



CONTACT INFORMATION
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Tucson, Arizona 85701
520-770-3500
<http://www.azgs.az.gov>
inquiries@azgs.az.gov

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James Doyle Sell Mining Collection

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WHITE MESAJ. H. C.
MAY 13 1974

<u>CAPITAL COST</u>		<u>OPERATING COSTS PER TON</u>	
Concentrator (1)	\$9,000,000	Concentrator	1.36
Water Supply	\$ 300,000	Mining	.35
Mine Equipment	\$1,000,000	Royalty (2)	.16
Service Facilities	\$1,000,000	Management Fee	.13
Engr. & Contr.	\$ 500,000	Min. Before Payback	.02
Pre-mining	\$ 400,000	.15% After Payback	-
	<u>\$12,200,000</u>		<u>\$2.02</u>
		Indirects (3)	.47
			<u>\$2.49</u>

The attached DCFROR is based on the following assumptions:

Copper	.80/lb.	10,000,000 Ton Reserve
NSR	.12 Smelting Costs	0.35% Grade - 90% Recovery
	.68	4,000 Tpd - Vat Leach
		Product - Cement Copper

(1) Concentrator costs based on San Xavier Vat Leach Plant

Tons per year of Mill Feed - 1,424,000 Tpy

Seven-year Operation

(3) Indirects on Navajo Reservation based on 25% of operating costs - (normally 50%)

Acid \$10.00 per ton - plus \$16.00 freight

Acid Consumption - 50 tons per day @ 4 lbs per lb copper

(2) Assume 1/2 of ore reserve subject to royalty interest

Mining by Rippers and Scrapers - Cost per ton .23 1/3

Waste to ore ratio = 0.5:1.00

Royalty: Shattuck Denn .110 per ton - 5% NSR
Coppermine .050 per ton - 2-1/2% NSR

Production - 8,971,000 lbs cu/yr.

** WHITE MESA **

CALCULATION OF RETURN ON INVESTMENT
TABLE A
INVESTMENT INVOLVED IN PROJECT

YEAR OF CONSTRUCTION	EXPENDITURES FOR CONSTRUCTION	FACTOR AT 8.7 PCT *****	VALUE AT COMPLETION DATE
1ST	3,200,000	1.13428	3,629,710
2ND	9,000,000	1.04350	9,391,500
TOTAL	\$12,200,000		\$13,021,210
	PRODUCTION CAPITAL		
	0	PRESENT VALUE =	0

TABLE B
EARNINGS FROM PROJECT

YEAR	CASH EARNINGS AFTER TAXES	PRESENT VALUE DISCOUNTED AT 8.7 PCT FACTOR	DISCOUNTED VALUE
1	2,554,000	0.959981	2,451,793
2	2,554,000	0.883147	2,255,559
3	2,554,000	0.812463	2,075,032
4	2,554,000	0.747436	1,908,953
5	2,451,000	0.687614	1,685,342
6	2,187,000	0.632579	1,383,452
7	2,187,000	0.581949	1,272,725
TOTAL	\$17,041,000		\$13,032,855
		DIFFERENCE =	11,644

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA J. H. C.

December 19, 1973

DEC 21 1973

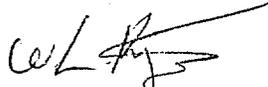
FILE MEMORANDUM

White Mesa Copper
Arizona

I talked today, by phone, with Mr. Jack A. Taitch, 1027 O.N.B. Bldg., Spokane, Washington (phone: 509-838-3711) concerning subject property. According to Taitch, the property is now controlled by the "Page Coppermine Trust" -- 40% Taitch; 35% Reserve Oil and Gas (Melfie); 25% White Mesa, Inc. (Ames). The trust is purchasing the 28(?) unpatented claims from Claude Thompson and Steinburger and paying a royalty to the Chase Manhattan bank on the 9 patented claims.

Taitch stated that the Trust's current costs are about \$2,000/month (land payments, assessment work). He indicated an agreement might be made along the lines of: \$2,000/month payments and a royalty upon production.

I plan to meet with Taitch early in January 1974 to discuss terms.


W. L. Kurtz

WLK:1b

cc: JJCcollins/TCOsborne
JHCourtright
RBCrist

Note to J.J.Collins: John: Any comments or instructions before I meet Taitch?

WLK



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

RECEIVED
JUN 29 1972
EXPLORATION DEPT.

June 27, 1972

TELEPHONE 303-757-5107

J. H. C.
JUN 30 1972

Mr. J.H. Courtright
Chief Geologist
ASARCO
P.O. Box 5747
Tucson, Arizona 85703

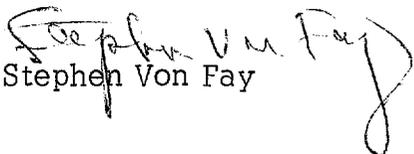
Oxide Copper
White Mesa
Coconino County, Arizona

Dear Harold:

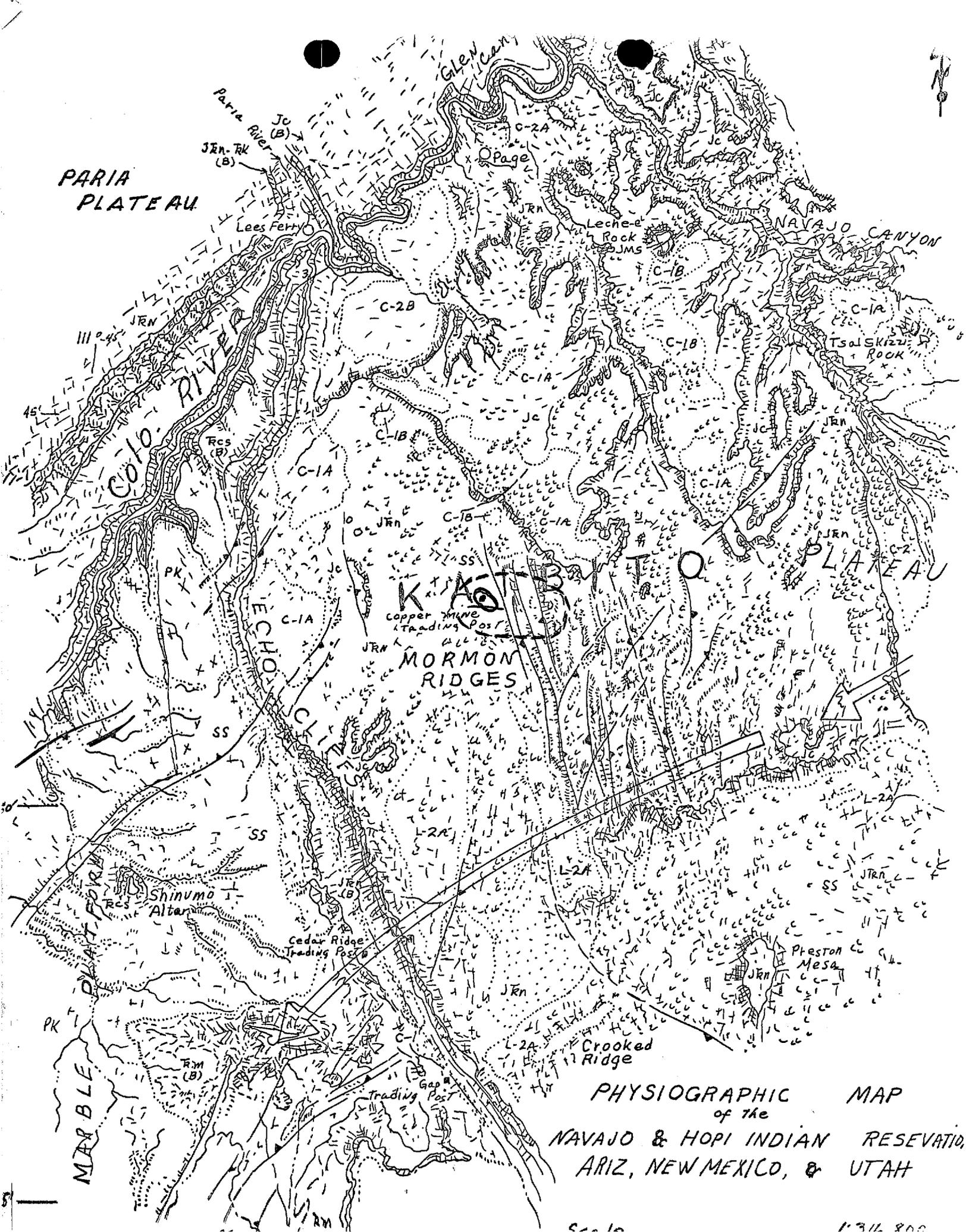
I am returning with thanks your file information on White Mesa. I am also enclosing portions of new regional maps now available with the "ore" and the general area of old claims outlined in red. You will note that the general area is in, and the "ore" is just west of an area where the Navajo sandstone is considered dry. We note in the text that the observation was made that copper was directly associated with water, and that the best copper was with the wettest rock. There may also be some correlation of copper with "shaling up" of the sandstone, possibly a permeability - porosity effect.

I wonder if it would be worthwhile to plot all known copper occurrences in this general area in order to see how they relate to geologic and other data and to determine if any pattern emerges which might lead to significant downdip sulphides?

Very truly yours,


Stephen Von Fay

SVF/pln
Enclosures
cc: JJCcollins



PARIA
PLATEAU

NAVAJO CANYON

COLORADO RIVER

KOIBATO PLATEAU
MORMON RIDGES

MARBLE PLATEAU

Shinumo Altar

Cedar Ridge Trading Post

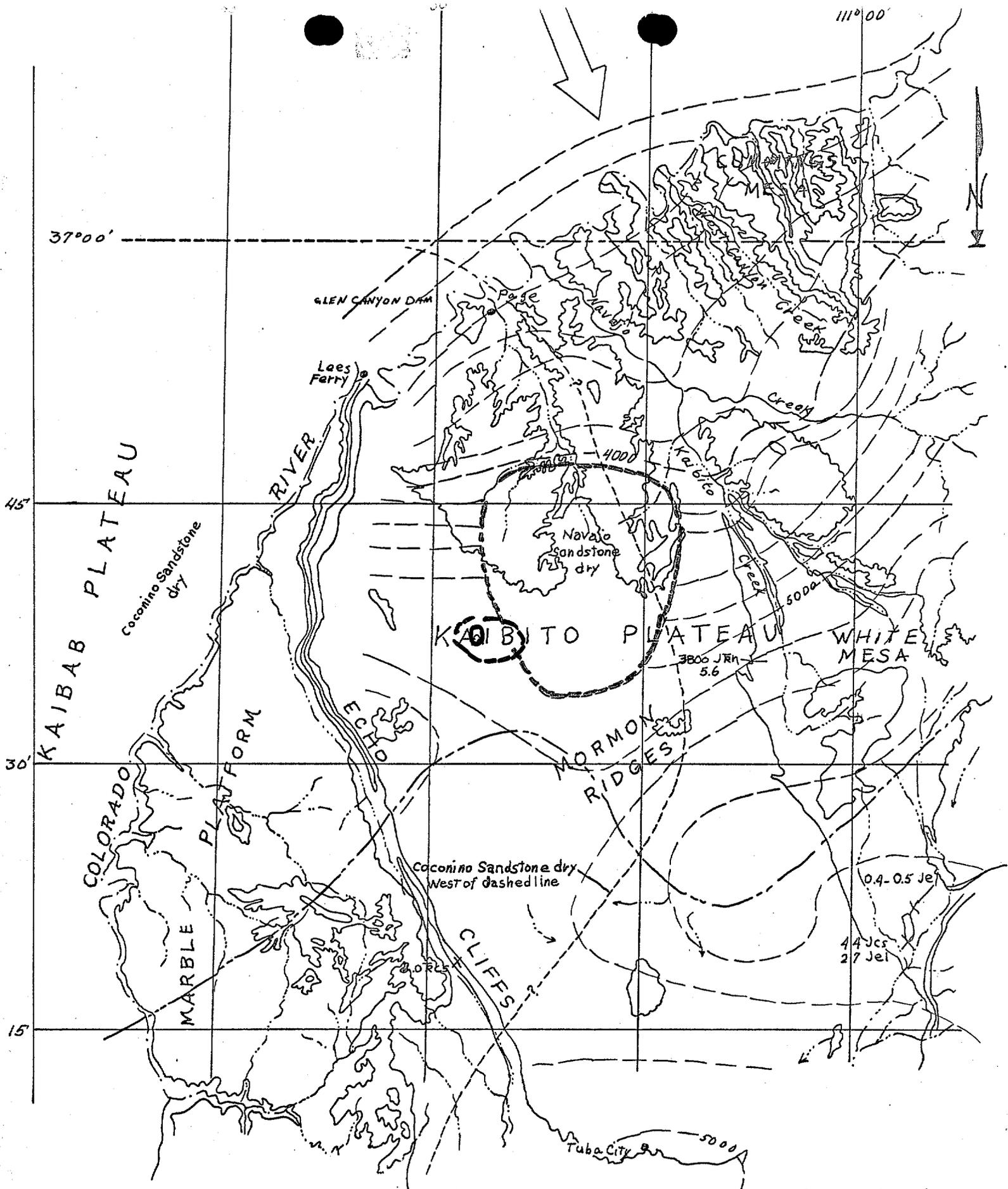
Trading Post

Crooked Ridge

Preston Mesa

PHYSIOGRAPHIC MAP
of the
NAVAJO & HOPI INDIAN RESEVATION,
ARIZ, NEW MEXICO, & UTAH

Scale 1:316,800



Map showing Water-Level Contours, Direction of water movements, and Areas of Recharge & discharge of Aquifers in the Navajo & Hopi Indian Reservations, Arizona, New Mexico, & Utah

Scale 1:500 000



AMERICAN SMELTING AND REFINING COMPANY
EXPLORATION DEPARTMENT
P. O. BOX 5747, TUCSON, ARIZONA 85703

J. H. COURTRIGHT
CHIEF GEOLOGIST

May 31, 1972

1150 NORTH 7TH AVENUE
TELEPHONE 602-792-3010

Mr. S. Von Fay
American Smelting and Refining Company
1805 South Bellaire Street
Denver, Colorado 80222

Dear Steve,

Enclosed is our file information on the White Mesa property consisting of one bound report and one file folder.

Kindly return at your convenience.

Best regards.

Yours very truly,

J.H. Courtright

JHC:kre

Encls: report and file folder

Returned June 27, 1972

See royalty schedule - 2nd page JHC JSC

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

S. I. B.
JUN 17 1966

14-20-0603-7517
CONTRACT No. _____

READ AND RETURN _____
PREPARE ANSWERS _____ HANDLE _____
FILE _____ INITIALS _____

MINING LEASE INDIAN LANDS
(For Minerals other than Oil and Gas)

COPPER Mining Lease NAVAJO Reservation

THIS INDENTURE OF LEASE, made and entered into in sextuplicate, on this 26th day of October, 1962, between The Navajo Tribe of Indians

of Window Rock, State of Arizona, part V of the first part, herein after called the lessor, and Zontelli Western Mining Company, a Minnesota Corporation, of Ironton, State of Minnesota, part V of the second part, hereinafter called the lessee

WITNESSETH:

I, Lessor, in consideration of \$1, receipt of which is hereby acknowledged, of the rent and royalty to be paid, and of the agreement of the lessee herein contained, grants and leases unto lessee for the sole purpose of prospecting for and mining minerals, as follows: Copper and related minerals but specifically excluding oil & gas

Located in White Mesa Copper Mining District, L. M. District 1, more particularly the land described as follows: Commencing at Post 1 of the Meridian and base line surveyed and established by A. W. Barber, General Land Office, Department of the Interior, then due North 6,000 ft. to Corner No. A; the true point of beginning thence due West 6,575 ft. to Corner No. B; thence due North 6,000 ft. to Corner No. C; thence due East 3,000 ft. to Corner No. D; thence due South 1,000 ft. to Corner No. E; thence due East 3,575 ft. to Corner No. F; thence due South 5,000 ft. to Corner No. A; the point of beginning; excepting and excluding therefrom 9 tracts totalling 181.21 acres, which are more particularly shown on plat Exhibit A; containing 642.39 acres, more or less.

section _____, township _____, range _____, meridian, Navajo

Reservation, Coconino County, State of Arizona, and containing

642.39

acres, more or less. The lessee may occupy as much of the surface of the land as is necessary to carry on the work of prospecting for and mining, preparation, and removal of said minerals, including milling and storing.

II. TERM.—Subject to the other provisions herein contained, this lease is for a term of 10 years from the date of its approval and as long thereafter as the minerals specified are produced in paying quantities.

III. DEFINITION.—Superintendent refers to the official in charge of the Indian Agency that has jurisdiction over the lands leased.

IN CONSIDERATION OF THE FOREGOING, THE LESSEE AGREES:

(1) ROYALTY.—To pay, or cause to be paid, to the The General Superintendent, Navajo Agency,
Window Rock, Arizona (Make check payable to "Bureau of Indian Affairs")

for the use and benefit of the lessor, a royalty as follows: As per schedule attached
The lessee shall pay to the General Superintendent for the use and the benefit of the Navajo Tribe royalty rates as follows: On copper ore or concentrates and associate minerals, 5% of the net smelter returns less any cost for haulage and freight not deducted by the smelter but the total deduction not to exceed actual cost of shipping from the mine or mill to a smelter or point of sale, when copper is priced 35¢ per pound or under, 7½% when copper is priced over 35¢ per pound and under 40¢, and 10% when copper is priced at 40¢ per pound and over, based on the average monthly quotation of Electrolytic Domestic Refinery copper in the Engineering and Mining Journal for the month in which the production is sold. On all other minerals, other than uranium and associated minerals, 10% of the net mint, reduction return or sales value, less any cost for haulage or freight not deducted by the purchaser if minerals are shipped separately, but the total deduction not to exceed the actual cost of shipping from the mine or mill to the point of sale. On uranium and associated minerals, rates as provided in the "Percentage Royalty Schedule" given in resolution of the Advisory Committee of the Navajo Tribal Council No. ACS-37-77
mum royalty, if the actual royalty paid is less than the minimum royalty.

(2) ANNUAL RENTAL.—To pay, or cause to be paid, to the Superintendent for the use and benefit of the lessor, in advance, beginning with the date of approval of the lease, as annual rental, the sum of One Dollar (\$1) per acre for the first lease year, and One Dollar (\$1) per acre per year, in advance of each anniversary date of the lease, for each and every year thereafter during the continuance of the lease. The rent is not to be credited on the royalties accruing to the lessor under this lease. If the lease is surrendered or canceled, no rent accruing to the lessor will be refunded.

(3) DILIGENCE, PREVENTION OF WASTE.—To exercise diligence in the conduct of prospecting and mining operations, to carry on development and operations in a workmanlike manner and to the fullest possible extent; to neither commit nor suffer waste to be committed upon the land leased; to comply with the applicable laws of the State in which the land is located; to take appropriate steps to preserve the property and provide for the health and safety of workmen; to surrender and return promptly the premises upon the termination of this lease to whoever is lawfully entitled thereto, in as good condition as received, except for the ordinary wear and tear and unavoidable accidents in their proper use of the premises; not to remove any building or permanent improvement erected on the leased property during the lease. If the payments agreed upon by this lease have been made and the other lease terms and applicable regulations have been complied with, the office fixtures and records, personal property, tools, pumping, and drilling outfits, boilers, engines, and mining machinery may be removed by the lessee at any time before 60 days after the lease expires by forfeiture or otherwise.

(4) FOREST PROTECTION.—The lessee agrees:

(a) Not to cut, destroy or damage timber without prior authority of the Commissioner of Indian Affairs or his authorized representative, such authorization to be made only where required by the pursuance of necessary mining operations.

(b) To pay for all such timber cut, destroyed or damaged at rates prescribed by the Commissioner of Indian Affairs or his authorized representative, such rates to be determined on the basis of sales of similar timber in the vicinity.

(c) Not to interfere with the sale or removal of timber from the land covered by this lease by contractors operating under an approved timber sales contract now in effect or which may be entered into during the period of this lease.

(d) To do all in its power to prevent and suppress forest, brush or grass fires on the leased land and in its vicinity, and to require its employees, contractors, subcontractors, and employees of contractors or subcontractors to do likewise. To place its employees, its contractors, subcontractors, and the employees of such contractors or subcontractors employed on the leased land at the disposal of any authorized officer of the Indian Service for the purpose of suppressing forest, brush or grass fires with the understanding that the payment for such services shall be made at rates to be determined by the Commissioner of Indian Affairs or his authorized representative, which rates shall not be less than the rates of pay prevailing in the vicinity for services of similar character: *Provided*, That no payment shall be made for services rendered in the suppression of fires for which the lessee, its employees, contractors or subcontractors, or the employees of such contractors or subcontractors are responsible.

(e) To pay for the loss of all timber ten inches or more in diameter occasioned by fires for which it, or any of its employees, its contractors, subcontractors, or the employees of such contractors or subcontractors are responsible for the start or spread, the assessment of the value of such damages to be determined by the Commissioner of Indian Affairs or his authorized representative on the basis of the value of such timber on sales of similar timber in the vicinity. Also, to pay liquidated damages of Five dollars (\$5.00) per acre for all young timber less than ten (10) inches in diameter destroyed by such fires unless a lesser rate of damages shall be approved by the Commissioner of Indian Affairs, and to pay all costs for the suppression of fires for which it, or any of its employees, contractors or subcontractors, or the employees of such contractors or subcontractors are responsible.

(f) Not to burn rubbish, trash, or other inflammable materials except with the consent of the authorized representative of the Commissioner of Indian Affairs, and not to use explosives in such manner as to scatter inflammable materials on the surface of the land during the fire season, except as authorized to do so by such representative.

(5) DEVELOPMENT.—The land described herein shall not be held by the lessee for speculative purposes, but for mining the minerals specified. The lessee shall begin operations within 18 months from the effective date of this lease. The lessee shall spend annually in actual mining operations, development, and improvements upon the leased land, or for the benefit of the leased land, including the annual rental, not less than Five Dollars (\$5.00) per acre. The lessee shall file with the Superintendent an itemized statement, in duplicate, within 20 days after each lease year, of the amount and character of the expenditures during the lease year. The statement must be certified under oath by the lessee or its agent. If the lessee fails to diligently develop or operate the mine, except when operation is interrupted by a strike, an act of God, or casualty not attributable to the lessee, this lease will be subject to cancellation. Whenever the Secretary of the Interior or his authorized representative considers the marketing facilities inadequate or the economic conditions unsatisfactory, he may authorize the suspension of operations for such time as he considers advisable, but this does not release the lessee from paying the advance annual rental. Payment of minimum royalty will not excuse complying with the provisions of this section.

(6) MONTHLY STATEMENTS.—To keep an accurate record of the mining operations, showing the sales, prices, dates, purchasers, and the amount of minerals mined, the amount of minerals removed, and the gross receipts, and to furnish the Superintendent sworn monthly reports before the twenty-fifth of the succeeding month. All royalty and advance rental due shall be a lien on all implements, tools, movable machinery, and all other chattels used in the operation and upon all of the unsold minerals obtained under the lease. An audit of the accounts and books of the lessee shall be made annually or at any other time directed by the Superintendent by a certified public accountant approved by the Secretary of the Interior and at the expense of the lessee. The lessee shall furnish, through the Superintendent, a free copy of the audit to the Secretary of the Interior within 30 days after the completion of each audit.

(7) REGULATIONS.—To abide by and conform to any and all regulations of the Secretary of the Interior now or hereafter in force relative to such leases including 25 CFR 171, and 30 CFR 231. Rate of royalty, the annual rental, or the term of the lease may not be changed by a future regulation without the written consent of the parties to this lease.

(8) ASSIGNMENT OF LEASE.—Not to assign this lease or any interest therein by an operating agreement including agreements providing for payment of overriding royalty or otherwise, nor to sublet any portion of the leased premises before restrictions are removed, except with the approval of the Secretary of the Interior. If this lease is divided by the assignment of an entire interest in any part of it, each part shall be considered a separate lease under all the terms and conditions of the original lease.

(9) BOND.—To furnish to the Superintendent an acceptable surety bond in the amount of Eight thousand five hundred Dollars (\$8,500.00). The right is reserved to the Secretary of the Interior or his authorized representative to increase the amount of bond above the sum named.

(10) LIQUOR.—The lessee further agrees that it will not use or permit to be used any part of said premises for any unlawful conduct or purpose whatsoever; that it will not use or permit to be used any part of said premises for the manufacture, sale, gift, transportation, drinking, or storage of intoxicating liquors or beverages in violation of existing laws relating thereto, and that any violation of this clause by the lessee or with its knowledge, shall render this lease voidable at the option of the Superintendent.

(11) INSPECTION.—The leased premises, producing operations, appurtenances, and all books and accounts of the lessee may be inspected by the lessor and its agents or any authorized representative of the Secretary of the Interior.

(12) DISPOSITION OF MINERALS AND SURFACE.—The lessor expressly reserves the right to lease, sell, or otherwise dispose of the oil and gas and the surface of the lands in this lease under existing law or laws hereafter enacted, such disposition to be subject to the right of the lessee to use as much of the surface as is necessary in the extraction and removal of the minerals from the leased land.

(13) SURRENDER AND TERMINATION.—The lessee may at any time terminate this lease or any part thereof upon the payment of all rentals, royalties, and other obligations due to the lessor, and the further sum of \$5, and in the event restrictions have not been removed, upon a showing satisfactory to the Secretary of the Interior or his authorized representative

that full provision has been made for the conservation and protection of the property, the lease to continue in full force and effect as to the lands not so surrendered. If this lease has been recorded, lessee shall file a recorded release with its application to the Superintendent for termination of this lease.

(14) **RELINQUISHMENT OF SUPERVISION BY THE SECRETARY OF THE INTERIOR.**—Should the Secretary of the Interior, at any time during the life of this instrument, relinquish supervision as to all or part of the acreage covered hereby, the relinquishment does not bind the lessee until the Secretary has given 30 days' written notice. Until the requirements are fulfilled, lessee shall continue to make all payments due under subsections 1 and 2. After notice of relinquishment has been received by lessee, this lease is subject to the following further conditions:

(a) All rentals and royalties accruing shall be paid directly to lessor or its successors in title.

(b) If at the time supervision is relinquished by the Secretary of the Interior as to all lands under this lease, and lessee has made all payments due under the lease and has fully performed all obligations on its part to be performed up to the time of such relinquishment, then the bond given to secure the performance of the lease and on file in the Indian Office shall be of no further force or effect.

(15) **WATER WELLS.**—The lessee may, at its own expense, drill and equip water wells on the leased premises and agrees that all wells will be left intact and properly cased at the termination of the lease by expiration of its term or otherwise. Lessee shall have the right to remove all mechanical pumping equipment installed by it at any wells.

(16) **DAMAGES.**—The lessee shall conduct all operations authorized in this lease with due regard to preventing unnecessary damages to vegetation, timber, soil, roads, bridges, cattle-guards, fences, and other improvements, including construction, operation, or maintenance of any of the facilities on or connected with this lease which causes damage to the watershed or pollution of the water resources. On termination of operations under this lease, the lessee shall make provisions for the conservation, repair, and protection of the property and leave all of the areas on which the lessee has worked in a condition that will not be hazardous to life or limb, and will be to the satisfaction of the Superintendent.

(17) **LIABILITY FOR DAMAGE.**—The lessee is liable for any and all damages resulting from its operations under this lease; including injury to the lessor, the tenants, licensees and surface owners, and for any and all damage to, or destruction of, all property, caused by the lessee's operations hereunder. The lessee agrees to save and hold the lessor and the United States, its employees, licensees, and the surface owner or their tenants harmless from all suits for injury or claims for damages to persons and property resulting from the lessee's operations under this lease.

(18) **ROADS.**—The lessee may use existing roads, if any, on the land and may construct, and maintain, at its own expense, any additional roads across lessor's lands that are necessary in carrying on the actual mining, prospecting, and exploration work after the location of these roads has been approved in writing by the Superintendent of the Navajo Agency. The public obtains no rights to these roads, and upon termination of this lease or if at any time it becomes unnecessary for lessee to use the road for conducting the operations authorized under this lease, the right to use the road shall thereupon cease and all the rights shall revert in lessor in accordance with law. The lessee shall hold the lessor and the United States harmless and indemnify them against any loss or damage that might result from the negligent construction or maintenance by lessee of the road. Installations made in connection with roads by the lessee may be removed by the lessee.

(19) **INDIAN LABOR.**—The lessee shall employ Indians, giving priority to lessor and other members of its tribe in all positions for which they are qualified and available and shall pay the prevailing wage rates for similar services in the area. The lessee shall do everything practicable to employ qualified Indians, giving priority to the lessor and other members of its tribe and their equipment in the hauling of all materials under this lease, insofar as the lessee does not use its own equipment for that purpose. Lessee agrees to make special efforts to work Indians, giving priority to the lessor and other members of its tribe into skilled, technical, and other higher jobs in connection with the lessee's operations under this lease.

(20) **INSURANCE, SOCIAL SECURITY, TAXES, ETC.**—The lessee agrees to carry such insurance covering all persons working in, on, or in connection with the leased premises for the lessee as will fully comply with the provisions of the statutes of the State of Arizona covering workmen's compensation and occupational disease, as are now in force or as may be amended. Further, the lessee agrees to comply with all the terms and provisions of all applicable laws of the State of Arizona, and of the United States of America as now exist or as may be amended, pertaining to Social Security, unemployment, compensation, wages, hours, and conditions of labor; and to indemnify and hold the lessor and the United States harmless from payment of any damages occasioned by the lessee's failure to comply with these laws. The lessee shall pay all taxes lawfully levied or assessed on the sale, severance, production, extraction, or removal of any of the minerals covered by this lease.

(21) **HEIRS AND SUCCESSORS IN INTEREST.**—It is further covenanted and agreed that each obligation under this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors of, or assigns of the parties to this lease.

(22) GOVERNMENT EMPLOYEES CANNOT ACQUIRE LEASE.—No lease, assignment thereof, or interest therein will be approved to any employee or employees of the United States Government whether connected with the Indian Service or otherwise, and no employee of the Interior Department shall be permitted to acquire any interest in such leases by ownership of stock in corporations having leases or in any other manner.

(23) CANCELLATION AND FORFEITURE.—When, in the opinion of the Secretary of the Interior or his authorized representative, there has been a violation of any of the terms or conditions of this lease before restrictions are removed, the Secretary of the Interior or his authorized representative has the right at any time after 30 days' notice to the lessee, specifying the terms and conditions violated, and after a hearing, if the lessee shall so request within 30 days of receipt of notice, to declare this lease void, and the lessor may then take immediate possession of the lands. After restrictions are removed, the lessor may use any available remedy in law or equity for breach of this contract by the lessee.

IN WITNESS WHEREOF, the said parties have hereunto subscribed their names and affixed their seals on the day and year first above mentioned.

TWO WITNESSES TO EXECUTION BY LESSOR:

William B. Weston

P. O. *Thomas Lynch*

Thomas Lynch

P. O. *Winkler Park, Ariz*

TWO WITNESSES TO EXECUTION BY LESSEE:

Stuart H. Blainch

P. O. *Cooney, Minnesota*

Josephine Blainch

P. O. *Cooney, Minnesota*

State of *Arizona*

County of *Apache*

Per I. O. Letter *5-21-63* (Realtor *Prop. Title*)
3156-63

ACKNOWLEDGMENT OF LESSOR

Before me, a notary public, on this *18th* day of *March*, 19*63*, personally appeared *Paul Jones, Chairman Navajo Tribal Council*, to me known to be the identical person who

executed the within and foregoing lease, and acknowledged to me that *he* executed the same as *his* free and voluntary act and deed for the uses and purposes therein set forth.

My commission expires *November 14, 1964*

THE NAVAJO TRIBE OF INDIANS

BY: *Paul Jones* [SEAL]
Chairman, Navajo Tribal Council

----- [SEAL]

ZONTELLI WESTERN MINING COMPANY

BY: *John Simmons* [SEAL]
President

Attest: *Anne V. Stang*
Secretary

APPROVED *5-31-63*

John C. Dibbern
Asst. AREA DIRECTOR

cpd. Joe JHC

AMERICAN SMELTING AND REFINING COMPANY

GEOPHYSICAL DIVISION

3422 SOUTH 700 WEST

SALT LAKE CITY, UTAH 84119

R. J. LACY
CHIEF GEOPHYSICIST

J. H. C.

SEP 3 1965

August 26, 1965

Mr. J. J. Collins
Revere Copper & Brass Inc.
230 Park Avenue
New York, N. Y. 10017

GEOPHYSICS
WHITE MESA COPPER DISTRICT
COCONINO COUNTY, ARIZONA

Dear John:

Although there appears to be no further interest in the subject prospect, you would probably be interested in the results of the geophysical tests over the area.

Mr. W. G. Farley's memorandum of August 4 is enclosed and this indicates the results of a resistivity test line. The results indicate that resistivity would be applicable in this case. It is possible that the resistivity low over the mineralized area might be related to a higher degree of fracturing of the rock and higher moisture content in the fractured zones. As you know, the two aeromagnetic test lines flown over the area suggest an intrusive in depth, which suggests that the slight doming in the overlying sandstones and fracturing may be related to the intrusive. Whether the copper mineralization may be related to the intrusive is a matter of conjecture.

Very truly yours,



R. J. LACY

RJL:ao
Enc.

cc: C P. Pollock, w/enc.
✓ W. E. Saegart
W. G. Farley

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.
AUG 16 1965

August 4, 1965

MEMO to R. J. Lacy

JHC file
Resistivity Traverses
White Mesa Copper District
Coconino Co., Arizona

Mr. John Collins of Revere Copper and Brass requested that I try resistivity on the White Mesa Copper District after noting more water and clay in the better copper oxide zones. It was felt that resistivity might be an indirect aid in mapping copper values.

During the last half of July, 1965, a test I. P. -- resistivity traverse (SE corner Eli claim to NE corner Ida M. Smith claim) was run east - west across the West ore zone using a 100 foot and a 200 foot wenner electrode spacing. These electrode spacings were chosen because most of the copper oxides occur within 100 feet of the surface.

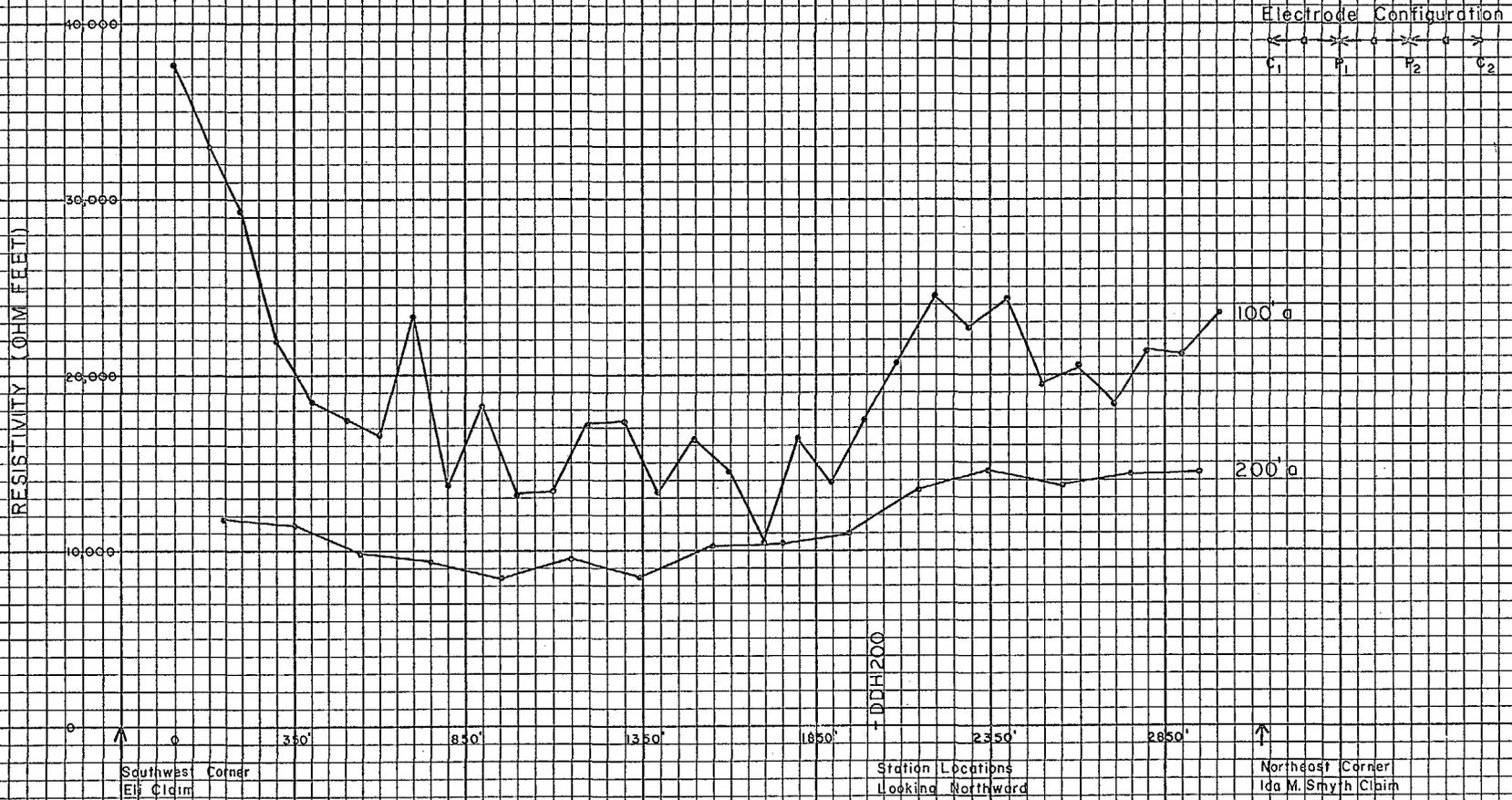
I. P. showed no anomalous values as expected. The I. P. response was zero over both barren and mineralized sandstone.

Resistivity values were very high. With the 100 foot electrode separation resistivity values were greater than 19,000 ohm-feet over the barren zones and from 10,000 to 19,000 ohm-feet over the mineralized zone. With the 200 foot electrode separation resistivity values were greater than 11,000 ohm-feet over the barren zones and from 8,000 to 11,000 over the mineralized zone.

If ASARCO should become interested in the property in the future, I believe that resistivity would be a definite aid in outlining the general mineralized zones.

W. G. Farley ✓
W. G. Farley

WGF/ce
cc: CPPollock
WESaegart
JJCollins



RESISTIVITY TRAVERSES
 WHITE MESA COPPER DISTRICT
 COCONINO CO., ARIZONA
 JULY 1965 WGF
 SCALE 1" = 500'

- COPY -

Revere Copper and Brass Incorporated

EXECUTIVE OFFICES

230 PARK AVENUE
NEW YORK, N. Y. 10017

Telephone: MUrray Hill 9-6800
Cable: REVERECOP—NEW YORK

J. J. COLLINS
GENERAL MANAGER—MINING DEPT.

August 2, 1965

J. H. C.

AUG 3 1965

Mr. Harold E. Richard, President
Hawley and Hawley
P. O. Box 5934
Tucson, Arizona 85703

Dear Mr. Richard:

Yes indeed you may dispose of our sample rejects and pulps. I suppose the big canvas sample sacks might as well be given to Mr. J. H. Courtright, of American Smelting, if convenient for you to do so. Although we abandoned the copper prospect near Page, you can be sure we greatly appreciate your service. Many thanks.

Very truly yours,



John J. Collins

JJC:asb

cc: J. H. Courtright, Tucson ✓

C.P.E.

W.E.S.

AUG 27 1965

New York, July 20, 1965

JUL 26 1965

J.H.C. Conn

Memorandum For:

Mr. C. P. Pollock

MR. ~~WES~~ ~~LPE~~

J. H. C.

READ AND RETURN

JUL 26 1965

PREPARE ANSWERS HANDLE

White Mesa Copper Prospect Near
Page, Arizona

FILE INITIALS

Estimates of ore reserve, metallurgy and general feasibility have been made by Courtright, Snedden, Mean, Weiss, Power, Boyack and Waldler. These estimates are based on visits to the property by most of these men (some, at Collins' request) and on data compiled by Collins.

The data of Collins are based both on old information (mostly old drill hole sampling of incomplete and questionable nature), and on new drilling done by Collins, plus recent operating results by Zontelli.

Ore reserve estimates of various classes range from 15 to 30 million tons at grades between .3 and .4% Cu. There may be a potential of double this tonnage of material, but this could only be determined by considerable additional drilling (low cost). Waste/ore ratios range within 0.1 and 0.3.

A basin-like aquifer with a large water supply has been studied by the U.S.G.S. Zontelli's well (producing at 300 g.p.m.) is 8 miles from the property and on the edge of the aquifer. The center of the aquifer is 7 miles farther away, from which point there would be a total pumping head of 1000'.

Direct and indirect operating costs, including mining at 15¢ per ton, are 75¢ to 80¢ per ton on the basis of 10,000 tons of ore per day. Since the sandstone ore is friable, the cost of mining by roofer and scraper or shovel-loaders will undoubtedly be low and not to be compared with cost at open pit mines such as Silver Bell.

Capital investment has been estimated at \$6.5 million. This involves a plant with crushing and grinding to minus 15 mesh, followed by a counter-current leaching system with 30 minutes to 3 hours of contact time giving recoveries of 85 to 94%.

These figures indicate a return on investment of about 9% before taxes, using 31¢ Cu. Due to the incompleteness of data, however, this figure of 9% is, I am sure, much lower than can ultimately be attained.

This is only a prospect, but a promising one, which has been very incompletely explored. Metallurgical tests have consisted of only a few samples of a few pounds each. There is, as yet, no basis for sound feasibility estimates, and all estimates have necessarily been conservative. In my opinion, further exploration and metallurgical testing are warranted, but only under a renegotiated deal with Zontelli. I believe it is Mr. Collins' opinion that, due to Zontelli's serious financial situation, a much more favorable agreement can be reached. There are no competitors. Revere has spent \$30,000, and they have advanced \$50,000 to Zontelli with the ability to foreclose.

In summary, it is my recommendation (1.) that the present agreement be allowed to lapse, (2.) that Mr. Collins should negotiate a more favorable agreement, and (3.) that additional drilling and metallurgical testing amounting to a cost of \$50,000 to \$100,000, depending on results, should be undertaken. These three activities can be carried on in a more-or-less overlapping manner.

Although this prospect has commercial potential, it could not, at best, represent a highly profitable business.

CC-EMcLTittmann

Kenyon Richard

RECEIVED
JULY 20 1965
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Copy to Courtright 7/9/65

E. McL. Tittmann

JUL 8 1965

J. H. C.

JUL 12 1965

Revere Copper and Brass Incorporated

Executive Offices

230 Park Avenue
New York

John H. Eikenberg
President

July 7, 1965

Amberg

White Mesa

Mr. E. McL. Tittmann, Chairman
American Smelting and Refining Company
120 Broadway
New York 5, N. Y.

Dear Ed:

Just a note to advise that the
period in which we may give notice has
been extended to June 21 in the matter
of the Zontelli properties.

Sincerely,

JHE

JHE:B

E. McL. Tittmann

JUL 7 1965

Con
K.R.
Pl note + return
To Mr. Tittmann
ED

Revere Copper and Brass Incorporated

Copy to Courtright 7/8/65

Executive Offices

C.P.A.
230 Park Avenue
New York 17, N. Y.

J. H. C.

JUL 12 1965

John H. Eikenberg
President

July 6, 1965

White Mesa

Mr. E. McL. Tittmann, Chairman
American Smelting and Refining Company
120 Broadway
New York, N. Y. 10005

Dear Ed:

With reference to our conversation of last Friday, it looks as though our trial period for the investigation of the Zontelli Western properties will be extended for two weeks from July 7. We will know for certain tomorrow.

This can give us sufficient time to arrive at a logical decision before investing any more sums.

Sincerely,

John

JHE:B

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.
JUL 13 1965

July 2, 1965

JHC file

PERSONAL-CONFIDENTIAL

Mr. T. A. Snedden, General Manager
United States Mining Department
American Smelting and Refining Company
P. O. Box 5795
Tucson, Arizona 85703

COPPER PROSPECT

WHITE MESA PROPERTY
Cost Estimate

Dear Sir:

On Thursday, July 1, Mr. C. E. Nelson requested a cost estimate on the White Mesa property.

The following information was given to Mr. Nelson by phone after consulting with Kenneth Power, who visited the property and made several tests at Silver Bell on grab samples taken off the dump. (Mr. Power's findings are listed in his report of January 25, 1965.) I also consulted Mr. Courtright, who in turn telephoned Mr. John Collins, of Revere Copper and Brass, Inc., to obtain additional information.

Mr. Collins stated that the deadline was July 7 or 9, depending on the interpretation of their agreement with Zontelli Western Mining Company. Also, their lawyers in New York had stated that the title to the property was presented to them June 28, and a clause in their agreement stated that no decision had to be made until thirty days after receipt of the title. The thought was that they could negotiate an extension of two weeks from today. He also mentioned that the titles were "fuzzy" and that our lawyers should contact Attorney Alfred B. Carr, of Evans, Kitchel & Jenckes, Phoenix, who conducted the investigation for Revere Copper.

Within two weeks from today, Revere can exercise their right to agree to spend \$50,000 over the next six-month period. At the end of that time they must vacate the property or buy it for, plus or minus, \$1,200,000.

The figures for the estimate are rough and are based on the following:

Mr. Power estimated the leaching cost to be 10¢ per lb. cu. produced. This was figured on Silver Bell's cost of 8¢ escalated to 10¢ per lb. cu. produced. Acid was figured at 2.7 lbs. per lb. cu. Iron was figured at 1.3 lbs. scrap per lb. cu. This ore would not require much acid or iron to leach, which we figured would about offset the added haulage of these materials to the property. The water would come from a large basin 15 miles away at a 1000-ft. lift. Silver Bell has about the same lift at a distance of 10 miles.

Royalty on the ore is on a sliding scale which we do not know. Thus, using a rough estimate by John Collins, we estimate:

Collins Estimate

.25% cu. ore	
Return 5# cu. @ \$.25/lb. cu.	\$1.25
Direct operating cost: Mining 15¢/ton ore, plus leaching cost, plus royalty	
	.75
Operating profit less indirect costs	<u>\$0.50</u>

ASARCO Estimate

.25% cu. ore	
Return 5# cu. @ 85% recovery @ 25¢/lb. cu.	\$1.06
Direct operating cost: Mining .3 waste to 1 ore = 19.5¢ ton ore, plus leaching, plus royalty	
	.80
Operating profit less indirect costs	<u>\$0.26</u>

Figures just received from Collins show an average grade of .33% cu.; thus:

.33% cu. ore			
6.6# cu. x 85% recovery = 5.6# x 25¢	\$1.40	158	50.
Direct operating cost	.80	70	20.
Operating profit less indirect costs	<u>\$0.60</u>	88	70.

The above figures are based on an ore grade of .25% cu. and .33% cu. The drilling and sampling of the drill holes by present and past owners cannot be relied upon. Mr. Collins is now attempting to evaluate the grade of these holes with interspaced holes. All holes were drilled in the location of the mine, which shows an ore reserve of 4,000,000 tons. This is only a portion of the mesa, which is about one mile wide and five miles long. The ore appears to continue throughout the entire mesa. The mesa is 100 ft. above the level of the general area, and the ore appears to extend 100 ft. below ground level for a total depth of 200 ft. of ore. Of the .3 to 1 waste-to-ore ratio, about 1/2 of the waste is wind-blown sand on top of the mesa.

Mr. T. A. Snedden

Page 3

July 2, 1965

Plans for a more detailed study are being made, as well as an investigation of the reported cost of peak power at .3¢ kwh.

Yours very truly,

R. B. Meen
Manager

RBM/jah
cc: CENelson

Memo for Record

White Mesa Copper Page, Arizona Laboratory Leaching Tests

St. Louis University July 1965

The material consisted of four grab samples I took in the Zontelli pit in the middle of June 1965.

No. 1 B was brown limonitic sandstone from the upper part of the pit with no evidence of copper. It assays 0.18 % Cu

No. 2 was light grey sandstone with a faint green tint. It averages about 1/4 % copper.

No. 3 was greener. It assays about 1/2 % copper

No. 4 was blue sandstone which I guessed might run 1-2 % because it is fairly common in a pit which was not profitable. Actually this sample assays up to 6.84 % Cu in the finer sizes.

The St. Louis figures indicate the necessity of grinding to minus 16 mesh and the desirability of going to minus 32 mesh. The copper minerals are soft, and the quartz grains are largely plus 32 mesh, or their clusters break up at minus 32 mesh.

The optimum acid is probably 1/3 normal, as 0.25 N is only rarely less efficient than 0.5 N

Recoveries of 99% were made after 30 minutes of agitation in a Mixmaster. The violence of this kind of agitation may have a bearing on the high recoveries, which may be difficult to duplicate in commercial practice. Nevertheless the goal is clearly indicated.

John J. Collins

TABLE I.

LEACHING EXPERIMENTS ON ARIZONA COPPER ORE
at St. Louis University, July 1965
for Revere Copper & Brass Inc.

Ratio of sample to acid 1/40 wt/wt Time - 30 minutes Temp+ 22° C

Samp.	Size mesh	conc H_2SO_4	concentration of Cu extracted from sample in %	Cu content of residue in %	% Extraction
Limonitic 1 B	-16	0.5 N	0.180	0.020	90.0
	-16	0.25N	0.180	0.010	94.4
2	-8+16	0.5N	0.260	0.015	94.2
2	-8+16	0.25N	0.220	0.015	93.2
2	-16+32	0.5N	0.160	<0.006	96.3+
2	-16+32	0.25N	0.150	<0.006	96.3+
2	-32	0.5N	0.380	<0.006	98.4+
2	-32	0.25N	0.390	<0.006	98.5+
3	-16+32	0.5N	0.580	0.002	99.5
3	-16+32	0.25N	0.612	0.002	99.5
3	-32	0.5N	0.580	0.002	99.5
3	-32	0.25N	0.480	0.002	99.5
4	-8+16	1.0N	1.70	0.046	97.4
4	-8+16	0.5N	5.50	0.020	99.7
4	-8+16	0.25N	5.04	0.110	97.8
4	-16+32	1.0N	2.34	0.006	99.8
4	-16+32	0.5N	1.14	<0.006	99.5+
4	-16+32	0.25	1.96	0.560	78.0 ? ←
4	-32	1.0N	6.84	<0.006	99.9+
4	-32	0.5N	6.40	0.034	99.95
4	-32	0.25N	6.54	0.020	99.96

St. Louis University, July 1965
by
Dr. V. T. Allen - C. B. Belt Jr.
for
Revere Copper & Brass Inc.

LEACHING EXPERIMENTS ON

ARIZONA COPPER ORE

PART TWO

METHOD OF ANALYSIS.

The ore samples were ground by means of iron mortar and pestle to pass 8 mesh (2mm). Three sieve fractions were separated by screening: -8+16, -16+32 and -32 mesh except for sample 1 b which was run as received. A sample of 1.25 grams of ore was leached for 30 minutes and agitated with the Sunbeam Mixmaster Junior as described in the previous report. The copper content of the leach was determined in the solution of acid by atomic absorption spectrophotometry using a Perkin Elmer model 214. Standards were made up from copper metal in a 0.2 N acid solution. After 30 minutes of stirring, the leach was completed. The acid solution was separated for analysis and the residue was washed from the bottle on to a filter paper, washed, and dried. The dry residue was scraped from the filter paper in to a 30 ml Teflon beaker and treated with 20 ml 48% HF and ½ ml con H₂SO₄. The samples were heated to dryness and the residue leached with hot 1 N HCl and decanted into a 25 ml volumetric flask and run for copper. The insensitive Cu line 2492.14 A was used. This gave a limit of detection of 3 ppm or 0.006% Cu in the original sample. For samples showing a very low Cu content in the residue, the more sensitive Cu line 3447.54 A was used (see samp. 3 in table) and the Cu-content of these residues estimated to be 0.002%. This line has a limit of detection of 0.01 ppm in solution or 0.0002% in the residue.

REAGENTS

All reagents used were of A.C.S. quality. All water used was demineralized.

REPORT ON THE EXAMINATION OF THE
WHITE MESA COPPER DISTRICT OF THE ZONTELLI WESTERN MINING CO.
NEAR PAGE, ARIZONA

By

John J. Collins, July 15, 1965

J. H. C.

JUL 19 1965

W.E.S.

JUL 26 1965

CONTENTS

	<u>Page</u>
1. Summary and Conclusions	1
2. Reserves: Table, Grade, Tonnage	3
3. Purpose and Scope	6
4. Geology	8
5. Geochemical Exploration (D.H. Hart)	10
6. Revere Drilling	12

SUPPLEMENT

Drill Logs

Geochemical Exploration by B. F. Brock

General Geology by J. W. Allan

MAPS

1. Geology and Topography of the White Mesa Copper District
scale 1" = 600 ft. by U.S.G.S., 1943
2. Western End of the White Mesa District
scale 1" = 200 ft. Base by U.S.G.S., 1943
supplemented by drill holes and geochemistry
3. Navajo Copper Property, West Section
scale 1" = 200 ft. Outlines of ore blocks.
4. Cross-sections, north end of West Orebody
scale 1" = 100 ft. horizontal, 1" = 50 ft. vertical
5. Geochemical Overlay, West Area
scale 1" = 200 ft.
6. Geochemical Overlay of Central Area
scale 1" = 200 ft.
7. Map of East Area
scale 1" = 400 ft. Photo base

Summary and Conclusions

The White Mesa Copper deposits are located twenty miles south of Page, in Coconino County, Arizona, in the Navajo Reservation. They are 13-18 miles east of a major north-south highway. The railroad is one hundred twenty-five miles to the south, at Flagstaff. Page has an excellent airfield for the twin-engine planes. Daily flights connect with Phoenix 1 1/2 hours away and Salt Lake City two hours distant.

The White Mesa copper prospect was recommended as an exploration project under the Revere-Zontelli Agreement because the occurrence is unique among sandstone copper deposits in having many features in its favor:

1. Lack of water was the previous major obstacle but Zontelli Western Mining Co. developed a major ground-water basin a dozen miles south of the copper zone. It has a total vertical head of less than one thousand feet between the bottom of the aquifer and the copper deposits. The Navajo water department has promised to let us take all the water we want.

2. All the copper in the ore dissolves in half an hour in weak acids when crushed to 32 mesh and agitated. Acid consumption is low as no alkaline minerals are present. Inspection and tests by an American Smelting leaching expert (Mr. K. Power) confirmed the ideal qualities of this ore. Tailings disposal is no problem as to space nor to drainage.

3. Mining costs should be very low as the ore is in low plateaus or hills, the overburden-to-ore ratio is probably 1-10, and short hauls are available. The soft fractured sandstone should rip easily and scrapers would allow very selective mining. The ore shatters to sand in a coarse impact crusher. An American Smelting Mining Engineer (Mr. W. Waidler) estimated costs at 15¢ per ton.

4. Capital investment costs should be very low. There is no need to buy mining equipment as there are several substantial earth moving contractors who should be interested and competitive bidding would give us a fair price. The crushing and grinding plant needs only low-energy, high-volume, short-life, second-hand equipment because the ore shatters readily to individual sand grains. An iron precipitation plant is a cheap installation. No townsite is needed as the Navajo can continue in their normal mode of life and the white employees can live in Page, only twenty miles distant. Office space is available in Page.

5. The whole copper district is available free of competition as all the privately-owned mining claims are held under lease or option-to-purchase, and the balance is Navajo Tribal land which the authorities have volunteered not to open to any other copper mining interests until we have decided what ground we want. There are no neighboring residences nor installations which could hinder our activities.

6. Labor is available from the Navajo, many of whom are excellent workers. They are not unionized. The minimum wage is one dollar twenty-five cents per hour and technically-trained men get one dollar fifty cents.

7. Two transmission lines (69,000 and 345,000 volts) cross the property from the Glen Canyon hydroelectric plant and the Navajo Tribe has at its disposal a large block of power. Off-peak rates would be very favorable and the Tribe has no other outlet scheduled. The planned Warm Creek coal-burning, generating plant will be in the vicinity. This should be an area of surplus power.

Ore reserves of the West Orebody are described in the following section. In addition, many copper outcrops occur in a zone three to six miles to the East, in similar favorable conditions but the initial drill holes have failed to cut ore. This probably means the major ore reserves is in the West Orebody

West Orebody Reserves
White Mesa Copper Prospect

Cutoffs: Ore 0.2% Cu, waste 0.10%, 13 cubic feet per ton

Block	Copper	95% Confid.	Tonnage	
			Ore	Overburden
2 - NW	0.37%		3,600,000	300,000
3 - W	0.38%		3,300,000	500,000
4 - NE	0.40%		780,000	
5 - S	0.43%		1,000,000	60,000
6 - E	0.34%		1,750,000	200,000
	<u>0.37%</u>		<u>10,430,000</u>	<u>1,060,000</u>
S Demn	0.37%		17,000,000	1,200,000

Ore Block	Thickness		Area Sq. ft.	No. of Holes	
	Ore	OB		Ore	Waste
2- NW	50ft.	4.5ft.	1,250,000	15	6 = 28%
3 - W	55	8	935,000	96	13 = 12%
4 - NE	80	nil	150,000	13	2 = 13%
5 - S	49	3	270,000	30	nil
6 - E	40	4	620,000	59	2 = 3%
	<u>51</u>	<u>4</u>	<u>3,225,000</u>	<u>213</u>	<u>23</u>
1 - S Demn	73	5	3,000,000	27	1 = 3%

Reserves

Grade

The above table was derived largely from electronically calculated Zontelli drill hole data, but the averages for the holes were combined by hand on an unweighted basis. Hence the figures are not precisely correct, but they are well within the range of accuracy of the sampling data. The Shattuck-Denn drilling was widely spaced, and the agreement with the closely-spaced Zontelli drilling is noteworthy.

The grade figures are considered conservatively about 20% because the Zontelli drillers allowed the dust to blow away, and the copper is in the dust, not within the sand grains. Furthermore Shattuck-Denn core drilled, dry, using compressed air. Their core analyses averaged 1/3 higher than their cuttings, which constitute the figures used here.

We have re-drilled near four Zontelli holes with a reverse air circulation vacuum drill from which no dust escaped. The results are equivocal, presumably because we are not sure how close our holes are to the Zontelli holes, which had been filled and obliterated. Not only did the survey location often disagree with the area of sampling discoloration on the ground, but there is no assurance as to the relationship of the sample dump and the drill hole.

Statistical analysis

Tonnage

Tonnage figures are based on a specific gravity of 2.5, derived from weighing blocks of ore from the Zontelli Pit and by reference to previous measurements. This means thirteen cubic feet per short ton.

Tonnage was estimated as a generalized average of the drill holes for total area of the ore blocks rather than by calculating areas of influence for each drill hole. For example, block 2 - NW has a surface area of 2,250,000 square feet. However, six of the twenty-one holes (28%) are in waste, so it was considered that 28% of the area would be waste and should be deducted from the gross area. The net ore area was then multiplied by the vertical tons, which was derived from the average thickness of the ore. Net tonnage of overburden was calculated in the same way.

Study of the Zontelli data shows that many holes stopped in "ore". The electronic count of 236 holes is:

In 123 holes the bottom analysis is 0.2% or higher	(1/2 of total)
70 " " " " " 0.3 " "	(1/3 " ")
46 " " " " " 0.4 " "	(1/5 " ")

This means there is considerable opportunity to increase the tonnage in depth.

Some fifty sites have been selected for deepening, roughly at spacings of two hundred feet or greater. It seems likely that the average depth of ore can be increased to the Shattuck-Denn figure. Among the twenty-eight Shattuck-Denn holes the following bottom in "ore":

16 holes at 0.2% or higher
8 " " 0.3 " "
4 " " 0.4

In addition some peripheral ore should be found, for example, southeast of the California claim and north of the Little Dick. Copper Hill has a little tonnage and the Zontelli Pit structure should persist to the south of the drilled area. The rock knob north of the West Orebody Mesa has some copper. The Dutchman claim, 1 1/2 miles to the southeast, has been drilled and proven to contain a small tonnage of good grade ore at very shallow depths. Geochemical prospecting may indicate other targets adjacent to the West Orebody lifting total tonnage to a potential 20,000,000.

PURPOSE AND SCOPE

This report describes the results of the "30-day examination period" provided for in the Zontelli-Revere Agreement dated May 25th, 1965. This interval was inserted in the agreement to allow time for a check on the title documents by our attorney in Arizona and for a study of the 500 Zontelli drill holes and for a reconnaissance of the surface geology. Field work actually began June 3rd and concluded, for the purpose of this report, on June 30th, although work is actually continuing.

The first objective of the field work was to confirm the correlation of geochemical prospecting of soil and rock over the previously drilled areas, on both ore and waste. In January a two-day test had been made on various types of samples and these indicated the desirability of the method. When the value of geochemistry was proved here, it was used to prospect for extensions of the West Orebody. Sufficient targets were found within a week to allow selection of a dozen drill hole sites to test for ore at depth.

At the same time records and maps of the Zontelli drilling were examined and a dozen holes were selected for a check on analyses and to extend holes to test for deeper ore, and thus increase the tonnage.

A truck-mounted, dry-hole, rotary rig arrived June 17th under contract with the well-known firm of Sprague & Henwood. Unfortunately the rig suffered many mishaps and only six holes were completed by the end of June. The cost to us has been unusually high, but the loss of time was a greater disappointment. Consequently an individual contract driller (J. D. Chaffin) was invited to demonstrate his reverse air circulation rig for several days beginning June 29th. Apparently his rig is preferable.

Geochemical prospecting continued throughout the month, largely in the Central and East portions of the 10-square mile Permit Area. The ore potential is sizeable and two dozen preliminary widely-spaced drill hole sites have been selected to test the ore occurrence.

Aerial photographs have been the base for most of the prospecting but the scale of the contact prints is too small for the detailed geological interpretation required for the recognition of ore structures. Only large general features have been mapped successfully. A special flight to obtain a larger scale set of photos will be required.

Very satisfactory geologists were provided under contract by Geophoto Services, Inc. of Denver, Colorado. All employees worked an average of ten hours a day every day in June to complete this report. Compensatory time or remuneration will be given them early in July.

They are:

James W. Allan, Mining Engineer, Project Manager

Bennett F. Brock, Geologist

Robert O. Kulstad, Geologist

Jack F. McCoy, A university student was an assistant, starting June 20.

Mr. D. H. Hart, American Smelting and Refining Co., Salt Lake City, spent about half of June as consultant in charge of geochemical prospecting, and the success of that program is due in large measure to his instruction and direction.

J. J. Collins supervised the work except for absences June 11, 12, and 14 on trips related to the project. Half-a-dozen Navajos did the auger work, drilling through soil to bedrock for geochemical samples. Two learned to do the chemical analyses.

GEOLOGY OF THE COPPER DEPOSITS

The geologic setting of the White Mesa copper deposits appears simple enough, but the search for ore is not.

All the known copper occurs in the upper few hundred feet of the Navajo sandstone formation. However, this restriction may be only an accident of erosion, as only the upper few hundred feet of the formation is exposed within 20 miles of the copper deposits. In this upper horizon, however, the copper does seem to favor the upper portion, and the known occurrences diminish in depth. However, relatively rich ore may underly low-grade or waste rock and both may interfinger. No sedimentary features have been recognized as ore controls.

The copper occurrence seems to be affected by faults and fractures. For example, the best exposed is the East-West "Smyth" Fault which, in the Zontelli pit, cleanly drops a horizontal ore bed down on the north side about 20-30 feet. This fault is also the boundary between good ore in the Gopher Claim on its north side and very poor rock in the Smyth claim on its south side. The paradox is that the visible fault is post-ore; there must be some other reason for this boundary.

At the other extreme of structural control is the west boundary of the West Orebody. It is proven to be abrupt by many drill holes and forms the west side of the Zontelli pit. Unfortunately, no fracture can be seen in the field, and the evidence on the 1:20,000 scale aerial photos is so dubious as to be debatable. Whatever the structural control may be, it is not understood as yet.

Nevertheless, the relationship of ore to other faults or fractures or photo linears is common enough to warrant attention to these structural features even though very few, statistically, are mineralized and those for only relatively short distances. Aerial photo mapping shows a maze of lineaments in the copper district. The richest ore occurs near fractures and persists along them to the greatest depths known. A number of bulldozer trenches will be dug at critical points.

Another important association seems to be that of moisture and ore. A drill hole generally starts in very dry rock. If the rock turns damp, the grade of copper generally increases; and in proportion, the wetter the rock, the richer the ore. The rock becomes drier in depth and the copper content diminishes. This association suggests the application of geophysics to the search for ore.

The location of the major copper occurrences forms an East-West belt about a mile or two wide and five miles long with other isolated occurrences reported at ten miles further West and 25 miles further East, at Kaibito. Deep water wells indicate this copper district . . . nearly parallel the crest of a large, gentle monocline. Near the West Orebody wells show the bottom of the Navajo formation at an elevation of about 5000 feet, some 1000 feet below the surface. Thence the formation dips northly at about 100 feet per mile to and beyond Page. For a few miles south of Coppermine the formation is flat and then dips very gently to the south, forming a major groundwater basin. Whether or not the crest of the monocline has any connection with the copper occurrence is purely speculative.

On July 14th an airborne magnetometer was flown over the copper district on two parallel, north-south lines several miles apart. Three broad, deep magnetic anomalies were indicated several miles north and south of the copper zone. Presumably, these are of no commercial interest.

GEOCHEMICAL EXPLORATION

White Mesa Project

by

D. H. Hart, June, 1965

In mid-January, geochemical tests were made in the copper mine area. It was found that the 2-2' Biquinoline cold acid extraction method as developed by the U. S. Geological Survey could be easily operated as an exploration tool for the White Mesa Project.

Although relatively few geochemical samples were taken during this first test, enough samples were analysed to establish the various limits of copper values which could be considered important. These were: background to 50 ppm and anomalies from 150 ppm. This is a much more conservative level than is normally considered, i. e., 3 times background versus 2 times.

The regional background could not be detected by the cold acid extraction method, but fusion indicated 0 to 6 ppm in soil and rock. By way of comparison, U. S. Geological Survey Bulletin 440 describes background for copper content in sandstone as being from 12 ppm to 36 ppm. These values are found within three miles of the copper zone.

The use of the geochemical approach on this project has afforded easy, quick evaluation of covered areas. Also, a rapid evaluation of barren appearing outcrops could be made. These are the principal uses for any good exploration tool. Further, it was found by the very nature of the mineralization that almost 100% of the copper could be readily leached. Therefore, the values determined were reliable and geochemistry could guide the drilling program. Finally, geochemical determinations were used for quick evaluation of the drill cuttings to help decide where to stop drilling.

The actual geochemical exploration program began the first week in June. It consisted of three major parts.

1. Definition of known areas
2. Exploration reconnaissance of new areas
3. Establishment of possible drill targets

Definition of known areas of mineralization was carried on over the well-drilled West Orebody. Geochemical lines were carried over known ore zones and extended into the flats around the outcrop hill which makes up the West Orebody. Also, in areas in which drill hole data were scarce, geochemical lines were used to cover the blank spots.

Exploration reconnaissance was undertaken in the Central Area and the East Area by running long lines from one known occurrence to another on a wide sample interval. Also geochemical lines were run over suspicious but barren appearing outcrops. Follow-up work to define any of the discoveries of interest was then done from this data and detail work will be used to drill holes in both the East and Central Areas.

Geochemical assaying of rock chip samples and of drill cuttings has also been undertaken and the original thoughts were proved to be true as the geochemical results have duplicated the actual assayed results.

Bio-geochemical Prospecting

A brilliantly red flower has been noted in the copper-rich soils of the White Mesa District. It occurs in the soil on cupriferous rock or in thick soil close to cupriferous cliffs. Soil close to the roots ranges from 700 to 1500 ppm. The flower has been observed only in this close association with copper. No other flower has been noted in this highly cupriferous environment.

An analysis was made at the Salt Lake City laboratory of American Smelting by ashing a plant: burning roots, stems and leaves separately in a clean glass ashtray. Approximately 1 gram of ash was brought up in acid to ten milliliters and an aliquot of one milliliter was then transferred to another tube and analysed for copper content. The results are as follows:

Roots = 1250 ppm Stem = 500 Leaves = 2250 ppm Dirt on roots = 6.5%

It is evident that this flower can be used as a copper indicator in this area. It has been identified as Gillia Latifolia, commonly called "Skyrocket". It blooms from May through September and is common to the mesa and canyon country of Utah, Arizona, and California.

Conclusion

It is clear that geochemistry has been very useful in all phases of the exploration program. It has doubled the surface expression of the area of interest, has indicated new mineralized zones, and it has eliminated others, while adding to the general, over-all understanding of the district.

Geochemistry should be continued in the same manner that it is now being used. Some exploration should be continued, principally in the East Area. Delineation and detail work should follow in both the Central and East Areas. Rock samples should be taken across cliff faces of all three areas. These could be used directly in the evaluation of the project as if they were additional drill holes. Lastly, geochemical analyses of the drill hole cuttings should be continued to help rapid control of the drilling.

REVERE DRILLING

The first objective was to try deepening some peculiarly shallow Zontelli Western holes and to try correlating analyses. Of the four holes re-drilled, one showed a great improvement and the others but little change on average. Many more tests should be made to develop a statistical appraisal.

As soon as geochemical analyses of soil proved to correlate well with the drill hole results, we planned some marginal drilling to try to increase the area of reserves. Only two of the marginal holes were successful, so the program was cut short and the rig put to wildcatting on the East Plateau.

This second group of holes is being drilled by a standard Mayhew compressed air rotary rig under contract from Sprague and Henwood, Salt Lake City. The few re-drilled check holes were put down with a Houston Tool Co. rotary rig using reverse air circulation pulling the cuttings up inside the rods to a vacuum cyclone chamber. No dust escapes from this apparatus. Both rigs used tri-cone bits. The latter rig was operated by J. D. Chaffin, a contractor from Bakersfield, California, as a brief demonstration. It seems preferable, though twice as costly, and no such rig is available within 30 days.

ZONTELLI WESTERN HOLES RE-DRILLED JUNE - JULY, 1965

ZR - 243 El. 6378 Coords. N 6942 E 5858 X-Section: "J"

Zontelli sampled only the middle ten feet in a one hundred foot hole causing a blank in the ore reserve picture.

S&H compressed air drill stopped at 120 feet because of insufficient air.

Vacuum reverse air drill stopped at 228 feet on request.

Comparison:

In low-grade, dry ore to 95 feet:

18 S&H samples average 0.15% Cu, Recovery 95%
10 Vacuum samples average 0.21% Cu, Recovery 92%

In richer, wet ore, 95 to 120 feet:

6 S&H samples average 0.55% Cu, Recovery 50%
4 Vacuum samples average 0.35% Cu, Recovery 80%

In the vacuum hole from 5 to 182 feet, 22 samples averaged 0.27% copper, where Zontelli had no ore at all.

ZR - 197 El. 6405 Coords. N6745 E 6771 X-Section: "K"

Zontelli: 0 - 65 ft. average 0.35% Cu
Vacuum: 2 - 64 ft. average 0.27% Cu, Recovery 98%

Our re-drilled hole went to 150 feet and failed to find any deeper ore.

ZR - 200 El. 6409 Coords. N 7067 E 6738 X-Section: "K"

Zontelli: 5 - 60 ft. average 0.21% Cu
Vacuum: 2 - 62 ft. average 0.33% Cu, Recovery 100%

Our re-drilled hole deepened the ore zone from 17 feet to 52 feet. Material below 0.2% Cu is excluded. The hole went to 150 feet without finding deeper ore.

ZR - 369 El. 6401 Coords. N 6325 E 8080 X-Section: "N"

Zontelli: 2.5 - 15 ft. = 0.4% Cu
Vacuum: 4 - 14 ft. = 0.31%, Recovery 86%

WEST OREBODY, MARGINAL HOLES DRILLED JUNE - JULY, 1965

R-1 El. 6397 Coords. N 6553 E 8035 X-Section: "L-M"

Intended to test for ore beyond the eastern end of the East Ore Block. No good below 20 feet and lean above that.

R-2 El. 6377 Coords. N 7410 E 7508 X-Section: "E"

Intended to test a geochemical anomaly east of the NE Ore Block. No good below 10 feet and poor above that.

R-3 El. 6304 Coords. N 8164 E 6721 X-Section: "A"

Intended to test the projection of the "high-grade" ore in old holes S-D 21, 22, 26, 27, 28 at 500 feet to the NNW of them. Average 7 - 80 feet is 0.4% Cu. This is the only hole to show ore off the mesa. Additional holes should be drilled around it.

R-4 El. 6324 Coords. N 9088 E 5977 X-Section: "R-E"

Intended to test for ore off the mesa east of the north end of the North Ore Block under a geochemical anomaly. No good to 200 feet.

R-5 El. 6388 Coords. N 8694 E 4800 X-Section: "R-G"

Intended to indicate the west boundary of the North Ore Block. It is sub-marginal to 150 feet.

S&H Hole: 1 - 70 ft. average 0.14% Cu with 95% recovery
Vacuum: 0 - 70 ft. average 0.17% Cu with 100% recovery
S&H Hole: 70 - 110 ft. average 0.11% Cu with 100% recovery
Vacuum: 70 - 110 ft. average 0.05% Cu with 100% recovery

R-6 El. 6386 Coords. N 9092 E 4852 Section: "R-E"

Intended to test the north end of the North Ore Block. It averaged 0.22% Cu from 1 - 60 feet and 0.17% Cu 60 - 185 feet.

R-7 El. 6262 At 405 feet N 52 W from NE corner of the Nannie Claim

Intended to test for ore off the mesa to the north of the North Ore Block. No good. Stopped at 90 feet.

R-8 El. 6258 At 305 feet N 37 E from NE corner of Nannie Claim.

Same as R-7. Bottomed at 100 feet.

Revere Copper and Brass Incorporated

230 Park Avenue
New York 17, New York

Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Location Page, Arizona
 Sampled: Date June 20, 1965 by J.J.C. and R. Kulstad Method Sprague & Henwood Dry rotary cuttings
 Analysed: Date 6/23/65 by Hawley and Hawley Method Single Determination
 Tabulated: Date 6/24/65 by B.C.

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al ₂ O ₃	TOTAL Al ₂ O ₃	QUARTZ	TOTAL SILICA	IRON AS Fe ₂ O ₃ Wt. %	LOSS ON IGN. % Rec.	Sol. Cu ppm	Total Cu
	Hole ZR243. EL.6378z			Zontelli Coordinates N		6942	E5858		
	0 - 6.6 ft Wind-blown soil			3/4" Bit Reduced to		3 7/8"	for sampling		X
15019	6.6 - 9.3 White-tan, 1/2" chips in sand.			Set Standpipe		60	92		0.14
20	- 15. Fine Tan and White sand.			Very dry, dusty		63	97		0.08
21	15.0 - 20. After 17' - damp = no dust.			White sand		57	88		0.09
22	- 25 Pale grey-white sand.			Minimum dust		59	91		0.10
23	- 30 " " " "			" "		65	100		0.18
24	- 35 " " " "			Faint green color		55	85		0.20
25	- 40 " " " "			Paler " 35-38 Hard		56	86		0.29
26	- 45 " " " "			" Malachite		59	91		0.22
27	- 50 " " " "			Red and greener		53	81		0.18
28	- 55 Hard white sand			"		74	114		0.18
29	- 60 Fairly hard Tan and white			very little green		64	99		0.17
30	- 65 " " " "			some		65	100		0.16
31	- 70 After 69' hard, dry, grey.			fair		65	100		0.17
32	- 75 " " " "			less		71	109		0.09
33	- 80 " " " "			"		63	97		0.10

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New York 17, New York

Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Location Page, Arizona S & H

Sampled: Date 6/22/65 by R. Kulstad Method Dry rotary cuttings

Analysed: Date 6/29/65 by Hawley & Hawley Method Sgl. Det.

Tabulated: Date 7/7/65 by B.C.

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al ₂ O ₃	TOTAL Al ₂ O ₃	QUARTZ	TOTAL SILICA	IRON AS Fe ₂ O ₃ Wt. %	LOSS ON IGN. %	cold Cu 2 ppm	Total Cu 2.5
	Hole R-1 Elev 6397 ¹⁰ coords N	6553	E 8035	Z					
15043	5' to bed rock + 3' 1/4 Bit					135		2000	0.24
	0-8' Brown wind blown sand with some chips of white sandstone - set casing								
44	Changed to 1 1/4 Bit					26.5	89	1000	.15
	8'-10' Brown sand with white chips								
45	10'-20' Dry brown sand with white chips					133	90	3000	.31
46	20 - 30 Damp brown sand Few white chips					148	99	1500	.17
47	30 - 40 Dry brown and white sand					152	100	500	.06
48	40 - 50 Moist brown and white fine grained sand					154.5	100	200	.05
49	50 - 60 Drill unable to lift tools					6	4	100	.04
	No visible copper to this depth. Hole caved. Drilled another alongside								
50	50 - 60 Grey and Brown Fine Sand					170	112%	200	0.05
51	60 - 70 " " " " "					161	106	90	.05
52	70 - 80 " " " " " Few Chips					177	117	85	.05
53	80 - 90 " " " " "					229	154	60	.05
54	90 - 100 " " " " "					140	94	60	.05
	Stopped at 102ft. when all air lost in hole								
	No copper minerals nor green color visible								

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230 Park Avenue
New York 17, New York

Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Project Location Page, Arizona
 S & H
 Sampled: Date 6/27/65 by R. Kulstad Method Dry rotary cuttings
 Analysed: Date 6/30/65 by Hawley & Hawley Method Sgle. Det.
 Tabulated: Date 7/7/65 by B C

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al ₂ O ₃	TOTAL Al ₂ O ₃	QUARTZ	TOTAL SILICA	IRON AS Fe ₂ O ₃ Wt. %	LOSS ON IGN. % Rec	Cold TiO ₂ Cu	Total P ₂ O ₅ Cu
	Hole R -2 Elev. N 7410 E 7508 Z								
15055	0 - 5 Soil 2ft. Brown and white fine sand							700	0.11
	To set collar 7 7/8 Bit								
56	5 - 10 4 3/4 " Bit = 21/ft. lbs.					52.5	50%	600	0.24
	More brown than above Some chips	Trace	Malachite						
57	10 - 20 Brown and white fine sand					194	92		0.13
58	20 - 24 1/2 4 1/4" Bit = 15 lbs./ft					43	64	600	0.10
	Sample caught in cyclone Brown fine sand			Trace of	Malachite				
	Large part of loss at collar pipe so not used below here								
59	24 1/2 - 30 Damp light brown fine sand - Blows dust					105	127		0.13
60	30 - 40 " " " " " "					149	100	D-300	0.09
61	40 - 50 " " " " " "					147	98	S-250	0.04
62	50 - 60 " " " " " "					145	97		0.04
63	60 - 70 " " " " " "					148	99	200	0.04
64	70 - 80 " " " " " "					155	102	200	0.04
	Slightly darker than above								
65	80 - 90 Brown fine sand					199	133	60	0.04
66	90 - 100 Light brown fine sand					204	135	60	0.04
67	100 - 110 Grey fine sand - Blows dust					160	107	70	0.03
68	110 - 120 Grey fine sand					158	106	60	0.03

Revere Copper and Brass Incorporated

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Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Project Location Page, Arizona
 S & H
 Sampled: Date 6/28/65 by R. Kulstad Method Dry rotary cuttings
 Analysed: Date 6/30/65 by Hawley and Hawley Method Sgle. Det.
 Tabulated: Date 7/7/65 by B C

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al ₂ O ₃	TOTAL Al ₂ O ₃	QUARTZ	TOTAL SILICA	IRON AS Fe ₂ O ₃ Wt.	LOSS ON IGN. % Rec	Cold TiO ₂ Cu	Total P ₂ O ₅ Cu
	Coords Hole R - 3 Box N 8164 E 6721 Elev 6304								
	0-5' 5 7/8 Bit Dune sand set collar								
	5-7 4 1/4 Bit Dune sand								
15070	7-10 Grey fine sand - Greenish cast					42	93		0.49
71	10-17 Damp greenish grey fine sand					75	71		0.37
72	Sand is packing in hole. Driller blew it out 17-20 Damp bluish grey fine sand - Driller blew hole to dry					42	93		0.38
73	20-30 Driller stopping every 5' to dry hole					98	65		0.75
	Upper 5' greenish brown fine sand								
	Lower 5' green fine sand - very damp								
	High grade material is packing in hole								
74	30-40 Damp greenish grey fine sand - Driller collected 10' sample					120 120x	80		0.31
75	40-50 Dry greenish grey fine sand					158	105		0.18
76	50-60 Hole became very wet at 6 1/2' - Collected sample - Damp greenish brown & grey fine sand.					113	75		0.49
77	60-70 " " " " " "					114	76	2000	0.28
78	70-80 Collected sample at 5' Damp greenish grey fine sand					103	68	2000	0.37
79	80-90 Dry grey and brown sand - greenish cast					114	76	1500	0.19
80	90-100 Dry grey and brown sand					120	145	800	0.14
81	100-110 Dry light brown fine sand					176	117	450	0.06

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230 Park Avenue
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Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Project Location Page, Arizona S & H

Sampled: Date 6/28/65 by R. Kulstad Method Dry rotary cuttings

Analysed: Date 6/30/65 by Hawley & Hawley Method Sgle. Det.

Tabulated: Date 7/7/65 by B C C

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al ₂ O ₃	TOTAL Al ₂ O ₃	QUARTZ	TOTAL SILICA	IRON AS Fe ₂ O ₃ Wt. %	LOSS ON IGN. % Rec	Cold TiO ₂ Cu	Total P ₂ O ₅ Cu
	Hole R-3 Cont'd								
15082	110'-120' Dry light brown fine sand					161	107		0.10
83	120 - 130 " " " " "					181	121		0.06
84	130 - 140 " " " " "					161	107		0.07
85	140 - 150 " " " " "					188	125	400	0.04
	Stopped hole at 150'. Too low grade								
	N B The upper cupriferous part of the hole gave poor recoveries whereas the low-grade section begining at 90' gave excessive recoveries. This hole should be re-drilled when convenient by the Chaffin reverse air rig. J.J.C.								

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Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Project Location Page, Arizona S & H
 Sampled: Date June 30, 1965 by John Mc Coy Method Dry rotary cuttings
 Analysed: Date 7/2/65 by Hawley & Hawley Method Sgle. Det.
 Tabulated: Date 7/7/65 by B C

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al ₂ O ₃	TOTAL Al ₂ O ₃	QUARTZ	TOTAL SILICA	IRON AS Wt. % O ₃	LOSS ON % Rec	Cold xxxx ^{xxxx} Cu	Total xxxx ^{xxxx} Cu
	Hole R - 5 ^E lev. 6388 Coord. N 8691 E 4800								
	7 7/8" Bit to 5'								
	0 - 1' Dry brown Dune sand								
	Bedrock at 1'								
15097	1-5' Dry brown sand with many large chips brown sandstone					140		400	0.11
	4 1/4 " Bit = 15 lbs./ft.								
98	5 - 10 Dry grey brown sand					56	75	500	0.15
99	10 - 20 Dry fine grey sand					113	75	200	0.13
100	20 - 30 " " " "					137	90	500	0.15
101	30 - 40 " " " " Larger Tarp					161	107	400	0.16
102	40 - 50 " " " " Much dust lost to this point Medium hard rock					160	107	2000	0.14
103	50 - 60 Dry fine light grey sand					128	85	2500	0.17
104	60 - 70 Slightly moist fine light grey sand					141	94	400	0.13
105	70 - 80 Dry fine light grey sand - chips of green Cu minerals					143	95	300	0.10
106	80 - 90 Dry fine light grey tan sand					152	100	700	0.10
107	90 - 100 " " " " & " " layers					148	100	700	0.10
108	100 - 110 Slightly damp fine light grey green tan sand					159	107	1000	0.16
109	110 - 120 Dry fine light grey tan sand					167	110	600	0.09
110	120 - 130 " " " " *					158	105	1000	0.08
111	130 - 140 " " " "					157	105	700	0.09
112	140 - 150 " " " "					190	125	200	0.10
	Terminated drilling at 150' Too low grade								

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Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Project Location Page, Arizona
 Sampled: Date 6/30/65 by J.J. Collins & R. Kulstad Method vacuum dry Chaffin:cutting
 Analysed: Date 7/2/65 by Hawley and Hawley Method Sgle. Det.
 Tabulated: Date 7/7/65 by B C

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al ₂ O ₃	TOTAL Al ₂ O ₃	QUARTZ	TOTAL SILICA	IRON XXXXX XXXXX Fe ₂ O ₃	LOSS XXXXX XXXXX % Rec	Gold XXXXX XXXXX ppm	Total XXXXX XXXXX Cu
	Re-drill of hole ZR - 243 Elev. 6378 Coords. N 69 1/2 E 5858								
	0 - 5' Wind-blown sandy soil. 3 1/4" Bit = 8 1/2 lbs./ft					Rock	at 5'		
15115	5 - 10' Alternating 1" layers brown and white sand								
	10 - 18 Grey-white sand, FeO 15', 16'						93		0.15
16	18 - 24 " " " , Pale green					43	86		0.31
17	24 - 30 " " " , Paler green					45	90		0.22
18	30 - 40 " " " , Pale green				FeO 30-31	75	88		0.25
19	40 - 50 Grey-tan sand lt. brown 40-41 No green or very faint					79	93		0.21
20	50 - 60 Grey-white sand . No green tint					83	97		0.18
21	60 - 70 Light grey sand . Faint green tint					82	96		0.24
22	70 - 80 " " " Fainter " "					80	94		0.17
23	80 - 90 Grey white sand. No green tint					75	88		0.13
24	90 - 97 Light grey sand. Faint green. Dry to 98'					55	92		0.22
25	97 - 104 Wet greenish-grey sand. Wet at 100'					50	85		0.31
26	104 - 108 Wet grey-tan sand, pale green wet					13	38		0.26
	108' Pulled & cleaned rods. Bottom 30' jammed with 1/2 % Cu							85% =	.39 ?
27	Contents of rods. Mostly 104-108'?					16	47		0.52
28	Cleanings from hole to 108', mostly 104'-8'?					10	29		0.30
15170	108 - 120 Coarser tan-grey sand. Very faint green. Wet					75 3/4	75		0.32
71	Sluff overnight in hole above 120'					7 1/2			0.57
72	120 - 130 Tan sand. 120-1 fine grain. Very faint green wetter					70 3/4	82		0.46
73	130 - 134 " " Med. grain, fair green . 130-2 = 9 lbs.					21	63		0.53

Revere Copper and Brass Incorporated

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Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Project Location Page, Arizona

Sampled: Date 7/1/65 by J.J. Collins & R. Kulstad Method Chaffin:cuttings Vacuum dry

Analysed: Date 7/9/65 by Hawley and Hawley Method Sgle Det.

Tabulated: Date 7/13/65 by B C

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al ₂ O ₃	TOTAL Al ₂ O ₃	QUARTZ	TOTAL SILICA	IRON AS Fe ₂ O ₃ Wt. %	LOSS ON IGN. % rec	Cold IO ppm	Total P. O. Cu
	Hole ZR - 243 Chaffin cont'd								
15174	134 - 138' Tan sand, med. grain. less green					24	74		0.42
75	138 - 146 Very fine grey sand. Less green. Drying here down					64	94		0.24
76	146 - 156 Pale tan-grey, coarse Alternating greens					80	94		0.24
77	156 - 162 " " " " Faint green color					46	91		0.26
78	162 - 170 " Grey Med. grain Better green					62	91		0.23
79	170 - 176 " " " " less green					47	93		0.19
80	176 - 182 " " coarse Better green			180-2=10 lbs		41	80		0.25
81	182 - 192 Dry, pale tan-grey Med. grain Less green					78	91		0.10
82	192 - 200 Dry med. to coarse More green-grey					75	108		0.12
83	200 - 208 Dry, fine grained tan with some green layers					72	105		0.09
84	208 - 220 Dry, fine grained tan Faint green					108	108		0.08
85	220 - 228 " fine to med. Tan with green layers					68	100		0.11
	Hole terminated because of too low grade								
	86 - 120								
	Cleanings from inside drill rods.: 3 1/4" Bit = 8. 1/2 lbs/ft								
86	120 - 136					17	12		0.82
87	136 - 208					12	2		0.51
88	114 - 120					7	14		0.67
89	108 - 114					8	16		0.52

White Copper and Brass Incorporated

230 Park Avenue
New York 17, New York

Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Prospect Location Page, Arizona

Dry vacuum

Sampled: Date 7/3/65 by R. Kulstad Method Chaffin cuttings

Analysed: Date 7/9/65 by Hawley and Hawley Method _____

Tabulated: Date 7/12/65 by B C

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al ₂ O ₃	TOTAL Al ₂ O ₃	QUARTZ	TOTAL SILICA	IRON AS Fe₂O₃ WT.	LOSS ON IGN. % rec	Cold TiO ₂ Cu	Total P ₂ O ₅ Cu
	Hole ZR - 200 Elev 6109 Z Coords N 7067 E 6738 Z								
	Bedrock at surface. Bit 4 3/4"								
15205	0 - 2' Dark brown and grey med. to fine sand					41			0.10
	Bit 3 1/4" = 8.6 lbs/ft								
15206	2 - 8 Tan and grey, med. to fine sand					60	120		0.26
15207	8 - 16 Brown and grey med. to fine sand. Strong green tint					73	105		0.78
15208	16 - 26 Grey fine sand with strong green tint					84	96		0.30
15209	26 - 36 " " " " " " " "					87	100		0.24
	Drill closed down to clean air filter								
15210	36 - 46 Fine sand, greenish grey tint					83	95		0.24
15211	46 - 52 Fine sand, grey greenish tint					54	105		0.34
15212	52 - 62 " " " " " " " "					85	100		0.16
15213	62 - 72 Brown and grey fine sand Slightly green					82	95		0.06
15214	72 - 80 " " " " " " Some green					67	100		0.05
15215	80 - 90 " " " " " " " "					82	95		0.05
	Continued July 4th, our sampler not present								
15335	90 - 100 Light grey, fine-grain sand					85		200	0.07
36	100 - 110 " " " " " " " "					91		200	0.07
37	110 - 120 " " " " " " " "					109		90	0.07
38	120 - 130 " " " " " " " "					107		80	0.03
39	130 - 140 " " " " " " " "					114		60	0.05
40	140 - 150 " " " " " " " "					100		70	0.04

Revere Copper and Brass Incorporated

230 Park Avenue
New York 17, New York

Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Prospect Location Page, Arizona S&H

Sampled: Date 7/5/65 by John McCoy Method Dry rotary cuttings

Analysed: Date _____ by _____ Method _____

Tabulated: Date 7/13/65 by B C

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al ₂ O ₃	TOTAL Al ₂ O ₃	QUARTZ	TOTAL SILICA	IRON AS Fe Wt. %	LOSS ON Ign. % Rec	Cold Fe Cu	Total Fe Cu
	Hole R - 8 Elev 6258 at 305 ft. N37E from NE corner Nannie								
	Bed rock on surface Light grey sandstone								
15158	4 3/4" Bit 0 - 10' Dry light grey-white fine sand					180	86	250	0.06
59	10 - 20 " " " " " "					190	91	250	0.06
	Changed to 3 7/8" Bit								
60	20 - 30 Dry light-grey-tan fine sand					140	108	400	0.04
61	30 - 40 " " " " " "					122	94	650	0.08
62	40 - 50 " " " " " "					103	79	600	0.07
63	50 - 60 Very damp light grey-tan fine sand					148	114	600	0.10
64	60 - 70 Damp light grey-tan fine sand					156	120	250	0.05
65	70 - 80 " " " " " "					116	89	150	0.03
66	80 - 90 Slightly damp light grey-tan fine sand					137	105	200	0.04
67	90 - 100 Dry light grey-tan fine sand					130	100	70	0.05
	Terminated drilling because of low grade ore								

Levere Copper and Brass Incorporated

230 Park Avenue
New York 17, New York

Mining Department Sampling and Analytical Data

Property Name White Mesa Copper Prospect Location Page, Arizona

S&H

Sampled: Date 7/7/65 by R. Kulstad Method Dry rotary cuttings

Analysed: Date _____ by Hawley and Hawley Method _____

Tabulated: Date 7/13/65 by B C

SAMPLE NO.	SAMPLE DESCRIPTION	EXTR. Al_2O_3	TOTAL Al_2O_3	QUARTZ	TOTAL SILICA	IRON AS Fe_2O_3 Wt. %	LOSS ON IGN. % Rec	Gold $1000 \times$ Cu	Total $1000 \times$ Cu
	Hole R - 9 at 170ft due West of SW corner of Duke claim								
	Bit 7 7/8" Set surface casing								
15234	0 - 5' Bed rock at surface. Dry brown med. sand							600	0.13
35	5 - 10 Bit 4 3/4" = 21 lbs/ft. Brown med. sand. of grey			Some chips				600	0.12
36	10 - 20 Dry grey with very little brown sand							650	0.08
	4 1/4" Bit = 15 lbs/ft								
37	20 - 30 Dry grey with very little brown sand					171	112	550	0.07
38	30 - 40 " " " " " " " "					166	110	200	0.08
	Hole caving badly. Moved hole 6' West and resumed								
	July 8								
39	40 - 50 Dry, grey with little brown Fine sand					174	116	60	
40	50 - 60 Dry, brown with grey fine sand					199	132	30	
41	60 - 70 " " " " " " " "					159	107	40	
42	70 - 80 " " " " " " " "					234	155	40	
43	80 - 90 Dry, grey with brown sand finer than above					161	107	60	
44	90 - 100 " " " " " fine sand					200	133	30	
45	100 - 110 " " " " " " slight greenish tint					175	116	40	
46	110 - 120 " " " " " " no green					165	110	40	
47	120 - 130 " " " " " " " "					175	116	30	
48	130 - 140 " " " " " " slight green					129	86	30	
	Lost air underground. Abandoned hole.								

Revere Copper and Brass Incorporated

EXECUTIVE OFFICES

230 PARK AVENUE

NEW YORK, N. Y. 10017

JOHN J. COLLINS

GENERAL MANAGER—MINING DEPT.

Telephone: 212 MUrray Hill 9-6800

Cable: REVERECOP—NEW YORK

January 29, 1965

Mr. J. H. Courtright
Exploration Department
American Smelting & Refining Company
816 Valley National Bank Building
Tucson, Arizona

J. H. C.

FEB - 8 1965

JJC Personal file

White Mesa
Arizona

Dear Harold:

It now seems that the signing of the White Mesa Agreement may be a protracted affair and it is unlikely to occur before the middle of February. Hence my previous mention of a visit to Bisbee has similarly receded toward the end of February.

It appears that I will be able to lease two or more junior geologists from the firm of Geophoto Services Inc., Denver, and as boss geologist we will be able to retain the consultant who did such good work for us on the kaolin project in Georgia, (Lee R. Stoiser of California).

Regards,



John J. Collins

JJC:asb

$$\begin{array}{r} 55 \\ 510 \\ \hline 3.610 \end{array}$$

TAS Rpt

10,000 tpd 133% cu

85% rec.

$$\begin{array}{r} 5.6 \\ 23 \\ \hline 768 \\ 112 \\ \hline 1288 \end{array}$$

$$66 \times 85 = 5.6 \times 23 = 139 \cdot 25$$

$$\underline{217}$$

Cost mining 23 } including indirect
 millin etc 75 }
98

cap - mill 4,500,000
 mining equip 900,000
 etc 1,100,000
 6,500,000

$$\begin{array}{r} 37 \\ 37 \\ \hline 407 \\ 95 \\ \hline 2335 \\ 3663 \\ \hline 38965 \end{array}$$

$$\begin{array}{r} 22.5 \\ 7. \\ \hline 1575 \\ 98 \\ \hline 59 \\ 7.1 \end{array}$$

500