serious decline in respect for the letter and intent of the law by bureaucrats and politicians, notes the Northwest Mining Association in their bulletin.

"As regulations have proliferated, administrative concerns for the rights guaranteed under the law have lessened to the point where regulations are, in some instances, now used as tools of harassment and political intervention," they charge. The result, they add, "is an outright means of thwarting an individual's ability to exercise his statutory rights."

Particularly prone to subversion are the rights guaranteed under the General Mining Act of 1872, it was pointed out. "An illustration of this is the recent attempt of Sen. Church (D-Idaho) to deny mining on the upper St. Joe River through fiat action of the Interior Department." It is to Secretary of the Interior Kleppe's credit that he did not accede to the well-publicized demands of the Senator, they added.

Another instance of insensitive, if not harassing bureaucratic behavior, they continue, was an application for a temporary, minor stream channel change required for a proposed, small scale placer mining operation on the Oro Grande Creek in central Idaho. Filed over 3 months ago, the delay means the operator will be unable to proceed for the remainder of this year.

"Such deviations from the intent of the law are growing in frequency . . . together, they threaten the rights of individuals attempting to produce minerals in the United States."

Sunshine Has Large 3rd Quarter Drop

Sunshine Mining Co. announced third-quarter earnings last weekend of one cent per share, as compared to 21 cents per share for the same period last year.

According to the company, net income for the third quarter was $65,000 as compared to $1,154,000 for the same period last year.

Revenues for the third quarter totaled $11,531,000 as compared to $13,641,000 last year.

For the first nine months of the year, earnings per share were 16 cents, as compared to 55 cents for the first nine months last year.

Net income for the first nine months of this year was $884,000, compared with $3,063,000 for last year.

Revenues for the first nine months total $37,949,000 versus $42,925,000 for the same period in 1975

The company owns the Sunshine mine near Kellogg, once the largest silver producer in the nation. The mine has been closed since March 11 by a strike.

Drilling Technology To Be Used In Ocean

Officials of the Deep Sea Drilling Project say a new feat of drilling technology will be attempted on an upcoming expedition.

The project headquarters at La Jolla, Calif., said an effort will be made to bore a hole 500 meters deep through tough rock under the sea floor in the deepest parts of the western Atlantic.

Scientists said the first deep penetration into the older oceanic crust may provide clues to its mineral character and the nature of ancient oceans.

Geology Ma Many Op

There are man ties open to the pe geology at BSU, s official school pape University.

This is due lar that geology major devoted to strictly may expand their learn by particip projects. Currently ty research projec ranging from stu energy to seeking ter pollution. Ther dents presently fe who are working jects.

Dr. Kenneth Ho gy department that, in many in geology majors fr ferred over geol larger, more wel ties. This is main research projects participate in. "Th able to understar expected of them ate and can hav perience behind t Dr. Hollenbaugh.

Also, the job women are excelle not at all uncomm in the field of this year, there ar men majoring in t

For those perso cial assistance, a larships ranging awarded to deser jors.

Japanese S Cheaper Th

Five of the larg bia mining firms, Placer, Bethlehem by Mining have study concluding ting and refining not be feasible o the province for at years.

The upshot, ac Week, a trade p tinuing exports o Japan for process increasing Japan ting charges. Rea mism: The five copper smelting a tish Columbia to cents per pound t milling costs, whi cents to let the

PLAN NOW TO ATTE

Jim Hunter - mgr - on stream July 1975
— $170M - May 74

Gordon Craig - milling - gen plant supt
8500 gpm

ARIZONA SECTION

6000 x 2500 - 3000 x 450 2000

Society of Mining Engineers
Underground Mining Division
Spring Meeting

May 18, 1974

Rock Camp - 130° ?

70 mile mine
100 surface

PROGRAM

Hazen - bench work
Parsons Turden

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

Jim Quinlan - geol

LAKESHORE MINE

HECLA MINING COMPANY

Dan Munter - geol
Craig Hansen - " oxide body 80' thick

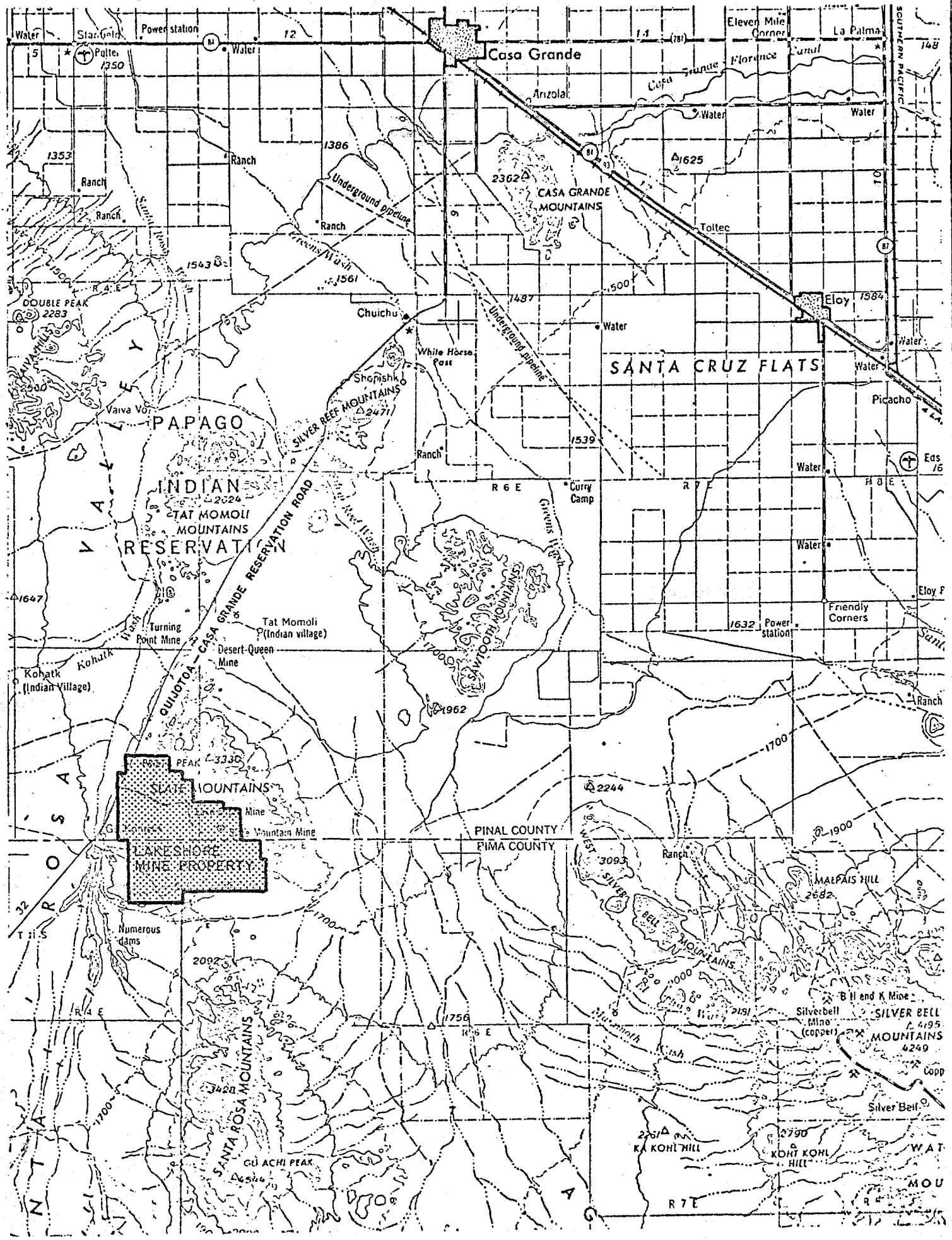
15,600 tpd - 9,150 sul (1.5%) 6450 oxide (1.4%).
oxide ore formed from cc zone - ≠ 100' thick

L A K E S H O R E

AT A GLANCE

Open pit 67 years
10,000' displ on Lakeshore Fault

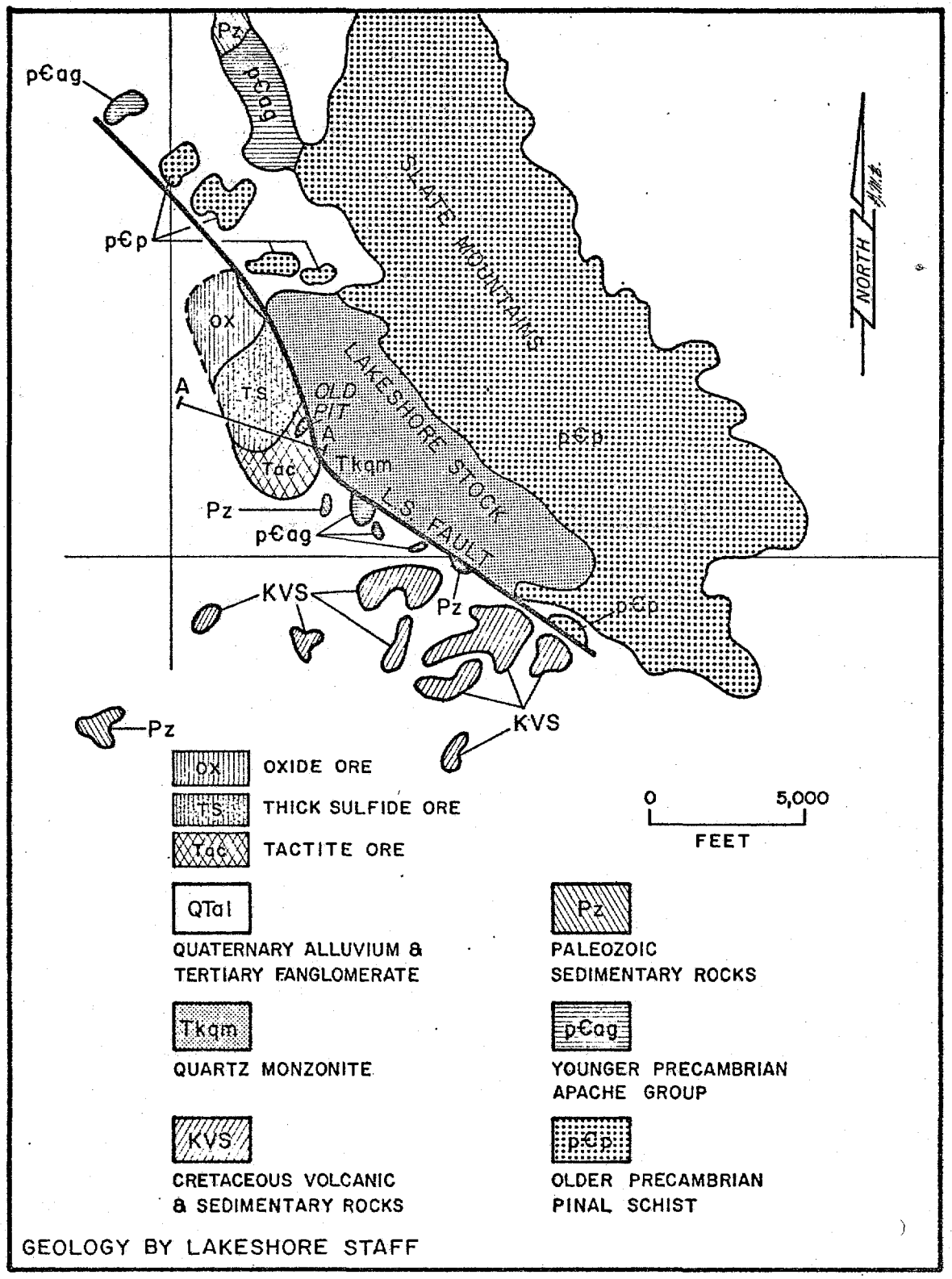
Location:	Slate Mountains 28 miles south-southwest of Casa Grande, Arizona 70 miles south of Phoenix, and 60 miles northwest of Tucson.
Elevation:	1900 feet above sea level
Ecosystem:	Typical Sonoran Desert
Temperature Range: (1970 - 1973 records)	22° F Low 116° F High
Annual Precipitation:	8 inches
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



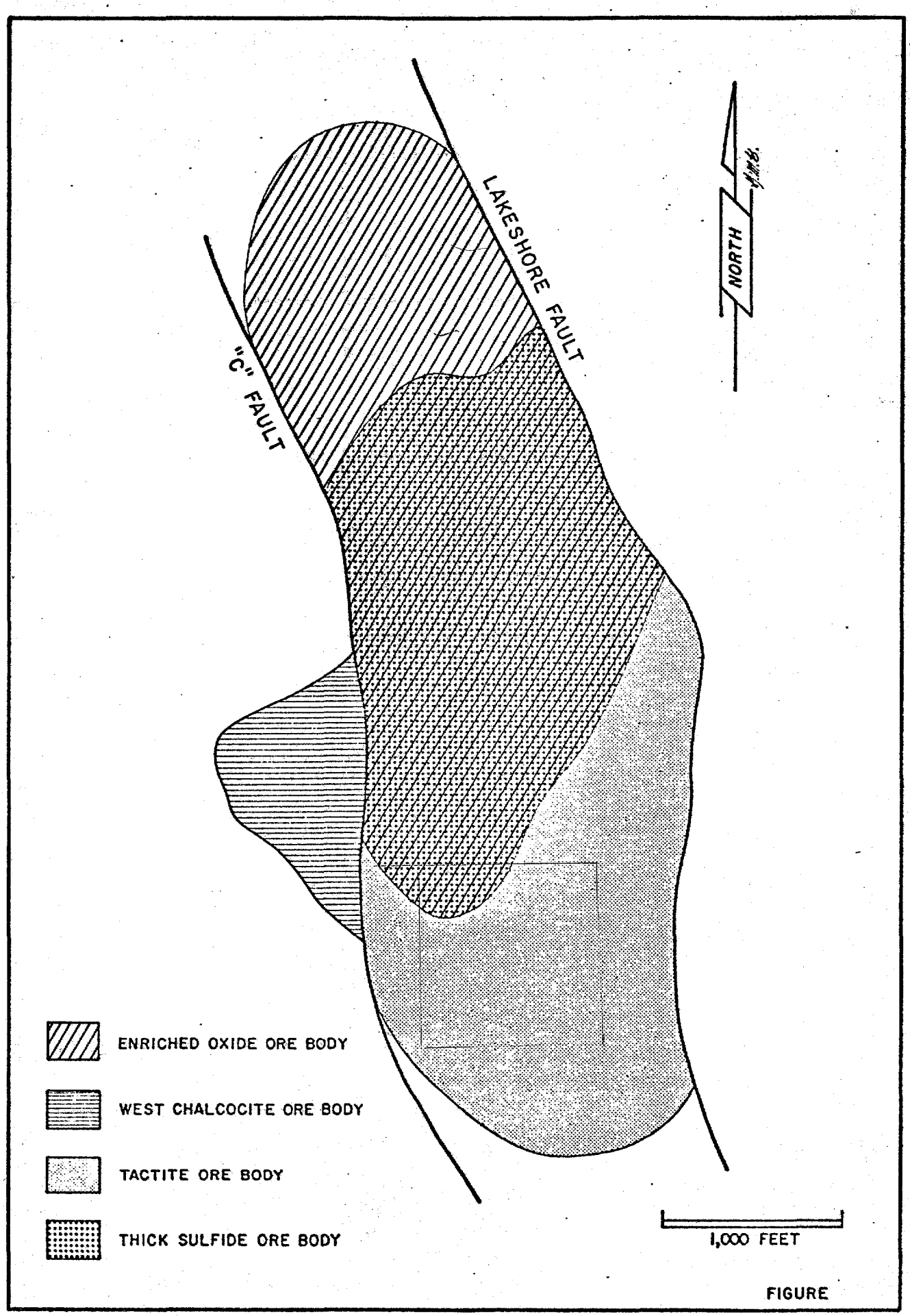
INDEX MAP SHOWING LOCATION OF LAKESHORE MINE PROPERTY

SCALE: 1" = 4 miles

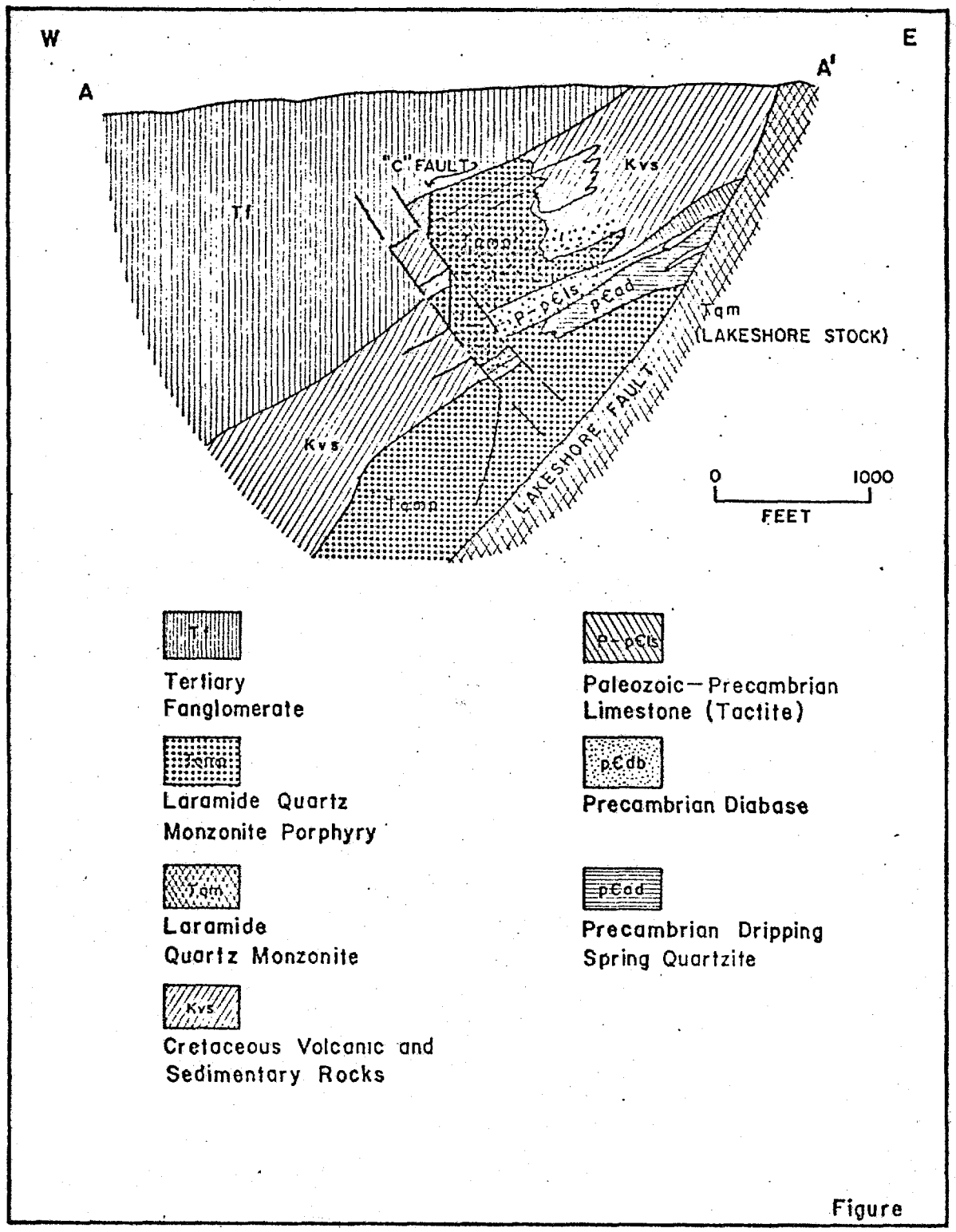
Fig. 1



SURFACE GEOLOGY, LAKESHORE MINING AREA

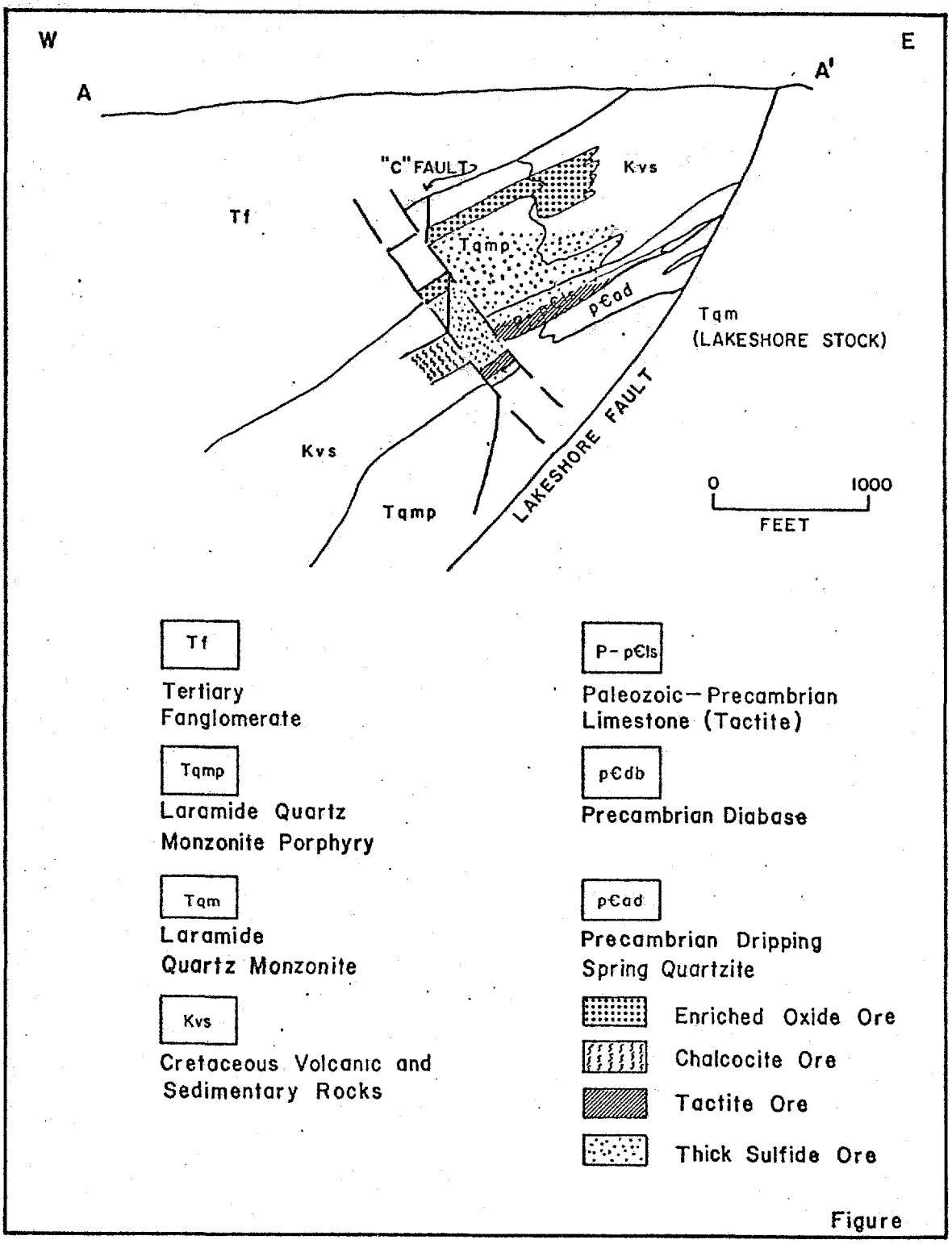


GENERALIZED COMPOSITE ECONOMIC PLAN: LAKESHORE ORE BODY

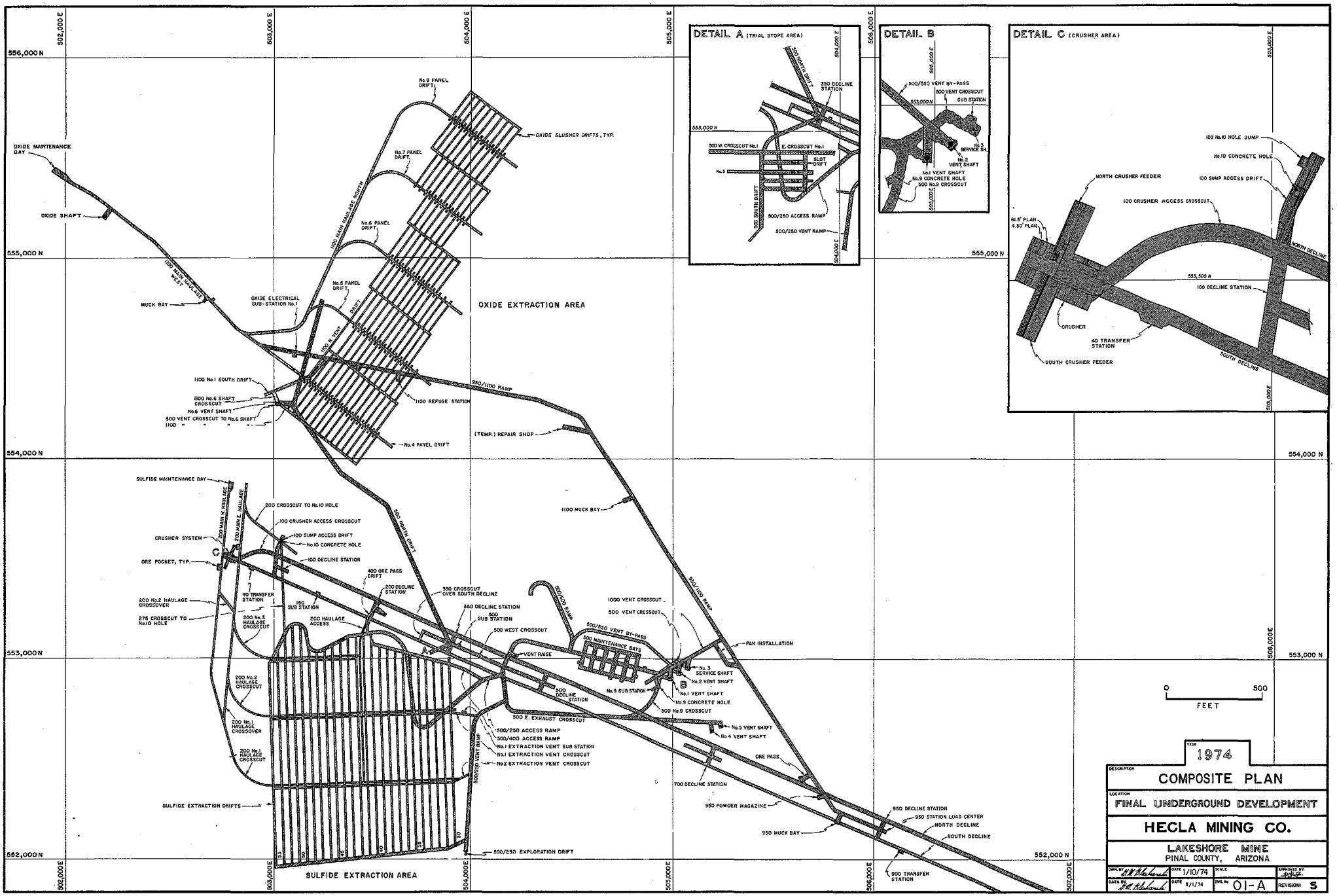


Figure

GENERALIZED GEOLOGIC CROSS SECTION, LAKESHORE MINE, ARIZONA



GENERALIZED ECONOMIC CROSS SECTION, LAKESHORE MINE, ARIZONA



YEAR 1974

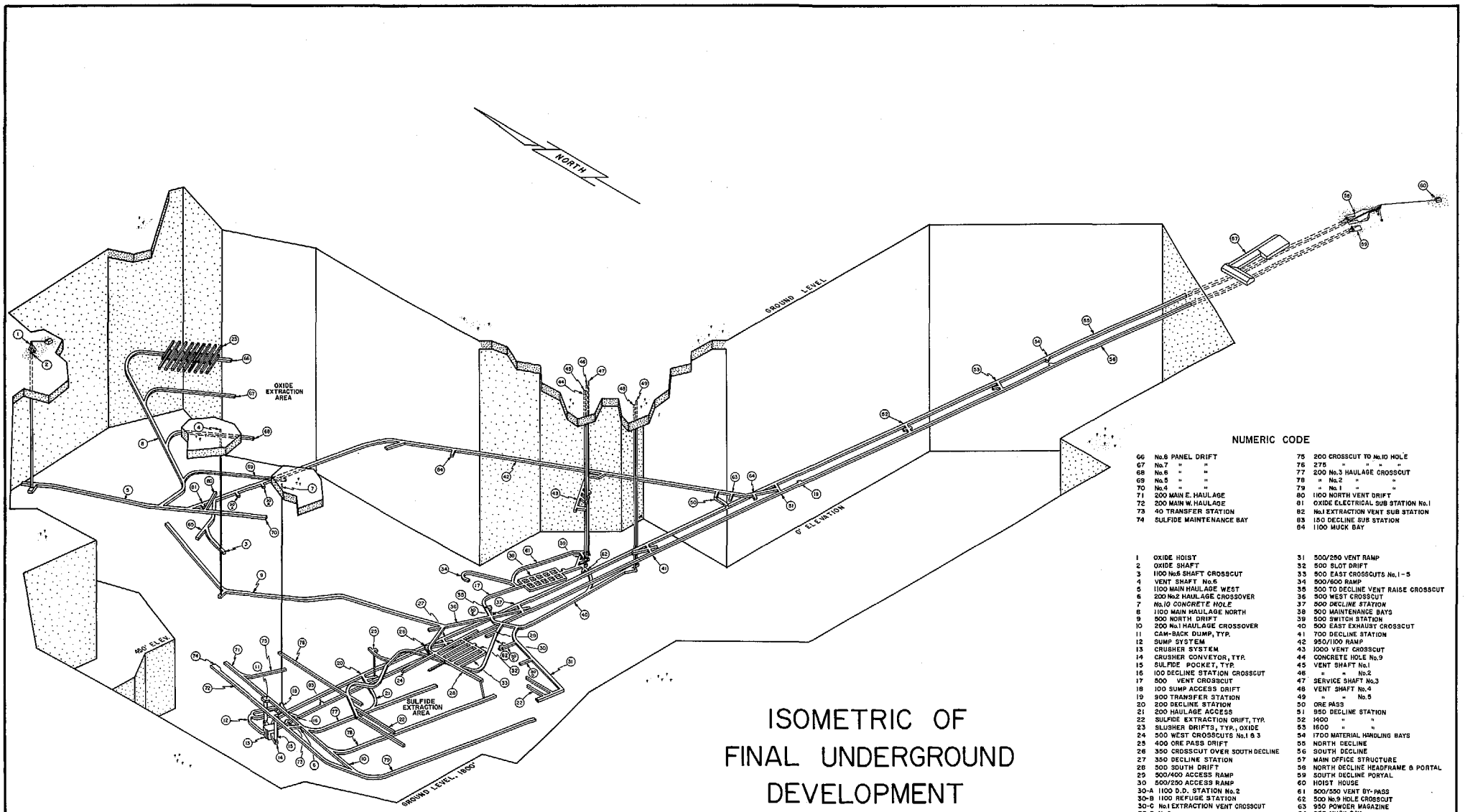
DESCRIPTION: COMPOSITE PLAN

LOCATION: FINAL UNDERGROUND DEVELOPMENT

HECLA MINING CO.

LAKESHORE MINE
PINAL COUNTY, ARIZONA

DWN. BY	DATE 1/10/74	SCALE	APPROVED BY
DATA BY	DATE 5/1/74	DWG. No. 01-A	REVISION: S



ISOMETRIC OF FINAL UNDERGROUND DEVELOPMENT

HECLA MINING COMPANY

LAKESHORE MINE

DWG. BY: *J. M. Blackwell* 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.5 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	500 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 POCKET, 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 PORYAL
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

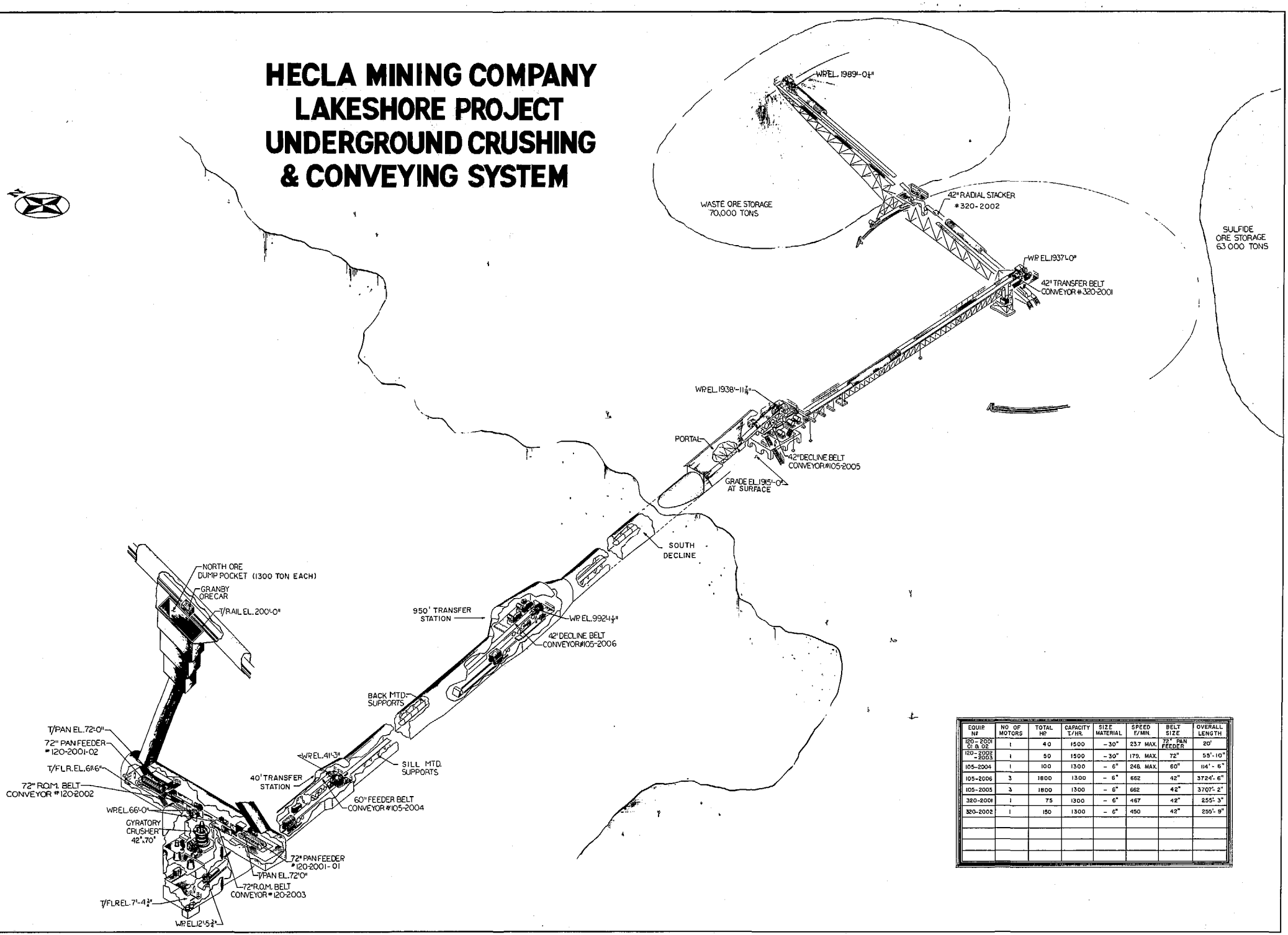
COLOR CODE

735	DECLINES, DECLINE STATIONS & SUMP SYSTEM
745	500 LEVEL DEVELOPMENT
738.5	1100 " "
740.5	ORE HANDLING SYSTEM
737	VENT SHAFTS & RAISES

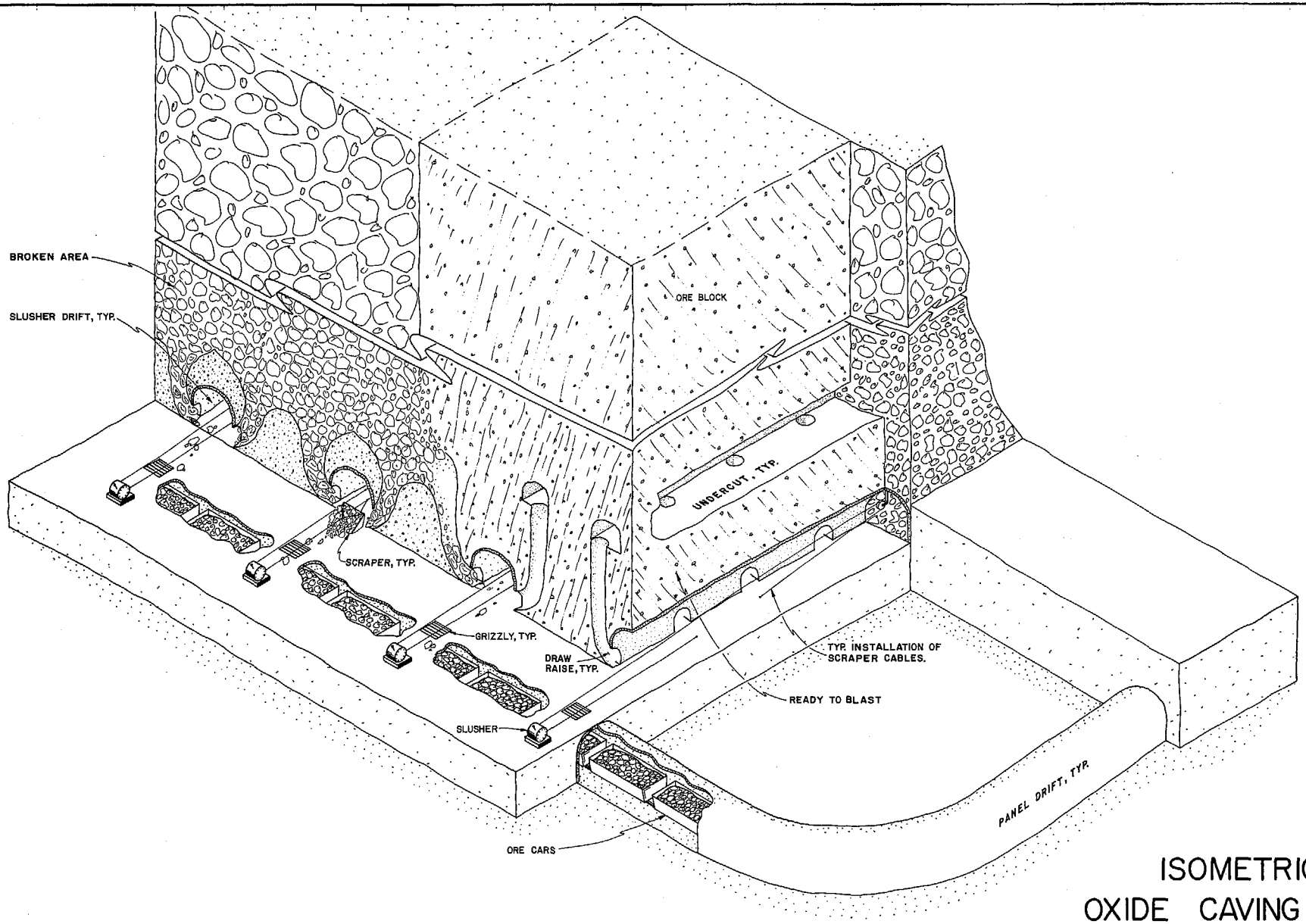
REV. L 1/29/74

DWG. No: 002-B

HECLA MINING COMPANY
LAKESHORE PROJECT
UNDERGROUND CRUSHING & CONVEYING SYSTEM



EQUIP Nº	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"

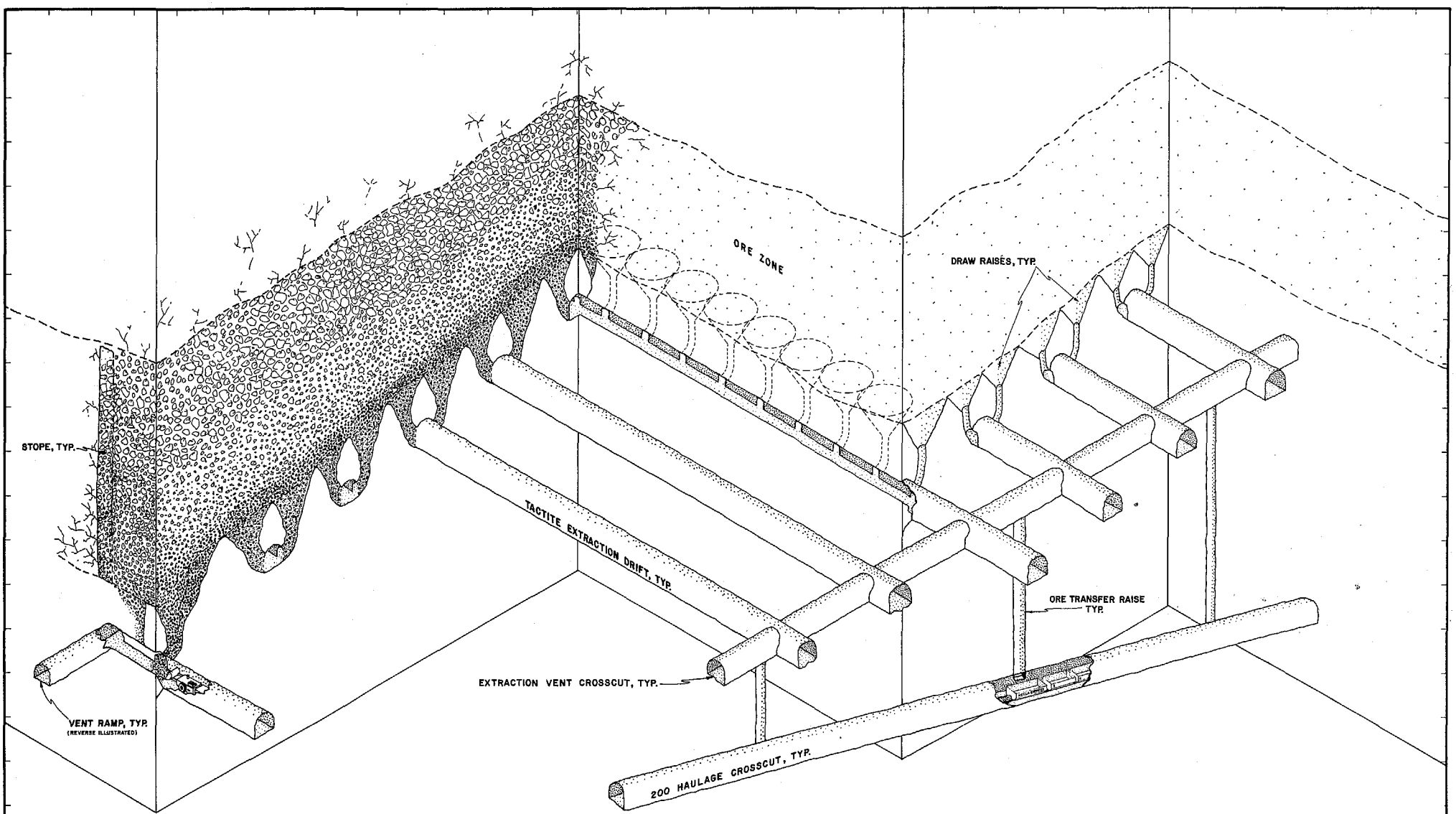


ISOMETRIC OF OXIDE CAVING SYSTEM

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

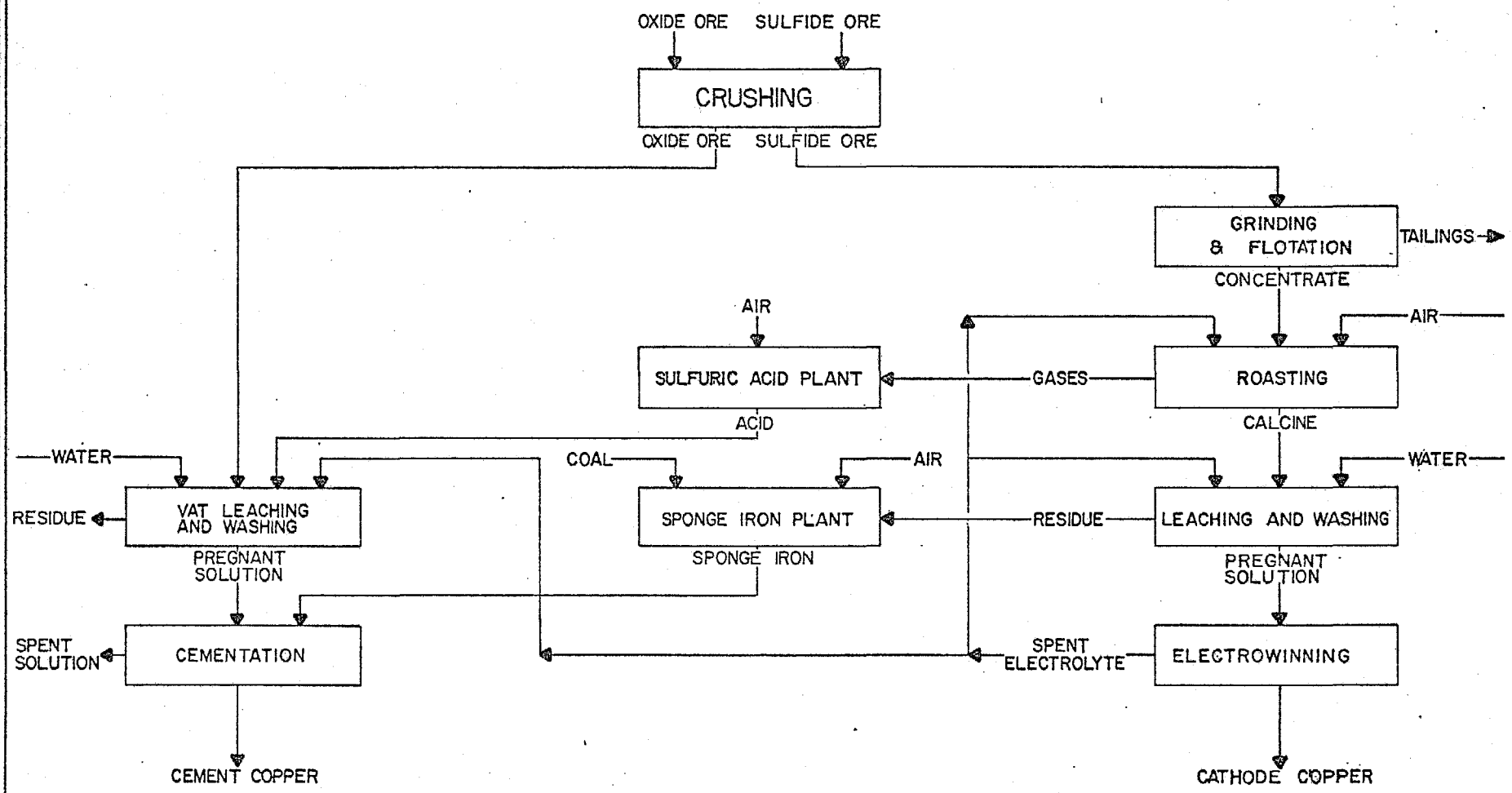
DWG. BY: J.M. Stachowski DATE: 4/23/74

DWG. 04-B

PROPOSED PLANT SURFACE FACILITIES

HECLA MINING COMPANY
LAKESHORE MINE
CASA GRANDE, ARIZONA

Lakeshore Project
Plant Flowsheet



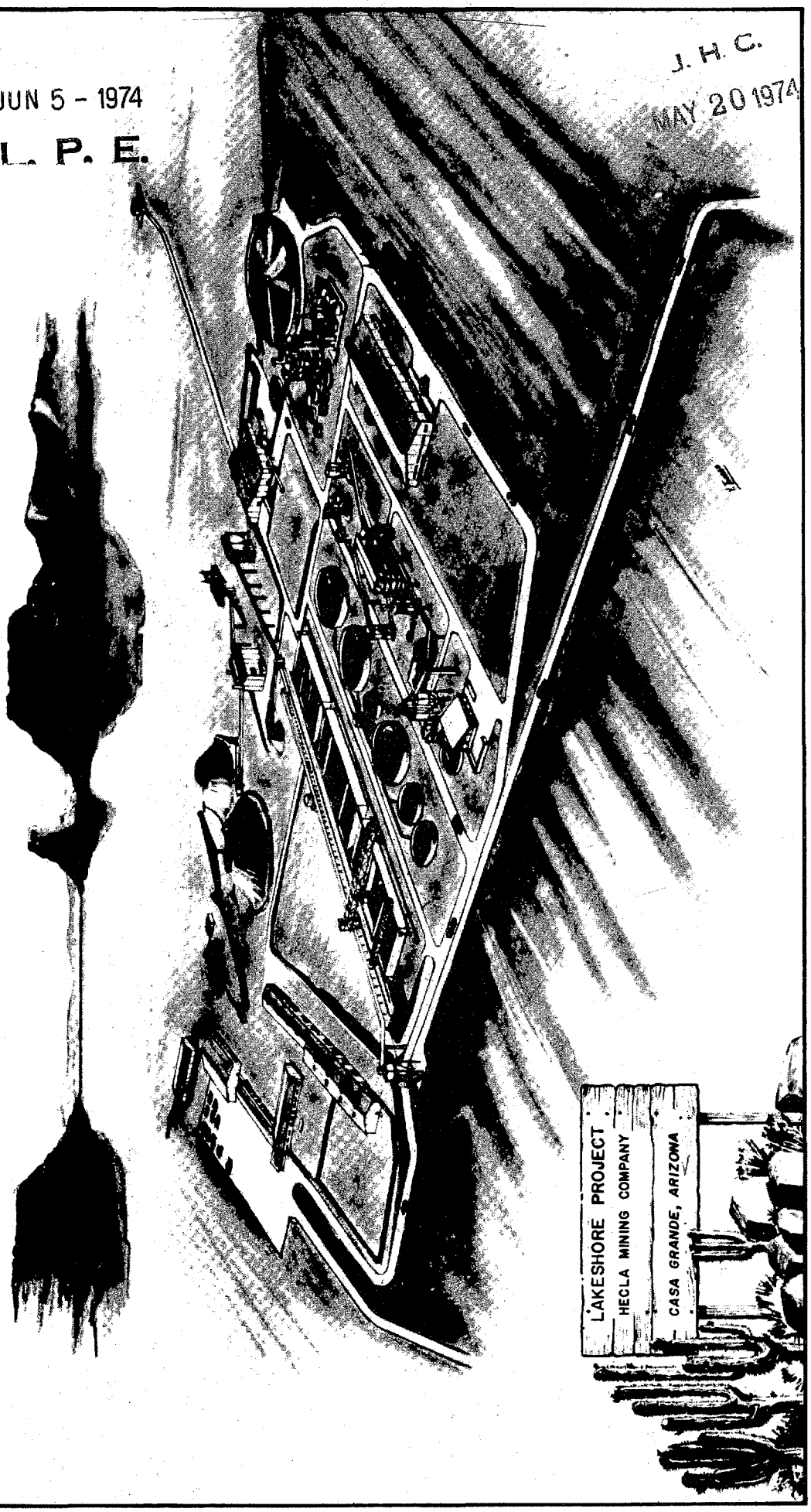
Lakeshore Mine file ~~LPE~~ J.H. Courtright

JUN 5 - 1974

L. P. E.

J. H. C.

MAY 20 1974



Lakeshore 1-2-69

Block Cave

138 mil at .87% Cu (.50) cutoff
Thickness - 544' (ranging from 156' to 976

Sulphides minus Tactites - 119 mil at .80% Cu

Oxide zone (overlying block cave area)
82 mil at .90% Cu (up graded from .76
.40 cutoff
Capital 92 million - op cost 2.95/Ton
includes development

Open Pit

Ree 70% - Oxide - 100 mil @ .90% Cu W/O 3:1
" 88% - Sulph - 200 " @ .81% Cu W/O 5:1

Oxide | mining cost - $.25 / Ton ($1.00)
Leach precip - $2.10 / Ton

Sulph | mining - $.25 - ($1.50)
milling $.85
indirect + OH .60
3.15

Capital - oxide - cement Cu 62 mil
" electro 73
Sul Cu con 60
UG " " 86

AMERICAN SMELTING AND REFINING COMPANY
ROCKY MOUNTAIN EXPLORATION DIVISION
1805 SOUTH BELLAIRE STREET. DENVER. COLORADO 80222

RECEIVED
JAN 24 1974
EXPLORATION DEPT.

STEPHEN VON FAY
SUPERVISOR

January 22, 1974

TELEPHONE 303-757-5107

J. H. C.
JAN 24 1974

Mr. J.H. Courtright
Chief Geologist
American Smelting and Refining Company
P.O. Box 5747
Tucson, Arizona 85703

file

Lakeshore Mine
Pinal County, Arizona

Dear Sir:

I am sending you a copy of a file memorandum by Mr. Beverly on a talk given here in Denver on Lakeshore.

The size (length) now appears to be substantially larger than the size given in your memorandum of January 2, 1969 (not attached).

On their sections they show a substantial chalcocite blanket deeper to the west, and not bounded downdip; bottoming on a fault, and dropped into that position from originally above the oxides. They think of the oxides as oxidation in place of the bottom portion of the chalcocite blanket occurring downfault to the west. It would appear that they are already thinking in terms of expanding size of the operation.

Very truly yours,

Stephen Von Fay

Stephen Von Fay

SVF:djl
cc. W.L. Kurtz

AMERICAN SMELTING AND REFINING COMPANY
Denver Colorado

January 21, 1974

FILE MEMORANDUM

Hecla's Lakeshore Mine
Pinal County, Arizona

Jim Quinlen, Hecla Mining Company's chief geologist for the Lakeshore Project presented a summary of the project to approximately 100 people at last night's Colorado Section-A.I.M.E. dinner meeting. The project is a joint venture with El Paso Natural Gas Company.

The geology of the copper deposit is best described by the attached J.H. Courtright memo dated January 2, 1969. Suffice it to say the alteration at the mine is the least understood aspect, yet they recognize a potassic center with chalcopyrite-molybdenite-quartz veinlets with some potash feldspar and biotite in the disseminated portion of the deposit. It is believed that abundant biotite veinlets in the surrounding sediments also reflects a potassic alteration event. The entire deposit is bounded by steeply dipping northerly basin and range faults and major flat faults along bedding planes. The largest displacement is 10,000 ft. along the northwesterly trending Lakeshore fault. This fault is also the economic boundary on the east side of the orebody. The fault cuts weakly altered and mineralized monzonite and thus the interpretation presented was that the orebody in the down-faulted block to the west is probably the mineralized cupola portion of the monzonite stock to the east.

The mineralization occurs as four different types in overlapping zones and thus requires a very complex approach to underground mining. The entire orebody is 6,000 ft. long and 1,500 ft.-2.500 ft. wide. It has a deep central core of "disseminated" chalcopyrite and molybdenite (.01-.03% Mo) which will be mined last. The grades in this thick, ±800 ft. portion average ±.85% Cu. There is a moderately deep southeastern portion of diopside tactite with chalcopyrite and magnetite mineralization that ranges up to 150 ft. thick and averages ±1.8% Cu that will be mined at 9,600 TPD. There is also a large (up to 500 ft. thick) oxide copper cap that averages 1.5% Cu on the west and north side of the deposit which also overlies the disseminated sulphide ore. Southwesterly and deeper from this lies a large, thick, faulted

and thus preserved chalcocite blanket of ±.8% Cu. The limits of this chalcocite ore have not been bounded toward the south and west. The oxide copper ore will be mined at 6,000 TPD simultaneously with the high-grade tactite ore. Sulfuric acid produced in the processing of the tactite ore plus the magnetite or iron residue will be used to recover copper from the oxide ore in the leach process with a copper cement concentrate. Gold and silver also will be recovered in this process. It was not stated which portion of the orebody contained the most gold and silver.

The mine is scheduled to be in full production by early 1975. The ten vats that will handle the oxide-leach ore have been completed. The mill that will process the tactite ore is now under construction. Two declines are almost completed and a third shaft is under construction. Rubber tired equipment is used to handle some of the development muck but most of the ore will be transported via train, crushed underground and carried to the surface on a conveyor belt. The block caving operation will be initiated via a panel drifting method and the oxide and tactite orebodies will be mined prior to extracting the chalcocite blanket and disseminated sulphide (chalcopyrite) ore. The present mill tonnage capacity may be expanded at a later date.

C.E. Beverly

C.E. Beverly

JHC

J. C.

JUN 12 1972

JASA Grande
6-7-72

File: Lakeshore

JHC

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.

April 20, 1972

APR 27 1972

file

FILE MEMORANDUM:

Age-Dates
Lakeshore Deposit
Pinal County, Arizona

During a quick visit to Lakeshore on April 18th with J. J. Collins and W. L. Kurtz, we learned that at least four potassium-argon dates have been determined at Lakeshore.

Granite, biotite, 67 m.y. (exposed at surface on east side).
Porphyry, biotite, 67 m.y. (underground; grades into granite).
Porphyry, sericite, 63 m.y. (mineralization in ore body).
Trachyandesite, 24 m.y. (interbed in base of fanglomerate overlying oxide ore).

James D. Sell

James D. Sell

JDS:lad

Casa Grande Dispatch
May 5, 1969

J.H. Courtright

J.H.C.
MAY 8 1969

CASA GRANDE DISPATCH
April 23, 1969

J.H.C
APR 28 1969

File Lakeshore

J.H.C.

From APR 23 1969

JHC copy

Pls Note Noted
RBW
ACH
KvdS
WB
JEC
TS
RFW
Return to
U.S.

HECLA MINING COMPANY
Wallace, Idaho

MR. RFW
READ AND RETURN ✓
PREPARE ANSWERS ____ HANDLE ____
FILE ____ INITIALS ____

April 21, 1969

To the Stockholders:

The Annual Meeting of the Hecla Shareholders will be held in the Ballroom of the Ridpath Motor Inn in Spokane, Washington on May 29, 1969 at 9 a.m., Pacific Daylight Saving Time. You are cordially invited to attend.

In addition to the election of Directors and approval of selection of auditors, you will be asked at this important meeting to approve an important proposal. This proposal involves agreements pursuant to which Hecla would acquire an undivided one-half interest in certain mining claims and mineral leases located about 30 miles south of Casa Grande, Arizona and would develop the properties under an operating agreement with El Paso Natural Gas Company. El Paso would own the other undivided one-half interest. You are referred to the accompanying Proxy Statement for details with respect to these agreements, which were approved by your Board of Directors with only one dissenting vote, and which you are urged to read carefully.

Management believes that the acquisition of these Properties, which contain a recently discovered copper deposit which is among the largest ever found within the United States, offers the prospect of being of very substantial benefit to Hecla. The Board of Directors recommends that you vote in favor of this proposal.

IT IS THEREFORE IMPORTANT THAT YOUR SHARES BE REPRESENTED AT THIS MEETING AND WE STRONGLY URGE YOU TO COMPLETE AND RETURN THE ENCLOSED PROXY PROMPTLY.

L. J. Randall
Chairman of the Board

W. H. Love
President

HECLA MINING COMPANY

Wallace, Idaho

NOTICE OF ANNUAL MEETING

To the Shareholders of
HECLA MINING COMPANY:

NOTICE IS HEREBY GIVEN, that the Annual Meeting of Shareholders of Hecla Mining Company has been called and will be held in the Ballroom of the Ridpath Motor Inn in the City of Spokane, State of Washington, on Thursday, the twenty-ninth day of May, 1969, at the hour of 9:00 o'clock a.m. (Pacific Daylight Time) on said day for the following purposes:

(1) The election of Directors of the Company to serve until the next Annual Meeting of the Company or until their respective successors are elected and have qualified,

(2) The approval of agreements under which Hecla Mining Company will:

(i) Acquire substantially all of the assets of Transarizona Resources, Inc., which consist of an undivided one-half interest in certain patented and unpatented mining claims and mineral leases together with an undivided one-half interest in a milling plant, all known as the Lakeshore Properties containing a large recently discovered copper deposit located about 30 miles south of Casa Grande, Arizona, for 1,000,000 shares of the authorized but unissued capital stock of Hecla Mining Company; and

(ii) Acquire the remaining undivided one-half interest in the Lakeshore milling plant owned by El Paso Natural Gas Company for $1,500,000 cash; and

(iii) Enter into an Operating Agreement with El Paso Natural Gas Company under which Hecla will be designated as operator of the Lakeshore Properties, in which El Paso Natural Gas Company owns the remaining undivided one-half interest,

(3) The approval of the selection of Messrs. Lybrand, Ross Bros. & Montgomery, New York City, as auditors for 1969,

all as more fully described in accompanying proxy statement.

In accordance with the By-Laws, the close of business on April 11, 1969, has been fixed as the record date for the determination of the stockholders entitled to notice of and to vote at the said meeting and at any adjournment thereof. The stock transfer books will not be closed.

BY ORDER OF THE BOARD OF DIRECTORS

WILLIAM J. GRISMER
Secretary

April 21, 1969

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PROXY STATEMENT

This statement is furnished by the management of Hecla Mining Company ("Hecla") in connection with the solicitation of proxies to be used at the Annual Meeting of Shareholders of Hecla to be held on Thursday, May 29, 1969, at Spokane, Washington, for the purpose of electing directors for the ensuing year, approving the acquisition by Hecla of an interest in certain copper properties located in Pinal County, Arizona (the "Lakeshore Properties") currently owned or leased by El Paso Natural Gas Company ("El Paso") and one of its subsidiaries, Transarizona Resources, Inc. ("Transarizona"), and ratifying the appointment of Lybrand, Ross Bros. & Montgomery as independent auditors of Hecla for the year 1969.

NOMINEES FOR BOARD OF DIRECTORS

The proxies named in the accompanying proxy intend to vote proxies at the Annual Meeting for the following nominees for election to the Hecla Board of Directors or for a substitute for any of said nominees who for some reason not now known may not be a candidate for election:

Name and Principal Occupation	Year in Which First Became Director	Capital Stock Owned Beneficially Directly or Indirectly as of March 5, 1969
ROBERT B. FULTON, Vice President, Exploration, Newmont Mining Corporation, New York, New York	1968	None(a)
HORTON HERMAN, partner in Paine, Lowe, Coffin, Herman and O'Kelly, attorneys at law, Spokane, Washington	1966	300 Shares
RICHARD N. HUNT, formerly Director, Vice President and Chief Geologist of U. S. Smelting, Refining & Mining Company, Salt Lake City, Utah (Retired); Vice President of Hecla Mining Company	1954	1,000 Shares
KENNETH LIEBER, Director and Senior Vice President of Cyprus Mines Corporation, Los Angeles, California	1967	400 Shares
W. H. LOVE, President and General Manager of Hecla Mining Company, Wallace, Idaho	1960	15,000 Shares
L. J. RANDALL, Chairman of the Board and Chief Executive Officer of Hecla Mining Company, Wallace, Idaho	1951	12,000 Shares
H. R. SHORT, Investor (Retired), Moscow, Idaho	(b)	54,300 Shares(b)

NOTE:

(a) Mr. Fulton was elected a Director of the Company on July 25, 1968 to fill a vacancy caused by the resignation of Mr. John E. D. Grunow. Mr. Fulton has been employed for more than the past five years by Newmont Mining Corporation.

(b) Includes 30,000 shares owned beneficially by Mrs. H. R. Short. Other members of Mr. Short's family own an additional 17,800 shares. Mr. Short has been proposed for nomination as a director to replace Mr. H. F. Magnuson. Mr. Short has been retired for more than the past five years.

The foregoing statement as to securities of the Company beneficially owned as of March 5, 1969 is based upon information furnished by each Director.

OUTSTANDING STOCK

Hecla Mining Company has an authorized capitalization of 6,000,000 shares of capital stock, par value $.25 per share, of which 4,957,575 shares were issued and outstanding as of April 11, 1969. Golconda Mining Corporation, of which H. F. Magnuson is a Vice President and Director, owned beneficially 661,900 shares, or 13.3%, of Hecla's capital stock as of March 5, 1969. As of such date, no other person owned of record or, to the knowledge of Hecla, beneficially, more than 10% of the issued and outstanding capital stock of Hecla.

Each share held of record as of the close of business on April 11, 1969, is entitled to one vote with respect to each matter to be acted upon. Holders of Hecla shares do not have cumulative voting rights in connection with the election of the directors nor do they have dissenter's rights in connection with the proposed El Paso transaction.

REMUNERATION OF DIRECTORS AND OFFICERS

Name of Individual	Capacities In Which Remuneration Was Received	Aggregate Remuneration	Estimated Annual Benefits Upon Retirement
L. J. RANDALL	Chairman of the Board and Director	$ 58,333	$ 13,199
W. H. LOVE	President, General Manager and Director	$ 51,667	$ 15,000
All Directors and Officers as a group (10 persons)		$205,817	$ 57,728

No additional stock options have been granted under the Hecla Mining Company Qualified Stock Option Plan of 1964 since January 1, 1968. Since such date, the following options have been exercised by officers of the Company:

Name	Number of Shares(1)	Option Price(1)	Market Price
L. J. RANDALL	None		
W. H. LOVE	None		
All other officers	4,700	$12.00 – $18.91	$31.81 – $39.06

As of this date the following officers hold options to purchase capital stock of the Company under the terms and conditions of the Qualified Stock Option Plan of 1964:

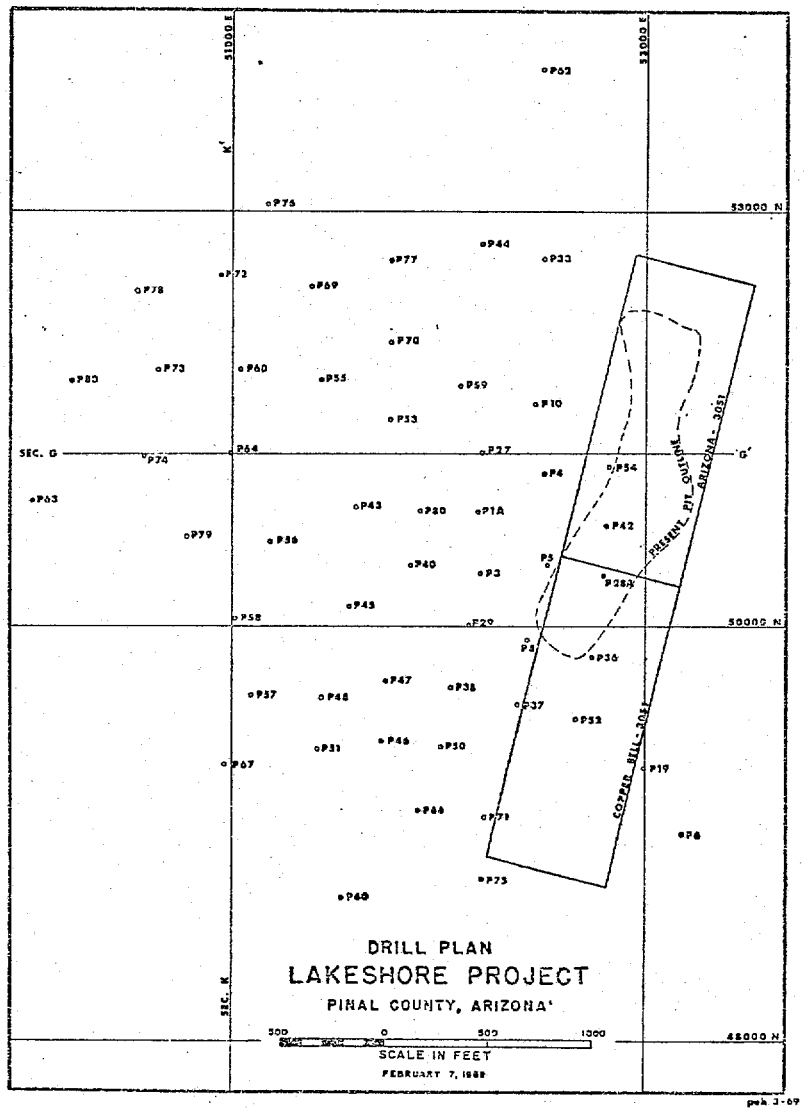
Name	Number of Shares(1)	Option Price(1)
L. J. RANDALL	4,000	$18.91
W. H. LOVE	4,000	$18.91
All other officers	3,900	$18.91

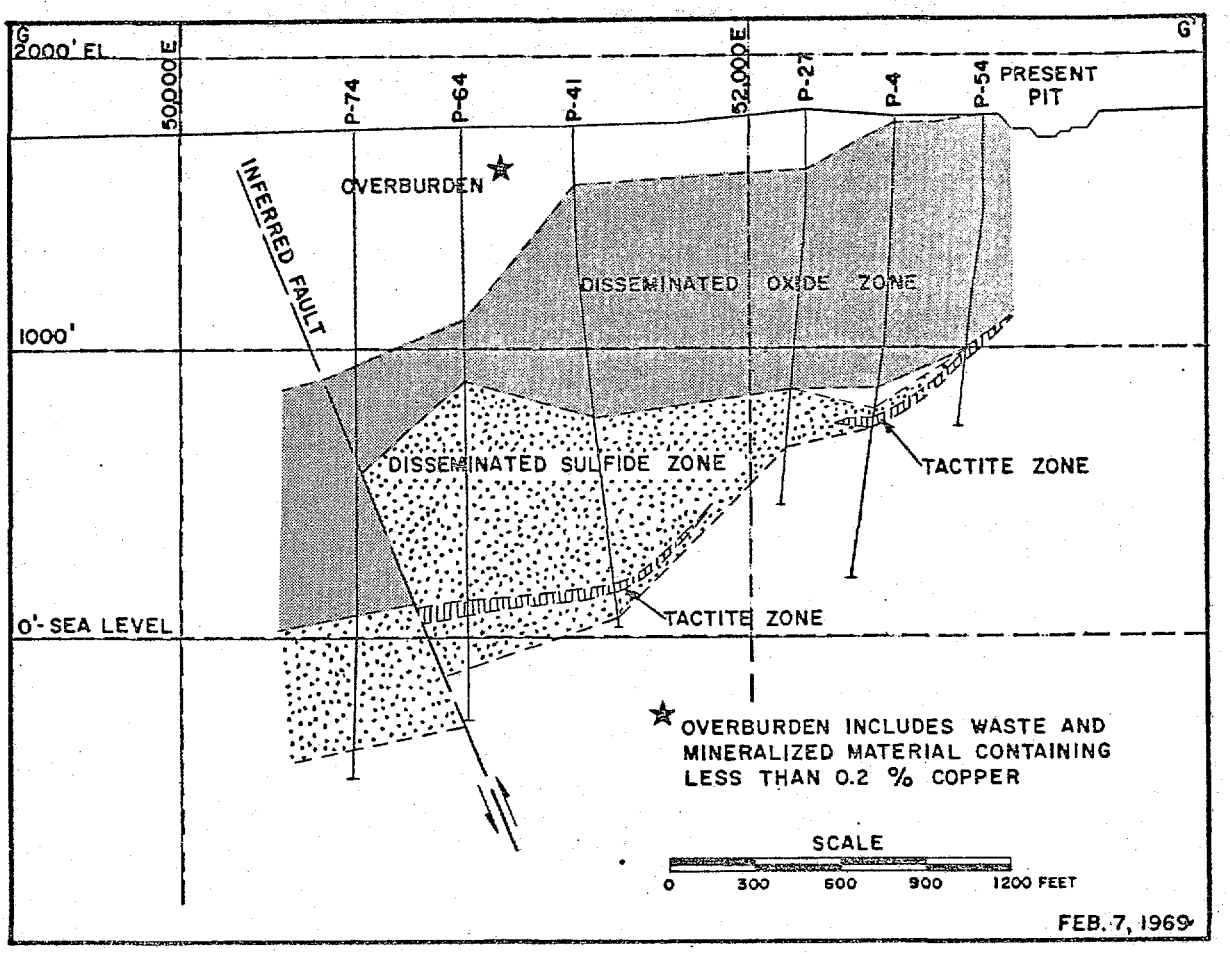
(1) The number of shares and the option price therefor reflect required adjustment for one-for-one stock distribution made June 7, 1968.

LAKESHORE DEPOSIT

The Company's planned operations relate to the Lakeshore copper deposit. It consists of three zones of mineralization, the uppermost being designated as the Disseminated Oxide Zone, the second being the Disseminated Sulfide Zone and the lowest being the Tactite Zone.

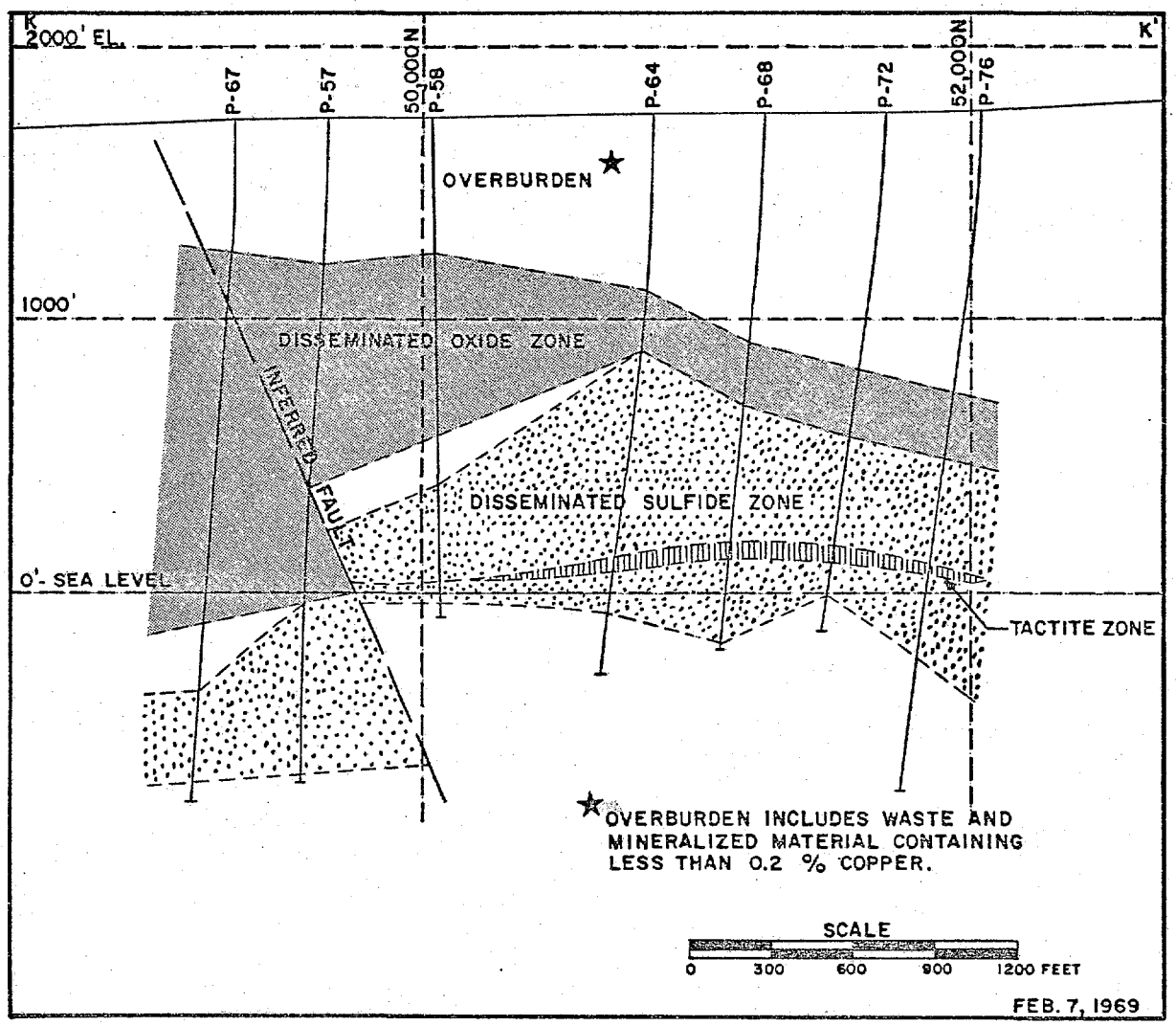
The Lakeshore copper deposit has been explored to February 7, 1969 by 53 drill holes consisting of a total of 42,000 feet of rotary and 49,000 feet of diamond drilling. Location of holes drilled in the deposit are shown on the following map. See also the accompanying sections G-G′ and K-K′ which indicate, from interpretations of drill core analysis, what Hecla's geologists believe to be the relationships among the three zones.





SECTION G-G', LAKESHORE PROJECT, PINAL CO., ARIZONA

THIS SECTIONAL DRAWING IS ILLUSTRATIVE ONLY AND IS BASED UPON AN INTERPRETATION OF DRILL HOLE DATA LOOKING NORTH.



SECTION K-K', LAKESHORE PROJECT, PINAL CO., ARIZONA

THIS SECTIONAL DRAWING IS ILLUSTRATIVE ONLY AND IS BASED UPON AN INTERPRETATION OF DRILL HOLE DATA LOOKING WEST.

The drilling program has resulted in the following disclosures:

1. The Disseminated Oxide Zone is found from the surface to depths of more than 1000 feet at an average depth of about 500 feet, and with an average thickness of about 550 feet in andesite and porphyry rocks. Mining of this zone would require copper recovery by the leaching method.

2. The Disseminated Sulfide Zone is found immediately below the oxide zone, with an average thickness of about 500 feet, and is also contained in andesite and porphyry rocks. Mining of this zone would require ore treatment by conventional milling operations.

3. The Tactite Zone of higher-grade copper sulfide content lies below a substantial portion of the sulfide mineralization referred to in (2) above, and occurs in altered sedimentary rocks. Its average thickness is 63 feet. Mining of this zone would require ore treatment by conventional milling operations.

Drilling is continuing on the property with five drill rigs in use, and the deposit is still "open" in the north and west direction.

The above mineralized deposits will be discussed in reverse order as follows:

Tactite Zone

Drilling to February 7, 1969 indicates 23,600,000 tons of tactite ore reserves averaging 1.69% copper, before making any allowance for an appreciable tonnage which would not be recovered by presently conceived underground mining plans. These reserves were delineated by drilling.

Initial plans call for sinking a vertical shaft near the center of the Lakeshore mineralized deposit, from which openings will be driven into the tactite ore zone. It is estimated that approximately four years will be required to bring the tactite ore body into production.

The Disseminated Oxide and Disseminated Sulfide Zones

Drilling to February 7, 1969 gives the basis for estimating that the Disseminated Sulfide Zone contains 241,000,000 tons of disseminated sulfide mineralization averaging 0.70% copper. This zone is in turn overlain by the Disseminated Oxide Zone which is estimated to contain 207,000,000 tons of disseminated oxidized copper mineralization of an average grade of 0.71% copper. As stated above, the outer boundaries of these zones have not been delineated on the north or the west side. The above grades are based on assay for total copper content only, without segregated analysis for copper in oxide form and for copper in sulfide form.

Limited studies regarding treatment of the oxide mineralization have given encouraging results. Final determination of the feasibility of mining and treating the oxide copper mineralization awaits further testing on drillhole samples, and on bulk samples obtained from underground work which is planned in conjunction with the development of the tactite ore, as mentioned above.

If results of such further drilling and metallurgical analysis confirm that the Disseminated Oxide Zone can be mined at a profit, such zone and the underlying Disseminated Sulfide Zone will be mined by the open-pit method. Alternatively, the Disseminated Sulfide Zone and the Tactite Zone may be mined through underground operations by block-caving. The shaft to be sunk to mine the tactite ore, and other mine workings from it, will be used to sample and determine the economic mineability of the Disseminated Sulfide Zone. Deposits of this type generally lend themselves to economic mining operations.

General Operating Plan

Initial efforts will be concentrated on preparation of the Tactite Zone for production, accompanied by expenditures for work in the Disseminated Oxide and Sulfide Zones to obtain bulk samples from various parts of the deposit to allow further metallurgical testing, and other testing and analysis. Management is of the opinion that Hecla will be able to finance the development and the preproduction costs of the tactite ore body without outside financing.

If further study proves that the Disseminated Oxide Zone can be mined economically, a substantial expenditure, which would require outside financing, would be needed to provide for open-pit mining equipment, an enlarged surface plant, removal of overburden, and for a refinery and heap-leach plant and equipment to treat the oxidized ore. Hecla has reviewed the availability of such outside financing with Chase Manhattan Bank (National Association) and has supplied such bank with data as to Hecla's operating plan and the economics of such operating plan as they exist to date. Chase Manhattan Bank (National Association) has advised Hecla that such bank believes, based upon its initial verification of such data, that debt financing, if required, can reasonably be expected to be obtainable from commercial banking sources.

Sample and metallurgical test data are adequate for a firm commitment to build a flotation concentrator for treatment of the Tactite Zone ore. A conventional sulfide flotation concentrator is planned with a capacity to process 8,000 tons of underground Tactite Zone ore per day (2,880,000 tons per year). The concentrator could be later expanded to treat ore from the Disseminated Sulfide Zone. Contingent upon final plans for oxidized ore treatment, this concentrator would include a pyrite flotation concentrate production circuit, the concentrate being used to produce sulfuric acid and sponge iron. It may also include a magnetic concentration circuit to produce a magnetite concentrate for use in the manufacture of sponge iron. Further studies are required to determine the most beneficial treatment of the copper concentrates, with particular attention to the manner in which the treatment will integrate with processing of the oxidized ore. At present, use of hydrometallurgical treatment of the sulfide concentrates appears most favorable.

With this approach, copper concentrates and pyrite concentrates would be roasted, with roaster gases used to manufacture sulfuric acid for subsequent utilization in leaching oxide ores, in a standard sulfuric acid package plant. The residue from roasting of the copper concentrate would be leached and copper recovered from solution by electrowinning. The leach residue and pyrite roast residue would be treated in a plant to manufacture sponge iron, which would be used in the precipitation plant in the oxide ore leach process.

The oxide ores would be vat-leached and/or heap-leached with established techniques, utilizing sulfuric acid as a solvent, followed by treatment in a conventional precipitation plant to produce cement copper. Based upon further studies and developments, plans relating to the foregoing may be modified as conditions warrant.

DESCRIPTION OF PLAN FOR PARTICIPATION IN LAKESHORE PROPERTIES

On February 11, 1969, your Board of Directors, with one dissenting vote, approved the execution and delivery of certain agreements (the "Agreements") providing for the acquisition by Hecla from El Paso and Transarizona of undivided one-half interest in the Lakeshore Properties (described more fully below), consisting of patented and unpatented lode mining claims and Papago Indian reservation mineral leases and related rights covering approximately 4,179 acres in Pinal County, Arizona. (See "Description of Lakeshore Properties".) Under the Agreements, Hecla would issue 1,000,000 shares of its Capital Stock to Transarizona, which would then become Hecla's largest shareholder with approximately one-sixth (or 16⅔%) of Hecla's outstanding Capital Stock. Hecla would then have 5,957,575 outstanding shares instead of the presently outstanding 4,957,575 shares. It should be noted that Hecla, on several occasions in the past, has expanded its mining activities through the issuance of additional shares of its Capital Stock.

Management of Hecla believes that the acquisition will be in the best interests of Hecla shareholders for the reasons set forth in "Factors Considered in Execution of Agreements" below, and recommends that the shareholders of Hecla approve adoption of the Agreements.

The Agreements, which are three in number and are interdependent one upon the other, must be approved by the shareholders of Hecla or none shall become effective. The agreements provide for (i) the acquisition by Hecla of substantially all of the assets of Transarizona, free of liabilities, which assets consist of an undivided one-half interest in the Lakeshore Properties including an undivided one-half

interest in a milling plant located thereon in exchange for 1,000,000 of the authorized but unissued shares of Capital Stock of Hecla; (ii) the acquisition by Hecla from El Paso of the remaining undivided one-half interest in the milling plant located on the Lakeshore Properties for $1,500,000 in cash; and (iii) an operating agreement with El Paso with respect to operations upon the jointly owned Lakeshore Properties.

The principal terms of the operating agreement provide, among other standard provisions, as follows:

(i) Hecla is designated as Operator and shall, beginning with the fifth calendar quarter of the agreement, make $250,000 quarterly minimum advance royalty payments to El Paso which Hecla is entitled to recoup out of El Paso's share of any "net profits".

(ii) Hecla shall provide all financing and have sole risk and responsibility for bringing the Lakeshore Properties to production and operation until such time as El Paso shall become a fully participating working interest owner.

(iii) El Paso and Hecla shall each be entitled to fifty percent (50%) of any "net profits" derived from operation of properties, subject to Hecla's right to recoup out of El Paso's share of net profits all minimum advance royalties and accrued interest. El Paso may elect for any accounting period to accelerate amortization of the preproduction costs referred to in paragraph (iv) below.

(iv) Hecla will establish mining accounts to which all preproduction costs (excluding minimum advance royalty) shall be charged.

(v) "Net profits" are defined as gross income before income taxes less operating costs and less an annual charge of ten percent (10%) of preproduction costs over a period of ten (10) years and less any accumulated prior losses.

(vi) Interest shall be charged to El Paso at an annual rate of three and one-half percent (3½%) of 50% of the unamortized balance of preproduction costs and is payable out of El Paso's share of remaining net profits.

(vii) If and when payout occurs, El Paso shall become a fully participating working interest owner. At such time, Hecla's obligation to pay minimum advance royalty shall cease, and thereafter El Paso is obligated to advance the funds required to pay for its share of costs and expenses attributable to operation of the property. Payout shall occur when all preproduction costs have been recovered by Hecla.

(viii) El Paso or Hecla may assign its rights under the operating agreement to a parent or a subsidiary, but otherwise only upon consent of the other party, with such other party having right of first refusal.

(ix) El Paso and Hecla agree that El Paso, prior to payout, shall have first call on purchase of up to fifty percent (50%) of all copper mined and recovered at the then quoted producer price for domestic copper.

(x) Date of closing shall be as soon as practicable and not later than August 11, 1969. If not closed by such latter date, the Agreement will terminate unless extended by mutual agreement of the parties expressed in writing. In event the Agreement is terminated, the parties will take such action as may be required to return each of them to their respective positions preceding the date of the Agreement, it being understood that each party shall bear solely, without right of reimbursement from the other, any expense which it shall have incurred in connection with the Agreement.

A copy of each of the foregoing agreements is on file at the Company's offices.

FACTORS CONSIDERED IN EXECUTION OF AGREEMENTS

During October, 1968, Hecla Mining Company, along with many other major mining companies, was invited to consider making a proposal to El Paso concerning the Lakeshore Properties. Extensive studies of the mineralization previously discovered under a surface drilling program by El Paso and Transarizona were then undertaken by Hecla personnel. These studies led to proposals made to El Paso and Transarizona; the same proposals are embodied in the Agreements described above. Material factors taken into account by Hecla in making its proposals included the magnitude of mineralization indicated by drilling on the properties, and prospects for further additions to the deposit. The venture reasonably assures Hecla of a substantial copper operation and presents possibilities to Hecla of becoming a major domestic copper producer in addition to its continuing interests in silver, gold, lead and zinc production.

Management believes that the Lakeshore Properties offer the prospect of being of substantial benefit to Hecla and its shareholders.

While substantial additional factual data must be obtained before final conclusions can be arrived at as to feasibility of the tentative open-pit operations, Management is greatly encouraged by various factors. The potentially mineable (by open-pit) material consists of a deposit among the largest ever found in the United States. The copper content also compares favorably with that of the large low-grade domestic copper deposits being mined by the open-pit method. Most important, however, in Management's decision to proceed is the fact that others, now producing on a large scale from low-grade copper oxide and sulphide ores, have successfully met the various problems inherent in their mining ventures. Adding to this encouraging picture is the existence of some 23.6 million tons of ore in the Tactite Zone averaging 1.69% copper, on which Management plans to start mining operations at the earliest practicable date.

Acquisitions have been a most important factor in the growth of Hecla. During the past eight years Hecla has acquired interests in six additional mining properties and companies, namely, a 100% interest in the Lucky Friday mine through merger into Hecla; a 30% operating interest in the Star-Morning Unit Area; a 50% interest in Mayflower mine net profits; a 35.4% common stock interest in Granduc Mines, Limited N.P.L.; a 13.6% stock interest in Day Mines, Inc.; and the acquisition of the Morning Mine from which Hecla receives a royalty.

DESCRIPTION OF LAKESHORE PROPERTIES

The Lakeshore Properties are located within the boundaries of the Papago Indian Reservation, Pinal County, Arizona, about 30 miles south of Casa Grande, Arizona. Undivided interests in these properties are owned 50% by El Paso and 50% by Transarizona and consist of (1) three patented lode mining claims covering 62 acres of land, known as the Treasure State Claims, covered by "Lease for Exploration Purposes and Option Agreement" dated November 14, 1955, as amended July 8, 1957, between Treasure State Mining Company and George Freeman, et al, (2) three patented and 19 unpatented lode mining claims covering 400 acres of land, known as the Drake Claims, (3) 3,717 acres of land located on the Papago Indian Reservation and covered by two "Mining Lease Indian Lands" between the Papago tribe and Transarizona (the "Papago Leases"), (4) an ore beneficiation plant utilizing a copper segregation process followed by conventional flotation treatment, and (5) a water permit authorizing the production of water from Papago lands required for operations upon lands covered by the Papago Leases and the 25 mining claims.

The lease covering the Treasure State Claims provides for a purchase price of $400,000 to be paid out of minimum royalty and production royalty. As of February 28, 1969, $218,249 of the purchase price remained to be paid.

The Drake Claims are owned equally by El Paso and Transarizona, but under terms of the Papago Lease a royalty has been granted to the Papago tribe of 1% of net smelter return until a total tonnage of ore containing 50,750,000 pounds of copper has been mined from the Drake and Treasure State Claims, and thereafter, 5% of net smelter return. Additionally, El Paso and Transarizona are required to perform annual labor of $100 per claim per year upon each of the 19 unpatented lode mining claims.

A bonus of $140,000 was paid to the Papago tribe for the Papago Leases, which run from August 17, 1966 to August 17, 1976 and as long thereafter as minerals are produced in paying quantities. An annual rental of $1.00 per acre per year and a minimum royalty of $50,000 per year, which can be credited against the production royalty referred to below, is required to be paid to the Papago tribe as long as the Papago Leases are in effect. A production royalty of 10% of net smelter return is also required to be paid to the Papago tribe and is subject to (i) renegotiation when the mineral deposit has been quantitatively and qualitatively determined and (ii) renegotiation at the end of each five-year period based on market conditions. The leases also provide for annual exploration, development, mining and processing, and improvement obligations of $30 per acre during the first year, $40 per acre during the second year, $50 per acre during the third year and $100 per acre during the fourth and subsequent years.

The water permit has a term of 25 years with the right to renegotiate the permit if the Papago Leases described above are in force and effect. A rental of $100 per year for each well site located off lands covered by the Papago Leases is in effect and well drilling is limited to within three miles of the exterior boundaries of lands covered by the Papago Leases, with no new wells to be closer than one-half mile to the present well serving Komelik village.

CAPITALIZATION

The capitalization of Hecla Mining Company and Wholly Owned Subsidiaries as of December 31, 1968 and as adjusted to give effect to the issuance of 1,000,000 shares of capital stock described elsewhere herein, and of Transarizona Resources, Inc. as of December 31, 1968 is as follows:

	Amount Authorized	Amount Outstanding December 31, 1968	Amount to Be Outstanding After Acquisition
Hecla Mining Company and Wholly Owned Subsidiaries:			
Capital stock, 25¢ par value	6,000,000 shs.	4,956,975 shs. (1)	5,956,975 shs. (1)
Transarizona Resources, Inc.:			
7% demand notes payable to Narragansett Wire Co. including accrued interest	$1,714,075	$1,714,075	—
Common stock, no par value ...	4,000,000 shs.	3,000,000 shs.	3,000,000 shs.

(1) Excludes 233 shares held in treasury.

COMPARATIVE PER SHARE DATA

The following tabulations reflect the per common share earnings, dividends and book values of Hecla and Transarizona and the comparable pro forma earnings, dividends and book values per common share giving effect to the proposed combination explained elsewhere in this Proxy Statement. These tabulations are based on the historical financial statements and the pro forma combined balance sheet and pro forma combined statement of income appearing elsewhere in this Proxy Statement, and should be read in conjunction with the introductions and notes thereto.

EARNINGS AND DIVIDENDS

	1964	1965	1966	1967	1968
HECLA MINING COMPANY					
Historical:					
Earnings (A and B)	$1.11	$1.24	$1.41(C)	$1.09	$1.02
Dividends (B):					
Cash	$0.35	$0.375	$0.575	$0.60	$0.65
The Bunker Hill Company capital stock(D)	0.265	0.225			
	$0.615	$0.60	$0.575	$0.60	$0.65
Pro forma earnings after proposed combination based upon pro forma combined statement of income					$0.78
TRANSARIZONA RESOURCES, INC.					
Net income (loss):					
Historical				$(0.01)	$(0.05)
Pro forma based on shares of Hecla to be issued for Transarizona				$(0.03)	$(0.15)
Annual rate of cash dividends:					
Historical—none					

BOOK VALUE

December 31 1968

	Hecla	Transarizona
Historical, based on average number of shares outstanding	$6.95	$0.23
Pro forma of proposed combined company based on shares to be outstanding	$6.20	

NOTES:

(A) Based on average number of shares outstanding.

(B) Adjusted for one for one stock distribution in 1968.

(C) Includes extraordinary item equal to $0.17 per share.

(D) Market value per share of Hecla. Two shares of The Bunker Hill Company capital stock were distributed for each 100 shares of Hecla.

HECLA MINING COMPANY AND WHOLLY OWNED SUBSIDIARIES

PRO FORMA COMBINED BALANCE SHEET
(Unaudited)

The pro forma combined balance sheet shown below has been prepared by combining the accounts of Hecla Mining Company and Wholly owned Subsidiaries and Transarizona Resources, Inc. as of December 31, 1968 on a pooling of interests basis. The pro forma combined balance sheet is subject generally to the notes to financial statements accompanying the consolidated financial statements of the companies shown elsewhere in this Proxy Statement.

	Hecla Mining Company and Wholly Owned Subsidiaries	Transarizona Resources, Inc.	Pro Forma Adjustments		Pro Forma Combined Balance Sheet
			Debit	Credit	
ASSETS					
Current assets:					
Cash, certificates of deposit and government securities	$ 6,694,388	$ 3,867	$ 529,743 (A)	$ 529,743 (B) 1,500,000 (E)	$ 5,198,255
Listed capital stocks, at cost	6,098,105				6,098,105
Commodity margin deposits	1,244,638				1,244,638
Due from sales of products	1,737,180				1,737,180
Accounts and notes receivable	824,644				824,644
Inventories	533,010	306,238			839,248
Prepaid insurance	88,928				88,928
Total current assets	17,220,893	310,105			16,030,998
Investments and interests in mining properties, at cost	16,722,347				16,722,347
Properties, plants and equipment, at cost, less reserves	3,390,542	2,602,078	1,500,000 (E)	454,593 (C)	7,038,027
Other assets	301,543	7,028			308,571
	$37,635,325	$ 2,919,211			$40,099,943
LIABILITIES AND SHAREHOLDERS' EQUITY					
Current liabilities:					
Accounts payable	$ 1,210,383				$ 1,210,383
Wages payable	217,418				217,418
Accrued taxes	1,534,307				1,534,307
7% demand notes payable to Narragansett Wire Co.		$ 1,714,075	$1,714,075 (A)		
Accounts payable to El Paso Natural Gas Co.		529,743	529,743 (B)		
Total current liabilities	2,962,108	2,243,818			2,962,108
Deferred income taxes	201,700				201,700
Shareholders' equity:					
Capital stock:					
Par value 25¢ per share; authorized 6,000,000 shares; issued 4,957,208 shares; to be issued 1,000,000 shares	1,239,302			250,000 (D)	1,489,302
No par value, authorized 4,000,000 shares; issued 3,000,000 shares		215,759	215,759 (D)		
Capital surplus	3,706,840	1,829,151	34,241 (D)	2,243,818 (A)	7,745,568
Retained earnings (deficit)	29,528,025	(1,369,517)	454,593 (C)		27,703,915
Less, treasury stock, at cost	(2,650)				(2,650)
	$37,635,325	$2,919,211			$40,099,943
Book Value per share (based on shares outstanding, at December 31, 1968; pro forma reflects proposed issuance of an additional 1,000,000 shares)	$6.95	$.23			$6.20

NOTES:

(A) To record the contribution to capital of Transarizona Resources, Inc. by Narragansett Wire Co. (parent of Transarizona) in an amount sufficient to liquidate the 7% demand note plus accrued interest payable to Narragansett and to provide funds for the account payable to El Paso Natural Gas Company.

(B) To record payment by Transarizona of amount owed to El Paso Natural Gas Company.

(C) To conform Transarizona's method of accounting for exploration expense to the method followed by Hecla Mining Company.

(D) To record the acquisition of the net assets of Transarizona Resources, Inc. (treated as a pooling of interests for accounting purposes), and the issuance of 1,000,000 shares of Hecla Mining Company capital stock in payment thereof.

(E) To record the purchase of one-half interest in the milling plant and related facilities for $1,500,000 from El Paso Natural Gas Company, the other one-half interest being owned by Transarizona Resources, Inc.

HECLA MINING COMPANY AND WHOLLY OWNED SUBSIDIARIES

PRO FORMA COMBINED STATEMENT OF INCOME
(Unaudited)

The pro forma combined statement of income shown below has been prepared by combining the results of operations of Hecla Mining Company and Wholly owned Subsidiaries and Transarizona Resources, Inc. for the year ended December 31, 1968 on a pooling of interests basis. The pro forma combined statement of income is subject generally to the notes to financial statements accompanying the consolidated financial statements of the companies shown elsewhere in this Proxy Statement.

	Hecla Mining Company and Wholly Owned Subsidiaries	Transarizona Resources, Inc.	Pro Forma Adjustments		Pro Forma Combined Statement of Income
			Debit	Credit	
Sales of concentrates and products	$20,129,596				$20,129,596
Operating expenses	11,143,770	$ 38,836			11,182,606
Depreciation, depletion and amortization	362,734	24,903			387,637
	11,506,504	63,739			11,570,243
	8,623,092	(63,739)			8,559,353
Other income:					
Dividends	530,808				530,808
Interest	119,107	83,340		$83,340(A)	35,767
Gain on sales of securities (first-in first-out)	1,302,907				1,302,907
Other	44,759				44,759
	1,997,581	83,340			1,914,241
	10,620,673	(147,079)			10,573,594
Other expenses:					
Ruby Hill Project development	79,274				79,274
Exploration	1,545,892		$319,208(B)		1,865,100
General and administrative	579,155				579,155
Property and excise taxes	843,602				843,602
Other	133,337				133,337
	3,181,260				3,500,468
	7,439,413	(147,079)			7,073,126
Provision for income taxes (C)	2,413,000				2,413,000
Net income	$ 5,026,413	($147,079)			$ 4,660,126
Pro forma earnings per share (D)					$0.78

NOTES:

(A) To exclude interest expense of $83,340 on the 7% demand notes payable to Narragansett Wire Co. The indebtedness, including such interest expense, was contributed to the capital of Transarizona by Narragansett prior to the proposed acquisition of Transarizona by Hecla Mining Company.

(B) To expense exploration costs capitalized by Transarizona to conform to Hecla's method of accounting.

(C) Had the Companies been combined from January 1, 1968 the provision for income taxes (combined Federal and State) would have been reduced by 55% (or approximately $210,000) of Transarizona's adjusted loss on the assumption that such loss could have been utilized by the combined companies. Such adjustment would have increased the pro forma earnings per share by approximately $0.04.

(D) Based on the 5,956,975 shares of common stock of Hecla that will be outstanding upon consummation of the acquisition of the assets of Transarizona.

DESCRIPTION OF HECLA CAPITAL STOCK

All shares of Hecla Capital Stock carry equal dividend, voting and liquidation rights and there is no limitation on the payment of dividends, sinking fund provisions or restrictions with respect to repurchase or redemption of shares contained in any indentures or other agreements. All outstanding shares of Capital Stock are fully paid and nonassessable as also will be the Hecla shares which will be issued to Transarizona if the Agreements are approved. Except for shares of unissued Capital Stock which may be issued as options to employees, any and all unissued shares which are to be issued for money shall first be offered pro rata to the holders of the then outstanding shares of the Capital Stock of the corporation. The eastern transfer agent of Hecla is Registrar and Transfer Company, 140 Cedar Street, New York 10006, and the western transfer agent is Spokane and Eastern Branch, Seattle-First National Bank, Spokane, Washington 99210. The eastern registrar of Hecla is Manufacturers Hanover Trust Company, 40 Wall Street, New York, New York 10015, and the western registrar is National Bank of Washington, Spokane, Washington 99210.

DIVIDEND POLICY

No definite dividend policy has ever been set in advance by the Directors of Hecla, and no definite dividend policy will be set in advance if the Agreements herein proposed are approved. Although no assurance can be given with respect to the payment of future dividends, Hecla has paid out nearly 48.6% of its total net income, after taxes, since January 1, 1964 in dividends. It is contemplated that dividends at the current per share rate of payment will be maintained whether or not the acquisition by Hecla of an interest in the Lakeshore Properties is obtained, but no assurance can be given with respect to this matter.

Hecla has paid dividends each consecutive year for the past 66 years, paying out a total of $55,104,259 as of December 31, 1968. There are no dividends in arrears or default in principal or interest of any security of Hecla.

MARKET PRICE OF SHARES

Hecla Capital Stock is listed on the New York Stock Exchange, the Pacific Coast Stock Exchange and the Spokane Stock Exchange. Application will be made to such exchanges for listing the Hecla Capital Stock to be issued to Transarizona pursuant to the Agreements. The Agreements provide that the Hecla shares to be issued to Transarizona will be taken for investment purposes and not for distribution.

The following table indicates the high and low closing prices of Hecla Mining Company Capital Stock on the New York Stock Exchange:

	High	Low
1967		
First Quarter	26 11/16	21 1/8
Second Quarter	31 3/8	22 9/16
Third Quarter	30	23 1/2
Fourth Quarter	31	23 9/16
1968		
First Quarter	37 1/2	25 3/4
Second Quarter	41 1/8	28 7/8
Third Quarter	41 1/4	30 3/4
Fourth Quarter	38 7/8	30 7/8
1969		
First Quarter	37 1/2	30 5/8

NOTE—All figures reflect one for one stock distribution effected June 7, 1968.

On April 15, 1969, the closing price of Hecla capital stock was $30 1/2 per share on the New York Stock Exchange.

HISTORY AND BUSINESS OF TRANSARIZONA RESOURCES, INC.

General

Transarizona was incorporated on May 23, 1956 under the laws of the State of Arizona for the purpose of conducting a general mining business.

From the date of its incorporation to October, 1962, the principal efforts of Transarizona were directed to the exploration and development of a relatively small open-pit oxide copper ore body located on the Lakeshore Properties, occurring in a rock formation that was adverse to leaching processes. This formation does not occur in the Disseminated Oxide or Disseminated Sulfide Zones. In cooperation with the U. S. Bureau of Mines, Transarizona developed a copper segregation process for the beneficiation of oxide copper ores produced from the open pit, as such ores were not economically amenable to the customary acid leaching processes. The Lakeshore Plant was constructed to utilize the jointly developed process. Because of various technical difficulties, maximum capacity and efficiency have never been attained in the Lakeshore Plant.

In October, 1962 Transarizona was forced into receivership by a major creditor due to lack of financial resources to make certain plant modifications which were required to correct the technical difficulties in the Lakeshore Plant and its ensuing inability to meet principal and interest payments on its outstanding notes.

From October 1962 until October 1966, Transarizona remained in receivership and all operations were suspended. Funds necessary to meet the lease obligations of the various properties held by Transarizona were advanced by the court-appointed receiver during the receivership period. In October, 1966 Narragansett Wire Co., Pawtucket, Rhode Island (a wholly-owned subsidiary of El Paso Natural Gas Company since October, 1967), a fabricator of copper building wire, completed its acquisition of the outstanding common stock of Transarizona, settled the claims of Transarizona's creditors, and cured the receivership status of Transarizona.

In November 1966, El Paso Natural Gas Company acquired an undivided 50 percent interest in all the properties of Transarizona Resources, Inc. and entered into an operating agreement naming El Paso as operator of all such properties. The operating agreement provided that future costs of exploration, development and operations would be shared on an equal basis. El Paso undertook the modification of the Lakeshore Plant, including an expansion of the plant capacity. El Paso also began extensive exploratory drilling of the Papago Indian Lease that had been renegotiated after the expiration of Transarizona's original Lease and Exploration Permit. Drilling conducted to date has led to the copper discovery which has prompted Hecla's interest in the Lakeshore Properties.

It should be emphasized that Hecla does not plan to mine the ores in the present open pit, which are now being mined by El Paso, or to operate the present Lakeshore Plant using the segregation treatment process. Hecla does plan, however, to convert this present Lakeshore Plant to treat sulfide ores in a conventional flotation circuit, and it is expected that most of the underground development ore produced prior to construction of a new concentrator will be so treated.

VOTE REQUIRED

The law firm of Paine, Lowe, Coffin, Herman and O'Kelly, Hecla's Washington counsel, has advised the Company that under Hecla's Articles of Incorporation and under the law of the State of Washington (Hecla's state of incorporation), the vote of a majority of the shares represented at the Annual Meeting will be required to approve the transactions involving the Lakeshore Properties. Like approval is required under the rules of the New York Stock Exchange.

Mr. H. F. Magnuson, a director of Hecla and a director and Vice President of Golconda Mining Corporation (the owner of 661,900 shares or 13.3% of Hecla stock), has voted against the proposed participation by Hecla in the development of the Lakeshore Properties on the grounds that the earnings per share of Hecla stock will be diluted by the issuance of an additional 1,000,000 shares to Transarizona and that to authorize such participation (and thus the creation of substantial Hecla debt) would be against the long-standing policy of the Helca Board of Directors. However, all other directors present at the meeting voted in favor. Mr. Magnuson has indicated his belief that the favorable vote of the holders

of two thirds of the outstanding Hecla stock is required to overcome his vote against the proposed project; as stated above, Hecla has received an opinion from Messrs. Paine, Lowe, Coffin, Herman and O'Kelly, Hecla's Washington counsel, to the effect that the vote of only a majority of a quorum is necessary to overcome Mr. Magnuson's vote against the proposed project.

Hecla's management has never formulated a definite policy against long term debt. In years past, Hecla has not incurred substantial long term debt in view of the absence of any specific project for which monies received pursuant to the issuance of such debt could be used.

The company's charter specifically provides that transactions such as the one being voted upon may be undertaken by a unanimous vote of the directors without shareholder approval. Each of the Management nominees has indicated that he will vote for the El Paso transaction. Accordingly, if a majority of a quorum of the Hecla shareholders vote in favor of the project, it will be resubmitted to the newly elected Hecla Board of Directors for further action by such Board.

APPROVAL OF AUDITORS

Messrs. Lybrand, Ross Bros. & Montgomery, who were first selected by the Board of Directors, with subsequent approval by the stockholders, as independent auditors for the year 1965, have again been selected as independent auditors for the year 1969, subject to approval of the shareholders at their meeting to be held on May 29, 1969. This firm is experienced in the field of mining accounting and is well qualified to act in the capacity of auditors.

The Board of Directors Recommends a Vote for Approval of Lybrand, Ross Bros. & Montgomery as Auditors for 1969.

GENERAL INFORMATION

The proxies delivered pursuant to this solicitation are revocable upon receipt of notice of revocation thereof by the Secretary of the Company. The shares represented by each proxy received will (unless such proxy is revoked as above provided) be voted in accordance with the instructions contained therein; if no instructions are given with respect to any matter to be voted upon, such proxy will be voted in favor of each matter to be voted upon.

Hecla will bear the expense of preparing, printing and mailing the Proxy Statement and accompanying material to its shareholders.

In addition to soliciting by mail, solicitations may be made by regular employees of Hecla in person, by telephone or by telegraph. Arrangements will be made with brokerage houses, custodians, nominees and fiduciaries to send proxy material to their principals and for reimbursement for reasonable expenses in so doing. Hecla has retained D. F. King and Co., Inc., 48 Wall Street, New York, New York 10005 to aid in the solicitation of proxies at a cost of approximately $8,500.

OTHER MATTERS

The Annual Report of the Company, including financial statements, for the year ended December 31, 1968 was mailed to shareholders on March 10, 1969. Additional copies are being mailed to all new stockholders of record up to the close of business on April 11, 1969. The Annual Report is not to be treated, however, as a part of the proxy solicitation material. It is not intended by the Management to bring any other matters before the meeting nor are there other matters now known which will be brought before the meeting by others. However, if other matters properly come before the meeting, it is the intention of the persons named in the attached form of proxy to vote said proxy in accordance with their judgment on such matters.

No Director or officer of Hecla, and to the best of the knowledge of Hecla no officer or Director of Transarizona, Narragansett or El Paso, has any financial interest in the consummation of the Agreements other than as a shareholder of Hecla or El Paso, as the case may be. At March 31, 1969, officers and Directors of Hecla owned no shares of the capital stock of El Paso Natural Gas Company or any of its affiliates.

By Order of the Board of Directors.

William J. Grismer
Secretary

Dated April 21, 1969.

IMPORTANT

IF YOU ARE UNABLE TO ATTEND THE MEETING IN PERSON, THE MANAGEMENT OF THE COMPANY REQUESTS THAT YOU SIGN AND MAIL THE ENCLOSED PROXY TO US IMMEDIATELY IN THE ENCLOSED ENVELOPE WHICH REQUIRES NO POSTAGE IF MAILED IN THE UNITED STATES. STOCKHOLDERS CAN HELP THE MANAGEMENT AVOID THE EXPENSE OF SENDING FOLLOW-UP LETTERS BY PROMPTLY RETURNING THE ENCLOSED PROXY.

REPORT OF INDEPENDENT CERTIFIED PUBLIC ACCOUNTANTS

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

We have examined the consolidated balance sheet of Hecla Mining Company and Wholly-owned Subsidiaries as of December 31, 1968 and the related statements of income, earnings retained in the business and capital surplus for the three years then ended. Our examinations were 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.

In our opinion, the aforementioned financial statements present fairly the consolidated financial position of Hecla Mining Company and Wholly-owned Subsidiaries at December 31, 1968 and the consolidated results of their operations for the three years then ended, in conformity with generally accepted accounting principles applied on a consistent basis.

We previously made yearly examinations, similar in scope to that indicated in the first paragraph above, of the consolidated financial statements which were reported by the company for the years 1964 and 1965. We have examined the Statement of Income and, in our opinion, it presents fairly the income for the years 1964 and 1965, in conformity with generally accepted accounting principles applied on a consistent basis.

LYBRAND, ROSS BROS. & MONTGOMERY

New York, February 12, 1969.

HECLA MINING COMPANY AND WHOLLY OWNED SUBSIDIARIES

CONSOLIDATED BALANCE SHEET
December 31, 1968

ASSETS

Current assets:		
Cash		$ 996,255
Certificates of deposit and accrued interest		1,941,176
Government securities, at cost and accrued interest (approximates market)		3,756,957
Listed capital stocks, at cost (market $10,174,106) (Note 2)		6,098,105
Commodity margin deposits (Note 2)		1,244,638
Due from sales of products		1,737,180
Accounts and notes receivable		824,644
Inventories, at lower of average cost or market:		
Materials and supplies	$ 447,088	
Metals and products	85,922	533,010
Prepaid insurance		88,928
Total current assets		17,220,893
Investments and interests in mining properties, at cost:		
Day Mines, Inc., 13.6% owned (market $8,477,644)	3,628,798	
Sunshine Mining Company, 4.2% owned (market $5,200,000)	2,574,087	
Granduc Mines, Limited (N.P.L.) (Note 3)	10,039,400	
Other	480,062	16,722,347

Properties, plants and equipment, at cost (Note 4):

	Cost	Reserves	Balance	
Mining properties	$ 2,068,044	$ 1,194,117	$ 873,927	
Deferred development costs	1,698,092	547,060	1,151,032	
Plants and equipment	5,604,376	4,686,708	917,668	
Automotive equipment	778,396	431,564	346,832	
Land	101,083		101,083	
	$10,249,991	$ 6,859,449	$ 3,390,542	3,390,542
Other assets				301,543
				$37,635,325

LIABILITIES

Current liabilities:		
Accounts payable		$ 1,210,383
Wages payable		217,418
Accrued taxes		1,534,307
Total current liabilities		2,962,108
Deferred income taxes		201,700
Contingencies (Note 8)		

SHAREHOLDERS' EQUITY

Capital stock, 25¢ par value (Notes 5 and 6):		
Authorized 6,000,000 shares, issued 4,957,208 shares	$ 1,239,302	
Capital surplus (Statement Annexed)	3,706,840	
Earnings retained in the business (Statement Annexed)	29,528,025	
	34,474,167	
Less 233 shares of capital stock reacquired at cost	2,650	34,471,517
		$37,635,325

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

HECLA MINING COMPANY AND WHOLLY OWNED SUBSIDIARIES

CONSOLIDATED STATEMENTS OF INCOME

	Year Ended December 31,				
	1964	1965	1966	1967	1968
Sales of concentrates and products	$18,888,476	$20,149,619	$21,396,122	$20,204,449	$20,129,596
Operating expenses	9,111,423	10,148,437	10,750,988	10,975,118	11,143,770
Depreciation, depletion and amortization (Note 4)	426,228	364,076	516,991	510,934	362,734
	9,537,651	10,512,513	11,267,979	11,486,052	11,506,504
	9,350,825	9,637,106	10,128,143	8,718,397	8,623,092
Other income:					
Dividends	267,286	288,547	207,686	374,669	530,808
Interest	237,754	217,557	509,591	429,025	119,107
Gain on sales of securities (first in-first out)		349,872	291,524	432,700	1,302,907
Other	126,761	88,568	54,125	22,086	44,759
	631,801	944,544	1,062,926	1,258,480	1,997,581
	9,982,626	10,581,650	11,191,069	9,976,877	10,620,673
Other expenses:					
Ruby Hill Project development	355,525	339,724	63,910	46,939	79,274
Exploration	356,239	377,391	697,371	1,001,008	1,545,892
General and administrative	398,560	421,529	478,052	426,797	579,155
Property and excise taxes	811,847	627,552	807,843	866,764	843,602
Other	272,076	240,609	164,835	138,163	133,337
	2,194,247	2,006,805	2,212,011	2,479,671	3,181,260
	7,788,379	8,574,845	8,979,058	7,497,206	7,439,413
Provision for income taxes:					
Federal					
Current	2,214,812	2,420,600	2,586,900	1,660,800	1,971,000
Deferred		(57,600)	(26,900)	149,200	113,000
State					
Current	375,188	391,900	411,900	293,000	319,200
Deferred		(5,900)	(1,900)	22,000	9,800
	2,590,000	2,749,000	2,970,000	2,125,000	2,413,000
Income before extraordinary item	5,198,379	5,825,845	6,009,058	5,372,206	5,026,413
Gain on sale of The Bunker Hill Company common stock (net of applicable income taxes of $300,826)			834,366		
Net income	$ 5,198,379	$ 5,825,845	$ 6,843,424	$ 5,372,206	$ 5,026,413
Per share of capital stock:*					
Income before extraordinary item	$1.11	$1.24	$1.24	$1.09	$1.02
Extraordinary item			0.17		
Net income	$1.11	$1.24	$1.41	$1.09	$1.02
Dividends:					
Cash	$0.35	$0.375	$0.575	$0.60	$0.65
The Bunker Hill Company capital stock† stock†	0.265	0.225			
Total dividends	$0.615	$0.60	$0.575	$0.60	$0.65

(*) Adjusted for one for one stock distribution in 1968.

(†) Market value per share of Hecla. Two shares of The Bunker Hill Company capital stock were distributed for each 100 shares of Hecla.

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

HECLA MINING COMPANY AND WHOLLY OWNED SUBSIDIARIES

CONSOLIDATED STATEMENT OF EARNINGS RETAINED IN THE BUSINESS

	Years Ended December 31,		
	1966	1967	1968
Balance at beginning of year	$21,241,045	$25,309,680	$27,721,262
Add: Net income	6,843,424	5,372,206	5,026,413
	28,084,469	30,681,886	32,747,675
Deduct: Cash dividends	2,774,789	2,960,624	3,219,650
Balance at end of year	$25,309,680	$27,721,262	$29,528,025

CONSOLIDATED STATEMENTS OF CAPITAL SURPLUS

	Years Ended December 31,		
	1966	1967	1968
Balance at beginning of year	$ 204,250	$3,760,294	$4,069,038
Add:			
Excess of amounts received for capital stock issued under the stock option plan over par value thereof (Note 5)	36,163	308,744	256,753
Excess of approximate market value of 156,000 shares of capital stock issued over par value thereof in connection with acquisition of capital stock of Day Mines, Inc.	2,778,750		
Excess of approximate market value of 50,460 shares of capital stock issued over par value thereof in connection with purchase of mining property	741,131		
	3,760,294	4,069,038	4,325,791
Deduct:			
Par value of capital stock issued in connection with the issuance of an additional 2,474,150 shares of stock under a one for one stock distribution made to shareholders on June 7, 1968 (Note 6)			618,951
Balance at end of year	$3,760,294	$4,069,038	$3,706,840

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

HECLA MINING COMPANY AND WHOLLY OWNED SUBSIDIARIES

NOTES TO FINANCIAL STATEMENTS

1. The consolidated financial statements include all of the Company's wholly-owned subsidiaries.

The Company's investment in its consolidated subsidiaries exceeded its equity in the net assets of such subsidiaries by $205,713, and has been charged to earnings retained in the business.

2. Details of listed capital stocks at December 31, 1968 are as follows:

	Number of Shares	Cost	Value Based on Market Quotations
American Smelting & Refining Co.	53,334	$ 2,651,703	$ 4,800,060
Foote Mineral Co.	19,100	625,963	573,000
Foote Mineral Co. convertible preferred	7,900	322,172	298,225
Newmont Mining Corporation	18,000	823,945	1,361,250
New York and Honduras Rosario Mining Co.	15,500	692,056	918,375
Palabora Mining Company	46,700	199,263	455,325
St. Joseph Lead Company	14,525	583,932	953,203
Other		199,071	814,668
		$ 6,098,105	$10,174,106

During 1968 the Company purchased 224 silver futures contracts maturing at various dates from July 1969 through March 1970. Treasury bills and cash deposits in the amount of $1,244,638 were held by brokers as margin for these purchases. At December 31, 1968 the futures' quotations were approximately $600,000 or 27.5¢ per ounce of silver below the prices at which the contracts were purchased.

3. The Company's investment in Granduc Mines, Limited (N.P.L.) comprises:

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 from operations on the first 32,500,000 tons of ore and 25% thereafter. As a condition of the lease, Hecla has waived its right to dividends on its preferred stock and Newmont has waived interest on its prior advances to Granduc until production begins.

In December 1968 the main haulage tunnel, which presented the principal pre-production problem was completed. The lessees are proceeding to place the property in production, which is presently estimated to begin in the last half of 1969.

4. The Company's policy with reference to depreciation, depletion and amortization is as follows:

Depreciation is generally computed on a declining-balance method over the useful lives of the assets, three to ten years. Amortization is computed on a straight-line method over an eight-year period. Depletion is computed on a unit of production basis and is based on estimated ore reserves.

Maintenance, repairs and renewals are charged to operations. Betterments of a major nature are charged to appropriate capital accounts and, if minor in amount, are charged to operations.

Profits or losses realized from sales or retirements of properties, plants and equipment are included in income.

The investment credit has not been significant in any year and is reflected in income as a reduction in the provision for Federal income taxes.

5. The stock option plan approved by shareholders in 1964 authorized the issuance of qualified stock options to officers and key employees at 100% of the fair market value on the dates the options are granted. The options are 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. Options were granted for 21,000 shares in 1966, and no options were granted in 1967 or 1968.

NOTES TO FINANCIAL STATEMENTS—(Continued)

Information as of December 31, 1968 and for the years 1966 through 1968 with respect to options granted under the plan is as follows:

	No. of Shares	Option Price		Fair Market Value At Applicable Date	
		Per Share	Total	Per Share	Amount
Under option at December 31, 1968	16,000	$12.00 to $18.91	$299,047	$12.00 to $18.91	$299,047
Options which became exercisable					
1966	38,500	$12.00 to $18.91	534,516	$18.91 to $23.25	849,516
1967	1,000	$16.31	16,313	$27.56	27,563
1968	10,500	$18.91	198,516	$31.12	326,813
Options exercised					
1966	2,900	$12.00 to $16.31	36,525	$17.91 to $30.03	73,703
1967	25,200	$12.00 to $18.91	311,893	$23.22 to $30.44	614,684
1968	18,700	$12.00 to $18.91	259,791	$23.25 to $39.06	550,147

The number of shares and prices in the preceding tabulation have been adjusted to reflect the one for one stock distribution made in June 1968.

No amounts are reflected in income in connection with the grant or exercise of options.

6. In April 1968 the shareholders approved (1) an increase in the authorized capital stock of the Company, from 2,750,000 shares of 25¢ par value to 6,000,000 shares of 25¢ par value and (2) the issuance on June 7, 1968 of one additional share for each share outstanding to shareholders of record May 10, 1968.

7. The Company and its wholly owned subsidiaries have three pension plans covering substantially all employees. Total pension expense charged to income was $105,618, $147,438 and $140,623 for 1968, 1967 and 1966 respectively, which was substantially paid into the funds. These amounts include actuarially computed current service costs, amortization of prior service costs on a 10% per year basis in respect of two plans and full accrual of prior service costs under the other plan for employees becoming eligible during the year. The unfunded past service costs at December 31, 1968 were $202,000.

8. The Company has entered into agreements relating to the Company's participation in development of a large copper ore deposit in Arizona which, subject to shareholder approval, provide for issuance of 1,000,000 shares of Company's authorized and unissued Capital Stock and involve substantial capital expenditures. See information contained following the caption "General Operating Plan" contained elsewhere in this Proxy Statement regarding these expenditures.

9. Supplementary profit and loss information:

	Year Ended December 31,		
	1966	1967	1968
Maintenance and repairs*			
Depreciation, depletion and amortization:			
Charged directly to profit and loss:			
Other	$516,991	$510,934	$362,734
Taxes, other than income taxes:			
Property taxes	$740,445	$632,548	$572,383
Corporation license	498	498	855
Mine occupation—State of Utah	49,462	49,106	50,300
Valuation of mines—State of Utah	9,481	175,642	208,209
Miscellaneous and excise	7,957	8,970	11,855
Total	807,843	866,764	843,602
Charged directly to profit and loss:			
Other	$807,843	$866,764	$843,602
Management and service contract fees:			
Charged directly to profit and loss:			
Other	$ 13,200	$ 13,200	$ 11,700
Rents and royalties:			
Rents		Not material	
Royalties:			
Charged directly to profit and loss:			
Operating expenses	$433,930	$599,455	$761,741

* The accounts of the Company do not segregate the amounts of maintenance and repairs, and it is not practicable to obtain the information.

REPORT OF INDEPENDENT CERTIFIED PUBLIC ACCOUNTANTS

To the Board of Directors
Transarizona Resources, Inc.

We have examined the accompanying balance sheet of Transarizona Resources, Inc. as of December 31, 1968 and the related statement of loss and deficit for the two years 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.

In our opinion, such financial statements present fairly the financial position of Transarizona Resources, Inc. at December 31, 1968 and the results of its operations for the two years then ended, in conformity with generally accepted accounting principles applied on a consistent basis.

MAIN LAFRENTZ & CO.

El Paso, Texas
February 11, 1969

TRANSARIZONA RESOURCES, INC.

BALANCE SHEET
December 31, 1968

ASSETS

Current assets:		
Cash		$ 3,867
Inventories (Note 2)		306,238
Total current assets		310,105
Property, plant and equipment, at cost:		
Mining properties	$ 859,029	
Plant and equipment	1,773,028	
	2,632,057	
Less: Accumulated depreciation, depletion and amortization (Note 3)	29,979	2,602,078
Deferred charges		7,028
		$2,919,211

LIABILITIES

Current liabilities:		
7% demand notes payable to Narragansett Wire Co., including accrued interest of $106,440		$1,714,075
Accounts payable to El Paso Natural Gas Company		529,743
Total current liabilities		2,243,818
Stockholders' equity:		
Common stock without par value; authorized, 4,000,000 shares; issued and outstanding, 3,000,000 shares (Note 1)	$ 215,759	
Capital surplus	1,829,151	
Retained earnings (deficit)	(1,369,517)	675,393
		$2,919,211

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

STATEMENT OF LOSS AND DEFICIT

	Years Ended December 31,	
	1967	1968
Costs and expenses, excluding depreciation, depletion and amortization	$ 5,854	$ 38,836
Depreciation, depletion and amortization	124	24,903
Interest expense	23,100	83,340
Net loss	29,078	147,079
Deficit, beginning of year	1,193,360	1,222,438
Deficit, end of year	$1,222,438	$1,369,517

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

TRANSARIZONA RESOURCES, INC.

NOTES TO FINANCIAL STATEMENTS

December 31, 1968

1. Operations:

In 1966, Narragansett Wire Co. acquired all of the Company's outstanding stock. Subsequently, El Paso Natural Gas Company (presently the parent of Narragansett) purchased a 50% interest in all of the mining properties and equipment owned by the Company and became the operator of all such properties.

From 1962 to October, 1966 the Company was in receivership and had no operations. During the remainder of 1966, 1967 and a portion of 1968, the Company was engaged in exploration and development of certain of its Mining Properties and the modification and expansion of the existing segregation and flotation plant. Late in 1968, the plant was put into operation; however, no revenues were derived from operations until 1969.

On February 11, 1969 the Company entered into an agreement with Hecla Mining Company for the acquisition by Hecla of all of the Company's property and assets. The agreement is subject to approval of Hecla's shareholders. Reference is made to "Description of Plan for Participation in Lakeshore Properties" included elsewhere herein for additional information regarding this matter.

2. Inventories:

Inventories consist of the following:

Ore	$180,793
Concentrates	77,278
Bar copper	48,167
	$306,238

Ore inventory is stated at the lower of average cost or market. Other inventories are stated at market, which is lower than cost.

There were no inventories entering into the determination of costs and expenses for the year ended December 31, 1967.

3. Depreciation, depletion and amortization and maintenance policies:

Depreciation, depletion and amortization is computed by the unit of production method based on estimated recoverable ore reserves.

Maintenance, repairs and minor renewals are charged to expense. Retirements are eliminated from property accounts and, after deduction for net salvage, are charged to accumulated depreciation accounts.

4. Supplementary profit and loss information:

Supplementary profit and loss information for the year ended December 31, 1968 is as follows:

Charged to costs and expenses:	
Maintenance and repairs	$10,038
Taxes, other than federal income taxes:	
Property taxes	$ 1,009
Sales taxes	212
	$ 1,221
Royalties	$ 5,064

Depreciation, depletion and amortization is shown separately in the statement of loss. The Company paid no management or service contract fees during the year. Supplementary profit and loss information for the year ended December 31, 1967 is not presented because the amounts were minimal.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 6, 1969

Mr. J.J. Collins, Chief Geologist
ASARCO - New York Office

LAKESHORE DRILL LOGS

Dear sir:

Enclosed are Lakeshore assay logs from drill hole P-1A through P-74.

These represent condensations of handwritten originals furnished us by El Paso Natural Gas.

Yours very truly,

J.H. Courtright

J.H. Courtright

JHC:lzb
Encl.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

December 31, 1968

J.H.C.
JAN 6 1969

Mr. Carl Williams
Building

Lakeshore Project - 30,000 TPD
Sulphide Concentrator

Dear Sir:

For estimating purposes use a total milling cost of $0.85/ton milled (direct and indirect costs). This would break down into $0.65/ton milled for direct costs and $0.20/ton milled for indirect costs. This milling cost figure does not include any molybdenite plant costs.

Yours truly,

ORIGINAL SIGNED BY
G. W. BOSSARD

G. W. BOSSARD
Milling Engineer

GWB/mg

cc: TASnedden
RBHeen
JHCourtright

J. H. C.

DEC 31 1968

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

December 31, 1968

TO: J. H. Courtright

FROM: J.E.Kinnison

LAKESHORE MINE
TRANSARIZONA DRILLING
SOUTH OF THE PIT

During the Mid 50's Transarizona sunk 16 drill holes in a roughly circular area about 700 to 2300 feet southeast of the present pit. These same holes were logged by Transarizona and also by Arthur Baker for Callahan and Shattuck Denn. You have seen portions of the core from these old drill holes.

During my recent examination of the surface near Lakeshore, Mr. Bauer and I located some of these holes and sampled the discarded rotary cuttings.

The oxide copper values occur as narrow bands of tactite interlayered with limestone, and generally grade from 1/2 to 2% copper. The sulfides are generally low-grade, running .2 to .6% Cu on the average. I interprete this area to be the southern margin of the pervasive tactite/sulfide zone disclosed by the El Paso Gas drill holes to the north. The depth to the limestone-tactite zone is much shallower than it is to the north, however, and I would guess that a fault separates the Shattuck Denn block on the south from the El Paso block on the north.

On the Isabella claim the abrigo limestone crops out. Exposures and shallow diggings show thin tactite beds, with oxide copper, dipping 35° westerly. Farther west alluvial cover is 200 to 250' thick, and the limestone section contains erratic tactite layers with a little oxide copper, generally less than 2%, and magnetite. The dip is still westerly.

Two drill holes near the Isabella outcrop contain disseminated pyrite and chalcopyrite below 130', and one hole near the west margin of the drill area shows disseminated pyrite in argillite below 300'. In general, oxidation extends below the depths of the deeper drill holes, or greater than about 500 to 600'. One feature of possible exploration significance is the presence of 1000+ feet of "Gila Conglomerate" in the two most westerly holes. These are described by Baker as well consolidated conglomerates, with occasional voids between generally small fragments of andesite or andesite conglomerate. The fragments contain leached capping from sulfides, but no oxide copper is present. The matrix is soaked with hematite in some sections. East of these two holes the same formation appears to have been cut by two other holes below 500'. The upper part of these holes having drilled in limestone, with tactite layers but no sulfide mineralization or oxidation product therefrom, then passed into an andesite conglomerate or breccia. Thus the contact dips east under the limestones. On our file copy of the log of one of these holes you have written the notation: "San Xavier Conglomerate?" and also "Silver Bell Type".

Could this also be an inclined breccia pipe?

John E. Kinnison

JEK:lab

AMERICAN SMELTING AND REFINING COMPANY
SOUTHWESTERN EXPLORATION DEPARTMENT
P.O. BOX 5795, TUCSON, ARIZONA 85703

J. H. COURTRIGHT
CHIEF GEOLOGIST
L. P. ENTWISTLE
ASSISTANT CHIEF GEOLOGIST
W. E. SAEGART
ASSISTANT CHIEF GEOLOGIST

1150 NORTH 7TH AVENUE
TELEPHONE 602-792-3010

December 30, 1968

Mr. C.L. Perkins,
Senior Vice-President
El Paso Natural Gas Company
El Paso, Texas 79999

LAKESHORE

Dear Mr. Perkins:

This will acknowledge your letter of December 24, 1968 requesting that proposals and plans for development of the Lakeshore copper deposit be submitted by January 15, 1969.

I have transmitted your letter to Mr. C.P. Pollock, Vice-President in charge of Exploration, and have been advised by him that ASARCO will present their offer and the required plans within the time allotted.

With our best wishes for the New Year,

Yours very truly,

J. H. Courtright

J.H. Courtright

JHC:lzb

cc: CPPollock
TASnedden

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

December 27, 1968

Mr. C.P. Pollock, Vice President
ASARCO - New York Office

LAKESHORE
Block-Cave Ore Estimate

Dear sir:

Attached are the following:

A. List of drill hole polygons, sulphide ore columns, mixed and tactites.

B. 400 scale plan map showing polygons and main haulage levels at 4 separate elevations.

C. 200 scale plan map showing cross-section lines, oxide, sulphide and tactite assay intercepts.

D. Eleven geologic cross-sections showing copper assays in the oxide zone, mixed zone and tactite zone.

E. Evaluation of Galigher Metallurgy, G.W. Bossard, 12-26-68.

These data should provide a base for a preliminary evaluation of underground mining possibilities. A more complete report will be ready for mailing by January 3, 1969.

In brief, the principal mineralized rock formations are tactites, andesites and monzonite porphyry. A deep zone of thorough oxidation is underlain by a "mixed" zone which is in turn underlain by a clean sulphide zone (chalcopyrite and pyrite).

The mixed zone contains minor oxide copper, limonite, chalcopyrite, and minor chalcocite (except in holes 73 & 74 where enrichment is strong). Copper recovery in the mixed zone may be only slightly lower than in the clean sulphides and thus in a preliminary assessment both zones may be considered as one.

The porphyry and andesite are well fractured and are considered minable by block caving. The tactites are similar to those elsewhere, including Silver Bell and Mission, and will at least in part, probably require longhole blasting, or sublevel caving.

The results of our calculations are summarized below:

Total sulphide zone, including Mixed and Tactite.

Tons - 138,400,000
Grade - .87% Cu
Average thickness 544' (ranging from 156' to 976')

Mixed zone

Tons - 29,800,000 (21% of total)
Grade - .91% Cu
Average thickness 149' (35' to 332')

Tactite zone

Tons - 19,300,000 (14% of total)
Grade - 1.26% Cu
Average thickness - 90' (17' to 262')

Total sulphide zone minus tactite zone

Tons - 119,100,000
Grade - .80% Cu

It should be noted that the average grade of the Tactite zone is 1.26% Cu, rather than 1.70% Cu as reported by teletype to you on Tuesday, December 24. The 1.70% Cu average was derived by using a 1.00% Cu cutoff. The average of 1.26% Cu is based on a .50% Cu cutoff.

Referring to Mr. Bossard's memo of December 26, it is to be noted that the tactite samples (Galigher report A) are composites of several drill holes (actually 49 holes) and thus can be considered representatives, while the two porphyry-andesite samples (Galigher report B) are from two holes only (Nos. 53 & 55).

In underground mining, only tactite sample No. 3 should be taken into account, as the other two samples include partially oxidized tactites which are not present in the block cave. For this sample Mr. Bossard estimates 90% recovery and a concentrate grade of 25% Cu.

In the porphyry-andesite samples, No. 1 (hole 53) is made up of approximately equal parts of porphyry, andesite and tactite with a relatively thin mixed zone at the top of the column. Sample No. 2 (hole 55) is composed mainly of porphyry and includes a more or less typical mixed zone. However, results on both samples indicate a recovery of 88% and a concentrate grade of 24%. This suggests that the mixed zone may not be an important factor and that at this stage of the investigation, an overall recovery of 88% is a reasonable assumption.

Yours very truly,

J.H. Courtright

J.H. Courtright

JHC:lzb
Encl.
cc: TASnedden, w/encl.
RBMeen, w/o encl.
GWBossard, w/o encl.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

December 26, 1968

Mr. C.P. Pollock, Vice President
ASARCO - New York Office

LAKESHORE

Dear sir:

Attached is Mr. Perkins' letter of December 24 advising that all companies interested in Lakeshore are to submit proposals by January 15, 1969. Proposals are to include plans concerning future exploration, exploration shafts and bulk sampling, mine development method, mill capacity and installation, smelting of concentrates, and refining and marketing the final product. This request is, of course, unrealistic to say the least.

We expect to mail you tomorrow one copy of the Lakeshore block cave ore reserve with geologic and assay sections. A more complete report will follow within a few days.

Yours very truly,

J.H. Courtright

J.H. Courtright

JHC:lzb
Encl.
cc: RBMeen
TASnedden

J. H. C.
DEC 26 1968

El Paso Natural Gas Company

El Paso, Texas 79999

C. L. PERKINS
SENIOR VICE PRESIDENT

December 24, 1968

Mr. J. H. Courtright
Chief Geologist
Southwestern Exploration Dept.
American Smelting & Refining Co.
1150 North 7th Avenue
Tucson, Arizona

Dear Mr. Courtright:

Following the announcement of a copper prospect on our Lakeshore property, an interest in participating in the development of this property was evidenced by many companies such as yours. This interest has continued and has become more intense as meetings have been held with interested parties and detailed data has been made available.

In order to expedite a determination as to the development of this property and consequently commence operation at the earliest possible date, we are now requesting that proposals and plans for participation be submitted in written form not later than January 15, 1969. Information on exploration, sampling, etc. now being conducted will continue to be available until such time.

We will, of course, consider any proposal submitted, however, our general desires, as previously discussed with you, are listed below.

1. A 50% interest to be carried during payout.

2. A percentage of profits during payout.

3. Minimum cash payment in lieu of a percentage of profits would commence after a mutually agreed number of years from the effective date of participation agreement.

4. A cash payment in addition to reimbursement of acquisition and exploration costs incurred to date of participation agreement.

5. A call on up to 40,000,000 pounds of copper per year.

In order for us to make a proper evaluation of your proposal, we also request submittal of your plans concerning future exploration, exploration shaft and bulk sampling, mine development method, mill capacity and installation, smelting of concentrates, and refining and marketing the final product. Your proposal should include copies of your feasibility studies, geological, geophysical, and metallurgical data.

We appreciate the interest which you have shown in our Lakeshore property. After considering all proposals, we will advise you if El Paso Natural Gas Company has any further interest in pursuing your proposal. We reserve the right to reject any and all proposals.

Yours very truly,

C. T. Perkins

J.C.C

JAN 6 1969

12-24-68

LZB

ASARCO NYK A

ASARCO TUC
C P POLLOCK

OUR MOST RECENT ESTIMATE OF THE LAKESHORE UNDERGROUND RESERVE IS 138 MILLION TONS AT 0.86 0/0 COPPER AS SULPHIDE. THE ORE BOTTOMS AT DEPTHS RANGING FROM 1400 FEET ON THE EAST TO 2000 FEET ON THE NORTHWEST. 2200

APPROXIMATELY 90 0/0 OF THIS TONNAGE AVERAGING 0.76 0/0 CU IS REGARDED AS RECOVERABLE BY BLOCK CAVE METHODS. THE REMAINING 10 0/0 IS IN A TACTITE BED AT THE BASE OF THE ORE ZONE, WHICH MAY REQUIRE LONG-HOLE BLASTING. THIS BED AVERAGES 1.70 CU.

THE CHANCES OF A SUBSTANTIALLY LARGER RESERVE MUST BE CONSIDERED EXCELLENT, AS LIMITS TO ORE-GRADE MINERALIZATION HAVE NOT SO FAR BEEN ENCOUNTERED IN THE DRILLING ON THE NORTH, NORTHWEST, OR ON THE SOUTH.

J. H. COURTRIGHT
BED AVERAGE IS 1.70 CU.
+
ASARCO NYK A

ASARCO TUC

Aa-16.2.0

J.H.C

DEC 13 1968

December 12, 1968

Mr. Michael J. Cole, Superintendent
Papago Indian Agency
Bureau of Indian Affairs
Sells, Arizona 85634

Your file - Real Prop. Mgt.
331 - Papago
(ASARCO)

Dear Mr. Cole:

Enclosed are the four copies of the extension of our Prospecting Permit H54-10-66, signed by my company, and the surety bond from the Federal Insurance Company.

In due course we expect to receive the fully signed permit.

Yours very truly,

ORIGINAL SIGNED BY
S. I. BOWDITCH

S. I. Bowditch

SIB:kc
Enclosure
cc: JHCourtright

Ak-164.2215

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

November 27, 1968

Mr. J.J. Collins, Chief Geologist
ASARCO - New York Office

Lakeshore Copper, Arizona

Dear sir:

Reference is made to your letter of November 25, wherein you state that the geologic background material for a mining estimate will be available to the Mining Department by December 1.

I wish to advise that we are currently in the process of securing and assembling data on the deposit and it is now apparent that at least two weeks more time will be required than my original estimate.

Yours very truly,

J.H. Courtright

JHC:lzb

cc: CENelson
TASnedden
RBMeen

J.H.C

NOV 27 1968

AMERICAN SMELTING AND REFINING COMPANY
ASARCO
EXPLORATION DEPARTMENT
120 BROADWAY, NEW YORK, N.Y. 10005

JOHN J. COLLINS
CHIEF GEOLOGIST

Air Mail

November 25, 1968

Mr. J.H. Courtright
Tucson Office

Lakeshore Copper, Arizona

Dear Mr. Courtright:

I have relayed to Messrs. Nelson and Scheick your statement on the progress of your work on the drilling information supplied by the El Paso Natural Gas Company regarding the Lakeshore copper deposit. We ask that in addition to the copy of your report that you will send to us in the New York office, you give another copy to Mr. Snedden in the Tucson office.

It is recognized that the evaluation of this deposit is a complex mining calculation, for which you will supply the geologic background material on December 1st. Thereafter the primary responsibility for the evaluation of the property and future contact with El Paso Natural Gas will devolve upon the Mining Department. You will continue to advise and assist them, however, in all aspects of geology and exploration.

Very truly yours,

John J. Collins

John J. Collins

CC:CENelson
TASnedden

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

November 18, 1968

MEMORANDUM

TO: R.F. Welch

FROM: J.H. Courtright

Mining Companies that reportedly have or are examining Lakeshore:

HANNA

CERRO

ANACONDA

NEWMONT

KENNECOTT

HUMBLE

SUPERIOR

DUVAL

OCCIDENTAL ?

TEXAS GULF

PLACER DEVELOPMENT

J.H. Courtright

JHC:lzb

cc: file

SOUTHWESTERN ORE PURCHASING OFFICE
Tucson Arizona

WES

October 24, 1968

W.E.S. OCT 29 1968

J. H. C. OCT 24 1968

Lake Shore
El Paso Natural Gas

FILE MEMORANDUM:

HUMBLE OIL AND REFINING COMPANY

This morning I received a telephone call from Mr. Ken Barritt, Humble Oil and Refining Company (Room 2245), P. O. Box 2180, Houston, Texas 77001.

Mr. Barritt has been evaluating a mine near Casa Grande, Arizona, which would be the Lakeshore Mine of El Paso Natural Gas Company. He contemplates the production of 870 tons of copper concentrate per day assaying as follows:

Oz. per Ton		Percent
Gold	Silver	Copper
0.1	5.0	28.0

I am requested to send a proforma based on an assumption that such copper concentrate could be purchased and/or smelted on toll.

I advised Mr. Barritt that I would supply this information without obligation to smelt the product, and the above information would be for evaluation purposes only.

ORIGINAL SIGNED BY
REED F. WELCH

REED F. WELCH

cc: JHCourtright
RMMcGeorge
ALHatch
KDLoughridge

SOUTHWESTERN ORE PURCHASING OFFICE
Tucson Arizona

J. H. C.

OCT 23 1968

October 23, 1968

Mr. J. H. Courtright, Supervisor
Southwestern United States Division
Exploration Department
TUCSON, ARIZONA

Dear Harold:

This morning Mr. Henry Martin called from Cleveland, Ohio, representing Oglebay and Norton Company. He was asking for purchase terms on 28% copper concentrate and 80% precipitate, which originated in the Casa Grande area.

Mr. Martin and I discussed the point of origin on the railroad, and he suggested it would be Casa Grande. Accordingly, I think such a copper concentrate and precipitate must be evaluated having a source at the Lakeshore Mine.

Yours very truly,

RFW

REED F. WELCH

~~Aa-16.2.0~~ File - Lakeshore Mine ~~J.H.C.~~

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

MAY 11 1966

May 10, 1966

FOR: ~~J.E.K.~~ ~~W.E.S.~~
READ AND RETURN
PREPARE ANSWERS ..... HANDLE .....
FILE ..... INITIALS .....

To: J. H. Courtright

J. E. K.
MAY ~~21~~ 12 1966

From: S. I. Bowditch

W.E.S.
MAY 18 1966

Lakeshore Mine
Papago Reservation

I talked today with Mr. Vernon B. Smith, Director of the Mining Department for the Papago Tribe, about the present situation at Lakeshore.

According to him, Narragansett Wire and Cable Company have bought out Transarizona Resources, Inc., thereby acquiring title to the three patented mining claims involved. Narragansett has paid off the debt owed by Transarizona to the Southern Arizona Bank. They have also taken on El Paso Natural Gas as a partner in the enterprise.

Transamerica had a ten year lease from the Tribe, which has about run out and which was in default because, 1) work requirements were not up to date and 2) no mining had taken place. As far as Mr. Smith knows, this lease was negotiated, and never put up for competitive bid. The Tribe was about to declare the lease in default, but Narragansett brought the work requirements up to date, and is negotiating for an extension, which will probably be granted. They also are applying for more ground, also on a negotiated basis. Mr. Smith is trying to persuade the Bureau of Indian Affairs to allow the Tribe to negotiate all leases, as such is done on many other reservations.

He also told me that Newmont is applying for more ground at the Reward, and that they have agreed to pay the Tribe royalty on ore produced from the patented claim, so that the whole Reward operation will be one clean package, with no comingling of ores.

S. I. Bowditch

S. I. Bowditch

SIB:bam
cc: Reed Welch

MR. ~~VJC~~, ~~LWK~~, ~~EFR~~, WES

READ AND RETURN .....

PREPARE ANSWERS ..... HANDLE .....

FILE ..... INITIALS .....

AMERICAN SMELTING AND REFINING COMPANY
EXPLORATION DEPARTMENT
120 BROADWAY, NEW YORK 5, N.Y.

C. P. POLLOCK
VICE PRESIDENT

J. E. K.
MAY 4 1966

April 26, 1966

W.E.S.
MAY 4 1966

J. H. C.
APR 28 1966

AIR MAIL

Mr. J. H. Courtright, Chief Geologist
American Smelting and Refining Company
P. O. Box 5795
Tucson, Arizona 85703

Lake Shore Mine - Papagago Indian Reservation, Arizona

Dear Mr. Courtright:

Referring to Mr. Welch's letter of April 21st and previous communications in connection with the Narragansett Wire Company's activities at the Lake Shore Mine, I have just telephoned Mr. William Morley in Providence, Rhode Island, to determine if his property would be available for an exploration program in case we wish to probe the gravels adjacent to the Lake Shore Mine.

Mr. Morley told me that three other mining companies had approached him in this connection and, while he had not tied up the property as yet, it would be 60 days before he could let me know whether he was in a position to make such a commitment to A. S. & R. He has promised to advise me about July 1st.

about time Indian lease expires

Very truly yours,

C. P. Pollock

C. P. Pollock

CC-RFWelch
ALHatch

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 26, 1966

Mr. K. E. Richard, Chief Geologist
American Smelting and Refining Company
120 Broadway
New York, N. Y. 10005

LAKE SHORE MINE AREA
PAPAGO RESERVATION, ARIZONA

Dear Sir:

Enclosed are copies of memorandums regarding the Lake Shore Mine and Transarizona Resources, and also a district map prepared by Arthur Baker III, as follows:

Memorandum by Courtright, March 13, 1959
Memorandum by Saegart, May 10, 1965
Memorandum by Kinnison, August 18, 1965
Memorandum by Kinnison, April 22, 1966
District Map by Arthur Baker III

As you know, the very small potential of the Lake Shore copper deposit in limestone was well established by the results of several drilling projects at the time of our visit in 1959. Later the property was put into small scale production with the help of a loan from the Southern Arizona Bank. The operation failed and the Bank took over.

Saegart reported May 10, 1965 on the financial status of Transarizona, noting that their obligations amounted to $1,880,000. He suggested that investigation of the property should be made to determine if any drilling subsequent to our visit in 1959 had been done, the results of which might offer encouragement to consider taking over the sizeable debt obligation.

Kinnison reported August 18, 1965 that under the supervision of PD personnel the Southern Arizona Bank drilled 5 or 6 holes in an area 1500' north of the area of the Lake Shore open pit. This drilling was for the purpose of satisfying the requirements of the Papago lease held by Transarizona. Results indicated that the intrusive andesite in this area contains .4-.5 of 1% Cu. Reportedly the drilling was extended into the adjacent monzonite which also contained marginal values in copper.

In an attempt to gather more information, Kinnison contacted George Freeman who advised that access to the property could not be granted at this time.

We will continue efforts to gain more information on this prospect as well as on the deal Narragansett now has with Papago.

Yours very truly,

J. H. Courtright

J. H. COURTRIGHT

JHC/kw
Enclosures
cc: RFWelch
WESaegart
SIBowditch
JEKinnison

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.

APR 22 1966

April 22, 1966

TO: J. H. COURTRIGHT

FROM: J. E. KINNISON

LAKE SHORE MINE
CASA GRANDE DISTRICT
PINAL COUNTY, ARIZONA

I reached Mr. George Freeman by telephone last night and learned the following:

1. He will be in Tucson today to meet with lawyers--presumably on the subject property--and if he has time he will see me this afternoon.

2. Access to the property is impossible until final arrangements on the recent purchase are arranged--this maybe early next week.

3. He cannot devulge much information at this time, but later may be able to give us more information.

I began the conversation by discussing the copper with grades of about .4% andesite, which I sampled last summer from air-rotary drill holes on indian land. I made a request to obtain a bulk sample from a nearby shaft of the same rock and he thought this would be all right as soon as the present negotiations are complete. Freeman has in the past always been very communicative, and he may be willing to lend information which the new owners will not. Having established this contact I will attempt to follow this up next week.

John E. Kinnison
JOHN E. KINNISON

cc: WLKurtz

Mr. J. H. Courtright

SOUTHWESTERN ORE PURCHASING OFFICE
Tucson Arizona

J. H. C.

April 7, 1966

APR 11 1966
J. E. K.

W.E.S.

APR 13 1966 APR 11 1966

CONFIDENTIAL FILE MEMORANDUM:

TRANSARIZONA RESOURCES, INC.

In conversation recently with Sherwood B. Owens he gave me the following information. Owens has been handling the foreclosure business on the Transarizona Mine operation for Southern Arizona Bank.

A few years ago Mr. W. B. Milner, Chairman of the Board of Transcontinental Resources, Ltd., 1158 Melville Street, Vancouver, B. C., in the name of Transarizona Resources, Inc., obtained a small business government loan to put the old Lake Shore Mine into operation. This loan amounted to about $600,000 which was spent in erecting two new reduction furnaces at the property. Because the furnaces did not work satisfactorily at the inception of operations and the estimate of cost did not include operating capital, the money was soon spent and many of the construction bills were not paid. This forced Southern Arizona Bank to foreclose and take over the property.

Since that time Owens has attempted to place the property in operating hands. In this endeavor Milner, who had spent approximately $1,500,000 of his own money in the project, sold his remaining stock in Transarizona Resources, Inc., to J. Edward Ogden and Robert Gruner from New York. I understand this stock was obtained for $50,000.

Over the period of the past two or three years Owens has interested major mining companies in the area. None of these companies wanted to operate the reduction plant, but were willing to spend exploration money on drilling projects in some of the claims held by Transarizona and Indian lease land held by Transarizona. Newmont, Phelps Dodge and Bear Creek have shown an interest in this project for exploration.

In the past two or three months Narragansett Wire Company of Rhode Island became interested in operating the mine. At the same time Bagdad Copper Corporation, El Paso Natural Gas and another company offered to pay the bank for its position in Transarizona. The same day that Narragansett made its payment for the bank's position, Bagdad Copper Corporation and El Paso Natural Gas were at the bank's offices with money ready to do the same. Narragansett paid $750,000 cash and obtained first mortgage on the Transarizona property, assuming the bank's position.

Before Narragansett can do anything with the property they want to obtain the remaining stock held by Ogden and Gruner. $250,000 has been offered for this outstanding stock, but the owners are holding out for $500,000. The first week in April this stock was acquired for $445,000 plus closing and legal fees. There are outstanding creditor bills and a few shares

of stock to purchase, which when finalized will add another $250,000, making a total of $1,445,000.

Narragansett is now in the process of making arrangements with Bagdad Copper Corporation to operate the mine. I understand Narragansett has made a smelting in toll agreement with Inspiration Consolidated Copper Company.

When Narragansett is in the clear with owning Transarizona Resources, Inc., Newmont and Phelps Dodge are both standing by waiting for a drilling project. I believe one of the companies has offered as much as $50,000 cash for this privilege.

About five or six months ago Newmont began a drilling project in the area of the old Pinal Copper Company property which may be the Greenback Mine due west of Lake Shore Mine in the Cimarron Mountains. This project began with two rigs and at the present time there are five rigs drilling. Water for the drilling project has been obtained from the Lake Shore Mine and was offered without cost when the Southern Arizona Bank held the mortgage. Now that Narragansett owns the property Newmont must pay $2.00 per thousand gallons of water. This amounts to about $750.00 a month.

Reserved mine area 5 sq'

REED F. WELCH

cc: ALHatch
TJWoodside
JHCourtright
JJCollins

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

August 18, 1965

FILE MEMORANDUM

Lake Shore Mine
(Transarizona Resources, Inc.)
Pinal County, Arizona

A memorandum by Mr. Saegart, May 10, 1965, shows the financial difficulties of the Transarizona Corporation, and also made reference to some exploration drill holes which had penetrated Cu some distance north of any previous drilling. I met Mr. George Freeman and went with him to examine these holes, and attempted to verify the reported assays.

A distance which I estimate to be 1500' north of the present open-cut, Freeman had drilled 3 holes in order to satisfy requirements of the Papago Indian Tribal lease. These drill holes were dug using a 4 3/4" rotary bit and air circulation, using a small Failing owned by J. O. Barnes of Casa Grande. Samples were taken in 10' intervals and the sample piles remained near the drill holes. Attached is a list of assays from drill holes 500 and 502, which are about 90' apart. These assays were furnished by Freeman, and my grab samples from the remaining sample piles show that they are essentially correct. My check samples were assayed for MoS_2 with negative results; and for Au and Ag with traces only. The rock in which the Cu occurs is a dark colored and unmineralized looking andesite. The Cu mineral has been reported to be calcocite but the Arizona Bureau of Mines has not been able to determine the Cu mineral, or even to tell whether it is an oxide or a sulfide. I presume it to be a very fine-grained sulphide because there is a distinguishable base of limonite-stained andesite, at about 40' in depth.

The 4th of this month I talked with Mr. Sherwood B. Owens who is the receiver for a bank loan from the Southern Arizona Bank in the amount of $400,000. Mr. Saegart's memorandum estimates that this loan, plus other indebtedness amounts to a total of $1,880,000. The foreclosure is in the courts at the present time and Mr. Owens expects the matter to end around the middle of September. Since my visit to the property with Mr. Freeman, 5 more drill holes (diamond drill) have been sunk, some 1000' NE of the drill holes I saw. These are reported to penetrate porphyry with values ranging between .4 and .8% Cu, with the majority of assays ranging .5. Apparently Phelps Dodge has directed this drilling and the Southern Arizona Bank has paid for it. The drill holes that I examined, in andesite, ranged .4 to .5% Cu.

These drill holes certainly show that there is some extent to the disseminated Cu mineralization, northward from the present open-cut under very shallow gravel cover. Enrichment by calcocite, however, does not appear to be strong, and it may be absent. If Asarco had access to the property this would naturally constitute a slim lead which could be followed up by additional drilling. The complex stock ownership and large indebtedness makes it seem unlikely that we would want to get into the matter at this time. Mr. Owens stated that once foreclosure is accomplished, Asarco would have no chance of negotiating for the property; this being because of the connections between the Southern Arizona Bank and it's President, Mr. Douglas, and Newmont.

Thus in summary, it appears that the present exploration chances are still not good enough for us to undertake the expensive and complicated manipulations required to obtain clear title to the property before foreclosure, and that afterwards we may not have a chance to do so because of preferential treatment of other mining companies.

John E. Kinnison

JOHN E. KINNISON

JEK:bam
Attachment
cc: JHCourtright w/att.
WESaegart w/att.

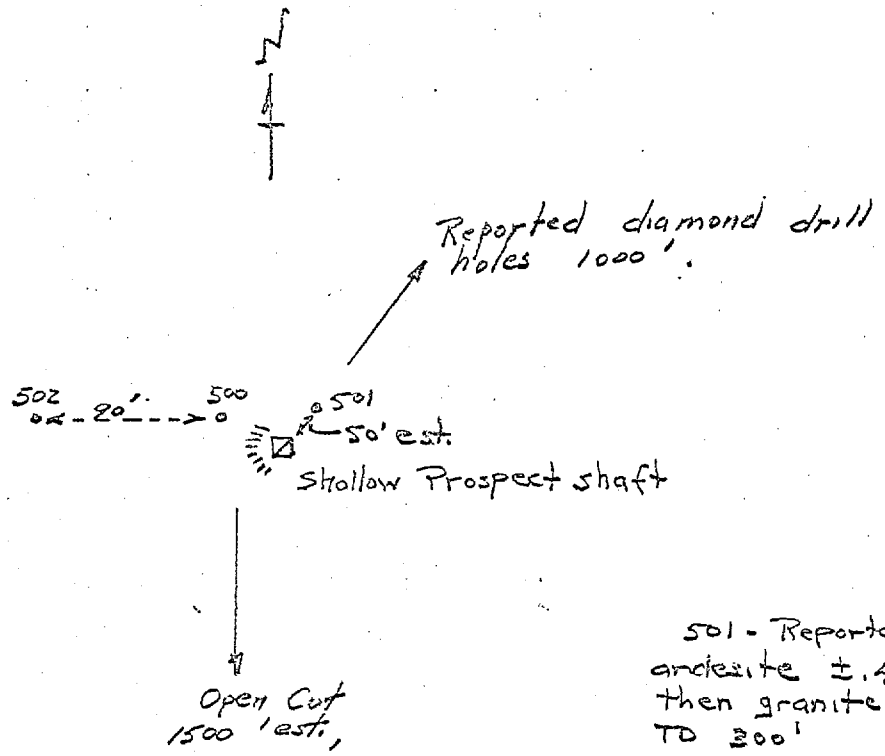
Hole 500

Drilled Aug. 4 & 6
J. O. Barnes
4 3/4" Rotary

Depth	% Cu
60 - 70	0.52
70 - 80	0.67
80 - 90	0.55
90 - 100	0.74
100 - 110	0.76
110 - 120	0.77
120 - 130	0.47
130 - 140	0.42
140 - 150	0.48
150 - 160	0.36
160 - 170	0.33
170 - 180	0.45
180 - 190	0.32
190 - 200	0.29
200 - 210	0.33
210 - 220	0.41
220 - 230	0.42
230 - 240	0.38
240 - 250	0.43
250 - 260	0.45
260 - 270	0.38
270 - 280	0.51
280 - 290	0.48
290 - 300	0.43

Hole 502

Depth	% Cu
0 - 10	0.09
10 - 20	0.29
20 - 30	0.18
30 - 40	0.16
40 - 50	0.18
50 - 60	0.30
60 - 70	0.26
80 - 100	0.26
100 - 110	0.31
120 - 130	0.30
140 - 150	0.20
160 - 170	0.29
180 - 190	0.24
200 - 210	0.23
220 - 230	0.29
240 - 250	0.25
260 - 270	0.31
280 - 290	0.30



501 - Reported 90' of andesite ±.4 % Cu, then granite @ .08 % Cu. TD 300'

300' TD - 500 -
250' TD - 502 -

LAKESHORE MINE AREA

Not to scale

J. E. K.

Route to: RBM
NW WW
Return to KW
Cpd for RBM

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

May 10, 1965

FILE MEMORANDUM

TRANSARIZONA RESOURCES INC.
PINAL COUNTY, ARIZONA

On April 30 I had a visit from Mr. J. Edward Ogden of 343 Modoc Ave., Oakland, California. Mr. Ogden recently purchased controlling interest in the Transarizona property from W. B. Milner of Vancouver, B. C. This was effected by purchase of 2 million shares of the Transarizona stock at a price of $100,000. (Total number of shares issued is approximately 3 million.)

The Transarizona property is currently in receivorship and according to Mr. Ogden, the following debts are outstanding:

1. A bank loan of $400,000. This is held by Southern Arizona Bank, and Mr. Sherwood B. Owens is the receivor. According to Ogden, the bank's expenses during receivorship, plus attorney fees, interest and taxes, have been approximately $200,000. Total due Southern Arizona Bank, then, is about $600,000.

2. Ogden holds $200,000 in second mortgages on the assets of Transarizona.

3. Amount owed manufacturers and suppliers is approximately $600,000. Ogden claims to have assignments of these debts.

4. There is an outstanding issue of 2-1/2% debentures in the amount of $480,000.

The above indebtedness, some of which might be settled for less than the stated amounts, totals $1,880,000. Mr. Ogden is eager to find a mining company to operate the mine and new plant to pay off the existing debt and thereby protect his investment.

ASARCO reviewed the exploration possibilities of the Transarizona area in 1959, and it was concluded that the potential was insufficient to justify our involvement. Mr. George Freeman advised me by telephone on [illegible]3 that some exploration drilling northwest of the mine area has been done since our review in 1959. In particular he mentioned that 2 or 3 drill holes in andesite(?) had penetrated 200-300 foot intercepts, assaying 0.5% Cu. Mr. Kinnison plans to meet George Freeman tomorrow to look at the drill core and assays from these holes.

I doubt very much that ASARCO would be interested in acquiring the Transarizona property considering the magnitude of the existing indebtedness. I am reporting the financial situation because our evaluation of the exploration potential could be changed due to the results of work done since 1959.

If Mr. Kinnison concludes that exploration possibilities are encouraging, any lease or purchase option of ground to the north or west of the known orebody would have to be accompanied by a production agreement covering the existing facilities.

The indebtedness is now so large that foreclosure is inevitable. Mr. Ogden stated that the bank would like evidence of participation by a reputable mining company by May 18. Presumably the bank will initiate foreclosure at that date. If the present exploration picture has improved sufficiently to warrant our consideration, we should probably attempt to deal with the bank after foreclosure.

Mr. Ogden telephoned today to advise that he now has an Arizona address which is as follows:

Gaylord Apartment Hotel
3547 E. Van Buren - Apt. 102
Phoenix, Arizona
Telephone: 273-7303

W. E. Saegart

W. E. SAEGART

WES/kw
cc: JHCourtright
RFWelch
JEKinnison

JHC

[illegible]AN SMELTING AND REFIN[illegible]PANY
[illegible] [illegible]IZONA
March 13, 1962

FILE MEMORANDUM

LAKE SHORE MINE (COPPER)
[illegible] DISTRICT
[illegible] COUNTY, ARIZONA

By letter of February 17 Mr. Richard advised Mr. Kentro of the Shattuck Denn Corporation that we had completed a preliminary study of their data and had concluded that the chances of finding a commercial deposit on the property were too small to warrant further exploratory work.

Similar opinions are expressed in several Company reports over the past two decades. The drilling results of recent years offer no reason for altering this opinion. The following brief review will serve to bring our files up to date on this mine.

The property is situated low on the southwest slope of the Slate Mts., 35 miles by road in a southerly direction from Casa Grande. Production is limited to a few thousand tons of oxidized copper ore mined during the 1920's. In 1948-49 the Bureau of Mines sampled the workings and put down 5 churn drill holes to prospect possible extensions of the known ore. Since then, three different companies carried out extensive drilling programs, as follows:

1956 — The Consolidated Uranium Company drilled 67 rotary holes 4-1/2" dia. averaging 200' in depth in the Lake Shore ore body (series numbered 1 to 67).

1956 — Transarizona drilled about 30 rotary holes (series 200 to 230) in and south of the Lake Shore ore body.

1958-1959 — Callahan-Shattuck Denn drilled 18 diamond drill holes (301 to 318) on various electromagnetic and magnetic anomalies south and southeast of the Lake Shore mine. This program is still in progress.

The Consolidated Uranium and Transarizona drilling defined the limits of the Lake Shore "ore body". According to Still and Still (report of January 6, 1958, attached) this deposit contains 1.5 million tons of open pit ore averaging 1.58% copper (oxide) with a waste-ore ratio of 2 to 1. Tests conducted by the Bureau of Mines at Tucson indicated that the ore was amenable to leaching with an acid consumption of 7 to 8 lbs. per ton of ore. However, the available tonnage is far too small to supply an operation of the size required for profitable treatment of such material.

The geologic environment of the district is shown on the attached 2000 scale map by Arthur Baker, Callahan's geologist. A quartz monzonite stock, about 3 miles in its long dimension, is bordered by Pre-Cambrian schists on the northeast and by limestone, quartzites and volcanics on the southwest. Complex

faulting occurs along the southwest contact where numerous small areas of garnetized limestone with scattered showings of copper and iron mineralization form a northwest trending belt about two miles in length. The Lake Shore mine proper is located at the northwest end of this belt. Much of the area is concealed by alluvial cover and topographic relief is quite low. The alluvium represents the fringe of valley fill which extends several miles westerly and southerly. An excellent 200 scale outcrop map by Baker is attached. In addition to such features as rock type and structure, this map shows the extent of the various occurrences of garnet, magnetite and copper observable in the outcrops.

The drilling by Transarizona (sections A-A' and B-B' in attached report by Still and Still of December 20, 1958) south of the Lake Shore mine cut several 50-foot intercepts of magnetite and garnet, but copper values were very low. In the Callahan-Shattuck Dean holes farther south there are a few short but high grade intercepts of oxide copper, and some sections of low grade disseminated sulphide mineralization, as follows (see geologic sections accompanying Still and Still report 12-20-58):

Hole No.	From	To	Length	% Cu	Type
M 300	211'	235'	24'	.41	Oxide
	235	240	5	1.06	Oxide and sulph.
	240	353 (bot.)	113	.30	Sulphide (dissem.)
M 306	386	405	19	1.00	Oxide
	475	482	7	1.52	Oxide
	542	543	1	18.75	Oxide
M 309	415	421	6	2.35	Oxide
M310	474	498	24	1.26	Oxide
	525	526	1	3.30	Oxide
	565	568	3	1.15	Oxide
M 311	330	335	5	.65	Sulphide
	335	386 (bot.)	51	±.20	Sulphide (dissem.)

Two holes put down to prospect a possible westerly continuation of the mineralization found in hole 310 failed to penetrate the overlying conglomerate (Gila), although one of them (No. 308) reached a depth of over 1000 feet.

At the time of our visit to the property in December, 1958 a hole was being drilled in monzonite about 6000 feet southeast of the Lake Shore mine. Minor amounts of disseminated chalcopyrite and molybdenite could be seen in the drill cores. Assay results recently received showed values ranging up to .40% copper, but an average of around .10% copper. Some outcrops in the vicinity showed occasional small spots of copper stain in a rather fresh or only slightly altered monzonite. In other outcrops the monzonite appeared to be barren.

There are numerous details of the geology and exploration that are not covered here; however, they are of no particular significance in evaluation of the prospect, the principal point being that despite the favorable geologic environment -- a monzonite porphyry intrusive, garnetized limestones, magnetite, etc. -- pervasive mineralization-alteration is lacking and ore-grade copper mineralization is confined to small, discontinuous zones. There is considered to be no valid reason to expect anything better, either at depth, or in gravel covered areas adjacent. The Lake Shore mine ore reserve is obviously too small to be economic.

Mr. Saegart analyzed the geophysical data (attached) in some detail and concluded (letter of January 26 to Mr. Richard) that due to the depth of oxidation, the electromagnetic method could have only very limited application, but that magnetite bodies under shallow cover should be detectable by magnetometer.

Our study of the Callahan-Shattuck Denn cores showed that magnetite is abundant, locally, in some of the tactite zones. There is, however, no spatial connection between the rare intercepts of copper sulphides and the magnetite zones; consequently, magnetic anomalies are not guides to sulphide mineralization.

Attachments

January 6, 1958	Report by Still and Still
December 20, 1958	Report by Still and Still
December 22, 1958	Report by Arthur Baker III
October 10, 1958	District Geol. Map - 1" = 2000'
July 26, 1958	Local Geol. Map - 1" = 200'
June 10, 1958	Magnetic Contour Map - 1" = 400'
July 1958	Electromagnetic Maps (5)
1956-58	Drill Logs, Holes by Transarizona and by Shattuck Denn-Callahan

J. H. COURTRIGHT

JHC:S
cc: DJPope - w/o att.
LHHart - w/o att.

March 12, 1959

Mr. D. M. Kentro, Manager
Shattuck Denn Mining Corporation
P. O. Box 1492
Prescott, Arizona

LAKE SHORE MINE

Dear Sir:

Enclosed is the material which you loaned to us as explained in your letter of January 5, 1959, as follows:

(1) Drill logs of work done by Transarizona.
Logs 1 thru 15
17 - 30 67
37 71
40 - 51 102 - 105
55 - 58 201 - 205
62 - 63 208
65 210 - 237

(2) You stated we could keep the logs of holes 217A, M300, and 305 through 318, which we have done.

(3) Still & Still report January 6, 1958. Their report of December 22, 1958 also is enclosed.

We have made copies of certain of the above items, and we thank you again for letting us look over these data.

Yours very truly,

Original Signed By
K. Richard

KENYON RICHARD

Encl: as noted above
KR/ds
cc: JHCourtright, w/o encl.

March 12, 1959

Mr. Arthur Baker III
Callahan Mining Corporation
P. O. Box 1208
Casa Grande, Arizona

LAKE SHORE MINE

Dear Sir:

Enclosed are the Transarizona maps which you forwarded to us with your letter of December 24, 1958:

Title	Scale	Date
"Geologically Favorable Area Topography and Geology"	1" = 200'	7/26/58
"Geology of Surrounding Area"	1" = 2000'	10/10/58
"Magnetic Contour Plan Composite"	1" = 400'	6/10/59

Mr. Courtright and I enjoyed the day we went over the property with you. Your discussions of the geology and your excellent maps aided us materially in understanding the exploration problems. We wish to thank you for this cooperation; and please pay us a call when you are in Tucson.

Yours very truly,

Original Signed By
K. Richard

KENYON RICHARD

Encl: as noted above
KR/ds
cc: JHCourtright - w/o encl.

Note on all copies

As explained to Mr. Hart in Tucson a few days ago, it was evident at the time of our visit to the property that their recent drilling (18 holes -- 300' to 1000' in depth) did not have worthwhile ore intercepts, and did not disclose possible new exploration targets. But we have maintained an apparent interest in the meantime in order to obtain copies of drill logs and other data for our files. A memorandum report will be prepared when time permits.

Aa-16A.22.1

February 17, 1959

J.H.C.

FEB 24 1959

Mr. D. M. Kentro, Manager
Shattuck Denn Mining Corporation
Box 1492
Prescott, Arizona

LAKE SHORE MINE

Dear Sir:

As you know, Mr. Bardon invited us, through Mr. Welch, to examine the subject property with particular attention to the results of the joint exploration recently done by your company and Callahan Mining. This examination was to be carried out on an informal basis, the purpose being to determine if our company might be interested in participation in this project.

The property was visited by Mr. Courtright and me with you and Mr. Art Baker in December, and discussions were held in my office with you and Mr. Art Still in January. You very kindly provided us with pertinent geological and geophysical reports, maps and drill logs. We sent these data to our geophysical department in Salt Lake City. Their analysis is now in hand. Although delayed by prior commitments, Mr. Courtright and I finally were able to check over certain of your drill cores in Mr. Freeman's office Saturday, February 14.

Although the district has many of the geological features characteristic of the more well-known porphyry and replacement type mineral districts, it is our impression that the chances of finding a commercial deposit are too small to warrant further exploratory work. Your exploratory drilling has been quite thorough, and we would not be inclined to recommend additional work by our company. Therefore, it is suggested that a more formal approach to the American Smelting and Refining Company in regard to interest in this project does not seem warranted.

We have appreciated your cooperation in providing us with all realtive information; and we are disappointed that we could not reach a more favorable conclusion.

We will return your maps and other data within a few days.

Yours very truly,

KENYON RICHARD

Original Signed By
K. Richard

KR/ds
cc: JHCourtright
RFWelch
bcc: DJPope
LHHart
RJLacy

Location: Transarizona Property, Casa Grande Dist., Pima Co., Ariz.

Level: Surface
N: [illegible] 48,883
E: 52,672
Elevation: 1774
Bearing: —
Angle: - 90°

Length: 301.0
Hor: 0.0
Vert: 301.0
Logged by: ABIII & others
Date: ABIII: 6/11/58

D. D. HOLE NO.: 212A
Date Started: 8/8/56 - 8/9/56
Date finished: 5/24/58 - 5/31/58
Size: 4" and AX
Casing: ?

Objective: Test magnetic anomaly

Results: Magnetite, low copper values, oxidized

Footage From	Footage To	Interval	Assays Sludges Cu	Assays Sludges Fe	Probe	Core recovery	Log	Descriptions and averages
0 to 175' dry rotary drilling. Information from old logging.								
0.0	42.0	42.0						Alluvium
42.0	[illegible]	[illegible]						"Andesite breccia". Probably diabase - ABIII
	65.0	23.0					diabase	
65.0	75.0	10.0						As above but with some light green qtzite
75.0	95.0	20.0						White limestone, epidote and garnet
95.0	115.0	20.0						Reddish ls, considerable epidote
115.0	118.0	3.0						Lost in waterin; hole
118.0	120.0	2.0	0.16	3.9				Ore at 120'
120.0	123.0	3.0	1.02	10.1				15% granite dilution. Reddish ls - Cu.
123.0	135.0	12.0	0.04	3.3				White ls.
135.0	140.0	5.0	0.78	18.1				Ore @ 140'. Heavy mag, some cu.
140.0	145.0	5.0	0.58	12.6				Mostly epidote. Some mag & cu garnet
145.0	155.0	10.0	0.36	10.2				Massive mag with red ls.
155.0	161.0	6.0	0.23	12.8				Red ls - some mag - lots of epidote
161.0	164.0	3.0	0.54	25.1				Red ls and magnetite
164.0	167.0	3.0	0.49	18.7				Some cu epidote and limonite
167.0	175.0	8.0	0.18	25.8				Water at 178'. Massive mag
175.0	178.0	3.0						Evidently no sample — ABIII
178 to 301 AX core drilling. Poor core. Sludge assays follow:								
178.0	188.0	10.0						No assay
188.0	198.0	10.0	0.09	32.8				
198.0	208.0	10.0	0.28	31.3				
208.0	218.0	10.0	0.17	20.6				
218.0	228.0	10.0	0.06	32.5				
228.0	238.0	[illegible]	0.04	34.8				
238.0	246.0	8.0	0.16	16.6				
246.0	256.0	10.0	0.11	8.7				
256.0	266.0	10.0	0.06	7.3				
266.0	276.0	10.0	0.04	5.0				
276.0	286.0	10.0	0.07	4.4				
286.0	296.0	10.0	0.05	5.6				
296.0	301.0	5.0						No assay

Note: Sampling by Transarizona personnel.

Geologic log of core drilling on next page

Location: Transarisona Property, Casa Grande Dist., Pinal Co., Ariz.

Level:
N:
E:
Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:
Date:

DDH HOLE NO.: 217A (continued)
Date Started:
Date finished:
Size:
Casing:

Objective:

Results:

Footage From	Footage To	Interval	Assays Cu%	Assays Fe_2O_3	Probe	Core recovery %	Log	Descriptions and averages
								Geologic log of core drilling — logged by ABXII
178.0	190.0	12.0				42		Altered grayish ls with abundant mag in streaks and patches. All dissem - rarely massive mag, up to 2" dia. Rare copper stain.
190.0	200.0	10.0				30		Gougy altered ls and qtsite, fe stin'd. Some quartz stringers, some silicification. No mag or cu.
200.0	214.0	14.0				50		White fine qtsite, thoroly shattered. Some gypsum stringers, light fe stn on fractures.
214.0	222.0	8.0				50		Altered yellowish diabase, some green epidote. Moderately shattered. Some magnetite.
222.0	227.0	5.0				80		Indistinguishable rock. Thoroughly brecciated and gougy, much mag and fe stn.
227.0	245.0	18.0				11		Fine qtsite or mudstone, thoroly brx, much altered. Fe stn, some qts stringers, no mag.
245.0	301.0	56.				18		Fine white qtsite (silicated ls? hornfels) all shattered. 270-275 smeared and gougy, some epidote, no fe stn.

Footage = 286'

Location: Tremarisona Property, Casa Grande Dist., Pinal Co., Ariz.

Level: Surface	Length: 372.0	D. D. HOLE NO.: M 300
N: 48,164	Hor: 0.0	Date Started: 5/6/58
E: 54,096	Vert: 372.0	Date finished:
Elevation: 1807	Logged by: ABIII	Size: NX to 51', BX remainder
Bearing: —		
Angle: - 90°	Date: 6/11/58	Casing: 51' (pulled)

Objective: Test outcropping magnetite at depth

Results: No ore. Low-grade copper mineralization in magnetite, oxidized; low-grade sulfides below.

Footage From	Footage To	Interval	Assays Core ~~eU3O8~~ % Cu	Assays ~~lU3O8~~ % Mo	Probe	Core recovery	Log	Descriptions and averages
			See Page 2 for detailed assays					
0.0	13.0	13.0				—		Cuttings. Alluvium
13.0	20.0	7.0				--		Cuttings. Tactite.
20.0	53.0	33.0				97		White fine diopside tactite with thin bands coarse ls, granulated. Locally up to 1/2" bands epidote. 46.6' 5" band with mag and spots cu stn
53.0	56.0	3.0				100		Tactite with much mag, light cu stn.
56.0	69.0	13.0				100		Granulated white tactite, some bands gray coarse ls. Thin bands epidote.
69.0	179.0	110.0				98		White tactite, thin-bedded, frequent straight hornfelsed shale bands up to 1" thick, esp. 117-130. Frequent thin bands epidote. Bedding about 40° dip. 81-98 soft and friable, some mag and light cu stn in upper 2' 109-110 epidote and mag, light cu stn 140-145 Epidote and mag, slight cu stn, in bands 1" to 1'.
179.0	183.0	4.0				100		Granulated tac with thin beds serpentine
183.0	211.0	28.0				90		Tac, some thin bands ls at top and bottom. 1"-4" bands mag and epidote
211.0	235.0	24.0	0.41	21.5		74		Gray fine qtzite, minor tac and ls. Strongly altered. Much mag. Porous, fe stn'd, light cu stn. 214-226 highly altered diabase
235.0	240.0	5.0	1.06	14.0		80		Upper half as above, with native cu. Lower half chloritic laminated shaly ls with abundant pyrite, mostly in beds less than 1/4" thick, some as stringers. No chalcocite.
240.0	250.0	10.0	0.17	4.1		100		Gray-white altered mudstone (?), thin-bedded. Minor py, mostly along bedding. No chalcocite
250.0	275.0	25.0	0.47	6.0		88		Gray to black fine qtzite and hornfels interbedded, beds up to 1" wide. Much chlorite in films. Much pyrite as stringers and thin bands.
275.0	300.0	25.0	0.21	8.6		56		Fine black diabase, much fractured, relatively abundant chalcopyrite.
300.0	310.0	10.0	0.14	3.9		30		Gray medium-grained qtzite, some tac.
310.0								

Location: Transcriacna Prope ty, Cosa Grande Dist., Pinal Co., Ariz.

Level:
N:
E:
Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:

Date:

D. D. HOLE NO.: N 300 (cont'd)
Date Started:
Date finished:
Size:

Page 2

Casing:

Objective:

Results:

Footage From	Footage To	Interval	Assays eU3O8 % Eq	Assays U3O8 % Eq	Probe	Core recovery	Log	Descriptions and averages
310.0	340.0	30.0	0.27	4.6		24		Dark gray fine-med qtzite, pyrite in thin films mst on fractures. Some chalcopyrite
340.0	362.0	22.0						No core
362.0	372.0	10.0						Qtzite monzonite, soft and friable

Core Assays (Sampling by Transcriacna)

211.0	214.0	3.0	0.06	25.0
214.0	220.0	6.0	0.05	6.4
220.0	226.0	6.0	0.79	42.1
226.0	229.0	3.0	0.11	4.05
229.0	235.0	6.0	0.70	23.02
235.0	240.0	5.0	1.06	14.0
240.0	245.0	5.0	0.17	4.1
245.0	250.0	5.0	0.17	4.0
250.0	255.0	5.0	0.25	7.7
255.0	260.0	5.0	0.16	4.6
260.0	265.0	5.0	0.25	6.6
265.0	270.0	5.0	1.50	8.4
270.0	275.0	5.0	0.18	5.5
275.0	280.0	5.0	0.20	9.1
280.0	285.0	5.0	0.31	10.3
285.0	290.0	5.0	0.33	8.8
290.0	295.0	5.0	0.15	8.7
295.0	300.0	5.0	0.14	6.3
300.0	305.0	5.0	0.10	4.6
305.0	310.0	5.0	0.17	3.1
310.0	315.0	5.0	0.15	4.3
315.0	320.0	5.0	0.07	5.4
320.0	325.0	5.0	0.31	4.1
325.0	330.0	5.0	0.45	4.5
330.0	335.0	5.0	0.34	3.2
335.0	340.0	5.0	0.28	6.0

See other side for sludge assays

Hole No. M 300 Sludge Assays

From	To	Interval	% Cu	% Fe
200	210	10	0.10	3.8
210.	220	10	0.08	15.6
220	230	10	0.20	21.0
230.0	235	5	0.43	25.7
236	243	7	0.66	17.9
243	253	10	0.56	18.0
253	263	10	0.36	17.1
263	273	10	0.34	13.5
273	283	10	0.40	19.0
283	293	10	0.40	10.8
293	303	10	0.27	8.4
303	313	10	0.25	8.3
313	323	10	0.31	10.1
323	333	10	0.46	9.2
333	343	10	0.35	5.8
343	353	10	0.28	6.6

Transarizona Property

Location: Casa Grande Dist, Pinal Co., Ariz.

Level: Surface
N: 40,605
E: 52,168
Elevation:
Bearing: 1762
Angle: - 90°

Length: 701.6
Hor: 0.0
Vert: 701.6
Logged by: ABIII

Date: As drilled

D.D. HOLE NO.: 305
Date Started: 8/13/58
Date finished: 9/3/58
Size: BX

Casing: 50' (pulled)

Objective: Test correlatin; EM and magnetic anomalies; spotted in center of mag anomaly

Results: Gila conglomerate to bottom

Footage From	Footage To	Footage Interval	Assays eU3O8	Assays U3O8	Assays Probe	Core recovery	Log	Descriptions and averages
0.0	50.0	50.0				--		Rock bit, no core or cuttings
50.0	65.0	15.0				100		Gila cgl. Mostly well consolidated, but less so than first 200' in Hole 306. Slight tendency to wash out. Frags mostly less than 2", but many up to 5". Larger frags mostly Kv. Smaller frags Kv and altered seds. A little mag up to 1/2" dia.
65.0	108.0	43.0				88		Gila cgl. More friable than above. Nearly all less than 1", few ls frags up to 2". Most pebbles Kv, altered ls. Abundant mag -- estimated 2% -- esp. 80'-90'. All core strong enough to deflect Brunton needle.
108.0	125.0	17.0				100		Gila cgl. Well consol. Numerous frags 2-10" mostly Kv, some ls. Little mag.
125.0	157.0	22.0				77		Gila cgl. Very friable. Frags mostly less than 1", some 2". Frags Kv and ls. Matrix limy. Mag fgags up to 1/2". Most pieces core will deflect Brunton needle.
157.0	230.0	87.0				100		Gila cgl. Well consol. Frags up to 3" common -- Kv, some ls. Rare mag mostly less than 1", but one piece mag and altered ls 2" dia.
230.0	301.0	71.0				70		Gila cgl. Well consol. As above, but kv frags up to 5". Occasional pieces mag up to 1". Rare sediment frags.
301.0	360.0	59.0				81		Gila cgl. Mostly 2" frags but occ Kv up to 5". Minor sediments, all in sizes le than 1". Rare garnet. Finer beds have fairly abundant magnetite.
360.0	475.0	115.0				100		Gila cgl as above but less mag.
475.0	565.0	90.0				100		Gila cgl. Well consol. Sizes as above. Rare sediments, very rare garnet. Only a couple pieces mag up to 1/2" in entire interval.
565.0	701.6	136.6				90		Gila cgl, as above. Mostly good core, but 570-606 and 656-670 bad drilling, poor core. No sign in recovered material from these intervals (10%-70% rec.) of any structure -- shearing or staining.

Location: Transamericana Property, Casa Grande Dist., Pinal Co., Ariz.

Level:	Surface	Length:	600.0	D. D. HOLE NO.:	306
N:	48,300	Hor:	0.0	Date Started:	8/11/58
E:	Maybe 52,542	Vert:	600.0	Date finished:	8/26/58
Elevation:	2 1789	Logged by:	ABXII	Size:	BX
Bearing:	--				
Angle:	- 90°	Date:	As drilled	Casing:	40'

Objective: Test correlating EM and magnetic anomalies; spotted in center of EM anomaly

Results: Intermittent low-grade copper mineralization to bottom. Oxidized.

Footage From	Footage To	Interval	Core Assays ~~Fe2O3~~ % Cu	~~Fe2O3~~	~~Rocks~~	Core recovery %	Log	Descriptions and averages
0.0	40.0	40.0				--		Rock bit. Cuttings not saved
40.0	66.0	26.0				77		Gila cgl. Pebbles mostly less than 3", rare ones up to 9", in brownish sandy matrix, not limy. Well consolidated. Pebbles about 50% Cretaceous volcanics (Kv), 50% altered sediments -- hornfels and feldspathized ls. Little qtzite. Occasional pebbles magnetite or partly magnetite, up to 1". No quartz monzonite.
66.0	70.0	4.0				88		White porous med-grained ss, some grains pumice. Thinly-bedded. Bedding dips 20
70.0	122.0	52.0				100		Gila cgl, same as 40-66. Kv pebbles up to 3".
122.0	144.0	22.0				100		Gila cgl. Exclusively sediment pebbles, mostly ls in all sizes, up to 12" dia. Occ. mag pebbles.
144.0	195.0	51.0				95		Gila cgl. Mostly pebbles less than 2", but some beds up to 5' thick with 6" ls pebbles. Honey-colored gar pebbles very abundant, esp. in smaller sizes. Also scattered pebbles up to 2" of Kv. No cu mineral in any pebbles. Rare magnetite.
195.0	218.0	23.0				100		Gila cgl. Pebbles up to 6" ls and Kv, much garnet in smaller sizes.
218.0	223.0	5.0				88		Gray med. ls with flat and vertical stringers up to 1" gray gouge and alteration. One such has scattered limonite pseudomorphs after py.
223.0	227.0	4.0				88		Massive gray coarse tremolite rock.
227.0	246.0	19.0				79		Mostly honey-colored garnet, intergrown with coarse tremolite. Numerous stringers white asbestiform tremolite. 230-232 gray med ls.
246.0	260.0	14.0				20		Mostly red hematite stn'd sheared material, some lenses silicified. Fault.
260.0	281.0	21.0				77		Honey garnet with bands up to 1' of gray med-grained ls.
281.0	329.0	38.0				100		Med-grained light gray ls. No bedding. Fractures with up to 1/4" asbestos. @293' 8" breccia in gougy matrix - fault

Location: Transarizona Property, Casa Grande Dist., Final Co., Ariz.

Level:
N:
E:
Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:
Date:

D. D. HOLE NO.: 306 (cont'd)
Date Started:
Date finished:
Size:
Casing:

Objective:

Results:

Footage From	Footage To	Interval	Assays Core % Cu	Assays U3O8	Assays Probe	Core recovery	Log	Descriptions and averages
329.0	346.0	18.0				85		Alternating 3' bands ls as above and honey garnet.
346.0	366.0	20.0				40		Honey garnet. U per 3' has 6" band gray ls; below this very friable.
366.0	376.0	10.0	1.25			12		One run. Honey garnet with clots hematite and limonite, films cu stn.
376.0	386.0	10.0	0.15			13		One run. Honey gar, some darker. Trace cu stn.
386.0	391.0	5.0	0.70			56		One run. Honey gar with cu stn films.
391.0	401.0	10.0	1.10			23		One run. Honey gar.
401.0	405.0	5.0	1.15			20		One run. Honey gar, local clots hematite limonite, some cu stn. One run from 401 to 406.
405.0	427.0	22.0				100		Light brown to light gray med ls. No bedding. Occ. thin stringers asbestos. 420-424 serpentinized shear, 80° dip.
427.0	446.0	19.0				100		Alternating bands up to 4" fine dark gray ls and white light gray-reddish med-crse ls. Crse ls can be followed back to fine in walls of fractures.
446.0	456.0	10.0				100		Reddish med-crse ls, probably completed stage of above. 450-452 and 453: up to 1' sheared, intensely serpentinized, gouge, trace cu stn, light fe and mn stn. Dips about 50°. Minor faults.
456.0	464.0	8.0				75		Soft friable grayish altered ls. About 30% gar disseminated in matrix of fine diopside (?)
464.0	469.0	5.0				20		Garnet
469.0	470.0	1.0				80		Altered ls.
470.0	475.5	5.5				100		Garnet. 473' 4" with cu stn and clots residual limonite and hematite. 474' slickensided slip dips 70°. In F4 is dark gar and residual hem up to cu stn above. In F5 is light gar, no limonite. 475' 7" band semi-textitized ls (diopside). Upper contact dips 45°, lower 35°; no shearing on either.

1945 31% Cu

Location: Tyrannosaurus Property, Gene Gremio Dist., Pinal Co., Ariz.

Level:	Length:	D. D. HOLE NO.: 306 (cont'd)
N:	Hor:	Date Started:
E:	Vert:	Date finished:
Elevation:	Logged by:	Sim: Page 3
Bearing:		
Angle:	Date:	Casing:

Objective:

Results:

Footage From	Footage To	Interval	Assays Core ~~U308~~ % Cu	~~U308~~ Au	~~Prob~~ Ag	Core recovery	Log	Descriptions and averages
475.5	477.0	1.5	1.75	NIL	TV	65		Part of one run. Garnet, moderate on stn, residual limonite-hm stbs
477.0	482.0	5.0	1.45	NIL	NIL	70.0		One run. Garnet, moderate on stn, relatively abundant residual hematite.
482.0	520.0	38.0				100		Light and dark gray grse ls, locally slightly reddish. Faint color banding horizontal to 15° dip. At top brecciated with asbestos in fractures.
520.0	523.0	3.0				100		Garnet. Upper 1.5' has nearly-vertical slip separating gar and ls — wavers in and out of core. Lower contact dips 70°.
523.0	526.5	3.5				100		Coarse reddish ls.
526.5	534.0	7.5				92		Dark gray-green altered ls, probably serpentine. Locally some pale gar diss. Several zones up to 2" wide with irregular limonite patches and stringers up to 1/8" asbestos. Slight slickensiding. Dips 70-80°. No on stn or sulfides.
534.0	540.0	6.0				100		Gray med-grse ls.
540.0	542.0	2.0				100		Greenish-gray serpentinized ls, grading down to coarse reddish gar. Upper contact replacement zone, dips 60-70°
542.0	543.0	1.0	18.75	0.06	3.00	80		Hard, silicified (chert nodule?). Much on stn, some malachite. Much residual limonite. Some specular hematite. 0 per 3" has garnet.
543.0	547.0	4.0				18		537-547 one run. Brown altered material resembling some of above but not silic. Strongly sheared. Some residual limonite on stn. Sheared serpentine?
547.0	557.0	10.0				95		Brownish white med ls, much brx, some small slips dipping 30-60°
557.0	570.0	13.0				98		White to light gray grse ls.
570.0	600.0	30.0				65		Dark blue-gray med gal, all thoroughly shattered but little cementation. Probably post-mineral fracturing.

6.5% @ 1.52% Cu
69%

Entire hole (sediments) is probably Mescabrosa formation

Transcriptions property

Location: Casa Grande D[illegible], [illegible]tral Co., Arizona

Level: Surface
N: 48,430
E: 53,104
Elevation: 1702
Bearing: --
Angle: - 90°

Length: 418.0
Hor: 0.0
Vert: 418.0
Logged by: ABXIX

Date: As drilled

D. D. HOLE NO.: [illegible]
Date Started: 8/29/[illegible]
Date finished: 9/1/[illegible]
Size: ~~BAS (pulled)~~ BX

Casing: 245' (pulled)

Objective: Test small magnetic anomaly and try to penetrate Martin formation

Results: Hole in andesite all the way

Footage			Assays			Core recovery	Log	Descriptions and averages
From	To	Interval	eU3O8	U3O8	Probe			
0.0	30.0	30.0				—		Rock bit. Pre-Cambrian schist and qm -- Quaternary and Recent alluvium, not Gila. Little mag -- handful will not deflect brunton needle.
30.0	70.0	40.0				—		Rock bit, short core runs 50-70' but only few pebbles recovered. Black andesite. Thoroly fractured. Light limonite stn on fractures, some apparently residual after py. Some fractures have light chlorite films. No magnetite.
70.0	80.0	10.0				—		Rock bit, no cuttings.
80.0	85.0	5.0				—		As 30-70', much contamination.
85.0	245.0	165.0				—		Rock bit. As 30-70', but much more fe staing (hematite). Hematite mostly in soft gouge, washes out to color water. Cuttings have more than usual fe stn -- residual hem & limonite after py films.
245.0	265.0	20.0				65		Andesite. Aphanitic to 1-2 mm grain size. Much shattered, with some fractures having up to 1/2" stringers white massive calcite in up to 3 mm grain sizes. Fe stn on some fractures but none on fractures with calcite.
265.0	418.0	163.0				95		Andesite, uniformly 1-2 mm grain sizes. Much fractured, with fe stn on most fractures, some slickensiding. Some fractures open 1/8" wide, with isolated xls calcite up to 3 mm and residual limonite and hematite. No cu stn. Other not abundant very fine fractures, evidently earlier than calcite-fe stn ones, have up to 1/2" irregular some chloritization in walls, no fe stn, cu stn, calcite or slickensides.

Py visible filling fracture
Stains in bottom of hole

Transmerinoan Property

Location: Casa Grande D[illegible], [illegible]inal Co., Arizona

Level:	Surface	Length:	1005.0	D. D. HOLE NO.:	308
N:	48,310	Hor:	0.0	Date Started:	8/4/58
E:	52,248	Vert:	1005.0	Date finished:	10/1/58
Elevation:	1764	Logged by:	ABIII	Size:	BX
Bearing:	--				
Angle:	- 90°	Date:	As drilled	Casing:	337' (pulled)

Objective: Test for westward continuation of mineralization in Hole 306

Results: Gila conglomerate all the way

Footage			Assays			Core recovery	Log	Descriptions and averages
From	To	Interval	eU3O8	U3O8	Probe			
0.0	46.0	46.0				--		Rock bit, no cuttings
46.0	76.0	30.0				--		Rock bit. About equal Kv and sediments (limestone). Some magnetite.
76.0	96.0	20.0				--		Rock bit. All Kv.? Much magnetite.
96.0	250.0	154.0				--		Rock bit. Nearly all Kv, some ls. Very little mag.
250.0	290.0	40.0				--		Rock bit. Gila cgl (as is all above). Mostly Kv, some ls, some garnet. Some mag, about equal to 46-76'.
290.0	320.0	30.0				--		Rock bit. Gila cgl. Mostly Kv, minor ls, little mag.
320.0	337.0	17.0				--		Rock bit, no cuttings.
337.0	351.0	14.0				100		Gila cgl, well consolidated. Mostly frags less than 1". Some mag, all less than 1/2", some garnet, all less than 1/4". In most beds many open voids between fragments.
351.0	366.0	15.0				100		Gila cgl. Some beds all pebbles less than 1", others less than 3". Kv, little mag no ls, no garnet. Voids in fine beds.
366.0	380.0	14.0				100		Gila cgl. Mostly less than 1", some up to 2". Kv, relatively abundant garnet -- about 5% -- very little mag. Voids.
380.0	410.0	30.0				90		Gila cgl. Well consol. Mostly less than 1", some up to 3". Kv, no gar, no sediments, mare mag. Voids in fine beds
410.0	465.0	55.0				95		Gila cgl. Well consol. Mostly under 1", nearly all under 2"; 415-430 few pebbles 4"-8". All Kv, with occ. pebbles epidote No gar, no sed. Occ mag, under 1/2" di
465.0	531.0	66.0				100		Gila cgl. As above but no magnetite
531.0	565.0	34.0				53		Gila cgl. Poorly consol, friable sandy matrix. Most pebbles under 1/2", some up to 1". Kv, some epidote, no mag
565.0	604.0	39.0				85		Gila cgl. As above but more in 1/2" - 1 size. Better consol, but not hard. Some voids.
604.0	605.0	1.0				30		Gila cgl. Thickness guessed. White soft porous fine tuff-like material. Abundant flakes bronze biotite up to 1 mm dia. Probably a bed, but could be a boulder.

Location: Gunn Granite Plateau, Mineral Co., Montana

Level:
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Elevation:
Bearing:
Angle:

Length:
Hor:
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Logged by:
Date:

D. D. HOLE NO.: 308 (cont'd)
Date Started:
Date Finished:
Size:
Casing:

Objective:

Results:

Footage			Assays			Core recovery	Log	Descriptions and averages
From	To	Interval	eU3O8	U3O8	Probe			
605.0	755.0	150.0				100		Mila cgl. Moderately consol; some green matrix washes out. Pebbles up to 2", some up to 8". All Kv, no mag. Locally voids between pebbles, some with calcite xls. @619' single slickensided slip with horz stn dips 60°.
755.0	868.0	113.0				88 68		Mila cgl. Moderately consol. Frags mostly less than 2". All Kv. Somewhat higher proportion pebbles of bleached Kv with occ pyrite casts. Matrix has pronounced red color, as compared to reddish-gray-brown of all other Mila in this hole and in #305. Evidently represents different conditions of deposition, not later staining. 795-815 couple 2' boulders Cretaceous conglomerate.
868.0	975.0	107.0				100		Mila cgl. Well consol. All Kv frags, many bleached and with py casts. Matrix mostly gray-brown but locally red as above. Frags mostly less than 1" but fairly numerous up to 3". Scattered areas of gypsum replacement of matrix -- not noted previously in this hole or #305 or #306.
975.0	1005.0	30.0				100		Mila cgl. Well consol. Bright red matrix. Matrix locally replaced by gypsum.

[illegible] Cross section [illegible]

309

Level: [illegible] | Target: 158.0 | Hole No.: [illegible]
Dip: [illegible] | Dip: [illegible] | Date Started: 8/1/58
Azimuth: [illegible] | Length: 158.0 | Date Finished: 10/20/58
Bearing: [illegible] | Assay by: [illegible] | Size: BX & AX
Angle: - 90° | Date: as drilled | Casing: 178' (pulled)

Objective: Test for east-ward extension of mineralization in No. 306

Results: In different fault block -- Abrigo fm. Magnetite with some copper.

Footage From	Footage To	Interval	Assays Cu%SOL	Assays Cu%S	Assays Probe	Core Recovery	Log	Descriptions and averages
0.0	15.0	15.0				--		Rock bit. Quaternary & Recent alluvium -- PC schist and qz wash
15.0	85.0	70.0				--		Rock bit. Jila cgl. Kv, some pebbles, some epidote. No garnet, minor magnetite.
85.0	117.0	32.0				95		Light gray med-gr limy dol. Much brx, healed with white to pinkish calcite and films up to 1/8" asbestos. Many voids. Some brx frags altered to chlorite. Brx zones dip 45° - 60°. @ 97' limonite after py cubes - 1/4" dia.
117.0	118.0	1.0				100		Slightly pinkish white clay minerals, probably altered mudstone band. Much brx, healed with dense white calcite. Contacts dip 25° - 30°.
118.0	120.0	2.0				100		Brown medium-gr qtzite, up to 1 mm. dia. Clay minerals in stringers and as grains probably after feldspars. Shattered, no slickensides.
120.0	122.0	2.0				100		Fine-med qtzite, mostly thoroly brx, with kaolin in fractures up to 1/4".
122.0	132.0	10.0				100		Grayish to brown med qtzite up to 1 mm. dia. Brx, no slickensides. Kaolin in fractures up to 3/8" thick and disseminated.
132.0	145.0	13.0				100		Gray med qtzite. Locally brx and sericitized. Contact with above stone irregular slip with 1" dense green clay.
145.0	150.0	5.0				90		Fault. Matrix dense green clay, with some frags sericitized qtz, and bottom frags reddish med qtzite. Little slick.
150.0	160.0	10.0				100		White to slightly reddish med qtzite. Thoroly brx, films and stringers up to 1/4" kaolin on all surfaces. Locally very light films fe stn.
160.0	173.0	13.0				81		Breccia zone. Frags qtzite and greenish tactite (?) up to 2", in matrix of brown-red gouge. Slickensides but no strong persistent zones.
173.0	178.0	5.0				95		Red qtz, gray but with numerous specks limonite tn giving overall reddish color. Faint irregular banding (boudin?) dips 20°. Slips dip 60-90°, with serpentine and magnetite. Basement of walls -- mostly [illegible] - kaolin

Transcriptions [illegible]erty

Location: Gene Trans [illegible] Co., Arizona

Level:
N
E
Elevation:
Bearing:
Angle

Length
Hor:
Vert:
Logged by:

Date:

D. D. HOLE NO: 309 (some'd)
Date Started
Date finished:
Size

Casing:

Objective

Results

Footage From	To	Interval	Assays el'308	L'308	Probe	Core recovery	Log	Descriptions and averages
189.0	195.0	7.0				100		Fine light reddish-brown ls. Moderately fractured, numerous calcite-lined vugs up to 1/2" dia. Rare limonite after py up to 3 mm dia, in fractures.
195.0	241.0	46.0				97		Fine-med gray ls, with reddish overall color from dissem spots hem. Moderately broken, with vugs up to 1/2".
241.0	248.0	7.0				100		White fine-gr hornfelsed mudstone, some hard, some soft (clay alteration?)/ Thoroly brx, much white talcy gouge. Many diverse slickensides, light hem stn on some. 6 per contact dips 85°, lower dips 40°.
248.0	294.0	46.0				100		Gray-green to dark red fine-med ls. Red coloration caused by splotches hem stn up to 5 mm dia; distributed in wispy streaks (bedding) and irregular blotches. Locally up to 1/2" bands dark, wavy ls. Bedding 55°. Moderate brx, healed with white calcite up to 1/4", dips 30-80° ~261' 6" strong brx in talcy gouge, some kaolin. Bottom shear dips 40° 269-271' strong brx, minor gouge. Local much kaolin. Main kaolinized shear dips 45°, another dips 75°. ~281' 1/2" stringer dissem limonite after py, no cu.
294.0	320.0	26.				100		Fault. Strongly brx. To 302' all frags are ls, minor talcy gouge, very little fe stn. Below 302' all frags gray-green to white fine qtzite (diopside tactite?). Gouge has some kaolin, locally purple coloration. No stron, shears. Some films up to 1/8" gypsum on slickensides; these only persistent structures. Dip 70
320.0	348.0	28.0				69		Fine gr-w ite qtzite (tactite?), some distinct fine qtz grains. Some band. up to 1' limy. Shattered but not as strong as above. Bedding dips 35-65°
348.0	366.0	18.0				100		Soft fine gray-green mudstone (hornfelsed and altered?) locally numerous limonite specks up to 1 mm after dissem py. Some 1" band ls. Bed dip 70°. A few more brx zones 1/ [illegible] in stringers [illegible]

Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:

Date:

Dip:

Objective:

Results:

Footage From	To	Interval	Assays Cu	U3O8	Probe	Core recovery	Log	Descriptions and averages
366.0	380.0	14.0				75		Hard light grey to gray-green hornfels. Upper 6' thoroly brx, much kaolin, local light purple coloration.
380.0	386.0	6.0	0.30			75		Hornfels as above, and some med-gr greenish altered ls, cobbertized. All with spots and blots fe stn. No visible cu, but 3" specimen from 384' assayed 0.75% Cu.
386.0	398.0	12.0				13		Hornfels, altered to soft white clay. Some dissem limonite after py.
398.0	402.0	4.0				50		Coarse porous ls, brown -- color probably secondary, from below.
402.0	410.0	8.0	0.25			50		5 1/2 runs. All core except one cut from each run taken for assay. Mostly massive magnetite, some small remnants unidentified altered rock. In lower 6' much hematite mud. No visible cu.
410.0	415.0	15.0				00		No core. Drillers reports mud
415.0	421.0	6.0	2.35			9		the run. Upper part much massive porous hematite. Lower part hematite-stained hornfels. Traces cu stn throughout.
421.0	431.0	10.0	0.20			15		Two runs. Hornfels, some with heavy disseminations magnetite and some massive magnetite.
431.0	435.0	4.0				38		Hornfels, partly altered to clays.
435.0	453.0	18.0				55		Med-fine clastics (0 to 1 mm), white. Thoroly brx. Little fe stn, no cu, no sulfides. Stringers limonite after py
453.0	454.0	1.0				60		Clastic as above, heavy hem impregnation. Bedding dips 50°.
454.0	458.0	4.0				62.0		Fine gray clastics, limonite in fractures and disseminated.

Transcaria [illegible] Property
Location: Casa Grande [illegible], Hinal[illegible], Arizona

Collar: Surface
N: 48,177
E: 52,553
Elevation: 1769
Bearing: --
Angle: - 90°

Length: 620.0
Hor: 0.0
Vert: 620.0
Logged by: ABXIII
Date: As drilled

D.D. HOLE NO.: 310
Date Started: 10/2/58
Date Finished: 10/31/58
Size: BX & AX
Casing: 573' (pulled)

Objective: Test for southward extension of mineralization in hole No. 306

Results: [illegible] two low-grade bands tested: low-grade. Lower hi-grade band faulted out.

Footage From	Footage To	Footage Interval	eU3O8	U3O8	Probe	Core recovery	Log	Descriptions and averages
0.0	60.0	60.0				--		Rock bit, no cuttings.
60.0	79.0	19.0				95		Dila cgl. Well consol. Gray to brown matrix. Frags up to 2", mostly under 1". One 4" piece white Hornfels. Frags about 60% sediments, 40% Andesite. Very rare magnetite up to 1/4". Rare garnet, all less than 1/4"
79.0	100.0	21.0				--		Rock bit, no cuttings.
100.0	147.0	47.0				43		Dila cgl. Well consol but locally matrix washes out. Mostly frags under 1". About 90% Kv, 10% Seds. Rare mag, rare garnet. Several boulders Kv up to 6".
147.0	250.0	103.0				100		Dila cgl. Well consol. Pebbles up to 6" dia, rarely up to 1'. About 75% seds, 25% Kv. Garnet abundant in dikes up to 1/4", some up to 3". Rare mag. No cu.
250.0	252.	2.0				35		Green fine-gr epid to rock. Upper contact depositional but epidote thoroly broken just below.
252.0	259.0	7.0				100		Fine dense blue-black mudstone. No bedding locally bleached green-white. Locally thoroly brx.
259.0	26[illegible]	9.0				100		Tremolite-actinolite rock. Locally xls up to 1" long. Some or as epidote, esp along edges of discontinuous mudstone patches.
26[illegible]	277.0	9.0				100		Med white ls, partly tremolitized, locally some greenish garnet.
277.0	296.0	19.0				100		Garnetite. Garnet is greenish, and much ls matrix remains; disseminations and small patches honey-colored garnet.
2[illegible]	2[illegible]	2.0				100		Minor fault. Coarse leached ls, thoroly brx and discolored. Little slickensiding
29[illegible]	31[illegible]	16.0				100		Med-gr white ls, disse- traces serpentine. Short stringers up to 1/4" wide kaolin. Locally ls leached and discolored. @303, 307, 310' up to 6" alteration, dissem cu as limonite after py up to 1/4" dia. Minor slickensides dip 45-70°. No cu.

Area:
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Elevation:
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Angle:

Length:
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Vert:
Logged by
Date:

D. D. HOLE NO.: 310 (cont'd)
Date Started:
Date finished:
Size:
Casing:

Objective:

Results:

Footage From	Footage To	Interval	Assays Core % Cu	Assays Sludge % Cu	Core recovery	Log	Descriptions and averages
314.0	318.0	4.0	0.10		60		Fault. Is thoroly brx, gougy, altered to coarse pale chlorite. At top and bottom some limonite after py cubes.
318.0	321.0	3.0			100		Med-gr white lst like 298-314. Lower half sheared & altered, comple clots limonite after py up to 1" dia.
321.0	325.0	4.0	0.30		32		Broken zone. Heavy limonite-hematite on fractures. Fractures dip about 70°; few slickensides. Traces cu & mm stn.
325.0	370.0	45.0			100		Fine white-gray ls, about 50% honey-colord to greenish garnet in bands 2-10' thick. To 327' and below 358' occ patches and stringers limonite cubes after py, no cu.
370.0	387.0	17.0			100		Massive honey-colored gar, friable. Many slips and indistinct irregular wavy surfaces with light hem paint. Upper contact chlorite brx 3" wide and thin slip dipping 70°. Lower contact brx 1' wide and slips dipping 60°, some hem.
387.0	441.0	54.0			100		Fine-med ls, gray-brown. Much fractured and healed with kaolin up to 1/4" wide. 400-405 fault. Strongly brx, much serpentinized. Few talcy slicks dip 85°. Pre-alteration fault. 416' 1' brx zone, mylonite, minor chl. Single talcy slick dips 75°; post-brx. 419-439 group of fault zones with up to 2' fairly solid ls between. Much brx, with thin white alteration zones. Locally clots honey garnet in matrix of brx. Very few post-brx talcy slickensides, dipping 60-85°.
441.0	446.0	5.0	0.38		80		Honey gar. Friable. Also up to 1/2" dia. At top and middle spots up to 1/2" of gossan, with cu stn in vicinity. Lower 8" thoroly crushed. Upper contact nearly-vertical wavy talcy slickenside.
446.0	449.0	3.0			100		Gray-brown med ls, all thoroly brx, esp at top, where matrix is partly crushed gar
449.0	450.0	1.0			100		Garnet, somewhat crushed. Trace cu stn.
450.0	456.5	6.5			100		Gray-brown med ls, brx with kaolin stringers.
456.5	464.5	8.0			100		Crse honey garnet, numerous bands ls up to 6" wide. 457' is 4" section with cu stn -- est. 1% Cu

Property: Tracaerisona Property
Location: Cave Branch Claim, Gila Co., Arizona

Level:
N:
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Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:
Date:

Drill Hole No. 110 (cont'd)
Date Started:
Date Finished:
Size:
Casing:

Objective:

Results:

Footage From	Footage To	Interval	Assays Core eUSO8 1 Cu.	Assays Core USO8 1 Cu.	Assays Sludge Probe	Core recovery	Log	Descriptions and averages
464.5	465.0	0.5	0.25			100		Crse garnet in matrix finer crushed gar. Friable. Light cu stn
465.0	474.0	9.0	0.10			7		One run. Crse & fine gar, crushed. Light hem impregnation, no cu stn.
474.0	476.5	2.5	1.35			9		One run. Crse gar, friable. Light cu stn
476.5	478.5	2.0				00		One run, no core
478.5	481.0	2.5	0.25			88		One run. Crse & fine gar, crushed, esp in mid to 1', where fine zones up to 1" wide are bordered by light red hem stn'd zones up to 1/2" wide, dipping 70°. Cu stn and a lot gossan.
481.0	486.0	5.0	1.19			24		One run. Fine & crse gar, crushed. Lots much gossan and cu stn. Assay is average of assays of both halves split core: 0.50% Cu and 1.85% Cu.
486.0	489.5	2.5				00		One run, no core
489.5	491.0	2.5				00		One run, no core
491.0	493.5	2.5				00		One run, no core
493.5	498.7	5.2	1.60	0.20		25		One run. Garnet, clots gossan, light cu stn
498.7	503.2	4.5	5.20	0.15		61		One run. Garnet, many vertical hem-stn slips, rare cu stn.
503.2	504.0	0.8	n.a.	0.10		62		Part of one run (assay 503.2-505.5). Jar as above. Contact below replacement of brx zone, very irregular. Min av. 60°
504.0	510.0	6.0	n.a.	n.a.		100		Fine hard white ls.
510.0	520.0	10.0	n.a.	n.a.		70		Brx zone. Ls, much altered, clots honey garnet up to 6" dia. No cu stn, mild hem stn in most altered and brx areas. Few post-alteration slips at 60°
520.0	522.0	2.0	n.a.	n.a.		100		Ls, much faintly purplish color, disseminated gar. Few slips at 75°.
522.0	523.4	1.4	n.a.	n.a.		90		Begin gar, some hem on minor breaks, no cu
523.4	525.8	2.4	0.10	0.10		80		Garnet, minor hem, no cu
525.8	526.8	1.0	3.30	0.65		80		Garnet, many gossan clots, much cu stn.
526.8	529.2	2.4	0.65	0.30	7% @ 0.45	32	34%	Garnet, light cu stn.
529.2	532.5	3.3	0.35	0.20		20		Garnet, some hem stn, light cu stn
532.5	534.0	1.5	0.25	0.20		66		Garnet, local traces cu stn.
534.0	537.0	3.0	n.a.	0.20		23		Garnet in upper part; lower 2' half gar, slips. No cu.
537.0	541.5	4.5	n.a.	0.15		80		Gray-brown fine ls, much irregular patches gar up to 1" and lower 0.5'
541.5	546.5	5.0	n.a.	0.10		100		Fine gar ls, [illegible] reddish colored

Transcribed from by

Location: Cash Grandey District, Pinal Co., Arizona

Level:
N:
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Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:
Date:

D. D. HOLE NO.: 310 (cont'd)
Date Started:
Date finished:
Size:
Casing:

Objective:

Results:

Footage From	Footage To	Footage Interval	Assays Core % Cu	Assays Sludge % Cu	Probe	Core recovery	Log	Descriptions and averages
546.5	548.1	1.6	n.a.	0.10		100		Garnet. Some hem stn along 1" horiz slip.
548.1	550.2	2.1	0.15	0.15	1.3% Cu	90		Garnet, trace cu stn.
550.2	552.2	2.0	0.20	0.15		35		Garnet, traces cu stn.
552.2	556.2	4.0	0.20	0.10		43.	.55%	Garnet, rare spots limonite, trace cu stn
556.2	558.2	2.0	0.10	0.10	0.18%	60		Garnet, no cu
558.2	560.0	1.8	0.20	0.10		55		Garnet, no cu
560.0	562.0	2.0	0.20	0.15		40		Garnet, no cu
562.0	565.0	3.0	1.15	0.80		29		Garnet. In lower 2" piece trace cu stn, and chalcocite (?).
565.0	568.2	3.2	2.25	0.65		70.		Garnet. Upper 2' good core, garnet with abundant spots gossan, much cu stn. Lower part rarely coarse gar, no cu.
568.2	573.2	5.0	0.80	0.35		80		Garnet, local spots limonite and cu stn. Lower 1' intensely crushed and hem impreg
573.2	575.6	2.4	n.a.	0.35		100		Top and bottom 8" thoroly brx ls, some clay alteration in matrix. Middle part thoroly crushed gar, much hem. Slips dip 30-80°. No cu
575.6	584.0	8.4	n.a.	n.a.		100		Med-gr white-reddish ls. Upper 3' brx and sheared - dips 60°. Local hem stn.
584.0	584.3	0.3				100		Perfect core. Jila cgl. Frags ls, Kv, epidote, mag, all less than 3/8" dia, and andesite frags up to 1". Matrix reddish ss. Contact above very irregular between solid ls & solid Jila, and with single irregular slip; average dip of both 55°. Lower contact gradational. No shearing.
584.3	607.0	22.7	n.a.	0.175		70		Andesite, variable grain size. Intensely brx, frags gouge to 2" dia. Many non-persistent slicks, dip 70°. Assay of interval 587.0 - 588.5: 1.5', typical.
607.0	620.0	13.0	n.a.	0.15		100		Jila cgl. Well consol. pebbles all less than 1" dia, in matrix brownish ss. All Kv pebbles, some bleached, some with epidote. One mag pebble 1/2" dia. Contact with above poor core; some shearing in recovered Jila.

Granearro & Property

Location: Casa Grande [illegible], Pinal Co., Arizona

Level: Surface	Length: 386.9	D.D. HOLE NO. 311
N. 47,936	Hor: 0.0	Date Started: 10/23/58
E. 54,020	Vert: 386.9	Date finished: 11/27/58
Elevation: 1606	Logged by: ABIII	Size: BX & AX
Bearing: --		
Angle: - 90°	Date: As drilled	Casing: 320' (pulled)

Objective: Test favorable basal limestones near inferred fault west of Hole #. 300

Results: No fault. Little cu or magnetite in limestone. In quartzite below, much pyrite and some copper.

Footage From	Footage To	Interval	Assays eU3O8	Assays U3O8	Assays Probe	Core recovery	Log	Descriptions and averages
0.0	15.0	15.0				--		Rock bit. Overburden -- quartz monzonite and schist pebbles.
15.0	40.0	25.0				--		Rock bit. Gray diopside tactite.
40.0	50.0	10.0				35		Gray diopside tactite. Locally vertical bedding. Strongly brx, not healed. Light hem stn locally. Little slick.
50.0	57.0	7.0				79		Coarse gray ls, numerous zones up to 4" of fine wavy red layers -- bedding, dipping 45°. Some slips with up to 1/4" white clay, dips 30-70°
57.0	79.5	22.5				100		Very dark andesite. Not magnetic. Fresh but many diversely-oriented fractures dipping 30-65° with traces slickensides and thin films hem stn and white clays.
79.5	87.0	7.5				80		Med-gr reddish ls, numerous fine color variations -- bedding, dipping 50°. @82' is 1' strongly brx zone, much clay.
87.0	92.0	5.0				100		Thin-bedded white clay -- originally marly sh ls, variation of bed above. Some thin ls beds. Bedding 55°
92.0	134.0	42.				100		Fine-med reddish ls, numerous small clots and stringers serpentine. Many post-serp stringers fine white calcite up to 1/4". Couple of small irregular clots mag. @ 107' trace cu stn. @ 95, 99, 103, 105, 113, 115, 119 zones up to 1 1/2' strong brx and alteration to white clay. Some with small patches honey garnet. Few slips, dipping 45°. Local light hem stn. Probably bedding plane slips. Below 120' increasingly brx and altered.
134.0	136.0	2.0				100		Strongly brx, tilaly recemented by clay minerals. Gravelly. Little slipping. One post-brx slipx dips 55°. Light hem.
136.0	160.0	24.0				100		Mostly white clay -- altered shale. Some ls. Much pink coloration. Small spots mag abundant, rare very small spots cu. 147-149.5 more mag than usual and some limonite after py. No [illegible] 143-145 intensely crushed dense fine gray qtzite with disseminated py in larger frags.

Transamericana Property

Location: Casa Grande district, Pinal Co., Arizona

Level:
N:
E:
Elevation:
Bearing:
Angle:

Objective:

Results:

Length:
Hor:
Vert:
Logged by:

Date:

D.D HOLE NO. 311 (cont'd)
Date Started:
Date finished:
Size:

Casing:

Footage			Assays			Core recovery	Log	Descriptions and averages
From	To	Interval	eU3O8	U3O8	Probe			
160.0	181.0	21.0				100		Mostly fine white clay, locally lizy. Some bands up to 2' fine gray-reddish ls. All thinly straight banded -- bedding. Much serpentine, mostly along beds but some along fine steep fractures. Local traces magnetite with serp. Bedding dips 30°.
181.0	196.0	15.0				95		@173' 1' brx, vugs, limonite after py. Medium locally coarse gray to slightly brownish ls. Some wavy thin beds white clay-shale. Much serp, some on beds, some in irregular 3" slots, locally with some mag. Bedding 25°.
196.0	200.0	4.0				100		Ls as above. Some straight thin beds clay -- shales. Many rounded chert nodules, with 1/4" rims serpentine.
200.0	223.0	23.0				100		Medium brown-gray ls, locally finely laminated over 3' widths, mostly thick-bedded. Bedding 25-30°. Much serp, mostly along beds, some in slots and stringers. Some beds have mag (a little).
223.0	260.0	37.0				100		Fine white diopside tactite (hornfels?). Over 20' thin-bedded, some beds up to 1" of green brown ls, some magnetite along beds, usually with slight eu stn. 239-245 much brx, soft, some gouge, no fe @256' double of 1" beds with disseminated py partly to limonite. First sulfides in hole: above here only local spots limonite, mostly associated with mag, indicate primary mineralization was not as intense as below. Here trace mag with pyrite.
260.0	279.0	19.0				100		Fine white diopside tac as above, with in top 5' two 8" bands black mudstone. Py locally disseminated in tac, and in fractures in mudstone. Some py partly oxidized, other fresh. Some stringers and disseminated streaks mag with py.
279.0	297.0	28.0				72		White tac, bands gray med ls up to 1" in lower 5'. Bands and steep stringers black and yellow-green serp with traces mag. Some py, mostly disseminated along vertical stringers. Bedding dips 30°

Transarizona Property

Location: Cane Branch District, Pinal Co., Arizona

Level:
N:
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Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:
Date:

D D. HOLE NO.: 311 (cont'd)
Date Started:
Date Finished:
Size:
Casing:

Objective:

Results:

Footage From	Footage To	Footage Interval	Assays Core eU3O8 % Cu	Assays Sludge U3O8 % Cu	Probe	Core recovery	Log	Descriptions and averages
297.0	305.0	8.0				44		Fault. Much brx & gouge, shears and slickensides dip 70°. Little fe stn. Py in some brx frags but not in fault planes or gouge -- shearing post-mineral.
305.0	330.0	25.0				95		50% fine white tactite, 50% gray-green mud ls -- similar to lower part 279-297. Ls up to 8". Many bedding bands serp, all very irregular up to 1" wide. Also serp up to 1/2" along steep fissures. Py dissem along some fractures, only in serpentine and mostly thru ls wall rock; very rare py in tac. All serp and py have traces mag.
330.0	332.0	2.0	0.75			95		(sludge 328-332). White qtzite (tactite?) much altered to chlorite. At top 1" sheared black chlorite dipping 10° at top and 50° at bottom. Below this 3" banding band massive mag with 3/8" basic band heavy dissem chalcopyrite. Below this qtzite is heavily stringered with py
332.0	335.6	3.6	0.60			95		White qtzite (tactite?), much chlorite esp in lower half which has many 60° shears. Py stringers throughout, mostly parallel bedding, some cross-cutting. Mag throughout, mostly in bedding bands, some in irregular spots. No mag below here to bottom of hole. Mag & py sometimes together, mostly separate. Rare small spots cp, all closely assoc with mag. Bedding 10-25°
335.6	338.6	3.0	0.25			82		White qtzite, altered and mineralized as above. Locally very heavy py
338.6	341.0	2.4	0.25			82		White qtzite, much chl. Locally silicified. Much py.
341.0	342.0	1.0	0.15			100		As above
342.0	344.0	2.0	0.10			92		As above
344.0	350.0	6.0	0.15			100		First 1' white qtzite as above. Remainder black very fine dense qtzite, stringered with py.
350.0	350.6	0.6	0.40			90		Black qtzite
350.6	354.0	3.4	0.35			100		White fine qtzite, strongly chloritized. Py stringers

Location: Transpirimna Property
Gaea Grande Dist., Pinal Co., Arizona

Level:
N:
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Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:
Date:

D. D. HOLE NO.: 311 (cont'd)
Date Started:
Date Finished:
Size:
Casing:

Objective:

Results:

Footage			Assays Core			Core recovery	Log	Descriptions and averages
From	To	Interval	eU3O8 % Oz	U3O8 % Oz	Probe			
354.0	355.6	1.6	0.20			81		White fine qtzite, some bands black, very fine. All strongly chloritized. Py stringers
355.6	360.0	4.4	0.15			85		As above
360.0	365.0	5.0	0.25			100		As above
365.0	367.0	2.0	0.60			90		As above
367.0	368.0	1.0	0.10			85		Med-gr white qtzite, chlorite, py stringers
368.0	371.8	3.8	0.50			26		As above
371.8	373.6	1.8	0.20			20		As above
373.6	375.0	1.4	0.25			14		Fine dark gray qtzite, less py than previously in qtzite
375.0	376.0	1.0	0.10			20		As above
376.0	377.0	1.0	0.20			40		As above
377.0	377.7	0.7	0.60			71		As above
377.7	378.6	0.9				90		As above
378.6	379.6	1.0				80		As above
379.6	381.6	2.0				70		As above
381.6	382.6	1.0				45		As above
382.6	383.9	1.3				85		As above
383.9	384.9	1.0				30		As above
384.9	386.2	1.3				79		As above
386.2	386.9	0.7				100		As above

Location: Trans-Pinna Property
Casa Grande Dist., Pinal Co., Arizona

Level:
N:
E:
Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:
Date:

D. D. HOLE NO.: 311 (cont'd)
Date Started:
Date Finished:
Size:
Casing:

Objective:

Results:

Footage			Assays			Core recovery	Log	Descriptions and remarks
From	To	Interval	Gamma eU3O8 % Eq.	Mineral U3O8 % Eq.	Probe			
354.0	355.6	1.6	0.20			81		White fine qtzite, some bands black, very fine. All strongly chloritized. Py stringers
355.6	360.0	4.4	0.15			85		As above
360.0	365.0	5.0	0.25			100		As above
365.0	367.0	2.0	0.60			90		As above
367.0	368.0	1.0	0.20			85		Med-gr white qtzite, chlorite, py stringers
368.0	371.8	3.8	0.50			26		As above
371.8	373.6	1.8	0.80			20		As above
373.6	375.0	1.4	0.25			14		Fine dark gray qtzite, less py than previously in qtzite
375.0	376.0	1.0	0.10			20		As above
376.0	377.0	1.0	0.20			50		As above
377.0	377.7	0.7	0.60			71		As above
377.7	378.6	0.9				90		As above
378.6	379.6	1.0				80		As above
379.6	381.6	2.0				70		As above
381.6	382.6	1.0				88		As above
382.6	383.9	1.3				85		As above
383.9	384.9	1.0				30		As above
384.9	386.2	1.3				79		As above
386.2	386.9	0.7				100		As above

Transarizona Property

Location: Casa Grande Dist., Pinal Co., Arizona

Level: Surface
N: 47,100
E: 52,686
Elevation: 1772
Bearing: —
Angle: -90

Length: 651.4
Hor: 0.0
Vert: 651.4
Logged by: ABIII

Date: As drilled

D.D. HOLE NO.: 113
Date Started: 10/31/58
Date finished: 11/21/58
Size: BX & AX

Casing: 428' (pulled)

Objective: Test for southward extension of mineralization in Hole No. 106

Results: Different fault block. Garnet, no mineralization.

Footage From	Footage To	Footage Interval	Assays eU3O8	Assays U3O8	Assays Probe	Core recovery	Log	Descriptions and averages
0.0	50.0	50.0				—		Rock bit. Overburden --quartz monzonite and schist pebbles.
50.0	90.0	40.0				—		Rock bit. Dila cgl -- Kv and seds
90.0	105.0	15.0				100		Dila cgl, well consol. Light gray-brown matrix. Pebbles mostly under 2", some up to 4". Mostly Kv, some Ls. Rare gar and magnetite.
105.0	138.0	33.0				100		Dila cgl, well consol. Light gray-brown matrix. Pebbles mostly under 2", fairly abundant up to 4". Mostly ls, some Kv. Little more gar than above. Rare mag.
138.0	180.0	42.0				100		Dila cgl, well consol. Light gray-brown matrix. Pebbles mostly under 2", fairly abundant up to 4". Mostly Kv, esp in plus 2" size, but some ls. Little garnet little mag. Lower 3' mostly sed pebbles, relatively abundant gar. @140' single slickenside dips 60°.
180.0	184.0	4.0				100		Dila cgl, moderately consol. Several nearly-vertical shears, impreg with hem; slickensides pitch 60°. Mostly Kv pebbles up to 2"; little seds, very rare mag and gar. Matrix brown; grades up & into gray-brown above.
184.0	190.0	6.0				100		Dila cgl, well consol. Brownish-gray matrix. Pebbles up to 2", mostly Kv, with seds increasing downward. Minor gar.
190.0	204.0	14.0				100		Dila cgl, well consol. Brownish-gray matrix. Exclusively sed pebbles. To 199' blue & pink ls, some tactite and garnet. Below 199' all blue ls in boulders up to 1". Some cal stringers up to 1/4" dipping 75-90°.
204.0	276.0	72.0				100		Medium blue limy col, often bleached to nearly white ls and coarsened in grain - esp below 240'. All moderately brx, bleached along cracks. 221-238 qz to strongly brx, healed with fine white calcite. No slickensides.
276.0	286.0	10.0				100		Very coarse white marble. @281' 3" brx and slip dipping 75°, hem stn, slickensides pitching [illegible].

Transcarisona Prop[illegible]y

Location: Casa Grande Dist., Pinal Co., Arizona

Level:
N:
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Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:
Date:

D. D. HOLE NO.: 312 (cont'd)
Date Started:
Date finished:
Size:
Casing:

Objective:

Results:

Footage From	Footage To	Footage Interval	Assays eU3O8	Assays U3O8 % Oz	Assays Probe	Core recovery	Log	Descriptions and averages
286.0	291.0	5.0				100		Fine hard blue and white dolomitic ls. Locally many dissem tinny spots limonite presumably after py. @287 Brx and hem stng dips 75°
291.0	339.0	48.0				100		Blue and white ls, as above
339.0	344.0	5.0		0.15		70		(sludge 336-344) Honey and deep red gar, all crushed. Much hem imprg, no sm. Contact with above single slickensided slip dipping 55°.
344.0	350.0	6.0				95		Garnet as above
350.0	355.0	5.0		0.10		100		Garnet as above
355.0	363.0	8.0		0.10		70		Gar as above. Very friable. In bottom 1' much fine gr (1 mm) deep green garnet (?).
363.0	365.5	2.5		0.10		00		No core
365.5	367.5	2.0		0.05		00		No core
367.5	370.0	2.5		0.10		00		No core
370.0	373.0	3.0		0.10		7		Fine green garnet (?)
373.0	376.0	3.0				92		Friable garnet, honey & red, some green
376.0	378.6	2.6				100		Upper 6" crse red gar, remainder reddish med ls. Contact dips 30°; altered shear
378.6	388.0	9.4				100		Reddish and gray med ls.
388.0	393.6	5.6				95		To 390' ls as above, locally brx and altered. Below 390 honey and red gar, lowr part much crushed and hem imprg. Contact is altered shear, dipping 10°
393.6	394.6	1.0				100		Garnet
394.6	396.0	1.4				100		Garnet
396.0	402.0	6.0				89		Garnet
402.0	407.0	5.0				100		Garnet
407.0	410.3	3.3				90		Garnet
410.3	413.6	3.3				90		Garnet
413.6	416.8	3.2				30		Garnet
416.8	420.0	3.2				00		No core
420.0	425.0	5.0				20		Garnet, many films kaolin
425.0	428.0	3.0				37		Garnet, some post-gar asbestos. Some slickensiding with hem films.
428.0	433.0	5.0				100		First 1' gar, remainder hard fine gray ls. Contact with above altered shear dipping 20°.
433.0	437.0	4.0				12		Shear zone, serpentinized breccia

Transarizona Property

Location: Casa Grande Dist, Pinal Co., Arizona

Level:
N:
E:
Elevation:
Bearing:
Angle:

Length:
Hor:
Vert:
Logged by:
Date:

D. D. HOLE NO.: 312 (cont'd)
Date Started:
Date finished:
Size:
Casing:

Objective:

Results:

Footage From	Footage To	Footage Interval	Assays Sludge eU3O8	Assays Sludge U3O8 %	Assays Sludge Probe	Core recovery	Log	Descriptions and averages
437.0	500.0	63.0				100		Fine gray limy dol, much bleached to light gray-white along fractures, in irregular spots and in bands. All moderately fractured, locally thin discontinuous stringers asbestos up to 1/8" thick.
500.0	602.0	102.0				95		Fine white ls, little different in appearance from above. All more or less broken, quite strongly @ 506-508. Local short stringers kaolin - fracture fillings. Local small areas of scattered spots of pale yellow-green mineral -- serpentine? -- up to 1/8" dia.
602.0	613.0	11.0				35		Fault. Gouge and breccia. Pieces ls up to 12" long, but mostly andesite frags up to 1", and gouge with heavy hem stn. Shears all directions; mostly steeper than 45°. Assays of two intervals: 602.2 - 605.7 and 605.7 - 613.2
613.0	622.0	9.0				33		Sheared and gougy andesite. Much contamination with fine material running in from above ~~xxxxxxx~~ interval.
622.0	651.4	29.4				50		Andesite, all much sheared, shears dipping 60-90°. Andesite fairly coarse grained -- up to 2 mm.

Note: No visible copper anywhere in core. No core split.

Ahe

STILL & STILL
CONSULTING MINING ENGINEERS & GEOLOGISTS
ROOM 24 - UNION BLOCK PRESCOTT, ARIZONA

J. W. STILL
ARTHUR R. STILL

TELEPHONE 658
P. O. BOX 1512

January 6, ~~1957~~ 1958

Mr. D. M. Kentro, Ass't. Vice Pres.
Shattuck Denn Mining Corporation
Prescott, Arizona

Re: Transarizona Resources, Inc., Pinal County, Ariz.

Dear Mr. Kentro:

At your request we visited the above named property with Mr. George Freeman on December 26th & 27th and have studied the various data furnished us by your company and by Mr. Freeman. This data consisted of the Bureau of Mines Report of Investigations #4706, two reports by Wisser & Cox dated 9/15/56 & 5/1/57, and numerous plans, sections, sketches, etc., which appear to pretty thoroughly cover all of the available information on the property.

The purpose of our investigation was to evaluate the potential of the Transarizona holdings, primarily with regard to the possibilities of additional ore other than that now blocked out, the size of the current ore reserves and its estimated mining cost.

SUMMARY & RECOMMENDATIONS:

While the present proven ore reserves at the Transarizona property do not represent a great deal of tonnage, and on this tonnage for copper alone an operation would probably do no more than just bail out the capital investment at present metal prices, there are several other factors which combine to make the property an attractive venture.

The two most obvious factors, without even considering additional ore potential, are the possibilities of further metallurgical study and test work which might improve the company's present extraction

estimate as well as cheapen the plant cost, and the distinct and definate possibility of recovering the magnetite in the Lakeshore orebody as a by product. With regard to the magnetite, Mr. Freeman figures that the Lakeshore ore will average 15% iron, and that a 76% recovery and a 68% concentrate can be made. While the data available to us was not sufficient to accurately check these figures, they would represent an income credit of from $1 to $1.50 per ton of mill feed if sold as briquetted or pellitized premium concentrates to a western steel mill, or an appreciably higher income credit if sold in the form of sponge iron to some of the major copper companies which are doing large volume leaching with scrap tin cans (at about $45 per ton) as the percipitating agent.

However, the greatest single factor which adds to the potential of the property is the combination of geological conditions which indicate an excellent possibility of developing substantial limestone replacement orebodies. The similarity of this geologic setting to that at Pima and Silverbell, the amount and degree of copper mineralization and limestone alteration already known to occur along and near the igneous-sedimentary contact and the known existance of several major and numerous minor magnetic anomalies in areas of shallow alluvial cover all combine, in our opinion, to make the exploration of the Transarizona holdings, and adjacent ground if possible, an unusually attractive exploration venture. This indicated probable ore potential differs from the presently known Lakeshore orebody in that it would be, for the most part, sulphide rather than oxide and would have a potential of a higher grade and a substantially larger ultimate tonnage.

We do not feel, however, that the Transarizona company at their present stage of exploration on the property are ready to intelligently start drilling on their magnetic anomalies. Due to this factor we have laid out herein a series of exploration recommendations, calling for additional geophysical and geological work prior to any drilling, which we feel that your

company should follow in the event that they decide to negotiate with Transarizona for a participating interest in the property.

This suggested exploration program consists of two phases, an early phase of additional geophysical and geological study as mentioned above at an estimated cost of $13,500 and, if deemed fully warranted at the time, a second phase of drilling the "indicated economic anomalies" at an estimated cost of $122,500. The first phase of this program would require an estimated time of 6 weeks and the second phase approximately 6 months.

In the event that your firm should be interested in exploration for Pima and Silverbell type deposits, and if equitable arrangements for participation can be negotiated with Transarizona, then we would not hesitate to recommend that the herein proposed exploration be done, since the potential reward fully justifies the required exploration expenditure.

ORE RESERVES & MINING COSTS.

Using the Transarizona rotary drilling results, and working from the plan and sections of the company's proposed open pit, an independent estimate of the mineable ore in the pit was run, together with the amount of overburden and waste to be removed in this mining. The following is our estimate:

Yards of alluvium	421,000
Tons of waste	2,489,000
Tons of Ore	1,351,770 @ 1.62% Cu

The above open pit estimate covers that area from Section S 865 to Section N 385. Drilling to the north, subsequent to the pit layout, to Section N 622 shows a continuation of this orebody which could be mined by extending the pit in this direction. In this extension area, we would estimate that there is an additional mineable tonnage of 182,600 tons @ 1.27% copper.

The above estimate on the open pit area alone shows a lower grade of ore and a higher waste ratio than that arrived at by the company. A check on this new estimate grade was made by taking an average of the drifting

within the ore limits on the four crosscuts that cut this orebody on the 152 level, and this averaged also 1.62% copper. The additional waste in the estimate is due to using a 45 degree backslope on the east side of the pit, rather than the steeper slope shown on the company sections.

The two million ton ore reserve quoted by the company includes roughly 1.5 million tons in the pit area, and 0.5 million tons below this pit floor and in the area to the north of the pit. We do not consider mineable either the "scraper ore" in the pit bottom or the deeper ore under the pit floor, as the grade is neither good enough to deepen the pit, with a prohibitive waste ratio, nor to carry any type of underground mining.

From the above, our estimate of mineable ore would total the following:

Present pit layout.....	1,351,770 tons	@ 1.62% Cu,	with waste/ore 1.84:1
Pit extension to north...	182,600 "	@ 1.27% Cu,	assumed same waste ratio
Total mineable reserve...	1,534,370 "	@ 1.58% Cu,	waste/ore ratio 1.84:1

Attached to the end of this report you will find Appendix #1, which shows the yards of alluvium, tons of waste, and tonnage and grade of ore by sections for the above estimate.

Assuming that the mining will be on a 2840 ton per day basis, 1000 tons of ore and 1840 tons of waste, and that a 1½ yard shovel and 15 ton trucks will be used on two shifts per day, we would estimate the following mining cost:

Stripping overburden alluvium....	421,000 yards @ 30¢.....	$ 126,300
Mining Ore & Waste.....	4,357,610 tons @ 66¢.....	2,876,322
		$ 3,002,322

$3,002,322/ 1,534,370 = $1.96 per ton of ore.

If it is assumed that a recovery of 90% will be made, the mining cost per pound of copper will be $1.96/2844 or 6.9¢ .

The above costs are somewhat higher than the company estimate. This is due to the combined effect of the higher stripping ratio, lower head

grade and higher mining cost estimate. Their 30¢ figure for stripping alluvium is reasonable and we have used it, as this material can be ripped and moved about 800 feet with cats and carryalls. The company's $1.30 cost per ton of ore on a 1.3:1 stripping ratio works back to a mining cost per ton of material of 56.5¢. The proposed open pit is to be on a contract basis, and in addition to the direct cost, the contractor's cost will have to include his profit and amortization of his equipment. Added to this will be the company cost for supervision and engineering and in view of all this, the 56.5¢/ton cost is somewhat low and we would estimate a total 66¢/ton mining cost.

GEOLOGY:

General Discussion:

Based upon our own field examination of the Transarizona property, and upon a thorough study of their geologic mapping, magnetic anomaly maps and etc., it is our opinion that the property has a very high geologic potential for the development of limestone replacement orebodies of the general Pima-Banner-ASAR and Silverbell types. Such deposits are apt to be considerably richer and larger than the presently known Lakeshore orebody and sulphide in character, although some oxide copper would be found in their upper extensions.

It is also our opinion, both from field observations and from the stratigraphic thicknesses of the exposed sediments as shown by the Transarizona mapping, that the quartzite and limestone outcroppings on the property are actually the Bolsa quartzite and the Abrigo limestone rather than the Troy quartzite and the Mescal limestone as previously reported. This may appear at first to be a strictly academic point but it is a very important factor when one considers that the Abrigo, and other overlying Paleozoic limestones, are the favorable hosts at camps like Bisbee, Tombstone, Pima-Banner and Silverbell while the Mescal, by

comparison, is normally much thinner and a relatively poor host for replacement type deposits.

The geologic setting of the Transarizona property is very similar to that at the relatively nearby camps of Pima and Silverbell where copper orebodies are found in Paleozoic limestones adjacent to, or within, granite or monzonite intrusives. At both of these camps the chalcopyrite orebodies are associated with typical skarn minerals (epidote, garnet, magnetite and calcium silicates) and in the Pima area alone at least four important deposits have been recently developed by the drilling of blinded geophysical anomalies.

In the Silverbell District the limestone replacement deposits outcropped and were found, and mined, at a relatively early date, that district having produced over 100 million pounds of copper from such orebodies by 1930. The major orebodies of the Pima District, however, were masked and are a relatively recent discovery, the earliest dating back to only 1951, and that area is still undergoing active exploration and development. The reserves of the overall Pima district are not a matter of public knowledge but it is known that several tens of millions of tons of ore have been blocked out and proven to date.

In conjunction with the favorable geologic setting at the Transarizona property there is abundant known copper mineralization and limestone alteration along the contact to testify to the past existance of mineralizing solutions in sizeable quantities. These factors, coupled with the broad pediment of shallow cover containing several large and numerous smaller magnetic anomalies make the occurrence of limestone replacement orebodies of economic importance an extremely good likelihood. An additional possibility in this area, even if a less probable one, is that of developing a large low grade copper such as the open pits at Silverbell

and the new AZR orebody just north of Pima.

Geologic Comments by Areas:

The one known orebody on the Transarizona property (i.e. the Lakeshore) is, as strange as it may sound, in our opinion not at all typical of what is apt to be found through further exploration in the balance of the area. We say this since the Lakeshore is a probably unique occurrence of mineralization in an overturned wedge of Paleozoic sediments that was drug into its present attitude by the overthrust, or "lid", fault. At the Lakeshore the sediments dip towards the granitic intrusion, terminating against it at a relatively shallow depth, and are bounded on the footwall (due to overturning) by Cretaceous(?) volcanics. Due to the abundant faulting associated with this deposit, its low dip and its termination at a shallow depth it has undergone essentially complete oxidation throughout its entire down-dip length. In conjunction with this, it appears likely that only a very thin (30 to 50 ft.) horizon of favorable limestone was present in the isolated and overturned wedge of sediments, this being now represented by the zone of high magnetite which is found along the immediate footwall of the orebody. The workings which service this deposit are the only development in the alluvial covered area since the orebody did have one small skin outcrop of economic grade copper which called it to the attention of earlier investigators.

One other area where the sediments dip towards the granitic contact is known on the property. This is the mass of limestone (1900 ft. by 300+ ft.) on the eastern edge of the Slate group which dips at an angle of about 45 degrees to the north, has been greatly altered and has had a reported production of a few thousand tons of roughly 5% copper oxide ore from several relatively shallow surface pits. At this local the limestone

has been intensly altered with the development of a great deal of andradite garnet, specularite and calcium silicates but with such a small amount of magnetite that it gives no magnetic anomaly with a surface magnetometer even on lines run directly over surface points which exhibit abundant mineralisation and alteration.

As against this, the other outcropping masses of limestone in the district dip away from the intrusive mass and potentially will continue to much greater depths such that sulphide ores, rather than oxides, would play a predominant role in the development of any later ore reserves. This is also true of most of the limestone in the covered areas, as inferred from the configurations of the magnetic anomalies.

Due to the varying thickness of the Paleozoic limestone as exhibited in the several outcroppings and underground in the Lakeshore mine it is obvious that the Cretaceous (?) volcanics unconformably overlay the Paleozoic sediments on an old erosion surface of considerable relief. This is evidenced by the 30 to 50 feet of altered limestone on the footwall of the Lakeshore orebody as against the minimum of 350 ft. of limestone (bounded to the southwest by alluvium) on the Isabella claim, etc. Due to this factor, it appears logical that at some points under the alluvial cover a much greater thickness of Paleozoic limestones may be encountered. It is, in our opinion, probable that some of the larger anomalies (such as anomaly B plus its extension to the southwest and the area of anomalies D & F) would indicate mineralization in this greater sequence of favorable limestone horizons.

RECOMMENDATIONS FOR EXPLORATION:

It is our opinion that this property holds a great deal of potential for exploration but, due to their large number of known

magnetic anomalies, it would take an unnecessarily large amount of capital to adequately and fairly either prove or disprove the potential if a drilling program is jumped off into prematurely and if drilling is the only exploration tool which is to be used from this stage forward.

It appears to us that a much more logical approach to the exploration of the property would be to conduct some additional geophysical work, in conjunction with an expanded geologic study, which would permit not only a check on the original magnetic anomalies but would also serve to word out those which may be solely due to magnetite. This procedure would help to delimit and define the actually worthwhile exploration targets, it would give a rapid and relatively inexpensive check on the magnitude of exploration worthiness of the entire holdings and it would greatly increase the chances for success of any later drilling program. Another factor worthy of consideration is that at least on portions of the property, such as the copper mineralization in limestone on the Slate workings, the predominant skarn mineral is garnet and the magnetite content is so low that no magnetic anomaly was obtained even over areas where abundant copper can be seen on the surface. Thus, a second geophysical method may also serve to indicate areas of mineralization of this type in covered areas that were not conducive to detection by the original ground magnetometer survey alone.

The above line of reasoning is that which was followed by the discoverers of the Pima orebody and because of the similarity of the geology and exploration problems of the two areas we are attaching hereto a copy of a noteworthy article by the three co-discoverers* of that orebody which describes fully, and discusses, the line of reasoning and method

* Geophysical Discovery and Development of the Pima Mine, Pima County Arizona, by Robert E. Thurman, Walter E. Heinrichs and E. D. Spaulding Mining Engineering, Feb. 1954

of approach which we would recommend for the further evaluation and exploration of the magnetic anomalies of the Transarizona property. As noted in this article, electromagnetics would probably prove to be the best second geophysical tool to use.

The IMEA drilling project which is presently contemplated by Transarizona is probably suited to their immediate purpose, that being to attempt to cheaply further prove the potential of their holdings so as to more easily attract a participating partner, but neither its scope nor its timing are, to us, entirely logical. We would recommend that this drilling program be postponed until after the completion of the above discussed additional geophysics and geologic study such that it could be incorporated into a more expanded drilling program in which the location of drilling sites could be much more intelligently made and the chances for success greatly enhanced. As this program presently exists it contains entirely too few holes to adequately and fairly either prove or disprove any of the anomalies that they contemplate drilling. In addition, the bulk of the holes, as located on the Transarizona maps, are improperly placed since they would test only the immediate area of the maximum "high" on the anomaly and this, in a dipping ore horizon, represents only the shallowest surface point and not necessarily the most optimum drilling target (illustrated in Fig. 4 of attached article on Pima).

In line with the above reasoning we would recommend the following exploration sequence, in the event that an equitable partnership arrangement can be negotiated with the present property owners. This proposed exploration program is set up in two stages, thus giving the opportunity to re-evaluate the entire risk in the project prior to the instigation of the more expensive second phase.

Phase I (Estimated time: 3 wks.)

Item	Estimated Cost	Total Cost
1) A thorough geophysical investigation involving the use of a second geophysical method (probably electromagnetics) to cover entire holdings..	$ 10,000	
2) A more thorough geologic study which would over-lap the geophysical work in time.....	3,500	
	$ 13,500	$ 13,500

Phase II (Estimated time: 6 mo.)

1) Concentrated drilling of "Indicated Economic Anomalies", 2 rigs, 2 shifts, 6 day week: 20,000 ft. dry rotary & core drilling, estimated direct drilling cost* of $4.33/ft.....	$ 86,600	
2) Supervision & Labor: 1 Exploration manager at $800/mo. 1 Two man survey party @ 800/mo. 4 samplers @$15/day or 1689/mo. 2 core splitters and gen'l. helpers at $14/day or..... 789/mo.		
$ 4077/mo. x 6 mo....	24,462	
plus taxes & ins. at 10%	2,446	
3) Bulldozer roadwork.....	1,500	
4) Core boxes, core processing & storage shed, assays and misc. supplies.....	7,500	
	$ 122,508	122,508
Total cost.....		$ 136,008

*Note on Drilling Cost: Using Joy bid to Transarizona of Sept. 20,1957. Assumed average hole depths of 500 ft. of which top 200 ft. is drilled by dry rotary. Then 2/5ths x $ 2.33/ft. plus 3/5ths x $5.00/ft. plus 10% for cementing, casing, lost time, etc. gives average drilling cost of $ 4.33/ft.

The above 20,000 feet of drilling, conducted at a time when it can be intelligently laid out, should be sufficient to justly

test the anomalies in the immediate Transarizona property. In the event that highly encouraging results are obtained and it is desired to actually "block out ore tonnage" by drilling then additional footage would very probably be required.

Very truly yours,

J. W. Still
Mining Engineer

Arthur R. Still
Mining Geologist

APPENDIX #1.

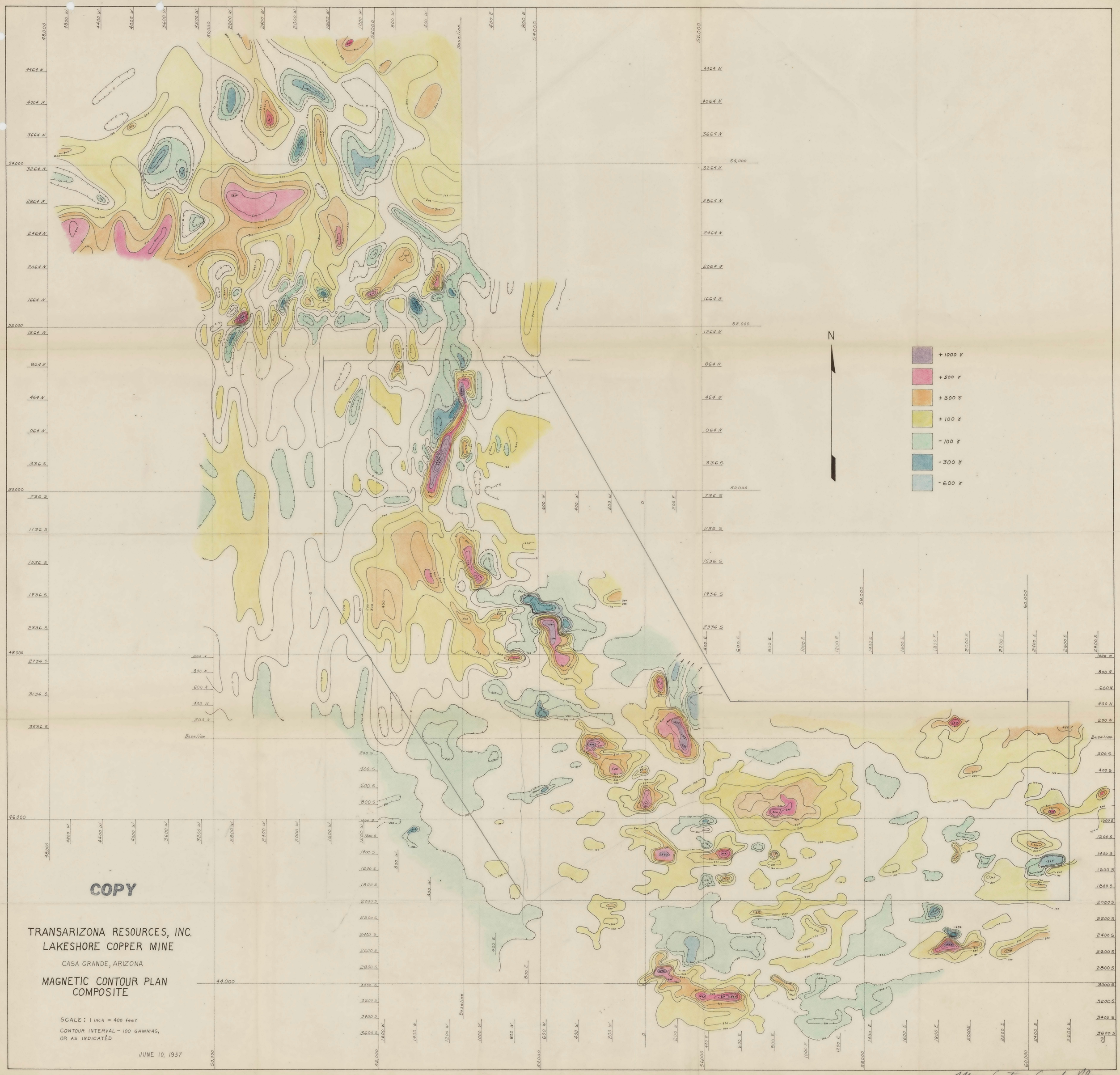
Pit Tonnage Calculations:

Section & Ore Grade	Yds Alluvium	Tons Waste	Tons & Grade of Ore
N 385 - 2.32%	1071	828	4156 @ 2.32%
N 330 - 1.64%	3194	3018	7840 @ 2.09%
N 230 - 1.87%	9367	11136	28346 @ 1.83%
N 185 - 1.13%	5521	4057	20414 @ 1.51%
N 140 - 1.51%	7320	13516	26931 @ 1.36%
N 85 - 0.97%	9745	38737	43775 @ 1.24%
Zero - 1.66%	21634	111003	93782 @ 1.40%
S 100 - 1.36%	36744	217648	141265 @ 1.51%
S 160 - 1.79%	21960	140942	84662 @ 1.57%
S 220 - 1.71%	21067	123014	86816 @ 1.75%
S 280 - 1.82%	23006	134400	87384 @ 1.76%
S 400 - 1.95%	51938	337036	181611 @ 1.89%
S 510 - 1.22%	49687	350618	162350 @ 1.63%
S 590 - 1.43%	40725	253683	102389 @ 1.32%
S 715 - 1.72%	59046	404320	173346 @ 1.59%
S 760 - 1.76%	16665	141426	56508 @ 1.74%
S 820 -1.55%	20413	139996	41447 @ 1.70%
S 865 ———	13512	49939	8628 @ 1.55%
	8431	13648	———
Totals	421,066	2,488,965 (1)	1,351,770 @ 1.62% (2)

Note: (1) Figured @ 12.5 cuft/ton...(2) Figured @ 11 cuft/ton.

Possible Pit Extension North of N385

Section & Ore Grade	Tons & Grade of Ore	Section	Tons & grade of Ore
N 480 - 1.02%	73514 @ 1.02%	N 592- 1.58%	14385 @ 1.52%
N 525 - 1.45%	34491 @ 1.17%	N 622 -1.43%	9092 @ 1.43%
N 562 - 1.64%	27672 @ 1.57%		
	23474 @ 1.62%	Total	182,628 @ 1.27%



Mag. Contour Comp. Plan