CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

The following file is part of the Grover Heinrichs Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

REPORT ON THE
AFTERTHOUGHT MINE
SHASTA COUNTY, CALIFORNIA

Edward Wisser

May 2, 1946

SUMMARY STATEMENT

At the Afterthought zinc-copper-lead-silver mine ore bodies hitherto mined have been lenses along zones of schistosity within a great intrusive mass of alaskite-porphyry, near the northeast flank of the mass. Although the cores of these lenses appear to have been high-grade, the lenses grade rapidly and erratically out into barren pyrite and little incentive exists for finding other lenses. Recent drilling, however, has developed an ore body of a different type, namely, a replacement of limy shale beds that butt into the flank of the alaskite mass down their dip, which is steeper than that of the alaskite contact. Such ore is higher in grade and much less gradational than the alaskite ore; but since this newly developed ore body can contain only 60,000 to 100,000 tons, several hundred thousand tons more of such ore must be found to justify mining operations at Afterthought.

The only likely place to find the additional ore needed appears to be a deep, sharp embayment in the flank of the alaskite mass, separated by a nose of alaskite from the ore body developed. The embayment is being drilled. If the hole fails to find ore it is recommended that the Afterthought property be dropped.

CONTENTS

	Page
INTRODUCTION	1
LOCATION. COMMUNICATIONS	1
GENERAL GEOLOGY	2
AFTERTHOUGHT MINE	3
Rock Formations	3
Shale	3
Volcanics	3
Limy horizons	3
Alaskite-porphyry	4
Basic dikes	5
Structure	5
Mineralization	9
Localization of ore	10
Value of the Property	10
Exploration of Embayment	11
Conclusion	12

ILLUSTRATIONS

In text	Face page
Section A-A'	9
Sections B-B'	11
Section C-C'	11

In Pocket at end of Report

Structural Contour Stereogram

REPORT ON THE AFTERTHOUGHT MINE, SHASTA COUNTY, CALIFORNIA.

INTRODUCTION.

The following report is based on a stay of four weeks at the property, March 28 to April 25, 1946. Mr. F.H.Stewart arrived about three months before the writer, and although his geologic work was frequently interrupted by unavoidable surveying, sampling etc., his surface and underground geology was nearly completed by the time of my arrival. My purpose was to check his work, add what might be possible to conceptions of ore localization and help lay out exploration should exploration be indicated.

Conclusions reached in the present report are based largely on Stewart's fieldwork, and many were worked out by Stewart and the writer together. Nevertheless, the writer assumes responsibility for the present report, while Stewart will submit a more detailed report, in which he may well differ from the writer on some points, especially since new information, mainly through drilling, is still coming in.

Beside the indespensible help of Stewart, Lyttleton Price, superintendent, and Jack Widauf gave the writer every possible assistance during the examination.

LOCATION. COMMUNICATIONS.

The Afterthought zinc mine lies 20 miles airline N 60°E from Redding. The mine plant and main mine entrance lie directly across Cow Creek from Highway 299, and the road distance along that highway from Redding is 23 miles.

GENERAL GEOLOGY.

No detailed description of the regional geology will be attempted. A great mass of alaskite-porphyry, called, from older conceptions, the Bully Hill rhyolite, intruded, probably in late Jurassic time, Triassic sediments and volcanics. The sediments intruded at Afterthought belong to the Pit formation, consisting of a thick series of shales intercalated with which are tuffaceous shale, andesitic tuff and andesite flows.

From the regional standpoint the alaskite intrusion appears to take the form of an arch trending northwest and plunging at each end. The Afterthought mine lies along the northeast edge of this massive, about three miles from its southeast tip, while the Bully Hill mines, 9 miles northwest of Afterthought, are situated close to where the alaskite probably plunges beneath the surface going northwest. (Other large exposures of alaskite are found in the Redding quadrangle, and these do not show the arch-like form).

In general, at least near Afterthought, the intrusion appears to have arched up the Pit shales rather than to have transgressed and engulfed them: in most places the alaskite contact conforms more or less to the attitude of the shales, so that the top of the intrusion was like that of a laccolith. Locally however, and notably in the area of the Afterthought ore bodies, the alaskite cuts sharply across the beds.

As seen along Highway 299, north and northeast of Afterthought, the area of sediments bordering the northeast contact of the alaskite massive appears to exhibit two or more flat thrusts dipping toward the intrusion and displacing, quite obviously, the Hossel-

kus limestone overlying the Pit shales. It seems doubtful whether any similar thrusts exist at Afterthought, although a few small ones may be present there. The alaskite mass slopes down to the northeast in that area, about parallel to the shale and volcanic beds, except in the transgressive or "nose" part of the area to be described.

Zinc-copper ores, with minor lead and locally high silver are found within the alaskite mass near its northwest end (Bully Hill) and its southeast end (Afterthought and Donkey). The ore bodies, commonly lenticular, are localized in zones of marked fissility or even schistosity, the fissile layers showing a uniform attitude within a given zone.

At Afterthought, at least one high-grade ore body lies in limy shale next to the alaskite mass.

AFTERTHOUGHT MINE.

Rock Formations.- Shales of the Pit formation occupy most of the northeastern half of the area studied. Where fresh, this shale is alternately black, massive-looking, without visible bedding, and dark gray to brown, fine-laminated.

Intercalated in the shales, especially toward the lower exposed horizons and bordering the alaskite massive are beds of andesitic crystal tuff and flows of fine-grained andesite, some of which may approach in composition dacite or even rhyolite. Both tuff and flows are perfectly conformable with the shale beds above and below them.

In the immediate vicinity of the mine certain horizons of this volcanic series are irregularly but strongly calcitized, so much so

that the rock approaches the composition of limestone. The most persistently calcitized horizon has been called on the accompanying vertical sections the "Main lime". Hand-lens examination of this rock suggests that it may be a calcitized quartz-andesite (quartz,feldspar phenocrysts, occasional apparent flow-banding); but it may have been originally a crystal tuff.

Stratigraphically below the Main lime, several horizons of black shales are very limy (see Section A-A'). The SA ore body is a replacement of such limy shale. Section A-A' indicates the probability that the SA ore body makes along the alaskite contact, and cuts stratigraphically across the limy shale beds, i.e.,it has replaced a series of such beds along the flat alaskite "floor". This notion in turn suggests the possibility that the calcitization is a local affair,linked to the alaskite contact, rather than that the limy beds and flows(?) are regional formations in the Pit shales,as intercalated beds of real limestone would be. To decide the matter, Stewart has recently made a reconnaissance along the Donkey road, north of the area mapped. He writes that here,while the alaskite sill above the Main lime persists (see Sections),the Main lime is very thin and the rest of the series of non-limy volcanics correspondingly thicker. Nowhere below the volcanics was any limy shale found. The lime formations are therefore local and areally related to the alaskite massive.

The alaskite-porphyry varies considerably in appearance,so much so that several intrusive units may be involved. In general, at the maximum distance inside the northeast contact the rock shows in places good-sized quartz phenocrysts,with sparser feldspars, in a dense white groundmass. Toward and at the contact the typical

appearance is that of "crackled"(irregularly fractured) to well-brecciated, jumbled, dark grey "rhyolite". The fragments are dense, with sparse small phenocrysts. Where they are separated and jumbled the resulting matrix often consists of very small "rhyolite" fragments in a groundmass which sometimes shows delicate flow surfaces concentrically surrounding the fragments. Shale fragments begin to show up among the "rhyolite" fragments as the contact is approached, and are abundant along the actual contact,which in places grades so irregularly into brecciated shale cemented by alaskite-porphyry as to merit the name "contact zone".

The shale series northeast of the alaskite mass contains numerous alaskite-porphyry sills, varying from thick sills (see Section to mere partings between shale laminae. The material of these sills differs markedly from that of the main massive:it contains abundant feldspar and quartz phenocrysts,shows flow surfaces and a trachytic texture whereby the feldspar laths are aligned parallel to the flow planes and to laminae in included shale slivers.

A fine-grained basic dike intrudes shale on the 2nd level and a similar dike intrudes alaskite on the 4th level. Lack of pyritization in these dikes suggests they may be post-mineral.

Structure.- The structure of the mine area seems to have been determined by the alaskite massive. The northeast contact of that mass trends northwest across the heart of the area and slopes down to the northeast like the flank of a mountain. The shale beds and volcanics dip northeast,in general, roughly parallel to the contact,so that the latter is like the top of a laccolith which has pushed up the beds in its cover. (Section A-A'). In detail there

are many structural complexities,most of which will be left for Stewart's report. However,the accompanying stereogram and sections all show abnormalities in the alaskite contact. The latter is thought to be much more regular, "laccolithic" in the segments northwest and southeast of the area depicted.

In the area depicted the chief feature of the alaskite flank is a marked ridge or nose extending eastward from the main alaskite mass and plunging down to the east (see Stereogram). The nose appears on the surface and is defined underground by D.D. Holes AS-2, AS-1, AU-1, AS-3.

Out in the shales northeast of the alaskite is the Main fault, which parallels,in a general way,the alaskite flank, both in strike and dip; hence the main alaskite mass, except possibly in the lower mine levels, never reaches the Main fault. Limited drag evidence from the mine workings suggests that the hanging wall moved down relative to the footwall; and duplication of the Main lime,shown on Section B-B' confirms this belief provided the fault, as seems likely, dips flatter than the beds.

Sections A-A', C-C' shows the alaskite flank approaching the Main fault with depth,and the two may coincide,either from the 8th level down,or at some horizon below the 8th level.

The outcrop of the alaskite contact shown on the stereogram takes the form of a long, shallow embayment,not to be confused with the local sharp embayment mentioned below. The Main fault cuts across the "seaward" side of this embayment, and seems to have taken a short cut from one point of this "bay" to the opposite point. In vertical section (Section A-A') much the same thing is shown: the fault, which may coincide with the alaskite flank below the

5th level, cuts straight up its dip to the surface, keeping outside the irregular reentrant or depression in the alaskite flank.

Since the alaskite mass is thought to have domed up the sediments (L.C.Graton: U.S.G.S. Bull. 430, Contributions to Economic Geology, 1909, Part I, 71-111) it must have been shoved up after its upper shell had consolidated. Because in general the northeast flank of the mass conformed to the attitude of the sediments, the main upward movement would have taken place along this contact. Where however a cup-like reentrant existed in the flank, the fault movement would not turn and twist to follow such an irregular surface; it would slice over the top of the cup. In other words, the sediments filling the cup would rise with the surrounding alaskite. These sediments here form the footwall block of the fault, so that while the latter is geometrically a "normal" fault, dynamically the fault movement was such that the footwall block moved up with reference to a fixed point in space, while the shales in the hanging wall remained fixed in space, or sagged somewhat downward.

A similar thing seems to have happened with respect to the NE fault shown on the Stereogram. This fault appears to have originated in the innermost corner of a sharp local embayment in the alaskite flank, just south of the east-jutting nose mentioned. In this corner the alaskite flank is straight and smooth, striking N65°E and dipping 60°SE. Uplift of the alaskite mass as a whole appears to have generated a fault along this plane. The fault propogated itself northeastward beyond the northeast end of the smooth plane, and entered the shales. Here again the sediments in the footwall, imbedded in the rising alaskite mass, rose in space, so that displacement of the sediments was that of a "normal" fault. Such a displace-

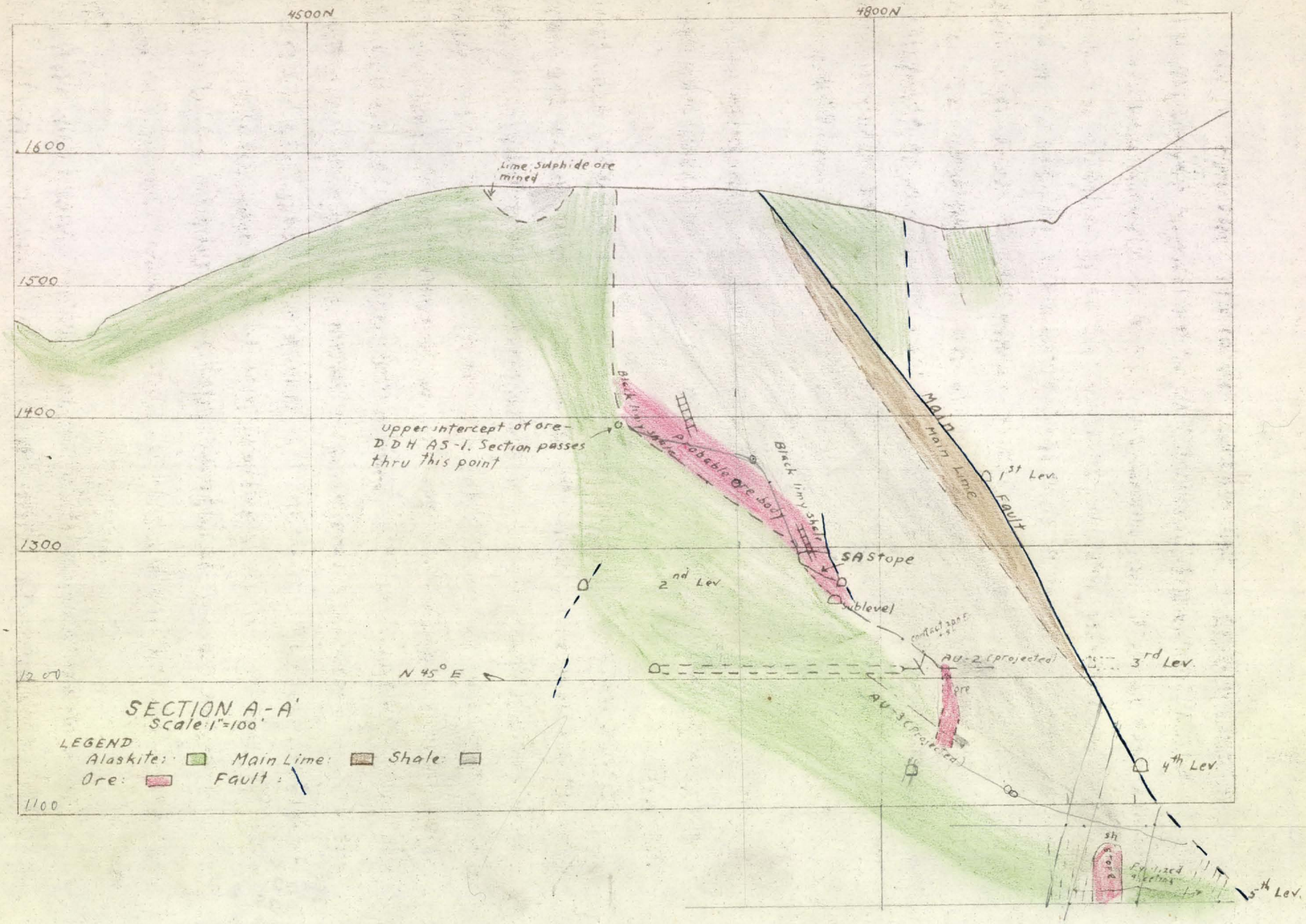
ment is shown, on the Stereogram, for the footwall of the Main lime bed.

The NE fault appears to end on the southeast at the Afterthought open-cut. This accords with the origin of the fault outlined above and implies that the embayment rose as a unit,so that fault movement took place along the alaskite flank southeast of the open-cut.

If the alaskite mass rose in space as postulated,its rise must have had a strong component toward the north or northwest,as shown, on the stereogram, by the anomolous ("reverse fault") displacement of the NE fault by the Main fault. Such a displacement,if the Main fault footwall rose and did not sink,could only have been caused by upward movement of the footwall with a strong component to the northeast. The idea of such a movement finds confirmation in the thrusts seen northeast and north of Afterthought,dipping southwest into the intrusive and implying a strong shove by the alaskite massive toward the north.

The alaskite nose appears to lie wholly in the block beneath the respective footwalls of the Main and NE faults. It cuts across and disrupts the sediments, as shown on the stereogram.

A notable type of structure within the alaskite massive,extending in places into the sediments, consists of broad and narrow zones of sheeting, or rather fissility grading into schistosity. Such "sheeting" is probably closer to flow than to fracture: i.e. it is true schistosity. Schist planes tend to align themselves perpendicular to a compressive stress,in this case doubtless the resistance,along the alaskite northeast flank,of the cover against which the alaskite massive rose.


4500N
4800N
1600
1500
1400
1300
1200
1100
Lime, sulphide ore mined
Upper intercept of ore - DDH AS-1. Section passes thru this point
Probable ore shoot
Black limy shale
Black limy shale
Main Lime
Main Lime Fault
1st Lev.
SA Stope
2nd Lev.
sublevel
contact zone
AU-2 (projected)
3rd Lev.
ore
AU-3 (projected)
N 45° E
4th Lev.
sh
stope
Fractured sections
5th Lev.
SECTION A-A'
Scale: 1"=100'
LEGEND
Alaskite:
Main Lime:
Shale:
Ore:
Fault:

Mineralization.- The typical ore bodies, not only of the Bully Hill-Afterthought district but of the larger Kennett district to the west as well, are lenses in sheeted or fissile zones such as those described. The Afterthought ore bodies in alaskite are shown on the stereogram, and in part on Section A-A'. The ore is an almost complete to complete replacement of highly fissile"rhyolite". Replacement decreases toward the edges of an ore body,and here small stringers, largely prite, are strung out along the planes of fissility. There is a suggestion that the typical ore body lies within a pyritic casing. Thus D.D.Hole As-1 entered pyrite, then ore,then pyrite again.

That these alaskite ore bodies carried some high-grade ore is shown, on the Stereogram, by the results of old drilling from the 6th level.

Toward the end of prior operations at Afterthought, a different type of ore body was found, the SA ore body, shown on the Stereogram and on Section A-A'. This is a replacement of limy shale,as is shown by the very limy nature of the ore and by shreds and larger masses of unreplaced shale within the ore. As indicated on the section,this ore body is believed to lie along a flat segment of the alaskite flank, and to have replaced a considerable series of limy beds where the latter butt against the alaskite. The upward extension,along the beds,of this ore body is obviously unknown from present developments.

Regarding the ore itself,the high-grade alaskite ore so closely resembles the lime ore that the following description applies to both.

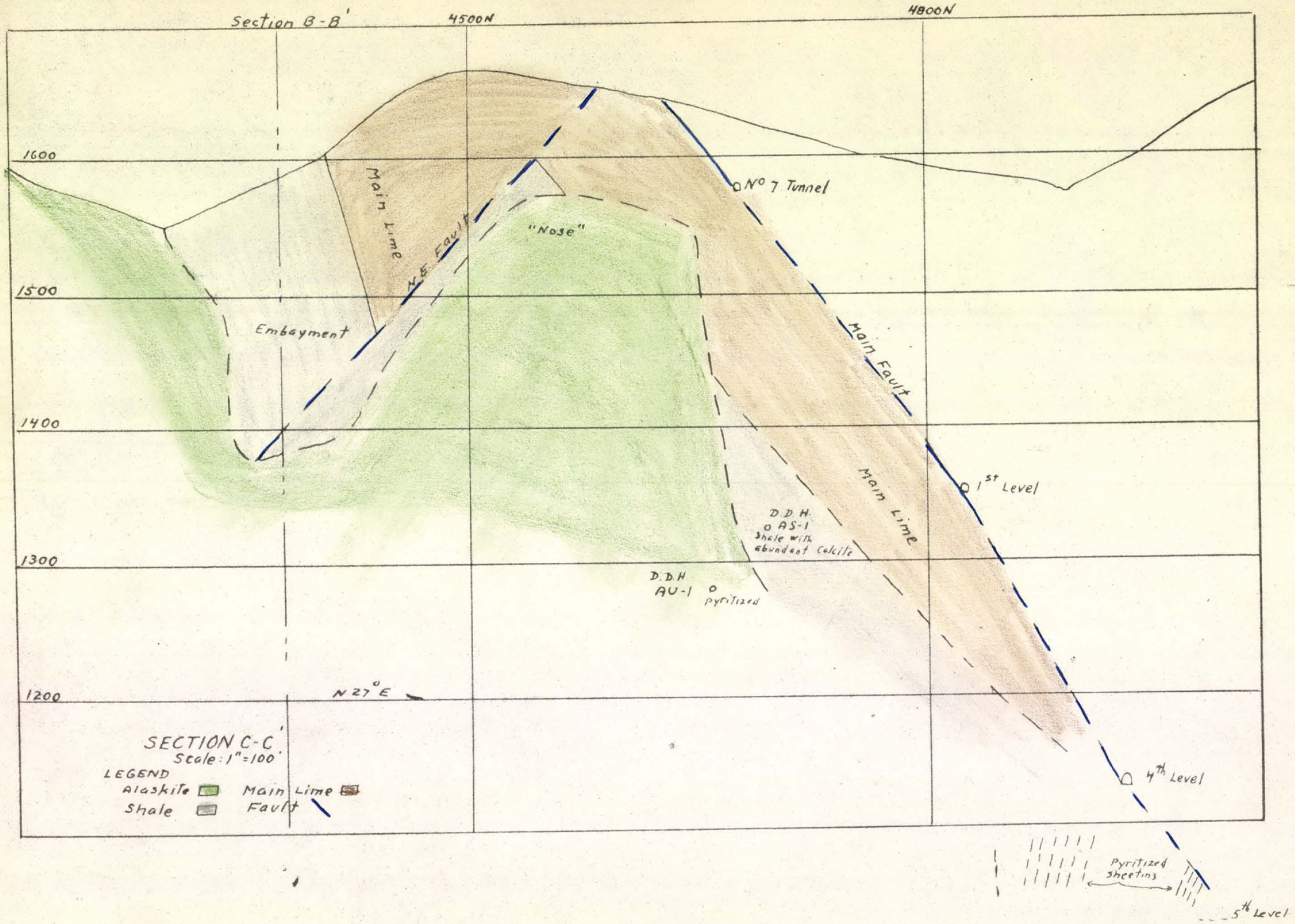
The high-grade replacement ore,whether of alaskite or shale,is an intimate admixture of black sphalerite or marmatite, pyrite, minor

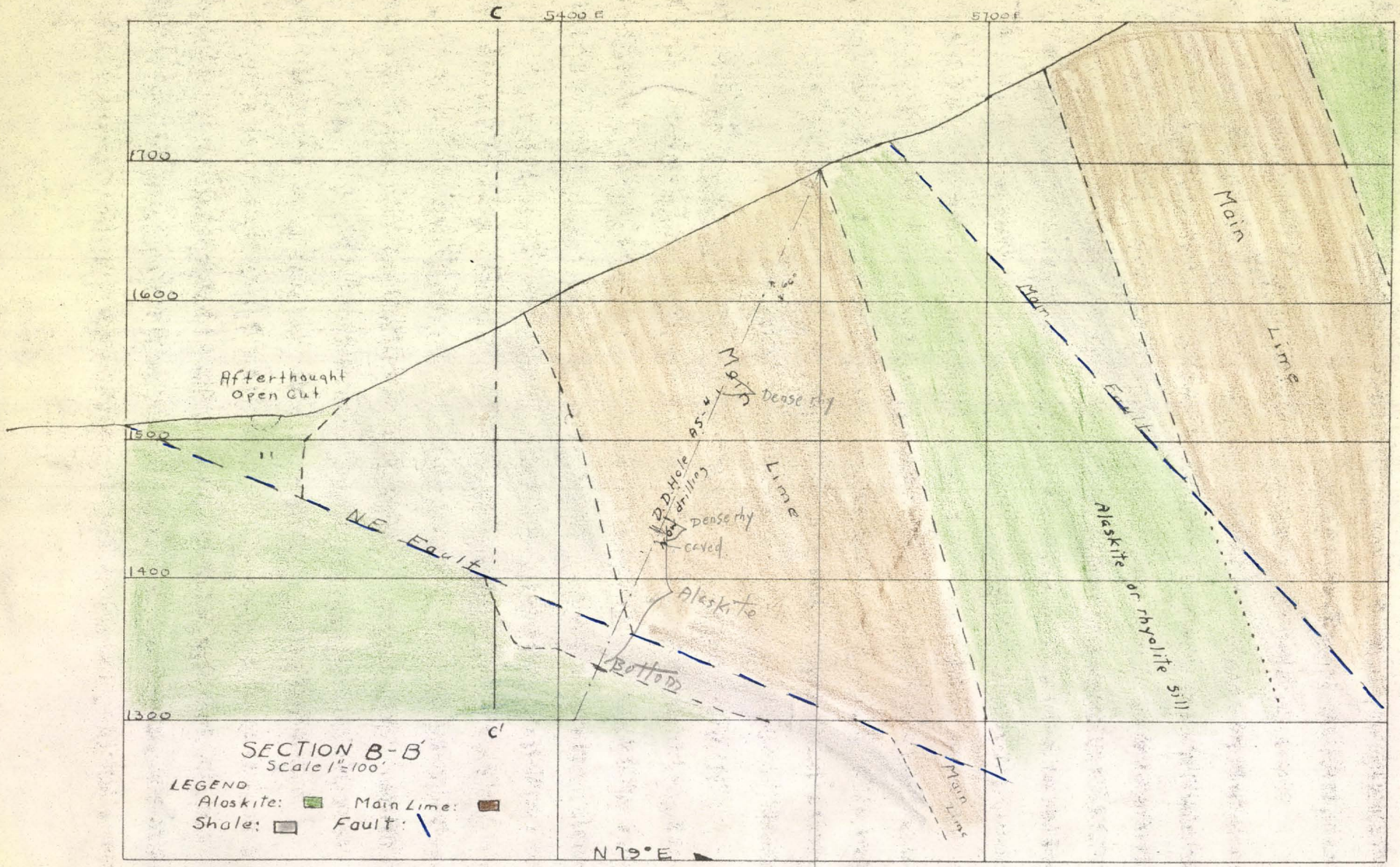
chalcopyrite and galena. Both types of ore in places show ghost laminae (ex-shale) or fissile planes (slaskite). Calcite occurs in the lime ore,as blebs and veinlets which contain sulphides and show the calcite to be pre- or intra-mineral.

Localization of Ore.- Localization of ore in the general area of the slaskite nose is apparent from the Stereogram. The slaskite ore is localized along a zone of strong sheeting near the slaskite contact, but what localizes the lenses within the sheeted zone is not apparent. The SA lime ore body is localized along the flat segment of the slaskite contact shown in Section A-A',where limy shale beds dip down against the contact. In the upper horizon, this ore body nestles within a minor embayment on the north side of the slaskite nose.

The major embayment south of the nose may be an ore localizer, first, because the Afterthought ore body lay on the west edge of this embayment (although in the slaskite) and the small lime ore body mined north of the Afterthought opencut lay within a branch of the embayment, and second, because elsewhere similar embayments in porphyry have yielded ore in adjoining sediments. Such embayments or slots in a porphyry flank make good solution channels.

Value of the Property.- The SA ore body, practically virgin, probably does not contain over 100,000 tons, even if the ore showings found in Holes AU-2, AU-3 represent a tonnage equal to that above the SA stope (Section A-A'). Assuming metallurgical success, an operation at Afterthought would require the finding of another 300,000 or 400,000 tons. (Possible ore,other than the SA ore body, indicated in the Carl Lindberg report,has been ignored). The only likely place to find sizable lime ore would seem to be the major


Section B-B'
4500N
4800N
1600
1500
1400
1300
1200
Main Lime
N.E. Fault
"Nose"
Embayment
No 7 Tunnel
Main Fault
Main Lime
1st Level
D.D.H.
AS-1
Shale with abundant Calcite
D.D.H
AU-1
Pyritized
N 27° E
4th Level
Pyritized Shearing
5th Level
SECTION C-C'
Scale: 1" = 100'
LEGEND
Alaskite
Shale
Main Lime
Fault



SECTION B-B'
Scale 1" = 100'

LEGEND
Aloskite: Main Lime:
Shale: Fault:

embayment south of the nose. D.D.Hole AS-4 is presently exploring this area,as described below.

There is however another possibility. In contrast to the almost barren alaskite mineralization seen by us,the hearts of these ore bodies must have been high-grade, as shown by the old drilling (Stereogram). The sheeted zone containing these ore bodies has been little explored northwest and southeast of the lenses. Two possible holes to accomplish this are shown in red on the stereogram. The hole to the northwest is preferred:it is shorter,and the sheeted zone is stronger where last seen going northwest. Neither hole however is recommended at present,because chances for their success appear too slim. If,on the other hand, exploration of the embayment finds enough high-grade lime ore to make a mine, some exploration of the alaskite sheeted zone would be warranted.

<u>The Embayment.</u>- Section C-C' is a cross-section of the embayment, Section B-B', a longitudinal section. The shape of the embayment at depth is highly speculative: it may be deeper, shallower, wider, narrower than supposed. Section B-B' shows the similarity in conditions between the embayment and the environment of the SA ore body. In both cases sediments dip down to a flattish alaskite contact and butt on the contact. If the embayment is an ore solution channel,there may be greater concentration of solutions and therefore greater deposition of ore than with the SA ore body.

Hole AS-4, now drilling, is more or less a compromise. The only lime ore known occurs, not in the Main lime, but in limy black shales below it. But the Main lime is so limy that it may be an ore bearer next the alaskite. The hole is designed to explore the Main lime near the alaskite but above the NE fault; crossing the fault, it should

enter the same horizon of shale beds that were limy and produced ore in the case of the SA ore body. If the trough of the embayment is deeper than indicated on the section, there will be room for a good-sized ore body here.

Conclusion.- If Hole AS-4 passes through a good thickness of ore, doubtless further holes should be drilled, their position depending on the position of the ore found, and the structure of the embayment and its contained sediments as disclosed by the present hole. One or more additional holes will probably be drilled if the present hole finds a "teaser" such as Holes AU2, AU-3 have disclosed. But if Hole AS-4 is completely barren, and unless its results indicate some new, unsuspected and potentially promising structure to lure us into further drilling, exploration at Afterthought should be stopped and the property dismissed.

E.W

Edward Wisser

San Francisco
May 2nd, 1946

INTERIM OFFICE REPORT ON DIAMOND-DRILLING,

AFTERTHOUGHT MINE, SHASTA CO., CALIF.

Edward Wisser

June 28, 1946

INTERIM OFFICE REPORT ON DIAMOND-DRILLING,

AFTERTHOUGHT MINE, SHASTA CO.,CALIF.

INTRODUCTION.

The writer has been kept in touch with drilling results at Afterthought, and has been consulted concerning specific holes proposed. Enough drilling data are now at hand to warrant, at this stage, a detailed analysis of results to date, and some evaluation of the chances for finding a mine. The following report attempts to do this. It must be pointed out, in self-defense, however, that the information in the writer's possession is rather woefully incomplete: he has no surface contour plan; no copy of Stewart's report; and his log of Diamond-drill Hole AU-5 goes only to 215', although a section sent from Los Angeles gives some information on the hole down to 307'.

This report deals with the area now being drilled, on the north side of the rhyolite nose and in the general vicinity of the SA ore body, above the 2nd level. Refer to the accompanying Structural Contour Stereogram and to the accompanying Sections A-A', D-D' and E-E'.

ENVIRONMENT AND POSSIBLE SIZE OF ORE SHOOTS.

Three ore shoots have been found to date; as will be shown, they may be portions of one continuous ore body, but since this is not certain, the three shoots will be discussed separately after describing the general structure of the area.

Structure of the Area.- The northeast slope of the alaskite main mass is taken as the key to the structure: all three ore shoots lie in limy shale along this contact, and until ore bodies in sedi-

ments have been found unconnected with this contact, the latter must be presumed to be the main ore localizer.

As shown by Stewart's sections, respectively through No.1 and No.2 Shaft (which should be consulted) the northeast slope of the alaskite mass is far from simple. From the surface to about the 1300' elevation, the slope may be an even one (or it may not-there are no data); but below the 1300' elevation, a flattish tongue protrudes northeast from the main slope (marked "sill" on the accompanying Stereogram). At least near No.1 Shaft, this is a true tongue, with shale beneath it; farther southeast the top of this tongue may be really a flat portion of the main northeast slope itself. (See the Stewart Sections mentioned).

The tongue is chopped-off steeply at its northeast end; this is called the "Upper corner" on the Stereogram. East of this corner or end of the "sill" is the top of another flattish alaskite mass, shown on the Stewart Sections and on the Stereogram. This mass is continuous down to the 8th level; no shale under it has been found, and it is probably continuous with the main alaskite mass (see Stewart Section through No.3 Shaft).

The "sill" or shelf seems to join the main mass north of the SA ore body; it merges into the mass, giving the latter a distinct flattening beneath the SA stope and in the area of Holes AU-2, AU-3. Its corner, or chopping-off plane, appears to persist past Holes AU-2, AU-3 (Section A-A'). The corner coincides with a steep fault, although the "sill" is not believed to have been faulted; rather, the tongue-like intrusion probably stopped at the gouge of a pre-intrusion fault. The fault near No.3 Shaft, which displaces the second flat alaskite surface mentioned would join the "corner

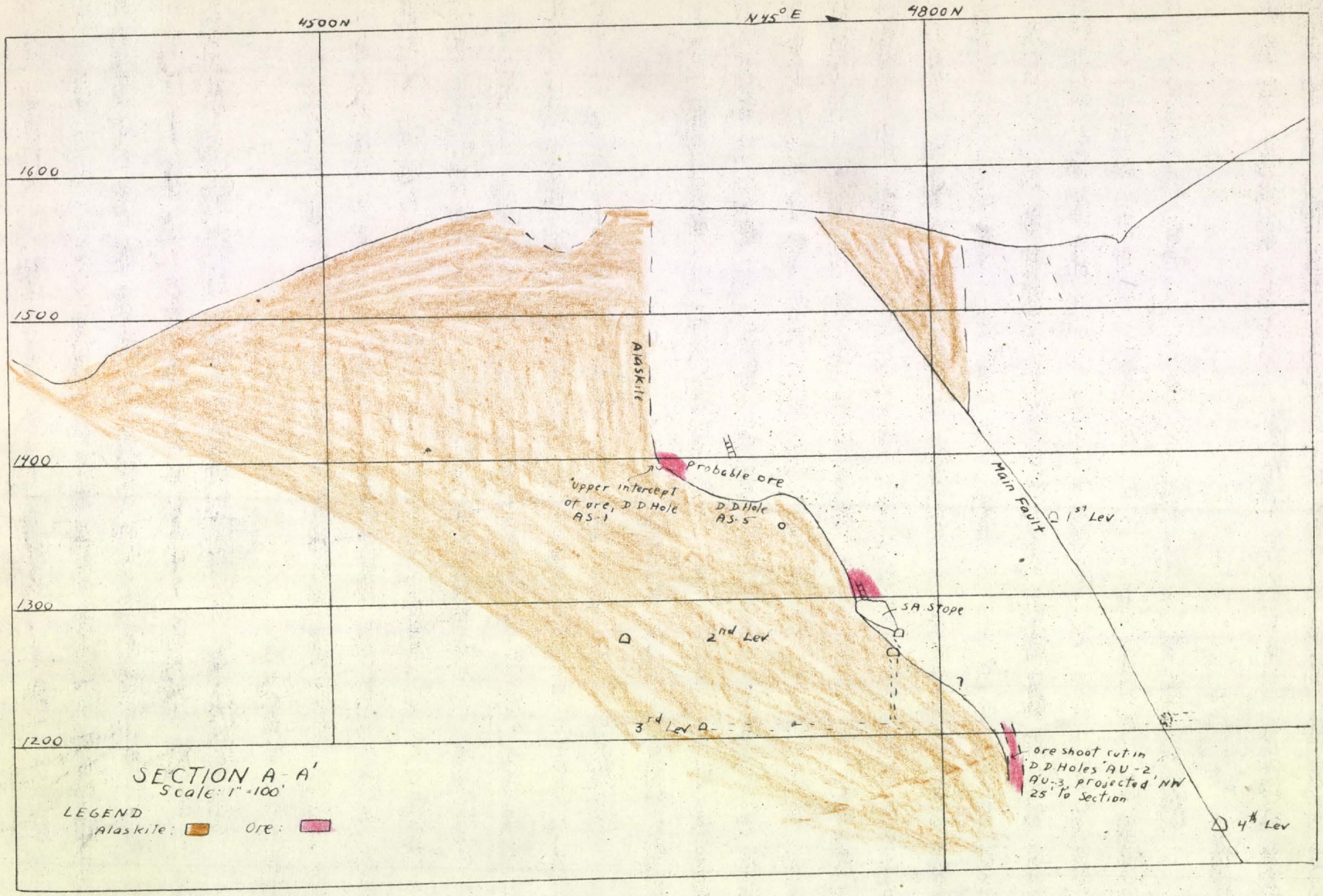
fault"northwest of Hole AU-2,so that the steep alaskite contact in the holes here may represent these two faults combined. Neither fault is thought to be post-mineral in origin, although some post-mineral late movement may have taken place on them. Note that the SA ore body tails out to the northwest as a sulphide vein along the steep alaskite contact there,which is marked by a zone of gouge and faulting. The ore shoot in Holes AU2, AU-3 and AU-4 is a similar affair.

The influence of presence of the "sill" may disappear southeast of Hole AU-4,but this is pure speculation.

Above the elevation of the SA ore body the northeast flank of the alaskite mass shows marked irregularities.Where Hole AS-1 cut the ore, a flat "meadow" and "valley" are found just north of a vertical "cliff" which marks the north contact of the alaskite nose as exposed on the surface. East of here, on the north flank of the nose, the main contact steepens greatly(Hole AU-1),but the contact must flatten greatly north of here, for otherwise Hole AU-5 would have emerged from the alaskite mass and entered shale.

Environment of AS-1 Ore Body.- This ore shoot occupies the "valley" and "meadow" below the "cliff". As shown on the Stereogram, it may have a fairly large horizontal cross-section, but the hole seems to have cut this shoot near its bottom,and there are only 200' vertically between this supposed bottom of ore and the surface. Since no ore shows on the surface,an upward extension of ore of 100' is the maximum permissable. Guessing at a horizontal section of 400 squ.ft., gives a possible 40,000 tons for this shoot,assuming that it does not connect with SA shoot (see below).

The AS-1 shoot may have a "tail"following the "cliff" to the

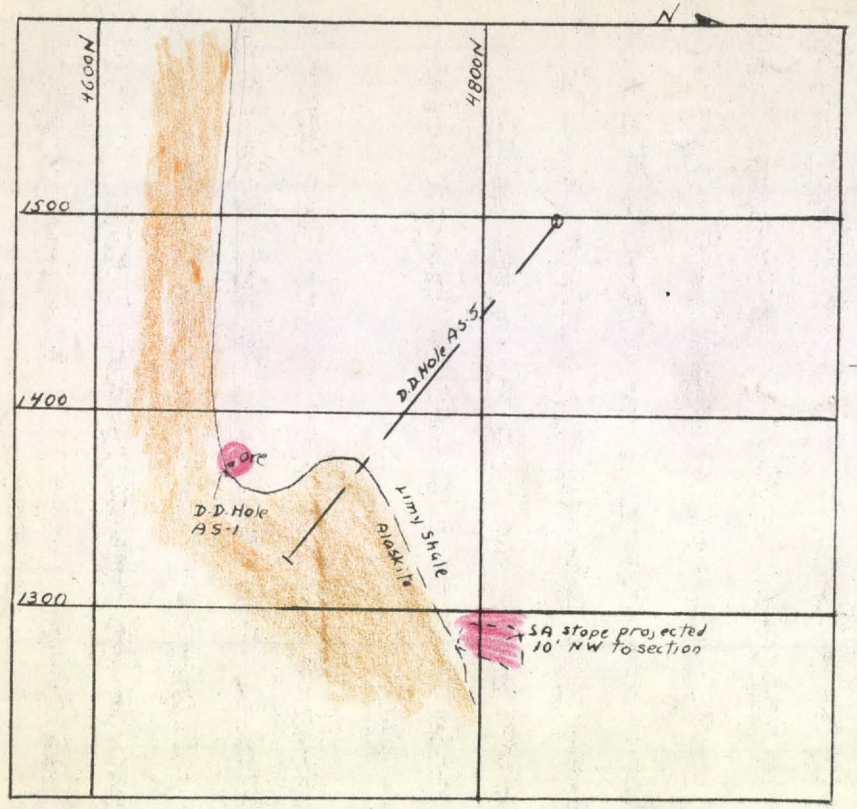

4500N
N45°E
4800N
1600
1500
1400
1300
1200
Alaskite
Probable ore
upper intercept of ore, D D Hole AS-1
D D Hole AS-5
Main Fault
1st Lev
SA Stope
2nd Lev
3rd Lev
ore shoot cut in D D Holes AU-2, AU-3, projected NW 25' to Section
4th Lev
SECTION A-A'
Scale: 1" = 100'
LEGEND
Alaskite:
Ore:

east,along the north side of the nose,and Hole AS-1 may in part have followed this tail,so that the above ore estimate may be too high.

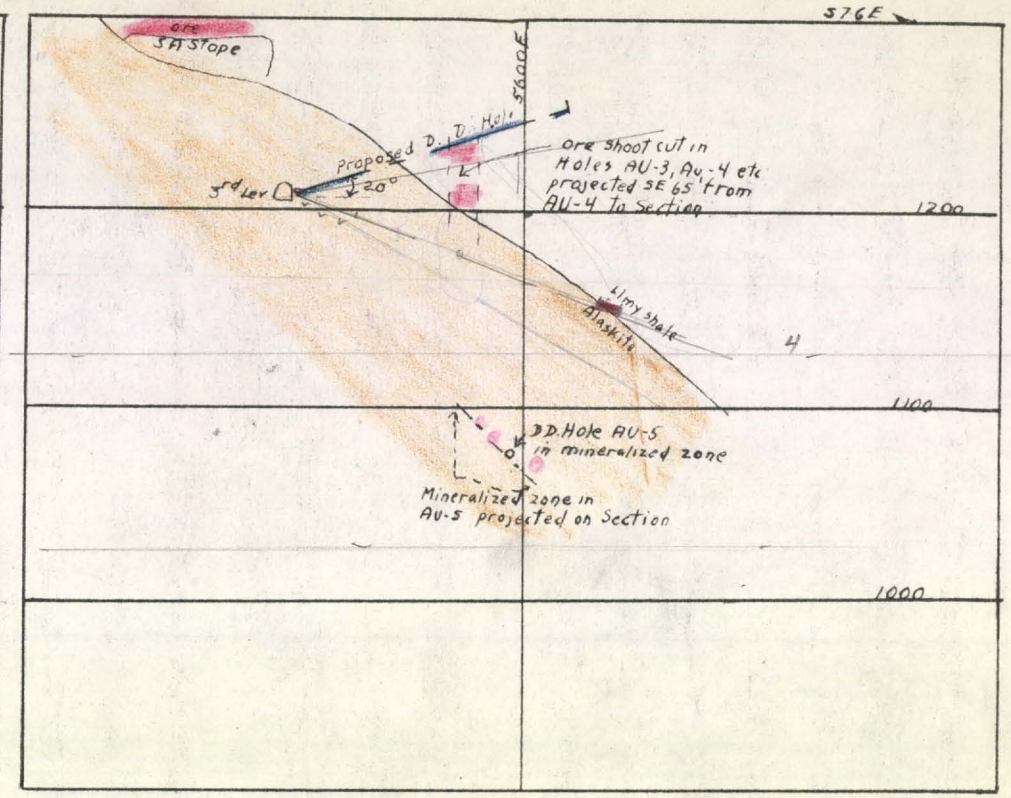
Environment of SA Ore Body.- The SA ore body occupies a flattening in the alaskite contact (connected with the junction of that contact with the "sill"--see above). It appears to have been localized also by the fault along the steep segment of the alaskite contact northwest of the SA stope,for the sulphides tail out along this contact fault in a vein-like manner. The SA shoot probably pinches going both up and down (Section A-A'),where the contact steepens; but there is no proof that the SA shoot is not continuous, both with the AS-1 shoot and with that cut in Holes AU-2 etc. (See below). The horizontal section of the SA shoot is about 300 squ.ft. Allowing 100' vertical extent(probably excessive) gives 30,000 tons for this shoot.

Environment of AU-3 Shoot.-This shoot, narrow as so far developed, lies along the southeast extension of the steep northeast edge of the "sill", as described on page 2. The hope is that it is a "tail", like that appended to the SA shoot, and that it may lead, northwest or southeast, to a "meadow", basin, or similar flat feature in the alaskite contact,which might contain a sizeable ore body. As it looks now,not over 10,000 tons could be alloted this vein-like shoot.

Possibility of the Three Shoots being Parts of One Orebody.- Hole AS-5 by no means disproves the continuity of the AS-1 and SA shoots. I have suggested by dashed red lines on the Stereogram how a continuous ore body could miss the hole; Section A-A' shows this even better. The hole entered the alaskite before reaching the probable position of the ore body.



SECTION D-D'
Scale: 1" = 100'



SECTION E-E'
Scale: 1" = 100'

Section A-A' shows the possibility that the SA ore shoot connects with that cut in Holes AU-3 etc. The latter shoot may widen out somewhat going up the contact, which flattens here.

The tonnage estimated for the three shoots totals 80,000. If they form a continuous ore body, the total indicated tonnage will not much exceed 100,000. This is not over one-quarter of the total required to make a mine.

CHANCES FOR THE MINE.

As it looks today, the chief chance for the additional 300,000 tons required lies in the possibility that the AU-3 shoot will widen out to the northwest, to the southeast, or in both directions. For this to happen, a flat concavity in the alaskite contact is probably required. One such concavity is seen to exist: the top of the "sill", SW of No.3 shaft. There is a possibility for another flattening SE of the AU-3 known shoot, above the mineralized stretch cut in the alaskite by Hole AU-5. (I assume no actual ore has been cut in this hole; if it has, this bet seems very favorable). The pyritic stretch cut in Hole AU-5 looks as if it were very close to ore; but Section E-E' shows that this stretch lies well within the alaskite mass. Any ore connected with this showing probably lies in limy shale, along the contact above the showing in the hole.

These possibilities look good enough to warrant testing.

RECOMMENDATIONS.

Southeast Extension of AU-3 Shoot.- Unless this shoot reaches the area of the showing in Hole AU-5, its SE extension is not worth testing. A proposed drill-hole is shown on the Stereogram and on Section E-E'. The hole is drilled 20° upward to avoid a possible flattening of the alaskite, and because, if the contact slopes as shown in the Section, ore not reaching the height above the contact

explored by the hole is not worth seeking.

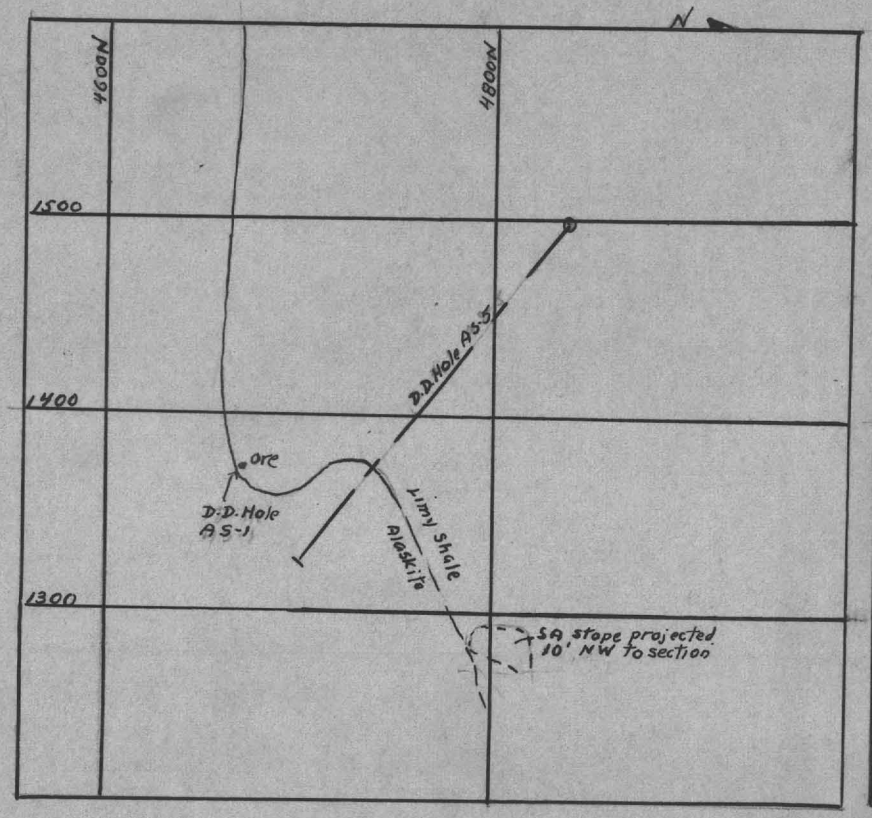
Northwest Extension of AU-3 Shoot.- Owing to the convergence of the two above-mentioned faults in this area, drilling here seems risky. I suggest the 40' south crosscut shown on the Stereogram, on the 4th Level. The crosscut should reach the vein-like ore shoot, if it persists this far. The main ore body,if there is one, will probably lie above the 4th level, on the flat top of the "sill" and west of the proposed crosscut; but if the vein-like shoot is a "tail" off this supposed main ore body,,it will connect with that ore body,should be cut in the crosscut,and will guide a raise up to the top of the "sill", some 50' above the 4th level. I believe this piece of exploration demands actual crosscutting etc.,with step-by-step interpretation of features seen, rather than drilling, for interpretation of the hole or holes might be difficult and lead to costly error.

CONCLUSIONS.

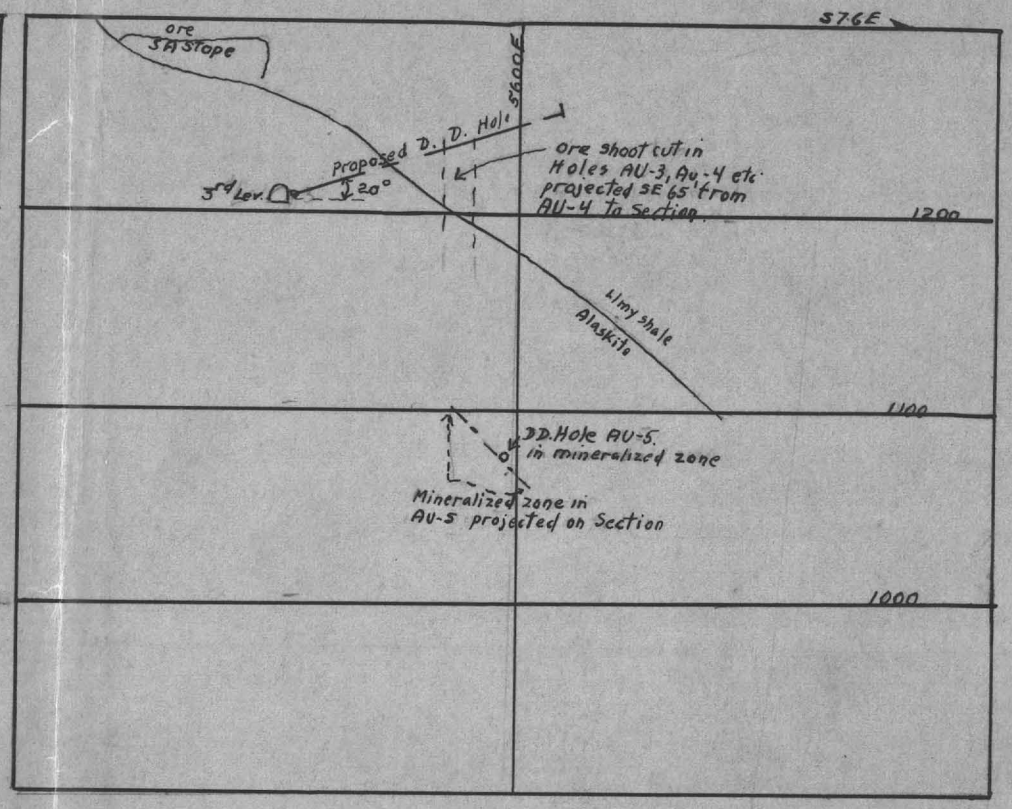
The work outlined above seems to me well worth doing, and it can be done quickly and cheaply. Further,this exploration at the present stage is critical, i.e., if it fails, the property I think may be safely dropped; if it gives favorable results,drilling should dropped and the mine developed by ordinary mining methods, for example,by crosscutting and drifting on the AU-3 shoot on the 3rd level, by raising from that level up the ore shoot to connect with the SA shoot on the 2nd level, and by raising on the SA shoot from the back of the stope,to reach,eventually, and explore,the AS-1 ore shoot.

San Francisco,June 28,1946 Edward Wisser

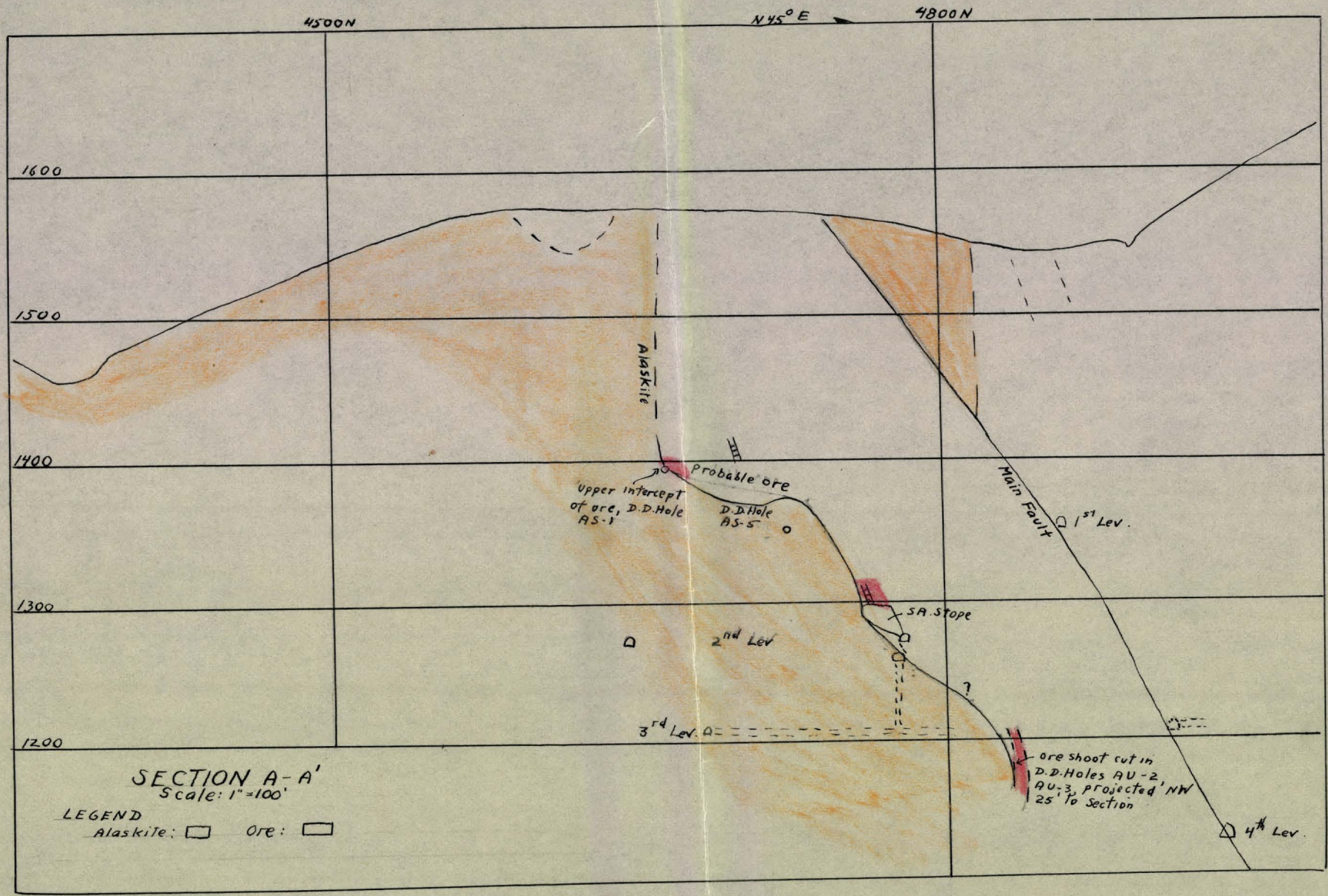
2 copies to Los Angeles
1 copy to L.Price.



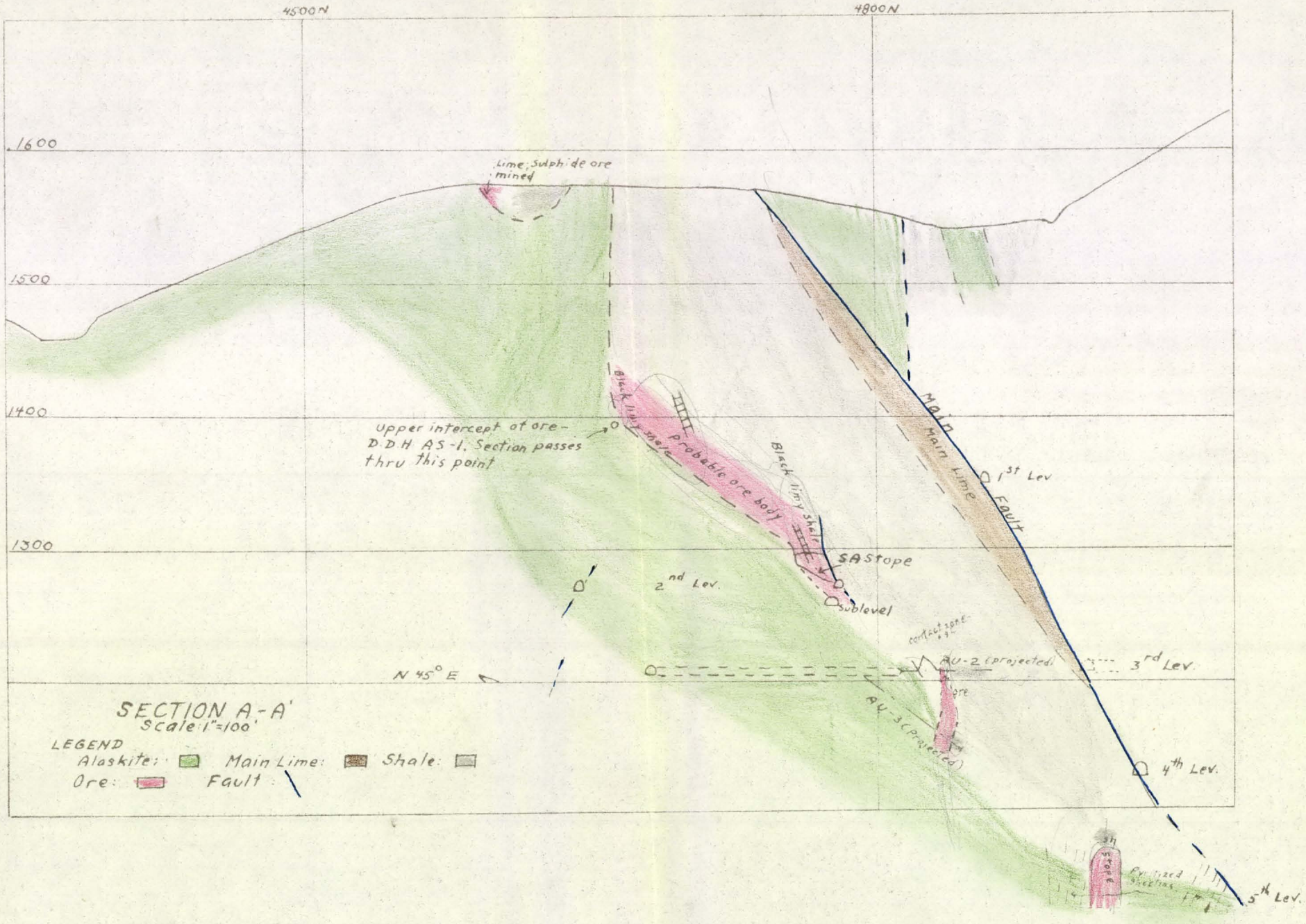
SECTION D-D'
Scale: 1" = 100'



SECTION E-E'
Scale: 1" = 100'


4500N
N45°E
4800N
1600
1500
1400
1300
1200
Alaskite
Probable ore
Upper intercept of ore, D.D. Hole AS-1
D.D. Hole AS-5
Main Fault
1st Lev.
SA. Stope
2nd Lev
?
3rd Lev.
ore shoot cut in D.D. Holes AU-2, AU-3, projected NW 25' to Section
4th Lev.
SECTION A-A'
Scale: 1" = 100'
LEGEND
Alaskite:
Ore:

Wissa-


4500N
4800N
1600
1500
1400
1300
Lime; Sulphide ore mined
Upper intercept of ore - D.D.H AS-1. Section passes thru this point
Black limy shale
Probable ore body
Black limy shale
Main Lime
Fault
1st Lev
SA Stope
2nd Lev.
Sublevel
contact zone
AU-2 (projected)
3rd Lev.
N 45° E
ore
AU-3 (projected)
4th Lev.
5th Lev.
5th Stope
Ex-ized shearing
SECTION A-A'
Scale 1"=100'
LEGEND
Alaskite:
Main Lime:
Shale:
Ore:
Fault:

AFTERTHOUGHT AND RISING STAR MINES

SHASTA COUNTY, CALIFORNIA, COMPARED.

Edward Wisser
September 4, 1946

AFTERTHOUGHT AND RISING STAR MINES, SHASTA COUNTY, CALIFORNIA, COMPARED.

INTRODUCTION.

The writer worked at the Rising Star mine of the Shasta Zinc and Copper Co. during the first half of 1922. At that time the ore reserves (nearly all positive ore) were estimated at250,000 tons averaging as follows: gold 0.03 oz., silver 2.9 oz., copper 2.1%, zinc 22.5%. The mine was worked for some time after I left, but on a small scale because the zinc oxide smelter failed to give satisfactory results and was fed only small, experimental batches of ore. After failure of this venture, the Glidden Paint Co. operated the mine, but in this case also metallurgy was the stumbling block and it is doubtful whether many thousands of tons were mined by them. Further, if correct mining practice was employed, with exploration and development keeping pace with stoping, I think it likely that as many tons of new ore were placed in sight as the tonnage mined. The above estimate therefore may not be far off the actual tonnage exposed in the Rising Star mine today.

In my report of August 20, 1946, I estimated the tonnage that might be expected from the four ore zones known at Afterthought at 255,000 tons; the average grade of this possible ore cannot of course be figured with any accuracy; from present data the Afterthought ore is lower in zinc than the Rising Star ore, somewhat higher in copper, much higher in silver and slightly higher in gold. Lead was not reported at the Rising Star; at Afterthought the ore carries about 2.4% lead.

In production to date the Rising Star is the bigger mine; but the similarity in possible tonnage in the two mines tempted me to

see how they compared in (1) size of ore bodies;(2) vertical range of ore;(3) area of ore-bearing ground and (4) structural control of ore shoots. The accompanying double plan shows graphically most of these comparisons.

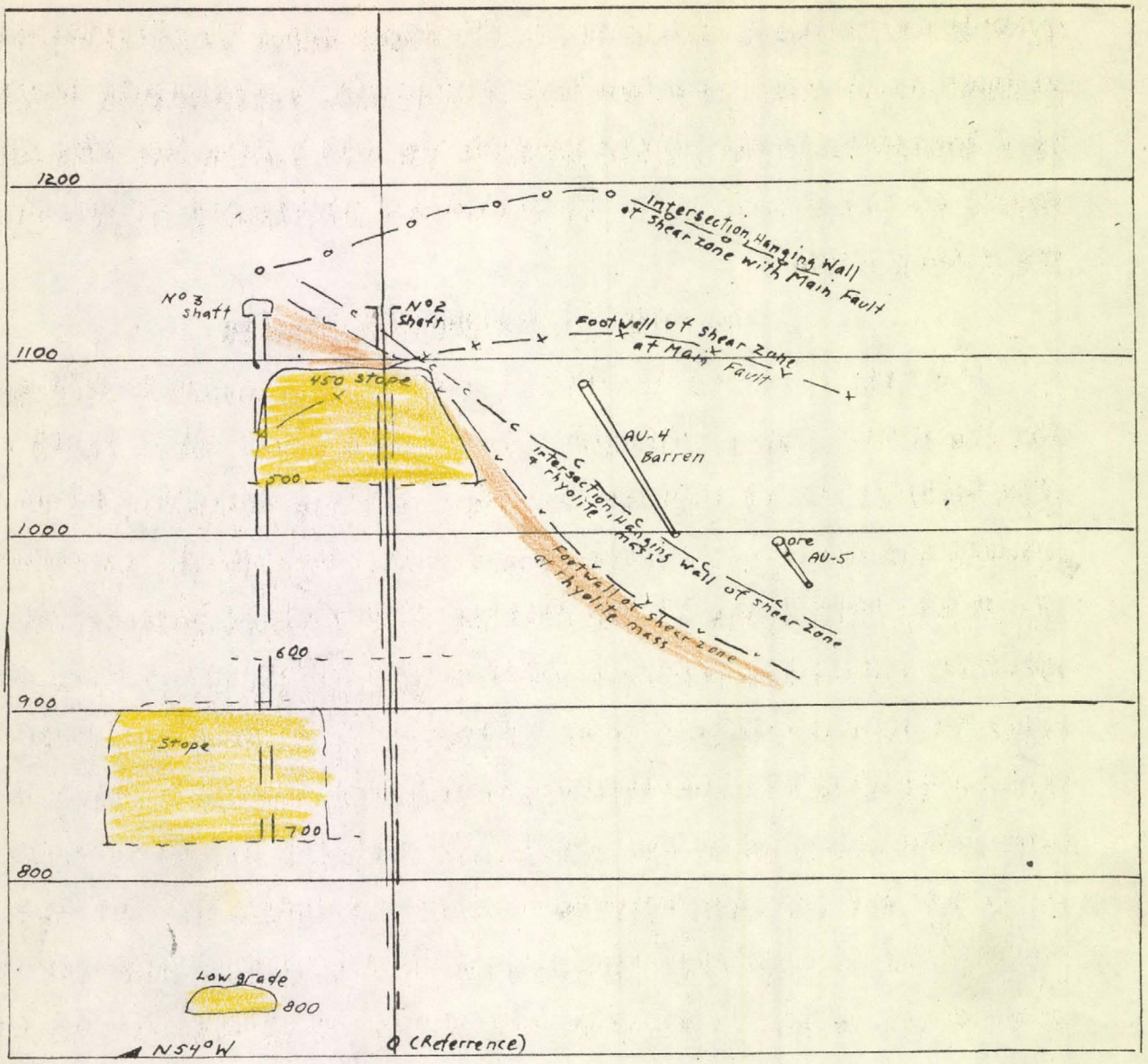
1.SIZE OF ORE BODIES. (HORIZONTAL AREA).

It is plain that the ore bodies mined or indicated at Afterthought compare well in size with those at the Rising Star; 150 ft. is a good-sized strike length for an ore shoot at either mine. From present sketchy data,the number of ore shoots at Afterthought (six excluding the small Afterthought opencut body,and small shoots in the footwall of the Main fault;and assuming, further,that ore shoots AS-1,200 and AU-6 are separate shoots) compares well with the number at the Rising Star(eight of size similar to those counted at Afterthought). When the more intensive exploration at the Rising Star is considered,together with the more numerous sheeted zones at Afterthought,it seems likely that several virgin shoots remain to be discovered at Afterthought.

2.VERTICAL RANGE OF ORE AND HEIGHT OF ORE SHOOTS.

The highest Rising Star ore was found at the elevation of the 82 level,about 115 ft.above the 500 or adit level,and 1125 ft. above sea-level. Ore presumably was found on the 1100 ft.level,elevation 410'.(mine unwatered to 900 level only in my time). Hence the known vertical range is about 700 ft. At Afterthought the highest ore came I believe to just below the No.7 tunnel.i.e. to an elevation of about 1550 ft.;and the lowest ore known was on the 900 level, at an elevation of 827 ft. The known vertical range is therefore the same as at the Rising Star.

At the Rising Star,several shoots were stoped continuously for a vertical height of 200 ft.,and one may have been stoped



VERTICAL LONGITUDINAL PROJECTION, MAIN SHEAR ZONE.
Scale: 1" = 100'
For position of projection, plane, see Plan.

for 300 ft. One shoot, not stoped continuously in 1922, seems to have extended a vertical distance of 400 ft. or more. At Afterthought the highest stope runs from the 700 to the 500, interrupted, however, by a low-grade floor pillar beneath the 600 level. The Afterthought shoots do not appear to be as persistent vertically as are those at the Rising Star.

3. AREA OF ORE-BEARING GROUND.

The ore shoots at the Rising Star are contained within an area 400 ft. x 650 ft., or 260,000 square feet. Those sofar found at Afterthought lie in an area 500 ft. x 550 ft. (excluding Afterthought opencut ore body) or 275,000 square feet, practically the same as the Rising Star area. At the Rising Star the ore bodies, wholly in rhyolite toward the surface, enter gypsum at depth, but this fact seems to have had little or no influence on tonnage and grade of the ore bodies. At Afterthought, on the other hand, the rhyolite mass, apparently unfavorable for ore, slopes downward to the northeast below the ore area, and apparently cuts high-grade ore out with depth (Hole AU-5, in rhyolite, vs. Hole AU-6, cutting same ore zone in sediments). But as shown on the accompanying Vertical Longitudinal Projection, Main Shear Zone, the rhyolite contact where cut by that zone plunges down to the southeast, so that the sediments cut by that zone deepen toward the southeast. The ore cut by Hole AU-5 at 993' elevation, and the streaks of ore cut in the same hole at lower horizons offer promise of ore in this area, and a SE extension of the ore-bearing zone which may offset its bottoming, caused by the underlying rhyolite mass, within the ore-bearing area as now defined. If this should prove the case, then the ore-bearing <u>solid</u>, i.e. horizontal area times vertical height, at Afterthought may be as large as the corres-

ponding solid at the Rising Star.

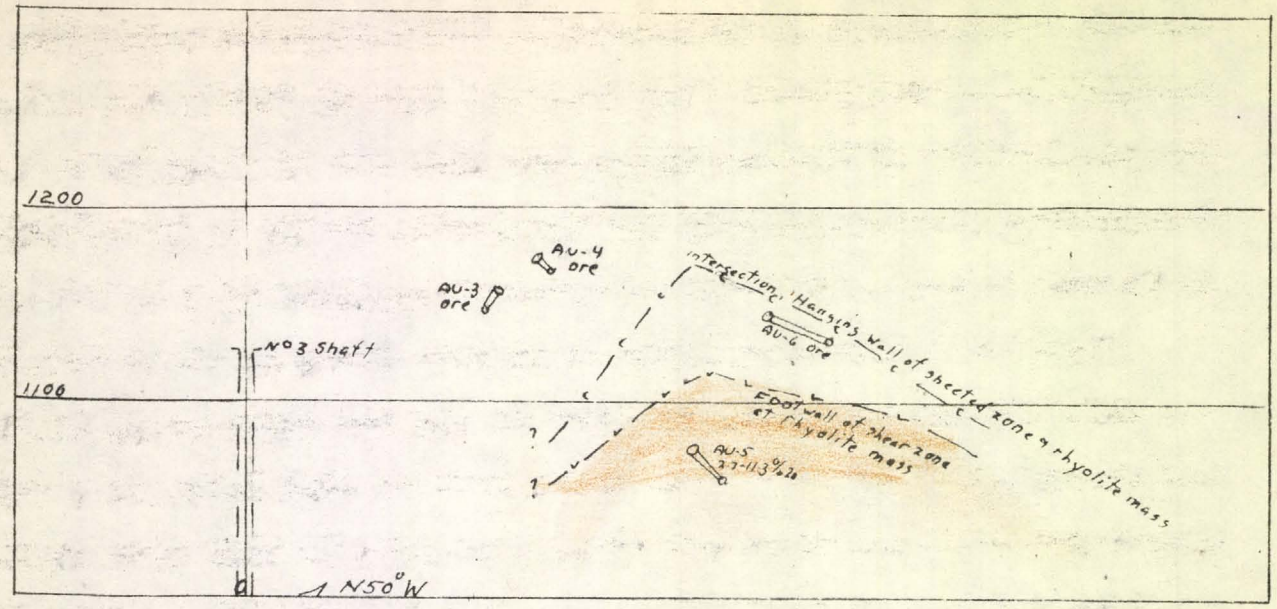
4. STRUCTURAL CONTROL OF ORE SHOOTS.

At the Rising Star, my detailed vertical sections suggest a general, somewhat vague control of the ore shoots by the Rising Star sheeted zone, and to a less extent, by the Middle sheeted zone; but by far the closest control is exerted by an unnamed sheeted zone that I have labelled the "Ore" sheeted zone. This strikes sub-parallel to the Rising Star zone, and merges with the latter on the 600 ft. level; but it dips SW, opposed to the dip of the Rising Star zone, and crosses the latter zone at about the 700 level. Below that level the main ore shoots are on the Ore sheeted zone, not the Rising Star zone. The junction of the two zones was an especial locus for ore.

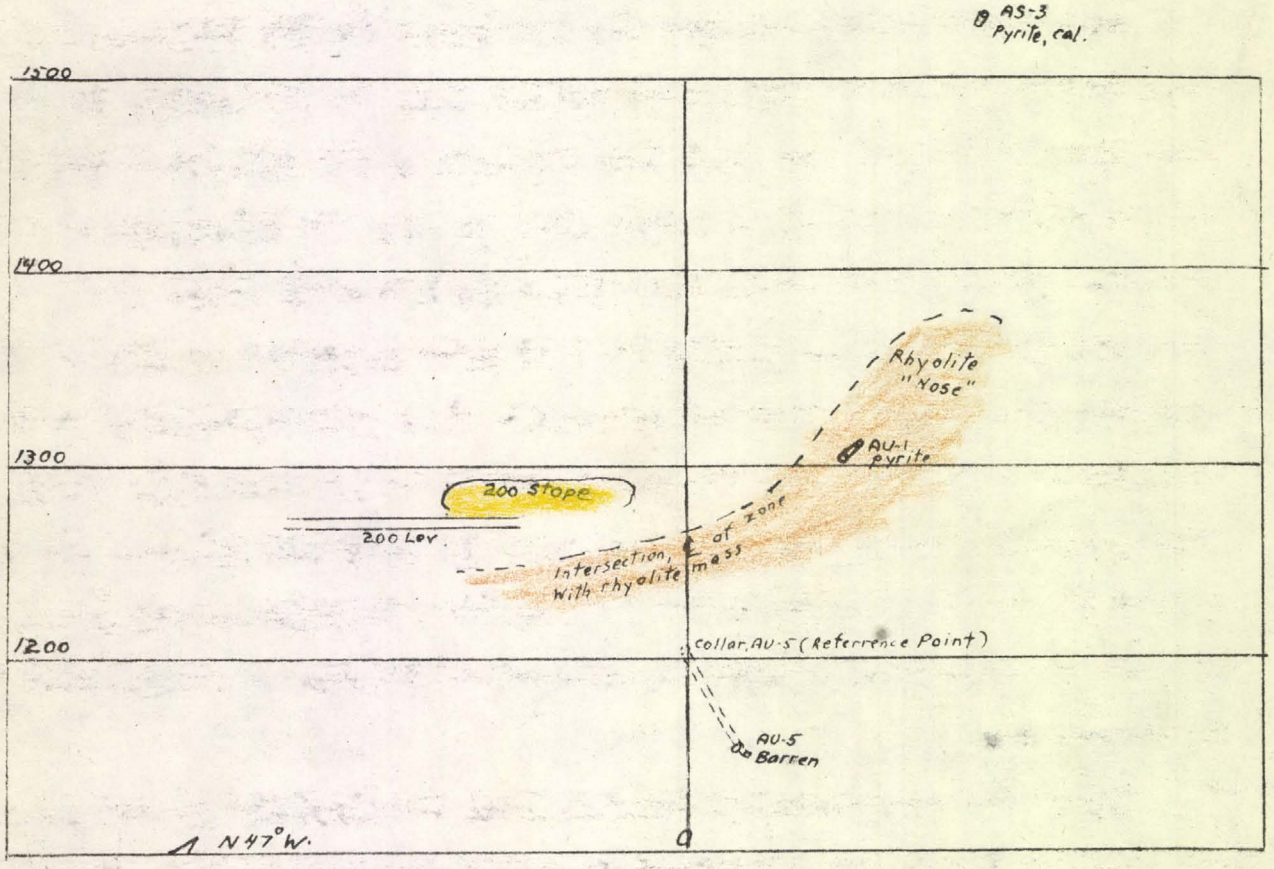
At Afterthought, ore control by sheeted zones is even more marked than at the Rising Star; but the high-grade zinc ore lies mainly in the sediments above the rhyolite main contact. It is thought by the writer that Afterthought ore may tend to spread out, within the sheeted zone that controls it, just above "flats" or shelves in the topography of the rhyolite mass (AS-1 ore body), and in the sediments that abutt on the rhyolite mass.

CONCLUSIONS.

No very definite conclusions are drawn from the above; the Afterthought looks about the same size mine, potentially, as the Rising Star, to me; or at least, it seems very possible that about as much ore remains at Afterthought as at the Rising Star. Both mines have possibilities, and each has a lesson for the other: at the Rising Star, no exploration was done in the Pit shales, although two sheeted zones lead into them south of the mine; this was probably because, as at Afterthought, these sheeted zones are less apparent in shale than in rhyolite, in spite of the fact that they definitely



VERTICAL LONGITUDINAL PROJECTION, AU-3-AU-6 SHEETED ZONE
Scale: 1" = 100'



VERTICAL LONGITUDINAL PROJECTION, 200 ORE BODY ZONE.
Scale: 1" = 100'

control ore in shale at Afterthought. Conversely, the high-grade ore in rhyolite at the Rising Star suggests that we should not overlook the possibility of finding high-grade zinc ore in rhyolite at Afterthought (the Opencut ore body was apparently mainly in rhyolite). This is to some extent a reversal of previous opinions held by the writer.

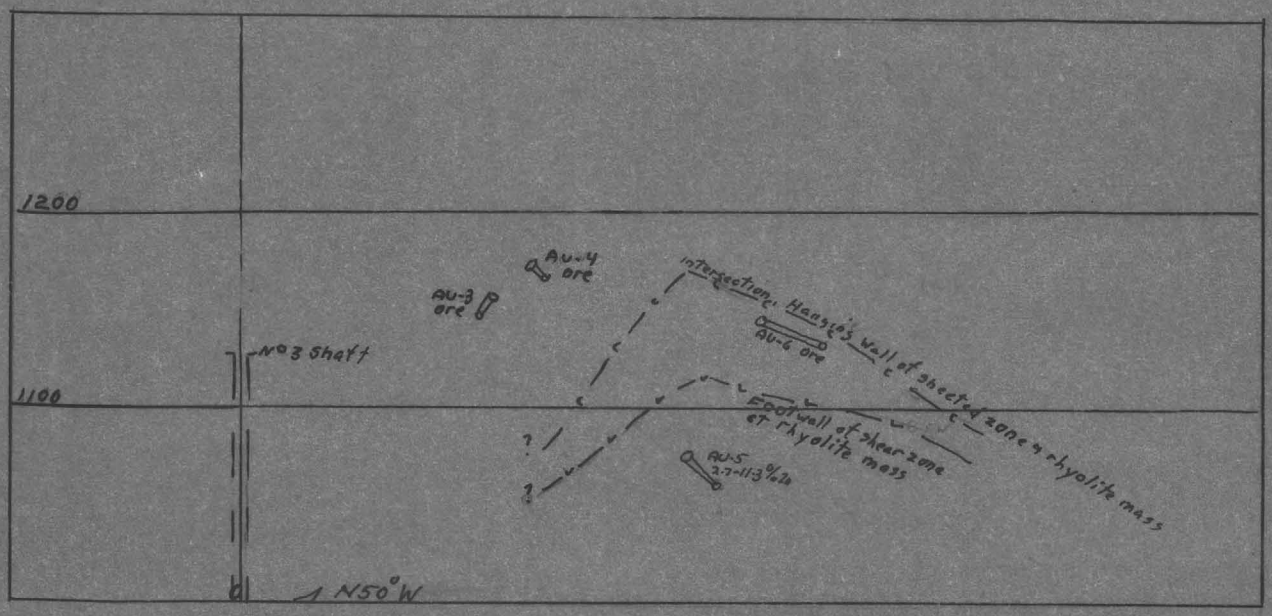
There are other possibilities at each mine. At the Rising Star, the Hillside sheeted zone, explored on the 500 level only, and showing strong indications of zinc and copper on that level, is a highly attractive prospect; there are other prospects in that mine which I shall be ready to discuss if the Rising Star and Bully Hill mines are ever optioned.

At Afterthought, chances for ore exist to the southeast, in the area described above (southeast extensions, in sediments, of the Main shear zone and the AU-6 sheeted zone). The embayment southwest of the rhyolite nose still looks good to me. Our knowledge of Afterthought structure is still very sketchy. How many drill holes could have missed ore at the Rising Star is more apparent on the vertical sections than on the plan accompanying this report, especially on the longitudinal projection. The chief lesson to me from this study is this: actual "tunnelling" is necessary to find and delimit ore lenses of the Rising Star-Afterthought type. Even closely-spaced drilling has too much chance of missing ore, and of causing a worthy mine to be passed up.

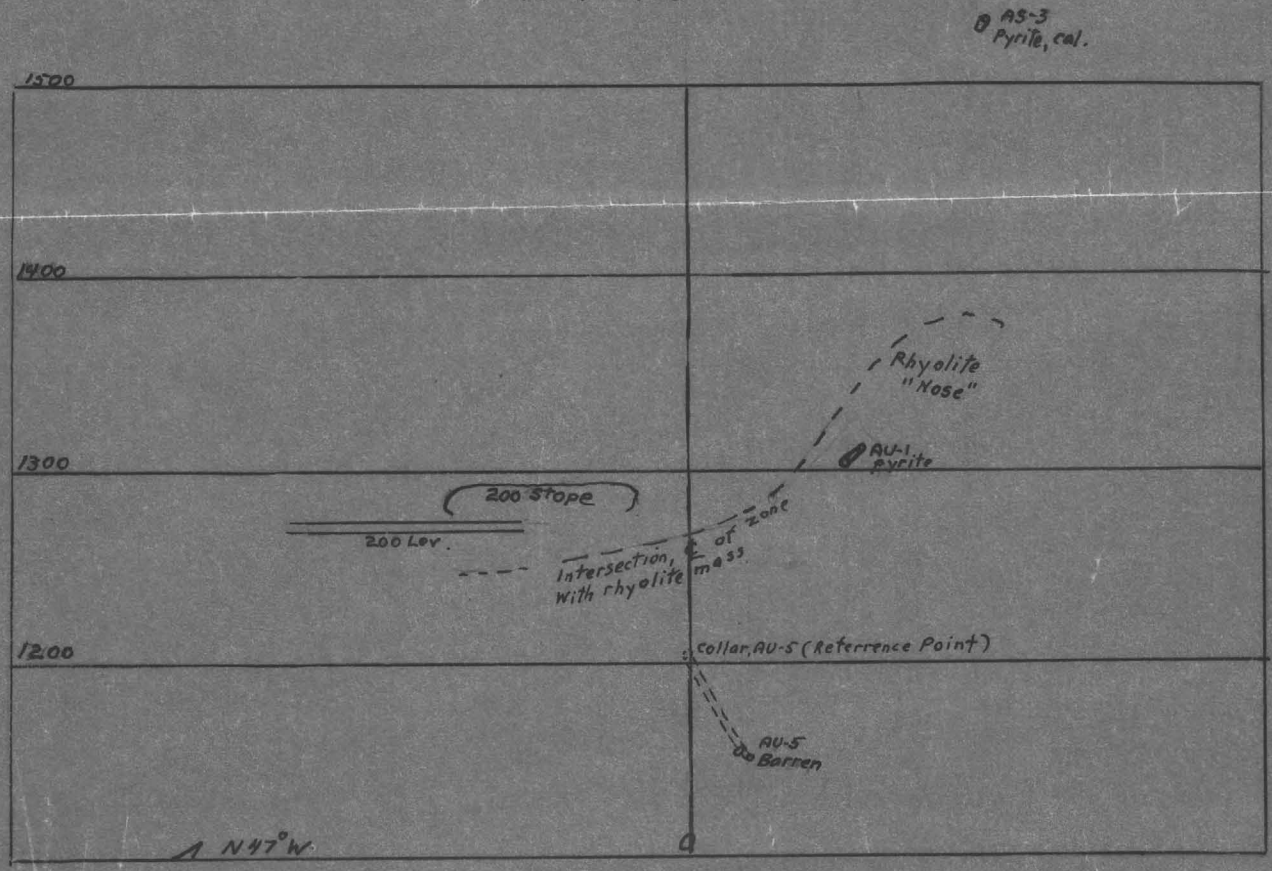
<u>Note</u>: The accompanying Longitudinal Projections of the AU-6 and 200 ore zones are furnished to guide any exploration that may be yet done on these zones. The intersections with the rhyolite mass are the probable lower limits of ore. Nothing is known about the upper limits.

E.W.

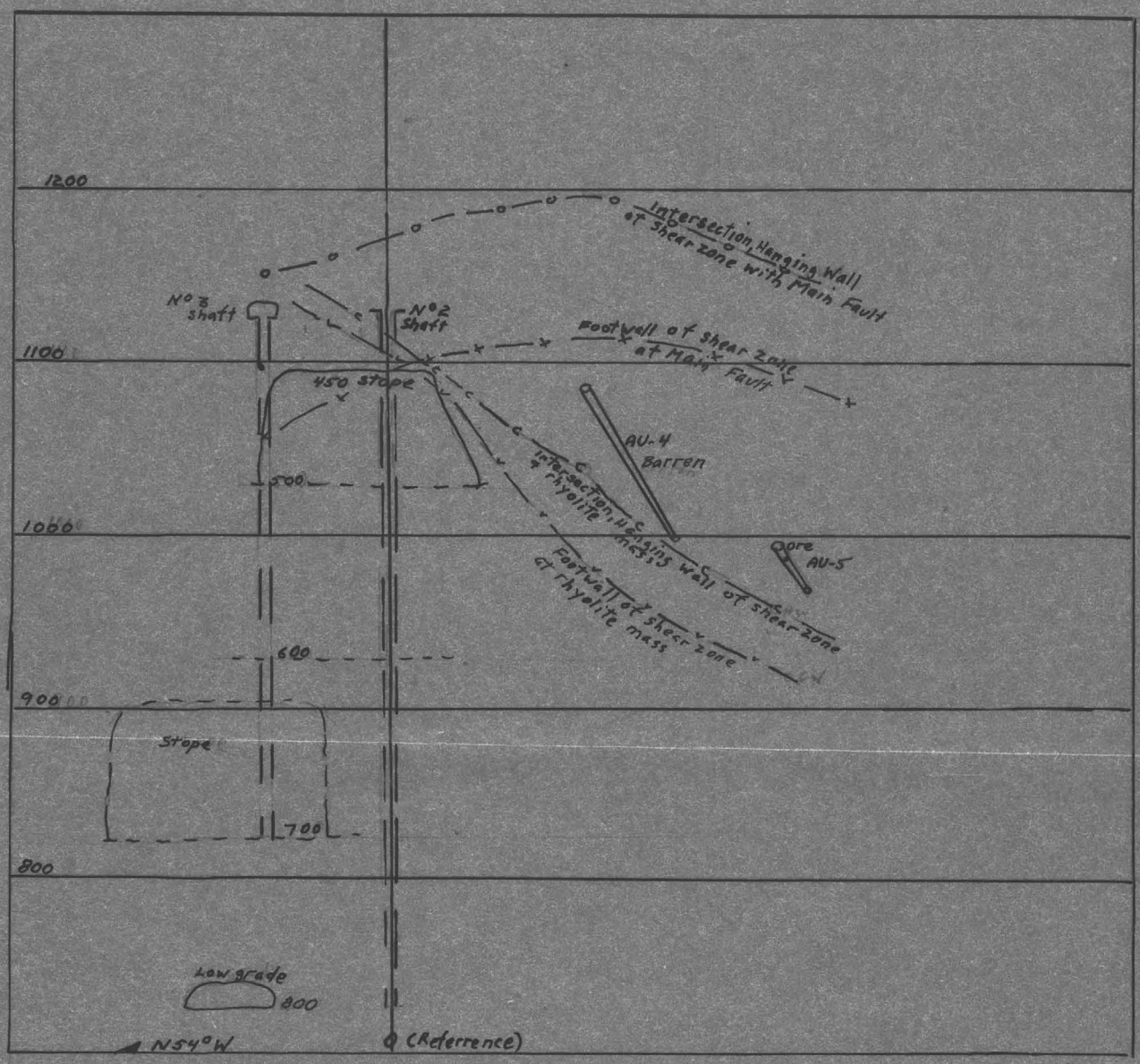
San Francisco, Sept. 4, 1946 Edward Wisser



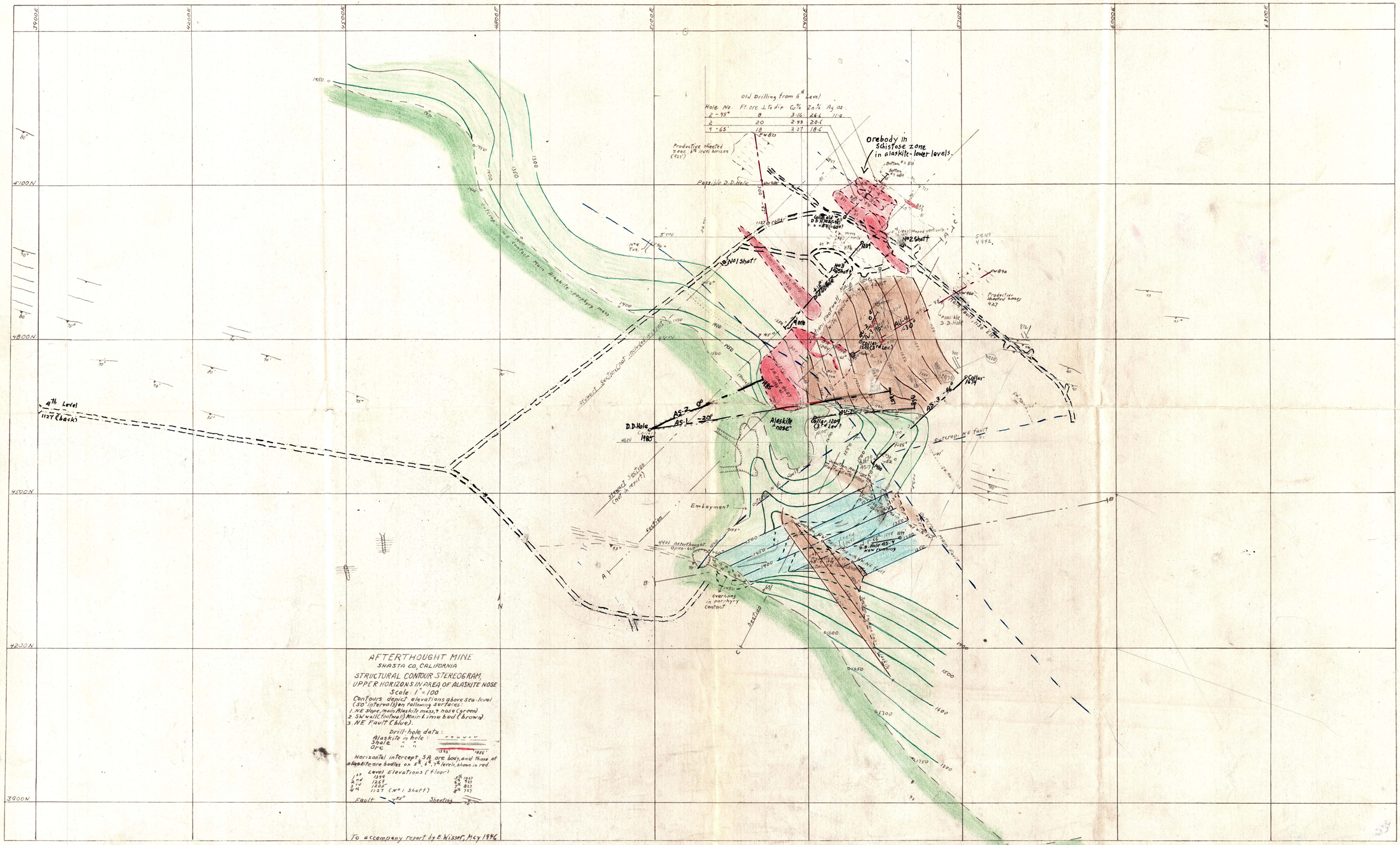
VERTICAL LONGITUDINAL PROJECTION, AU-3-AU-6 SHEETED ZONE.
Scale: 1" = 100'



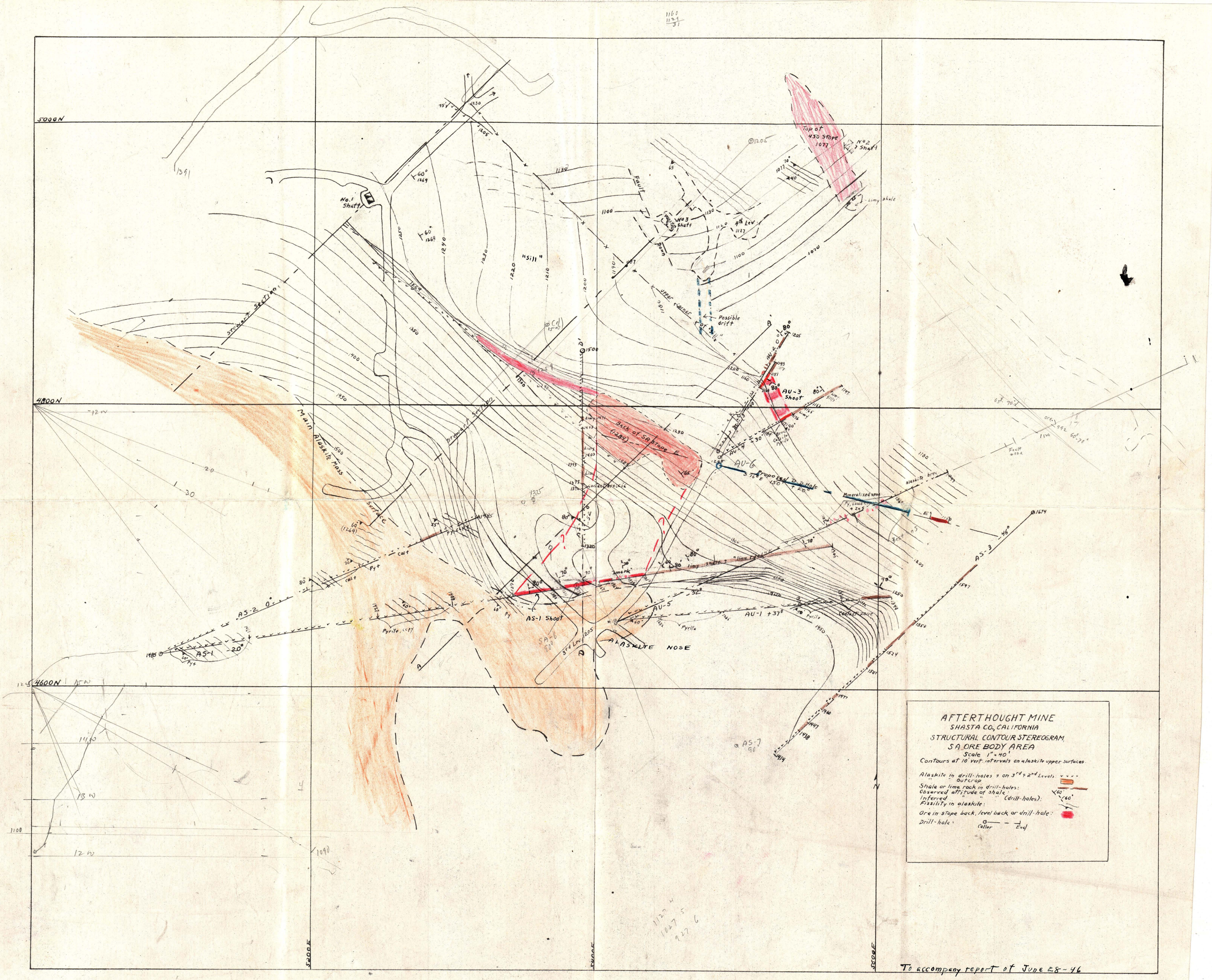
VERTICAL LONGITUDINAL PROJECTION, 200 ORE BODY ZONE.
Scale: 1" = 100'



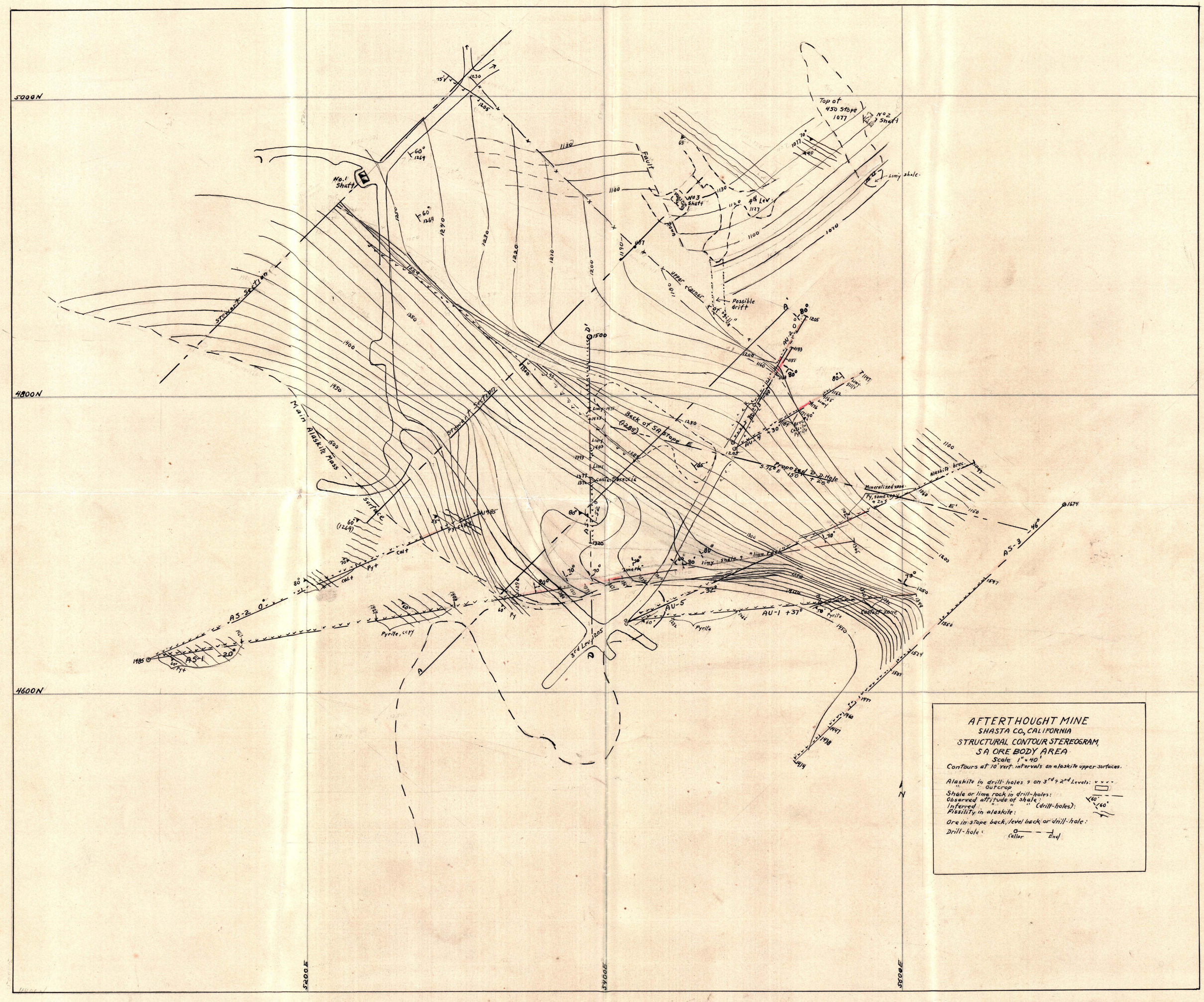
VERTICAL LONGITUDINAL PROJECTION, MAIN SHEAR ZONE.
Scale: 1" = 100'
For position of projection, plane, see Plan.

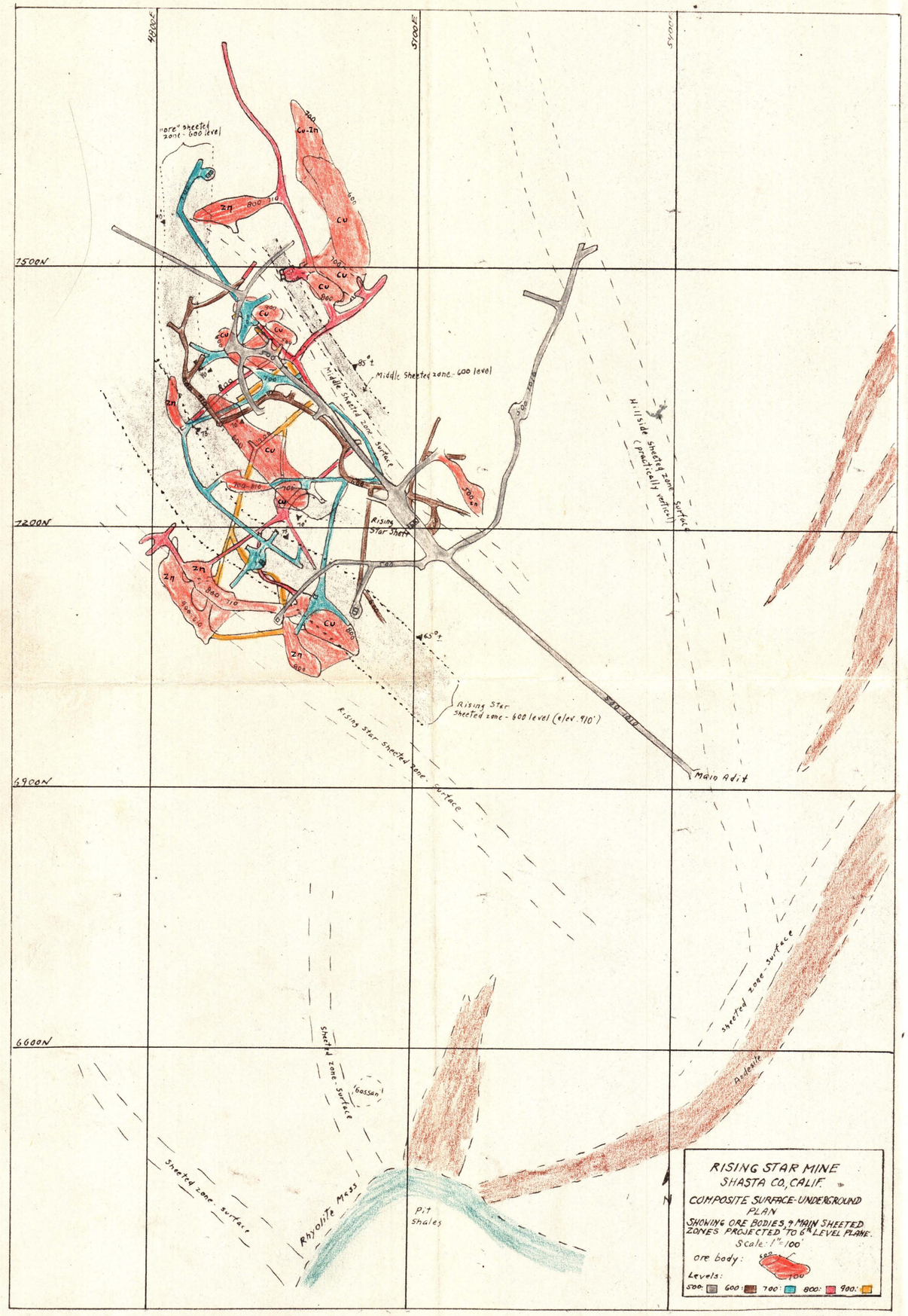

AFTERTHOUGHT MINE
SHASTA CO, CALIFORNIA
STRUCTURAL CONTOUR STEREOGRAM,
UPPER HORIZONS IN AREA OF ALASKITE NOSE
Scale: 1" = 100'
Contours depict elevations above sea-level (50' intervals) on following surfaces:
1. NE slope, main Alaskite mass, & nose (green)
2. Skwell (footwall) Main Lime bed (brown)
3. NE Fault (blue).
Drill-hole data:
Alaskite in hole:
Shale " "
Ore " "
1393
1355'
Horizontal intercept, SA are box, and those of alaskite ore bodies on 2nd, 3rd, 4th levels shown in red.
Level Elevations (floor)
1st 1399
2nd 1269
3rd 1205 (No 1 Shaft)
4th 1127 (No 2 Shaft)
5th 1037
6th 937
7th 837
8th 737
Fault 35°
Shearing 70°
To accompany report by E. Wisser, May 1946
Old Drilling from 6th Level
Hole No. Ft. ore ⊥ to dip Cu% Zn% Ag oz.
2-45° 8 3.16 26.6 11.9
2 20 2.93 20.6
4-65° 18 2.27 18.6
Orebody in Schistose zone in alaskite-lower levels.
Productive sheeted zone 4th (4th) horizon (427)
Possible D.D. Hole
Collar old D.D. Hole No. 4 (4th Lev.)
No 1 Shaft
No 2 Shaft
No 3 Shaft
Ore
Collar 1200 (3rd Lev.)
Collar 1674
Alaskite "nose"
D.D. Hole
Outcrop NE fault
Embayment
Overhang in porphyry contact
D.D. Hole No. 4 New Dummies
Stereo section (not in report)
Section
4th Level (1127 Back)
Productive sheeted zones 427
Outcrop NE fault
Stereo section (Footwall Lime bed)
Stereo section (Alaskite porphyry mass)
Outcrop NE contact main Alaskite porphyry mass
4900E
4800E
4700E
4600E
4500E
4400E
4300E
5100N
4900N
4800N
4500N
4200N
3900N

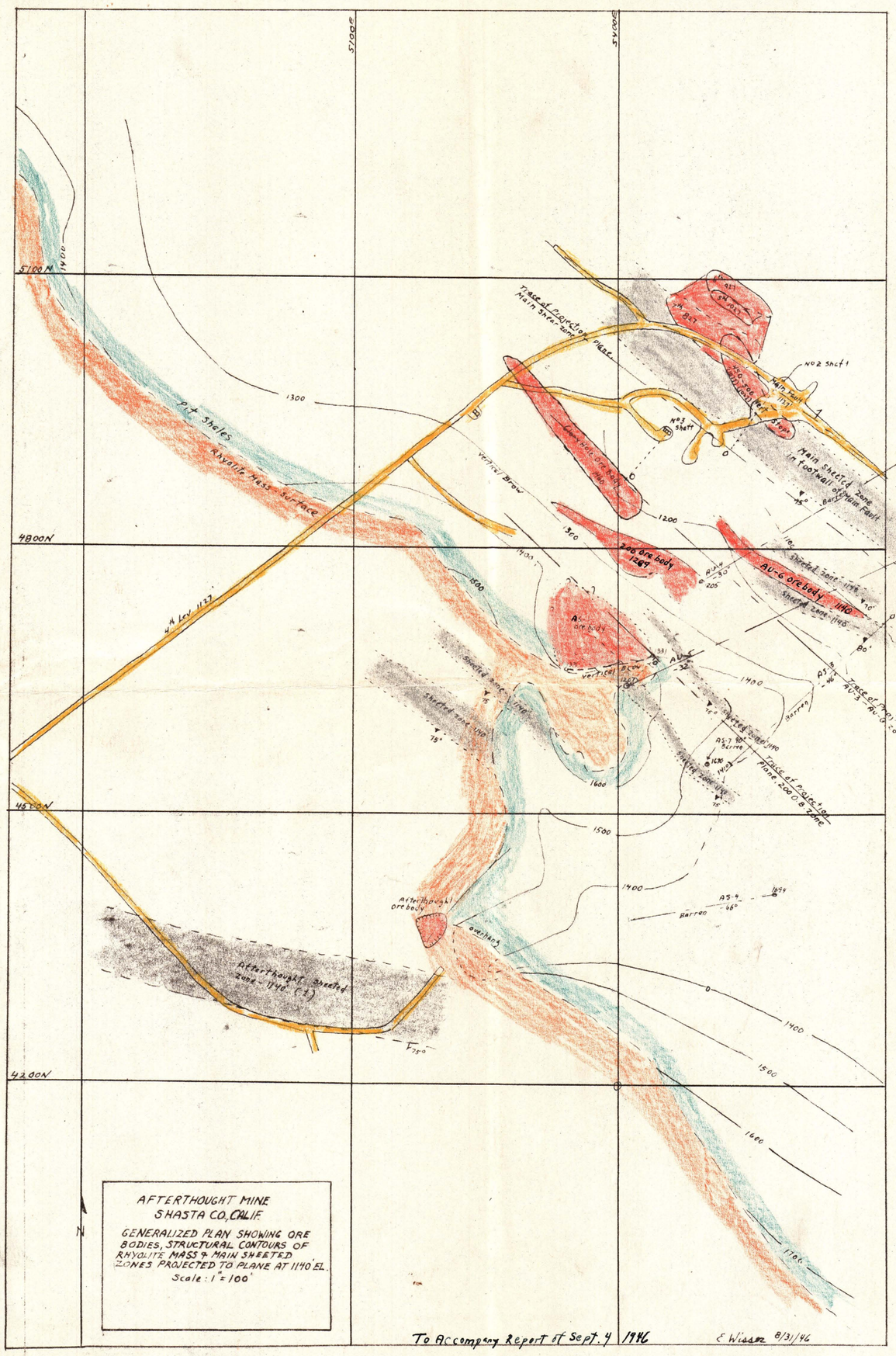
Stereogram
May-46


AFTERTHOUGHT MINE
SHASTA CO., CALIFORNIA
STRUCTURAL CONTOUR STEREOGRAM
SA ORE BODY AREA
Scale 1" = 40'
Contours at 10' vert. intervals on alaskite upper surfaces.
Alaskite in drill-holes & on 3rd & 2nd Levels
" " outcrop
Shale or lime rock in drill-holes:
Observed attitude of shale:
Inferred " " " (drill-holes):
Fissility in alaskite:
Ore in stope back, level back or drill-hole:
Drill-hole: Collar End
5000N
4800N
4600N
No. 1 Shaft
W03 Shaft
W02 Shaft
"Sill"
Fault
Strike
Dip
Upper corner of "Sill"
Possible drift
Top of 450 Stope 1077
4th Lev 1127
Limy shale
Stewart Section
Main Alaskite Mass
Surface
Back of SA Stope E (1289)
AU-3 Shoot
AU-6
Proposed D Hole
Mineralized zone
alaskite breccia
AS-1 Shoot
AS-1
AS-2
AS-3
AU-1
AU-5
ALASKITE NOSE
3rd Lev 1205
Pyrite
Calc
Contact zone
To accompany report of June 28-46

Stereogram, June 28/40

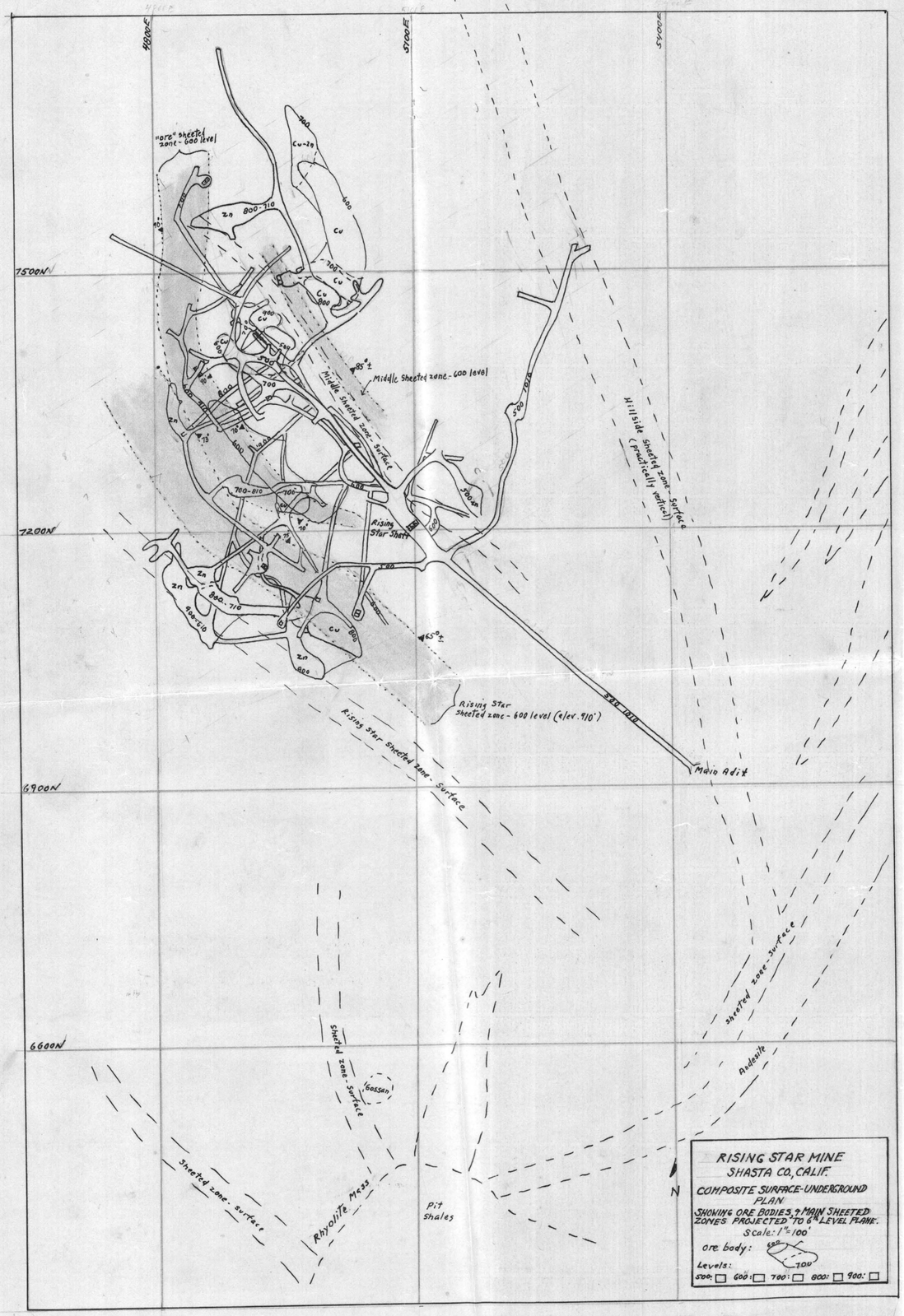

AFTERTHOUGHT MINE
SHASTA CO., CALIFORNIA
STRUCTURAL CONTOUR STEREOGRAM,
SA ORE BODY AREA
Scale 1" = 40'
Contours at 10' vert. intervals on alaskite upper surfaces.
Alaskite in drill-holes & on 3rd & 2nd Levels:
" " outcrop
Shale or lime rock in drill-holes:
Observed attitude of shale:
Inferred " " " (drill-holes):
Fissility in alaskite:
Ore in stope back, level back or drill-hole:
Drill-hole:
Collar
End
5000N
4800N
4600N
5200E
5400E
5600E
No. 1 Shaft
No. 2 Shaft
No. 3 Shaft
Top of 450 Stope 1077
4th Lev.
Limy shale
Fault
Dam
Upper corner of "Stile"
Possible drift
Stewart's Section
Main Alaskite Mass
Surface
Back of SA Stope E (1289)
Proposed D.D. Hole
Mineralized zone
Alaskite breccia
Contact zone
Limy shale
Limy sills
Pyrite
Pyrite, ccpy
Py
Cal+
3rd Lev. 1205
AS-1
AS-2
AS-3
AU-1
AU-2
AU-5
A
B
D
D'
E
E'
N



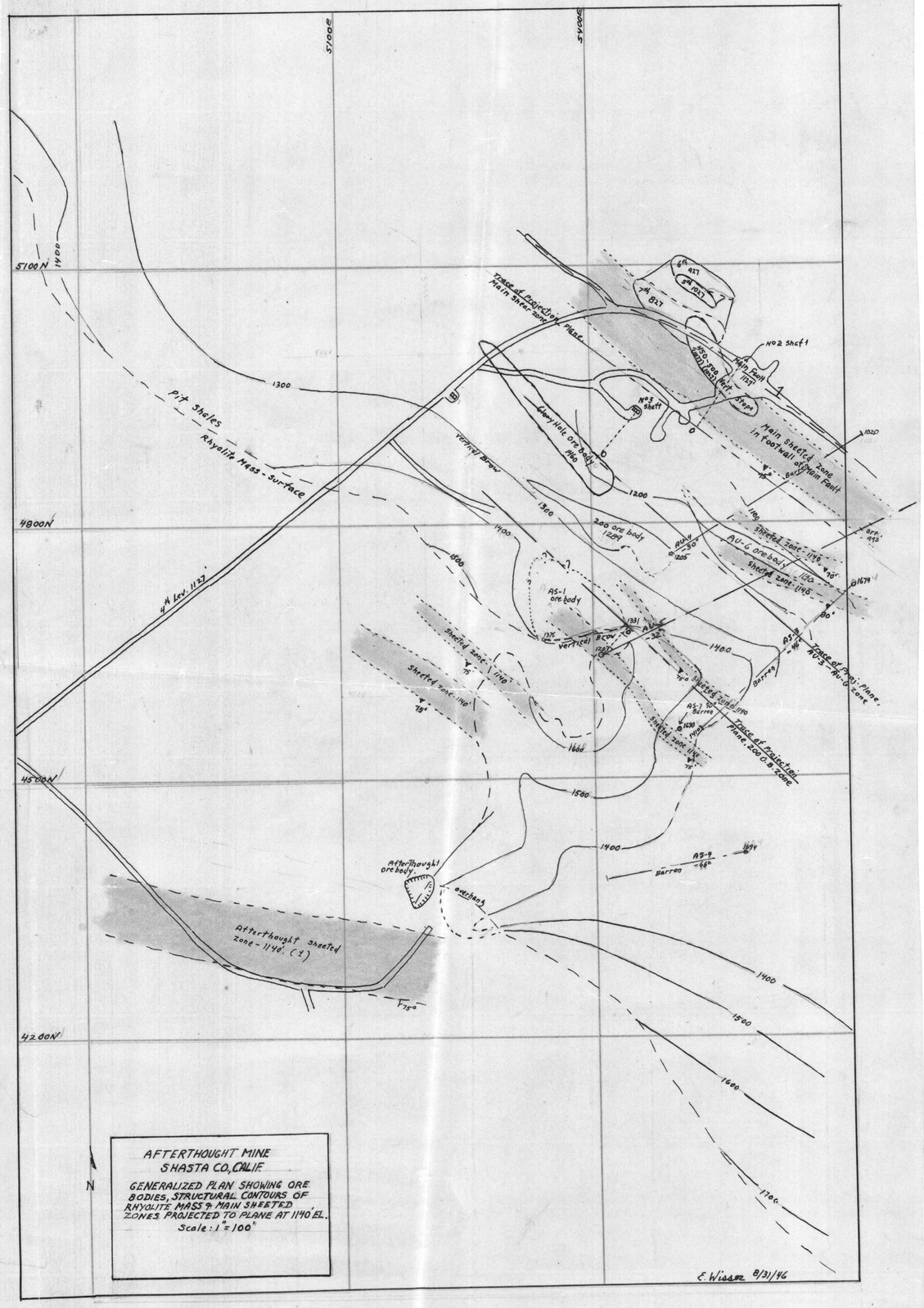


To Accompany Report of Sept. 4 1946

E Wisser 8/31/46



RISING STAR MINE
SHASTA CO, CALIF.
COMPOSITE SURFACE-UNDERGROUND PLAN
SHOWING ORE BODIES, & MAIN SHEETED ZONES PROJECTED TO 6th LEVEL PLANE.
Scale: 1" = 100'
ore body:
Levels: 500: 600: 700: 800: 900:



AFTERTHOUGHT MINE
SHASTA CO, CALIF.
GENERALIZED PLAN SHOWING ORE BODIES, STRUCTURAL CONTOURS OF RHYOLITE MASS & MAIN SHEETED ZONES PROJECTED TO PLANE AT 1140' EL.
Scale: 1" = 100'

E. Wisser 8/31/86