STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES

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No. 379: 1973 Orange Hill, Alaska project report

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ORANGE HILL PROJECT REPORT

1973

by

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CONTENTS

RELATED MAPS UNDER SEPARATE COVER

Map No. 1, Geologic Map

Overlay Maps

No. 1 Drill Hole Locations, Roads, Drainages, etc.
No. 2 Claim Map
No. 3 Percentage Vein Quartz
No. 4 Faults and Non-mineralized Joints
No. 5 Mineralized Structures
No. 6 Mineralized Structures Projected
No. 7 Copper Equivalent Grade Potential

SUMMARY

Project attention was focused on the relationships of the quartz feldspar porphyry intrusions to the Orange Hill mineralization by Noel McAnulty and Bob Seraphim during their examination in early July. Thereafter, geologic mapping was concentrated on detailing the areal extent of the porphyry intrusions as distinct from the silicic and feldspathic alterations with which the porphyry, or alaskite, had been grouped in previous mapping.

Investigation of the mineralization associated with the Bryner structural zone was the objective of the first two diamond drill holes and a test for tactite mineralization the objective of the third hole.

With the compilation of more detailed information, a pattern of the higher grade mineralization has become apparent from which it is possible to predict probable reserves of 165 million tons averaging 0.4% copper equivalent grade and the good likelihood that further exploration will double such reserves.

CONCLUSIONS

Mineralization in the Orange Hill area is genetically related to and spatially controlled by quartz feldspar porphyry intrusions. Mineralization explored to date is associated with a northeasterly striking quartz feldspar porphyry body which outcrops on the east flank of Orange Hill. The higher grade mineralization forms a south facing semi-circular zone within which PROBABLE reserves of 165 million tons averaging 0.4% copper equivalent grade are estimated. Such reserves are estimated to also contain 22 million tons averaging over 0.5% copper equivalent available to initial mining with minimal overburden stripping. Additional POSSIBLE reserves amenable to open pit mining are estimated at 150 million tons.

RECOMMENDATIONS

It is recommended that detailed geologic mapping be continued in order to: 1) complete the coverage of the entire project area and, 2) gain a better understanding of the origins and controls of the higher grade mineralization. An alteration and sulfide distribution study similar to that begun by Cy Fields should be continued and expanded upon.

It is further recommended that the objectives of the next phase of diamond drilling remain the testing of unexplored geologically favorable areas of the property.

PROJECT OBJECTIVES AND IMPLEMENTATION

The primary project objective was that of determining grade potentials in geologically favorable areas of the property.

Geologic mapping was carried out for the purpose of gaining more precise factual information on ore controls and the areal extent of potential economic mineralization.

The mineralization associated with the northeasterly striking Bryner structural zone has been tested by drilling at locations near exposures in Cross Gulch and 6,000 feet southwesterly where the zone projects under cover at the extreme south end of Orange Hill. In addition, a test for tactite mineralization was successfully conducted in the area of cover east of Orange Hill.

SUMMARY OF PROJECT ACTIVITIES

Exploration conducted at Orange Hill during 1973 consisted of 1,910 feet of diamond drilling in three holes, drill location and access road construction and geologic mapping.

In preparation for the field season, the D-6 Cat was moved from Horsfeld to Orange Hill in early May. Set-up of the camp was begun on June 24, with the remainder of the month devoted to camp repairs and brunton-chain surveying of previously drilled hole locations and access roads.

Noel McAnulty and Robert Seraphim made a three-day geologic examination during the period July 6 through July 8 in conjunction with the earlier examinations of the Horsfeld and Baultoff prospects. Thereafter, to July 22, work was concentrated on the movement of the Longyear diamond drill and supplies from the mouth of Bond Creek to Orange Hill, the construction of access roads and the servicing and repair of the equipment in preparation for drilling. Geologic mapping was the focus of activity during the latter part of July.

Diamond drilling was begun with the arrival of the drill crew on August 1, and was carried out concurrently with geologic mapping and dozer work during the month of August.

With the completion of DDH-114 on September 1, diamond drilling was terminated and the drill rig secured on the location. Access road construction was continued until September 5, and geologic mapping together with the staking of 20 lode mining claims was carried out until September 8, at which time the field work for the season was terminated.

GEOLOGIC REPORT

INTRODUCTION

This report presents the findings of the geological investigation at Orange Hill during 1973.

Data from previous investigations were drawn on in the compilation of the maps. The text, however, is confined to the presentation of new information and is intended to be supplemental to the reports of past investigations.

ROCK TYPE DISTRIBUTIONS

Quartz Feldspar Porphyry

Silicic and feldspathic alterations have been grouped with quartz feldspar porphyry intrusions as a single map unit in all previous investigations. Because of the apparent genetic relationship of the porphyries to mineralization, it was considered essential that the areal extent of the quartz feldspar porphyries be separately defined.

Having been distinguished in mapping, the quartz feldspar porphyry is seen to constitute a small part of the total mass of the siliceously altered area on the east flank of the hill. The intrusion is dike-like but with many apophyses and gradational contacts particularly where associated with K-spar flooding at the south end of Orange Hill. Other more plug-like, though irregular porphyry intrusions, varying in size from less than 100 feet in diameter to more than one thousand feet in diameter occur throughout the area. Most are located in the southern portion of the claimed area and to the southeast where mapping is incomplete. The predominant strike or trend of the quartz feldspar porphyry intrusions, whether dikes or masses, is north-easterly.

As noted in the description of silicic alteration, quartz veining is closely associated with the porphyry intrusions. The intense silicic alteration in two centers on the east flank of Orange Hill seems inconsistent with the small mass of porphyry outcropping in the area, suggesting that near-surface cupolas of porphyry probably underlie the silicic centers. Feldspathization manifested as K-spar flooding is also closely associated with the porphyry intrusion on the south end of Orange Hill.

At least two ages of porphyry intrusion are known to have occurred, based upon cross-cutting relatinnships and it is very likely that the number of distinctive quartz feldspar porphyry intrusions will be found to be much greater as more is learned about them.

Gabbro

Not shown on the geologic map is a gabbro intrusion to the south of the claimed area which was examined by Noel McAnulty and Bob Seraphim during their visit in July. The plug may be the source of the gabbroic dikes which intrude the cliff line metasediments. Since skarn mineralization is found on the margins of such dikes, the gabbro may have played a role in the metallization of the area. It is significant to note in this regard, that a number of the specimens from the Orange Hill area petrographically studied by Gene Foord in 1971 were determined to be gabbroic in composition.

Undifferentiated Intrusions

The fine-grained character of the Triassic rocks and of some pre-mineral intrusives in the area has made grouping of such rocks in mapping necessary. The lack of detail, however, has made it impossible to gain an understanding of the metasomatic or intrusive history which is believed to be more involved than it presently appears. A porphyritic diorite, for instance, logged in most drill holes and which probably constitutes a considerable volume of bedrock, has yet to be differentiated in surface mapping. The undifferentiated intrusions shown on the geologic map, therefore, are token recognition of the complexity of rock types in the area which need much more thorough study.

Triassic Rocks

The areal extent of the Triassic rocks has been considerably modified from that shown on Linn's map. The extension of the metasediments northerly into the upper end of the California Gulch and the finding of limestone and skarn continuity across the south end of Orange Hill are the principal revisions.

The classification of the metasediments in the upper California Gulch area has been made without the aid of petrographic study and the identification is open to question. However, the appearance of the rock is the same as heavily quartz-veined metasediments in other localities and the irregularity and gradational nature of the contact produced is typical of intrusive contacts elsewhere in the area.

The finding of continuous limestone and tactite outcrops across the south end of Orange Hill has provided a basis for interpretation of the ground magnetometer data in the area of cover extending from Orange Hill to adit "E". The interpretation suggested continuity of the calcareous units under cover between outcrops which was tested for by DDH-114 and found to be true.

SILICIC ALTERATION

Random quartz veining is a conspicuous feature of the Orange Hill area. As shown on Overlay No. 3, Percentage Quartz Veins, the intensity of secondary quartz veining is highly variable with the degree of concentration closely related to the proximity of quartz feldspar porphyry intrusions. The most intense quartz veining conforms to the margin of the porphyry masses where the veins increase in size and number as the edge of the porphyry is approached. In several areas, as at the head of California Gulch, such veins coalesce to form essentially 100 per cent quartz masses.

As will be noted on the Overlay, the concept of a single siliceous core is not supported by the details of quartz veining distribution. Nor is the idea of an "L" shaped silicified zone, as shown in previous mapping, borne out in detail. Instead, there are a number of northeasterly trending silicic zones each conforming to a northeasterly trending quartz feldspar porphyry intrusion.

The vertical configuration of the silicic zoning is probably that of a halo around each quartz feldspar porphyry body with the greatest concentration of quartz in the cupola zone. The two holes which straddle the highly silicic area at the head of California Gulch, DDH-105 and DDH-109, each show a lessening in the quantity of introduced quartz within the relatively shallow depth of the 500 feet from which it may be concluded that the more intense silicic alteration has some degree of overhang on the margins. Cross sections D-D and E-E illustrate what is conceived to be the vertical configuration of the intense quartz veining halo relative to the quartz feldspar porphyry intrusions. Cross section D-D also illustrates the possibility of blind apexing porphyry intrusions being responsible for the increase in quartz veining with depth in DDH-102 and DDH-106.

Most quartz veins in the Orange Hill area are barren of sulfides. Those quartz veins bearing the economic minerals, chalcopyrite and molybdenite, are estimated to constitute five per cent or less of the rock mass. The amount of quartz veining as such, therefore, is not a guide to ore grade mineralization. Rather, copper grades appear to inversely relate to the percentage of introduced quartz above about 15 per cent quartz veining.

The relationship of quartz sulfide mineralization to total quartz veining, however, appears to be more indirect than direct. The mineralization is believed zoned primarily around the quartz porphyry intrusions and only secondarily, is the grade of mineralization considered to be influenced by the dilution of sulfide content from the introduction of barren quartz veins.

STRUCTURE

Faults

The Bryner fault is the strongest fault exposed in the vicinity of Orange Hill. It outcrops only in upper Cross Gulch being covered for its strike length within the mapped area. Its northeasterly projection may be expressed by a topographic break on the ridge 1,800 feet to the north.

At outcrop, the fault strikes N 32° E and dips 85° Southeasterly as determined by DDH-113 (Linn reports a 30-40° northwesterly dip). Many joints and subsidiary faults strike parallel to sub-parallel as do the predominant mineralized joints for a one-half-mile width adjacent to the fault. It is believed that movement is left lateral (Linn reports it as right lateral) based upon the offsets on parallel faults, though not on evidence of movement on the Bryner fault itself. As with a N 10° E striking fault located on the south end of Orange Hill, the fault zone is occupied by a post mineral dike.

The basis for the projection of the Bryner fault is the 1953 Bear Creek Mining Company ground magnetic data which shows a sharp magnetic low striking approximately N 70° W across the projection of the Bryner fault. The magnetic feature is believed to be a fault displacing the limestone and Bryner fault alike. The Bryner fault appears to be offset westerly by the cross-fault as indicated by a sharp break in the west trending magnetic highs of the magnetite bearing calcareous units.

Rotary drill hole 15 through which the Bryner fault projects cut intensely argillically altered biotite quartz diorite and was abandoned because of artesian water flow, a circumstance similar to that which caused the abandonment of DDH-113 at the point of penetrating the Bryner fault.

If the Bryner fault is located correctly relative to DDH-114, the fault zone intersected in the interval 749 feet to 771 feet would be the Bryner fault dipping 75° to 80° southeasterly.

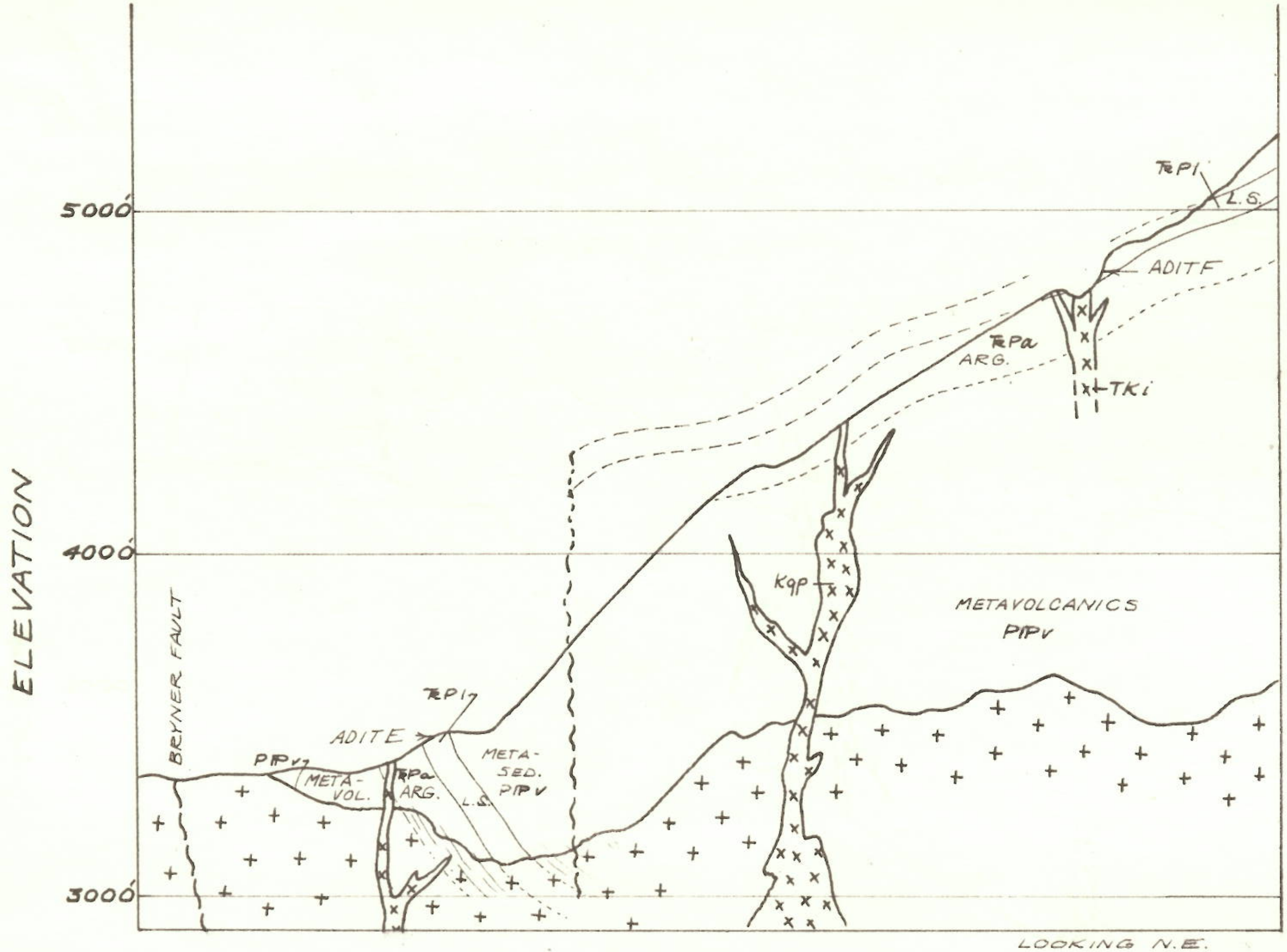
Overlay No. 4, Faults and Non Mineralized Joints, records the pattern of known faults and late joints in the Orange Hill area. Of note, in addition to the Bryner fault are faults at the head of Moose Gulch, striking N 20° E into the lower end of Cross Gulch. The faults have steep dips and movements are left lateral. Faults striking N 30-35° W dipping steeply to the southwest predominate in the California Gulch area and one such fault is believed responsible for the incised canyon of Moly Gulch.

The most important faults in the southeastern portion of the property have westerly to northwesterly strikes. Thus, a fault at adit "J" strikes N 70° W and displaces the limestone a few tens of feet with left lateral movement. Faults of similar strike and containing molybdenite mineralization cut the quartz porphyry intrusions at the south end of the mapped area.

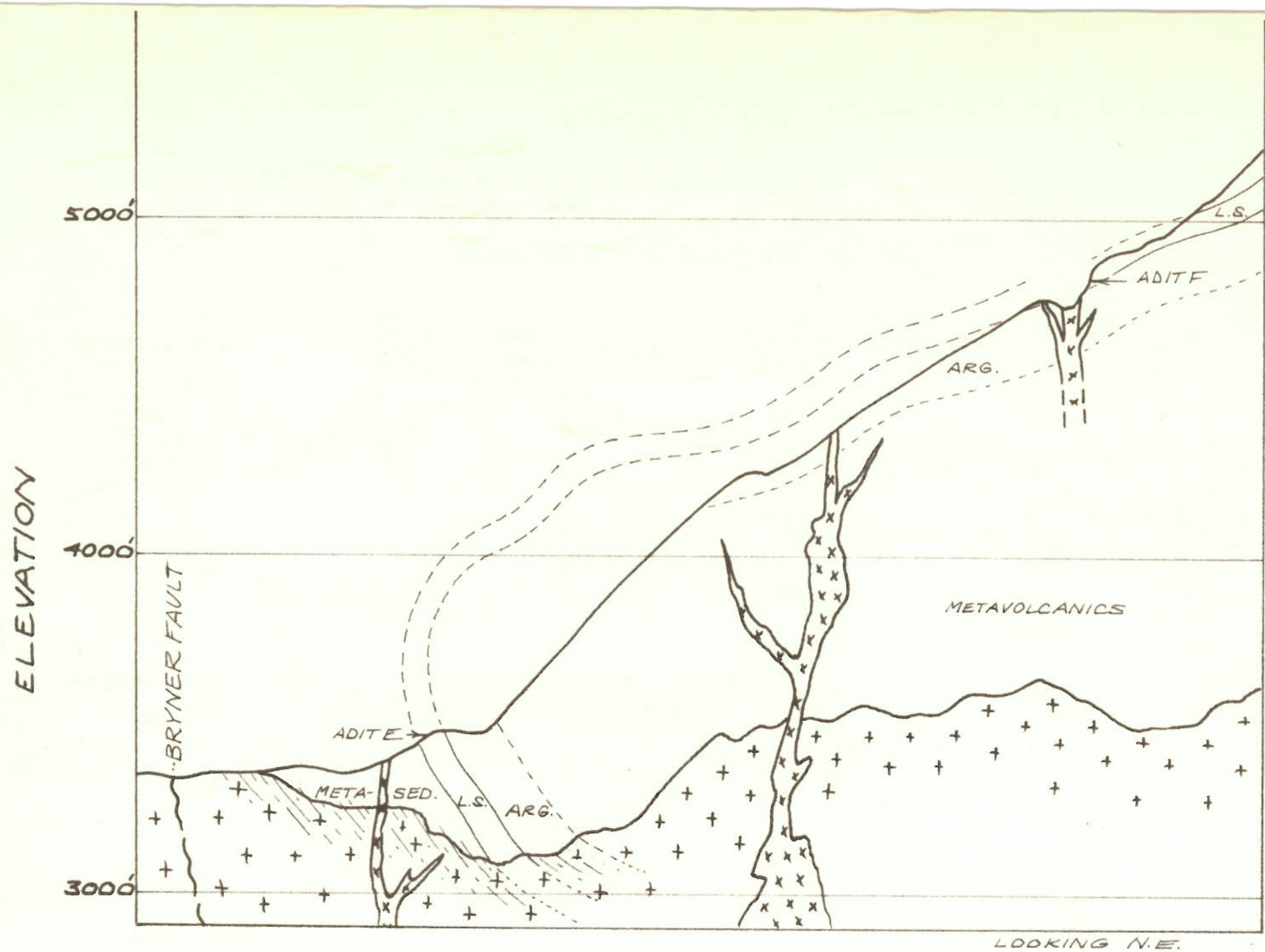
Folds

The prior description of the limestone at adit "E" as a downfaulted block now appears questionable in light of the evidence that the outcropping is a segment of a calcareous unit with 3,500 feet of continuity, rather than an isolated block.

Were a fault responsible for the placement of the adit "E" limestone as illustrated in Figure 1-A, the magnitude of vertical displacement would be 1,000 feet requiring a fault of the order of the Bryner fault or greater. While the fault trace must necessarily be assumed to lie under cover, the subsidiary structures which should accompany such a fault are notably absent. Moreover, unless terminated by other structures to the west, the fault would have to either; 1) project through the south end of Orange Hill, in which case there should be evidence of a fault and a demarkation between metasediments on the north and metavolcanics on the south or, 2) project to the south of Orange Hill in which case outcrops of Triassic rocks on the south end of Orange Hill should be entirely metasediments. Neither of these factual requirements are met to substantiate the fault hypothesis.



CROSS SECTION A-A'
SHOWING
DIAGRAMATIC SKETCH OF FAULT
SCALE 1" = 500'
FIGURE 1-a



CROSS SECTION A-A'
SHOWING
DIAGRAMATIC SKETCH OF FOLD
SCALE 1"=500'

FIGURE 1-b

On the other hand, the hypothicating of a fold projecting northerly into the diorite appears supported by the outcroppings of diorite intruding skarn, limestone and calcareous argillite 500 feet northerly from and on projection with the main cliff line limestone. In like manner, the adit "E" limestone is interpreted from the magnetic data to be similarly intruded by diorite approximately 600 feet east of the adit, indicating that both limbs of the fold project into the diorite intrusion on the north.

Figure 1-B illustrates in cross section the concept of the fold in which the 70° southerly dipping limestone at adit "E" is believed to be the overturned limb of a recumbent fold overturned to the northwest.

The significance of the mode of structural placement of the adit "E" limestone lies in its bearing on ore potentials to the south of the presently drilled area. If the metasediments have been relatively more favorable to ore deposition than the metavolcanics or if metasedimentary contamination of the quartz diorite enhanced the diorite's favorability to mineralization, the greater exposure of metasediments afforded by folding could have importantly influenced ore deposition.

MINERALIZATION

Structural control is an obvious and important factor in the localization of the higher grade mineralization at Orange Hill and for this reason a compilation of mineralized vein strikes was made in the course of geologic mapping. Three types of veins were distinguished, i.e., pyrite-chalcopyrite-molybdenum bearing quartz veins; pyrite-chalcopyrite-molybdenum fracture fillings, and friable pyrite-molybdenite bearing quartz veins. In addition, gypsum veins were noted but appeared to lack association with significant mineralization.

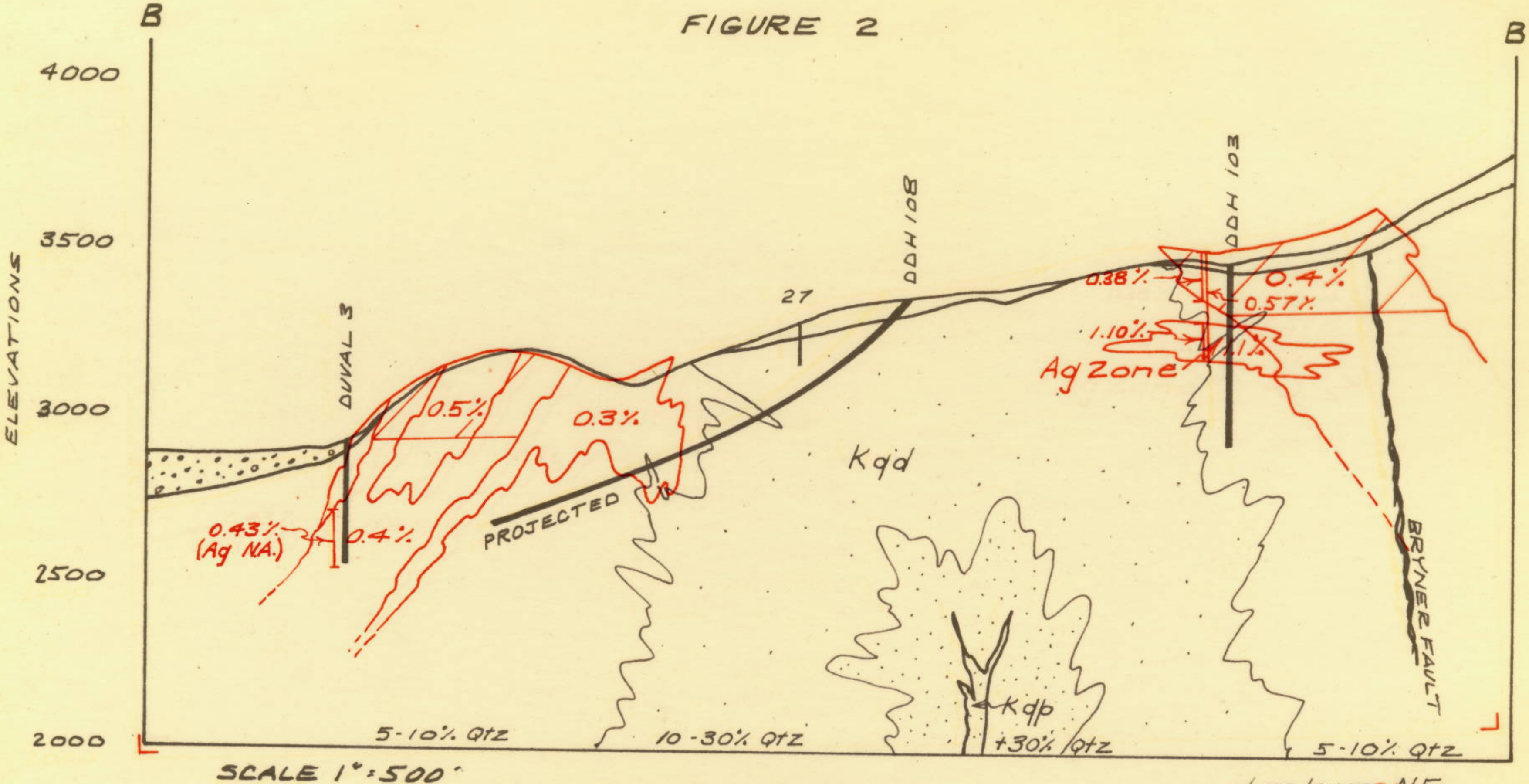
The distinctiveness of the friable pyrite-molybdenite veins bears description beyond that provided by Linn. Such veins are dike-like, near vertical in attitude, and highly variable in width ranging from inches to several feet within 50 foot strike lengths. Rather than having sharp walls as is characteristic of the other quartz veins, the silica makes out into the country rock creating a bleached halo along the margins of the veins. The associated sulfides are molybdenite as dustings and slip-plane coatings and pyrite in the form of friable blebs and pods.

The veins are almost totally restricted to the California Gulch area where they swarm in a radiating pattern northerly from a projected focal point several hundred feet south of the head of the gulch. While it appears as though the veins are restricted in strike to the northwestnortheast quadrant, overburden conceals most of the area to the east, south and west where the veins could be expected to complete their radiating pattern.

The strike pattern of these and other mineralized structures are recorded on Overlay No. 5, Mineralized Structures. Overlay No. 6, Mineralized Structures - Projected, presents the strike symbols extended for ease in assessing structural patterns. As will be noted, given vein strikes predominate in certain areas. One such set occupies a zone at least one-half mile wide and strikes N 25-35° E parallel to sub-parallel with Bryner fault from north of Cross Gulch southwesterly through the low area to the east of Orange Hill. Another dominant set, approximately one-quarter mile wide, strikes north with a near vertical dip from the head of California Gulch into the Moose Gulch area. Within Moose Gulch in Lower Cross Gulch, veins striking N 20-30° W are superimposed on the previously mentioned north striking set.

To the south of Orange Hill, sulfide fracture fillings predominate over quartz associated veins although molybdenum bearing quartz veins (not including the friable pyrite variety) occur with about the same frequency as to the north. The fracture filling veins have a strike of N 45-60° W with near vertical attitudes to the point of cover, beyond which one-quarter mile to the southeast, the mineralized veins curve to a near east-west strike.

FIGURE 2

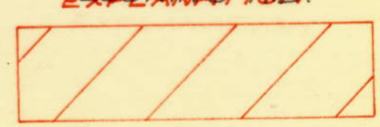


CROSS SECTION B-B′

SHOWING CONFIGURATION
OF
SILICIC ALTERATION

MINERALIZATION OVERLAY
PERCENT Cu EQUIVALENT GRADES

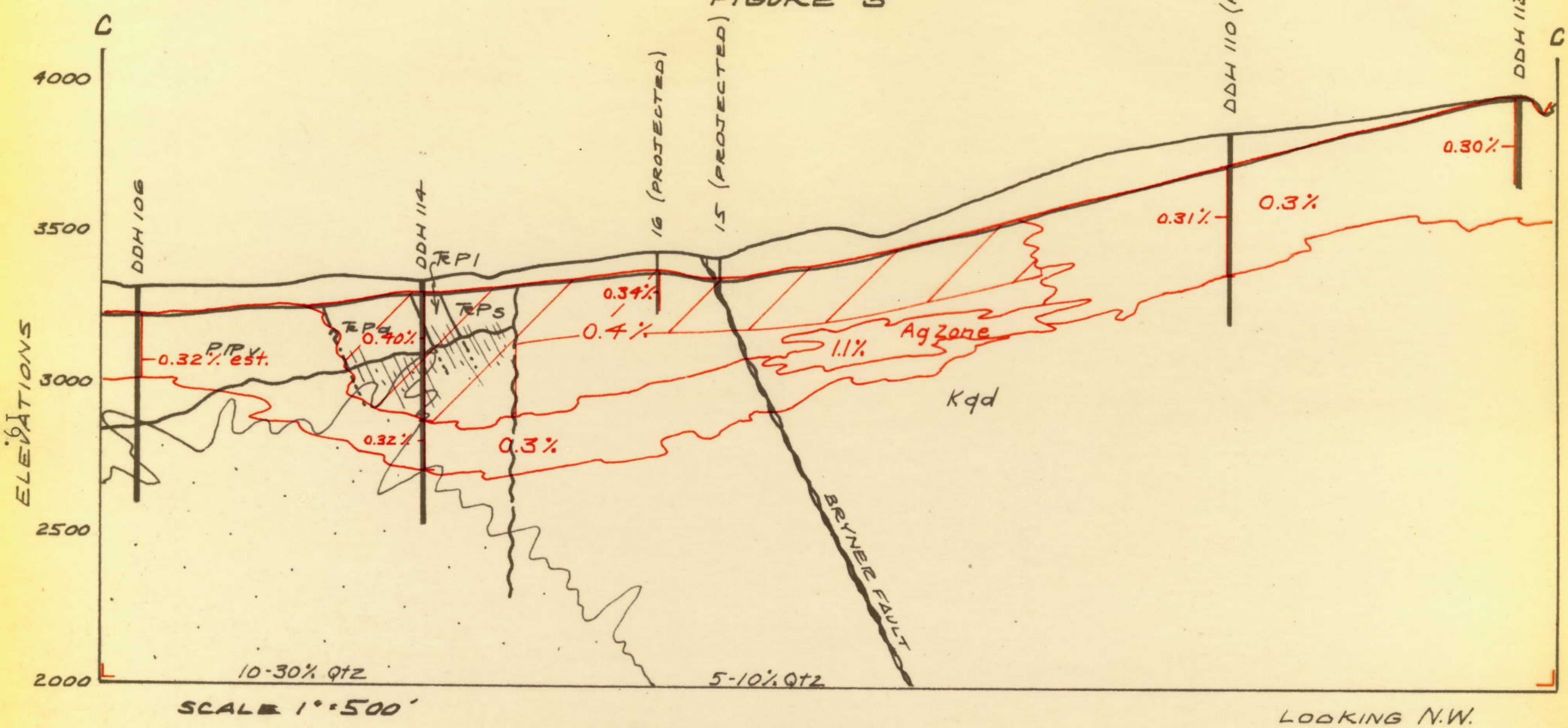
EXPLANATION



AREA OF ESTIMATED
PROBABLE RESERVES

FIGURE 2

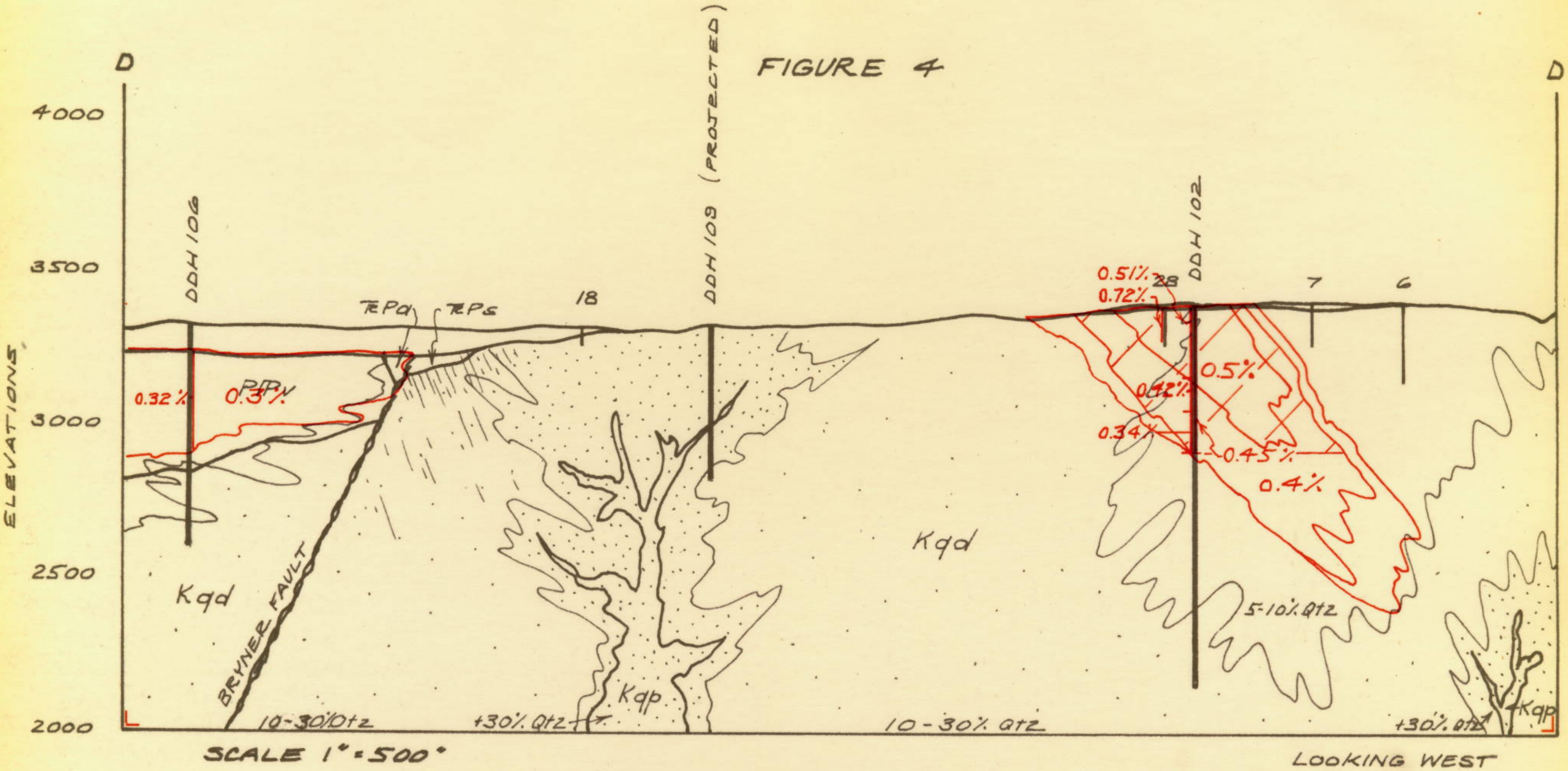
FIGURE 3



CROSS SECTION C-C'
SHOWING CONFIGURATION
OF
SILICIC ALTERATION
MINERALIZATION OVERLAY
PERCENT CU EQUIVALENT GRADES

FIGURE 3

FIGURE 4



CROSS SECTION D-D'

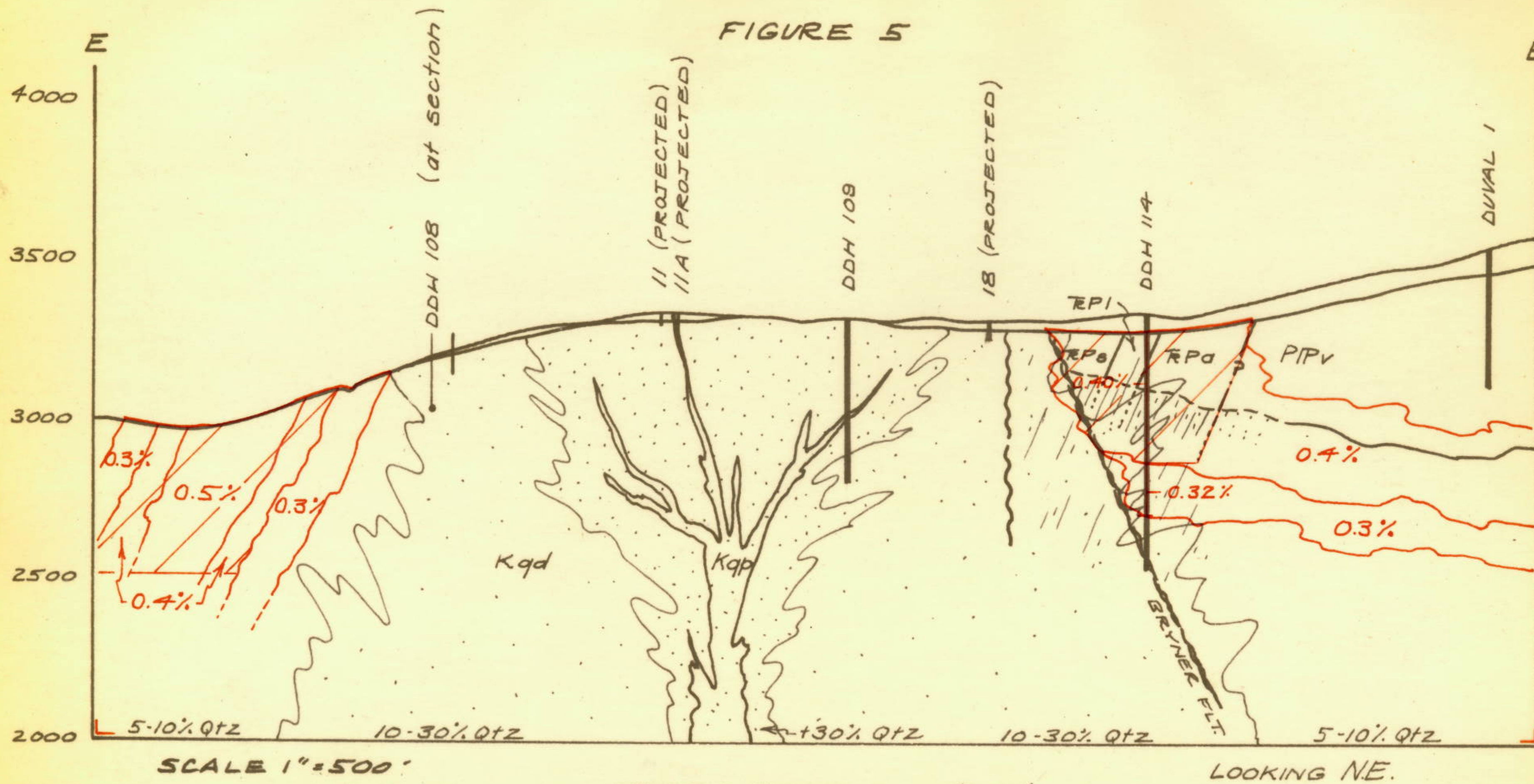
SHOWING CONFIGURATION
OF
SILICIC ALTERATION

MINERALIZATION OVERLAY
PERCENT CU EQUIVALENT GRADES

FIGURE 4

E

FIGURE 5



CROSS SECTION E-E'

SHOWING CONFIGURATION
OF
SILICIC ALTERATION

MINERALIZATION OVERLAY
PERCENT CU EQUIVALENT GRADES

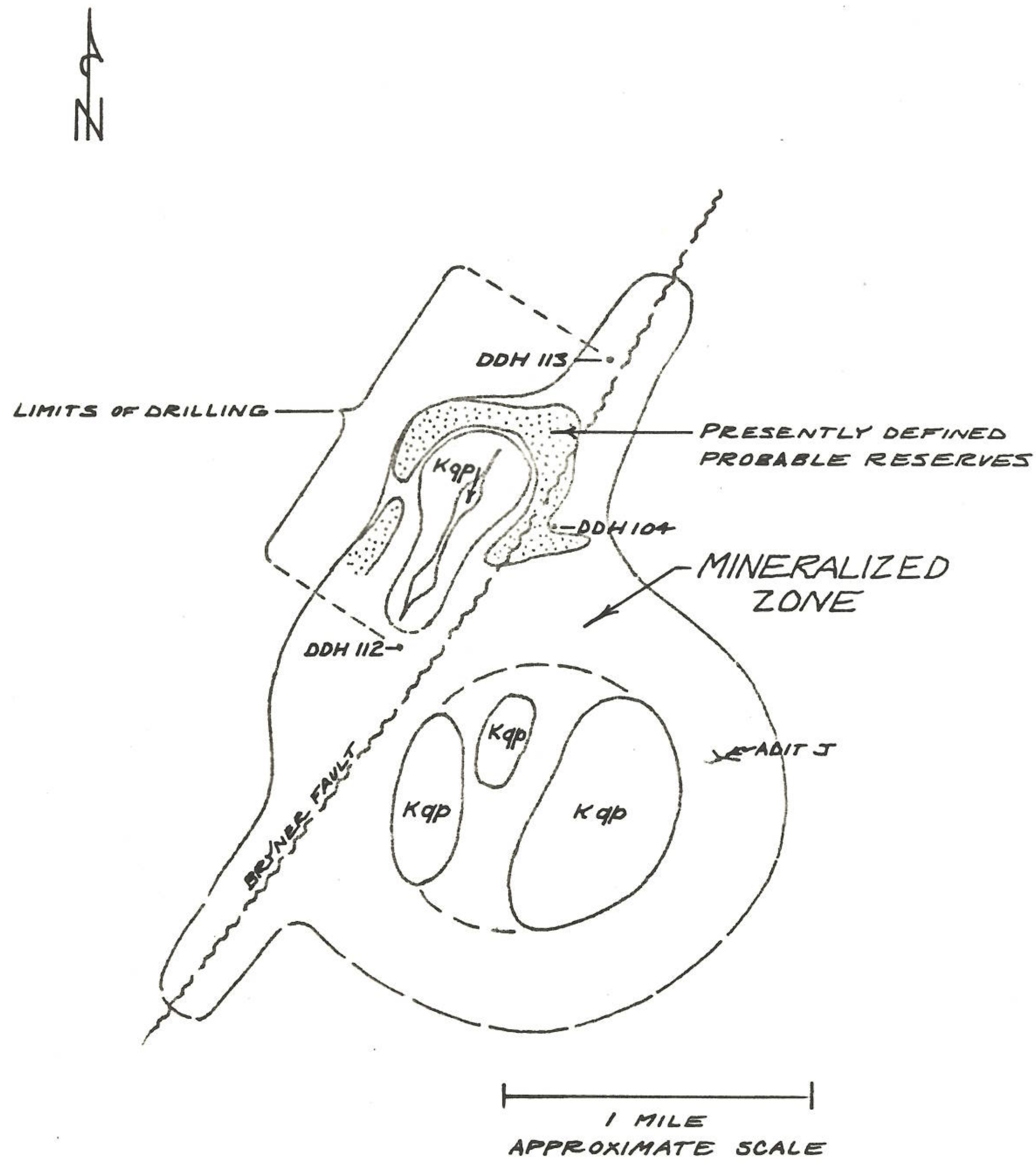
FIGURE 5

CONCLUSIONS CONCERNING ORE CONTROLS

The genetic relationship of mineralization to the quartz feldspar porphyry intrusions seems well established by the zoning of the mineralization around the silicified porphyry dike or stock system on the east flank of Orange Hill. Less certain are the specific relationships of the higher grade mineralization to given porphyry intrusions or to the porphyry intrusions as a whole in the vicinity of Orange Hill.

Concerning the relationship of mineralization to porphyry intrusions as a whole, it appears possible that the quartz feldspar porphyry around which exploration has been concentrated is satellitic to a larger perhaps main, porphyry mass located to the southeast. This might explain the association of relatively high zinc and silver and the lack of bornite in the sulfide assemblage which suggests that the area currently under exploration is on the periphery of the main center of mineralization.

Figure 6 illustrates a concept of zoning which takes into account the bornite occurrences in the vicinity of adit "J", the intensity of the alteration of the limestone to the south of the adit, and the volume of exposed quartz feldspar porphyry at the southeast corner of the claimed area. If such a concept of zoning is valid, the tonnage



CONCEPTUAL SKETCH
OF
ORANGE HILL
MINERALIZATION ZONING

FIGURE 6

potential for bornite associated mineralization would add considerably to that of the potential of the mineralization explored to date. Though the reserves would not be amenable to open pit mining, the predicted higher bornite to chalcopyrite ratio offers the opportunity for higher grade copper mineralization than that of the present reserves.

With regard to the known mineralization, proximity to the quartz feldspar porphyry appears to be a critical factor controlling grade and for the present, the empirical guage of intensity of quartz veining stemming from the porphyries appears to be a guide to the higher grade zones. Thus, the better grade mineralization is found in areas where quartz veining is not greater than 20 per cent and more generally less than 15 per cent of the rock mass.

The quartz feldspar porphyries have not as yet been found to be significant hosts for mineralization other than some of the smaller masses which are well altered and mineralized with disseminated chalcopyrite.

A more subtle control is believed exerted by the contamination of the quartz diorite by the metasediments or the metavolcanics. The widely scattered occurrences of skarn mineralization within the quartz diorite attest to the considerable degree of assimilation that has taken place along the margins of the intrusion. Some of the more basic facies of the quartz diorite which often carry higher grade mineralization are believed to be assimilated Triassic inclusions, and if so, contamination of the quartz diorite has favorably influenced sulfide deposition.

Not to be confused with the basic facies is a dark colored porphyritic diorite intersected in most diamond drill holes. It also is found to be generally better mineralized within the quartz diorite though apparently less favorable to deposition relative to the metasediments.

Rock type favorability also mainfested itself within the Triassic rocks. In addition to the carbonate units, fine grained metasediments proved to be favorable hosts, as in DDH-112. Moreover, though other factors may have influenced the mineralization in DDH-106, the 400 feet of metasediments intersected were found to be significantly higher grade (0.25% - 0.3% copper equivalent) than the quartz diorite immediately below.

The Orange Hill mineralization is strongly structurally controlled. Fracture filling and veinlet associated sulfides invariably accompany the higher grade mineralized zones. Significantly, the pattern of post mineral fractures is similar to that of the mineralized veins. It is considered more than coincidence, therefore, that the northeasterly trend of the quartz feldspar porphyry intrusions parallels the strongest known fault in the area, the Bryner fault and that the mineralized area itself is elongated in the same direction.

SUMMARY OF DRILL HOLE ASSAY AVERAGES

At this writing, check assays by Union Assay Office are in disagreement with the assays of Resource Associates of Alaska, the firm that assayed the 1973 core samples. The average variance of 12 pulp samples is minus 8.6% for copper and minus 37.2% for molybdenite relative to the comparable averages of the Resource Associates' assays. The table on the following page presents the summary of the Resource Associates assay averages with the estimated adjusted averages noted in parentheses. Silver and gold assays are by the Union Assay Office.

TONNAGE AND GRADE POTENTIALS

Because of the significant association of silver in the Orange Hill mineralization, silver credits as well as molybdenite credits are included in the copper equivalent grades referred to in this report. A 2.5 times factor has been used to calculate the MoS_2 equivalent and the metal prices of 60¢ per pound copper and $2.75 per ounce silver have been used to derive the silver equivalents.

Overlay No. 7, Copper Equivalent Grade Potentials, and the Mineralization Overlays for cross-sections B-B', C-C', D-D' and E-E' depict the areal and vertical distributions of the copper equivalent grades in the Orange Hill area.

SUMMARY OF 1973 DIAMOND DRILL HOLE ASSAY AVERAGES

DDH	Depth (in feet)	Interval (in feet)	% Cu	% MoS_2	Au oz/T	Ag oz/T
112	2- 90	88	0.130 (0.119)	0.016 (0.010)	N	0.23
	90-190	100	0.328 (0.301)	0.034 (0.021)	N	0.22
	2-190	188	0.234 (0.215)	0.025 (0.016)	N	0.22
113	21-120	99	0.240 (0.220)	0.024 (0.015)	N	0.25
	120-420	300	0.241 (0.220)	0.023 (0.014)	N	0.22
114	57-172	115	(15% core recovery - unreliable)			
	172-240	68	0.435 (0.399)	0.015 (0.010)	N	0.15
	240-320	80	0.339 (0.311)	0.035 (0.022)	N	0.25
	320-480	160	0.286 (0.262)	0.039 (0.024)	N	0.17
	480-590	110	0.269 (0.246)	0.034 (0.021)	N	0.11
	590-640	50	0.221 (0.202)	0.036 (0.023)	N	0.26
	640-750	90	0.145 (0.133)	0.031 (0.019)	N	0.10

The better grade mineralization is seen to occupy a semi-circular zone having a circumferential strike length of approximately 6,500 feet, a width of 0.4% copper equivalent grade ranging from 200 feet to possibly greater than 800 feet and vertical thicknesses of from 150 feet to 500 feet. Based upon these dimensions, 165 million tons averaging 0.4% copper equivalent, including 22 million tons of 0.5% copper equivalent, are estimated to comprise the presently established PROBABLE open pittable reserves at Orange Hill.

The estimate does not include the potential for reserves below present drill hole intersections or the potential for ore development in the area south of Orange Hill, nor does it include the silver anomalous zone intersected in DDH-103. The potential for doubling the PROBABLE surface minable reserves is, therefore, considered to be excellent.

The potential for underground reserves of bornite associated mineralization remains to be investigated as outlined on Overlay No. 7. The prospect zone is conceived to underlie the metavolcanics and to surround the quartz porphyry intrusions responsible for the intense alteration of limestones in the vicinity of adit "J". The reserve potential, though undetermined, could exceed the potential for surface minable reserves.

RESOURCE ASSOCIATES OF ALASKA, INC.
P. O. BOX 80006 - COLLEGE, ALASKA 99701
TELEPHONE 907 479-6097/6320

January 9, 1974

Mr. Wallace McGregor
AJV Corporation
N 10018 Huntington Road
Spokane, Washington 99218

Dear Mr. McGregor:

Our check samples for molybdenum from the rejects are now in and compiled. I am still waiting for the total copper, sulfide copper and oxide copper that we have ordered from other labs to arrive. As soon as these arrive I will forward them to you. The molybdenum results follow:

% MOS_2

	Pulp #1		Pulp #2				
Sample #	RAA	Union	Skyline	Rocky Mountain	Chemex	RAA	
4560	.028	.033	.040	.045	.042	.040	
4570	.011	.015	.025	.021	.022	.018	
4590	.018	.015	.030	.023	.022	.018	
4602	.028	.022	.026	.018	.022	.028	
4610	.006	.007	.003	.005	.005	.005	
4617	.103	.066	.095	.068	.077	.083	
4637	.006	.007	.016	.011	.012	.006	
4647	.040	.033	.043	.033	.033	.043	
4657	.063	.033	.063	.056	.055	.060	
4667	.038	.018	.046	.040	.040	.043	
4677	.046	.015	.010	.010	.010	.012	
4687	.026	.015	.023	.020	.020	.020	
AVERAGE	.034	.023	.035	.029	.030	.031	Average=0.30%
VARIANCE	88%	77%	86%	97%	100%	97%	

Average Without Union = 0.32%						
New Variance	94%	72%	91%	91%	94%	97%

I would appreciate receiving the results of your new checks.

Sincerely yours,

RESOURCE ASSOCIATES OF ALASKA, INC.

Lawrence E. Heiner

LEH/lf

SKYLINE LABS, INC.
SPECIALISTS IN EXPLORATION GEOCHEMISTRY
12090 WEST 50TH PLACE • WHEAT RIDGE, COLORADO 80033 • TEL.: (303) 424-7718

REPORT OF ANALYSIS

Job No. M-2318
January 18, 1974

Mr. Wallace McGregor
Northwest Exploration
North 10018 Hungtington Road
Spokane, Washington 99218

12 Pulp Samples

PULP #1

Item	Sample No.	MoS_2 (%)
1.	4560	.027
2.	4570	.010
3.	4590	.0125
4.	4602	.021
5.	4610	.0060
6.	4617	.105
7.	4637	.0075
8.	4647	.047
9.	4657	.062
10.	4667	.042
11.	4677	.043
12.	4687	.028

Charles E. Thompson
Charles E. Thompson
Chief Chemist

SKYLINE LABS, INC.
SPECIALISTS IN EXPLORATION GEOCHEMISTRY
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REPORT OF SPECTROGRAPHIC ANALYSIS

Mr. Wallace McGregor
Northwest Exploration
North 10018 Hungtington Road
Spokane, Washington 99218

Job No. M-2318
January 18, 1974

Values reported in parts per million except where noted otherwise, to the nearest number in the series 1, 1.5, 2, 3, 5, 7 etc.

Element	Comp. Sample Number 4551-4555	4556-4560	4561-4565	4566-4570	4571-4574	4575-4577
Fe	3%	10%	10%	3%	7%	10%
Ca	2%	3%	3%	1.5%	3%	2%
Mg	.5%	1%	1.5%	.5%	1%	.5%
Ag	<1	<1	<1	<1	<1	<1
As	<500	<500	<500	<500	<500	<500
B	10	20	10	10	20	20
Ba	300	500	700	200	700	300
Be	<2	<2	<2	<2	<2	<2
Bi	<10	<10	<10	<10	<10	<10
Cd	<50	<50	<50	<50	<50	<50
Co	5	20	20	5	10	15
Cr	20	30	50	20	20	30
Cu	500	3,000	5,000	1,000	1,500	1,500
Ga	10	15	20	15	10	10
Ge	<20	<20	<20	<20	<20	<20
La	20	<20	<20	20	<20	<20
Mn	1,000	1,500	1,500	1,000	1,500	1,500
Mo	30	150	500	50	100	100
Nb	<20	<20	<20	<20	<20	<20
Ni	<5	10	10	<5	5	7
Pb	<10	<10	<10	<10	<10	<10
Sb	<100	<100	<100	<100	<100	<100
Sc	<10	20	15	10	20	20
Sn	<10	<10	<10	<10	<10	<10
Sr	100	200	500	100	300	150
Ti	1,000	2,000	2,000	1,500	2,000	3,000
V	100	200	200	100	150	100
W	<50	<50	<50	<50	<50	<50
Y	<10	10	10	<10	15	30
Zn	<200	<200	<200	<200	<200	<200
Zr	20	20	30	20	20	20

Element	Comp. Sample Number 4578-4582	4583-4587	4588-4592	4593-4597	4598-4602	4603-4607
Fe	15%	10%	7%	5%	10%	10%
Ca	10%	1.5%	1.5%	2%	3%	3%
Mg	2%	1.5%	2%	2%	2%	2%
Ag	<1	1	<1	<1	1	1
As	<500	<500	<500	<500	<500	<500
B	20	20	20	10	10	10
Ba	500	500	500	500	700	700
Be	<2	<2	<2	<2	<2	<2
Bi	<10	<10	<10	<10	<10	<10
Cd	<50	<50	<50	<50	<50	<50
Co	20	20	20	10	30	20
Cr	70	50	50	20	70	50
Cu	2,000	3,000	1,500	2,000	3,000	2,000
Ga	20	10	15	15	20	20
Ge	<20	<20	<20	<20	<20	<20
La	<20	<20	<20	<20	<20	<20
Mn	2,000	2,000	2,000	2,000	3,000	3,000
Mo	70	300	150	100	200	200
Nb	<20	<20	<20	<20	<20	<20
Ni	10	15	10	7	10	10
Pb	<10	10	<10	10	<10	10
Sb	<100	<100	<100	<100	<100	<100
Sc	30	10	10	10	10	10
Sn	<10	<10	<10	<10	<10	<10
Sr	500	150	150	200	200	200
Ti	5,000	3,000	2,000	3,000	3,000	3,000
V	200	150	150	150	200	200
W	<50	<50	<50	<50	<50	<50
Y	20	20	20	20	20	20
Zn	<200	200	<200	<200	<200	<200
Zr	30	100	50	100	100	150

Element	Comp. Sample Number 4608-4612	4613-4617	4618-4622	4635-4639	4640-4644	4645-4649
Fe	10%	10%	7%	15%	10%	5%
Ca	2%	2%	2%	7%	2%	1.5%
Mg	1.5%	1.5%	1.5%	1%	1.5%	1%
Ag	1	2	1	1	1	1
As	<500	<500	<500	<500	<500	<500
B	20	20	20	20	20	10
Ba	300	300	200	30	500	700
Be	<2	<2	<2	<2	<2	<2
Bi	<10	<10	<10	<10	<10	<10
Cd	<50	<50	<50	<50	<50	<50
Co	30	30	10	20	15	10
Cr	100	150	70	50	150	100
Cu	2,000	3,000	1,000	2,000	3,000	2,000
Ga	15	15	15	10	15	15
Ge	<20	<20	<20	<20	<20	<20
La	<20	<20	<20	<20	<20	20
Mn	2,000	3,000	3,000	5,000	3,000	2,000
Mo	70	300	50	20	150	200
Nb	<20	<20	<20	<20	<20	<20
Ni	20	30	10	10	20	20
Pb	<10	15	150	<10	<10	15
Sb	<100	<100	<100	<100	<100	<100
Sc	20	20	15	10	15	10
Sn	<10	<10	<10	<10	<10	<10
Sr	200	200	150	100	150	100
Ti	2,000	5,000	2,000	1,000	2,000	1,500
V	200	200	150	100	200	100
W	<50	<50	<50	<50	<50	<50
Y	20	20	20	<10	20	10
Zn	<200	1,000	2,000	500	500	500
Zr	100	50	50	<20	70	30

Element	4650-4654	4655-4659	Comp. Sample Number 4660-4664	4665-4669	4670-4674	4675-4699
Fe	7%	10%	10%	7%	7%	5%
Ca	2%	1.5%	5%	1.5%	1%	1.5%
Mg	1%	1%	1.5%	1%	.7%	1%
Ag	1	2	1	1	<1	<1
As	<500	<500	<500	<500	<500	<500
B	15	15	15	15	10	10
Ba	500	500	500	300	300	500
Be	<2	<2	<2	<2	<2	<2
Bi	<10	<10	<10	<10	<10	<10
Cd	<50	<50	<50	<50	<50	<50
Co	10	20	15	10	10	20
Cr	100	70	50	30	30	30
Cu	3,000	5,000	2,000	2,000	3,000	2,000
Ga	20	20	20	15	10	10
Ge	<20	<20	<20	<20	<20	<20
La	<20	<20	<20	<20	<20	<20
Mn	2,000	2,000	2,000	1,000	1,000	1,000
Mo	300	500	300	100	300	200
Nb	<20	<20	<20	<20	<20	<20
Ni	20	10	5	5	5	7
Pb	20	30	10	10	<10	10
Sb	<100	<100	<100	<100	<100	<100
Sc	15	15	20	15	15	15
Sn	<10	<10	<10	<10	<10	<10
Sr	100	100	200	100	70	100
Ti	2,000	2,000	3,000	2,000	1,500	2,000
V	150	150	200	100	100	100
W	<50	<50	<50	<50	<50	<50
Y	10	10	20	20	10	10
Zn	<200	200	<200	<200	<200	<200
Zr	50	50	50	100	100	100

Element	Comp. Sample Number 4680-4684	4685-4695
Fe	7%	5%
Ca	1.5%	2%
Mg	1%	1.5%
Ag	<1	1
As	<500	<500
B	10	15
Ba	300	500
Be	<2	<2
Bi	<10	<10
Cd	<50	<50
Co	20	20
Cr	50	30
Cu	3,000	2,000
Ga	10	10
Ge	<20	<20
La	<20	<20
Mn	1,000	2,000
Mo	200	200
Nb	<20	<20
Ni	10	10
Pb	<10	20
Sb	<100	<100
Sc	15	15
Sn	<10	<10
Sr	150	100
Ti	2,000	2,000
V	150	150
W	<50	<50
Y	20	20
Zn	<200	1,000
Zr	30	150

Charles E. Thompson

Charles E. Thompson
Chief Chemist