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DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
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March 27, 1957

Mr. George C. Selfridge, Chairman
Operating Committee, DMEA
Department of the Interior
Washington 25, D. C.

Re: Docket No. DMEA-2436 (Cobalt-Copper)
Northfield Mines, Inc.
Stevenson Property
Lemhi County, Idaho
Contract No. Idm-E334

Dear Mr. Selfridge:

Enclosed are four copies of a Field Team final report by Alfred L. Service, mining engineer, Bureau of Mines, and Howard B. Nickelson, geologist, Geological Survey, on the Stevenson property.

The project explored for cobalt-copper ore and comprised road and trail construction, trenching, diamond drilling, cross-cutting, and drifting at a total cost of $96,862.62, of which the Government's share was $67,803.83. The contract became effective June 2, 1952, and was terminated by mutual agreement October 1, 1953. A discovery was certified December 21, 1955.

Because of incomplete information no specific ore reserves have been calculated; however, if the zones are continuous, reserves up to 1,300 tons of ore per foot of depth, having an average grade of 0.453 percent cobalt and 1.176 percent copper, are indicated.

The report concludes that further exploration on the Merle 3 zone with Government assistance is warranted.

The Field Team concurs with the recommendation of the writers.

By Field Team, Region I, NW District

Reviewed by
DMEA OPERATING COMMITTEE
4-8-57
(date)

A. E. Weissenborn
A. E. Weissenborn, Executive Officer
U. S. Geological Survey

Stephen L. Zoldoski
for Wing G. Agnew, Member
U. S. Bureau of Mines

Enclosures
cc: USBM(2)
USGS(SRO)
Nickelson

Final Field Team Rpt

DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

FIELD TEAM, REGION I
Northwest District

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FINAL REPORT

Contract Idm-E334

by

Alfred L. Service
Mining Engineer
U. S. Bureau of Mines

Howard B. Nickelson
Geologist
U. S. Geological Survey

NORTHFIELD MINES, INC.
230 Park Avenue
New York 17, New York

Docket No.:	DMEA-2436
Commodity:	Cobalt-Copper
Contract date:	June 2, 1952
Termination date:	October 1, 1953

Reviewed by
DMEA OPERATING COMMITTEE
4-8-57
(date)

STEVENSON PROPERTY
Blackbird Mining District
Lemhi County, Idaho

Spokane, Washington

March 1957

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FINAL REPORT

NORTHFIELD MINES, INC.
Stevenson Property
Blackbird Mining District
Lemhi County, Idaho

Contract Idm-E334

* * * *

INTRODUCTION

This report describes an exploration project for copper and cobalt conducted jointly by Northfield Mines, Inc., and the Defense Minerals Exploration Administration at the Stevenson property, Lemhi County, Idaho.

Summary

Geochemical exploration in the early part of 1951 by the Geological Survey indicated three northwest-trending mineralized zones on the Northfield property (pl. 1). Subsequently, bulldozing by the company confirmed the presence of these zones by exposing favorable gossans. In March 1952 Northfield Mines, Inc., applied for DMEA assistance, and on June 2, 1952, a contract was granted authorizing exploration of the three zones (the Queen, the Merle 3, and the Merle 5) by further bulldozing, diamond drilling, and underground exploration.

Bulldozing on the Queen zone exposed a group of weak and discontinuous gossans; these were not investigated further as the other zones were more favorable (pl. 2). Bulldozing on the Merle 3 zone traced a strong northwest-trending gossan for approximately 1,100 feet (pl. 2), but six diamond drill holes from the surface failed to intersect the zone at depth.

Bulldozing on the Merle 5 zone traced a strong northwest-trending gossan zone for approximately 1,200 feet and eight diamond

drill holes provided information on the dip, width, and trend of the zone; information on the grade of the zone was inconclusive because surface oxidation was deep and the core recovery was poor (pl. 2 and drill logs in holder). The underground work, cross-cutting, drifting, and diamond drilling explored along the strike of the Merle 5 zone for approximately 440 feet, outlining an ore body containing approximately 532 tons per foot depth of vein, with a grade 0.468 percent cobalt and 1.245 percent copper. This work was done in partially oxidized vein material, and it is probable that the grade of ore will improve with depth (pls. 3 and 4).

A request for additional funds for further underground exploration of the Merle 5 and Merle 3 zones was approved by Amendment No. 7. This work had barely been started when the New York office of the company hired consulting geologists, Philip J. Shenon and Roy P. Full, to appraise the area and make recommendations for continued exploration. Shenon and Full did not recommend further underground exploration, and the contract was terminated October 1, 1953.

Recommendation

The exploration work outlined ore-grade material, but further work will be necessary to establish its continuity.

A Certification of Discovery or Development was issued by the Government on December 21, 1955. Further exploration work with Government participation is warranted.

LOCATION AND ACCESSIBILITY

The Northfield property, known locally as the Stevenson property, is in the Blackbird Mining District, Lemhi County, Idaho. The claims (pl. 5) lie along the upper portion of Little Deer Creek in secs 22, 26, and 27, T. 21 N., R. 18 E. Boise Meridian.

Salmon, Idaho, the nearest town and supply point, is about 50 miles from the property via Williams Creek road. Challis, Idaho, is about 60 miles southeast of the property via Morgan Creek road. There is a railhead at Mackay, Idaho, about 120 miles south of the area, and at Darby, Montana, about 113 miles north of the mine. Mackay, Idaho, is the shipping point due to better roads.

A rough bulldozer road has been constructed to the project site from the Blackbird 7100-level mine yard. This road is adequate during summer months, but it is usually closed during the winter. Expensive maintenance is necessary to keep it open. The Operator's engineers have suggested an alternate route up Little Deer Creek which would be more accessible during all seasons.

The topography in the vicinity of the mine is of moderate to sharp relief; altitudes range from 5,000 to 7,500 feet. Most of the slopes are overlain by a thick layer of soil that makes geologic reconnaissance difficult. Abundant timber growth, mainly lodgepole pine and fir, provides adequate mine timber.

Climatic conditions in the area vary according to the altitude. At higher altitudes, similar to the area immediately surrounding the mine, the climate is moderate to severe with average humidity. Snow can be expected from early September to mid-June, and it has been known to snow during July and August.

PROPERTY

The Stevenson property consists of 45 claims adjacent to the Calera Mining Company's Blackbird property. Only 23 of these claims were included in the DMEA contract; they are shown on the accompanying claim map (pl. 5). The property is held under a lease with option from Floyd W. Stevenson, whose last known address was 322 G. Street, c/o General Delivery, Richland, Washington, and Merle Stevenson.

The claims included in the contract are recorded at the courthouse in Salmon City, Lemhi County, Idaho, as follows:

Name	Book	Page
Merle	Y	512
Merle Nos. 1 to 6	Y	513 to 518
David Nos. 16 to 23	Information not available	
Woodtick	Y	519
Woodtick No. 1	Y	520
Euphemia No. 3	Y	511
Bob No. 1	Information not available	
Bob No. 2	do.	

Patented Lode claims included in the contract are as follows: Tom Jefferson No. 2, Diamond Queen, Little Queen, and Queen. All four claims are described in Mineral Survey 2128. The Queen Patented claim was transferred to DMEA Project Contract No. Idm-E645 by the Calera Mining Company to resolve a conflict concerning ownership of ground in the area of the David No. 18 claim. The transfer was made by Quit Claim Deed, dated January 10, 1956, by mutual agreement between Northfield Mines, Inc., and the Calera Mining Company, and with the consent of the Government.

History

Gold was first discovered in the Blackbird district in 1893, and in 1896 copper was found. The first development work in the district started in 1899, and by 1901 the Blackbird Copper-Gold Mining Co. had completed 1,400 feet of drifts and crosscuts on its Blackbird property. Good ore was found and tentative plans for a smelter were made. Transportation costs proved to be too high, however, and all work on the property was suspended.

John Beliel located the first cobalt claims along Blackbird Creek in 1901. The group was extended in later years, but no development work was started until 1915 when the Haynes Stellite Co. acquired an interest. About 4,000 tons of ore were mined before the mine was closed in 1920.

In 1938 the Uncle Sam Mining Co. obtained a lease with option on the Blackbird Copper-Gold Mining Co. property and produced about 563,539 tons of ore and concentrate; operations ceased in 1941 (Anderson, Alfred L., A Preliminary Report of the Cobalt Deposits in the Blackbird District, Lemhi County, Idaho: Idaho Bur. Mines and Geol. Pamph. 61, p. 7-8, 1943).

In 1939 Floyd Stevenson, James G. Sims, and Howard Sims relocated the principal claims that made up the Haynes Stellite and Beliel groups. Not much is known about the older history of the Northfield area except that some prospecting and development were done about 1900-1910 to the north and south of the ridge near the area. About 1937 F. S. Stevenson staked a number of claims in the area and obtained control of some of the old patented claims. No development or exploration work was done on the Stevenson property until the late 1940's, when an access road was bulldozed from the Blackbird property. During the construction of this road two promising gossan zones were discovered, but no further work was done.

During World War II the Bureau of Mines and Geological Survey started investigations of the cobalt potential in the area. At about this same time the Howe Sound Mining Company took up options on the old Blackbird properties in the name of the Calera Mining Company. Development work on this property progressed rapidly, and by December 1955 the company was mining more than 1,000 tons of ore per day (Hubbard, Charles R., A Survey of the Mineral Resources of Idaho: Idaho Bur. Mines and Geol. Pamph. 105, p. 14-15, 1955).

In 1951 Northfield Mines, Inc., a subsidiary of Ventures Limited, a Canadian company, acquired an interest in the Stevenson property and immediately started a geologic reconnaissance of the area. The Geological Survey through John S. Vhay followed the work

with interest because the company project, consisting of surface trenching, aided in confirming the results of the earlier geochemical sampling and geological mapping done by the Survey. A formal request for an exploration program with DMEA assistance was presented in March 1952.

Mine Workings

Prior to the project the existing workings on the Stevenson property consisted of a few test pits and shallow exploration headings. During the project 840 feet of drifts and crosscuts on the 7000 level (pls. 3 and 4) were driven and a compressor shop, generator house, and combination living quarters and office space were built. Several trailers were moved to the site for additional living quarters and laboratories. All of the permanent facilities are in good condition and were used during the 1955 season by crews working on the Idaho Metallurgical Industries project.

The mine workings are accessible and generally in good condition except for the 7000 adit and 703 drift which are caved near the faces. Timbers are holding well and very little work would be necessary if operations were resumed.

Heavy ground was encountered in the underground work on the Merle 5 zone. It was necessary to use timber in all headings, and in many instances side lagging and spiling were necessary. This condition apparently is common in the district because Calera Mining Company has experienced difficulties in its development and exploration headings caused by sheared and schistose rock. During the project work it was found that when water was present the ground had a tendency to slough rather than to cave.

The lateral length of the headings was not enough to cause any ventilation difficulties, and as they were all on one level, drainage was not a problem.

GEOLOGY

Regional Geology

Joseph B. Umpleby briefly described the Blackbird district in Geology and Ore Deposits of Lemhi County, Idaho: U. S. Geol. Survey Bull. 528, 1913.

The areal geology in the vicinity of the Stevenson property was mapped by J. S. Vhay (Cobalt-Copper Deposits of the Blackbird Mining District, Lemhi County, Idaho: U. S. Geol. Survey Strategic Minerals Preliminary Report 3-219, 1948). Vhay's map illustrating the geology of the district is enclosed as plate 6.

P. J. Shenon, R. P. Full, H. L. Baner, Jr., and D. M. Snyder, consulting geologists for Northfield Mines, Inc., spent two summers studying the Northfield properties. Their report and detailed maps were not available for this report, but a 1" = 2000' geologic map of the Blackbird area was enclosed with the DMEA application of Idaho Metallurgical Industries, Ltd., Docket No. DMEA-3739. An adaptation of this map is enclosed as plate 7.

The rocks of the Blackbird district are metamorphosed sedimentary rocks of the Yellowjacket formation of Beltian age (Precambrian) that have been intruded by granitic rocks of the Idaho batholith. The Yellowjacket rocks cannot be readily separated into stratigraphic units, but particular types are largely confined to one or the other of three adjacent north-trending structural and compositional units. Vhay has designated these units from east to west, respectively, as the Haynes-Stellite structural block, the Blackbird structural block, and the Lookout structural block. Designation of these blocks is shown on plate 6.

The Haynes-Stellite block is composed of well-bedded quartzites and biotite quartzites that contain thin layers of phyllite. The small biotite crystals in the phyllites lie parallel to the bedding. Ripple marks and cross bedding are occasionally observed in the quartzites.

The Blackbird structural block is the most important because it contains almost all of the known mineral deposits in the district. This block has been subjected to a greater degree of dynamic metamorphism than the adjoining blocks; consequently, all the sedimentary rocks have been metamorphosed to schists. The northern part of this block is characterized by the presence of garnet, chloritoid, hornblende, or cordierite, or associations of several of these minerals, and the southern part by the presence of different proportions of quartz and biotite with small amounts of alkali feldspar, and, locally, considerable muscovite. Bedding in the southern part, generally thin, is usually preserved, except in the highly schistose areas and on the crests of tight folds. In the northern or garnet schist area bedding is usually destroyed, but it can be observed in pure quartzite beds or by concentrations of garnet which mark the original bedding.

The Lookout structural block contains schistose and nonschistose rock types, but well-bedded, nonschistose quartzites and quartz-biotite granulite with various proportions of quartz and biotite predominate. White spots of cordierite are widespread. The northern portion of this block adjoining the granite contact is characterized by the presence of garnet and chloritoid.

The igneous rocks of the district include granitic rocks related to the Idaho batholith, pre-metamorphic basic dikes and post-metamorphic (possibly Tertiary) quartz-feldspar porphyry dikes. Vhay now thinks that all the "granitic rock" and "granite" in the mapped area shown on plates 6 and 7 is strongly metamorphosed Belt sedimentary rock, which should be called porphyroblastic gneiss (oral communication). The granitic rocks lie north of all three structural blocks.

The quartz-feldspar porphyry dikes were intruded after the regional metamorphism and are found within the fault zone separating the Lookout block from the Blackbird block and farther west in the Lookout block.

The gabbro and basic dikes were emplaced before the metamorphism of the country rock and are therefore pre-batholith in age. Some of the gabbro dikes are large enough to be shown on plate 6, but most of the other basic dikes are too narrow to show. The basic dikes are best observed in underground workings as they are closely associated with the mineralized zones. The original mineral constituents of these dikes have been so metamorphosed and altered that they are now unrecognizable.

As indicated on plate 6 the sedimentary rocks in the Blackbird block are everywhere folded, and the folds plunge north between 30° and 45°. Vhay has shown that in the western portion of the block the folds are open and their axial planes are nearly vertical. Toward the eastern edge of the block the folds become increasingly tighter and their axial planes dip less steeply to the west. All the folds plunge between 30° and 45° N.

The folding in the Haynes Stellite block consists of open, wide flexures. The beds generally strike easterly and dip 40°-60° northerly.

Vhay puts the boundary between the Lookout and Blackbird blocks as a steeply dipping, north-trending fault zone, along which are one or more quartz-feldspar porphyry dikes. Shenon and Full have recognized the dikes and fault zone but have extended the biotite schist rocks west of the fault zone as a gradational contact with quartzite, whereas Vhay calls these rocks quartzite and quartz-cordierite-muscovite hornfels. Vhay believes that movement along this fault zone probably was downward and southward on the east side (pls. 6 and 7).

The boundary between the Blackbird and the Haynes Stellite block is more variable in character and controlled to the north by a low angle thrust fault dipping westward. To the south the boundary appears to be a high angle fault where the west side moved either down or to the south. Shenon and Full do not stress the presence of faulting as the boundary between these two blocks; for the most

part, they have mapped gradational contacts, although they have mapped some northwest-striking steeply dipping faults along the boundary (pls. 6 and 7).

According to Vhay several low-angle thrust faults exist in the north part of the Lookout block, and all the blocks are cut by high angle faults. Little is known about the displacement on these faults because of the lack of recognizable key beds in the Yellowjacket formation. Faulting took place before and after the period of ore deposition. Numerous unmineralized faults of both ages have been encountered in the underground workings at Calera and Northfield, but to the writers' knowledge none of these faults have a displacement of over 100 feet. In the underground workings on the 7400 level of the Calera mine these faults usually are braided and occur in zones, creating difficult and expensive mining problems. Post-mineral movement along pre-mineral faults has been observed in the Calera workings.

Ore Deposits

The rocks of the Blackbird block are cut by numerous shear zones; some are the loci of the major ore deposits and others are only slightly mineralized. Vhay has distinguished three general types (oral communication):

1. Those which strike northwest, dip from 50° to 75° NE. and are relatively broad.

2. Those which strike north and dip steeply either east or west are in general narrower and some are related closely to the fold structures.

3. Those which strike northeast and dip steeply either east or west; only a few of these are known and most seem relatively narrow.

The most important northwest-striking mineralized zone in the district is the Chicago shear zone on the Calera property. This zone has been explored underground for approximately 6,600 feet and has been traced on the surface for approximately 9,000 feet. The dip of this zone ranges from less than 30° to over 80°; the average dip is approximately 60° NE. The ore deposits within the zone are usually elongated tabular bodies.

The Merle 3 and the Merle 5 zones on the Northfield property, both northwest-trending, have been traced on the surface for about 2,000 feet. Vhay mentions two other northwest zones--one starts about 300 feet west of the cobalt triangulation station and extends about 1,600 feet to the southeast, and the other is about 1,200 feet

west of the Chicago zone. The Bonanza and the Tinker Pride shear zones to the north are now being explored by Idaho Metallurgical Industries, Inc., under DMEA Contract No. Idm-E884; both zones are northwest trending and northeast dipping (pls. 6 and 7).

The best known of the ore zones that strike north and dip steeply east or west is the Brown Bear zone. This zone has been thoroughly explored by the Calera Mining Company. The deposits in the Brown Bear zone are characterized by chimneylike bodies of disseminated ore that are controlled by the intersection of the shear zone with the crests of tight folds. The ore bodies found along the Queen zone on the Northfield property appear to have some of the characteristics of the Brown Bear zone.

According to Vhay the following metallic minerals are present in the shear zones: pyrite, pyrrhotite, cobaltite, chalcopyrite, safflorite, arsenopyrite, chalcocite and covellite, minor amounts of gold; the gangue consists of quartz, biotite, tourmaline, chlorite, muscovite, carbonates, and minor amounts of vivianite, apatite, and ludlamite are present. The following minerals have been recognized in the zone of oxidation: hematite, goethite, cobalt, chalcanthite, (bieberite?), erythrite, heterogenite(?), pitticite(?), native copper, cuprite, malachite, jarosite, and nontronite.

Geology of the Northfield Area

This section has been summarized from data contained in the Operator's final report, the Shenon and Full report on the area, inspection reports by Wayne Roberts, Geological Survey, and unpublished material from J. S. Vhay. The mineralized zones in the Northfield area are shown on plate 2.

The metamorphic rocks of the area comprise five lithologic units: grey schist, quartz mica schist, biotite schist, quartzite schist, and quartzite. There are, of course, gradations between the types. Pre-mineral basic dikes are present.

The beds exposed, underground and in the trenches, are tightly folded and overturned to the east; dips suggest that two smaller anticlinal structures are present in the Queen zone and a larger anticline in the Merle 3 area. The general strike of the beds is north to northeast; folds plunge 20°-40° N.

Significant concentrations of cobalt and copper are largely confined to the Queen, Merle 3, and Merle 5 shear zones (pl. 2), which are generally referred to simply as zones. It should be emphasized that movement along any one of the shear planes in these zones is probably minor.

On the surface these zones have little expression because of the rather deep weathering in the area and the consequent lack of outcrops. The zones can be traced by geochemical soil-sampling methods and by geophysical methods. When exposed in bulldozer trenches, the most diagnostic features are iron oxide-, jarosite- and malachite-stained surfaces. Gouge may or may not be recognizable. Cobalt bloom is generally absent. The occurrence of copper does not necessarily parallel that of cobalt, but malachite and jarosite are perhaps the most useful guides in the exploration of a zone by trenching.

Queen Area.--The Queen area, the most westerly zone, has been explored by about 20 trenches. Most of these trenches cut mineralized rock and expose a considerable amount of shearing. The results of this work show that it is difficult to trace the continuity of a strong mineralized gossan from one trench to the next one. Under these conditions the pattern of ore deposition, although strong in a particular exposure, appears to be quite spotty when viewed over-all.

Seven DMEA trenches averaging from 150 to 200 feet in length were cut in the immediate area. The strongest gossan was found in the unnumbered trench between Trench 14 and Trench 15 (pl. 2). In this trench the zone was offset by a fault and the same zone was also faulted in Trench 14. The zone in Trench 15 was weak and relatively unmineralized.

The intervening area between the Queen zone and the Merle 3 zone to the east was propsected with a number of trenches to check the highs from the geochemical survey. Exposures of the bedrock revealed that the area had been mildly sheared, and in places mineralized rock was present.

During the summer of 1956 at approximate coordinates 11,590 N, 10,025 E a long diamond drill hole was drilled due west at -55° to a depth of 855 feet for assessment work (hole 15, pl. 2). This hole was drilled in an unprospected area, and most of the hole was in Calera Mining Company ground. Seven zones of mineralized rock were cut. The best zones were cut from 225 to 232 feet, from 328 to 337 feet, and from 447 to 450 feet; the other intersections were weak. A copy of the log of this hole is in the holder. No sample data were available. The mineralized zones intersected in this hole could be the continuation of either the Merle 3 or the Queen zones.

Merle 3 Zone:--This zone, although somewhat irregular when viewed on a plan section, is a rather strong continuous zone within beds of quartzite and quartzite schist. It was originally traced on the surface by trenching for about 1,200 feet. Later trenching by Full and Shonon extended the zone northward for a total length

of approximately 3,000 feet. Full and Shenon think the zone swings north and weakens beyond the original trenching. Vhay believes their work may be on a north-trending structure instead of on the Merle 3 zone and that the Merle 3 may continue northwest into the unprospected area (pls. 2 and 7).

The over-all general strike is from N. 20° to 30° W. with a dip ranging from vertical to steeply east and showing a plunging lineation pattern of from 20° to 40° N. Offsetting of the zone by faulting has been noted and one characteristic of these offsets is that the segments on the north side of the faults are displaced to the west. This displacement has been in the range of 50-75 feet measured horizontally. The width of the Merle 3 zone, as mapped, varies from 30 to 60 feet; the actual width of the zone of differential movement is undoubtedly greater.

The strength of the gossans is not uniform throughout the zone, but mineralized rock consisting of quartz, hydrothermal biotite and some iron gossan was noted in all the zone exposures. Trench cuts north of Cut 1 showed considerably more gossan color than those to the south.

Six inclined diamond drill holes (D9 to D14, inclusive) ranging from 224 to 670 feet in depth were put down in this area to intersect at depth the mineralized zone that had been outlined by trenching. (See plate 2 and the drill logs in holder.) The results of the drilling were very unsatisfactory. The zone was oxidized to at least 200 feet below the surface and cobaltite was recognized in only one drill hole (D11). Since the surface expression of the Merle 3 zone is strong, there should be a reason for the poor showing at depth. Two explanations might be suggested: (1) it is possible that the zone dips vertically or westward, and (2) if the ore shoots occur as plunging lenses, it is possible that the drill holes intersected the barren zone between the ore shoots.

Several other mineralized zones lying just east of the Merle 3 zone have been trenched and the geochemical exploration indicated that a large anomaly is present in this area. The continuity of these zones has not been fully explored (pls. 1 and 2).

Merle 5 Zone:--The Merle 5 zone is about 800 feet east of the Merle 3 zone. The original Northfield trenches and the DMEA trenches traced the Merle 5 for approximately 1,100 feet and later Full and Shenon extended it northward for a total length of approximately 2,400 feet (pls. 2 and 7). The strongest portion of this zone lies between Trench 18 on the south and Trench 5 on the north. Within these limits the zone is readily recognizable as a defined mineralized shear about 160 feet wide lying within unmineralized grey schist and quartzite schist. North of Cut 5 the zone diminishes in width, and the gossan indicates a lowering of mineral

content. The zone also splits into two, and possibly three, relatively smaller shears, and further north Hall and Shenon indicate the zone as a fault paralleled by a basic dike.

Eight surface drill holes (D1 to D8, inclusive) were drilled to test the Merle 5 zone at depths of from 80 to 160 feet below the surface. All holes except D8 showed either sulfide or oxide-sulfide mineralization. DDH's D2 and D7 cut ore or near-ore intersections; DDH's D1, D3, D4, D5, and D6 gave low but interesting assay values that extended over 20-50 feet in width (pl. 2 and drill logs in holder). Information gained from the drilling and trenching was encouraging enough to justify underground exploration. The adit (700XC) was started at an altitude of 7,000 feet and was directed to crosscut the zone. The zone was cut, but heavy ground forced the company to abandon plans to drift along the zone. A lateral drift (701D) about 240 feet long was driven on the east wall of the zone, and four diamond drill holes were drilled across the zone to determine the width and grade of the ore. Drift 702D South was driven to test a favorable zone intersection in DDH's D5, D6, and D7. This work was rather unsatisfactory because the drift was too near the surface and intersected the oxidized portion of the zone (pls. 2, 3, and 4). The underground exploration indicated that this portion of the Merle 5 zone is of ore grade even though much of it is partly oxidized. The grade and reserves are discussed under ore reserves.

The general strike of the ore zone underground is N. 10°-15° W. and its dip is 65°-70° SW. The ore occurs disseminated and as small stringers across the zone with an occasional pod or lenses of predominantly sulfide ore. The walls of the zone are generally poorly defined, and the ore cut-off grade will probably have to be determined by sampling and assaying. The sheared and soft wall rock creates difficult and expensive mining.

THE PROJECT

Geologic Justification

Geochemical prospecting by Geological Survey personnel on the Northfield property indicated anomalies that might correspond to zones containing cobalt (pl. 1). Subsequent trenching by the Northfield Mines, Inc., across these zones cut gossans similar to those overlying the productive zone on the Calera property. The results of this prospecting indicated that cobalt and copper in mineralized zones existed below the gossan and that further exploration by trenching, diamond drilling, and underground exploration was justified.

Northfield Mines, Inc., submitted a proposal to explore its ground for cobalt and copper. The work proposed consisted of

5,500 feet of surface trenching, 2,000 feet of diamond drilling, 1,000 feet of drifting and crosscutting, and 4,500 feet of road and trail construction. It was estimated that the project could be completed in 7 months at a cost of $102,462.50. The proposal was approved with no major changes; the total allowed cost was $102,900, of which the Government's participating share was 70 percent or $72,030. The contract was effective on June 2, 1952, and work started early the following month.

There were seven amendments to the contract which are as follows:

Amendment No. 1, dated August 11, 1952 (effective June 2, 1952) allowed the rental of a cabin for 8 months at $50 per month and deleted $400 under "Miscellaneous" as boarding house loss to cover the cabin rental costs.

Amendment No. 2, dated September 15, 1952, and effective the same date, increased the surface diamond drilling from 2,000 to 3,000 feet by transferring unused bulldozing and road rehabilitation funds plus the differential between actual and allowed cost of completed diamond drilling. This additional footage was used to drill the Nerle 3 zone.

Amendment No. 3, dated November 7, 1952 (effective July 10, 1952) allowed the drifting to be subcontracted and permitted cost for snow removal from the access road to be considered part of the drifting cost.

Amendment No. 4, dated November 19, 1952 (effective June 2, 1952) authorized a full-time engineer-geologist for 5 months instead of a part-time engineer for 7 months. The additional funds required were taken from the amount set up for boarding house loss.

Amendment No. 5, dated March 10, 1953 (effective April 2, 1953) extended the time for the completion period from April 2, 1953, to August 2, 1954.

Amendment No. 6, dated June 9, 1953 (effective June 2, 1952) allowed the Operator to be reimbursed for drifting done by an independent contractor which had not been provided for in the original contract by removing the "allowable maximums" from certain items under the first three categories of Exhibit "A" of the contract.

Amendment No. 7, dated August 6, 1953, and effective the same date, authorized additional exploration on a unit-cost basis and increased the total contract costs from $102,900 to $233,150. The new work authorized by this amendment consisted of the following:

Crosscut the Merle 5 zone from the 702 drift and drift on the zone to the north, the total drifting and crosscutting not to exceed 400 feet. Diamond drill short holes from the drift to test the zone with approximately 400 feet of drilling allowed.

Crosscut a maximum of 1,200 feet from the 702 drift to the Merle 3 zone and drift north and south on the zone for approximately 550 feet. Crosscut an additional 300 feet and diamond drill a total of 600 feet at locations selected by the Operator with the approval of the Field Team. In the event that any other mineralized zones were encountered, provision was made to allow approximately 300 feet of drifting and 200 feet of diamond drilling. Other items authorized by Amendment No. 7 were 21 diamond drill stations, 250 hours of bulldozing for snow removal, 600 copper and cobalt assays, and an allowance of $5,000 for mine maintenance.

The project progressed uninterruptedly from July 1952 to October 1, 1953, when the contract was terminated by mutual agreement. The work authorized by Amendment No. 7 was not completed.

Ore Reserves

The underground workings have outlined ore-grade material, but as the continuity of the material is unknown, there was no attempt to calculate inferred reserve tonnage.

The ore cut-off grade is based upon that used in the Calera operation, as reported to the writers in December 1955. At that time Calera's cut-off grade was 0.6 percent equivalent cobalt. Equivalent cobalt is derived by dividing the copper assay by 6 and adding the result to the cobalt assay.

The outline of the ore zone in underground workings is shown on plate 4. Based on sample assays, there is a reserve of 532 tons of indicated ore per foot of depth with a calculated grade of 0.453 percent cobalt and 1.176 percent copper or 0.649 percent equivalent cobalt.

Surface trenches have exposed a strong and continuous vein for approximately 400 feet south of the 7000 level adit where it apparently ends against a northeast-trending fault that dips approximately 60° NW. If the vein continues for this distance and averages 20 feet in width, another 800 tons of mineralized rock per foot depth can be inferred. The surface indications of the vein north of the face of the 702 drift weaken, and no estimate of reserves in this direction can be made until further exploration has been done.

No ore reserves can be estimated for the Merle 3 and Queen zones.

Summary of Factual Data

Following are the work units that were completed, and their cost:

Item	Units completed	Actual cost per unit	Total cost
Drifting and crosscutting	840.2 ft.	$72.57/ft.	$ 60,976.35
Diamond drilling	4,752.0 ft.	4.61/ft.	21,917.20
Trenching	425.5 hrs.	13.40/hr.	5,700.50
Roads and trails	141.0 hrs.	13.00/hr.	1,832.50
Assays			9,684.66
Operating equipment			1,601.79
Initial rehabilitation & repairs			3,724.62
Total approved costs			$105,437.62
Less proceeds from property disposition			8,575.00
Net cost of project			$ 96,862.62

Total amount of contract	$233,150.00
Government's share at 70 percent	163,205.00
Total amount expended	$ 96,862.62
Government's participation	67,803.83
Total amount unexpended	$136,287.38
Government share unexpended	95,401.17
Royalty payments received	none

Factors causing the high drifting and crosscutting costs were heavy ground, inexperienced labor, and poor administration.

No ore was mined during the contract period, and no royalty is due the Government. Since the termination of the project, the property has remained idle except for the necessary assessment work.

All major operating equipment was rented. Operating materials and supplies costing $21,118.96 had a salvage value of $8,575. The salvage proceeds were deducted from the cost of the project.

Exploration Possibilities

This property is a potential producer of cobalt and further exploration is warranted. The following suggestions are offered as guides to future work that might be done in this area.

The best exploration target is the Merle 5 zone because the DMEA exploration has determined that a minable ore zone exists. However, this zone should be explored at depth and laterally beyond the present underground workings. The first step in this exploration would be long diamond drill holes, spaced at intervals of 200-300 feet, drilled to intersect the vein between 300-400 feet below the surface. If this drilling proved favorable, deeper underground exploration should follow.

In conjunction with the above drilling exploration, the Merle 3 zone should be redrilled with deeper and flatter holes than previously drilled. These holes would determine if the zone dips vertically or westward instead of eastward, as was previously believed, and would establish the depth of oxidation. If this drilling proved successful, the Merle 3 zone could be explored either from the present adit as outlined by Amendment No. 7 or from the underground work proposed above on the Merle 5 zone.

The larger sized diamond drill bits give better core recovery. This is evident in the good recovery obtained from hole 15 (pl. 2) drilled during the summer of 1956 for assessment work. (See the log in holder.)

Exploitation Possibilities

The reserves of oxidized or partially oxidized ore above the project level are too small for a profitable operation, and it is believed that these reserves may not be mined. Adverse factors to be considered in planning any future exploration are the poor ground conditions, which will create expensive mining, and probable dilution from poor wall rock.

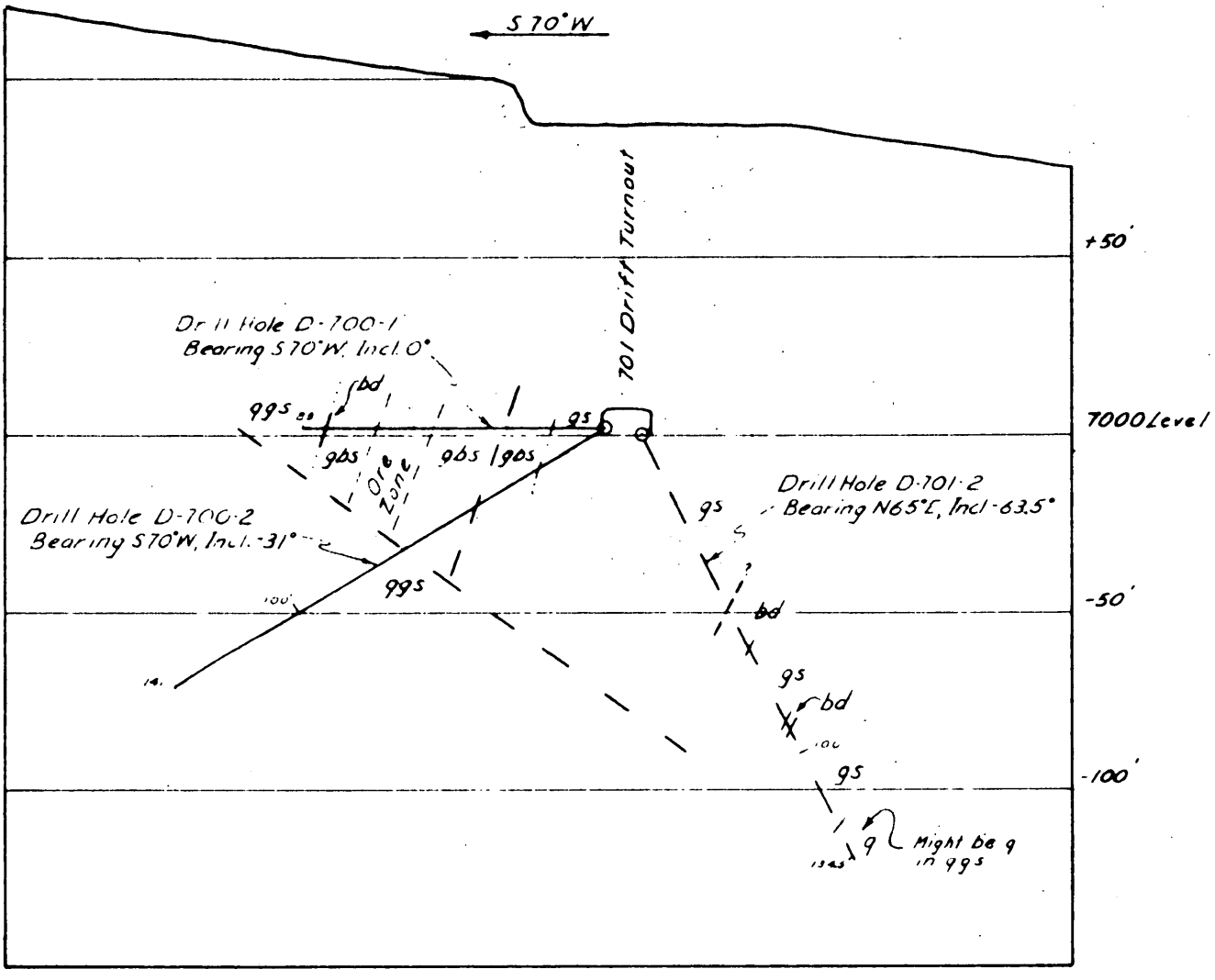
If sufficient ore reserves are found to warrant a mill, it is known from the present Calera operation that the cobalt recovery will be approximately 80 percent, with satisfactory copper recovery.

Discussion of Conclusions

Work on the project was done in a reasonably competent manner. Administration of the contract was complicated by some of the terms in the actual cost contract, the Operator's methods of submitting vouchers, and the Operator's loose, but lengthy, chain of command.

The results of the project showed that the ore zone oxidation is deep and that ground conditions are difficult; they also show that minable ore exists along the Merle 5 zone. The Merle 3 zone is strong on the surface and warrants further deep exploration. Government participation in such work is warranted.

Enclosures
Distribution:
DMEA(4) ✓
USBM(5)
USGS(SRO)
Docket
Nickelson



ASSAY RESULTS

No.	Interval	Type	%Co	%Cu
D-700-2-1	0-10'	Core	0.022	0.15
-2	10-20.5'	"	0.029	0.07
-3	24.5-31'	"	0.220	0.43
-4	31-36	"	0.059	1.54
-5	36-41'	"	0.183	1.01
-6	41-48'	"	0.044	0.50
-7	48-53'	"	0.044	0.60
-8	53-63'	"	0.059	0.17
-9	63-73'	"		
-10	73-93'	"		
-11	93-107'	"		
-12	107-122'	"		
-13	131-141'	"		

LEGEND

- qs — Grey Schist
- q — Quartzite
- qgs — Quartzite-Grey Schist (intercalated)
- qtz — Quartz
- qms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- ms — Mineralization-qtz., Fe gossan & Sulfides
- ms — Mineralization-Cobalt
- —— Contact
- —— Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho

SECTION 1

Scale: 1" = 50'

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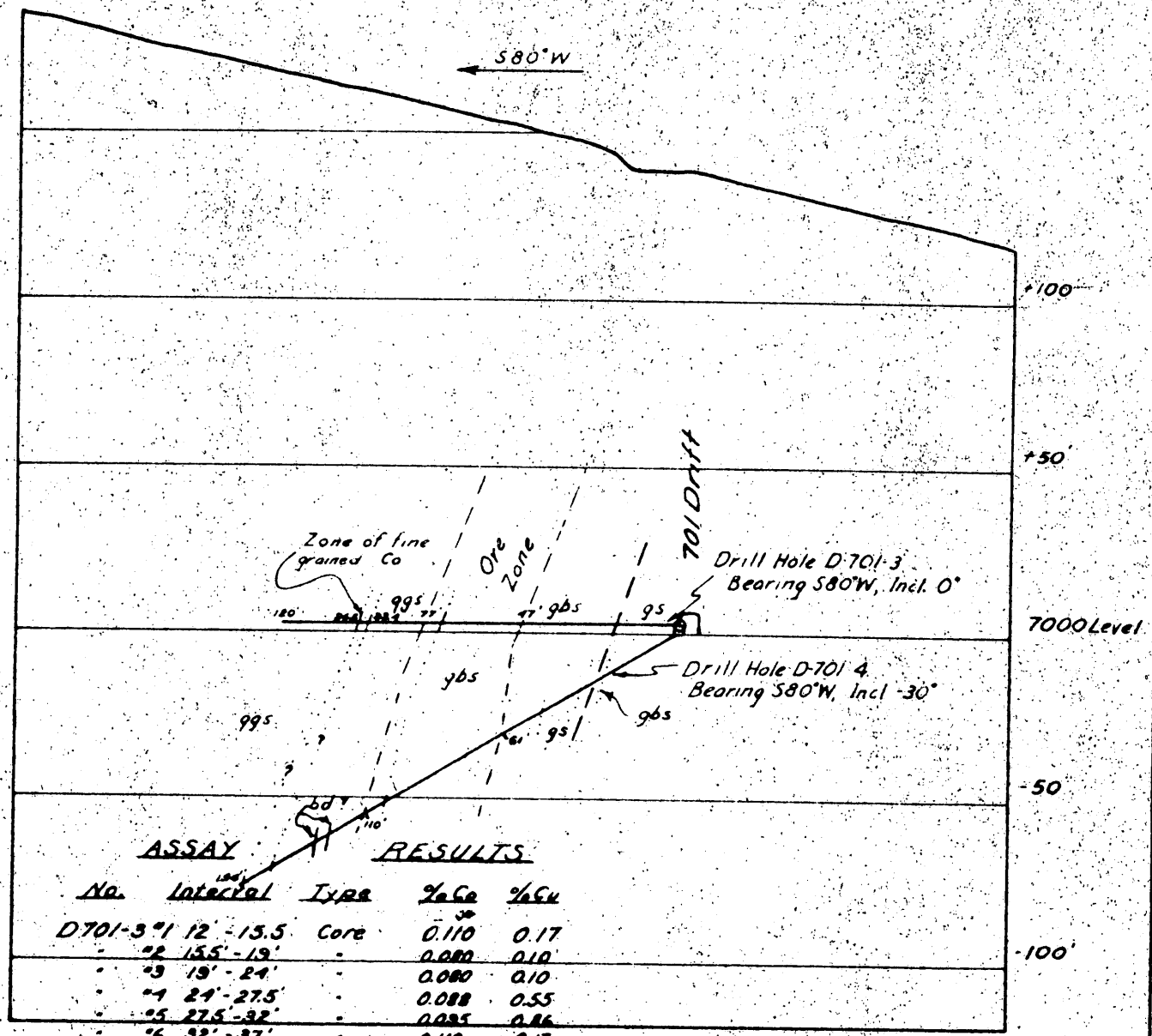

ASSAY RESULTS

No.	Interval	Type	%Co	%Cu
D701-3 #1	12'-15.5'	Core	0.110	0.17
" #2	15.5'-19'	"	0.080	0.10
" #3	19'-24'	"	0.080	0.10
" #4	24'-27.5'	"	0.088	0.55
" #5	27.5'-32'	"	0.095	0.86
" #6	32'-37'	"	0.110	0.17
" #7	37'-42.5'	"	0.095	0.38
" #8	42.5'-47'	"	0.102	0.40
" #9	47'-50'	"	0.763	2.10
" #10	50'-52.5'	"	0.477	1.27
" #11	52.8'-57'	"	0.374	0.83
" #12	57'-60'	"	0.073	0.22
" #13	60'-63'	"	0.697	0.55
" #14	63'-68'	"	0.469	1.05
" #15	63'-68'	Sludge	0.249	1.39
" #16	68'-73'	Core	0.660	0.73
" #17	68'-73'	Sludge	1.027	0.88
" #18	73'-77'	Core	0.469	1.21
" #19	93.4'-96.5'	"	0.822	0.80
D701-3 #20	93.5'-96.5'	Sludge	1.057	1.21
D701-4 #1	31.2'-34'	Core	0.103	0.60
" #2	34'-36'	"	0.117	0.48
" #3	51'-54'	"	0.103	0.71
" #4	54'-57.5'	"	0.088	0.63
" #5	57.5'-61.5'	"	0.073	0.43
" #6	61.5'-67.0'	"	0.308	0.68
" #7	67'-73'	"	0.367	1.95
" #8	73'-78'	"	0.396	0.58
" #9	78'-86.5'	"	0.147	0.68
" #10	86.5'-94'	"	0.367	0.43
" #11	95'-102'	"	0.624	0.33
" #12	102'-108.6'	"	0.374	1.14
" #13	129'-132.5'	"	0.132	0.76
" #14	57.5'-108.5'	Composite	0.237	0.81
D701-4 #15	141'-152'	Core	0.147	0.63

LEGEND

- gs — Grey Schist
- q — Quartzite
- 99s — Quartzite-Grey Schist (intercalated)
- qtz — Quartz
- qms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- ms — Mineralization qtz., Fe gossan & Sulfides
- ms — Mineralization Cobalt
- Contact
- Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho

SECTION 2

Scale 1" = 50'

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DIAMOND DRILL HOLE NO. D 15

DESCRIPTIVE LOG

NORTHFIELD MINES, INCORPORATED
STEVENSON PROPERTY
LEMHI COUNTY, IDAHO

DIAMOND DRILL HOLE NO.D15
DESCRIPTIVE LOG

Coordinates: 101,540 N
100,050 E
Collar Elevation: 7140' Approx.

Direction: West
Inclination: -55°
Depth: 855 Feet

Footage From	To	% Core Rec'y	Size	Description
0.0	5.0	80	NX	Light gray QBS, light iron stain on fract, no apparent min, core soft and weathered
5.0	8.0	90	NX	Light gray QBS, minor iron staining on fract, no apparent min
8.0	11.0	80	NX	Light gray, massive QBS, light iron stain on fract, no apparent min
11.0	13.0	100	NX	Light gray, massive QBS, very biotitic top 0.5' of run, light to mod weathering, no apparent min
13.0	18.0	100	NX	Light gray QBS, mod to int silic, lower 20" of run vuggy and int iron stained, probable oxidized min
18.0	23.0	80	NX	Light gray QBS, with some very biotitic bands, light silic with iron stain on fract, top 6" vuggy
23.0	28.0	90	NX	Light gray QBS, top 6" of run lightly silic, soft and weathered
28.0	30.0	75	NX	Light gray QBS, mod weathered, no apparent min
30.0	35.0	100	NX	Lightly silic gray QBS, generally massive with minor iron staining, 0.3' of weak gossan at 33', mod. weathering, no apparent min
35.0	40.0	80	NX	Light gray QBS, top 1.0' mod weathered, balance of run lightly silic, with fine quartz stringers, light iron staining, min not apparent
40.0	45.0	60	NX	Light gray QBS, lightly iron stained and weathered, no apparent min

Footage From	Footage To	% Core Rec'y	Size	Description
45.0	46.0	100	NX	Light gray QBS, soft and weathered, no apparent min
46.0	49.0	100	NX	Light gray, massive QBS, soft and weathered, no apparent min
49.0	54.0	80	NX	Light gray QBS, soft and weathered, no apparent min
54.0	55.0	100	NX	Light gray QBS, soft and weathered, iron stained on fract, no apparent min
55.0	60.2	97	NX	Light gray QBS, some irreg light silic, 1/4" of gossan at 59', core weathered with iron stain on fract, no apparent min
60.2	63.5	100	NX	Light gray, frag QBS, soft and weathered, iron staining on fract, 1" of quartz at top of run, no apparent min
63.5	68.5	100	NX	Light gray QBS, slightly qtzitic, 1.0' of weathered biotite schist at 65 feet. Iron stain on fract, no apparent min
68.5	73.3	80	NX	Light gray qtzitic QBS with minor iron stain on fract, iron stained qtz frags at bottom of run, no apparent min
73.3	79.0	75	NX	Upper 5' of run light gray QBS with light iron stain on fract, lower 0.7' intensely broken, may indicate movement, no apparent min
79.0	82.0	100	NX	Alternating bands of light gray QBS and dark green biotite schist, lower part of run mod to int weathered, 0.2' of qtz at 80.5', no apparent min
82.0	85.4	90	NX	Greenish-gray QBS with irreg zones of biotite schist up to 3", mod to int weathered with consid iron stain, lower 6" of run schist and qtz pebbles, no apparent min
85.4	90.0	100	NX	Light gray QBS, upper 3.6' of run soft and mod to int weathered, iron stain on fract, lower 1' lightly silic with occ fine qtz stringers, no apparent min
90.0	95.3	100	NX	Light gray QBS, upper 2.5' of run lightly weathered, with iron stain on fract, lower 2.8' lightly silic with iron stain on fract, no apparent min

Footage From	Footage To	% Core Rec'y	Size	Description
95.3	101.0	95	NX	Light gray, generally massive QBS, lower 0.4' of run sandy, may indicate movement, no apparent min
101.0	105.6	90	NX	Upper 0.5' of run lightly silic QBS with minor iron stain, lower 4.0' of run is fresh black biotite schist with fine qtz stringers, no apparent min
105.6	111.2	100	NX	Light gray QBS with bands of black biotite schist up to 0.3' wide, light iron staining on fract, rather blocky, no apparent min
111.2	116.0	100	NX	Alternating bands up to 0.5' wide of light to mod silic QBS and black biotite schist, no apparent min
116.0	121.0	90	NX	Lightly silic QBS with occ bands of biotite schist, rock generally fresh, no apparent min
121.0	126.0	85	NX	Upper mod silic QBS, balance of run weathered and iron stained, 1.0' of mod silic QBS with gossan and minor jarosite staining, completely oxidized at 125.0' to 155.0'
126.0	131.0	85	NX	Gray QBS, light to mod silic, 0.5' seam of biotite schist at 129.5', upper half of core weathered, one or two blebs of cobaltite in lower half of run, min very weak
131.0	135.4	80	NX	Top 12" of run light gray mod silic QBS, iron stained and weathered, next 2 1/2' only frags of qtz and biotite schist recovered, lower part of run very biotitic, some small vugs
135.4	141.0	90	NX	Light gray QBS, light to mod silic, weathered and iron stained on fract, no apparent min
141.0	146.0	100	NX	Light gray, mod silic QBS with occ bands of very biotitic QBS, a few flecks of cobaltite at 144.5', min very weak
146.0	151.0	100	NX	Light to mod silic gray QBS with occ fine qtz stringers, a few blebs of cobaltite at 147', lower part of run weathered on fract, min minor

Footage From	Footage To	% Core Rec'y	Size	Description
151.0	156.0	100	NX	Light gray to gray qtzitic QBS, blocky, no apparent min
156.0	161.0	100	NX	Gray qtzitic QBS, blocky, light iron stain on fract
161.0	166.0	100	NX	Gray qtzitic QBS, blocky, occ biotitic seams, no apparent min
166.0	171.0	100	NX	Irreg silic QBS and qtzitic QBS, light gray to gray, some fine stringers of qtz, lower 1.0' of run weathered and iron stained, no apparent min
171.0	176.0	100	NX	Top 0.2' gougy QBS, next 1.0' int broken and iron stained on fract, balance of run massive and blocky gray QBS with light iron stain on fract, no apparent min
176.0	181.0	100	NX	Gray qtzitic QBS, blocky with iron stain on fract, no apparent min
181.0	186.0	100	NX	Qtzitic QBS becoming silic in lower half of run, blocky, no apparent min
186.0	191.6	100	NX	Mod silic gray QBS, blocky, with a few flecks of pyrrhotite in lower foot of run
191.6	197.0	100	NX	Mod to int silic gray QBS, top 3.0' of run iron stained on fract, from 294.6' to 296.0' occ fine blebs of cobaltite, min minor
197.0	201.8	100	NX	Int silic gray QBS, blocky, with light iron stain on fract, occ small blebs of chalco with some pyrite, min very weak
201.8	205.8	100	NX	Int silic QBS, fract, iron stained vugs indicate probable oxidized sulfides, min very weak
205.8	210.8	85	NX	Mod to int silic QBS, lower 1.5' frag and vuggy, indicating oxidized mtl, weak iron stain, occ flecks of chalco in lower 0.3' of run, min very weak
210.8	215.8	90	NX	Top 2.5' of run sheared basic dike, lower 2.5' frag of silic QBS with minor sulfides and fault gouge
215.8	221.0	55	NX	Top 0.5' fault gouge, bal mod silic, frag QBS, light oxidation, no apparent min

Footage From	Footage To	% Rec'y	Size	Description
221.0	225.2	95	NX	Mod to int silic QBS, int iron stained on fract, only frag recovered, min not appar
225.2	228.0	100	NX	Top 0.5' frag, int silic QBS, bal of run qtz with very heavy iron sulfides and chalcocite stain, min int
228.0	232.0	90	BX	Top 0.5' int silic QBS with fine qtz stringers and a few flecks of sulfides, next 2.5' silic QBS with gossan and int iron stain, lower 1.0' dark green biotite schist with stringers of qtz and occ finely diss cobaltite, mod to int min
232.0	236.0	85	BX	Light to mod silic QBS, upper 3.5' int iron stained and weathered, a few flecks of chalco and pyrite in top 0.5'
236.0	241.0	100	BX	Lightly silic QBS with occ stringers of qtz, iron stain on fract, no apparent min
241.0	246.0	100	BX	Lightly silic, generally massive QBS, light to mod iron stain on fract, no apparent min
246.0	249.8	100	BX	Mod silic light gray QBS, blocky, iron stain on fract, no apparent min
249.8	252.8	100	BX	Mod silic light gray blocky QBS, iron stain on fract, no apparent min
252.8	257.9	100	BX	Mod silic blocky QBS, with occ iron stain on fract, no apparent min
257.9	263.4	95	BX	Lightly silic, light gray blocky QBS, iron stain on fract, no apparent min
263.4	268.7	100	BX	Light gray, frag and iron stain QBS, considerable weathering, no apparent min
268.7	274.0	100	BX	Upper half of run massive, lightly silic QBS, lower half of run light to mod weathered and iron stain, 0.6' of chalco with chalcocite, partially oxidized at 272.0', min weak
274.0	279.0	100	BX	Light gray well banded QBS, weak iron stain on fract, no apparent min
279.0	284.0	100	BX	Light gray QBS, fresh, blocky, no apparent min
284.0	289.0	100	BX	Light gray qtzitic QBS, 0.6' of iron stain qtz with pyrite at 287.0', blocky, no apparent min

Footage From	Footage To	% Core Rec'y	Size	Description
289.0	294.0	100	BX	Light gray blocky qtzitic QBS, with iron stain on fract, no apparent min
294.0	299.0	90	BX	Light gray, rather qtzitic QBS with zones of iron stain, frag in lower 1.5' of run, no apparent min
299.0	304.0	100	BX	Light gray qtzitic QBS with iron stain on fract, rock appears bleached, no apparent min
304.0	309.0	95	BX	Light gray QBS, blocky, with occ zones of iron stain, lower 1.5' consists of sandy gouge cementing breccia, no apparent min
309.0	314.0	90	BX	Light gray frag QBS, lightly silic, with minor iron stain, no apparent min
314.0	319.0	90	BX	Light to mod silic QBS, frag and rather massive, no apparent min
319.0	324.0	90	BX	Mod silic frag QBS, occ flecks of pyrite, min very weak
324.0	329.0	90	BX	Mod silic QBS alternating with bands of green biotite schist and qtz seams, lower foot of run int min with chalco, pyrite, and cobaltite in qtz and biotite schist gangue
329.0	334.0	100	BX	Top 4.0' of run int min biotite schist and qtz with chalco, pyrite, and cobaltite, lower foot of run basic dike, slight weathering
334.0	339.0	100	BX	Light to mod silic gray QBS with occ fine stringers of qtz, 0.7' of chalco, pyrite, and cobaltite in a gangue of qtz and biotite schist at 337'
339.0	344.0	100	BX	Light to mod silic QBS, with occ stringers of qtz with fine blebs of chalco, min very weak
344.0	348.5	100	BX	Mod to int silic gray QBS, blocky, lower 1.0' fault gouge with breccia and slickensides, no apparent min
348.5	353.7	80	BX	Top 0.2' breccia cemented with gouge, lower 5.0' mod silic blocky QBS, no apparent min
353.7	357.5	90	BX	Light to mod silic blocky QBS, min not apparent

Footage From	Footage To	% Core Rec'y	Size	Description
357.5	362.5	100	BX	Light to mod silic blocky QBS, no apparent min
362.5	372.5	90	BX	Mod to int silic blocky QBS with occ flecks of chalco and pyrite, min very weak
372.5	376.8	90	BX	Mod to int silic frag QBS with flecks of pyrite and chalco throughout, min weak
376.8	378.8	100	BX	Mod to int silic QBS, frag, no appar min
378.8	383.8	50	BX	Int silic blocky QBS, no apparent min
383.8	388.7	100	BX	Int silic QBS, qtzitic bands alternating with biotitic bands, blocky, a small bleb of chalco at 387.3', otherwise no apparent min
388.7	393.9	100	BX	Mod to int silic qtzitic QBS, top 3.0' dark green biotite schist, no apparent min
393.9	398.8	100	BX	Int silic qtzitic QBS with biotitic bands up to 2.0', occ large blebs of chalco along qtz healed fract, min very weak
398.8	403.8	100	BX	Mod silic qtzitic QBS, blocky, min not apparent
403.8	410.0	100	BX	Light to mod silic qtzitic QBS, biotitic bands irr and crenulated, blocky, no apparent min
410.0	413.1	85	BX	Gray frag QBS with irreg silic, no apparent min
413.1	418.2	100	BX	Soft, generally massive QBS with occ qtzitic seams, 0.2' basic dike at 411.5', lower 0.3' of run basic dike, no appar min
418.2	422.0	100	BX	Top 3' of run brown basic dike followed by 1.0' of int silic and frag QBS, rest of run mod silic QBS, no apparent min
422.0	424.3	100	BX	Gray to dark gray qtzitic QBS, very frag, no apparent min
424.3	429.0	100	BX	Gray qtzitic QBS with irreg biotite bands and irreg silic, no apparent min
429.0	434.0	100	BX	Gray generally massive QBS with occ fine qtz stringers, occ chalco flecks, min weak

Footage From	Footage To	% Core Rec'y	Size	Description
434.0	439.0	80	BX	Top 1.6' int silic qtzitic QBS, generally frag, no apparent min. Next 1.4' int min biotite schist and qtz, min consists of pyrite, chalco and diss cobaltite. Lower 2.0' of run sheared and frag biotite schist
439.0	442.5	80	BX	Int silic frag QBS with flecks of chalco and occ cobaltite, min very weak
442.5	447.0	40	BX	Int silic QBS, very frag, some flecks of chalco, min very weak
447.0	449.8	100	BX	Int silic QBS, frag, with consid chalco and pyrite and fine grained cobaltite, min mod to intense
449.8	454.8	100	BX	Light to mod silic gray QBS, slightly qtzitic with only an occ fleck of chalco, minor min
454.8	458.0	100	BX	Mod silic and blocky QBS with one or two stringers of chalco in lower 3.0' of run, min very weak
458.0	463.0	100	BX	Light to mod silic blocky qtzitic QBS with fine stringers of siderite on fract, no apparent min
463.0	468.0	100	BX	Light to mod silic QBS, mod fract with siderite on fract, lower 3.0' has altered look with numerous bands and seams of siderite, no apparent min
468.0	469.3	100	BX	Altered mtl, very argillaceous with numerous streaks of siderite, badly fract, no apparent min
469.3	474.3	100	BX	Light to mod silic QBS, somewhat qtzitic toward bottom of run, no apparent min
474.3	479.3	100	BX	Qtzitic QBS with some irreg silic and some zones of argillaceous mtl at bottom of run, no apparent min
479.3	484.3	100	BX	Mod to int silic qtzitic QBS, blocky, occ sulfide blebs and streaks, minor min
484.3	489.0	100	BX	Mod to int silic qtzitic QBS with an occ fleck of sulfides, min minor
489.0	493.4	100	BX	Mod silic qtzitic QBS interbedded with qtzite, no apparent min

Footage From	Footage To	% Core Rec'y	Size	Description
493.4	497.0	100	BX	Top 3.0' qtzite interbedded with QBS, mod silic and blocky, lower 6.0' of run very biotitic, no apparent min
497.0	502.0	100	BX	Mod silic qtzitic QBS, blocky, thick to massive bedded, 0.1' qtz stringer at 501', no apparent min
502.0	506.5	100	BX	Light to mod silic qtzitic QBS, blocky, banding contorted, no apparent min
506.5	510.8	100	BX	Gray qtzitic QBS, with biotitic bands, no apparent min
510.8	515.8	85	BX	Gray to dark gray qtzitic QBS becoming very biotitic at bottom of run, blocky with contorted banding, no apparent min
515.8	520.8	80	BX	Frag biotitic QBS, no apparent min
520.8	525.8	80	BX	Frag, lightly silic qtzitic QBS, lower 1.0' is gouge and breccia
525.8	531.0	100	BX	Black, dense biotite schist grading to light to mod silic QBS in lower 2.5' of run, 0.4' of barren qtz at 530.5', no apparent min
531.0	536.0	100	BX	Mod silic QBS, blocky, a few flecks of sulfides at 535.0', min very weak
536.0	539.5	100	BX	Mod to int silic qtzitic QBS, blocky, a few flecks of chalco in lower 0.1' of run, min very weak
539.5	544.0	100	BX	Mod to int silic QBS with bands of dark green biotite schist, banding crenulated and disturbed, light greenish-blue stain on fract, occ blebs of sulfides in lower 2.0' of run, 0.3' of qtz at 543.5', min very weak
544.0	548.0	100	BX	Light to mod silic QBS, thin to medium bedded with flecks of chalco throughout run, min very weak
548.0	553.0	100	BX	Mod silic QBS appears disturbed, fine stringers and flecks of chalco along qtz stringers, min very weak
553.0	558.0	100	BX	Irreg silic QBS with qtz stringers 0.05' wide, chalco and pyrite occur as stringers and blebs along qtz stringers, min very weak to weak

Footage From	Footage To	% Core Rec'y	Size	Description
558.0	563.0	100	BX	Gray QBS, banding crenulated, core appears very argillaceous, no apparent min
563.0	568.0	100	BX	Irreg silic gray QBS, lower 2.0' of run very argillaceous, with flecks and fine streaks of siderite, no apparent min
568.0	572.0	100	BX	Light to mod silic QBS, top 1.5' generally argillaceous, no apparent min
572.0	577.0	100	BX	Irreg silic QBS, banding slightly contorted, no apparent min
577.0	581.5	100	BX	Lightly and irreg silic QBS, no apparent min
581.5	586.5	100	BX	Lightly silic QBS, banding contorted and offset by minor fract, no apparent min
586.5	591.0	100	BX	Lightly silic gray QBS, top 2.5' flecks of sulfides and occ blebs of cobaltite, banding disturbed, lower 2.0' shows no min, min very weak
591.0	596.0	100	BX	Irreg silic QBS, occ flecks of sulfides, min very weak
596.0	601.0	100	BX	Thin to medium bedded QBS, an occ fleck of sulfides, very minor min
601.0	605.5	100	BX	Upper 2.5' black biotite schist with seams and stringers of qtz with associated flecks of pyrite, chalco, and occ blebs of cobaltite, lower 2.0' of run qtzitic QBS with sulfides, min weak
605.5	609.5	100	BX	Light to mod silic qtzitic QBS with occ fine stringers of sulfides, min very weak
609.5	614.0	100	BX	Top 1.0' of run greenish black biotite schist with qtz stringers and blebs of sulfides common, lower 3.5' of run grades to silic qtzitic QBS with sulfides common and an occ fleck of cobaltite, min weak to moderate
614.0	618.2	90	BX	Thin to medium bedded QBS with a few irreg fine stringers of qtz, occ flecks of sulfides, min minor
618.2	622.5	80	BX	Light to mod silic frag QBS with a few flecks of chalco at bottom of run, min minor

Footage From	Footage To	% Core Rec'y	Size	Description
622.5	627.0	100	BX	Irreg silic QBS with seams of biotite schist thruout, 0.8' of biotite schist at 626.0', no apparent min
627.0	631.0	95	BX	Well banded qtzitic QBS, lower 1.0' lightly silic, no apparent min
631.0	634.8	100	BX	Irreg silic qtzitic QBS, no apparent min
634.8	639.8	85	BX	Lightly silic QBS, no apparent min
639.8	642.0	100	AX	Mod silic QBS, generally frag, no apparent min
642.0	647.0	80	AX	Mod silic qtzitic QBS, no apparent min
647.0	652.0	90	AX	Light gray qtzitic QBS, irreg silic, no apparent min
652.0	657.0	40	AX	Irreg silic QBS with qtzitic layers, occ fine qtz stringers, core loss due to redrilling, no apparent min
657.0	660.0	100	AX	Top 1.5' brownish argillaceous qtzite, lower 1.5' generally massive bedded qtzite, no apparent min
660.0	665.0	90	AX	Light to mod silic QBS, occ fine qtz stringers, no apparent min
665.0	670.0	100	AX	Thin to medium bedded QBS, irreg and lightly silic, no apparent min
670.0	674.0	100	AX	Interbedded biotite schist and QBS, fine qtz stringers thruout, 0.3' barren qtz at 670.0', no apparent min
674.0	679.0	100	AX	Light to mod silic QBS, blocky, no apparent min
679.0	684.0	100	AX	Mod silic QBS, bands slightly contorted, a fleck of chalco at 685.0', min minor
684.0	689.5	100	AX	Mod silic QBS, more sandy mtl qtzitic, no apparent min
689.5	694.5	100	AX	Mod silic, generally massive schistose qtzite, argillaceous in lower 1.0' of run, 1 foot of qtz at 693.5', no apparent min
694.5	699.5	95	AX	Lightly silic QBS, no apparent min

Footage From	Footage To	% Core Rec'y	Size	Description
699.5	704.5	100	AX	Lightly silic qtzitic QBS, banding irreg and contorted, no apparent min
704.5	707.5	95	AX	Irreg silic QBS, sandy layers qtzitic, no apparent min
707.5	712.0	100	AX	Lightly silic qtzitic QBS, massive, blocky, no apparent min
712.0	715.5	100	AX	Light to mod silic qtzite and interbedded QBS, no apparent min
715.5	720.5	50	AX	Mod to int silic frag QBS, no apparent min
720.5	725.5	100	AX	Upper 4.0' massive schistose qtzite, lower 1.0' qtzitic QBS with lightly contorted banding, no apparent min
725.5	730.5	100	AX	Generally qtzite, slightly schistose, some siderite along healed fract, no apparent min
730.5	735.5	100	AX	Light gray qtzite, rather schistose and argillaceous, massive, no apparent min
735.5	740.5	100	AX	Light to mod silic schistose qtzite with argillaceous zones thruout, no apparent min
740.5	745.5	95	AX	Thin bedded argillaceous qtzite, schistose with fine stringers of siderite thruout, 0.3' sheared basic dike at 742.0', no apparent min
745.5	749.0	90	AX	Upper 2.0' of run thin bedded argillaceous qtzite, lower 1.5' of run mod silic qtzitic QBS, 0.4' of barren qtz at 748.0', no apparent min
749.0	754.0	100	AX	Lightly silic qtzitic QBS, banding slightly contorted, no apparent min
754.0	759.0	100	AX	Light to mod silic schistose qtzite, no apparent min
759.0	764.0	100	AX	Mod silic schistose qtzite, rather blocky, generally massive, no apparent min
764.0	769.0	100	AX	Mod to int silic qtzitic QBS, banding contorted with a few siderite stringers, no apparent min
769.0	774.0	90	AX	Mod to int silic qtzitic QBS, frag and blocky, very biotitic in lower 1.0' of run, occ flecks of chalco, min very weak

Footage From	Footage To	% Core Rec'y	Size	Description
774.0	779.0	45	AX	Mod to int silic frag QBS, mod chalco min in lower 0.5' of run
779.0	784.0	90	AX	Dark green biotite schist and qtz with flecks of chalco, no cobaltite observed, min weak
784.0	789.0	50	AX	Thin bedded irreg silic frag QBS, occ small stringers of chalco and some siderite, min very weak
789.0	794.0	60	AX	Very frag light to mod silic QBS, 0.2' of gouge and breccia at 790.0'. No apparent min
794.0	799.5	95	AX	Top 1.0' of run sheared basic dike, next 2.5' is mod silic qtzitic QBS with stringers of siderite and qtz, lower 2.0' of run is green biotite schist and qtz with occ flecks of pyrite and chalco, min very weak
799.5	805.0	100	AX	Light gray, generally massive and blocky QBS, no apparent min
805.0	810.0	95	AX	Light gray, irreg silic qtzitic QBS, banding slightly contorted, a fleck of chalco at 805.8', otherwise no apparent min
810.0	815.0	100	AX	Upper 1.5' mod silic QBS, lower part of run irreg silic, no apparent min
815.0	820.0	100	AX	Light gray qtzitic QBS and schistose qtzite, massive with occ siderite stringers, no apparent min
820.0	825.0	100	AX	Light gray schistose qtzite, no apparent min
825.0	830.0	100	AX	Gray QBS, biotitic bands lightly contorted, no apparent min
830.0	835.0	100	AX	Light gray schistose qtzite with some chlorite along tight fract, no apparent min
835.0	840.0	100	AX	Light gray schistose qtzite with occ fine stringers of siderite, no apparent min

Footage From	Footage To	% Core Rec'y	Size	Description
840.0	845.0	100	AX	Light silic gray QBS, banding somewhat contorted, no apparent min
845.0	850.0	100	AX	Lightly silic gray QBS, a fine fleck of chalco at 846.0', otherwise no apparent min
850.0	855.0	100	AX	Lightly silic gray QBS, banding lightly contorted, no apparent min

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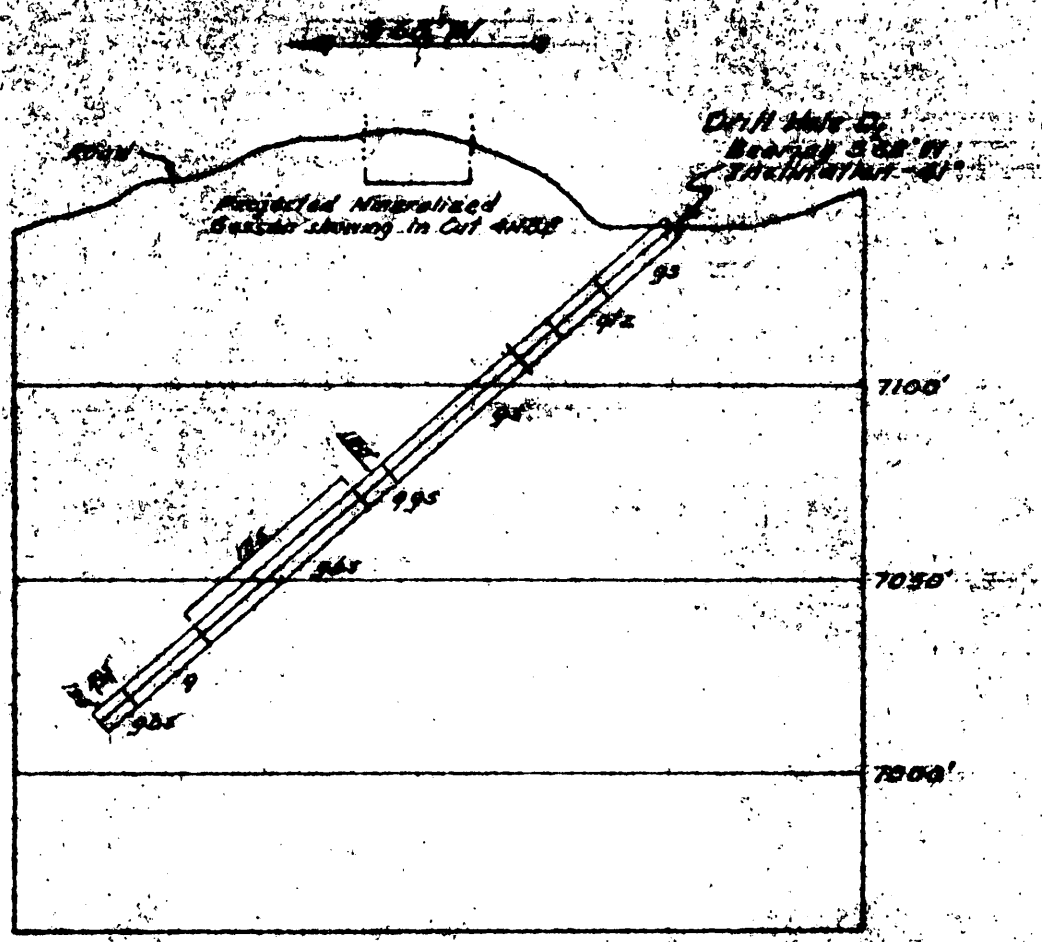
DATE	INITIALS	CODE



ASSAY RESULTS

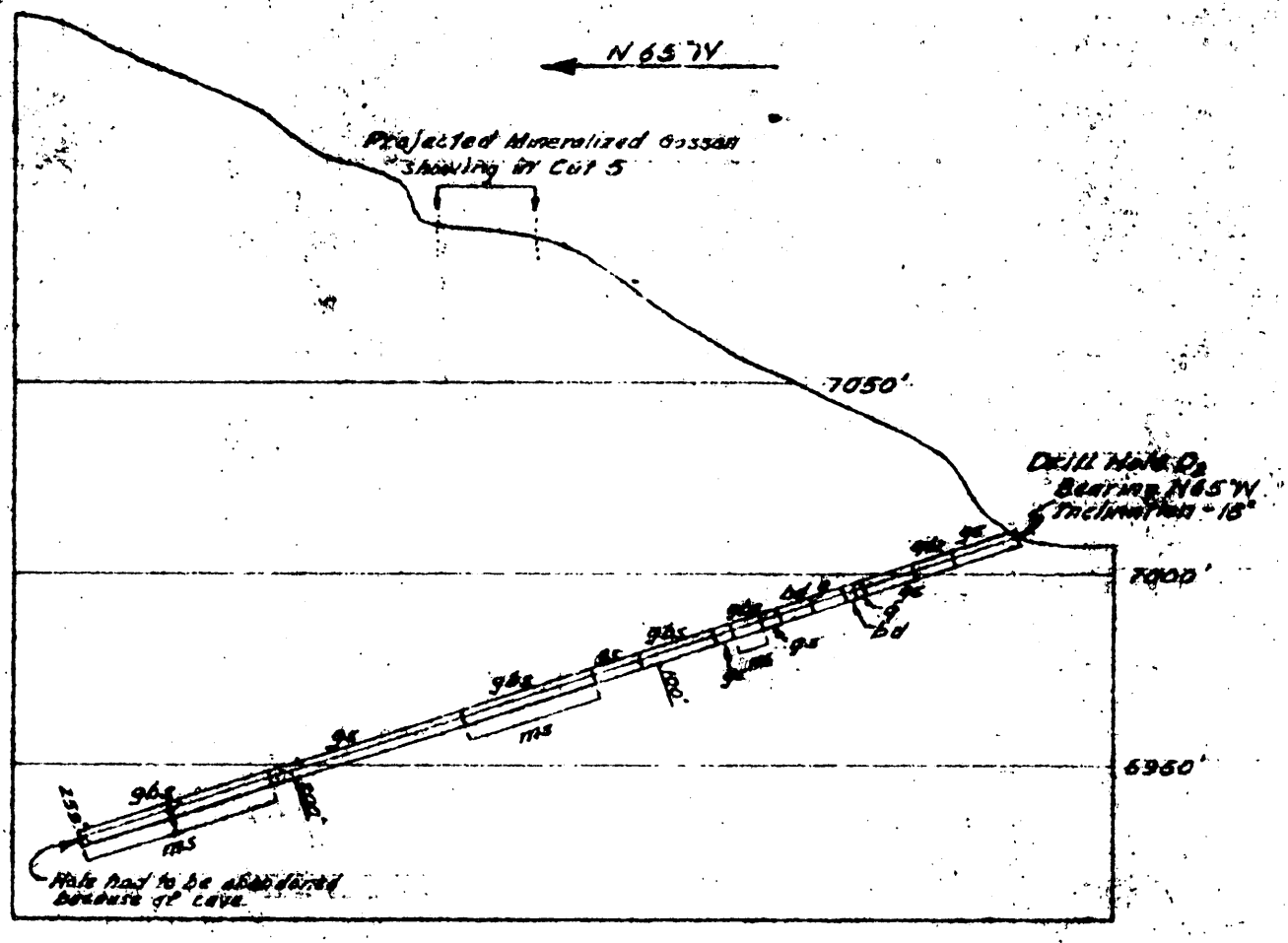
No.	Interval	Type	%Co	%Cu
D_1-19	109-112	Core	[illegible]	0.08
-20	112-116	"	0.192	0.52
-21	116-120	"	[illegible]	0.79
-22	120-125	"	0.078	0.15
-23	125-130	Slurry	[illegible]	0.19
-24	130-135	Core	0.117	0.75
-25	135-140	"	0.102	0.34
-26	140-145	"	0.055	0.43
-27	145-150	"	0.161	0.20
-28	150-155	"	0.117	0.25
-29	155-160	"	0.102	0.25
-30	160-165	"	0.088	0.18
-31	165-170	"	0.146	0.60
-32	170-175	"	0.088	0.18
-33	175-180	"	0.117	0.24
-34	180-185	Slurry	0.110	0.20

LEGEND

- Grey Schist
- Quartzite
- Quartzite-Grey Schist (intercalated)
- Quartz
- Quartz Mica Schist
- Green Biotite Schist
- Basic Dike
- Mineralization qtz, Fe gossan & Sulfides
- Mineralization Cobalt
- Contact
- Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho
SECTION D_1 - D_1'
Scale: 1" = 80'

Docket No. DMEA 2436



ASSAY RESULTS

No.	Interval	Type	% Co	% Cu
D_2-17	70-77	Core	0.20	0.44
-9	[illegible]	"	0.17	1.22
-10	[illegible]	"	0.10	0.09
-11	[illegible]	"	0.11	0.06
-12	[illegible]	"	0.11	0.27
-13	[illegible]	Sludge	0.20	0.87
-14	[illegible]	Core	0.22	0.44
-15	[illegible]	"	0.22	0.56
-16	[illegible]	"	0.22	0.10
-17	[illegible]	"	0.14	0.17
-2	[illegible]	"	0.46	0.85
-3	[illegible]	"	0.17	0.03
-4	[illegible]	"	0.17	0.30
-5	[illegible]	"	0.17	0.90
-6	[illegible]	Sludge	0.14	0.13
-7	[illegible]	Core	0.46	0.46
-8	[illegible]	"	0.29	0.33
-18	[illegible]	Sludge	0.12	0.25

LEGEND

- gs — Grey Schist
- q — Quartzite
- q/gs — Quartzite-Grey Schist (intercalated)
- qtz — Quartz
- qms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- M.E. — Mineralization - qtz, Fe gossan & Sulfides
- M.S. — Mineralization - Cobalt
- Contact
- Fault

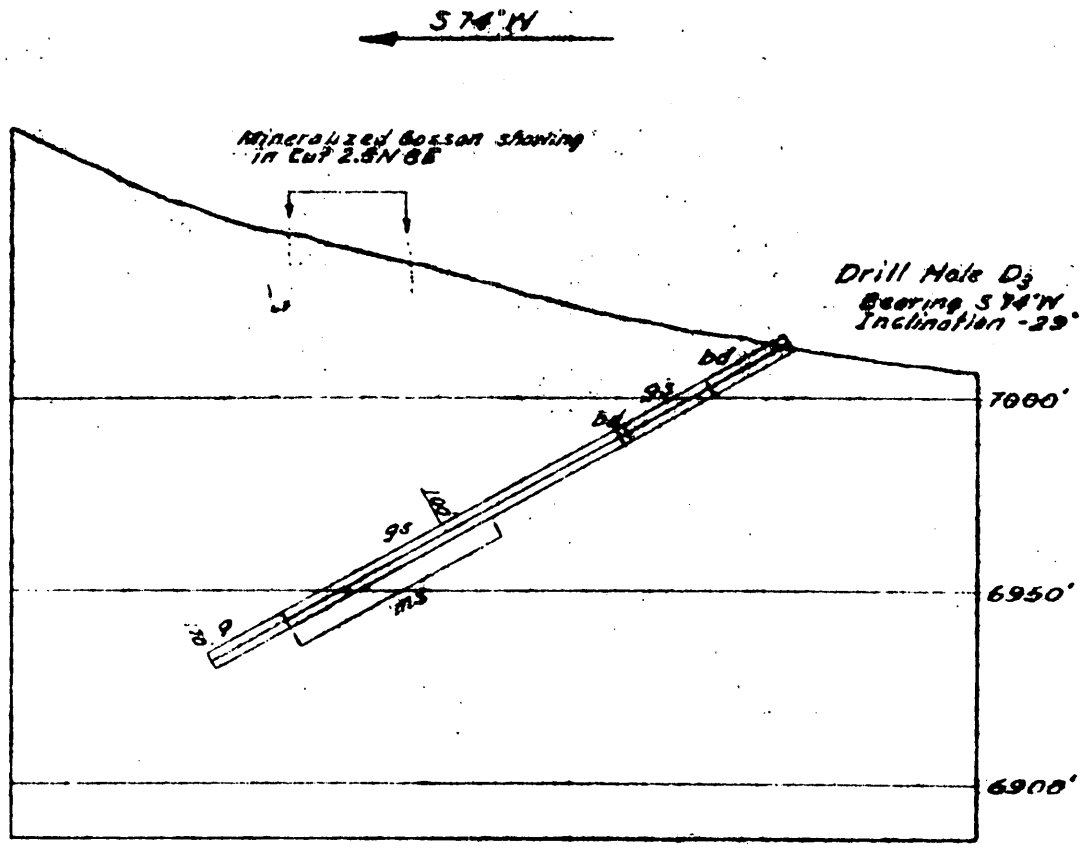
NORTHFIELD MINES, INC.

Blackbird Mining District, Idaho

SECTION D_2-D_2'

Scale: 1" = 50'

Docket No. DMEA 2436



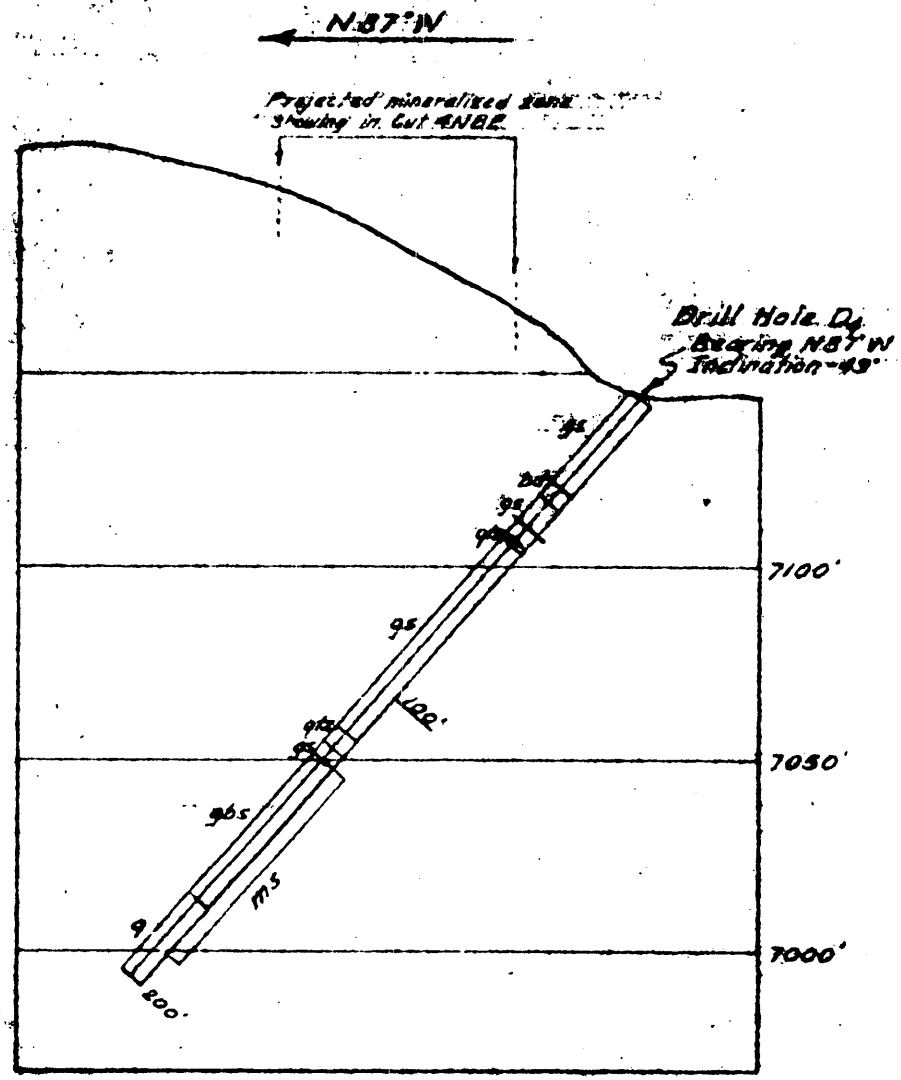
ASSAY RESULTS

No.	Interval	Type	% Co	% Cu
D3-36	97-102	Core	0.073	1.13
-37	107-108.2	"	0.088	0.32
-38	109-119	"	0.094	0.27
-39	119-128	"	0.058	0.38
-40	128-134	"	0.088	0.32
-41	144-148	"	0.249	0.63
-35	146-150	"	0.102	0.15

LEGEND

- gs — Grey Schist
- q — Quartzite
- gs/q — Quartzite-Grey Schist (intercalated)
- q/2 — Quartz
- gms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- m2 — Mineralization-qtz, Fe gossan & Sulfides
- m3 — Mineralization-Cobalt
- Contact
- Fault

NORTHFIELD MINES INC.
Blackbird Mining District, Idaho
SECTION D_3 - D_3'
Scale: 1" = 50'



ASSAY RESULTS

No.	Interval	Type	%Co	%Cu
[illegible]	124.5-131	Core	0.073	0.30
[illegible]	131-136	"	0.085	0.25
[illegible]	136-141	Sludge	0.044	0.12
[illegible]	141-146	Core	0.044	0.18
[illegible]	146-147	"	0.073	0.56
[illegible]	148-149	Sludge	0.059	0.32
[illegible]	156-157	"	0.044	0.20
[illegible]	157-164	Core	0.073	0.46
[illegible]	[illegible]	"	0.323	1.18
[illegible]	[illegible]	"	0.190	0.50
[illegible]	181-184	"	0.029	0.42

LEGEND

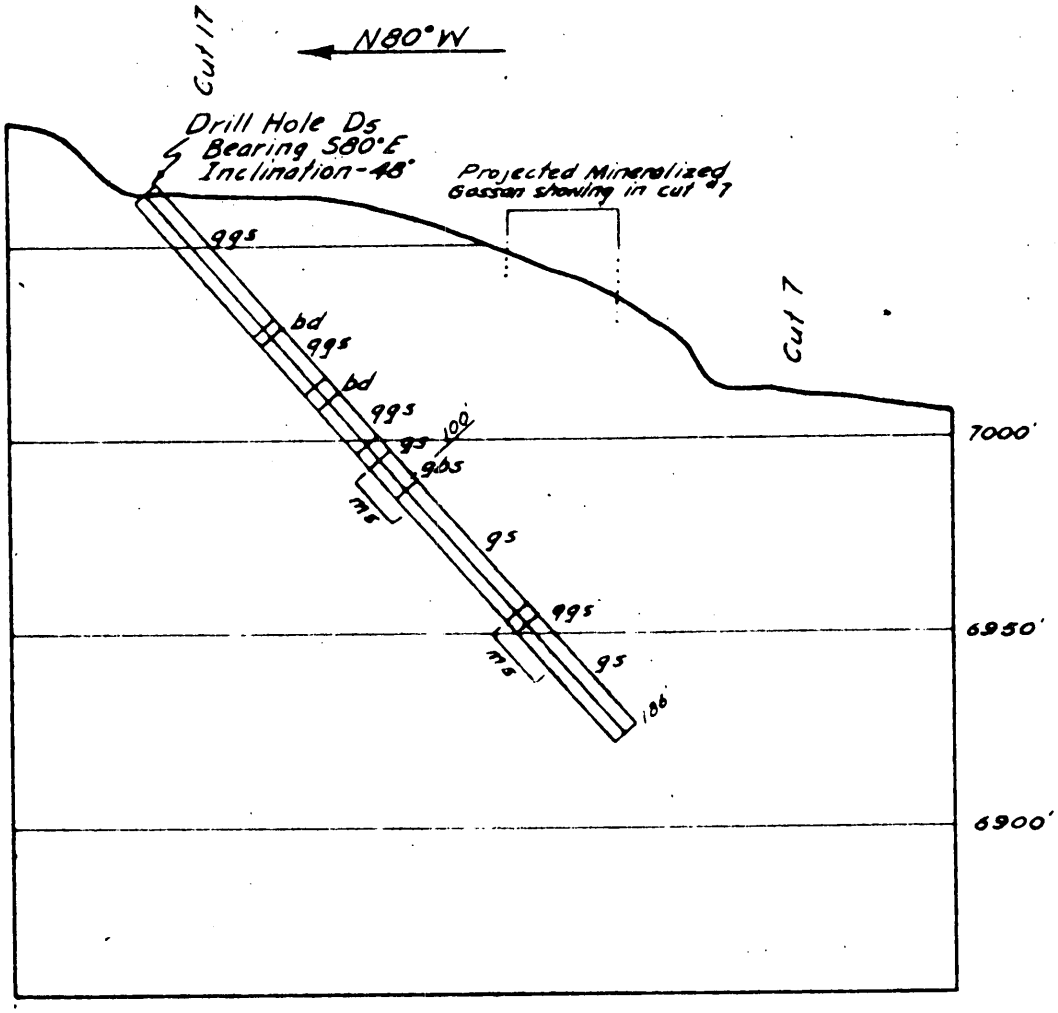
- gs — Gray Schist
- q — Quartzite
- q-gs — Quartzite-Gray Schist (intercalated)
- qtz — Quartz
- qms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- Min — Mineralization: qtz, Fe gossan & Sulfides
- MC — Mineralization-Cobalt
- Contact
- Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho

SECTION D4-D4'

Scale: 1"=50'

Docket No. DMEA 2436



ASSAY RESULTS

No.	Interval	Type	% Co	% Cu
D5-53	71'-78'	Core	0.073	0.05
-54	144'-151'	"	0.088	0.07
-56	151'-156.5	"	0.117	1.54

LEGEND

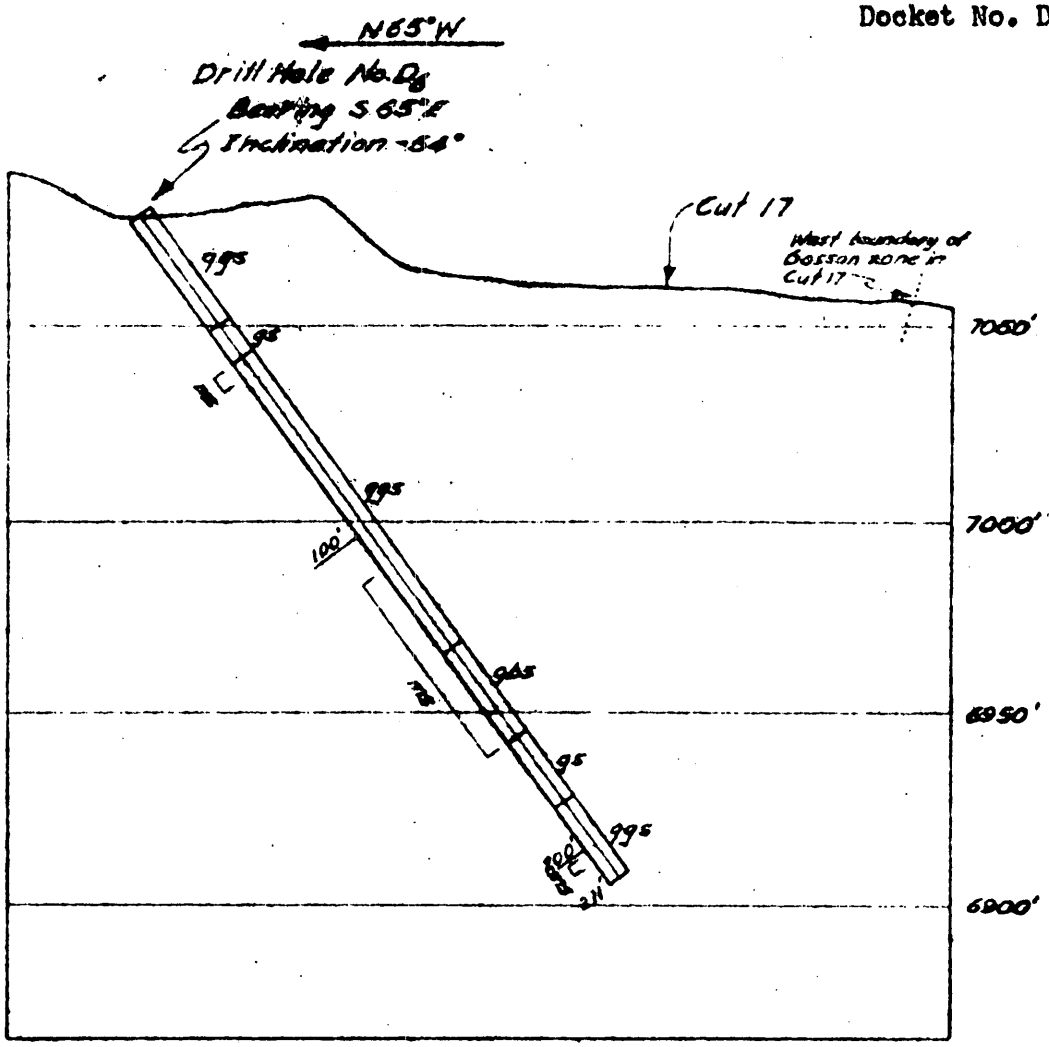
- qs — Grey Schist
- q — Quartzite
- qgs — Quartzite-Grey Schist (intercalated)
- qtz. — Quartz
- qms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- ms — Mineralization-qtz, Fe gossan & Sulfides
- ms — Mineralization-Cobalt
- —— Contact
- —— Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho

SECTION D_5 - D_5'

Scale: 1" = 50'

Docket No. DMEA 2436



ASSAY RESULTS

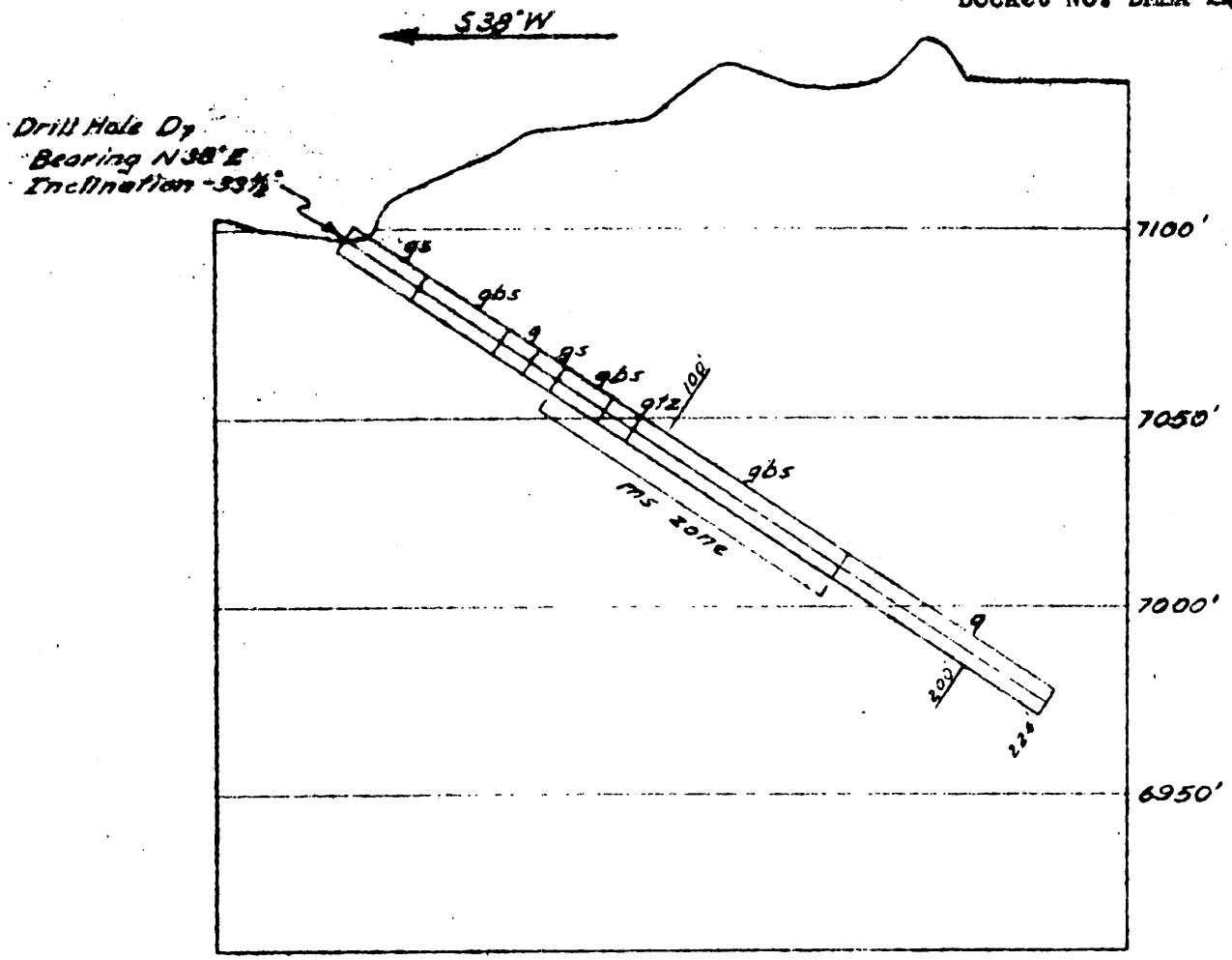
No.	Interval	Type	% Co	% Cu
D6-10	95-106	Core	0.264	0.10
-1	121-131	"	0.051	0.15
-2	131-141	"	0.037	0.80
-3	141-151	"	0.044	0.27
-4	151-161	"	0.029	0.57
-5	161-171	"	0.046	0.17
-6	171-181	"	0.029	0.15
-7	181-191	"	0.029	0.15
-8	200-204.5	"	0.088	0.88
-9	204.5-211	"	0.066	0.07

LEGEND

- gs — Grey Schist
- 9 — Quartzite
- 9gs — Quartzite-Grey Schist (intercalated)
- qtz. — Quartz
- qms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- ms — Mineralization-qtz, Fe, garnet & Sulfides
- ms — Mineralization-Cobalt
- Contact
- Fault

NORTHFIELD MINES INC.
Blackbird Mining District, Idaho
SECTION D6 - D6'
Scale: 1" = 80'

Docket No. DMEA 2436



ASSAY RESULTS

No.	Interval	Type	% Co	% Cu
D7-1	69-79	Core	0.301	0.48
-2	79-86	"	1.291	0.98
-3	86-96.5	"	0.426	0.79
-4	86-96.5	Sludge	0.279	0.79
-5	96.5-104	Core	0.110	0.27
-6	104-109	"	0.169	0.25
-7	109-115.5	"	0.085	0.37
-8	115.5-122.5	"	0.161	0.20
-9	122.5-126.5	"	0.315	2.22
-10	126.5-129	"	0.081	0.45
-11	129-134	Sludge	0.147	0.25
-12	134-144	Core	0.073	0.12
-13	144-152.5	"	0.081	0.50
-14	152.5-158	"	0.147	0.30
-15	173-183	"	0.088	0.12
-16	219-224	"	0.301	0.32

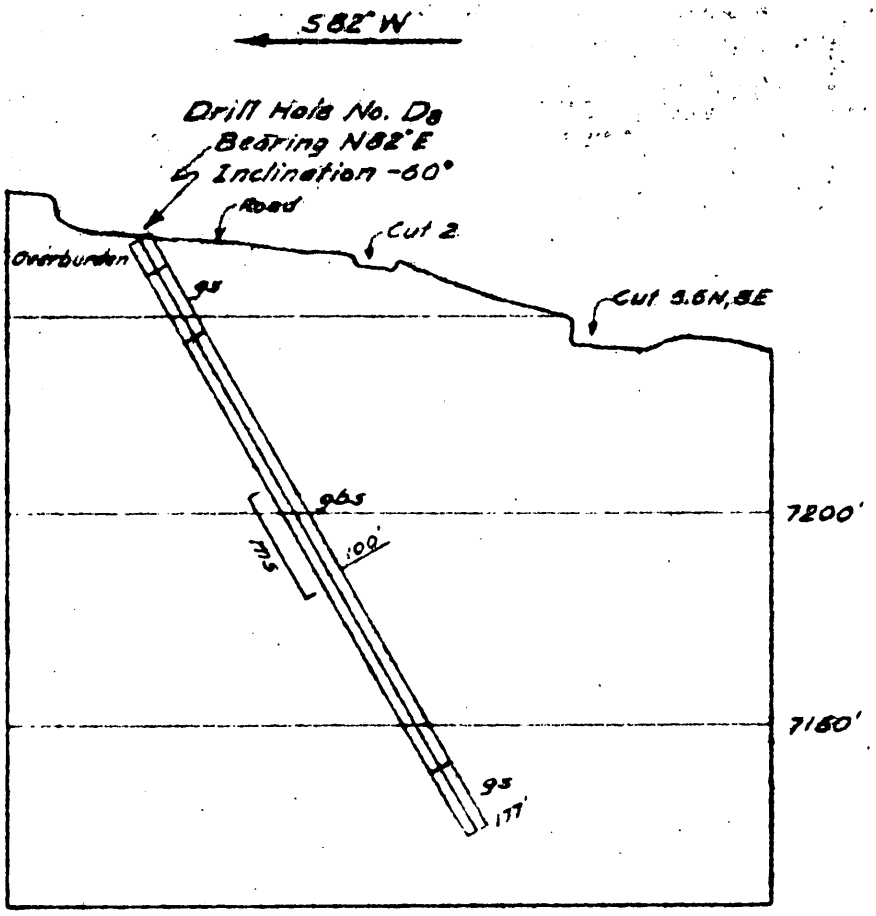
LEGEND

- gs — Grey Schist
- q — Quartzite
- gqs — Quartzite - Grey Schist (intercalated)
- qtz — Quartz
- qms — Quartz-Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- ms — Mineralization-qtz, Fe gossan & Sulfides
- ms — Mineralization - Cobalt
- Contact
- Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho

SECTION D7 - D7'

Scale: 1" = 50'



ASSAY RESULTS

No.	Interval	Type	%Co	%Cu
D8-1	72-82	Core	0.037	0.28
-2	82-92	"	0.046	0.29
-3	92-102	"	0.029	0.18

LEGEND

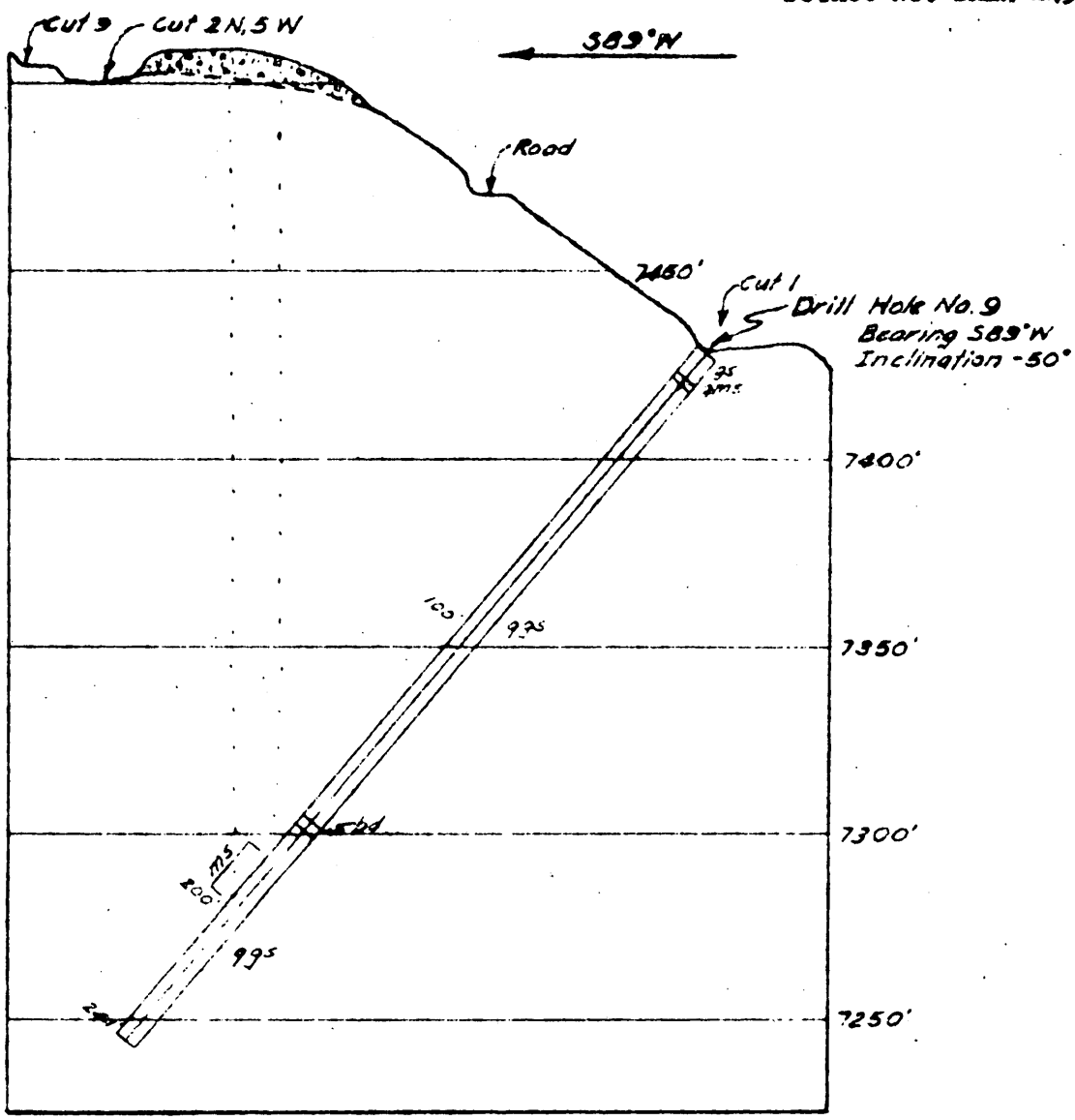
- gs — Grey Schist
- q — Quartzite
- qgs — Quartzite - Grey Schist (intercalated)
- qz — Quartz
- qms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- mz — Mineralization qtz., Fe gossan & sulfides
- ms — Mineralization - Cobalt
- —— Contact
- —— Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho

SECTION D8 - D8'

Scale: 1" = 50'

Docket No. DMEA 2436



ASSAY RESULTS

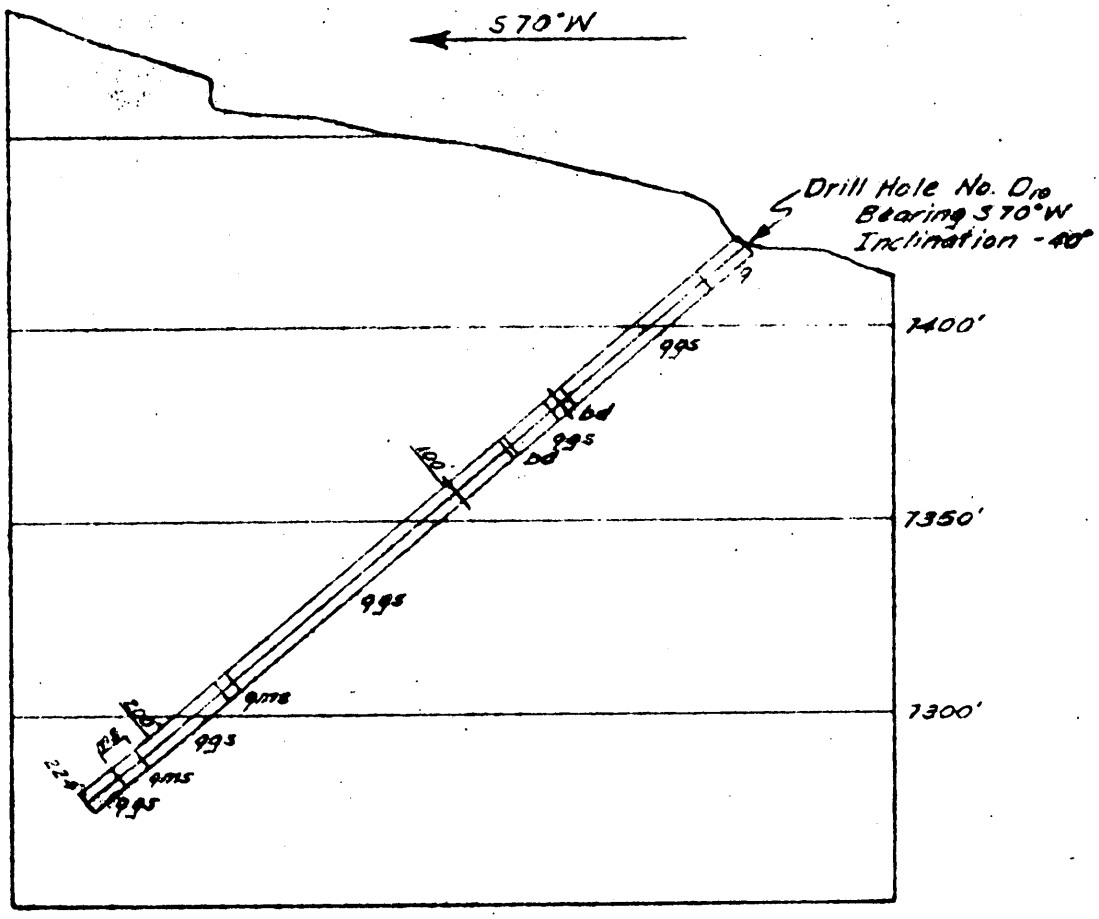
No.	Interval	Type	%Co	%Cu
D_9-1	167-172	Core	0.015	0.10
-2	172-183.6	"	0.015	0.12
-3	183.6-188	"	0.022	0.55
-4	193.5-195.5	"	0.029	1.29
-5	195.5-198	"	0.015	0.00

Note: Sample No D_9-2 also contains 2.40% WO_3

LEGEND

- gs — Grey Schist
- q — Quartzite
- qgs — Quartzite - Grey Schist (intercalated)
- qtz — Quartz
- qms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- ms — Mineralization - qtz., Fe gossan & Sulfides
- ms — Mineralization - Cobalt
- Contact
- Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho
SECTION D_9 - D_9'
Scale: 1" = 50'



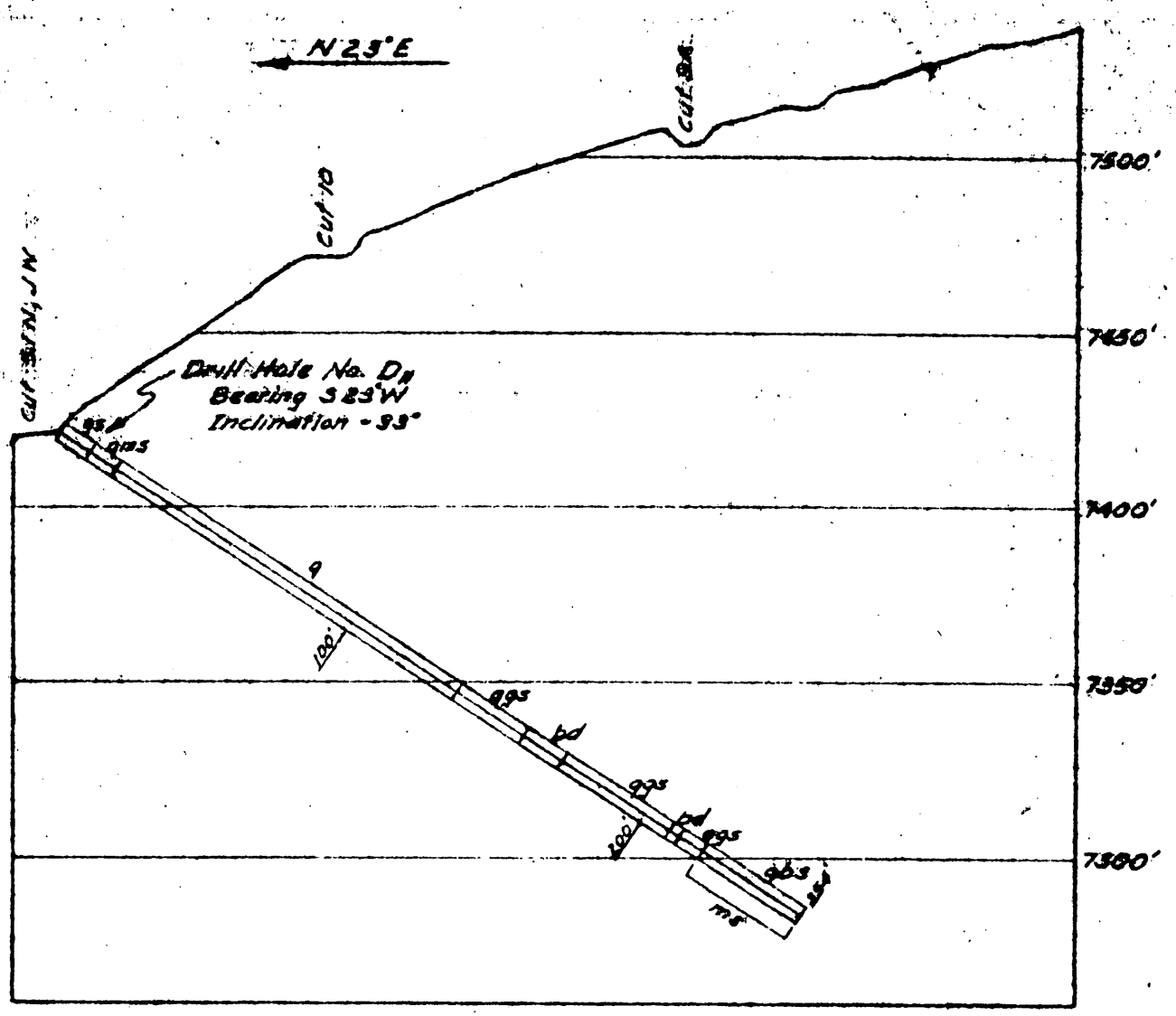
ASSAY RESULTS

No.	Interval	Type	% Co	% Cu
D_{10}-1	141'-151	Core	0.073	0.00
-2	195-197	"	0.058	0.00
-3	203-206	"	0.051	0.00

LEGEND

- gs — Grey Schist
- q — Quartzite
- qgs — Quartzite - Grey Schist (intercalated)
- qtz. — Quartz
- qms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- ms — Mineralization - qtz, Fe gossan & Sulfides
- ms — Mineralization - Cobalt
- Contact
- Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho
SECTION D_{10} - D_{10}'
Scale: 1" = 50'



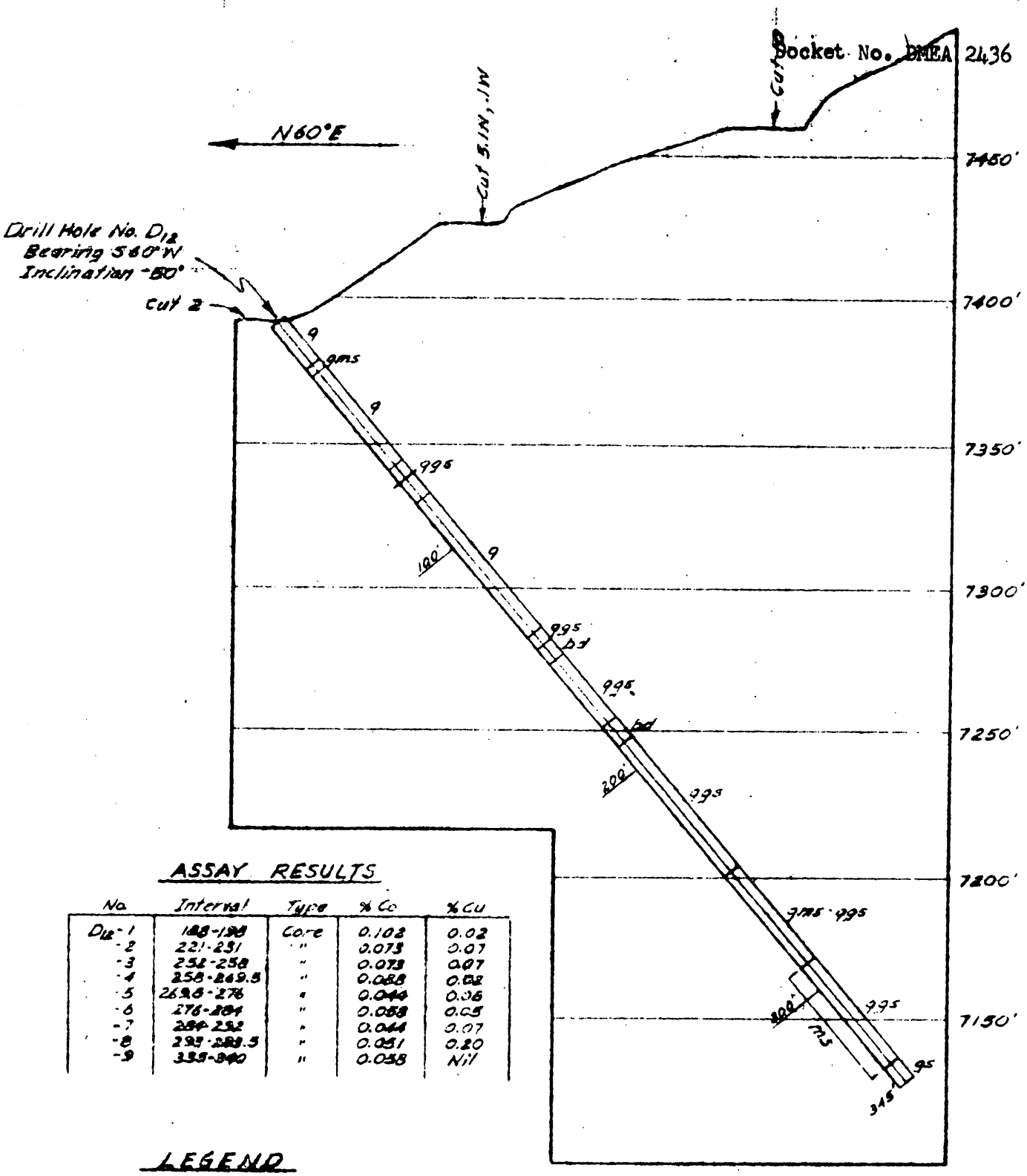
ASSAY RESULTS

No.	Interval	Type	% Co	% Cu
D_{11}-1	222-228	Core	0.807	0.40
-2	228-234	"	0.044	0.20
-3	234-241	"	0.087	0.32
-4	241-251	"	0.036	0.18
-5	251-254	"	0.044	0.28

LEGEND

- gs — Grey Schist
- q — Quartzite
- gsq — Quartzite-Grey Schist (intercalated)
- qtz — Quartz
- qms — Quartz Mica Schist
- gbs — Green Biotite Schist
- bd — Basic Dike
- ms — Mineralization - qtz, Fe gossan & Sulfides
- ms — Mineralization - Cobalt
- Contact
- Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho
SECTION D_{11} - D_{11}'
Scale: 1" = 50'



ASSAY RESULTS

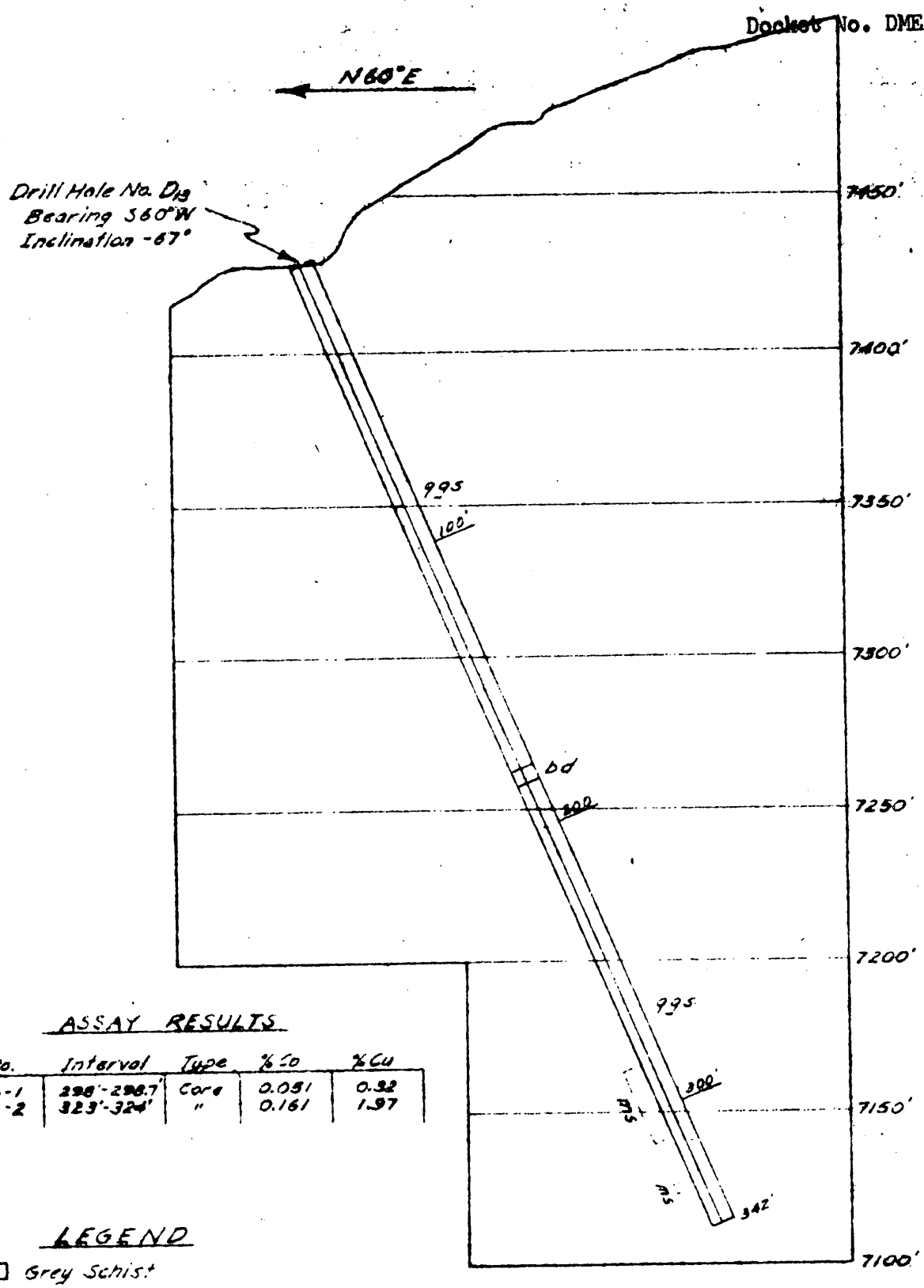
No.	Interval	Type	% Co	% Cu
D_{12}-1	188-198	Core	0.102	0.02
-2	221-231	"	0.073	0.07
-3	252-258	"	0.073	0.07
-4	258-269.5	"	0.068	0.02
-5	269.5-276	"	0.044	0.06
-6	276-284	"	0.058	0.05
-7	284-292	"	0.044	0.07
-8	292-299.5	"	0.051	0.20
-9	339-340	"	0.058	Nil

LEGEND

- qs — Grey Schist
- q — Quartzite
- qgs — Quartzite - Grey Schist (intercalated)
- qtz — Quartz
- qms — Quartz Mica Schist
- qbs — Green Biotite Schist
- bd — Basic Dike
- ms — Mineralization - qtz, Fe gossan & Sulfides
- ms — Mineralization - Cobalt
- —— Contact
- —— Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho
SECTION D_{12} - D_{12}'
Scale: 1" = 60'

Docket No. DMEA 2436



ASSAY RESULTS

No.	Interval	Type	% Co	% Cu
D13-1	298'-298.7'	Core	0.051	0.32
-2	323'-324'	"	0.161	1.97

LEGEND

- 99S — Grey Schist
- 9 — Quartzite
- 99S — Quartzite-Grey Schist (intercalated)
- 9Qz — Quartz
- 9MS — Quartz Mica Schist
- 9BS — Green Biotite Schist
- bd — Basic Dike
- mS — Mineralization-qtz, Fe gossan & sulfides
- mg — Mineralization - Cobalt
- —— Contact
- —— Fault

NORTHFIELD MINES, INC.
Blackbird Mining District, Idaho
SECTION D13 - D13'
Scale: 1" = 50'

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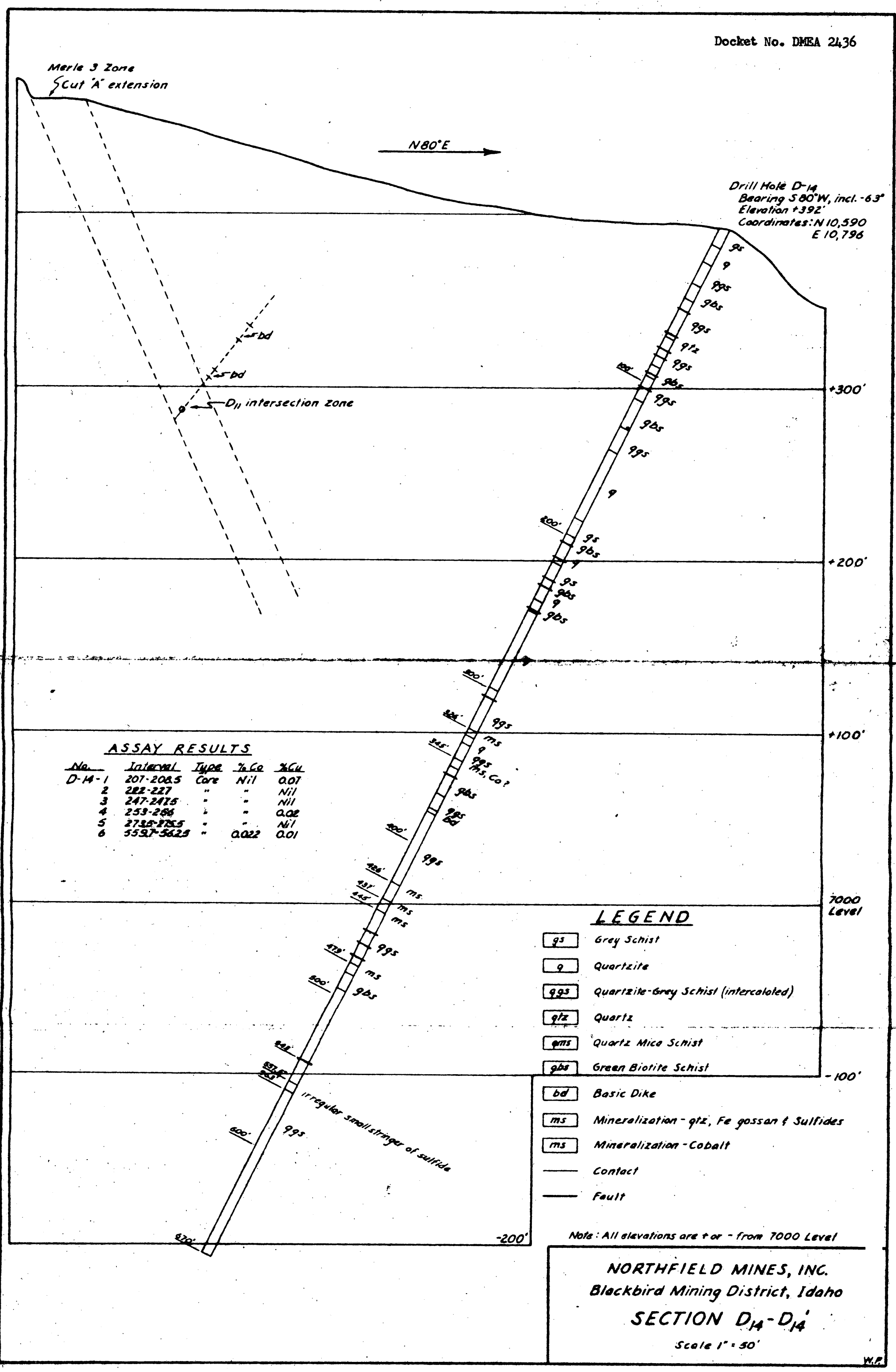
D M E A
RECEIVED [illegible] 1957

DATE	[illegible]	CODE

Docket No. DMEA 2436



ASSAY RESULTS

No.	Interval	Type	%Co	%Cu
D-14-1	207-208.5	Core	Nil	0.07
2	222-227	"	"	Nil
3	247-247.5	"	"	Nil
4	253-256	"	"	0.02
5	273.5-275.5	"	"	Nil
6	559.7-562.5	"	0.022	0.01

OFFICIAL FILE COPY
D M E A
RECEIVED
DATE
1957
CODE

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

~~WASHINGTON 25, D.C.~~
So. 157 Howard Street
Spokane 4, Washington

August 10, 1954

Mr. George C. Selfridge, Chairman
Operating Committee, DMEA
Department of the Interior
Washington 25, D. C.

Re: Docket No. DMEA-2436 (cobalt-copper)
Northfield Mines, Inc.
Lemhi County, Idaho
Contract No. Idm-E334

Dear Mr. Selfridge:

Reference is made to our letter of July 29, 1954, in which we referred to the "Final Report" submitted by the Operator. We find copies of this report have not been sent to you. We are therefore enclosing three copies of this report.

Sincerely yours,

John S. Vhay

John S. Vhay
Acting Member, DMEA
Field Team, Region II

Enclosure

cc: USBM (2)
Nickelson

EXPLANATION

MAPPED ROCK UNITS

HB — Rocks of Haynes-Stellite structural block, massive, thin-bedded quartzite, thin-bedded phyllites, and rock of intermediate composition; rocks generally have blocky fracture and are not schistose

BB — Quartz-biotite rocks of Blackbird structural block, includes quartzite, biotite phyllites and schists, and beds of all intermediate compositions

LB — Lookout structural block, includes quartzite, quartz-cordierite-muscovite hornfels, some quartz-biotite schist, with a little garnet in a few places

Garnet-chloritoid-quartz-biotite schist, includes some schistose quartzites with no discernable garnet or chloritoid

Granitic rock of Idaho batholith

Porphyry dikes and sills

Gabbro and other basic dikes. Pre-metamorphic; have been considerably altered.

Contact, dashed where inferred

Gradational contact, may be a fault in some places. Location generally very indefinite.

FAULTS and SHEAR ZONES

Inclined — Vertical — Shear zone

Wide shear zone

Inclined — Vertical — Fault

Wide fault (dashed where inferred)

Fault or shear zone where very uncertain

BEDDING

Inclined

Vertical

Overturned

Folded

Crumpled

Average attitude of crumpled bedding

Tightly crumpled, usually cut by slip-shear cleavage

Axial plane of folds

Plunge of folds or crumples, or of intersection of axial-plane cleavage or slip-shear cleavage with bedding

CLEAVAGE

Inclined — Vertical — Axial-plane or flow cleavage, has variable angle to axial plane depending upon lithology, grading into — In quartzite beds, also schistosity, and unclassified cleavage

Inclined — Vertical — Slip-shear cleavage, with or without mica in rock parallel to it, passes through beds of different lithology without change of direction

Inclined — Vertical — Joints, may be axial-plane cleavage in quartzite beds

Inclined — Vertical — Late fracture cleavage, may produce wrinkles in older cleavages

MINERALIZED ROCK (Not necessarily ore minerals)

Veins or Lenses

Tourmalinized fault or shear zone

Altitude unknown, where indicated by float, old pits, or material on dumps.

SYMBOLS, may be combined thus:

Triangulation station

Bench mark and altitude

Adit — Road

Contour Interval: 100 feet.

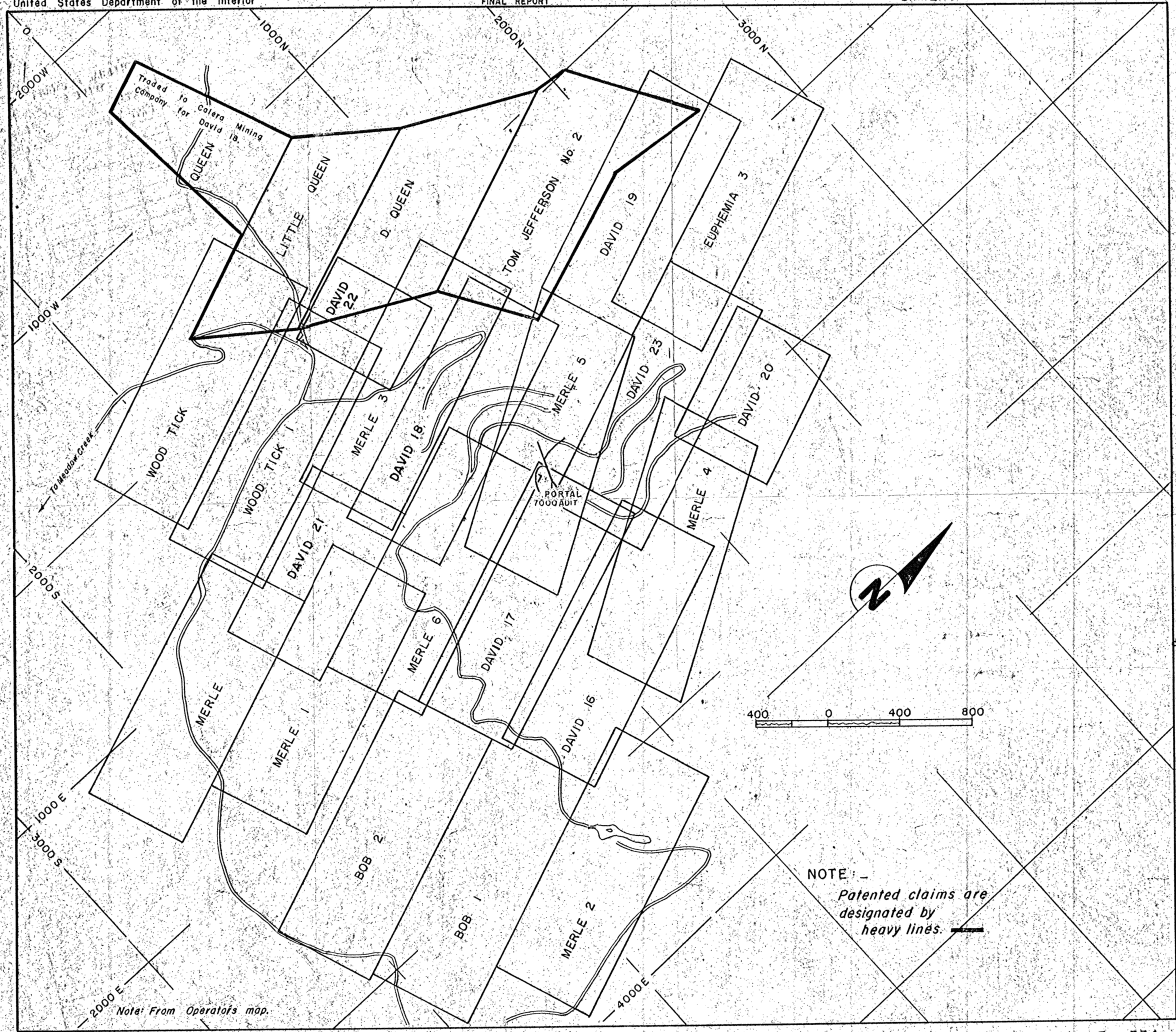
GENERAL GEOLOGIC MAP OF BLACKBIRD DISTRICT

LEMHI COUNTY, IDAHO

SCALE 1000 0 1000 2000 3000 4000 5000 FEET

Geology by J. S. Vhay, assisted by G. M. Sowers, D. J. Varnes, J. G. Broughton, and J. L. Weitz.

Topography by Topographic Branch
June 1946



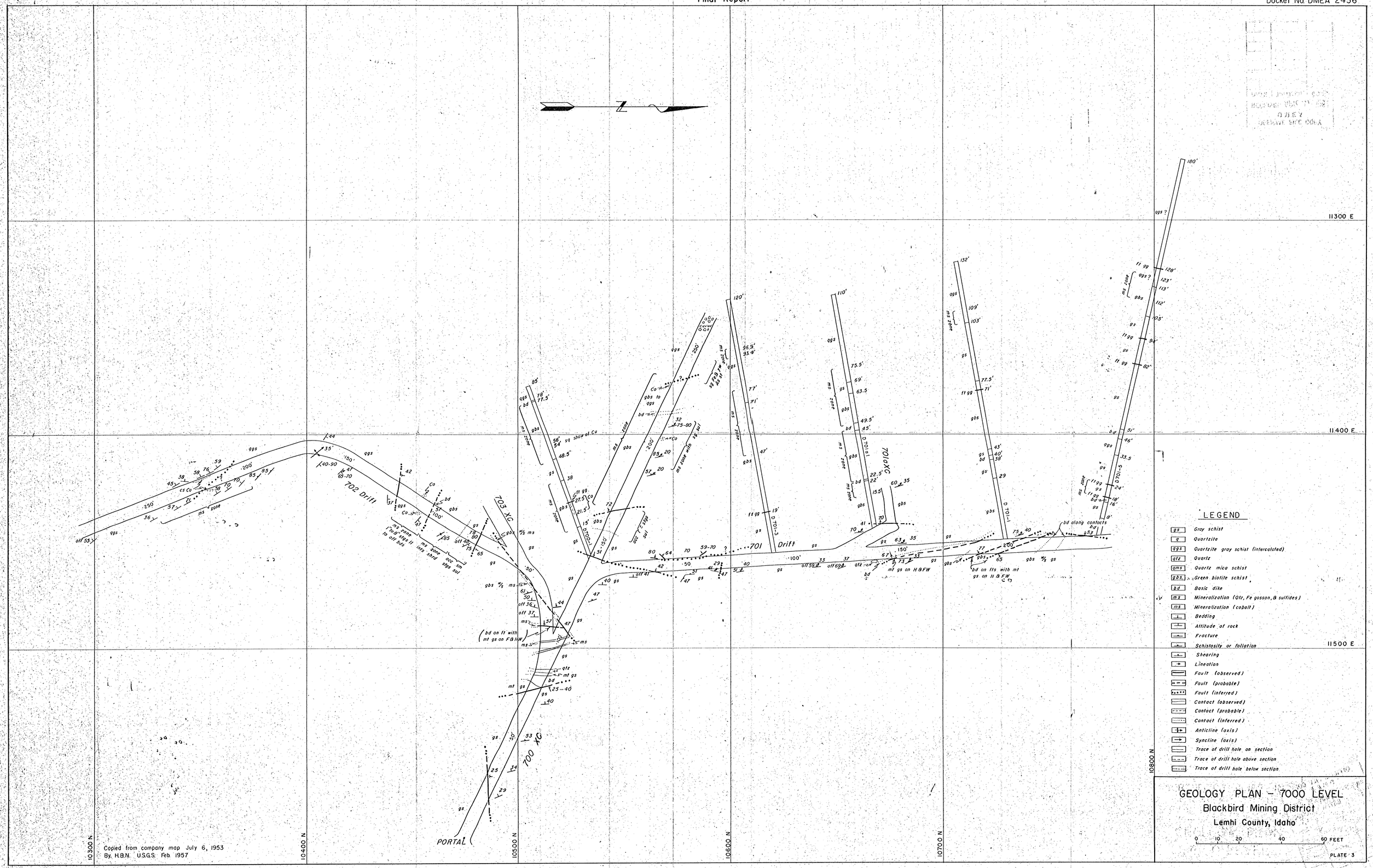
LITTLE DEER CREEK GROUP OF CLAIMS, BLACKBIRD MINING DIST., LEMHI COUNTY, IDAHO. NORTHFIELD MINES INC. — Idm. E - 334

PLATE 5

United States
Department of the Interior

Prepared for
Defense Minerals Exploration Administration
Final Report

Docket No. DMEA 2436

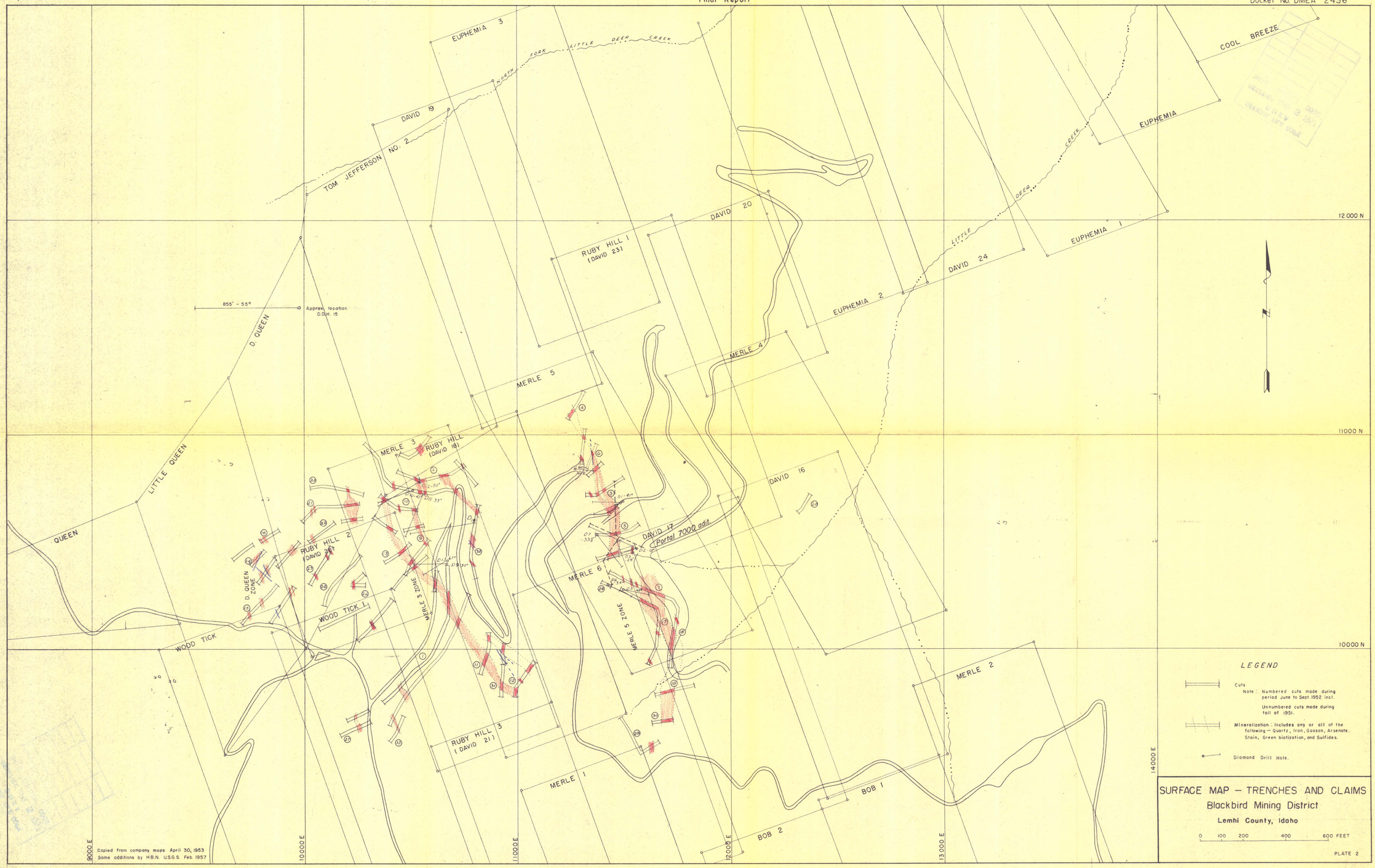


Copied from company map July 6, 1953
By. H.B.N. U.S.G.S. Feb. 1957

United States
Department of the Interior

Prepared for
Defense Minerals Exploration Administration
Final Report

Docket No. DMEA 2436



LEGEND

Cuts
Note: Numbered cuts made during period June to Sept. 1952 incl.
Unnumbered cuts made during fall of 1951.

Mineralization: Includes any or all of the following — Quartz, Iron, Gossan, Arsenate, Stain, Green biotization, and Sulfides.

Diamond Drill Hole.

SURFACE MAP — TRENCHES AND CLAIMS
Blackbird Mining District
Lemhi County, Idaho

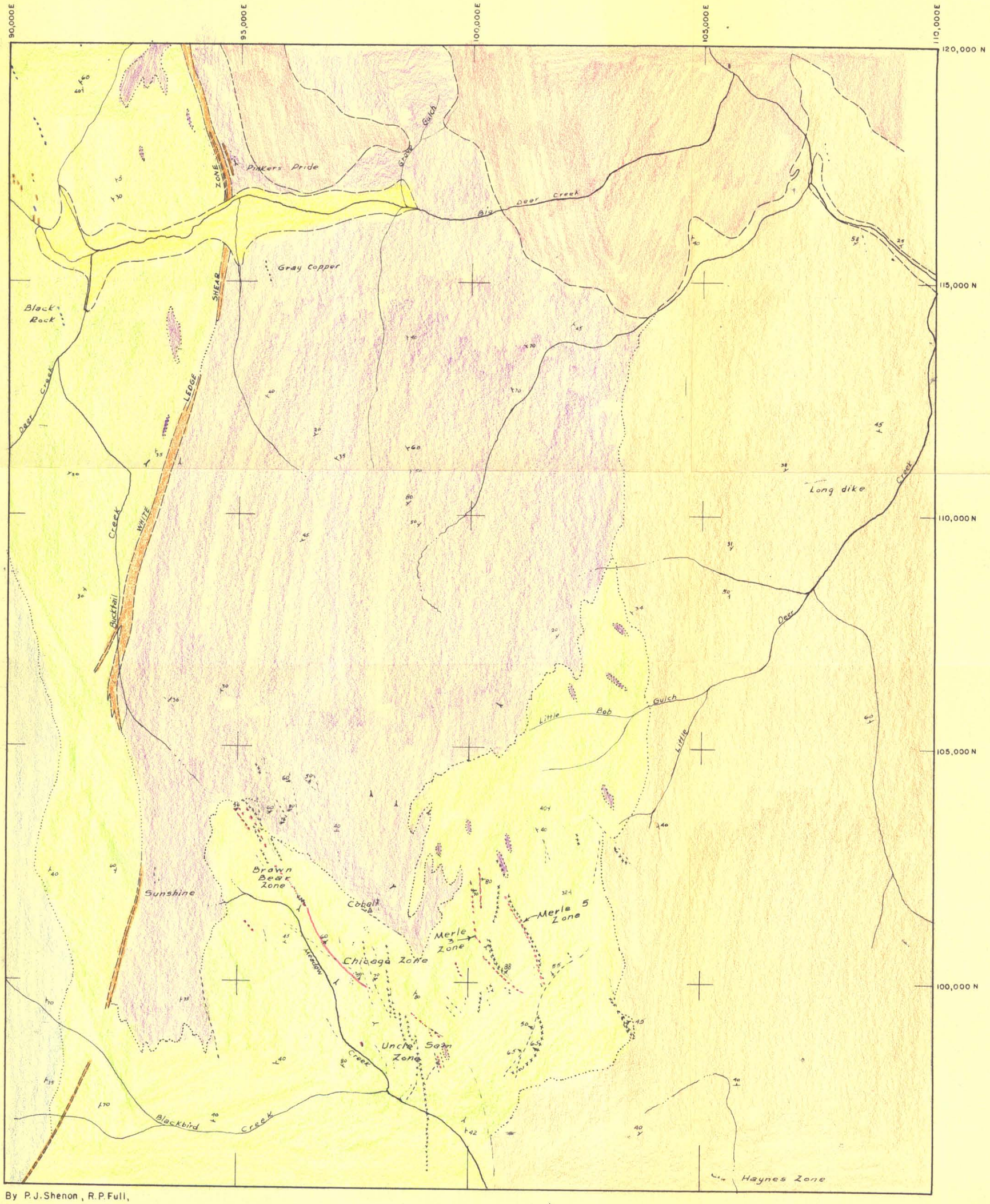
0 100 200 400 600 FEET

PLATE 2

UNITED STATES
DEPARTMENT OF THE INTERIOR

PREPARED FOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
FINAL REPORT

DOCKET NO. D.M.E.A. 2436



EXPLANATION

- Alluvium
- Quartzite
- Argillaceous quartzite
- Garnet schist
- Quartz-biotite rocks
- Granite
- Acidic dike
- Basic dike
- Sulphide-bearing vein
- Quartz and tourmaline vein
- Fault or shear zone
- Approximate contact
- Gradational contact
- Strike and dip of beds

SURFACE GEOLOGIC SKETCH
BLACKBIRD AREA
Lemhi County Idaho
1" = 2000'
1955

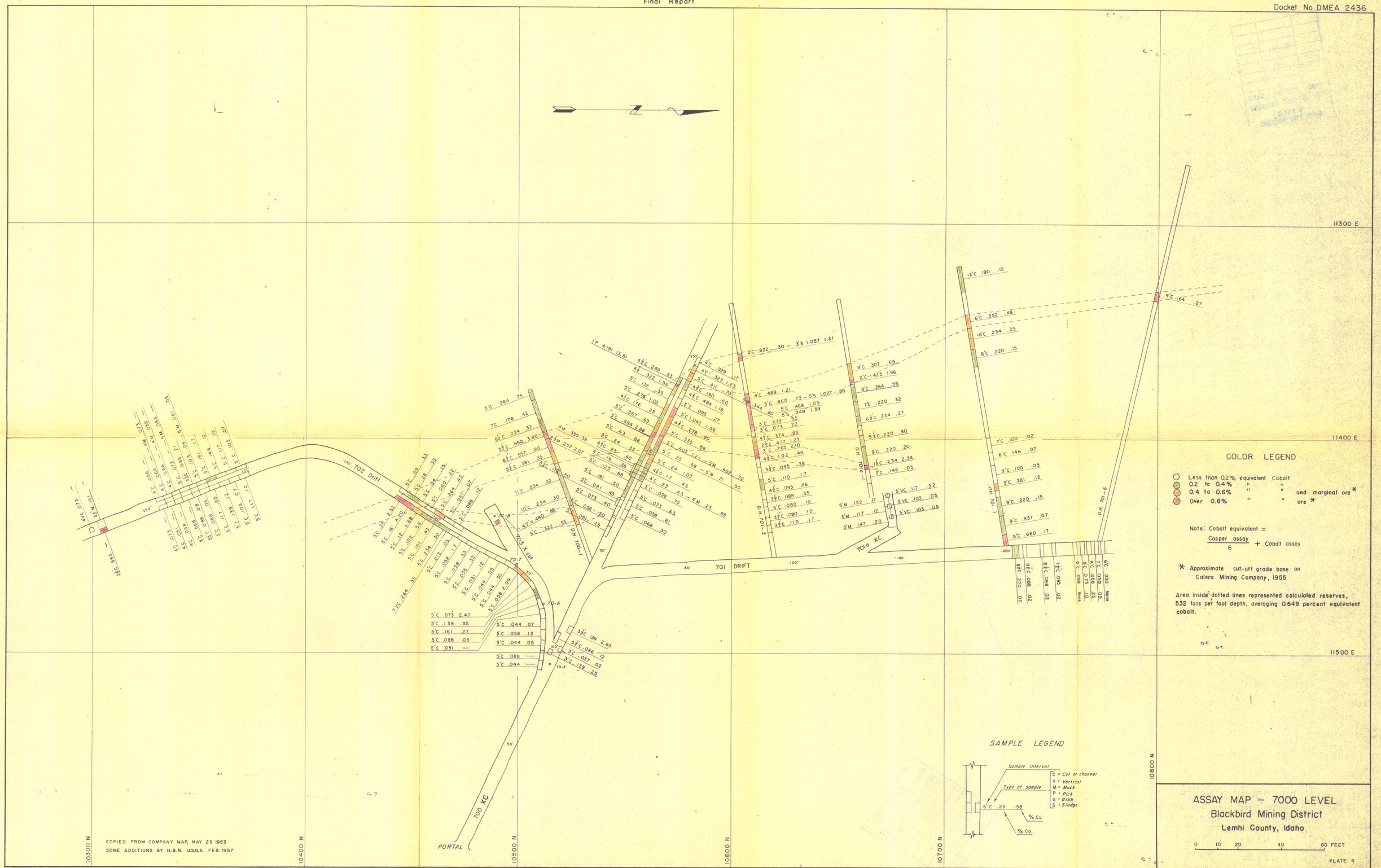
PLATE — 7

By P.J. Shenon, R.P. Full,
H.L. Bauer Jr, D.M. Snyder.
Copied by H.B. Nickelson, USGS.

United States
Department of the Interior

Prepared for
Defense Minerals Exploration Administration
Final Report

Docket No. DMEA 2436



ASSAY MAP — 7000 LEVEL
Blackbird Mining District
Lemhi County, Idaho

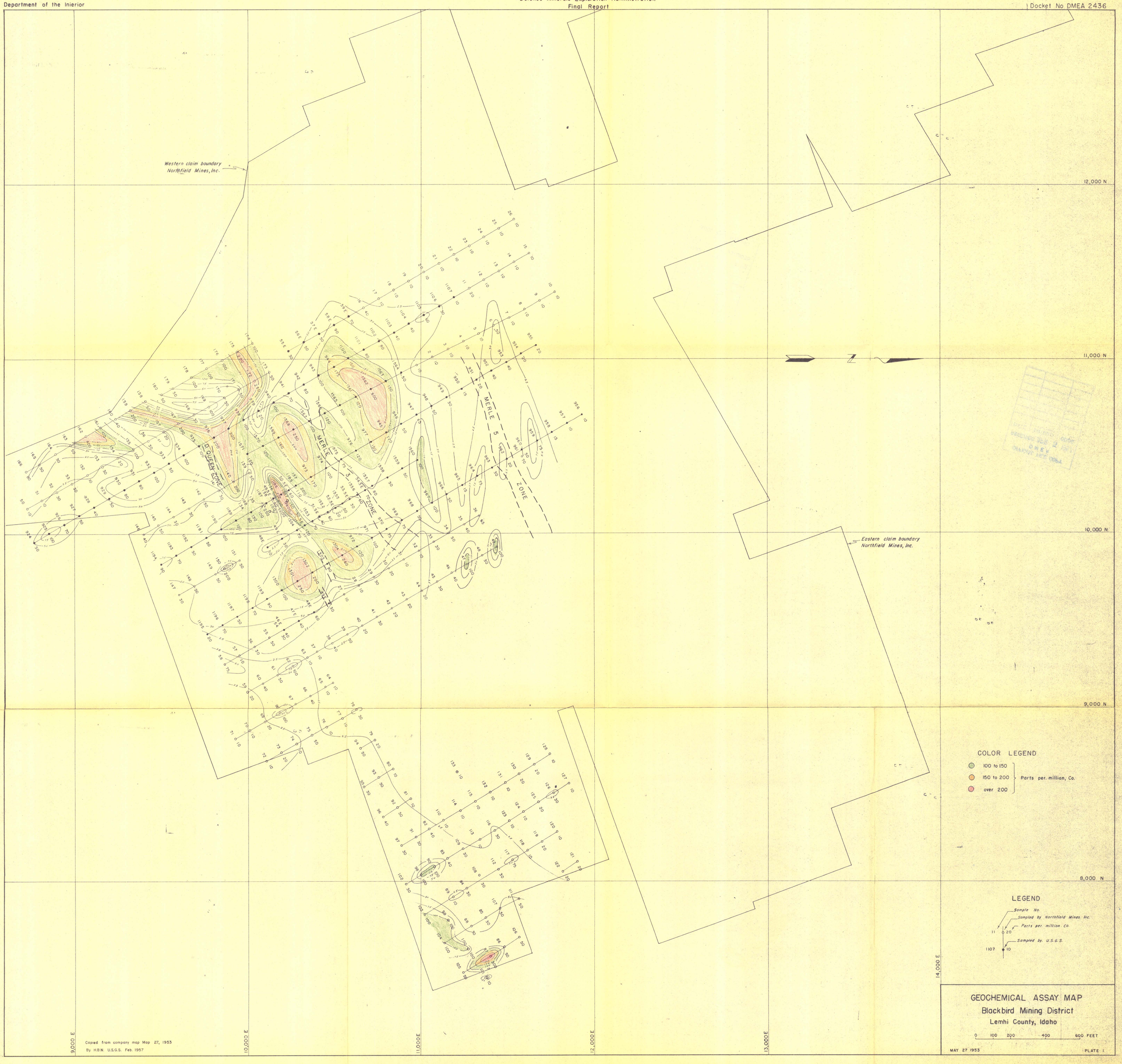
0 10 20 40 60 FEET

PLATE 4

United States
Department of the Interior

Prepared for
Defense Minerals Exploration Administration
Final Report

Docket No DMEA 2436



Copied from company map Map 27, 1953
By H.B.N. U.S.G.S. Feb. 1957

GEOCHEMICAL ASSAY MAP

Blackbird Mining District

Lemhi County, Idaho

0 100 200 400 600 FEET

MAY 27 1953

PLATE I