

# NORTHWEST GROUP

018100

GEOLOGICAL SETTING (cont.)

## GEOLOGICAL SETTING

PURDEX MINERALS  
by D.A. Campbell.

The town of Terrace, B.C. is located in a broad intermontane valley formed at the crossing of the present Skeena Valley and what was probably a major preglacial river valley which is now occupied by the Kitimat River. West and south of the Terrace basin the Coast Range Mountains rise to elevations of from 5,000 to 6,500 feet. East of the basin the Bulkley Ranges tower to elevations of 6,000 to 8,000 feet, the elevation of the Terrace basin being about 500 feet. The Zymoetz River flows westward from the Bulkley Ranges to join the Skeena River at the northeast corner of the basin. The Northwest Property is located in the Bulkley Mountains on the north side of the Zymoetz River exactly 24 miles due east of Terrace. The showings, comprised of copper mineralization in a sequence of volcanic rocks, are distributed over a distance of about two miles north from the Zymoetz River from an elevation of approximately 2,500 feet to the summit of the mountain ridge at 4,500 feet.

The Terrace basin is located on the eastern edge of the Coast Range batholith of granodioritic intrusive rocks. West and south of Terrace the terrain is underlain predominantly by granodiorite intrusives. North and east of Terrace the mountains and valleys are underlain by Mesozoic formations which have been extensively intruded by apophyses of granodiorite from the batholith to the west. (Fig. 1).

The western fringe of the intruded rocks, within 16 miles east of Terrace, is comprised predominantly of Triassic sedimentary rocks including limestones, sandstones and cherts. East of these rocks the underlying formations are the volcanic and sedimentary rocks of the Hazelton Group of Jurassic age. The western border of this group lies approximately four miles west and north of the Northwest Property.

The Northwest Property and the mountain ridge on which it is located is entirely underlain by Hazelton Group volcanic rocks which, in this area, are comprised of andesitic to basaltic flows and pyroclastics all apparently complexly intercalated with one another. The volcanic rocks occur in beds ranging in thickness from 25 to 100 feet. The beds consistently strike north to northeast and dip to the east at 35 to 60 degrees.

Regional faults or shear zones with minor displacements have been mapped in the region. They trend northnorthwest and dip steeply westward. One north-trending, steeply west dipping shear zone exposed on the Northwest showings may be related to these regional structures.

### Property Geology

Most of the claim area covers a heavily forested mountain side but near the summit of this ridge bedrock crops out commonly as scarps and bluffs. The summit of the

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PROPERTY FILE

GEOLOGICAL SETTING ( cont'd)

mountain in the claim area is largely comprised of glaciated bedrock ridges interspersed with alluvium filled meadows and draws. The discovery showings are along a bluff a few hundred feet below the edge of the summit of the mountain. Bluffs and ridges form the only outcrops in this area and overburden ranges in depth from a few feet on ridges to tens of feet in the draws and basins. From the discovery bluffs to and onto the summit of the mountain outcrops are abundant enough to permit mapping of the general geology, however, below the discovery area outcrops are few and scattered, being mostly bush-covered bluffs, and geological correlation becomes increasingly difficult. The writer mapped only the immediate area of the original showings, and logged the core of the holes drilled in that area, however, a sketch reconnaissance by Bralorne geologists is available for the summit portion of the claim group. The new discovery, No. 2 Zone, located down the mountainside from the original showing has been mapped only in a cursory manner so the geology in that area is not yet well defined.

In the region of the original discovery a sequence of volcanic rocks strikes northward and dips east at 60 to 35 degrees. From the east of the area, where the surface exposures end at a drift-filled draw, probably a fault, the sequence of volcanic beds, from the top to bottom is approximately as follows:

<u>Rock Type</u>	<u>Thickness of bed (ft.)</u>	<u>Description</u>
1. Tuff	+ 10	Red-maroon, massive, dense, fine course-grained.
2. Agglomerate (tuff)	30 - 40	Maroon, streaky, massive, fine grained to fragmental.
3. Aphanite	50	Grey-maroon, massive, dense, aphanitic. Probably tuff.
4. Feldspar porphyry	120	Pink-grey, aphanitic, feldspar phenocrysts. Intrusive.
5. Aphanite	30	As #3.
6. Agglomerate	+ 20	As #2.

The feldspar porphyry is intrusive into this sequence and appears to be a sill-like structure in this area. Immediately north and east of this area the outcrops are all feldspar porphyry. According to the mapping by Bralorne in 1963 the entire summit of the mountain covered by the northeastern portion of the claim group is underlain by feldspar porphyry.

Southeast of the main showings, across the shear zone or possible fault, trenches and drilling have revealed purple and red amygduloidal, vesicular and porphyritic andesite-basalt flow rocks.

About 1/2 a mile south of the main showings, at the newly discovered No. 2 Zone, the exposed rock types are tuffs and amygduloidal flows, all of which appear to be mineralized with bornite and chalcocite.

of fragments in the rock ranges from about 50 percent to nil, as the agglomerate locally  
Contacts of the agglomerate with the adjacent aphanite are not well exposed  
Mineralization: is sharp in some places and gradual in others.

A number of exposures on the main discovery showings are stained with malachite but generally the mineralized outcrops have been smoothed by glaciation and are unmarked by stain, being deceptively inconspicuous. Because of this surface veneer of polishing and leaching it has been found advisable to blast off the surface of the rock to a depth of a few inches at least to permit dependable sampling.

The ore mineralization at the main showings consists of bornite and chalcocite finely disseminated in the volcanic rocks. The commonest sites of mineralization in the rocks are in fine fractures and incipient openings along flow structures. At these places and adjacent to them the rock is host to microscopic specks and/or thumb-nail sized splashes of bornite and/or chalcocite. At the main showing the most profusely mineralized rock is the agglomerate in all exposed beds. In this rock the copper minerals replace the tuffaceous matrix between the fragments comprising the agglomerate. Coarse tuffs are also mineralized in the same manner but less profusely. In some places the aphanite rocks, which are probably tuffs, are sparsely mineralized with disseminated chalcocite. It is apparent that the more porous volcanic fragmental tuffaceous and flow breccia rocks are the most favoured hosts for copper mineralization.

It is obvious from megascopic and microscopic study of ore specimens that the bornite and chalcocite have been introduced into the rocks and tend to replace the finer grained matrices of the particular host rock, whether tuff or agglomerate. To date it has been found that the dense fine grained rocks, i.e. aphanite, massive flows, feldspar porphyry etc., are not favourable hosts for the copper mineralization.

The grade of the mineralization has been well established from a large number of bulk samples from all showings as well as from old and recent core samples. With noteworthy consistency there are only minor amounts of marginal grades of 0.10 to 0.50 percent copper in the showings sampled to date. More generally the grade ranges from nil to trace in the barren rock and increases to high grade sharply in mineralized rock. The grade in the mineralized rocks at all showings consistently ranges from one to four percent copper with a general bulk average apparently in the vicinity of two percent. As the ore controls become better known it may well be possible to upgrade the ore by selective mining.

#### MAIN SHOWING - (ZONE 1)

The writer's geological plan is shown in Figure 3. As shown on it, the original discovery showings are exposures along a bluff of a bed of volcanic tuffaceous agglomerate. This rock is characteristically maroon coloured and is comprised of angular fragments up to one inch in diameter in a matrix comprised of fine to course tuff. The percentage

## ECONOMIC GEOLOGY (cont'd)

of fragments in the rock ranges from about 60 percent to nil, as the agglomerate locally grades into tuff. Contacts of the agglomerate with the adjacent aphanite are not well exposed but they appear to be sharp in some places and gradational in others.

The discovery agglomerate bed, No. 1 Bed, is well exposed across its width along the south-facing bluffs and along its strike, over the top of the bluffs, in trenches for a distance of 200 feet. At the bluffs the bed is heavily mineralized with copper but at the north end the limited exposures indicate a petering out of the copper mineralization. These features have been generally confirmed by the old core holes drilled under the showings from the east. (The core of eight holes was relogged by the writer and the logs are appended to this report.)

Surface mapping and logging of the drill core revealed a gouge-filled shear zone that cuts off the agglomerate bed to the east (down dip) and underlies the alluvium-filled draw immediately east of the main showings. Recent drilling, (DH 1-64), has intersected a richly mineralized agglomerate bed on the east side of this fault, 170 feet below the surface, which is probably the faulted extension of the #1 bed.

Extensive surface trenching and recent sampling, together with three drill holes (#1, 2 and 7), indicate that in the No. 1 Bed a strike length of 150 feet is mineralized. To the north the bed continues but the copper in it drops to sub-marginal grades, to the south the bed passes under overburden and is possibly also terminated by the fault angling in from the east. (There is an alleged old drill hole in this area that intersected 37 feet of high grade copper.) The average mineralized width of the bed is about 30 feet, and the down dip depth from the surface to the shear zone (fault ?) is about 120 feet. From these dimensions the ore blocked out above the fault in No. 1 bed is:

$$\frac{150 (30) 120}{12} = 45,000 \text{ tons}$$

The approximate grade from surface sampling and drill core is 2 % Cu.

At 34¢ copper the gross value of this easily mined and milled orebody is \$612,000.

The recent intersection on the east side of the shear zone at a depth of 170 feet averaged 2.11 percent copper across 55 feet which represents a true width of 35 feet at the indicated dips in the area. Thus the promise of considerable additional ore down dip on this bed (No. 1) is excellent. Another drill hole is presently being drilled from the surface to confirm this most recent intersection. At least 5,000 feet of further drilling is warranted to confirm the position and grades of the No. 1 ore bed in the immediate vicinity of the main showings to a depth of 200 feet below surface.

In September of this year a reconnaissance soil sampling survey was made of the white shale group and a large number of medium to weak copper anomalies was detected

ECONOMIC GEOLOGY (cont'd)

NO. 2 BED, (ZONE 1):

Two hundred feet due west of the outcrop of the No. 1 Bed a limited outcrop at the base of a bluff is exposed of another identical maroon agglomerate bed that is heavily mineralized with copper. Only about 30 feet of length and ten feet of true width of this bed is exposed, both ends passing under deep overburden. A drill hole from the outcrop bearing due east across the dip (DH XI), intersected 29 feet of agglomerate richly mineralized with bornite. Surface samples of this bed average 3.26 percent copper.

Hole # 1-64, collared 80 feet south and west of this showing and 50 feet below it in elevation, intersected an agglomerate bed due south of the surface exposure but it is barren. This bed does not line up in dip with the mineralized portion of the bed on the surface, (No. 2 Bed), but the area where the bed should be is occupied in the hole by intrusive feldspar porphyry. It is evident from this that the No. 2 Bed should be explored to the north, away from the porphyry and to a limited extent further south until the configuration of the porphyry intrusive body is delimited.

Hole # 6 intersected what may be the down-dip extension of No. 2 Bed approximately due east of the outcrop and 200 feet down dip from it. This intersection assayed 1.5 percent copper across a true width of 35 feet. The host rock here is not an agglomerate but an intricately fractured very fine grained tuff which lies against a fault zone also intersected in the hole; thus, being in a different host rock, this intersection may not be related to the No. 2 Bed.

It is estimated that at least 5,000 feet of drilling will be required to fully explore the potential of the No. 2 Bed in the immediate area of the main showings. Certainly it would appear that the No. 2 Bed has a potential at least as great or double that of the proven portion of No. 1 Bed, i.e., 50-100,000 tons, at about the same grade.

KEELER SHOWING:

On the summit of the ridge approximately 3,000 feet north and east of the Main Showing, (No. 1 Zone), the Bralorne crews trenched an area of copper mineralization of comparable grade to that in the Main Showings and reportedly within feldspar porphyry rock. This showing has not been seen by the writer nor has any recent work been done on it. The geological mapping of the claim group which is recommended as part of next year's program will assist in assessing the nature and worth of this showing and determine if it warrants further work. On paper, the size and grade of the showing certainly suggests another important zone.

NO. 2 ZONE:

In September of this year a reconnaissance soil sampling survey was made of the entire claim group and a large number of medium to weak copper anomalies was detected

ECONOMIC GEOLOGY (cont'd)

on the mountainside west and south of the Zone 1 showings. One of these anomalies located 2,000 feet west and slightly south of Zone 1 has bedrock exposed in north-trending bluffs. Prospecting of this area revealed copper mineralization in volcanic rocks similar to Zone 1.

The volcanic beds in this area, now termed Zone 2, strike northeastward and dip 50 degrees to the southeast. The rock types reported by Mr. Agnew are tuffs, amygduloidal flows and flow breccias with minor intercalated thin-bedded greywackes and water-lain tuffs. Apparently all of the pyroclastic and flow rocks are mineralized with bornite and chalcocite. A series of four trenches to bedrock were excavated and sampled. These trenches are in an east-west line trending across the strike of the beds. The trenches are ten to 20 feet in length and spaced 100 feet apart thus the four of them span a distance across the beds of 400 feet, the hillside between the trenches is overburden. The type and grade of copper mineralization in these trenches is the same as that in Zone 1. From west to east the trench bulk samples assay as follows:

<u>Trench</u>	<u>Trench length samples (ft.)</u>	<u>Copper</u> %	<u>Rock Type</u>
6-2	18	2.56	
5-2	19	0.81	Tuff-agglomerate.
3-2 + (2-2)	43	1.54	Mixed.
1-2	15	2.53	Amygduloidal flow.

The consistency in grade in all of these trenches is noteworthy but the most important feature is that the samples include several different beds of different rock types. In addition, although only about 25 percent of the 400 feet of length of showing has been exposed and sampled all of that 25 percent is consistently rich in copper, (bornite and chalcocite). This of course suggests the possibility of the existence of a large tonnage deposit of relatively excellent grade.

The lateness in the season of the discovery of the No. 2 Zone did not permit more than the trenching to be done on it. The discovery definitely warrants bulldozer stripping, trenching and sampling and about 10,000 feet of diamond drilling to properly assess its potential.

ECONOMIC GEOLOGY (cont'd) CONCLUSIONS

OTHER AREAS:

The 20 or so soil anomalies on the property each deserve further investigation, particularly in view of the results of the No. 2 Zone discovery. The easiest way to do this in some cases would be deep and extensive stripping with a bulldozer, followed by hand trenching, blasting and sampling.

At the time of his examination in August the writer examined an exposure at the logging road bridge near the junction of the Zymoetz and Clore rivers. This showing is a southeast trending, steeply dipping fracture-shear zone, about two feet in width, in dense maroon aphanitic tuff. Within and adjacent to the zone the rock is impregnated with fine disseminations of bornite and the cracks are covered with malachite. The showing itself is limited in extent but in view of what we know from the copper occurrences on the Northwest Group to the north this showing should be thoroughly prospected.

The widespread geochemical soil anomalies on the property plus the known fracture-shear rock distribution and the widespread exposed mineralization all suggest the potential for a major copper deposit or several rich smaller deposits.

RECOMMENDATIONS

The writer recommends diamond drilling at the three known zones to define their extent and in further explore new exposures. The approximate distribution of minimum depths is as follows:

Zone 1, East	5,000 feet
Zone 1, West	5,000 feet
Zone 2, East	10,000 feet
Total	20,000 feet

These depths may be warranted of course as knowledge of the geologic structure.

It is also strongly recommended that a photogrammetric topographic map be prepared of the property and the property be prospected as soon as possible next year by a geologist well experienced in volcanic rocks.

It is recommended for lowering of operating costs that a jeep road be bulldozed to all showings from the end of the present logging road. It is also recommended that

## CONCLUSIONS

The proven ore on the No. 1 Zone indicates, that good grade, (2% Cu), medium to small tonnage, (50 - 100,000 tons), copper orebodies occur within certain volcanic beds in the Hazelton Group rocks underlying the Northwest Property of Purdex Minerals Ltd.

Geological indications plus limited drill results, suggest that the area has a potential for larger orebodies of similar grade.

There is little evidence to date suggesting very large tonnage, low grade deposits. The known deposits appear to cut off sharply rather than grade out into low grade material.

Very limited surface exposures in Zone 2 indicate the good possibility of the existence of either a large tonnage, good grade (2 - 4% Cu) deposit spread throughout several different beds of volcanic rock types, or, several small tonnage good grade deposits spaced closely to one another.

The widespread geochemical soil anomalies on the property plus the known favourable host rock distribution and the widespread exposed mineralization all suggest the potential for a major copper deposit or several rich smaller deposits.

## RECOMMENDATIONS

The writer recommends diamond drilling on the three known zones to delimit known ore and to further explore new exposures. The approximate distribution of minimum footage is as follows:

1. Zone 1, Bed 1	5,000 feet
2. Zone 1, Bed 2	5,000 feet
3. Zone 2	<u>10,000 feet</u>
Total	20,000 feet

More footage may be warranted of course as knowledge of the deposits expands.

It is also strongly recommended that a photogrammetric topographic map be prepared of the property and the property mapped as soon as possible next year by a geologist well experienced in volcanic rocks.

It is recommended for lessening of operating costs that a jeep road be bulldozed to all showings from the end of the present logging road. It is also recommended that



RECOMMENDATIONS (cont'd)

the bulldozer be retained, (No less than a D-7), and as much stripping of showings and geochemical anomalies be done as deemed feasible.

It is recommended that bulldozer stripping and trench blasting be done as much as feasible in all directions from the discovery showings on Zone 2.

It is strongly suggested that the open ground east and south of the company's property be staked as soon as possible.

All samples should be assayed for silver as well as copper but I understand this is already being done.

A suite of ore and rock specimens is being given to a student geological engineer at U.B.C. for use as thesis material to be finished next spring. It is the writer's intention to help this student's research in hopes that we might gain further useful knowledge as to the character of the ore mineralization. This investigation will be at no cost to Purdex.

Respectfully submitted,

D. D. Campbell, PhD. P.Eng.

NO. 2

2470

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GEOLOGICAL SECTION  
NORTHWEST GROUP

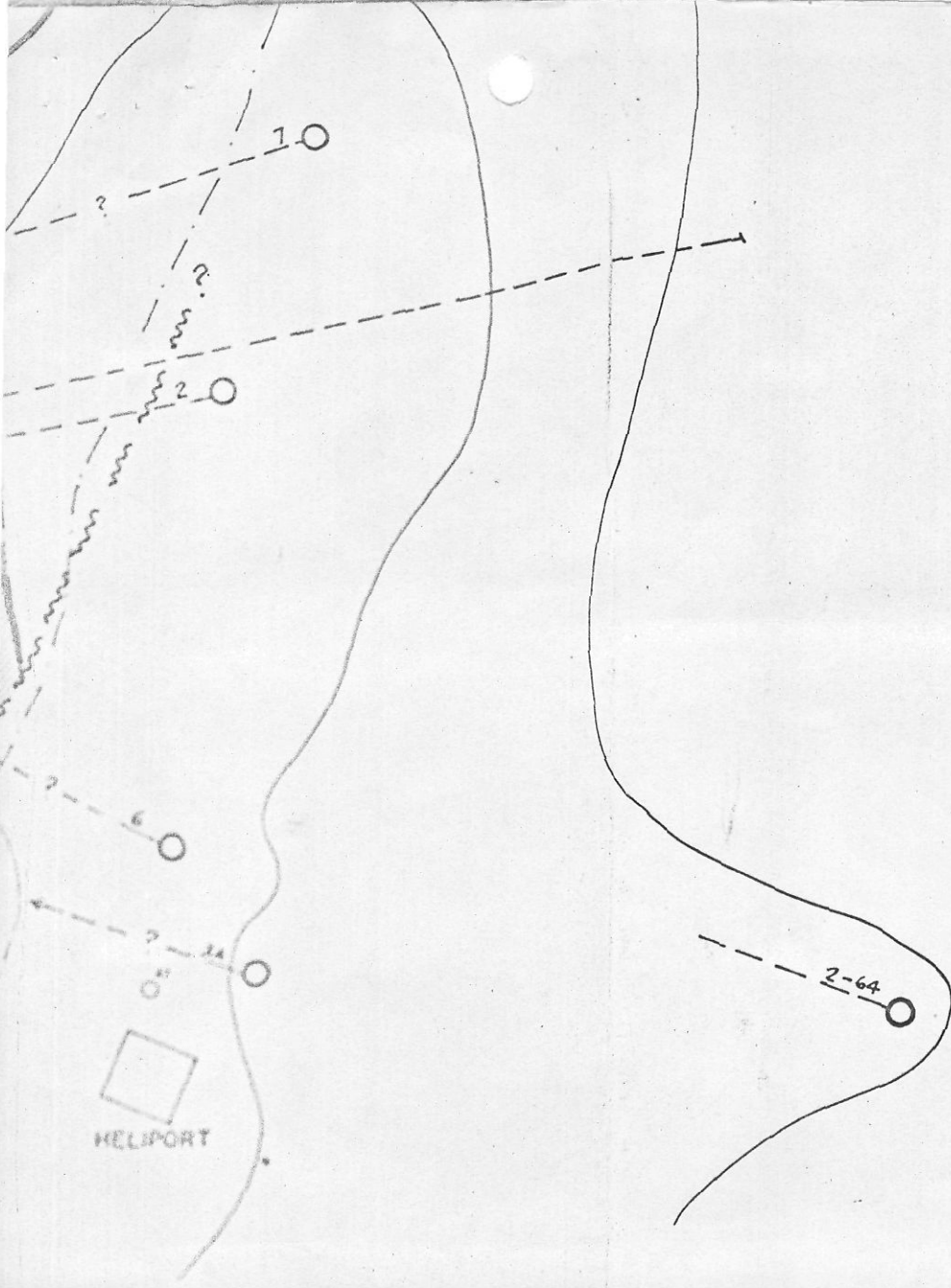
THROUGH DDH 6

ZONE 1 - (DISCOVERY) GERRAGE, B.C.

SCALE 1" = 30'

NOV. 1 1964

FIG 4



1.64	455	455
2	175 +	= 250
3	40 +	? 55
4	175 +	250
5	130	? 185
6	175 +	? 250
7	105	? 150
8	215 +	= 305
9	85	= 120
		<hr/>
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GEOLOGY PLAN NORTHWEST GROUP

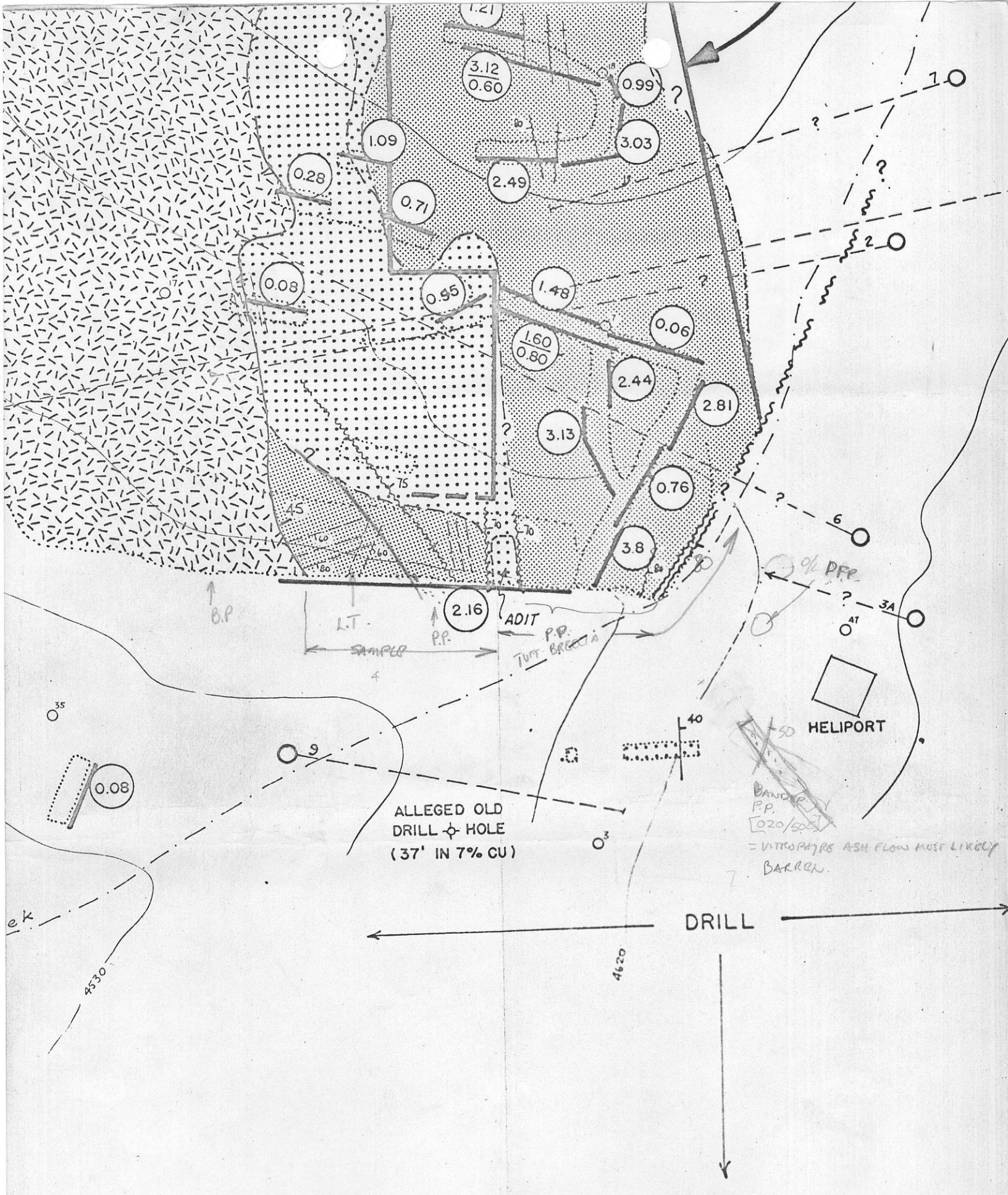
ZONE NO. 1 - MAIN SHOW

TERRACE, B.C.

SCALE : 1" = 30'

NOV. 1 1964

FIG. 3



NO. 2 BED

4.03

3.64

2.11

0.05

0.51

0.63

1-64

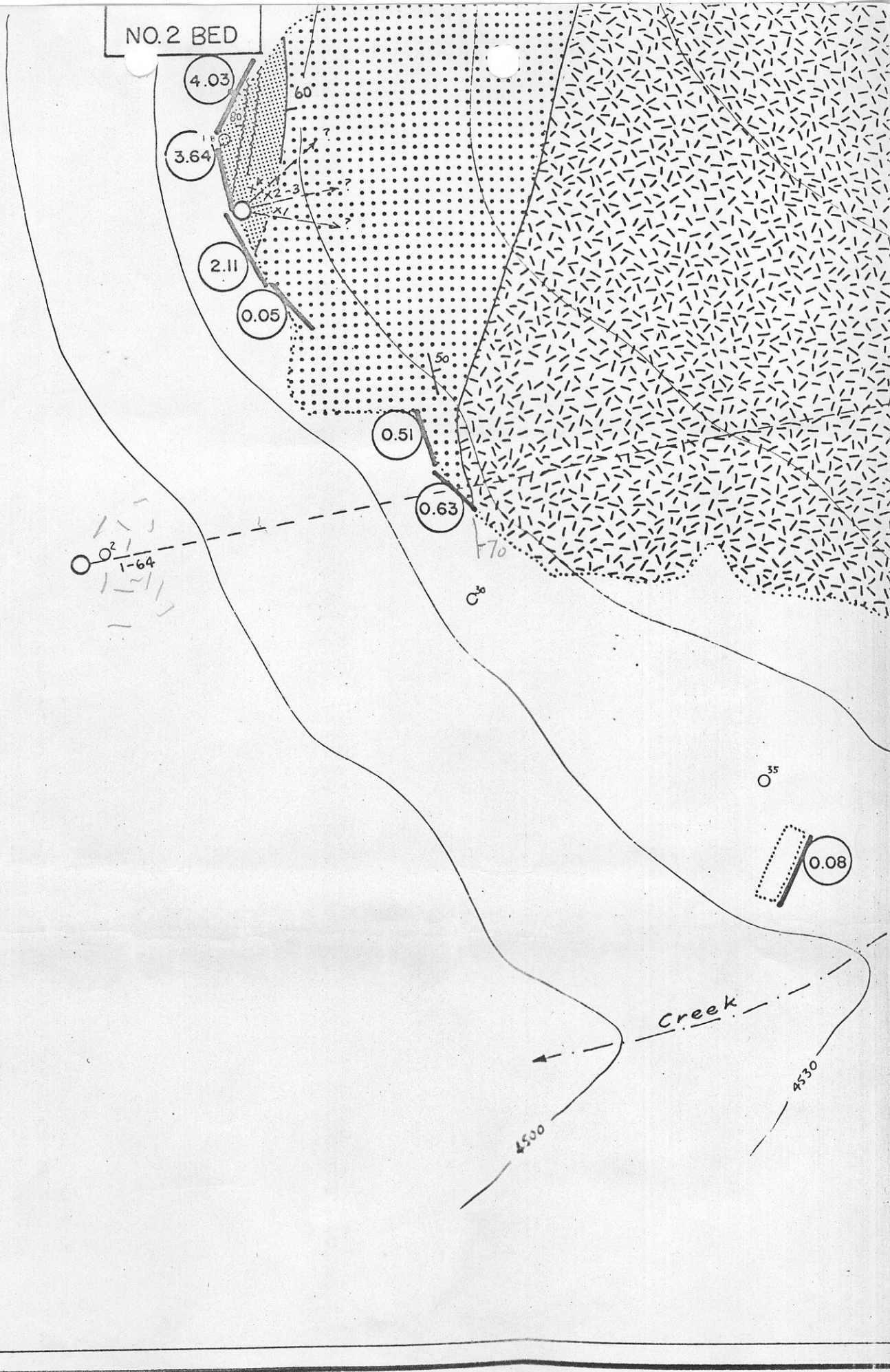
35

0.08

Creek

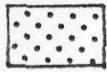
4500

4530

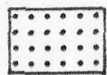


# LEGEND

## VOLCANICS



PORPHYRITIC "SPOTTED" FLOWS. (MULTICOLOURED)

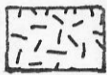


APHANITE OR TUFF. (DENSE, MAROON)



AGGLOMERATE AND COARSE TUFF

## INTRUSIVE



FELDSPAR PORPHYRY = B.P.



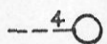
BEDDING ATTITUDE



FAULT ( MAPPED , INFERRED )



FRACTURES



DIAMOND DRILL HOLE



OPENCUT



OUTCROP

## ASSAYS



% COPPER , LENGTH OF SAMPLE = HEAVY LINE



% COPPER  
% SILVER

CONTOURS EXACT BUT ELEVATIONS APPROXIMATE

PROSPECT

46

35

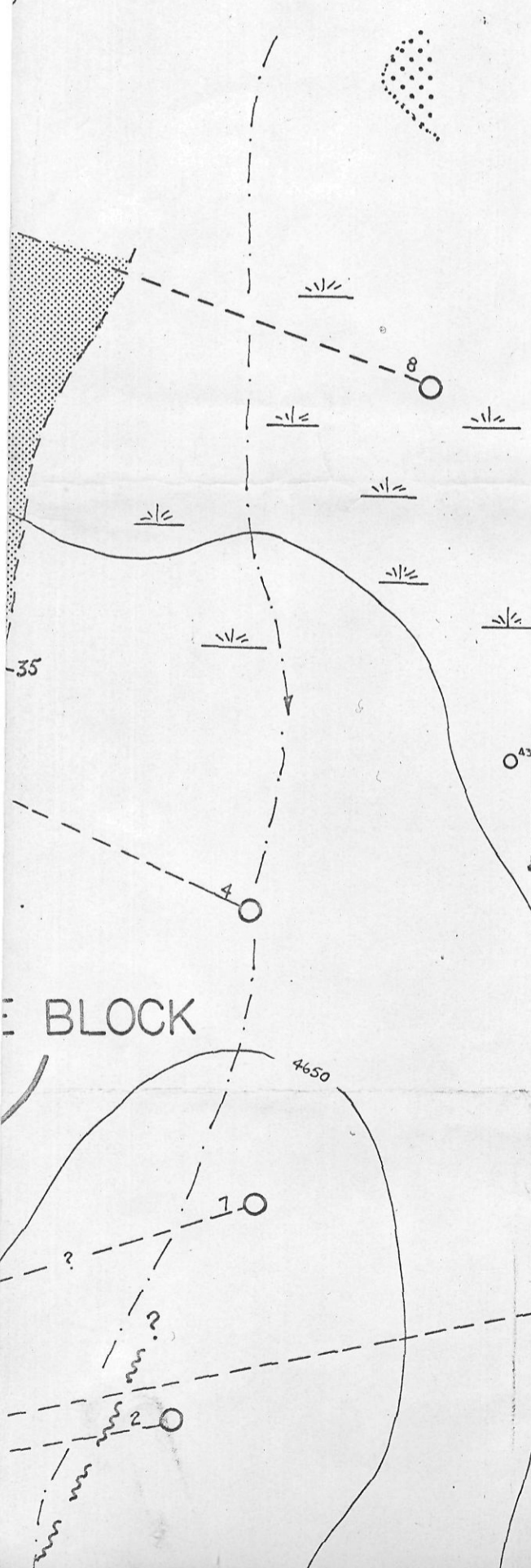
E BLOCK

4650

10

20

40



HELIPORT

50

50

ALL SHATTERED & FILLED WITH B.P. INTERSTICE

STRIP & PROSPEC

AM 508  
15 0 48

46

4680

4680

35

NO. 1 BED

ORE BLO

0.24

1.21

3.12  
0.60

0.99

3.03

1.09

0.28

2.49

0.71

0.08

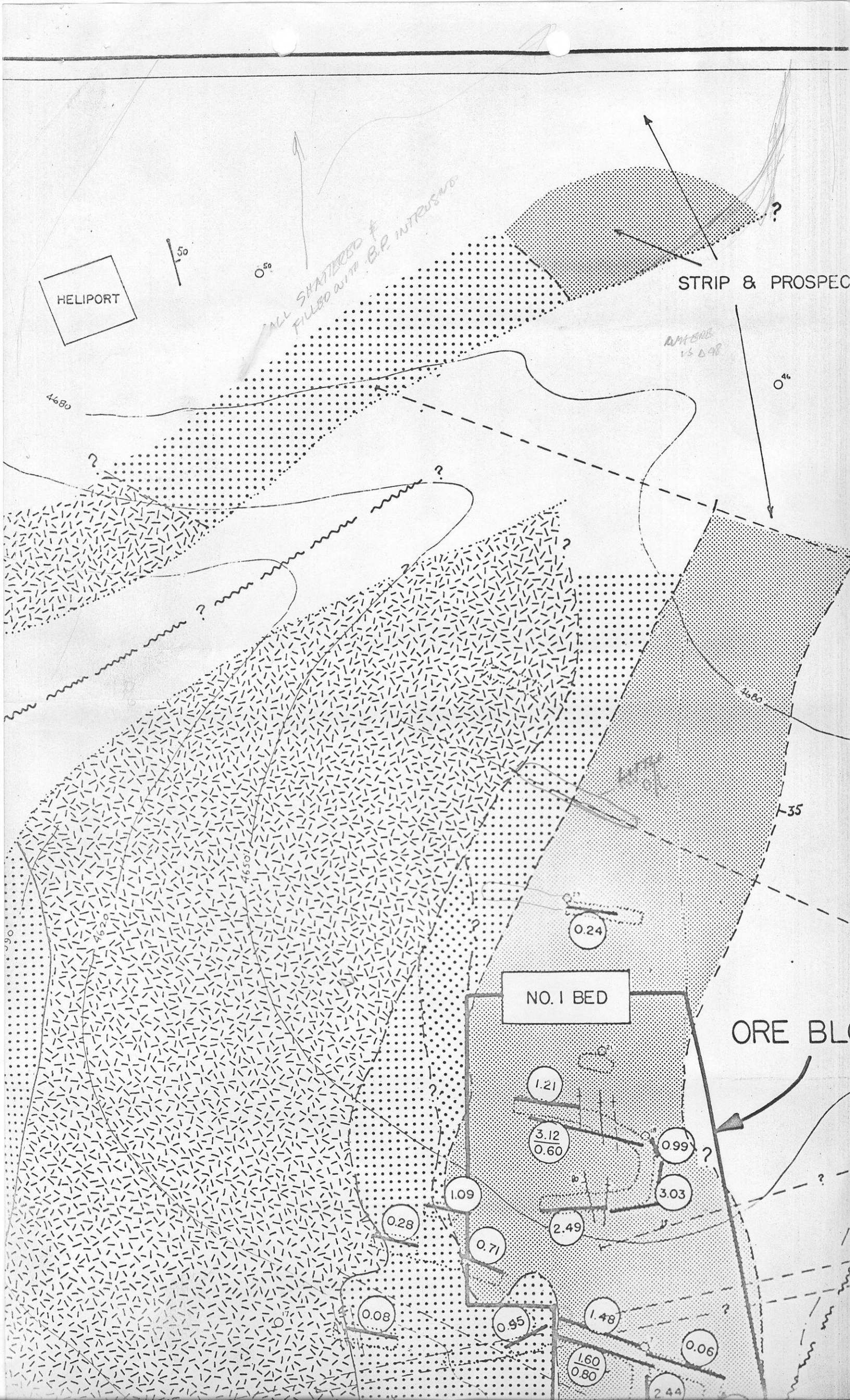
0.95

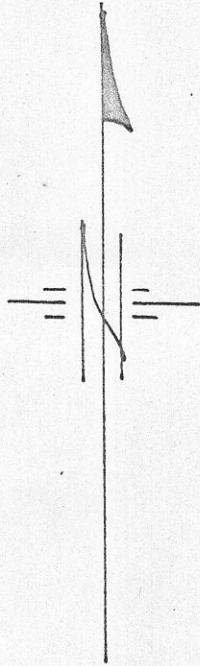
1.48

1.60  
0.80

0.06

2.44





HELIPORT

50

4680

4650

4620

?

?

4500

NO. 2 BED

4.03

3.64

2.11

0.05

4560

4590

4620

4650

60

80

X2-3

50