CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
1520 West Adams St.
Phoenix, AZ 85007
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

The following file is part of the

Arizona Department of Mines and Mineral Resources Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

PROGRESS REPORT
ON THE MINING AND MILLING OPERATIONS
WHITE HILLS PROPERTY
MOHAVE COUNTY, ARIZONA, U.S.A.

ARIZONA SILVER CORPORATION

BY

D. P. TAYLOR, P. ENG.

VANCOUVER, B.C.

JULY 1982

Arizona Silver Corporation

Consolidated Statement of Changes in Financial Position
for the Year ended December 31, 1982

	1982	1981
Working capital provided by		
Interest income	$ 8,451	$ 167,449
Exploration costs recovered from production of silver and gold ore	113,526	57,281
Issuance of capital stock for cash and properties	128,475	1,816,935
	250,452	2,041,665
Working capital applied to		
Net loss for the year	10,253	-
Item not requiring an outlay of funds: Depreciation	(6,717)	-
	3,536	-
Mineral lease payments	35,174	19,486
Acquisition of oil and gas interest including drilling costs	501,235	1,390,551
Purchase of fixed assets	53,103	125,265
Exploration and development costs incurred, net of depreciation	468,480	749,365
Admininstration costs incurred	323,664	249,067
Reduction of debenture payable	60,000	-
Incorporation costs	924	-
	1,446,116	2,533,734
Increase (Decrease) in working capital for the year	(1,195,664)	(492,069)
Working capital (Deficiency), beginning of the year	336,299	828,368
Working capital (Deficiency), end of the year	($ 859,365)	$ 336,299

See accompanying notes to the financial statements

JUNG & LEE

To the DIRECTORS, ARIZONA SILVER CORPORATION

PROGRESS REPORT on the MINING and MILLING OPERATIONS
WHITE HILLS PROPERTY, MOHAVE COUNTY, ARIZONA, U.S.A.

INTRODUCTION

In June, 1982 from the 13th to 17th, an inspection was conducted of the Mining and Milling operations of Arizona Silver Corp. in the White Hills, Arizona, U.S.A. The writer was accompanied on this inspection by Messrs. R. Martin and C. Coe of Arizona Silver and by members of the mine staff.

The underground workings of the G.A.R. Mine were inspected, the Mill was inspected and a review of production records was made.

MILL and PLANT

Fully equipped Mill and Plant facilities now exist in the property. Ore is fed to a crushing-screening plant where a coarse and a fine product is separated after crushing and forwarded to the leaching plant. Tailings from the old G.A.R. dump is screened only. At the time of inspection the Mill was processing G.A.R. Mine dump and tailings. Recoveries from this relatively low grade material were in the 75-80% range.

Extraction is in two operations. Coarse material (3/16 inch) is placed in two leaching ponds where it is soaked in cyanide solution for 5 days: average throughput in this operation is 100 tons per day. Fine material is processed in two agitation tanks, also in cyanide solution. These tanks are currently processing 50 tons of ore per 8 hour shift, on full production they should handle about 200 tons per 24 hour day. Current extraction costs, including haulage, are $8.40 U.S. per ton. Projected costs for a 24 hour per day operation are $5.50 per ton.

Pregnant cyanide solutions are processed in a zinc loaded extraction plant which takes the gold and silver out of the solution in a filter press. The gold and silver is processed into Dory bars on site for shipping and/or storage. Tailings have been found to contain considerable mercury from old extraction processes and a retort has been constructed to recover this mercury for both economic and anti-pollution reasons.

The plant also contains adequate workshop and assay laboratory facilities to service the White Hills operations. Housing in trailers is provided for live-in personnel.

At the time of the inspection there was approximately 3,000 ozs. of Dory bar held in storage and 3,500 ozs. of material in the extraction filter presses ready for melting to Dory bar form.

Repair work on the reservoir has been completed and pumping from the G.A.R. Mine was in progress. The reservoir has about 1 million gallons of storage capacity.

G.A.R. MINE

The G.A.R. Mine has been completely rehabilitated. A two compartment 370 foot timber lined vertical shaft and new headframe have been completed. Underground levels have been cleared of debris and retimbered where necessary.

Development work has consisted of an 80 foot raise from the 400 foot level and over 400 feet of development drifting on an inclined slusher drift. This development work is designed to open ground below the old G.A.R. inclined shaft where high grade (up to 80 oz./ton silver) material was stoped out in production earlier in this century. The development drift was expected to have to proceed a further 200 to 250 feet to the area of interest at the time of inspection.

Long hole drilling from the underground workings on the G.A.R. has been successful in delineating the three vein structures but has shown considerable downthrow of the veins north of the main G.A.R. fault. This development is of interest in that it gives new exploration life to the northern workings of the mine at deeper (100 feet plus) levels than thus far reached.

Mineralization in the workings is very erratic with small areas of high grade material having been noted and some significantly high gold assays particularly having been taken from isolated areas. No fully developed ore shoots have been encountered through values found auger well for prospects as the drift reaches below the G.A.R. inclined shaft.

The mine facilities are quite adequate at present to handle full production from the G.A.R. inclined shaft area when stopable ore material is reached.

Production of tailings and mine dump material is continuing with adequate mill supply from the G.A.R. tailings pond and dump for at least three months' mill feed. Dump material from other old workings owned by Arizona Silver Corporation (e.g. Norma, Schaeffers Treasure, Daisy and Prince Albert) will provide considerable mill feed of economic grade which is immediately accessible. Sampling of these dumps to date has shown them to be economically productive though tonnages, apparently significant, have not yet been defined.

PROPOSED EXPLORATION and DEVELOPMENT

Work on the G.A.R. Mine should continue on the course established. The development of the area below the inclined shaft is expected to develop significant ore potential. Further underground drilling below and laterally from current workings is proving to be a good exploration method for both geological mapping and interpretation and for ore definition. The underground drilling programme should continue.

An induced polarization survey has been conducted over most of the company's lands. The survey was of a broad scale exploratory nature and has indicated three large anomalous zones. Proposals for development and definition by further I.P. surveying and by drilling have been submitted to the company.

The potential for developing new tonnages of ore material both in the G.A.R. Mine and on other parts of the property are considered good. Current plant capacity should be capable of handling additional tonnages produced.

Respectfully Submitted,

D. P. Taylor, P.Eng.

VANCOUVER, B.C.
July 15, 1982

LETTER OF CONSENT

I, DAVID P. TAYLOR, residing at 1884 West Seventh Avenue, Vancouver British Columbia, do hereby consent to the use of my Progress Report on the:

Mining and Milling Operations

White Hills Property

Mohave County, Arizona, U.S.A.

dated July 15, 1982 in any Prospectus or Statement of Material Facts by Arizona Silver Corporation.

I have no interest, nor expect to receive any interest in Arizona Silver Corporation or any of the properties of that Company.

DATED at Vancouver, British Columbia this 15th day of July, 1982.

D. P. Taylor, P. Eng.

March 10, 1983

ADDENDUM TO THE REPORTS OF D.P. TAYLOR, P. ENG.
ON THE WHITE HILLS, MOHAVE COUNTY, ARIZONA, U.S.A.
PROPERTIES OF ARIZONA SILVER CORP.

TO THE DIRECTORS OF ARIZONA SILVER CORP.

Dear Sirs:

I would like, first, to give you a summary of the development of your property since I started to work for you three years ago..

Prior to my involvement with your White Hills, Arizona, U.S.A. operations, reports had been prepared on these properties by G. Gutrath, P. Eng., (January 1978) and J.J. Oberbillig (April, 1979). Recommendations made in these reports have been subsequently satisfied, specifically Oberbillig's recommendations regarding the upgrading and expansion of your leach-beneficiation plant, and Gutrath's recommendations regarding rehabilitation of the G.A.R. Shaft on your property and testing of other known showings on your property.

The work conducted to date has concentrated on your leach-mill operation and on the G.A.R. Shaft and has been successful, particularly in the instance of the milling of ore. The mill has very successfully handled not only your own ore from old dump material but also product from the Hulda Mine on the adjacent property of Continental Silver Corp.

I have now visited your operations five times and have witnessed a steady improvement in the prospect toward a viable profitable operation on your ground. The mill is now at full production capability. The G.A.R. Mine requires upgrading to State requirements, spelt out in detail following; the underground development work in the G.A.R. has been successful in finding and partially developing ore potential. The property is amenable to geophysical and geological exploration, as defined in my July, 1982 report. New targets should be found on completion of this work.

Underground work and long hole drilling in the G.A.R. workings have indicated areas of significant economic interest to be opened up and further explored.

I have, once more, inspected your White Hills operations. Although little work of significance has been done on the G.A.R. since my last visit the workings are in very good condition; the milling operation is capable of working at 24 hour/day capacity with excellent efficiency.

However, the State of Arizona is going to require certain upgrading of the G.A.R. Shaft facilities to satisfy State Law, as the State mine inspectors now consider this operation sufficiently advanced to be a "development" rather than an "exploration" project.

My observations from this visit are as follows:

On my last visit to your White Hills properties in Mohave County, Arizona, U.S.A., I inspected the milling and underground facilities of your company.

On all counts the operation appears to be in excellent condition and has been well run by your employees.

My inspection took place on 25 - 26 of February, 1983. No significant work has been conducted on any underground workings since my last visit to the property in June of 1982.

As you are aware, shortly after my June, 1982 visit it was deemed by the Arizona State Mines Department that the G.A.R. workings were no longer considered by the Department to be exploration but development workings.

Unfortunately under State Law, several new pieces of equipment and a general upgrading of your shaft facilities are required under Arizona law to facilitate legally reopening the G.A.R. underground workings.

The G.A.R. shaft work that has been done to date is of excellent quality, however the new equipment needed to satisfy the State requirements will be quite expensive.

The shaft itself will require full equipment to change it from a one to a two hoist compartment facility. This will require new hoisting equipment, a new, second cage, safety equipment on the current cage, a second hoisting gear, a more powerful generator and a general upgrading of existent equipment.

During my visit I inspected the State Department requirements and my estimate of costs to bring the G.A.R. mine to State requirements for a developing mine (also in effect, a producing mine) is as follows. Fortunately there is a more than adequate hoist on the property that can be utilized for this job.

1 - 50 Kw generator		$40,000	
Rewiring and new Panel		14,000	
New cage with safety equipment		13,000	
Safety equip present cage		7,000	
Hoist installation		5,000	
Completion of second shaft compartment		30,000	
Material and labour 4 men x 30 days			
Recondition compressor		8,000	
Replace ventilation system		7,000	
Replace hoist cables		10,000	
(1000 feet x 7/8 inches)			
Recondition underground pumps		3,000	
		$137,000	U.S.
Contingencies at 15%		20,550	
		$157,550	U.S.
	Say	$160,000	U.S.

As I have said, these are the requirements that are needed to bring the G.A.R. workings up to Arizona State standards for what the State now deems a development rather than an exploration project.

Respectfully submitted

D.P. Taylor, P. Eng.

Vancouver, B.C.
10 March, 1983

GEOPHYSICAL REPORT

ON THE WHITE HILLS 1-28 & 38-62

AND THE PAT 1 and PAT 2 CLAIMS

WHITE HILLS AREA

INDIAN SECRET MINING DISTRICT

MOHAVE COUNTY

ARIZONA, U. S. A.

BY

D. P. TAYLOR, P. ENG.

VANCOUVER, B.C.

JULY, 1982

TABLE OF CONTENTS

MAPS (In Pocket)

WHITE HILLS PROPERTY - Surface Plan with Grid

I.P. GEOPHYSICAL SURVEY - 2 Sheets

INTRODUCTION

The White Hills area was inspected by the writer during the period 13-17 June, 1982. Specifically to this report the White Hills 1-28 and 38-62 and the PAT 1 & 2 claims, located on the White Hills ground, Indian Secret Mining District, Mohave County, Arizona, U.S.A. and data pertaining to these claims was inspected at that time and has subsequently been reviewed. A third phase of exploration is recommended for the property.

The writer was escorted on this inspection by senior personnel from the operations of Arizona Silver Corporation and Continental Silver Corp., companies currently producing on adjacent properties in the White Hills.

LOCATION AND ACCESS

The property is located in the White Hills range, Mohave County, Arizona. The claims are 60 miles south of Las Vegas, Nevada and 60 miles north of Kingman, Arizona, the county seat. There is good road access to the entire property.

TOPOGRAPHY AND CLIMATE

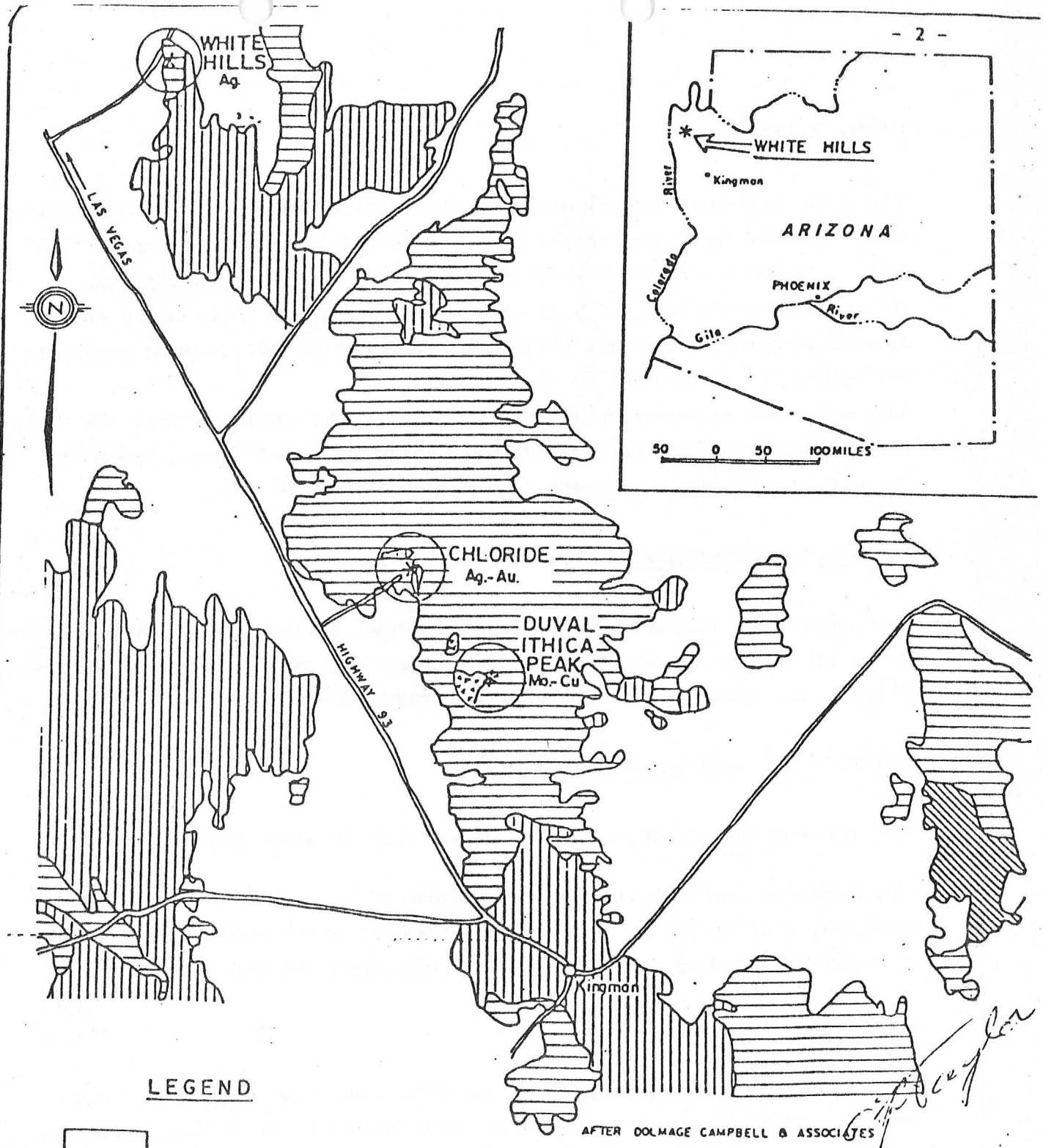
The property lies mainly on detrital desert flats at about 1100 meters A.S.L.

The climate is arid with summer temperatures of up to 120° F. Winter temperatures may drop to 20° F. The climate allows for year-round operation. Water is available from deep mine workings or wells about 450 feet of depth.

PROPERTY

The properties under discussion are the White Hills 1-28, White Hills 38-62, PAT 1 and PAT 2, unpatented mineral claims located in the Indian Secret Mining District, Mohave County, Arizona, U.S.A.

Records in the county Court House at Kingman, Arizona show the claims to be registered in the name of Corval Development Inc., a wholly owned subsidiary of Arizona Silver Corporation(acquired from Weasel Enterprises Ltd. pursuant to an Agreement dated March 17, 1978)and shows the claims to be in good standing by recording of assessment work until August 31, 1982.



LEGEND

- ALLUVIUM
- GRANITE - TERTIARY
- VOLCANICS - TERTIARY & CRETACEOUS
- SCHIST - PRECAMBRIAN
- GRANITE GNEISS - PRECAMBRIAN

AFTER DOLMAGE CAMPBELL & ASSOCIATES

CORVAL RESOURCES LTD.

WHITE HILLS SILVER PROPERTY

ARIZONA, U.S.A.

REGIONAL GEOLOGY

MILES 20 10 0 20 40 MILES

HISTORY

High grade silver mineralization was discovered in the White Hills mining camp in 1892. Direct shipments were made during this early period valued up to $1500 per ton in silver at present metal prices. Numerous other veins were discovered and by 1893 there was a ten stamp mill working on the property. Between 1892 and 1907 it is estimated that 8,000,000 ounces of silver were mined. Production ceased in 1907.

In the early 1930's the Hulda was leased by Floyd R. Brown. Approximately 732 tons of ore grading 80 to 104 oz. silver were shipped from the Hulda shaft area.

In 1968, the main key claims in the White Hills area silver camp were acquired by Consolidated Mineral Inc. A Vancouver based company, Buffalo Lake Mines Ltd., obtained an option on the property from Consolidated and proceeded with an extensive program of exploration and development work. The G.A.R. incline was rehabilitated and a batch-leach plant was built to treat the old mine dumps. The leach operation was not successful and Buffalo Lake terminated its option on the property. In 1977, the Hulda Group was acquired by Continental Silver Corp.

During the last 5 years exploration work on the Hulda claim as recommended by J.J. Oberbillig, P. Geol., through Phase III of his July 1978 report has been completed, and also Phases I and II of G. Gutrath, P. Eng., report of July 1978 have been completed on the Gotcha claims.

A report dated May 1980 by D.P. Taylor, P. Eng., (the writer) recommended induced polarization surveying and drilling for the claims. Wide space I.P. surveying has been completed on the property and further work is recommended. This work has covered recommendations by G. Gutrath, P. Eng., Phase I and II of his programme as defined in his report of January, 1978.

GEOLOGY

The area is underlain by a Pre Cambrian gneissic granite containing northwest

GEOLOGY (continued)

to westerly striking fissure-vein zones. These zones vary in dip from 20° to 80° northerly.

Silver mineralization occurs as chlorides and oxides in veins of quartz, hematite, limonite, and manganous oxides. Veins in the area have been worked to 500 feet of depth in oxides. Only traces of sulphides have ever been noted on surface.

It has been noted that silver grades are localized in ore shoots and also that considerable surface leaching of both gold and silver is evident in the upper zones of vein structures in the area.

Telluride gold appears to exist in the area. Samples from depth show increases in gold and tellurium values; gold tellurides are known to be soluble and subject to downward transport.

Large amounts of pyrolusite are common with silver mineralization and make I.P. a useful tool in ore search.

GEOPHYSICAL SURVEY

The survey was conducted during the spring of 1981 by a private contractor, Jim Sorrel of Tuscon, Arizona. Equipment used was a Western I.P. Model X-1 time domain machine. Grid lines were established over the entire White Hills area at 500 foot spacings. The entire area was surveyed using a 200 foot Wenner array, power was by battery supply.

This report shall specifically deal with that part of the survey covering the White Hills claims.

Much of the survey on the White Hills claims appears to have read only overburden, that is assumed from areas having a 2.0 millisecond decay time. Some areas of anomalous interest have developed on the claims. Bedrock response is

GEOPHYSICAL SURVEY (continued)

assumed to be in the 4-6.5 M.S. range. Areas of longer decay readings are assumed to reflect response to alteration zones, structural features (predominantly faults), instrusive ridges beneath overburden or areas of underground water flow. Many of these conjectural features should be related to one another and possibly would be related to mineralization, as these features are known to be in underground workings in the area.

These main anomalies have resulted from survey work conducted to date. The following is a result, in part, of discussions of the data between the writer and David Mark, Geophysist of Geotronics Surveys Ltd. of Vancouver, B.C.

The most prominent anomaly is on Line 7 between Stations 19S and 45S. This long linear feature is unusually long and was run twice to assure validity. A subjective assessment would be that it is caused either by a major north-south fault or by a subsurface topographical ridge, possibly of instrusive into a fault. Both features would be of mineralogical interest.

A second anomaly on Line 8 is centered at Station 55S. This anomaly is believed to be bedrock response and has a distinct west-northwesterly trend over between 1000 and 1500 feet long, this geographical trend is the same as that of the G.A.R. Mine to the northeast.

The third anomaly is that found on Line 4. The strongest response on this line is in the area of Station 8S, the feature extends southward to about 28S. The anomaly has a strong north-south directional component with notable east-westerly components around Station 8S. Shallow I.P. in this area (100 and 50 foot dipole spacings) are not as well defined as the standard readings but also indicate some anomalous response. Readings on this line were double checked to assure their validity.

One test set of data was taken on Line 3, using a 1000 foot dipole spacing and got good response at that depth. The suggestion is that to the west, away from the hills, deeper levels must be reached to receive bedrock response.

CONCLUSIONS

I.P. surveying on the White Hills claims has delineated three features warranting further investigation by drilling and has shown the validity of I.P. as an exploration tool on the White Hills claims. Further I.P. on closer line spacings and with variable dipole spacings should further define these features and possibly find new anomalies.

Drilling is going to be necessary to define what features and/or mineralization is causing the I.P. responses. As suggested in my May, 1980 report, reverse circulation drilling is recommended as the most effective type of drilling in this area both in terms of sample recovery and cost effectiveness.

RECOMMENDATIONS

Further induced polarization surveying in conjunction with reverse circulation drilling is recommended as a Phase 3 Exploration Program for the White Hills claims. An I.P. crew should be placed on the property for a period of one week to test the known anomalies thoroughly to define their extent, ovientation, and profile to depth.. Anomalies defined should be tested by reverse circulation drilling with bedrock samples being systematically assayed. Assaying may be conducted at the plant laboratory of Arizona Silver Corporation. Drill holes should penetrate at least 75 feet of bedrock, hole depths will vary but a nominal depth of 250 feet is being assigned to all holes.

Cost of the above programme are expected to be as follows, all figures are in U.S. dollars:

I.P. Survey

7 days in field @ $500/day		$ 3,500	
Data preparation and report		4,000	
Travel and Board		4,000	
		$ 11,500	
Contingencies @ 15%		1,725	
	Total	$ 13,225	$13,225

RECOMMENDATIONS (continued)

Drilling

6 holes x 250 feet @ $15/foot		$ 22,500	
Supervision and Sampling		5,000	
Assaying		3,000	
Engineering		2,000	
		32,500	
Contingencies @ 15%		4,875	
	Total	$ 37,375	$ 37,375
	TOTAL		$ 50,600
		SAY	$ 51,000 (US)

Further work on the White Hills claims should follow a professional assessment of the results of this programme and be conducted on the recommendations of a consultant.

Respectfully Submitted,

D.P. Taylor, P. Eng.

Vancouver, B.C.

July 8, 1982

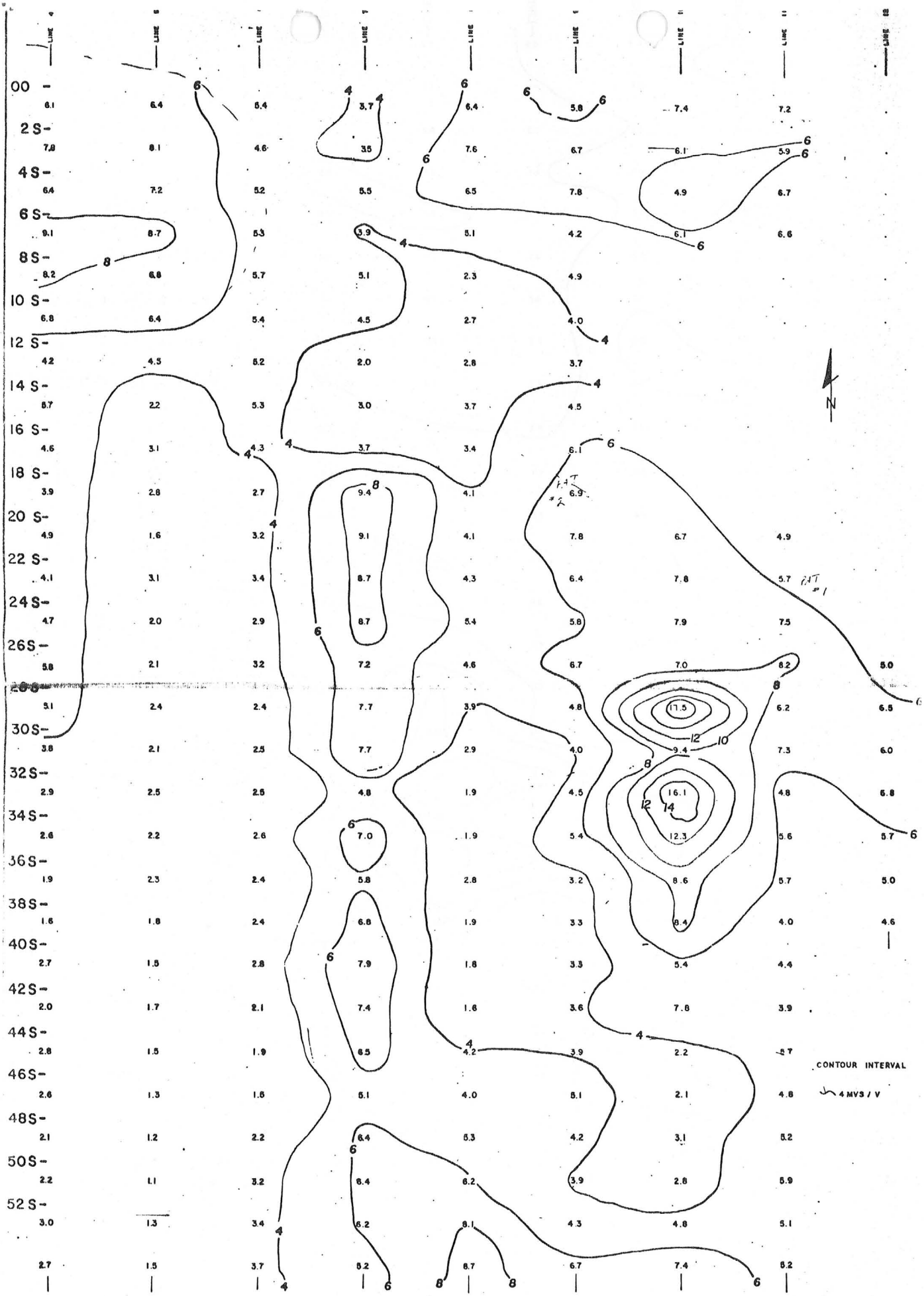
CERTIFICATION

I, David P. Taylor, residing at 1884 West Seventh Avenue, Vancouver British Columbia, do hereby certify THAT:

1. I am an exploration geologist residing at the above address.
2. I am a registered member, in good standing, of the Association of Professional Engineers of the Province of British Columbia.
3. I am a graduate of the Royal School of Mines, London University M. Sc. (Mineral Exploration), 1971.
4. I have practised as an exploration geologist for fourteen years.
5. I have no interest, nor expect to receive any interest in Arizona Silver Corporation or any of the properties of that Company.
6. I consent to the use of this report in any Prospectus or Statement of Material Facts by Arizona Silver Corporation.

DATED at Vancouver, British Columbia this 8th day of July, 1982.

D. P. Taylor, P. Eng.



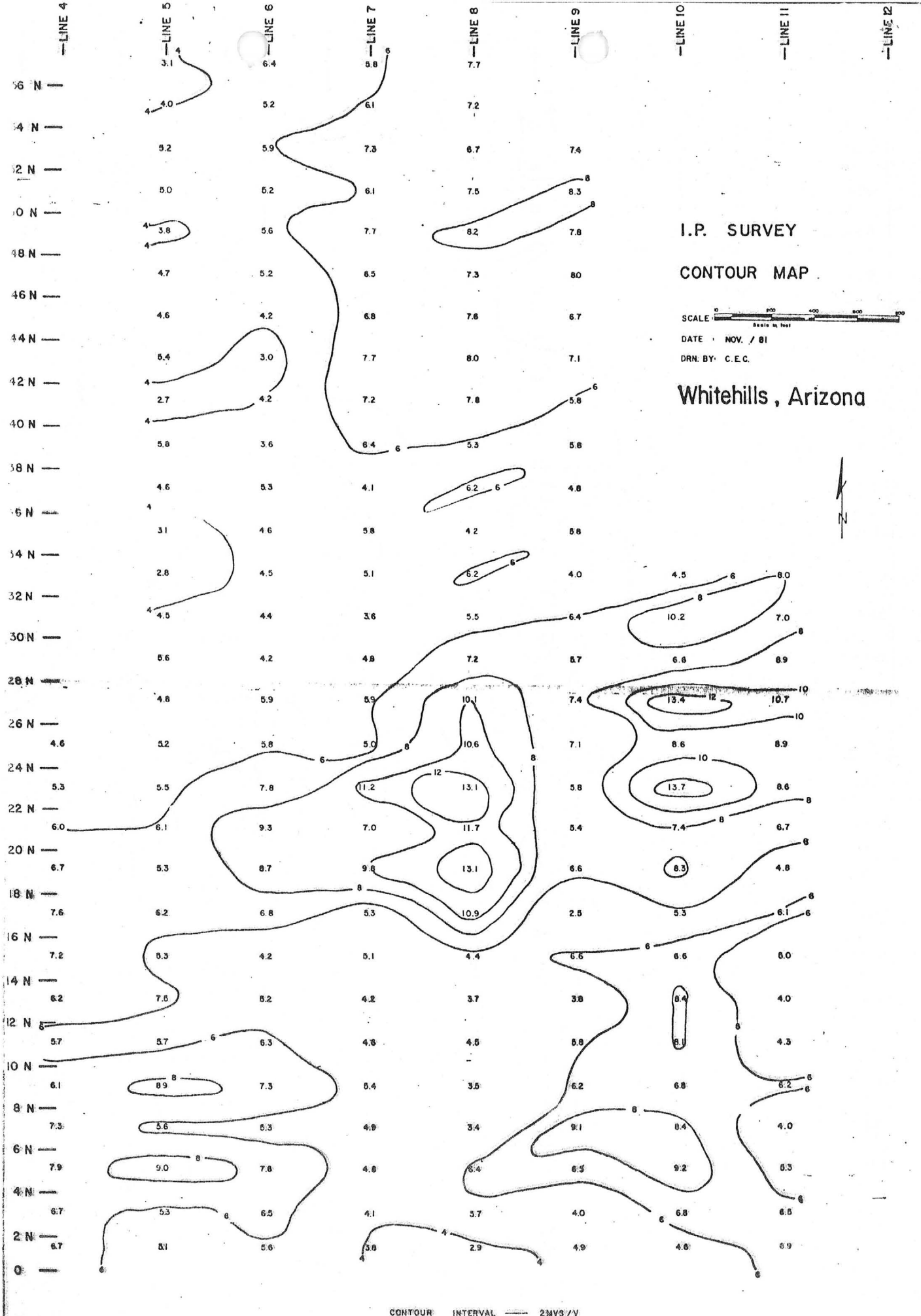
I.P. GEOPHYSICAL SURVEY

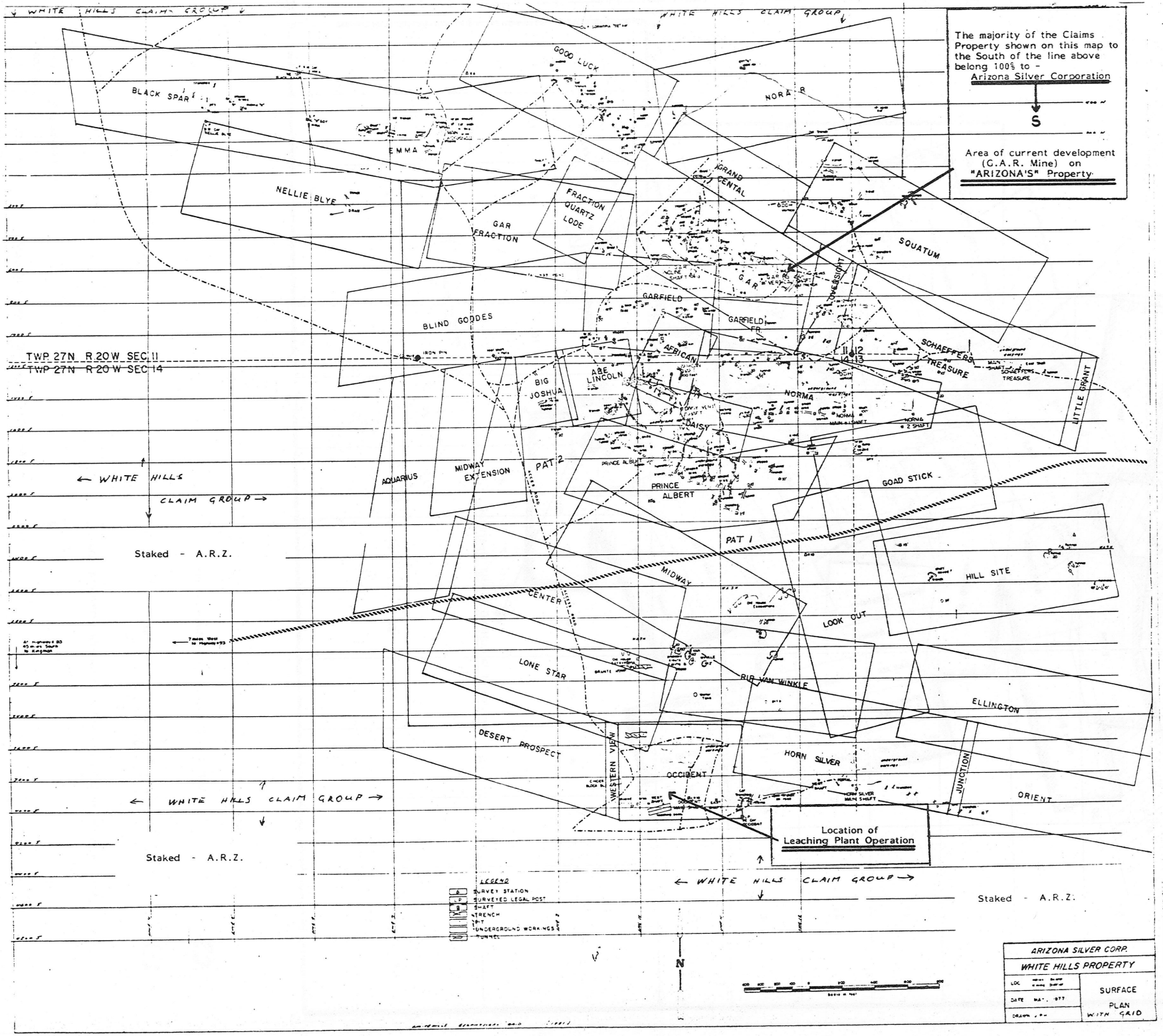
WHITEHILLS, ARIZ.

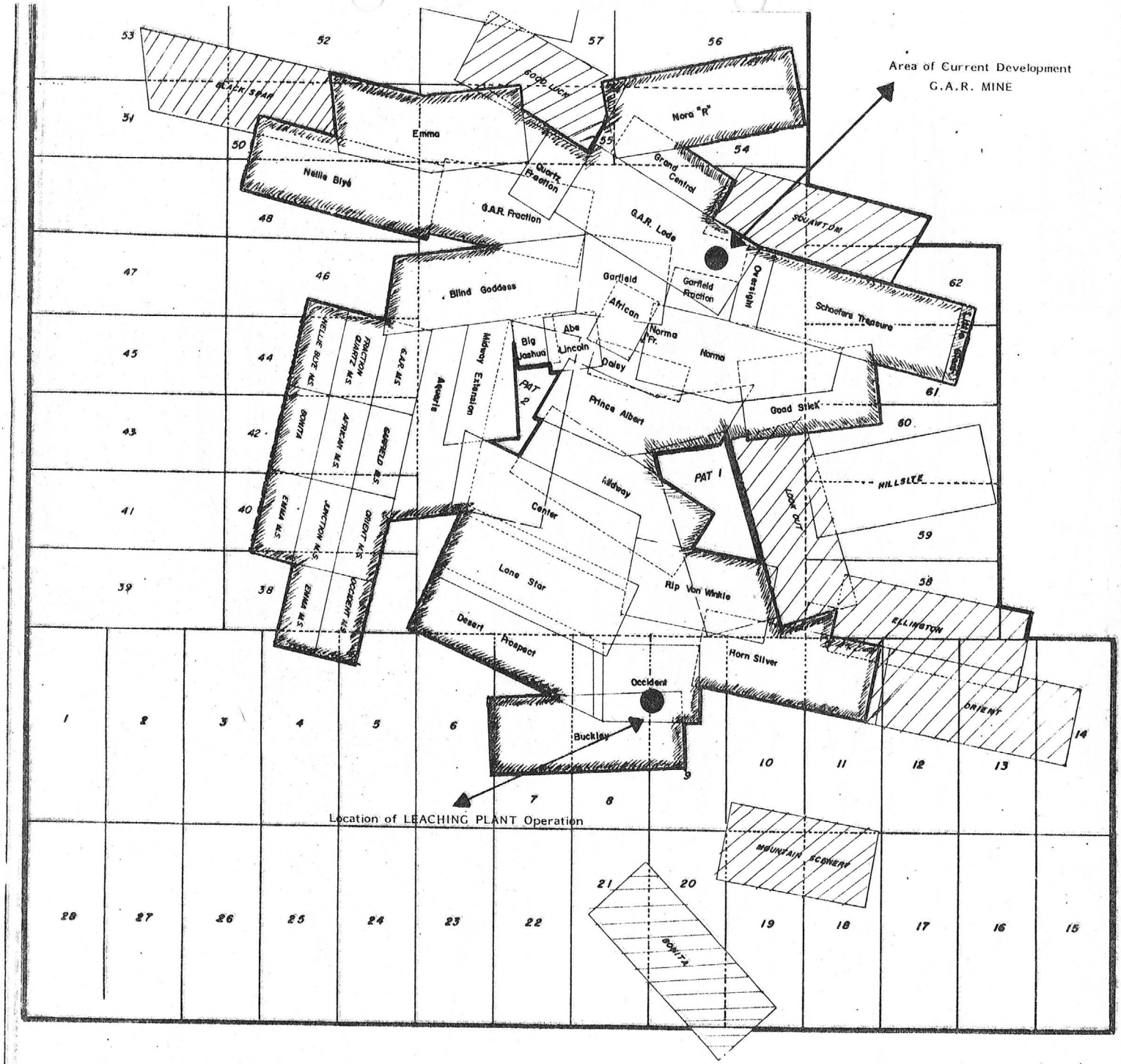
SCALE

DATE

ARIZONA SILVER CORPORATION


LINE 4
LINE 5
LINE 6
LINE 7
LINE 8
LINE 9
LINE 10
LINE 11
LINE 12
56 N
54 N
52 N
50 N
48 N
46 N
44 N
42 N
40 N
38 N
36 N
34 N
32 N
30 N
28 N
26 N
24 N
22 N
20 N
18 N
16 N
14 N
12 N
10 N
8 N
6 N
4 N
2 N
0
I.P. SURVEY
CONTOUR MAP
SCALE
DATE : NOV. / 81
DRN. BY: C.E.C.
Whitehills, Arizona
N
CONTOUR INTERVAL — 2MV3/V


WHITE HILLS CLAIM GROUP
WHITE HILLS CLAIM GROUP
The majority of the Claims Property shown on this map to the South of the line above belong 100% to - Arizona Silver Corporation
S
Area of current development (G.A.R. Mine) on "ARIZONA'S" Property
BLACK SPAR
EMMA
NELLIE BLYE
GOOD LUCK
NORA R
GRAND CENTRAL
FRACTION QUARTZ LODE
GAR FRACTION
SQUATUM
GAR
GARFIELD
BLIND GODDES
GARFIELD FR
DIVERSION
SCHAEFFERS TREASURE
AFRICAN
ABE LINCOLN
BIG JOSHUA
NORMA
DAISY
LITTLE GRANT
TWP 27N R 20W SEC 11
TWP 27N R 20W SEC 14
← WHITE HILLS CLAIM GROUP →
Staked - A.R.Z.
AQUARIUS
MIDWAY EXTENSION
PAT 2
PRINCE ALBERT
GOAD STICK
PAT 1
HILL SITE
MIDWAY
CENTER
LOOK OUT
LONE STAR
RIP VAN WINKLE
ELLINGTON
DESERT PROSPECT
WESTERN VIEW
OCCIDENT
HORN SILVER
JUNCTION
ORIENT
Location of Leaching Plant Operation
LEGEND
SURVEY STATION
SURVEYED LEGAL POST
SHAFT
TRENCH
PIT
UNDERGROUND WORKINGS
TUNNEL
N
ARIZONA SILVER CORP.
WHITE HILLS PROPERTY
SURFACE PLAN WITH GRID



LEGEND

WHITE HILLS 32 Patented Mining Claims

WHITE HILLS 1 - 28; 38 - 62;
Pat 1 & Pat 2 Mining Claims

These Claims do not belong to ARIZONA SILVER CORPORATION

N

Scale in feet

CORVAL DEVELOPMENT INC.
WHITE HILLS PROPERTY
U/K Yuma County Mining District
DATE: MAY, 1977
DRAWN J.P.H.

CLAIM MAP

Memorandum: To Mr. George Tower.

A Preliminary Report on the Silver Mines

At White Hills.

Indian Secret Mining District.

Mohave County, Northwestern Arizona.

G.M.Ellis.

April 19, 1964.

Table Of Contents:

INTRODUCTION:

A fitting description of White Hills could well be the Following: It was once a Bonanza deposit; a boom camp where mining of silver was confined to the oxidized zone and was carried out to relatively shallow depths. Because no development work was planned in coordination with mining, and underground work was chiefly that of stoping, the period of activity lasted about ten years.

When miners stoped out a pocket or body of ore they did not look for more by underground exploration, instead they went immediately to another body of ore. When the unusually rich silver chloride in sight was mined out, no attempt was made to outline reserves, and so White Hills became a ghost town. It is todayessentially, as it was in 1909 when it was visited and described by F.C. Shrader of the USGS.

The fifteen mines , located eight miles by a good, unsurfaced road from the highway, lie in a diameter of two miles surrounding the ghost town of White Hills. They produced approximately $1 million per year for a period of ten to twelve years as certified by F.C. Schrader (during 1895-1905) and by the returns of the Kingman,Arizona Smelter.

The mines are situated in a basin of gentle relief on the west slopes of the White Hills in the Indian Secret Mining District. What follows is a brief description of the geology and history of that part of Mohave County, Arizona, as described by Schrader and as observed during two years of prospecting and exploration in the area by the author and his brother, (Gerald and Fritz Ellis), who were representing Mr. Charles Steen.

In 1909 F.C. Schrader of the USGS was sent to Mohave County by Lindgren to study and prepare a report on an area about which very little was known. His report: "Mineral Deposits of the Cerbat Range, Black Mts., and Grand Wash Cliffs, Mohave County, Arizona, (US Geological Survey Bulletin 397), 1909" describes the mines as they were then and still are today.

Part II: Brief History of Mohave County, Arizona:

In the early 1860's a Mexican prospector named Joe Martinez , grubstaked by a Kingman merchant, discovered a gold vein in the Oatman district of the Black Mts. while looking for his burro which had wandered away from his camp. The gold vein discovered by this prospector later became the famous Gold Road Mine.

This discovery brought on an invasion by prospectors from the California and Nevada gold camps. Oatman and Gold Road became mining towns, housing and supplying the many men who opened the gold deposits of the Black Mts., among which the most productive mines became the Tom Reed and the Gold Road.

Some of the prospectors had ventured further east into the Kingman area, and on north into the Cerbat Mountains. The Hualapai and Paiute Indians presented at first a formidable obstacle; however, by the late 1860's these Indians were eventually defeated by the unending waves of prospectors that continued to pour into t[illegible]rea. They were

attracted by the news of the discoveries of high grade silver and gold. "Chloriders", as these early silver prospectors were referred to, founded the towns of Chloride, Cerbat, Stockton Hill, and Mineral Park in the Cerbat Mts. These towns were all within a few miles of each other, on both flanks of the Cerbats, and about 25 miles north of Kingman.

In the early 1870's ores of lead, zinc and copper were found beneath the gold and silver portions of these deposits. Of major importance was the copper. It was so rich that in spite of the high costs of transportation to Swansea, Wales, profits were realized. Ore was transported by covered wagon to the Colorado River, thence by barge to California, and shipped by freighters around the tip of South America to Wales. The costs of transportation and treatment amounted to several hundred dollars per ton. This arrangement continued until later in the period when it became feasible to treat the ore in San Francisco and in New Mexico.

Mining progressed for years until 1892 when high grade silver was discovered in White Hills. During the brief history of this area many miners were active extracting the rich horn silver and native silver which characterized the deposits. Again, a third invasion by prospectors from the California and Nevada camps hit this latest zone.

With mining activity booming in three distinct areas: Oatman, the Chloride district, and White Hills, Kingman became the supply center and eventually the county seat of Mohave County.

In Oatman, 25 miles west of Kingman, gold mining continued intermittently up until 1942 when the last mine, The Gold Road, closed down due to a war production regulation. Since then it has become a ghost town. All the gold mining operations ceased. The only activity today is

that of Americana Investment Inc. which recently erected a mill to recover gold from the approximately one million ton Tom Reed gold mine tailings dump.

In the Chloride district of the Cerbat Mts. (Chloride, Cerbat, Stockton Hill, Mineral Park) mining was intermittent for many years. Some of the mines closed down after the miners encountered complex ores. The last mining was seen in the early years of World War II when the Tennessee Mine closed down. (Originally the TenneSSee was a silver-gold deposit which later became a complex -ore body; mining had been stopped at the 600 foot level in barren rock. New management deepened the shaft through the barren zone and encountered ore at 1000 feet and mined down to 1600 feet at the time the operations ended).

Chloride, Cerbat, Stockton Hill and Mineral Park became ghost towns. (They are referred to as the Chloride district).

The only mining activity today here is in the Mineral Park area. In the late 1950's and early 1960 Kennecott Copper(Bear Creek) did a considerable amount of sampling and drilling in a large area of Mineral Park. After giving up the property, Duval Sulphur and Potash moved in and acquired the prospect. At the time this writer left Mohave County Duval Sulphur and Potash had completed two years of diamond drilling, had outlined a large ore body, and today stripping operations are under way. What had once been a district known for gold-silver- copper-lead and zinc vein deposits, is today a large, low -grade , copper-molyb - denum deposit to be mined by open pit methods. This will be the first type of mining operation by open pit in the northwestern part of the State.

The White Hills, located north of the Chloride district, was active during the period 1895-1905. In more recent times work there was undertaken by Charl Steen on a small scale, and the results added little to what was written about the district 1909

Part III - An Outline Briefly Describing the Geology in Several Districts:

Black Mts: Located west ofnKingman,(West of the Colorado River), are the Black Mts., a range which runs N-S. Deposits are in Tertiary volcanic rocks and are deeply oxidized. As a rule there are no sulphides. The values are in gold. There are no base metals present. The water table is present at about 700 to 800 feet.

Cerbat Range: This range is located East, North and South of Kingman, (East of the Colorado River), and it extends also N-S. A fifteen-mile-wide valley(Hualapai Valley) and a ten-mile-wide valley(Big Sandy Valley) separate the northernmost and southernmost ends of the Cerbat Mts. from the Grand Wash Cliffs(where the Colorado Plateau begins). To the East

This range is 30 miles long, lo miles wide, high, and rugged; it is made up in large part of a pre-cambrian granitic complex, intruded by post Paleozoic intrusives (granites, pegmatites, aplites, amphibolitic dykes, porphyries), and overlain by volcanics. The Range is a broken one: Just north of Kingman are (a) the Cerbat Mts , which is that part of the Cerbat Range comprising the district of Chloride (or the areas of Chloride-Cerbat-StocktonHill- Mineral Park) where the deposits consist of gold-silver and base metals, and where extensive deposits were mined to a depth of from 199 to 600 feet. The sulphide primary ores are present at a shallow depth; the water table is present at about 300 feet..

The extent of mineral deposition in just this part of the Cerbat Range known as the Cerbat Mts. is most impressive. The four areas of Chloride-Cerbat-Stockton Hill- Mineral Park are close to one another

and there are about 70 (seventy) mines on the deposits, located on both flanks, in the canyons and in the flats off the flanks.

Just south of the Cerbat Mts. are (b) the part of the Cerbat Range known as the Hualapai Mts. which are characterized by deposits not unlike those mentioned above. Located 15-20 miles So. of Kingman. Being drilled by Bear Creek and CLIMAX MoLy. for Cu. Mo in 1962.

Just north of the Chloride district, or more properly stated, north of the Cerbat Mts. are the northernmost extensions of the Cerbat Range, (c) the White Hills: they are lower in elevation than the more rugged mountains to the south. The only minerals known here were the oxidized ores of silver. Much regarding the depth to the water table, and to the primary sulphide ore zone is not known. The highest elevation here is about 3,0000feet compared to 6,000 feet in the mountains to the south. The deposits at White Hills lie at the Base of the Range. A very low, detritus-filled pass separates the White Hills from the Cerbat Mts.

Part IV: History- Geology and Mining- at White Hills: 1895-1965

The country rock at White Hills is light-coloured, medium-grained gneissoid granite containing garnet with some dark amphibolite schist. To the east this complex is overlain by Tertiary volcanic rocks.

The deposits are in the gneissoid granite and are in quartz veins.

Some of the veins are blanket veins, others are low - dipping, to steep-dipping(20 to 80 degrees), and they averaged in width three feet at the surface. Associated with these veins were very great amounts of manganese and iron oxides. The ore was oxidized, chiefly chloride of silver and native silver, with local values in gold.

In 1892, an Indian named Hualapai Jeff showed Henry Shaffer a rich sample of silver ore. At the time Shafer was prospecting and mi ning in Gold Basin (near the Grand Wash Cliffs) with two partners named John Burnett and John Sullivan. The Indian, Hualapai Jeff, took Shaffer to an area to show him where the silver had come from, for it was the source of the great quantities of iron oxide which the Indians had used for face paint. In all the years of mining in Mohave County this one region had never been seen by anyone. This district had been kept secret by the Indians. Henry Shaffer saw at last the source of both the silver and the iron oxide, and named the rich outcrop "Shaffer's Treasure". This was the beginning of the great era of the White Hills camp. Shaffer rushed to his partners with the news.

The first ore shipped from this place was by Shaffer and his two partners: it averaged $1000 (one thousand) per ton. Prospectors rushed to the area and by 1894 White Hills had become the largest camp in Mohave County, with a population of 1200.

A company was formed: "The White Hills Mining Co." by two Denver men named Moffatt and Root. Mining was performed by company miners and also by a system of leasees, with up to 500 leasees working at the camp. Moffatt and Root set up a ten stamp mill to work the lower grade dumps which had accumulated. The higher grade ore was shipped to the smelter in Kingman.

A 19 ton carload of the ore shipped to the smelter in 1894 is reported by Schrader in his USGS Bulletin to have contained 29,000 ounces (twenty-nine thousand) of silver and 80 (eighty) ounces of gold. There were in some instances rich sections inside the ore shoots which assayed 6,000 and 7,000 ounces of silver to the ton. All veins were mineralized and were usually rich; they were reported to average $200 per ton in silver.

In 1895 Moffatt and Root sold the property for $1½ million to the White Hills Mining and Milling Co., an English group with offices in London and in Colorado Springs.

This company installed a 40 stamp mill, built 7 miles of 7" wooden pipe lines, two large reservoirs, installed electricity, established a telephone system, and built about 20 houses. For power coal was hauled in from Kingman by wagon; also Joshua trees and palm yuccas supplied the fuel for the steam hoists at the mines. The 40 stamp mill was not operated to full capacity, because only a moderate amount of ore was in sight, as there was a lack of development work. The English company had spent a great deal of money and did not not meet its final payments Thereupon, the White Hills property was put up for Sheriff's sale and the mines were bought back by the former owners Moffatt and Root in 1904.

Litigation between these two men and their families kept the property tied up in and out of court from 1904 to the late 1920's. No serious work was undertaken outside of the period 1894-1904 (or 1895-1905) except for occassional attempts by leasees to work on a small scale.

Although there was no mining activity on a large scale since 1904, and all the miners left White Hills, there was always a watchman employed at the property up until 1946. In the late 1920's the titles had been cleared and the patented claims were owned by a group of individuals.

Mr. Samuel Withers who during the height of mining had charge of the

ore-buying for the Kingman Sampling Works said that during a period of 27 months he bought 2,250,000 ounces of silver in the ore from White Hills alone,(this does not include about 1,000,000(million)ounces of silver in bullion produced by the mill at White Hills and shipped to the refinery. Withers said that during a 9 year period about 8,000,000(million) ounces of silver were produced at the White Hills mines; he considered this a conservative estimate and did not include the gold production.

Not only did the two mining companies that operated in the area produce a great quantity of silver, but it was said that the individuals working as leasees made fortunes ranging from a few thousand to many thousands of dollars each from the surface workings.

From the air or on the ground one becomes impressed by the great number of workings as far as one can see: dumps, drifts, shafts, adits, etc., which make up about 15 mines, nearly all of which are located some 3/4 of a mile of the camp.(There are about 12 to 14 veins, mostly parallel, on which the mining or stoping had been carried out. Extensive stoping was on about 8 veins.)

The chief mines are : The Prince Albert, Norma, Grand Army of the Republic(the GAR) , Occident, Horn Silver, Hidden Treasure(Shaffer's Treasure), Good Luck, Excelsior, Garfield, Daisy, Bryan, Chief of the Hills, West Treasure, African, and Grabd Central.

Schrader , in his report, stated: that not very much work was done at the Hidden Treasure mine because of the nature of the ore(refractory); in the Prince Albert (where the veins are of the blanket type dip, and which intersected with the Norma vein) the deposits were mostly worked out, so far as the oxidized zone was concerned. The Norma and Occident and Horn Silver mines were large producers as can be seen by the huge dump piles today. At the GAR mine the ore was free-milling; the ore was

rich on all five levels, and during the early days there had been up to 100 men stoping at one time. Here also the dump piles are extensive.

As to the character of the original primary ore or sulphide ore , it was impossible to determine. All mining was done at the oxidized zone to the bottom of the shafts, the deepest of which descended to about 700 feet inclined at about 45 degrees. Most of the inclined shafts however descended 200 to 300 feet. Some kidneys of pyrite and galena were reportedly found in places. At the Norma and Garfield mines it was reported that lead carbonate was found.

An underground inspection will show thousands of feet of tunnels, inclined adits, shafts, but not very much cross cutting; on the contrary. What mainly characterized the mining technique employed during the 10 - year period of production was : mining which was not supported by development work or underground exploration.

An engineer named Turner reported many years ago that the entire mining was carried out down to 350 feet vertically; that in places, such as the GAR, stoping was done from grass roots all the way down. A three-compartment-vertical shaft recommended to be driven down for 1,000 feet had gone to a depth of 374 feet when work was stopped.

Some of the workings, manways, timber , etc, are still in fair shape, owing to the dry desert climate; other workings are caved-in.

A 20,000 ton tailings dump west of the Occident and Horn Silver mines, and a 5,000(&w more)ton tailings dump west of the GAR area were sampled in recent times by means of an auger and found to carry values in silver.

There exist several dozen dumps in the entire property, comprising,

according to some observers, over 100,000 tons. A conservative figure would place it at from 50,000 to 75,000 tons. It was impossible to sample these thoroughly (this would require a bulldozer as some of the piles are too high to be separated for sampling). Grab samples assay $2, $4, $7, $13, etc, up to $150, etc. A grab sample taken by this writer at the dump outside the Norma No.1 shaft , consisting of a large rock shaped like a bycicle tire, and containing a crust of crystalline cyrargyrite, assayed 70 ounces.

Part V: Recent Work at White Hills:

In 1946, John Jordan, mining engineer from California University, (today one of the principal owners of the property) was sent to White Hills along with two other geologists by a mining group. Mr. Jordan said that he and the other geologists spent a total of six months, mapping the surface geology and the underground workings. An aerial photograph was prepared. No other work was done.

In 1951 a group called the U.S. Copper and Oil Co. decided to do some work on the Norma vein at the NO. 2 shaft. This company was unable to meet the payroll and so the work was suspended by Mr. Jordan, who was in charge of the operation. He said that at the time the project had been to find -by proceeding westwards on the 6th level drift from the NO.2 shaft- a segment or block of ore which had been faulted off. (This faulting of the ore in the Norma vein was evident on the 5th level proceeding eastwards off the NO.1 shaft.) The rake of the ore was such that Mr. Jordan believed

that by ~~extending the old~~ driving a new drift on a lower level he would hit ore. In ~~extending the~~ driving this new drift he encountered low values in silver (from about $13 to $133 and down to $8 per ton ore in silver. There were also low values in gold.). Because the nature of the fissure was changing and hydrothermal quartz was already present, Mr. Jordan believed the drift was approaching the outer limits of ore.

In 1952, John Jordan was able to purchase part of the property , and has been steadily doing so. Today he owns the largest area of White Hills. In 1956 he did a limited amount of work at the Norma NO.2 shaft, mostly repairing the inclined shaft.

In the Fall of 1960 the Ellis Brothers arrived in Kingman , Arizona, after a few years prospecting in Northern Canada and Honduras. Of the districts examined in Mohave County, the White Hills appeared to be the most favourable.

In January, 1961, a report was prepared by them and submitted to Charles Steen; the White Hills property was strongly recommended as one which merited immediate attention and careful consideration.

In July, 1961, Mr. Steen visited the property and examined the workings. He took an option on the property and said he would spend $100,000.

In February, 1962, three of Mr. Steen's geologists went to White Hills to perform preliminary work. The following was done:

(1) The two tailings dumps were augered and sampled. Some 25,000 to 30,000 tons assayed over $1.

(2) Close to 150 samples were cut in the levels of the GAR. Values were poor. (The veins had been mined out years before an[illegible] ore was left). However an

interesting observation was made; values in gold increased with depth. This same observation was made by an engineer (MR. J.A. TURNER) many years ago at the three-compartment-vertical shaft.

(3) Cement crosses were made at the entrance to almost every shaft, adit, and tunnel on the property as well as at the site of every benchmark. The area then was photographed in colour from the air.

(4) A geochemical and geophysical survey was made. Lines were set up at every 100 feet and stations at every 50 feet. At each station a reading was made and a soil sample taken for chemistry.

(5) Some surveying was done in order to prepare the drill stations.

This initial phase of exploration ended in April, 1962.

About six months later drilling began. Three vertical holes were drilled down to 490 feet.

To this writer it did not appear necessary to photograph the area in colour or otherwise. Besides, the owner, Mr. Jordan, had a copy in black and white of the 1946 air photograph. The time spent by a group of four or five men mixing concrete and preparing distinguishable cement markings all over the area, could have been better utilized repairing manways and trying to enter the more inaccessible underground workings to study them. No attempt was made to verify the existence of lead carbonate or pyrites at the Garfield mine and Norma mine; no dump piles were examined or sampled, (except for that which had been done previously by the Ellis Brothers).

A geochemical and geophysical survey did not have much significance in White Hills. In a property were bits of vein material are scattered in so many places (because the dumps have been exposed for over half a century) it would be difficult to interpret results. Many weeks were spent on this survey in geochemistry and geophysics: the time, once again, could have been better employed inside the old workings.

From the very start the manner in which White Hills was approached seemed to lack something: the property was first reported to Mr. Steen in January, 1961. Six months later in July, 1961 he went out to examine this prospect. Seven months later in February, 1962 three geologists were sent to begin their preliminary exploration work. Ten weeks later the geologists had left to work in other places . Six months later in October, 1962 the drilling actually began. Mr. Steens most experienced mining geologist, Mr. Glen Walker had told this writer that he would recommend a total of 8 holes to be drilled: 6 holes on the surface and 2 holes from the bottom of the Norma NO.2 shaft. However only three holes were drilled: one in the southern part of town to intersect the Occident vein, and two in the northern part on the east and west ends of the GAR Veins. A possible fourth hole may have been drilled but the writer never learned this for sure. (In December, 1962, in Lima, Peru, Mr. Steen told this writer that an interesting vei n of good width had been intersected and that he was planning to use his angle drill to drill what was to be the fourth hole.)

Five months after the drilling had begun, in February, 1963, this writer learned from his brother and from one of the geologists that during the drilling the equipment broke down continuously, so that it had been finally decided to contract the drilling to a drilling company. The holes were down to 490 feet when the contract work was given out to a company. The holes were to be cored and then afterwards deepened. However, in coring, because of the altered nature of the veins, recovery was very poor. Assays were low.

A total of $40,000 had been spent. Mr. Steen stopped exploration some time after June, 1963. He decided about two weeks ago to return the property to its owners.

Part VI: Conclusion and Recommendation:

The White Hills property consist of some 45 or more patented full and fractional claims in good standing owned by Mr. John Jordan and several individuals. Around this group of claims this writer and his brother had staked approximately 150 claims to cover vein extensions and open areas inside parts of the patented ground. The principal owner, MR. Jordan, is a resident of Kingman , Arizona. He is one of the outstanding citizens and is the city resident engineer, in addition to being a succesful business man. At no time were his ideas on White Hills sought, nor did he express them, as regards the method of exploration which was employed. In all other respects he was most cooperative, as were the Kingman residents and city officials in general.

Because little or no underground exploration or development work was ever carried out at White Hills, so that what actually constituted mining operations there was only the extraction of silver of bonanza grade, the property remains today a very important prospect to examine.

The possibility of drifts, especially at lower levels, hitting ore if extended laterally should be considered. Usually drifting ended the momen t the face ran out of ore. What makes the underground workings conspicuous appear to be the limited amount of cross - cutting and lack of lateral exploration.

The most practical approach to testing the possibilities at White Hills would be to make use of one or more of the several important shafts either at the Norma or GAR veins; clean them out, deepen them, and then cross-cut and drift. Together with this some of the existing drifts could be extended

Some of the workings require repair. When the watchman was removed from the White Hills after 1946 the town began to succumb to the attacks of souvenir hunters. Manways were destroyed, boulders were thrown down shafts, and one by one the houses were raided. One of the two existing graveyards was completely desecrated; the second one lies intact and well preserved mainly because it lies out of sight . Four houses still stood when this writer was last there.

Considering what the price of silver is today, and the future of this mineral; the accessibility of this property; its past history, together with the importance of large bodies of dumps and tailings, thought could well be given to the possibility of an excellent ore body existing beneath the zone of oxidation which might well support an exploration and mining venture.

Judging from a study of the reports written by men who had experience in the area: Schrader with the USGS in 1909; an engineer named Turner who examined the area in 1929; the work done by Jordan in 1946, 1951, (these reports are available), and from personal experience by this writer who spent a good deal of time in the area, it is believed by the undersigned that the property merits further investigation.

Except for three holes drilled by Mr. Charles Steen in three widely-separated points on White Hills no further work ever went beyond where the miners had left off in 1905, so that no more is known today than was known then.

Respectfully submitted,

Gerald M. Ellis

Gerald M. Ellis.

April 19, 1964.

New York City, N.Y.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine White Hills (Silver, gold) Date May 29, 1962

District Indian Secret Dist., Mohave Co. Engineer Travis P. Lane

Subject: Visit of May 16, 1962.

Property & Ownership: Charles Steen (of Utex Exploration Company) and associates has acquired all the patented lode claims in the district. The recent owners of a large group of the original White Hill Mining Co. properties have either sold outright to Steen or have traded for a participating interest in his venture. In addition to the patented ground (some 90 claims) the Steen project includes 160 recently staked lode claims. The new ground is mostly on the west border of the former productive area.

Chas. Steen's office address: 1790 E. Plumb Lane, Reno, Nevada. The resident Supt. is Glen Walker, Loma Vista Motel, Kingman.

Location, History, Description: The White hills district is located on the western edge of the White Hills which are a north extension of the Cerbat Mountains. The district is some 4 miles by 3 miles in areal extent and is in an area of granitic rocks, It is centered some 28 miles north of Chloride and is about 5 miles east from Hwy. 93. The original discoveries were made in 1892 and shipments of very high grade silver ore began shortly thereafter. Peak production was reached in 1894 and population of the camp at that time was 1200. About 1895 the important producing properties were sold to an English concern, the White Hills Mining and Milling Company, for $1,500,000. The company built a 40-stamp mill and established an elaborate water system and camp. After several years operation the company failed and the mine was bought in at sheriff's sale by the original owners. These people built a 10-stamp mill in 1904 and successfully treated a large quantity of the accumulated dump ore. The mine has been idle for many years except for occasional short-lived exploration projects and scattered leaser production.

Total production of the district is variously estimated at from $2,000,000 to $3,000,000. Arizona Bureau of Mines Bulletin No. 140 lists value of production (to 1906) at $1,900,000 silver and $100,000 gold. No substantial production has been made since 1906. The district is described in considerable detail in U.S.G.S. Bulletin No. 397 "Mineral Deposits of the Cerbat Range, Black Mountains and Grand Wash Cliffs" (1909).

The ore deposits were principally quartz veins of the "blanket" or low dip type. The numerous productive veins were more or less parallel and were narrow (av. 3') with rich values in silver chloride accompanied by a significant amount of gold. Both manganese and iron oxide are abundant in the ore. The mineralization is oxidized to the bottom of the mines (maximum incline depths apparently less than 1000') and productive depth somewhat less.

At the time of visit a dozer was at work stripping and trenching in a low hill area west of the former producing area. A diamond drilling program will be conducted here to explore for extension of the formerly productive vein system and possible new deposits.

WHITE HILLS DISTRICT - Chas. Steen

March 22, 1962 - At Kingman learned that Chas. Steen of Moab, Utah is making an intensive study of the White Hills district with 2 men in the field for the past several months. He has taken up 160 lode claims in the area.

TRAVIS P. LANE - Weekly Report - 3-24-62

WHITE HILLS DISTRICT - Chas. Steen

March 22, 1962 - At Kingman learned that Chas. Steen of Moab, Utah is making an intensive study of the White Hills district with 2 men in the field for the past several months. He has taken up 160 lode claims in the area.

TRAVIS P. LANE - Weekly Report - 3-24-62

May 18, 1962 - Visited the Recorders office in Kingman, interviewed Johnny Jordan, City engineer. He is part owner of the old WHITE HILLS Property and is now associated with developers of the project.

TRAVIS P. LANE - Weekly Report - 5-1962

NAME OF MINE: WHITE HILLS
OWNER:

COUNTY: Mohave
DISTRICT: Indian Secret Dist.
METALS: ~~Pb,Ag~~ Au

OPERATOR AND ADDRESS		MINE STATUS	
Date:		Date:	
1/47	J. R. ~~Paine~~, Chloride Payne ★It is reported that $20,000 worth of bullion has been shipped within the last six months from the White Hills mine in the White Hills district of Mohave County. Robert Payne, of Chloride, along with Russel McAllister and Earl Cook, of Kingman, obtained the property early in the year. ENGIN. & MINING JNL-11-47-VOL.148-NO.11	1/47	Milling & Shipping

WHITE HILLS PROPERTY - Mohave Co

WHITE HILLS PROPERTY

Drove into White Hills property to check on possible activity. No evidence of recent work.

This property idle.
5-27-57

Travis P. Lane
9-2-58 Report

MARK GE

[redacted]

MOHAVE MINER
12/23/43

MOHAVE COUNTY 1897

Since the discovery of the mines of White Hills in 1892 many mining companies have invested in mines and have expended thousands of dollars in development. Notably is this the case at White Hills, where an English company, after paying $1,750,000 for the White Hills group of mines, has expended over $500,000 in developing water and blocking out ~~xxx~~ ore bodies in the mines. A 40-stamp combination mill has been built, through which all of the ores of the district will be run. At Chloride a Scotch syndicate has just completed a 100-ton concentrating plant to put the ores of the Elkhart mine in a more marketable condition. New hoisting plants have been put on the lead groups at Chloride and seven hoists are in steady operation at White Hills. At Cubat, Lane & Howard, the millionaire gold miners of California, have bonded a gold property, and have a shaft on it 200 feet in depth. The ore body is immense and averages over 5 ounces of gold to the ton.

In Todd Basin, 16 miles north of Kingman, the Oro Plata mine, with a big hoist and twenty chloriders, is turning out $10,000 in gold per month. South of Chloride the Conor Minnesota mines are producing heavilyy.

Near Mineral Park are many ledges of turquoise, which show evidence of having been systematically worked by a prehistoric race. Stone hammers and rude tools have been found in all the openings in the mines.

For the year ending June 30, 1897, the ore shipment through the Kingman Sampling Works, and to the smelters, and bullion by express, is valued at $1,250,000. Shipments of lead aggregate over 200 tons.

TAKEN FROM THE REPORT OF THE GOVERNOR OF ARIZONA 1899

MOHAVE COUNTY MINES

The White Hills mines were discovered in 1892, and a large amount of money has been expended in their development. There have also been extensive mining operations at Chloride and at Cubab and Todds Basin. Important discoveries of copper ore are reported from the region of Mineral Park, and ledges of the gem called "chalchuite" by the Aztecs have been located. This is known to us as the turquoise, and these localities appear to have been worked by the aboriginal races long ago. Further information will be found in the portion of this report devoted to building and ornamental stones and under the head of minerals of Arizona. The silver and lead and copper mines are also separately noticed under the appropriate hadings.

SHEEP TRAIL

The property in Union Pass district across the Colorado River from Kingman and near Bullshead Rapids, about 6 miles from the river west, appears to have been acquired by a corporation under the title or name of Arizona and New England Consolidated Mining Company. It has a mill and a cyanide plant.

WHITE HILLS MINE MOHAVE COUNTY

NJN WR 8/26/83: Corwin Coe reported that Corval Development (Arizona Silver) is drilling the Hulda vein structure at White Hills Mine, Mohave County and logging it with their silver probe. Drilling is occurring on Occident and Horn Silver claims.

NJN WR 11/23/84: Stan Keith reported the McCracken (f) Ramsey (f) and White Hills (f) Mines, all silver properties, mineralization in coeval and have the same magma chemistry.

CJH WR 9/20/85: Phone call: Conrad W. Pilz, formerly Staff Metallurgist, Cyprus Metallurgical Processing Corp reported that Corval Development has shut down all operations.

NJN WR 6/6/86: Bill Vanderwall (c) reported that Corval AKA Arizona Silver Corp (~) is selling equipment from the White Hills mine (f) Mohave County.

NJN WR 3/13/87: Bill Vanderwall (c) reproted that Arizona Silver Corp (c) dba Corval Development Inc (c) is returning the White Hills property (file) Mohave County to the owners.

~~DO NOT REPRODUCE THIS FILE~~

WHITE HILLS MINE (File) Mohave Co., White Hills Dist.

WR KP 4-29-77: Corval reported to have begun operations on February 15, 1977, at White Hills Mine.

WR CJH 9-18-79: Started report on field examination and interview with Corwin Coe at the White Hills operation of Corval Development Inc.

CH/Report 11/23/79 - Met with Corwin Coe at the White Hills operations of Corval Development, Inc. The dump material that they have been testing in the leaching vats has been found to be uneconomic without crushing and screening. Additionally the retention time in the agitation tanks to obtain 60-70% recovery has been cut to two hours. They hope to be on stream in about two weeks. Mr. Coe said that future underground mining is a distinct possibility.

CJH: WR 5/15/80 = Drive to Corval Development Co's White Hills operation in the company of George McDevitt. Talked to the mill foreman Dennis Cook Corwin Coe was in Kingman. They have constructed a new wooden hopper + - 50 tons capacity, which will hold feed for a new crusher when it is installed. Additionally, a wooden headframe for the GAR shaft is being constructed. Shaft repair will be undertaken.

CJH WR 12/19/80: A visit to the GAR Mine of Corval Development Inc. (see CJH FER 9/16/80 "White Hills Mine") revealed that the retimbering of the shaft has been accomplishe to 250 feet. Below that they are dewatering and cleaning up old debris. A pre-existing station is anticipated at 325 feet. The shaft three compartments; hoisting, service and manway. A skip riding on straight-grained, knot-free Douglas fir guides will be used for rock hoisting.

MG WR 11/13/81: Arizona Silver Corp. (Corval Development Inc.) has converted from heap leaching to agitation vat leaching to recover gold and silver. Ore is supplied from the Hulda Mine (Mohave County) which has two levels and 600 feet of workings. The shaft at the G.A.R. Mine (Mohave County) is completed and the ore zones are under development.

Do not remove

2 of

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine White Hills Mine (file) **Date** June 4, 1982

District White Hills (Mohave County) **Engineer** Nyal J. Niemuth

Subject: Mine Visit

A visit was made to the White Hills Mine and manager Ray Kerby supplied the following information.

Current silver prices (around $6.00/oz) have adversely affected operations. Costs have been trimmed by reducing the number of employees to fifteen and by temporarily halting the mining of new material from the Hulda. Production continues from old dump material at the rate of 100 tons per day (TPD). Fifty TPD of fines are processed in agitation tanks. Coarse material is currently vat leached at a rate of 50 TPD, although a capacity of 100 TPD exists.

Silver recovery is from a Merril Crowe zinc precipitation type unit built at the mill site. The Escapule unit that was previously used has been taken out of service and sold. The current unit has a capacity of 30 tons of solution per hour. The final products produced are 20 pound Dore bars that contain about 95% silver and 2-3 ounces of gold. Water for operation is pumped from the GAR and Occidental shafts and from a water well north of the operations and is put in a storage tank until needed.

Development and exploration continue at the GAR mine. The geology of GAR is a series of narrow veins striking west, dipping on average 35^{0} north. The GAR shaft is relined and open to 400 feet. An old cross cut drift on the 400' level was cleaned out and extended further north where it intersected a fifth vein. Also from this cross cut a 125 foot drift was made west on the main vein. At this point a raise was driven up and the new north vein intersected and drifted on. Currently the main and new north vein are being long hole drilled.

cc: Tucson Office

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine White Hills (Silver, gold) Date May 29, 1962

District Indian Secret Dist., Mohave Co. Engineer Travis P. Lane

Subject: Visit of May 16, 1962.

Property & Ownership: Charles Steen (of Utex Exploration Company) and associates has acquired all the patented lode claims in the district. The recent owners of a large group of the original White Hill Mining Co. properties have either sold outright to Steen or have traded for a participating interest in his venture. In addition to the patented ground (some 90 claims) the Steen project includes 160 recently staked lode claims. The new ground is mostly on the west border of the former productive area.

Chas. Steen's office address: 1790 E. Plumb Lane, Reno, Nevada. The resident Supt. is Glen Walker, Loma Vista Motel, Kingman.

Location, History, Description: The White hills district is located on the western edge of the White Hills which are a north extension of the Cerbat Mountains. The district is some 4 miles by 3 miles in areal extent and is in an area of granitic rocks, It is centered some 28 miles north of Chloride and is about 5 miles east from Hwy. 93. The original discoveries were made in 1892 and shipments of very high grade silver ore began shortly thereafter. Peak production was reached in 1894 and population of the camp at that time was 1200. About 1895 the important producing properties were sold to an English concern, the White Hills Mining and Milling Company, for $1,500,000. The company built a 40-stamp mill and established an elaborate water system and camp. After several years operation the company failed and the mine was bought in at sheriff's sale by the original owners. These people built a 10-stamp mill in 1904 and successfully treated a large quantity of the accumulated dump ore. The mine has been idle for many years except for occasional short-lived exploration projects and scattered leaser production.

Total production of the district is variously estimated at from $2,000,000 to $3,000,000. Arizona Bureau of Mines Bulletin No. 140 lists value of production (to 1906) at $1,900,000 silver and $100,000 gold. No substantial production has been made since 1906. The district is described in considerable detail in U.S.G.S. Bulletin No. 397 "Mineral Deposits of the Cerbat Range, Black Mountains and Grand Wash Cliffs" (1909).

The ore deposits were principally quartz veins of the "blanket" or low dip type. The numerous productive veins were more or less parallel and were narrow (av. 3') with rich values in silver chloride accompanied by a significant amount of gold. Both manganese and iron oxide are abundant in the ore. The mineralization is oxidized to the bottom of the mines (maximum incline depths apparently less than 1000') and productive depth somewhat less.

At the time of visit a dozer was at work stripping and trenching in a low hill area west of the former producing area. A diamond drilling program will be conducted here to explore for extension of the formerly productive vein system and possible new deposits.

TPL
Copy

WHITE HILLS DISTRICT - Chas. Steen

March 22, 1962 - At Kingman learned that Chas. Steen of Moab, Utah is making an intensive study of the White Hills district with 2 men in the field for the past several months. He has taken up 160 lode claims in the area.

TRAVIS P. LANE - Weekly Report - 3-24-62

New Project

WHITE HILLS DISTRICT - Chas. Steen

March 22, 1962 - At Kingman learned that Chas. Steen of Moab, Utah is making an intensive study of the White Hills district with 2 men in the field for the past several months. He has taken up 160 lode claims in the area.

TRAVIS P. LANE - Weekly Report - 3-24-62

May 18, 1962 - Visited the Recorders office in Kingman, interviewed Johnny Jordan, City engineer. He is part owner of the old WHITE HILLS Property and is now associated with developers of the project.

TRAVIS P. LANE - Weekly Report - 5-1962

NAME OF MINE: WHITE HILLS
OWNER:

COUNTY: Mohave
DISTRICT: Indian Secret Dist.
METALS: ~~Pb,Ag~~ Au

OPERATOR AND ADDRESS		MINE STATUS	
Date:		Date:	
1/47	J. R. ~~Paine~~ Payne, Chloride	1/47	Milling & Shipping

★It is reported that $20,000 worth of bullion has been shipped within the last six months from the White Hills mine in the White Hills district of Mohave County. Robert Payne, of Chloride, along with Russel McAllister and Earl Cook, of Kingman, obtained the property early in the year.
ENG-IN. & MINING-JNL-1-47-VOL.148-NO.1

WHITE HILLS PROPERTY - Mohave Co

WHITE HILLS PROPERTY

Drove into White Hills property to check on possible activity. No evidence of recent work.

This property idle.

Travis P. Lane
9-2-58 Report

MARK GE

WHITE HILLS MINE MOHAVE COUNTY

Active Mine List Oct. 1968 - 6 men

Visit to White Hills mine where Consolidated Minerals are milling the various mine dumps. Mine report to follow. FTJ WR 11-8-68

The cyanide mill at the White Hillsmine in the White Hills is adding flotation to the system. FTJ QR 1-20-69

Mine visit to White Hills mine - plant still under construction. FTJ WR 1-10-69

Active Mine List April 1969 - 6 men

Visited White Hills mine and mill - Conference with J.J. Oberbillig, who is mgr., for Buffalo Lake Mines Ltd., 13th Floor, Marine Bldg., 355 Barrard Street, Vancouver, British Columbia, who have taken over the operation. Their local address is Box 962, Las Vegas Star Route, Kingman, Arizona 86401. Buffalo Lake Mines Ltd., is an old company - a skeleton - taken over by Canadian interests. Work at mine mostly testing to determine future plans. FTJ WR 7-11-69

Visited the White Hills mine. They are sampling more of the dumps and also some underground workings. FTJ WR 9-5-69

Active Mine List Oct. 1969 - 9 men - J.J. Oberbillig, Mgr., Box 962, Kingman

Visited with Floyd Brown foreman, at the White Hills mine. He said Metlers were going to drill several holes in an attempt to develop ore. Mill shut down for the time being. FTJ WR 3-6-70

Visited White Hills mine - idle but were waiting for Metlers drill crew. FTJ WR 5-8-70

Active Mine List May 1970 - 4 men - J.J. Oberbillig, Mgr.

Visited White Hills mine - idle waiting for money to start exploration drilling. FTJ WR 7-11-70

Exploration work was done at the White Hills mine during the quarter. FTJ QR 7-1-70

Mine visit - Talked with Matt who said Oberbillig is president and was trying to raise some capital for exploration. FTJ WR 9-4-70

Active Mine List Oct. 1970 - 2 men - J.J. Oberbillig, Mgr.

Visited White Hills mine - talked to Lloyd Brown who is in charge. They are waiting for outside financial help. FTJ WR 11-6-70

WHITE HILLS MINE MOHAVE COUNTY

Phoned Floyd Brown at White Hills mine who said inactive at present but drilling planned. FTJ WR 1-8-71

The Chico mine was inactive as was Buffalo Lakes Mines at White Hills. Drilling at the White Hills is however, contemplated. FTJ QR 1-13-71

Buffalo Lake Mines Ltd. wound up their White Hills operation. GW QR 9/71

Pat Patterson of Chloride permitted us to copy underground and surface maps of the White Hills silver mine. VBD WR 6/15/76

WHITE HILLS MOHAVE COUNTY

ABM Bull. 125 p. 97 (GAR) Map - showing claims (Cabinet Sec. 5)
" of White Hills Silver Mining Co.

Mr. Charles Kunkas is owner of these claims. 6/29/76 - verbal report to JHJ 6/68/76

Mr. Floyd Brown was named Superintendent of the mine. VBD/WR 3-22-77

Corval Development is mining here. WR KP Week ending 4-29-77

WR KP Week ending April 29, 1977

Bryon Boon-Department of Economic Security called to inquire about the metals mined by Corval Development at the White Hills Mine. Although we have no reference to such a firm, it is likely that the White Hills Mine in Mohave County is or would produce silver. Boon reported that Corval Development has filed with the unemployment insurance division as having 16 employees at the White Hills Mine. The Company has reported to have begun operations on February 15, 1977. They are a Nevada Corporation incorporated in July of 1972 in that state. The corporate office is in care of Rudolph Martin, 705-900 W. Hastings Street, Vancouver, B. C. The mine address is in care of Floyd Brown, 1885 Airway, Kingman, Arizona 86401.

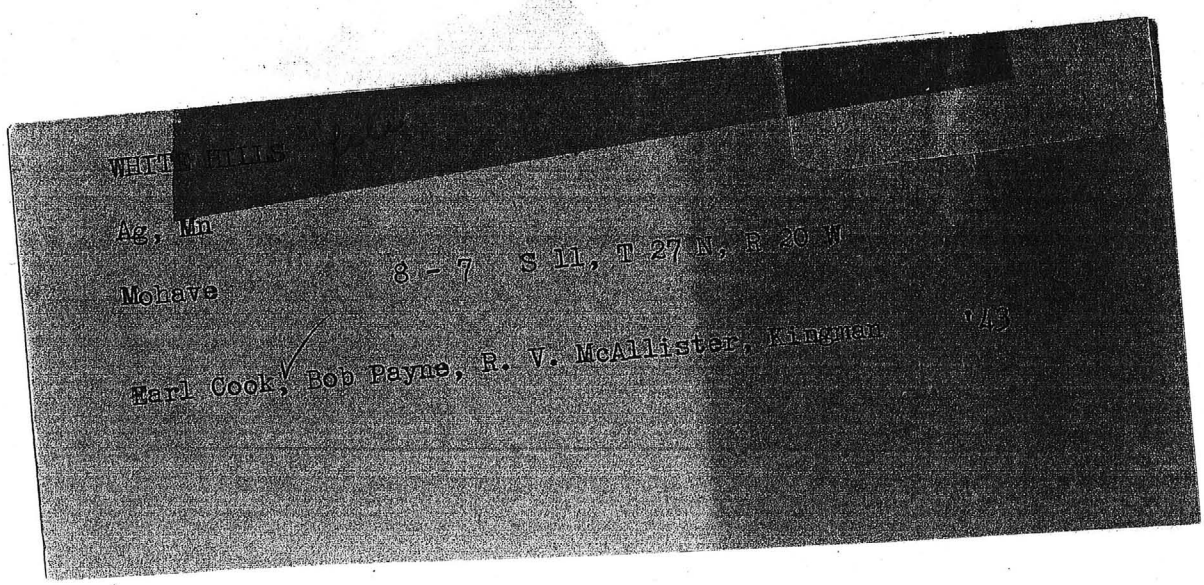
Telephone Call: 6/10/79 from Doug Martin to Mr. Jett: Corval Corporation, a Canadian company, also parent company of Arizona Silver Corporation (incorporated in Nevada) is working White Hills Mine - Mohave County. Pads are built, cyaniding plant will be picked up from Tombstone in two weeks. 45,000 tons of tails to start with.

WHITE HILLS file

Ag, Mn

Mohave 8 - 7 S 11, T 27 N, R 20 W

Earl Cook, Bob Payne, R. V. McAllister, Kingman '43



MOHAVE COUNTY 1897

Since the discovery of the mines of White Hills in 1892 many mining companies have invested in mines and have expended thousands of dollars in development. Notably is this the case at White Hills, where an English company, after paying $1,750,000 for the White Hills group of mines, has expended over $500,000 in developing water and blocking out ore bodies in the mines. A 40-stamp combination mill has been built, through which all of the ores of the district will be run. At Chloride a Scotch syndicate has just completed a 100-ton concentrating plant to put the ores of the Elkhart mine in a more marketable condition. New hoisting plants have been put on the lead groups at Chloride and seven hoists are in steady operation at White Hills. At Cubat, Lane & Howard, the millionaire gold miners of California, have bonded a gold property, and have a shaft on it 200 feet in depth. The ore body is immense and averages over 5 ounces of gold to the ton.

In Todd Basin, 16 miles north of Kingman, the Oro Plata mine, with a big hoist and twenty chlorideres, is turning out $10,000 in gold per month. South of Chloride the Comor Minnesota mines are producing heavily.

Near Mineral Park are many ledges of turquoise, which show evidence of having been systematically worked by a prehistoric race. Stone hammers and rude tools have been found in all the openings in the mines.

For the year ending June 30, 1897, the one shipment through the Kingman Sampling Works, and to the smelters, and bullion by express, is valued at $1,250,000. Shipments of lead aggregate over 200 tons.

TAKEN FROM THE REPORT OF THE GOVERNOR OF ARIZONA 1899

MOHAVE COUNTY MINES

The White Hills mines were discovered in 1892, and a large amount of money has been expended in their development. There have also been extensive mining operations at Chloride and at Cubab and Todds Basin. Important discoveries of copper ore are reported from the region of Mineral Park, and ledges of the gem called "chalchuite" by the Aztecs have been located. This is known to us as the turquoise, and these localities appear to have been worked by the aboriginal races long ago. Further information will be found in the portion of this report devoted to building and ornamental stones and under the head of minerals of Arizona. The silver and lead and copper mines are also separately noticed under the appropriate hadings.

SHEEP TRAIL

The property in Union Pass district across the Colorado River from Kingman and near Bullshead Rapids, about 6 miles from the river west, appears to have been acquired by a corporation under the title or name of Arizona and New England Consolidated Mining Company. It has a mill and a cyanide plant.

MOHAVE COUNTY 1897

Since the discovery of the mines of White Hills in 1892 many mining companies have invested in mines and have expended thousands of dollars in development. Notably is this the case at White Hills, where an English company, after paying $1,750,000 for the White Hills group of mines, has expended over $500,000 in developing water and blocking out ore bodies in the mines. A 40-stamp combination mill has been built, through which all of the ores of the district will be run. At Chloride a Scotch syndicate has just completed a 100-ton concentrating plant to put the ores of the Elkhart mine in a more marketable condition. New hoisting plants have been put on the lead groups at Chloride and seven hoists are in steady operation at White Hills. At Cubat, Lane & Howard, the millionaire gold miners of California, have bonded a gold property, and have a shaft on it 200 feet in depth. The ore body is immense and averages over 5 ounces of gold to the ton.

In Todd Basin, 16 miles north of Kingman, the Oro Plata mine, with a big hoist and twenty chloriders, is turning out $10,000 in gold per month. South of Chloride the Comor Minnesota mines are producing heavily.

Near Mineral Park are many ledges of turquoise, which show evidence of having been systematically worked by a prehistoric race. Stone hammers and rude tools have been found in all the openings in the mines.

For the year ending June 30, 1897, the one shipment through the Kingman Sampling Works, and to the smelters, and bullion by express, is valued at $1,250,000. Shipments of lead aggregate over 200 tons.

LOCATION, TYPE OF CLAIMS & FOOTAGE DRILLED

The White Hills claim group is situated in Sections 11, 12, 13 & 14, T. 27 N., R. 20 W., G&SRPM, Mohave County, Arizona.

This group consists of 36 patented claims, 11 mill sites and 64 unpatented claims. The unpatented claims are named White Hills #1 thru #62 and Pat #1 & #2.

All of the holes drilled on the White Hills group were validation holes, although, #9 and #10 were tested for ore. Neither test indicated vein material worthy of assay. All unpatented claims were validated except White Hills #1-3 and #25-28.

A total of 480 feet were drilled as test and validation holes on this property.

ASSAYS

No assays were taken since all were validation holes and well cuttings did not indicate mineralization of commercial value.

GEOLOGY AND STRUCTURE

The country rock in the area is a highly complex mixture of crystalline granitic rocks of pre-Cambrian age. Most of the surface outcrops consist of light gray to light brown, medium grained gneissic granite. The granite varies widely in content, with quartz, biotite, phlogopite mica and manganese being the most common minerals. These and other minor minerals may become abundant locally. Good pegmatite material was observed in wells drilled on the south side of the property, particularly in the White Hills #10 hole.

The general attitude of the veins vary locally, however, most veins strike North 65 to 85 West with northerly

dip from about 20 to 85 degrees. Secondary linements may vary somewhat from these attitudes.

The weathered, oxidized veins are generally reddish-brown and consist of quartz, biotite, hematite, limonite, manganese and minor minerals. Unweathered vein material may range from dark gray to light brown due to varying degrees of oxidation.

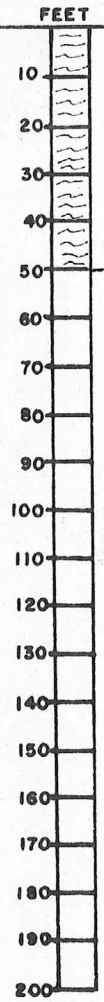
Previous reports showed that old mine workings encountered several veins with very rich pockets which assayed as much as 6000 to 7000 ounces of silver per ton. All veins immediately north of the White Hills claims were mineralized and this condition should hold throughout the area. The objective is to locate the enriched zones by the exploration methods outlined above.

The medium to dark gray, dense, very hard rock encountered in White Hills #52, #46 & #9 is apparently Cretaceous volcanics. Local drillers and miners refer to this as "Blue granite"which is a misnomer. Cretaceous volcanics crop out on or near the Schaefers Treasure and Goad Stick claims. This outcrop may be the source of the flow westward. The flow lies on top of the basement rocks and under the surface gravels. The flow may change to a sill-like deposit or as a dike near the source.

Quaternary basalt flows occur along the eastern side of the White Hills property. Large outwash basalt boulders cover the surface of some of the claims along the east side and hinders vehicle travel off the main trails.

The vein and fault systems are complex but all contain low grade silver throughout. The G.A.R. claim has many veins which have produced large amounts of high-grade ore. Some of the veins on the G.A.R., Norma and adjacent claims were reported

WHITE HILLS # 60



0-50' Lt. gray to Lt Br Gneissic granite w/thin stringers of quartzite

T.D. 50'

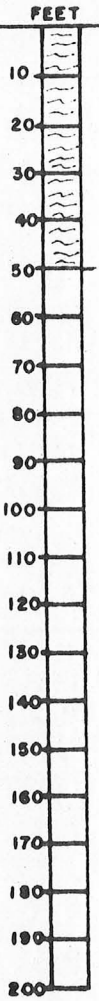
Validation & ore test

Loc: 50' N & 50' W of SE Cor. Post

Validates: White Hills #58,59, 60, 61 & 62

No assays.

WHITE HILLS # 60



0-50' Lt. gray to Lt Br Gneissic granite w/thin stringers of quartzite

T.D. 50'

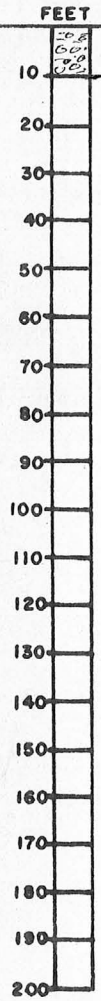
Validation & ore test

Loc: 50' N & 50' W of SE Cor. Post

Validates: White Hills #58,59, 60, 61 & 62

No assays.

WHITE HILLS #4



T. D. 10'

0-10' Surface gravel
w/boulders

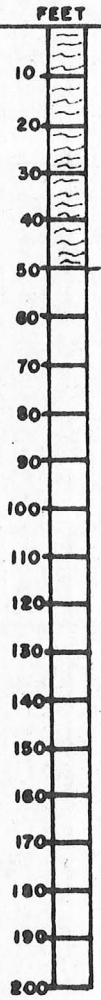
Validation hole

Loc: 40' E & 50' S of NW corner post

Validates: White Hills #4

No assays

WHITE HILLS # 60



0-50' Lt. gray to Lt Br Gneissic granite w/thin stringers of quartzite

T.D. 50'

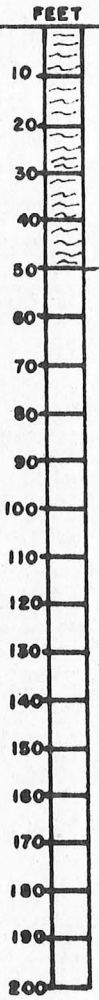
Validation & ore test

Loc: 50' N & 50' W of SE Cor. Post

Validates: White Hills #58,59, 60, 61 & 62

No assays.

WHITE HILLS # 60



0-50' Lt. gray to Lt Br Gneissic granite w/thin stringers of quartzite

T.D. 50'

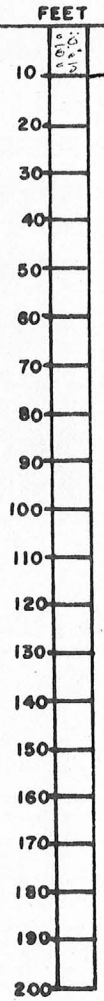
Validation & ore test

Loc: 50' N & 50' W of SE Cor. Post

Validates: White Hills #58,59, 60, 61 & 62

No assays.

PAT #2



T.D. 10'

0-10' Surface gravels w/bldrs.

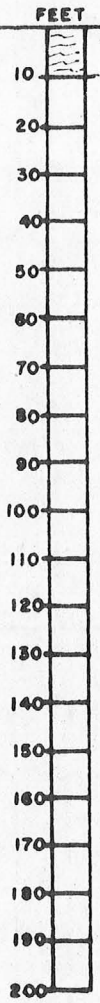
Validation hole

Loc: 520' S & 340' E of NW cor post

Validates: Pat #2

No assays

PAT #1

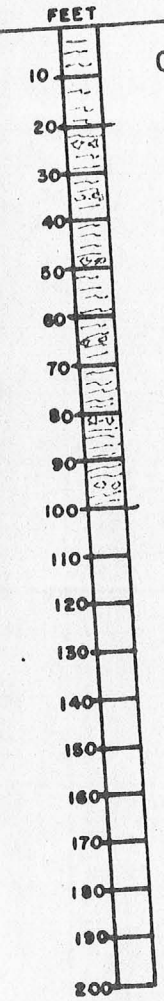


T.D. 10'
0-10' gneissic granite

Validation hole
Loc: 100' S & 250' W of NE cor.
Validates: Pat #1

No assays

WHITE HILLS #10



0-100' Gneissic granite, abd quartz and biotite locally, Alt. bands of red & lt gray granitic rocks.

20-100' Several zones of pegmatitic material. Phenocrysts up to ½ inch.

T. D. 100'

Validation & ore test

Loc: 600' S & 230' E of NW cor. Post NW #10 = NE #9

Validates: White Hills #10, 11, 12, 13, 14, 15, 16, 17, 18 & 19

No assays