

3380 0039

Sneke Range

337

Black Horse & DIST.

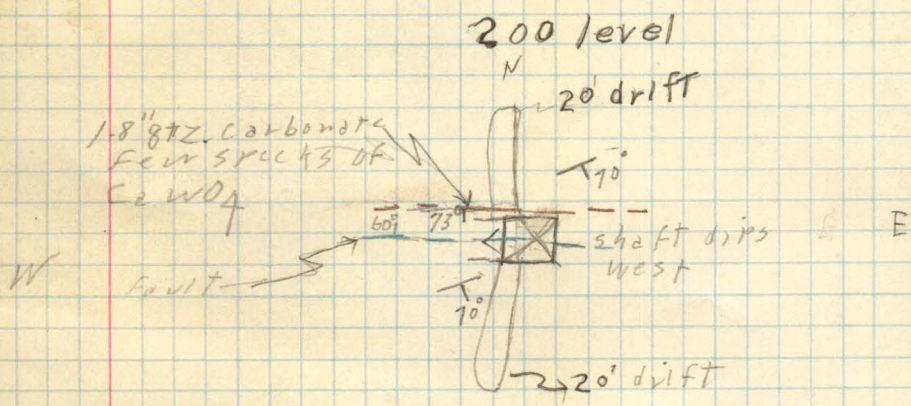
The Black Horse property is about a mile northeast of Sacramento Pass by a dirt road that leaves U. S. Highway 6 a few hundred

802

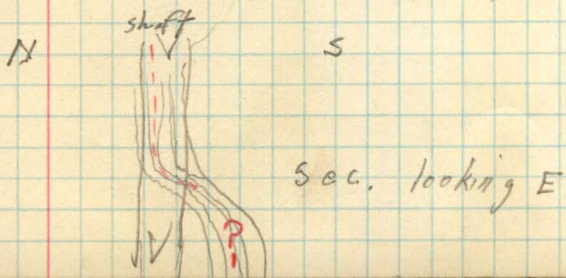
-660-

yards east of the summit. In 1942, the claims were owned by Wayne D. Couder and leased to the Gilded Age Mining Co. Small amounts of scheelite occur in 2 discontinuous bedded quartz veins that are 2 feet wide at the maximum. The best ore appears to contain about 1.0 percent of WO_3 ; 42 units of WO_3 were recovered from 40 tons of sorted ore milled in 1941.

Black Horse Mine
White Pine Co. Nevada



Half way between the 125' level & the 200' level bedding rolls south out of the shaft



3380 0039
Sections to be included in the

FINAL REPORT

Black Horse Mine, DMEA 2289 (tungsten)

White Pine County, Nevada

Idm-E 467

337

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The Black Horse Mine, owned by the Graham Development Corp., 1000 Lincoln Road, Miami Beach, Florida, was explored under Defense Minerals Exploration Administration contract Idm-E 467 dated December 18, 1952.

All the funds provided under the contract have been expended and an examination of the property to evaluate the completed program was made by Henry Jones, U. S. Bureau of Mines, on July ____, 1953 and by R. M. Smith, U. S. Geological Survey, on July 13, 1953.

The purpose of the work was to explore on the 200-foot level for the downward continuation of tungsten ore bodies mined on the 120-foot level.

Work completed consisted of sinking the existing Black Horse Shaft an additional 65 feet, cutting a station on the 200-foot level, and crosscutting 250 feet on the 200-foot level (fig. 4).

No ore was revealed by the exploratory work, but about 50 feet of additional exploration is warranted on the 200-foot level in the east crosscut to test small tungsten showings and to cut the projected position of the main vein at this location. This work should be done on company account but any ore discovered on the 200-foot level should be subject to royalty repayments to the government.

As the vein appears to have pinched to less than mining width on the 200-foot level it is recommended that no further exploration with DMEA funds be done at the Black Horse mine.

GEOLOGY

In the mine area limestone, shale, carbonaceous shale, and carbonaceous limestone have been highly folded and faulted; the beds strike east and dip steeply north, or are overturned. The rocks have been cut by faults that are nearly parallel to the bedding and by one other fault, the post-mineral (?) Black Horse fault which strikes N. 25° - 45° E. and dips 50° - 70° SE.

ORE DEPOSITS

The ore bodies are quartz-calcite veins along the bedding faults. The veins pinch and swell along the strike and down the dip and range from a knife edge to about 3 feet in width. They have been mined to a depth of 120 feet. The ore mineral is scheelite which occurs disseminated irregularly in the veins. The total production to date is about 730 tons; average grade of the ore mined was about 2.0 percent WO_3 .

No ore was found by the work under the DMEA contract. Shaft sinking was started on the main vein at a depth of 155 feet. At an incline depth of 165 feet in the shaft the vein pinches, flattens, and dips about 10° south, cutting the south wall of the shaft. On the 200-foot level the projected position of the vein is 20 feet south of the shaft. A crosscut was driven 75 feet south from the shaft but the vein was not found. A vein that strikes east and dips 70° S. was cut in the station about 3 feet north of the shaft, and is composed of 1-8 inches of quartz and calcite and contains scattered crystals of scheelite. Near the face of the east crosscut a similar vein was cut. Elsewhere on the level a few barren calcite stringers were found. Three faults in the ^{east} north crosscut (fig. 4) may be strands of the Black Horse fault but they could not be seen in the wet, freshly driven shaft. A crosscut to the west revealed no ore minerals or vein quartz.

On July 13 the operator planned to drive a few more rounds but as he was undecided where to locate them, the geologist recommended drifting a few rounds each way on the vein near the face of the east crosscut and also extending this crosscut about 20 feet south to explore the projected position of the main vein.

ORE RESERVES

Reserves of 1,200 tons of ore inferred to be above the 200 level from showings in June, 1952 was the target of the exploratory work. The work on the 200 foot level, eliminates a large part of the vein area from any class of ore reserve. One half of that area (above 165 feet in the shaft) may average 1.0 feet in thickness and is inferred to contain 600 tons of ore averaging 0.5 percent WO_3

2289-Rev.

Room 208 - 222 So. West Temple
Salt Lake City 1, Utah
March 17, 1953

Memorandum

To: E. H. Bailey

From: R. M. Smith

Subject: Interim report on the Black Horse Mine, DMEA 2289 (Tungsten)
Graham Development Corporation.

The Black Horse Mine, White Pine County, Nevada, owned by the Graham Development Corporation, 1000 Lincoln Road, Miami Beach, Florida, is being explored under DMEA Contract Idm-E467. A progress examination was made March 10, 1953 by R. M. Smith and D. C. Laub.

The exploration program consists of three projects:

1. Sink the present Black Horse shaft an additional 72 feet to reach the 200-foot level and provide for a sump.
2. Cut a shaft station at the 200-foot level.
3. Drift and crosscut a total of 250 feet on the 200-foot level to explore the vein on the hanging wall side of the Black Horse fault, and to determine the presence or absence of the vein on the footwall side of the fault.

The project is expected to require about 9 months to complete and the estimated cost is as follows:

Shaft sinking 72 feet @ \$100/foot	\$7,200.00
Shaft station (unit is the entire job)	490.00
Drift and/or crosscut 250 feet @ \$37/foot	9,250.00
Tungsten analyses 45 @ \$4.00 each	<u>180.00</u>
TOTAL ESTIMATED COST	\$17,120.00
Government participation @ 75%	\$12,840.00

In the mine area limestone, shale, carbonaceous shale, and carbonaceous limestone, have been highly folded and faulted; the beds strike east and dip steeply north, or are overturned. The rocks have been cut by faults that are nearly parallel to the bedding and by one other fault, the post-mineral (?) Black Horse fault which strikes N. 25°-45° E. and dips 50°-70° SE.

The ore bodies are quartz-calcite veins along the bedding faults. The veins pinch and swell along the strike and down the dip and range from a

March 17, 1953

knife edge to about 3 feet in width. They have been mined to a depth of 120 feet. The ore mineral is scheelite which occurs disseminated irregularly in the veins. The total production to date is 630 tons; average grade of the ore mined was about 2.2 percent WO_3 .

The shaft has now been sunk below the 200-foot level (Project 1) and a 5 x 20 foot station (Project 2) has been cut on the north side of the shaft. A crosscut is being driven south from the south side of the shaft and has been advanced 20 feet. Below the 120-foot level the shaft is along the vein which is nearly vertical and parallel to the bedding. About midway between the 120-foot level and the 200-foot level the beds flatten abruptly and dip south about 10°. The vein is irregular but as its dip remains about parallel to the bedding, the vein cuts the south wall and dips away from the shaft. Below the flattening, the beds are steeper and on the 200 level they strike N. 70° E. and dip 70° SE. The projected position of the vein on the 200-foot level is about 20 feet south of the shaft, but the vein has not yet been cut. A vein composed of 1 to 8 inches of quartz and calcite containing a few specks of scheelite was cut in the 200 level station about 2 feet north of the shaft. It strikes east and dips 73° S. The Black Horse fault was projected to cut the shaft above the 200-foot level but it has not been found. Presumably it is steeper than projected and lies west of the 200-foot level.

The operator plans to crosscut as much as 20 feet farther south to cut the vein, and then to drift east on the vein beneath the ore shoots which were mined.

As the 200-foot level is in the hanging wall of the Black Horse fault, the downward continuation of known ore bodies should be explored first. If ore is discovered by this work then exploration in the footwall of the fault for the faulted continuation of the vein will probably be warranted. If no ore is discovered by this work, exploration in the footwall of the fault is not justified.

Roscoe M. Smith

cc: A. C. Johnson

Room 208 - 222 So. W. Temple
Salt Lake City 1, Utah
10 October 1952

Mr. Edgar H. Bailey
U. S. Geological Survey
102 Old Mint Building
San Francisco 3, California

Dear Edgar:

Subject: BMEA Docket 2289

In accordance with your request of September 29, 1952, the following appraisal of suggestions concerning the proposed exploratory program at the Black Horse Mine, White Pine County, Nevada, was prepared. The items are in the same order as in Mr. Frank E. Johnson's letter of September 22 to Mr. H. C. Miller:

1. Suggestion to explore for the faulted segment of the vein beyond the Black Horse fault on the 120-foot level.

This method would require rehabilitation of the 120-foot level consisting of laying track, pipe, and timbering or filling the underhand stope.

Drifting on the proposed 200-foot level (Phase 1) has, as its objective, exploration of the vein on the east (hanging-wall) side of the Black Horse fault. This work is not dependent upon finding the faulted segment on the west (footwall) side of the fault. The extension of the shaft proposed in Phase 1 will cut the fault and extend into the footwall of the fault on the 200-foot level. This work will be done regardless of finding the faulted segment on either level. The 200-foot level site for Phase 2 exploration will eliminate the need for rehabilitating and extending the 120-foot level, and will, therefore, be a less expensive method. Concerning Phase 2, the applicant considers that the faulted segment will be found within 75 feet of the shaft, but as the direction of displacement is not known he has allowed 150 feet of crosscut, 75 feet each way, in case the first crosscut is in the wrong direction. Although it is unlikely that more than 20 or 25 feet of crosscutting will be necessary, it is better to allow too much footage rather than too little. No penalty will accrue if the total footage allowed is unused, but a considerable delay will result

from an under-estimation because a new application would be necessary to do the work. Exploration for the faulted segment by long-hole percussion drilling is not recommended because, near the faults, the veins are more irregular and may be narrower than they are elsewhere. A small amount of quartz in the drill cuttings could be from either the vein or a barren stringer not associated with the vein. Because of the spotty distribution of scheelite in the veins, it would be fortuitous if the hole encountered scheelite, whereas lack of scheelite in the cuttings would probably result in one of two conclusions:

- (a) That the vein was not cut -- a conclusion that could be either right or wrong -- or,
- (b) That the information yielded by the hole is inconclusive and a crosscut is necessary.

Exploration for the faulted segment by diamond drilling is not recommended because the cost per foot for a small job in an isolated area approaches the cost of crosscutting.

2. Suggestion to make Phase 1 contingent upon Phase 2. The inferred ore which might be found by Phase 1 (fig. 3) is the primary objective of the exploratory work and should be done first and without regard to the faulted segment. In Phase 1, 1,200 tons is expected to cost \$16,890 in exploratory sinking and drifting, a more reasonable ratio than results when the total estimate is divided by the total inferred tons.

Phase 3 of the proposed work is contingent upon the success of Phases 1 and 2. This means that if Phase 2 reveals ore, the total tonnage objective of Phase 3 will be 300 tons of inferred ore in the hanging wall of the fault plus the ore found by Phase 2. Thus the cost per unit of WO_3 will be smaller here, also, than appears at first glance. In the event that either Phase 1 or Phase 2 reveals less ore than necessary to justify the remaining phases, government participation will be terminated.

At a conference in Reno, Nevada, Oct. 8, 1952, the applicant stated that he is willing to install a larger hoist and skip, and that an additional compressor (325 c.f.m.) has been installed, but he contends that no reduction in his estimated cost can be made. This contention is based on two factors:

- (a) The estimated cost of shaft sinking is higher than the average for the region because the shaft is wet, and from 25 to 50 gallons of water per minute must be pumped.
 - (b) Although some saving in cost will result from installation of larger equipment, this saving is offset by recent increases in operating costs.
3. Suggestion to drift 50 feet on the second vein (Sample BM 4). This work is considered to be less likely to reveal a significant tonnage than work on the main vein. Indicated ore at this showing of the vein is about 2 tons, but it is inferred that 30 tons containing 1.3 percent WO_3 may be present in the block 50 feet long, 1 foot wide and 7 feet high above the 100-foot level. In the event that Phases 1, 2 and 3 are successful, this work may be justified, but I cannot recommend that it be included in the contract.
 4. Suggestion to do more detailed surface mapping. No map of surface geology was included in the report as the mine area contains few exposures; most of the area is covered by alluvium. The strikes and dips of the beds can be more accurately determined underground. Efforts to determine the displacement along the Black Horse fault from surface mapping were unsuccessful because of poor exposures in critical areas. It is concluded, therefore, that a revisit is not warranted. If more geologic data is required during the course of a project, then it is suggested that either the company hire a consultant to do the mapping, or we should provide for mapping as part of the project.
 5. Suggestion that there may be lithologic control of the size of the ore bodies. As the veins are vertical and parallel the bedding, it is considered to be unlikely that a detailed stratigraphic study

would yield information that would help predict the size of the ore bodies at depth.

6. The rocks in the mine are slightly schistose carbonaceous shale and limy shale, and the veins are composed of quartz and calcite. The vein material drills hard, the wall rock drills soft, and the ground is tight and difficult to pull, partly because drifting is parallel to the bedding.
7. No timbering will be required in the shaft, except ties and occasional stulls with headboards or caps.
8. The inclination of the shaft is 60° west, and the depth is 156 feet. As line A-A' is parallel to the bearing of the shaft (fig. 2), the longitudinal section (fig. 3) shows the true inclination and depth of the shaft.

The estimated costs are higher than the average for this type of work as a result of at least four factors:

- (a) The shaft makes 25 to 50 gallons of water per minute.
- (b) There are no housing facilities and the operator plans to commute to Ely - 54 miles of travel each way daily.
- (c) The equipment is small and inadequate.
- (d) Neither the applicant nor his supervisory representatives appear to have more than a limited amount of experience in underground mining.

The examining engineers and geologists discussed the proposed work with the applicant and made suggestions, many of which were adopted. These suggestions were, in general, modifications of the applicants original proposals which revised them as little as possible. This tendency to go along with the applicant as far as possible may be open to criticism, but reflects my interpretation of the Defense Production Act and subsequent procedural instructions that the intent of DWEA is to evaluate the operator's proposals and,

October 10, 1952

as far as practicable, to approve or deny government assistance on that basis. In the case of the Black Horse Mine, it is entirely fair to criticize past operations, and to suspect that future operations will also be inefficient. As pointed out in the report (p. 8) there is little chance that the loan will be repaid, but there is a good chance that several hundred units of WO_3 will be produced. If it is in the national interest to produce tungsten under these conditions, the loan should be approved; if not, it is suggested that the loan be denied on the basis that it is unlikely that the total production will be 20 times the exploration cost, as is necessary to obtain full repayment. In the event of approval, the extent of government participation should be controlled by making payments on a footage basis, and by refusal to approve expenditures beyond those specified in the contract either by letter or by implication.

Sincerely yours,

RMS

R. M. Smith

DNEA 2289, Graham Development Corp., Black Horse Tungsten Mine

White Pine County, Nevada

Roscoe Smith, Geologist
U. S. Geological Survey

June 11, 1952

Geology

The area is underlain by sedimentary rocks of probable Cambrian age which have been highly folded and complexly faulted. In the mine area interbedded limestone, shale, and carbonaceous shale strike east and dip steeply north or are overturned. The rocks are cut by many faults; most prominent is an east striking set that nearly parallels the bedding, and one other fault, the post mineral (?) Black Horse fault, which strikes N.25° E. and dips 60° SE.

Ore Deposits

Tungsten ore occurs in small shoots and lenses in quartz-calcite veins 1 to 3 feet wide in thin-bedded carbonaceous limy shale. At least three veins occur on the property; a gold-bearing vein with a small showing of scheelite reported to be at the bottom of a 100 foot shaft, the Black Horse tungsten vein, and an unnamed vein on the 50 foot level of the Black mine 50 feet south of the main vein (fig. 2). Only the Black Horse tungsten vein has yielded ore in commercial quantities.

The Black Horse vein is in a fault zone which strikes east and dips steeply south. It is locally 9 feet wide but averages about 2 feet in width. It contains lenticular masses of quartz which average about a foot in width.

The ore mineral is scheelite, which is essentially free of molybdenum, and it occurs as disseminated specks and as concentrations of as much as 2½ percent WO_3 in the quartz. Ore was mined to a depth of 100 feet. Only the highest grade parts of the vein were mined, and total production is reported to be 630.5 tons of ore estimated to contain 1410 units, of which 35 percent or 493 units were recovered. The average grade was about 2.2 percent WO_3 .

Exploration on the 120 foot level, 20 feet below the 100 level stopes, disclosed little or no high grade ore. Grade on the 120 level may average 0.50 percent WO_3 . Samples cut by Bureau of Mines engineers on the 120 level on the best ore average 1.57 percent WO_3 across a width of 1.2 feet.

On the 120 level the vein is cut off by the Black Horse fault; the faulted continuation of the vein is not exposed either at the surface or underground, and the amount of displacement along the fault is not known.

Ore Reserves

There are a few tons of measured ore averaging 0.5 percent WO_3 in the blocks above the existing levels. A total of 1,700 tons of indicated ore averaging 0.5 percent WO_3 is estimated to be in the block above the 120 level (fig. 3). If the vein is persistent to the east of the workings, about 1200 tons may be inferred to be in the triangular block 170 feet long, 160 feet high, and 1.0 feet thick, above the proposed 200 foot level. An additional 900 tons of ore averaging 0.5 percent WO_3 may be inferred to be above the proposed 300 foot level above the Black Horse fault. The block is 130 feet long, 85 feet high, and 1.0 feet thick. Total reserves are 3800 tons containing 1900 units of WO_3 . Of this total, perhaps 85

percent can be mined, and 15 percent left in pillars. On this basis the effective reserve is 3200 tons containing 1600 units. No ore reserve estimated is made for the block under the Black Horse fault.

Proposed Exploration

The applicant has proposed (letter of May 9, 1952 to H. C. Miller) to explore the Black Horse vein to a depth of 300 feet by exploratory work in three phases:

1. Sink the Black Horse incline shaft 72 feet and cut a station at the 200 foot level. Drift 200 feet east along the vein.

2. Crosscut north and south from the 200 level station in the hanging-wall (west) of the Black Horse fault (fig. 3) to locate the faulted continuation of the Black Horse vein. A total of 150 feet of crosscut is proposed for this work. It is suggested that 150 feet of diamond drilling and 75 feet of crosscut be allowed.

3. In the event that Phase 2 reveals a vein on the west side of the fault, and also a significant quantity of ore on either side of the fault, sink the Black Horse shaft 100 feet, cut a station at the 300 foot level and drift along the vein on both sides of the Black Horse fault. A total of 200 feet of drift is allowed for this work. An additional 75 feet should be provided for crosscutting.

Conclusions and Recommendations

The total estimated reserves are 1600 units having a gross value of about \$101,000 at the current price (\$63.00 per unit). The applicant's program is logical and the chances that it will reveal a few thousand tons of low grade ore are good. Although the reserves are inadequate to repay the loan a limited amount of exploratory work appears to be justified. It is recommended, therefore, that the application be approved and that each phase of the program be contingent upon the success of the preceding phase.

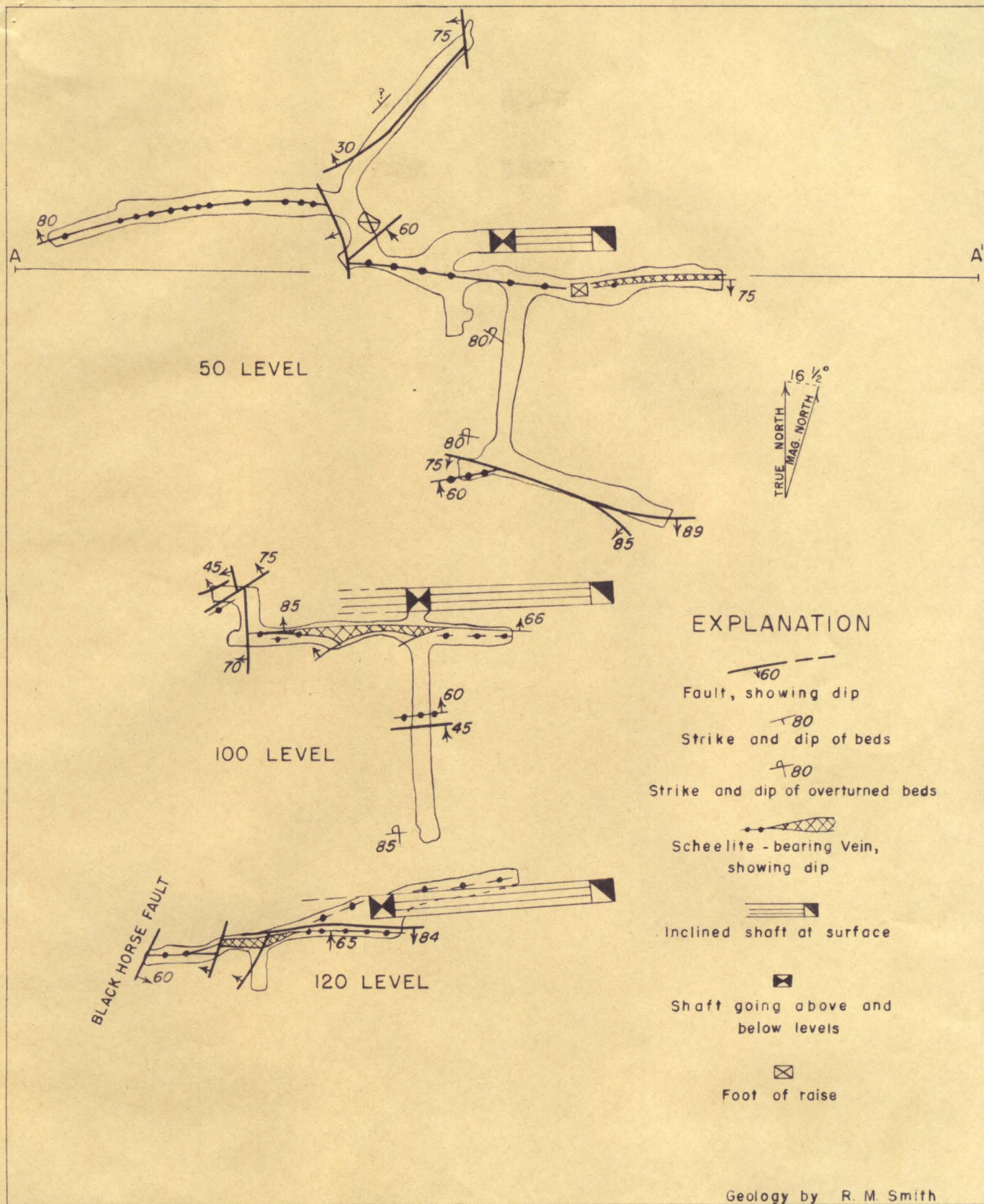


FIG. 2 GEOLOGIC LEVEL MAPS OF THE BLACK HORSE MINE
WHITE PINE COUNTY, NEVADA

0 40 80 FEET
Scale

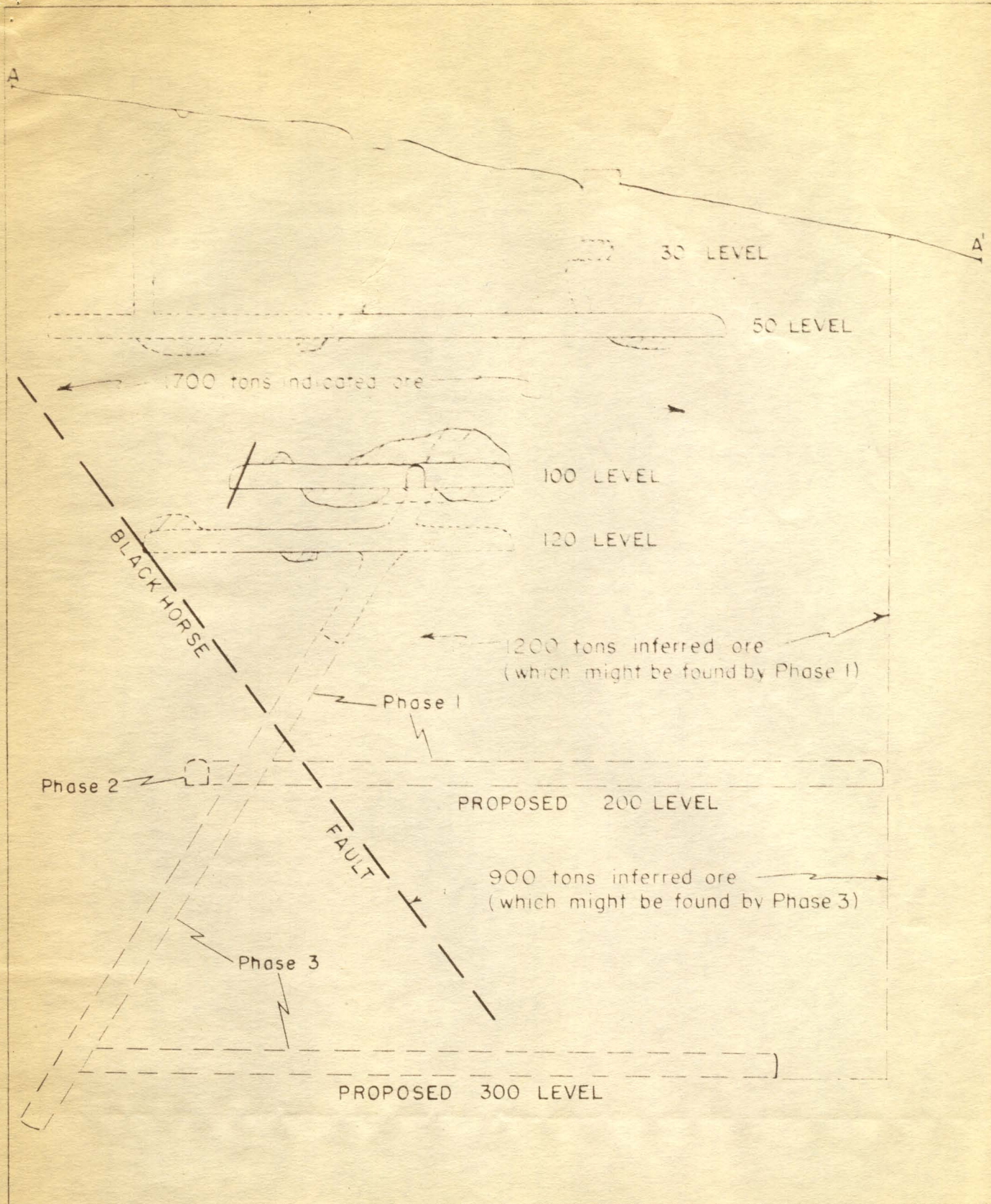


FIG. 3 LONGITUDINAL SECTION ALONG LINE A-A', OF THE BLACK HORSE MINE
WHITE PINE COUNTY, NEVADA

0 40 80 FEET
Scale

Smith

GRAHAM DEVELOPMENT CORPORATION
EXPLORATION PROJECT CONTRACT

DOCKET NO. DMEA-2289 *Idm E 467*

EXHIBIT "A"

Description of the Work

The exploration work on this project is indicated on the map attached hereto and made a part hereof entitled "Figure 1 - Longitudinal section of the Black Horse Mine, White Pine County, Nevada."

Time Schedule: 0 - 9 months

1. Sink the present Black Horse shaft an additional 72 feet to reach the 200 foot level and provide for a sump.
2. Cut a shaft station at the 200 foot level.
3. Drift and/or crosscut a total of 250 feet on the 200 foot level to explore the vein on the hanging wall side of the Black Horse fault and to determine at least its presence or absence on the footwall side of the fault.

Estimated Costs of the Project

72 feet of shaft sinking @ \$100.00/foot	\$7,200.00
Shaft station <u>1/</u>	490.00
250 feet of drifting and/or crosscutting @ \$37.00/ft.	9,250.00
45 Tungsten analyses @ \$4.00/analysis	<u>180.00</u>
Total Estimated Cost of Project	<u><u>\$17,120.00</u></u>
Government Participation @ 75%	<u><u>\$12,840.00</u></u>

1/ The unit here is the entire job.

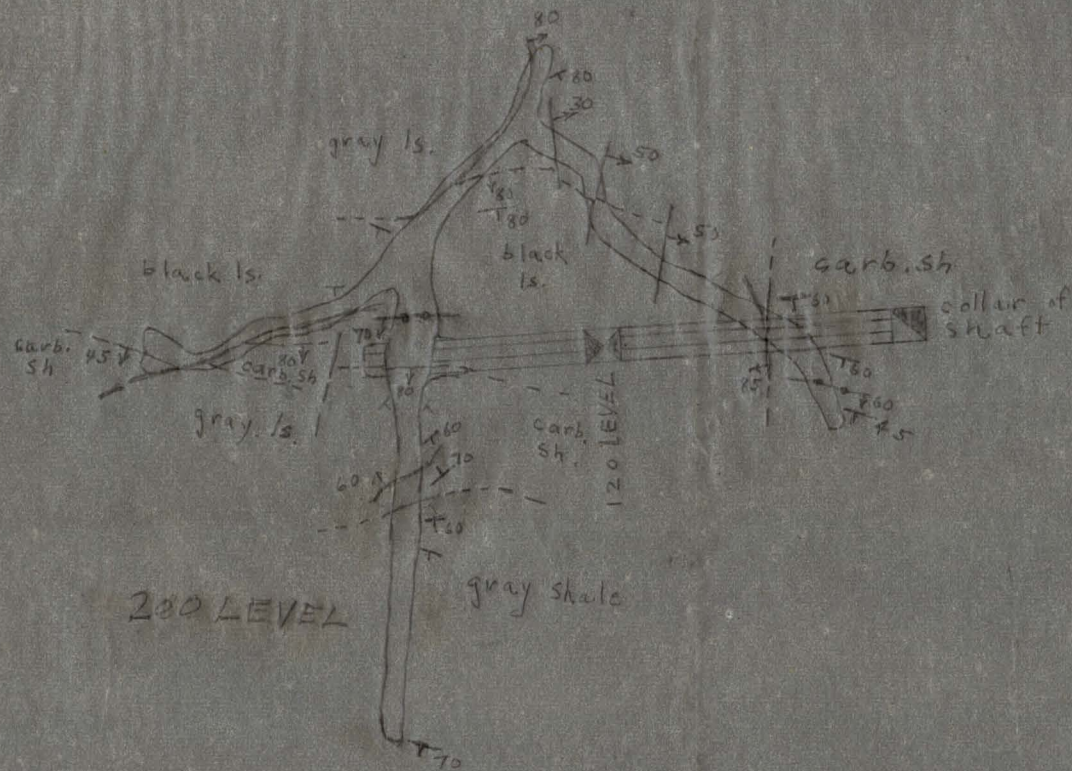


fig. 4

Geologic Map of the BLACK HORSE MINE
200 FOOT LEVEL
White Pine County, Nev

1" = 40'

337

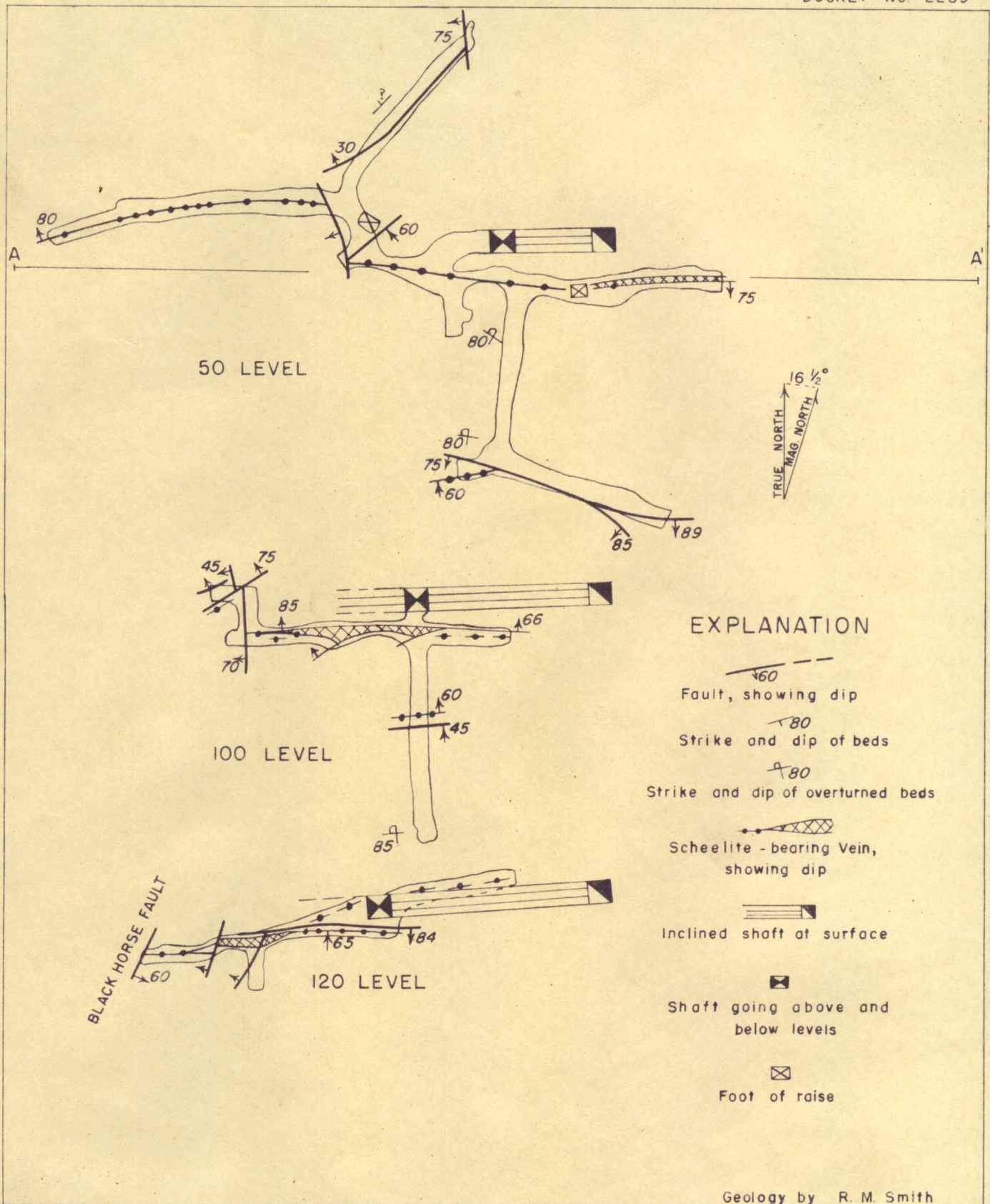


FIG. 2 GEOLOGIC LEVEL MAPS OF THE BLACK HORSE MINE
WHITE PINE COUNTY, NEVADA

0 40 80 FEET
Scale

A

A'

Collar

30 L

50 L

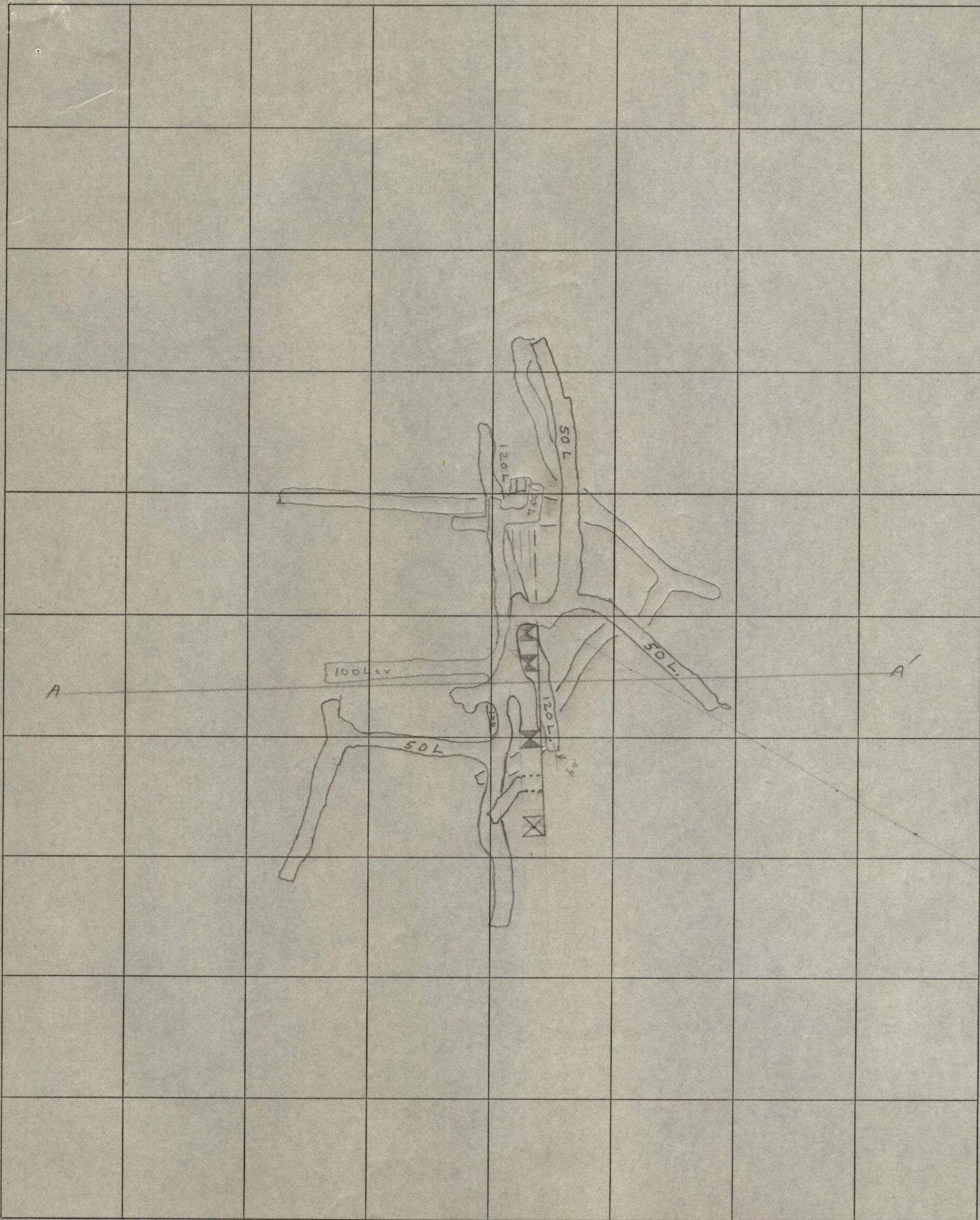
100 L

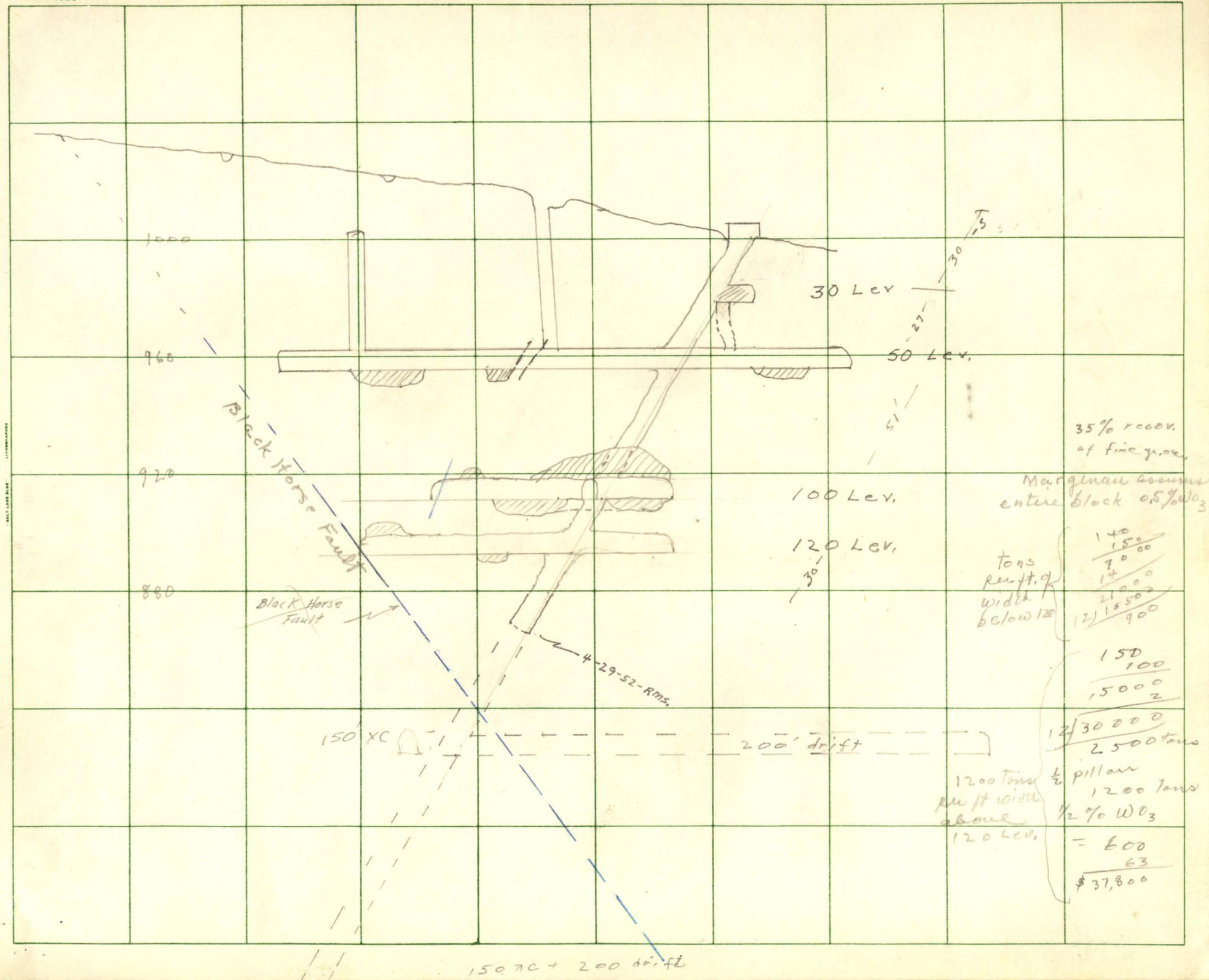
120 L

Proposed 200 L

Proposed 300 L

10





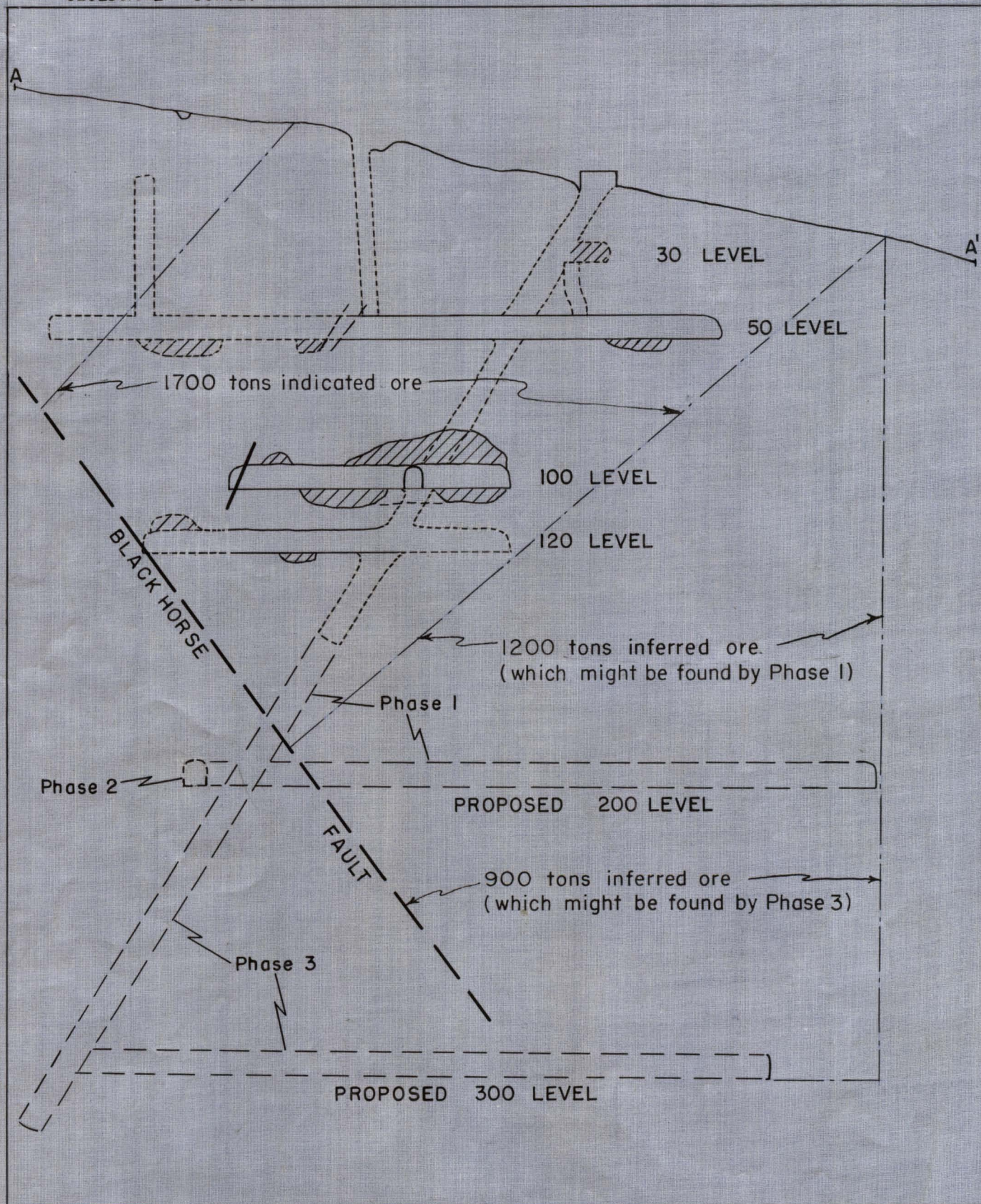


FIG. 3 LONGITUDINAL SECTION ALONG LINE A-A', OF THE BLACK HORSE MINE
WHITE PINE COUNTY, NEVADA

0 40 80 FEET
Scale

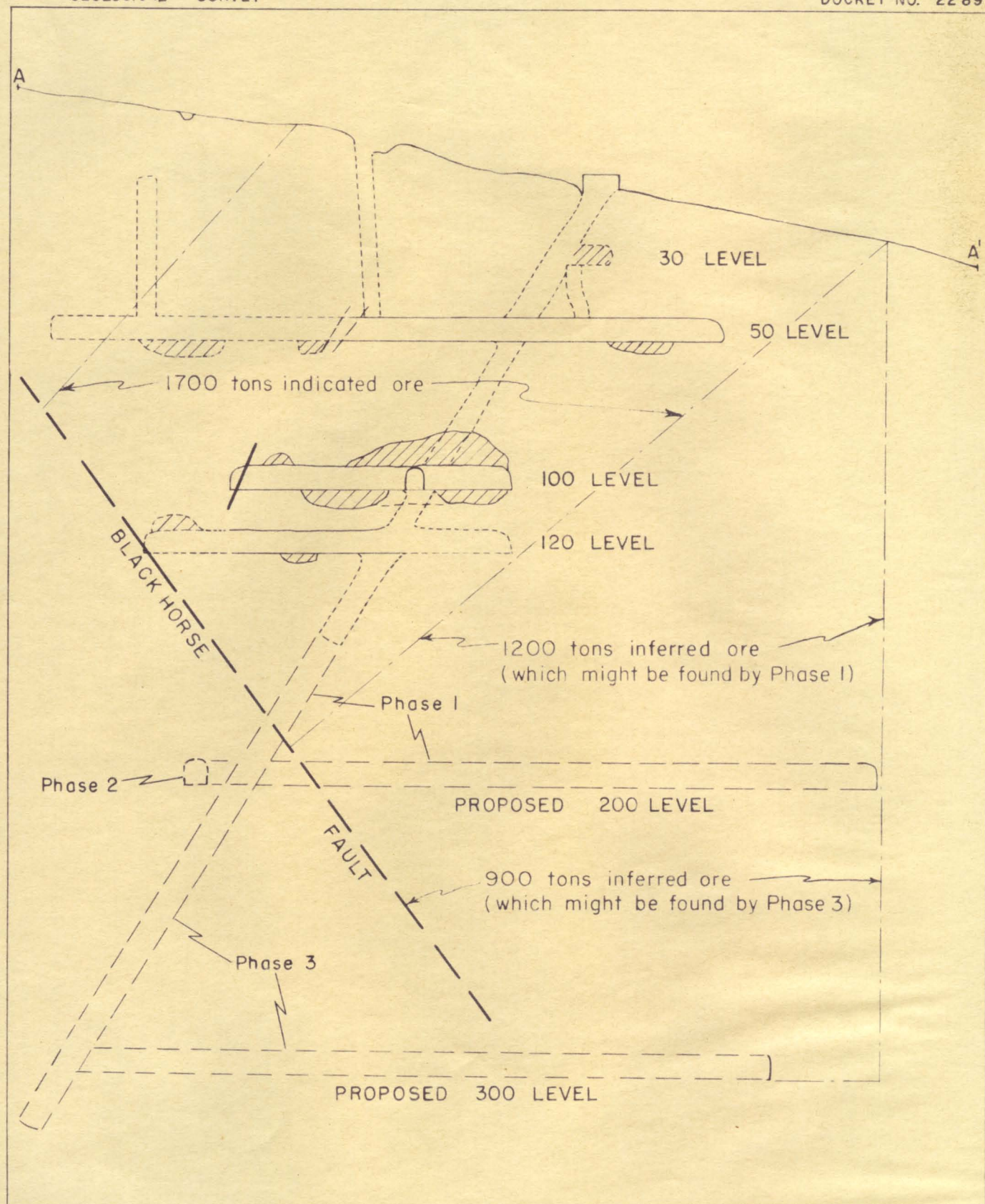


FIG. 3 LONGITUDINAL SECTION ALONG LINE A-A', OF THE BLACK HORSE MINE
WHITE PINE COUNTY, NEVADA

0 40 80 FEET
Scale



IN REPLY REFER TO:

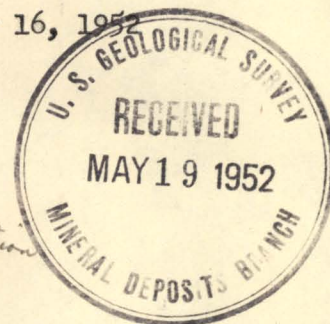
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
102 Old Mint Building
San Francisco 3, California

May 16, 1952

Subject: DMEA 2289

Mr. Ralph J. Roberts
U. S. Geological Survey
222 S. West Temple
Salt Lake City, Utah

*letter May 9
to H C Miller
Proposed Exploration*



Dear Ralph:

The enclosed data pertaining to DMEA 2289 is self-explanatory and should be taken into account in the preparation of the report on the Black Horse deposit.

Please return the enclosed when you send in the docket and report as it is to go on to Washington.

Sincerely yours,

Edgar H. Bailey



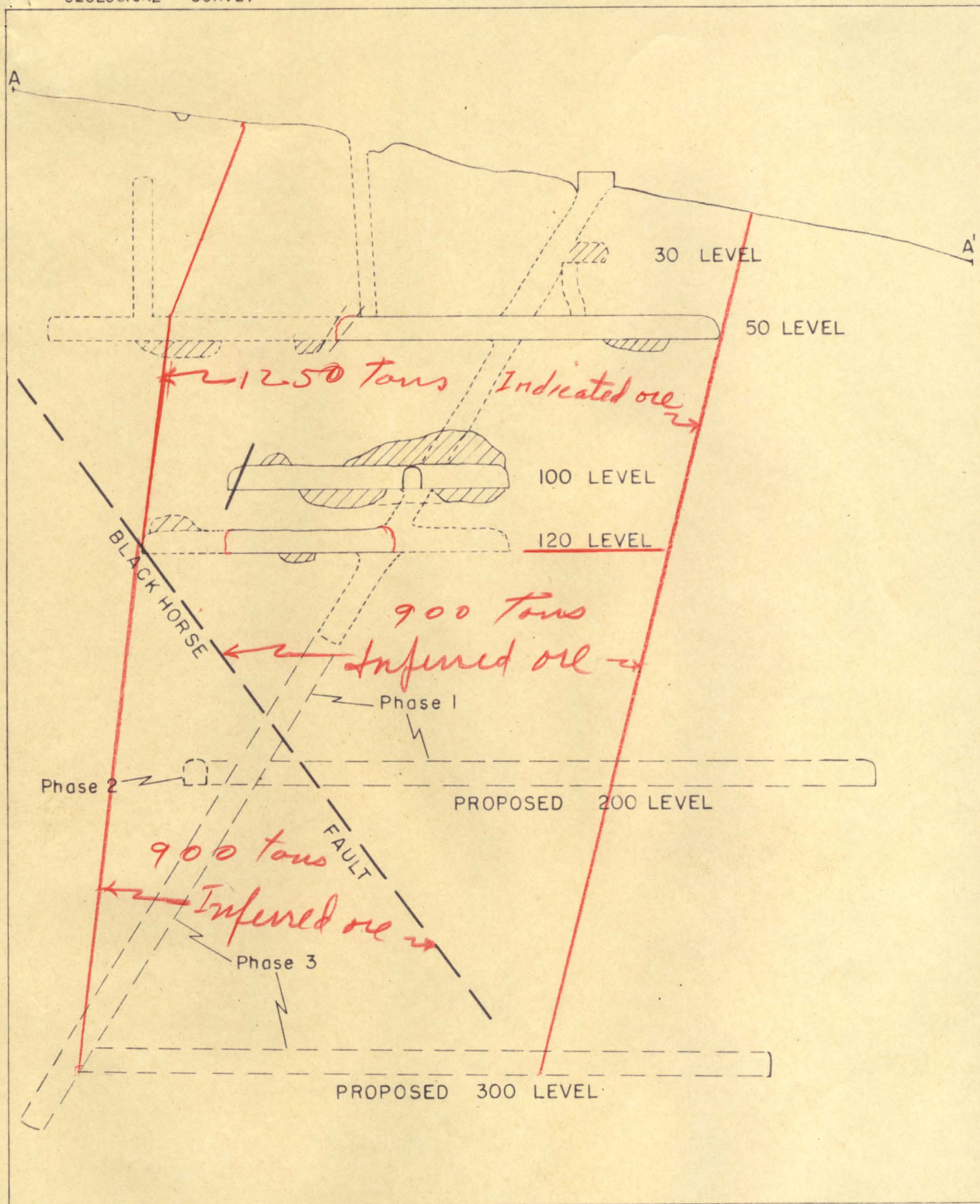
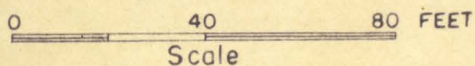
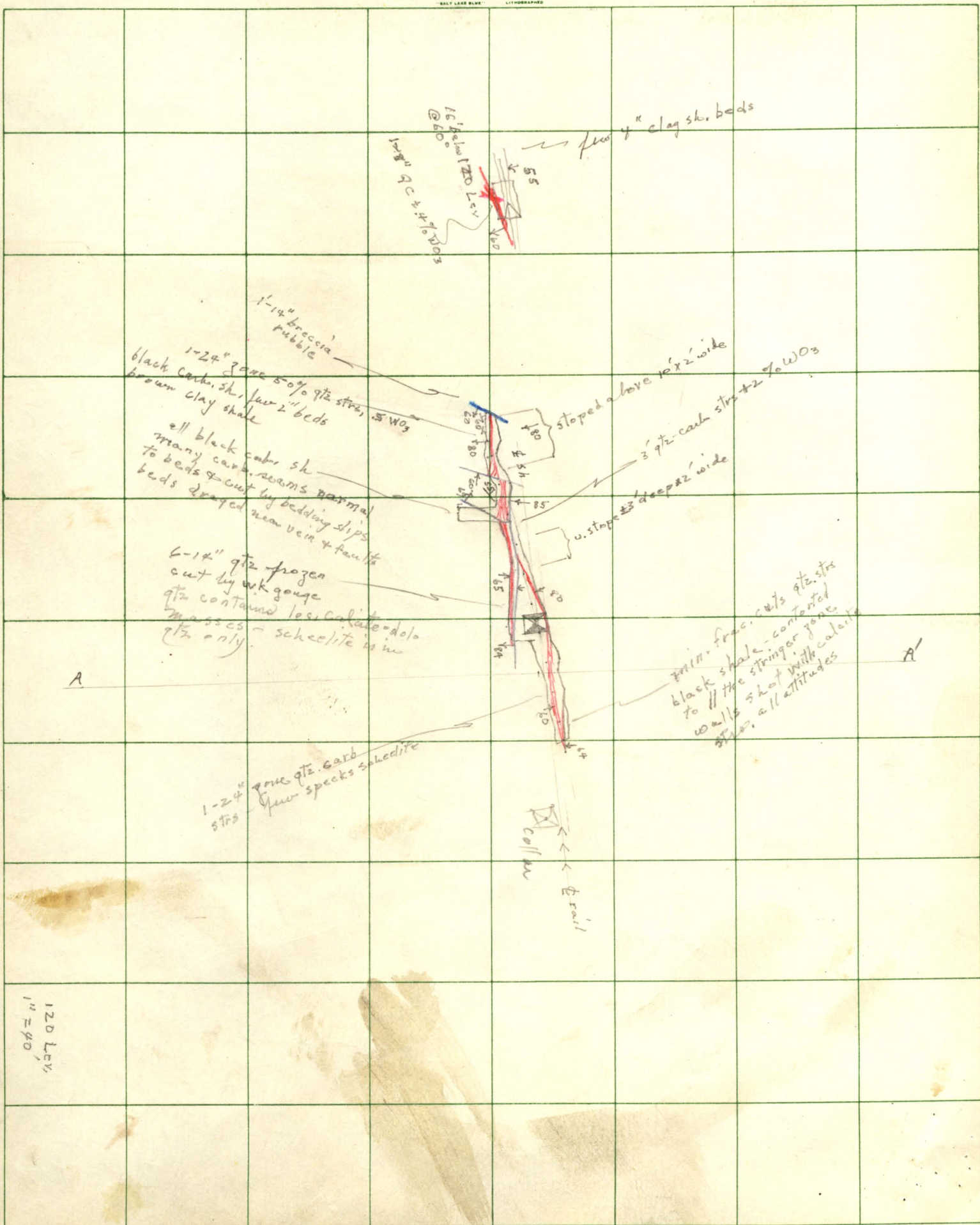


FIG. 3 LONGITUDINAL SECTION ALONG LINE A-A', OF THE BLACK HORSE MINE
WHITE PINE COUNTY, NEVADA



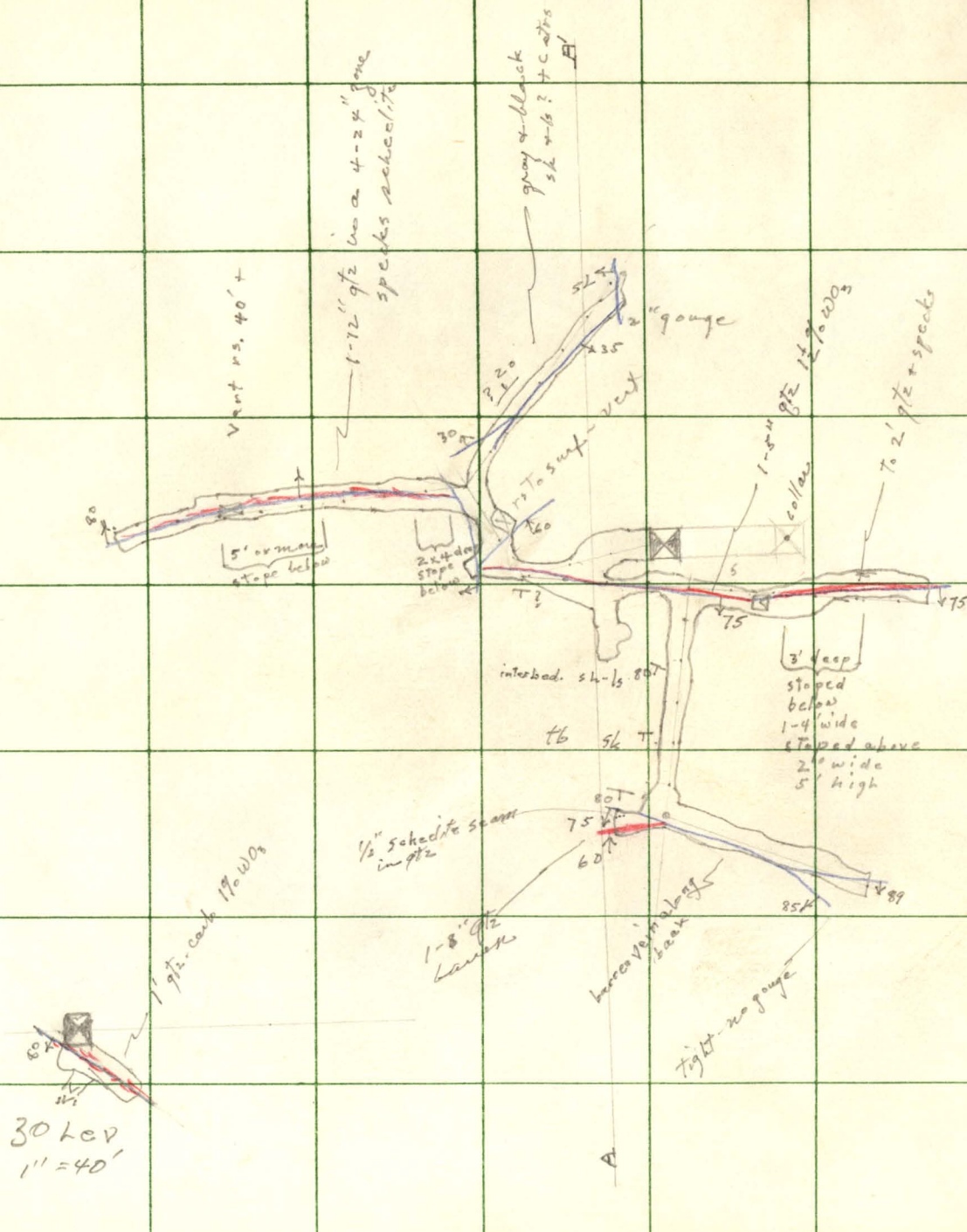
EAST LANE BLVD LITHOGRAPHED



120 LCV
1" = 40'



100 L.E.V.
1" = 40'



Ver. Sheared Ls.



Ls. with
Calcite
Veins



max. shale at thin Ls.
max. shale
with white
53°
faint
N 60 E

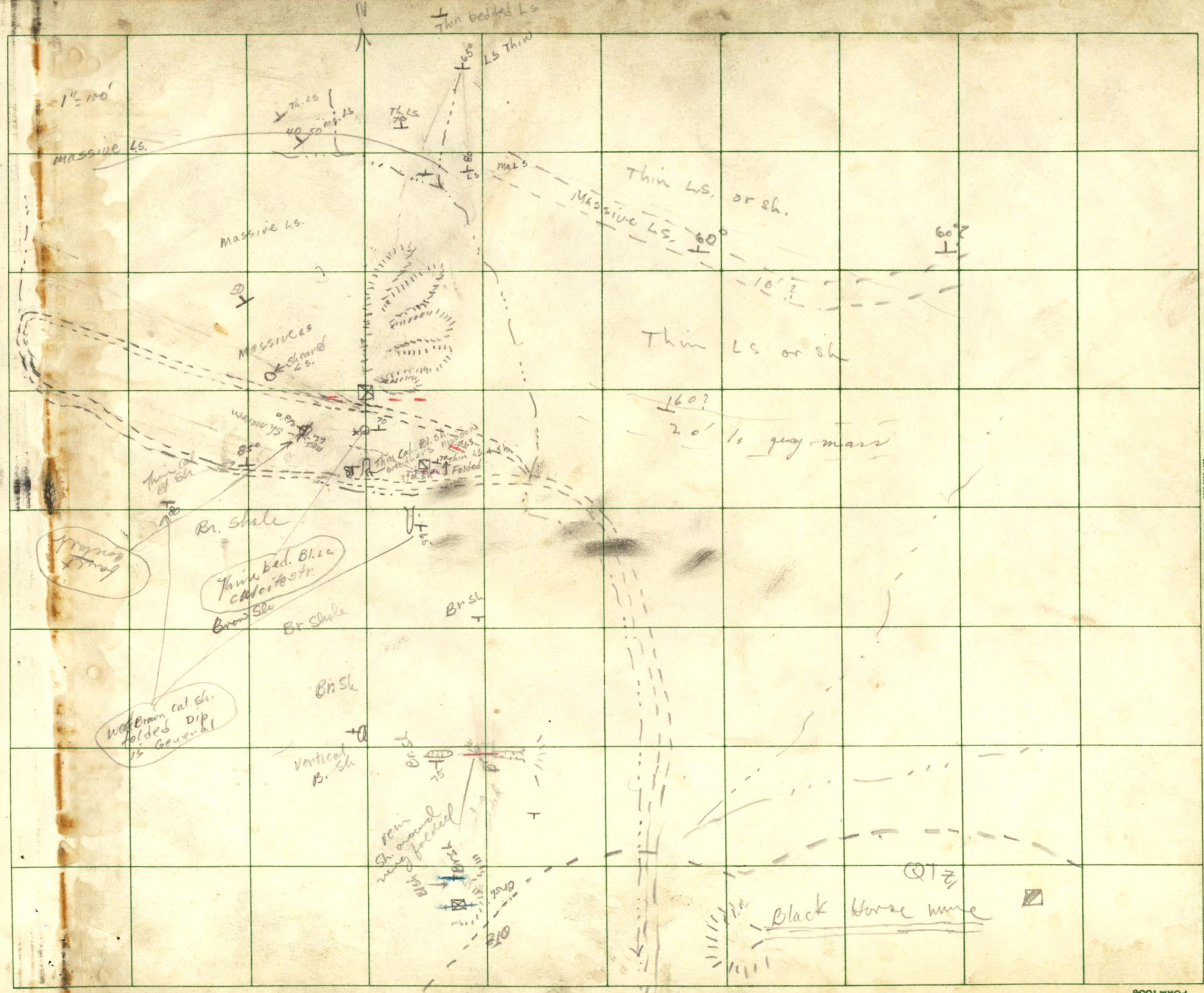
Thin Maroon
Ls.
with cal. string

max. shale
+
T
+
T

75°
70°
folded
thin Ls.



Gold King Mine
1" = 25'



Room 208 - 222 So. W. Temple
Salt Lake City 1, Utah
3 October 1952

Mr. Edgar H. Bailey
U. S. Geological Survey
102 Old Mint Building
San Francisco 3, California

Subject: DMEA Docket 2289

Dear Edgar:

In accordance with your request of September 29, 1952, the following appraisal of suggestions concerning the proposed exploratory program at the Black Horse Mine, White Pine County, Nevada, was prepared. The items are in the same order as in Mr. Frank E. Johnson's letter of September 22 to Mr. H. C. Miller:

1. Suggestion to explore for the faulted segment of the vein beyond the Black Horse fault on the 120-foot level.

This method would require rehabilitation of the 120-foot level consisting of laying track, pipe, and timbering or filling the underhand stope.

(Phase 1)

Drifting on the proposed 200-foot level has, as its objective, exploration of the vein on the east (hanging-wall) side of the Black Horse fault. This work is not dependent upon finding the faulted segment on the west (footwall) side of the fault. The extension of the shaft proposed in Phase 1 will cut the fault and extend into the footwall of the fault on the 200-foot level. This work will be done regardless of finding the faulted segment on either level, the 200-foot level site for Phase 2 exploration will eliminate the need for rehabilitating and extending the 120-foot level, and will, therefore,

be a less expensive method. Concerning Phase 2, the applicant considers that the faulted segment will be found within 75 feet of the shaft, but as the direction of displacement is not known he has allowed 150 feet of crosscut, 75 feet each way, in case the first crosscut is in the wrong direction. Although it is unlikely that more than 20 or 25 feet of crosscutting will be necessary, it is better to allow too much footage rather than too little. No penalty will accrue if the total footage allowed is unused, but a considerable delay will result from an under-estimation because a new application would be necessary to do the work. Exploration for the faulted segment by long-hole percussion drilling is not recommended because, near the faults, the veins are more irregular and may be narrower than they are elsewhere. A small amount of quartz in the drill cuttings could be ^{from} either the vein or a barren stringer not associated with the vein. Because of the spotty distribution of scheelite in the veins, it would be fortuitous if the hole encountered scheelite, whereas lack of scheelite in the cuttings would probably result in one of two conclusions:

- (a). That the vein was not cut -- a conclusion that could be either right or wrong -- or,
- (b). That the information yielded by the hole is inconclusive and a crosscut is necessary.

Exploration for the faulted segment by diamond drilling is not recommended because the cost per foot for a small job in an isolated area approaches the cost of crosscutting.

2. Suggestion to make Phase 1 contingent upon Phase 2.

The inferred ore which might be found by Phase 1 (fig. 3) is the primary objective of the exploratory work and should be done first and without regard to the faulted segment. In Phase 1, 1,200 tons is expected to cost \$16,890 in ^{exploratory} sinking and drifting, a more reasonable ratio than results when the total estimate is divided by the total inferred tons.

Phase 3 of the proposed work is contingent upon the success of Phases 1 and 2. This means that if Phase 2 reveals ore, the total tonnage objective of Phase 3 will be 900 tons of inferred ore in the hanging wall of the fault plus the ore found by Phase 2. Thus the cost per unit of WO_3 will be smaller here, also, than appears at first glance. In the event that either Phase 1 or Phase 2 reveals less ore than necessary to justify the remaining phases, government participation will be terminated.

At a conference ~~with~~ (the applicant) in Reno, Nevada, Oct. 8, 1952, ~~he~~ stated that he is willing to install a larger hoist and skip, and that an additional compressor (325 c.f.m) has been installed, but he contends that no reduction in his estimated cost can be made. This contention is based on two factors:

- (a) The estimated cost of shaft sinking is higher than the average for the region because the shaft is wet, and from 25 to 50 gallons of water per

minute must be pumped.

- (b) Although some saving in cost will result from installation of larger equipment, this saving is offset by recent increases in operating costs.

3. Suggestion to drift 50 feet on the second vein (Sample BM 4).

This work is considered to be less likely to reveal a significant tonnage than work on the main vein. Indicated ore at this showing of the vein is about 2 tons, but it is inferred that 30 tons containing 1.3 percent WO_3 may be present in the block 50 feet long, 1 foot wide and 7 feet high above the 100-foot level. In the event that Phases 1, 2 and 3 are successful, this work may be justified, but I cannot recommend that it be included in the contract.

4. Suggestion to do more detailed surface mapping. No map of surface geology was included in the report as the mine area contains few exposures; most of the area is covered by alluvium. The strikes and dips of the beds can be more accurately determined underground. Efforts to determine the displacement along the Black Horse fault from surface mapping were unsuccessful because of poor exposures in critical areas. It is concluded, therefore, that a revisit is not warranted. If more geologic data is required during the course of a project, then it is suggested that either the company hire a consultant to do the mapping, or we should provide for mapping as part of the project.

5. Suggestion that there may be lithologic control of the size of the ore bodies. As the veins are vertical and parallel the bedding, it is considered to be unlikely that a detailed stratigraphic study would yield information that would help ~~us~~ predict the size of the ore bodies at depth.
6. The rocks in the mine are slightly schistose carbonaceous shale and limy shale, and the veins are composed of quartz and calcite. The vein material drills hard, the wall rock drills soft, and the ground is tight and difficult to pull, partly because drifting is parallel to the bedding.
7. No timbering will be required in the shaft, except ties and occasional stulls with headboards or caps.
8. The inclination of the shaft is 60° west, and the depth is 156 feet. As line A-A' is parallel to the bearing of the shaft (fig. 2), the longitudinal section (fig. 3) shows the true inclination and depth of the shaft.

The estimated costs are higher than the average for this type of work as a result of at least four factors:

- (a) The shaft makes 25 to 50 gallons of water per minute.
- (b) ~~there~~ are no housing facilities and the operator plans to commute to Ely - 54 miles of travel each way daily.
- (c) the equipment is small and inadequate.
- (d) neither the applicant nor his supervisory representatives appear to ^{have more than a limited amount of} ~~be experienced~~ in underground mining.

The examining engineers and geologists discussed the proposed work with the applicant and made suggestions, many of which were adopted. These suggestions were, in general, modifications of the applicants original proposals which revised the ^m~~originals~~ as little as possible. This tendency to go along with the applicant as far as possible may be open to criticism, but reflects my interpretation of the Defense Production Act and subsequent procedural instructions that the intent of DMEA is to evaluate the operator's proposals and, as far as practicable, to approve or deny government assistance on that basis. In the case of the Black Horse Mine, it is entirely fair to criticize past operations, and to suspect that future operations will also be inefficient. As pointed out in the report (p.8) there is little chance that the loan will be repaid, but there is a good chance that several hundred units of WO_3 will be produced. If it is in the national interest to produce tungsten under these conditions, the loan should be approved; if not, it ~~should~~ ^{is suggested that the loan} be denied on the basis that it is unlikely that the total production will be 20 times the ^{exploration} ~~cost~~, as is necessary to obtain full repayment. In the event of approval, the extent of government participation should be controlled by ~~making payments on a footage basis, and by~~ refusal to approve expenditures beyond those specified in the contract either by letter or by implication.

Sincerely yours,

R. M. Smith

DMEA 2289, Graham Development Corp., Black Horse Tungsten Mine

White Pine County, Nevada

Roscoe Smith, Geologist
U. S. Geological Survey

June 11, 1952

Geology

The area is underlain by sedimentary rocks of probable Cambrian age which have been highly folded and complexly faulted. In the mine area interbedded limestone, shale, and carbonaceous shale strike east and dip steeply north or are overturned. The rocks are cut by many faults; most prominent is an east striking set that nearly parallels the bedding, and one other fault, the post mineral (?) Black Horse fault, which strikes N.25° E. and dips 60° SE.

Ore Deposits

Tungsten ore occurs in small shoots and lenses in quartz-calcite veins 1 to 3 feet wide in thin-bedded carbonaceous liny shale. At least three veins occur on the property; a gold-bearing vein with a small showing of scheelite reported to be at the bottom of a 100 foot shaft, the Black Horse tungsten vein, and an unnamed vein on the 50 foot level of the Black mine 50 feet south of the main vein (fig. 2). Only the Black Horse tungsten vein has yielded ore in commercial quantities.

The Black Horse vein is in a fault zone which strikes east and dips steeply south. It is locally 9 feet wide but averages about 2 feet in width. It contains lenticular masses of quartz which average about a foot in width.

The ore mineral is scheelite, which is essentially free of molybdenum, and it occurs as disseminated specks and as concentrations of as much as 2½ percent WO_3 in the quartz. Ore was mined to a depth of 100 feet. Only the highest grade parts of the vein were mined, and total production is reported to be 630.5 tons of ore estimated to contain 1410 units, of which 35 percent or 403 units were recovered. The average grade was about 2.2 percent WO_3 .

Exploration on the 120 foot level, 20 feet below the 100 level stopes, disclosed little or no high grade ore. Grade on the 120 level may average 0.50 percent WO_3 . Samples cut by Bureau of Mines engineers on the 120 level on the best ore average 1.57 percent WO_3 across a width of 1.2 feet.

On the 120 level the vein is cut off by the Black Horse fault; the faulted continuation of the vein is not exposed either at the surface or underground, and the amount of displacement along the fault is not known.

Ore Reserves

There are a few tons of measured ore averaging 0.5 percent WO_3 in the blocks above the existing levels. A total of 1,700 tons of indicated ore averaging 0.5 percent WO_3 is estimated to be in the block above the 120 level (fig. 3). If the vein is persistent to the east of the workings, about 1200 tons may be inferred to be in the triangular block 170 feet long, 160 feet high, and 1.0 feet thick, above the proposed 200 foot level. An additional 900 tons of ore averaging 0.5 percent WO_3 may be inferred to be above the proposed 300 foot level above the Black Horse fault. The block is 130 feet long, 85 feet high, and 1.0 feet thick. Total reserves are 3600 tons containing 1900 units of WO_3 . Of this total, perhaps 85

percent can be mined, and 15 percent left in pillars. On this basis the effective reserve is 3200 tons containing 1600 units. No ore reserve estimated is made for the block under the Black Horse fault.

Proposed Exploration

The applicant has proposed (letter of May 9, 1952 to H. C. Miller) to explore the Black Horse vein to a depth of 300 feet by exploratory work in three phases:

1. Sink the Black Horse incline shaft 72 feet and cut a station at the 200 foot level. Drift 200 feet east along the vein.

2. Crosscut north and south from the 200 level station in the hanging-wall (west) of the Black Horse fault (fig. 3) to locate the faulted continuation of the Black Horse vein. A total of 150 feet of cross cut is proposed for this work. It is suggested that 150 feet of diamond drilling and 75 feet of crosscut be allowed.

3. In the event that Phase 2 reveals a vein on the west side of the fault, and also a significant quantity of ore on either side of the fault, sink the Black Horse shaft 100 feet, cut a station at the 300 foot level and drift along the vein on both sides of the Black Horse fault. A total of 200 feet of drift is allowed for this work. An additional 75 feet should be provided for crosscutting.

Conclusions and Recommendations

The total estimated reserves are 1600 units having a gross value of about \$101,000 at the current price (\$63.00 per unit). The applicant's program is logical and the chances that it will reveal a few thousand tons of low grade ore are good. Although the reserves are inadequate to repay the loan a limited amount of exploratory work appears to be justified. It is recommended, therefore, that the application be approved and that each phase of the program be contingent upon the success of the preceding phase.

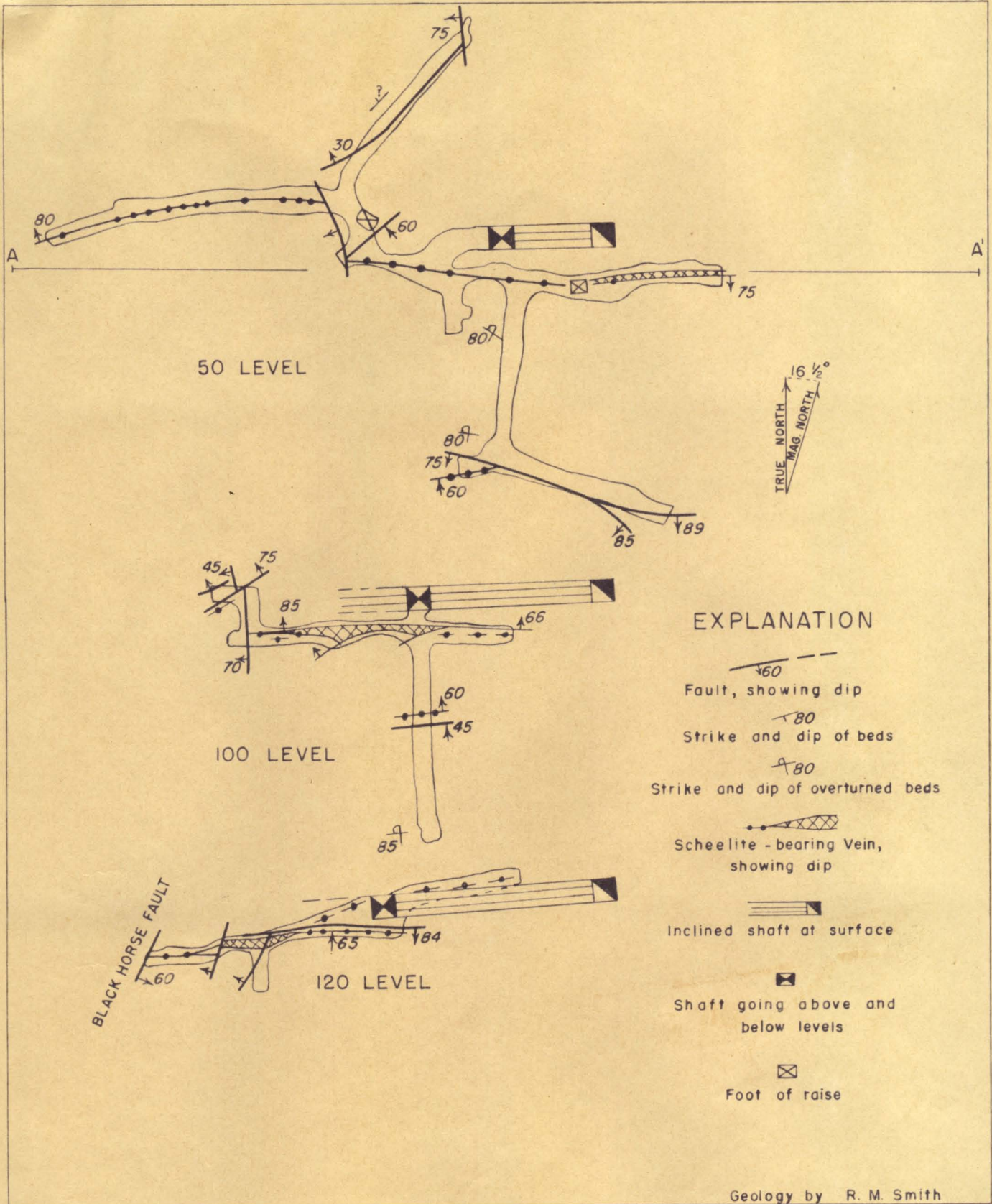


FIG. 2 GEOLOGIC LEVEL MAPS OF THE BLACK HORSE MINE
WHITE PINE COUNTY, NEVADA

0 40 80 FEET
Scale

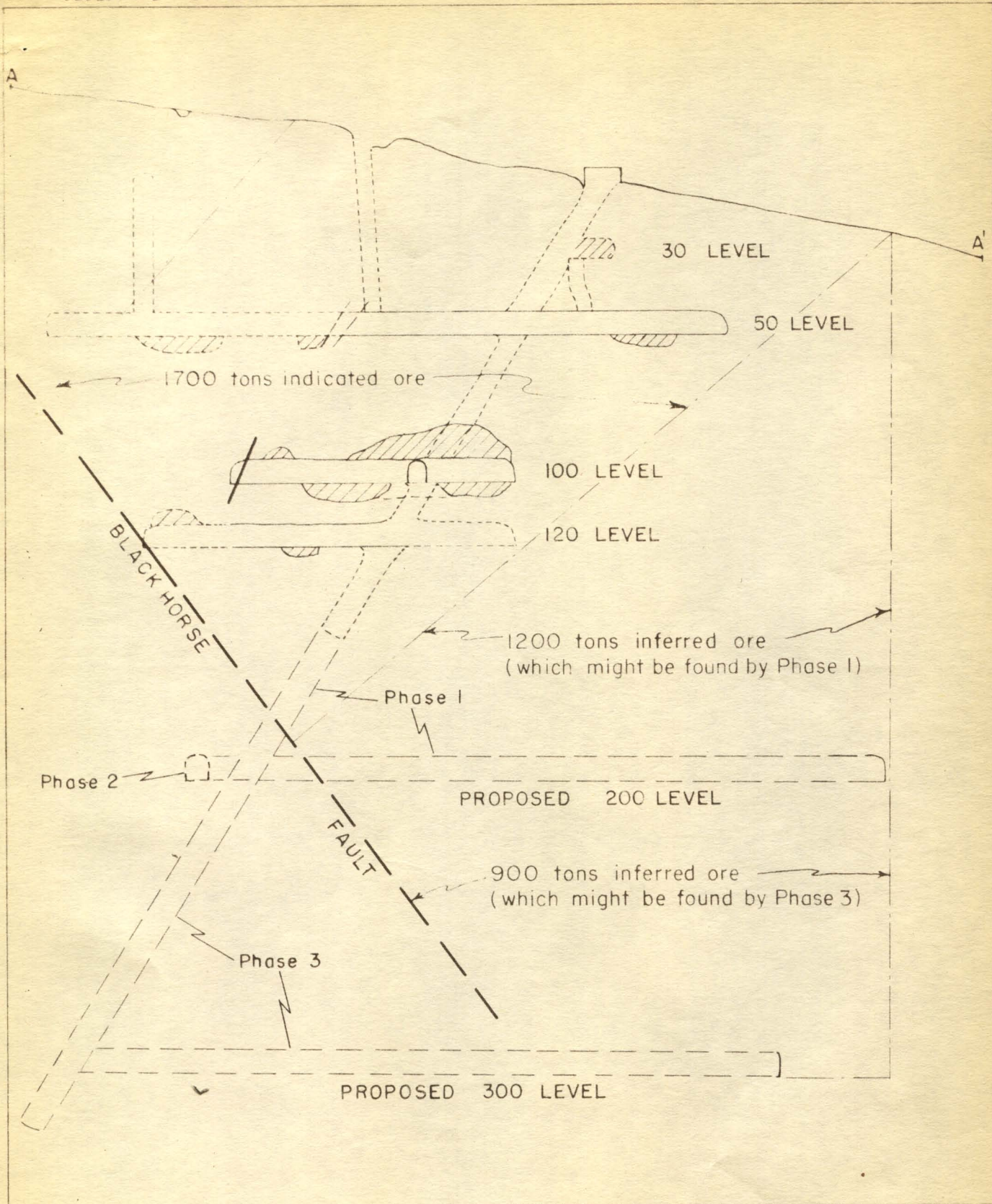


FIG. 3 LONGITUDINAL SECTION ALONG LINE A-A', OF THE BLACK HORSE MINE
WHITE PINE COUNTY, NEVADA

0 40 80 FEET
Scale

SAMPLE NO.	WIDTH FT.	WO ₃ %
BM 1	1.5	0.77
BM 2	7.4	0.35
BM 3	2.3	1.35
BM 4	1.0	1.31
BM 5	1.8	1.32
BM 6	1.2	1.62
BM 7	1.3	2.22
BM 8	1.2	0.88

354.72 (1.57)

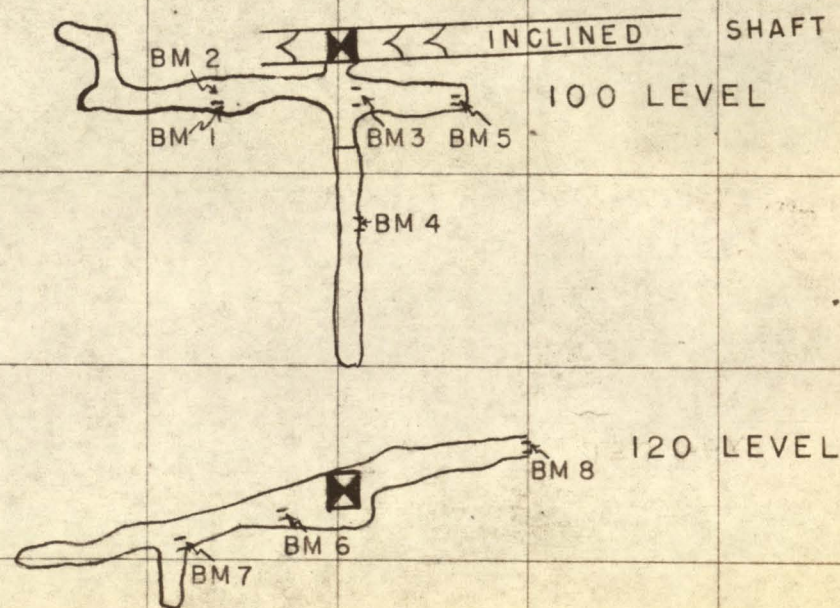


FIGURE 4 SAMPLE MAP- BLACK HORSE TUNGSTEN MINE, WHITE PINE CO, NEVADA.

DMEP 22.89