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Arizona Department of Mines and Mineral Resources Mining Collection

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VIS6.42

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

VERBAL INFORMATION SUMMARY

1. Information from: Steve Fry

   Company: Union Texas Petroleum Company

   Address: 1330 Postoak
   Houston, TX 77252

2. Phone: (713) 623-6544

3. Mine: Zonia

4. ADMMR Mine File: Zonia

5. County: Yavapai MILS Number: 407

6. Summary of information received, comments, etc.:

   Mr. Fry reported that our December 1988 verbal information summary states that Union Texas Petroleum is supposed to be owner of the Zonia Mine and that it is probably incorrect. He does not know who the current owner is.

   He provided a partial ownership history: McAlester Fuel was the last operator of the mine. Sometime after operations ceased N-Star bought McAlester Fuel. Later Union Texas and Ultimar Oil bought N-Star with the agreement that Ultimar would run the mineral properties and Union Texas the oil property. Subsequently there have been other deals and he has no idea whether the Union Texas-Ultimar partnership has any position in the property but he doubts it.

Date: 9-16-92 Engineer: Ken A. Phillips

Arizona Department of Mines and Mineral Resources

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Date: 9-16-92 Engineer: Ken

07/21/92

ARIZONA COPPER RESERVES

COMPILED BY

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

PROPERTY:

ZONIA

OPERATOR\OWNER:

Zonia Co.
212 S. Marina St.
Prescott, AZ 86303
602-778-2101

LEASED BY ARIMETCO. 10/92 - NJN.

LOCATION INFORMATION:

TOWNSHIP 11 N RANGE 4 W SECTION 12
COUNTY - Yavapai AZMILS - 407
DESCRIPTION - 30 miles north of Wickenburg

ORE TYPE AND RESERVE INFORMATION:

Acid Soluble - 35 MILLION TONS AT 0.31% Cu

RESERVE INFO - Acid Soluble - (includes minable and in situ)

SOURCES:

George Phelps - NJN WR 3/1/85, Lundin, Richard J. et al "Porphyry Copper Mineralization Assoc. with the Central Arizona Greenstone Belt." Feb 1985 pg 4 (ADMMR Zonia file)

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

VERBAL INFORMATION SUMMARY (SHORT FORM)
May be Reproduced
May Be Inserted Into Mine File Or Added To "Rumor Page"

1. **Information from:** Robert E. Holt

   Address: Owl Head Ranch - Box 1018 MSR

   Tucson, AZ 85737

2. **Phone:** 575-2792

3. **Mine:** ZONIA

4. **ADMMR Mine File:** ZONIA

5. **County:** Yavapai

6. **MILS Number** 407

7. **Operational Status:**

8. **Summary of information received, comments, etc.:**

   Mr. Holt was given old ownership information on the Zonia Mine with the caution that it probably was out of date. Mr. Holt later reported that the property had changed hands several times with company buyouts.

   The current owner is supposed to be: Union Texas Petroleum Company
   1330 Postoak
   Houston, TX 77252
   Phone: (713) 623-6544

Date: December 1988 H Matar
(signature) ADMMR

ZONIA GROUP YAVAPAI COUNTY

NJN WR 9/1-/83: Jim Vacek reported that Queenstake Resources is trying to buy the Zonia Mine, Yavapai County.

CJH WR 3/23/84: Visitor: Don Anderson (c). He reported that Antioch Resources (c) names as a principal asset, the Zonia Mine, Walnut Grove District, Yavapai County. They will be carrying out a modest exploration program on this property this summer. The target will be volcanogenic massive sulfide deposits with significant precious metals values.

NJN WR 3/1/85: At the Zonia Group (f) Yavapai County, George Phelps reported that Queenstake Resources Ltd (c) 900, 850 W. Hastings St., Vancouver V6C 1E1 and Antioch Resources Inc. have purchased the property from McAlester Fuel Co. Copper oxide reserves are estimated to be 35 million tons grading .31% Cu. This includes mineable, leach basin and insitu reserves. (The new owner and reserve data should be changed in the copper ~~reference~~ reserve file.) Recently Phelps Dodge reviewed the property as a place to dispose of sulfuric acid and produce Cu from a SX/EW plant. They turned it down because operating costs were extimated at over 30¢/pound. Currently Antioch and Queenstake are reviewing the schist units for gold zones. One shaft, the Z-10, was recently rehabilitated 90'. Underground samples taken there ran .3 - .5 oz Au/ton. They would be interested in having a joint venture partner assist them due to the large property position and number of target zones.

NJN WR 11/24/86: Dave Hembree, Queenstake Resources Ltd (c) reports that they are no longer interested in the Zonia (file) Yavapai County. Their portion of the property has been returned to Antioc Resources (c). Their exploration program consisting of underground rehabilitation and sampling only found spoty lenses of precious metal minralization.

ZONIA GROUP YAVAPAI

Visited with Mr. Brunner at the Zonia mine of McAlester Fuel Company where he said they were loading holes in preparation for blasting 4 million tons of ore and overburden for the purpose leaching-in-place. He said they had contract-drilled over 300,000 feet of 9" hole to an average depth of 250 feet. GW WR 3/21/73

Went on to the Zonia operation of McAlester Fuel Company. Mr. Brunner wasn't in but the office manager said there had been no leach liquor from the recent Blast area because two pumps must be installed which he estimated would be in July. GW WR 5-16-73

Went on to the Zonia mine of the McAllester Fuel Co. where Jack Brunner said he was preparing a blast of 1M lbs of Anfo around March 1st. He said the first blast contained 4,125,000 lbs. of Anfo and covered an area of 10 acres from which they have leached an average of 5000 lbs of Cu daily, which is below the expected recovery of 9000 lbs. He said Anof is .09 per lb. now as against .05 at the time of the initial blast. GW WR 1-25-74

Had a rumor that an attempt is being made to deal the Zonia copper property to a large Cu company. GW WR 5/2/75

Frank Bowman, Amax Arizona, said the last precipitates at the Zonia had been sold last month. VBD WR 9/19/75

KAP WR 4/17/81: In the company of Dick Beard, a field interview was held with Jack Kuhn, Jean Cline, and Hugh Olmstead of Inspiration Development Company. The Zonia Mine was suggested to them as a possible acquisition. Jack Kuhn explained that he felt the Inspiration Smelter is probably interested in precious metal bearing siliceous flux.

TPL WR 5/28/60: Mr. Hughes described the Zonia project, west of Kirkland Junction, which is being conducted by Mr. Hughes and his partners, but under the name "H.T.H. Mining Co." The property comprises the Zonia group and the adjoining Brown group. The partnership plans to install a 500 ton mill and copper leach plant and have already moved in some items of equipment. Mining will be by open cut method. I will visit the site on my next trip in the region.

NJN WR 1/8/82: George Phifs from Queen STake Resources (a Canadian Corporation controlled by Canada Tungsten who is owned by Amax) is interested in taking a look at the Zonia, Yavapai County for a "parallel" zone of precious metal mineralization.

Went on to Zonia where Mr. Brunner was too busy for an interview. The office force stated they were making some major repairs to the precipitating unit.
G.W. WR 9/17/71

Directory of Mining - August 1971 - 25 employees.

Visited the Zonia Mine of McAllester Fuel Company where a "sulfer burner" is being installed. Mr. Brunner, manager, wasn't available for an explanation of the new equipment. GW WR 11/24/71

The Zonia leaching operation continued at their regular rate as did the Bruce Mine near Bagdad. FTJ QR 9/71

The McAlester Fuel Company, Zonia Copper leaching operation worked all thru the period except for a short shut-down to replace some of the piping. GW QR - 9/71

Went on to the Zonia operation of the McAlester Fuel Company where I met Mr. Brunner very briefly for the first time. He was busy with two insurance men taking an inventory of equipment. GW WR 1/26/72

The copper leaching operation of the McAlester Fuel Company continues at the rate of 16,000 tons per day. A small SO_2 plant has been recently completed and is operating very satisfactorily. GW QR 2/72

John Brunner, manager of the Zonia Copper Mine of McAlester Fuel Company is really bitter toward State Air Pollution Commission who have threatened to fine his company $1,000 per day until the 2½% SO_2 fume emission from their newly installed H_2SO_4 plant is stopped. This directive would mean returning to the use of purchased acid. Mr. Brunner said that since the new acid plant has been in operation is the only time the operation as a whole has been on the black side of the ledger. GW WR 5/24/72

Went to the Zonia Copper mine of McAlester Fuel Company but Mr. Brunner wasn't in, however, the office manager said they had received a summons to appear in court regarding their air pollution. GW WR 9/20/72

Active Mine List - October 1972 - Empl. 25

Mr. Brunner of the Zonia copper leaching operation of MacAlister Fuel Company wasn't in but the office manager said they were operating as usual and that they had a permit from the State Environmental Agency allowing their effluent of SO_2 gas. GW WR 1/24/73

ZONIA GROUP YAVAPAI COUNTY

Mr. Mercer of Air Pollution Control phoned re use of SO_2 by McAlester Fuel Company. Current use 17 tpd. Also use 50 tpd H_2SO_4. FPK Note 3-11-70

Visit with Nagib Akel, Brunner's assistant. They are taking copper ppts from the discard pond and hope to increase overall recovery. FTJ WR 3-20-70

Zonia mine was active during this quarter. FTJ QR 4-3-70

Visited Zonia mine - Mr. Akel said operations about normal. FTJ WR 5-22-70

Active Mine List May 1970 - 46 men - J.J. Brunner, Project Manager

Zonia mine operated at the usual rate for the year. FTJ Annual Report 6-30-70

Went to Zonia, visited with Mr. Brunner, who said operations normal. FTJ WR 7-24-70

Visited Zonia. Talked to office personnel as Mr. Brunner was not available. FTJ WR 9-18-70

Active Mine List Oct. 1970 - 29 men

Visited Zonia - Mr. Brunner wasn't in but its rumored that Zonia increased production lately. GW WR 11-20-70

Zonia mine operated at its regular rate through the quarter. FTJ QR 1-13-71

To the Zonia mine - Mr. Brunner was out so did not learn too much but ppt plant was changed and other improvements made. FTJ WR 1-22-71

To Zonia mine - Interview with Jack Brunner who said they were using a D9 Cat with 10' ripper to break up some of their leach dumps. FTJ WR 3-22-71

The Zonia mine was operating at its regular rate. FTJ QR 4-5-71

To Zonia mine. 23 Company employees, and 13 contract. They are mining at the rate of 12,500T/day. FTJ WR 5-24-71

To Zonia mine. Jack Brunner was somewhere around pit, after driving around pit - gave up. I wanted to know about some obvious changes in the precipitation process. FTJ WR 7-27-71

ZONIA GROUP

YAVAPAI COUNTY

Visited Zonia - brass from Oklahoma visiting the mine. FTJ WR 11-22-68

Active Mine List Oct. 1968 - 21 men - 18 contract

Zonia operated at regular rate. FTJ QR 12-31-68

Visited Zonia & Richard Chilson and inspected pit with Don Anderson. Operating at regular rate, but are short of water. FTJ WR 1-24-69

Visited Zonia mine - Don Anderson not at mine - operations normal. Have fairly good well developed. FTJ WR 3-21-69

Zonia mine - Division of McAlester Fuel Co. operated at regular rate during quarter. FTJ QR 4-18-69

Active Mine List April 1969 - 39 men - Don F. Anderson, Project Manager

Visited Zonia mine southeast of Kirkland Junction. Don Anderson, Manager, took me through the mine which is operating at 12,000 tpd. The mainly silicate ore in schist is placed in heaps in 12 ft. rises over more than a million square feet of leach area. Pit benches are 27 feet high. The oxide ores with chalcocite are of satisfactory grade but primary material averages only 0.2 percent copper. FPK WR 6-4-69

Visited Zonia - Anderson was making tour of property - operations normal. FTJ WR 7-18-69

Talked to Don Anderson at Zonia. He is resigning as of Oct. 15, 1969 and will be replaced by J.J. Brunner. There is no change in operations. FTJ WR 9-19-69

Active Mine List Oct. 1969 - 37 men - J.J. Brunner, Project Manager

Visited Zonia - Mr. Brunner showed me around. They have installed a filter and are treating iron sulphate water with SO_2 with activated charcoal as a catalytic. Hope to up recovery. FTJ WR 11-21-69

Visited Zonia and Mr. Brunner who I understand is doing some shaking up. He said he hoped to have things in better shape soon and may be make some money for the company. FTJ WR 1-23-70

Zonia mine was making additions to their plant during this quarter. FTJ QR 1-16-70

ZONIA GROUP YAVAPAI COUNTY

Visited the Zonia Mine. They are mining about 8000 tpd. To date about 1,000,000 tons of ore mined produced about 3,000,000 lbs. of copper. They have ceased crushing of ore and also use of bulldozers for ore transport and are now using front end rubber wheeled loaders to avoid compaction of heaps. In addition, before adding ore to heaps, the top 3' of ore is scraped off. The new and smaller leach pit is near completion. Interview with Don Anderson who said recovery was about 70%.
FTJ WR 3-24-67

Visited the Zonia operation east of Kirkland Junction. Operation said to be normal.
FTJ WR 5-19-67

Zonia Copper mining division of McAlester Fuel Co., situated 22 miles southwest of Prescott, Arizona, (via Kirkland) has stripped off the cover of an oxide copper orebody. In 1966 actual mining started here and leaching of the low grade copper ore by adding an acid water to the top of the ore is under way. Skillings Mining Review May 13, 1967

Visited Zonia mine. Interviewed accountant who said operations were improved. They are now spraying leach piles rather than flooding. FTJ WR 9-22-67

Visited Zonia - they are mining 8000 tpd. The pad has a series of lifts, 6' high. These are sprayed using Armstrong sprinklers with 5% acid solution until saturated, then allowed to stand for a few days, sprayed again with 3% solution. Recovery is said to have improved. The ore contains about 9% chrysocolla, balance carbonate and oxides.
FTJ WR 11-24-67

Active Mine List Nov. 1967 - 44 men

Visited the Zonia mine - operating at regular rate. Some changes made in pit mining to allow some selectivity. FTJ WR 1-19-68

Visited Zonia office - operation as usual with expectation to reach 15,000 tpd to leach piles. FTJ WR 3-22-68

Active Mine List April 1968 - 18 men

Mine visit to Zonia - operations normal. FTJ WR 5-24-68

Visited Zonia - tour of the mine with Don Anderson. They are mining about 3000 tpd. Some exploration on surface continues and crew of 3 underground timbering. FTJ WR 7-26-68

Visited the Zonia mine - Don Anderson is now project manager. They are mining 12,000 tpd.
FTJ WR 9-20-68

ZONIA MINE YAVAPAI COUNTY

Visited Zonia. Mr. Anderson said they hoped to begin mining and spraying in about 1 month. Heap piles expected to be 25' high rather than the original plan of 50'/ Also highest point of leach pit cut to 250' to the bottom of the pit. Letting of contract for mining not completed as they are undecided whether to use dozer, carry-alls or trucks for placement of ore. Asphalt was being spread over the entire surface of pit on top of cement-soil foundation. Pit estimated to hold 6-7,000,000 tons when filled and if necessary; a new pit will be prepared.

FTJ WR 3/18/66

Visited the Zonia Mine. Leaching had been taking place for about 10 days on two leach piles. 450,000 tons have been mined to date. 18,000 tpd, 5 days a week is scheduled for mining. 6 scrapers and 6 dozers do the mining. Aerial photos are taken monthly to determine tonnage mined. 163 gpm of water is sprayed at present producing about 2 tons of cement copper per day, carrying about 85% copper. This is expected to increase to 350 gpm. Assay control is accomplished by X-Ray equipment in a very modern laboratory.

FTJ WR 6/24/66

During 1966, McAlester Fuel Co. became the newest copper producer in Arizona by opening its Zonia Mine, fives east of Kirkland Junction in Yavapai County. In 1965, McAlester engaged in exploration and development, and in April 1966 the Company commenced to recover precipitate by heap leaching method. Currently McAlester is moving ore and waste at the annual rate of 1 million tons and is increasing steadily its copper output to a projected capacity of 40,000 lb per day.

In the mining area, tractors are employed to rip the ore for loading and transportation by scrapers to the leaching basin. After the ore is saturated by sulphuric acid solution, the copper sulphate bearing water is circulated to cells containing scrap iron to precipitate the copper. From the plant, the precipitate is delivered to a siding at Kirkland on the Santa Fe Ry.

Taken from Skillings Mining Review 10/15/66

Visited Zonia Mine. Was told they have mined 900,000 tons of ore since start up. Copper recovered not revealed. They now have to drill and blast, as ripping ore became too difficult. John Mercer has contract for mining and employs about 22. McAlester (Zonia) employ 22 also.

FTJ WR 10/21/66

Visited the Zonia operation out of Kirkland Jct. Mining was temporarily suspended while the leach piles were being scorified. Also blast holes were being drilled on a pile. Apparently solutions were not going through the piles as anticipated. They were also preparing another leach pit but smaller than the pit now used.

FTJ WR 2/24/67

Richard Chilson with 3 men operating pilot plant on limited scale. Results not divulged. FTJ WR 9-10-65

Visited Zonia mine and was shown the work being done and plans for the future by Don Anderson, mine superintendent. FTJ WR 1-21-66

ZONIA GROUP YAVAPAI COUNTY

Visited the Joker Mine of Multi-Metals Mining Co. This is a partnership operation composed of three people of Brownsville, Texas. Sam Hughes, 225 S. Marine Street, Prescott, is the principal and the promoter of this project, as well as in another concerning the Zonia Mine near Kirkland Junction.
At the Joker mine the company is completing construction of a mill, 50 tpd, and surface plant. The mine is said to have produced a considerable quantity of high grade gold silver ore many years ago. The hoist, bins, rod mill screens, tables, shop, etc. are all housed in a 2½ story small building directly over and enclosing the collar of the main shaft which is practically vertical and reported to be 250' deep. It is filled at 120 ft. No work is in progress in the mine. 3 men are working including Mr. Hughes.
Mr. Hughes described the Zonia project, west of Kirkland Junction, which is being conducted by Mr. Hughes and his partners, but under the name "H.T.H. Mining Co."
The property comprises the Zonia group and the adjoining Brown group. The partnership plans to install a 500 ton mill and copper leach plant and have already moved in some items of equipment. Mining will be by open cut method. I will visit the site on my next trip in the region. TPL WR 5-28-60

Visited the Recorder's office in Prescott to check ownership of the Zonia Mine. The property comprises 14 patented claims owned by James L. Gillingham, Jr., 899 Union St., Alameda, California. (Claims are "Fortuna", "Arrastre", "Arteria" etc.) TPL WR 7-2-60

Visited the McMahan property adjoining the Zonia mine. The Cuprite Copper Company of Brownsville, Texas is constructing a rectangular concrete tank, etc. and intends to make percolation leach tests of material from this property and from the Zonia deposit which is said to be under option. Dr. Ray Harris, Professor at Texas Tech is the principal in the venture. The crew consists of Donald Dukes, Geologist, in charge and one helper. Neither Harris nor Dukes was present and the information available was therefore rather sketchy. These are the people who backed Sam Hughes on the Joker mine near Prescott. The project closed down amid bitter squabbles and is now in litigation. TPL WR 7-1-61

Visited the Zonia Camp where Mrs. Bruce Millan is caretaker for the owner, James L. Gillingham. No activity. TPL WR 10-28-61

Learned a California company has taken an option on the Zonia property and some men were then examining the property. EGW WR 5-29-63

According to M. O'Leary - Bunker Hill Co., 620 Market Street, San Francisco, is drilling the Zonia. FPK 4-13-64

They are not drilling now according to EGW. FPK 11-16-64

Richard Chilson with backing of McAllister Fuel Co. have optioned the property and have completed a drilling program. 30 to 40 holes were drilled in the 300 ft. range and 5,000,000 tons of .9% copper oxide ore is reported to have been developed. 5 men are employed. Three leaching tanks are completed and installed and operation will begin during the week of June 21 on a pilot basis. Information from Alvin Bray who lives on the property. FTJ WR 6-18-65

Attached 5/12/80 MW

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine	ZONIA - McALISTER FUEL CO.	Date	April 25, 1980
District	Walnut Grove (Yavapai County)	Engineer	Clifford J. Hicks CJH
Subject:	Mine Visit		

The Zonia is still idle with no present plans to reopen, according to Mr. Henry Tucker, Watchman. Mr. Jake Bruener, Project Manager, lives in Wickenburg, phone 684-2188.

CJH:mw

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA 85007
602/271-3791

Memorandum for the Files

August 9, 1977

Zonia Mine - McAlister Fuel Company

The property is still up for sale. It has been visited by representatives of ASARCO, Chevron, Quintana, Phelps Dodge, American Selco, Minerals Exploration Co., and Noranda.

Phelps Dodge is presently conducting a geophysical survey. They probably are not interested in the oxide ore. They are looking for the deep-seated sulfide possibilities.

Mr. Bruener believes the best prospects to purchase the property, are chemical companies that buy copper scrap. The cement copper produced at the Zonia is better than the scrap and savings can be made by eliminating smelter and refinery charges.

John H. Jett, Director

KP/WR 1/21/80 - The Zonia is apparently still idle. Although everyone was likely in town at the time of our visit, a small crew maintains the facility. Watchman guards the property twenty-four hours.

MG WR 5/6/80: Talked with Mr. Jake Bruener, Project Manager for McAlester Fuel. He said that McAlester Fuel is now owned by Alaska Interstate and that the people in charge are not "in the least" interested in mining properties like the Zonia. They want to sell it and about two weeks ago, 310 acres of the Zonia property were formally patented.

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine Zonia Mine Date January 25, 1966

District Walnut Grove Dist., Yavapai County Engineer F.T. Johnson

Subject: Mine Visit

Visited Zonia mine - division of McAlester Fuel Co., McAlester, Oklahoma. The local address of the Zonia division is Kirkland, Ariz. Phone (602) 445-5475. Mr. Donald F. Anderson is mine superintendent and was guide to the leaching pit where work is at present concentrated.

The Zonia is in Sec. 12, T. 11 N., R. 4 W. and is reached by taking the Walnut Grove road from Kirkland Jct. The distance is about 7 miles and is well marked and well maintained.

Briefly the copper occurs as disseminations and along fracture planes in pre-Cambrian sericite schist. Copper minerals are principally malachite, some chrysocolla and less chalcocite. Mr. Anderson said the area to be mined is about 2000' long and up to 500' wide, probably averaging 250'-300'. There are other small occurrences on the property that are to be explored.

The leach pit that is being prepared occupies a canyon south of the McMahon shaft. The canyon also marks the southerly boundary of the deposit. The pit is to be 100' wide at the bottom and sides are on a 30° slope. Its length will be about 1500' long with the precipitation plant to be at its mouth. Bottom and sides are to be cemented with a 1:6 mix of earth and cement. Givens Construction Co., 4110 E. Washington, Phoenix, have the contract for the cement work and John Mercer of Globe has the contract for road building and excavation. Stripping and mining contract has not been placed.

Water for the operation is to be taken from the 850' McMahon shaft that has over 7000' of workings under water. The mine is reported to make about 150 gpm. Leach piles are to be 50' in height and piles to be built up to the top of pit - a distance of 300 feet.

Mr. Anderson stated that reserves are estimated at 10,000,000 tons with a grade slightly under 1% Cu. Operation life - 5 years. Stripping ratio is 1 waste to 4 ore. Operation expected to start in March.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Zonia Mine

Date January 25, 1966

District Walnut Grove Dist., Yavapai County

Engineer F.T. Johnson

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DE. RTMENT OF MINERAL RESOURC.
STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine Zonia Mine Date May 18, 1952

District Engineer Mark Gemmill

Subject: Inquiry from Mr. Manning re. Mill at Kirkland or vicinity

I have been unable to contact Dr. DeHesse but did talk to Archie Poarch. Mr. Poarch told me that he had made some mill tests for Dr. DeHesse on ore from the Zonia property which is located about 8 miles east of Kirkland Jct. He said that the tests were satisfactory so far as recovery was concerned but that the ore was very low grade and he did not think that the proposition offered commercial possibilities unless the orebodies would warrant a very large operation. He stated that so far as he knew there were no plans for a mill there or anywhere else in the area.

(note)

In the early forties the Bureau of Mines made a very thorough investigation of the Zonia. They sampled all of the underground workings which are quite extensive, and did a lot of surface trenching and diamond drilling. There is a report out on this which I have seen but do not now have. As I remember it the average of the ore was .45 % copper. I dont remember the tonnage estimate if any.

DEPARTMENT OF MINERAL RESOURCES
State of Arizona
MINE OWNER'S REPORT

Date June 15, 1946

1. Mine: Zonia Group

2. Location: Sec. Lat. 34° 20' N Twp. 11 N Range 4 W Nearest Town Kirkland R. R. at
Long. 113 W 7 Miles to State Hwy.
Distance 12 Direction NW Road Condition Good road into mine

3. Mining District & County: Walnut Grove Mining District, Yavapai County

4. Former Name of Mine: Known as Zonia Group for over 30 Years

5. Owner: James L. Gillingham
899 Union St., Alameda, Calif. (7-2-60)
Address: 1265 Weber St., Alameda, California

6. Operator: Not producing. No equipment on property
Address:

7. Principal Minerals: Copper. Lesser values in gold and silver

8. Number of Claims: 14 Lode * Placer
Patented 14 Unpatented

9. Type of Surrounding Terrain: Rugged to moderate hilly country, cut by deep gulches. Elevation approx. 3500 feet. Moderate climate with favorable winter conditions for continuous work.

10. Geology & Mineralization: The main ore bodies on the surface occur in a sericitic schist and monzonite. The ore zone strikes north east and dips 55 to 60 degrees N.W. thru pre-Cambrian schist intruded by monzonite. The schists are deeply leached, especially thru the Tourmaline ore zone. Principal minerals - azurite, malachite, chrysocolla with cuprite and chalcocite.

11. Dimension & Value or Ore Body: Hammon Copper Co. development of 1926/1930 estimated from surface to 240 ft., 1,338,000 tons of developed ore of 1.75% copper, 760,000 tons probable ore of 1.50% in superficial zone at S.W. corner of property where operation included McMahan adjoining claims. Exploratory shaft sunk there by earlier syndicate to 874 ft. never left the oxidized zone and discontinued when values desired had not been obtained on encountering heavy inflow of water. Bureau of Mines work during the war at this point determined a block of ore of approx. 300,000 tons of 1.05% copper, with silver and gold values of about 60 cents per ton. This area is superficial in mineralization and at some distance from what some geologists consider the main ore channel. An open quarry at the Copperopolis shows 3%

copper values with a incline shaft adjacent giving similar average content for about 10 ft. Face of quarry values taken from 85' width.

12. Ore "Blocked Out" or "In Sight": Not considered in Hammon or B of Mines work.

A tunnel about 60 ft. below ridge on the Tourmaline claim, cutting to the center of a heavily leached zone gave nearly a 2% copper content and gives indication of what may be found at depth in what seems without much doubt the main channel of the metal solutions.

There appears major faulting and displacement in the Arrastra area with numerous secondary quartz veins cutting the lodes. One such fissure vein cuts the lode on the Sunflower claim with high values obtained in copper, gold and silver. This claim furnished ore for a small smelter operation early in this century. Near this area on the Iron Hat is what appears to be a hematite gossan.

Ore Probable: Mineralized zones run the complete length of the property with lodes up to 200 ft. and more in width. A great deal of superficial prospect work and trenching.

13. Mine Workings—Amount and Condition:

	No.	Feet	Condition
Shafts	2	200 plus each	Lower levels flooded. Timbering fair At Copperopolis and Sunflower
Raises			
Tunnels	4	300' plus	Some drifting at Copperopolis and Sunflower. Condition unknown. Sunflower has tunnel near surface, entrance caved. Three tunnels cut upper levels of Tourmaline-Polar Star lode.
Crosscuts			
Stopes			

Hammon Corp. development work was extensive. 7,000 ft. of levels, cross cuts and raises plus 1565 ft. long hole drilling.

14. Water Supply: Water year around in creek, used in old smelter operation. Cuprite shaft water estimated at 150 Gal. per minute. For large leaching operation water was to be obtained from Hassayampa River.

15. Brief History: Early smelter operation. Values in slag tell story of inefficient operation. McMahan and Zonia properties incorporated in joint operation: first by syndicate which sank 874 Ft. shaft on McMahan ground just off Fairplay claim. Too much water before values realized. Records show they were still in oxides of copper at the bottom. Hammon group just prior to last depression were planning an 1800 Ton per day operation, starting with developed surface ores at same location for immediate returns. Drop in copper prices made continuance impossible. Bureau of Mines investigated same superficial ore body during war. Indications of shortening of war added to capital investment of magnitude for short period influenced decision not to go ahead. As far as owner knows there was no investigation made of nor attention given to the central and most important part of property.

16. Signature:

17. If Property for Sale, List Approximate Price and Terms: Prefer a lease to parties financially able and competent to carry thru an exploration program.

MISCELLANEOUS

The Hammon Copper Co. operation unified 735 acres of what they considered highly mineralized ground for their program. Their exploration and operations were carried out over threeto four years, culminating with the break in prices of 1929. They conceded the prime importance of the Zonia Group as the heart of the area.

The extensive work done immediate to and including the Fairplay claim was occasioned by a deep development shaft and obvious values, sometimes spectacular, present in the surface ores. They planned to do their main exploration from values derived there.

The opinion of reputable geologists who have thoroughly studied the evidences is that the real importance of the Zonia Group lies beneath the heavily leached zone running thru the Tourmaline, Polar Star, Arrastra, Fraction, etc. claims, an area which has never been explored at any depth. A drilling program of not great magnitude would tell the story quickly.

There is also a distinct possibility that the intrusive grano-monzonite may carry disseminated copper minerals at depth. Values are apparent on the surface on the Defiance, and a considerable block of monzonite carrying strong commercial values was found at around 300 ft. during work from the Cuprite shaft.

The owner is desirous of having the main issue approached directly and would be glad to discuss the matter with properly qualified parties.

MZ-1

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA

DEPT. MINERAL RESOURCES
RECEIVED
OCT 1 1941
PHOENIX, ARIZONA

MINE OWNER'S REPORT

Date September 26, 1941

1. Mine Zonia Group
2. Location
3. Mining District & County Walnut Creek District, Yavapai County, Arizona
12 miles S. E. Kirkland, 7 miles from Kirkland Junction
4. Former name
Zonia Mine, later 1926- 1930 property of the Hammon Copper Co.
5. Owner Estate of James L. Gillingham (in probate)
6. Address (Owner) Son, J. L. Gillingham 2040 Clinton Ave, Alameda, Calif.
7. Operator Not being operated at present
8. Address (Operator)
9. President, Owning Co.
9A. President, Operating Co.
10. Gen. Mgr.
14. Principal Minerals Copper. N. E. sect. of property Copper, Gold and Silver.
11. Mine Supt.
15. Production Rate
12. Mill Supt.
16. Mill: Type & Cap. No equipment on Property
13. Men Employed
17. Power: Amt. & Type
18. Operations: Present None

19. Operations: Planned

Ore developed in quantity tonnage was to be used as a leaching plant operation, shipping the matte copper to a smelter. First unit for which sufficient tonnage had been developed was to be of 600 Tons. When two additional units of like capacity were added an electrolitic plant was to be added and refine copper on the property.

20. Number Claims, Title, etc. 14 Patented Claims in the Zonia Group, owned by the Gillingham Estate. There are also six claims of McMahan Groups held on possessory titled which can be included, on which a joint operation was carried on by the Hammon Copper Co. Titles clear and properties can be offered jointly, or the Zonia Group offered as a separate operation.

21. Description: Topography & Geography Hilly not mountainous. Low grade ore apexes on hills 200 to 300 ft. above the adjacent countryside. Elevation about 3800. Climate excellent the year around. Roads into property in good shape. Main R. R. line at Kirkland, 12 miles distant.

22. Mine Workings: Amt. & Condition On Zonia ground numerous old shafts and tunnels. All showing ore. Property seems in two zones. To the S. W. of French Gulch which runs thru heart of property the copper lies as oxides and carbonates in a sericitic schist. One shaft on Zonia Copperopolis being 265Ft. showing 50 ft. av. 3.5% Copper. Another shaft on adjoining claim and going into Zonia Fairplay 874 FT all in oxidized ore. N. E. claims show many quartz claims. Cu, Ag, Au.

(over)

Large tonnage occurs in a sericitic schist, four lodes, one partially developed.

23. Geology & Mineralization

Low grades occur in large tonnage in schist, on one formation alone, 60 to 120 ft. in width. There are four or five similar parallel ore bodies. Only one has had real work done upon it. Schist occurs on edge of diabase dikes and enclosing porphoritic monzonite. Zone to the N. E. of French gulch which cuts thru the heart of Zonia ground carries good values in gold and silver in addition to copper. Shaft 200 ft. there

24. Ore: Positive & Probable, Ore Dumps, Tailings

Developed ore body, 35 lbs. copper per ton 1,338,050 Tons. Adjacent tonnage of probable ore, 30 lbs. per ton, 760, 165 Tons. All above 300ft. level. Less than one tenth of mineralized length of property has been proven. Minimum of 10,000,000 Tons estimated without considering areas not developed and development at depth. Sulphide zone not determined.

24A. Dimensions and Value of Ore body

Evidence that it may be in the Monzonite.

Ore in proven body where development work was done is shallow, to average depth of 260 ft., 3600 ft. N.E.-S.W., 60 to 120 ft. wide. On this ore body alone evidenced by surface work not one fifth has been proven by underground work. Evidence of gossan and other mineralization throut property lead to belief of possibility of production of very large tonnage. Present work is inadequate to show.

25. Mine, Mill Equipment & Flow-Sheet

Complete plans are available for leaching operation. With drawings, results of successful leaching tests in tonnage, with 93% plus recovery with weak sulphuric acid. Working shaft finished to lower level of developed ore. Property was ready to go into a 600 Ton per day leaching operation in 1929, when copper market started declining.

26. Road Conditions, Route

Good. Some of roads in claims need slight repair work. Major work was done.
Property can be reached from Kirkland Junction, on Phoenix to Prescott Highway.

27. Water Supply

Ample mine water for milling and leaching. Domestic water available from two wells. French Gulch running thru property has running water the year around.

28. Brief History

Around 1900 ores from Copperopolis and Sunflower shafts were run thru a smelter, still remaining on property. Boston and Arizona Copper Co. Operators. Spillbury sunk shaft off edge on Zonia Group to depth to find sulphides about 1920. Never left the oxidized zone. Sunk 874 ft. at highest point in property. Hammon Copper Co. had operation in 1926-1930. Had to abandon with break of market. Had material there at the time to built leaching plant.

29. Special Problems, Reports Filed

30. Remarks

Properties as they are at present have developed ore sufficient for leaching plant of 600 tons. per day. Shipping can be done but owners do not desire that type of operator, unless conditions make only that possible. The area in the heart of the group near the Zonia Arrastra claim has furnished much high grade copper, gold, silver ore from the Sunflower Claim. Little work has been done in modern times from this shaft but values were so high that the Hammon Copper Co. considered working it as a separate venture from the leaching operation. This ground is worth of drilling for high grades and the owners would consider having this done.

31. If property for sale: Price, terms and address to negotiate.

The property is for sale or lease to responsible people only who could carry thru a program. All reports are available but not filed now.

32. Signature.....

33. Use additional sheets if necessary.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
MINE OWNERS REPORT

DATE: September, 1941

MINE: Zonia Group

LOCATION: 12 miles southeast of Kirkland, 7 miles from Kirkland Junction.

MINING DISTRICT & COUNTY: Walnut Creek Mining District, Yavapai County, Arizona.

FORMER NAME: Zonia Mine - later, 1926-1930 property of the Hammen Copper Company.

OWNER: Estate of James L. Gillingham (In Probate).

ADDRESS: (Owner) Son: J. L. Gillingham, ~~2040 Clinton Avenue~~ 1265 Webster St. 899 Union St, Alameda, Calif, Alameda, California.

PRINCIPAL MINERALS: Copper, northeast Section of property Copper, Gold and Silver.

MILL-TYPE & CAP.: No equipment on property.

OPERATIONS PLANNED: Ore developed in quantity tonnage was to be used as a leaching plant operation, shipping the matte copper to a smelter. First unit for which sufficient tonnage had been developed was to be of 600 tons. When two additional units of like capacity were added an electrolytic plant was to be added and refine copper on the property.

NUMBER OF CLAIMS, TITLE, ETC.: 14 patented claims in the Zonia Group owned by the Gillingham Estate. There are also six claims of McMahan Groups held on possessory title which can be included, on which a joint operation was carried on by the Hammon Copper Company. Titles clear and properties can be offered jointly, or the Zonia Group offered as a separate operation.

DESCRIPTION--TOPOGRAPHY & GEOGRAPHY: Hilly not mountainous. Low grade ore apexes on hills 200 to 300 feet above adjacent countryside. Elevation about 3800. Climate excellent the year around. Roads into property in good shape. Main R. R. line at Kirkland, 12 miles distant.

MINE WORKINGS--AMOUNT & CONDITION: On Zonia ground numerous old shafts and tunnels. All showing ore. Property seems in two zones. To the southwest of French Gulch, which runs through heart of property, the copper lies as oxides and carbonates in a sericitic schist. One shaft on Zonia Copperopolis being 265 feet showing 50 feet av. 3.5% copper. Another shaft adjoining claim and going into Zonia Fairplay 874 feet all in oxidized ore. Northeast claims show many quartz claims. Cu., Ag., Au.

GEOLOGY & MINERALIZATION: Large tonnage occurs in a sericitic schist, four lodes, one partially developed. Low grades occur in large tonnage in schist, on one formation alone, 60 to 120 feet in width. There are four or five similar parallel ore bodies. Only one has had real work done upon it. Schist occurs on edge of diabase dikes and enclosing porphoritic monzonite. Zone to the northeast of French Gulch which cuts through the heart of Zonia ground carries good values in gold and silver in addition to copper. Shaft 200 feet there.

ORE--POSITIVE & PROBABLE, ORE DUMPS, TAILINGS: Developed ore body, 35 lbs. copper per ton 1,338,050 tons. Adjacent tonnage of probable ore, 30 lbs. per ton, 760,165 tons. All above 300 foot level. Less than one-tenth of mineralized length of property has been proven. Minimum of 10,000,000 tons estimated without considering areas not developed and development at depth. Sulphide zone not determined.

DIMENSIONS AND VALUE OF ORE BODY: Evidence that it may be in the Menzenite. Ore in proven body where development work was done is shallow, to average depth of 260 feet, 3600 feet N.E.-S.W., 60 to 120 feet wide. On this ore body alone evidenced by surface work not one-fifth has been proven by underground work. Evidence of gossan and other mineralization throughtout property lead to belief of possibility of production of very large tonnage. Present work is inadequate to show.

MINE, MILL EQUIPMENT & FLOW SHEET: Complete plans are available for leaching operation. With drawings, results of successful leaching tests in tonnage, with 93% plus recovery with weak sulphuric acid. Working shaft finished to lower level of developed ore. Property was ready to go into a 600 ton per day leaching operation in 1929, when copper market started declining.

ROAD CONDITIONS, ROUTE: Good. Some of roads in claims need slight repair work. Major work was done. Property can be reached from Kirkland Junction, on Phoenix to Prescott Highway.

WATER SUPPLY: Ample mine water for milling and leaching. Domestic water available from two wells. French Gulch running through property has running water the year around.

BRIEF HISTORY: Around 1900 ores from Copperopolis and Sunflower shafts were run through a smelter, still remaining on property. Boston and Arizona Copper Company Operators. Spillbury sunk shaft off edge on Zonia Group to depth to find sulphides about 1920. Never left the oxidized zone. Sunk 874 feet at highest point in property. Hammon Copper Company had operation in 1926-1930. Had to abandon with break of market. Had material there at the time to build leaching plant.

REMARKS: Properties as they are at present have developed ore sufficient for leaching plant of 600 tons per day. Shipping can be done but owners do not desire that type of operation, unless conditions make only that possible. The area in the heart of the group near the Zonia Arrastra claim has furnished much high grade copper, gold, silver ore from the Sunflower Claim. Little work has been done in modern times from this shaft but values were so high that the Hammon Copper Company considered working it as a separate venture from the leaching operation. This ground is worthy of drilling for high grades and the owners would consider having this done.

IF PROPERTY FOR SALE--PRICE, TERMS AND ADDRESS TO NEGOTIATE: The property is for sale or lease to responsible people only who could carry through a program.

SIGNATURE: JAMES L. GILLINGHAM

ZONIA GROUP. J. L. Gillingham, owner, Alameda, California.

The Zonia is located in the Walnut Creek Mining District, Yavapai County, Arizona.

An extremely large area of carbonate ore is exposed on the surface with development localized in one of the 60 to 120 foot wide mineral bearing formations.

A drilling program would quickly prove the additional extent and value of the now known million tons, and would multiply the tonnage.

The project can only be considered as a long term venture, but has great merit as a prospective quantity producer of copper.

from COPPER REPORT NO. 2, DECEMBER 23, 1942, by Earl F. Hastings, for
COPPER BRANCH, WAR PRODUCTION BOARD.

War Minerals Report
United States Department of the Interior - Bureau of Mines

W.M.R. 38 - Copper November 1942

ZONIA MINE
Yavapai County, Ariz.

SUMMARY

The Zonia mine, Yavapai County, Ariz., is a potential small-scale producer of copper. The Gold Fields North American Development Co. has an option to mine surface ores and to leach them if ore reserves are large enough to justify exploitation of the deposit.

At the request of the War Production Board, the Bureau of Mines has undertaken to check-sample the outcrops of the deposit and to estimate the reserves of oxidized ores. The Bureau will diamond drill the southern portion of the deposit to confirm the quantity and grade of ore available for open-cut mining to a depth of 100 feet. It is possible that this work may indicate a maximum of 300,000 tons of oxidized ore containing 9,000,000 pounds of salable copper. In addition, the northern part of the ore zone presents possibilities for developing a maximum of 500,000 tons of oxidized ore containing 15,000,000 pounds of salable copper.

Exploration and sampling by the Bureau of Mines can be completed in 3 months at a cost of $17,500. If the results are favorable the company purposes to construct a leaching plant, for which a flow sheet has been determined from tests in the laboratory and in a pilot plant. Extraction of copper was established at 93 percent. Construction of this plant will require about 6 months. Thus, the minimum elapsed time from the beginning of exploration and check-sampling to the completion of the treatment plant would be 9 months.

Oxidized ore amenable to leaching could be mined from an open-cut at the rate of 500 tons a day. Cement copper precipitates would be produced for shipment to a custom smelter. The corresponding annual production of standard or electrolytic copper would be about 5,000,000 pounds.

INTRODUCTION

The Zonia mine is 12 miles southeast of Kirkland, a station on the Phoenix branch of the Santa Fe Railroad and 7 miles southeast of Kirkland Junction on paved U. S. Highway 89. A well-graded gravel road connects the mine with Kirkland.

The Gold Fields North American Development Co. has an option to mine surface ores and to leach them if ore reserves are large enough to justify exploitation of the deposit.

This report is based principally upon (1) information contained in a a report to the Hammon Copper Co. by F. A. Sizer, mining engineer, under date of October 24, 1930, and (2) upon correspondence with W. C. Hammon and W. J. Loring. No field report by an engineer from the Bureau of Mines is available at this time.

HISTORY AND REFERENCES

Some ore was mined from this deposit at an early date, and direct smelting was attempted. A syndicate sank the Cuprite shaft on the McMahon group of claims previous to 1920 but did not find commercial sulfide ore. The shaft produced more water than could be pumped by available equipment.

In the late 1920's the Hammon Copper Co. of San Francisco, Calif., acquired the mine and did a large amount of development on the shallow oxidized ore. E. L. Sweeney made preliminary leaching tests on this ore for the company. W. J. Loring directed the mine development and built a pilot leaching plant, where he confirmed the percentage of extraction obtained in the laboratory tests by Sweeney. James L. Gillingham owns the Zonia group of mining claims and has options on the McMahon group, title to which is held by Sophia O. McMahon.

The following groups of claims of the Zonia mine cover an area having a length of 11,000 feet and a maximum width of 3,600 feet.

Group	Acres	Remarks
Zonia	255.5	Patented
McMahon	171.7	
Metals	161.7	
Rolla Smith	100.5	
Shanefeldt	41.6	For tailings disposal
	731.0	

PHYSICAL FEATURES

The deposit is in the mountainous belt of Arizona, lying between the desert and the plateau. The altitude of the mine is about 3,800 feet. Water stands at 265 feet below the collar of the Cuprite shaft.

DESCRIPTION OF DEPOSIT

The ore zone strikes northeast and dips 55° to 60° northwest through pre-Cambrian sericitic schist intruded by monzonite. The ore zone outcrops 3,600 feet along the strike. The maximum width of the zone is 200 feet. Ore is found in both schist and monzonite. The schist ore body is oxidized to the 335-foot level and is rather soft. The physical character of the wall rock is unknown. A series of trenches across the southern part of the ore zone indicates ore of minable grade for a length of 700 feet and a width ranging from 26 feet to 145 feet. In places the ore is separated into several narrow bands by intervening areas of very low-grade material. Sporadic trenching and sampling show occurrences of copper for maximum distance of 425 feet southeast of the ore zone.

The northern part of the ore zone extends through a strike a distance of 400 feet and shows good copper assays across widths of 65 to 145 feet. These assays were on spot samples taken obliquely across the ore zone in three widely separated groups. The northern and southern parts of the ore zone are separated by a distance of 400 feet in which no samples were taken. The nature of this intermediate area between outcrops is not clarified in available field reports.

Underground, the ore zone was exposed on the 210-foot level by drifts

and crosscuts through a length of 1,550 feet and a maximum width of 300 feet. On this level the ore body has a length of 925 feet and a maximum width of 88 feet; it has an area of 65,000 square feet and contains 5,400 tons per foot of depth. The average copper content is 1.33 percent. A band of lean material, too low-grade for mining, bisects this block through a distance of 250 feet. Exclusion of this material would reduce the calculated tonnage but materially increase the average grade of ore mined. A strike drift near the McMahon shaft shows several short stretches of good ore. On the 335-foot level the ore zone that was 45 to 170 feet wide was followed for a distance of 430 feet northeast of the McMahon shaft. Ore was exposed at the north end of the level through a length of 57 feet and a maximum width of 20 feet.

Ore in monzonite outcrops on the Defiance claim east of the schist ore body, where surface trenching indicates a width of about 45 feet.

MINE WORKINGS

Old mine maps show the Cuprite shaft (also called the McMahon shaft) to be 874 feet deep. Drifts were run from this shaft on five levels.

THE ORE

The principal ore minerals are azurite, malachite, and chrysocolla, with slight amounts of cuprite and chalcocite. The ore also carries some limonite, specularite, and hematite, with minor amounts of siderite, pyrite and chalcopyrite.

It is possible that the low-grade copper assays in portions of the outcrop may be due to partial leaching of the copper at the surface and that the commercial ore may become wider with depth. Surface assay map is attached (fig. 1).

POSSIBLE ORE RESERVES

In his report Sizer estimates the ore reserves, from surface to a depth of 240 feet, to be 1,338,000 tons of developed ore containing 1.75 percent copper and 760,000 tons of probable ore containing 1.50 percent copper. Assays of surface trench samples indicate that the southern portion of the ore body contains 1.73 percent copper and will produce 3,440 tons of ore per foot of depth. Verification of the grade of this ore from surface to a depth of 100 feet waits on diamond drilling. Assuming that this block of ground can be mined by an open-cut to a depth of 40 feet at the narrow ends and to 125 feet at the middle, 300,000 tons of ore would be recoverable.

Should the ore be continuous throughout the northern portion of the ore zone, a maximum of 500,000 tons of commercial ore might be mined by an open cut.

EXPLORATION AND CHECK SAMPLING TO BE PERFORMED BY BUREAU OF MINES

As soon as men and equipment can be assembled, a program of exploration will be initiated by the Bureau of Mines to confirm the quantity and grade of

ore to a depth of 100 feet. This will consist of (1) check sampling that may seem advisable in surface trenches and underground on the 210-foot level, (2) cutting additional trenches across the outcrop of the ore zone, and (3) diamond drilling about 10 holes totaling 2,000 feet. The time required to complete this exploration and check sampling is estimated at 3 months.

ESTIMATED COST OF EXPLORATION AND SAMPLING

The cost of exploration and sampling to be performed by the Bureau of Mines is estimated to be $17,500. Details are below:

Item	Amount
Diamond drilling, 2,000 feet at $4 a foot	$ 8,000
Diamond-drill sampling	2,000
Surface trenching, 1,000 feet at $3 a foot	3,000
Check sampling, surface and underground, 300 samples at $5 each	1,500
Supervision and analyses	3,000
	17,500

ORE TREATMENT

The usual method of treating lean oxidized-copper ores is by leaching. A leaching process developed by Sweeney in the laboratory and checked by Loring in a pilot plant at the mine indicated an extraction of 93 percent of the copper from the ores of the Zonia deposit. For estimating purposes, an extraction of 90 percent is assumed for a full-scale plant at the Zonia mine. Construction of a leaching plant is planned by the Gold Fields North American Development Co. The Bureau of Mines can estimate construction costs after it has studied the treatment process and flow sheet developed for this ore.

Smelter payments for shipments of cement copper precipitates based on the schedule of the American Smelting & Refining Co., Hayden, Ariz., for precipitates containing 75 percent copper are estimated to be 13.375 cents a pound of copper recovered at the smelter after deducting freight from the mine plant.

TIME REQUIRED TO START PRODUCTION

Assuming that labor, supplies, materials, and equipment can be obtained as needed, the construction of a leaching plant with a capacity of 500 tons per day is estimated to require 6 months. Allowing 3 months for exploration, the minimum elapsed time from the initial exploration to the completion (1) of preparations for open-cut mining and (2) of the construction of a leaching plant would be 9 months.

CONCLUSIONS

The Bureau of Mines will

1. Cut additional trenches across outcrops of the deposit.

2. Check-sample surface and underground exposures of ore.
3. Diamond drill the deposit from surface to a depth of 100 ft.

Should this work indicate that adequate ore reserves are available for open-cut mining, the Gold Fields North American Development Co. purposes to construct a leaching plant for the treatment of the ore and to start production as soon as possible.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
MINE OWNERS REPORT

DATE: September, 1941

MINE: Zonia Group

LOCATION: 12 miles southeast of Kirkland, 7 miles from Kirkland Junction.

MINING DISTRICT & COUNTY: Walnut Creek Mining District, Yavapai County, Arizona.

FORMER NAME: Zonia Mine - later, 1926-1930 property of the Hammon Copper Company.

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MINE WORKINGS--AMOUNT & CONDITION: On Zonia ground numerous old shafts and tunnels. All showing ore. Property seems in two zones. To the southwest of French Gulch, which runs through heart of property, the copper lies as oxides and carbonates in a sericitic schist. One shaft on Zonia Copperopolis being 265 feet showing 50 feet av. 3.5% copper. Another shaft adjoining claim and going into Zonia Fairplay 874 feet all in oxidized ore. Northeast claims show many quartz claims. Cu., Ag., Au.

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ROAD CONDITIONS, ROUTE: Good. Some of roads in claims need slight repair work. Major work was done. Property can be reached from Kirkland Junction, on Phoenix to Prescott Highway.

WATER SUPPLY: Ample mine water for milling and leaching. Domestic water available from two wells. French Gulch running through property has running water the year around.

BRIEF HISTORY: Around 1900 ores from Copperopolis and Sunflower shafts were run through a smelter, still remaining on property. Boston and Arizona Copper Company Operators. Spillbury sunk shaft off edge on Zonia Group to depth to find sulphides about 1920. Never left the oxidized zone. Sunk 274 feet at highest point in property. Hennon Copper Company had operation in 1926-1930. Had to abandon with break of market. Had material there at the time to build leaching plant.

REMARKS: Properties as they are at present have developed ore suffisient for leaching plant of 600 tons per day. Shipping can be done but owners do not desire that type of operation, unless conditions make only that possible. The area in the heart of the group near the Zonia Arrastra claim has furnished much high grade copper, gold, silver ore from the Sunflower Claim. Little work has been done in modern times from this shaft but values were so high that the Hennon Copper Company considered working it as a separate venture from the leaching operation. This ground is worthy of drilling for high grades and the owners would consider having this done.

IF PROPERTY FOR SALE--PRICE, TERMS AND ADDRESS TO NEGOTIATE: The property is for sale or lease to responsible people only who could carry through a program.

SIGNATURE: JAMES L. GILLINGHAM

2040 Clinton Avenue,
Alameda, California.
September 28, 1941

Mr. J. S. Coupal,
Dept. of Mineral Resources,
Phoenix, Arizona.

Dear Sir:

I am enclosing herewith a brief form report on the French Gulch property owned in my family. The probate proceedings are about to be carried thru and all of my father's heirs are to quit-claim to me. The title is perfect having been perfected by a Supreme Court decision in Yavapai County. This was prior to the large Hammon Copper Co. operation. The six McMahan claims adjoining our claims are to be logically acquired if an operator wishes to continue the plan of the Hammon Copper Co. I have the assurance of the McMahan people that they will join in any plan of operation which seems desirable.

On our Zonia group we have the heart of the mineralization of the whole area. Evidence of a large gossan and possibly a definite area of redeposition and perhaps enrichment. The area has not been proven and awaits exploratory work. The possibilities of major ore deposits are large and Frank L. Sizer, E. M. of San Francisco believes in the possibilitiescof the sulphides in the monzonite at depth. A block of good ore of such a character was found in developing the ground for the Hammon people. Their work was entirely above the water level on the deep shaft on the top of a hill 300 ft. above the old camp. The site was excellent for tailings purposes and the old shaft induced them to do their exploratory work there. It however just scratches the evidence of mineralization on the property. An adjacent hill to the East is penetrated by two tunnels and an equally good prospect is evident, with the same type of formation showing.

I am interested in getting a large operator, two of whom I am in the process of discussing the property with at present, to continue the plan for leaching that the Hammon people had and had developed enough ore for. As an alternative if I do not such an operator for the low grades, I would consider permitting the high grade aspect of the property to be tackled. Much ore was reputed to be taken out of the Sunflower shaft which ran an ounce in gold, 15 Oz. in silver and 15-20% copper. The last interests operating were considering making that aspect of the property a separate venture, having included more claims to the N. E. This ore was used in the original smelting operation around 1900. Their copper is still evident in the slag.

I have available a full set of reports of unquestioned veracity of the last operation to handle the low grades. All work and the thousands of assays were checked and a full plan with drawings for the construction of the plant for crushing and leaching. Leaching tests ran over a period of better than two years and a recovery of better than 93% was assured, and sufficient to run a plant for six years was developed for tonnage. The plan was to develop and increase the plant in units of 600 Tons up to 1800 Tons.

I am not sending on the reports as they are too voluminous but they are available in San Francisco to anyone competent and interested.

I would be very glad to hear from you further.

Very truly yours,

James L. Gillingham

James L. Gillingham

ZONIA COPPER MINE

Yavapai County, Arizona

McAlester Fuel Company
P. O. Box 907
McAlester, Oklahoma 74501
Phone: (918) 423-5050

Attention: Frank Edwards
Vice President

***

McAlester Fuel Company
P. O. Box 176
Wickenburg, Arizona 85358
Phone: (602) 684-2188

Attention: J. J. Brunner
Technical Director

May 23, 1979

McAlester Fuel Company owns or controls over two square miles of mineralized lands lying in the Walnut Grove Mining District, Yavapai County, Arizona. The Zonia Mine is a completely equipped, ready-to-operate copper mine and reduction plant, capable of producing an average of 250,000 pounds of contained copper per month from oxide ores now ready for leaching.

Within the boundaries of the property there are proven unleached oxide reserves of 20,500,000 tons. Although core drilling has failed to locate significant sulfide deposits to date, American Selco Incorporated has leased the East Property, Appendix (i)a, to explore for sulfide and mine the sulfide if found in commercial concentrations. This exploration and mining of sulfides, if found, can be conducted without interference with leaching of oxides.

McAlester operated the mine continuously from March 1966 until March 1975 and produced over 33,000,000 pounds of copper. The Mine was shut down in March of 1975 because free market copper prices, perhaps the most volatile of all major metals for the past ten years, reached a very low point.

This mine has not been profitable for McAlester because of its inability to market the product effectively and continuously at a fair price. Market difficulties in turn restricted the ability to produce at an optimum rate. However, as a captive to a user of cement copper, this mine could be a sound economic venture. A company involved in the chemical or other industry which has no need to convert this highly pure virgin copper to wirebar or cathode could, by taking over operation of the Zonia Mine, assure itself of a long-term supply of copper of uniform quality at a price per pound that would be much less than the Merchant Market Price. Finished product prices could be more accurately determined as the owner would be shielded against the broad and explosive copper price swings experienced during the last ten years.

Because of marketing difficulties and the need to increase expenditures in its principal business of exploration for oil, McAlester desires to sell the Zonia Mine, reserving the right to explore for and mine the sulfide ore more than 250 feet beneath the surface.

McALESTER FUEL COMPANY

Frank Edwards, Vice President

TABLE OF CONTENTS

Appendix

List of Claims:

MINE HISTORY

The property included within the lode claims has been the subject of attention for mineral purposes for a number of years. Five of the original claims were first located approximately sixty years ago.

During the early 1930's, a substantial amount of work was done on the property by the Hammond Copper Company. A shaft was sunk; underground drifts, cross-cuts and raises were cut; however, due to the unfavorable economic conditions prevailing at the time, the work was abandoned.

In the early years of World War II, considerable work in the nature of drilling and sampling was performed under the Strategic Minerals Investigation Program. Later, the Miami Copper Company took a lease and option on the property, carried forward an extensive drilling program, and determined the existence of substantial reserves but chose not to proceed with development because of metallurgical problems then believed to exist.

McAlester's interest in the property commenced in 1964. Air reconnaissance was made; surface geology was examined; an extensive drilling program was instituted and a pilot plant erected to develop and test the metallurgical processes intended to be employed.

Determination was made that there was in excess of twenty million tons of 6/10 per cent copper-bearing ores in place on the property and that such minerals were susceptible of economically feasible mining and extraction. The decision was made to go forward with a full scale mining and heap leaching operation for the recovery of copper cement.

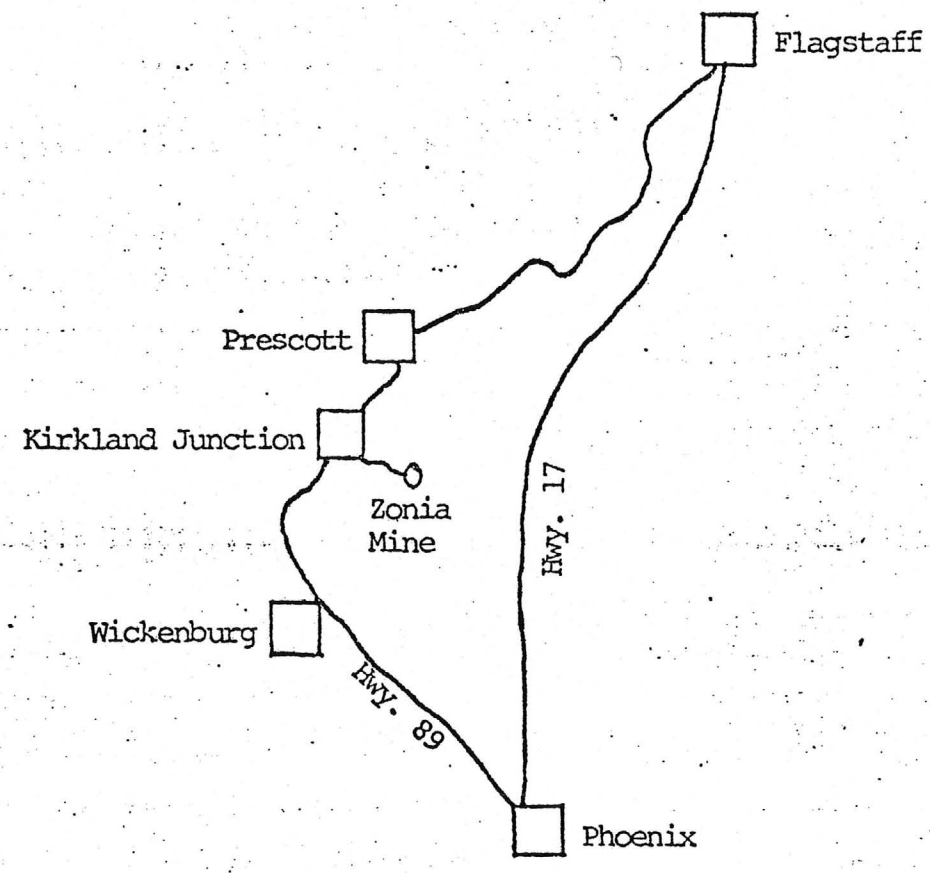
McAlester has operated the mine continuously from 1966 until March 25, 1975, and, during the course of this operation, has produced 33,663,000 pounds of copper.

The mine was shut down in March of 1975 due to worldwide depressed copper prices.

LOCATION

The Mine is located in Sections 11, 12, 13 and 14, Township 11 North, Range 4 West, Gila and Salt River Meridian, Yavapai County, Arizona, and is six miles southeast of Kirkland Junction and U. S. Highway 89 and is 12 miles from the Santa Fe Railroad at Kirkland, Arizona; however, the railroad shipping point is at Hillside, Arizona, a distance of 30 miles from the Mine.

The surface of the property is rugged and the climate is arid and typical of Arizona at an elevation of 4,500 feet. Minimum winter temperatures are in the range of 10° F. and summer temperatures of 100° F. are not unusual. Rainfall is in the range of 5 to 15 inches per year.



LODE AND MILLSITE CLAIMS

McAlester Fuel Company, by purchase, lease, amended locations, exploration and development, now holds full possessory right, subject only to the paramount rights of the United States and the State of Arizona, to Lode and Millsite Claims encompassing over two square miles. A plat and a complete listing of the claims will be found in Appendixes (i), (i)a and (i)b.

IMPROVEMENTS ON PROPERTY

Buildings have been constructed on the Millsite claims. They consist of the administration and management offices and other buildings housing shop, labortory, employee change rooms, supplies, storage and other similar facilities. Over four miles of principal roads have been constructed, and the property has been adequately fenced.

Ample water is available from wells at a distance of five miles. The wells are on the Whitehead Ranch and are leased at a rate of $200 per month. One well and pump can deliver 700 gallons per minute to the Mine via an 8" steel casing welded pipe line. One well has been in continuous operation at three to four hundred gallons per minute since 1969. There is a second well ready in case of trouble. These wells are 500 feet deep and are fully cased. The water level in the operational well is at -110' and has remained there since the start of pumping. The water contains 260 p.p.m. of hardness, and, in Arizona, is considered super potable.

Power is purchased from Arizona Public Service. At present there are four transformer substations on the property, each served by A. P. S. Highlines at 33,000 volts. All electrical equipment with the exception of lights are operated by 3 phase 440 volt circuits.

A complete tabulation of equipment is shown in Appendix (ii).

ANALYSIS (Typical)

SEMI-QUANTITATIVE EMISSION SPECTROGRAPH ANALYSIS OF WET CEMENT COPPER

Cu	-	80 %	Ni	<	200 ppm
0	-	17 %	Mo	<	100 ppm
Fe	-	1 %	Ca	<	700 ppm
Sn	<	700 ppm	Van	<	10 ppm
Si	<	3000 ppm	Ag	<	10 ppm
Al	<	1000 ppm	Zn	<	500 ppm
Mn	<	5000 ppm	Ti	<	100 ppm
Pb	<	300 ppm	Co	<	30 ppm
Mg	<	500 ppm	Se	<	20 ppm
Cr	<	100 ppm	As	<	Trace-less
Bi	<	20 ppm			than 1 ppm

USES OF CEMENT COPPER

A large amount of the cement copper produced from the Mine has been sent direct to the smelters, charged onto the reverberatories and from the reverberatories onto the converters and thence wirebar. Conversion cost of cement copper to wirebar at that time was around 17 cents per pound. Today this conversion would cost an uneconomical 20-25 cents per pound; however, installation of a lix plant on the property would permit production of cathode copper at about 15-17 cents per pound.

There are many potentially profitable copper derivatives and chemicals that can be produced from Zonia cement copper. Some of the products to be considered are copper powder, cuprous oxide, cupric oxide, fungicide and soil amendments. In addition to the oxides, there are the chlorides which are used extensively in catalytic processes, copper hydroxide, copper cyanide, etc.

It would appear that there are a great many places in the chemical industry where cement copper is as good as and much cheaper to use than cathode or powdered copper that must be purchased at premium prices. It may well be that at this point in time the best use of Zonia cement is in the high cuprous oxides for use in agricultural sprays, dust and fertilizer additives.

FGE
3/25/77

LEACHING AND REDUCTION OPERATION

The Zonia Mine has three leach basins containing over seven million tons of ore which was blasted, hauled and dumped into planned lifts. Additionally, there are two in situ leach areas having more than seven and one-half million tons of broken ore.

The mode of attack to recover the copper will depend on the ultimate copper price and market; however, we believe the quickest and cheapest approach would be to simply add acid to the heaps and in situ ore and continue to operate as in the past.

With this method the copper-bearing oxide ores are continuously leached by sprinkling with diluted sulfuric acid. The copper minerals are dissolved and the pregnant (high copper content) solution is then passed to the launder where copper is precipitated from solution in the form of cement copper on scrap iron or salvaged de-tinned cans. The waste solution is then treated with additional sulfuric acid and recycled to the leach areas.

The acid needed to dissolve copper from the ore is largely produced at the property from purchased liquid sulfur. The sulfur is burned to SO_2 in a modern Chemipulp sulfur burner and reacted with incoming leach solutions in a packed tower followed by carbon boxes by the following reaction:

$$Fe_2(SO_4)_3 + SO_2 + 2H_2O \rightarrow 2\ FeSO_4 + 2H_2SO_4$$

Note that each pound of sulfur results in the production of six pounds of acid.

The sulfur burner also produces about 3,000 to 4,000 pounds per hour of waste steam which is used to dry precipitates and also to raise temperature of leach solutions pumped back to the heaps and/or in situ leaching areas.

OXIDE ORE RESERVES

Present untouched, virgin oxide reserves of 20,500,000 tons of ore containing 123,000,000 pounds of copper have been drilled and proven. Whether this is ore or waste depends on the price of copper. By in situ mining and leaching this ore, it is estimated that thirty per cent, or roughly 37,000,000 pounds of copper, would be recoverable over a period of ten years.

A complete tabulation of oxide ore reserves is shown in Appendix (iii).

Recoverable Copper Under Leach

The following table shows the tons of ore being leached, per cent copper in ore, pounds of copper extracted, pounds of copper remaining in ore, and estimated pounds of recoverable copper remaining.

Leach Basin	Tons Ore	% Cu	Lbs. Cu Extracted	Lbs. Cu Remaining	Est. Lbs. Recoverable Cu Remaining
1	3,600,502	0.616	16,464,447	27,881,326	16,359,710
2	347,045	0.804	2,221,267	3,357,333	2,246,789
3	3,182,702	0.562	11,879,563	23,874,417	13,689,770
	7,130,249	0.60	30,565,277	55,113,076	32,296,269
In Situ					
5	5,041,388	0.215	2,045,937	19,632,031	7,532,700
6	2,616,000	0.374	650,287	18,919,553	10,548,353
	7,657,388	0.269	2,696,224	38,551,584	18,081,053
Total	14,787,637	0.429	33,261,501	93,664,660	50,377,322

As can be seen, the old heaps still contain 55,000,000 pounds of copper, of which some 32,000,000 pounds of copper are estimated to be ultimately recoverable. Broken ore in situ contains 38,500,000 pounds of total copper, of which 18,000,000 pounds are estimated to be ultimately recoverable.

Summary	Pounds
Under Leach, Old Heaps - Recoverable Copper	32,000,000
Under Leach, In Situ - Recoverable Copper	18,000,000
Untouched, Virgin Ore - Recoverable Copper	37,000,000
Total - Recoverable Copper	87,000,000

PRODUCTION HISTORY

From 1966 through March 1975 net copper produced from the Zonia Mine totaled 33,261,501 pounds. Average production for the year ending December 31, 1974 was 219,710 pounds per month.

There remains ample unleached ore in our most recent in situ blast area that, taken along with the production which continued to come from the leach basins until shut-down, should sustain a production level of approximately 220,000 pounds of copper per month for the next two years. At the end of that time, however, there will have to be new ore mined and placed on the leach heaps or an in situ blast conducted for additional leaching; otherwise, the production rate will begin to decline rapidly.

Listed below are monthly production figures from January 1974 through March 1975:

1974	Leach Basins 1, 2 & 3	In Situ 5	In Situ 6	Monthly Total
January	121,614	158,181		279,795
February	110,417	111,786		222,203
March	103,378	120,262		223,640
April	107,495	107,395		214,890
May	99,619	107,671		207,290
June	131,984	95,157		227,141
July	92,637	45,700	13,682	152,019
August	99,407	64,582	39,645	203,634
September	122,291	63,393	74,046	259,730
October	89,857	43,256	91,876	224,989
November	81,052	23,892	90,948	195,892
December	86,164	42,612	96,519	225,295
Total - 1974				2,636,518
1975				
January	99,113	46,962	94,890	240,965
February	80,969	51,955	62,562	195,486
March	64,564	49,239	69,009	182,812
Total - 1975				619,263

AVERAGE COST OF PRODUCTION

As can be seen from the following 1974 cost analysis, the cash operating cost before freight, royalty and production taxes average $79,112 per month. Based on these figures and an overall production rate of 219,710 pounds of copper per month, the cost per pound of copper is 36¢.

Indications are that, if the market warranted, production could be increased to 250,000 pounds of copper per month by simply increasing the amount of sulfuric acid used in the leaching solution. Cost per pound of copper would then be in the 34¢ range as operating cost would be affected only by that amount expended for additional sulfuric acid.

Cost Analysis

Cash Operating Costs		Average Monthly
Production - Direct		
Sulfur Dioxide		$ 15,544
Carbon		106
Rentals	Actual	150
Electric Power		6,164
Fuel, Oil & Grease		517
Insurance		1,433
Truck & Auto Expense		107
Pension Plan Costs	Actual	827
Repairs and Supplies	Estimate	3,000
Precipitation Material		23,501
Field Office Salaries	Actual	10,007
Research and Patent Costs		330
Safety Expense		419
Payroll Taxes		1,388
Payroll Labor		13,124
Total		$ 76,617
Other Costs - Selling & Office		
Dues & Subscriptions		$ 57
Employee Exams		18
Insurance & Miscellaneous		80
Office Expense		174
Analysis		*
Property Taxes		1,667
Telephone		499
Total		$ 2,495
Total Cash Production Costs		$ 79,112

* Incurred on Sales

START-UP OPERATIONS

Start-up operations on a property such as Zonia would normally take an estimated two to three months; however, there are some twenty million gallons of solution stored in the discard pond that could be pumped back into the circuit at a very high rate. There is also a water system capable of delivering seven hundred gallons per minute of fresh water. By the purchase of adequate acid, sulfur and iron and pumping seven hundred gallons per minute of fresh water into the circuit, along with three hundred to three hundred and fifty gallons per minute of solution that now exists in the discard pond, it would be possible to be on stream in a period of thirty days.

Further, Mr. Brunner, recently retired from McAlester Fuel Company, makes his home in Wickenburg, Arizona, about a thirty-minute drive from the Mine. Mr. Brunner has been in full charge of and directed the day-to-day operation of Zonia Mine for more than six years. His experience would be invaluable to a new owner-operator of the Mine, and he has stated that he would be available on a consulting basis.

ENCUMBRANCES

1. Robert Ford Royalty

In March of 1965, Robert Ford & Associates, Inc. assigned to McAlester all its right, title and interest in certain claims now included within the Zonia Mining Area. This assignment calls for an annual minimum advance royalty to Mrs. Jahala Ford of $7,500 against 1¼% of Average Producer's Price less 17 cents.

2. Herbert J. Miller Royalty

1¼% of Average Producer's Price less 17 cents.

Miller and Ford would probably be agreeable to a modification of these royalties to better reflect today's economic conditions.

FGE
3/25/77

OFFERING

Taking into consideration the replacement costs of equipment, buildings, roads, piping, pumps, leaching facilities, etc., it is felt that a fair market value of the Mine and equipment for outright purchase for cash should be in the neighborhood of 1.8 million dollars. Financing of the purchase could be considered by McAlester to a financially responsible party making a substantial down payment.

In lieu of a cash offer to purchase the property outright, McAlester will also consider an offer to either lease the oxide leaching facilities and oxide ore bodies under some reasonable rental, royalty, or similar type arrangement.

All geological, financial and production records concerning the Zonia Mine may be inspected at the McAlester Fuel Company office in McAlester, Oklahoma. For on-site inspection of the Mine, arrangements should be made with Mr. J. J. Brunner, Wickenburg, Arizona, Telephone (602) 684-2188.

This offer is made subject to prior sale or lease.

APPENDIX (i)

Description of West Property

PATENTED LODE MINING CLAIMS

The following patented lode mining claims are situated in the Walnut Grove Mining District, Yavapai County, Arizona, the deeds of which are of record in the offices of the Recorder of Yavapai County, as follows:

Name of Claim	M.S.	Patent No.	Book of Deeds	Page
		Locklear Group		
Georgia	3866	954817	134	557-566
Georgia No. 2	3866	954817	134	557-566
Georgia No. 3	3866	954817	134	557-566
Yankee Girl	3866	954817	134	557-566
Sunrise	3866	954817	134	557-566
Sunrise No. 2	3866	954817	134	557-566
Sunrise No. 3	3866	954817	134	557-566
Sunrise No. 4	3866	954817	134	557-566
Richmond	3867	951190	134	369-372
Virginia	3867	951190	134	369-372
		Gillingham Group		
Polar Star	1324		49	485
Tourmaline	1324		49	485
Copper Glance	1324		49	485
Sunset	1324		49	485
Manilla	1324		49	485
Copperopolis	1324		49	485
Defiance	1324		49	485
Fairplay	1324		49	485
		Quartette		
Quartette	1321		77	114-117

UNPATENTED LODE MINING CLAIMS

The following unpatented lode mining claims situated in the Walnut Grove Mining District, Yavapai County, Arizona, the Location Notices of which are of record in the offices of the Recorder of Yavapai County, Arizona, as follows:

McMahan Group

Name of Claim	Record of Mines Book	Page No.
Cuprite	51	45
Cuprite (amended)	86	343
Black Prince	49	153
Shamrock	69	503

Zonia Group

Name of Claim	Book of Official Records	Page
Zonia No. 2	360	402
Zonia No. 5	360	405
Zonia No. 14	360	414
Zonia No. 19	361	525
Zonia No. 20	424	60
Zonia No. 25	464	547
Zonia No. 26	464	548
Zonia No. 27	464	549
Zonia No. 28	464	550
Zonia Amended	573	813
Fraction Amended	573	812

Lois Group

Lois No. 1	464	551
Lois No. 2	464	552
Lois No. 3	464	553
Lois No. 4	464	554
Lois No. 5	464	555
Lois No. 6	464	556
Lois No. 17	464	557
Lois No. 18	464	558
Lois No. 19	464	559
Lois No. 20	464	560

Mistake Claims

Mistake Fraction No. 1	761	114
Mistake Fraction No. 2	761	115
Mistake No. 1	761	116
Mistake No. 2	761	117
Mistake No. 3	761	118
Mistake No. 4	761	119
Mistake No. 5	761	120
Mistake No. 6	761	121
Mistake No. 7	761	122
Mistake No. 8	761	123
Mistake No. 9	761	124
Mistake No. 10	761	125
Mistake No. 11	761	126

Victory Copper Group

Victor Copper	152	223
Victory Copper No. 1, One	152	224
Copper Bar No. 2	154	181
Copper King No. 1	57	176
Copper King No. 3	57	178
Copper King No. 4	57	179
Scott No. 1	294	17
Scott No. 2	294	18

UNPATENTED MILLSITES

Name of Claim	Book of Official Records	Page
Zonia Millsite No. 1 (Amended)	573	814
Zonia Millsite No. 2 (Amended)	573	815
Zonia Millsite No. 3 (Amended)	573	816
Zonia Millsite No. 4 (Amended)	573	817
Zonia Millsite No. 5 (Amended)	573	818
Zonia Millsite No. 6 (Amended)	573	819
Zonia Millsite No. 7 (Amended)	573	820
Zonia Millsite No. 8 (Amended)	573	821
Zonia Millsite No. 9 (Amended)	573	822
Zonia Millsite No. 10 (Amended)	573	823
Zonia Millsite No. 11 (Amended)	573	824
Zonia Millsite No. 12 (Amended)	573	825
Zonia Millsite No. 13 (Amended)	573	826
Zonia Millsite No. 14 (Amended)	573	827
Zonia Millsite No. 15 (Amended)	573	828
Zonia Millsite No. 16 (Amended)	573	829
Zonia Millsite No. 17 (Amended)	573	830
Zonia Millsite No. 18 (Amended)	573	831
Zonia Millsite No. 19 (Amended)	573	832
Zonia Millsite No. 20 (Amended)	573	833
Zonia Millsite No. 21 (Amended)	573	834
Zonia Millsite No. 22 (Amended)	573	835
Zonia Millsite No. 23 (Amended)	573	836
Zonia Millsite No. 24 (Amended)	573	837
Zonia Millsite No. 25 (Amended)	573	838
Zonia Millsite No. 26 (Amended)	573	839
Zonia Millsite No. 27 (Amended)	573	840
Zonia Millsite No. 28 (Amended)	573	841
Zonia Millsite No. 29 (Amended)	573	842
Zonia Millsite No. 30 (Amended)	573	843
Zonia Millsite No. 31 (Amended)	573	844
Zonia Millsite No. 32 (Amended)	573	845
Zonia Millsite No. 33 (Amended)	573	846
Zonia Millsite No. 34 (Amended)	573	847
Zonia Millsite No. 35 (Amended)	573	848
Zonia Millsite No. 36 (Amended)	573	849
Zonia Millsite No. 37	573	850
Zonia Millsite No. 38	573	851
Zonia Millsite No. 39	573	852
Zonia Millsite No. 40	573	853
Zonia Millsite No. 41	573	854
Zonia Millsite No. 42	573	855
Zonia Millsite No. 43	573	856
Zonia Millsite No. 44	573	857
Zonia Millsite No. 45	573	858
Zonia Millsite No. 46	573	859
Zonia Millsite No. 47	573	860
Zonia Millsite No. 48 (Amended)	573	861
Zonia Millsite No. 49	573	862
Zonia Millsite No. 50	573	863
Zonia Millsite No. 51	573	864
Zonia Millsite No. 52	573	865
Zonia Millsite No. 53	573	866
Zonia Millsite No. 54	573	867

Name of Claim	Book of Official Records	Page
Zonia Millsite No. 55	573	868
Zonia Millsite No. 56	573	869
Zonia Millsite No. 57	573	870
Zonia Millsite No. 58	573	871
Zonia Millsite No. 59	573	872
Zonia Millsite No. 60	573	873
Zonia Millsite No. 61	573	874
Zonia Millsite No. 62	573	875
Zonia Millsite No. 63	573	876
Zonia Millsite No. 64	573	877
Zonia Millsite No. 65	573	878
Zonia Millsite No. 66	573	879
Zonia Millsite No. 67	573	880
Zonia Millsite No. 68	573	881
Zonia Millsite No. 69	573	882
Zonia Millsite No. 70	594	851
Zonia Millsite No. 71	594	852
Zonia Millsite No. 72	594	853
Zonia Millsite No. 73	594	854

APPENDIX (i)a

Description of East Property

I. PATENTED LODE MINING CLAIMS

Gillingham Group

Name of Claim	M.S.	Patent No.	Book of Deeds (Yavapai County, Az)	Page
Sun Flower	1323A		49	478
Lone Pine	1323A		49	478
Fraction	1323A		49	478
Iron Hat	1323A		49	478
Fountain	762		27	633
Arrastra	767		27	636
Iron Hat Millsite				

II. UNPATENTED LODE MINING CLAIMS

1. The following unpatented lode mining claims situated in the Walnut Grove Mining District, Yavapai County, Arizona, the location notices of which are of record in the office of the Recorder of Yavapai County, Arizona as follows:

Zonia Group

Name of Claim	Book of Official Records	Page
Zonia No. 6	360	406
Zonia No. 7	360	407
Zonia No. 8	360	408
Zonia No. 9	360	409
Zonia No. 10	360	410
Zonia No. 11	360	411
Zonia No. 15	360	415
Zonia No. 16	360	522
Zonia No. 17	361	524
Zonia No. 18	361	523
Zonia No. 21	458	388
Zonia No. 22	458	389
Zonia No. 23	458	390
Zonia No. 24	459	486

Mistake Claims

Name of Claim	Book of Official Records	Page
Mistake No. 12	761	127
Mistake No. 13	761	128
Mistake No. 14	761	129
Mistake No. 15	761	130
Mistake No. 16	761	131
Mistake No. 17	761	132
Mistake No. 18	761	133
Last Mistake	761	134

Triad Claims

Name of Claim	Book of Official Records	Page
Triad No. 1	1095	928
Triad No. 2	1095	929
Triad No. 3	1095	930
Triad No 2 (Amended)	1203	81

2. An undivided one-half interest in the following unpatented lode mining claims situated in the Walnut Grove Mining District, Yavapai County, Arizona, the location notices of which are of record in the office of the Recorder of Yavapai County, Arizona, as follows:

Copper Crown Group

Name of Claim	Book of Mines	Page
Gold Crown	159	400
Copper Crown No. 1	147	155
Copper Crown No. 2	147	156
Copper Crown No. 3	147	157
Copper Crown No. 4	151	331
Copper Crown No. 5	151	332
Copper Crown No. 6	151	333
Copper Crown No. 7	151	334
Copper Crown No. 8	151	335

Name of Claim	Book of Official Records	Page
Copper Crown No. 9	55	111
Copper Crown No. 10	7	186
Copper Crown No. 12	55	112
Copper Crown No. 13	560	929
Copper Crown No. 14	63	204
Copper Crown No. 15	64	179
Copper Crown No. 16	64	180
Copper Crown No. 17	64	181
Copper Crown No. 18	68	385
Copper Crown No. 19	68	386
Copper Crown No. 20	68	387
Copper Crown No. 21	68	388
Copper Crown No. 22	68	389
Copper Crown No. 23	68	390
Copper Crown No. 24	68	391
Copper Crown No. 25	68	392
Copper Crown No. 26	68	393
Copper Crown No. 27	83	74
Copper Crown No. 28	73	402
Copper Crown No. 29	73	403
Copper Crown No. 30	73	404
Copper Crown No. 31	73	405
Copper Crown No. 32	83	75
Copper Crown No. 33	112	374
Copper Crown No. 34	112	375
Copper Crown No. 35	112	376
Copper Crown No. 36	560	930
Copper Crown No. 37	560	931
Copper Crown No. 38	560	932
Copper Crown No. 39	560	933
Copper Crown No. 40	560	934

Name of Claim	Book of Official Records	Page
Copper Crown No. 41	560	935
Copper Crown No. 42	560	936
Copper Crown No. 43	560	937
Copper Crown No. 44	560	938
Copper Crown No. 45	560	939
Copper Crown No. 46	560	940
Copper Crown No. 47	560	941
Copper Crown No. 48	560	942
Copper Crown No. 49	560	943
Copper Crown No. 50	560	944
Copper Crown No. 51	560	945
Copper Crown No. 51 (amended)	706	403
Copper Crown No. 52	560	946
Copper Crown No. 53	___	___

Flat
Lois No. 20
Lois No. 19
Lois No. 18
Lois No. 17
Lois No. 3
Lois No. 2
Lois No. 1
Lois No. 5
Lois No. 4
Mistake No. 1
Mistake No. 3
Mistake No. 4
Mistake No. 7
Mistake No. 8
Mistake No. 13
Mistake No. 14
Mistake No. 15
Scott No. 2
Victor Copper
Black Prince
Defiance
Fair play
Copperopolis
Sunrise No. 4
Sun Set
Georgia No. 3
Zonia No. 24
Zonia No. 25
Copper Crown
Placerita
Gulch
JEEP
TRAIL
Lucky Dime Group
N
35,900 N 15° E
Area of

EQUIPMENT

Rolling Stock

1	10 Ton B.E. cable operated crane with magnet and 40' Boom. Mobile truck mount. Gasoline operated.
1	35 Ton P H cable operated crane with magnet and 70' Boom. Mobile truck mount. Diesel operated.
2	Hough loaders - 1½ Yd.
1	Ford Backhoe (Diesel)
1	5 Ton International Dump Truck (Gasoline)
1	Chevrolet Pickup (LUV)
1	Chevrolet Pickup (4x4)
1	Dodge Dart Sedan
1	Ford (Courier)

Buildings

1	Shop including store room, assay office, change and locker rooms. (Size 50' x 80')
1	Office - Four rooms and lavatory. Size 26' x 50'.
2	Small instrument shacks and one operator's shack.

Motor Control Centers

4	Units, weatherproof, outdoor cubicles.

Power Sub-Stations

4	Including switch gear. Step down transformers 33000 to 480 volts owned by Arizona Public Service. Switch gear by McAlester. Light transformer 440 to 110/220 by McAlester

EQUIPMENT (Continued)

Pumps

1	150 HP, 350' turbine for water service.
	Solution Service all 316 SS.
1	50 HP, 6" x 80' turbine
1	50 HP, 6" x 130' turbine
4	20 HP, Submersible turbines
3	4" x 3" x 6" Worthington 30 HP direct connected
2	8" x 6" Gould 40 HP, direct connected
2	8" x 6" Turbines 25 HP
3	4" x 3" x 10" Gould pumps 75 HP, direct connected
2	4" x 3" x 10" Gould pumps 100 HP, direct connected
1	4" x 3" x 10" Gould pump 50 HP, direct connected
3	3" x 2" x 10" Gould pumps 50 HP, direct connected
3	3" x 2" x 10" Gould pumps 40 HP, direct connected
1	3" x 2" x 10" Gould pump 30 HP, direct connected
1	4" x 3" x 6" Gould pump 30 HP, direct connected

Pipelines

Water - 20,000 ft. 8" welded steel casing equipped with necessary valves, air bleeds and vacuum breakers.

Solution from Heaps and in situ:

6 - 4" PVC (Leach Basin #1)

1 - 4" PVC)
1 - 6" PVC) (Leach Basin #2 & #3)

EQUIPMENT (Continued)

8" Transite)
6" Fiberglass) (Leach Basin #5 & #6)
4" PVC)

4" PVC - Leach Basin #4 (discard pond)

Solution to Heaps and in situ:

3 - 6" Fiberglass and PVC main feeders

1 - 4" Fiberglass and PVC main feeder

1 - 4" PVC

1 - 8" Transite main feeder

Distribution from main feeders is by 4" PVC headers and 1½" polypropylene tubing. Rainbirds are attached to 1½" tubing with saddles and 3/4" screwed PVC pipe.

Reduction Plant

1 25 Ton ChemiPulp Sulfur Burner

2 13.75" dia. x 27' covered molten sulfur storage tanks. Insulated and equipped with suitable steam coils, PVC valves, steam traps, etc.

1 8' x 22' underground sulfur unloading tank equipped as above including compressed air and controls for transfer of sulfur to storage.

1 Wasteheat boiler including pumps, deaeration tank and permutite water softener.

1 SS and rubberlined carbon steel scrubber 5½' dia. complete with two 25' beds of packing, suitable packing supports, solution distributers, piping and instrument nozzles for thermometer and pressure taps.

1 Instrument shack containing stack analyser*, level control SO_2 analyser, flow rate charts, EMF charts, standard

* Not functional.

EQUIPMENT (Continued)

boiler controls, and ennunciator board. The motor control center for the sulfur plant and the rectifier for the burner air blower (DC variable speed control) is also housed in this instrument shack. Suitable motor interlocks are provided to protect the plant in case of operator error.

2 Automatic compressors furnish plant and instrument air.

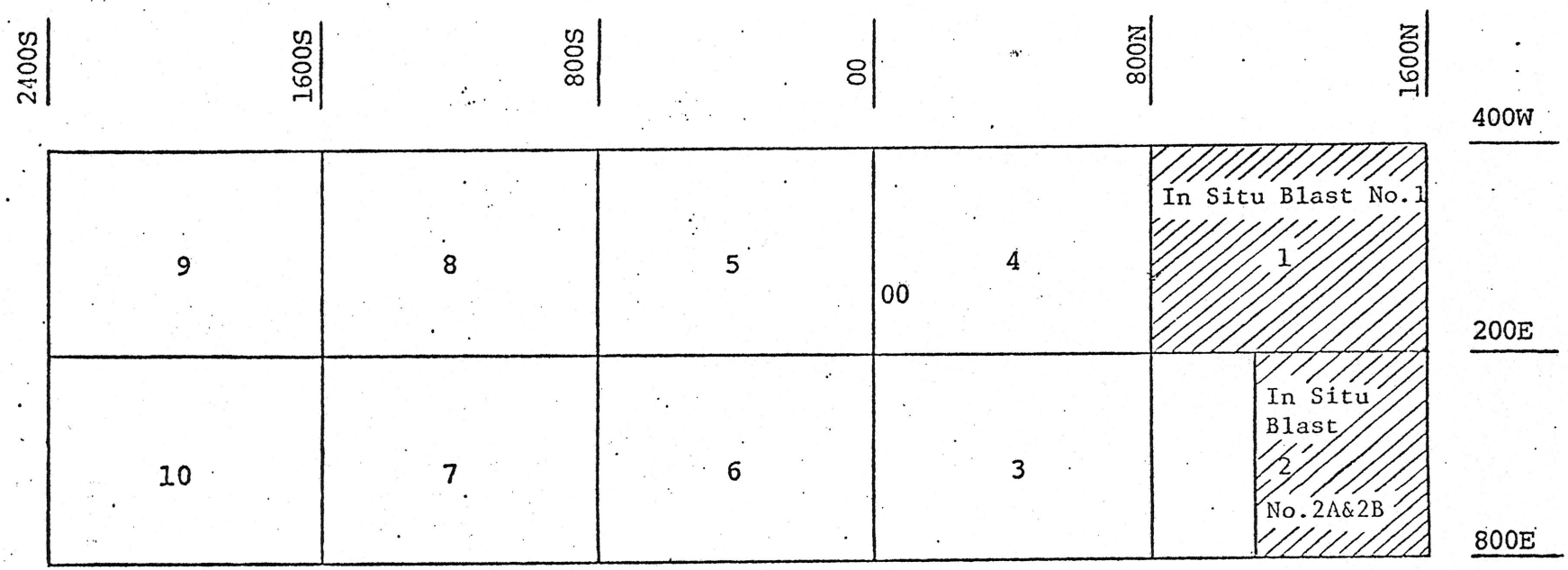
5 Carbon Boxes - 4 units 14' x 6' x 8' deep and pme 10' square by 10' deep. Loaded with activated carbon and equipped with pipe and distributors for up flow of solutions.

3 8' diameter by 21' wood precipitation silos equipped with 3½ 316 ss grates and 316 ss Rovange air operated discharge gates.

ORE RESERVES

VIRGIN, UNTOUCHED ORES

BLOCKS 1 THROUGH 10 LOCATIONS ON ZONIA MINE COORDINATES



SUMMARY OF VIRGIN, UNTOUCHED ORES

	+1.00%		+.60%		+.40%		+.20%		Total	Total
	TONS Ore	LBS. Cu	TONS	LBS	TON	LBS	TONS	LBS	TONS	LBS
BLOCK NO.1	(All accounted for in: In Situ Basin 5.)									
BLOCK NO.2 *	29,62[illegible].6	592,5[illegible].0	109,62[illegible].6	1,315,55[illegible].2	228,14[illegible].2	1,825,15[illegible].6	651,85[illegible].8	3,607,40[illegible].2	1,019,25[illegible].2	6,340,7[illegible].6
BLOCK NO.3	13,333.1	266,666.0	136,29[illegible].2	1,635,5[illegible].4	521,4[illegible].1	6,571,8[illegible].2	3,157,11[illegible].8	13931,111.2	1,12[illegible]	2,305,[illegible]
BLOCK NO.4	234,44[illegible].1	5,68[illegible].0	672,59[illegible].6	8,071,111.2	751,851.3	6,014,5[illegible].1	1,117,10[illegible].4	5,78[illegible].6	3,156,29[illegible].2	35,5[illegible]
BLOCK NO.5	241,18[illegible].1	4,82[illegible]	431,111.2	5,173,33[illegible].1	62[illegible]1,81[illegible].3	5,239,51[illegible].1	1,733,333.1	5,933,85[illegible].6	3,050,7[illegible].8	22,17[illegible]
BLOCK NO.6	0.0	0.0	250,000.0	3,120,00[illegible]	314,814.8	5,518,51[illegible].1	1,943,72[illegible].6	7,774,81[illegible].4	3,018,51[illegible].1	17,413,33[illegible].6
BLOCK NO.7	4,144.1	88,88[illegible].0	9,629.6	115,555.2	27,407.4	219,259.2	997,777.8	3,991,111.2	1,03[illegible]	[illegible]
BLOCK NO.8	11,851.9	237,036.0	14,111.0	133,332.0	125,9[illegible].3	1,007,40[illegible].4	1,887,40[illegible].1	7,549,62[illegible].6	2,08[illegible]	[illegible]
BLOCK NO.9	8,88[illegible].8	177,77[illegible].0	97,777.8	1,173,33[illegible].0	9[illegible].3	73[illegible]1[illegible].1	1,59[illegible]	6,370,37[illegible].4	2,60[illegible]	[illegible]
BLOCK NO.10	0.0	0.0	0.0	0.0	27,62[illegible].6	237,03[illegible].8	111,07[illegible].0	456,2[illegible].0	143,7[illegible].6	623,55[illegible].8
TOTAL	594,07[illegible].8	11,88[illegible]	1,728,1[illegible].0	20,737,7[illegible].6	1367,9[illegible].6	3[illegible]9037.[illegible]	3,625,9[illegible].8	55303,7[illegible].2	24,511,1[illegible].2	122,826,5[illegible].6

* Ore not within In Situ Basin No. 6.

BLOCK NO. 2

	LEVEL	+1.00% SQ. FT.	+1.00% AVR. SQ. FT.	+1.00% CUBIC FT.	+.60% SQ. FT.	+.60% AVR. SQ. FT.	+.60% CUBIC FT.	+.10% SQ. FT.	+.10% AVR. SQ. FT.	+.10% CUBIC FT.	+.20% SQ. FT.	+.20% AVR. SQ. FT.	+.20% CUBIC FT.
	1250	0	2,000	100,000	0	1,000	50,000	0	400	20,000	0	2,200	110,000
		1,000	4,000	200,000	2,000	12,200	610,000	800	12,400	620,000	4,400	4,200	210,000
	1200				22,400			24,000			4,000		
	1150	4,000	2,000	100,000		13,800	690,000		26,400	520,000		54,100	2,720,000
	1100	0	0		5,200	2,600	130,000	29,800	18,400	920,000	104,800	83,800	4,190,000
	1050	0			0			8,000	4,000	200,000	52,900	31,400	1570,000
				400,000			1,480,000			3,060,000			8,600,000
		400,000 / 27 = 14,814 yards			1480,000 / 27 = 54,814 yards			3,080,000 / 27 = 114,074 yards			8,600,000 / 27 = 325,925.9 yards		
ACCUM. totals	1,019,259.2 tons		29,629.6 tons/100%		10% 529.6 tons/60%			2.8% 148.2 tons/40%			5% 51,851.8 tons/ 3.3%		
	6,310,710.0 LBS. CU.		592,592. LBS. CU.		1,31[illegible]555.2 LBS. CU.			1,92[illegible]5,185.6 LBS. CU.			2,07,407. LBS. CU.		
	0.3110% CU.												

BLOCK NO. 3

	LEVEL	+100% SQ. FT.	AVR. SQ. FT.	CUBIC FT.	+50% SQ. FT.	AVR. SQ. FT.	CUBIC FT.	+40% SQ. FT.	AVR. SQ. FT.	CUBIC FT.	+30% SQ. FT.	AVR. SQ. FT.	CUBIC FT.
	4250	0			0			0			66,400		
			0			0			0			33,200	1,660,000
	4200	0			0			0			0		
			1,800	90,000		16,800	840,000		62,300	3,115,000		125,800	6,290,000
	4150	3,600			33,600			124,600			251,600		
			1,800	90,000		18,400	920,000		103,700	5,435,000		257,200	12,860,000
	4100	0			3,200			92,500			262,800		
			0			1,600	32,000		50,400	2,520,000		331,400	16,570,000
	4050	0			0			8,000			335,000		
									4,000	20,000		193,000	9,650,000
				180,000			1,840,000			11,090,000			46,650,000
		180,000 / 27	= 6,666.7 yards		1,840,000 / 27	= 68,148.1 yards		11,030,000 / 27	= 408,518.5 yards		15,652,000 / 27	= 579,703.7 yards	
			13,333.3 tons			136,296.2 tons			817,037.1 tons			3,479,777.7 tons	
	ACCUM totals 1,128,332.8 tons												
	22,305,184.8 LBS. CU.		266,666.0 LBS CU.			1,635,555.1 LBS CU.			6,537,651.2 LBS CU.			13,333,111.2 LBS.	
	.2518 % CU.												

BLOCK NO. 4

	LEVEL	1.00 % SQ. FT.	1.00 % AVR. SQ. FT.	1.00 % CUBIC FT.	.60 % SQ. FT.	.60 % AVR. SQ. FT.	.60 % CUBIC FT.	.40 % SQ. FT.	.40 % AVR. SQ. FT.	.40 % CUBIC FT.	.20 % SQ. FT.	.20 % AVR. SQ. FT.	.20 % CUBIC FT.
	4250	0			13,600			29,400			35,200		
			5,000	250,000		35,800	1,790,000		37,600	1,880,000		51,200	2,560,000
	4200	10,000			58,000			51,800			67,200		
			25,400	1,270,000		61,400	3,070,000		62,400	3,120,000		87,600	1,300,000
	4150	10,800			64,800			70,000			108,000		
			33,400	1,670,000		58,400	2,920,000		69,000	3,450,000		133,000	5,650,000
	4100	26,000			52,000			68,000			158,000		
			13,000	650,000		26,000	1,300,000		34,000	1,700,000		99,000	1,950,000
	4050	0			0			0			40,000		
												20,000	1,000,000
				3,840,000			2,030,000			10,150,000			12,510,000
		3,840,000 / 27	= 142.2	2.2 yards	2,080,000 / 27	= 336.9	3 yards	10,150,000 / 27	= 375,92	.9 yards	12,540 / 27	2 = 72?	3.7 yards
	3,156,296.2 tons		2,344,444.1	tons		3,592	tons		75,851.8	tons		1,447,40	1 tons
ACCUM. Total	25,561,443.2 LBS. CU.		5,688,888.0	LBS. CU.		8,071,111.2	LBS. CU.		6,014.814.1	LBS. CU.		5,783,0	6 LBS. CU.
	.4050 % CU.												

BLOCK NO. 5

	LEVEL	+1.00% SQ. FT.	+1.00% AVR. SQ. FT.	+1.00% CUBIC FT.	+.60% SQ. FT.	+.60% AVR. SQ. FT.	+.60% CUBIC FT.	+.40% SQ. FT.	+.40% AVR. SQ. FT.	+.40% CUBIC FT.	+.20% SQ. FT.	+.20% AVR. SQ. FT.	+.20% CUBIC FT.
	4250	6,400	24,200	1,210,000	28,000	44,000	2,200,000	36,000	36,000	1,800,000	22,800	60,700	3,035,000
	4200	12,000	31,000	1,550,000	60,000	50,000	2,500,000	36,000	63,000	3,150,000	99,600	71,300	3,565,000
	4150	20,000	10,000	500,000	10,000	21,200	1,060,000	20,000	61,400	3,070,000	44,000	95,000	4,750,000
	4100	0	0		2,400	1,200	60,000	32,800	16,400	820,000	146,000	157,000	7,850,000
	4050	0			0			0			168,000	84,000	4,200,000
				3,260,000			5,820,000			9,940,000			23,400,000
		3,260,000 / 27 = 120,7		10.7 yards	5,820,000 / 27 = 215,5		5.6 yards	9,940,000 / 27 = 323,4		7.4 yards	23,400,000 / 27 = 866,666.7		yds
		3,030,740.8 tons	24	91.1 tons	1.00%	431	111.2 tons	1.50%	651	814.8 tons	1.40%	1,733,333.4	tons 1.20%
	ACCUM Totals	22,174,814.4 LBS. CU.	4,8	9,628.0	LBS. CU.	5,1	3,334.1	LBS. CU.	5,239,516.1		LBS. CU.	6,233,353.	LBS. CU.
		.3622 %											

BLOCK NO. 6

	LEVEL	+100% SQ. FT.	+100% AVR. SQ. FT.	+100% CUBIC FT.	+60% SQ. FT.	+60% AVR. SQ. FT.	+60% CUBIC FT.	+40% SQ. FT.	+40% AVR. SQ. FT.	+40% CUBIC FT.	+20% SQ. FT.	+20% AVR. SQ. FT.	+20% CUBIC FT.
	4250	0	0		0	0		0	0		0	10,000	500,000
	4200	0	0		0	24,600	1,230,000	0	47,000	2,350,000	20,000	80,000	1,000,000
	4160	0			49,200			94,000			140,000		
	4100	0	0		24,000	33,600	1,680,000	126,000	110,000	5,600,000	128,800	134,400	6,720,000
	4050	0	0		0	12,000	600,000	0	63,000	3,150,000	236,000	182,400	9,120,000
				0.00			3,510,000			11,000,000		118,000	5,900,000
					3,510,000 / 27 = 130,000 yards			11,000,000 / 27 = 407,407 yards			25,240,000 / 27 = 934,814 yards		46,240,000
	3,018,518.4 tons				260.00 tons / 60%			814,814.8 tons / 40%			1,541,703.6 tons / 20%		
ACCUM TOTALS	17,413,332.8 LBS. CU.				3,120,000 LBS. CU.			6,518,518.4 LBS. CU.			7,714,814.1 LBS. CU.		
	2884 % CU.												

BLOCK NO. 7

	LEVEL	+1.00% SQ. FT.	+1.00% AVR. SQ. FT.	+1.00% CUBIC FT.	+.60% SQ. FT.	+.60% AVR. SQ. FT.	+.60% CUBIC FT.	+.40% SQ. FT.	+.40% AVR. SQ. FT.	+.40% CUBIC FT.	+.20% SQ. FT.	+.20% AVR. SQ. FT.	+.20% CUBIC FT.
	4250	2,100	1,200	60,000	5,200	2,600	130,000	6,000	3,000	150,000	26,800	47,100	2,370,000
	4200	0	0		0	0		0	0		69,000	79,000	3,900,000
	4150	0			0			0			88,000		
			0			0			2,200	110,000		91,000	4,700,000
	4100	0	0		0	0		1,400	2,200	110,000	100,000	50,000	2,500,000
	4050	0			0			0			0		
				60,000			130,000			370,000			13,470,000
		60,000 / 27 = 2,222.2 yards			130,000 / 27 = 4,814.8 yards			370,000 / 27 = 13,703.7 yards			13,470,000 / 27 = 498,888.9 yards		3.9 yards
	1,032,259.2 tons	4,444.4 tons		1.00%	9,629.6 tons		1.60%	27,407.4 tons		1.40%	99,777.8 tons		1.20%
ACCUM TOTALS	207.85184												
	1,414,813.6 LBS. CU.	88,826.0 LBS.		CU.	115,555.2 LBS.		CU.	213,259.2 LBS.		CU.	3,991,111.2 LBS.		CU.
	.2124 % CU.												

BLOCK NO. 8

LEVEL	SQ. FT.	AVR. SQ. FT.	CUBIC FT.	SQ. FT.	AVR. SQ. FT.	CUBIC FT.	SQ. FT.	AVR. SQ. FT.	CUBIC FT.	SQ. FT.	AVR. SQ. FT.	CUBIC FT.
	+1.00%			+.60%			+.10%			+.20%		
4250	6,400	3,200	160,000	6,000	3,000	150,000	27,200	13,600	680,000	26,000	117,000	5,850,000
4200	0	0		0	0		0	6,000	300,000	138,000	117,000	5,850,000
4150	0			0			12,000	10,200	510,000	26,000	141,800	7,090,000
4100	0	0		0	0		8,400	4,200	210,000	187,800	113,800	5,690,000
4050	0	0		0	0		0			10,000	20,000	1,000,000
			160,000			150,000			1,700,000			25,190,000
	160,000 / 27 = 5,925.9 yards			150,000 / 27 = 5,555.5 yards			1,700,000 / 27 = 62,962.9 yards			25,480,000 / 27 = 943,703.7 yards		
	2,036,296.0 tons		1,651.8 tons / 1.00%			1,111.0 tons / 1.60%			1,852.5 tons / 1.10%			1,887,407.4 tons / 2.20%
ACCUM TOTALS	8,927,401.0 LBS CU.		237,036.0 LBS CU.			133,332.0 LBS. CU.			1,697,106.4 LBS. CU.			7,549,629.6 LBS. CU.
	.2192 % CU.											

BLOCK NO. 9

	LEVEL	+1.00% SQ. FT	+1.00% AVR. SQ FT.	+1.00% CUBIC FT.	+.60% SQ. FT.	+.60% AVR. SQ. FT.	+.60% CUBIC FT.	+.40% SQ. FT.	+.40% AVR. SQ. FT.	+.40% CUBIC FT.	+.20% SQ. FT.	+.20% AVR. SQ. FT.	+.20% CUBIC FT.
	4250	1,600	2,100	120,000	35,200	19,900	990,000	59,600	59,600	2,980,000	96,000	107,000	5,350,000
	4200	0	0		1,400	1,100	220,000	59,300	91,800	4,090,000	119,000	109,000	5,450,000
	4150	0			4,100			104,000			100,000		
			0			2,200	110,000		73,000	3,900,000		112,000	5,600,000
	4100	0	0		0	0		52,000	26,000	1,300,000	124,000	92,000	1,100,000
	4050	0			0			0			40,000	20,000	1,000,000
				120,000			1,320,000			12,270,000			21,500,000
		120,000 / 27 = 4,444 yards			1,320,000 / 27 = 48,888 yards			12,270,000 / 27 = 454,444 yards			21,500,000 / 27 = 796,296 yards		
	2,609,148 tons	9,888.8 tons		1.00%	97,728 tons		1.60%	909,888.8 tons		1.40%	1,592,592.6 tons		1.20%
ACCUM. TOTALS	11,992,590.4 LBS. CU.	177,776.0 LBS. CU.			1,173,333.6 LBS. CU.			7,211,110.4 LBS. CU.			6,930,370.4 LBS. CU.		
	.2871 % CU.												

BLOCK NO. 10

	LEVEL	+1.00% SQ. FT.	+1.00% AVR. SQ. FT.	+1.00% CUBIC FT.	+.60% SQ. FT.	+.60% AVR. SQ. FT.	+.60% CUBIC FT.	+.10% SQ. FT.	+.10% AVR. SQ. FT.	+.10% CUBIC FT.	-.30% SQ. FT.	-.30% AVR. SQ. FT.	-.30% CUBIC FT.
	1250	0	0		0	0		0	0		12,000	9,100	470,000
	4200	0	0		0	0		0	4,000	200,000	6,800	12,400	620,000
	4150	0			0			8,000			18,800		
	4100	0	0		0	0		0	1,000	200,000	0	9,000	450,000
	4050	0	0		0	0		0	0		0	0	
										400,000			1,540,000
	143,703.6 tons							400,000 / 27 = 14,814.8 yards 29,629.6 tons @ 1.40%			1,540,000 / 27 = 57,057.0 111,071.0 tons/cu.ft.		
ACCUM TOTALS	693,332.8 LBS. CU.							237,036.8 LBS. CU.			456,296.0 LBS CU		
	.2412 % CU.												

ZONIA, YAVAPAI CO.

HOMESTAKE MINING COMPANY

FINAL REPORT

on the

(file)
ZONIA COPPER DEPOSIT
YAVAPAI COUNTY, ARIZONA

by

Jon W. Cameron
April 22, 1975

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ZONIA REPORT

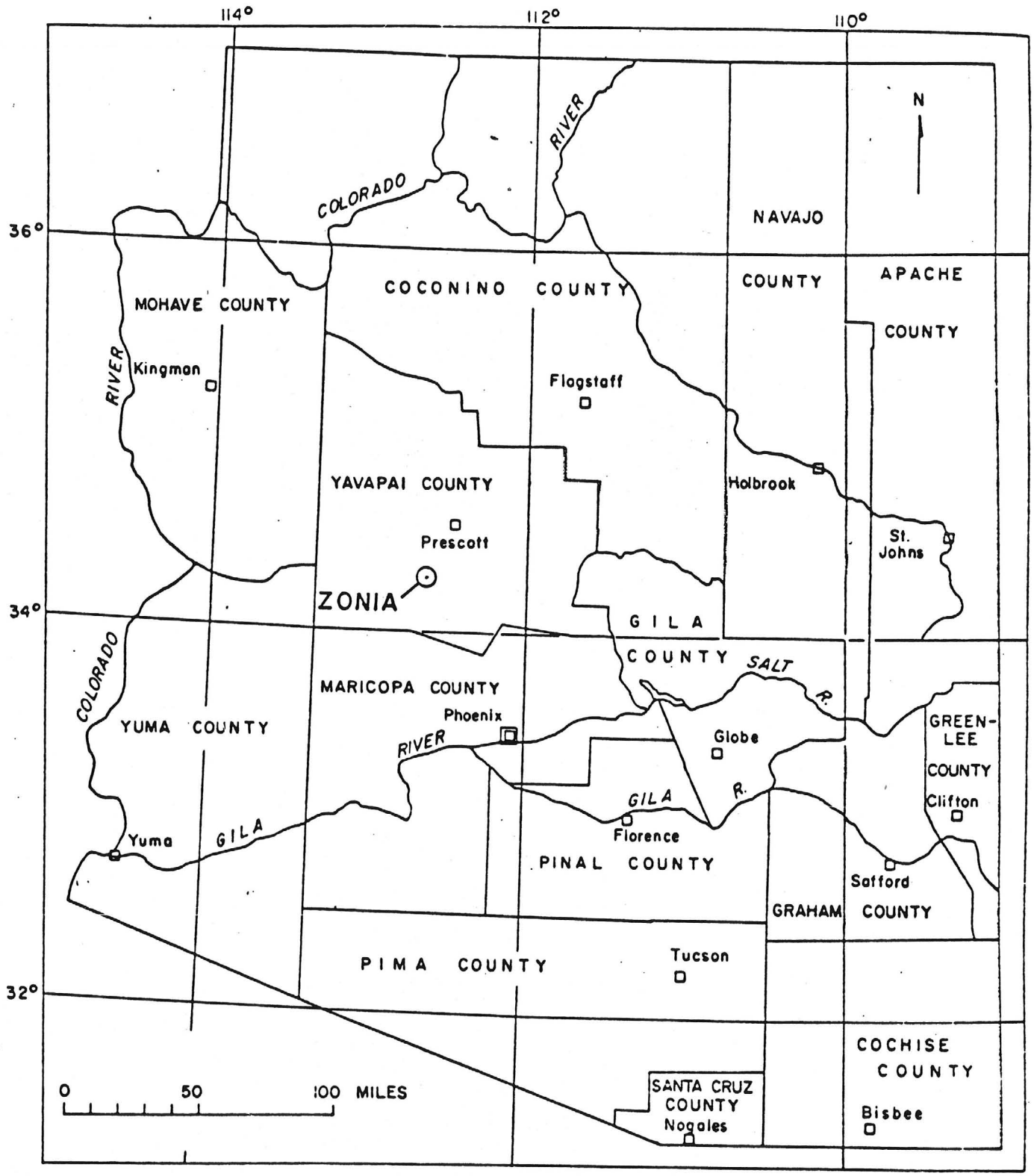
SUMMARY:

The Zonia copper deposit is a northeast trending elongated complex zone of igneous and sedimentary rocks which have undergone hydrothermal alteration and strong dynamic-weak thermal metamorphism. The low grade metamorphism affected all rock types, except the diabase, Tertiary alluvium, and Quaternary basalt, in only slightly different manners. Dominant metamorphic minerals include chlorite and sericite. Hydrothermal solutions have altered the intrusive quartz monzonite porphyry and enclosing wall rocks. Mineralization in the porphyry and adjacent greenstones includes chlorite, sericite, epidote, pyrite, calcite, quartz, magnetite, chalcopyrite, K-feldspar, biotite and molybdenite. Siderite, up to 20%, occurs over large areas and is a product from metamorphic and/or hydrothermal alteration.

Chalcopyrite is the dominant, perhaps only, primary copper mineral. The porphyry and greenstones contain broad surface areas and long drill hole intercepts of +0.15% Cu, with significantly lengthy drill intervals ranging from 0.3% to 0.5% Cu. Locally, near surface leaching, lateral transportation and enrichment of copper have produced mineralized zones with ±1.0% oxide Cu. Total oxidation reaches downward for several hundreds of feet and oxidation along structures extends beyond 1,500 feet. No economic tonnage has been established by Homestake to date, but significant copper mineralization traverses an area greater than 12,000 by 4,000 feet. Supergene enrichment is a prominent feature and has generated some of the near-economic mineralization. One high grade zone (+7.0% Cu) was intersected by drilling. Lead, zinc, gold and silver are almost totally absent in all analyzed samples. McAlester Fuel has 16,000,000 tons of rock under leach.

LOCATION:

The Zonia copper deposit is located in the Walnut Grove Mining District in southwestern Yavapai County, Arizona, 70 miles NNW of Phoenix, approximately halfway between Wickenburg and Prescott, and 6 miles southeast of Kirkland Junction by an elevated graveled road. The target area lies on the northwestern edge of a northeast trending Precambrian schist belt, as mapped on the Yavapai County geologic map.



ARIZONA INDEX MAP

FIGURE 1

PREVIOUS HISTORY:

During the 1880's mining activity began with production of high grade copper ores which were shipped for direct smelting. During the early part of the 20th Century several shafts were sunk to exploit various mining plans. The first drill holes were drilled by Shannon in 1910. In 1942 the United States Bureau of Mines tested potential copper reserves without much success. Miami Copper investigated Zonia during the 1950's. McAlester Fuel tested Zonia in the 1960's and put an open pit copper mine and heap leaching plan in operation. Later McAlester added in situ leaching to make a combined tonnage of 16,000,000 tons under leach. By 1974 approximately 400 holes had been drilled in the area, of which 350 holes were drilled by McAlester in developing reserves.

A detailed review of earlier activities is given by Chadwick and by Allen and Spencer (both attached).

HOMESTAKE ACTIVITIES:

Homestake became involved in Zonia in 1971 when an agreement with McAlester was formulated. Due to litigation involving McAlester, a formal agreement was not signed until September, 1974. During this initial period Homestake personnel carried out various work on the project, including surface mapping of rock types (J. B. Hite and H. L. Stensrud), ground magnetic surveying, trenching and other sampling, and analysis of previous drilling data. Since September, 1974, the surface was remapped with special emphasis on detailed mineralogy, geochemical surveys for Cu, Mo and Pb were run, drill data were re-evaluated, and seven rotary and core holes were drilled for a total of 6,421 feet. The deepest hole was 1,528 feet.

Homestake has a two-part agreement with McAlester: 1.) a purchase option that can be exercised at any point, and 2.) time correlated exploration expenditures given in the table below. By March 23, 1975, Homestake will have spent over $140,000 on Zonia.

DATE	EXPENDITURES
3/23/75	$ 75,000
9/23/75	150,000
3/23/76	250,000
9/23/76	400,000
3/23/77	Decision Date

PREVIOUS GEOLOGIC REPORTS:

Dozens of reports and maps have been compiled on Zonia. Many of these are listed by Chadwick (attached) and some are available in Homestake's files. Several diverse genetic theories were developed by the various authors to account for the anomalous copper.

The report by R. H. W. Chadwick (1964) is confined to a syngenetic volcanic approach and is thought by this author to have missed many of the major geologic facts.

The report by J. W. Allen and J. J. Spencer (1957, attached) is probably the most thorough analysis prior to Homestake's involvement. Allen, et al, recognized a hydrothermal dominance in ore control at Zonia and stated "... copper mineralization ... is generally associated spatially with the quartz diorite and quartz diorite schist. Much of the quartz diorite has been sheared and altered to a quartz-mica schist." Other key phases by Allen, et al, were: "mesothermal pyritic replacement" and "Too little work was done on the hypogene mineralization ..."

LITHOLOGY:

The lithological units at Zonia are comprised of one sedimentary series with several facies, changing from a calcareous-rich phase upward to an argillaceous and clastic dominated facies and a host of igneous rocks, followed by metamorphism and finally formation of Tertiary alluvium and Quaternary basalt. The following described rocks are listed in an order that the author believes to be actual decreasing relative age.

Limestone: A thinly foliated argillaceous limestone occurs on the southeast side of the district. This limestone when fresh, is a dense medium grey carbonate-rich (±80%) rock. It rapidly weathers to a loose, rubbly, strongly foliated, micaceous phyllite. The mica changes from sericite on the extreme southeast to chlorite inward toward the monzonite (schist) contact. This change is interpreted to be an effect of hydrothermal alteration. Age of this limestone is considered to be Precambrian.

Phyllite: This strongly foliated phyllite is an upper facies of the above described limestone. It has a silvery white to chloritic green color and rapidly weathers to a loose, scaly outcrop. Overall carbonate content reaches a minimum of ±30% near the monzonite or schist contact. Where this rock contains chlorite and siderite, the weathered color becomes a "lively" hematite red. A northeast trending zone of banded iron formation(?) crops out at 3,600' S, 1,700' E(?), just west of a major wash. This zone is tens of feet wide and consists of silicification with fine grained hematite. The phyllite is also considered to be Precambrian.

Granite: As interpreted by this author, the Precambrian granite lying on the west side of the district is the next oldest rock. The granite also bounds the eastern side of the limestone. This granite is a coarse grained equigranular quartz monzonite. It generally has undergone moderate shearing and frequent granulation of the phenocrysts with development of sericite. Locally, narrow northeast trending shear zones have developed strong quartz-sericite alteration. This granite shows weak hydrothermal alteration including pyrite and varying amounts of sericite and clay development. Siderite is common in the granite with volume contents ranging up to 10 or 15%. The siderite is most strongly developed within shear foliation. Along the eastern periphery of the granite medium grained textures are apparent and swarms of quartz veins are more prevalent. These medium grained textures may represent a chill margin. Northeast trending intermediate to mafic dikes cut the granite. These mafic dikes generally have been metamorphosed into chloritic phyllites. These dikes are considered to be related to the greenstone-andesite described below. Other dikes of a felsic composition also cut the granite and are considered related to the younger quartz monzonite porphyry or another felsic intrusive.

Chlorite Phyllite: The chlorite phyllite has affinities comparable to the above described phyllite and the greenstone-andesite described below. In part, the chlorite phyllite may represent the upward continuation of the sedimentary series with a marked change toward a low-carbonate clastic-dominated mafic sediment, i.e., a volcanic associated sediment versus chemical sedimentation characterizing the limestone and phyllite. From this aspect, the age of part of the chlorite phyllite may predate the granite. Elsewhere the chlorite phyllite appears to be a carbonate-free metamorphic rock produced from a fine grained intrusive or extrusive andesite. At these places the chlorite phyllite grades laterally and vertically into fine or medium grained andesites which may or may not contain greenstone grade metamorphism. This portion of the chlorite phyllite is interpreted to be younger than the granite as shown by cross-cutting relations.

In effect, the chlorite phyllite may represent metamorphic products of two rock types that genetically are dis-similar.

Greenstone-Andesite: The greenstone-andesite is a group of rocks which generally, but not always, have undergone greenstone facies metamorphism. The original rock types vary from an intrusive (or extrusive) andesite to a water laid andesitic tuff or mafic detrital sediment. This detrital sediment may be the upward continuation of the limestone and phyllite series. Where unmetamorphosed, the andesite (probably multiple stages) is a fine to medium grained porphyry containing plagioclase, biotite,

and hornblende as the major constituents with trace to minor quartz (dacitic). Where metamorphosed it grades into the chlorite phyllite as discussed above. The andesite is considered younger than the granite. The sedimentary (tuffs or mafic detrital) part of the greenstone is a fine grained carbonate-bearing chlorite-rich rock with thin zones (<20') of quartz eye bearing units that grade in and out with an increase in size (<1/4") and quantity (< 20%) of quartz eyes toward the center of these units. This gradational character is seen repeatedly in drill holes Z-601-D and less frequently in Z-603-RD and Z-607-RD.

At 3,300' N and 1,000' E, breccia fragments up to 10 inches in diameter of andesite occur in an andesite matrix. This is considered an igneous breccia which is probably intrusive in nature. in a pyroclastic terrain? he may
Alteration in the greenstone-andesite ranges from propylitic to varying quantities of sericite, silicification, pyrite, magnetite, chalcopyrite, and molybdenite depending on which alteration halo is present.

Quartz Monzonite Porphyry: The quartz monzonite porphyry is a medium grained intrusive rock which may indeed represent several or multiple stages from an intermediate to a felsic magma. The rock has an abundance of feldspar, quartz and mafic minerals. The feldspars locally are saussuritized. These mafic minerals initially were biotite and minor hornblende. The mafic minerals now are generally altered to chlorite which probably is a result of both hydrothermal and metamorphic alteration. The quantity of groundmass in the monzonite is variable from a porphyritic quartz monzonite to a quartz monzonite porphyry.

Alteration in the monzonite varies from weak orthoclase and biotite (locally very strong orthoclase at 2,740' N, 3,360' E, and in Z-602-RD at 525 feet) with quartz, sericite, chlorite, pyrite and chalcopyrite (±1% wt) in the potassic zone to quartz, sericite and pyrite (±0.1% Cu as chalcopyrite) in the phyllic zone. In the propylitic zone, one-half mile northeast of drill hole Z-601-D and peripheral to the potassic zone in northeastern areas of the map, chlorite, epidote, calcite and pyrite are dominant. The monzonite frequently has been metamorphosed to a quartz-sericite schist.

The monzonite marked the end of an igneous series which began with mafic (andesite) components, progressed to a felsic series and culminated with hydrothermal alteration of these igneous rocks and the enclosing wall rocks. The main mass of monzonite appears to have vertical walls, but may dip steeply to the northwest.

The monzonite, or a similar monzonite, extends northeastward from Z-601-D for greater than four miles. In this northward extension, the monzonite contains rather pervasive epidote alteration with local patches (±500 feet diameter) of higher pyrite and/or of moderate argillic alteration. These features suggest that Zonia could be only one alteration plume among others that occur peripheral to this large monzonite stock.

Schist: The schist, at its maximum metamorphism is a quartz-sericite schist with strong foliation and very little remaining original texture except for corroded quartz eyes. It frequently grades into recognizable quartz monzonite porphyry. The fact that the schist was produced from the monzonite by dynamic, with or without thermal, metamorphism is only fully appreciated after logging the drill core in detail, especially in Z-601-D and Z-603-RD. This feature causes intermingling of the monzonite and schist as illustrated on the geology map. All rocks mapped as schist by this author are considered to previously have been quartz monzonite porphyry. It is believed that the schistose textures were best developed in the argillic alteration halo and in the more solidified margins of the monzonite, both which were peripheral to the area of most intense silicification and potassic alteration. Therefore, the age of the schist postdates the monzonite.

Felsite: The felsite, as mapped, represents a group of rocks that include quartz latite porphyry (large mass on north corner of map), aplites (in granite), and bleached greenstone xenoliths (in the monzonite in the central areas). These finer grained felsic rocks were not studied in detail, but they, except for the greenstone inclusions, probably represent continuation of the magmatic differentiation process.

Undifferentiated Mafic Intrusives: The undifferentiated mafic intrusives, as mapped, include diabase, diorite and quartz diorite dikes and plugs that generally show low grade or no alteration or metamorphism. The diabase is the most frequent dike forming rock in this group. Narrow (±10 feet) diabase dikes were intersected in every drill hole. These dikes show weak to very strong epidote and moderate chlorite alteration; pyrite is usually a minor constituent. Where traceable, the diabase dikes generally strike N 25° E and are persistent, crossing lithological contacts. These undifferentiated intrusives are post metamorphism, possibly much younger than the above described rocks.

Tertiary Alluvium: Much time elapsed between the above described rocks and the erosion which produced the Tertiary alluvium. The alluvium is composed of weakly cemented, well compacted, unsorted fragments ranging up to ±6 inches in diameter. The dominant rock type in the alluvium is the granite. Several other rock types, including greenstone, are sparsely scattered in the alluvium, especially near its base. This alluvium may have covered much of

the surface at Zonia. It forms large outcrop areas at the southwestern end of the map and northeastward and southeastward off the map. Drill hole Z-603-RD was collared in alluvium which contains up to 50 ppm molybdenum with moderate hydrothermal alteration. The source of this altered granite was not defined. Several windows in the alluvium southwestward off the map expose underlying schist with moderate to strong pyrite. Bedding is essentially horizontal in the alluvium, locally, a northwestward dip is apparent.

Quaternary alluvium containing many rock types exists locally in washes or other topographic lows.

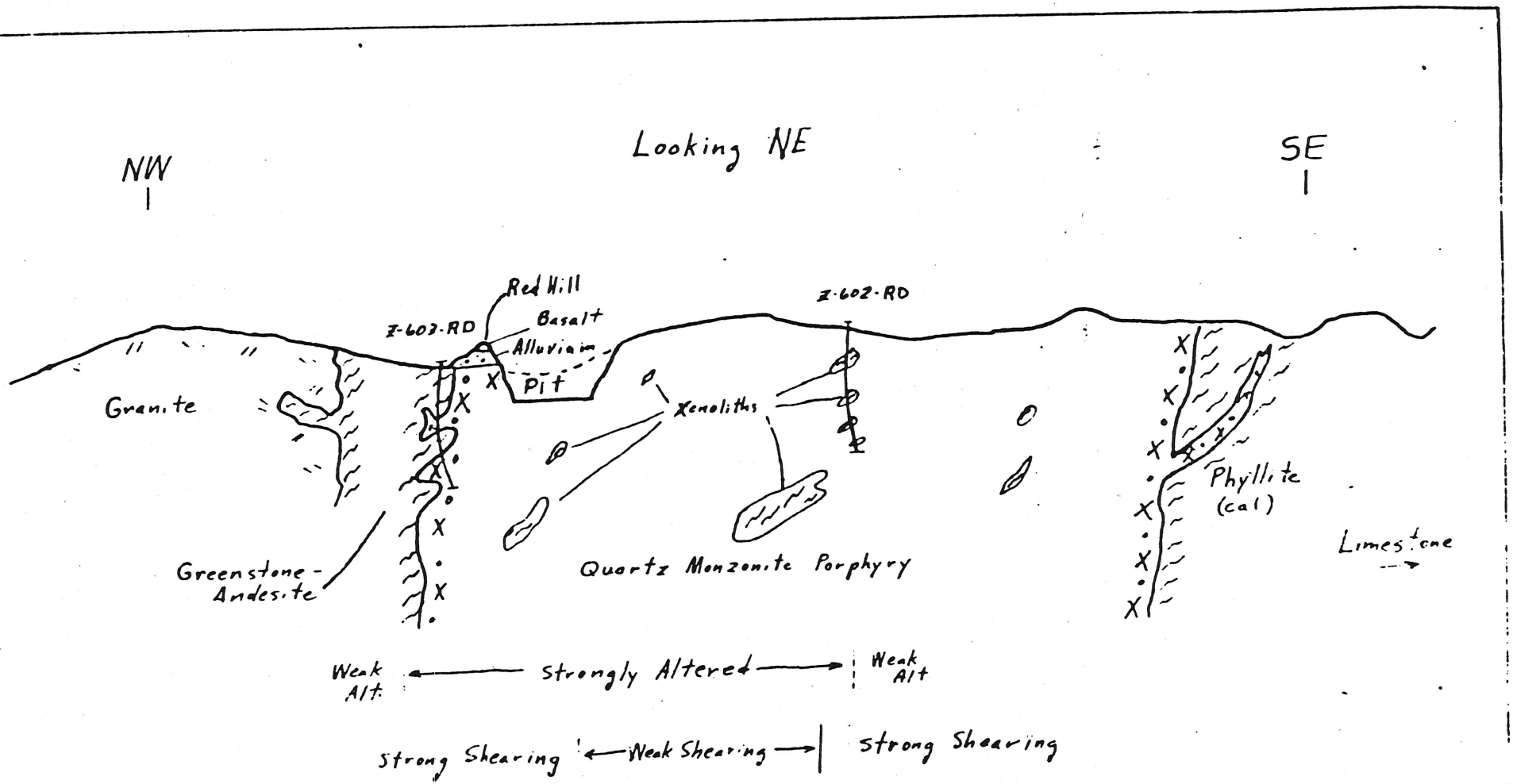
Quaternary Basalt: The Quaternary basalt is a black to dark grey, vesicular, fine grained, porphyritic basalt with medium to fine grained plagioclase phenocrysts. It forms large flows and several dikes as seen in Red Hill and drill hole Z-603-RD. In Z-603-RD it contains several percent of crushed pyrite. Several sills were formed in the alluvium parallel the bedding. A large partially eroded flow extends northeastward from the map area.

STRUCTURE:

Due to dynamic metamorphism few major structures are obvious. Many small structures were traversed but not traced. Numerous shear zones parallel the foliation are seen at the surface and in drill core. The northeast trending foliation is the dominant fabric. In the vicinity of Z-602-RD and Z-605-R a brecciated zone crops out. A N 80° E zone of secondary structural weakness may exist to explain the local "splinters" of increased alteration oblique to the dominant trend of alteration.

PEBBLE DIKE:

An intrusive pebble dike was discovered in outcrop at 2,920' N and 2,780' E. This pebble dike strikes northeast with a length of <15 feet and a maximum width of 2 feet. It pinches out at both ends, but the structure is traceable southwestward for 100 feet. At the northeast end, rounded pebbles of sulfide containing chalcopyrite and pyrite (both oxidized) and of monzonite are cemented by a sulfide (also oxidized) and quartz matrix. Southwestward, in a road cut, only minor breccia and transported strong copper oxide mark this zone. Rock type on both sides of the pebble dike is monzonite. This dike is considered pneumatolytic in character. A massive sulfide zone (chalcopyrite and lesser pyrite) must occur at depth(?) to provide a source area for the chalcopyrite pebbles.



SCHEMATIC NW-SE VERTICAL SECTION

Through Z-603, Red Hill and Z-602

Scale: Variable J.W.C.

Figure 2.

METAMORPHISM:

Metamorphism at Zonia includes dynamic and thermal types. The dynamic component ranges from very feeble as seen locally in the andesite complex on the northwest side and in the monzonite in the northern areas (Reconnaissance Geology Map) to strong, as seen within the western part of the pit and east of the pit at which points schistose and phyllitic fabrics are dominant. The dynamic metamorphism is strongest in the periphery of the monzonite intrusive and its bordering wall rocks. A realistic explanation of this fact is that dynamic metamorphism occurred during the central time of hydrothermal alteration at which time the quartz monzonite porphyry was probably still somewhat plastic. This plastic central monzonite escaped the more severe dynamic deformation which the cooler margins suffered. Metamorphism in the sedimentary section on the eastern side is confined to development of bedding plane foliation probably primarily due to burial and compaction with a minor shearing component. Metamorphism in the greenstones produced much chlorite and lesser sericite whereas within the felsic rocks sericite was the dominant metamorphic mineral.

Metamorphism occurred during the hydrothermal mineralization. This fact is apparent because some of the sulfide and quartz veins are dramatically sheared while others remain essentially unsheared, both commonly occurring in the same rock sample. A major portion of the hydrothermal alteration preceded the metamorphism (at least the last stage of metamorphism), doubtlessly with development of a typical broad zonal pattern. The metamorphism has destroyed much of this zonation, even where the rocks were plastic enough to escape the more severe shearing effects. It is believed that an argillic zone existed, beyond the high pyrite halo, which was metamorphically altered to a sericite-rich schist. Hydrothermal biotite appears to have been metamorphically altered to chlorite (greenstone facies). Within the least metamorphosed quartz monzonite porphyry vein orthoclase and quartz are apparent whereas in the sheared monzonite only a few unobvious veins occur, but, staining of thin sections with cobaltinitrite show diffuse orthoclase-rich linears.

HYDROTHERMAL ALTERATION:

Hydrothermal alteration (see Alteration Map) appears to have produced zonal patterns similar to typical Laramide porphyry copper deposits even though a strong zonal pattern is not now visible. These zones may have been less dramatically developed and were more spotty in the development than what is "typical".

As discussed under METAMORPHISM, the dynamic and thermal metamorphism masks the earlier hydrothermal alteration. The metamorphism, combined with thorough supergene oxidation and weathering, has obliterated many of the definable near surface hydrothermal effects. The hydrothermal alteration is best observed within drill core; locally at the surface prime evidence is visible.

Strongest hydrothermal alteration in the quartz monzonite porphyry consists of stockwork vein quartz and orthoclase as seen in the northern areas (well developed at 3,000' N, 2,700' E) and in drill hole Z-602-RD at 525 feet. The monzonite displays weak vein biotite which has incompletely been altered to chlorite. In the northeastern areas the potassic alteration in the monzonite grades laterally into propylitic alteration in the greenstones with a narrow high grade sulfide zone at the contact. Elsewhere, a broader, highly metamorphosed, strongly pyritic zone marks the transition from a potassic environment through a phyllic zone equivalent and then into a propylitic zone. Due to metamorphism, any previously existing argillic zone has been destroyed with enlargement of the apparent phyllic zone. Sericite, clay, quartz, and pyrite alteration pervade beyond the greenstone complex into the granite on the west side. Locally within the granite, these alteration products become more apparent (see Total Sulfide overlay at 2,000' S and 4,000' W) and may be associated with a N 80° E structural trend. Chlorite, perhaps partially due to metamorphism (a retrograde effect), is a common alteration mineral in many environments. Metamorphic (greenstone facies) chlorite has replaced much of what is considered secondary hydrothermal biotite in the potassic zone.

Magnetite appears to be a hydrothermally controlled mineral. The greenstone which was cut in drilling generally contains minor, but detectable, magnetite dispersed throughout the rock. Within the quartz-calcite-sulfide veinlets that cut the greenstone, magnetite was generally absent. Therefore, the generation of pervasive magnetite in the greenstone is probably an intermediate hydrothermal effect with quartz-calcite-sulfide veining representing a later or final hydrothermal effect.

Within the greenstones near Z-602-RD and extending northeastward and southwestward from Z-602-RD, a strong magnetite content is apparent (see Z-602-RD drill log and the Ground Magnetic Map). Magnetite content in the above zone approaches 30% by volume. This high magnetite zone (and deeper high pyrite zone) appears to be a skarn-type replacement in zenoliths or horsts of greenstone caught in the quartz monzonite porphyry at a place of strong total Fe alteration within the overall alteration zonation. The massive sulfide zone contains compact granular pyrite with minute inclusions of chalcopyrite and, locally, films of chalcocite. No other base metals are detectable (megascopically or microscopically). Assays for precious metals are very low in Au and Ag.

Calcite, epidote, chlorite, and magnetite occur interstitial to the pyrite grains and increase rapidly in volume inward or uphole from the strongest pyrite zone. This mineralization forms banded replacements parallel the bedding in the greenstone.

Perhaps the last hydrothermal effect is "Fe bearing green silicate" vein swarms which obliquely cut earlier hydrothermal trends (see Alteration Map). These veins vary from 1/8 inch to several inches in width and have been almost invariably altered to a dense fine grained hematite. Very locally, the "green silicate" has survived oxidation. At these sparse data points, the "green silicate" is a dense fine grained compact to radiating tourmaline (schorlite).

Veins of quartz and siderite, with or without tourmaline and sulfides, up to 6 inches in width are not uncommon. Such veins occur in all premineral rocks in all alteration zones and were seen in outcrop and drill core. They appear infrequently in the central northeast areas. In outcrop, the siderite and tourmaline are usually strongly oxidized.

Characteristics of the silicate hydrothermal alteration at Zonia are: "spotty", insufficient quartz veining, and an under-developed phyllic zone. Metamorphism has been partly responsible for these apparent characteristics.

Significant copper mineralization exists as oxides near the surface and as chalcopyrite below the oxidation. Values range up to 7.5% Cu. See Protore Map for distribution of the copper. Strong vein chalcopyrite (with tenorite) crops out at 2,240' N, and 2,020' E. Average values in the monzonite in the northeast areas and adjacent greenstones are 0.15% to 0.20% Cu. Adjacent to the west side of the pit, drilling indicates ±0.3% Cu in the greenstones and 0.1% Cu in the monzonite. Several intercepts in the drill holes average ±0.4% Cu for 100 feet or more. A 2 foot vein with very strong copper was cut in both Z-601-D and Z-606-RD drill holes. The vein in Z-601-D assayed 7.65% Cu, 100 ppm Zn, 40 ppm Pb, 1.17 oz/ton Ag, and 0.015 oz/ton Au.

BASE METALS:

Copper and molybdenum are the only metals that could be considered economically significant. No economic reserves have been substantiated by Homestake. Drilling intersected several intervals of +100 feet that averaged 0.3% to 0.5% Cu with 10 to 30 ppm Mo. Weak chalcocite is frequent immediately below the zone of oxidation. Oxides of copper dominate near surface environments. Lead and zinc show only trace concentrations, as discussed elsewhere, but based on outcrop, show zoning peripheral to the copper,

as discussed under LTERATION. In granite or he west side and phyllite on the east, ½ inch veins with calcite, quartz and galena have been observed.

PRECIOUS METALS:

Homestake's work, along with the previous assays, has shown that Au values seldom exceed 0.003 oz/ton. Approximately 502 known drill core and surface samples have been analyzed for Au and Ag. Silver contents generally are stronger than gold, but both are essentially insignificant. Possibly, significant gold may occur at 700 feet in the Cuprite shaft as reported in USBM RI 4023.

DRILLING DATA:

Approximately 400 drill holes have been drilled by Shannon, Bunker Hill, U.S. Bureau of Mines, Cominco (? on extreme southwest gravel cover), Miami Copper, McAlester Fuel, and Homestake. In addition, McAlester drilled holes for development and blasting of their in situ leach ore. Depth of the 400 holes range from 50 to 1,528 feet (see Drill Hole Depth Map). Five(?) holes were drilled by Cominco(?) in the alluvium at the southwestern margin of the mapped area (several sketchy logs and some core still exist). Cominco's drilling was to check for potential enrichment under the alluvium.

Homestake drilled seven rotary and core holes, the Z-600 series, to test the attitude of the monzonite stock and examine copper mineralogy and grades at depth. Drill logs are attached.

MAPS AND OVERLAYS:

The following maps are attached.

Geology Map: The geology map is titled Reconnaissance Geology Map with the intent to show that it is not a detailed surface map. The lithology as sketched is a by-product from mapping surface alteration and mineralogy. Approximately 80 hours were spent in the field collecting the data which is presented on the geology map and the six overlays. The data were collected along NW-SE traverses spaced at 1,000 foot intervals with interspaced traverses and additional NE-SW traverses as deemed necessary to obtain an overall alteration picture. Contacts and trends were extrapolated between traverses.

Alteration Map: The alteration map presents a "typical", zoned, non-symmetrical, three-dimensional, disseminated copper, hydrothermal cupola with a central axis which has a bearing of N 40° E and plunges ≤30° NE, i.e., the hydrothermal column has

been tilted $\geq 60^{o}$ southwestward or was formed in a non-vertical manner. The outcrop pattern at Zonia could be produced by erosion of a non-symmetrical, elongated, pear-shaped envelope with the central axis untilted. Neither of these models is substantiated nor weakened by Homestake's drill data. Prior to metamorphism the envelope may have been essentially equidimensional.

Total Sulfide Map: This map shows original total sulfides at the surface. Essentially, all near surface sulfides have been oxidized. Therefore, the recorded sulfide percentages on the map are reconstructions based on outcrop limonites. The high sulfide pattern resembles an elongated horseshoe with the open end facing N 40^{o} E. The limbs taper northeastward to the edge of the map. Further northeastward (off the map area) the horseshoe appears to close, forming a distorted oval.

Surface sulfide percentages range from nil in the weakly altered areas to 8% (wt) in the pyritic halo. Sulfide veins, now oxidized, up to 6 inches in width, crop out in all rock types outside of the pyritic halo.

Siderite Map: Siderite is abundant in some areas at Zonia as illustrated by this overlay. The siderite appears to be associated with two features: 1.) intensity of metamorphic foliation, and 2.) the sedimentary rocks on the southeast. Rocks with increasingly stronger shearing have increasingly stronger siderite. The siderite may be considered part of the hydrothermal zoning, but its occurrence conforms closely with the intensity of foliation. The granite on the west contains considerable siderite. The siderite in the outcrops is generally oxidized; therefore, percent siderite was estimated from analysis of limonites. Calcite and pyrite frequently occur mixed with the siderite in many rocks, therefore, the author differentiated limonites after sideritic carbonates based on presence and textures of the iron oxides.

Siderite was not formally identified; however, megascopically and petrographically it has typical siderite characteristics. Where unoxidized siderite was seen in outcrop and in drill core (Z-603-RD at 525 feet and Z-604-R at 335 feet in spot core), it has a pinkish to brownish color. The siderite may actually be some other iron bearing carbonate, but probably contains no manganese or magnesium.

Geochemical Maps: Surface geochemical maps were produced for copper, molybdenum and lead using rock chip outcrop samples where possible. In some areas, e.g., the pit, original outcrop was not available, therefore, samples were collected from the existing surfaces and noted as such.

In general, the central area shows anomalously high copper with values ranging above 3,000 ppm and anomalously low molybdenum values generally comparable to background intensities. Anomalous molybdenum occurs peripheral to the copper high and is closely confined to the high sulfide zone. Molybdenum values range up to 100 ppm. The heavy or massive sulfide zones intersected in Z-602-RD and Z-605-R contain background levels of molybdenum. The lead geochemical data are very bland. Several one point lead anomalies are seen in the southern areas. In the northeast half of the map the lead shows more uniform and slightly weaker values than in the southern areas.

Protore Grade Map: Prior to Homestake's drilling, protore values in the existing holes were estimated using total copper assays and sparse notations of mineralogy on the previous drill logs. These estimations were plotted in plan and correlate very well with the Geochemical Copper Map.

Drill Hole Depths Map: Attached is a map that shows location and approximate depth of all drill holes, except the five holes drilled by Cominco(?) and the more recent McAlester holes.

Cross Sections: Three cross sections perpendicular and one cross section parallel the regional trend were drawn using surface and drill hole data. In part, some of the contacts are one point extrapolations based on empirical information. However, these cross sections are believed to illustrate the general attitudes of the various geologic contacts. Figure 2, above, illustrates the general attitudes of contacts and distribution of the various rock types.

Three sets of profiles are presented: lithology, alteration, and copper grades. The copper grade profiles lend tremendous weight to the supergene enrichment features discussed elsewhere and to the possibility that "down" is "out" at Zonia. This "down is out" possibility is also pointed out by the set of alteration profiles.

Geophysics Map: T. F. Kuhl ran a ground magnetic survey in 1973. This survey shows two narrow parallel northeast trending highs. A short high occurs just to the west of the southern end of the pit. A second high starts at Z-605-R, extends northeastward parallel the high sulfide zone to Z-602-RD, then continues northeastward as the high sulfide zone turns more northerly. Below 570 feet, hole Z-602-RD contains up to 30% magnetite in greenstone with strong chlorite and epidote alteration. Minor magnetite occurs in Z-605-R.

Earlier I.P. work (Cominco?) shows that the high pyrite extends southwestward under the Tertiary gravels. An earlier drill hole at 5,300' S, 4,520' W verified this feature.

Claim Map: Two coordinate systems have been used on the claim map. The first was skewed 45° east from north.

AERIAL PHOTOGRAPHS:

Aerial photographs were flown by Cooper Aerial (Tucson, Arizona) in 1972 and cover a strip five or six miles long.

INSTRUMENTAL MINERALOGY:

Approximately 150 thin and polished sections were made to study detailed mineralogy and rock textures. Topic areas investigated were protore mineralogy, silicate alteration, siderite, and genetic histories of the metamorphosed rocks.

AGE DATING:

Age dating of the quartz monzonite porphyry by whole-rock Rb-Sr isotopes has been initiated. First results give three possible dates: 1,100 my, 840 my, and "Tertiary". Two additional samples are being assayed to help clarify the inconsistencies. A total of seven samples will have been analyzed (see Appendix I for details).

EROSION, OXIDATION, LATERAL TRANSPORTATION, COPPER, RED HILL, CUPRITE SHAFT AND "ORE PODS":

Literature on the Cuprite shaft and outcrops at Red Hill have drawn attention to Zonia for over a century. Red Hill is the basalt capped hill at the northern margin of the Zonia pit. Underlying the basalt is alluvium which overlies a contact between chloritic phyllite and schist. For many years this contact was believed, by some, to be a time horizon that marked a stratigraphic change from rhyolite tuff to andesite tuff and based on observed features and past mining history, this time horizon represented a definite volcanogenic massive sulfide bearing interface. In the present writing, this contact is definitely considered an intrusive contact between earlier andesites or mafic sediments and the quartz monzonite porphyry, coupled with intense metamorphism, minor faulting, supergene enrichment and later oxidation.

The Cuprite shaft (874 feet deep) is located just southwest of Red Hill and about 50 feet east of the above described intrusive contact. From the Cuprite workings, especially the 210 foot level,

an undetermined tonnage of +1% Cu was mined ("... a few hundred tons of hand-sorted ore may have been produced.", USBM RI 4023, p.3). No records have been found that describe any of the copper mineralogy; only types of mill recovery are discussed. Inferred from these indirect means, the ore primarily, if not completely, consisted of oxides of copper, probably chrysocolla, malachite, cuprite and perhaps much manganese-bearing black oxides. At any rate, the presence of strong copper of unknown mineralogy, along with the outcrops, convinced many geologists that Zonia in fact represented a volcanogenic massive sulfide deposit.

In this report the Cuprite shaft mineralization is considered a product of uplift and erosion of a hydrothermally altered environment in which sulfides of copper (chalcopyrite) underwent oxidation, leaching, lateral (and vertical) transportation, precipitation (probably as chalcocite), and finally, oxidation in situ. Multiple enrichment may have occurred. The zone of strongest enrichment was at the contact between the sheared quartz monzonite porphyry and an acid reactive mafic phyllite. This supergene activity produced the hematite stained outcrop near Red Hill and the Cuprite shaft. Grading westward from the Cuprite shaft zone, enrichment copper values are reduced until only primary tenor is left.

The Copperopolis shaft area represents an area of higher grade protore (±0.3% Cu) in monzonite, than at the Cuprite shaft, with or without enrichment. Oxide copper also dominates the copper mineralogy at the surface at Copperopolis with underlying chalcopyrite.

Ore pods consisting of transported strong oxide copper were encountered during mining and in drilling in the pit and in situ leaching areas. These "ore pods" are mafic xenoliths that reacted as acid consuming copper precipitating traps. The "ore pods" range up to ten feet in width and ten's of feet in length with copper grades commonly well above 2%.

CONCLUSIONS:

The Zonia deposit represents a long history of sedimentation and multiple stages of intrusive activity with magmatic differentation that produced increasingly more felsic intrusives with increasing time. The entire complex underwent hydrothermal alteration coupled with metamorphism. The monzonite intrusive(s) was surely the source of the hydrothermal solutions which altered the monzonite and its enclosing wall rocks to produce a disseminated copper deposit that is similar, in most hypogene and supergene aspects, to the numerous Laramide porphyry copper deposits.

The strongly calcareous sedimentary and earlier mafic igneous wall rocks reacted with the hydrothermal solutions to produce skarn-type alteration.

Due to erosion and supergene oxidation, leaching, transportation, and enrichment of copper, several small high grade zones were formed. In the high primary copper, low pyrite and high reactivity zone (potassic zone), hydrothermal copper was only moderately enriched during oxidation to produce a broad area of marginally-economic oxide copper. Below this oxidized central zone, primary chalcopyrite exists with significant reduction in tenor. The author believes that grades comparable to the near surface (±1,000 feet) grades may not exist at depth; "down" may actually be "out" (see Profiles). However, until explored by deep drilling, potential deeply buried higher grade (±0.6% Cu) protore values in a potassic environment or skarn-type replacement will continue to be elusive at Zonia. The Zonia deposit may represent one plume of mineralization generated peripheral to a relatively large stock of quartz monzonite. Others may exist (have existed) at the edges of this stock.

Several future exploration possibilities exist at Zonia:

1. Chase the narrow mineralized zones with very high grade copper (see Z-601-D at 781 feet and pebble dike mineralization).

2. Make a leaching operation with an approximate tenor of 0.15 to 0.25% Cu on 20 to 40 million tons.

3. Drilling deeper in hope of higher grade mineralization.

Number 1. is not a viable Homestake target. The Silver Crown and Copper Crown mines 2 miles northeast are this type of mines. They have not made significant profits.

Number 2. has been shown (by McAlester) to not be desirably economic, due to acid consumption and mechanical problems involving channelling and sealing (clays, compounded by strong acid solutions) of dumps.

Number 3. is considered inviable because of a reduced volume of quartz monzonite porphyry at depth (as compared to predictions based on surface exposure) and the fact that the author believes (based on the zoning developed during mapping and drilling) that "down" is "out". Two-thirds of the deposit as interpreted (see Attachment 13, Alteration Cross Section) has been removed. The surface exposures represent "the best of Zonia".

No evidence exists that would indicate a present or future economic potential at Zonia, other than a low value leach deposit.

recommended that Homestake terminate its interest in the Project.

LEDGEMENTS: T.M. Rizzi,

ake personnel that contributed to the geologic efforts at include (in chronological order): J. C. Ruckmick, J. B. T. F. Kuhl, H. L. Stensrud, and J. K. Jones. A host of Homestake geologists made cursory investigations of the ops. All have contributed to the various genetic theories scussions, at times heated.

ster Fuel personnel assisted by contributing their files aking available information that was obtained during their g efforts at Zonia.

J. W. Cameron

Jon W. Cameron
Southwest District Manager

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1972 Homestake Mining

DRAFT

PROPOSED PHASE II EXPLORATION PROGRAM FOR THE ZONIA PROJECT, YAVAPAI COUNTY, ARIZONA

10 May 1972

SUMMARY:

The Zonia property is composed of 136 lode claims and 73 millsite claims, all contiguous, located in central Arizona approximately 60 miles northwest of Phoenix. Copper mineralization at Zonia occurs in schistose volcanic rocks, mostly rhyolite tuffs, of middle Precambrian age. At the surface and to depths from 200 to 750 feet the copper occurs mostly as disseminated oxide, carbonate, and silicate minerals in weathered tuffs exhibiting abundant evidence of leached sulfide minerals.

Several companies and exploration groups have explored the Zonia claims since 1886. In 1942 the United States Bureau of Mines did some shallow work on the oxide ores. The McAlester Fuel Company of McAlester, Oklahoma, commenced work on the property in 1964, proceeding with pilot studies and, in 1966, commenced large-scale mining of the oxide ores for heap-leaching and recovery of cement copper. McAlester is presently operating the Zonia mine and to date

has extracted approximately 7 million tons of oxide ores averaging about 0.6% copper. From these materials they have recovered approximately 23 million pounds of copper. A more complete history of work on the property is given below.

In December, 1971 Homestake and McAlester entered into an agreement granting Homestake options to explore and to purchase the Zonia claims. A synopsis of the terms of this agreement is included in another section of this text.

Three hundred and eighty two exploration holes have been drilled on the Zonia claims. Most of these are percussion or rotary holes and almost all of the holes were shallow explorations for oxide copper from 100 to 300 feet in depth. To date no core-holes have been drilled below the zone of oxidation and the sulfide mineralization at Zonia remains essentially unexplored.

The primary objective of Homestake's exploration program at Zonia is to explore the zones of sulfide mineralization for possibilities of both disseminated and concentrated ("massive") copper deposits of commercial size and grade. Phase I of Homestake's program, carried out from December, 1971 to

to May, 1972, has been directed toward resolution of specific drill targets below the oxide zones tested to date. This work has included detailed geologic mapping of the property, geochemical sampling, and assembly and plotting of all data on several sets of maps and both vertical and horizontal cross-sections. This work is complete and the data and initial drilling recommendations are included in this proposal.

Phase II, the next stage of exploration at Zonia, will be initial testing of targets in the sulfide zone by both rotary and diamond-core drilling. To adequately evaluate the targets indicated by the data assembled thus far it is recommended that 8 rotary holes and 6 diamond-drill holes be drilled as shown on the maps and sections. The estimated cost of the Phase II program is $150,000, including all direct, administrative and general costs, and should take no longer than six months to complete.

LOCATION AND ACCESS:

The Zonia property is in sections 1, 11, 12, 13, and 14 of T. 11 N., R. 4 W, Yavapai County, Arizona, approximately 60 airline miles northwest of Phoenix and 17 miles southwest

of Prescott. Access is by 8 miles of good graded dirt road from Kirkland Junction on U.S. Highway 89. A location map is included as Page 1.

REFERENCES:

The only generally available references on the Zonia deposit are the following U.S. Bureau of Mines publications:

1. War Minerals Report 38, 1942.
2. War Minerals Report 120, 1943.
3. Report of Investigations: RI 4023, March, 1947.

The most complete and comprehensive compilation on mineralization at Zonia to date is Russell H. W. Chadwick's private report to Bunker Hill dated April, 1964. This is available in Homestake's files.

The best references to the general geology of the Precambrian rocks in the region around the Zonia deposit are:

1. U.S.G.S. Professional Paper 278; Anderson et al, 1958.
2. U.S.G.S. Professional Paper 308; Anderson and Creasey, 1958.
3. U.S.G.S. Professional Paper 467; M. H. Krieger, 1965.
4. U.S.G.S. Bulletin 1324-C; Anderson et al, 1971.

HISTORY OF EXPLORATION AND DEVELOPMENT:

Extensive evidence of copper mineralization on the Zonia claims has encouraged a lengthly series of unsuccessful attempts to deal with the oxide minerals. The earliest recorded activity at Zonia occurred about 1886 when the Zonia Copper Mining Company attempted to smelt some of the higher-grade oxide ores. In 1910 the Shannon Copper Company of Clifton, Arizona, drilled six churn-drill holes and then terminated exploration. From 1916 to 1920 a private syndicate sank the Cuprite shaft to 874 feet and carried out extensive underground exploration by drifting from this shaft. The syndicate shut down the operation after failing to find enough ore that could be mined at a profit.

From 1927 to 1930, the Hammon Copper Company of San Francisco carried out more underground development work on the 210 and 335 levels of the Cuprite shaft and experimented with a leaching process to recover the copper. The project was abandoned when copper prices dropped to 10 cents and below in the early 1930's.

In 1942, at the request of the War Production Board, the U.S. Bureau of Mines carried out a brief trenching, drilling, and

sampling program to develop copper for the war effort. This work outlined about 300,000 tons of ore at 1.05% copper.

The Miami Copper Company optioned the claims in 1956. They made a geologic map and drilled fifty rotary and churn-drill exploration holes, including a few deep holes penetrating some portions of the sulfide zones. This work was terminated in 1957 after failing to develop enough oxide ore to support a large leaching project at the current prices.

In 1963 and 1964, the Bunker Hill Mining Company explored the claims and drilled eleven rotary holes. They released the property after reaching the same conclusion as Miami Copper.

The McAlester Fuel Company optioned the Zonia claims in 1964. Soon afterward Cominco optioned adjoining ground to the south and did some geophysical work followed by four drill holes. Cominco subsequently dropped this ground after failing to find sufficient mineralization. Now most of the Cominco claims have been acquired by the McAlester Fuel Company.

McAlester drilled a number of relatively shallow rotary holes confirming several million tons of oxide materials averaging

about 0.6% copper. After favorable pilot leaching studies they commenced open-pit mining in 1966.

Homestake and McAlester entered into their present agreement in December, 1971.

PRESENT OPERATIONS:

Since 1966 the McAlester Fuel Company has mined approximately 17 million tons from the Zonia open pit. Of these materials, 10 million tons have been dumped as waste and 7 million tons have been stacked on leach heaps. The mining rate has varied considerably but generally has been programmed at about 8000 tons of ore and 2000 tons of waste per day. The grade of materials on the heaps has been calculated from blast holes as 0.6% copper, but this may be from 10% to 15% too high. To date McAlester has produced 23 million pounds of cement copper, or approximately 30% of the copper content of the heaps. The rate of cement copper production has increased stealily over the years and currently runs about 15,000 pounds per day.

McAlester staffs and operates the leach heaps and plant but contracts the mining.