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ASBESTOS • COPPER • GOLD • SILVER • URANIUM

Atomic Ores

P. O. BOX ~~100~~ 1760 • FLAGSTAFF, ARIZONA 86001 • (602) 774-7100

JACK P. BIRD
President

RICHARD W. RUSH
Vice-President

December 5, 1970

Bruce Imswiler, Chief Geologist
International Minerals & Chemical Corporation
1196 Telegraph Street
Reno, Nevada 89502

Dear Mr. Imswiler:

In response to your request, these brief notes regarding the asbestos properties in Arizona are included with the enclosed report. I assume that you have proper maps available in your office.

Atomic Ores holds the properties by agreement. Pan American Fiber Corporation owns 130 claims about the locality known as Rock House, about 17 miles southeast of Young, Arizona. Five small mines in this group supplied 30% of the U. S. Stockpile. Another 112 claims are held by Arizona Asbestos Corporation and these claims are east of Cherry Creek.

The system for determining reserves in the enclosed report follows that system instituted by Charles Weathers, a Phoenix mining engineer. This system proposes that 25% of the prospective area will produce but my own investigations strongly indicate that the productive zone should be nearly continuous in the area. Therefore, I raise the estimate of inferred reserved to 1,000,000 tons of finished fiber. If the material is sold in the building industry, the value should be $200 per tone but if the market for spinning fibers can be tapped, then the value should be $400 per ton average.

Should you care to visit the property and to investigate the additional information in our files, please contact me. I shall be pleased to meet with you at any time with concern for the asbestos matter or for my original reason for calling you.

Sincerely,

Richard W. Rush

RWR/sls

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TWO ASBESTOS PROPERTIES IN THE FLUORINE MINING DISTRICT, SIERRA ANCHA MOUNTAINS, GILA COUNTY, ARIZONA

by

RICHARD W. RUSH

Calif. Cert. 1787

TWO ASBESTOS PROPERTIES IN THE FLUORINE MINING DISTRICT, SIERRA ANCHA MOUNTAINS, GILA COUNTY, ARIZONA

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RICHARD W. RUSH

July 30, 1970

CONTENTS

TWO ASBESTOS PROPERTIES IN THE FLUORINE MINING DISTRICT, SIERRA ANCHA MOUNTAINS, GILA COUNTY, ARIZONA

Richard W. Rush

Introduction:

This report is a summary of the geological evaluation of a part of the asbestos mining district of Arizona, and no attempt is made to extend the study beyond that goal. Political and economic factors are better treated by specialists in those fields. The district has little activity at the present time and such a valuable resource should be put into production for benefits accruing to the consumer, producers and operators, community, state and nation. This summary of the geological information leads to the conclusion that the properties could yield approximately 600,000 to 664,677 tons of asbestos fiber.

Location:

The asbestos mining district of the Sierra Ancha Mountains in central Arizona is adjacent to Cherry Creek and southeast of the village of Young, Arizona, which is the only municipality in the region. As shown on the Arizona state highway map, Young is approximately 80 miles north of Globe, Arizona, via Highways 88 and 288. The hard surfaced highway connecting Payson and Heber and which crosses the Mogollon Rim near central Arizona intersects a gravel surfaced road which leads approximately 25 miles northeastward from Young to the intersection. A few additional jeep trails traverse the rugged canyon topography surrounding the broad topographic depression in which Young lies. (See section of Gila County road map.) An unimproved road leads south from Bottle Springs, 13 miles northeast of Young, to the Rock House property, 17 miles south of the Bottle Spring intersection (Shown on MacFadden Peak topographic map near northeast corner). The Harvey Turner property is 10 miles southeast of Young and on the east side of Cherry Creek (shown by symbol on Young, Arizona topographic map). (See MacFadden Peak topographic map, northeast). All the mining property locations are indicated on the Gila County road map.

An airstrip which accommodates twin engine airplanes is west of Cherry Creek at Young and an airstrip approximately 3,000 feet long and suitable for single engine light planes is at Rock House.

Unpatented Claims:

The Rock House property consists of 130 unpatented claims with the original group of claims overstaked by a later block of claims indicated by the prefix AFC (see appendix for list of claims on affadavit of assessment work completed and American Fiber Corporation claim map). The Harvey Turner property contains 142 unpatented claims in several groups largely scattered over the tops of mesas east of Cherry Creek (see appendix for list of claims on affadavit of assessment work completed).

References:

Excellent references which summarize the geology, economics and history up to 1955 are those by Wilson and Butler (1928) and Stewar- (1955), (see appendix). In those publications the Rock House property is referred to as the American Fiber Company claims and, in addition, since 1961, the group has been known as the Pan American Fiber Corporation claims. The Harvey Turner claims include that property known previously as the American Asbestos Cement Corporation claims and, in part, as the Thornburg and Vosberg claims. In addition, each of the properties is treated in detail in reports submitted to each of the operating companies by consulting engineers and geologists. The reference material cited has provided much of the data upon which the present summary is based.

Mining Activity:

None of the mines have been active since 1961, when the mill operated by Pan American Fiber Corporation burned. A contributing factor to closing of all the mines in the Sierra Ancha region was the termination of the federal asbestos stockpile program prior to 1961. The meager production of asbestos from Arizona since that time has come from mines along the Salt River and closer to Globe. The three mills in Globe have been active intermittently since 1961.

General Geology:

All of the properties of the Sierra Ancha region occur on the Sierra Ancha plateau at elevations ranging from 4,000 feet to 6,300 feet above sea level. The Sierra Ancha plateau is a stream dissected surface underlain by gently flexed and normally faulted sedimentary units classified as Upper (Proterozoic) Precambrian. (See Arizona Highway Geologic map and Gila County Geologic map.) The canyon of Cherry Creek below Aztec Peak is

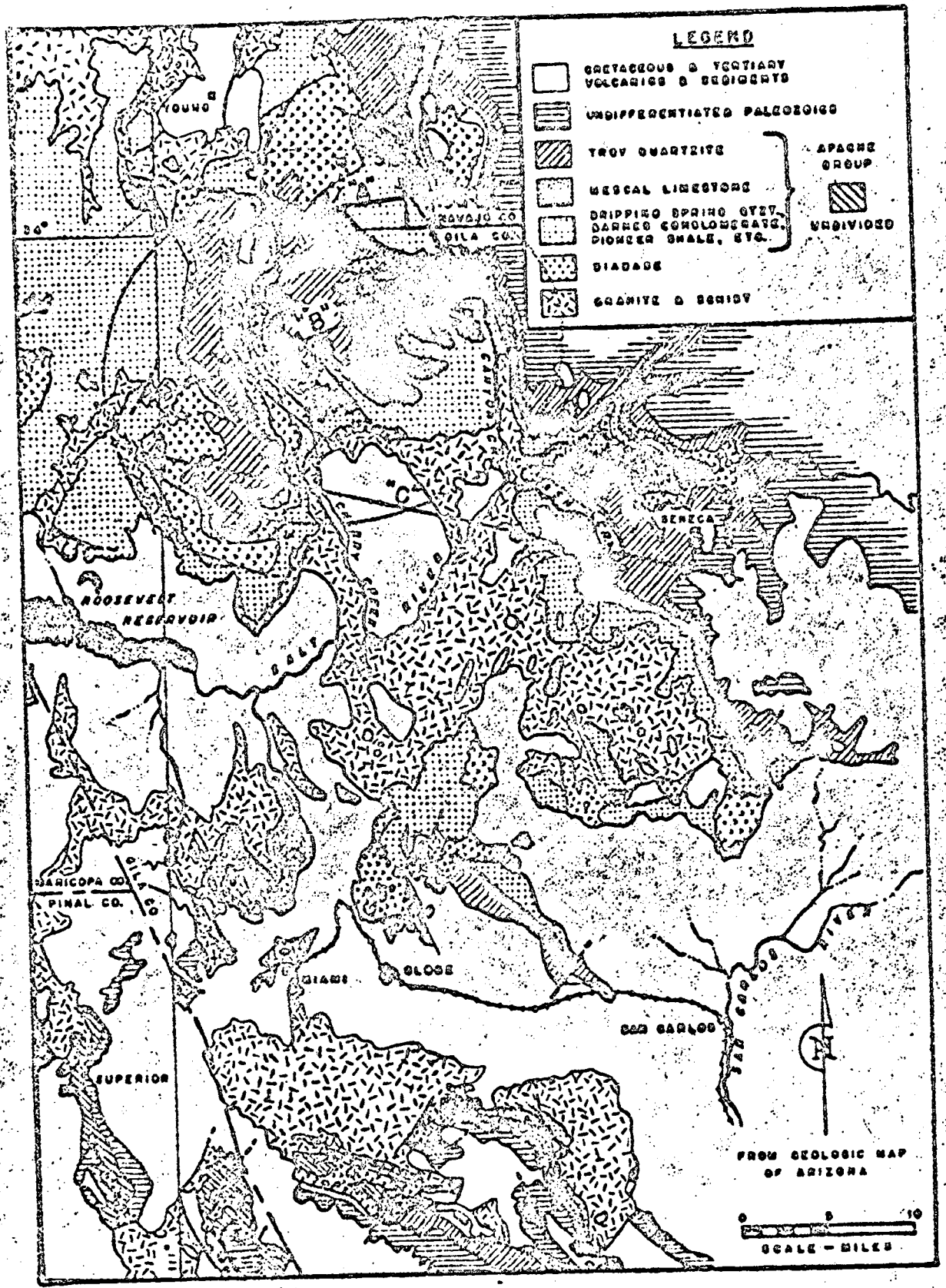

Figure 4. - Geologic map of the central Arizona asbestos region.
From reference No. 15. Stewart, L. A., Chrysotile Asbestos Deposits of Arizona, U. S. B. M. I.C. 7706 (1955)

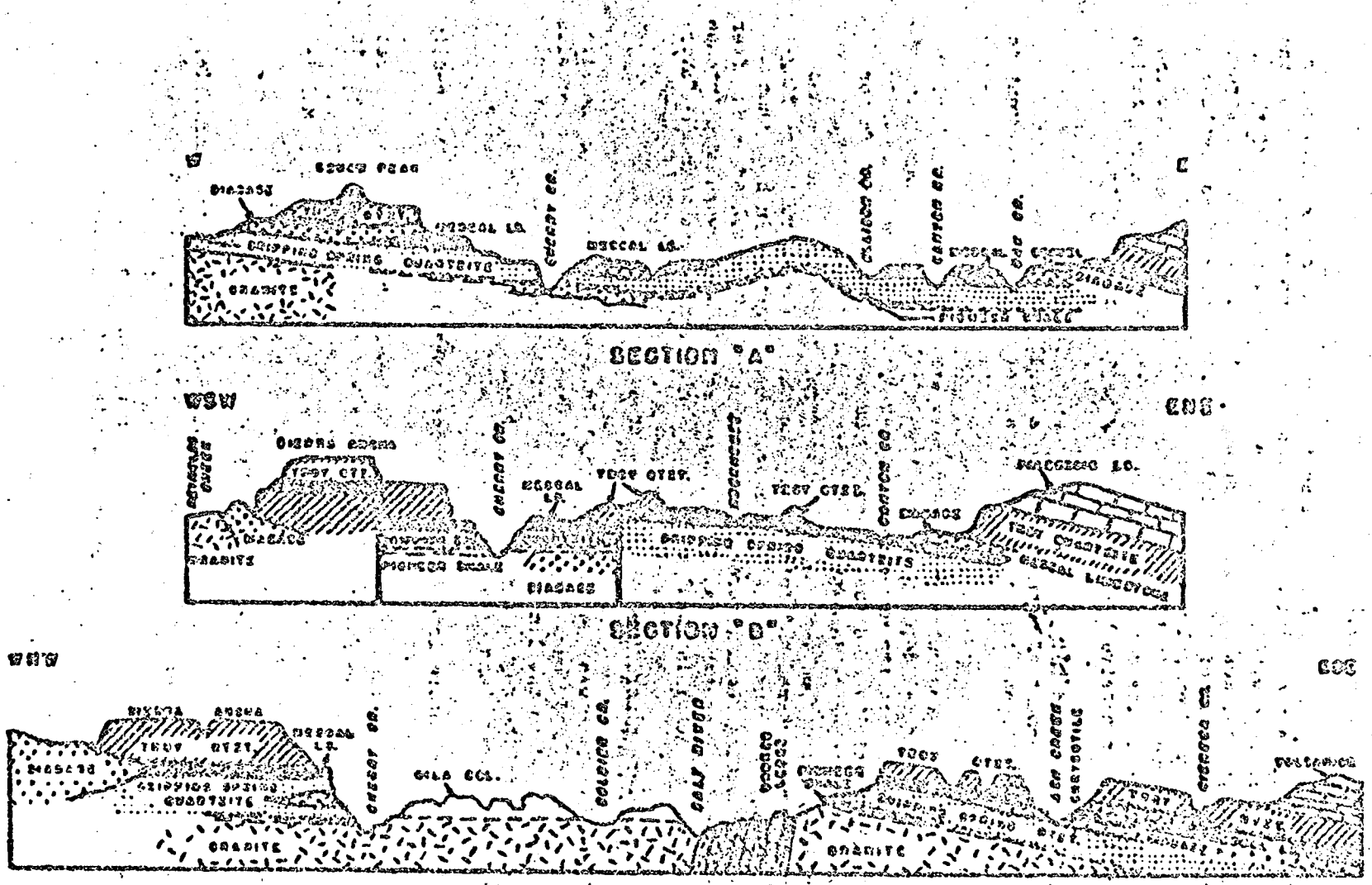

Figure 3 - Sections across the asbestos region.
After M. H. Dodge, Arizona Bureau of Mines Bull. 117, p. 239.

From reference No. 15. Stewart, L.A., Chrysotile Asbestos Deposits of Arizona, U. S. B. M. I.C. 7705 (1938)

about 4,000 feet deep. Tributaries to Cherry Creek descend with high gradients from the relatively smooth plateau surface through increasingly rugged gorges to junctions with Cherry Creek. The Harvey Turner property is in the region of deep canyons east of Cherry Creek. Rock House is on the relatively undissected surface of the plateau, east of Cherry Creek.

The stratigraphic sequence in the region is listed below:

Top

Tertiary and Quaternary		Gravel and sand
Cambrian (?)		Troy sandstone
	Unconformity	
Precambrian		
Younger	Apache Group	Basalt flows
		Mescal limestone
		Dripping Springs quartzite
		Barnes conglomerate
		Pioneer shale
		Scanlan conglomerate
	Unconformity	
Older		Granite and schist

Occurrence of Asbestos:

Principal rock units of concern to this study are the Mescal limestone and the diabase occurs in all of the Upper of Younger Precambrian rock units, but in the Mescal limestone, serpentine and associated retinalite and asbestos occur sporadically at and near the contact of diabase and limestone. The serpentine and its variety, retinalite, are massive, hydrous magnesium-iron silicates and the asbestos, variety chrysotile, is similar in composition but develops as a hollow, tubular fiber. Both soft harsh fiber occur unpredictably and the chemical difference between the two may be a result of the iron, calcium or silicon content or a comination of the three elements. Soft fiber is normally light colored, less than 2% iron and it has a high tensile strength (see appendix for analyses).

Extensive field investigations show clearly that a weakly metamorphosed zone, ranging in thickness from 3 to 8 feet normally and up to 20 feet thick locally, occurs at the upper contact of the diabase sills and overlying limestone. The weak metamorphic zone contains nearly all known occurrences of

chrysotile fiber. The lower diabase contact zone at Asbestos Peak (Bateman, 1923) is the only known occurrence of commercial asbestos under the diabase sill.

The diabase sills, intruded into the Mescal limestone, are remarkably extensive and, concomittantly, remarkably thin. The upper contact of diabase and limestone with asbestos-bearing metamorphic outcrops zone continuously over the linear distance of seven miles from Cherry Creek through the Harvey Turner property to Campbell Creek near Rock House. An additional two miles of the contact is terpreted to lie below younger rocks between Campbell Creek and Rock House. Furthermore, the same contact zone is exposed for another two miles at Rock House. The lower contact zone is exposed for another two miles at Rock House. The lower contact zone is not exposed as continuously as is the upper contact but available data indicate that the sills range in thickness from 20 to 50 feet. The presence and continuity of an asbestos-bearing metamorphic zone at the lower contact of the diabase and limestone has never been investigated. Because high quality commerical fiber does occur at the lower contact at Asbestos Peak, the lower contact should be investigated at other localities. If the lower contact should prove to be at least as productive as the upper contact zone then reserve estimates given here must be doubled, at least.

Local structures including gentle flexures and faults are known to have a direct bearing on the localization of exceptionally thick ore zones (Wilson, 1969). A few such structures, mainly faults, are, clearly, factors of importance in localizing ore bodies in the relatively narrow band of ore outcrop on the Rock House property. Additional detailed geologic studies should be conducted in the covered areas of the Rock House property to search for such structure and test drilling of the structures should be executed.

The only published discussion related to the geochemistry of asbestos formation is that of Bateman (1916) who concluded that hydrous silicate solutions from the molten diabase invaded the passive Mescal limestone and aqueous silica solutions emanating from the diabase developed the serpentine and asbestos. Field observations lead to the unverified conclusion that longer, softer asbestos fibers occur most commonly at or near sags in the top of a diabase sill. All limestone-diabase contact zones are likely to contain ore. When traced along the diabase-limestone contact, serpentine commonly grades into asbestos and vice versa. A diabase-limestone contact may be barren or as much as 8 feet of asbestos ore may appear in the limestone adjacent to the contact.

Only one zone of asbestos fiber may occur or, as at Rock House, as many as three fiber zones may occur in the limestone.

Reserves-General:

Reserves of asbestos have been treated in great detail in each of the company reports submitted to each of the companies and the methods used for calculation idffer in each case. For the purposes of this report, estimates of known and visible reserves will be treated under the heading of available and proved reserves, whereas estimated reserves based on geological prediction will be treated as inferred reserves.

Proved Reserves:

At the Rock House the report prepared by Gerald Weathers cites 499 tons of available asbestos visible in the old mines. In addition to this, proved reserve assessment work performed since 1961 has exposed an additional 1,542 tons in several mines and one of these contains three zones in the Mescal limestone. Furthermore, the mine dumps contain an appreciable amount of fiber as a result of the early mining practice of hand cobbing only the first three most valuable grades of fiber. Much of the remaining fiber now resides in the dumps and more was gobbed back into the mine stopes. Conservatively estimating the dumps to contain 30,000 tons of rock with a fiber content of 15%, the result is an additional 4,500 tons of proved reserve. No estimate of the material gobbed back into the stopes can be made until the stopes can be cleaned and the material sampled. The proved and available reserves at Rock House total 6,542 tons.

The results of extremely detailed work by J. D. Brewer, geologist for American Asbestos Corporation, and consulting engineer Walter A. Rukeyser yields a total proved and available reserve on the Harvey Turner property of 2,700 tons. Both of these men examined in detail the open stopes for ore and the ore zones discovered by drilling. All details of their work is available in the report submitted by Rukeyser.

The total of proved and available reserves is given below:

Rock House	6,542 tons
Harvey Turner	2,700 tons
Total	9,242 tons

Inferred Reserves:

Calculation of inferred reserves is a far greater problem which involves a knowledge of the geological mode of occurrence of the ore. The methods used here in an attempt to discover a minimum and a maximum value for inferred tonnage are those used by Weathers in his calculations of reserves at Rock House and his method is devised after the experience of Steward (1961) at the Regal Mine. The full discussion of Weathers is quoted in following pages.

The technique used by Weathers and Stewart in estimating 25% of the total acreage available as productive is applied here, and, of the 25% productive acreage, an additional 15% is removed as mining loss. The tonnage measure is derived from U.S. Bureau of Mines figures in that 1,000 square feet of productive area underlain by 1 inch of fiber will produce 6.5 tons per 1,000 ft^2 or 282.75 tons per acre. It follows that 2 inches of fiber underlying the same area will produce 565.50 tons per acre and 3 inches fiber will produce 848.25 tons per acre.

At Rock House Weathers calculated 266,000 tons inferred reserve. The minimum value for the same property is 256,035 tons as calculated here.

Applying the same techniques to the Harvey Turner property which contains 112 claims yields the following inferred reserves:

112 claims (est. 20 acres per claim) =

1. 398,677 tons

Property	Minimum	Maximum
Rock House	256,035	266,000
Turner	398,677	398,677
Totals (Tons)	654,712	664,677

These totals indicate a total useful inferred reserve of more than 600,000 tons in the two properties.

Recommendations given on later pages indicate that the tonnage figures given here may be greatly increased.

Value of Reserves:

The gross value of the reserves is another difficult problem and no figure can be given which is not controversial. The discussion given by Weathers on this problem is quoted in full on the following pages.

The value given by Weathers of $596 per ton may be rounded off to $600 per ton and used as a maximum value.

At least one mine and mill operator states that his average market value per ton of ore is $450 per ton. A number of factors, prompted by a conservative attitude, suggest that $400 per ton of ore is the lowest value which can be considered. The table summarizing the calculations is given below:

Reserve	600,000 tons	664,677 tons
@ $400/ton	$240,000,000	$265,870,800
@ $500/ton	$300,000,000	$332,338,500
@ $600/ton	$360,000,000	$398,806,200

In indicating a preference for the lower of the median figures, $300,000,000, this writer is basing judgment on a knowledge of the field geology and the fact that much of the ore can be mined by surface methods. Also, it seems obvious that more modern milling methods and a shorter transport distance northeastward to the railhead at Snowflake, Arizona will increase returns to the operators.

Costs:

The full discussion given by Weathers regarding costs and profit expected is given because it is based on the data given by Stewart at the Regal Mine (Stewart 1961). No other published material exists with regard to mining costs in the area, and company records are not sufficiently detailed to yield useful data

Recommendations:

High quality chrysotile asbestos fiber from the Arizona region is light-colored, soft, strong and low in iron content and these properties are not possessed by the larger part of other asbestos fiber produced in North America. Despite the fact that the United States is one of the two major asbestos manufacturing nations in the world, it does not make full utilization of this domestic resource. Most of the asbestos

fiber which is competitive with Arizona asbestos fiber arrives in the United States from South Africa and it is reported that the South African deposits are approaching depletion.

In his report, Weathers tabulated his recommendations clearly and these are quoted in full on the following pages. Rukeyser's recommendations are fewer and more difficult to find because they are scattered throughout his report. One of his suggestions was to unite the producing district or a large part of it and, presumably, operate the mines as a single, well-organized source of supply. A major goal to be achieved would be to reduce the mining costs of such a unit.

A second step is suggested here to reduce the transportation cost by using the railhead at Snowflake, Arizona, which is approximately 90 miles northeast of Young. At present, about half of that road distance is hard surfaced and, within about two years, a new and shorter segment of paved road will be built to connect Young and Highway 160 to the north.

It may be suggested, too, that a mill and warehousing facility should be built near Young and an additional warehouse at Snowflake.

A further and more revolutionary suggestion is to transport finished fiber from Young to Snowflake via pneumatic pipeline. The suggestion has merit but some experimentation is required to determine the effects on the fiber. Additional studies must be made to determine power and pump requirements in addition to purchase and installation costs of plastic pipe.

Prior to any serious contemplation of mining operations a detailed geologic map of the area should be prepared. The geologic map should be prepared on an air photograph base and the final map should be of such a scale that the metamorphic zone, containing the asbestos fiber, is shown clearly throughout the region. In addition, the geologic map should show all significant fractures and flexures which may have some bearing on the localization of ore. Until such a map is completed, it is not possible to derive useful, accurate and detailed measurements of ore distribution and thickness. The completed geologic map will serve as the best guide to exploratory drilling, also.

It is recommended that an additional four square miles north of and adjacent to the Rock House property should be staked and claimed as an additional ore reserve. All such

claims should be staked in the field and claim notices filed at the Gila County Recorder's office at one time to protect company security and avoid any intrusion on the property by others.

It is recommended that, for the first time, the remaining 99% of the Rock House property and the four square miles to the north of it should be explored by drilling techniques. The drilling program is divided into three categories as (1) development (2) wide range exploration and (3) close range exploration.

Development drilling is envisioned as a system of drill holes positioned on a line 200 feet back of the outcrop and mine groups extending from the Montezuma group of mines in NW 1/4, section 22 T7N, R 15 E (Rock House) through the area of the Asbestos mine group SE 1/4, Section 15 and NW 1/4, Section 14, T 7N, R 15E. The drill holes should be spaced at intervals of 50 feet along the two mile line between the end points for a total of 208 holes. Average depth estimates derived from available maps are crude at best but an average depth of 30 feet per hole is the best figure to use. Drilling should be done by coring methods using a minimum of 3 inch diameter core which should yield the most satisfactory data for determination of fiber thickness and lengths of fiber. The developmental drilling program should serve as the best guide to possible surface mining of the proven and most promising portion of the Rock House property.

Wide range drilling exploration is the method suggested for subsurface exploration of the remaining unclaimed portions of sections 3,4,9,10 T 7N, R 15E which are north of Rock House. The purpose of the drill holes in this phase is to search for the asbestos-bearing metamorphic zones at the top and bottom of the diabase sill which, geologic evidence indicates, underlies younger rocks in the area. It is recommended that the overlying troyquartzite and the upper portion of the Mescal limestone should be drilled by rotary method to the first occurrence of the metamorphic zone which appears in the cuttings. A minimum of 3 inches diameter core should be recovered through the upper metamorphic zone which, most likely, will not exceed 10 feet in thickness. Rotary drilling then may be used to drill through the underlying diabase sill to the first occurrence of the metamorphic zone in the underlying Mescal limestone. If the lower metamorphic zone does appear in the cuttings at this point then another 10 foot core should be cut. If no metamorphic zone appears after drilling 5 feet into the Mescal below the diabase, then the hole should be terminated.

In the wide range drilling program two north-south lines

of seven holes each, spaced at 1/2 mile intervals are recommended. The first hole in the western line should be in the middle, south line, section 16 and the last hole at the north end should be in the middle, north line, section 4, T 7N, R 15E. The southern most hole in the eastern line should be in the middle, south line, section 15 and the northernmost hole in the middle, north line, section 3, T 7N, R 15E.

Estimated depths and thicknesses of rock are crude if determined from present maps. The table summarizes depths, thicknesses and types of rock for each of the two lines of exploratory holes.

Western line	Eastern line
2 holes--T.D. 200Ft quartzite-100ft limestone- 60ft diabase - 40ft	3 holes--T.D. 100 ft limestone-60 ft. diabase -40 ft.
1 hole--T.D. 100Ft limestone- 60ft diabase - 40ft	2 holes--T.D. 320 ft quartzite-220ft. limestone- 60ft. diabase - 40ft.
2 holes--T.D. 550Ft quartzite -450ft limestone - 60ft diabase - 40ft	2 holes--T.D. 60 ft. limestone - 20 ft. diabase - 40 ft.
2 holes-- 400Ft quartzite -300ft limestone - 60ft diabase - 40ft	

Total drilling depth	--(est.)	3460 ft.
Total quartzite	--(est.)	2140 ft.
Total limestone	--(est.)	760 ft.
Total diabase	--(est.)	560 ft.

These figures could be greatly improved if a more accurate geologic map were available.

Close range exploartion is to follow wide range exploration and it is dependent on discoveries, if any, made by the wide range program. Close range drilling is intended to prove continuity of ore between first, the mines and outcrop zone at the south and east side of Rock House and the drill holes to the north and, second, between wide range exploratory holes. Because geologic evidence suggests that the metamorphic zone should be continuous under Rock House then the close range drilling should be dependent upon wide range drilling and the total number of close range drill

holes will be determined by the thickness and quality of ore discovered in wide range drilling then, eventually, close range drilling on 100 foot centers should be completed to outline each commercial area.

If the method of estimating reserves given earlier is valid, as suggested by surficial geologic studies, then the total reserve of the total area under consideration should be doubled, at least, and, assuming commercial possibilities at two horizons then the latter total should be doubled again. The goal of the exploration program is to arrive at useful and more valid estimates of reserves.

It is recommended that the Rock House area should be explored and mined first because the topography and surface condistions afford easy transport and the continuity and grade of fiber has been demonstrated. Experience in drilling and mining the Rock House area may permit exploration of the Harvey Turner property to be done by wagon drill.

It is recommended that the dumps at Rock House should be milled for the recoverable ore. A new and more efficient milling procedure should favor a far greater recovery of ore than has been the case in earlier operations.

It is recommended that exploration should be extended through approximately 15 sqare miles of the reservation east of Rock House.

Conclusion:

Studies show conclusively that the potential of the mining district is large enough to merit more effort and expense to reactivate the district. The quality of the product is unlike other asbestos produced in North America. Criticism of the product in past years can be avoided with the application of new methods and allowing well-trained people to exercise their talents in the area.

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APPENDIX I

POTENTIAL OF THE ROCK HOUSE PROPERTIES

Potential Production Area:

One of the major difficulties of the Arizona asbestos industry is to evaluate the ore deposits, due to their erratic nature. Very little information is available concerning their continuance in other horizons or the overall extent of ore bodies.

In this investigation, the possible extent of the asbestos bearing horizons is estimated by superimposing a plan map of the areas mined (from individual mines in the district having a long history of production) upon a plan map of their respective claim boundaries. This ratio is then applied to the Rock House property. Thus, the plans of the Regal, Victory, and Eldorado Mines, indicate an average of 6.3 acres (representing an elongated ore body) has been mined from the containing 20 acre claim or about 30% of the claims have been mined.

The Rock House property has 12 separate partially mined areas within seventeen different claims, plus many serpentine bearing outcrops aligned roughly northeasterly across the entire property. Therefore, it is very probable the claims containing the favorable asbestos horizons and also asbestos prospects could be expanded into a similar ratio of potential productive area to overlying claim boundary.

The potential and evaluation of the Rock House property is based largely upon these observations, combined with the geologic features of the property, its past production record, information concerning

the Arizona asbestos mines from noted authorities and the results of the field examinations.

The whole of the Rock House properties are underlain by those members of the Mescal formation, which ordinarily carry asbestos deposits excepting the portion covered by diabase. If a conservative ratio of the potential productive area to the overlying claims is applied to the Rock House property, it is judged that 25% of the area carries asbestos ore and the potential is 356 acres of which 15% would be left as pillars, etc., or a total of 303 acres are judged to be underlain by recoverable asbestos of ore grade. Drilling results indicate the ore bodies on the property with a cut off grade of 2" accumulative of fiber, carry an average of 3.32" of fiber, which, for convenience and conservatism is rounded off to 3". The potential is 43,560 feet^2 x 1/4' = 10,890 cubic feet per acre. Since 12.4 cubic feet of fiber in place equals one ton; then each acre contains 878 tons of asbestos ore or 266,000 recoverable tons of 3" (accumulative) fiber underlies the 356 acres to be mined.

Average Value of Fiber per Ton:

The value per ton is another figure subject to much controversy, a factor dependent upon the grades mined, efficiency of the mill and prevailing selling prices. This value is especially difficult to obtain from the Rock House production records because:

1. Often the operators sold only the first three grades and

discarded the remainder. Then only the net value after deducting haulage, milling and other costs was recorded. (Ref. Table VI, Appendix).

2. Much of the recent shipments have consisted of the lesser grades from the dumps left by former operators.

3. Settlement sheets from the government ore buyers show past sales of shorter grades from the Rock House property have contained as much as 50% fiber of a higher grade, proving the inefficiency of the present mills (See Table VII, Appendix).

4. Fiber shipped from the Rock House property was evaluated from $250 per ton to over $1,000. per ton.

Thus, it is difficult to compile statistics from production records showing the average value of recoverable fiber in the rock.

The writer has taken the figures presented in Table VIII, Ref. No. 17, covering the production from the Jaquays Mining and Milling Operation as being most representative of the proportional percent of the fibers present in the asbestos ore from this district.

During the year of 1958, 24,660 tons of rock were mined, of which 2,335 tons of hand-cobbed ore were trucked to the mill. Of this amount 574.53 tons of fiber were recovered, representing 24.6% of the ore milled. Grades below Group No. 4 filter fiber or 75.4% of the millfeed were not separated, but were left in the mill tailings to be sold as stucco grade to West Coast users. These combined shorter grades are valued at an average of $125. per ton. According to the table, the first four grades were sold at an average price of $673.95 per ton. Sales for the remaining 1761 tons of millfeed are not quoted.

In the following estimate of value per ton, excluding grades below

4, the percentages of the grades of fibers present, regarded as representative of the Arizona asbestos deposits are taken from Table No. VIII. The values of the first four grades per ton are based upon the average prices per ton received from the sale of the Rock House production.

ESTIMATED VALUE PER TON OF FIBER OF THE FIRST FOUR GRADES:

Grade	% of Total Fiber Recovered	Average Value Per Ton	Value
1	18.9	$ 1,510.	$ 285.
2	11.9	900.	107.
3	32.7	400.	131.
4	36.5	200.	73.
	The estimated value per ton of fiber produced (excluding grades below 4)		$ 596.

ESTIMATED POTENTIAL:

The potential production is estimated as 266,000 tons valued at $596. per ton for the first four grades, or	$158,536,000.

ESTIMATED PRODUCTION COSTS:

Exploration: Refer to "Estimate of Total Drilling cost and Rate of Progress" for derivation of this figure.	$1,706,000.
Mining and Development: According to Table VIII, about 34 tons of waste aremined per ton of ore or 266,000 x 34 = 9,044,000 tons of ore to be mined at the current average cost of $8 per ton [17] =	$72,352,000.
Transportation: The ore is usually semi-processed at the mine site and the millfeed is trucked to Globe. Table VIII indicates 12% of the rock mined is milled; therefore 9,044,000 tons x .12 = 1,085,280 tons to be trucked to Globe at the current average cost of $10 per ton or	$10,852,800.
Milling Costs: 1,085,280 x $20 per ton	$21,705,600.
Marketing and Research: Cost estimated at 5% of the value of the ore or	$ 7,926,800.
Contingencies to cover mining equipment costs, mill erection costs (to be amortized) and miscellaneous overhead are estimated at another 5% of the ore value or	$ 7,926,800.
Total Cost	$122,470,000.
ESTIMATED PROFIT:	$ 36,066,000.

SOURCES OF ADDITIONAL PROFIT:

It is possible to increase the profit estimated in the previous section in numerous ways as follows:

1. To find in the ore deposits an increase in the overall fiber length, or the number of mineable fiber bands.

2. To find an increase in the estimated per cent of area containing fiber.

3. Lower the cost of mining.

4. Reduce the haulage cost and distance to the mill and warehouse.

5. Increase the mill efficiency (more fiber recovery, less fiber breakage).

6. Fiberize and sell the recoverable portion of the 75% of millfeed of less than 4 grade.

7. Upgrade the value of the lower grade products by producing grades for specific uses.

8. Develop a market for the resulting large limestone waste dumps (potential buyers are the growing agricultural industry or paper mill industry).

Percentage Tabulation of Costs and Values:

A percentage breakdown of the various costs and values excluding the fiber of less than 4 grade is estimated as follows:

Item	% of Total Cost	% of Value	Cost or Value per Ton of Fiber Produced (Est.)
Exploration	1.39	1.08	$ 6.44
Mining & Development	59.08	45.64	272.01
Transportation	8.86	6.84	40.77
Milling	17.73	13.69	81.59
Market & Research	6.47	5.00	29.80
Contingencies	6.47	5.00	29.80
Profit		22.75	135.59
Total	100.%	100.%	$ 596.00

be drilled on a grid pattern to delineate underlying asbestos ore deposits. A recommended Phase I exploration program is outlined in the report; subsequent prospecting recommendations should follow a detailed geologic study for additional specific exploration targets.

Summations and Recommendations pertaining to the Arizona asbestos industry are:

1. The product, a low-iron chrysotile asbestos of all grades should be well received by an industry unable to meet its demands.

2. The expected gross per unit volume should be high.

3. Exploration should be preceded by close Geological studies of the deposits.

4. A more economical mining method designed for greater production per man hour should be adapted to these deposits.

5. Milling techniques and products should be improved.

6. Quality control of the asbestos must be exercised to produce asbestos grades to conform to industrial use specifications.

7. A dependable supply of the product must be assured.

8. The entry into the Arizona and U. S. asbestos industry will require a large monetary outlay to block out sufficient ore reserves; to develop the mines and follow more economical mining method; to build an efficient mill and to develop markets for all grades of asbestos produced.

APPENDIX II

An opencut farther north on the outcrop shows 3/4 inch total fiber in a zone 5 feet above the diabase contact. The quality of asbestos in this deposit varies from soft to semisoft.

Silk claim. - At this deposit a small amount of stoping has been done from a short adit, where two zones were worked in the same heading. The lower zone, 4 feet above the top of the underlying sill, is an 8-inch serpentine band containing a total of 1-1/2 to 2 inches of asbestos. Six feet above floor level the back of the stope exposes a 10-inch zone containing a total of 1 to 2 inches of asbestos. The quality of the fiber here is semisoft to fairly harsh.

It is likely that several tons of asbestos was mined from the two zones.

SIERRA ANCHA DISTRICT

For the purpose of this report, the Sierra Ancha district is considered to include the area bounded by Salt River on the south and by Tonto Creek and Canyon Creek, respectively, on the west and east. No asbestos deposits are known north of the latitude of the town of Young.

The district is entirely within the Tonto National Forest, except for a small portion of the Fort Apache Indian Reservation on the east side.

This rugged mesa, known as the Sierra Ancha, is one of the most prominent topographic features in the central part of the State. Its highest point, Aztec Peak, has an altitude of about 7,400 feet. The sierra consists of a thick succession of the nearly horizontal formations of the Apache group. Large bodies of diabase have been intruded into the strata at various horizons. The Sierra Ancha forms the east side of the Tonto Valley, and the north side of the Salt River Valley. Cherry Creek has cut a canyon about 4,000 feet deep along the east side of the sierra, separating it from another high, rugged plateau. Further east this second plateau is deeply trenched by Canyon Creek, forming a canyon nearly as deep as that of Cherry Creek.

At numerous places within this area, asbestos has been found in favorable beds of the Mescal limestone. Several mines have been productive. There are numerous smaller prospects. It is likely that many potential deposits are concealed by the heavy overburden that exists over much of the area.

American Ores Mine

This group, comprising 32 contiguous unpatented claims, is owned by William G. Shanley, 450 S. Normandy, Los Angeles 5, Calif. The property is about 37 road miles from Globe in secs. 19 and 20, T. 5 N., R. 14 E., in the Tonto National Forest. The claims are at the end of a steep, 3-mile dirt road that goes eastward up Pocket Creek from the Globe-Young road 34 miles north of the junction of State Highway 88 (Apache Trail) and U. S. Highway 60.

History

The nucleus of the present group was originally located by Charles Watkins in 1915. Charles F. Sloan optioned the claims in 1917, organized the American Ores & Asbestos Co., and shipped several hundred tons of No. 1 Crude fiber to the United States Asbestos Co. of Lancaster, Pa. In 1918 this company, with the Raybestos Co., of Bridgeport, Conn., secured control of the mine and operated extensively in

1919 and 1920. Peak employment was 275 men, producing hand-cobbed crude Nos. 1 and 2 grades. As there was no market for the shorter asbestos, this material was either thrown into the stope fill or went over the dumps. By 1921 the then economic limit of the known ore had been reached. The surface equipment was dismantled the following year, and assessment work was allowed to lapse.

W. G. Shanley relocated the property in 1923 and organized the International Asbestos Co. A crushing pilot mill, consisting of a crusher, two sets of rolls and screens, was built in 1926 to test the yield of stope fill and dump material. During 2 test runs in 1927 this mill is said to have recovered about 140 tons of crude Nos. 1, 2, and 3 grades from 1,030 tons of rock milled. The larger mechanical units are still in place, but the whole edifice is in a bad state of disrepair.

There is no record of production from the mine from 1927 to 1947. From 1947 to the present time several short term leases have been granted. These lessees have worked on mine and mill tailing-dump material and have mined some ore from pillars and old stope faces. The caved portals of tunnels 16 and 20 have been reopened.

Geologic Setting

The claims are situated along a northwest-trending ridge on the south face of the Sierra Ancha Mountains at an altitude of approximately 6,300 feet. In this area the upper or siltstone member of the Mescal formation is present overlying the thick-bedded algal member, which here lacks the algal structure that characterizes most other parts of the asbestos region.[19]

On the south side of the ridge, in the vicinity of the mine workings, a 10-foot diabase sill has been intruded along the contact between the upper and algal members of the Mescal formation. The productive asbestos zones lie immediately below the lower contact of this sill in a limestone stratum, which is 20 to 30 feet thick and is underlain by a thick diabase sill. This thin limestone block outcrops on the steep hillside slope 50 to 100 feet below the crest of the ridge. It is cut off on the west by the union of the two sills. At about 2,000 feet east, alluvium obscures the outcrop, but the lower diabase sill appears to be cutting up across the limestone bedding and probably likewise joins the upper sill at this end. The remaining thickness of the Mescal formation is present beneath the underlying sill, about 500 feet lower in the section. Near the top of this limestone a serpentine-asbestos vein has been prospected by several small cuts and a 100-foot adit, but no commercial concentration of fiber has been found.

About one-half mile north across the ridge on the Pocket Creek side, a similar thin section of limestone lies between diabase sills. Exposures are poor, but three dumps indicate that this zone had been prospected by adits that now are caved. Very little asbestos can be seen in these dumps, but Shanley states[20] that soft fiber of fair length was encountered.

Mine Workings

The mine workings consist of a series of 20 adits, ranging in length from 40 to 870 feet, exploring an outcrop length of 1,900 feet. Some of the adits are interconnected by drifts and a maze of stopes. Figure 24 is a reduction from a

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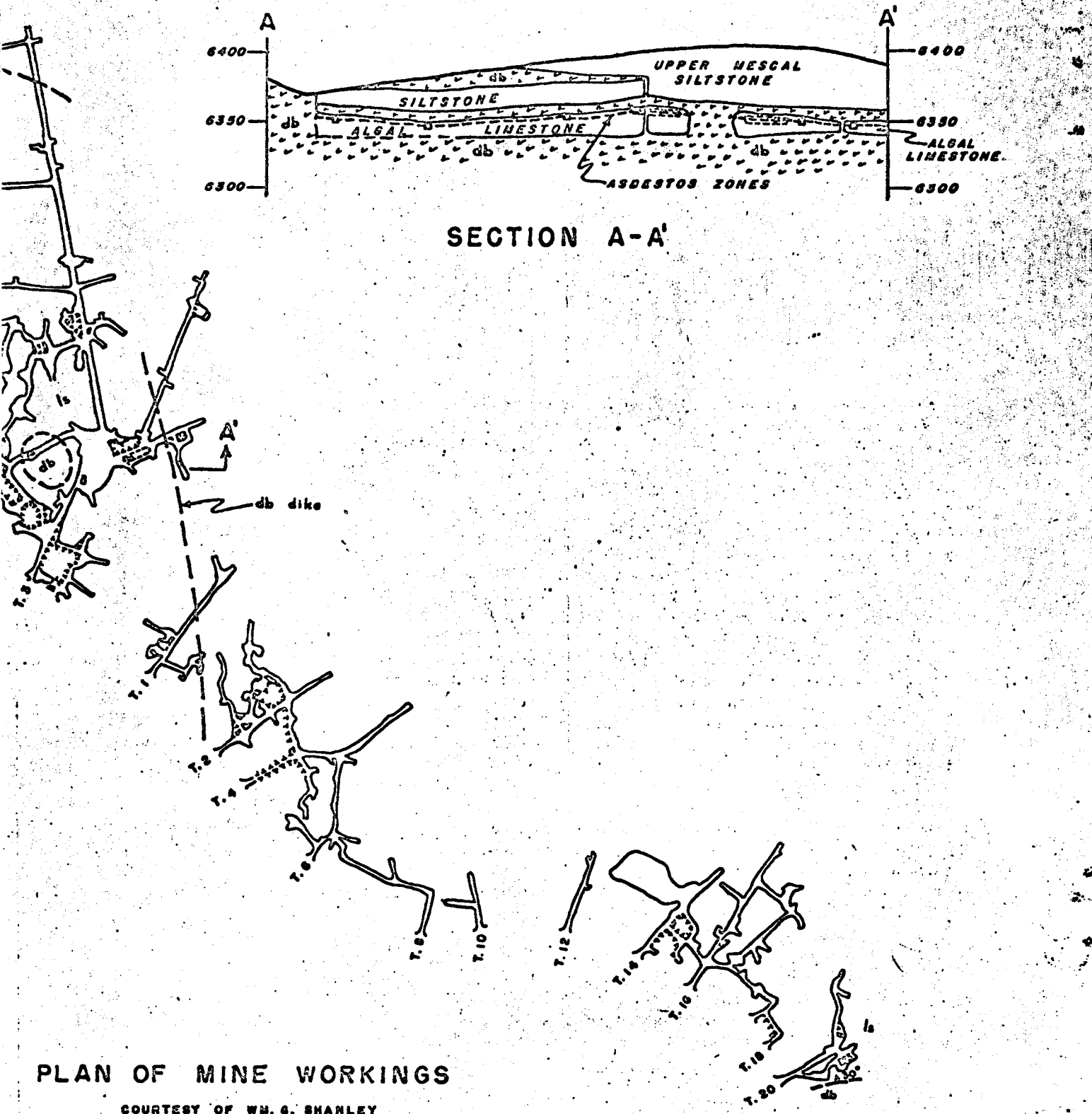
19/ Shride, A. F., Federal Geol. Survey, oral communication.
20/ Written communication.

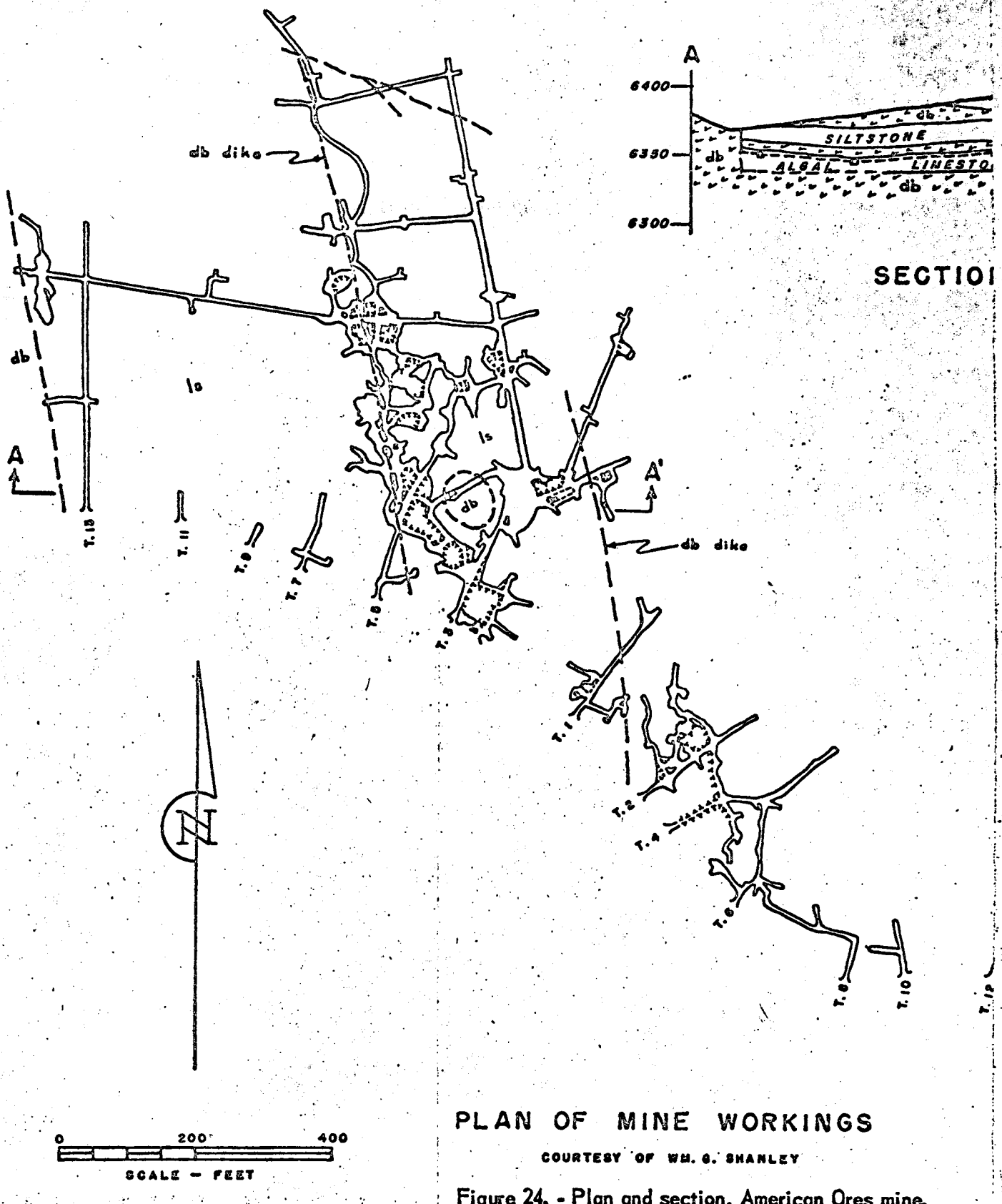


SECTION A-A'

PLAN OF MINE WORKINGS

COURTESY OF WM. G. SHANLEY

Figure 24. - Plan and section, American Ores mine.



PLAN OF MINE WORKINGS

COURTESY OF WM. G. SHANLEY

Figure 24. - Plan and section, American Ores mine.

map furnished by Shanley. Although dated December 1920, this map has been proved by later surveys[21] to be essentially accurate, as very little underground work has been done since that time.

The adits have been driven into the limestone bed under the 10-foot diabase sill at the top of the algal member. The main serpentine-asbestos zone is 2-1/2 feet below the diabase contact and is notably persistent throughout virtually all the workings. A less persistent zone is 4-1/2 to 5 feet lower.

The most productive area was in the T3 and T5 workings, where the intrusion of 2 parallel, north-trending, 4-foot diabase dikes have slightly arched the formations. Between the 2 dikes, a diabase plug, 60 or more feet in diameter, cuts through the limestone. Major concentrations of asbestos in both zones were found in this area of greatest deformation. It is said that considerable quantities of 4- to 6-inch fiber were obtained in these stopes. Wilson states:[22] "This asbestos deposit is unique in having yielded fiber that occasionally was of exceptional length. Some of its specimens, which were as much as 14 inches long, are believed to represent the longest crossfiber chrysotile yet found in the world." Additional exploration northward by drifts and crosscuts failed to find extensions of this ore body.

The limestone stratum is cut off by discordant diabase west of T13. One small lens of fiber was found adjacent to this crosscutting diabase. One small stope was developed in T14, but these workings now are inaccessible.

Examination of the accessible workings indicates that in much of the mine area the asbestos occurs in veinlets that are too narrow or the asbestos is too harsh to form commercial ore. There is a promiscuous intermingling of fairly harsh and soft fiber within the veins. A band of soft fiber may change to harsh within a few feet; elsewhere, one veinlet may be soft and an adjacent one harsh.

One lessee reopened the caved portal of T16, extended the end of one of the stub drifts, and encountered a lens of soft, silky fiber up to 2 inches in length. T20, the easternmost adit, was likewise reopened. Most of the fiber seen in these workings is harsh. The underlying diabase has crosscut upward in the limestone unit to within about 3 feet of the fiber-bearing zone.

In February 1954, M. A. Hoffpauir, Jr., and William Haley were reopening the caved portal of T14. A small plant, designed to recover fiber from the tailings dump, has been erected below the base of the old mill. The material is fed manually to a vertical 2-foot Agnew centropak, elevated by suction to a cyclone, then passed over a 14-mesh shaking screen to remove dust. The fiber on the screen is aspirated to a second cyclone, where the final product is bagged. The plant is said to have a capacity of 1 ton of mill feed per hour.

American Asbestos Cement Corp.

The property of the American Asbestos Cement Corp., held by asbestos locations, consists of 93 contiguous claims (fig. 25). This group, owned by Vance Thornburg and associates, is situated in secs. 24, 25, 26, 35 and 36, T. 8 N., R. 14 E., and

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21/ T8 and westward by Shride 1943. T16 and 20 by Stewart 1954.
22/ Wilson, E. D., Asbestos Deposits of Arizona: Arizona Bureau of Mines, Bull. 126, 1928, p. 71.

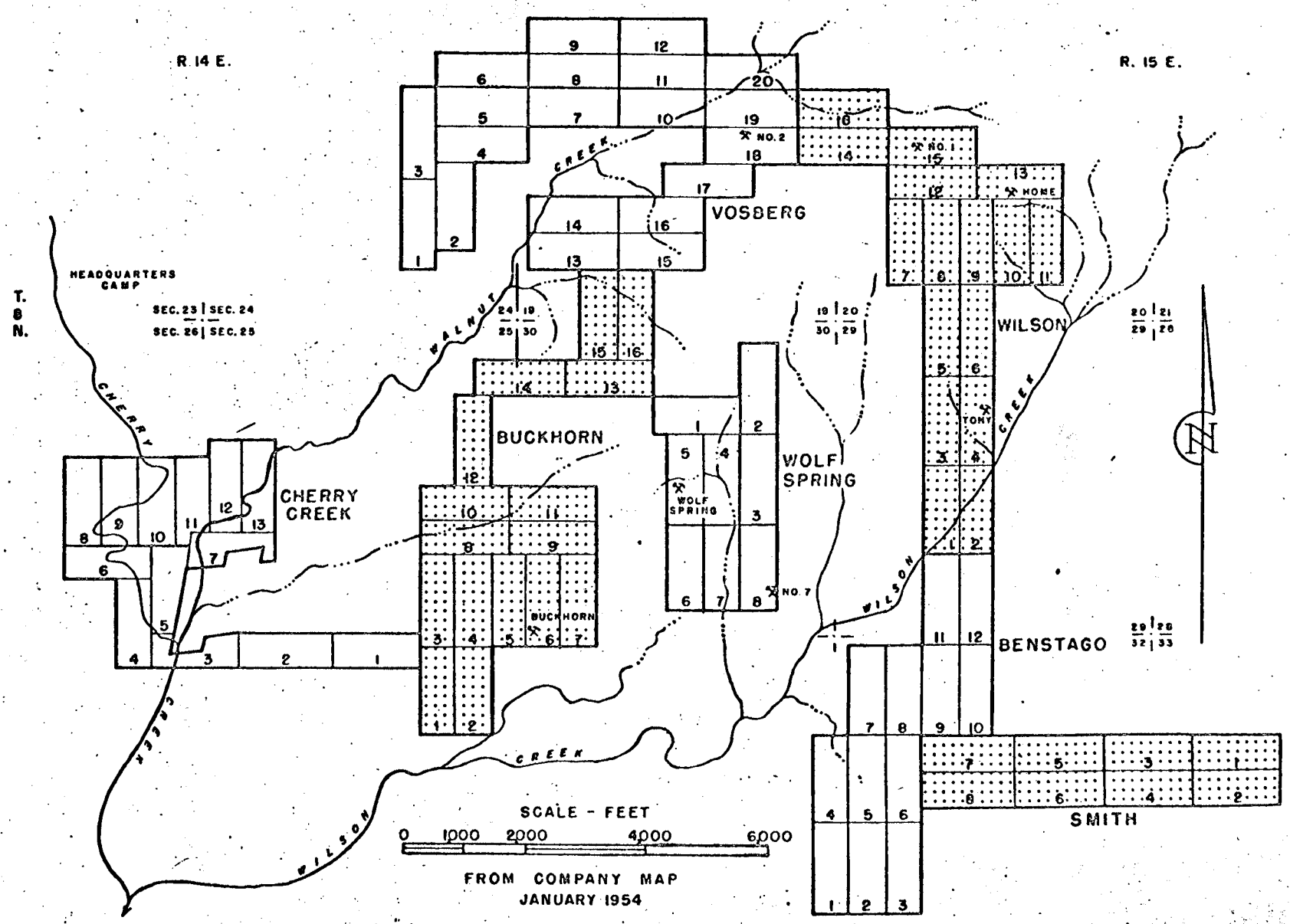


Figure 25. - Claim map, American Asbestos Cement Corp.

secs. 19, 20, 29, 30, 32, and 33, T. 8 N., R. 15 E., of the Tonto National Forest. The company camp is accessible by an 8-mile road down Cherry Creek that branches southward from the Globe-Young highway 1/2 mile east of the Young post office. A series of pilot roads leads from the camp to the various deposits.

History

The original claims near Cherry Creek were located by Clyde Kennedy in 1916-18. Additional locations were made by George B. Wilson and associates, and some asbestos was produced in 1921. The Riga Asbestos Co. held the property from 1922 to 1924, during which time small shipments of asbestos were made.

In 1927 the Triangle Asbestos Co. was formed and took over the 72 claims, constructed a small mill, and produced a considerable amount of the higher grades of asbestos. In the early 1930's the Triangle Asbestos Co. passed out of existence. Thereafter intermittent operations were conducted by various lesses. In 1949, George Kohl secured a lease of the entire property from the Wilson estate and in November of that year, with associates, formed the Gila Asbestos Co. A mill was constructed, access roads were "dozed" to various deposits, and mining was conducted.

Early in 1951 the American Asbestos Cement Corp., Ammon Smith, president, bought out the Gila Asbestos Co. and renegotiated a lease-option with the owners. Both the latter companies produced a considerable amount of asbestos, part of which went into the Government Stockpile.

The Thornburg interests took over the property in February 1954, and they continue to operate under the name of the American Asbestos Cement Corp.

Geologic Setting

Cherry Creek and its tributaries have carved the region with many steep-sided canyons but have left intervening mesas that stand from 5,000 to 5,600 feet above sea level. The claims rim these mesas in the vicinity of Cherry, Walnut, and Wilson Creeks. Because of the complex erosional dissection of the region, the extensive holdings of the American Asbestos Cement Corp. cover miles of Mescal limestone outcrops. The limestone, generally flat lying, is intruded by diabase sills, which often are characterized by discordant structures. In this area, the diabase sills and the favorable limestone units are in general close proximity, consequently there are scores of places that show varying degrees of asbestos mineralization.

Only a few of the larger deposits are described here. The smaller occurrences are too numerous to discuss in this report.

Mine Workings

No. 1 mine. - The No. 1 mine is on the north face of a mesa on Wilson claim 15. The Gila Asbestos Co. reopened old shallow workings here in 1950 and, in the course of exploration, discovered the lower ore zone from which production was begun in June of that year.

The limestone bedding dips southeast (into the hill) at approximately 5°. To facilitate extraction, a haulage adit was driven in diabase 35 feet below the deposit. At 150 feet from the portal, a raise was put up to the stope. Using a

slusher at the head of the raise, ore or waste could be alternately scraped into the raise and trammed to the surface from the chute in the haulage drift (fig. 26). The mine was operating when the property was acquired by the American Asbestos Cement Corp. in February 1951.

Two fiber zones have been exposed 13 and 17 feet below the base of the algal member. The lower zone, from which virtually all production has been made, is 7 feet above a thick diabase sill. The favorable horizons are cut off to the southwest by the sill cutting upward to the base of the algal member. To the northeast the sill remains concordant for approximately 400 feet, then cuts down to a lower stratigraphic level.

Surface outcrops and mine workings show that the serpentine-fiber zone pinches down to the northeast, away from the roll, becoming subcommercial at a distance of 150 feet. Near the roll the serpentine zone had a maximum thickness of as much as 10 inches and probably averaged 5 to 6 inches throughout the mine. Approximately half of this zone was fiber, of which possibly 60 percent was of No. 1 and No. 2 grades. Approximately 300 feet from the surface the mineralization pinched down, and a fault trending east-southeast cut off the zone. The deposit was considered exhausted in November 1951. Pillars were pulled, and caving has rendered the mine virtually inaccessible.

The fiber that was produced was slightly harsh but of good tensile strength. Part of it was of Government Stockpile quality.

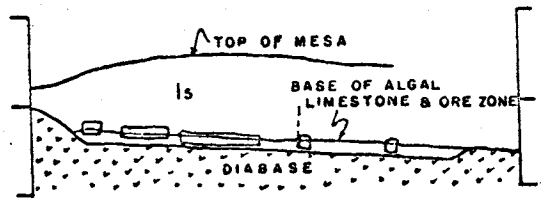
No. 2 mine. - the No. 2 mine workings are around the periphery of a small mesa that is on the Vosburg claim 18, about 1/2 mile west of No. 1 mine. The diabase sill that is in contact with the algal limestone member between the two mines cuts downward into the lower member at the south edge of the mesa and remains concordant to the north. From the discordant section of the sill on the south side of the mesa, a secondary branching sill forms a wedge between the limestone beds for some distance into the hill.

Three asbestos-bearing zones are present in the No. 2 mine area. The upper zone is approximately 6 feet below the base of the algal member. The other two are 13 and 17 feet below the algal; that is, in the same stratigraphic position as the ore zones of the No. 1 mine. The limestone-diabase contact is a few feet under the lower zone. A 110-foot adit has been driven in this limestone wedge on the lower and middle zones. The lower contained 1/2 to 2 inches total fiber and the middle zone only 1/2 inch. Eighty feet from the portal a raise opened the upper zone. Forty feet of drifting on this level exposed a diabase roll trending north west, cutting off the ore in that direction. A drift follows the diabase contact for 70 feet, and some stoping was done in the limestone northeast of the diabase. The best of this deposit showed 1-1/2 to 3 inches of soft fiber.

On the northeast side of the mesa, asbestos has been mined from a small deposit adjacent to a south-trending diabase dike. The workings are reported to be 140 feet long by a maximum of 40 feet wide, only part of which are accessible.

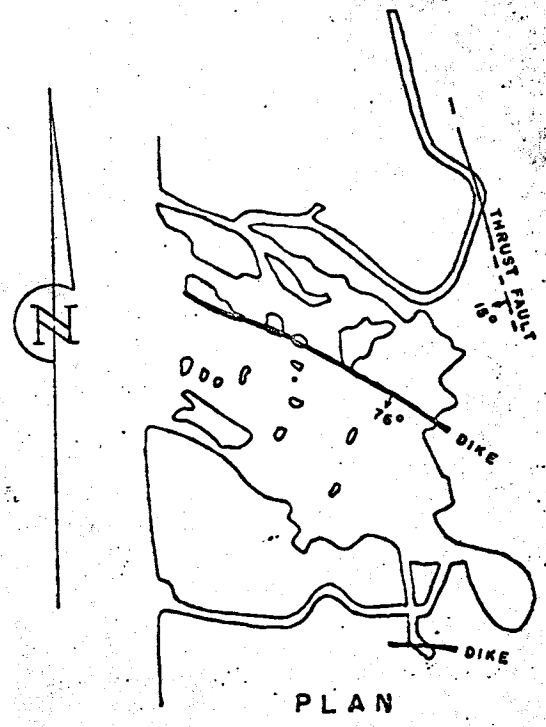
Asbestos exposed in the pillars adjacent to the dike total 2-1/2 to 7 inches. Away from the dike the fiber content decreases. The fiber is soft, but much of it is weathered and weak.

On the southwest side of the mesa, a 20-foot adit exposes 1/2 to 1-1/2 inches of soft fiber in the lower zone. The higher zones were not observed.

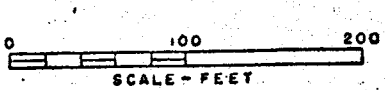


SECTION C - C'

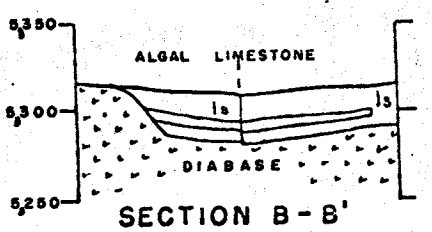
PLAN AND SECTION
TONY MINE



PLAN
HOME MINE

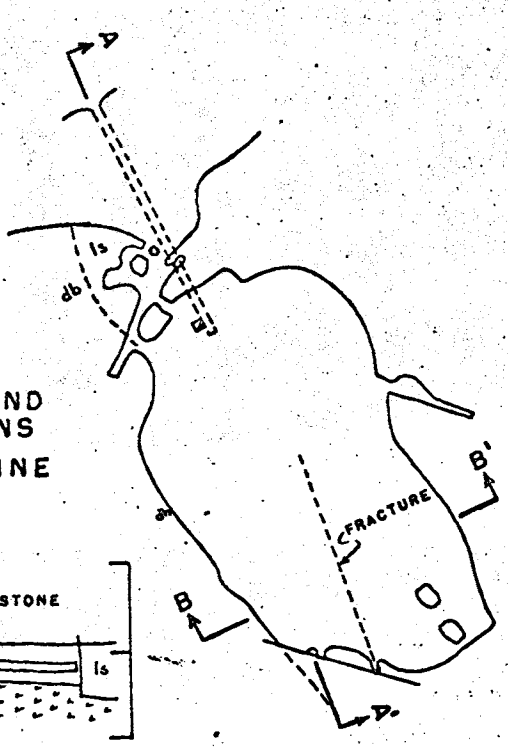


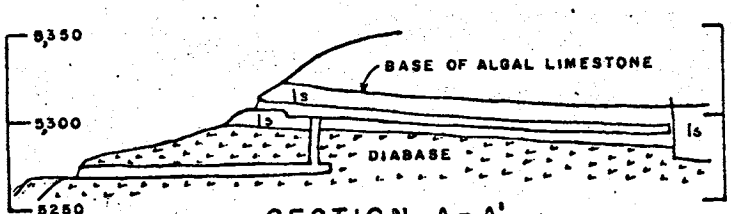
FROM COMPANY MAPS
JULY 1952



SECTION B - B'

PLAN AND SECTIONS
NO. 1 MINE





SECTION A - A'

Figure 26. - Plans and sections, No. 1, Home and Tony mines, American Asbestos Cement Corp.

Home mine. - The Home mine is on a small limestone-capped mesa that is underlain by a diabase sill more than 50 feet below the limestone. On the north side of the mesa, a discordant sill cuts off the favorable horizons. A 2-foot-wide, nearly vertical, diabase dike cuts through the deposit on a strike of N. 65° W. This deposit is said to have been one of the first worked in the district, but the venture ceased when it was determined that the quantity of hand-cobbed grades was insufficient to maintain operations. The shorter grades were thrown into the backfill.

In February 1952 the American Asbestos Cement Corp. reopened the mine and produced a considerable tonnage of short fiber. The deposit, as outlined by the stoped area, has a maximum length of 250 feet and an average width of 150 feet (fig. 26). Operations were suspended about July 1952. The serpentine zone averaged 12 to 16 inches in thickness and contained about 2 to 3 inches of fiber, which was soft to semisoft. Very little No. 2 length was recovered. Where the zone contained better-than-average fiber, the ore was recovered by usual stoping methods. However, the ore zone in much of the area was 24 to 30 inches thick and contained very short fiber. In this area, development drifts were driven but only the thickness of the zone on the sides was mined. The broken ore from these horizontal slots was loaded into mine cars using a scraper.

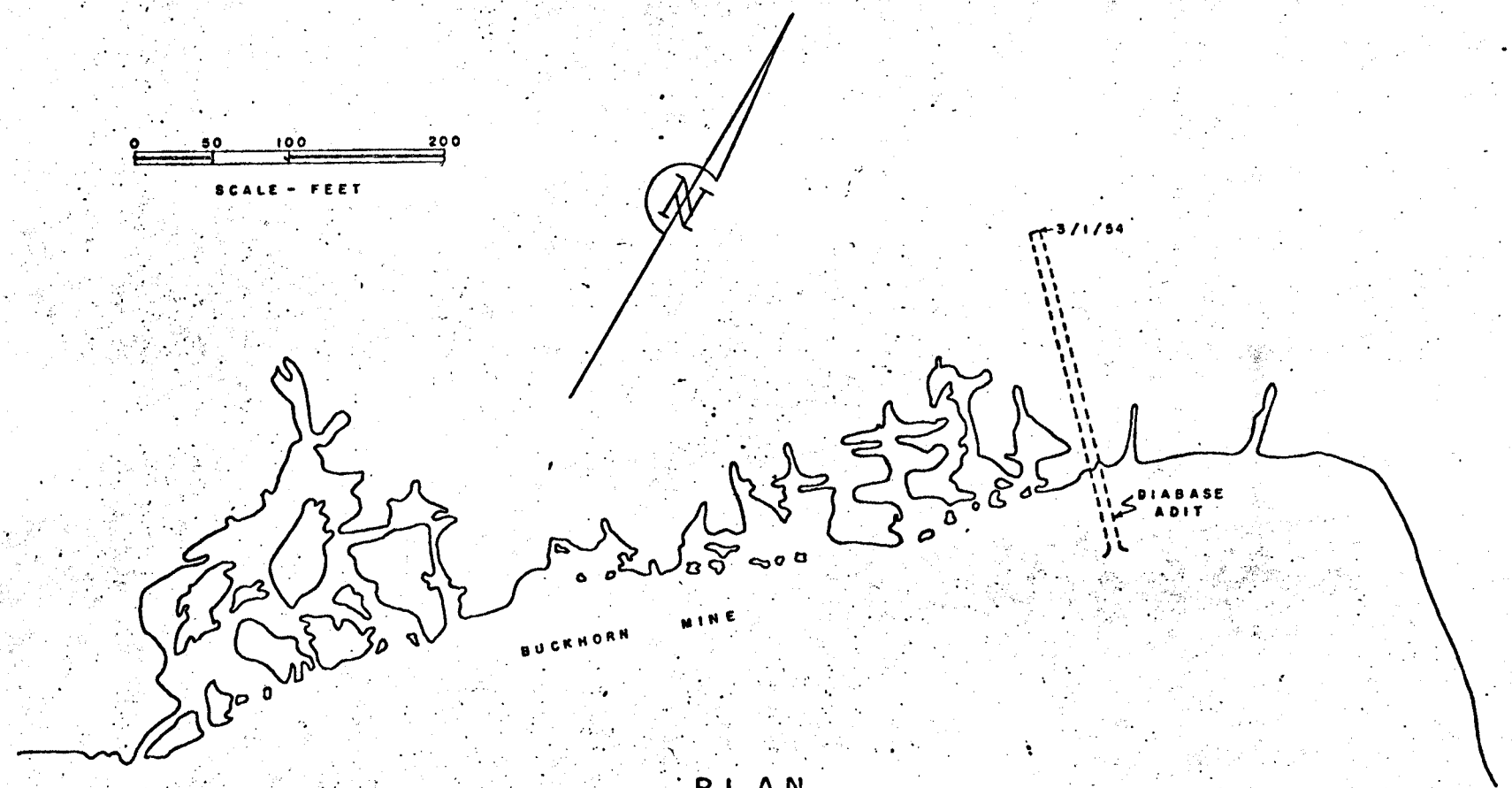
Buckhorn mine. - The Buckhorn mine is situated about 2 miles southwest of the No. 1 mine along the south side of Buckhorn Mesa. The ore zone is exposed in an outcrop that is approximately 43 feet stratigraphically below the base of the algal member. Two asbestos zones about 3 feet apart usually are present. The top of an essentially concordant diabase sill lies 1 to 2 feet below the lower asbestos zone. Mineralization is exposed almost continuously along approximately 1,300 feet of outcrop. The deposit has been opened for a length of 800 feet by 15 adits and by extensive stopes (fig. 27). Most of this work was done by the Triangle Asbestos Co.

A large part of the stoped area is inaccessible owing to backfill. Examination of the accessible adit and stope faces shows veins totaling 1 to 3 inches of fiber, most of which is soft and of good tensile strength. Obviously, during past operations much of No. 1 and No. 2 grades was recovered. Of the fiber that now can be seen in the stope faces, only a small percentage is of spinning grade.

Late in 1952 the company, with Defense Minerals Exploration Administration assistance, diamond-drilled for extensions of the deposit northwest of the mine faces. Marginal ore was indicated in the central portion of the area, and in March 1954 an adit was being driven to test this mineralization. Because of the slight dip of the bedding northwest into the mesa, this adit was begun in diabase, several feet below the ore zone at the outcrop.

Tony mine. - The Tony deposit is localized in a trough 230 feet wide, which is formed between two gentle rolls of the underlying diabase sill. The ore zone is at the base of the algal member and 5 to 6 feet above the sill. The formation dips northward (into the hill) at about 10°. A northwest-treading, vertical, strike-slip fault cuts the ore body. The deposit has been mined by interconnecting stopes for a width and length of about 120 feet (fig. 26). The asbestos observed was weathered and weak.

Wolf Springs prospect. - The Wolf Springs adit has explored mineralization in a tilted limestone block that is discordantly truncated by an underlying diabase sill cut off southward in the hill and eastward by topography. The outcrop exposed



PLAN

FROM COMPANY MAP

MARCH 1954

Figure 27. - Buckhorn mine, American Asbestos Cement Corp.

3 inches of weathered asbestos and bone. An adit was driven northward for 160 feet, penetrating a diabase roll at 85 feet. Following the contact 40 feet east, the diabase sill was found to swing southeast, and a lens of mineralization was opened against the contact. There a 10-inch serpentine zone contained a total of 3 inches of soft fiber. The same contact was exposed 50 feet to the southeast by another drift, but the showings consisted of a 4-inch serpentine band with 1 inch of fairly harsh, short fiber.

No. 7 prospect. - On the east side of a mesa, about 50 feet below the rim, mineralized zones have been prospected by a west-bearing, 80-foot adit with a right branch near the face. This drift is immediately north of and parallels a roll that cuts upward through 20 feet of lower Mescal beds to the base of the algal limestone. Mineralized zones are present 6 and 10-1/2 feet below the algal limestone in a level-bedded formation. The upper zone contained less than 1/2 inch of fiber and pinched out a few feet from the portal. The lower zone, carried on the floor, averaged 2 inches of pink, harsh fiber over the entire length of the workings.

The discordant sill south of the adit cuts down to the south and becomes concordant 20 feet below the base of the algal limestone. A mineralized zone, 4 feet above the diabase, can be traced for several hundred feet south. A 25-foot adit, 200 feet south of the No. 7 prospect, exposed at the surface a 7-inch serpentine band containing 2 inches of weathered fiber. This mineralization pinched out 12 feet from the portal.

Mill

The mill was constructed by the Gila Asbestos Co. in 1950. It is situated at the main camp on Cherry Creek approximately 1 mile north of the junction of Cherry and Walnut Creeks. Various additions and alterations have been made since the original installation. The mill has an 8-hour capacity of 15 to 20 tons of mill rock in the cruding section and 5 to 6 tons of mill feed in the fiberizing section.

The flowsheet is shown in figure 28. The mill was idle in March 1954.

Reynolds Falls Group

The Reynolds Falls claims are in the Tonto National Forest at the junction of Reynolds Creek and its tributary, the South Fork, in sec. 21, T. 6 N., R. 21 E. The group of 25 contiguous, unpatented claims, which lie on both sides of the streams, is owned by John E. Wells of Tulsa, Okla.

The property is reached by an ungraded, 4-mile dirt road that branches eastward from the Globe-Young highway at the Reynolds Creek Ranger station, 49 miles north of Globe.

History

This area first was prospected in 1917 by B. L. Rogers. William Andrews made a few shipments in 1924 and 1928, after which title passed to Imperial Asbestos, Ltd. A small mill, consisting of crusher, rolls, and screens, was installed, and a small amount of asbestos was produced. In 1931 J. E. Wells acquired the property. It was operated under lease by Richard C. Currier and later by Arthur Enders, both of whom mined considerable asbestos.

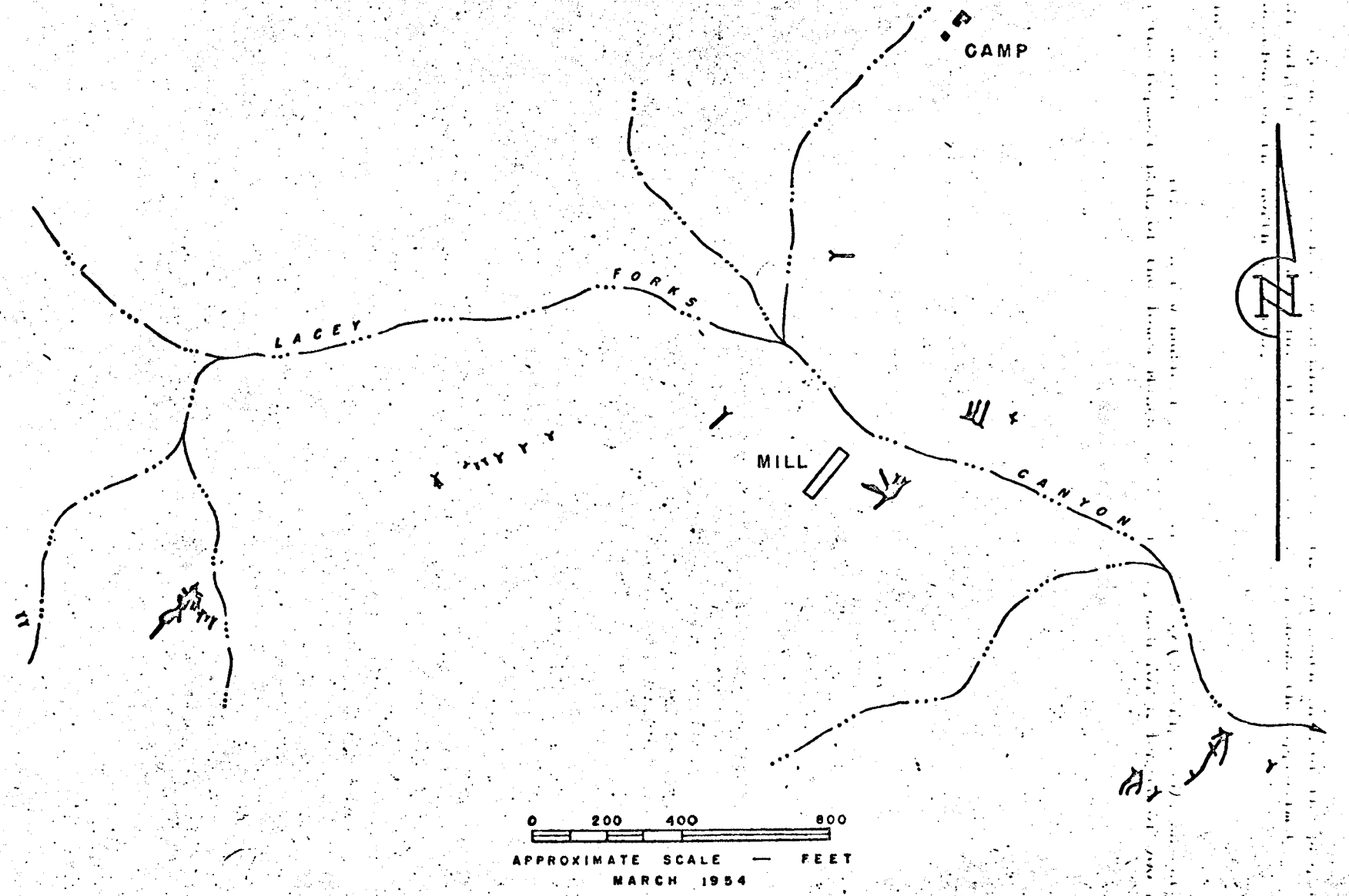


Figure 33. - Sketch location map, North End Rock House group, American Fiber Co.

along the west and south sides of a hill, which is capped with algal limestone. This segment of lower Mescal limestone is terminated at each end by the discordant rising of an underlying diabase sill. Two asbestos-bearing zones, 13 and 19 feet below the algal limestone, can be traced intermittently along this outcrop. Each end of this exposure has been prospected, on the west by a 50-foot adit and on the east by 3 closely spaced, 40-foot adits. This exploration shows asbestos from traces to a total of 1-1/2 or 2 inches in both zones, varying in quality from soft to harsh, with the fiber content decreasing at depth. On the west end, 2 small pits expose a little weathered grade 2 asbestos in a zone 3 feet below the base of the algal member.

Across the valley to the south (fig. 33) and about 200 feet east of the mill, a southwest-trending adit has opened a small deposit lying within a reentrant between two intersecting diabase rolls. An area of about 80 by 80 feet has been explored; part of it has been stoped. The production was mostly of soft-quality asbestos, some of which was grade 2. The top zone, 13 feet below the base of the algal, is present only to 35 feet within the portal. The 19-foot zone extended throughout the workings. At the surface, this latter zone is 3 feet above the diabase contact.

About 1,100 feet southeast of the above-mentioned work, 2 deposits have been prospected. The lower one, in a block of lower Mescal limestone near the wash bottom, was investigated by three adits branching from one portal. These adits are 30, 80, and 170 feet long. The main adit has three short crosscuts. The fiber of both the 13- and the 19-foot zones is weathered near the surface. In the long adit only a little harsh fiber is exposed in the face. The upper workings, approximately 100 feet higher on the hillside, are in a block detached from the lower limestone segment and elevated by a discordant diabase sill. The portal is caved, but notes taken in 1942 indicate that 2 branching adits were each 70 feet long and that the east branch exposed a steeply dipping, crosscutting diabase structure. Two discontinuous zones at 3 and 9 feet below the algal limestone showed less than 1/2 inch of harsh asbestos in each zone.

On the same side of the valley and a couple of hundred feet west of the mill (fig. 33), a 50-foot adit on the 19-foot zone exposes near-surface showings of up to 1-1/2 inches of short, harsh fiber that decreases to 1/2 inch at the face.

Six hundred feet southwest on the same hillside several short opencuts and short adits, some of which are caved, have prospected beds that dip into the hill at 5° to 15° S. The best showing on the surface contains a total of 1 to 2 inches of soft fiber in the upper zone. A second zone, 5 feet lower, shows up to 2 inches of jointed fiber that is weathered and weak. It is likely that this deposit is cut off by a diabase sill a short distance within the hill.

Approximately 800 feet farther southwest (fig. 33), a deposit has been extensively explored by a wide 100-foot-long quarry cut, a 175-foot adit with stopes, and several more adits to the east, whose portals have caved. Diabase appears to cut out the zones immediately east of the workings. In the long adit the upper zone at 3 feet below the algal limestone contained 1 to nearly 2 inches of soft fiber but pinched out completely 30 to 40 feet from the portal. The 9-foot zone contained a similar amount of fiber, but 50 feet from the end of the drift it pinched to a mere trace.

Some asbestos was mined from another small deposit about 500 feet west of the above-described workings. There, a quarry cut having a maximum width of 75 feet

produced asbestos from 2 zones. The upper zone contained up to a total of 1-1/2 inches of soft fiber, and 4 feet lower a zone contained similar quantities of asbestos. A 15- and a 20-foot adit showed decreasing mineralization. The deposit is limited by a crosscutting diabase sill on the northwest and southwest sides.

The last output from any of these deposits was made in 1951.

South deposit (May mine). - In 1952 the company opened the May deposit 2 miles south of camp. The mineralized units are massive limestone beds 35 to 45 feet below the base of the algal member and approximately 15 feet above a thick diabase sill that is concordant under the mine workings. This sill cuts up across the limestone bedding along the south face of a mesa and, except at the original portal, conceals the ore zones to the east (fig. 34).

Four asbestos zones are present; the upper 2 separated by 1 foot of limestone, contain only minor quantities of asbestos and have not been mined. The third and fourth zones are 6 and 9 feet, respectively, below the upper band. The mine workings carry the third vein at the top of the stope. The total fiber of the 2 lower zones varies from 1-1/2 to 3 inches or more and averages about 2 inches for each zone. Much of the fiber is of No. 1 length. The mineralization is strongest adjacent to the crosscutting discordant contact, decreasing in intensity northward away from the contact.

In March 1954 the stoped area was 260 feet long by an average of 50 feet wide. The asbestos, in general, is semisoft and of fair tensile strength. The longer grades have been acceptable for the Government Stockpile in Globe.

Montezuma No. 3 prospect. - This prospect is situated approximately 1,400 feet southwest of the May mine on a similar contact between limestone and a diabase sill, which is suggestive of continuation of the same structure. A 20-foot opencut has exposed discontinuous asbestos veins on the floor of the cut. Judging by the sequence of beds, this mineralization probably represents the upper two zones exposed at the May deposit.

Milling Facilities

A mill for producing crude grades was constructed on the property and has been in use since 1952. The capacity of the plant is approximately 15 tons of mill rock per 8 hours. The flowsheet is shown as figure 35.

Melrose Mines

The Melrose property, owned by George W. Wright, consists of 46 contiguous claims. This property, sometimes locally known as the Maxwell-Wright group, is in secs. 25, 26, 34, 35, and 36, T. 8 N., R. 14 E. of the Tonto National Forest at an average altitude of 4,800 feet (fig. 36).

The property is accessible by a 10.5-mile road down Cherry Creek that branches southward from the Globe-Young Highway 1/2 mile east of the Young Post Office. This is the same road that serves the American Asbestos Cement Corp., except that it continues southward down Cherry Creek for 2.6 miles beyond the A.A.C.C. camp.

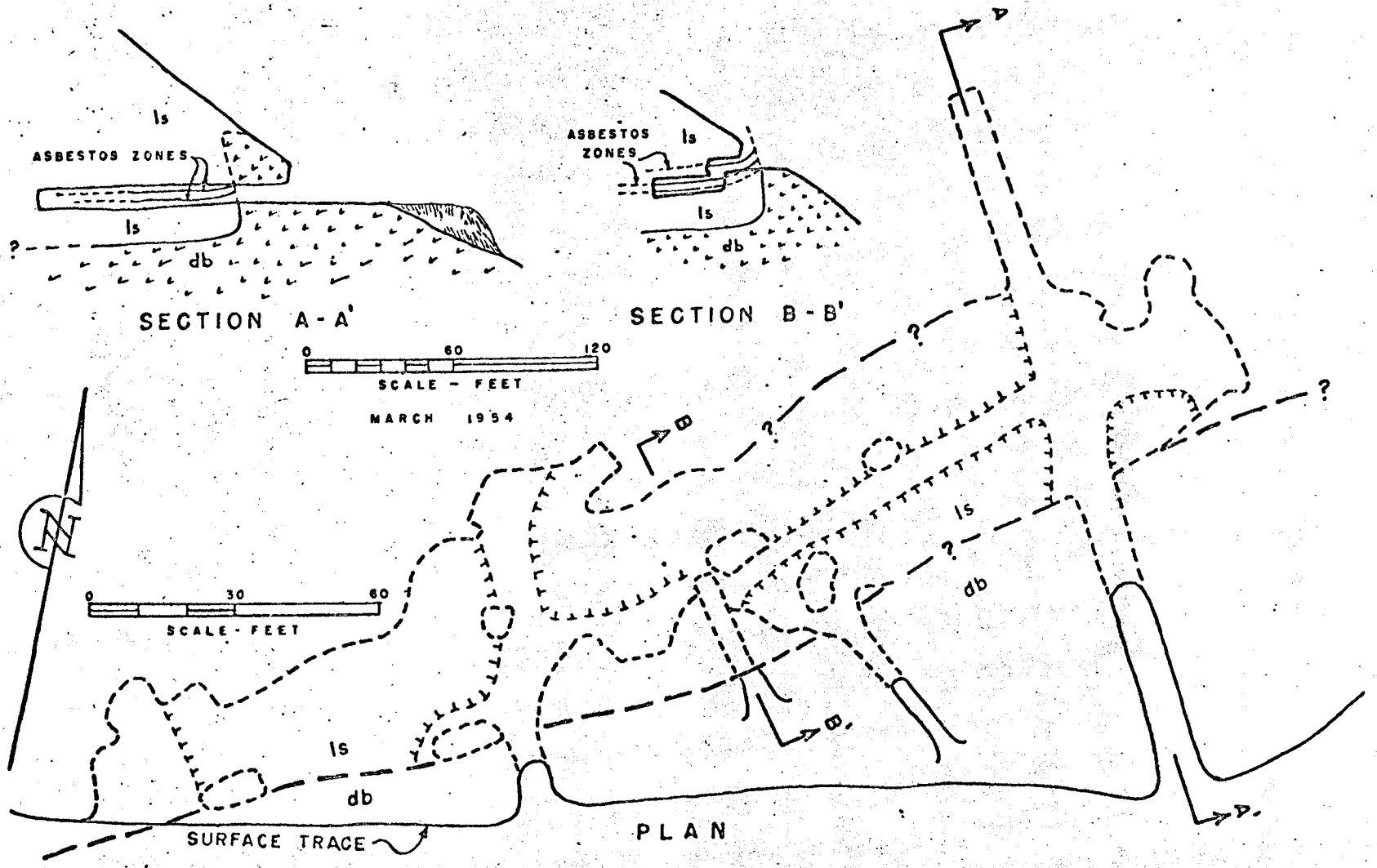


Figure 34. - Plan and sections, May mine, American Fiber Co.