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U.S. v. ASARCO

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Repository Location SPOKANE, WASHINGTON

File Bates Number: USGSPO 0000764

File Owner: N. EADES

File Location: DOI - SOL, WASH DC

Document Date: 11/28/58

Document Title: OPERATOR'S AMENDED FINAL REPORT Docket No. DMEA 3409

Document Author: C. B. MERRITT

Original Document Attached: Y (N)

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ACC WP (CBI) DP (PI) Other

Reviewer: C PALUT

STATUTORY PRIVILEGE OF CONFIDENTIAL BUSINESS & PROPRIETARY INFO

MAIN OFFICE
1400 W. 52ND STREET
SEATTLE 7, WASH.
Sunset 3717

O. BARDAHL, *President*
C. B. MERRITT, *Secy.-Treas.*

Directors
PAUL W. PETRICK SAM A. WRIGHT
OSCAR M. PETERSON PIATT H. HULL

SUNSET MINES, *Inc.*

Producers of

ZINC • LEAD • SILVER • GOLD

MINE AND MILL OFFICE
P. O. BOX 869, KELLOGG, IDAHO
Phone 8-2542

DAVID HARVEY, *Vice-President*
R. E. LOMAS, *Superintendent*
G. E. DAHLSTROM, *Office Manager*

November 28, 1958

Mr. Wing G. Agnew, Acting Executive Officer
United States Department of the Interior
Defense Minerals Exploration Administration
DMEA Region 1
So. 157 Howard Street
Spokane 4, Washington

Dear Mr. Agnew:

You will find stated below, the information which you requested in your letter of August 6th, 1958:

OPERATOR'S AMENDED FINAL REPORT

1. DMEA Docket No. 3409 (lead-zinc)
   Contract No. Idm-E738

   Operator: Sunset Mines, Inc.
   % C.B. Merritt, Secretary
   1400 West 52nd Street
   Seattle 7, Washington

   Name and location of property: Liberal King Mine
   Yreka Mining District
   Shoshone County, Idaho

2. Summary of Project:

Date of the contract was November 22, 1954 and termination date, June 25, 1958, effective July 1, 1957.

The contract work was started early in June 1955 and work was stopped in November 1957 before completion of the contract.

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U. S. G. S.
SPOKANE, WASH.

Stagall	Cost
Rehabilitation of 265 ft. of tunnel	$ 927.50
Diamond drill station	375.00
2 diamond drill hole surveys	160.00
4 assays @ $3.50 each	14.00
2,792 feet of diamond drilling	12,000.00
ALLOWABLE FOR COMPRESSED air for 2,792 feet of diamond drilling	1,[illegible]
Total	$ 14,[illegible]

Stage II	Cost
Rehabilitating approximately 500 Ft. crosscut	$ 313.50
Excavate diamond drill station	300.00
Total	$ 613.50
Total - Stages I and II	15,585.00
Government participation @ 50 percent	7,792.50
Payment acknowledged in the amount of	7,229.50 ✓
Due Sunset Mines, Inc.	563.00 ✓
Operator repaid the Government in royalties on production	$ 847.50

3. Geology:

The geology of the Sunset Mine is similar to the geology of other mines in the Pine Creek District. The rocks are mostly light to dark colored quartzites mixed with black shales and slates in the Pritchard formation.

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DEC [illegible]

The Sunset vein is a fissure vein in the quartzites and slates and does not outcrop on the surface. It was found on the 1000 level while working the Liberal King vein on that level. It strikes about N.45°W. and dips about 40-60 degrees to the southwest. Commercial ore of lead and zinc was found in the Sunset vein on the 800 level for a distance of about 800 feet. Some of the ore widths were 12 feet thick but the ore body is now mined out.

Three diamond drill holes drilled to the eastward from the main level for a total depth of 2,795 feet failed to encounter the Sunset vein above the 600 level. Therefore it is believed the vein either died out or flattened greatly above the 600 level.

The Sunset vein has produced about 257,000 tons of ore since 1944 but the known ore reserves of the mine are now practically depleted.

4. Conclusions:

A district-wide labor strike interrupted work between July 1955 and February 1956.

Rehabilitation of the east end of the main adit and three diamond drill holes were completed by August 1956 under State 1.

Rehabilitation of approximately 500 feet of crosscut and excavation of a diamond drill station were completed under State 11.

The project work was recessed between August 1956 and April 1957 and again in July 1957.

Finally, in November 1957, because of lack of funds and low metal prices the mine was shut down.

Yours very truly,

SUNSET MINES, INC.

C. B. Merritt

C. B. Merritt
Secretary

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Repository Name USGS

Repository Location SPOKANE, WASHINGTON

File Bates Number: USGSP00000764

File Owner: N. EADES

File Location: DOI - SOL, WASH DC

Document Date: 9/15/54

Document Title: FIELD EXAMINATION DOCKET NO. DMEA-3409 SUNSET MINES

Document Author:

Original Document Attached: Y (N)

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Type of Privilege:

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Reviewer:

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Docket

UNITED STATES
DEPARTMENT OF THE INTERIOR
Defense Minerals Exploration Administration
So. 157 Howard Street
Spokane 4, Washington

September 15, 1954

MEMORANDUM

To: DMEA Field Team, Region II

From: Verne C. Fryklund, Jr., Geologist, U. S. Geological Survey

Subject: Docket No. DMEA-3409 (lead-zinc), Field Examination, Sunset Mines, Inc., Shoshone County, Idaho

INTRODUCTION

The Sunset Mines, Inc., has existed since November 1953 when it acquired the assets of Sunset Minerals, Inc. Sunset Minerals, Inc., operated Contract Idm-E102, Docket No. DMEA-1489 (lead-zinc). Contract Idm-E102 was originally set up to explore the Liberal King vein at the Sunset mine; the contract was revised by amendment on December 26, 1952, and remaining contract funds were expended on a short drift on the Sunset vein, the only productive vein in the mine. Justification for this change in objective was presented in a memorandum by Verne C. Fryklund, Jr., Geological Survey, submitted November 12, 1952. The November 12, 1952, memorandum is pertinent to the present request.

SUMMARY AND RECOMMENDATIONS

Sunset Mines, Inc., desires to explore the up-dip portion of the Sunset vein. The Sunset vein was discovered on the 1000 level of the mine and a single ore body was mined from just above the 1300 level to above the 800 level. Vertical elevation to the surface from the 800 level is slightly more than 2,000 feet; along the vein, the distance may be almost 2,500 feet. The strike length of the Sunset vein is not known as it has not been traced on the surface. The project, as proposed by the operator, would explore the Sunset vein on a strike length of 1,700 feet on the Tunnel level by drifting and raising and below the Tunnel level by diamond drilling. The proposed work is to be as follows:

1. Rehabilitate 310 feet of crosscut.

2. Drive approximately 800 feet of crosscut to the Sunset vein (or whatever footage needed to reach the vein).

3. From the crosscut drive 1,700 feet of drift on two headings.

4. Four hundred feet of raising on the vein.

5. Two thousand feet of diamond drilling to explore the vein below the Tunnel level.

My recommendations are:

Stage I

A. On 800 level:

1. Crosscut 75 feet, from vertical raise 30 feet NW of Station 2086.

2. Drill one vertical and two angle EX diamond drill holes, totaling 550 feet, from the end of the crosscut.

B. On Main level:

1. From the westernmost crosscut drill two inclined holes to cut the Sunset vein. Holes to be AX size; attitudes to be determined by prior consultation with the Government. (Such drilling should stop when the first encouraging-looking mineralized rock is intersected and the remaining footage used in Stage II.)

Stage II - To be dependent upon encouraging results of diamond drilling from Main level, as determined by the Field Team.

A. Crosscut to, and drift on, the Sunset vein a total of 2,000 feet.

B. Raise 400 feet at locations to be determined by the Field Team.

C. If diamond drilling footage remains from Stage I, it will be used for exploration below Main level.

I further suggest a Stage III.

A. 2,000 feet of diamond drilling, AX size, northward from the Main level Sunset vein drift in search of possible parallel veins in the Yreka shear zone.

LOCATION AND ACCESSIBILITY

The portal of the mine of Sunset Mines, Inc., is on the east bank of Pine Creek about 3 miles south of Pinehurst, Idaho (Kellogg is about 8 miles distant by highway), in sec. 20, T. 48 N., R. 2 E. The road to the mine is black topped. The altitude of the portal is about 2,525 feet, about 200 feet above Pine Creek; the crest of Amy Peak, which lies almost directly over the mine area, has an altitude of 4,371 feet.

CLAIMS TO BE EXPLORED

The applicant desires to include the Robert Burns and Tam o'Shanter claims--drifting will be in these claims--and the Arkansas, Kansas, Bee, and Baldy claims that lie to the north. The main level crosscut and the 800 level crosscutting and diamond drilling will, however, be in the Liberal King claim.

GEOLOGY

Regional Geology

The country rock of the Coeur d'Alene district consists of slightly metamorphosed sediments of the pre-Cambrian Belt series that have been folded, faulted, and intruded by granitic stocks and dikes of various types. The Belt series in this area has been subdivided into six formations. The mine of Sunset Mines, Inc., is in the Prichard formation, oldest of the six.

In the general vicinity of this mine all the mines are in the Prichard formation. Except for the Douglas and Constitution mines, all operating properties in the area are on the Yreka shear zone which strikes N. 65° W. and is about 2,000 to 2,500 feet wide (it seems possible that the Douglas and Constitution mines may also be on an off-set segment of the Yreka shear zone).

Local Geology

The surface geology of the mine area is presented on the Smelterville and vicinity quadrangle, at a scale of 1:24,000, placed on open file in 1953. At the surface beds strike northwesterly and dip 35 to 65 degrees northeast. The Lower Prichard quartzite beds

indicate crossfolding, with axes steeply plunging northeast, at right angles to the general regional strike. Underground, strikes are more variable and many beds are overturned dipping to the south. It is probable that overturned beds have been dragged by movement along the Sunset structure.

The Liberal King and Sunset veins are the only major structures known in the mine. The Liberal King vein strikes N. 75° W. and dips about 75° S. It crops out. The Sunset vein strikes approximately N. 45° W. and dips from 5° to 50° S. The Liberal King vein is a replacement vein, along a zone of shearing, composed mainly of white quartz. At some exposures the vein is 10 feet wide. In addition to quartz, minor amounts of chalcopyrite, galena, and sphalerite are present. The mineralogy is distinctly different from productive veins in the Pine Creek area. These productive veins contain minor amounts of dark, glassy quartz and are characterized by sulfide gangue, either pyrite or pyrrhotite.

Sections (see operator's map) show that the Liberal King vein should have intersected the Sunset vein in the east end of the 1200 level stopes. This intersection was not recognized by the company (stopes are now inaccessible). There is, therefore, no way of determining the relative ages of the two veins.

As noted by Mr. Lomas, present general manager, to date there are 3,640 feet of drift and crosscuts and 800 feet of raises on the Liberal King structure. There has been no production from the Liberal King vein.

The Sunset vein was accidentally discovered (probably in 1944) during the search for the Liberal King vein on the 1000 level. Ore in the amount of 237,396 tons has been removed from the single ore shoot. From this ore 313,931 pounds of copper, 13,356,875 pounds of lead, and 26,039,433 pounds of zinc have been recovered to the end of 1953 (Bureau of Mines statistics).

The dip of the Sunset vein (5 to 50 degrees) is the flattest of any of the major productive veins of the Coeur d'Alene district. The vein was formed by replacement along what is considered to be a reverse fault. Ore widths reached 12 feet in the ore shoot with at least 5 feet of shearing in the hanging wall.

The vein minerals are pyrite, arsenopyrite, carbonate, pyrrhotite, sphalerite, quartz, tetrahedrite, chalcopyrite, and galena.

The factors controlling the formation of the single ore shoot have been the subject of casual discussion among the geologists of the district. One school of thought believes that the white

quartzite bands overlying the stope area are of considerable significance. As the white quartzite bands have the same physical properties, except for color, as much of the remainder of the country rock, I fail to see what its influence may have been. There is, however, no question but that the greatest ore widths are on the flattest portions of the vein; in fact, the ore shoot is a textbook example of the way ore shoots are formed along the flat portions of reverse faults. The maximum pitch length in the ore shoot was 700 feet; the maximum stope length about 500 feet. Except for pillars, the ore shoot is mined out.

The DMEA extension of the 800 level west drift (Contract Idm-E102) demonstrated the continuity of the vein and of ore mineralization to the end of the drift, but no ore body was discovered. The dip of the vein here is steepening, and this has been characteristic of the nonproductive parts of the vein.

Exploration Possibilities

For reasons already stated, knowledge of the Sunset vein is confined largely to the relatively small ore shoot area. The structure is strong and the strike length is undoubtedly great. This, coupled with the fact that there is probably an up-dip extension of 2,000 feet or more on the vein, makes the Sunset vein a very attractive target for future exploration.

While it is not at all certain that the upper end of the ore shoot has been reached, there is no question that the bottom of the ore shoot has been reached. Future exploration in the mine must, of course, look for the upper end of the known ore shoot; however, the primary targets for future exploration should be possible new ore shoots east and west on the Sunset vein.

From the point of view of operating ease, drifting on the Sunset vein could be done most conveniently from the adit level. Such a drift would explore the vein over the known ore shoot, at a point 600 feet higher than where the vein has been seen last, in the process of extending long drifts along the vein in search of new ore shoots. I would say that a total of 4,000 feet of drifting on the Sunset vein would be reasonable.

This work still would leave the surface portion of the vein (perhaps 2,000 feet above the adit level) unexplored. Geochemical prospecting followed by bulldozing and drilling would be natural steps in such an exploration. If successful, the next stage would require a new shaft, and for practical purposes, a new mine.

In addition, parallel veins have produced ore in the Pine Creek area and future exploration of the mine should test the Yreka shear zone north of the Sunset mine by means of long diamond drill holes at least.

The above paragraphs indicate my own personal opinion of the way the Sunset vein deserves to be explored; however, the operator does not seem to have the funds necessary for such exploration. It would appear that the primary target, at this time, is the upward extension of the ore shoot.

It has been decided, in conference with the Bureau of Mines, and agreed to by the operator, to precede crosscutting and drifting by drilling four diamond drill holes (totaling 3,600 feet) below the adit level. Crosscutting and drifting is to be dependent upon encouraging vein intersections. I suggest that no more than one encouraging vein intersection be required before crosscutting is started.

In addition, it has also been decided to test the Sunset vein below the 800 level by 550 feet of EK drill hole from a 75-foot long crosscut south of the 800 level drift.

Distribution:
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Repository Name USGS

Repository Location SPOKANE, WASHINGTON

File Bates Number: USGSP0000764

File Owner: N. EADES

File Location: DOI - SOL, WASH DC

Document Date: 12/58

Document Title: FINAL REPORT CONTRACT Idm-E738 SUNSET MINES & MAPS

Document Author: J.D. BARDILL - R.D. SAMPLE A.E. WEISSENBORN

Original Document Attached: Y (N)

If not attached, Original Document Current Location
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Type of Privilege:

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DEPARTMENT OF THE INTERIOR

DEFENSE MINERALS EXPLORATION ADMINISTRATION

FIELD TEAM, REGION I

FINAL REPORT

Contract Idm-E738

John D. Bardill
Metallurgist
U. S. Bureau of Mines

A. E. Weissenborn
R. D. Sample
Geologists
U. S. Geological Survey

SUNSET MINES, INC.
P. O. Box 869
Kellogg, Idaho

Docket No.:	DMEA-3409
Commodity:	Lead-zinc
Contract date:	November 22, 1954
Termination date:	July 1, 1957

LIBERAL KING (SUNSET) MINE
Yreka Mining District
Shoshone County, Idaho

Spokane, Washington

December 1958

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FINAL REPORT

SUNSET MINES, INC.
Liberal King (Sunset) Mine
Yreka Mining District
Shoshone County, Idaho

Contract Idm-E738

* * * *

INTRODUCTION

This report describes an exploration project conducted jointly by the Sunset Mines, Inc., an Idaho corporation, and the Defense Minerals Exploration Administration in the Liberal King mine, Shoshone County, Idaho, from November 1954 to July 1957.

Exploration had been done unsuccessfully on the same property under Contract No. Idm-E102 (Docket No. DMEA-1489) by Sunset Minerals, Inc., a Washington corporation, from August 1951 to December 1953. The Sunset Mines, Inc. acquired all assets and assumed all liabilities of the Sunset Minerals, Inc. on November 1, 1953.

Summary

Under the previous DMEA contract (Idm-E102) the Liberal King vein had been explored by trenching and diamond drilling from the surface and by underground exploration from the Liberal King No. 2 adit level. Before the project was completed it became obvious that further exploration of the Liberal King vein would be fruitless and the remaining footage was transferred to the Sunset vein in the same mine. This exploration, which was done from the 800 level of the Sunset mine, found small lenses of ore grade rock but failed to discover a minable ore body. The results of this project are described in a final report by Erickson and Fryklund dated February 1955.

The exploration under the second DMEA contract (Idm-E738) was designed to explore the upper extension of the Sunset vein. The exploration was done from the No. 3 tunnel or main (100) Liberal King level about 500 feet vertically above the uppermost workings on the Sunset vein.

The contract was in two stages. Stage I provided for rehabilitating about 310 feet of the main tunnel, cutting a diamond drill station, and drilling three or more holes not to exceed an aggregate of 4,500 feet. Stage II provided for 500 feet of rehabilitation of the main tunnel east of the shaft, cutting another diamond drill station, and drilling an additional three or more holes totaling not more than 3,000 feet of drilling. Stage III provided for further exploration of the vein by crosscutting, raising and drifting.

Only 265 feet of rehabilitation and 2,792 feet of diamond drilling were completed under Stage I. The Sunset vein was never encountered or, if encountered, was not recognized. Rehabilitation of 500 feet of the main tunnel and excavation of a diamond drill station were completed under Stage II. Stage II drilling was never started because the mine closed, probably permanently, as a result of lack of funds, low metal prices, and exhaustion of known ore reserves.

A total of $15,585.00 was expended under the contract in which the Government's participation at 50 percent was $7,792.50.

No significant lead-zinc mineralization was discovered by the work.

Recommendations

A pseudo-certification of discovery or development is included in the Termination Agreement.

The purpose of the Stage II drilling was to test the last target area on this property wherein new ore might be found. Should the mine ever be reopened and the completed drill station be made accessible, serious consideration should be given to drilling these holes. Other exploration possibilities exist at the Sunset mine property but testing of these possibilities should be dependent on the finding of specific targets by geochemical or other surface work.

LOCATION AND ACCESSIBILITY

The Sunset mine is on the east bank of Pine Creek about 3 miles south of Pinehurst, Idaho, which in turn is about 5 miles distant by paved highway from Kellogg, Idaho, the nearest trading center and railhead (pl. 1). From Pinehurst the road to the mine is paved except for the last one-half mile which is graveled. The

altitude at the portal of the main adit is 2,520 feet above sea level or about 200 feet above Pine Creek. Amy Peak, with an altitude of 4,371 feet, lies immediately east of the mine area.

Snowfall is heavy during the winter months but the roads are kept open through the cooperation of county and mine officials.

PROPERTY

Amendment No. 1, dated May 16, 1955, effective November 22, 1954, deleted Annex I to the contract and substituted a new Annex I which defined the property to be explored under the contract as follows:

> "The land consists of the following unpatented mining claims located in the Yreka Mining District, Shoshone County, Idaho, in Sections 16, 17, 20, and 21, Township 48 North, Range 2 East:
>
> | Claim | Quartz Location Book | Page |
> |---|---|---|
> | Robert Burns | 4 | 442 |
> | Tam O'Shanter | 4 | 443 |
> | Baldy | 22 | 516 |
> | Bee | 22 | 517 |
> | Arkansas | 22 | 15 |
> | Kansas | 22 | 52 |
> | Liberal King | Q | 288 |
> | Monarch | Z | 257 |
> | Liberal King Fraction | 18 | 271 |
> | Liberal King Fraction Amended | 23 | 271 |
>
> as shown on the attached map entitled "Sunset Mines, Inc., Proposed D.M.E.A. Project": Provided, That, the line on said map labelled "line projected on 600 level" shows the vertical and horizontal boundaries of a block of ground within which all ore bodies are excluded from the land described above." (See pl. 3).

The principal mine workings consist of a 3,900-foot adit (the Main or No. 3 tunnel, also known as the 100 level), a shaft, and eight working levels. The working levels are 200, 400, 600, 800, 1000, 1100 intermediate, 1200 and 1300 levels. The shaft is vertical from the adit level to the 1200 level. The Main adit is connected by a raise to the Lookout Mountain No. 3 tunnel for ventilation. A winze collared on the 1000 level connects with the 1200 and 1300 levels. The altitude of the portal is 2,520 feet

and the 1300 level is at an altitude of 1,177 feet. The main working levels extend about 800 feet horizontally and about 1,300 feet vertically.

The No. 2 Liberal King tunnel is at an altitude of 3,530 feet and has been opened for about 900 feet on the Liberal King vein.

The country rock is Prichard slate with bands of quartzite, and the level openings for the most part need no support. A modified square-set method of stoping is used because of spotty occurrence of ore and tendency of backs to slab when left unsupported. Few stopes were filled during mining operations for lack of fill material which might have been made available if development had not been allowed to lag.

Ventilation is only fair and mechanical blowers are used to ventilate most working places. The mine water is handled by electric pumps and the amount of water pumped normally varies between 30 and 50 gpm.

The surface plant includes five buildings, a covered saw-mill, and a 150-ton mill. The buildings are used for office, dry, machine shop, compressor house, and lamp and storage building. Electric power is furnished by the Washington Water Power Company.

Following is a tabulation of the reported production. (Figures supplied by the Mineral Industry Division, Bureau of Mines, Region I.)

Production of the Sunset (Liberal King) mine, Yreka district, Shoshone County, Idaho, from 1901 through 1957, in terms of gross metal content of concentrates produced and ore shipped directly to smelters.

Year	Ore (tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
1901-36	No production reported					
1937	238	--	285	--	30,450	--
1938-39	No production reported					
1940	375	2	685	420	30,750	44,847
1941 1/	2,740	34	3,200	3,400	233,500	562,500
1942 1/	1,046	10	1,046	1,000	75,000	175,000
1943	No production reported					
1944 1/	7,671	20	2,800	40,000	220,000	60,000
1945 1/	15,404	100	10,100	20,000	825,000	1,719,000
1946 1/	20,793	110	17,000	30,000	1,212,000	2,370,000
1947 1/	28,630	110	20,350	37,000	1,527,125	3,220,000
1948 1/	24,586	160	20,000	38,000	1,629,160	2,939,800
1949 1/	24,596	140	23,650	40,000	1,783,000	3,242,000
1950 1/	31,938	220	37,425	61,100	2,641,400	4,985,080
1951 1/	45,700	156	24,366	20,000	1,658,000	3,582,000
1952 1/	18,631	100	13,000	16,000	1,000,000	2,000,000
1953	15,048	38	6,191	7,011	491,490	1,139,206
1954	3,981	12	2,013	?	157,602	370,837
1955	4,913	12	2,225	?	173,011	370,841
1956	6,436	34	5,619	6,767	415,605	999,619
1957	4,415	21	1,653	?	291,554	638,572
Totals	257,141	1,279	191,608	320,698	14,394,647	28,419,302

1/ Production figures represent mill heads.

GEOLOGY

Regional

The country rock of the Coeur d'Alene district consists of slightly metamorphosed sedimentary rocks of the Precambrian Belt series that have been folded, faulted and intruded by granitic stocks and dikes of various types. The general geology has been described and published by many writers. Among the important publications are the following:

1. Ransome, F. L., Calkins, F. C., Geology and ore deposits of the Coeur d'Alene district, Idaho: U. S. Geol. Survey Prof. Paper 62, 1908.

2. Calkins, F. C., A geological reconnaissance in northern Idaho and northwestern Montana: U. S. Geol. Survey Bull. 384, 1909.

3. Umpleby, J. B., Jones, E. L., Jr., Geology and ore deposits of Shoshone County, Idaho: U. S. Geol. Survey Bull. 732, 1923.

4. Shenon, P. J., Silver Belt of the Coeur d'Alene district: Idaho Bureau of Mines and Geology, Pamphlet 50, 1939.

The geology of the Coeur d'Alene district has been restudied in recent years by S. W. Hobbs and his associates of the U. S. Geological Survey, and the surface geology of the Sunset mine area is shown on Geologic Map of Smelterville and Vicinity Quadrangle, Shoshone County, Idaho: U. S. Geol. Survey Open File map, 1953.

V. C. Fryklund, Jr., in summarizing the regional geology of the district, states: "The Belt series in this area has been subdivided into six formations on the basis of lithology. No unconformities have been recognized. From the bottom of the series to top, the formations are as follows: Prichard, Burke, Revett, St. Regis, Wallace, and Striped Peak. The total section is at least 23,000 feet thick. The veins in the district generally strike between N. 45° W. and west and usually dip steeply to the southwest. Many of the veins and faults of the district are in zones of rock that are bleached to a color lighter than normal, presumably by hydrothermal solutions that precede the ore-forming solutions. The exact nature of the bleaching is currently being studied by the U. S. Geological Survey."

The Sunset mine is in the lower part of the Prichard formation, the oldest of the six. In the vicinity of the Sunset mine the Prichard formation is made up largely of dark gray to black argillites with thin, regular laminations ranging in color from almost white to dark gray. The thickness is believed to be over 12,000 feet. There are two well-defined quartzitic zones within the Prichard, one near the top of the formation and the other much lower in the section. The one near the top, which marks the transition zone between the Prichard and Burke formation, is about 800 feet thick. It consists of massive white quartzite beds, up to 50 feet thick, interbedded with dark gray, finely laminated argillite. The lower zone has been termed the Middle Prichard quartzite. According to Shenon, this zone lies approximately 10,000 feet below the top of the formation.

A very striking structural feature of the district is the west-northwesterly trending Osburn fault or fault zone (pl. 1) which has been traced intermittently through the district for over 30 miles. The Sunset mine lies about 2½ miles south of the western portion of this fault. Locally, the fault zone ranges in width from 100 to 200 feet and where exposed dips steeply south. The extent of its pre-ore movement is not known, but it may have a post-ore strike-slip component of movement of about 16 miles. Numerous mineralized faults and zones are subparallel to the Osburn fault. The Yreka shear zone north of the Sunset mine lies along one of these sub-parallel structures. Most of the mines in the Pine Creek area are located on this zone which strikes N. 65° W. and is about 2,000 to 2,500 feet wide (pl. 2).

Local Geology

The geology of the Sunset mine area and vicinity is best shown on a U. S. Geological Survey map prepared by V. E. Nelson, J. F. Smith, Jr., et al, titled "Surface geology of the Pine Creek Area, Shoshone County, Idaho" and placed on open file in 1953 (pl. 2). This map shows the various structures and formations striking generally north-northwest and the bedding in the area of the mine dipping to the northeast. In his final report on the Liberal King mine, which is part of the Sunset mine, Verne C. Fryklund, Jr. states the following:

> "The Lower Prichard quartzite beds indicate gentle cross folding, with axes plunging steeply northeast, at right angles to the general regional strike. Underground, strikes are more variable and many beds are overturned, dipping to the south. It is probable that the beds have been dragged by movement along the Sunset structure. Among the Lower Prichard beds are bands

of white, fine-grained quartzites that contrast strikingly with the dark-gray to black fine-grained quartzite and shale (argillite in Coeur d'Alene terminology) beds composing the remainder of the Prichard formation. These white quartzite beds are the only stratigraphic horizons in the entire Belt series in the Coeur d'Alene district that can be traced with any continuity on the surface or underground.

"The Liberal King and Sunset veins are the only major structures known in the mine; only the Liberal King vein crops out. (Pls. 4, 5, and 5-A) The Liberal King vein strikes N. 75° W. and dips about 75° S. The Sunset vein strikes approximately N. 45° W. and dips from 5°-50° S.

"The Sunset vein was accidentally discovered (probably in 1944) during the search for the Liberal King vein on the 1000 level. About 233,000 tons of ore have been removed from the single ore shoot, now exhausted, that probably averaged 15 percent combined lead and zinc.

"The dip of the Sunset vein (5°-50°) is the flattest of any of the major productive veins of the Coeur d'Alene district. The vein was formed by replacement along what is believed to be a reverse fault. Ore widths reached 12 feet in the ore shoot with at least 5 feet of shearing in the hanging wall.

"Vein minerals are pyrite, arsenopyrite, carbonate, quartz, sphalerite, tetrahedrite, chalcopyrite, and galena.

"The factors controlling the formation of the single ore shoot have been the subject of discussion among the geologists of the district. One school of thought believes that the white quartzite bands overlying the stope area are of considerable significance. As the white quartzite bands have the same physical properties, except for color, as much of the remainder of the country rock, Fryklund fails to see what its influence may have been. On the other hand, there is no question but that the greatest ore widths are on the flattest portion of the vein; in fact, Fryklund considers that the ore shoot is a textbook example of the formation of ore shoots along the flat portions of reverse faults."

The ore shoot has been stoped from a short distance above the 800 level to a short distance below the 1200 level. The maximum pitch length in the ore shoot was 700 feet, the maximum stope length about 500 feet. Except for pillars and drift sills which were being pulled, the ore shoot is mined out. Below the 1200 level the vein

continues nearly as rich as in the stoped areas but the vein narrows so much that mining became unprofitable. The vein also narrows above the 800 level.

That the Sunset vein continues northwestward from the stoped ore body and steepens in dip is demonstrated by the 600 feet of drift driven along the vein on the 800 level under Contract No. Idm-E102 (pl. 3). Although lenses of ore grade material were encountered in this extension, no commercial ore bodies were found.

THE PROJECT

Although the previous contract had been unsuccessful, the Operator believed that more work should be done on the Sunset vein. An analysis of the available facts showed the situation to be as follows: 800 feet of drifting northwesterly from the stoped area on the 800 level of the Sunset vein had failed to find ore. The vein structure, however, continued strong with lenses of ore grade material, and there was no indication that it would terminate. The ore shoot had apparently been bottomed below the 1200 level but there was an up dip interval of approximately 3,000 feet between the 800 level stopes and the surface which had never been tested except for a short drift on the 600 level. Exploration possibilities therefore existed both along strike and up dip from the 800 level, particularly at places where the dip of the vein might flatten. Of the two possibilities, exploration up dip from the 800 level seemed more attractive for the following reasons:

(1) There seemed to be a good possibility that the vein might flatten, and if so, the flattening might localize an ore shoot similar to the ore that had been mined.

(2) The exploration could be done on a multi-stage basis from the upper Liberal King workings and the early stages would be relatively inexpensive.

(3) The results would probably be more conclusive than those likely to be obtained by additional drifting along the vein on the 800 level.

On September 30, 1954, the Operator submitted an application to explore the Sunset vein from the Liberal King No. 3 or Main adit level. The application proposed rehabilitating No. 3 crosscut on the Main adit level a distance of 310 feet, extending the crosscut approximately 800 feet to the Sunset vein, drifting approximately

1,700 feet on the vein, driving 400 feet of raises from the drifts, and drilling 2,000 feet of diamond drill holes downward to explore the vein between the 600 and Main adit levels (pl. 3). Total estimated cost of this proposed project was $124,000 with Government participation of 50 percent or $62,000.

A modified plan of exploration was recommended by the Field Team and Contract No. Idm-E738, dated November 22, 1954, authorized the following two-stage program on a unit cost basis.

Stage I

1. Excavate a diamond drill station on the main tunnel level.

2. Drill 3 diamond drill holes AX size from a northerly crosscut on the main tunnel, aggregating not in excess of 2,500 feet.

Stage II

1. Rehabilitate 310 feet of No. 3 crosscut on the main tunnel level.

2. Extend the No. 3 crosscut to the Sunset vein and drift on the vein for an aggregate total of not more than 2,000 feet.

3. Drifts and crosscuts should be timbered as required but not to exceed 1,000 feet.

4. Raise 400 feet on the Sunset vein from the drift.

The estimated total cost of the project was $101,125 to which the Government was to contribute $50,562.50. The Operator also agreed in Annex II of the contract that the contribution of the Government to the work done under Contract Idm-E102 be added to any money which the Government would contribute under the provisions of the new contract (Idm-E738) for repayment under the royalty provisions of Contract Idm-E738. The amount of the Government contribution to be added from Contract Idm-E102 was $42,739.75.

Rehabilitation of 265 feet of the No. 3 crosscut and excavation of the diamond drill station were completed early in July 1955.

Amendment No. 1, dated May 16, 1955, added the Liberal King Fraction and Liberal King Fraction Amended claims to the subordinated land. Certain restrictions excluded some of the ground subject to royalties (pl. 3).

Amendment No. 2, dated May 25, 1955, transferred rehabilitation of the No. 3 crosscut from Stage II to Stage I.

A district-wide labor strike halted work between late August 1955 and February 1, 1956.

Diamond drill hole No. 301, bearing roughly N. 49° E., was drilled horizontally to a depth of 1,003 feet. At 307.5 feet about 10 inches of high-grade ore was cut. Sludge samples between 305 and 310 feet averaged 1.8 ounces silver per ton, 5.3 percent lead and 5.5 percent zinc.

Diamond drill hole No. 302, started at a bearing of N. 80° E. and at an inclination of minus 25°, deviated to a bearing of N. 58° E. before it was stopped at 1,339 feet. Mineralized stringers were cut between 250 and 280 feet, 378 to 392 feet, 420 to 421 feet, 446 to 447 feet, and between 1100 and 1120 feet. Assays of the sludges showed negligible amounts of silver, lead and zinc.

Diamond drill hole No. 303, bearing N. 25° E., was drilled horizontally to a depth of 453 feet. No significant mineralization was encountered. Logs of these holes are included in the Appendix of this report.

Amendment No. 3, dated June 15, 1956, effective November 22, 1954, deleted all of Exhibit "A" of the contract and Amendment No. 2 and substituted the following:

Stage I

1. Rehabilitate 310 feet of No. 3 crosscut on the main tunnel level.

2. Cut one diamond drill station on the main tunnel level.

3. Subject to the prior approval of the Government as to location, direction and depth, drill from a northerly crosscut on the main tunnel level three diamond drill holes aggregating not more than 4,500 feet.

Stage II

1. Crosscut from the No. 3 crosscut on the main tunnel level to the Sunset vein and drift on the vein. Total footage of drifting and crosscutting was not to exceed 1,633 feet.

2. Install not to exceed 1,000 feet of timbering in drifts and crosscuts.

3. Raise not more than 400 feet on the Sunset vein from the main tunnel level.

The amended contract was on a fixed unit cost basis with the price of diamond drilling on a sliding scale. There was no change in the total estimated cost of the contract.

Amendment No. 4, dated February 6, 1957, effective November 22, 1954, extended the time for completion of the work to three years and divided the work into three stages, with the following major work items:

Stage I

This consisted of the work completed under Stage I as amended by Amendment No. 3, dated June 15, 1956.

Stage II

1. Rehabilitate approximately 500 feet of the main tunnel east of the main shaft to a drill site at the eastern end of the tunnel level.

2. Cut a diamond drill station not to exceed 600 cubic feet.

3. Drill 3 AX size holes to explore the Sunset vein not to exceed a total of 3,000 feet.

Stage III

1. Crosscut from the main tunnel level to the Sunset vein and drift on the vein. Total footage was not to exceed 1,600 feet.

2. Government contribution to timbering was not to exceed 300 feet.

3. Raise not to exceed 400 feet on the Sunset vein.

The total cost of the project was to remain unchanged.

Rehabilitation of the main tunnel level and cutting the diamond drill station were completed prior to July 1, 1957. Because of lack of finances, exhaustion of known ore reserves, and low metal prices all DMEA work was suspended at that time.

Finally, in November 1957, all mining operations were suspended.

The contract was terminated by mutual agreement effective as of July 1, 1957. The results of the exploration were unsuccessful; however, the Termination Agreement contains a pseudo-certification.

Summary of Factual Data

The following work was completed under the contract:

Stage I	Authorized	Completed	Unit Cost	Total Cost
Rehabilitation	310 ft.	265 ft.	$ 3.50/ft.	$ 927.50
Drill station	1	1	375.00/ea.	375.00
Drill hole surveys	3	2	80.00/ea.	160.00
Assays	30	4	3.50/sample	14.00
Core drilling	4,500 ft.	2,792 ft.	3.50 to 5.00/ft.	12,099.00
Allowance for compressed air, etc.	4,500 ft.	2,792 ft.	0.50/ft.	1,396.00
Total - Stage I				$14,971.50

Stage II				
Rehabilitate approx. 500 ft. crosscut	1 unit	1 unit	$313.50	$ 313.50
Excavate diamond drill station	600 cu.ft.	600 cu.ft.	0.50/cu.ft.	300.00
Diamond drilling	3,000 ft.	0	3.50 to 5.00/ft.	—
Drill hole surveys	3	0	80.00/ea.	—
Allowance for compressed air, etc.	3,000 ft.	0	0.50/ft.	—
Assays	20	0	3.50/sample	—
Total - Stage II				$ 613.50

Total amount of contract	$101,125.00
Government's participation at 50 percent	50,562.50
Total amount expended	15,585.00
Government's participation at 50 percent	7,792.50
Total amount unexpended	85,540.00
Government's share unexpended	42,770.00

Production of ore during the contract period and subject to DMEA royalty is given in the following table:

Zinc Production

Lot No.	Tons Conc.	Analysis of Concentrates Oz. Au	Oz. Ag	% Zn	% Pb	% Cu	Net Smelter Returns
LKL 1	37.7580	0.0125	2.40	52.05	6.40		$3,051.47
LKL 2	53.1920	0.0125	1.50	53.20	4.55		4,152.54
LKL 3	61.9005	—	1.00	55.10	2.35		4,788.33
LKL 4	24.5785	—	0.70	55.55	0.80		1,864.12
	177.4290						$13,856.46

Lead Production

1	5.705	0.03	11.65	24.9	38.45	7.30	$ 689.53
7	7.435	0.0226	1.75	19.4	39.4	7.35	898.46
13	9.309	0.04	7.8	17.65	32.35	10.2	1,069.59
18	4.601	0.0325	8.05	18.8	27.4	11.08	439.90
	27.050						$3,097.48

Total returns	$16,953.94
Royalty payments received	$ 847.70

The Government had no equity in any equipment or supplies used on the project.

Discussion of Conclusions

Project work was hampered by a labor strike, which lasted five months, and idle periods caused by lack of finances. Finally, in November 1957, because of lack of funds, exhaustion of known ore reserves, and low metal prices the mine was shut down and the contract was terminated by mutual consent. That portion of the work which was completed was performed in a workmanlike manner and the standard of work was good.

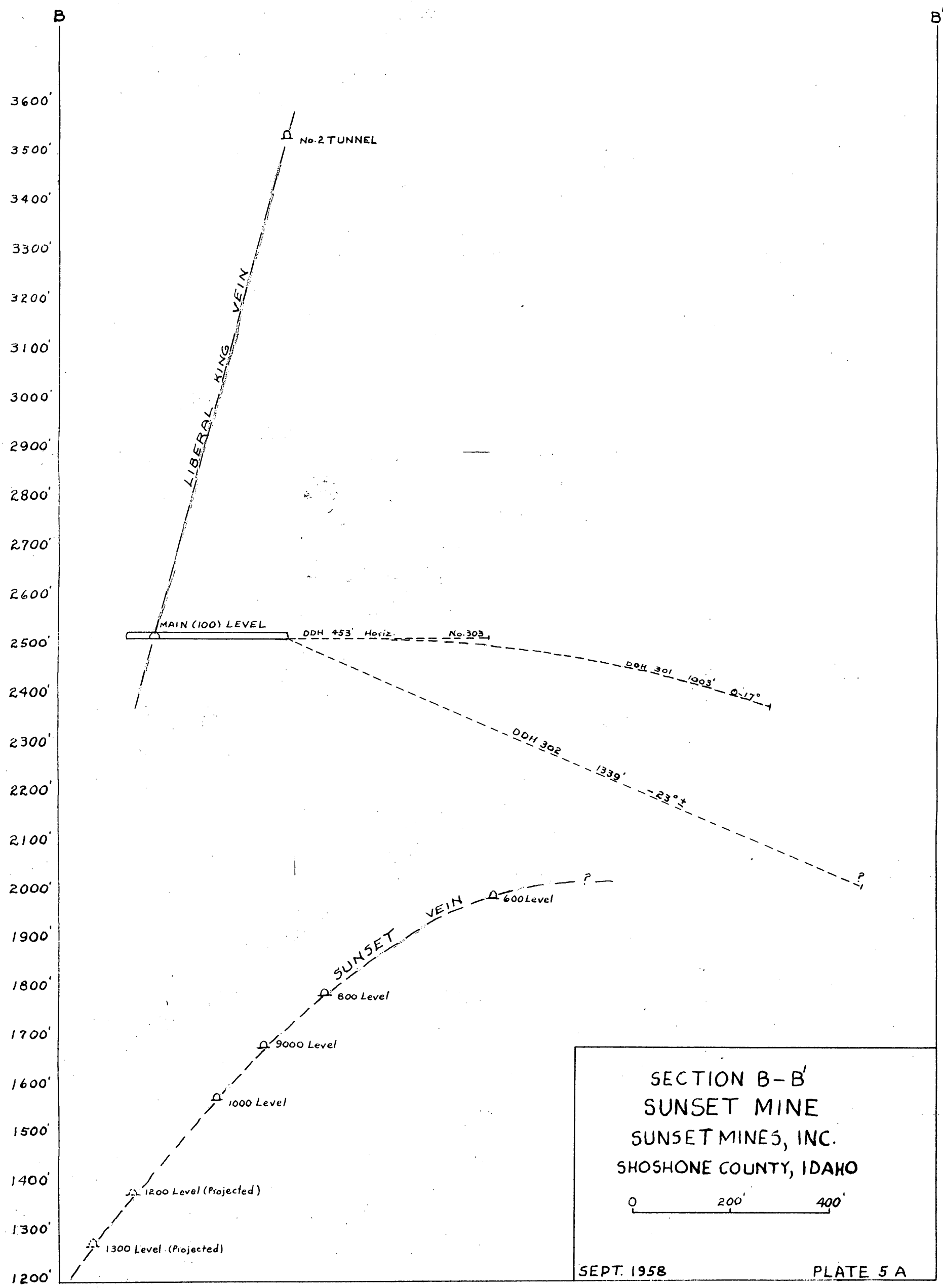
Both the Liberal King and the Sunset veins were explored with unfavorable results. No further work seems justified on the Liberal King vein. The failure to find any trace of the Sunset vein in the three holes drilled from the No. 3 adit crosscut is difficult to explain. Drilling the four diamond drill holes authorized under Stage II offers the only remaining hope of discovering ore immediately adjacent to the mine workings, and the area they were designed to explore remains untested. If the mine

should be reopened and the drill station at the east end of the Main level should be made accessible, consideration should be given to drilling these holes. The drilling might explain why the Sunset vein was not found in the three holes drilled.

Both the northwest and southeast extensions of the Sunset vein beyond the present mine workings are still unexplored and there still is a possibility that in the mine area the Sunset vein might yet be found in the 2000-foot interval between the Liberal King No. 3 adit level and the surface. Any exploration of either of these objectives should be dependent on the finding of specific targets by geochemical or other surface work.

Attachments

Distribution:
OME (3)
USBM (5)
USGS(SRD)
Docket
Sample


B
B'
3600'
3500'
3400'
3300'
3200'
3100'
3000'
2900'
2800'
2700'
2600'
2500'
2400'
2300'
2200'
2100'
2000'
1900'
1800'
1700'
1600'
1500'
1400'
1300'
1200'
No. 2 TUNNEL
LIBERAL KING VEIN
MAIN (100) LEVEL
DDH 453' Horiz.
No. 303
DDH 301 1003' @ -17°
DDH 302 1339' -23° ±
?
?
SUNSET VEIN
600 Level
800 Level
9000 Level
1000 Level
1200 Level (Projected)
1300 Level (Projected)
SECTION B-B'
SUNSET MINE
SUNSET MINES, INC.
SHOSHONE COUNTY, IDAHO
0
200'
400'
SEPT. 1958
PLATE 5 A

DIAMOND DRILL HOLE NO. 301

Horizontal - 1,003 feet Logged by Verne C. Fryklund

Footage	Recovery	Description	Remarks
3- 27'	Essent. all	Light gray to dark banded qtzite	
27- 51'	"	"	
51- 76'	"	"	At 56.2' - 1" pyrite vein; at 58.2' - 1" " "
76-101'	"	"	Small pyrite veinlets
101-126'	"	"	At 102' - 1" vein carb. pyrite
126-150.5'	95%	"	
150.5-174'	Essent. all	"	
174-199'	"	"	
199-225.5'	"	"	
225.5-250'	"	"	Pyrite veinlets
250-275'	"	"	" "
275-301'	94 + %	"	At 296.8' - 1/4" zinc-pyrite stringer
301-328'	Essent. all	3/8" Zn stringer at 305.9' 1/4" " " " 306.1'	Sludge assay - 1.8 oz. Ag/ton 5.3% lead, 5.5% Zn
328-354'	95%	Light to dark banded qtzite	Scattered pyrite grains
354-382'	86%	"	
382-408'	91 + %	"	Minor pyrite specks
408-433'	81 + %	"	
433-459'	96 + %	"	Minor pyrite veinlets
459-487'	87 + %	Med. gray quartzite	Little pyrite
487-511'	99 + %	Light & med. gray qtzite	Minor pyrite veinlets
511-535'	91 + %	"	Pyrite veinlets
535-560'	96 + %	"	
560-595'	16%	"	Broken pellets
595-624'	80%	Med. gray, banded qtzite	1/4" pyrite vein at 604'
624-654'	75%	"	Minor pyrite veinlets
654-682'	87%	"	"
682-708'	89%	"	"
708-734'	All	"	Minor carb. & pyrite veinlets
734-759'	93 + %	"	Minor pyrite veinlets
759-791'	62 + %	Dark gray quartzite	Minor calcite blebs
791-818'	75 + %	"	Little calcite
818-848'	72 + %	"	Some gouge
848-873'	89 + %	Gray quartzite	Minor pyrite veinlets
873-902'	74%	Med. gray quartzite	" "
902-928'	90%	Dark gray quartzite	Small fault at 903'
928-954'	92%	"	Disseminated pyrite in veinlets
954-979'	88%	"	"
979-1003'	85%	Light & dark gray qtzite	No evidence of fault; minor pyrite

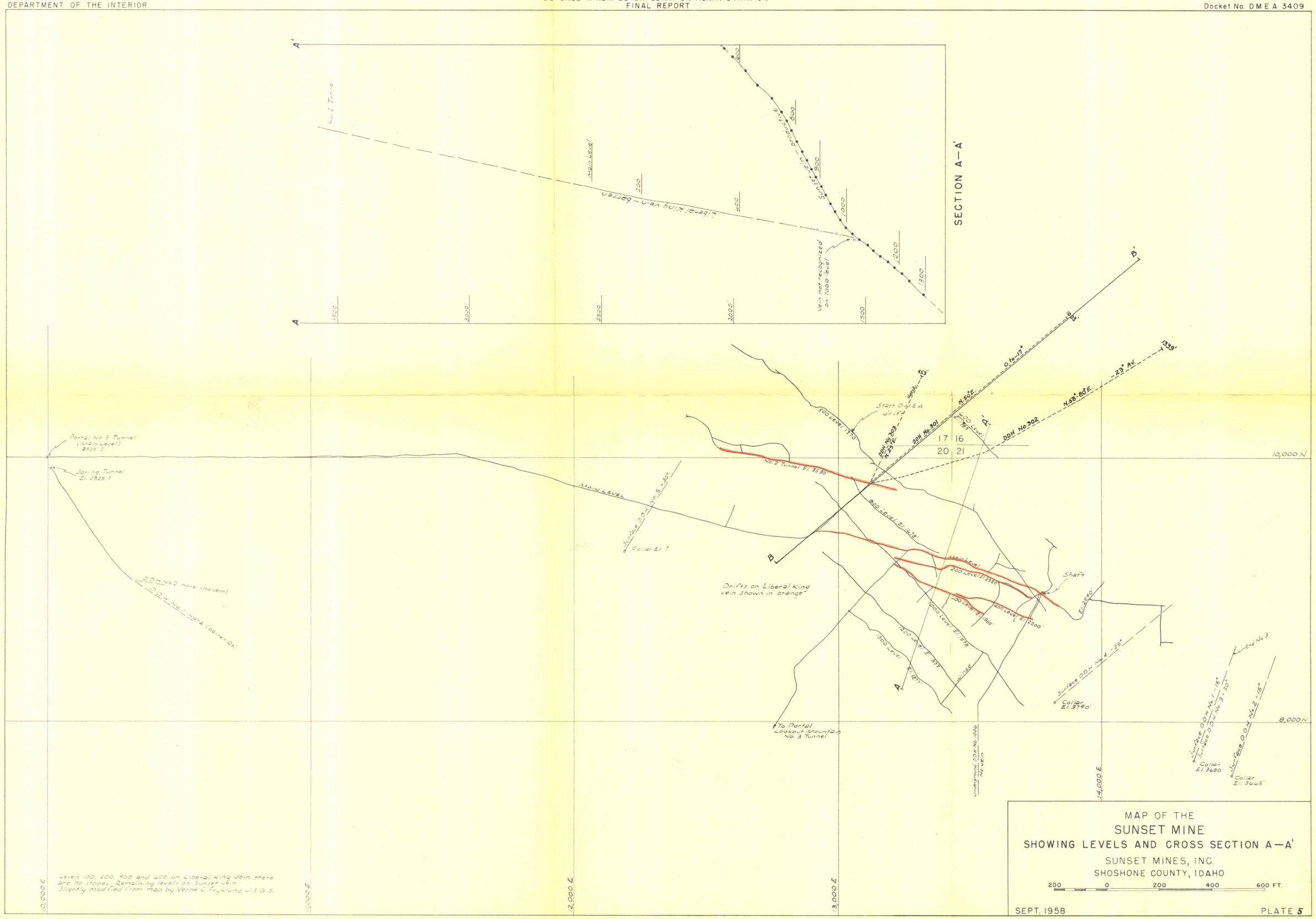
DIAMOND DRILL HOLE NO. 302

Minus 25 degrees - 1,339 feet Logged by Verne C. Fryklund

Footage	Recovery	Description	Remarks
124-148'		Med. light gray qzt	Nothing of interest
148-173'		"	"
173-196'		"	"
196-220'		"	"
220-246'	All	"	"
246-272'	"	"	265-267 stringers of Zn S., pyrite and carb.
272-296'	"		Nothing
296-321'	"	"	"
321-346'	"	"	"
346-371'	"	"	"
371-395'	"	"	278.2' - 1" pyrite & galena 279.2' - 2" pyrite, PbS, Zn S streak
395-425'	"	"	408.7 - ½" pyrite stringers, Zn S 419.9 - 2" carb. pyrite, Zn stringers
425-450'	"	"	426.6-445. Spots of pyrite, Zn S, qtz, carb.
450-477'	"	"	467.8' - 3" white sandstone bed
477-501'	"	"	Pyrite streaks
501-526'	"	"	Nothing
526-550'	"	"	"
550-575'	"	"	"
575-608'	65%	"	Broken pyrite streaks
608-631'	All	"	Few pyrite streaks
631-657'	All	"	" " "
657-685'	86+ %	"	Nothing
685-708'	93+ %	Light to dark gray banded quartzite	Some argillite bands
708-734'	80%	"	Some quartz stringers
734-766'	65+ %	"	Gouge at 753'
766-791'	97+ %	"	Beds parallel to core
791-816'	All	"	Carb. stringers
816-842'	83%	"	" "
842-865'	All	"	" "
865-890'	Most all	"	Nothing
890-919'	74+ %	"	Carb. stringers
919-945'		"	Pyrite stringers
945-970'	Most all	"	" "
970-980'	75%	"	" "
980-1339'	(end of hole)	Scanned by Fryklund but not recorded as logs. Nothing of interest reported.	

DIAMOND DRILL HOLE NO. 303

453 feet - Scanned by Fryklund but not logged. Nothing of interest reported.


SECTION A—A'
A
A'
No. 2 Tunnel
Main Level
Liberal King Vein – barren
Sunset Vein – productive
Vein not recognized on 1000 level
1500'
3000'
2500'
2000'
1500'
200
400
600
800
1000
1200
1300
B
B'
Portal No. 3 Tunnel (Main Level) 2825' ±
Spring Tunnel El. 2825' ±
DDH No. 2 Horz. (no vein)
DDH No. 1 Horz. (barren Qz.)
Main Level
Surface DDH No. 5 – 30°
Collar El. ?
Drifts on Liberal King vein shown in orange
To Portal Lookout Mountain No. 3 Tunnel
Underground DDH No. 1006 No vein
Start DMEA Drift
DDH No. 303 N 25° E.
DDH No. 301
DDH No. 302
N 50° E.
0 to -17°
N 58°-60° E.
-23° Av.
1339'
800 Level 1770
No. 2 Tunnel El. 3530'
800 Level El. 1678'
Main Level
200 Level El. 2330
400 Level El. 985'
600 Level El. 1578
1000 Level El. 2200'
1200 Level El. 377
1300 Level El. 1275'
Winze
Shaft
El. 2540'
Surface DDH No. 4 – 25°
Collar El. 3740'
Adit No. 3
Surface DDH No. 1 – 15°
Surface DDH No. 3 – 30°
Collar El. 3680'
Surface DDH No. 2 – 15°
Collar El. 3665'
17 16
20 21
10,000 N
9,000 N
10,000 E
11,000 E
12,000 E
13,000 E
14,000 E
Levels 100, 200, 400 and 600 on Liberal King Vein there are no stopes. Remaining levels on Sunset Vein.
Slightly modified from map by Verne C. Frykland, U.S.G.S.
MAP OF THE
SUNSET MINE
SHOWING LEVELS AND CROSS SECTION A—A'
SUNSET MINES, INC.
SHOSHONE COUNTY, IDAHO
200 0 200 400 600 FT.
SEPT. 1958
PLATE 5

UNITED STATES
DEPARTMENT OF THE INTERIOR

PREPARED FOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
FINAL REPORT

DOCKET NO. D M E A 3409

Geology from company maps and V.C. Frykland, U.S.G.S. Levels 800 and 1000 on Liberal King Vein. There are no stopes. Remaining levels on Sunset vein.

COMPOSITE MAP OF THE
SUNSET MINE
SHOWING LEVELS, GEOLOGY AND DRILL HOLES
SUNSET MINES, INC.
SHOSHONE COUNTY, IDAHO

50 0 50 100 150 FT.
R. D. SAMPLE

SEPT. 1958

PLATE 4

UNITED STATES
DEPARTMENT OF THE INTERIOR

PREPARED FOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
FINAL REPORT

Docket No. D M E A 3409

Levels 100, 200, 400 and 600 on Liberal King Vein, there are no stopes. Remaining levels on Sunset Vein. Slightly modified from applicants map.

CLAIM MAP OF THE
SUNSET MINE
SHOWING LEVELS, DRILL HOLES, PROPOSED WORKINGS AND EXCLUDED GROUND

SUNSET MINES, INC.
SHOSHONE COUNTY, IDAHO

200 0 200 400 600 FT.
R. D. SAMPLE

SEPT. 1958

PLATE 3

UNITED STATES
DEPARTMENT OF THE INTERIOR

PREPARED FOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
FINAL REPORT

DOCKET NO
DMEA 3409

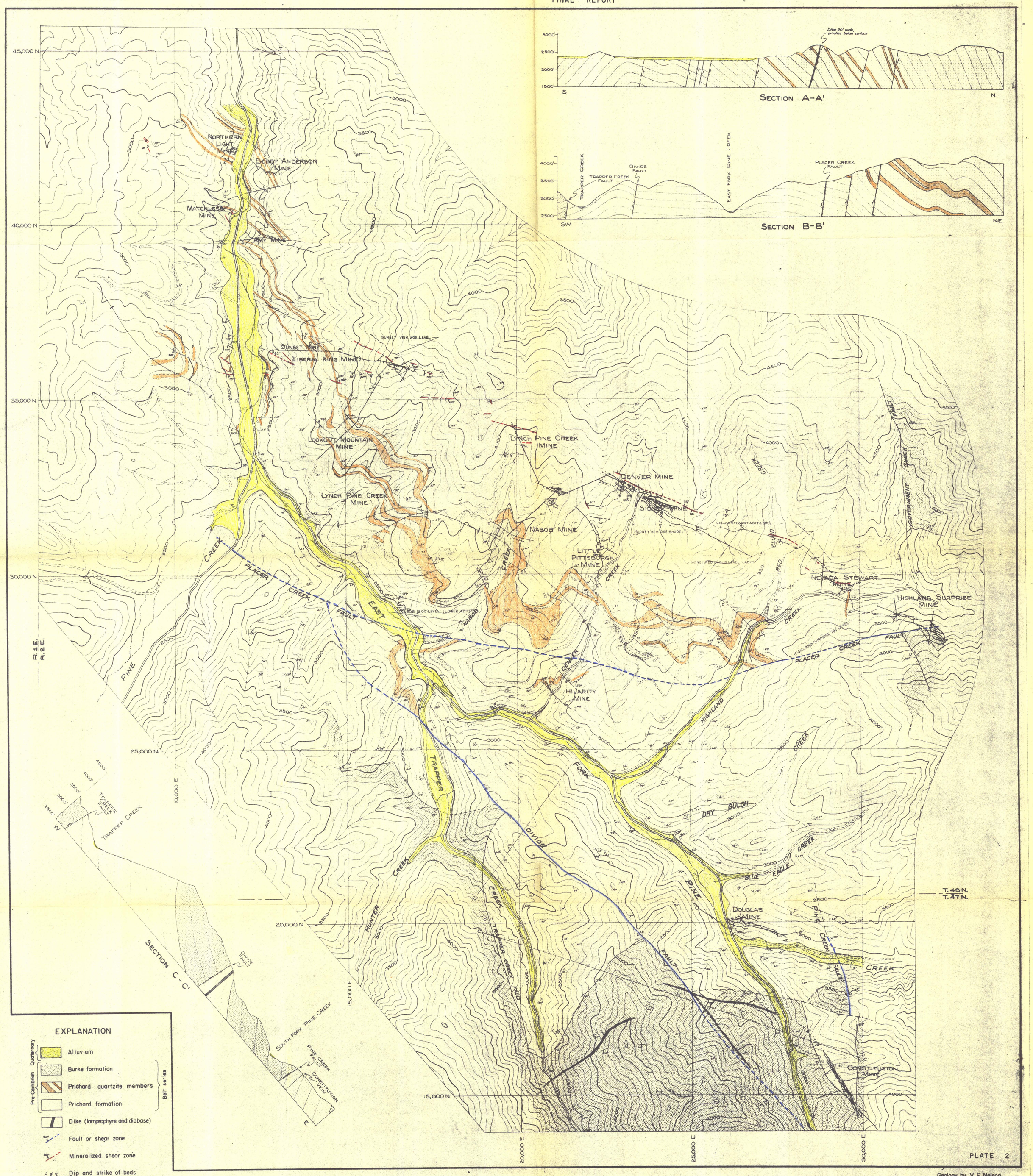


PLATE 2

Geology by V. E. Nelson
J. F. Smith, Jr.
assisted by G. A. Duell
R. M. Hutchison
surveyed in 1943

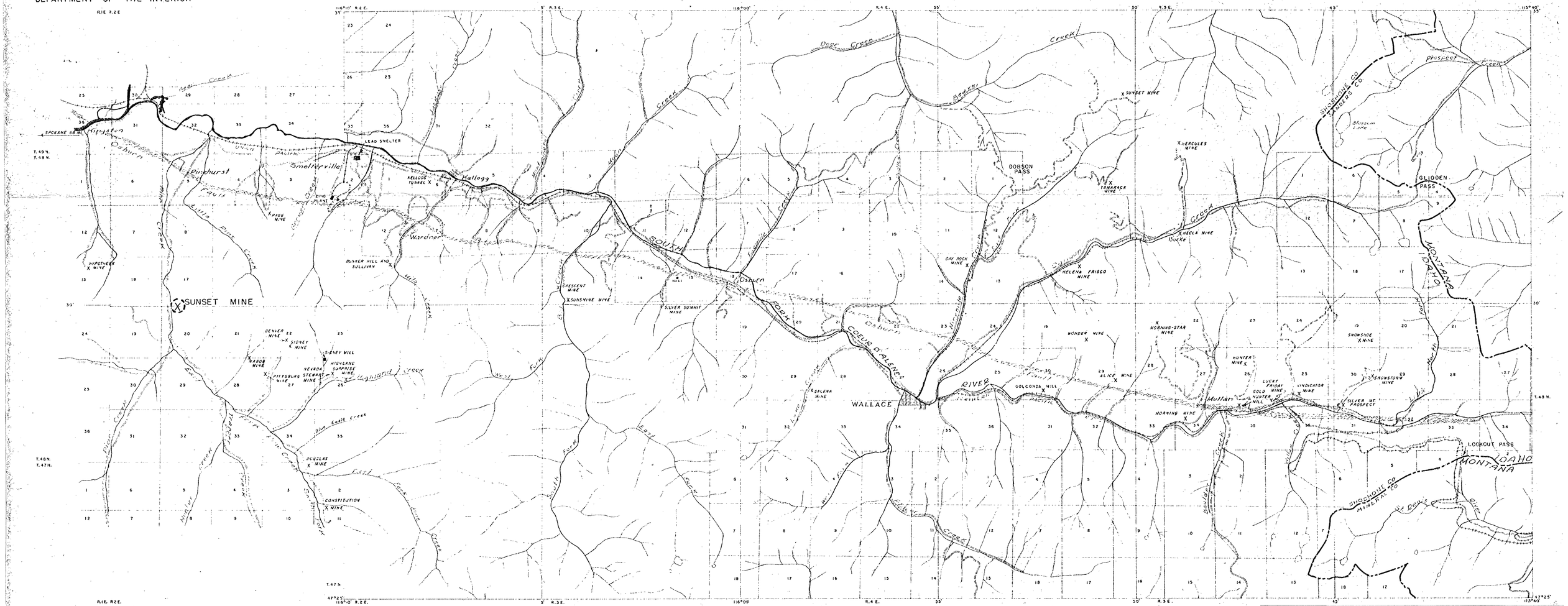
Base is from
U. S. Geological Survey
topographic map

SURFACE GEOLOGY OF THE PINE CREEK AREA, SHOSHONE COUNTY, IDAHO

UNITED STATES
DEPARTMENT OF THE INTERIOR

PREPARED FOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
FINAL REPORT

DOCKET. NO. DMEA 3409



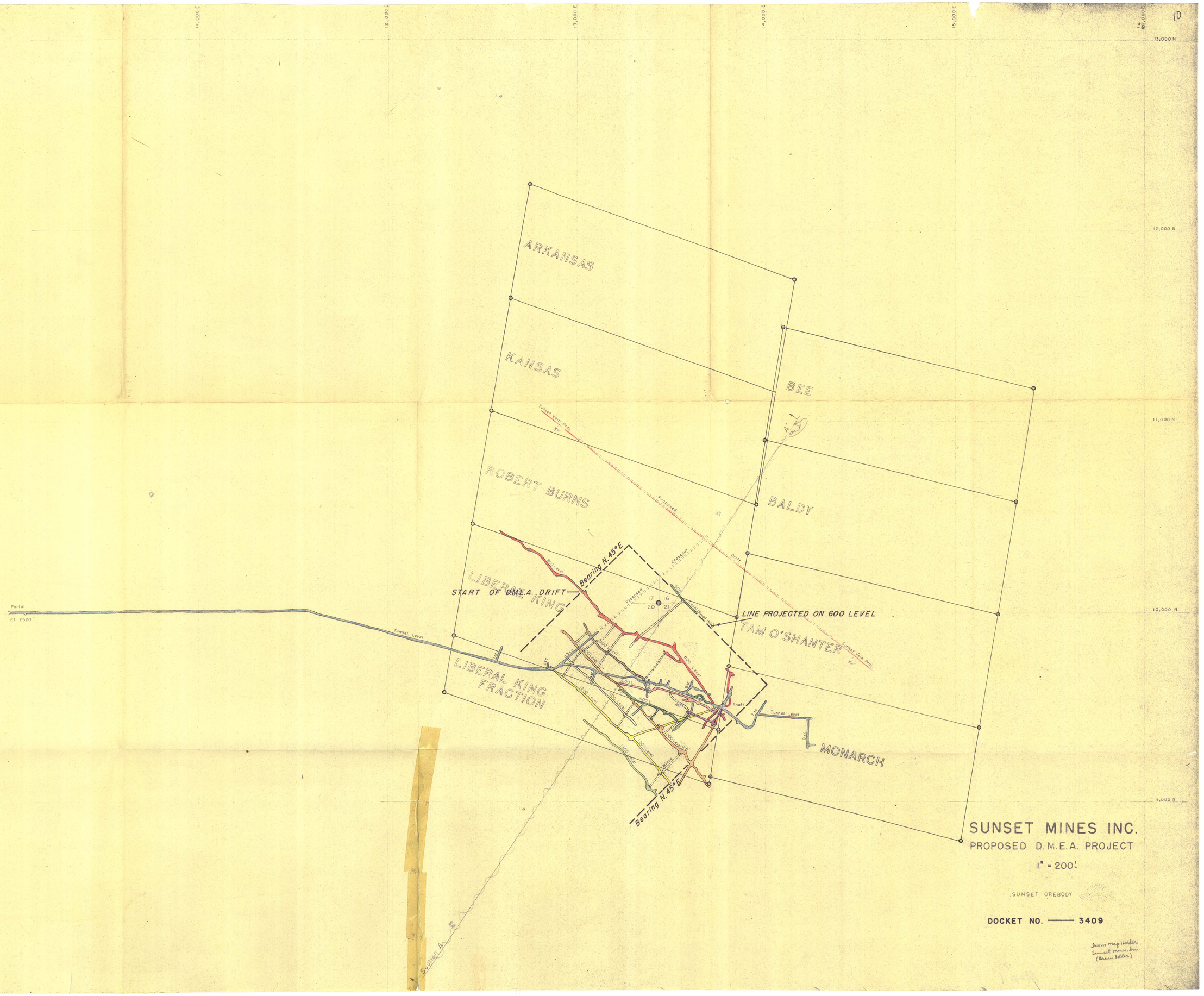
LOCATION MAP
SUNSET MINE
COEUR D' ALENE DISTRICT
SHOSHONE COUNTY, IDAHO

1 ½ 0 1 2 MILES

R. D. SAMPLE

Sept. 1958

Plate I



SUNSET MINES INC.

PROPOSED D.M.E.A. PROJECT

1" = 200'

SUNSET OREBODY

DOCKET NO. —— 3409

From Map Holder
Sunset Mines Inc
(Brown Folder)