UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
NOV 18 1953

224 New Customhouse
Denver 2, Colorado

November 13, 1953.

3183-Co
For Review
WSM

Memorandum

To: Administrator, Defense Minerals Exploration Administration
Attention: 200

From: Field Team, Region IV

Subject: Report of Examination - DMEA Docket 3183 (Cobalt),
D. M. Stranahan, Blue Bird claims, Graham County, Arizona.

Enclosed are four copies of the report of examination on the subject property, a copy of the letter of denial to the applicant, and two copies of Form 3b.

W. H. King
W. H. King

E. N. Harshman
E. N. Harshman
for A. H. Koschmann

Enclosures

Reviewed by
DMEA OPERATING COMMITTEE
11-23-53
(date)

COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

224 New Customhouse
Denver 2, Colorado

November 13, 1953

Mr. Daniel Mayhew Stranahan
El Presidio Hotel
Tucson, Arizona

Re: Docket No. DMEA-3183

Dear Mr. Stranahan:

Reference is made to your application for Government aid on the Blue Bird claims.

Projects approved by the Defense Minerals Exploration Administration must, in its judgment, show definite promise of yielding material of acceptable grade, and in quantities that will significantly improve the mineral supply position for the National Defense Program.

A careful study of your property and data available to this agency reveals that the probability of disclosing mineable reserves of Cobalt is not considered sufficiently promising to justify Government participation. Under these circumstances, we regret to advise that your application for exploration aid is denied.

The copy of the report on the Blue Bird Cobalt Mine which accompanied the application is returned herewith.

Very truly yours,

W.H. King

W.H. King
Field Team, RegionIV

E.N. Harshman

E.N. Harshman
For A. H. Koschmann
Fld. Team, Reg. IV

Enclosures

EMC: cwm
cc: Docket, Administrator, DMEA; WRStorms: AFShride; AHKoschmann (2); Chron.

Reviewed by
DMEA OPERATING COMMITTEE
11-23-53
(date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
NOV 18 1953

Mining Division
Region IV

November 13, 1953.

Memorandum

To: Field Team, Region IV

From: Chief, Mining Division, Region IV

Subject: Report of Examination - DMEA Docket 3183 (Cobalt), D. M. Strassman, Blue Bird Claims, Graham County, Arizona.

Enclosed are eight copies of the Engineering Report of Examination on the subject property.

The applicant requested $21,500.00 to explore the claims by 3,000 feet of diamond drilling.

The examiners agree that a significant discovery is unlikely by the work proposed by the applicant. The Bureau engineer believes that because of the strategic position of cobalt, Government knowledge of the deposit is desirable and we believe that some agency of the Government should undertake work of such nature. We believe that a private individual should not be required to expend funds that would probably result only in the solution of a geologic problem that would furnish the Government with the desired information.

We recommend that the application be denied.

W. H. King

Enclosures

Reviewed by
DMEA OPERATING COMMITTEE
11-23-53
(Date)

MINING DIVISION
REGION IV

November 3, 1953

Memorandum

To : W. H. King, Chief, Mining Division, Region IV

From : Chief, Mining Methods Br., Mining Div., Region IV

Subject : Report on Docket DMEA-3183, D. M. Stranahan's Bluebird Cobalt Mine, Graham County, Arizona

Enclosed are original and 8 copies of a report on the above property by John M. Soule' of the Bureau of Mines. As the Bureau of Mines and Geological Survey examiners could not agree on their recommendations, an entirely separate report is being submitted by each.

Although there seems little chance of making a significant discovery of cobalt-bearing material by the proposed exploration project, Soule' recommends that the exploration loan be granted to more fully appraise the deposit as cobalt is on the list of critical strategic metals. A few diamond drill holes at only a small expense to the Government should definitely prove the merit of the deposit, so I concur with Soule's recommendations.

Brochure is enclosed.

Walter R. Storms

Walter R. Storms

CC W. H. King (8)
A. F. Shride
DMEA-3183
MF

WRStorms:frj

Reviewed by
DMEA OPERATING COMMITTEE
11-23-53
(Date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D. C.~~
~~Denver Federal Center~~
Denver 2, Colorado

November 4, 1953

To: Field Team, Region IV

From: A. H. Koschmann

Subject: DMEA Docket 3183, Blue Bird Claims, (Cobalt), Graham County, Arizona

Attached are 8 copies of the geologic report by J. N. Falck of the U. S. Geological Survey covering the subject docket.

It has been recommended that the application for exploration assistance be denied.

E. M. Hanshman
for A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Enclosures (8)

Reviewed by
DMEA OPERATING COMMITTEE
11-23-53
(date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P. O. Box 4126, University Station
Tucson 5, Arizona

October 30, 1953

Memorandum

To: A. H. Koschmann

From: J. H. Faick

Subject: DMEA-3183, Blue Bird Claims, (Cobalt), Graham County, Arizona

We are sending you the Survey's report on the examination of the above property by J. H. Faick.

This report recommends denial of the application because the ore reserves are too small and too low-grade to be significant, and because the geological criteria, such as hydrothermal alteration, ground preparation and type of host rock, do not indicate that important reserves will be found by the proposed exploration.

John H. Faick
Geologist

Reviewed by
DMEA OPERATING COMMITTEE
11-23-53
(date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMEA-3183, D. M. STRANAHAN'S BLUEBIRD COBALT MINE

Graham County, Arizona

John H. Soule', Mining Engineer
U. S. Bureau of Mines

November 1953

Reviewed by
DMEA OPERATING COMMITTEE
11-23-53
(Date)

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The Bluebird cobalt deposits in Graham County, Ariz. were discovered in 1935 and a small concentrator was installed shortly thereafter. A few tons of cobalt concentrates were produced, but not shipped. Cobalt is one of our most critical metals and this deposit is of interest because of its content of that metal. The tungsten mineral, scheelite, also has been found in the mine near the cobalt deposits.

J. S. Vhay of the Federal Geological Survey mapped the area in 1942 and suggested a small expleratory project, if the need for cobalt at that time warranted it. In early 1953, the deposits were examined by J. H. Soule' of the Bureau of Mines who suggested a small expleratory project to more accurately appraise the deposits because of the critical nature of the metals, cobalt and tungsten.

D. M. Stranahan, an engineer of Panaminas, Inc., a subsidiary of Ventures Ltd., examined the property in 1939 and recommended some work by his company. Satisfactory lease terms could not be arranged and no work was done. His interest was revived in 1953 and a satisfactory lease was obtained on the property. Stranahan then applied for Government assistance to explore the deposits.

The exploration application was docketed as DMEA-3183 and a field examination of the property by a DMEA Field Team was required. This examination was made on October 19, 1953 by John H. Soule' of the Bureau of Mines and John N. Faick of the Geological Survey. They were accompanied by D. M. Stranahan, the applicant.

The deposits are located in sec. 5, T. 5 S., R. 21 E. in Graham County, Ariz. Although fairly accessible, the area is somewhat isolated. It is nearly 19 miles from a paved highway and nearly 45 miles from the nearest sizeable town, Safford, Ariz. Minor supplies, services, and accommodations may be obtained in Safford.

The altitude at the mine is about 4,200 feet. The terrain varies from moderate to rugged although the relief is not great. Summers are hot and winters generally are mild. Any freezing weather usually is not prolonged. Rainfall is scanty and only desert vegetation abounds. There are no permanent streams in the area, but 2 wells on the property would furnish a small amount of water.

A group of 5 contiguous claims comprises the Bluebird property. The claims are unpatented and are held by F. D. Mayhugh of Tucson, Ariz., and W. L. Lombardi of Tombstone, Ariz. They are leased to D. M. Stranahan, at present of Tucson, Ariz.

The Blue Bird cobalt mine explores narrow tight fractures in quartz diorite, along which are localized several small pods, pockets, and lenses of low-grade cobalt ore. The ore bodies are localized near the intersection of easterly and northwesterly trending joints and gash fractures with a north trending fracture or fault. The ore consists of cobaltite and smaltite, with which are associated several other sulfide minerals, in a gangue of quartz and carbonate.

The veins containing the cobalt minerals are arranged in echelon, strike northerly, and dip to the east at moderate angles. The veins vary in width from small stringers to a maximum of 3 feet. They have been developed down dip for nearly 100 feet, but laterally they have

been developed for less than 20 feet. Scheelite occurs in a small veinlet that has a maximum width of 3 inches and persists for about 25 feet before disappearing into the walls of the drift. Minable ore reserves are meager, probably less than 100 tons of ore, containing a little over 1 percent cobalt. There are practically no reserves of scheelite. The deposits were developed by an inclined shaft nearly 100 feet deep, and by an adit connecting to the bottom of the shaft. The adit is about 270 feet long.

It is concluded that the critical metals, cobalt and tungsten, are present in veins in the Bluebird mine. Although a significant discovery is unlikely, especially with respect to tungsten, it is felt that in view of the critical nature of the metals, some work should be done on the property so it can be more accurately evaluated. Supplies and equipment necessary for the project are available and the ability of the applicant to conduct the exploration is not questioned.

It is recommended that the Government participate in the exploration of the Bluebird cobalt mine. A project is proposed which would be divided into 2 phases, the second phase to be undertaken only upon satisfactory results being obtained during the first phase. The first phase would consist of diamond drilling 4 holes for a total of about 1,200 feet of "AX" size hole which would cost an estimated $8,584.00. The second phase, if undertaken, would consist of drilling an additional 1,800 feet of "AX" hole in 6 additional holes as shown on a map accompanying the report. The second phase is estimated to cost $12,876.00, or a total of $21,460.00 for the project. This project should be completed in 4 months.

BLUE BIRD CLAIMS

(COMALE)

GRAHAM COUNTY, ARIZONA

IMMA 3183

D. M. Strecahan, Applicant

by

John H. Falck

Geologist, U. S. Geological Survey

BLUE BIRD CLAIMS
(COBALT)
GRAHAM COUNTY, ARIZONA
D.M.E.A. 3183
D. M. Strunahan, Applicant
by
John W. Faick
Geologist, U. S. Geological Survey

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INTRODUCTION

The Blue Bird Claims, Graham County, Arizona, were examined October 19, 1953, by John H. Boulé, Engineer, U. S. Bureau of Mines, and John N. Faick, U. S. Geological Survey. The purpose of the examination was to determine the advisability of exploring the property by diamond drilling for cobalt. The examination was made in behalf of the Defense Minerals Exploration Administration, to which application (Docket DMEA 3183) has been made for assistance in exploration. The application was submitted by D. M. Strumsham, representing Ventures, Ltd., and he accompanied the examiners to the property. John H. Boulé had previously examined the claims for the U. S. Bureau of Mines and the property had also been examined by the U. S. Geological Survey, and Survey geologists have recently visited the property on behalf of the Atomic Energy Commission.

GEOLOGY

The Blue Bird claims and the adjacent area is underlain by a complex of intrusive rocks thought to be of pre-Cambrian age. Cambrian quartzite caps a few low hills in the area. There are 3 principle types of intrusive rocks. These are relatively fine-grained, medium to dark gray quartz diorite; coarse-grained gabbro, and fine-grained, light gray quartz monzonite. The quartz diorite is the host rock for the cobalt deposits which have formed along narrow fractures in the quartz diorite.

The deposits have been developed (See Fig. 4) by a shaft about 90 feet deep and which is inclined from about 50 to 80 degrees easterly. This shaft is connected with the surface by an adit about 260 feet long. The shaft was started at the surface on an outcrop of cobalt ore which was about 12 inches wide and reported to be of fairly good grade. The fracture upon which the ore was localized was followed by the shaft, and several small lenses of cobalt ore were penetrated by it. The adit penetrated the principle ore zone at a distance of about 175 feet from the portal.

The minerals which were observed by this writer or reported by others to occur in the Blue Bird cobalt deposit are as follows:

1. Pyrite	8. Chalcopyrite
2. Arsenopyrite	9. Scheelite
3. Cobaltite	10. Erythrite
4. Linnaeite	11. Limonite
5. Smaltite	12. Quartz
6. Glaucodote	13. Calcite
7. Molybdenite	14. Tourmaline

In addition to the above minerals it is reported that there is a very small amount of gold in the ore. Greenish stains

which are present in a few places along the walls of the adit are interpreted by this writer to be an alteration product of some primary nickle mineral. Most of the ore is fine-grained and consists of either massive sulfides or sulfides disseminated in quartz-carbonate gangue.

These minerals form narrow veinlets and small pockets and pods of ore that are localized along narrow fractures and to a slight extent replace the quartz diorite adjacent to the fractures. Very small amounts of the sulfide minerals are disseminated in the diorite within a couple of inches of the fractures. There is very little apparent hydrothermal alteration of the quartz diorite, and fresh-looking rock is present in close proximity to the ore minerals. The wall rocks, however, appear to be slightly silicified within a few inches of the quartz veins and stringers.

Limonite, which forms surficial stains on joint planes in the quartz diorite, is present in relatively greater than normal amounts along a zone from about 20 to 50 feet wide and several hundred feet long, and corresponds approximately in location to the outcrop of the mineralized zone. This writer believes this iron-stained zone, which is estimated to contain about one percent limonite, is an alteration halo surrounding the principle ore zone and indicates its approximate position.

The principle fracture or fractures that localize the sulfide mineralization strike about N. 15-20° E. and dip 50-55° S.E. This fracture, along which there apparently has been a little movement, is intersected on the hanging wall side by several joints or gash fractures all of which may be classified into two groups on the basis of attitude. One group of joints strikes nearly east and dips about 45° south; the other group strikes N. 45° E. and dips about 75° S.E.

There are several lenses and pods of ore exposed in the mine workings, and the size and distribution of the individual ore bodies is indicated in a general way by Figure 4. It is probable that most of these small pods of ore are interconnected with thin stringers or veinlets. Available evidence indicates that the ore bodies form where the principle fracture zone, trending N. 15°-20° E., is intersected by gash fractures or joints which are elements of either the easterly trending or northeasterly trending sets.

It is reported that the original outcrop upon which the shaft was sunk was 2 to 3 feet wide and about 40 feet long; however, available data indicate the vein at the outcrop is only 12 inches wide. In October 1939 Mr. Strunahan reported a hole dug 10 feet north of the shaft exposed a vein 12 inches wide, which contained 0.71 percent cobalt, and 50 feet north of the shaft the vein was also 12 inches wide, and contained 0.06 percent cobalt. In a new

trench about 20 to 25 feet north of the shaft, the vein was also about 12 inches wide; thus this appears to be the true width of the vein at the surface. Mr. Strachan apparently assumes the vein is continuous down the dip and ranges in width from 6 inches to 3 feet where exposed in the shaft.

Strachan also assumes a steep northerly pitch of the ore shoot, a condition that could not be verified by this writer and one that seems unlikely because the easterly and northeasterly trending joints, which influence localization of the ore, dip from 45 to 75 degrees south.

The full extent of the ore bodies is not known because the mine workings cut obliquely across them and have not exposed the maximum strike length. The ore is bunchy, pockety or poddy and erratic in distribution. The average exposed length of the ore lenses along the dip is about 8.5 feet. The largest lense, near the bottom of the shaft, has a maximum exposed length of 12 feet on the horizontal, 20 feet on the dip and has a width of 2 feet.

ORE RESERVES AND GRADE

The following table of samples indicates the width and grade of ore:

Sample No.	Taken by	Location	Width in Inches	%Cobalt
1	U.S.G.S.	See Fig. 1	3	10.67
2	U.S.G.S.	"	36	0.01
3	U.S.B.M.	"	24	0.28

Sample No.	Taken by	Location	Width in Inches	%Cobalt
4	U.S.G.S.	See Fig. 1	3	0.02
5	U.S.G.S.	"	60	0.01
6	U.S.G.S.	"	36	0.02
7	U.S.G.S.	"	11	1.67
8	U.S.G.S.	"	10	1.01
9	U.S.G.S.	"	12	0.04
10	U.S.G.S.	"	24	0.02
11	U.S.G.S.	"	20	0.10
12	U.S.B.M.	"	18	0.15
13	U.S.G.S.	"	25	0.03
14	U.S.B.M.	"	20	0.06
Crude ore	U.S.B.M.	Ore bin		0.22
Concentrate	U.S.B.M.	Old mill		7.00

The weighted average of samples 1 to 14 inclusive indicates the ore contains 0.49 percent cobalt and the average width of vein material is 22 inches.

Mr. Stranahan has provided the following sample results with his application:

Sample No.	Location	Width in Inches	% Cobalt
1	Adit near shaft	12	0.55
2	" " "	6	0.07
3	" " "	4	0.40

Sample No.	Location	Width in Inches	% Cobalt
4	N. side of shaft, 69 feet below collar; appx. location U.S.G.S. 5, 6, 7	18	7.37
5	N. side of shaft 32 ft. below collar	42	1.97
6	N. side of shaft 39 ft. below collar. About 6 ft. below U.S.G.S. No. 1	20	0.97
7	N. side of shaft, about 25 feet below collar.	6	0.25
8	S. side of shaft, about 20 ft. below collar.	42	0.30
9	N. side of shaft, about 59 ft. below collar. Near U.S.G.S. and U.S.B.M. samples 2 and 3	24	0.49
10	Dump at shaft, 5 cuts		0.50
11	East side of dump, exclusive of No. 10		2.25
12	Outcrop 10 ft. north of shaft	12	0.71
15	Adit, about 200 ft. from portal	12	0.15
16	Outcrop, 50 ft. north of shaft	12	0.06

The weighted assay of Strassman's samples, exclusive of the dump samples, indicates a cobalt content of 1.33 percent and a

vein width of 18 inches. However, if this 1.33 percent average is substituted for the 7.27 percent in sample no. 4, which appears erratic and abnormally high, then the average weighted analysis becomes 0.82 percent cobalt. I believe this is a realistic figure, and reasonably comparable to the 0.49 percent cobalt (weighted average) obtained from the U.S.B.M. and U.S.G.S. samples.

The analysis of samples and the measured widths of the vein indicate that it averages about 20 inches wide and contains about 0.65 percent cobalt. This is equivalent to 13 pounds of cobalt per ton of ore. Cobalt is quoted (E. and M. J., October 1953) at $2.40 per pound; therefore ore containing 13 pounds per ton is worth about $31.00 per ton.

The vein is partly explored and developed for a strike length of about 80 feet and about the same distance on the dip. Thus about 1000 tons of ore is indicated; however, this estimate should be reduced by about 200 tons to account for the ore removed during development and subsequent stoping.

About 800 tons of ore containing 0.65 percent cobalt is a reasonable estimate of the ore reserves. This closely approximates the reserves given by Strenahan[1] who estimated the reserves to be

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[1] Strenahan, B.M., The Blue Bird Cobalt Mine, p. 7, 1939. Private report. Loaned with DMEA application.

600 tons of ore containing 1 percent cobalt. This writer's estimate is 10,400 pounds of cobalt in the ore, which is comparable to 12,000 pounds of cobalt based on Strawhan's estimate.

PROPOSED EXPLORATION

The applicant's proposed exploration program is similar to a program previously submitted by John Soulé, Engineer, U. S. Bureau of Mines, as a Bureau project. The proposal is to drill 8 inclined drill holes into the ore zone from the surface. The amount of drilling proposed is about 3000 feet and the cost is estimated at $21,500. This proposed exploration would be on a 90-10 participation basis; therefore, the Government's share of the cost would be about $19,350.

CONCLUSIONS AND RECOMMENDATIONS

Interpretation of the data obtained by investigation of the Blue Bird Cobalt prospect resulted in the following conclusions:

1. The ore bodies occur as small lenses, pods and pockets localized along or at intersections of narrow, tight fractures or faults.
2. The indicated and measured ore reserves are relatively small and of relatively low grade, being about 800 tons of ore containing from 0.5 to 0.8 percent cobalt.
3. The inferred reserves, although not estimated, are also small as indicated by the size of the exposed ore zone. It is probably not advisable to predict ore more than 20 feet vertically or horizontally beyond the known ore zone; therefore inferred reserves must be small.

4. The apparent absence or weakness of hydrothermal alteration near the ore zone is interpreted by this writer to mean that ore bearing or mineralizing solutions sufficient to alter the country rock have not found access to the fracture zones, and by analogy have probably not deposited significant amounts of ore along the zone.

Geological conditions indicate that there is not likely to be a significant amount of cobalt ore discovered at the Blue Bird prospect; therefore, it is recommended that this application, DMEA 3183, be denied.

DMEA-3183, D. M. STRANAHAN'S BLUEBIRD COBALT MINE
GRAHAM COUNTY, ARIZONA

Engineering Report

By John H. Seule'
Mining Engineer
U. S. Bureau of Mines

November 1953

Reviewed by
DMEA OPERATING COMMITTEE
11-23-53
(date)

DMEA-3183, B. M. STRANAHAN'S BLUEBIRD COBALT MINE
GRAHAM COUNTY, ARIZONA

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INTRODUCTION

The Bluebird cobalt deposits in Graham County, Ariz. were discovered in 1935 and a small concentrator was installed shortly thereafter. A few tons of cobalt concentrates were produced, but not shipped. Cobalt is one of our most critical metals and this deposit was of interest for its content of that metal. The tungsten mineral, scheelite, also has been found in the mine near the cobalt deposits.

J. S. Vhay of the Federal Geological Survey mapped the area in 1942 and suggested a small exploratory project, if the need for cobalt at that time warranted it. The property was examined by J. H. Soule' of the Bureau of Mines early in 1953. He suggested a small exploratory project to more accurately appraise the deposits because of the critical nature of the metals, cobalt and tungsten.

D. M. Stranahan, an engineer of Panminas Inc., a subsidiary of Ventures Ltd., examined the property in 1939 and recommended some work by his company. Satisfactory lease terms could not be arranged, so no work was done. His interest was revived in 1953 and a satisfactory lease obtained on the property. Stranahan then applied for Government assistance to explore the deposits.

The exploration application was docketed as DMEA-3183 and a field examination of the property by a DMEA Field Team was required. The DMEA Field Team examination was made on October 19, 1953 by John H. Soule' of the Bureau of Mines and John N. Faick of the Geological Survey. They were accompanied by D. M. Stranahan, the applicant.

ACKNOWLEDGMENTS

Acknowledgment is made of the use of maps prepared by D. M. Stranahan, the applicant, and other maps prepared by members of the Federal Geological Survey.

LOCATION, TOPOGRAPHY AND PHYSICAL FEATURES

The Bluebird cobalt deposit is situated in sec. 5, T. 5 S., R. 21 E., with the claim group overlapping into sec. 4 adjoining on the east and secs. 32 and 33 of the adjoining township in the north. The location is shown in figures 1, 2, and 3. The deposits are in Graham County. The mining district is unnamed. The mine is just south of the southern border of the San Carlos Indian Reservation, and east and north of the boundaries of the Crooke National Forest.

The property is reached by going to Geronimo, Ariz., 52 miles southeast of Globe, Ariz. on U. S. Highway 70, or 27 miles northwest of Safford, Ariz. on the same highway. From Geronimo, go 1.0 mile southeasterly toward Safford on the main highway, then turn sharply to the right or southwest and continue on this ranch road for 12.9 miles from the highway. Ignore any sharp turns or branches from this road. The gentle forks encountered merely are splits in the road which join farther on. At the 12.9-mile point, which is 0.2 miles beyond a ranch house whose yard fence adjoins the ranch road on the left, turn sharply to the right, or northwest and follow up the sandy bed of the main wash for 4.4 miles, taking the right hand branches of the wash at the 1.9 and 3.1 mile points. At the 4.4-mile point, follow the west bank of

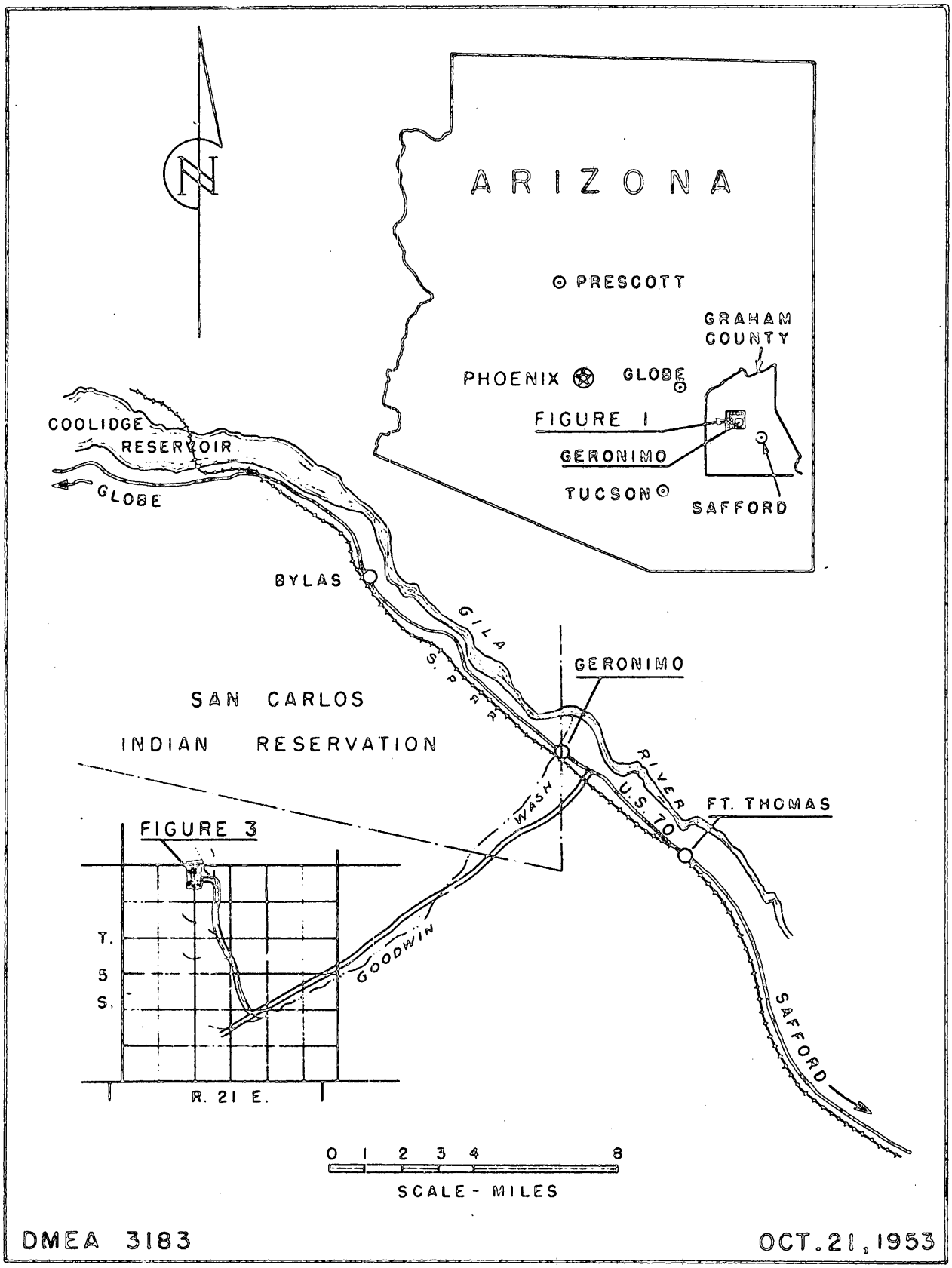

FIGURE 1. - LOCATION MAP, BLUEBIRD COBALT MINE
GRAHAM COUNTY, ARIZONA

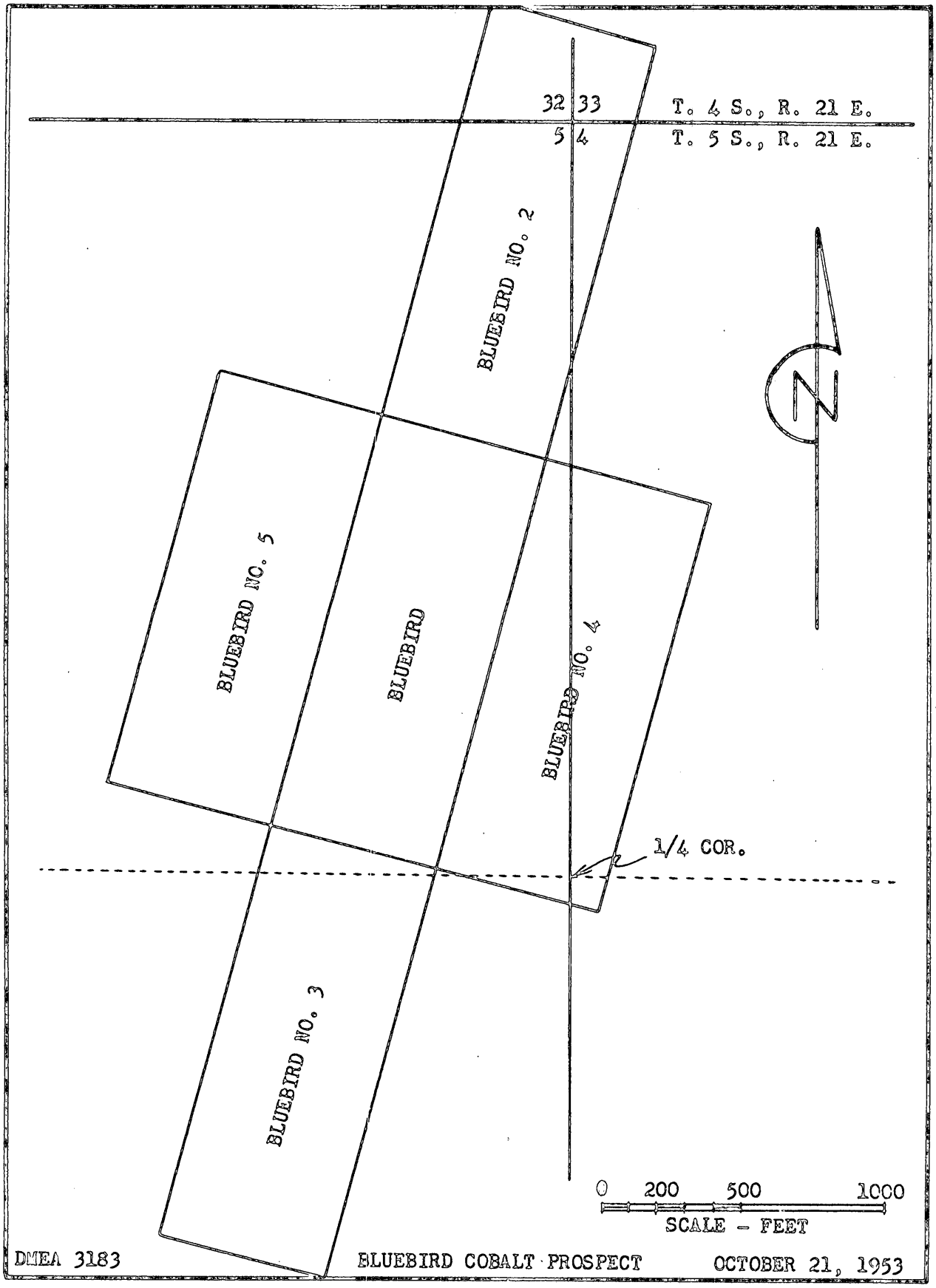

FIGURE 3 - CLAIM MAP

the wash, thence up a small hogback showing dim tracks, and continue to the mine, 1.3 miles from the sand wash. The route is shown in figure 1. Access to the mine could be difficult during periods of heavy rainfall. Some of the road becomes very slippery and the sandy portions may give trouble when rains reach cloudburst proportions. The last 1.3 miles of the road is narrow and steep grades are common.

Although the relief at the mine may not exceed 400 feet, small craggy bluffs give some of the terrain a rugged aspect. Steep slopes are common. The altitude of the mine is about 4,200 feet.

The mean annual precipitation is about 13 inches, largely as summer thunder showers and winter rains. Winter snows generally are light and constitute but a small part of the annual precipitation. Temperatures vary from near zero in the winter to about 112° F. in the summer. Sub-zero weather usually is not prolonged, but the summer heat may last for considerable periods of time.

There are no permanent streams in the area, but two wells on the property near the mine should furnish ample water for a modest mining operation. Water stood at about 15 feet below the collar of the well nearest the old mill.

Vegetation is scanty, consisting of the usual desert array of jojoba bushes, catsclaw, mesquite, cactus, and other plants. There is no timber suitable for mining purposes in the vicinity of the deposits. Some Ponderosa pine grows in the higher reaches of the Santa Theresa Mountains to the south, but most of this timber is not accessible.

There is no skilled labor in the vicinity of the mine. All such must be imported, possibly a small amount from Safford, but probably from Globe. Most of the better class of skilled miners there probably have permanent employment. A small amount of unskilled labor may be recruited from nearby ranches.

There are no living accommodations at the mine, except one primitive shack. Limited accommodations may be available at nearby ranches, otherwise Safford and Thatcher, some 45 miles southeast of the mine, have the nearest accommodations. As it takes nearly one and one-half hours to drive from the main highway to the mine, a camp should be established for any work at the mine unless a very small crew could get board and room at a nearby ranch.

HISTORY AND PRODUCTION

The discovery of the Bluebird cobalt deposit dates back to 1935. This discovery created considerable interest, and a large number of claims were located in the area. Many of these evidently have lapsed. Development work was done on the Bluebird deposit and a small concentrator was erected. Operations lasted but a short while as only 12 tons of concentrates reportedly were obtained from the mill. These concentrates were not sold and have been scattered or stolen.

No operations were undertaken after the early efforts until 1952, when a short diamond drill hole was drilled. There are no available data on the results obtained from this hole. In 1953, some road repairing was done, as well as some trenching and cleaning out the mine workings.

OWNERSHIP AND EXTENT

The Bluebird claims are held by virtue of location by W. L. Loubardi of Tombstone, Ariz. and F. D. Mayhugh of Tucson, Ariz. These claims were located on March 26, 1938 as recorded at the county court house in Safford. The property at present consists of a contiguous group of 5 claims as shown in figure 3. These claims are now leased to D. M. Stranahan, at present living at the Presidio Hotel, Tucson, Ariz. Mr. Stranahan is a mining engineer employed by Panaminas Inc., a subsidiary of Ventures Limited. Although the application for Government assistance was made in Stranahan's name, he says he is being backed by Panaminas Inc.

DESCRIPTION OF THE DEPOSITS 1/

The Bluebird cobalt mine explores narrow, tight fractures in quartz diorite, along which are localized several small pods, pockets, and lenses of low-grade cobalt ore. The ore bodies are localized near the intersection of easterly and northeasterly trending joints and gash fractures with a north trending fracture or fault. The ore consists of cobaltite and smaltite, with which are associated several other sulfide minerals, in a gangue of quartz and carbonate.

MINABLE ORE RESERVES

The Bluebird cobalt deposits occur as small veins arranged in echelon, which vary from small stringers to widths of 3 feet. The vertical extent of the individual veins seldom reaches a length of 20 feet, but the aggregate extends down dip approximately the depth of the

1/ Faick, John N., geologist, U. S. Geological Survey

shaft, or 100 feet. Lateral development does not disclose the strike-length of the shoots. Presumably it is small. An average of all of the samples taken in the shaft and shown on figure 4 indicates a vein width of a little less than 2 feet. The average grade of these samples, weighted by sample length, is 1.2 percent cobalt. Perhaps 100 tons of ore of this grade could be called minable. Because of dilution and mining to a minimum width, the amount of material to be mined would be increased and the grade lowered.

The scheelite occurrence was checked with an ultra-violet lamp. This scheelite occurs in a small veinlet that has a maximum width of 3 inches. This stringer persists for about 25 feet before it disappears into the walls of the drift. Parts of the veinlet apparently contain scheelite of good grade. There are no minable reserves of tungsten ore.

PRESENT STATUS

The Bluebird mine is developed by a shaft almost 100 feet deep and by a 270-foot adit, connecting with the bottom of the shaft. Small stopes extend laterally from the shaft for only a few feet. Other than a few location pits, there are no workings of consequence other than those mentioned above (see figure 4).

The lessee of the property now is doing a small amount of trenching and rehabilitation work on the property. Other than an engineless hoist and compressor, and 2 mine cars, there is no equipment on the property. Equipment at the mill is such that practically nothing can be done with it.

PROJECT PROPOSALS WITH COSTS

The Bluebird cobalt, or tungsten deposit cannot be considered promising as a potential source of appreciable quantities of cobalt or tungsten. This is because of the seemingly small lateral extent of the mineralized zone. However, cobalt and tungsten minerals are present in the mineralized zone and because of the critical nature of cobalt, it seems that some work should be done so that a proper evaluation of the deposit may be made.

The greatest amount of ground could be covered by diamond drilling the deposits, although underground work would give more detail. In drilling, it is possible for the drill holes to miss the small ore bodies but it is felt that these ore bodies,as shown in the shaft, are closely enough spaced so that most of the hole penetrations would encounter the veins. A minimum of 1,200 feet of drilling in 4 holes from surface sites is recommended. This will be followed by an additional 1,800 feet if the results obtained in the first drilling so warrant. The proposed drill sites are shown on figure 2. They are spaced on 100-foot centers. Two holes will be drilled from each site to penetrate the mineralized zone at depths of 100 and 200 feet below the adit level as shown by the sections on figure 5. It is recommended that sections A-B and C-D (sites 1 and 2) be drilled first. The remainder of the program would be drilled if the results obtained in the first 4 holes should so warrant. The holes would vary in depth from 200 to about 400 feet.

The applicant in his proposal suggested 3,000 feet of drilling which was to cost $21,500.00. These costs are detailed as follows:

3,000 feet of diamond drilling at $6.50 per foot —	$19,500.00
1,500 feet of casing if needed at $1.00 per foot —	1,500.00
Assaying ————————————————	100.00
Contingencies ————————————————	400.00
Total	$21,500.00

The above costs are predicated upon the bases of "EX" drilling which is not recommended. It is believed that all drilling should be done "AX" size with a reduction to "EX" size only if absolutely necessary. This would dispense with the casing item above and this difference could be applied to "AX" size drilling. The above costs are revised to allow for AX drilling and to conform to the short form type of contract. It seems the applicant would supervise the work at no cost to the project.

3,000 feet of "AX" drilling at $7.12 per foot —	$21,360.00
Assaying ————————————————	100.00
Total	$21,460.00

The costs should be subdivided according to the 2 phases of recommended drilling, the second phase to follow the first only upon satisfactory results obtained in the first phase as determined by the inspecting engineer. The costs are subdivided as follows:

Phase I

1,200 feet of "AX" drilling at $7.12 per foot —	$8,544.00	
Assaying ————————————————	40.00	
Phase I total		$8,584.00

Phase II

1,800 feet of drilling at $7.12 per foot ———	$12,816.00	
Assaying ————————————————	60.00	
Phase II total		12,876.00
Project total		$21,460.00

The Government's share of the contribution to the project, if successful, would be $16,095.00. Assuming an ore containing 1 percent recoverable cobalt, the Government's royalty would amount to about

$2.00 per ton. This would mean that nearly 8,000 tons of ore must be discovered in order for the Government to be repaid for its contribution to the project. Such a discovery is unlikely although the drilling program is designed to explore an area, indicated by drilling, 500 feet long by 150 feet deep by 1.67 feet thick, the average thickness of the vein shown in the shaft. Under these conditions, a maximum of 16,700 tons of material would be indicated by the drilling. The problem would be to determine how much of this material is ore.

If in drilling the first phase of the project (the first 4 holes) disappointing results are obtained, the project would be terminated and the cost of the Government's contribution to the project would be about $6,411.00.

CONCLUSIONS

The following conclusions were derived from 2 examinations of the Bluebird cobalt mine and from a study of information pertaining to the property:

(1) The cobalt mineral, cobaltite, occurs in appreciable amounts in the mine. The occurrences have been developed nearly 100 feet vertically, but less than 20 feet laterally. Additional development would be necessary to properly appraise the deposits.

(2) From present exposures, it seems that a significant discovery of cobalt is improbable. A significant discovery of scheelite seems even more improbable.

(3) Supplies and equipment necessary for a project are obtainable.

(4) The property is accessible although some of the road to the mine is not good.

(5) The applicant has had years of experience in mining engineering and seems fully qualified to conduct a project of the type he proposed.

RECOMMENDATIONS

The following recommendation is based primarily upon the importance of the metal, cobalt. Should the situation with respect to cobalt be extremely critical, it would seem to the advantage of the Government to determine the potentialities of the deposit for present or future reference. Upon the foregoing, the following recommendation is made to grant Government assistance in exploring the Bluebird cobalt deposits. The application is docketed as DMEA-3183 and the project proposal follows:

Exhibit A

The exploration project will consist of diamond drilling not more than 10 holes from five drill sites shown in the accompanying map. Two holes will be drilled from each site, one to intersect the mineralized zone at about 100 feet below the adit level and the second at about 200 feet below the adit level. The work will be divided into 2 phases. The first phase will consist of drilling 4 holes, 2 from site No. 1 and 2 from site No. 2 as shown on the accompanying map. Should the results obtained from this work prove

to be satisfactory in the judgment of the inspecting Government representative, six additional holes would be drilled from sites Nos. 3, 4 and 5 as shown on the accompanying map. Two holes would be drilled from each site, one to intersect the mineralized zone about 100 feet below the adit level and the second to intersect the zone at about 200 feet below the adit level. Phase I would consist of 1,200 feet of drilling, and Phase II, should it be undertaken, would consist of 1,800 feet of drilling, a total of 3,000 feet for both phases.

A map of the proposed drilling is attached.

Estimated Costs of the Project

Phase I

1,200 feet of "AX" size diamond drilling at $7.12 per foot —	$8,544.00
Assaying ————————————————	40.00
Total Phase I	$8,584.00

Phase II

1,800 feet of "AX" size diamond drilling at $7.12 per foot —	$12,816.00
Assaying ————————————————	60.00
Total Phase II	$12,876.00

Total estimated cost of the project ——— $21,460.00
This project should be completed in 4 months after the start of the drilling, and in about 2 months if Phase II is not undertaken.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
NOV 18 1953

224 New Customhouse
Denver 2, Colorado

November 13, 1953.

Mr. Daniel Mayhew Stranahan
El Presidio Hotel
Tucson, Arizona

Re: Docket No. DMEA-3183

Dear Mr. Stranahan:

Reference is made to your application for Government aid on the Blue Bird claims.

Projects approved by the Defense Minerals Exploration Administration must, in its judgment, show definite premise of yielding material of acceptable grade, and in quantities that will significantly improve the mineral supply position for the National Defense Program.

A careful study of your property and data available to this agency reveals that the probability of disclosing mineable reserves of Cobalt is not considered sufficiently promising to justify Government participation. Under these circumstances, we regret to advise that your application for exploration aid is denied.

The copy of the report on the Blue Bird Cobalt Mine which accompanied the application is returned herewith.

Very truly yours,

W. H. King
W. H. King
Field Team, Region IV

E. N. Harshman
E. N. Harshman
For A. H. Koschmann
Field Team, Region IV

Enclosures

HMC:cwm

cc: Docket; Administrator, DMEA; WRStorms; AFShride; AHKoschmann (2); Chron.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
NOV 18 1953

224 New Customhouse
Denver 2, Colorado

November 13, 1953.

Memorandum

To: Administrator, Defense Minerals Exploration Administration
Attention: 200

From: Field Team, Region IV

Subject: Report of Examination - DMEA Docket 3183 (Cobalt),
D. M. Stranahan, Blue Bird claims, Graham County, Arizona.

Enclosed are four copies of the report of examination on the subject property, a copy of the letter of denial to the applicant, and two copies of Form 3b.

W. H. King

W. H. King

E. N. Harshman

E. N. Harshman
For A. H. Koschmann

Enclosures

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
NOV 18 1953

Mining Division
Region IV

November 13, 1953.

Memorandum

To: Field Team, Region IV

From: Chief, Mining Division, Region IV

Subject: Report of Examination - DMA Docket 3183 (Cobalt), D. M. Stranahan, Blue Bird Claims, Graham County, Arizona.

Enclosed are eight copies of the Engineering Report of Examination on the subject property.

The applicant requested $21,500.00 to explore the claims by 3,000 feet of diamond drilling.

The examiners agree that a significant discovery is unlikely by the work proposed by the applicant. The Bureau engineer believes that because of the strategic position of cobalt, Government knowledge of the deposit is desirable and we believe that some agency of the Government should undertake work of such nature. We believe that a private individual should not be required to expend funds that would probably result only in the solution of a geologic problem that would furnish the Government with the desired information.

We recommend that the application be denied.

W. H. King

W. H. King

Enclosures

MINING DIVISION
REGION IV

November 3, 1953

Memorandum

To : W. H. King, Chief, Mining Division, Region IV

From : Chief, Mining Methods Br., Mining Div., Region IV

Subject : Report on Docket DMEA-3183, D. M. Stranahan's Bluebird Cobalt Mine, Graham County, Arizona

Enclosed are original and 8 copies of a report on the above property by John H. Soule' of the Bureau of Mines. As the Bureau of Mines and Geological Survey examiners could not agree on their recommendations, an entirely separate report is being submitted by each.

Although there seems little chance of making a significant discovery of cobalt-bearing material by the proposed exploration project, Soule' recommends that the exploration loan be granted to more fully appraise the deposit as cobalt is on the list of critical strategic metals. A few diamond drill holes at only a small expense to the Government should definitely prove the merit of the deposit, so I concur with Soule's recommendations.

Brochure is enclosed.

Walter R. Storms

Walter R. Storms

CC W. H. King (8)
A. F. Shride
DMEA-3183
RF

WRStorms:frj

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.
Denver Federal Center
Denver 2, Colorado

November 4, 1953

To: Field Team, Region IV

From: A. H. Koschmann

Subject: DMEA Docket 3183, Blue Bird Claims, (Cobalt), Graham County, Arizona

Attached are 8 copies of the geologic report by J. N. Falck of the U. S. Geological Survey covering the subject docket.

It has been recommended that the application for exploration assistance be denied.

E. N. Hershman
for A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Enclosures (8)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P. O. Box 4126, University Station
Tucson 5, Arizona

October 30, 1953

Memorandum

To: A. H. Koschmann

From: J. H. Faick

Subject: DMEA-3183, Blue Bird Claims, (Cobalt), Graham County, Arizona

We are sending you the Survey's report on the examination of the above property by J. H. Faick.

This report recommends denial of the application because the ore reserves are too small and too low-grade to be significant, and because the geological criteria, such as hydrothermal alteration, ground preparation and type of host rock, do not indicate that important reserves will be found by the proposed exploration.

John H. Faick
Geologist

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMEA-3183, D. M. STRANAHAN'S BLUEBIRD COBALT MINE

Graham County, Arizona

John H. Seule', Mining Engineer
U. S. Bureau of Mines

November 1953

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The Bluebird cobalt deposits in Graham County, Ariz. were discovered in 1935 and a small concentrator was installed shortly thereafter. A few tons of cobalt concentrates were produced, but not shipped. Cobalt is one of our most critical metals and this deposit is of interest because of its content of that metal. The tungsten mineral, scheelite, also has been found in the mine near the cobalt deposits.

J. S. Vhay of the Federal Geological Survey mapped the area in 1942 and suggested a small exploratory project, if the need for cobalt at that time warranted it. In early 1953, the deposits were examined by J. H. Soule' of the Bureau of Mines who suggested a small exploratory project to more accurately appraise the deposits because of the critical nature of the metals, cobalt and tungsten.

D. M. Stranahan, an engineer of Panaminas, Inc., a subsidiary of Ventures Ltd., examined the property in 1939 and recommended some work by his company. Satisfactory lease terms could not be arranged and no work was done. His interest was revived in 1953 and a satisfactory lease was obtained on the property. Stranahan then applied for Government assistance to explore the deposits.

The exploration application was docketed as DMEA-1183 and a field examination of the property by a DMEA Field Team was required. This examination was made on October 19, 1953 by John H. Soule' of the Bureau of Mines and John H. Faick of the Geological Survey. They were accompanied by D. M. Stranahan, the applicant.

The deposits are located in sec. 5, T. 5 S., R. 21 E. in Graham County, Ariz. Although fairly accessible, the area is somewhat isolated. It is nearly 19 miles from a paved highway and nearly 45 miles from the nearest sizeable town, Safford, Ariz. Minor supplies, services, and accommodations may be obtained in Safford.

The altitude at the mine is about 4,200 feet. The terrain varies from moderate to rugged although the relief is not great. Summers are hot and winters generally are mild. Any freezing weather usually is not prolonged. Rainfall is scanty and only desert vegetation abounds. There are no permanent streams in the area, but 2 wells on the property would furnish a small amount of water.

A group of 5 contiguous claims comprises the Bluebird property. The claims are unpatented and are held by F. D. Mayhugh of Tucson, Ariz., and W. L. Lombardi of Tombstone, Ariz. They are leased to D. A. Stranahan, at present of Tucson, Ariz.

The Blue Bird cobalt mine explores narrow tight fractures in quartz diorite, along which are localized several small pods, pockets, and lenses of low-grade cobalt ore. The ore bodies are localized near the intersection of easterly and northwesterly trending joints and gash fractures with a north trending fracture or fault. The ore consists of cobaltite and smaltite, with which are associated several other sulfide minerals, in a gangue of quartz and carbonate.

The veins containing the cobalt minerals are arranged in echelon, strike northerly, and dip to the east at moderate angles. The veins vary in width from small stringers to a maximum of 3 feet. They have been developed down dip for nearly 100 feet, but laterally they have

been developed for less than 20 feet. Scheelite occurs in a small veinlet that has a maximum width of 3 inches and persists for about 25 feet before disappearing into the walls of the drift. Minable ore reserves are meager, probably less than 100 tons of ore, containing a little over 1 percent cobalt. There are practically no reserves of scheelite. The deposits were developed by an inclined shaft nearly 100 feet deep, and by an adit connecting to the bottom of the shaft. The adit is about 270 feet long.

It is concluded that the critical metals, cobalt and tungsten, are present in veins in the Bluebird mine. Although a significant discovery is unlikely, especially with respect to tungsten, it is felt that in view of the critical nature of the metals, some work should be done on the property so it can be more accurately evaluated. Supplies and equipment necessary for the project are available and the ability of the applicant to conduct the exploration is not questioned.

It is recommended that the Government participate in the exploration of the Bluebird cobalt mine. A project is proposed which would be divided into 2 phases, the second phase to be undertaken only upon satisfactory results being obtained during the first phase. The first phase would consist of diamond drilling 4 holes for a total of about 1,200 feet of "AX" size hole which would cost an estimated $8,584.00. The second phase, if undertaken, would consist of drilling an additional 1,800 feet of "AX" hole in 6 additional holes as shown on a map accompanying the report. The second phase is estimated to cost $12,876.00, or a total of $21,460.00 for the project. This project should be completed in 4 months.

BLUE BIRD CLAIMS

(COBALT)

GRAHAM COUNTY, ARIZONA

DMEA 3183

D. M. Strunahan, Applicant

by

John H. Faick

Geologist, U. S. Geological Survey

BLUE BIRD CLAIMS
(COBALT)
GRAHAM COUNTY, ARIZONA
D.M.E.A. 3183
D. M. Strassman, Applicant
by
John H. Faick
Geologist, U. S. Geological Survey

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Figure 1	LOCATION MAP	See Engineering Report
Figure 2	TOPOGRAPHIC MAP	"
Figure 3	CLAIM MAP	"
Figure 4	MINE WORKINGS	"
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INTRODUCTION

The Blue Bird Claims, Graham County, Arizona, were examined October 19, 1953, by John H. Soulé, Engineer, U. S. Bureau of Mines, and John H. Faick, U. S. Geological Survey. The purpose of the examination was to determine the advisability of exploring the property by diamond drilling for cobalt. The examination was made in behalf of the Defense Minerals Exploration Administration, to which application (Docket DMEA 3183) has been made for assistance in exploration. The application was submitted by D. M. Strunsman, representing Ventures, Ltd., and he accompanied the examiners to the property. John H. Soulé had previously examined the claims for the U. S. Bureau of Mines and the property had also been examined by the U. S. Geological Survey, and Survey geologists have recently visited the property on behalf of the Atomic Energy Commission.

GEOLOGY

The Blue Bird claims and the adjacent area is underlain by a complex of intrusive rocks thought to be of pre-Cambrian age. Cambrian quartzite caps a few low hills in the area. There are 3 principle types of intrusive rocks. These are relatively fine-grained, medium to dark gray quartz diorite; coarse-grained gabbro, and fine-grained, light gray quartz monzonite. The quartz diorite is the host rock for the cobalt deposits which have formed along narrow fractures in the quartz diorite.

The deposits have been developed (See Fig. 4) by a shaft about 90 feet deep and which is inclined from about 50 to 80 degrees easterly. This shaft is connected with the surface by an adit about 260 feet long. The shaft was started at the surface on an outcrop of cobalt ore which was about 12 inches wide and reported to be of fairly good grade. The fracture upon which the ore was localized was followed by the shaft, and several small lenses of cobalt ore were penetrated by it. The adit penetrated the principle ore zone at a distance of about 175 feet from the portal.

The minerals which were observed by this writer or reported by others to occur in the Blue Bird cobalt deposit are as follows:

1. Pyrite	8. Chalcopyrite
2. Arsenopyrite	9. Scheelite
3. Cobaltite	10. Erythrite
4. Linnaeite	11. Limonite
5. Smaltite	12. Quartz
6. Glaucodote	13. Calcite
7. Molybdenite	14. Tourmaline

In addition to the above minerals it is reported that there is a very small amount of gold in the ore. Greenish stains

which are present in a few places along the walls of the adit are interpreted by this writer to be an alteration product of some primary nickle mineral. Most of the ore is fine-grained and consists of either massive sulfides or sulfides disseminated in quartz-carbonate gangue.

These minerals form narrow veinlets and small pockets and pods of ore that are localized along narrow fractures and to a slight extent replace the quartz diorite adjacent to the fractures. Very small amounts of the sulfide minerals are disseminated in the diorite within a couple of inches of the fractures. There is very little apparent hydrothermal alteration of the quartz diorite, and fresh-looking rock is present in close proximity to the ore minerals. The wall rocks, however, appear to be slightly silicified within a few inches of the quartz veins and stringers.

Limonite, which forms surficial stains on joint planes in the quartz diorite, is present in relatively greater than normal amounts along a zone from about 20 to 50 feet wide and several hundred feet long, and corresponds approximately in location to the outcrop of the mineralized zone. This writer believes this iron-stained zone, which is estimated to contain about one percent limonite, is an alteration halo surrounding the principle ore zone and indicates its approximate position.

The principle fracture or fractures that localize the sulfide mineralization strike about N. 15-20° E. and dip 50-55° S.E. This fracture, along which there apparently has been a little movement, is intersected on the hanging wall side by several joints or gash fractures all of which may be classified into two groups on the basis of attitude. One group of joints strikes nearly east and dips about 45° south; the other group strikes N. 45° E. and dips about 75° S.E.

There are several lenses and pods of ore exposed in the mine workings, and the size and distribution of the individual ore bodies is indicated in a general way by Figure 4. It is probable that most of these small pods of ore are interconnected with thin stringers or veinlets. Available evidence indicates that the ore bodies form where the principle fracture zone, trending N. 15°-20° E., is intersected by gash fractures or joints which are elements of either the easterly trending or northeasterly trending sets.

It is reported that the original outcrop upon which the shaft was sunk was 2 to 5 feet wide and about 40 feet long; however, available data indicate the vein at the outcrop is only 12 inches wide. In October 1939 Mr. Strenahan reported a hole dug 10 feet north of the shaft exposed a vein 12 inches wide, which contained 0.71 percent cobalt, and 50 feet north of the shaft the vein was also 12 inches wide, and contained 0.06 percent cobalt. In a new

trench about 20 to 25 feet north of the shaft, the vein was also about 12 inches wide; thus this appears to be the true width of the vein at the surface. Mr. Strauchan apparently assumes the vein is continuous down the dip and ranges in width from 6 inches to 3 feet where exposed in the shaft.

Strauchan also assumes a steep northerly pitch of the ore shoot, a condition that could not be verified by this writer and one that seems unlikely because the easterly and northeasterly trending joints, which influence localization of the ore, dip from 45 to 75 degrees south.

The full extent of the ore bodies is not known because the mine workings cut obliquely across them and have not exposed the maximum strike length. The ore is bunchy, pockety or poddy and erratic in distribution. The average exposed length of the ore lenses along the dip is about 8.5 feet. The largest lense, near the bottom of the shaft, has a maximum exposed length of 12 feet on the horizontal, 20 feet on the dip and has a width of 2 feet.

ORE RESERVES AND GRADE

The following table of samples indicates the width and grade of ore:

Sample No.	Taken by	Location	Width in Inches	%Cobalt
1	U.S.G.S.	See Fig. 1	3	10.67
2	U.S.G.S.	"	36	0.01
3	U.S.B.M.	"	24	0.28

Sample No.	Taken by	Location	Width in Inches	%Cobalt
4	U.S.G.S.	See Fig. 1	3	0.02
5	U.S.G.S.	"	60	0.01
6	U.S.G.S.	"	36	2.02
7	U.S.G.S.	"	11	1.67
8	U.S.G.S.	"	10	1.01
9	U.S.G.S.	"	12	0.04
10	U.S.G.S.	"	24	0.02
11	U.S.G.S.	"	20	0.10
12	U.S.B.M.	"	18	0.15
13	U.S.G.S.	"	25	0.03
14	U.S.B.M.	"	20	0.08
Crude ore	U.S.B.M.	Ore bin		0.22
Concentrate	U.S.B.M.	Old mill		7.00

The weighted average of samples 1 to 14 inclusive indicates the ore contains 0.49 percent cobalt and the average width of vein material is 22 inches.

Mr. Strunsman has provided the following sample results with his application:

Sample No.	Location	Width in Inches	% Cobalt
1	Adit near shaft	12	0.55
2	" " "	6	0.07
3	" " "	4	0.40

Sample No.	Location	Width in Inches	% Cobalt
4	N. side of shaft, 69 feet below collar; approx. location U.S.G.S. 5, 6, 7	18	7.37
5	N. side of shaft 52 ft. below collar	42	1.97
6	N. side of shaft 39 ft. below collar. About 6 ft. below U.S.G.S. No. 1	20	0.97
7	N. side of shaft, about 25 feet below collar.	6	0.25
8	S. side of shaft, about 20 ft. below collar.	42	0.30
9	N. side of shaft, about 59 ft. below collar. Near U.S.G.S. and U.S.B.M. samples 2 and 3	24	0.49
10	Dump at shaft, 5 cuts		0.50
11	East side of dump, exclusive of No. 10		2.25
12	Outcrop 10 ft. north of shaft	12	0.71
15	Adit, about 200 ft. from portal	12	0.15
16	Outcrop, 50 ft. north of shaft	12	0.06

The weighted assay of Strauchen's samples, exclusive of the dump samples, indicates a cobalt content of 1.33 percent and a

vein width of 18 inches. However, if this 1.33 percent average is substituted for the 7.27 percent in sample no. 4, which appears erratic and abnormally high, then the average weighted analysis becomes 0.82 percent cobalt. I believe this is a realistic figure, and reasonably comparable to the 0.49 percent cobalt (weighted average) obtained from the U.S.B.M. and U.S.G.S. samples.

The analysis of samples and the measured widths of the vein indicate that it averages about 20 inches wide and contains about 0.65 percent cobalt. This is equivalent to 13 pounds of cobalt per ton of ore. Cobalt is quoted (E. and M. J., October 1953) at $2.40 per pound; therefore ore containing 13 pounds per ton is worth about $31.00 per ton.

The vein is partly explored and developed for a strike length of about 80 feet and about the same distance on the dip. Thus about 1000 tons of ore is indicated; however, this estimate should be reduced by about 200 tons to account for the ore removed during development and subsequent stoping.

About 800 tons of ore containing 0.65 percent cobalt is a reasonable estimate of the ore reserves. This closely approximates the reserves given by Strauchen[1] who estimated the reserves to be

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[1] Strauchen, D.M., The Blue Bird Cobalt Mine, p. 7, 1939. Private report. Issued with DMEA application.

600 tons of ore containing 1 percent cobalt. This writer's estimate is 10,400 pounds of cobalt in the ore, which is comparable to 12,000 pounds of cobalt based on Strenshen's estimate.

PROPOSED EXPLORATION

The applicant's proposed exploration program is similar to a program previously submitted by John Soulé, Engineer, U. S. Bureau of Mines, as a Bureau project. The proposal is to drill 8 inclined drill holes into the ore zone from the surface. The amount of drilling proposed is about 3000 feet and the cost is estimated at $21,500. This proposed exploration would be on a 90-10 participation basis; therefore, the Government's share of the cost would be about $19,350.

CONCLUSIONS AND RECOMMENDATIONS

Interpretation of the data obtained by investigation of the Blue Bird Cobalt prospect resulted in the following conclusions:

1. The ore bodies occur as small lenses, pods and pockets localized along or at intersections of narrow, tight fractures or faults.
2. The indicated and measured ore reserves are relatively small and of relatively low grade, being about 800 tons of ore containing from 0.5 to 0.8 percent cobalt.
3. The inferred reserves, although not estimated, are also small as indicated by the size of the exposed ore zone. It is probably not advisable to predict ore more than 20 feet vertically or horizontally beyond the known ore zone; therefore inferred reserves must be small.

4. The apparent absence or weakness of hydrothermal alteration near the ore zone is interpreted by this writer to mean that ore bearing or mineralizing solutions sufficient to alter the country rock have not found access to the fracture zones, and by analogy have probably not deposited significant amounts of ore along the zone.

Geological conditions indicate that there is not likely to be a significant amount of cobalt ore discovered at the Blue Bird prospect; therefore, it is recommended that this application, DMEA 3183, be denied.

DMRA-3183, D. M. STRANAHAN'S BLUEBIRD COBALT MINE
GRAHAM COUNTY, ARIZONA

Engineering Report

By John H. Soule'
Mining Engineer
U. S. Bureau of Mines

November 1953

DMRA-3183, D. M. STRANAHAN'S BLUEBIRD COBALT MINE
GRAHAM COUNTY, ARIZONA

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INTRODUCTION

The Bluebird cobalt deposits in Graham County, Ariz. were discovered in 1935 and a small concentrator was installed shortly thereafter. A few tons of cobalt concentrates were produced, but not shipped. Cobalt is one of our most critical metals and this deposit was of interest for its content of that metal. The tungsten mineral, scheelite, also has been found in the mine near the cobalt deposits.

J. S. Vhay of the Federal Geological Survey mapped the area in 1942 and suggested a small exploratory project, if the need for cobalt at that time warranted it. The property was examined by J. H. Soule' of the Bureau of Mines early in 1953. He suggested a small exploratory project to more accurately appraise the deposits because of the critical nature of the metals, cobalt and tungsten.

D. M. Stranahan, an engineer of Panaminas Inc., a subsidiary of Ventures Ltd., examined the property in 1939 and recommended some work by his company. Satisfactory lease terms could not be arranged, so no work was done. His interest was revived in 1953 and a satisfactory lease obtained on the property. Stranahan then applied for Government assistance to explore the deposits.

The exploration application was docketed as DMEA-3183 and a field examination of the property by a DMEA Field Team was required. The DMEA Field Team examination was made on October 19, 1953 by John H. Soule' of the Bureau of Mines and John N. Faick of the Geological Survey. They were accompanied by D. M. Stranahan, the applicant.

ACKNOWLEDGMENTS

Acknowledgment is made of the use of maps prepared by D. M. Stranahan, the applicant, and other maps prepared by members of the Federal Geological Survey.

LOCATION, TOPOGRAPHY AND PHYSICAL FEATURES

The Bluebird cobalt deposit is situated in sec. 5, T. 5 S., R. 21 E., with the claim group overlapping into sec. 4 adjoining on the east and secs. 32 and 33 of the adjoining township in the north. The location is shown in figures 1, 2, and 3. The deposits are in Graham County. The mining district is unnamed. The mine is just south of the southern border of the San Carlos Indian Reservation, and east and north of the boundaries of the Crooke National Forest.

The property is reached by going to Geronimo, Ariz., 62 miles southeast of Globe, Ariz. on U. S. Highway 70, or 27 miles northwest of Safford, Ariz. on the same highway. From Geronimo, go 1.0 mile southeasterly toward Safford on the main highway, then turn sharply to the right or southwest and continue on this ranch road for 12.9 miles from the highway. Ignore any sharp turns or branches from this road. The gentle forks encountered merely are splits in the road which join farther on. At the 12.9-mile point, which is 0.2 miles beyond a ranch house whose yard fence adjoins the ranch road on the left, turn sharply to the right, or northwest and follow up the sandy bed of the main wash for 4.4 miles, taking the right hand branches of the wash at the 1.9 and 3.1 mile points. At the 4.4-mile point, follow the west bank of

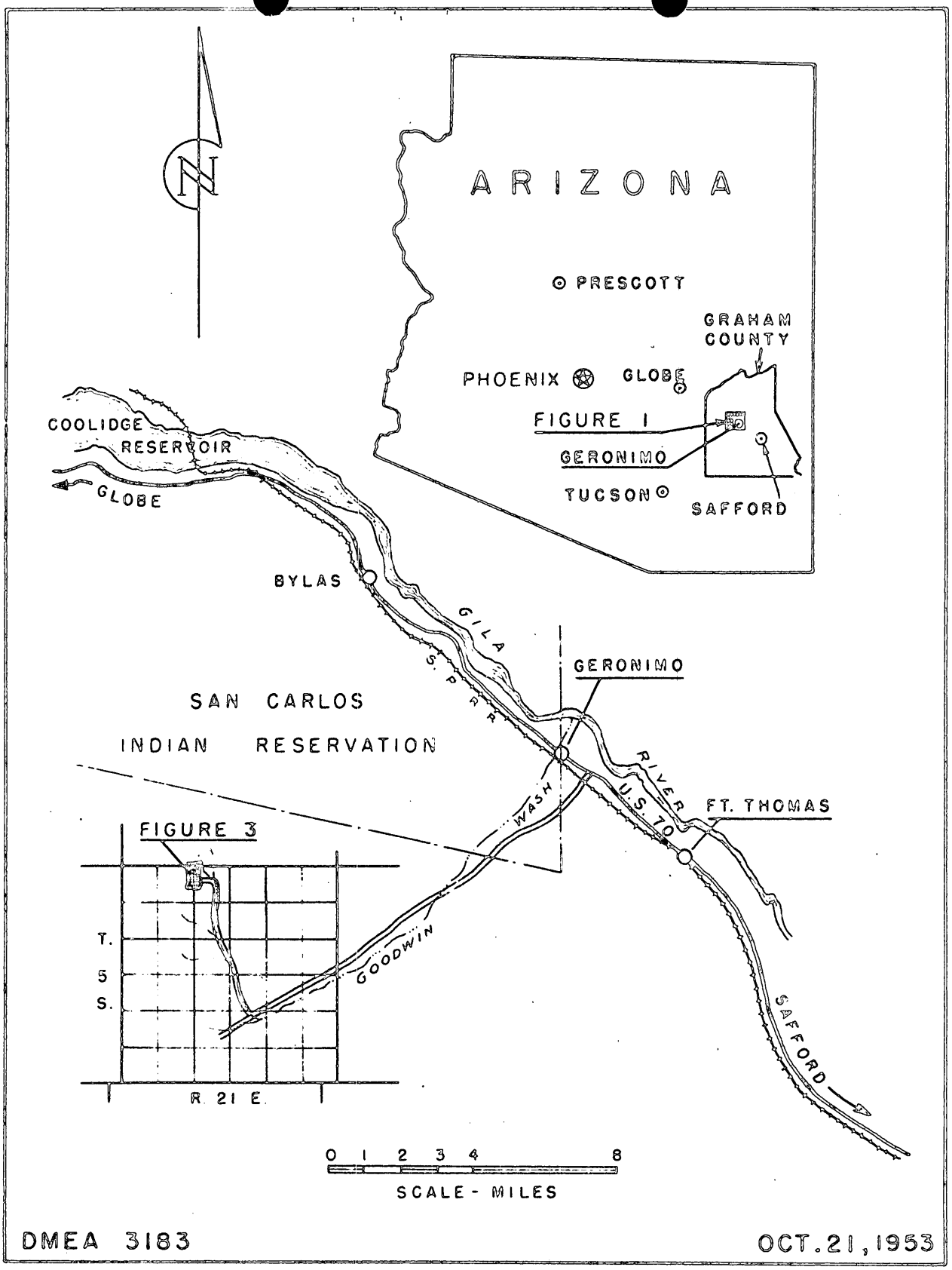

FIGURE 1. - LOCATION MAP, BLUEBIRD COBALT MINE
GRAHAM COUNTY, ARIZONA

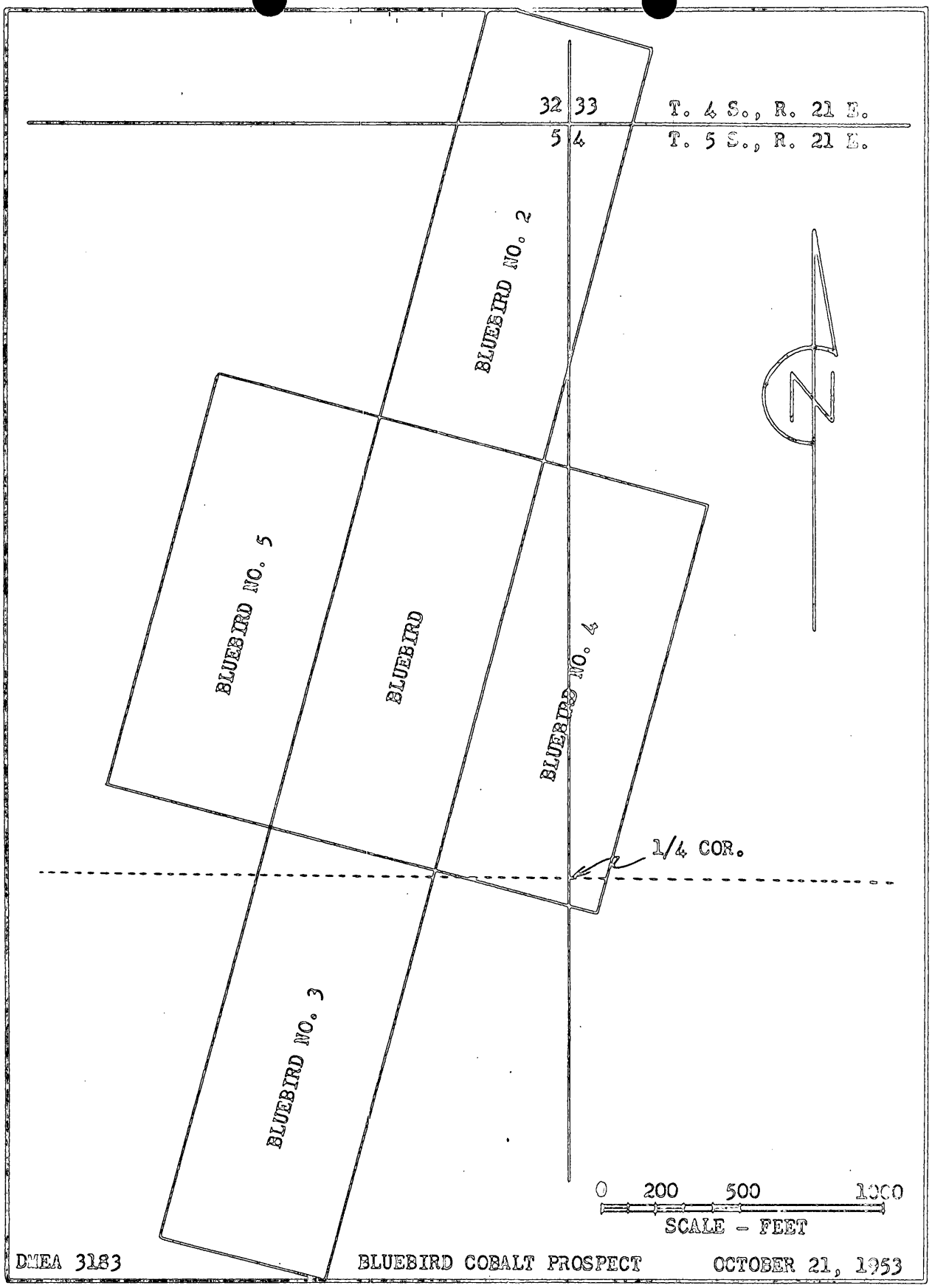

FIGURE 3 - CLAIM MAP

the wash, thence up a small hogback showing dim tracks, and continue to the mine, 1.3 miles from the sand wash. The route is shown in figure 1. Access to the mine could be difficult during periods of heavy rainfall. Some of the road becomes very slippery and the sandy portions may give trouble when rains reach cloudburst proportions. The last 1.3 miles of the road is narrow and steep grades are common.

Although the relief at the mine may not exceed 400 feet, small craggy bluffs give some of the terrain a rugged aspect. Steep slopes are common. The altitude of the mine is about 4,200 feet.

The mean annual precipitation is about 13 inches, largely as summer thunder showers and winter rains. Winter snows generally are light and constitute but a small part of the annual precipitation. Temperatures vary from near zero in the winter to about 112° F. in the summer. Sub-zero weather usually is not prolonged, but the summer heat may last for considerable periods of time.

There are no permanent streams in the area, but two wells on the property near the mine should furnish ample water for a modest mining operation. Water stood at about 15 feet below the collar of the well nearest the old mill.

Vegetation is scanty, consisting of the usual desert array of jojoba bushes, catsclaw, mesquite, cactus, and other plants. There is no timber suitable for mining purposes in the vicinity of the deposits. Some Ponderosa pine grows in the higher reaches of the Santa Theresa Mountains to the south, but most of this timber is not accessible.

There is no skilled labor in the vicinity of the mine. All such must be imported, possibly a small amount from Safford, but probably from Globe. Most of the better class of skilled miners there probably have permanent employment. A small amount of unskilled labor may be recruited from nearby ranches.

There are no living accommodations at the mine, except one primitive shack. Limited accommodations may be available at nearby ranches, otherwise Safford and Thatcher, some 45 miles southeast of the mine, have the nearest accommodations. As it takes nearly one and one-half hours to drive from the main highway to the mine, a camp should be established for any work at the mine unless a very small crew could get board and room at a nearby ranch.

HISTORY AND PRODUCTION

The discovery of the Bluebird cobalt deposit dates back to 1935. This discovery created considerable interest, and a large number of claims were located in the area. Many of these evidently have lapsed. Development work was done on the Bluebird deposit and a small concentrator was erected. Operations lasted but a short while as only 12 tons of concentrates reportedly were obtained from the mill. These concentrates were not sold and have been scattered or stolen.

No operations were undertaken after the early efforts until 1952, when a short diamond drill hole was drilled. There are no available data on the results obtained from this hole. In 1953, some road repairing was done, as well as some trenching and cleaning out the mine workings.

OWNERSHIP AND EXTENT

The Bluebird claims are held by virtue of location by W. L. Lombardi of Tombstone, Ariz. and F. D. Mayhugh of Tucson, Ariz. These claims were located on March 26, 1938 as recorded at the county court house in Safford. The property at present consists of a contiguous group of 5 claims as shown in figure 3. These claims are now leased to D. H. Stranahan, at present living at the Presidio Hotel, Tucson, Ariz. Mr. Stranahan is a mining engineer employed by Panaminas Inc., a subsidiary of Ventures Limited. Although the application for Government assistance was made in Stranahan's name, he says he is being backed by Panaminas Inc.

DESCRIPTION OF THE DEPOSITS 1/

The Bluebird cobalt mine explores narrow, tight fractures in quartz diorite, along which are localized several small pods, pockets, and lenses of low-grade cobalt ore. The ore bodies are localized near the intersection of easterly and northeasterly trending joints and gash fractures with a north trending fracture or fault. The ore consists of cobaltite and smaltite, with which are associated several other sulfide minerals, in a gangue of quartz and carbonate.

MINABLE ORE RESERVES

The Bluebird cobalt deposits occur as small veins arranged in echelon, which vary from small stringers to widths of 3 feet. The vertical extent of the individual veins seldom reaches a length of 20 feet, but the aggregate extends down dip approximately the depth of the

1/ Faick, John N., geologist, U. S. Geological Survey

shaft, or 100 feet. Lateral development does not disclose the strike-length of the shoots. Presumably it is small. An average of all of the samples taken in the shaft and shown on figure 4 indicates a vein width of a little less than 2 feet. The average grade of these samples, weighted by sample length, is 1.2 percent cobalt. Perhaps 100 tons of ore of this grade could be called minable. Because of dilution and mining to a minimum width, the amount of material to be mined would be increased and the grade lowered.

The scheelite occurrence was checked with an ultra-violet lamp. This scheelite occurs in a small veinlet that has a maximum width of 3 inches. This stringer persists for about 25 feet before it disappears into the walls of the drift. Parts of the veinlet apparently contain scheelite of good grade. There are no minable reserves of tungsten ore.

PRESENT STATUS

The Bluebird mine is developed by a shaft almost 100 feet deep and by a 270-foot adit, connecting with the bottom of the shaft. Small stopes extend laterally from the shaft for only a few feet. Other than a few location pits, there are no workings of consequence other than those mentioned above (see figure 4).

The lessee of the property now is doing a small amount of trenching and rehabilitation work on the property. Other than an engineless hoist and compressor, and 2 mine cars, there is no equipment on the property. Equipment at the mill is such that practically nothing can be done with it.

PROJECT PROPOSALS WITH COSTS

The Bluebird cobalt, or tungsten deposit cannot be considered promising as a potential source of appreciable quantities of cobalt or tungsten. This is because of the seemingly small lateral extent of the mineralized zone. However, cobalt and tungsten minerals are present in the mineralized zone and because of the critical nature of cobalt, it seems that some work should be done so that a proper evaluation of the deposit may be made.

The greatest amount of ground could be covered by diamond drilling the deposits, although underground work would give more detail. In drilling, it is possible for the drill holes to miss the small ore bodies but it is felt that these ore bodies,as shown in the shaft, are closely enough spaced so that most of the hole penetrations would encounter the veins. A minimum of 1,200 feet of drilling in 4 holes from surface sites is recommended. This will be followed by an additional 1,800 feet if the results obtained in the first drilling so warrant. The proposed drill sites are shown on figure 2. They are spaced on 100-foot centers. Two holes will be drilled from each site to penetrate the mineralized zone at depths of 100 and 200 feet below the adit level as shown by the sections on figure 5. It is recommended that sections A-B and C-D (sites 1 and 2) be drilled first. The remainder of the program would be drilled if the results obtained in the first 4 holes should so warrant. The holes would vary in depth from 200 to about 400 feet.

The applicant in his proposal suggested 3,000 feet of drilling which was to cost $21,500.00. These costs are detailed as follows:

3,000 feet of diamond drilling at $6.50 per foot —	$19,500.00
1,500 feet of casing if needed at $1.00 per feet —	1,500.00
Assaying	100.00
Contingencies	400.00
Total	$21,500.00

The above costs are predicated upon the bases of "EX" drilling which is not recommended. It is believed that all drilling should be done "AX" size with a reduction to "EX" size only if absolutely necessary. This would dispense with the casing item above and this difference could be applied to "AX" size drilling. The above costs are revised to allow for AX drilling and to conform to the short form type of contract. It seems the applicant would supervise the work at no cost to the project.

3,000 feet of "AX" drilling at $7.12 per foot —	$21,360.00
Assaying	100.00
Total	$21,460.00

The costs should be subdivided according to the 2 phases of recommended drilling, the second phase to follow the first only upon satisfactory results obtained in the first phase as determined by the inspecting engineer. The costs are subdivided as follows:

<u>Phase I</u>

1,200 feet of "AX" drilling at $7.12 per foot —	$8,544.00	
Assaying	40.00	
Phase I total		$8,584.00

<u>Phase II</u>

1,800 feet of drilling at $7.12 per foot —	$12,816.00	
Assaying	60.00	
Phase II total		12,876.00
Project total		$21,460.00

The Government's share of the contribution to the project, if successful, would be $16,095.00. Assuming an ore containing 1 percent recoverable cobalt, the Government's royalty would amount to about

$2.00 per ton. This would mean that nearly 8,000 tons of ore must be discovered in order for the Government to be repaid for its contribution to the project. Such a discovery is unlikely although the drilling program is designed to explore an area, indicated by drilling, 500 feet long by 250 feet deep by 1.67 feet thick, the average thickness of the vein shown in the shaft. Under these conditions, a maximum of 16,700 tons of material would be indicated by the drilling. The problem would be to determine how much of this material is ore.

If in drilling the first phase of the project (the first 4 holes) disappointing results are obtained, the project would be terminated and the cost of the Government's contribution to the project would be about $6,411.00.

CONCLUSIONS

The following conclusions were derived from 2 examinations of the Bluebird cobalt mine and from a study of information pertaining to the property:

(1) The cobalt mineral, cobaltite, occurs in appreciable amounts in the mine. The occurrences have been developed nearly 100 feet vertically, but less than 20 feet laterally. Additional development would be necessary to properly appraise the deposits.

(2) From present exposures, it seems that a significant discovery of cobalt is improbable. A significant discovery of scheelite seems even more improbable.

(3) Supplies and equipment necessary for a project are obtainable.

(4) The property is accessible although some of the road to the mine is not good.

(5) The applicant has had years of experience in mining engineering and seems fully qualified to conduct a project of the type he proposed.

RECOMMENDATIONS

The following recommendation is based primarily upon the importance of the metal, cobalt. Should the situation with respect to cobalt be extremely critical, it would seem to the advantage of the Government to determine the potentialities of the deposit for present or future reference. Upon the foregoing, the following recommendation is made to grant Government assistance in exploring the Bluebird cobalt deposits. The application is docketed as DMA-3183 and the project proposal follows:

Exhibit A

The exploration project will consist of diamond drilling not more than 10 holes from five drill sites shown in the accompanying map. Two holes will be drilled from each site, one to intersect the mineralized zone at about 100 feet below the adit level and the second at about 200 feet below the adit level. The work will be divided into 2 phases. The first phase will consist of drilling 4 holes, 2 from site No. 1 and 2 from site No. 2 as shown on the accompanying map. Should the results obtained from this work prove

to be satisfactory in the judgment of the inspecting Government representative, six additional holes would be drilled from sites Nos. 3, 4 and 5 as shown on the accompanying map. Two holes would be drilled from each site, one to intersect the mineralized zone about 100 feet below the adit level and the second to intersect the zone at about 200 feet below the adit level. Phase I would consist of 1,200 feet of drilling, and Phase II, should it be undertaken, would consist of 1,800 feet of drilling, a total of 3,000 feet for both phases.

A map of the proposed drilling is attached.

Estimated Costs of the Project

Phase I

1,200 feet of "AX" size diamond drilling at $7.12 per foot —	$8,544.00
Assaying ————————————————	40.00
Total Phase I	$8,584.00

Phase II

1,800 feet of "AX" size diamond drilling at $7.12 per foot —	$12,816.00
Assaying ————————————————	60.00
Total Phase II	$12,876.00

Total estimated cost of the project ———— $21,460.00
This project should be completed in 4 months after the start of the drilling, and in about 2 months if Phase II is not undertaken.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

824 New Customhouse
Denver 2, Colorado

October 2, 1953.

Memorandum

To: Administrator, Defense Minerals Exploration Administration
Attention: Code 200

From: Executive Officer, DMEA Field Team, Region IV

Subject: Docketing for Exploration Assistance

Enclosed herewith in duplicate is DMA Form 3a and MF-103 and supporting data pertaining to the following applications for Government assistance in exploration work:

John A. Cooley 3412 South 16th Street Phoenix, Arizona	Copper and Uranium
Daniel Mayhew Stranahan El Presidio Hotel Tucson, Arizona	Cobalt
Lloyd P. Mock 1440 St. Paul Street Denver 6, Colorado	Tungsten

W. H. King
W. H. King

Enclosures

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

Not to be filled in by applicant

Docket No. DMEA-3183
Metal or Mineral
Date Received 10-5-53
Estimated Cost
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Daniel Hughes Strachan
Box 1010 Rt. 2,
Tucson, Arizona.

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.

(*d*) If a partnership, add to the above statement the names and addresses of all partners.

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract Unpatented Mining Claim, Blue Bird 1 to 5 inclu. located in Turnbull Mining District, in Graham County in State of Arizona, in Township 5, Range 21 East of G. & S. R. B. & M.

(*b*) State any mine name by which the property is known. Blue Bird

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise Lessee

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property. Enclosed

(*e*) If you own the land, describe any liens or encumbrances on it

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice.

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes.

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you.

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.

5. *The exploration project.*—(*a*) State the mineral or minerals for which you wish to explore .....
.....Cobalt.....

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contacts, veins, ore-bearing beds, etc.

(*c*) The work will start within ....7.... days and be completed within ....6.... months from the date of an exploration project contract.

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations.

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.).

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs.

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)?

(*b*) How do you propose to furnish your share of the costs?

[X] Money [ ] Use of equipment owned by you [ ] Other

Explain in detail on acompanying paper.

CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated .....October 23rd, 1953.....195...

David M Shannahan
(Applicant)

By.....

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

#3 (f)

The Blue Bird Property consists of 5 unpatented mining claims situated in the Turnbull Mining District, in Graham County, State of Arizona in Township 5, Range 21 East of G. & S.R.B. & M., location notices are recorded in the Record of Mines in the Office of the County Recorder of said Graham County, Arizona in Safford, Arizona. as follows ,

Claim	Book	Page
Blue Bird #1	31	453
Blue Bird #2	31	454
Blue Bird #3	31	455
Blue Bird #4	31	456
Blue Bird #5	31	457

Assessment work for the past year was done by the applicant.

#4 (a)

Before 1939 an inclined shaft, average 65 deg., was sunk on the vein and an adit about 270 ft in length was driven connecting with the bottom of the shaft at about 230 ft from the portal. The adit encountered the vein at about 170 ft and was driven on the vein to a point some 30 ft beyond the shaft.
The above work was done by the owner and a former lessee.

#4 (b)

The owners installed a small mill, bin, crusher and table, during World War #2 but operated only a short time, the owner claims he could not obtain gasoline and was forced to suspend operations. A small amount of concentrate was recovered and sacked but never shipped. It has since been stolen or washed away. Bureau of Mines samples of the vein ran from 0.01% Co to 10.67% Co. and samples taken by me in 1939 ran from 0.06% Co to 7.37% Co.
The ore bin grab ran 0.22% Co and the concentrates 7.0% on samples taken by the Bureau of Mines.

#4 (c)

Quoting from data I obtained from Project #328 of the Bureau of Mines supplemental examination Report on proposed development at the Blue Bird Cobalt deposits, Graham Co., Arizona by John H. Soule'- Feb 1953 of which I understand there is a copy on file with the Bureau of Mines in Denver and also in Washington.
Quoting again from the above mentioned Report, "The ore occurs in small irregular veins in echelon in a precambrian complex mostly quartz diorite and gabbro much of which is altered. The veins are in the quartz diorite. The ore is composed of Cobaltite, scheelite, pyrite, quartz and minor chalcopyrite.
My reason for wishing to explor this property is the expectation of opening up and operating a cobalt mine.
I enclose herewith the following maps from the Bureau of Mines Report on Project #328 by Mr. John H. Soule' of the Bureau of Mines at Tucson, Arizona.

Fig 2- Topographic Map and Drill Sites.
Fig 3- Mine Workings and Samples
Fig 4- Sections of proposed holes.

I do not see how the layout of Diamond Drill Holes as proposed in Project #328 could be improved and we therefore expect to follow this program.

#4 (c) Continued

I enclose copy of my report dated Nov 6th, 1939 to Panaminas, Inc.
Please return this copy.

#4 (d)

There is a good dirt road for 14 miles from Highway #70 just East of Geronimo to within 5 miles of the property, the balance of the road is up a wash for approximately 4 miles and then one mile of hilly road with steep grades.
The later part of the road is easily passable with a jeep but will be repaired by the applicant before this contract could be in effect.
There is a railroad station and shipping point at Fort Thomas on the Bowie-Globe branch of the Southern Pacific R. R. There is also a flag stop at Geronimo.
Safford, County Seat of Graham County, is 27 miles Southeast of Geronimo on Highway #70.

#4 (e)

The Contractor will supply equipment, labor and supplies. The Contractor will supply water. There are two wells on the property but due to the dry season they probably will not make sufficient water in which case the contractor will haul water from a nearby ranch.

#5 (b)

The plan is to follow the program laid out by the Bureau of Mines to drill ten holes with a total of 3000 feet. Two holes at different vertical angles from each of five sites. Please refer to attached maps by the Bureau of Mines, mentioned in #4 (c) for details.

#5 (c)

The contractor has all necessary equipment in Tucson and needs only to load and transport equipment to the property.

#5 (d)

The background of the applicant is as follows;
Stevens Institute of Technology 3 years, and 43 years experience,
Ray Consolidated Copper Co 2½ years, surveyor, sampler and shift Boss.
New Jersey Zinc Co., Franklin Furnace. Surveying.
New York Zinc Co., Edwards, N. Y. 3 years chief engineer and 3 years mine supt
New Jersey Zinc Co. Austinville, Va. Mill construction
Illinois Zinc Co. Edwards, N. Y. and (Peru Mining Co) Hanover, N. M. Exploration, leasing properties and drilling. Later mine supt.
Ventures, Ltd and various subsidiaries of same. 1937 to date.
Mine foreman and Mine supt in Venezuela, Manager at Valzinco in Virginia, exploration in British Guiana, Cuba, Costa Rica, Nicaragua, Honduras, Mexico, United States and a few times in Canada.

Contractors are Reynolds and Vaught of Tucson, Arizona.
Drilled for the Pima Copper Co near Tucson, Anaconda Copper Co near Prescott, Arizona and for others. They are recommended by Victor H. Verity, lawyer and mining engineer of Tucson.

Addition to Form RF-103 Sheet #3

#6 (a)

Estimate of costs. All work by contract.

3000 feet of diamond drilling at $6.50 per foot	$19,500.00
Possible casing at $1.00 per foot-1500 ft	1,500.00
Assaying	100.00
Contingencies 2%	400.00
Total	$21,500.00

#6 (b)

The contractors bid is as follows;

1. Drilling to be done size EK to maximum depth of 500 ft.
2. All drilling done from surface.
3. Cementing if necessary done at expense of contractor
4. Water for drilling to be furnished by contractor.
5. Price per foot to include moving drill to property and from drill site to drill site.
6. Sludge samples to be taken by contractor every 5 feet if so requested.
7. Core boxes to be furnished by contractor.
8. If casing of any drill hole is required, this will be done at an additional cost of one dollar per foot.
9. Price per foot for drilling would be six dollars and fifty cents on a contract for a minimum of 1500 feet of drilling.

Any engineering or geological consultants called in by the applicant will be for the account of the applicant.

#6 (c) Furnished by contractor

#6 (d) Furnished by contractor

#6 (e) None

#6(f) None

#6 (g) None

#6 (h) As above in #6 (a).

#7 (a) Yes

#7 (b) By cash from account in the Chemical Bank & Trust Co., Park Ave at 41st Street, New York, N. Y.

LEASE AND PURCHASE AGREEMENT

THIS AGREEMENT MADE and entered into this [illegible] day of April, 1953, by and between Walter L. Lombardi, of Tombstone, Arizona, and F. D. Mayhugh, of Tucson, Arizona, the Parties of the First Part, hereinafter called the "Lessors" and/or the "Sellers", and Daniel M. Stranahan of Room 1641, 230 Park Avenue, New York, N. Y., hereinafter called the "Lessee" and/or the "Buyer".

WITNESSETH:

That for and in consideration of the mutual covenants and agreements herein contained, the parties hereto have agreed and by these presents do agree as follows:

The Lessors lease to the said Lessee the following described property known as the Blue Bird Mines, situated in the Turnbull Mining District, in Graham County in the State of Arizona in Township 5, Range 21 East of G. & S.R.B. & M., location notices of which are duly recorded in the Record of Mines in the Office of the County Recorder of said Graham County, Arizona, in Safford, Arizona, to all of which respective books of records of mines and pages thereof reference is hereby made for a more particular description of each of said mining claims:

Name of Claim	Book	Page
Blue Bird No.1	31	453
Blue Bird No.2	"	454
Blue Bird No.3	"	455
Blue Bird No.4	"	456
Blue Bird No.5	"	457

NOW THEREFORE, it is mutually agreed between the parties hereto as follows:

1. For and in consideration of sampling and of reporting the results of such sampling to the Lessors, and for performing the annual assessment requirements, and for other good and valuable considerations, the Lessee is to have immediate possession of the aforesaid claims, to discover, mine, remove,

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was made by us from an original subject.

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By Tony Garcia

mill or ship ore, or in any other way to perform upon said claims as provided in the following provisions hereto:

2. The Lessee is hereby granted a five (5) year lease to the said claims, with an extension of five (5) years if this contract is fulfilled, and with an option to purchase said claims at any time during said agreement at a total purchase price of One Hundred and Fifty Thousand Dollars ($150,000.00). The Lessee and Lessors hereto agree that in the event such purchase option is exercised the Lessors will immediately convey to the Lessee said mining claims by good and sufficient deed, and it is agreed that all payments made, whether as minimum monthly or royalty payments, shall apply on said purchase price of One Hundred and Fifty Thousand Dollars ($150,000.00).

3. The Lessee promises and agrees that ten (10) per cent of the net smelter returns will be paid as royalties from all products sold at the smelter or reduction point and shall be paid through the Miners and Merchants Bank, Bisbee, Arizona, or any other bank designated by the Lessors.

4. The Lessee agrees to keep accurate books of account of his operations hereunder and of the tonnages of all ores mined, milled or shipped as crude ores from said claims under this agreement, and the Lessee agrees to permit an inspection of such books of account by the Lessors or by anyone designated by them at all reasonable times and places. The Lessee further agrees that all work done hereunder shall be performed in a good and minerlike manner with a view of preservation of the premises as a workable mine, unless prevented from so doing by strikes, labor troubles, accidents, breakdowns or other causes beyond the reasonable control of the Lessee.

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5. The Lessors shall place upon the claims at a conspicious place a notice of non-liability of the Lessors for any labor or other liens that may be filed against the Lessee at any time during the term of this Lease and Purchase Agreement.

6. The Lessee hereby agrees to do and perform upon said unpatented mining claims the annual labor and improvements required by law of the United States and the State of Arizona to keep and maintain said claims in good standing as unpatented lode Mining Claims, and such work shall be done, and the annual affidavits of work done shall be filed at the Office of the County Recorder, Safford, Arizona, on or before the 1st of April of each year.

7. The Lessee hereby agrees to do and perform upon said unpatented mining claims the annual labor and improvements required for the assessment year of 1953 on or before the 1st of June, 1953.

8. After the 1st day of October, 1953, the Lessee agrees to do and perform upon or for the benefit of said mining premises a minimum of one hundred (100) shifts of labor during each calendar month for the lifetime of this agreement.

9. The Lessee shall comply with the provisions of the Workmen's Compensation Act of the State of Arizona and Federal Regulations pertaining to Mining Operations, and shall make all payments, returns and reports required by such acts, and shall at all times protect and save harmless said premises and the Lessors of and from any and all claims, actions, suits, liabilities for damages or compensation for any matter or thing arising out of their work and operations conducted in or upon said premises.

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was made by us from an original subject.

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10. The Lessee shall promptly pay for all labour, services and materials, done, performed, or furnished to or for said premises or for the work done thereon.

11. It is mutually agreed between the parties hereto that any and all machinery, equipment and implements placed upon the premises during the life of this agreement, shall be and remain the property of the Lessee and that in case of termination of this agreement for any cause, the Lessee may, within ninety (90) days thereafter, remove the same, but this shall not apply to any timbers in place beneath the surface.

12. If the Lessee shall at any time be in default in the performance of any of the terms and conditions hereof upon him made incumbent, such default shall not operate or give the Lessors the right to cancel, forfeit or terminate this agreement, unless the Lessors shall notify the Lessee by letter addressed to the Lessee at Room 1641, 230 Park Avenue, New York, N. Y., and such notice of such default shall specify the nature of the default, and the Lessee shall have thirty (30) days thereafter to cure such default, and if such is not done within that period, this agreement shall terminate automatically and all payments paid to the Lessors shall remain their property as liquidated damages and not as a penalty. A repetition or recurrence of such default will cause forfeiture immediately thereupon.

13. The Lessee may terminate this agreement at any time upon thirty(30) days' written notice delivered in person or mailed to the Lessors at Tombstone, Cochise County, Arizona.

14. It is further mutually covenanted and agreed that the Lessee may not sublease or assign any or all his interest in said claims or in this lease and purchase agreement without

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the written consent of the Lessors, except that the Lessee without such written consent may at any time assign this lease and purchase agreement and all his interest therein to Quebec Metallurgical Industries Ltd., a corporation organized under the laws of Canada with head office at 66 Lauder Street, Ottawa, Ontario, Canada, or to a company associated with the said Quebec Metallurgical Industries Ltd. Upon assignment, the assignee shall assume all the obligations of the Lessee hereunder, including any obligation to make payments as herein provided for, and the Lessee shall thereby be relieved completely and forever of the said obligations and payments.

15. This agreement and all the provisions thereof shall be binding upon the heirs, administrators, assigns and representatives of the parties hereto forever.

16. ACT OF GOD. The requirements of this agreement hereinbefore set forth shall be subject to such reasonable interruptions as may arise from fire, flood, strikes, acts of God, riot, invasions, war, or from acts, laws or decrees made, done or enacted by the State of Arizona, or by the United States of America, or by military authorities.

IN WITNESS WHEREOF the parties hereto have hereunder set their hands and seals the day and year first above written.

SIGNED, SEALED AND DELIVERED)
in the presence of)

State of Virginia
County of Madison
Dated April 23, 1953
William E. Randolph
Notary Public
My Commission Expires April 23, 1956

Walter L. Lombardi
Walter L. Lombardi

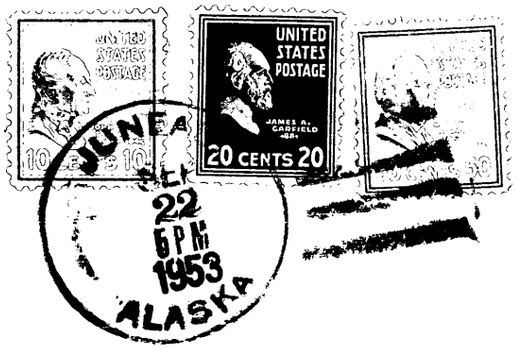
F. D. Mayhugh
F. D. Mayhugh
LESSORS

Daniel H. Stranahan
Daniel H. Stranahan
LESSEE

We hereby certify that this negative photostat was made by us from an original subject.

TUCSON BLUE PRINT CO.

By Tony Lorenzo



VIA AIR MAIL

Operating Committee
Defense Minerals Exploration Administration
Interior Building
Washington 25, D. C.

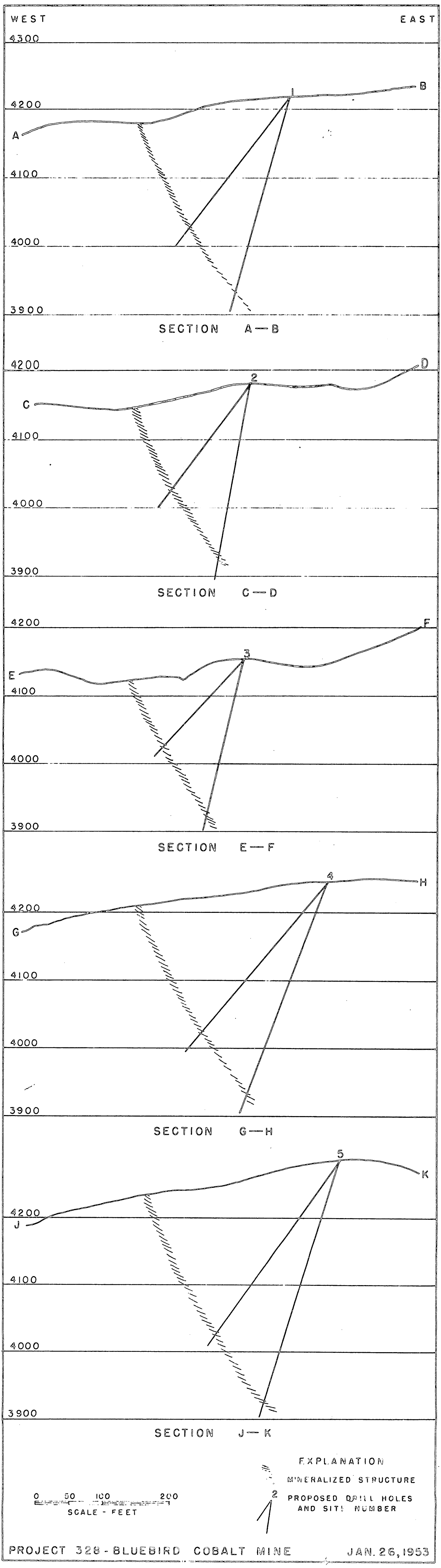


FIGURE 4. - SECTIONS OF PROPOSED HOLES

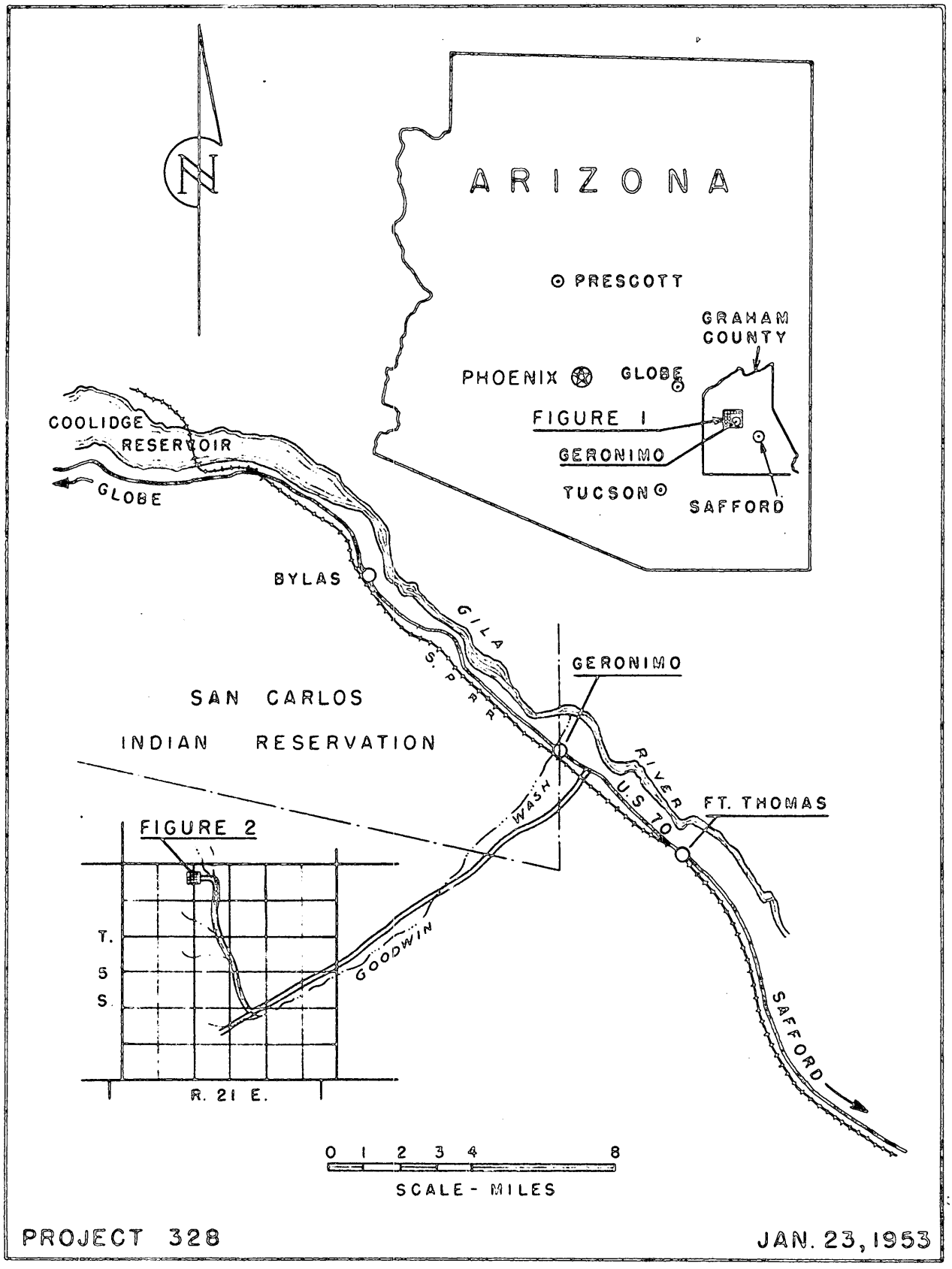


FIGURE 1. - LOCATION MAP, BLUEBIRD COBALT MINE
GRAHAM COUNTY, ARIZONA

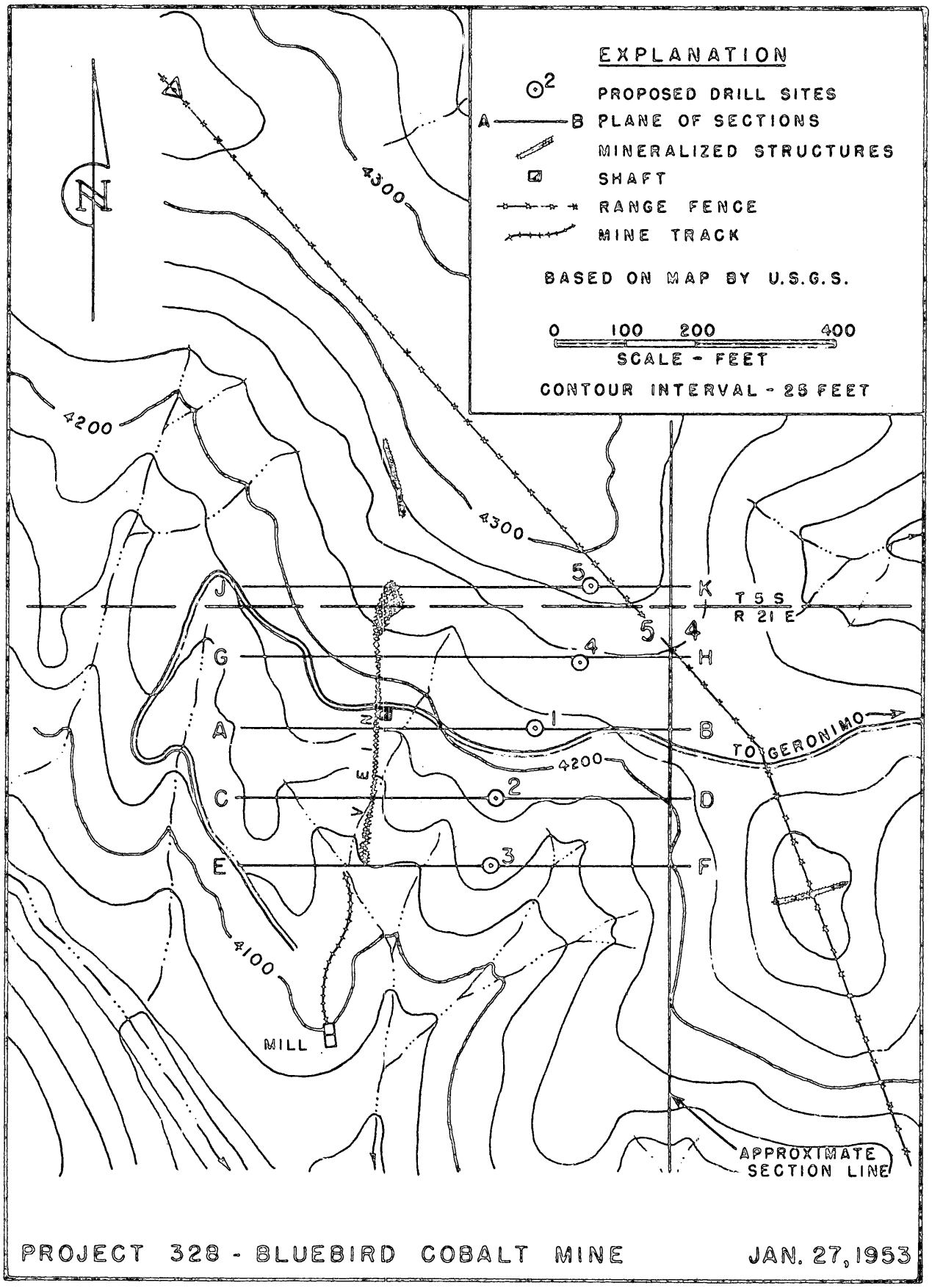
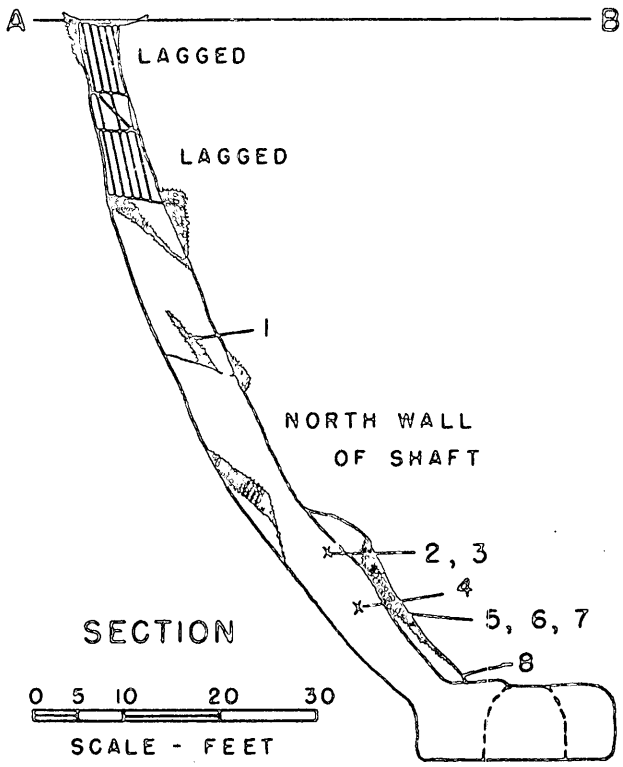
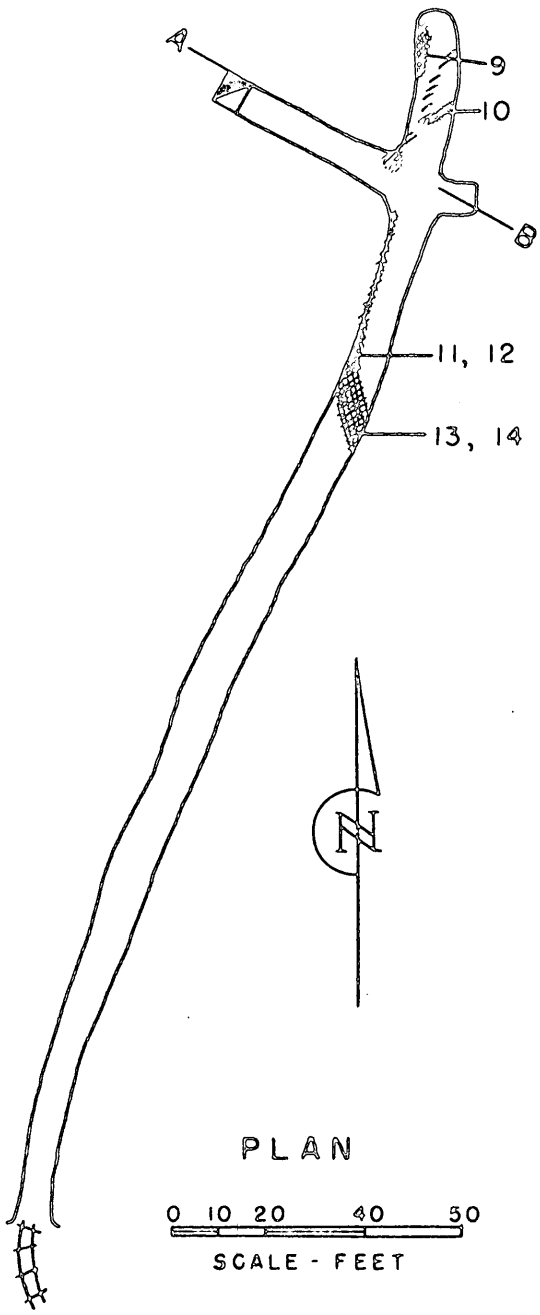


FIGURE 2. - TOPOGRAPHIC MAP AND DRILL SITES





SAMPLES

☆ BY BUREAU OF MINES

OTHERS BY GEOLOGICAL SURVEY

SAMPLE	LENGTH	Cu %	Co %	WO_3
1	3 in.	0.02	10.67	
2	36 in.	0.08	0.01	
☆ 3	24 in.	0.25	0.28	-0.01
4	3 in.	0.39	0.02	
5	60 in.	Tr.	0.01	
6	36 in.	0.10	2.02	
7	11 in.	0.18	1.67	
8	10 in.	Tr.	1.01	
9		0.42	0.04	
10	24 in.	0.05	0.02	
11	20 in.	0.56	0.10	
☆12	18 in.	0.70	0.15	2.08
13	25 in.	0.64	0.03	
☆14	20 in.	1.85	0.08	0.13
☆ORE BIN GRAB		0.09	0.22	-0.01
☆CONCENTRATES(?)		0.38	7.00	-0.01

FROM MAP BY U. S. G. S.

PROJECT 328 - BLUEBIRD COBALT MINE JAN. 26, 1953

FIGURE 3. - MINE WORKINGS AND SAMPLES

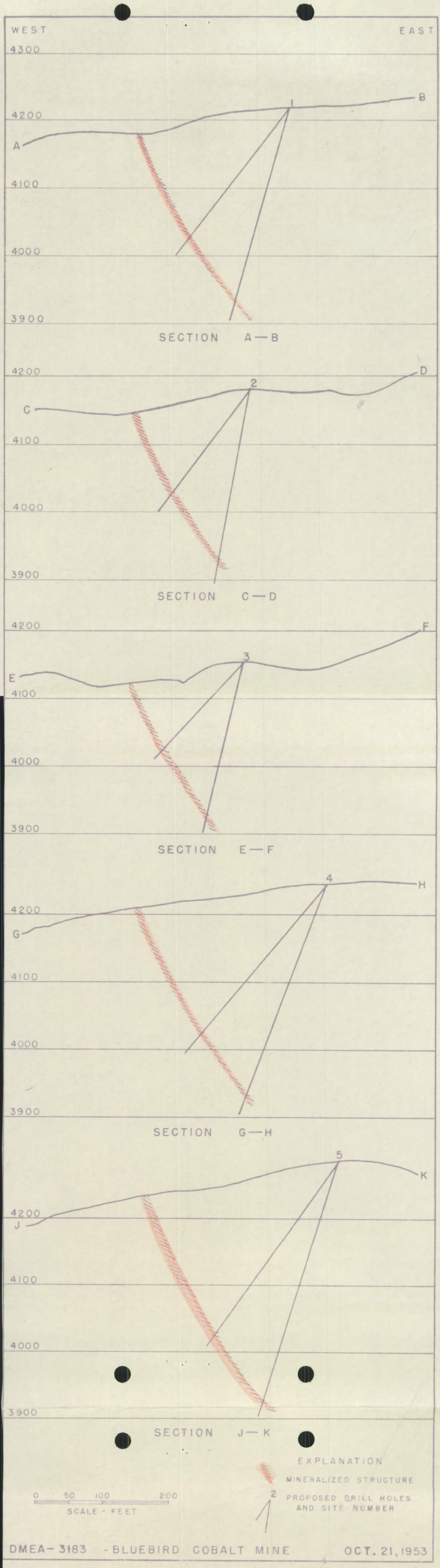
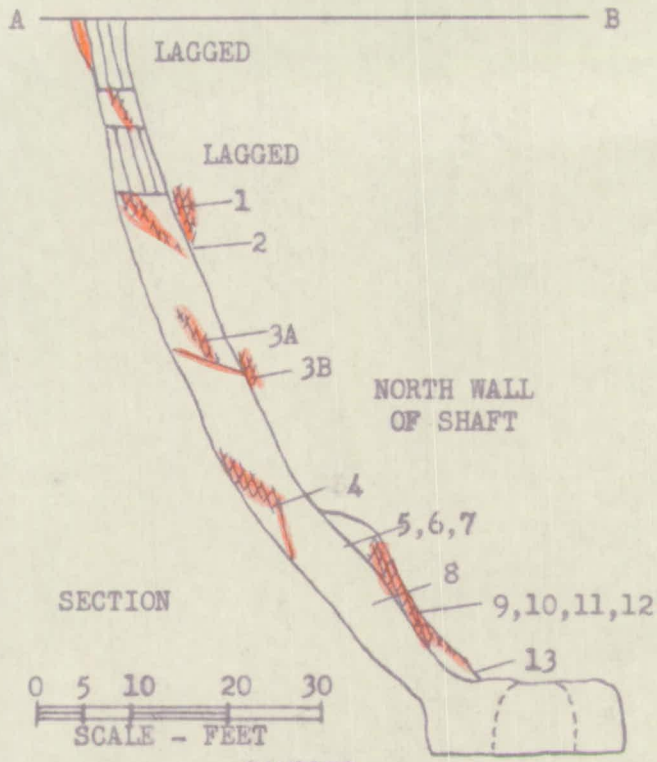
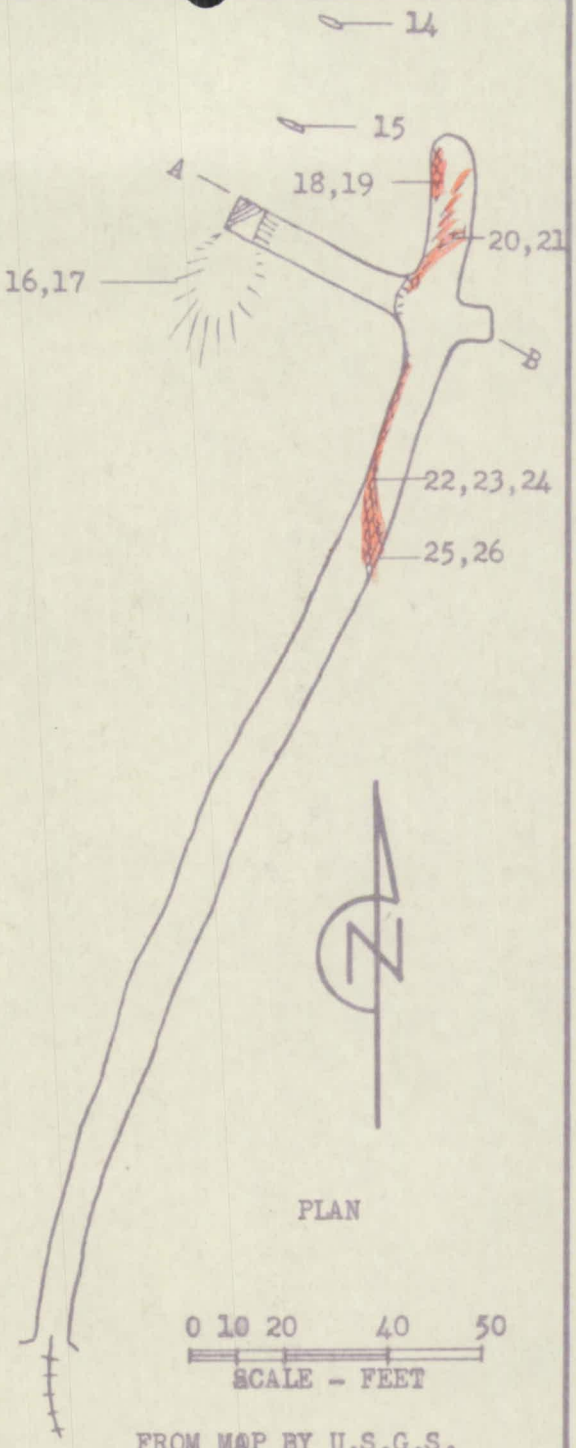


FIGURE 5 - SECTIONS OF PROPOSED HOLES





SAMPLES

NO	LENGTH	Cu%	Co%	WO_3%	SAMPLER
1	24 in		0.30		DMS
2	6 in		0.25		DMS
3A	3 in	0.02	10.67		USGS
3B	20 in		0.95		DMS
4	41 in		1.97		DMS
5	24 in		0.49		DMS
6	36 in	0.08	0.01		USGS
7	24 in	0.25	0.28	-0.01	USBM
8	3 in	0.39	0.02		USGS
9	18 in		7.37		DMS
10	60 in	Tr	0.01		USGS
11	36 in	0.10	2.02		USGS
12	11 in	0.18	1.67		USGS
13	10 in	Tr	0.01		USGS
14	12 in		0.06		DMS
15	12 in		0.71		DMS
16	DUMP		0.50		DMS
17	DUMP HG		2.25		DMS
18	6 in		0.07		DMS
19	?	0.42	0.42		USGS
20	24 in	0.05	0.02		USGS
21	12 in		0.55		DMS
22	12 in		0.15		DMS
23	20 in	0.56	0.10		USGS
24	18 in	0.70	0.15	2.08	USBM
25	25 in	0.64	0.03		USGS
26	20 in	1.85	0.08	0.13	USBM

FROM MAP BY U.S.G.S.

USGS - U. S. GEOLOGICAL SURVEY
USBM - U. S. BUREAU OF MINES
DMS - D. M. STRANAHAN

BLUEBIRD COBALT PROSPECT
DMEA 3183 OCTOBER 21, 1953

FIGURE 4. - MINE WORKINGS AND SAMPLES

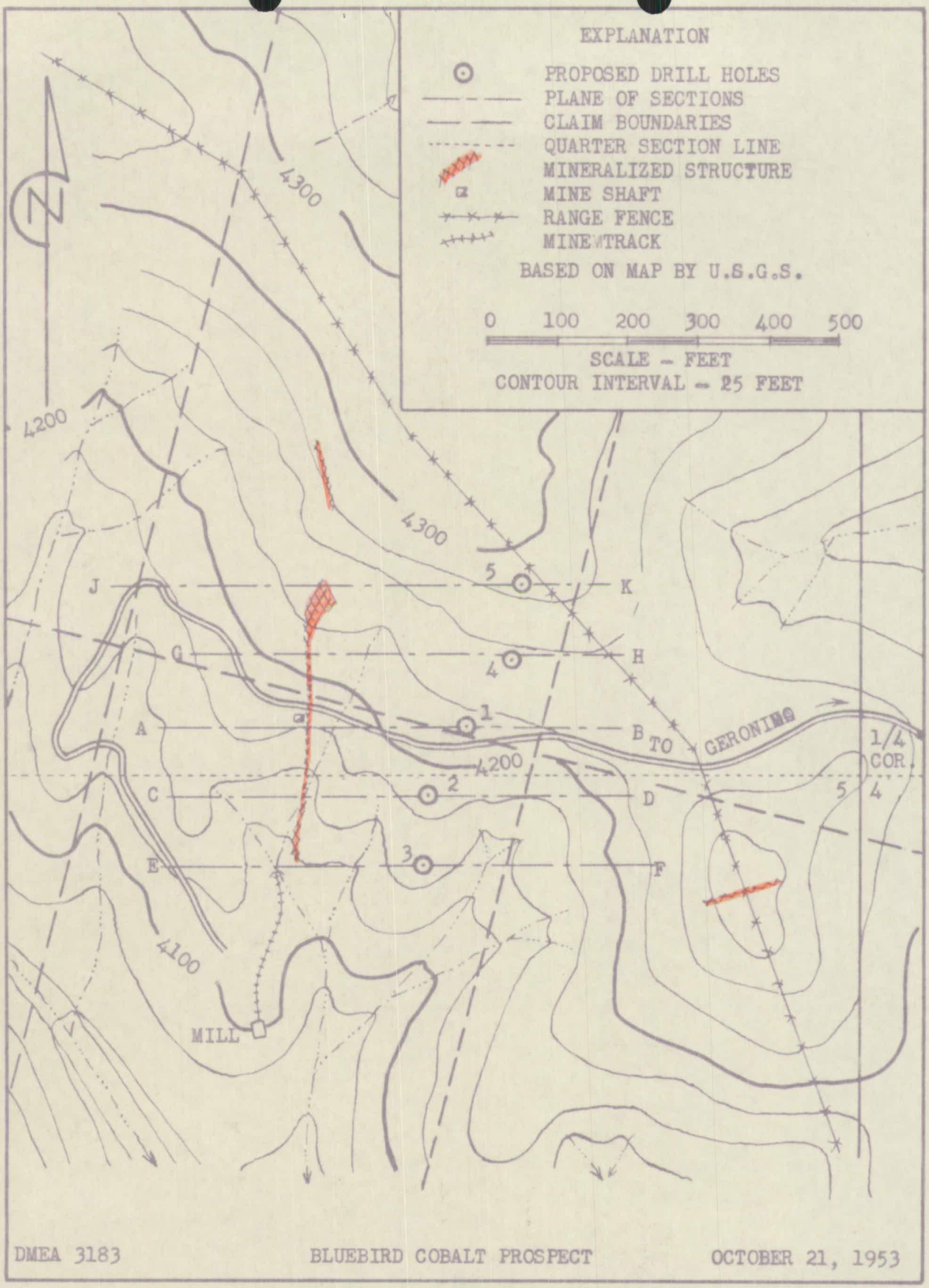
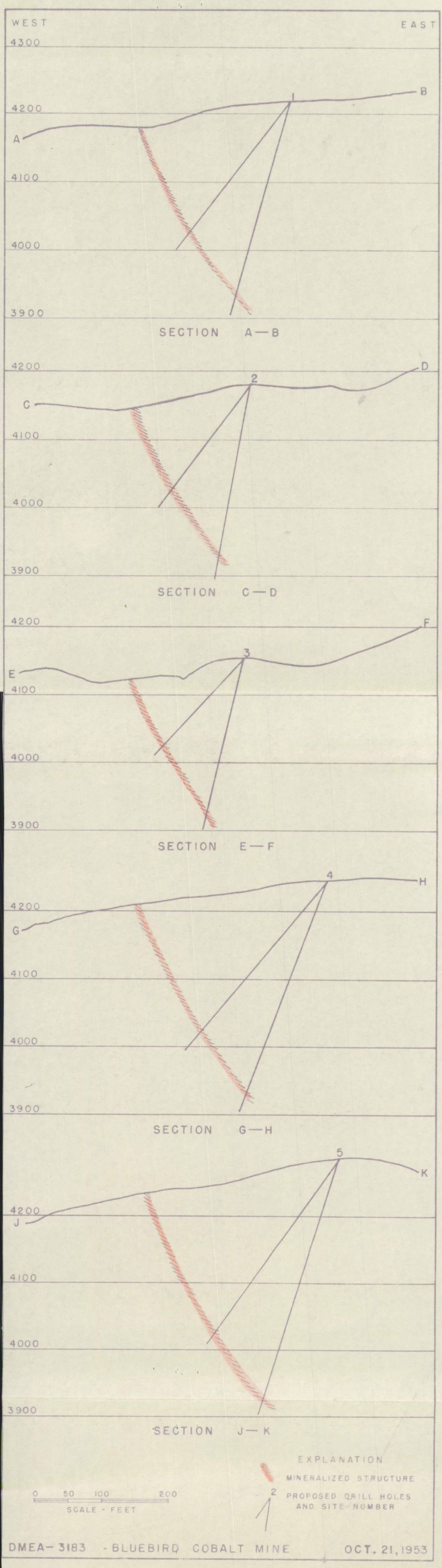


FIGURE 2. TOPOGRAPHIC MAP



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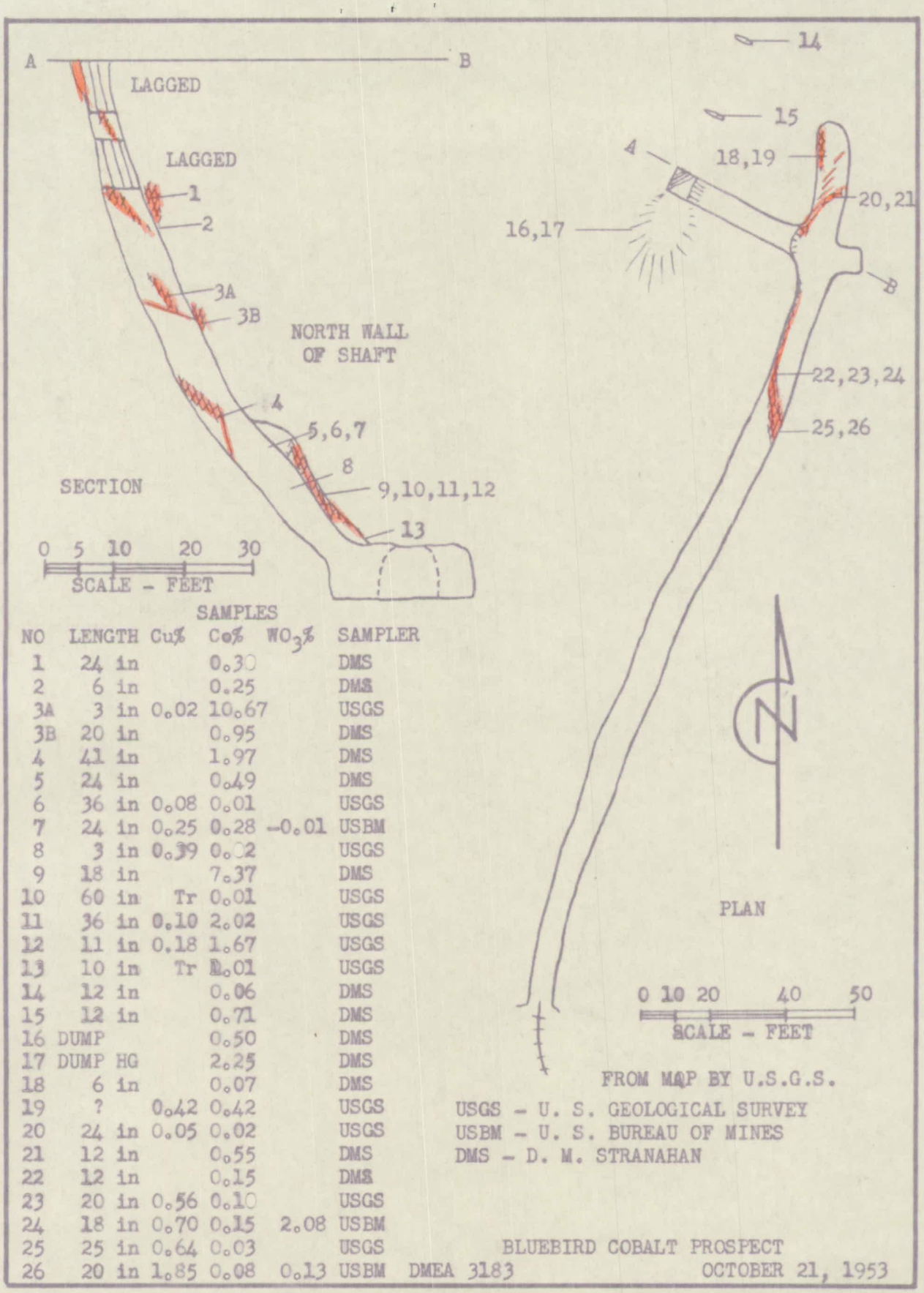

SAMPLES

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12	11 in	0.18	1.67		USGS
13	10 in	Tr	0.01		USGS
14	12 in		0.06		DMS
15	12 in		0.71		DMS
16	DUMP		0.50		DMS
17	DUMP HG		2.25		DMS
18	6 in		0.07		DMS
19	?	0.42	0.42		USGS
20	24 in	0.05	0.02		USGS
21	12 in		0.55		DMS
22	12 in		0.15		DMS
23	20 in	0.56	0.10		USGS
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25	25 in	0.64	0.03		USGS
26	20 in	1.85	0.08	0.13	USBM

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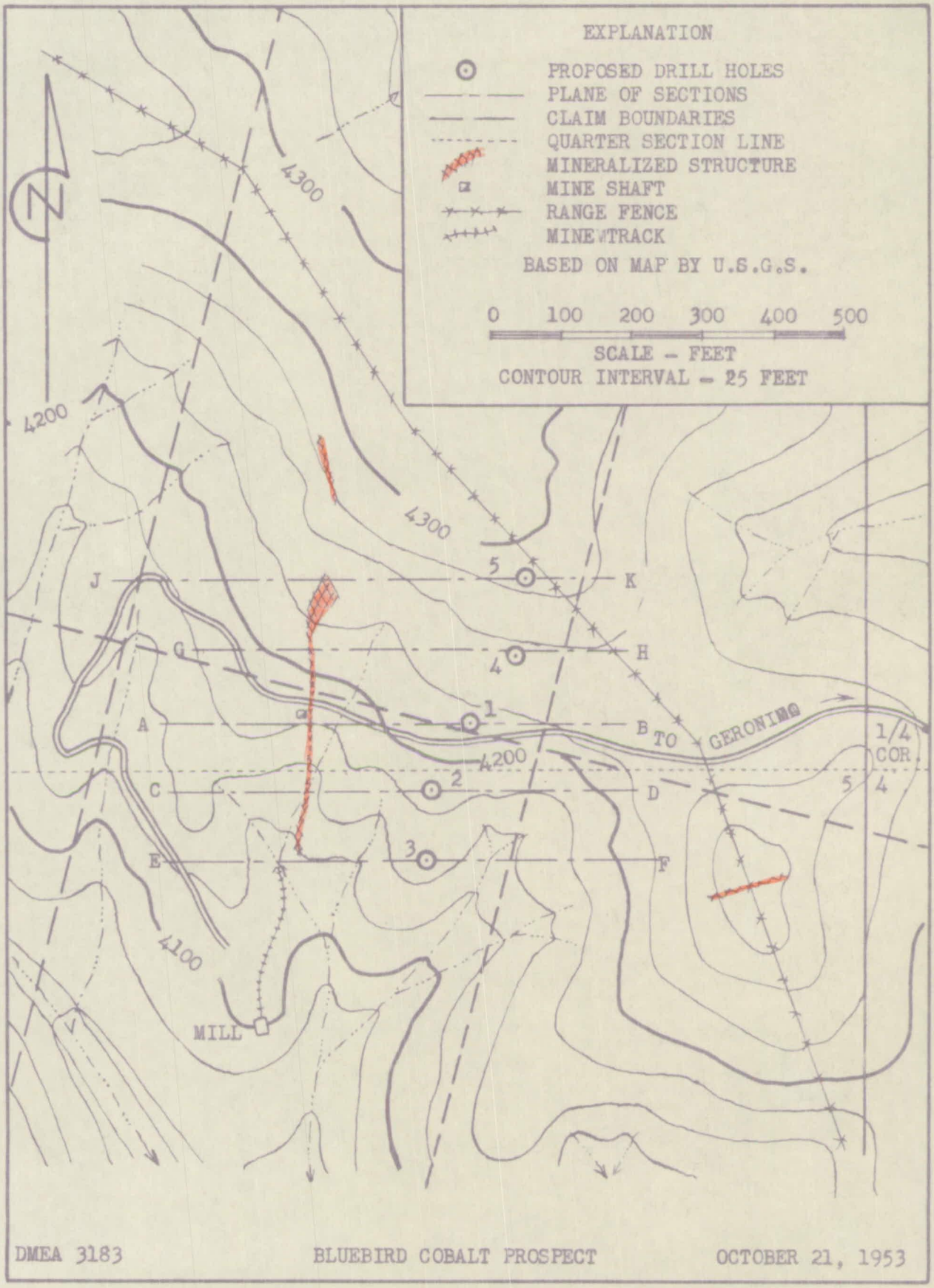

FIGURE 2. TOPOGRAPHIC MAP